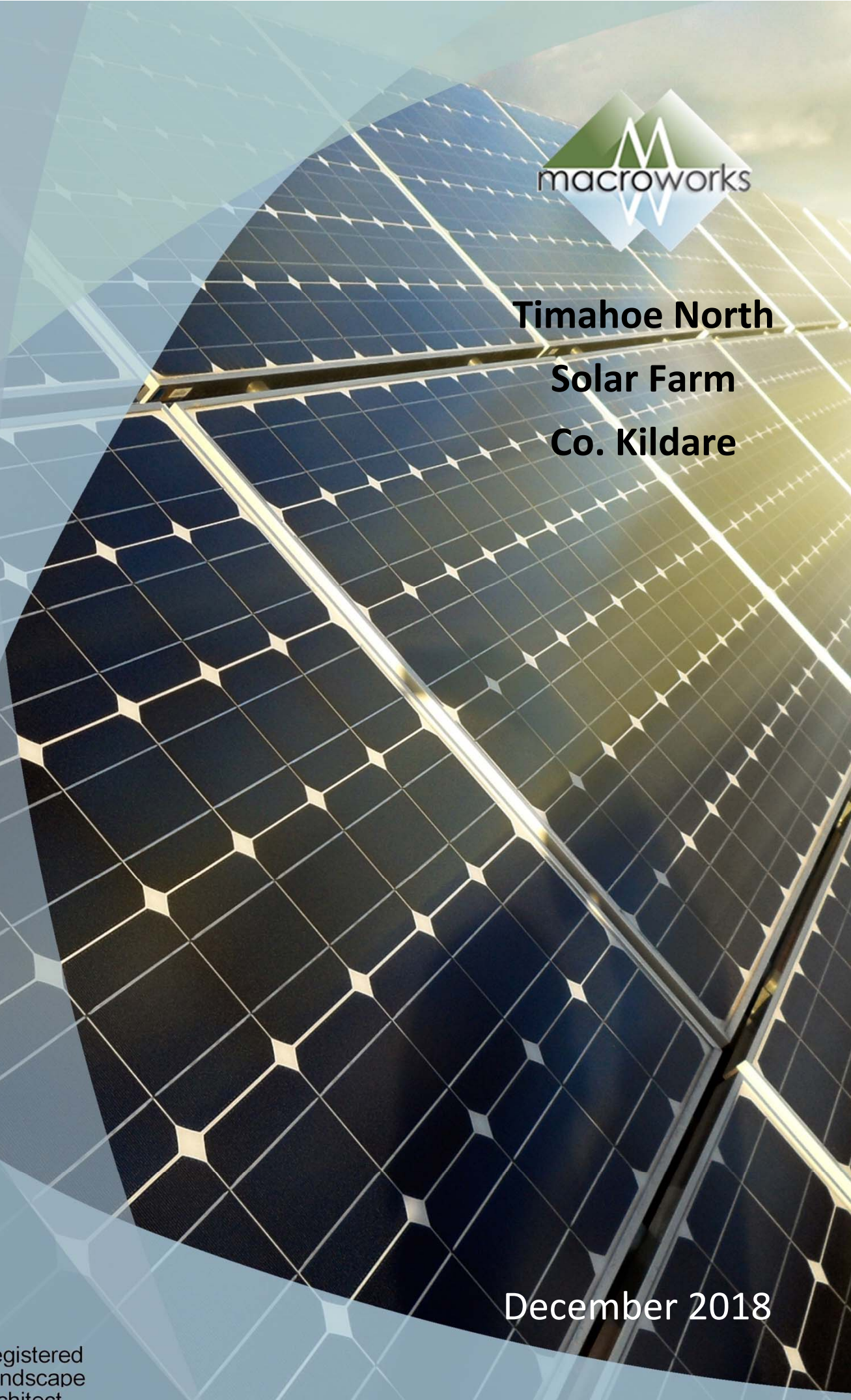
Appendix 5-3

Glint and Glare Assessment

GLINT AND GLARE ASSESSMENT



macroworks

Timahoe North
Solar Farm
Co. Kildare

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GLINT AND GLARE STUDY

Executive Summary

This Glint and Glare study was produced using Macro Works' proprietary glint and glare software, which has been used to analyse the potential for reflectance on dwellings and road receptors adjacent to the proposed Timahoe North solar project. This study also assesses the potential for impact on the nearest aviation receptors.

Through desk-based studies and fieldwork, the likely significance of reflectance has been determined for all identified receptors taking into consideration the existing vegetative screening within the site and surrounding area.

This Glint and Glare study concludes that there will not be any hazard reflectance effects experienced along the surrounding roads nor will there be any irritant effects at the dwellings in the vicinity of the site as a result of the proposed Timahoe North solar farm. Furthermore, it has been determined that there will be no potential for hazardous impacts at any of the aviation receptors analysed.

1.1 INTRODUCTION

This Glint and Glare study has been produced in respect of a proposed solar farm development which lies 3km south of the settlement of Johnstown Bridge, in the townlands of Timahoe East, Mulgeeth, Ballynamullagh and Drehid. This is a ground-based installation of photovoltaic panels within a project site area of 238 hectares.

1.1.1 Statement of Authority

Macro Works' relevant experience includes nineteen 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 was developed in conjunction with the Physics Department of the National University of Ireland, (NUI) Maynooth. The Macro Works Glint and Glare analysis model has successfully replicated results from the Federal Aviation Authority (FAA) approved Solar Glare Hazard Analysis Tool (SGHAT) software. SGHAT has become the standard glare analysis tool for the aviation industry in the USA and Ireland. The Macro Works Glint and Glare analysis model has been utilised to assess the effects of glint and glare for more than 80 no. 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 transport route (road and rail) receptors in Ireland. Guidance has been prepared, however, by the Federal Aviation Authority 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.

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, however, studies generally agree that there is still a potential for hazard or irritant effects 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.

1.1.3 Definitions

The study is concerned with the potential irritant and hazard effects of glint and glare in relation to ground-based receptors (that include the occupants of surrounding dwellings as well as road users) and aviation receptors. The assessment of aviation receptors will be carried out in accordance with FAA guidance supplied by the Irish Aviation Authority (IAA). In their "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"*

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.

1.1.3 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** 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 2** refers). Similar levels of reflectance can be found in common situations in rural environments from the likes of shed roofs and the lines of plastic ground covering used in cropping, to wet road surfaces (**Figures 3 - 6** refer).

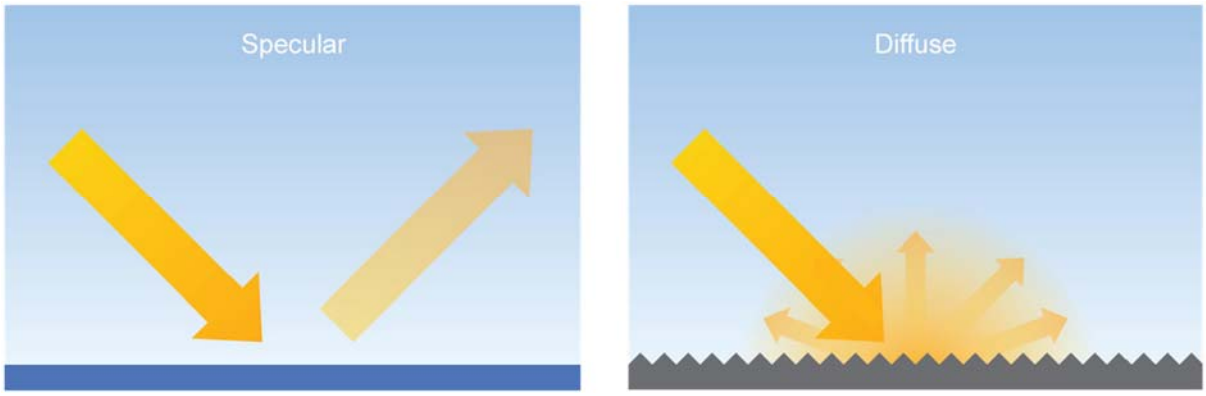

Figure 1 – Specular vs Diffuse reflection of light from polished and rough surfaces.

[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

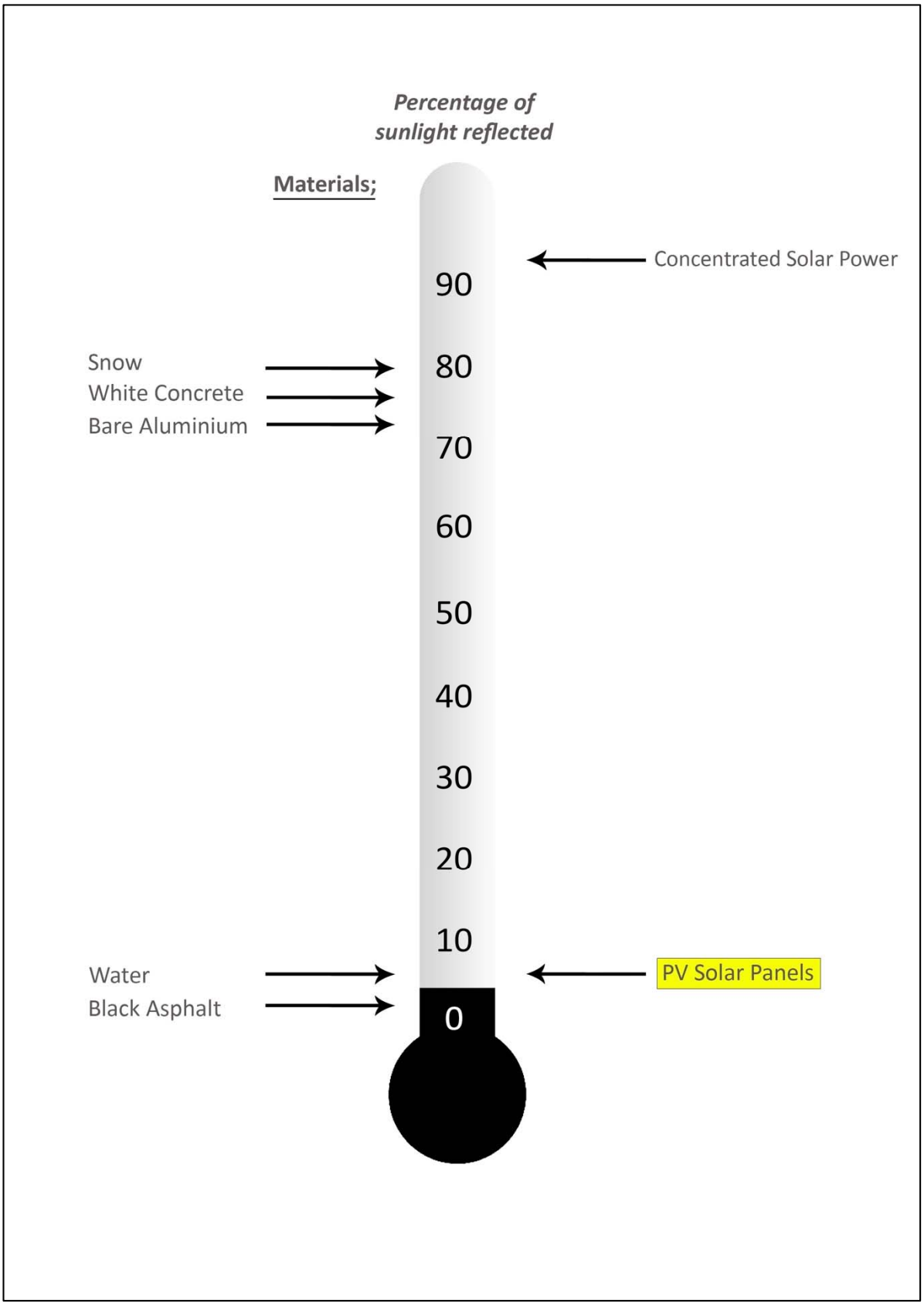

Figure 2 – Reflectivity produced by different surfaces in comparison to PV solar panels demonstrates that the amount of sunlight (measured in watts per meter (W/m2)) reflected from the surface of a solar panel is very similar to that of still water and is far less than that of many surfaces commonly found in the environment, urban or rural.

Figure 3 – Similar level of reflectance (to photovoltaic panels) emanating from plastic ground covering in an Irish rural scenario.

Figure 4 – Higher levels of reflectance (to photovoltaic panels) emanate from green houses and roofs on agricultural buildings in an Irish rural scenario.

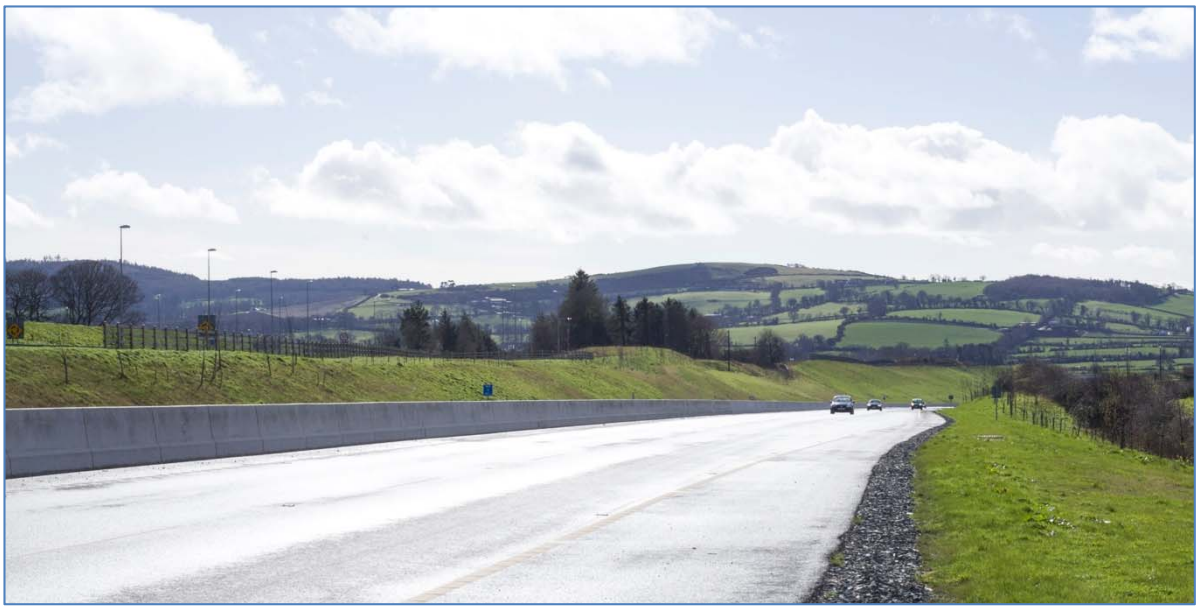

Figure 5 – Similar levels of reflectance (to photovoltaic panels) emanating from wet road surfaces.

Figure 6 – Higher levels of reflectance (to photovoltaic panels) emanating from metallic roof surfaces in an Irish rural scenario.

1.1.4 Assessment Methodology

Macro Works' glint and glare assessment methodology follows a rational sequence of steps to identify receptors that might be potentially affected by glint and glare. It then hones in on those that may actually experience such 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 irritant 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 as standard on all solar farms.

2. By populating the study area with a regular grid of receptor points (100m centres) we carry out a pre-analysis of the study area (1st analysis) that allows us to determine those areas theoretically exposed to glint and glare effects that might warrant further investigation. This pre-analysis is based on a 3D model of the development placed upon a Digital Terrain Model (DTM) for the area.

   Note: This DTM accurately replicates the profile of the terrain but does not account for screening by any vegetation or buildings that are present – in this sense the results are somewhat theoretical but they do offer a representation of an absolute worst-case, bare earth scenario.

3. Identify relevant receptors (dwellings and transport routes) that fall within the theoretically affected zones of the study area. Dwelling identification utilises a combination of up to date aerial photography and the Eircode Finder tool which locates and identifies buildings classed as residential. Route receptors are defined by regularly spaced points along roads and rail lines (50m spacing).

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.

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

   Note: The limitation of DSM data in the context of this assessment type is that it is unable to elucidate on what occurs beneath the tree canopy. The results of glint and glare analysis using this data type are thus supplemented where possible with a thorough assessment of aerial photography, Google Street View imagery and on-site verification during fieldwork.

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

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

8. 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.

The process for dealing with aviation receptors differs from that used for ground-based receptors and is as follows:

1. Establish an area for consideration: the Irish Aviation Authority (IAA) have requested to be consulted on all applications for PV solar arrays within 10km of an airport or an aerodrome, for this reason a 10km aviation study area has been adopted as standard. The Dublin Airport Authority (DAA) separately requested referral of all projects falling within 15km of either of the main Dublin or Cork Airports.

2. If there is a military aerodrome within the 10km aviation study area or Dublin/Cork airport within 15km, then the locations of aviation receptors such as runway approaches and air traffic control towers will be identified.

3. The Federal Aviation Authority (FAA) approved Solar Glare Hazard Analysis Tool (SGHAT) will be used to determine if any of these aviation receptors has the potential to theoretically experience glint or glare. This tool also calculates the intensity of such reflectance and whether it is acceptable by FAA standards.

4. SGHAT does not account for terrain screening or screening provided by surface elements such as existing vegetation or buildings, therefore the results of the SGHAT will be considered, in conjunction with an assessment of existing intervening screening that may be present, to establish if reflectance can actually be experienced by the receptors.

5. Finally, if necessary, additional assessment will be undertaken using Macro Works' proprietary model which considers any screening provided by any proposed mitigation measures.

Important Note

It must be emphasised at this point that all results, whether from FAA endorsed SGHAT software or our own proprietary 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 at Dublin Airport (with comprehensive historical data on sunshine duration) for months March to August indicate monthly averages of mean daily duration of sunshine as 5.3 hours, or approximately 44% of daylight hours.
https://www.met.ie/climate/available-data/historical-data

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 array.

1.1.5 Magnitude of Impact

Although there is currently no regulations 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 will be used to determine the impact levels herein (**Table 1** refers). The percentage figures provided are intended only as a guide and the final category of assessment is determined on the basis of professional judgement and experience.

Table 1 – Magnitude of Glint and Glare Effects

Magnitude of Impact	Description
Very High	Hazard / irritant 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) with no intervening screening.
High	Hazard / irritant 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) with little or no intervening screening.
Medium	Irritant 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) with low levels of intervening screening.
Low	Irritant 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) with moderate / low levels of intervening screening.
Very low*	Irritant 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) with moderate to high levels of intervening screening.
None*	Effects not geometrically possible or no visibility of reflecting surfaces likely due to high levels of intervening screening

*Note: In some instances, a precautionary reflectance impact level of 'Very low / None' is attributed where a very minor degree of reflectance cannot be categorically excluded from occurring. This could occur in respect of a second storey window where it is difficult to ascertain the precise level of screening.

1.1.6 Relevant Parameters of the Proposed Solar Farm

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 above the terrain of 3m and will be tilted at an angle of approximately 20-30 degrees. The final design and layout of the project site has been constraints-led, avoiding any environmentally sensitive parts of the site. As part of this assessment, the worst-case dimensions were used to inform the predicted glint and glare results at the site hence 3m tall panels with a tilt of 20 degrees will be used. It is not geometrically possible for glare to occur to the north of a south facing, fixed frame PV panels hence the (1km buffer) study area does not extend to the north of the proposed solar farm (**Figure 7** refers).

The proposed Timahoe North project is currently a brownfield site (former commercial scale cutaway peatland) and forms part of the Bord na Móna Allen Group of Bogs. The predominant land use beyond the site is that of either bog or agricultural farmland comprising of a variety of different sized geometric fields. There are a number of the residential properties located along a local road to the east of the site. The transport infrastructure within the study area is limited and comprises of only two local roads and several smaller private lane ways. There are no railways, motorways, national roads or regional roads within the study area.

Figure 7 – Aerial view (Google Earth Pro) of proposed solar array area (orange outline) and the study area (blue outline).

1.2 IDENTIFICATION OF RELEVANT RECEPTORS

1.2.1 Ground Based Receptors

Figures 8 - 10 below are output maps of the study area showing the results (areas of potential solar irradiance) of 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 and transport route receptors are potentially affected by glint and glare.

Note: The yellow buffer line around the reflectance pattern indicating 'Area of consideration for further analysis' represents a precautionary approach of including dwellings and road 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.

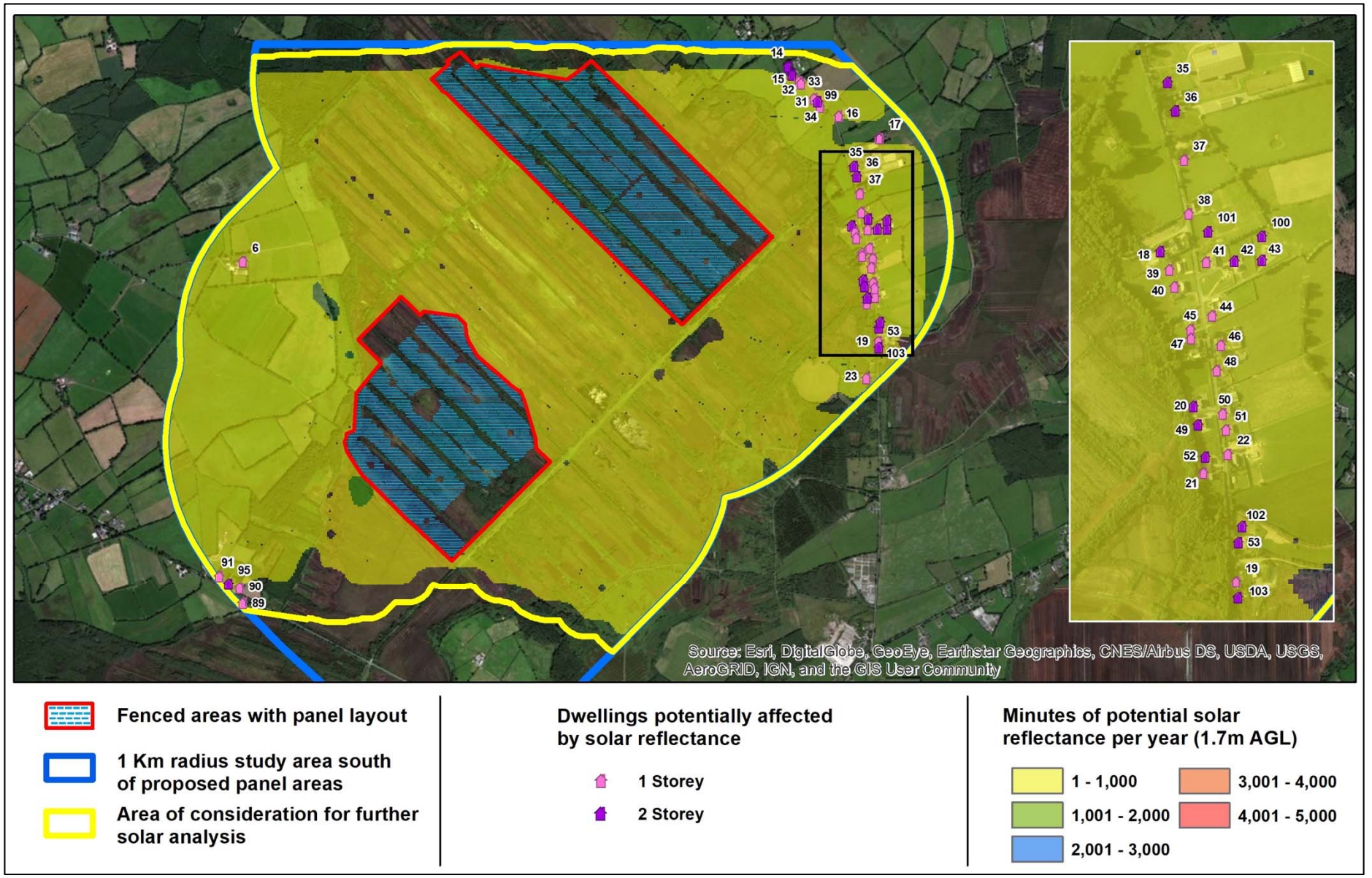

Figure 8 – Parts of the study area where houses are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on a viewers' eye-level when standing on the ground floor = 1.7m above ground level

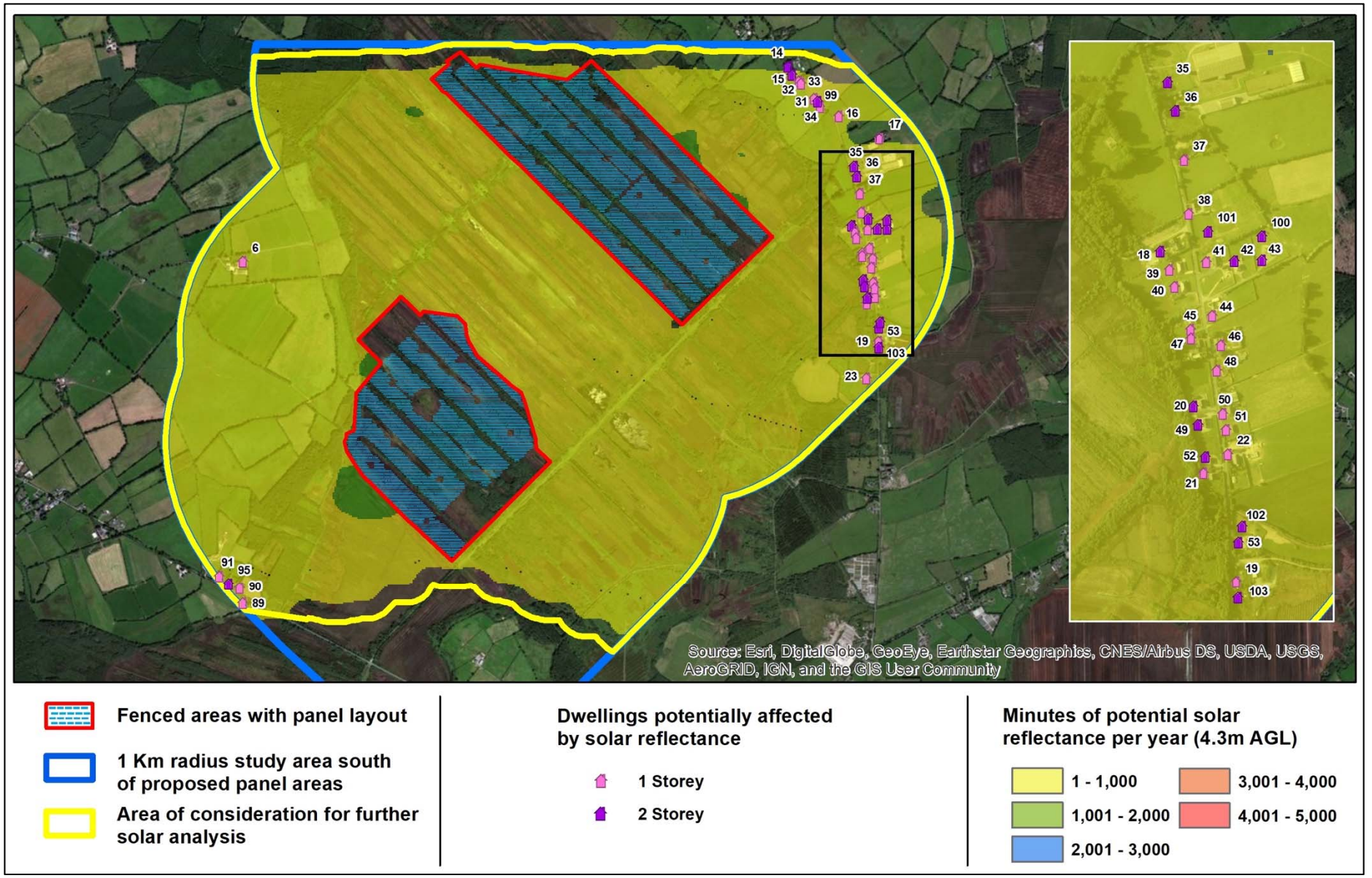

Figure 9 – Parts of the study area where houses are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on a viewers' eye-level when standing on the first floor = 4.3m above ground level

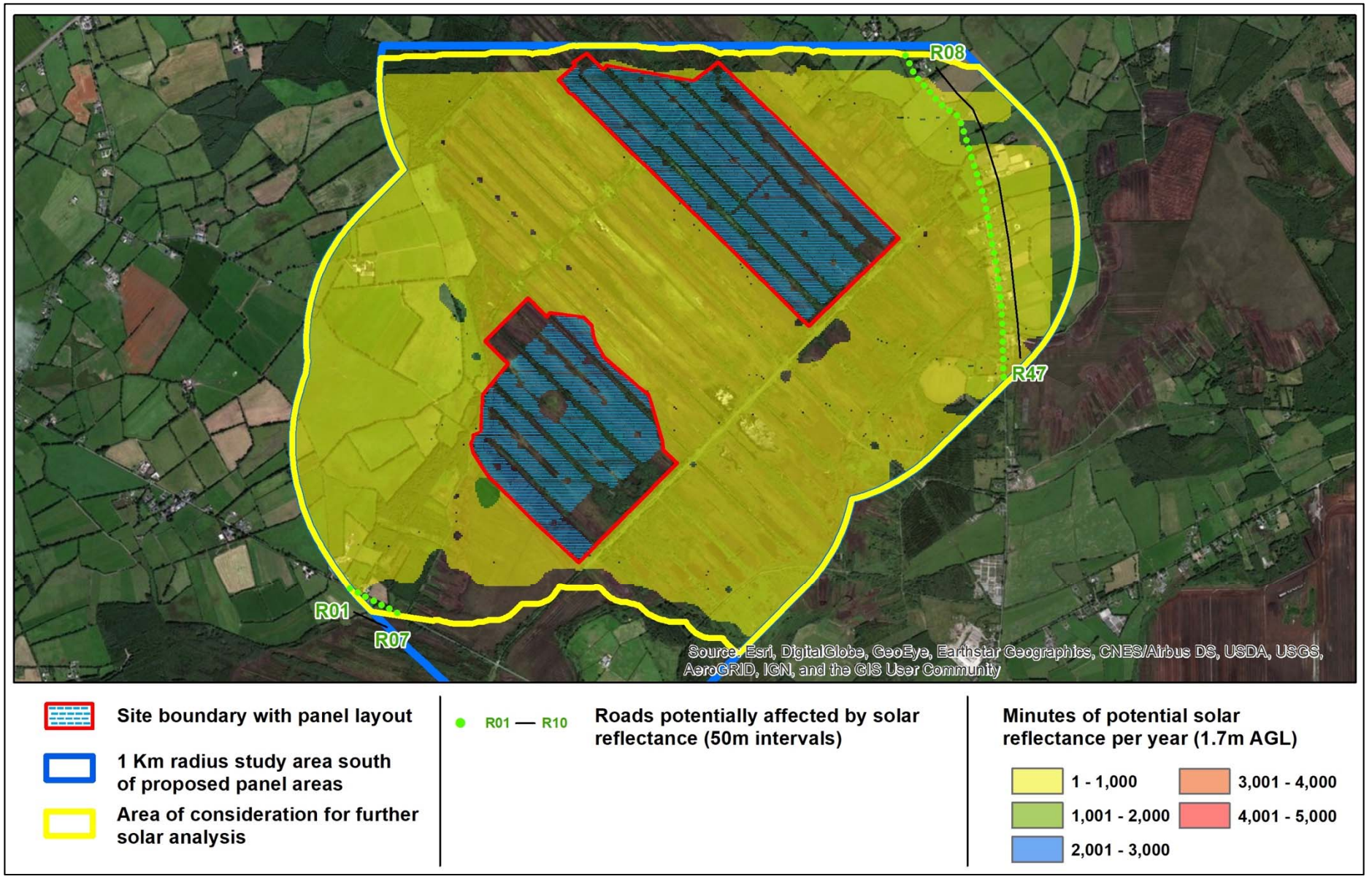

Figure 10 – Parts of the study area where roads are potentially affected by glint and glare. The results are based on 3D terrain data that does not account for screening by vegetation or man-made structures and are based on viewer's eye level at 1.7m above ground level.

1.2.2 Aviation Receptors

No aviation receptors (aerodromes and airfields) that might require testing for glint and glare impacts were identified within the standard 10km study area. In the case of the airports at Dublin and Cork, the IAA suggests that any solar farm falling with a 15km radius should be referred. As the proposed solar farm is located approximately 40km to the southwest of Dublin Airport it falls outside of this zone for referral and is highly unlikely to be a source of any hazard or irritation upon the aviation activities. For this reason, it is deemed that no further assessment is required for Dublin Airport.

In response to a specific request by the IAA, the proposed solar farm will be assessed for potential glint and glare issues at the following aerodromes: Casement, Weston Clonbullogue and Moyglare.

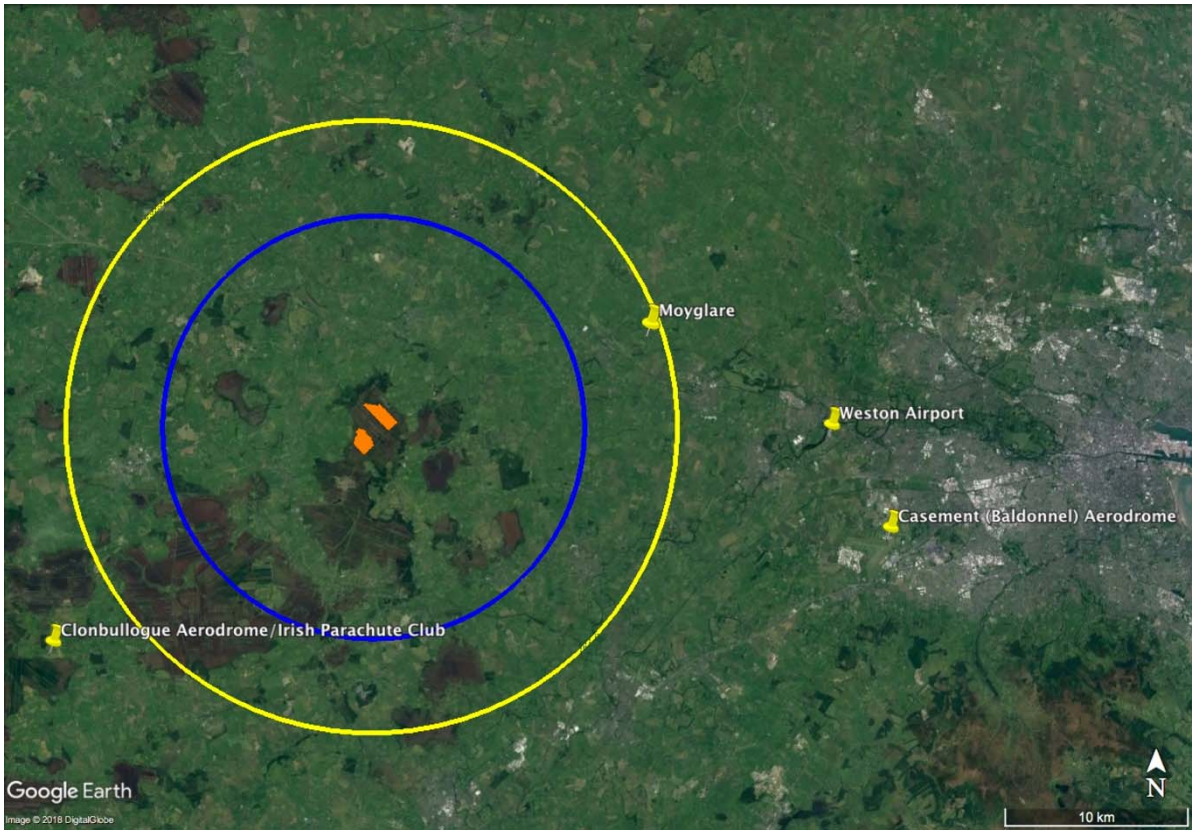

Figure 11: Showing the proposed PV solar array area (orange), the standard 10km study area (blue circle), a 15km buffer for Dublin / Cork Airports (yellow circle) and the aviation receptors specifically requested for assessment by the IAA (yellow pins).

1.3 MITIGATION BY DESIGN

The principal mitigation measure employed in this instance is the siting of the proposed solar farm in a robust rural area thus avoiding, insofar as possible, impacts upon roads and dwellings.

1.4 RESULTS OF GLINT AND GLARE ASSESSMENT AT RECEPTORS

1.4.1 Ground-based

The analysis results tables in Appendix A and B and output graphs in Appendix C and D set out the times of day and days of the year that glint and glare effects could theoretically be experienced at residential and road receptors within the Study Area. An assessment of glint and glare effects is provided in Section 1.5 below and presents a summary of the data provided in the appendices. This assessment also outlines the magnitude of impact that may occur at receptors.

Note: Due to the southerly orientation of the proposed solar PV panels, 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. Inversely, receptors situated to the east of the site and can only be affected by evening reflectance, when the sun is setting in the west.

1.4.2 Aviation-based

The Federal Aviation Authority (FAA) has endorsed the Solar Glaze Hazard Analysis Tool (SGHAT), developed by Sandia Laboratories in the US, *"as the standard for measuring the ocular impact of any proposed solar energy system on a federally-obligated airport*".

There is no guidance in Ireland as yet to specifically address the effects of solar panel reflections upon surrounding receptors, however, the Solar Glare Hazard Analysis Tool (SGHAT) produced by Sandia National Laboratories in the US is endorsed by the Federal Aviation Authority (FAA) and is commonly regarded as the accepted industry standard by aviation authorities internationally when considering the glint and glare effects upon aviation related receptors. For these reasons, SGHAT has been used as the default tool for glint and glare analysis for this part of the assessment. The SGHAT website describes the tool as follows:

> *"This tool determines when and where solar glare can occur throughout the year from a user-specified PV array as viewed from user-prescribed observation points. The potential ocular impact from the observed glare is also determined..."*

One of the principal outputs from the SGHAT is a glare report per receptor that indicates the time of day and days per year that glare has the potential to occur. The plot is coloured according to a legend that indicates the intensity of the glare per period and whether it is harmful to human vision. The results of the SGHAT are contained in Appendix F.

1.5 ASSESSMENT OF GLINT AND GLARE EFFECTS

1.5.1 Residential Dwellings

The results of the analysis for the 43 dwellings which occur within the 'Area of Consideration for Further Analysis' (**Figures 8 - 9** refers) is contained in Appendix A and C.

Note: All the results in Appendix A, except the final two columns, are purely theoretical as they are based on a "bare-ground" scenario which does not account for existing intervening screening and are used only to establish receptors that require more detailed investigation - they do not represent an accurate portrayal of real impacts.

A summary of the results in Appendix A is included in **Table 2** below. An assessment of the results will be undertaken in *Section 1.5.1.1 - Assessment Outcomes – Dwellings*.

Note: In cases where the calculated maximum total minutes in Appendix A is less than 5 minutes per day for a dwelling receptor or where the calculated total minutes per year does not exceed 60 minutes, a 'no' impact categorisation will be assigned in **Table 2** and no additional examination will be undertaken.

Table 2 – Summary of Results contained in Appendix A - Dwellings

ID	Reflectance is theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)
6	No	No
14	No	No
15	No	No
16	No	No
17	No	No
18	Yes	No
19	No	No
20	Yes	No
21	No	No
22	No	No
23	No	No
31	No	No
32	No	No
33	No	No
34	No	No
35	No	No
36	Yes	No
37	Yes	No
38	No	No
39	No	No
40	No	No
41	No	No

ID	Reflectance is theoretically possible based on DTM topographic mapping (for control purposes)	Potential for impact after existing screening is taken into account (DSM)
42	Yes	No
43	Yes	No
44	Yes	No
45	Yes	No
46	Yes	No
47	Yes	No
48	Yes	No
49	No	No
50	No	No
51	No	No
52	No	No
53	No	No
89	No	No
90	No	No
91	No	No
95	No	No
99	No	No
100	Yes	No
101	Yes	No
102	No	No
103	No	No

1.5.1.1 Assessment Outcomes - Dwellings

A total of 43 dwellings were examined. Analysis of terrain-level screening (using a digital terrain model - DTM) identified that glint and glare is theoretically possible at 13 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, determined that no dwellings actually have the potential to be materially affected by glint and glare. This indicates that the existing screening afforded by buildings and hedgerows that occurs between receptors and potentially reflecting panels has a significant bearing on the overall glint and glare likely to be experienced.

For the reasons outlined above, it has been determined that there will be no irritant effects generated from glint and glare along surrounding dwellings as a result of the proposed solar farm.

1.5.2 Road Receptors

Receptor Points (R) have been positioned along all the potentially affected roads within the 'Area of Consideration for Further Analysis' (**Figure 10** refers). R01-07 are situated on a local road to the southwest of the proposed project and R08-47 are located on a local road to the east of the site. The results of the analysis for Road Receptors are contained in Appendix B and D.

Note: All the results in Appendix B, except the final two columns, are purely theoretical as they are based on a "bare-ground" scenario which does not account for existing intervening screening and are used only to establish receptors that require more detailed investigation - they do not represent an accurate portrayal of real impacts. It is important to be cognisant that the figures for the maximum minutes per day in Appendix B relate to the time window that a section of road can potentially experience reflectance and that not all the panels within the area of potential reflectance will generate reflectance simultaneously. In the case of road users, these effects are will only last the period of time it takes to travel along the affected section, and therefore will be significantly less than the maximum periods outlined.

A summary of the results is included in **Table 3** below. An assessment of the results will be undertaken in *Section 1.5.2.1 - Assessment Outcomes – Roads*

Table 3 –Summary of Results contained in Appendix B - Roads

ID	Reflectance is theoretically possible based on DTM topographic mapping (**for control purposes**)	Potential for impact after existing screening is taken into account (DSM)
R01	Yes	No
R02	Yes	No
R03	No	No
R04	No	No
R05	No	No
R06	No	No
R07	No	No
R08	No	No
R09	No	No
R10	No	No
R11	Yes	No
R12	Yes	No
R13	Yes	No
R14	Yes	No
R15	Yes	No
R16	Yes	No
R17	Yes	No
R18	No	No
R19	No	No
R20	No	No
R21	No	No
R22	Yes	No
R23	Yes	No
R24	Yes	No
R25	Yes	No
R26	Yes	No
R27	Yes	No
R28	Yes	No
R29	Yes	No
R30	Yes	No

ID	Reflectance is theoretically possible based on DTM topographic mapping (**for control purposes**)	Potential for impact after existing screening is taken into account (DSM)
R31	Yes	Yes
R32	Yes	No
R33	Yes	No
R34	Yes	No
R35	Yes	No
R36	Yes	No
R37	Yes	No
R38	Yes	No
R39	Yes	No
R40	Yes	No
R41	Yes	No
R42	Yes	No
R43	Yes	No
R44	Yes	No
R45	Yes	No
R46	Yes	No
R47	Yes	No

1.5.2.1 Assessment Outcomes – Roads

Appendix B examined a total of 47 Receptor Points. Analysis of terrain-level screening (using a digital terrain model - DTM) identified that glint and glare is only theoretically possible at 35 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, determined that only one Receptor Point (R31) has the potential to be materially affected by glint and glare. This indicates that the existing screening afforded by buildings and hedgerows that occurs between receptors and potentially reflecting panels has a significant bearing on the overall glint and glare likely to be experienced.

DSM analysis results show that theoretical reflectance is predicted to occur at Receptor Point R31 between March and September, in the evening hours between 6:30pm and 8:00pm, for up to a maximum of 4 minutes per day (average of 3.5 minutes per day across glare periods). However, existing screening in the intervening landscape has the effect of substantially reducing the potential for glare. This screening is captured in the DSM model which indicates that in reality the total minutes of potential reflectance will reduce to a negligible 12 minutes per year.

Note: The potential for hazardous effects is further mitigated by virtue of this short section of road being aligned in a north-south orientation, therefore any potential glare would be almost perpendicular to the direction of view of a driver travelling along this section of road; and that during the periods of potential reflection, the sun will be located within 10^{o} of the line of sight to the reflecting panels, thus the viewer will be faced with the far brighter intensity of sunlight.

For the reasons outlined above, it is considered that there will be no potential for hazardous effects along surrounding roads as a result of glint and glare generated by the proposed solar farm.

1.5.3 Aviation Receptors

1.5.3.1 Magnitude of Impact for Aviation Receptors

Within the FAA's interim policy, a 'Review of Solar Energy System Projects on Federally Obligated Airports'[2] it states that:

"To obtain FAA approval to revise an airport layout plan to depict a solar installation and/or a ''no objection'' to a Notice of Proposed Construction Form 7460–1, the airport sponsor will be required to demonstrate that the proposed solar energy system meets the following standards:

- *No potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATCT) cab, and*

- *No potential for glare or ''**low potential for after-image**'' (shown in green in Figure 1 [**Figure 12** below refers]) along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath."*

The SGHAT was designed to determine whether a proposed solar energy project would result in the potential for ocular impact as depicted on the Solar Glare Hazard Analysis Plot (**Figure 12** refers). The SGHAT website describes the tool as follows:

> *"This tool determines when and where solar glare can occur throughout the year from a user-specified PV array as viewed from user-prescribed observation points. The potential ocular impact from the observed glare is also determined..."*

SGHAT analyses ocular impact over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon. One of the principal outputs from the SGHAT report is a glare plot per receptor that indicates the time of day and days per year that glare has the potential to occur. The SGHAT plot is coloured according to a legend that indicates the intensity of the glare per period and whether it is harmful to human vision. The SGHAT plot classifies the intensity of ocular impact as either Green Glare, Yellow Glare or Red Glare. These colour classifications are equivalent and synonymous with the FAA's definitions regarding levels of ocular impact (**Figure 12** refers) e.g. 'Green Glare' in the SGHAT is equivalent to the FAA's *''low potential for after-image','* and so forth. These correlations are illustrated on the Solar Glare Hazard Analysis Plot in **Figure 12**.

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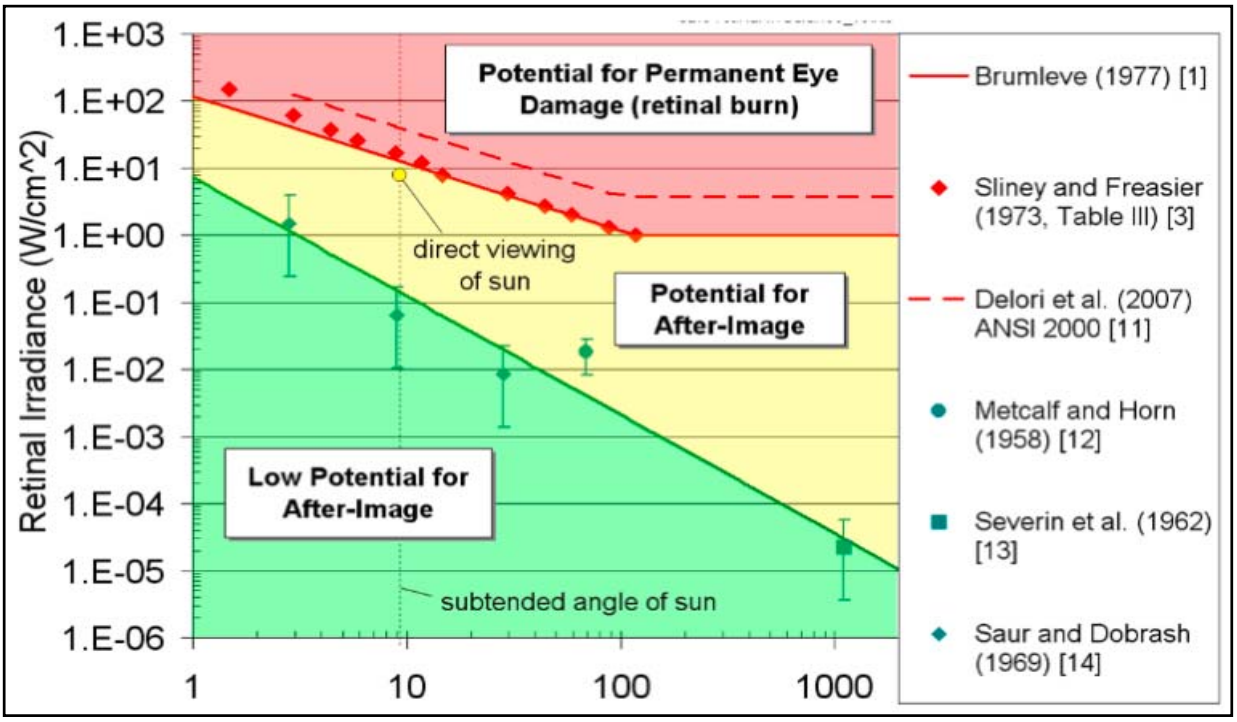
[2] Federal Aviation Administration (FAA). (2013). Department of Transportation - Federal Aviation Administration. *Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports*. Vol 78 (No 205), 63276-63279.



Solar Glare Ocular Hazard Plot: The potential ocular hazard from solar glare is a function of retinal irradiance and the subtended angle (size/distance) of the glare source. It should be noted that the ratio of spectrally weighted solar illuminance to solar irradiance at the earth's surface yields a conversion factor of ~100 lumens/W. Plot adapted from Ho et al., 2011.

Chart References: Ho, C.K., C.M. Ghanbari, and R.B. Diver, 2011, Methodology to Assess Potential Glint and Glare Hazards from Concentrating Solar Power Plants: Analytical Models and Experimental Validation, J. Solar Energy Engineering, August 2011, Vol. 133, 031021-1 – 031021-9.

Figure 12 – *Figure 1* from the FAA Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports

1.5.3.2 Assessment Outcomes - Aviation

Results of the SGHAT in Appendix F show that there will be no impact whatsoever at either Clonbullogue or Moyglare aerodromes. SGHAT results also show that there is the potential for glare to occur along the approaches to Runway 29 at Casement Aerodrome and Weston Runway 25. Additionally, SGHAT results indicate theoretical potential for glare to occur at the Air Traffic Control Towers (ATCT) at both Casement and Weston.

In relation to Runway Approaches at Casement Aerodrome, the SGHAT results show that there was *'No Glare Found'* along the approaches to Runways 05, 11 or 23, although they do indicate the potential for "*Green Glare*" (i.e. glare with a *'low potential for temporary after image'*) along the approach to Runway 29.

In relation to Runway Approaches at Weston Aerodrome, the SGHAT results show that there was *'No Glare Found'* along the approach to Runway 07, although they do indicate the potential for "*Green Glare*" (i.e. glare with a *'low potential for temporary after image'***)** along the approach to Runway 25. *'Green Glare' / glare with a 'Low potential for temporary after image'* is considered by the FAA to be an acceptable level of reflectance effect for Runway Approaches.

In Appendix F, receptor "1-ATCT" represents the ATCT at Weston Aerodrome. SGHAT results show that at the ATCT there is the potential for up to 58 minutes of glare per annum and that the intensity of this glare is *"Green Glare"* i.e. it has a "*low potential for after image'*. Receptor "2-ATCT" represents the ATCT at Casement Aerodrome. SGHAT results show that at the ATCT there is the potential for up to 32 minutes of glare per annum and that the intensity of this glare is *"Green Glare"* i.e. it has a "*low potential for after image'*. Whilst the FAA consider glare with a *low potential for after image* (Green Glare) to be an acceptable level of reflectance effect along runway approaches, it is not acceptable at an ATCT.

However, the user manual for Sandia National Laboratories SGHAT states *"SGHAT does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc."* which could screen potential reflectance from reaching the ATCTs.

Consequently, viewshed analyses were undertaken from the ATCTs at both Casement and Weston using a Digital Terrain Model (DTM), which represents a bare earth scenario exclusive of all forms of screening such as vegetation or buildings (**Figure 13** Refers). The viewshed analyses (based on OSI DTM data) indicates that, as a result of terrain screening, there is no intervisibility between the proposed solar array and either of the Air Traffic Control Towers. It follows, therefore, that there is no potential reflectance likely to occur at the Air Traffic Control Towers at Casement or Weston.

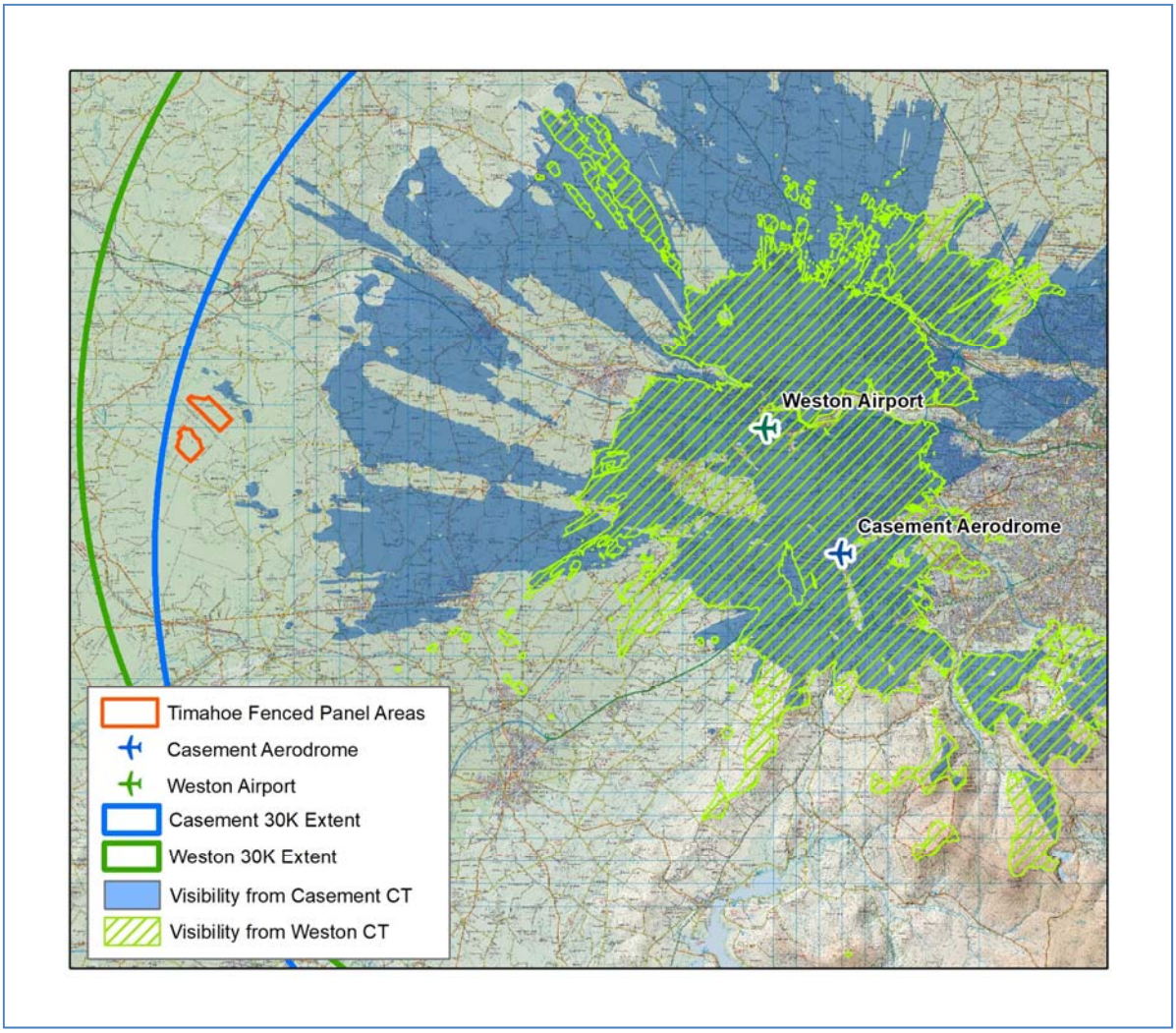


Figure 13 – Showing the results of viewshed analyses carried out for the ATCTs at both Casement and Weston Aerodromes.

1.5.3.3 Discussion and General Aviation Context

The Solar Trade Associations (STA) report is the most up-to-date compilation of analysis relating to glint and glare and its impacts on aircraft and airports. In turn, this references the Federal Aviation Authority's report - a 'Technical Guidance for Evaluating Selected Solar Technologies on Airports' relating to the effects of glint and glare on air traffic control towers and on pilots of aircraft. The STA report also compiles a list of experts in the field of glint and glare, all of whom agree that there have been no significant issues of glint and glare for pilots and air traffic controllers arising from PV solar installations. The majority of them also note that they have never seen a solar site refused planning on the grounds of glint and glare. The report also lists 43 airports from around the world that have large solar PV installations next to the runway or under their flight paths and that this is considered to be only a small fraction of such facilities that lie in close proximity to airports. The report concludes, *"the STA do not believe that there is cause for concern in relation to the impact of glint and glare from solar PV on aviation and airports"*. It should be noted that Crookedstown Solar Farm, which is located in County Antrim is situated 600m from Belfast International Airport's primary

runway (**Figure 14** refers). To date, there appears to have been no issues raised relating to glint and glare.

It is also important to note that *"to minimize unexpected glare, windows of air traffic control towers and airplane cockpits are coated with anti-reflective glazing and operators will wear polarized eye wear."* [3]

Figure 14 – Crookedstown Solar Farm's proximity to Belfast International Airport.[4]

1.5.4 General Ameliorating Factors

Glint and glare can only occur when weather conditions allow for direct sunlight to hit the photovoltaic panels. As referred to previously, according to the Met Eireann website (https://www.met.ie/climate/available-data/historical-data), the monthly averages of mean daily duration of sunshine is approximately 44% of daylight hours in the vicinity of the site. While we cannot correlate the exact periods of sunlight with our predicted periods of potential glare, it is clear that the figures for the periods and duration of glare listed in this report are conservative and would likely be subject to a substantial reduction in reality.

General ameliorating factors with respect to glint and glare include the fact that all of the instances of potential glint and glare that could occur in respect of this development proposal occur in the evening or early morning. At such times the sun will be low in the sky and will be incidental (in close vertical and horizontal alignment) to the reflected rays and much brighter by comparison. In other

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[3] 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

[4] *Lightsource, (2016), Crookedstone Solar Farm [ONLINE]. Available at: http://www.lightsource-re.ie/2016/05/18/irelands-first-large-scale-solar-farm-connected/ [Accessed 2 December 2016].*

words, at times when glare is perceived to be a potential problem, the observer will be facing a significantly brighter source of distraction i.e. the sun itself.

1.6 OVERALL CONCLUSION

From the analysis and discussions contained herein, it is considered unlikely that there will be any irritant or hazard effects from glint and glare at dwellings or roads surrounding the proposed solar farm. Furthermore, SGHAT calculations have determined that glare emanating from the proposed solar farm is unlikely to pose any hazard effects upon the identified aviation receptors.

APPENDIX A:

RESULTS OF GLINT AND GLARE ASSESSMENT AT RECEPTORS - DWELLINGS

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 even in the absence of site screening, glint and glare effects will not be experienced for the full periods shown.

Summary of Glint and Glare Analysis at Dwellings

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
6	1 of 1	March	12	28	28	2.3	06:30 a.m. - 08:00 a.m.				187 days	0 days
		April	30	70	70	2.3	07:00 a.m. - 08:00 a.m.				51.2% days	
		May	31	80	80	2.6	07:00 a.m. - 07:30 a.m.				Tot: 498 mins	Tot: 0 mins
		June	30	106	106	3.5	07:00 a.m. - 07:30 a.m.				Max: 4 mins	
		July	31	94	94	3	07:00 a.m. - 07:30 a.m.				Avg: 2.7 mins	
		Aug	31	70	70	2.3	07:00 a.m. - 07:30 a.m.					
		Sept	22	50	50	2.3	07:00 a.m. - 07:30 a.m.					

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
14a	1 of 2	March									0 days	0 days
		April										
		May									Tot: 0 mins	Tot: 0 mins
		June										
		July										
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
14b	2 of 2	March	3	6				6	2.0	06:30 p.m. - 07:00 p.m.	6 days	0 days
		April									1.6% days	
		May									Tot: 12mins	Tot: 0 mins
		June									Max: 2mins	
		July									Avg: 2mins	
		Aug										
		Sept	3	6				6	2.0	07:00 p.m. - 07:30 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
15a	1 of 2	March									0 days	0 days
		April										
		May									Tot: 0 mins	Tot: 0 mins
		June										
		July										
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
15b	2 of 2	March	6	12				12	2.0	06:30 p.m. - 07:00 p.m.	11 days	0 days
		April									3% days	
		May									Tot: 26mins	Tot: 0 mins
		June									Max: 4mins	
		July									Avg: 2.4mins	
		Aug										
		Sept	5	14				14	2.8	07:00 p.m. - 07:30 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
16	1 of 1	March									28 days	0 days
		April	14	34				34	2.4	07:30 p.m. - 08:00 p.m.	7.7% days	
		May									Tot: 70 mins	Tot: 0 mins
		June									Max: 4mins	
		July									Avg: 2.5 mins	
		Aug	9	24				24	2.7	07:30 p.m. - 08:00 p.m.		
		Sept	5	12				12	2.4	07:30 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
17	1 of 1	March									0 days	0 days
		April										
		May									Tot: 0 mins	Tot: 0 mins
		June										
		July										
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
18a	1 of 2	March	10	36				36	3.6	06:30 p.m. - 08:00 p.m.	183 days	0 days
		April	30	64				64	2.1	07:30 p.m. - 08:00 p.m.	50.1% days	
		May	31	108				108	3.5	07:30 p.m. - 08:00 p.m.	Tot: 572 mins	Tot: 0 mins
		June	30	104				104	3.5	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.1 mins	
		Aug	31	94				94	3.0	07:30 p.m. - 08:00 p.m.		
		Sept	20	52				52	2.6	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
18b	2 of 2	March	12	36				36	3.0	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	106				106	3.5	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	124				124	4.0	07:30 p.m. - 08:00 p.m.	Tot: 672mins	Tot: 0 mins
		June	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	122				122	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.6mins	
		Aug	31	106				106	3.4	07:30 p.m. - 08:00 p.m.		
		Sept	21	64				64	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
19	1 of 1	March	10	20				20	2.0	06:30 p.m. - 08:00 p.m.	168 days	0 days
		April	23	46				46	2.0	07:30 p.m. - 08:00 p.m.	46% days	
		May	31	72				72	2.3	07:30 p.m. - 08:00 p.m.	Tot: 388 mins	Tot: 0 mins
		June	30	82				82	2.7	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	66				66	2.1	07:30 p.m. - 08:00 p.m.	Avg: 2.3 mins	
		Aug	31	74				74	2.4	07:30 p.m. - 08:00 p.m.		
		Sept	12	28				28	2.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
20a	1 of 2	March	12	34				34	2.8	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	76				76	2.5	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	86				86	2.8	07:30 p.m. - 08:00 p.m.	Tot: 524 mins	Tot: 0 mins
		June	30	104				104	3.5	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	86				86	2.8	07:30 p.m. - 08:00 p.m.	Avg: 2.8 mins	
		Aug	31	86				86	2.8	07:30 p.m. - 08:00 p.m.		
		Sept	21	52				52	2.5	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
20b	2 of 2	March	12	24				24	2.0	06:30 p.m. - 08:00 p.m.	186 days	64 days
		April	30	116				116	3.9	07:30 p.m. - 08:00 p.m.	51% days	17.5% days
		May	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Tot: 662mins	Tot: 174mins
		June	30	128				128	4.3	07:30 p.m. - 08:00 p.m.	Max: 6mins	Max: 4mins
		July	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Avg: 3.6mins	Avg: 2.7mins
		Aug	31	98				98	3.2	07:30 p.m. - 08:00 p.m.		
		Sept	21	60				60	2.9	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
21	1 of 1	March	10	28				28	2.8	06:30 p.m. - 08:00 p.m.	184 days	0 days
		April	30	70				70	2.3	07:30 p.m. - 08:00 p.m.	50.4% days	
		May	31	84				84	2.7	07:30 p.m. - 08:00 p.m.	Tot: 484 mins	Tot: 0 mins
		June	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	76				76	2.5	07:30 p.m. - 08:00 p.m.	Avg: 2.6 mins	
		Aug	31	86				86	2.8	07:30 p.m. - 08:00 p.m.		
		Sept	21	48				48	2.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
22	1 of 1	March	12	28				28	2.3	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	84				84	2.7	07:30 p.m. - 08:00 p.m.	Tot: 520 mins	Tot: 0 mins
		June	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	82				82	2.6	07:30 p.m. - 08:00 p.m.	Avg: 2.8 mins	
		Aug	31	90				90	2.9	07:30 p.m. - 08:00 p.m.		
		Sept	21	52				52	2.5	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
23	1 of 1	March									78 days	0 days
		April									21.4% days	
		May	19	38				38	2.0	07:30 p.m. - 08:00 p.m.	Tot: 170 mins	Tot: 0 mins
		June	30	70				70	2.3	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	29	62				62	2.1	07:30 p.m. - 08:00 p.m.	Avg: 2.2 mins	
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
31	1 of 1	March	9	24				24	2.7	06:30 p.m. - 08:00 p.m.	35 days	0 days
		April	8	22				22	2.8	07:30 p.m. - 08:00 p.m.	9.6% days	
		May									Tot: 98 mins	Tot: 0 mins
		June									Max: 4mins	
		July									Avg: 2.8 mins	
		Aug										
		Sept	18	52				52	2.9	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
32	1 of 1	March	2	4				4	2.0	06:30 p.m. - 07:00 p.m.	6 days	0 days
		April									1.6% days	
		May									Tot: 12 mins	Tot: 0 mins
		June									Max: 2mins	
		July									Avg: 2 mins	
		Aug										
		Sept	4	8				8	2.0	07:00 p.m. - 07:30 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
33	1 of 1	March	7	14				14	2.0	06:30 p.m. - 08:00 p.m.	14 days	0 days
		April									3.8% days	
		May									Tot: 28 mins	Tot: 0 mins
		June									Max: 2mins	
		July									Avg: 2 mins	
		Aug										
		Sept	7	14				14	2.0	07:00 p.m. - 07:30 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
34	1 of 1	March	11	34				34	3.1	06:30 p.m. - 08:00 p.m.	49 days	0 days
		April	13	48				48	3.7	07:30 p.m. - 08:00 p.m.	13.4% days	
		May									Tot: 160 mins	Tot: 0 mins
		June									Max: 4mins	
		July									Avg: 3.3 mins	
		Aug	5	14				14	2.8	07:30 p.m. - 08:00 p.m.		
		Sept	20	64				64	3.2	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
35a	1 of 2	March	11	26				26	2.4	06:30 p.m. - 08:00 p.m.	130 days	0 days
		April	30	96				96	3.2	07:30 p.m. - 08:00 p.m.	35.6% days	
		May	24	70				70	2.9	07:30 p.m. - 08:00 p.m.	Tot: 390 mins	Tot: 0 mins
		June									Max: 4mins	
		July	14	38				38	2.7	07:30 p.m. - 08:00 p.m.	Avg: 0 mins	
		Aug	31	100				100	3.2	07:30 p.m. - 08:00 p.m.		
		Sept	20	60				60	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
35b	2 of 2	March	12	42				42	3.5	06:30 p.m. - 08:00 p.m.	132 days	11 days
		April	30	96				96	3.2	07:30 p.m. - 08:00 p.m.	36.2% days	3% days
		May	24	70				70	2.9	07:30 p.m. - 08:00 p.m.	Tot: 432mins	Tot: 22mins
		June									Max: 4mins	Max: 2mins
		July	14	42				42	3.0	07:30 p.m. - 08:00 p.m.	Avg: 3.3mins	Avg: 2mins
		Aug	31	114				114	3.7	07:30 p.m. - 08:00 p.m.		
		Sept	21	68				68	3.2	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
36a	1 of 2	March	12	42				42	3.5	06:30 p.m. - 08:00 p.m.	157 days	0 days
		April	30	70				70	2.3	07:30 p.m. - 08:00 p.m.	43% days	
		May	31	104				104	3.4	07:30 p.m. - 08:00 p.m.	Tot: 484 mins	Tot: 0 mins
		June	5	10				10	2.0	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	27	86				86	3.2	07:30 p.m. - 08:00 p.m.	Avg: 3.1 mins	
		Aug	31	110				110	3.5	07:30 p.m. - 08:00 p.m.		
		Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
36b	2 of 2	March	12	40				40	3.3	06:30 p.m. - 08:00 p.m.	157 days	0 days
		April	30	102				102	3.4	07:30 p.m. - 08:00 p.m.	43% days	
		May	31	98				98	3.2	07:30 p.m. - 08:00 p.m.	Tot: 504mins	Tot: 0 mins
		June	5	12				12	2.4	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	27	68				68	2.5	07:30 p.m. - 08:00 p.m.	Avg: 3.2mins	
		Aug	31	118				118	3.8	07:30 p.m. - 08:00 p.m.		
		Sept	21	66				66	3.1	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
37	1 of 1	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	106				106	3.5	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Tot: 630 mins	Tot: 0 mins
		June	30	104				104	3.5	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	98				98	3.2	07:30 p.m. - 08:00 p.m.	Avg: 3.4 mins	
		Aug	31	112				112	3.6	07:30 p.m. - 08:00 p.m.		
		Sept	21	64				64	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
38	1 of 1	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	106				106	3.5	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	116				116	3.7	07:30 p.m. - 08:00 p.m.	Tot: 652 mins	Tot: 0 mins
		June	30	112				112	3.7	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Avg: 3.5 mins	
		Aug	31	108				108	3.5	07:30 p.m. - 08:00 p.m.		
		Sept	21	60				60	2.9	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
39	1 of 1	March	12	34				34	2.8	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	74				74	2.5	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	104				104	3.4	07:30 p.m. - 08:00 p.m.	Tot: 594 mins	Tot: 0 mins
		June	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	120				120	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.2 mins	
		Aug	31	92				92	3.0	07:30 p.m. - 08:00 p.m.		
		Sept	21	56				56	2.7	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
40	1 of 1	March	11	34				34	3.1	06:30 p.m. - 08:00 p.m.	184 days	0 days
		April	30	62				62	2.1	07:30 p.m. - 08:00 p.m.	50.4% days	
		May	31	98				98	3.2	07:30 p.m. - 08:00 p.m.	Tot: 554 mins	Tot: 0 mins
		June	30	110				110	3.7	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	112				112	3.6	07:30 p.m. - 08:00 p.m.	Avg: 3 mins	
		Aug	31	88				88	2.8	07:30 p.m. - 08:00 p.m.		
		Sept	20	50				50	2.5	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
41	1 of 1	March	13	40				40	3.1	06:30 p.m. - 08:00 p.m.	187 days	0 days
		April	30	112				112	3.7	07:30 p.m. - 08:00 p.m.	51.2% days	
		May	31	116				116	3.7	07:30 p.m. - 08:00 p.m.	Tot: 670 mins	Tot: 0 mins
		June	30	110				110	3.7	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.6 mins	
		Aug	31	108				108	3.5	07:30 p.m. - 08:00 p.m.		
		Sept	21	70				70	3.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
42a	1 of 2	March	13	34				34	2.6	06:30 p.m. - 08:00 p.m.	188 days	0 days
		April	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	51.5% days	
		May	31	128				128	4.1	07:30 p.m. - 08:00 p.m.	Tot: 708 mins	Tot: 0 mins
		June	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	124				124	4.0	07:30 p.m. - 08:00 p.m.	Avg: 3.8 mins	
		Aug	31	114				114	3.7	07:30 p.m. - 08:00 p.m.		
		Sept	22	72				72	3.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
42b	2 of 2	March	13	44				44	3.4	06:30 p.m. - 08:00 p.m.	188 days	0 days
		April	30	112				112	3.7	07:30 p.m. - 08:00 p.m.	51.5% days	
		May	31	134				134	4.3	07:30 p.m. - 08:00 p.m.	Tot: 752mins	Tot: 0 mins
		June	30	128				128	4.3	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	130				130	4.2	07:30 p.m. - 08:00 p.m.	Avg: 4mins	
		Aug	31	128				128	4.1	07:30 p.m. - 08:00 p.m.		
		Sept	22	76				76	3.5	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
43a	1 of 2	March	13	44				44	3.4	06:30 p.m. - 08:00 p.m.	188 days	4 days
		April	30	120				120	4.0	07:30 p.m. - 08:00 p.m.	51.5% days	1.1% days
		May	31	128				128	4.1	07:30 p.m. - 08:00 p.m.	Tot: 734 mins	Tot: 8 mins
		June	30	120				120	4.0	07:30 p.m. - 08:00 p.m.	Max: 6mins	Max: 2mins
		July	31	124				124	4.0	07:30 p.m. - 08:00 p.m.	Avg: 3.9 mins	Avg: 2 mins
		Aug	31	116				116	3.7	07:30 p.m. - 08:00 p.m.		
		Sept	22	82				82	3.7	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
43b	2 of 2	March	13	50				50	3.8	06:30 p.m. - 08:00 p.m.	188 days	43 days
		April	30	112				112	3.7	07:30 p.m. - 08:00 p.m.	51.5% days	11.8% days
		May	31	130				130	4.2	07:30 p.m. - 08:00 p.m.	Tot: 760mins	Tot: 114mins
		June	30	130				130	4.3	07:30 p.m. - 08:00 p.m.	Max: 6mins	Max: 4mins
		July	31	128				128	4.1	07:30 p.m. - 08:00 p.m.	Avg: 4mins	Avg: 2.7mins
		Aug	31	130				130	4.2	07:30 p.m. - 08:00 p.m.		
		Sept	22	80				80	3.6	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
44	1 of 1	March	12	38				38	3.2	06:30 p.m. - 08:00 p.m.	186 days	2 days
		April	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	51% days	0.5% days
		May	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Tot: 706 mins	Tot: 4 mins
		June	30	124				124	4.1	07:30 p.m. - 08:00 p.m.	Max: 6mins	Max: 2mins
		July	31	132				132	4.3	07:30 p.m. - 08:00 p.m.	Avg: 3.8 mins	Avg: 2 mins
		Aug	31	112				112	3.6	07:30 p.m. - 08:00 p.m.		
		Sept	21	64				64	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
45	1 of 1	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	110				110	3.7	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Tot: 666 mins	Tot: 0 mins
		June	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	122				122	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.6 mins	
		Aug	31	104				104	3.4	07:30 p.m. - 08:00 p.m.		
		Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
46	1 of 1	March	12	30				30	2.5	06:30 p.m. - 08:00 p.m.	187 days	0 days
		April	30	110				110	3.7	07:30 p.m. - 08:00 p.m.	51.2% days	
		May	31	130				130	4.2	07:30 p.m. - 08:00 p.m.	Tot: 706 mins	Tot: 0 mins
		June	30	126				126	4.2	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	130				130	4.2	07:30 p.m. - 08:00 p.m.	Avg: 3.8 mins	
		Aug	31	118				118	3.8	07:30 p.m. - 08:00 p.m.		
		Sept	22	62				62	2.8	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
47	1 of 1	March	12	30				30	2.5	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	102				102	3.4	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	110				110	3.5	07:30 p.m. - 08:00 p.m.	Tot: 644 mins	Tot: 0 mins
		June	30	122				122	4.1	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.5 mins	
		Aug	31	108				108	3.5	07:30 p.m. - 08:00 p.m.		
		Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
48	1 of 1	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	102				102	3.4	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	116				116	3.7	07:30 p.m. - 08:00 p.m.	Tot: 650 mins	Tot: 0 mins
		June	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Avg: 3.5 mins	
		Aug	31	102				102	3.3	07:30 p.m. - 08:00 p.m.		
		Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
49a	1 of 2	March	11	26				26	2.4	06:30 p.m. - 08:00 p.m.	184 days	0 days
		April	30	74				74	2.5	07:30 p.m. - 08:00 p.m.	50.4% days	
		May	31	84				84	2.7	07:30 p.m. - 08:00 p.m.	Tot: 496 mins	Tot: 0 mins
		June	30	104				104	3.5	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	80				80	2.6	07:30 p.m. - 08:00 p.m.	Avg: 2.7 mins	
		Aug	31	82				82	2.6	07:30 p.m. - 08:00 p.m.		
		Sept	20	46				46	2.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
49b	2 of 2	March	12	28				28	2.3	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	108				108	3.6	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	98				98	3.2	07:30 p.m. - 08:00 p.m.	Tot: 596mins	Tot: 0 mins
		June	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	102				102	3.3	07:30 p.m. - 08:00 p.m.	Avg: 3.2mins	
		Aug	31	98				98	3.2	07:30 p.m. - 08:00 p.m.		
		Sept	21	48				48	2.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
50	1 of 1	March	12	30				30	2.5	06:30 p.m. - 08:00 p.m.	186 days	28 days
		April	30	100				100	3.3	07:30 p.m. - 08:00 p.m.	51% days	7.7% days
		May	31	100				100	3.2	07:30 p.m. - 08:00 p.m.	Tot: 602 mins	Tot: 70 mins
		June	30	110				110	3.7	07:30 p.m. - 08:00 p.m.	Max: 4mins	Max: 4mins
		July	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.2 mins	Avg: 2.5 mins
		Aug	31	90				90	2.9	07:30 p.m. - 08:00 p.m.		
		Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
51	1 of 1	March	12	30				30	2.5	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	94				94	3.1	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	82				82	2.6	07:30 p.m. - 08:00 p.m.	Tot: 544 mins	Tot: 0 mins
		June	30	112				112	3.7	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	88				88	2.8	07:30 p.m. - 08:00 p.m.	Avg: 2.9 mins	
		Aug	31	84				84	2.7	07:30 p.m. - 08:00 p.m.		
		Sept	21	54				54	2.6	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
52a	1 of 2	March	11	24				24	2.2	06:30 p.m. - 08:00 p.m.	184 days	0 days
		April	30	86				86	2.9	07:30 p.m. - 08:00 p.m.	50.4% days	
		May	31	84				84	2.7	07:30 p.m. - 08:00 p.m.	Tot: 496 mins	Tot: 0 mins
		June	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	82				82	2.6	07:30 p.m. - 08:00 p.m.	Avg: 2.7 mins	
		Aug	31	82				82	2.6	07:30 p.m. - 08:00 p.m.		
		Sept	20	46				46	2.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
52b	2 of 2	March	12	30				30	2.5	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	106				106	3.5	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	100				100	3.2	07:30 p.m. - 08:00 p.m.	Tot: 576mins	Tot: 0 mins
		June	30	98				98	3.3	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	96				96	3.1	07:30 p.m. - 08:00 p.m.	Avg: 3.1mins	
		Aug	31	98				98	3.2	07:30 p.m. - 08:00 p.m.		
		Sept	21	48				48	2.3	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
53a	1 of 2	March	8	16				16	2.0	06:30 p.m. - 08:00 p.m.	178 days	0 days
		April	30	60				60	2.0	07:30 p.m. - 08:00 p.m.	48.8% days	
		May	31	78				78	2.5	07:30 p.m. - 08:00 p.m.	Tot: 424 mins	Tot: 0 mins
		June	30	90				90	3.0	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	70				70	2.3	07:30 p.m. - 08:00 p.m.	Avg: 2.4 mins	
		Aug	31	76				76	2.5	07:30 p.m. - 08:00 p.m.		
		Sept	17	34				34	2.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
53b	2 of 2	March	8	16				16	2.0	06:30 p.m. - 08:00 p.m.	177 days	0 days
		April	30	76				76	2.5	07:30 p.m. - 08:00 p.m.	48.5% days	
		May	31	86				86	2.8	07:30 p.m. - 08:00 p.m.	Tot: 474mins	Tot: 0 mins
		June	30	94				94	3.1	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	94				94	3.0	07:30 p.m. - 08:00 p.m.	Avg: 2.7mins	
		Aug	31	76				76	2.5	07:30 p.m. - 08:00 p.m.		
		Sept	16	32				32	2.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
89	1 of 1	March									0 days	0 days
		April										
		May									Tot: 0 mins	Tot: 0 mins
		June										
		July										
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
90	1 of 1	March									18 days	0 days
		April									4.9% days	
		May									Tot: 40 mins	Tot: 0 mins
		June	18	40	40	2.2	07:00 a.m. - 07:30 a.m.				Max: 4mins	
		July									Avg: 2.2 mins	
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
91	1 of 1	March									63 days	0 days
		April									17.3% days	
		May	12	24	24	2	07:00 a.m. - 07:30 a.m.				Tot: 152 mins	Tot: 0 mins
		June	30	76	76	2.5	07:00 a.m. - 07:30 a.m.				Max: 4mins	
		July	21	52	52	2.5	07:00 a.m. - 07:30 a.m.				Avg: 2.4 mins	
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
95a	1 of 2	March									44 days	0 days
		April									12.1% days	
		May	4	8	8	2	07:00 a.m. - 07:30 a.m.				Tot: 92 mins	Tot: 0 mins
		June	28	60	60	2.1	07:00 a.m. - 07:30 a.m.				Max: 4mins	
		July	12	24	24	2	07:00 a.m. - 07:30 a.m.				Avg: 2.1 mins	
		Aug										
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
95b	2 of 2	March									83 days	0 days
		April	3	6	6	2	07:00 a.m. - 07:30 a.m.				22.7% days	
		May	19	38	38	2	07:00 a.m. - 07:30 a.m.				Tot: 200mins	Tot: 0 mins
		June	30	80	80	2.7	07:00 a.m. - 07:30 a.m.				Max: 4mins	
		July	28	70	70	2.5	07:00 a.m. - 07:30 a.m.				Avg: 2.4mins	
		Aug	3	6	6	2	07:00 a.m. - 07:30 a.m.					
		Sept										

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
99a	1 of 2	March	11	28				28	2.5	06:30 p.m. - 08:00 p.m.	42 days	0 days
		April	10	32				32	3.2	07:30 p.m. - 08:00 p.m.	11.5% days	
		May									Tot: 118 mins	Tot: 0 mins
		June									Max: 4mins	
		July									Avg: 2.8 mins	
		Aug	1	2				2	2.0	07:30 p.m. - 08:00 p.m.		
		Sept	20	56				56	2.8	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
99b	2 of 2	March	11	34				34	3.1	06:30 p.m. - 08:00 p.m.	43 days	0 days
		April	10	36				36	3.6	07:30 p.m. - 08:00 p.m.	11.8% days	
		May									Tot: 138mins	Tot: 0 mins
		June									Max: 4mins	
		July									Avg: 3.2mins	
		Aug	1	4				4	4.0	07:30 p.m. - 08:00 p.m.		
		Sept	21	64				64	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
100a	1 of 2	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	126				126	4.1	07:30 p.m. - 08:00 p.m.	Tot: 700 mins	Tot: 0 mins
		June	30	108				108	3.6	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	124				124	4.0	07:30 p.m. - 08:00 p.m.	Avg: 3.8 mins	
		Aug	31	120				120	3.9	07:30 p.m. - 08:00 p.m.		
		Sept	21	72				72	3.4	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
100b	2 of 2	March	13	46				46	3.5	06:30 p.m. - 08:00 p.m.	188 days	65 days
		April	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	51.5% days	17.8% days
		May	31	132				132	4.3	07:30 p.m. - 08:00 p.m.	Tot: 742mins	Tot: 180mins
		June	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	Max: 6mins	Max: 4mins
		July	31	126				126	4.1	07:30 p.m. - 08:00 p.m.	Avg: 3.9mins	Avg: 2.8mins
		Aug	31	130				130	4.2	07:30 p.m. - 08:00 p.m.		
		Sept	22	80				80	3.6	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
101a	1 of 2	March	12	36				36	3.0	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	124				124	4.0	07:30 p.m. - 08:00 p.m.	Tot: 682 mins	Tot: 0 mins
		June	30	116				116	3.9	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	120				120	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.7 mins	
		Aug	31	110				110	3.5	07:30 p.m. - 08:00 p.m.		
		Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
101b	2 of 2	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
		April	30	120				120	4.0	07:30 p.m. - 08:00 p.m.	51% days	
		May	31	132				132	4.3	07:30 p.m. - 08:00 p.m.	Tot: 728mins	Tot: 0 mins
		June	30	124				124	4.1	07:30 p.m. - 08:00 p.m.	Max: 6mins	
		July	31	126				126	4.1	07:30 p.m. - 08:00 p.m.	Avg: 3.9mins	
		Aug	31	120				120	3.9	07:30 p.m. - 08:00 p.m.		
		Sept	21	74				74	3.5	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
102a	1 of 2	March	9	18				18	2.0	06:30 p.m. - 08:00 p.m.	181 days	0 days
		April	30	60				60	2.0	07:30 p.m. - 08:00 p.m.	49.6% days	
		May	31	74				74	2.4	07:30 p.m. - 08:00 p.m.	Tot: 426 mins	Tot: 0 mins
		June	30	86				86	2.9	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	74				74	2.4	07:30 p.m. - 08:00 p.m.	Avg: 2.4 mins	
		Aug	31	74				74	2.4	07:30 p.m. - 08:00 p.m.		
		Sept	19	40				40	2.1	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
102b	2 of 2	March	10	20				20	2.0	06:30 p.m. - 08:00 p.m.	181 days	0 days
		April	30	82				82	2.7	07:30 p.m. - 08:00 p.m.	49.6% days	
		May	31	96				96	3.1	07:30 p.m. - 08:00 p.m.	Tot: 510mins	Tot: 0 mins
		June	30	94				94	3.1	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	98				98	3.2	07:30 p.m. - 08:00 p.m.	Avg: 2.8mins	
		Aug	31	82				82	2.6	07:30 p.m. - 08:00 p.m.		
		Sept	18	38				38	2.1	07:00 p.m. - 08:00 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
103a	1 of 2	March	11	22				22	2.0	06:30 p.m. - 08:00 p.m.	162 days	0 days
		April	19	38				38	2.0	07:30 p.m. - 08:00 p.m.	44.4% days	
		May	31	76				76	2.5	07:30 p.m. - 08:00 p.m.	Tot: 366 mins	Tot: 0 mins
		June	30	78				78	2.6	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	66				66	2.1	07:30 p.m. - 08:00 p.m.	Avg: 2.3 mins	
		Aug	28	60				60	2.1	07:30 p.m. - 08:00 p.m.		
		Sept	12	26				26	2.2	07:00 p.m. - 07:30 p.m.		

House Nos.	Level	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
103b	2 of 2	March	11	26				26	2.4	06:30 p.m. - 08:00 p.m.	162 days	0 days
		April	19	54				54	2.8	07:30 p.m. - 08:00 p.m.	44.4% days	
		May	31	70				70	2.3	07:30 p.m. - 08:00 p.m.	Tot: 402mins	Tot: 0 mins
		June	30	84				84	2.8	07:30 p.m. - 08:00 p.m.	Max: 4mins	
		July	31	80				80	2.6	07:30 p.m. - 08:00 p.m.	Avg: 2.5mins	
		Aug	28	62				62	2.2	07:30 p.m. - 08:00 p.m.		
		Sept	12	26				26	2.2	07:00 p.m. - 07:30 p.m.		

APPENDIX B:

RESULTS OF GLINT AND GLARE ASSESSMENT AT RECEPTORS – ROADS

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 road receptor within the Study Area. It is important to note that even in the absence of site screening, glint and glare effects will not be experienced for the full periods shown. This is on the basis that full sunlight is required for glint and glare to occur and such effects will be fleeting for moving vehicles.

Summary of Glint and Glare Analysis along Roads

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R01	March									31 days	0 days
	April									8.5% days	
	May	2	4	4	2	07:00 a.m. - 07:30 a.m.				Tot: 62 mins	Tot: 0 mins
	June	21	42	42	2	07:00 a.m. - 07:30 a.m.				Max: 2 mins	
	July	8	16	16	2	07:00 a.m. - 07:30 a.m.				Avg: 2 mins	
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R02	March									20 days	0 days
	April									5.5% days	
	May									Tot: 40 mins	Tot: 0 mins
	June	20	40	40	2	07:00 a.m. - 07:30 a.m.				Max: 2 mins	
	July									Avg: 2 mins	
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R03	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R04	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R05	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R06	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R07	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R08	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R09	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R10	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R11	March	1	2				2	2.0	06:30 p.m. - 07:00 p.m.	2 days	0 days
	April									0.5% days	
	May									Tot: 4 mins	Tot: 0 mins
	June									Max: 2 mins	
	July									Avg: 2 mins	
	Aug										
	Sept	1	2				2	2.0	07:00 p.m. - 07:30 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R12	March	8	18				18	2.3	06:30 p.m. - 08:00 p.m.	17 days	0 days
	April									4.7% days	
	May									Tot: 36 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 2.1 mins	
	Aug										
	Sept	9	18				18	2.0	07:00 p.m. - 07:30 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R13	March	11	26				26	2.4	06:30 p.m. - 08:00 p.m.	30 days	0 days
	April	4	12				12	3.0	07:30 p.m. - 08:00 p.m.	8.2% days	
	May									Tot: 84 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 2.8 mins	
	Aug										
	Sept	15	46				46	3.1	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R14	March	11	28				28	2.5	06:30 p.m. - 08:00 p.m.	40 days	0 days
	April	9	30				30	3.3	07:30 p.m. - 08:00 p.m.	11% days	
	May									Tot: 118 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 3 mins	
	Aug										
	Sept	20	60				60	3.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R15	March	11	34				34	3.1	06:30 p.m. - 08:00 p.m.	47 days	0 days
	April	12	46				46	3.8	07:30 p.m. - 08:00 p.m.	12.9% days	
	May									Tot: 150 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 3.2 mins	
	Aug	4	10				10	2.5	07:30 p.m. - 08:00 p.m.		
	Sept	20	60				60	3.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R16	March	11	32				32	2.9	06:30 p.m. - 08:00 p.m.	52 days	0 days
	April	15	50				50	3.3	07:30 p.m. - 08:00 p.m.	14.2% days	
	May									Tot: 166 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 3.2 mins	
	Aug	6	16				16	2.7	07:30 p.m. - 08:00 p.m.		
	Sept	20	68				68	3.4	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R17	March	7	18				18	2.6	06:30 p.m. - 08:00 p.m.	50 days	0 days
	April	18	56				56	3.1	07:30 p.m. - 08:00 p.m.	13.7% days	
	May									Tot: 154 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 3.1 mins	
	Aug	9	28				28	3.1	07:30 p.m. - 08:00 p.m.		
	Sept	16	52				52	3.3	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R18	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R19	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R20	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R21	March									0 days	0 days
	April										
	May									Tot: 0 mins	Tot: 0 mins
	June										
	July										
	Aug										
	Sept										

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R22	March	6	12				12	2.0	06:30 p.m. - 08:00 p.m.	72 days	0 days
	April	26	80				80	3.1	07:30 p.m. - 08:00 p.m.	19.7% days	
	May	4	8				8	2.0	07:30 p.m. - 08:00 p.m.	Tot: 182 mins	Tot: 0 mins
	June									Max: 4 mins	
	July									Avg: 2.5 mins	
	Aug	21	50				50	2.4	07:30 p.m. - 08:00 p.m.		
	Sept	15	32				32	2.1	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R23	March	11	22				22	2.0	06:30 p.m. - 08:00 p.m.	132 days	0 days
	April	30	110				110	3.7	07:30 p.m. - 08:00 p.m.	36.2% days	
	May	25	66				66	2.6	07:30 p.m. - 08:00 p.m.	Tot: 378 mins	Tot: 0 mins
	June									Max: 4 mins	
	July	15	36				36	2.4	07:30 p.m. - 08:00 p.m.	Avg: 2.9 mins	
	Aug	31	94				94	3.0	07:30 p.m. - 08:00 p.m.		
	Sept	20	50				50	2.5	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R24	March	12	36				36	3.0	06:30 p.m. - 08:00 p.m.	156 days	0 days
	April	30	84				84	2.8	07:30 p.m. - 08:00 p.m.	42.7% days	
	May	31	104				104	3.4	07:30 p.m. - 08:00 p.m.	Tot: 480 mins	Tot: 0 mins
	June	5	10				10	2.0	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	26	84				84	3.2	07:30 p.m. - 08:00 p.m.	Avg: 3.1 mins	
	Aug	31	104				104	3.4	07:30 p.m. - 08:00 p.m.		
	Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R25	March	12	38				38	3.2	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	66				66	2.2	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	104				104	3.4	07:30 p.m. - 08:00 p.m.	Tot: 554 mins	Tot: 0 mins
	June	30	86				86	2.9	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	96				96	3.1	07:30 p.m. - 08:00 p.m.	Avg: 3 mins	
	Aug	31	108				108	3.5	07:30 p.m. - 08:00 p.m.		
	Sept	21	56				56	2.7	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R26	March	12	36				36	3.0	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	82				82	2.7	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	112				112	3.6	07:30 p.m. - 08:00 p.m.	Tot: 600 mins	Tot: 0 mins
	June	30	96				96	3.2	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	100				100	3.2	07:30 p.m. - 08:00 p.m.	Avg: 3.2 mins	
	Aug	31	112				112	3.6	07:30 p.m. - 08:00 p.m.		
	Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R27	March	12	34				34	2.8	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	94				94	3.1	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	106				106	3.4	07:30 p.m. - 08:00 p.m.	Tot: 616 mins	Tot: 0 mins
	June	30	108				108	3.6	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	104				104	3.4	07:30 p.m. - 08:00 p.m.	Avg: 3.3 mins	
	Aug	31	112				112	3.6	07:30 p.m. - 08:00 p.m.		
	Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R28	March	11	34				34	3.1	06:30 p.m. - 08:00 p.m.	185 days	0 days
	April	30	100				100	3.3	07:30 p.m. - 08:00 p.m.	50.7% days	
	May	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Tot: 626 mins	Tot: 0 mins
	June	30	100				100	3.3	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	116				116	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.4 mins	
	Aug	31	104				104	3.4	07:30 p.m. - 08:00 p.m.		
	Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R29	March	12	32				32	2.7	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	106				106	3.5	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Tot: 662 mins	Tot: 0 mins
	June	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	122				122	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.6 mins	
	Aug	31	108				108	3.5	07:30 p.m. - 08:00 p.m.		
	Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R30	March	12	36				36	3.0	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	106				106	3.5	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Tot: 660 mins	Tot: 0 mins
	June	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	116				116	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.5 mins	
	Aug	31	108				108	3.5	07:30 p.m. - 08:00 p.m.		
	Sept	21	62				62	3.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R31	March	11	36				36	3.3	06:30 p.m. - 08:00 p.m.	184 days	5 days
	April	30	102				102	3.4	07:30 p.m. - 08:00 p.m.	50.4% days	1.4% days
	May	31	110				110	3.5	07:30 p.m. - 08:00 p.m.	Tot: 644 mins	Tot: 12 mins
	June	30	118				118	3.9	07:30 p.m. - 08:00 p.m.	Max: 4 mins	Max: 4 mins
	July	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Avg: 3.5 mins	Avg: 2.4 mins
	Aug	31	100				100	3.2	07:30 p.m. - 08:00 p.m.		
	Sept	20	64				64	3.2	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R32	March	12	38				38	3.2	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	116				116	3.7	07:30 p.m. - 08:00 p.m.	Tot: 688 mins	Tot: 0 mins
	June	30	124				124	4.1	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	122				122	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.7 mins	
	Aug	31	106				106	3.4	07:30 p.m. - 08:00 p.m.		
	Sept	21	68				68	3.2	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R33	March	12	26				26	2.2	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	114				114	3.8	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	114				114	3.7	07:30 p.m. - 08:00 p.m.	Tot: 666 mins	Tot: 0 mins
	June	30	122				122	4.1	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	120				120	3.9	07:30 p.m. - 08:00 p.m.	Avg: 3.6 mins	
	Aug	31	106				106	3.4	07:30 p.m. - 08:00 p.m.		
	Sept	21	64				64	3.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R34	March	12	34				34	2.8	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	102				102	3.4	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	110				110	3.5	07:30 p.m. - 08:00 p.m.	Tot: 650 mins	Tot: 0 mins
	June	30	126				126	4.2	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	110				110	3.5	07:30 p.m. - 08:00 p.m.	Avg: 3.5 mins	
	Aug	31	110				110	3.5	07:30 p.m. - 08:00 p.m.		
	Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R35	March	11	32				32	2.9	06:30 p.m. - 08:00 p.m.	185 days	0 days
	April	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	50.7% days	
	May	31	108				108	3.5	07:30 p.m. - 08:00 p.m.	Tot: 616 mins	Tot: 0 mins
	June	30	128				128	4.3	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	106				106	3.4	07:30 p.m. - 08:00 p.m.	Avg: 3.3 mins	
	Aug	31	98				98	3.2	07:30 p.m. - 08:00 p.m.		
	Sept	21	52				52	2.5	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R36	March	12	30				30	2.5	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	100				100	3.3	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	98				98	3.2	07:30 p.m. - 08:00 p.m.	Tot: 616 mins	Tot: 0 mins
	June	30	122				122	4.1	07:30 p.m. - 08:00 p.m.	Max: 6 mins	
	July	31	118				118	3.8	07:30 p.m. - 08:00 p.m.	Avg: 3.3 mins	
	Aug	31	90				90	2.9	07:30 p.m. - 08:00 p.m.		
	Sept	21	58				58	2.8	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R37	March	12	26				26	2.2	06:30 p.m. - 08:00 p.m.	186 days	0 days
	April	30	90				90	3.0	07:30 p.m. - 08:00 p.m.	51% days	
	May	31	90				90	2.9	07:30 p.m. - 08:00 p.m.	Tot: 548 mins	Tot: 0 mins
	June	30	112				112	3.7	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	90				90	2.9	07:30 p.m. - 08:00 p.m.	Avg: 2.9 mins	
	Aug	31	88				88	2.8	07:30 p.m. - 08:00 p.m.		
	Sept	21	52				52	2.5	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R38	March	11	30				30	2.7	06:30 p.m. - 08:00 p.m.	184 days	0 days
	April	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	50.4% days	
	May	31	86				86	2.8	07:30 p.m. - 08:00 p.m.	Tot: 514 mins	Tot: 0 mins
	June	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	80				80	2.6	07:30 p.m. - 08:00 p.m.	Avg: 2.8 mins	
	Aug	31	86				86	2.8	07:30 p.m. - 08:00 p.m.		
	Sept	20	48				48	2.4	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R39	March	11	30				30	2.7	06:30 p.m. - 08:00 p.m.	184 days	0 days
	April	30	68				68	2.3	07:30 p.m. - 08:00 p.m.	50.4% days	
	May	31	84				84	2.7	07:30 p.m. - 08:00 p.m.	Tot: 486 mins	Tot: 0 mins
	June	30	88				88	2.9	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	78				78	2.5	07:30 p.m. - 08:00 p.m.	Avg: 2.6 mins	
	Aug	31	88				88	2.8	07:30 p.m. - 08:00 p.m.		
	Sept	20	50				50	2.5	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R40	March	6	12				12	2.0	06:30 p.m. - 08:00 p.m.	173 days	0 days
	April	30	66				66	2.2	07:30 p.m. - 08:00 p.m.	47.4% days	
	May	31	84				84	2.7	07:30 p.m. - 08:00 p.m.	Tot: 436 mins	Tot: 0 mins
	June	30	88				88	2.9	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	72				72	2.3	07:30 p.m. - 08:00 p.m.	Avg: 2.5 mins	
	Aug	31	80				80	2.6	07:30 p.m. - 08:00 p.m.		
	Sept	14	34				34	2.4	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R41	March	11	26				26	2.4	06:30 p.m. - 08:00 p.m.	183 days	0 days
	April	30	60				60	2.0	07:30 p.m. - 08:00 p.m.	50.1% days	
	May	31	76				76	2.5	07:30 p.m. - 08:00 p.m.	Tot: 442 mins	Tot: 0 mins
	June	30	92				92	3.1	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	70				70	2.3	07:30 p.m. - 08:00 p.m.	Avg: 2.4 mins	
	Aug	31	80				80	2.6	07:30 p.m. - 08:00 p.m.		
	Sept	19	38				38	2.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R42	March	7	14				14	2.0	06:30 p.m. - 08:00 p.m.	173 days	0 days
	April	29	60				60	2.1	07:30 p.m. - 08:00 p.m.	47.4% days	
	May	31	78				78	2.5	07:30 p.m. - 08:00 p.m.	Tot: 416 mins	Tot: 0 mins
	June	30	88				88	2.9	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	74				74	2.4	07:30 p.m. - 08:00 p.m.	Avg: 2.4 mins	
	Aug	31	70				70	2.3	07:30 p.m. - 08:00 p.m.		
	Sept	14	32				32	2.3	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R43	March	9	18				18	2.0	06:30 p.m. - 08:00 p.m.	166 days	0 days
	April	23	46				46	2.0	07:30 p.m. - 08:00 p.m.	45.5% days	
	May	31	74				74	2.4	07:30 p.m. - 08:00 p.m.	Tot: 388 mins	Tot: 0 mins
	June	30	84				84	2.8	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	70				70	2.3	07:30 p.m. - 08:00 p.m.	Avg: 2.3 mins	
	Aug	30	72				72	2.4	07:30 p.m. - 08:00 p.m.		
	Sept	12	24				24	2.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R44	March	11	24				24	2.2	06:30 p.m. - 08:00 p.m.	159 days	0 days
	April	18	38				38	2.1	07:30 p.m. - 08:00 p.m.	43.6% days	
	May	31	72				72	2.3	07:30 p.m. - 08:00 p.m.	Tot: 354 mins	Tot: 0 mins
	June	30	70				70	2.3	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	66				66	2.1	07:30 p.m. - 08:00 p.m.	Avg: 2.2 mins	
	Aug	26	58				58	2.2	07:30 p.m. - 08:00 p.m.		
	Sept	12	26				26	2.2	07:00 p.m. - 07:30 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R45	March	11	22				22	2.0	06:30 p.m. - 08:00 p.m.	152 days	0 days
	April	15	34				34	2.3	07:30 p.m. - 08:00 p.m.	41.6% days	
	May	31	70				70	2.3	07:30 p.m. - 08:00 p.m.	Tot: 348 mins	Tot: 0 mins
	June	30	82				82	2.7	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	31	68				68	2.2	07:30 p.m. - 08:00 p.m.	Avg: 2.3 mins	
	Aug	18	36				36	2.0	07:30 p.m. - 08:00 p.m.		
	Sept	16	36				36	2.3	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R46	March	1	2				2	2.0	07:30 p.m. - 08:00 p.m.	57 days	0 days
	April	5	10				10	2.0	07:30 p.m. - 08:00 p.m.	15.6% days	
	May	18	38				38	2.1	07:30 p.m. - 08:00 p.m.	Tot: 118 mins	Tot: 0 mins
	June	7	14				14	2.0	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	11	24				24	2.2	07:30 p.m. - 08:00 p.m.	Avg: 2.1 mins	
	Aug	9	18				18	2.0	07:30 p.m. - 08:00 p.m.		
	Sept	6	12				12	2.0	07:00 p.m. - 08:00 p.m.		

Route Nos.	Month	TOTs / MNTH Days	TOTs / MNTH Mins	MORNING Tot Mins	MORNING Av Mins	MORNING Period	EVENING Tot Mins	EVENING Av Mins	EVENING Period	WITHOUT SCREENING	WITH EXISTING SCREENING
R47	March									24 days	0 days
	April									6.6% days	
	May	3	6				6	2.0	07:30 p.m. - 08:00 p.m.	Tot: 54 mins	Tot: 0 mins
	June	19	44				44	2.3	07:30 p.m. - 08:00 p.m.	Max: 4 mins	
	July	2	4				4	2.0	07:30 p.m. - 08:00 p.m.	Avg: 2.3 mins	
	Aug										
	Sept										

APPENDIX C:

GEOMETRIC ASSESSMENT RESULTS - DWELLINGS

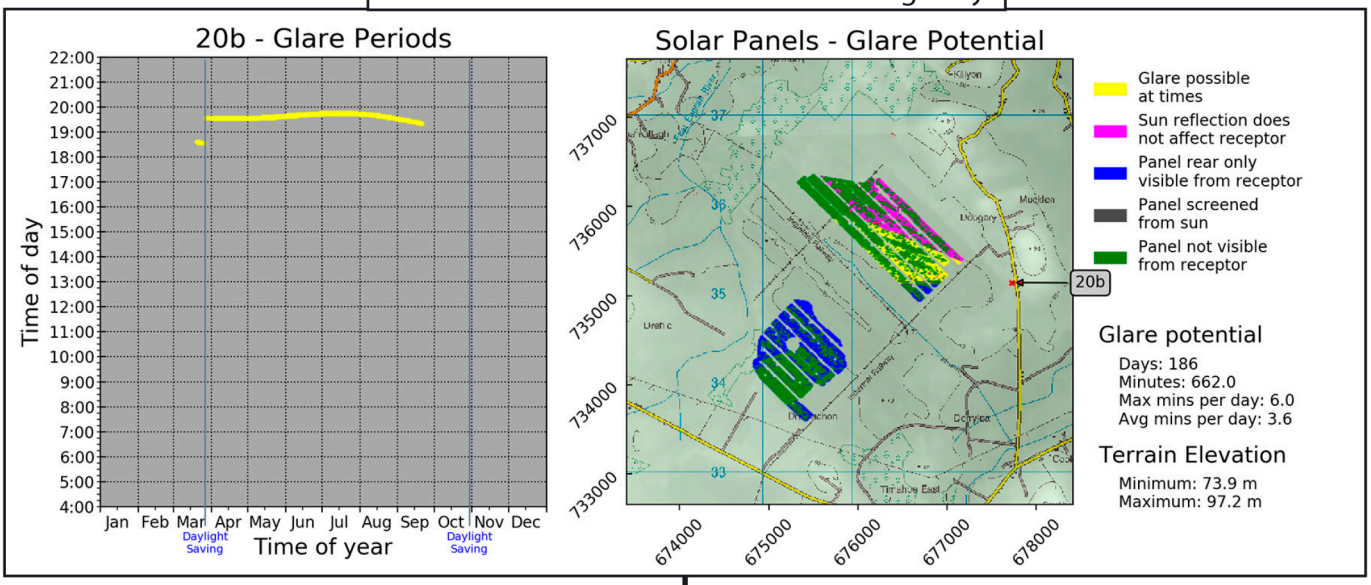
Note 1: Only those dwellings have been included where an episode of glint and glare has been predicted when taking account of the existing non-landform screening (vegetation and buildings). If a dwelling receptor is not present, it has been determined that glint and glare is unlikely given current levels 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.

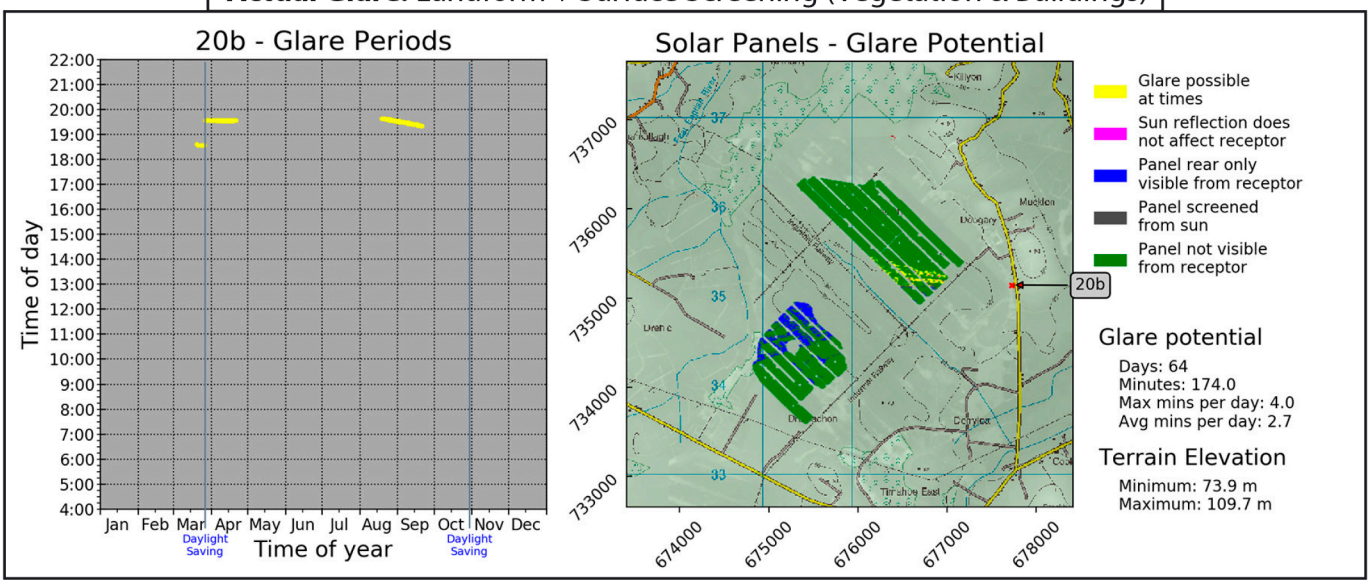
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)

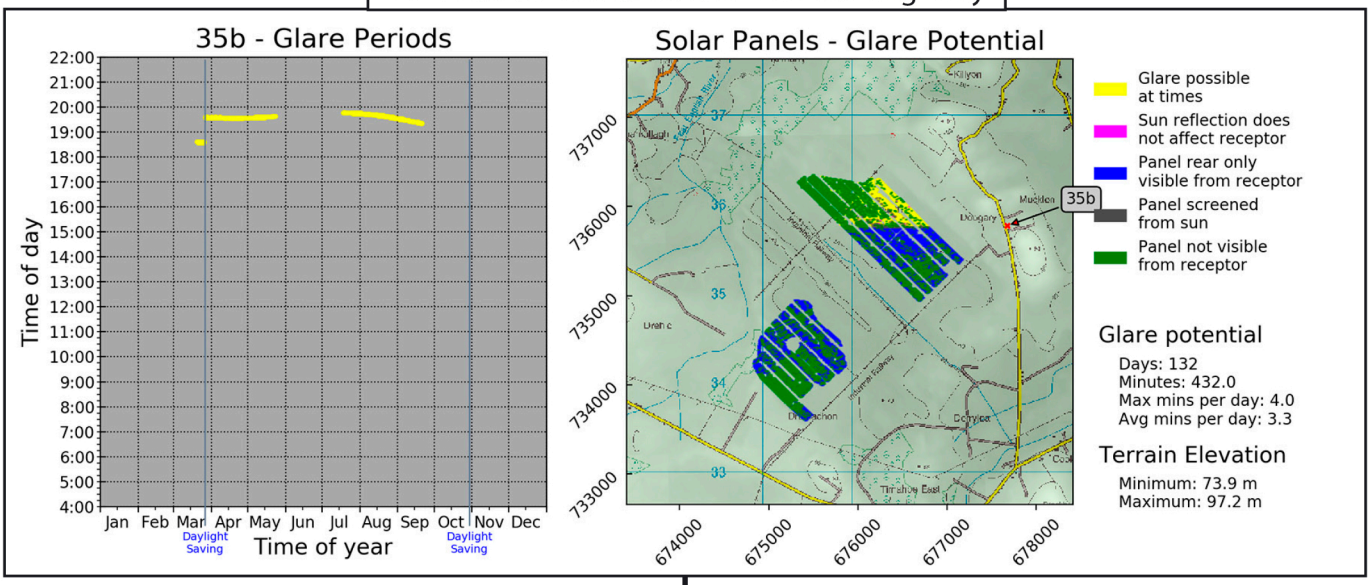


Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

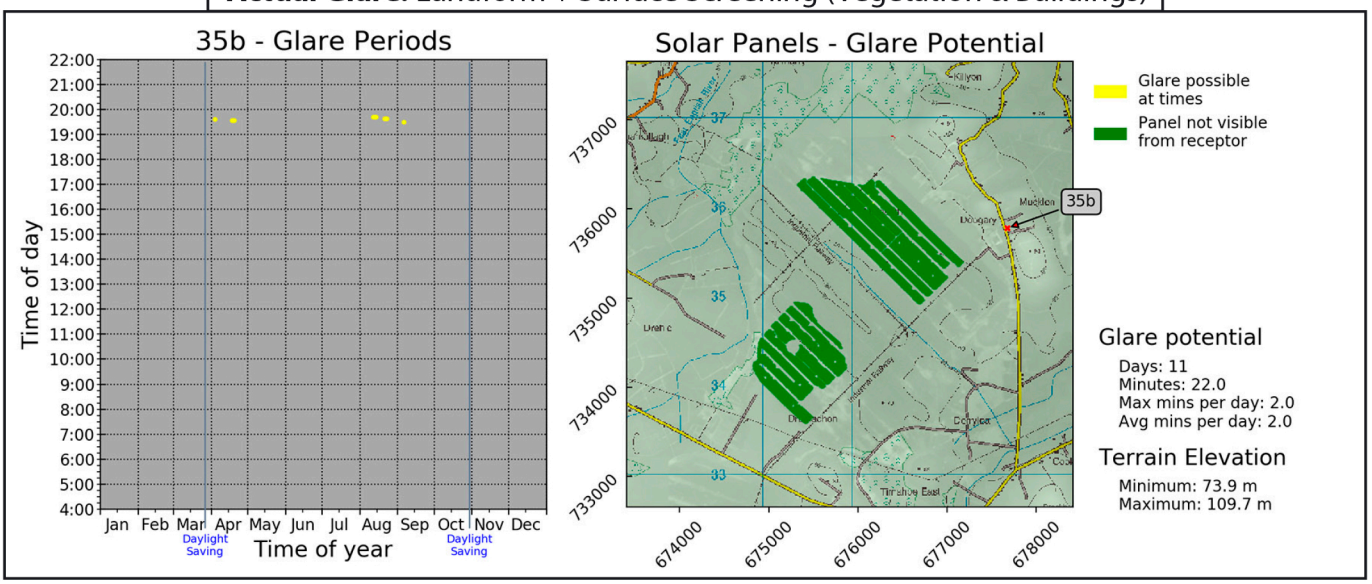
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)

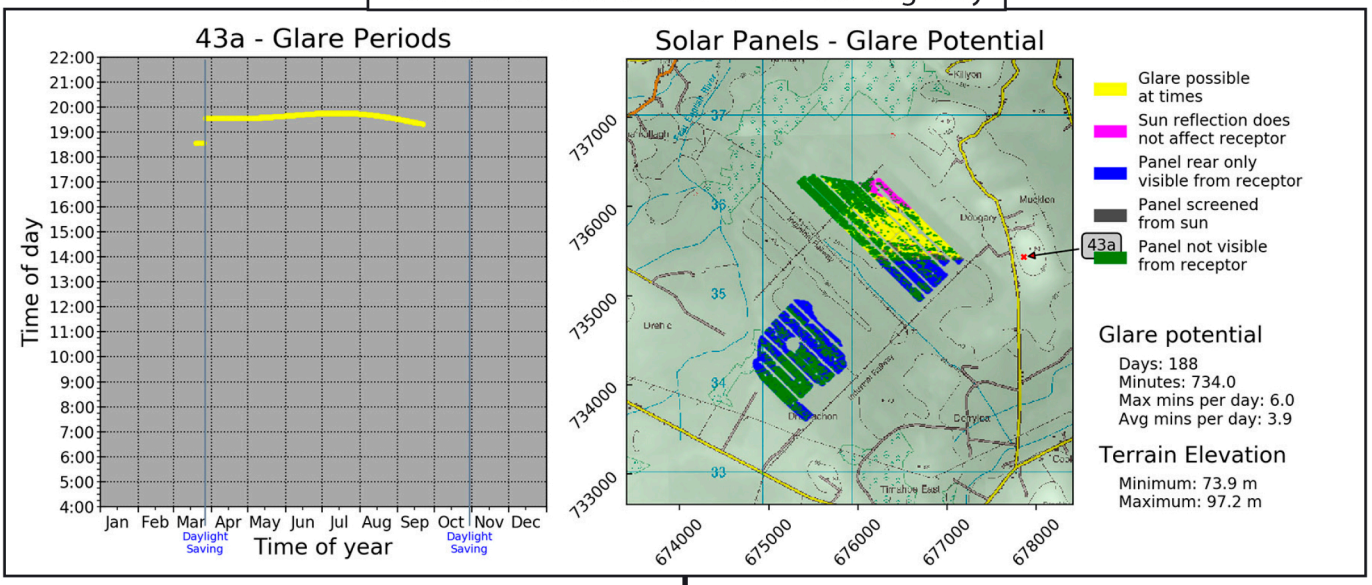


Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

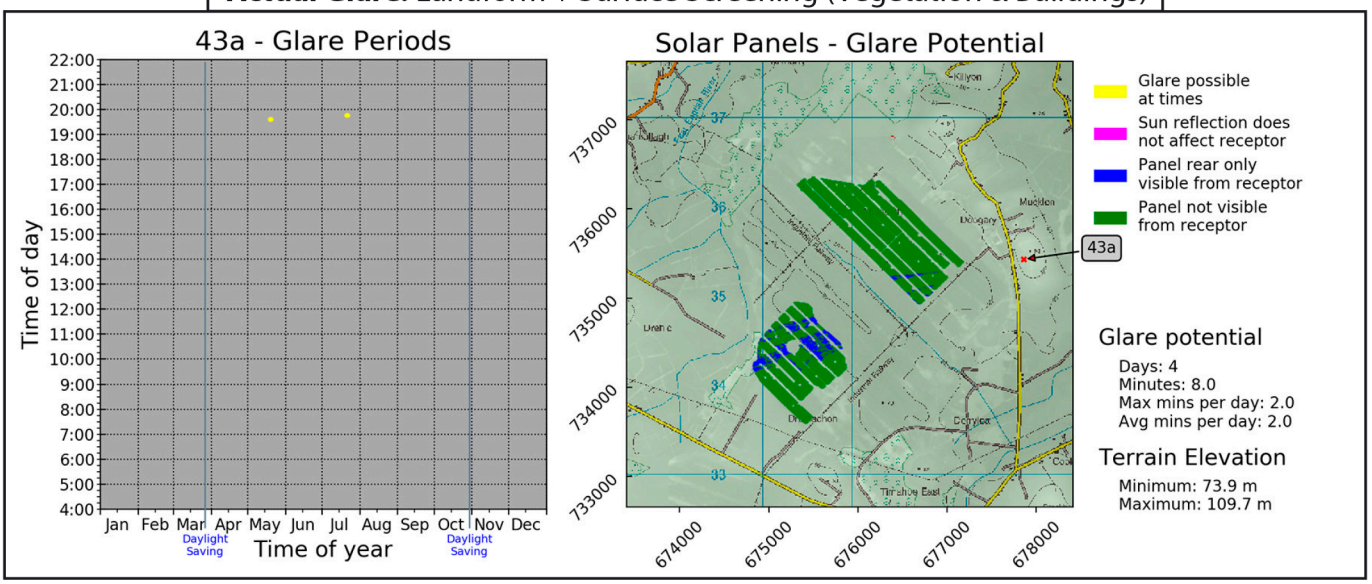
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)

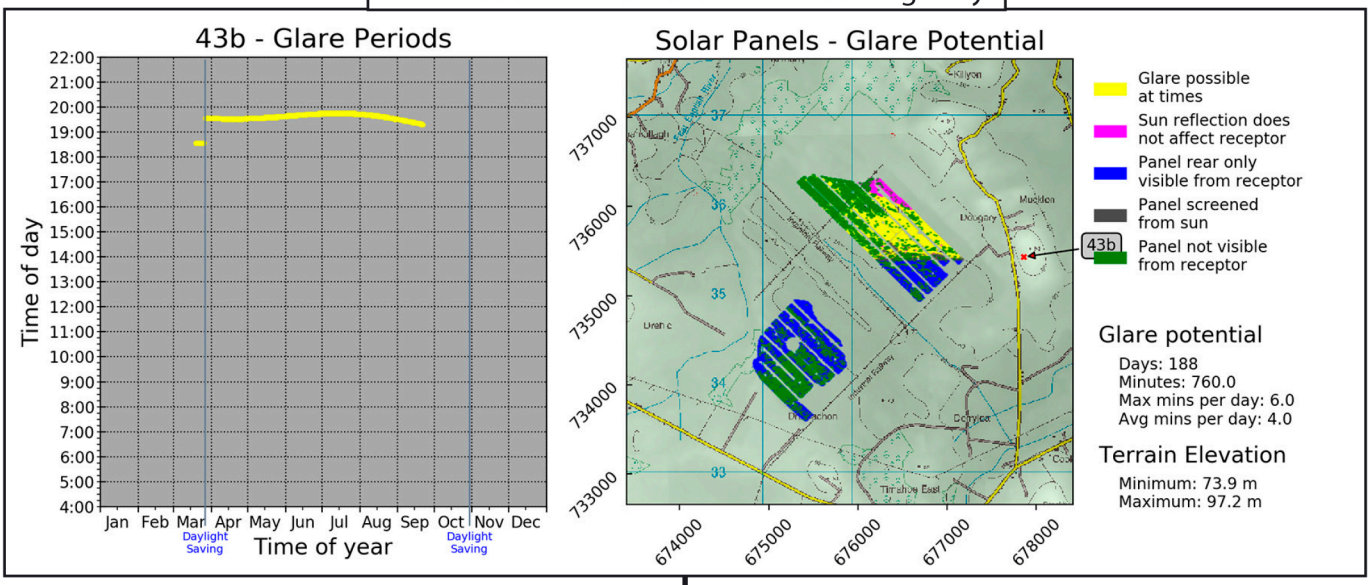


Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

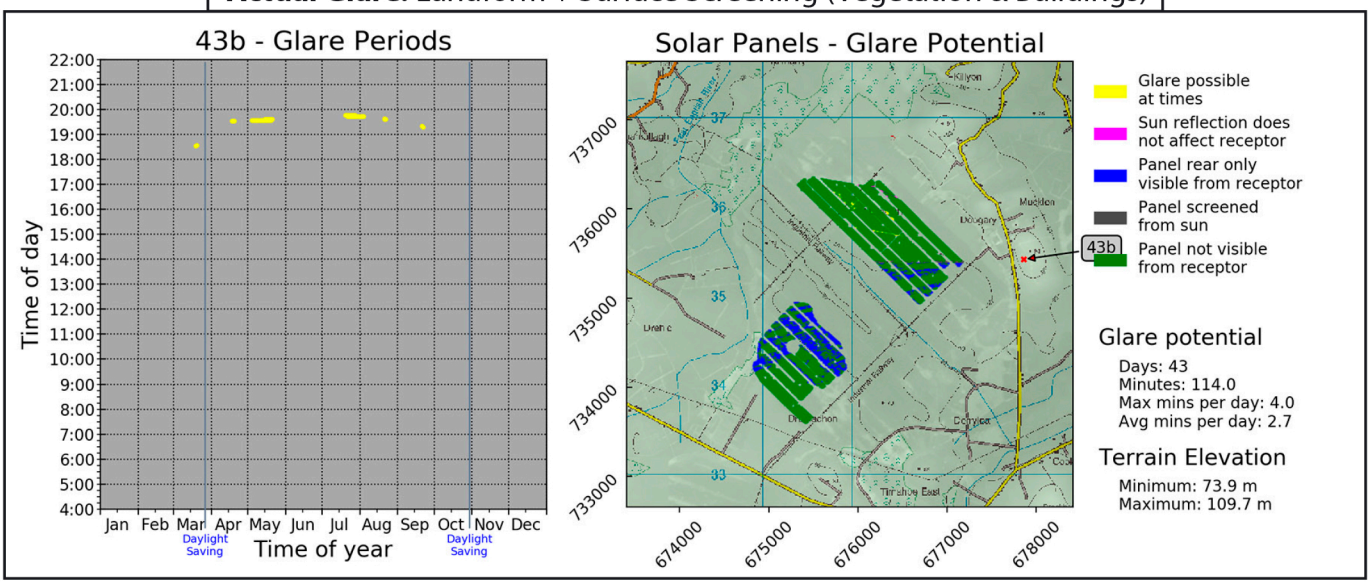
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)

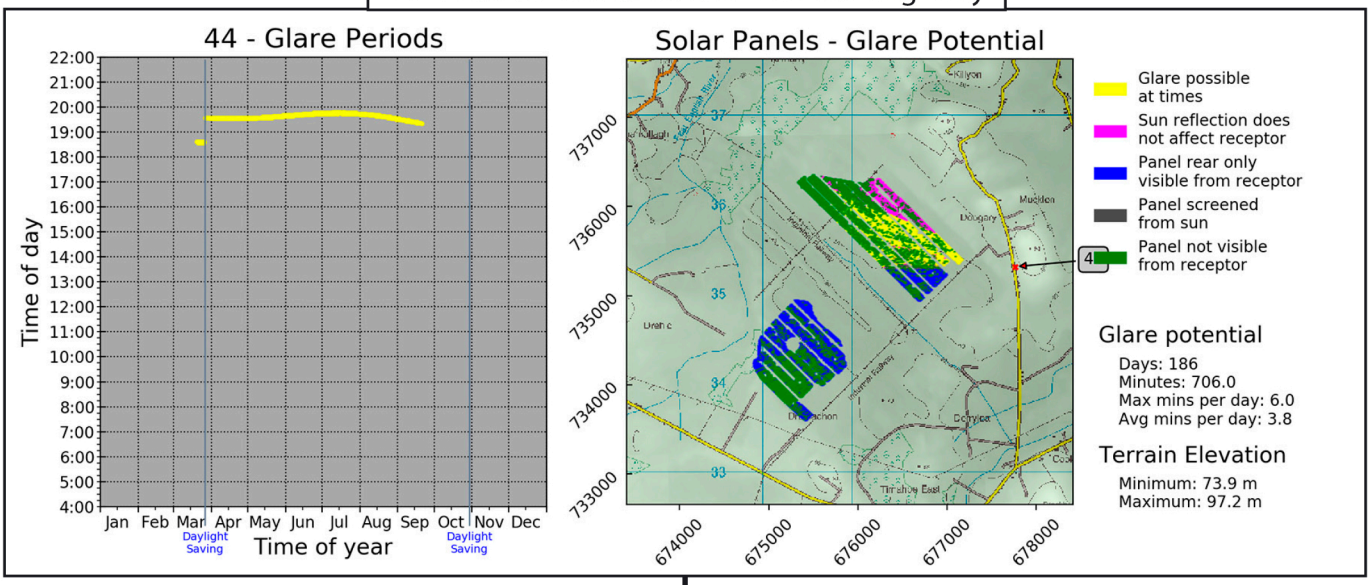


Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

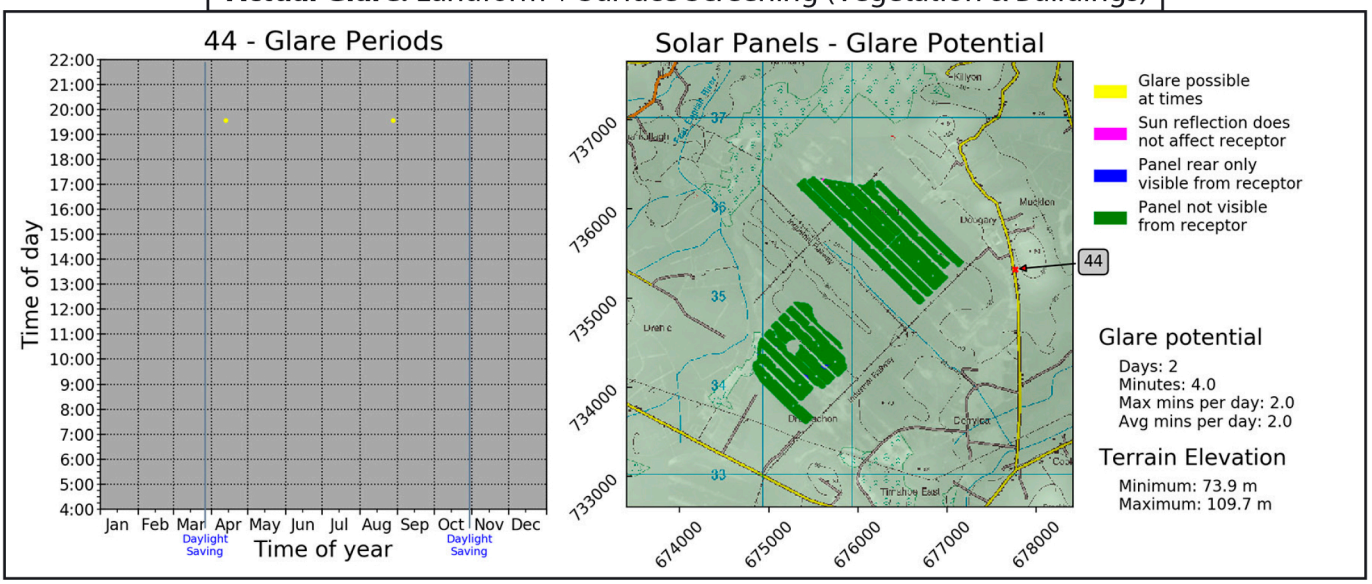
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)

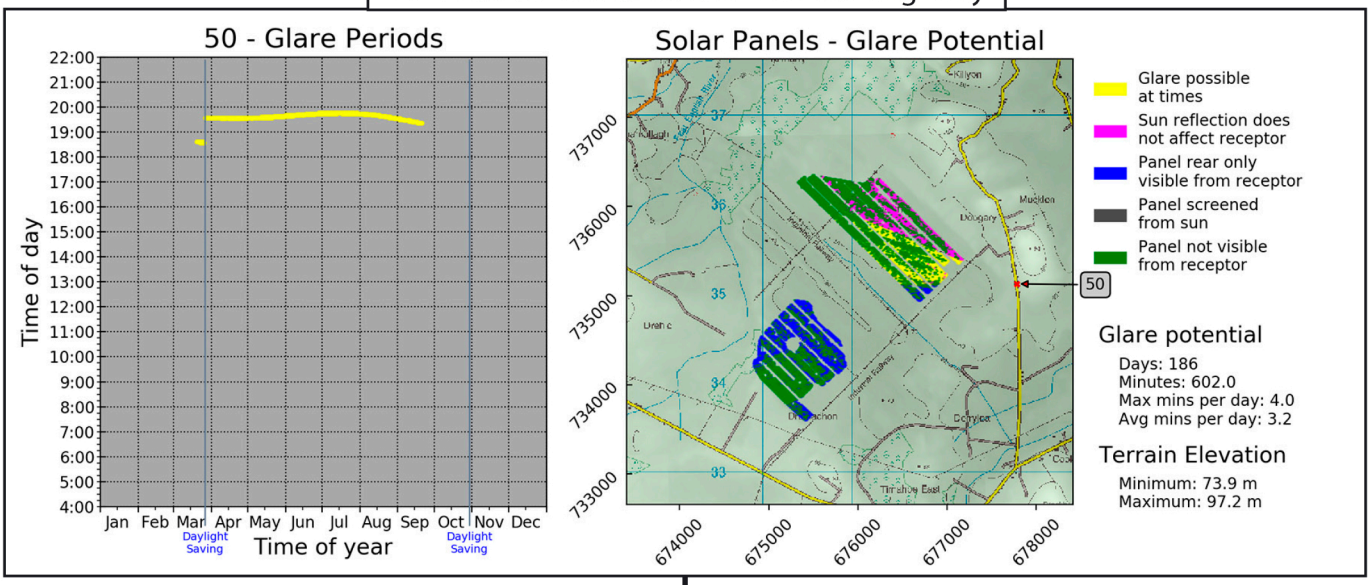


Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

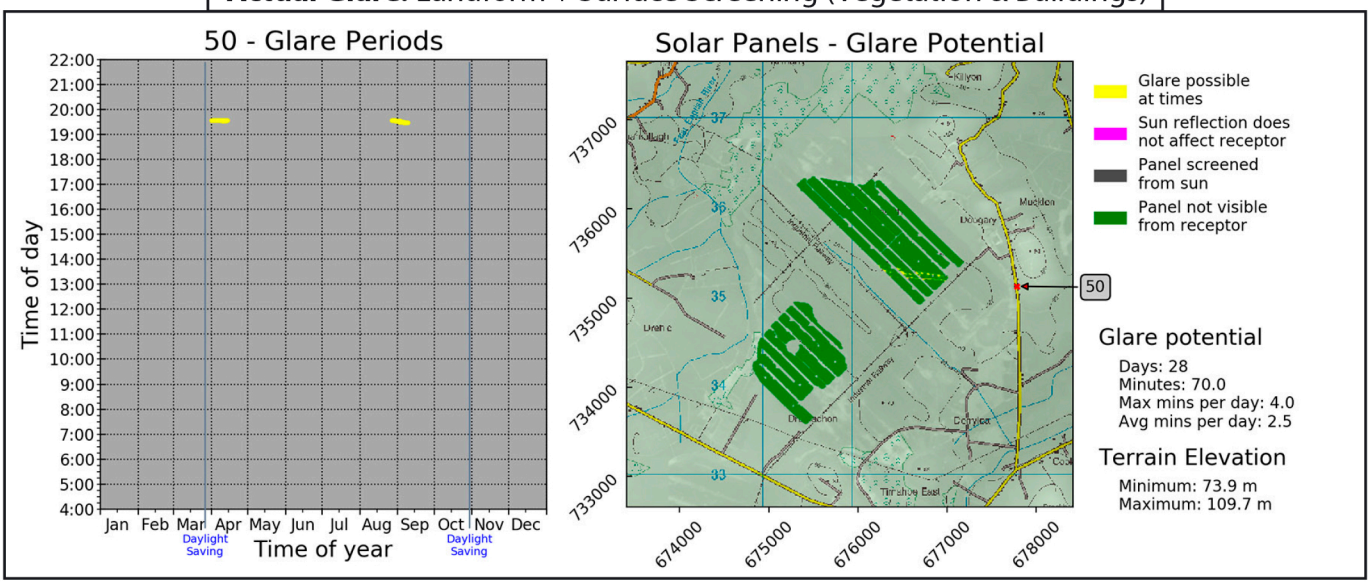
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)

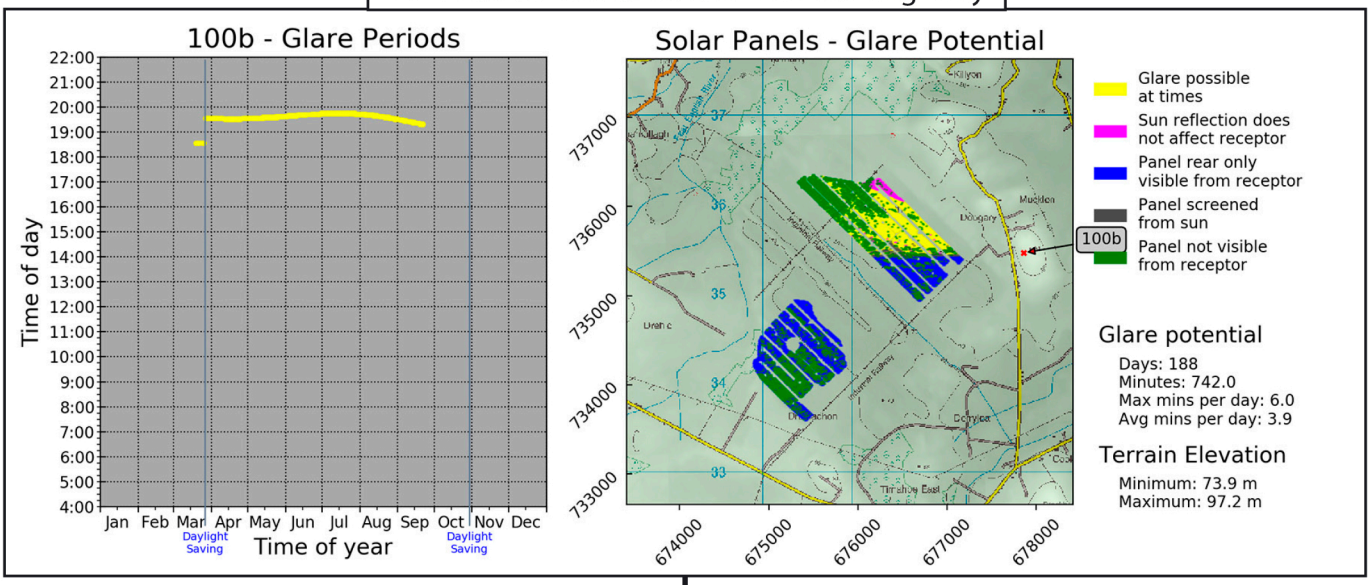


Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

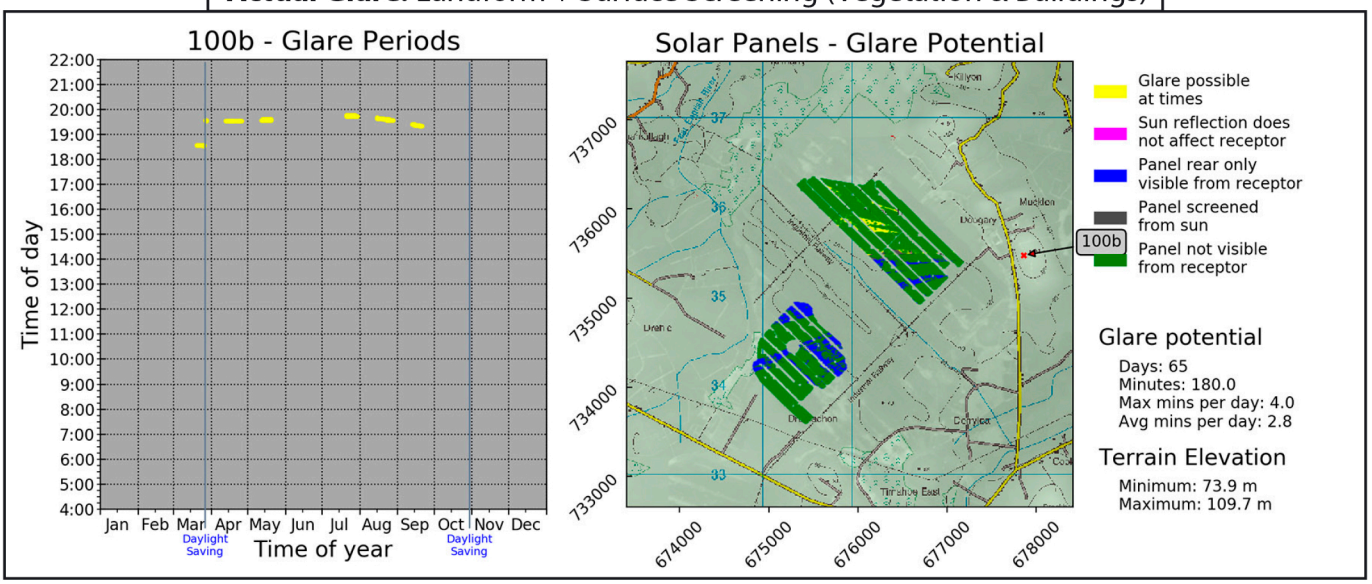
Appendix C - Glare Periods - Dwelling Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)



Note: the use of 'b' in a receptor name indicates the upper floor in a 2-storey dwelling

APPENDIX D:

GEOMETRIC ASSESSMENT RESULTS – ROAD POINTS

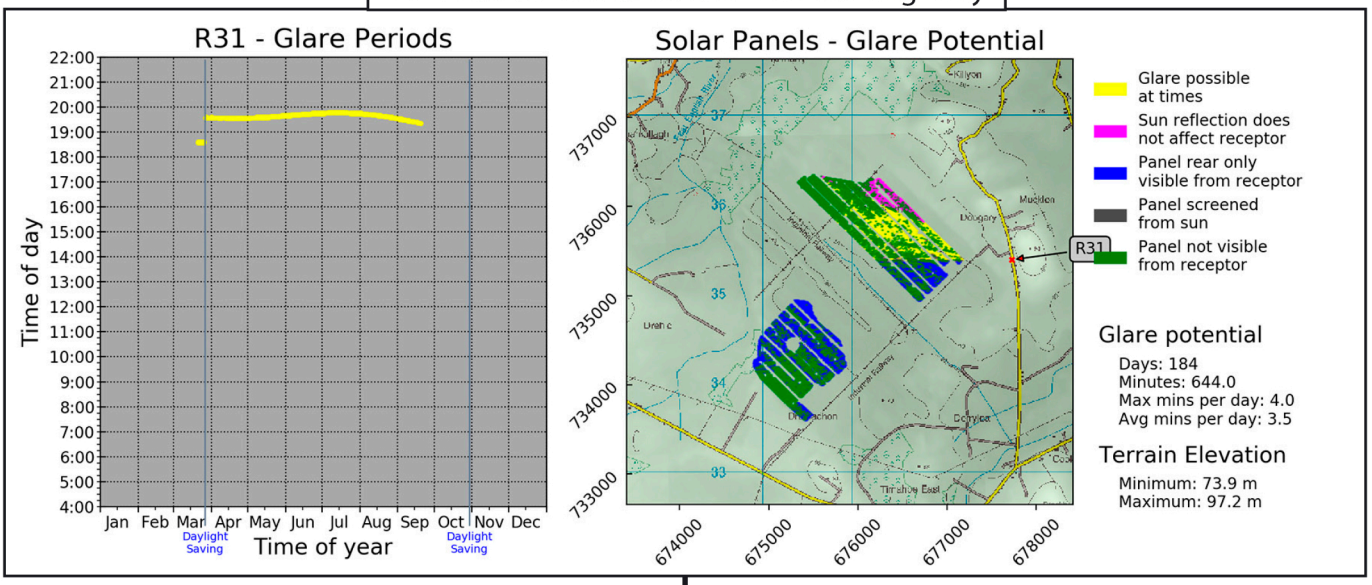
Note 1: Only those route receptors have been included where an episode of glint and glare has been predicted when taking account of the existing non-landform screening (vegetation and buildings). If a route receptor is not present, it has been determined that glint and glare is unlikely given current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

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

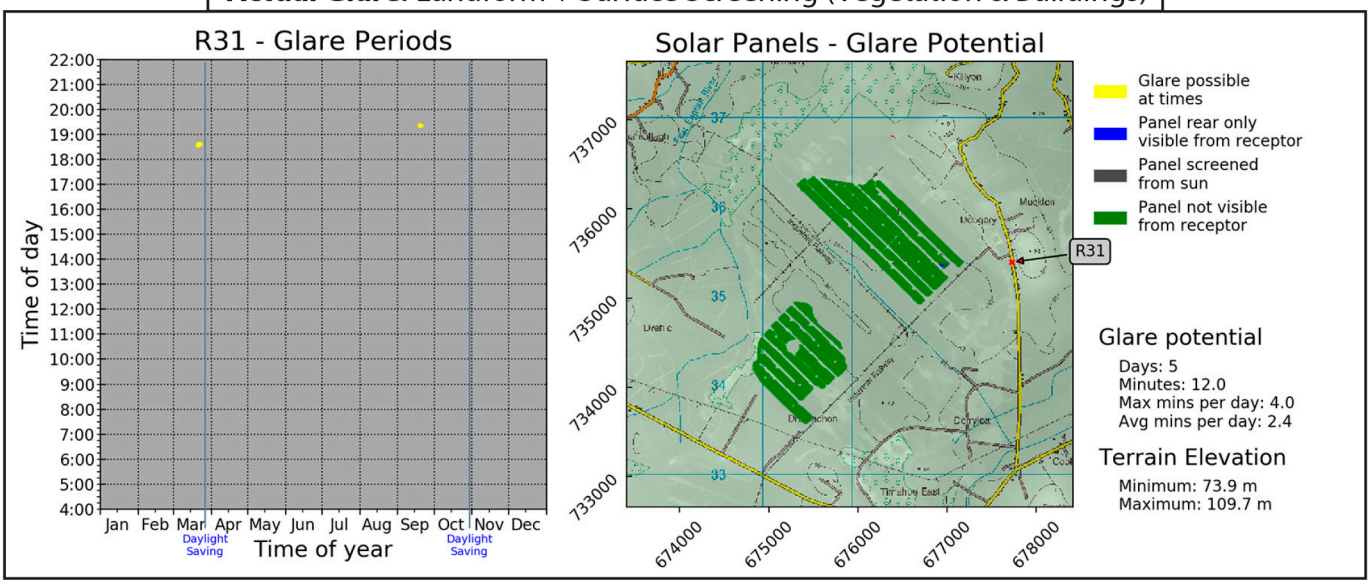
Appendix D - Glare Periods - Roads Receptors

Only includes receptors with potential for residual glare after surface screening effects accounted for

Theoretical Glare: Landform Screening Only



Actual Glare: Landform + Surface Screening (Vegetation & Buildings)



APPENDIX E:

RECEPTOR GRID COORDINATES (IRISH GRID)

Dwellings		
Receptor ID	**Easting**	**Northing**
19	677807	734801
23	677741	734597
103	677810	734770
18	677657	735452
35	677671	735784
36	677687	735728
37	677704	735632
38	677714	735525
39	677675	735415
40	677685	735381
41	677748	735431
44	677760	735325
45	677717	735297
46	677777	735267
47	677718	735280
48	677768	735217
101	677751	735490
20	677722	735147
21	677743	735015
22	677790	735053
49	677731	735111
50	677780	735132
51	677786	735100
52	677746	735047
53	677811	734879
102	677818	734911
89	674250	733334
90	674231	733419
95	674169	733443
91	674116	733486
42	677803	735432
43	677857	735434
100	677857	735481
14	677300	736343
15	677323	736296
16	677587	736064
17	677813	735940
31	677446	736163
32	677363	736260
33	677376	736247
34	677481	736116
99	677469	736147
6	674248	735249

Transport Routes		
Receptor ID	**Easting**	**Northing**
R01	674137	733422
R02	674181	733399
R03	674226	733376

R04	674270	733353
R05	674315	733330
R06	674359	733307
R07	674403	733284
R08	677246	736408
R09	677271	736364
R10	677290	736318
R11	677320	736278
R12	677353	736241
R13	677387	736204
R14	677418	736165
R15	677453	736129
R16	677493	736100
R17	677535	736072
R18	677559	736030
R19	677574	735982
R20	677590	735935
R21	677604	735887
R22	677619	735839
R23	677634	735792
R24	677648	735744
R25	677663	735696
R26	677677	735648
R27	677689	735600
R28	677700	735551
R29	677709	735502
R30	677719	735452
R31	677727	735403
R32	677735	735354
R33	677743	735304
R34	677752	735255
R35	677760	735206
R36	677767	735156
R37	677774	735107
R38	677779	735057
R39	677785	735008
R40	677789	734958
R41	677791	734908
R42	677794	734858
R43	677793	734808
R44	677794	734758
R45	677795	734708
R46	677797	734658
R47	677798	734608

APPENDIX F:

SGHAT RESULTS

FORGESOLAR GLARE ANALYSIS

Project: **Casement, Weston, Mayglare & Clonbullogue**
Site configuration: **Timahoe**
Analysis conducted by Nikolas Hennessy (nik@macroworks.ie) at 15:25 on 29 Aug, 2018.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
Flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	FAIL	Receptor(s) marked as ATCT receive green and/or yellow glare

Default glare analysis and observer eye characteristics are as follows:

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 17857.2848

PV Array(s)

Name: Panel Area North
Axis tracking: Fixed (no rotation)
Tilt: 23.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363024	-6.839997	81.16	3.00	84.16
2	53.359284	-6.846349	82.86	3.00	85.86
3	53.358490	-6.847636	82.49	3.00	85.49
4	53.370885	-6.868064	82.46	3.00	85.46
5	53.371371	-6.866905	84.48	3.00	87.48
6	53.371653	-6.867249	83.83	3.00	86.83
7	53.372396	-6.865789	84.14	3.00	87.14
8	53.371781	-6.864545	90.24	3.00	93.24
9	53.372012	-6.864202	89.45	3.00	92.45
10	53.371218	-6.857078	86.60	3.00	89.60
11	53.372063	-6.855018	87.96	3.00	90.96

Name: Panel Area South
Axis tracking: Fixed (no rotation)
Tilt: 23.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

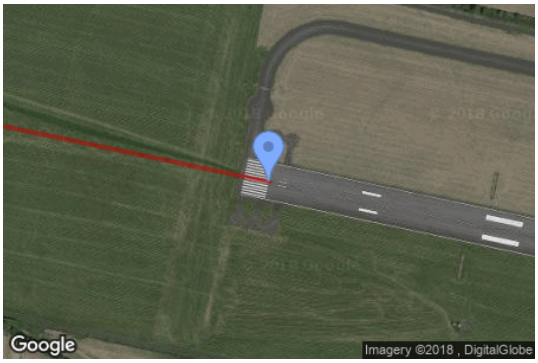
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.352010	-6.876347	85.97	3.00	88.97
2	53.352574	-6.876390	85.32	3.00	88.32
3	53.353650	-6.876304	85.35	3.00	88.35
4	53.353906	-6.875274	87.92	3.00	90.92
5	53.355468	-6.875274	84.40	3.00	87.40
6	53.356903	-6.873128	82.25	3.00	85.25
7	53.358311	-6.875360	83.26	3.00	86.26
8	53.360539	-6.871454	81.47	3.00	84.47
9	53.359643	-6.870038	79.82	3.00	82.82
10	53.359797	-6.869695	79.66	3.00	82.66
11	53.359541	-6.866862	79.35	3.00	82.35
12	53.358747	-6.865704	78.81	3.00	81.81
13	53.357953	-6.865661	78.64	3.00	81.64
14	53.357031	-6.865060	79.77	3.00	82.77
15	53.355263	-6.861584	79.07	3.00	82.07
16	53.352753	-6.860468	78.96	3.00	81.96
17	53.352497	-6.860554	79.28	3.00	82.28
18	53.351651	-6.859181	81.59	3.00	84.59
19	53.346887	-6.867549	83.32	3.00	86.32
20	53.351242	-6.874716	84.06	3.00	87.06

Flight Path Receptor(s)

Name: Casement 05 Runway
Description:
Threshold height: 15 m
Direction: 41.3°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.293830	-6.453465	98.26	15.24	113.50
Two-mile	53.272113	-6.485435	154.45	127.73	282.18

Name: Casement 11 Runway
Description:
Threshold height: 15 m
Direction: 101.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

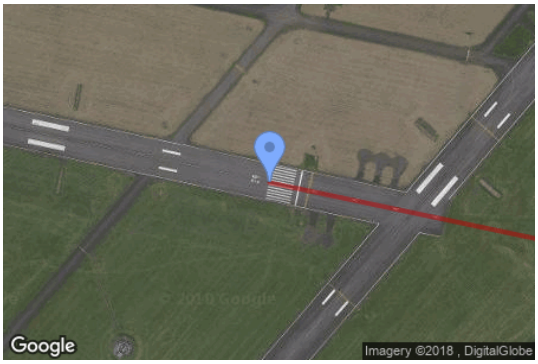


Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.304622	-6.468287	86.32	15.24	101.56
Two-mile	53.310549	-6.515700	73.62	196.62	270.24

Name: Casement 23 Runway
Description:
Threshold height: 15 m
Direction: 220.9°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.303267	-6.439788	93.37	15.24	108.61
Two-mile	53.325107	-6.408047	62.48	214.82	277.30

Name: Casement 29 Runway
Description:
Threshold height: 15 m
Direction: 281.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.301696	-6.445153	96.10	15.24	111.34
Two-mile	53.295759	-6.397747	106.23	173.80	280.03

Name: Clonbullogue 26 Runway
Description:
Threshold height: 15 m
Direction: 264.5°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.249904	-7.118223	72.00	15.24	87.24
Two-mile	53.252665	-7.070065	68.82	187.10	255.92

Name: Clonbullogue 8 Runway
Description:
Threshold height: 15 m
Direction: 84.9°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.249308	-7.128137	70.00	15.24	85.24
Two-mile	53.246763	-7.176327	71.79	182.14	253.92

Name: Mayglare 25 Runway
Description:
Threshold height: 15 m
Direction: 253.1°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.404970	-6.633212	66.24	15.24	81.48
Two-mile	53.413390	-6.586761	68.76	181.40	250.16

Name: Mayglare 7 Runway
Description:
Threshold height: 15 m
Direction: 73.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.403928	-6.638984	67.85	15.24	83.09
Two-mile	53.395866	-6.685613	77.35	174.42	251.77

Name: Weston 07 Runway
Description:
Threshold height: 15 m
Direction: 63.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.350770	-6.493330	47.50	15.24	62.74
Two-mile	53.337644	-6.536538	56.27	175.16	231.43

Name: Weston 25 Runway
Description:
Threshold height: 15 m
Direction: 243.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.354037	-6.482623	46.75	15.24	61.99
Two-mile	53.367163	-6.439411	31.65	199.03	230.68

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	53.305496	-6.441790	93.54	9.00
2-ATCT	2	53.355640	-6.489488	49.45	15.00

Map image of 1-ATCT

Map image of 2-ATCT

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Panel Area North	23.0	180.0	85	0	-
Panel Area South	23.0	180.0	101	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
Casement 05 Runway	0	0
Casement 11 Runway	0	0
Casement 23 Runway	0	0
Casement 29 Runway	113	0
Clonbullogue 26 Runway	0	0
Clonbullogue 8 Runway	0	0
Mayglare 25 Runway	0	0
Mayglare 7 Runway	0	0
Weston 07 Runway	0	0
Weston 25 Runway	10	0
1-ATCT	41	0
2-ATCT	22	0

Results for: Panel Area North

Receptor	Green Glare (min)	Yellow Glare (min)
Casement 05 Runway	0	0
Casement 11 Runway	0	0
Casement 23 Runway	0	0
Casement 29 Runway	60	0
Clonbullogue 26 Runway	0	0
Clonbullogue 8 Runway	0	0
Mayglare 25 Runway	0	0
Mayglare 7 Runway	0	0
Weston 07 Runway	0	0
Weston 25 Runway	6	0
1-ATCT	15	0
2-ATCT	4	0

Flight Path: Casement 05 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Casement 11 Runway

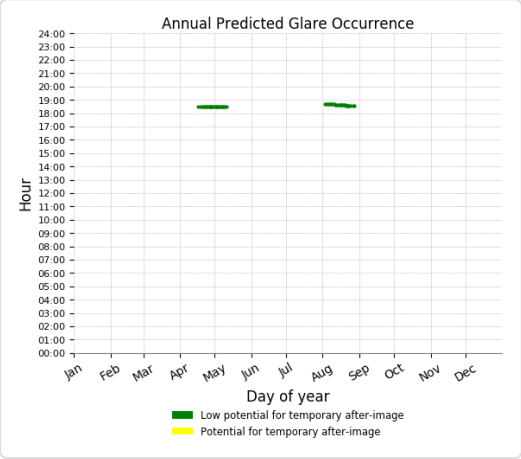
0 minutes of yellow glare
0 minutes of green glare

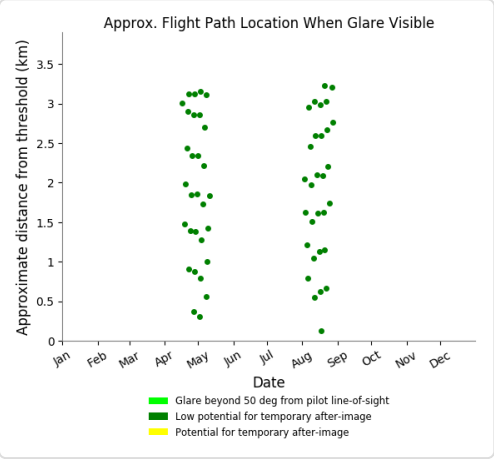
Flight Path: Casement 23 Runway

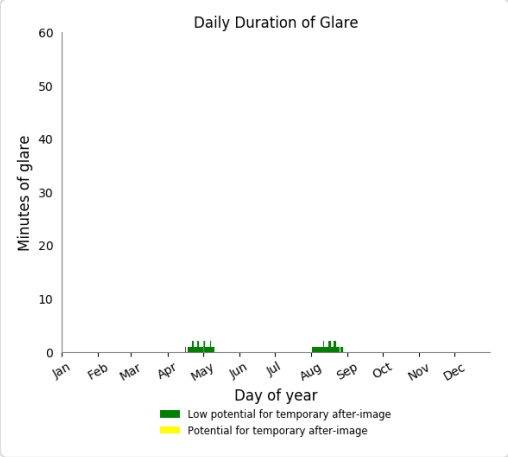
0 minutes of yellow glare
0 minutes of green glare

Flight Path: Casement 29 Runway

0 minutes of yellow glare
60 minutes of green glare







Flight Path: Clonbullogue 26 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Clonbullogue 8 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Mayglare 25 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Mayglare 7 Runway

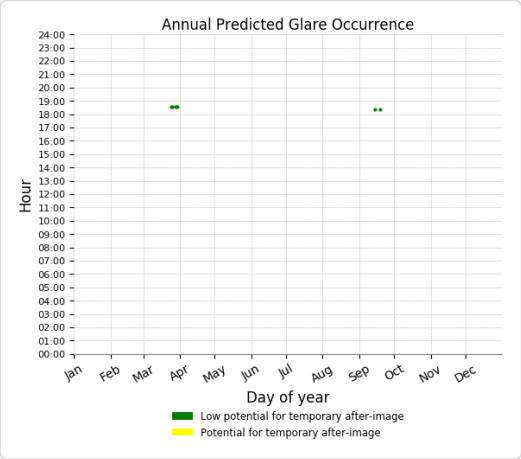
0 minutes of yellow glare
0 minutes of green glare

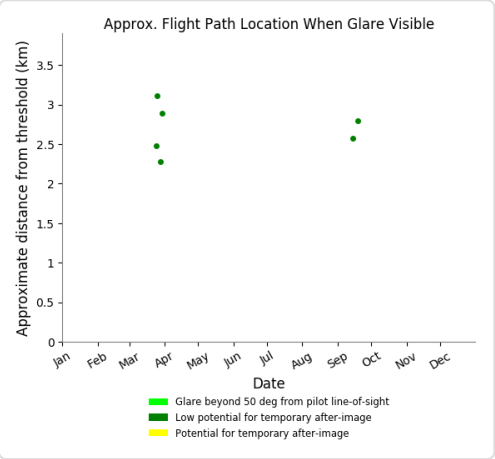
Flight Path: Weston 07 Runway

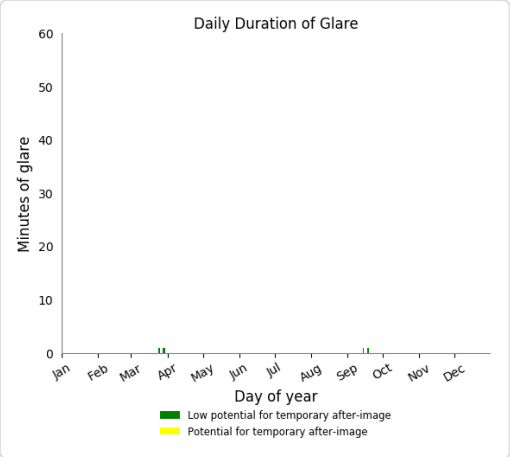
0 minutes of yellow glare
0 minutes of green glare

Flight Path: Weston 25 Runway

0 minutes of yellow glare
6 minutes of green glare

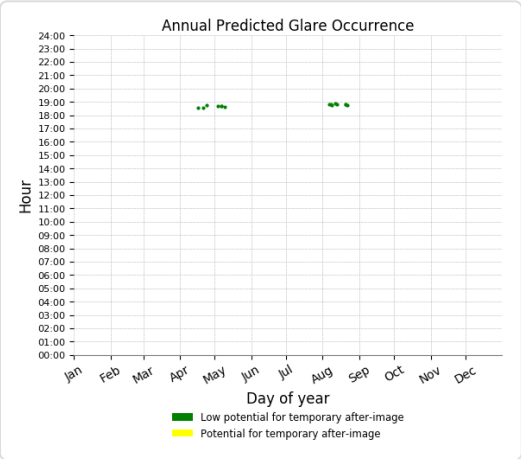


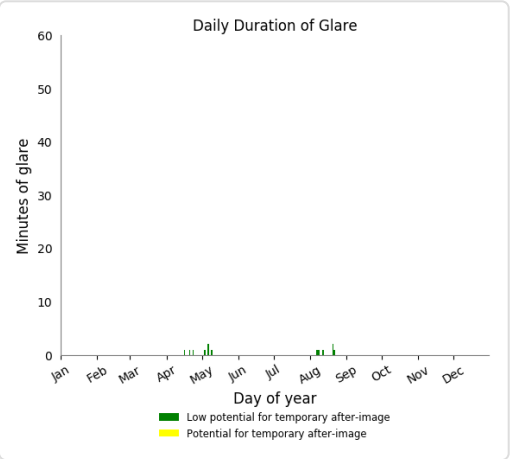




Point Receptor: 1-ATCT

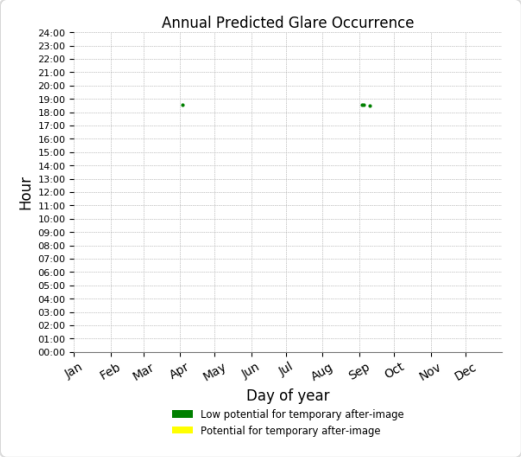
0 minutes of yellow glare
15 minutes of green glare

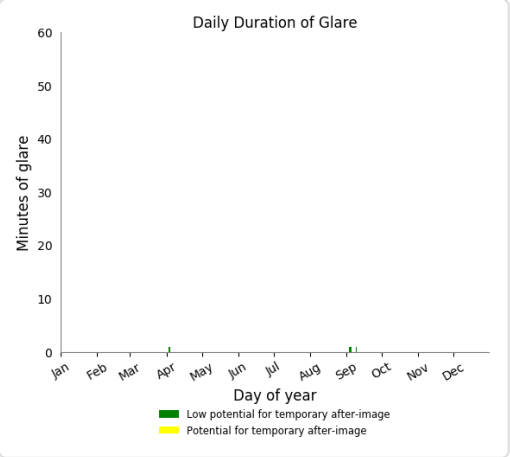




Point Receptor: 2-ATCT

0 minutes of yellow glare
4 minutes of green glare





Results for: Panel Area South

Receptor	Green Glare (min)	Yellow Glare (min)
Casement 05 Runway	0	0
Casement 11 Runway	0	0
Casement 23 Runway	0	0
Casement 29 Runway	53	0
Clonbullogue 26 Runway	0	0
Clonbullogue 8 Runway	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
Mayglare 25 Runway	0	0
Mayglare 7 Runway	0	0
Weston 07 Runway	0	0
Weston 25 Runway	4	0
1-ATCT	26	0
2-ATCT	18	0

Flight Path: Casement 05 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Casement 11 Runway

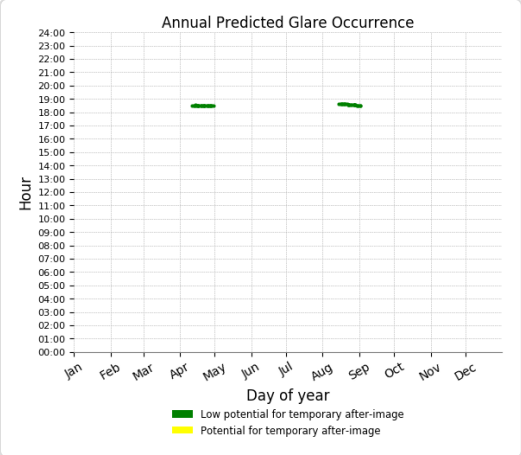
0 minutes of yellow glare
0 minutes of green glare

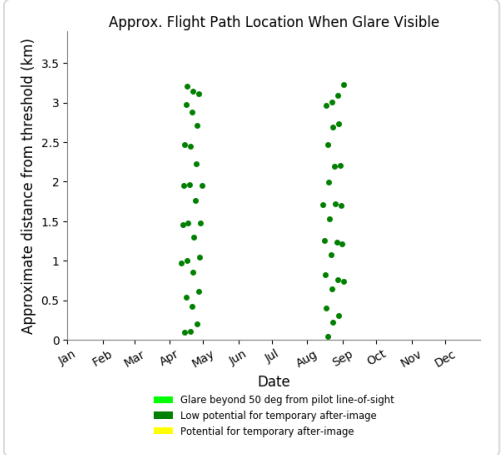
Flight Path: Casement 23 Runway

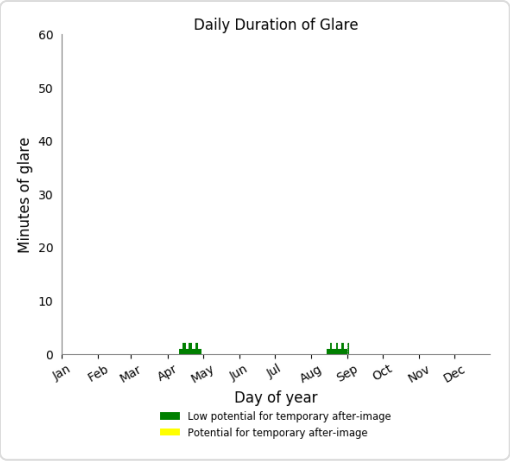
0 minutes of yellow glare
0 minutes of green glare

Flight Path: Casement 29 Runway

0 minutes of yellow glare
53 minutes of green glare







Flight Path: Clonbullogue 26 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Clonbullogue 8 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Mayglare 25 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Mayglare 7 Runway

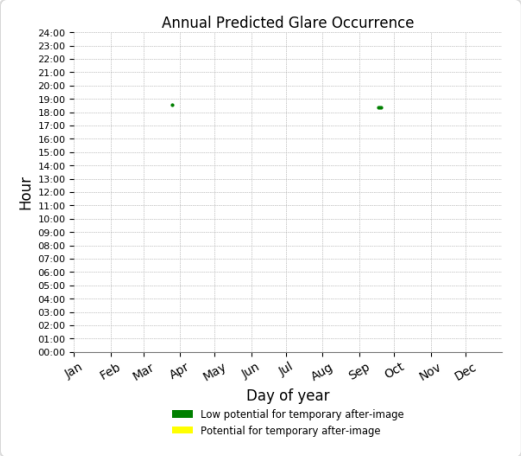
0 minutes of yellow glare
0 minutes of green glare

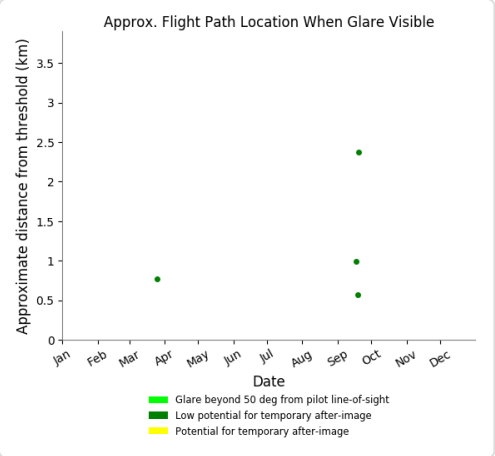
Flight Path: Weston 07 Runway

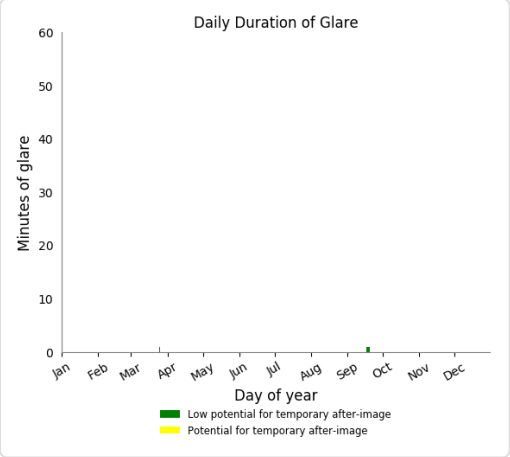
0 minutes of yellow glare
0 minutes of green glare

Flight Path: Weston 25 Runway

0 minutes of yellow glare
4 minutes of green glare

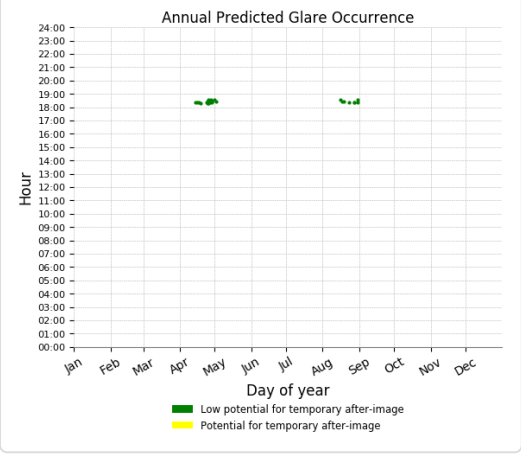


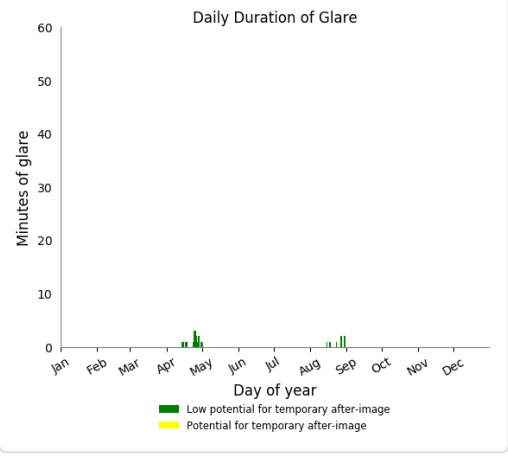




Point Receptor: 1-ATCT

0 minutes of yellow glare
26 minutes of green glare

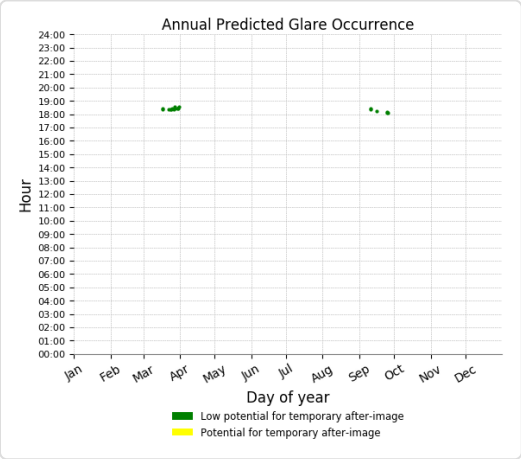


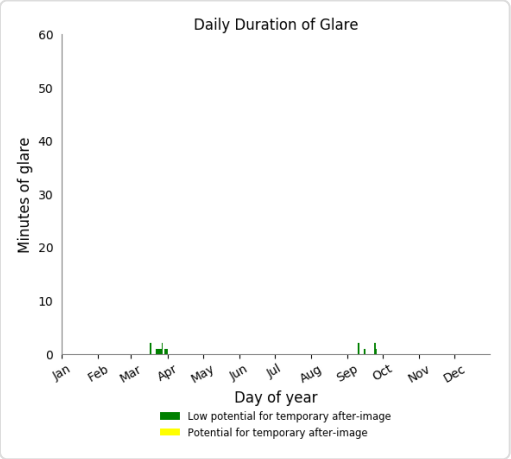


Point Receptor: 2-ATCT

0 minutes of yellow glare

18 minutes of green glare





Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.