

Appendix 5.1 Methodology

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Appendix 5.1 Landscape and Visual impact Assessment Methodology

Introduction

The Landscape and Visual Impact Assessment method follows good practice guidance and advice on the assessment of the impacts of development on landscape and visual resources contained in the following documents:

- Guidelines for Landscape and Visual Assessment (Landscape Institute and Institute of Environmental Assessment, 3rd Edition 2013) (GLVIA 3);
- Landscape Character Assessment: Guidance for England and Scotland, The Countryside Agency and SNH, 2002;
- Assessing the Cumulative Impact of Onshore Wind Energy Developments, SNH, March 2012;
- Scottish Planning Policy, 2014;
- Spatial Planning for Onshore Wind Turbines – natural heritage considerations, SNH, June 2015;
- Assessing impacts on Wild Land Areas – technical guidance consultation on draft guidance, SNH, 2017;
- Siting and Designing Wind Farms in the Landscape – Version 3a, SNH 2017;
- Visual Representation of Windfarms: Guidance, Version 2.2, SNH, 2017;
- Photography and Photomontage in Landscape and Visual Impact Assessment. The Landscape Institute, Advice Note 01/11, March 2011, and consultation draft 2018.

The general approach to the LVIA includes the following tasks:

- Scoping;
- Baseline Assessment (comprising desk study, field survey and reporting); and
- Assessment and Reporting.

These tasks are described in detail below.

Scoping

The scope of the LVIA was agreed through written communication with Scottish Natural Heritage (SNH) and Shetland Islands Council (SIC) during 2018. Confirmation of the viewpoints to be included in the assessment was completed through correspondence Sarah Fletcher and Jonathan Swale of SNH and Austin Taylor of SIC (further details are provided in Chapter 5).

The Landscape and Visual Baseline

The first stage of the assessment reviews the existing landscape and visual resource of the study area in terms of its character, quality (i.e. the baseline condition) and establishes sensitivity of the resources/receptors. The baseline assessment forms the basis against which to assess the magnitude and significance of the predicted landscape and visual effects arising from the Proposed Development.

The Study Area for the LVIA is defined by a 40km radius oval offset from the outermost turbines of the Proposed Development, as shown in **Figure 5.1.1**. This extent of Study Area was determined as appropriate, given the height of the proposed wind turbines, accepted practice and was agreed in consultation with SNH and SIC.

The baseline assessment has three elements:

- Description – the process of collecting and presenting information about landscape and visual resources in a systematic manner;
- Classification – the more analytical activity whereby landscape and visual resources are refined into units of distinct and recognisable character; and
- Evaluation – the process of attributing a sensitivity rating to a given landscape or visual resource, by reference to specified criteria.

In determining these elements, the baseline assessment process comprises three stages: desk study, field survey and analysis. These are described below.

Future Baseline

In the absence of the Proposed Development does not proceed the land within the application boundary is expected to remain in its current state. No other changes are expected to occur.

Desk Study

The location of the Proposed Development and the extent of the application boundary is shown in **Figure 1.1 and 1.2a-e**. This is also detailed in Chapter 3 (Proposed Development). As part of the desk study, existing map and written data regarding the Proposed Development site and its environs were reviewed, including:

- Scottish Planning Policy (SPP), 2014;
- Renewable Energy and the Natural Heritage, SNH Policy Document, 2014;
- Spatial Planning for Onshore Wind Turbines – natural heritage considerations, SNH, June 2015;
- Wildness in Scotland’s Countryside, SNH Policy Statement 02/03;
- The Shetland Local Development Plan (LDP) 2014;
- Onshore Wind Energy, Supplementary Guidance, Shetland Local Development Plan, 2014 (Adopted February 2018);
- Local Landscape Areas, Supplementary Guidance, Shetland Local Development Plan, Consultation Draft 2014
- SNH Commissioned Report: No. 93: A Landscape Assessment of the Shetland Islands, Gillespies (1998);
- Shetland Coastal Character Assessment, NAFC Marine Centre, University of the Highlands and Islands, 2016
- Inventory of Historic Gardens and Designed Landscapes in Scotland, Historic Scotland; and
- Ordnance Survey Maps.

The desk study enabled the definition of the baseline landscape and visual resource within the study area and the main users of the area, key viewpoints and key features were identified (these were subsequently confirmed as part of the field studies).

The aim of the baseline visual assessment was to ensure that a representative range of viewpoints were included in the visual assessment in order to represent the identified receptors. The potential extent of visibility of the

Proposed Development was identified by reference to Ordnance Survey map data, the draft zone of theoretical visibility mapping, and observations made in the field. Following this, potential visual receptors likely to be affected by the Proposed Development were identified.

The viewpoints were selected to ensure that the visual assessment included a representative range in relation to the following criteria:

- Type of receptor - including different landscape character areas if appropriate;
- Distance of receptor from proposed development - to a maximum distance of a 40km radius oval offset from the outermost turbines of the Proposed Development, as shown in **Figure 5.1.1**; and
- Direction of receptor from Proposed Development, with the aim of achieving an even distribution from different compass points around the site.

The desk study provides the basis for subsequent field survey work. It informs the description of the Landscape and Coastal Character Areas (LCAs and CCAs) for the study area, the definition of the potential extent of visibility and the identification of the principal viewpoints and receptors, which were subsequently confirmed during the field survey.

Field Survey

The baseline landscape assessment included field survey work, carried out to verify the landscape and coastal character areas identified within the study area and gain a full appreciation of the relationship between the proposed development and the landscape.

Field survey work also verified the appropriateness of the proposed viewpoints. This involved checking the initial viewpoint selection on the ground, to ensure that there will be views of the Proposed Development from these locations. In some instances, this can be remedied by slight adjustments of the location, although this has to remain relevant to the particular receptor(s) for which the viewpoint was selected. It is also important to ensure that the selected viewpoints are a representative view, and demonstrate potential visibility of the Proposed Development for the selected location. The fieldwork was supported by analysis of Ordnance Survey maps, and observations were recorded with photographs.

Analysis and Reporting

Analysis and reporting of the baseline assessment took place after completion of the desk and field surveys. The baseline landscape assessment provided a description, classification and evaluation of the landscape and coastal character of the study area from which to assess the potential landscape effects of the proposed development. The baseline visual assessment provided an initial list of viewpoints for the viewpoint assessment, with brief commentary on viewpoint location, distance from the proposed development, receptors and rationale for selection, from which to assess the potential visual effects of the proposed development.

The baseline assessment is supported by **Figure 5.1.1**, LVIA Study Area, **Figure 5.1.2**, Landscape Designations (including long distance walking routes and National Cycle Routes), **Figure 5.1.3**, Landscape (and Coastal) Character Areas, **Figure 5.1.4**, Viewpoint Locations, **Figures 5.2.1-8** Zone of Theoretical Visibility (ZTV) maps.

The baseline assessment provided a description of the landscape and visual resource from which an assessment of the landscape and visual effects of the Proposed Development can be undertaken to determine the development's acceptability in principle and the appropriate mitigation measures.

Layout and Design Optimisation

The design and layout of the Proposed Development has been determined by a combination of landscape and visual factors alongside, ecology, ornithology and peat constraints. The intention was for the layout to have a coherent response to the underlying terrain of northern Yell and to appear as a logical, well designed layout in

views from surrounding receptors in the surrounding settlements. It is accepted that there will be areas of visibility. The design Proposed Development has achieved a balanced array which is seen to fit into the local landscape features. A full and detailed description of the process of design optimisation is set out in **Chapter 2: (Site Selection and Design Iterations)**.

Assessment of Residual Landscape and Visual Effects

The assessment describes the changes in the character and quality of the landscape and visual resources that are expected to result from the Proposed Development.

In assessing landscape impacts, the potential direct effects on the fabric of the landscape are considered, together with the potential effects on the perception of landscape character. The latter depends on a number of factors:

- the nature of the landscape area, including factors such as the nature of views and sense of enclosure;
- the extent of the potential visibility of the Proposed Development (e.g. the number of potential viewpoints and extent of the Proposed Development seen);
- the proportion of the character area with potential visibility; and
- the distance to the Proposed Development.

The baseline landscape character assessment together with an assessment of the potential effects on each character area is included in the assessment, along with consideration of the extent of potential significant effects.

A viewpoint analysis has been carried out to identify and evaluate the potential effects on visual amenity arising from the proposed development at specific representative locations in the study area. The viewpoints selected are considered to be representative of the spectrum of receptors in the study area, located at different distances, directions and elevations relative to the proposed development. The viewpoints were identified and agreed through consultation with SIC and SNH.

The assessment involved the preparation of existing photographs and photomontages from representative viewpoints to illustrate existing views, to predict the extent of views of the proposed development and to assist, together with field work, in the assessment of effects. These are shown in **Figures 5.3.1-5.3.21**.

Assessment Criteria

The aim of the LVIA is to identify, predict and evaluate likely significant landscape and visual effects associated with a proposed development. Wherever reasonably possible, identified effects are quantified, however, the nature of LVIA requires an element of interpretation using professional judgement. In order to provide a level of consistency to the assessment, the prediction of magnitude and assessment of significance of the residual landscape and visual effects have been based on pre-defined criteria.

Sensitivity of the Landscape and Magnitude of Change

The capacity of the landscape to accommodate change of the type and scale involved in the formation of the proposed development is assessed. Part of this process involves an assessment of landscape sensitivity, and susceptibility to change, in the context of these proposals.

The sensitivity of the landscape is not absolute and varies according to the existing landscape, the nature of the Proposed Development and the type of change being considered. The determination of the sensitivity of the landscape resource to changes associated with the Proposed Development is defined as high, medium, low or negligible - or intermediate bands between these. It is developed from guidance within GLVIA 3, and based on professional interpretation of a combination of parameters as follows:

- Key landscape characteristics - a professional evaluation informed by an understanding of the key characteristics of the landscape and existing character assessments, describing the elements that make up the landscape including:
 - Landscape value, as reflected by local, regional or national landscape designation;
 - Landscape scale – which is the relative size of the main landscape elements and components;
 - Physical influences such as landform;
 - Land cover, including different types of vegetation; and
 - The nature of views - whether open, closed, long or short distance, simple or diverse.

GLVIA 3 advises that the two components of ‘value’ and ‘susceptibility’ to change are taken into account in assigning sensitivity to change from the proposed development to landscape and visual receptors. The two factors are described and explained in greater detail below.

Landscape Value

Establishing landscape value requires an understanding of how society values different Landscapes. This is used to inform judgements on the significance of effects. Value is most often expressed through designation; however, undesignated landscapes and components of individual landscapes also need to be examined. As part of the baseline the following factors are considered when developing an understanding of landscape value:

- Landscape quality/condition - the physical state of the landscape;
- Scenic quality - aspects of the landscape that appeal to the senses;
- Rarity - presence of unusual or rare features;
- Recreation values - particularly where landscape experience is important;
- Perceptual aspects - value for particular experience such as tranquillity; and
- Cultural associations - with people such as writers or artists, events, etc.

Information on landscape value is included in the baseline descriptions of landscape character, and in information included in the citations for designated landscapes. This information has been reviewed and refined through survey and analysis.

Susceptibility to Change

GLVIA 3 defines susceptibility to change as *'the ability of the landscape to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies.'*

The degree to which a particular landscape type or area can accommodate change will vary with:


- existing land use;
- the pattern and scale of the landscape;
- visual enclosure/openness of views, and distribution of visual receptors; and
- the scope for mitigation, which will be in character with the existing landscape.

Key characteristics likely to be affected by the Proposed Development are evaluated, taking into account *'quality, value, contribution to landscape character, and the degree to which the particular element or characteristic can be replaced or substituted'*.

Landscape Sensitivity

In order to evaluate the sensitivity of the landscape receptor the criteria outlined in Table 1 below have been used, combining an understanding of the landscape value and susceptibility to change, based on GLVIA 3.

Table 1 – Landscape Sensitivity

Description	Sensitivity		
Landscape with important components, usually of particularly distinctive character and high quality, susceptible to relatively small changes and for which mitigation will be difficult or not possible. Some less distinctive or lower quality landscapes may also fall into this category where characteristics are such that mitigation of negative changes will be difficult. Landscape is often recognised through designation.	 <p style="text-align: center;">High Sensitivity</p>		
Landscape with characteristics reasonably tolerant of changes or for which mitigation is likely to be possible. These landscapes may be of high quality or of distinctive character but will usually be relatively ordinary and moderately valued.		<p style="text-align: center;">Medium Sensitivity</p>	
A less distinctive or relatively poor landscape with few features of quality or interest, potentially tolerant of substantial change and with scope for mitigation of any negative changes.			<p style="text-align: center;">Low Sensitivity</p>
Considerably modified or degraded landscape, with few/no features of quality or interest e.g. heavily industrialised landscapes.			

In some instances, a landscape with important components and high quality may be of a lower sensitivity as a result of its potential tolerance to change and opportunities for mitigation. Conversely a landscape with few features of interest may be of a higher sensitivity because it is vulnerable to change with little opportunity to mitigate change.

Having described the landscape resource and the key components that contribute to the character of the landscape character areas, and categorised the sensitivity of each landscape type to change, the probable magnitude of change sustained as a result of the proposed development is assessed. This change could be adverse, neutral or beneficial. The assessment of the magnitude of change is described below.

Magnitude of Change on Landscape Receptors

Each effect on landscape needs to be assessed in terms of its size or scale, the geographical extent of the area influenced, and its duration and reversibility.

Size or Scale (including nature of influence on landscape character)

Judgements are made about the size or scale of the change in the landscape that are likely to be experienced as a result of the Proposed Development. The judgements take account of:

- the extent to which landscape elements will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;
- the degree to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones; and
- whether the effect changes the key characteristics of the landscape which are critical to its distinctive character.

Geographic Extent

The geographic extent over which landscape effects are considered to be distinct from size or scale, the extent of effects will vary according to the nature of the proposal. The effect of a development may have an influence at the following scales:

- at site level, within the development site itself;
- at the level of the immediate setting of the site;
- at the scale of the landscape character area within which the proposal lies; or
- at a larger scale influencing several landscape character areas.

Table 2 - Judgement on Magnitude

Level of Magnitude	Definition of Magnitude
Substantial	Total loss or major alteration to key elements/features/characteristics of the baseline (pre-development) conditions such that post development character/composition of baseline will be fundamentally changed.
Moderate	Partial loss or alteration to one or more key elements/features/characteristics of the baseline (pre-development) conditions such that post development character/ composition/ attributes of baseline will be partially changed.
Slight	Minor loss of or alteration to one or more key elements/features/characteristics of the baseline (pre-development) conditions. Change arising from the loss/alteration will be discernible but underlying character/composition of the baseline condition will be similar to pre-development circumstances/patterns.
Negligible	Very minor loss or alteration to one or more key elements/features/characteristics of the baseline (pre-development) conditions. Change barely distinguishable, approximating to the “no change” situation.
None	No change.

Visual Receptor Sensitivity and Magnitude of Change

The sensitivity of visual receptors depends upon:

- the location of the viewpoint;
- the context of the view;
- the activity of the receptor; and
- frequency and duration of the view.

Value attached to Views

Judgements are also made about the value attached to views experienced taking account of:

- Recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations.
- Indication of value attached to particular locations as a distinctive view through appearance in guide books, provision of formal facilities such as a car park and sign board, references in art and literature.

Susceptibility of Visual Receptors to Change

The susceptibility of different visual receptors to changes in views is a function of:

- the occupation or activity of people experiencing the view at particular locations; and
- the extent to which their attention or interest may therefore be focussed on the views and visual amenity they experience at particular locations.

Visual receptor susceptibility is defined as high, medium, or low, or a gradation of these, as set out in Table 3.

Table 3 - Judgement on Sensitivity

Level of Sensitivity	Definition of Visual Receptor Sensitivity
High	Users of outdoor recreational facilities including strategic recreational footpaths, cycle routes or rights of way, whose attention may be focused on the landscape; important landscape features with physical, cultural or historic attributes; views from principal settlements; visitors to beauty spots and picnic areas.
Medium	Other footpaths; people travelling through or past the landscape on roads, train lines, boats or other transport routes, views from minor settlements.
	People engaged in outdoor sports or recreation (other than appreciation of the landscape), those whose attention may be focused on their work or activity rather than the wider landscape.
Low	Views from heavily industrialised or densely built up areas.

Magnitude of Change on Visual Receptors

The magnitude of visual change arising from the Proposed Development is described as substantial, moderate, slight, or negligible/none based on the overall extent of visibility. For individual viewpoints it will depend upon:

- distance of the viewpoint from the development;
- duration of effect;
- angle of view in relation to main receptor activity;
- proportion of the field of view occupied by the development;
- background to the development; and
- the extent of other built development visible, particularly vertical, elements.

Size or Scale

Judging magnitude of visual effects identified needs to take account of:

- The scale of change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the Proposed Development.
- The degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture.
- The nature of the Proposed Development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpses.

Geographical Extent

The geographical extent of a visual effect will vary with different viewpoints and is likely to reflect:

- the angle of the view in relation to the main activity of the receptor;
- the distance of the viewpoint from the proposed development; and
- the extent of the area over which the changes would be visible.

Duration and Reversibility of Landscape Effects

The effects on the landscape will continue for the permitted life of the wind farm. Following this time period, in the absence of a renewed planning permission, the turbines will be removed and the landscape reinstated with the majority of the proposed changes being fully reversible following de-commissioning.

Level and Significance of Effects

The significance of any identified landscape or visual effect has been assessed as major, moderate, minor or no effect. These categories have been determined by consideration of viewpoint sensitivity (combining susceptibility and value) and predicted magnitude of change (size, scale, geographical extent, duration) as described above, with the following matrix in Table 4 used as a guide to correlating sensitivity and magnitude to determine significance of effects.

Table 4 - Significance of Effects on Landscape and Visual Receptors

Sensitivity	Magnitude of Change			
	Substantial	Moderate	Slight	Negligible
High	Major	Major to Moderate	Moderate	Moderate to Minor
Medium	Major to Moderate	Moderate	Moderate to Minor	Minor
Low	Moderate	Moderate to Minor	Minor	Minor to None
Negligible	Moderate to Minor	Minor	Minor to None	Minor to None

This assessment has been calibrated such that the threshold of significance is major to moderate. In this assessment, moderate level effects, and those below this level are not considered to be significant. Where, for the purpose of this assessment, the landscape or visual effect has been classified as major or major/moderate, this is considered to be a significant effect in terms of the EIA Regulations. It is recognised that in some landscape and visual assessment methodologies a moderate level may be considered to be significant, but this is due to assessors calibrating their scale of effects differently, rather than because the threshold has been set high here. Essentially in an assessment where moderate is considered significant, the level of effect will be broadly similar to that which is described as major/moderate here. The Guidelines for Landscape and Visual Impact Assessment require that each assessor develops and explains their methodology but do not set out a prescriptive approach. Variation between assessors is therefore common. It should be noted that effects are not always adverse and may also be beneficial, however this chapter assumes that the effect is adverse unless otherwise stated.

The table is not used as a prescriptive tool, and the methodology and analysis of potential effects at any particular location must make allowance for the exercise of professional judgement. Thus, in some instances, a particular parameter may be considered as having a determining effect on the analysis.

Assessment of Cumulative Effects

General

This section sets out the scope of work undertaken for the assessment of the potential landscape and visual effects arising from the Proposed Development in conjunction with other built/consented and application stage wind farm developments. The effects within the 40km radius study area to Proposed Development have been assessed. Figures 5.5.1 to 5.5.8 highlight the existing/potential zone of theoretical visibility to each wind farm identified, and the degree of change brought about by the construction of the Proposed Development. The cut-off date for the inclusion of new schemes in the cumulative assessment was the 31st January 2019.

Cumulative Assessment Methodology

The approach used to address cumulative effects is based on GLVIA 3 and the SNH guidance note on cumulative assessment, *Assessing the Cumulative Impact of Onshore Wind Energy Developments*, March 2012.

Scope of Cumulative Assessment

During the LVIA scoping it was confirmed to Shetland Islands Council and consultees that the Cumulative Landscape and Visual Impact Assessment (CLVIA) should assess all sites within a 40km radius from the proposed Yell Wind Farm, that are in ‘the public domain’, as at December 2018 i.e.:

- any constructed wind farm;
- any consented wind farm proposal; and
- any wind farm proposal that has been lodged as a planning application to Shetland Islands Council within the study area.

At the time of writing, there are currently three operational or consented/under construction commercial scale wind farm developments within the 40km radius Study Area. Details of these wind farms are given below in Table 5 and their locations relative to the Proposed Development are illustrated in **Figure 5.4.1**, Sometimes it may appropriate to smaller non – commercial schemes. In the context of the Proposed Development, it was appropriate to confine the assessment to larger commercial schemes in the absence of significant smaller scale developments. Cumulative Site Location Plan. A Zone of Theoretical Visibility (ZTV) plan showing the existing visibility of the consented/built sites plus the Proposed Development is shown in **Figure 5.5.1**.

Table 5 - Built and Consented Wind Farms within the 40km Study Area

Wind Farm	Developer	Stage	Distance and Direction from Yell	Number of Wind Turbines	Blade Tip Height
Garth	North Yell Development Council	Operational	1.9 km to the south east	5	67 m
Beaw Field	Peel Energy	Consented	16.9 km to the south	17	145 m
Viking	Viking Energy	Consented and in planning for a tip height extension which would replace the	38.0 km to the south	103	145 m

Wind Farm	Developer	Stage	Distance and Direction from Yell	Number of Wind Turbines	Blade Tip Height
		consented project (see below)			

At the time of writing, there is currently one proposed wind farm development that is the subject of a planning application within 40 km of the Proposed Development site, as shown below in Table 6. The location of this site is shown on **Figure 5.4.2**. A Zone of Theoretical Visibility (ZTV) plan showing the existing visibility of the consented/built sites plus the Proposed Development and sites in planning is shown in **Figure 5.5.2**.

Table 6 - Wind Farms within Planning within the 40km Study Area

Wind Farm	Developer	Stage	Distance and Direction from Yell	Number of Wind Turbines	Blade Tip Height
Viking Tip Height Variation	Viking Energy	In Planning	38.0 km	103	155 m

The Proposed Development forms the focus of the study and the CLVIA provides a tool to consider ways in which the Proposed Development will have additional impacts when considered together with existing and proposed developments.

The assessment considers:

- The contribution that the Proposed Development will make to the ‘cumulative baseline’ – i.e. the operational and consented sites; noting that whilst operational sites are clearly already present in the landscape, there is a high degree of certainty around the future presence of consented sites, but it is also the case that some consented sites may not ever be operational.
- The effects on landscape and visual receptors and the effects resulting from the Proposed Development in combination with sites at application stage, noting that there is a lower degree of certainty that these sites may obtain consent and be operational: some will and others will fall away, such that the associated cumulated effects will not arise.

As set out in *Assessing the Cumulative Impact of Onshore Wind Energy Developments* (SNH, 2012), “*Cumulative impacts can be described as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effects of a set of developments taken together*” (Paragraph 7, page 4). “*The purpose of a Cumulative Landscape and Visual Assessment (CLVIA) is to describe, visually represent and assess the ways which a proposed windfarm would have additional impacts when considered in addition to other operational, consented or proposed windfarms. It should identify the significant cumulative effects arising from the proposed windfarm*” (Paragraph 55, page 12).

As such, the assessment presented includes consideration and assessment of both the additional effect of the Proposed Development, and the combined (total) changes resulting from a set of developments. In Shetland there are relatively few wind farms and they are located at a considerable distance from each other. The key issue for the Proposed Development is the relationship with the nearby existing Garth Wind Farm and to a lesser degree the consented Beaw Field Wind Farm, both of which have been taken as being part of the baseline. As such the cumulative assessment forms an integrated part of the main LVIA.

Types of Cumulative Effect

Cumulative effects are those that occur, or may occur, as a result of more than one project being constructed. Potential cumulative landscape and visual effects arise from the combined effects of additional wind farm developments. Combined effects relate to the following:

- Extending visibility of wind turbines over parts of the study area from where there are currently existing wind farm developments visible, which give rise to extended combined visibility of development at particular locations in the landscape, which may be simultaneous or successive in nature.
- Extending visibility of development over parts of the study area from where there are currently no developments visible, which may give rise to an extended sequential visibility of wind energy development across the landscape.
- Both simultaneous and sequential visibility of the Proposed Development.
- In relation to the simultaneous visibility, cumulative effects occur where more than one development is visible in the same direction from a particular place (combined visibility), as well as where developments become visible in more than one direction from that place, i.e. successive visibility. In relation to the sequential visibility, cumulative effects occur where the observer has to move to another viewpoint to see the development, so they appear in sequence depending on speed of travel and distance between the viewpoints.

The assessment of potential cumulative landscape and visual effects is carried out in the same generic way as that of non-cumulative effects. Professional judgements are made in relation to the magnitude of change caused by the proposed development to the existing landscape and visual baseline.

Magnitude of Cumulative Change

CLVIA effects may result from additional changes to the baseline landscape or visual amenity caused by the proposed development in conjunction with other developments. The emphasis of the assessment is on the changes the Proposed Development would bring to the existing landscape, which incorporates wind farm developments as part of its baseline landscape character and visual amenity. The assessment therefore identifies the additional contribution of the Proposed Development to the magnitude of change experienced as a result of all other wind farms in the Study Area. The magnitude of cumulative change arising from the Proposed Development is assessed as substantial, moderate, slight or negligible, based on interpretation of the following largely quantifiable parameters, to take account of cumulative change:

- number of existing and proposed wind farm / turbine developments visible;
- distance to existing and proposed wind farm developments;
- direction and distribution of existing and proposed wind farm developments;
- landscape setting, context and degree of visual coalescence of existing and proposed wind farm developments; and
- proportion of developed/undeveloped landscape occupied by existing and proposed wind farm developments.

The principle of magnitude of cumulative change makes it possible for the Proposed Development to have a major effect on a particular receptor while having only a minor cumulative effect. For example, if the magnitude of change of Development 1 on Receptor 1 is substantial (it is less than 1 km from the Receptor) the effect of Development on Receptor 1 is likely to be major. In terms of a cumulative effect on this receptor, Development 2 may be visible, but if it is located for example 15 km from the receptor, the magnitude of cumulative change is likely to be slight (Development 2 will hardly be seen at 15 km) and the cumulative effect is therefore minor.

A significant cumulative change is likely to only occur if both Development 1 and Development 2 are both fully visible, at relatively close distances from the receptor, possibly in the same direction of view and forming a large developed proportion of the skyline.

On the basis of professional interpretation of the above parameters, the magnitude of cumulative change arising at both landscape and visual receptors from each of the existing and the proposed developments, both individually and in combination with each other, has been evaluated for the proposed development.

Level and Significance of Cumulative Effects

The level of any identified cumulative landscape or visual effect has been assessed as major, moderate, minor or none, or intermediate between these bands, in relation to the sensitivity of the receptor and the predicted magnitude of change as outlined above. As in the case of noncumulative effects, the matrix shown in Table 4 is used to bring together receptor sensitivity and magnitude of change, and determine cumulative significance through professional judgement.

Supporting Graphics

Approach

The LVIA is supported by a range of figures including viewpoint photography. These have been prepared in adherence to the principles presented in the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Assessment, 3rd Edition 2013), the Landscape Institute's Advice Note 01/11 Photography and Photomontage in Landscape and Visual Impact Assessment, March 2011, and consultation draft 2018 and the Visual Representation of Windfarms: Guidance, Version 2.2, SNH, 2017.

Photography

All photography was undertaken through the use of a full frame digital Single Lens Reflex (dSLR) (Canon EOS 5d) camera mounted with a 50 millimetre (mm) 'fixed' lens (Canon EF 50mm - f/1.4 USM). The camera was mounted on a tripod with a panoramic head in order to obtain a stable platform for the single frame and panoramic views. The position of the tripod was recorded with a handheld GPS device. In addition to recording the location of the viewpoint, observations with regard to time of day, weather, cloud cover, and visibility were recorded.

Following completion of the fieldwork, the photography was reviewed and the clearest images selected for the production of panoramic images. In some cases, small adjustments are made to the images through the use of Adobe Photoshop/CS3 software in order to improve clarity.

The panoramas were then prepared through the joining of two or more images (typically three) in Photoshop.

Visualisations

The visualisations supporting the LVIA have been presented in order to provide a view of the Proposed Development within its landscape context and assist the assessor in determining the change and resultant effect on the viewpoint location.

The photomontages have been prepared through the use of Adobe Photoshop and Resoft Windfarm software. Use of Windfarm allows wind turbines to be accurately positioned in the photograph/panorama and rendered so as to account for cloud cover, sun position and colour of the proposed wind turbines. While every effort is undertaken to render the turbines to account for the prevailing lighting conditions, where they may appear indistinct against the background, manipulation of the rendering has been applied in order to make the turbine appear more distinct.

The presentation of graphics material requires careful consideration in order to prepare a visualisation that provides an accurately scaled depiction of the Proposed Development for use at the viewpoint location. In this instance, where a photomontage has been prepared for a viewpoint, the photomontage has been presented in two formats at A3 height and A1 width. These comprise:

- 1) Baseline panorama and matching wireline. A panorama, using an angle of view of 90°, illustrating the existing view presented alongside an identically sized matching wireframe. The size of the image and matching wireframe is 820mm by 130mm, with a 90° horizontal field of view and a 14.2° vertical field of view. To accommodate the required field of view the image is presented as a cylindrical projection. To facilitate the verification process, the horizontal extent of the central 50mm frame is indicated beneath the image, along with the extent of the 53.5° panorama. This format shows the wider landscape context within which the Proposed Development will sit, and allows direct comparison of the changes to be made in addition to providing a useful aid memoire. The recommended viewing distance for these visualisations is at a comfortable arm's length, as set out on the visualisation figure. In some instances, a wider field of view has been used at 90°, 180°, 270°.
- 2) An illustration of the proposal using an angle of view of 53.5° at the equivalent of a 50mm lens. The image size is 260mm high by 820mm wide. The horizontal field of view is 53.5° and the vertical field of view is 18.2° in the centre of the image. The image is presented as a planar projection. The recommended viewing distance for these visualisations is a comfortable arm's length. This format allows for direct comparison of the effects in the field at a comfortable viewing distance as recommended by SNH.

In the preparation of the narrow field of view image, the photomontage has been prepared utilising a single frame without manipulation. Visualisations in both formats have been used in order to establish the nature of effects on receptors as part of the LVIA.

In views where a photomontage has not been prepared, a wireframe view has been submitted. As with the photomontages, the turbines have been accurately positioned and the wireframe outputted so as to match the field of view to the panorama/photograph.

It should be noted that the LVIA has not been solely conducted on the visualisations presented within the ES but has included analysis of a range of wireframe views and other visualisations in addition to review of computer modelling of the site in addition to other materials not presented in this assessment.

Visibility Mapping

The visibility mapping or Zones of Theoretical Visibility (ZTVs) maps have been prepared through the use of Resoft's Windfarm computer software. The ZTV uses the Ordnance Survey's OS Terrain 5 digital terrain data which provides a representation of the bare-earth ground surface, in combination with a model of the wind turbine. The terrain model does not account for areas of tall vegetation and buildings which may in actuality screen the development, and in this regard, the model may overstate visibility of the turbines.

When calculating the extent of visibility, the software accounts for earth curvature and atmospheric refraction and provides the results in bands of colour. These are set to be clearly recognisable and distinct, however typically for cumulative visibility mapping, blue, yellow and green are adopted, green being the product of where the visibility of two developments overlap.

View height is also factored into the calculation, for the purposes of this assessment; the view height has been set at 2m above ground level.

While the ZTV provides a useful indication of where visibility of the wind turbines might be experienced, it should be noted that a very small portion of the wind turbine model used in the modelling may give rise to the indication of visibility, i.e. visibility to a small component of one wind turbine might indicate visibility of the whole turbine. In some instances, it may be useful to confirm the nature of visibility with wireframe views as part of the analysis of the visibility mapping.

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