

**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group06: Little Gouls, Meikle Gouls & Gouls  
View South (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.21d
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:




**Key:**

 Proposed Craig Watch Wind Turbine

T5      T4   T7      T6      T9   T8                      T10      T11

Garbet

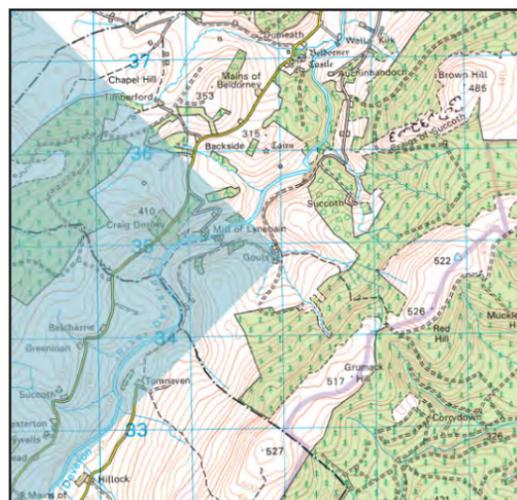
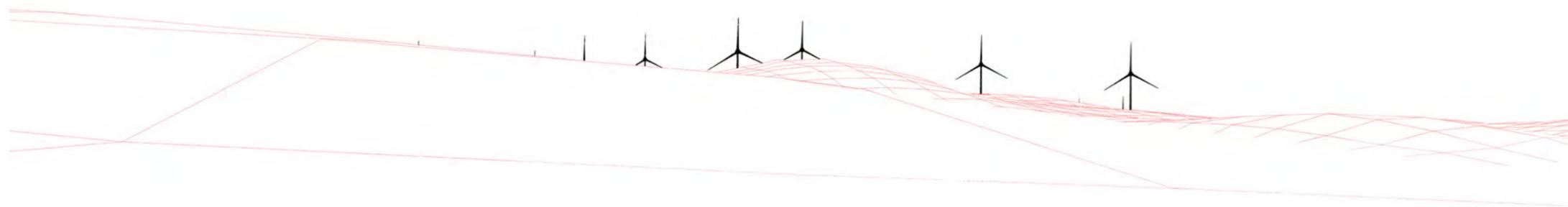


Figure Title:  
Residential Visual Amenity Assessment -  
Group06: Little Gouls, Meikle Gouls & Gouls  
View West (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.21e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  




**Key:**

 Proposed Craig Watch Wind Turbine

T2 T5 T3

T1 T7

T4 T9

T6

T8

T10

T11

Garbet

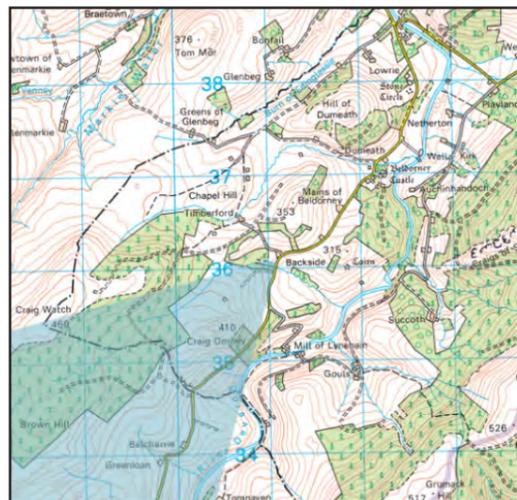
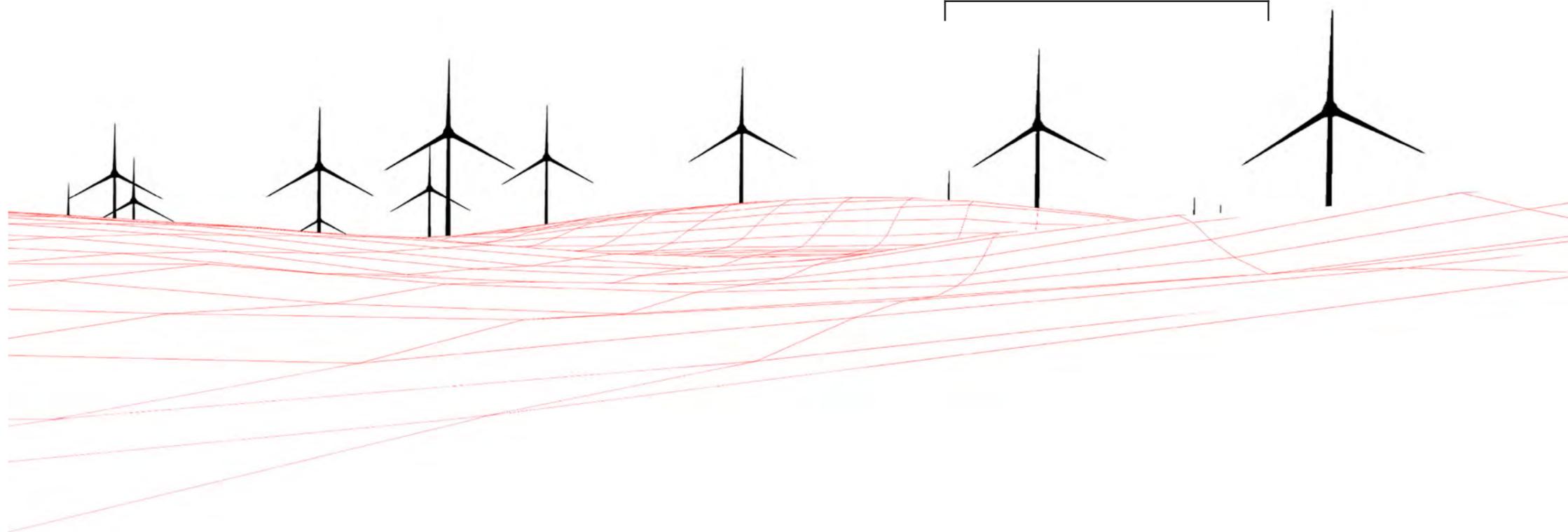


Figure Title:  
Residential Visual Amenity Assessment -  
Group07: Backside farm & Craig Dorney Lodge  
View West/ Southwest (53.5 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number:  
1620010178

Figure No:  
5.7.22a

Date:  
April 2022

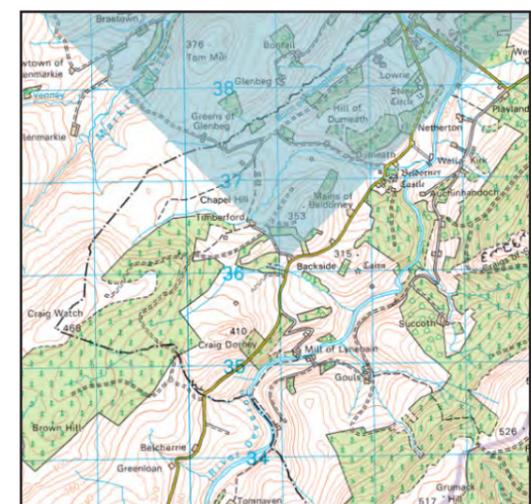
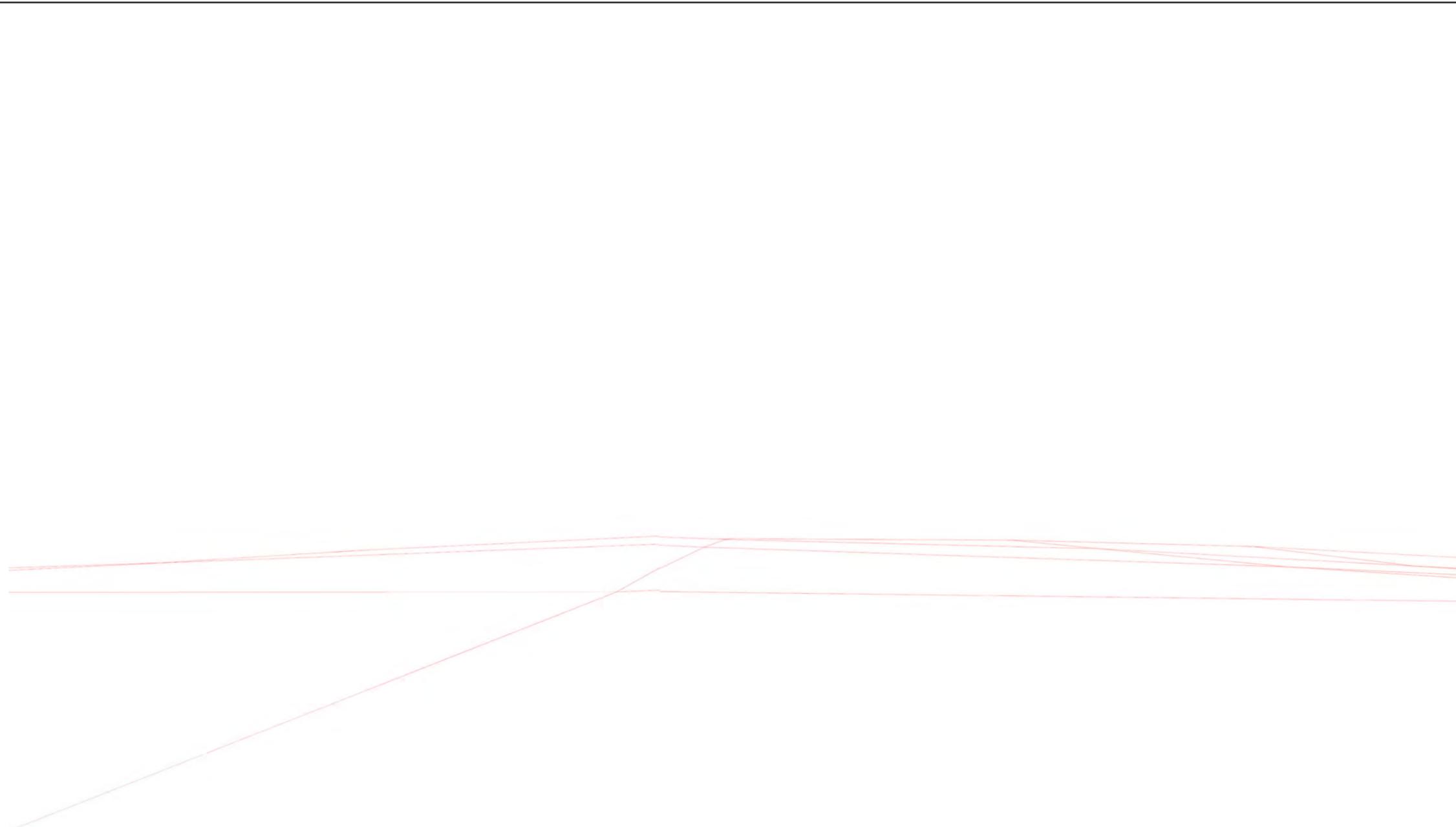
Prepared By:  
KL

Scale:  
NTS

Issue:  
1

Client:





**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group07: Backside farm & Craig Dorney Lodge  
View North (90 Degree View)

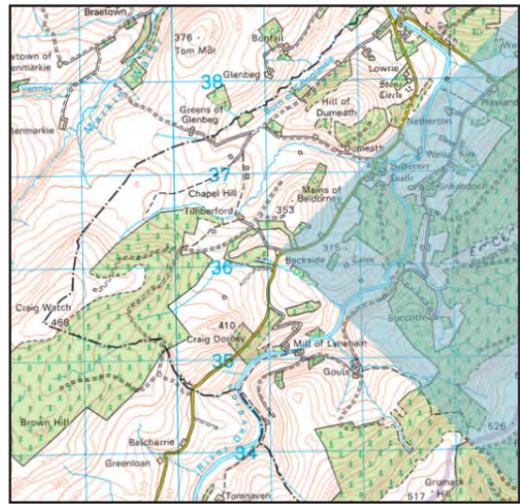
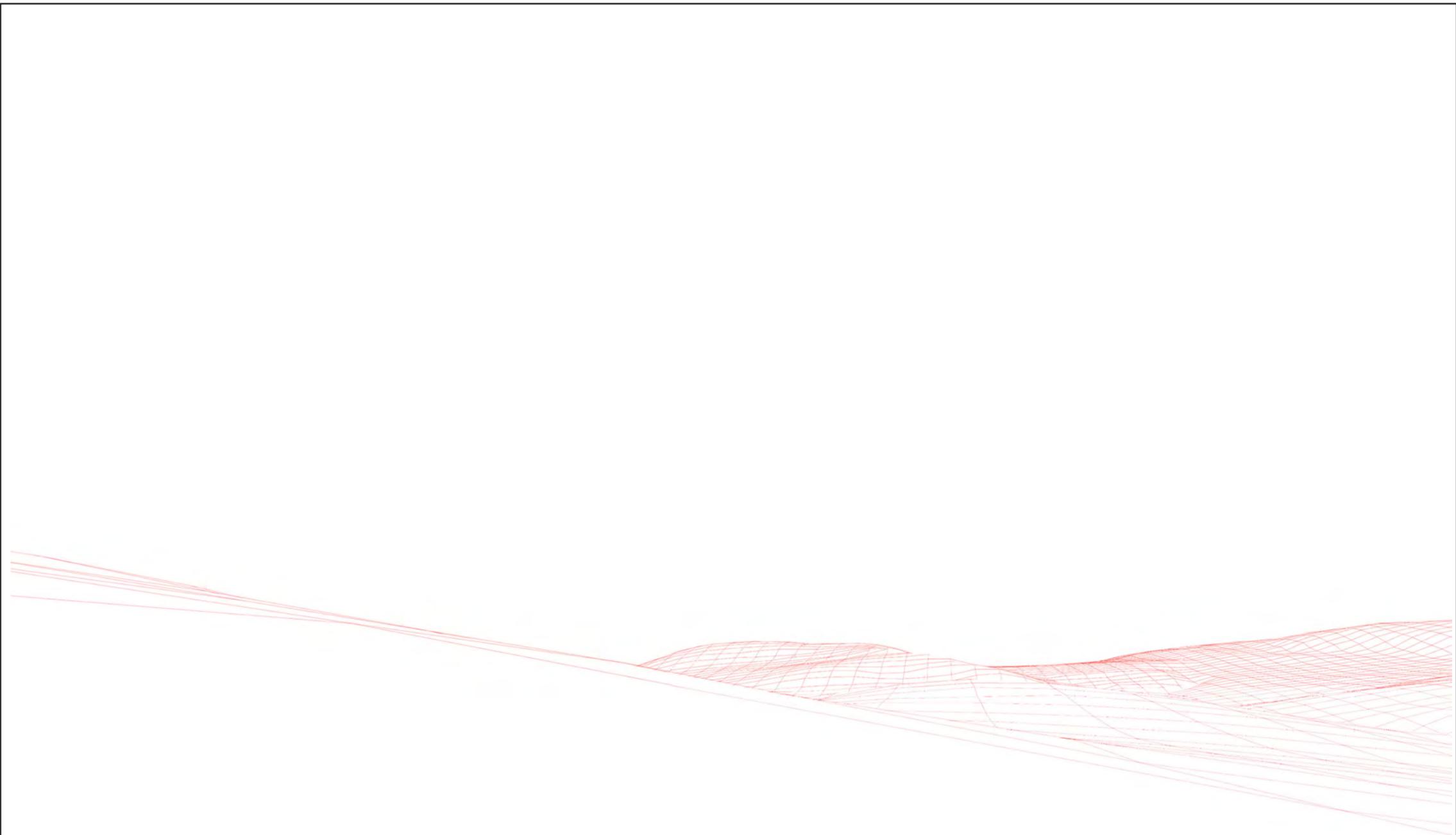
Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

Project Number: 1620010178	Figure No: 5.7.22b
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:







**Key:**

 Proposed Craig Watch Wind Turbine

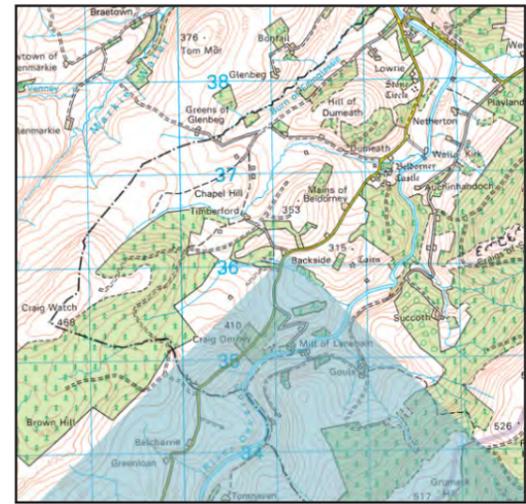
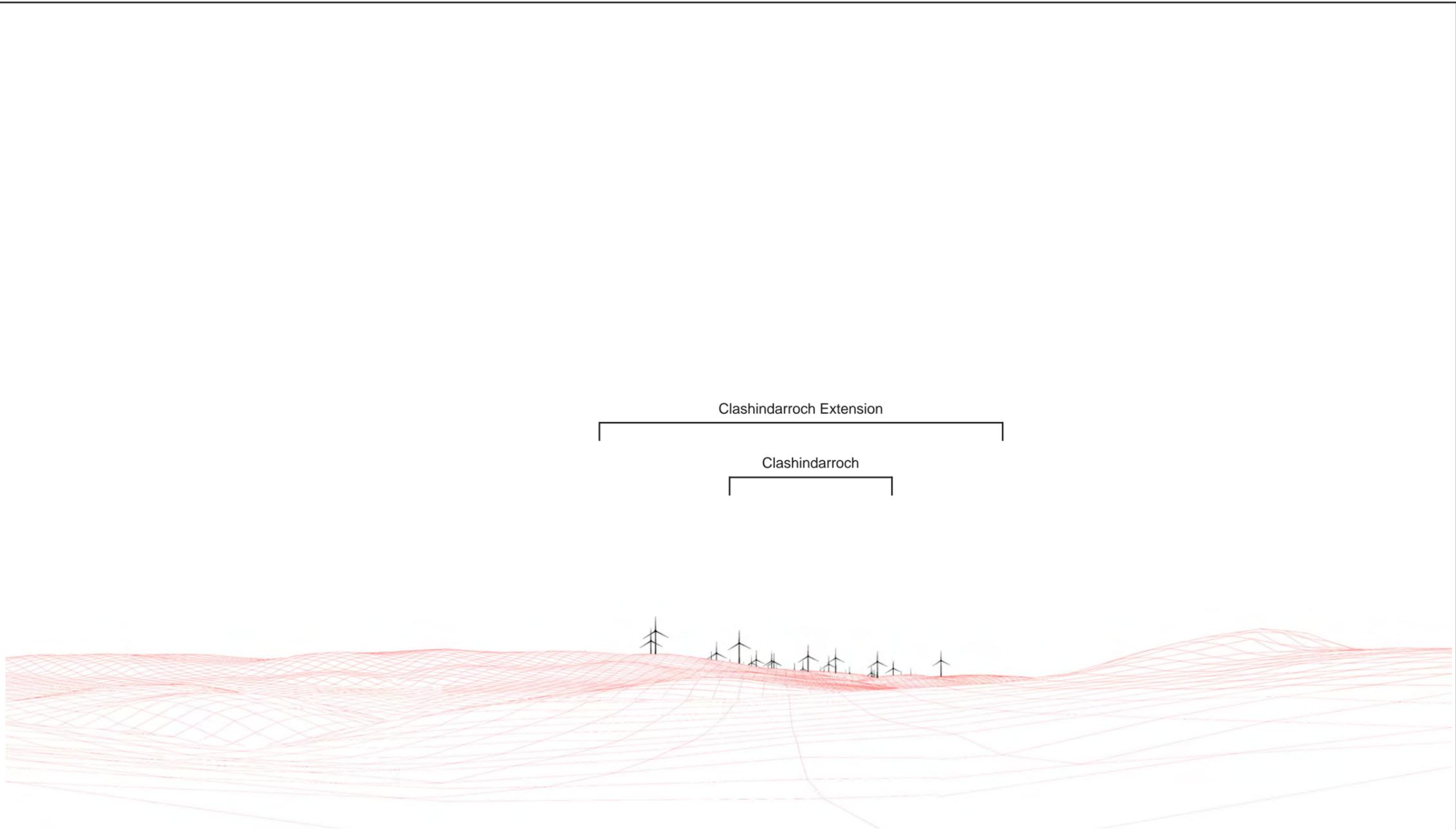
Figure Title:  
Residential Visual Amenity Assessment -  
Group07: Backside farm & Craig Dorney Lodge  
View East (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.22c
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group07: Backside farm & Craig Dorney Lodge  
View South (90 Degree View)

Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

Project Number: 1620010178	Figure No: 5.7.22d
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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**Key:**

 Proposed Craig Watch Wind Turbine

T2 T5 T3      T1 T7 T4 T6      T8      T10      T11

Garbet

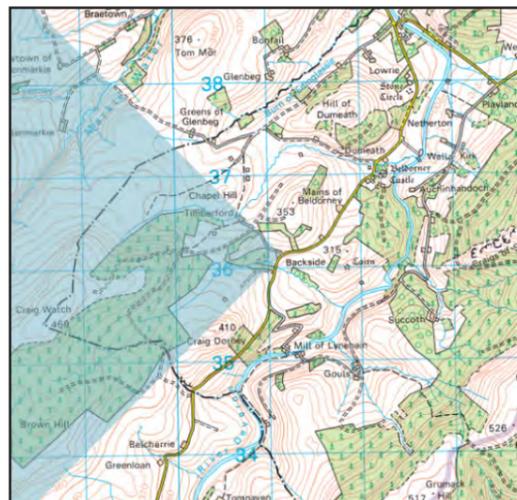
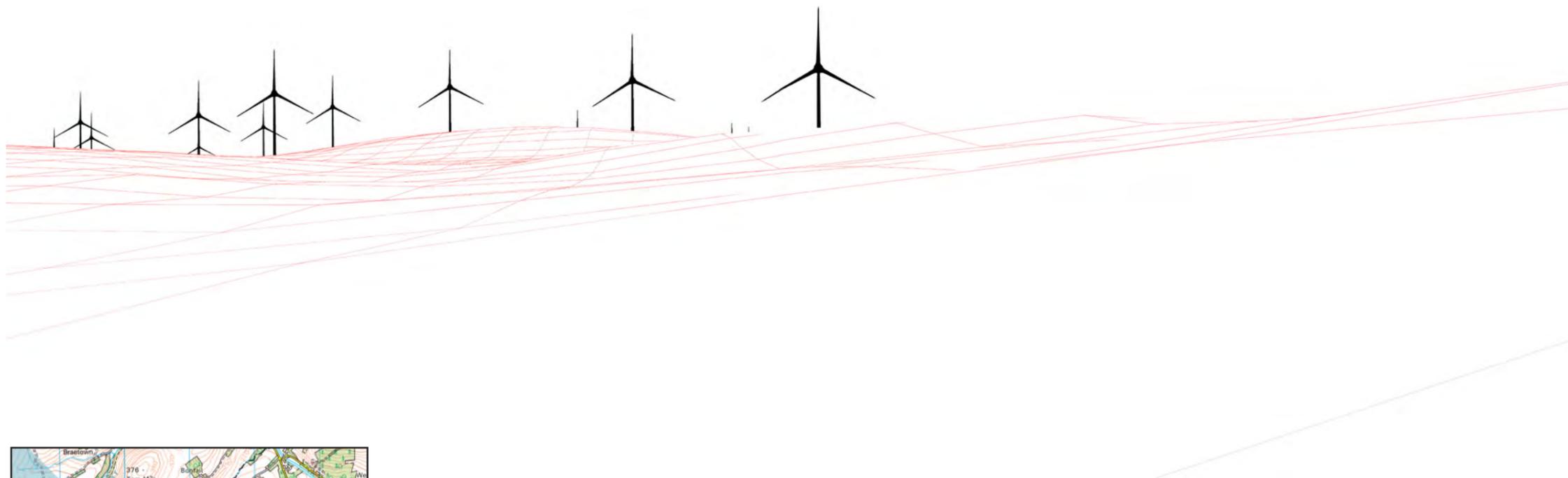


Figure Title:  
Residential Visual Amenity Assessment -  
Group07: Backside farm & Craig Dorney Lodge  
View West (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.22e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



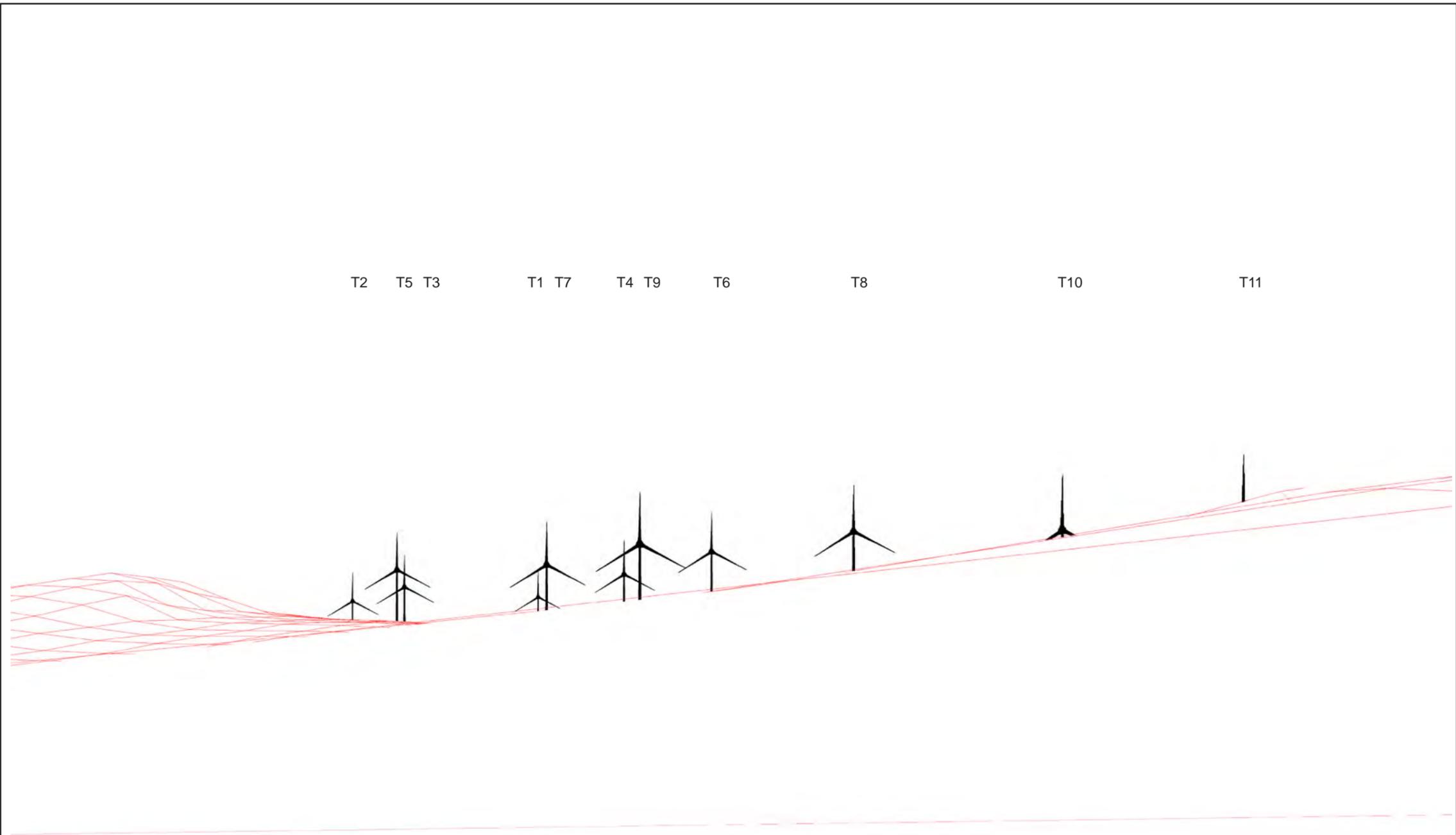



Figure Title:  
Residential Visual Amenity Assessment -  
Group08: Tighnaird & The Old School House  
View West/ Southwest (53.5 Degree View)

Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

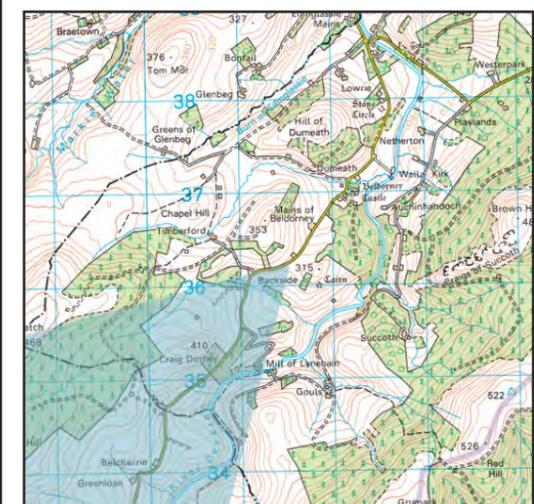
Project Number: 1620010178	Figure No: 5.7.23a
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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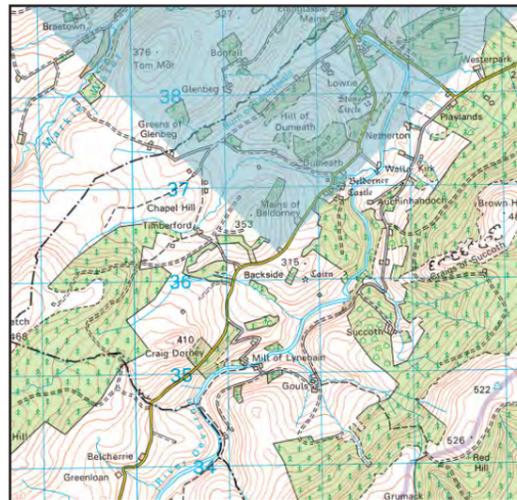
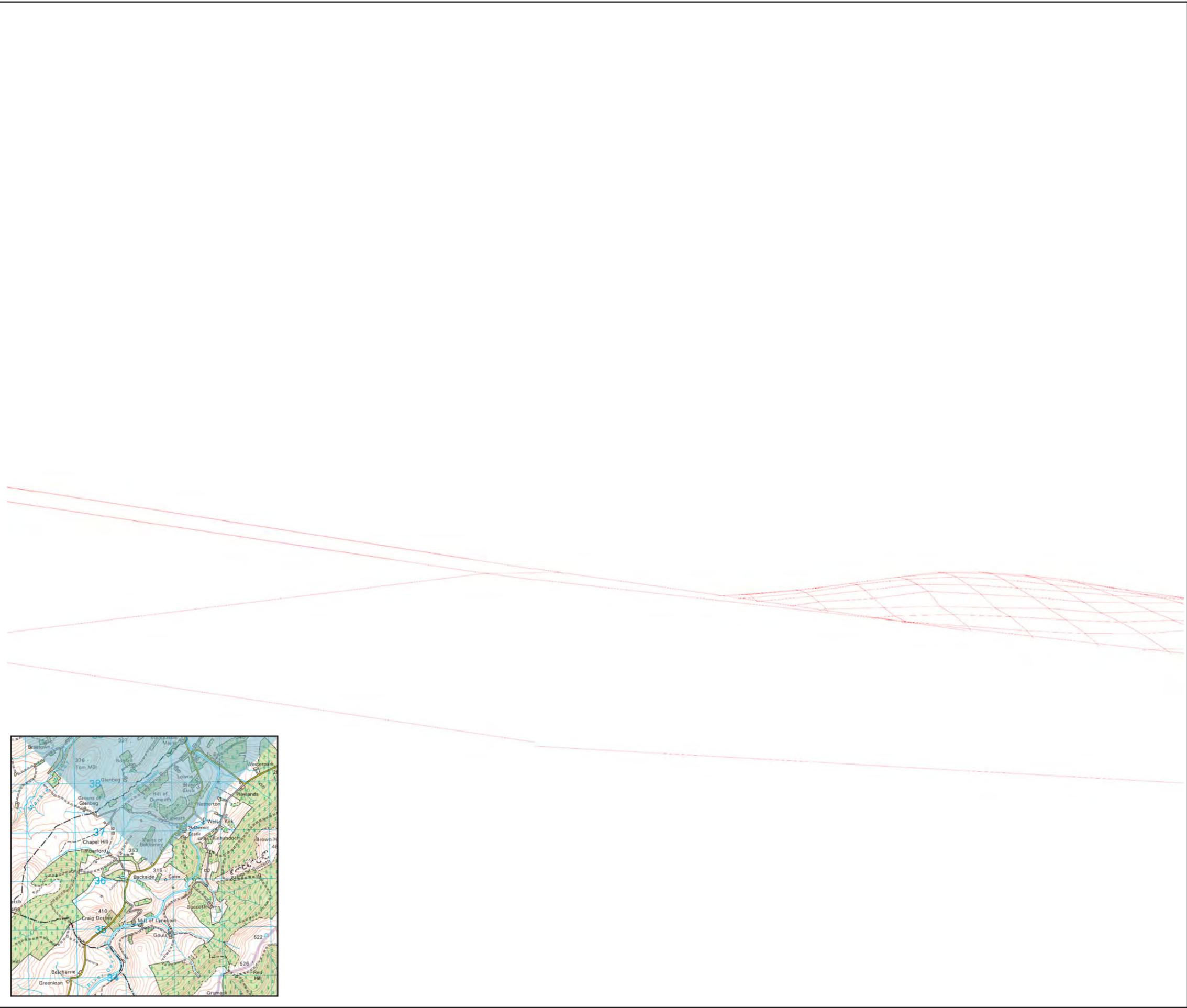
Client:





**Key:**





**Key:**

 Proposed Craig Watch Wind Turbine

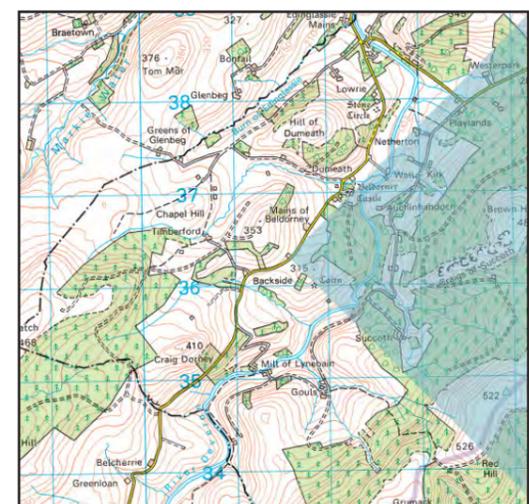
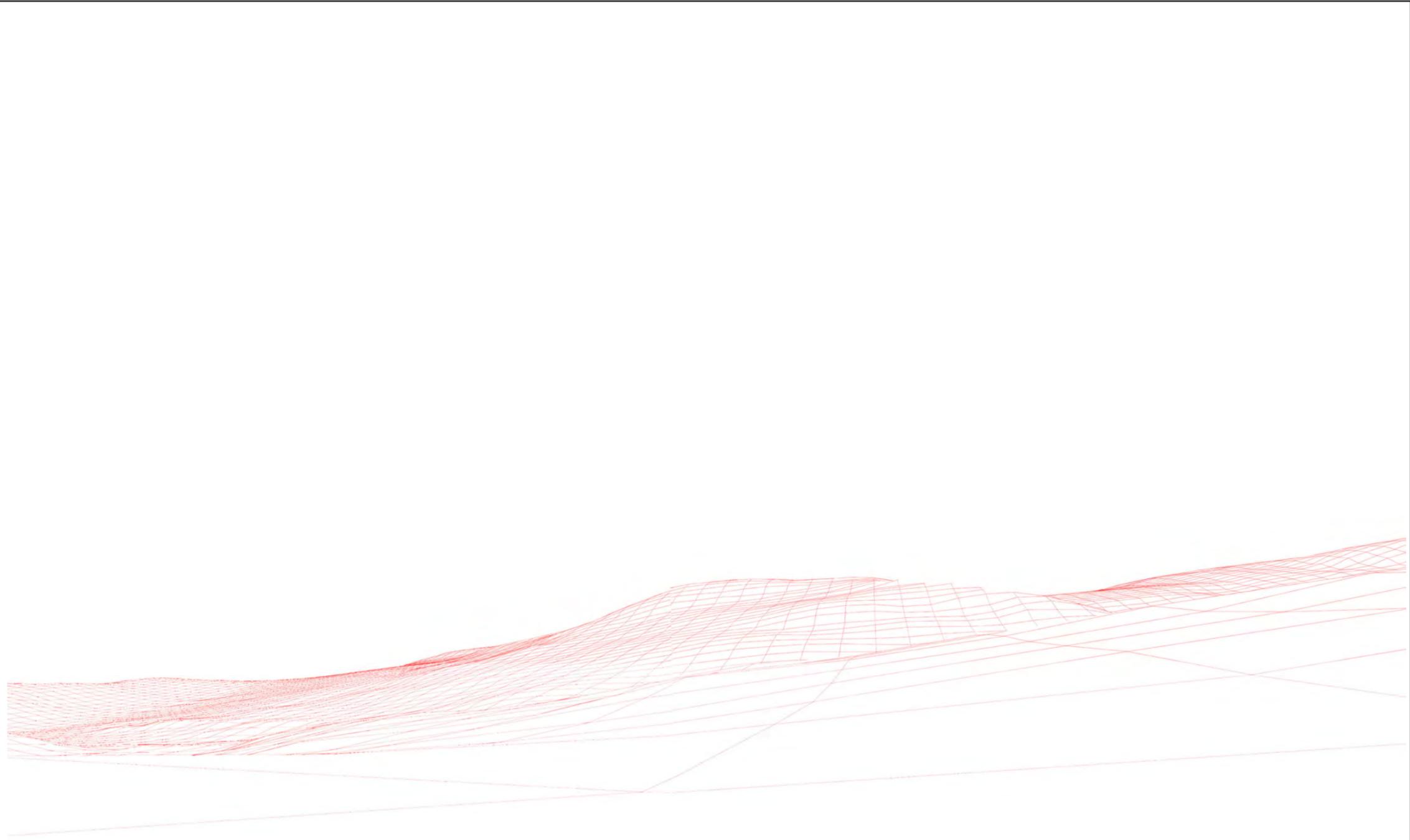
Figure Title:  
Residential Visual Amenity Assessment -  
Group08: Tighnaird & The Old School House  
View North (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.23b
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group08: Tighnaird & The Old School House  
View East (90 Degree View)

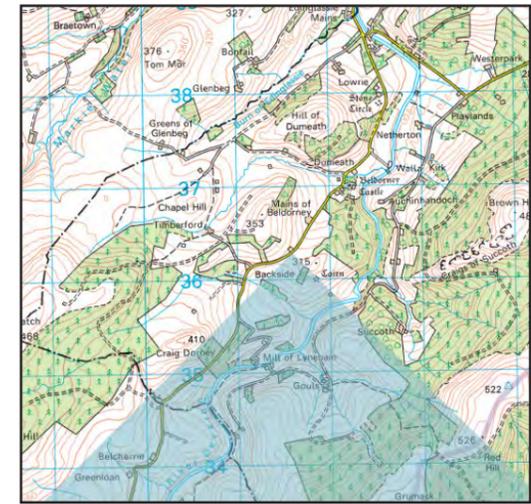
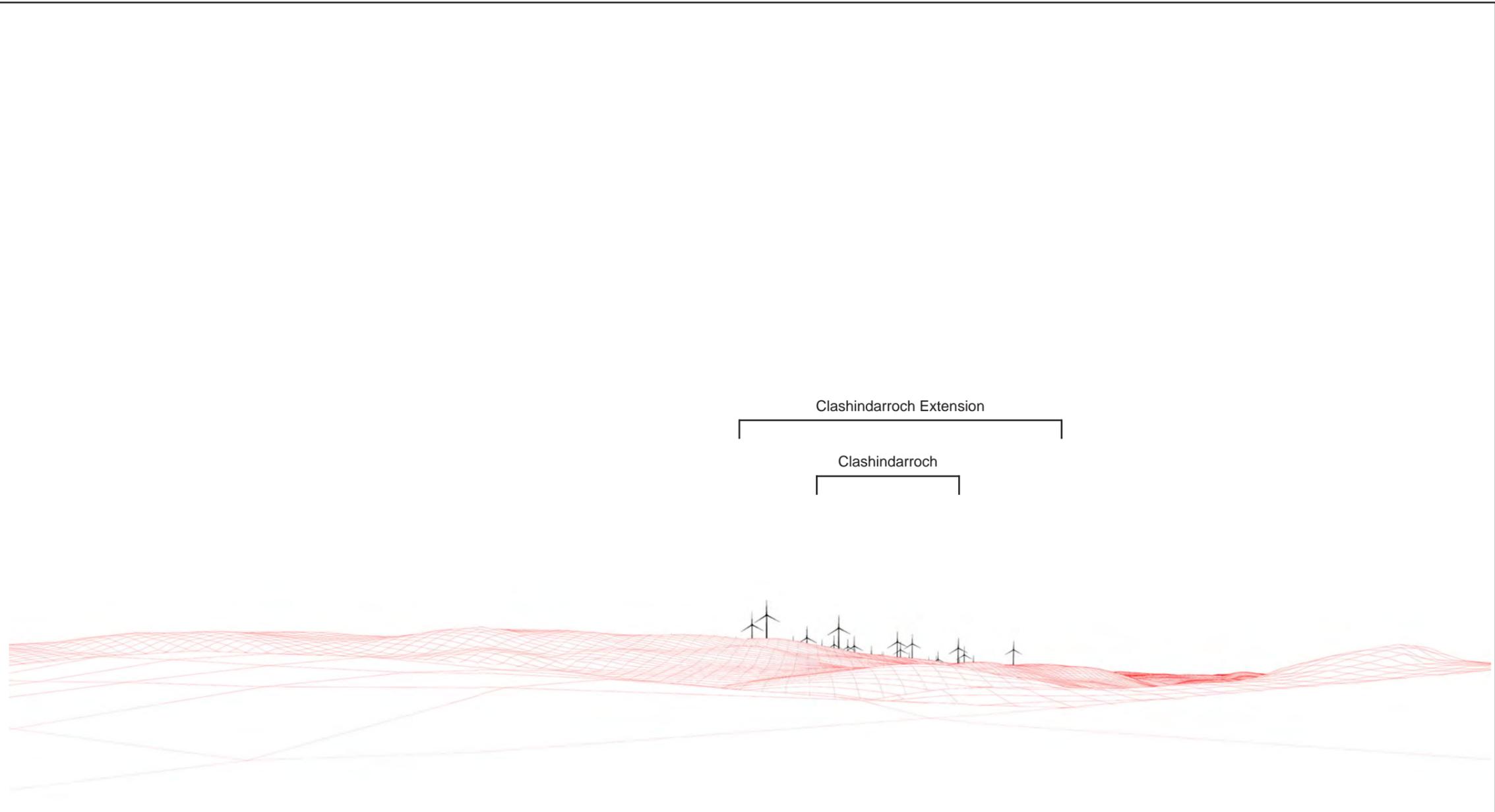
Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.23c
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:







**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group08: Tighnaird & The Old School House  
View South (90 Degree View)

Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

Project Number: 1620010178	Figure No: 5.7.23d
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:




**Key:**

 Proposed Craig Watch Wind Turbine

T2 T5 T3      T1 T7    T4 T9 T6      T8      T10      T11

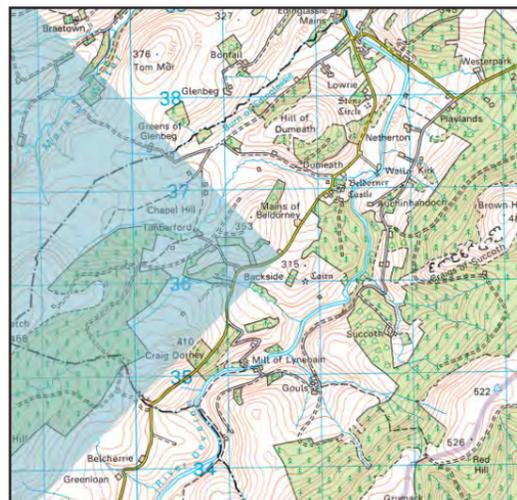
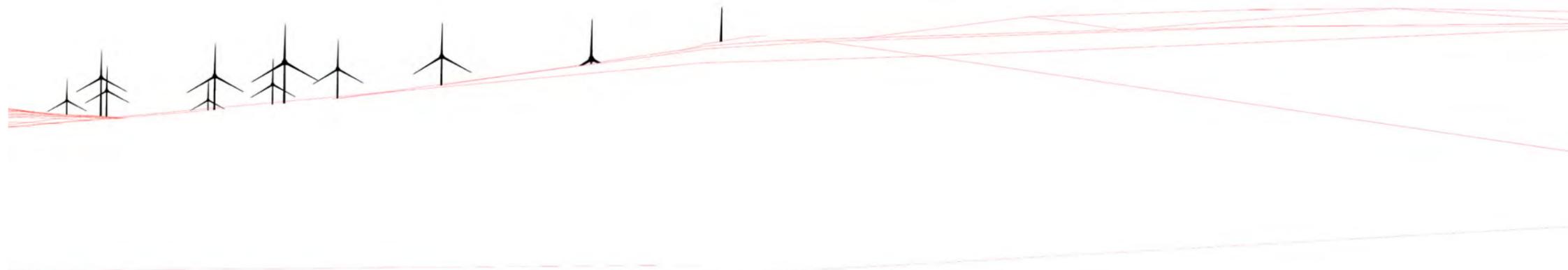


Figure Title:  
Residential Visual Amenity Assessment -  
Group08: Tighnaird & The Old School House  
View West (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.23e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  




**Key:**

 Proposed Craig Watch Wind Turbine

T2    T5 T3    T7 T1    T9 T4    T6    T8    T10    T11

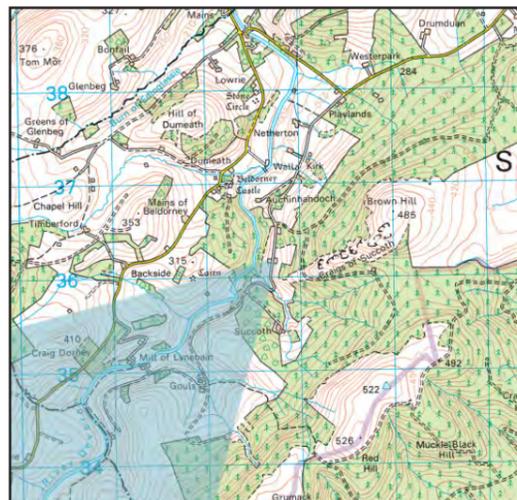
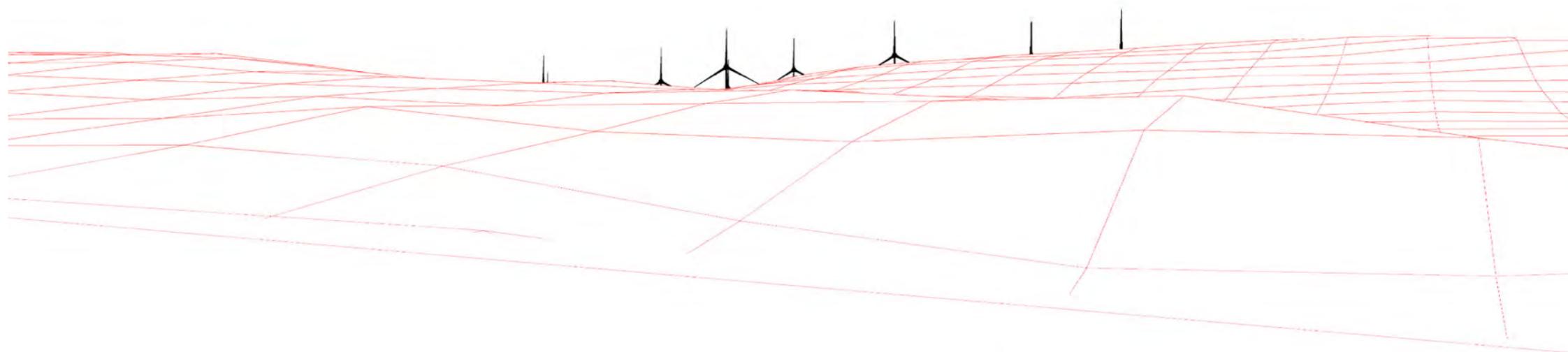


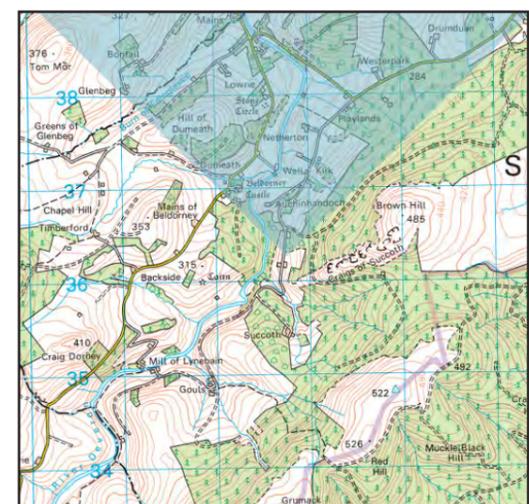
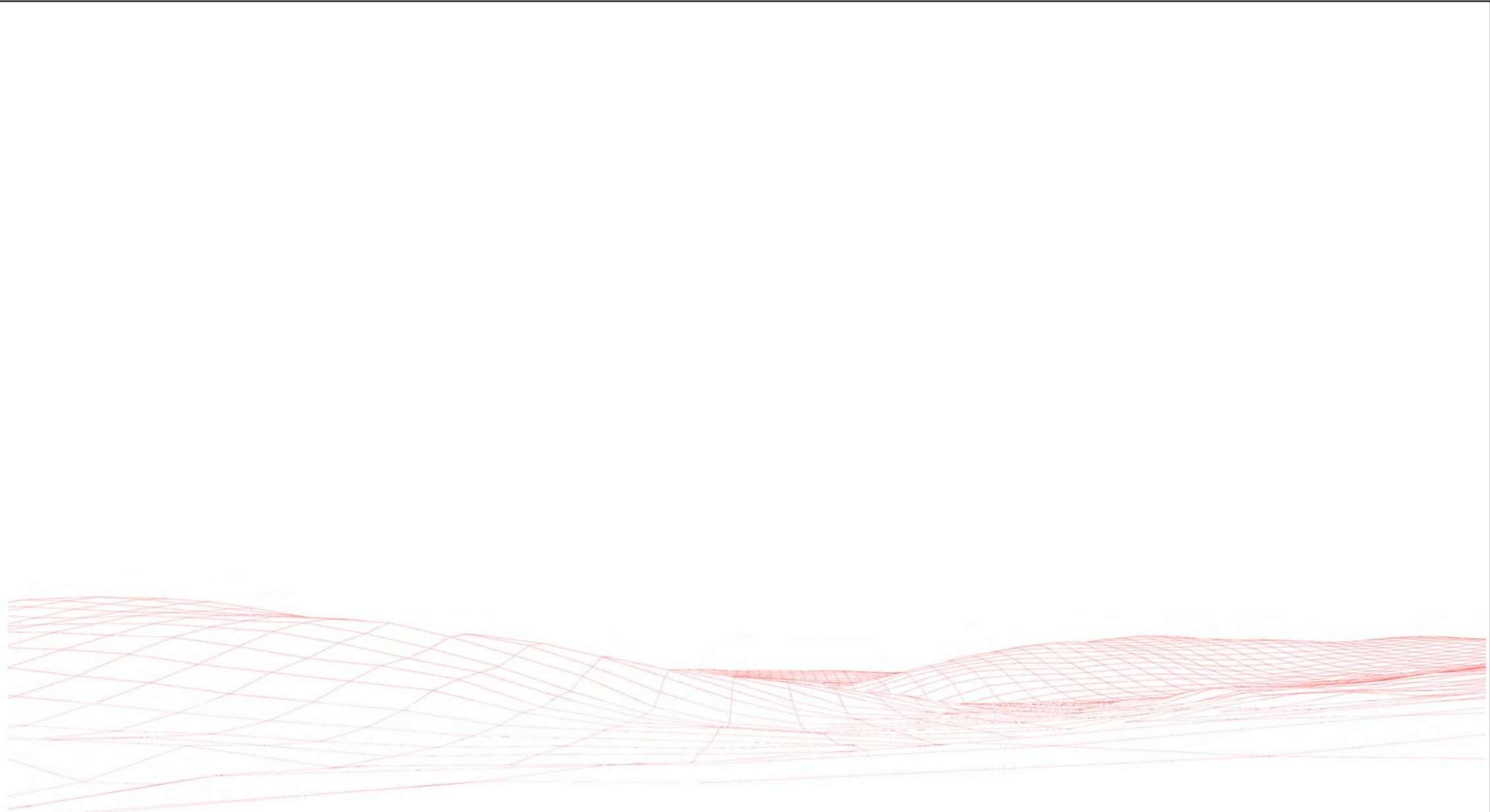
Figure Title:  
Residential Visual Amenity Assessment -  
Group09: Howemill Croft & Howemill  
View Southwest/ West (53.5 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.24a
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group09: Howemill Croft & Howemill  
View North (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

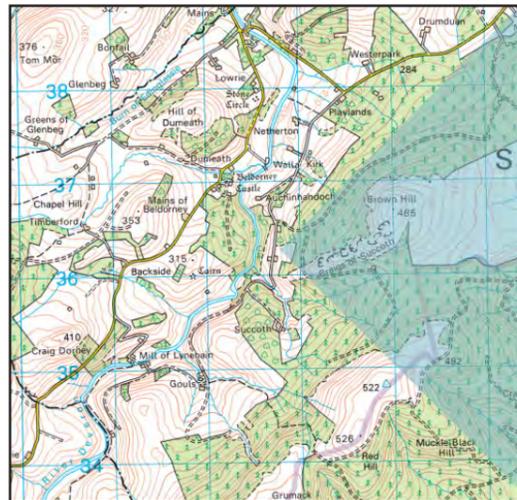
Project Number: 1620010178	Figure No: 5.7.24b
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:



**Key:**

 Proposed Craig Watch Wind Turbine

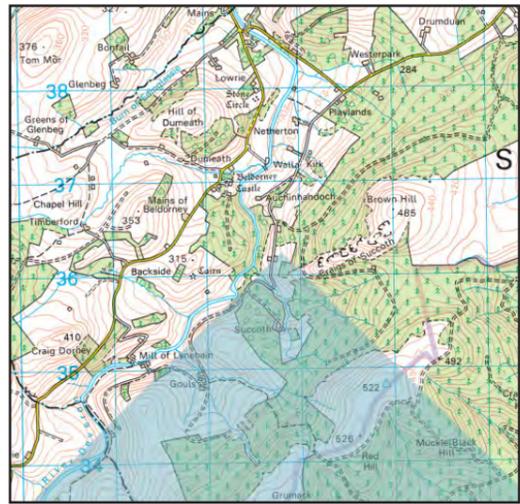
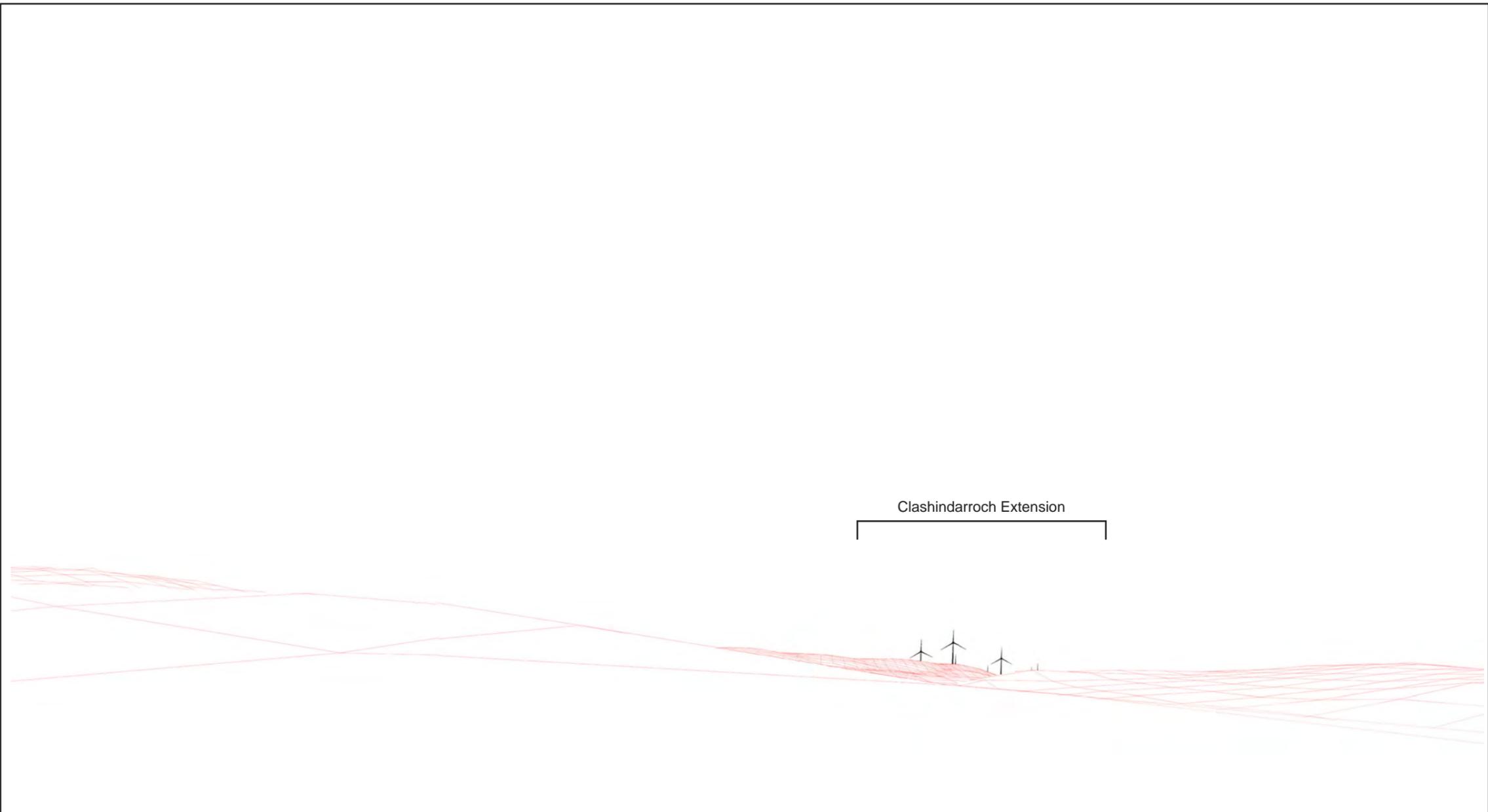
Figure Title:  
Residential Visual Amenity Assessment -  
Group09: Howemill Croft & Howemill  
View East (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.24c
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:





**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group09: Howemill Croft & Howemill  
View South (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.24d
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  




**Key:**

 Proposed Craig Watch Wind Turbine

T2 T5 T3 T7 T1 T9 T4 T6 T8 T10 T11

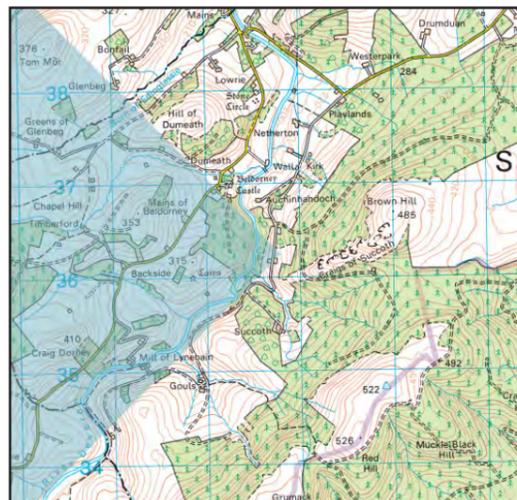
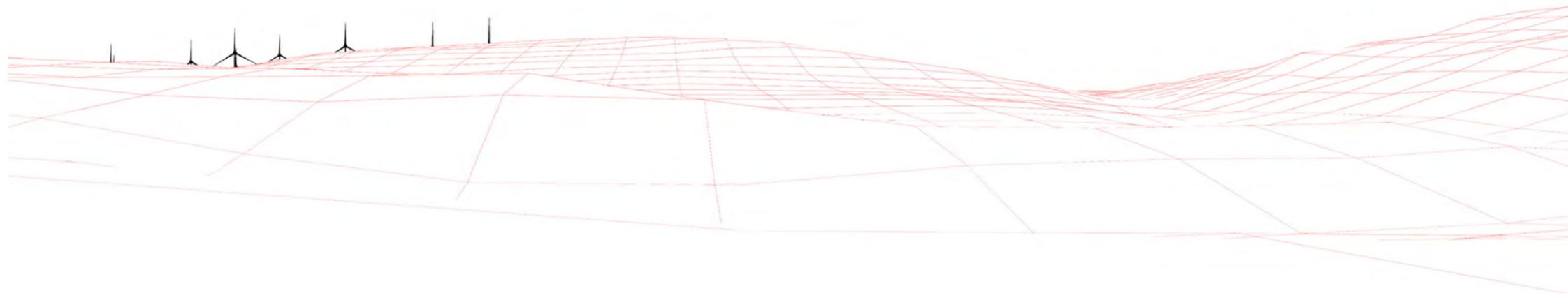


Figure Title:  
Residential Visual Amenity Assessment -  
Group09: Howemill Croft & Howemill  
View West (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.24e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  




**Key:**

 Proposed Craig Watch Wind Turbine

T2      T3 T5      T1      T7 T4      T9 T6      T8      T10      T11

Dorenell

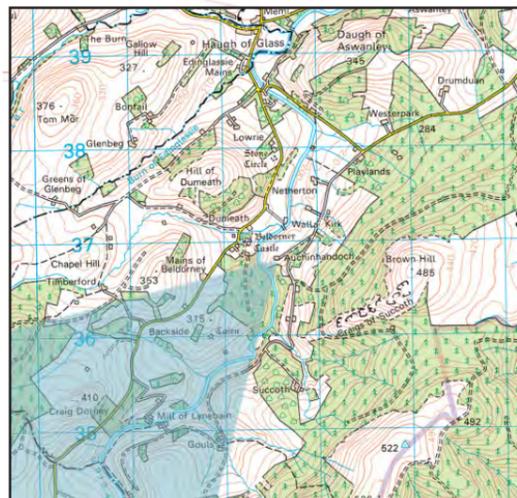
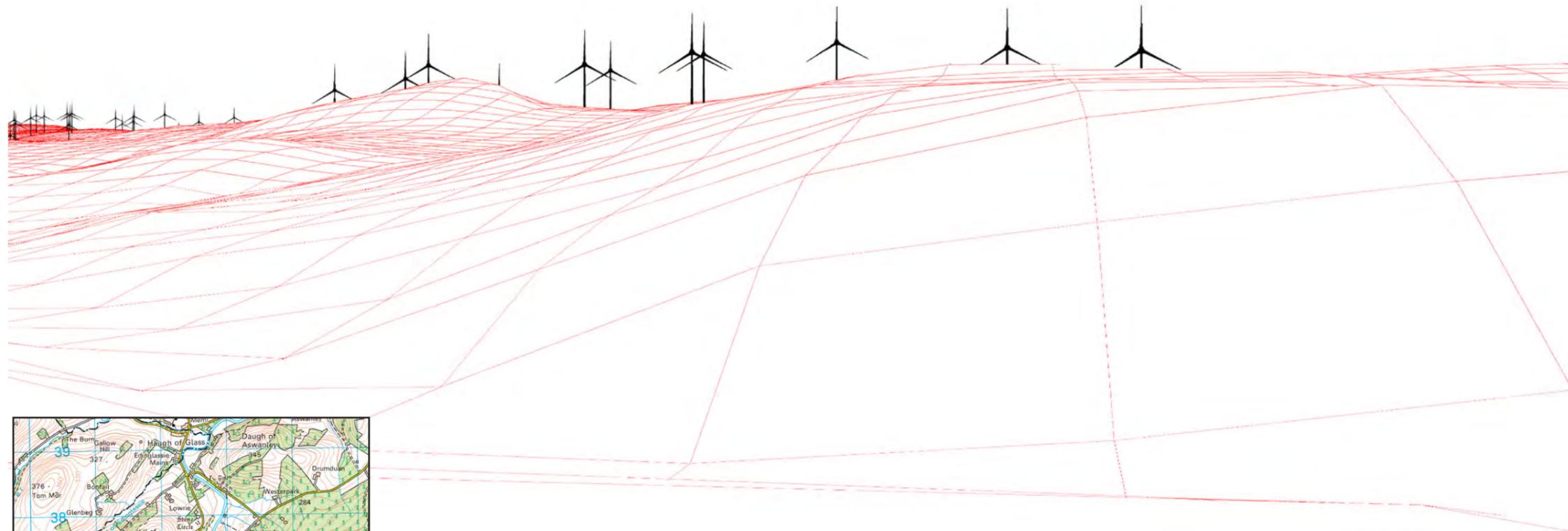


Figure Title:  
Residential Visual Amenity Assessment -  
RVA16: Auchinhandoch  
View Southwest/ West (53.5 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number:  
1620010178

Figure No:  
5.7.25a

Date:  
April 2022

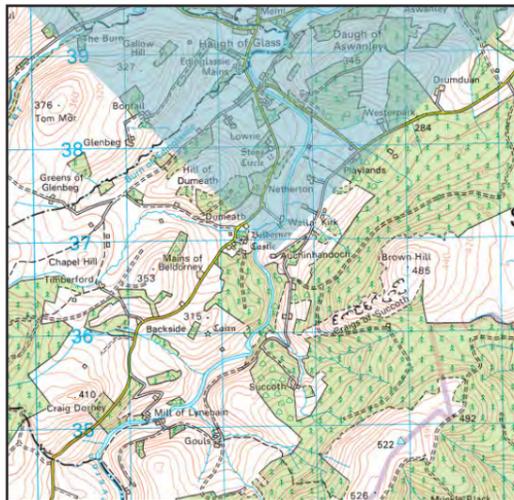
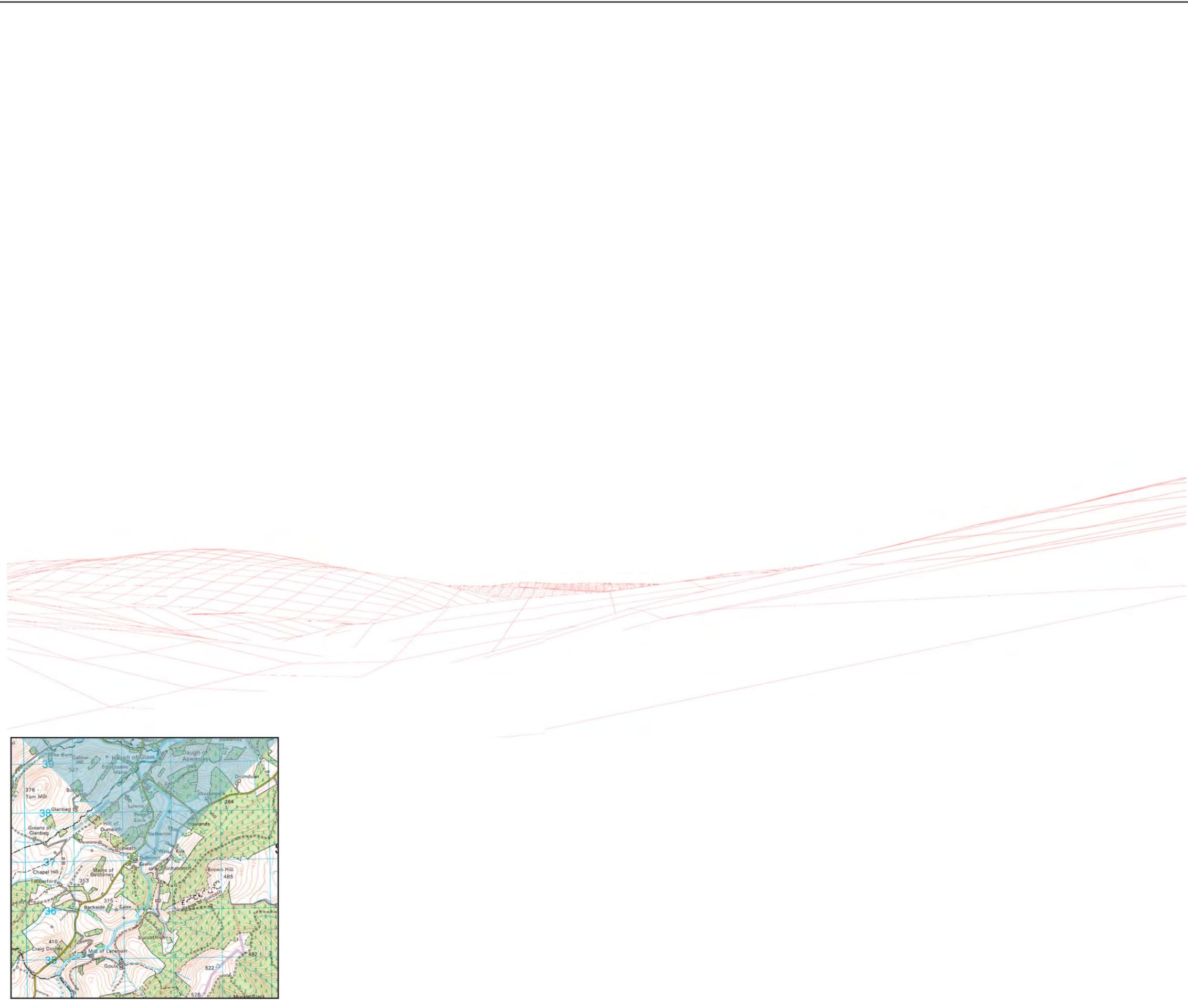
Prepared By:  
KL

Scale:  
NTS

Issue:  
1

Client:





**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
RVA16: Auchinhandoch  
View North (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

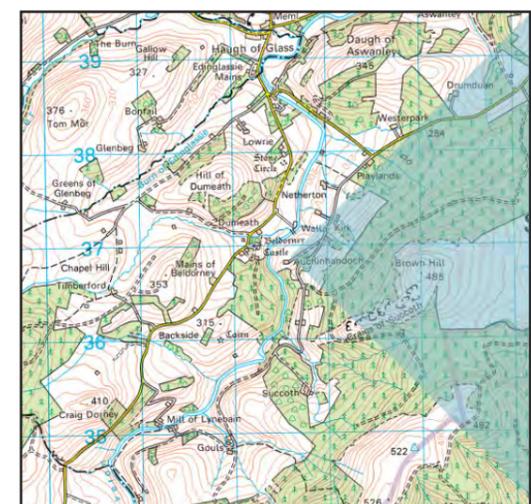
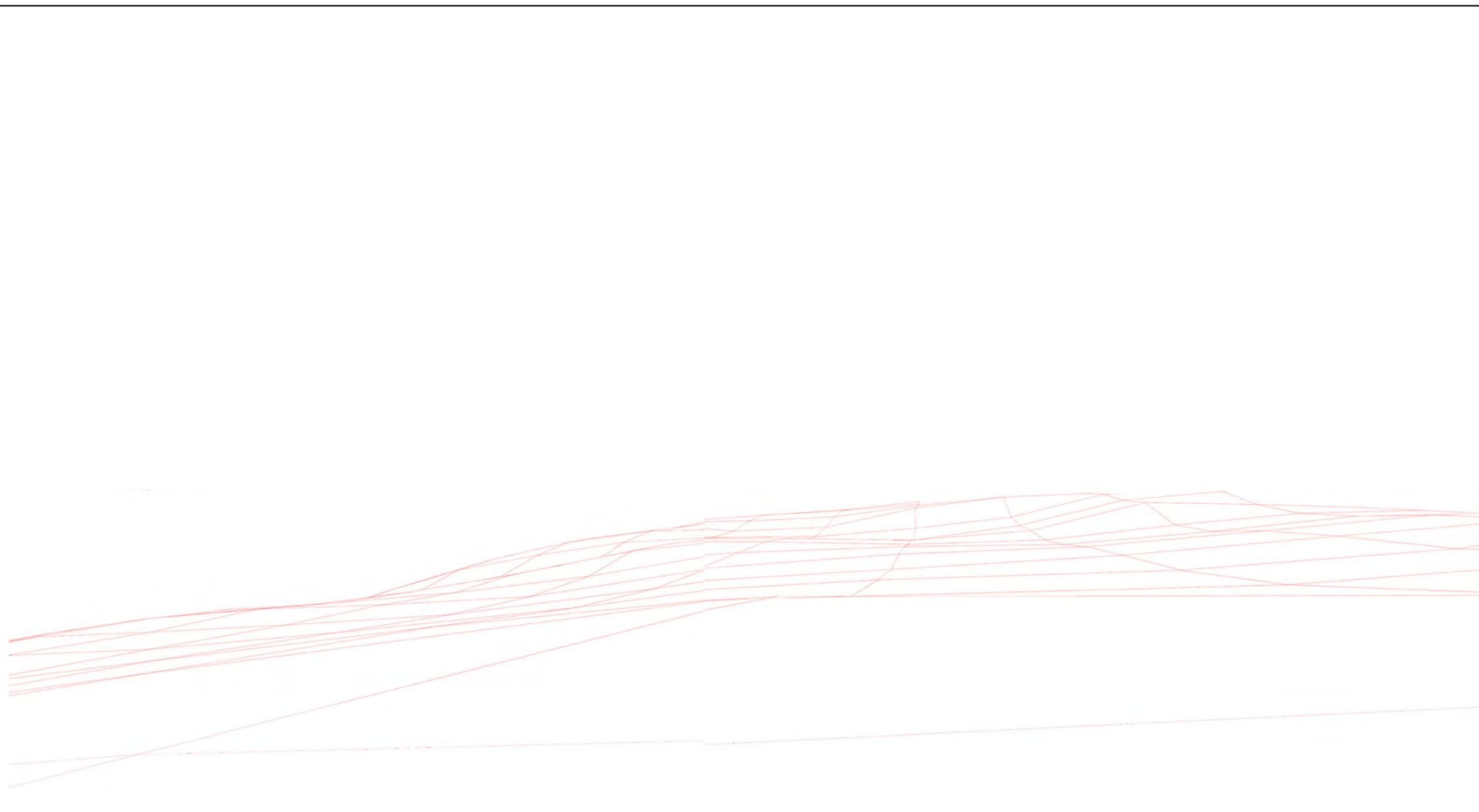
Project Number: 1620010178	Figure No: 5.7.25b
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
RVA16: Auchinhandoch  
View East (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number:  
1620010178

Figure No:  
5.7.25c

Date:  
April 2022

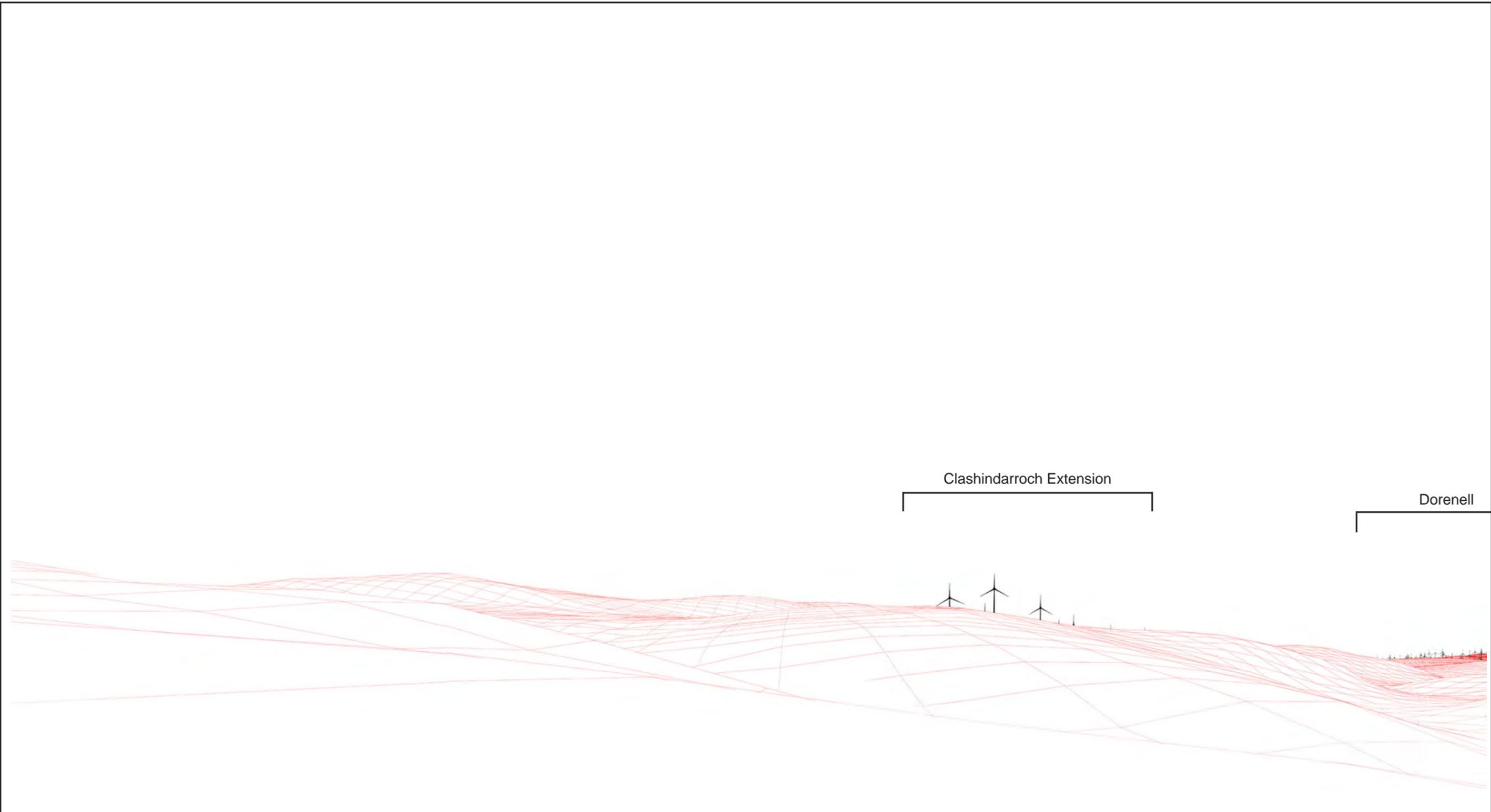
Prepared By:  
KL

Scale:  
NTS

Issue:  
1

Client:





**Key:**

 Proposed Craig Watch Wind Turbine

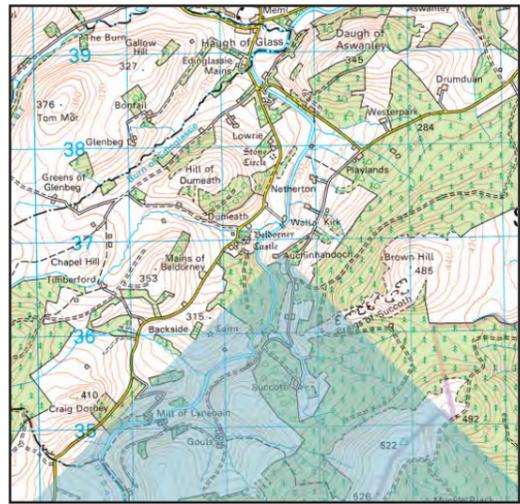


Figure Title:  
Residential Visual Amenity Assessment -  
RVA16: Auchinhandoch  
View South (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.25d
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Date: April 2022	Prepared By: KL
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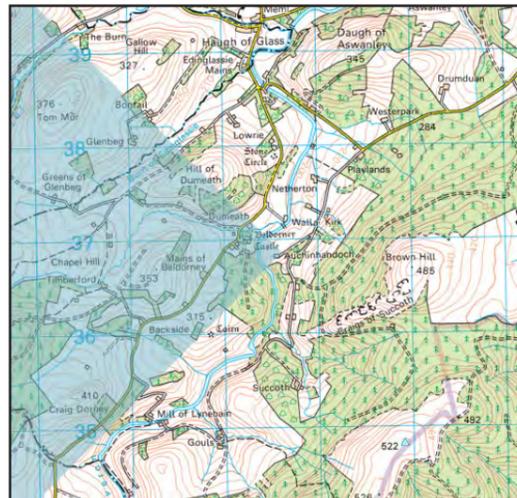
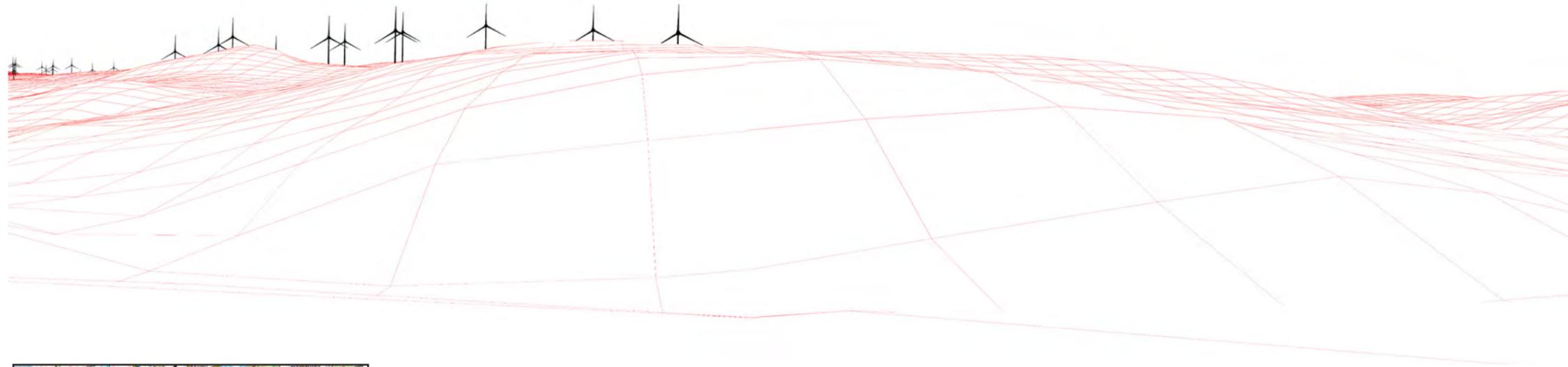
Scale: NTS	Issue: 1
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Client:




Dorenell

T2 T3 T5 T1 T7 T4 T9 T6 T8 T10 T11



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
RVA16: Auchinhandoch  
View West (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

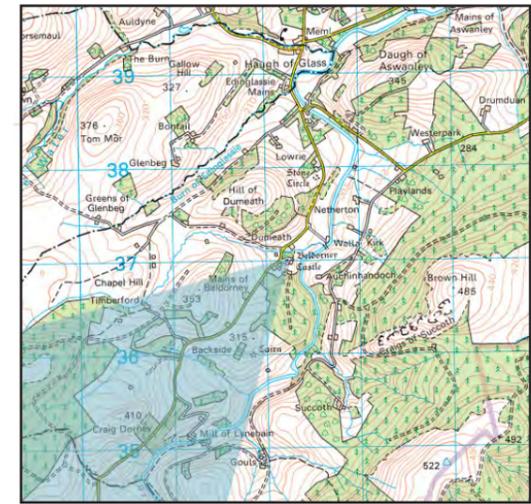
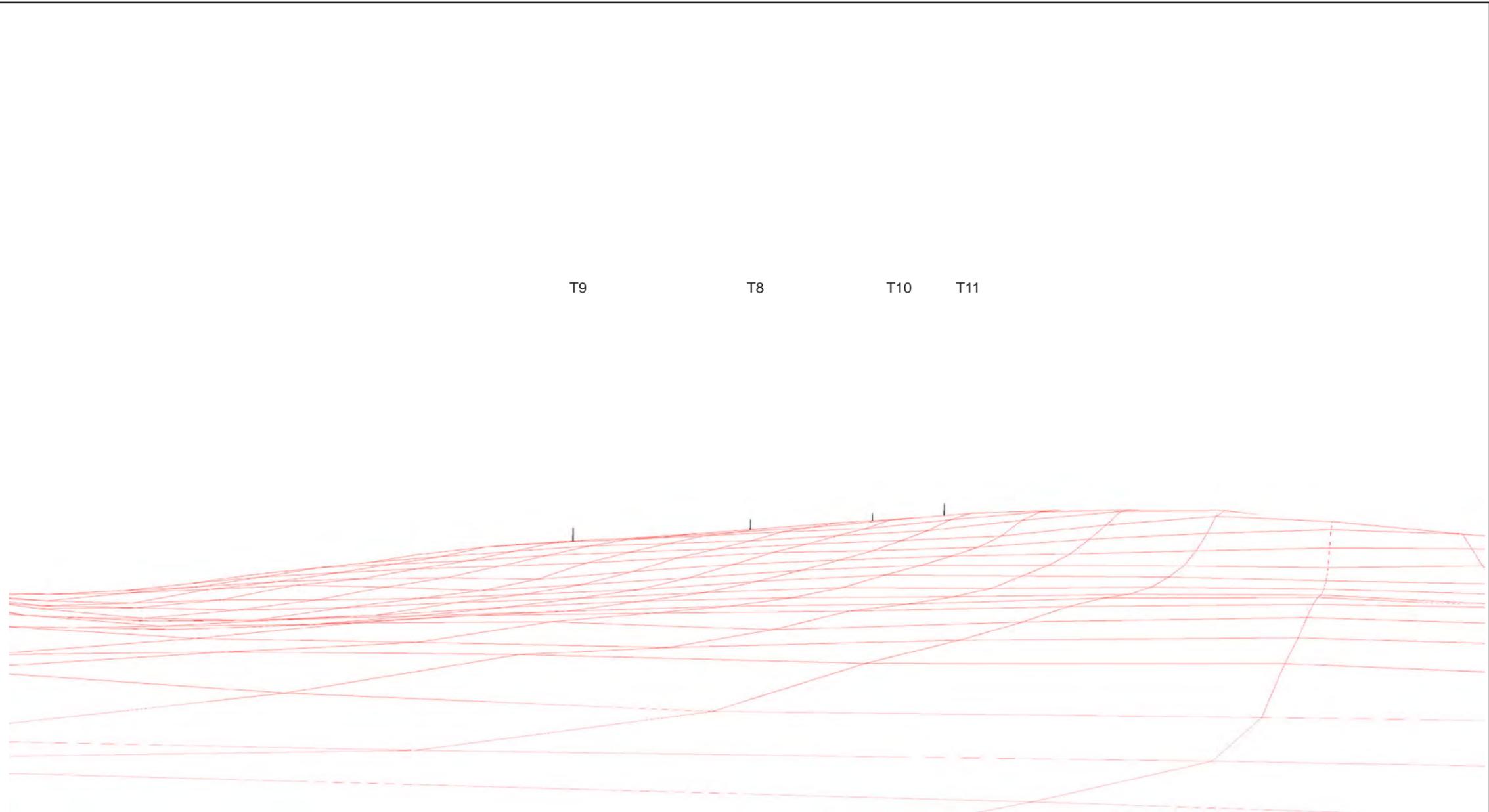
Project Number: 1620010178	Figure No: 5.7.25e
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group10: Beldorney Castle & Dumeath  
View Southwest (53.5 Degree View)

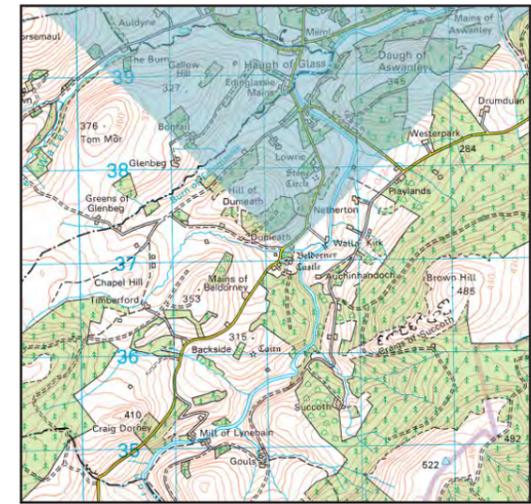
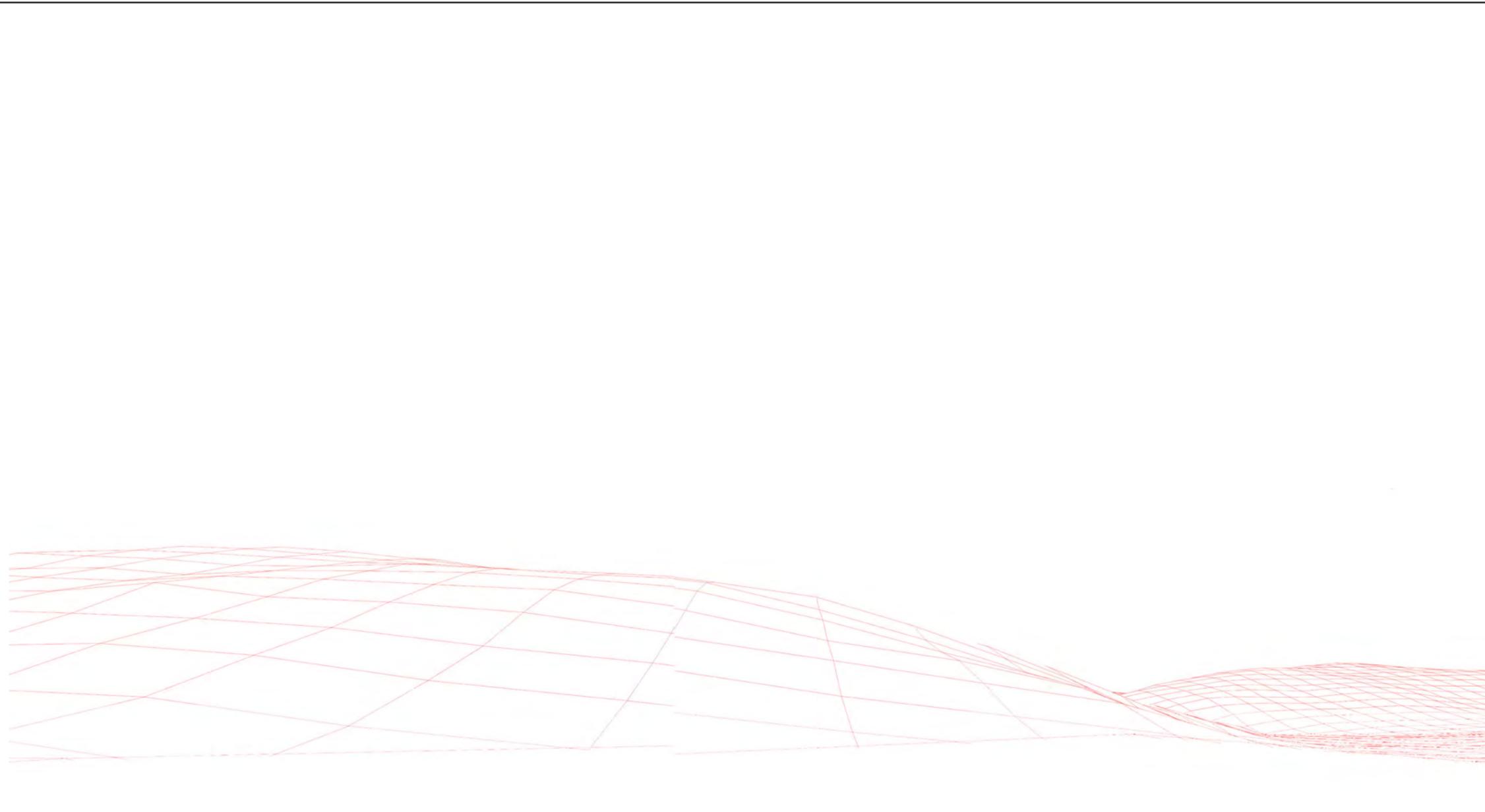
Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.26a
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:







**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group10: Beldorney Castle & Dumeach  
View North (90 Degree View)

Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

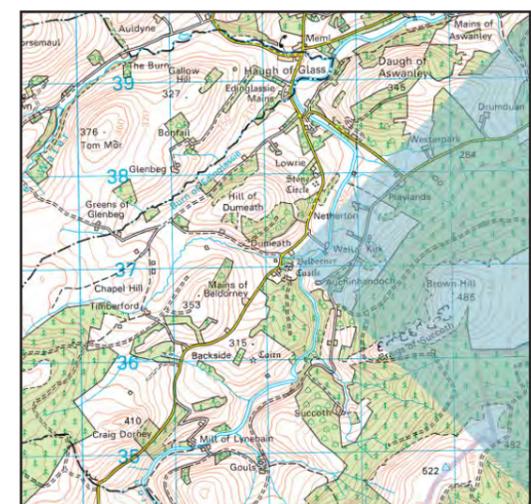
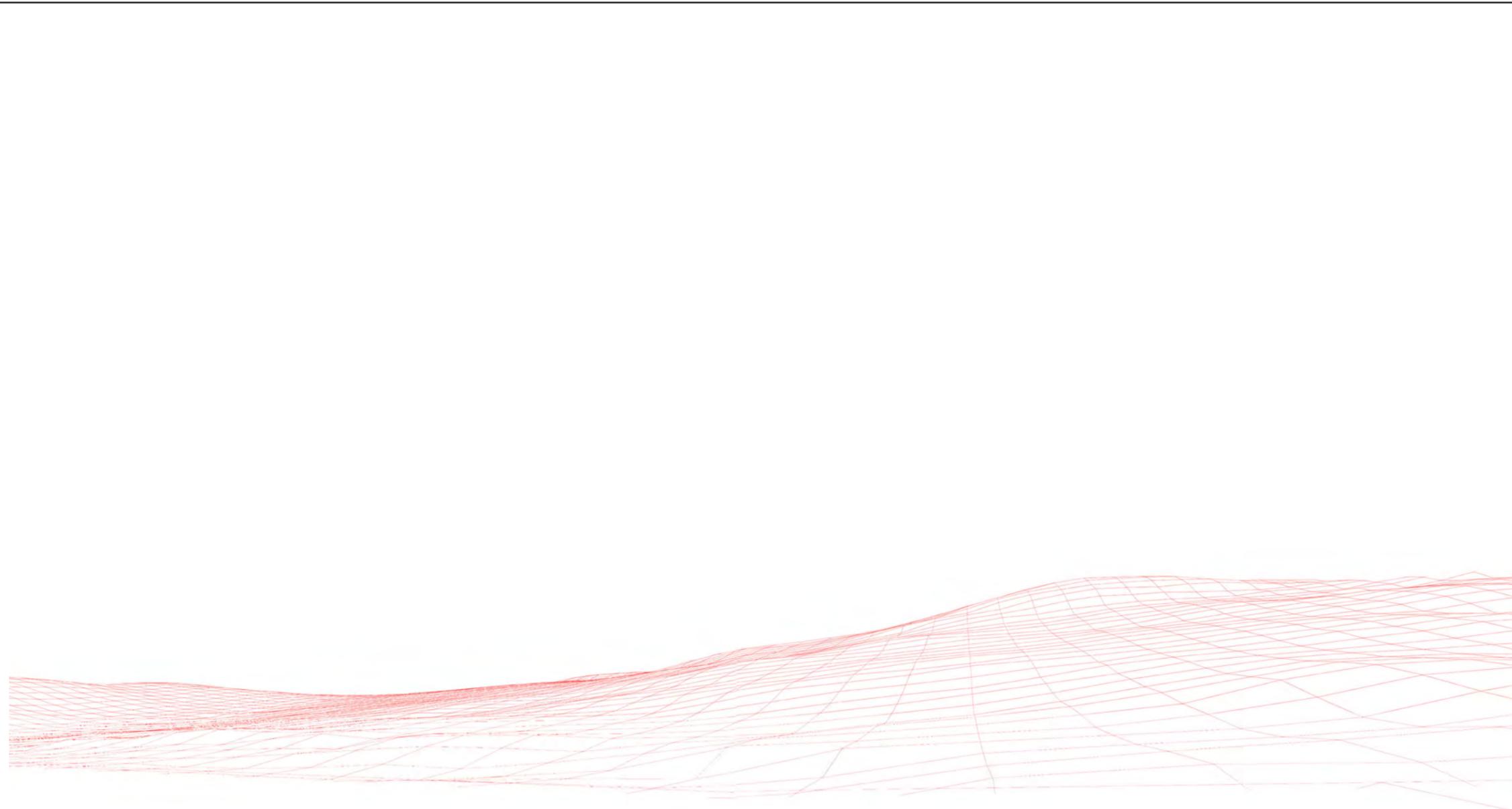
Project Number: 1620010178	Figure No: 5.7.26b
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group10: Beldorney Castle & Dumeth  
View East (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

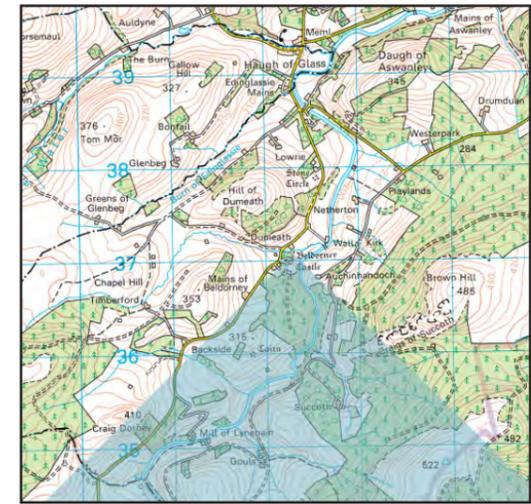
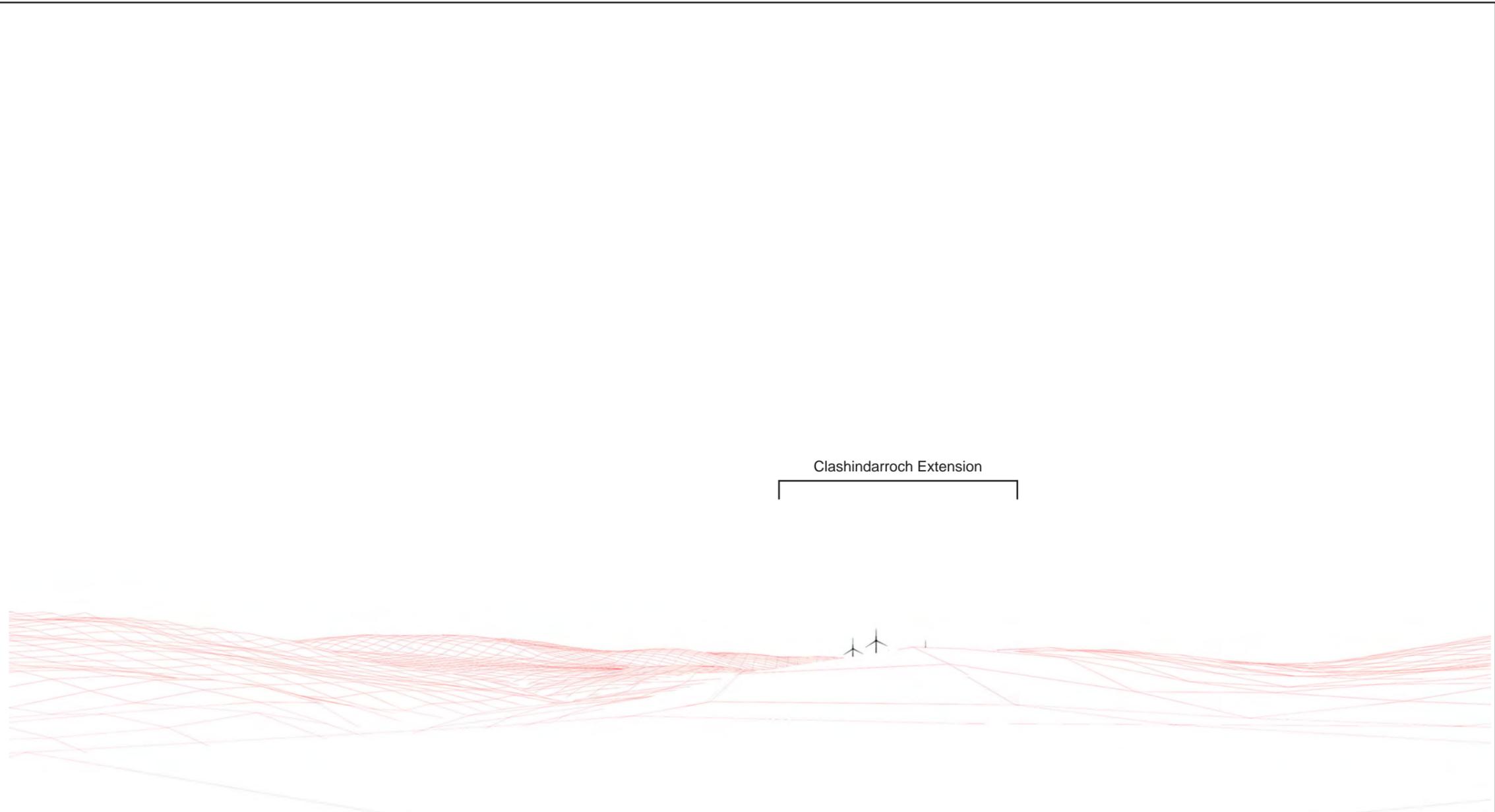
Project Number: 1620010178	Figure No: 5.7.26c
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group10: Beldorney Castle & Dumeach  
View South (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.26d
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Date: April 2022	Prepared By: KL
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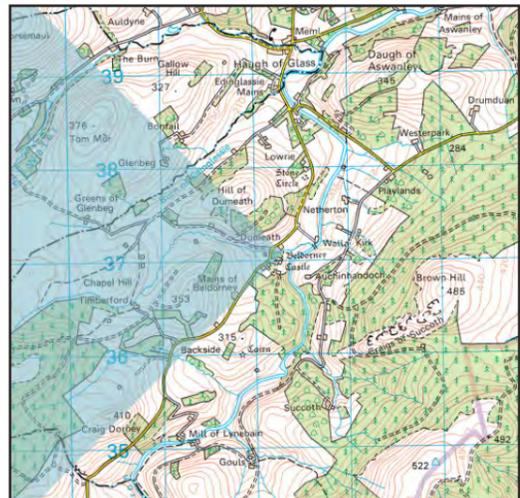
Scale: NTS	Issue: 1
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Client:






T9      T8      T10      T11



**Key:**

 Proposed Craig Watch Wind Turbine

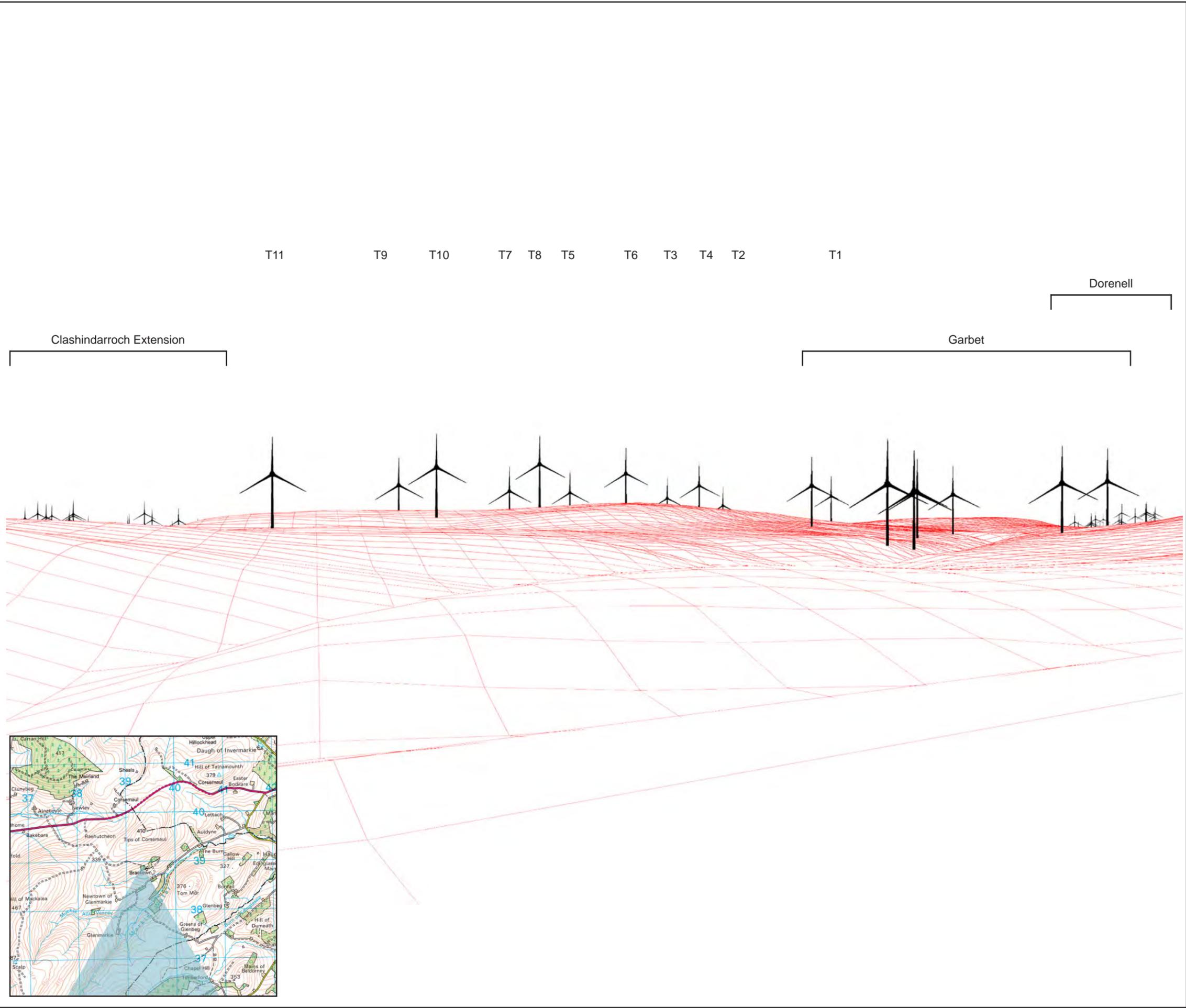
Figure Title:  
Residential Visual Amenity Assessment -  
Group10: Beldorney Castle & Dumeth  
View West (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.26e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group11: Easter Braetown & Wester Braetown  
View South (53.5 Degree View)

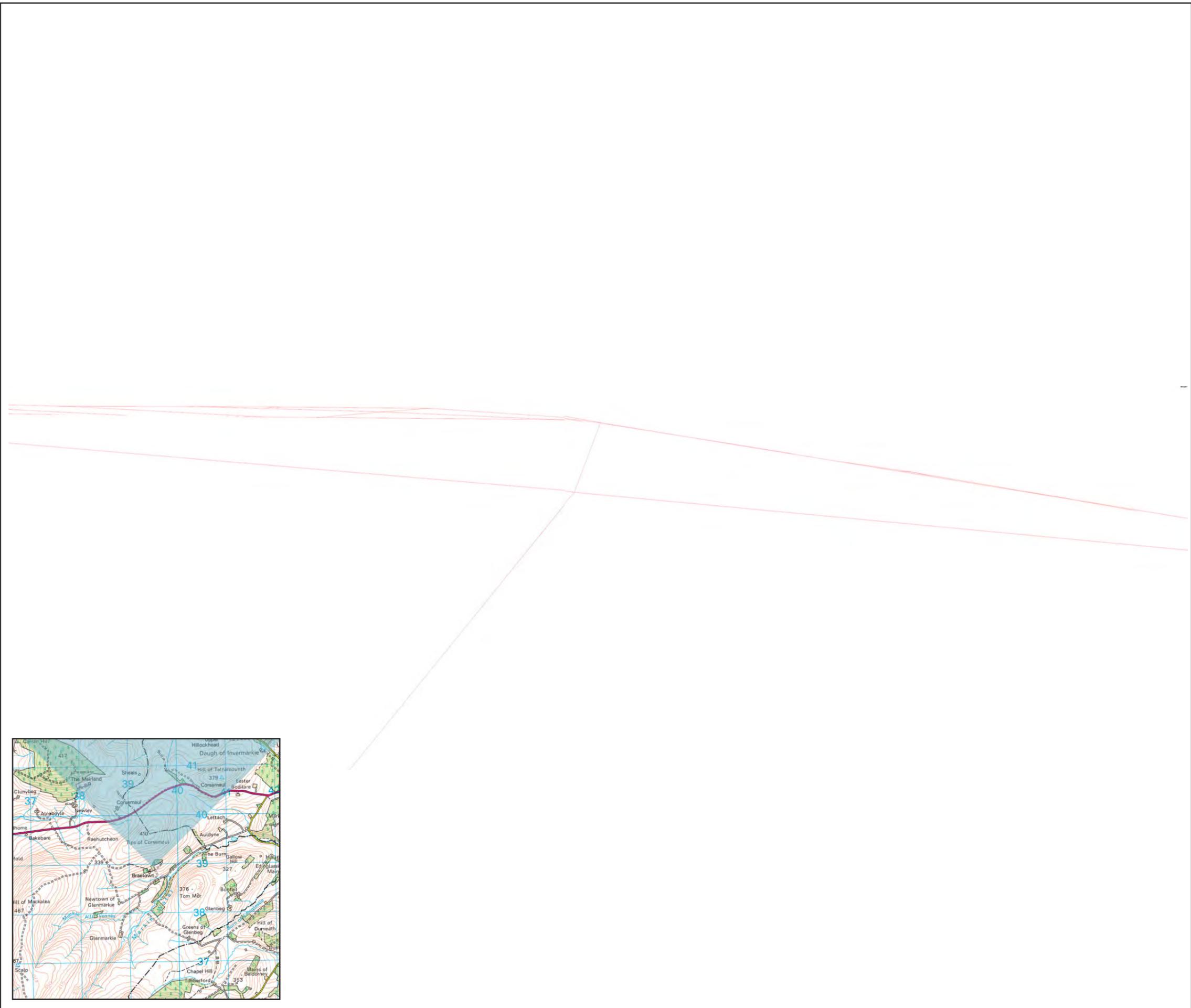
Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

Project Number: 1620010178	Figure No: 5.7.27a
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:







**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group11: Easter Braetown & Wester Braetown  
View North (90 Degree View)

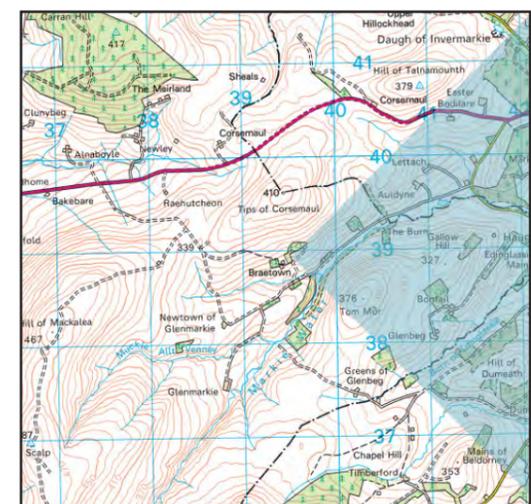
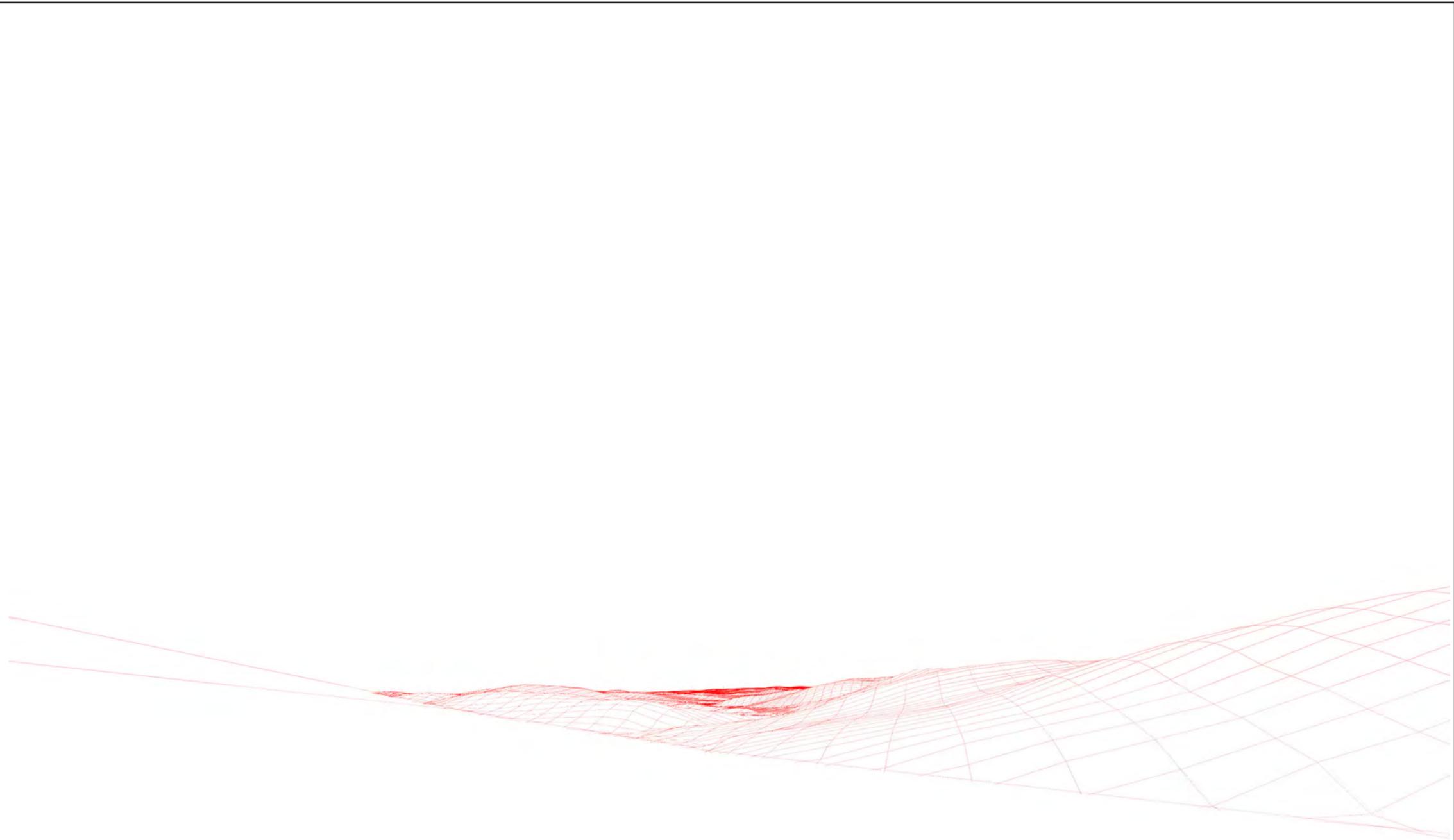
Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.27b
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:







**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group11: Easter Braetown & Wester Braetown  
View East (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.27c
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Date: April 2022	Prepared By: KL
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Scale: NTS	Issue: 1
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Client:




**Key:**

 Proposed Craig Watch Wind Turbine

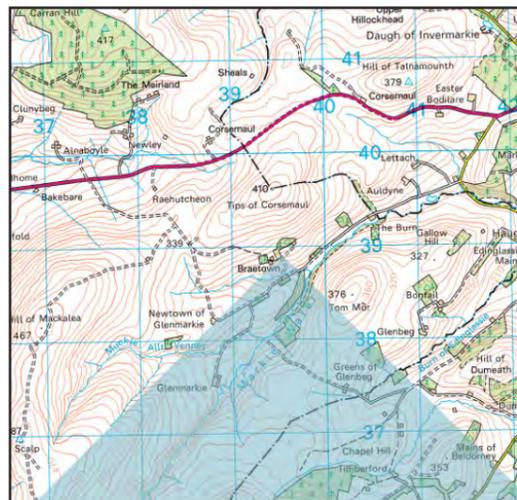
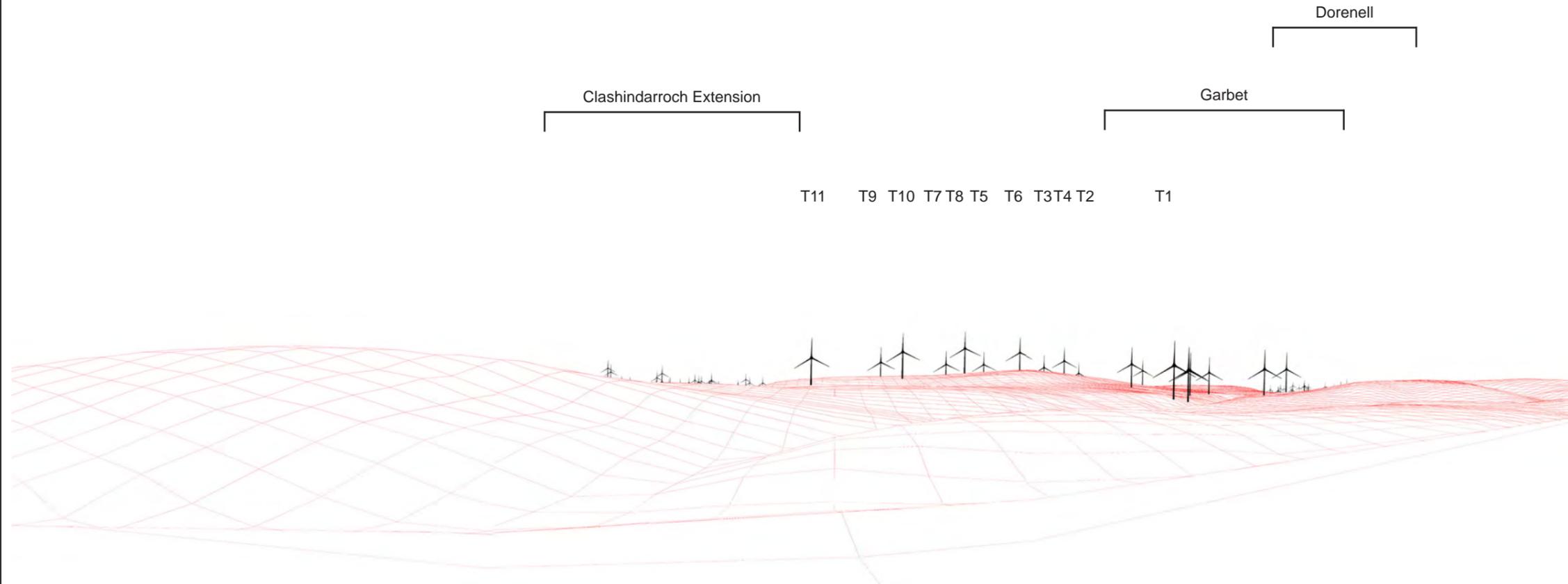


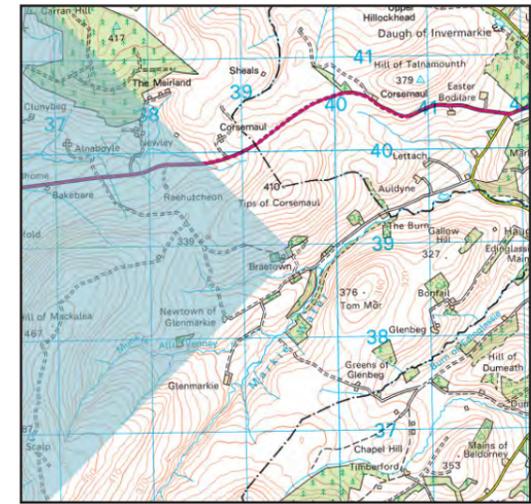
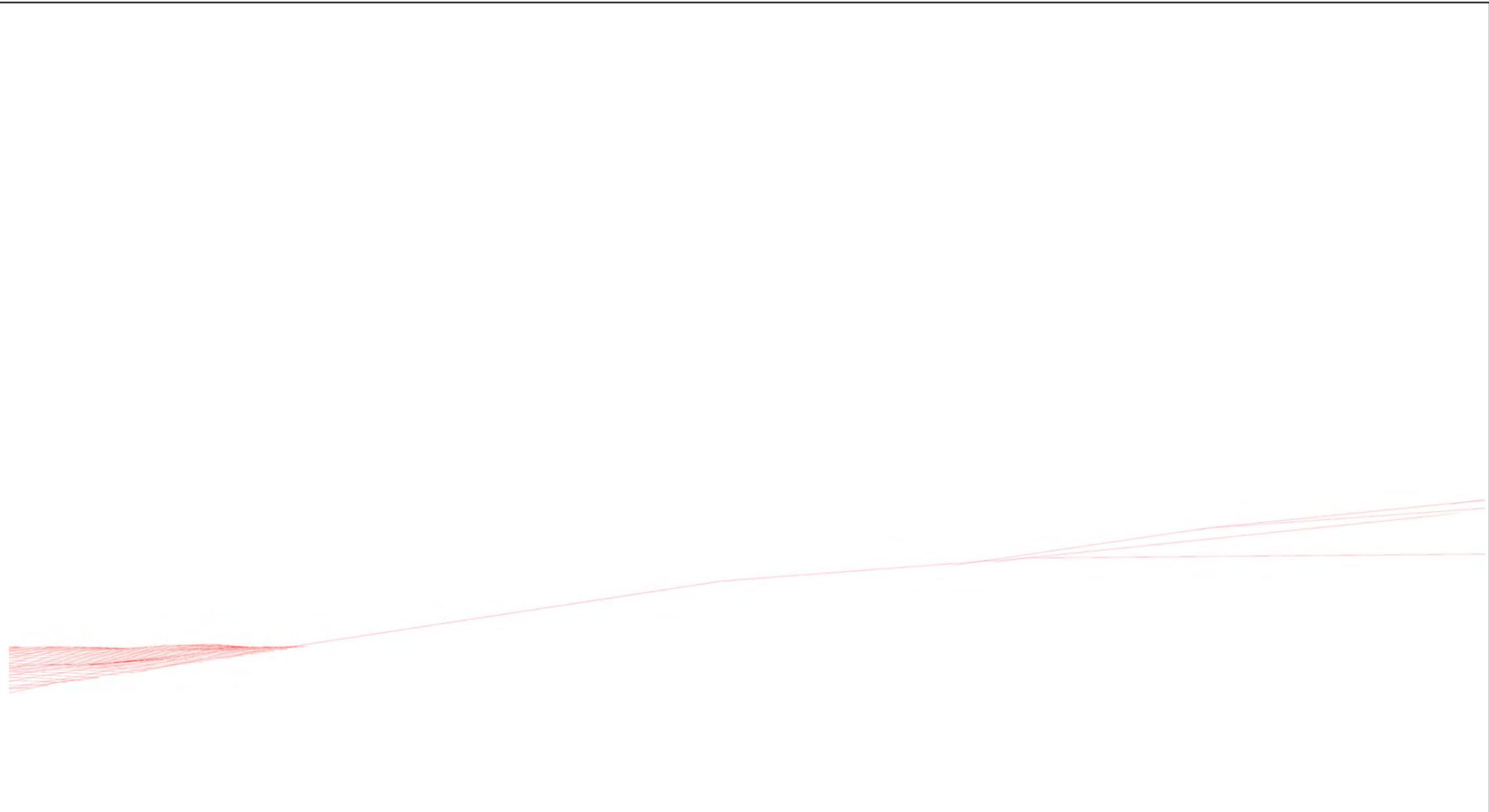
Figure Title:  
Residential Visual Amenity Assessment -  
Group11: Easter Braetown & Wester Braetown  
View South (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.27d
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
Group11: Easter Braetown & Wester Braetown  
View West (90 Degree View)

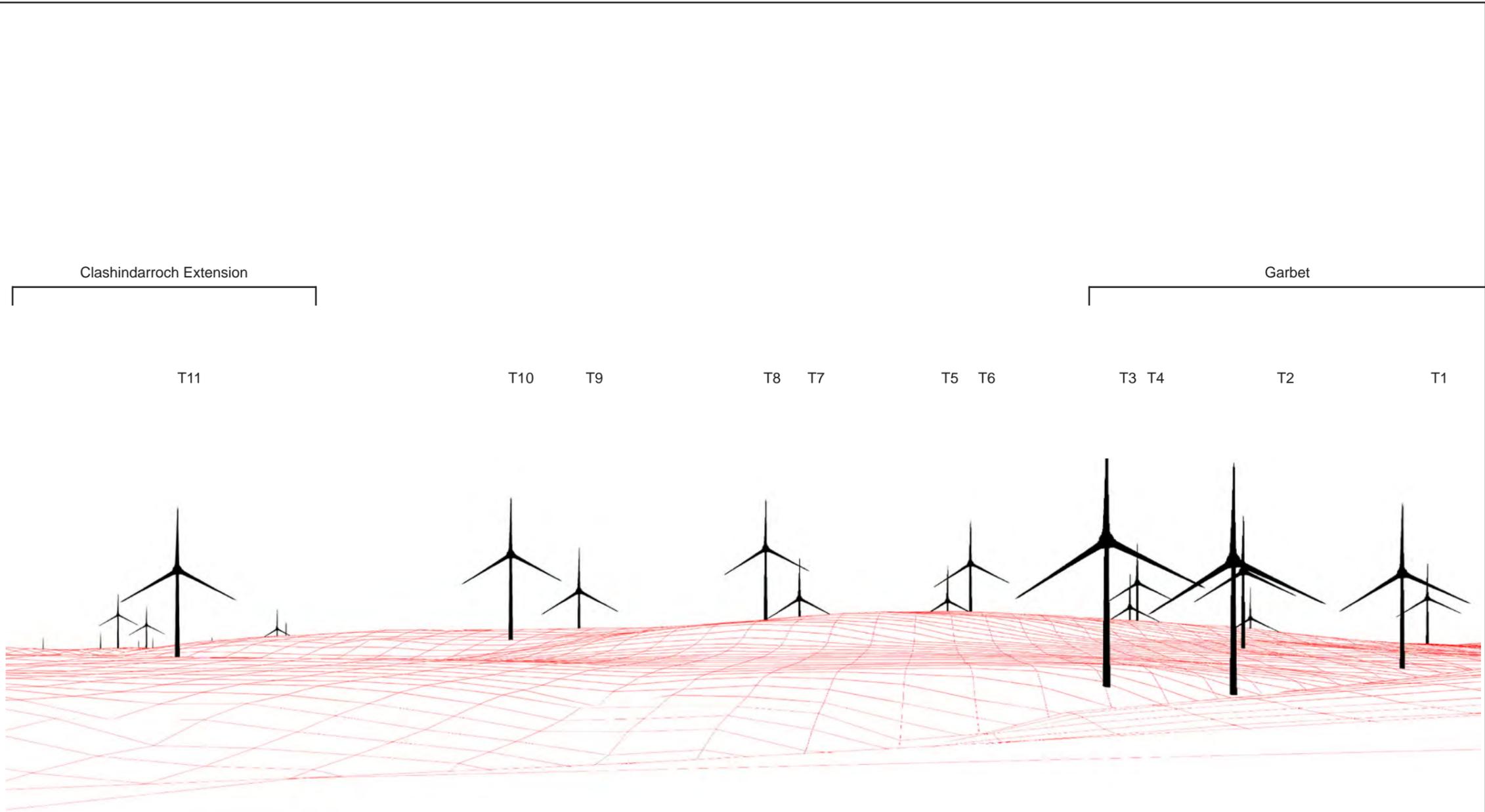
Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.27e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:







**Key:**

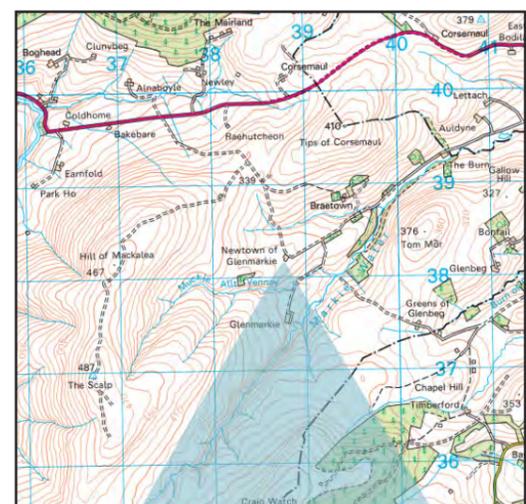
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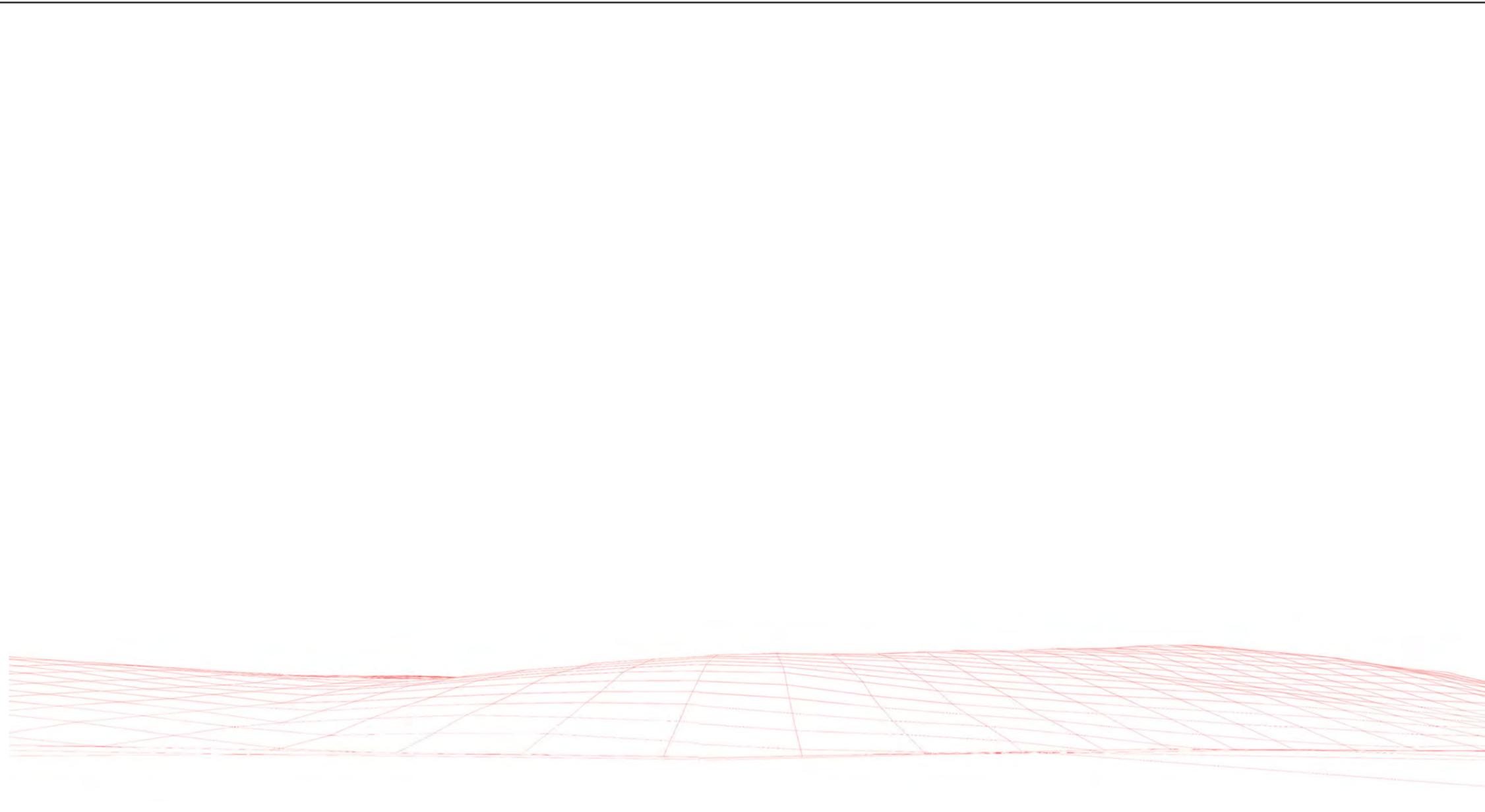
Figure Title:  
Residential Visual Amenity Assessment -  
RVA17: Newton of Glenmarkie  
View South (53.5 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.28a
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:



**Key:**

 Proposed Craig Watch Wind Turbine

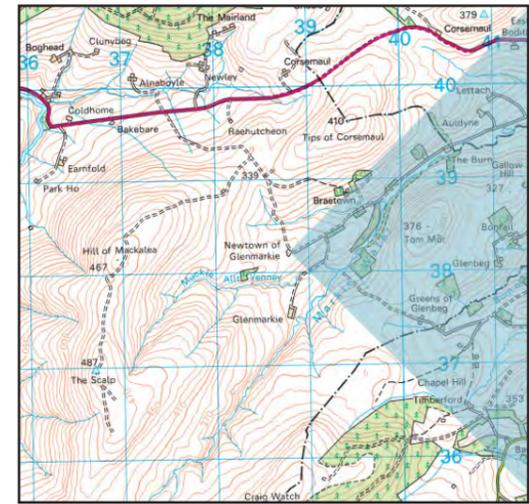
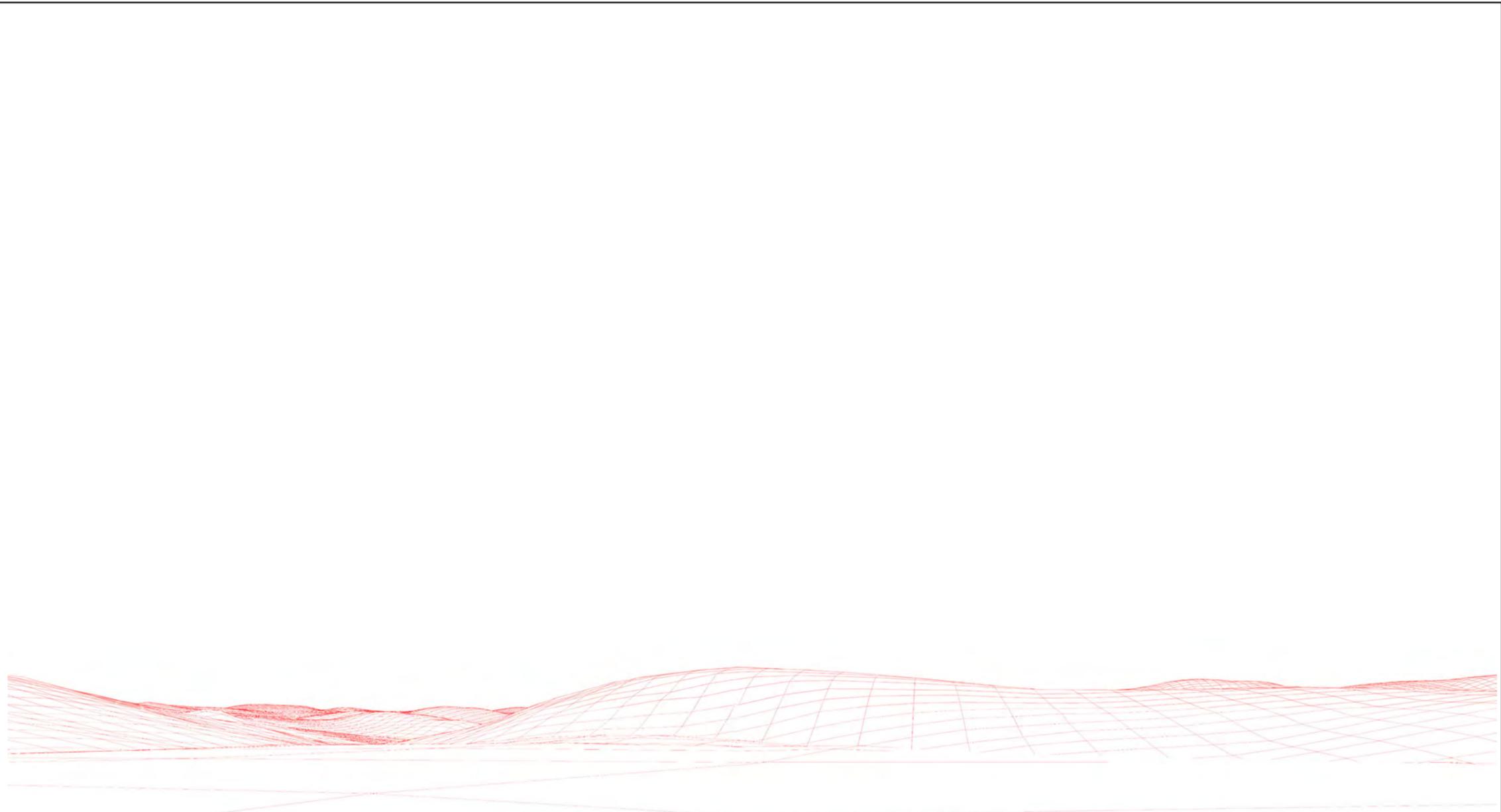
Figure Title:  
Residential Visual Amenity Assessment -  
RVA17: Newton of Glenmarkie  
View North (90 Degree View)

Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

Project Number: 1620010178	Figure No: 5.7.28b
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:  



**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
RVA17: Newton of Glenmarkie  
View East (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number: 1620010178	Figure No: 5.7.28c
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:




**Key:**

 Proposed Craig Watch Wind Turbine

Clashindarroch Extension

Garbet

T11

T10 T9

T8 T7

T5 T6

T3 T4 T2

T1

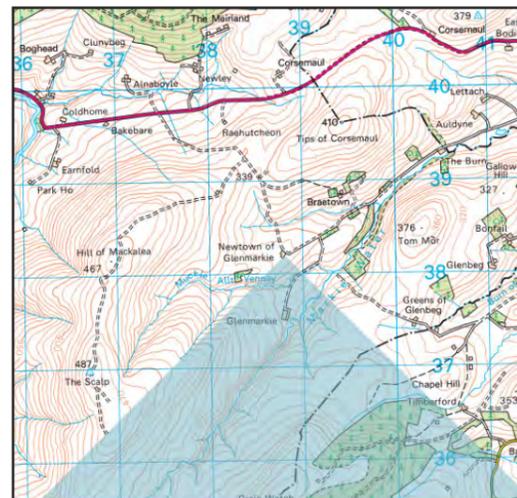
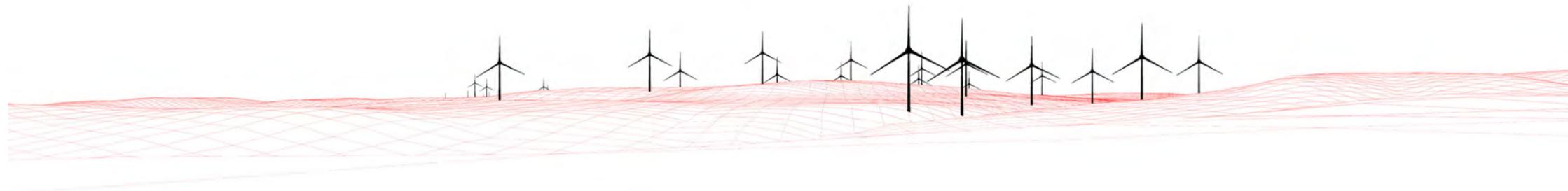


Figure Title:  
Residential Visual Amenity Assessment -  
RVA17: Newton of Glenmarkie  
View South (90 Degree View)

Project Name:  
Craig Watch Wind Farm  
Environmental Statement

Project Number:  
1620010178

Figure No:  
5.7.28d

Date:  
April 2022

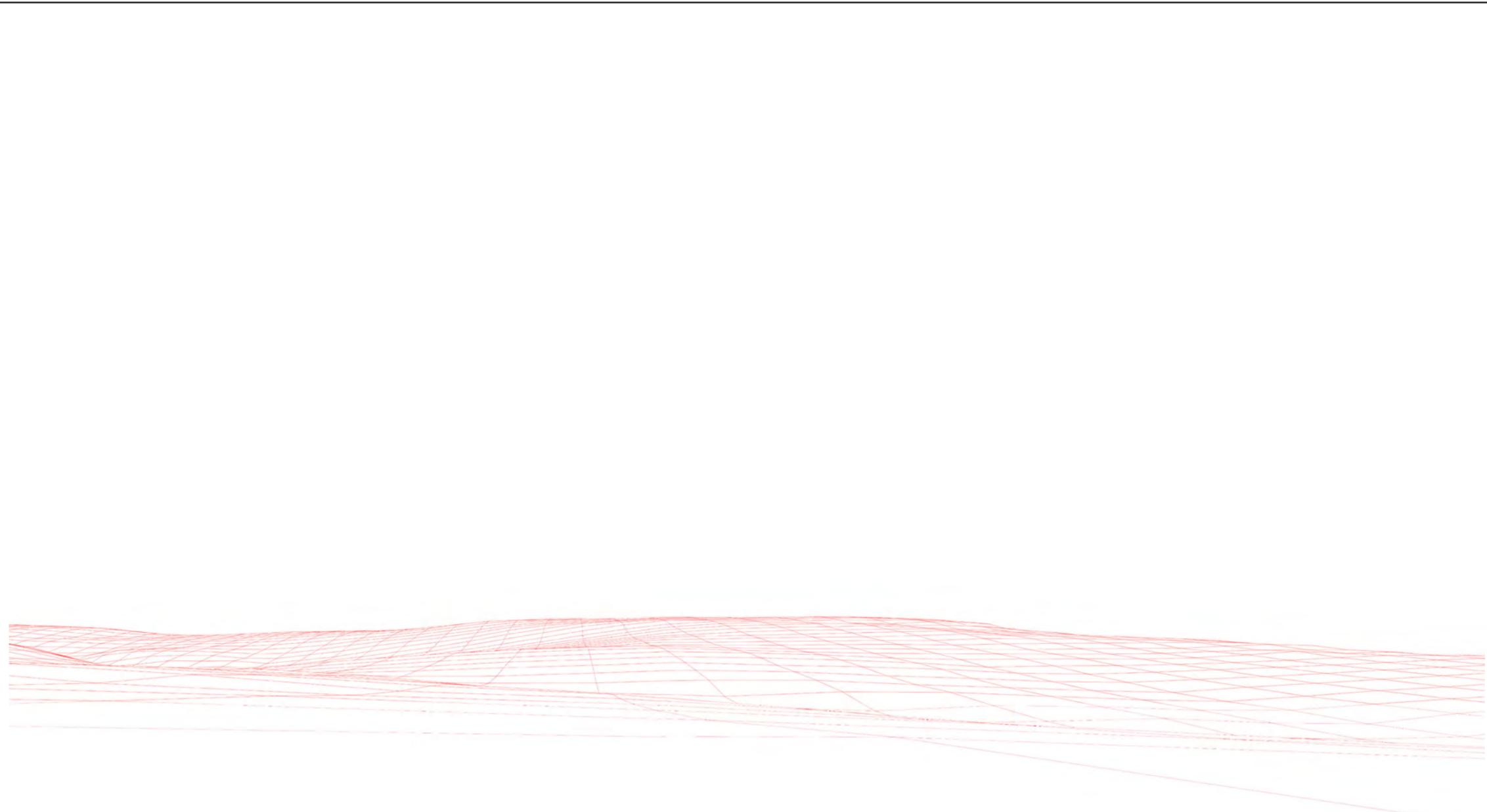
Prepared By:  
KL

Scale:  
NTS

Issue:  
1

Client:





**Key:**

 Proposed Craig Watch Wind Turbine

Figure Title:  
Residential Visual Amenity Assessment -  
RVA17: Newton of Glenmarkie  
View West (90 Degree View)

Project Name:  
**Craig Watch Wind Farm  
Environmental Statement**

Project Number: 1620010178	Figure No: 5.7.28e
Date: April 2022	Prepared By: KL
Scale: NTS	Issue: 1

Client:

 **Statkraft**



## **TA 5.8: Lighting Assessment**



## Technical Appendix 5.8: Lighting Assessment

### 1.1 Turbine Lighting

- 1.1.1 The use of lighting on wind turbines is an evolving issue related to the recent trend towards taller turbines, specifically in respect of turbines of 150 m or over to be visibly lit in relation to aviation safety. This is a Civil Aviation Authority (CAA) requirement and accords with CAA Publication 393: The Air Navigation Order 2016 and Regulations<sup>1</sup>.
- 1.1.2 A consequence of such lighting is potential for significant landscape and visual effects, especially where developments are located in remote rural locations where there are few artificial light sources and where darkness is an integral and valued aspect of the night landscape.
- 1.1.3 In order to mitigate such effects, a condition is proposed that will require the Applicant to submit an Aviation Lighting Landscape and Visual Impact Mitigation Plan – the plan will include measures to minimise the visual impact of lighting based on solutions currently approved by the Civil Aviation Authority (CAA), whilst also allowing flexibility for the review of the mitigation plan in line with updated CAA policy.
- 1.1.4 The following assessment of lighting impacts addresses the worst-case scenario based on the inclusion of 2,000 candela steady red lights on all turbine nacelles and 32 candela lights midway down turbine towers.
- 1.1.5 The assessment is accompanied by a series of graphic outputs including visibility mapping for the proposed aviation lighting (see Figure 5.8: Lighting ZTV).
- 1.1.6 A series of night photomontages showing the effect of the lighting at three of the 21 representative viewpoints (Volume 3b), including:
- Viewpoint 6: Ben Rinnes (see Figure 5.14g);
  - Viewpoint 8: Little Gheal Charn (see Figure 5.16g) and
  - Viewpoint 13: A920 near Wester Bodylair (see Figure 5.21g).

### 1.2 Potential Effects

- 1.2.1 There is a distinction between light pollution or nuisance and the effect of lighting on the character and amenity of the landscape at night.
- 1.2.2 The International Commission on Illumination's Guide<sup>2</sup> on the limitation of the effects of obtrusive light from outdoor lighting installations, identifies a number of principle forms of obtrusive lighting or 'light pollution':
- Light Intrusion/ Nuisance ("Trespass"): the spilling of light beyond the boundary of the property or area being lit;
  - Skyglow: the brightening of the night sky, usually occurring above settlements or other concentrations of artificial light and exacerbated by the presence of dust particles or water droplets; and
  - Glare: the 'uncomfortable' brightness of a light source when viewed against a darker background.

- 1.2.3 Aviation lighting of the type proposed is generally designed to focus light horizontally (i.e., between 0 and 3 degrees) with consequent reductions in light intensity both above and below the lights.
- 1.2.4 This finding has been verified during field observations undertaken in respect of existing comparable aviation lighting present at the:
- Craigkelly Transmission Mast site, Burntisland, Fife;
  - Hunterston offshore wind turbine test facility at the dry dock at Fairlie in Ayrshire;
  - Methil energy park in Fife; and
  - Windy Standard III, Dumfries and Galloway.
- 1.2.5 The precise specification of the lighting on a number of these developments is not known. However, the test light at Windy Standard III Light was known and comprised a medium-intensity aviation obstacle light MI- ACWGAM (s/n V007884) operated at both 2,000 and 200 candela and which was fitted with a red lens/ gel and opaque cap. The light intensity distribution of this light slightly exceeded the requirements of the ICAO International Standards and as such represents a worst case. Moreover, since observations of this light took place there have been advances in light design that limit downward spill of light.

### 1.3 Existing Lighting Examples

- 1.3.1 In order to observe the effect of lights at different distance, elevations and atmospheric conditions field reconnaissance was undertaken:
- from varying distances of up to 15 km from each development to verify the effect of distance on the perception of the lighting;
  - during differing weather conditions including periods of rain, low cloud and clear skies;
  - at different times of day to reflect the variation in perceived brightness and prominence of lights at dusk and during hours of darkness; and
  - from different directions and elevations.
- 1.3.2 During field reconnaissance it was apparent that whilst skyglow and illumination of the cloud base can occur as a result of a multiplicity of different external light sources, especially those that emit lights upwards. Aviation lights of the type proposed do not cause skyglow or illumination of cloud base due to their design, which focuses light horizontally. Additionally, no dazzling, glare or light spill intrusion into neighbouring properties or receptor locations was witnessed. The lights were, however, bright and prominent points of light in views at distances of up to 15 km, especially where there was a high degree of contrast (i.e., when the lights were seen against a dark sky or backclothed by a dark landmass, or where there were little, or no, existing artificial light sources present at the viewpoint, in the intervening landscape, or behind the aviation lights). During periods of greater ambient light, (e.g. before or at dusk, or in the event of moonlight, especially where such lights are reflected off the sea) the prominence of lights was observed to be lessened. It is also the case that the size of the lights reduced according to distance and the perceived brightness of the lights diminished with distance.
- 1.3.3 Observations during periods of low cloud cover (i.e., that enveloped the lights) indicate that there is a noticeable reduction in perceived brightness. During such conditions localised halo effects were

<sup>1</sup> Ref. CAA Policy and Guidelines on Wind Turbines, CAP 764: Civil Aviation Authority:2016

<sup>2</sup> CIE 150: 2017 – Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (Second Edition) - <http://cie.co.at/publications/guide-limitation-effects-obtrusive-light-outdoor-lighting-installations-2nd-edition> [Accessed November 2022]

observed in the immediate vicinity of the lights. Halo effects had a low light intensity and did not extend vertically. Other effects witnessed during field reconnaissance included illumination of the base of turbine blades and a 'flickering' effect caused by the screening effect of blades as they pass the turbine lights. However, these effects are dependent upon the direction of wind and the location of the receptor. Where a number of lit turbines are present such 'flickering' is likely to be uncoordinated.

- 1.3.4 The key effect of interest in landscape and visual terms is therefore less concerned with light pollution, and more the introduction of new artificial lighting within a largely unlit landscape context, with consequent effects on the night character and visual amenity of the area. In this context, effects on landscape character are almost exclusively concerned with perceptions of darkness and remoteness as the key characteristic constituent elements of landscapes are generally obscured after dark.

## 1.4 Potential Cumulative Effects

- 1.4.1 With a growing number of developments in Scotland requiring visible aviation lighting there is potential for cumulative lighting effects on the character and amenity of landscapes at night. Within 10 km of the Proposed Development's turbines the neighbouring Clashindarroch II array, if consented, would introduce 2000 candela (cd) lighting on four cardinal turbines approximately 5.5 km to the southeast of the Proposed Development with consequent potential for cumulative lighting effects on the character and amenity of Glen Deveron. The neighbouring Garbet, which would be located less than 1 km from the north westernmost of the Proposed Development turbines, would require lighting. Whilst a reduced lighting scheme has been proposed for this scheme, it has yet received formal approval from the CAA, and so currently, aviation lighting on all seven of these proposed turbines is assumed.

- 1.4.2 There are also two developments at scoping within 10 km of the Proposed Development:
- Clashindarroch Extension (a twenty-eight turbine development with maximum blade tip heights of 200 m, situated around 3.4 km to the south east of the Proposed Development); and
  - Glenfiddich Wind Farm (an eleven turbine development with 200 m turbines, situated 2.8 km to the west of the Proposed Development).

- 1.4.3 Scoping schemes are, by nature, likely to change during the application process and are therefore associated with a high degree of uncertainty. Moreover, no details of approved reduced lighting schemes or other mitigation were available at the time of this assessment. Consequently, a precautionary approach has been taken, and lighting on all of the scoping scheme turbines has been assumed.

## 1.5 Mitigation

- 1.5.1 There are a number of other factors that could mitigate lighting impacts, even during the expected limited hours of light activation. These include:
- a reduced lighting scheme with only seven of the eleven turbines being lit (i.e., four unlit which are currently due to be lit), and the omission of mid-level lights<sup>3</sup>;
  - the use of a maximum 200 candela light setting, instead of the more usual 2,000 candela en-route lights, during periods of clear meteorological visibility exceeds 5 km<sup>4</sup>;

- the extent of ambient light in the sky against which the lights on the Proposed Development's turbines would be seen;
- atmospheric conditions;
- the inherent reduction in the apparent size of turbine lights when viewed over distance;
- the reduction in lighting intensity for receptors at different elevations relative to source, as a result of design of the lights; and
- the design of the lights to avoid, as far as practicable, illumination of turbine nacelles, towers and blades.

### Ambient Light Conditions

- 1.5.2 A key factor in the perceived brightness and intrusiveness of turbine lights concerns the degree of contrast between the night sky and the intensity of the lights and perceived brightness.

- 1.5.3 During summer months ambient natural light levels remain relatively high well into night-time hours<sup>5</sup>, with consequent limitations on the darkness of the night sky and limitations on the degree of contrast. In contrast, winter months are generally associated with considerably less ambient natural light, with earlier setting of the sun and a rapid increase in the darkness of the sky. During this time, there is a notable increase in the potential contrast and exacerbation of lighting impacts, but reduced numbers of tourist and recreational receptors are also anticipated at this time.

### Reduced Lighting Intensity Over Distance

- 1.5.4 As observed during field reconnaissance, the perceived size of the light source, as experienced at different locations, will vary according to distance and would generally be perceived as a point of light rather than globe or spray of light.

### Atmospheric Conditions

- 1.5.5 The intensity of the lights, whilst constant at the turbine, can be partially obscured or lessened by the presence of precipitation or air borne particles either at the Site or in the wider landscape, which can reduce the amount of light reaching receptors. The incidence of such conditions is not uncommon.

### Reduced Lighting Intensity by Relative Elevation and Distance

- 1.5.6 Figure 5.8 illustrates the intensity of turbine lights at different locations across the LVIA Study Area taking into account of the angle at which they would be seen from key receptor locations. It is apparent from this figure that locations within 5 km of the proposed turbines would be subject to reduced levels of intensity and perceived brightness.

### Lighting Design

- 1.5.7 The degree of mitigation achieved through careful design of lights is crucial. The incorporation of light caps and collars or semi-opaque lens below -1 degree would restrict up-lighting effects and the degree of downlighting and illumination of the nacelle. In the case of the Proposed Development, this could reduce the visibility and perceived brightness of turbine lights, especially where receptors are situated close by (i.e., within 5 km of proposed turbines) and at low elevations relative to the lights (e.g. at properties in close proximity to the turbines).

<sup>3</sup> A proposal to this effect was submitted to the CAA in early 2022. (Ref. Avatica (March 2022) Craig Watch Wind Farm, Moray: Proposal for Reduced Lighting Scheme (Report No. 22/994/RAM/2). This was approved by the CAA in June 2022 and comprises medium intensity steady red (2000 candela) lights on the nacelles of turbines 1, 2, 4, 5, 8, 9 and 11 and omission of intermediate 32 candela lights in mid tower locations.

<sup>4</sup> In accordance with CAA guidance on wind turbines, CAP 764 which is in the process of revision. A draft of the revised edition issued in June 2020 contains a new section on lighting of onshore wind turbines with tip heights of 150 m or more, incorporating existing CAA policy set out in their Policy Statement of June 2017 and Recommended Practices from paragraph 6.2.4.3 of ICAO Annex 14.

<sup>5</sup> Night is defined in CAAs 2010 Policy Statement on Lighting of En-Route Obstacles and Onshore Wind Turbines as "the time from half an hour after sunset until half an hour before sunrise."

## 1.6 Assessment of Landscape and Visual Effects

### Baseline Context

1.6.1 Existing artificial light sources in the vicinity of the Proposed Development are generally associated with settled glens, transportation corridors as well as settled coastal landscapes. The key landscape types, as described in TA5.2, that contain such lighting sources comprise:

- NS 19: Farmed Rolling Ridges and Hills;
- NS 23: Farmed Basin;
- NS 26: Wooded Estates;
- NS 27: Farmed Moorland Edge;
- NS 32: Broad Wooded and Farmed Valley;
- NS 127: Upland Strath;
- NS 284: Coastal Farmlands;
- NS 287: Broad Farmed Valley;
- NS 288: Upland Farmland; and
- NS 294: Upland Valleys.

1.6.2 The location of these landscapes is indicated in Figure 5.3a. Within these landscapes is artificial lighting primarily associated with a number of key settlements (including Alford, Dufftown, Elgin, Forres, Grantown on Spey, Huntly, Inverurie and Keith and Tomintoul) with lower light levels evident within smaller settlements and at scattered properties. Light sources are also present where vehicles are visible moving along key transportation routes including the:

- A95;
- A96;
- A97;
- A98 coastal route;
- A920;
- A939;
- A940;
- A941; and
- A944;

1.6.3 Lower incidence of artificial light sources are evident on category B roads throughout the Study Area where settlement is characterised by hamlets and small villages, scattered farmsteads and detached properties, such as those present along the:

- B9001;
- B9002;
- B9009;
- B9014;
- B9015;
- B9016;
- B9017;
- B9018;

- B9022;
- B9024;
- B9115;
- B9117; and
- B9118.

1.6.4 Further scattered farmsteads and properties are also present along the sides of minor roads throughout the Study Area, such as those within Glen Deveron.

1.6.5 In contrast to these populated landscapes, uplands in the Study Area contain few sources of artificial light, reflecting their more remote and largely unpopulated condition.

1.6.6 Consequently, existing light sources are generally low lying, and either associated with the interior and exterior of properties, as well as street lighting in towns, but none-the-less, can be associated with glare, light spill, especially in the case of vehicle headlights which can be between 20,000 and 75,000 candela and which typically have a wide beam, light colour, thereby increasing the contrast with the dark backdrop of the landscape. The prominence of headlights and taillights on vehicles is exacerbated by the movement of vehicles on the road network.

1.6.7 The principal receptors present comprise residents of settlements and scattered dwellings as well as road users within vehicles. The perception of these receptors in respect of the darkness of the landscape, and consequently their susceptibility and sensitivity to new light sources is conditioned, in part, by the extent of street lighting within settlements, whether the dwellings have blinds or curtains (effectively screening views out from the property) or internal lights that can lessen or entirely screen the degree of perceived darkness outwith the properties and vehicles. Views from within road vehicles will be affected by dashboard lights and headlight beams, thereby lessening the perceived darkness of the adjacent landscape. The perception of road users is also transitory, and of limited duration in comparison to that of residents of dwellings.

1.6.8 Receptors in the darker and more remote parts of the Study Area which have the greater susceptibility and sensitivity to lighting include

- NS 28: Outlying Hills & Ridges;
- NS 32: Broad Wooded and Farmed Valley;
- NS 122: Mountain Massif - Cairngorm;
- NS 123: Smooth Rounded Hills - Cairngorms;
- NS 289: Upland Farmed Valleys;
- NS 290: Upland Moorland and Forestry;
- NS 291: Open Rolling Upland; and
- NS 292: Open Upland.
- NS 294: Upland Valley.

1.6.9 Of the designated/ classified landscapes in the Study Area, those that are most susceptible to the introduction of new lighting sources comprise:

- the Cairngorms National Park,
- Cairngorms Wild Land Area (WLA)
- Ben Rinnes, Spey Valley and Glen Deveron Special Landscape Areas (SLAs).

1.6.10 This is due to the degree of characteristic darkness evident in these areas, and the naturalness of the WLAs. However, even these classified landscapes are subject to some influence from lighting in

neighbouring settled coastal and valley landscapes. It is also the case that the key issue of susceptibility within the dark Skies Park, relates to the preservation of views of the starlit night sky rather than naturalness or wildness.

## 1.7 Residual Effects

### Visibility and Intensity of Lights

1.7.1 Figure 5.8: lighting ZTV indicates the viewshed of the Proposed Development's lighting along with the visible light intensity based on two scenarios:

- the use of the full 2,000 candela lighting intensity on turbine nacelles; and
- a reduced lighting intensity based on a maximum of 200 candela during periods of clear meteorological visibility exceeding 5 km.

1.7.2 It is apparent from this figure and field verification that lower lying receptor locations within valleys and settled lowlands would be subject to the least visibility of the turbines lights due to the screening effect of intervening topography and vegetation. Moreover, where visibility does occur, reduced levels of intensity and consequent perceived brightness, are likely due to the mitigating effect of distance and elevation relative to the lights, and angle of view relative to the principal angle of illumination. In contrast, elevated open locations such as open hill summits and moorland would be subject to more extensive areas of visibility and a higher intensity of the lighting, and perceived brightness.

1.7.3 Forested uplands would, however, be less susceptible given the restricted extent of visibility in such locations and elevated summits are subject to infrequent visitations from receptors after dark.

1.7.4 The perceived brightness of the turbine lights would also be dependent upon the ambient lighting conditions as well as existing light sources within settlements, properties and vehicles. Interior lights and the use of curtains at properties after dark would greatly reduce the impacts associated with the turbine lights, whilst car dash-lights and headlights coupled with the transient nature of views from vehicles would lessen the magnitude of impacts on the amenity of road users. Similarly, restricted views of the turbine lights would be provided from a number of key settlements which are already subject to varying degrees of artificial light sources.

### Effects on Landscape Character

1.7.5 Landscape types with predicted visibility of turbine lights would include:

- NS 14: Gently Undulating Coastal Farmland;
- NS 17: Coastal Agricultural Plain;
- NS 18: Low Hills and Basins;
- NS 19: Farmed Rolling Ridges and Hills;
- NS 20: Undulating Agricultural Heartland;
- NS 27: Farmed Moorland Edge;
- NS 28: Outlying Hills & Ridges;
- NS 32: Broad Wooded and Farmed Valley;
- NS 122: Mountain Massif - Cairngorm;
- NS 123: Smooth Rounded Hills - Cairngorms;
- NS 126: Upland Glen - Cairngorms;
- NS 284: Coastal Farmlands;
- NS 288: Upland Farmland;

- NS 289: Upland Farmed Valleys;
- NS 290: Upland Moorland and Forestry;
- NS 291: Open Rolling Upland; and
- NS 292: Open Upland.

1.7.6 Whilst views of the lighting are theoretically possible from landscape types 28, 126, 285, 287, 293 these landscapes are characterised by extensive commercial forestry and so such lighting would be substantially restricted.

1.7.7 Table 5.8.1, below, summarises the likely visibility and prominence of turbine lights and assesses the likely effects on the character of each landscape. It is noted that, with few exceptions, published character assessments do not generally provide a description of night landscape characteristics and so it has been necessary to place an interpretation of such characteristics based on the descriptions provided, with particular reference to the absence of artificial light sources associated with settlement or transport, perceived remoteness or wildness, and references to open and undeveloped backdrops and skylines that, by implication, provide a dark backdrop or boundary to landscape types and which are therefore susceptible to the inclusion of proposed aviation lighting.

1.7.8 The assessment of residual effects takes account of the mitigating effects of:

- the use of a maximum 200 candela light setting, instead of the more usual 2,000 candela en-route lights, during periods of clear meteorological visibility exceeds 5 km;
- the extent of ambient light in the sky against which the lights on the Proposed Development's turbines would be seen;
- the inherent reduction in the apparent size of turbine lights when viewed over distance; and
- the reduction in lighting intensity for receptors at different elevations relative to source, as a result of design of the lights.

Landscape Character Type	Visibility	Magnitude of Impact	Residual Effect
NS 14: Gently Undulating Coastal Farmland	Sporadic visibility of the Proposed Development's lighting would be provided from a small proportion of this coastal landscape. The lights would be seen inland and at a distance of over 25 km. Where visible, the lights would be seen at an intensity of between 75 and 200 candela and appear as a series of small points of red light. The presence of other prominent light sources within this landscape such as those associated with vehicles and scattered dwellings, would reduce the relative prominence of the Proposed Development.	The Proposed Development would represent a Negligible impact due to the limited extent of this LCT it would affect, its distance and the presence of existing lighting within the LCT itself.	The Proposed Development would constitute a Moderate/ Minor (non-significant) effect. The current rural and largely dark coastal character of this landscape would remain virtually unchanged.
NS 17: Coastal Agricultural Plain	Views of the Proposed Development's lights from this LCT would be highly constrained. Moreover it would be seen at distances of over 40 km.	Whilst the theoretical intensity of lights viewed from this LCT would be around 200 candela, the distance at which the lights would be seen and the limited proportion of the LCT affected means that it would represent a Negligible impact.	The Proposed Development would constitute a Minor (non-significant) effect. The current rural and largely dark coastal character of this landscape would remain virtually unchanged.
NS 18: Low Hills and Basins	Views of the Proposed Development's lights from this LCT would be constrained. Moreover they would be seen at distances of over 25 km.	Theoretical intensity of lights viewed from this LCT would be around 200 candela. Given the distance at which the lights would be seen and the limited proportion of the LCT affected the magnitude of impact on this LCT would be Slight.	The Proposed Development would constitute a <b>Moderate</b> effect which would not represent a significant effect on the "naturalness" of the landscape.
NS 19: Farmed Rolling Ridges and Hills	Whilst the ZTV in Figure 5.8 indicates widespread, if fragmented, visibility, field reconnaissance suggests that actual visibility would be greatly constrained by a combination of intervening topography and vegetation, including skylined shelterbelts.  Where visibility does occur the lights would be seen at an intensity of up to 200 candelas, the lights being apparent on the skyline at a distance of over 20 km but would often be seen in the context of brighter lights at farmsteads or on minor local roads nearby.	Given the distance at which the lights would be seen and the limited proportion of the LCT affected the magnitude of impact on this LCT would be Slight.	The Proposed Development would constitute a <b>Moderate</b> effect which would not represent a significant effect on the quiet and essentially dark rural landscape.
NS 20: Undulating Agricultural Heartland	Views of the Proposed Development's lights from this LCT would be highly constrained. Moreover it would be seen at distances of over 36 km.	Whilst the theoretical intensity of lights viewed from this LCT would be around 200 candela, the distance at which the lights would be seen coupled with the limited proportion of the LCT affected means that it would represent a Negligible impact.	The Proposed Development would constitute a Minor effect and would not be significant. The current rural and largely dark coastal character of this landscape would remain virtually unchanged.

Landscape Character Type	Visibility	Magnitude of Impact	Residual Effect
NS 27: Farmed Moorland Edge	Views of the Proposed Development's lights from this LCT would be highly constrained by a combination of intervening topography and vegetation. Moreover where visible the lights would be seen at distances of over 4 km.	Whilst the theoretical intensity of lights viewed from this LCT would be up to 200 candela, the distance at which the lights would be seen and the limited proportion of the LCT affected means that it would represent a Negligible impact.	The Proposed Development would constitute a Minor effect, which would not be significant.
NS 28: Outlying Hills & Ridges	Views of the Proposed Development's lights from this LCT would be confined to a relatively small number of open summits including Viewpoint 10, 14 and 15, which are located at distances of over 10 km from the Proposed Development. Much of the viewshed in this LCT is covered by dense coniferous forestry.	The theoretical intensity of lights viewed from this LCT would be up to 200 candela. Seen from the Top o' Noth summit the Proposed Development would introduce prominent new elevated sources of light around 11 km to the northwest. In contrast viewed from other parts of the LCT, including vantage points at Mither Tap Viewpoint and Clashmach Hill, the Proposed Development's lighting would be seen distantly, would be partially or substantially obscured by intervening topography and vegetation and would be seen distantly. Consequently, whilst localised substantial impacts would occur at the Top o'Noth viewpoint, the majority of the LCT would be subject to no impact or impacts that are Slight or Negligible.	The Proposed Development lights would constitute a <b>Major</b> (significant) effect at the Top o' Noth summit but Moderate to None (non-significant) effects occurring elsewhere across the majority of this LCT. The wildest and most remote areas of the landscape, which are the more distant tracts of the LCT, would not be significantly affected.  In any event, the LCT would retain is essentially wild, remote and essentially dark character.
NS 32: Broad Wooded and Farmed Valley	The key visibility of the Proposed Development within this LCT would occur within Glen Deveron between the A941 and Huntly, from where the Proposed Development's lights would form a prominent series of elevated lights within a largely dark context.	The Proposed Development's lights would be seen at an intensity of between 10 and 750 candelas, the lowest intensity being associated with the closest receptor locations. Given the proximity of the LCT to the Proposed Development, the prominence and elevated position of the lights and contrast with a largely dark context, the magnitude of impact on this LCT would be Substantial in locations between the Haugh of Glass and the A941.	The Proposed Development would result in localised <b>Major</b> (significant) effects between A941 and Huntly.
NS 122: Mountain Massif - Cairngorm	Views of the Proposed Development's lights from this LCT would be confined to the upper slopes of the summit. The Proposed Development would be seen at distances of over 38 km.	Whilst the theoretical intensity of lights viewed from this LCT would be around 200 candela, the distance at which the lights would be seen and the limited proportion of the LCT affected means that it would represent a Negligible impact.	The Proposed Development would constitute a Minor effect which would not be significant. The current remote and wild character of this landscape would not be significantly affected.
NS 123: Smooth	Views of the Proposed Development's lights from this	Whilst the theoretical intensity of lights viewed from this LCT	The Proposed Development would constitute a Minor effect which

Landscape Character Type	Visibility	Magnitude of Impact	Residual Effect
Rounded Hills - Cairngorms	LCT would be highly constrained by intervening topography, the closest receptor location affected is likely to be the Cromdale Hills, which lie around 24 km from the Proposed Development (see Viewpoint 17).	would be around 200 candela, the distance at which the lights would be seen and the limited proportion of the LCT affected means that it would represent a Negligible impact.	would not be significant. The current remote and largely dark character of this landscape would remain largely unchanged.
NS 126: Upland Glen - Cairngorms	Views of the Proposed Development's lights from this LCT would be highly constrained by intervening topography and forest cover, the principal receptor location affected is likely to be at the Mullachdubh summit, south of the A944, which lie around 27 km from the Proposed Development (see Viewpoint 17)	Whilst the theoretical intensity of lights viewed from this LCT would be around 200 candela, the distance at which the lights would be seen and the limited proportion of the LCT affected means that it would represent a Negligible impact.	The Proposed Development would constitute a Minor effect, which would not be significant. The current remote and largely dark character of this landscape would remain largely unchanged.
NS 284: Coastal Farmlands	Visibility of the Proposed Development's lighting would be substantially constrained by a combination of intervening topography and vegetation coastal landscape.  Where visible, the lights would be seen inland and at a distance of over 21 km. Where visible, the lights would be seen at an intensity of up to 75 candela and appear as a series of small points of red light. The presence of other prominent light sources within this landscape such as those associated with Elgin Aerodrome, vehicles and scattered dwellings, would reduce the relative prominence of the Proposed Development.	The Proposed Development would represent a Negligible impact due to the limited extent of this LCT it would affect, its distance and the presence of existing lighting within the LCT itself.	The Proposed Development would constitute a Moderate/ Minor effect, which would not be significant. The current rural and largely dark coastal character of this landscape would remain virtually unchanged.
NS 288: Upland Farmland	The Proposed Development's lights would be visible from elevated open locations on either side of the A95 corridor and the northern side of the B9014 corridor from where the lights would be seen at distances of over 9 km and at an intensity of between 8 and 200 candela.  The lights would form a prominent new elevated source.	Given the extent of the LCT likely to be affected, the proximity of the Proposed Development and the relatively dark nature of the landscape and consequent contrast of the lights, the magnitude of impact on this LCT would be Moderate.	The Proposed Development would constitute a <b>Major/ Moderate</b> effect which would be significant.
NS 289: Upland Farmed Valleys	Views from this relatively low lying and incised landscape would be constrained by a combination of intervening topography and vegetation. Where visible, a small number of the turbine lights would be visible and would be seen with lighting intensities of less than 80 candelas. The lights would, represent prominent, but highly localised elevated locations and/ or within parts of the A941 corridor to the south of the	Localised Moderate impacts would be experienced along the A941 corridor.	Localised <b>Major/ Moderate</b> (significant) impacts would be experienced along the A941 corridor and would reduce the perceived dark rural character of this LCT.

Landscape Character Type	Visibility	Magnitude of Impact	Residual Effect
	Proposed Development, including locations at Auchindoun Castle.  The lights would constitute new features and appear as distant points of red light, the appearance of which would be complicated by any flickering effect arising from rotor movement. Such impacts would be partially lessened by the incidence of existing light sources associate with vehicles and scattered dwellings and farmsteads in the valleys.		
NS 290: Upland Moorland and Forestry	This is an extensively forested landscape with a small number of more open moorland summits, some of which are already associated with wind energy developments. Much of the LCT would offer no views of the Proposed Development after dark, but a small number of elevated summits at the eastern end of the LCT would be subject to views of the Proposed Development, including Stony Hill, Moss of Rothes, Bracken Noits and Green Hill. Lighting intensity at these locations would be up to 200 candela, the lights being seen at distances of around 20 km to the south east.	The majority of this LCT would afford no views of the Proposed Development's lighting. Moreover, even where the Proposed Development's lights are visible, they would be seen from distant locations that are anticipated to receive infrequent visitations by hill walkers after dark. Consequently, the impact on the LCT is considered to be Negligible.	The Proposed Development would constitute a Minor effect which would not be significant. The Proposed Development's lights would not significantly affect the scale, or form of this landscape or its overwhelming dark night character.
NS 291: Open Rolling Upland	Much of the LCT would offer no views of the Proposed Development after dark, but a small number of elevated summits at the eastern end of the LCT would be subject to views of the Proposed Development, including the Hill of Slackmore. Lighting intensity at these locations would be up to 200 candela, the lights being seen at distances of around 22 km to the east south east.	The majority of this LCT would afford no views of the Proposed Development's lighting. Moreover, even where the Proposed Development's lights are visible, they would be seen from distant locations that are anticipated to receive infrequent visitations by hill walkers after dark. Consequently, the impact on the LCT is considered to be Negligible.	Minor and not significant effect. The Proposed Development would not significantly affect the scale, or form of this landscape or its overwhelming dark night character.
NS 292: Open Upland	Variable, depending upon distance and elevation, ranging from, no visibility within some forested areas of the LCT, to 2000 candelas in elevated locations within 5 km of the Proposed Development. However, in close proximity to the Proposed Development's turbines the intensity of the lighting and their perceived brightness would be reduced.	The Proposed Development's lighting would constitute a substantial impact on the character of this LCT.	<b>Major</b> (significant) effect on the perceived remoteness and isolation of this LCT.

**Significant Cumulative Lighting Effects on LCTs**

1.7.9 Potential significant in-addition and in-combination effects are predicted in parts of:

- NS 32: Broad Wooded and Farmed Valley LCT;

- NS 288: Upland Farmland;
- NS 289: Upland Farmed Valleys; and
- NS 292: Open Upland.

1.7.10 Key to these effects would be the interplay between the Proposed Development and the Clashindarroch Extension and Glenfiddich scoping schemes, which taken together would establish a prominent cluster of lights, the randomised flickering effect of which is likely to detract from the largely dark condition of these landscapes at night.

### Effects on Landscape Designations and Classifications

1.7.11 There are few special qualities of designations or landscape classifications within the Study Area that have direct relevance to the turbine lighting of the Proposed Development, the exception being those pertaining to the remoteness, solitude and wildness of parts of the Cairngorm National Park, which is also classified as a National Scenic Area and Wild Land Area. Similarly, the special qualities of Ben Rinnes Special landscape Area, which forms part of the setting to Cairngorms National Park, include its "remote uplands", which contain little influence from artificial lighting, but are nonetheless influenced by lighting in neighbouring settlements and transportation routes.

1.7.12 Viewed from the more susceptible and wilder elevated summits in the Cairngorms National Park, the Proposed Development's lighting, would be seen distantly but would add a notable number of new lights to the view from these areas, adding to existing lights associated with settlements and scattered farmsteads and properties in the intervening landscape, extending lighting into currently dark parts of views from these receptor locations. Notwithstanding this, the Proposed Development's lights would appear less bright than a number of the existing light sources, such as security lights and car headlights and as such would represent a slight magnitude of impact and a Moderate (non-significant) effect on the perceived remoteness and wildness of the Cairngorms National Park. Seen in conjunction with the lights on the adjoining Clashindarroch II and Garbet array, the Proposed Development would constitute Moderate (non-significant) in-addition effects, but in-combination cumulative effects arising from all three developments are likely to be **Major/ Moderate** (significant). The addition of the Clashindarroch Extension and Glenfiddich scoping schemes would compound this, forming a prominent cluster of lights that would have a complex randomised flickering effect and could, detract from the remote and wild character at summits in the National Park.

1.7.13 Viewed from Ben Rinnes SLA, the Proposed Development would introduce prominent new points of light to a largely dark outlook, thereby reducing the perceived remoteness of the uplands in this designated area. The lights would constitute a notable change to the baseline and a Moderate impact, equating to a **Major/ Moderate** (significant) effect on this special quality of the SLA. Moreover, if seen in conjunction with the lights on the adjoining Clashindarroch II and Garbet array, there is potential for the Proposed Development to result in **Major/ Moderate** (significant) in-addition effects, and for in-combination cumulative effects associated to also be significant, as aviation lighting increases. In the event that the Clashindarroch Extension and Glenfiddich Schemes are consented, the impact on Ben Rinnes is likely to be exacerbated.

### Effects on Visual Amenity

1.7.14 The sensitivity of visual receptors varies between High, in respect of residential receptors, hill walkers and tourists, to Medium in respect of general road users.

1.7.15 Most of the residential receptors and road users are located within the settled lowland and incised valley landscapes. As previously discussed, such locations often contain existing sources of artificial light, including those associated with settlements and road vehicles, and as a result may have a lesser susceptibility to new lighting. In contrast, rural farmsteads and scattered dwellings, including those

located within the Site, are generally located in more remote rural settings away from the principal concentrations of lighting where the landscape is generally perceived as essentially dark. In such locations, lighting is generally confined to the interior of dwellings, or present in the form of security lighting, or associated with low frequency road traffic. It is also the case that lighting in the more rural locations is positioned at low level, with little or no lighting evident on adjoining hillsides.

1.7.16 Views of the Proposed Development would be highly variable from the road network, settlements and scattered dwellings due to a combination of undulating topography and the extent of woodland and commercial forestry that interrupts visibility.

### Transportation Routes

1.7.17 Visibility of the Proposed Development's lights from transportation routes within the Study Area would be highly constrained, with notable viewshadow and screening by a mixture of topography, vegetation and built structures occurring within the enclosed incised interior of settled valleys and along a high proportion of key transportation corridors. Routes with the clearest views of the Proposed Development's lights would include sections of the:

- A95, east of Charlestown of Aberlour and in the vicinity of Knock Hill;
- A96, south of Keith;
- A97, primarily north of Aberchirder;
- A98, north of Keith;
- A920, between Huntly and Dufftown; and
- A941, in the vicinity of Bridged, and between Coleburn Distillery and Rothes.

1.7.18 Views of the Proposed Development's lights would also be provided from the network of B roads throughout the Study Area where settlement is characterised by hamlets and small villages, scattered farmsteads and detached properties, such as those present along the:

- B9009, western approach to Dufftown;
- B9015, southern approach to Rothes;
- B9016, northern approach to the junction with the A96, north of Keith;
- B9017, north of Keith;
- B9018, approach to the junction with the A95, east of Keith;
- B9022, Glen Barry to the River Deveron;
- B9024, east of Glen Dronach;
- B9115, by the junction with the A96, south of Keith;
- B9117, between the A95 and Milltown of Rothiemay; and
- B9118, at Milltown of Rothiemay.

1.7.19 Viewed from such low lying and enclosed positions, the Proposed Development is likely to be seen fleetingly, and only a small number of the turbines would be evident. Given the short duration of such visibility the impact on the majority of local roads would be Slight, equating to a Moderate (non-significant) effect in respect of the amenity of tourist road users and Moderate/ Minor (non-significant) effect in respect of commuters. The closest road to the Proposed Development would be the minor road in Glen Deveron, which would be subject to Substantial impacts and **Major** (significant) effects in respect of the amenity of tourist road users and **Major/ Moderate** (significant) in respect of commuters locations between the Haugh of Glass and the A941.

- 1.7.20 In cumulative terms, there is also potential for significant sequential and concurrent effects on the road in Glen Deveron and A941 as a result of the interplay between lighting on the Proposed Development and the Clashindarroch Extension and Glenfiddich arrays.

#### *Recreational Routes and Summits*

- 1.7.21 With few exceptions, recreational routes and smaller hill summits in the study area are unlikely to be regularly or frequently utilised after dark and therefore are unlikely to have their amenity significantly adversely affected. However, wild camping and overnight stays may be anticipated within the Cairngorms National Park the summit of the Massif representing one of the more wild and remote locations that may be visited by wild campers. Similarly, Ben Rinnes represents a sensitive designated location and popular destination for hill walkers, including campers.
- 1.7.22 Elevated summits in the Cairngorms National Park are visited infrequently during the hours of darkness but are utilised occasionally by wild campers/ hill walkers overnighing at the summits, who would see the lights distantly and in the context of existing lights associated with settlements and scattered farmsteads and properties in the intervening landscape. Consequently, the lights would represent a slight magnitude of impact and a Moderate (non-significant) effect on the amenity of receptors..
- 1.7.23 Seen in conjunction with the lights on the adjoining Clashindarroch II and Garbet array, the Proposed Development would constitute a Moderate (non-significant) in-addition visual effect, but in-combination cumulative effects arising from all three developments are likely to be **Major/ Moderate** (significant). The addition of the Clashindarroch Extension and Glenfiddich scoping schemes would exacerbate this, introducing a complex randomised flickering effect that would detract from the darkness of the summits in the National Park.
- 1.7.24 Viewed from the Ben Rinnes summits, another remote position that is visited infrequently after dark the Proposed Development's lights would introduce prominent points of light to a largely dark outlook, thereby reducing the perceived remoteness of the uplands in this designated area. The lights would constitute a notable change and a Moderate impact and a **Major/ Moderate** (significant) effect. If the Clashindarroch Extension and Glenfiddich Schemes are consented the impact on the amenity and the darkness of Ben Rinnes is likely to be compounded to a significant extent.

#### *Settlements*

- 1.7.25 The Proposed Development's lighting would generally not be visible from the key settlements within the Study Area due to the screening effect of adjoining topography and/ or vegetation.
- 1.7.26 The key effect on the amenity of settlement and residential receptors would be confined to small villages/ hamlets, farmsteads and scattered dwellings that are generally distributed along the sides of valleys and the local road network where there is a degree of existing lighting associated with building interiors as well as external lighting and lights on vehicles on public roads. The Proposed Development would introduce prominent new light sources to the skyline in views from these properties and their approaches, and in the case of properties within Glen Beg and the Deveron Valley, thereby resulting in significant reductions in perceived darkness and remoteness at these properties. Such impacts are likely to reduce the degree of darkness and sense of remoteness at these properties. Potential significant in-addition and in-combination effects are also predicted on such properties within Glen Beg, the Deveron Valley and the A941 corridor in respect of the Proposed Development and the Clashindarroch Extension and Glenfiddich scoping schemes which would result in sequential and concurrent lighting impacts.

## 1.8 Summary and Conclusions

- 1.8.1 The preceding assessment considers the potential effect of lights on the Proposed Development's turbines on landscape and visual receptors, with particular regard to effects on remote rural locations where there are few artificial light sources and where darkness is an integral and valued aspect of the night landscape.
- 1.8.2 Currently, it is anticipated that the Proposed Development would require both steady red 2,000 candela lights on all turbine nacelles as well as low intensity lights at mid height on towers. However, it is anticipated that nacelle lights would be reduced in intensity during periods of clear meteorological visibility exceeding 5 km (thereby reducing intensity to a maximum of 200 candela during such periods). The Applicant has already submitted proposals for a reduced lighting scheme to the CAA which have been approved which comprises medium intensity steady red (2000 candela) lights on the nacelles of turbines 1, 2, 4, 5, 8, 9, 11 and the omission of previously require intermediate level 32 candela lights.
- 1.8.3 The proposes a planning condition that will require them to submit an Aviation Lighting Landscape and Visual Impact Mitigation Plan – the plan will include measures to minimise the visual impact of lighting based on solutions currently approved by the CAA, whilst also allowing flexibility for the review of the mitigation plan in line with updated CAA policy.
- 1.8.4 The degree of darkness in the existing landscape and at key viewpoints was investigated to establish a baseline against which to judge the likely impact of the lights. It is apparent from this initial baseline study that there is a notable contrast in night character between the settled valleys and lowlands that which contain the principal concentrations of artificial lighting, and the more remote and undeveloped interior of the upland landscapes present throughout the Study Area which have few light sources within them, are often characterised by extensive forest cover or remote exposed summits, and which are generally visited infrequently by low numbers of receptors after dark.
- 1.8.5 The assessment of residual effects provides an analysis of viewshed, visible light intensity and perceived brightness and takes account of the intermittent screening of the lights by passing blades on turbines, resulting in a 'flickering' effect and consequent increased prominence of the lights. From this assessment, it is apparent that there is potential for such lighting to represent some localised significant effect on night character and visual amenity of the Study Area. Similarly, seen in conjunction with a number of neighbouring developments that are currently proposed, there is potential for significant cumulative effects (both in-addition and in-combination) in parts of:
- NS 32: Broad Wooded and Farmed Valley LCT;
  - NS 288: Upland Farmland;
  - NS 289: Upland Farmed Valleys;
  - NS 292: Open Upland;
  - elevated locations in the Cairngorm National Park and Ben Rinnes SLA;
  - properties and road users within Glen Beg, the Deveron Valley and the A941 corridor; and
  - hill walkers at key summits in the Cairngorms National Park and Ben Rinnes.