# APPENDIX 14-1

***LVIA METHODOLOGY***

# Appendix 14-1 – LVIA Methodology

## Proposed Clonberne Wind Farm, Co. Galway

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# 1. LANDSCAPE AND VISUAL IMPACT ASSESSMENT (LVIA) METHODOLOGY

## 1.1 Scope and Definition of LVIA Study Area

Chapter 14 follows the naming conventions and definitions detailed in Section 1.1.1. of Chapter 1 of this EIAR. For the purposes of this chapter, where the 'the Site' is referred to, this relates to the primary study area for the Proposed Project, as shown delineated in green on the LVIA Baseline map (Appendix 14-4).

The Guidelines for Landscape and Visual Impact Assessment 3rd Edition (hereafter, GLVIA3) (Landscape Institute [LI] & Institute of Environmental Management and Assessment [IEMA], 2013) guidance refers to the identification of the area of landscape that is to be covered while assessing landscape and visual effects. The guidelines state:

> *"The study areas should include the site itself and the full extent of the wider landscape around it which the Proposed Project may influence in a significant manner."*

Landscape and visual baseline mapping and viewpoint selection are based on wider study areas referred to as the 'LVIA Study Area'. The geographical parameters for this LVIA were determined by desktop study, survey work undertaken and the professional judgement of the assessment team, as well as experience from other relevant projects and policy guidance or standards, including :

- *Appendix 3* of the 'Wind Energy Development Guidelines for Planning Authorities' (hereafter, WEDGs) (Department of the Environment, Heritage and Local Government [DoEHLG], 2006), including reference to the Draft Revised WEDGs Department of Planning, Housing and Local Government (DoHPLG), 2019;
- The Guidelines for Landscape and Visual Impact Assessment 3rd Edition– GLVIA3, (Landscape Institute & IEMA, 2013 2013).

### 1.1.1 LVIA Study Area for Effects on Landscape and Visual Receptors: 20km Radius

The distance at which a Zone of Theoretical Visibility (ZTV) map is set from a proposed wind farm development usually defines the parameters of the LVIA Study Area. In this chapter, the LVIA Study Area was chosen as 20 kilometres from the proposed turbines for landscape and visual effects as is suggested by guidance (WEDGs, DoEHLG, 2006, p.94; Draft Revised WEDGs, DoHPLG, 2019, p.152):

> *'For blade tips in excess of 100m, a Zone of Theoretical Visibility radius of 20km would be adequate'.*

### 1.1.2 LCA Study Area for Effects on Designated Landscape Character Areas: 15km Radius

Through experience conducting LVIA for other wind energy development projects, the assessment team determined that no significant effects on landscape character are likely to arise beyond distances of 15km from the proposed turbines. The turbines of a wind farm are unlikely to significantly impact the key characteristics of an LCA beyond a distance of 15km, even for the most sensitive designated LCAs. Therefore, a study area of 15km, hereafter referred to as the LCA Study Area, is deemed appropriate for effects on landscape character in relation to the assessment of effects upon designated Landscape Character Areas.

### 1.1.3 Topics Scoped Out of Assessment

On the basis of desk studies and survey work undertaken, the professional judgement of the assessment team, experience from other relevant projects and policy guidance or standards, the following topic areas have been scoped out of the assessment:

- Effects on landscape and visual receptors that have minimal or no theoretical visibility (as predicted by the ZTV) and/or very distant visibility, and are therefore unlikely to be subject to 'Significant' effects;
- Effects on designated landscapes beyond a 20km radius (LVIA Study Area) from the proposed turbines, from where it is judged that potential significant effects on key characteristics and/or special qualities, or views are judged unlikely to occur;
- Effects on landscape character and designated Landscape Character Areas beyond a 15km (LCA Study Area) radius from the proposed turbines, where it is judged that potential 'Significant' effects on landscape character are unlikely to occur;
- Effects on visual receptors beyond a 20km radius (LVIA Study Area) from the proposed turbines, where it is judged that potential 'Significant' effects are unlikely to occur;
- Cumulative effects in relation to single turbines (except where otherwise stated);
- Cumulative landscape and visual effects beyond a 20km radius (LVIA Study Area) from the proposed turbines, where it is judged that potential 'Significant' cumulative effects are unlikely to occur.

## 1.2 Essential Aspects of the Proposed Project from an LVIA Perspective

Guidance for the LVIA (GLVIA3, 2013) states that:

> *"It is important to make sure that the project description provides all the information needed to identify its effect on particular aspects of the environment. For LVIA, it is important to understand, from the project description, the essential aspects of the scheme that will potentially give rise to its effect on the landscape and visual amenity."*

The tall, vertical nature of the Proposed Wind Farm turbines make them the most prominent elements of the Proposed Project from a landscape and visual perspective and have the most potential to give rise to significant landscape and visual effects. In this regard, the Proposed Wind Farm turbines are deemed to be the 'essential aspect' of the Proposed Project which will give rise to effects on the landscape and visual amenity and therefore a primary focus of the LVIA conducted in Chapter 14.

Other elements of the Proposed Development are not deemed to be as visually prominent as the proposed turbines; however, they do also have the potential to give rise to localised landscape and visual effects. Although these elements are not the primary focus of the LVIA, they are given due consideration throughout Chapter 14.

## 1.3 Guidelines

While the legislation and general guidance on Environmental Impact Assessment (EIA) is set out in Chapter 1 of this EIAR, only guidance specifically pertaining to the Landscape and Visual Impact Assessment are outlined below.

Ireland signed and ratified the European landscape Convention (ELC) in 2002, which introduces a pan-European concept which centres on the quality of landscape protection, management and planning, The Department of Arts, Heritage, and the Gaeltacht has published a National Landscape Strategy for Ireland in 2015. The Strategy aims to ensure compliance with the ELC and contains six main

objectives, which include developing a national Landscape Character Assessment and Developing Landscape Policies.

In 2000, the Department of the Environment and Local Government published 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities', which recommended that all Local Authorities adopt a standardised approach to landscape assessment for incorporation into Development Plans and consideration as part of the planning process. However, this DoELG 2000 guidance remains in draft form.

The Landscape and Visual Impact Assessment of this chapter was primarily based on the *Guidelines for Landscape and Visual Impact Assessment, Third Edition* or GLVIA3 (The Landscape Institute/Institute of Environmental Management and Assessment, UK, 2013). A range of other guidelines also inform the preparation of this LVIA, which include:

- WEDGs (DoEHLG, 2006) and Draft Revised WEDGs (DoHPLG, 2019);
- 'Visual Assessment of Wind Farms: Best Practice' (Scottish Natural Heritage [SNH], 2002);
- 'Visual Representation of Wind Farms: Version 2' (hereafter, SNH Guidance v.2) (SNH, 2014);
- 'Visual Representation of Wind Farms: Version 2.2' (hereafter, SNH Guidance v.2.2) (SNH, 2017);
- 'Siting and Designing Wind Farms in the Landscape, Version 3a' (hereafter, SNH Guidance v.3a) (SNH, 2017);
- 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (Nature Scot, 2021; includes methodology from SNH, 2012);
- 'Visual Representation of Development Proposals' (Landscape Institute Technical Guidance Note 06/19, 2019) (hereafter, LI TGN 06/19);
- 'Spatial Planning for Onshore Wind Turbines: Natural Heritage Considerations' (SNH, 2015);
- 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities' (DoEHLG, 2000);
- 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (Environmental Protection Agency of Ireland [EPA], 2000).

## 1.4 Visibility Mapping: Zone of Theoretical (ZTV)

The Zone of Theoretical Visibility (ZTV) represents the are over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM), overlaid on a map base. A DTM refers to the way in which a computer represents a piece of topography in three dimensions as a digital model. A ZTV map provides the following information:

- Indicates broad areas where visibility of a wind energy development is most likely to occur;
- How much of the wind energy development is likely to be visible (using different coloured bands for different numbers of turbines);
- The extent and pattern of visibility.

Production of ZTV maps is usually one of the first steps of Visual Impact Assessment, helping to inform the selection of the Study Area in which impacts will be considered in more detail and the identification of sensitive vantage points (Visual Representation of Wind Farms, SNH Guidance v.2.2, 2017).

### 1.4.1 Limitations of ZTV Mapping

The 2017 SNH Guidance v.2.2 guidelines referred to above acknowledge the following limitations inherent to the use of theoretical visibility mapping:

- The ZTV presents a 'bare ground' scenario, i.e. visibility of the Proposed Development in a landscape without visually screening structures or vegetation. This includes trees, hedgerows, buildings and small-scale landform or ground surface features. The ZTV also does not take into account the effects of weather and atmospheric conditions, and therefore can be said to represent a 'worst-case' scenario, that is where the wind turbines could potentially be seen given no intervening obstructions and favourable weather conditions.
- The ZTV indicates areas from where a wind farm may be visible, but cannot show how it will look, nor indicate the nature or magnitude of visual impacts. The visibility of the turbines will decrease with the distance from which they are viewed, but this is not accounted for in the ZTV. Figure 1-1 below provides an illustration of the differences in view relative to the distance from a turbine.


*Figure 1-1 The effect of distance on visibility of wind turbines (Illustrative Purposes Only)*

- A ZTV is only as accurate as the data on which it is based. It is not easy to test the accuracy of a ZTV in the field, although some verification will occur during the assessment of viewpoints.
- In order to handle large areas of terrain, the DTM data is based on information that does not allow detail to be distinguished below a certain level. There are also differences in the way that the software package 'interpolates' between heights in the calculations made.

### 1.4.2 ZTV Methodology

The ZTV maps presented in the EIAR show visibility of the Proposed Development using the half blade height of the wind turbines as points of reference. The WEDGs (DoEHLG, 2006 p.94) and Draft Revised WEDGs (DoHPLG, 2019 p.152) note that:

> *"It is recommended that the Zone of Theoretical Visibility should assess the degree of visibility based on the numbers of turbines visible to half the blade length in addition to hub-height".*

Furthermore, as well as per the guidance, a Half-Blade ZTV is considered more appropriate and useful than a Full-Blade ZTV for analysing visibility of the proposed turbines and scoping receptors in and out for assessment, particularly when using an elevation model representing a bare earth scenario. The decision to use a Half-Blade ZTV is based upon the guidance as well as the professional judgement and the extensive experience the assessment team have ground truthing ZTVs against the reality of turbine visibility within landscapes where turbines already exist.

The maps also show the theoretical visibility of the Proposed Development in addition to visibility of other existing, permitted and proposed wind farms in the area. The area covered by the ZTV maps in Chapter 14 have a radius of 20 kilometres from the outer-most proposed turbines.

The 2006 DoEHLG Wind Energy Development Guidelines for Planning Authorities require that:

> *'in areas where landscapes of national or international renown are located within 25 km of a proposed wind energy development, the Zone of Theoretical Visibility should be extended as far (and in the direction of) that landscape'.*

A mapping investigation determined that no landscapes of National or International renown are located between 20 to 25 km from the Proposed Development and the extension of the ZTV beyond 20 km from the outer-most proposed turbine is not warranted. Therefore, 20 km was deemed a sufficient and appropriate boundary for the location and scale of the Proposed Project and any assessment of landscape and visual effects, as is determined in the WEDGs:

> *"For blade tips in excess of 100m, a Zone of Theoretical Visibility radius of 20km would be adequate" (2006 WEDGs Page 94; 2019 draft WEDGs Page 152).*

ZTV maps assume a worst-case or 'bare ground' scenario, i.e., no land-cover. They represent visibility of the proposed wind farm in the absence of all natural and manmade features from the landscape, including vegetation, houses, and other buildings. In reality, such features will restrict or limit visibility of the wind turbines, due to the visual screening effects of vegetation, for example forestry and road-side hedgerows and trees, and buildings, particularly within towns and villages.

Separate colour bands are used on each ZTV map to indicate the number of turbines which will potentially be visible to half blade i.e. only half a blade might be visible over the topography as opposed to seeing a full turbine. The legend on each map shows the number of visible turbines for each corresponding colour, which are as follows:

- Orange: 1-2 turbines theoretically visible.
- Teal: 3-4 turbine theoretically visible
- Yellow: 5-8 turbines theoretically visible
- Navy: 9-11 turbines theoretically visible

### 1.4.3 On-Site Visibility Appraisal: Route Screening Analysis (RSA)

As the ZTV does not account for localised undulations in topography and other screening factors, the actual visibility is often far less than is indicated by the ZTV. Therefore, whilst the ZTV is a useful tool to aid analysis of likely visibility of the proposed turbines and scope out areas where impacts will not occur, the LVIA in Chapter 14 is also informed by visibility appraisals conducted from sensitive receptors throughout the LVIA Study Area.

During site visits conducted during 2020, 2021, 2022, 2023 and 2024, the likely visibility of the proposed turbines was appraised from receptors where the ZTV indicated theoretical visibility. This included an analysis of visibility looking towards the proposed turbines from the local road network immediately surrounding the Site during an exercise called 'Route Screening Analysis' (RSA), a methodology developed by MKO.

### 1.4.4 Route Screening Analysis Methodology - Roads

In order to comprehensively demonstrate the varying characteristics of visual screening existent on roads, proximate to the Proposed Development and to record the actual visibility in comparison to the theoretical visibility, a methodology was developed. This is termed Route Screening Analysis (RSA) and it was undertaken from all public roads within a 3km radius of the proposed turbines. Additional RSA was undertaken from roads beyond 3km where visual receptor sensitivity was considered highest

(i.e. the roads around the Levally Lough SAC and the R328 regional road serving the village of Dunmore).

Route Screening Analysis as its name suggests considers the actual visibility of the proposed wind turbines from surrounding roads. The landscape surrounding the Proposed Development comprises rolling agricultural land, a network of trees and hedgerows, and settlements. In order to get a clearer understanding of visibility and visual screening, and to bridge the gap for the assessor between the computer-generated ZTV maps and the actual nature of visibility in the study area, Route Screening Analysis was undertaken.

Every public road was driven within 3 km radius of the proposed turbines, and from roads beyond 3km where visual receptor sensitivity was considered highest (i.e. the roads around the Levally Lough SAC and the R328 regional road serving the village of Dunmore). The extent of roadside screening was recorded digitally on a tablet/GPS device as the route is driven. In addition, dashcam video footage was recorded along the routes to allow later confirmation of mapping, and to methodically record the views along the route. All routes were driven slowly. Using the tablet device, visual screening was logged as one of three categories:

- Little/No Visual Screening – mainly open and with some very light vegetation.
- Partial/Intermittent Visual Screening – light deciduous roadside vegetation and vegetation with short gaps which would allow intermittent or partial views.
- Dense/Full Visual Screening – vegetation which is dense enough to block views e.g., coniferous forestry.

Visual screening between the proposed turbines and the relevant side of the road was recorded. In cases where the road travels directly in the direction of the proposed wind farm or between the two turbine clusters, screening of the lowest classification was recorded (least amount of screening). The Route Screening Analysis surveys were conducted in August 2021. Great care was taken to ensure recording of screening accounted for seasonal variation, particularly the condition of deciduous vegetation (lack of leaves and growth) in winter months. The visual screening data was then mapped and validated against the georeferenced dashcam footage.

## 1.5 Photomontage Visualisations

Photomontages are visualisations that superimpose an image of a proposed development upon a photograph or series of photographs from a specific location termed 'viewpoint'. They are intended as graphical representations of how a proposed development will appear in the existing landscape and are used as a tool in the LVIA process. A series of photomontages have been prepared as part of this assessment and are presented in a separate volume: EIAR Volume 2: *Photomontage Booklet* (hereafter, *Photomontage Booklet*), submitted as part of this EIAR.

The following two guidance documents are considered the industry benchmark for producing photomontages specifically for wind energy developments and were the standards adhered to during the production of photomontages for the *Photomontage Booklet*:

- LI TGN 06/19 (2019);
- SNH Guidance v.2.2 (2017).

The verified photomontages produced for this EIAR are classified as 'Type 4 Visualisations' in the LI TGN 06/19 (2019), meaning that the visualisations maintain the following qualities. The proposed turbines modelled in the photomontages are proportionately scaled within a topographic model from the specific locations where the photographic imagery is captured, i.e. the 'viewpoints'. The turbines and topographic model are then carefully positioned and scaled within the landscape view presented in each photomontage (to 90° and 53.5° horizontal fields of view, as prescribed by the SNH Guidance v.2.2 (2017) and LI TGN 06/19 (2019). The modelling of turbines in the topographical model (wireline)

is generated by software using input co-ordinates of the turbine locations, viewpoint locations and the specific turbine specifications of the turbines presented.

The views presented in the *Photomontage Booklet* include a range of distances and geographic perspectives, and the images used for photomontages represent differing atmospheric conditions. Although it is not reasonable to control the weather, all images were captured when weather was sufficient to enable clear and long-ranging visibility in the direction of the proposed turbines from selected viewpoints.

The proposed turbines appear differently in the landscape depending on factors such as time of day, weather conditions and the location of the observer. The photomontages produced aim to realistically represent the proposed turbines while considering their contrast against the backdrop of the sky and landscape. The turbines presented in the photomontages have been coloured in such a way that ensures sufficient contrast for purposes of visual impact assessment, whilst at the same time balancing the intention to present the photomontages as life-like visualisations.

### 1.5.1 Photomontage Viewpoint Selection

The viewpoints (photo locations) were selected following guidance contained in the DoEHLG *'Wind Energy Development Guidelines for Planning Authorities'* (2006), the *'Guidelines for Landscape and Visual Impact Assessment'* (2013) and in the *'Visual Representation of Wind Farms'* (SNH Guidance v.2.2 ). The selection of photo locations is designed to give a representative range of views of the proposed turbines.

Viewpoints, the photo locations from which the photomontages are produced, were chosen after compiling the Visual Baseline. The main purpose of establishing the visual baseline is to identify the key visual receptors that should be considered for viewpoint selection. To this end, the following have been identified:

- Designated Scenic Routes and Views
- Settlements
- Recreational, Cultural Heritage, and Tourist Destinations
- Viewing Points (e.g. marked on OSi Maps)
- Recreational Routes
    - Waymarked Walking Routes
    - Cycle Routes
    - Scenic Drives
    - Tourist Routes
- Transport Routes
- Residential Visual Amenity

These visual receptors are listed in tables under the sections identified above along with theoretical visibility at those locations indicated by the ZTV maps. After all key visual receptors are identified, a Visual Receptor Preliminary Assessment is carried out to eliminate the visual receptors for the following reasons:

- No or very limited theoretical visibility indicated on the ZTV map for the visual receptor.
- Designated views and scenic routes as well as OSi Viewing Points that are not directed towards the proposed turbines.
- Visual receptors visited on site, where views towards the turbines were either entirely visually screened or substantially screened and distance from the proposed turbines would mitigate any visual effects.

Viewpoints were chosen having regard to the SNH Guidance v.2.2 (2017) which advises that a range of views should be shown at a range of distances and aspects, as well as at varying elevations and showing

both where the development will be completely visible as well as partially visible. Consideration was also given to ensure that photomontages captured other wind farms in the LVIA Study Area in order to assess cumulative visual effects.

### Note on VPs 16, 17 and 18

These viewpoints are included in order to ensure a comprehensive assessment of all elements of the Proposed Project, including the Proposed Grid Connection, with the proposed onsite substation shown in VP16 and VP17, and the proposed LCIMs shown in VP18.

## 1.5.1.2 Photomontage Limitations

Photographs, and therefore photomontages, are subject to a range of limitations, as stated in *'Visual Assessment of Wind Farms'* (Scottish Natural Heritage Guidance v.2, 2014):

- Visualisations provide a tool for assessment that can be compared with an actual view in the field; they should never be considered as a substitute to visiting a viewpoint in the field.
- Neither photographs nor visualisations can replicate a view as seen in reality by the human eye.
- Visualisations are only as accurate as the data used to construct them.
- Visualisations can only represent the view from a single location at a particular time and in particular weather conditions.
- Static visualisations cannot convey the effect of turbine blade movement.

Although the scale, siting and geometry of photomontages are based on technical data, the other qualities of the image are open to judgments. The guidance also notes that interpretation of visualisations also needs to take into account additional information including variable lighting, movement of turbine blades, seasonal differences and the movement of the viewer through the landscape. However, accepting these limitations, the SNH Guidance v.2 (2014) and v.2.2 (2017) state that photomontages are useful tools in the Visual Impact Assessment of wind turbines.

Furthermore, with regard to the representation of cumulative visual effects, existing, permitted and proposed turbines are also shown in the photomontages. The representation of existing turbines relies on photographs taken on site, while permitted and proposed turbines are images of turbines superimposed into the image. As such there can be a discrepancy in the lighting and sharpness between these two different representations.

Photomontages (Type 4 - Visual Representation of Development Proposals, Landscape Institute Technical Guidance Note 06/19, 2019) are 2D representations of 3D views and thus cannot convey the perspective and depth of view of seeing the actual objects with the naked eye. One of the areas that this limitation affects cumulative visual effects is where proposed turbines are proposed to be located in front or behind existing or permitted turbines. In the field this physical separation may be obvious, while on the photomontage the turbines may appear as one wind farm.

## 1.5.1.3 Photomontage Presentations

The photomontage visuals contained in the *Photomontage Booklet* are devised to be viewed at arm's length. The existing views, photomontages and wireline views are panoramas presented on banner sheets of paper of size 'A1'. More specifically, the horizontal field of view presented in the visualisations are spread across 84.1cm, the equivalent of the maximum horizontal field of an A1 sheet of paper. In line with best practice guidance for the production of photomontages for wind energy development (SNH Guidance v.2.2, 2017 and LI TGN 06/19, 2019) the A1 banners present the proposed turbines enlarged to fit within a 53.5° horizontal field of view

The viewpoints presented in the *Photomontage Booklet* show several views from each viewpoint location. These include:

1. **Overview Sheet** – Viewpoint details include location description, grid reference distance from nearest turbine and technical data in relation to photography. Three maps at various scales show the viewpoint location. A 120-degree existing view image (Key Image) without any proposed and permitted turbines. Existing turbines visible in the landscape may appear within the image and the horizontal extent of the 90-degree and 53.5-degree image to be presented in subsequent images is also framed.
2. **Existing at 90º** - 90-degree visual baseline image without any proposed or permitted turbines and a matching wireframe image of the same view which includes any existing turbines visible in the landscape. If turbines are already existing in the landscape, these are visible on the photograph and are rendered in the wireframe.
3. **Proposed Photomontage with Cumulative at 90º** – Showing a 90-degree photomontage image with the proposed wind farm and all other existing, permitted and proposed wind farms within the view. A matching wireframe image shows the turbines of all proposed, permitted and existing wind farms individually coloured and labelled for ease of identification.
4. **Proposed Photomontage with Cumulative at 53.5º** – Showing a photomontage image of the proposed turbines and any existing, permitted and proposed turbines in a 53.5-degree horizontal field of view.
5. **Proposed Wireframe with Cumulative at 53.5º** - Showing a wireframe image of the proposed turbines and any existing and permitted turbines in a 53.5-degree horizontal field of view. The Proposed Project turbines and any other existing, permitted and proposed wind farms are individually labelled for ease of identification.

### 1.5.2 Presentation of Wireline Views

The SNH Guidance v.2.2 (2017) suggests that all turbine blades should be presented in the same orientation when presented within a wireline view with one blade completely vertical. The rationale for this method proposes that the singular vertical blade will show the greatest turbine tip height for all turbines. Using this method, the orientation of the turbine blades does not match what is presented in the corresponding photomontage. Conversely, guidance in the WEDGS (DoEHLG, 2006, p. 97) and Draft revised WEDGs (DoEHLG, 2006, p. 97) state the following in relation to wirelines (they refer to wireframes – equivalent of a wireline):

> *"Related to the above, the photomontage should be accompanied by a wire frame computer generated perspective view of the landscape, or shaded-relief model, illustrating all theoretically visible turbines. These wire frame diagrams may also be used to indicate turbines that are not visible in whole or in part due to screening, simply to prove that point.* ***Wire frames and photomontages should be at the same scale and presented in unison so that direct comparison/correlation can be made****".*

This LVIA has been cognisant of the guidance from both sources (WEDGS (DoEHLG, 2006) and Draft revised WEDGs (DoHPLG, 2019); and SNH v.2.2 (2017). However, it is considered that that the guidance in the WEDGs and Draft revised WEDGs is a preferable option. Wireline views showing the turbines in irregular orientation with each other, but in unison with the corresponding photomontage is an optimal method of presentation for the following reasons:

- Enables direct correlation and comparison with the photomontages;
- If all turbines are oriented the same way this is an unnatural and unrealistic representation, there is no scenario where this would occur in reality;
- Although the single vertical blade shows greatest tip height, it doesn't necessarily show the greatest visual exposure of turbines in the landscape, as there could potentially be two

blades (instead of one) seen above a feature of the landform when using a non-regular orientation;

For the reasons outlined above, the turbines in the wireline views within the *Photomontage Booklet* are presented in unison with the orientation of the turbines in the photomontages, in line with the WEDGs and Draft Revised WEDGs guidance.

### 1.5.3 Photowires (Early-Stage Draft Photomontages): Alternative Viewpoints

Photomontage imagery was captured from many locations in the LVIA Study Area other than the 18 no. Photomontage viewpoints that were selected for the EIAR Volume 2: Photomontage Booklet. Photowires are early-stage photomontage visualisations comprising panoramic photos with overlaid wirelines (Classified as Type 3 Visualisations in the Landscape Institute Technical Guidance Note, 2019). Photowires were produced from 10 other viewpoint locations in the LVIA Study Area. The viewpoints are draft views, providing an indication of the locations of the proposed turbines, but they do not include any cumulative turbines, for example. These viewpoints were not selected for inclusion as photomontages due to limited visibility of the proposed turbines, or a more appropriate nearby viewpoint being selected to represent a particular location. These Photowires do not form part of the assessment of visual effects included in Appendix 14-3.

The photowires in Appendix 14-5 are presented on A3 paper. In accordance with the Landscape Institute Technical Guidance Note 06/19, 2019, and the Visual Representation of Wind Farms (Scottish Natural Heritage, 2017) the photowires are therefore presented with a horizontal field of view of 27 degrees and a vertical field of view of 18.2 degrees, and are scaled according to the guidance set out in Table 5 of that document (Landscape Institute Technical Guidance Note 06/19, 2019).

Photowires are used as tools both to pick the best viewpoints for the *Photomontage Booklet*, and then also to demonstrate as part of discussion in the LVIA chapter the locations where very limited visibility might occur. A photowire might not have been selected for the *Photomontage Booklet* as another nearby viewpoint was felt to be a better representation of views from receptors in a particular area or represented a greater number of sensitive receptors.

The photowire imagery in Appendix 14-5 are draft, therefore:

- No rendering is applied to the imagery to make the turbines photorealistic – hence the orange colour;
- Photowires do not include cumulative – modelling and rendering of other permitted and proposed wind farms;
- The wireline element of the Photowire only accounts for screening from topography in the elevation model;
- The wireline overlaid the photograph is shown in front of above ground elements of the landscape e.g. vegetation screening and the built environment. Therefore, the photowire shows where the turbines are located relative to the viewpoint but are seen in front of above ground features which would visually screen them in reality on the ground.

The 10 no. Photowires are also presented within Appendix 14-5 and they are discussed to illustrate certain points made in Section 14.7 of Chapter 14 – *Likely Significant Landscape and Visual Effects*. The location of Photowire viewpoints in Appendix 14-5 are marked as green icons and labelled alphabetically (e.g. A to J). They are discussed throughout the chapter as Photowire Viewpoint Locations (referred to as PWs (e.g., PWA, etc.)).

It should be emphasised that photowires are useful visual aids to inform the impact assessment; however, they do not include modelling of other existing, permitted, or proposed wind energy developments and are therefore not used for the assessment of cumulative effects.

# 1.6 Landscape and Visual Impact Assessment Methodology

## 1.6.1 Identification of Landscape Receptors

The landscape receptors were selected following the guidance contained in the *'Guidelines for Landscape and Visual Impact Assessment'* (2013) and in the *'Visual Representation of Wind Farms'* (Scottish Natural Heritage, 2017).

The following landscape receptors are identified in the landscape baseline:

- **Landscape Designations** based on:
  - Galway County Development Plan 2022-2028
  - Mayo County Development Plan 2022-2028
  - Roscommon County Development Plan 2022-2028
- **Landscape Character of the Proposed Project Site** and its immediate environment based on:
  - Site Surveys undertaken throughout 2020, 2021, 2022, 2023, and 2024.
  - Landscape Character Types identified in *Landscape Character Types as a basis for Guidelines*: in the WEDGs and draft WEDGs.
- **Landscape Character of the LVIA Study Area** based on:
  - Landscape and Landscape Character Assessment of County Galway
  - Landscape Appraisal of County Mayo
  - Roscommon Landscape Character Assessment
  - Site Surveys undertaken throughout 2020, 2021, 2022, 2023, and 2024.

After all landscape receptors are identified, a Landscape Receptor Preliminary Assessment is carried out to eliminate from further consideration the landscape receptors, where no or very limited theoretical visibility has been indicated on the ZTV map. All other landscape receptors were selected for further assessment of landscape effects.

## 1.6.2 Assessing Landscape Effects

The methodology uses qualitative methods in order to arrive at an assessment, which is based on the Landscape and Landscape Assessment (2000) Guidelines as well as the GLVIA (2013), and the Guidelines (DoEHLG, 2006) were also taken into account.

Landscape effects can be described as changes which affect the landscape as a resource. This includes how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects and its landscape character. Landscape effects also relate to changes in the structure of the landscape. Under the GLVIA (2013), the assessment of likely significant effects on landscape receptors includes a judgement on both the sensitivity of the receptor as well as magnitude of the change.

### 1.6.2.1 Assessing Landscape Sensitivity

Landscape Sensitivity is described in the GLVIA (2013) as a combination of the landscape's susceptibility to change as well as the value attached to the landscape.

Susceptibility to change can be described as the ability of the landscape receptor (either the overall character, quality of the landscape or a particular landscape feature) to accommodate the proposed turbines without undue consequences for the maintenance of the baseline (existing) landscape and/or the aims of landscape planning policies and strategies.

Determination of landscape value considers scenic amenity designations, sensitivity and value designations found in local landscape policy, as well as other indications of landscape value attached to undesignated landscapes (Page 84, GLVIA, 2013).

Section 14.4 - *Landscape Baseline* of Chapter 14 describes and determines the Landscape Values of the Site and its wider landscape setting in order to establish the capacity of the immediate landscape in which the proposed turbines will be built, as is prescribed by best practice guidance: *"as part of the baseline description the value of the potentially affected landscape should be established"* (Page 80, GLVIA, 2013). Comprehension of landscape value and its susceptibility to change enables determination of the sensitivity of the landscape at a micro level (the Site) and its capacity to absorb the infrastructure of the Site.

### Determination of Sensitivity of Designated Landscape Character Areas

Designated Landscape Character Areas (LCAs) are comprehensively assessed in Appendix 14-2. Ireland does not currently have a standardised nationwide Landscape Character Assessment. The LCAs scoped in for assessment in Chapter 14 are located in differing counties and each county uses a differing method and scale to represent sensitivity of its individual LCAs, (e.g., Co. Roscommon LCAs – classes from "moderate" value to "exceptional" value, Co Mayo LCUs – low, medium or high, Co. Galway LCUs – Designated either Low, High or Special.) For the purposes of the LVIA and to provide consistency across the assessment of LCAs (Appendix 14-2), a rating of sensitivity was assigned to each LCA within the following classification scale:

- Very High
- High
- Medium
- Low

The sensitivity classification assigned to each LCA takes into account key characteristic and sensitivity descriptions (and where applicable sensitivity ratings) in the respective county development plans, as well as any relevant wind energy capacity designations and policy. A rationale for the sensitivity classification of each LCA is provided in the assessment tables included in Appendix 14-2. LCAs at the 'Very High' end of the scale would include very sensitive landscapes of national importance, whilst LCAs at the 'Low' end of the scale might be locally important landscapes, but which do not comprise receptors or characteristics of unique or national value.

## 1.6.2.2 Assessing magnitude of Change in the Landscape

The magnitude of change in each landscape character area is a combination of the visual presence - size and scale - of the change, the extent of the area to be affected, and the duration and reversibility of the effect. The magnitude of change for each landscape character area was assessed using the definitions outlined in Table 1-1 below.

*Table 1-1 Magnitude of Landscape Change Assessment Criteria*

| Magnitude of Change | Description |
|---|---|
| Substantial | Where a landscape will experience the loss of key landscape features or the introduction of uncharacteristic additions over a large area. The changes to the landscape are prominent and large in scale. The level of change has an effect on the overall landscape character. The effects are likely long term and may be irreversible. |

| Magnitude of Change | Description |
|---|---|
| Moderate | A more limited loss of or change to landscape features over a medium extent which will result in some change to landscape features and aesthetics. Could include the addition of some new uncharacteristic features or elements that would lead to the potential for change in landscape character in a localised area or part of a landscape character area. Would include moderate effects on the overall landscape character that do not affect key characteristics. The effects could be long to medium term and/or partially reversible. |
| Slight | The loss of or change to landscape features of limited extent, or changes to landscape character in smaller areas. Changes would not affect key characteristics. The addition of any new features or elements to the landscape would only result in low-level changes to the overall aesthetics of the landscapes. Changes to the landscape are more evident at a local level and not over a wide geographical area. The effects could potentially be medium to short term and/or reversible. |
| Negligible | A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short term and/or reversible. |

### 1.6.2.3 Landscape Effects Assessment Matrix

Table 1-2 below shows the significance of landscape effects, arrived at by combining the landscape receptor sensitivity and the magnitude of change classifications. Landscape receptor sensitivity is shown in the left-hand first column and magnitude of landscape change is shown in the first row at the top of the table. This table is used as an indicative tool to assist in determining the significance of landscape effects. In different circumstances differing levels of mitigating factors may ultimately result in a different determination of the level of significance. The significance of a landscape effect is based on a balance between the sensitivity of the receptor and the magnitude of effect. The significance of landscape effect is arrived at using a combination of the matrix shown in Table 1-2 and Table 1-3 below.

*Table 1-2 Landscape effects significance assessment matrix*

| | Substantial | Moderate | Slight | Negligible |
|---|---|---|---|---|
| Very High | Major | Major/Moderate | Moderate | Moderate/Minor |
| High | Major/Moderate | Moderate | Moderate/Minor | Minor |
| Medium | Moderate | Moderate/Minor | Minor | Minor/Negligible |
| Low | Moderate/Minor | Minor | Minor/Negligible | Negligible |

The determination of significance uses a seven-point scale, ranging from Major to Negligible. This seven-point scale is translated to the EPA impact assessment classifications of significance, as outlined in Table 1-3 below.

*Table 1-3 EPA Impact Assessment Significance Classification for Landscape Effects*

| Matrix Classification Significance | EPA Significance Classification | EPA (2022) Definition of Significance |
|---|---|---|
| **Major** | Profound | An effect which obliterates sensitive characteristics |
| **Major/Moderate** | Very significant | An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment |
| **Moderate** | Significant | An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. |
| **Moderate/Minor** | Moderate | An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends |
| **Minor** | Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities |
| **Minor/Negligible** | Not Significant | An effect which causes noticeable changes in the character of the environment but without significant consequences. |
| **Negligible** | Imperceptible | An effect capable of measurement but without significant consequences |

### 1.6.3 Assessing Visual Effects

Visual effects relate to changes in views and visual amenity of the surroundings of individuals or groups of people. These may result from changes in content and character of views as a result in changes to the landscape. The assessment of visual effects is based on views shown in photomontages and the potential visibility indicated by the ZTV maps as well as actual visibility on the ground.

It should be noted that in assessing visual effects, there are different types of visual effects:

- **Visual obstruction:** This occurs when there is an impact on a view which blocks the view.
- **Visual intrusion:** This occurs when there is an impact on a view, but which does not block the view.

Due to the nature of the development and the appearance of wind turbines, visual intrusion occurs more frequently than obstruction.

The likely significant effects of the proposed turbines in terms of visual and landscape effects are informed by the ZTV and photomontages. Visual effects relate to changes in views and visual amenity of the surroundings of individuals or groups of people. These may result from changes in content and character of views because of changes to the landscape. The significance of the effect on visual receptors is a combination of the sensitivity of the receptor as well as the magnitude of the change.

### 1.6.3.1 Visual Receptor Sensitivity

Visual Receptor Sensitivity depends on the occupation or activity of the people, as well the extent to which the attention is focused on views and visual amenity, according to the GLVIA (2013). Visual receptor sensitivity is assessed as either being Very High, High, Medium, or Low, based on the definition of descriptions and examples set out in Table 1-4 below.

*Table 1-4 Visual Receptor Sensitivity Assessment Criteria*

| Sensitivity of Visual Receptor(s) | Description |
|---|---|
| Very High | Included in this category are viewers that are primarily focused on views from this particular location, such as visitors to popular destinations identified for their outstanding views. Residents in close proximity who have primary views of a scenic quality in the direction of the proposed turbines. |
| High | Includes viewers at designated views or landscapes. Viewers such as residents in close proximity to the viewpoint who have primary views that will be in the direction of the proposed turbines that may not necessarily be of a particularly scenic quality; viewers at well-known heritage or popular tourist or recreational areas, viewers along scenic or tourist routes. |
| Medium | Includes viewers who may have some susceptibility to a change in view. Viewers such as residents in medium proximity but who do not have views focused on the direction of the proposed turbines or whose views are not of a particularly scenic quality; those from views which are not designated but may have local recreational uses or those travelling along routes or at views which are considered moderately scenic. |
| Low | Includes viewers engaged in activities where the focus is not on the landscape or view. These including those travelling along a busy route, viewers at work or engaged in sport not related to views or experience of the landscape. |

Photomontage viewpoints are specific locations which are representative of key visual receptors. The photomontage viewpoint assessment tables in Appendix 14-3 consider all receptors represented in the determination of the visual receptor sensitivity rating for each viewpoint. This determination takes a balanced approach considering the types, sensitivities, and quantities of visual receptors represented. The sensitivity rating given to each photomontage viewpoint in Appendix 14-3 considers both the susceptibility of the visual receptors represented as well as the value attached to the available views at that particular location.

### 1.6.3.2 Magnitude of Visual Change

The magnitude of the visual change resulting at each viewpoint is a combination of scale of the change, the extent of the area to be affected and the duration and reversibility of the effect, determined by reviewing the photomontage and wireframe images for each viewpoint. The magnitude of change is determined in accordance with the definitions and descriptions included in Table 1-5 below.

*Table 1-5 Magnitude of Visual Change Assessment Criteria*

| Magnitude of Change | Description |
|---|---|
| Substantial | Substantial change, where the proposals would result in large-scale, prominent or very prominent change, leading to substantial obstruction of existing view or complete change in character and composition of the baseline though removal of key elements or addition of uncharacteristic elements which may or may not be visually discordant. This includes viewpoints where the proposed turbines are fully or almost fully visible over a wide extent, at close proximity to the viewer. This change could be long term or of a long duration. |
| Moderate | The change in the view may involve partial obstruction of existing view or partial change in character and composition of the baseline through the introduction of new elements or removal of existing elements. Likely to occur at locations where the proposed turbines are partially visible over a moderate or medium extent, and which are not in close proximity to the Site. Change may be readily noticeable but not substantially different in scale and character from the surroundings and wider setting. |
| Slight | The proposals would be partially visible or visible at sufficient distance to be perceptible and result in a low level of change in the view and its composition and a low degree of contrast. The character of the view may be altered but will remain similar to the baseline existing situation. This change could be short term or of a short duration. |
| Negligible | Any change would only be barely distinguishable from the status quo "do-nothing scenario" in the surroundings. The composition and character of the view would be substantially unaltered, approximating to little or no change. |

### 1.6.3.3 Visual Effects Assessment Matrix

Table 1-6 below shows the significance of visual effects, arrived at by combining the visual receptor sensitivity and the magnitude of change classifications. Visual receptor sensitivity is shown in the left-hand first column and magnitude of visual change is shown in the first row at the top of the table. This table is used as an indicative tool to assist in determining the significance of visual effects. In different circumstances differing levels of mitigating factors may ultimately result in a different determination of the level of significance (see below). The significance of a visual effect is based on a balance between the sensitivity of the receptor and the magnitude of effect. The significance of visual effect is arrived at using a combination of the matrix shown in Table 1-6 and Figure 1-2 below.

*Table 1-6 Visual Effects Significance Assessment Matrix*

| | Substantial | Moderate | Slight | Negligible |
|---|---|---|---|---|
| Very High | Major | Major/Moderate | Moderate | Moderate/Minor |
| High | Major/Moderate | Moderate | Moderate/Minor | Minor |
| Medium | Moderate | Moderate/Minor | Minor | Minor/Negligible |
| Low | Moderate/Minor | Minor | Minor/Negligible | Negligible |

The determination of significance uses a seven-point scale, ranging from Major to Negligible. This seven-point scale is translated to the EPA impact assessment classifications of significance, as outlined in Table 1-7 below.

*Table 1-7 EPA Impact Assessment Significance Classification for Visual Effects*

| Matrix Classification Significance | EPA Significance Classification | EPA (2017) Definition of Significance |
|---|---|---|
| **Major** | Profound | An effect which obliterates sensitive characteristics |
| **Major/Moderate** | Very significant | An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment |
| **Moderate** | Significant | An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. |
| **Moderate/Minor** | Moderate | An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends |
| **Minor** | Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities |
| **Minor/Negligible** | Not Significant | An effect which causes noticeable changes in the character of the environment but without significant consequences. |
| **Negligible** | Imperceptible | An effect capable of measurement but without significant consequences |

#### 1.6.3.4 Residual Visual Effect

After determining the significance of the visual effect using the above visual effects assessment matrix and significance graph, mitigating factors are taken into consideration to arrive at the final residual effect. In some cases, mitigating factors merit a reduction in classification.

### 1.6.4 Determination of Residual Landscape and Visual Effects

The matrices and tables above are excellent tools to aid professional judgement in the determination of the significance of an effect. They are useful in that they provide a transparent, objective, structure to the process of balancing sensitivity and magnitude of change. In the context of the determination of visual effects, the formulaic process created by the use of the matrix above provides an indicative initial assessment, which can be seen clearly in the photomontage assessment tables in Appendix 14-3.

*However, over-reliance on the formulaic process, which is heavily influenced by the definitions of sensitivity and magnitude of change contained in Table 1-4 and*

Table 1-5 1-5 above, can lead to a failure to properly account for the full range of circumstances and factors at play in the determination of the significance of a visual effect (see section 3.35, GLVIA3, 2013). A wide range of factors, mitigating or otherwise, can factor into such a determination, and it is not possible to capture the complexity involved in balancing all considerations within the necessarily limited definitions contained in these tables. This then naturally results in circumstances whereby the process of the determination of significance using the formulaic method involved with the matrix shown in Table 1-6 can result in misrepresentations of the significance of visual effects. It is only with professional judgement, and narrative descriptions of effect, that such complexity can be integrated into the determination of significance. Therefore, the formulaic methods based upon the matrix presented above is combined with professional judgement in the determination of significance. This is illustrated in Figure 1-2 below where the professional judgment of the competent expert is used to properly determine the significance of an effect taking all considerations into account.

A focus is placed upon the narrative description of effects (see section 3.36, GLVIA3, 2013) given the naturally subjective nature of the significance determination process, particularly in relation to visual effects, ensuring that the rationale for the overall judgement is clear (see sections 3.28-3.29, GLVIA3, 2013). The comprehensive assessment of photomontages included in Appendix 14-3 aims to provide a transparent and robust determination of residual visual effects utilising the graph in Figure 1-2 below in combination with a clear and logical narrative.

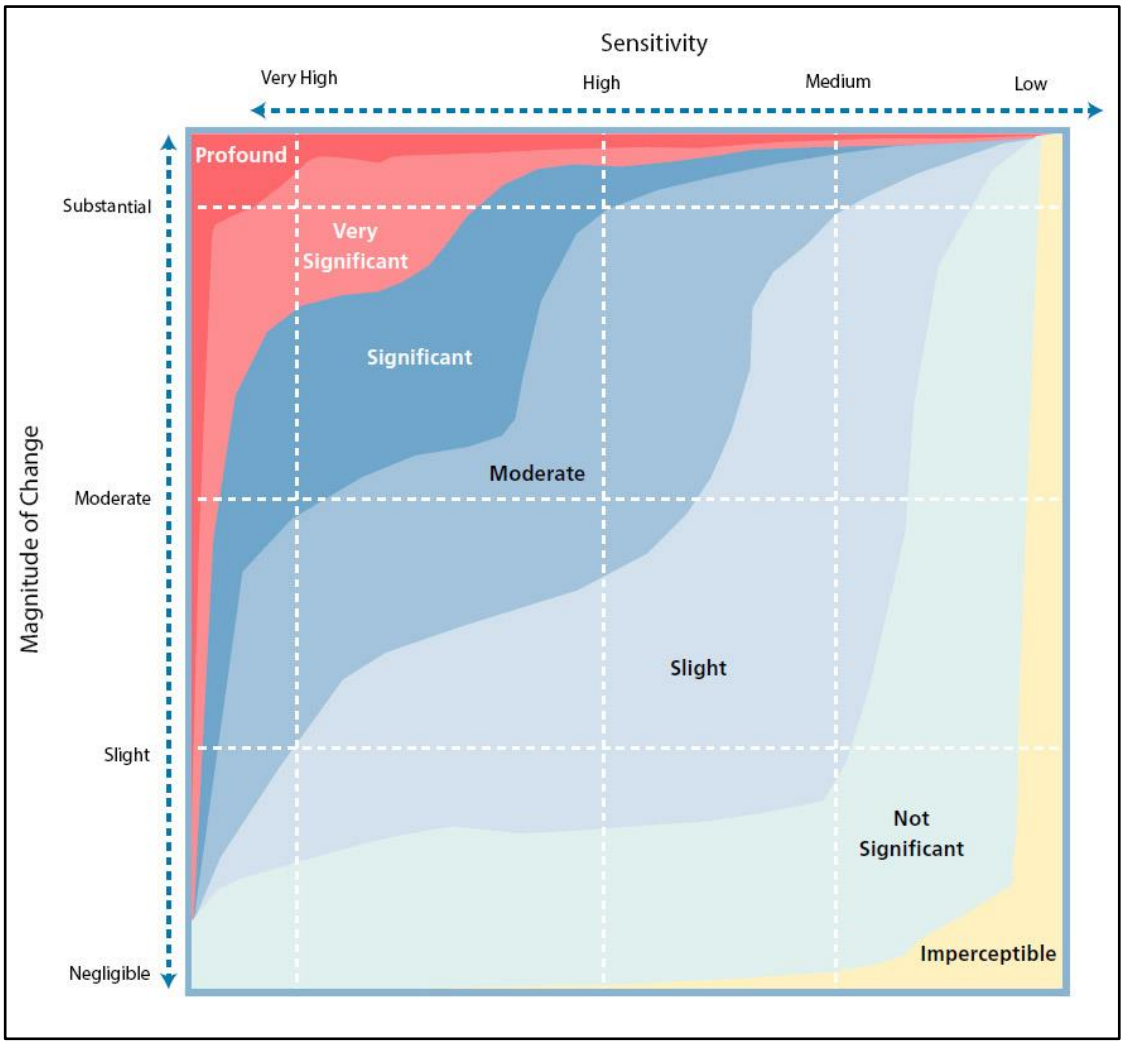


*Figure 1-2 Visual Effect Significance Graph (adapted from EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022)*

## 1.6.5 Assessing Cumulative Landscape and Visual Effects

### 1.6.5.1 Cumulative Landscape Effects

The Nature Scot 2021 publication *Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments* identifies two principal areas of cumulative landscape effects, on the physical fabric of the landscape and on the landscape character, which state:

- *Cumulative effects on the **physical fabric** of the landscape arise when two or more developments affect landscape components such as woodland, dykes, rural roads or hedgerows. Although this may not significantly affect the landscape character, the cumulative effect on these components may be significant – for example, where the last remnants of former shelterbelts are completely removed by two or more developments.*
- *Cumulative effects on **landscape character** arise when two or more developments introduce new features into the landscape. In this way, they can change the landscape character to such an extent that they create a different landscape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or degraded landscapes may be enhanced as a result of such a change in landscape character.*

Potential changes to the physical fabric outlined above are predominantly restricted to the Site and the LCAs in which the site is located. Therefore, these landscape receptors will be assessed for cumulative landscape effects on the physical fabric of the landscape arising from the proposed turbines.

Cumulative effects on the landscape character will be assessed in the Landscape Character Areas (LCAs) that have theoretical visibility of the proposed turbines with particular emphasis on the LCA in which the proposed turbines will be located.

Cumulative landscape effects are discussed in a separate row within the LCA Assessment Tables in Appendix 14-2 with any cumulative effects on landscape character arising incorporated within the magnitude of change determination made within those tables. Cumulative landscape effects are also discussed and summarised in the LVIA Chapter of the EIAR.

### 1.6.5.2 Cumulative Visual Effects

For this assessment, the Nature Scot (2021) definition of cumulative effects as additional changes caused by a proposed development in conjunction with other similar developments, is used, however, this assessment also considers other types of developments. The definition in the Guidelines DoEHLG (2006) defines cumulative impacts in terms of wind farms, as the perceived effect on the landscape of two or more wind energy developments visible from any one place.

The GLVIA (2013) and Nature Scot (2021) guidance also note that cumulative visual effects can be experienced **in combination**, where two or more developments are visible from one viewpoint, either **simultaneously** or **in succession** and these are considered in the assessment of visual effects from photomontage viewpoints in Appendix 14-3.

Another type of cumulative visual effect includes where two or more developments are seen **sequentially**, where a viewer moves to another viewpoint or along a transport or recreational route and sees the same or different developments. The photomontage viewpoints illustrate combined visibility and analysis of the photomontages, route screening, as well as site visits and field work undertaken allows sequential visibility to be assessed.

The guidance on cumulative effects given in the WEDGs relating to the Site is as follows:

- *"Similarity in the siting and design approach is preferred where a number of wind energy developments are located in the same landscape character area, particularly within the same viewshed. However, an alternative approach where a particular aesthetic effect is sought may be acceptable.*
- *Different wind energy developments can appear as a single collective unit if located near each other.*
- *It is preferable to avoid locating turbines where they can be seen one behind another, when viewed from highly sensitive key viewpoints (for example, viewing points along walking or scenic routes, or from designated views or prospects), as this results in visual stacking and, thus, confusion. This may not be critical, however, where the wind energy development to the rear is in the distant background.*
- *Wind energy developments within relatively close proximity to one another, while in different landscape character contexts, may be so close as to be within the same visual unit and, therefore, should involve the same siting and design approach."*

The SNH 2017 publication *Siting and Designing Wind Farms in the Landscape* states that *'introducing turbines that are not similar in form, design, colour and scale may increase visual complexity and clutter'*.

Therefore, the cumulative assessment will concentrate on the following issues:

- Whether the proposed turbines increase the spatial extent of turbines in the view
- Whether the different wind energy developments can appear as a single collective unit or there is separation
- Whether 'visual stacking' occurs
- Whether the contrast of different size and design between different wind developments creates visual clutter.

As cumulative visual effects depend on the aspect from which the turbines will be seen various viewpoints were selected to give a thorough overview of the how the proposed turbines will appear in conjunction to turbines already present, permitted or proposed.

Cumulative visual effects are discussed in a separate row within the viewpoint assessment tables in Appendix 14-3 with any cumulative effects on landscape character arising incorporated within the magnitude of change determination made within those tables. Cumulative visual effects are also discussed and summarised in the LVIA Chapter of the EIAR.