NORTH FALLS

Offshore Wind Farm

PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

Appendix 29.1 Seascape, Landscape and Visual Impact Assessment and Visualisation Methodology

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North Falls Offshore Wind Farm

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North Falls Offshore Wind Farm

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Chapter 1
SLVIA Methodology

Introduction

This appendix sets out the detailed methodology used for the North Falls offshore (**Chapter 29**) and onshore (**Chapter 30**) Seascape, Landscape and Visual Impact Assessment (SLVIA), Landscape and Visual Impact Assessment (LVIA) and Cumulative SLVIA/ LVIA.

The methodology for the production of accompanying visualisations was based on current good practice guidance as set out by Scottish Natural Heritage (SNH) (now known as NatureScot)[1]. In the absence of alternative guidance from Natural England, NatureScot guidance provides industry standard guidance for the production of wind farm visualisations. Detailed information about the approach to viewpoint photography, and Zone of Theoretical Visibility (ZTV) and visualisation production is provided at the end of the appendix.

Seascape, landscape and visual assessments are separate, although linked, processes. SLVIA therefore considers the likely effects of a proposed development on:

- Seascape/ landscape as a resource in its own right (caused by changes to the constituent elements of the seascape/ landscape, its specific aesthetic or perceptual qualities and the character of the seascape/ landscape); and
- Views and visual amenity as experienced by people (caused by changes in the appearance of the seascape/ landscape).

SLVIA deals with seascape/ landscape and visual effects separately, followed by an assessment of cumulative seascape/ landscape and visual effects where relevant.

Guidance

This methodology has been developed by Chartered Landscape Architects (Chartered Members of the Landscape Institute (CMLI)) at Land Use Consultants Ltd (LUC), who have extensive experience in the assessment of seascape/ landscape and visual effects arising from wind energy developments and the associated onshore infrastructure.

The methodology has been developed primarily in accordance with the principles contained within the Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)[2]. NatureScot cumulative guidance[3] also informs the approach to the assessment of cumulative seascape/ landscape and visual effects.

Scope of Assessment

An SLVIA considers physical changes to the seascape/ landscape as well as changes in seascape/ landscape character. It also considers changes to areas designated for their scenic or landscape qualities, and the visual impacts of a proposed development as perceived by people.

All potentially significant seascape/ landscape and visual effects (including cumulative effects) are examined, including those relating to construction, operation and, where relevant, decommissioning.

Where it is judged that significant effects are unlikely to occur, the assessment of likely effects on some receptors may be 'scoped out'. For an Environmental Impact Assessment (EIA) development this is usually agreed at scoping stage.

Assessment Methodology

Study Area

The study area for an SLVIA/ LVIA is determined by the nature and scale of the development proposed and the nature of the study area and has been agreed through consultation with statutory consultees (60km radius around proposed turbines for offshore study and 2km radius around proposed substation and including the proposed cable corridor for onshore study). This was agreed through the SLVIA Topic Group Meeting (dated 07/12/22) and the Onshore Topic Group Meeting (dated 04/05/2022).

Methodological Overview

The key steps in the methodology for assessing seascape/ landscape and visual effects are as follows:

- The seascape/ landscape of the study area is analysed, and seascape/ landscape receptors identified, informed by desk and field-survey;
- The area over which the development will potentially be visible is established through the creation of an initial ZTV plan[4];
- The visual baseline is recorded in terms of the different receptors (groups of people) who may experience views of the development (informed by the initial ZTV) and the nature of their existing views and visual amenity;
- Potential assessment viewpoints are selected, as advocated by GLVIA3 to represent a range of different receptors and views, in consultation with statutory consultees:
  - *"**Representative viewpoints**, selected to represent the experience of different types of visual receptor, where larger numbers of viewpoints cannot all be included individually and where the significant effects are unlikely to differ – for example, certain points may be chosen to represent the views of users of particular public footpaths and bridleways;*
  - ***Specific viewpoints**, chosen because they are key and sometimes promoted viewpoints within the landscape, including for example specific local visitor attractions, viewpoints in areas of particularly noteworthy visual and/or recreational amenity such as landscapes with statutory landscape designations, or viewpoints with particular cultural landscape associations; and*
  - ***Illustrative viewpoints**, chosen specifically to demonstrate a particular effect or specific issues, which might, for example, be the restricted visibility at certain locations."* (GLVIA3, Para 6.19, Page 109).
- Likely significant effects on both the seascape/ landscape as a resource and visual receptors will be identified; and
- The level (and significance) of seascape/ landscape and visual effects are judged with reference to the **nature of the receptor** (commonly referred to as the sensitivity of the receptor), which considers both susceptibility and value, and the **nature of the effect** (commonly referred to as the magnitude of impact or magnitude of change), which considers a combination of judgements including scale, geographical extent, duration and reversibility.

Direction of Effects

As required by The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations' 2017) the assessment must identify the direction of effect as either being beneficial, adverse (also referred to as positive or negative) or neutral.

The direction of seascape/ landscape, visual and cumulative effects (**beneficial**, **adverse** or **neutral**) is determined in relation to the degree to which the proposal fits with the existing seascape/ landscape character or views, and the contribution to the seascape/ landscape or views that the proposed development makes, even if it is in contrast to the existing character of the seascape/ landscape or views.

With regard to wind energy development and its associated onshore infrastructure, whilst there is a broad spectrum of response from the strongly positive to the strongly negative, an assessment is required to take an objective approach. Therefore, to cover the 'maximum case effect' situation, likely seascape/ landscape and visual effects (including cumulative effects) are generally assumed to be adverse (negative).

[1] Scottish Natural Heritage (2017) Visual Representation of Wind Farms Guidance, Version 2.2
[2] The Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge
[3] Scottish Natural Heritage (2021) Guidance: assessing the cumulative landscape and visual impact of onshore wind energy developments
[4] A bare ground ZTV indicates areas from where a development is theoretically visible but does not account for screening from vegetation and/or buildings.

Method for Assessing Seascape/ landscape Effects

As outlined in GLVIA3 *"An assessment of landscape effects deals with the effects of change and development on landscape as a resource"* (GLVIA3, Para 5.1, Page 70). Changes may affect the elements that make up the seascape/ landscape, the aesthetic and perceptual aspects of the seascape/ landscape and its distinctive character.

An assessment of seascape/ landscape effects requires consideration of the nature of seascape/ landscape receptors (sensitivity of the receptor) and the magnitude of impact (or magnitude of change). GLVIA3 states that the nature of seascape/ landscape receptors, commonly referred to as their sensitivity, should be assessed in terms of the susceptibility of the receptor to the type of change proposed, and the value attached to the receptor. The nature of the effect on each seascape/ landscape receptor, commonly referred to as its magnitude of impact or change, should be assessed in terms of scale, geographical extent, duration and reversibility.

These aspects are considered together, to form a judgement regarding the overall significance of seascape/ landscape effects (GLVIA3, Figure 5.1 Page 71). The following sections set out the methodology used to evaluate sensitivity and magnitude.

Sensitivity of Seascape/ Landscape Receptors

The sensitivity of a seascape/ landscape receptor to change is defined as high, medium or low and is based on weighing up professional judgements regarding susceptibility and value, as set out in the table below.

Table 1.1: Sensitivity of Seascape/ Landscape Receptors

	Higher		Lower
Susceptibility	Attributes that make up the character of the seascape/ landscape offer very limited opportunities for the accommodation of change without key characteristics being fundamentally altered by wind energy development and its associated onshore infrastructure, leading to a different seascape/ landscape character.	↔	Attributes that make up the character of the seascape/ landscape are resilient to being changed by wind energy development and its associated onshore infrastructure.
Value	Landscapes with high scenic quality, high conservation interest, recreational value, important cultural associations or a high degree of rarity. Areas or features designated at a national level e.g., National Parks or National Scenic Areas or key features of these with national policy level protection.	↔	Landscape of poor condition and intactness, limited aesthetic qualities, or of character that is widespread. Areas or features that are not formally designated.

There may be a complex relationship between the value attached to a seascape/ landscape and the susceptibility of the seascape/ landscape to a specific change. Therefore, the rationale for judgements on the sensitivity of seascape/ landscape receptors needs to be clearly set out for each receptor. Further information on the criteria is provided below. It should be noted that whilst landscape designations at an international or national level are likely to be accorded the highest value, it does not necessarily follow that such landscapes all have a high susceptibility to all types of change, and conversely, undesignated landscapes may also have high value and susceptibility to change (GLVIA3, Page 90).

Susceptibility of Seascape/ Landscape Receptors

Susceptibility is defined by GLVIA3 as *"the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) 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"* (GLVIA3 paragraph 5.40).

A series of criteria are used to evaluate the susceptibility of Seascape/ Landscape Character Types (LCT) or Areas (LCA) to wind energy development, and its associated onshore infrastructure, as set out in the table below.

Table 1.2: Seascape/ Landscape Susceptibility Criteria

	Aspects Indicating Reduced Susceptibility		Aspects Indicating Greater Susceptibility
Scale	Larger scale	↔	Smaller scale
Value	Absence of strong topographical variety, featureless, convex or flat	↔	Presence of strong topographical variety or distinctive landform features
Seascape/ landscape pattern and complexity	Simple	↔	Complex
Settlement and man-made influence	Regular or uniform	↔	Rugged and irregular
Skylines	Presence of contemporary structures e.g., utility, infrastructure or industrial elements	↔	Absence of modern development
Inter-visibility with adjacent seascape/ landscapes	Non-prominent/screened skylines	↔	Presence of small scale, historic or vernacular settlement
Perceptual aspects	Presence of existing modern man-made features. Developed, urban.	↔	Distinctive, undeveloped skylines. Remote, natural, wild.

Published seascape/ landscape capacity or sensitivity studies (where they exist) may be reviewed to inform the evaluation of susceptibility, in addition to fieldwork undertaken across the study area. This review includes an evaluation as to the relevance of the publication to the assessment being undertaken (e.g., consideration of the purpose and scope of the published studies and whether they have become out of date).

Seascape/ landscape susceptibility is described as being **high**, **medium** or **low**.

Value of Seascape/ Landscape Receptors

The European Landscape Convention advocates that all landscape is of value, whether it is the subject of defined landscape designation or not, *"The landscape is important as a component of the environment and of people's surroundings in both town and country and whether it is ordinary landscape or outstanding landscape"* (Explanatory Report to the European Landscape Convention, Page 6). The value of a seascape/ landscape receptor is recognised as being a key contributing factor to the sensitivity of seascape/ landscape receptors.

The value of seascape/ landscape receptors is determined with reference to:

- Review of relevant designations and the level of policy importance that they signify (such as landscapes designated at international, national or local level); and/or
- Application of criteria that indicate value (such as scenic quality, rarity, recreational value, representativeness, conservation interests, perceptual aspects and artistic associations) as described in GLVIA3, paragraphs 5.44-5.47.

Internationally and nationally designated landscapes would generally indicate landscape of higher value whereas those without formal designation (such as a widespread or common landscape type without high scenic quality) are likely to be of lower value, bearing in mind that all seascape/ landscapes are valued at some level. There is however variation across both designated and undesignated areas, and so judgements regarding value are also informed by fieldwork.

Seascape/ landscape value is described as being **high**, **medium** or **low**.

Magnitude of Seascape/ Landscape Impact

The overall judgement of magnitude of seascape/ landscape impact (magnitude of change) is based on combining professional judgements on scale, geographical extent, duration and reversibility. Further information on the criteria is provided below.

Scale of Change

For seascape/ landscape elements/features this depends on the extent of existing seascape/ landscape elements that would be lost or changed, the proportion of the total extent that this represents, and the contribution of that element to the character of the seascape/ landscape.

In terms of seascape/ landscape character, this reflects the degree to which the character of the seascape/ landscape would change as a result of removal or addition of seascape/ landscape components, and how the changes would affect key characteristics.

The scale of the change is described as being **large**, **medium**, **small**, or **barely perceptible**.

Geographical Extent

The geographical extent over which the seascape/ landscape effect would arise is described as being **large** (scale of the seascape/ landscape character type, or widespread, affecting several seascape/ landscape types or character areas), **medium** (more immediate surroundings) or **small** (site level).

Duration

GLVIA3 states that *"Duration can usually be simply judged on a scale such as short term, medium term or long term"* (GLVIA3, Page 91). For the purposes of the assessment, duration is often determined in relation to the phases of the proposed development, as follows:

- **Short-term** effects are those that occur during construction, and may extend into the early part of the operational phase, e.g., construction activities, generally lasting 0-5 years;
- **Medium-term** effects are those that occur during part of the operational phase, generally lasting 5-10 years; and
- **Long-term** effects are those which occur throughout the operational phase (in this instance 30 years), e.g., presence of turbines/ onshore infrastructure, or are permanent effects which continue after the operational phase, generally lasting over 10 years.

Reversibility

In accordance with the principles contained within GLVIA3, reversibility is reported as **reversible**, **partially reversible** or **irreversible** (i.e., permanent), and is related to whether the change can be reversed at the end of the phase of development under consideration (i.e., at the end of construction or at the end of the operational lifespan of the development).

Judgements on the magnitude of seascape/ landscape impact (magnitude of change) are recorded as **high**, **medium, low or negligible** and are guided by the table below.

Table 1.3: Magnitude of Seascape/ Landscape Impact

	Higher		Lower
Scale	Extensive loss of seascape/ landscape features and/or elements, and/or change in, or loss of key seascape/ landscape characteristics, and/or creation of new key seascape/ landscape characteristics	↔	Limited loss of seascape/ landscape features and/or elements, and/or change in or loss of some secondary seascape/ landscape characteristics
Geographical Extent	Change in seascape/ landscape features and/or character extending considerably beyond the immediate site and potentially affecting multiple seascape/ landscape character types/areas	↔	Change in seascape/ landscape features and/or character extending contained within or local to the immediate site and affecting only a small part of the seascape/ landscape character type/area
Duration	Changes experienced for a period of around 10 years or more	↔	Changes experienced for a shorter period of up to 5 years
Reversibility	Change to features, elements or character which cannot be undone or are only partly reversible after a long period	↔	A temporary seascape/ landscape change which is largely reversible following the completion of
	Higher		Lower
			construction, or decommissioning of the development

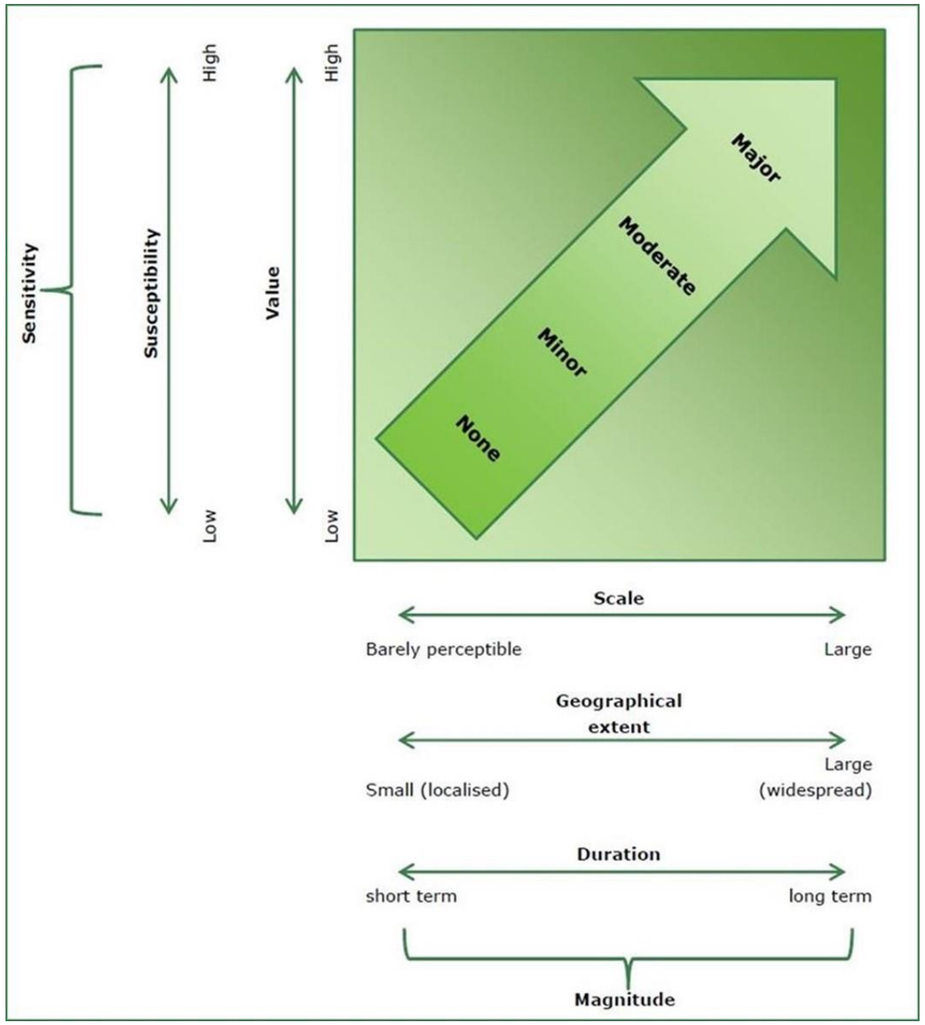
Judging Levels of Seascape/ landscape Effect and Significance

The final step in the assessment requires the judgements of sensitivity and magnitude of impact to be combined to make an informed professional assessment on the significance of each seascape/ landscape effect (GLVIA3, Figure 5.1, Page 71).

Although a numerical or formal weighting system is not applied, consideration of the relative importance of each aspect is made to feed into the overall decision. Levels of effect are identified as **negligible**, **minor**, **moderate** or **major** where moderate and major effects are considered significant in the context of the EIA Regulations.

This determination requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case-by-case basis, guided by the principles set out in **Figure 1.1** below. A rigid matrix-type approach, which does not take on board professional judgement and experience, and where the level of effect is defined simply based on the level of sensitivity (nature of receptor) combined with the magnitude of impact (magnitude of change), is not used. As such, the conclusion on the level of effect is not always the same.

Figure 1.1: Judging Levels of Effect – Seascape/ Landscape or Visual (including cumulative)



Method for Assessing Visual Effects

Significance of Visual Effects

As outlined in GLVIA3 *"An assessment of visual effects deals with the effects of change and development on views available to people and their visual amenity"* (GLVIA3, Para 6.1, Page 98). Changes in views may be experienced by people at different locations across the offshore and onshore study area including from static locations (normally assessed using representative viewpoints) and whilst moving through the landscape (normally referred to as sequential views, e.g., from roads and walking routes or offshore on boats).

Visual receptors are individuals or groups of people who may be affected by changes in views and visual amenity. They are usually grouped by their occupation or activity (e.g., residents, motorists, recreational users) and the extent to which their attention is focused on the view (GLVIA3, Paras. 6.31-6.32, Page 113).

GLVIA3 states that the sensitivity of visual receptors should be assessed in terms of the susceptibility of the receptor to change in views and/or visual amenity and the value attached to particular views. The magnitude of impact (magnitude of change) should be assessed in terms of the scale, geographical extent, duration and reversibility of the effect.

These aspects are considered together, to form a judgement regarding the overall significance of visual effect (GLVIA3, Figure 6.1, Page 99). The following sections set out the methodology used to evaluate sensitivity and magnitude.

Sensitivity of Visual Receptor

The sensitivity of a visual receptor to change is defined as high, medium or low and is based on weighing up professional judgements regarding susceptibility and value, and each of their component considerations, as set out in the table below.

Table 1.4: Sensitivity of Visual Receptors

	Higher		Lower
Susceptibility	Viewers whose attention or interest is focused on their surroundings, including communities/individual residential receptors/people engaged in outdoor recreation/ visitors to heritage assets or other attractions where views of surrounding area an important contributor.	↔	People whose attention is not on their surroundings (and where setting is not important to the quality of working life) such as commuters/people engaged in outdoor sports/people at their place of work.
Value	Views may be recorded in management plans, guide books, and/or which are likely to be experienced by large numbers of people.	↔	Views which are not documented or protected.

The sensitivity of visual receptors may involve a complex relationship between a visual receptor's (e.g., person's) susceptibility to change and the value attached to a view. Therefore, the rationale for judgements of sensitivity is clearly set out for each receptor in relation to both its susceptibility (to the type of change proposed) and its value. Further information on the criteria is provided below.

Susceptibility of Visual Receptor

The susceptibility of visual receptors to changes in views/visual amenity is a function of the occupation or activity of people experiencing the view and the extent to which their attention is focused on views (GLVIA 3, para 6.32). This is recorded as high, medium or low informed by the table below.

Table 1.5: Susceptibility of Visual Receptors

High	Medium	Low
People whose attention or interest is focussed on their surroundings, including: ■ Communities where views contribute to the landscape setting enjoyed by residents; ■ People engaged in outdoor recreation (including users of cycle routes, footpaths and public rights of way whose interest is likely to be focused on the landscape); ■ Visitors to heritage assets or other attractions where views of surroundings are an important contributor to experience; and	■ People travelling in vehicles on scenic routes and tourist routes, where attention is focused on the surrounding landscape, but is transitory; and ■ People at their place of work whose attention is focused on the surroundings and where setting is important to the quality of working life.	■ People travelling more rapidly on more major roads, rail or transport routes (not recognised as scenic routes); ■ People engaged in outdoor sport or recreation which does not involve or depend upon appreciation of views of the landscape; and ■ People at their place of work whose attention is not on their surroundings (and where setting is not important to the quality of working life).

High	Medium	Low
■ Visitors to formal or promoted stopping places on scenic or tourist routes.		

Value of View or Visual Amenity

GLVIA3 also requires evaluation of the value attached to the view or visual amenity and relates this to planning designations and cultural associations (GLVIA3, Para. 6.37, Page 114).

Recognition of the value of a view is determined with reference to:

- Planning designations specific to views;
- Whether it is recorded as important in relation to designated landscapes (such as views specifically mentioned in the special qualities of an Area of Outstanding Natural Beauty);
- Whether it is recorded as important in relation to heritage assets (such as designed views recorded in citations of Gardens and Designed Landscapes (GDL) or views recorded as of importance in Conservation Area Appraisals); and
- The value attached to views by visitors, for example through appearances in guidebooks or on tourist maps, provision of facilities for their enjoyment and references to them in literature and art.

A designated viewpoint or scenic route advertised on maps and in tourist information, or which is a significant destination in its own right, is likely to indicate a view of higher value. High value views may also be recognised in relation to the special qualities of a designated landscape or heritage asset, or it may be a view familiar from photographs or paintings.

Views experienced from viewpoints or routes not recognised formally or advertised in tourist information, or which are not provided with interpretation or, in some cases, formal access are likely to be of lower value.

Judgements on the value of views or visual amenity are recorded as **high**, **medium** or **low**.

Magnitude of Visual Impact

The overall judgement of magnitude of visual impact (magnitude of change) is based on weighing up professional judgements on scale, geographical extent, duration and reversibility. Further information on the criteria is provided below.

Scale of Change

The scale of a visual change depends on:

- The scale of the 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; and
- The nature of the view 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.

Note that wireframes and ZTVs prepared to illustrate potential visual effects are calculated on the basis of bare ground and therefore demonstrate the maximum extent of visibility possible, in the absence of buildings or vegetation. Where woodland is present, consideration is given to seasonal changes and if levels of screening by are likely to change notably.

In this assessment scale of visual change is described as being **large**, **medium**, **small** or **barely perceptible**.

Geographical Extent

The geographical extent of a visual change records the extent of the area over which the changes will be visible e.g., whether this is a unique viewpoint from where the proposed development can be glimpsed, or whether it represents a large area from which similar views are gained. Geographical extent is described as being **large**, **medium** or **small**.

Duration

The duration of visual effects is reported as **short-term**, **medium-term** or **long-term**, as defined for the duration of landscape effects (see above).

Reversibility

Reversibility is reported as **irreversible** (i.e., permanent), **partially reversible** or **reversible**, and is related to whether the visual change can be reversed at the end of the phase of development under consideration (i.e., at the end of construction or at the end of the operational lifespan of the development). For the offshore works operational visual effects are generally considered to be partially reversible as the decommissioning phase will remove turbines and offshore substation platforms at the end of the operational phase.

Judgements on the magnitude of visual impact are recorded as **high**, **medium, low or negligible** and guided by the table below.

Table 1.6: Magnitude of Visual Impacts

	Higher		Lower
Scale	A large visual change resulting from the proposed development is the most notable aspect of the view, perhaps as a result of the development being in close proximity, or because a substantial part of the view is affected, or because the development introduces a new focal point and/or provides contrast with the existing view and/or changes the scenic qualities of the view.	↔	A small or some visual change resulting from the proposed development as a minor or generally unnoticed aspect of the view, perhaps as a result of the development being in the distance, or because only a small part of the view is affected, and/or because the development does not introduce a new focal point or is in contrast with the existing view and/ does not change the scenic qualities of the view.
Geographical Extent	The assessment location is clearly representative of similar visual effects over an extensive geographic area.	↔	The assessment location clearly represents a small geographic area.
Duration	Visual change experienced over around 10 years or more.	↔	Visual change experienced over a short period of up to 5 years.
Reversibility	A permanent visual change which is not reversible or only partially reversible following decommissioning of the proposed development.	↔	A temporary visual change which is largely reversible following the completion of construction, or decommissioning, of the proposed development.

Judging the Level of Visual Effect and Significance

As for landscape effects, the final step in the assessment requires the judgements of sensitivity of visual receptor and magnitude of visual impact (magnitude of change) to be combined to make an informed professional assessment on the significance of each visual effect.

Although a numerical or formal weighting system is not applied, consideration of the relative importance of each aspect is made to feed into the overall decision. Levels of visual effect are identified as **negligible**, **minor**, **moderate** or **major** where moderate and major visual effects are considered **significant** in the context of the EIA Regulations.

This determination requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. As such, the conclusion on the level of effect is not always the same. Judgements are made on a case-by-case basis, guided by the same principles as set out in **Figure 1.1** above.

Cumulative Seascape, Landscape and Visual Impact Assessment (CSLVIA)

The aim of a Cumulative Landscape and Visual Impact Assessment (CLVIA) is to *"describe, visually represent and assess the ways in which a proposed windfarm would have additional impacts when considered together with other existing, consented or proposed windfarms"*[5] (Para. 55, SNH, 2012).

The cumulative assessment therefore focuses on the additional cumulative change which may result from the introduction of a proposed development. The cumulative assessment may also make reference to total (also referred to as combined) cumulative effects, where these have the potential to be significant. A cumulative assessment may also consider the potential interactions between different types of development (e.g., transmission infrastructure, other energy generation stations or other built development) if these are likely to result in similar landscape and visual impacts.

As with an SLVIA, a CSLVIA deals with cumulative seascape/ landscape and visual effects separately.

Differences Between SLVIA and CSLVIA

Although both SLVIA and CSLVIA look at the effects of a proposed development on the seascape/ landscape and on views, there are differences in the baseline against which the assessments are carried out.

For the SLVIA, the baseline includes existing wind farm and onshore substation developments which are present in the landscape at the time of undertaking the assessment, which may be either operational or under construction as they form a part of the baseline situation. Their presence has the potential to influence the assessment of effects on landscape character and the assessment of effects on views. For the CSLVIA the baseline is partially speculative and includes (in addition to existing wind farms and onshore substations):

- Scenario 1: Wind farms/ onshore substations which have been granted planning consent but are not yet constructed (consented).
- Scenario 2: Submitted valid wind farm applications which are currently awaiting determination by the relevant consenting authority, including those at appeal and in some instances those currently at scoping (with relevance to the scoping stage Five Estuaries and East Anglia GREEN onshore substations, considered in the onshore CLVIA)..

Types of Cumulative Effects

SNH's Assessing the Cumulative Impact of Onshore Wind Energy Developments[6] states that *"cumulative landscape effects can impact on either the physical fabric or character of the landscape, or any special values attached to it"* (Para. 48, SNH, 2012).

Three types of cumulative effects on visual amenity are considered in the assessment: combined, successive and sequential:

- **Combined effects** occur where a static viewer is able to view two or more developments from a viewpoint within the viewers' same arc of vision (assumed to be about 90 degrees for the purpose of the assessment);
- **Successive effects** occur where a static viewer is able to view two or more developments from a viewpoint, but needs to turn to see them; and
- **Sequential effects** occur when a viewer is moving through the landscape from one area to another, for instance when a person is travelling along a road or footpath, and is able to see two or more developments at the same, or at different times as they pass along the route. Frequently, sequential effects occur where developments appear regularly, with short time lapses between points of visibility. Occasionally sequential effects occur where long periods of time lapse between views of developments, depending on speed of travel and distance between viewpoints.

Assessment Methodology for CSLVIA

The CSLVIA considers the potential effects of the addition of a proposed development, against a landscape baseline that includes wind farms/ associated onshore substations that may or may not be present in the landscape in the future, i.e., schemes that are consented but not yet built, and/or undetermined planning applications. The developments included in each scenario are assumed to be present in the landscape for the purposes of the CSLVIA.

The methodology for the CSLVIA follows that of the SLVIA, which considers the introduction of a proposed development to a baseline which includes existing (operational and under construction) wind farms and associated onshore substations. The scale of cumulative change considers aspects such as:

- The pattern and arrangement of developments in the seascape/ landscape or view, e.g., developments seen in one direction or part of the view (combined views), or seen in different directions (successive views in which the viewer must turn) or developments seen sequentially along a route;
- The relationship between the scale of the wind farms, including turbine size and number, and if wind farms appear balanced in views in terms of their composition, or at odds with one another; and
- The distances between developments, how they relate to each other and their distances from the viewer.

Significance of Cumulative Effects

As for a SLVIA, judging the significance of cumulative landscape and visual effects requires consideration of the sensitivity and the magnitude of impact (magnitude of change) on those receptors. The following sections set out the methodology applied for the assessment of cumulative effects for both seascape/ landscape and visual receptors and explains the terms used.

Method for Assessing Cumulative Seascape/ Landscape Effects

Sensitivity

An assessment of cumulative seascape/ landscape effects requires consideration of the sensitivity of the seascape/ landscape receptors. This requires consideration of susceptibility and value, and is as recorded in the SLVIA/ LVIA.

Magnitude of Cumulative Seascape/ Landscape Impacts

Similar to the methodology applied for an SLVIA, the magnitude of cumulative seascape/ landscape impact (magnitude of change) is based on combining professional judgements on scale, geographical extent, duration and reversibility. Judgements on the magnitude of cumulative seascape/ landscape impact (magnitude of change) are recorded as high, medium or low.

Scale of Change

The scale of cumulative seascape/ landscape change is the additional influence the proposed development has on the characteristics and character of the area assuming the other developments considered in the CSLVIA baseline scenarios are already present in the landscape. This is influenced by:

- How the proposal fits with existing pattern of development, including the relationship to seascape/ landscape character types and areas; and
- The siting and design of the proposed development in relation to other existing and proposed developments (including distance between, composition, size and scale).

Geographical Extent

As for the SLVIA, the geographical extent over which the cumulative landscape change will be experienced is described as being large (scale of the seascape/ landscape character type or widespread, affecting several seascape/ landscape types or character areas), medium (immediate surroundings) or small (site level).

Duration and Reversibility

For the purpose of the cumulative seascape/ landscape assessment consideration of the judgements of the duration and reversibility of landscape effects are as recorded in the SLVIA.

[5] Scottish Natural Heritage (2012) Assessing the cumulative impact of onshore wind energy developments

[6] Scottish Natural Heritage (2012) Assessing the cumulative impact of onshore wind energy developments [online]. Available at: https://www.nature.scot/guidance-assessing-cumulative-impact-onshore-wind-energy-developments [Accessed on 02 March 2020]

Judgements on the magnitude of cumulative seascape/ landscape impact (magnitude of change) are recorded as high, medium or low.

Levels of Cumulative Landscape Effect and Significance

The final step in the assessment of cumulative seascape/ landscape effects requires the judgements of sensitivity and magnitude of cumulative seascape/ landscape impact to be combined to make an informed professional assessment on the significance of each cumulative seascape/ landscape effect.

As for the SLVIA the levels of cumulative seascape/ landscape effect are described as negligible, minor, moderate or major where moderate and major cumulative seascape/ landscape effects are considered significant in the context of the EIA Regulations.

More significant effects are likely where:

- The proposed development extends or intensifies a seascape/ landscape effect;
- The proposed development 'fills' an area such that it alters the seascape/ landscape resource; and/or
- The interaction between the proposed development and other developments means that the total effect on the seascape/ landscape is greater than the sum of its parts.

GLVIA 3 states *"The most significant cumulative landscape effects are likely to be those that would give rise to changes in the landscape character of the study area of such an extent as to have major effects on its key characteristics and even, in some cases, to transform it into a different landscape type. This may be the case where the project being considered itself tips the balance through its additional effects. The emphasis must always remain on the main project being assessed and how or whether it adds to or combines with the others being considered to create a significant cumulative effect"* (GLVIA 3, Para 7.28).

This determination of cumulative seascape/ landscape effects requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case-by-case basis, guided by the same principles as set out in **Figure 1.1** above.

Method for Assessing Cumulative Visual Effects

Sensitivity

The assessment of the significance of cumulative visual effects requires consideration of the sensitivity of the visual receptors. This requires consideration of susceptibility and value, and is as recorded in the SLVIA.

Magnitude of Cumulative Visual Impacts

As for cumulative seascape/ landscape effects and the methodology for the SLVIA, the magnitude of cumulative visual impact (magnitude of change) is based on combining professional judgements on scale; geographical extent; duration and reversibility. Judgements on the magnitude of cumulative visual effect are recorded as high, medium, low or barely perceptible.

Scale

The scale of cumulative change to views depends on the additional influence the proposed development has on views assuming the other wind farm developments/ associated onshore substations are already present in the landscape. This is influenced by:

- Whether the proposed development introduces development into a new part of the view so that the proportion of the developed part of the view increases;
- The relationship between the proposed development and other developments in terms of design, size and layout;
- The apparent visual relationship of cumulative developments to seascape/ landscape character types and or areas; and/or
- In the case of magnitude of impact to routes, the relative duration of views of developments from routes.

There has to be clear visibility of more than one development, of which one must be the proposed development, for there to be a cumulative effect (given this is an assessment of the effects of the proposed development and not a broader CLVIA of combined cumulative effects). Where the proposed development is clearly visible and other developments are not, the effect is likely to be the same as recorded in the SLVIA (i.e., the effect is not a cumulative effect).

Geographical Extent

As for the SLVIA, the geographical extent of cumulative visual changes records the extent of the area over which the changes will be visible e.g., whether this is a unique viewpoint from where the proposed wind farm can be glimpsed, or whether it represents a large area from which similar views are gained from large areas. Geographical extent is described as being large, medium or small.

Duration and Reversibility

For the purpose of the cumulative visual assessment consideration of the judgements of the duration and reversibility of visual effects are as recorded in the SLVIA.

Levels of Cumulative Visual Effect and Significance

The final step in the assessment of cumulative visual effects requires the judgements of sensitivity and magnitude of cumulative visual impact to be combined to make an informed professional assessment on the significance of each cumulative visual effect.

As for the SLVIA the levels of cumulative visual effect are described as negligible, minor, moderate or major, where moderate and major cumulative visual effects are considered significant in the context of the EIA Regulations.

The evaluations of susceptibility, value, scale, geographical extent, duration and reversibility are considered together to provide an overall profile of each identified visual effect. An overview is taken of the distribution of judgements for each aspect to make an informed professional assessment of the overall level of each visual effect, drawing on guidance provided in GLVIA3. Levels of effect are identified as negligible, minor, moderate or major where moderate and major visual effects are considered significant in the context of the EIA Regulations.

More significant effects are likely where:

- The proposed development extends or intensifies a visual effect;
- The proposed development 'fills' an area such that it alters the view/ visual amenity;
- The interaction between the proposed development and other developments means that the total visual effect is greater than the sum of its parts; and/or
- The proposed development will lengthen the time over which effects are experienced (sequential effects).

This determination of cumulative visual effects requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Again, as for the assessment of seascape/ landscape and visual effects, judgements are made on a case-by-case basis, guided by the same principles as set out in **Figure 1.1** above.

Visualisation Methodology

This appendix sets out the approach to the production of the visualisations which accompany the North Falls SLVIA and LVIA contained in chapter 29 and 30. Figures are included in Volume II of the PEIR.

The methodology for the production of visualisations was based on current good practice guidance from NatureScot (formerly SNH)[7] and the Landscape Institute[8]. Further information about the approach is provided below.

Data Sources

Data used for generating maps and visualisations:

- OS Terrain 50 DTM (offshore ZTV);

[7] Scottish Natural Heritage (2017) Visual Representation of Wind Farms, Version 2.2

[8] Landscape Institute (2019) Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment

- 1m resolution first return LIDAR data (onshore ZTV); and
- Ordnance Survey 1:25,000 and 1:50,000 raster data.

Zone of Theoretical Visibility (ZTV) Mapping

Evaluation of the theoretical extent to which the development would be visible was informed by establishing a ZTV, using specific computer software designed to calculate the theoretical visibility of the proposed development within its surroundings.

For the offshore ZTV, ESRI's ArcMap 10.5.1 software was used to generate the ZTV. The Spatial Analyst/Viewshed tool does not use mathematically approximate methods. This program calculates areas from which the turbine hubs and maximum blade tip height are potentially visible. This is performed on a 'bare ground' computer generated terrain model, which does not take account of potential screening by buildings or vegetation. It should be noted that the software uses raster[9] height data, but while it is displayed as continuous data (with each grid square referred to as a 'cell'), it assumes a single height value from the centre of that cell for the whole cell. Therefore, any height variations between centre points of cells will not be recognised.

The DTM used for the SLVIA analysis is OS Terrain® 50 height data, obtained from Ordnance Survey in July 2022. The DTM data has not been altered (i.e., by the addition of local surface screening features) for the production of the ZTV. We have not identified any significant discrepancies between the used DTM and the actual topography around the Study Area. The effect of earth curvature and light refraction has been included in the ZTV analysis and a viewer height of 2m above ground level has been used. As it uses a 'bare ground' model, it is considered to over-emphasise the extent of visibility of the proposed development and therefore represents a 'maximum potential visibility' scenario. The ZTV is used as a starting point in the assessment to provide an indication of theoretical visibility. This information is verified in the field so that the assessment conclusions represent the actual visibility of the proposals reasonably accurately.

The ZTV was calculated to show the potential number of turbines visible to maximum blade tip height (401m) and maximum hub height (232.5m) above Ordnance Datum.

To construct cumulative ZTVs (CZTVs) to illustrate the cumulative visibility of the proposed development in conjunction with other wind farms, the ZTV to tip height of each wind farm was generated (based on the tip height of each turbine to an applicable maximum radius in accordance with the current guidance (SNH, 2017)), and then combined with the proposed development ZTV (60km radius). The CZTVs are colour coded to distinguish between areas where the proposed development is predicted to be visible (either on its own, or in conjunction with other wind farms), and areas where other wind farms would be visible, but the proposed development would not.

For the onshore ZTV, the ZTV is calculated to a height of 18m (15m for the GIS building plus a further 3m for the lighting rod) for the indicative onshore substation operational footprint, from a viewing height of 1.5m above ground level. The terrain model includes surface features and is derived from 1m resolution first return LIDAR (2018) data (obtained from DEFRA in May 2022). Earth curvature and atmospheric refraction have been taken into account. The ZTV was calculated using ArcMap 10.8.1 software.

Viewpoint Photography

The methodology for photography is in accordance with guidance from NatureScot[10] and the Landscape Institute[11]. The focal lengths used are in accordance with recommendations contained in guidance and are stated on the figures. Photography was undertaken by LUC between November 2021 and July 2022. A Nikon D750 and a D700 full frame sensor digital single lens reflex (SLR) camera, with a fixed 50mm focal length lens, was used to undertake photography from all viewpoint locations.

A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images. A panoramic head was used to ensure the camera rotated about the no-parallax point of the lens in order to eliminate parallax errors[12] between the successive images and enable accurate stitching of the images. The camera was rotated through a full 360˚ at each viewpoint.

The location of each viewpoint and information about the conditions was recorded in the field in accordance with NatureScot (SNH, 2017) and LI guidance (LI, 2019).

Weather conditions and visibility were considered an important aspect of the field visits for the photography. Where possible, visits were planned around clear days with very good visibility. Viewpoint locations were visited at times of day to ensure, as far as possible, that the sun lit the scene from behind, or to one side of the photographer. South facing viewpoints can present problems particularly in winter when the sun is low in the sky. Photography opportunities facing into the sun were avoided.

Visualisations

For the offshore visualisations, wirelines are computer generated line drawings which show outlines of the proposed turbines and the bare earth topography. Photomontages are computer generated images of the proposed development modelled into the actual baseline photography. Wirelines and photomontages are assessment tools and are not a substitute for site visits. They do not convey turbine movement and are representative of particular views but cannot represent visibility at all locations.

Photographic Stitching, Wirelines and Offshore Photomontages

Photographic stitching software PTGui© 11.19 was used to stitch together the adjoining frames to create panoramic baseline photography. A selection of identical control points has been created within each of the adjoining frames to increase the level of accuracy when stitching the 360° panoramic photography.

The software package ReSoft© WindFarm version 4 was used to create a digital terrain model (DTM) from OS Terrain® 5 height data. The DTM includes the Site, viewpoint locations and all landform visible within the baseline photography. Turbine and viewpoint location coordinates were entered. Photomontages have been constructed to show the candidate turbine with the specified tip and hub height. A default viewer height of 1.5m above ground level has been set in the ReSoft© software, however on limited occasions this viewer height has been increased by a small increment to achieve a closer match between the terrain data and photographic landform content[13].

Wind farm layouts included within the cumulative assessment have been added to the ReSoft© WindFarm model.

The Panoramic baseline daytime photographic images were imported into ReSoft© WindFarm software. From each viewpoint the wireline views of the landform model with the proposed turbines were carefully adjusted to obtain a match. Fixed features on the ground, such as buildings and roads, were located in the model and used as markers to help with the alignment process where necessary. Each view was rendered taking account of the sunlight and the position of the sun in the sky at the time the photograph was taken. Blade angle and orientation adjustments were also made to represent a realistic situation.

The exported renders were imported into Adobe Photoshop© where they were aligned and composited with the baseline photography. Turbines or sections of turbines which were located behind foreground elements in the photograph were masked out (removed) to create the photomontage.

Finally, where applicable, the images were converted from Cylindrical Projection to Planar Projection using PTGui© 11.19 software.

3ds Max software was used to render the turbines with the aviation lighting proposed for the development. These light sources were created to match the specifications provided by the client in terms of luminous intensity (candela units), colour and position. Real-time camera data was imported into the 3DS Max physical camera setups within the 3D models environment including F-stop and FOV (field of view) values. Depth of field (Bokeh) and vertical & horizontal lens shift data was also used to give additional accuracy to the placement of the views and enhance the depth and light level distortion from the required viewpoints. The sunlight and daylight system created within the software was set to accurately simulate the natural light still present at the date, time and geographical location of night-time photography. The turbines in the night views are orientated with the hub facing the viewer (and not obscured by turbine blades). This ensures that the images show the maximum visibility of lighting that is proposed to be installed on the hubs.

As with the daytime images the exported renders were then composited with the baseline photographic view using Adobe Photoshop© software and converted from Cylindrical Projection to Planar Projection using PTGui© software.

Onshore Visualisations

As the detail and location of the various components in the onshore substation zone is subject to change, for the purposes of PEIR the assessment considers a worst-case scenario. At 15m high the GIS building represents the tallest structure in the onshore

[9] Raster data is a matrix of cells (or pixels) which contain a value representing information.
[10] Scottish Natural Heritage (2017) Visual Representation of Wind Farms, Version 2.2
[11] Landscape Institute (2019) Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment

[12] Parallax is the difference in the position of objects when viewed along two different lines of sight. In the case of a camera this would occur if the rotation point of the lens was not constant and would result in stitching errors in the panorama.
[13] An altered height above ground level was used for mountain summits where local topography did not match the wireframes due to data resolution.

substation zone. The onshore substation block visualisations are based on an indicative 15m high structure across the extents of the onshore substation indicative operational footprint. A 3m high lighting rod, which would be required on top of the GIS building, is also modelled across the extents of the onshore substation indicative operational footprint. In reality, the various components within the onshore substation zone would occupy a smaller footprint within this overall area. However, the final proposal will not be any larger than the worst-case shown in the ZTV and visualisations.

Figure Layout

The printed figures for the viewpoints produced in accordance with NatureScot requirements are presented in Volume II of the PEIR

Adobe InDesign© software was used to present the figures. The dimensions for each image (printed height and field of view) are in accordance with NatureScot requirements. Photography information and viewing instructions are provided on each page where relevant.

For the offshore visualisations, the elongated A3/A1 width format pages for each viewpoint are set out as follows. This follows NatureScot visualisation standards:

- The first A3 page contains an OS 1:50,000 scale map showing the viewpoint location, direction of the 90˚ baseline photography, wireline views and 53.5˚ photomontage view. Wind turbine locations for the proposed development are also shown when visible in the map view;
- The following page contains 90˚ baseline photography and wireline to illustrate the wider landscape and visual context. These are shown in cylindrical projection and presented on an A1 width page. Additional pages in the same format are provided where relevant to illustrate wider cumulative visibility up to 360˚; and
- The subsequent two pages contain a 53.5˚ wireline and photomontage. These images are both shown in planar projection and presented on an A1 width page.

The onshore visualisations are presented with a map book page and a 90˚ degree baseline view and a 90˚ and 53.5˚ proposed view (block visual), on elongated A3/A1 width format pages.