Mabbett®
Planning | Design | Environment | Engineering | Safety

See a Difference.

Project No: 315035

Oaklands Farm Solar Park - Glint & Glare Review

Prepared for:

South Derbyshire District Council

Civic Offices
Civic Way
Swadlincote, UK
DE11 0AH

Contents Amendment Record

This report has been issued and amended as follows:

Revision	Description	Date	Signed
1.0	First Issue	13 August 2023	A Clacy

Acknowledgement

This report has been prepared for the sole and exclusive use of South Derbyshire District Council in accordance with the scope of work presented in Mabbett & Associates Ltd (Mabbett) Letter Agreement (315035/JJ/050724/2.0), dated 05 July 2024. This report is based on information and data collected by Mabbett. Should any of the information be incorrect, incomplete or subject to change, Mabbett may wish to revise the report accordingly.

This report has been prepared by the following Mabbett personnel:

MABBETT & ASSOCIATES LTD

Alexandra Clacy, MSc
Environmental Engineer

This report has been reviewed and approved by the following Mabbett personnel:

MABBETT & ASSOCIATES LTD

Joshua Jones, BSc, MSc, MIAQM, MIEnvSc
Senior Environmental Consultant

Table of Contents

Section 1.0: Introduction

1.1 Introduction

SDDC is reviewing a proposed solar development (referred to as Oaklands Farm Solar Park). The development has been submitted to the Planning Inspectorate as a Nationally Significant Infrastructure Project (NSIP). The project is to be located on land southeast of Walton-on-Trent in Derbyshire and south of Drakelow Power Station (hereafter referred to as the 'Proposed Development').

As part of the NSIP application process, a Glint and Glare Assessment was prepared by Pager Power Limited[1] (Pager Power) for the proposed development. SDDC has requested Mabbett's support with the review process.

This report presents the independent Glint and Glare Review undertaken for the proposed development by Mabbett. In its preparation, Mabbett has made no contact with Pager Power and as such all interpretations are based on an independent review.

No validation modelling has been undertaken by Mabbett as part of this review.

1.2 Structure of Report

Section 2 presents the technical review of the submitted Glint and Glare Assessment report with comment provided on the assessment results and outcomes (including cumulative effects considerations).

[1] Pager Power Limited. Solar Photovoltaic Glint and Glare Study, Oaklands Farm Solar Park 15/01/2024

Section 2.0: Glint and Glare Assessment Review

The following sections provide a summary of the technical review undertaken. The sections below correlate to sections within the Pager Power report, as seen below in the table.

Mabbett Report	Pager Power Report
2.1 Introduction	1 Introduction
2.2 Solar Development Layout and Details	2 Solar Development Layout and Details
2.3 Glint and Glare Assessment Methodology	3 Glint and Glare Assessment Methodology Appendix F - Assessment Limitations and Assumptions
2.4 Identification of Receptors	4 Identification of Receptors
2.5 Model Results	5 Geometric Assessment Results and Discussion 6 Geometric Assessment Results and Discussion 7 Overall Conclusions

2.1 Introduction

The introduction sets out an overview of the site and report.

Definitions for glint and glare are provided. The definitions are consistent with those adopted by Mabbett from reputable sources such as the US Federal Aviation Administration (FAA) guidance '*Technical Guidance for Evaluating Selected Solar Technologies on Airports*'.

2.2 Solar Development Location and Details

This section details the layout of the proposed development and solar arrays within.

The technical information states that the azimuth angle of the solar panels is at 180 degrees and the elevation tilt will be between 15 and 22 degrees. Pager Power have modelled the tilt at 20 degrees, stating that *"any changes in panel angle within this range is predicted to slightly change the time of day in which reflections occur and is not predicted to change duration of the intensity of any reflections".* Mabbett agree that the change in panel angle will slightly affect the time of day in which reflections occur.

The panel height is assessed at the panel centre height of 1.75m. Mabbett agree with modelling from the midpoint of the panel as opposed to the highest or lowest panel points. Modelling of the highest or lowest panel points may under- or over-predict glare at receptors. Whilst this remains a limitation for modelling of panel midpoint heights, the limitation is minimised as the potential difference between average modelled height and actual height is smaller.

It is noted that the solar panel surface material is not listed under Section 2.4 'Solar Panel Technical Information'. Solar panel surface material is of particular relevance for assessment of aviation receptors as different material types may produce glare of different intensity as defined by Sandia National Laboratories (a research and development laboratory of the US Department of Energy) and adopted by US FAA in 2013 and 2018 as a metric for determination of potential impact.

Pager Power state "*In the first instance, a surface material of 'smooth glass with an anti-reflective coating' is assessed because it is the panel surface most used for modern solar panels*". Mabbett note that the current industry standard for solar panels is that an anti-reflective coating is applied, and in the absence of confirmation of the make and model of the panels, an anti-reflective coating is a reasonable assumption. It is recommended that a condition be attached to the consent (where granted) to submit details of the solar panels and confirmation that an anti-reflective coating will be applied to the installed solar panels.

2.3 Glint and Glare Assessment Methodology

Pager Power outline the guidance available in the UK and the USA with respect to solar developments and aviation activity.

It is noted that Pager Power do not reference the Civil Aviation Authority (CAA) Combined Aerodrome Safeguarding Team (CAST) Safeguarding Guidance Note within the guidance listed. The relevant sections CAST Safeguarding Guidance Note is shown below:

Section 2 'Safety Considerations' outlines the following safety considerations that must be assessed for the design of the planned solar photovoltaic development. Points 1 and 2 are relevant to glare assessment:

- *"ATS personnel – The control tower (if applicable) is the most important location for visual surveillance across an aerodrome for monitoring operations on the ground as well as in the air. It is therefore of critical importance that the development of solar photovoltaic developments does not significantly hinder the view from a control tower's visual control room (VCR). This may be from redesigning the layout and design of the proposed solar development to avoid glare from the solar panels or by avoiding the physical blocking of key viewpoints.*
- *Pilot – A pilot's ability to safely navigate the airspace around an aerodrome is paramount. A pilot is required to look for other aircraft and obstructions on the ground, as well as navigate towards a runway or reference points. This applies to both pilots of fixed wing aircraft and helicopters in the air, and sometimes on the ground. The standard operations that should be considered are:*
    - *pilots on approach*
    - *pilots in a visual circuit*
    - *pilots on the ground (departing and taxiing aircraft).*

  …"

Section 3.1 'Safety impacts - Glint & Glare' states:
"A key safety concern when considering a solar photovoltaic panel development on- or off-aerodrome is related to the reflection of sunlight off the photovoltaic panels commonly referred to as glint and glare.
'Glint and glare' is the general term used to describe the reflection of sunlight from a reflective surface, typically one that is capable of producing specular solar reflections. The definition of glint and glare is as follows:

- *Glint – a momentary flash of bright light typically received by moving receptors or from moving reflectors.*
- *Glare – a continuous source of bright light typically received by static receptors or from large reflective surfaces.*

Typical surfaces that are considered with respect to glint and glare are glass, metallic structures e.g. roofs, and solar PV panels. The orientation of a solar panel (azimuth and elevation angle) as well as its height will determine whether glint and glare effects are possible towards the assessed receptors.

The receptors that should be considered are usually ATS personnel in a control tower and pilots of aircraft within a suitable distance of an aerodrome. It is essential to conduct a glint and glare assessment when a reflective surface is to be located on or immediately adjacent to an aerodrome. In most cases, an assessment should be undertaken for a solar PV development which is being proposed within a specific distance (indicated by the aerodrome authority) from an aerodrome. For many aerodromes, 5km is the distance of choice but it could be considered out to 10km. In exceptional circumstances, assessments may be required beyond 10km.

The UK CAA and US FAA have produced guidance with respect to glint and glare however neither of them mandates a specific methodology for assessing the effects of glint and glare.

The effects of glare may mean that some solar PV developments are unacceptable, however layout modifications (such as changes to panel tilt and elevation angle) can often alleviate these concerns and overcome objections. The benefit of early consultation with the aerodrome authority cannot be understated."

Section 4 ‘Aerodrome Operator Safety Assurance’ states:
“The aerodrome operator in conjunction with any ATS personnel should, as part of the change management process in their safety management system, consider all the potential hazards posed by solar photovoltaic developments / BESS on or in the vicinity to their aerodrome and within the aerodrome’s physical and technical safeguarded areas, in order to ensure the safety of the overall operation. The developer should provide the aerodrome with a safety survey which should include:

- *a glint and glare survey when a development is within a distance specified by the aerodrome from an Aerodrome Reference Point (ARP) (5km in most cases)*

  …

The aerodrome operator should also ensure both impact and safety assessments are undertaken to provide assurance that any on- or off-aerodrome planned development does not introduce unacceptable hazards to aircrew, ATS personnel, RFFS and aerodrome vehicle operators undertaking their tasks.

As part of the aerodrome and or ATS change management process, safety assurances should take into account any potential adverse effect to critical ATS infrastructure and equipment.

The assessment must also consider any impacts to aircraft utilising instrument flight procedures and aircraft in the visual circuit.

Developers should apply the same principals for safety assurance for unlicensed aerodromes and airfields as required by this policy that are not officially safeguarded.

The developer in conjunction with the aerodrome operator, ATS personnel, RFFS and aerodrome operations should develop adequate mitigation to mitigate any risks identified.

Should risk mitigation or agreement not be possible, the aerodrome operator should follow Local Planning Authority procedures and lodge an objection regarding the development under their statutory obligations.”

It is noted that there is no formal guidance for the assessment of solar reflections toward roads and residential dwellings.

Pager Power refers to its self-published guidance as a suitable means to assessing road safety, residential amenity and aviation activity with respect to solar reflections. Pager Power states that its “*approach is to identify receptors, undertake geometric reflection calculations and review the scenario which a solar reflection can occur, whilst comparing the results against available solar reflection studies*”. Mabbett has reviewed the Pager Power guidance and consider it to be robust.

A review of independent studies on glare issues from solar panels is provided in Appendices A and B. Details of the Sun’s movements and solar reflections are presented in Appendix C. Mabbett has reviewed and consider that these sections provide satisfactory additional information.

The significance criteria for determining whether a significant detrimental impact will occur is provided in Appendix D. These are in accordance with Pager Power guidance which Mabbett considers to be robust.

With regard to modelling, it is noted that Pager Power has used two models:

1. The Pager Power model, which produces a chart stating whether a reflection can occur, the duration and the panels that can produce the solar reflection towards the receptor; and,
2. An additional model (Forge Solar) based on the Sandia National Laboratories Solar Glare Hazard Analysis Tool (SGHAT) for assessment of solar glare intensity toward an aviation approach path receptor.

Mabbett does not have access to the Pager Power model and cannot review the model to determine if it aligns with current industry guidance and existing SGHAT models. Further details regarding the model methodology, its assumptions and limitations are provided in Appendices E and F. These are considered to be reasonable. It is noted that in reference to glare intensity, Pager Power state that is has “*undertaken many aviation glint and glare assessments with both models (SGHAT and Pager Power’s) producing similar results*”. On this basis, it may be inferred that Pager Power has undertaken similar model validation

for geometric analysis i.e. whether a reflection can occur, the duration and the panels that can produce the solar reflection towards the receptor.

Mabbett consider the Forge Solar model to be an appropriate model for the assessment of aviation receptors.

2.4 Identification of Receptors

2.4.1 Aviation Receptors

Pager Power has identified Grangewood Airfield as an aviation receptor. It is correctly identified that there does not appear to be an Air Traffic Control Tower (ATCTs) at the airfield, and that there is one runway and two flight approach paths.

Pager Power state that as Grangewood Airfield is a general aviation (GA) airfield, *"aviation activity is dynamic and does not necessarily follow the typical approaches / flight paths of a larger licensed aerodrome of airport"*. As such, the assessed receptors were based on the following characteristics:

- *"1-mile approach path with a splay angle of 5 degrees, considering 2.5 degrees either side of the extended runway centreline;*
- *A descent angle of 5 degrees;*
- *Circuit width of 1 nautical mile from runway centreline;*
- *Maximum altitude of 500 feet above the average threshold altitude."*

Mabbett consider this a robust approach to assessment.

2.4.2 Ground Based Receptors

Pager Power has identified potential ground-based receptors within a 1km assessment area based on mapping and aerial photography of the region. Although there is no formal guidance for screening distance, 1km is standard practice within glint and glare assessments. Pager Power has excluded the area north of the proposed development. It is stated that glare to the north of the proposed development is "highly unlikely" due to the orientation of the arrays, and as such this approach is reasonable.

2.4.2.1 Roads

Pager Power has identified three local roads within 1km of the proposed development (an unnamed regional road, Church Street, Coton Lane, Main Street, Burton Road, and Rosliston Road). It is stated that "technical modelling is not recommended for local roads, where traffic densities are likely to be relatively low". Pager Power has stated that solar reflection experienced by a road user travelling along these roads will have low impact for which mitigation is not necessary. Pager Power have also acknowledged that Coton Road is determined to be a local road, however, is of importance to the local road network and as such included within the modelling assessment. This analysis is reasonable and in line with industry guidance.

Pager Power have assessed all road receptors at a height of 1.5m. It is stated in the report that "*this height is used for modelling purposes. Small changes to this height are not significant, and views for elevated drivers are also considered in the results discussion, where appropriate*". Later in Section 6.4 it is stated that "*Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers (such as HGVs) along dual carriageways and motorways compared to other types of road*". Mabbett agree that this approach is reasonable.

There are only 54 road receptors presented in the roads receptor table in Appendix G. Based on Figure 4 within the report, it is understood that receptors 56 to 76 represent Coton Road.

2.4.2.2 Residential Dwellings

Pager Power has identified 89 nearby residential dwellings with the 1km assessment area as potential receptors. These residential dwellings are representative of nearby dwellings to the proposed development, and so it is reasonable that no additional dwellings were included.

Residential dwellings were modelled at an additional height of 1.8m above ground level to simulate the typical viewing height of an observer from ground floor. It is stated in the report that "*consideration of views from upper floors are also considered in the results discussion, where appropriate*". Later in Section 6.4 it is stated that "*the ground floor is typically considered the main living space and therefore has a greater significance with respect to residential amenity*". Mabbett agree that this approach is reasonable.

A future housing development (referred to a 'Drakelow Park') was also identified by Pager Power. However, these were not included within geometric modelling as north of the proposed panels. Mabbett considers this conclusion reasonable and in line with industry guidance.

2.4.2.3 Public Rights of Way & Bridleways

Pager Power have acknowledged that there is a number of Public Rights of Way (PRoW) and Bridleways located in the area surrounding the Proposed Development. Pager Power state that significant impacts are not predicted towards pedestrians/observers along PRoWs and Bridleways for the following reasons:

- *"The typical density of pedestrians on a PRoW and horse riders on a bridleway is low in a rural environment;*
- *Any resultant effect is much less serious and has far lesser consequences than, for example, solar reflections experienced towards a road network whereby the resultant impacts of a solar reflection can be much more serious;*
- *Glint and glare effects towards receptors on a PRoW and a bridleway are transient, and time and location sensitive whereby a pedestrian could move beyond the solar reflection zone with ease with little impact upon safety or amentiy;*
- *Any observable solar reflection to users of the PRoW and bridleways would be of similar intensity to those experienced whilst navigating the natural and built environment on a regular basis.*
- *There is no safety hazard associated with reflections towards an observer on a footpath of bridleways.*

Pager Power state that the overall impact upon pedestrians and horse riders if low and no mitigation is required. This analysis is reasonable and in line with industry guidance.

2.4.2.4 Railways

Pager Power has not mentioned rail receptors within its report. However, a receptor review indicates that no such receptors fall within the 500m screening distance recommended by industry guidance. Therefore, this does not alter the conclusions of the report.

2.5 Model Results & Discussion

2.5.1 Aviation

Pager Power state their key considerations for quantifying the impact significance for the assessed aviation receptors. These include whether glare is predicted to be experienced in practice, the location of origin of glare, the intensity of glare, and the operationally significance of glare. Mabbett consider these to be reasonable considerations when evaluating impact significance.

Where solar reflections have a maximum glare intensity of 'potential for temporary after-image', Pager Power state that expert assessment of the following factors is required to determine the impact significance and mitigation requirement:

- *"The likely traffic volumes and level of safeguarding at the aerodrome – licensed aerodromes typically have higher traffic volumes and are formally safeguarded;*
- *The time of day at which glare is predicted and whether the aerodrome will be operational such that pilots can be on the approach at these times.*
- *The duration of any predicted glare – glare that occurs for low durations throughout the year is less likely to be experienced than glare that occurs for longer durations throughout the year.*
- *The location and size of the reflecting area relative to a pilot's primary field-of-view.*
- *The location of the source of glare relative to the position of the Sun at the times and dates in which solar reflections are geometrically possible – effects that coincide with direct sunlight appear less prominent that those that do not.*

- *The level of predicted effect relative to existing sources of glare – a solar reflection is less noticeable by pilots when there are existing reflective surfaces in the surrounding environment."*

The modelling predicted that solar reflections outside the pilot's primary horizontal field of view are geometrically possible towards the splayed approach path to runway 12 at Grangewood Airfield, and solar reflections with a maximum of 'low potential for temporary after-image' are predicted towards the right and left hand base leg and base leg join flight paths. Solar reflections with a maximum of 'low potential for temporary after-image' are predicted towards all flight paths towards runway 30.

Pager Power conclude that the predicted impact classification towards Grangewood Airfield is "Low Impact" and no mitigation is recommended. Mabbett consider this to be reasonable and in line with industry guidance.

Pager Power have also conducted a high-level assessment on aviation receptors within 10km of the proposed development. Pager Power identified four additional aerodromes outside the screening distance for assessment, but within 10km of the Proposed Development (Sittles Farm Airstrip, Fisherwick Airfield, Streethay Farm Airstrip, and Tatenhill Airfield).

Pager Power concludes that:

- *"Any solar reflections experienced by pilot's using the final approaches, base legs, or base leg joins at these aerodromes would have intensities no greater than 'low potential for temporary after-image'. This level of glare is acceptable in accordance with the associated guidance and industry best practice.*
- *Personnel within any surrounding ATC Towers are not predicted to have visibility of the proposed development due to screening that will significantly obstruct views of the proposed development."*

Mabbett agree that the maximum intensity of predicted glare will be 'low potential for after-image' based on the results for Grangewood Airfield and on Mabbett's own glint and glare assessment experience. Solar glare intensity will decrease as the distance of the pilot to the source of the glare increases. As such, aerodromes at a greater distance to the Proposed Development than Grangewood Airfield will not experience a greater impact.

2.5.2 Roads

Pager Power state their key considerations for quantifying the impact significance for the assessed road receptors. These include whether glare is predicted to be experienced in practice, and the location of the reflecting panel relative to a road user's direction of travel. Mabbett consider these to be reasonable considerations when evaluating impact significance.

Where solar reflections are predicted to be experienced from inside of a road user's primary horizontal field of view, Pager Power state that expert assessment of the following factors is required to determine the impact significance:

- *"Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers (such as HGVs) along dual carriageways and motorways compared to other types of road.*
- *Whether a solar reflection is fleeting in nature. Small gap/s in screening (e.g., an access point to the site) may not result in a sustained reflection for a road user.*
- *The separation distance to the panel area – large separation distances reduce the proportion of an observer's field of view that is affected by glare.*
- *The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not.*
- *Whether the solar reflection originates from directly in front of a road user – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side".*

Glare was predicted at each modelled road receptor.

2.5.2.1 Glare Predicted Within Road User's Central Field of View

The modelling predicted that solar reflections are geometrically possible from inside a road user's primary horizontal field of view at 53 of the modelled receptors.

Pager Power have conducted a desk-based review identifying any existing vegetation or infrastructure, as well as reviewed the local terrain, to determine if there is a line of sight between the road users and the reflecting panels. Additionally, Pager Power have identified if there are any mitigating factors that is applicable to receptors where glare is predicted.

Where line of sight is obstructed, Pager Power have determined a predicted impact classification of "No Impact".

Mabbett note that glare is predicted toward receptor 15 although "*reflecting panel areas are predicted to be significantly obstructed by existing screening See Appendix I – Figure i4*" (page 41). Figure i4 is reproduced in Figure 2.1 for reference.

The Google Street View image is from June 2023. It is not confirmed what time of year the predicted glare occurs in Table 4 and this receptor is not referenced in the Appendix H where only partial road receptor results are presented. It is therefore not possible to cross-check that the existing screening provides adequate obstruction to the line of sight. Review of other Google Street View images that hedge height may be lower outside the selected evidence (June 2023) and not provide sufficient cover.

Figure 2.1 Viewpoint at Road Receptor 15 (Proposed Development in field to the left)

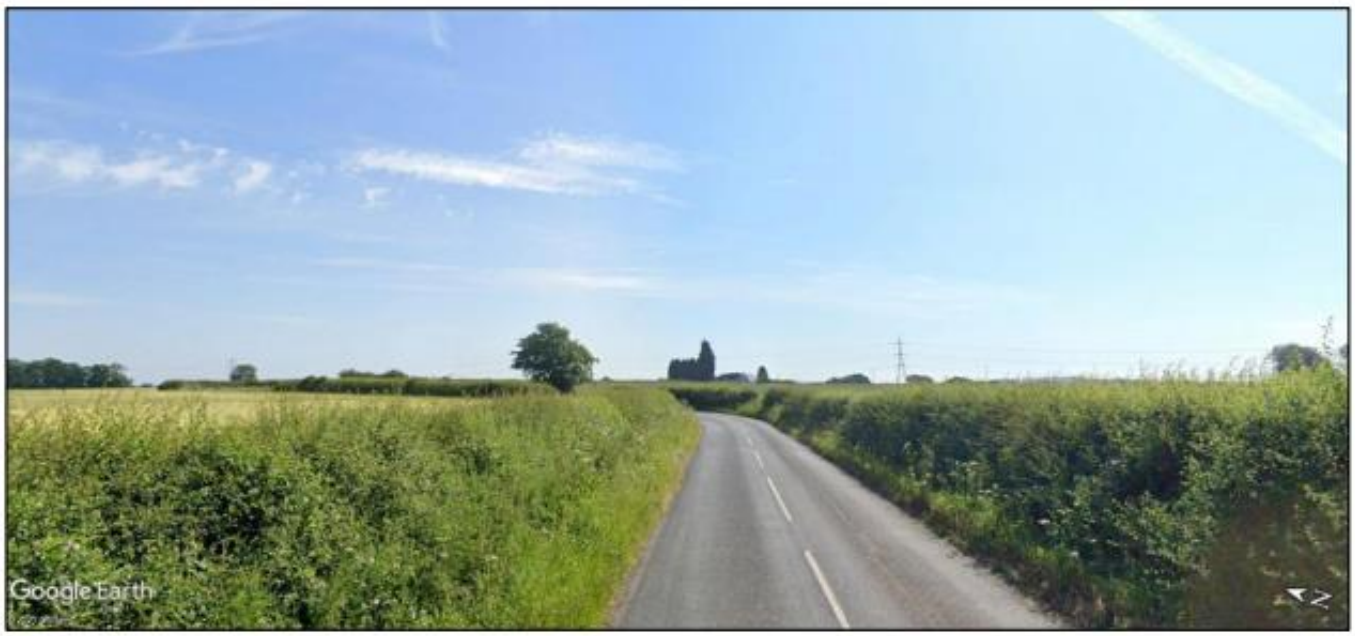
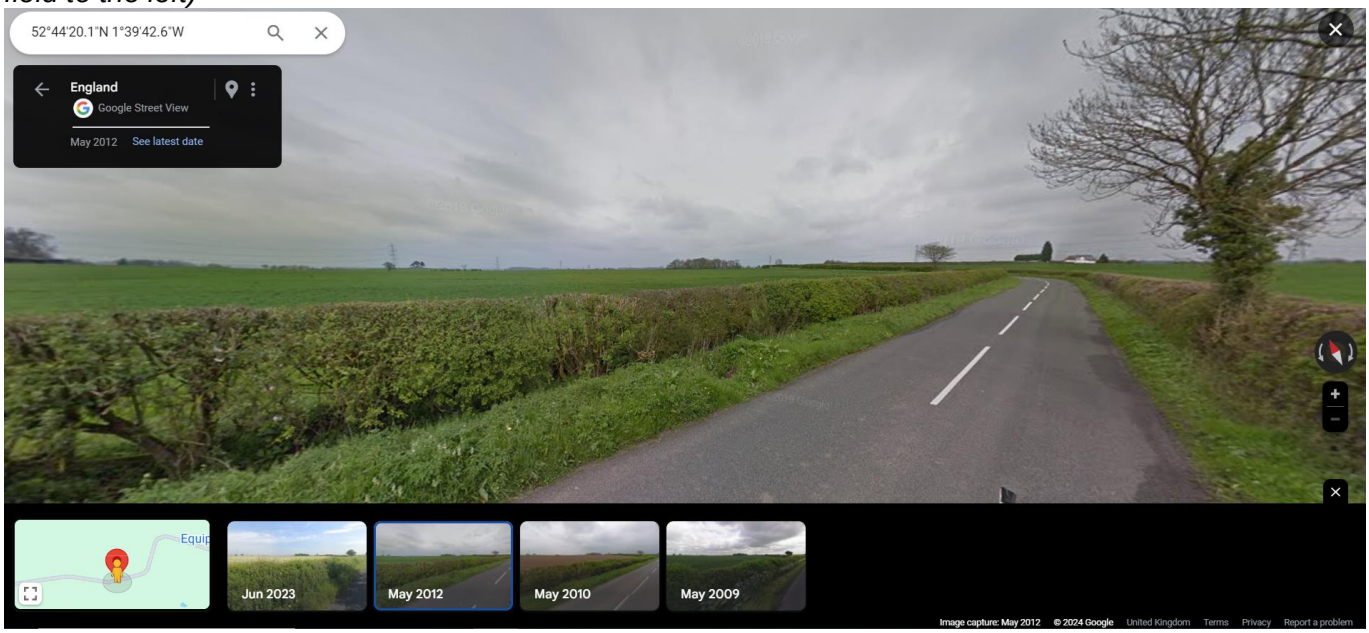


Figure 2.2 Vegetation Obstructing Line of Sight at Receptor 15 – May 2012 (Proposed Development in field to the left)



Imagery © Google Street View

Mabbett also note that glare is predicted toward receptor 56 although "*reflecting panel areas are predicted to be significantly obstructed by existing screening See Appendix I – Figure i17*" (page 44). Figure i17 is reproduced in Figure 2.3 for reference. It is noted that this viewpoint is representative of receptor 57 rather than 56 (shown in Figure 2.4).

The Google Street View image is from June 2023. It is not confirmed at what time of year the predicted glare occurs in Table 4 and this receptor is not referenced in the Appendix H where only partial road receptor results are presented. It is therefore not possible to cross-check that the existing screening provides adequate obstruction to the line of sight. Review of other Google Street View images that hedge height may be lower outside the selected evidence (May 2023) and not provide sufficient cover.

Figure 2.3 Viewpoint at Road Receptor 57 (Proposed Development in field to the right)

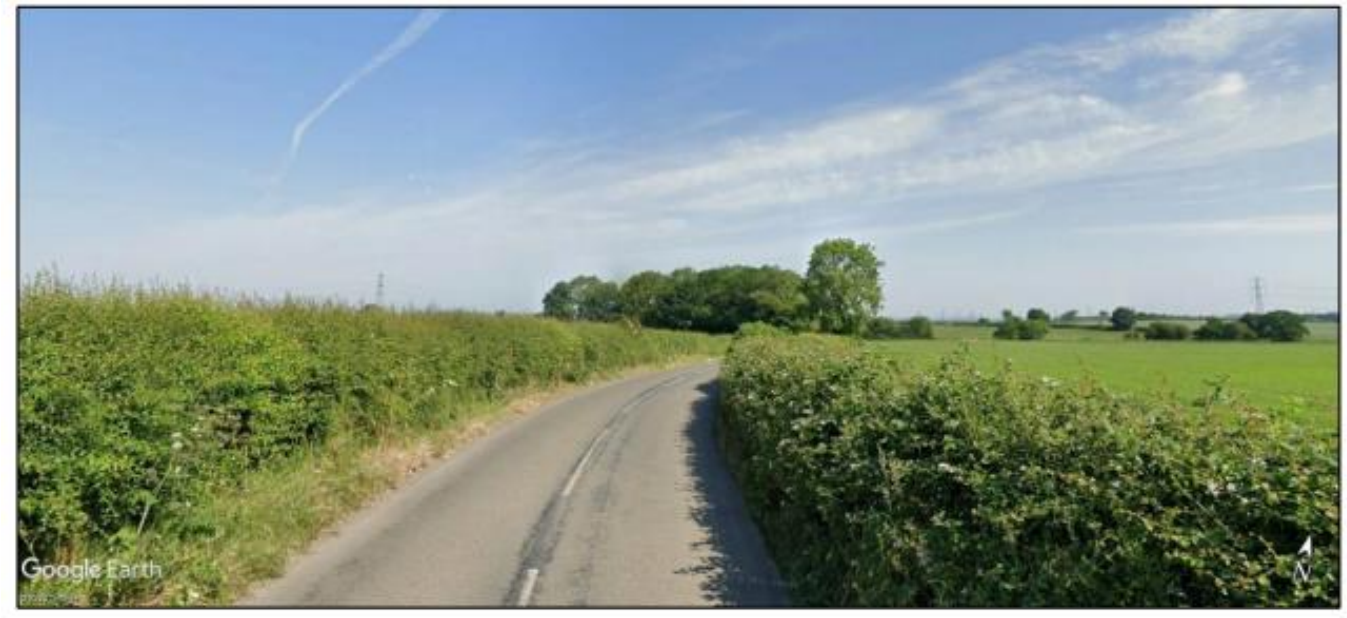
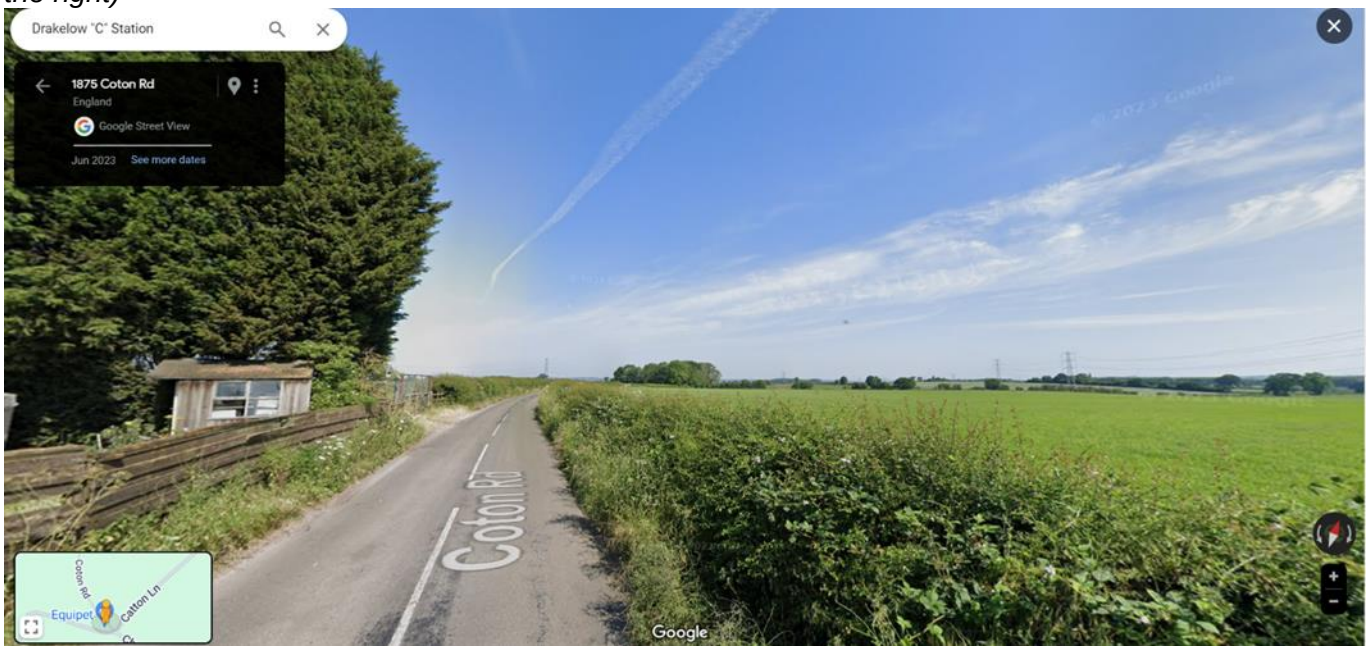
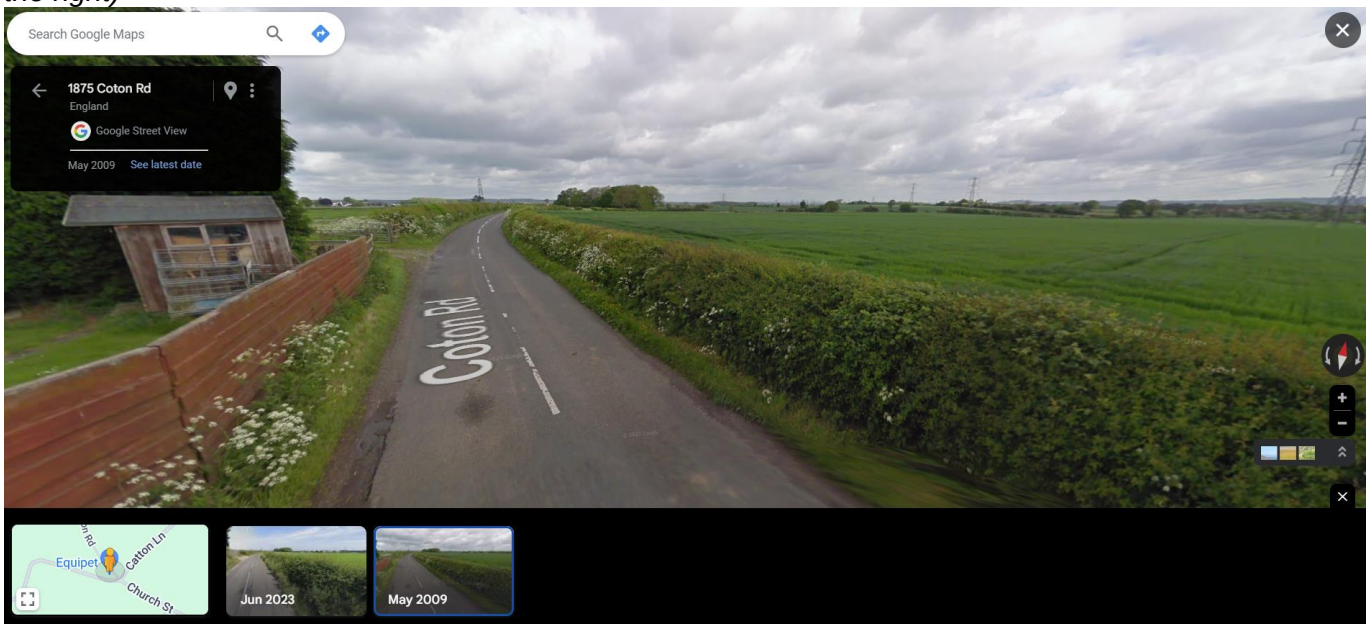


Figure 2.4 Vegetation Obstructing Line of Sight at Receptor 15 – June 2023 (Proposed Development to the right)



Imagery © Google Street View

Figure 2.5 Vegetation Obstructing Line of Sight at Receptor 15 – May 2009 (Proposed Development to the right)



Imagery © Google Street View

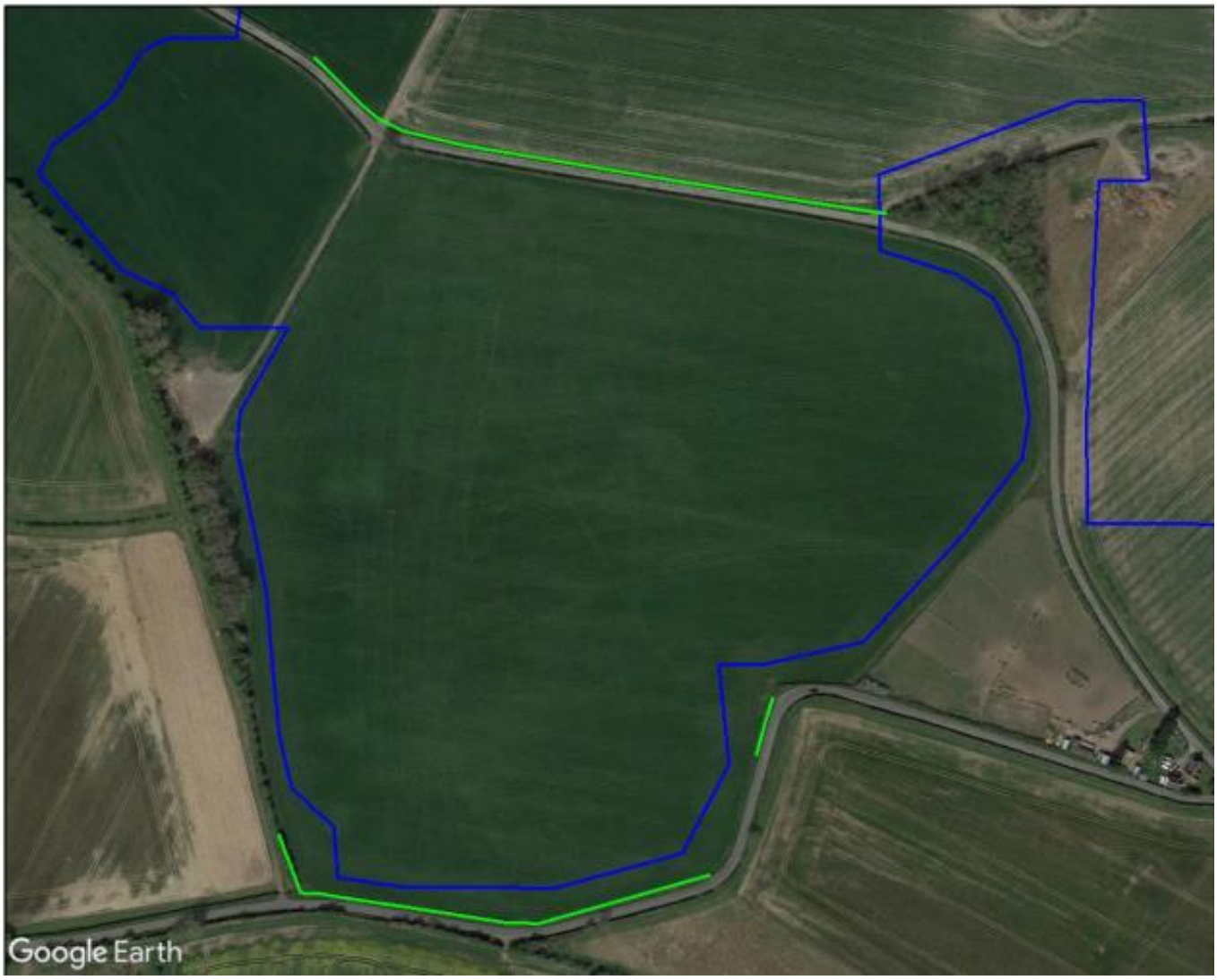
Further clarification: confirmation to be provided regarding the times of year when glare is predicted toward road receptors 15 and 56. Where glare is predicted outside the month of June, additional evidence / review of mitigating factors to be provided to demonstrate that impact is not significant.

Mabbett have reviewed the evidence of screening provided by Pager Power at the remaining impacted receptors and agree that it will be sufficient to obstruct line of sight between road users and the reflecting panels. Furthermore, Mabbett have reviewed and agree with the listed mitigating factors at each impacted receptor.

Where line of sight is not obstructed or there are insufficient mitigating factors, Pager Power have provided mitigation solutions, such as allowing vegetation to grow to sufficient height or establishing additional screening, as shown below in Figure 2.6.

Pager Power acknowledges that temporary screening is required to mitigate any impacts prior to the proposed planting reaching maturity. Mabbett consider this reasonable and in line with industry guidance.

Figure 2.6 Proposed Mitigation Screening



2.5.2.2 Glare Predicted Outside Road User's Central Field of View

Modelling predicted that solar reflections are geometrically possible from outside a road user's primary horizontal field of view at 23 of the modelled receptors.

Pager Power have conducted a desk-based review identifying any existing vegetation or infrastructure, as well as reviewed the local terrain, to determine if there is a line of sight between the road users and the reflecting panels. Additionally, Pager Power have identified if there are any mitigating factors that is applicable to receptors where glare is predicted.

Where line of sight is obstructed, Pager Power have determined a predicted impact classification of "No Impact". Where line of sight is not obstructed, Pager Power have determined a predicted impact classification of "Low Impact", with no mitigation required. Mabbett consider this reasonable and in line with industry guidance.

Mabbett note that glare is predicted toward receptor 72 although "*Reflecting panel areas are predicted to be significantly obstructed by existing vegetation See Appendix I – Figures i22 and i23*" (page 45). Figure i22 (specifically for receptor 72) is reproduced in Figure 2.7 for reference.

The Google Street View image is from June 2023. It is not confirmed what time of year the predicted glare occurs in Table 4 and this receptor is not referenced in the Appendix H where only partial road receptor results are presented. It is therefore not possible to cross-check that the existing screening provides

adequate obstruction to the line of sight. Review of other Google Street View images that hedge height may be lower outside the selected evidence (June 2023) and not provide sufficient cover.

Mabbett note that the existing vegetation at receptor 72, shown below in Figure 2.7, is sufficient to block line of sight between the road users and reflecting arrays. However, as solar reflections are predicted outside a road user's primary horizontal field of view, the residual impact is upgraded from "no impact" to "low impact" and the significance of effect is not changed.

Figure 2.7 Viewpoint at Road Receptor 72 (Proposed Development in field to the left)

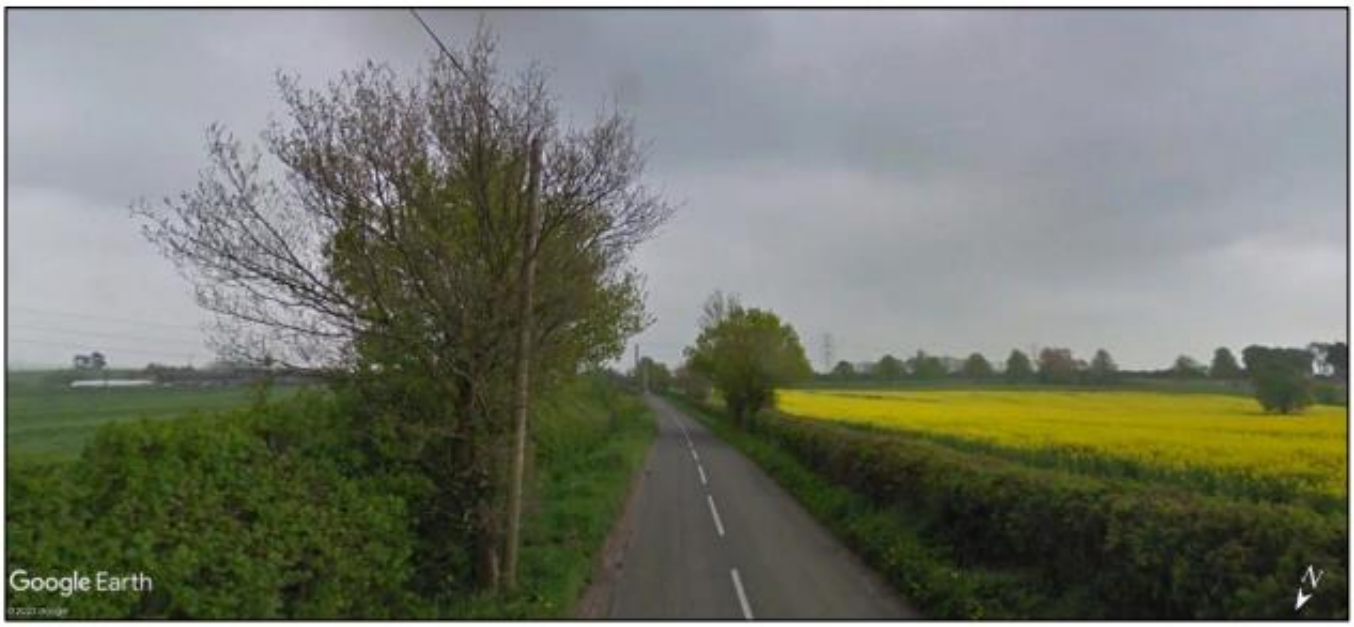
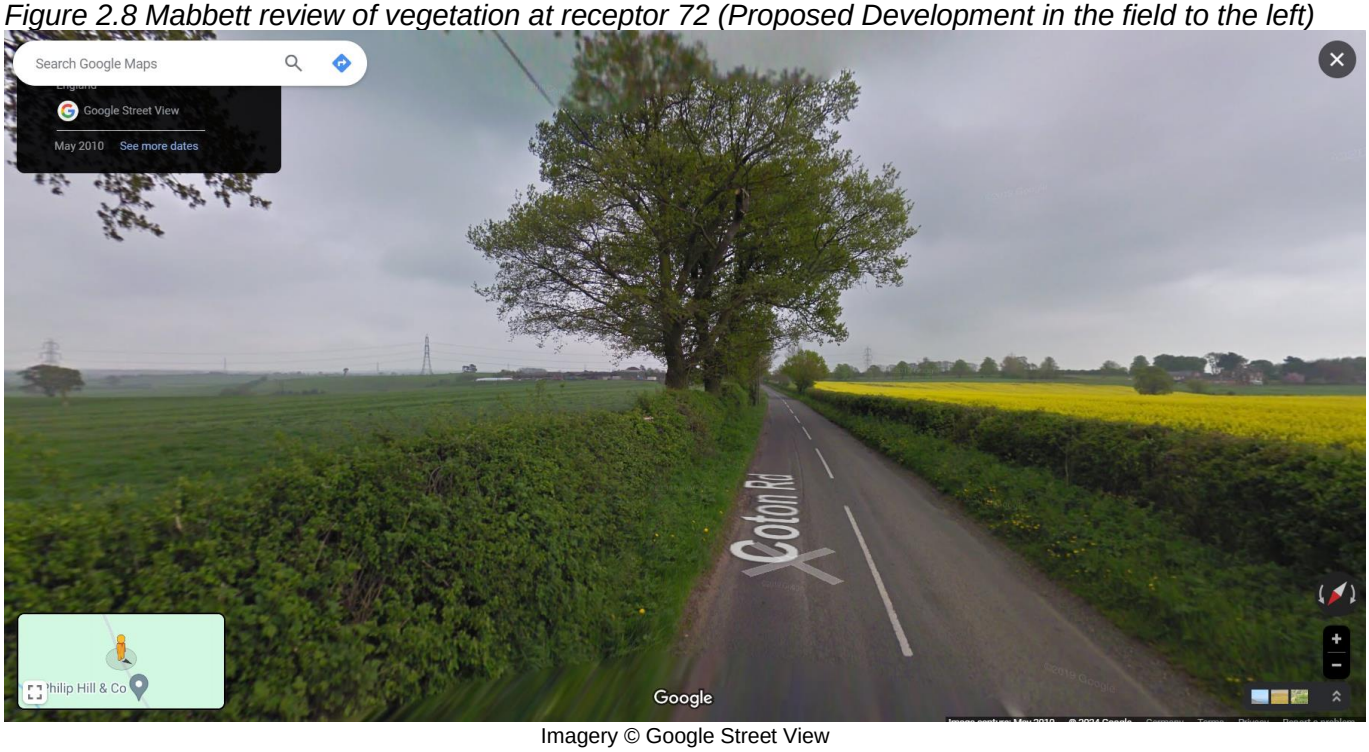


Figure 2.8 Mabbett review of vegetation at receptor 72 (Proposed Development in the field to the left)



Imagery © Google Street View

Mabbett have reviewed the evidence of screening provided by Pager Power at the remaining impacted receptors and agree that it will be sufficient to obstruct line of sight between road users and the reflecting panels. Furthermore, Mabbett have reviewed and agree with the listed mitigating factors at each impacted receptor.

2.5.3 Residential Dwellings

Pager Power state their key considerations for quantifying the impact significance for the assessed residential receptors. These include whether glare is predicted to be experienced in practice, and the duration of the predicted effects (relative to thresholds of 3 months per year and 60 minutes on any given day). Mabbett consider these to be reasonable considerations when evaluating impact significance.

Where solar reflections are predicted to be experienced from inside of a road user's primary horizontal field of view, Pager Power state that expert assessment of the following factors is required to determine the impact significance:

- *"The separation distance to the panel area – large separation distances reduce the proportion of an observer's field of view that is affected by glare.*
- *The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not.*
- *Whether solar reflections will be experienced from all storeys. The ground floor is typically considered the main living space and therefore has a greater significance with respect to residential amenity.*
- *Whether the dwelling appears to have windows facing the reflecting areas. An observer may need to look from a wide angle to observe the reflecting areas."*

Glare was predicted at 85 of the 89 modelled residential dwellings. With no mitigation, glare was predicted for less than three months of the year and less than 60 minutes on any given day for 9 residential dwellings. Unmitigated glare was also predicted for more than three months of the year but less than 60 minutes on any given day for the remaining 76 modelling residential dwellings.

Where solar reflections are geometrically possible, Pager Power have conducted a desk-based review identifying any existing vegetation or infrastructure, as well as reviewed the local terrain, to determine if there is a line of sight between residential dwellings and the reflecting panels. Additionally, Pager Power have identified if there are any mitigating factors that is applicable to receptors where glare is predicted.

Where line of sight is obstructed, Pager Power have determined a predicted impact classification of "No Impact". Where there is line of sight but sufficient mitigating factors, Pager Power have determined a predicted impact classification of "Low Impact". Pager Power have not recommended that mitigation is required.

Mabbett have reviewed the evidence of screening provided by Pager Power at the impacted residential dwellings and agree that it will be sufficient to obstruct line of sight between the relevant receptors and the reflecting panels. Furthermore, Mabbett have reviewed and agree with the listed mitigating factors at each impacted receptor.

For worst-case receptors, glare is predicted from early March to late September. Vegetation may provide sufficient screening where fully grown although cover may be less dense during early Spring (March) and early Autumn (September). Available imagery is limited near these residential dwellings, and therefore additional evidence (e.g. Google Street View or site photographs) would be beneficial to provide more robust evidence that vegetation will obstruct line of sight towards the residential dwellings.

Nonetheless, considering the screening cover and mitigating factors through other months, it is considered that the assessment conclusions are robust.

Section 3.0: Further Information

3.1 Recommended Clarifications

The following is recommended:

- Further review of the vegetation screening at road receptors 15 and 56.
    - Confirmation to be provided regarding the times of year when glare is predicted toward road receptors 15 and 56. Where glare is predicted outside the month of June, additional evidence / review of mitigating factors to be provided to demonstrate that impact is not significant.
- For predicted impacts at worst-case residential dwelling receptors, additional evidence (e.g. Google Street View or site photographs) would be beneficial to provide more robust evidence that vegetation will obstruct line of sight towards the residential dwellings at times of year where vegetation cover may be less dense (e.g. March and September. Nonetheless, considering the screening cover and mitigating factors through other months, it is considered that the assessment conclusions are robust.

3.2 Other aspects

No independent analysis of visibility or otherwise has been conducted by Mabbett. Overall, the approach of examining available imagery to draw a conclusion is reasonable if applied conservatively. There is no reason to think the approach to doing this is unreasonable; however, independent analysis is outside the scope of this review. Mabbett cannot comment on the accuracy of the conclusions around real-world visibility.