macroworks

GLINT AND GLARE ASSESSMENT

Proposed Greenhills Renewable Energy Park

County Cork

Prepared by Macro Works Ltd

November 2025

LVIA I TVIA I Landscape Design I Visibility Analysis I Glint and Glare I Verified Photomontages I CGI I Shadow Flicker Analysis

Registered Landscape Architect

EXECUTIVE SUMMARY

This Glint and Glare Assessment was carried out by Macro Works Ltd to determine the potential for solar reflectance effects upon dwelling and transport route receptors within 1km of the proposed Greenhills Renewable Energy Park.

The R634 regional road, which is situated to the northeast of the site was identified at an early stage of the process as a key receptor within the study area. Analysis of the final proposed solar farm layout identified that no notable reflectance effects will occur along this major route once the proposed mitigation screen planting has fully established. It should be noted that the N25 national primary route is located outside of the glint and glare study area, and thus, was scoped out of the glint and glare assessment.

The assessment of reflectance at all residential dwellings within the 1km study area was also assessed. It concluded that there will be no significant nuisance effects generated from glint and glare towards surrounding dwellings as a result of the proposed solar farm.

The potential for hazardous effects upon aviation activities in the wider area was also considered but no relevant aviation receptors were identified and thus, aviation receptors were scoped out for further consideration.

On the basis of the analysis undertaken, it is not considered that there will be any significant nuisance or hazard effects generated from glint and glare upon any receptor identified in the study area as a result of the proposed solar farm.

1. GLINT AND GLARE ASSESSMENT

1.1 INTRODUCTION

This Glint and Glare Assessment was carried out by Macro Works Ltd to determine the potential for solar reflectance effects upon dwelling and transport route receptors of Greenhills Renewable Energy Park in east County Cork.

1.1.1 Statement of Authority

Macro Works' relevant experience includes twenty years of analysing the visual effects of a wide range of infrastructural and commercial development types. This experience includes numerous domestic and international wind and solar energy developments. The Glint and Glare analysis model used in this study for non-aviation receptors was developed by Macro Works in conjunction with the National University of Ireland, (NUI) Maynooth. It has successfully replicated results from the Federal Aviation Administration (FAA) approved Solar Glare Hazard Analysis Tool (SGHAT) software and has been utilised to assess the effects of glint and glare for many solar development sites throughout Ireland to date.

1.1.2 Guidance and Best Practice

There is currently no specific guidance or standards for the assessment of photovoltaic glint and glare effects on residential and/or route (road and rail) receptors in Ireland. Guidance has been prepared, however, by the Federal Aviation Administration to address the potential hazards that solar developments may pose to aviation activities, and this has been adopted for use by the Irish Aviation Authority. This guidance, concerned with hazard assessment, has relevance to the other receptor types mentioned, and coupled with numerous assessments already carried out across the UK, combine to establish a suitable best practice for solar development.

By virtue of their efficiency, the intensity of reflected light from modern PV solar panels is deliberately low and currently equates with that of the reflection from still water. Recent studies generally agree, however, that there still exists the potential for hazard or nuisance upon surrounding receptors. Macro Works' glint and glare analysis methods and determination of effects are based on a combination of available studies and established best practice. This methodology has been successfully implemented on numerous previous solar farm projects that met with the approval of both Planning Authorities and An Coimisiún Pleanála.

1.1.3 Definitions

The study is concerned with the potential nuisance and hazard effects of glint and glare in relation to receptors that include the occupants of surrounding dwellings as well as road and rail users. In its "Technical Guidance for Evaluating Selected Solar Technologies on Airports"[1] the FAA have defined the terms 'Glint' and 'Glare' as meaning;

Glint – "A momentary flash of bright light"

Glare – "A continuous source of bright light"

1 Harris, Miller, Miller & Hanson Inc.. (November 2010). Technical Guidance for Evaluating Selected Solar Technologies on Airports; 3.1.2 Reflectivity. Technical Guidance for Evaluating Selected Solar Technologies on Airports. Available at: https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide.pdf

Glint and glare are essentially the reflection of sunlight from reflective surfaces. This study uses a multi-step process of elimination to determine which receptors have the potential to experience the effects of glint and glare. It then examines, using a computer-generated geometric model, the times of the year and the times of the day such effects could occur. This is based on the relative angles between the sun, the panels and the receptor throughout the year.

1.1.4 General Nature of Reflectance From Photovoltaic Panels

In terms of reflectance, photovoltaic solar panels are by no means a highly reflective surface. They are designed to absorb sunlight and not to reflect it. Nonetheless, photovoltaic panels have a flat, polished surface, which emits 'specular' reflectance rather than a 'diffuse' reflectance, which would occur from a rough surface (Figure 1.1 refers). Several studies have shown that photovoltaic panels (as opposed to Concentrated Solar Power) have similar reflectance characteristics to water, which is much lower than the likes of glass, steel, snow and white concrete by comparison (Figure 1.2 refers). Similar levels of reflectance can be found in common situations in rural environments from surfaces such as shed roofs, lines of plastic ground covering used in cropping and wet roads to name but a few (Figure 1.3 - Figure 1.5 refer).

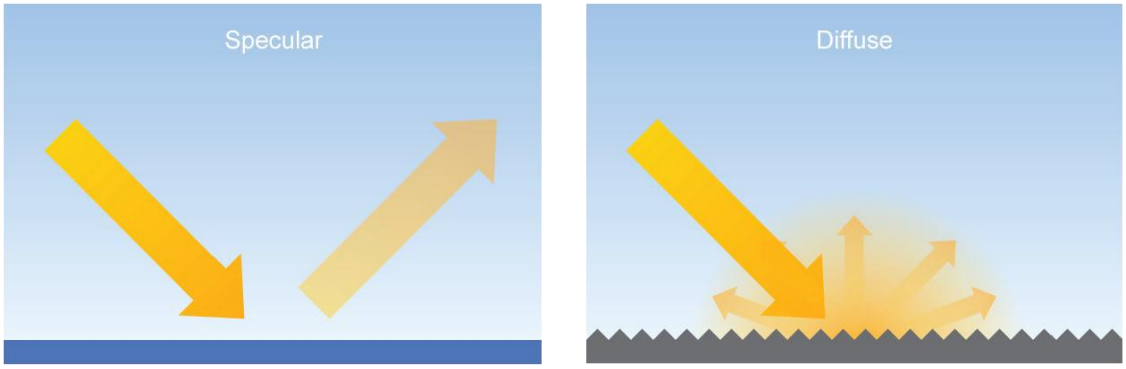

Figure 1.1: Specular vs Diffuse reflection of light from polished and rough surfaces.

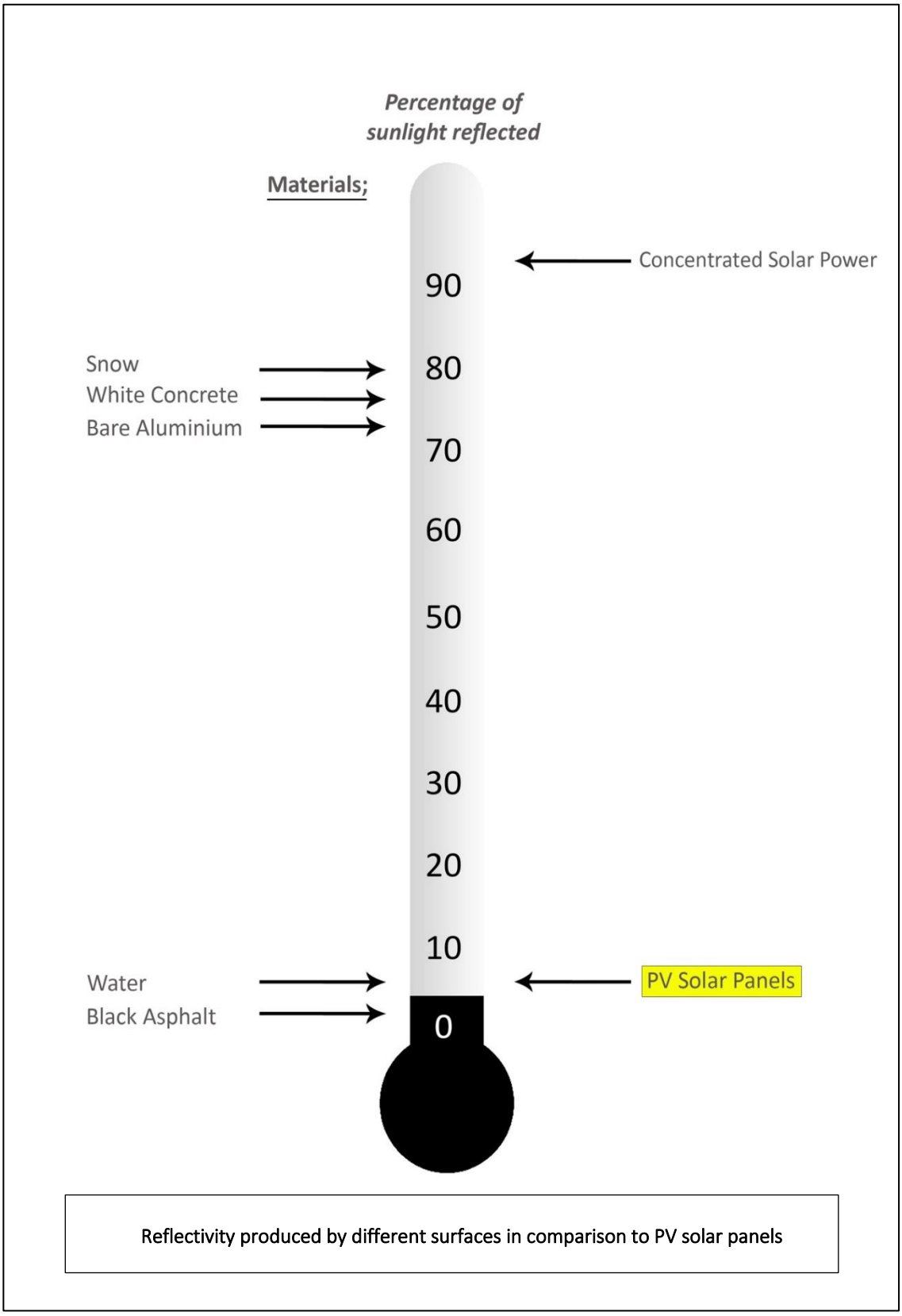

Figure 1.2: Demonstrates that the amount of sunlight (measured in watts per meter -W/m2) reflected from the surface of a solar panel is very similar to that of still water and is far less than that of many surfaces commonly found in the environment, urban or rural.

Figure 1.3: Similar level of reflectance (to photovoltaic panels) emanating from plastic ground covering in an Irish rural scenario.

Figure 1.4: Similar levels of reflectance (to photovoltaic panels) emanating from wet road surfaces.

Figure 1.5: Higher levels of reflectance (to photovoltaic panels) emanating from powder coated corrugated metal roof surfaces in an Irish rural scenario.

1.2 ASSESSMENT OF GROUND-BASED RECEPTORS

1.2.1 Assessment Methodology For Ground-Base Receptors

Macro Works' glint and glare assessment methodology follows a rational sequence of steps to identify receptors that might potentially be affected by glint and glare. These receptors are then analysed further to yield those receptors that are likely to actually experience reflectance effects. These steps are set out below;

1. Identify study area within which to assess the potential for glint and glare effects. The potential for substantial nuisance or hazardous impacts are greatest in close proximity to the source of reflectance and the potential for adverse impacts reduces with increased distances therefore to balance these factors a buffer extent of 1km from the site boundary is used by default on all solar farms.

2. Pre-analyse the study area for potential glare effects by populating the study area with a regular grid of receptor points (100m spacing). This analysis (1st analysis) allows us to determine those areas theoretically exposed to glint and glare effects that might warrant further investigation. We call this the "Area of Consideration for Further Analysis". This pre-analysis is based on a 3D model of the development superimposed onto a Digital Terrain Model (DTM) of the study area. Note: This DTM accurately replicates the profile of the terrain but does not account for screening by the vegetation or buildings that are present – in this sense the results are somewhat theoretical but they do offer a representation of a bare-earth, worst-case scenario.

3. Identify relevant receptors (dwellings and transport routes) that fall within the theoretically affected zones of the study area (or the "Area of Consideration for Further Analysis"). Dwelling identification utilises a combination of up to date aerial photography and the Eircode Finder tool which locates and identifies buildings classed as residential. Transport route receptors are defined by regularly spaced points along roads and rail lines (50m spacing). The height of the road Receptor Points are set to 1.7m above ground level. This is broadly equivalent to the eye level a person walking or a driver of a 4x4 / SUV type vehicle. The height of rail Receptor Points are set to 2.8m above ground level to represent the eye level of a train driver.

4. Execute the glint and glare analysis on the DTM-based 3-D model (2nd analysis), in respect of each of the theoretically affected receptors. This identifies the times of the day and months of the year that glint and glare could potentially affect receptors in the absence of screening.

   Note: When the sun is situated within 10 degrees of a reflecting PV panel as viewed from a particular receptor, the sun will be a much greater source of glare than what emanates from the surface of the PV panel therefore any potential glare during these periods is excluded when assessing potential impacts.

5. Perform the same calculations (3rd analysis) using a high-resolution digital surface model (DSM) that accounts for the existing screening inherent on and surrounding the site at the time of capture. This offers a truer reflection of the actual glare that is likely to occur and highlights where landscape mitigation may be required.

   Note: A limitation of DSM data in the context of this assessment type is that it is a snapshot of the screening situation at the time of the data capture. This situation is broadly indicative as hedgerows are a semi-permanent feature of the Irish countryside, however, seasonal variation through growth and/or cutting may result in minor changes to their screening potential. A further limitation is due to the aerial overhead nature of data capture. This can result in the under-reporting of potential visibility beneath the tree or woodland canopy and can understate the visibly porous nature of some thin hedgerows. This can result in minor underestimating of glare periods. However, where the data is deemed to be significantly unreliable for the reasons stated, analysis is supplemented, where possible, with a thorough assessment of aerial photography, Google Street View imagery and on-site verification.

6. Where instances of glint and glare remain, determine whether they are likely to cause a hazard / nuisance. For dwellings, this is achieved by comparing the periods of glare potential with our 'Magnitude of Glint and Glare Effects' table, while transport routes are examined in further detail for potential for hazardous impacts.

7. If hazard / substantial nuisance is likely to occur, mitigation measures are proposed where possible. This might relate to the re-siting of particular panels and / or the provision of additional screening.

8. If necessary, re-run the glint and glare calculations (4th analysis) to verify the effectiveness of the proposed mitigation measures and determine if there are any residual glare impacts.

1.2.2 Magnitude of Impacts for Dwelling Receptors

Although there is currently no regulation or guidance as to acceptable levels of glint and glare effects at receptors in Ireland, it is considered necessary to provide a gauge for determining relative levels of impact across a range of development types. Macro Works has established the following indicative textual categories of effect, which are used herein to determine the relative impact levels (Table 1-1 refers). The percentage figures provided are intended as a relative guide only. The final category of assessment is determined on the basis of professional judgement, and accounts for mitigating factors where relevant and the careful consideration of a range of circumstantial variables that may act to intensify or reduce the effect upon a particular receptor.

Note: The magnitude of glint and glare effects in Table 1-1 relates only to static receptors such as residential dwelling. As road receptors are moving objects and will only ever have the potential to experience momentary reflectance periods, the following impact magnitudes are not considered relevant for road receptors. Instead, road receptors will be assessed on whether periods of reflectance have the potential to generate significant nuisance or hazard effects.

Table 1-1 Magnitude of Glint and Glare Effects

Magnitude of Impact	Description
Very High	Hazard / nuisance effects emanating from highly reflective surfaces (>50% sunlight reflection) for most of the year (>70% / 255 days) and for significant periods of each day (>45 mins).
High	Hazard / nuisance effects emanating from moderately reflective surfaces (>30% sunlight reflection) for the majority of days in a year (>50% / 182 days) and for substantial periods of each day (>30 mins).
Medium	Nuisance effects emanating from moderately/low reflective surfaces (>10% sunlight reflection) for a substantial number of days in a year (>30% / 109 days) and for substantial periods of each day (>20 mins).
Low	Nuisance effects emanating from low reflective surfaces (>5% sunlight reflection) for a modest number of days in a year (>10% / 36 days) and for notable periods of each day (>15 mins).
Very Low	Nuisance effects emanating from low reflective surfaces (>5% sunlight reflection) for a small number of days in a year (≤10% / 36 days) and for short periods of each day (<15 mins).
Negligible	Effects either not geometrically possible or barely measurable.

Important Note

It must be emphasised at this point that all results, whether from FAA endorsed SGHAT software or our own bespoke software, are theoretical by default in that they assume that the sun is always shining and at full intensity. The results do not account for climate and inherent weather patterns that occur across the island of Ireland.

Records from the meteorological station of Cork Airport for the years 1991 - 2020 indicate a mean daily duration of sunshine of 4 hours, or approximately 42% of daylight hours[2].

While we cannot correlate the historic random periods of sunshine with our predicted periods of glare, we can state with a high level of confidence that the weather, more precisely cloud cover, will account for a substantial reduction in all figures quoted in this report i.e. frequency and duration of glare periods.

In addition, atmospheric conditions such as haze, mist, fog and precipitation will all have the effect of both reducing the visibility of the site overall and reducing the intensity of any glare emanating from the proposed solar farm.

1.2.3 Relevant Parameters of the Proposed Development

The photovoltaic panels are to be oriented in a south-facing direction to maximise solar gain and will remain in a fixed position throughout the day and year (i.e. they will not rotate to track the movement of the sun). The panels will maintain a maximum height of up to 3.4 m above the terrain and will be tilted at a pitch ranging between 10-25 degrees from horizontal towards the south. It is not geometrically possible for glare to occur in the terrain to the north of these south-facing PV panels; hence the 1 km study area does not extend to the north of the proposed PV panels.

A Zone of Theoretical Visibility (ZTV) analysis was undertaken as part of the Landscape and Visual Impact Assessment (LVIA), but it should be noted that areas shown on the ZTV map to have the potential for visibility of the PV array do not necessarily have the potential to be impacted by glint and glare (e.g. there is no geometric potential for glare anywhere to the north of the site but there may be the theoretical potential to see the back of PV panels).

The landform of the study area is gently rolling, with more elevated lands located in its northern extent. Several watercourses traverse the study area, the nearest of which is the River Tourig, located to the south of the site and contained within steep valleys in some locations. The River Blackwater is the principal watercourse in relation to the proposed development, albeit contained outside of the glint and glare study area some c. 3km east of the site.

The site and central study area represent a relatively typical rural context, where pastoral farmland is the predominant land use and is surrounded by hedgerows comprising mixed vegetation and mature trees. Some of the pastoral fields within the study area are notably larger than others and have been modified over time, with large areas of hedgerow removed to facilitate farming practices. There are also notable areas of mature woodland and riparian vegetation along the valleys of streams and watercourses within the study area, whilst blocks of conifer woodland are also prominent land uses, particularly in the northern extent of the study area.

2 https://www.met.ie/cms/assets/uploads/2023/09/www_met_ie_cork_9120.htm

The only settlement within the 1 km glint and glare study area is the village of Inch, located to the west of the site along the alignment of the River Tourig. Otherwise, the study area comprises a modest but notable rural population of residential dwellings, consisting of linear clusters of dwellings, farmsteads, and one-off dwellings. With regard to transport routes, the R634 is the only major route within the glint and glare study area and traverses the northern and northeastern quadrant of the study area, passing immediately adjacent to the site. A dense network of interconnecting local roads also traverses the surrounding study area, with many of these passing directly adjacent to the proposed solar parcels.

Due to the southerly orientation of the PV panels in the proposed solar farm, ground-based receptors (houses and transport routes) situated to the west of the solar array can only be affected by morning reflectance, when the sun is rising in the east. Conversely, receptors situated to the east of the site can only be affected by evening reflectance, when the sun is setting in the west.

Further, south facing panels in a landscape such as this result in a typical pattern of glare with potential glare impacts upon surrounding receptors occurring during the months February – October. This broadly represents the season where some or all foliage is present on vegetation. The assessment of the screening capacity of the surrounding vegetation in its winter state is therefore not necessary.

Figure 1.6: Aerial view (Google Earth Pro) of proposed solar development site (red outline), and the study area (blue outline).

1.2.4 Mitigation by Design

It is proposed that all existing hedgerows within and around the perimeter of the site be allowed to 'grow-out' prior to construction. Additionally, advanced nursery stock in the form of 8-10cm girth trees will be used to fill any noticeable gaps. It is also proposed to plant new sections of hedgerow, along some sections of the site boundary, whilst extensive new corridors of native thicket/woodland will be planted along the boundary of localised sections of the site to further screen the proposed development from some of the nearest surrounding receptors. The location of the proposed mitigation planting is indicated on the Landscape Masterplan Package LD.GRNHLLS-SLR

Once the relevant construction and associated works are complete, the hedgerows will be brought under regular agricultural management and trimmed to a height of approximately 3m-4m for hedgerows (generally greater than the maximum height of the proposed panels) whilst native woodland thickets will be allowed to grow out, reaching an established height of c. 8-10m within c. 5 years from implementation. Other existing hedgerows and vegetation will also be maintained to maximise screening of the proposed development to provide consistent screening of the solar farm from nearby dwellings and transport routes. These proposed mitigation measures were added to the Digital Surface Model (DSM) analysis in order to produce the 'post-mitigation' results.

1.2.5 Assessment of Residential Receptors

1.2.5.1 Identification of Relevant Residential Receptors

Figure 1.7 - Figure 1.10 are output maps of the study area showing the results (areas of potential solar irradiance) of 1st phase reflectance analysis carried out on the proposed solar farm. These account for the path of the sun throughout the entire year; the panel positions and parameters; the 3D terrain parameters. This is the starting point for determining which residential receptors have the geometric potential to be affected by glint and glare – in the absence of screening.

Note: the yellow buffer line around the reflectance pattern indicating 'Area of consideration for further analysis' on the output maps represents a precautionary approach of including dwellings at the fringe of potentially affected areas. It accounts for the fact that this 'first-filter' map is based on a sampling grid point density of 100m.

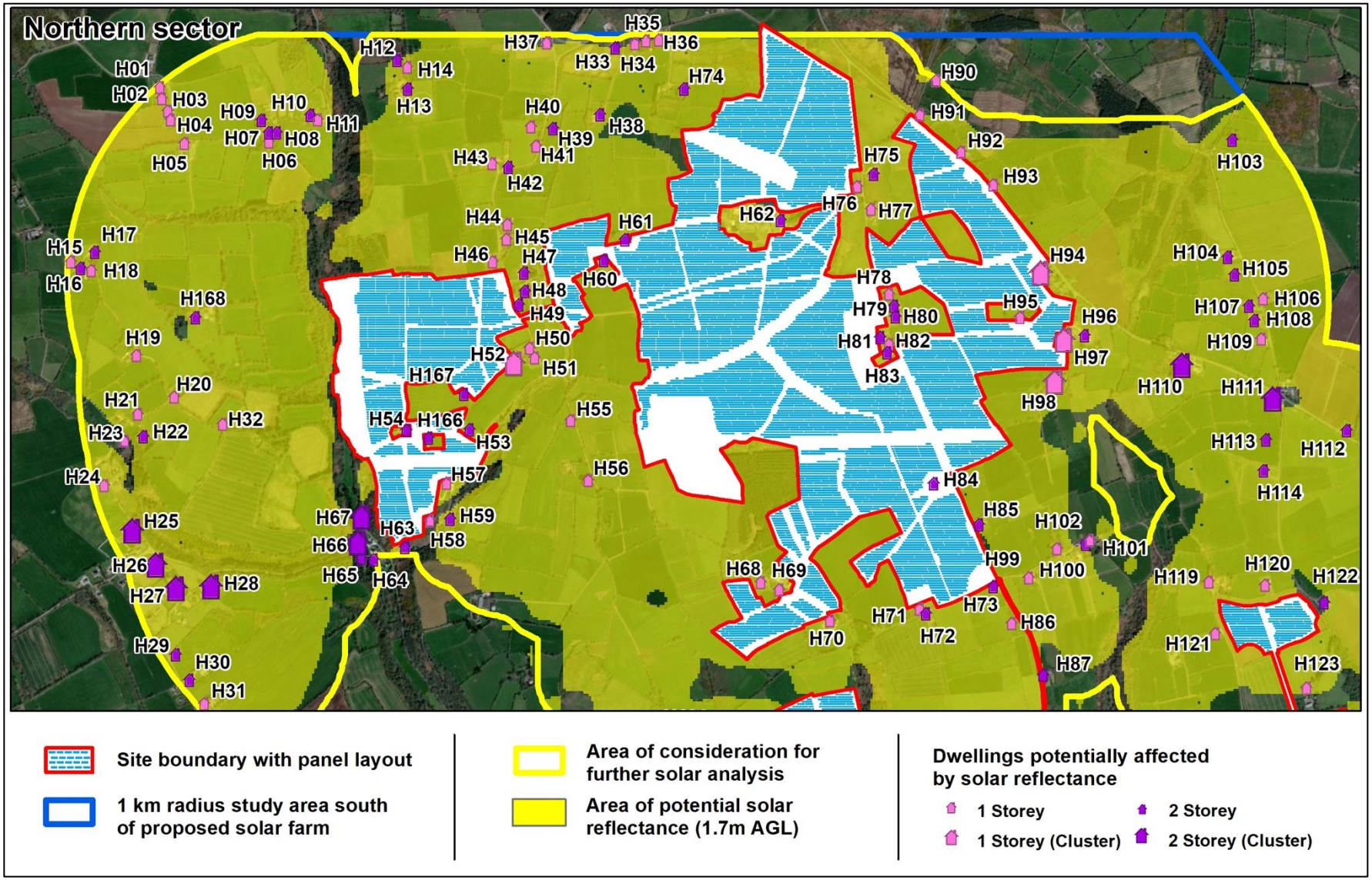

Figure 1.7 Parts of the study area (Northern extent of site) where houses are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on a viewers' eye-level when standing on the ground floor = 1.7m above ground level.

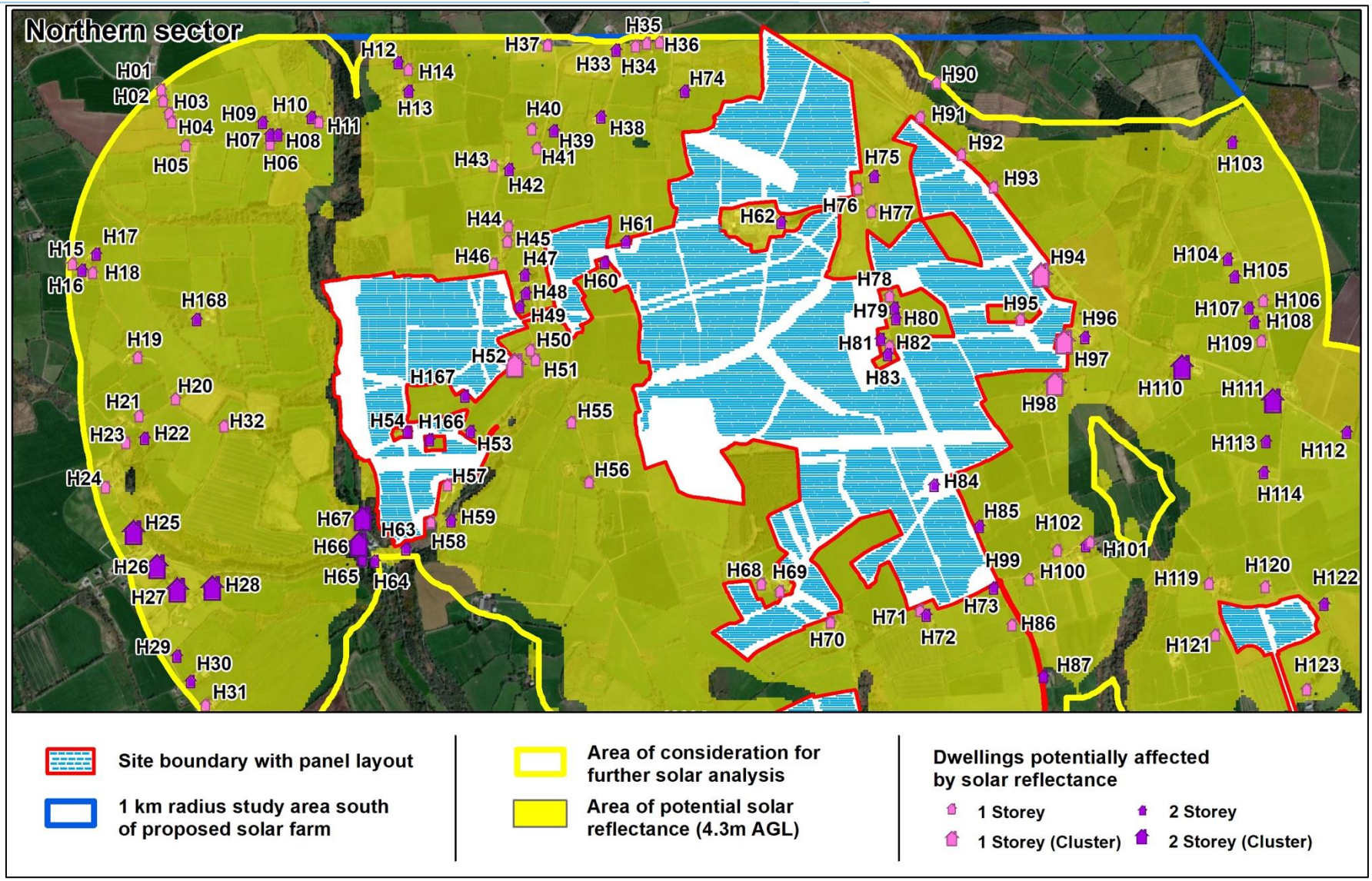

Figure 1.8 Parts of the study area (Northern Extent of Site) where houses are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on a viewers' eye-level when standing on the ground floor = 4.3m above ground level.

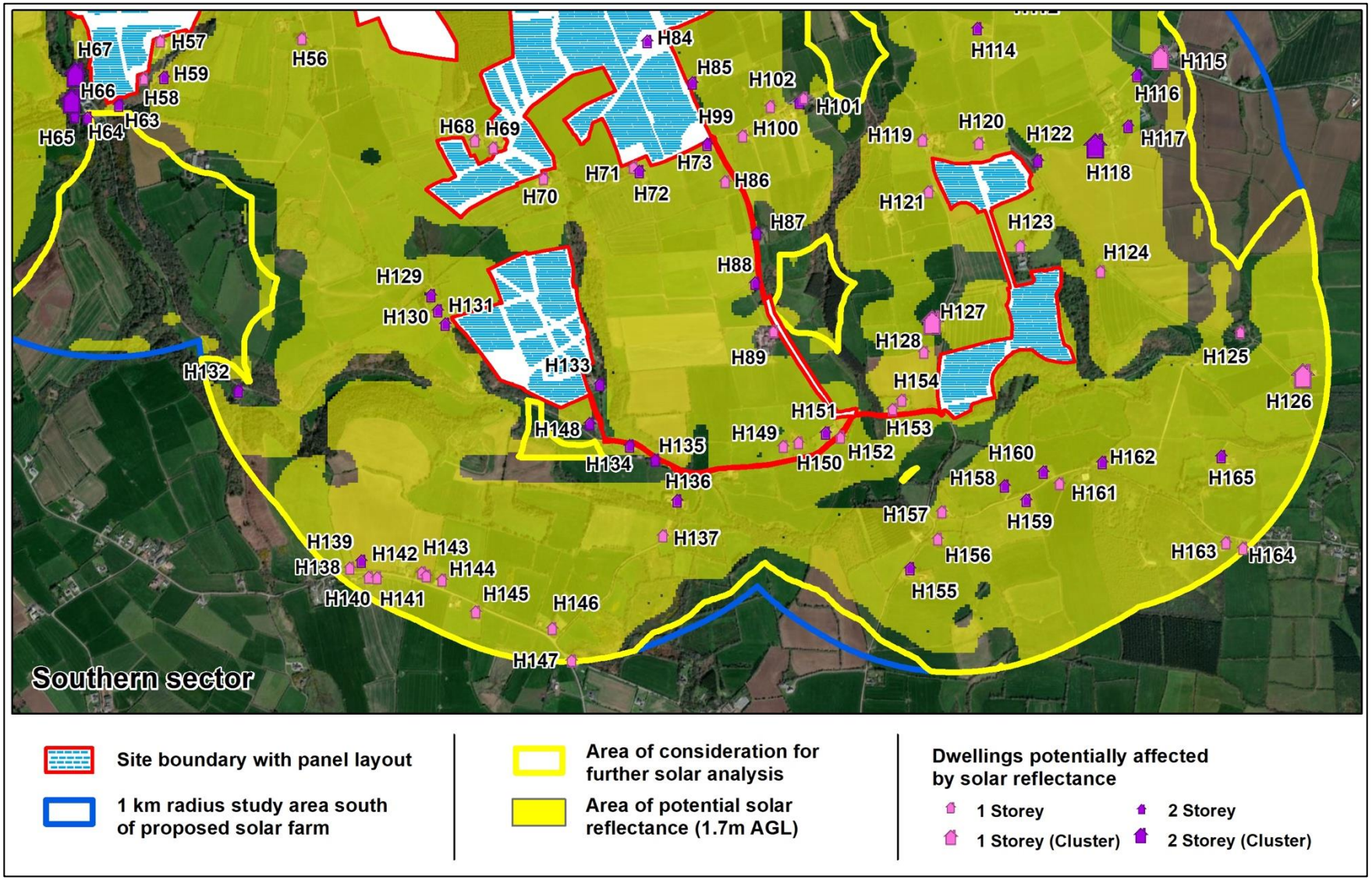

Figure 1.9 Parts of the study area (Southern Extent of Site) where houses are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on a viewers' eye-level when standing on the first floor = 1.7m above ground level.

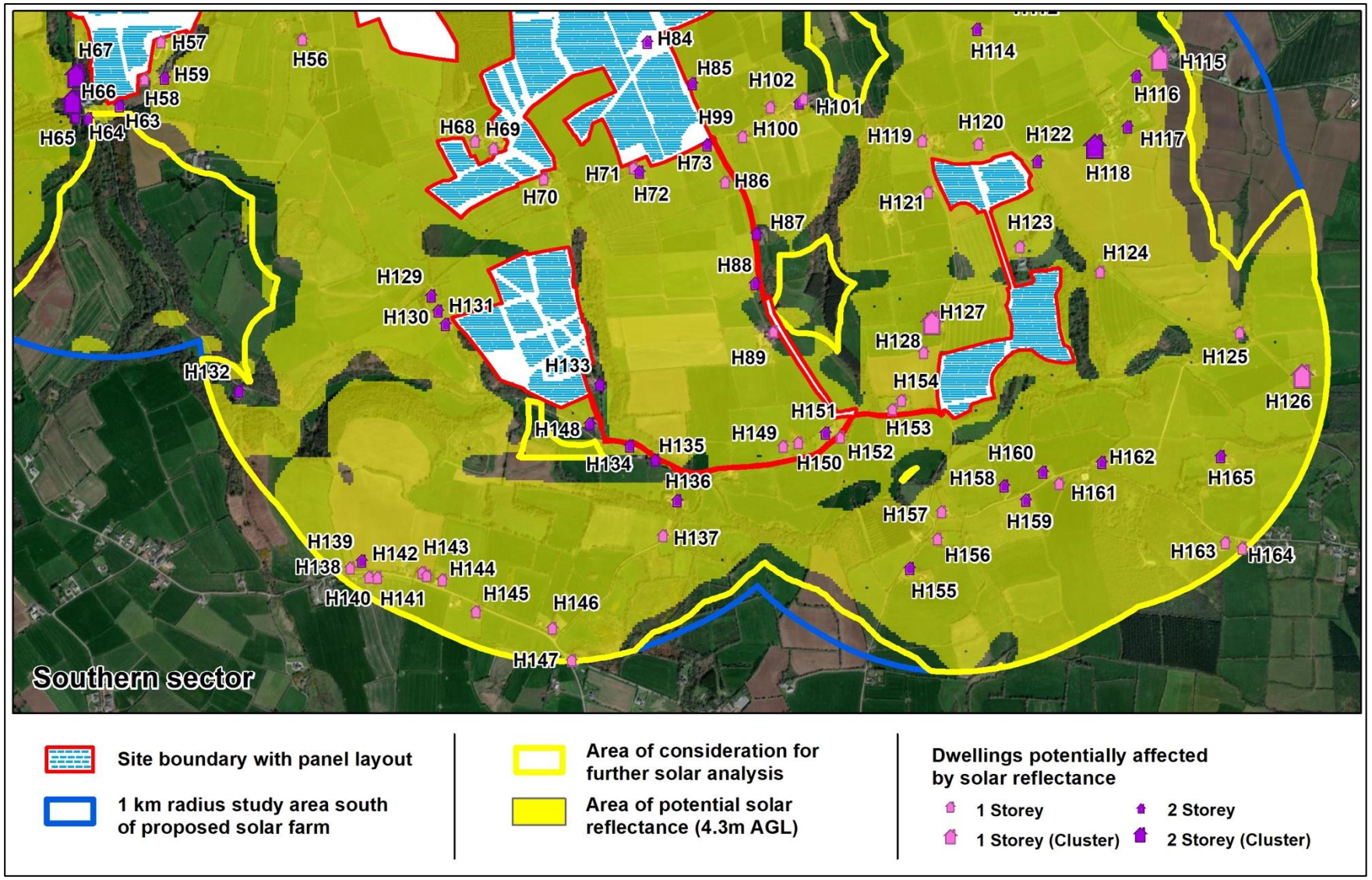

Figure 1.10 Parts of the study area (Southern Extent of Site) where houses are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on a viewers' eye-level when standing on the first floor = 4.3m above ground level.

1.2.6 Results of Analysis of Residential Receptors

The results of the analysis for the dwellings which occur within the 'Area of Consideration for Further Analysis' are contained in Appendix A and C. These set out the times of day and days of the year that glint and glare effects could theoretically be experienced at residential receptors within the study area. Appendix C includes the entire potential glare periods, however in accordance with the stated methodology, Appendix A excludes periods where the sun is within 10 degrees of the angle of reflectance and it is these figures that form the basis of this assessment.

A summary of the results in Appendix A is included in Table 1-2 below. An assessment of the results will be undertaken in Section 1.2.6.1. This assessment also outlines the potential magnitude of impact that may occur at residential receptors.

Note: The results in the left hand columns of Appendix A are theoretical in that they are derived from a "bare-ground" data model that does not account for screening that might exist in the intervening landscape in the form of buildings and/or vegetation. This helps to establish a worst-case scenario baseline, from which we identify a subset of receptors for more thorough investigation. It is important to note that these figures do not necessarily represent an accurate portrayal of real impacts.

Note: This glint and glare assessment was based on a panel tilt of 10 degrees, 15 degrees, 20 degrees and 25 degrees, identifying a robust assessment of the range of potential glint and glare effects that could be generated from the proposed solar development. Potential panel tilts between these ranges (i.e. 10 degrees, 15 degrees, 20 degrees and 25 degrees etc.) are not considered to have any notable variation in the potential periods of reflectance identified in this analysis and are therefore considered as being assessed with the tilt range envelope specified. It is considered that the assessed panel tilts represent a robust range in potential impacts arising from the proposed panels.

Table 1-2 Summary of Results in Appendix A - Dwellings

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
H01	Yes Potentially	Yes Potentially	Yes Potentially
H02	Yes Potentially	Yes Potentially	Yes Potentially
H03	Yes Potentially	Yes Potentially	Yes Potentially
H04	Yes Potentially	Yes Potentially	Yes Potentially
H05	Yes Potentially	Yes Potentially	Yes Potentially
H06	Yes Potentially	None	None
H07	Yes Potentially	Yes Potentially	Yes Potentially
H08	Yes Potentially	Yes Potentially	Yes Potentially
H09	Yes Potentially	None	None
H10	Yes Potentially	Yes Potentially	Yes Potentially
H11	Yes Potentially	Yes Potentially	Yes Potentially
H12	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
H13	Yes Potentially	None	None
H14	Yes Potentially	None	None
H15	Yes Potentially	None	None
H16	Yes Potentially	None	None
H17	Yes Potentially	None	None
H18	Yes Potentially	None	None
H19	Yes Potentially	Yes Potentially	Yes Potentially
H20	Yes Potentially	None	None
H21	Yes Potentially	None	None
H22	Yes Potentially	None	None
H23	None	None	None
H24	Yes Potentially	None	None
H25	Yes Potentially	Yes Potentially	Yes Potentially
H26	Yes Potentially	Yes Potentially	Yes Potentially
H27	Yes Potentially	Yes Potentially	Yes Potentially
H28	Yes Potentially	Yes Potentially	Yes Potentially
H29	Yes Potentially	Yes Potentially	Yes Potentially
H30	Yes Potentially	None	None
H31	Yes Potentially	None	None
H32	Yes Potentially	None	None
H33	None	None	None
H34	None	None	None
H35	None	None	None
H36	None	None	None
H37	None	None	None
H38	Yes Potentially	None	None
H39	Yes Potentially	Yes Potentially	Yes Potentially
H40	Yes Potentially	Yes Potentially	Yes Potentially
H41	Yes Potentially	None	None
H42	Yes Potentially	Yes Potentially	Yes Potentially
H43	Yes Potentially	Yes Potentially	Yes Potentially
H44	Yes Potentially	Yes Potentially	Yes Potentially
H45	Yes Potentially	Yes Potentially	Yes Potentially

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
H46	Yes Potentially	None	None
H47	Yes Potentially	None	None
H48	Yes Potentially	None	None
H49	Yes Potentially	Yes Potentially	None
H50	Yes Potentially	Yes Potentially	Yes Potentially
H51	Yes Potentially	None	None
H52	Yes Potentially	None	None
H53	Yes Potentially	None	None
H54	Yes Potentially	Yes Potentially	Yes Potentially
H55	Yes Potentially	Yes Potentially	Yes Potentially
H56	Yes Potentially	None	None
H57	None	None	None
H58	None	None	None
H59	None	None	None
H60	Yes Potentially	Yes Potentially	Yes Potentially
H61	Yes Potentially	Yes Potentially	Yes Potentially
H62	Yes Potentially	None	None
H63	None	None	None
H64	None	None	None
H65	None	None	None
H66	None	None	None
H67	None	None	None
H68	Yes Potentially	Yes Potentially	Yes Potentially
H69	Yes Potentially	Yes Potentially	Yes Potentially
H70	Yes Potentially	None	None
H71	Yes Potentially	Yes Potentially	None
H72	Yes Potentially	Yes Potentially	Yes Potentially
H73	Yes Potentially	Yes Potentially	None
H74	Yes Potentially	None	None
H75	Yes Potentially	None	None
H76	Yes Potentially	None	None
H77	Yes Potentially	Yes Potentially	Yes Potentially
H78	Yes Potentially	Yes Potentially	Yes Potentially

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
H79	Yes Potentially	Yes Potentially	Yes Potentially
H80	Yes Potentially	Yes Potentially	Yes Potentially
H81	Yes Potentially	Yes Potentially	Yes Potentially
H82	Yes Potentially	Yes Potentially	None
H83	Yes Potentially	Yes Potentially	Yes Potentially
H84	Yes Potentially	None	None
H85	Yes Potentially	Yes Potentially	None
H86	Yes Potentially	Yes Potentially	None
H87	Yes Potentially	None	None
H88	None	None	None
H89	None	None	None
H90	None	None	None
H91	Yes Potentially	None	None
H92	Yes Potentially	Yes Potentially	None
H93	Yes Potentially	None	None
H94	Yes Potentially	None	None
H95	Yes Potentially	None	None
H96	Yes Potentially	Yes Potentially	Yes Potentially
H97	Yes Potentially	Yes Potentially	Yes Potentially
H98	Yes Potentially	Yes Potentially	None
H99	Yes Potentially	None	None
H100	Yes Potentially	None	None
H101	None	None	None
H102	None	None	None
H103	None	None	None
H104	Yes Potentially	Yes Potentially	None
H105	Yes Potentially	Yes Potentially	None
H106	Yes Potentially	Yes Potentially	Yes Potentially
H107	Yes Potentially	Yes Potentially	Yes Potentially
H108	Yes Potentially	Yes Potentially	Yes Potentially
H109	Yes Potentially	None	None
H110	Yes Potentially	Yes Potentially	Yes Potentially
H111	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
H112	Yes Potentially	Yes Potentially	Yes Potentially
H113	Yes Potentially	Yes Potentially	Yes Potentially
H114	Yes Potentially	Yes Potentially	Yes Potentially
H115	None	None	None
H116	Yes Potentially	Yes Potentially	Yes Potentially
H117	Yes Potentially	None	None
H118	Yes Potentially	Yes Potentially	Yes Potentially
H119	Yes Potentially	None	None
H120	Yes Potentially	None	None
H121	Yes Potentially	Yes Potentially	None
H122	Yes Potentially	Yes Potentially	Yes Potentially
H123	Yes Potentially	None	None
H124	Yes Potentially	None	None
H125	None	None	None
H126	Yes Potentially	None	None
H127	None	None	None
H128	Yes Potentially	Yes Potentially	Yes Potentially
H129	Yes Potentially	None	None
H130	Yes Potentially	None	None
H131	Yes Potentially	None	None
H132	None	None	None
H133	None	None	None
H134	None	None	None
H135	None	None	None
H136	Yes Potentially	None	None
H137	Yes Potentially	None	None
H138	Yes Potentially	Yes Potentially	Yes Potentially
H139	Yes Potentially	Yes Potentially	Yes Potentially
H140	Yes Potentially	None	None
H141	Yes Potentially	None	None
H142	Yes Potentially	None	None
H143	Yes Potentially	None	None
H144	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
H145	Yes Potentially	None	None
H146	Yes Potentially	None	None
H147	None	None	None
H148	None	None	None
H149	None	None	None
H150	Yes Potentially	None	None
H151	Yes Potentially	None	None
H152	Yes Potentially	None	None
H153	Yes Potentially	None	None
H154	Yes Potentially	None	None
H155	Yes Potentially	None	None
H156	Yes Potentially	None	None
H157	Yes Potentially	None	None
H158	Yes Potentially	None	None
H159	Yes Potentially	None	None
H160	Yes Potentially	Yes Potentially	Yes Potentially
H161	Yes Potentially	None	None
H162	Yes Potentially	Yes Potentially	Yes Potentially
H163	Yes Potentially	None	None
H164	Yes Potentially	None	None
H165	Yes Potentially	Yes Potentially	Yes Potentially
H166	Yes Potentially	None	None
H167	Yes Potentially	Yes Potentially	Yes Potentially
H168	Yes Potentially	None	None

1.2.6.1 *Effects on Residential Receptors*

A total of 168 dwellings were examined. Computer analysis using terrain-only data (DTM) identified that glint and glare is geometrically possible at 138 of these. Further analysis, taking account of the existing screening inherent across the study area (using a digital surface model - DSM) and on-site verification of the analysis results, indicates that 65 no. dwellings are actually likely to have the potential to be materially affected by glint and glare prior to mitigation. This is on the basis of the considerable screening afforded by buildings and hedgerows that occur between the vast majority of receptors and potentially reflecting panels. Post mitigation establishment only 54 no. of these dwellings have the potential to incur glint and glare effects. A summary of those dwellings that have the potential to experience the most notable effects are provided below.

H26-H29

Receptors H26 to H29 represent a cluster of single and two-storey dwellings at the settlement of Inch to the west of L3803 at Ballymackibbot Cross Roads. The analysis indicates the theoretical potential for reflectance emanating from the proposed PV panels at the ground floor from all tilt angles for a maximum of 28 minutes per day (H26, 15-degree tilt) and a maximum of 107 days of the year (H26, 25-degree tilt). Reflectance has the potential to occur at the 1st floor of dwellings in these clusters for a maximum of 62 minutes (H28, 15-degree tilt) per day over 113 days of the year (H27, 25-degree tilt). It should also be noted that the potentially reflecting panels range from between c. 800m to 3.4km from these residential receptors. Prior to the proposed mitigation, the magnitude of impact is deemed **Medium.**

Once the proposed mitigation screen planting has fully established these periods of potential reflectance will marginally reduce. Nonetheless, the magnitude of effect will remain **Medium.**

H44

House H44 is a single storey dwelling located along the L3803 local road in the townland of Barnaviddane. The analysis indicates the theoretical potential for reflectance emanating from the proposed PV panels at all tilt angles for a maximum of 40 minutes per day (25-degree tilt) and a maximum of 137 days of the year (25-degree tilt). It should also be noted that the potentially reflecting panels are located over c. 800m from this residential receptor. Prior to the proposed mitigation, the magnitude of impact is deemed **Medium.**

Once the proposed mitigation screen planting has fully established these periods of potential reflectance will marginally reduce. Nonetheless, the magnitude of effect will remain **Medium.**

H50

House H50 is a single storey dwelling located at the intersection of the L3803 and the L7813 local road in the townland of Barnaviddane. The analysis indicates the theoretical potential for reflectance emanating from the proposed PV panels from all tilt angles for a maximum of 36 minutes per day and a maximum of 129 days of the year (25-degree tilt). It should also be noted that the potentially reflecting panels range from between c. 400m to 1.6km from this residential receptor. Prior to the proposed mitigation, the magnitude of impact is deemed **Medium.**

Once the proposed mitigation screen planting has fully established these periods of potential reflectance will marginally reduce. Nonetheless, the magnitude of effect will remain **Medium.**

H79-H81

House H79 to H81 are two-storey dwellings located along the L7829 local road in the townland of Ballydaniel. The analysis indicates the theoretical potential for reflectance emanating from the proposed PV panels at the ground floor from all tilt angles for a maximum of 38 minutes per day (H81, 25-degree tilt) and a maximum of 171 days of the year (H81, 15-degree tilt). Reflectance has the potential to occur at the 1st floor of dwellings in these clusters for a maximum of 40 minutes (H81, 15-degree tilt) per day over 173 days of the year (H81, 25-degree tilt). Prior to the proposed mitigation, the magnitude of impact is deemed **Medium.**

Once the proposed mitigation screen planting has fully established these periods of potential reflectance will be entirely eliminated at the ground floor of all three dwellings, whilst the potential reflectance periods will reduce to a maximum of 28 minutes per day (H81, 15-degree tilt) over 169 days of the year (H81, 25-degree tilt). Nonetheless, the magnitude of effect will remain **Medium.**

H106-H108

Houses H106-H108 are a cluster of single and two-storey dwellings located along a local road in the townland of Ballygalvin, north of Redforge Cross Roads. The analysis indicates the theoretical potential for reflectance emanating from the proposed PV panels at the ground floor from all tilt angles for a maximum of 34 minutes per day (H108, 20-degree tilt) and a maximum of 124 days of the year (H106, 20-degree tilt). It is important to note that H106 is a single storey dwelling, whereas reflectance has the potential to occur at the 1st floor of dwelling H107 and H108 for a maximum of 34 minutes (H107, 15-degree tilt) per day over 135 days of the year (H108, 25-degree tilt). It should also be noted that the potentially reflecting panels are located over c. 800m to the west of these properties. Prior to the proposed mitigation, the magnitude of impact is deemed **Medium.**

Once the proposed mitigation screen planting has fully established these periods of potential reflectance will further reduce, with the maximum periods of reflectance reducing to a maximum of 18 minutes per days (20-degree tilt) over 83 days of the year (25-degree tilt) at H106, a maximum of 14 minutes per day at the ground flood and a maximum of 22 minutes per day at the first floor of H107 and a maximum of 22 minutes per day at the ground flood and a maximum of 28 minutes per day at the first floor of H108. Thus, the residual magnitude of effect is classified as **Medium-low** at both H106 and H107 and remains **Medium** and H108.

A summary of all the pre and post-mitigation magnitude of effect for all other potentially effected dwellings is provided in the table below.

Receptor	Pre-mitigation Magnitude of Effect	Post-mitigation establishment Magnitude of Effect
H01	Low	Low
H02	Low	Low
H03	Low	Low
H04	Medium-low	Medium-low
H05	Negligible	Negligible
H07	Low	Low
H08	Low	Low
H10	Very Low	Very Low
H11	Negligible	Negligible
H19	Medium-low	Medium-low
H25	Medium-low	Medium-low
H39	Negligible	Negligible
H40	Negligible	Negligible
H42	Low	Low
H43	Low	Low
H45	Medium-low	Medium-low
H54	Low	Low
H55	Medium-low	Medium-low
H60	Medium-low	Medium-low

H61	Medium-low	Medium-low
H68	Low	Very Low
H69	Medium-low	Medium-low
H72	Medium-low	Medium-low
H77	Negligible	Negligible
H78	Medium-low	Negligible
H83	Low	Negligible
H96	Negligible	Negligible
H97	Negligible	Negligible
H110	Medium-low	Medium-low
H112	Negligible	Negligible
H113	Medium-low	Medium-low
H114	Negligible	Negligible
H116	Low	Low
H118	Low	Low
H122	Negligible	Negligible
H128	Negligible	Negligible
H138	Negligible	Negligible
H139	Very Low	Very Low
H160	Medium-low	Medium-low
H162	Negligible	Negligible
H165	Low	Low
H167	Very Low	Very Low

Note: It is important to note that the reflectance periods identified above are theoretical and represent the worst-case scenario in terms of potential reflectance and assume that the sun is always shining and at full intensity. The results do not account for climate and inherent weather patterns that occur across the island of Ireland (refer to Met Eireann data[3]). In addition, atmospheric conditions such as haze, mist, fog and precipitation will all have the effect of both reducing the visibility of the site overall and reducing the intensity of any glare emanating from the proposed solar farm. Overall, it is not considered that the reflectance periods outlined above will materially impact on the enjoyment of any properties considered in this assessment. As landscape professionals with a combined 20+ years of LVIA experience, Macro Works do not consider that the reflectance periods outlined above will materially impact on the enjoyment of these residential properties.

3 https://www2.metweb.ie/climate/available-data/historical-data

1.2.6.2 *Ameliorating Factors*

A key consideration for reflectance effects is the incidence (incoming) angle of the sun's rays when they strike the reflecting surface (solar panels in this instance). The most intense reflective rays occur when the receptor is at 90 degrees to the incidence rays. At decreasing angles the reflectance becomes increasingly diffused across a wider portion of the reflecting surface, thereby diminishing the intensity of the reflected rays. The nature of the reflecting surface also plays a major part in the degree of diffusion / absorption of the incidence rays and modern PV solar panels have become very efficient at absorbing rather than reflecting light.

A technical note on solar module glare and reflectance prepared by SunPower Corporation[4] outlines the degree of material reflectivity for a range of sun incident angles. As per the table below (Table 1-3 below) the degree of reflectivity of solar panels below 30 degrees is < 5.03% and is likely to have no material consequence on surrounding receptors. It is also important to reiterate that in terms of reflectance, photovoltaic solar panels are by no means a highly reflective surface. They are designed to absorb sunlight and not to reflect it. Furthermore, as technology has improved, the addition of an antireflective coating on panels has become an option. A June 2023 study by Loughborough University states "currently around 90% of commercial PV modules are supplied with an AR coating applied to the cover glass"[5].

Several studies have shown that even standard photovoltaic panels, without anti-reflective coatings have similar reflectance characteristics to water, which is much lower than the likes of glass, steel and snow by comparison (see Table 1-3). Similar levels of reflectance can be found in common situations in rural environments from surfaces such as shed roofs, lines of plastic ground covering used in cropping and wet roads to name but a few. In the case of modern PV solar panels which include an anti-reflective coating, reflectance levels are even less than that emitted from standard window glass and still water.

Table 1-3 Material Reflectivity at various sun incident angles (derived from Sunpower Corporation (September 2009), T09014 Solar Module Glare and Reflectance Technical Memo)

Common Reflective Surfaces (In surrounding environments for PV systems)		**Sun Incident angle in degrees**						
		0	15	30	45	60	75	90
Material Reflectivity (percent of incident light reflected)	Steel	36.73%	39.22%	46.34%	57.11%	70.02%	83.15%	94.40%
	Snow	21.63%	23.09%	27.29%	33.63%	41.23%	48.96%	55.59%
	Standard Glass	8.44%	9.01%	10.65%	13.12%	16.09%	19.10%	21.69%
	Plexiglass	8.00%	8.54%	10.09%	12.44%	15.25%	18.11%	20.56%
	Plastic	6.99%	7.46%	8.82%	10.87%	13.33%	15.83%	17.97%
	Smooth Water	4.07%	4.35%	5.14%	6.33%	7.76%	9.22%	10.47%
	Solar Glass (high light transmission)	3.99%	4.26%	5.03%	6.20%	7.61%	9.03%	10.26%
	Solar Glass w/AR coating	2.47%	2.64%	3.12%	3.84%	4.71%	5.59%	6.35%

Note: Index of refraction values may vary slightly depending on suppliers and reference documentation.

4 Sunpower Corporation (September 2009), T09014 Solar Module Glare and Reflectance Technical Memo

5 "The performance and durability of Anti-reflection coatings for solar module cover glass – a review" Available at: https://www.sciencedirect.com/science/article/pii/S0038092X23004061

1.2.7 Conclusion - Residential Receptors

Each dwelling within 1km of the proposed development has been fully assessed based on location, height and orientation in relation to the proposed solar farm. For the reasons outlined above, it has been determined that glint and glare impacts are at the lower end of the spectrum (i.e. ranging between Medium and Negligible) as the proposed panels are not considered to be highly reflective surfaces, and the frequency/durations involved are not considered excessive to the degree that they will have a material impact on the enjoyment of any property.

It must also be re-emphasised that the reflectance periods provided are theoretical by default and represent a worst-case scenario in that they assume that the sun is always shining and at full intensity. In the Irish context, the reflectance frequency/duration figures provided are likely to be at least double the reality, according to Met Eireann data.

Thus, it is considered that there will be no significant nuisance effects generated from glint and glare towards surrounding dwellings as a result of the proposed solar farm.

1.2.8 Assessment of Transport Route Receptors

1.2.8.1 Identification of Relevant Transport Route Receptors

Figure 1.11 is an output map of the study area showing the results (areas of potential solar irradiance) of 1st phase reflectance analysis carried out on the proposed solar farm. These account for the path of the sun throughout the entire year; the panel positions and parameters; the 3D terrain parameters. This is the starting point for determining which transport route receptors have the geometric potential to be affected by glint and glare – in the absence of screening.

Note: the yellow buffer line around the reflectance pattern indicating 'Area of consideration for further analysis' on the output map represents a precautionary approach of including transport route sections at the fringe of potentially affected areas. It accounts for the fact that this 'first-filter' map is based on a sampling grid point density of 100m.

Receptor Points have been positioned along all the potentially affected roads (R) within the 'Area of Consideration for Further Analysis'. Transport route Receptor Points are placed automatically in an un-biased fashion at 50m intervals along route lines using Geographic Information Systems (GIS) software. There will be instances where points may be screened by single trees in otherwise open sections of route, or, conversely they may be exposed through a gateway in an otherwise long section of screening hedgerow. Their frequency is designed, however, to reflect the overall screening characteristics of the route sections.

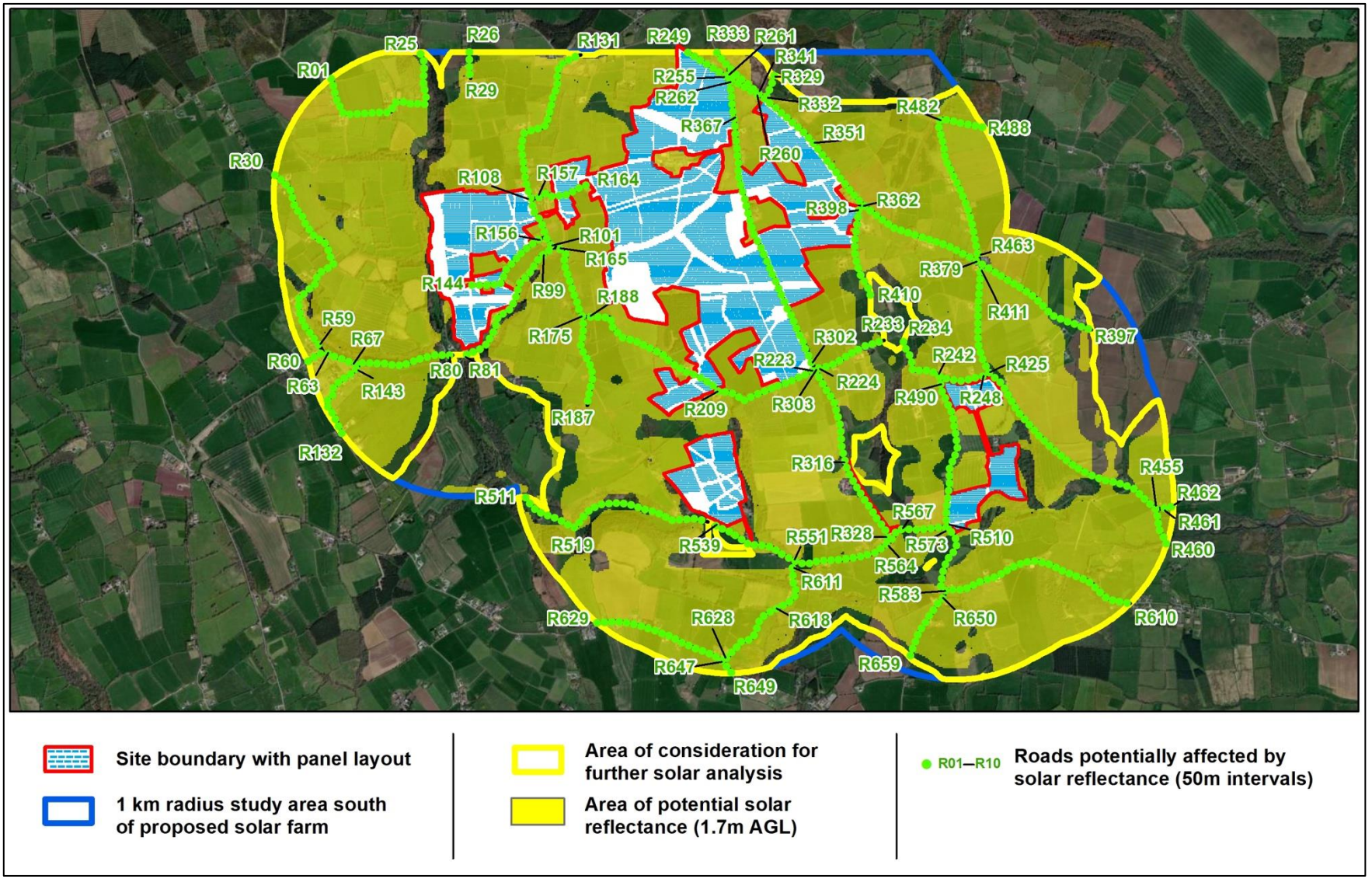

Figure 1.11 Parts of the study area where roads are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on viewer's eye level at 1.7m above ground level for roads

1.2.9 Results of Analysis of Transport Route Receptors

The results of the analysis for the transport routes which occur within the 'Area of Consideration for Further Analysis' is contained in Appendix B and D. These set out the times of day and days of the year that glint and glare effects could theoretically be experienced at transport route receptors within the study area. Appendix D includes the entire potential glare periods, however in accordance with the stated methodology, Appendix B excludes periods where the sun is within 10 degrees of the angle of reflectance, and it is these figures that form the basis of this assessment.

A summary of the results in Appendix B is included in Table 1-4 below. An assessment of the results will be undertaken in Section 1.2.9.1

Note: The results in the left hand columns of Appendix B are theoretical in that they are derived from a "bare-ground" data model that does not account for screening that might exist in the intervening landscape in the form of buildings and/or vegetation. This helps to establish a worst-case scenario baseline, from which we identify a subset of receptors for more thorough investigation. It is important to note that these figures do not necessarily represent an accurate portrayal of real impacts.

Note: This glint and glare assessment was based on a panel tilt of 10 degrees, 15 degrees, 20 degrees and 25 degrees, identifying a robust assessment of the range of potential glint and glare effects that could be generated from the proposed solar development. Potential panel tilts between these ranges (i.e. 10 degrees, 15 degrees, 20 degrees and 25 degrees etc.) are not considered to have any notable variation in the potential periods of reflectance identified in this analysis and are therefore considered as being assessed with the tilt range envelope specified. It is considered that the assessed panel tilts represent a robust range in potential impacts arising from the proposed panels.

It is important to note that the figures for the maximum minutes per day in Appendix B relate to the time window that a section of route can potentially experience reflectance and are therefore of less consequence than they would be for a static dwelling receptor. Such effects can only be experienced for the period of time it takes to travel along the affected road section, and therefore will be fleeting and in any event significantly less than the maximum periods outlined.

Table 1-4 Summary of Results contained in Appendix B - Transport Receptors: Roads

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R01	Yes Potentially	Yes Potentially	None
R02	Yes Potentially	Yes Potentially	Yes Potentially
R03	Yes Potentially	Yes Potentially	Yes Potentially
R04	Yes Potentially	None	None
R05	Yes Potentially	None	None
R06	Yes Potentially	None	None
R07	Yes Potentially	None	None
R08	Yes Potentially	None	None
R09	Yes Potentially	Yes Potentially	Yes Potentially

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R10	Yes Potentially	Yes Potentially	Yes Potentially
R11	Yes Potentially	Yes Potentially	Yes Potentially
R12	Yes Potentially	Yes Potentially	Yes Potentially
R13	Yes Potentially	Yes Potentially	Yes Potentially
R14	Yes Potentially	None	None
R15	Yes Potentially	None	None
R16	Yes Potentially	None	None
R17	Yes Potentially	Yes Potentially	Yes Potentially
R18	Yes Potentially	None	None
R19	None	None	None
R20	None	None	None
R21	None	None	None
R22	None	None	None
R23	None	None	None
R24	None	None	None
R25	None	None	None
R26	Yes Potentially	None	None
R27	Yes Potentially	None	None
R28	Yes Potentially	None	None
R29	Yes Potentially	None	None
R30	Yes Potentially	None	None
R31	Yes Potentially	None	None
R32	Yes Potentially	None	None
R33	Yes Potentially	None	None
R34	Yes Potentially	Yes Potentially	Yes Potentially
R35	Yes Potentially	None	None
R36	Yes Potentially	Yes Potentially	Yes Potentially
R37	Yes Potentially	None	None
R38	Yes Potentially	None	None
R39	Yes Potentially	None	None
R40	Yes Potentially	Yes Potentially	Yes Potentially
R41	Yes Potentially	Yes Potentially	Yes Potentially
R42	Yes Potentially	Yes Potentially	Yes Potentially

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R43	Yes Potentially	Yes Potentially	Yes Potentially
R44	Yes Potentially	Yes Potentially	Yes Potentially
R45	Yes Potentially	None	None
R46	Yes Potentially	None	None
R47	Yes Potentially	Yes Potentially	Yes Potentially
R48	Yes Potentially	Yes Potentially	Yes Potentially
R49	Yes Potentially	None	None
R50	None	None	None
R51	None	None	None
R52	Yes Potentially	None	None
R53	Yes Potentially	None	None
R54	Yes Potentially	None	None
R55	Yes Potentially	None	None
R56	Yes Potentially	None	None
R57	Yes Potentially	None	None
R58	Yes Potentially	None	None
R59	Yes Potentially	None	None
R60	Yes Potentially	Yes Potentially	Yes Potentially
R61	Yes Potentially	Yes Potentially	Yes Potentially
R62	Yes Potentially	Yes Potentially	Yes Potentially
R63	Yes Potentially	None	None
R64	Yes Potentially	Yes Potentially	Yes Potentially
R65	Yes Potentially	None	None
R66	Yes Potentially	Yes Potentially	Yes Potentially
R67	Yes Potentially	Yes Potentially	Yes Potentially
R68	Yes Potentially	None	None
R69	Yes Potentially	None	None
R70	Yes Potentially	None	None
R71	Yes Potentially	None	None
R72	Yes Potentially	None	None
R73	Yes Potentially	None	None
R74	Yes Potentially	None	None
R75	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R76	Yes Potentially	None	None
R77	Yes Potentially	None	None
R78	None	None	None
R79	None	None	None
R80	None	None	None
R81	None	None	None
R82	None	None	None
R83	None	None	None
R84	None	None	None
R85	None	None	None
R86	None	None	None
R87	None	None	None
R88	None	None	None
R89	None	None	None
R90	None	None	None
R91	None	None	None
R92	None	None	None
R93	None	None	None
R94	None	None	None
R95	None	None	None
R96	None	None	None
R97	Yes Potentially	None	None
R98	Yes Potentially	None	None
R99	Yes Potentially	None	None
R100	Yes Potentially	None	None
R101	Yes Potentially	None	None
R102	Yes Potentially	None	None
R103	Yes Potentially	Yes Potentially	None
R104	Yes Potentially	None	None
R105	Yes Potentially	Yes Potentially	None
R106	Yes Potentially	Yes Potentially	None
R107	Yes Potentially	Yes Potentially	None
R108	Yes Potentially	Yes Potentially	Yes Potentially

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R109	Yes Potentially	Yes Potentially	Yes Potentially
R110	Yes Potentially	None	None
R111	Yes Potentially	None	None
R112	Yes Potentially	Yes Potentially	Yes Potentially
R113	Yes Potentially	None	None
R114	Yes Potentially	Yes Potentially	Yes Potentially
R115	Yes Potentially	Yes Potentially	Yes Potentially
R116	Yes Potentially	Yes Potentially	Yes Potentially
R117	Yes Potentially	Yes Potentially	Yes Potentially
R118	Yes Potentially	Yes Potentially	Yes Potentially
R119	Yes Potentially	Yes Potentially	Yes Potentially
R120	Yes Potentially	Yes Potentially	Yes Potentially
R121	Yes Potentially	Yes Potentially	Yes Potentially
R122	Yes Potentially	None	None
R123	Yes Potentially	Yes Potentially	Yes Potentially
R124	Yes Potentially	Yes Potentially	Yes Potentially
R125	Yes Potentially	None	None
R126	Yes Potentially	None	None
R127	Yes Potentially	None	None
R128	None	None	None
R129	None	None	None
R130	None	None	None
R131	None	None	None
R132	Yes Potentially	None	None
R133	Yes Potentially	None	None
R134	Yes Potentially	None	None
R135	Yes Potentially	Yes Potentially	Yes Potentially
R136	Yes Potentially	None	None
R137	Yes Potentially	None	None
R138	Yes Potentially	Yes Potentially	Yes Potentially
R139	Yes Potentially	None	None
R140	Yes Potentially	None	None
R141	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R142	Yes Potentially	None	None
R143	Yes Potentially	None	None
R144	Yes Potentially	Yes Potentially	Yes Potentially
R145	Yes Potentially	Yes Potentially	None
R146	Yes Potentially	None	None
R147	Yes Potentially	Yes Potentially	None
R148	Yes Potentially	None	None
R149	Yes Potentially	None	None
R150	Yes Potentially	Yes Potentially	Yes Potentially
R151	Yes Potentially	Yes Potentially	None
R152	Yes Potentially	Yes Potentially	None
R153	Yes Potentially	Yes Potentially	None
R154	Yes Potentially	None	None
R155	Yes Potentially	Yes Potentially	Yes Potentially
R156	Yes Potentially	Yes Potentially	Yes Potentially
R157	Yes Potentially	None	None
R158	Yes Potentially	None	None
R159	Yes Potentially	None	None
R160	Yes Potentially	Yes Potentially	None
R161	Yes Potentially	None	None
R162	Yes Potentially	None	None
R163	Yes Potentially	None	None
R164	Yes Potentially	Yes Potentially	None
R165	Yes Potentially	None	None
R166	Yes Potentially	None	None
R167	Yes Potentially	None	None
R168	Yes Potentially	None	None
R169	Yes Potentially	Yes Potentially	Yes Potentially
R170	Yes Potentially	Yes Potentially	Yes Potentially
R171	Yes Potentially	None	None
R172	Yes Potentially	None	None
R173	Yes Potentially	None	None
R174	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R175	Yes Potentially	Yes Potentially	Yes Potentially
R176	Yes Potentially	None	None
R177	Yes Potentially	None	None
R178	Yes Potentially	None	None
R179	Yes Potentially	None	None
R180	Yes Potentially	None	None
R181	Yes Potentially	Yes Potentially	Yes Potentially
R182	Yes Potentially	Yes Potentially	Yes Potentially
R183	Yes Potentially	Yes Potentially	Yes Potentially
R184	Yes Potentially	None	None
R185	None	None	None
R186	Yes Potentially	Yes Potentially	Yes Potentially
R187	Yes Potentially	Yes Potentially	Yes Potentially
R188	Yes Potentially	Yes Potentially	Yes Potentially
R189	Yes Potentially	Yes Potentially	Yes Potentially
R190	Yes Potentially	Yes Potentially	Yes Potentially
R191	Yes Potentially	Yes Potentially	None
R192	Yes Potentially	None	None
R193	Yes Potentially	None	None
R194	Yes Potentially	None	None
R195	Yes Potentially	None	None
R196	Yes Potentially	None	None
R197	Yes Potentially	None	None
R198	Yes Potentially	None	None
R199	Yes Potentially	None	None
R200	Yes Potentially	None	None
R201	Yes Potentially	None	None
R202	Yes Potentially	Yes Potentially	Yes Potentially
R203	Yes Potentially	None	None
R204	Yes Potentially	None	None
R205	Yes Potentially	Yes Potentially	Yes Potentially
R206	Yes Potentially	None	None
R207	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R208	Yes Potentially	None	None
R209	Yes Potentially	None	None
R210	Yes Potentially	None	None
R211	Yes Potentially	None	None
R212	Yes Potentially	None	None
R213	Yes Potentially	None	None
R214	Yes Potentially	None	None
R215	Yes Potentially	Yes Potentially	Yes Potentially
R216	Yes Potentially	None	None
R217	Yes Potentially	Yes Potentially	Yes Potentially
R218	Yes Potentially	Yes Potentially	Yes Potentially
R219	Yes Potentially	Yes Potentially	None
R220	Yes Potentially	Yes Potentially	None
R221	Yes Potentially	Yes Potentially	None
R222	Yes Potentially	Yes Potentially	None
R223	Yes Potentially	Yes Potentially	None
R224	Yes Potentially	Yes Potentially	None
R225	Yes Potentially	Yes Potentially	None
R226	Yes Potentially	Yes Potentially	Yes Potentially
R227	Yes Potentially	Yes Potentially	Yes Potentially
R228	Yes Potentially	None	None
R229	Yes Potentially	None	None
R230	None	None	None
R231	None	None	None
R232	None	None	None
R233	None	None	None
R234	None	None	None
R235	None	None	None
R236	None	None	None
R237	None	None	None
R238	None	None	None
R239	Yes Potentially	None	None
R240	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R241	Yes Potentially	None	None
R242	Yes Potentially	Yes Potentially	Yes Potentially
R243	Yes Potentially	None	None
R244	Yes Potentially	None	None
R245	Yes Potentially	None	None
R246	Yes Potentially	None	None
R247	Yes Potentially	None	None
R248	Yes Potentially	None	None
R249	None	None	None
R250	Yes Potentially	Yes Potentially	None
R251	Yes Potentially	Yes Potentially	None
R252	Yes Potentially	Yes Potentially	None
R253	Yes Potentially	Yes Potentially	None
R254	Yes Potentially	Yes Potentially	None
R255	Yes Potentially	Yes Potentially	None
R256	Yes Potentially	Yes Potentially	None
R257	Yes Potentially	Yes Potentially	None
R258	Yes Potentially	Yes Potentially	None
R259	Yes Potentially	Yes Potentially	None
R260	Yes Potentially	Yes Potentially	None
R261	Yes Potentially	Yes Potentially	None
R262	Yes Potentially	Yes Potentially	None
R263	Yes Potentially	Yes Potentially	None
R264	Yes Potentially	Yes Potentially	None
R265	Yes Potentially	Yes Potentially	None
R266	Yes Potentially	Yes Potentially	None
R267	Yes Potentially	Yes Potentially	None
R268	Yes Potentially	None	None
R269	Yes Potentially	None	None
R270	Yes Potentially	None	None
R271	Yes Potentially	None	None
R272	Yes Potentially	Yes Potentially	Yes Potentially
R273	Yes Potentially	Yes Potentially	Yes Potentially

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R274	Yes Potentially	Yes Potentially	None
R275	Yes Potentially	Yes Potentially	Yes Potentially
R276	Yes Potentially	Yes Potentially	None
R277	Yes Potentially	Yes Potentially	Yes Potentially
R278	Yes Potentially	None	None
R279	Yes Potentially	Yes Potentially	None
R280	Yes Potentially	Yes Potentially	None
R281	Yes Potentially	Yes Potentially	None
R282	Yes Potentially	Yes Potentially	None
R283	Yes Potentially	Yes Potentially	None
R284	Yes Potentially	Yes Potentially	None
R285	Yes Potentially	Yes Potentially	None
R286	Yes Potentially	Yes Potentially	None
R287	Yes Potentially	Yes Potentially	None
R288	Yes Potentially	Yes Potentially	None
R289	Yes Potentially	Yes Potentially	None
R290	Yes Potentially	Yes Potentially	None
R291	Yes Potentially	Yes Potentially	None
R292	Yes Potentially	Yes Potentially	None
R293	Yes Potentially	Yes Potentially	None
R294	Yes Potentially	None	None
R295	Yes Potentially	None	None
R296	Yes Potentially	None	None
R297	Yes Potentially	Yes Potentially	None
R298	Yes Potentially	Yes Potentially	None
R299	Yes Potentially	Yes Potentially	None
R300	Yes Potentially	Yes Potentially	None
R301	Yes Potentially	Yes Potentially	None
R302	Yes Potentially	Yes Potentially	None
R303	Yes Potentially	Yes Potentially	None
R304	Yes Potentially	None	None
R305	Yes Potentially	None	None
R306	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R307	None	None	None
R308	None	None	None
R309	Yes Potentially	None	None
R310	Yes Potentially	None	None
R311	None	None	None
R312	None	None	None
R313	None	None	None
R314	None	None	None
R315	None	None	None
R316	None	None	None
R317	None	None	None
R318	None	None	None
R319	None	None	None
R320	None	None	None
R321	None	None	None
R322	None	None	None
R323	None	None	None
R324	Yes Potentially	None	None
R325	Yes Potentially	Yes Potentially	Yes Potentially
R326	Yes Potentially	None	None
R327	Yes Potentially	None	None
R328	Yes Potentially	None	None
R329	None	None	None
R330	None	None	None
R331	None	None	None
R332	Yes Potentially	None	None
R333	None	None	None
R334	None	None	None
R335	Yes Potentially	None	None
R336	Yes Potentially	Yes Potentially	None
R337	Yes Potentially	Yes Potentially	None
R338	Yes Potentially	Yes Potentially	None
R339	Yes Potentially	Yes Potentially	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R340	Yes Potentially	Yes Potentially	None
R341	Yes Potentially	Yes Potentially	None
R342	Yes Potentially	None	None
R343	Yes Potentially	None	None
R344	Yes Potentially	Yes Potentially	None
R345	Yes Potentially	Yes Potentially	None
R346	Yes Potentially	Yes Potentially	None
R347	Yes Potentially	Yes Potentially	None
R348	Yes Potentially	Yes Potentially	None
R349	Yes Potentially	None	None
R350	Yes Potentially	Yes Potentially	None
R351	Yes Potentially	Yes Potentially	None
R352	Yes Potentially	Yes Potentially	None
R353	Yes Potentially	Yes Potentially	None
R354	Yes Potentially	Yes Potentially	None
R355	Yes Potentially	Yes Potentially	None
R356	Yes Potentially	Yes Potentially	None
R357	Yes Potentially	Yes Potentially	None
R358	Yes Potentially	Yes Potentially	None
R359	Yes Potentially	None	None
R360	Yes Potentially	None	None
R361	Yes Potentially	None	None
R362	Yes Potentially	None	None
R363	Yes Potentially	None	None
R364	Yes Potentially	None	None
R365	Yes Potentially	None	None
R366	Yes Potentially	None	None
R367	Yes Potentially	None	None
R368	Yes Potentially	Yes Potentially	None
R369	Yes Potentially	None	None
R370	Yes Potentially	None	None
R371	Yes Potentially	None	None
R372	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R373	Yes Potentially	Yes Potentially	Yes Potentially
R374	Yes Potentially	Yes Potentially	Yes Potentially
R375	Yes Potentially	Yes Potentially	Yes Potentially
R376	Yes Potentially	Yes Potentially	Yes Potentially
R377	None	None	None
R378	None	None	None
R379	None	None	None
R380	Yes Potentially	None	None
R381	Yes Potentially	None	None
R382	Yes Potentially	None	None
R383	Yes Potentially	None	None
R384	Yes Potentially	None	None
R385	Yes Potentially	None	None
R386	Yes Potentially	None	None
R387	Yes Potentially	None	None
R388	Yes Potentially	None	None
R389	Yes Potentially	None	None
R390	None	None	None
R391	None	None	None
R392	None	None	None
R393	None	None	None
R394	None	None	None
R395	None	None	None
R396	None	None	None
R397	None	None	None
R398	Yes Potentially	None	None
R399	Yes Potentially	None	None
R400	Yes Potentially	None	None
R401	Yes Potentially	None	None
R402	Yes Potentially	None	None
R403	Yes Potentially	None	None
R404	Yes Potentially	None	None
R405	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R406	None	None	None
R407	None	None	None
R408	None	None	None
R409	None	None	None
R410	None	None	None
R411	Yes Potentially	None	None
R412	Yes Potentially	None	None
R413	Yes Potentially	Yes Potentially	Yes Potentially
R414	Yes Potentially	Yes Potentially	Yes Potentially
R415	Yes Potentially	None	None
R416	Yes Potentially	None	None
R417	Yes Potentially	None	None
R418	Yes Potentially	None	None
R419	Yes Potentially	None	None
R420	Yes Potentially	None	None
R421	Yes Potentially	Yes Potentially	None
R422	Yes Potentially	None	None
R423	Yes Potentially	None	None
R424	None	None	None
R425	None	None	None
R426	None	None	None
R427	None	None	None
R428	Yes Potentially	Yes Potentially	None
R429	Yes Potentially	Yes Potentially	None
R430	Yes Potentially	Yes Potentially	Yes Potentially
R431	Yes Potentially	None	None
R432	Yes Potentially	None	None
R433	Yes Potentially	None	None
R434	Yes Potentially	None	None
R435	Yes Potentially	None	None
R436	Yes Potentially	None	None
R437	Yes Potentially	None	None
R438	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R439	Yes Potentially	None	None
R440	Yes Potentially	None	None
R441	Yes Potentially	None	None
R442	Yes Potentially	Yes Potentially	Yes Potentially
R443	None	None	None
R444	None	None	None
R445	Yes Potentially	None	None
R446	Yes Potentially	None	None
R447	Yes Potentially	None	None
R448	Yes Potentially	None	None
R449	None	None	None
R450	None	None	None
R451	None	None	None
R452	Yes Potentially	None	None
R453	Yes Potentially	None	None
R454	Yes Potentially	None	None
R455	Yes Potentially	None	None
R456	Yes Potentially	Yes Potentially	Yes Potentially
R457	Yes Potentially	None	None
R458	Yes Potentially	None	None
R459	Yes Potentially	None	None
R460	Yes Potentially	None	None
R461	Yes Potentially	None	None
R462	Yes Potentially	None	None
R463	Yes Potentially	None	None
R464	Yes Potentially	None	None
R465	Yes Potentially	Yes Potentially	Yes Potentially
R466	Yes Potentially	None	None
R467	Yes Potentially	None	None
R468	Yes Potentially	None	None
R469	Yes Potentially	None	None
R470	Yes Potentially	Yes Potentially	None
R471	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R472	Yes Potentially	Yes Potentially	None
R473	Yes Potentially	None	None
R474	Yes Potentially	None	None
R475	Yes Potentially	None	None
R476	Yes Potentially	Yes Potentially	None
R477	Yes Potentially	None	None
R478	Yes Potentially	None	None
R479	Yes Potentially	None	None
R480	None	None	None
R481	None	None	None
R482	None	None	None
R483	None	None	None
R484	None	None	None
R485	None	None	None
R486	Yes Potentially	None	None
R487	Yes Potentially	None	None
R488	Yes Potentially	None	None
R489	Yes Potentially	Yes Potentially	Yes Potentially
R490	Yes Potentially	None	None
R491	Yes Potentially	Yes Potentially	Yes Potentially
R492	Yes Potentially	Yes Potentially	Yes Potentially
R493	Yes Potentially	Yes Potentially	None
R494	Yes Potentially	Yes Potentially	None
R495	Yes Potentially	None	None
R496	None	None	None
R497	None	None	None
R498	None	None	None
R499	None	None	None
R500	None	None	None
R501	None	None	None
R502	None	None	None
R503	None	None	None
R504	None	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R505	None	None	None
R506	Yes Potentially	Yes Potentially	None
R507	Yes Potentially	None	None
R508	Yes Potentially	None	None
R509	Yes Potentially	None	None
R510	Yes Potentially	Yes Potentially	None
R511	None	None	None
R512	None	None	None
R513	None	None	None
R514	None	None	None
R515	None	None	None
R516	None	None	None
R517	None	None	None
R518	None	None	None
R519	Yes Potentially	None	None
R520	Yes Potentially	None	None
R521	Yes Potentially	None	None
R522	Yes Potentially	None	None
R523	Yes Potentially	None	None
R524	Yes Potentially	None	None
R525	None	None	None
R526	None	None	None
R527	None	None	None
R528	None	None	None
R529	None	None	None
R530	None	None	None
R531	None	None	None
R532	None	None	None
R533	None	None	None
R534	Yes Potentially	None	None
R535	Yes Potentially	None	None
R536	Yes Potentially	None	None
R537	None	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R538	None	None	None
R539	None	None	None
R540	None	None	None
R541	None	None	None
R542	None	None	None
R543	None	None	None
R544	None	None	None
R545	None	None	None
R546	None	None	None
R547	None	None	None
R548	None	None	None
R549	None	None	None
R550	None	None	None
R551	None	None	None
R552	None	None	None
R553	None	None	None
R554	Yes Potentially	None	None
R555	Yes Potentially	None	None
R556	None	None	None
R557	None	None	None
R558	Yes Potentially	None	None
R559	Yes Potentially	None	None
R560	Yes Potentially	None	None
R561	Yes Potentially	None	None
R562	Yes Potentially	None	None
R563	Yes Potentially	None	None
R564	Yes Potentially	None	None
R565	Yes Potentially	None	None
R566	None	None	None
R567	None	None	None
R568	None	None	None
R569	None	None	None
R570	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R571	Yes Potentially	None	None
R572	Yes Potentially	None	None
R573	Yes Potentially	None	None
R574	None	None	None
R575	None	None	None
R576	None	None	None
R577	None	None	None
R578	None	None	None
R579	None	None	None
R580	None	None	None
R581	None	None	None
R582	None	None	None
R583	Yes Potentially	None	None
R584	Yes Potentially	None	None
R585	Yes Potentially	Yes Potentially	Yes Potentially
R586	Yes Potentially	None	None
R587	Yes Potentially	None	None
R588	Yes Potentially	None	None
R589	Yes Potentially	None	None
R590	Yes Potentially	None	None
R591	Yes Potentially	None	None
R592	Yes Potentially	None	None
R593	Yes Potentially	None	None
R594	Yes Potentially	Yes Potentially	Yes Potentially
R595	Yes Potentially	None	None
R596	Yes Potentially	None	None
R597	Yes Potentially	None	None
R598	Yes Potentially	None	None
R599	Yes Potentially	None	None
R600	Yes Potentially	None	None
R601	Yes Potentially	None	None
R602	Yes Potentially	None	None
R603	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R604	Yes Potentially	None	None
R605	Yes Potentially	None	None
R606	Yes Potentially	None	None
R607	Yes Potentially	None	None
R608	Yes Potentially	None	None
R609	Yes Potentially	None	None
R610	Yes Potentially	Yes Potentially	Yes Potentially
R611	None	None	None
R612	Yes Potentially	None	None
R613	Yes Potentially	None	None
R614	Yes Potentially	None	None
R615	Yes Potentially	None	None
R616	Yes Potentially	None	None
R617	Yes Potentially	None	None
R618	Yes Potentially	None	None
R619	Yes Potentially	None	None
R620	Yes Potentially	None	None
R621	Yes Potentially	None	None
R622	Yes Potentially	None	None
R623	Yes Potentially	None	None
R624	Yes Potentially	None	None
R625	Yes Potentially	None	None
R626	Yes Potentially	None	None
R627	Yes Potentially	None	None
R628	Yes Potentially	None	None
R629	Yes Potentially	None	None
R630	Yes Potentially	None	None
R631	Yes Potentially	None	None
R632	Yes Potentially	None	None
R633	Yes Potentially	None	None
R634	Yes Potentially	None	None
R635	Yes Potentially	None	None
R636	Yes Potentially	None	None

Receptor ID	Reflectance theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)	Potential for impact after the proposed mitigation screening is taken into account (DSM)
R637	Yes Potentially	None	None
R638	Yes Potentially	None	None
R639	Yes Potentially	None	None
R640	Yes Potentially	None	None
R641	Yes Potentially	None	None
R642	Yes Potentially	None	None
R643	Yes Potentially	None	None
R644	Yes Potentially	None	None
R645	Yes Potentially	None	None
R646	Yes Potentially	None	None
R647	Yes Potentially	None	None
R648	Yes Potentially	None	None
R649	None	None	None
R650	Yes Potentially	None	None
R651	Yes Potentially	None	None
R652	Yes Potentially	None	None
R653	Yes Potentially	None	None
R654	Yes Potentially	None	None
R655	Yes Potentially	None	None
R656	Yes Potentially	None	None
R657	None	None	None
R658	None	None	None
R659	None	None	None

1.2.9.1 *Effects on Road Receptors*

Appendix B examined a total of 659 road Receptor Points. Analysis of terrain-level screening (using a digital terrain model - DTM) identified that glint and glare is theoretically possible at 501 of these road Receptor Points. Further analysis, taking account of the existing screening inherent across the study area (using a digital surface model - DSM) and on-site verification of the analysis results, determined that 175 of the road receptor points will actually have the potential to be materially affected by glint and glare prior to mitigation. These road receptor points are situated on local and regional roads in the vicinity of the proposed development. The results indicate that the existing screening afforded by buildings and vegetation that occurs between receptors and potentially reflecting panels has a significant bearing on reducing the overall glint and glare likely to be experienced within the study area. The final analysis (DSM with mitigation added) indicates 82 Road Receptor Points have the potential to experience residual glare.

The 82 road Receptor Points with the potential to incur glint and glare residual effects in the DSM analysis will be assessed in further detail (pre and post-mitigation) in the sections below.

Receptor and Road No.	Summary of Potential Reflectance periods	Mitigating Factors	Significant nuisance or hazard effects
R02-03, R09-13, R17 Local Road L-7812	Pre Mitigation: Max minutes per day: 30 (R02, 10-degree tilt) Max days per year: 69 (R09, 20-degree tilt) Post Mitigation: Max minutes per day: 30 (R02, 10-degree tilt) Max days per year:68 (R09, 10-degree tilt)	- Road is located over c. 1.5km from the potentially reflecting panels - Only east bound receptors have the potential to experience reflectance. -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Intermittent potentially affected road receptors.	No
R34, R36, R40-44, R47-48 Local Road L-78121	Pre Mitigation: Max minutes per day: 40 (R41, 25-degree tilt) Max days per year: 165 (R40, 25-degree tilt) Post Mitigation: Max minutes per day: 40 (R34, 20-degree tilt) Max days per year: 165 (R40, 25-degree tilt)	- Potentially reflecting panels are located some c. 1-3km from these road receptors. - Potential glare will be outside of the field of view from some road receptors along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). - Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Intermittent potentially affected road receptors.	No

R60-62, R64, R66-67 Local Road L3803 west of Inch	Pre Mitigation: Max minutes per day: 60 (R66, 20-degree tilt) Max days per year:136 (R64, 25-degree tilt) Post Mitigation: Max minutes per day: 60 (R66, 20-degree tilt) Max days per year: 130 (R64, 20-degree tilt)	- Potentially reflecting panels are located some c. 800m-3.4km from these road receptors. - Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Only road users travelling east bound have the potential to experience reflectance, as potential glare will be outside of the field of view from road users travelling west i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No
R108-109, R112, R114-119, R121, R123 Local Road L3803 east of Inch to Knocknagappagh	Pre Mitigation: Max minutes per day: 34 (R114, 25-degree tilt) Max days per year: 148 (R114, 25-degree tilt) Post Mitigation: Max minutes per day: 34 (R114, 25-degree tilt) Max days per year: 145 (R114, 25-degree tilt)	- Potentially reflecting panels are located some c. 200m-1.8km from these road receptors. -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. - Potential glare will be outside of the field of view from some road receptors along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No

R135, R138 **Local Road L-38071 south of Inch to L3803**	Pre Mitigation Max minutes per day: 38 (R135, 15-degree tilt) Max days per year: 80 (R135, 20-degree tilt) Post Mitigation Max minutes per day: 38 (R135, 15-degree tilt) Max days per year: 80 (R135, 20-degree tilt)	- Potentially reflecting panels are located some c. 3km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling west along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No
R144, R150, R155-156 **L-7813 at Barnaviddane**	Pre Mitigation: Max minutes per day: 36 (R156, 25-degree tilt) Max days per year: 127 (R156, 25-degree tilt) Post Mitigation: Max minutes per day: 32 (R156, 25-degree tilt) Max days per year: 97 (R156, 25-degree tilt)	- Potentially reflecting panels are located some c.450m to c. 3km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling west along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Intermittent potentially affected road receptors.	No
R169-170, R175, R181-183, R186-187 **L7828 from Barnaviddane to Rath Ring Fort**	Pre Mitigation: Max minutes per day: 42 (R169, 25-degree tilt) Max days per year: 140 (R169, 25-degree tilt) Post Mitigation: Max minutes per day: 36 (R169, 25-degree tilt) Max days per year: 137 (R169, 25-degree tilt)	- Potentially reflecting panels are located some c.400m to c. 1.1km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Intermittent potentially affected road receptors.	No

R188-190, R202, R205, R215, R217-218 L7828 from Rath to Park National School	Pre Mitigation: Max minutes per day: 28 (R189, 15-degree tilt) Max days per year: 126 (R205, 25-degree tilt) Post Mitigation: Max minutes per day: 26 (R205, 20-degree tilt) Max days per year: 125 (R205, 25-degree tilt)	-Potentially reflecting panels are located some c.300m from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling west along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Intermittent potentially affected road receptors.	No
R226-227, R242 L-78281 from Park National School to its intersection with the L-6013	Pre Mitigation: Max minutes per day: 20 (R227, 25-degree tilt) Max days per year: 129 (R227, 25-degree tilt) Post Mitigation: Max minutes per day: 20 (R226, 15-degree tilt) Max days per year: 128 (R227, 25-degree tilt)	-Potentially reflecting panels are located some c.150m from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling east along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect. -Intermittent potentially affected road receptors.	No
R272-273, R275, R277, R325 L-7829 from the R634 to its intersection with the L3808	Pre Mitigation Max minutes per day: 22 (R273, 20-degree tilt) Max days per year: 131 (R273, 20-degree tilt) Post Mitigation Max minutes per day: 22 (R273, 20-degree tilt) Max days per year: 131 (R273, 20-degree tilt)	-Potentially reflecting panels are located some c.100-400m from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No

R373-376 **R634 from Knocknagappagh to Garryduff**	Pre Mitigation: Max minutes per day: 10 (R374, 25-degree tilt) Max days per year: 27 (R374, 25-degree tilt) Post Mitigation: Max minutes per day: 10 (R374, 25-degree tilt) Max days per year: 26 (R374, 25-degree tilt)	-Potentially reflecting panels are located some c.500m- 1km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling southeast along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Marginal reduction in reflectance periods as the mitigation screen planting will have a limited screening effect.	No
R413-414, R430, R442, R456 **Local road from Redforge Cross Roads to the L-6013 overbridge of the River Tohrig**	Pre Mitigation Max minutes per day: 10 (R413, 20-degree tilt) Max days per year: 48 (R414, 20-degree tilt) Post Mitigation Max minutes per day: 10 (R413, 20-degree tilt) Max days per year: 46 (R414, 20-degree tilt)	-Potentially reflecting panels are located some c.900m from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No
R465 **Local road from Redforge Cross Roads to the L-6014**	Pre Mitigation: Max minutes per day: 8 (R465, 15-degree tilt) Max days per year: 67 (R465, 15-degree tilt) Post Mitigation: Max minutes per day: 8 (R465, 10-degree tilt) Max days per year: 53 (R465, 15-degree tilt)	-Potentially reflecting panels are located some c.900m-1.4km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers).	No

R489, R491-492 L-38081 from its intersection with the L78281 to the L-3808	Pre Mitigation Max minutes per day: 30 (R491, 20-degree tilt angle) Max days per year: 79 (R491, 25-degree tilt) Post Mitigation Max minutes per day: 30 (R491, 20-degree tilt angle) Max days per year: 74 (R491, 25-degree tilt)	-Potentially reflecting panels are located some c.1.1km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling south along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No
R585, R594, R610 L3808 from south of Inch to Kilnatoora	Pre Mitigation: Max minutes per day: 22 (R594, 25-degree tilt) Max days per year: 96 (R594, 25-degree-tilt) Post Mitigation: Max minutes per day: 22 (R594, 25-degree tilt) Max days per year: 88 (R594, 25-degree-tilt)	-Potentially reflecting panels are located some c.1.1km from the potentially affected road receptors. -Potential glare will be outside of the field of view for road users travelling east along this road section, i.e. offset greater than 100 degrees to the direction of travel (Figure 1.12 refers). -Intermittent potentially affected road receptors.	No

Note: It is important to note that there must be clear sunshine for any glare to occur. It is also important to note that reflectance only has the potential to occur for limited sections of the potentially affected roads, often intermittent and for less than c. 100m in some sections.

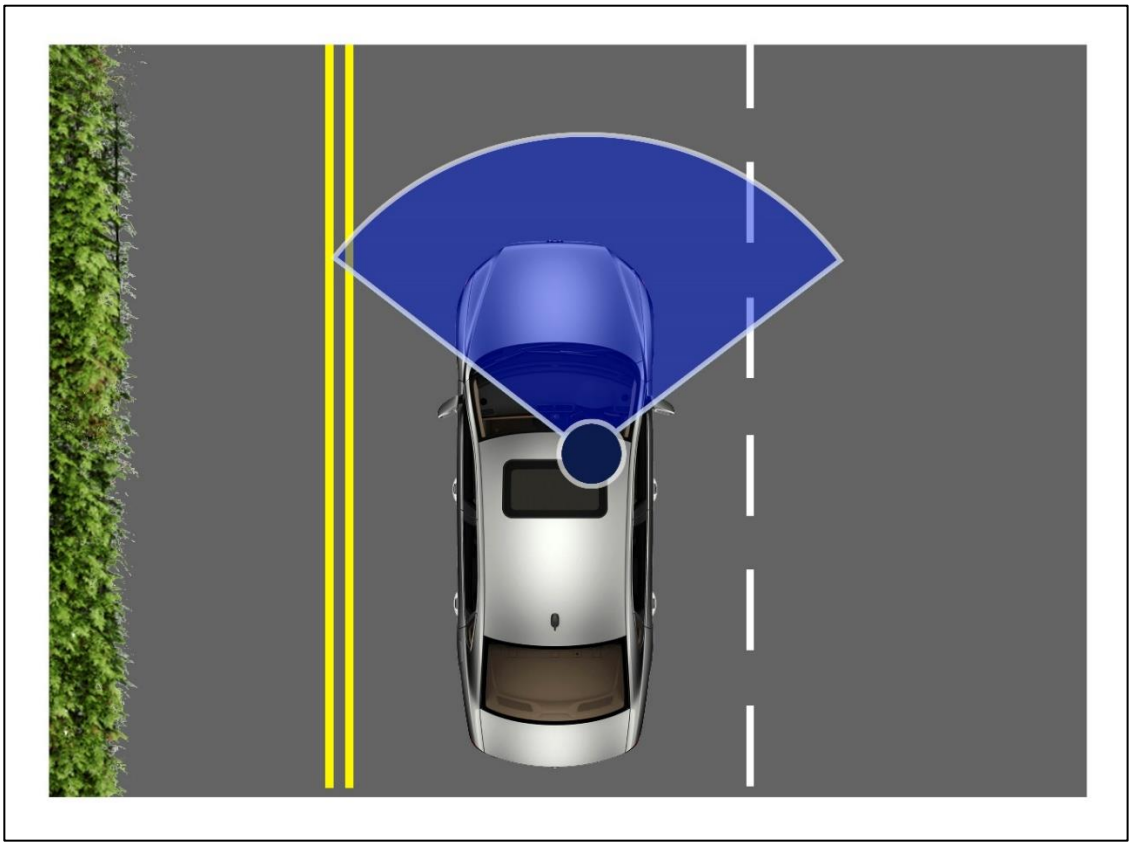

Figure 1.12 Illustration of a 100 degree field of view for driver (blue hatched area) extending 50 degrees to the left and 50 degrees to the right from the direction of travel.

1.2.10 Conclusion - Road Receptors

For the reasons outlined above, it is not considered that the glint and glare emanating from the proposed solar PV panels will generate significant nuisance or hazard effects for road users within the study area. Whilst there is some potential for residual reflectance along sections of the surrounding local and regional road network, the receptors likely to be affected are limited to short and intermittent stretches of these routes. The proposed panels are not considered to be highly reflective surfaces, and any potential effects on road receptors would be of very short duration, limited to the time taken for vehicles to pass through the affected sections. Reflectance would only occur under conditions of full sunlight, and only when such periods coincide precisely with the theoretical angles of potential reflectance.

It is also reiterated that the predicted reflectance periods represent a theoretical worst-case scenario, assuming continuous clear-sky conditions and full solar intensity. In the Irish context, such conditions are infrequent, and the actual frequency and duration of any potential reflectance events are therefore expected to be considerably lower, likely less than half of the theoretical values indicated, based on Met Éireann climate data

1.3 ASSESSMENT OF AVIATION RECEPTORS

1.3.1 Identification of Relevant Aviation Receptors

In accordance with current IAA and DAA protocol 10 km and 15 km radius study areas were established for the identification of IAA registered aerodromes and main airports respectively, that might require testing for glint and glare impacts. However, there are no IAA registered aerodromes within the 10 km aviation study area and neither of DAA's Dublin or Cork airports occur within 15 km of the proposed solar farm. For these reasons, no further aviation analysis was undertaken.

Furthermore, the Planning and Development (Solar Safeguarding Zone) Regulations 2022 set out 43 Solar Safeguarding Zones (SSZs). A SSZ is an area around an airport, aerodrome or helipad in which there is a potential for glint or glare from solar panels to impact aviation safety. The proposed development is not located within any of the defined SSZs, and therefore, an aviation-based glint and glare analysis was scoped out for further assessment.

1.4 OVERALL CONCLUSION

From the analysis and discussions contained herein, it is considered that there will not be any significant nuisance effects from glint and glare at dwellings within the study area. It is also considered that there will not be any hazardous glint and glare effects upon road receptors resulting from the proposed Greenhills Solar Farm.

APPENDIX A: RESULTS OF GLINT AND GLARE ASSESSMENT - DWELLING RECEPTORS

The results tables set out the days of the year and the times of the day that glint and glare effects could theoretically be experienced for each residential receptor within the study area. It is important to note that the analysis assumes that the sun will be shining at all times without cloud cover, thus the output periods in the context of the Irish climate could be considered to be significantly exaggerated.

APPENDIX B: RESULTS OF GLINT AND GLARE ASSESSMENT - TRANSPORT RECEPTORS

The results tables set out the days of the year and the times of the day that glint and glare effects could theoretically be experienced for each residential receptor within the study area. It is important to note that the analysis assumes that the sun will be shining at all times without cloud cover, thus the output periods in the context of the Irish climate could be considered to be significantly exaggerated.

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APPENDIX C: GEOMETRIC ASSESSMENT RESULTS – DWELLING RECEPTORS

Note 1: Only those dwellings have been included where an episode of glint and glare has been predicted when taking account of the existing non-landform screening (vegetation and buildings). If a dwelling receptor is not present, it has been determined that glint and glare is unlikely given current levels of screening inherent in the surrounding landscape. See Appendix A for the full list of results for all dwellings in tabular format.

Note 2: Yellow panels are those that have potential to generate reflectance, but not all at once.

Note 3: Unlike for Appendix A, in Appendix C glare periods where the glaring panels are within 10 degrees of the shining sun have been included.

APPENDIX D: GEOMETRIC ASSESSMENT RESULTS – TRANSPORT RECEPTORS

Note 1: Only those transport route receptors have been included where an episode of glint and glare has been recorded when taking account of the existing non-landform screening (vegetation and buildings). If a route receptor is not present, it has been determined that glint and glare is unlikely given current levels of screening inherent in the surrounding landscape. See Appendix B for the full list of results for all transport route receptors in tabular format.

Note 2: Yellow panels are those that have potential to generate reflectance, but not all at once.

Note 3: Unlike for Appendix B, in Appendix D glare periods where the glaring panels are within 10 degrees of the shining sun have been included.