CLASHINDARROCH II WIND FARM

LVIA Visualisation Methodology

Prepared for: Vattenfall Wind Power Ltd

Technical Appendix 7.1

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BASIS OF REPORT

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1.0 INTRODUCTION

1. This Appendix sets out the methodologies used by SLR Consulting Ltd. to prepare the figures which support the Landscape and Visual Impact Assessment (LVIA). The LVIA is contained in Chapter 7 of this Environmental Impact Assessment (EIA) Report and the supporting figures are contained in Volume 3a Figures and Volume 3b and 3c LVIA Visualisations.
2. Zones of Theoretical Visibility (ZTV) and Photomontages for the project have been prepared in accordance with the accepted methodologies included in the following guidance documents:
    - Scottish Natural Heritage (SNH): Visual Representation of Wind Farms, Version 2.2, issued February 2017 (Ref. 7.1.1);
    - Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals, September 2019 (Ref. 7.1.2); and
    - Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Management and Assessment) 3rd Edition, 2013 (Ref. 7.1.3).

2.0 ZTV METHODOLOGY

3. A ZTV, sometimes known as a Zone of Visual Influence (ZVI), is used to identify the theoretical visibility of a wind farm development. It is a computer generated analysis which evaluates visibility using the height and extent of a proposed development against a Digital Terrain Model (DTM). The DTM produces a 'bare earth' model which does not take account of any surface features including vegetation or buildings. Additionally, ZTVs do not take account of the decrease in visibility that occurs with increased distance from a proposed development, or any variation in weather conditions and related visibility. Accordingly, ZTVs show 'worst case' visibility.
4. SLR use ESRI ArcGIS 10.2.2 to produce ZTVs as it is an industry recognised software package designed to perform this type of analysis.
5. Wind farm layouts are inputted in to ArcGIS and the correct turbine parameters for the candidate turbine being assessed are assigned. The ZTVs are then run using OS Terrain 50 data as a terrain base. The observer height is set to 2m above ground level and the Earth's curvature (radius = 6370km) and atmospheric refraction (refraction coefficient = 0.075) is applied.
6. The completed ZTV is then presented in a title block in ArcGIS.
7. Software used to generate ZTVs:
    - ArcGIS 10.5.1.
8. Data used to generate ZTVs:
    - Ordnance Survey (OS) Terrain 50 height data; and
    - Turbine co-ordinates and dimensions.
9. The ZTV analysis presented in the LVIA does not take into account the screening effects of vegetation, buildings or other surface features.

3.0 PHOTOGRAPHY AND STITCHING PANORAMAS

10. The following is a step by step guide on how SLR produces photomontages for LVIAs.
11. At each viewpoint location a series of high resolution photographs is taken by a professional photographer or landscape architect, experienced in viewpoint photography, and using a digital Single Lens Reflex (SLR)

camera with a full frame sensor. A 50mm fixed focal length lens is used to reduce inaccuracies and enable verification.

12. At each viewpoint location, the camera is mounted on a levelled tripod with a calibrated panoramic head which, in accordance to SNH 2017 guidance (Ref 7.1.1), is set to a height of 1.5m (accommodating adjustments made to allow for uneven ground). Single frame photographs are then taken every 20 degrees to form a complete 360 degree view from the viewpoint. Photography is taken in landscape format. Each single frame photograph has a horizontal field of view of approximately 39.6 degrees. Taking photographs every 20 degrees provides sufficient overlap between the frames to achieve an accurately stitched panorama. When appropriate, two to three sets of 360 degree sweeps are taken in differing lighting conditions to ensure the photographs have the best possible clarity.

13. The location of the tripod is recorded via a hand held GPS device and a photograph of the tripod in situ is taken. If necessary, this allows a viewpoint to be revisited at a later date with the required level of accuracy.

14. Upon receipt of the photographs by the SLR visualisation team, photograph metadata is checked to ensure that they are taken correctly and that they comply with accepted best practice.

15. Each set of viewpoint photographs is reviewed and the best representative 360 degree sweep selected for stitching as a panorama. The suitability of lighting and clarity of view are then checked; if necessary any minimal enhancement to the exposure/sharpness of the frames is carried out to achieve the clearest possible view. The 360 degree sweeps are then digitally stitched together to create a 360 degree cylindrically projected panorama. The stitching is completed using PT Gui Pro 11.18 which is an industry recognised photo stitching software package.

16. The stitched panoramas are reviewed against a digital model of the landscape for alignment and location accuracy. Any anomalies generated in the stitching process are checked and adjusted where necessary.

17. The panoramas are resized to the correct dimensions as described in the SNH 2017 guidance (Ref 7.1.1).

18. Photomontages produced following the above process, are illustrative tools which assist and inform the assessment, but they do not, and cannot be expected to, replicate the appearance of the proposed development as it would be apparent to the human eye.

4.0 PRODUCTION OF A COMPUTER MODEL

19. A 3D model is created within ReSoft WindFarm v4.2.5.2 by loading in terrain datasets, the positions of any turbines, viewpoint locations and any reference points that have been used to assist with the accurate positioning of the turbines within the photomontage. The model is typically viewed at a resolution of 50m to reduce processing errors and ensure detail is visible in the landscape at distance. The terrain data used for this analysis comprises a combination of Next Map 25 data, Ordnance Survey Terrain 5 data and OS Terrain 50 data. The greatest route mean square error value for the height points in the terrain data used is 4m.

20. An additional computer model is created within Autodesk InfraWorks 360 from the same data used to create the ReSoft WindFarm model for modelling the site infrastructure and any potential forest felling to be considered. This assists preparation of the photomontages as well as providing an additional means of cross checking accuracy of outputs (wirelines and photomontages). Additionally, the VR model has been used to inform the design iteration process and at Public Information Days.

5.0 WIRELINES

21. Once the processes described above are complete then wireline views are generated in the Photomontage module of ReSoft WindFarm based on the GPS coordinates for each viewpoint.

22. The wirelines are then exported for insertion into the title blocks.

6.0 PHOTOMONTAGE

23. Once the processes above are complete then excerpts from panoramas can be taken into the Photomontage module in ReSoft WindFarm and aligned with the wireline using the associated viewpoint coordinates, view direction and pitch angle for each viewpoint where a photomontage is prepared.
24. Once the photograph is aligned with the wireline, the turbines are lit according to the weather conditions and the time of day/year, rendered to the image and exported.
25. The draft photomontage is then taken into Photoshop and adjusted to create a realistic image of the proposed development. Relevant site infrastructure and forest felling is incorporated in the photomontage where appropriate.
26. Raster outputs are then generated, and re-projected into planar projection using PT Gui Pro.

7.0 FIGURE PRODUCTION

27. Once all the outputs have been prepared they are incorporated into suitable digital templates for presentation. The figures are all used to assist and inform the assessment process bearing in mind that they are illustrative. The Landscape Architects carrying out the professional assessment reported in the LVIA use the outputs in the field and at viewpoint locations as well as in the desk based assessment carried out to assist and inform the judgements made regarding predicted magnitudes of change and resulting effects on landscape fabric, landscape character, landscape designations and visual amenity.

8.0 REFERENCES

Ref. 7.1.1: Scottish Natural Heritage (February 2017) Visual Representation of Wind Farms, Version 2.2.

Ref. 7.1.2: Landscape Institute (September 2019) Landscape Institute Advice Note 06/19: Visual Representation of Development Proposals.

Ref. 7.1.3: Landscape Institute and Institute of Environmental Management & Assessment (December 2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA 3).

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