



Technical Appendix 7.1

Landscape and Visual Impact Assessment Methodology

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Technical Appendix 7.1

Landscape and Visual Impact Assessment Methodology

7.1 Introduction

1. This methodology has been prepared by chartered landscape architects at RSK Environment Limited ('RSK'). It describes in detail the method that has been used to undertake the Landscape and Visual Impact Assessment (LVIA) for the proposed Development. The LVIA systematically identifies and assesses the potential significance or degree of change to the baseline landscape resource and existing views and visual amenity experienced by people resulting from the proposed Development.
2. The LVIA, the preparation of and presentation of associated visual representations of the proposed Development has been informed by the following guidance and sources of information:
 - Landscape Institute (2019), Visual Representation of Development Proposals. Landscape Institute Technical Guidance Note 06/19;
 - Landscape Institute (2019), Residential Visual Amenity Assessment (RVAA). Landscape Institute Technical Guidance Note 02/19;
 - Landscape Institute and Institute of Environmental Management and Assessment (2013), Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3);
 - Scottish Natural Heritage¹ (2020), Assessing Impacts on Wild Land Areas – Technical Guidance;
 - Scottish Natural Heritage (2017), Siting and Designing Wind Farms in the Landscape, Version 3a;
 - Scottish Natural Heritage (2017), Visual Representation of Wind Farms, Version 2.2;
 - Scottish Natural Heritage (2012), Assessing the Cumulative Impact of Onshore Wind Energy Developments;
 - The Countryside Agency and Scottish Natural Heritage (2002), Landscape Character Assessment Guidance for Scotland and England; and
 - The Highland Council (2016), Visualisation Standards for Wind Energy Developments.

7.2 Study Area

3. The starting point for the LVIA is identification of the study area. Guidance published by SNH advises that a study area of 40 km from the outermost wind turbines is suitable for wind turbines of the height in the proposed Development. Our preliminary study area extended to 45 km as the wind turbines are at the upper end of the size category identified by SNH.
4. Zone of theoretical visibility (ZTV) analysis was undertaken using a 45 km study area. Mapping of landscape character, landscape designations, wild land areas and identification of visual receptors was undertaken. The size of the study area does not indicate that '**Significant**' effects are likely to occur across its entirety or at the outer edges of the study area. It indicates the area in which '**Significant**' effects could potentially occur and which require further detailed investigation.

¹ SNH were renamed to NatureScot on 24 August 2020

7.3 Desk Study

5. Having identified a preliminary study area a desk study of the Site and study area is undertaken to identify landscape and visual resources that will be analysed in further detail in the LVIA. The desk study uses publicly available information sources to inform our understanding of landscape designations (such as National Scenic Areas (NSA) and Special Landscape Areas (SLA)), landscape character, wild land areas, location and activity of key visual receptors such as national cycle network routes, tourist routes, roads, railways and settlements.
6. Mapping of landscape and visual resources using GIS and provides the basis for desk-based analysis of potential visibility of the proposed Development in Resoft WindFarm. GIS and Resoft WindFarm are used to generate ZTV maps and wirelines both of which provide an indication of which landscape and visual receptors would potentially be affected by the proposed Development.
7. Landscape character information has been obtained from Stanton, C. (1998) Caithness and Sutherland Landscape Character Assessment. Scottish Natural Heritage Review No 103, Scottish Natural Heritage digital map-based landscape character assessment (published in 2019)² and The Highland Council (2017) Landscape Sensitivity Appraisal: Black Isle, Surrounding Hills. Moray Firth Coast and Caithness.

7.4 Field Survey

8. Having undertaken desk studies, prepared ZTV maps, mapping of landscape character information and designations and prepared initial wirelines of a proposed Development layout, baseline field survey work is undertaken. The purpose of field survey work is to familiarise the LVIA team with the Site and the landscape and visual baseline of the wider LVIA study area; confirm viewpoint locations identified during desk study and identify alternative or additional viewpoint locations; assess any changes or differences to the published description of baseline landscape character; undertake a preliminary assessment of effects of the proposed Development and refine the detailed study area.
9. Following the baseline field survey viewpoint photography is undertaken at key viewpoints that will be used in the LVIA to inform preliminary assessment and design. Photography is also undertaken at further visits following final agreement of viewpoints with consultees in order to capture any viewpoints identified during scoping.
10. Following design freeze a second field survey visit is undertaken by the Landscape Architect. ZTV maps and cumulative wirelines are used in the survey to assess the potential effects of the proposed Development. A cumulative and sequential assessment is undertaken and a residential visual amenity assessment is also undertaken after design freeze. During the field survey draft wirelines are taken to each viewpoint and areas identified as requiring more detailed assessment are also visited.

7.5 Assessment of Landscape Effects

11. The assessment of landscape effects considers two types of effects: physical effects and effects on landscape character.
12. **7.5.1 Physical Effects**
The physical effects of the proposed Development are direct effects on components of the landscape at the Site that would be altered or removed. For example, the removal of trees or changes to landcover. The assessment identifies which components would be affected and if the effects would be '**Significant**' or '**Not Significant**'.

² Available at <https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions>

7.5.1.1 Sensitivity of Landscape Components

13. The sensitivity of landscape components is evaluated through a combination of judgements on the value attached to the components and their susceptibility to changes resulting from the proposed Development. The potential to mitigate effects is also a consideration.
14. The value of the landscape component is evaluated according to its relative importance or contribution to landscape character. For example, the value of a drystone wall may be greater if it makes an important contribution to the overall pattern of features and elements in the landscape. Its value would be further increased if formed part of a rare example of an historic field pattern.
15. Susceptibility of landscape components relates to their potential to be restored, replaced or substituted.
16. The evaluation of sensitivity of landscape components is described and assessed using a verbal scale of **‘Very High’**, **‘High’**, **‘Medium’** and **‘Low’**.

7.5.1.2 Magnitude of Effect on Landscape Components

17. The magnitude of effect on landscape components reflects the degree to which they would be physically affected by the proposed Development and the relative importance or contribution of the components to landscape character.
18. The evaluation of magnitude of effect is defined as follows:
- High. There would be loss or considerable alteration to a landscape component;
 - Medium. There would be partial loss or alteration to a landscape component;
 - Low. There would be limited loss or alteration to a landscape component; and
 - Negligible. The amount of loss or alteration to a landscape component would barely be discernible.

7.5.1.3 Significance of Effects on Landscape Components

19. The significance of effects on landscape components is evaluated through a combination of the judgements made on sensitivity to change, magnitude of effect and the potential for mitigation.
20. Effects of greater significance are more likely to occur where there is complete removal or considerable alteration to a landscape component such that it would be completely lost or irreversibly changed. However, landscape components of **‘High’** sensitivity may require relatively limited change to result in effects of greater significance. A **‘Significant’** effect on a landscape component does not necessarily mean there would be a **‘Significant’** effect on landscape character.

7.5.2 Landscape Character Effects

21. Two different categories of landscape character receptor are considered: landscape character types (LCT) and landscape designations. In the case of LCT the key characteristics are described in published landscape character assessments. The assessment of effects on LCT is based on an understanding of the key characteristics of each LCT and the potential for the proposed Development to change key characteristics of the baseline and the degree to which that would alter the defining character of each LCT.
22. The second category of landscape character receptor is landscape designations and Wild Land Areas (WLA). The boundaries of landscape designations and WLA may be coincident with a number of LCT. The key characteristics and special qualities of landscape designations and WLA may be described differently to those parts of LCT with which they coincide. The assessment of effects on landscape designations and WLA is therefore based on the published description of key characteristics and special qualities for each designated area.

7.5.2.1 Sensitivity of Landscape Character to Change

23. Sensitivity of landscape character is evaluated by combining judgements about landscape value and landscape susceptibility.

Landscape Value Evaluation

24. Value relates to the relative importance of different landscapes to society. Paragraph 5.20 and box 5.1 of GLVIA3 list a range of factors which can help identify valued landscapes including landscape quality (condition); scenic quality; rarity; representativeness; conservation interests; recreation value; perceptual characteristics; and associations.

25. Landscape designations such as NSA or SLA indicate value or importance. An absence of such designation does not automatically imply a lack of value as other factors, such as scarcity, may be considered relevant. The evaluation of value is based on the criteria in **Table 7.1.1** which represent highest and lowest value. The outcome of the evaluation is a rating of **‘High’**, **‘Medium’**, **‘Low’** or **‘Negligible’** and the ratings are explained in detail in **Chapter 7: Landscape and Visual Impact Assessment**.

Table 7.1.1: Criteria informing judgements on landscape value

Value	Criteria
Highest	<ul style="list-style-type: none"> • National landscape designations. • Landscapes of higher quality in good condition as evidenced by consistent intactness of well-defined features and elements. • Landscape character types rarely found or unique. • Habitat or wildlife designations and cultural heritage designations that make a notable contribution to landscape character. • Substantial evidence of recreational activity where experience of the landscape is important. • Qualities of wildness, remoteness or tranquillity are strongly evident. • Strong cultural associations as evidenced by references in literature, music and art.
Lowest	<ul style="list-style-type: none"> • No formal landscape designation is present. • Low quality landscape in poor condition as evidenced by areas despoiled or degraded land and poorly defined or disparate features and elements. • Commonly found landscape character types or characteristics. • Habitat or wildlife designations and cultural heritage designations make limited or no discernible contribution to landscape character. • Very limited or no evidence of recreational activity where experience of the landscape is important. • Qualities of wildness, remoteness or tranquillity are very limited. • Very limited or no cultural associations

Landscape Susceptibility Evaluation

27. The susceptibility of landscape character to change is about its ability to accommodate the changes resulting from the proposed Development and the potential for the landscape to be altered and the degree to which alteration would affect key characteristics and components of the baseline. The following factors are considered:
- The proposed Development. This factor considers the specific components and aspects of the proposed Development that have the potential to result in changes to baseline landscape character. These include, movement, colour, size, scale, design, location and context.
 - Landscape character. The degree to which the landscape can accommodate the proposed Development relates to key landscape characteristics and the potential for these to be altered or influenced by the proposed Development leading to a change in emphasis of key characteristics as a result of the introduction of the proposed Development. For example, a landscape where qualities of wildness, remoteness and tranquillity are prevalent may be more susceptible than a landscape mainly influenced by infrastructure, urban and industrial development. The degree to which the proposed Development contrasts with the characteristics of the baseline will also be a consideration.
 - Wider landscape context. The susceptibility of the landscape character type in which the proposed Development would be located will be evaluated. So, too will the susceptibility of adjacent landscape character types and those in the wider area. For example, views of distant mountains may be important to the perception of scale and openness of a landscape character type from which there are also views of the proposed Development.

28. The evaluation of susceptibility is based on the criteria in **Table 7.1.2 Criteria informing judgements on landscape susceptibility** which represent highest and lowest value.

Table 7.1.2: Criteria informing judgements on landscape susceptibility

Susceptibility	Criteria
Highest	<ul style="list-style-type: none"> The landscape is high quality and/or in good condition. Key landscape characteristics have the potential to be altered by the addition of the proposed Development. The landscape is unlikely to be able to accommodate the changes resulting from the proposed Development. The landscape character type would be directly affected by the proposed Development to a high degree and there would not be any screening by landform, buildings or vegetation. The landscape character type would not be directly affected but is strongly associated with the landscape character type that is directly affected.
Lowest	<ul style="list-style-type: none"> The landscape is low quality and/or in poor condition. Key landscape characteristics would not be altered by the addition of the proposed Development. The landscape could accommodate the changes resulting from the proposed Development. The landscape character type would not be directly affected by the proposed Development and it would be partly screened by landform, buildings or vegetation. The landscape character type would not be directly affected and there is limited association with the proposed Development and its immediate context.

Landscape Sensitivity Evaluation

30. The sensitivity of landscape receptors is based on the judgements regarding the susceptibility of the landscape receptor to change and the value placed on the landscape, as discussed above. **Table 7.1.3** indicates general categories of sensitivity based on combining these judgements and serves as a useful guide when making these judgements. The sensitivity of landscape receptors is assessed as **‘Very High’**, **‘High’**, **‘Medium’** and **‘Low’** and the judgements regarding these ratings are described in detail in **Chapter 7: Landscape and Visual Impact Assessment**.

Table 7.1.3: Evaluation of landscape sensitivity

		Susceptibility		
		High	Medium	Low
Value	Very high	High	High	Medium-high
	High	High	Medium-High	Medium
	Medium	Medium-High	Medium	Low-Medium
	Low	Medium	Low	Low

7.5.2.2 Magnitude of Effect

31. The assessment of the magnitude effect resulting from the proposed Development is about the scale of change and the geographical extent over which this would occur. Visibility of the proposed Development is a key factor to consider when evaluating magnitude of effect and distance to the proposed Development and topography are important in understanding the nature of effects:

- The size and scale of the development taking into consideration:
 - The extent of landscape components that would be lost and their contribution to landscape character;

- The degree to which aesthetic or perceptual aspects of the landscape are altered either by the removal of existing components of the landscape, or, the addition of new features;
- Whether the change in key characteristics is critical to a distinctive landscape character; and
- Distance to the proposed Development and the amount of the proposed Development that would be visible.
- The geographical extent over which landscape effects would be experienced. For example, there may be a moderate loss of landscape elements over a wide area, or a substantial addition affecting a very localised area;
- The likely duration of the change to the landscape; and
- Whether the change to the landscape is potentially reversible.

32. The evaluation of magnitude of effect is based on the criteria in **Table 7.1.4** which represent highest and lowest value.

Table 7.1.4: Criteria informing judgements on magnitude of landscape effect

Magnitude	Criteria
Highest	<ul style="list-style-type: none"> There would be substantial loss or alteration to key components / characteristics of the baseline. Large scale of change to baseline landscape character. A large proportion of the proposed Development would be visible.
Lowest	<ul style="list-style-type: none"> There would be limited loss or alteration to key components / characteristics of the baseline. Small amount of change to baseline landscape character. Small proportion of the proposed Development would be visible.

7.5.2.3 Significance of Effects on Landscape Character

34. Significance of effect on landscape is evaluated through a combination of sensitivity and magnitude of effect. The level of effect is assessed by combining all of the considerations and criteria set out above. This is described by GLVIA3 as an ‘overall profile’ approach to combining judgements and requires that all the judgements, against each of the identified criteria.

35. The relative weight attributed to each of the considerations is a matter for experienced professional judgement and will vary depending on the specific receptor or effect being assessed.

36. Significant effects are more likely where the proposed Development becomes a defining characteristic of the landscape receptor or results in noticeable change to a receptor of particularly **‘High’** sensitivity. Effects are less likely to be **‘Significant’** if the proposed Development is part of an existing pattern of similar development or results in limited change to a landscape receptor. **Table 7.1.5** is a guide to how the evaluation of sensitivity to change and magnitude of effect combine in the evaluation of significance of effect. **Table 7.1.5** is not prescriptive. A number of factors are taken into account as indicated above in the evaluation of sensitivity and magnitude and professional judgement is used to decide if the effects are **‘Significant’** or **‘Not Significant’**. The judgements are described in detail in for each receptor in **Chapter 7 Landscape and Visual Impact Assessment**.

Table 7.1.5: Significance of effect evaluation guide

		Magnitude of effect					
		High	Medium-High	Medium	Low-Medium	Low	Negligible
Sensitivity	High	Significant	Significant	Significant	Significant / Not Significant	Significant / Not Significant	Not Significant
	Medium-High	Significant	Significant	Significant / Not Significant	Significant / Not Significant	Significant / Not Significant	Not Significant
	Medium	Significant	Significant / Not Significant	Significant / Not Significant	Not Significant	Not Significant	Not Significant
	Low-Medium	Significant / Not Significant	Significant / Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Low	Significant / Not Significant	Significant / Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

7.6 Assessment of Effects on Views and Visual Amenity

37. The assessment of visual effects is about the effects of the proposed Development on views and visual amenity experienced by people (or visual receptors) in the study area. The assessment of visual effects uses a series of viewpoints that have been selected and agreed with consultees as being representative of the type of views experienced and visual receptors present in the study area.

7.6.1.1 Visual Receptor Sensitivity

38. Sensitivity of visual receptors is evaluated by combining judgements about value of views and visual amenity and the susceptibility of visual receptors to change resulting from the proposed Development.

Value of Views and Visual Amenity

39. Paragraph 6.37 of GLVIA3 explains judgement needs to be made about the value attached to the view experienced, taking account of the existing recognition attached to particular views (e.g. through planning or statutory designations) and other indicators such as appearance in guidebooks, tourist maps or cultural references. The evaluation of the value of views and visual amenity is based on the criteria in **Table 7.1.6** which represent highest and lowest value.

Table 7.1.6: Criteria informing judgements on the value of views and visual amenity

Value	Criteria
Highest	<ul style="list-style-type: none"> Viewpoint identified on Ordnance Survey maps or for which facilities are provided for interpretation and enjoyment of the view. View is given policy protection in the local development plan. Viewpoint is in a designated landscape or the designated landscape is integral to the composition and quality of views. There is evidence that the view is locally important and/or well visited.

Value	Criteria
Lowest	<ul style="list-style-type: none"> The view is of cultural importance as evidenced by references to it in literature and art. Viewpoint is not identified on Ordnance Survey maps and there are no facilities provided for interpretation and enjoyment of the view. View is not given policy protection in the local development plan. Viewpoint is not in a designated landscape nor is a designated landscape integral to the composition and quality of views. There is no evidence that the view is locally important and/or well visited. The view is not of cultural importance as there is no evidence of references to it in literature and art.

Visual Receptor Susceptibility

40. Susceptibility to visual change is determined by the activity of people experiencing a particular view and the extent to which their attention or interest may be focused on views and visual amenity. The evaluation of the value of susceptibility is based on the criteria in **Table 7.1.7**.

Table 7.1.7: Criteria informing judgements on visual receptor susceptibility

Value	Criteria
High	<ul style="list-style-type: none"> The viewpoint location may have been specifically created to for its view and/ or is experienced by people, whether residents or visitors, whose attention or interest is likely to be focused on the view. People with a particular interest in their available view or with prolonged viewing opportunities such as: residential locations; tourist destinations providing a specific important and highly valued view; recreational hilltops; ornamental parks/ designed landscapes; and national trails
Medium	<ul style="list-style-type: none"> The view may be experienced by people who are drawn to the view yet do not feel compelled to stop and take it in. People with a general interest in their surroundings or with transient viewing opportunities such as users of road, rail or transport routes; and users of general public open spaces.
Low	<ul style="list-style-type: none"> The viewpoint location may be transient and/ or experienced only in passing by people, whether residents or visitors, whose attention or focus is on other activities, not on their surroundings. People with a passing interest in their surroundings such as: recreation grounds and play areas; places of employment; major highways; commercial buildings; and commuters

Evaluation of Visual Receptor Sensitivity

41. The sensitivity of visual receptors is based on the judgements regarding the susceptibility of the visual receptor to change and the value placed on the landscape and view. The sensitivity of visual receptors is assessed as **'Very High'**, **'High'**, **'Medium'** or **'Low'**. **Table 7.1.8** indicates general categories of sensitivity and serves as a useful guide when making these judgements.

Table 7.1.8: Evaluation of visual receptor sensitivity

		Susceptibility		
		High	Medium	Low
Value	Very High	High	High	Medium-High
	High	High	Medium-High	Medium
	Medium	Medium-High	Medium	Low-Medium
	Low	Medium	Low	Low

7.6.1.2 Magnitude of Effect

42. The magnitude of a visual effect is about understanding the scale, nature, extent and duration of visual change a new development will have on a view.
43. The magnitude of effect arising from the proposed Development is described as ‘High’, ‘Medium’, ‘Low’, ‘Negligible’ or ‘No Change’ based on the interpretation of a combination of largely quantifiable parameters as discussed below.
- The size and scale of visual change that takes place taking account of:
 - The loss or addition of features;
 - Changes in composition including the proportion of the view occupied by the proposed Development;
 - The degree of contrast or integration of new features with existing landscape elements and characteristics in terms of form, scale, mass, line, height, colour, texture; and
 - The nature of the view of the proposed Development in terms of the relative amount of time over which it would be experienced, and, whether views would be full, partial or glimpsed;
 - The geographical extent of the change taking account of:
 - The angle of view in relation to the main activity of the receptor;
 - The distance of the viewpoint from the proposed Development; and
 - The extent of the area over which the changes would be visible;
 - The likely duration of the visual change; and
 - Whether the visual change is potentially reversible.
44. The magnitude of visual change is assessed as ‘High’, ‘Medium’, ‘Low’ or ‘Negligible’ informed by the criteria listed in **Table 7.1.9: Criteria informing judgements on magnitude of change to visual receptors.**

Table 7.1.9: Criteria informing judgements on the magnitude of change to visual receptors

Value	Criteria
Highest	<ul style="list-style-type: none"> The proposed Development would occupy most of the view and/ or its context. The proposed Development would be a new component in the view causing notable change in the characteristics of the view over an extensive area or an intensive change over a more limited area. The proposed Development would be very noticeable and will alter the overall perception of the view. Substantial change to the composition of the view.
Lowest	<ul style="list-style-type: none"> The proposed Development would occupy a small portion of the view and/ or its context. The proposed Development would be similar to the main component of the view.

Value	Criteria
	<ul style="list-style-type: none"> The proposed Development would not be readily noticeable and to the casual observer there would be limited change. Small change to the composition of the view.

7.6.1.3 Significance of Effects on Views and Visual Amenity

46. Significance of effect on views and visual amenity is evaluated through a combination of sensitivity and magnitude of effect. The level of effect is assessed by combining all of the considerations and criteria set out above. This is described by GLVIA3 as an ‘overall profile’ approach to combining judgements and requires that all the judgements, against each of the identified criteria.
47. The relative weight attributed to each of the considerations is a matter for experienced professional judgement and will vary depending on the specific receptor or effect being assessed.
48. Significant effects are more likely where the proposed Development becomes a defining characteristic of the view composition or occupies a large proportion of the view. Significant effects are also more likely where the proposed Development would introduce components uncharacteristic of the baseline environment resulting in a very noticeable contrast with the existing view. Significant effects could also arise where there is a small amount of change to a particularly sensitive view or visual receptor or where there would be sustained views of the proposed Development that would impinge upon the experience of receptors at a visitor destination or using a recreational route. Significant effects are less likely to occur where a small proportion of the proposed Development would be visible or where it would occupy a small proportion of the field of view. Significant effects are also less likely to occur where the proposed Development would be visible in distant views as a minor feature or where the visual receptor is of ‘Low’ sensitivity. **Table 7.1.5** is a guide to how the evaluation of sensitivity to change and magnitude of effect combine in the evaluation of significance of effect. **Table 7.1.5** is not prescriptive. A number of factors are taken into account as indicated above in the evaluation of sensitivity and magnitude and professional judgement is used to decide if the effects are ‘Significant’ or ‘Not Significant’. The judgements are described in detail in for each receptor in **Chapter 7: Landscape and Visual Impact Assessment.**

7.7 Assessment of Cumulative Landscape and Visual Effects

7.7.1 Introduction

49. Guideline for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) paragraph 7.3 uses definitions of cumulative effects set out in SNH guidance Assessing the Cumulative Effects of Onshore Wind Energy Developments (2012):
- “**Cumulative effects** [are] the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together;
 - Cumulative landscape effects** [are] effects that can impact on either the physical fabric or character of the landscape, or any special values attached to it; and
 - Cumulative visual effects** [are] effects that can be caused by combined visibility, which occurs where the observer is able to see two or more developments from one viewpoint and / or sequential effects which occur when the observer has to move to another viewpoint to see different developments. Combined visibility may either be in combination, where several windfarms are within the observer’s arc of vision at the same time, or in succession, where the observer has to turn to see the various windfarms.”
50. The cumulative landscape and visual impact assessment (CLVIA) described in **Chapter 7: Landscape and Visual Impact Assessment** assesses the addition of the proposed Development to other windfarm developments. It is the incremental effects arising from the introduction of the proposed Development that is assessed as opposed to the collective effects of all windfarm development of which the proposed Development is one. It considers two scenarios in which the environmental baseline of operational and under construction windfarms is a part:

- Cumulative Scenario 1 whereby the cumulative effects of the addition of the proposed Development to operational windfarms, windfarms under construction and consented windfarms is assessed; and
- Cumulative Scenario 2 whereby the cumulative effects of the addition of the proposed Development to operational windfarms, windfarms under construction, consented windfarms and windfarms in planning is assessed.

7.7.2 Scope of the Cumulative Assessment

51. The CLVIA study area was agreed with consultees during direct scoping. A 45 km study area was agreed and this was taken as a starting point for the CLVIA. Cumulative windfarm developments were mapped in GIS and cumulative ZTV maps were prepared. At this stage the cumulative assessment considered potential sequential effects on key routes such as the A9, A99 and A836 and NC500; intervisibility between the proposed Development and other developments and the existing pattern of windfarm development in the baseline environment.
52. SNH guidance and GLVIA3 indicate that the focus of the CLVIA should be upon the proposed Development with operation, under construction, consented and development in planning. Development at pre-application stage is generally not considered in the CLVIA as there is often uncertainty regarding the layout and design of development at pre-application stage with information not available to the project team. However, there may be instances where there is the potential for **‘Significant’** cumulative effects to arise from the addition of the proposed Development with a development which is at pre-application stage. Orkney Islands Council advised that Hoy windfarm, a development of six wind turbines each approximately 150 m in height to blade tip, was at pre-application stage at the time scoping was undertaken in September 2020, and an application for the development was expected within a week. Given the size of the Hoy wind turbines is comparable to the proposed Development, the potential for intervisibility of the two developments at key viewpoints and the imminent submission of a planning application it was decided to include Hoy windfarm as an application site. The planning application for Hoy windfarm was called in by the Scottish Government Department of Planning and Environmental Appeals (DPEA) and is awaiting a decision.
53. The cumulative assessment considers the following factors:
- The distance between individual windfarms (or wind turbines);
 - The distance over which windfarms are visible;
 - The overall character of the landscape and its sensitivity to windfarms;
 - The siting and design of each windfarms and how each site relates to others; and
 - The way in which the landscape is experienced.
54. The CLVIA methodology is described below and combines judgements on sensitivity and magnitude to identify if cumulative effects would be **‘Significant’** or **‘Not Significant’**.

7.7.3 Cumulative Baseline Study

55. The cumulative baseline study involves identifying operational windfarms and those under construction which follows advice in GLVIA3. Those schemes are part of the LVIA baseline. The cumulative baseline must then include those schemes in the LVIA baseline and *“in addition potential schemes that are not yet present in the landscape but are at various stages in the development and consenting process.”* (GLVIA3, page 133). All schemes within 45km of the proposed Development have been mapped in GIS using THC’s Wind Turbine Map³ and OIC planning portal. The starting point for the baseline study was to include all windfarms within 45 km of the proposed Development and single wind turbines over 20 m in height within 5 km of the proposed Development. The CLVIA excluded large offshore windfarms as these are situated 15 km offshore and to the south south east of the proposed Development. The CLVIA includes operational, consented and application stage developments as of 20th August 2021. After that date additional cumulative sites at pre-application or planning stage were not included.

7.7.4 Cumulative Landscape and Visual Sensitivity

56. The sensitivity of landscape and visual receptors to change is a judgement based on a combined evaluation of receptor value and susceptibility to cumulative change. The evaluation of value in the LVIA would not change. However, susceptibility of landscape and visual receptors to cumulative change could be different to that evaluated in the LVIA of the proposed Development. Susceptibility is therefore re-evaluated and sensitivity to cumulative change is adjusted accordingly.

7.7.5 Cumulative Magnitude of Effect

57. Cumulative magnitude of effect is about the degree to which the addition of the proposed Development to operational, under construction, consented and in planning windfarms would alter the characteristics and qualities of landscape and visual receptors in the receiving environment. The following factors are all considered in the assessment of cumulative magnitude of effect:
- The pattern of cumulative windfarm development. The cumulative magnitude of effect is likely to be higher if the proposed Development is introduced into an area where windfarm development is not an established or emerging feature. Conversely, cumulative magnitude of effect is likely to be less if the proposed Development is introduced into an area where windfarm development is an established or emerging feature.
 - Size of the proposed Development. If the proposed Development is a similar size to other windfarm developments in the area it is likely that the cumulative magnitude of effect would be less than if it were considerably larger than other developments.
 - Siting and design of cumulative development. This factor relates to both the pattern of cumulative development and the size of individual schemes. Cumulative magnitude of effect is likely to be **‘High’** if the proposed Development is notably different in design to nearby cumulative development and/or is situated in a different landscape character type. Where the proposed Development is of a similar design to nearby development and located in the same or similar landscape character type the cumulative magnitude of effect is likely to be less as a degree of integration with cumulative schemes would be achieved.
 - The horizontal extent of development. The degree to which the proposed Development would add to the amount of development visible on the horizon or as a continuous feature in the landscape is considered. If the proposed Development results in a large increase in the amount of windfarm development visible the magnitude of effect is likely to be **‘High’**.
58. The degree of cumulative magnitude of effects is expressed as follows:
- High. The proposed Development would result in substantial incremental change to the cumulative baseline;
 - Medium. The proposed Development would result in moderate incremental change to the cumulative baseline;
 - Low. The proposed Development would result in limited incremental change to the cumulative baseline;
 - Negligible. The proposed Development would result in barely discernible incremental change to the cumulative baseline; and
 - No change. The proposed Development would result in no change to the cumulative baseline.

7.7.6 Significance of Cumulative Effects

59. Significant cumulative effects are likely to arise where the addition of the proposed Development results in a high degree of incremental change when considered against the cumulative baseline. The addition of the proposed Development could result in windfarms becoming the defining feature in views or a defining characteristic of the landscape in combination with other windfarms.
60. Significant effects are also more likely where the proposed Development is one of many in the area and in different landscape character types such that windfarms become a common place or dominant characteristic of the area that reduces the distinction between different LCT.
61. Significant cumulative effects are less likely where the proposed Development is a considerable distance from other windfarms or where a degree of integration in terms of design and landscape context is achieved with nearby cumulative windfarms.

7.8 Visualisations

7.8.1 Zone of Theoretical Visibility (ZTV)

62. The ZTV is produced using GIS software (ESRI ArcGIS Pro Version 2.6). It indicates the number of turbines that may be theoretically visible at any point in the LVIA study area. Terrain 50 height data was used for the majority of the study area with Terrain 5 used for the Site and 10 km in all directions from Site centre. The ZTV is ‘bare earth’ meaning it does not take into

³ Available at https://www.highland.gov.uk/info/198/planning_-_long_term_and_area_policies/152/renewable_energy/4

account the potential localised screening effects of woodland, trees, buildings and slight variations in topography. The blade tip ZTV shows the number of wind turbines that would theoretically be visible to blade tip height at the top of the rotor sweep based on the maximum dimensions described in **Chapter 3: Proposed Development**. The hub height ZTVs are based on the maximum height to hub as stated in **Chapter 3: Proposed Development**. The cumulative ZTVs are based on the height of the proposed Development to blade tip and the height of cumulative windfarms to blade tip based on the dimension set out in **Table 7.4**.

63. The ZTVs are based on theoretical visibility at 2 m above ground level and they do not illustrate the decrease in horizontal and vertical visibility of the proposed Development with increasing distance from it. ZTVs do not illustrate what the effects of the proposed Development would be. They are used in the preliminary stages of the LVIA to define a study area and viewpoints and provide a basis for desk based studies and preliminary baseline field survey. They assist in informing the assessment of effects but should not be used exclusively to assess potential effects. For example, a blade tip ZTV may indicate theoretical visibility of all wind turbines of the proposed Development from a part of the study area but a wireline visualisation indicates that only the extremity of blade tips would be visible. ZTVs are therefore used in conjunction with wirelines and field survey work to assess and describe potential effects.

7.8.2 Photomontages

64. Photomontage and wireline visuals for this assessment were created with reference to SNH's Visual Representation of Windfarms Version 2.2 (2017) and THC's Visualisation standards for Wind Energy Developments (2016).
65. Visualisations of windfarms have various limitations which the viewer should be aware of when using them to form a judgement on a windfarm proposal. These include:
- A visualisation can never show exactly what the windfarm 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 windfarm proposal these images are best viewed at the viewpoint location shown;
 - The images must be printed at the right size to be viewed properly;
 - Images should be held flat and at a comfortable arm's length; and
 - 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.
66. The photography for each viewpoint was taken using a Nikon D810 36.3 Mega Pixels Full Frame (35.9mm x 24mm) Sensor Camera with a Sigma 50mm 1:2.8 DG lens. A tripod with a panoramic head was used with lens nodal point 1.5m above ground level and a GPS location for the viewpoint was recorded. The photographs were taken in landscape format covering a full 360 degree sweep. In addition, a set of target photography for each viewpoint was taken and the most appropriate ones were used as single frame base photographs. Tonal adjustments/post processing to the photography was undertaken by the photographer. All photography was captured in the best available weather conditions.
67. The digital terrain model used within Resoft Windfarm was constructed by using OS Terrain 5 for the central area of study, which included the majority of viewpoints. OS Terrain 50 was used for the surrounding area covering the remaining distant viewpoint camera positions. The terrain model detail may not reflect the exact accuracy of the real terrain. Therefore, turbine visibility may be slightly more, or less in reality. Use of OS Terrain 5 data for the Site minimises this.
68. The turbine models used for the proposed Development were derived from the default Resoft Windfarm turbine library using a Gamesa turbine with dimensions reset to: hub height – 84 m, rotor diameter and tip height – 149.9 m. The turbine coordinates listed in **Chapter 3 Proposed Development** were used.
69. The following software products were used: PTGUI, Kolor Autopano, Resoft Windfarm, ESRI ArcMap, Google Earth, Adobe Illustrator, Adobe Photoshop and Adobe Indesign.

70. The 360 degree photography was stitched using cylindrical projection and 90 degree baseline images were extracted from this. The 90 degree baseline images were aligned in Resoft Windfarm using locators for landmarks visible in the photograph. Where necessary a slight image rotation was set in Resoft Windfarm to align the horizon with the terrain model. This is often needed due to a residual error in levelling of the camera onsite.
71. If required (to obtain a better alignment), the camera position was iterated, where possible, with reference to verification photographs of the camera tripod in place and ArcMap GIS aerial photography.
72. The 90 degree cumulative wireline images were created in Resoft Windfarm using cylindrical projection, with turbines facing forward and each with one blade pointing straight up.
73. The 53.5 degree images were derived from 50mm photographs stitched in PTGUI using a planar projection. The planar stitched images were placed in Resoft Windfarm and matched with the terrain model. The date and time of photographs were input and rendered photomontage images output. Turbines are presented facing forward and with blades in a random rotation. Photoshop was used to mask the rendered turbines where they would be hidden by existing viewpoint detail such as trees and buildings. Google Earth and ArcMap GIS were used as reference for this process. Corresponding 53.5 degree wirelines were also output from Resoft Windfarm showing turbines facing forward and each with one blade pointing straight up.
74. Photomontages have been created for the majority of viewpoints. Where this was not practical, such as from a railway line or a ferry, wirelines only have been produced.
75. Multiple single frame images were stitched in PTGUI using planar projection to produce 65.5 degree baseline panoramas. These were aligned with the terrain model in Resoft Windfarm. The date and time of photographs was input and rendered photomontage images output. Turbines were presented facing forward and with blades in a random rotation.
76. For those viewpoints where the existing Lochend windfarm turbines were considered to be obvious and pointing in a noticeably different direction to those of the proposed Development, the Lochend turbines were painted out in Photoshop and rendered to face the same direction as the proposed Development wind turbines.
77. Photoshop was used to mask the rendered turbines where they would be hidden by existing viewpoint detail such as trees and buildings. Google Earth and ArcMap GIS were used as reference for this process. Corresponding 65.5 degree cumulative wirelines were also output from Resoft Windfarm showing turbines facing forward and with blades in random rotation.
78. To create the 50 mm single frame images, a photograph from the set of target photography that most corresponded to the centre of view of the 65.5 degree image and that contained the nearest turbine was selected and then placed into Resoft Windfarm, rotated where necessary and aligned with the terrain model. Slight rotation is often needed due to a residual error in levelling, onsite, of the camera. Date and time of photography were input and photomontage renders output with the turbines facing forward and blades in a random rotation. Photoshop was used to mask the rendered turbines where they would be hidden by existing viewpoint detail.
79. The 75 mm photomontages were extracted from the single frame 50 mm photomontages using a template in photoshop which was set up to replicate the Highland Council guidelines recalibration template. Where necessary a slight repositioning of the image was made, within the template's 'zone of permissible offset', to move turbines into view that may have been partially cut off.
80. The Highland Council advice that 50 mm single frame and 75 mm photomontages should be viewed as follows:
- "The image should be viewed at a comfortable arm's length (approximately 500 mm) and viewed normally with both eyes. The page should obscure any foreground not visible within the photomontage itself. This enables the photomontage to be directly compared within the wider context of the real landscape."*

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