Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

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Glossary of terms

TERM	DEFINITION
Bokeh	Term used in photography to describe the way the lens renders out-of-focus points of light.
LANDMAP	LANDMAP is a unique national information system, allowing information about landscape in Wales to be collected and organised into a nationally consistent dataset. The LANDMAP database includes both objective and subjective information and is designed to enable landscape quality to be taken into account in decision making.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Landscape effects	Effects on the landscape as a resource in its own right.
Seascape	Landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other.

TERM	DEFINITION
Visual amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating or travelling through an area.
Visual effects	Effects on specific views and on the general visual amenity experienced by people.

Abbreviations and acronyms

TERM	DEFINITION
AyM	Awel y Môr
DTM	Digital Terrain Model
EIA	Environmental Impact Assessment
ETG	Expert Topic Group
FoV	field of view
GPS	Global Positioning System
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, Third Edition
IEMA	Institute of Environmental Management and Assessment
ICAO	International Civil Aviation Organization
LVIA	Landscape and Visual Impact Assessment
MDS	Maximum design scenario
METAR	Meteorological Terminal Air Report
PEIR	Preliminary Environmental Information Report

TERM	DEFINITION
OWF	Offshore Wind Farm
OS	Ordnance Survey
SLR	Single-lens reflex
SLVIA	Seascape, Landscape and Visual Impact Assessment
UN	United Nations
VP	Viewpoint
WTGs	Wind turbine generators
ZTV	Zone of Theoretical Visibility

Units

UNIT	DEFINITION
m	meter
mm	millimeter
km	kilometer

1 Methodology

1.1 Introduction

1 This Annex sets out the methodology used in the seascape, landscape and visual impact assessment (SLVIA) Chapter 10, Volume 2 of the Environmental Statement (ES).

1.2 Assessment criteria and assignment of significance

1.2.1 Approach to assessment

2 The Landscape Institute with the Institute of Environmental Management and Assessment (IEMA) (2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) sets out an approach to the assessment of magnitude of change in which three separate considerations are combined within the magnitude of change rating. These are the size or scale of the effect, its geographical extent and its duration and reversibility. This approach is to be applied in respect of both landscape and visual receptors. It is considered that the process of combining all three considerations in one rating can distort the aim of identifying significant effects of wind farm development. For example, a high magnitude of change, based on size or scale, may be reduced to a lower rating if it occurred in a localised geographical area and for a short duration. This might mean that a potentially significant effect will be overlooked if effects are diluted due to their limited geographical extents and/ or duration or reversibility.

3 GLVIA3 is guidance and not prescriptive in setting out a methodology and it is acknowledged that professional judgement is a key factor in the assessment of landscape and visual effects. In order to present a precautionary assessment of potentially significant effects, the methodology presented and utilised throughout the assessment bases the assessment of the level of magnitude of change on size or scale to determine the significance of the effects, and then describing the geographical extents of these effects and their duration and reversibility separately. Duration and reversibility are stated separately in relation to the assessed effects (i.e. as short/ medium/ long term and temporary/ permanent) and are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or non-significant in accordance with the requirements of the Environmental Impact Assessment (EIA) Regulations.

4 GLVIA3 makes it clear at paragraph 3.33 that 'it is not essential to establish a series of thresholds for different levels of significance of landscape and visual effects, provided that it is made clear whether or not they are considered significant.' This is the approach followed in the Preliminary Environmental Information Report (PEIR). However, the methodology for the ES introduces the definition of levels of effect under five different categories with the higher levels being assessed as significant.

5 The assessment methodology uses six scales of magnitude of change – high, medium-high, medium, medium-low, low and negligible/ none; which are preferred to the 'maximum of five categories' suggested in GLVIA3 as a means of clearly defining and summarising magnitude of change judgements.

1.2.2 Types of effect

6 The SLVIA predicts, describes and assesses the likely significant effects that the offshore elements of Awel y Môr Offshore Wind Farm (AyM OWF) (hereafter described as the Development), will have on the seascape, landscape and visual resource, and covers the following types of effect which may arise during construction, decommissioning or operation of the offshore wind farm, which includes the wind turbine generators (WTGs), offshore substations and a met mast:

- **Seascape effects** – arising from the introduction of new offshore elements which may alter the seascape character of the array area itself and the perceived character of the wider seascape through visibility of these changes.
- **Landscape effects** – arising from the introduction of new offshore elements which may be visible from the land and may therefore affect the perceived character of the landscape. This may also include effects on the special landscape qualities and integrity of designated landscapes.
- **Visual effects** – arising from the introduction of new offshore elements in views and the resultant effects on visual amenity experienced by people from principal visual receptors (i.e. groups of people, such as within settlements, using transport routes or recreational trails) and representative viewpoints throughout the day and into the night.

7 In addition to the above, cumulative effects may arise where the study areas for two or more projects overlap so that they are experienced at a proximity where they may have a greater incremental effect, or where projects may combine to have a sequential effect. The SLVIA assesses the cumulative effect that would arise through the introduction of the Development.

1.2.3 Receptors

Seascape character

8 GLVIA 3 paragraph 5.6, advises that where LVIA is carried out in coastal or marine locations baseline studies must take account of seascape. Seascape is defined in the UK Marine Policy Statement, (UK Government, 2011) as "*landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other.*"

9 GLVIA 3 paragraph 5.6, identifies the following different factors which together determine seascape character:

"coastal features;

views to and from the sea;

particular qualities of the open sea;

the importance of dynamic changes due to weather and tides;

changes in seascapes due to coastal processes;

cultural associations; and

contributions of coastal features to orientation and navigation at sea."

Landscape character

10 GLVIA 3, paragraph 5.4, advises that Landscape Character Assessment should be regarded as the main source for baseline studies and identifies the following factors which combine to create areas of distinct landscape character:

"the elements that make up the landscape in the study area including:

physical influences – geology, soils, landform, drainage and water bodies;

landcover, including different types of vegetation and patterns and types of tree cover; and

the influence of human activity, including landuse and management, the character of settlements and buildings, and pattern and type of fields and enclosure.

The aesthetic and perceptual aspects of the landscape – such as, for example, its scale, complexity, openness, tranquillity or wildness;

The overall character of the landscape in the study area, including any distinctive Landscape Character Types or Areas that can be identified, and the particular combinations of elements and aesthetic and perceptual aspects that make each distinctive, usually by identification as key characteristics of the landscape."

11 In Wales, LANDMAP data is used to provide further insight into the character and components of the landscape.

1.2.4 Defining impact significance – seascape/ landscape

Sensitivity of seascape/ landscape receptor

12 The sensitivity of a seascape/ landscape character receptor is an expression of the combination of the judgements made about the value associated with that receptor and the susceptibility of the receptor to the development proposed.

13 This follows the approach to sensitivity set out in GLVIA3 which differs from that used in the Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance (NRW 2019) which assumes that all nationally designated landscapes have a high sensitivity due to their high value.

Value of the seascape/ landscape receptor

14 The value of a seascape/ landscape character receptor is a reflection of the value that society attaches to that seascape/ landscape. The assessment of the seascape/ landscape value is classified as high, medium-high, medium, medium-low or low and the basis for this assessment is made clear using evidence and professional judgement, based on the following range of factors.

- **Seascape/ landscape designations** - A receptor that lies within the boundary of a recognised landscape-related planning designation has been of increased value, depending on the proportion of the receptor that is affected and the level of importance of the designation which may be international, national, regional or local. The absence of designations does not however preclude value, as an undesignated landscape character receptor may be valued as a resource in the local or immediate environment. LANDMAP visual and sensory evaluation is also a consideration in relation to landscape value.
- **Seascape/ landscape quality** - The quality of a seascape/ landscape character receptor is a reflection of its attributes, such as scenic quality, sense of place, rarity and representativeness and the extent to which its valued attributes have remained intact. A seascape/ landscape with consistent, intact, well-defined and distinctive attributes is considered to be of higher quality and, in turn, higher value, than a landscape where the introduction of elements has detracted from its character.

- **Seascape/ landscape experience** - The experiential qualities that can be evoked by a seascape/ landscape receptor can add to its value and relates to a number of factors including the perceptual responses it evokes, the cultural associations that may exist in literature or history, or the iconic status of the seascape/ landscape in its own right, the recreational value of the seascape/ landscape, and the contribution of other values relating to the nature conservation or archaeology of the area.

Seascape/ landscape susceptibility to change

15 The susceptibility of a seascape/ landscape character receptor to change is a reflection of its ability to accommodate the changes that will occur as a result of the addition of the Development without undue consequences for the maintenance of the baseline situation and/ or the achievement of landscape planning policies and strategies. Some seascape/ landscape receptors are better able to accommodate development than others due to certain characteristics that are indicative of capacity to accommodate change. These characteristics may or may not also be special landscape qualities that underpin designated landscapes.

16 Notably the baseline seascape or landscape is largely characterised by the features and elements that occur within them with contextual influences through visibility providing a lesser influence.

17 In GLVIA3 it is made clear in paragraph 5.41 that in Landscape and Visual Impact Assessment (LVIA) the assessment of susceptibility must be '*the individual assessment of the susceptibility of the receptors in relation to the change arising from the specific development proposal.*' Susceptibility of a receptor to the development proposed must therefore be influenced by the relationship of the receptor to the development proposed – will it directly alter the features and elements that define its seascape/ landscape character or will the changes occur as part of a wider visual influence that may also include many other features as part of the context of the seascape/ landscape character receptor in question? The location of the development proposed relative to the receptor being considered is therefore of relevance to susceptibility of seascape/ landscape character.

18 The assessment of the susceptibility of the seascape/ landscape receptor to change is classified as high, medium-high, medium, medium-low or low and the basis for this assessment has been made clear using evidence and professional judgement, which accords with GLVIA3. Indicators of landscape susceptibility to the development proposed are based on the following criteria.

- **Overall strength and robustness:** Collectively the overall characteristics and qualities of a particular seascape/ landscape may result in a strong and robust seascape/ landscape that is capable of reasonably accommodating the influence of the Development without undue adverse effects on the key characteristics of a seascape/ landscape.
- **Seascape/ landscape scale and topography:** The scale and topography are large enough to physically accommodate the influence of the Development. Topographical features such as more complex, distinctive or small-scale coastal landforms are likely to be more susceptible than simple, broad and homogenous coastal landforms.
- **Openness and enclosure**: Openness in the seascape/ landscape may increase susceptibility to change because it can result in wider visibility, however open seascape/ landscape may also be larger scale and simple, which would decrease susceptibility. Conversely, enclosed seascape/ landscapes can offer more screening potential, limiting visibility to a smaller area, however they may also be smaller scale and more complex which would increase susceptibility. In general, large scale, simple and open seascapes/ coastlines are likely to be less susceptible to the Development than more enclosed, complex seascapes/ coasts (such as indented bays, headlands etc).
- **Skyline**: Prominent and distinctive skylines and horizons with important landmark features that are identified in the seascape/ landscape character assessment, are generally considered to be more susceptible to development in comparison to broad, simple skylines which lack landmark features or contain other infrastructure features.

- **Relationship with other development and landmarks:** Contemporary landscapes where there are existing similar developments (WTGs or energy developments) or other forms of development (industry, mineral extraction, masts, urban fringe/ large settlement, major transport routes) that already have a characterising influence result in a lower susceptibility to development in comparison to areas characterised by limited development or smaller scale, historic development and landmarks.
- **Perceptual qualities:** Notable seascapes/ landscapes that are acknowledged to be particularly scenic, wild or tranquil are generally considered to be more susceptible to development in comparison to ordinary, cultivated or farmed/ developed landscapes where perceptions of 'wildness' and tranquillity are less tangible. Seascapes/ landscapes which are either remote or appear natural may vary in their susceptibility to development.
- **Landscape context and association:** the extent to which the Development will influence the character of seascape/ landscape receptors across the study area relates to the associations that exist between the seascape/ landscape receptor within which the Development is located and the seascape/ landscape receptor from which the Development would be experienced. In some situations, this association is strong, where the seascapes/ landscapes are directly related, and in other situations weak where the landscape association is weak. The context and visual connection to areas of adjacent seascape/ landscape character or designations has a bearing on the susceptibility to development.

Seascape/ landscape sensitivity rating

19 An overall sensitivity assessment of the seascape/ landscape receptor is made by combining the assessment of the value of the seascape/ landscape character receptor and its susceptibility to change. The evaluation of seascape/ landscape sensitivity has been applied for each seascape/ landscape receptor - high, medium-high, medium, medium-low and low - by combining individual assessments of the value of the receptor and its susceptibility to change.

Seascape/ landscape magnitude of change

20 The magnitude of change affecting seascape/ landscape receptors is an expression of the scale of the change that will result from the offshore elements of, and is dependent on, a number of variables regarding the size or scale of the change and the geographical extent over which the change would be experienced.

Size or scale of change

21 This criterion relates to the size or scale of change to the seascape/ landscape that will arise as a result of the Development, based on the following factors.

- **Seascape/ landscape elements:** The degree to which the pattern of elements that makes up the seascape/ landscape character is altered by the Development, by removal or addition of elements in the seascape/landscape. The magnitude of change will generally be higher if the features that make up the seascape/ landscape character are extensively removed or altered, and/ or if many new offshore elements are added to the seascape/ landscape.
- **Seascape/ landscape characteristics:** The extent to which the effect of the Development changes, physically or perceptually, the key characteristics of the seascape/ landscape that may be important to its distinctive character. This may include, for example, the scale of the landform, its relative simplicity or irregularity, the nature of the seascape/ landscape context, the grain or orientation of the seascape/ landscape, the degree to which the receptor is influenced by external features and the juxtaposition of the Development in relation to these key characteristics. If the Development are located in a seascape/ landscape receptor that is already affected by other similar development, this may reduce the magnitude of change, particularly if there is a high level of integration and the developments form a unified and cohesive feature in the seascape/landscape.

- **Seascape/ landscape designation:** In the case of designated landscapes, the degree of change is considered in light of the effects on the special landscape qualities which underpin the designation and the effect on the integrity of the designation and are as set out in the relevant management plan documentation. All landscapes change over time and much of that change is managed or planned. Often landscapes will have management objectives for 'protection' or 'accommodation' of development. The scale of change may be localised, or occurring over parts of an area, or more widespread affecting whole landscape receptors and their overall integrity.
- **Distance:** The size and scale of change is also strongly influenced by the proximity of the Development to the receptor. Distance may be an influential factor to the extent that over a long range the scale of the influence on seascape/landscape receptors may be small or very limited. Conversely, landscapes or seascapes closest to the development are likely to be most affected. Where the development is located within a 'host' seascape character unit this would be directly affected whilst adjacent areas of seascape/landscape character would be indirectly affected.
- **Amount and nature of change:** The amount of the Development that is seen. Visibility of the Development may range from one WTG blade tip to all of the WTGs; generally, the greater the amount of the Development that can be seen, the higher the scale of change. The degree to which the Development is perceived to be on the horizon or 'within' the seascape/ landscape is also influential. Generally, the magnitude of change is likely to be lower where the Development is largely perceived to be on the horizon at a distance, rather than 'within' the seascape/ landscape being considered.

Geographical extent

22 The geographic extent over which the seascape/ landscape effects are experienced is also assessed, which is distinct from the size or scale of effect. This evaluation is not combined in the assessment of the level of magnitude, but instead expresses the extent of the receptor that will experience a particular magnitude of change and therefore the geographical extents of the significant and non-significant effects.

23 The extent of the effects will vary depending on the specific nature of the Development and is principally assessed through analysis of the extent of perceived changes to the seascape/ landscape character through visibility of the Development.

Seascape/ landscape magnitude of change rating

24 The 'magnitude' or 'degree of change' resulting from the Development is described as 'High', 'High-medium', 'Medium', 'Medium-low' 'Low' or 'Negligible/ no change'. In assessing magnitude of change, the assessment focuses on the size or scale of change and its geographical extent. The duration and reversibility are stated separately in relation to the assessed effects (i.e. as short/ medium/ long term and temporary/ permanent). The basis for the assessment of magnitude for each receptor will be made clear using evidence and professional judgement. The levels of magnitude of change that can occur are defined in Table 1.

Table 1: Magnitude of change definitions – seascape/ landscape character.

MAGNITUDE OF CHANGE	DEFINITION/ DESCRIPTION
high	The Development will result in a major alteration to the baseline characteristics of the seascape/ landscape, providing a prevailing influence and/ or introducing elements that are uncharacteristic in the receiving seascape/ landscape. The addition of the Development will result in a major incremental change, loss or addition to the baseline context.
medium	The Development will result in a moderate alteration to the baseline characteristics of the seascape/ landscape, providing a readily apparent influence and/ or introducing elements potentially uncharacteristic in the receiving seascape/ landscape. The addition of the Development will result in a moderate incremental change, loss or addition to the baseline context.

MAGNITUDE OF CHANGE	DEFINITION/ DESCRIPTION
low	The Development will result in a minor alteration to the baseline characteristics of the seascape/ landscape, providing a slightly apparent influence and/ or introducing elements that are characteristic in the receiving seascape/ landscape. The addition of the Development will result in a minor incremental change, loss or addition to the baseline context.
Negligible/ no change	The Development will result in a negligible or no alteration to the baseline characteristics of the seascape/ landscape, providing no influence, a barely discernible influence and/ or introducing elements that are substantially characteristic in the receiving seascape/ landscape. The addition of the Development will result in a negligible or no incremental change, loss or addition to the baseline context.

25 There may also be intermediate levels of magnitude of change, such as medium-high and medium-low, where the change falls between definitions.

Evaluating seascape/ landscape effects and significance

26 The level of seascape/ landscape effect is evaluated primarily through the combination of seascape/ landscape sensitivity and magnitude of change. This process is assisted by the matrix in Table 4 which is used to guide the assessment. Geographical extent and duration and reversibility are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or non-significant.

27 On this basis potential seascape/ landscape effects are assessed and categorised as Negligible, Minor, Moderate-Minor, Moderate, Moderate-Major or Major. In instances where the magnitude has been assessed as 'no change' the level of effect is recorded as 'no effect'.

28 Once the level of effect has been assessed, a judgement is then made as to whether the level of effect is 'significant' or 'non-significant' as required by the EIA Regulations. For the purposes of this assessment, any effects with a significance level of Major and Moderate-Major are deemed significant.

29 (dark green shaded boxes in Table 4). 'Moderate' levels of effect have the potential, subject to the assessor's professional judgement, to be considered as significant or not significant, depending on the sensitivity and magnitude of change factors evaluated (mid-green shaded boxes in Table 4).

30 Further information is also provided about the nature of the effects (whether these would be direct/ indirect; temporary/ permanent/ reversible; beneficial/ neutral/ adverse or cumulative).

31 A significant effect occurs where the combination of the variables results in the Development having a defining effect on the seascape/ landscape receptor, or where changes of a lower magnitude affect a seascape/ landscape receptor that is of particularly high sensitivity. A major loss or irreversible effect over an extensive area or seascape/ landscape character, affecting seascape/ landscape elements, characteristics and/ or perceptual aspects that are key to a nationally valued landscape are likely to be significant, particularly if they are of long duration and permanent.

32 A non-significant effect would occur where the effect of the Development is not defining, and the seascape/ landscape character of the receptor continues to be characterised principally by its baseline characteristics. Equally a small-scale change experienced by a receptor of high sensitivity may non-significantly affect the special landscape quality or integrity of a designation. Reversible effects, on elements, characteristics and character that are of small-scale or geographical extent or affecting lower value receptors are unlikely to be significant.

1.2.5 Defining impact significance - visual

33 Visual Effects are concerned wholly with the effect of the Development on views, and the general visual amenity and are defined by the Landscape Institute in GLVIA 3, paragraphs 6.1 as follows:

"An assessment of visual effects deals with the effects of change and development on views available to people and their visual amenity. The concern ... is with assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views."

34 Visual effects are identified for different receptors (people) who would experience the view at their place of residence, within their community, during recreational activities, at work, or when travelling through the area. The visual effects may include the following:

- **Visual effect:** a change to an existing static view, sequential views, or wider visual amenity as a result of development or the loss of particular landscape elements or features already present in the view;
- **Cumulative visual effects:** the cumulative or incremental visibility of similar types of development may combine to have a cumulative visual effect.

35 The level of visual effect (and whether this is significant) is determined through consideration of the sensitivity of the visual receptor and their view and the magnitude of change that would be brought about by the Development.

Zone of Theoretical Visibility (ZTV)

36 Plans mapping the Zone of Theoretical Visibility (ZTV) are used to analyse the extent of theoretical visibility of AyM, across the Study Area and to assist with viewpoint selection. The ZTV does not however, take account of the screening effects of buildings, localised landform and vegetation. As a result, there may be roads, tracks and footpaths within the study area which, although shown as falling within the ZTV, are screened or filtered by built form and vegetation, which would otherwise preclude visibility.

37 The ZTVs provide a starting point in the assessment process and accordingly tend towards giving a 'worst case' or greatest calculation of the theoretical visibility.

Viewpoint Analysis

38 Viewpoint analysis is used to assist the assessment and is conducted from selected viewpoints within the study area. The purpose of this is to assess both the level of visual effect for particular receptors and to help guide the design process and focus of the assessment. A range of viewpoints are examined in detail and analysed to determine whether a significant visual effect would occur.

39 The assessment involves visiting the viewpoint location and viewing wirelines and photomontages prepared for each viewpoint location. The fieldwork is generally conducted in periods of fine weather with good visibility and considers seasonal changes such as reduced leaf cover or hedgerow maintenance.

40 The SLVIA therefore includes viewpoint analysis prepared for each representative viewpoint and presented as supporting assessment in the SLVIA.

41 The viewpoint analysis is used to assist in the assessment of effects on visual receptor locations as well as landscape/ seascape character effects reported in the SLVIA.

Visual Receptors

42 The assessment also includes consideration of groups of visual receptors that may be located within particular areas or using certain, primary routes through the study area. The SLVIA assesses the effects on views from residential areas within settlements as well as people using the Wales Coast Path, National Cycle Route (NCR) 5 and the A55.

43 The coastal areas of settlements where there may be parking, recreational facilities, commercial areas, beaches etc are not included in the assessment of the effects on settlements. This is to avoid double counting of effects from such areas as these are generally considered in relation to the representative viewpoints and the assessments of the effects on the Wales Coast Path and/ or NCR 5.

44 This accords with paragraph 6.36 of GLVIA which advises that 'the combined effects on a group of people within an area may also be considered, by aggregating properties within a settlement, as a way of assessing the effect on the community as a whole. Care must, however, be taken first to ensure that this really does represent the whole community and second to avoid any double counting of the effects.'

Evaluating visual sensitivity to change

45 In accordance with paragraphs 6.31-6.37 of GLVIA3, the sensitivity of visual receptors is determined by a combination of the value of the view and the susceptibility of the visual receptors to the change likely to result from the Development on the view and visual amenity.

Value of the view

46 The value of a view or series of views reflects the recognition and the importance attached either formally through identification on mapping or being subject to planning designations, or informally through the value which society attaches to the view(s). The value of a view has been classified as high, medium-high, medium, medium-low or low and the basis for this assessment has been made clear using evidence and professional judgement, based on the following criteria.

- **Formal recognition** - The value of views can be formally recognised through their identification on Ordnance Survey (OS) or tourist maps as formal viewpoints, sign-posted and with facilities provided to add to the enjoyment of the viewpoint such as parking, seating and interpretation boards. Specific views may be afforded protection in local planning policy and recognised as valued views. Specific views can also be cited as being of importance in relation to landscape or heritage planning designations, for example the value of a view has been increased if it presents an important vista from a designed landscape or lies within or overlooks a designated area, which implies a greater value to the visible landscape.

- **Informal recognition** - Views that are well-known at a local level and/ or have particular scenic qualities can have an increased value, even if there is no formal recognition or designation. Views or viewpoints are sometimes informally recognised through references in art or literature and this can also add to their value. A viewpoint that is visited or appreciated by a large number of people will generally have greater importance than one gained by very few people.

Susceptibility to change

47 Susceptibility relates to the nature of the viewer experiencing the view and how susceptible they are to the potential effects of the Development.

48 A judgement to determine the level of susceptibility therefore primarily relates to the nature of the viewer and their experience from that particular viewpoint or series of viewpoints, classified as high, medium-high, medium, medium-low or low and based on the following criteria:

- **Nature of the viewer** - The nature of the viewer is defined by the occupation or activity of the viewer at the viewpoint or series of viewpoints. The most common groups of viewers considered in the visual assessment include residents, motorists, and people taking part in recreational activity or working. Viewers, whose attention is focused on the landscape, or with static long-term views, are likely to have a higher susceptibility. Viewers travelling in cars or on trains will tend to have a lower susceptibility as their view is transient and moving. The least sensitive viewers are usually people at their place of work as they are generally less susceptible to changes in views.

- **Experience of the viewer** - The experience of the visual receptor relates to the extent to which the viewer's attention or interest may be focused on the view and the visual amenity they experience at a particular location. The susceptibility of the viewer to change arising from the Development may be influenced by the viewer's attention or interest in the view, which may be focused in a particular direction, from a static or transitory position, over a long or short duration, and with high or low clarity. For example, if the principal outlook from a settlement is aligned directly towards the Development, the experience of the visual receptor is altered more notably than if the experience relates to a glimpsed view seen at an oblique angle from a car travelling at high speed. The visual amenity experienced by the viewer varies depending on the presence and relationship of visible elements, features or patterns experienced in the view and the degree to which the landscape in the view may accommodate the influence of the Development.

49 In LVIA the need to consider susceptibility to the specific proposal rather than susceptibility in general is emphasised in paragraph 3.24 of GLVIA3. Therefore, the visual relationship of the Development to the viewer is also of relevance in determining the susceptibility of the visual receptor.

Visual sensitivity rating

50 An overall level of sensitivity is applied for each visual receptor or view – high, medium-high, medium, medium-low or low – by combining individual assessments of the value of the view and the susceptibility of the visual receptor to change. Each visual receptor, meaning the particular person or group of people likely to be affected at a specific viewpoint, is assessed in terms of their sensitivity.

Visual magnitude of change

51 The visual magnitude of change is an expression of the scale of the change that will result from the Development and is dependent on a number of variables regarding the size or scale of the change and the geographical extent over which the change would be experienced. A separate assessment is also made of the duration and reversibility of visual effects.

Size or scale of change

52 An assessment is made regarding the size or scale of change in the view that is likely to be experienced as a result of the Development, based on the following criteria:

- **Distance:** the distance between the visual receptor/ viewpoint and the Development. Generally, the greater the distance, the lower the magnitude of change, as the Development will constitute a smaller scale component of the view.
- **Size:** the amount and size of the Development that is seen. Visibility may range from small or partial visibility of the Development, to all of the offshore elements being visible. Generally, the larger and greater number of parts of the Development that appear in the view, the higher the magnitude of change. This is also related to the degree to which the Development may be wholly or partly screened by landform, vegetation (seasonal) and/ or built form. Conversely open views are likely to reveal more of the Development, particularly where this is a key characteristic of the landscape context.
- **Scale:** 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. The scale of the Development may appear larger or smaller relative to the scale of the receiving seascape/ landscape.
- **Field of view:** the vertical/ horizontal field of view (FoV) and the proportion of the view that is affected by the Development. Generally, the more of the proportion of a view that is affected, the higher the magnitude of change. If the Development extends across the whole of the open part of the outlook, the magnitude of change is higher as the full view has been affected. Conversely, if the Development cover just a narrow part of an open, expansive and wide view, the magnitude of change is likely to be reduced as it will not affect the whole open part of the outlook. This can in part be described objectively by reference to the horizontal/ vertical FoV affected, relative to the extent and proportion of the available view.

- **Contrast:** the character and context within which the Development is seen and the degree of contrast or integration of any new features with existing seascape/ landscape elements, in terms of scale, form, mass, line, height, colour, luminance and motion. Contrasts and changes may arise particularly as a result of the rotation movement of the WTG blades, as a characteristic that gives rise to effects. Developments which contrast or appear incongruous in terms of colour, scale and form are likely to be more visible and have a higher magnitude of change.
- **Consistency of image:** the consistency of image of the Development in relation to other developments. The magnitude of change of the Development is likely to be lower if its WTG height, arrangement and layout design are broadly similar to other developments in the seascape, in terms of its scale, form and general appearance. New development is more likely to appear as logical components of the landscape with a strong rationale for their location.
- **Skyline/ background:** Whether the Development would be viewed against the skyline or a background seascape may affect the level of contrast and magnitude. If the Development adds to an already developed skyline the magnitude of change would tend to be lower.
- **Number:** generally, the greater the number of separate developments seen simultaneously or sequentially, the higher the magnitude of change. Further effects would occur in the case of separate developments and their spatial relationship to each other would affect the magnitude of change. For example, development that appears as an extension to an existing development would tend to result in a lower magnitude of change than a separate, new development.
- **Nature of visibility:** the nature of visibility is a further factor for consideration. The Development may be subject to various phases of development change and the manner in which the Development may be viewed could be intermittent or continuous and/ or vary seasonally, due to periodic management or leaf fall.

Geographical extent

53 The geographic extent over which the visual effects has been experienced is also assessed, which is distinct from the size or scale of effect and is described in terms of the physical area or location over which it is experienced (described as a linear or area measurement). The extent of the effects varies according to the specific nature of the Development and is principally assessed through ZTV, field survey and viewpoint analysis of the extent of visibility likely to be experienced by visual receptors.

Visual magnitude of change rating

54 The 'magnitude' or 'degree of change' resulting from the Development is described as 'High', 'High-medium', 'Medium', 'Medium-low' 'Low' and 'Negligible'. In assessing the magnitude of change the assessment focuses on the size or scale of change and its geographical extent. The duration and reversibility are stated separately in relation to the assessed effects (i.e. as short/ medium/ long term and temporary/ permanent). The basis for the assessment of magnitude for each receptor is made clear using evidence and professional judgement.

55 The levels of magnitude of change that can occur on views are defined in Table 2.

Table 2: Magnitude of change definitions - visual

MAGNITUDE OF CHANGE	DEFINITION/ DESCRIPTION
high	The Development will result in a high level of alteration to the existing view and will be the prevailing feature, forming the major focus of visual attention due to its large vertical scale and lateral spread, filling a large proportion of the field of view. Contrasts in form, line, colour, texture, luminance or motion may contribute to the prevailing influence. Moving objects associated with the Development contribute substantially to drawing viewer attention.

MAGNITUDE OF CHANGE	DEFINITION/ DESCRIPTION
	The Development will introduce elements that are substantially uncharacteristic in the baseline view. The addition of the Development will result in a major incremental change, loss or addition to the baseline view.
medium	Plainly visible, so will not be missed by casual observers, but does not strongly attract visual attention or dominate the view because of its apparent size. The Development is obvious and will have sufficient size to contrast with other seascape/ landscape elements, but with insufficient visual contrast to strongly attract visual attention and insufficient size to occupy most of an observer's field of view. The Development will result in a medium level of alteration to the baseline view, forming a readily apparent influence and/or introducing elements that are uncharacteristic in the receiving view, which will result in a moderate incremental change, loss or addition to the baseline view.
low	The Development will be visible when scanning in its general direction; otherwise it may be missed by casual observers. Very small and/or faint, but when the observer is scanning the horizon or looking more closely at an area, can be detected and sometimes noticed by casual observers; however, most people would not notice it without some active looking. The Development will result in a low level of alteration to the baseline view, providing a slightly apparent influence and/or introducing elements that are characteristic in the receiving view. The addition of the Development will result in a low incremental change, loss or addition to the baseline view.
Negligible/ no change	Visible only after extended viewing. The Development is near the limit of visibility or is not visible. It would not be seen by a person who was unaware of it in advance and

MAGNITUDE OF CHANGE	DEFINITION/ DESCRIPTION
	therefore looking for it. Even under those circumstances, it may be seen only after looking at it closely for an extended period. The Development will result in a negligible or no change to the existing view. If visible it may, form a barely discernible influence and/ or introduce elements that are substantially characteristic in the baseline view. The addition of the Development will result in no change or a negligible incremental change, loss or addition to the baseline view.

56 There may also be intermediate levels of magnitude of change, such as medium-high and medium-low, where the change falls between definitions.

Evaluating visual effects and significance

57 The level of visual effect is evaluated through the combination of visual sensitivity and magnitude of change. This process is assisted by the matrix in Table 4 which is used to guide the assessment. Geographical extent and duration and reversibility are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or non-significant.

58 On this basis potential visual effects are assessed and categorised as Negligible, Minor, Moderate-Minor, Moderate, Moderate-Major or Major. In instances where the magnitude has been assessed as 'no change' the level of effect is recorded as 'no effect'.

59 Once the level of effect has been assessed, a judgement is then made as to whether the level of effect is 'significant' or 'non-significant' as required by the EIA Regulations. For the purposes of this assessment, any effects with a significance level of Major and Moderate-Major are deemed significant (dark green shaded boxes in Table 4). 'Moderate' levels of effect have the potential, subject to the assessor's professional judgement, to be considered as significant or not significant, depending on the sensitivity and magnitude of change factors evaluated (mid-green shaded boxes in Table 4).

60 Further information is also provided about the nature of the effects (whether these would be direct/ indirect; temporary/ permanent/ reversible; beneficial/ neutral/ adverse or cumulative).

61 A significant effect is more likely to occur where a combination of the variables results in the Development having a defining effect on the view or visual amenity or where changes affect a visual receptor that is of high sensitivity.

62 A non-significant effect is more likely to occur where a combination of the variables results in the Development having a non-defining effect on the view or visual amenity or where changes affect a visual receptor that is of low sensitivity.

Frequency and likelihood of visual effects – weather conditions

63 The judgements made in the SLVIA are based on optimum 'very good' to 'excellent' visibility of the Development. This means that the viewpoint assessment represents a maximum effect assessment of the likely visual effects. The same viewpoint may be experienced under less optimal viewing conditions resulting in a significant effect appearing as non-significant, due to the change in the variable weather conditions. Due to the conditions of the assessment the reverse (a non-significant effect appearing as significant) is unlikely to occur.

64 Optimal weather conditions are assessed as the worst-case scenario, but in reality, the degree and extent of visual effects arising from the construction and operation of the Development is a combination of several different factors, including the prevailing weather conditions. The prevailing weather can determine changes in character and visibility, with varied wind, light and tidal movements and the clarity or otherwise of the atmosphere. Collectively, these will combine to reduce the number of days upon which views of the Development are available from the coastline and hinterland, or to inhibit views, rendering them more visually recessive within the wider seascape. Viewing conditions and visibility has been found to vary in the study area, and the effects of the wind farm will vary greatly according to the weather.

65 Although the SLVIA is based on 'very good' to 'excellent' visibility conditions, a description of visibility frequency is provided using METAR visibility data from the nearest Met Office station that records visibility (Rhyl), to highlight potential trends in the visibility conditions of the study area. Both GLVIA3 (8.15) and NatureScot guidance (NatureScot 2017, para 39) refer to use of Met Office visibility data to assess typical visibility conditions within an area.

66 Most synoptic observing stations have sensors which provide a measurement of visibility. Visibility sensors measure the meteorological optical range which is defined as the length of atmosphere over which a beam of light travels before its luminous flux is reduced to 5% of its original value. The use of light within the visible spectrum allows the sensor to most accurately simulate human perception of visibility. Reasonably accurate measurements are possible over a range of visibility extending from a few tens of metres to a few tens of kilometres.

67 Although there are limitations to how this data can be applied to judgements about offshore wind farm visibility, the visibility data provides some understanding and evidence basis for evaluating the visibility of the WTGs against their background.

68 Met Office visibility data has been assessed from the nearest weather station that records visibility, at Rhyl. Visibility is categorised into distance ranges, such as <1km, 1 to 2km, 2 to 3km etc and a frequency table has been compiled showing the total number of observations within each distance category at hourly intervals for each month. This information is contained in Volume 4, Chapter 2: Annex 10.4. The data has been summarised and mapped along with the ZTV in Figure 20 to highlight trends in the visibility conditions of the study area, such as the distance range band which has the most visibility observations recorded, and approximate number of viewing days lost to low visibility weather conditions. Visibility data is then assessed to set out the frequency of visibility (over a 10-year period) at different distance ranges, based on Met Office banded visibility definitions: < 1km Very Poor; 1 - 4km Poor; 4 - 10km Moderate; 10 - 20km Good; 20 - 40km Very Good; 40km > Excellent.

69 The Met Office visibility data is then interpreted to allow more specific quantification of the likely frequency of visibility of the Development from the viewpoints (as a % and average number of days per year), based on the distance of each viewpoint location from the array area. The Met Office visibility frequency data is used to inform an assessment of the 'likelihood of effect' from each viewpoint, in order to qualify any significant effects assessed in optimum visibility conditions with how likely they are to actually occur given the prevailing weather/ visibility conditions.

1.2.6 Defining impact significance – night-time visual

Types of effect

70 The assessment of the lighting of the offshore elements of AyM is intended to determine the likely effects on the visual resource i.e. it is an assessment of the visual effects of lighting on views experienced by people at night.

71 The assessment of WTG lighting does not consider effects of lighting on landscape character (i.e. landscape effects).

72 The International Civil Aviation Organization (ICAO), a United Nations (UN) body sets international Standards; Recommendations and 'Notes' for aviation lighting in its publication 'Annex 14 to the Convention on International Civil Aviation' - Volume I Aerodrome Design and Operations (ICAO, Eighth Edition, July 2018). ICAO (2018) indicates a requirement for no lighting to be switched on until 'Night' has been reached, as measured at 50cd/m2 or darker. It does not require 2,000 candela medium intensity to be on during 'twilight', when landscape character may be discerned.

73 The aviation and marine navigational lights may be seen for a short time during the twilight period when some recognition of landscape features/ profiles/ shapes and patterns may be possible. It is considered however, that level of recognition does not amount to an ability to appreciate in any detail landscape character differences and subtleties, nor does it provide sufficient natural light conditions to undertake a landscape character assessment.

74 The proposed aviation lighting will not have significant effects on the perception of landscape character, which is not readily perceived at night in darkness, particularly in rural areas. The matter of visible aviation and marine navigation lighting assessment is wholly a visual concern and the assessment presented in this section focusses on that premise.

75 This approach is supported by the recent Report to the Scottish Ministers for Crystal Rig IV Wind Farm (January 2021) (page 8, Reporter's conclusions), which found that the proposed lighting 'is indeed a visual concern' and that 'without being able to see and fully appreciate the features of the landscape and the composition of views it is not possible to carry out a meaningful landscape character assessment'.

76 In summary, it is considered that the proposed aviation and marine navigation lighting will not result in effects on landscape character, which is not readily perceived at night in darkness, particularly in rural areas. The effects of aviation lighting on landscape character are therefore scoped out of this assessment, which focuses on the likely visual effects of aviation and marine navigational lighting.

Assessment of significance

Overview

77 The nature of the daytime and night-time effects from visible aviation and marine navigation lighting are clearly very different, in that during day light hours visibility of the large-scale moving turbines gives rise to effects that are very different to the pinpoint effects of lighting at night.

78 It is considered therefore, that the same criteria should not be used to assess these differences in daytime and night-time effect. For example, the criteria provided in Sectopm 1.2.5underpinning the magnitude of visual effect, as a component of significance, includes definitions that are not appropriate or relevant to a night-time assessment.

Sensitivity

79 In relation to the sensitivity of visual receptors, this is defined through the application of professional judgement in relation to the interaction between the 'value' of the view experienced by the visual receptor and the 'susceptibility' of the visual receptor (or 'viewer', not the view) to the particular change likely to result from the development. 'Value' and 'Susceptibility are identified separately in this judgement, as per Section 1.2.5 of this methodology.

80 Factors are applied to determine whether the value attached to a view is classified as 'high'; 'medium' or 'low', which in turn is considered in the assessment of sensitivity of a receptor. It follows that the most highly valued views will add weight to the assessment of overall sensitivity. It is considered, however, that the factors weighed in reaching a decision on value are not all applicable at night-time, in the same way they may be during the day.

81 For example, with the exception of a viewpoint location within a Dark Sky Park/IDSR (where one clear objective to is observe the night sky) or from a residential property that has windows facing a wind farm, it is not appropriate to attribute value to views at night when the detail of the view, or of elements that add value to it within a landscape, cannot readily be discerned. Furthermore, the popularity of a viewpoint during the day may be completely different to its use at night. The offshore elements of AyM are not located within a Dark Sky Reserve or a nationally designated landscape where dark skies are considered to be part of the identified Special Qualities. However, the aviation and marine navigational lights are likely to be visible from the viewpoints within these areas, so heightened value to views may be ascribed in respect of viewing locations where one objective is to observe the night sky, however other value factors assessed for day-time viewpoints may be of less relevance to the value judgement.

82 Descriptions of 'susceptibility' provided from Section 1.2.5 are considered appropriate for the purposes of establishing receptor sensitivity at night-time. The susceptibility of people to changes in their night-time amenity should form the main consideration when formulating sensitivity, with less weight attached to value at night.

83 In reaching a view on the significance of the likely visual effects from the visible aviation lighting, it is relevant to consider what parts of the landscape - where darkness qualities are well displayed - are likely to be affected by visibility of the aviation lights and, in turn, to understand what people might be doing in these areas at night to be susceptible to visibility of aviation lights.

84 The susceptibility of people experiencing night-time outdoors will depend on the degree to which their perception is affected by existing baseline lighting. In brightly lit areas, or when travelling on roads from where sequential experience of lighting may be experienced, the susceptibility of receptors is likely to be lower than from within areas where the baseline contains no or limited existing lighting.

Magnitude of change

85 In relation to the other key component in determining significance of effect, the magnitude of change, reference to 'loss of important features' and 'composition of the view' are not readily discernible or relevant at night and, on this basis, a distinct set of criteria to explain the magnitude of change at night, as a consequence of the appearance of aviation lights, is set out in Table 3 below.

Table 3: Magnitude of change criteria for visible aviation and marine navigation lights.

LEVEL OF MAGNITUDE	DEFINITION OF MAGNITUDE
High	Addition of aviation and marine navigation lighting results in large scale of change/ large intrusion to the existing night-time baseline conditions/ darkness in the view, due to a full and/ or close-range view of visible aviation lighting and/ or a high degree of contrast/ low degree of integration with level of baseline lighting in the view. Results in obtrusive light which compromises or diminishes the view of the night sky.
Medium	Addition of aviation lighting results in moderate scale of change/ moderate intrusion to the existing night-time baseline conditions/ darkness in the view, due to partial and/ or middle distance view of visible aviation lighting and/ or moderate level of contrast/ integration with level of baseline lighting in the view. Results in light that may partially compromise or diminish the view of the night sky, but which is not considered obtrusive.
Low	Addition of aviation and marine navigation lighting results in small scale of change/ minor intrusion to the existing night-time baseline conditions/ darkness in the view, due to limited and/ or distant view of aviation lighting and/ or

LEVEL OF MAGNITUDE	DEFINITION OF MAGNITUDE
	low degree of contrast/ high degree of integration with level of baseline lighting in the view. Results in light that does not compromise or diminish the view of the night sky, nor is it considered obtrusive.
Negligible	Addition of aviation and marine navigation lighting results in a largely indiscernible change/ negligible intrusion to the existing night-time baseline conditions/ darkness in the view, due to glimpsed view of lighting and/ or slight degree of contrast/ very high degree of integration with level of baseline lighting in the view. Results in light that does not compromise or diminish the view of the night sky, nor is it considered obtrusive.

86 Intermediate levels of magnitude may be identified between these levels where, on the application of professional judgement, the assessor considers a level of change lies between the two definitions. The term 'obtrusive' used in the above definitions is interpreted as having the following meaning: "noticeable or prominent in an incongruous or intrusive way".

Assessing significance

87 The significance of effects of aviation and marine navigation lighting is assessed through a combination of the sensitivity of the visual receptor and the magnitude of change that would result from the visible aviation lighting, taking into account the considerations described above, and informed by the matrix in Table 4. which provides an understanding of the threshold at which significant effects may arise.

88 A significant effect occurs where the aviation and marine navigation lighting would provide a defining influence on a view or visual receptor. A non-significant effect would occur where the effect of the aviation and marine navigation lighting is not material, and the baseline characteristics of the view or visual receptor continue to provide the definitive influence. In this instance the aviation lighting may have an influence, but this influence would not be definitive.

89 In determining significance, particular attention is paid to the potential for 'Obtrusive Light' i.e. whether the lighting impedes a particular view of the night sky; creates sky glow (brightening of the night-sky); glare (uncomfortable brightness; or light intrusion (the spilling of light beyond the site or area being lit) (ILP) (2011) (GN01:2011).

1.2.7 Defining impact significance - cumulative seascape, landscape and visual

90 Cumulative effects are the incremental effects that arise through the interaction of two or more developments within the seascape, landscape and visual context. Cumulative effects arise where the study areas for two or more wind energy developments (or other relevant development) (hereafter described as cumulative developments) overlap so that both are experienced at a proximity where they may have a greater incremental effect, or where such developments may combine to have a sequential effect irrespective of any overlap in study areas.

91 In GLVIA3 (Landscape Institute and IEMA, 2013, p120) the guidelines define cumulative landscape and visual effects as those that "*result from additional changes to the landscape and visual amenity caused by the proposal in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future.*"

92 NatureScot's guidance, Assessing the Cumulative Impact of Onshore Wind Energy Developments (2012) is widely used across the UK to inform the specific assessment of the cumulative effects of both on and offshore wind farms. Both GLVIA3 and NatureScot's guidance provides the basis for the methodology for the cumulative SLVIA and LVIA undertaken in the SLVIA. The NatureScot (2012) guidance defines:

"Cumulative effects as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments taken together (NatureScot, 2012: p4);

Cumulative landscape effects are those effects that 'can impact on either the physical fabric or character of the landscape, or any special values attached to it' (NatureScot, 2012, p10); and

Cumulative visual effects are those effects that can be caused by combined visibility, which occurs where the observer is able to see two or more developments from one viewpoint and/ or sequential effects which occur when the observer has to move to another viewpoint to see different developments" (NatureScot, 2012, p11).

93 In the SLVIA (Chapter 10, Volume 2) the main assessment undertaken in Sections 10.10 and 10.11 covers the effect of the addition of the Development to the predicted baseline context that contains operational and under construction wind farms and its interaction with them. This therefore considers aspects of the impact of the Development that are associated with cumulative effects.

94 The cumulative Section 10.13 of the SLVIA Chapter 10 (Volume 2) considers the addition of the Development to a context that contains operational/ under construction, consented and application stage wind farm/ energy developments.

Types of Cumulative Effect

95 Cumulative effects on seascape/ landscape character arise when the influence of two or more wind energy developments (or other relevant development) becomes a characteristic of a seascape/ landscape receptor through the addition of the offshore elements of AyM.

96 Cumulative effects on views may consist of combined visibility and sequential effects. Combined visibility occurs where the observer is able to see two or more developments from one viewpoint. Combined visibility may either be 'in combination', where several cumulative developments are within the observer's main angle of view at the same time, or 'in succession', where the observer has to turn to see the various wind farms. Sequential effects occur when the observer has to move to another viewpoint or location to see different cumulative developments, and may arise assessed on roads, cycle paths, railway lines and footpaths. Such effects may be frequently sequential or occasionally sequential depending on the time lapses between instances of visibility.

97 The significance of cumulative effects is determined through a combination of the sensitivity of the seascape/ landscape receptor or visual receptor/ view and the cumulative magnitude of change arising from the addition of the Development. The sensitivity of landscape receptors and visual receptors/ views is taken from the main assessment, while the cumulative magnitude of change is evaluated according to additional criteria, described below.

Cumulative Magnitude of Change

98 The cumulative magnitude of change is an expression of the degree to which seascape/ landscape character receptors and visual receptors/ views will be changed by the addition of the Development to cumulative developments that are already operational/under construction plus those that are consented or at application stage. The cumulative magnitude of change is assessed based on a number of criteria, as follows:

- **The location of the Development in relation to other cumulative developments.** If the Development is seen in a part of the view or setting to a seascape/ landscape receptor that is not affected by other such development, this will generally increase the cumulative magnitude of change as it will extend such an influence into an area that is currently unaffected. Conversely, if the Development is seen in the context of other sites, the cumulative magnitude of change may be lower as wind farm influence is not being extended to otherwise undeveloped parts of the outlook or setting. This is particularly true where the scale and layout of the Development is similar to that of the cumulative developments as where there is a high level of integration and cohesion with other projects the various developments may appear as a single project;
- **The extent of the developed skyline.** If the Development will add notably to the developed skyline in a view, the cumulative magnitude of change will tend to be higher as skyline development can have a particular influence on both views and seascape/ landscape receptors;
- **The number and scale of cumulative developments seen simultaneously or sequentially**. Generally, the greater the number of clearly separate developments that are visible, the higher the cumulative magnitude of change will be. The addition of the Development to a view or landscape where a number of smaller developments are apparent will usually have a higher cumulative magnitude of change than one or two large developments as this can lead to the impression of a less co-ordinated or strategic approach;
- **The scale comparison between wind farm developments**. If the Development is of a similar scale to other visible wind farms, particularly those seen in closest proximity to it, the cumulative magnitude of change will generally be lower as it will have more integration with the other sites and will be less apparent as an addition to the cumulative situation. The converse also applies;

- **The consistency of image of the Development in relation to other wind farm developments.** The cumulative magnitude of change as a result of the Development is likely to be lower if its turbine height, arrangement and layout design are broadly similar to other wind farms in the seascape as they are more likely to appear as relatively simple and logical components of the seascape;
- **The context in which the wind farm developments are seen.** If developments are seen in a similar landscape context, the cumulative magnitude of change is likely to be lower due to visual integration and cohesion between the sites. If developments are seen in a variety of different landscape settings, this can lead to a perception that wind farm development is unplanned and un-coordinated, affecting a wide range of landscape characters and blurring the distinction between them; and
- **The magnitude of change of the Development as assessed in the main assessment.** The lower this is assessed to be, the lower the cumulative magnitude of change is likely to be. Where the Development is assessed to have a negligible magnitude of change on a view or receptor there will not be a cumulative effect as the contribution of the Development will equate to the 'no change' situation.

99 Definitions of cumulative magnitude of change are applied in order that the process of assessment is made clear. These are:

- **High**, the addition of the Development to other wind energy developments in the seascape/ landscape or view will result in a major change to the cumulative wind farm situation;
- **Medium**, the addition of the Development to other wind energy developments in the seascape/ landscape or view will result in a moderate change to the cumulative wind farm situation;
- **Low**, the addition of the Development to other wind energy developments in the seascape/ landscape or view will result in a minor change to the cumulative situation;
- **Negligible/ no change**, where the alteration to the cumulative situation is barely discernible or there would be no change.

100 There may also be intermediate levels of cumulative magnitude of change – high-medium, medium-low and low-negligible - where the change falls between two of the definitions.

Significance of Cumulative Effects

101 Significant cumulative seascape, landscape and visual effects arise where wind farms become a principal characteristic of the seascape/ landscape or view as a result of the addition of the Development to other cumulative development which results in wind turbines/ energy development becoming so prolific that they become a prevailing landscape and visual characteristic. The creation of a wind farm seascape/ landscape may evolve as follows:

- A small-scale, single wind farm will often be perceived as a new or 'one-off' feature or landmark within the seascape/ landscape. Except at a local site level, it will not usually change the overall existing seascape/ landscape character, or become a new characteristic element of a wider seascape/ landscape;
- With the addition of further wind farm/ energy development, wind farms/ energy development can become a characteristic element of the seascape/ landscape, as the wind farms/ energy developments appear as repeated seascape/ landscape elements. Providing there is sufficient separation, physically, visually and perceptually, between each development, coalescence is avoided and the wind farms are likely to appear as a series of wind farms within the seascape/ landscape, without becoming the dominant or defining characteristic of the seascape/ landscape; and
- The next stage is to consider larger commercial wind farms/ energy development or an increase in the number of wind farms/ energy developments that appear to physically, visually and perceptually coalesce. This may lead to a 'wind farm seascape/ landscape' where multiple wind farms/ energy developments are the prevailing or defining characteristic of the seascape/ landscape. A wind farm/ energy development characterised seascape/ landscape may, however, already exist as part of the baseline seascape/ landscape or visual context.

102 In this context, the addition of the Development may lead to the final step of the key characteristics of a seascape/ landscape or view becoming defined by the presence of wind farms/ energy development, so that other patterns and components are no longer definitive and, in some cases, to transform it into a different seascape/ landscape type. In this case, the cumulative effect would be assessed as significant. In some cases, significant cumulative effects may arise where the Development lies in close proximity to other developments, but with notable differences between them in terms of scale and setting, thus increasing the cumulative magnitude of change. However, provided that the Development is designed to achieve a high level of visual integration with adjacent or nearby wind farms, these effects may not be assessed as significant.

103 Significant cumulative effects may also result from the creation of a situation where wind farms/ energy developments have some geographical separation but remain highly inter-visible, potentially resulting in a proliferation of wind farm/ energy development on the skyline, the creation of multiple discrete wind farm/ energy seascapes/ landscapes or where there are distinct inconsistencies in image/ differences in appearance between wind farms/ energy developments.

1.2.8 Evaluation of significance

104 The matrix presented in Table 4: Matrix used to guide determination of level of effect and significance.

105 is used as a guide to illustrate the SLVIA process. In line with the emphasis placed in GLVIA3 upon the application of professional judgement, an overly mechanistic reliance upon a matrix is avoided through the provision of clear and accessible narrative explanations of the rationale underlying the contributing factors and levels of assessment made for each seascape, landscape and visual receptor. Such narrative assessments provide a level of detail over and above the outline assessment provided by use of the matrix alone.

106 The seascape, landscape and visual assessment unavoidably, involves a combination of quantitative and qualitative assessment and wherever possible cross references have been made to objective evidence, baseline figures and/ or to photomontage visualisations to support the assessment conclusions. Often a consensus of professional opinion has been sought through consultation, internal peer review, and the adoption of a systematic, impartial, and professional approach. Importantly each effect results from its own unique set of circumstances and have been assessed on a case-by-case basis. The matrix as presented in Table 4 should therefore be considered as a guide and any deviation from this guide has been clearly explained in the assessment.

107 Although it is not reliant on the use of a matrix it illustrates how combinations of the ratings for sensitivity and magnitude of change can give rise to significant effects, as well as to give an understanding of the threshold at which significant effects may arise.

108 On this basis potential effects are assessed as of Negligible, Minor, Moderate-Minor, Moderate, Moderate-Major and Major. In those instances where the magnitude has been assessed as 'no change' and the level of effect is recorded as 'no effect'.

109 For the purposes of this assessment, any effects with a significance level of Major and Moderate-Major have been deemed significant in EIA terms (dark green shaded boxes in Table 4). 'Moderate' levels of effect have the potential, subject to the assessor's professional judgement, to be considered as significant or not significant, depending on the factors evaluated (mid-green shaded boxes in Table 4). In accordance with the GLVIA3, experienced professional judgement will be applied to the assessment of all effects and reasoned justification presented in respect of the findings in each case. Light green boxes in Table 4 indicate a non-significant effect.

110 The matrix as well as other aspects of the SLVIA methodology differs from that presented in Table 2 of Volume 1, Chapter 3: Environmental Impact Assessment Methodology. This deviation from the standard methodology and matrix accords with Section 3.6 of Chapter 3 which allows for topic specific variation whilst allowing a degree of professional judgement.

Table 4: Matrix used to guide determination of level of effect and significance.

SENSITIVITY	MAGNITUDE OF CHANGE					
	HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM-LOW	LOW	NEGLIGIBLE
HIGH	Major (Significant)	Major (Significant)	Major-Moderate (Significant)	Moderate (Significant/ Non-significant)	Moderate-Minor (Non-significant)	Minor (Non-significant)
MEDIUM-HIGH	Major (Significant)	Moderate-Major (Significant)	Moderate (Significant/ Non-significant)	Moderate (Significant/ Non-significant)	Moderate-Minor (Non-significant)	Minor (Non-significant)
MEDIUM	Moderate-Major (Significant)	Moderate (Significant/ Non-significant)	Moderate (Significant/ Non-significant)	Moderate-Minor (Non-significant)	Minor (Non-significant)	Minor (Non-significant)
MEDIUM-LOW	Moderate	Moderate	Moderate-Minor	Moderate-Minor	Minor	Negligible

SENSITIVITY	MAGNITUDE OF CHANGE					
	HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM-LOW	LOW	NEGLIGIBLE
	(Significant/ Non-significant)	(Significant/ Non-significant)	(Non-significant)	(Non-significant)	(Non-significant)	(Non-significant)
LOW	Moderate (Significant/ Non-significant)	Moderate-Minor (Non-significant)	Minor (Non-significant)	Minor (Non-significant)	Negligible (Non-significant)	Negligible (Non-significant)

1.2.9 Duration and reversibility

111 The duration and reversibility of seascape, landscape and visual effects is based on the period over which the Development is likely to exist (during construction and operation) and the extent to which these elements are removed (during decommissioning) and its effects reversed at the end of that period. Long term, medium term and short-term seascape, landscape and visual effects are defined as follows:

- **long term** – more than 10 years (may be defined as permanent or reversible);
- **medium term** – 6 to 10 years; and
- **short term** – 1 to 5 years.

1.2.10 Nature of effects

112 The EIA Regulations state that the ES should define 'the direct effects and any indirect, secondary, cumulative, transboundary, short term, medium term and long term, permanent and temporary, positive and negative effects of the development'.

113 In accordance with the EIA Regulations in this assessment the nature of effects refers to whether the seascape, landscape and/ or visual effect of the Development is positive or negative (herein referred to as 'beneficial'/ 'neutral' or 'adverse').

114 Guidance provided in GLVIA3 on the nature of effect states that 'in the LVIA, thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity', but it does not provide guidance as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and, where applied, this involves reasoned professional opinion.

115 In relation to many forms of development, assessments will identify 'beneficial' and 'adverse' effects by assessing these under the term 'Nature of Effect'. The seascape, landscape and visual effects of wind farms are difficult to categorise in either of these brackets as, unlike other disciplines, there are no definitive criteria by which the effects of wind farms can be measured as being categorically 'beneficial' or 'adverse'. In some disciplines, such as noise or ecology, it is possible to quantify the effect of a wind farm in numeric terms, by objectively identifying or quantifying the proportion of a receptor that is affected and assessing the nature of that effect in justifiable terms. However, this is not the case in relation to seascape, landscape and visual effects where the approach combines quantitative and qualitative assessment.

116 Whether wind farm development has beneficial, adverse or neutral impacts on the seascape, landscape and visual resource could be said to be highly subjective. People have varied opinions about the aesthetics and presence of wind farms as part of the environment. Generally, in the development of 'new' wind farms, a precautionary approach is adopted which assumes that significant seascape, landscape and visual effects are weighed on the adverse side of the planning balance, unless otherwise stated. Beneficial or neutral effects may, however, arise in certain situations and are stated in the assessment where relevant, based on the following definitions.

- **Beneficial effects** - contribute to the seascape, landscape and visual resource through the enhancement of desirable characteristics or the introduction of new, beneficial attributes. The development contributes to the landscape by virtue of good design or the introduction of new landscape planting. The removal of undesirable existing elements or characteristics can also be beneficial, as can their replacement with more appropriate components.

- **Neutral effects** - occur where the development fits with the existing seascape/ landscape character or visual amenity. The development neither contributes to nor detracts from the landscape and visual resource and can be accommodated with neither beneficial or adverse effects, nor where the effects are so limited that the change is hardly noticeable. A change to the seascape, landscape and visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation.
- **Adverse effects** - are those that detract from the seascape/ landscape character or quality of visual attributes experienced, through the introduction of elements that contrast, in a detrimental way, with the existing characteristics of the seascape, landscape and visual resource, or through the removal of elements that are key in its characterisation.

1.2.11 Visual analysis and representations

117 Zones of Theoretical Visibility (ZTVs) and visualisations (wirelines or wirelines and photomontages) are graphical images produced to assist and illustrate the SLVIA and the cumulative context. The methodology used for the taking of viewpoint photography and the preparation of photomontages is in accordance with the NatureScot guidance on Visual Representation of Wind Farms, Version 2.2 (2017), the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA 3) (Landscape Institute and IEMA, 2013).

Zone of Theoretical Visibility (ZTV)

118 The ZTVs in Volume 6, Annex 10.5 Figures 12 to 20 and 23 to 27 have been calculated using Arc GIS software to generate a ZTV of the WTGs or their associated aviation lighting, to demonstrate the maximum theoretical extent of their visibility from any point in the study area.

119 A 3D computer model has been developed of the existing landscape using OS Terrain 5. This is used to produce the ZTV analysis and wirelines, these tiles provide a digital record of the existing landform of Great Britain. The computer model includes the entire study area and takes account of the effects caused by atmospheric refraction and the earth's curvature.

120 The resulting ZTV analysis has been overlaid on Ordnance Survey mapping at an appropriate scale and presented as figures.

121 Cumulative ZTV plots based on the intervisibility of the Development and other relevant developments within the study area have also been produced.

122 There are limitations in this theoretical production, and these should be considered in the interpretation and use of the ZTV as follows.

- Where the ZTV has been calculated using OS Terrain 5 digital terrain data, this will not account for the screening effects of minor changes in ground level, vegetation or built form.
- The ZTVs are based on theoretical visibility from 2 m above ground level.
- The Blade Tip ZTV does not indicate the decrease in visibility that occurs with increased distance from the array area. The nature of what is visible from 3km away will differ markedly from what is visible from 10km away, although both are indicated on the Blade Tip ZTV as having the same level of visibility.
- There is a wide range of variation within the visibility shown on the ZTV, for example, an area shown on the blade tip ZTV as having visibility of 34 WTGs may gain views of the smallest extremity of blade tips, or of 34 full WTGs. This can make a considerable difference in the effects of the Development on that area. The hub height ZTV has been used in conjunction with the blade tip ZTV to provide an indication of the degree to which the WTGs are visible.

123 These limitations mean that while the ZTV is used as a starting point in the assessment, providing an indication of where the Development is theoretically visible and tending to present a worst-case or over-estimate the actual visibility.

124 The SLVIA includes a Horizontal Angle ZTV (Volume 6, Annex 10.5: Figure 14) to show the horizontal field of view (in degrees) that may be affected by views of the WTGs.

125 A ZTV has been prepared to illustrate the difference in theoretical visibility between Maximum design scenario (MDS) A and MDS B. This is Volume 6, Annex 10.5: Figure 23.

Baseline photography

126 Once a viewpoint has been selected, the location is visited, confirmed, and assessed with the aid of a wireline or similar visualisation in the field. A hand-held Global Positioning System (GPS) is used to record the location of the tripod.

127 The photographs used to produce the photomontages are taken at the locations agreed with the consultees using Canon EOS 5D and 6D Digital single-lens reflex (SLR) cameras, with a fixed lens and a full-frame (35mm negative size) complementary metal oxide semi-conductor sensor. The photographs are taken on a levelled tripod with a pano-head at a height of approximately 1.5m above the surface level at the location.

128 In accordance with Landscape Institute (2019) guidance photographs of the tripod position have been taken in-case there is a need for future confirmation or verification of the viewpoint location. Whilst these are included in the LI (2019) guidance in Appendix 10 'Indicative Listing – Per viewpoint' these have not been included as part of the SLVIA submission.

129 The resulting visualisations are prepared to indicate other relevant cumulative development in order that they may assist any cumulative assessment as well as the SLVIA.

130 Whilst no two-dimensional image can fully represent the real viewing experience, the visualisation aims to provide a realistic representation of the offshore elements, based on current information and photomontage methodology.

131 Guidelines for LVIA (GLVIA3) para 8.22 states – 'In preparing photomontages, weather conditions shown in the photographs should (with justification provided for the choice) be either:

- representative of those generally prevailing in the area; or
- taken in good visibility, seeking to represent a maximum visibility scenario when the development may be highly visible'.

132 In preparing photomontages for the SLVIA, photographs have generally been taken in favourable weather conditions during periods of 'good', 'very good' or 'excellent' visibility conditions - seeking to represent a maximum visibility scenario when the Development may be most visible. The photographs taken from Viewpoint (VP) 17: Penrhyn Castle and VP 50: Gwrych Castle in the study area were not taken in favourable weather conditions due to the restrictions that have been or are in place for access to these locations which have limited suitable times coincidental with visits during good weather.

Visualisations

133 Photomontages are produced in accordance with NatureScot Visual Representation of Windfarms Guidance (NatureScot 2017) and Landscape Institute (2019) Technical Guidance Note 06/19 Visual Representation of Development Proposals.

134 A photomontage is a visualisation which superimposes an image of a proposed development upon a photograph or series of photographs. Photomontage is a widespread and popular visualisation technique, which allows changes in views and visual amenity to be illustrated and assessed, within known views of the 'real' landscape.

135 To create the baseline panorama, the frames are individually cylindrically projected and then digitally joined to create a fully cylindrically projected panorama using PTGui software. This process avoids the wide-angle effect that would result should these frames be arranged in a perspective projection, whereby the image is not faceted to allow for the cylindrical nature of the full 360-degree view but appears essentially as a flat plane.

136 Tonal alterations are made using Adobe Photoshop software to create an even range of tones across the photographs once joined.

137 The baseline photographs and cumulative wireline visualisations shown for each viewpoint cover a 90-degree FoV (or in some cases, up to 360-degree), which accords with NatureScot guidance.

138 The photographs are also used to create planar projection panoramas using PTGui software. These are used in the creation of the 53.5-degree field of view photomontages.

139 Wireline representations that illustrate the Development are set within a computer-generated image of the landform and used in the assessment to predict theoretical location and scale of the Development. These are produced with Resoft WindFarm software and are based on a terrain model with a 5m data grid. There are limitations in the accuracy of Digital Terrain Model (DTM) data so that landform may not be picked up precisely and may result in wind turbines being more or less visible than is shown, however, the use of OS Terrain 5 minimises these limitations. Where descriptions within the assessment identify the numbers of wind turbines visible this refers to the illustrations generated and therefore the reality may differ to a degree from these impressions.

140 Where wireline views are presented without baseline photographs, and where otherwise it is difficult to distinguish where the land becomes the sea, the sea has been indicated on the wirelines as requested by stakeholders.

141 Wirelines show a WTG model set within cumulative wind farm development, of the Development and allow the potential proportions of the wind turbines to be appreciated from the visualisations.

142 Fully rendered photomontages are produced for the agreed viewpoints using Resoft WindFarm software, to provide a photorealistic image of the appearance of the offshore elements of AyM. In the daytime photomontages modelled representations are combined with the baseline view photographs to create a photorealistic rendered photomontage image of the development.

143 In addition, some viewpoints also have wirelines and photomontages to illustrate MDS B.

144 For viewpoints located within 20 km of the AyM array area the Met Mast and OSPs have been added to the photomontages using other modelling software and combined in Adobe Photoshop.

145 Beyond this distance the met mast is unlikely to be readily noticeable and it is considered that due to their smaller scale and height the OSPs do not contribute materially to the overall effect of AyM. Where appropriate jacket foundations have been added to the photomontages for two of the closest viewpoints (namely 13 and 18 CHECK) to illustrate how these would appear in views as they are considered to form part of the MDS. However, it is not considered necessary to add these into every photomontage as jacket foundations are unlikely to give rise to a materially different effect.

146 'Panoramic photomontages' are produced in the SLVIA with a 53.5° horizontal FoV, based on relevant guidance (NatureScot, 2017) and due to their suitability to encompass the horizontal spread of AyM and show the turbines at a representative scale and distance, set within their seascape context.

147 The 53.5 degree field of view wirelines and photomontages are prepared using a planar projected image and should also be viewed flat at a comfortable arm's length. These images are each printed on paper 841 x 297mm (half A1) which provides for a relatively large-scale image. It is important that the visualisations are viewed in the field and at the correct size/ scale and distance from the viewer in order to gain a reasonable understanding of the effects of AyM.

148 In the wirelines, the wind turbines are shown with the central wind turbines facing the viewer directly, with the full rotor diameter visible at its tallest extent. In the photomontages, the wind turbine rotors are shown with a random rotational appearance with the central wind turbines facing the viewer directly as a worst case or otherwise in accordance with the direction of the operational OWF WTGs to avoid unnecessary discord with this baseline. In reality, turbine rotors will face the wind (prevailing WSW).

149 Rendering of the wind turbines in the photomontages is as photorealistic as possible to the conditions shown in each viewpoint photograph. There is some variation in the appearance and visibility of the wind turbines between the viewpoints, as they are rendered to suit the conditions shown in each of the different viewpoint photographs, which have some unavoidable degree of variation in terms of lighting and weather conditions. The key requirement is that the wind turbines are rendered with sufficient contrast against the skyline backdrop to illustrate their maximum visibility scenario in each image. Photomontages are prepared to depict how the Development would appear to illustrate the worst-case.

150 In some cases, the visibility of the operational OWFs has been enhanced using photomontage techniques. This is in accordance with NatureScot Guidance and is noted on the visualisations.

Night-time visualisations

151 Night-time visualisations have been produced from several key viewpoints, to visually represent aviation and marine navigation lighting at night. Lighting intensity scenarios have been portrayed to illustrate the maximum lighting intensity and minimum lighting intensity proposed.

152 Night-time visualisations have been produced using a combination of Resoft's WindFarm software's aviation module software for positioning of the lights, 3D modelling software that can simulate lighting conditions, referencing existing lighting imagery/ atmospheric conditions from the baseline photographs and professional judgement using photoshop.

153 The appearance of the lights in the night-time photomontages emulates how lights appear in the other parts of the baseline photographs. A light shown in a photograph tends to have a slight 'halo' (or bokeh) around it due to the way a camera lens renders out-of-focus points of light. This is not the way lights are seen in reality, as they tend to be much more defined as point sources. However, the proposed lighting has been shown in this way for consistency with the lights in the baseline photographs.

154 The visual effect of the AyM OWF at night has been assessed in the SLVIA chapter, informed by the night-time photomontage visualisations produced from four representative viewpoints, in agreement with the SLVIA/ Cultural Heritage Expert Topic Group (ETG): Viewpoint 24: Moelfre Headland at Sculpture; Viewpoint 13: Great Orme near Summit Complex; Viewpoint 22: Abergele promenade; and Viewpoint 60: Foel Lus. These are included in Volume 6, Annex 106. Following consultation feedback a further night time visualisation has been prepared from Viewpoint 61: Llandudno Promenade near Venue Cymru.

Limitations of visualisations

155 The photographs and other graphic material such as wirelines and photomontages used in this assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what can be seen by the human eye. The assessments are carried out from observations in the field and therefore may include elements that are not visible in the photographs.

156 The photomontage visualisations of the Development (and any wind farm proposal) have a number of limitations when using them to form a judgement on visual impact. These include the following:

- A visualisation can never show exactly what the Development will look like in reality due to factors such as: different lighting, weather and seasonal conditions which vary through time and the resolution of the image.
- The images provided give a reasonable impression of the scale of the wind turbines and the distance to the wind turbines but can never be 100% accurate.
- A static image cannot convey turbine movement, or flicker or reflection from the sun on the turbine blades as they move.
- The viewpoints illustrated are representative of views in the area but cannot represent visibility at all locations.
- To form the best impression of the impacts of the Development proposal these images are best viewed at the viewpoint location shown.

- For field work review and assessment the photomontages should, where possible, be printed and viewed at the correct size (260mm by 820mm);
- Images viewed on screen should be viewed with the image enlarged to the 260mm height by 'zooming' to 'actual size' to give a realistic impression when viewed at approximately arm's length.
- Images should be held flat at a comfortable arm's length. If viewing these images on a wall or board at an exhibition, viewers should stand at arm's length from the image presented to gain the best impression.

157 There are practical limitations to shooting viewpoint photographs only in very good or excellent visibility and at particular times of day. The photographs shown in the visualisations show the most favourable weather conditions available during photographic survey work, which over the assessment period has been highly limited by COVID-19 restrictions. This has particularly been the case in relation to accessing the castles in Wales and for viewpoints requested at a later stage in the assessment process which have relied on photography taken during the Winter.

1.2.12 Technical Methodology

158 In accordance with the requirements of Landscape Institute (2019) Technical Guidance Note 06/19. Table 5 sets out the technical information for the preparation of the visualisations contained in Annex 10.6.

Table 5: Technical information relating to the preparation of visualisations.

CATEGORY	DETAIL
Photography	
Visualisation Type	Type 4 – where survey of viewpoint locations is not required
Camera location	Established via hand-held Garmin GPS

CATEGORY	DETAIL
	EasyGPS online Waypoint Viewer www.easygps.com
Level of accuracy of location	1-3m (depending on satellites)
Camera	Canon EOS 5D Mark II and Canon EOS 6D Digital SLR Full-frame (35mm negative size) CMOS sensor.
Lens	50mm fixed f1.4 lens
Tripod	Set to approximately 1.5m Nodal Ninja panoramic head with Adjust Leveller Nodal Ninja panoramic head set to take photographs at 20 degree increments
Photography process	Camera used on fully manual settings Photographs taken in RAW image format Bracketed exposures are taken for each view and those depicting the clearest images are selected to prepare the panoramic image
Preparation of panoramic photographs	PTGUI v12.8 is used to join and cylindrically project the images Adobe Photoshop 2021 used to correct tonal alterations and create an even range of exposure across the photographs so that the individual photographs are not apparent. Planar panoramic images are prepared using Resoft Windfarm software or Hugin Panorma Stitcher
3D Model/ Visualisation	
Topographic height data	Ordnance Survey Terrain 5 (5m resolution)

CATEGORY	DETAIL
	Ordnance Survey Terrain 50 (50m resolution)
Use of coordinates in software	Coordinates are brought in from the surveyed GPS coordinates Positions checked using aerial photography
Markers for horizontal alignment	Existing OWF WTGs and their known coordinates
Markers for vertical alignment	Existing OWF WTGs and their known coordinates
Rendering software	Resoft Windfarm v.5.2.5.3 (Wind turbines in wirelines and photomontages) Sketchup or AutoCAD Map 3D 2018 (OSPs, Met Mast and jacket foundations) Autodesk 3ds Max 2018 Visual Nature Studio V 3.10 (digital visualisations using aerial photography drape in place of baseline photographs)
Limitations	
Terrain data	There may therefore be local, small-scale landform that is not reflected in the data and subsequently the visualisation but may alter the real visibility of the Development, either by screening theoretical visibility or revealing parts of the Development that are not theoretically visible.
Movement	Static images are unable to capture the movement within the view or of the WTGs

1.3 References

Landscape Institute with the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition.

Landscape Institute (2019) Technical Guidance Note 06/19 Visual Representation of Development Proposals.

NatureScot (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments.

NatureScot (2017) Visual Representation of Windfarms. Version 2.2.

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