Appendix 3.1: Landscape and Visual Appraisal Methodology

SP Energy Networks

400kV OHL ZV Diversion
Landscape and Visual Appraisal Methodology

Final report
Prepared by LUC
August 2024

Appendix 3.1

Landscape and Visual Appraisal Methodology

Appraisal Methodology

A.3.1.1 As set out in **Chapter 3** of the Environmental Appraisal Report, the LVA has been carried out in accordance with the principles contained within GLVIA3. However, as this is not EIA development reporting of the significance of effects is not required. The appraisal is therefore presented to assist in the determination of the S37 application.

A.3.1.2 The primary appraisal considers the introduction of the Proposed Development under the current baseline conditions, which includes operational and under construction infrastructure projects. Effects resulting from the introduction of the Proposed Development under a future baseline scenario in which Redshaw substation is consented and constructed are considered within the cumulative appraisal (under future baseline scenario 1). Effects resulting from the introduction of the Proposed Development under a future baseline scenario which includes all other proposed (applications submitted) and consented developments (listed in **Table 1.1: Other Developments considered in Cumulative Appraisal** in **Chapter 1** of the Environmental Appraisal Report) are considered separately within the cumulative appraisal (under future baseline scenario 2).

A.3.1.3 In undertaking this LVA, the following activities have been carried out:

- Review of baseline material including the sources listed below;
- Definition of a Study Area, informed by the location and context of the Site and the scale of the Proposed Development;
- Analysis of the Site and surrounding Study Area, in terms of baseline landscape character and overall sensitivity (taking account of both susceptibility and value) to the type and scale of development proposed;
- Identification of three representative viewpoints which represent typical views experienced by visual receptors likely to be affected by the Proposed Development;
- Identification of potential effects on landscape and visual receptors, including cumulative effects in conjunction with other existing, consented and/or proposed developments;
- Consideration of potential additional mitigation measures to avoid or reduce potential landscape or visual effects; and
- Identification of likely residual effects on landscape and visual receptors following the implementation of all proposed mitigation measures.

Information Sources

A.3.1.4 The following information sources have informed the appraisal:

- Ordnance Survey (OS) Landranger (1:50,000) and Explorer (1:25,000) maps;
- Aerial photography; and

- NatureScot National Landscape Character Assessment (2019)[1].

Field Survey

A.3.1.5 Field survey was carried out to inform the appraisal in February and March 2024 in clear conditions.

Consultation

A.3.1.6 Beyond the screening request submitted to Scottish Ministers, no further consultation has been undertaken to inform the approach to the LVA. The professional judgement and experience of the assessors undertaking the appraisal has informed the approach to devising the proposed Study Area, the scope of landscape and visual receptors likely to be affected, and the selection of representative viewpoints which are accompanied by wireline and photomontage visualisations, which are consistent with the approach and details set out in the screening request.

Assumptions and limitations to the appraisal

A.3.1.7 No substantial information gaps have been identified during the preparation of baseline information or undertaking of the LVA. It is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and appraisal of likely effects on landscape, views, visual amenity and residential visual amenity.

Sensitivity of Receptors

A.3.1.8 Receptors considered in this appraisal include physical landscape features or components, LCTs, and people (visual receptors) whose views and visual amenity may be affected by the Proposed Development. The susceptibility of receptors and the value of the landscape receptor or view is determined in order to inform an overall judgement of receptor sensitivity.

Susceptibility

A.3.1.9 For the specific Proposed Development, the susceptibility of landscape receptors has been determined with consideration of criteria such as scale; landcover, pattern and complexity; settlement and other human influences; skylines and inter-visibility with adjacent landscapes; and perceptual aspects. For visual receptors, susceptibility is based on the activities those people may be engaged in whilst experiencing the view (e.g. engaged in outdoor recreation), and the according susceptibility those receptors may have to changes in their views and visual amenity. Susceptibility is recorded as **high**, **medium** or **low**.

Value

A.3.1.10 The value of landscape receptors has been determined using criteria such as scenic quality, rarity, recreational value, representativeness, conservation interests, perceptual aspects and artistic associations. The value of the existing views or visual amenity experienced by visual receptors is determined using criteria such as the importance of the view, as indicated by reference in relation to designations or heritage assets, appearance in guidebooks or tourist maps and provision of visitor facilities. The value of the landscape or view is recorded as high, medium or low.

A.3.1.11 The overall sensitivity of landscape and visual receptors to change is defined as **low**, **medium** or **high** (or the intermediate levels of **low-medium** or **medium-high**) and is based on weighing up professional judgements regarding susceptibility and value, and each of their component considerations.

Magnitude of Change

A.3.1.12 The appraisal considers the potential magnitude of change likely to be experienced by the landscape or visual receptor. When determining the magnitude of landscape or visual change, an overall

[1] NatureScot (2019) Scottish Landscape Character Types Maps and Descriptions. [online] Available at: https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions

judgement takes account of a combination of factors including scale, geographical extent, duration and reversibility. This determination requires the application of professional judgement and experience to recognise the many different variables which are considered and which are given different weight according to site-specific and location-specific considerations in each instance.

Size/Scale

A.3.1.13 The scale of change depends on:

- The loss or addition of features in the landscape or view and changes in its composition, including the proportion of the landscape/view occupied by the Proposed Development;
- The degree of contrast or integration of any new features or changes in the landscape or view with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture;
- The nature of the view of the Proposed Development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpsed; and
- The size/scale of landscape or visual change is described as being **large**, **medium**, **small** or **barely perceptible**.

Geographical Extent

A.3.1.14 The geographical extent of a landscape or visual change records the extent of the area over which the changes will be experienced/visible e.g. whether this is at the Site level or from a viewpoint from where the Proposed Development can be glimpsed, or whether it effects a wider area in terms of effects on landscape character or represents a large area from which similar views are gained. Geographical extent is described as being **large**, **medium** or **small**.

Duration

A.3.1.15 GLVIA3 states that 'Duration can usually be simply judged on a scale such as short term, medium term or long term.' For the purposes of this appraisal, the duration of effects arising during the construction phase of the Proposed Development are reported as **short-term** (e.g. less than 12 months), whilst those arising during the operational phase are reported as **long-term**[2].

Reversibility

A.3.1.16 In accordance with the principles contained within GLVIA3, the reversibility of the changes which will arise is reported as **reversible**, **partially reversible** or **irreversible** (i.e. permanent), and is related to whether the change can be reversed at the end of the phase of development under consideration (i.e. at the end of construction or at the end of the operational lifespan of the development).

A.3.1.17 The overall judgement of magnitude of landscape or visual change/effect is based on weighing up professional judgements on size and scale, geographical extent, duration and reversibility. The magnitude of change/effect is recorded as **low**, **medium** or **high** (or the intermediate levels of **low-medium** or **medium-high**) or **barely perceptible.**

Potential Landscape and Visual Effects

A.3.1.18 The evaluations of the individual aspects set out above (susceptibility, value, size and scale, geographical extent, duration and reversibility) were considered together to provide an overall profile of each identified effect. An overview was then taken of the distribution of judgements for each aspect to make an informed professional appraisal of the overall level of each effect, drawing on guidance provided in GLVIA3.

[2] The Proposed Development will be operational for a temporary period of three years with a temporary alignment between towers ZV110A and ZV110B as shown on Figure 1.3. The downlead connections to the gantry will only be constructed once the proposed Redshaw substation is constructed and prior to the substation being brought into operation. The temporary alignment between ZV110A and ZV110B will then be removed. OHL cables generally require refurbishment after approximately 40 years.

A numerical or formal weighting system has not been applied. Levels of effect are identified as **Negligible**, **Minor**, **Moderate** or **Major** (or the intermediate levels of **Minor-Moderate** or **Moderate-Major**).

A.3.1.19 The levels of effect used in this LVA are defined in **Table 3.1** for landscape effects and **Table 3.2** for visual effects. The descriptions are provided as examples, and each effect is judged individually.

Table A.3.1.1: Levels of Landscape Effect

Level	Effect Description
Major	The Proposed Development will result in an obvious change in landscape characteristics and character, such as introduction of overriding new key characteristics, likely affecting a highly valued landscape with a medium or high susceptibility to that type of change.
Moderate	The Proposed Development will result in a noticeable change in landscape characteristics and character, potentially altering secondary key characteristics, likely affecting a landscape with a medium sensitivity to that type of change. This level of effect may also occur when a smaller scale of change acts on a higher sensitivity landscape or a larger scale of change acts on a lower sensitivity landscape.
Minor	The Proposed Development will result in a small change in landscape characteristics and character, likely affecting a landscape of lower sensitivity. This level of effect may also occur when a larger scale of change occurs for a temporary period.
Negligible	The Proposed Development will not result in a noticeable change in landscape characteristics or character.

Table A.3.1.2: Levels of Visual Effect

Level	Effect Description
Major	The Proposed Development will result in an obvious change in the visual amenity experienced by the receptor(s), who are likely to have medium or high susceptibility to that type of change or affecting a valued view.
Moderate	The Proposed Development will result in a noticeable change in the visual amenity experienced by the receptor(s), who are likely to be of medium susceptibility to that type of change or affecting a moderately valued view. This level of effect may also occur when a smaller scale of change acts on a higher susceptibility receptor/high value view or when a larger scale of change acts on a lower susceptibility receptor/lower value view.
Minor	The Proposed Development will result in a small change in the visual amenity experienced by the receptor(s), who may be of lower susceptibility to that type of change or affecting a view of lower value.
Negligible	The Proposed Development will not result in a noticeable change in the visual amenity experienced by the receptor(s).

Direction of Effect

A.3.1.20 The direction of landscape and visual effects (**beneficial**, **adverse** or **neutral**) is determined in relation to the degree to which the proposal fits with the existing character of the landscape or view and the contribution that the Proposed Development makes, even if it is in contrast to the existing character of the landscape or view. With regard to the type and scale of development proposed, potential landscape and visual effects have been assumed to be adverse (negative) and have been determined as such within the appraisal unless otherwise stated.

Cumulative Appraisal

A.3.1.21 In line with GLVIA3, the appraisal of the cumulative landscape and visual effects is proportionate to the Proposed Development. For the purposes of the consideration of cumulative effects, operational, consented and proposed (subject to a valid application or subject to a current appeal/public inquiry process) developments located within a 10km radius of the Proposed Development have been considered, as shown on **Figure 1.3 and 1.4** and listed in **Table 1.1: Other Developments considered in Cumulative Appraisal** in **Chapter 1**. Proposed schemes that currently have not progressed beyond scoping, within 5km of the Proposed Development, are also considered within the appraisal of cumulative landscape and visual effects given their proximity to the Proposed Development.

A.3.1.22 It was not considered appropriate to include schemes beyond the 10km Study Area in this instance, because of the very limited relationship the Proposed Development will have with developments over such a distance.

A.3.1.23 The likelihood for cumulative landscape and/or visual effects to arise through combined, successive, or sequential views of other types of existing, consented and/or proposed development are considered.

A.3.1.24 The appraisal considers the potential cumulative effects resulting from the introduction of the Proposed Development to the following:

- **Current baseline conditions** which include infrastructure projects (within 10km of the Proposed Development) which are operational and under construction;
- **Future baseline scenario 1**: in which Redshaw substation is consented and constructed (cumulative assessment scenario); and
- **Future baseline scenario 2**: which includes all other proposed and committed developments listed in **Table 1.1: Other Developments considered in Cumulative Appraisal** in **Chapter 1** of the Environmental Appraisal Report (cumulative assessment scenario).

Zone of Theoretical Visibility (ZTV) and Visualisation Production

Zone of Theoretical Visibility (ZTV)

A.3.1.25 Evaluation of the theoretical extent to which both the existing and proposed overhead line diversion is visible across the Study Area is undertaken by establishing a ZTV.

A.3.1.26 ESRI's ArcGIS Pro 3.2.1 software is used to generate the ZTVs. The Spatial Analyst/Viewshed tool does not use mathematically approximate methods, and the program calculates areas from which the existing overhead line and proposed overhead line diversion are potentially visible.

A.3.1.27 The ZTV has been calculated based on:

- The tower heights of the existing ZV108, ZV109, ZV110, and ZV111 towers, to represent visibility of the section of the existing OHL subject to the proposed diversion; and
- A combination of the existing and proposed tower heights of the retained/upgraded ZV108, proposed ZV109R, proposed ZV110A, proposed ZV110B, and retained/upgraded ZV111, to represent visibility of the Proposed Development.

A.3.1.28 This has been performed based on a 'bare earth' computer generated digital terrain model (DTM) which does not take account of potential surface features such as buildings, woodland, vegetation or other features which may provide screening. Further detail about how the ZTVs have been generated and the data used is provided below.

Bare Earth ZTVs

A.3.1.29 The bare earth DTM is comprised of OS Terrain® 5 (5m resolution) data across the 5km Study Area. It should be noted that the software uses raster height data, but while it is defined as continuous data

(with each grid square referred to as a 'cell'), it assumes a single height value from the centre of that cell for the whole cell. Therefore, any height variations between centre points of cells will not be recognised.

A.3.1.30 The DTM data has not been altered (i.e. by the addition of local surface screening features) for the production of the bare earth ZTV. No significant discrepancies have been identified between the DTM used and the actual topography around the Study Area. The effect of earth curvature and light refraction has been included in the bare earth ZTV analysis and a viewer height of 2m above ground level has been used.

A.3.1.31 There are limitations in the use and reliance on this theoretical visibility, and these should be considered in the interpretation and use of the ZTV:

- The ZTV uses a 'bare ground' DTM model, and does not consider the potential screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility;
- The ZTV is considered to over emphasise the extent of visibility of the Proposed Development and therefore represents a 'maximum potential visibility' scenario; and
- There is often a wide range of variation within the visibility illustrated by a ZTV, for example, an area shown as having visibility of the Proposed Development may in reality only be the result of only a small proportion of the visible towers, which can make a considerable difference in the potential effects of the Proposed Development on receptors within the area affected by visibility.

A.3.1.32 In light of these limitations, whilst ZTVs are used as a starting point to inform the appraisal, providing an indication of where the Proposed Development will theoretically be visible, the information drawn from the ZTV was verified with reference computer generated wireline images of the Proposed Development in the field, to ensure that the appraisal conclusions represent the likely visibility of the Proposed Development and consequential change in views which will be experienced with a reasonable degree of accuracy.

Visualisation Production

Viewpoint Photography

A.3.1.33 The methodology for undertaking viewpoint photography is in accordance with guidance from NatureScot (SNH, 2017)[3] and the Landscape Institute (Landscape Institute (LI), 2019)[4]. The focal lengths used are in accordance with recommendations contained in guidance and are stated on the visualisation figures (**Figure 3.3** to **Figure 3.5** which accompany this LVA, and **Figure 7.3** to **Figure 7.6** which accompany the Cultural Heritage appraisal contained in **Chapter 7**). Photography was undertaken by LUC between Autumn 2023 and Spring 2024. A Nikon D750 full frame sensor digital single lens reflex (SLR) camera with a fixed 50mm focal length lens was used to undertake photography from all viewpoint locations.

A.3.1.34 A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images. The cameras were orientated to take photographs in landscape and, where necessary, portrait format. A panoramic head was used in each instance to ensure the camera rotated about the no-parallax point of the lens in order to eliminate parallax errors[5] between the successive images and enable accurate stitching of the images. For landscape ranges, the camera was moved through increments of 24˚ (degrees) and rotated through a full 360˚ at each viewpoint. 15 photographs were taken for each 360˚ view. For portrait ranges, the camera was moved through increments of 15˚ (degrees) and rotated through a full 360˚ at each viewpoint. 24 photographs were taken for each 360˚ view.

A.3.1.35 The location of each viewpoint and information about the conditions at the time of the photographs being taken was recorded in the field in accordance with NatureScot (SNH, 2017) and LI guidance (LI, 2019).

[3] Scottish Natural Heritage (2017) Visual Representation of Wind Farms, Version 2.2
[4] Landscape Institute (2019) Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment
[5] Parallax is the difference in the position of objects when viewed along two different lines of sight. In the case of a camera this would occur if the rotation point of the lens was not constant and would result in stitching errors in the panorama.

A.3.1.36 Weather conditions and visibility were considered an important aspect of the field visits for the photography. Where possible, visits were planned around clear days with good visibility. Viewpoint locations were visited at appropriate times of day to ensure, as far as possible, that the sun lit the scene from behind, or to one side of the photographer. South facing viewpoints can present problems particularly in winter when the sun is low in the sky. Photography opportunities facing into the sun were avoided where possible to prevent the overhead transmission infrastructure appearing in silhouette. Adjustments to lighting of the overhead transmission infrastructure were made in the rendering software to make the infrastructure appear realistic in the view under the specific lighting and atmospheric conditions present at that time the photography was taken.

Photography Stitching

A.3.1.37 Photographic stitching software PTGui© was used to stitch together the adjoining frames to create panoramic baseline photography using cylindrical projection.

Wireline Visualisations

A.3.1.38 The software package Blender was used to create a 3D Environment model. A digital terrain model (DTM) was created within the 3D model from OS Terrain® 5 and OS Terrain® 50 height data. The DTM includes the proposed development extents, viewpoint locations and all landform visible within the baseline photography. Overhead transmission line infrastructure, cumulative wind farm developments, the proposed Redshaw substation and viewpoint location coordinates were added.

Photomontage Visualisations

A.3.1.39 The software Blender 4.01 was used to model the transmission line infrastructure including the specified tower types and heights of the 400kV OHL ZV Diversion. The viewpoint locations were added to the Blender model using the on-site photography coordinate positions, cross-referenced and micro-sited with high-resolution aerial photography and model views created, which replicated the camera parameters and perspective geometry of the baseline photography. The Blender wireline exports overlaid and aligned with the photographs were linked as a background to each model view which allowed accurate horizontal and vertical alignment of the transmission line towers.

A.3.1.40 Virtual camera setups within Blender were used for each viewpoint to replicate the settings of the camera used to take the baseline photography (ISO, F-stop, shutter speed - converted to EV value) and each view was rendered taking account of the position of the sun in the sky, informed by the date and time when the photography was taken.

A.3.1.41 The 3D model views were rendered and then composited and aligned with the baseline photography using Adobe Photoshop© software. Where the transmission line infrastructure proposals were located behind foreground elements in the photography, those parts of the render were ‘masked’ or removed.

A.3.1.42 The 3D model views were rendered and then composited and aligned with the baseline photography using Adobe Photoshop© software. Where the transmission line infrastructure proposals were located behind foreground elements in the photography, those parts of the render were ‘masked’ or removed.

A.3.1.43 Finally, where applicable the images were converted from Cylindrical Projection to Planar Projection using PTGui© software.

Figure Layout

A.3.1.44 Adobe InDesign© software was used to present the figures. The dimensions for each image (printed height and field of view) are detailed below and each viewpoint visualisation has been presented as follows:

- A3 Viewpoint location map

- 90˚ Baseline photograph (cylindrical projection) and 90˚ Wireline image (cylindrical projection) below. The wireline image shows the Proposed Development and developments considered in cumulative appraisal:
  - Page size: 841 x 297mm.
  - One 90˚ section, with view direction centred on the Proposed Development, presented in this format.
- 53.5˚ Wireline image (planar projection)
  - Page size: 841 x 297mm.
- 53.5˚ Baseline photograph (planar projection)
- 53.5˚ Photomontage image (planar projection), showing the Proposed Development
  - Page size: 841 x 297mm.
  - One 53.5˚ section, with view direction centred on the Proposed Development, presented in this format.
- 53.5˚ Photomontage image (planar projection), showing the Proposed Development and the proposed Redshaw substation (without proposed mitigation)
  - Page size: 841 x 297mm.
  - One 53.5˚ section, with view direction centred on the Proposed Development, presented in this format.