FEARNA STORAGE

Fearna Pumped Storage Hydro Scheme
EIA Report

Appendix 7.1 – LVIA Technical Methodologies

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Quality Information

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Appendix 7.1: Technical Methodologies for Visual Representation

1.1 Introductions

1.1.1 The Landscape and Visual Impact Assessment (LVIA) of the Proposed Development has been informed by several technical models and drawings. The methods for producing these are described below.

1.1.2 It should be remembered that,

> *"visualisations, whether they are hand drawn sketches, photographs or photomontages, can never exactly match what is experienced in reality. They should, however, provide a representation of the proposal that is accurate enough for the potential impacts to be fully understood"* (SNH, 20171: para 96, p22) and that *"visualisations in themselves can never provide the full picture in term of potential impacts; they only inform the appraisal process by which judgements are made"* (SNH, 20171; para 98, p22).

1.1.3 Baseline photography for visualisations has been undertaken by ASH design + assessment Ltd (ASH), and Creative Sides Photography. Editing has been completed by ASH and 3d modelling has been completed by Gilkes Energy Ltd and ASH.

The Proposed Development

1.1.4 The Proposed Development has been modelled in accordance with the specifics stated in **Chapter 2: The Proposed Development**, illustrated on **Figure 2.2**.

Current Guidance

1.1.5 The main guidance documents which have informed the technical methodologies used to undertake this LVIA and prepare the supporting drawings and visualisations are as follows:

- *Visual Representation of Wind Farms, Version 2.2* (SNH, 2017)[1], referred to as the NatureScot (2017) Guidance.
- *Visualisation Standards for Wind Energy Developments* (THC, 2016)[2], referred to as the THC (2016) Guidance.

1.1.6 The Landscape Institute (LI) also provides technical guidance on visualisation production[3]. While the NatureScot (2017)[1] Guidance and THC (2016)[2] Guidance are the most relevant for the Proposed Development, this document has also been used for reference.

1.1.7 Three sets of visualisations have been prepared to support the LVIA:

- One set to accord with the NatureScot (2017)[1] Guidance, included as **Volume 3a** of the EIA Report; and
- One set to accord with the THC (2016)[2] Guidance, included as **Volume 3b** of the EIA Report.
- One set of wirelines to accompany **Appendix 7.4: Wild Land Area Assessment,** to the NatureScot (2017)[1] Guidance, included as **Figures 7.4.6a-h of Appendix 7.4**.

[1] Scottish Natural Heritage (2017) Visual Representation of Wind Farms, Version 2.2

[2] The Highland Council (2016) *Visualisation Standards for Wind Energy Developments.*

[3] Landscape Institute (2019) *TGN 06/19 Visual Representation of Development Proposals.*

1.1.8 Location plans for visualisations have also been provided. These plans illustrate the field of view for each Visualisation Location (VL). It should be noted that the illustrated field of view fans for the THC (2016)[2] Guidance single frame images are representative of the field of view of these images but do not take account of permissible offsets in the angle of view.

1.2 Zone of Theoretical Visibility (ZTV) Production

1.2.1 Zone of Theoretical Visibility (ZTV) diagrams have been prepared using Esri ArcGIS, Version 10.7 (ArcGIS) and an Ordnance Survey (OS) Terrain 5 digital terrain model (DTM) to illustrate the potential visibility of the Proposed Development. Given the complexity of the proposal, which is comprised of various features, ZTVs have been generated for the main visible above-ground features:

- The Fearna Dam and Coire Dubh Dam (see **Figure 7.1a**);
- The powerhouse (see **Figure 7.1b**); and
- The access track to the upper reservoir (see **Figure 7.1c**).

1.2.2 The ZTVs have been prepared based on a viewer height of 2m above ground level in line with the NatureScot (2017)[1] Guidance, with earth curvature and light refraction set to 0.075.

1.2.3 Terrain 5 is a grid of heightened points with regular five metre post spacing. The software uses this information to create a virtual, three-dimensional, bare ground model which is representative of the earth's surface. It does not take into account elements above the ground such as buildings or trees. Therefore, while the ZTV indicates areas of potential visibility of the Proposed Development, in reality, not all locations within the ZTV would necessarily afford a view of it. Nevertheless, the ZTV is a valuable tool in both landscape character and visual impact appraisal.

1.2.4 While Terrain 5 is a product which is updated by OS on a quarterly basis, the terrain model was created using data available in 2023. The terrain model has not been updated since that time. This prevents excessive reworking of models and allows for continuity during the appraisal process.

Photography

1.2.5 Photographs have been taken using a full frame sensor (equivalent to a 35mm film frame), digital single lens reflex (DSLR) cameras. Cameras used include:

- Canon EOS 6D with Canon EF 50mm f/1.4 USM lens; and
- Sony ILCE-9 with Sony 50mm f/1.8 Sony DT50mm lens.

1.2.6 The details of the camera and lens used for each VL are included on the relevant photograph or photomontage.

1.2.7 The majority of baseline photographs have been taken in landscape format by a camera attached to a tripod and rotating panoramic head unit (set to 20° intervals) with a levelling base in order to maintain a stable platform for photography work, and to ensure an even overlap for successive panorama images. Due to the angle of view, from some VLs (VL3 and VL4), it has been necessary to take photographs in portrait format, in order to capture features which would be below the base of a landscape image. All photography has been taken at a height of 1.5m above ground level.

1.2.8 On arrival at each VL, a global positioning system (GPS) navigation device has been switched on and allowed to acquire satellite positions. This device will identify its location, to the nearest metre, using a 12 figure OS grid reference (for example 252294 925050 or NC 52294 25050). In order to increase the accuracy of readings, the grid reference has not been recorded until all other work at the VL has been completed and the GPS device has been switched on for several minutes. This passage of time has allowed the GPS device to increase the accuracy of readings through repeated, automated measurements. All GPS readings taken have been to a maximum of ±5 m accuracy.

1.2.9 At each VL, the grid reference, ground level and camera viewing height has been recorded, along with a brief description of the nature of view, weather conditions and visibility. The camera has embedded details of the date, time, camera make and model, the lens focal length, shutter speed, f-number and

ISO speed rating as metadata in each photograph file. A photograph of the tripod position has also been taken.

1.2.10 Baseline photographs have been combined to create 360° baseline panoramic images in cylindrical projection using PTGui software. Where applicable, these have been converted to planar projection using Hugin – Panorama Stitcher software (Hugin).

1.2.11 All single frame images conform to the fields of view characteristic of the lenses they represent (50mm or 75mm). However, for VL3 and VL4, due to the angle of view, there was a requirement to use portrait photography. The single frames for these two visualisations therefore comprise representative images with the field of view equivalent to a single frame, cropped from the larger panorama.

1.2.12 As detailed in **Table 1** below, some adjustments have been made using Adobe Photoshop 2025 (Photoshop) to the baseline photographs.

Table 1: Visualisation Location Photography

VL	OS Grid Coordinates	Date and Time	Weather Conditions	Format of Single Frame Photos	Notes
VL1	204513, 801836	06/08/2024 14.23	Sunshine and partial cloud	Landscape	Minor enhancement to brightness and contrast.
VL2	206870, 801242	10/09/2024 13.57	Sunshine and partial cloud	Landscape	Minor enhancement to brightness and contrast.
VL3	204035, 805211	12/11/2023 13:43	Clear, blue sky with scattered cloud	Portrait	Minor enhancement to brightness and contrast.
VL4	206560, 804288	12/11/2023 10:19	Clear, blue sky with temperature inversion in Glengarry	Portrait	Minor enhancement to brightness and contrast. Minor distortion to this panorama due the use of tilted photographs.
VL5	202591, 799571	31/10/2023 12.45	Clear, blue sky with scattered cloud	Landscape	Minor enhancement to brightness and contrast.
VL6	209307, 801521	10/09/2024 12:14	Sunshine and cloud	Landscape	Minor enhancement to brightness and contrast.
VL7	197870, 803636	10/09/2024 15:27	Clear, blue sky with partial cloud	Landscape	Minor enhancement to brightness and contrast.
VL8	201258, 794472	27/11/2024 15:50	Blue sky with some low cloud/mist and snow on mountain tops	Landscape	Minor enhancement to brightness and contrast.
VL9	201039, 803491	06/08/2024 14:47	Cloudy but clear with sunny spells	Landscape	Minor enhancement to brightness and contrast. Minor distortion to this panorama due the use of tilted photographs.
VL10	196530, 798040	07/09/2024 17:26	Blue sky with scattered wispy clouds and slight haze	Landscape	Minor enhancement to brightness and contrast.

1.3 Wireline Preparation

1.3.1 Wirelines of the Proposed Development have been created for all VLs and WLs using 43D Topos R2 (Topos). 3D models and plans of the various Proposed Development elements and modified terrain models have been provided by the client and modelled into Terrain 5 DTM (see paragraph 1.2.3). Where appropriate, wirelines have been converted to planar projection using Hugin.

1.3.2 Topos automatically shows the main ridge-lines and changes in terrain within the wirelines. Where necessary, additional lines have been added by hand to help improve the understanding of the wireline for the viewer. The extent of the wirelines is limited to that included within the 3d model. For this reason, where a very extensive view is obtained, the full backdrop and horizon line visible in photographs is not always represented in the wireline view. Wirelines should therefore always be viewed in combination with baseline photographs and photomontages.

1.3.3 Similar to the limitations of the ZTV, the wireline visualisations provide an indication of the Proposed Development's potential appearance but do not take account of screening elements such as buildings, trees or minor variations in topography.

1.3.4 Wirelines show the level of inundation areas at their maximum water level. Additional wirelines are also included for the VLs which overlook the inundation areas (VL3 and VL4), showing the minimum water level.

1.4 Photomontage Preparation & Rendering

1.4.1 Photomontage visualisations have been created using the wirelines and baseline panoramic photograph images described above, illustrating the Proposed Development at three different stages:

- During construction (VL2 and VL5 only);
- Year 1 of operation; and
- Year 15 of operation.

1.4.2 Proposed Development elements including the dams and other built structures were rendered in Topos and exported to Photoshop, using the wireline to position these accurately into the photograph.

1.4.3 In photomontages, the inundation areas have been shown at their mid-way water levels, which represents a midpoint between the minimum water level and maximum water level. This is considered to give a good representation of how the reservoirs would appear for the majority of the time (see Chapter 7, paragraphs 7.3.14 – 7.3.18).

1.4.4 Tracks and construction areas have been illustrated where these would be visible using 3d georeferenced models and Topos which accurately places these features in the view and manually rendered into the image using Photoshop.

1.4.5 Photomontages at year 15 show planting which is proposed for landscape purposes. These have been applied using a mix of Sketch-up Plugins (Enscape and Skatter) and manual rendering. Touch-up rendering to create a realistic image was applied in Photoshop.

1.4.6 Photomontages show the preliminary concept designs of the Proposed Development and are intended to give an illustrative impression of how the Proposed Development would appear in the landscape.

1.4.7 It should be noted that construction montages illustrative of assumed activities and areas affected. The exact areas and features present may be different from those shown as this would be subject to the requirements of the contractor and programming of works.

1.5 Viewing Instructions

1.5.1 The graphic material used in this assessment is for illustrative purposes only and should not be considered as representative of what the human eye will see. While visualisations can give a reasonable impression of the scale and distance to the Proposed Development, they cannot show exactly what they will look like in reality. This is due to various factors, including the resolution of the image; and the static nature of visualisations which cannot convey movement associated with the Proposed Development or within the landscape and changing light/ shadows, weather and seasonality etc. As such, visualisations are best viewed at the viewpoint location to appreciate the wider context.

1.5.2 All visualisations, whether prepared in accordance with the NatureScot (2017)[1] or THC (2016)[2] Guidance should be printed at the specified size and viewed flat at a comfortable arm's length. The graphic below has been extracted from the THC (2016)[2] Guidance to illustrate how single frame images prepared in accordance with the THC (2016)[2] Guidance should be viewed.

The image should be viewed at a comfortable arm's length (approximately 500mm) and viewed normally with both eyes. The page should obscure any foreground not visible within the photomontage itself. This enables the photomontage to be directly compared within the wider context of the real landscape.

Plate 1.6.1: Viewing Instructions for Single Frame Visualisations, Extracted from the THC, 2016 Guidance

1.5.3 If visualisations are viewed on a computer screen, rather than printed at the specified size, they should be enlarged to the full screen height to give a realistic impression. Use of devices with smaller screens, such as tablets, should be avoided for viewing visualisations.

1.5.4 It should be noted that the THC (2016)[2] Guidance 75mm focal length photomontage and the NatureScot (2017)[1] Guidance 53.5° field of view images, when printed at the correct size, illustrate an image greater than actual size if held at a comfortable arms' length. This is intended to counteract the effects of a loss of relative perspective when viewing a flat image. It is important to note that these visualisations are provided for illustrative purposes to support the LVIA and are presented in a format to conform with the NatureScot (2017)[1] and the THC (2016)[2] Guidance. Whilst they provide a helpful tool for assessment purposes, the judgements of landscape and visual effects reported in the LVIA are not reached wholly on the basis of these images, but through the landscape architect's professional experience and understanding of how the Proposed Development would appear in the field.