Kintore Hydrogen Plant

Environmental Impact Assessment Report
Chapter 11: Air Quality

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Kintore Hydrogen
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1 Introduction

1.1 Purpose of this chapter

1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) presents the findings of Environmental Impact Assessment (EIA) work undertaken concerning potential impacts of Kintore Hydrogen Plant on air quality.

1.1.2 For the construction phase, the most important consideration is dust. The mitigation measures provided within this report should ensure that the risk of adverse effects is reduced to a level categorised as 'not significant'.

1.1.3 During the operational phase, the most important consideration is the emissions from the proposed hydrogen flare.

1.1.4 The proposed development would not generate traffic flows on the surrounding road network during the construction or operational phase that are above the threshold where air quality assessment is required.

1.1.5 Further information of the hydrogen flare emissions modelling is contained in Volume 3, Appendix 11.1: Operational Air Quality Assessment.

1.1.6 This EIAR chapter:

- presents the environmental baseline established from desk studies, surveys and consultation to date;
- presents the potential environmental effects on air quality arising from Kintore Hydrogen Plant, based on the information gathered and the analysis and assessments undertaken;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

1.2 Planning policy and legislative context

The European Directive on ambient air and cleaner air for Europe

1.2.1 European Directive 2008/50/EC of the European Parliament and the Council of 21 May 2008[1] set legally binding concentration-based limit values, as well as target values, for the protection of public health and sensitive habitats. The Directive was transposed into domestic law by the Air Quality Standards Regulations in England, Scotland, Wales and Northern Ireland in June 2010[2], which continue to apply post-Brexit.

1.2.2 The pollutants included are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), oxides of nitrogen (NO_x) particulate matter of less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter of less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$), lead (Pb), carbon monoxide (CO), benzene, ozone (O_3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

UK Air Quality Strategy

1.2.3 The Environment Act 1995 established the requirement for the government and devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality. The AQS for England, Scotland, Wales and Northern Ireland was published in July 2007[3] and sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. In July 2021, the Scottish Government published an updated AQS, the Cleaner Air for Scotland 2 – Towards a Better Place for Everyone[4]. The new AQS sets out how the Scottish Government will continue to deliver air quality improvements to achieve the objective levels, with actions shaped around 10 general themes that largely reflect the high level recommendations arising from a review of the first Cleaner Air for Scotland strategy.

1.2.4 The AQS sets standards and objectives for 10 main air pollutants in order to protect health, vegetation and ecosystems. These are benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide, ozone and polycyclic aromatic hydrocarbons.

1.2.5 The UK air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on scientific and medical evidence. Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date. These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

1.2.6 The limit values and objectives relevant to this assessment are summarised in Table 1.1.

Table 1.1: Summary of relevant objectives of the National Air Quality Strategy[5]

Pollutant	Objectives	Concentration measured as	Date to be achieved by (and maintained thereafter)
Nitrogen dioxide (NO_2)	200 µg/m³ not to be exceeded more than 18 times a year	1 hour mean	31 December 2005
	40 µg/m³	Annual mean	31 December 2005
Particulate Matter (PM_{10})	50 µg/m³, not to be exceeded more than 7 times a year	24 Hour mean	31 December 2010
	18 µg/m³	Annual mean	31 December 2010
Particulate Matter ($PM_{2.5}$)	10 µg/m³	Annual mean	2020

Local Air Quality Management (LAQM)

1.2.7 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality. LAQM is the responsibility of Aberdeenshire Council in the area of the proposed development.

Aberdeenshire Local Development Plan

1.2.8 The policies and land allocations in the Aberdeenshire Local Development Plan[6] will direct decision-making on all land-use planning issues and planning applications in Aberdeenshire.

1.2.9 Policy P4: Hazardous and Potentially Polluting Developments and Contaminated Land states that the Council will refuse development if there is a "*risk that could cause significant pollution, create a significant nuisance (for example through impacts on air quality or noise), or present an unacceptable danger to the public or the environment*". As part of this policy, appropriate mitigation measures must be provided for any potential significant detrimental impacts on air quality from the proposed development.

1.2.10 Policy PR1: Protecting Important Resources states that new developments should not have a significant adverse impact on air quality. Additionally, air quality assessments may be required to demonstrate that appropriate mitigation to minimise any adverse effects can be provided and implemented.

1.3 Consultation

1.3.1 No comments were made specific to air quality assessment in the Scoping Opinion, and the proposed scope and assessment approach overall were agreed. Further matters agreed subsequent consultation specific to air quality are listed in Table 1.2, together with how details of how these issues have been considered in the production of this EIAR and cross-references to where this information may be found.

Table 1.2: Key points raised during scoping and consultation to date

Date	Consultee and type of response	Points raised	How and where addressed
June 2023	Aberdeenshire Council – Scoping Opinion	Scope and approach of EIA agreed, including the scoping-out of traffic emissions modelling as traffic generation was expected to fall below the thresholds for assessment. No specific comments made regarding air quality assessment.	Assessment has been undertaken in accordance with approach agreed at scoping stage, with the additional of modelling point-source pollutant emissions from the flare (discussed below).
February 2024	Scottish Environmental Protection Agency (SEPA) – email correspondence	Clarification on any requirement to model plume visibility. SEPA confirmed that this is controlled via PPC permitting, where the application of Best Available Techniques (BAT) must be demonstrated, and emissions other that pure water vapour are expected to be free from visible emissions during normal operation.	We confirmed that an assessment of plume visibility would not be included in the EIAR as the high hydrogen flare temperature and intermittent operation means visible condensing water vapour is not likely, and there are no other visible releases. No further response has been received.
March 2024	Aberdeenshire Council – submission of EIA Scoping Update letter	Informing Aberdeenshire Council of the addition of a hydrogen flare to the proposed development design, to safely manage hydrogen during an abnormal operational event. We set out the proposed approach to point-source air pollutant dispersion modelling and assessment for this emission source.	Response from Aberdeenshire Council not received at the time of writing, so approach proposed has been followed.

2 Assessment Approach

2.1 Guidance

2.1.1 Neither the National Planning Framework 4 (NPF4), nor the supporting planning circulars or planning advice notes provide prescriptive guidance on the methodology for assessing air quality effects or describing significance.

LAQM Technical Guidance

2.1.2 The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their review and assessment work in their Local Air Quality Management Technical Guidance (LAQM.TG(22))[7]. This guidance provides methods and assessment criteria that are applicable to planning developments. This guidance has been used where appropriate in this assessment.

EPUK and IAQM Land Use Planning and Development Control

2.1.3 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) published the Land-Use Planning and Development Control: Planning for Air Quality guidance in January 2017[8]. This guidance sets out criteria for identifying when certain types and methods of assessment are recommended, guidance on undertaking detailed assessments and criteria for assigning the significance of any identified effects. This guidance has been used where applicable in this assessment.

IAQM Guidance on the Assessment of Dust from Demolition and Construction

2.1.4 The guidance on the assessment of dust from demolition and construction[9] provides an evaluation matric to determine the potential risk of dust generation for demolition, earthworks, construction and trackout by assessing the dust emission magnitude and the sensitivity of the surrounding area. Dust and air emissions mitigation measures are recommended depending on the level of risk identified for the site. This guidance has been used where applicable in this assessment.

2.2 Assessment methodology

Construction phase methodology

2.2.1 The purpose of the construction phase assessment is to identify the level of risk from dust and traffic emissions associated with construction activities, and to propose a suitable mitigation strategy to ensure negative impacts are controlled and minimised.

2.2.2 Dust from construction processes contains a range of particle sizes, types and compositions. These can cause annoyance from soiling, and long-term exposure can potentially have morbidity or mortality effects. The emissions for consideration in this assessment are particulate matter; PM_{10} and $PM_{2.5}$.

2.2.3 Concentration-based limit values and objectives have been set for the PM_{10} and $PM_{2.5}$ suspended particle fraction, but no statutory or official numerical air quality criterion for deposited dust annoyance or nuisance has been set. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

2.2.4 Consistent with the IAQM guidance on the assessment of dust from demolition and construction, a risk-based assessment has been undertaken.

2.2.5 Construction traffic generated by the proposed development also has the potential to impact air quality through NO_2 emissions. Screening criteria provided by EPUK and IAQM state that a detailed air quality assessment is required where the proposed development would cause a change in Light Duty Vehicles (LDVs) of more than 500 annual average daily total (AADT) on local roads, and/or a change in Heavy Duty Vehicles (HDVs) of more than 100 AADT for sites outside an AQMA on local roads. The maximum AADT traffic generation from the proposed development in construction, as a flow on any one road link, would be 67 HDVs and 13 LDVs on the B977 to the north of Leylodge. This is below the threshold, so construction traffic emissions have been screened out and considered to be 'not significant'.

Operational phase methodology

2.2.6 Operational traffic flows fall below the EPUK and IAQM threshold for requiring a detailed air quality assessment, and therefore air quality impacts arising from operational traffic have been screened out and considered to be 'not significant'. The maximum daily total during the peak of operation is 124 LDVs and 0 HDVs on the B977 to the north of Leylodge. Details of traffic generation are given in Chapter 9: Transport and Access.

2.2.7 A quantitative assessment of air quality impacts arising from the hydrogen flare have been modelled using the Atmospheric Dispersion Modelling System (ADMS), developed by Cambridge Environmental Research Consultants (CERC), and meteorological data set from Dyce (Aberdeen Airport).

2.2.8 The assessment has focused on the emissions of NO_x as the main pollutant resulting from hydrogen combustion. Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2. For the purposes of this assessment, it is assumed that 100% of NO_x emissions are in the form of NO_2.

2.2.9 Further details of the air pollutant dispersion modelling methodology, including model parameters and inputs, is provided in Appendix 11.1.

2.3 Study area

2.3.1 For the construction phase the study area is up to 250 m from the site boundary and up to 50 m from roads within 250 m of the site, based on the IAQM guidance on the assessment of dust from demolition and construction.

2.3.2 LAQM.TG(22) describes the typical locations where air quality impacts should be considered: generally, the guidance suggests that it should be all locations *"where members of the public are regularly present"*. This can include residences, businesses, schools, and leisure or recreational areas among other examples.

2.3.3 For the operational phase, pollutant concentrations have been predicted at both representative sensitive receptors and over a 10 km by 10 km Cartesian grid of 100 m grid resolution to encompass other areas where the public may be regularly present. Representative sensitive receptors for this assessment have been selected at the nearest residential properties and businesses, where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest, as listed in Table 2.1 and illustrated in Figure 2.1. These individual receptor points represent either individual properties, groups of properties, or the nearest edges of larger settlements.

Table 2.1: Modelled sensitive receptors

ID	Description	X	Y
1	Residential	376445	814083
2	Residential	376508	814113
3	Business (garage)	377035	814091
4	Residential	376962	813841
5	Residential	377013	813865
6	Farm buildings	376845	813638
7	Residential	377134	813984
8	Residential	377091	813917
9	Residential	376834	813271
10	Residential	376792	813246
11	Residential	377006	813359
12	Residential	377020	813389
13	Business	375331	813650
14	Residential	375219	813264
15	Residential	376175	812928
16	Residential	376215	814866
17	Farm buildings	377396	813981
18	Residential	377074	815245
19	Residential	378541	815283
20	Residential	373794	815591
21	Residential	375376	814377
22	Residential	375466	814622
23	Residential (farm house)	377394	814746

2.3.4 The 10 km by 10 km grid is considered to be of sufficient size to capture air quality impacts on all potentially relevant receptor locations, based on expert judgement of plume dispersion. Beyond this distance, NO_2 concentrations from the hydrogen plant are anticipated to be negligible.

2.3.5 There are no nationally-designated nature conservation sites that are sensitive to nutrient nitrogen deposition or acid gas effects within this study area.

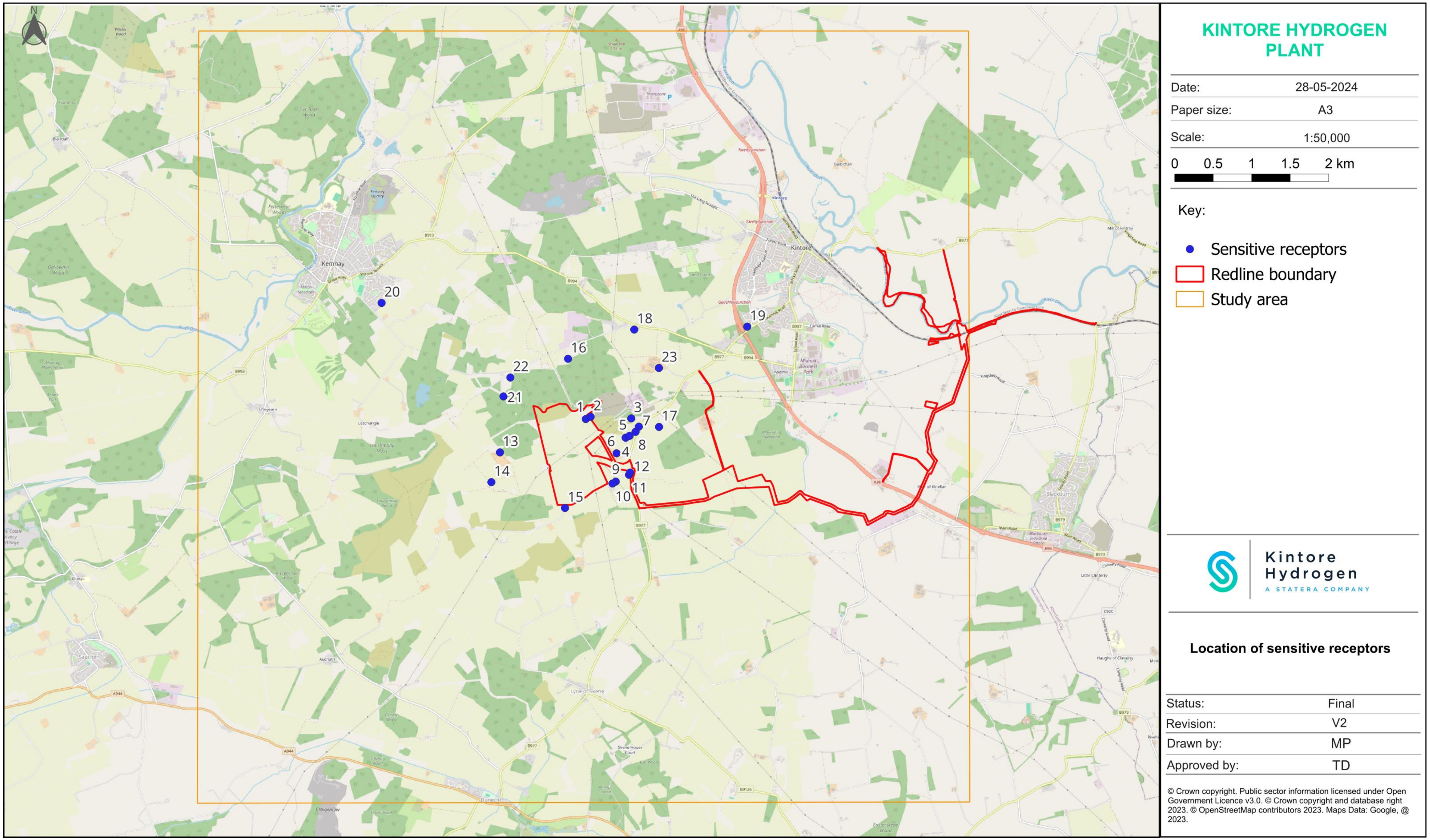


Figure 2.1: Location of sensitive receptors and dispersion modelling study area

2.4 Baseline study

Desktop study

2.4.1 Information on air quality was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 2.2 below. Details of background air pollutant concentrations established from these courses are given in Appendix 11.1: Operational Air Quality Assessment.

Table 2.2: Summary of desktop study sources

Title	Source	Year	Ref.
Defra Background mapping data for local authorities	https://uk-air.defra.gov.uk/data/laqm-background-home	2024	10
Air Quality Annual Progress Report for Aberdeenshire Council	https://www.scottishairquality.scot/sites/default/files/publications/2023-09/APR__Scotland_2023_v1.0.pdf	2023	11

2.5 Uncertainties and/or data limitations

2.5.1 All air quality assessment tools, whether models or monitoring measurements, have limitations. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will have an impact on the data produced.

2.5.2 The atmospheric dispersion model itself has limitations, due to a model inherently being a simplified version of the real situation: however, it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor.

2.5.3 Each of the data inputs for the model will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data to provide a conservative worst-case assessment. Worst-case assumptions that were adopted include:

- the emergency hydrogen flare is assumed to operate continuously at maximum capacity – this could not occur in reality, but ensures any potential frequency of operation has been assessed;
- an average of baseline air quality monitoring results at roadside locations has been used, rather than other lower background monitoring data; and
- results are presented for the worst-case meteorological year of the five years considered.

2.5.4 Notwithstanding the limitations of the assessment, the predicted total concentration reported in the air quality assessment as a result of the highly conservative modelling assumptions is likely to be towards the top of the uncertainty range rather than being a central estimate, therefore representing a cautious and 'maximum case' assessment. The actual concentrations that will be found when the development is operational are therefore extremely unlikely to be higher than those presented within this chapter and are more likely to be lower.

2.5.5 Further detail of inherent uncertainties or limitations associated with the set up of the dispersion model, and how these are managed, are given in Appendix 11.1: Operational Air Quality Assessment.

2.6 Impact assessment criteria

Assessment of construction dust

2.6.1 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to characterise the magnitude of potential impacts and sensitivity of receptors. For the assessment of air quality during construction, the IAQM dust guidance methodology has been used to determine the significance of an effect.

Source magnitude

2.6.2 The IAQM guidance gives examples of the dust emission magnitudes for demolition, earthworks, construction activities and track-out. These are based on the site area, building volume, number of Heavy Duty Vehicle (HDV) movements generated by the activities and the materials used. The ranking of source magnitude is set out in Table 2.3.

Table 2.3: Criteria for magnitude of impact

Features of the source of dust emissions	Dust emission magnitude
Demolition – building over 75,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 12 m above ground level. **Earthworks** – total site area over 110,000 m², potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 6m in height **Construction** – total building volume over 75,000 m³, activities include piling, on-site concrete batching, sand blasting. **Track-out** – >50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition – building between 12,000 to 75,000 m³, potentially dusty construction material and demolition activities 6 to 12 m above ground level. **Earthworks** – total site area between 18,000 to 110,000 m², moderately dusty soil type (e.g. silt), five to ten heavy earth moving vehicles active at any one time, formation of bunds 3m to 6m in height. **Construction** – total building volume between 12,000 and 75,000 m³, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. **Track-out** – 20 to 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	Medium
Demolition – building less than 12,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 6 m above ground, demolition during winter months. **Earthworks** – total site area less than 18,000 m². Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 3 m in height. **Construction** – total building volume below 12,000 m³, use of construction materials with low potential for dust release (e.g. metal cladding or timber). **Track-out** – <20 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

Sensitivity of the area

2.6.3 The pathway is the route by which dust and particulate matter may be carried from the source to the receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. Table 2.4 and Table 2.5 set out the IAQM basis for categorising the sensitivity of people and property receptors to dust soiling and PM_{10}.

Table 2.4: Sensitivities of people and property receptors to dust soiling effects

Receptor	Sensitivity
• users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and • the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	High
• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • indicative examples include parks and places of work.	Medium
• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads	Low

Table 2.5: Sensitivities of people and property receptors to PM_{10}

Receptor	Sensitivity
• locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	High
• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	Medium
• locations where human exposure is transient. • indicative examples include public footpaths, playing fields, parks and shopping streets	Low

Significance of effect

2.6.4 The significance of the effect is determined based on the magnitude of the impact and the sensitivity of the receptor, as shown in Table 2.6 to Table 2.9.

Table 2.6: Risk of dust impacts – demolition

		Magnitude of impact		
Sensitivity of receptor		Large	Medium	Small
	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible

Table 2.7: Risk of dust impacts – earthworks

		Magnitude of impact		
Sensitivity of receptor		Large	Medium	Small
	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible

Table 2.8: Risk of dust impacts – construction

		Magnitude of impact		
Sensitivity of receptor		Large	Medium	Small
	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible

Table 2.9: Risk of dust impacts – trackout

		Magnitude of impact		
Sensitivity of receptor		Large	Medium	Small
	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

2.6.5 The dust risk categories that have been determined for each of the four activities above have been used to define the appropriate site-specific dust control measures based on those described in the IAQM guidance. The guidance states that provided the dust control measures are successfully implemented, the resultant effects of the dust exposure will normally be 'not significant'.

Assessment of operational-phase effects

2.6.6 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor, as described above. This section describes the criteria applied to characterise the magnitude of potential impacts and sensitivity of receptors, using the EPUK & IAQM (2017) guidance. The guidance follows a similar approach in that the magnitude of an impact is considered in the context of the sensitivity of air quality at each receptor to determine the significance of effect.

Magnitude of impact

2.6.7 The magnitude of impact is the predicted change in pollutant concentration at a sensitive receptor location relative to the Air Quality Assessment Level (AQAL).

Sensitivity of the receptor

2.6.8 The sensitivity of the receptor to change in air pollutant concentration is indicated by the baseline long-term average concentration at that location. Receptors with a higher baseline concentration, with less headroom to exceedance an AQAL, are therefore considered to be more sensitive to changes in air quality concentrations.

Significance of effect

2.6.9 For long-term (annual mean) impacts, the change in concentration relative to the applicable long-term AQAL is first considered at each receptor to determine an impact descriptor as outlined in the EPUK & IAQM (2017) guidance.

2.6.10 When describing air quality impacts at a sensitive receptor, the change in magnitude of the concentration is then also considered in the context of the absolute concentration (total of baseline plus proposed development contribution) and any potential exceedance of the long-term AQAL at the sensitive receptor.

Table 2.10: Impact description for individual sensitive receptors

Concentration with development	% change in concentration relative to Air Quality Assessment Level (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

Concentration with development	% change in concentration relative to Air Quality Assessment Level (AQAL)			
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

IAQM and EPUK notes to this table:

AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level' (EAL).

The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.

The table is only designed to be used with annual mean concentrations.

Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme' concentration for an increase.

The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposures less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approached and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

2.6.11 The above criteria and matrix are for assessing long-term impacts. In relation to short-term impacts, paragraph 6.39 of the EPUK & IAQM (2017) guidance states:

"*Where such peak short term concentrations from an elevated source are in the range 11-20% of the relevant AQAL, then their magnitude can be described as small, those in the range 21-50% medium and those above 51% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. That is not to say that background concentrations are unimportant, but they will, on an annual average basis, be a much smaller quantity than the peak concentration caused by a substantial plume and it is the contribution that is used as a measure of the impact, not the overall concentration at a Receptor. This approach is intended to be a streamlined and pragmatic assessment procedure that avoids undue complexity*."

2.6.12 Therefore, the following descriptors for assessing the impact magnitude resulting from short term impacts are applied in this assessment:

- 10% or less – negligible;
- 11-20% - slight;
- 21-50% - moderate; and
- 51% or greater – substantial.

2.6.13 As with the long-term impact assessment, the short-term impact assessment then goes on to consider the absolute concentration and any potential exceedance of the long-term AQAL at the sensitive receptor.

2.6.14 For both long- and short-term effects, the assessment of significance of effect from the proposed development overall is principally made through professional judgement, taking into consideration the varying impact magnitude and effect significance predicted at individual receptors as set out above. Guidance is provided on the factors that need to be considered when reaching this judgement, namely:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

2.6.15 In assigning significance levels to the likely effects, the following terms have been used:

- Substantial – only adverse effects are normally assigned this level of significance. They represent key factors in the decision making process with regard to planning consent;
- Major – these beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision making process;
- Moderate – these beneficial or adverse effects may be important, but are not likely to be key decision making factors;
- Minor – these beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of the project; and
- Negligible – no effects or those that pose a very small risk in comparison to normal risks in everyday life, or are beneath levels of perception, or are within normal bounds of variation or within the margin of forecasting error.

2.6.16 Effects assessed as **moderate** or above are considered to be **significant** in this assessment.

2.7 Maximum design envelope parameters for assessment

2.7.1 The maximum design envelope parameters identified in Table 2.11 have been selected as those having the potential to result in the greatest effect on an identified receptors or receptor groups. These parameters have been identified based on the overview description of the development provided in Chapter 2: Project Description and Site Setting

2.7.2 Effects of greater adverse significance are not predicted to arise should other development designs, within the project design envelope parameters, be taken forward.

Table 2.11: Maximum design envelope parameters assessed

Potential impact	Maximum design parameter	Justification
Construction phase		
Increase in suspended particulate matter concentrations and deposited dust	A 'high risk' site for earthworks, construction and trackout has been assumed as a conservative approach.	Reasonable maximum for potential construction dust generation
Operational phase		
Increase in NO_2 concentrations due to emissions from the hydrogen flare	Hydrogen flare operating at full capacity 24/7/365	Maximum potential long-term (annual mean) air quality impact
	Hydrogen flare modelled at two locations, representing more likely case scenario and maximum case scenario for proximity to receptors. Location of stacks are specified in Appendix 11.1.	Maximum potential air quality impacts to identified sensitive receptors
	Hydrogen flare modelled with two heights and diameters, representing a design envelope for flare designs (with the maximum case being the lower release height)	Maximum potential air quality impacts to identified sensitive receptors
	Maximum height building envelopes as shown in the Planning Parameters Plan have been arranged as blocks within the site boundary, one of which is represented as being as close as possible to the proposed flare locations, as shown in Appendix 11.1.	Maximum potential building wake effect on air pollutant dispersion

2.8 Impacts scoped out of the assessment

2.8.1 The impacts listed in Table 2.12 have been scoped out of the assessment for air quality as agreed through the EIA scoping process detailed in Chapter 5: Scoping and Consultation.

Table 2.12: Impacts scoped out of the assessment

Potential impact	Justification
Construction phase	
Complex air quality dispersion modelling of traffic-source air pollutants	Traffic movements fall below thresholds for assessment set out in the applicable guidance.
Operation phase	
Complex air quality modelling of traffic-source air pollutants	Traffic movements fall below thresholds for assessment set out in the applicable guidance.

2.9 Mitigation measures adopted as part of Kintore Hydrogen Plant

2.9.1 A number of measures have been designed in to Kintore Hydrogen Plant to reduce the potential for impacts on air quality. These are listed in Table 2.13.

2.9.2 A CEMP will be secured by planning condition to mitigate construction-phase impacts. As shown in the Outline CEMP submitted with the planning application, this will include the dust mitigation measures applicable to a high risk site as recommended in the IAQM dust guidance. They include general mitigation measures, as well as measures specific to earthworks, construction and trackout. Demolition mitigation measures have not been specified on the basis that demolition is not anticipated at the proposed development.

2.9.3 The implementation of recommended construction dust control measures ensures that the effects from dust during the construction phase are 'not significant', as stated in the IAQM dust guidance.

2.9.4 Operation of the proposed development will be regulated by SEPA through a PPC Permit. This will require that BAT is applied, will specify limits for air operational air pollutant emissions, and will require monitoring and reporting of these to SEPA.

Table 2.13: Designed-in mitigation measures

Measures adopted as part of Kintore Hydrogen Plant	Justification
Construction phase	
Applicable IAQM dust mitigation measures for a 'high risk' site, which are detailed in the Outline CEMP	Application of these good-practice management measures will reduce the dust risk to a non-significant level..
Operation phase	
Hydrogen flare design and operation in accordance with BAT, regulated through the PPC Permit by SEPA.	Ensures that flare operation meets the regulatory standards air pollutant emissions.

3 Baseline environment

3.1 Current baseline

3.1.1 The background concentration can often represent a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic.

3.1.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra background maps[12], which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- Published results of local air quality monitoring in the 2023 Air Quality Annual Progress Report (APR) for Aberdeenshire Council[13].

3.1.3 A description of baseline air quality is provided in Appendix 11.1. For the purpose of this assessment, a baseline NO_2 concentration of 13.8 µg/m^3 has been used. This is based on monitoring data for the year 2022, and to ensure that the assessment presents conservative results, no reduction in background has been applied for future years.

3.2 Future baseline

3.2.1 Future air quality baseline conditions are expected to improve, particularly with ongoing improvements to the vehicle fleet in the UK. However, to ensure that the assessment presents conservative results, it is assumed that there would be no reduction in the baseline conditions from current levels.

Climate change

3.2.2 The dispersion modelling of operational effects has been undertaken for five years of hourly meteorological conditions. The assessment therefore already takes into account a wide range of ambient temperatures and wind speeds. The assessment has been undertaken using the relevant technical guidance and based on current knowledge, the results of the assessment are not expected to be significantly influenced by climate change effects within the expected operational lifetime of the proposed development.

4 Assessment of Effects

4.1 Construction phase

4.1.1 To follow the methodology outlined in the IAQM dust guidance, this section first defines the unmitigated dust emission magnitude for earthworks, construction and trackout. There is no demolition proposed for the development so demolition is not considered further.

Magnitude of impact

4.1.2 To perform a conservative, worst-case assessment, the dust emission magnitude for the earthworks, construction and trackout stage is classified as **large**.

4.1.3 The dust emission magnitude is predicted to be of local spatial extent, short term duration, intermittent and reversible.

Sensitivity of the receptor

4.1.4 As a conservative, worst-case assessment, the sensitivity of the surrounding area to earthworks, construction and trackout is classified as **high**.

Significance of effect

4.1.5 The dust emission magnitude has been considered in the context of the sensitivity of the area to give the risk of dust impacts. As shown in Table 4.1, all construction relative activities associated with the proposed development were assigned high risk classifications as a conservative approach.

Table 4.1: Dust impact risk for earthworks, construction and trackout

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	High risk	High risk	High risk
Human health	High risk	High risk	High risk

4.1.6 The mitigation measures appropriate to a high risk site are set out in Table 2.13. Provided this mitigation is implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that:

"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'".

4.1.7 The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

4.1.8 Overall, it is predicted that the **large** impact on the **high** sensitivity receptor would result in a **negligible** effect once the recommended IAQM mitigation measures are implemented, which is **not significant**.

Further mitigation or enhancement

4.1.9 No significant adverse effects have been predicted once the mitigation measures presented in Table 2.13 are implemented and therefore no further mitigation beyond the committed measures is considered to be required.

Residual effect

4.1.10 No further mitigation or enhancement is considered to be required so the residual effect would be **negligible** once the recommended IAQM mitigation measures are implemented, which is **not significant**.

Future monitoring

4.1.11 With the exception of dust monitoring set out in Table 2.13, no other monitoring is considered necessary.

4.2 Operational phase

4.2.1 A total of four scenarios have been modelled, showing two different stack sizes (representing a stack design envelope) and two different stack locations (representing different areas of the locational envelope defined in the Planning Parameters Plan). The results presented in this chapter are for Scenario 1, which depicts the smaller of the two stack options (with a lower release height), located to the east of the flaring infrastructure area which is closest to the eastern site boundary and hence the closest to existing sensitive residential receptors. The results of the other three scenarios are presented in Appendix 11.1: Operational Air Quality Assessment.

4.2.2 The assessment has considered both the Process Contributions (PC) and the resultant Predicted Environmental Concentrations (PEC). The PC is the contribution of the proposed development (hydrogen flare) emissions to local air quality at each of the receptors. The PEC is the PC plus the background concentration.

Magnitude of impact

4.2.3 For the purpose of this assessment, the magnitude of impact is considered to be the change in concentration relative to the AQAL, i.e. the PC as a % of AQAL column in Table 4.2 and Table 4.3.

Sensitivity of the receptor

4.2.4 For the purpose of this assessment, the sensitivity of the receptor is indicated by the long term average concentration at each receptor, i.e. the PEC as a % of the AQAL column in Table 4.2 and Table 4.3.

Significance of effect

Long-term effects

4.2.5 Table 4.2 summarises the long-term maximum PC and PEC values at the selected sensitive receptors, as well as the maximum concentration at any grid point outside the site boundary. Figure 4.1 shows the contours for the annual-mean NO_2 PC.

Table 4.2: Long-term predicted NO_2 concentrations (µg/m^3)

Receptor ID	PC	PC as % of AQAL	PEC	PEC as % of AQAL	Impact descriptor	Initial significance
Maximum concentration outside site boundary	7.71	19%	21.54	54%	Moderate	Not significant
1	3.28	8%	17.12	43%	Slight	Not significant
2	2.48	6%	16.31	41%	Slight	Not significant
3	0.22	1%	14.05	35%	Negligible	Not significant
4	0.35	1%	14.18	35%	Negligible	Not significant
5	0.33	1%	14.17	35%	Negligible	Not significant
6	0.19	0%	14.02	35%	Negligible	Not significant
7	0.23	1%	14.06	35%	Negligible	Not significant
8	0.28	1%	14.12	35%	Negligible	Not significant
9	0.09	0%	13.92	35%	Negligible	Not significant
10	0.08	0%	13.91	35%	Negligible	Not significant
11	0.14	0%	13.97	35%	Negligible	Not significant
12	0.15	0%	13.98	35%	Negligible	Not significant
13	0.00	0%	13.84	35%	Negligible	Not significant
14	0.00	0%	13.84	35%	Negligible	Not significant
15	0.00	0%	13.84	35%	Negligible	Not significant
16	0.64	2%	14.47	36%	Negligible	Not significant
17	0.16	0%	13.99	35%	Negligible	Not significant
18	0.18	0%	14.02	35%	Negligible	Not significant
19	0.05	0%	13.88	35%	Negligible	Not significant
20	0.01	0%	13.85	35%	Negligible	Not significant
21	0.04	0%	13.87	35%	Negligible	Not significant
22	0.03	0%	13.87	35%	Negligible	Not significant
23	0.10	0%	13.93	35%	Negligible	Not significant

4.2.6 Predicted-annual mean NO_2 concentrations at existing sensitive receptors are below the AQAL and impact descriptors range from 'negligible' to 'slight', which is not significant.

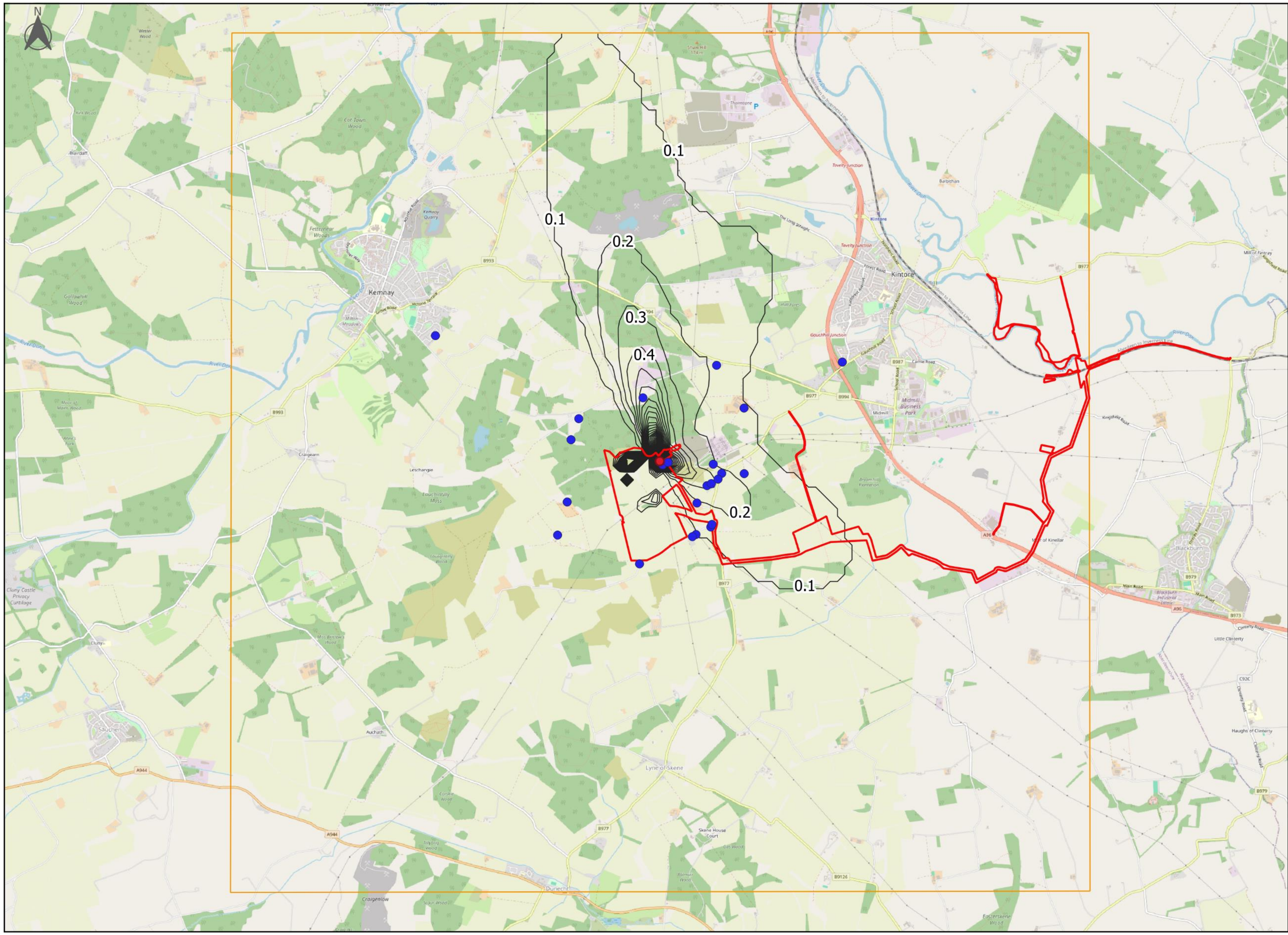
4.2.7 The maximum concentration at any grid point outside the site boundary has an initial impact descriptor of 'moderate' based on the percentage contribution of the PC to the AQAL, which is classed as potentially significant. However, guidance from the Environment Agency[14] states that:

4.2.8 *"You don't need to take further action if your assessment has shown that both of the following apply:*

- *Your proposed emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is not BAT EAL*
- *The resulting PECs won't exceed environmental standards".*

4.2.9 The PEC for the maximum concentration of NO_2 outside the site boundary is below the AQAL of 40 µg/m^3 and so does not need to be considered further. The PEC is only 54% of the AQAL, which demonstrates that there is considerable headroom between the AQAL and the PEC. Therefore, the impact is not considered to be significant. It should also be noted that this is a maximum grid point, and not located at any existing sensitive receptor.

4.2.10 Overall, on this basis and using professional judgement, the overall significance of effect is considered to be **negligible**, which is **not significant**.



KINTORE HYDROGEN PLANT	
Date:	28-05-2024
Paper size:	A3
Scale:	1:50,000

0 0.5 1 1.5 2 km

Key:

- Stack location
- Sensitive receptors
- Redline boundary
- Study area

Annual-mean contours

- 0.1 µg/m³ increments

Kintore Hydrogen
A STATERA COMPANY

Annual-mean NO_2 PC (µg/m³)

Status:	Final
Revision:	V2
Drawn by:	MP
Approved by:	TD

Figure 4.1: Annual-mean process contribution (µg/m³)

Short-term effects

4.2.11 Table 4.3 summarises the short-term maximum PC values at selected sensitive receptors and the maximum concentration at any grid point outside the site boundary. Figure 4.2 shows the contours for the hourly-mean NO_2 PC.

Table 4.3: Short-term predicted NO_2 concentrations (µg/m^3)

Receptor ID	PC	PC as % of AQAL	Impact descriptor	Initial significance
Maximum concentration outside site boundary	288.16	144%	Substantial	Significant
1	197.35	99%	Substantial	Significant
2	110.08	55%	Substantial	Not significant
3	5.27	3%	Negligible	Not significant
4	13.31	7%	Negligible	Not significant
5	14.38	7%	Negligible	Not significant
6	6.50	3%	Negligible	Not significant
7	8.99	4%	Negligible	Not significant
8	12.02	6%	Negligible	Not significant
9	3.83	2%	Negligible	Not significant
10	3.31	2%	Negligible	Not significant
11	5.57	3%	Negligible	Not significant
12	5.50	3%	Negligible	Not significant
13	0.19	0%	Negligible	Not significant
14	0.19	0%	Negligible	Not significant
15	0.13	0%	Negligible	Not significant
16	14.85	7%	Negligible	Not significant
17	5.63	3%	Negligible	Not significant
18	6.41	3%	Negligible	Not significant
19	1.97	1%	Negligible	Not significant
20	0.65	0%	Negligible	Not significant
21	3.16	2%	Negligible	Not significant
22	1.68	1%	Negligible	Not significant
23	3.77	2%	Negligible	Not significant

4.2.12 Of the individual sensitive receptors, the results show that the highest PC as a percentage of the AQAL is 99% (at receptor 1) and has an initial impact descriptor of 'substantial' based on percentage contribution. Receptor 2 also has an initial impact descriptor of 'substantial', with a PC as a percentage of the AQAL of 55%. As such, the impact at these locations are considered to be potentially significant.

4.2.13 With reference to these locations, the Environment Agency's guidance states that where the PCs exceed 10% of the AQAL, the impacts are not considered significant if the PEC remains below the AQAL. The guidance continues by stating that:

"when you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration".

4.2.14 Assuming a background NO_2 concentration of 27.6 µg/m^3 the PEC for receptor 2 is 137.75 µg/m^3 and 69% of the AQAL (which is 200 µg/m^3). On the basis that the PEC remains well below the AQAL for receptor 2, this is not considered to be significant.

4.2.15 The PEC for receptor 1, however, would exceed the AQAL in the modelled scenario. It should noted here that the appraisal is initially on a highly conservative basis, considering flare operation at maximum capacity during every hour of the year. This is not the proposed mode of operation: in practice it is extremely unlikely that flare operation at this capacity, which is a capability provided for abnormal events, would occur as frequently as 18 times, for an hour each time, per annum (which is the basis of the short-term AQAL). It is therefore extremely unlikely that the short-term AQAL, by definition, could be exceeded in practice.

4.2.16 The maximum concentration at any grid point outside the site boundary also has an initial impact descriptor of 'substantial'. The PC and the PEC would exceed the AQAL of 200 µg/m^3. As noted above, this could only be the case if the flare were to be operated at maximum capacity for more than 18 hours per year (which is not expected).

4.2.17 On the basis that the flare would not occur as frequently as modelled, and using professional judgement, the overall short-term impacts are considered to be **minor adverse**, which is **not significant**. Further mitigation measures to secure this are discussed in the next section.

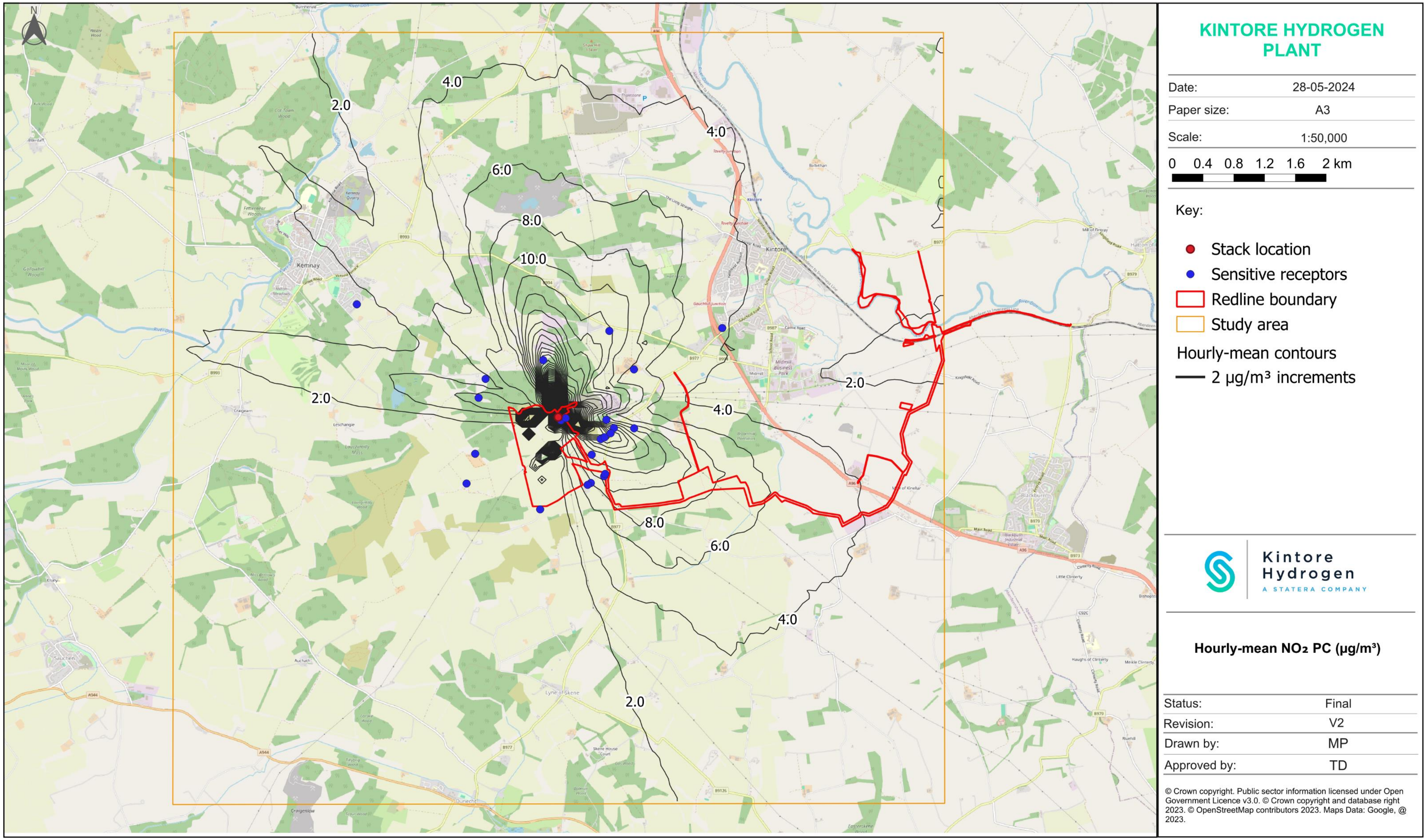


Figure 4.2: Hourly-mean NO_2 process contributions (µg/m³)

Potential for ecological effects

4.2.18 As noted in paragraph 2.3.5, there are no nationally- or internationally-designated ecological sites within the 5 km radius study area. Nevertheless, the potential for any nutrient nitrogen or acid gas deposition effects to occur at more distant sites has been considered as a precaution.

4.2.19 The closest such designated site is the Loch of Skene SPA and SSSI, whose designation and sensitivity are discussed in Chapter 8: Ecology and Biodiversity. The loch lies around 6.4 km south-southeast from the potential flare stack locations.

4.2.20 As can be seen from Figure 4.1, the Loch of Skene would be well outside the 0.1 µg/m^3 annual mean process contribution NO_2 concentration contour, even though this has been modelled under the extremely worst-case scenario of continuous flare operation at maximum capacity, which could not occur in practice.

4.2.21 As such, it is considered that there would be no appreciable effect on nutrient nitrogen or acid gas deposition and this is not assessed further.

Further mitigation or enhancement

4.2.22 At this stage, the specifics of the flare design and location are subject to further detailed design. Several scenarios have been modelled to represent the design envelope, which are presented in Appendix 11.1: Operational Air Quality Assessment. The maximum-case modelled, Scenario 1, has been used for the initial assessment of impacts prior to further mitigation in this chapter, in the preceding section.

4.2.23 The results of Scenarios 2, 3 and 4 show that there are design options for the location of the flare and height of release that would avoid significant adverse effects at all receptors, including the closest Receptor 1.

4.2.24 It is expected by Kintore Hydrogen that a Grampian condition on the planning permission in principle will specify that commissioning and operation of the hydrogen plant may not occur until the residential properties at Receptors 1 and 2 are vacant. Kintore Hydrogen is seeking to acquire these properties by agreement, and thereby prevent impacts via a number of pathways (including noise and visual impact) to the residents of these properties.

4.2.25 This is not a required further mitigation measure for air pollutant impacts, as other design solutions exist that would also appropriately mitigate the effect to a non-significant level. Implementation of the Grampian condition would avoid any significant adverse effects at these receptors in any flare design scenario. Alternatively, Scenarios 2, 3 and 4 have shown that the flare can be designed and located such that significant adverse effects are avoided, and this could be secured by condition in the planning permission if needed.

4.2.26 To illustrate this latter option, Table 4.4 presents the impact of emissions on the short-term AQAL from Scenario 3, the next-greatest of those modelled.

Table 4.4: Short-term predicted NO_2 concentrations (µg/m^3) for Scenario 3

Receptor ID	PC	PC as % of AQAL	Impact descriptor	Initial significance
Maximum concentration outside site boundary	136.32	68%	Substantial	Not significant
1	62.56	31%	Moderate	Not significant
2	50.40	25%	Moderate	Not significant
3	4.32	2%	Negligible	Not significant
4	10.33	5%	Negligible	Not significant
5	10.20	5%	Negligible	Not significant
6	5.88	3%	Negligible	Not significant
7	6.92	3%	Negligible	Not significant
8	9.21	5%	Negligible	Not significant
9	3.58	2%	Negligible	Not significant
10	3.09	2%	Negligible	Not significant
11	5.17	3%	Negligible	Not significant
12	5.05	3%	Negligible	Not significant
13	0.18	0%	Negligible	Not significant
14	0.17	0%	Negligible	Not significant
15	0.13	0%	Negligible	Not significant
16	12.76	6%	Negligible	Not significant
17	4.96	2%	Negligible	Not significant
18	5.66	3%	Negligible	Not significant
19	1.89	1%	Negligible	Not significant
20	0.62	0%	Negligible	Not significant
21	2.92	1%	Negligible	Not significant
22	1.53	1%	Negligible	Not significant
23	3.50	2%	Negligible	Not significant

4.2.27 As shown, the initial impact descriptors at sensitive receptors range from ‘negligible’ to ‘moderate’ and the initial impact descriptor for the maximum concentration at any grid point outside the site boundary is ‘substantial’. When adding the background concentration to this, the PEC for the receptor 1 is 90.23 $\mu g/m^3$, which is 45% of the AQAL, and the PEC for the maximum concentration at any grid point outside the site boundary is 163.99 $\mu g/m^3$ which is 82% of the AQAL. On the basis that the PEC remains well below the AQAL of 200 $\mu g/m^3$ at these and all locations, this is not considered to be a significant effect.

Residual effect

4.2.28 Following the implementation of the proposed mitigation measures, the impact at all sensitive receptors would be **negligible**, which is **not significant**.

Future monitoring

4.2.29 The proposed development will be subject to monitoring of abnormal operations, flare use and air pollutant emissions under the requirements of its PPC Permit. No additional future monitoring is considered to be required.

4.3 Inter-related effects

4.3.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the construction or operation of Kintore Hydrogen Plant on the same receptor.

Project lifetime effects

4.3.2 This section provides the assessment of the potential for effects that occur during more than one stage of the development’s lifetime (such as phases of construction, operation or decommissioning) to interact such that they may create a more significant effect on a receptor than when assessed in isolation for each stage.

4.3.3 During construction, the main inter-related effects would be related to dust, which is assessed to have a negligible, not significant effect. During operation, effects would be related to NO_2 emissions from the hydrogen flare, which is assessed to have a negligible and minor effect, which is not significant. Due to the differing nature of the impacts and the (at most) minor effect they would have, no project lifetime effects of greater significance than those already assessed are predicted.

Receptor-led effects

4.3.4 This section provides the assessment of the potential for effects via multiple environmental or social pathways to interact, spatially and temporally, to create a greater inter-related effect on a receptor than is predicted for each pathway (in its respective topic chapter) individually.

4.3.5 In respect of air pollution, the potential inter-related receptor-led effects would be those that could combine to have a greater effect on population health and wellbeing, for example from the combination of air pollutant, noise and traffic impacts. This has been assessed in Chapter 14: Population and Health.

5 Cumulative Effects Assessment

5.1.1 This section provides an assessment of the air quality effects of the proposed development in combination with other relevant future development projects that have been scoped into the cumulative effects assessment (CEA).

5.1.2 During the construction phase, there is the potential for cumulative effects where there are other sources of dust located within 500 m of the proposed development (the IAQM indicative maximum radius of effects for an individual construction site being 250 m). There is also the potential for cumulative effects at receptors within 100 m of roads used by traffic generated during the construction phase.

5.1.3 For the operational and maintenance phase, the zone of influence is considered to be within the 10 km modelling study area for point source emissions and up to 200 m from roads for traffic emissions from other developments.

5.1.4 Table 5.1 identifies the projects that fall within the zone of influence for air quality and have potential for cumulative effects that require assessment in this topic area.

Table 5.1: Shortlist of relevant cumulative developments

ID	Development	Distance from main site (m)	Potential cumulative impacts	Receptor(s) affected
1	Scheme comprises formation of battery energy storage system (BESS) (49.9 megawatts), construction of substation, welfare facility, security fencing, CCTV, floodlighting, formation of access, attenuation basin and associated infrastructure	50	Construction – increase in suspended and deposited dust during construction. Increase in NO_2 from construction traffic. Operation – increase in NO_2 from operational traffic generated.	Construction – potentially all receptors within 250m of application site and cumulative development. Operation – potentially all receptors within 100m of roads used by traffic generated by cumulative development
5	Erection of Enclosed High Voltage Electricity Substation and Associated Development Comprising Formation of Substation Platform, Fenced Compound with CCTV, Siting of Battery Storage Container, Formation of Access Tracks, SUDS Basin, Temporary Construction Compound and Landscaping	571	Construction – increase in suspended and deposited dust during construction. Increase in NO_2 from construction traffic. Operation – n/a	Construction – potentially all receptors within 250 m of application site and cumulative development. Operation – n/a
6	Electricity Substation Comprising Platform Area, Control Building, Associated Plant and Infrastructure, Ancillary Facilities, Landscape Works and Road Alterations and Improvement Works	274		

5.2 Construction phase

5.2.1 As presented in Table 5.1, there are three consented developments that have the potential to influence construction dust and emissions. Should the proposed development be under construction at the same time as these other developments, there is a risk of increased impacts due to the combination of dust emissions. However, it is expected that other construction sites within close proximity to the proposed development would adhere to the same level of mitigation and good practice as those set out in Table 2.13.

5.2.2 Furthermore, the recommended mitigation measures for the proposed development include the requirement to "*hold regular liaison meetings with other high risk construction sites within 250m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised*". The purpose of this measure is to specifically address the potential for unacceptable cumulative effects.

5.2.3 With the implementation of appropriate mitigation measures by the proposed development and by any nearby construction sites, overall cumulative effects are expected to be **not significant**.

5.2.4 The impact of construction-related traffic emissions from the proposed development was scoped out of the air quality assessment using the IAQM screening criteria. As set out in Chapter 9: Transport and Access, the proposed development traffic flows would make a small contribution to future baseline traffic flows, which include a 'growthing up' factor to account for cumulative development flows. Therefore, the cumulative effect associated with construction traffic due to the proposed development is considered to remain non-significant.

5.3 Operational phase

5.3.1 As shown in Table 5.1, one cumulative development has the potential to influence NO_2 emissions from the operational traffic generated. There are no other developments with emissions of NO_2 from point sources within the 10 km grid centred on the proposed development.

5.3.2 The impact of operational-related traffic emissions from the proposed development was scoped out of the air quality assessment using the IAQM screening criteria. As set out in Chapter 9: Transport and Access, the proposed development traffic flows would make a small contribution to future baseline traffic flows, which include a ‘growthing up’ factor to account for cumulative development flows. Therefore, the cumulative effect associated with operational traffic due to the proposed development is considered to remain non-significant.

5.3.3 The dispersion modelling of point-source combustion emissions from the Kintore Hydrogen Plant enclosed ground flare indicates negligible long-term impacts at all locations, and so there is no potential for a significant cumulative effect with traffic emissions from other development.

6 Conclusion and Summary

6.1.1 The impact of air pollutant emissions from the proposed development during construction and operation have been assessed in line with guidance from Defra, Environmental Protection UK and the Institute of Air Quality Management (IAQM).

6.1.2 During the construction of the proposed development, the impact of dust generation has the potential to cause significant adverse effects at sensitive receptors such as residences and businesses. Implementation of mitigation measures described in the IAQM construction dust guidance, which are included in the Outline CEMP for the proposed development, would reduce the residual dust effects to a level categorised as 'not significant'.

6.1.3 Construction traffic generation would fall below the threshold for assessment of air pollution emissions in the IAQM guidance and are therefore considered to be 'not significant'.

6.1.4 In operation, the proposed development would cause nitrogen dioxide (NO_2) emissions from a hydrogen flare. Pollutant concentrations at sensitive receptors have been assessed through detailed atmospheric dispersion modelling. The assessment has been undertaken based on a number of highly conservative assumptions, representing a maximum case, established through modelling four design scenarios.

6.1.5 The results of the dispersion modelling reported in this assessment indicate that predicted contributions and resultant environmental impact are considered to be negligible to minor adverse (not significant) at all receptor locations in all but one design scenario. Effects at the two nearest properties could be significant in this scenario.

6.1.6 This can be further mitigated either through a Grampian condition, under which operation of the proposed development is made contingent upon the properties being unoccupied, or through adoption of a location and design of the flare that mitigates the effect at these receptors to a non-significant level, which has been shown to be feasible by the other design scenarios modelled.

6.1.7 Using professional judgement, the resulting air quality effect of the proposed development with implementation of mitigation is considered to be **not significant** overall.

Table 6.1: Summary of potential environment effects, mitigation and monitoring

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Construction phase							
Construction dust	Good practice dust management measures specified in the Outline CEMP	Large	High	Negligible: not significant	None in addition to those recommended in the IAQM dust guidance	Negligible: not significant	Dust monitoring as recommended in the IAQM dust guidance
Operation phase							
NO_2 emissions from hydrogen flare	None	Negligible to Substantial	Specific to each receptor	Minor adverse: not significant	Grampian condition concerning nearest two properties, or location of flare to be at a sufficient distance from occupied sensitive receptors.	Negligible: not significant	As required by PPC Permit. No additional monitoring proposed.

References

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