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Chapter 14

Air Quality

14 Air Quality

Introduction

14.1. The original Environmental Statement (ES) submitted in March 2014 considered a range of potential local air quality impacts due to emissions during construction and operation of the facilities. This was followed by a series of addendums in September 2014, October 2016 and March 2019, which identified that the key findings of the original assessment remained valid i.e. not significantly affected by factors such as building dimensions, background pollution, vehicle movements and model updates. The same conclusion was reported in the latest update to the air quality assessment completed in the ES addendum submitted in September 2023.

14.2. The principal aim of this April 2025 addendum to the Air Quality ES chapter is to address a specific request from Northern Ireland Environment Agency (NIEA) in their 19 April 2024 consultation response to the ES addendum submitted in September 2023 for additional modelling of operational emissions and to consider the findings in light of the 2014 assessment.

14.3. Specifically, the NIEA request was for a revised study using:

- the latest versions of air dispersion modelling software (AERMOD and ADMS);
- an up-to-date five-year meteorological dataset (2019 to 2023);
- the latest background air quality concentrations; and
- latest sensitive receptor locations.

14.4. This additional request from NIEA was the subject of discussion to agree the scope of additional assessment to be included in this ES addendum. That discussion took place online via a Teams call with a representative from the Industrial Pollution and Radiochemical Inspectorate (IPRI) of NIEA on 11th June 2024, to determine the scope of the update. The design parameters relating to emissions from the EfW remain the same as for the ES in March 2014. The target opening year is now 2029, with 2030 being the first anticipated full year of operation.

14.5. It was agreed that, given the results presented in the original draft 2014 permit application showed total concentrations were not of concern and there has been no change to the design, the update should focus on:

- emissions from the Energy from Waste (EfW) facility;
- normal and abnormal operational scenarios;
- human health and ecological impacts;

- plume visibility and effects of a nearby wind farm[1].

14.6. Further assessment has also been undertaken following an objection sent to the Minister for Infrastructure from community group NoArc21 on 5th June 2024, who raised the following concerns regarding traffic and odour.

- Lack of quantitative assessment of road traffic emissions and consideration of the potential for combined impacts of stack and road traffic emissions; and
- Potential for odours from untreated waste to affect the amenity of local residents;

14.7. The specific aspects that have been considered in this chapter are therefore:

- Baseline air quality and receptors;
- Traffic emissions during operation;
- Odour emissions from waste handling;
- Stack emissions from the EfW, including plume visibility and wind farm impacts;
- Cumulative impacts of stack and traffic emissions.

14.8. It is intended that this addendum is read alongside the original March 2014 ES chapter and addendums prepared in September 2014, August 2016, March 2019 and September 2023.

14.9. The lead author of this ES addendum chapter is an Environmental Chemist (BSc, MSc), Member of the Institution of Environmental Sciences (MIEnvSci) and Fellow of the Institute of Air Quality Management (FIAQM). They have 25 years' experience in undertaking air quality and health risk assessments for planning and permitting and have led air quality assessments for Environmental Impact Assessments for high profile and nationally significant infrastructure projects including Hynet, Horizon, East West Rail, Wrexham and Meaford Energy Centres, Port of Tilbury, Tees Valley and BP Kinneil. They are regularly engaged by planning authorities to undertake peer reviews of detailed dispersion modelling for road and rail transport, and waste to energy projects; have presented evidence at several DCO hearings, planning hearings and public inquiries, and are an active member of the IAQM committee over the last five years.

Methodology

Traffic emissions

14.10. At the time of the ES addendum submissions in March 2019 and September 2023, further assessment of the potential impacts of traffic emissions was scoped out because the traffic flows did not exceed National Highways' Design Manual for Roads and Bridges (DMRB)[2] screening

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[1] At the time of writing only one turbine is understood to be under construction, as part of the committed development at Ballyutoag (T/2014/0478/F). A review in 2023 did not identify any additional consented or proposed local windfarms.

[2] National Highways, DMRB LA105 Air Quality, November 2019, available at [LA 105 - Air quality (standardsforhighways.co.uk)](https://www.standardsforhighways.co.uk)

criteria and because the background air pollutant concentrations meant air quality criteria at sensitive locations would be unaffected and a qualitative assessment concluded there would at most be “a marginal deterioration in the existing local air quality” due to the traffic travelling to and from the proposed development.

14.11. There remains a very low risk of exceedances of air quality criteria in the revised opening year of 2030. However, objector group concerns refer to the Institute of Air Quality Management (IAQM) guidance for development planning[3] published in 2017, which contains more stringent screening criteria for traffic. To address these concerns, a quantitative assessment of the impact of operational vehicle movements associated with the proposed development for the revised opening year has been undertaken.

14.12. The need for an assessment of impacts commences with the indicative criteria given in Table 6.2 of the IAQM (2017) guidance. Of relevance to the proposed development, the criteria indicate an air quality assessment is required if traffic flows generated by a development exceed:

- a change of light duty vehicles (LDV) of more than 500 Annual Average Daily Traffic (AADT) (or more than 100 AADT within or adjacent to an AQMA); or
- a change of heavy duty vehicles (HDV) of more than 100 AADT (or more than 25 AADT within or adjacent to an AQMA).

14.13. For those road links where the changes in traffic flows due to a development exceed one or both of the above criteria, and there are sensitive receptors within 200 metres of the road, pollutant concentrations are estimated and compared with relevant Air Quality Strategy (AQS) objectives.

14.14. The existing local air quality within the study area is good (see Baseline section of this addendum), and there is a low risk of exceedences of AQS objectives. It is therefore proportionate to undertake a simple quantitative assessment. The National Highways’ DMRB spreadsheet has been used to estimate the contribution from proposed development traffic emissions to pollutant concentrations at roadside receptors. The DMRB screening calculation uses the latest version of Defra’s emissions factor toolkit (EFT) to calculate traffic emissions based on updated traffic flows, speeds and fleet composition provided by the Transport Planners (details in April 2025 ES addendum chapter 12).

14.15. The local air quality assessment focuses on the impacts of the key air pollutants nitrogen dioxide (NO_2), nitrogen deposition and particulate matter (PM_{10}) as the air quality criteria for these pollutants are likely to be most difficult to achieve in the vicinity of roads. A conservative assessment is provided using traffic estimates for the year 2030, which is the first full opening year of the proposed development, but using vehicle emission factors for the year 2029, which is the earliest anticipated opening. This means the full traffic growth expected for 2030, is combined with slightly more conservative emission factors for a 2029 vehicle fleet composition (as this will

[3] IAQM ‘Land-Use Planning & Development Control: Planning for Air Quality’, Version 1.2 (2017), available at https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

be slightly older compared to 2030). By estimating air pollutant concentrations under these conservative assumptions at properties closest to the roadside, the results can be considered robust.

14.16. The National Highways' DMRB screening tool[4] is a spreadsheet-based model which uses a simple algorithm based on distance from the road centreline, to estimate pollutant concentrations at receptor locations. It uses information on:

- AADT traffic flows for LDVs and HDVs;
- average traffic speeds as a speed band category, determined in accordance with DMRB LA 105 (paragraph 2.29 – 2.38 and Appendix 14.1);
- National Highways speed band emission factors (based on Defra's Emission Factor Toolkit (EFT) v12.0.1)[5]; and
- information on road alignment and road width (taken form aerial photography).

14.17. To allow a comparison with relevant air quality criteria, the road NO_x estimated through the DMRB screening tool was converted to NO_2 using Defra's 2029 mapped background pollutant concentrations in line with Local Air Quality Management (LAQM) guidance[6].

14.18. In summary, the assessment comprises:

- Identification of sensitive receptors (human and ecological) on the road network affected by the proposed development traffic;
- Comparison of development traffic data flows against the assessment criteria in IAQM guidance for development planning;
- Assessment of operational traffic emissions using the DMRB spreadsheet tool at a selection of sensitive receptors near the affected roads within the study area;
- Assessment of cumulative impacts of the EfW stack and road traffic emissions at key locations; and
- Comparison of results to the IAQM (2017) significance criteria (see below).

Assessment of Significance

14.19. The changes in pollutant concentrations have been evaluated using the IAQM (2017) assessment criteria. The IAQM matrix for describing the impact of a change in concentration at individual receptors is reproduced in Table 14-1. These descriptors are used in the assessment

[4] National Highways, DMRB Air Quality Spreadsheet Version Draft DMRB V9_EFTV12.0.1

[5] https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/

[6] NOx to NO2 Calculator | LAQM, accessed on February 2025

of changes to annual mean concentrations of NO_2 and PM_{10} with the proposed development, and range from negligible to slight, moderate or substantial. The impact description depends upon:

- the larger value of the total concentration without or with the proposed development, as a percentage of the relevant Air Quality Assessment Level (AQAL i.e. the AQS objective); and
- the change in concentration, classified according to the percentage change relative to the AQAL of interest. The change is calculated based on concentrations rounded to one decimal place. The percentage change is then rounded up or down to the nearest whole number before application of the impact descriptor.

Table 14-1 - IAQM Planning Guidance Air Quality Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor	**Percentage Change in Concentration Relative to AQAL***			
	1	**2 – 5**	**6 – 10**	**>10**
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

* Changes in concentration as a percent are rounded. Changes of less than 0.5% can be described as negligible.

14.20. The overall determination of significance of effect requires the professional judgement of a suitably qualified air quality professional. This judgement must take account of such factors as:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts (i.e. extrapolating the findings from the individual modelled receptors); and
- the influence and validity of assumptions adopted when modelling the impacts.

14.21. The combined contribution from EfW stack emissions to pollutant concentrations at the most affected properties has also been derived using the output from an updated air dispersion modelling study and combined with the pollutant concentration at receptors for a cumulative assessment with road traffic and local background.

Odour emissions

14.22. Dispersion modelling of emissions of odour from the MBT facility was undertaken for the March 2014 ES. This showed that potential odour emissions from the MBT stack with the proposed exhaust air treatment system are unlikely to cause annoyance or arise in complaints from nearby residents.

14.23. A qualitative screening assessment has been undertaken in line with the IAQM (2018) odour guidance to consider potential impacts from the proposed development from non-point (diffuse) sources of odour.

14.24. The IAQM published guidance for the assessment of odour for planning[7] in 2018. This guidance sets out a methodology for assessing the effects of odour on amenity. The scale of the exposure would be determined by the parameters collectively known as FIDOL factors (Frequency, Intensity, Duration, Odour unpleasantness and Location).

14.25. The IAQM (2018) guidance has been developed to assist in the assessment of the effects of odour on amenity. The IAQM guidance notes that for an adverse effect to occur there must be an effective odour exposure pathway. For odour exposure to occur, all three links in the source-pathway-receptor chain must be present.

14.26. The magnitude of effect experienced is determined by the scale of the exposure (considering the Frequency, Intensity, Duration and Odour unpleasantness (FIDO)) and the sensitivity of the receptor (L, denoting the location), which is often taken to be a surrogate for the sensitivity and incorporates the social and physical factors that can be expected for a given community.

14.27. The risk of exposure is determined based on the Source Odour Potential and the Pathway Effectiveness. The first stage of assessment is therefore to categorise the Source Odour Potential, with examples shown in Table 14-2.

Table 14-2 - Source Odour Potential Criteria

Odour Potential	Description
Large	Large permitted processes of odorous nature or large Sewage Treatment Works (STWs);

[7] IAQM, 'Guidance on the assessment of odour for planning', Version 1.1 (2018), available at https://iaqm.co.uk/text/guidance/odour-guidance-2014.pdf

	Highly odour compounds with very low detection thresholds with unpleasant to very unpleasant odours; Open air operation with no containment.
Medium	Smaller permitted processes or small STWs, 1000s of tonnes per year; Moderately odorous compounds with neutral to unpleasant odours; Some mitigation measures in place, but significant residual odour remains.
Small	Below Part B threshold, 100s of tonnes per year; Mildly odorous, processes classed as less offensive; Effective, tangible mitigation measures in place (e.g. Best Available Techniques (BAT), Best Practicable Means (BPM) leading to little or no residual odour.

14.28. The next stage is to determine the Pathway Effectiveness as a transport mechanism for odour, as shown in Table 14-3. This includes consideration of the distance, whether the receptors are down wind of the odour source, the effectiveness of the release, the topography and terrain between the source and receptor. Using the following risk ranking the Pathway Effectiveness can be categorised as ineffective, moderately effective or highly effective.

Table 14-3 - Pathway Effectiveness Criteria

Pathway Effectiveness	**Description**
Highly Effective	Receptor is adjacent to the source/site; Direction – high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind).
Moderately Effective	Receptor is local to the source.
Ineffective	Receptor is remote from the source; Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind).

14.29. The effect of that odour impact on the exposed receptor is then estimated, taking into account its sensitivity, as shown by the matrix in Table 14-4.

Table 14-4 - Odour Effect Criteria

Risk of Odour Exposure	**Receptor Sensitivity**		
	Low	**Medium**	**High**
High	Slight Adverse	Moderate Adverse	Substantial Adverse
Medium	Negligible	Slight Adverse	Moderate Adverse
Low	Negligible	Negligible	Slight Adverse
Negligible	Negligible	Negligible	Negligible

14.30. Where the effect is greater than "slight adverse" it is likely to be considered significant for the purpose of Environmental Impact Assessment (EIA).

Stack emissions

14.31. Operation of the proposed development requires an Environmental Permit from IPRI. The March 2014 assessment of emissions to air for planning and permitting followed the Environment Agency's environmental permitting guidance, in particular Horizontal Guidance H1 Environmental Risk Assessment and associated H1 Annex A – Amenity and accident risk from instillations and waste activities, and Annex F – Air Emissions.

14.32. The H1 Annex A and Annex F guidance was withdrawn on 1st February 2016 and the latter replaced with online guidance 'Air emissions risk assessment for your environmental permit'[8] which effectively outlines the same approach within the H1 Annex F. Therefore, the approach applied for the original air quality assessment completed in March 2014 remains broadly appropriate today. Since publication, the online guidance has had several updates, most recently on 21 May 2024. Updates to methodology are mostly minor, though some Environmental Assessment Levels (EALs) have been added, revised or removed. This addendum takes account of the relevant updates.

[8] Air emissions risk assessment for your environmental permit, EA, 2016. Accessed 25/11/24 at: Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)

14.33. The updated dispersion modelling study presented in this addendum has used more recent versions of the United States Environmental Protection Agency (US EPA)'s dispersion modelling and meteorological data processing software AERMOD and AERMET (version 23132, the latest available at the time the work was conducted in 2025).

14.34. In line with the 2014 assessment, modelling has also been undertaken using the latest version of Cambridge Environmental Research Consultants (CERC)'s Atmospheric Dispersion Modelling System (ADMS), version 6. This was undertaken to investigate:

- differences in results when using a different dispersion algorithm to that in AERMOD;
- effects of the committed Ballyutoag wind farm on plume dispersion; and
- plume visibility.

14.35. The 2014 ES modelling study utilised hourly sequential meteorological data for Belfast International Airport covering the period 2004 to 2012.

14.36. NIEA IPRI specifically requested in their consultation response to the Department in April 2024 that the modelling be re-run utilising recent meteorological data. Accordingly, the updated study uses a recent five-year meteorological dataset for the period 2019 to 2023. The data provider, ADM Ltd, was consulted to confirm that this site remains the most suitable source of meteorological data in the format required for dispersion modelling. It was also confirmed that no changes to the location or anemometer height and of the surface roughness parameters were required in the processing of the meteorological data.

14.37. No changes to terrain data files or modelled receptor locations (both discrete and grid receptors) have been necessary.

14.38. It was agreed with IPRI that the EfW stack emissions could be the focus of the updated study, as this stack is substantially taller and has a higher flow rate and associated emission rates than other on-site emission points including the MBT. The design parameters relating to emissions from the EfW as well as other model inputs including on-site structures remain unchanged from that used in the original 2014 ES and subsequent addenda other than a non-material change to the bottom ash bunker building (reported in the September 2014 ES Addendum (paragraphs 6.20 to 6.29), which has been incorporated in this model update.

14.39. This updated study considers the normal and abnormal operation of the EfW. All hours of the year have been modelled to identify maximum short-term and long-term concentrations using the five-year meteorological data set. The results presented are conservative in terms of the maximum field-wide ground level concentrations for short and long-term exposure at sensitive human health and ecological sites. The updated assessment of normal operation furthermore assumes, as for the 2014 ES, that emissions are continuous at 100% of the emission limit values (ELV) in the Industrial Emissions Directive (IED) 2010/75/EC (see March 2014 ES Table 14.2).

14.40. The results of both the updated AERMOD and ADMS studies have been interpreted using the latest background data and published assessment criteria in Environment Agency online air emissions risk assessment guidance and the Air Pollution Information System (APIS) website[9]. Background pollutant concentrations have been updated where more recent values are publicly available. Some pollutants are, however, no longer measured and thus it has not been possible to update these values.

14.41. Nitrogen and acid deposition rates have been calculated and compared against the latest critical loads for sensitive habitats, with consideration of the latest background estimates for deposition.

14.42. The plume visibility assessment has been updated using the latest version of the module in ADMS. This provides an estimation of the frequency that a visible plume may occur, along with its length and whether a visible plume may reach ground level. The findings are presented in Section B.3 of Appendix 14.2. The full appraisal of potential visible plumes in relation to visual amenity is provided in the ES addendum Chapter 10, Landscape and Visual Impact

Baseline Conditions

Site location

14.43. There are no changes to the proposed facility location since the last review undertaken for the ES addendum in September 2023[10].

Sensitive receptors

14.44. Google Earth aerial mapping and datasets from the Department for Agriculture, Environment and Rural Affairs (DAERA)[11] have been consulted to check for new potential sensitive receptors (human health and ecological) in the study area for the air quality assessment.

14.45. A new committed development of residential properties (55 dwellings) has been identified to the north east at land west of Hydepark Lane. This, and an extension to the Diageo Baileys Global Supply facility, has been considered as part of the update to the traffic assessment.

14.46. No additional receptors have needed to be included in the assessment for this addendum, as there were already receptors included near the committed development area in the previous studies.

Local Air Quality Management

14.47. The proposed development is located in an area of relatively good air quality and does not lie within an Air Quality Management Area (AQMA).

14.48. Due to the changes in local council boundaries since 2014, existing local air quality has been considered with reference to the Antrim and Newtownabbey Borough Council (ANBC) and the adjacent BCC air quality management reports, namely:

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[9] https://www.apis.ac.uk/

[10] Ch.10 Air Quality, Atkins, September 2023.

[11] https://www.daera-ni.gov.uk/publications

- ANBC 2023 Air Quality Progress Report[12]; and
- BCC 2023 Air Quality Progress Report[13]

14.49. The only AQMA within ANBC is located 3 km from the proposed development. The closest AQMA within BCC is located 7 km from the proposed development. Neither of these AQMAs is likely to be significantly affected by emissions from the EfW facility or associated traffic, due to the distance between the AQMA and the pollution source.

Air Quality Monitoring Data

14.50. No exceedances of AQS objective for annual mean nitrogen dioxide (NO_2) of 40 µg/m^3 were recorded in ANBC's jurisdiction in 2022.

14.51. The BCC 2023 Air Quality Progress Report indicate only two exceedances of the AQS Objective NO_2 in 2022 out of 76 diffusion tubes; these were a kerbside site in proximity of the A12 Westlink, and on the M3 Motorway. These sites are not representative of the proposed development location.

14.52. The measured annual mean NO_2 concentration at the Belfast Centre automatic monitoring station in 2022 was 21 µg/m^3 i.e. well below the AQS objective.

14.53. Particulate matter monitoring is not carried out within ANBC. No exceedances of the PM_{10} and $PM_{2.5}$ AQS objectives have been recorded within BCC's jurisdiction since 2008.

Background Mapped Values

14.54. Background concentrations of air pollutants used in the 2014 assessment have been updated using:

- Defra background mapping and monitoring network measurement online datasets[14];
- Belfast Centre Automatic Urban Monitoring Network (AURN) site data[15]; and
- APIS website[9].

14.55. Note, some of the sources differ to those used in the March 2014 ES and subsequent addenda and are considered the most appropriate at this time, being based on the latest available source of measured or modelled concentrations as opposed to projected and interpolated values (in some cases, the original source used no longer exists or the pollutant no longer measured).

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[12] 2023 Air Quality Progress Report, Antrim and Newtownabbey Borough Council, 2023, https://antrimandnewtownabbey.gov.uk/getmedia/9b93bb25-5d10-4367-8e7f-cc718f558f4b/PR-2023-edited-following-comments.aspx

[13] 2023 Air Quality Progress Report, Belfast City Council, 2023, https://www.airqualityni.co.uk/assets/documents/dc-reports/659e842d71c90-BELFAST%20CC%20AQ%20Progress%20Report%202023.PDF

[14] Air Quality Compliance Data Hub, Defra, UK, Available at: https://uk-air.defra.gov.uk/

[15] Annual and Exceedance Statistics, Defra UK, Available at: https://uk-air.defra.gov.uk/

14.56. The background concentrations used in the updated assessment are presented in Table 14-5. The main changes from the 2014 ES and subsequent addenda are the use of a measured concentration for annual mean NO_2 from the Belfast AURN site in 2023; this provides a much more conservative figure than background mapped concentrations used in the original assessment. Conversely, the APIS nitrogen and acidity deposition rates (presented in Section 4.3) are notably lower than those in the original assessment of the ecological impacts, reflecting improvements in local air quality over time.

Table 14-5 – Background Values used in the Updated Assessment (Updates ES 2014 Table 14.11)

Substance	Annual mean, $\mu g/m^3$	Data source	Year
NO_2	20	Belfast Centre AURN station	2023
NO_2	5.1	Defra mapped background*	2029
PM_{10}	13	Belfast Centre AURN station	2023
PM_{10}	8.7	Defra mapped background*	2029
$PM_{2.5}$	7	Belfast Centre AURN station	2023
Benzene	0.38	Belfast Centre AURN station	2022
HCl	0.18	Lough Navar - Acid Gas and Aerosol Network	2015
HF	N/A	N/A	N/A
SO_2	1	Belfast Centre AURN station	2023
CO (mg/m^3)	0.08	Belfast Centre AURN station	2023
Cd	0.14	Defra modelled background	2022
TI	N/A	N/A	N/A

Substance	Annual mean, μg/m³	Data source	Year
Hg	0.0015	Chilbolton Observatory - TEKRAN (Mercury) Network	2023
Sb	N/A	N/A	N/A
As (ng/m^3)	0.74	Defra modelled background	2022
Pb (ng/m^3)	2.6	Belfast Centre Heavy Metals Network	2023
Cr (ng/m^3)	1.1	Belfast Centre Heavy Metals Network	2023
Co (ng/m^3)	0.12	Belfast Centre Heavy Metals Network	2023
Cu (ng/m^3)	5.1	Belfast Centre Heavy Metals Network	2023
Mn (ng/m^3)	4.7	Belfast Centre Heavy Metals Network	2023
Ni (ng/m^3)	3.5	Defra modelled background	2022
V (ng/m^3)	0.79	Belfast Centre Heavy Metals Network	2023
NH_3	2.2	Belfast Centre National Ammonia Monitoring Network	2023

“N/A” more recent background concentrations not available or not required for assessment

* Defra Background concentrations used in the estimate of roadside concentrations

Legislation and criteria

14.57. There have been no changes to the relevant legislation for air quality since the previous ES addendum update in September 2023 that affect these 2025 updates.

14.58. The air quality objectives adopted in the UK and limit values remain effectively as per the AQS for England, Scotland, Wales and Northern Ireland[16] and those for which limit values required by EU Daughter Directives on Air Quality[17] were transposed into UK law through the Air Quality Standards Regulations (Northern Ireland) 2010[18]. There have been no changes to limit values and target air quality values following the UK's withdrawal from the EU.

14.59. The air quality objectives of most relevance to assessment of human health are shown in Table 14-6.

Table 14-6 - Summary of Air Quality Limit Values, Target Values and Objectives

Pollutant	Limit, Target or Objective	Measured as
NO_2	200 µg/m^3	1 Hour Mean
	40 µg/m^3	Annual Mean
PM_{10}	50 µg/m^3 not be exceeded more than 35 times in a year	24 Hour Mean
	40 µg/m^3	Annual Mean
$PM_{2.5}$	25 µg/m^3	Annual Mean
	Exposure reduction target of 15% reduction in concentrations at urban background sites between 2010 and 2020	Annual Mean

[16] Defra (2011). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1

[17] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32008L0050.

[18] Defra (2010) Air Quality Standards Regulations (Northern Ireland): The Air Quality Standards Regulations (Northern Ireland) 2010 (legislation.gov.uk)

14.60. The Environment Agency online guidance for permitting contains updates to EALs which are considered in the interpretation of dispersion modelling results for the EfW stack emissions. The latest update was made in May 2024.

14.61. The APIS[9] website hosts a database of assessment criteria for ecological sites (critical levels and loads) and is regularly updated. The values used in the assessment of the EfW stack emissions are provided in Appendix 14.1.

Assessment of effects

Traffic emissions

14.62. The development generated traffic flows exceed the IAQM screening criteria, therefore a quantitative assessment is presented for traffic emissions, as per the recommended approach in National Highways' DMRB LA 105 [19] for a low risk potential project (i.e. one which is likely to result in traffic changes that are localised to the project rather than over a wider area) in a medium/low risk receiving environment (i.e. sensitive receptors within 50 m of roads triggering traffic change criteria and good existing air quality).

14.63. The annual average daily traffic (AADT) flows and fleet data used in the assessment are presented in Table 14-7. These were provided by AtkinsRéalis Transport Planners for the scenarios:

- Opening year 2030 without the proposed development (i.e. 'Do Minimum' (DM)); and
- Opening year 2030 with the proposed development (i.e. 'Do Something' (DS)).

[19] National Highways, DMRB LA105 Air Quality (June 2024), available at: https://www.standardsforhighways.co.uk/search/af7f4cda-08f7-4f16-a89f-e30da703f3f4

Table 14-7 –Change in Two-Way Vehicle Flows with and without the Development in 2030

Link Number	Link	Do Minimum		Do Something		Increase in AADT	Increase in HDVs
		AADT	HDV (%)	AADT	HDV (%)		
1	Boghill Road off Hydepark Road	426	19.1	672	31.1	246	**127**
2	Hydepark Road between Boghill Road and Hightown Road at Boghill junction	5,459	8.2	5,705	10.2	246	**137**
2a	Hydepark Road between Boghill Road and Hightown Road at Hightown junction	5,633	8.1	5,882	10.1	249	**137**
3	Hightown Road between Hydepark Road/Road and Mallusk Road at Hightown junction	8,699	4.0	8,919	5.5	220	**147**
3a	Hightown Road between Hydepark Road/Road and Mallusk Road at Mallusk junction	13,576	3.8	13,795	4.9	219	**155**
4	Mallusk Road between Scullions Road and Hightown Road at Hightown junction	10,870	4.5	11,058	5.9	188	**158**
4a	Mallusk Road between Scullions Road and Hightown Road at Scullions junction	14,718	10.5	14,908	11.4	190	**156**
5	Scullions Road between Mallusk Road and M2 Motorway	23,340	10.1	23,499	10.6	159	**119**

14.64. As shown in **bold** in Table 14-7, the IAQM traffic screening criterion for HDVs is exceeded on the road links included in the traffic study area. As such, an assessment was undertaken using the DMRB spreadsheet tool to quantify the contribution of the additional HDV movements due to the operation of the proposed development on the local pollutant concentrations.

14.65. The road link with the highest increase in HDVs is link no. 4, representing Mallusk Road between Scullions Road and Hightown Road at Hightown junction. This has an increase of 159 HDVs per day with the proposed development in place. The closest sensitive receptor to this link is the Rosehall Medical Practice, located 22 m from the road edge.

14.66. The closest receptor to an affected road link (link no. 3 in the model), is a complex of residential properties at 121 Hightown Road, approximately 4 m away from the road edge. The HDV increase expected with the proposed development on this road link is 147 per day.

14.67. Results are provided for these two locations representing, in the first case, the receptor on link 4 (closest to the road with the highest increase in HDVs and, therefore, the highest increase in emissions with the development), and secondly, the closest receptor to link 3, where the exposure occurs over a shorter distance between traffic and receptor. The locations used in the assessment are shown in Figure 0-1.

14.68. As shown in Table 0-1, an increase in pollution occurs only on Link 3 for NO_2 and is below 1% of the relevant AQAL . The IAQM guidance states that such increases can be classed as negligible. While Defra background mapped values have been used in this assessment, measured air quality data show the total pollutant concentrations for NO_2 and PM_{10} are well below (less than 75% of) the AQAL of 40 µg/m^3.

14.69. This assessment confirms that the additional traffic generated by the proposed development would not result in an adverse impact at the nearby sensitive receptors. Further, more detailed assessment using a dispersion model is not required.

Table 0-1 – Results of Traffic Assessment

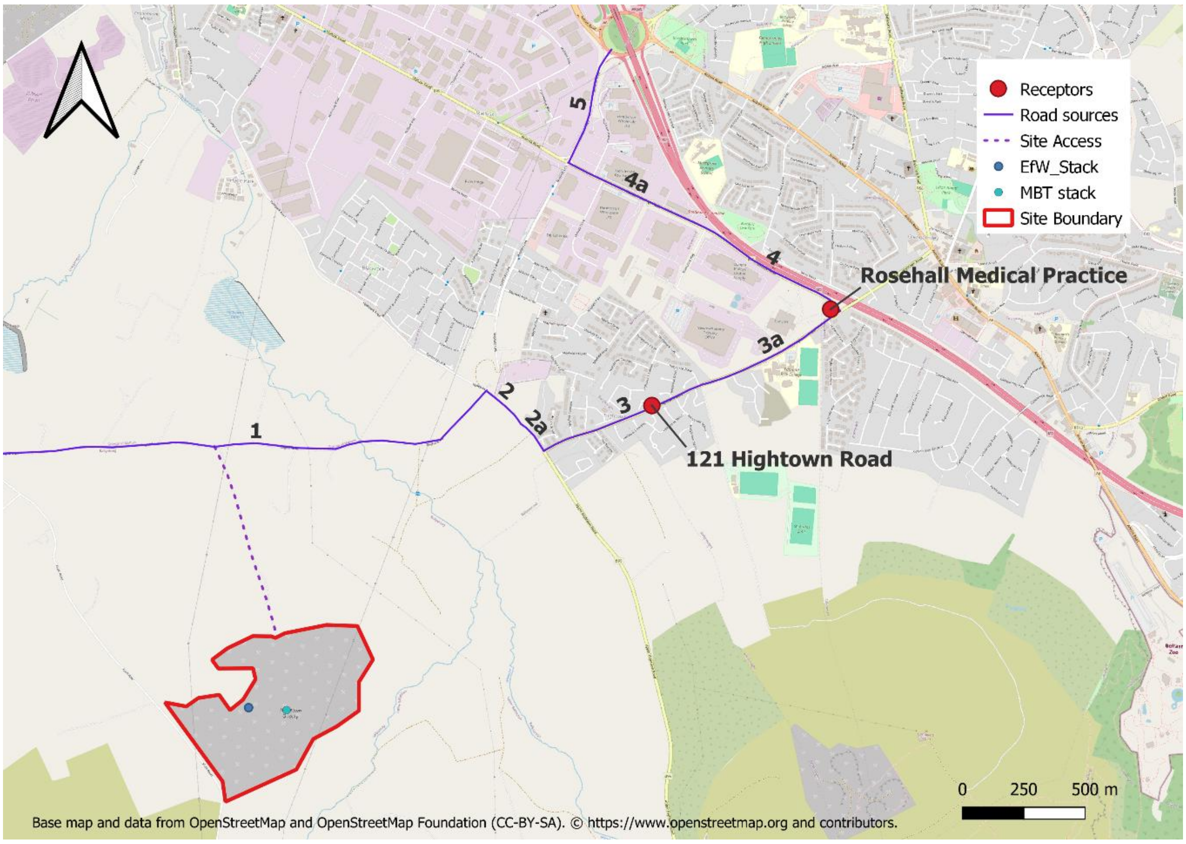
Link	Scenario	Total NO_2, µg/m³	Change as % of AQAL	IAQM Significance	Total PM_{10}, µg/m³	Change as % of AQAL	IAQM Significance
3	**DM 2030**	6.6	0	Negligible	10.0	0	Negligible

Link	Scenario	Total NO_2, µg/m³	Change as % of AQAL	IAQM Significance	Total PM_{10}, µg/m³	Change as % of AQAL	IAQM Significance
	DS 2030	6.7			10.0		
	Change	+0.1			0.0		
4	**DM 2030**	5.6	0	Negligible	9.2	0	Negligible
	DS 2030	5.6			9.2		
	Change	0.0			0.0		

14.70. There are no ecological sites within 200 m of the road network considered in the Traffic Assessment. Belfast Lough SPA and Ramsar site is adjacent to the M2, at a location 4 km to the south east of the junction with link 5. At this distance, air quality impacts associated with road transport emissions from development traffic will not be discernible from fluctuations in background[20]. No material impacts due to the traffic emissions are therefore expected at ecological sites within the study area.

[20] IAQM 'A guide to the assessment of air quality impacts on designated nature conservation sites, Version 1.1 (2020), available at air-quality-impacts-on-nature-sites-2020.pdf

Figure 0-1 – Traffic assessment road links and receptors



Odour emissions

14.71. The IAQM (2018) guidance sets out a methodology for estimation of the effect of odour on a receptor, taking account of the risk of exposure (as a function of the source odour potential and pathway effectiveness) and receptor sensitivity.

14.72. As set out previously in Section 14.267 to 14.271 of the March 2014 ES, the mitigation measures which are inherent in the design of the facility are intended to prevent an unacceptable level of odour beyond the Site boundary. These measures include: the transport of waste and materials in enclosed or covered trucks; the unloading and processing of the waste within MBT buildings kept under negative pressure; exhaust air treated by wet scrubbing and biofiltration, and emissions released via a 20 m high stack. The design therefore inherently reduces the potential for odour emissions from the new MBT to have an adverse effect on the nearest residents.

14.73. Odours will not be emitted from the EfW stack as potentially odorous compounds will be destroyed in the high combustion gas temperatures prior to discharge. Similarly to the MBT stack, waste handling within the EfW reception area will be undertaken within an enclosed building kept under negative pressure and the generated flue gas will be extracted to the EfW stack. As such, odours from the EfW stack are considered negligible and excluded from further consideration.

14.74. Site access is from the north of the site from Boghill Road. There will be fewer than 200 HDV movements per day in and out of the site. Fugitive odour emissions from waste transport are not considered a material concern, as waste will be transported to site within enclosed or covered trucks. As such, odours from vehicles off-site are excluded from consideration.

14.75. In line with the IAQM (2018) guidance, the odour source potential for on-site sources is considered to be 'medium' for the following reasons:

- the waste material is moderately odorous with an unpleasant odour;
- the MBT has a biofilter to reduce odours from the stack while other areas of waste handling will be contained within buildings kept under negative pressure; and
- the development will operate under an Environmental Permit and there will be effective, tangible mitigation measures in place in line with BAT.

14.76. The wind rose for Belfast International Airport for 2019 to 2023 (Figure 0-2) shows a higher frequency of winds from the south and south west, while winds from other directions occur with a relatively uniform and low frequency; there is a slightly higher frequency of winds from the east compared to an evenly distributed case.

14.77. The receptors downwind of the highest frequency wind directions (i.e. within areas to the north and north east of the site) lie within the most effective odour exposure pathway, however these receptors are further away from the EfW and MBT buildings. Whilst closer, the receptors upwind of the site have an ineffective exposure pathway as winds will carry infrequently any odours towards them. A review of the surrounding area has shown that there are no residential receptors (i.e. high sensitivity receptors) within 200 m of the MBT facility either downwind or upwind of the site, as shown in

14.78.

14.79.

14.80. Table 0-1 and Figure 0-3. The closest receptor to the MBT facility and downwind of the prevailing wind directions is on 32 Boghill Road, approximately 800 m north of the MBT buildings. The closest residential receptor to the MBT facility is 120 Flush Road, approximately 150 m to the north west of the site boundary and approximately 497 m from the MBT facility; this location is not downwind of the prevailing winds.

14.81. The risk of residual odours from the proposed waste handling operations beyond a few hundred metres of the site is minimal as odours will be dispersed in the atmosphere. Under calm conditions, odour would remain close to the identified odour sources whereas during turbulent conditions odour would be moved away from the source of odour and dissipate.

14.82. Overall, the pathway effectiveness for the closest receptors is found to be ineffective for on-site odours. The risk of odour exposure at receptors in the area around the site is therefore assessed as 'negligible' in line with the IAQM approach, as the source odour potential is 'medium' and the pathway effectiveness is ‘ineffective’. Taking into consideration the negligible risk of odour exposure, high sensitivity of the receptors, and the distance between sources and receptors, the magnitude of odour effect at the properties identified is deemed to be ‘negligible’.

Figure 0-2 - Windrose of 2019-2023 Belfast International Airport Meteorological Data

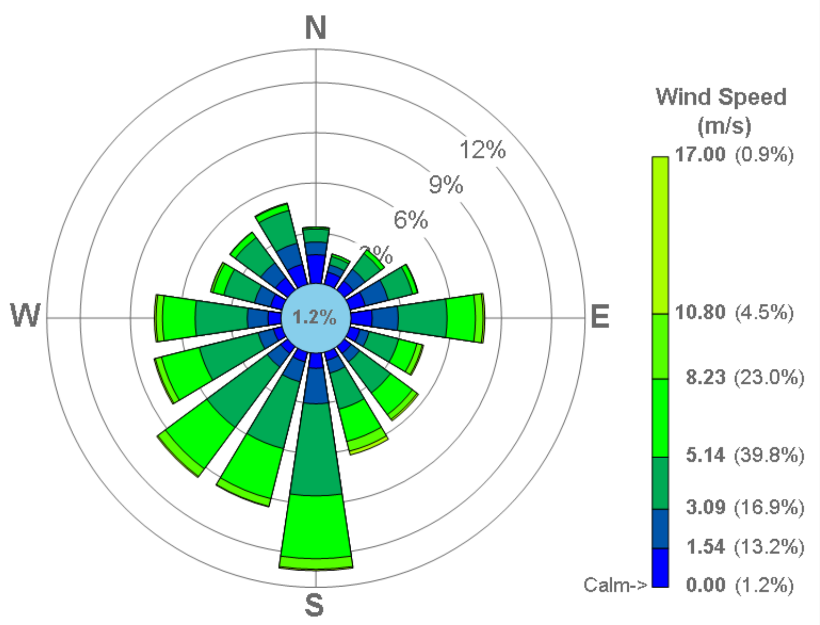


Table 0-1 - Receptor Pathway Effectiveness

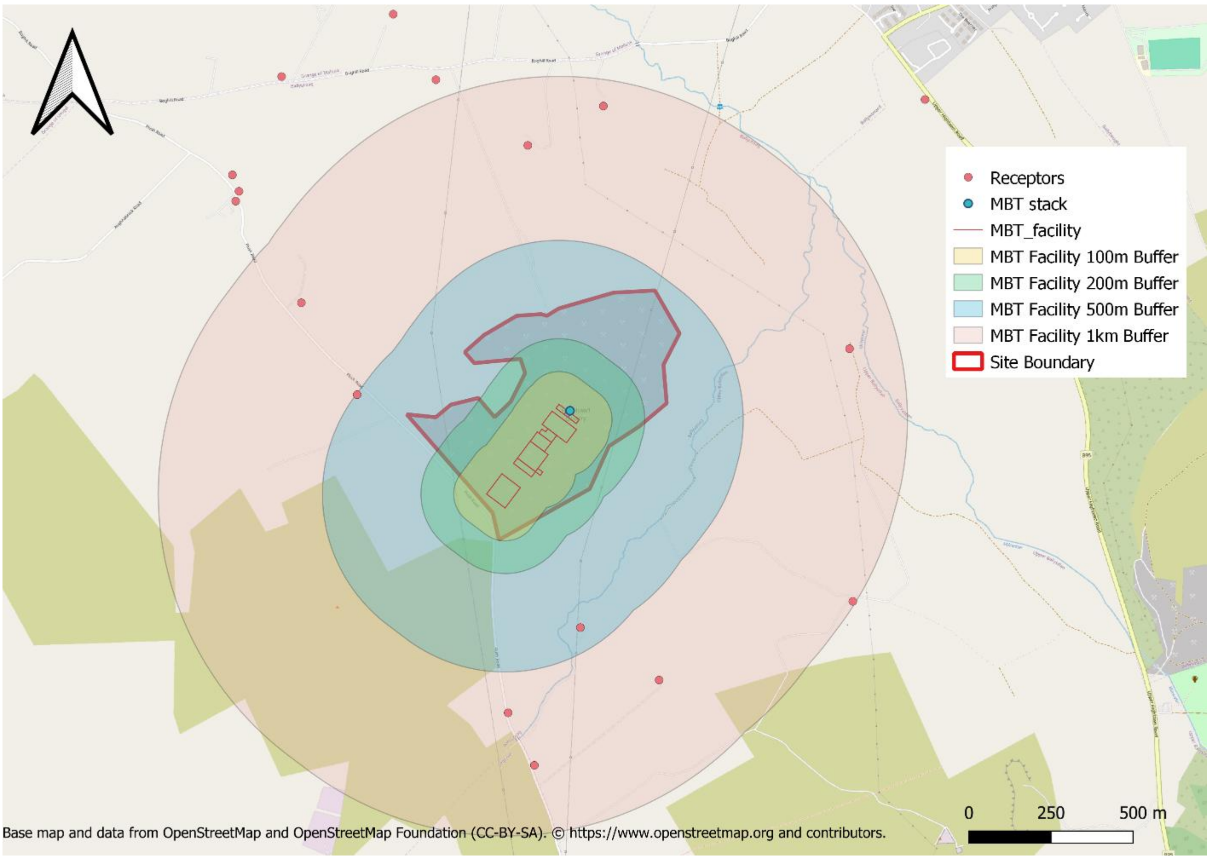
No	Potential Receptor & Grid Reference	Grid Reference X	Grid Reference Y	Receptor Type	Distance from MBT Stack (m)	Direction	Pathway Effectiveness
1	35 Boghill Rd.	329050	381470	Farm	1,283	N	Ineffective
2	34 Boghill Rd.	329190	391220	Residence	1,038	N	Ineffective

No	Potential Receptor & Grid Reference	Grid Reference		Receptor Type	Distance from MBT Stack (m)	Direction	Pathway Effectiveness
		X	Y				
3	32 Boghill Rd.	329140	380990	Farm	795	N	Ineffective
4	26 Boghill Rd.	329370	381110	Residence	920	NNE	Ineffective
5	102 Upper Hightown Rd.	339330	391140	Residence	1,413	NE	Ineffective
6	100 Upper Hightown Rd.	330350	381130	Farm	1,436	NE	Ineffective
7	62 Upper Hightown Rd.	330120	380370	Farm	851	E	Ineffective
8	43 Flush Rd.	330130	379600	Farm	992	SE	Ineffective
9	53 Flush Rd.	329540	379360	Farm	704	S	Ineffective
10	65 Flush Rd.	329300	379520	Farm	431	S	Ineffective
11	55 Flush Rd.	329160	379100	Residence & industry	790	S	Ineffective

No	Potential Receptor & Grid Reference	Grid Reference		Receptor Type	Distance from MBT Stack (m)	Direction	Pathway Effectiveness
		X	Y				
12	69 Flush Rd.	329080	379260	Farm	625	S	Ineffective
13	120 Flush Rd.	328620	380230	Residence & industry	497	NW	Ineffective
14	133 Flush Rd.	328450	380510	Farm	803	NW	Ineffective
15	148 Flush Rd.	328250	380820	Farm	1,155	NW	Ineffective
16	149 Flush Rd.	328260	380850	Residence	1,165	NW	Ineffective
17	151 Flush Rd.	328240	380900	Residence	1,211	NW	Ineffective
18	55 Boghill Rd.	328390	381200	Residence	1,308	NNW	Ineffective
19	45 Boghill Rd.	328730	381390	Residence & business	1,292	NNW	Ineffective
20	40 Boghill Rd.	328860	381190	Residence	1,058	N	Ineffective

No	Potential Receptor & Grid Reference	Grid Reference X	Grid Reference Y	Receptor Type	Distance from MBT Stack (m)	Direction	Pathway Effectiveness
21	1 Boghill Rd.	328000	381500	Residence	1,793	NW	Ineffective
22	2 Boghill Rd.	327537	381136	Residence	1,907	NW	Ineffective

Figure 0-3 - Odour assessment buffers around the MBT Facility



Stack emissions

14.83. The findings of the updated dispersion modelling study for the EfW during normal operation using AERMOD are discussed in this section. These are based on the field-wide maxima pollutant concentrations (i.e. highest from the modelled grid and discrete human health receptors) and, for ecological sites, pollutant concentrations and deposition rates at selected designated site locations, presented in Appendix 14.1. Details of the short-term results and of the assessment under abnormal operation of the facility are also presented in Appendix 14.1.

14.84. The full results of the updated dispersion modelling studies including use of ADMS are provided in Appendix 14.2; this includes the assessment of impacts of the committed Ballyutoag wind farm and the findings of the plume visibility studies.

Human health

14.85. When compared with results in Table 14.15 of the March ES 2014 assessment, the vast majority of the updated Process Contributions (PCs) presented in Appendix 14.1, **Error! Reference source not found.** are similar, if not lower. The exception to this is chromium (Cr III) and mercury, which are higher than the result presented in the ES 2014 assessment. That is because the assessment basis is now to use a 24 hour mean rather than annual mean to conservatively compare to the updated EAL.

14.86. The modelled PC using the latest AERMOD and meteorological data for most substances is less than 1% of the assessment criterion and hence can be screened out as negligible without needing to consider background contributions. The exceptions are cadmium, arsenic, copper and nickel with PCs of up to 35% of the respective EAL. Each individual metal was modelled conservatively with the assumption that it comprises 100% of the IED emission limit value (see 2014 ES Table 14.2) for each respective group of metals. It is extremely unlikely that these substances would be emitted at close to the maximum respective emission rates and Environment Agency guidance[21] indicates that it is reasonable to assume that each Group 3 metal comprises no more than 11% of the IED emission limit concentration for Group 3 metals. The calculated PECs for cadmium, arsenic, copper and nickel on this conservative basis are less than half of their respective long-term assessment criterion and can thus be considered not significant. PCs are furthermore likely to be an order of magnitude lower than appraised and, therefore, comfortably within the assessment criteria for the PEC.

14.87. For mercury, although the latest modelled PC is lower than in 2014, the PC as a percentage of the assessment criterion has increased. This is because the assessment criterion in 2025 is updated to a 24 hour mean basis, however the PC remains a negligible fraction of the respective criterion.

[21] Release from waste incinerators version 4, Environment Agency, 2016, accessed: Releases from waste incinerators (publishing.service.gov.uk)

14.88. Overall, the updated results confirm that the original assessment was robust and that the long-term exposure to emitted pollutants via direct inhalation is not considered to be significant.

14.89. Modelled PCs under abnormal operation of the facility are lower or similar to those originally reported in the March 2014 ES chapter for the incidents assessed under the conservative assumptions embedded in the model, concluding that adverse impacts due to these incidents are unlikely to occur.

Ecological Sites

14.90. When compared with the results in the March 2014 ES in Table 14.17 of the air quality chapter, the updated modelled outputs are lower.

14.91. All pollutants and averaging periods can be screened out as the PC is less than 1% of the long-term criterion. This is the field-wide maximum PC modelled using the maximum permitted daily emission rate and assumes continuous operation of the EfW. The long-term impacts due to the emissions from the EfW facility are considered not significant.

14.92. The maximum short-term PC for nitrogen dioxide is well below 10% of the non-statutory daily mean criterion, therefore short-term impacts are not significant, in line with the assessment criteria provided in permitting guidance[8].

14.93. The updated results confirm that the original assessment methodology was robust and that the impact of direct exposure of vegetation to these substances is not significant.

14.94. In terms of deposition, the estimated contributions of nitrogen and sulphur to acid deposition rates are less than 1% of the critical load at the identified designated sites, and at local sites except for receptor 27 (Squires Hill SLNCI) for sulphur (1.5%). Whilst above the arbitrary screening threshold of 1% is exceeded, it is not considered, given the baseline conditions (including existing deposition rates) that these process contributions will lead to a significant adverse effect on the habitats in question. Further discussion and explanation can be found in Chapter 9, Ecology, of this Addendum.

14.95. **Error! Reference source not found.** compares the estimated total nitrogen deposition rates (due to NO_x and NH_3 in combination) to the relevant updated critical load (lower end of the range presented) for the habitat types associated with each designated site, as derived from the APIS website. The deposition loads used represent the average for years 2020 to 2022.

14.96. As shown in **Error! Reference source not found.**, the calculated PCs as nitrogen deposition a re less than 1% of the lower critical load at the modelled statutory site locations (receptors 22 to 26) and between 0.5% and 1.9% of the lower critical load at local, non-statutory sites (receptors 27 to 34). The increments over 1% occur at locations representative of Belfast Hills-Squires Hill SLNCI, Cave Hill-Collinward SLNCI and Hyde Park Dam SLNCI. These local site contributions are equivalent to less than 1% of the current background loading (e.g. 0.6% at Squires Hill). The significance of effects of nitrogen deposition as a result of the proposed development has been considered in more detail with reference to Natural England guidance[22] in Chapter 9, Ecology, of this addendum.

14.97. In comparison with results for ecological receptors reported in the March 2014 ES, the findings as a percentage of critical loads are higher, due to more stringent criteria now applying for most habitat types. The conclusions of both reports are, however, consistent. In view of the baseline conditions, and the results of the updated air dispersion modelling which show very small incremental changes, ecological impacts as a result of the proposed development have been assessed as not significant in EIA terms in both assessments.

Plume visibility and nearby wind farm

14.98. The effects of the committed Ballyutoag wind farm on the dispersion of emissions from the EfW stack and the potential for visible plumes have been investigated as part of the modelling update. Details on the studies undertaken to assess the impacts of the wind farm and plume visibility are provided in Appendix 14.2, section **Error! Reference source not found.** and **Error! Reference so urce not found.** respectively.

14.99. An update of the modelling study of the effects of local wind farm on dispersion was undertaken using ADMS v6 and five years of recent meteorological data (2019 to 2023). The assessment found that the wind farm could cause a small change in modelled long term average ground level concentrations, compared to the situation without the wind farm. However, overall, as the updated modelled outputs are lower than previously reported in the March 2014 ES, this is not a significant change and the conclusions reached in the March 2014 ES are still valid.

14.100. The updated plume visibility study was undertaken with ADMS v6 using meteorological data for 2019 to 2023. A default 98% humidity cut off was applied in the model in line with the developer's guidance. The plume was modelled to be visible for approximately 48 to 58% of the time, which represents a more frequently visible plume compared to that reported in the March 2014 ES. This is due to refinements to the plume visibility module now incorporated in ADMS v6 (ADMS v4.2 was used in the March 2014 ES). However, as the modelled average plume length is just 55 to 60 m, this means it will only be visible very close to or within the footprint of the site.

14.101. The full appraisal of potential visible plumes in relation to visual amenity is provided in Chapter 10, Landscape and Visual, of this addendum.

Cumulative effects

14.102. The reported annual mean contributions from the EfW emissions were modelled using AERMOD are the highest in five years of meteorological data (2019 to 2023) (see **Error! R eference source not found.**). The highest field-wide concentrations with the development in place have been selected to provide a conservative assessment in combination with the

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[22] Natural England Commissioned Report (NECR 2101), 2016. Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance. Available at: https://publications.naturalengland.org.uk/publication/5354697970941952 [accessed 16/12/2024].

maximum calculated traffic contribution at selected residential receptors in the study area close to the affected road network (see Table 0-1).

14.103. The maximum combined contribution from the EfW and development traffic at a receptor for human health is 0.4 µg/m³ as NO_2 or 1% of the AQAL of 40 µg/m³, as shown in Table 0-2. The cumulative effects from EfW operation and traffic emissions are therefore expected to be of negligible significance, in accordance with IAQM guidance assessment criteria, regardless of the choice of background data for the surrounding area (Table 14-5).

14.104. The maximum combined contribution is 0.1 µg/m³ as PM_{10} or less than 0.5% of the annual mean AQS objective of 40 µg/m³, including Defra mapped background for the area around the EfW for 2029 (Table 14-5). The cumulative effects from EfW operation and traffic emissions at human health receptors are therefore expected to be of negligible significance, in accordance with IAQM guidance assessment criteria.

Table 0-2 - Cumulative Effects of EfW and Traffic Emissions

Pollutant	EfW, µg/m³	Traffic, µg/m³	Combined, µg/m³	% of AQAL	Background*	IAQM Significance
NO_2	0.3	0.1	0.4	1	20 / 5.1	Negligible
PM_{10}	<0.1	0.0	0.1	<0.5	13 / 8.7	Negligible

* Measured concentration / Defra 2029 mapped background concentration

14.105. The modelled PC due to the operation of the EfW at Belfast Lough SPA/Ramsar at the point closest to the M2 motorway is less than 0.1 µg/m³ i.e. 0.3% of the critical level. No material cumulative impacts due to the combination of traffic and stack emissions are expected due to the distance of ecological sites from this point on the affected road network.

Conclusions

14.106. An updated air quality assessment has been produced in response to consultation responses following the submission of the September 2023 ES addendum. NIEA IPRI specifically requested updated dispersion modelling for the EfW emissions to reflect recent meteorological data. This updated assessment also addresses objector submissions made to the DfI Minister on 5th June 2024 in respect of traffic and odour.

14.107. Increases in road traffic due to the operation of the proposed development have been compared against the IAQM (2017) development screening criteria. Pollutant concentrations were estimated through an air quality screening assessment using the National Highways DMRB spreadsheet tool at locations representative of sensitive exposure. The results show that estimated impacts due to the operational traffic generated by the proposed development are of negligible significance, in line with IAQM guidance.

14.108. An odour assessment using IAQM (2018) guidance has demonstrated that the effects of onsite odours at receptors would be negligible. This is largely due to the distance between receptors and the proposed development, meaning pathways for exposure are ineffective. The proposed mitigation measures described in the planning application are intended to prevent unacceptable odours beyond the site boundary.

14.109. Long- and short-term human health and ecological impacts as a result of emissions from the EfW were reassessed using the most recent version of AERMOD and ADMS modelling software, and a more recent meteorological dataset (2019 to 2023). This study comprised a comprehensive assessment of normal and abnormal operations using AERMOD. When compared with the original assessment for the proposed development, the updated modelled outputs at receptors were similar or lower.

14.110. For most pollutants, EfW stack emissions are not expected to cause an exceedance of air quality criteria. Where concentrations approach or exceed the relevant assessment criterion, e.g. in the assessment of some heavy metals for abnormal operation, this is due to a change in the basis for the assessment criterion rather than model algorithms or meteorological data. Originally a very conservative modelling approach was taken, and when applying more realistic assumptions the results are found not to be significant. For ecological sites there are some increases in the proportion of the criteria as critical loads have become more stringent since the previous assessment, however the contributions are still a very small percentage at the most affected sites, which are locally designated.

14.111. The main study using AERMOD was replicated using the latest version of an alternative model, ADMS. All of the model outputs using ADMS were either similar to or lower than those produced by AERMOD.

14.112. The effects of the committed Ballyutoag wind farm on dispersion of EfW emissions and the potential for a visible plume from the EfW were also revisited using the latest version of ADMS. The wind farm was modelled to cause a change in modelled ground level concentrations for long term contributions compared to modelling without the wind farm but overall, as the updated modelled outputs are lower, the change is not significant.

14.113. The updated plume visibility modelling using ADMS v6 found that, for the normal operation of the EfW, a plume may be visible for approximately 48 to 58% of the time and that, on average, it will be 55 to 60 m in length i.e. above the footprint of the site. This represents a more frequently visible plume compared to the March 2014 ES, due to changes embedded in the plume visibility module in the latest version of ADMS.

14.114. Cumulative effects of the combined contributions from vehicle emissions and stack emissions to receptor concentrations and the changes in pollutant concentrations were found to be negligible in light of ambient air quality criteria.

14.115. Overall, the AERMOD and ADMS assessment outcomes for human health and ecological impacts are similar to those reported in the March 2014 ES and subsequent addenda. Emissions from the proposed development are not expected to result in significant effects on air quality and the assessment approach adopted is robust and in line with best practice

Clyde Shanks

Appendix 14.1

AERMOD dispersion modelling

AERMOD dispersion modelling

The detailed results of the updated dispersion modelling study using AERMOD are presented in this section. The tables present the field-wide maxima pollutant concentrations (i.e. highest from the modelled grid and discrete human health receptors) and, for ecological sites, pollutant concentrations and deposition rates at specific designated site locations. The updated results tables are intended to be viewed alongside the corresponding tables in the March 2014 ES; the same table names have been used for ease of comparison.

A.1. Human health

A.1.1. Long term

The long term (annual mean) process contributions (PC) as the field wide maxima using AERMOD, are provided in Table 0-1. These are the maximum annual mean concentrations from the five-year meteorological dataset for 2019 to 2023. Long term modelled PCs less than one percent of the relevant assessment criterion are considered not significant and no further calculation of the total concentration including background is required. Where the PC is greater than one percent of the assessment criterion, the Process Environmental Contribution (PEC) has also been calculated using the appropriate updated background concentration. For the calculation of NO_2 from NOx, a 70% conversion rate has been applied in line with the latest modelling guidance[1], which is consistent with the approach in the 2014 ES. The updated assessment shows that, overall, the original assessment presented in the March 2014 ES was robust and that the long-term impact of direct inhalation of modelled pollutants at permitted emission levels is not significant.

[1] Environmental permitting: air dispersion modelling reports, EA, 2014 (last update March 2024), available at: https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports

Table 0-1 - AERMOD Dispersion Model Results for Long Term Impact by Direct Inhalation (for comparison to 2014 ES Table 14.15)

Substance	Assessment Criterion, µg/m^3	Averaging Period / Assessment Basis	PC, µg/m^3	PC as % of criterion	Background, µg/m^3	PEC, µg/m^3	PEC as % of criterion
PM_{10}	40	Annual	0.019	<0.1	-	-	-
$PM_{2.5}$	20	Annual	0.019	0.1	-	-	-
TOC [(c)]	5	Annual	0.019	0.4	-	-	-
HCl	N/A[(b)]	-	0.019	-	-	-	-
HF	16	Monthly	0.002	<0.1	-	-	-
SO_2	N/A[(b)]	-	0.095	-	-	-	-
NO_2 [(d)]	40	Annual	0.265	0.7	-	-	-
CO	N/A[(b)]	-	0.095	-	-	-	-
Cd	0.005	Annual	0.00009	1.8	0.00014	0.00023	4.6
Tl	N/A[(b)]	-	0.00009	-	-	-	-
Hg	0.06[(a)]	24 hour (long term)[(e)]	0.0017	2.9	0.0015	0.0033	5.4
Sb	5	Annual	0.0009	<0.1	-	-	-
As	0.006	Annual	0.0009	15.7	0.00074	0.0016	28.1
Pb	0.25	Annual	0.0009	0.4	-	-	-
Cr III	2[(a)]	24 hour (long term)[(e)]	0.018	0.9	-	-	-
Cr IV	0.00025	Annual	0.00001	0.4	-	-	-
Co	N/A[(b)]		0.001	-	-	-	-
Cu	0.05[(a)]	24 hour (long term) [(e)]	0.018	35.2	0.005	0.023	45.4
Mn	0.15	Annual	0.001	0.6	-	-	-
Ni	0.02	Annual	0.001	4.7	0.0035	0.004	22.2
V	N/A[(b)]	-	0.001	-	-	-	-

Substance	Assessment Criterion, µg/m³	Averaging Period / Assessment Basis	PC, µg/m³	PC as % of criterion	Background, µg/m³	PEC, µg/m³	PEC as % of criterion
NH_3	180	Annual	0.019	<0.1	-	-	-

Note: (a) EAL updated in latest permitting guidance

(b) EAL removed from latest permitting guidance

(c) Assumes that TOC is benzene for a conservative approach

(d) 70% conversion to NO_2 has been applied to the modelled long-term oxides of nitrogen concentrations

(e) Due to the way the updated criterion is expressed, the daily mean PC has been used for a conversative approach to the calculation

A.1.2. Short term

A.1.2.1. Normal operation

The short-term PCs representing the field-wide maximum output from AERMOD for human health are provided in Table 0-2. These are the maximum hourly and daily results from a five year meteorological dataset for 2019 to 2023.

The modelling approach assumes that the plant operates continuously throughout the year with emissions at the maximum allowable level under the IED such that they coincide with the least favourable meteorological conditions. In reality, emissions are expected to be lower than IED and there will be times when there are no emissions such as non-operational periods for servicing and maintenance.

PCs that are less than 10% of the relevant assessment criterion can be considered as insignificant, whereas for those greater than 10% of the assessment criterion the PEC has been calculated taking account of the estimated background concentrations (in line with permitting guidance, this is estimated as twice the measured/mapped long-term value).

For the calculation of NO_2 from NOx, a 35% conversion rate has been applied as per the March 2014 ES, which remains in line with the latest guidance[1].

The calculations of PEC for NO_2 and SO_2 are based on modelling a continuous emission at the half hourly emission limit, for a conservative representation of the results; however, results are also provided under the assumptions that these pollutants are continuously emitted at the daily emission limits, in line with the approach detailed in section 4.2.2.2 of the March 2014 ES.

As with the long-term results, the heavy metal results represent a very conservative approach assuming each metal is emitted at the limit value for the whole group.

Table 0-2 - AERMOD Dispersion Model Results for Short Term Impact by Direct Inhalation (for comparison to March 2014 ES Table 14.16)

Substance	Assessment Criterion, µg/m³	Averaging Period / Assessment Basis	PC, µg/m³	PC as % of criterion	Background, µg/m³	PEC, µg/m³	PEC as % of criterion
PM_{10}	50	24 h	0.4	0.7	-	-	-
TOC as benzene	30(a)	24 h	0.4	1.2	-	-	-
HCl	750	1 h	16.6	2.2	-	-	-
HF	160	1 h	0.6	0.3	-	-	-
SO_2	125	24 h	1.8	1.4	-	-	-
SO_2(d)	350	1 h (99.73%ile)	55.5	**15.8**	2	57.5	16.4
SO_2	350	1 h (99.73%ile)	13.9	4.0	-	-	-
SO_2(d)	266	15 min (99.9%ile)	74.3	**27.9**	2	76.3	28.7
SO_2	266	15 min (99.9%ile)	18.6	7.0	-	-	-
NO_2(c), (d)	200	1 h (99.79%ile)	38.8	**19.4**	42	80.8	40.4
NO_2(c)	200	1 h (99.79%ile)	19.4	9.7	-	-	-
CO (d)	30,000	1 h	27.7	0.1	-	-	-
CO (d)	10,000	8 h	4.0	0.0	-	-	-
Cd	0.03(a)	24 h (short term)	0.01	**45.2**	0.0003	0.01	46.1
Tl	N/A(b)	-	0.01	-	-	-	-
Hg	N/A(b)	-	0.01	-	-	-	-
Sb	150	1 h	0.1	0.1	-	-	-
As	N/A(b)	-	0.1	-	-	-	-
Pb	N/A(b)	-	0.1	-	-	-	-
Cr	N/A(b)	-	0.1	-	-	-	-

Substance	Assessment Criterion, µg/m^3	Averaging Period / Assessment Basis	PC, µg/m^3	PC as % of criterion	Background, µg/m^3	PEC, µg/m^3	PEC as % of criterion
Co	N/A[b]	-	0.1	-	-	-	-
Cu	N/A[b]	-	0.1	-	-	-	-
Mn	1500	1 h	0.1	<0.1	-	-	-
Ni	0.7[a]	1 h	0.1	**19.8**	0.007	0.1	20.8
V	1[a]	24 h (short term)	0.1	**13.8**	0.002	0.1	14.0
NH_3	2,500	1 h	2.8	0.1	-	-	-

Note: [a] EAL updated in latest permitting guidance

[b] EAL removed from latest permitting guidance

[c] 35% conversion to NO_2 has been applied to the modelled short-term oxides of nitrogen concentrations

[d] Calculated using half hourly average emission rate

The short-term PCs for most substances are substantially less than 10% of the relevant assessment criterion. Consequently, the short-term effects of those substances can be considered insignificant.

The majority of the updated PCs are lower than those in Table 14.16 of the March 2014 ES. There are some cases, such as cadmium, mercury and nickel, where the PC in the updated assessment is lower but the PC as a percentage of the assessment criterion has increased; this is due to the assessment criterion having been reduced since the March 2014 assessment.

The short-term PCs that are above the 10% screening threshold are for SO_2, NO_2, cadmium, nickel and vanadium therefore the PEC was calculated for these substances. The PEC is less than 50% of the assessment criteria for modelled pollutants, including where based on the more conservative emission rate for SO_2 and NO_2. No further assessment of the potential for short-term impacts is necessary.

In summary, the short-term impacts of exposure via direct inhalation of modelled pollutants, both for the original and updated assessments, are not significant.

A.1.3. Abnormal operation

Abnormal operations at EfW facilities may include incidents such as technically unavoidable stoppages, disturbances or failures of the pollution control and/or monitoring equipment. During abnormal operations the IED emission limits may be transiently exceeded, though there are some short term values that must not be exceeded. Assumptions applied to the short- and long-term results to provide an assessment of the theoretical potential for abnormal impacts have been replicated from the March 2014 ES air quality chapter, where full details of the approach can be found.

The outcomes of the updated assessment for each of the scenarios considered in the March 2014 ES are presented in the sections below, retaining as far as possible the same table structure to allow a direct comparison.

A.1.3.1. Failure of the SNCR system

Long Term Impact

Table 0-3 summarises the calculations associated with the impact of SNCR system failure on annual mean NO_2.

Table 0-3 - Assessment of Long Term NO_2 Impact Due to Failure of the SNCR System (for comparison with March 2014 ES paragraph 14.160-161)

Assessment	Result
PC normal (μg/m^3)	0.3
PC abnormal (μg/m^3)	1.0
Background[(a)] (μg/m^3)	21.0
PEC abnormal (μg/m^3)	22.0
PEC as % criterion	55.0

The results show that the PEC, calculated using the maximum field-wide PC, is 55% of the long term assessment criterion, therefore, the abnormal operation is unlikely to cause an exceedance of the annual mean air quality objective.

Short Term Impact

Table 0-4 summarises the calculations associated with the short term impacts of SNCR system failure on hourly concentrations of NO_2.

Table 0-4 - Assessment of Short Term NO_2 Impact Due to Failure of the SNCR System (for comparison with March 2014 ES paragraph 14.158-159)

Assessment	Result
1 h PC normal (µg/m^3)	38.8
1 h PC abnormal (µg/m^3)	97.0
Background[(a)] (µg/m^3)	42.0
PEC abnormal (µg/m^3)	139.0
PEC % of criterion	69.5

The PEC is under 70% of the assessment criterion, and as such exceedances of the NO_2 standard of 200 µg/m^3 are considered highly unlikely. This represents a very pessimistic scenario given that the maximum PC is estimated based on continuous emissions at the half hourly emission limit for 100% of the time of the failure, coinciding with the least favourable meteorological conditions in five years.

Conclusion

The estimated PCs for SNCR system failure are lower in this updated study however PECs are higher compared to those originally reported in the March 2014 ES chapter because a higher measured background concentration was used in the assessment (as opposed to a mapped background concentration in the original assessment).

Considering the conservative nature of the assessment, it is concluded that abnormal operation due to failure of the SNCR to the maximum extent allowed by the IED is not likely to cause exceedance of an AQS objective, and consequently there would be no significant impact.

A.1.3.2. Failure of the Acid Gas Abatement System

Long term impact

Assessment of the potential long-term impact due to the failure of the acid gas abatement system is shown in Table 0-5 abnormal emissions.. The PC for the abnormal operation has been calculated as an annual average assuming 60 hours of abnormal emissions.

Table 0-5 - Assessment of LongTerm Impact Due to Failure of the Acid Gas Abatement System (for comparison with March 2014 ES Table 14.23)

Substance	Averaging period	Criterion µg/m^3	PC normal	PC abnormal	PC as % of criterion
HCl	Annual	-[(a)]	0.019	0.020	-
HF	Annual	16	0.002	0.002	0.01
SO_2	Annual	-[(a)]	0.095	0.096	-

[(a)] Long term EAL no longer in guidance.

The estimated abnormal PC for HF is substantially less than 1% of the assessment criterion and the potential for long-term impacts due to failure of the acid gas abatement system are negligible. The long term EALs for HCl and SO_2 used previously are no longer in the latest guidance.

Short Term Impact

Assessment of the potential short-term impact due to the failure of the acid gas abatement system is shown in Table 0-6.

Table 0-6 - Assessment of Short Term Impact Due to Failure of the Acid Gas Abatement System (for comparison with 2014 ES Table 14.22)

Substance	Average period	Criterion, μg/m^3	Max PC	PC abnormal μg/m^3	PC as % of criterion	PEC abnormal μg/m^3	PEC as % of criterion
HCl	1 h	750	16.6	166.4	22.2	166.7	22.2
HF	1 h	160	1.1	8.3	5.2	-	-
SO_2	1 h 99.73%ile	350	55.5	166.4	47.5	168.4	48.1
SO_2	15 min 99.9%ile	266	74.3	222.9	83.8	224.9	84.6
SO_2 (½ hr 97%ile)	15 min 99.9%ile	266	18.6	55.7	21.0	57.7	21.7

The abnormal PECs for the modelled pollutants are below the relevant assessment criteria. Based on the conservative nature of the assessment, which applies maximum emission rates combined with least favourable meteorological conditions, it is unlikely that these concentrations would be reached.

Conclusion

In comparison with the March 2014 assessment, both long- and short-term PC results are mostly similar or lower than those originally estimated and the potential for short term impact due to failure of the acid gas abatement system to exceed short term criteria is very unlikely. Both the original ES chapter and this updated assessment conclude that impacts from acid gas abatement system are not significant.

A.1.3.3. Failure of the Activated Carbon Injection System

Long Term Impact

Assessment of the potential long-term impact due to the failure of the activated carbon injection system is shown in Table 0-7.

Table 0-7 - Assessment of Long-Term Impact Due to Failure of Activated Carbon Injection System (for comparison with March 2014 ES Table 14.25)

Metal	Average Period	Criterion μg/m^3	PC normal μg/m^3	PC abnormal μg/m^3	PC as % of criterion	PEC abnormal μg/m^3	PEC abnormal as % of criterion
Cd	Annual	0.005	0.00009	0.0001	2.1	0.0002	4.9
Hg	Annual	0.06	0.00009	0.0001	0.2		
As	Annual	0.006	0.00009	0.0011	18.0	0.0018	30.3
Co	Annual	-[a]	0.001	0.0011	-		
Ni	Annual	0.02	0.001	0.0011	5.4	0.0046	22.9
V[a]	Annual	-[a]	0.001	0.00011	-	-	-

[a] Long term EAL no longer in guidance

The long-term abnormal PEC is less than half the assessment criterion for the modelled pollutants, therefore abnormal emissions are not likely to cause an exceedance of the identified air quality criteria in the event of a failure of the system.

Short Term Impact

Assessment of the potential short-term impacts due to the failure of the activated carbon injection system is shown in Table 0-8.

Table 0-8 - Assessment of Short-Term Impact Due to Failure of Activated Carbon Injection System (for comparison with March 2014 ES Table 14.24)

Metal	Average Period	Criterion μg/m^3	PC normal, μg/m^3	PC abnormal, μg/m^3	PC as % of criterion	PEC abnormal, μg/m^3	PEC abnormal as % of criterion
Cd	24 h (S/T)	0.03	0.01	0.06[c]	188	0.06	189
Hg	1 h	0.6	0.01	0.3	45.2	0.3	45.7
As	1 h	-[b]	0.14	2.8	-	2.8	-
Co	1 h	-[b]	0.14	2.8	-	2.8	-
Ni	1 h	0.7	0.14	2.8	395	0.3	44.9
V[a]	24 h (S/T)	1	0.14	0.6[c]	58	2.2	216

[a] EAL updated
[b] EAL no longer in guidance
[c] abnormal PC calculated assuming 4 hours of abnormal emissions and 20 hours of normal short term emission rate

The estimated short-term PCs due to abnormal emissions exceed the relevant short term screening criteria for cadmium, mercury, nickel and vanadium and are above the assessment criterion for cadmium and vanadium, the assessment basis for which have recently been updated. This assessment has applied the assumption that emissions of each of these substances would be at the total permitted emission concentration for their relative group. The results for cadmium and vanadium have been calculated assuming four hours of abnormal emissions using daily average emission rates i.e. assumed to be emitted at their daily limit 100% of time, coinciding with the least favourable hours of meteorological data, for a conservative approach. Furthermore, for vanadium, as discussed in paragraph 14.83 of Chapter 14, emissions are more likely 11% of Group 3 metals giving a PEC an order of magnitude lower; if cadmium is assumed to represent 50% of the maximum Group 1 emission rate, the PEC halves and the 24 hour mean guideline is unlikely to be exceeded. Therefore, the probability for short term EALs to be exceeded are extremely remote.

Conclusion

In comparison with the March 2014 assessment, both long- and short-term PCs are lower than those originally estimated. In some cases, the PC as a percentage of the assessment criterion has increased due to updated basis for the assessment criterion. Applying more reasonable assumptions for emission rates, this updated assessment finds that no significant adverse impacts as a result of carbon injection are expected.

A.1.3.4. Failure of the Bag Filters

Long Term Impact

Assessment of the potential long term impact due to the failure of the bag filters is shown in Table 0-9

Table 0-9 - Assessment of Long Term Impact Due to Failure of Bag Filters (for comparison with March 2014 ES Table 14.27)

Substances	Average period	Criterion µg/m^3	PC normal, µg/m^3	PC abnormal, µg/m^3	PC % of assessment criterion	PEC abnormal, µg/m^3	PEC abnormal as % of criterion
PM_{10}	Annual	40	0.019	0.021	0.05	-	-
$PM_{2.5}$	Annual	25	0.019	0.021	0.01	-	-

The estimated abnormal PCs would not exceed 1% of the assessment criterion, therefore long term impact on the achievement of PM_{10} and $PM_{2.5}$ objectives/targets can be considered negligible.

Short Term Impact

Assessment of the potential short term impact due to the failure of the bag filters is shown in Table 0-10

Table 0-10 - Assessment of Short Term Impact Due to Failure of Bag Filters (for comparison with March 2014 ES Table 14.26)

Substance	Average period	Criterion	PC normal, µg/m^3	PC abnormal, µg/m^3	PC abnormal as % of criterion	PEC abnormal, µg/m^3	PEC abnormal as % of criterion
PM_{10}	24 h (s/t)	50	0.4	1.2	2.3	-	-
Cd	24 h (s/t)	0.03[b]	0.01	0.05[c]	150.5	0.05	151.5
Tl	1 h	30	0.01	0.2	0.7	-	-
Hg	1 h	0.6[b]	0.01	0.2	33.9	0.2	34.4
Sb	1 h	150	0.1	2.1	1.4		
As	1 h	-[a]	0.1	2.1	-		
Pb	1 h	-[a]	0.1	2.1	-		
Cr	1 h	-[a]	0.1	2.1	-		
Co	1 h	-[a]	0.1	2.1	-		
Cu	1 h	-[a]	0.1	2.1	-		
Mn	1 h	1500	0.1	2.1	0.1		
Ni	1 h	0.7	0.1	1.9	267	1.9	268
V	24 h (s/t)	1[b]	0.1	0.46[c]	46.1	2.0	204

[a] EAL no longer in latest guidance.
[b] EAL updated in latest guidance
[c] abnormal PC calculated assuming 4 hours of abnormal emissions and 20 hours of normal short term emission rate

The short-term PECs for cadmium, mercury, nickel and vanadium exceed the assessment criteria. As previously discussed, these metals have been modelled on the assumption that they comprise the total of metal emissions for their respective group (these maximum emissions are unlikely to be reached). When these PCs for the Group 3 metals are calculated assuming release at 1/9th of total emission rates, the PEC reduces by an order of magnitude so assessment criteria are not exceeded.

The assessment for cadmium used an hourly mean to compare to a criterion expressed as a daily average which is highly conservative given that the event would last only four hours. Applying a more realistic 50% of the Group 1 emission rate, with four hours at the abnormal release rate plus 20 hours at the normal rate, this gives an adjusted PC of 0.02 $\mu g/m^3$ which is below the daily mean criterion. This assumes all hours in a 24-hour period are represented by the field-wide maximum result from a five year meteorological dataset, a purely hypothetical situation.

Conclusion

Both long- and short-term PCs are lower than those presented in the March 2014 assessment. Both the original ES chapter and this updated assessment conclude that impacts as a result bag filters failure are unlikely to result in an exceedance of the relevant criteria and thus are not significant.

A.2. Human health risk assessment

A.2.1. Substance deposition

The maximum modelled long-term (annual mean) PCs for Group 1 to 3 heavy metals are similar to, or lower than, those presented in the March 2014 ES.

There are no changes to the “ground limits” in the latest permitting guidance. On this basis, there is no change to the conclusions of the assessment previously presented.

A.2.2. Dioxins and furans

The maximum modelled long-term PC for dioxins and furans is 1.9×10^{-10} $\mu g/m^3$ or 0.0002 pg/m^3, slightly lower than the 2.6×10^{-10} $\mu g/m^3$ or 0.0003 pg/m^3 reported in the March 2014 ES Appendix 14.9.

There is no change to the tolerable daily intake (TDI) which remains at 2 pg WHO-TEQ/kg bw/day recommended by the UK Committee on Toxicity (COT). On this basis, there is no change to the conclusions of the human health risk assessment previously presented.

A.3. Ecological sites

A.3.1. Long term

Concentrations

The maximum modelled field wide PCs were assessed to determine the likelihood of significant ecological impacts associated with direct exposure to air pollutants. Impacts were considered insignificant where the short-term PC is less than 10% of the short-term standard for protected conservation areas and the long-term PC is less than 1% of the long-term standard for protected conservation areas, in line with the assessment criteria for the national and international designated sites provided in the latest permitting guidance. When these criteria have been exceeded, the PEC has been calculated taking into account the background concentrations. For local nature sites, calculation of PEC is not required.

The results for relevant pollutants are provided in Table 0-11.

Table 0-11 - Screening of Maximum Impact from Emissions to Air on Vegetation and Ecosystems

Substance	Criterion	Averaging Period	Max PC µg/m³	PC as % of criterion	Background, µg/m³	PEC µg/m³	PEC as % of criterion
HF	5	24 h	0.04	0.7	-	-	-
SO_2	30	Annual	0.09	0.3	-	-	-
NO_x as NO_2	30	Annual	0.26	0.9	-	-	-
NO_x as NO_2	75	24 h	2.5	3.3	-	-	-
NH_3	3	Annual	0.02	0.6	-	-	-

When compared with the PCs in the March 2014 assessment in Table 14.17 of the air quality chapter, the updated modelled outputs are lower.

All pollutants and averaging periods can be screened out as the PC is less than 1% of the long-term criterion. This is the field-wide maximum PC modelled using the maximum permitted daily emission rate and assumes continuous operation of the EfW. The long-term impacts due to the emissions from the EfW facility are considered not significant.

The maximum short-term PC as nitrogen dioxide is well below 10% of the non-statutory daily mean criterion, consequently, short-term impacts are not significant.

The updated results confirm that the original assessment methodology was robust and that the impact of direct exposure of vegetation to these substances is not significant.

Deposition

Table 0-12 compares the latest estimated contributions of nitrogen and sulphur to acid deposition to the relevant updated critical load range for the habitat types associated with each designated site, as derived from the APIS website.

As well as the model algorithm and meteorological data, critical loads have been updated since the March 2014 ES so direct comparison of the two sets of results as a percentage of critical load is challenging. The focus should be on the conclusions drawn from results by an Ecologist, rather than the modelled output in isolation.

The estimated PC as an acid deposition rate is less than 1% of the critical load at all sites for nitrogen, and for all statutory and local sites except for receptor 27 (Squires Hill SLNCI) for sulphur (1.5%). Whilst the arbitrary screening threshold of 1% is exceeded, these contributions of are less than 2% the baseline conditions (including existing deposition rates) and are not considered by the Project Ecologist to lead to a significant adverse effect on the habitats in question. Further discussion is provided in Chapter 9, Ecology, of this Addendum.

Table 0-13 compares the estimated total nitrogen deposition rates (calculated for NO_x and NH_3 in combination) to the relevant updated critical load (using the lower end of the range presented) for the habitat types associated with each designated site, as derived from the APIS website. The background deposition loads represent the average for years 2020-2022.

The calculated PCs as nitrogen deposition are less than 1% of the lower critical load at all modelled statutory site locations (receptors 22 to 26) and are between 0.5 and 1.9% of the lower critical load at non-statutory sites (receptors 27 to 34). The increments of over 1% occur at locations representative of Belfast Hills-Squires Hill SLNCI, Cave Hill-Collinward SLNCI and Hyde Park Dam SLNCI. These local site contributions are equivalent to less than 1% of the current background loading (e.g. 0.6% at Squires Hill).

The significance of effects of nitrogen deposition is considered in more detail in Chapter 9, Ecology of this Addendum.

Table 0-12 - Acidification due to Nitrogen and Sulphur Deposition (comparison with Table 14.18 and 14.19 of ES March 2014)

No.	Protected Area	Feature	Acid Deposition		PC as N keq/ha/year	PC as % of CLmax N	PC as S keq/ha/year	PC as % of CLmax S
			Critical Load	Current Load				
22	Belfast Lough SPA (based on average set of critical loads & deposition values)	Common redshank Tringa tetanus (Eastern Atlantic – wintering) (A162)	Not acid sensitive		0.001	N/A	0.001	N/A
23	Belfast Lough SPA (335300, 378300)	Common redshank Tringa tetanus (Eastern Atlantic – wintering) (A162)	Not acid sensitive		0.001	N/A	0.001	N/A
24	Belfast Lough SPA & Inner Belfast Lough ASSI (334881, 380373, a western point)	Common redshank Tringa tetanus (Eastern Atlantic – wintering) (A162)	Not acid sensitive	1.13 (N: 1.01 | S: 0.19)	0.001	N/A	0.001	N/A
25	Belfast Lough Open Water SPA (343000, 385000, a central point)	Marine area. Sea inlet. Podiceps cristatus (A005) (coastal saltmarsh)	No comparable acid critical load class		0.001	N/A	0.001	N/A
26	Outer Belfast Lough ASSI (335635, 381087 western point)	Coastal sand dunes / Coastal vegetated shingle	maxCLmaxS: 4 MaxCLminN: 1.071 MaxCLmaxN: 5.071		0.001	0.02	0.001	0.03
27	Belfast Hills – Squires Hill SLNCI (330200, 378800, central point)	Heath, grassland , scrub (dwarf shrub heath)	CLmaxS: 0.46 CLminN: 0.5 CLmaxN: 0.96	1.27 (N: 1.13 | S: 0.22)	0.007	0.7	0.007	1.5
28	Belfast Hills – Squires Hill SLNCI (328916, 378962, western point)	Heath, grassland , scrub (dwarf shrub heath)	CLmaxS: 1.61 CLminN: 0.714 CLmaxN: 2.324	1.32 (N: 1.18 | S: 0.22)	0.002	0.1	0.002	0.15

No.	Protected Area	Feature	Acid Deposition		PC as N keq/ha/year	PC as % of CLmax N	PC as S keq/ha/year	PC as % of CLmax S
			Critical Load	Current Load				
29	Cave Hill – Collinward SLNCI (332378, 379708)	Heath, grassland , scrub (dwarf shrub heath)	CLmaxS: 0 CLminN: 0 CLmaxN: 0	1.19 (N: 1.06 | S: 0.2)	0.004	N/A	0.004	N/A
30	Cave Hill – Collinward SLNCI (330700, 380600)	Heath, grassland , scrub (dwarf shrub heath)	CLmaxS: 0 CLminN: 0 CLmaxN: 0	1.21 (N: 1.11 | S: 0.18)	0.005	N/A	0.006	N/A
31	Boghill SLNCI (328000, 381500)	Lake & wet grassland (coastal & floodplain grazing marsh)	No comparable acid critical load class	1.27 (N: 1.16 | S: 0.18)	0.003	N/A	0.003	N/A
32	Boghill SLNCI (327537, 381136)	Lake & wet grassland (coastal & floodplain grazing marsh)	No comparable acid critical load class	1.28 (N: 1.18 | S: 0.18)	0.003	N/A	0.003	N/A
33	Hyde Park Dam SLNCI (329030, 381635)	Reservoir surrounded by varied swamps (fen, marsh & swamp)	Not sensitive to acidity	1.25 (N: 1.14 | S: 0.19)	0.004	N/A	0.004	N/A
34	Hazelwood ASI (332496, 380422)	Hazel woodland and scrub (broadleaved, mixed & yew woodland)	CLmaxS: 1.453 CLminN: 0.143 CLmaxN: 1.596	1.92 (N: 1.76 | S: 0.24)	0.004	0.24	0.005	0.32

Table 0-13 - Nitrogen Deposition at Ecological Receptors (comparison with Table 14.20 in ES March 2014)

No.	Protected Area	Feature	Nitrogen deposition (kg/ha/y)		PC as N* kg/ha/y	PC as % of Min CL
			Critical Load	Current Load		
22	Belfast Lough SPA (based on average set of critical loads & deposition values)	Common redshank Tringa tetanus (Eastern Atlantic – wintering) (A162)	10 – 20	14.9	0.01	0.1%
23	Belfast Lough SPA (335300, 378300)	Common redshank Tringa tetanus (Eastern Atlantic – wintering) (A162)	10 – 20	14.9	0.01	0.1%
24	Belfast Lough SPA & Inner Belfast Lough ASSI (334881, 380373, a western point)	Common redshank Tringa tetanus (Eastern Atlantic – wintering) (A162)	10 – 20	15.0	0.02	0.2%
25	Belfast Lough Open Water SPA (343000, 385000, a central point)	Marine area. Sea inlet. Podiceps cristatus (A005) (saltmarsh)	10 – 20	14.2	0.01	0.1%
26	Outer Belfast Lough ASSI (335635, 381087 western point)	"Coastal sand dunes / Coastal vegetated shingle (Charadrius hiaticula)"	5 – 10	13.5	0.02	0.3%
27	Belfast Hills – Squires Hill SLNCI (330200, 378800, central point)	Heath, grassland, scrub (dwarf shrub heath)	5 – 15	15.8	0.09	1.9%
28	Belfast Hills – Squires Hill SLNCI (328916, 378962, western point)	Heath, grassland, scrub (dwarf shrub heath)	5 – 15	16.5	0.03	0.6%
29	Cave Hill – Collinward SLNCI (332378, 379708)	Heath, grassland, scrub (dwarf shrub heath)	5 – 15	14.9	0.05	1.1%
30	Cave Hill – Collinward SLNCI (330700, 380600)	Heath, grassland, scrub (dwarf shrub heath)	5 – 15	15.5	0.08	1.5%
31	Boghill SLNCI (328000, 381500)	Lake & wet grassland (coastal & floodplain grazing marsh)	10 – 20	16.3	0.05	0.5%
32	Boghill SLNCI (327537, 381136)	Lake & wet grassland (coastal & floodplain grazing marsh)	10 – 20	16.5	0.05	0.5%

No.	Protected Area	Feature	Nitrogen deposition (kg/ha/y)		PC as N* kg/ha/y	PC as % of Min CL
			Critical Load	Current Load		
33	Hyde Park Dam SLNCI (329030, 381635)	Reservoir surrounded by varied swamps (fen, marsh & swamp)	5 – 15	16.0	0.06	1.2%
34	Hazelwood ASI (332496,380422)	Hazel woodland and scrub (broadleaved, mixed & yew woodland)	10 – 15	24.7	0.05	0.5%

* Combined contribution from both NO_x and NH_3

Clyde Shanks

Appendix 14.2

ADMS dispersion modelling

ADMS dispersion modelling

B.1. Sensitivity study

The air dispersion study undertaken with ADMS v4.2 for the March 2014 assessment[2] have been updated using the latest version ADMS v6. This update uses meteorological data for 2019 to 2023, 2022/23 background concentrations and the latest assessment criteria. To provide a meaningful comparison, other model inputs and assessment methodology remain unchanged.

This sensitivity study focuses on normal operation for human health only, which is sufficient to evaluate the difference compared with AERMOD outputs. The long-term PCs are similar to the AERMOD outputs reported in the main chapter Section paragraph 14.83 of Chapter 14 and in Table A-1. The short-term PCs are either similar or lower to those derived from AERMOD.

The long and short term PCs from the ADMS dispersion model are provided and appraised in Table B-1 and Table B-2 respectively. These are the maximum field wide results, expressed as percentiles where appropriate for consistency with the short-term findings reported previously in Appendix 14.8 of the March 2014 ES.

On this basis, further assessment of the ADMS dispersion model outputs for receptor concentrations or other operational scenarios is not considered necessary.

[2] ES Appendix 14.8 Details of ADMS Dispersion Modelling

Table B-1 - ADMS Dispersion Model Results for Long Term Impact by Direct Inhalation

Substance	Assessment Criterion, µg/m^3	Averaging Period	PC, µg/m^3	PC as % of criterion	Background, µg/m^3	PEC, µg/m^3	PEC as % of criterion
PM_{10}	40	Annual	0.02	<0.1	-	-	-
$PM_{2.5}$	20	Annual	0.02	0.1	-	-	-
TOC as benzene	5	Annual	0.02	0.4	-	-	-
HCl	N/A[(b)]	-	0.02	-	-	-	-
HF	16	Monthly	0.00	<0.1	-	-	-
SO_2	N/A[(b)]	-	0.09	-	-	-	-
NO_x, 70% as NO_2	40	Annual	0.25	0.6	-	-	-
CO	N/A[(b)]	-	0.09	-	-	-	-
Cd	0.005	Annual	0.0001	1.7	0.0001	0.0002	4.5
Tl	1	Annual	0.0001	<0.1	-	-	-
Hg	0.06[(a)]	Annual	0.0001	0.1	-	-	-
Sb	5	Annual	0.0009	<0.1	-	-	-
As	0.006	Annual	0.0009	14.7	0.0007	0.0016	27.1
Pb	0.25	Annual	0.0009	0.4	-	-	-
Cr III	2[(a)]	24 h (long term)	0.0009	<0.1	-	-	-
Co	N/A[(b)]		0.0009	-	-	-	-
Cu	0.05[(a)]	24 h (long term)	0.0009	1.8	-	-	-
Mn	0.15	Annual	0.0009	0.6	0.005	0.0056	27.9
Ni	0.02	Annual	0.0009	4.4	-	-	-
V	N/A[(b)]		0.0009	-	-	-	-

Substance	Assessment Criterion, µg/m³	Averaging Period	PC, µg/m³	PC as % of criterion	Background, µg/m³	PEC, µg/m³	PEC as % of criterion
NH_3	180	Annual	0.02	<0.1	-	-	-

Note: [(a)] EAL updated

[(b)] EAL removed

Table B-2 - ADMS Dispersion Model Results for Short Term Impact by Direct Inhalation

Substance	Assessment Criterion, µg/m³	Averaging Period	PC, µg/m³	PC as % of criterion	Background, µg/m³	PEC, µg/m³	PEC as % of criterion
PM_{10}	50	24 h (90.41%ile)	0.1	0.1			
TOC	30	24 h	0.2	0.8			
HCl[(a)]	750	1 h	9.2	1.2			
HF[(a)]	160	1 h	0.6	0.4			
SO_2	125	24 h (99.18%ile)	0.9	0.7			
SO_2 [(a)]	350	1 h (99.73%ile)	13.3	3.8			
SO_2	350	1 h (99.73%ile)	3.3	1.0			
SO_2[(a)]	266	15 min (99.9%ile)	38.8	14.6	2.0	40.8	15.4
SO_2	266	15 min (99.9%ile)	9.7	3.7			
NO_2[(a)]	200	1 h (99.79%ile)	12.0	6.0			
NO_2	200	1 h (99.79%ile)	6.0	3.0			
CO[(a)]	30,000	1 h	15.4	0.1			
CO[(a)]	10,000	8 h	0.2	<0.1			
Cd	0.03	24 h (short term)	0.0	3.9			

Substance	Assessment Criterion, µg/m³	Averaging Period	PC, µg/m³	PC as % of criterion	Background, µg/m³	PEC, µg/m³	PEC as % of criterion
Tl	30	1 h	0.0	<0.1			
Hg	0.6	1 h	0.0	1.3			
Sb	150	1 h	0.1	0.1			
As	N/A		0.1	-			
Pb	N/A		0.1	-			
Cr	N/A		0.1	-			
Co	N/A		0.1	-			
Cu	N/A		0.1	-			
Mn	1500	1 h	0.1	<0.1			
Ni	0.7	1 h	0.1	11.0	0.0064	0.1	11.9
V	1	24 h (short term)	0.0	1.2			
NH_3	2500	1 h	1.5	0.1			

[a] estimated using half hourly emission limit value

B.2. Impacts of Wind Farm

The potential effects of the nearby wind farms on dispersion of pollution released from the EfW stack were assessed in response to a further information request made during the planning appeal in 2016. This was reported in an addendum to Appendix 14.8 of the 2014 ES[3], issued to the PAC in November 2016

The study was originally undertaken using ADMS v5.1.2 and this has been updated using ADMS v6 and five years of recent meteorological data (2019 to 2023). No further changes have been made to the model inputs and thus the details provided in the 2016 addendum report are still representative of the modelling undertaken.

The updated results are presented in Table B-3. This summarises the maximum ground level concentrations for a unitised emission rate, with and without the effects of the wind farm.

The updated results show that the long-term average PCs (first three rows) for individual years are around 25 to 30% higher with the effects of the wind farm included compared to modelled results with no wind farm. Conversely there is a slight reduction in the maximum hourly PCs of in most years. The differences in daily mean PCs range from no change up to 40% higher than those modelled without wind farm. These differences in the maximum field-wide result are greater than estimated in 2016, however, the maximum PCs from the updated modelling are, in nearly all cases, lower than were previously modelled.

The modelled increases to PCs with the wind farm estimated in the latest version of ADMSv6 do not change the conclusions of the main assessment, which found that during normal operation short term PECs would comfortably meet relevant criteria. There would be no material change in the abnormal operational results which largely are influenced by the estimated maximum hourly concentrations, which are comparatively less affected.

[3] November FEI 2016 Appendix 18 Air Quality

Table B-3 - Results of ADMS v6 Dispersion Model for Unitised Emission Rate (for comparison with Section A.1.13 of Appendix 18 to ES addendum/statement of case November 2016)

Averaging Period	Scenario Modelled	Meteorological Data Year				
		2019	2020	2021	2022	2023
8 hour average	without wind turbines	0.04	0.04	0.03	0.05	0.04
	with wind turbines	0.05	0.05	0.04	0.05	0.05
8 hour rolling	without wind turbines	0.04	0.04	0.03	0.05	0.04
	with wind turbines	0.05	0.05	0.04	0.05	0.05
24 hour average	without wind turbines	0.04	0.04	0.03	0.05	0.04
	with wind turbines	0.05	0.05	0.04	0.05	0.05
15 min 99.9%	without wind turbines	2.77	3.05	3.73	2.98	3.72
	with wind turbines	2.75	3.02	3.63	2.97	3.62
1 hour 100%	without wind turbines	2.57	2.98	3.29	3.96	3.01
	with wind turbines	2.57	2.98	3.29	3.95	3.01
1 hour 99.79%	without wind turbines	1.55	1.61	2.20	1.48	2.19
	with wind turbines	1.55	1.61	2.14	1.48	2.13
1 hour 99.73%	without wind turbines	1.46	1.55	1.59	1.42	1.71
	with wind turbines	1.46	1.55	1.59	1.42	1.70
24 hour 100%	without wind turbines	0.50	0.59	0.51	0.62	0.50
	with wind turbines	0.59	0.74	0.51	0.62	0.59
24 hour 99.18%	without wind turbines	0.37	0.48	0.42	0.46	0.34
	with wind turbines	0.41	0.48	0.42	0.51	0.47
24 hour 90.41%	without wind turbines	0.13	0.16	0.12	0.17	0.14
	with wind turbines	0.17	0.20	0.15	0.19	0.18

B.3. Plume Visibility

B.3.1. ADMS approach

Visible plumes from stack exhausts can arise when hot, wet gas mixtures are cooled to ambient temperature, resulting in the condensation of water vapour and a “white” plume. The extent of the plume is dependent on the volumetric flow rate of gases from the source, the amount of water vapour in the cooled gases, the relative humidity of the atmosphere and the dispersion of the plume in the atmosphere.

ADMS modelling software includes a module that can output estimates of plume visibility. Mathematical equations approximate the complex interactions between the plume and atmospheric conditions to predict the frequency and length of a visible plume.

Plume visibility is calculated using a combination of factors related to the plume’s physical properties and the surrounding atmospheric conditions. The key parameters influencing plume visibility are:

- initial water content: this includes water vapour or liquid water present in the emissions;
- ambient air humidity: used to determine the likelihood of water vapor in the plume condensing into visible droplets;
- temperature and humidity calculations: the model calculates the plume-affected temperature and specific or relative humidity at each output point to determine whether conditions are right for condensation to occur; and
- condensation of water: based on the initial water content and the ambient humidity, the model calculates whether the plume will be visible due to condensed water droplets at various distances downstream from the source.

B.3.2. Previous versions

The plume visibility assessment results presented in Appendix 14.5 of the March 2014 ES[2] were generated using ADMS v4.2, which was the version available at the time of the work being undertaken in 2013.

ADMS v5.0 SP1 (April 2013)

Changes to how plume visibility was calculated were made by the developer CERC in an update to ADMS, v5.0 released in April 2013. This included a “service pack” (SP1) to address errors in the original v5.0 version which gave rise to an unrealistically long plume, as the calculation of length was based on the last visible point based on locations where the plume was visible.

The most notable change in SP1 was the definition of when a plume would be visible was made, allowing a user to specify a threshold of ambient relative humidity above which the plume would not be considered visible. The results of the changes from v4.2 were generally to increase the frequency of visible plumes compared to v4.2. Figures presented by CERC at a user group conference showing the step change in results between those obtained using v4.2 and v5 SP1 are shown in below.

Owing to concerns regarding the representativeness of the outputs from these later versions, the decision made in consultation with the appointed air quality practitioner at the time was to not update the assessment. This was because ADMS model results were in their opinion likely to over-estimate the likelihood of a visible plume compared to reality.

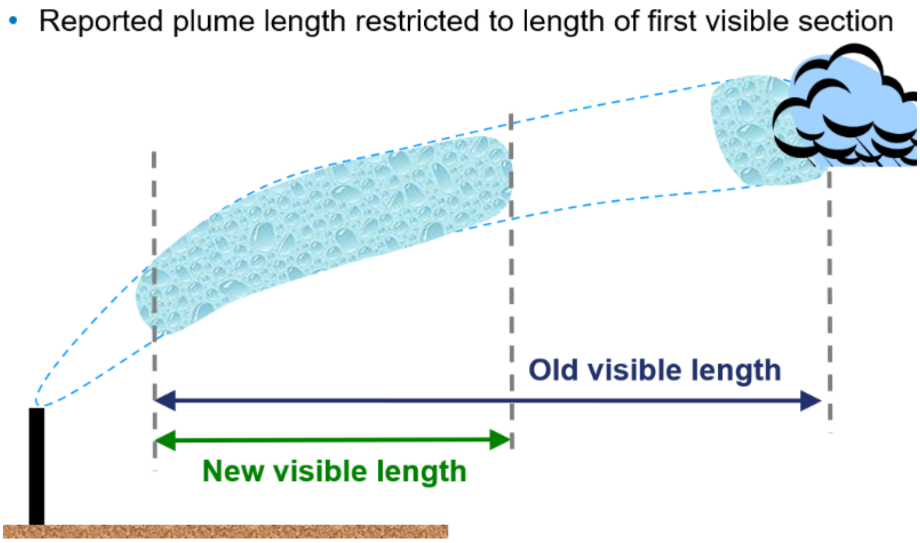
ADMS v5.1 (May 2015)

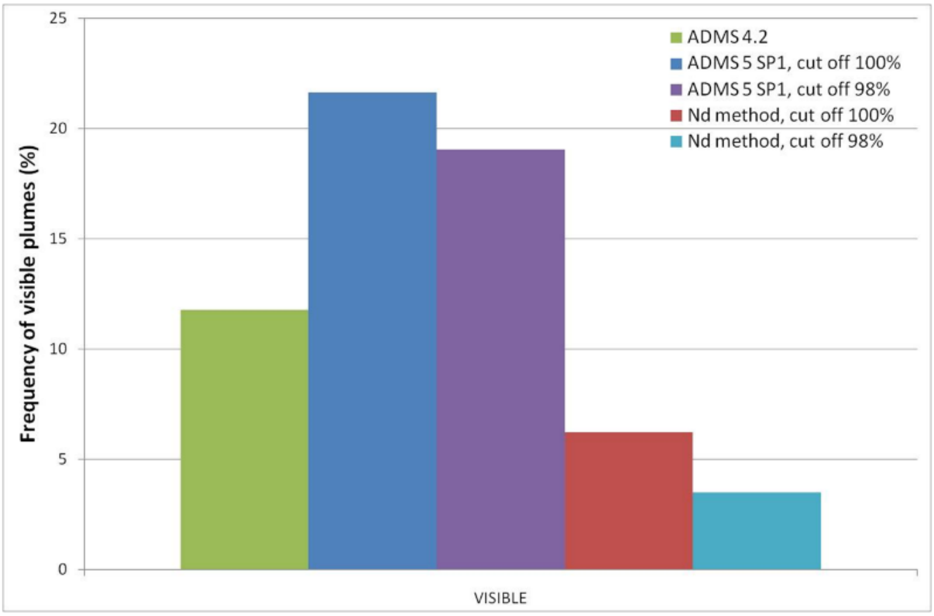
A further update was made by CERC in ADMS v5.1 in May 2015, which substantially refined the methodology for determining a visible plume. Previously, a plume was visible if the liquid water content was above 10^{-5} kg/kg; the update introduced two criteria:

1. An absolute liquid water content threshold, editable by the user with a default value of $2x10^{-3}$ kg/kg
2. An opacity criterion calculated by comparing the plume size to the visible length of plume.

Plumes would no longer be reported if the ground level humidity was 100%, and the default relative humidity for which a plume is indistinguishable from cloud was reduced to 98% from 100%.

Figure B-1 - Plume visibility changes in ADMS v5 SP1 compared to v5





^Nd= new method tested by CERC for relating liquid water content and droplet distribution to plume visibility.

ADMS v5.2 (Nov 2016)

In November 2016, ADMS v5.2 was released however this did not contain notable changes to the visibility module.

ADMS v6 (May 2023)

Several years later, CERC released ADMS v6 in May 2023. This version included improvements to how the model calculates the visibility of stack releases with a high water content. It was previously assumed that water exited the stack as a vapour, even when the water content was above the saturation level, which may have led to spikes in temperature immediately downstream of the stack. The model algorithm was adjusted by CERC to calculate the amount of water exiting the stack as water in the liquid phase to prevent this issue.

B.3.3. Results

Original assessment

The March 2014 ES assessment used ADMS v4.2 to estimate plume visibility using meteorological data for the years 2008 to 2012. This study found the plume to be visible between 17% and 21% of the time and the average plume length to be 57 m to 75 m i.e. typically within the site boundary, with a maximum length of 179 m. A grounding of a visible plume was not predicted.

Updated assessment

Following the introduction of further improvements to the plume visibility module in ADMS v6, it was agreed with IPRI that the assessment of visibility should now be updated for the EfW stack, which is by far the main visible plume.

The updated study uses meteorological data for 2019 to 2023 and the default 98% humidity cut off was applied. No other changes to the model inputs used in the original study have been made.

The updated plume visibility results using ADMS v6 are provided in Table B-4 and Table B-5. The results show that there is no visible plume until a short distance above the stack. The plume is modelled to be visible for approximately 48 to 58% of the time and with an average length of 55 to 60 m, i.e. remaining very close to or within the footprint of the site.

The area within which a visible plume occurs is illustrated in Figure B-2 for the year 2020, which gave the highest frequency of visible plume. The position of a viewer must be borne in mind when interpreting these findings: a plume would more commonly be seen at an oblique angle and so would not appear at the full length reported by the model, which assumes a perpendicular viewpoint.

A histogram showing the distribution of plume length is shown in Figure B-3 again for the year 2020, which gave the highest frequency of visible plume. This shows that for over 4,500 hours of the year plumes are less than 10 m long. Of the 55.7% of visible plumes that are up to 50m long, one third of these are between 1 and 10 m, so barely extending beyond the stack itself.

In summary, there will typically be no plume for around 50% of the time and when visible, it will be typically less than 60 m long, well within the footprint of the site. It will only appear at this length if the plume is observed from a perpendicular viewpoint. A grounding visible plume is not estimated to occur.

The full appraisal of potential visible plumes in relation to the visual amenity is provided in Chapter 10, Landscape and Visual, of this addendum.

Table B-4 - Plume Visibility Results for EfW Stack Release, 2019-2023 (for comparison to Appendix 14.8 Section A1.1.23)

Year	Number of hours of valid met. data	Number of visible plumes	Number of plumes visible at release	Median visible plume length (m)	Mean visible plume length (m)	Maximum visible plume length (m)	Mean / max. distance of visible plume from stack centre
2019	8415	4804 (57.1 %)	0	38.7	56.5	415.6	61.2 / 417.6
2020	8620	5017 (58.2 %)	0	42.7	59.6	513.7	64.8 / 516.3
2021	8351	4394 (52.6 %)	0	36.2	56.0	513.7	60.5 / 516.1
2022	8490	4137 (48.7 %)	0	39.1	55.5	573.3	60.4 / 575.5
2023	8571	4514 (52.7 %)	0	40.4	60.1	379.3	65.5 / 383.2

Table B-5 - Estimated Range of Plume Visible Length, 2019-2023

Visible Plume Length (m)	Percentage of Time Visible				
	2019	2020	2021	2022	2023
>0 to 50	59.7%	55.7%	61.3%	58.8%	56.4%
>50 to 100	23.0%	26.2%	22.9%	25.5%	23.8%
>100 to 150	9.8%	10.0%	7.6%	9.1%	10.1%
>150 to 200	4.2%	4.6%	3.9%	3.8%	5.4%
>200 to 250	1.9%	1.8%	2.4%	1.6%	2.7%
>250 to 300	1.0%	0.9%	1.1%	0.4%	1.1%

Figure B-2 - Plume visibility results, ADMS v6 with 2020 meteorological data

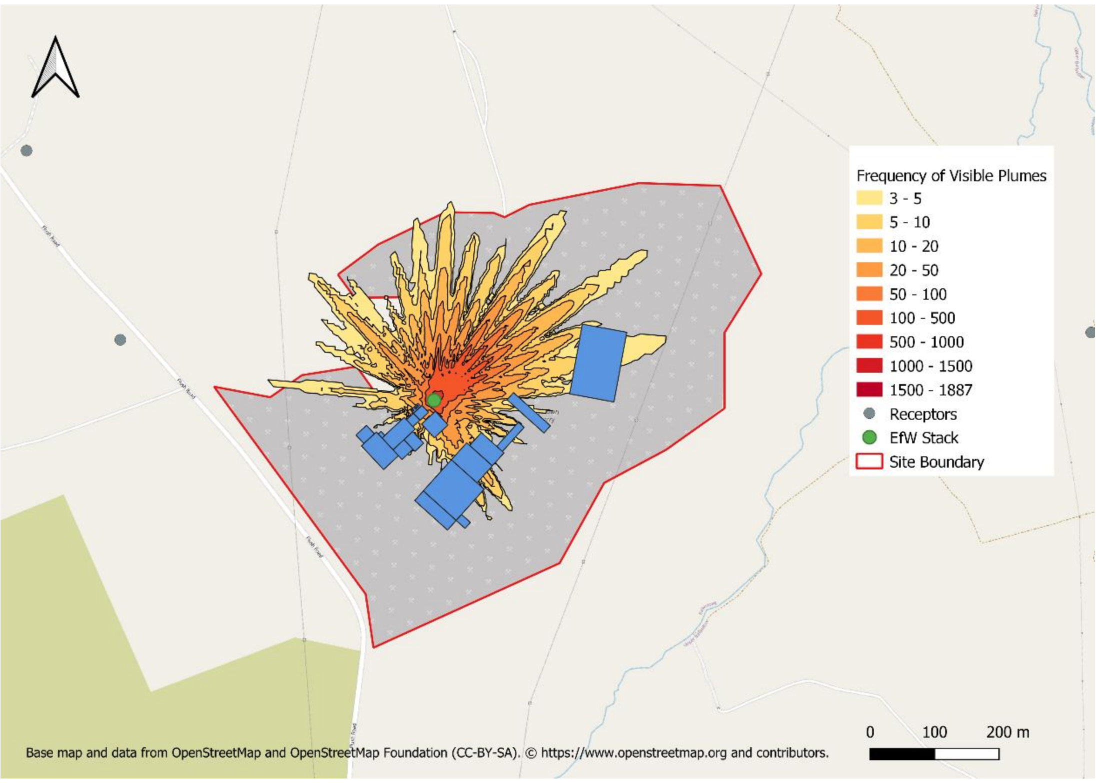
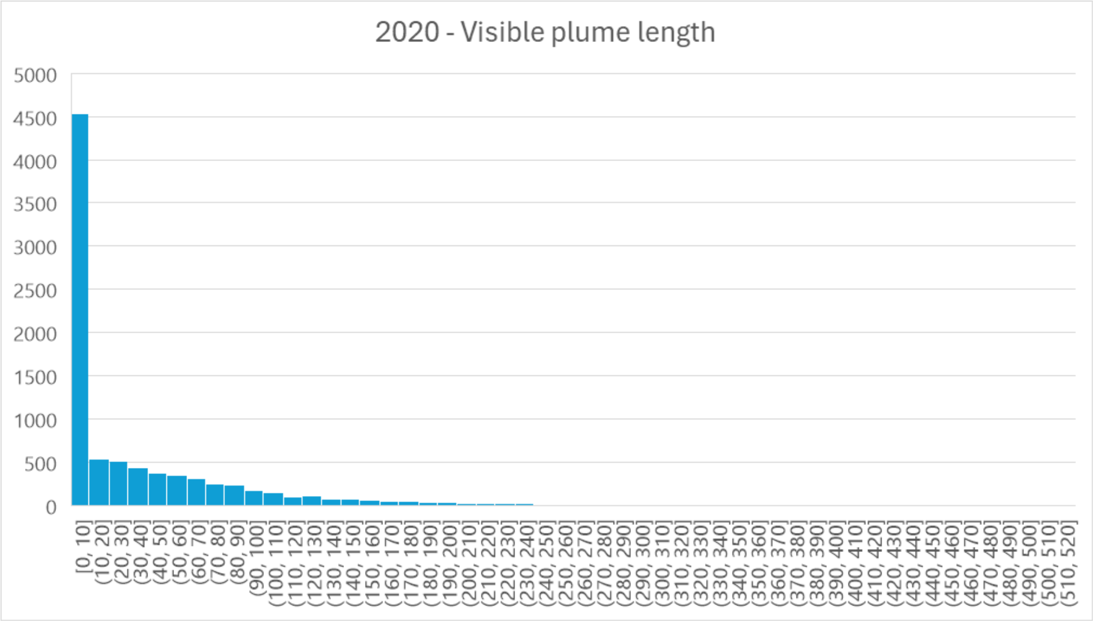


Figure B-3 - Plume visibility histogram, ADMS v6 with 2020 meteorological data



B.3.4. Sensitivity testing

The plume visibility module in ADMS v6 was also run using the meteorological data set for the years 2008 to 2012 for comparison with the March 2014 ES findings and to identify whether the cause of the increase in visibility was due to the more recent meteorological data.

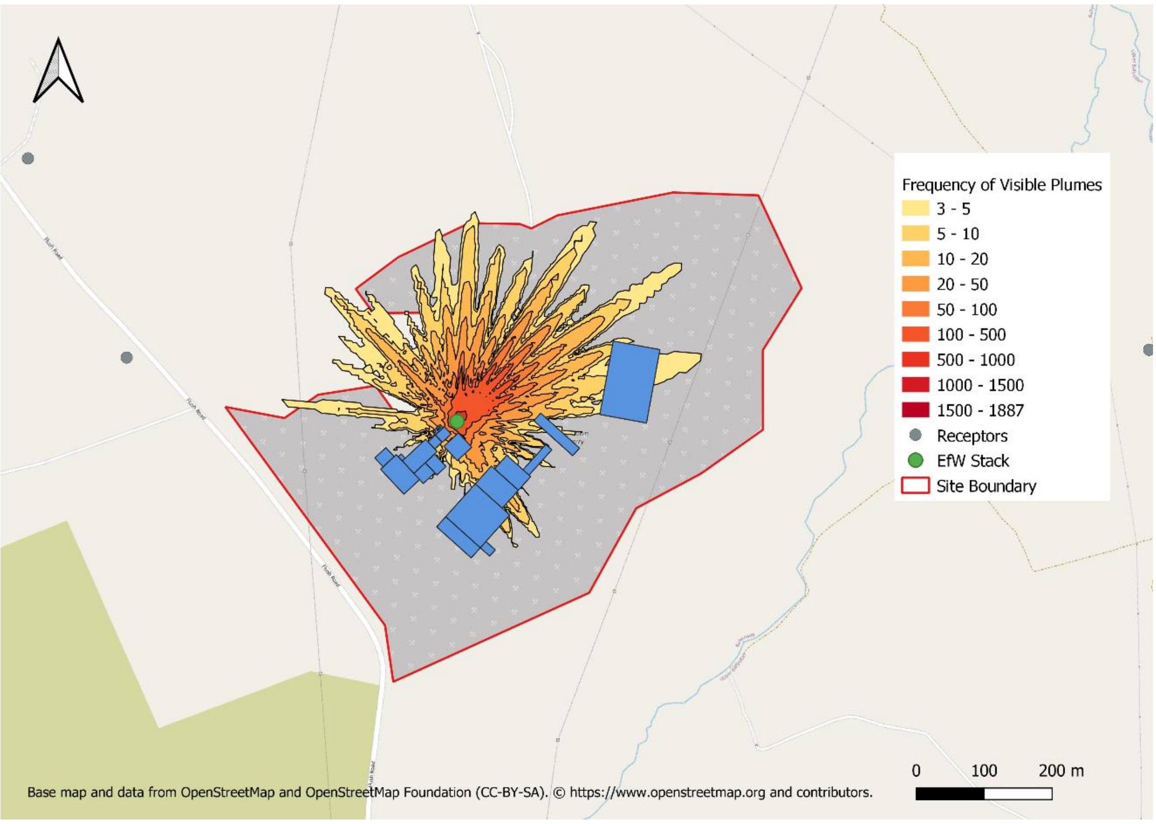
The range of results for plume visibility and distance of visible plume length for the earlier set of meteorological data is very similar: 49.1% to 64.2% visible with an average length of 55 to 68m. These results are provided in Table B-6, and a plot showing the distribution of visible plumes around the stack is shown in 2008 (i.e. the year with the highest frequency of visible plumes) is provided in Figure B-4.

Table B-6 - Plume Visibility Results for EfW Stack Release, 2008 to 2012 (for comparison to Appendix 14.8 Section A1.1.23)

Year	Number of hours of valid met. data	Number of visible plumes	Number of plumes visible at release	Median visible plume length (m)	Mean visible plume length (m)	Maximum visible plume length (m)	Mean / max. distance of visible plume from stack centre
2008	8559	5494 (64.2%)	0	49.1	64.0	486.7	68.8 / 488.9
2009	8544	5137 (60.1%)	0	53.6	67.7	514.0	72.7 / 516.2
2010	8165	4007 (49.1%)	0	35.2	57.2	514.0	61.4 / 516.2
2011	8430	4629 (54.9%)	0	37.7	55.0	413.4	60.7 / 415.3
2012	8577	5407 (63.0%)	0	39.3	58.1	460.8	62.5 / 463.5

The results from the plume visibility assessment using ADMS v6 for the years 2019 to 2023 were processed for the hours of daylight when a plume would be most visible. The range of results for plume visibility was again very similar: the plume was found to be visible 42 to 53% of the time, with an average plume length of between 54 m and 61 m.

Figure B-4 - Plume visibility results, ADMS v6 with 2008 meteorological data



B.3.4.1. Effects of wind farm on plume visibility

The committed Ballyutoag wind farm is located approximately 1 km north of 71 Ballyutoag Road and 1.6 km to the south west of the EfW stack, i.e. upwind of the site. Given the distance and the orientation of the wind farm relative to the EfW, and the modelled average length of the visible plume up to 60 m, no significant interaction is expected between the wind farm and the plume that would materially affect the modelled plume visibility.

Additional considerations on the effects of the wind farm on the plume were provided by Clean Air Thinking and reported in the Addendum to Appendix 14.8 (2018)[4]. It was considered that there could potentially be marginal, beneficial effects due to the additional turbulence induced by the wind farm increasing the mixing of the plume with the surrounding air, encouraging evaporation; and that may be offset by the velocity deficit to some degree giving greater plume rise, keeping the plume more 'compact' near the stack. These considerations are still deemed to be applicable to the updated findings.

Regarding the effect on ground level pollutant concentrations, the difference is complex in spatial terms, but the wind farm will not change the local relative humidity, which is the key variable in plume visibility calculations in both 2014 and 2025. The updated assessment including the wind farm still shows minor changes on the modelled pollutant concentrations due to the presence of the latter, and similar outcomes are expected for the plume visibility model estimates.

[4] Addendum to Appendix 14.8 – Details of ADMS Dispersion Modelling, 2018

B.4. ADMS Release Notes

ADMS 4.2 to 5.0 SP1.pdf

ADMS 5.0 SP1 to 5.1.pdf

P26_01.pdf