17 Air Quality

17.1 Introduction

17.1.1 Since the submission of the previous application for Beaw Field, there have been no changes to the air quality baseline and given that the infrastructure of the Consented Development is not changing, there would be no air quality effects. The findings of the previous air quality assessment therefore remain valid, and the previous air quality chapter is set out in full below, with a brief update included in relation to planning policy.

17.1.2 This chapter has been prepared by Wardell Armstrong, by qualified air quality professionals of the Institute of Air Quality Management. This chapter presents an air quality impact assessment for the Consented Development.

17.1.3 This chapter addresses the issues associated with the potential air quality impacts during the construction, operation and decommissioning stage of the Consented Development. The Consented Development consists of a 17 turbine wind farm with a maximum tip height of 145m together with the ancillary infrastructure required to construct and operate the wind farm. Following the operational life span the wind turbines will be decommissioned in a co-ordinated manner which will be more representative of construction type activities than of demolition (Chapter 3: Project Description). However, some minor demolition activity will be required to remove the turbine foundations and sub-station control building.

17.1.4 During the operational lifespan of the Consented Development, the generation of electricity from the wind turbines will produce no gaseous emissions and will not contribute directly to local air pollution. Therefore, the air quality impacts associated with the Consented Development are confined to the initial construction and decommissioning phases only.

Consultations

17.1.5 A Scoping Report was submitted to Shetland Islands Council (SIC) by Wardell Armstrong on behalf of Peel Wind Farms (Yell) Ltd in April 2015 (Chapter 1: Introduction). Correspondence that relates to air quality matters were received from: Richard MacNeill (Planning Officer) of SIC, RSPB Scotland and Alison Wilson of Scottish Environment Protection Agency (SEPA).

17.1.6 SIC stated '*Good construction practices, site management and conditions should be efficient to ensure that dust emissions are controlled. However, it is recognised that there is the potential for emissions from plant and machinery to impact upon neighbouring land uses depending on the site layout/construction work and relationships with dwellinghouses etc*. This should be considered'.

17.1.7 SEPA stated '*One of our key interests in relation to major developments is pollution prevention measures during the periods of construction, operations, maintenance, demolition and restoration. The construction phase includes construction of access roads, borrow pits and any other site infrastructure'*

17.1.8 *'We advise that the applicant should, through the EIA process or planning submission, systematically identify all aspects of site work that might impact upon the environment, potential pollution risk associated with the proposals and identify the principles of preventative measures and mitigation. This will establish a robust environmental management process for the development. A draft schedule of mitigation should be produced as part of this process. This should cover all the environmental*

sensitivities, pollution prevention and mitigation measures identified to avoid or minimise environmental effects.'

17.1.9 In relation to borrow pit activities: '*The impact of such facilities (including dust, blasting and impact of water) must be assessed in accordance with Planning Advice Note PAN 50 Controlling the Environmental Effects of Surface Mineral Workings (Paragraph 53)*'

17.1.10 Details of local access and recreational routes in the vicinity of the Site were provided via email from Kevin Serginson (SIC) on 8th September 2015. Three recreational walking and cycling routes are located within the vicinity of the Consented Development: the B9081 cycle route, the Catalina Memorial Walk to the west and the Ward of Otterswick Walk to the west (Figure 6.3). The circular walking route, the 'Ward of Otterswick Walk' which links with the 'Catalina Walk' leading to the Catalina Memorial for those lost in an air crash, follows the B9081 from Hamnavoe, passes the site entrance to the Arisdale Farm, heads north to Ward of Otterswick and then south back to Hamnavoe. Air quality impacts to countryside users using these routes will be assessed in this Chapter.

17.2 Legislative framework

17.2.1 The Scotland Third National Policy Framework, 'Scottish Planning Policy'[1], was legislated in June 2014. This document sets forth planning strategies and plans stating the requirements and expectations of existing and new developments in Scotland over the next five years.

17.2.2 The Scottish Planning Policy provides supporting documentation and guidance relating to dust and air quality matters. Namely, PAN 50 "Controlling the Environmental Effects of Surface Mineral Workings" with associated Annex B "Control of Dust at Surface Mineral Workings"[2] and policy guidance "Air Quality and Land Use Planning". See Chapter 4: Planning and Policy Background for further information.

17.2.3 Draft National Planning Framework (NPF) 4 is under preparation and will include all aspects of national planning policy as per the provisions of the Planning (Scotland) Act 2019 and will replace NPF3 once adopted. Draft NPF4 requires that development proposals for renewable energy developments must take into account effects on greenhouse gas emissions reduction targets.

Air quality standards and objectives

17.2.4 The Air Quality Strategy (AQS), 2000 sets objectives for eight pollutants, which may potentially occur in the UK at levels that give cause for concern. These pollutants are: nitrogen dioxide, sulphur dioxide, carbon monoxide, lead, fine particulates (PM_{10}), benzene, 1, 3–butadiene and ozone. Of the eight pollutants listed, only PM_{10} is relevant to this assessment. HGV movements throughout the construction phase will not exceed 100 HGV movements per day and will primarily be confined to within the Site as the majority of the materials for construction will be sourced from the borrow pits. Therefore, an air quality assessment for traffic is not required in accordance with the criteria defined in Environmental Protection UK (EPUK) 2015 Guidance[3]. Current levels of nitrogen dioxide and particulate matter in the vicinity of the Site are well below the Air Quality Objectives.

17.2.5 The AQS objective for PM_{10} was given statutory status in the Air Quality (Scotland) Regulations, 2000[4], Air Quality (Scotland) Amendment Regulations 2002[5] and the most recent version, Air Quality Standards (Scotland) Regulations 2010[6]. These objectives are used for assessing Local Air Quality Management (LAQM). In regards to fine particulates, the Air Quality Objectives state assessment criteria for 24 hour and annual mean only. There are no short term objectives (i.e. 15 minute, one hour or eight hour means) defined by the Air Quality Objectives for fine particulates.

17.2.6 EU Directive 2008/50/EC[7] was authorised for use in June 2008 and was transposed into UK legislation on 11th June 2010. This EU Directive consolidates existing air quality legislation and provides a new regulatory framework for $PM_{2.5}$.

17.2.7 The current Air Quality Standards and Objectives applicable for this assessment are detailed in Table 17.1.

Table 17.1: Air Quality Standards (Scotland) Regulations 2010. Summary of current air quality standards and objectives

Pollutant	*Averaging period*	*Limit value*
PM_{10}	24 hour mean	50µg/m^3 not to be exceeded more than 35 times a calendar year
	Calendar year	18µg/m^3
$PM_{2.5}$	Calendar year	12µg/m^3 to be met by 1st January 2015

Local authority obligations

17.2.8 The Environment Act 1995 requires local authorities to conduct periodic reviews and assessments of air quality. These aim to identify all those areas where the air quality objectives are being, or are likely to be exceeded. If necessary these areas are declared Air Quality Management Areas (AQMA) and local authorities are required to make action plans for improvements in air quality, in pursuit of the national air quality objectives.

17.2.9 The Site is located in the administrative area of SIC. The 2011 Progress Report is the most recent air quality report available from SIC. There are no declared AQMA's on the Shetland Isles and no monitoring is undertaken at Yell. The closest automatic monitoring station (part of the AURN network) is located approximately 40km from the island of Yell in Lerwick and monitors O_3 only. There are no representative air pollution monitors in the vicinity of the Site. Therefore, background concentrations will be taken from the Department for Environment, Food and Rural Affairs (Defra) background maps.

17.2.10 Furthermore, there are no specific standards or guidance in relation to dust, construction activities or air quality issued by SIC.

National guidance and dust effects

17.2.11 "Dust" is a generic term and has no universally recognised definition. The Department of the Environment Minerals Division, December 1995 described "dust" as comprising organic or inorganic particles in the size range of 1-75µm (micrometres). Additionally, BS6069 (Part 2) Characterization of air quality Glossary (1987) uses the term "dust" to describe particulate matter in the size range 1–75µm in diameter, which is primarily composed of mineral materials and soil particles. The BS6069 definition is still considered to be valid and is therefore used in this assessment. Dust particles with an aerodynamic diameter between 1 and 10µm are classed as particle matter (PM) and those between 10 and 75µm are simply termed dust and deposit within 500m. Air Quality legislation recognises PM_{10} (10µm) and $PM_{2.5}$ (2.5µm) are important particle sizes in relation to public health.

17.2.12 Particles less than 1µm behave more like gases than solids and are generally referred to as "fume" whereas particles larger than 75µm are termed "grit".

17.2.13 Research has been carried out into acute health effects associated with the inhalation of Particulate Matter. Inhaled mineral 'dust' with an aerodynamic diameter in excess of 10µm stops in the upper respiratory tract where the particles get trapped in the mucous lining of the nasopharyngeal tract. Dust in the range 10 – 75µm is therefore normally considered not to be a notable health concern, unless the particles are of toxic mineralogy[8]. The dust which could be raised as a result of borrow pit and turbine construction activities will not have toxic mineralogy. The body effectively clears 10 – 75µm dust from the nasopharyngeal tract by sneezing, blowing, dripping through the nose or by flow into the pharynx where they may be swallowed[9]. The Department of Health[10] also concluded that it is unlikely that coarse, windblown particles (i.e. dust in the range 10 – 75µm) have a significant effect on health. The report also stated that although individuals with pre-existing respiratory and/or cardiovascular disorders are more at risk of acute effects from exposure to particles, there is no evidence that healthy individuals are likely to experience acute effects on health as a result of exposure to concentrations of coarse particles found in ambient air in the UK. Other pollutants or other factors in the environment, for example changes in temperature, can affect health to a greater extent than particles.

Dust (10 - 75µm)

17.2.14 Dust may become suspended and entrained in air and, as such, can disperse from a source. Research commissioned by the Department of the Environment and reported in the Digest of Environmental Pollution Statistics No. 2 1979, has shown that dust particles greater than 30µm (large particles), make up the greatest proportion (approximately 95%) of mineral dust such as those which would be expected to be emitted during earthmoving operations. Particles in this size range have a relatively high mass and settling velocity, and will generally deposit within 100m from the point of release. Particles in the size range of 10-30µm (intermediate particles) therefore make up a minor proportion (*c.*5%) of overall fugitive dust and will fall out of the atmosphere within 500m from the point of release.

17.2.15 Guidance issued by the Institute of Air Quality Management (IAQM) 2014[11], states that the majority of 10-30µm particles are deposited within 350m of source. However, UK Government guidance[15] quotes a figure of 250m. The UK Government Guidance[15] is also referred to in the PAN 50 Guidance. For the purposes of this chapter, 350m will be used as this provides a worst case scenario. Additionally, modelling studies have shown that deposition rates decrease significantly (in an almost logarithmic manner) with increasing distance from the source. Included within the minor proportion of dust (approximately 5%) particle sizes of <10µm, namely PM_{10} and $PM_{2.5}$ are present. However, particulate matter within the dust emissions can be significantly reduced through effective dust mitigation measures at the source. These smaller particles are capable of travelling up to 1km from the source.

17.2.16 The Consented Development comprises numerous small scale construction areas across the Site. These include access routes, turbine areas, substation, compound area, borrow pits and turbine construction and earthworks. For the purposes of this assessment, these specific construction areas will be referred to as construction zones. Outside of these construction zones and for the duration of the wind farm operational life span no dust would be generated.

17.2.17 Particulate matter (PM_{10}) includes the particle size fractions of greatest concern to impact on human health as the particles are small enough to be inhaled and to penetrate the thoracic region of the respiratory system; particles in the range 1 – 2.5µm ($PM_{2.5}$) pose the greatest risk to health as they can penetrate more deeply[12]. The vast majority of mineral dust, such as those generated within the construction zones of the Consented Development (i.e. borrow pits, access routes, substation, compound area and turbine earthworks), are larger than 10µm in diameter and, therefore, increased

levels of dust in the air do not necessarily equate to an increase in levels of $PM_{10,}$ or $PM_{2.5}$ or cause harm to human health.

17.2.18 Research[13] suggests that of the small proportion of mineral dust emissions from construction sites (which are comparable to those from quarry sites in their size and composition) which are in the range 1-10µm; only 10% to 15% (by weight) are in the $PM_{2.5}$ fraction. However, research has shown that the deposition efficiency of those respirable dust particles does not directly correlate with size. It is mainly the very fine particulates (between 1.0 and 0.5µm) which are deposited in the alveoli[14], although many of the particles in this range deposit in the upper airways before reaching the alveoli[15]. Other particles are more efficiently deposited in higher regions of the respiratory tract and get trapped in a layer of mucus.

17.2.19 The potential impact on the local community of large and intermediate dust particles dispersing from the construction works and borrow pit activities has the potential to cause annoyance or nuisance. The amount of dust which may cause complaint or nuisance in a particular circumstance is difficult to determine accurately as, in part, it depends upon the perceptions of individual residents or households; and there are no statutory limits such as those applicable to suspended particulates or gaseous pollutants. UK Government guidance issued in 1991 as to the determination of nuisance from fugitive dust[16] identified that complaints are likely when the rate of dust deposition is 2 to 3 times the normal background level of dust deposition in the area. However in 1995, further UK Government guidance[17] suggested that there is little consensus about possible nuisance dust levels, and there is little basis for applying any of the published guidelines as a definitive absolute dust nuisance standard for the UK. The 1995 guidance did advise that severe or continual concerns about dust are most likely to be experienced near to significant dust sources, generally within 100m.

17.2.20 The main source of dust from the Consented Development would be generated during working of the borrow pits, due to material extraction and processing. It should be noted that all borrow pits are located at least 700m from the nearest residential receptor. The borrow pits will be worked in sequence from west to east to provide aggregates for the onsite construction activities. No materials would be removed from the Site and the borrow pits will be worked on a campaign basis. Guidance and research for quarries[15 & 16] states that dust will naturally deposit within 250m to 500m of the source and that effective dust mitigation measures are sufficient to control dust emissions. Therefore, given that borrow pit activities are small scale quarry operations it can be assumed that the dust generated from the borrow pits will have naturally deposited out of the wind column before reaching any of the nearby residential receptors.

17.3 Methodology

17.3.1 The proposed methodology for the air quality assessment was submitted to SIC via email on 8th September 2015. No formal reply has been received, however the methodology conformed to responses received at Scoping stage. The following Guidance and methodology has been used in this assessment:

- The Institute of Air Quality Management (IAQM) Guidance; 'Guidance on the assessment of dust from demolition and construction' 2014, will be used to assess dust and air quality impacts in relation to construction activities (earthworks, construction and trackout).
- Borrow pit activities will be assessed using the criteria and guidance contained within both the IAQM 2014 Guidance and the Scotland Planning Advice Note PAN 50 'Controlling Environmental Effects of Surface Mineral Workings'.

- The decommissioning of the Consented Development will involve construction operations that are similar to the initial build, but at a reduced scale i.e. decommissioning of the turbines in sections and earthwork activities to restore the land to its former use. Dust control during the decommissioning phase will be undertaken in accordance with the Dust Management Plan.
- Construction areas of the Consented Development (i.e. borrow pit, turbines, access routes, substation and compound area) are the only areas capable of generating dust during the construction phase. Outside of these specific areas, no dust would be generated as no construction activities would occur. For the purposes of this Air Quality Chapter, area of working have been defined as Construction Zones and include a 100m buffer around the area of working.

17.3.2 Various construction activities would be undertaken in and around each type of construction area (e.g. turbines, borrow pits, access routes) therefore it is necessary to define these working areas as much of the Site will not be subject to construction activities. Working areas where dust could be generated have been termed 'construction zones'. At the construction zones, works would occur in and around the area being developed; for example, vehicle movements for crane deployment. Therefore, to provide a worst case scenario and to include all possible sources of dust generation around the immediate development area, a 100m buffer zone around each of the construction zones has been applied. Outside of these construction zones there would be no sources of dust generation.

Construction phase assessment – dust emissions

17.3.3 The PAN 50 Guidance document notes a distance of 1km for particulate matter transportation. Therefore, sensitive receptors were selected to a distance of 1km. However, in light of specific dust guidance, the IAQM 'Guidance on the assessment of dust from demolition and construction' 2014 will be used to assess the likely impact of earthworks, construction and trackout activities for the turbine construction, access tracks, borrow pits, substation and compound.

17.3.4 Pan 50 states that the assessment should: Establish baseline conditions; identify dust generating site activities; identify site parameters which could increase dust impacts and recommend dust mitigation measures. This approach is the same used in IAQM Guidance.

Step 1

17.3.5 Step 1 of the assessment is to screen the requirement for a more detailed assessment of dust and particulate matter. The IAQM Guidance states a detailed dust assessment is required if there are sensitive receptors (human) within 350m of a dust source, 50m of an ecological designation or within 50m of a 500m length of the route to be used by construction traffic.

17.3.6 There are no sensitive receptors (residential or ecological) which could be affected by dust within 350m (or 50m for ecology) of a construction zone however, countryside and recreational users and residential receptors may be susceptible to particulate matter emissions up to 100m and 1km respectively, therefore an assessment for particulate matter is required.

17.3.7 It is important to note that particulate matter forms only a small proportion of the dust content. In general therefore, by controlling dust generation at the source, the particulate matter generated and available for transport would be limited. It is also important to understand that, in assessment terms, dust impacts to an already soiled surface are negligible.

17.3.8 Public Rights of Way (PRoW) users are exposed to particulate matter emissions for a much shorter time period given their transient nature and short term exposure to the particulate matter emissions. Therefore, PRoW users are assessed within the first 100m from the dust source only, as this represents the area of worst exposure, thereby providing a worst case scenario.

Step 2

17.3.9 Step 2 of the assessment determines the potential risk of dust arising in sufficient quantities to cause annoyance, or health impacts and/or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc.);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

17.3.10 The risk of dust effects is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon two factors:

- Step 2A – the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large; and
- Step 2B – the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity.

17.3.11 These two factors are then assessed (Step 2C) to determine the risk of dust impacts with no mitigation applied.

17.3.12 The risk of dust effects is determined for three types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The three types of activities to be considered are:

- Earthworks;
- Construction; and
- Trackout.

Step 3

17.3.13 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the IAQM[11] and the PAN 50[2] Guidance documents. Site specific mitigation measures have been outlined in subsection “Mitigation Measures” of this Chapter.

Step 4

17.3.14 Step 4 assesses the residual effect to determine whether dust could still be significant with mitigation measures in place.

Sensitive receptors

17.3.15 Residential receptors within 1km of the Application Boundary have been assessed.

17.3.16 The air quality impacts to countryside users have also been assessed. As previously stated, recreational users are exposed to potential dust emissions for much shorter periods of time (transient receptors) and are considered less sensitive than residential receptors, which are typically static. Therefore, only walking, cycling and recreational routes which may affect countryside and recreational users within 100m of a dust generating activity will be assessed as this distance represents the worst case dust deposition, which by theory would also contain the most particulate matter content.

17.3.17 Three recreational routes are within 100m of the Consented Development construction zones:

- B9081 Cycle Route: Access track, Borrow Pit 1, Borrow Pit 4
- Catalina Memorial Walk: Access track
- Ward Of Otterswick Walk: Access track, Turbine 3, Turbine 6

17.3.18 Within 100m of the access track, within the western extent of the Consented Development, the Catalina Memorial Walk and the Ward of Otterswick Walk follow the same route through the Consented Development, before they diverge into their own separate footpaths (Figure 6.3). Additionally, the Catalina Memorial Walk and Ward of Otterswick Walk are only briefly within 100m of the access track within the western extent of the Consented Development. Therefore, for the purposes of this assessment the Ward of Otterswick Walk will be assessed as this represents a worst case exposure.

17.3.19 The Ward of Otterswick Walk is noted to travel in close proximity to Turbines 3 and 6. The footpath will pass around the turbine construction zone.

17.3.20 The Scottish Outdoor Access Code grants statutory access rights (non-motorised) to Scotland's outdoor areas. Given the general free movement this imparts it is impossible to define and assess the dust impact beyond the assessment areas already identified (i.e. particular routes and receptors proximal to construction zones).

17.3.21 Two ecological designations (Site of Special Scientific Interest (Otterswick) and a Special Protection Area (Otterswick and Graveland)) are present in the north-west section of the Site. The two designations are approximately 260m from Turbine 1 and 160m from the turbine buffer zone. In accordance with the IAQM Guidance 50m criteria for a detailed assessment, ecology does not need to be assessed further.

17.3.22 The dust sensitive receptors are detailed in Table 17.2 and shown on Figure 17.1.

Table 17.2: Dust sensitive receptors and closest distances to proposed operational stages and site boundary

Receptor	*Closest distance from turbine construction zone (m) (including 100m buffer zone)*	*Turbine (closest to receptor)*	*Closest distance from borrow pit (m) (including 100m buffer zone)*	*Closest distance from site boundary (m)*
ESR 1	811	9	1,103	752
ESR 2	789	16	1,152	224
ESR 3	1,995	11	733	82
Cycle Route	Adjacent	10, 13	Adjacent	Within
Ward of Otterswick Walk	10	3 & 6	93	Within

17.3.23 All residential receptors are located at least 700m from a significant source of dust and given the dust transportation criteria established by the IAQM Guidance (350m) an assessment of dust soiling is not required. Dust would not be capable of transporting to any of the nearest sensitive receptors and no dust soiling impacts would be generated. Therefore, only a particulate matter impact assessment is required.

17.4 Assessment of significance

Sensitivity of the area for human receptors

17.4.1 Based upon the category of receptor sensitivity, the sensitivity of the area to the health effects of PM_{10} is determined using the criteria detailed in Table 17.3.

Table 17.3: Sensitivity of the area to human health impacts

Receptor sensitivity	*Annual mean PM_{10} concentration*	*Number of receptors*	*Distance from source (m)*				
			<20m	*<50m*	*<100m*	*<200m*	*<350m*
High	>18µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	16-18µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low

Table 17.3: Sensitivity of the area to human health impacts

Receptor sensitivity	*Annual mean PM_{10} concentration*	*Number of receptors*	*Distance from source (m)*				
			<20m	*<50m*	*<100m*	*<200m*	*<350m*
	14-16µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<14µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium		>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
Low		>1	Low	Low	Low	Low	Low

17.5 Risk of dust impacts

17.5.1 During the decommissioning phase of the Consented Development, some minor demolition activities will be required. Demolition will be required to remove the concrete turbine foundations from the ground, to 1m below ground level as well as demolishing the sub-station control building. All other activities involved in the decommissioning phase would be comparable to earthwork and construction type activities.

Table 17.4: Risk of dust impacts – demolition

Sensitivity of area	*Dust emission magnitude*		
	Large	*Medium*	*Small*
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

17.5.2 The risk of dust being generated by earthworks and construction activities at the site has been determined using the criteria in Table 17.5.

Table 17.5: Risk of dust impacts – earthworks and construction

Sensitivity of area	***Dust emission magnitude***		
	Large	***Medium***	***Small***
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

17.5.3 The risk of dust being generated by trackout from the Site is determined using the criteria in Table 17.6.

Table 17.6: Risk of dust impacts - trackout

Sensitivity of area	***Dust emission magnitude***		
	Large	***Medium***	***Small***
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Medium	Low	Negligible

17.6 Baseline

17.6.1 There is a limited number of existing dust and particulate matter sources in the vicinity of the Site:

- Road traffic – exhaust particles and emissions from the road surfaces;
- Long range transport;
- Sea spray; and
- Domestic fuel burning.

17.6.2 Regionally transported dust and particulates would be limited given the low background concentrations of the Shetland Isles and the surrounding seas.

17.6.3 The effect of transported dust is principally its potential to cause annoyance or nuisance. For instance dust depositing on houses or vehicles. The Particulate matter content of dust is very low (approximately <5%) therefore, dust mitigation measures at the source can limit the amount of dust being generated, and by association any particulate matter of that dust.

17.6.4 SIC does not undertake air pollution monitoring in the vicinity of the Site. Therefore, baseline PM_{10} and $PM_{2.5}$ concentrations for the site (modelled) have been obtained from default concentration maps, on

the LAQM internet support pages provided by Defra and the devolved administrations[18] (See Table 17.7).

Table 17.7: Background concentrations of particulate matter (µg/m^3) as an annual mean for 2015

Existing sensitive receptor	*Grid square (x, y)*	*PM_{10}*	*$PM_{2.5}$*
ESR 1	452500, 1183500	13.44	7.15
ESR 2	451500, 1180500	13.45	7.16
ESR 3	449500, 1180500	13.46	7.18

17.6.5 Modelled (predicted) levels of PM_{10} show annual mean daily PM_{10} concentrations for 2015 at each of the existing sensitive receptors is between 13.44 and 13.46 µg/m^3, well below the Annual Air Quality Objective of 18µg/m^3.

17.6.6 Modelled (predicted) levels of $PM_{2.5}$ show annual mean daily $PM_{2.5}$ concentrations for 2015 at each of the existing sensitive receptors is between 7.15 and 7.18 µg/m^3, well below the Annual Air Quality Objective of 12µg/m^3.

17.6.7 Respirable fine particulates (PM_{10} and $PM_{2.5}$) includes the size fractions of greatest concern to human health. The majority of mineral dust are larger than 10µm in diameter and increased levels of dust in the air do not necessarily equate to an increase in levels of PM_{10}. In general, construction dust rarely represents an adverse risk to human health and are more typically associated with the consequences of dust soiling i.e. within 350m of a dust source. Dust mitigation measures will ensure dust will be contained at the source, which by association, will limit the availability of fine particulates to transport to nearby receptors.

Meteorology and topography

17.6.8 Predominantly, the transportation of dust occurs in periods of dry and/or windy conditions when dust is windswept from dusty surfaces or is strong enough to aid erosion of an exposed surface. The wind speeds and their potential to transport dust are detailed below.

17.6.9 Wind Speed:

- <6.0m/s – movement of dust raised by site activity;
- 6.0 - 17.0m/s – some erosion of dust by wind; and
- >17.0m/s – potentially significant erosion of dust by wind.

17.6.10 The Shetland Islands are, on average, one of the windiest locations in the UK as the islands are fully exposed to the Atlantic Ocean. The prevailing winds for northwest Scotland are from the southwest[19] with an average mean wind speed of 20 to 25 knots (10 to 12m/s)[20], as recorded from the Beltasound Met Office Station (closest Met Office station to Yell). The historic wind speeds recorded at the Beltasound Met Station would be capable of wind whipping an exposed surface and allowing dust and fine particulates to become entrained in a moving air flow.

17.6.11 With a south westerly predominant wind direction, Gossabrough would be located downwind of the Site. However, due to locations of the construction zones across the Site, residents of Gossabrough would only be capable of receiving fine particulates from the construction of Turbines 1 to 7 and Borrow Pit 4. All other construction zones, in south westerly winds, would transport dust and fine particulates away from Gossabrough to open countryside or the North Sea.

17.6.12 Dust mitigation measures will ensure that dust is contained at the source which will ensure that no dust and fine particulates could be transported by the local winds toward a sensitive receptor.

17.6.13 Additionally, the elevation of the Site reduces from 110m at Turbine 4 in the west, to 69m AOD at Turbine 9 in the east. Therefore, the majority of the construction zones are located on the lee side of the local topography (Figure 17.1); which may reduce and inhibit wind speeds, which by effect would reduce the potential for dust and particulate matter to be wind whipped and transported.

17.6.14 The Shetland Islands also experience some of the highest rainfall rates in the United Kingdom[22]. Therefore, as rainfall is frequent, the potential for the soils to dry out over long periods is low. Rainfall is a natural suppressant which will limit loose dust being picked up and transported by the wind.

17.6.15 Meteorological patterns on Yell have the potential to limit dust transportation. Given the rainfall, predominant wind direction and varied topography of the area, it is predicted that the environmental conditions will limit dust and fine particulate transportation.

17.7 Assessment of impacts

17.7.1 Air Quality and dust impacts would only be generated during the 24 month construction phase of the Consented Development. No construction activities, which could generate dust, will occur outside of the construction zones. Construction activities may consist of earthworks, building construction, aggregate extraction, transport within the Site, processing, loading and unloading and turbine construction. No materials or aggregate would be removed from the Site.

Access routes

17.7.2 The access route will be constructed from the site access in the west, in an easterly direction to the compound area in the centre of the Consented Development. The access route will split and veer toward each of the turbine locations and borrow pits; connecting them to the main access route. 11.1km of access tracks will be constructed and they will be maintained for the duration of the Consented Development.

17.7.3 The access route will be hard packed with an unconsolidated surface and will be constructed using aggregate won from the borrow pits within the Site. For further detailed information in relation to the construction of the access routes, refer to Chapter 3: Project Description. Dust may be generated during the initial construction of the roads but will be confined to the specific areas where construction is occurring. The separation distance between the access route and sensitive residential receptors will ensure that all dust generated from the road construction, or use of the route, will naturally deposit before reaching the receptor locations.

17.7.4 Aggregate for the construction of the access route will be sourced from the onsite borrow pits, reducing vehicle transportation distances. The predicted dust impact from constructing the access routes will be minimal due to the small footprint of the route. Additionally, construction of the route will primarily involve

earthwork activities across peat and soils which will naturally be moist due to the location of the Consented Development; limiting the amount of dust which could be generated.

17.7.5 Dust could be generated as HGV's travel over the aggregate surface. It should be noted that due to the cargo and road surface, the vehicles will be travelling at reduced speeds. The access track will cross the B9081 and may come within 100m of a transient user of the cycle route. Any vehicles using the route would quickly move along the route and exceed a 100m separation distance to the countryside user. Therefore, dust and fine particulate impacts to the countryside user would be minimal.

17.7.6 The Ward of Otterswick Walk briefly follows the route of the access track in the centre of the Consented Development before it diverts away and to the north. The countryside user along this track would only be exposed to the dust emissions when a vehicle passes at the same time as the pedestrian. Mitigation measures will include safety signs to warn drivers to take care when passing walkers on the access track.

17.7.7 Dust mitigation measures will be adopted for the access route to ensure that dust is not generated in sufficient quantities which could be transported to cause adverse impacts to nearby sensitive receptors.

Turbine construction

17.7.8 The construction of the turbine foundations will be dependent on the site-specific ground conditions at each location within the Site. Each turbine foundation will comprise a reinforced concrete base of approximately 18-22m diameter and approximately 2.0-2.5m deep (depending on the ground conditions) with a reinforced concrete central column up to 1m in length extending from the foundation base to the ground surface. The turbine tower would attach to the top of this central column. In addition to turbine foundations, a hardstanding area for the crane is required adjacent to the turbine foundations and this will remain in place until the decommissioning has been completed.

17.7.9 The Ward of Otterswick Walk briefly passes Turbines 3 and 6. Suitable mitigation measures at the turbine construction zone will ensure that any generated dusts will be minimal.

17.7.10 The main sources of dust will be from earthwork type activities during the excavation required to form the foundation bases and crane pads. It is anticipated that due to the site-specific conditions, some turbines may require more extensive earthworks i.e., cut and fill. Vehicle movements around the turbine vicinity may also create some dust.

17.7.11 Decommissioning of the turbines will occur after operation. This will involve careful deconstruction of the turbines and restoring the base of the turbine back to its former use. To dismantle the turbine careful deconstruction will occur however, to remove the turbine foundation some short term demolition activities will be required. Demolition activities would be short term and confined to the area within the turbine construction area. No residential receptors are located within 350m of the turbine construction zone.

17.7.12 Dust mitigation measures will reduce dust being generated at the source and by association the available particulate matter which could be transported.

Borrow pits

17.7.13 Of all the construction activities to be undertaken during the Consented Development, mineral extraction within the borrow pits represents the greatest dust generation potential. The mechanical action of

breaking up the aggregates may create dust if appropriate mitigation is not adopted. The aggregates won from the borrow pits will be used for the construction activities within each of the construction zones. No aggregate will be sourced from offsite and therefore, traffic movements away from the Site are reduced. Plans and cross-sections of the borrow pit designs are presented in Figures 3.16 to 3.19.

17.7.14 The borrow pits will be located adjacent to the access routes, as an aggregate source for the access route construction and future ease of movement. As the Consented Development progresses, the borrow pits will be worked across the Site east to west.

17.7.15 The main potential sources of dust from working of the borrow pits, as detailed in the Department of the Environment report (DoE, 1995)[17] include:

- Surface stripping and the handling of soils;
- Mechanical handling operations, including crushing and grading processes;
- Haulage of material, both on the site, and to and from the site; and
- Storage of material including stockpiles.

17.7.16 PAN 50 notes that the largest particles (>10µm) will natural deposit within 300-500m while particles (<10µm) may travel up to 1km. It should be noted that no residential receptor is within 500m of a borrow pit. The particulate matter content of dust makes up a very small proportion of its overall content. With effective dust mitigation, the sum available for transport would be minimal as dusts would be contained at the source.

17.7.17 The following borrow pit activities will take place on the Site and may be susceptible to creating dust:

- Removal of peat;
- Construction of drainage and lagoons within the pit, although it should be noted that lagoon water may be used for dust suppressant purposes but at all times there will be available water for good practice dust suppression on the access routes and other construction activities;
- Drilling of the rock face to create stability and weaken the rock for extraction;
- Blasting of the faces and transport of the material by HGV;
- Crusher and screening of aggregate;
- Transport from the borrow pits to the construction zones; and
- Restoration of the pit, once mineral extraction has ceased.

17.7.18 All material will be stored around or within the borrow pits. Soils will be mounded and kept within the site for future restoration and will additionally be used for restoring the local land quality.

17.7.19 PAN 50 states that for dust control the following activities should be conducted:

- Minimise creation of dust by planning and design;
- Control the escape of dust;
- Minimise dust pick-up by wind; and
- Remove dust from the atmosphere.

17.7.20 PAN 50 also states that if the dust measures are not sufficiently controlling dust generation, site operations should be suspended until the measures are working or external parameters reduce e.g. high wind speeds or it rains.

17.7.21 Specific dust mitigation measures for working of the borrow pits will be written and implemented before any operations begin.

Temporary compound area

17.7.22 The compound area will be located within the centre of the Consented Development, east of turbine 14. The compound area will provide refuelling areas and storage for fuels. In addition, the compound area will provide a canteen and toilet facilities for the onsite employees. Dust would only be generated during the preparation of the surface i.e. earthworks. Dust created during the construction of the facilities and during the operation of the compound area will be minimal.

17.7.23 The compound area occupies a very small footprint and is located 1.2km from the nearest existing sensitive receptor (ESR 3). The resulting dust and air quality impacts would be negligible.

Substation

17.7.24 The substation is located to the southeast of Turbine 14 and adjacent to the access route. During the construction phase of the substation, dust could be created during the site preparation (earthworks) and construction of the infrastructure. The substation occupies a small footprint and any earthwork operations would be minimal. The substation is located approximately 1.3km from the nearest residential receptor (ESR 3). Therefore, the resulting dust and air quality impacts as a result of the substation being constructed would be negligible. Additionally, the demolition of the sub-station control building during the decommissioning phase would result in very minor dust impacts.

Construction phase assessment – Dust emissions

17.7.25 The main activities involved with the construction phase of works (in addition to activity specific examples given above) are as follows:

17.7.26 Demolition will involve the removal the concrete turbine foundations to 1m below ground level as well as removing the sub-station control building. This may generate some minor adverse dust effects in the local area.

17.7.27 Earthworks which may be required prior to the construction phase of works. The following examples of earthworks would be used across all activities within the Consented Development.

- Clearing the footprint of the borrow pits;
- Stripping and stockpiling of topsoil and subsoil;
- Ground excavation;
- Bringing in, tipping and spreading materials on site;
- Stockpiling materials;
- Levelling ground;
- Trenching;

- Road construction;
- Vehicle movements on site roads; and
- Windblown materials from the site.

17.7.28 Construction which will involve the construction of individual access roads, compound area, substation, borrow pit infrastructure and the turbines.

17.7.29 The decommissioning will comprise co-ordinated dismantling of the turbines and restoring the land back to its former use i.e. earthworks for the access routes and borrow pits. Therefore, the construction phase impact assessment and subsequent dust mitigation measures will be used in the future decommissioning phase.

17.7.30 Trackout which is the transport of dust and dirt to the public highway network via trailing or depositing mud and dirt from the construction zones. There will be few movements between the site access route and the public highway network as most materials will be sourced from within the Site i.e. aggregates. Only employee movements from the Site to the public highway network are expected to create any trackout impacts. Therefore, trackout impacts are expected to result in minor to negligible impacts as the majority of dirt and mud would be contained on the Site access route.

Step 2A

17.7.31 Step 2A of the construction phase dust assessment has defined the potential dust emission magnitude from earthworks, construction activities and trackout in the absence of site specific mitigation.

17.7.32 Examples of the criteria for the dust emission classes are detailed in the IAQM guidance.

Step 2B

17.7.33 Step 2B of the construction phase dust assessment has defined the sensitivity of the area, taking into account the significance criteria detailed in the IAQM Guidance. The sensitivity of the area for each activity is assessed for potential human health effects. Dust soiling effects on the local designated access routes will not destroy the nature of their use and the impact of dust soiling on footpaths and cycle routes is negligible.

17.7.34 Earthwork and construction activities will be undertaken within each construction zone (i.e. borrow pit, access route, turbines, compound area and substation).

17.7.35 No residential receptor within the vicinity of the development site is capable of receiving dust soiling effects due to the distances of separation (greater than 700m) between the construction zones and sensitive receptor as dust will naturally deposit within 350m of the source. Particulate matter naturally deposits out of the wind column with increasing distance from the source and is interlinked with the amount of dust available and generated i.e. if dust is limited at the source there will be less available particulate matter. Fine particulates are known to travel up to 1km but given the distances of separation, the majority of the particulate matter will have deposited out of the wind column before reaching the residential receptor locations.

17.7.36 For trackout, only countryside and recreational users, using the footpaths and cycle routes would be affected as they are within 100m of the Site access route.

Step 2C

17.7.37 Step 2C of the construction phase dust assessment has defined the risk of impacts from each activity. The dust emission magnitude is combined with the sensitivity of the surrounding area.

17.7.38 It should be noted that no dust would be created after the 24 month construction phase.

17.7.39 The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in Table 17.3 to Table 17.6.

Summary

17.7.40 Table 17.8 details the results of Step 2 of the construction phase assessment for human receptors.

Table 17.8: Construction phase dust assessment (Step 2) – Human Receptors

	Activity			
	Demolition	***Earthworks***	***Construction***	***Trackout***
Step 2A				
Dust Emission magnitude	Small[a]	Large[b]	Large[c]	Medium[d]
Step 2B				
Sensitivity of closest receptors	Low	Low	Low	Low
Sensitivity of countryside users	Low	Low	Low	Low
Sensitivity of area to human health effects	Low[e]	Low[e]	Low[e]	Low[e]
Step 2C				
Human health risk (transient countryside users):	Negligible	Low	Low	Low
Human health risk (long term residential):	Negligible	Low	Low	Low

Notes:

a. Total demolition volume estimated to be less than 20,000m^3 and demolition would occur at ground level.

b. Total site area of more than 10,000m^2

c. Total building volume estimated to be more than 100,000m^3

d. Estimation of the dust emission class based on the size of the development site (large), estimated HGV movements per day (<100 HGVs per day) and unpaved road length of >100m in isolated areas.

e. Background annual mean PM_{10} concentration is considered to be between 13.44 and 13.46 µg/m^3 (taken from the LAQM Defra default concentration maps, for the appropriate grid squares, for 2015).

17.7.41 This assessment has found that the human health impact associated with the construction phase is low for residential receptors and countryside users of the PRoW (without mitigation). Therefore, the predicted impact to residential receptors experiencing adverse health risks from fine particulates will be negligible at a distance of 1km with mitigation.

17.7.42 Transient receptors would not be within the area of effects (i.e., within 100m of the dust source) for extended periods of time. Therefore, as a transient user would be unlikely to be exposed for the duration of the Air Quality Objectives (24 hour) and the dust mitigation measures will ensure dust and by association particulate matter will be limited. The risk of exceeding the Air Quality Objectives would be low and a transient user would experience negligible adverse environmental effects.

17.8 Mitigation measures

Step 3

17.8.1 Step 2C of the construction phase assessment has identified that:

- The risk of human health effects to transient countryside users is classed as low for earthworks, construction activities and trackout; and
- The risk of human health effects on long term residential receptors is classed as low for earthworks, construction activities and trackout.

17.8.2 These risks assume that no mitigation measures are applied, except those required by legislation. Site specific mitigation measures do not need to be recommended if the risk category is negligible. Demolition activities would be classed as negligible. Therefore, no specific mitigation would be required for demolition except the standard mitigation measures outlined below as best practice.

17.8.3 As the risk category for these activities are not 'negligible', site specific mitigation measures will need to be implemented to ensure that dust effects will not be significant. Dust mitigation is required only for the 24 month construction phase. No dust or air quality impacts would be created during the 25 year operational life span of the wind farm.

17.8.4 A best practice Dust Management Plan (DMP) will be written and implemented, by the appointed Contractor for the Consented Development. The DMP will outline dust mitigation measures for each of the construction activities (i.e., borrow pits, turbines, substation, compound area and access route). The DMP will be implemented into the Construction Environmental Management Plan (CEMP), (an outline version of which is contained with Appendix 3.6).

17.8.5 Mitigation measures which can be used across all five construction activities have been selected from the PAN 50[2] and the IAQM[11] Guidance documents. Dust mitigation may include, but is not limited to:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Develop and implement a dust management plan, or equivalent document, that includes measures to control, reduce and limit dust generation;
- Record any exceptional incidents that cause dust and/or air emissions, either on- of off-site, and the measures taken to reduce said incidents;

- Remove materials that have potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on site cover appropriately, for example screening, barriers or tarp;
- Impose and signpost a maximum-speed-limit of 25mph on surfaced roads and 20mph on the Site access roads;
- During the construction phase- ensure all vehicles switch off engines when stationary to avoid unnecessary air pollution emissions;
- Avoid bonfires and burning of waste materials during the construction, operation and decommissioning phases;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Compact, grade, surface and maintain haul roads;
- Spray exposed surfaces; and
- Where applicable, a rumble grid or wheel wash facility should be installed on the Site access route, near the exit point to the public highway network. This will ensure no mud or dirt is tracked onto the public highway network.

17.8.6 Specific mitigation measures for borrow pit operations:

- A maximum speed limit of 15 mph within the borrow pit;
- Layout and construct stockpiles, tips and mounds to minimise dust creation; use gentle slopes and avoid sharp changes of shape;
- Minimise the height of all material and locate mounds away from open ground to avoid wind whipping;
- Daily visual inspections of the borrow pit currently being worked to ensure dust is being controlled and minimised;
- Protect surfaces from wind until disturbed surfaces are sealed and stable;
- Protect exposed material from wind i.e., site design (keep material within voids or protect using natural topography);
- Use dust extraction equipment on all applicable equipment;
- Drop material in a downwind orientation (so the bucket acts as a wind buffer);
- Monitor and visually check borrow pit roads to ensure the roads are graded to the access route standard. If dust emissions are being created, use water sprays to contain the borrow pit road dust;
- Sheet or cover loaded vehicles to ensure no wind whipping of material during transport to the construction zones; and
- Avoid trackout onto the public highways.

17.8.7 It is recognised that the final design solutions will be developed with the input of the Principal Contractor to maximise construction efficiencies and should have regard to standard best practice mitigation

measures, to use modern construction techniques and sustainable materials, and to incorporate the particular skills and experience offered by the successful contractor.

17.8.8 Dust is controlled through good practice dust mitigation which sufficiently reduces dust being generated at the source and limits its availability for transport. Particulate matter contents of dust (approximately 5%) are very low and separate from the transported dust to travel up to 1km. By establishing good practice dust mitigation at the source, dust generation and particulate matter will be significantly limited.

17.8.9 Additionally, the scoping response received from Shetland Islands Council stated that good construction practices should efficiently reduce and control dust emissions during the construction phase.

17.8.10 The DMP will be used in the decommissioning phase and will be updated, as necessary, to incorporate the best practice dust mitigation available at the time of decommissioning.

Significance of effects

17.8.11 With the implementation of the mitigation measures, the likelihood of dust generation impacting on sensitive users is low to negligible and results in no significant environmental effects.

17.8.12 Due to the separation distances between the construction zones and sensitive receptors there would be no adverse environmental effects due to dust soiling. Dust will naturally deposit within 350m of the dust source and no residential receptor is located within 350m of a construction zone which could generate significant levels of dust.

17.8.13 Countryside users and recreational users using the B9081 cycle route, and the Ward of Otterswick Walk will experience a low to negligible risk from fine particulates from the construction zones. As the Ward of Otterswick Walk represents a worst case exposure, and the Catalina Walk shares the same footpath route briefly, within the western extent of the Consented Development, it can be assumed that the impact to users of the Catalina Walk will also be low to negligible. A transient user is exposed to dust emissions (which includes fine particulate) for much shorter periods of time and are exposed to durations well below the Annual Mean Objectives for PM_{10} and $PM_{2.5}$. With dust mitigation measures, the likelihood that fine particulate could be generated in sufficient quantity to cause exceedance of the Air Quality Objectives is negligible.

17.8.14 The assessment has taken into account the exposure of individuals walking along the access routes, at the same time as a passing heavy goods vehicle as well as taking into account countryside users passing within close proximity to the turbine construction and borrow pit areas. Given the short term exposure and the likelihood that the user would be exposed to large quantities at dust at the time they are traversing the construction zone it can be concluded that the risk of fine particulates causing exceedance of the Air Quality Objectives for PM_{10} and $PM_{2.5}$ in the vicinity of the Consented Development is low to negligible (without mitigation). With mitigation, the generation of dust will be significantly limited, which by association will reduce the generation of fine particulates.

17.8.15 With mitigation, the impact to recreational users will be negligible and exceedance of the short term or long term Air Quality Objectives is not predicted to occur.

17.8.16 The site specific Dust Management Plan will significantly reduce the potential for dust to be generated at the source locations, which will limit the dust available for transport and thereby reducing and limiting any dust impacts.

17.8.17 Fine particulates can travel up to 1km from the dust source. All residential receptors (Figure 17.1) are located at least 700m from a significant dust source i.e., borrow pit. ESR 3 is located 400m, at the closest point, to the access track however, given the short time period to construct this section of the route the dust impacts would be negligible. Additionally, ESR 3 is also located in an upwind location from the access route which further reduces the chance of dust reaching the receptor.

17.8.18 ESR 1 and ESR 2 are located >780m from the nearest construction zone which could generate dust. Given the distance of separation, any dust generated would naturally deposit before reaching the receptor location and the low fine particulate content (of the dust) would also naturally deposit before reaching the receptor location. At the separation distance, the human health impacts of the fine particulates would be low. Dust mitigation measures will reduce the potential for dust to be generated, which by association will also reduce the availability of particulate matter.

17.8.19 Exceedance of the Air Quality Objectives would not occur at the Consented Development or at any sensitive receptor locations.

17.9 Cumulative impacts

17.9.1 There are no other developments proposed to be built in the vicinity of the Application Boundary. Therefore, there will be no cumulative air quality or dust impacts during the construction span of the development. During the operational lifespan of the wind farm, there would be no adverse air quality or dust impacts.

17.9.2 The working of multiple construction zones within the Site has the potential to create a cumulative impact. However, every Consented Development construction zone is located at least 700m from a long term residential receptor and any cumulative dust impacts will naturally deposit before reaching the receptor location. Any cumulative impact would be dependent on the local meteorological conditions at the time and due to the locations of each of the activities, the potential for any cumulative effects would be low.

17.10 Residual effects

Step 4

17.10.1 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from earthworks, construction and trackout associated with the Consented Development.

17.10.2 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for dust and particulate matter to be generated and there will be no residual impacts associated with the Consented Development.

17.11 Monitoring

17.11.1 No monitoring is required.

17.12 Summary and conclusions

17.12.1 The construction phase dust assessment has been undertaken with the guidance and criteria's contained within the IAQM 2014 Guidance[11] and PAN 50 of the Scottish Planning Policy[2].

17.12.2 Construction activities are contained within 'construction zones' i.e. areas of operation and their 100m buffer zones; outside of these areas no construction activities, which could generate dust, would occur. The IAQM Guidance criteria, with the addition of a 1km assessment criteria for particulate matter, was undertaken for demolition, earthwork, construction and trackout activities i.e. turbines, substation and access routes.

17.12.3 Existing residential receptors within the vicinity of the Consented Development would not be capable of receiving dust soiling effects due to the distance of separation and the natural dust deposition transport range of 350m[11].

17.12.4 The construction phase assessment has identified the predicted particulate matter impacts to nearby sensitive receptors. There will be no dust impacts to any of the sensitive receptors. The predicted human health impacts are low for earthworks, construction and trackout for residential receptors and transient countryside users (without mitigation measures). With site specific dust mitigation measures dust can be contained at the source and any particulate matter, which is a by-product of the dust, would be negligible.

17.12.5 Transient users may pass within close proximity to the turbine construction areas in addition to following the access tracks for variable distances. However, transient users are exposed to dust and fine particulate emissions for much shorter periods of time. Background concentrations in the vicinity of the Consented Development are well below the Air Quality Objectives and exceedance of fine particulate, due to dust generation from the construction activities would be unlikely. With mitigation measures, the dust generated during the construction phase can be significantly reduced which will by association reduce the generation of fine particulates. Additionally, it should be noted that fine particulates make up only a very small proportion of dust. The predicted impact, with mitigation for countryside and recreational users of the footpaths and cycle routes is negligible, resulting in no significant environmental effects.

17.12.6 The existing residential receptors in the vicinity of the Consented Development are located at least 700m from any dust generating operation. At these separation distances, the dust and particulate matter impacts would be minimal and with mitigation, the resulting impacts to human health and dust would be negligible, resulting in no significant environmental impacts in regards to air quality and dust.

17.12.7 A Dust Management Plan will be written and implemented by the appointed Contractor and will be incorporated into the Construction Environmental Management Plan. The DMP will include dust mitigation measures specific for each operation being undertaken.

17.12.8 Turbine decommissioning and site restoration to its previous use will involve earthwork and construction activities primarily. Turbines would be decommissioned in a controlled manner using cranes with each turbine section being dismantled with care. Some demolition will be required to remove the concrete foundation bases of the turbines to 1m below ground level as well as removing the sub-station control building. The DMP will be used for the decommissioning phase and dust mitigation will be updated, as necessary to reflect the best practice dust mitigation measures at the time of decommissioning.

17.12.9 Standard best practice mitigation measures which must be implemented in the Dust Management Plan have been outlined in “Mitigation measures” section of this Air Quality Chapter. The dust mitigation measures outlined are not exclusive and other measures may need to be adopted dependent on the site specific design, layout or other such post application issues that the appointed Principal Contractor has identified.

17.12.10 The implementation of specific dust mitigation for each of the construction zone operations in line with known best practice techniques, good construction practices and site management will create a negligible impact to existing sensitive receptors In the vicinity of the Consented Development for both dust and fine particulates (PM_{10} and $PM_{2.5)}$, resulting in no significant environmental effects.

[1] Scotland's Third National Planning Framework 3 (NPF3)
[2] The Scottish Office Development Department Planning Advice Note PAN 50 Annex B Controlling the Environmental Effects of Surface Mineral Workings, The Control of Dust at Surface Mineral Workings 1998
[3] Environmental Protection UK and Institute of Air Quality Management Land-Use Planning and Development Control: Planning for Air Quality 2015
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