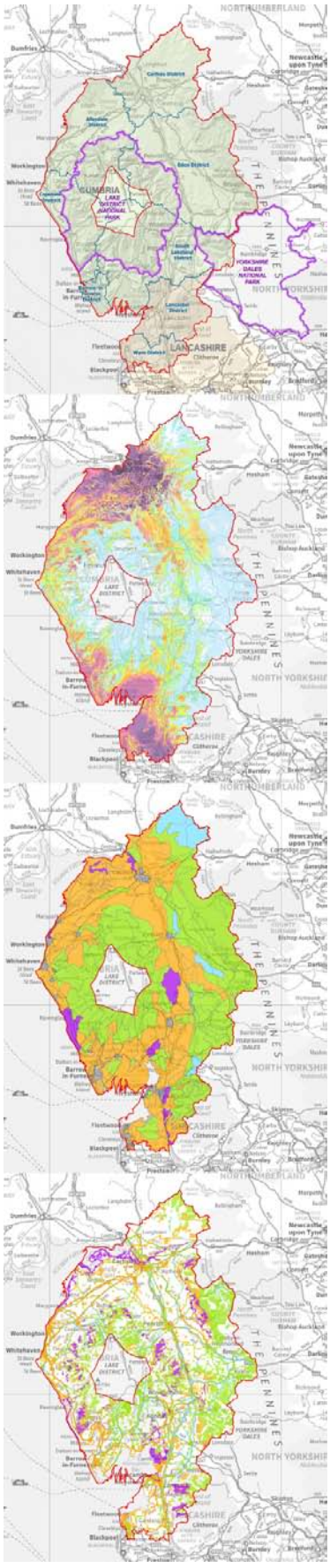
Cumbria County Council

Cumulative Impacts of Vertical Infrastructure:

Appendix 1: GIS Technical Report

WYG/A072895-1/October 2014



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This report has been prepared by WYG for **Cumbria County Council** and their partners.

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1. Overview and Summary of the Assessment of the Cumulative Effects of Vertical Infrastructure (CIVI)

1.1 Introduction and Background

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.

1.1.1 This area is subject to increasing pressure to accommodate energy and communications related infrastructure – most notably wind turbines and the National Grid North West Coast Connections (NWCC) project. This development can by its nature result in significant impacts upon landscape character and visual amenity, both individually and cumulatively.

1.1.2 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. That requires a 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.

1.2 What is the purpose of the CIVI Study?

1.2.1 In 2013, WYG were commissioned by Cumbria County Council, with their partners Lancashire County Council, the Lake District National Park Authority, Carlisle City Council and Allerdale Borough Council, to undertake a piece of work which would build upon existing local landscape character guidance, following industry standard best practice approaches, specifically to consider the cumulative impact of vertical infrastructure upon the landscape character and visual amenity in Cumbria and North Lancashire.

1.2.2 The Cumbria Wind Energy Supplementary Planning Document[1] (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. This study addresses the cumulative effect of "vertical infrastructure" on the landscape character and visual amenity of Cumbria and adjacent areas of Lancashire arising from the growth in such structures to date and anticipated further growth into the future. The vertical infrastructure considered in this study is

[1] Cumbria County Council (2007) (addendum January and October 2008) Cumbria Wind Energy Supplementary Planning Document

development characterised by vertical elements, such as wind turbines, communications masts, or pylons carrying power lines.

1.2.3 The study considers the sensitivity of the landscape within the study area and the sensitivity of the people who use that landscape to changes arising from vertical infrastructure developments, and how the existing and approved schemes affect the character of the landscape and the views experienced by people who use it.

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.

2. The use of GIS within the Study

2.1 What is GIS

2.1.1 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"[2].

2.1.2 GIS is:

- Used to map, view, query, interpret, and visualise data in many ways that reveal relationships, patterns, and trends
- Used to build models of real-world scenarios
- Especially suited to working with large amounts of data and over wide geographic areas.

2.2 GIS and the CIVI Study

2.2.1 GIS is fundamental to the Study underpinning the collection, capture and storage of vertical infrastructure and contextual data; calculating the Zones of Theoretical Visibility and automating the combination of ZTVs 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; assessing the spatial interaction of landscape category and susceptibility to define the sensitivity of receptors; calculating the magnitude of landscape and visual change; and combining receptor sensitivity and magnitude of change to provide an assessment of significance of effects.

2.3 GIS and other software used

2.3.1 ESRI ArcGIS 10 software has been used throughout for all mapping, data collation and spatial analysis. The 3d Analyst extension to ArcGIS has been employed to create the map of landscape category, calculate the Zone of Theoretical Visibility (ZTV) maps and to combine ZTVs into Cumulative ZTV maps.

2.3.2 Geoprocessing models have been setup using ModelBuilder in ArcGIS to automate tasks wherever possible, including:

- Creating feature classes and assigning field definitions
- Generation of ZTVs and CZTVs
- Landscape categorisation

[2] Environmental Systems Research Institute (ESRI)

- Determining magnitude of change for landscape and visual receptors

2.3.3 AutoCAD Map3D has been used for data conversion and the digitising of some features. Microsoft Excel has been employed extensively for formatting data received in tabular format, the preparation of the Landscape Character Tables, the creation of lookup tables to facilitate analyses and for various calculations.

2.3.4 All maps have been exported to PDF from ArcGIS and optimized for viewing and printing using Adobe Acrobat Professional.

3. Data collection

3.1 Acknowledgements

3.1.1 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 District Council
- Carlisle District Council
- Copeland District Council
- Eden District Council
- Lancaster District Council
- Wyre District Council

3.1.2 A complete list of data providers is included as Appendix A.

3.2 Data Sources

3.2.1 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, OFCOM, developers, and others as listed in Appendix A. The district and county local authorities have provided data relating to existing infrastructure and proposed developments currently within the planning system.

Landscape Character Assessments

3.2.2 The baseline for the assessment used existing landscape character assessments as detailed below:

- Natural England, National Landscape Character Areas (http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/northwest.aspx)[3];
- Cumbria County Council (2007) Cumbria Wind Energy Supplementary Planning Document: Part 1 (including addendum January and October 2008) (http://www.cumbria.gov.uk/planning-environment/renewable-energy/windEnergy.asp);

[3] Links to assessments valid at 29/08/14

- Coates Associates (2007) Cumbria Wind Energy Supplementary Planning Document: Part 2 Landscape and Visual Considerations (http://www.cumbria.gov.uk/planning-environment/renewable-energy/windEnergy.asp);
- Cumbria County Council (2003) Technical Paper 5: Landscape Character, Cumbria and Lake District Joint Structure Plan 2001-2016 (http://www.planningcumbria.org/eLibrary/Content/Internet/538/755/1599/2318/2323/38520131637.pdf);
- 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 (http://www.planningcumbria.org/eLibrary/Content/Internet/538/755/1599/2318/2323/38520131750.pdf);
- Cumbria County Council (2011) Cumbria Landscape Character Guidance and Toolkit: Part 1 Landscape Character Guidance (http://www.cumbria.gov.uk/planning-environment/countryside/countryside-landscape/land/landcharacter.asp);
- Cumbria County Council (2011) Cumbria Landscape Character Guidance and Toolkit: Part 2 Landscape Character Toolkit (http://www.cumbria.gov.uk/planning-environment/countryside/countryside-landscape/land/landcharacter.asp;
- 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) http://www.lakedistrict.gov.uk/caringfor/policies/lca);
- Yorkshire Dales National Park Authority (2001) Yorkshire Dales National Park Landscape Character Assessment (http://www.yorkshiredales.org.uk/specialplace/specialquality-landscape/characteroflandscape);
- Land Use Consultants (2010) The Solway Coast Area of Outstanding Natural Beauty Landscape and Seascape Character Assessment (http://www.allerdale.gov.uk/downloads/Solway_Coast_AONB_-_Landscape_Character_Assessment.pdf);
- Lovejoy (2005) Landscape Sensitivity to Wind Energy Developments in Lancashire (http://new.lancashire.gov.uk/media/152752/Wind-Energy-Development.pdf);
- Environmental Resources Management (2000) A Landscape Strategy for Lancashire: Landscape Character Assessment (http://new.lancashire.gov.uk/media/152746/characterassesment.pdf);
- Environmental Resources Management (2000) A Landscape Strategy for Lancashire: Landscape Strategy (http://new.lancashire.gov.uk/media/152743/strategy.pdf);
- Chris Blandford Associates (2009) Forest of Bowland Area of Outstanding Natural Beauty: Landscape Character Assessment (http://new.lancashire.gov.uk/media/152746/characterassesment.pdf)

3.2.3 Landscape Character Assessments are in preparation for the Arnside and Silverdale AONB and the North Pennines AONB. These were not available at the time of carrying out the Study.

3.2.4 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 as detailed in Appendix A.

3.3 Datasets used in the study

3.3.1 Datasets were collected relevant to the following themes:

- Ordnance Survey Base mapping
- Landscape Character
- Landscape Designations and Policies
- Cultural Landscape Designations
- Biodiversity Designations
- Access and Recreation
- Visual Receptors
- Vertical Infrastructure

3.3.2 A schedule of all datasets received was maintained in Microsoft Excel and updated upon receipt of any data to include details of the supplier, version date and other appropriate information. A compact version of the schedule of datasets used is included as Appendix B.

4. Data standards

4.1 Data format and conversion

4.1.1 Data for the study has been provided and collected in a number of formats including:

- ESRI Geodatabase
- ESRI Shapefile
- MapInfo TAB
- MapInfo MID/MIF
- AutoCAD DWG
- Geographic Markup Language – GML, GZ
- Raster datasets – ESRI GRID and Raster Catalogs
- Raster imagery – TIFF, JPEG
- Web Feature Service
- Google Earth - KML, KMZ
- Microsoft Access - MDB
- Microsoft Excel – XLS, XLSX
- Text formats including ASCII and CSV

4.1.2 Each of the datasets provided was subject to a brief check for issues relating to georeferencing, missing attribute data, and incomplete coverage across the study area. A series of thematic ArcGIS map documents (mxd files) was created in order to map and review the many datasets received.

4.1.3 In order to use the data in the study it has been necessary to convert and process the collected datasets as follows:

- All vector datasets were converted to Geodatabase Feature Classes
- Feature Datasets (a collection of Feature Classes) were created for related data, e.g. onshore wind developments, telecommunication masts and transmitters
- Tabular data was formatted to ArcGIS conventions (field names without spaces or special characters, cell formats as numeric or string) and saved as tables within a Geodatabase
- Raster image tiles were checked for correct georeferencing
- Spatial and attribute indices were added to large datasets to facilitate use

4.1.4 All raster outputs from the analyses have been stored in ESRI GRID format with a 50m grid resolution.

4.2 Coordinate system

4.2.1 All spatial datasets used or created during the course of the study have been stored in a Transverse Mercator projection in Ordnance Survey 1936 British National Grid coordinates .Data

received in WGS 1984 projection has been re-projected to British National Grid coordinates using the 7 parameter "OSGB_1936_To_WGS_1984_NGA_7PAR" transformation.

4.3 Spatial resolution

4.3.1 The Study uses numerous datasets which have been captured at a range of scales; from 6 figure grid references for turbine locations and telecommunication masts locations identified from OS MasterMap, to 50 metre gridded DTM data and designations and policy data captured against 1:50,000 base maps.

4.3.2 Data capture specifically undertaken for the Study includes:

- Digitising Long Distance Footpaths from OS 1:50,000 raster maps
- Digitising a limited number of point locations for vertical infrastructure from aerial photography
- Digitising point locations for tourist attractions from OS MasterMap and raster maps

4.3.3 The spatial resolution of the study is defined as 50m (equivalent to the resolution of the DTM) and it is recommended that the Study outputs are not analysed at a scale greater than 1:50,000.

4.4 Metadata

4.4.1 Datasets provided with the report are complete with metadata to the latest UK Gemini 2.2 standard, to facilitate the future use of the datasets and satisfy the requirements of the 2007 INSPIRE[4] directive.

[4] Infrastructure for Spatial Information in Europe (INSPIRE) Directive

5. Defining the Study Area

5.1.1 The extent of the Study Area is defined by the combined area of:

- Cumbria County Council including the Districts of Allerdale, Barrow-in-Furness, Carlisle, Copeland, Eden, and South Lakeland.
- The area of the Lake District National Park Authority within a 12km buffer from its boundary
- The area of the Yorkshire Dales National Park Authority within Cumbria County
- The Lancashire districts of Lancaster and Wyre

OS Boundary-Line and Natural England's National Parks datasets were combined to create the GIS polygon representing the Study Area as shown on Map SA.01.

5.1.2 Buffer zones from the study area were generated at 15km, 25km and 35km intervals (Map SA.02). These represented the area of search for vertical infrastructure according to the height criteria included in Table 6.1.

5.1.3 A further 29 LPAs are located within or partly within the buffer zones and for which vertical infrastructure data was collected:

- Dumfries and Galloway
- Scottish Borders
- Northumberland
- Northumberland National Park
- Gateshead District
- County Durham
- Darlington
- Richmondshire District
- Harrogate District
- Craven District
- Bradford District
- Ribble Valley District
- Pendle District
- Calderdale District
- Burnley District
- Rossendale District
- Hyndburn District
- Blackburn with Darwen
- Bury District
- Preston District
- South Ribble District
- Chorley District
- Bolton District
- Wigan District
- St. Helens District
- West Lancashire District
- Sefton District
- Fylde District
- Blackpool

6. Mapping Vertical Infrastructure

6.1 Developments considered

6.1.1 Developments considered within the study include both existing and proposed developments. Proposed developments included in the detailed analyses and assessment were limited to those that had already received planning permission (consented) at the time of writing the study.

6.1.2 Data has been collected for the following types of vertical infrastructure and shown on Maps VI.01 to VI.15:

- Onshore wind turbines;
- Offshore wind turbines;
- Electricity transmission towers (pylons); and
- Mobile phone, radio and television transmitters, or other communications masts.

6.1.3 The study defines three scales of vertical infrastructure based upon height; large-scale, medium-scale, and small-scale. Small-scale structures are considered as from 15m up to 50m in height; medium-scale structures as 51m-100m; and large-scale structures as over 100m.

6.1.4 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. Low voltage electricity transmission lines (11kV and 33kV) on wooden poles have been excluded from the study as these structures are generally below the 15m height threshold.

6.1.5 Stacks and chimneys associated with power generation and distribution were originally considered to be included within the assessment. However, due to lack of available data these elements have had to be excluded from this study. These types of structures are not identified consistently on OS Mastermap and height data is not readily available.

6.1.6 Developments in the planning system but not yet consented are not included in the main analyses and assessment; however, they are discussed and analysed to some extent in the Main Report and include the following:

- Onshore wind turbine developments - submitted applications in the study area and buffer zones;
- Walney Extension offshore wind farm;
- the Moorside Nuclear Power Station; and
- The North West Coast Connections reinforcement works and route corridors.

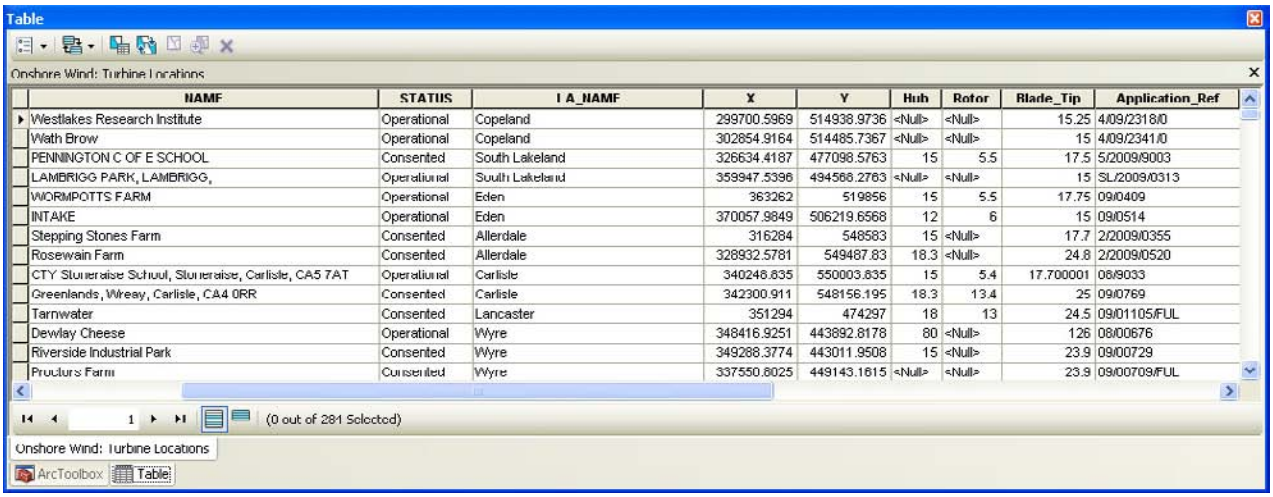
6.1.7 Developments which are at the scoping or screening stage of the planning process have also been excluded, due to the limited level of information available with regards the proposed layout and structure heights.

6.2 Vertical infrastructure database

6.2.1 Data for the developments (proposed and existing) was collated as point feature classes in a vertical infrastructure geodatabase in GIS, including 6-figure OS grid references for the location of each structure and the height of the structure in metres above ground level.

6.2.2 For onshore and offshore wind developments the following information was also collated as attribute data in the database:

- Development name or address
- Current status: Operational, Under-Construction, Consented or Submitted Planning Application
- Relevant Local Planning Authority
- Planning application reference
- Year of application
- Year of planning consent
- Year the development commenced operating
- Hub and blade-tip height, and rotor diameter of wind turbines



NAME	STATUS	LA_NAME	X	Y	Hub	Rotor	Blade_Tip	Application_Ref
Westlakes Research Institute	Operational	Copeland	299700.5969	514938.9736	<Null>	<Null>	15.25	4/09/2318/0
Wath Brow	Operational	Copeland	302854.9164	514485.7367	<Null>	<Null>	15	4/09/2341/0
PENNINGTON C OF E SCHOOL	Consented	South Lakeland	326634.4187	477098.5763	15	5.5	17.5	5/2009/9003
LAMBRIGG PARK, LAMBRIGG,	Operational	South Lakeland	359947.5396	494566.2763	<Null>	<Null>	15	SL/2009/0313
WORMPOTTS FARM	Operational	Eden	363262	519856	15	5.5	17.75	09/0409
INTAKE	Operational	Eden	370057.9849	506219.6568	12	6	15	09/0514
Stepping Stones Farm	Consented	Allerdale	316284	548583	15	<Null>	17.7	2/2009/0355
Rosewain Farm	Consented	Allerdale	328932.5781	549487.83	18.3	<Null>	24.8	2/2009/0520
CTY Stanwaise School, Stanwaise, Carlisle, CA5 7AT	Operational	Carlisle	340248.835	550003.835	15	5.4	17.700001	08/9033
Greenlands, Wreay, Carlisle, CA4 0RR	Consented	Carlisle	342300.911	548156.195	18.3	13.4	25	09/0769
Tarnwater	Consented	Lancaster	351294	474297	18	13	24.5	09/01105/FUL
Dewlay Cheese	Operational	Wyre	348416.9251	443892.8178	80	<Null>	126	08/00676
Riverside Industrial Park	Consented	Wyre	349288.3774	443011.9508	15	<Null>	23.9	09/00729
Proctors Farm	Consented	Wyre	337550.8025	449143.1615	<Null>	<Null>	23.9	09/00709/FUL

5-1 Extract from database of onshore wind developments

6.2.3 For electrical transmission towers the pylon model and voltage of the associated powerline was also collated as attributes.

6.2.4 Once the database had been assembled, a preliminary sift was carried out to exclude structures that did not meet the height/distance thresholds as set out in Table 5.1.

Table 5.1 Scale and Distance Criteria for Vertical Elements

Height of vertical element (m)	Scale of infrastructure	Maximum distance (km) from study area boundary
15 to 50	Small-scale	15

Height of vertical element (m)	Scale of infrastructure	Maximum distance (km) from study area boundary
51-100	Medium-scale	25
Over 100	Large-scale	35

Structures which did not satisfy the inclusion criteria were identified by overlaying the study area and buffer zone polygons on the vertical infrastructure point datasets and running a combination of location and SQL (Structured Query Language) queries to filter out structures which were too small or too distant.

6.2.5 With regards the data collated for telecommunications masts, it was evident that there were several incidences of structures that were geographically coincident, i.e. a number of telecommunications transmitters which are located at different heights on a larger telecommunications mast and share the same OS 6 figure grid reference. In these instances, only the largest structure height (i.e. the main mast) was used in the calculation of the ZTVs.

6.3 Limitations and Assumptions

6.3.1 For developments where location coordinates for the proposed structures are not stated explicitly in the planning application, grid references have been derived from development layout plans and, in a small number of cases (mostly domestic scale wind turbines), the structure location has been assumed to be at the centroid of the development boundary. In those instances where location coordinates for developments have been provided by a LPA, it has been assumed that these are correct.

6.3.2 Given the extent of the study area and the number of vertical structures considered, it has not been possible to validate the location of all features or the attribute data associated with the features. Where possible, checks have been made against OS base mapping and recent aerial photography but it is possible that errors are present. Additionally, discrepancies for the location of structures were found between datasets received from different sources. Further, the micro-siting of onshore wind turbines (generally within 50m of the permitted location) introduces a potential error of ±50m for the location of turbines. Consequently, data validation is recommended as an important element in the ongoing maintenance of the vertical infrastructure database.

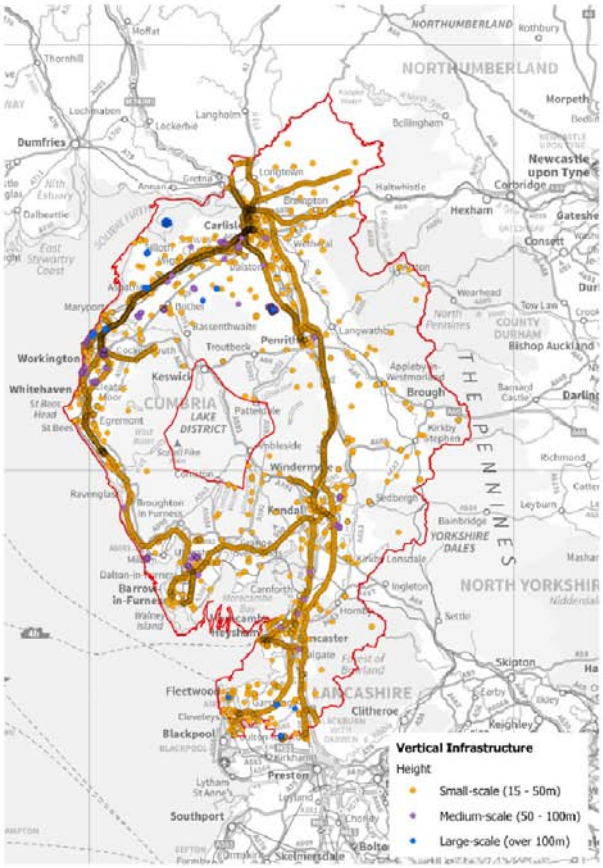
6.3.3 For some of the smaller domestic wind turbines, the planning application does not explicitly state the dimensions of the proposed turbine. In these instances the dimensions have been assumed based on the generating capacity stated in the application.

6.3.4 For all National Grid pylons, the model of the pylon (but not the height of the structure) is stated in the National Grid dataset. The study assumes the pylon height is the nominal standard height for the model and does not take into account the use of height extensions or reductions for particular pylons. With regards pylons on the local distributor network, the pylon height has been assumed as a standard height for the operating voltage (mostly 132kV) of the associated line.

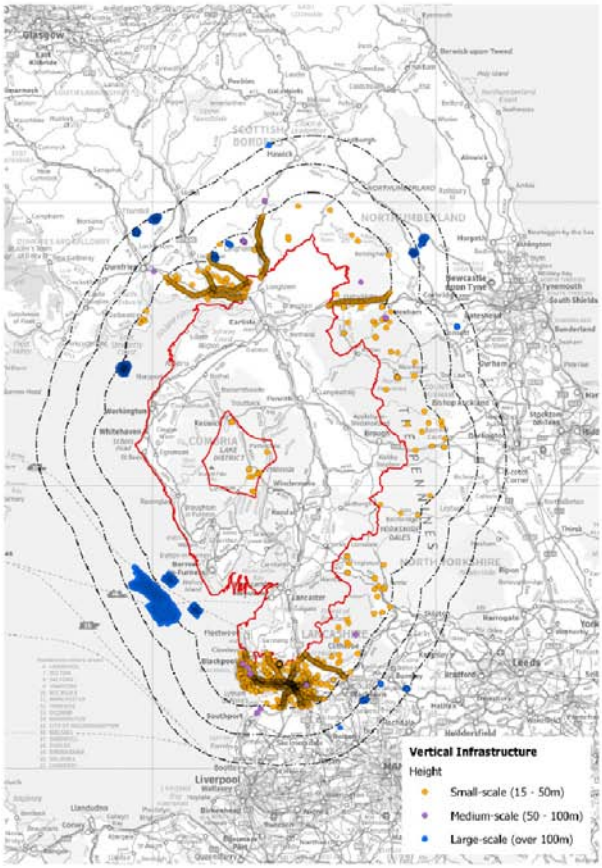
6.3.5 Vertical infrastructure data for the Study was collected during the period September 2013 to February 2014. Updates to the data collected at the start of the study were undertaken where possible in February 2014. However, there is a potential that some development proposals submitted in late 2013 and early 2014 have been omitted from the database.

6.3.6 The recording of proposals for vertical infrastructure was found to be inconsistent across LPAs. The majority of LPAs maintained schedules of existing and proposed wind energy development proposals but not all could readily identify proposals for telecommunication masts. Consequently, it is likely that some existing and proposed masts have been omitted from the database.

Vertical Infrastructure in the Study Area



Vertical Infrastructure in the Buffer Zones



5-2 Vertical infrastructure recorded in the CIVI database

7. Mapping Landscape Areas

7.1.1 The Landscape Character Assessments and corresponding datasets 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.

Maps LCA.01 to LCA.07 illustrate the extent of these assessments within the study area and the classifications used.

7.1.2 Some assessments classified areas of landscape according to the landscape type represented, some of which were sub-divided (as in Cumbria) into sub-types. Other assessments identified landscape character areas as geographically unique areas, while the landscape types or sub-types could occur in several different geographic locations. Further, the following character assessments overlap; Cumbria and Lake District National Park, Cumbria and Solway Coast AONB, Lancashire and Forest of Bowland AONB. The following table outlines the classifications used by the assessments:

Table 6.1 Landscape Character Assessment Classifications

Landscape Character Assessment	Classification Units
Cumbria	Landscape Types; Landscape Sub-Types
Lancashire	Landscape Types; Landscape Character Areas
Lake District National Park	Landscape Types; Landscape Sub-Types; Areas of Distinctive Character
Yorkshire Dales National Park	Landscape Character Areas
Solway Coast AONB	Landscape Character Types; Landscape Character Areas
Forest of Bowland AONB	Landscape Character Types; Landscape Character Areas

7.1.3 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. In order to create a continuous non-overlapping polygon dataset the Cumbria sub-type areas were clipped to exclude the area covered by the Solway AONB Landscape Character Areas and Lake District National Park Areas of Distinctive Character, and the Lancashire Landscape Character Areas were clipped to exclude the area covered by the Forest of Bowland AONB Landscape Character Areas.

7.1.4 Each distinct polygon or "landscape area" was assigned a unique identifier code which takes the form of a geographical abbreviation plus a reference which links back to the source assessment. The following abbreviations for the geographical areas were used:

- Cumbria – CCC
- Lancashire – LCC
- Lake District National Park – LDNP
- Yorkshire Dales National Park – YDNP
- Solway Coast AONB – SC
- Forest of Bowland AONB – FOB

For example, the assessment for the Solway Coast AONB identifies landscape character area G1 Allonby; the corresponding polygon in the GIS layer of landscape areas has been assigned the unique identifier SC-G1. The Cumbria sub-type 1a Intertidal Flats occurs in 4 geographically separate locations and is represented by polygons CCC-1a-1, CCC-1a-2, CCC-1a-3 and CCC-1a-4 respectively in the landscape areas layer. The landscape areas are shown on Map LCA.08.

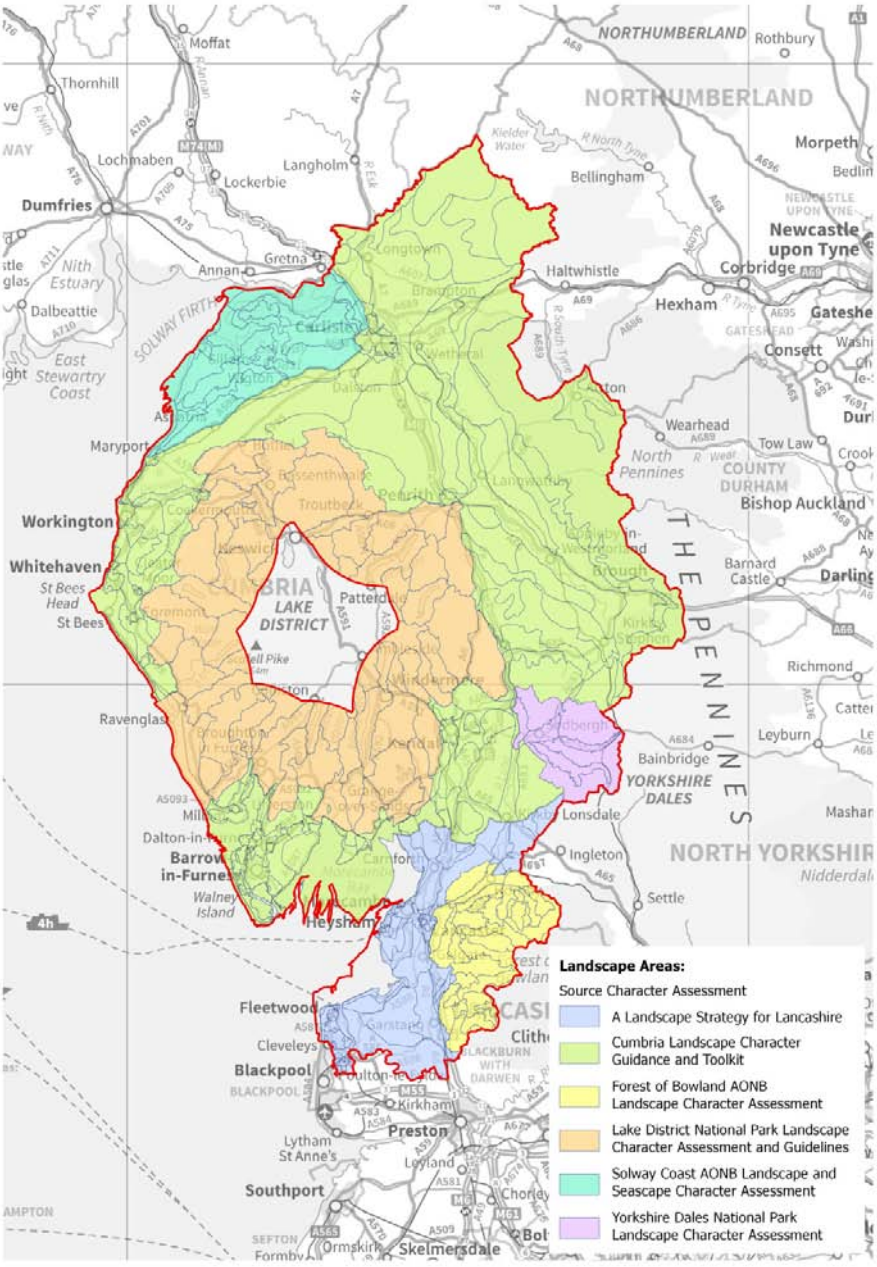
7.1.5 The areas identified as urban in the landscape character assessments (and in general are not afforded the same detailed assessment as the non-urban landscape character areas) are included in the landscape areas dataset for completeness but are not assigned a unique identifier. These areas are considered in detail under the settlements grouping of visual receptors.

7.1.6 Combining the various landscape character assessment polygons into a single GIS layer resulted in the creation of a number of "sliver" polygons (small, narrow polygons along the borders of larger polygons), occurring at the join between two assessments. The larger of these slivers have been included in the full assessment and given an appropriate unique identifier. The smaller slivers are excluded from the assessment but included in the landscape areas dataset for completeness; these smaller areas have not been assigned a unique identifier.

7.1.7 The elements of the landscape character type/sub type/area descriptions relevant to the CIVI study are summarised in the set of Landscape Character Assessment Tables. Information was collated from the assessments in a consistent format under the following headings for each landscape area where available and relevant:

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

A concise version of these tables was compiled in Excel and linked to the GIS polygons by the unique identifier codes using a table join.



6-1 Landscape Areas and source Character Assessments

8. Mapping Visual Receptors

8.1.1 The following groups of visual receptors are considered in the study and are shown on Maps VR.01 to VR.07:

- People in settlements
- Users of CROW access land
- Users of long distance footpaths
- Users of cycle routes
- Travellers along roads;
- Railway travellers; and
- Visitors to tourist attractions

Settlements

8.1.2 Settlements have been mapped from settlement boundary datasets provided by the LPAs, supplemented with urban areas as identified on the OS Meridian dataset "Developed Land Use Area". In total, 694 settlements have been identified within the study area boundary; these are shown on Map VR.01 and listed in Appendix C.

CROW Access Land

8.1.3 Land designated under the Countryside and Rights of Way Act 2000 has been mapped from the Natural England All Areas Access Layer GIS dataset. The dataset includes Open Country, Registered Common Land and all CROW s16 dedicated land with areas of Section 28 restrictions, military byelaw, race courses and aerodromes removed. The study area includes over 2100km^2 of designated CROW Access Land as shown on Map VR.02.

Long distance footpaths

8.1.4 Long distance footpaths and promoted walking routes within the study area are shown on Map VR.03 and include the following:

- National Trails, mapped from the Natural England dataset:
  Hadrian's Wall Path
  Pennine Bridleway
  Pennine Way
- Other long distance footpaths, digitised from Ordnance Survey 50k raster tiles (using local rights of way network datasets where coincident):
  Cumbria Way
  Dales Way
  Lancashire Coastal Way
  Wyre Way
- Promoted walking routes, as identified on tourism websites and digitised from route maps:
  A Dales High way
  Allerdale Ramble
  Cistercian Way

Coast to Coast Walk
Cumbria Coastal Way
Isaac's Tea Trail
Lancaster Canal Walk
Pennine Journey
St Bega's Way

Cycle routes

8.1.5 Cycle routes considered in the Study are shown on Map VR.04 and include:

- National Cycle Network, Regional Routes and links from SUSTRANS dataset
- National Byway and Local Cycle Routes from data provided by LPAs

Roads

8.1.6 The study considers travellers on the following classes of road:

- Motorways;
- Primary routes (trunk roads);
- A roads; and
- B roads.

The road network included in the study is extracted from OS VectorMap District data and route numbers are shown on Map VR.05.

Railways

8.1.7 Railway lines included are those within the National Rail Network, the Blackpool to Fleetwood Tramway and the following heritage (tourist) railways (as shown on Map VR.06):

- Eden Valley Railway
- Lakeside and Haverthwaite Railway
- Ravenglass and Eskdale Railway
- South Tynedale Railway
- Railway at Threkeld Quarry and Mining Museum

Route data is extracted from OS VectorMap District data.

Tourist Attractions

8.1.8 The tourist attractions considered (as shown on Map VR.07) are those identified in the following lists and are located within the study area:

- Cumbria Top 20 Visitor Attractions 2013 by visitor numbers[5]

[5] Source: Cumbria Tourism - Visitor Attractions Monitor 2013

- Visits to tourist attractions in Lancashire 2012/13[6]

Heritage railways which are included on these lists are considered under the railways grouping. The list of attractions considered includes:

- Brockhole, Lake District National Park Centre
- Carlisle Castle
- Carlisle Cathedral
- Grizedale Forest Park
- Hill Top (the home of Beatrix Potter)
- Holker Hall
- Leighton Moss RSPB Reserve
- Rheged Centre, Redhills
- Sizergh Castle
- The Beacon, Whitehaven
- The World of Beatrix Potter
- Ullswater Steamers
- Whinlatter Forest Park & Visitor Centre
- Windermere Lake Cruises
- Wray Castle

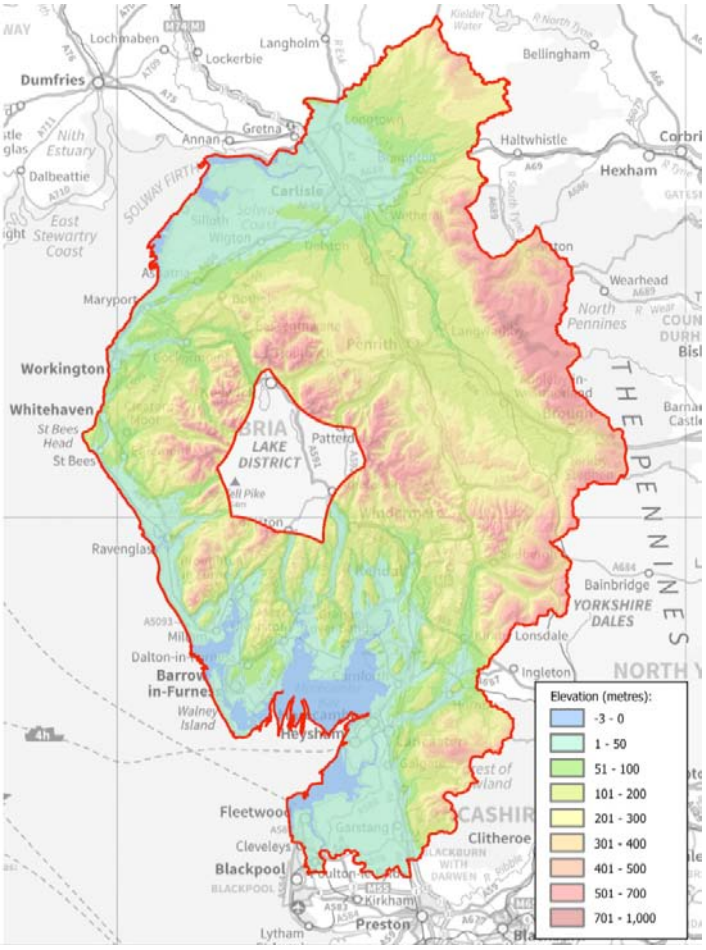
8.1.9 The locations of tourist attractions have been mapped in GIS with reference to OS Street View raster maps, OS VectorMap District data, the Country Parks dataset supplied by Natural England, and the RSPB dataset of its reserves. In the case of lake cruises on Windermere and Ullswater, the entire lake has been mapped as the location of the receptors.

6 Source: Regional Attractions Survey; Visit Britain – Survey of Visits to Visitor Attractions

9. Zone of Theoretical Visibility Calculation

9.1 Digital Terrain Model

9.1.1 A Digital Terrain Model (DTM) was compiled from Ordnance Survey OS Terrain™ 50 data in ASCII grid format for the full extent of the study area and the buffer zones. With regards accuracy of the DTM, the Root Mean Square Error (RMSE) for OS Terrain 50 is 4m based on a comparison of the data against GPS readings.[7] The DTM for the extent of the study area is shown below:



8-1 Topography of the Study Area

[7] OS Terrain 50 User guide and technical specification http://www.ordnancesurvey.co.uk/docs/user-guides/os-terrain-50-user-guide.pdf

9.2 ZTV parameters and calculation

9.2.1 A Zone of Theoretical Visibility (ZTV) was generated using the Viewshed tool in ArcGIS 3D Analyst for each wind turbine, pylon, telecommunication mast or other vertical element. 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:[8,9]

Table 8.1 ZTV Distances for Various Heights of Vertical Elements

Height of vertical element (m)	Scale of infrastructure	ZTV distance (km)
up to 50	Small-scale	15
51-100	Medium-scale	25
Over 100	Large-scale	35

9.2.2 In general, the offshore wind turbines all 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 landscape 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.

9.2.3 For all ZTVs the viewer height was set at 1.5m above the ground level of the DTM and correction for the curvature of the earth was applied with a refractivity coefficient of 0.13.

9.2.4 Each ZTV was output in ESRI GRID format with a 50m grid cell resolution equivalent to that of the underlying DTM data and with the value of each grid cell equal to the number of structures theoretically visible within the extent of the grid cell.

9.2.5 Cumulative ZTVs were created using a combination of the Viewshed, Reclassify and Raster Math tools in 3d Analyst. For presentation on Maps ZTV.01 to ZTV.08, the ZTVs have been clipped to the study area boundary. Values contained in the cumulative ZTV rasters represent the number of structures visible from a grid cell rather than the number of developments visible.

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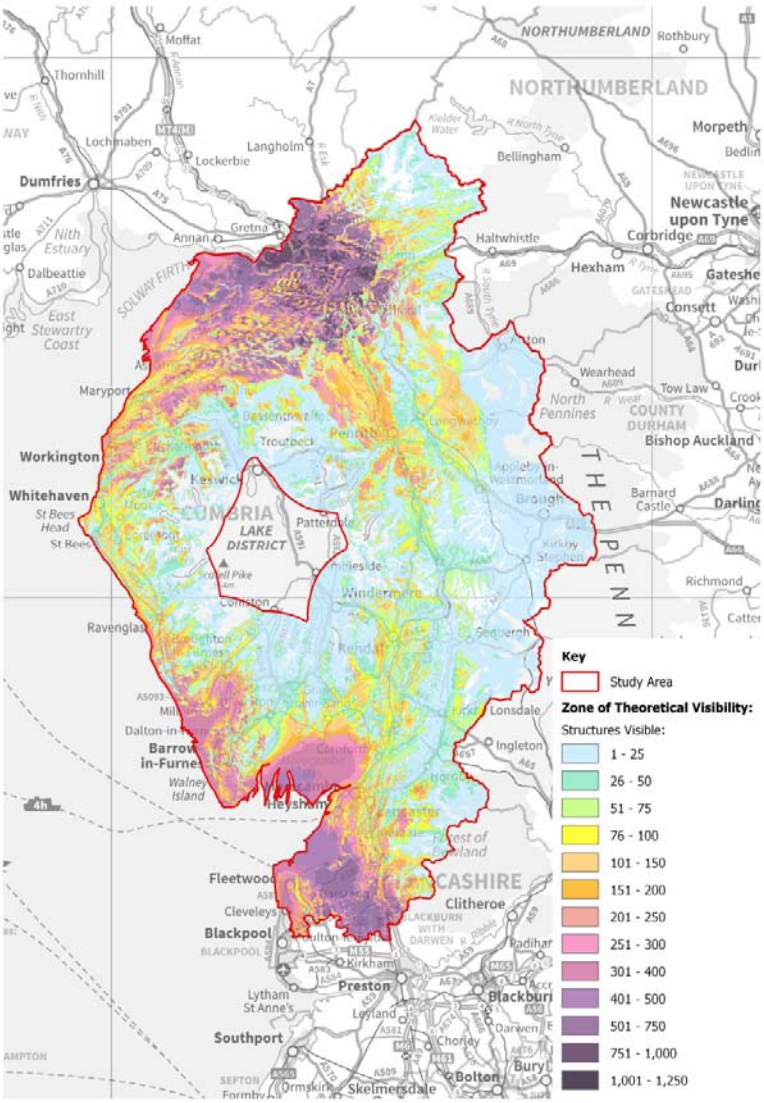
8 Adapted from Table 2 of Horner+Maclennan & Envision, Visual Representation of Windfarms Good Practice Guidance, Scottish Natural Heritage, 2006

9 Paragraph 53 of the latest SNH guidance (Visual Representation of Windfarms Version 2, Scottish Natural Heritage, July 2014), published after the analysis for this study had been undertaken, includes a revised table of recommended ZTV extents with a ZTV distance of 30km recommended for turbines 86-100m high, 35km recommended for turbines 101-130m high and 45km recommended for turbines over 150m



8-2 Cumulative ZTV of all vertical infrastructure (excluding developments at the planning stage)

9.3 ZTV limitations

9.3.1 Because the computer generated ZTV is based on the existing landform only 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. The ZTVs therefore represent a worst case scenario of visibility.

10. Category, Susceptibility and Sensitivity

10.1 Landscape Category

10.1.1 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;
- 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.

10.1.2 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. Each indicator of landscape category was attributed a weighting of 1 to 5 according to its relative importance; a weighting of 5 represents the most important.

Table 9.1 Indicators of Landscape Category and weightings

Category	Indicator	Weighting
Landscape designation	National Park	5
	National Park Variation	4
	AONB	4
	Heritage Coast	3
Landscape policy area	Limestone Pavement	1
	Other local policies	1
Cultural landscape designation	World Heritage Site	3
	Historic Park & Garden	3
	Registered Battlefield	3
	Conservation Area	3
	Scheduled Monument	1
	Listed Building	1
Biodiversity designation	International designation (SAC, RAMSAR, or SPA)	2
	National designation (SSSI)	1
Recreation interest	CROW Land	1
	National Trail	3
	Long distance Footpath	2

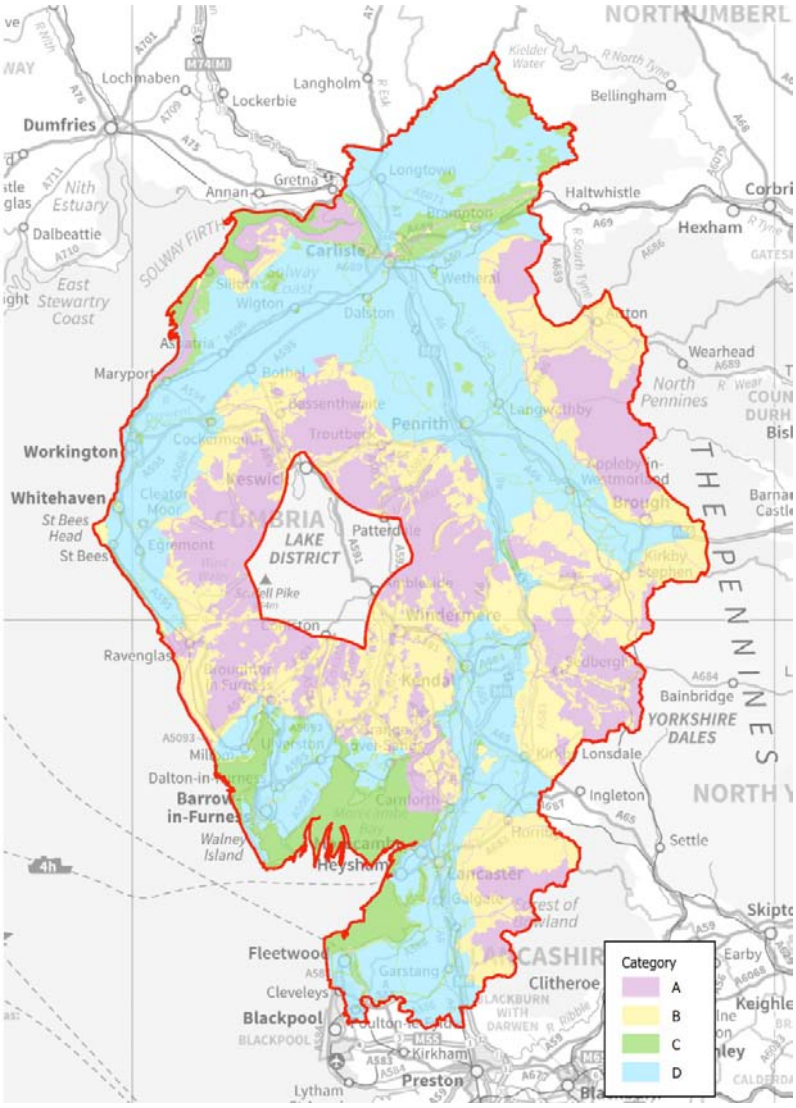
Category	Indicator	Weighting
	Promoted Walking Route	1
	National Cycle Route	3
	Regional Cycle Route	2
	Local Cycle route	1
	Country Park	1
	Canal	1

10.1.3 Listed buildings have been included only where there is a concentration of 10 or more listed buildings in a 1km x 1km grid square. With regards biodiversity, nationally designated sites have been included only where they lie outside internationally designated sites; i.e. a site covered by several biodiversity designations (e.g. SPA, SAC and SSSI) is counted once and for the highest level of designation present (international or national).

10.1.4 Each indicator was mapped as a raster layer in GIS and added together with weightings applied to produce a landscape category raster with 50m grid resolution. Scores in the resulting raster range from 0 (no indicators present) to 20 (several indicators present). Four landscape categories were defined (A – D), with corresponding scores as follows:

Table 9.2 Indicators of Landscape Category and weightings

Score Range	Landscape Category
6 or more	A
4 or 5	B
2 or3	C
0 or 1	D



9-1 Landscape Category of the Study Area

10.1.5 A vector version of the landscape category raster was created in order to allow overlay analysis with the landscape areas and visual receptor feature classes.

10.1.6 For the landscape areas, an average landscape category score for each landscape area was calculated by:

- Intersecting the landscape area polygons with the landscape category polygons;
- For each resultant polygon, multiplying the area in m^2 of the polygon by the category score of the polygon
- Summing these values for each landscape area
- Divide this total by the area in m^2 of the landscape area polygon to give an average landscape category score
- Round the score to the nearest whole number
- Assign the landscape category A-D as per this value

10.1.7 The landscape category for the visual receptors was assigned by intersecting the visual receptor feature class with the landscape category feature class. For the settlements the same procedure was used to calculate an average score for landscape category as for the landscape areas. For the remaining visual receptors, the landscape category is determined directly from the intersected polygons.

10.2 Susceptibility

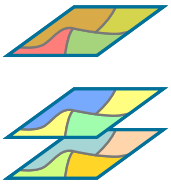
10.2.1 The susceptibility of each landscape area to each of the three-scales of vertical infrastructure was determined with reference to the relevant landscape character assessment and graded High, Moderate or Slight. This information was included as three fields in the landscape area tables which were linked to the landscape area polygons.

10.2.2 The susceptibility of the 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. A Susceptibility field was created in the attribute table for each type of receptor and the following grades assigned:

- 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; and
- Visitors to tourist attractions - High susceptibility.

10.3 Sensitivity

10.3.1 **GLVIA3**[10] 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. This study uses GIS to assess the sensitivity of both landscape and visual receptors based on the spatial interaction of susceptibility and category.



9-2 Spatial interaction of Landscape Category and Susceptibility to derive Sensitivity

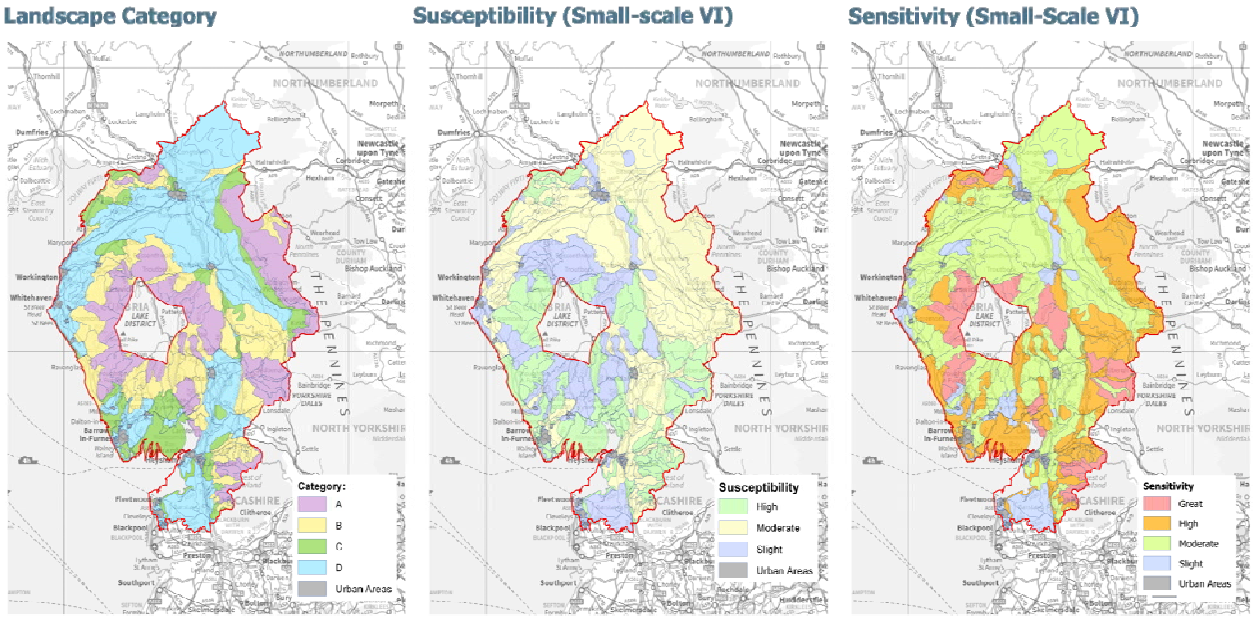
[10] Guidelines for Landscape and Visual Impact Assessment 3rd Edition published by The Landscape Institute and the Institute of Environmental Management & Assessment in April 2013

10.3.2 The following matrix was used to determine the sensitivity from the combination of category and susceptibility:

Table 9.3 Matrix for assessing Landscape and Visual Sensitivity

	Landscape category			
Susceptibility	**A**	**B**	**C**	**D**
High	Great	High	High	High
Moderate	High	High	Moderate	Moderate
Slight	Moderate	Moderate	Slight	Slight

10.3.3 A table join was used with a lookup matrix to automatically fill in the sensitivity fields for the landscape areas and visual receptors. There are three sensitivity fields for each landscape area, one per scale of vertical infrastructure, and one sensitivity field for each visual receptor.



9-3 Landscape Category, with Susceptibility and Sensitivity maps (for small-scale vertical infrastructure)

11. Assessing magnitude of change

11.1 Landscape areas

Magnitude of direct landscape change

11.1.1 Direct magnitude of change was defined as the magnitude of change resulting from the presence of vertical infrastructure within a landscape area. The GIS calculation for direct change is derived from:

1. the scale of the vertical infrastructure present, defined from the cumulative height of the infrastructure within the landscape area, and
2. the geographic extent from the density of the infrastructure present in the landscape area.

11.1.2 For each of the three scales of vertical infrastructure, the point locations of all structures of that scale were overlaid on the landscape area polygons. A Spatial Join was used to count the number of structures present within each landscape area and to calculate the total height of those structures.

11.1.3 For each landscape area, density was calculated for each of the three scales of vertical infrastructure by dividing the count of structures within the landscape area by the area in km^2 of the landscape area.

11.1.4 These two measures were then combined by multiplying the cumulative height by the density, and classifying the resultant scores as follows:

Table 10.1 Magnitude of direct landscape change: small-scale vertical infrastructure

Cumualtive Height x Density	Direct Magnitude
>500	Large
>50 and ≤500	Medium
>0 and ≤50	Small
0	None

Table 10.2 Magnitude of direct landscape change: medium-scale vertical infrastructure

Cumualtive Height x Density	Direct Magnitude
>1000	Large
>100 and ≤1000	Medium
>0 and ≤100	Small
0	None

Table 10.3 Magnitude of direct landscape change: large-scale vertical infrastructure

Cumualtive Height x Density	Direct Magnitude
>1500	Large
>150 and ≤1500	Medium
>0 and ≤150	Small
0	None

Magnitude of indirect landscape change

11.1.5 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,

11.1.6 For each scale of vertical infrastructure, the following process was used to calculate an averaged visibility score to define the magnitude of indirect landscape change:

- Convert the cumulative ZTV from a raster grid to a polygon feature class;
- Intersect the landscape area polygons with the cumulative ZTV polygons;
- For each resultant polygon, multiply the area in m^2 of the polygon by the visibility score of the polygon;
- Sum these values for each landscape area;
- Divide this total by the area in m^2 of the landscape area polygon to give an average visibility score for the landscape area, and;
- Assign the magnitude of indirect landscape change using the following classification:

Table 10.4 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

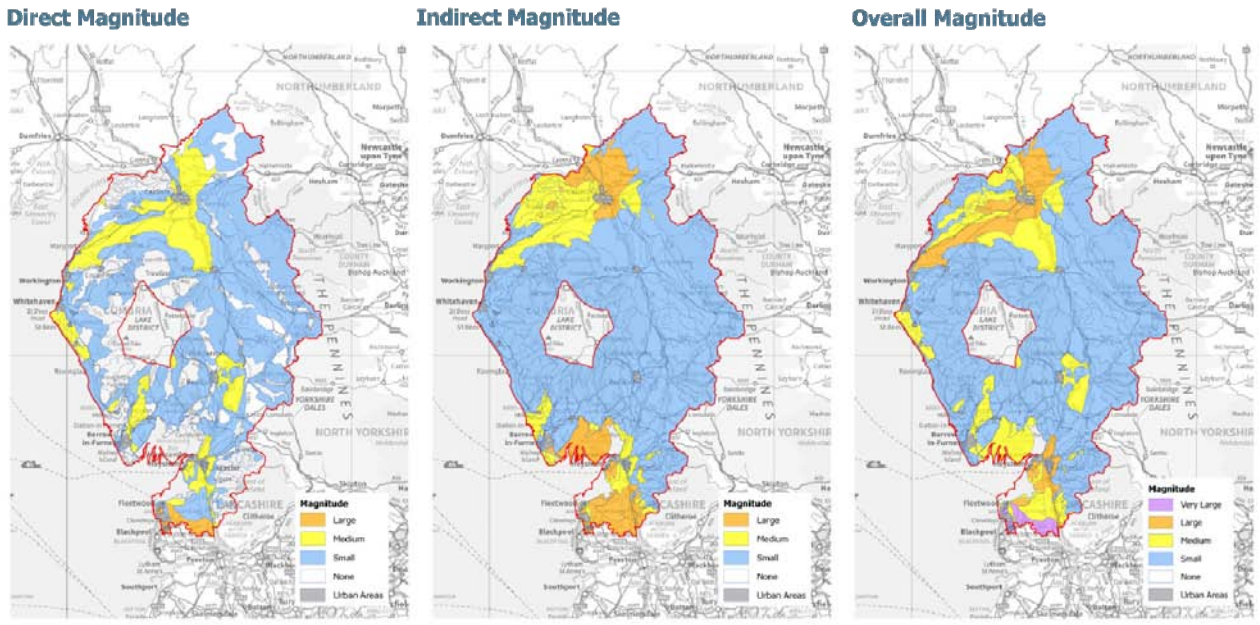
Overall magnitude of change

11.1.7 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 10.5 Matrix for assessing Magnitude of Cumulative 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

11.1.8 A table join was used with a lookup matrix to automatically complete the overall magnitude of change fields for the landscape areas.



10-1 Combination of Direct Magnitude and Indirect magnitude to derive Overall Magnitude

11.2 Visual Receptors

Magnitude of Cumulative Visual Change

11.2.1 The Magnitude of Cumulative Visual Change for the visual receptors was determined by intersecting the relevant visual receptor GIS layer with the cumulative ZTV. The same definitions of “Many, Some, Few” are used as for indirect landscape change, as per the following table.

Table 10.6 Criteria for assessing Magnitude of Cumulative Visual 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

11.2.2 For settlements the same procedure was used to calculate an average score for visibility as for the landscape areas. For the remaining visual receptors, the magnitude of cumulative visual change for each scale of vertical infrastructure is assigned using the following process:

- Reclassify the cumulative ZTV raster into 4 classes of visibility as per Table 10.6
- Convert the reclassified cumulative ZTV from a raster grid to a polygon feature class;
- Intersect the visual receptor feature class with the cumulative ZTV polygons

12. Significance of cumulative effects

12.1 Landscape areas

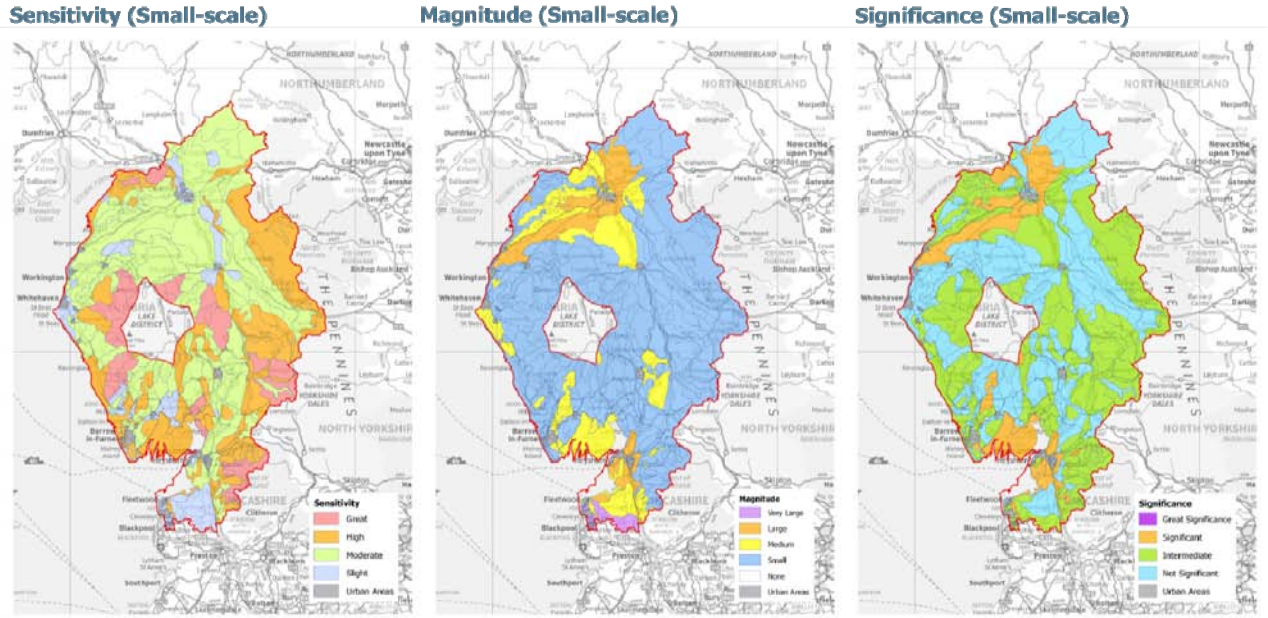
12.1.1 Final conclusions about significance relate the separate judgements about sensitivity of the receptors and magnitude of the changes combined, to judge whether the effect is significant or not.

12.1.2 The following matrix has been used in GIS to determine the significance of the effect of the cumulative developments at each scale on the landscape character of each landscape area by combining the magnitude of change and sensitivity of the landscape receptor:

Table 11.1 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

12.1.3 A table join was used with a lookup matrix to automatically complete the significance of landscape effects fields for the landscape areas.



11-1 Spatial interaction of Sensitivity and Magnitude to derive Significance of

12.2 Visual receptors

12.2.1 The following matrix has been used in GIS to determine the significance of visual effects of the cumulative developments, combining the magnitude of change and sensitivity of the visual receptor:

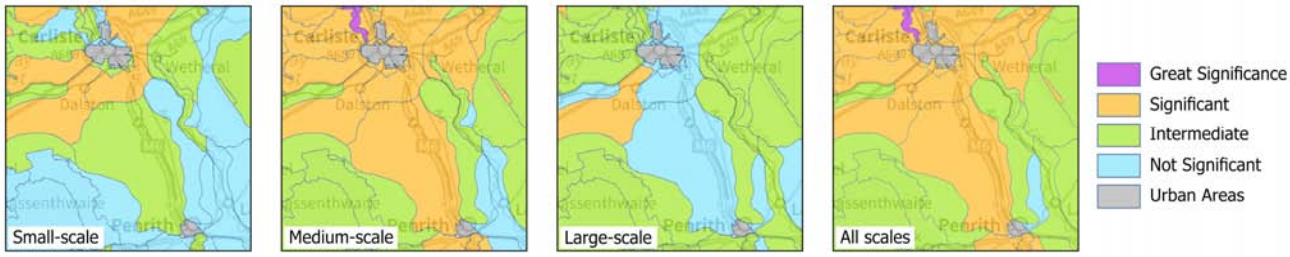
Table 11.2 Matrix for assessment of Significance of visual effects

	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

12.2.2 A table join was used with a lookup matrix to automatically complete the significance of visual effects fields for the visual receptor feature classes.

12.3 Significance of cumulative effects for all scales of vertical infrastructure

12.3.1 The significance of effects for the three scales of vertical infrastructure have been combined to provide an overall assessment of significance for all scales of vertical infrastructure. For both landscape areas and visual receptors, the highest level of significance across the three-scales takes precedence as shown in 11-2 below:



11-2 Determining Significance of cumulative effects for all scales of vertical infrastructure

13. Mapping Vertical Infrastructure through Time

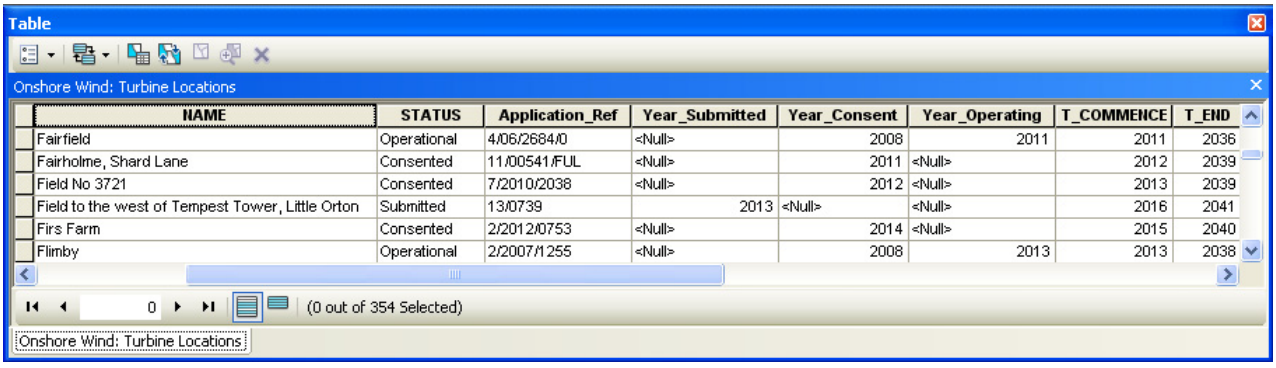
13.1.1 Temporal maps are included in the study to illustrate the pattern of vertical infrastructure developments through the period 2010 to 2020. Two sets of temporal maps have been created; the first illustrating developments which are currently operational, under-construction or with planning consent, and a second set of maps which also include developments submitted for planning.

13.1.2 All vertical infrastructure developments in the study are considered to be either:

- Permanent development – electricity transmission infrastructure, telecommunication masts and transmitters; or
- Temporary development – onshore and offshore wind turbines with a 25 year development lifespan

13.1.3 Operational start dates for wind energy developments were collected as part of the data collation phase of the study. This information was stored in the **Year_Operating** field in the attribute data table. In addition, data for the year planning consent was granted (**Year_Consented**) was gathered for those schemes which are not yet operational. Similarly, data for the year the application was submitted (**Year_Submitted**) was gathered for those developments in the planning process that have not yet been determined.

13.1.4 Two attribute fields have been created to store the operating start (**T_COMMENCE**) and end (**T_END**) dates for all wind energy developments, where the end date is equal to the start date plus 25 years.



NAME	STATUS	Application_Ref	Year_Submitted	Year_Consent	Year_Operating	T_COMMENCE	T_END
Fairfield	Operational	4/06/2684/0	<Null>	2008	2011	2011	2036
Fairholme, Shard Lane	Consented	11/00541/FUL	<Null>	2011	<Null>	2012	2039
Field No 3721	Consented	7/2010/2038	<Null>	2012	<Null>	2013	2039
Field to the west of Tempest Tower, Little Orton	Submitted	13/0739	2013	<Null>	<Null>	2016	2041
Firs Farm	Consented	2/2012/0753	<Null>	2014	<Null>	2015	2040
Flimby	Operational	2/2007/1255	<Null>	2008	2013	2013	2038

12-1 Extract from GIS database showing temporal attribute fields

13.1.5 The following assumptions have been made to assign notional operational start dates for those developments which are not currently operational; with regards consented developments:

- If known, the operational start date is set to that stated on the developer's website
- For small-scale and medium-scale single or pairs of turbines, a notional operational start date has been assumed to be one year after consent was granted.

- For large-scale turbines, and medium-scale and large-scale windfarms, the notional operational start date has been assumed as two-years after consent was granted.
- If the above rules give a start date of 2014 or earlier the notional start date has been set to 2015.

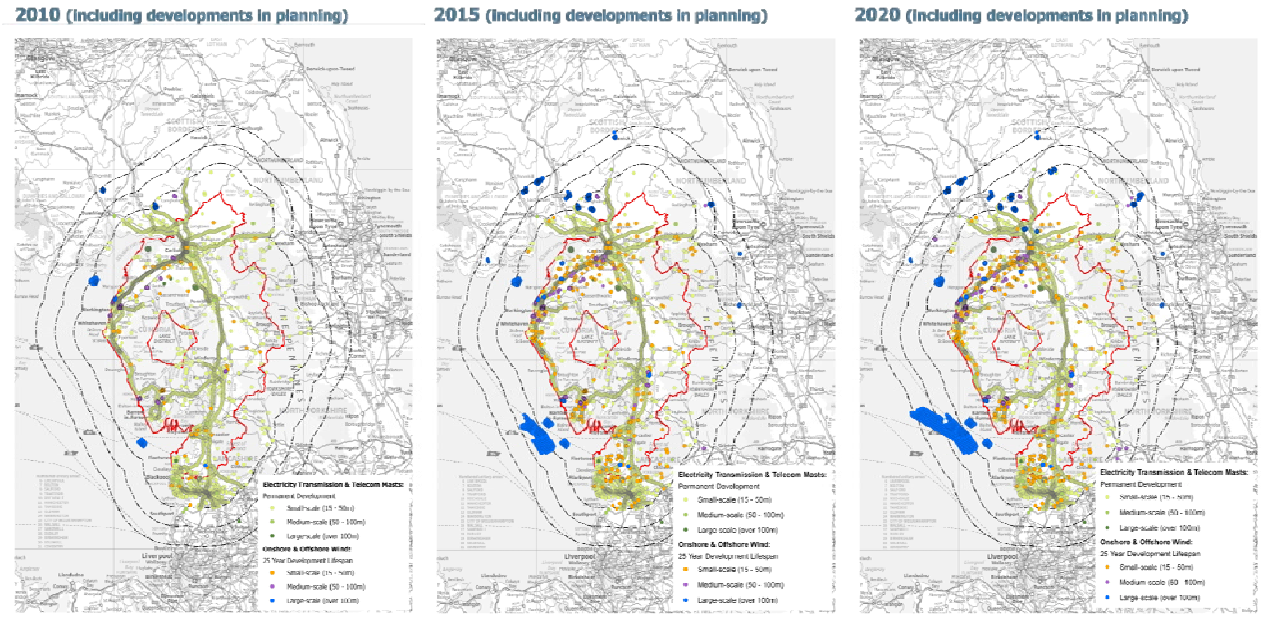
With regards submitted applications:

- An operational start date of three years from the date of submission is assumed;
- If the above rules give a start date of 2014 or earlier the notional start date has been set to 2015.

13.1.6 In addition, for some operational developments, the date that operations commenced was unavailable. For these developments, start dates have been estimated with reference to Google Earth aerial photography captured at various intervals from 2000 onwards.

13.1.7 The developments displayed on each temporal map for a specific year X are drawn using a definition query of the form:

"T_COMMENCE" <=X AND "T_END" >=X

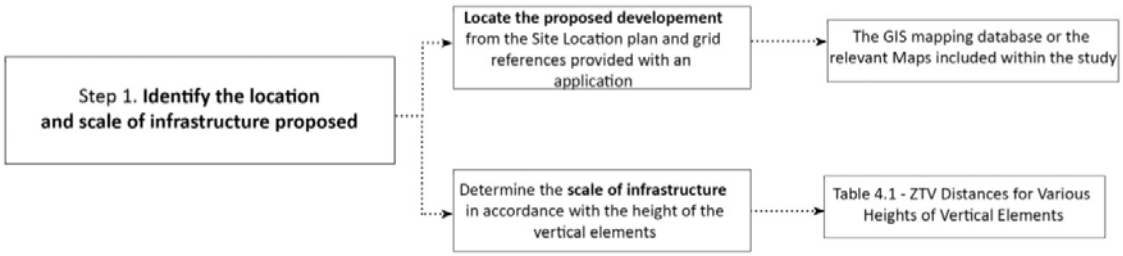


12-2 Temporal plans showing pattern of vertical infrastructure development for the period 2010 to 2020

14. Guidance on using the datasets for assessment

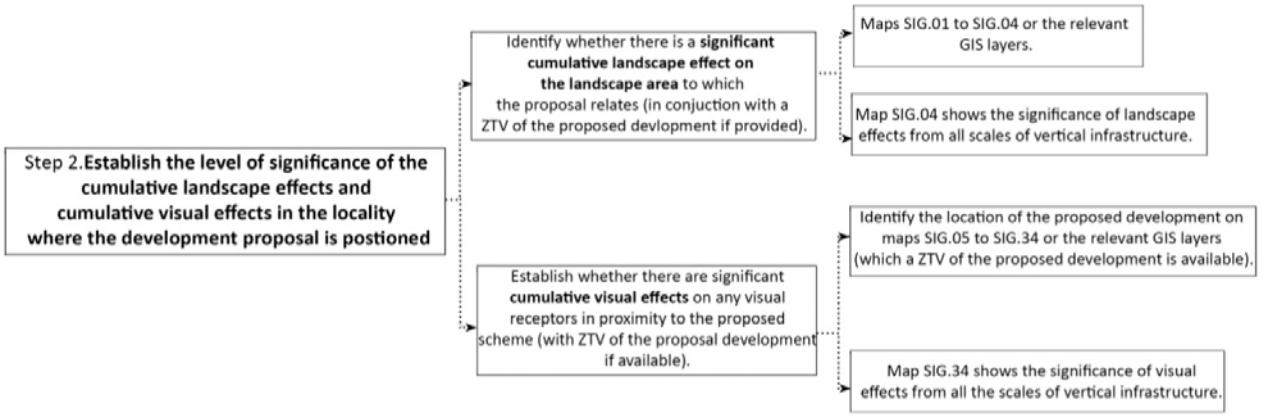
14.1.1 General guidance on using the Study datasets and maps for the assessment of development proposals is provided in Section 4 of the Part 1 Key Findings & Guidance report. The Guidance seeks to offer a step-by-step approach which can be applied by local authority planning officers, developers and the public, when using the Study. Set out below is a more technical version of this guidance targeted at GIS users.

1. Establish the location of the proposed development and the scale of its vertical components.



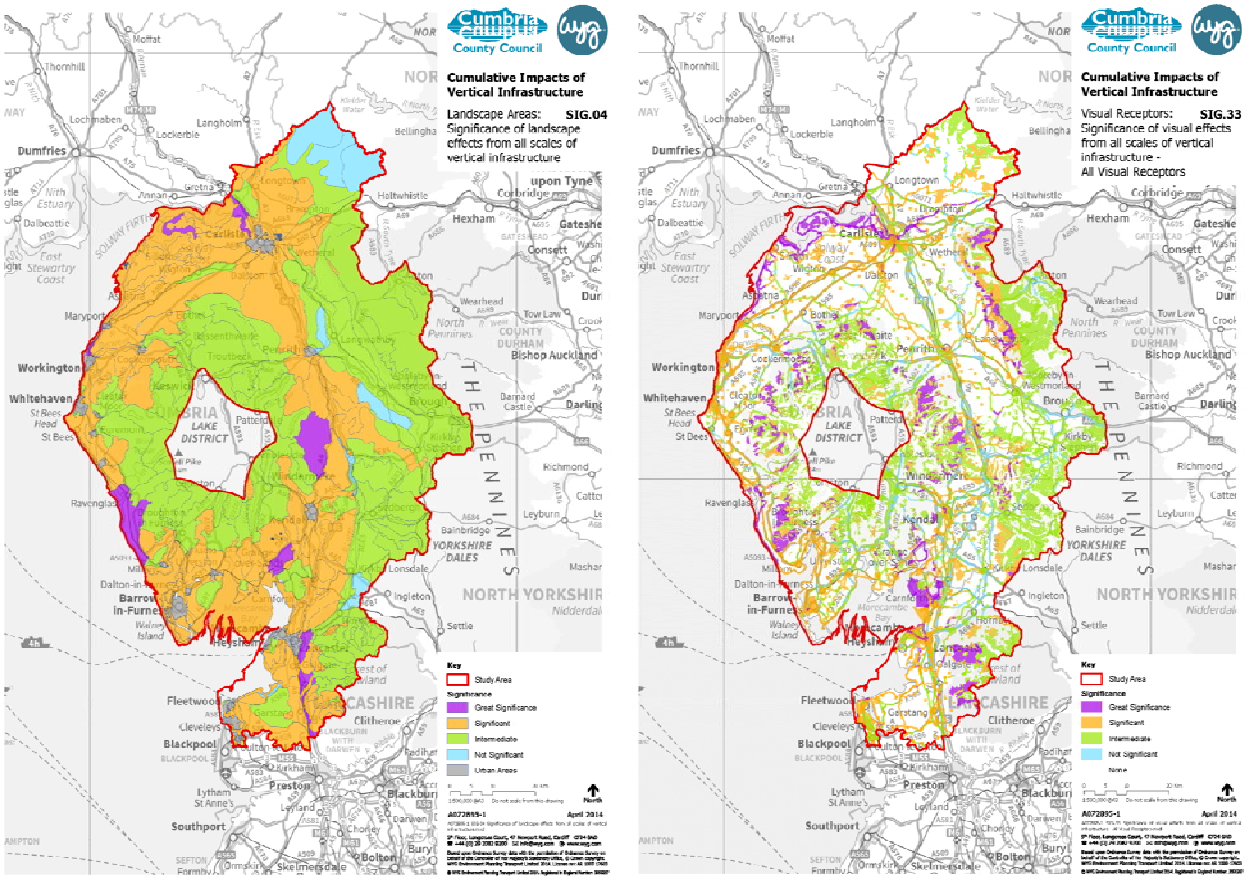
14.1.2 In the first instance the location of the proposed development should be determined. A site location plan and grid references should have been provided with an application in order to locate the proposed development in GIS. Proposed vertical infrastructure elements can be plotted in GIS from OS coordinates, or if only a site plan has been received, a raster copy of this can be geo-referenced and the proposed structures digitised as point data and saved as a new GIS layer. If only a site boundary has been provided then this can be digitised in GIS as a polygon.

2. Initial appraisal; establish the significance of existing cumulative landscape effects and cumulative visual effects in the locality of the proposed development



14.1.3 If a plan showing the ZTV of the development proposal has been provided by the applicant, a copy of the ZTV plan can be either saved as an image (e.g. JPEG, TIFF or PNG format) using

Adobe Acrobat or equivalent software, or scanned from a paper copy, and this image can be georeferenced/registered in GIS. Alternatively, a GIS version of the ZTV can be requested from the applicant either in the form of a georeferenced image or as a polygon dataset. The ZTV can be overlaid on the visual receptor GIS layers symbolised using the **Sig_All** attribute field (as on Map SIG.33) to understand the interaction of the visibility of the proposal with existing levels of cumulative visual effects within the area influenced by the development proposal.



13-1 Significance of landscape effects and visual effects from all scales of vertical infrastructure

14.1.4 The definitions used in the assessment for the different scales of infrastructure and the appropriate extents for ZTVs in relation to the height of the vertical element are as follows:

Table 13.1 Scale and ZTV Distances for Various Heights of Vertical Elements

Height of vertical element (m)	Scale of infrastructure	ZTV distance (km)
up to 50	small-scale	15
51-100	medium-scale	25
Over 100	large-scale	35

Source: Table 3.1 of Part 2: The Assessment

Please note that for wind turbines the height to blade-tip (not the height to hub/nacelle) determines the scale of infrastructure.

14.1.5 These definitions can be used by officers to define the scale and associated ZTV of the proposal they are assessing. The landscape areas affected, the visual receptors affected, and existing visibility of vertical infrastructure in the relevant area, (which will contribute to the overall cumulative effect locally), can then be identified.

14.1.6 It is possible that, at this stage, the initial appraisal will have provided enough contextual information to enable a decision to be made about the cumulative effects of the proposal under consideration. However, a more detailed appraisal is likely to be required for more complex projects or where there are pressure points affecting decision-making. Then it is advisable to proceed through each step of the assessment process and build up evidence and justification for judgements made about the additional effects of the development proposal and to inform the decision to be made.

3. Identify the landscape and visual receptors relevant to the development proposal and their sensitivity

14.1.7 In order to assess the impact of a proposal for vertical infrastructure development, both the landscape and visual receptors which have the potential to be affected by the proposal should be identified. Landscape receptors are the defined aspects of the landscape resource that have the potential to be affected by a proposal and visual receptors are individuals and/or defined groups of people who have the potential to be affected by a proposal.

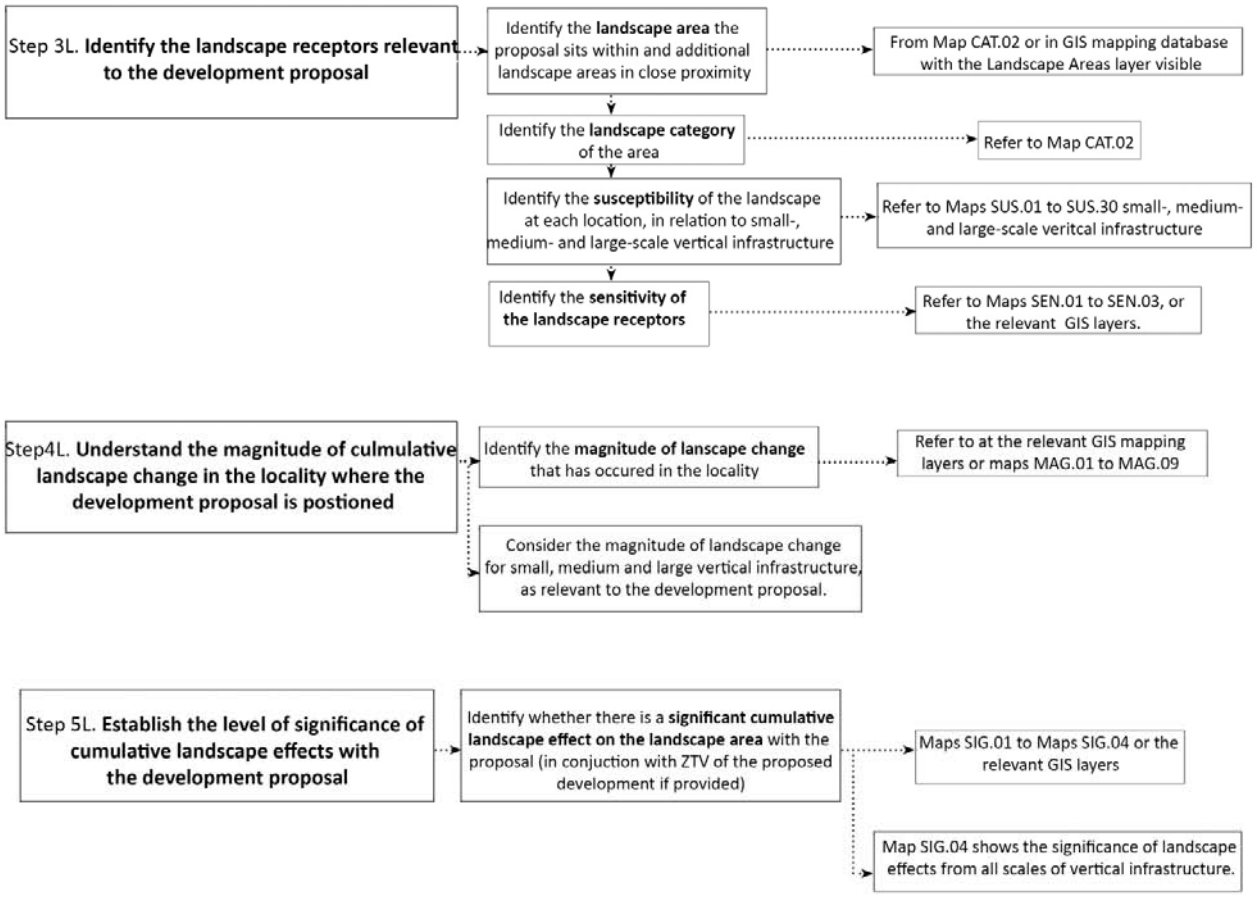
Landscape Receptors

14.1.8 The next step is to identify which landscape area the proposal sits within and any additional landscape areas which adjoin or fall within the ZTV of the development proposal and which therefore have the potential to be impacted upon. This can be achieved by overlaying the development proposal GIS layer and geo-referenced ZTV on the Landscape Areas layer and selecting those landscape areas which intersect.

14.1.9 The attribute data table associated with the Landscape Areas GIS layer identifies the overall sensitivity of the landscape area in relation to small, medium and large scale vertical infrastructure contained in the fields **Sens_Small**, **Sens_Med** and **Sens_Large** respectively. The tables detailing how the assessments of landscape sensitivities for each area have been concluded are included in Appendix 4: Landscape Character Assessment Tables and summarised in the attribute data linked to the Landscape Areas GIS layer. These factors include:

- The key sensitive elements of the landscape area (fields **Sens_1** to **Sens_5**)
- The susceptibility of the landscape area to vertical infrastructure (fields **Sus_Small**, **Sus_Med** and **Sus_Large)**
- Guidance for future decision making for the landscape character area (fields **Guidance1** to **Guidance5**)
- The category of the landscape area (field **Category**)

14.1.10 In assessing development proposals for vertical infrastructure officers should take into consideration the relative sensitivity of the landscape receptor to vertical infrastructure development as defined by the assessment (attribute fields **Sens_Small**, **Sens_Med** and **Sens_Large** as displayed on Maps SEN.01 to SEN.03), and the specific characteristics and sensitivities of the landscape receptors as set out in the relevant table which have determined this.

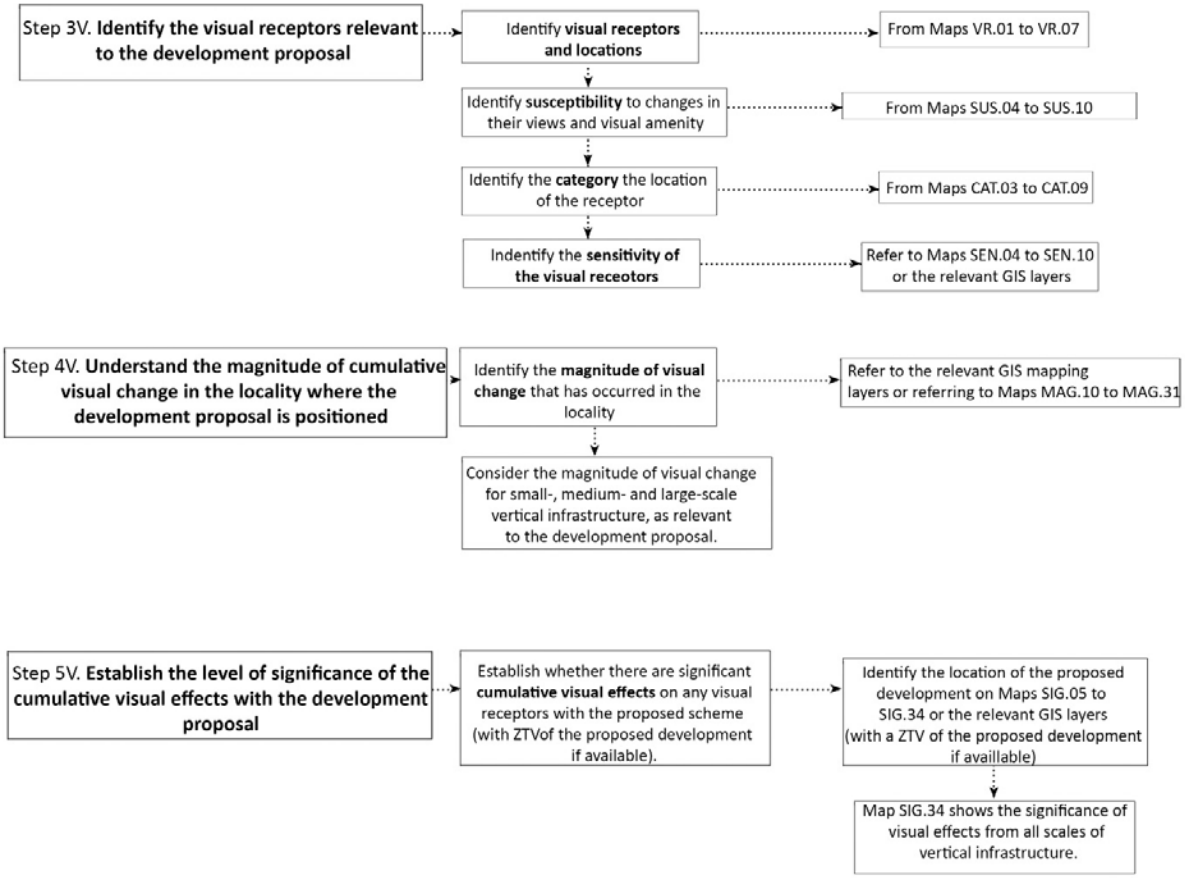


Visual Receptors

14.1.11 The Study identifies places where people viewing the landscape (the visual receptors), which are present throughout the Study area and include settlements, CROW access land, long distance walking routes, cycle routes, roads, railway lines and tourist attractions; these are identified on Maps VR.01 to VR.07 and GIS data layers are provided for each category of visual receptor.

14.1.12 To identify any visual receptors which are potentially impacted upon by the development proposal, overlay the geo-referenced ZTV onto the visual receptors layers and identify those visual receptors which fall within the ZTV. (If the ZTV has been provided as a polygon dataset it will be possible run a select by location query to identify the visual receptors which are within the ZTV). It should be noted that there may be additional places where visual receptors may be present in addition to those identified within the Study and therefore if the officer is aware of any

further visual receptor locations where there is potential for effects on visual amenity, then these should also be taken into account.



14.1.13 The Study identifies the sensitivity of visual receptors by considering their susceptibility to changes in their views and visual amenity (recorded in the field **Sus_All**), and the category attached to the location of the receptor (recorded in the field **Category**). The sensitivity of the visual receptors relating to the development which they are assessing can be determined by interrogating the field **Sens_All** in the GIS layers for the visual receptors. A matrix is detailed at Table 3.12 of Part 2: The Assessment which shows how susceptibility and the landscape category have been combined to determine sensitivity.

Table 13.2 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

Source: Table 3.12 of Part 2: The Assessment

4. Understand the magnitude of cumulative landscape change and cumulative visual change in the locality where the development is proposed

14.1.14 The Study assesses the magnitude of cumulative landscape change on landscape receptors and the magnitude of cumulative visual change on visual receptors taking into consideration the size or scale of change, the geographical extent of the area influenced, and its duration and reversibility.

14.1.15 To identify the **existing magnitude of landscape and visual change** that has occurred in the locality of the development proposal for the three scales of vertical infrastructure, refer to the attribute fields **Mag_Small**, **Mag_Med** and **Mag_Large** included in the Landscape Areas and Visual Receptors GIS layers; thematic maps for these fields are included as Maps MAG.01 to MAG.09 in relation to the magnitude of landscape change and Maps MAG.10 to MAG.30 in relation to the magnitude of visual change.

5. Establish the significance of existing cumulative landscape effects and cumulative visual effects in the locality where the development is proposed

14.1.16 The Study identifies the significance of cumulative landscape effects and visual effects by combining the conclusions made in relation to the sensitivity of receptors and magnitude of change. As explained at Step 2, cumulative landscape and visual effects are identified to be: of great significance, significant, of intermediate significance, or not significant, for each scale of vertical infrastructure.

14.1.17 With regards existing cumulative landscape effects, refer to the Landscape Areas GIS layer and fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** (shown on Maps SIG.01 to SIG.04). Map SIG.04 shows the significance of landscape effects from all scales of vertical infrastructure and the corresponding data is contained in the **Sig_All** field. With regards identifying cumulative visual effects, refer to the fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** contained in the attribute data for the visual receptor layers (and shown on Maps SIG.05 to SIG.33). Map SIG.33 shows the significance of visual effects from all scales of vertical infrastructure and the corresponding data is contained in the **Sig_All** field.

6. Justify Judgements Utilising the Study Methodology

14.1.18 When considering proposals for vertical infrastructure development, officers should work through the steps detailed above in order to fully understand the baseline position at the location where the additional infrastructure development is proposed. By understanding the conclusions of the Study, the officer will be able to make a more informed assessment of the cumulative impact of additional vertical infrastructure development at the location proposed. The project environmental assessment (if provided as part of the planning application submission) will provide an assessment of the landscape and visual and cumulative effects of the proposal itself. By following through the CIVI assessment steps, the officer will be able to collate the evidence needed to justify the conclusion about whether there might be further cumulative effect arising from the proposed development in addition to those existing.

14.1.19 The following is a checklist of the detailed factors which are of relevance in determining cumulative impact (and associated GIS layers and attributes):

Scale of infrastructure proposed

- Small
- Medium
- Large

Landscape receptors

Landscape Areas dataset defined from analysis of landscape character assessments

Landscape category

Recorded in the **Category** field of the Landscape Areas dataset and determined in accordance with the indicators set out in Part 2 - The Assessment Table 3.3.

Landscape susceptibility

Recorded in the fields **Sus_Small**, **Sus_Med** and **Sus_Large** of the Landscape Areas dataset and determined in accordance with the criteria set out in Part 2 – The Assessment paragraph 3.2.45 – 3.2.52

Landscape sensitivity

Recorded in the fields **Sens_Small**, **Sens_Med** and **Sens_Large** of the Landscape Areas dataset and determined by a combination of judgements on landscape category and landscape susceptibility.

Magnitude of cumulative landscape change (direct and indirect)

Overall magnitude of cumulative landscape change is recorded in the fields **Mag_Small**, **Mag_Med** and **Mag_Large** of the Landscape Areas dataset and determined in accordance with criteria set out at Table 3.5 of Part 2: The Assessment. (Refer to the fields **DMag_Small, DMag_Med, DMag_Large, IMag_Small, IMag_Med,** and **IMag_Large** respectively for direct and indirect magnitude of cumulative landscape change).

Significance of cumulative landscape effects

Recorded in the fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** and determined by considering a ombination of landscape sensitivity and magnitude of change

Visual receptors

- Residents in and visitors to settlements
- Users of CROW/access land
- Users of long distance footpaths
- Users of cycle routes
- Travellers on roads
- Travellers on railways
- Visitors to tourist attractions

Visual receptor susceptibility

For each group of visual receptors, recorded in the field **Sus_All** and determined in accordance with the criteria set out in Part 2 – The Assessment Table 3.11

Visual sensitivity

For each group of visual receptors, recorded in the field **Sens_All** and determined by a combination of judgements on landscape category and visual receptor sensitivity

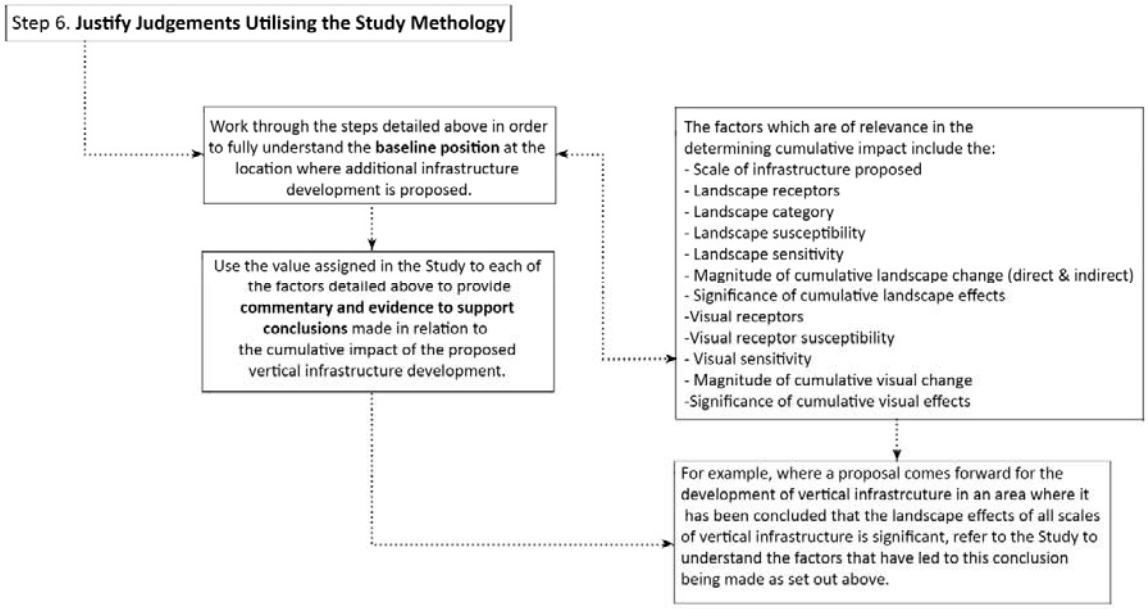
Magnitude of cumulative visual change

For each group of visual receptors, recorded in the fields **Mag_Small**, **Mag_Med** and **Mag_Large** and determined in accordance with the criteria set out in Part 2 – The Assessment Table 3.13

Significance of cumulative visual effects

For each group of visual receptors, recorded in the fields **Sig_Small**, **Sig_Med**, **Sig_Large** and **Sig_All** determined by the combination of visual sensitivity and magnitude of change.

14.1.20 The judgements set out in the Study assigning a value to each of the factors detailed above can be used by officers to provide commentary and evidence to support conclusions made in relation to the cumulative impact of vertical infrastructure development. For example, where a proposal comes forward for the development of vertical infrastructure in an area where it has been concluded that the landscape effects of all scales of vertical infrastructure is significant, the officer should refer to the Study to understand the factors that have led to this conclusion being made as set out above.



15. Maintaining and future-proofing the CIVI GIS

15.1.1 The datasets that constitute the CIVI database can be considered as a snapshot in time of the existing and proposed vertical infrastructure, the areas covered by relevant designations and policies, the location of visual receptors and the landscape character assessments in place as of February 2014.

15.1.2 In order for the GIS database to continue to be relevant, accurate and useful, it is recommended that a continuing programme of updates is undertaken. With regards the vertical infrastructure datasets, the updates would need to include the study area and the buffer zones.

15.1.3 The following schedule of updates to the datasets is suggested:

Regular updating of vertical infrastructure development data within the study area:

It is suggested this is carried out on a monthly basis for the study area. This would entail the LPAs recording when any enquires relating to vertical infrastructure come in at screening or scoping stages, or when planning applications have been permitted or refused, and the updates to the datasets undertaken at the end of each month.

6-monthly to annual updating of development data within the buffer zones:

There are 29 LPAs located within or partly within the buffer zones to the study area. Given the large geographical area for which data will be sought, it is suggested that development data within these zones is updated on a biannual or annual basis.

Annual updating of designations and landscape character information:

The data to be updated would include the variation orders associated with the National Park Boundaries, changes to other designated areas, updates to local development plans, , and updates associated with local character assessments. For these elements, it is recommended that a review is carried out of the designations and adoption of studies relating to Cumbria, Lancashire, National Parks and AONBs, on a yearly basis in order to identify relevant information and the value of updating the information at this stage in time. It is suggested that major changes are updated on a yearly basis, with minor changes updated on a 2-3 yearly basis.

2-3 yearly updating of visual receptor information:

The data that may need updating includes any major residential developments or settlement expansions; new or amendments to cycle routes or footpaths; changes to the road and railway network, and any new major tourist attractions. It is suggested that these are reviewed in relation to their relevance and updated on a 2-3 year basis, with any major changes updated on a yearly basis.

6-monthly to annual updating of analysis and assessment datasets:

In addition to keeping the baseline datasets up to date, it is advised that the assessment datasets (relating to Category, Susceptibility, Sensitivity, Magnitude and Significance) are maintained at

regular intervals in order that officers can continue to make valid judgements on the potential cumulative impacts of proposed vertical infrastructure

15.1.4 The CIVI Study methodology and GIS are designed to be flexible in that additional types of vertical infrastructure (such as tall chimneys and stacks if a reliable data source becomes available) or receptor (e.g. users of local rights of way) can be incorporated into the baseline datasets and into the analyses and assessment.

Appendix A: List of data providers

Data used in this Study has been provided by:

- Cumbria County Council
- Lancashire County Council
- Lake District National Park Authority
- Yorkshire Dales National Park Authority
- Allerdale District Council
- Carlisle District Council
- Copeland District Council
- Eden District Council
- Lancaster District Council
- Wyre District Council
- Ordnance Survey
- Natural England
- English Heritage
- National Grid
- Electricity North West
- SUSTRANS

Appendix B: List of datasets used

Ordnance Survey Base mapping:

- OS MasterMap
- OS VectorMap District
- OS Meridian 2
- OS MiniScale
- OS Raster 250k
- OS Raster 50k
- OS Raster 25k
- OS Raster 10k
- OS Boundary Line
- OS Terrain 50

Landscape Character (provided by LPAs):

- Cumbria Landscape Types and Sub-Types
- Lake District National Park Landscape Types, Sub-Types and Areas of Distinctive Character
- Solway Coast AONB Landscape Types and Character Areas
- Yorkshire Dales National Park Landscape Character Areas
- Lancashire Landscape Types and Character Areas
- Forest of Bowland AONB Landscape Character Areas

Landscape Designations and Policies (Natural England data):

- National Parks
- National Parks Variation Orders
- Areas of Outstanding Natural Beauty
- Heritage Coast
- Landscape Policies (LPAs)

Cultural Landscape Designations (English Heritage data unless noted):

- World Heritage Sites
- Registered Parks and Gardens
- Registered Battlefields
- Scheduled Monuments
- Conservation Areas (provided by LPAs)
- Listed Buildings

Biodiversity Designations (Natural England data):

- Ramsar
- Special Protection Areas
- Special Areas of Conservation
- Sites of Special Scientific Interest

Access and Recreation:

- CROW Access Land (Natural England)
- National Trails (Natural England)
- Long Distance Footpaths (from OS mapping)
- Promoted Walking Routes (tourism websites)
- National Cycle Routes (SUSTRANS)

- Links to National Cycle Routes (SUSTRANS)
- National Byway (SUSTRANS)
- Regional Cycle Routes (SUSTRANS)
- Local Cycle Routes (LPAs)
- Country Parks (Natural England)
- Canals (from OS mapping)

Visual Receptors (not included in above listings):

- Settlements (LPAs, OS Meridian)
- Roads (OS VectorMap District)
- Railways (OS VectorMap District)
- Tourist Attractions (tourism websites, OS mapping)

Vertical Infrastructure:

- Onshore wind (LPA planning applications, developer websites, OS MasterMap)
- Offshore wind (LPA planning applications, developer websites)
- Pylons (National Grid, Electricity North-West, OS MasterMap)
- Telecommunication masts (LPA planning applications, Ofcom 'Sitefinder' database, OS MasterMap)

Appendix C: Settlements assessed in the Study

Abbeystead
Abbeytown
Aglionby
Aiketgate
Aikhead
Aikton
Ainstable & Towngate
Aldcliffe
Allerby
Allithwaite
Allonby
Alston
Anthorn
Arkholme
Arkleby
Arlecdon
Armathwaite
Arrad Foot
Asby Workington
Askam & Ireleth
Askham
Aspatria
Aughton
Ayside
Backbarrow
Baldwinholme
Bampton and Bampton Grange
Bandrake Head & Oxen Park
Banks
Barber Green
Barbon
Bardsea
Barepot
Barton
Bassenthwaite
Baycliff
Beaumont
Beck Side
Beckermet
Beckfoot
Beetham Village
Berrier
Biggar
Biglands
Bigrigg
Bilsborrow
Birkby
Blawith
Bleatarn
Blencarn
Blencathra
Blencogo
Blencow
Blennerhasset and Baggrow
Blindcrake
Bolton
Bolton Low Houses
Boltonfellend
Boltongate
Bomby
Boot
Bootle
Borwick
Bothel
Botton Head
Boustead Hill
Bouth
Bowgreave
Bowland Bridge
Bowness-on-Solway
Bowscale
Bowston
Braides
Braithwaite
Brampton
Appleby
Branthwaite
Braystones
Bridekirk
Bridgefoot & Little Clifton
Brigham
Brigsteer
Brisco
Broadbwath
Bromfield
Broom
Brough and Church Brough
Brough Soweby
Brougham
Broughton-in-Furness
Broughton Cross
Broughton Mills
Broughton Moor
Broungton Beck
Brow Top
Burbanks
Burgh-by-Sands
Burneside
Burnrigg
Burns Farm
Burrells
Burton-in-Kendal
Butterwick
Caldbeck
Calder Bridge
Calder Vale
Calthwaite
Camerton
Cantsfield
Capernwray
Cardewlees
Cardurnock
Cargo
Cark in Cartmel
Carr Bank
Cartmel
Carwath
Casterton
Castle Carrock
Catlowdy
Catterlen
Causewayhead
Chapels
Church Hill
Churchtown
Claughton
Clawthorpe
Cleator
Cliburn
Clifton
Clifton Dykes
Coast Road
Cockerham
Colby
Conder Green
Coniston
Cotehill
Coulderton
Coupland Beck
Cowan Head
Cowgill
Crackenthorpe
Croft Ends
Crofton
Croglin
Crook Kendal
Crookland & Millness
Crosby-on-Eden
Crosby Garrett
Crosby Maryport
Crosby Moor
Crosby Ravensworth
Crosby Villa
Crosscanonby
Crossgate
Crossgill
Crossmoor
Crosthwaites
Culgaith
Cumdivock
Cummerdale
Cumrew
Cumwhinton
Cumwhitton
Dacre
Dean
Deanscales
Dearham
Dendron

Dent
Distington
Dockray
Dolphinholme
Dovenby
Drigg
Drumburgh
Drybeck
Dubwath
Duddon Bridge
and Bank End
Dufton
Dundraw
Durdar
Eagland Hill
Eaglesfield
Eamont Bridge
Easton
Edenhall
Ellonby
Embleton
Endmoor
Ennerdale Bridge
Eskdale Green
Fairfield
Far Sawrey
Farlam
Farleton
Faugh
Fenton
Field Broughton
Fingland
Finsthwaite
Flimby
Flookburgh &
Ravenstown
Forton
Foxfield
Friars Ground
Frizington and
Rheda
Gaisgill and
Longdale
Gaitsgill
Galgate
Gamblesby
Garnett Bridge &
Watchgate
Garrigill
Garsdale
Garsdale Head
Garth ow
Gatebeck
Gawthrop
Gawthwaite
Ghyll head
Bowness
Gilcrux
Gilgarran
Gilsland (Part)
Glasson
Glasson
Glassonby
Gleaston
Glenridding
Goadsbarrow
Goose Green
Gosforth
Grayrigg
Great and Little
Broughton
Great Asby
Great Clifton
Great Corby
Great Eccleston
Great Musgrave
Great Ormside
Great Orton
Great Salkeld &
South Dykes
Great Strickland
Great Urswick
Greenwell
Gressingham
Greysouthen
Greystoke
Grinsdale
Grizebeck
Grizedale
Guardhouse
Hackthorpe and
Lowther Village
Haile
Hale
Halfpenny
Hall Dunnerdale
Hallbank
Hallbankgate
Hallthwaites
Hambleton
Harker
Harrington
Harriston
Hartley
Haverigg
Haverthwaite
Hawksdale
Haws Bank
Hayton
Hayton Aspatria
Heads Nook
Heaton
Helton
Hesket
Newmarket
Hethersgill
Heversham
Heysham
Nuclear Power
Station
High Biggins
High Bankhill
High Bridge
High Carley
High Casterton
High Cunsey
High Harrington
High Hesket
High Ireby
High Newton
High Nibthwaite
High Wray
Hilton
Hincaster
Hoff
Holbeck
Holker
Holme
Holme Mills
Holmrook
Hornby
Hornsby &
Scarrowhill
Houghton
How
Howgate
Hunsonby &
Winskill
Hutton
Hutton Roof
Kirkby Lonsdale
Hycemoor &
Bootle Station
Ings
Inskip
Ireby
Ireby
Irthington
Irton Hall
Isel
Ivegill
Johnby
Kaber
Kearstwick
Keekle &
Summergrove
Keld Shap
Kelsick
Kentmere
Kershopefoot
Killington
Kilnhill Bassenfell
King's Meaburn
Kirkandrews-on-
Eden
Kirkbampton
Kirkbride &
Angerton
Kirkbride Airfield
Kirkby-in-
Furness &
Sandside
Kirkby Lonsdale
Kirkby Stephen

Kirkby Thore
Kirkcambeck
Kirkhouse
Kirkland
Kirkland
Frizington
Kirkoswald
Kirksanton
Kit Brow
Knock
Lady Hall
Laithes Penrith
Lake Rigg
Lakeside
Lamonby
Lamplugh
Lanercost
Langrigg
Langwathby
Laversdale
Lazonby
Leasgill
Leck
Lee
Leece
Lees Hill
Lessonhall
Levens
Lindal in Furness
Lindale
Lingyclose Head
Linstock
Little Asby
Little Bampton
Little Musgrave
Little Orton
Little Salkeld
Little Strickland
Little Urswick
Long Marton
Longburgh
Longdales
Longtown
Lorton
Low Biggins
Low Braithwaite
Low Crosby
Low Hesket
Low Moresby
Low Newton
Low Row
Low Stott Park
Low Whinnow
Lowca
Lower Green
Bank
Lower Thurnham
Loweswater
Lowgill
Lowick Bridge
Lowick Green
Lupton
Lyneholmeford
Marshaw
Marton
Matterdale End
Maulds Meaburn
Mawbray
Meal Bank
Mealsgate and
Fletchertown
Meathop
Melkinthorpe
Melling
Melmerby
Middleshaw
Middleton
MIddletown
Milburn
Mill Houses
Mill Side
Millbeck
Millholme
Millhouse
Millthrop
Milnthorpe
Milton
Moat
Mockerkin
Monkhill
Moor Row
Moorhouse and
Bow
Moresby Park
Morland
Mosedale
Motherby
Muncaster
Mungrisdale
Murton
Myerscough
Nateby
Nateby
Natland
Nealhouse
Near Sawrey
Nenthead
Nether Burrow
Nether Kellet
Nether Wasdale
Nethertown
New Hutton
Newbiggin
Newbiggin
Newbiggin-on-
Lune
Newbiggin
Stainton
Newbiggin
Temple Sowerby
Newbiggin
Ulverston
Newby Bridge
Newby East
Newby Morland
Newby West
Newland
Newland Bottom
Newton
Newton Arlosh
Newton
Blackford
Newton in
Furness
Newton Reigny
Newtown
Newtown
Lowther
Nook
North Side
Oakenclough
Old Hutton
Old Town
Orton
Orton Rigg
Oughterby
Oughterside
Oulton
Ousby
Out Rawcliffe
Outhgill
Mallerstang
Over Kellet
Overton
Oxenholme
Papcastle
Parsonby
Parton
Patterdale
Patton Bridge
Pennington
Penny Bridge &
Greenodd
Penruddock
Pica
Pilling
Pilling Lane
Plantation Bridge
Plumbland
Plumgarths
Plumpton
Pooley Bridge
Port Carlisle
Priest Hutton
Prospect
Quernmore
Rampside
Ratten Row
Raughton Head
Ravenglass
Ravenstonedale
and Greenside

Reagill
Redmain
Renwick
Rigmaden
Roa Island
Roadhead
Rockcliffe
Rose Bank Castle
Rosgill
Rosley
Rosley Station
Rosside
Rottington
Row
Ruckcroft
Rusland Cross
Ruthwaite
Salter
Sandale
Sandford
Sandside
Sandwith
Sandysike
Santon Bridge
Satterthwaite
Scaleby
Scaleby Hill
Scales
Scorton
Scotby
Seascale
Seathwaite
Seaville
Sebergham
Sedbergh
Sedgwick
Shap
Siddick
Silecroft
Silverband
Skelsmergh
Skelton
Skirwith
Slack Head
Sleagill
Sleetbeck
Smithfield
Sockbridge &
Tirril
Soulby
Soutergate
Southwaite
Spark Bridge
Spittal Farm
St Bees
St Helens
St Michael's on
Wyre
Staffield
Stainburn
Stainton
Stainton Kendal
Stainton with
Adgarley
Stair
Stake Pool
Stalmine
Staveley
Staveley and Fell
Foot
Staynall
Stockdalewath
Stodday
Stone House &
Cow Dub
Storrs
Storth
Street
Stubble Green
Summerlands
Sunnyside
Talkin
Tallentire
Tarnacre House
Farm
Tarnbrook
Tatham
Tebay
Temple Sowerby
Thanet Well
The Howe
The Common
The Green
The Hill
Thornhill
Thornthwaite
Thornton
Threapland
Threlkeld
Thrushgill
Thurnham
Thursby
Thurstonfield
Todhills
Torpenhow
Torver
Tower Wood
Townhead
Ousby
Troutbeck
Troutbeck
Troutbeck Bridge
Tunstall
Uldale
Ullock
Ulpha
University of
Lancaster
Unthank
Gamblesby
Unthank Skelton
Waberthwaite
Waitby
Walby
Walton
Warcop
Warwick-on-
Eden
Warwick Bridge
& Little Corby
Watchill
Water Yeat
Watermillock
Waverbridge
Waverton &
Parkgate
Welton
Wennington
West Curthwaite
West Hall
Westlakes
Westlinton
Westnewton
Wetheral
Wetheral Pasture
Whin Lane End
Whitbeck
Whitrigg
Kirkbride
Whitrigg
Torpenhow
Whittington
Wiggonby
Williamson Park
Wilton
Winder
Winmarleigh
Winscales
Winster
Winton
Witherslack
Woodend
Woodhouse
Woodville
Wray
Wreay
Wreay
Watermillock
Wythop Mill
Yanwath
Yearngill