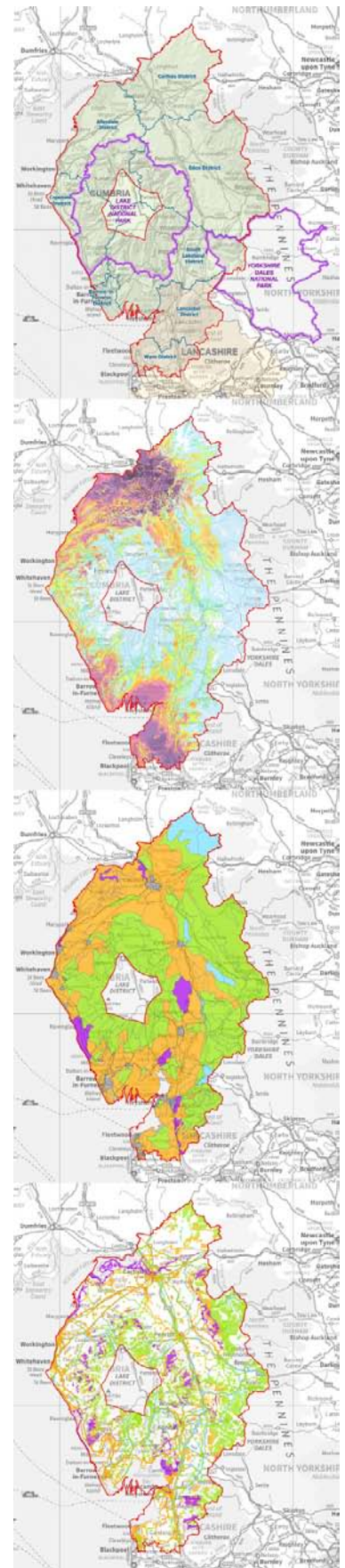


# Cumbria County Council Cumulative Impacts of Vertical Infrastructure: Part 2 The Assessment

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# Cumulative Impacts of Vertical Infrastructure

## Part 2: The Assessment

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# 1. Introduction to the Study

- 1.1.1 Cumbria and North Lancashire is an area of diverse, and frequently high quality, landscape. The conservation of this landscape is key for its environmental and amenity value, and for the economic benefits it brings.
- 1.1.2 This area is subject to increasing pressure to accommodate energy and communications related infrastructure – most notably wind turbines and the National Grid North West Coastal Connections (NWCC) project. This development can by its nature result in significant impacts upon landscape character and visual amenity, both individually and cumulatively.
- 1.1.3 The National Planning Policy Framework, and associated National Planning Policy Guidance, is generally supportive of sustainable development. The need to conserve and enhance the landscape and to address potential issues of cumulative impact, in order that appropriate sites for development can be identified, is also emphasised in the guidance. There is a need therefore, to develop robust local evidence base and policies, which will allow for appropriate weight to be given to issues of landscape character and visual amenity and ensure the appropriate siting of such developments.
- 1.1.4 The Cumbria Wind Energy Supplementary Planning Document<sup>1</sup> (CWESPD) helps to inform decisions on the ability of the Cumbria landscapes to accommodate wind energy development, based upon consideration of landscape character, sensitivity and value. The aim of this work is to build upon existing local landscape character guidance, following industry standard best practice approaches, to specifically consider the cumulative impact of vertical infrastructure upon Cumbria and North Lancashire<sup>2</sup>.
- 1.1.5 The objectives of the study are to:
- Assess the degree to which developments involving the introduction of vertical elements into the landscape (existing, under construction, and proposed) result in cumulative effects upon landscape character and visual amenity;
  - Identify the degree to which cumulative effects of vertical infrastructure developments upon landscape character and visual amenity may be considered a constraint on further such development; and
  - Provide both evidence base and guidance to support local & strategic policy, to be used when considering proposals for vertical infrastructure development.

---

<sup>1</sup> Cumbria County Council (2007) (addendum January and October 2008) Cumbria Wind Energy Supplementary Planning Document

<sup>2</sup> The relationship between this guidance and other national and local guidance (including the Cumbria Wind Energy SPD) is clarified in CIVI Introduction & Guidance document.

### 1.2 What comprises vertical infrastructure development?

1.2.1 The “vertical infrastructure” in this study comprises the following (subject to a height threshold of 15m):

- Single and multiple land and sea based Wind turbines;
- Transmission Towers – National and Local Distributors pylons; and
- Mobile phone, radio and television transmitters, or other communications masts.

1.2.2 This report provides the technical information related to the assessment of the cumulative effects of the vertical infrastructure under consideration: the methodology used and the results of the analyses. Further information about the GIS and the analyses used is found in [Appendix 1 GIS Technical Report](#).

### 1.3 The outputs from the CIVI Study

1.3.1 A suite of reports, maps and associated tabulated information was produced in the course of the Study, presented in the following documents:

#### Part 1 Key Findings & Guidance

Summarises how the assessment was carried out and the findings of the assessment and; provides general guidance to users of the assessment and a step-wise process for appraising proposals for other developments involving vertical infrastructure elements and their cumulative effects.

#### Part 2 The Assessment

Provides the background to the study, the details of the assessment methodology and how it was derived and carried out, and sets out the details of the findings of the assessed.

#### Appendix 1 GIS Technical Report

Provides information about the GIS at the heart of the Study and which was fundamental to the assessment; details the data collected, the analyses and techniques employed to inform the assessment, and guidance for using the CIVI datasets

#### Appendix 2 Book of Maps

A set of 145 maps, generated from each stage of the Study, from mapping the study area extents and the vertical infrastructure whose cumulative effects were assessed, through mapping the outputs of each of the assessment stages, to maps of the findings of the overall significance of cumulative landscape and visual effects.

#### Appendix 3 Ground Truthing

The details of the ground truthing exercise, with tabulated information for each of the 52 selected viewpoints accompanied by photographs and location maps.

## Appendix 4 Landscape Character Assessment Tables

Landscape character information was collated from the assessments carried out by each of the authorities within the study area summarised in a consistent tabulated format under headings for each landscape area of: Overview, Key characteristics, Sensitivities in relation to vertical structures, and Guidance in relation to vertical structures.

### **The future**

- 1.3.2 The CIVI Study has primarily been prepared for use by local authority planning officers, to assist both development management and planning policy officers during the decision making process relating to planning applications for 'vertical infrastructure developments'. It provides an evidence base in relation to the existing extent and spatial distribution of, and anticipated cumulative effects associated with, existing and consented vertical infrastructure development in Cumbria and in the districts of Wyre and Lancaster in Lancashire.
- 1.3.3 The document will also be useful to developers when considering schemes for vertical infrastructure development. It will help to inform developers as to the methodology that will be used by the local authority in the assessment of planning applications for vertical infrastructure development. It will help to inform developer decisions about the siting and design of vertical infrastructure and scoping of landscape and visual assessments of development proposals.
- 1.3.4 The Study and its GIS information represent a snapshot in time. The Study has provided a rich collation of information about vertical infrastructure developments and landscape character as well as analysis and assessment of cumulative effects. In order to maximise its potential usefulness in the future to Cumbria County Council (CCC) and the CIVI project partners, the GIS will need to be kept up to date, so that the information used as the basis for decision making is as current as it can be.

## 2. The use of Data within the Study

### 2.1 Acknowledgements

2.1.1 We wish to thank the following key data providers for their help with the study:

- Cumbria County Council;
- Lancashire County Council;
- Lake District National Park Authority;
- Yorkshire Dales National Park Authority;
- Allerdale Borough Council;
- Carlisle City Council;
- Copeland Borough Council;
- Eden District Council;
- Lancaster City Council; and
- Wyre Borough Council.

2.1.2 A complete list of data providers is included in [Appendix 1 GIS Technical Report](#).

### 2.2 Data Sources

2.2.1 The study uses base mapping and GIS data, publicly available and from Cumbria County Council (CCC) and other local authorities in the study area and buffer zones, and OS MasterMap data to identify vertical infrastructure features shown on maps. This is supplemented by data from National Grid, developers, and others. The district and county local authorities have provided data relating to existing infrastructure and proposed developments currently within the planning system.

2.2.2 The baseline for the landscape assessment used existing LCAs as detailed below:

- Natural England, National Landscape Character Areas;
- Cumbria County Council (2007) Cumbria Wind Energy Supplementary Planning Document: Part 1 (including addendum January and October 2008);
- Coates Associates (2007) Cumbria Wind Energy Supplementary Planning Document: Part 2 Landscape and Visual Considerations;
- Cumbria County Council (2003) Technical Paper 5: Landscape Character, Cumbria and Lake District Joint Structure Plan 2001-2016;
- Cumbria County Council and AXIS (2003) Technical Paper 6: Planning for Renewable Energy Development in Cumbria, Cumbria and Lake District Joint Structure Plan 2001-2016;
- Cumbria County Council (2011) Cumbria Landscape Character Guidance and Toolkit: Part 1 Landscape Character Guidance;
- Cumbria County Council (2011) Cumbria Landscape Character Guidance and Toolkit: Part 2 Landscape Character Toolkit;

- Chris Blandford Associates (2008) Lake District National Park: Landscape Character Assessment and Guidelines (part of the Lake District National Park Landscape Character Supplementary Planning Document, adopted 19th October 2011);
- Yorkshire Dales National Park Authority (2001) Yorkshire Dales National Park Landscape Character Assessment
- Land Use Consultants (2010) The Solway Coast Area of Outstanding Natural Beauty Landscape and Seascape Character Assessment;
- Lovejoy (2005) Landscape Sensitivity to Wind Energy Developments in Lancashire;
- Environmental Resources Management (2000) A Landscape Strategy for Lancashire: Landscape Character Assessment;
- Environmental Resources Management (2000) A Landscape Strategy for Lancashire: Landscape Strategy; and
- Chris Blandford Associates (2009) Forest of Bowland Area of Outstanding Natural Beauty: Landscape Character Assessment.



2-1 Landscape character studies forming the baseline for the landscape analysis

- 2.2.3 LCAs are currently being developed for the Arnsdale and Silverdale AONB and the North Pennines AONB. These were not available at the time of carrying out this study.
- 2.2.4 National and Regional and, where relevant, local landscape designations have been considered within the study. These have been collated from information supplied by the Local Authorities, Natural England, English Heritage, Sustrans and others.

## 2.3 Limitations

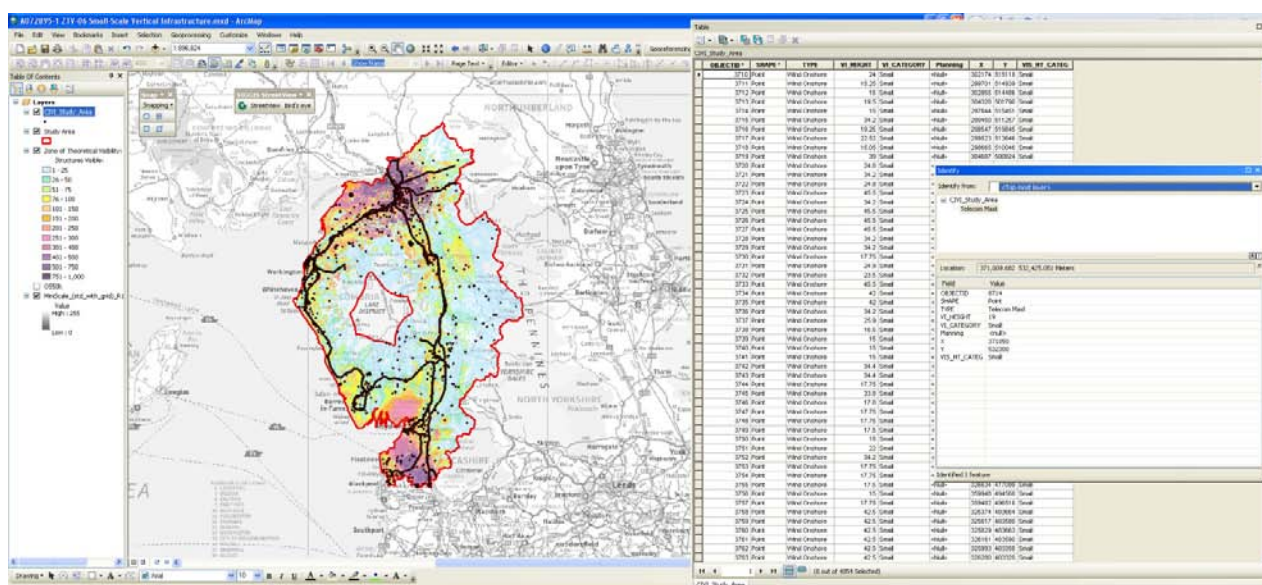
- 2.3.1 The data used to inform the report are listed in the GIS Technical Report, Appendix 1. This has been compiled for agreed data sets for this Study. However, other data may be available which could provide further depth to the study and should be referred to when considering specific developments. For example, national routes and trails have been considered within this study, but it was not possible to consider all public rights of way (PROW) at this stage. Areas such as the Arnsdale and Silverdale AONB have a dense network of PROWs and areas of locally agreed access land which are not part of the CROW data, but due to the high level nature of this assessment, these have not been considered. Any detailed assessment would need to address PROWs and other data sets that have not been included in the CIVI assessment.

# Cumulative Impacts of Vertical Infrastructure

## Part 2: The Assessment

### 2.4 The use of GIS within the Study

- 2.4.1 A Geographic Information System (GIS) is defined as a system that “integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information”.<sup>3</sup>
- 2.4.2 GIS is fundamental to the CIVI Study underpinning the collection, capture and storage of vertical infrastructure and contextual data; calculating the Zones of Theoretical Visibility (ZTV) and combining these into Cumulative ZTVs; bringing together the landscape character assessments into a consistent set of landscape areas; classifying the landscape of the study area into 4 categories; examining the combination of landscape category and susceptibility to determine the sensitivity of receptors; calculating the magnitude of landscape and visual change; and combining receptor sensitivity with magnitude of change to provide an assessment of significance of effects.



2-2 Illustration from GIS with map, layers, attributes, etc

- 2.4.3 The GIS Technical Report provides further information about the use of GIS in the Study, the data collected, the analyses and techniques employed to inform the assessment, and guidance for using the CIVI datasets.

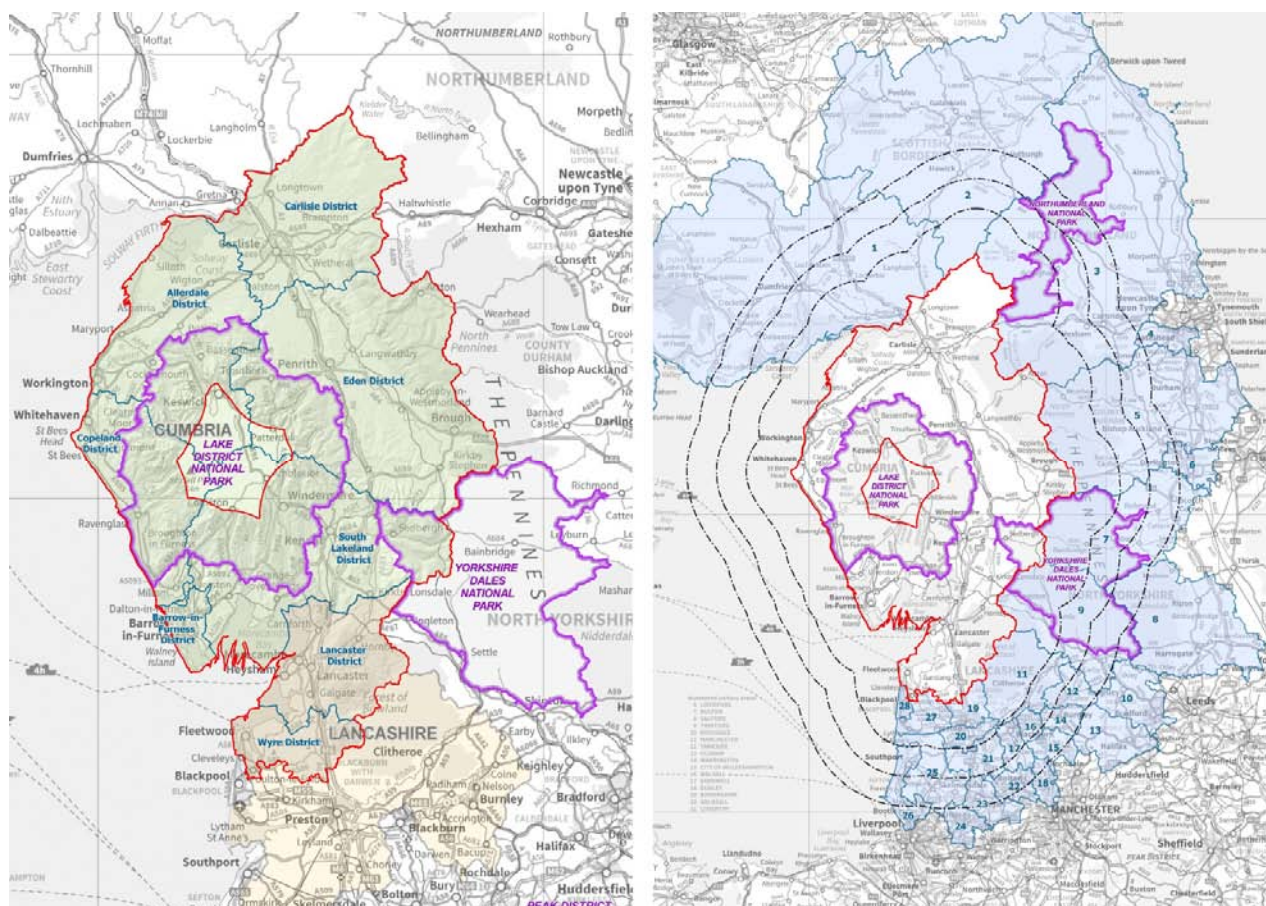
<sup>3</sup> Environmental Systems Research Institute (ESRI)

### 3. Assessment methodology

#### 3.1 Overview

##### Study area

- 3.1.1 Map SA.01 shows the extents of the study area. This comprises the County of Cumbria, and the Wyre and Lancaster Districts of Lancashire. A 12km buffer has been mapped and applied stretching into the Lake District National Park, in order to focus on the study on the outlying fells of the National Park, which are most susceptible to cumulative effects.
- 3.1.2 Buffers of 15km, 25km and 35km beyond the study area, shown on Map SA02, were defined to reflect the effects of vertical infrastructure on the landscape and visual aspects of the study area resulting from structures located outside the study area. This is discussed further below.



3-1 Study area boundary and buffers

### Receptors considered

- 3.1.3 A receptor is something that has the potential to be affected by a proposal. In the case of this study, landscape and visual receptors have been considered. These are defined in the Guidelines for Landscape and Visual Impact Assessment (GLVIA3<sup>4</sup>) as:
- Landscape receptors: 'defined aspects of the landscape resource that have the potential to be affected by a proposal'; and
  - Visual receptors: 'individuals and/or defined groups of people who have the potential to be affected by a proposal'.
- 3.1.4 For this study, the landscape receptors are the landscape areas defined from analysis of the LCAs that have been carried out by the various authorities in the study area. As described below, these are based upon landscape type and sub-type definitions and identified landscape character areas. Each landscape area is a geographically distinct area of landscape, with key characteristics and sensitivities.
- 3.1.5 The County, National Park and AONB LCAs identify key characteristics and sensitivities for each landscape type or area which were used as the basic assessment unit and for informing the assessment of sensitivity of the different landscape types and areas to the developments under consideration. The information in the different LCAs varied in its presentation and was re-structured so that key characteristics, sensitivity to vertical infrastructure development, and guidance in the assessments for future decision making, were tabulated in a consistent format. This information was incorporated in the GIS and combined with landscape designations or policies covering the landscape types and areas to establish the overall sensitivity of the receptors and to inform the subsequent analyses: the basis for the assessment of effects. Further details on establishing landscape sensitivity are described in section 3.2.
- 3.1.6 The visual receptors considered are people viewing the landscape from:
- Homes and settlements;
  - Publicly accessible land;
  - Linear routes;
  - Specific points along linear routes;
  - Tourist attractions.
- 3.1.7 Routes considered were: motorways, A- and B-roads; mainline and tourist or promoted railway lines, and strategic public rights of way, such as, national trails, long distance or promoted footpaths, and national and regional cycle routes.
- 3.1.8 Settlements, linear routes, tourist attractions, promoted visitor facilities and scenic routes were mapped from available data, as places from where people would enjoy views of the landscape.

---

<sup>4</sup> Guidelines for Landscape and Visual Impact Assessment 3<sup>rd</sup> Edition published by The Landscape Institute and the Institute of Environmental Management & Assessment in April 2013

The data combined national level datasets with data provided by local authorities with their associated attribute data – further information may be found in Appendix 1 – Technical Report. Information on publicly accessible land was extracted from the Countryside and Rights of Way Act 2000 - Access Layer obtained from Natural England. The sensitivity of people using these routes and areas was established as described in section 3.3.

## Developments considered

- 3.1.9 Developments considered within the study include both existing and proposed developments, limited to those that had already received consent at the time of writing the study. These are developments for which there is reasonable certainty about the details of the proposal, although there may not be certainty about the likelihood of the developments being constructed. For the purposes of the assessment, it was considered that the level of certainty justifies their inclusion at this stage, in order to provide a comprehensive cumulative assessment<sup>5</sup>.
- 3.1.10 Developments submitted for consent but not yet consented were not included in the main analyses. However, section 5, dealing with change through time, considers those for which there is a reasonable level of certainty as to the structures being proposed and their locations. At this stage it is not certain whether they may gain consent and be constructed, in order to inform the Guidance accompanying this assessment.
- 3.1.11 Data for the developments (existing and consented) were collated in GIS, including 6-figure grid references for location, blade-tip height and rotor diameter of wind turbines, heights of telecommunication masts and other vertical infrastructure elements. From this information, a Zone of Theoretical Visibility (ZTV) was generated in ArcGIS 3D Analyst for each wind turbine, telecommunication mast or other vertical element. Because the computer generated ZTV is based on the existing landform only<sup>6</sup>, it illustrates the theoretical visibility of the vertical infrastructure within the surrounding area based on the existing landform, without taking into account screening provided by other elements such as vegetation, woodland cover and built development.
- 3.1.12 The distance for each ZTV produced was defined, dependent on the height of the vertical structure being considered. The following table illustrate the distance over which the ZTV was produced for the various height thresholds of infrastructure considered:<sup>7</sup>

**Table 3.1 Various Scales of Vertical Elements and ZTV Distances**

| Height of vertical element (m) | Scale of infrastructure | ZTV distance (km) |
|--------------------------------|-------------------------|-------------------|
| up to 50                       | small-scale             | 15                |

<sup>5</sup> It is intended that the assessment will be kept under review so that the data contributing to it are up to date.

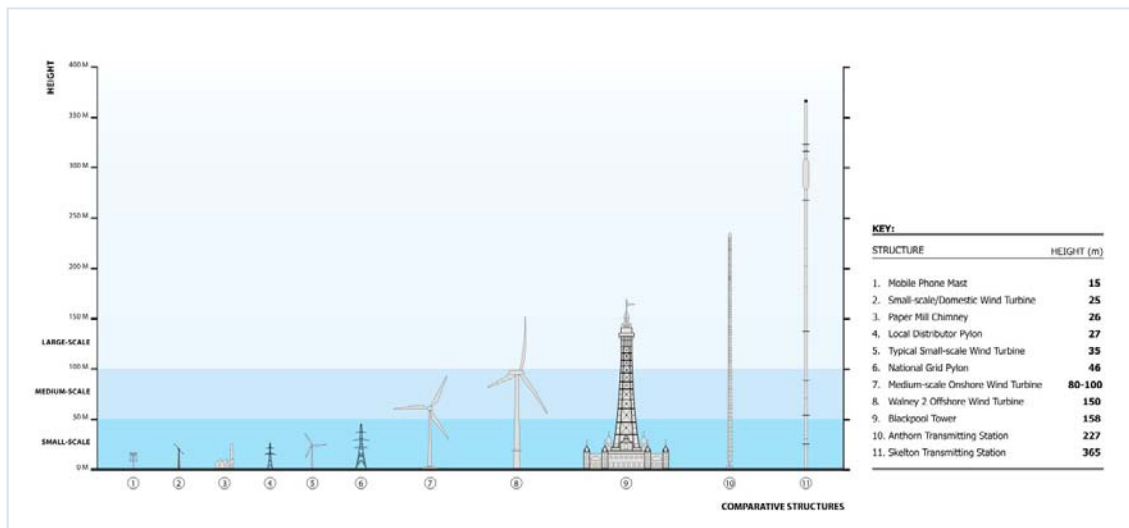
<sup>6</sup> Landform based on Ordnance Survey OS Terrain 50 height data

<sup>7</sup> Adapted from Table 2 of Horner+MacLennan & Envision, Visual Representation of Windfarms Good Practice Guidance, Scottish Natural Heritage, 2006

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

| Height of vertical element (m) | Scale of infrastructure | ZTV distance (km) |
|--------------------------------|-------------------------|-------------------|
| 51-100                         | medium-scale            | 25                |
| Over 100                       | large-scale             | 35                |



3-2 Relative heights of vertical infrastructure

- 3.1.13 The minimum height structure to be included within the study was 15m, in order to eliminate elements in the urban and urban fringe areas e.g. highway and street lighting columns or telecommunication poles. Many older wind farms fall into the medium-scale category while more recent and especially off-shore wind farms would be large-scale.

#### Use of scales and terminology

- 3.1.14 For ease of analysis and clarity, throughout the study, a three-point scale has generally been used to aid the explanation of the various criteria, as illustrated in the table below. Where deemed appropriate for certain criteria, a two or four point scale has also been introduced, as follows:

**Table 3.2 The Use of Scales**

| Criterion                | Descriptors |              |             |   |
|--------------------------|-------------|--------------|-------------|---|
| Scale of Infrastructure  | large-scale | medium-scale | small-scale |   |
| Distance                 | Distant     | Mid distance | Near        |   |
| Length, e.g. of routes   | Long        | Medium       | Short       |   |
| Landscape susceptibility | High        | Moderate     | Slight      |   |
| Landscape category       | A           | B            | C           | D |

| Criterion                           | Descriptors          |             |                           |                 |      |
|-------------------------------------|----------------------|-------------|---------------------------|-----------------|------|
| Visual category                     | A                    | B           | C                         | D               |      |
| Sensitivity                         | Great                | High        | Moderate                  | Slight          |      |
| Duration                            | Temporary, long term |             | Permanent                 |                 |      |
| Geographical area                   | Present              |             | Indirect                  |                 |      |
| Reversibility                       | Reversible           |             | Permanent                 |                 |      |
| Magnitude                           | Very Large           | Large       | Medium                    | Small           | None |
| Significance of effect <sup>8</sup> | Great significance   | Significant | Intermediate significance | Not significant |      |

3.1.15 The thresholds and use for these terms are defined in the relevant sections of the following text. Areas where no change occurs, i.e. there is no vertical infrastructure present or visible, are also identified.

3.1.16 In order to allow for ease of reading the following policies have been adopted in this report:

- All assessment words have been capitalised e.g. High, Large, Medium, Moderate, Slight, Small, Great, to make them easy to distinguish in the text and differentiate them from other uses of similar words; and
- When referring to large medium, small for the scale of the vertical infrastructure, these are not capitalised and have been hyphenated: large-scale, etc.

### Definition of cumulative effects

3.1.17 Cumulative landscape and visual effects are generally described as those that result from changes to the landscape or visual amenity caused by actions that occurred in the past or present or are likely to occur in the foreseeable future.<sup>9</sup>

3.1.18 The definition of cumulative effects of vertical infrastructure development used in the study has been derived from definitions used in various guidance for assessing the effects of development proposals, as follows:

- **Combined landscape effects:** effects of the vertical infrastructure developments, taken together, on the physical fabric of the landscape or any special values attached to it;
- **Combined visual effects:** effects of the vertical infrastructure developments, taken together, on views, where developments are seen together either in one angle of view or in different angles of view from the one viewpoint;
- **Sequential effects:** experience of vertical infrastructure developments at different places in the landscape, or one after another along a route; and

<sup>8</sup> See further explanation in paragraphs 3.2.21 to 3.2.23.

<sup>9</sup> Based upon Guidelines for Landscape and Visual Impact Assessment 2<sup>nd</sup> Edition as quoted in GLVIA3

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- **Temporal effects:** effects accumulating over a period of time on the landscape or visual amenity, from vertical infrastructure developments, as they are added to or removed from the landscape.

3.1.19 The change through time, or cumulative temporal effects, arising from infrastructure that is present in the landscape, development making its way through the planning system, and development strategically planned for the future, is analysed by representation on a sequence of maps in Appendix 2 Book of Maps and in Section 5 of this report.

3.1.20 Cumulative change can result in the key descriptors of a landscape area changing, for example, an area may become thought of as “a wind energy landscape”. Based upon accepted thresholds used<sup>10</sup> for determining what is “a wind energy landscape”, thresholds for determining when the landscape character is characterised by vertical infrastructure have been defined, as follows:

- Vertical infrastructure developments begin to coalesce visually from some viewpoints;
- Simultaneous visibility of vertical infrastructure developments within the same field of view occurs frequently;
- Vertical infrastructure developments are frequently visible simultaneously over relatively short distances where they may be said to dominate the view; and
- Visibility from linear routes is frequent with little of a route outside of the visual influence of Vertical infrastructure developments.

3.1.21 Whether the cumulative effect is beneficial or adverse (or neutral) has not been addressed in this study and will depend on the specific landscape character and its characteristics or qualities, the objectives for the landscape found in policies or designations for the area.

### Criteria for assessing cumulative effects

3.1.22 The methodology for this assessment has been rooted in existing accepted approaches and practice, so that the process and outcomes are recognisable – and acceptable – to people using or referring to the assessment. Therefore, various existing sources of guidance on cumulative impact assessment and information concerning landscape character have been referred to<sup>11</sup> and the methodology derived from them is outlined in the following paragraphs.

3.1.23 Cumulative effects assessment is “concerned with identifying situations where a number of individual effects combine to cause a significant effect on a particular resource”<sup>12</sup>. This study focuses, first, on the landscape resource and its character, the sensitivity of the different landscape character areas within the study area and the degree to which they may be altered by vertical infrastructure development, whether by its presence in the landscape or its visibility.

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<sup>10</sup> Based upon SNH Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments, Scottish Natural Heritage, March 2012; <http://www.snh.gov.uk/docs/A675503.pdf>

<sup>11</sup> Refer to Section 7 for References & Bibliography

<sup>12</sup> Cumulative Effects of Wind Turbines, A Guide to Assessing the Cumulative Effects of Wind Energy Development, Landscape Design Associates for ETSU, ref W/14/00538/REP, Crown Copyright 2000

Secondly, the study addresses how viewers of the landscape, and their visual amenity, may be affected by the changes in the landscape due to the presence of the vertical infrastructure development, at various locations or along routes.

## 3.2 Cumulative landscape effects

### Judging Sensitivity of the landscape receptors

- 3.2.1 **GLVIA3**<sup>13</sup> advises that the sensitivity of landscape receptors combines judgments of their susceptibility to the type of change arising from the development proposal and the value attached to the landscape.
- 3.2.2 Susceptibility to change means the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies.
- 3.2.3 The value attached to the landscape is usually based on a consideration of the following elements:
- The importance of the landscape, or the perceived value of the landscape to users or consultees, as indicated by, for example, international, national or local designations;
  - Cultural associations in the arts or in guides to the area, or popular use of the area for recreation, where experience of the landscape is important; and
  - Conservation interests: The presence of features of wildlife, earth science or archaeological or historical and cultural interest can add to the value of the landscape as well as having value in their own right.
- 3.2.4 For this study, some of the elements usually considered as values attached to the landscape fall within the descriptions used to form the basis of the landscape susceptibility (as described below). The sensitivity has therefore been determined by combining judgements on susceptibility and landscape “category” to ensure elements of landscape value are not ‘double counted’. To facilitate analysis using the information available, the categorisation of the landscape was based on the evidence of designations, policies protective of particular landscape areas, promotion of areas or routes because of their landscape or visual qualities, and identified or designated cultural heritage, biodiversity or recreation interests. These are illustrated on [Maps DES.01 to DES.04](#). Four landscape categories were defined (A – D), using the following indicators:

**Table 3.3 Indicators of Landscape Category**

| Category              | Indicator     |
|-----------------------|---------------|
| Landscape designation | National Park |

<sup>13</sup> [Guidelines for Landscape and Visual Impact Assessment 3<sup>rd</sup> Edition](#) published by The Landscape Institute and the Institute of Environmental Management & Assessment in April 2013

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| Category                       | Indicator                                                                                                                                                                     |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | National Park Variation<br>AONB<br>Heritage Coast                                                                                                                             |
| Landscape policy area          | Limestone Pavement<br>Other local policies                                                                                                                                    |
| Cultural landscape designation | World Heritage Site<br>Historic Park & Garden<br>Registered Battlefield<br>Conservation Area<br>Scheduled Monument<br>Listed Building                                         |
| Biodiversity designation       | International designation (SAC, RAMSAR, SPA)<br>National designation (SSSI)                                                                                                   |
| Recreation interest            | CROW Land<br>National Trail<br>Long Distance Footpath<br>Promoted Walking Route<br>National Cycle Route<br>Regional Cycle Route<br>Local Cycle route<br>Country Park<br>Canal |

3.2.5 The susceptibility of landscape receptors to changes due to vertical infrastructure development is determined through the consideration of the following criteria:

- The ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the landscape character and/or the achievement of landscape planning policies and strategies;
- Intrinsic aesthetic characteristics, scenic quality or sense of place, including providing landscape setting to other places or the importance of elements or components of the landscape in the landscape character of the area or in their contribution to the landscape setting of other areas;
- The degree to which the changes arising from the development would alter the overall character, quality/condition of a particular landscape type or area; and
- The degree to which the changes arising from the development would alter individual elements or features or aesthetic and perceptual aspects important to the landscape character.

3.2.6 Existing landscape studies may identify the sensitivity of the landscape type or area or its characteristics to the general type of development that is proposed.

- 3.2.7 In addition, the objectives for the landscape or guidance in relation to wind energy development in a landscape area found in the LCAs, were taken into account in judging the susceptibility of the landscape character in different areas, for example:
- To maintain the integrity and quality of the landscape (as may be appropriate within a designated landscape);
  - To maintain the landscape character; and
  - To accept landscape change.
- 3.2.8 The LCAs, which are the sources of baseline information for the landscape of the study area, identify key characteristics of landscape types and areas, sensitivities to wind energy and related development, and guidance for future decision making, which reflect objectives for the landscape. These are the sources for identifying the susceptibilities, which feeds into establishing the landscape sensitivity.
- 3.2.9 This study considers the cumulative effects of vertical infrastructure of different scales. In the LCAs (summarised in [Appendix 4 LCA Tables](#)), the susceptibility of the landscape character types and areas has been assessed in relation to large-, medium- and small-scale vertical infrastructure development as defined above in Table 3.1. Their susceptibility was graded for each as High, Moderate or Slight, adapting the considerations in section 3.2.5 above, with objectives or sensitivities stated in the LCAs or WESPD, to generate assessment criteria.
- 3.2.10 The criteria for determining High susceptibility include the following:
- The changes arising from the development would alter the overall character, quality/condition of a particular landscape type or area;
  - The changes arising from the development would alter or remove individual elements or features or aesthetic and perceptual aspects important to, or add new elements incongruous to, the landscape character;
  - The proposed development would compromise the achievement of landscape planning policies and strategies for the landscape;
  - The changes arising from the development would alter or remove elements or features or aesthetic and perceptual aspects important to the landscape character, or add new elements that would reinforce the key characteristics of the landscape character; and
  - **Indicators:** High sensitivity in WESPD or LCA to above or similar criteria.
- 3.2.11 The criteria for determining Slight susceptibility include the following:
- The changes arising from the development would result in little alteration in the overall character, quality/condition of a particular landscape type or area;
  - The proposed development would not compromise the achievement of landscape planning policies and strategies for the landscape;
  - The changes arising from the development would result in little alteration in individual elements or features or aesthetic and perceptual aspects important to, or add few new elements incongruous to, the landscape character; and
  - **Indicators:** Low sensitivity in WESPD or LCA to energy or vertical infrastructure.

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- 3.2.12 As the WESPD or LCAs do not provide explicit assessment of “Moderate sensitivity”; Moderate susceptibility is judged relative to the criteria for High and Slight susceptibility, as intermediate between the two sets of criteria.
- 3.2.13 The landscape categories and susceptibility have been combined using a matrix to arrive at the judgment of **landscape sensitivity**, as follows:

**Table 3.4 Matrix for assessing Landscape Sensitivity**

|                | Landscape category |          |          |          |
|----------------|--------------------|----------|----------|----------|
| Susceptibility | A                  | B        | C        | D        |
| High           | Great              | High     | High     | High     |
| Moderate       | High               | High     | Moderate | Moderate |
| Slight         | Moderate           | Moderate | Slight   | Slight   |

#### Judging Magnitude of cumulative landscape change

- 3.2.14 Effects on landscape receptors are assessed in terms of size or scale, the geographical extent of the area influenced, and its duration and reversibility. GLVIA3 provides the following indicators to be considered when assessing the magnitude of cumulative landscape change:

**Table 3.5 Considerations for assessing Magnitude of cumulative landscape change**

| Consideration                                               | Indicative criteria in GLVIA3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Criteria used for CIVI                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Size or scale of change                                     | <p>Grouped based upon:</p> <ul style="list-style-type: none"> <li>- The extent of existing landscape elements that will be lost (or added), the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;</li> <li>- The degree to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or additions of new ones;</li> <li>- Whether the effect changes the key characteristics of the landscape, which are critical to its distinctive character.</li> </ul> | <p>Scale of infrastructure development/s as defined above: Large, Medium, Small;</p> <p>Transmission infrastructure falls into the “Small” category defined above based upon the height range of pylons. For the purposes of assessing magnitude of change, they will be defined as medium-scale infrastructure, but with the ZTV extent of small-scale infrastructure, balancing the size of the components with the length of corridors they occupy.</p> |
| Geographical area over which the landscape would be changed | <p>Described on a scale of:</p> <ul style="list-style-type: none"> <li>- Site level: within the development site itself;</li> <li>- The level of the immediate setting of the site;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                          | <p>Presence of infrastructure development within the area;</p> <p>Extent of the area with theoretic visibility of infrastructure development/s, which might</p>                                                                                                                                                                                                                                                                                            |

| Consideration               | Indicative criteria in GLVIA3                                                                                                                                                                                                                                                                        | Criteria used for CIVI                                                                                                                                                                                         |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <ul style="list-style-type: none"> <li>- At the scale of the landscape type or character area within which the proposal lies;</li> <li>- On a larger scale, where the development influences several landscape types or character areas.</li> </ul>                                                  | alter perception of the landscape character within the area (indirect effect).                                                                                                                                 |
| The duration of the changes | <p>The durations of changes due to the development are described as:</p> <ul style="list-style-type: none"> <li>- Short term: zero to five years;</li> <li>- Medium term: five to ten years;</li> <li>- Long term: ten to twenty-five years;</li> <li>- Permanent: more than twenty-five.</li> </ul> | <p>Most wind turbines, masts etc would be considered as temporary, long term development;</p> <p>Pylons, power stations, and large-scale transmission masts, would be considered as permanent development.</p> |
| Reversibility               | The prospect and the practicality of the effect being reversed within twenty-five years.                                                                                                                                                                                                             | <p>For the purposes of assessing magnitude of change, it is assumed that temporary development is reversible. Permanent development is not considered reversible.</p>                                          |

- 3.2.15 The considerations above are used to inform the assessment of the magnitude of landscape change, and by using the GIS to calculate the level of change, the following definitions of magnitude have been used:

**Table 3.6 Criteria for assessing Magnitude of cumulative landscape change**

| Magnitude    | Indicative criteria                                                                                                                                                                    |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Large change | Large scale, long term or permanent change over a wide geographic area, affecting all of a landscape type or character area or influencing several landscape types or character areas. |
| Small change | Small scale, temporary, reversible change over a restricted landscape area.                                                                                                            |

- 3.2.16 Medium change is judged relative to the criteria for Large and Small magnitude, as intermediate between the two sets of criteria, for example, large-scale development within a restricted location, not affecting most of the landscape character area, would be a Medium level of change.
- 3.2.17 The indirect influence on the landscape character was considered, where there is no vertical infrastructure present in a landscape area but vertical infrastructure outside the area is visible, as well as direct change in landscape character arising from the presence of the vertical infrastructure within the landscape area.
- 3.2.18 The GIS calculation for direct change is derived from:

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- a) the scale of the vertical infrastructure present, defined from the cumulative height of the infrastructure within the area, and
- b) the geographic extent from the density of the infrastructure present in the landscape area.

3.2.19 Indirect change was calculated in GIS as the degree of visibility from the cumulative ZTVs (scale) and proportion of the area with different degrees of visibility (geographic extent), averaged over each landscape area, using the following classification:

**Table 3.7 Criteria for assessing Magnitude of indirect landscape change**

| Magnitude | Criteria                             |
|-----------|--------------------------------------|
| Large     | Many (51 or more) structures visible |
| Medium    | Some (26 to 50) structures visible   |
| Small     | Few (1-25) structures visible        |
| None      | No structures visible                |

3.2.20 An additional level of overall Magnitude of change of Very Large has been included in order to differentiate the cases where direct change was Large and indirect change was Large or Medium, from cases where direct change was Large and indirect change was Small or None. The level of Magnitude of “none” was introduced to account for areas where there were no elements of vertical infrastructure present and therefore no direct effects on the landscape, but where visibility of vertical infrastructure could influence the character of the landscape. The Magnitude of the direct and indirect landscape change is combined into a measure of overall magnitude of change based on the following matrix:

**Table 3.8 Matrix for assessing overall Magnitude of Landscape Change**

|                         | Indirect landscape change |            |        |        |
|-------------------------|---------------------------|------------|--------|--------|
| Direct landscape change | Large                     | Medium     | Small  | None   |
| Large                   | Very Large                | Very Large | Large  | Large  |
| Medium                  | Large                     | Large      | Medium | Medium |
| Small                   | Medium                    | Medium     | Small  | Small  |
| None                    | Medium                    | Small      | Small  | None   |

#### Judging the Significance of cumulative landscape effects

3.2.21 Final conclusions about significance relate the separate judgements about sensitivity of the receptors and magnitude of the changes combined, to judge whether the effect is significant or not, based upon the following considerations:

**Table 3.9 Criteria for judging Significance of cumulative landscape effect**

| Significance              | Indicative criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Significant               | <p>Vertical infrastructure development becomes a significant or characteristic of the landscape, defining a new landscape character type or area;</p> <p>The values and experiences associated with the landscape are greatly influenced by vertical infrastructure development;</p> <p>Large irreversible negative changes, over an extensive area, on elements and/or aesthetic and perceptual aspects that are key to the character of nationally valued landscapes.</p>                                                        |
| Intermediate significance | <p>Vertical infrastructure development is becoming a characteristic of the landscape, but not of sufficient dominance to be a defining characteristic of the area.</p>                                                                                                                                                                                                                                                                                                                                                             |
| Not significant           | <p>Vertical infrastructure development is not becoming an important or key characteristic of the landscape;</p> <p>The presence of vertical infrastructure development has little effect on the values and experiences associated with the landscape e.g. wildness, sense of history;</p> <p>Reversible negative changes of short duration, over a restricted area, on elements and/or aesthetic and perceptual aspects that contribute to, but are not key characteristics of the character of landscapes of community value.</p> |

- 3.2.22 A category of “intermediate significance” has been introduced to deal with those cases where the assessment lies between the criteria for Significant and Not Significant. In addition, where the sensitivity of the receptor has been judged as “Great” and the magnitude of change “Very Large”, the effect has been judged as correspondingly of “**Great significance**”.
- 3.2.23 The following matrix has been used in the GIS to determine the significance of the effect of the cumulative developments on the landscape character of each landscape area by combining the magnitude of change and sensitivity of the landscape receptor using the following matrix:

Table 3.10 Matrix for assessing Significance of landscape effects

|             | Magnitude          |                    |                 |                 |
|-------------|--------------------|--------------------|-----------------|-----------------|
| Sensitivity | Very Large         | Large              | Medium          | Small           |
| Great       | Great Significance | Great Significance | Significant     | Intermediate    |
| High        | Great Significance | Significant        | Significant     | Intermediate    |
| Moderate    | Significant        | Significant        | Intermediate    | Not Significant |
| Slight      | Intermediate       | Intermediate       | Not Significant | Not Significant |

### 3.3 Cumulative visual effects

#### Judging Sensitivity of the visual receptors

- 3.3.1 Visual receptors are people or groups of people likely to be visually affected by developments at particular locations. Their sensitivity is assessed in terms of their susceptibility to changes in their views and visual amenity and, where relevant, the value attached to particular views or whether they are viewing from landscapes designated for the landscape or visual qualities, reflected in the A – D categories above.
- 3.3.2 The susceptibility of visual receptors to changes in views and visual amenity is related to the occupation or activity of people experiencing the view and the extent to which their attention or interest is focused on the view.

**Table 3.11 Criteria for Susceptibility of visual receptors**

| Susceptibility          | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High susceptibility     | <p>Daily, prolonged or sustained views available over a long period, such as those available to residents at home from the primary living areas of their property, or to people where the view of the landscape is an important attractant;</p> <p>People engaged in outdoor leisure and recreation, such as, using public rights of way, whose attention or interest is likely to be focused on the landscape and on the view;</p> <p>Visitors to heritage assets or designated landscapes, or to other attractions, where views of the surroundings are an important contributor to the experience;</p> <p>Communities where views contribute to the landscape setting enjoyed by residents in the area;</p> <p>Travellers on transport routes which are recognised scenic routes, where awareness of views is likely to be high.</p> |
| Moderate susceptibility | Residents with views from secondary living areas of their properties;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Susceptibility        | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | People engaged in outdoor leisure and recreation, with frequent to occasional open views, or where the view of the landscape is only part of its attraction.                                                                                                                                                                                                                                                                    |
| Slight susceptibility | <p>Travellers on road, rail or other transport routes that are not recognised scenic routes;</p> <p>People engaged in outdoor sport or recreation which does not involve or depend upon appreciation of views of the landscape;</p> <p>People at their place of work whose attention is focused on their work or activity and not on their surroundings; where the setting is not important to the quality of working life.</p> |

- 3.3.3 The categories of designation/policy and susceptibility have been combined using a matrix to arrive at the judgment of **visual sensitivity**, as follows:

**Table 3.12 Matrix for assessing Visual Sensitivity**

|                | Landscape category of the location |          |          |          |
|----------------|------------------------------------|----------|----------|----------|
| Susceptibility | A                                  | B        | C        | D        |
| High           | Great                              | High     | Moderate | Moderate |
| Moderate       | High                               | High     | Moderate | Slight   |
| Slight         | Moderate                           | Moderate | Slight   | Slight   |

### Judging the Magnitude of cumulative visual change

- 3.3.4 As with landscape change, visual change is evaluated in terms of size or scale, the geographical extent of the area influenced, duration and reversibility, based upon the indicators in GLVIA3.

**Table 3.13 Considerations for assessing Magnitude of cumulative visual change**

| Consideration           | Indicative criteria                                                                                                                                                                                                                                                                                                                                                                                                           | Criteria used for CIVI                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Size or scale of change | <p>Grouped based upon:</p> <ul style="list-style-type: none"> <li>- The loss or addition of features in the view;</li> <li>- Changes in its composition, including the proportion of the view occupied by the proposed development;</li> <li>- The degree of contrast or integration of the changes with the existing or remaining landscape elements and characteristics, in terms of form, scale and mass, line,</li> </ul> | <p>Scale of infrastructure development/s as defined above: large-scale, medium-scale, small-scale;</p> <p>Transmission infrastructure falls into the “small-scale” group defined above based upon the height range of pylons. For the purposes of assessing magnitude of change, they are defined as medium-scale infrastructure, but with the ZTV extent of small-scale infrastructure, balancing the size of the</p> |

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| Consideration               | Indicative criteria                                                                                                                                                                                                                                                                                                                                                                                                                  | Criteria used for CIVI                                                                                                                                                                                                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | height, colour and texture;<br>- The nature of the view, whether full, partial or glimpsed, or the relative amount of time over which it will be experienced.                                                                                                                                                                                                                                                                        | components with the length of corridors they occupy.                                                                                                                                                                                                                            |
| Geographical extent         | Groups reflect:<br>- The angle of view in relation to the main activity of the receptor, whether occurring in many of the views available or a small part of panoramic views;<br>- The distance of the viewpoint from the vertical infrastructure development, near, mid-distance, distant;<br>- The extent of the area over which the changes would be visible, whether similar views from much of the area or occasional glimpses. | Presence of infrastructure development within the view;<br>Distance from the infrastructure (reflected in the extents of the ZTV's for the different scales of infrastructure elements);<br>Extent of the theoretic visibility of infrastructure development/s within the view. |
| The duration of the changes | The durations of changes due to the development are categorised as:<br>- Short term: zero to five years;<br>- Medium term: five to ten years;<br>- Long term: ten to twenty-five years<br>- Permanent: more than twenty-five.                                                                                                                                                                                                        | Most wind turbines, masts etc would be considered as temporary, long term development;<br>Pylons, power stations, and large-scale transmission masts, would be considered as permanent development.                                                                             |
| Reversibility               | The prospect and the practicality of the effect being reversed within twenty-five years                                                                                                                                                                                                                                                                                                                                              | For the purposes of assessing magnitude of change, it is assumed that temporary development is reversible. Permanent development is not considered reversible.                                                                                                                  |

3.3.5 The considerations above are used to inform the assessment of the magnitude of visual change, and by utilising the GIS to automatically calculate the level of change, the following definitions of magnitude have been used:

**Table 3.14 Criteria for assessing Magnitude of cumulative visual change**

| Magnitude    | Indicative criteria                                                                                                               | Criteria used in CIVI                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Large change | Long term or permanent major change in many of the views available, especially near views;<br>Vertical infrastructure development | Many vertical infrastructure elements visible, classified for each scale of infrastructure. |

| Magnitude     | Indicative criteria                                                                                                                                                                                                                                                                                                                                                                                                      | Criteria used in CIVI                                                                       |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|               | appears as a dominant characteristic of the visual aesthetic of the area.                                                                                                                                                                                                                                                                                                                                                |                                                                                             |
| Medium change |                                                                                                                                                                                                                                                                                                                                                                                                                          | Some vertical infrastructure elements visible, classified for each scale of infrastructure. |
| Small change  | Short term, reversible, minor change, especially in mid-distance or distant views, and not resulting in altering the aesthetic or perceptual aspects of the landscape in the view or at the location of the viewpoint.<br><br>Vertical infrastructure development is seen as separate isolated features within the views, too infrequent and of insufficient importance to be perceived as a characteristic of the area. | Few vertical infrastructure elements visible, classified for each scale of infrastructure.  |

- 3.3.6 The same definitions of “Many, Some, Few” are used as for indirect landscape change, in Table 3.7 Criteria for assessing Magnitude of indirect landscape change.

### Judging the Significance of cumulative visual effects

- 3.3.7 Final conclusions about significance relate the separate judgements about sensitivity of the receptors and magnitude of the changes combined, to judge whether the effects are significant or not. The following factors inform the judgment about the significance of visual effects:

**Table 3.15 Criteria for judging Significance of cumulative visual effects**

| Significance    | Indicative criteria                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Significant     | Vertical infrastructure development is dominant within the view, seeming to define a new visual aesthetic;<br>Large scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view of sensitive receptors;<br>The visual amenity of people particularly sensitive to changes in views and visual amenity, or at recognised and important viewpoints or from recognised scenic routes, is greatly changed. |
| Intermediate    | Vertical infrastructure development is seen as a key characteristic of the landscape in the view, but not of sufficient dominance to be a defining characteristic of the area.                                                                                                                                                                                                                                                                     |
| Not significant | Vertical infrastructure development is not an important or key characteristic of the landscape in the view;<br>Vertical infrastructure developments are separate isolated elements of the landscape in the view, too infrequent and of                                                                                                                                                                                                             |

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| Significance | Indicative criteria                                                                                                                                                                                                                                                              |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | insufficient importance to be perceived as a characteristic of the area;<br>Reversible negative effects of short duration, or effects over a restricted area, on visual amenity;<br>The presence of vertical infrastructure development has little effect on the visual amenity. |

- 3.3.8 As in the assessment of landscape effects, where the sensitivity of the receptor has been judged as “Great” and the magnitude of change “large”, the significance of the effect is judged as correspondingly “Great”.
- 3.3.9 The following matrix has been used in the GIS to determine the significance of visual effects of the cumulative developments, combining the magnitude of change and sensitivity of the visual receptor:

**Table 3.16 Matrix for assessment of Significance of visual effects**

|             | Magnitude          |                 |                 |
|-------------|--------------------|-----------------|-----------------|
| Sensitivity | Large              | Medium          | Small           |
| Great       | Great significance | Significant     | Intermediate    |
| High        | Significant        | Significant     | Intermediate    |
| Moderate    | Significant        | Intermediate    | Not Significant |
| Slight      | Intermediate       | Not Significant | Not Significant |

#### Visual acuity

- 3.3.10 The assessment of the visual effects may be moderated by considerations affecting visual acuity, especially atmospheric conditions. **The Guide to Best Practice in Seascape Assessment**<sup>14</sup> advises that, at a distance of 1km, in conditions of good visibility, a pole of 100mm diameter will become difficult to see, and at 2km a pole of 200mm diameter will similarly be difficult to see, that is to say, “there will be a point where an object, whilst still theoretically visible, will become too small for the human eye to resolve. Mist, haze, or other atmospheric conditions may significantly exacerbate that difficulty”.

<sup>14</sup> M. Hill, J. Briggs, P. Minto, D. Bagnall, K. Foley, A. Williams *Guide to Best Practice in Seascape Assessment*, Countryside Council for Wales, Brady Shipman Martin, University College Dublin, March 2001; Maritime Ireland / Wales INTERREG Report No.5

3.3.11 The weather is a factor affecting the assessment of, especially, visual impacts. The Met Office<sup>15</sup> publish average statistics for weather patterns for the region, monthly and annual. The Met Office states that ‘the range of topography and altitude in the north west of England provides a climate of great variety, and the region includes both the coldest place in England (Cross Fell in the Pennines) and the wettest place in England (the Lakeland fells around Seathwaite in Cumbria)’. ‘The exposure of NW England to westerly maritime air masses and the presence of extensive areas of high ground mean that the region has some of the wettest places in the UK. The higher parts of the Lake District are particularly wet, with an average of over 3200mm of rain each year.’ Annual averages for the region for weather conditions that may affect visibility are:

- Days of Air Frost 54.2, 27% of the year;
- Sunshine hours 1334.0, 90% of the average for England: 1461.8;
- Rainfall mm 1292.8, 154% of the average for England: 838.7; and
- Days of Rainfall  $\geq$  1mm 162.9, 44.6% of the year.

3.3.12 The visibility in the area would be affected by the weather, varying from day to day throughout the various seasons. Slim, light coloured objects such as wind turbines or pylons will be more difficult to see in restricted visibility conditions. This assessment is based on clear visibility conditions.

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<sup>15</sup> The data quoted were obtained from The Met Office website: <http://www.metoffice.gov.uk/climate/uk/averages/>. The data are for the Boulmer weather station

## 4. The Assessment

### 4.1 Landscape Character

#### Landscape Baseline

4.1.1 LCAs were collated for the following areas:

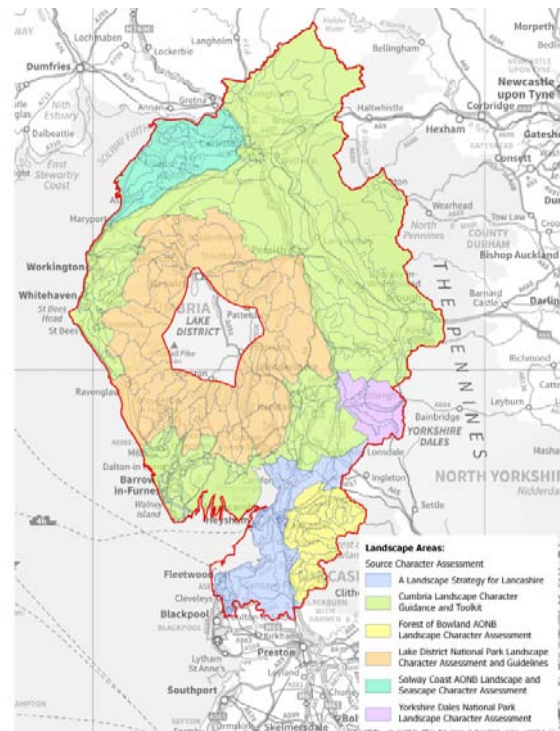
- Cumbria;
- Lancashire;
- Lake District National Park (LDNP);
- Yorkshire Dales National Park (YDNP);
- Solway Coast AONB; and
- Forest of Bowland AONB.

4.1.2 These areas are illustrated on [Maps LCA.01 to LCA.08](#).

4.1.3 Some assessments classify areas of landscape according to the landscape type represented, some of which are sub-divided (as in Cumbria) into sub-types. Other assessments identify landscape character areas as geographically unique areas, while the landscape types or sub-types could occur in several different geographic locations. For example, Type 11: Upland Fringes/ Sub type 11a: Foothills/ Sub type 11b: Low Fells in the Cumbria assessment or Character Type 15: Coastal Plain in the Lancashire assessment are not in geographically unique locations, but the Lancashire assessment sub-divides the type level to identify unique geographic landscape character areas, for example, Landscape Character Area 15d: The Fylde.

4.1.4 After trialling various approaches, the assessment proceeded on the basis of the unique landscape character areas identified in all the assessments except Cumbria's and the sub-type areas of the Cumbria assessment. This gave a reasonably consistent sub-division of landscape areas as the basis for the assessment. The sub-type areas in Cumbria were each given a unique identifier in the GIS so that individual areas could be described and analysed.

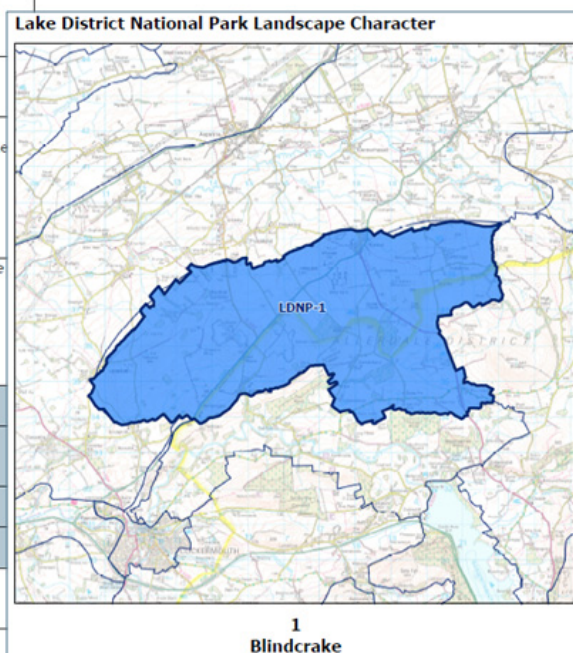
4.1.5 In order to allow the GIS-based analyses, it was necessary to identify the elements of the landscape character type/sub type/area (from here on referred to as "landscape areas") descriptions relevant to the CIVI study, which were then summarised in a set of [LCA Tables, Appendix 4](#), in a consistent format. Information was collated from the assessments under the following headings for each landscape area where available and relevant:



4-1 Areas covered by landscape character assessments

- Overview;
- Key characteristics;
- Sensitivities in relation to vertical structures; and
- Guidance in relation to vertical structures.

| Lake District National Park<br>Landscape Character Assessment<br>and Guidelines (September 2008) |                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                        |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------|
| <b>Area 1: Blindcrake</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                        |
| Overview                                                                                         | Blindcrake Area of Distinctive Character is situated at the north western edge of the Lake District, to the northeast of Cockermouth and extends outside the northern boundary of the National Park.                                                                                                                                                                                                                     |                    |                        |
| Sub –types included within this area                                                             | <ul style="list-style-type: none"> <li>• Upland Limestone Farmland (I);</li> <li>• High Fell Fringe (J)</li> </ul>                                                                                                                                                                                                                                                                                                       |                    |                        |
| Key characteristics                                                                              | <ul style="list-style-type: none"> <li>• Gently rolling upland pastoral farmland, of a high open nature;</li> <li>• Network of narrow road corridors, which are often lined with hedgerows or stone walls;</li> <li>• Unique linear settlement with historic characteristics, specimen trees and some woodland;</li> <li>• Outcrop of Limestone crags and pavement;</li> <li>• Predominantly a tranquil area.</li> </ul> |                    |                        |
| Sensitivities in relation to vertical structures                                                 | <ul style="list-style-type: none"> <li>• Small-scale settlement pattern, which is vulnerable to potential expansions at the edges of villages and the introduction of large-scale buildings;</li> <li>• Sustained pressure to develop wind farms close to the National Park leading to increased development of key skylines and views eroding valuable landscape quality.</li> </ul>                                    |                    |                        |
| <b>Blindcrake Area LDNP-1</b>                                                                    | Large-scale                                                                                                                                                                                                                                                                                                                                                                                                              | Medium-scale       | Small-scale            |
| Sensitivity to vertical infrastructure                                                           | <b>Moderate</b>                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Moderate</b>    | <b>Slight</b>          |
| Magnitude of change                                                                              | <b>Small</b>                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Large</b>       | <b>Small</b>           |
| Significance of effect                                                                           | <b>Not significant</b>                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Significant</b> | <b>Not significant</b> |
| Guidance in relation to vertical structures                                                      | <ul style="list-style-type: none"> <li>• Protect key open views in all directions;</li> <li>• Conserve the predominantly strong sense of tranquillity throughout.</li> </ul>                                                                                                                                                                                                                                             |                    |                        |



4-2 Tabulated landscape character information with assessment results, [Appendix 4 Book of Maps](#)

4.1.6 Linked to the character assessments were sets of guidance for the landscape, including indicators of the types of development that would be acceptable in the area or intrusive on its character. This information was collated under the 'Guidance in relation to vertical structures' heading within the tables. The available information varied for each assessment: the Cumbria assessments included details on the appropriate scale of wind energy development for the landscape area and guidelines in relation to climate change, natural features, cultural features, development, access and recreation. The Lancashire study provided guidance on the scale of wind energy development that may be appropriate to each character area; the LDNP study, Forest of Bowland AONB study and the Solway Coast AONB study included guidelines for managing landscape change; and the YDNP study did not include any specific guidance. In the case of the YDNP, where appropriate, suitable guidance has been added. Only guidance in relation to vertical infrastructure was extracted from these studies to inform this assessment.

## Landscape Sensitivity

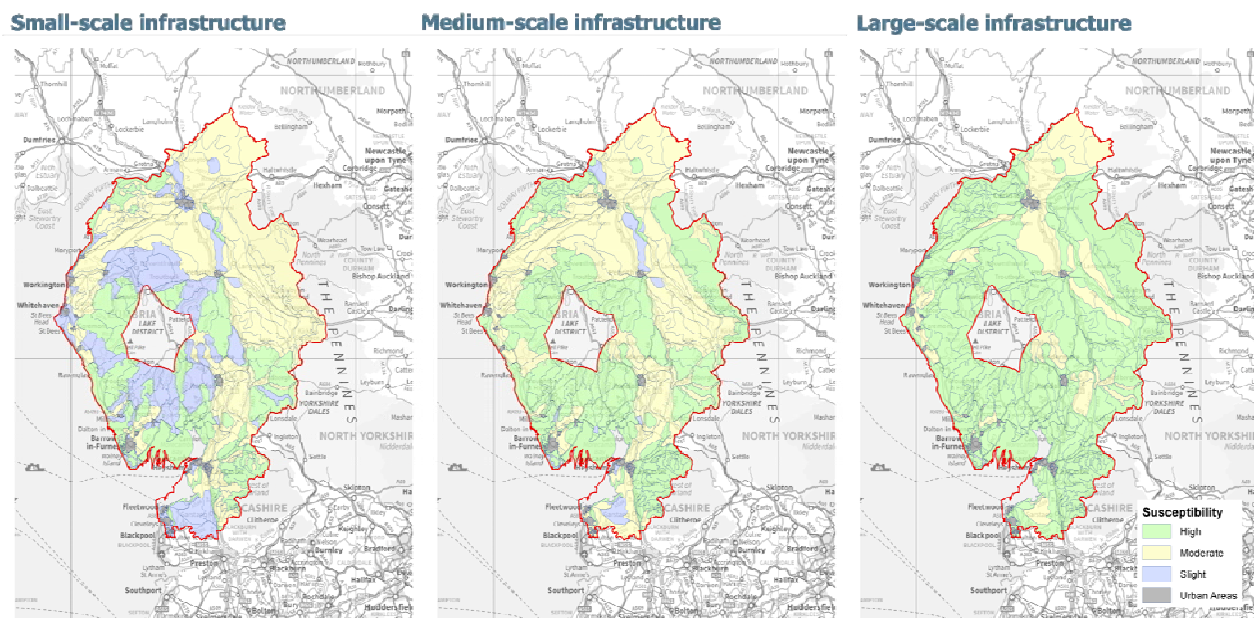
### Landscape Susceptibility

4.1.7 From the information collated from character assessment studies it was possible to determine the likely susceptibility of the individual landscape areas to change resulting from vertical infrastructure development. Each of the landscape areas were mapped in GIS, as illustrated on

# Cumulative Impacts of Vertical Infrastructure

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Maps SUS.01 to SUS.03, to show their susceptibility to each of the three scenarios, large-scale, medium-scale and small-scale vertical infrastructure developments. The susceptibility of the landscape areas is described as High, Moderate or Slight, in accordance with the criteria set out in section 3.2.



4-3 Mapping of landscape susceptibility by scale of vertical infrastructure

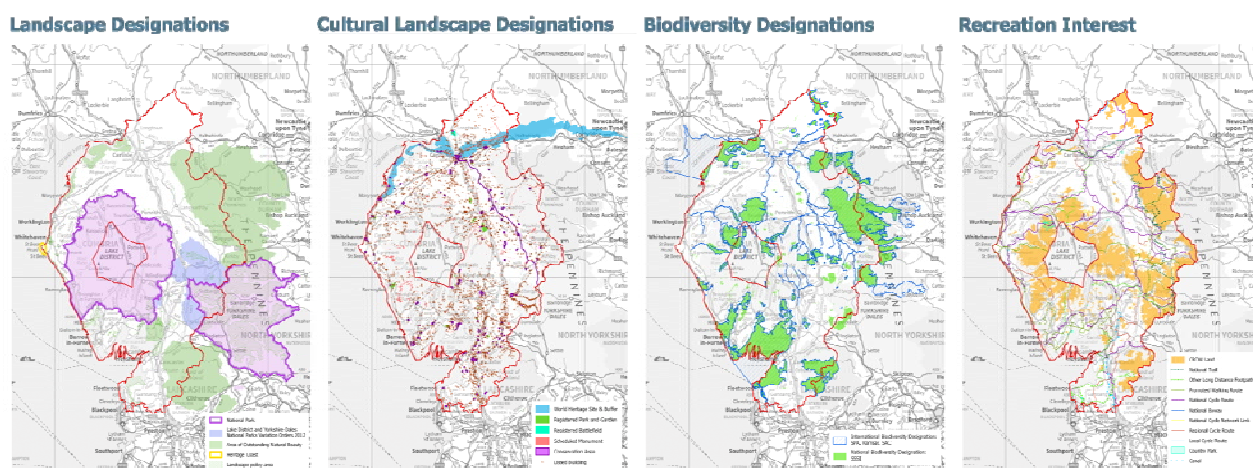
- 4.1.8 The susceptibility of the landscape to change varies over the study area. Areas of High susceptibility to small-scale infrastructure are evident within the LDNP, YDNP, Forest of Bowland AONB, Arnside and Silverdale AONB, and Solway Coast AONB. The majority of the north east section of the study area has Moderate susceptibility to small-scale vertical infrastructure, including the North Pennines AONB, with areas of Moderate susceptibility also evident in the Forest of Bowland, Arnside and Silverdale and Solway Coast AONBs, and the corridor of land along the A595/A596 between Whitehaven and Carlisle. Susceptibility to small-scale vertical infrastructure varies over the study area with some landscape areas within and bordering the National Parks assessed as of Slight susceptibility.
- 4.1.9 When looking at the susceptibility of landscape areas to medium-scale development, some areas of Slight susceptibility are identified throughout the study area, including areas at Garstang, north of Penrith, north of Carlisle, and around Barrow-in-Furness. These areas are relatively small and the majority of the study area indicates High or Moderate susceptibility to medium-scale vertical infrastructure, with areas of High susceptibility concentrated around the LDNP, Forest of Bowland AONB, Arnside and Silverdale AONB, Solway Coast AONB and the YDNP.
- 4.1.10 The susceptibility of the landscape areas to large-scale vertical infrastructure is predominately High with only a few areas of Moderate susceptibility and no areas of Slight susceptibility (refer to Map SUS.03). The areas of Moderate susceptibility fall around the M6 corridor north of Penrith stretching to Longtown and to the north east of the study area, a small area between Penrith and Brough, and along the M6 corridor to the east of Kendal. A number of other areas of Moderate

susceptibility are also scattered through the study areas including areas around Garstang; Bothel; Whitehaven and Ulverston.

- 4.1.11 In summary, the susceptibility of the landscape areas varies in relation to small-scale, medium-scale and large-scale vertical development, with no areas of Slight susceptibility to large-scale developments identified. Landscape areas are identified throughout the study area as being Slightly susceptible to small and medium-scale developments, with areas around the National Parks and AONBs generally Highly susceptible.

### Landscape Category

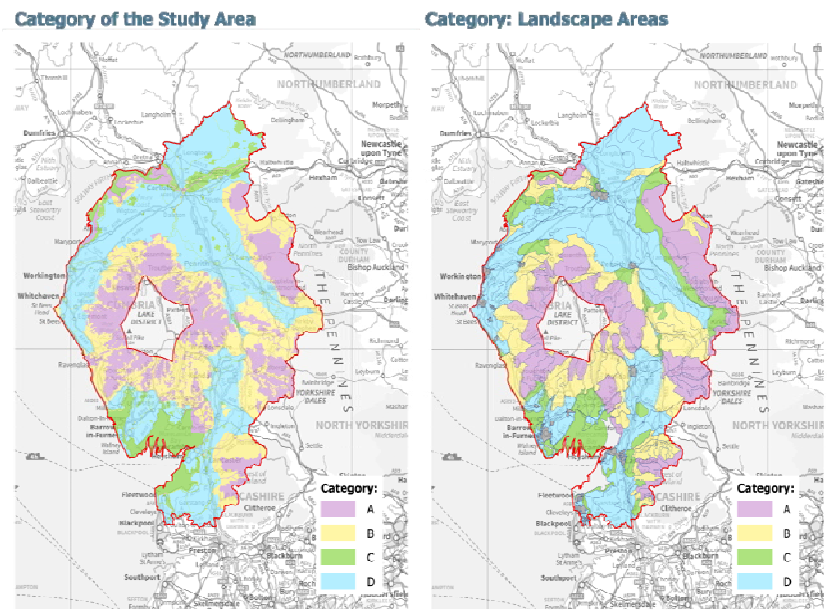
- 4.1.12 As explained in section 3.2.4, the landscape was categorised based on a weighted scoring of the designation/policy applying to an area. The designations and policies are shown on Maps DES.01 to DES.04.



4-4 Factors contributing to categorisation of the landscape

- 4.1.13 Table 3.3 illustrates the various policies and designations that have been used as indicators to inform the landscape category scoring of A, B, C and D. Maps CAT.01 to CAT.02 illustrate the distribution of the landscape categories across the study area. Landscape areas within the LDNP, YDNP, Solway Coast AONB, Forest of Bowland AONB, Silverdale and Arnsdale AONB, and North Pennines AONB have been categorised as predominately A or B.
- 4.1.14 Landscape Categories C and D are concentrated along the A595/A596 corridor between Whitehaven and Carlisle, north east towards Longtown, and along the M6 corridor south to Penrith and across to Brough. A corridor of C and D category areas are also concentrated in a corridor from Garstang to Kendal, again along the line of the M6.
- 4.1.15 In summary, the areas categorised as A and B are concentrated around the National Parks and AONBs, while the corridors between these designations generally fall within category C and D.

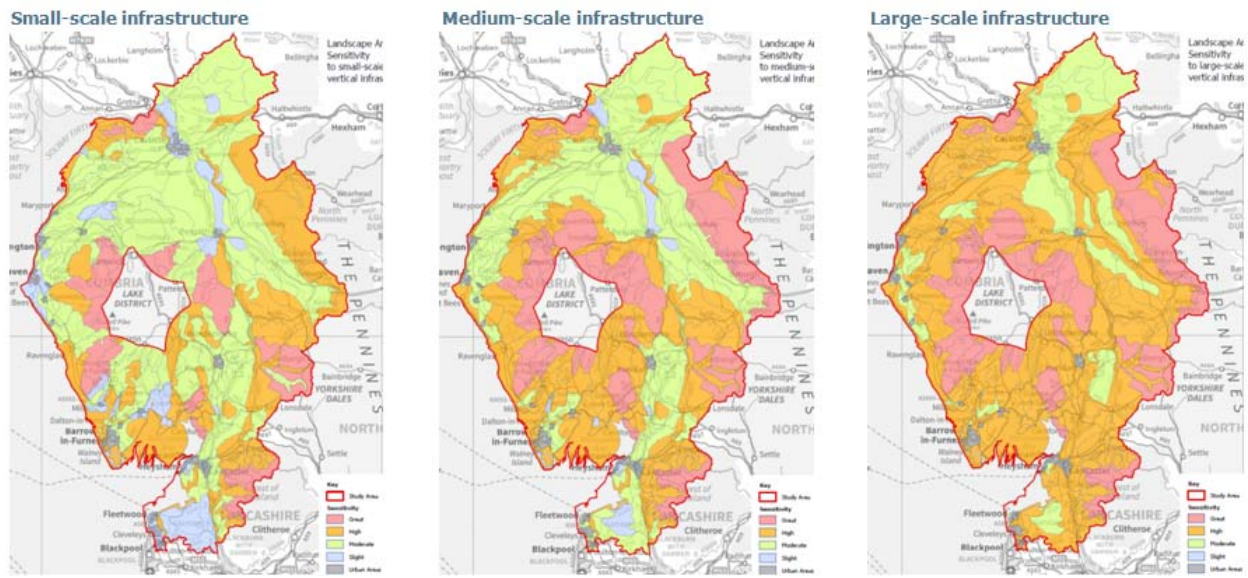
Cumulative Impacts of Vertical Infrastructure  
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4-5 Landscape categories - overall and by landscape area

Landscape Sensitivity

4.1.16 Landscape sensitivity was analysed by correlating the susceptibility of the landscape character areas to the three scales of vertical infrastructure development and the categories derived from the designation/policy analysis (termed landscape category), as described above. The degree of sensitivity is termed Great, High, Moderate and Slight, in accordance with the Matrix in Table 3.4.



4-6 Landscape sensitivity by scale of vertical infrastructure

4.1.17 The sensitivity of the study area varies for large-scale, medium-scale and small-scale vertical infrastructure, but in general, similar patterns are evident over the study area. With reference to sensitivity to small-scale vertical infrastructure development, a number of areas around the LDNP

and YDNP are considered to have a Great and High sensitivity to small-scale vertical infrastructure development, however, a number of the landscape areas in the National Parks also have a Moderate sensitivity to small-scale vertical infrastructure development. A Moderate sensitivity prevails in the northern section of the study area, with only a few areas of Slight sensitivity noted throughout. A corridor of Moderate sensitivity is noted between in the A595/A596 corridor between Whitehaven and Carlisle, and extending to Longtown, and south to Penrith and Brough. A corridor of Moderate sensitivity is also noted between Lancaster and Kendal.

- 4.1.18 The sensitivity to medium-scale vertical infrastructure development map identifies a corridor of Moderate sensitivity between the A595/A596 corridor from Whitehaven to Carlisle, stretching north east past Longtown and south to Penrith and beyond to Brough. A corridor of Moderate sensitivity is also evident from the south of the study area north to Kendal. A Great and High sensitivity to medium-scale development is mainly is focused around the National Parks and AONBs.
- 4.1.19 Sensitivity to large-scale vertical infrastructure has been assessed as Great for a large portion of the LDNP, some areas within the YDNP, Forest of Bowland AONB, Arnsdale and Silverdale AONB, North Pennines AONB, and Solway Coast AONB. Areas of High sensitivity generally surround the areas of Great sensitivity, particularly around the National Parks and AONBs. There are no areas of Slight sensitivity to large-scale vertical infrastructure identified. Areas of Moderate sensitivity form a corridor from the north of Longtown south to Penrith. Other areas of Moderate sensitivity are located throughout the study area, namely around Whitehaven, Garstang and Kendal.
- 4.1.20 In summary, the areas of Great and High sensitivity to vertical infrastructure development are generally focused around the National Parks, and AONBs, with corridors of Slight and Moderate sensitivity identified between the A595/A596 corridor between Whitehaven and Carlisle, Longtown south to Penrith and Brough, and from Garstang stretching towards Kendal. As anticipated, there are more areas with Great and High sensitivity to large-scale and medium-scale infrastructure developments than to small-scale infrastructure developments.

## 4.2 Visual Amenity

### Visual Baseline

- 4.2.1 The baseline information relating to visual receptors was collated from map based data analysis and data supplied by Cumbria CC and the other authorities in the study area. The visual receptors considered are the views afforded to people from:
  - Homes and settlements;
  - Publicly accessible land;
  - Specific points along linear routes;
  - Tourist Attractions.
- 4.2.2 The locations of the visual receptors considered are shown on Maps VR.01 to VR.07.

# Cumulative Impacts of Vertical Infrastructure

## Part 2: The Assessment

- 4.2.3 In order to carry out a “ground truthing exercise” to check the findings of the otherwise GIS-based assessment, 52no. specific viewpoints were selected throughout the study area to inform the study. The details of the ground truthing exercise, with tabulated information for each viewpoint accompanied by photographs and location maps, are included in Appendix 3, and summarised in section 4.8.1.



4-7 Vertical infrastructure crossing the view from south of Broughton in Furness

### Visual Sensitivity

#### Visual Susceptibility

- 4.2.4 The susceptibility of the various visual receptors was determined in accordance with the criteria in Table 3.11. As advised in GLVIA3, the susceptibility of visual receptors is related to their occupation and the extent to which their attention or interest is focused on the view and does not alter in relation to the scale of the vertical infrastructure developments. The groups of visual receptors considered were as follows:

- People in settlements – High susceptibility;
- Users of CROW access land – High susceptibility;
- Users of long distance footpaths – High susceptibility;
- Users of cycle routes – High susceptibility;
- Travellers along roads generally – Slight susceptibility;
- Travellers along roads – scenic routes – Moderate susceptibility;
- Railway travellers – commuter routes- Slight susceptibility;
- Railway travellers – commuter routes partly used as scenic routes – Medium susceptibility;
- Railways travellers – promoted scenic routes – High susceptibility;
- Users of tourist attractions – High susceptibility.

- 4.2.5 The varied susceptibility for roads and railway users is based on the fact that the scenic routes are used mainly for their appreciation of the view, in comparison to the commuter routes which are mainly used for transportation purposes only.

#### Visual Category

- 4.2.6 The consideration of the location of the various visual receptors has been based on the landscape category of the areas the visual receptor lies within or passes through. The landscape categories (A, B, C or D) of the various visual receptor locations are illustrated on [Maps CAT.03 to CAT.09](#).

- 4.2.7 The landscape category of settlements varies throughout the study area with the majority of the larger settlements categorised as D as a result of the lack of designations in the more built up areas, although conservation areas, listed buildings, and scheduled monuments have been taken into account in the categorisation. These include Carlisle, Lancaster, Whitehaven, Workington, Penrith, Carnforth, Kendal, Barrow-in-Furness, Morecambe, Haysham and Fleetwood. A few relatively large settlements such as Cockermouth and Brampton have been assessed as category C, with Windermere, due to its location within the LDNP along with other designations present in the area, assessed as category A. Other small settlements are dotted throughout the study area and the assessed category ranges through the four landscape categories A-D, with a number of small settlements around Whitehaven in category D and those within the LDNP generally A or B.
- 4.2.8 The majority of the CROW access land lies within the LDNP, YDNP and North Pennines and this has generally been categorised as A with some areas of category B. Smaller areas of access land are present throughout the study area and their categories range from A-D, with areas of A category noted in the Solway Coast AONB, Forest of Bowland AONB, and Arnside and Silverdale AONB, and areas of B, C and D category located north east of Longtown.



4-8 View from Hampsfell Hospice

- 4.2.9 The long distance footpaths (LDNF) predominately fall into category A, with their routes passing into the North Pennines, YDNP, LDNP and AONBs. Outside these areas, the routes may be categorised as A, B, C, or D. The category of a route changes along its length, depending on what areas it passes through.
- 4.2.10 Along the length of the Cycle Routes various categories have been determined, with some routes covering the whole range of categories from A-D. Short routes around Lancaster have been categorised as D and some routes around Fleetwood and Ulverston, but the majority of the other cycle routes are A or C category. Notable routes include NCR 7, running north south between Carlisle and Penrith and NCR 71 from Penrith and across to Appleby-in-Westmoreland (predominately C category). Where routes run into the National Parks, they are generally assessed as category A routes.
- 4.2.11 The category of the roads, along their lengths, changes as they pass through the various areas, with the route of the M6 predominately category D, but with short sections ranging from C to A along its route. D category routes are mainly located in the stretches between Workington and Carlisle (including the A595 and A596), Carlisle and Penrith; and Garstang and Lancaster. Routes

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

west of Kendal and around Windermere are predominantly A and B category routes. Only short lengths of category A routes are present throughout the study area.



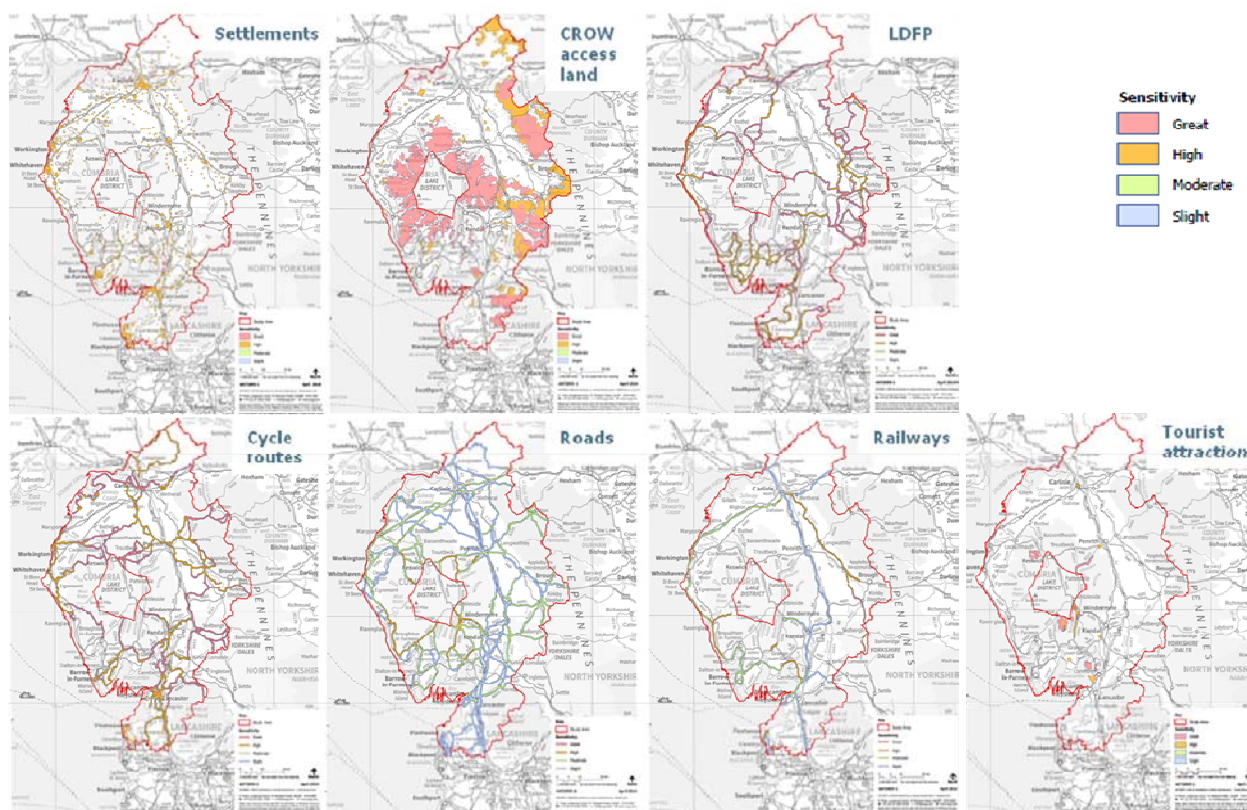
4-9 Todshills Service Station on M6

- 4.2.12 A number of railways traverse the study area and again the assessed category ranges along the length of the route. The main route running north south through the study area, from Gretna just outside the study area, through Carlisle, Penrith, Kendal, Lancaster and on to Preston, has predominantly been assessed as category D. The route east west from Carlisle to Workington has been assessed as category D, Carlisle to Brough as predominately a C route, with only a few sections of routes categorised as A.
- 4.2.13 The tourist attractions lie within and outside the National Parks and AONBS. Larger areas, assessed as category A, include Whinlatter Forest Park and Visitor Centre; Grizedale Forest Park; and Ulswater Steamers. Carlisle Castle and Carlisle Cathedral, within Carlisle, are assessed as category B alongside locations within Kendal and some within the LDNP.

#### Visual Sensitivity

- 4.2.14 Visual sensitivity was analysed by correlating the susceptibility of the visual receptors to each scale of vertical infrastructure development and the categories derived from the designation/policy analysis in accordance with the Matrix in Table 3.12. The sensitivity is termed Great, High, Moderate or Slight.
- 4.2.15 The sensitivity of the settlements varies little from the groupings derived for visual susceptibility, with the majority of the settlements assessed as High sensitivity. Some settlements have been assessed as Great sensitivity, notably some within the Arncliffe and Silverdale AONB, the National Parks and other AONBS. There are some settlements outside these areas which have also been assessed as Great sensitivity.
- 4.2.16 The majority of the CROW access land has been assessed as Great sensitivity, with some areas on its borders assessed as High sensitivity. These areas predominately lie within or adjacent to the National Parks and AONBs. No areas of Moderate or Slight sensitivity have been assessed.
- 4.2.17 The majority of the Long Distance Footpaths have been assessed as Great sensitivity, particularly where they pass through the National Parks; AONBs; and some sections of the coastline. Smaller sections of the routes have been assessed as High sensitivity generally where they lie outside the National Parks and AONBs.

- 4.2.18 The cycle routes have been assessed as either Great or High sensitivity, with those assessed as Great generally falling within the National Parks and AONBs. Lengths of routes outside these areas are either High or Great sensitivity.



4-10 Mapping visual sensitivity

- 4.2.19 Roads within the study area have predominantly been assessed as Moderate or Slight sensitivity, with routes within the National Parks generally assessed with a Moderate or High sensitivity. The sensitivity of the routes varies along their lengths with only very short sections of route assessed as Great sensitivity around Ravenglass and Broughton-in-Furness. The M6, running through the centre of the study area in a north south direction is predominately assessed as a Slight sensitivity.
- 4.2.20 The railways within the study area have been assessed as Great to Slight sensitivity, with the main line railway route between Carlisle and Lancaster assessed as Slight sensitivity. The main line route between Carlisle and Workington and along the coast to Ravenglass has been assessed as Moderate sensitivity. Shorter stretches of routes, particularly those from Ravenglass into the LDNP and south towards Millom; a stretch between Carnforth and Grange-over-Sands; a stretch between Fleetwood and Cleveleys; and a longer stretch between Carlisle and Brough; have been assessed as High sensitivity.
- 4.2.21 The Tourist attractions have been assessed as either Great or High sensitivity, with both Great and High sensitivity attractions located within the LDNP. Attractions within Carlisle, Penrith, and Kendal have all been assessed as High sensitivity attractions.

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

#### 4.3 The Developments Considered

##### 4.3.1 The assessment considered the following vertical infrastructure:

- Single and multiple onshore and offshore Wind turbines;
- Transmission Towers – National and Local Distributors pylons; and
- Mobile phone or other communications masts.



4-11 Examples of vertical infrastructure elements

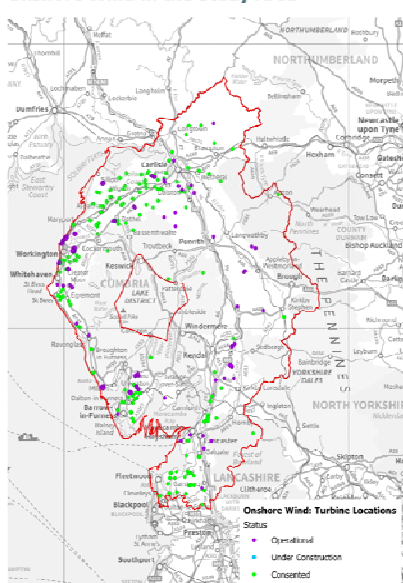
- 4.3.2 Existing, under construction and consented schemes have been considered in the assessment. It has been assumed that all schemes currently with consent will be constructed and the analysis of the data works on the assumption that all consented schemes and under construction schemes have been full constructed and are operational. Schemes currently in the planning system have been discussed further in Section 5, which specific details of the developments in Appendix 1 GIS Technical Report.
- 4.3.3 The vertical infrastructure has been classified as large-scale, medium-scale, and small-scale, based upon their height. Small-scale structures are considered as above 15m up to 50m; medium-scale structures as 51m-100m; and large-scale structures as over 100m. The grouping of large-scale, medium-scale and small-scale has been used to determine the distance over which the ZTV for that vertical infrastructure element has been run, as illustrated in Table 3.1. In general, the majority of existing wind farms in the study area fall within the medium-scale category; more recent onshore developments and the offshore wind turbines fall into the large-scale group; the transmission infrastructure falls into the small-scale group; and the remaining vertical infrastructure falls into all 3 groups. However, although the transmission infrastructure falls into the small-scale group based upon the height range of pylons, for the purpose of assessing magnitude of change they have been defined as medium-scale infrastructure, but with the ZTV extent of small-scale infrastructure. This is to balance the size of the components – the pylons- with the length of the corridors they occupy.
- 4.3.4 The location of the various vertical infrastructure considered can be seen on [Maps VI.01 to VI.14](#). [Map VI.15](#) illustrates the clustering of the vertical infrastructure based on the density of structures and their proximity to each other. This illustrates that there are concentrated areas of vertical infrastructure in the northern aspects of the study area, with dense clustering to the north and west of Carlisle (shown as “Highly clustered”), and with corridors of clustering emerging between Carlisle and Maryport, and between Penrith and Longtown (shown as “Clustered”). Corridors of clustering are also emerging near the coast between Workington and Ravenglass; and between Garstang and Kendal. Areas around Barrow-in-Furness and west of Fleetwood also have relatively dense areas of clustering. The areas with no vertical infrastructure are generally located within the National Parks and AONBs, although there are a few areas

outside these with no vertical infrastructure. Other areas where vertical infrastructure is present are described as Dispersed.

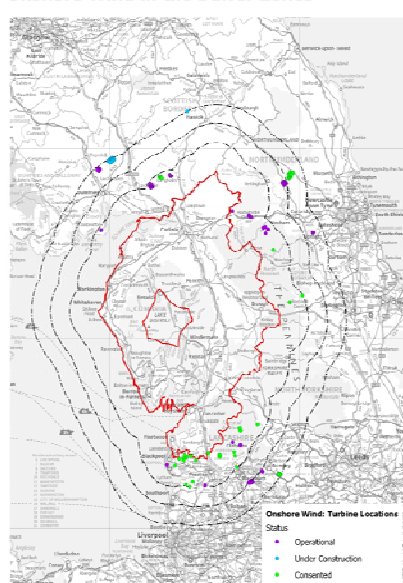
## Onshore Wind Turbines and the Zone of Theoretical Visibility

- 4.3.5 On shore wind energy and its associated ZTV are illustrated on [Maps VI.01 to VI.04](#), and [ZTV.01](#). These show the onshore turbines considered in the assessment. [Map VI.01](#) shows the operational, under construction and consented schemes considered within the study area and [Map VI.03](#) those considered within the buffer zone, up to 35km from the study area boundary. Consented schemes, not yet constructed, are located throughout the study area.

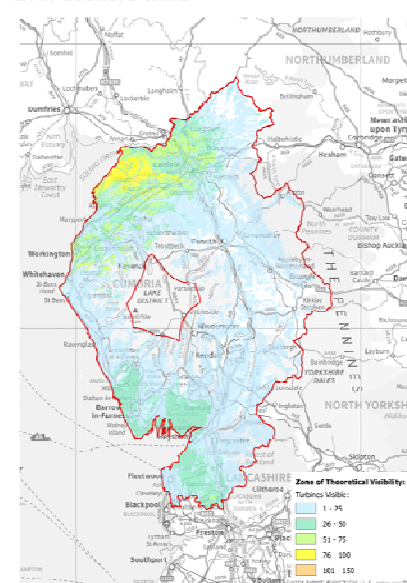
Onshore Wind in the Study Area



Onshore Wind in the Buffer Zones



ZTV: Onshore Wind



4-12 Distribution & theoretical visibility of onshore wind developments

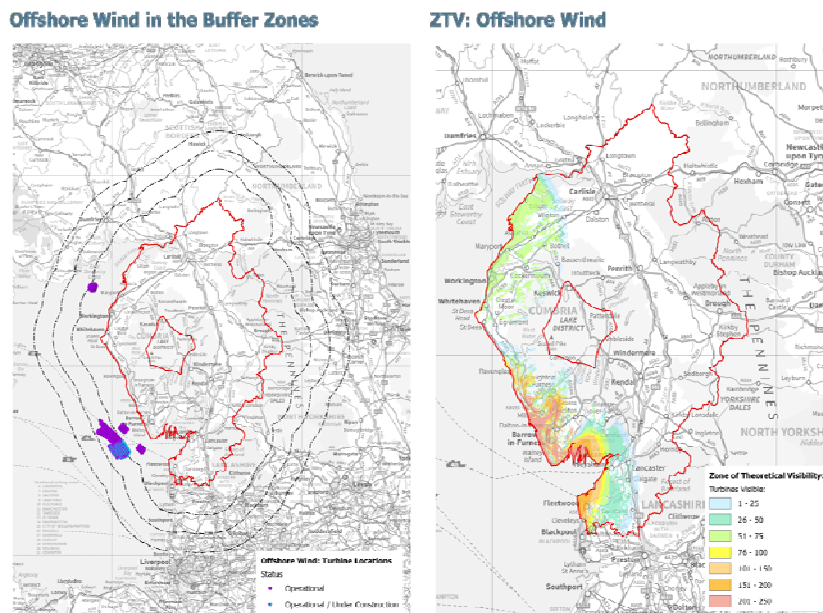
- 4.3.6 [Map VI.02](#) and [VI.04](#) illustrates the various scales of onshore turbines considered. Within the study area the large-scale schemes are located to the south of the study area, around Garstang, and the north of the study area, in the corridor between Workington and Carlisle. A number of large scale wind farms are operational, under construction and consented with the 35km buffer zone to the north of the study area (in Scotland and Northumberland) and the far south of the study area, around Blackburn and Burnley.
- 4.3.7 Distinct groupings of turbines (operational, under construction and consented) are evident over the study area with a prominent band of turbines located in the corridor of land stretching north east of Carlisle west through to Workington. This band contains turbines of various heights, small-scale, medium-scale and large-scale. Groups of turbines are also congregated around Fleetwood and Garstang; and Barrow-in-Furness. Routes of turbines are evident through the study area with a route forming along the western coast; and a route roughly following the line of the M6 through the study area.
- 4.3.8 The ZTV, [Map ZTV.01](#) illustrates that turbines are visible to some degree over the majority of the study area. The highest concentration of visible onshore wind turbines is located in the corridor

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

of land along the A595/A596 between Workington and Carlisle. A small area with a high visibility of turbines is also located south of Garstang.

#### Offshore Wind Turbines and the Zone of Theoretical Visibility



4-13 Distribution & theoretical visibility of offshore wind developments

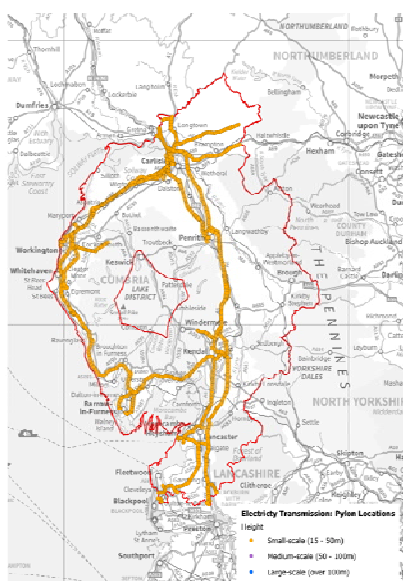
4.3.9 Offshore wind energy and its associated ZTV are illustrated on Maps VI.05, VI.06, and ZTV.02. These show the offshore turbines considered in the assessment. The majority of the offshore wind turbines considered have been constructed with only the West of Duddon Sands windfarm currently under construction. There are currently no consented offshore windfarm schemes to consider. All of the offshore turbines are considered large-scale and lie within the 25km buffer zone. Two distinct areas containing off shore turbines are evident: a large group of turbines (Walney 1 and 2, with West of Duddon Sands to the south) and two smaller groups (Ormonde and Barrow) are located off shore from Walney Island; and a group of turbines (Robin Rigg) off shore north west from Workington. The associated ZTV for these wind farms runs in land with over 200no. offshore turbines theoretically visible along the coast between Ravenglass and Millom; Barrow-in-Furness and Walney Island; and the southern extent of Morecambe Bay. Over 150no. turbines are theoretically visible from areas around Fleetwood. The majority of the whole length of the western coast of the study area is shown to have some theoretical visibility of an off shore wind farm.

#### Electricity Transmission Infrastructure and the Zone of theoretical Visibility

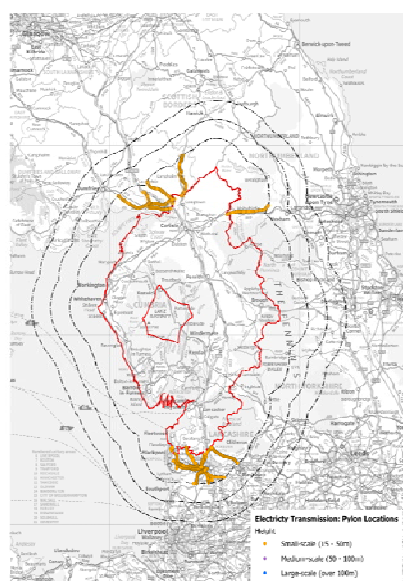
4.3.10 Electricity Transmission Infrastructure and associated ZTV are shown on Maps VI.07, VI.08 and ZTV.03. The pylons are all considered small scale structures. Corridors of transmission infrastructure run along the western coast, and along a similar route to the M6. Routes run to the south and north of the LDNP, connecting the transmission infrastructure on the west coast to that running through Cumbria. In addition, a number of stretches of transmission infrastructure reach out from Carlisle and around Preston.

- 4.3.11 Theoretical visibility of electricity transmission infrastructure is concentrated along its routes, with high theoretical visibility in the north and south of the study area. In the north, high visibility is concentrated around Carlisle, stretching to the northern boundary of the study area and westward towards Workington. In the south, high theoretical visibility is concentrated around Morecambe Bay; Heysham and Morecambe; and Garstang.

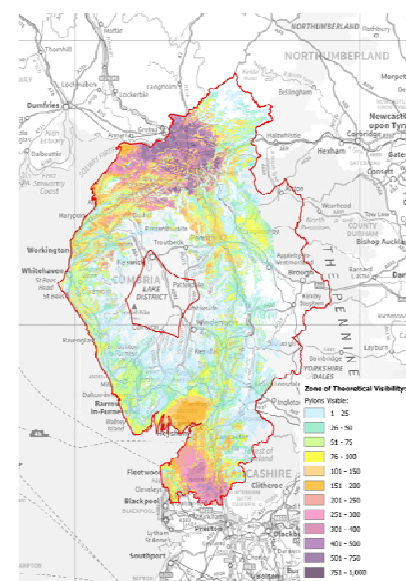
**Electricity Transmission in the Study Area**



**Electricity Transmission in the Buffer Zones**



**ZTV: Electricity Transmission**

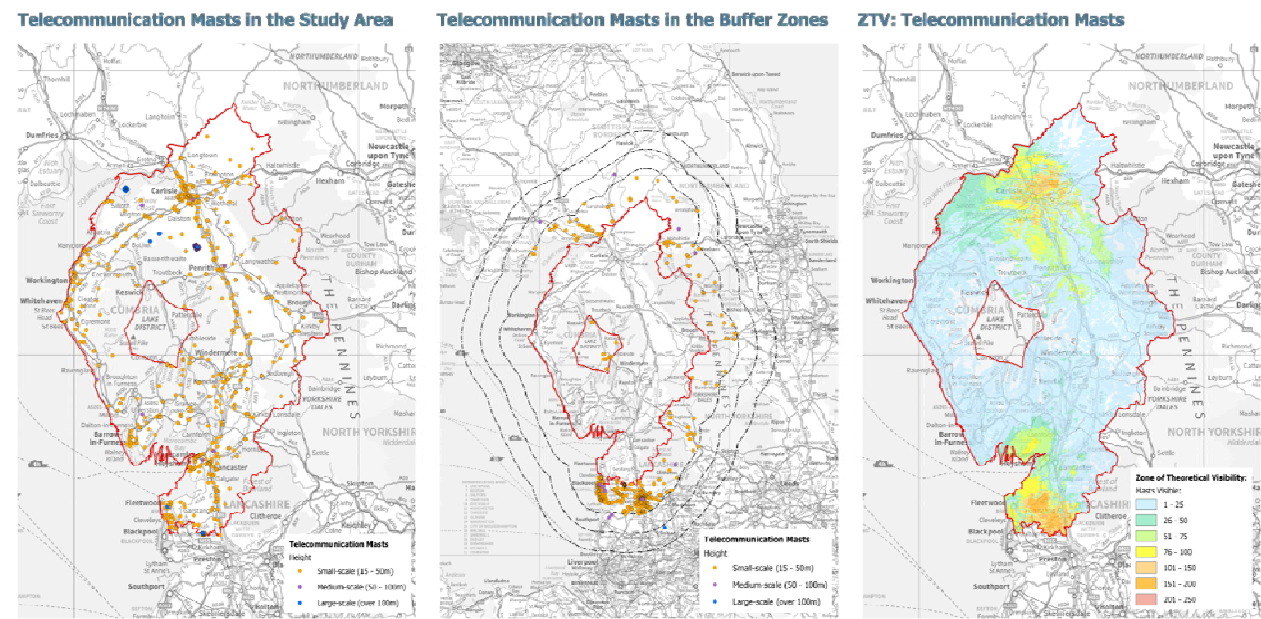


4-14 Distribution & theoretical visibility of electricity transmission elements

### Telecommunication Masts and the Zone of Theoretical Visibility

- 4.3.12 Telecommunication Mast and their associated ZTV are shown on [Maps VI.09, VI.10](#) and [ZTV.04](#). They are generally small-scale with only a handful of medium-scale and large-scale masts located throughout the study area. Large-scale masts to note include Skelton Transmitting station at 365m (the tallest guyed mast in the UK) north of Penrith; and Anthorn station, adjacent to the Solway Firth, consisting of thirteen masts at 227m tall arranged in two rings around a central mast. The telecommunication mast are spread prolifically across the study area and within the buffer zone, with clustering evident around Blackpool, Preston, Carlisle, coastal settlements, and the route of the M6.

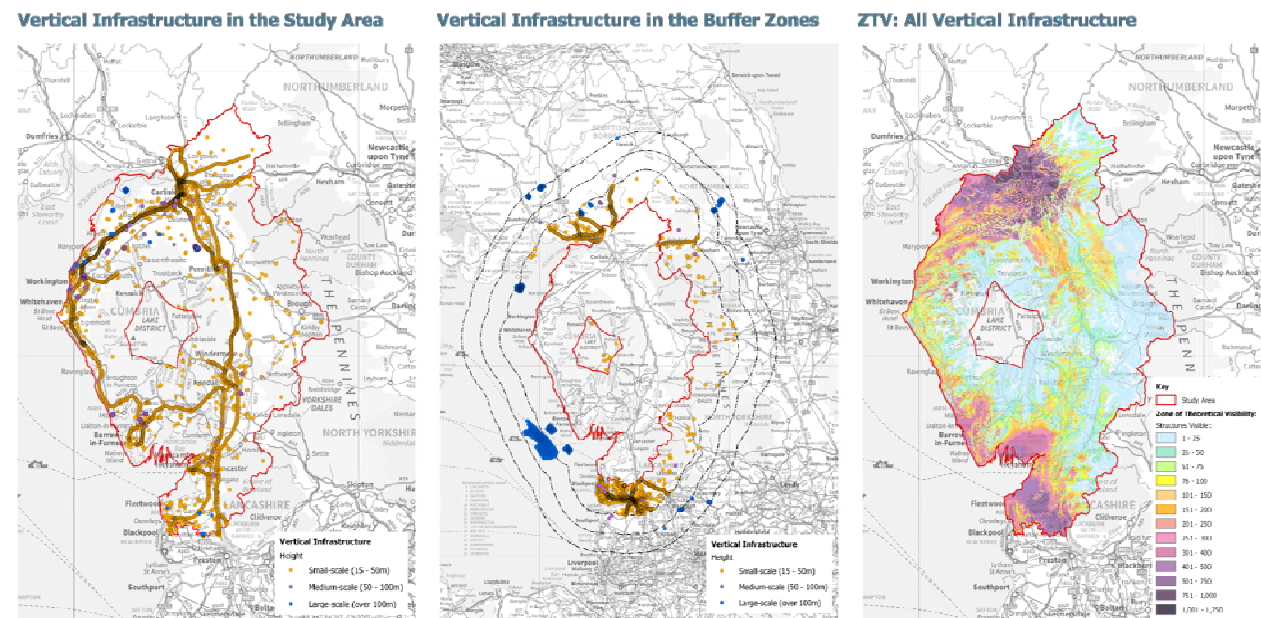
Cumulative Impacts of Vertical Infrastructure  
Part 2: The Assessment



4-15 Distribution & theoretical visibility of telecommunications masts

4.3.13 Theoretical visibility of telecommunication masts is afforded over the majority of the study area, with only a few isolated locations affording no visibility of any masts. The greatest number of masts are visible in the northern and southern extents of the study area, predominately around Carlisle and Garstang.

Overall Zone of Theoretical Visibility



4-16 Distribution & theoretical visibility of all vertical infrastructure

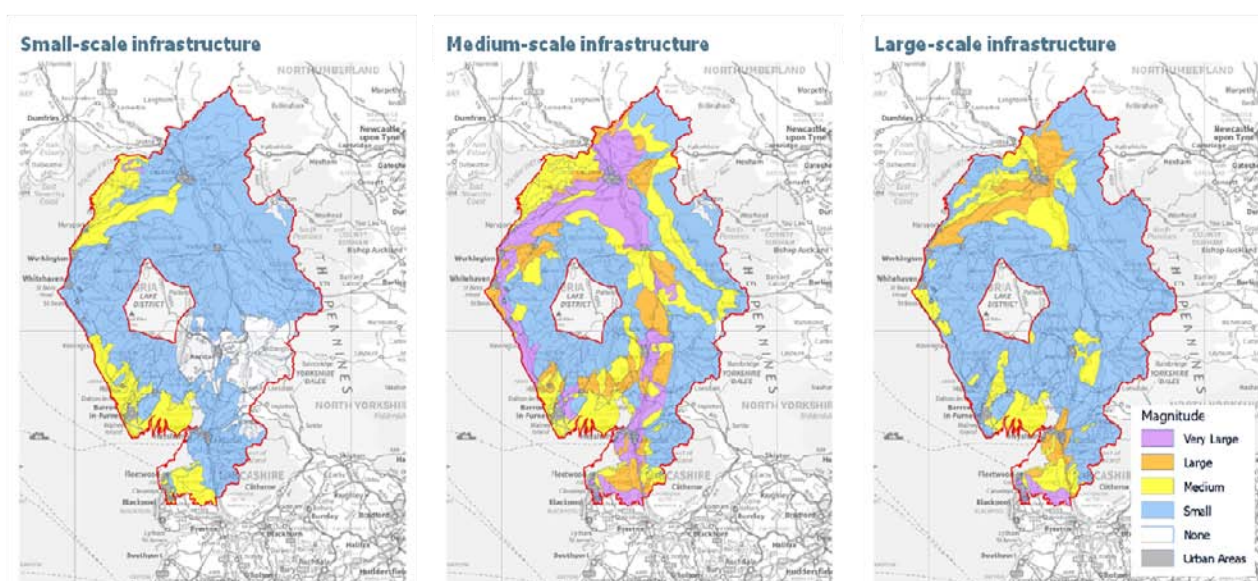
4.3.14 Map VI.11 and VI.12 illustrates all the vertical infrastructure, cumulatively, within the study area and buffer zone. These maps illustrate that vertical infrastructure generally concentrates in

similar areas, along the M6 route corridor, along the coast, and in a ring around the LDNP. The exception to this is the telecommunications masts, which are more widely spread.

- 4.3.15 Map ZTV.05 illustrates the combined theoretical visibility of all the vertical infrastructure. This shows that distinct areas experience a high degree of visibility of vertical infrastructure: an area around Carlisle and in a corridor along the northern section of the study area; an area in the south of the study area around Garstang, Fleetwood, Morecambe and Heysham; around Morecambe Bay; and around Barrow-in-Furness. Bands of high visibility are also emerging along the western coast and along the M6 corridor. In some of these areas, over 1,000 structures are theoretically visible.

## 4.4 Magnitude of Landscape Change

- 4.4.1 The magnitude of landscape change has been assessed for small-scale, medium-scale and large-scale infrastructure based on the criteria described in section 3.2. Both direct and indirect changes to the landscape have been considered to establish an overall magnitude of change on the landscape areas. The following table summarises the magnitude of change assessed as illustrated on Maps MAG.01 to MAG.09.



4-17 Magnitude of change by scale of vertical infrastructure

**Table 4.1 Magnitude of change to Landscape Areas from small-scale vertical infrastructure**

|                                   | Summary assessment                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Direct magnitude of change</b> | A large portion of the study area has been assessed as subject to some degree of direct change with only a few areas where there is No change from small-scale vertical infrastructure. The areas with no change (assessed as None) are dispersed throughout the study area, generally in isolated parcels of land, although groups of areas are found in the LDNP and the Solway Coast AONB. |

|                                     | Summary assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | Areas identified with a Large magnitude of change are located on the southern extents of the study area south and south east of Fleetwood. Areas identified with a Medium magnitude of change are located throughout the study area, including around Lancaster, east of Kendal, between St Bees and Ravenglass, north of Barrow-in-Furness and in the A595/A596 corridor of land running between Carlisle and Workington, and on to and Penrith and Longtown. The majority of the other landscape areas have been assessed with a Small magnitude of change to small-scale vertical infrastructure.                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Indirect magnitude of change</b> | The majority of the study area has been assessed as subject to some degree of indirect change due to small-scale vertical infrastructure. Only very small areas within the centre of some of the larger settlements have been assessed with no indirect effects. Areas with a Large magnitude of change are focused at the northern and southern extents of the study area, primarily in the area around Carlisle and north towards Longtown; an area around Morecambe Bay; and an area around Garstang and Heysham. Small areas with a Large magnitude of change have also been identified within the Solway Coast AONB. Areas assessed with a Medium magnitude of change are generally focused in similar areas, with a large band of Medium change identified within the Solway Coast AONB and the adjacent corridor of land along the A595/A596 between Carlisle and Workington. The remainder of the study area has been assessed with a Small magnitude of change due to small-scale vertical infrastructure. |
| <b>Overall Magnitude of change</b>  | The overall magnitude of change identifies that there is a Very Large change within the landscape areas to the south of the study area. These areas are focused south and east of Fleetwood. Landscape areas assessed with a Large magnitude of change located around Carnforth, Lancaster, and Heysham; and to the north of the study area, in the corridor of land between Carlisle, Workington and Longtown. A small area of Large change is also identified within the Solway Coast AONB. Areas subject to Medium change congregate in similar areas, but are also located around Morecambe Bay, east of Kendal, between St Bees head and Ravenglass, around Barrow-in-Furness, and north of Penrith. The remainder of the study area is assessed with a Small magnitude of change to small-scale vertical infrastructure.                                                                                                                                                                                      |

**Table 4.2 Magnitude of change to Landscape Areas from medium-scale vertical infrastructure**

|                                   | Summary assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Direct magnitude of change</b> | Direct changes due to medium-scale vertical infrastructure occur throughout the study area with Large, Medium and Small changes assessed. The landscape areas with Large change are located throughout the study area: a band along has been identified between Carlisle and Workington (the A5695/A596 corridor) and between Longtown and Penrith; along the coast between Workington and Millom; and in a broken band from Penrith south to Lancaster and beyond. |

|                                     | Summary assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | Other areas identified with Large change are located east of Barrow-in-Furness. A Medium magnitude of change has been assessed for areas throughout the study area, generally on the outskirts of areas experiencing a Large magnitude of change. Additional areas include a band identified north of Morecambe Bay between Ulverston and Kendal. Landscape areas with Small changes are located throughout the study area, but predominately on the outskirts of areas assessed with a Medium or Large change. Notable areas include those along the boundary of the North Pennines AONB and at the north eastern extent of the study area. No change (None) is recorded in the majority of the LDNP included in the study area, the majority of the YDNP, the majority of the Forest of Bowland; the majority of the North Pennines AONB; the majority of the Arnside and Silverdale AONB and the majority of the Solway Coast AONB. This is largely due to the locations of the transmission networks outside these designated areas. |
| <b>Indirect magnitude of change</b> | The majority of the study area has been assessed as subject to indirect change to some degree due to medium-scale vertical infrastructure. Large changes have been assessed in both the northern and southern extents of the study area with the majority of the northern boundary assessed as affording Large changes. This includes the Solway Coast AONB through to south of the A595 road corridor – stretching between Brampton and Workington; and an area stretching from the north of the study area to south of Penrith. Other landscape areas with a Large magnitude of change recorded are located along the western coast around Whitehaven, Ravenglass and Barrow-in-Furness; around Morecambe Bay; and around Heysham, Fleetwood, and Garstang. Areas recorded with a Medium magnitude of change are generally located on the periphery of the areas of Large change. A Small change has been assessed for the majority of the areas within the LDNP and areas along the eastern boundary of the study area.               |
| <b>Overall Magnitude of change</b>  | The overall magnitude of change on the landscape areas due to medium-scale vertical infrastructure has identified an area of Very Large change in the corridors of land between Workington and Carlisle (along the A595/A596 corridor) and between Longtown and Penrith. Smaller areas of Very Large change have also been identified along the coast between Whitehaven and Millom; around Barrow-in-Furness; and north of Kendal stretching south to the southern extent of the study area. Areas assessed with a Large change are located on the periphery of these areas. Areas assessed with a Small magnitude of change are predominantly located within the LDNP; YDNP; Forest of Bowland AONB; and North Pennines AONB. A Medium change is noted in the Solway Coast AONB and around Morecambe Bay. Very few areas have been identified where no change (None) has been assessed.                                                                                                                                                |

## Cumulative Impacts of Vertical Infrastructure

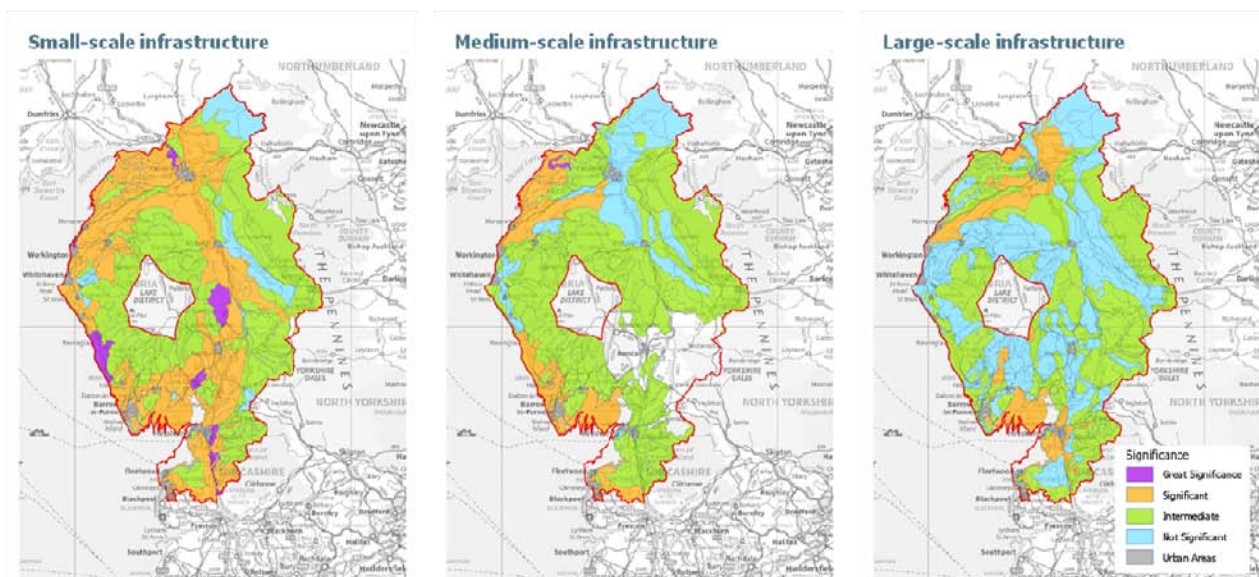
### Part 2: The Assessment

**Table 4.3 Magnitude of change to Landscape Areas from large-scale vertical infrastructure**

|                                     | Summary Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Direct magnitude of change</b>   | Direct changes to landscape areas from large-scale vertical infrastructure are identified to the north and south of the study area only. There would be no direct change (None) from large scale vertical infrastructure in the majority of landscape areas within the study area. The areas that do experience change lie within the Solway Coast AONB, where one area of Large change (due to the presence of a group of large-scale communications masts) has been identified and one area of Small change. Other areas with a Small change lie within the corridor of land between Workington and Carlisle (the A595/A596 corridor) and stretching to Penrith,; and areas lying to the east and south of Fleetwood.                                                                       |
| <b>Indirect magnitude of change</b> | In comparison to direct changes, the majority of the study area is shown to experience indirect change from large-scale vertical infrastructure. The exception to this is a corridor of land to the west and east of Kendal, where No change (None) has been assessed. Areas assessed as subject to a Large magnitude of change are located around the Solway Coast AONB, Barrow-in-Furness and Morecambe Bay; and east of Fleetwood. Areas assessed with a Medium magnitude of change are in similar areas, with a large area running between Longtown, Carlisle and Workington. A Small magnitude of change as a result of large-scale vertical infrastructure is recorded on the majority of the remainder of the study area.                                                              |
| <b>Overall Magnitude of change</b>  | Overall, one landscape area would be subject to Very Large Change due to large-scale infrastructure, located within the Solway Coast AONB. Medium change has been assessed in the area of the Solway Coast AONB and the adjacent corridor of land between Workington and Carlisle (the A595/A596 corridor). Medium change has also been assessed between Ravenglass and Barrow-in-Furness; around Morecambe Bay; and around Fleetwood and Garstang. The majority of the remainder of the landscape areas within the study area have been assessed as subject to a Small magnitude of change due to large-scale vertical infrastructure. A corridor of land west of Kendal and east to the YDNP has been assessed where no change (None) would occur from large-scale vertical infrastructure. |

## 4.5 Significance of cumulative landscape effects

- 4.5.1 The significance of cumulative landscape effects is determined by combining the sensitivity of the landscape areas with the magnitude of change, as described in the methodology in section 3.2. Maps SIG.01 to SIG.03 illustrate the significance of landscape effect on the landscape areas for small-scale, medium-scale and large-scale vertical infrastructure considered. The overall significance of cumulative landscape effects on Map SIG.04 was assessed by combining the assessment results for each scale of infrastructure.



4-18 Significance of cumulative landscape effect by scale

### Significance of cumulative landscape effect of small-scale vertical infrastructure

- 4.5.2 No landscape areas with a Great Significance of effect to small-scale vertical infrastructure have been identified within the study area. However, a number of areas with a Significant effect have been identified, predominantly to the north and south of the study area. Significant effects have been identified in the corridor between Workington and Carlisle (the A595/A596 corridor) and Longtown; north of Carlisle on the northern boundary of the study area; around Morecambe Bay; north east and south of Morecambe, Heysham and Fleetwood; and two areas to the south of the LDNP. Areas with Intermediate significance of effects recorded are located throughout the study area, notably within the Solway Coast AONB; within the North Pennines AONB; within the YDNP; within the Forest of Bowland AONB; within the Arnsdale and Silverdale AONB; within the LDNP; south and north of Penrith; and along the western coast.

### Significance of landscape effects of medium-scale vertical infrastructure

- 4.5.3 A number of locations throughout the study have been identified where a Great Significance of effect due to medium-scale vertical infrastructure has been assessed. These lie north of Carlisle on the border of the Solway Coast AONB; north east of Grange-over-Sands; between Ravensglass and Millom; east of Lancaster; south of Galgate; and north of Kendal. Areas where a Significant effect has been assessed are in a distinct pattern through the study area: running in the corridor of land along the route of the M6; in the corridor of land between Longtown, Carlisle and Workington (the A595/A596 road corridor); within the Solway Coast AONB; along the coast between Whitehaven and Ravensglass; and around Barrow-in-Furness across to Morecambe Bay and Carnforth.
- 4.5.4 The remainder of the other areas have been assessed as subject to Intermediate significance of effect to medium-scale vertical infrastructure. Effects assessed as Not Significant have been recorded in areas towards the north eastern boundary of the study area; the western boundary

## Cumulative Impacts of Vertical Infrastructure

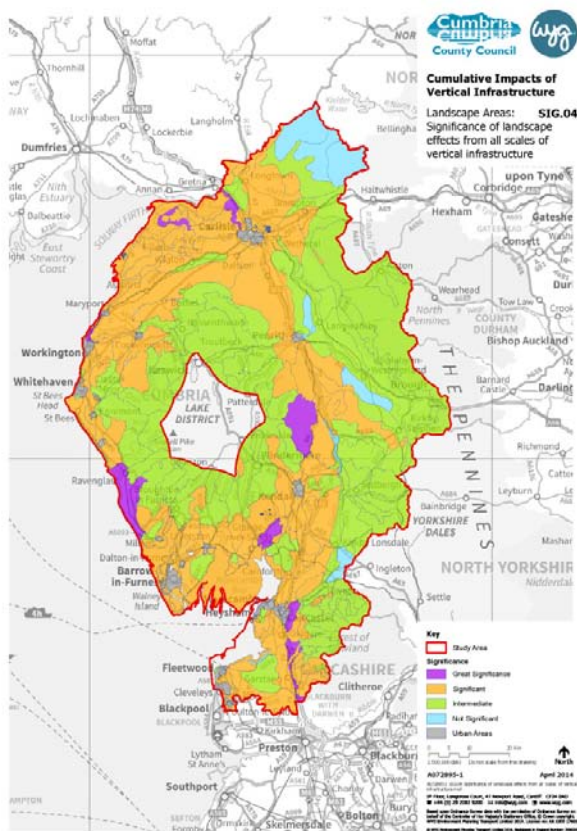
### Part 2: The Assessment

of the North Pennines AONB; and small area dotted around Whitehaven, Morecambe Bay and Kirby Lonsdale.

#### Significance of cumulative landscape effect of large-scale vertical infrastructure

- 4.5.5 An area of Great Significance to large-scale vertical infrastructure has been identified within the Solway Coast AONB. This area lies adjacent to landscape areas identified with a Significant effect due to large-scale vertical infrastructure also within the Solway Coast AONB. Other areas where a Significant effects have been identified lie on the west coast, between Ravenglass and Morecambe Bay; along the southern boundary of the study area south east of Fleetwood; and in the A595/A596 road corridor between Workington and Carlisle. Intermediate effects to large-scale vertical infrastructure are assessed in areas of the LDNP; the North Pennines AONB; the Forest of Bowland AONB; and between Kendal and Garstang.
- 4.5.6 Areas where the effects due to large-scale vertical infrastructure are assessed as Not Significant are located east of Workington and Whitehaven; some areas on the edge of the North Pennines AONB; and a band from Penrith through to the north eastern extent of the study area.

#### Significance of cumulative landscape effect of all scales of vertical infrastructure



4.5.7 Some distinct areas of Great Significance to all scales of vertical infrastructure have been identified. These lie within the Solway Coast AONB; north of Carlisle; along the western coast between Ravenglass and Millom; north east of Grange-over-Sands; an area of land west of junction 39 of the M6; and some small areas of land on the boarder of the Forest of Bowland AONB. Areas of Significant effect form a pattern along the route of the M6; along the coast from Morecambe Bay to Barrow-in-Furness; along the coast from Ravenglass north to the northern boundary of the study area; throughout the Solway Coast AONB; and throughout the A595/A596 corridor of land between Workington and Carlisle.

4.5.8 Effects assessed as Not Significant are few across the study area, with areas identified predominantly towards the east of the study area, including areas north east of Longtown; on the western boundary of the North Pennines AONB; east of Penrith; and south of Kirby Lonsdale.

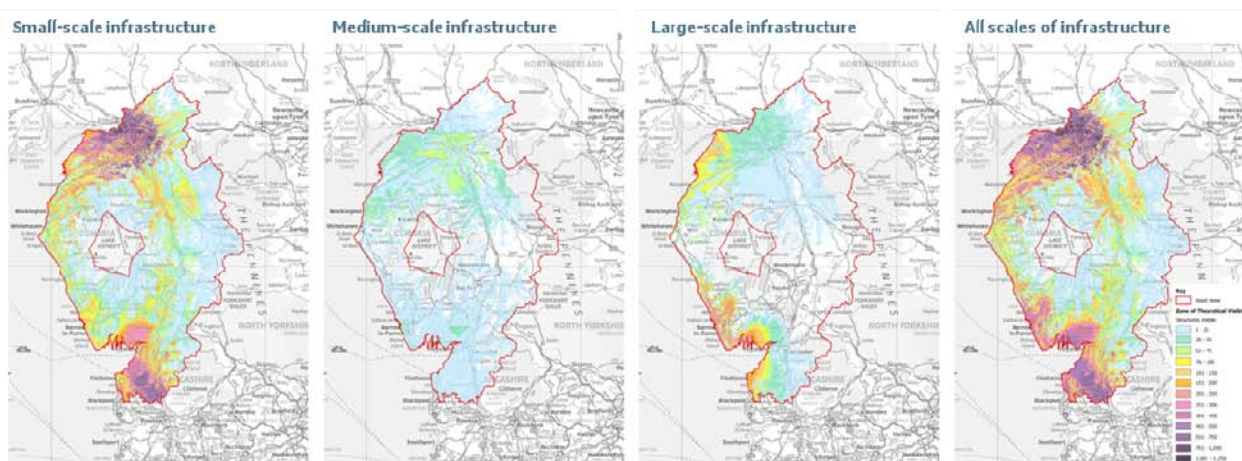
4-19 Overall significance of cumulative landscape effects

## Summary of Significance of cumulative effect on the Landscape

- 4.5.9 In summary, the effect of vertical infrastructure on the landscape varies across the study area with patterns emerging illustrating that hot spots are located throughout the study area where a Great Significance of effect is experienced. Significant effects are located throughout with a clear pattern emerging that shows significant effects are experienced in the corridor of the M6, between the National Parks and AONBs; along the western coastline; and in the southern and northern reaches of the study area. Significant effects are also illustrated within the Solway Coast AONB. An inland corridor experiencing Significant effects is evident on the A595/A596 road corridor between Wokington and Carlisle to join with the M6 route corridor.
- 4.5.10 The remainder of the study area experiences Intermediate effects from vertical infrastructure development with very few area identified experiencing Not Significant effects.

## 4.6 Magnitude of Visual Change

- 4.6.1 The magnitude of visual change has been assessed for small, medium and large-scale infrastructure based on the amount of vertical infrastructure visible from the receptor location. Maps ZTV.06 to ZTV.08 illustrate the theoretical visibility assessed over the whole study area for large, medium and small-scale vertical infrastructure and this has been used to inform the visibility anticipated for each of the visual receptor groups. The ZTV maps illustrate the visibility throughout the study area and this visibility has been translated to determine the magnitude of change, defined as Large (many – 51 or more structures visible), Medium (some – 26 to 50 structures visible) or Small (few – 25 or less structures visible).



4-20 Zones of theoretical visibility by scale of vertical infrastructure

- 4.6.2 From an analysis of the theoretical visibility over the whole study area, a large portion of the study area has many views of small-scale vertical infrastructure, resulting in a large magnitude of change. These views are concentrated in a band along the northern boundary of the study area, between the A595/A596 road corridor from Workington to Carlisle and across to Brampton, and in the southern extreme of the study area around Garstang and Lancaster. A large magnitude of

## Cumulative Impacts of Vertical Infrastructure

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change is also evident along the western coast boundary of the study area and along the M6 corridor through the middle of the site. Areas with some visibility (a Medium magnitude of change) have been identified, with the areas around the LDNP and along the eastern boundary of the study area identified as having few (Small magnitude of change) vertical infrastructure elements visible.

- 4.6.3 Map ZTV.07 illustrates the visibility of medium-scale vertical infrastructure over the study area. A Large magnitude of visual change due to medium-scale vertical infrastructure has been identified around Carlisle and some smaller areas towards Workington and Whitehaven. Areas with some (Medium magnitude of change) visibility of medium-scale vertical infrastructure are evident adjacent to the Solway Firth and around Penrith, Cockermouth and Carnforth. The majority of the remaining study area affords few (small magnitude of change) views of medium-scale vertical infrastructure with areas around the LDNP and eastwards towards The Pennines affording no views of medium-scale vertical infrastructure.
- 4.6.4 Many views of large-scale vertical infrastructure (Large magnitude of change) are concentrated along the western boundary of the study area, around the Solway Firth, Maryport, Whitehaven, Workington, Ravensglass, Millom, Barrow-in-Furness, Morecambe Bay and Fleetwood. Some views (Medium magnitude of change) are assessed around Carlisle and to the west of Garstang and Carnforth. Few views (Small magnitude of change) are assessed in a large area around Penrith and south east of Lancaster. The central portion of the study area, around the LDNP and stretching to the eastern boundary of the study area are void of any visibility of large-scale vertical infrastructure.
- 4.6.5 The magnitude of visual change on the various visual receptors is illustrated on Maps MAG.10 to MAG.30 and summarised in the following tables.

**Table 4.4 Summary of magnitude of visual change on the visual receptors to small-scale vertical infrastructure**

| Visual Receptor                                       | Small-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to Settlements (Map MAG.10) | Many small-scale vertical structure elements are visible in a number of settlements including Carlisle, Workington, Penrith, Kendal, Barrow-in-Furness Lancaster, Morecambe, Heysham, Fleetwood, Cleveleys, Garstang and Poulton-le-Fylde resulting in a Large magnitude of change. Whitehaven has some vertical structures visible, resulting in a Medium magnitude of change. Most settlements throughout the study area afford some degree of change, with only a handful within the National Parks or AONBs affording No views ("None") of small-scale vertical elements. |
| Users of CROW/access land (Map MAG.13)                | Access land assessed with a Large magnitude of change to vertical infrastructure includes areas around the Solway Coast, on the boundaries of the LDNP, YDNP, the North Pennines, and the Forest of Bowland. Within these same areas, areas of access land with a Small and Medium magnitude of change have also been assessed. Other small parcels of land throughout the study area have been assessed with a                                                                                                                                                               |

| Visual Receptor                                  | Small-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                  | Large to Small magnitude of change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Users of Long Distance Footpaths<br>(Map MAG.16) | The magnitude of change varies across the lengths of the various long distant footpaths. However, routes around Carlisle and within and around the Solway Coast AONB have predominantly been assessed with a Large magnitude of change. Other areas assessed with a Large magnitude of change are generally focused along the coast or on routes stretching inland from here; and in a stretch between Fleetwood and Kendal. These include sections of routes between Fleetwood and Garstang, Fleetwood and Lancaster, along the western boundary of the North Pennines, from Maryport into the LDNP, from St Bees Head into the LDNP, from Millom into the LDNP and routes around Morecambe Bay. Other routes have been assessed with either a Medium or Small magnitude of change. Only a very small portion of routes have been identified as having No views of small-scale vertical infrastructure ("None"). |
| Users of Cycle routes<br>(Map MAG.19)            | The cycle routes with visibility of small-scale vertical infrastructure are concentrated throughout the study area with a Large magnitude of change assessed for the routes radiating out from Carlisle; a route along the along the Solway Coast; a route south from Carlisle to Penrith; from Carlisle east to Brampton and north to Longtown. A Large magnitude of change has also been assessed for routes around Morecambe and Heysham; routes around Kendal; routes around Penrith and routes around Workington. A number of sections of route have been assessed with a Small magnitude of change throughout the study area with only a few stretches affording No views of any small-scale vertical elements (assessed as "None").                                                                                                                                                                        |
| Travellers on Roads<br>(Map MAG.22)              | A number of the roads within the study area have been assessed with a Large magnitude of change to small-scale vertical infrastructure. These road are predominantly concentrated around Carlisle and radiating out along the corridor between the Solway Coast and the north of the LDNP; north towards Longtown; east towards Brampton; and south to Penrith and beyond. Routes in the southern section of the study area, including those around Lancaster, Morecambe, Heysham, Fleetwood, Garstang and Cleveleys are also assessed with a Large magnitude of change to small-scale vertical infrastructure elements. Other routes through the study area have been assessed with a Small magnitude of change, and some sections with a Medium magnitude of change. Only a few short isolated sections of route have No change due to small scale vertical infrastructure (assessed as "None").                |
| Travellers on Railways<br>(Map MAG.25)           | The majority of the rail network has views of small-scale vertical infrastructure with the majority of the long stretch of the north south link south from Gretna running beyond Garstang assessed with a Large magnitude of change. The majority of the route from Carlisle to Workington has also been assessed as experiencing a Large magnitude                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Cumulative Impacts of Vertical Infrastructure

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| Visual Receptor                              | Small-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | of change as have a number of other stretches along the coast and between Carlisle and Brough. Other stretches of route have been assessed with a Medium or Small magnitude of change with only very small stretches affording No views ("None") of small-scale vertical infrastructure elements.                                                                                                                                                                                                                                                      |
| Users of Tourist Attractions<br>(Map MAG.28) | The tourist attractions within the study area have been assessed with a Large, Medium, or Small magnitude of change to small-scale vertical infrastructure. The tourist attractions closer to the centre of the LDNP have generally been assessed with a Small magnitude of change, and the attractions within the settlements of Carlisle, Penrith and near Kendal, a Large magnitude of change. Areas of Leighton Moss RSPB Reserve near Carnforth, lying on the eastern edge of Morecambe Bay, have been assessed with a Large magnitude of change. |

**Table 4.5 Summary of magnitude of visual change on the visual receptors to medium-scale vertical infrastructure**

| Visual Receptor                                          | Medium-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to Settlements<br>(Map MAG.11) | Settlements within the northern section of the study are anticipated to afford Many views of medium-scale vertical infrastructure elements, resulting in a Large magnitude of change. These are primarily located in the periphery around Carlisle to the north, south, east and west. Some settlements with a Large magnitude of change are also located to the east of Workington. The larger settlements of Workington and Carlisle are anticipated to have Some views of medium-scale vertical infrastructure, resulting in a Medium magnitude of change, but on the whole a Small magnitude of change has been assessed for the majority of the settlements. |
| Users of CROW/access land<br>(Map MAG.14)                | Small areas of access land along the western and northern boundary of the LDNP have been assessed to have a Large magnitude of change due to vertical infrastructure. A small area along the north west boundary of the North Pennines has also been assessed with a Large magnitude of change. The majority of the access land has been assessed with a Small magnitude of change. Areas assessed with a Medium magnitude of change include areas on the western boundary of the North Pennines, the Solway Coast, and the northern aspects of the LDNP.                                                                                                         |
| Users of Long Distance Footpaths<br>(Map MAG.17)         | Some sections of long distant footpaths around Carlisle have been assessed with a Large magnitude of change due to the potential views afforded of medium-scale vertical infrastructure elements. Small portions of other routes throughout the study area have also been assessed with a Large magnitude of change; however, these are only very short                                                                                                                                                                                                                                                                                                           |

| Visual Receptor                                      | Medium-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      | <p>sections of routes. Routes along the boundary of the Solway Coast and the North Pennines have been assessed with a Medium magnitude of change, affording some views of vertical infrastructure. The majority of the footpath routes in the south of the study area have been assessed with a Small magnitude of change along with sections of routes throughout the study area. A number of routes into the North Pennines and YDNP afford No views ("None") of medium-scale vertical infrastructure.</p>                                                                                                                     |
| <p>Users of Cycle routes<br/>(Map MAG.20)</p>        | <p>Views of medium-scale vertical infrastructure elements are available over the whole study area with a Large magnitude of change assessed on sections of route around Carlisle. A Large magnitude of change has also been assessed for short stretches of route around Workington and between Carlisle and Penrith. A Medium magnitude of change has been identified for routes adjacent to the Solway Firth and short sections of route around Workington, Penrith and into the North Pennines. The majority of the routes in the southern section of the study area have been assessed with a Small magnitude of change.</p> |
| <p>Travellers on Roads<br/>(Map MAG.23)</p>          | <p>A Large magnitude of change to medium-scale vertical infrastructure has been assessed for a number of routes concentrated around Carlisle, with sections of route assessed with a Medium magnitude of change concentrated around the corridor between the Solway Coast and the LDNP; and roads radiating out from Penrith. The majority of the other routes have been assessed with a Small magnitude of change with some routes towards the YDNP and North Pennines affording No views (assessed as "None").</p>                                                                                                             |
| <p>Travellers on Railways<br/>(Map MAG.26)</p>       | <p>Stretches of the rail network around Carlisle and small stretches around Workington have been assessed with a Large magnitude of change to medium-scale vertical infrastructure. Only short sections of route have been assessed with a Medium magnitude of change affording some views of medium-scale vertical infrastructure. The majority of the route sections have been assessed with a Small magnitude of change with some stretches throughout the study area affording No views ("None").</p>                                                                                                                        |
| <p>Users of Tourist Attractions<br/>(Map MAG.29)</p> | <p>The majority of the tourist attractions have been assessed with a Small magnitude of change to medium-scale vertical infrastructure with only attractions within Carlisle assessed with a Large magnitude of change and a very small section of the Whinlatter Forest Park &amp; Visitor's centre. The majority of the Whinlatter Forest Park has been assessed with a Small or no ("None") magnitude of change. Small sections within the Leighton Moss RSPB have been assessed with a Medium magnitude of change.</p>                                                                                                       |

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

**Table 4.6 Summary of magnitude of visual change on the visual receptors to large-scale vertical infrastructure**

| Visual Receptor                                          | Large-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to Settlements<br>(Map MAG.12) | Areas assessed as having a Large magnitude of change are located predominantly to the north and south of the study area, namely settlements around Fleetwood, Cleveleys, Poulton-le-Fylde, and Barrow-in-Furness. A number of small settlements where a Large magnitude of change has been recorded are located in a corridor between Workington and Carlisle and towards the Solway Coast. A Medium magnitude of change has been assessed for the larger settlements of Carlisle, Maryport and Workington, and a number of smaller settlements in similar areas. Small changes are anticipated to the majority of the settlements with some settlements, predominantly in AONBs and National Parks, assessed with no change ("None").                                                                                                     |
| Users of CROW/access land<br>(Map MAG.15)                | A Large magnitude of change has been assessed from Access Land concentrated along the western portion of the study area, particularly around the Solway Coast and the western extents of the LDNP. A Medium magnitude of change has been identified in areas of land around Carlisle, areas of the LDNP and Carnforth. A Small magnitude of change has been assessed along the western boundary of the North Pennines, within the Forest of Bowland, and predominantly along the northern extent of the LDNP. No magnitude of change has been identified within the access land in the YDNP.                                                                                                                                                                                                                                               |
| Users of Long Distance Footpaths<br>(Map MAG.18)         | Footpath routes assessed with a Large magnitude of change to large-scale vertical infrastructure are concentrated along the western coast: along the coast from the Solway Firth towards Whitehaven; from Ravenglass through to Millom and Barrow-in-Furness; on sections running inland from the coast; and around the coast at Fleetwood and Cleveleys. Areas assessed with a Medium magnitude of change are predominantly concentrated around Carlisle and the Solway Coast; Morecambe Bay; and around Garstang, Galgate and Morecambe. Other sections of route assessed with a Small magnitude of change lie around Morecambe Bay and sections inland around The North Pennines AONB and from Carlisle to the LDNP. A number of routes have been assessed with No change ("None"), particularly around Windermere and out to the YDNP. |
| Users of Cycle routes<br>(Map MAG.21)                    | Cycle routes assessed with a Large magnitude of change are concentrated along the western coast, with routes identified along the Solway Coast; between Maryport and Workington; around Whitehaven; around Ravenglass; around Barrow-in-Furness; and around Fleetwood. Small sections with a Large magnitude of change are also identified on routes away from Cockermouth and Cleaton Moor towards the west of the study area. Routes around Carlisle and Lancaster have been assessed as affording a Medium magnitude of change. A Small                                                                                                                                                                                                                                                                                                 |

| Visual Receptor                              | Large-scale Vertical Infrastructure Visual / Magnitude of change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | magnitude of change has been assessed for a number of other routes throughout, with no views (“None”) of large-scale vertical infrastructure concentrated around Windermere, Kendal and in areas east out towards the YDNP.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Travellers on Roads<br>(Map MAG.24)          | A Large magnitude of change to large-scale vertical infrastructure has been assessed as concentrated along coastal areas, particularly in the area of land between the LDNP and Solway Coast out to Workington; between Ravensglass and Barrow-in-Furness; and around Fleetwood and Cleveleys. A Medium magnitude of change has been assessed for roads radiating out from Carlisle and route around Morecambe and Heysham. Roads exiting out form Penrith and Cockermouth have been assessed with a Small magnitude of change. Routes with No view (“None”) are predominately concentrated around Windermere and Kendal in areas out towards the YDNP. |
| Travellers on Railways<br>(Map MAG.27)       | A Large magnitude of change to large-scale vertical infrastructure has been assessed for sections of route near the coast at Fleetwood and Cleveleys; Heysham; Barrow-in-Furness; Millom; Ravensglass; Whitehaven and Wokington. Routes out of Carlisle have been assessed with a Medium magnitude of change and short sections around Lancaster, Grange-over-Sands and Ravensglass.<br>Other sections of routes have been assessed with a Small magnitude of change with No change (“None”) assessed around Windermere, Kendal and Kirby Stephen.                                                                                                      |
| Users of Tourist Attractions<br>(Map MAG.30) | The Beacon, in Whitehaven, has been assessed with a Large magnitude of change to large-scale vertical infrastructure. A Large magnitude of change has also been assessed on a small area within the Whinlatter Forest Park, however, the majority of this area has been assessed with a Small or no (“None”) magnitude of change. Tourist attractions within Carlisle, Penrith and around Carnforth have been assessed with a Medium and Small magnitude of change. Attractions in the eastern section of the LDNP have been assessed with no (“None”) magnitude of change.                                                                             |

## 4.7 Visual Significance

- 4.7.1 The visual significance is determined by combining the sensitivity of the visual receptor with the magnitude of change, as described in the methodology in section 3.3. [Maps SIG.05 to SIG.32](#) illustrate the significance of visual effect determined for the various receptor and the tables below summarise the significance of visual effects for the various scales of infrastructure considered:

**Table 4.7 Summary of visual effect on visual receptors to small-scale vertical infrastructure**

| Visual Receptor                                          | Significance of Visual Effect of small-scale vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to Settlements<br>(Map SIG.05) | A Significant effect has been assessed for people within some of the larger settlements within the study area, namely Carlisle, Penrith, Morecambe, Heysham, Fleetwood, Cleveleys, Workington and Whitehaven. Significant effects have also been determined for people within a number of the smaller settlements, particularly those within the corridor of land along the Solway Coast and those along the M6 corridor. Some small settlements have been assessed as having a Great Significance of visual effect, including those settlements within the Solway Coast AONB; settlements on the border of the North Pennines AONB; and north of Carnforth. A number of settlements have been assessed with an Intermediate Significance, with no areas identified where the effects are Not Significant. |
| Users of CROW/access land<br>(Map SIG.09)                | Areas of Great Significance of effect of small scale vertical infrastructure have been identified throughout the study area. These include area of access land within the Solway Coast AONB, area within the North Pennines AONB, area within the periphery of the LDNP, areas within the Forest of Bowland AONB; and areas within the Arnside and Silverdale AONB. Some areas of Significant effect are also identified and these lie predominantly adjacent to areas of Great Significance. The remainder of the access land where an effect has been identified has been assessed with an Intermediate Significance of effect to small-scale vertical infrastructure.                                                                                                                                   |
| Users of Long Distance Footpaths<br>(Map SIG.13)         | The significance of effect on the users of the footpath routes alters along the length of the route. Areas identified with a Great Significance of effect to small-scale vertical infrastructure are concentrated within and around the Solway Coast AONB, The North Pennines AONB, and around Morecambe Bay. Small sections assessed with a Great significance of effect are also located near Cockermouth; Windermere; Sedbergh, Aspatria, and Dalston. Significant effects are generally located on lengths in a similar vicinity to these areas and are focused predominantly along the coastal areas. Other stretches of footpath have been assessed with an Intermediate Significance, with only a few short stretches assessed as Not Significant.                                                  |
| Users of Cycle routes<br>(Map SIG.17)                    | A Great Significance of visual effect from small-scale vertical infrastructure has been assessed for cycle routes along the Solway Coast and into Carlisle; and for short sections of routes around Kendal, Carnforth, Lancaster, Cockermouth, Ravenglass; Cleaton Moor; and Langwathby. A number of other routes have been assessed to afford Significant effects, particularly those around Lancaster; south of Carlisle; Kendal, and Workington. Most other stretches have been recorded with an Intermediate Significance, with no sections assessed as Not Significant                                                                                                                                                                                                                                |

| Visual Receptor                              | Significance of Visual Effect of small-scale vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | to small-scale vertical infrastructure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Travellers on Roads<br>(Map SIG.21)          | Significant effects on the road network to small-scale vertical infrastructure are predominately located in the northern section of the study area, particularly in the band of land between the Solway Coast and the LDNP, and along the coast. Intermediate and Significant effects are assessed on a number of other sections of route within the study area.                                                                                                                                             |
| Travellers on Railways<br>(Map SIG.25)       | The significance of effect varies throughout the study area over the length of routes, with Significant effects recorded on routes into and out of Carlisle; around Ravenglass; around Grange-over-Sands; and at Fleetwood. Other stretches of route have been assessed with both Intermediate and Not Significant effects. Only very short stretches have been assessed as None, where no significance of effect is recorded.                                                                               |
| Users of Tourist Attractions<br>(Map SIG.29) | A Great significance of effect has been assessed to sections of the Leighton Moss RSPB Nature Reserve where it lies adjacent to Morecambe Bay. Significant effect have been assessed on tourist attractions within Carlisle, Penrith and Whitehaven and intermediate effects have been assessed on the majority of the tourist attractions that lie within the LDNP. Significant effects have also been assessed at Sizergh Castle, near Kendal, Holker Hall, near Grange-over-Sands and Leighton Moss RSPB. |

**Table 4.8 Summary of visual effect on visual receptors to medium-scale vertical infrastructure**

| Visual Receptor                                          | Significance of Visual Effect of medium-scale vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to Settlements<br>(Map SIG.06) | Only a few settlements have been identified with a Great Significance of effect to medium-scale vertical infrastructure and these are located to the north east of Carlisle. Those with Significant effects identified lie predominately within the north of the study area within and surrounding Carlisle, on the border of the North Pennines AONB, in the Solway Coast AONB and north of Penrith. Areas have also been identified within and around Workington. Intermediate Significance has been determined in all settlements when a magnitude of change has been recorded.                                                                                                                            |
| Users of CROW/access land<br>(Map SIG.10)                | Areas of access land assessed as affording Great Significance of effect to medium-scale vertical infrastructure are predominately located within the northern boundaries of the LDNP and a few small areas on the western extent of the North Pennines AONB. Significant effects have been determined along the boundary of the North Pennines AONB, The Solway Coast AONB and the northern extent of the LDNP. A small area within Carnforth has also been identified with Significant visual effects. Intermediate effects have been identified on the majority of the access land anticipated to have views of vertical infrastructure, particularly along the boundaries of the National Parks and AONBs. |

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

| Visual Receptor                               | Significance of Visual Effect of medium-scale vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Users of Long Distance Footpaths (Map SIG.14) | The significance of visual effect varies across the length of the footpaths, with short stretches affording a Great Significance of effect concentrated within and around Carlisle. Lengths of footpath with Significant effect have been assessed within the Solway Coast AONB and the North Pennines AONB. Other effects on lengths of footpath vary from Intermediate and None.                                                                                                                         |
| Users of Cycle routes (Map SIG.18)            | A few short sections of route around Carlisle have been assessed to afford a Great Significance of effect; and a short section to the north east of Cockermouth. Routes with Significant effects assessed are predominately concentrated in the northern section of the study area, along the Solway Coast and between Carlisle and Penrith. Intermediate effects have been determined on the majority of the other routes with only some lengths of route assessed as None, where no views are available. |
| Travellers on Roads (Map SIG.22)              | Significant effects due to medium-scale vertical infrastructure development are located around Carlisle and along stretches of route in the area of land between the Solway Coast and the LDNP. Lengths of road with an Intermediate significance of effect determined are also located in this area along with additional sections along the western coast and south of Carlisle.                                                                                                                         |
| Travellers on Railways (Map SIG.26)           | Significant effects due to medium-scale vertical infrastructure are only evident in small stretches of the rail network around Carlisle and Workington, with Intermediate effects recorded in close vicinity to these. Intermediate effects are also recorded on stretches of the rail network near Langwathby; Ravenglass; Morecambe Bay; and Fleetwood. A Not Significant effect from medium-scale vertical infrastructure has been determined on the majority of the rail network.                      |
| Users of Tourist Attractions (Map SIG.30)     | An area assessed with Great significance of effect from medium-scale vertical infrastructure lie within the Whinlatter Forest Park, but for the remainder of the tourist attractions, the majority have been assessed with an Intermediate significance from medium-scale vertical infrastructure. The exceptions are the attractions within Carlisle, where a Significant effect has been assessed and small sections of the Leighton RSPB nature reserve and within Whinlatter Forest Park.              |

**Table 4.9 Summary of visual effect on visual receptors to large scale vertical infrastructure**

| Visual Receptor              | Significance of Visual Effect of large-scale vertical infrastructure                                                                 |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to | A Great Significance of visual effect due to large-scale vertical infrastructure has been assessed to some small settlements located |

| Visual Receptor                                  | Significance of Visual Effect of large-scale vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Settlements<br>(Map SIG.07)                      | within the Solway Coast AONB. Areas of Significant effect are concentrated in the north and south of the study area, and along the western coast. Key areas include Carlisle and the corridor of land along the A595 to Workington, Barrow-in-Furness and surrounding areas, Fleetwood and Cleveleys and surrounding area, and Ravensglass and surrounding area. The remainder of settlements where a magnitude of change has been recorded have been assessed with an Intermediate significance.                                                                                                                |
| Users of CROW/access land<br>(Map SIG.11)        | Areas of access land with a Great Significance identified predominantly lie within the western boundary of the LDNP and northern areas of the Solway Coast AONB. Areas assessed with Significant effects generally lie adjacent to these areas with a small area also identified within Carnforth. Intermediate effects have been assessed predominately along the boundary of the North Pennines AONB, the Forest of Bowland AONB and the northern extent of the LDNP. No effects are noted to the access land around Kendal and Windermere and out towards the YDNP.                                           |
| Users of Long Distance Footpaths<br>(Map SIG.15) | Lengths of footpath identified with a Great Significance to large-scale vertical infrastructure are concentrated along the western coast, particularly lengths of route between Maryport and the Solway Coast, and a length between Ravensglass and Millom. Sections of route with a Significant effect are present within the Solway Coast AONB, along the western coast and around Barrow-in-Furness and Morecambe. Routes within the North Pennines AONB have been assessed as Intermediate along with other routes within the study area. A number of stretches have been assessed with no effects ("None"). |
| Users of Cycle routes<br>(Map SIG.19)            | A Great Significance of effect has been determined for stretches of cycle route located along the Solway Coast; short stretches around Barrow-in-Furness; around Ravensglass; near Cleaton Moor; near Fleetwood; near Broughton-in-Furness; Maryport; and near Cockermouth. A number of routes with a Significant effect assessed lie in the northern part of the study area around Carlisle, along the coast, and around Barrow-in-Furness and Fleetwood. The remainder of the routes with views of any vertical infrastructure have been assessed as Intermediate.                                             |
| Travellers on Roads<br>(Map SIG.23)              | Significant effects due to large-scale vertical infrastructure have been assessed along the lengths of road located within the area of land between the Solway Coast AONB and the LDNP. Lengths with Significant effect are also located between Ravensglass and Barrow-in-Furness. Lengths of road with Intermediate effects are predominately located along coastal areas, with other inland routes generally having a Not Significant effect recorded.                                                                                                                                                        |
| Travellers on Railways<br>(Map SIG.27)           | Significant effects due to large-scale vertical infrastructure are predominately concentrated on the western coast, with stretches identified at Fleetwood; Broughton-in Furness; Barrow-in-Furness;                                                                                                                                                                                                                                                                                                                                                                                                             |

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

| Visual Receptor                              | Significance of Visual Effect of large-scale vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | Ravenglass; Whitehaven; and a short stretch at Carlisle. Intermediate effects are also determined in these areas with other Intermediate effects identified around Carlisle and the North Pennines AONB. Other stretches have been assessed as Not Significant or None.                                                                                                                                                                                                                                                                                                                                                   |
| Users of Tourist Attractions<br>(Map SIG.31) | A small section within the Whinlatter Forest Park has been assessed with a Great Significance of effect to large-scale vertical infrastructure, with the remainder of the park ranging from Significant, Intermediate and no effect. Significant effect from large-scale vertical infrastructure have been assessed for the tourist attractions within Carlisle, Whitehaven and near Grange-over-Sands. The areas of the Leighton RSBP nature reserve adjacent to Morcambe Bay have also been assessed as Significant, with those further inland as Intermediate. Intermediate effects have been assessed within Penrith. |

#### Overall Significance of Effect on Visual Receptors

- 4.7.2 The significance of effect of small-scale, medium-scale and large-scale vertical infrastructure has been combined for each group of visual receptors to produce an overall significance of effect. This is detailed in the tables below and illustrated on the relevant maps indicated for each receptor in the table below:

**Table 4.10 Overall Significance of Effect on Visual Receptors**

| Visual Receptor                                          | Overall Significance of Visual Effect of vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents in and visitors to Settlements<br>(Map SIG.08) | Areas of Great Significance to all scales of vertical infrastructure have been assessed in the northern extent of the study area around Carlisle and the Solway Coast; along the western outskirts of the North Pennines AONB; at Ravenglass; and around Carnforth and Grange-over-Sands. Significant effects on settlements have also been assessed throughout the study area with a pattern emerging of Significant effects along the M6 corridor; the corridor between Whitehaven and Carlisle; and along the western coast. Settlements where Intermediate effects have been recorded are located throughout the study area. The only settlements identified with no effects are located in the LDNP; YDNP and North Pennines AONB. |
| Users of CROW/access land<br>(Map SIG.12)                | Access land with a Great significance of effect to all scales of vertical infrastructure is located throughout the study area, particularly areas within the Solway Coast AONB; LDNP; Forest of Bowland AONB; North Pennines AONB; YDNP; Arnsdale and Silverdale AONB. Areas with Significant effects are located in similar areas throughout the study area. The remaining areas where views of vertical infrastructure are visible have been assessed as Intermediate.                                                                                                                                                                                                                                                                |
| Users of Long                                            | Areas of route assessed with a Great Significance are located throughout the study area with sections located running east and west from Carlisle;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

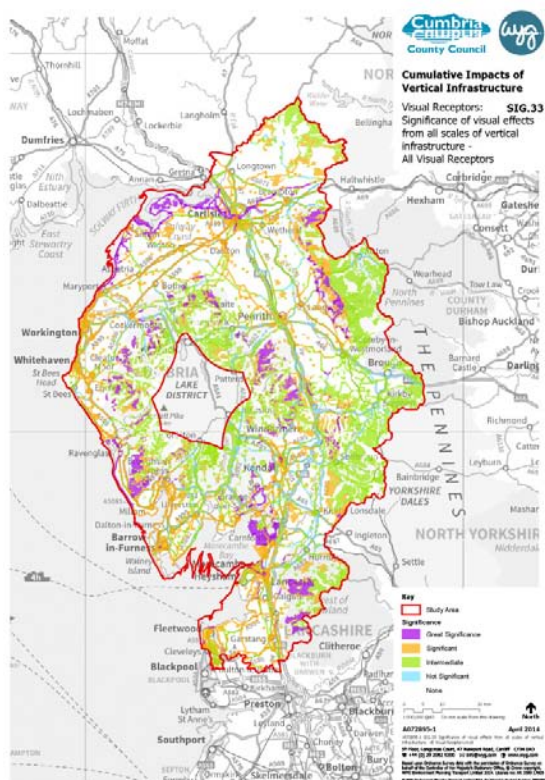
| Visual Receptor                              | Overall Significance of Visual Effect of vertical infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Distance Footpaths<br>(Map SIG.16)           | within the Solway Coast AONB; along the coast to Maryport; along the coast between Ravenglass and Millom; around Morecambe Bay; and along the western edge of the North Pennines AONB. Small sections of route assessed with a Great Significance of effect are also located throughout the study area. Areas of Significant effect are generally located along the coast, although some stretches are noted inland. Other lengths are assessed with an Intermediate significance, with no routes or route sections assessed as Not Significant, and only small stretches where None has been recorded.                                                                    |
| Users of Cycle routes<br>(Map SIG.20)        | Areas of route assessed with a Great Significance of effect are located throughout the study area, with longer stretches of route located around Carlisle and the Solway Coast AONB. Shorter stretches assessed with a Great Significance are located around Kendal; Carnforth; Morecambe; Haysham; Lancaster; Cockermouth; Cleaton Moor; Maryport; Longwathby; Brampton and Dalston. Other stretches of route have been assessed with a Significant and Intermediate Significance of effect with no areas assessed as Not significant where views of vertical infrastructure area available.                                                                              |
| Travellers on Roads<br>(Map SIG.24)          | Areas assessed with a Significant effect are predominately located in the corridor of land between Carlisle and Workington and along the coast. Short sections of Significant effects are also located throughout the study area. Areas assessed with an Intermediate Significance of effect are again located throughout the study area with areas assessed as Not Significant located towards the eastern extent of the study area.                                                                                                                                                                                                                                      |
| Travellers on Railways<br>(Map SIG.28)       | Lengths of route assessed with a Significant effect to all scales of vertical infrastructure run along the coast, notably around Fleetwood; around Morecambe Bay; from Barrow-in-Furness along the coast to Maryport and across to Carlisle. Inland routes with a Significant effect include stretches between Carlisle and Brough. Intermediate effects are noted on stretched north and south of Penrith; around Kendal; south of Lancaster; and north of Carlisle. Other stretches are predominately assessed as Not Significant, with only a few short lengths of route assessed as None.                                                                              |
| Users of Tourist Attractions<br>(Map SIG.32) | A Great Significance from scales of vertical infrastructure has been assessed for sections of the Leighton RSPB Nature reserve, with other sections assessed as Significant and Intermediate. A Great Significance has also been assessed for an area within the Whinlatter Forest Park, with other areas within the park assessed as Significant, Intermediate and with no effect. Other tourist attractions within the LDNP have generally been assessed as Intermediate, with attractions within and near the settlements of Carlisle, Penrith, Kendal, Whitehaven and Grange-over-Sands assessed with a Significant effect from all scales of vertical infrastructure. |

## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

#### Summary of Significance of effect on Visual Receptors

- 4.7.3 Map SIG.33 illustrates the Significance of visual effects from all scales of vertical infrastructure on all visual receptors. This combines all the visual effects on all the visual receptors of all scales of vertical infrastructure.
- 4.7.4 To summarise, Great Significant effects have been assessed around the Solway Coast, running between Maryport and Carlisle. Great Significant effects have also been assessed east of Carlisle; on coastal areas around Ravenglass to Millom; around Carnforth and Morecambe Bay; and around Fleetwood. Great Significant effects have been assessed on the outskirts of the LDNP; outskirts of the Forest of Bowland AONB; outskirts of the YDNP; outskirts of the North Pennines AONB; within the Arnside and Silverdale AONB; and within the Solway Coast AONB.



4-21 Overall significance of cumulative visual effects

4.7.5 Significant effects have been assessed throughout the study area cumulating in similar areas to areas of Great Significance covering a wider area, with a high concentration of Significant effects located along the western coast and in the corridor between Workington and Carlisle.

4.7.6 Intermediate and Not Significant effects are distributed throughout the study area, with very few receptors identified where no significant effects ("None") have been recorded.

#### 4.8 Ground Truthing

4.8.1 A ground truthing exercise has been carried out from specific viewpoints and is included in Appendix 3. This has been carried out from 52no. viewpoints throughout the study area to comment on significance of effect ratings assessed for the landscape area and visual receptors where appropriate to the location. For a number of the areas, the ground

truthing exercise confirms the assessment although it does highlight some areas for further discussion. The ground truthing exercise has been carried out from very specific viewpoints and from those viewpoints it is possible that there are some variations from the viewpoint assessment compared to the Study assessment for the overall landscape area or visual receptor groups. Where these have been identified, they are acknowledged in Appendix 3, but the assessment generated from the Study has not been amended at this stage as further work would be required to validate the statements for the wider area. The overall study has been carried out based on a bare earth analysis and assuming perfect visibility. The ground truthing exercise has been carried out during varied visibility conditions which partly accounts for the differences in the this and the

assessment, alongside the presence of vegetation and buildings within the landscape screening potential views.

- 4.8.2 The differences highlighted do however identify that more detailed work is required in these areas and should a vertical infrastructure development be proposed within the vicinity of the viewpoints, the variation to the significance suggested in the ground truthing exercise should be taken into consideration.



4-22 Vertical infrastructure in the view from A596 north-east of Prospect

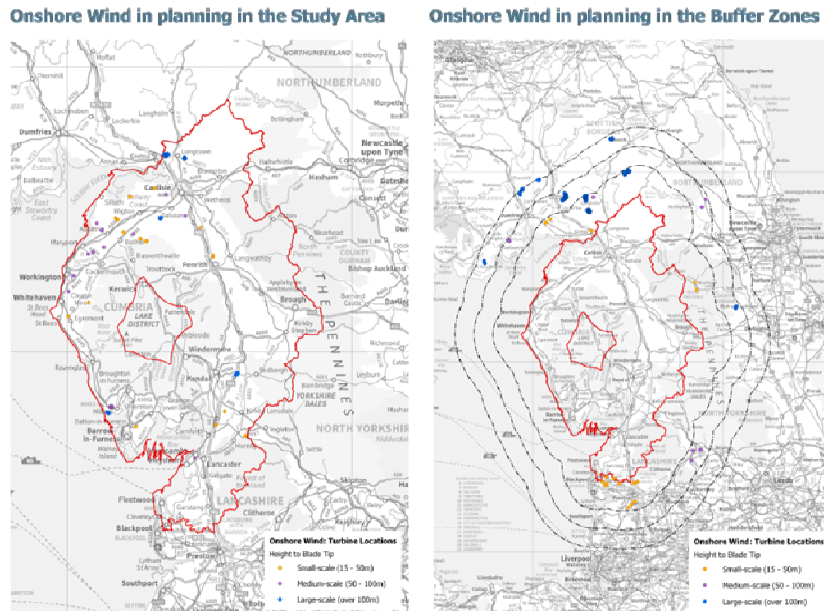
## 5. Schemes in the Planning Process and change through time

### 5.1 Schemes in the Planning Process

5.1.1 Schemes in the planning process that have not been consented could not be included in this assessment due to the level of uncertainty regarding them obtaining planning permission. This assessment is intended to aid in the guidance regarding the acceptability of such schemes, as discussed further in Section 6.

5.1.2 This section of the report discusses some of the known schemes in the planning process that have not yet been consented. These consist primarily of a number of on shore windfarm developments within and just outside the border of the study area and the following nationally significant infrastructure projects:

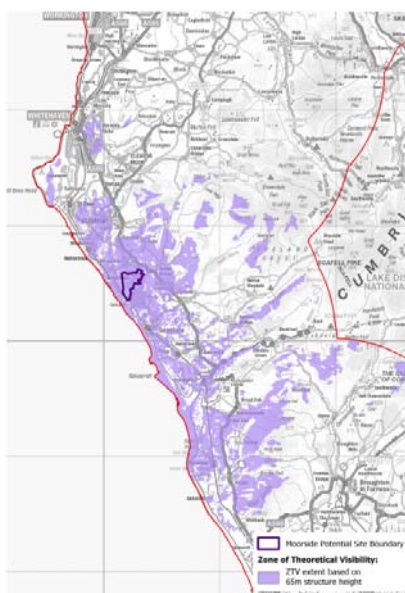
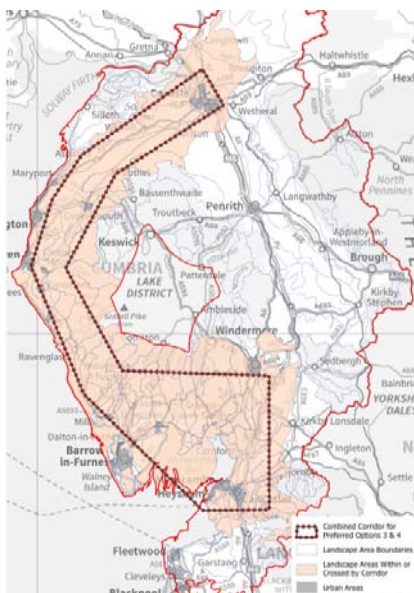
- The North West Coast Connections reinforcement works and route corridors (refer to [Map NSI.01](#)).
- the Moorside Nuclear Power Station (refer to [Map NSI.02](#)); and
- Walney off-shore wind farm extension (refer to [Map NSI.03](#)).



5-1 Wind developments in the planning process

5.1.3 [Maps VI.13 and VI.14](#) illustrate the onshore wind developments in the planning stage within the study area and within the buffer zone. The majority of the proposed wind farms are located in the north of the study area, along the A596/A595 route corridor between Carlisle and Whitehaven. These consist of all sizes of turbine. Other proposed onshore turbines are located along the M6 route corridor and around Millom and Barrow-in-Furness. Some large-scale

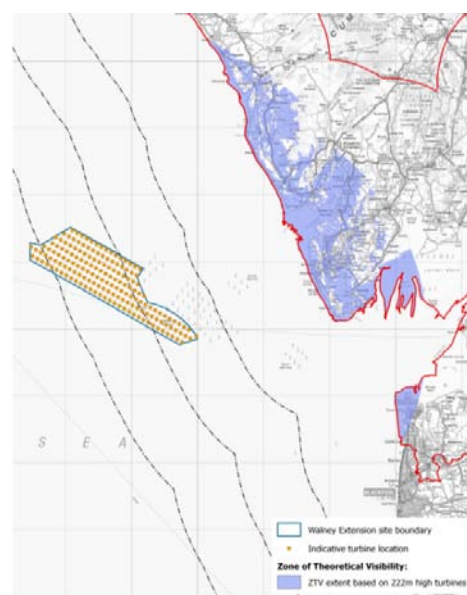
developments are also proposed around Longtown. Within the buffer zone, a number of large-scale turbines are proposed to the north of the study area within the Scottish Borders. A number of small-scale turbines are proposed south of the study area around Preston and Poulton-le-Fylde. Other schemes are proposed to the east in County Durham, Northumberland, and on the Lancashire, Bradford and North Yorkshire borders.



5.1.4 The route of the North West Coast Connections (NWCC) reinforcement works and route corridor has not been confirmed at the time of writing. The likely route corridor is illustrated on [Map NSI.01](#) and this has been used in order to provide some comment on its theoretical visibility in the surrounding area. By comparing this route to [Map ZTV.03](#), showing

the theoretical visibility of the existing electricity transmission infrastructure, it is evident that the NWCC will result in an intensification of theoretical views of vertical infrastructure along the coast, where a pattern was already beginning to emerge from existing infrastructure. An intensification will occur around Carlisle and the route corridor between Carlisle and Workington, where there already is a relatively high concentration of theoretical views of electricity transmission infrastructure.

- 5.1.5 A ZTV has been produced for Moorside Nuclear Power Station. As there is little detail currently available on these proposals the ZTV has been produced based on a typical layout of structures at 65m high (refer to [Map NSI.02](#)). The proposals are located north of Sellafield and the ZTV is shown to extend along the coast, from Whitehaven to Whitbeck. The ZTV is shown to extend inland and indicates the proposals could be visible from a number of hilltop summits within the LDNP. The areas illustrated with theoretical visibility of the proposals are in similar locations to those already experiencing theoretical visibility of on shore wind turbines. Should the scheme be consented it will result in an intensification of visibility of vertical infrastructure along this section of the coast and inland.



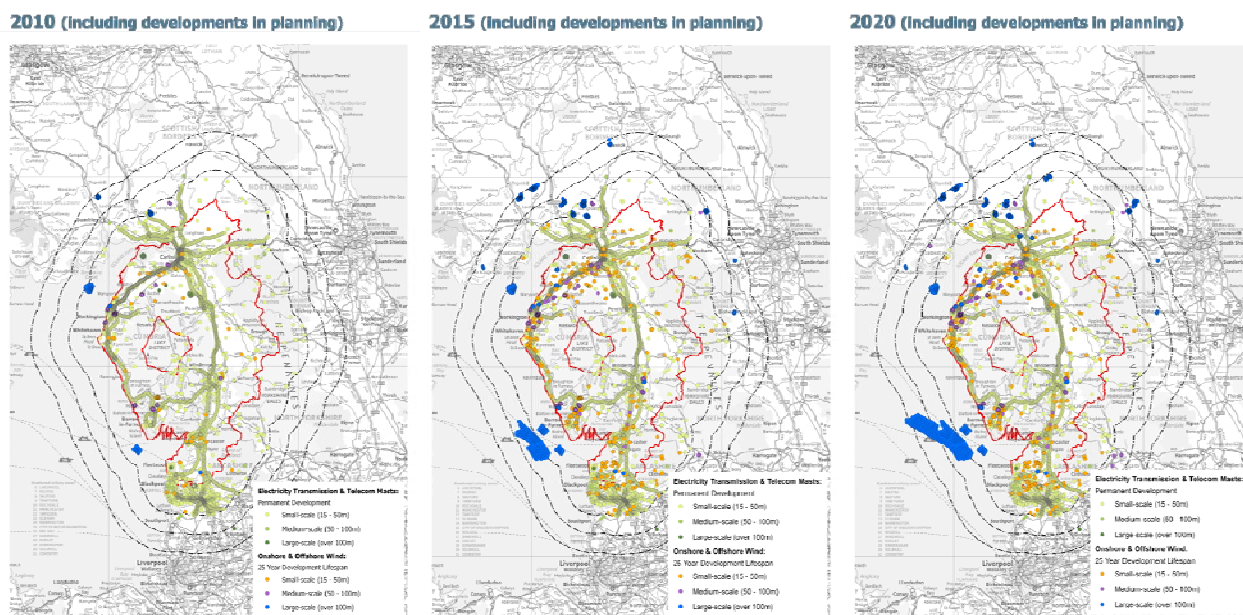
## Cumulative Impacts of Vertical Infrastructure

### Part 2: The Assessment

- 5.1.6 A ZTV has been produced for the proposed extension to Walney off-shore wind farm (refer to [Map NSI.03](#)). The proposed wind farm will consist of up to 207 turbines of 142-222m height. The ZTV has been calculated based on a layout similar to the existing Walney 1 and 2 wind farms and with the maximum turbine height of 222m. The ZTV stretches along the coast from Sellafeld, across the Duddon Channel to Walney Island, and across Morecambe Bay to Fleetwood. The ZTV follows a similar pattern to the ZTV of the existing off-shore wind farms in the area. Should the Walney Extension be approved, the ZTVs illustrate it would result in an intensification of visible off-shore wind farms along this section of the coastline.

## 5.2 Potential changes in the landscape and visual amenity over time

- 5.2.1 [Maps TMP.01 to TMP.06](#) illustrate the anticipated temporal effect of vertical infrastructure development on the study area over a time period from 2010 to 2020, at 5 year period intervals. These have been produced both excluding developments currently in planning ([Maps TMP.01 to TMP.03](#)) and including developments currently in planning (TMP.04-TMP.06). The plans have been calculated by, in most cases, using consent +1 year for the small & medium-scale vertical infrastructure and single turbines and consent +2 years for the large-scale vertical infrastructure and wind farms to allow for some delays that may occur due to the discharge of planning conditions and other issues.



5-2 Change in distribution of vertical infrastructure over time

- 5.2.2 By reviewing the distribution plans (excluding developments in the planning process) the following observations can be made :
- From 2010 to 2015 there is an increase in offshore wind farm development with the large wind farm at Walney constructed south west of Walney Island. There is an increase in on shore wind farm development with all scales of wind farm development indicated throughout the study area, notably within the corridor between Workington and Carlisle; the corridor

between Penrith and Carlisle; the corridor between Kendal and Lancaster; around the coast near Fleetwood; around the coast and inland around Barrow-in-Furness; and along the coast. There is also a notable increase in wind farms within the buffer areas, particularly to the south east and the north; and

- Between 2015 and 2020 a large-scale wind farm development is shown to the west of Morpeth, Ray Estate.

## 6. Conclusion

- 6.1.1 From a detailed analysis of the landscape and visual aspects of the study area, it is clear that Cumbria and Lancashire have valued landscape areas and visual receptors that are currently being affected by the vertical infrastructure in place and due to be constructed. A concentration of effects is evident in a number of areas throughout the counties, along the western coast and Solway coast, notably an area within the Solway Coast AONB where Great Significance of cumulative effect due to large-scale vertical infrastructure has been identified adjacent to areas with Significant cumulative effect. Other areas where a concentration of cumulative effects is evident are along the corridor of land along the route of the M6, and along the corridor of land between Carlisle and Workington.
- 6.1.2 Future proposals are likely to intensify these effects and future major infrastructure developments may result in more areas of the counties experiencing Significant and Great Significance effects on the landscape and visual receptors.
- 6.1.3 The use of this document as a basis for future decision making and the application of the Guidance within it is intended to inform decisions about the effects different scales and extents of vertical infrastructure development may have in different parts of the counties, to reduce and, in the long term, aid in the avoidance of Significant and Great significance effects.
- 6.1.4 Due to the nature of these schemes and the temporary (although long term) duration of some structures, this assessment represents a snap shot in time and should be updated on a regular basis to incorporate schemes that have received planning permission; schemes that have been removed; new developments; and changes to landscape designations.
- 6.1.5 Additional sets of receptors may be included, for example tourists attractions not currently taken into account by CIVI, as data for them become available, or the areas of access land beyond those designated under the CROW Act, or other receptors important in particular localities. The CIVI GIS provides tools which can be applied to added receptor groups and for added developments. The key to its continuing relevance and value to decision making will be maintenance and updating of the GIS.
- 6.1.6 The GIS is at the heart of the CIVI assessment and, through updating, will represent the most up-to-date information, superseding the “paper reports”. The process of assembling the baseline data for the Study has generated a consistently tabulated set of the information in all the landscape character assessments within the study area, enabling consistent judgements to be made across the study area. The LCA Tables have been extended to include the outcomes of the assessment, the sensitivity to the different scales of vertical infrastructure, the magnitude of change at each scale and the resultant significance of existing cumulative effects on the landscape in each area.
- 6.1.7 In conclusion, CIVI provides a wealth of information and brings together a large amount of data about the landscape and the places where people may be enjoying views of the landscape in the study area. The CIVI assessment provides a valuable baseline with which to evaluate



development proposals for further vertical infrastructure development and a resource to support decision-making about such development proposals.





## Appendices





## **Appendix A: References & Bibliography**



## References & Bibliography

- Natural England, National Landscape Character Areas<sup>16</sup>
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- Chris Blandford Associates (2009) Forest of Bowland Area of Outstanding Natural Beauty: Landscape Character Assessment;

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<sup>16</sup> <http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/northwest.aspx>





## **Appendix B: Report Conditions**





## **Cumulative Impacts of Vertical Infrastructure**

This report is produced solely for the benefit of **Cumbria County Council** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed by us in writing.

This report is prepared for the proposed uses stated in the report and should not be relied upon for other purposes unless specifically agreed by us in writing. In time technological advances, improved practices, fresh information or amended legislation may necessitate a re-assessment. Opinions and information provided in this report are on the basis of WYG using reasonable skill and care in the preparation of the report.

This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

This report is limited to those aspects reported on, within the scope and limits agreed with the client under our appointment. It is necessarily restricted and no liability is accepted for any other aspect. It is based on the information sources indicated in the report. Some of the opinions are based on unconfirmed data and information and are presented accordingly within the scope for this report.

Reliance has been placed on the documents and information supplied to WYG by others, no independent verification of these has been made by WYG and no warranty is given on them. No liability is accepted or warranty given in relation to the performance, reliability, standing etc of any products, services, organisations or companies referred to in this report.

Whilst reasonable skill and care have been used, no investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal, budget and weather related conditions.

Although care is taken to select monitoring and survey periods that are typical of the environmental conditions being measured, within the overall reporting programme constraints, measured conditions may not be fully representative of the actual conditions. Any predictive or modelling work, undertaken as part of the commission will be subject to limitations including the representativeness of data used by the model and the assumptions inherent within the approach used. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions.

The potential influence of our assessment and report on other aspects of any development or future planning requires evaluation by other involved parties.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. WYG accept no liability for issues with performance arising from such factors.

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WYG Environment Planning Transport Ltd