Technical Appendix 5.1: LVIA Methodology

Contents

Technical Appendix 5.1: LVIA Methodology

Introduction

The primary guidance in relation to Landscape and Visual Impact Assessment (LVIA) are the Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3)[i], as clarified by LITGN-2024-01 Notes and Clarifications[ii].

"Landscape and Visual Impact Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and people's views and visual amenity." (GLVIA3, paragraph 1.1).

GLVIA3 states *that "professional judgement is a very important part of the LVIA" (paragraph 2.23) and that "in all cases there is a need for the judgements that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others."* (paragraph 2.24). It goes on at paragraph 3.32 to state that *"there are no hard and fast rules about what effects should be deemed 'significant" but LVIAs should always distinguish clearly between what are considered to be the significant and non-significant effects."*

Landscape and visual assessment are separate, though linked and GLVIA3 notes they require *"related but very different considerations"*. The assessment of the potential effect on the landscape is considered in terms of change to the environmental resource (i.e. the landscape). Visual effects are a related effect on people.

Landscape effects derive from changes to physical landscape features which may give rise to changes in its distinctive character and how this is experienced, including consideration of aesthetic and perceptual aspects.

Visual effects relate to changes that arise in the composition of views that people see as a result of changes to the landscape and their perception of how this alters visual amenity.

Establishing the Baseline

The baseline is evaluated through desk study and site work and is the current situation at the time of the assessment, unless noted otherwise. Operational developments and those under construction are considered as part of the baseline (as advised in GLVIA3, paragraph 7.13) and included as part of the assessment of landscape and visual effects.

The future baseline consists of changes to the landscape which are considered certain or likely to happen – including consented proposals which are not yet present in the landscape but are expected to be constructed. These are typically also included as part of the future baseline (where they are likely to be constructed before the proposed development) but may be included within the assessment of cumulative effects if their construction is less certain or the timing is likely to be later. The approach and reasoning is set out within the assessment.

Landscape (and seascape and/or townscape) Effects

The starting point for assessment is a desk-based review of published landscape studies, which may include landscape character assessments, sensitivity and capacity studies and/or landscape designation reviews. These documents are listed in the assessment references.

In order to reach an understanding of the effects of development upon the landscape resource it is necessary to consider different aspects of the landscape including:

- Landscape Fabric: The individual physical features of the landscape, such as hills, valleys, woods, hedges, tree cover, vegetation, buildings and roads for example. Effects on these are described and quantified (for example *"25m of hedgerow will be removed"*).
- Landscape Character: The key characteristics of the receiving landscape. The degree to which the proposed development changes *"distinct and recognisable pattern of elements, or characteristics, in the landscape that make one landscape different from another, rather than better or worse"* ('An Approach to Landscape Character Assessment'[iii]).
- Special qualities of designated landscapes: The documented features, character, views and perceptual characteristics that a landscape is designated to protect. In Scotland 'Special Landscape Qualities - Guidance on assessing effects'[iv] sets out how this aspect of assessment should be undertaken for National Scenic Areas and National Parks.

Sensitivity of Landscape Receptors

The sensitivity (High, Medium, Low) of the landscape to a particular development is considered on a case by case basis and considers the susceptibility of the landscape, which varies depending on the type of development proposed and the attributes of the landscape receptor, and the landscape value. As stated in GLVIA3, *"LVIA sensitivity is similar to the concept of landscape sensitivity used in the wider arena of landscape planning, but is*

not the same", and for this reason judgements reached within the LVIA relating to sensitivity may differ from published baseline studies.

Landscape value (National, Regional, Community) reflects the importance attached to a landscape by society, often used as a basis for designation or recognition which expresses national or local authority consensus, because of its special qualities/attributes. The factors which are considered are informed by specific guidance[v] and include aesthetic or perceptual aspects such as scenic beauty, tranquillity or wildness or cultural associations as well as recreational/community value, conservation interests, landscape character and condition and representativeness/rarity.

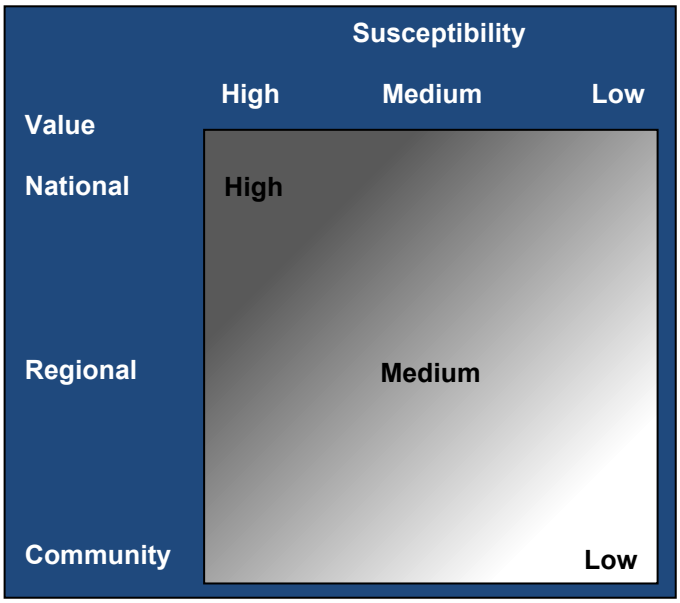
Landscape susceptibility (High, Medium, Low) according to GLVIA3 means *"the ability of the landscape to accommodate the proposed Development without undue consequences for maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies"*. Judgements on landscape susceptibility include consideration of both the physical and aesthetic attributes and the potential scope for mitigation. The approach to this is also informed by specific guidance[vi] [vii].

- Susceptibility of landscape character areas are influenced by their characteristics and are often considered (though often recorded as 'sensitivity' rather than susceptibility) within landscape character assessments and capacity studies.
- Susceptibility of designated landscapes is influenced by the nature of the special qualities and purposes of designation and/or the valued elements, qualities or characteristics, indicating the degree to which these may be unduly affected by the development proposed.

The criteria and the detailed judgements regarding susceptibility and value of landscape receptors are identified within the main LVIA chapter and appendices to this assessment.

Sensitivity is judged taking into account the judgments about the value and susceptibility of the receptor as illustrated by Diagram 1 below. Where sensitivity is judged to lie between levels, an intermediate assessment will be adopted.

Diagram 1 - Sensitivity of Landscape Receptors



Scale of Change to Landscape Receptors

The approach to assessing effects on landscape character is to consider the key characteristics for the Landscape Character Type (LCT) within which the proposed development is located (host) and the adjacent LCT's (non-host) and identify to what degree they would be altered by the proposed development. A similar approach applies to designated landscapes, for which the effects on the defined purposes of designation and special qualities are considered.

The magnitude of landscape change arising from the proposed development at any particular location is assessed in terms of its size or scale, extent of the area or receptor that is influenced, and the duration and reversibility of the change.

The scale of the change (Large, Medium, Small, Negligible) takes account of:

- Degree of alteration to key landscape features/elements; characteristics; and for designated areas – special qualities and/or purposes of designation;

- distance from the development; and
- landscape context to the development.

Visual Effects

This aspect of the assessment considers the views seen by people living in, visiting and travelling through the assessment study area. LVIA focusses on changes to views experienced from public spaces (public amenity) as an environmental effect. Assessment of effects on views from people's homes and gardens (private amenity) or other private property is a separate planning matter and is provided as a separate assessment under different guidance).

In order to identify the level of a visual effect it is necessary to establish the relative sensitivity of the viewers and the magnitude of the change they experience.

Sensitivity of Visual Receptors

Sensitivity (High, Medium, low) is a combination of both susceptibility of the viewer to the proposed change and the value of the views.

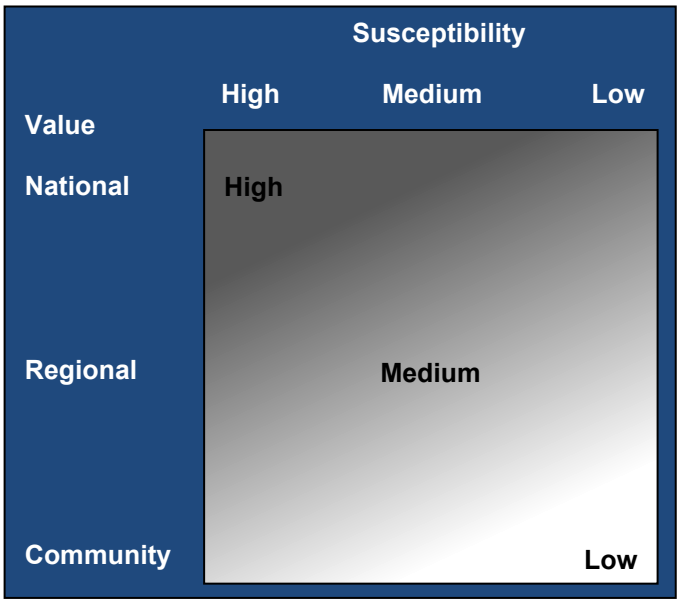
Those living within view of the scheme are usually regarded as the highest susceptibility group as well as those engaged in outdoor pursuits for whom the visual experience is a key part of the objective. For visual receptors susceptibility and value are closely linked - the most valued views are also likely to be those where viewer's expectations will be highest. Visual receptor susceptibility is defined as in accordance with the criteria below.

- High - Local residents; users of outdoor recreation focussed on the appreciation of views including footpaths, beauty spots and picnic areas; people experiencing views to or from important features of physical, visual, cultural or historic interest.
- Medium - Local road users and travellers on trains. People engaged in outdoor recreation with some appreciation of the landscape e.g. road cycling, nature conservation, golf and water based recreation.
- Low - Workers, users of facilities and commercial buildings (indoors) experiencing views from buildings. Road and rail users on fast moving commuting or trunk routes. Visual receptors where views are incidental to the activity and/or location.

The value of public views (National, Regional, Community) depends on the nature, location and context of the view and the recognised importance of the view. Considerations include cultural associations; designation or policy protection; views of or from landmarks; and/or the promoted or recognised scenic quality of the view. The value attributed relates to the value of the view, e.g. a National Trail is nationally valued for access, but not always for the available views from every section.

Sensitivity is judged taking into account the component judgments about the value and susceptibility of the receptor as illustrated by Diagram 2 below. Where sensitivity is judged to lie between levels, an intermediate assessment will be adopted.

Diagram 2 - Sensitivity of Visual Receptors



Scale of Change to Views

The magnitude of visual change arising from the proposed development at any particular location is assessed in terms of its size or scale, extent of the area or receptor that is influenced and the duration and reversibility of the change.

The representative viewpoints are used as 'samples' on which to base judgements of the scale of change on visual receptors. The wider extent of the change and its duration are not captured in the viewpoint analysis (as a single location cannot capture these factors for an entire route or area). As duration and extent are necessary considerations in determining magnitude of change, magnitude and level of effect judgements are provided for visual receptors and not for viewpoints.

Each route and receptor group will encompass a range of possible views, which might vary from no view of the development to very clear, close views. Effects are described to identify where views towards the development are likely to arise and what the scale and duration and extent of those views are likely to be – informed by site work, ZTV studies and the representative viewpoints nearby. Each of these individual effects are then considered together in order to reach a judgement of the effects on the visual receptors along that route, or in that place. The exceptions to this are specific viewpoints – where people visiting that location to look at the view are assessed as a visual receptor group.

The scale of the change to views (Large, Medium, Small, Negligible) arising from the proposed development reflects the degree to which the views from that location would be changed and takes account of:

- The distance of the viewpoint from the development;
- the degree to which the development is visible or screened;
- the angle of view in relation to main receptor activity or main focus of the view;
- the horizontal and vertical field of view occupied by the development; and
- the degree to which the development alters the nature of the available views.

The approach to assessing effects on views is to consider the full 360 degree view from any given receptor – not just those towards the development and/or shown in visualisations. It is assumed that the change would be seen in clear visibility in winter and the assessment is carried out on that basis. Where there are operational (and consented) developments considered as part of the baseline, the visual effects consider the effects of adding the proposed development to that baseline. Where appropriate, comment may be made on lighting and seasonal or weather conditions.

Magnitude

Magnitude of change (Large, Medium, Small, Negligible) judgements take account of the degree of change arising from the proposed development at any particular location in terms of its size or scale, extent of the area or receptor that is influenced, and the duration and reversibility of the change.

The judgement of the extent of change (Wide, Intermediate, Localised or Limited) reflects the geographic area (or length of a route) in terms of relative size and importance to the receptor.

Duration and reversibility can be linked depending on the nature of the development. Reversibility is a judgement about the ability and practicality of the proposed development to be reversible (such as wind farms which are predominantly reversible), partially reversible to something similar (such as mineral extraction) or a permanent change in the landscape (such as housing). Duration reflects how long the change will last. The duration of the change would be considered Short-term when lasting less than 2 years; Medium-term when lasting between 2 and 10 years; or Long-term when lasting between 10 and 25 years, and Permanent for more than 25 years.

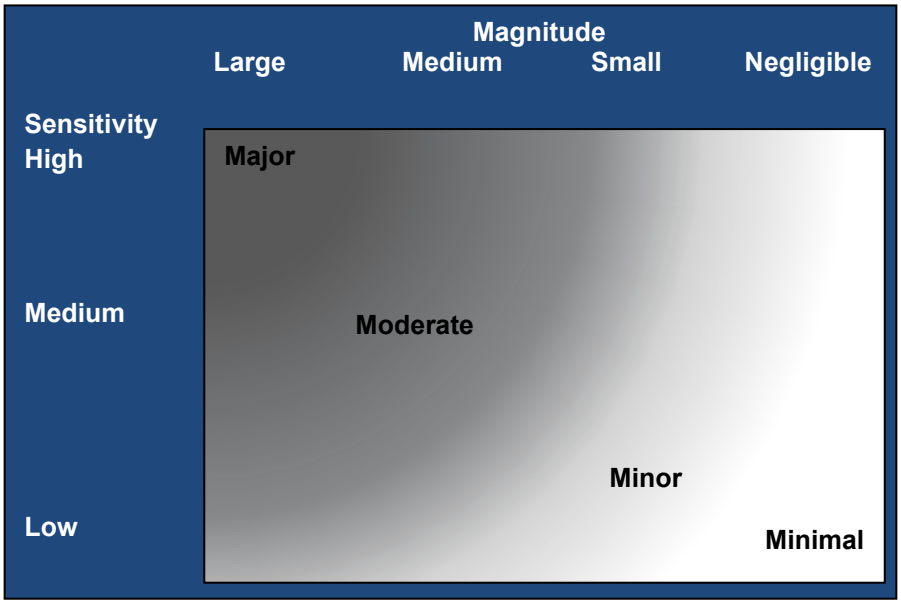
The maximum scale of change on the receptor is the primary factor in determining magnitude. However, for particularly widespread and/or long lasting effects the magnitude judgement may be slightly greater than the scale of change; or for effects that are constrained in geographic extent and/or short-lived the magnitude of change may be slightly lower than the scale of change.

Level of Effect and Significance

The level (Major, Moderate, Minor, Minimal) of any identified landscape or visual effect reflects a professional judgement as to the relative importance of the effects identified, taking account of the sensitivity of the receptor and the predicted magnitude of change as illustrated by Diagram 3 below.

Where the effect has been classified as Major or Major/Moderate this is considered to be equivalent to likely significant effects referred to in the EIA Regulations. Where 'Moderate' or lower effects are predicted, these have been judged to be not significant.

Diagram 3 – Level of effect



Positive/Adverse

Landscape and visual effects can be Positive (an improvement) or Adverse (a change for the worse) and in some instances may be considered Neutral (neither better nor worse – just different). Whether an effect is positive, neutral or adverse is identified based on professional judgement. GLVIA3 notes that this is a *"particularly challenging"* (para. 2.15) aspect of assessment, especially in the context of a changing landscape.

Night-time Effects

There is a distinction between light pollution or nuisance (which would be the subject of a technical lighting assessment) and the effect of lighting on the amenity of the landscape at night. This aspect of assessment is still an emerging discipline regarding the scope and receptors which would be impacted as a result of lighting. For wind farm aviation lighting, NatureScot 'Guidance on Aviation Lighting Impact Assessment'[viii] is used to inform the methodology.

Landscape Character

The key characteristics of landscapes which distinguish the landscape character areas described in character assessments are generally obscured after dark. Potential changes to landscape character at night would arise from changed skylines and to perceptions of darkness and an absence of development. Changes to this small subset of characteristics would not be likely to give rise to notable effects on landscape character and are not considered in detail within the assessment.

Visual Receptors

For visual receptors, night-time views are considered to be of Community value unless there is a particular element that can be best appreciated in the hours of darkness. This may include views of landmarks that are lit at night or recognised dark skies areas (e.g. Dark Sky Parks and Discovery Sites as identified by https://www.darkskydiscovery.org.uk/), or Special Qualities of designated areas.

The susceptibility of visual receptors also differs at night reflecting the different activities people undertake in the hours of darkness. For example, drivers using roads at night tend to be more focused on the road and the area illuminated by their headlights than during the day and may have oncoming headlights, cats' eyes or reflective signage drawing their attention, resulting in low susceptibility. This is particularly the case on unlit rural roads that may be narrow and winding. People taking part in activities such as stargazing, would be of high susceptibility. People in settlements would be of similar sensitivity as in the daytime.

The assessment focusses on locations where people are likely to be present at night. Recreational routes and other outdoor recreational locations are generally unlikely to be used at night (unless they are lit or specifically promoted for e.g. stargazing) and are not usually considered.

Designations

For landscape receptors, susceptibility is judged based on the degree to which they are currently characterised by darkness. Value is judged based on document indicators of value (e.g. a Dark Sky Park), and special qualities or purposes of designation which can be appreciated at night.

Cumulative Effects

There is no definitive guidance relating to the assessment of cumulative effects, only guidance for specific types of development[ix] and application[x] which inform this methodology.

In line with GLVIA3 (paragraph 7.5) and NatureScot guidance on assessing the cumulative impact of onshore wind energy developments, the assessment of cumulative effects should focus on whether there are any likely significant cumulative impacts which are reasonably foreseeable and which are likely to influence the decision making of the Proposed Development, rather than an assessment of every potential cumulative effect. In practice this means considering other nearby development proposals and the effects that might arise from the combined influence of those with that of Proposed Development on landscape and visual receptors.

As noted above, operational developments are included in the baseline, consented development which is expected to be constructed typically forms part of the future baseline and is included as such. However, where there is some uncertainty regarding the future construction of consented developments, they may be considered as the first scenario of the cumulative assessment.

Proposals in planning are considered where significant cumulative effects are likely. The assessment of effects is considered within the cumulative assessment.

Proposals in scoping and other potential developments such as local plan allocations are typically noted but not considered within the cumulative assessment, as there is no certainty that these proposals will progress to planning submissions and the nature of the proposed schemes may be subject to change. They may be exceptionally included at the request of consultees and/or where there is sufficient information available to inform assessment.

The assessment is based on the same landscape and visual baseline and receptor groups as the main LVIA, and the methodology is the same in terms of forming and expressing judgements. Two types of judgement may be provided:

- Additional effects –The effects that would arise from the addition of the proposed development to a baseline which includes the cumulative development(s) being considered.
- Combined effects – The effects that would arise from the addition of both the proposed development and the cumulative development(s) being considered to the main assessment baseline.

Typically, only the additional effects need to be considered, and the cumulative assessment is provided to inform decision-making in the event that one or more of the cumulative developments has been consented prior to the proposed development (i.e. the future baseline has changed). The combined effects may be relevant where two or more development applications are determined together.

Cumulative effects on landscape receptors arise from combined effects on the same receptor – such as two developments within the same character area; or one development within, and one visible from, a designated area.

Cumulative effects on visual receptors arise either from two (or more) developments both being visible from the same place; or from sequential views as people travel.

In order to simplify what may otherwise be a complex assessment, the following approaches are also used:

- The cumulative assessment considers scenarios within which developments may be 'grouped' - for instance two nearby cumulative proposals may be considered in one scenario if it is considered that the cumulative effects arising if one or both are developed are likely to be similar.
- Receptors judged to receive Negligible or Small-Negligible magnitude effects are not considered for cumulative effects on the basis that any significant effects arising would be unlikely to be contributed to by the Proposed Development.

Qualitative assessment of design and aesthetic considerations arising as a result of cumulative development, and/or considerations set out within local guidance provided in relation to cumulative development, is also provided where relevant.

Visual Aids

Guidance and Standards Used

All visibility maps (ZTVs), photography, visualisations (wirelines and photomontages) and their graphical presentation have been undertaken to relevant guidance[xi] [xii].

Visibility Maps: Zone of Theoretical Visibility

Zone of Theoretical Visibility (ZTV) maps have been generated using GIS software to assist in in identifying areas where visibility would not occur as well as informing viewpoint selection. They illustrate areas where part or all of the proposed development may be visible.

Unless expressly stated, the visibility maps present the extent of potential visibility on the basis of a 'bare ground' scenario. They do not account for the effects of screening and filtering of views as a result of intervening features (e.g. buildings, trees, hedgerows, etc) and so tend to over-estimate visibility, both in terms of the area from which the project can potentially be seen and potentially in terms of the extent of the development visible from a particular viewpoint.

The computer models include the study area and calculations of visibility take account of the effects caused by atmospheric refraction and the Earth's curvature.

ZTVs which include vegetation and buildings may use real height information derived from standard DSM products such as LiDAR – this approach is typically used for smaller study areas and urban areas. For larger study areas assumed heights are used which are stated on the ZTV figure. The location and extent of woodland and buildings is derived from OS Open Data and assumed/estimated heights for these are added to the bare ground model. As a result, the ZTV study does not take account of all above ground features – only those included as woodland and buildings in the OS mapping at the time the ZTV was prepared. These ZTV studies present a more realistic visibility pattern than bare ground studies, but do not take detailed account of felling cycles, tree growth, demolition or construction.

Visualisations

The methodology for photography and visualisation (undertaken by GreenCat Renewables Ltd) is provided in Annex 2.

Image Verification

Should the user wish to undertake verification of the images, please refer to ANNEX E of the Visual Representation of Wind Farms: Version 2.2 (SNH, 2017) for full details of the methods required.

Technical details meeting TGN 06/19 requirements for type 4 visualisations as identified in Appendices 10 and 11 of the TGN are set out either in this methodology, or on the individual visualisations, with the exception of the make and model of panoramic head and elements used to check vertical and horizontal alignment. TGN 06/19 suggests that these will vary by project, but in practice these usually vary by viewpoint (e.g. if photography is undertaken at separate times or by different photographers; or where viewpoints are sufficiently distant from each other that they do not share the same elements suitable for matching). These details and the 'additional imagery' requirements of a photograph of the tripod location and a 'composite view' showing the underlying construction of a photomontage are recorded for each viewpoint and can be provided if required for verification purposes.

Data Accuracy

Accuracy figures for the following terrain data products are expressed statistically by the providers as root-mean-square error (RMSE) in metres:

- OS Terrain®50 (50m resolution): 4m RMSE.
- OS Terrain®5 (5m resolution): Urban and major communication routes 1.5m RMSE; Rural 2.5m RMSE; Mountain and moorland 2.5m RMSE.
- DEFRA LiDAR: 0.15m RMSE

SNH Visualisation Guidance Annex A: Information on limitations of visualisations.

"Visualisations of wind farms have a number of limitations which you should be aware of when using them to form a judgement on a wind farm proposal. These include:

A visualisation can never show exactly what the wind farm 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 turbines and the distance to the 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 wind farm proposal these images are best viewed at the viewpoint location shown;

The images must be printed at the right size to be viewed properly (260mm by 820mm);

You should hold the images flat at a comfortable arm's length. If viewing these images on a wall or board at an exhibition, you should stand at arm's length from the image presented to gain the best impression.

It is preferable to view printed images rather than view images on screen. If you do view images on screen you should do so using a normal PC screen with the image enlarged to the full screen height to give a realistic impression. Do not use a tablet or other device with a smaller screen to view the visualisations described in this guidance."Annex 1: Glossary of Terms

Note – many of these definitions are taken from GLVIA3.

Term	Definition
CLVIA	Cumulative Landscape and Visual Impact Assessment.
Cumulative Effects	Cumulative effects are the additional effects arising from changes caused by a development in conjunction with other past, present or reasonably foreseeable actions.
Direct Effect	A direct (or primary) effect may be defined as an effect that is directly attributable to the development.
GLVIA3	'Guidelines for Landscape and Visual Impact Assessment, Third Edition', published by Landscape Institute and Institute of Environmental Management & Assessment, 2013.
Indirect Effect	An indirect (or secondary) effect is an effect that results indirectly from the proposed project as a consequence of the direct effect, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects.
Key Characteristics	Those combinations of elements which are important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
LVIA	Landscape and Visual Impact Assessment.
Landscape Capacity	The amount of change which a particular landscape character type or area is able to accommodate without significant detrimental effects on its character. Capacity is likely to vary according to the type and nature of change proposed.
Landscape Character	The distinct and recognisable pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Landscape Character Areas	These are single unique areas which are the discrete geographical areas of a particular landscape type.
Landscape Character Types	These are distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetic attributes.
Landscape Effects	Effects on the landscape as a resource in its own right.
Landscape Elements	Individual components which make up the landscape such as trees and hedges.
Landscape Features	Particularly prominent or eye-catching elements, like tree clumps, church towers or wooded skylines.
Landscape Quality or Condition	This is a measure of the physical state of the landscape. It may include the extent to which a typical character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
Landscape Receptor	Defined aspects of the landscape resource that may be affected by a proposal.
Landscape Resource	The combination of elements that contribute to landscape context, character and value.
Landscape Value	The relative value or importance attached to different landscapes by society on account of their landscape qualities.
Level of Effect	Determined through the combination of sensitivity of the receptor and the proposed magnitude of change brought about by the development. The level of an effect gives an indication as to the degree of importance (based on the magnitude of the effect and sensitivity of the receptor) that should be attached to the impact described.
Magnitude (of impact)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.
Mitigation	Measures including any process, activity or design to avoid, reduce, remedy or compensate for adverse environmental impact or effects of a development.
Photowire	A visualisation which superimposes a simple wireline of a proposed development upon a photograph or series of photographs.
Photomontage	A visualisation which shows a rendered image of a proposed development set within a photograph or series of photographs edited to show screening by intervening features.
Residential Visual Amenity	A collective term describing the views and visual amenity from a residential property, relating to the type, nature, extent and quality of views that may be experienced from the property and its 'domestic curtilage' including gardens and access driveway. Residential Visual Amenity is only one component of the overall Residential Amenity, others being for example noise, shadow flicker and access amongst others.
Residual Effects	Potential environmental effects remaining after mitigation.
Sense of Place	The essential character and spirit of an area.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.

Significant Effects	It is a requirement of the EIA Regulations to determine the likely significant effects of development on the environment. Where possible significant effects should be mitigated. Judgements as to whether an effect is significant or not are based on the level of effect, with the more important effects being deemed significant.
Type or Nature of Effect	Whether an effect is direct, indirect, temporary or permanent, positive (beneficial), neutral or negative (adverse) or cumulative.
Visual amenity	Value of a particular place in terms of what is seen by visual receptors taking account of all available views and the total visual experience.
Visual Effect	Effects on specific views and on the general visual amenity experienced by people.
Visual Receptors	Individuals and/or defined groups of people who may be affected by a proposal.
Visualisation	Computer simulation, photomontage or other technique to illustrate the appearance of a development.
Wildness	A quality of appearing to be remote, inaccessible and rugged with little evidence of human influence.
Wireframe or Wireline	A computer-generated line drawing of the DTM (Digital Terrain Model) and the proposed development from a known location.
Zone of Theoretical Visibility (ZTV)	Area within which a proposed development may have an influence or an effect on visual amenity.

Annex 2: Visualisation Methodology

Annex 5.2 – Visualisation Methodology

1.1 Introduction

All visualisations included in the LVIA have been produced in accordance with NatureScot's *Visual Representation of Wind Farms* [1]. Photography was undertaken and panoramic images have been produced from these photographs to record a 90° panorama, that provides landscape context to each location. A 53.5° image has been extracted from this and photomontaged to provide an accurate illustration of the visual impact. Each viewpoint location typically includes:

- A baseline 90° panorama, including photograph and matching wireline;
- A 53.5° wireline; and
- A 53.5° photomontage.

1.2 Site Photography

1.2.1 Site Preparation

Each location was investigated prior to any site visits to identify the most suitable location for photography to be recorded. This included looking at access, safety, and how representative locations were of receptors. Wirelines were produced to allow photographers to identify the location of the Proposed Development once on site, which would reduce the chance of foreground features such as vegetation obscuring any views. Further to this the weather forecast was checked using the Met Office (https://www.metoffice.gov.uk/) in order to undertake the photography in conditions of good weather and good visibility. The sun position on the day of photography was also identified using Suncalc (https://www.suncalc.org/) in order to avoid glare and sun flares.

1.2.2 Camera Specifications

All photography has been undertaken at each representative viewpoint location using a digital Single Lens Reflex SLR camera with full frame sensor and a prime 50mm fixed focal length lens, in combination with a panoramic head equipped tripod, and a ball socket leveller. In the case of this assessment the cameras used were Nikon D600, Nikon D610, and Canon EOS 4D Mark III.

1.2.3 Photography

Each location was visited in times of good weather and photographed to 360°. The tripod was levelled and set to capture photography at a height of 1.5m (unless stated otherwise) and capture views every 20°, with the camera in landscape position. Multiple sets were recorded in order to get the best quality possible and the location was recorded with a Garmin eTrex 22x GPS.

1.2.4 Panoramic Stitching

Once photography was complete, the images from each location were stitched together in the PTGui (Version 12.27) software to create a 360° panorama. From this resulting image, two 90° panoramas were extracted: a cylindrical version to be used for the baseline slides and a planar version to be used for the photomontage slide.

[1] Visual Representation of Wind Farms Guidance Version 2.2, NatureScot, February 2017

1.2.5 Postproduction

Some minor adjustments were made in some of the panoramic images using Adobe Lightroom in order to alter attributes such as exposure, brightness, and contrast to improve visibility and create the clearest image possible.

1.3 Wireline Production

1.3.1 Cylindrical Wireline

To generate wireline visualisations, a computer model of the proposed site and study area is produced. ReSoft© Windfarm R5 software is used to create a 3D computer model of the proposed development representing the shape, size and position of the proposed development, and the existing landform (terrain). The landform information is derived from Ordnance Survey 50m resolution terrain. The computer model includes the study area and calculations of visibility take account of the effects caused by atmospheric refraction and the Earth's curvature.

For the 90° the software was set to produce cylindrical wirelines and in the ridgeline format. These wirelines not only included the Proposed Development, but also included cumulative wind farm development as required.

1.3.2 Planar Wireline

In addition to the 90° wireline image, a 53.5° was also created using the ReSoft© Windfarm R5 software. In this instance, the software was set to produce planar wirelines and also in the ridgeline format. This is done by producing a 90° planar wireline, which is then positioned within a 53.5° template (see Section 1.5 below). These wirelines only include the Proposed Development.

1.4 Photomontaging

1.4.1 Wind Farm Photomontage

The ReSoft Windfarm R5 software is also used in the production of the 53.5° photomontage. This involves taking the above 90° wireline (Planar) and combining it with the equivalent planar 90° panorama. Detailed viewpoint information as recorded on site, including the GPS co-ordinates is used to enable the accurate alignment of the photographs with the computer model. A perspective match is achieved between the computer-generated wireline and the photographs by iteratively adjusting the parameters until all the major features in the image are aligned satisfactorily. The Proposed Development is then rendered using Resoft WindFarm taking into account the time and conditions occurring on the day of the photography to provide a realistic image.

1.4.2 Additional Components

Additional components such as the access tracks, laydown areas, areas of cut and fill, and the Battery Energy Storage System (BESS) was modelled in windPRO and added to the photomontage created in Section 1.4.1. The SketchUP software was used to create some of the elements such as the BESS, which was then imported into the windPRO software. The access tracks and hardstandings were modelled using OS Terrain 50 Elevation data and the Proposed Development layout. The BESS was modelled based on the layout of the Proposed Development. All details were completed to be technically accurate depictions of the Proposed Development. These elements were included for any relevant visualisations.

1.4.3 Editing

In addition to the turbines, access track, BESS etc, some editing was done in Adobe Photoshop, typically where vegetation or manmade features would partially obscure the view, in order to create a photorealistic impression of the Proposed Development.

1.5 Templating

The 90° cylindrical baseline photography and the 90° cylindrical wirelines were then inserted into the NatureScot template for these and fitted to the correct hight and width. The production of the 53.5° planar wirelines and the 53.5° planar photomontages was slightly different. In order to create the final version of these, the 90° images were inserted into the relevant templates, with the remaining 36.5° cropped out of the frame. This was done to allow for optimal positioning of the wireline and photomontage.

1.6 Night-Time Visualisations

In addition to the above visualisations, four night-time photomontages were produced in accordance with NatureScot's Guidance on Aviation Lighting Impact Assessment[2].

1.6.1 Photography

The same steps and principals used to complete the day-time photography was carried out for the night-time photography, with photography undertaken around 30 minutes after sunset where possible, although this was influenced by viewing conditions and seasonal variation.

1.6.2 Photomontaging

The same methodology to create the 53.5° planar day-time photomontages, was also used to create the night-time photomontages, with the lighting added in Adobe Photoshop. These photomontages display an impression of the CAA approved visible aviation lighting at an intensity of 200cd. A degree of judgement required to illustrate the brightness of the lighting compared to the background photography including exposure settings.

[2] https://www.nature.scot/doc/guidance-aviation-lighting-impact-assessment

References

[i] Landscape Institute and Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3). Published by Routledge.

[ii] Landscape Institute (2024), Notes and Clarifications on Aspects of GLVIA3. Available at: https://www.landscapeinstitute.org/technical-resource/notes-and-clarifications-on-aspects-of-the-3rd-edition-guidelines-on-landscape-and-visual-impact-assessment-glvia3-litgn-2024-01/.

[iii] Natural England (2014). An Approach to Landscape Character Assessment. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691184/landscape-character-assessment.pdf

[iv] NatureScot (2025). Special Landscape Qualities – Guidance on Assessing Effects. Available at: https://www.nature.scot/doc/special-landscape-qualities-guidance-assessing-effects#:~:text=This%20guidance%20sets%20out%20how%20to%20assess%20effects,Loch%20Lomond%20and%20Trossachs%20National%20Park%20Authority%20%28LLTNPA%29.

[v] Landscape Institute (2021). Technical Guidance Note 02/21 Assessing landscape value outside national designations. Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2021/05/tgn-02-21-assessing-landscape-value-outside-national-designations.pdf

[vi] NatureScot (2022). Landscape Sensitivity Assessment Guidance. Available at: https://www.nature.scot/doc/landscape-sensitivity-assessment-guidance-methodology

[vii] Marine Management Organisation (2019). An approach to seascape sensitivity assessment (MMO1204). Available at: MMO1204_An_Approach_to_seascape_sensitivity_assessment_for_publication_a.pdf

[viii] NatureScot (2024). 'Guidance on Aviation Lighting Impact Assessment'. Available at https://www.nature.scot/doc/guidance-aviation-lighting-impact-assessment

[ix] NatureScot (2021). Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments. Available at: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments

[x] Planning Inspectorate (20 September 2024). Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment. Available at: https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-advice-on-cumulative-effects-assessment

[xi] Landscape Institute (2019). Technical Guidance Note 06/19: Visual Representation of Development Proposals. Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf

[xii] Scottish Natural Heritage (2017). Visual Representation of Wind Farms. Available at: https://www.nature.scot/doc/visual-representation-wind-farms-guidance