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4. Shadow Flicker Assessment

4.1 Introduction

- 4.1.1 This technical appendix considers the potential shadow flicker effects from the proposed Glenouther Wind Farm (hereafter referred to as ‘the Proposed Development’) on residential receptors (including cumulatively with other wind farms). The assessment is based on the proposed turbine layout as detailed in **Chapter 4: Development Description** and shown on **Figure 4.1: Site Layout Plan (Overview)** of the EIA Report.
- 4.1.2 Shadow flicker is an effect that can occur when the shadow of a moving wind turbine blade passes over small openings such as windows in nearby buildings, briefly reducing the intensity of light within the room and causing a periodic flickering of light and shade to be perceived. Shadow flicker occurs when a certain combination of conditions prevails at a certain location, time of day and year, and may have a negative effect on residents and occupants of affected properties.
- 4.1.3 This technical appendix is supported by **Figure A4.4.1: Theoretical ‘Maximum-Case’ Shadow Flicker Occurrence and Properties** which is referenced throughout the text.

4.2 Scope of the Assessment

- 4.2.1 The assessment considers the potential operational effects of shadow flicker on habitable residential properties within the shadow flicker study area (see description of the study area below). Shadow flicker only occurs from wind turbines when they are operating.
- 4.2.2 The assessment has not considered potential effects of shadow flicker relating to epilepsy. Approximately 1 in every 100 people has epilepsy. Up to 3% of people with epilepsy are affected by flashing lights (‘photosensitive epilepsy’)¹. According to the Epilepsy Society², “The turbine blades would need to rotate at speeds faster than 3 hertz (flashes per second)”³ in order to trigger epileptic seizures in people with photosensitive epilepsy. According to the National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) (2025)⁴ “Shadow flicker frequencies are not in the region known to induce seizures in sufferers of epilepsy (which is above 3 hertz), and as such, where the frequency of potential flashes will not exceed 3 hertz, the Secretary of State should give no weight to any claims of effects on people with epilepsy from onshore wind turbines” (page 143). Whilst the NPSs are not Scottish policy documents, the text quoted here is accepted to be generally applicable.
- 4.2.3 For the purposes of this assessment, any potential shadow flicker effects arising from the Proposed Development are considered in the context of effects on residential amenity.

4.3 Assessment Methodology

Legislation, Guidance and Policy

- 4.3.1 This assessment is carried out in accordance with the principles contained within the following legislation, guidance and policy documents:
- Town and Country Planning (Environmental Impact Assessment)(Scotland) Regulations 2017⁵;
 - Department of Energy and Climate Change (DECC) (2011) Update of UK Shadow Flicker Evidence Base⁶;

¹ Epilepsy Society (2025). Epilepsy Facts and Myths. Available [online] at: https://epilepsysociety.org.uk/sites/default/files/2025-08/FactsaboutepilepsyJuly25_0.pdf [Accessed: 2nd April 2026]

² Formally called ‘The National Society for Epilepsy’

³ Epilepsy Society (2025). Photosensitive Epilepsy. Available [online] at: <https://epilepsysociety.org.uk/sites/default/files/2025-04/PhotosensitiveepilepsyApril2025.pdf> [Accessed: 2nd April 2026]

⁴ Department of Energy and Climate Change (2025). National Policy Statement for Renewable Energy Infrastructure (EN-3). Available [online] at: <https://assets.publishing.service.gov.uk/media/6915b78bbc34c86ce4e6e71f/national-policy-statement-for-renewable-energy-infrastructure-en-3-web-accessible.pdf> [Accessed: 2nd April 2026]

⁵ Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Available [online] at: <https://www.legislation.gov.uk/ssi/2017/102/contents>

⁶ Department of Energy and Climate Change (DECC) (2011). Update of UK Shadow Flicker Evidence Base. Available [online] at: <https://www.gov.uk/government/publications/update-of-uk-shadow-flicker-evidence-base> [Accessed: 2nd April 2026]

- UK Government (2015, updated in 2023) Planning Practice Guidance for Renewable and Low Carbon Energy⁷ (not Scottish guidance but applicable in relation to shadow flicker assessment for EIA purposes, as discussed further below);
- Department of Environment (2009, updated in 2019) Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy'(PPS18)^{8 9}, (not Scottish guidance but applicable in relation to shadow flicker assessment for EIA purposes, as discussed further below);
- Scottish Government (2023) National Planning Framework 4 (NPF4)¹⁰; and
- National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) 2025⁴.

Study Area

- 4.3.2 Properties which are beyond 130 degrees either side of north, relative to the turbines were excluded, following the UK Government's Planning Practice Guidance for Renewable and Low Carbon Energy (2015)¹¹. This is because turbines do not cast long shadows on their southern side.
- 4.3.3 In the UK and at UK latitudes, shadow flicker is only likely to occur in a building located within x10 of the rotor diameter of a turbine⁴¹². The rotor diameter of the Proposed Development's turbines has been assumed for the purposes of this EIA Report to be 162 m; therefore, the potential area in which shadow flicker could occur is considered to be 1,620 m and 130 degrees either side of north from the turbines.
- 4.3.4 Section 4.8 details the approach to micro-siting.

Desk Based Research and Data Sources

- 4.3.5 The following data sources have informed the assessment:
- OS Address Base data;
 - Google Maps aerial imagery;
 - Met Office Data: Sunshine at Saughall Climate Station¹³; and
 - National Oceanic and Atmospheric Administration (NOAA) Data: Global Monitoring Laboratory Sunrise and Sunset at the Proposed Development¹⁴.
- 4.3.6 The identification of relevant properties through desk-based assessment and verification of inhabited properties through the various EIA surveys (including for the Residential Visual Amenity Assessment – **Technical Appendix 5.2**) has been used to inform the shadow flicker assessment. No properties were identified that were not inhabited but could be in the future.

⁷ UK Government (2015). Planning Practice Guidance for Renewable and Low Carbon Energy. Available [online] at: <https://www.gov.uk/guidance/renewable-and-low-carbon-energy> [Accessed: 2nd April 2026]

⁸ No formal guidance is available (at the time of writing) as to what levels of shadow flicker are considered to be acceptable in Scotland. Therefore, in the absence of any specific guidance for Scotland, the PPS18 is considered to be a valid reference for determining the significance of shadow flicker effects.

⁹ Department of Northern Ireland (2009). Practice Guidance for Planning Policy Statement 18 (PPS18). Available [online] at: https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Best%20Practice%20Guidance%20to%20PPS%2018%20-%20Renewable%20Energy_0.pdf [Accessed: 2nd April 2026]

¹⁰ Scottish Government (2023). National Planning Framework 4. Available [online] at: <https://www.gov.scot/publications/nationalplanningframework-4/> [Accessed: 2nd April 2026]

¹¹ It is noted that these standards were published for use in England, however in the absence of Scottish planning advice on this topic, they are considered to be a reasonable basis for informing this assessment.

¹² Scottish Government (2014) Onshore Wind Turbines: Planning Advice. Although this guidance was withdrawn in December 2025, it has not been replaced by any new empirical study which has determined that the use of x10 the rotor diameter is not appropriate as a general rule to determine the study area for shadow flicker assessment. Until such time as new guidance emerges, this x10 rotor diameter consideration has been used in this assessment as supported by NPS EN-3.

¹³ Met Office UK Climate Averages. Saughall Climate Station. Available [online] at: <https://www.metoffice.gov.uk/research/climate/maps-and-data/location-specific-long-term-averages/gcuurcg7q>

¹⁴ NOAA (no date) Global Monitoring Laboratory, Sunrise Table for 2026, Location: Latitude 55.709939 Longitude -4.4154432. Available [online] at: <https://gml.noaa.gov/grad/solcalc/table.php?lat=55.709939&lon=-4.4154432&year=2026>

Consultation

4.3.7 In undertaking the assessment, consideration has been given to the consultation which has been undertaken as detailed in **Table A4.4.1**.

Table A4.4.1: Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
East Ayrshire Council (EAC) December 2025	EIA Scoping	Stated that there is currently no level of shadow flicker set out in guidance which is deemed to be acceptable and would not result in significant effects, and advised that switching off turbines during the dates and times when shadow flicker is likely to occur is the only way to mitigate impacts. Noted that x10 rotor diameters should only be used as a guide to determine which properties should be assessed. EAC has experience of shadow flicker impacting a property more than x10 rotor diameter distance from a turbine and notes that properties that are slightly beyond such a distance but not too distant should be considered as they may still experience impacts.	Drawing upon all available guidance noted in Paragraph 4.3.1 above and evidence on shadow flicker from wind turbines, it has been necessary to take a pragmatic approach to the assessment as informed by professional judgement and standard industry practice. The study area adopted (noting that this was, until recently, supported in Scottish Government guidance) ¹² and approach to determining the significance of effects is described in this assessment.

Assessing Shadow Flicker

- 4.3.8 Although the effect has been quantified as part of the shadow flicker assessment for the Proposed Development, there is no formal guidance available (at the time of writing) at either national or local level regarding the limit on the amount of shadow flicker that is considered acceptable or not acceptable within Scotland. In absence of this, and reflecting the need to determine the significance of shadow flicker effects in EIA terms, the Department of Environment Northern Ireland (2009) Best Practice Guidance for Planning Policy Statement 18 (PPS18): Renewable Energy provides an indication of what may be an acceptable duration of shadow flicker, stating that: *“It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day.”* (page 29).
- 4.3.9 This limit has also been utilised in the Republic of Ireland, Germany and Belgium¹⁵, and is generally used across Scotland for shadow flicker assessments.
- 4.3.10 As this limit is widely accepted as a suitable metric in shadow flicker analysis for wind farms, it is considered to be an appropriate threshold (and is somewhat conservative given that the assessment considers properties up to 1,620 m) against which to make a professional judgement on the significance of the Proposed Development's effects with respect to shadow flicker. In this way, predicted effects are judged as being **Significant** and require mitigation whereby shadow flicker occurrence is estimated to exceed the aforementioned thresholds. Any values below these thresholds represent effects that are **Not Significant**. Where a significant effect is identified, this is considered to be significant in the context of the EIA Regulations and mitigation will be required. It should be noted, however, that as there is no formal guidance available on this topic within the UK or Scotland, the conclusions drawn are relative to these thresholds and are based on professional judgement and common practice.

¹⁵ Department of Energy and Climate Change (DECC) (2011) Update of UK Shadow Flicker Evidence Base. Available [online] at: <https://www.gov.uk/government/publications/update-of-uk-shadow-flicker-evidence-base> [Accessed: 20th April 2026]

Quantifying the Initial Theoretical 'Maximum-Case' Shadow Flicker Occurrence – Step 1

- 4.3.11 The shadow flicker assessment has been undertaken using ReSoft Windfarm Shadow Flicker module ('ReSoft model' or 'ReSoft modelling'). In the ReSoft modelling, the following worst-case assumptions have been made and have been used to determine a maximum theoretical level of shadow flicker occurrence:
- All properties within the study area are assumed to have a specified window size (in this case 1.5 m x 2 m) facing directly on to each turbine that has the potential to cause an effect.
 - The turbine blades are assumed to be rotating 24 hours a day for 365 days per year, and therefore no reductions due to low or unproductive windspeeds, or turbine maintenance are considered.
 - The turbine blades are assumed to always be positioned so that their full face will be between the sun and each property, therefore no reductions due to wind direction or blade pitching are considered.
 - It is assumed that the sun always shines in a clear sky on every day of the year, i.e. there are no periods of cloud cover or low visibility due to fog, mist and haze etc.
 - A human receptor is deemed to always be present in all affected rooms.
 - No account is taken of the potential screening effects of trees or vegetation.
 - Curtains or blinds are assumed not to be fitted to windows.
- 4.3.12 The ReSoft modelling is therefore based on an estimated theoretical 'maximum-case', or 'worst-case' scenario based on conservative (i.e. high) estimates, and this is what is shown in **Figure A4.4.1**. However, the occurrence of shadow flicker is only possible during the operation of the wind turbines (i.e. when the rotor blades are turning), when the sun is shining and when the sky is clear enough so that the light from the sun cast shadows, therefore, the real-life instances of shadow flicker will always be less than that predicted by the ReSoft model.

Step 2 – Quantifying the 'Realistic' Shadow Flicker Occurrence – Step 2

- 4.3.13 To quantify a more appropriate (realistic) occurrence of shadow flicker, which could be experienced by residential receptors within the study area and upon which to base the significance of effects, the initial theoretical maximum case results are adjusted to take account of the average percentage of time the sun shines during the daytime in the area local to the Site.
- 4.3.14 The initial estimates have been translated into realistic estimates by considering typical daylight hours across each month of the year and when the sunshine will most likely be shining brightly enough to cast a shadow (accounting for average cloud cover) – see **Table A4.4.2**. Daylight hours and sunshine hours data was taken from NOAA at the Site and from the most recent meteorological records collected at the nearest climate station to the Site (Saughall Climate Station in East Ayrshire) and inputted into the ReSoft modelling.
- 4.3.15 It should be noted that the more 'realistic' scenario, like the theoretical maximum scenario, does not reflect the fact that the turbines will not be continually rotating 365 days a year, for example, due to changes in wind speed and maintenance/shutdown periods.
- 4.3.16 It should also be noted that even if shadow flicker impact does occur at a specific location, this does not imply that it will be witnessed. Potential witnesses may be sleeping or occupied in a room on another side of the property, which is not impacted, or indeed absent from the location altogether (e.g. at work etc) during the time of shadow flicker events. Furthermore, trees, outbuildings and other obstacles may screen an observer from shadow flicker effects.
- 4.3.17 The effects of shadow flicker which occur under the 'realistic' estimation will, therefore, be reduced further, however, it is not practicable or proportionate to model every scenario and therefore the realistic estimation, albeit still unlikely and overly conservative, is considered to be a reasonable approach.

Cumulative Effects

- 4.3.18 As well as solus shadow flicker effects associated with the operation of the Proposed Development, consideration has also been given to other wind turbines in the vicinity which could potentially impact on the same receptors as the Proposed Development. Analysis has been undertaken to determine the study area for these schemes, and from this it has been determined if there could be overlap with the study area for the Proposed Development, and therefore if there could be incremental shadow flicker occurrence on the same properties should the Proposed Development become operational.

4.4 Existing Conditions

- 4.4.1 There are 24 properties located within 1,620 m of the turbines, however four are beyond 130 degrees either side of north relative to the proposed turbines (P10. Harelaw Farm, P11. Blair Farm, P12. Greelaw Farm and P13. High Clunch Farm) and will therefore not experience shadow flicker. These properties are therefore not considered further. The remaining 20 properties could theoretically experience shadow flicker effects, as shown on **Figure A4.4.1**, and have been considered in this assessment.
- 4.4.2 As noted, annual average sunlight hours were calculated using Met Office Data from the Saughall Climate Station (for typical sunshine hours) and NOAA Data at the Proposed Development Site (for typical daylight hours). Saughall Climate Station is the closest climate station to the Proposed Development, located approximately 16.67 km south-east of the nearest proposed turbine (T5). Sunny daylight hours are only expected to occur approximately 29.45% of the time on average over the course of a year, as detailed within **Table A4.4.1**.
- 4.4.3 **Table A4.4.2** shows the average percentages of time when the sun is shining throughout a typical year at the Site.

Table A4.4.2: Monthly Percentage of Sunny Daylight Hours Based on the Saughall Climate Station and NOAA Data

Monthly	Average Daylight Hours per month	Total Daylight hours per month	Typical Sunshine hours per month	Monthly % of Sunny Hours
January	7.78	241.03	38.16	15.83
February	9.64	270.00	65.30	24.19
March	11.88	368.15	103.08	28.00
April	14.21	426.38	147.94	34.70
May	16.30	505.17	196.49	38.90
June	17.44	523.15	164.47	31.44
July	16.86	522.63	158.89	30.40
August	14.98	464.38	155.02	33.39
September	12.73	394.49	116.96	29.65
October	10.42	323.10	83.38	25.81
November	8.31	249.25	54.32	21.79
December	7.13	221.13	38.67	17.49
Annual	12.31	4491.62	1322.68	29.45

4.5 Implications for Climate Change

- 4.5.1 As shadow flicker effects are intrinsically linked to weather, there is the potential that the current baseline sunny daylight hours could be affected in the future due to a changing climate. The baseline percentage of sunny daylight hours per year is, however, not expected to change over the 30-year operational life of the Proposed Development to such a degree that the assessment of effects will be materially affected.

4.6 Future Baseline in the Absence of the Proposed Development

- 4.6.1 In the absence of the Proposed Development, it is likely that the Site will continue under the same land use, with no shadow flicker effects being generated in consequence. However, the effects of shadow flicker may occur as a result of alternative wind energy development as wind farm development is a clear force for change and is likely to

continue within the area. This is also supported by the Onshore Wind Policy Statement (December 2022)¹⁶. As farmers diversify income and seek opportunities to generate energy for domestic and commercial use, interest in this type of development may continue.

4.7 Design Considerations

- 4.7.1 **Chapter 3** of the EIA Report describes the design process. As part of the design of the Proposed Development, proximity of turbines to properties was considered in relation to reducing effects on residential visual amenity and operational noise and a minimum buffer of 1.2 km was adopted for all properties except Blair Farm and North Drumboy. This in turn has helped to reduce the potential for shadow flicker occurrence at certain properties.

4.8 Micrositing

- 4.8.1 It is proposed that the turbines and other infrastructure will be subject to a 50 m horizontal micrositing allowance which will be applied to allow a degree of flexibility in the layout of site components during construction should unfavourable ground conditions be encountered. Depending on the direction of any micrositing, shadow flicker occurrence may theoretically increase or decrease depending on the distance and orientation to individual properties. Should the turbines move closer to the properties assessed it is not anticipated that this would materially alter the findings of this assessment as any additional levels of occurrence would be expected to be minimal.

4.9 Assessment of Effects

- 4.9.1 The assessment of operational effects is based on the turbine layout provided in **Chapter 4** of the EIA Report. Potential effects identified are considered to be adverse unless otherwise stated.

Operational Effects

- 4.9.2 Applying the methodology steps above, the maximum theoretical shadow flicker occurrence (i.e. the 'Theoretical Maximum Hours per Year' and 'Theoretical Maximum Hours per Day') for each property within the study area has been calculated (Step 1). The results of the modelling for the study area are shown in **Table A4.4.3**.
- 4.9.3 **Table A4.4.3** also presents the 'realistic' estimate which is the initial theoretical maximum hours per year and minutes per day factored down by the percentage of time the sun is expected to realistically be shining on average over the course of a year (29.45%) for the purposes of judging likely significant effects (Step 2).

Table A4.4.3: Maximum and Realistic Occurrence of Shadow Flicker Experienced by Properties within the Study Area (bold numbers indicate an exceedance of thresholds)

Property ID (Receptor)	Theoretical Maximum Days per Year	Theoretical Maximum Minutes per Day	Theoretical Maximum Hours per Year	Realistic Shadow Flicker Minutes per Day	Realistic Shadow Flicker Hours per Year
P1. Townhead of Floak Farm	71	30	29.29	8.82	8.61
P2. Townhead of Floak Bungalow	75	30	30.31	8.82	8.91
P3. Mid Floak Farm	87	30	29.21	8.82	8.59
P4. Mid Floak Bungalow, Floak	64	30.6	23.52	9.00	6.91
P5. Floak (Group)	53	30.6	21.13	9.00	6.21
P6. Marramead (North Drumboy Group)	133	36	56.52	10.58	16.62

¹⁶ Scottish Government (2022) Onshore Wind Policy Statement. Available [online] at: <https://www.gov.scot/publications/onshore-wind-policy-statement-2022/documents/> [Accessed: 20th February 2026]

Property ID (Receptor)	Theoretical Maximum Days per Year	Theoretical Maximum Minutes per Day	Theoretical Maximum Hours per Year	Realistic Shadow Flicker Minutes per Day	Realistic Shadow Flicker Hours per Year
P7. North Drumboy	147	54	72.81	15.88	21.41
P8. Greenfinch	146	52.2	70.58	15.35	20.75
P9. South Drumboy Farm	173	33.6	70.86	9.88	20.83
P20. Glenouther Farm	161	34.2	72.6	10.05	21.34
P24. Easterhouse of Whitelee	34	26.4	11.55	7.76	3.40
P25. East Whitelee Farm (Group)	34	26.4	11.6	7.76	3.41
P26. Pebblebank, East Whitelee	33	25.8	11.13	7.59	3.27
P29. Laverockhall Cottage	36	28.2	13.29	8.29	3.91
P30. Dounne Law Cottage	37	28.8	13.94	8.47	4.10
P31. Blacklaw Cottage (Group)	38	29.4	14.63	8.64	4.30
P32. Blacklawhill Farm	47	27	16.49	7.94	4.85
P33. Lowtown of Blacklaw Farm	75	30.6	27.83	9.00	8.18
P36. Corsehouse Cottage	105	45	47.03	13.23	13.83
P37. Corsehouse	46	30.6	19.01	9.00	5.59

4.9.4 Shadow flicker occurrence on the potential receptors identified in **Table A4.4.3** above which exceeds the significance threshold (30 Hours per Year or 30 Mins per Day) are noted below. As shadow flicker occurrence surpasses the Theoretical Maximum Hours per Year threshold of 30 hours or Theoretical Maximum Minutes per Day of 30 minutes, it is considered that they could theoretically experience significant effects under the theoretical maximum scenario (Step 1).

- Theoretical Maximum Hours per Year/Minutes per Day:
 - P2. Townhead of Floak Bungalow - 30.31 hours;
 - P4. Mid Floak Bungalow, Floak – 30.6 minutes;
 - P5. Floak – 30.6 minutes;
 - P6. Marramead – 56.52 hours/36.00 minutes;
 - P7. North Drumboy – 72.81 hours/54.00 minutes;
 - P8. Greenfinch – 70.58 hours/52.2 minutes;
 - P9. South Drumboy Farm – 70.86 hours/33.6 minutes;
 - P20. Glenouther Farm – 72.6 hours/34.2 minutes

- P33. Lowtoun of Blacklaw Farm – 30.6 minutes
- P36. Corsehouse Cottage – 47.03 hours/45.00 minutes
- P37. Corsehouse – 30.6 minutes.

4.9.5 However, following the calculation of the more 'Realistic Scenario', which takes into consideration average sunny daylight hours when the sun would be bright enough to cause the effects of shadow flicker (Step 2), the shadow flicker predictions for the 11 properties highlighted above and in **Table A4.4.3** fall below the significance threshold level for both hours per year and minutes per day.

■ Realistic Shadow Flicker Hours Per Year/Minutes per Day:

- P2. Townhead of Floak Bungalow – 8.91 hours;
- P4. Mid Floak Bungalow, Floak – 9.00 minutes;
- P5. Floak – 9.00 minutes;
- P6. Marramead (North Drumboy Group) – 16.62 hours/10.58 minutes;
- P7. North Drumboy – 21.41 hours/15.88 minutes;
- P8. Greenfinch – 20.75 hours/15.35 minutes;
- P9. South Drumboy Farm – 20.83 hours/9.88 minutes;
- P20. Glenouther Farm – 21.34 hours/10.05 minutes;
- P33. Lowtoun of Blacklaw Farm – 9.00 minutes;
- P36. Corsehouse Cottage – 13.83 hours/13.23 minutes;
- P37. Corsehouse – 9.00 minutes.

4.9.6 Trees, vegetation and local topography in the vicinity of the residential receptors may have a screening effect which could either reduce the effects of shadow flicker or eliminate shadow flicker being experienced completely.

4.9.7 Based on the results above, all properties in **Table A4.4.2** are predicted to experience shadow flicker effects which are considered to be below the assessment thresholds and therefore, in accordance with the methodology, shadow flicker effects will be **not significant**.

Mitigation

4.9.8 It is not considered that additional mitigation for shadow flicker effects is required based on the above assessment. If shadow flicker issues arise during operation, mitigation measures can be incorporated into the operation of the wind turbines to reduce the amount of shadow flicker experienced. The Applicant is nonetheless committed to promptly investigating any complaints of shadow flicker and taking appropriate action as required.

Cumulative Effects

4.9.9 There are four other wind turbine developments which could potentially result in cumulative shadow flicker effects with the Proposed Development on properties considered in this assessment. Analysis of these schemes has been undertaken to determine if their study areas could overlap with that of the Proposed Development, and if they could impact the same properties resulting in greater shadow flicker occurrence than predicted for the Proposed Development in isolation. This analysis is presented in **Table A4.4.4**. Cumulative schemes are shown in **Figure 5.1.7a of Volume 3a: Figures** of the EIA Report, with Clonherb and Blacklaw Hill turbines shown on **Figure A4.4.1**.

Table 4.1 : Analysis of the Cumulative Shadow Flicker Effects

Wind Farm/Turbine	Status	Distance (km) ¹⁷	Turbine Rotor Diameter (m)	Shadow Flicker Study Area (m) (x10 Rotor Diameter)	Closest Property Impacted by Proposed Development and Distance to Cumulative Scheme (km)	Cumulative Assessment Required?
Clonherb	Operational	2.6	33.4	334	P19.High Clunch Farm – 0.97	No
Blacklaw Hill	Consented	2.0	34.0	340	P32. Blacklawhill Farm – 0.45	No
Moorshield	Application	3.5	137.8	1,378	P6. Marramead – 2.2	No
Whitelee Phase 1	Operational	3.3	93	930	P10. Kingswell Country House – 1.6	No

4.9.10 As shown in **Table A4.4.4**, none of the properties impacted by the Proposed Development are within x10 rotor diameter distances to the four cumulative schemes, and as such it is not considered likely that significant cumulative impacts will occur.

4.10 Interrelationship Between Effects

4.10.1 Shadow flicker potentially affects the experience of residential amenity and in this sense is one of a wider group of effects including noise and residential visual amenity effects. However, bearing in mind that the predicted shadow flicker effects will be not significant in accordance with the assessment methodology discussed above, and the fact that shadow flicker effects are different in kind from noise and other visual effects, there are no significant effects predicted due to the interrelation between shadow flicker and any other effects relating to residential amenity.

4.11 Summary of Likely Significant Effects

4.11.1 The predicted operational effects of the Proposed Development with respect to shadow flicker (including cumulatively with other nearby schemes) are assessed as **Not Significant** in the context of the EIA Regulations.

¹⁷ Nearest distance of turbine relative to nearest Proposed Development turbine

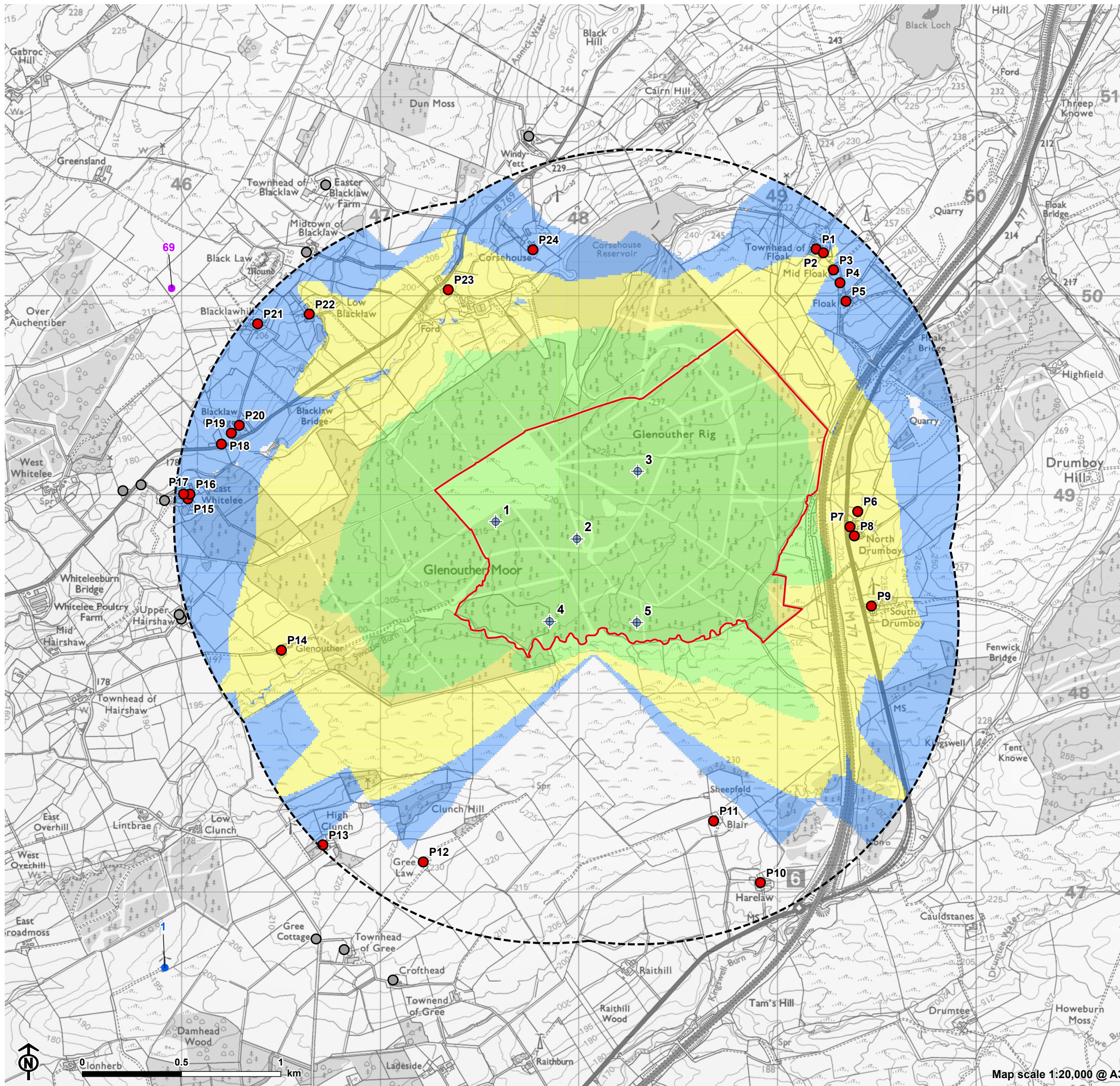


Figure A4.4.1: Estimated Theoretical 'Maximum-Case' Shadow Flicker Occurrence and Properties

- Site boundary
- Turbine
- Study area (x10 rotor diameter - 1,620 m)
- Estimated theoretical hours of shadow flicker per year
 - 0 - 30 hours
 - 30 - 100 hours
 - > 100 hours
- Residential properties within study area
- Residential properties beyond study area

- | | |
|--------------------------------|--------------------------------|
| P1: Townhead of Floak Farm | P13: High Clunch Farm |
| P2: Townhead of Floak Bungalow | P14: Glenouther Farm |
| P3: Mid Floak Farm | P15: Easterhouse of Whitelee |
| P4: Mid Floak Bungalow, Floak | P16: East Whitelee Farm |
| P5: Floak | P17: Pebblebank, East Whitelee |
| P6: Marramead | P18: Laverockhall Cottage |
| P7: North Drumboy | P19: Dounne Law Cottage |
| P8: Greenfinch | P20: Blacklaw Cottage |
| P9: South Drumboy Farm | P21: Blacklawhill Farm |
| P10: Harelaw Farm | P22: Lowtoun of Blacklaw Farm |
| P11: Blair Farm | P23: Corsehouse Cottage |
| P12: Greelaw Farm | P24: Corsehouse |

Wind farm layout (by status)

- Operational
- Consented

Operational

- 1: Clonherb

Consented

- 69: Blacklaw Hill

Notes:

Less than 30 hours of shadow flicker per year is considered to have a minimal effect on properties. Theoretical occurrence does not take into account screening by vegetation and topography.

Study area = 1620 m (10 x rotor diameter)

Sun angle = 2° above horizon

Viewer height = 1.5 m

Cumulative wind farms based on information available to LUC on 28/01/2026.