Chapter 18: Air Quality - Contents

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18. Air Quality

18.1 Executive Summary

18.1.1 An Air Quality Assessment has been undertaken for the proposed Loch Kemp Storage Project ('the 'Proposed Development'). The assessment has considered the baseline environment within the Site Boundary ('the Site') and the surrounding area in terms of air quality, the potential impact on air quality arising from the construction of the Proposed Development, and recommendation of mitigation measures considered to be required within the Proposed Development design to mitigate any predicted significant air quality effects.

18.1.2 Construction phase air quality impacts are likely to include the generation of dust during site works and the generation of emissions by off-site transportation. Mitigation measures are recommended, where relevant, in order to reduce impacts at sensitive receptors. These would be incorporated into a Dust Management Plan (DMP). Upon implementation of relevant mitigation measures, the residual dust effects are predicted to be '*not significant*', and the residual effects from off-site vehicle emissions and on-site plant are also predicted to be '*not significant*'.

18.1.3 Given the sensitivity of the ecological receptors the deposition of dust on the Ness Woods Special Area of Conservation (SAC) / Easter Ness Forest Site of Special Scientific Interest (SSSI), it is recommended that a monitoring scheme be designed and implemented as part of a DMP. There is not considered to be a potential for cumulative effects in relation to construction phase dust or vehicles emissions.

18.1.4 Activities associated with the operational phase would be negligible. As such, the effects associated with the operational and maintenance activities have been scoped out of the assessment.

18.1.5 The effects associated with the construction phase have been considered to be representative of worst case decommissioning effects, therefore no separate assessment of decommissioning scenarios have been undertaken.

18.2 Introduction

18.2.1 This Chapter considers the potential effects, including cumulative effects, of the Proposed Development on Air Quality during construction and operation. As described in **Chapter 3: Description of Development**, with proper maintenance the Proposed Development should remain functional indefinitely. If the project were to be decommissioned, it is anticipated that the potential effects on Air Quality would be at worst equal to or lesser than the construction impacts. As such, a separate assessment of potential decommissioning effects on Air Quality is not included in this Chapter.

18.2.2 This Chapter describes the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant environmental effects the Proposed Development would have on the baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. Consideration has also been given to potential cumulative air quality effects with other proposed developments. In particular, it considers the construction and operational activities.

18.2.3 The Chapter has also been informed by the following chapters:

- Chapter 3: Description of Development; and
- Chapter 16: Traffic, Access and Transport.

18.2.4 This assessment has been carried out by SLR Consulting. A table presenting relevant qualifications and experience of key staff involved in the preparation of this Chapter is included in **Appendix 4.1: EIA Team**, contained within **Volume 4** of this EIA Report.

18.3 Scope of Assessment

Consultation Responses

18.3.1 To inform the scope of the assessment for the Proposed Development, consultation was undertaken with statutory and non-statutory bodies. **Table 18.1: Consultation Responses** summarises the scoping and consultation responses relevant to the Air Quality Assessment and provides information on where and/or how points raised have been addressed in this assessment.

18.3.2 Full details on the consultation responses and scoping opinion can be reviewed in **Chapter 5: Scoping and Consultation**, and associated appendices.

Table 18.1: Consultation Responses

Consultee	Consultation Type	Date	Issue Raised	Response/Action Taken
Scottish Government Energy Consents Unit (ECU)	Scoping Opinion	21st November 2022	Potential adverse effects on Ness Woods Special Area of Conservation (SAC)	An assessment of dust and airborne pollution on local ecological receptors including the Ness Woods SAC is provided in **Section 18.8** of this Chapter. This assessment has been

				undertaken in consultation with Ecological Consultants. (Further impacts on the Ness Woods SAC are discussed in **Chapter 10: Terrestrial Ecology** and the standalone Shadow Habitat Regulations Assessment.)
			Provision of Construction Traffic Management Plan (CTMP)	An outline CTMP is provided in **Volume 4, Appendix 16.1: Transport Assessment.** The final CTMP would be implemented by the appointed Principal Contractor.
			Provision of traffic generation and distribution as part of the Transport Assessment	This assessment has been informed by the Transport Assessment included in **Volume 4, Appendix 16.1** of this EIA Report.
			Requirement for construction phase dust suppression scheme	Proposed construction dust mitigation is included in **Section 18.9** of this Chapter. These would be incorporated into a Dust Management Plan (DMP).
The Highland Council (THC)	Scoping Response	11th March 2022	Impacts from mud & debris from construction traffic should be considered in the EIA Report.	Proposed construction dust mitigation is included in **Section 18.9** of this Chapter. These would be incorporated into a DMP.
			Likely impacts from dust and airborne pollution should be considered in the EIA Report.	An assessment of dust and airborne pollution on local human and ecological receptors is included in **Section 18.8** of this Chapter.

Issues Scoped Out of Assessment

18.3.3 Traffic movements associated with the operational phase would be negligible in comparison to those associated with the construction phase, with movements limited to those associated with maintenance and routine checks. There would be no dust generating activities present during the operational phase of the Proposed Development.

18.3.4 The effects associated with the operational and maintenance activities are therefore considered unlikely to affect air quality and have been scoped out of the assessment.

18.3.5 Decommissioning activities are not anticipated to exceed the construction phase worst case criteria assessed, given forecast improvements to air quality. In addition, it is also recognised that policy, legislation, and local sensitivities constantly evolve; which will limit the relevance of undertaking an assessment at this stage. As such, in recognition of the above, a qualitative assessment of likely decommissioning activities has not been undertaken, given the uncertainty of potential works.

18.4 Legislation, Policy and Guidance

Legislation

Air Quality Standards (Scotland) Regulations

18.4.1 The Air Quality (Scotland) Regulations (AQSR) 2010 transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within UK legislation.

18.4.2 The AQSR includes Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment. Limit values are legally binding and are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites). Compliance is regulated at a national level (based upon a series of zones and agglomerations).

Air Quality Strategy

18.4.3 The UK Government and the Devolved Administrations are required under the Environment Act 1995 to produce a national air quality strategy to improve air quality. The latest Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland was published in 2007 (Defra, 2007)[1].

18.4.4 The AQS provides the over-arching strategic framework for air quality management in the UK and contains non-statutory national air quality Objectives established by the UK Government and Devolved Administrations for the protection of public health and the environment.

18.4.5 The AQS Objectives of relevance to human receptors in this assessment are provided in **Table 18.2 Relevant Ambient AQS Objectives**.

Table 18.2: Relevant Ambient AQS Objectives

Pollutant	Objective	Concentration measured as
Nitrogen Dioxide (NO_2)	40	Annual Mean
	200	1-hour Mean (not to be exceeded on more than 18 occasions per annum)
Particulate Matter (PM_{10})	18	Annual Mean
	50	24-hour Mean (not to be exceeded on more than 7 occasions per annum)
Particulate Matter ($PM_{2.5}$)	10	Annual Mean

[1] Defra (2007). UK Air Quality Strategy.

18.4.6 The above AQS Objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period – herein referred to as relevant exposure. **Table 18.3** provides an indication of those locations.

Table 18.3: Human Health Relevant Exposure

Objective Averaging Period	Relevant Locations	Objectives should apply at	Objectives should not apply at
Annual Mean	Where individuals are exposed for a cumulative period of 6-months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices, Hotels, Gardens of residences, Kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short-term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

Local Air Quality Management

18.4.7 As reinforced within the AQS, Part IV (Section 82) of the Environment Act 1995 includes a statutory duty for local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to review and assess air quality within their areas to determine the likeliness of compliance, regularly and systematically.

18.4.8 Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective.

18.4.9 The Department for Environment, Food and Rural Affairs (DEFRA) and the Devolved Administrations, which includes the Scottish Government, have published technical guidance for use by local authorities in their review and assessment work[2].

Ecological Habitats

18.4.10 Ecological habitats vary in terms of their sensitivity, perceived ecological value, geographic importance, and level of protection. Within the UK, there are three types of nature conservation designations: international, national and local designations, with a greater level of protection afforded to the former, relative to the latter. Further legislative information can be found within the **Shadow Habitats Regulation Appraisal (HRA)** submitted in Support of the Section 36 Application**.**

[2] Defra (2022). Local air quality management technical guidance (TG22), August 2022

18.4.11 Ecological designations are provided environmental protection with respect to air quality, through the application of standards known as Critical Levels for airborne concentrations and Critical Loads for deposition to land from air.

18.4.12 The Critical Levels and Loads of relevance to NOx emissions are provided below.

Critical Levels

18.4.13 Critical Levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Critical Levels for the protection of vegetation and ecosystems are specified within relevant UK air quality legislation[1].

18.4.14 **Table 18.4: Ecological Protection: Relevant Critical Levels** provides details of the Critical Levels of relevance to NOx emissions.

Table 18.4: Ecological Protection: Relevant Critical Levels

Pollutant	Concentration (µg/m³)	Averaging Period	Habitat
NOx	30	Annual mean	All ecosystems
	200 (a) (b)	Daily mean	All ecosystems

Table Notes:
(a) Non statutory
(b) Where O_3 and SO_2 are not elevated above their Critical Level (common across the UK) a value of 200µg/m³ is recommended for assessments (IAQM, 2020)[3].

18.4.15 The recorded maximum sulphur dioxide concentration and AOT40 ozone concentration (for 2021 and as a 5-year average, respectively) are below the relevant limits and are therefore not considered 'high' in the area of the Site. This therefore indicates that application of the 200 µg/m³ 24-hour critical level is appropriate for sensitive ecological receptors in this area.

Critical Loads

18.4.16 Critical Loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

18.4.17 Critical Loads for eutrophication are habitat/species specific (derived from a range of experimental studies), whereas Critical Loads for acidification are dependent on soil chemistry, as well as habitat type.

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

National Policy

Scottish National Planning Framework

18.4.18 National Planning Framework 4 (NPF4) is the national spatial strategy for Scotland. It sets out the spatial principles, regional priorities, national developments and national planning policy. NPF4 replaces NPF3 and Scottish Planning Policy. Relevant policies from NPF4 include:

Policy 23(d): Development proposals that are likely to have significant adverse effects on air quality will not be supported. Development proposals will consider opportunities to improve air quality and reduce exposure to poor air quality. An air quality assessment may be required where the nature of the proposal or the air quality in the location suggest significant effects are likely.

18.4.19 The policies within the NPF4 in relation to air pollution are considered within this Air Quality Assessment.

The Clean Air Strategy

18.4.20 The Clean Air Strategy (CAS), published in 2019 (Defra, 2019), sets out a wide range of actions by which the UK Government, in partnership with the Devolved Administrations, will seek to reduce pollutant emissions and deliver cleaner air across the UK. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air, focussing on transport, domestic, farming and industry. The CAS also indicates how the Devolved Administrations intend to make their share of emissions reductions.

Local Policy

The Highland-wide Local Development Plan (HwLDP)

18.4.21 The Highland-wide Local Development Plan[4] (HwLDP), adopted on the 5th April 2012, identifies the overarching objectives for spatial planning and provides a framework for development within THC's area of administration up until 2030. THC are currently undergoing the process of replacing the HwLDP with a new Proposed Plan. As such, the HwLDP currently provides the context for planning decisions within THC's area of administration.

18.4.22 A review of the HwLDP indicated the following policies to be of relevance to air quality in the context of this assessment:

"Policy 28: Sustainable Design

The Council will support developments which promote and enhance the social, economic and environmental wellbeing of the people of Highland.

Proposed developments will be assessed on the extent to which they: […] Impact on the following resources, including pollution and discharge, particularly within designated areas: […]"

"Policy 72: Pollution

Proposals that may result in significant pollution such as noise (including aircraft noise), air, water and light will only be approved where a detailed assessment report on the levels, character and

[4] The Highland Council (2012) Highland-wide Local Development Plan

transmission and receiving environment of the potential pollution is provided by the applicant to show how the pollution can be appropriately avoided and if necessary mitigated."

"Policy 73: Air Quality

Development proposals which, individually or cumulatively, may adversely affect the air quality in an area to a level which could cause harm to human health and wellbeing or the natural environment must be accompanied by appropriate provisions, such as an Air Quality Assessment, (deemed satisfactory to the Local Authority and SEPA as appropriate) which demonstrate how such impacts will be mitigated.

Some existing land uses may have a localised detrimental effect on air quality. Any proposals to locate development in the vicinity of such uses and therefore introduce receptors to these areas (e.g. housing adjacent to busy roads) must consider whether this would result in conflict with the existing land use. Proposals which would result in an unacceptable conflict with the existing land use to air quality impacts will not be approved."

18.4.23 The above policies relating to air quality have been addressed within this assessment.

Technical Guidance

18.4.24 The following technical guidance has been considered in the assessment:

- Defra Technical Guidance on Local Air Quality Management (LAQM.TG(22))[2];
- Guidance on the Assessment of Mineral Dust Impacts for Planning (Institute of Air Quality Management (IAQM)), (IAQM, 2016)[5];
- Guidance on the Assessment of Dust from Demolition and Construction (Institute of Air Quality Management (IAQM) (IAQM, 2023)[6];
- Land-Use Planning and Development Control: Planning for Air Quality (IAQM and Environmental Protection UK (EPUK), 2017)[7];
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM, 2020)[8];
- Design Manual for Roads and Bridges (DMRB) LA 105 (Highways England et al., 2019)[9].
- Planning Advice Note (PAN) 50, Annex B: Control of Dust at Surface Mineral Workings[10]; and

[5] IAQM, 2016. Guidance on the Assessment of Mineral Dust Impacts for Planning (Institute of Air Quality Management, (2016)

[6] IAQM, 2023. Guidance on the Assessment of Dust from Demolition and Construction (2023)

[7] EPUK & IAQM, 2017. Land-Use Planning & Development Control: Planning for Air Quality (2017)

[8] IAQM, 2020. A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (2020)

[9] Highways England, Transport Scotland, Welsh Government and Department for Infrastructure (2019). Design Manual for Roads and Bridges LA105 Air Quality.

[10] Scottish Office, 1998. Planning Advice Note PAN 50 Annex B: Controlling the Environmental Effects of Surface Mineral Workings: The Control of Dust at Surface Mineral Workings. (March, 1998)

- The Mineral Industry Research Organisation (MIRO). Good practice guide: control and measurement of nuisance dust and PM_{10} from the extractive industries[11].

18.5 Methodology

18.5.1 The assessment scope has been informed by both national and local planning policy and guidance, established best practice and experience, as well as via the consultation process from relevant consultees.

Construction Dust Assessment

18.5.2 The assessment of potential dust generated by construction activities on nearby sensitive human and ecological receptors has been undertaken in accordance with the IAQM 'Guidance on the Assessment of Mineral Dust Impacts for Planning'[5]. Although aimed at mineral developments in England, the guidance provides an effective methodology in the absence of specific Scottish guidance for the assessment of sites that encompass activities similar in nature, size and duration to that of mineral sites. Recommendation for mitigation measures have utilised IAQM guidance documents referencing both construction and mineral-related control measures. Where appropriate, guidance from Annex B of PAN50[10] has also been used within the assessment to ensure all relevant guidance has been represented.

18.5.3 The IAQM uses a distance-based screening criteria for both airborne concentrations (PM_{10}) and deposited dust. The IAQM guidance states that adverse impacts from soft rock and hard rock sites are uncommon beyond 250m and 400m respectively, measured from the nearest dust generating activity.

18.5.4 The study area has therefore been defined as follows:

- Human and ecological receptors within 400 m of the Development Area (in accordance with IAQM mineral dust assessment guidance); and
- Human and ecological receptors within 50 m of the routes used by construction vehicles, up to 250 m form the Site access (in accordance with IAQM construction dust assessment guidance).

18.5.5 The IAQM assessment methodology for deposited (disamenity) dust and PM_{10} (health effects) are stipulated below.

Deposited Dust

18.5.6 The IAQM method for deposited dust utilises a risk-based approach based on the source-pathway-receptor conceptual model, i.e. the hypothetical relationship between the source (S) of the pollutant, the pathway (P) by which exposure might occur, and the receptor (R) that could be adversely affected.

[11] AEA (2011) Mineral Industry Research Organisation (MIRO) Good practice guide: control and measurement of nuisance dust and PM10 from the extractive industries (2011)

18.5.7 The key steps are:

- assess Application Site characteristics and baseline conditions;
- estimate dust impact risk: The Dust Impact Risk for each representative receptor is determined from the Source Term (residual dust risk after embedded mitigation) and Pathway. The 'pathway effectiveness' is based upon the distance of the receptor from the dust source and the frequency at which it is down-wind from the source (factoring out the frequency of wet days). The assessment of impact considers emissions from the Application Site activities concurrently, if relevant within the screening distances; and
- estimate likely magnitude of effect: The risk predicted at each representative receptor is considered together with the sensitivity of that receptor, to give the likely magnitude of the effect that will be experienced.

Assessment of Ambient Suspended Particulate Matter (PM)

18.5.8 The IAQM guidance recommends a screening distance of 1km, if receptors of relevant exposure are located within this distance the assessment should progress onto a screening exercise.

18.5.9 The IAQM guidance presents the screening methodology whereby further assessment is not considered to be a requirement if background PM_{10} concentrations are below a specific value. This value is however based upon the Air Quality Objective (AQO) for England & Wales (40µg/m³) as opposed to the lower AQO relevant for Scotland (18µg/m³). As such, a review of the background PM_{10} concentrations has been undertaken, alongside an estimation of the total Predicted Environmental Concentration (PEC) to assess the potential for the AQO to be exceeded, as a result of the Proposed Development.

Construction Phase Road Traffic Screening Assessment

18.5.10 The assessment of additional road vehicle movements generated during the construction phase on sensitive receptor locations has been undertaken with reference to established screening criteria. The screening criteria utilised is dependent on the application (i.e. there are different criteria for human and ecological receptors). These are discussed further in **paragraph 18.5.26** to **18.5.33**.

18.5.11 Human and ecological receptors within 200 m of roads which are expected to experience increases in traffic volume as a result of the proposed construction activities have been assessed, where necessary. If an ecological and/ or human receptor is located >200 m from an affected road link, further consideration is not required.

18.5.12 The 200 m distance screening threshold is supported in various guidance documents (IAQM, 2020 and Highways England *et al*., 2019) and is therefore considered appropriate.

Construction Phase Non Road Mobile Machinery (NRMM) Assessment

18.5.13 Non-Road Mobile Machinery (NRMM) emissions for the Proposed Development have the potential to impact upon ecological and human receptors.

18.5.14 According to the IAQM 'Guidance on the Assessment of the Dust from Demolition and Construction'[6], experience of assessing exhaust emissions from NRMM suggests that they are unlikely to make a significant impact on local air quality.

18.5.15 According to Defra's LAQM.TG(22) guidance, experience of assessing the exhaust emissions from on-site plant (NRMM) and site traffic suggests that, with suitable controls and site management, they are unlikely to make a significant impact on local air quality.

18.5.16 In accordance with Defra and IAQM guidance, impacts associated with construction phase generated NRMM emissions are not likely to be significant. Notwithstanding the above, a qualitative assessment of NRMM emissions has been undertaken to inform the likelihood of a significant effect arising.

18.5.17 One of the predominant categories of NRMM during the construction of the Proposed Development is the use of dump trucks for material transfer using internal haul routes. Given the expected frequency and duration of these dump truck movements, and the proximity to ecological receptors, a separate assessment of on-site vehicle movements has been undertaken alongside consideration of all NRMM operated on-site.

NRMM

18.5.18 With reference to LAQM.TG(22), the qualitative assessment takes into account:

- The number and type of plant to be used (including the emissions standards);
- The working hours to be employed and the duration of works;
- Distances from NRMM to the nearest receptors; and
- Existing air quality conditions in the area (local monitoring and/or Defra background pollutant concentration maps).

18.5.19 A 50 m distance screening threshold[12] in relation to NRMM emissions has been applied to the spatial extent of construction activities within the Site.

Emissions from On-Site Vehicle Movements

18.5.20 Human and ecological receptors within the 50 m distance threshold of on-site roads which are expected to experience increases in traffic flows as a result of the proposed construction activities have been assessed, where necessary. If an ecological and/ or human receptor is located >50 m from an affected road link, further consideration is not required.

Assessment Criteria & Assignment of Significance

18.5.21 Whilst **Chapter 4: EIA Process and Methodology** provides an indicative EIA assessment matrix, it also identifies that assessment methodologies will reflect the prevailing technical area guidance and specific requirements of receptor groups. As such the following sections provide a description of the assessment criteria and assessment methodologies used to assess air quality, which are derived from best practice guidance documents.

[12] Following a review of approaches adopted for other Nationally Significant Infrastructure Projects (NSIP) where extensive onshore construction activities are proposed, a 50m distance screening threshold in relation to NRMM emissions has been accepted by statutory consultees and the Planning Inspectorate (England) (Northampton Gateway, 2019 The Northampton Gateway Rail Freight Interchange Order 201X. Applicants' Response to Secretary of State's Request for Comments).

Construction Phase Dust Assessment

18.5.22 The IAQM minerals dust assessment methodology provides a framework to establish the unmitigated risk of dust impacts associated with a development at both human and ecological receptors.

18.5.23 The IAQM assessment methodology predicts the likely magnitude of effect using a number of factors, including the receptor sensitivity and the risk of impact. The risk of impact is determined using the residual source magnitude of a dust generating activity and the pathway effectiveness. The determination of the magnitude of effect is presented below in **Table 18.5: IAQM Determination of Magnitude of Effect**.

Table 18.5: IAQM Determination of Magnitude of Effect

Risk of Impact	**Receptor Sensitivity**		
	Low	**Medium**	**High**
High Risk	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk	Negligible	Slight Adverse Effect	Moderate Adverse Effect
Low Risk	Negligible	Negligible	Slight Adverse Effect
Negligible Risk	Negligible	Negligible	Negligible

18.5.24 Following determination of the separate degree of estimated effects of the overall disamenity, ecological and health effects, a conclusion on the likely significance of air quality effects is reached. The assessment takes into account controls that are incorporated into the scheme design. If the outcome of the assessment is that the air quality effect is not significant, then it is likely that these controls would be sufficient. If, on the other hand, the assessment predicts the impacts and effects to be significant, then it is likely that additional mitigation will be required, to a proportionate degree to sufficiently reduce the impacts.

Construction Phase Road Traffic Screening Assessment

Human Receptors

18.5.25 Screening criteria provided within the EPUK & IAQM guidance document[7] has been used to determine whether further assessment of construction-generated traffic, using the local road highway network, on sensitive human receptor locations is required. If there is relevant human exposure located within 200 m of an 'affected' road link, further consideration of effects is required.

18.5.26 The screening criteria for an 'affected road' link relevant to this assessment is as follows (specific to a development located outside of an AQMA):

- A change of traffic flows of light duty vehicle (LDV) flows of more than 500 annual average daily traffic (AADT) or;
- A change of traffic flows of heavy duty vehicle (HDV) flows of more than 100 AADT.

18.5.27 If the construction traffic is not found to exceed any of the screening criteria presented, then effects are considered to be *not significant* and can be screened out of further consideration.

Ecological Receptors

18.5.28 The assessment procedure outlined within the IAQM guidance document[8] (IAQM, 2020) has been used in relation to the assessment of sensitive ecological receptors and off-site road traffic (i.e. traffic generated by The Proposed Development which will use the local road highway network). This initially comprises a screening assessment to indicate whether:

- Any sensitive qualifying features are located within 200 m of a road link projected to experience developmental-generated vehicle movements; and
- Construction activities are likely to generate either >1,000 (and/ or >200 HDV) AADT movements on a road link within 200 m of the ecological receptor.

18.5.29 Whilst assessing impacts on internationally-designated ecological sites (e.g. SAC, SPA and Ramsar), screening should be undertaken in-combination with other projects and plans. No international ecological designations are found within 200 m of the road links utilised by construction traffic, therefore consideration of in-combination impacts is not required.

18.5.30 Whilst assessing impacts on national and/ or local ecological designations, it is appropriate to assess developmental trips in isolation. This is reflective of the level of protection afforded to these sites.

18.5.31 The outcomes of the above will determine whether impacts associated with the Proposed Development could result in a likely significant effect on the assessed ecological feature.

18.5.32 If the above conditions are not met, then impacts on ecological designations are likely to be imperceptible, whereby resultant effects are considered to be *not significant.*

Construction Phase Non Road Mobile Machinery (NRMM)

18.5.33 Where there are no receptors within the 50 m distance threshold of NRMM, then effects are considered to be *negligible* and can be screened out of further consideration. Further qualitative review in accordance with the stated methodology is required, if receptors are located within this distance threshold.

Emissions from On-Site Vehicle Movements

18.5.34 Screening criteria for receptors within the 50 m distance threshold follows that previously described for off-site vehicle movements, as detailed in **paragraphs 18.5.29 to 18.5.30**.

18.5.35 Where construction activities are likely to generate >200 HDV AADT movements on a road link within 50 m of the ecological receptor, further consideration is required.

18.5.36 If the on-site construction traffic is not found to exceed any of the screening criteria presented, then effects are considered to be *negligible* and can be screened out of further consideration.

Assumptions and Limitations

Dust Assessment

18.5.37 The construction dust assessment is primarily a tool to identify the proportionate level of mitigation required for the various construction activities.

18.5.38 It is recognised that the baseline may not list all receptors within the Application Site locale, however it includes all identified receptors from the reviews undertaken and is considered representative of

the baseline at the time of the desk-based assessment. Furthermore, in terms of dust, receptors were selected to represent worst-case locations. Those closest to the proposed operations for instance are likely to experience greater impacts and effects.

18.5.39 Resultant effects ultimately depend on the effective application of the recommended mitigation. Therefore, there can be uncertainty on the representativity of the assessment procedure and associated post-mitigated outcomes if appropriate mitigation is not secured.

18.5.40 It is assumed that mitigation measures set out within the assessment would be secured in a Dust Management Plan should planning consent be granted.

Vehicular Emissions & NRMM Assessment

18.5.41 Construction phase traffic flows have been provided by Pell Frischmann, the appointed Transport Consultant for the EIA stage of the Proposed Development, as AADT flows (i.e. annualised average daily traffic flows).

18.5.42 Traffic data for the purposes of this assessment is consistent with the analysis undertaken, and presented as part of **Chapter 16: Traffic, Access and Transport**.

18.5.43 Details and indicative locations of on-site plant have been provided by Fichtner Consulting Engineers Ltd (Fichtner), the appointed engineering consultant for the planning stage of the Proposed Development.

18.6 Baseline Conditions

18.6.1 The characterisation of the existing environment has been undertaken using latest publicly available data sources, as listed in **Table 18.6: Source of Baseline Data**.

Table 18.6: Sources of Baseline Data

Data	Source	Year	Coverage
2020 LAQM Air Quality Annual Progress Report	The Highland Council[13]	2020	Local (THC administrative area)
Automatic Urban and Rural Network	Defra	2021	National (Scotland)
Background Mapped Concentration Estimates	Scottish Air Quality[14] Defra[15]	2018	National (Scotland)

[13] The Highland Council (2020) Annual Status Report, Air Quality.

[14] Scottish Government (2023) Supplied background maps Data for Local Authority Review and Assessment purposes (scottishairquality.scot)

[15] Defra (2023). Defra supplied background maps Background Maps | LAQM (defra.gov.uk)

Tulloch Bridge Meteorological Data	ADM Ltd	2017 – 2021	Local
Background Critical Loads / Critical Levels	Air Pollution Information System APIS	2018-2020	National (Scotland)

Local Authority Review & Assessment

18.6.2 THC, in fulfilment of statutory LAQM requirements, has conducted an ongoing exercise to review and assess air quality within their administrative area. The latest publicly available LAQM report for THC (not impacted by the COVID-19 pandemic) at the time of writing is the 2020 Annual Status Report (ASR)[13].

18.6.3 This process has resulted in the declaration of one AQMA for concentrations of NO_2 known as "Inverness City Centre AQMA", located approximately 35 km northeast of the Site. The AQMA does not represent a constraint to the Proposed Development.

Review of Air Quality Monitoring

Automatic Air Quality Monitoring

18.6.4 THC operate three automatic monitors within their administrative area, all of which are located in Inverness approximately 35 km from the Site. In addition, from review the UK Automatic Urban and Rural Network (AURN), there are no AURN automatic monitors located within 50 km of the Site.

Non-Automatic Air Quality Monitoring

18.6.5 Passive diffusion tube monitoring is currently undertaken by THC at numerous locations throughout the Council's area as part of their commitment to LAQM. The diffusion tubes are located in areas which are deemed to require further assessment of NO_2 concentrations.

18.6.6 At the time of assessment, the closest diffusion tubes to the Site are located in Inverness. Due to the distance between the Site and the monitoring locations, similar pollutant concentrations are not anticipated and therefore these monitoring locations have not been considered within the context of this assessment.

DEFRA Mapped Background Concentrations

18.6.7 The Scottish Government provides Scotland-specific air pollutant maps[14] of annual mean background NO_X, NO_2 and PM_{10} concentration, using a methodology tailored to represent air pollutant concentrations in Scotland, using Scotland-specific meteorology and measurements from Scottish air quality monitoring sites to calibrate and verify the model. The available projections from 2018 are based on assumptions that were applicable prior to the Covid-19 pandemic.

18.6.8 Background concentrations of $PM_{2.5}$ are not provided by the Scottish Government and have therefore been taken from the DEFRA nationwide model which also uses a reference year of 2018.

18.6.9 Annual mean background concentrations have been obtained, based on the 1 km grid square which covers the Site and the wider modelled domain. The maximum predicted mapped background concentrations across the study area for the following milestone years are presented in **Table 18.7: Maximum Defra Mapped Backfround Concentrations:**

- 2023: Base / current year;

- 2025: Indicative construction start year; and
- 2029: Indicative operational start year.

Table 18.7: Maximum Defra Mapped Background Concentrations

Grid Square (x, y)	Annual Mean Background Concentration (µg/m³)			
	PM_{10}	$PM_{2.5}$	NO_2	NOx
2023	5.53	3.21	1.21	1.67
2025	5.45	3.15	1.12	1.54
2029	5.43	3.13	1.08	1.48

18.6.10 All of the mapped background concentrations presented are well below the respective annual mean AQOs.

Evolution of Baseline

18.6.11 Baseline air quality conditions are not expected to evolve significantly during the interim period, prior to construction commencing.

18.6.12 Air quality is expected to improve in future years, with the introduction of electric vehicles and more stringent emission standards, as well as the recent enforcement of local and national policy and initiatives. With the introduction of these initiatives and cleaner technologies, pollutant concentrations reported locally are expected to reduce further, or at least remain comparable to those presented.

18.6.13 Local background future year projections provided by Scottish Government and DEFRA (based upon semi-empirical evidence) are provided in **Table 18.7: Maximum Defra Mapped Background Concentrations**. These data demonstrate the anticipated improvement in background pollutant concentrations for the local area.

Meteorology

18.6.14 The most important climatic parameters governing the release and dispersal of fugitive dust emissions from the Site are wind speed, direction and rainfall:

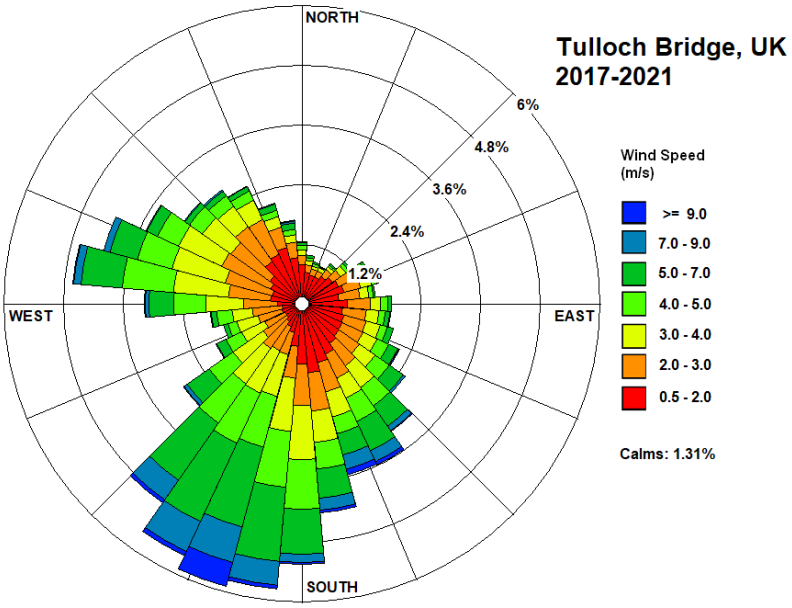
- wind direction determines the broad direction of dispersal;
- wind speed affects ground level concentrations by increasing the initial dilution of pollutants in the emission. It will also affect the potential for dust entrainment; and
- rainfall naturally supresses dust release (>0.2 mm of rainfall a day considered sufficient to suppress dust).

18.6.15 Consultation was undertaken with ADM Ltd to obtain representative meteorological data of the locale of the Site. ADM Ltd advised the use of the nearby meteorological station of Tulloch Bridge, located approximately 39 km to the south of the Site.

18.6.16 A windrose from Tulloch Bridge meteorological station is presented in **Plate 18.1**. It is evident that winds from the south-southwest are predominate in the area with winds from the east-northeast

less frequent. Therefore, receptor locations located to the north-east and east of site operations are most likely to be impacted by wind-blown dust emissions.

Plate 18.1: 5 year Windrose from Tulloch Bridge Meteorological Station



18.6.17 Relevant rainfall data applicable to the Application Site has been obtained from the Meteorological Office website of UK mapped climate averages for 1991-2020. The average annual days of rain >0.2 mm for the area of the Site is 240 to 260 days per year, comprising 66 % to 71 % of the year.

Baseline Conditions at Ecological Receptors

18.6.18 The Proposed Development falls within the Ness Woods Special Area of Conservation (SAC) designated for mixed woodland on base-rich slopes, western acidic oak woodland and the presence of the Common otter. All of the habitats and species for which the SAC has been designated have a status of 'unfavourable condition, no change". Ness Woods SAC is also designated as Easter Ness Forest Site of Special Scientific Interest (SSSI) which is designated for upland mixed ash woodland and upland oak woodland.

18.6.19 The habitats within the Site and the immediate surrounding area are predominantly broadleaved woodland, bracken, acid grassland and dry heath. Bryophyte and lichen species have been identified during on-site ecological surveys (see **Chapter 10: Terrestrial Ecology** and associated appendices).

18.6.20 The APIS website[16], a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology, has been used to provide information on background

[16] http://www.apis.ac.uk/, accessed November 2022

pollutant concentrations, current deposition rates and CLo's for nutrient nitrogen (**Table 18.8: Nitrogen Critical Levels & Critical Loads**) and CLo functions for acidity (**Table 18.9: Acid Critical Load Functions and Current Loads**).

Table 18.8: Nitrogen Critical Levels & Critical Loads

Site	APIS Critical Load Class (most sensitive)	NOx Annual Mean (µg/m^3)	Critical Load Range (kg N/ha/yr)	Current Load (kg N/ha/yr)
Ness Woods SAC	Acidophilous Quercus-dominated woodland	1.65	10-15	6.3

Table 18.9: Acid Critical Load Functions and Current Loads

Site	APIS Critical Load Class (most sensitive)	Critical Load Function (keq/ha/yr)			Current Load (keq/ha/yr)	
		ClmaxS	CLminN	CLmaxN	N	S
Ness Woods SAC	Broadleaved, mixed and yew woodland	0.591	0.142	0.876	0.5	0.1

Future Baseline

18.6.21 There are no current or future modifying influences which are likely to change baseline air quality conditions at the Site or within the locale of the identified receptors. As presented in **Table 18.7: Maximum Defra Mapped Background Concentrations** predicted air quality in the site locale is predicted to improve year on year as a result of advances in technology.

18.7 Mitigations by Design / Embedded Mitigation

18.7.1 Mitigation measures that have been identified and adopted as part of the evolution of the project design (embedded into the project design) are described in **Chapter 2: Design Evolution and Alternatives.** Measures that are relevant to Air Quality are listed below:

- A single designated track route for on-site transportation through the Ness Woods SAC / Easter Ness Forest SSSI;
- Hard paved surface in the locale of the powerhouse building and associated processing plant;
- Hard paved site access, extending to 100 m on-site;
- Wheel-wash located at transition of paved to unpaved road surface; and
- On-site tracks across the Site would be constructed from unbound stone with regular maintenance and grading.

18.7.2 It is anticipated that excavated material would be utilised on-site in construction of the project structures within the Proposed Development, principally the rockfill dams. Therefore, no off-site transfers and consequently generation of vehicles on the local road network as a result of material transfer off-site are anticipated. Further details are provided in **Volume 4, Appendix 3.4: Outline Spoil Management Plan.**

18.8 Potential Significant Effects – Construction Phase

Construction Dust Assessment Screening

18.8.1 This section considers the potential impacts and associated effect significance of the construction, of the Proposed Development on off-site human receptors based on the typical activities described in **Chapter 3: Description of Development**.

18.8.2 In accordance with the adopted IAQM screening criteria, further assessment of deposited dust and PM_{10} is required at human receptors within 400 m and 1 km, respectively. In terms of ecological receptors, an assessment of dust deposition is required on those located within 400 m of potentially dust generating activities.

18.8.3 Fifteen human receptor locations (HR1 to HR15) have been identified for consideration in the assessment, as shown in **Table 18.10: Receptors Identified within Study Area**, whilst their locations are illustrated in **Figure 18.1: Human Receptor Locations**. The receptors identified are not exhaustive and represent worst-case locations as the closest receptors to the Site or the roads used by vehicles accessing the Site. The ecological receptors are presented in **Figure 18.2: Ecological Receptor Locations**.

Table 18.10: Receptors Identified within Study Area

ID	Description	National Grid Reference		<400 m of Potential Dust Sources?	<50 m of Off-Site Route used by Site Traffic? (Up to 500 m from site access)
		x	Y		
Human Receptors					
HR1	Residential	247131	814006	No	No
HR2	Residential	247678	814205	No	No
HR3	Residential	247802	814454	Yes – on-site tracks	No
HR4	Residential (Easter Drummond)	247934	814626	Yes – site access, on-site tracks, borrow pit	No
HR5	Residential	248350	814589	Yes – site access, on-site tracks	No
HR6	Residential	248392	814703	Yes – site access, onsite tracks	No
HR7	Residential	248473	814646	Yes – site access, on-site tracks	No
HR8	Residential	248550	814414	No	No

HR9	Residential	248580	814992	Yes – site access, on-site tracks	No
HR10	Whitebridge Hotel	248706	815266	No	No
HR11	Residential (Kinbrylie)	248550	815453	No	No
HR12	Residential	24872	815845	No	No
HR13	Residential	248816	816271	No	No
HR14	Residential	248578	816277	Yes – on-site tracks, Dam 3	No
HR15	Residential	248992	816986	No	No
Ecological Receptors					
Ness Woods SAC		n/a		Yes – powerhouse, dam construction, on-site tracks, processing plant	No
Easter Woods SSSI		n/a			No

Further Assessment: PM_{10}

18.8.4 The assessment of PM_{10} follows the key elements as recommended within the IAQM Minerals guidance, whilst incorporating the AQO for Scotland and relevant guidance within Annex B of PAN50[10]. The likelihood that the AQO for PM_{10} will be exceeded as a result of the construction of the Proposed Development has been assessed.

18.8.5 The existing air quality in terms of annual PM_{10} has been taken from the Scottish Government background maps[14] in the absence of any background monitoring in proximity to the Site. The maximum background concentration for PM_{10} is 5.56 µg/m^3(2022).

18.8.6 To ensure a worst-case scenario is presented, a process contribution of 5 µg/m^3 for PM_{10} has been applied as per IAQM guidance, thus resulting in a maximum Predicted Environmental Concentration (PEC) of 10.55 µg/m^3. This value is considered to be highly conservative given the significant reduction in concentration that would occur with increasing distance from the Development Area activity.

18.8.7 The calculated PEC is below the PM_{10} AQO of 18 µg/m^3, with a headroom of >7 µg/m^3. It is therefore considered unlikely that any process contribution from the activities within the Site would lead to an exceedance of the annual objective at places of relevant exposure. As such, no further assessment of the impact of PM_{10} is required.

18.8.8 The impact of PM_{10} emissions can be classified as negligible. The overall effect of the construction phase of the Proposed Development on PM_{10} concentrations in the local area is therefore considered to be '*not significant*'.

Further Assessment: Deposited Dust (Disamenity, Human Receptors)

18.8.9 The activities within the 400 m screening distance are limited to on-site transportation, (including the site access and on-site tracks within the immediate locale), the construction footprint of Dam 3 and a single Borrow Pit (BP1).

18.8.10 All human receptors are greater than 50 m from the route used by off-site vehicles, up to 500 m from the site access.

Residual Source Emissions

18.8.11 The potential dust sources and their potential for emission are considered below. From these, the determined residual source emissions are stated per activity or area, which in turn are based on general knowledge of mineral and construction processes. For certain processes (e.g. on-site transport, stockpiles, track construction) they are considered generically to the process wherever it may take place within the Proposed Development but at different locations according to the construction programme.

18.8.12 The activities with the potential to generate dust within the screening distance of the identified human receptors are as follows:

- Site preparation;
- Excavation & surfacing – on-Site tracks;
- Excavation & surfacing – access junction;
- Borrow Pit BP1;
- Construction – Dam 3;
- On-site transportation; and
- Off-site transportation.

Site Preparation

18.8.13 The site preparation phase would comprise the construction of the new junction access and the creation of on-site tracks to allow access to all work areas. The preparation phase within the identified screening area would involve a degree of vegetation clearance, soil stripping, excavation, surface works.

18.8.14 If required, a borrow pit may be constructed in proximity to the proposed site access (Ref BP1) which would involve short-term blasting & excavation works, stockpiling and a mobile crusher and screener. It is however likely that should BP1 be required, the majority of the site access and initial on-site tracks would be completed, activities associated with the borrow pit would therefore not likely be concurrent with operations in the immediate locale.

18.8.15 Construction of the new site access junction and the on-site tracks leading from the access would be the first works to be completed within the construction scheme. The construction of the site access itself would have a short time duration of approximately 9 weeks.

18.8.16 The junction itself would be hard paved which would continue for a minimum of 100 m into the Site, at which point the track surface would transition to that of compacted aggregate.

18.8.17 There is potential for small to moderate levels of dust emissions during the site preparation works required, however the works would be temporary and short-term in nature and of limited spatial extent.

Construction – Dam 3

18.8.18 Dam 3 would be constructed from rockfill with an asphalt face on the inundation side. The structural element would comprise circa 380,000 m^3 rockfill material with a total materials element of circa 780,000 m^3 including backfilling and re-use of spoil.

18.8.19 The footprint of Dam 3 is located approximately 390 m from receptor HR14. The area of construction within the 400 m distance screening criteria of receptor HR14 comprises a small area of circa 600 m^2 on the backfill side, circa 1% of the total dam footprint. The construction of Dam 3 is likely to be undertaken over a period of 40 months, with construction activities located within the screening distance of receptor HR14 considered be to significantly less.

18.8.20 The primary dust generating activities associated with the construction of the rockfill dam within 400 m of receptor HR14 would be placement operations (dumping and spreading of material using bulldozers) and compaction (typically using vibratory rollers). The backfill side would require significantly less compaction activities when compared to those required on the inundation side.

18.8.21 The nature and volume of the material, and construction methods required for the construction of Dam 3 is considered a high risk for dust emissions. However, taking into consideration the spatial extent and duration of operations within the screening distance of receptor HR14, the residual source emissions magnitude is considered to be moderate in the absence of additional mitigation measures.

On-Site Transportation

18.8.22 There is a risk of dust emissions from transport on the internal site roads given their unpaved surface of compacted aggregate, in the absence of additional mitigation. Dust may be caused from downward blowing exhausts and cooling fans as well as the turbulence caused by the movement of vehicles.

18.8.23 On-site transportation within the screening areas identified for human receptors would be limited to the initial 900 m tracks leading from the site compound (and paved site access road) and a stretch of approximately 450 m of tracks in proximity to the eastern (backfill) side of Dam 3. Use of these track would primarily be used for the delivery of plant and equipment, staff access and the importation of materials, where required.

18.8.24 On a worst case day, HDV movements along the on-site tracks are greater than 250. The annual average daily HDV movements between the main compound and the dam construction areas range from zero (2030) to 207 (2027).

18.8.25 Based upon the above, the risk of dust emissions from on-site tracks identified is considered to be large in the absence of additional mitigation.

Off-Site Transportation (Track-out)

18.8.26 The access road would be hard paved surface for a minimum of 100 m from the junction, with a wheel wash located at the transition between the hard paved and the compacted aggregate road

surface. This provides a stretch of paved road for the any remaining dust and water to fall from the vehicles undercarriage prior to accessing the public road network. The number of outward HDV movements in any worst-case day will be less than 200.

18.8.27 Taking into account the high number of HDV movements, the section of paved access road, the permanent vehicle cleaning facilities and the speed limits proposed, the residual source emission magnitude for trackout from off-site transportation is considered to be medium, in the absence of additional mitigation.

18.8.28 The residual source emission magnitude (the potential magnitude of dust emission after the designed in environmental measures have been taken into account) for each of the dust generating activities within the relevant screening distance is presented in **Table 18.11: IAQM Assessment, Disamenity – Residual Source Emissions Magnitudes**.

Table 18.11: IAQM Assessment, Disamenity– Residual Source Emissions Magnitudes

Potential Dust Generating Area / Associated Activities	Factors and Assumptions	IAQM Residual Source Emissions
Site Preparation	Site access junction & on-site tracks: • Vegetation clearance, Excavation & Surfacing ; • Small working areas, progressive works; and • Duration of <3months. Borrow Pit (BP1**,** if required): Blasting and initial excavation works required; Limited duration of activities (<60 days max); Minimal material storage from Borrow Pit required, material utilised in the immediate area; and Crusher and screener plant.	Medium
Dam Construction – Dam 3	Dam 3 Construction works of duration approx. 40 months Rockfill structure, materials and methods of high dust potential Circa 1% of construction activities within 400 m of receptors.	Medium
On-site Transportation	>250 HDV movements on a worst-case day Track surface: compacted aggregate Speed limits of 15mph on tracks within 1km of site access Tracks within 400 m of human receptors limited to a 900 m section (from site access) and 450 m section (adj. to Dam 3)	Large
Off-site Transportation	<100 HDV movements on a worst-case day	Medium

	Hard paved site access for a minimum of 100 m from junction Wheel-wash located at transition of paved to unpaved road surface	

Pathway Effectiveness

18.8.29 The pathway effectiveness at each identified receptor has been assigned in accordance with the IAQM criteria and is based on the distance of the receptor to the stated dust generating activity or phase and the frequency of potentially dusty winds (>5 m/s and dry). A conservative approach has been adopted whereby all on-site areas within the screening distance of each receptor have been considered, allowing a worst case scenario of potential impacts from both the site preparation phase and the site construction phase.

18.8.30 A summary of pathway effectiveness is displayed in **Table 18.12: IAQM Pathway Effectiveness – Disamenity Dust, Human Receptors**. The pathway effectiveness is considered to be 'inefficient' at all identified receptors. It is observed that all human receptors are located upwind of the Proposed Development on the basis of the prevailing winds being south-westerly.

Table 18.12: IAQM Pathway Effectiveness – Disamenity Dust, Human Receptors

Receptor	Distance to Source (m) / IAQM Category	Frequency of Potentially Dusty Winds[a] (%) / IAQM Category	Pathway Effectiveness
HR3	270 / Distant	<1 %, Infrequent	Inefficient
HR4	170 / Intermediate	<1 %, Infrequent	Inefficient
HR5	110 / Intermediate	<1 %, Infrequent	Inefficient
HR6	60 / Close	<1 %, Infrequent	Inefficient
HR7	150 / Intermediate	<1 %, Infrequent	Inefficient
HR9	350 / Distant	<1 %, Infrequent	Inefficient
HR14	310 / Distant	<1 %, Infrequent	Inefficient

Table Notes:

a) Frequency of potential winds have been based upon the 5 year average meteorological data from Tulloch Bridge, adjusted for the average number of days when rainfall would be <0.2mm/day.

18.8.31 Dense coniferous woodland plantation currently occupies the construction area with potential to impact the identified human receptors. Whilst a degree of vegetation clearance would be required for the necessary site preparation works, woodland would be retained wherever possible and would subsequently act as an effective barrier for any airborne dust emissions generated during the construction phase. The coniferous nature of the woodland would result in the screening being present all year round.

Receptor Sensitivity

18.8.32 All human receptors identified for the assessment are residential and have therefore been classified as 'high' sensitivity.

Magnitude of Effect

18.8.33 On the basis of the source term, receptor sensitivity and pathway effectiveness, the magnitude of effect due to potential dust deposition at each identified receptor has been estimated. **Table 18.13: IAQM Impact & Magnitude of Effect – Disamenity Dust, Human Receptors** presents a summary of the magnitude of effect at the human and receptor locations.

Table 18.13: IAQM Impact & Magnitude of Effect – Disamenity Dust, Human Receptors

Receptor	Pathway Effectiveness	Residual Source Emission Applied (Maximum)	Dust Impact Risk	Magnitude of Effect
HR3	Inefficient	Large	Low Risk	Slight Adverse
HR4	Inefficient		Low Risk	Slight Adverse
HR5	Inefficient		Low Risk	Slight Adverse
HR6	Inefficient		Low Risk	Slight Adverse
HR7	Inefficient		Low Risk	Slight Adverse
HR9	Inefficient		Low Risk	Slight Adverse
HR14	Inefficient		Low Risk	Slight Adverse

18.8.34 Based upon the consideration of the magnitude of effects at individual receptors and the number of receptors that would experience these effects, the overall effect from dust emissions on disamenity is considered to be *not significant*.

Further Assessment - Dust Deposition (Ecological)

18.8.35 As presented in **Figure 18.2: Ecological Receptor Locations**, the activities within the 400 m screening distance of the identified ecological receptors with the potential to generate dust emissions include the areas of the powerhouse platform, the on-site tracks leading from the lower reservoir to the upper reservoir, Dam 1, Dam 8 and Borrow Pits 7 and 8. Broadleaved woodland habitats dominate the area surrounding the lower reservoir works, including the powerhouse platform and building, the on-site tracks and the area in close proximity to Dam 1. There are small sections along the route of the on-site tracks within the SAC / SSSI where the woodland is interspersed with pockets of bracken and acid grassland.

Residual Source Emissions

18.8.36 The dust sources and their potential for emissions are considered below. The activities related to the tunnel excavation works are limited to those required at the surface; activities undertaken within the tunnel would be suitably sheltered and not considered to introduce a source of dust to surface receptors.

18.8.37 The activities with the potential to generate dust within the screening distance of the SAC /SSSI are listed below, the activities may not occur concurrently with each other, as the following sections describe:

- Site clearance and preparation;
- Construction of the powerhouse building;
- Construction of a platform at lower reservoir works and tunnel portal;
- Excavation of access tunnel and drop shaft;
- Processing (concrete batching plant, crusher and screener);
- On-Site Tracks;
- Excavation & surfacing;
- On-site transportation (material transfer);
- Borrow Pits (No. 7 & 8);
- Blasting & Excavation;
- Stockpiling;
- Dams 1 & 8;
- Construction works with rockfill (Dam 8);
- Central Processing Area;
- Crushing and screening; and
- Concrete Batching Plant (for upper reservoir works).

Powerhouse (Area)

18.8.38 Initial works within the locale of the powerhouse building have the greatest risk of dust generation, over a period of approximately 10 months. During this time the principal activities would involve excavation, construction of the platform, clearing of the shaft area and the subsequent works to drop the shafts to the required level. Blasting activities would potentially be required on a daily basis during the preparation and excavation of the shafts, alongside transfer of any excavated material that is not required in the construction of the powerhouse platform to the upper reservoir.

18.8.39 During these initial site works, mobile crushing and screening plant is likely to be required for a short period of time (i.e. <6 months) to allow for the direct application of excavated material in the construction works of the powerhouse platform, quayside and pier. Following their completion, the crushing and screening plant would be relocated to the upper reservoir. Consequently, the requirement for extensive stockpiling of material within the powerhouse area is restricted, both by the working plan and the limited spatial availability. Following the construction of the powerhouse platform, quayside and pier, excavated mineral surplus to construction requirements would be transferred directly to the upper reservoir; excavation and material transfer activities alike would be operational 24-hours a day, 7 days a week, 50 weeks of the year.

18.8.40 Following the initial intense period (approx. 10 months) of surface excavation work, the potential for dust generation from the area of the powerhouse building would reduce significantly, limited to the transfer of material from the tunnel portal and on-site vehicle movements.

18.8.41 Due to the volume of concrete required for the structure construction, a concrete batching plant (CBP) would be located within the locale of the powerhouse building. The location of the CBP is to be finalised, however it is likely that it will be within 100 m to the west / southwest of the powerhouse building. The CBP and mobile crushing / screening plant would be operated under a Part B Environmental Permit whereby emissions of particulates to air would be strictly controlled and monitored by SEPA.

On-Site Tracks

18.8.42 The transfer of materials via dump trucks on-site presents a risk of dust generation, as a result of the unpaved surface of the internal roads, downward blowing exhausts and cooling fans in addition to the turbulence caused by the movement of vehicles. Whilst the site design has successfully reduced the gradient of the track route that runs through the SAC, this does result in an increased length of tracks vehicles need to traverse on.

18.8.43 The track that runs through the SAC / SSSI would be a highly utilised route used for the continuous transfer of tunnel spoil and shaft material from the locale of the powerhouse platform to the upper reservoir. Returning dump trucks would be utilised for the transfer of processed aggregate, cement and sand from the upper reservoir plant area to the powerhouse platform for use in the CBP, thus minimising the movements required.

18.8.44 Approximately 5 No. dump trucks would be required for the transfer of material between the upper and lower reservoir, with a combination of 20 t and 40 t capacity due to the size limitation of trucks accessing the tunnel cavities.

18.8.45 On a worst case day, HDV movements along the on-site tracks within the SSSI are greater than 250. The annual average daily HDV movements range from zero (2030) to 185 (2027).

18.8.46 Based upon the above, the risk of dust emissions from on-site tracks identified is considered to be large in the absence of additional mitigation.

18.8.47 Tracks on the remaining areas of the Site, beyond the extent of the SAC/SSSI would be used in the transfer of material from the processing area to the respective construction sites (i.e. the dam locations).

Borrow Pits

18.8.48 There are two potential borrow pits within 400 m of the SAC / SSSI, namely BP7 and BP8 at distances of approximately 280 m and 300 m, respectively. Works required in each location would be of limited duration and would require blasting, excavation and material transfer activities. Stockpiling of material would be located in close proximity to each Borrow Pit location, with the majority of material transferred directly to the main processing area.

18.8.49 Based on the above, the construction of the borrow pits is considered to present a small dust source with a short-term, temporary duration.

Dam Construction

18.8.50 Dams within 400 m of the SAC / SSSI include Dam 1 and Dam 8. Whilst Dam 1 is significantly larger in magnitude and located within the SAC / SSSI, the 22-month construction would be of concrete as opposed to rock filled and therefore the potential for dust generation is significantly reduced. The

primary dust generating activities associated with the construction of Dam 1 would be the use of the CBP and on-site transportation. The location of the CBP is to be confirmed, with the potential for it to be located outside of the distance threshold. As per the CBP at the powerhouse platform, it would be operated under a separate Environmental Permit with all airborne emissions strictly regulated by SEPA.

18.8.51 Dam 8 has a significantly smaller footprint and is located 200 m from the SAC / SSSI. The rock-filled construction of Dam 8 introduces a higher potential for dust generation due to the material being handled and utilised. The magnitude of the structure means that construction would be less than 2-months in total and therefore short-term and temporary in nature.

Residual Source Emission Magnitude Summary

18.8.52 The residual source emission magnitude (the potential magnitude of dust emission after the designed in environmental measures have been taken into account) for each of the dust generating activities within the screening distance is presented in **Table 18.14: IAQM Assessment, Ecological – Residual Source Emissions Magnitudes**.

Table 18.14: IAQM Assessment, Ecological – Residual Source Emissions Magnitudes

Potential Dust Generating Area / Associated Activities	Factors and Assumptions	IAQM Residual Source Emissions
Borrow Pits	Blasting and initial excavation works required; Short term duration of activities ; and Minimal storage required, material transferred to plant.	Small
On-site Tracks Construction	Vegetation clearance, Excavation & Surfacing (4 months); Small working areas, progressive works; Plant required, including bulldozers, excavators, compactors, asphalt paver	Medium
On-site Transportation	>250 HDV movements on a worst-case day; Track surface: compacted aggregate; Speed limits of 15mph on tracks within SAC/SSSI, including tracks within a 100m buffer area of the SSSI/SAC.	Large
Powerhouse Area	Initial 12 months: Excavation, blasting, crushing and screening, on-site transportation, construction of powerhouse platform, quayside and pier; and Multiple plant required, including compactors, pavers, drilling and piling rigs. Remaining months: Material handling, on-site transportation (paved surface);	Large

	Concrete Batching and Shotcrete Plant; and Limited and temporary stockpiling of material required, surplus material transferred to upper reservoir area.	
Dam Construction (Dam 1 & Dam 8)	Dam 1 Multiple plant required, Multiple plant required, including compactors, pavers, drilling and piling rigs. Construction works of duration >12 months; Concrete structure, minimal use of dusty materials; Potential use of CBP; and Dust generating activities limited to on-site transportation and CBP. Dam 8 Multiple plant required, including compactors, pavers, drilling and piling rigs. Construction period <60 days; No processing; and Rockfill construction, use of potentially dusty material alongside on-site transportation.	Medium

Pathway Effectiveness

18.8.53 The pathway effectiveness for the habitats of the SAC and SSSI has been undertaken using an adapted methodology, giving regard to the large spatial extent of the designation in comparison to the discrete nature of the human receptors.

18.8.54 The pathway effectiveness has given due regard to the prevailing winds in the local area, the distance from the potential dust sources and the level of rainfall experienced in the local area. The consideration of pathway effectiveness also takes into account the effect of impaction by the broadleaved woodland habitats. Impaction is considered to significantly reduce the potential for surface wind speeds to reach the strength at which dust can become airborne, whilst further reducing the dispersion of dust emissions beyond a short distance due to the capturing effects of the foliage. Given the broadleaved nature of the dominant habitat that occupies the SAC / SSSI, impaction would have a greater effect during the summer months, however the seasonal increase in rainfall during the winter months is considered to counteract this imbalance.

18.8.55 The orientation with regard to the prevailing winds of receptors in areas dominated by broadleaved woodland has not been considered, on account of the woodland habitat likely removing the contributions of any prevailing wind directions that may be in occurrence above the treelines.

18.8.56 A summary of pathway effectiveness is displayed in **Table 18.15: IAQM Pathway Effectiveness – Disamenity Dust, Ness Woods SAC / Easter Woods SSSI**.

Table 18.15: IAQM Pathway Effectiveness – Disamenity Dust, Ness Woods SAC / Easter Woods SSSI

Habitat	Distance to Source	Prevailing Wind	Rainfall	
Broadleaved Woodland Summer months –impaction effects Winter months – seasonal increase in rainfall	<20 m	n/a	66 – 71 % of the year – sufficient rainfall to suppress dust emissions	Highly Effective
	<50 m	n/a		Moderately Effective
	>50 m	n/a		Ineffective
Acid grassland / Bracken / Dry Heath	<50 m	n/a		Highly Effective
	<100 m	Downwind		Highly Effective
	<100 m	Upwind		Moderately Effective
	>100 m	Downwind		Moderately Effective
	>100 m	Upwind		Ineffective

Receptor Sensitivity

18.8.57 The habitats within Ness Woods SAC and Easter Forest SSSI are not known to have any specific sensitivity to dust. Statutory consultation responses from NatureScot do not detail any concern or specific sensitivities to dust deposition or air pollutants. However, given the statutory international designation and as a precautionary approach the habitats are considered to be of high sensitivity in accordance with IAQM guidance. Further information on the habitats of Ness Woods and Easter Forest SSSI can be found within the **Habitats Regulation Appraisal (HRA) Report (Section 5.4.1)**.

Magnitude of Effect

18.8.58 On the basis of the source term, receptor sensitivity and pathway effectiveness, the magnitude of effect due to potential dust deposition at each identified receptor has been estimated. **Table 18.16: IAQM Dust Impact & Magnitude of Effect (without mitigation) – Disamenity Dust, Ecological Receptors** presents a summary of the magnitude of effect.

Table 18.16: IAQM Dust Impact & Magnitude of Effect (without mitigation) – Disamenity Dust, Ecological Receptors

Receptor	Pathway Effectiveness	Residual Source Emission	Dust Impact Risk	Magnitude of Effect
Powerhouse Area / On-site Transportation				
Woodland <20 m	Highly Effective	Large	High Risk	Substantial Adverse

Woodland <50 m		Moderately Effective		Medium Risk	Moderate Averse
Woodland >50 m		Ineffective		Low Risk	Slight Adverse
Acid Grassland / Bracken / Dry Heath	<50 m	Highly Effective		High Risk	Substantial Adverse
	<100 m downwind	Highly Effective		High Risk	Substantial Adverse
	<100 m upwind	Moderately Effective		Medium Risk	Moderate Averse
	>100 m downwind	Moderately Effective		Medium Risk	Moderate Averse
	>100 m upwind	Ineffective		Low Risk	Slight Adverse
Construction of On-Site Tracks / Dams					
Woodland <20 m		Highly Effective	Medium	Medium Risk	Moderate Averse
Woodland <50 m		Moderately Effective		Low Risk	Slight Adverse
Woodland >50 m		Ineffective		Negligible	Negligible
Acid Grassland / Bracken / Dry Heath	<50 m	Highly Effective		Medium Risk	Moderate Averse
	<100 m downwind	Highly Effective		Medium Risk	Moderate Averse
	<100 m upwind	Moderately Effective		Low Risk	Slight Adverse
	>100 m downwind	Moderately Effective		Low Risk	Slight Adverse
	>100 m upwind	Ineffective		Negligible	Negligible
Borrow Pits					
Woodland <20 m		Highly Effective	Small	Low Risk	Slight Adverse
Woodland <50 m		Moderately Effective		Negligible	Negligible
Woodland >50 m		Ineffective		Negligible	Negligible
Acid Grassland / Bracken / Dry Heath	<50 m	Highly Effective		Low Risk	Slight Adverse
	<100 m downwind	Highly Effective		Low Risk	Slight Adverse
	<100 m upwind	Moderately Effective		Negligible	Negligible
	>100 m downwind	Moderately Effective		Negligible	Negligible
	>100 m upwind	Ineffective		Negligible	Negligible

18.8.59 As noted in **Table 18.16: IAQM Dust Impact & Magnitude of Effect (without mitigation) – Disamenity Dust, Ecological Receptors**, the potential dust deposition effect, in the absence of mitigation, is predicted to range from slight adverse to substantial adverse with regard to activities in the Powerhouse area and on-site transportation. All receptors within the considered bands of distance are considered to have the potential to have a slight to substantial adverse impact from operations during the construction period in the absence of additional mitigation.

18.8.60 The construction work associated with the on-site tracks and dam structures is predicted to be negligible on woodland habitats located greater than 50 m from the source and other habitats located greater than 100 m upwind of the source. The remaining habitats within the distance bands have the potential to have a slight to moderate adverse effect in the absence of additional mitigation.

18.8.61 The activities associated with the Borrow Pits are predicted to pose a negligible effect on woodland habitats greater than 20 m from the source and on other habitats greater than 100 m (even less than 100 m from the source for upwind locations). At worst case, the activities associated with the Borrow Pits are predicted to pose a slight adverse effect in the absence of additional mitigation.

18.8.62 Whilst a qualitative assessment of potential effects on ecological habitats is limited in its extent to predict magnitude of effect, the overall effect on ecological receptors is considered to be significant in the absence of additional mitigation measures. Further operational dust control measures are therefore required to reduce the potential impact on these habitats, with particular focus required on the areas of the lower reservoir works and on-site transportation through the designated area. Further mitigation measures are proposed in **Section 18.9.**

Construction Phase- Road Traffic Screening Assessment

18.8.63 The Site would be accessed by road traffic by a new access junction from the existing B862 public road. The primary construction activities that will generate vehicle movements on the local road network will comprise:

- Importation of material to produce concrete, and to a lesser extent shotcrete;
- Importation of fuel for construction plant;
- Importation of material to create the initial stages of the access;
- Daily movements associated with servicing a large construction site / compound; and
- Occasional deliveries of larger items of plant.

18.8.64 Vehicle generation during the construction phase is summarised below in **Table 18.17: Construction Phase Vehicle Generation (off-site)** (provided by the appointed transport consultant for the Proposed Development). The proposed route of construction vehicles using the main public road network is illustrated in **Volume 2, Figure 16.4 – Delivery Routes,** illustrating that all construction material deliveries will be from the A9 (T), the B861 and the B862. 100% of HDV movements will therefore access / leave the Site from the north.

Table 18.17: Construction Phase Vehicle Generation (off-site)

Time Period	HDVs (as AADT)	LDVs (as AADT)
2025 (Jul – Dec)	6	28
2026	24	98
2027	18	121
2028	13	107
2029	2	54
2030 _(Jan – Jun)	<1	3
Average across 59 month construction period	13	84

Human Receptors

18.8.65 From **Table 18.17: Construction Phase Vehicle Generation (off-site)** it is evident that both LDV and HDV movements during all construction years are below the EPUK & IAQM screening criteria. As such, road traffic impacts associated with construction activities on air quality can be considered as having a negligible and therefore not significant effect on human receptors. No further assessment is therefore required.

Ecological Receptors

18.8.66 The proposed route of construction vehicles using the main public road network is illustrated in **Volume 2, Figure 16.4 – Delivery Routes,** illustrating that all construction material deliveries will be from the A9 (T), the B861 and the B862. There are no ecological designations present within 200m of the proposed construction route. Furthermore, the 24-hour AADT road traffic flows generated during the construction phase are well below the IAQM[8] screening criteria of 1,000 AADT (and/ or 200 HDVs as AADT).

18.8.67 Construction works are expected to last approximately 5 years (inclusive of commissioning activities expected to last approximately 6 months), and as such any consequential impacts onto local road traffic flows are believed to be temporary, with no long-term deterioration of conditions.

18.8.68 As such, road traffic impacts associated with construction activities on air quality can be considered as having a negligible and therefore *not significant* effect on ecological designations. No further assessment is therefore required.

Construction Phase- Non-Road Mobile Machinery

NRMM

18.8.69 Construction activities associated with the Proposed Development are likely to commence in July 2025 and last approximately 5 years. The assessment of NRMM on ecological receptors has been divided into the following:

- Assessment of on-site vehicle movements associated with material transfer; and
- Assessment of remaining NRMM.

On-Site Vehicle Movements – Material Transfer Activities

18.8.70 The assessment of on-site vehicle emissions looks at the movements associated with the transfer of surplus material between the locale of the powerhouse platform and the upper reservoir and the potential impact on the Ness Woods SAC and Easter Ness Forest SSSI.

18.8.71 Construction of the Proposed Development is anticipated to generate approximately 1,100,000 m^3 of excavated rock spoil through the tunnelling, shaft works and dam and access track excavation works. Approximately 186,000 m^3 of which would be from the powerhouse platform excavation.

18.8.72 Further details are provided in **Volume 4, Appendix 3.4: Outline Spoil Management Plan.**

18.8.73 Given the assessment relates to on-site movements alone, screening of traffic flows can be undertaken in isolation directly with the IAQM prescribed screening criteria[8], without consideration of in-combination impacts. The 24-hour AADT traffic flows through the SAC / SSSI are presented in **Table 18.18: Construction Phase Vehicle Generation (On-site, within the SAC / SSSI)** (provided by Pell Frischmann, the appointed transport consultant for the Proposed Development).

Table 18.18: Construction Phase Vehicle Generation (On-site, within the SAC / SSSI)

Time Period	HDVs (as AADT)	LDVs (as AADT)
2025 (Jul – Dec)	122	13
2026	96	98
2027	185	149
2028	183	143
2029	45	70
2030 (Jan – Jun)	0	5

18.8.74 The 24-hour AADT traffic flows generated on the designated track running through the SAC & SSSI are well below the screening criteria of 1,000 AADT (and/ or 200 HDVs).

18.8.75 As such, the impact of on-site vehicle movements on air quality can be considered as having a negligible and therefore *not significant* effect on ecological designations. No further assessment is therefore required.

Remaining On-Site NRMM

18.8.76 NRMM emissions are controlled through European Directives (e.g. Regulation EU 2016/1628) in terms of maximum operable emission limits. Emissions standards are applied to NRMM engines at the point of placing on the market – and typically become stricter following the introduction and availability of cleaner technologies and fuels. The most recent stringent emission standards, Stage V, were effective from 2019 for engines below 56 kW and above 130 kW, and from 2020 for engines of 56-130 kW. By the time construction activities are expected to commence (2024), all NRMM will comply with Stage V emissions, as a minimum – or a later emission standard introduced in the interim period.

18.8.77 Despite the above, a review of NRMM proposed within 50 m of human or ecological receptors has been undertaken. There are no human receptors within the 50 m screening threshold, however there are ecological receptors in the form of Ness Woods SAC and Easter Ness Forest SSSII. Areas located within 50 m of the SAC/SSSI are presented in **Figure 18.3: NRMM Assessment – Ecological Receptors** and include:

- Powerhouse and associated infrastructure; and
- Dam 1.

18.8.78 It is worth noting that where there is uncertainty and/or optionality regarding the extent of specific construction activities within 50m, all possible construction activities have been considered for completeness. This is considered worst-case, as it is possible that the full extent of construction activities and NRMM identified may not be relevant or occur within 50m of the SAC / SSSI. However, this approach ensures all potential scenarios and associated impacts have been assessed for completeness.

18.8.79 **Table 18.19: NRMM Plant** details the full extent of construction activities requiring NRMM potentially occurring within these identified areas and the primary plant required.

Table 18.19: NRMM Plant

Relevant Area	Plant Required
Powerhouse Dam construction (includes plant utilised in Underground Waterway works)	Bulldozer (153kw, 21t) x 5-13 Excavator (35t) x4 Excavator (20t) x 3-20 Dump trucks (CAT 745C) x 6 CAT Grader (14m) x 2-6 Vibratory Compactor (12t) x 3-5 Crawler Crane (35t) x 1-4 Asphalt Paver x1 Concrete Batching Plant x 1-3 Shotcrete Plant x 2-5 Wheeled loader (60kw) x 2-7 Wheeled loader (240kw) x 4 Wheeled drill / hammer x 2 Shotcrete jumbo x 4-5 Rock drill x 2-7 Tracked Excavator x 2 Crawler Crane (50t) x 1-4 Permanent Secant Piling (rotary 110t) x 1 Top Hammer Drilling Rig x 2 Crawler Crane Piling Rig (50t) x 2 Vibratory Rig for Sheet Piling (52t) x 1

18.8.80 Whilst taking into account the extent of NRMM proposed to be used (type, quantum and emission standards), associated control measures and the transient / phased nature of the construction works, - the likelihood of NRMM emissions comprising a significant concern for the SAC / SSSI is low. A significant proportion of the SAC / SSSI habitats within the distance threshold are associated with the on-site tracks leading between the lower and upper reservoir. As per the IAQM guidance, movements of NRMM in this area are considered to have a negligible and therefore *not significant* effect on ecological designations (as discussed earlier in this chapter).

18.8.81 **Table 18.20: Ecological Receptors in Proximity to Spatial Extents of NRMM (excluding on site transportation)** and **Figure 18.3: NRMM Assessment – Ecological Receptors** presents the ecological receptors that are located within the 50 m buffer of the remaining NRMM (i.e. excluding the on-site tracks leading between the lower and upper reservoir), to inform the spatial extent of the SAC and SSSI which may be affected by emissions. The remaining NRMM located within the distance threshold are associated with the powerhouse platform and the construction of Dam 1.

Table 18.20 Ecological Receptors in Proximity to Spatial Extents of NRMM (excluding on-site transportation)

Site Name	Spatial Extent of Affected Area (% of total site area)	Habitat(s)
Ness Woods SAC	5.1ha within 50 m of powerhouse platform construction footprint (~0.6% of total SAC) 1.9 ha within 50 m of Dam 1 construction footprint (<0.5% of total SAC)	Broadleaved woodland Bracken Acid Grassland - unimproved
Easter Woods SSSI	5.1ha within 50 m of powerhouse platform construction footprint (~1.1% of total SSSI) 1.9 ha within 50 m of Dam 1 construction footprint (<0.5% of total SSSI)	Broadleaved woodland Bracken Acid Grassland – unimproved

18.8.82 Construction works associated with Dam 1 would be a total of 24 months, with the extent and use of NRMM constantly changing as works progress. There is approximately 1.9 ha of the SAC / SSSI within the distance threshold of the Dam 1 construction footprint, representing less than 0.5% of the total area of both the SAC and SSSI.

18.8.83 Construction works associated with the powerhouse platform would be greatest in intensity for the initial 12 months of work when plant is required for excavation, blasting and on-site processing. Following this period however the number of NRMM and intensity of use will significantly reduce as construction activities are limited to handling of material and on-site transportation (which has been assessed separately in this chapter). There is approximately 5.1 ha of the total SAC / SSSI area within the distance threshold of the Powerhouse area, representing approximately 0.6% and 1.1% of the total area of both the SAC and SSSI, respectively.

18.8.84 The existing levels of NOx, Nitrogen deposition and Nitrogen and Sulphur loads associated with the most sensitive woodland habitats are below the site-specific critical levels / loads, as presented in **Table 18.8: Nitrogen Critical Levels & Critical Loads**. The current NOx concentration is 5.5% of the annual AQO for ecological habitats, the current nitrogen deposition load is between 42% and 63% of the critical load range, and there is headroom of 43% and 83% between the current and maximum critical loads for Nitrogen and Sulphur-derived acid, respectively.

18.8.85 Based on the above, emissions are considered to be negligible and therefore effects are considered to be not significant. Furthermore, any impacts arising from construction activities are considered to be temporary.

18.8.86 As discussed in **Section 18.5**, exhaust emissions from NRMM are unlikely to have a significant impact on local air quality where suitable controls are implemented, as per guidance provided by the IAQM and Scottish Government. A series of construction phase control measures shall be proposed to minimise NRMM emissions. Therefore, despite the proximity of SAC and SSSI in relation to the proposed construction works, consistent with advice provided by the IAQM and Scottish Government, the likelihood of NRMM emissions causing a significant impact on the SAC / SSSI is considered to be low.

Cumulative Effects

18.8.87 Cumulative dust effects arising from construction activities could be experienced where construction activities from more than one scheme overlap at an affected receptor, dependent on the impact (e.g. dust soiling, human health and ecological).

18.8.88 There are no consented or proposed operations within the study area[17] that require assessment for cumulative effects of dust emissions. The closest consented operation is the access track to the Dell wind farm located approximately 2 km southwest of the proposed Site access.

18.8.89 However, all schemes which are considered to pose a risk of cumulative effects will have had to undertake a construction dust assessment separately relating to their own site activities and associated risks, with the recommendation of best practice mitigation to remedy residual effects *not significant*.

18.8.90 On account of there being no statutory designated ecological designations within the 200 m screening distance of the roads proposed to be utilised by construction vehicles, there is no requirement for a cumulative assessment of vehicle movements associate with other projects in the local area.

Associated Works

18.8.0 A 275 kV air insulated switchgear (AIS) switching station is to be provided at the site. This development is the subject to a separate planning application to be made in the future by Scottish & Southern Electricity Networks Transmission (SSEN Transmission).

18.8.1 The proposed switching station is required to enable the operation of the Proposed Development and as such, is considered as Associated Works, as described in **Section 3.7** of **Chapter 3: Description of Development**. The switching station is proposed to be constructed between months 30 and 48 of the construction programme, although this has yet to be confirmed.

18.8.2 With regard to potential dust effects from construction of the Associated Works, there are no human or ecological receptors within 400 m of the proposed switching station, access track or cable trench.

[17] The study area for potential cumulative impacts of construction phase dust is considered to be 400m from the proposed activities, in accordance with IAQM Guidance

As such, there is negligible potential for cumulative impacts from dust deposition from the simultaneous construction of the Proposed Development and Associated Works.

18.8.3 With regard to traffic emissions, the traffic generation with the Associated Works is not yet known, however an estimate from similar schemes presumes traffic generated onto the public road network would comprise 20 LDVs and 16 HDV movements per day at its peak. Based on the estimated traffic movements generated from the Proposed Development in **Table 18.17: Construction Phase Vehicle Generation (off-site)**, it is evident that the total movements would remain well below the respective EPUK and IAQM screening criteria with effects considered to be negligible and therefore *not significant* on human and ecological receptors.

18.9 Mitigation

Construction Environmental Management Plan (CEMP)

18.9.1 A Construction Environmental Management Plan (CEMP) would be prepared by the appointed Principal Contractor. The CEMP would apply to all construction activities required as part of the Proposed Development. In particular, the CEMP would specify conditions to limit fugitive dust emissions. The final site-specific CEMP would be submitted to The Highland Council (THC) for approval under condition.. An Outline CEMP is included in **Volume 4, Appendix 3.3**.

Construction Dust Mitigation

18.9.2 The overall effects from deposited dust and PM_{10} concentrations resulting from the Proposed Development on human receptors are considered to be 'not significant' with the designed-in dust control measures taken into account within the assessment. The overall effects of deposited dust on ecological receptors cannot, however, be considered to be 'not significant' due to the potential magnitude of dust generating activities in proximity to the SAC / SSSI.

18.9.3 It is therefore recommended that additional mitigation is required to sufficiently reduce the impacts. Mitigation measures recommended for implementation, in accordance with the IAQM guidance[18], are detailed in **Table 18.21: Recommended Dust Control Measures.**

Table 18.21 Recommended Dust Control Measures

Activity	Description
General / Whole Site Best Practice	
Design and location of dust generating activities	As far as practicable, dust generating activities should be located away from high and medium sensitive receptors

[18] Mitigation measures recommended from both the IAQM guidance documents 'Guidance on the assessment of dust from demolition and construction' (2016, v1.1) and Guidance on the Assessment of Mineral Dust Impacts for Planning (2016, v1.1) have been reviewed for suitable site specific recommendations.

Provision for dust mitigation measures	Planning and design of the scheme should make provision for water supply to meet the site demand for mitigation and dampening, whilst minimising the potential for site run-off of water or mud
Equipment and vehicles	Provision of a wheel wash and a hard paved section of 100 m minimum before the site entrance to minimise track-out potential onto the local road network A separate paved parking area for off-site vehicles (such as staff cars) with no access to the working areas, to help prevent track-out of mud on the local road network
Management	A Dust Management Plan (DMP) should be produced and adhered to and utilised as an active document. Regular site inspections should be undertaken to monitor compliance with the DMP. All dust and air quality complaints should be recorded, identifying the cause and taking appropriate measures to reduce emissions in a timely manner, recording the measures taken. Display the name and contact details of the person(s) accountable for air quality and dust on the site boundary (i.e. environment manager site manager)
Training	Provide training to the site personnel on dust mitigation. Training should also cover 'emergency preparedness plans' to react quickly in case of any failure of the planned dust mitigation.
Monitoring	Regular visual monitoring (on-site and off-site) to monitor dust deposition and trackout impacts. This should include dust soiling checks of street furniture, cars and window sills of off-site receptors within 100 m of the boundary.
Communication	Maintain good communication to help alleviate anxieties between the operators and the surrounding communities. Set up regular, accessible liaison arrangements with the local community and provide information as freely as possible. Hold regular liaison meetings with other high risk construction sites located within 500 m of the site boundary, where required, to ensure plans are coordinated and dust emissions minimised.
Vehicle Movements (On-site)	Good practises that should be implemented across the Site include: Regular inspection of on-site tracks for integrity and instigate any necessary repairs as soon as reasonably practicable (all inspections and subsequent actions recorded in the site log book) Regular clearing, grading and maintenance of haul routes; Speed limit of 15 mph from the point of site access for a distance into Site of 1 km (to protect the amenity of offsite residential receptors) Appropriate site-specific speed limits being set on remaining unmade roads. Where lower speed limits are not practicable as a permanent measures, the Site Manager should consider setting speed limits according to operating conditions at the time (i.e. reduced speed limits during periods of dry and windy weather conditions) Fitting of dump trucks with upswept exhausts and radiator fan shields where practical. Ensuring loads are evenly loaded to avoid spillages

	Ensure HDVs that travel offsite are cleaned with an effective wheel or vehicle washer prior to leaving site
Vehicle Movements (Off-site)	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable), ideally located at the transition between hard paved and compacted aggregate road surface Water assisted dust sweepers should be available for use on the site access and local roads to remove, as necessary, any material tracked out of the site. All vehicles entering and leaving the site are covered to prevent the escape of materials during transport
Soil & Overburden Handling	Soil scrapers should be used where possible, given their effectiveness to minimising soil handling where the site is flat. In cases of complex topography, the use of dozers, loaders and dump trucks may be effective and practical for soil removal. For all handling of materials, handling should be minimised where possible and drop heights reduced to the minimum practicable.
Extraction (inc. drilling and blasting)	Where possible, use of hydraulic excavators and breakers used over blasting activities. Equipment for abrasive blasting should be fitted with dust extraction systems and the dust suitably disposed of.
Processing (crushing and screening)	The plant should always be used within its design capacity The plant should maintain good standards, serviced in line with manufacturer recommendations All bulk cement and other fine powder materials should be delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent the escape of material and overfilling during delivery
Earthworks & Material handling	Materials should be dampened down with sprays / mists prior to handling, where required Water suppression available to dampen down material during periods of prolonged dry weather to minimise the potential for dust generation during handling
Stockpiles	For long-term stockpiles of overburden / soils consideration should be given to seeding and / or vegetation of exposed surfaces with quick growing plant. For short-term stockpiles the following measures should be implemented as standard: Material should be stored on hard paved surfaces, in a designated area to minimise vehicles traversing across the base of the stockpile
Specific Measures for Activities in Proximity to the SAC / SSSI	
Planning of Activities	Where practicable, activities with a high potential for dust generation and located within 100m of the SAC / SSSI should only be planned during favourable weather conditions. Where possible, activities of high dust potential should be avoided during extended periods of dry and windy weather

Design and location of dust generating activities	It is recommended that the central processing area in the upper reservoir area (to house crushing and screening plant and CBP) is located at a minimum distance of 200m from the SAC / SSSI boundary, where practicable.
Vehicle Movements	Additional measures that are recommended for the haul route through the SAC / SSSI and 100m at each end include: Application of water suppression (i.e. misting) to the load by bowser / fixed sprays in dry conditions Speed limits set to 15mph Monitoring regime of dust deposition within the SAC / SSSI, to include baseline surveys prior to the commencement of construction operations
Stockpiles	For short-term stockpiles located within 100m of the SAC / SSSI: - Where possible, materials should be stored under cover; - Material should be dampened down where required, using sprays or mists Long-term stockpiles (i.e. >6 months) with infrequent material transfer within 200 m of the SAC / SSSI where seeding is not possible: consideration should be given to netting screens or side walls to allow shelter from the wind (at least until a crust has formed on the mound surface) Long-term stockpiles (i.e. >6 months) with frequent material transfer within 200 m of the SAC / SSSI where seeding is not possible: consideration should be given to netting screens, semi permeable fences or misting sprays (i.e. atomising sprays to minimise the water-run off)
Earthworks & Material handling	Where conveyors are used within 100 m of the SAC / SSSI, the following controls should be implemented: Enclosure of transfer points and discharges; Fixed sprays where required; No abrupt changes in grade, Return belt cleaners with arisings suitably collected; Shrouding of feed hoppers, transfer pts and discharges; and Minimisation of drop heights at hoppers and discharges. design hopper load systems to ensure a good match with truck size, and enclose fully on all sides
Processing	Where crushing and screening takes place within 200 m of the SAC / SSSI, it is recommended that the activity be undertaken within a fully enclosed structure. If this is not possible, (i.e. use of mobile plant), processing should be located as far from the SAC / SSSI as possible within a sheltered area to minimise dust emissions. The plant should be fitted with water spray suppression bars to ensure the material is kept damp throughout the process and the following as part of the working scheme: Dampening of material stockpiles prior to crushing operations should be undertaken, as required Equipment should be protected by partial or complete enclosure, where possible

Soil & Overburden Handling	Stripping and overburden handling operations within 200 m of the SAC / SSSI should be avoided during dry and windy condition, where practicable. Soils handling is generally a short lived seasonal activity and is considered flexible as to its timings. Overburden can usually be worked at higher moisture levels which then reduce the risk of unacceptable dust emissions
Monitoring	An appropriate monitoring scheme for dust deposition should be implemented to monitor dust deposition within the SAC / SSSI; it is recommended that a period of baseline monitoring at least 6 months before work commences on-site should be undertaken. An indicative monitoring scheme is provided in **Volume 4, Appendix 18.1: Dust Monitoring Scheme** however prior to commencement the details and logistics of the scheme should be discussed and confirmed with THC and included within the Dust Management Plan.

Construction Phase Vehicle Emissions

18.9.4 Impacts associated with off-site vehicle emissions during the construction phase on air quality has been determined as having an insignificant/ neutral effect on both human and ecological receptors. No mitigation above that embedded in the design is considered to be required.

NRMM Mitigation Measures

18.9.5 A series of construction phase control measures should be implemented to minimise NRMM emissions. These include:

- Preparing and maintaining the site;
- Plan site layout (layout of the works taking place on-site) so that machinery and dust causing activities are located away from receptors, as far as is possible.;
- Operating Vehicles/Machinery and Sustainable Travel;
- Ensure the vehicle fleet for construction activities are of low emission category where possible;
- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid / minimise the use of diesel or petrol powered generators where possible and use mains electricity or battery powered equipment where practicable;
- Produce a construction logistics plan to manage the sustainable delivery of goods and materials; and
- Impose and signpost a maximum-speed-limit of 100 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased providing the recommended dust control measures are in place).

18.9.6 In accordance with the Scottish Government, and IAQM, impacts on the SAC / SSSI associated with construction phase generated NRMM emissions are not likely to be significant. Furthermore, impacts associated with NRMM emissions are believed to be temporary (given the nature of construction works), with no long-term deterioration of conditions.

18.10 Residual Effects

18.10.1 This section considers the potential residual effects and associated effect significance of the construction of the Proposed Development, following the implementation of the mitigation measures proposed in **Section 18.9.**

Construction Residual Effects

18.10.2 The designed in measures (see **Section 18.7**) combined with the recommended operational measures detailed in **Table 18.21: Recommended Dust Control Measures** are considered to be appropriate to mitigate the potential impact and for the residual effects to be considered *not significant*.

18.10.3 Given the sensitivity of the ecological receptors the deposition of dust on the Nes Woods SAC / Easter Woods SSSI, a precautionary approach is recommended comprising a dust deposition monitoring scheme be designed and implemented. An indicative dust monitoring methodology is presented in **Volume 4, Appendix 18.1: Dust Monitoring Scheme.**

18.10.4 With regard to NRMM emissions during the construction phase, providing the recommend controls and site management is in place, NRMM are unlikely to make a significant impact on local air quality, as per Defra's LAQM.TG(22) guidance. The residual effect is therefore considered to be not significant.

18.11 Conclusion

18.11.1 This assessment has considered the potential air quality effects arising from activities associated with the construction of the Proposed Development. Consideration has been given to potential worst-case effects arising from construction activities based upon available information. Worst-case parameters have been adopted to provide a robust assessment.

18.11.2 Activities associated with the operational phase would be negligible in comparison to those associated with the construction phase; the effects associated with the operational and maintenance activities have been scoped out of the assessment.

18.11.3 A qualitative assessment of the potential dust effects associated with worst-case construction activities has been undertaken following IAQM guidance (IAQM, 2016).

18.11.4 Following the construction phase dust assessment and the implementation of the recommended dust mitigation measures, impacts on disamenity, human and health and ecological receptors are considered to be not significant.

18.11.5 Effects will be temporary and are only likely to materialise if certain activities and/or meteorological conditions coincide. Given the proximity and potential sensitivity of Ness Woods SAC / Easter Woods SSSI to dust deposition, it is recommended that a monitoring scheme be designed and implemented as part of the Dust Monitoring Scheme. An indicative dust monitoring methodology is presented in **Volume 4, Appendix 18.1: Dust Monitoring Scheme.**

18.11.6 A screening assessment of potential construction generated vehicle flows has been undertaken, with due consideration given to both human and ecological receptors. These impacts are believed to be temporary, as they will only occur throughout the duration of construction works.

18.11.7 In relation to human receptors, maximum developmental flows generated by all potential scenarios are not projected to exceed the IAQM & EPUK screening criteria (EPUK & IAQM, 2017). As such, impacts on human receptors can be screened out and effects are not considered to be significant. No further assessment is required.

18.11.8 In relation to ecological receptors, there are no designated ecological sites located within 200m of the proposed construction vehicle routing arrangements. Furthermore, road traffic flows are observed to be below the IAQM prescribed screening criteria (IAQM, 2020). As such, impacts on ecological receptors can be screened out and effects are not considered to be significant. No further assessment is required.

18.11.9 There is not considered to be a potential for cumulative effects in relation to construction phase dust or vehicles emissions.

18.11.10 A summary of the above assessment outcomes is provided in **Table 18.22: Summary of Construction Phase Effects.**

Table 18.22 Summary of Construction Phase Effects

Impact	Magnitude	Sensitivity of Receptor	Mitigation Measures	Residual Effect
Dust/ PM_{10} generated from temporary construction activities	Low - High	High	Implementation of best-practice and site -specific recommended mitigation, see **Table 18.21: Recommended Dust Control Measures** Preparation of Dust Monitoring Plan Monitoring of dust deposition at ecological receptors, see **Volume 4, Appendix 18.1: Dust Monitoring Scheme**	Negligible
Temporary construction-generated road traffic volumes on human receptors	Negligible (below relevant screening criteria)	High	Not required	Negligible
Temporary construction-generated road traffic volumes on ecological receptors	Negligible (below relevant screening criteria)	High	Not required	Negligible

Temporary construction-generated emissions from NRMM	On-Site vehicle movements - Negligible (below relevant screening criteria) On-Site NRMM – Negligible	High	Implementation of best-practice mitigation, see **Section 18.9**	Negligible