

## 8. ECOLOGY

### Executive Summary

This chapter provides an assessment of the potential impacts on non-avian ecology resulting from the proposed varied development. The assessment has been prepared with reference to the Guidelines for Ecological Impact Assessment in the United Kingdom published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016). This chapter also provides an assessment of the likely significant effects of the proposed varied development and describes how these differ from the effects assessed for the consented Viking Wind Farm.

Ecology surveys identified that the site is dominated by blanket bog, with smaller areas of acid grassland, dry heath, wet heath, heath and acid grassland mosaics and bare peat. Some peat has been degraded and modified through grazing practices, with other large areas of good quality active bog also present. Ground Water Dependent Terrestrial Ecosystems (GWDTE) were also recorded during National Vegetation Classification (NVC) surveys. The site area extends to approximately 7,040 ha. Approximately 5,727 ha of the site is mapped as blanket bog (or modified bog). The Habitat Management Plan (HMP) (Technical Appendix 8.9)<sup>1</sup> identified approximately 26% (1,500 ha) of the blanket bog has upwards of 20% bare peat within the site, and as such are candidate areas for restoration.

Without application of mitigation, significant effects are predicted on Sandwater SSSI, blanket bog, standing and running water, GWDTE, fish species and freshwater macro-invertebrates associated with the Consented Viking Wind Farm. As the footprint of the proposed varied development remains the same as the consented Viking Wind Farm, the likely significant effects are not considered to differ between the developments.

The Site Environmental Management Plan (SEMP)<sup>2</sup> sets out proposed measures to minimise disturbance to ecological features (Sandwater SSSI, blanket bog, standing and running water, GWDTE, fish species and freshwater macroinvertebrates) throughout the construction period. The outline SEMP is provided in Technical Appendix 2.2 and will be further developed and submitted to the SIC for approval prior to construction commencing.

The HMP provided in Technical Appendix 8.9, Technical Appendix 8.10 sets out proposed measures for habitat restoration and enhancement. Proposed measures include the restoration of 260 ha of degraded peatland habitat and the potential removal of existing barriers to fish movement within the watercourses of the ecological study area.

Following the implementation of the proposed mitigation measures detailed in this chapter, there are no residual significant effects associated with the consented Viking Wind Farm or the proposed varied development on ecological features. As such, there are no differences in the effects between the consented Viking Wind Farm and the proposed varied development.

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<sup>1</sup> submitted to Shetland Islands Council (SIC) as part of the condition discharge procedure for the consented Viking Wind Farm

<sup>2</sup> As required in connection with condition 22 (Annex 2, part 2) of the relevant section 36 consent

## 8.1 Introduction

8.1.1 This chapter considers the likely significant effects resulting from potential impacts associated with the proposed varied development on non-avian ecological features. The specific objectives of the chapter are to:

- describe the ecological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential significant effects, including direct, indirect and cumulative effects, on ecological features associated with the consented Viking Wind Farm;
- describe the potential significant effects, including direct, indirect and cumulative effects, on ecological features associated with the proposed varied development;
- describe the mitigation measures proposed to address potential significant effects;
- assess the significance of residual effects remaining following the implementation of mitigation; and
- provide an assessment of how the likely significant effects of the proposed varied development differ from the effects of the consented Viking Wind Farm.

8.1.2 The assessment has been carried out by Ramboll Environmental and Health UK Limited (Ramboll) in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Ecological Impact Assessment (EclA) guidelines (CIEEM, 2016). All staff contributing to this chapter have undergraduate and/or postgraduate degrees in relevant subjects, have extensive professional EclA experience, and hold professional membership of the CIEEM.

8.1.3 This chapter is supported by:

- Technical Appendix 8.1: Phase 1 Habitat Survey;
- Technical Appendix 8.2: NVC Survey;
- Technical Appendix 8.3: Groundwater Dependent Terrestrial Ecosystems;
- Technical Appendix 8.4: Rare Plants Survey;
- Technical Appendix 8.5: Confidential;
- Technical Appendix 8.6: Confidential;
- Technical Appendix 8.7: Fish Survey;
- Technical Appendix 8.8: Freshwater Invertebrate Survey;
- Technical Appendix 8.9: Habitat Management Plan; and
- Technical Appendix 8.10: Habitat Management Plan Figures.

8.1.4 Figures 8.1 – 8.4 are referenced in the text, where relevant.

8.1.5 Effects on avian ecology are addressed separately in Chapter 5: Ornithology.

## 8.2 Assessment Methodology and Significance Criteria

### *Scope of the Assessment*

8.2.1 The proposed varied development would result in an increase in turbine height and rotor diameter in comparison to the consented Viking Wind Farm. The footprint of the proposed varied development has not changed in comparison to the consented Viking Wind Farm.

8.2.2 This chapter considers the potential impacts on the following ecological features:

- designated nature conservation sites;
- habitats, such as peatlands and GWDTE, from habitat loss and fragmentation;

- protected mammals (otter *Lutra lutra*);
- freshwater pearl mussel *Margaritifera margaritifera*;
- fish (Atlantic salmon *Salmo salar*, brown trout *S. trutta*, three-spined stickleback *Gasterosteus aculeatus*, flounder *Platichthys flesus* and European eel *Anguilla anguilla*);
- amphibians (common frog *Rana temporaria* and common toad *Bufo bufo*); and
- non-native invasive species (rhododendron *Rhododendron ponticum*, Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica*).

8.2.3 The assessment is based on the description of the proposed varied development provided in Chapter 2: Description of Development of this EIA Report. The assessment has been prepared with reference to the Guidelines for Ecological Impact Assessment in the United Kingdom published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016).

8.2.4 The following policy and legal framework has been taken into account in carrying out the assessment:

- EC Directive on the Conservation of Natural Habitats and Wild Flora and Fauna, 92/43/EEC (EU, 1992) (as amended);
- Wildlife and Countryside Act 1981, (as amended);
- Conservation (Natural Habitats, &c.) Regulations 1994, as amended;
- Nature Conservation (Scotland) Act 2004 (as amended);
- Wildlife and Natural Environment (Scotland) Act 2011;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- UK Post-2010 Biodiversity Framework (UK Government, 2012);
- Scottish Planning Policy (2014); and
- the Living Shetland Biodiversity Action Plan (BAP) (Living Shetland, 2018).

### **Method of Baseline Characterisation**

#### *Extent of the Ecological Study Area*

8.2.5 The ecological study area for this assessment is the area included within the site boundary of the proposed varied development and the desk study area is the area within a 10 km radius of the proposed varied development, as shown as “10km Buffer” on Figure 8.1: Ecological Designations within 10km.

#### *Desk Study*

8.2.6 A review of the desk study carried out for the ES has been undertaken using the Scottish Natural Heritage (SNH) SiteLink website<sup>3</sup> to identify designated nature conservation sites, and the Shetland Biological Records Centre (SBRC) to identify important ecological features, both within a 10 km radius of the proposed varied development.

#### *Field Surveys*

8.2.7 The following field surveys were undertaken for the ES in order to identify all relevant ecological features:

- Phase 1 habitat surveys in September 2005 and May 2008 by Highland Ecology, as described in Technical Appendix 8.1: Phase 1 Habitat Survey;
- NVC surveys between April and June 2008 by Highland Ecology, as described in Technical Appendix 8.2: NVC Survey, and used to inform Technical Appendix 8.3: Groundwater Dependent Terrestrial Ecosystems;

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<sup>3</sup> URL: <https://sitelink.nature.scot/home>

- rare plants survey in August 2008 by EnviroCentre Limited, as described in Technical Appendix 8.4: Rare Plants Survey;
- protected terrestrial mammal surveys (otter) in October 2008 by Celtic Environment, as described in Technical Appendix 8.5: Otter Survey;
- freshwater pearl mussel survey in May and July 2008 by EnviroCentre Limited, as described in Technical Appendix 8.6: Freshwater Pear; Mussel Survey;
- fish population and habitat survey in August and September 2008 by Waterside Ecology, as described in Technical Appendix 8.7: Fish Survey; and
- freshwater invertebrate survey in August 2008 by Aquaterra Ecology, as described in Technical Appendix 8.8: Freshwater Invertebrate Survey.

8.2.8 The field surveys were not repeated for the 2018 assessment as the footprint of the proposed varied development has not changed and the results of the 2005 and 2008 surveys in support of the ES are considered as still reflecting the ecological baseline of the site.

*Cumulative Baseline*

8.2.9 The developments that have been identified as potentially resulting in cumulative impacts are illustrated in Figure 4.6. With respect to non-avian ecology, no such development is located within 10 km of the proposed varied development, therefore, no cumulative effects are predicted, and no cumulative impact assessment is required in respect of ecology.

**Assessment of Impacts**

*Feature Evaluation*

8.2.10 Designated nature conservation sites, habitats and species (i.e. ecological features) identified within the desk and ecological study areas have been assigned ecological values using the standard CIEEM scale that classifies ecological features within a defined geographic context (CIEEM, 2016). The classification uses recognised and published criteria where the habitats and ecological study area are assessed in relation to their size, diversity, naturalness, rarity, fragility, typical-ness, connectivity with surroundings, intrinsic value, recorded history and potential value (Ratcliffe, 1977 and Wray et al, 2010). Table 8.1 describes the frame of reference used.

<b>Geographic Importance</b>	<b>Examples</b>
International	Internationally designated nature conservation sites including Special Areas of Conservation (SAC), Ramsar sites, Biogenetic Reserves, World Heritage sites, Biosphere Reserve, candidate SACs and potential Ramsar sites; discrete areas which meet the published selection criteria for international designation but which are not themselves designated as such; or a viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas which are essential to maintain the viability of a larger whole.  Resident or regularly occurring populations of species which may be considered at an international level, such as European Protected Species (EPS), the loss of which would adversely affect the conservation status or distribution of the species at an international level; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
National	Nationally designated nature conservation sites including Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Marine Nature Reserves; discrete areas which meet the published selection criteria for national designation (e.g. SSSI selection guidelines) but which are not designated as such; or areas of a habitat type identified in the UK Post-2010 Biodiversity Framework (UK Government, 2012).

<b>Table 8.1: Geographic Importance</b>	
	Resident or regularly occurring populations of species which may be considered at the national level, such as species listed in Schedules 5 and 8 to the Wildlife and Countryside Act 1981, the loss of which would adversely affect the conservation status or distribution of the species across the UK; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
Regional	<p>Areas of a habitat type identified in the Regional BAP; viable areas of habitat identified as being of regional value in the appropriate Natural Area Profile (or equivalent); or smaller areas of such habitat which are essential to maintain the viability of a larger whole.</p> <p>Resident or regularly occurring populations of species which may be considered at an international level, or at the national level, the loss of which would adversely affect the conservation status or distribution of the species across the region; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.</p>
County	<p>Designated nature conservation sites at the local authority level in Scotland including statutory Local Nature Reserves (LNR) and non-statutory Local Nature Conservation Sites; or discrete areas which meet the published selection criteria for designation, but which are not designated as such.</p> <p>Resident or regularly occurring populations of species which may be considered at the local authority level, the loss of which would adversely affect the conservation status or distribution of the species across the local authority area.</p>
Local	<p>Features of local value include areas of habitat or populations/communities of species considered to appreciably enrich the habitat resource within the immediate surrounding area, for example, species-rich hedgerows.</p> <p>Resident or regularly occurring populations of species which may be considered at an international level, or at the national level, the loss of which would adversely affect the conservation status or distribution of the species across the immediate surrounding area; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.</p>

8.2.11 A wide range of sources can be used to assign importance to ecological features, including legislation and policy. In the case of designated nature conservation sites, their importance reflects the geographic context of the designation. For example, sites designated as SACs are recognised as being of importance at an international level. Ecological features not included in legislation and policy may also be assigned importance due to, for example, local rarity or decline, or provision of a functional role for other ecological features. Professional judgement is used to assign such importance.

*Criteria for Characterising Impacts*

8.2.12 The potential impacts on ecological features have been considered in relation to the proposed varied development. The impacts have been assessed in relation to the baseline conditions of the ecological study area without consideration of any specific mitigation measures that might be employed. The likely impacts of development activities upon ecological features have been characterised according to several variables detailed in Table 8.2.

<b>Table 8.2: Impact Characterisation</b>	
<b>Parameter</b>	<b>Description</b>
Direction	Impacts are either adverse (negative) or beneficial (positive).
Magnitude	This is defined as high, moderate, low or negligible, with these being classified using the following criteria: High: Total/near total loss of a population due to mortality or displacement or major reduction in the status or productivity <sup>4</sup> of a population due to mortality or displacement or disturbance. Total/near total loss of a habitat type at the relevant geographic scale, e.g. Natural Heritage Zone (NHZ) <sup>5</sup> . Medium: Partial reduction in the status or productivity of a population due to mortality or displacement or disturbance. Partial loss of a habitat. Low: Small but discernible reduction in the status or productivity of a population due to mortality or displacement or disturbance. Small proportion of habitat lost. Negligible: Very slight reduction in the status or productivity of a population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Slight loss of habitat that is barely discernible from the habitat resource as a whole.
Extent	The area over which the impact occurs.
Duration	The time for which the impact is expected to last prior to recovery of the ecological feature or replacement of the feature by similar resource (in terms of quality and/or quantity). This is expressed as short-term, medium-term, or long-term relative to the ecological feature that is impacted.
Reversibility	Irreversible impacts: permanent changes from which recovery is not possible within a reasonable time scale or for which there is no reasonable chance of action being taken to reverse it. Reversible impact: temporary changes in which spontaneous recovery is possible or for which effective mitigation (avoidance/cancellation/reduction of effect) or compensation (offset/recompense/offer benefit) is possible.
Frequency and timing	The number of times an activity occurs will influence the resulting effect (if appropriate, described as low to high and quantified, where possible). The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. the breeding season.

8.2.13 The assessment only describes those characteristics relevant to understanding the ecological impact and determining the significance of the effect.

*Significance Criteria*

8.2.14 Significant effects are assessed with reference to the geographical importance of the ecological feature. However, the scale of significance of an effect may not be the same as the geographic context in which the feature is considered important. For example, an impact on a species which is on a national list of species of principal importance for biodiversity may not have a significant effect on its national population.

8.2.15 For the purposes of EclA, apart from in exceptional circumstances, a significant effect is only considered to be possible where the feature in question is considered to be of regional, national or international importance. That is not to say that impacts from the proposed varied development

<sup>4</sup> Status is defined as the conservation status of the species and indicates whether the species is likely to become extinct in the near future. Productivity is defined as the rate of population growth.

<sup>5</sup> Natural Heritage Zones are an established biogeographical regional classification used by SNH (SNH, 2002).

could not result in effects on features of county or local importance<sup>6</sup>, simply that those effects are not considered significant under the 2017 EIA Regulations.

8.2.16 The potential for significant effects, in the absence of mitigation, has been determined with reference to the geographic conservation importance and the criteria in Table 8.1. By referring to the criteria in Table 8.2, the assessment seeks to characterise the magnitude of the impacts in space and time. Except in exceptional circumstances, impacts characterised as being of negligible or low magnitude would typically be short term and reversible. Therefore, even if the feature is of regional, national or international conservation importance, a negligible or low magnitude impact is not likely to result in a significant effect. Moderate and high magnitude impacts, are likely to be medium to long term, and possibly irreversible. Where the feature is of regional, national and international conservation importance, moderate and high magnitude impacts are, in general, likely to result in significant effects.

8.2.17 Mitigation and/or compensation is proposed for all effects considered significant under the 2017 EIA Regulations. Where appropriate, as a good practice measure, additional measures and/or compensation may be proposed for impacts on features of county or local importance, or where required in relation to protected species where legislation may require actions to protect populations or individuals.

8.2.18 Residual effects are characterised as either adverse (negative) or beneficial (positive) and either significant or not significant, taking account of mitigation and/or compensation proposals.

### ***Assumptions and Limitations***

8.2.19 It should be noted that the availability and quality of the data obtained during desk studies is reliant on third party responses. This varies from region to region and for different species groups. Furthermore, the comprehensiveness of data often depends on the level of coverage, the expertise and experience of the recorder and the submission of records to the local recorder.

8.2.20 The habitat and faunal surveys provide a snapshot of ecological conditions and do not record plants or animals that may be present in the ecological study area at different times of the year. The absence of a particular species cannot definitely be confirmed by a lack of field signs and only concludes that an indication of its presence was not located during the survey effort. However, the surveys carried out between 2005 and 2008 were undertaken during optimal periods for identifying flowering plants or locating field signs of faunal species and there are not considered to be any limitations on the data derived. While the data is now ten years old and has not been updated, it is considered a reasonable basis upon which to provide an impact assessment given that the footprint of the proposed varied development would not be different from the consented Viking Wind Farm and that it is unlikely that habitat and species distribution would have materially changed.

## **8.3 Baseline Conditions**

### ***Current Baseline - Designated Nature Conservation Sites***

8.3.1 There is one designated nature conservation site within the site boundary and a further 14 designated nature conservation sites within the 10 km desk study area. Details of these designated nature conservation sites are provided in Table 8.3 (listed from closest to the proposed varied development) and their locations are shown on Figure 8.1: Designated Sites.

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<sup>6</sup> It is noted that the CIEEM (2016) Guidelines for Ecological Impact Assessment allow for effects to be categorised as 'significant' at any geographic scale e.g. from local to international, however in the context of the 2017 EIA Regulations, an effect on features of local and county conservation importance are, in general, not considered significant under the 2017 EIA Regulations.

<b>Table 8.3: Designated Nature Conservation Sites within 10 km of Proposed Varied Development</b>			
<b>Site Name</b>	<b>Qualifying features</b>	<b>Distance (km) from Proposed Development (at closest point)</b>	<b>Comment</b>
Burn of Lunklet SSSI	Vascular plant assemblage	Within western area of site	Impacts are possible due to the proximity of the proposed varied development to watercourses that drain into the SSSI.
Sandwater SSSI	Mesotrophic loch Open water transition fen	Immediately adjacent to the southern site boundary	Impacts are possible due to the proximity of the proposed varied development to watercourses that drain into the SSSI.
Laxo Burn SSSI	Vascular plant assemblage	0.5 km north	Impacts are possible due to the proximity of the proposed varied development to watercourses that drain into the SSSI.
Catfirth SSSI	Relict scrub vegetation containing hazel <i>Coryllus avellana</i> , rowan <i>Sorbus aucuparia</i> and rose <i>Rosa sp.</i>	0.6 km south	No impacts are predicted as the SSSI is separated from the proposed varied development by road and open moorland.
Loch of Girlsta SSSI	Arctic charr <i>Salvelinus alpinus</i> Mesotrophic loch	1.2 km south	No impacts are predicted as the SSSI is separated from the proposed varied development by road and open moorland and no watercourses from within the proposed varied development drain into the loch.
South Whiteness SSSI	Saltmarsh Shetland mouse-ear-hawkweed <i>Pilosella flagellaris ssp bicapitata</i>	3.9 km south	No impacts are predicted due to the distance of the SSSI from the proposed varied development.
Yell Sound Coast SAC and SSSI	Harbour seal <i>Phoca vitulina</i> Otter	4.8 km north	No impacts are predicted due to the distance of the designated nature conservation sites from the proposed varied development.
Loch of Clousta SSSI	Tall herb ledge	5.0 km west	No impacts are predicted due to the distance of the SSSI from the proposed varied development.
The Vadills SAC and SSSI	Egg wrack <i>Ascophyllum nodosum ecad mackaii</i> Saline lagoon Tidal rapids	6.1 km west	No impacts are predicted due to the distance of the designated nature conservation sites from the proposed varied development.
Muckle Roe Meadows SSSI	Lowland neutral grassland	6.5 km north-west	No impacts are predicted due to the distance of the SSSI



<b>Table 8.3: Designated Nature Conservation Sites within 10 km of Proposed Varied Development</b>			
	Vascular plant assemblage		from the proposed varied development.
Dales Voe SSSI	Saltmarsh	6.6 km north	No impacts are predicted due to the distance of the SSSI from the proposed varied development.
Burn of Valayre SSSI	Relict scrub vegetation, including rose <i>Rosa sp.</i> , rowan and eared willow <i>Salix aurita</i>	8.0 km north-west	No impacts are predicted due to the distance of the SSSI from the proposed varied development.
Lochs of Tingwall and Asta SSSI	Mesotrophic loch	8.1 km south	No impacts are predicted due to the distance of the SSSI from the proposed varied development.
Sullom Voe SAC	Lagoons Reefs Shallow inlets and bays	8.8 km north-west	No impacts are predicted due to the distance of the SAC from the proposed varied development.

### **Otter**

8.3.2 Records of otter primarily occur along the coast, with no records within the ecological study area.

### **Freshwater Pearl Mussel**

8.3.3 A reproductively viable freshwater pearl mussel population in atypical peat dominated fen habitat was recorded in Shetland in 2002 (Cosgrove and Harvey, 2005). The freshwater pearl mussel is not known to occur in the desk study area, but the species was identified by SNH during scoping work as potentially occurring in the ecological study area due to the aquatic habitats present.

### **Fish**

8.3.4 A limited native freshwater fish fauna occurs in Shetland. The species expected to be present within the ecological study area are brown trout, Atlantic salmon, European eel, three-spined stickleback and flounder.

### **Other Species**

8.3.5 Table 8.4 provides a list of other species expected to be present in the ecological study area.

<b>Table 8.4: Occurrence of Terrestrial Species in Shetland</b>		
<b>Species</b>	<b>Shetland History</b>	<b>Occurrence in Ecological Study Area</b>
Common frog and common toad	Common frog introduced and widely established. Common toad also introduced but not naturalised	Common frog likely
Bats (approx. seven species)	Non-breeding vagrants	Unlikely but could occur as vagrants
Mountain hare <i>Lepus timidus</i>	Widespread	Widespread
Stoat <i>Mustela erminea</i> and ferret-polecat <i>M. putorius x M. furo</i>	Widespread	Widespread

<b>Table 8.4: Occurrence of Terrestrial Species in Shetland</b>		
Hedgehog <i>Erinaceus europaeus</i>	Introduced and naturalised	Widespread
Invertebrates (Alpine charr <i>Eudonia alpina</i> and the Manchester treble-bar moth <i>Carsia sororiata anglica</i> )	Common and widespread	Widespread

### **Field Surveys**

#### *Phase 1 Habitats*

8.3.6 Full details of the habitat types recorded during the Phase 1 habitat surveys are provided in Technical Appendix 8.1: Phase 1 Habitat Survey and the locations of the habitats are shown on Figure 8.2: Phase 1 Habitat Survey. Blanket bog is the dominant habitat type in the ecological study area. The following sensitive<sup>7</sup> habitat types were recorded:

- unimproved acid grassland;
- marshy grassland;
- dry heath and dry heath/acid grassland mosaic;
- wet heath and wet heath/acid grassland mosaic;
- blanket bog;
- wet and dry modified bog;
- flush/spring;
- bare peat; and
- standing and running water.

8.3.7 Table 8.5 shows the area of the sensitive habitats recorded within the ecological study area during the Phase 1 habitat surveys.

<b>Table 8.5: Habitat Types</b>	
<b>Habitat Type</b>	<b>Area (ha)</b>
Unimproved acid grassland	386.5
Marshy grassland	1.7
Dry heath	90.6
Wet heath	49.3
Dry heath/acid grassland mosaic	92.9
Wet heath/acid grassland mosaic	154.4
Blanket bog	5707.5
Wet modified bog	11.4
Dry modified bog	8.1
Flush/spring	9.7
Bare peat	46.4
Standing water	125.0
<b>Total</b>	<b>6,683.5</b>

<sup>7</sup> Sensitive habitats are those considered to be more susceptible to environmental change and/or habitats that are protected by additional legislation i.e. Annex 1 habitats under the Habitats Directive (92/43/EEC).

8.3.8 The blanket bog activity varies considerably in the ecological study area. The habitat in the east has areas of eroded and fragmented bog but also large areas of intact and active bog across the site. The west of the ecological study area is dominated by intact and active bog, except around Upper Kergord and the Mid Kame ridge. Wet and dry dwarf heath occur within the blanket bog on slopes or in areas of eroded bog. Acid grassland occurs throughout the ecological study area, typically in mosaics with wet and dry heath.

*NVC and GWDTE*

8.3.9 Full details of the NVC communities recorded during the NVC surveys are provided in Technical Appendix 8.2: NVC Survey and the locations of the habitats are shown on Figures 8.3.1 to 8.3.23: NVC Communities. Technical Appendix 8.3: GWDTE provides information on the area of each NVC community that is potentially groundwater dependent, with their locations shown on Figures 8.3.1 to 8.3.23: NVC Communities and Figures 8.4.1 to 8.4.9: GWDTE. NVC communities and their potential for groundwater dependency are determined from guidance provided by the Scottish Environment Protection Agency (SEPA, 2017) where the NVC communities indicate that a wetland has the potential to be either highly or moderately groundwater dependent. Table 8.6 provides a summary of the groundwater dependency areas present in the ecological study area. Chapter 9 provides a hydrological assessment of the potential GWDTE identified during ecology surveys.

<b>Table 8.6: GWDTE</b>	
<b>Groundwater Dependency</b>	<b>Area (ha)</b>
High	26.3
High/moderate mosaic <sup>8</sup>	6.8
Moderate	589.9
Moderate/high mosaic <sup>9</sup>	15.3
<b>Total</b>	<b>638.3</b>

8.3.10 The following NVC communities recorded in the ecological study area are considered to be moderately GWDTE:

- U6 *Juncus squarrosus-Festuca ovina* grassland;
- M15 *Scirpus cespitosus-Erica tetralix* wet heath;
- M30 *Hydrocotylo-Baldellion*; and
- MG10 *Holcus lanatus-Juncus effusus* rush-pasture.

8.3.11 The following NVC communities recorded in the ecological study area are considered to be highly GWDTE:

- M5 *Carex rostrata-Sphagnum squarrosum* mire;
- M6 *Carex echinata-Sphagnum recurvum* mire;
- M10 *Carex dioica-Pinguicula vulgaris* mire;
- M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture; and
- CG10 *Festuca ovina-Agrostis capillaris-Thymus praecox* grassland.

*Relationship Between Phase 1 and NVC Habitat Types*

8.3.12 The acid grassland Phase 1 habitat in the ecological study area is composed of the following NVC communities: U4a, U4b, U5b, U6, U6a and U6b. The blanket bog habitat comprises three extensive NVC mire communities or sub-communities (M17a, M17b and M19), with other more localised and patchier mire communities within the overall matrix (M1, M3, M6, M15), along with acid grassland

<sup>8</sup> In this category, the proportion of highly GWDTE are higher than the proportion of moderately GWDTE.

<sup>9</sup> In this category, the proportion of moderately GWDTE are higher than the proportion of highly GWDTE.

and dry heath (U6, H10). The dry heath habitat is composed of the following NVC communities: H10a, H10b, H10c, H12a and H12c. The wet heath habitat is composed of the following NVC communities: M15a, M15b, M15c and M15d. The flush/spring habitat is composed of M6b and M6c. M23 occurs as small isolated stands throughout the ecological study area. Full details of the NVC communities recorded during the NVC surveys are provided in Technical Appendix 8.2: NVC Survey. M6 and M23 are considered to be highly GWDTE and U6 and M15 are considered to be moderately GWDTE. The other communities are not considered to be groundwater dependent.

#### *Rare Plants*

8.3.13 A total of 91 flowering plants and 85 algae, moss and liverwort species were recorded during the survey. None of the species recorded was included amongst those in the list of rare or otherwise notable species in Shetland, with the exception of dandelion *Taraxacum sp.*, for which two indeterminate sub-species were recorded.

8.3.14 No other rare or notable species or taxa (in a local, national or international context) were recorded in the ecological study area and the species were generally found to be common and widespread.

#### *Otter*

8.3.15 No holts (protected dwellings) were recorded in the ecological study area, with two spraints not considered to be recently recorded in the site area for the proposed varied development. Full details of the otter survey and the location of field signs can be found in Technical Appendix 8.5: Otter Survey (confidential).

8.3.16 The lack of evidence of otter presence recorded during the survey suggests the species is not widely dispersed throughout the ecological study area, and, therefore, it is assumed the population is present at a low density.

#### *Freshwater Pearl Mussel*

8.3.17 Full details of the freshwater pearl mussel survey can be found in Technical Appendix 8.6: Freshwater Pearl Mussel Survey. However, results of the survey suggest freshwater pearl mussels are absent from the sections of watercourses surveyed within the ecological study area.

#### *Fish*

8.3.18 Full details of the fish species recorded can be found in Technical Appendix 8.7: Fish Survey. Five species were identified in the ecological study area: European eel, Atlantic salmon, brown/sea trout, three-spined stickleback and flounder. Trout were present in all catchments surveyed. Salmon were only present in the Burrafirth and Laxo catchments and densities were low. European eel, three-spined stickleback and flounder also occurred at low densities.

#### *Freshwater Macro-invertebrates*

8.3.19 Full details of the species composition of the freshwater macro-invertebrate survey can be found in Technical Appendix 8.8: Freshwater Invertebrate Survey. The biodiversity of the invertebrate communities was low throughout the ecological study area. The main reason for this is considered to be the isolated nature of Shetland. Low diversity was present in most groups, with only one species of mayfly *Ephemeroptera sp.*, two genera of stonefly *Plecoptera* and seven species of caddis fly *Trichoptera sp* present. In general, the invertebrate communities present were indicative of watercourses with good water quality and a small degree of organic enrichment.

#### **Future Baseline**

8.3.20 The future baseline of the ecological study area under the “do nothing” scenario is unlikely to change for the peatland habitats. The habitats already modified by surrounding peat cutting and farming practices are expected to continue to be modified by these practices. Therefore, the distribution of species present within the ecological study area and the surrounding habitat is

unlikely to change significantly in the future. However, climate change may have an effect on species distribution and exacerbate degradation of habitats already modified by peat cutting, farming practices or existing peat landslides, with bare peat more susceptible to climate change related increases in severe weather e.g. higher intensity rainfall.

### **Issues Scoped Out**

#### *Decommissioning*

8.3.21 The effects associated with the construction phase are considered to be representative of worst case decommissioning effects, which are likely to be of a smaller scale, shorter duration and avoid semi-natural habitats. As a result, no separate assessment of the impacts of decommissioning is considered necessary.

#### *Habitats*

8.3.22 Habitats of less than local value are scoped out from further consideration in this assessment on the basis that effects on these habitats would not be considered significant in terms of the 2017 EIA Regulations given their low ecological value. Habitats considered to be of less than local value are the quarry, bare ground, improved grassland and poor semi-improved grassland areas.

#### *Terrestrial Vertebrates*

8.3.23 Common frog, stoat, polecat, mountain hare and hedgehog were recorded in the ecological study area and are all introduced non-native species to Shetland. As a result, these species are not considered valuable ecological features and are not subject to further evaluation, assessment and consideration within this chapter. It could be argued that the main conservation value of these species populations would be in their control, removal or eradication from the ecological study area, but this is beyond the scope of this assessment.

#### *Freshwater Pearl Mussel*

8.3.24 No populations of freshwater pearl mussel were recorded during surveys, with most of the habitats considered to be unsuitable to support this species. As a result, this species is likely to be absent from the ecological study area and is, therefore, not subject to further evaluation, assessment and consideration within this chapter.

### **Ecological Importance**

8.3.25 A summary of the ecological features identified as being sensitive to the proposed varied development and which have been ‘scoped-in’ to the assessment is given in Table 8.7, together with the justification for their inclusion.

<b>Ecological Feature</b>	<b>Importance</b>	<b>Justification</b>
Burn of Lunklet SSSI	National	This is a statutory designated site for the presence of vascular plants, including Shetland hawkweed <i>Hieracium zetlandicum</i> , a nationally rare plant listed on the Scottish Biodiversity List (Scottish Government, 2013) and protected under the Wildlife and Countryside Act 1981. The proposed varied development has a potential hydrological connection to the SSSI.
Sandwater SSSI	National	This is a statutory designated site for its mesotrophic loch and wetland habitats supporting submerged aquatic plants, including the nationally scarce slender-leaved pondweed <i>Potamogeton filiformis</i> . The

**Table 8.7: Importance of Ecological Features**

		proposed varied development has a potential hydrological connection to the SSSI.
Laxo Burn SSSI	National	This is a statutory designated site for the presence of vascular plants, including the only known population of weak-leaved hawkweed <i>Hieracium attenuatifolium</i> , a plant protected under the Wildlife and Countryside Act 1981. The proposed varied development has a potential hydrological connection to the SSSI.
Blanket bog, wet and dry modified bog and bare peat	Regional	Blanket bog is included in Annex 1 of the EC Habitats Directive (EU, 1994) and is sensitive to environmental change, such as changes to hydrology, carbon function, species composition and nutrient status. The majority of blanket bog in the UK is in poor condition due to drainage and damage from peat extraction. The example within the ecological study area is of varying condition, with the majority subject to modification, but does include areas of active blanket bog. The blanket bog in the ecological study area is of a sufficient size and connectivity to support a diverse range of species and is noted to contain <i>Sphagnum</i> rich vegetation. The ecological study area contains one of the few large areas of blanket bog occurring on an island and although the blanket bog vegetation on the Shetland isles is not quite as rich as the mainland, it is in relatively good condition. As a result, the blanket bog is considered to be of regional importance.
Wet and dry heath (and associated acid grassland mosaics)	Local	Heathland is included in Annex 1 of the EC Habitats Directive (EU, 1994) and is also sensitive to environmental change. The examples in the ecological study area are frequently grassy in nature due to grazing pressure and in relatively poor condition. As a result, the wet and dry heaths, although extensive, are considered to be of local importance.
Acid grassland	Local	Acid grassland is common throughout the ecological study area and Shetland and is considered to be of local importance.
Flush/spring	Local	Flushes contain important components of vegetation and can support a suite of species. However, the flushes in the ecological study area are considered to be poor examples of this vegetation type due to their low number of indicator species. As a result, they are considered to be of local importance.
Standing and running water	Regional	Standing and running water is protected under the Water Framework Directive (EU, 2000). The standing water in the ecological study area is integral to the blanket bog habitat and the running water habitats are

**Table 8.7: Importance of Ecological Features**

		generally of good water quality, providing habitat for otter and fish species, although a low biodiversity of macro-invertebrate species. Running water is also integral to the blanket bog habitat. As a result, both standing and running water are considered to be of regional importance.
GWDTE	Regional	GWDTE are sensitive to changes in hydrology and hydrogeology and are a priority under the EU Water Framework Directive (EU, 2000). The examples of these habitat types within the ecological study area are of varying condition and subject to modification due to their location within the blanket bog habitats but do include areas of increased diversity and naturalness. As a result, this feature is considered to be of regional importance.
Rare plants	Local	No notable species were recorded during the surveys except from dandelion <i>Taraxacum sp.</i> This species was generally widespread in the ecological study area and is, therefore, considered to be of local importance.
Otter	Local	Otters are a European Protected Species under the EC Habitats Directive (EU, 1994) although this species is not native to Shetland. Otter activity was low throughout the ecological study area. Although no protected resting or dwelling places were recorded in the ecological study area, the species could be disturbed by the proposed varied development and it is considered to be of local importance.
Terrestrial invertebrates	Local	The desk study identified two species of conservation importance within the ecological study area. Alpine charr is locally common in Shetland and the Manchester treble-bar moth is a nationally widespread species. As a result, this feature is considered to be of local importance.
Fish species	Regional/Local	Atlantic salmon is listed in Schedule 3 to the Habitats Regulations <sup>10</sup> and brown trout is a priority species in the UK Post-2010 Biodiversity Framework (UK Government, 2012). Atlantic salmon was present in two watercourses and is rare in Shetland. Although brown trout was frequent in the ecological study area, it is considered to represent a high genetic diversity. Both Atlantic salmon and brown trout are considered to be of regional importance. The other three species recorded in the ecological study area (European eel, three-spined

<sup>10</sup> URL: <http://www.legislation.gov.uk/ukxi/1994/2716/schedule/3/made>

<b>Table 8.7: Importance of Ecological Features</b>		
		stickleback and flounder) are considered to be of local importance.
Freshwater macro-invertebrates	Local	The invertebrate communities present in the ecological study area watercourses consisted mainly of common and widespread species, with no rarities found. Diversity was found to be low. In general, the communities were typical of those found in moderately clean and well-oxygenated water. As a result, this feature is considered to be of local importance.

## 8.4 Assessment of Effects

8.4.1 The footprint of the consented Viking Wind Farm has not changed for the proposed varied development discussed in this chapter. As a result, the potential impacts and **likely significant ecological effects are not considered to differ** between the consented Viking Wind Farm and the proposed varied development. These impacts and effects are considered below.

### *Construction Effects*

8.4.2 The assessment of likely effects associated with construction is based on the typical activities described in Chapter 2: Description of Development of this EIA Report.

### *Designated Nature Conservation Sites*

8.4.3 No direct impacts within designated nature conservation sites have been identified as only the Burn of Lunklet SSSI is located within the site boundary but outwith the footprint of the proposed varied development. However, indirect impacts are possible on the Burn of Lunklet SSSI, Sandwater SSSI and Laxo Burn SSSI due to potential hydrological connectivity. A turbine is proposed 199 m to the south-west of Lamba Water, which drains into the Burn of Lambawater and then into the Burn of Lunklet SSSI. An access track and permanent met mast are also proposed 270 m to the south-west of the Burn of Lambawater. Sandwater SSSI has potential hydrological connectivity with the proposed varied development from proposed infrastructure occurring on a ridge 462 m to the west of the Burn of Pettawater in the valley below, which drains into Sandwater SSSI. Although the Laxo Burn is present in the north of the ecological study area, the area notified as a SSSI occurs downstream and 650 m to the north-east of the site boundary. Potential hydrological connectivity exists where proposed access tracks cross tributaries of the Laxo Burn where it occurs within the ecological study area.

8.4.4 Work associated with access track and turbine construction, would occur in the upper catchments of the Burn of Lunklet and Laxo Burn, with the potential for pollutants or sedimentation runoff materials (most likely peat) to be washed downstream and enter the Burn of Lunklet SSSI and the Laxo Burn SSSI. The notified features of these SSSIs are endemic hawkweed species growing on the river banks. If pollution or sedimentation runoff occurred, it is unlikely that it would affect the notified features of the SSSIs as the hawkweed species do not grow within the watercourses themselves. Any predicted impact, whilst adverse to the water quality of the Burn of Lunklet and Laxo Burn, would not threaten SSSI features or site integrity and therefore is considered to be a short term negligible magnitude impact with **no significant effects** predicted. However, Sandwater SSSI is notified for supporting a nationally scarce pondweed species. Any pollution or sedimentation runoff entering the catchment could result in poorer water quality leading to a reduction, or even loss, of the pondweed species in the SSSI. This would be a likely **significant adverse effect** at the national level, although the duration and magnitude would depend on the nature of the pollution or siltation event.



*Habitats*

- 8.4.5 Construction activities have the potential to degrade or destroy terrestrial habitat either directly through excavation, compaction, or modification (e.g. vegetation removal) or indirectly as a result of dewatering or from the accidental release of fuels, lubricants or other chemicals leading to habitat modification. The construction of the turbine foundations (20 m diameter per turbine), crane hardstanding<sup>11</sup>, substation (0.3 ha), converter station (4.9 ha) and access tracks<sup>12</sup> would result in permanent habitat loss. The construction of construction compounds (1 ha) and up to ten borrow pits (between 0.2 ha and 1.8 ha) would result in temporary habitat modification or loss in the short to medium term until habitats were reinstated following completion of the proposed varied development. The significance of these effects per habitat type is considered below. The potential for peat slide due to construction within peatland habitats is considered in Chapter 9: Hydrology, Hydrogeology, Geology, Soils and Peat.
- 8.4.6 As previously described in Chapter 2: Description of Development above, floating stone track design would be used in areas where peat depth is greater than 1 m<sup>13</sup>. The approach to track construction would aim to ensure hydraulic connectivity is maintained by including measures such as the inclusion of a non-alkaline porous horizon within the track sub-base to prevent the track structure acting as a barrier to natural hydrogeological processes.
- 8.4.7 Figure 8.2.1 and 8.2.2: Phase 1 Habitat Survey and Figures 8.4.1 to 8.4.9: GWDTE, show the proposed site infrastructure overlaid on the habitats mapped using the Phase 1 habitat survey methodology and GWDTE NVC communities, respectively.

*Phase 1 Habitats*

- 8.4.8 Table 8.8 details the area of habitat in the ecological study area affected by the construction of the proposed varied development, and the percentage of the total area those areas of habitats comprise. The ecological feature with the highest percentage of potential direct loss is bare peat, followed by wet heath/acid grassland mosaic. The features with the highest percentage of potential indirect modification are bare peat and wet heath/acid grassland mosaic. Although blanket bog is the dominant habitat type, the percentage affected is low due to the size of the habitat present in the ecological study area. However, blanket bog has the largest area of direct and indirect loss at 85.1 ha and 130.2 ha, respectively. In Shetland, there are 56,664.5 ha of active<sup>14</sup> blanket bog (Quarmby *et al*, 1999), representing approximately 5.6% of the total of this habitat type recorded in Scotland. Both the consented Viking Wind Farm and the proposed varied development would lead to the loss of 0.15% and 0.23% of the blanket bog present in Shetland from direct and indirect impacts, respectively.

		Direct Effect – Habitat Loss		Indirect Effect – Habitat Modification <sup>15</sup>	
Habitat Code	Habitat Size in Ecological Study Area (ha)	Area Lost (ha)	Percentage Loss (%)	Area Modified (ha)	Percentage Modified (%)
Acid grassland	386.5	2.3	0.58	3.1	0.81
Dry heath	90.6	1	1.08	0.9	0.97

<sup>11</sup> Crane hardstanding would typically consist of one main permanent area of up to 0.1 ha adjacent to each turbine, with a temporary area of up to 0.1 ha per turbine. The final size, design and layout of the crane hardstandings would be determined by the turbine supplier according to their preferred erection method.

<sup>12</sup> Three types of access tracks would be used: single width (6 m wide), double width (12 m wide) and operational (3.4 m wide).

<sup>13</sup> Subject to engineering limitations, to be considered further as part of the detailed design

<sup>14</sup> Blanket bog still supporting a significant area of vegetation that is normally peat forming.

<sup>15</sup> A 10 m buffer around the areas of direct habitat loss has been used to calculate the indirect habitat modification as this is considered to represent the likely area indirectly affected by the proposed varied development.

Wet heath	49.3	0.2	0.49	0.8	1.62
Dry heath/acid grassland mosaic	92.9	0.8	0.84	2	2.19
Wet heath/acid grassland mosaic	154.4	4.7	3.04	7.7	4.98
Blanket bog	5,707.5	85.1	1.49	130.2	2.28
Bare peat	46.4	2.9	6.26	3.7	7.94
<b>Totals</b>	<b>6,527.6</b>	<b>97</b>	<b>1.5</b>	<b>148.4</b>	<b>2.3</b>

*GWDTE*

8.4.9 Table 8.9 details the area of potential GWDTE in the ecological study area affected by the construction of both the consented Viking Wind Farm and the proposed varied development, and the percentage of the total area this comprises. The highest percentage of potential direct loss occurs in moderate/high GWDTE mosaics, followed by moderately GWDTE. The highest percentage of potential indirect modification occurs in highly GWDTE, followed by moderately GWDTE. Although moderately GWDTE are the dominant ecological feature, the percentage directly affected is low due to the size of the area present in the ecological study area. However, moderately GWDTE have the largest area of direct and indirect loss at 27.4 ha and 51.1 ha, respectively.

**Table 8.9: Area of GWDTE Affected by Proposed Varied Development**

Groundwater Dependency	Area Present in Ecological Study Area (ha)	Direct Effect – Loss		Indirect Effect - Modification <sup>16</sup>	
		Area Lost (ha)	Percentage Loss (%)	Area Modified (ha)	Percentage Modified (%)
High	26.3	1	3.8	2.7	10.3
High/moderate mosaic	6.8	0.2	2.9	0.3	4.4
Moderate	589.9	27.4	4.7	51.1	8.7
Moderate/high mosaic	15.3	1.4	9.2	0.4	2.6
<b>Totals</b>	<b>638.3</b>	<b>30</b>	<b>4.7</b>	<b>54.5</b>	<b>8.5</b>

*Habitats Summary*

8.4.10 The only features in the ecological study area with a direct loss of greater than 5% are bare peat and the moderate/high GWDTE mosaics, with a potential loss of 2.9 ha and 1.4 ha, respectively. The only features that have an indirect modification of greater than 5% are highly and moderately GWDTE, and bare peat, with a potential modification of 2.7 ha, 51.1 ha and 3.7 ha, respectively.

8.4.11 In the absence of mitigation, this assessment has identified a combination of permanent and temporary adverse impacts on the habitats of the ecological study area from direct loss and indirect modification. The impacts from accidental pollution events could be both direct, on for example the habitats themselves, and indirect on the species utilising those habitats. These impacts could lead to a **significant adverse effect** at the regional level on blanket bog (including bare peat), standing/running water and potential GWDTE. Effects on other habitat types, such as acid grassland, wet and dry heath (and their associated mosaics) and flush/spring, are considered to be **not significant** due to the small proportions involved.

*Otter*

8.4.12 Construction activities in the vicinity of watercourses in the ecological study area have the potential to result in the permanent loss of riparian habitat (unlikely to exceed 15 m in length at each crossing site) where there is construction of culverts and bridges. Construction activities also have the potential to disturb otter as a result of noise, vibration or light. These impacts would be localised, short term and low magnitude on this species, which is known to occur at low levels in the ecological study area. Pollution or siltation of watercourses could directly affect otter depending on the nature of the pollution event or indirectly through the reduction of fish stocks, and this impact is considered to be moderate. However, the otter activity recorded suggests otters rarely or only occasionally use the watercourses in the ecological study area for feeding. Thus, pollution is unlikely to significantly affect otter foraging. As a result, the effects from the construction impacts on otter are considered to be **not significant**.

*Terrestrial Invertebrates*

8.4.13 Construction activities would lead to the permanent and temporary loss of habitat utilised by the two moth species of conservation concern, particularly heathland habitats. However, the magnitude of this impact is considered to be low since both of these widespread upland species would not be significantly affected by small areas of habitat loss, with the majority of the site

<sup>16</sup> A 10 m buffer around the areas of direct habitat loss has been used to calculate the indirect habitat modification as this is considered to represent the likely area indirectly affected by the proposed varied development.

remaining undeveloped throughout construction. As a result, the effect from the construction impact of habitat loss on terrestrial invertebrates is considered to be **not significant**.

#### *Fish Species and Freshwater Macro-invertebrates*

- 8.4.14 Construction impacts have the potential to result in the degradation or destruction of aquatic habitats inhabited by fish species and freshwater macro-invertebrates, either directly by excavation or compaction, or indirectly by pollution from the accidental release of fuels, lubricants or other chemicals as well as changes in drainage patterns and silt released into aquatic habitats. The degradation of aquatic habitats could kill fish and macro-invertebrates directly or change the chemical composition of the habitat. Pollution or sediments from construction runoff could also enter watercourses in the ecological study area and impact fish species and macro-invertebrates in the larger watercourses that drain them. This could lead to a **significant adverse effect** on fish species at the regional level for salmon and brown trout and at the local level for macro-invertebrates, European eel, three-spined stickleback and flounder.

### **Operational Effects**

#### *Designated Nature Conservation Sites*

- 8.4.15 Operational impacts on designated nature conservation sites are considered possible through accidental spillage of fuels, chemicals and lubricants during operation and maintenance works that have the potential to enter aquatic habitats, leading to habitat loss or degradation. Any predicted impact, whilst adverse to the water quality of the Burn of Lunklet and Laxo Burn, would not threaten SSSI features or site integrity and therefore is considered to be a short term negligible magnitude impact with **no significant effects** predicted. However, any pollution or sedimentation entering the catchment of Sandwater SSSI could result in the loss of the qualifying pondweed species. Although the duration and magnitude of the impact would depend on the nature of the pollution or siltation event, this could be a **significant adverse effect** at the national level.

#### *Habitats*

- 8.4.16 Operational impacts on habitats are considered possible through accidental spillage of fuels, chemicals and lubricants during operation and maintenance works that have the potential to enter terrestrial and aquatic habitats, leading to habitat loss or degradation. In the absence of mitigation, this would be a **significant adverse effect** on blanket bog, standing and running water, and potential GWDTE at the regional level. Although an adverse effect would also occur on other habitats present in the ecological study area, such as acid grassland and heathland, this would be on local level features and is considered **not significant** under the 2017 EIA Regulations.

#### *Otter*

- 8.4.17 Fuel and chemical spills from service vehicles and plant have the potential to enter watercourses and directly impact otter depending on the nature of the pollution event or indirectly through the reduction of fish stocks, and this impact is considered to be moderate. However, the low otter activity recorded suggests otters rarely or only occasionally use the watercourses in the ecological study area. Thus, pollution is unlikely to significantly affect otter. As a result, the effect of the operational impact on otter is considered to be **not significant**.

#### *Terrestrial Invertebrates*

- 8.4.18 As no further habitat loss would occur during operation, no operational effects are predicted on terrestrial invertebrates.

#### *Fish and Freshwater Macro-invertebrates*

- 8.4.19 Fuel and chemical spills from service vehicles and plant have the potential to enter watercourses and adversely impact fish species and freshwater macro-invertebrates by degrading the aquatic habitat, and either directly killing fish species and macro-invertebrates or by killing their prey and

changing the chemical composition of the watercourses. This could lead to a **significant adverse effect** on fish species at the regional level for salmon and brown trout and at the local level for macro-invertebrates, European eel, three-spined stickleback and flounder.

## 8.5 Mitigation

- 8.5.1 No significant effects during construction or operation of the proposed varied development are predicted on the Burn of Lunklet SSSI, Laxo Burn SSSI, acid grassland, wet and dry heath and their associated acid grassland mosaics, flush/spring, otter or terrestrial invertebrates and, consequently, no mitigation is required for these ecological features. Mitigation for significant effects predicted on Sandwater SSSI, blanket bog (including bare peat), standing and running water, potential GWDTE, fish species and freshwater macro-invertebrates are provided in this section.

### *Pre-construction Protected Species Surveys*

- 8.5.2 Pre-construction protected species surveys, following best practice guidance, would be completed within eight months prior to the start of construction, particularly focusing on otter, which are known to be present at a low level in the ecological study area. The survey would focus on a buffer zone of 200 m around proposed infrastructure locations. This would identify any protected species signs within the proposed varied development not recorded during previous surveys. Should a breeding otter holt be discovered during the survey, SNH would be consulted immediately as a EPS licence is likely to be required for any construction work to continue, along with suitable mitigation or compensation works.

### *Schedule of Works*

- 8.5.3 As far as possible, all relevant works would be programmed to avoid periods of high sensitivity for protected species and this would be agreed with the Shetland Islands Council (SIC) in consultation with SNH prior to the commencement of works. However, a lack of significant daylight during winter months means that construction work would be required during the spring, summer and early autumn months and this would unavoidably coincide with some ecological sensitivities, such as fish migration season.
- 8.5.4 Before any construction works begin, ecological training and the raising of awareness of construction staff would be undertaken by the Ecological Clerk of Works (ECoW). All new staff would undergo an ecological induction and be made aware of the ecological features on the site and the legal implications of not complying with agreed working practices.

### *Micro-siting of Infrastructure and Demarcation of Exclusion Zones*

- 8.5.5 The potential for temporary disturbance to protected species (e.g. otter, Atlantic salmon and brown trout) during construction would be minimised as far as possible. A 50 m exclusion zone would buffer all at-risk watercourses and water bodies, whenever possible and as agreed with SEPA. Where exclusion is not possible, such as at water crossing points, access to the watercourses by personnel and machinery would be kept to a minimum. Infrastructure would be micro-sited to avoid the most sensitive habitats, such as active priority peatland habitat and GWDTE, wherever possible. The ECoW would help to ensure that opportunities to avoid sensitive habitats during construction are identified and undertaken.

### *SEMP*

- 8.5.6 An outline SEMP is included in Technical Appendix 2.2. The SEMP would be further developed post-consent and pre-construction to include protection and mitigation measures, as well as monitoring programmes, for all predicted and potential environmental impacts identified.

- 8.5.7 The SEMP would include measures to control levels of disturbance during the construction period and measures relating to operational hours and construction site management.
- 8.5.8 All standing and running water within the proposed varied development would have appropriate buffers established and observed, as agreed with SEPA. Exclusion zones within which construction activities would not occur, with the exception of works such as tracks crossing over watercourses, would be established and demarcated during the construction phase, where necessary. At all watercourse locations, appropriate pollution response spill kits and silt mitigation measures would be installed as described within the SEMP, in line with current good practice guidance. Pollution prevention would ensure the protection of Sandwater SSSI and standing and running water habitats.

### ***Watercourse Crossings***

- 8.5.9 In order to facilitate otter movements, protect salmon and trout spawning and nursery areas and facilitate fish movements within catchments, the number of watercourse crossings has been kept to a minimum at the design stage. Where a watercourse crossing has been unavoidable, best practice would be followed for any construction works combined with appropriate hydrological mitigation, as detailed in Technical Appendix 2.7: Watercourse Crossing Details. Although otter activity was found to be low within the ecological study area, best practice design for otters would be utilised at all watercourse crossings. Where necessary, the otter-friendly engineering works described in the Design Manual for Roads and Bridges (Highways Agency, 2008) would be adopted. This would allow the safe passage of otters under rather than over supported roads, by leaving spaces for ledges and providing ramps at either end of bridges and culverts.

### ***Potential Hydrological Changes due to Cabling, Tracks and Drains***

- 8.5.10 The potential for cable trenches to act as drains would be avoided by back-filling with compacted excavated material, rather than more porous bedding. In areas where cabling trenches are on steeper slopes, clay bunds may be installed if required within the trenches at regular intervals to minimise groundwater flow downslope. In order to limit the disruption to surface water flows caused by trackside drains, cross drains would be constructed at regular intervals to conduct surface flow across the track where it would be discharged into the drainage system.
- 8.5.11 Regular discharge points would limit the concentration of surface run-off and the diversion of flows between sub-catchments. Run-off control measures, such as interceptor drains and silt traps, would be used to control the flow of any run-off from operation activities and maintain water quality. In accordance with industry guidance (SNH, 2015), ditches would follow the natural flow of the ground with a generally constant depth to ditch invert. They would have shallow longitudinal gradients where possible. Regular check-dams would be used where necessary to control the rate of run-off. The ditches would be designed to intercept any stormwater run-off and to allow clean water flows to be transferred independently through the works without mixing with construction drainage. The regular interception and diversion of clean run-off around infrastructure would prevent significant disruption to shallow groundwater flow, flush areas and blanket bogs.
- 8.5.12 The proposed drainage management measures would also reduce the flow of water onto any exposed areas of rock and soil, thereby reducing the potential volume of silt-laden run-off requiring treatment. Greenfield run-off (i.e. non-silty surface water flow that has not yet passed over any disturbed construction areas) would be discharged into an area of vegetation for dispersion or infiltration, mimicking natural flows, so as not to alter downstream hydrology or soil moisture characteristics.
- 8.5.13 Floating track construction would be adopted with the aim of maintaining existing surface and sub-surface flows where possible. Floating track construction would avoid compression of peat by ensuring sufficiently low pressure from the tracks, maintaining maximum permeability by using large sized clean aggregate and installing small diameter pipe cross drains in the track base to aid

percolation. There would be no mounding or re-use of excavated peat in the track side areas where surface flows would be impeded. The track design would have due regard to key principles set out in the joint SNH/FCS guide to floating roads on peat (SNH/Forestry Commission Scotland, 2010). Track construction through potential GWDTE, where there is no clearly defined channel flow, would use a floating construction that incorporates measures, such as a porous granular rock fill blanket, non-alkaline porous layer and perforated pipes, to maintain the flow connectivity across the tracks. Careful management would mitigate potential changes to the hydrology of peat and GWDTE and consequent changes to habitats and species distribution.

### **Habitat Reinstatement, Restoration and Compensation**

- 8.5.14 Best practice techniques of vegetation and habitat restoration would be adopted and implemented in areas of disturbed vegetation, such as track sides, borrow pits and waste peat and soil mounding. Early restoration of all disturbed areas would be undertaken to minimise the effects of soil and peat exposure erosion. Re-instatement techniques would be agreed in consultation with SNH prior to construction.
- 8.5.15 Compensatory restoration for the predicted 85.1 ha of blanket bog permanently lost as a consequence of construction would be undertaken, as detailed in Technical Appendix 8.9: Habitat Management Plan and Technical Appendix 8.10: Habitat Management Plan Figures. The Habitat Management Plan (HMP) proposes to match the 260 ha of blanket bog that was to be restored in the ES and the ES Addendum. It is noted that the HMP was submitted to SIC for approval on the 15<sup>th</sup> June 2018. It is proposed that the same HMP would take effect for the proposed varied development.
- 8.5.16 The HMP would provide an additional degree of enhancement with the restoration of greater than three times the area lost. On this basis, the HMP is considered to substantially overcome (through offsetting) the adverse effects on priority peatland habitat. Additional blanket bog restoration would also result from the proposed mitigation measures for whimbrel *Numenius phaeopus* and diver *Gavia sp.*, as detailed in Technical Appendix 8.9: Habitat Management Plan. Any plant material used in restoration techniques would be of local provenance and appropriate for the locations being restored. Where it is not possible to use plant material of local provenance, the ECoW would be consulted to provide guidance on suitable alternatives. Since many blanket bog areas are degraded and the baseline conditions suggest that current management practices would continue to degrade the habitat, damaged and degraded areas greater than three times the area lost would be protected and restored. Extensive surveying of the existing state of the blanket bog has been carried out with a view to identifying candidate areas for restoration within common grazings. Technical Appendix 8.10 shows, in map form, the candidate areas which have been identified, amounting to 1,500 ha overall and 1,100 ha within the common grazings. As such significantly more degraded peatland habitat has been identified within the site than is required for compensatory mitigation.

### **Borrow Pit Working**

- 8.5.17 Borrow pit design and reinstatement would ensure that best practice is adopted and the sites are reinstated as soon as possible. Detailed reinstatement plans for each borrow pit would be produced separately and agreed in consultation with SNH prior to construction. Up to ten borrow pit sites have been identified, as discussed in Chapter 2: Description of Development. These range in size from approximately 0.2 ha to 1.8 ha. This provides a range of sites where reinstatement work would be undertaken. Further details are provided in Technical Appendix 8.9: Habitat Management Plan.

## 8.6 Good Practice Measures

### *Habitat Enhancement*

- 8.6.1 Enhancement measures are outlined in Technical Appendix 8.9: Habitat Management Plan and include the removal or redesign of two existing man-made barriers to fish movement within the ecological study area (and one outwith the ecological study area). By appraising these barriers, working with relevant stakeholders and removing impediments to fish movements, it would be possible to permit fish access into the upper reaches of the catchments of the ecological study area. This could have direct significant benefits to fish populations, and indirect benefits to otter and fish-eating birds. Another opportunity exists to enhance watercourses by encouraging the regeneration of riparian vegetation. Riparian habitat regeneration would directly benefit trout populations and other associated species. Any habitat enhancement would be agreed in consultation with land owners, crofters and their representatives.

## 8.7 Residual Effects

- 8.7.1 There would be no significant effects pre-mitigation on the Burn of Lunklet SSSI, Laxo Burn SSSI, otter and terrestrial invertebrates and, consequently, no residual effects would occur.

### *Habitats*

- 8.7.2 Implementation of the proposed SEMP would avoid likely significant adverse effects from pollution or siltation events on Sandwater SSSI, standing and running water and other habitats in the ecological study area.
- 8.7.3 Following completion of construction of the proposed varied development (including reinstatement work), residual adverse effects are anticipated for the short to medium term (approximately five to ten years), until habitats have re-established. Permanent loss would occur in blanket bog (85.1 ha) and potential GWDTE (30 ha) due to the excavation of turbine bases, other infrastructure and access tracks. This impact is considered to be of low magnitude due to the small footprint involved. Approximately 260 ha of blanket bog would be restored as part of the compensation and enhancement for the permanent loss of blanket bog during construction and additional blanket bog would be restored as part of proposed measures for whimbrel and diver *Gavia sp.* As a result, no significant residual effects are predicted.
- 8.7.4 Habitat reinstatement and proposed access track construction includes proposed measures to maintain hydrologic connectivity, where required, to minimise effects on potential GWDTE. As a result, no significant residual effects are predicted for potential GWDTE.
- 8.7.5 Overall, with the completion of the mitigation and good practice measures detailed in this chapter, whereby the most ecologically valuable and sensitive habitats have been avoided and measures to reduce impacts on all other habitats have been employed, the effects on habitats are considered to be **not significant**.

### *Fish and Freshwater Macro-invertebrates*

- 8.7.6 Following implementation of mitigation, such as the implementation of pollution prevention measures proposed in the SEMP, no residual effects are predicted on fish species or freshwater macro-invertebrates.

## 8.8 Monitoring

- 8.8.1 The Applicant proposes to establish the Shetland Windfarm Environmental Advisory Group (SWEAG) to exercise environmental (not just ecological) oversight of the proposed varied development. The purpose of SWEAG will be to oversee the implementation of a monitoring



strategy for the detection of environmental change resulting from the proposed varied development during the construction and operation phases.

## 8.9 Summary and Conclusions

- 8.9.1 The EclA considered potential effects on ecological features, such as designated nature conservation sites, habitats and protected species in line with best practice guidance (CIEEM, 2016).
- 8.9.2 The ecological study area was surveyed in 2005 and 2008 to provide baseline information on habitats and faunal species. It is considered that material changes in the extent or distribution of habitats or species are unlikely. Given that the footprint of the proposed varied development remains unchanged from the consented Viking Wind Farm, this baseline information is considered to form an appropriate basis for this EIA Report. Additional pre-construction surveys would be undertaken to update the baseline prior to construction commencing, in order to ensure potential impacts are properly managed.
- 8.9.3 The dominant habitat in the ecological study area is blanket bog, accounting for 86% of the recorded semi-natural habitats. Potential GWDTE were recorded throughout the site (<10% of the recorded habitats). Protected species surveys identified a low level of otter activity. Five fish species were identified in the ecological study area (European eel, Atlantic salmon, brown trout, three-spined stickleback and flounder), with only brown trout occurring in high densities. Freshwater macro-invertebrates were also recorded at low densities but were indicative of watercourses with good water quality and a small degree of organic enrichment.
- 8.9.4 The effects as a result of direct habitat loss through the construction of both the consented Viking Wind Farm and the proposed varied development would be offset through the restoration of an area of blanket bog greater than three times the area lost as a result of the proposed varied development. In addition, a range of other good practice mitigation measures are set out in this chapter.
- 8.9.5 Overall, with the application of mitigation, the consented Viking Wind Farm was assessed as having no significant effects. The proposed varied development would also have no significant effects on ecological features. On the basis that the footprint of the proposed varied development does not differ from the consented Viking Wind Farm, there would be no difference in the likely significant ecological effects.

### List of Figures

Figure 8.1: Ecological Designations within 10 km

Figure 8.2: Phase 1 Habitat Survey

Figure 8.3: NVC Communities

Figure 8.4: GWDTE

## 8.10 References

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### Glossary and Abbreviations

Abbreviation	Expanded term / Definition
BAP	Biodiversity Action Plan
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
EclA	Ecological Impact Assessment

<b>Abbreviation</b>	<b>Expanded term / Definition</b>
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HMP	Habitat Management Plan
LNR	Local Nature Reserve
NNR	National Nature Reserve
NVC	National Vegetation Classification
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SAC	Special Area of Conservation
SIC	Shetland Islands Council
SNH	Scottish Natural Heritage
SSSI	Site of Special Scientific Interest
SBRC	Shetland Biological Records Centre
SWEAG	Shetland Windfarm Environmental Advisory Group

