Rosefield Solar Farm

Environmental Statement

Volume 4
Appendix 5.4: Glint and Glare Assessment

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

EN010158/APP/6.4
September 2025
Rosefield Energyfarm Limited

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1. Introduction

1.1. Purpose of the report

1.1.1. This glint and glare assessment has been prepared on behalf of Rosefield Energyfarm Limited ('the Applicant') to present the likely significant glint and glare effects in relation to the Development Consent Order (DCO) application for the construction, operation (including maintenance), and decommissioning of Rosefield Solar Farm (hereafter referred to as the 'Proposed Development').

1.2. The Order Limits

1.2.1. The extent of the Order Limits is shown in **Location, Order Limits and Grid Coordinate Plans [EN010158/APP/2.1]** and the Proposed Development is described in full in **ES Volume 1, Chapter 3: Proposed Development Description [EN010158/APP/6.1]** and shown spatially on the **Works Plans [EN010158/APP/2.3]**.

1.3. The Proposed Development

1.3.1. The Proposed Development comprises the construction, operation (including maintenance), and decommissioning of solar photovoltaic ('PV') development and energy storage, together with associated infrastructure and an underground cable connection to the National Grid East Claydon Substation.

1.3.2. The Proposed Development would include a generating station with a total exporting capacity exceeding 50 megawatts ('MW').

1.3.3. The location of the Proposed Development is shown on **ES Volume 3, Figure 1.1: Location Plan [EN010158/APP/6.3]**. The Proposed Development would be located within the Order Limits (the land shown on the **Works Plans [EN010158/APP/2.3]** within which the Proposed Development can be carried out). The Order Limits plan is provided as **ES Volume 3, Figure 1.2: Order Limits [EN010158/APP/6.3]**. Land within the Order Limits is known as the 'Site'.

2. Legislative framework, planning policy and guidance

2.1. Background

2.1.1. There is no legislation of relevance to glint and glare assessments. This assessment has been undertaken with regard to the following planning policy and guidance.

2.2. National planning policy

2.2.1. National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) sets out the primary policy for decisions by the Secretary of State for nationally significant renewable energy infrastructure.

2.2.2. **Sections 2.10.102 to 2.10.106** set out general considerations for the assessment of impacts of glint and glare in relation to solar panels. Applicants are expected to identify receptors likely to have glint and glare issues, and to estimate the potential impact. The combined effect of frames and supports may also be considered. It is also mentioned that most commercially available Solar PV modules have anti-reflective finishes rendering them equal or less hazardous than objects typically found in the outdoor environment, such as bodies of water or glass buildings.

2.2.3. **Sections 2.10.134 to 2.10.136** give advice on possible mitigation measures to address the impacts of glint and glare, such as anti-reflective coating with a specified angle of maximum reflection attenuation, the implementation of screening to block reflections, or adjusting the azimuth alignment or the elevation tilt angle.

2.2.4. **Sections 2.10.158 and 2.10.159** state the need to consider the potential impact on receptors such as nearby homes, motorists, public rights of way, and aviation infrastructure (including aircraft departure and arrival flight paths), with **Section 2.10.159** stating that *"Whilst there is some evidence that glint and glare from solar farms can be experienced by pilots and air traffic controllers in certain conditions, there is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms"*.

2.3. Local planning policy

2.3.1. The Vale of Aylesbury Local Plan (VALP) 2013 – 2033 (Adopted September 2021), Policy C3 Renewable Energy, states that planning

permission will normally be granted for off-site renewable energy (including solar) where it has been demonstrated that certain criteria have been met, including that there is no significant adverse impact on local amenity, health or quality of life as a result of outlook through unacceptable visual intrusion and that there is no adverse impact on highway safety.

2.4. Guidance

2.4.1. UK Regulation (EU) 139/2014 (UK Civil Aviation Authority (CAA), 2018) sets out requirements and administrative procedures related to certified aerodromes to establish a consistent framework for aerodromes, ensuring safety and efficiency in aerodrome management and operation (including maintenance). Chapter M on visual aids for navigation (lights), **Section GM1 ADR-DSN.M.615**, requires a safety assessment to identify situations where the risk of dazzling becomes unacceptable. Dazzle due to veiling luminance should not exceed 20,000cd/m^2, which could reduce the visual perception of pilots during approach and rolling, or of air traffic controllers supervising aircraft operations on, and close to the runway. Surprise (flash) effects should not be avoided on pilots at touchdown.

2.4.2. Guidance Note GA1 (Combined Aerodrome Safeguarding Team (CAST), 2024) recommends considering glint and glare over a wide area, covering visual reference points and other important points like the circuit. It also states that solar reflections with potential to cause after-image ("yellow glare") are of considerable concern, especially for a pilot on approach. It recommends fixed solar panels, instead of tracking systems, due to the certainty over the range of times when glare is possible.

2.4.3. Aerodrome Safeguarding Advice Note 5 (CAST, 2024) provides high-level guidance regarding safety considerations (Air Traffic Service personnel and pilots) and study areas, but it does not prescribe a specific methodology for assessing glint and glare effects. It recommends early consultation with the aerodrome authority. A glint and glare assessment should be conducted for solar energy developments within 5km from an aerodrome, but it could be considered out 10km and beyond in exceptional circumstances. Safety should be considered for the Air Traffic Services personnel at the control tower, especially within the visual control room, pilots (on approach, in a visual circuit or on the ground, departing and taxiing aircraft), and Communication, Navigation, and Surveillance equipment. Panels close to the ends of a runway should accommodate an Energy Failure After Take-off area, which extends 45 degrees either side from the extended runway centreline.

2.4.4. Many aviation stakeholders refer to the US Federal Aviation Administration (FAA) Interim Policy 'FAA Review of Solar Energy System Projects on Federally Obligated Airports 2013' (FAA, 2013). This document

recommends undertaking technical assessments using the Solar Glare Hazard Analysis Tool (Sandia National Laboratories, 2016).

2.4.5. This assessment has also been carried out in accordance with industry best practice and two documents published by Pager Power. Firstly, the fourth edition of the Solar Photovoltaic and Building Development Glint and Glare Guidance (Pager Power, 2022), which includes guidance for aviation and railway operations, road users, and dwellings. Secondly, the second edition of the Solar Photovoltaic Glint and Glare Guidance (Pager Power, 2018), which includes methodology for the assessment of helipad operations.

2.4.6. At the time of undertaking this assessment, there was no published guidance on the effects of glint and glare on bridleways, public rights of way (PRoW) or fields with grazing animals.

3. Assessment methodology

3.1. Glint and glare definition

3.1.1. As per the definitions set out in **NPS EN-3**, **Paragraph 2.10.102**, glint is a momentary flash of bright light typically received by moving receptors or from moving reflectors.

3.1.2. Glare is a continuous source of bright light typically received by static receptors or from large reflective surfaces.

3.1.3. The term 'solar reflection' is used in this report to refer to both reflection types, glint and glare.

3.2. Methodology

3.2.1. The methodology for this glint and glare assessment is as follows:

- Identification of key sensitive receptors in the area surrounding the Proposed Development;
- Geometric analysis to determine if solar reflections will be visible from each receptor. Where the panels are not visible, no impact is possible upon the receptor;
- Estimation of the annual Solar Glare Ocular Hazard Plot (SGOHP) using a Solar Glare Hazard Analysis Tool where solar reflections are visible;
- Determination of the significance of the potential effects upon each receptor, following the specific criteria for each type of receptor with respect to published studies and guidance, and considering the SGOHP and any relevant mitigating factors; and
- Establish whether these impacts will cause significant effects which may require additional mitigation.

3.3. Solar glare ocular hazard metric (SGOHP)

3.3.1. Glint and glare is evaluated using the SGOHP, which is the standard for measuring the ocular impact of any proposed solar energy system. It includes two metrics: The Potential for After-image and the potential for Permanent Eye Damage. The visual impact is a function of the retinal irradiance (brightness) and the subtended angle (size) of a glare source, and it quantifies the potential to cause an after-image in the retina, which would reduce the visual performance. SGOHP is classified as (**Figure 3.1**):

- Green glare: Low potential to cause after-image;

- Yellow glare: Potential to cause an after-image; and
- Red glare: Potential for permanent eye damage.

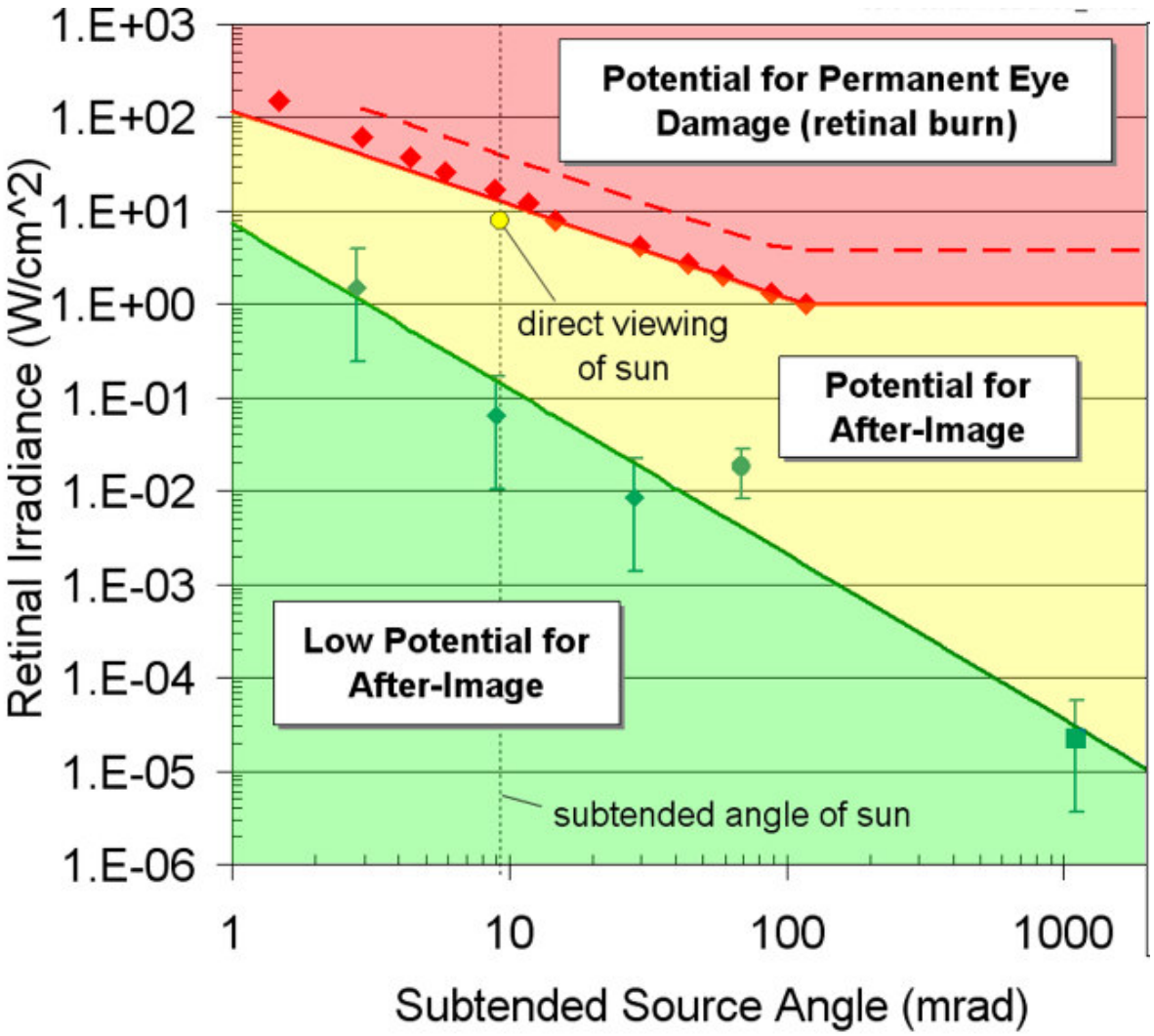

Figure 3.1: Solar glare ocular hazard plot

3.4. Technical assumptions and limitations

3.4.1. The technical assessments have been undertaken with the following assumptions:

- Clear and sunny skies for the entire year, as a highly conservative worst-case scenario;
- Fixed intensity within the cone of reflection, which is defined by the slope error of the Solar PV modules surface material;
- Solar panels being evenly distributed across the Solar PV areas;

- No consideration for Solar PV overshadowing between rows of panels, gaps between them or supporting structures;
- Times are denoted in standard time with no daylight savings;
- Only the front part of the Solar PV modules will reflect the solar rays. The reverse of the panels and other parts of the solar system (i.e. frames or supports) will have a matt finish and will therefore not cause solar reflections; and
- Terrain elevation heights have been interpolated based on Ordnance Survey (OS) Terrain 50m Digital Terrain Model (DTM) data.

3.4.2. The technical assessments in this report have been undertaken using the following assumptions for the retinal glare hazard metric:

- Ocular transmission coefficient 0.5;
- Pupil diameter 0.002m; and
- Eye focal length 0.017m.

4. Evaluation criteria

4.1. Impact levels for approaching aircrafts

4.1.1. The location of the solar reflection is more important than the duration of reflection on the receptors, as the receptor is fast-moving. The time of visible reflections may also be relevant in relation to operational schedules at the receptor. Solar reflections have no impact when receptors are not in use.

- Green glare or yellow glare with significant mitigating factors: Low impact;
- Yellow glare without significant mitigating factors: Moderate impact; and
- Red glare: High impact.

4.1.2. The FAA Interim Policy (FAA, 2013) allows only for green glare along the final approach.

4.2. Impact levels for Air Traffic Control Towers (ATCT)

4.2.1. The ATCT is the most sensitive aviation receptor, and the FAA Policy 2021 (FAA, 2021) recommends avoiding ocular impacts to the ATCT cab. However, a more pragmatic approach is included in more recent guidance (Pager Power, 2022):

- Green glare with significant mitigating factors: Low impact;
- Green glare without significant mitigating factors or yellow glare: Moderate impact; and
- Red glare: High impact.

4.2.2. The FAA Interim Policy (FAA, 2013) requires no glare to the ATCT.

4.3. Impact levels for road receptors

4.3.1. The angle of glare instances (i.e. the angle between the reflection and the receptors line of sight) has more of an impact on road users than the ocular hazard posed by the duration of glare, as it will become a distraction and obscure the sight of drivers, rather than a health or ocular hazard. As such, the following categorisations of impact apply regardless of the colour identified in the SGOHP assessment:

- Effective mitigating factors: Low impact.
- Partial mitigating factors: Moderate impact.
- No mitigating factors:

  - Reflections not in front of view[1]: Moderate impact;
  - Reflections in front of view: High impact.

4.4. Impact levels for railway receptors

4.4.1. The angle of glare instances (i.e. the angle between the reflection and the receptors line of sight) has more of an impact on railway receptors than the ocular hazard posed by the duration of glare, as it will become a distraction and obscure the sight of drivers, rather than a health or ocular hazard. As such, the following categorisations of impact apply regardless of the colour identified in the SGOHP assessment:

- Effective mitigating factors: Low impact.
- Partial mitigating factors: Moderate impact.
- No mitigating factors:
  - Reflections not in front of view: Moderate impact;
  - Reflections in front of view: High impact.

4.5. Impact levels for building receptors

4.5.1. For buildings, the main factor is the frequency of glare, both daily and annually, more than the level of SGOHP. As such, the following categorisations of impact apply regardless of the colour identified in the SGOHP assessment:

- Reflections significantly screened or mitigated: Low impact.
- Reflections not screened/mitigated[2]:
  - Frequency < 90 hours/year and <60 min/day: Low impact;
  - Frequency < 90 hours/year or <60 min/day: Moderate impact; and
  - Frequency > 90 hours/year and >60 min/day: High impact.

4.6. Impact levels for other receptors

4.6.1. There is no specific guidance on glint and glare on PRoW or bridleways. Glare should be avoided where possible, but it is generally considered that significant effects upon pedestrians on a PRoW or riders on bridleways are not possible. The ‘Advice on solar farms near routes used by equestrians’ (The British Horse Society, 2025) states that ‘any reflection is unlikely to be a direct problem to horses or equestrians because of the angles and distances involved and because the surface has a dull sheen

[1] The Applicant considers in front of view to be 10 degrees from the line of sight.
[2] 90 hours per year equate to three months (90 days) of 60 minutes per day.

rather than glare even on a bright day.' It also states that the BHS 'has no evidence of glint and glare from solar panels and no evidence of horses reacting to it or of it being detrimental to the health and wellbeing of horses.' The typical density of pedestrians and riders is low in a rural environment. There is little safety hazard associated with reflections towards an observer on a footpath or a bridleway, and any resultant effect is much less serious than, for example, on the road network. Furthermore, pedestrians or horses have more freedom to move beyond the solar reflection with little impact upon safety or amenity.

4.6.2. In the absence of specific glint and glare evaluation criteria for helicopters, impact levels are assimilated to those of approaching aircrafts.

4.7. Mitigating factors

4.7.1. Mitigating factors include, but are not limited to, the following:

- The reflections occur in the same direction to direct sunlight. In these cases, the user is likely to be prepared and adapted for glare;
- Significant screening (i.e. trees or hedgerows, deciduous or with gaps). This increases the likelihood of reflections will be less intense and smaller;
- Times of the day/year when reflections are visible. If the reflections do not overlap with the operational times of the receptor (i.e. use of a room or rush hour on a road), there is usually no impact;
- Type of road (major national, national, regional or local). The denser the traffic, the higher the risk of an accident;
- Length of the path (i.e. road/railway) affected by glare. The longer the path, the higher the risk of an accident;
- Duration of exposure. Continuous exposure may be more severe than one spread over time;
- Glare angle between the reflection and the line of sight. Glare is more intense close to the line of sight; and
- For buildings, oblique reflections impacting a window are less likely to be seen from inside.

4.8. Impact significance and mitigation

4.8.1. The significance and the need for mitigation depend on the level of impact:

- No impact: Reflection not visible. No mitigation required;
- Low impact: Reflection visible but of limited relevance (i.e. significantly screened). No mitigation recommended;

- Moderate impact: Reflection visible but not under worst-case conditions. Mitigation recommended; and
- Major impact: Reflections visible under worst-case conditions, which implies a significant impact. Mitigation and consultation required.

4.8.2. The reflective capacity of Solar PV modules, especially those designed with anti-reflective glass or produced with anti-reflective coating, have a reflective capacity equal or less hazardous than elements already in the environment such as bodies of water, glazed element in buildings (i.e. windows or curtain walls), parking lots, metal structures, wet roads or even snow on the ground. This is recognised in **NPS EN-3** and FAA Policy 2021 (FAA, 2021).

5. Proposed Development location and details

5.1. Reflector areas

5.1.1. **Annex A, Figures A.1 to A.5** show the proposed Site layout, in line with **ES Volume 3, Figure 3.5: Zonal Masterplan [EN010158/APP/6.3]**, which includes three large reflector areas with Solar PV modules (shown in light blue):

- Parcel 1 to the west;
- Parcel 2 (north and south) at the centre;
- Parcel 3 to the east. A darker shade of blue along the eastern border of this parcel indicates an area under risk of flooding from Claydon Brook Tributary.

5.1.2. This layout assumes a worst-case scenario for the purposes of this assessment. Discreet elements (Compounds, Rosefield Substation, BESS, and BoSS) have not been included in this layout, as there is flexibility in their location within certain areas. Instead, those areas have been considered as fully dedicated to Solar PV modules. This is in line with **Table 5.3** in **ES Volume 1, Chapter 5: Approach to the EIA [EN010158/APP/6.1]**.

5.1.3. All reflector areas feature the following characteristics:

- Fixed panels (no solar tracking system);
- Azimuth angle 180 degrees from north (due south);
- Elevation angle between 10 and 30 degrees;
- Minimum height AGL (above ground level) of 0.8m and maximum of 3.5m. For the purpose of this report, the middle height has been used (2.15m AGL). In areas under risk of flooding in Parcel 3, the Solar PV modules will be raised one additional metre. This is in line with **ES Volume 3, Figure 3.1A: Height Parameters [EN010158/APP/6.3]** and secured within the **Design Commitments [EN010158/APP/5.9]**; and
- Smooth glass with anti-reflective coating, with a slope error of 8.43mrad.

5.2. Embedded mitigation

5.2.1. The Proposed Development includes embedded mitigation (**Annex A, Figures A.2 and A.3**) consisting of screening in the form of vegetation to provide a barrier against glare, in order to ensure potential impacts are within recommendation range for receptors on the ground. Newly planted hedgerows will be approximately 0.6m to 0.8m high in Year 1. Once established around Year 10, these elements will have a height of 3.5m

AGL. Vegetation may provide varying levels of cover, immediately after planting, during winter, and after maintenance (i.e. pruning). For this assessment, only screening scheduled for early planting as set out in the **Outline Landscape and Ecological Management Plan [EN010158/APP/7.6]** has been considered. This will ensure significant coverage when the Solar PV modules are put in place.

6. Assessment receptors and obstructions

6.1. Study areas

6.1.1. There is little formal guidance with regard to the maximum distance at which glint and glare should be assessed. However, based on industry best practice and past assessment experience, two study areas have been defined and used in this assessment (**Annex A, Figure A.1**). These areas are defined by the maximum distance from the proposed Solar PV modules.

6.1.2. The first study area applies to aviation receptors and comprises up to 10km from the Solar PV modules.

6.1.3. The second study area applies to ground-based receptors (residential dwellings, roads, railways, PRoW and bridleways) and comprises up to 1km from the Solar PV modules. This study area is smaller than the above due to the reduced visibility (shielding by obstructions) and lower impact that occurs with distance (smaller size of reflections) for ground-based receptors.

6.1.4. This assessment has only considered receptors within the study areas and with potential view of the Solar PV modules.

6.2. Aviation receptors

6.2.1. The location of aviation receptors is presented in **Annex A, Figure A.1**. Seven aerodromes, airstrips and helistrips have been identified within the 10km study area (**Table 6.1**).

Table 6.1: Aviation infrastructures

Code	Name	Runway
RN1	Finmere Aerodrome GB-0077	10/28
RN2	Thornborough Grounds Airstrip GB-0208	04/22
RN3	Pear Tree Farm GB-0213	07/25
RN4	Bicester Aerodrome	16/34
RN5	Bicester Aerodrome	06/24
RN6	Bernwood Farm Airstrip GB-09015	09/27
RN7	Bernwood Farm Airstrip GB-09015	05/23
RN8	Field Farm Airstrip GB-0941	15

Code	Name	Runway
HP1	Field Farm Helistrip GB-0793	-

6.2.2. 12 active approaching flying paths (**Table 6.2** and **Annex A, Figure A.1**) with significant views of the proposed solar reflector areas have been selected in relation to the aviation infrastructures in **Table 6.1**.

6.2.3. Bernwood Farm (**RN6** and **RN7**) has been excluded from the assessment as the tenancy is being surrendered and the airstrip will not be in use during the construction, operation (including maintenance) and decommissioning of the Proposed Development. Impacts on the approaches to Field Farm Airstrip (**RN8**) are not geometrically possible as it is located to the south and the low tilt angles for the Solar PV modules.

Table 6.2: Flying paths

Code	Name
FP01	Finmere Aerodrome runway 10
FP02	Thornborough Grounds Airstrip runway 04
FP03	Pear Tree Farm runway 07
FP04	Bicester Aerodrome runway 16
FP05	Bicester Aerodrome runway 06
FP06-FP12	Field Farm Helistrip GB-0793

6.2.4. Flying paths generally represent planes approaching a runway for landing. The standard flying path, as defined in the FAA Interim Policy (FAA, 2013), is a two-mile approach in line with the runway with a three degrees gliding slope and a 15.4m threshold height on landing. Departing aircrafts are not included because after taking off, pilots will be looking up towards the sky and not down at elements on the ground.

6.2.5. In case of helipads, all possible approaching paths are assessed unless specified or requested otherwise. This includes two-mile approaches from all directions, with a 10 degrees descent path and a 2m threshold height on landing (approximate eye level of a helicopter pilot) over the helipad centre point.

6.2.6. Pilots are assumed to have a field of view of 30 degrees vertically and 50 degrees horizontally from the direction of travel.

6.2.7. An ATCT at Bicester Aerodrome has also been considered in the assessment. The observation height has been estimated at 8m AGL.

6.3. Road and railway receptors

6.3.1. Only local roads were found within the 1km study area. The most relevant of these roads can be found in **Table 6.3** and **Annex A, Figures A.4 and A.5**. Smaller roads leading to individual dwellings are not considered. Based on the significant criteria in Solar Photovoltaic and Building Development Glint and Glare Guidance from 2022, local roads need not be included in the detailed assessment because only low impacts would be found in a worst-case scenario, which would have no significant effects. This is because traffic volumes and speeds are likely to be relatively low, resulting on low risk on local traffic. Therefore, an overview assessment has been undertaken on these roads.

Table 6.3: Road receptors

Code	Name	Type
RD1	School Hill	Local
RD2	Addison Road	Local
RD3	Orchard Way	Local
RD4	Claydon Road	Local
RD5	Botyl Rd./St. Marys Rd.	Local
RD6	East Claydon Road	Local
RD7	Hogshaw Road	Local

6.3.2. Three railway sections are present within the 1km study area (**Table 6.4** and **Annex A, Figure A.4).** Both directions of travel have been considered on these sections, with a driver eye height of 2.75m above the railway tracks.

Table 6.4: Railway receptors

Code	Name
RW1	High Speed 2 (HS2)
RW2	East West Rail
RW3	Provision for future local services

6.4. Building receptors

6.4.1. In built-up areas with multiple layers of buildings, only the outer buildings have been considered. Where groups of buildings share the same potential impact in terms of glint and glare, only one building has been selected as representative of the rest. Therefore, 39 buildings (mostly dwellings) have been selected within the 1km study area (**Table 6.5** and **Annex A, Figures A.4 and A.5**).

6.4.2. The analysis has focused on ground floor spaces, as it is typically considered the main living space and has a greater significance with respect to residential amenity and views from the first floor. The observation point is set at 1.8m AGL.

Table 6.5: Building receptors

Code	Name	Location
BL01	Old Dairy	Steeple Claydon
BL02	Pond Farm	Steeple Claydon
BL03	Calvert Cottages	Calvert
BL04	Calvert Cottages	Calvert
BL05	Rosehill Farm	Steeple Claydon
BL06	Shepherd's Furze Farm	Steeple Claydon
BL07	Knowlhill Farm	Middle Claydon
BL08	Finemerehill House	Quainton
BL09	Dry Leys Farm	Quainton
BL10	The Ox House	Quainton
BL11	Hill Cottage Farm	Quainton
BL12	Hogshaw Farm	Quainton
BL13	Oak Cottages	Hogshaw
BL14	Borshaw Farm	Hogshaw
BL15	Unknown	Hogshaw
BL16	Staplers Piace	Granborough

Code	Name	Location
BL17	Berry Lees Farm	East Claydon
BL18	Tuckey Farm	Winslow
BL19	Station House	East Claydon
BL20	Sion Hill Farm	East Claydon
BL21	House in Churchway	East Claydon
BL22	Whitehouse Farm	East Claydon
BL23	Bernwood Farm	Botolph Claydon
BL24	Touchwood	Botolph Claydon
BL25	2 Botyl Road	Botolph Claydon
BL26	12 Botyl Road	Botolph Claydon
BL27	Botyl Road	Botolph Claydon
BL28	1-23 Orchard Way (odd)	Botolph Claydon
BL29	Muxwell Farm	Botolph Claydon
BL30	Claydon House	Middle Claydon
BL31	Catherine Farm	Middle Claydon
BL32	Blackmore Hill Farm Cottages	Middle Claydon
BL33	4-7 Catherine Cottages	Middle Claydon
BL34	Winters Tale Farmhouse	Middle Claydon
BL35	13-17 Brackley Lane	Calvert
BL36	South Lodge	Middle Claydon
BL37	The Leys Cottage	Granborough
BL38	Rookery Farm	Granborough
BL39	Ricall Farm	Granborough

6.5. Other receptors

6.5.1. Several PRoW and bridleways are present within the 1km study area (**Annex A, Figures A.4 and A.5**). These include two Long Distance Route receptors: Bernwood Jubilee Way (**PW1**) and North Buckinghamshire Way/Midshires Way (**PW2**). At the time of undertaking this assessment, there was no published guidance in relation to this type of receptors. Therefore, PRoW and bridleways have been considered in an overview assessment.

6.5.2. Padding fields at Hogshaw Farm have been included in the assessment (**FL1** in **Annex A, Figure A.5**) in addition to buildings in Hogshaw Farm's complex (**BL12** in **Table 6.5**) as a response to concerns expressed by the owners of the farm in the Phase Two Consultation. An overview assessment has been undertaken due to absence of glint and glare guidance on grazing animals on fields.

6.6. Obstruction elements

6.6.1. Large elements in the landscape can act as barriers and block solar reflections from view. As a worst-case, only permanent elements of significant size have been included in the analyses. These comprise woods and structures (**Annex A, Figures A.2 and A.3**).

6.6.2. Ten large existing woods within the 1km study area have been identified and included in the assessments (**Table 6.6** and **Annex A, Figures A.2 and A.3)**. These are mostly Local Wildlife Sites (LWS) and Sites of Special Scientific Interest (SSSI). Other smaller woods of significant mass and density have also been included.

Table 6.6: Existing woods

Code	Name	Height AGL (m)
W01	Unknown	8
W02	Shrubs Woods (LWS)	8
W03	Decoypond Wood (LWS)	8
W04	Sheephouse Wood (SSSI)	8
W05	Home Wood (LWS)	8
W06	Romer Wood (LWS)	8
W07	Greatsea Wood (LWS)	8
W08	Balmore Wood (LWS)	8

Code	Name	Height AGL (m)
W09	Runt's Wood (LWS)	8
W10	Finemere Wood (SSSI)	8
Other	Unnamed	8

6.6.3. Structures and small elements in the landscape have generally not been considered in the analyses. However, a number of larger structures such as farm barns have been included where these could have a significant shielding effect on the solar reflections for particular receptors (**Annex A, Figures A.2 and A.3**).

7. Nearby solar projects

7.1.1. Four solar farms have been identified in close proximity to the Proposed Development, which could potentially result in cumulative effects on the receptors identified when considered together with the Proposed Development. These are listed in **Table 7.1** and their locations presented in **Annex A, Figures A.1 to A.5**.

Table 7.1: Nearby solar projects

Code	Name	Anticipated generating capacity (MW)	Notes
SF01	Longbreach Solar Farm (Planning ref. 25/01865/APP)	49.9	Pending decision
SF02	Fox Covert Solar Farm	22	Constructed
SF03	Tuckey Solar Farm	25	Approved
SF04	Calvert Solar Farm	13	Pending decision

8. Overview assessments

8.1. Roads

8.1.1. Drivers travelling east along School Hill (**RD1**) may see solar reflections from solar reflectors in Parcel 1 early in the mornings around the summer months[3], especially from the bridge over the railway line (**RW1**). Further east, solar reflections will be significantly screened by the existing hedges and trees on the southern edge of the road. Drivers travelling west will not receive solar reflections from the back of the Solar PV modules. **Low impact is predicted**.

8.1.2. Drivers travelling south along Addison Road (**RD2**) will not receive solar reflections from the back of Solar PV modules. Solar reflections on drivers travelling north are not possible. **No impact is predicted**.

8.1.3. Drivers travelling along Orchard Road (**RD3**) may receive limited solar reflections from Solar PV modules on the northern edges of Parcel 1 around the summer months. These reflections would be seen early in the morning for drivers travelling east and late in the evening for drivers travelling west. Solar reflections will be significantly screened by existing hedges and trees along the southern edge of the road. As the reflections occur in the same direction as direct sunlight, the driver eyesight is already adapted to bright sunlight, reducing the potential impact. **Low impact is predicted**.

8.1.4. Drivers travelling north along Claydon Road (**RD4**) will not see solar reflections within their field of view due to the low tilt angle of the Solar PV modules, which will only reflect the northern sky. Drivers travelling south will not receive solar reflections form the back of Solar PV modules. **No impact is predicted**.

8.1.5. Drivers on Botyl Road and St. Marys Road (**RD5**) will not receive solar reflections within the field of view due to the distance to the solar reflectors, the direction of travel and the significant screening from houses, trees and hedges. **No impact is predicted**.

8.1.6. Drivers on East Claydon Road (**RD6**) will not receive solar reflections from the back of the Solar PV modules in Parcel 3. **No impact is predicted**.

8.1.7. Drivers travelling west along the western section of Hogshaw Road (**RD7**) may see solar reflections from Parcel 2 north. These reflections would be visible late in the evenings around the summer months, they would be simultaneous with direct sunlight, and they would be significantly screened

[3] From March to September.

by existing trees and hedges along the road. Drivers on the eastern section of the road and drivers travelling east will not receive solar reflections. **Low impact is predicted**.

8.1.8. Overall, the roads analysed will receive **low or no impacts** in terms of glint and glare (**Table 8.1**). The traffic volumes and/or speeds on local roads are likely to be relatively low, and any solar reflections from the Proposed Development that are experienced by a road user would be considered of **low impact** in the worst-case scenario. This will result in **no significant adverse** effects, and therefore no additional mitigation is required.

Table 8.1: Summary of road analysis

Code	Name	Predicted Impact
RD1	School Hill	Low
RD2	Addison Road	None
RD3	Orchard Way	Low
RD4	Claydon Road	None
RD5	St. Marys Road	None
RD6	East Claydon Road	None
RD7	Hogshaw Road	Low

8.2. PRoW and bridleways

8.2.1. Several PRoW and bridleways run through and around the Site.

8.2.2. Professional experience suggests that significant effects to pedestrians or observers along PRoW due to glint and glare from solar developments are not possible. The sensitivity of the receptors (in terms of amenity and safety) is low because:

- Effects would typically coincide with direct sunlight. The sun is a far more significant source of glare as it is more intense than reflected sunlight. Observers also have a higher tolerance to glare when their eyes are adapted to direct sunlight;
- The reflection intensity from Solar PV modules is similar to still water, and significantly less than reflections from glass or steel, which is frequently a feature of the outdoor environment surrounding PRoWs. Therefore, the reflections are likely to be comparable to those from

common outdoor sources whilst navigating the natural and built environment on a regular basis;

- The typical density of pedestrians, cyclists and/or horse riders on a PRoW is low in a rural environment, such as the location of the Proposed Development;
- Any resultant effect is much less serious and has far lesser consequences than, for example, solar reflections experienced by drivers on roads or the railway where the resultant impacts of a solar reflection can be much more serious to safety;
- Glint and glare effects towards observers on a PRoW are transient in time and location, and observers can move beyond the solar reflection zone with ease with little impact upon safety or amenity; and
- Most solar reflections are likely to be screened by existing and proposed vegetation, and the effectiveness will increase in time as vegetation grows.

8.2.3. Overall, the PRoW and bridleways analysed will receive **low or no impact** in terms of glint and glare. This will result in **no significant adverse** effects, and therefore no additional mitigation is required.

8.3. Other receptors

8.3.1. A geometric assessment of solar reflections from Parcel 2 north shows that these could be visible from the western padding fields at Hogshaw Farm (receptor **FL1**). These reflections will be visible for less than half an hour, immediately before sunset during the summer months, and they will be simultaneous with direct sunlight from the setting sun. Proposed embedded mitigation in the form of early planting up to 3.5m high on the eastern boundary of Parcel 2 north will provide significant screening to those fields to block solar reflections. Although the effectiveness of this screening may be temporarily reduced in the early years, **low impact** is predicted.

8.3.2. Although there is no specific guidance regarding glint and glare to grazing animals on fields, the predicted frequency of glare would be within recommendation for other sensitive ground-based receptors such as dwellings. Therefore, it can be considered that potential solar reflections upon these fields will result in **no significant adverse** effects, and no additional mitigation is required.

9. Technical assessments

9.1. Background

9.1.1. Two scenarios were considered using the minimum and maximum tilt values for the Solar PV modules: 10 and 30 degrees. The elevation angle for the Solar PV modules will be constrained between these two tilt values, as specified in **ES Volume 1, Chapter 3: Proposed Development Description [EN010158/APP/6.1]** and secured via the **Design Commitments [EN010158/APP/5.9]**.

9.1.2. The results of the technical assessment are presented in **Annex B**. The output of this analysis is limited to receptors receiving solar reflections within the field of view. The receptors omitted in the output will receive no glare impacts.

9.1.3. The graphs show the visible reflections throughout the year and their level of glare as perceived from the receptor. For route receptors (i.e., flying paths, railways or roads), every instance in time represents the highest level of glare along the entire length of the receptor analysed. These graphs also show when these reflections are visible (days/months and times). Times are standard clock time with no summer savings.

9.1.4. It should be noted that the assessment assumes worst-case conditions (full sunny weather throughout the year and no cloud coverage). The risk of glare, in reality, will be significantly lower than predicted. For ground-based receptors, reflections will occur very close to direct sunlight from a viewer's point of view due to the timings (dawn and sunset) and the low tilt (between 10-30 degrees). This means that the reflection will not catch the viewer unprepared and any potential impacts will be less intense.

9.2. Results for aviation receptors

9.2.1. The results show green glare early in the morning (between 5AM and 7AM) in both scenarios on the following receptors (**Annex B, Table B.1**):

- Pear Tree Farm runway 07 (**FP03**);
- Bicester Aerodrome runway 06 (**FP05**); and
- Field Farm Helistrip (**FP06 to FP12**).

9.2.2. These levels of glare will result in **low impact** with **no significant adverse** effects, which would therefore require no additional mitigation.

9.2.3. No solar reflections will be visible from the ATCT at Bicester Aerodrome (**AT1**).

9.3. Results for railway receptors

9.3.1. The results show marginal green glare on **RW01** for trains travelling south early in the morning (between 6AM and 7AM) in the 10 degrees tilt scenario (**Annex B, Table B.2**), and no solar reflections in with 30 degrees tilt. As these reflections will have large glare angles from the line of sight, the impact will be **low**. This impact will have **no significant adverse** effects and therefore requires no additional mitigation.

9.4. Results for building receptors

With regards to buildings, the frequency of solar reflections is the key parameter. The analysis shows that none of the 39 buildings assessed will exceed the recommended limits of 60 minutes per day and 90 hours per year (**Annex B, Table B.3**). This will result in **low impact** with **no significant adverse** effects, which will therefore require no additional mitigation.

10. Cumulative assessment of nearby solar projects

10.1. Background

10.1.1. The identified four nearby solar projects do not qualify as Nationally Significant Infrastructure Projects (NSIPs) due to their anticipated generation capacity (less than 50MW). Their size implies that potential cumulative adverse effects on receptors in the study area are less likely.

10.1.2. It should be noted that these projects are likely to include embedded mitigation measures to avoid significant adverse effects on receptors on their own.

10.1.3. None of the typical glare sources in rural environments are causing adverse instances of glint or glare around the Site at present, although it is considered feasible that new (natural) glint and glare sources could be introduced to the study area in the future. These sources include:

- Rainwater collected on roofs, fields, and roads;
- Bodies of water e.g., ponds/lakes/rivers; and
- Building/greenhouse windows.

10.2. Ground-based receptors

10.2.1. Cumulative effects are only possible where study areas overlap. In the case of ground-based receptors, this implies another project within 2km that has a 1km study area.

10.2.2. Longbreach Solar Farm (**SF01**) can potentially cause significant effects on **BL15**, **BL16** and **RD7**. Glare from the Proposed Development on **BL15** and **BL16** is very low, and it is predicted to be marginal on the eastern part of **RD7**. Therefore, cumulative effects are likely to be **not significant**.

10.2.3. Fox Covert Solar Farm (**SF02**) does not share ground-based receptors with the Proposed Development.

10.2.4. Tuckey Solar Farm (**SF03**) could have significant effects on **BL17**, **BL18**, and **RD6**. As the Proposed Development will have no impacts on these receptors, no cumulative effects are possible. **SF03** will have no impacts on **BL19**, as it is shielded by existing woods, and on **BL20**, as it is far south. Therefore, no significant cumulative effects will affect these two properties.

10.2.5. Calvert Solar Farm (**SF02**) only shares the HS2 railway (**RW1**) with the Proposed Development. **SF02** is unlikely to impact **RW1**, as it is located on a slope oriented southwest, away from the railway line. As impacts

from the Proposed Development are also marginal, no significant cumulative effects are predicted.

10.2.6. Overall, cumulative effects on ground-based receptors will be **not significant**.

10.3. Aviation receptors

10.3.1. Cumulative effects on the identified aviation receptors are theoretically possible as the four nearby solar projects are within the 10km study area.

10.3.2. Very limited cumulative effects are predicted on Finmere Aerodrome (**FP01**) from **SP01**, **SP02** and **SP03**, and on receptors **FP03** to **FP12** from **SP04**.

10.3.3. The glint and glare impacts on aviation receptors from the Proposed Development are low. The limited size of nearby solar projects and large distances to these receptors are also predicted to result in low impacts. The combined effects are predicted to be **not significant**.

11. Conclusions

11.1.1. This assessment has considered sensitive receptors around the Site consisting of flying paths, roads, railway, buildings, PRoW, bridleways and fields.

11.1.2. Embedded mitigation, consisting of vegetation screening 3.5m AGL, has been included within the assessment. The assessment results conclude that the Proposed Development will only have **low** impact on certain identified sensitive receptors, and all effects are predicted to be **not significant**.

11.1.3. Cumulative effects from nearby solar projects are also predicted to be **not significant**.

12. References

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Annex A: Analysis elements

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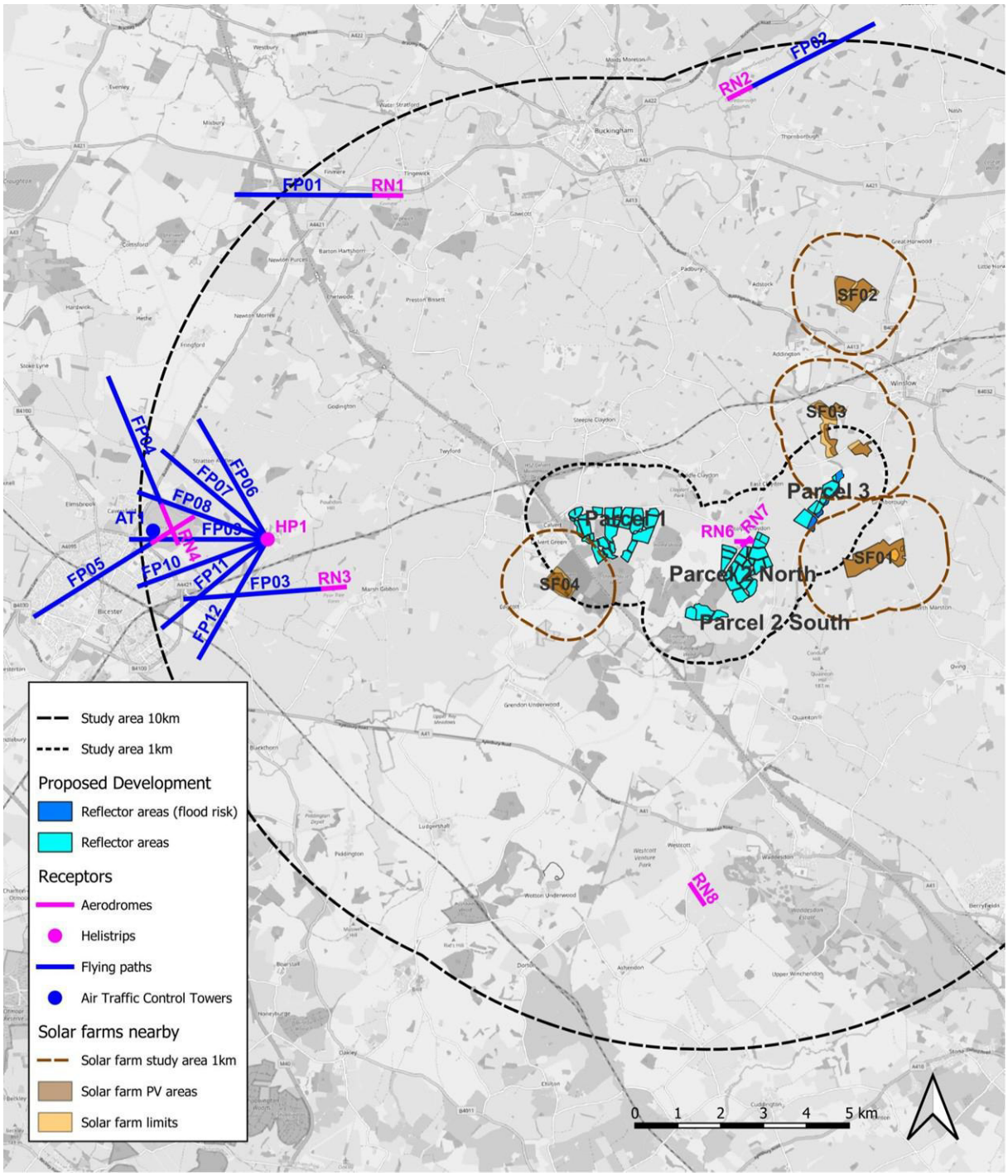

Figure A.1: Analysis elements within the 10km study area

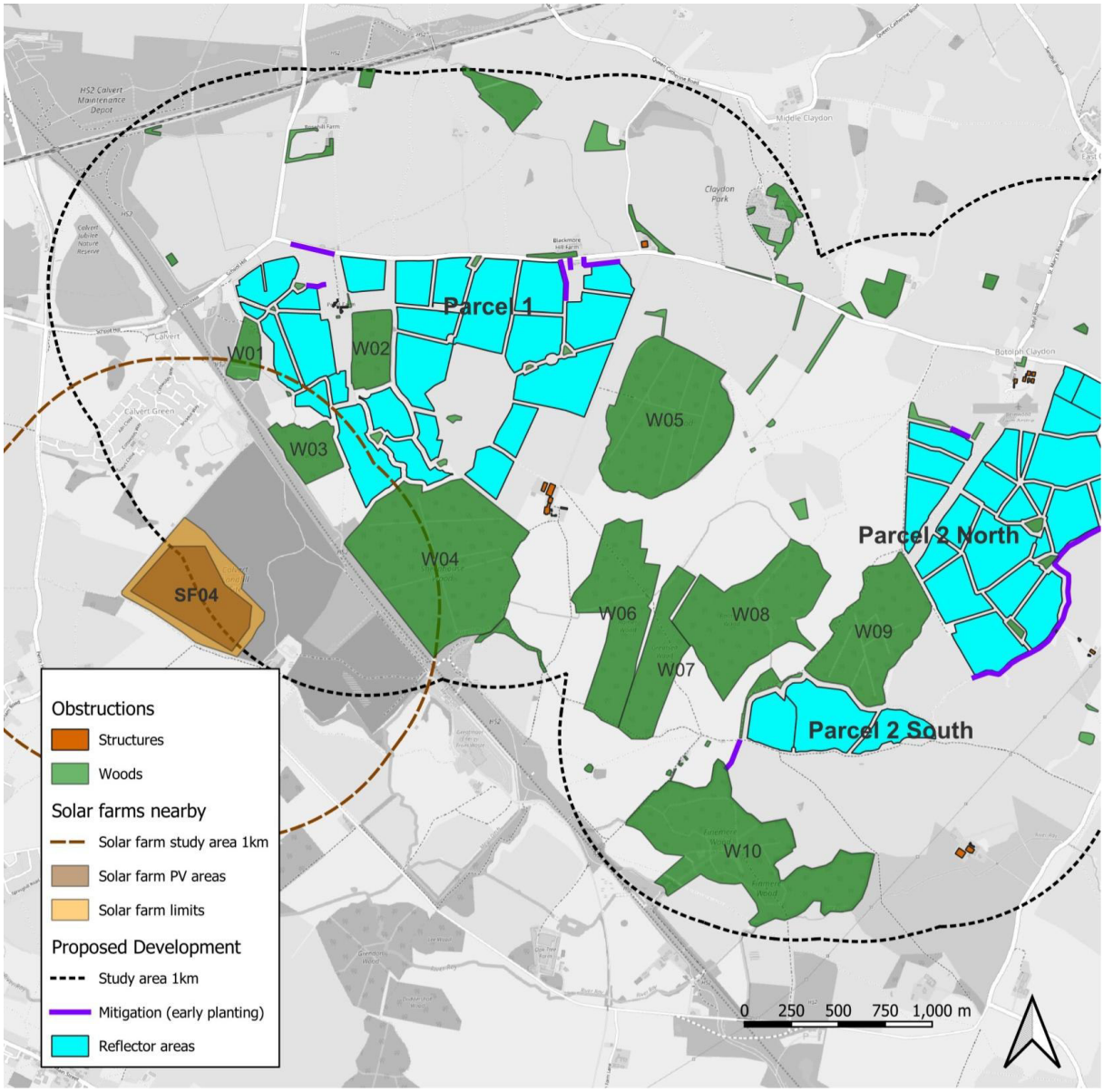

Figure A.2: Proposed Development, obstructions and solar farms nearby within the 1km study area (**WEST** section).

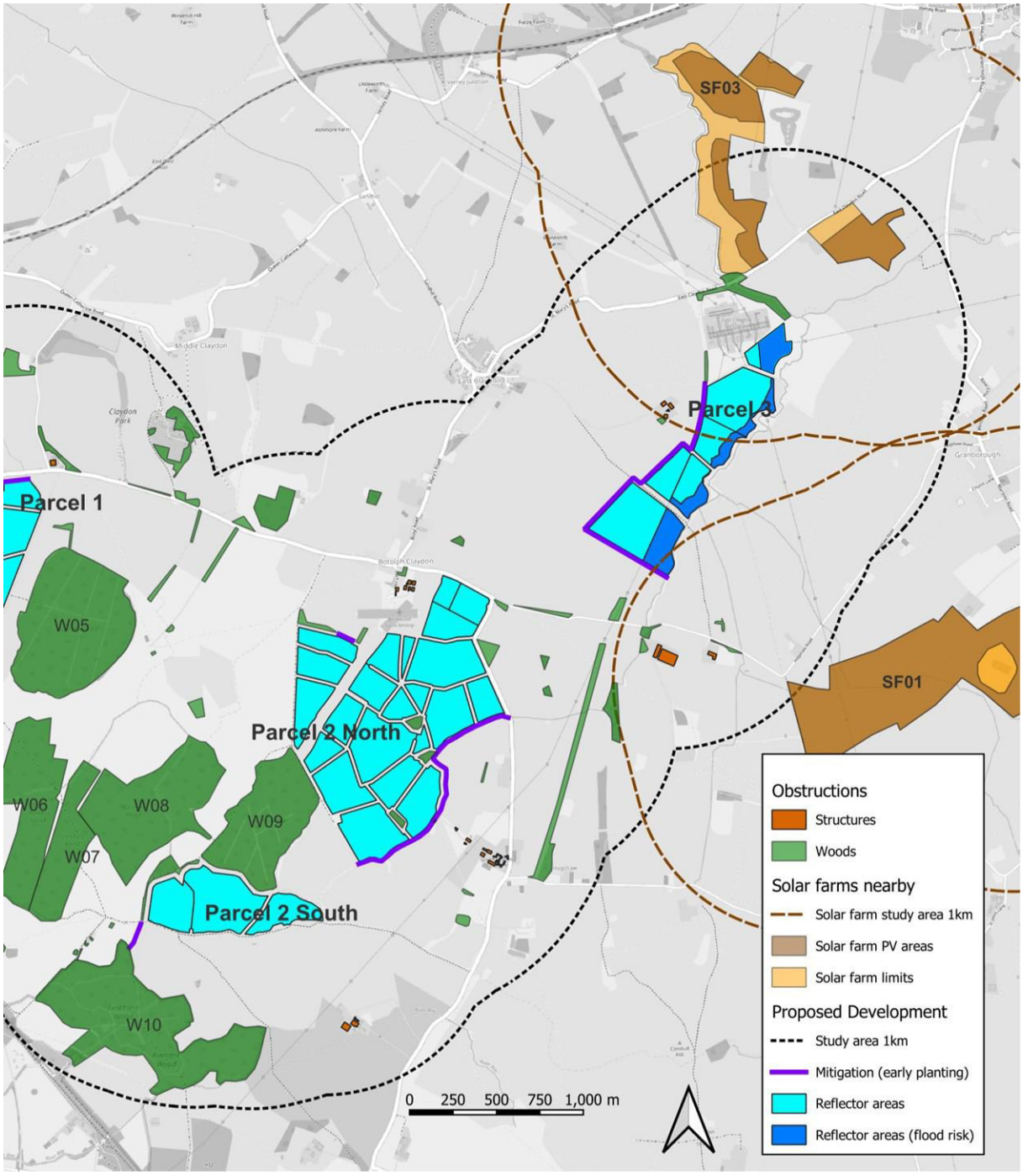

Figure A.3: Proposed Development, obstructions and solar farms nearby within the 1km study area (**EAST** section).

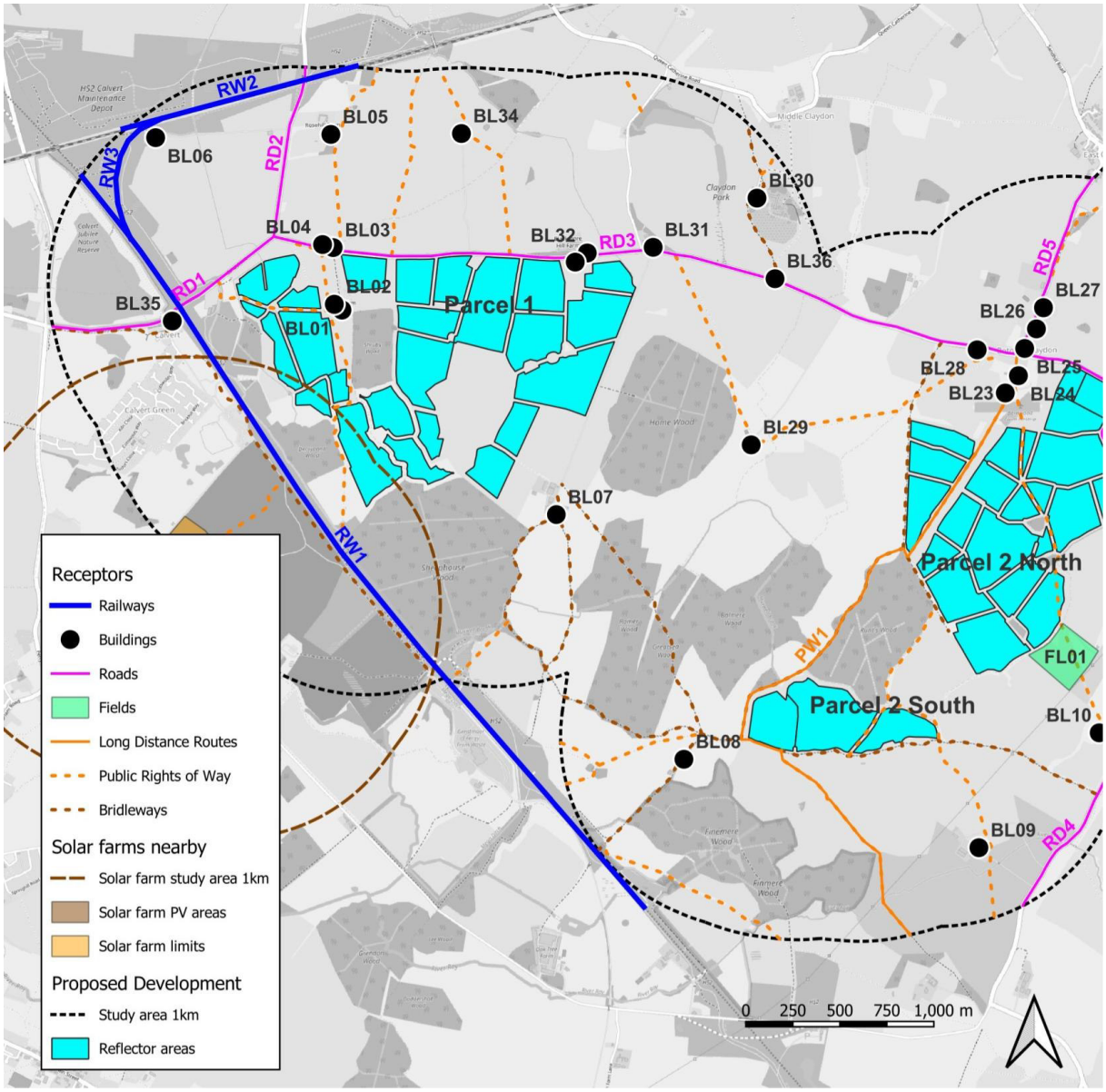

Figure A.4: Receptors within the 1km study area (**WEST** section)

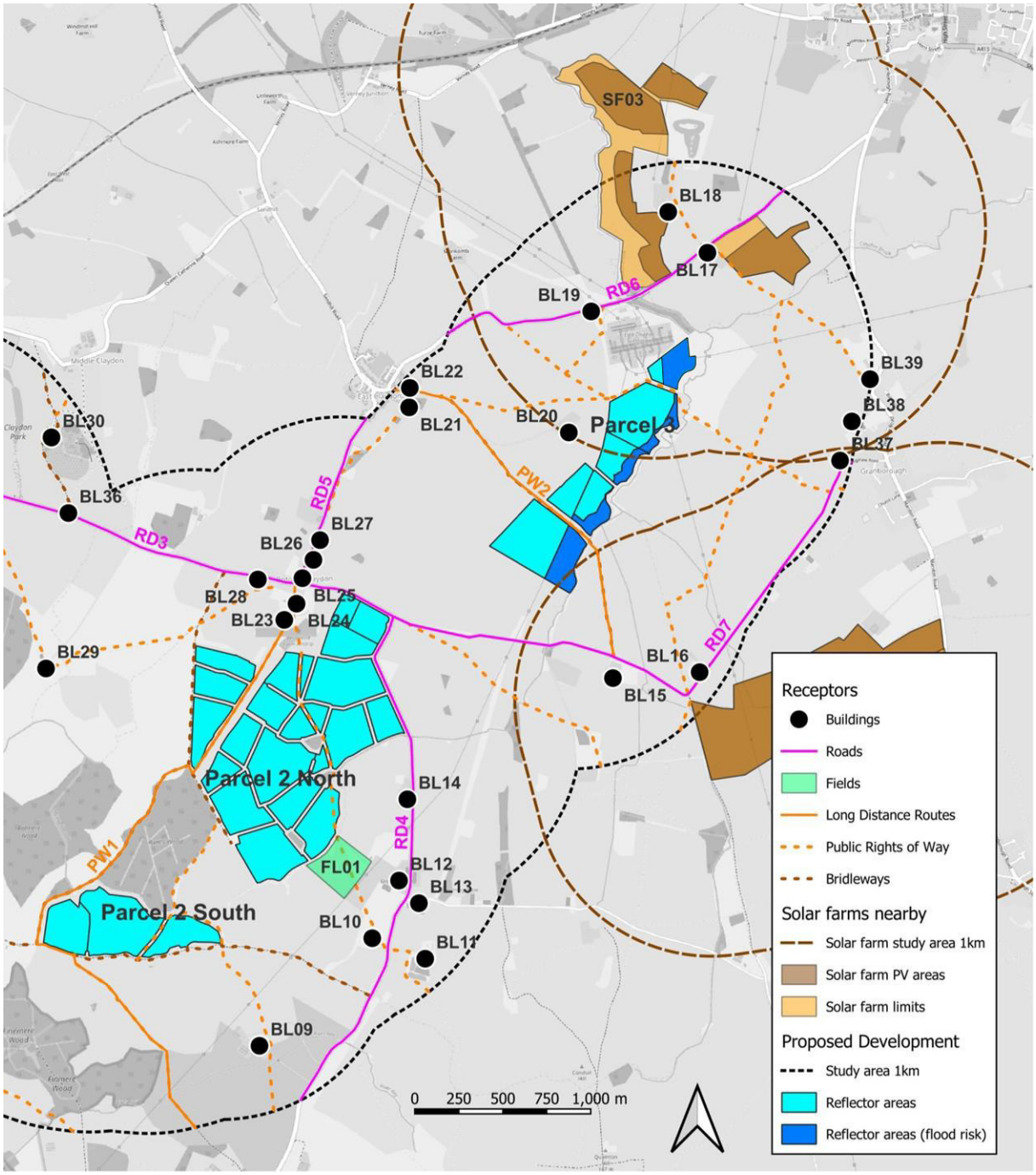

Figure A.5: Receptors within the 1km study area (**EAST** section)

Annex B: Assessment results

Annex B: Assessment results

Table B.1: Annual retinal glare hazard for aviation receptors

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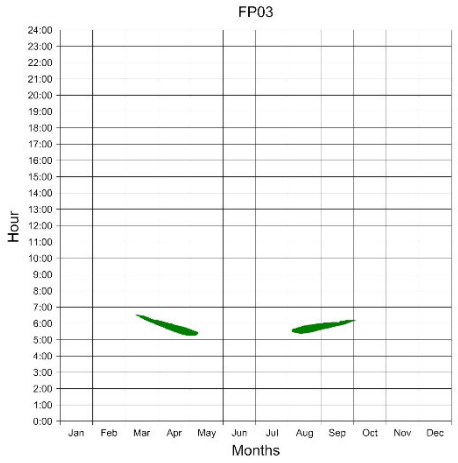
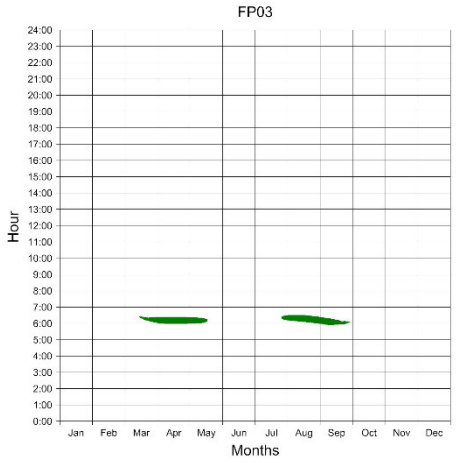
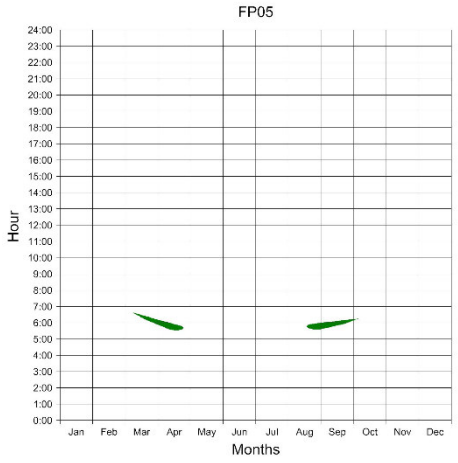
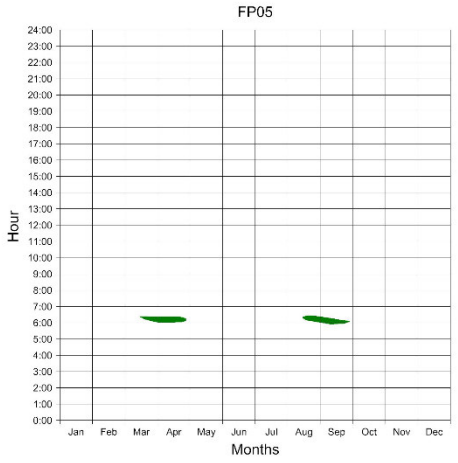
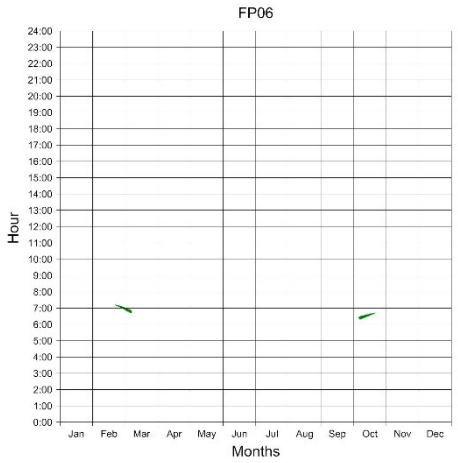
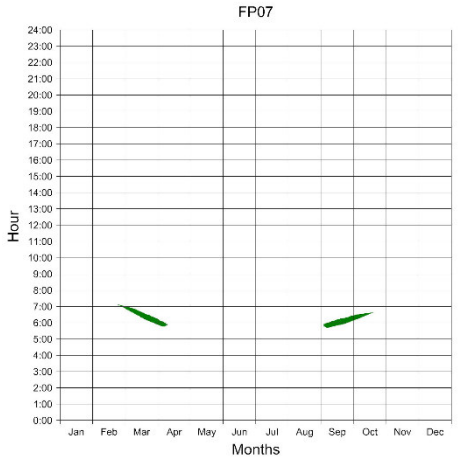
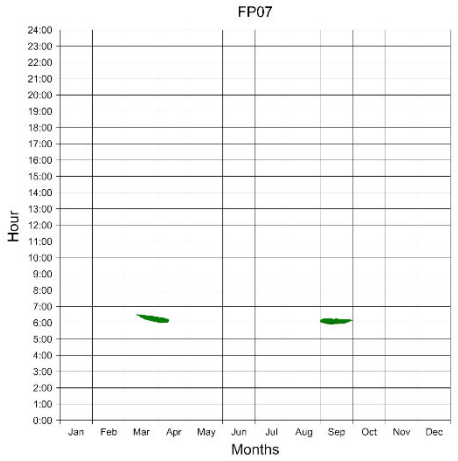
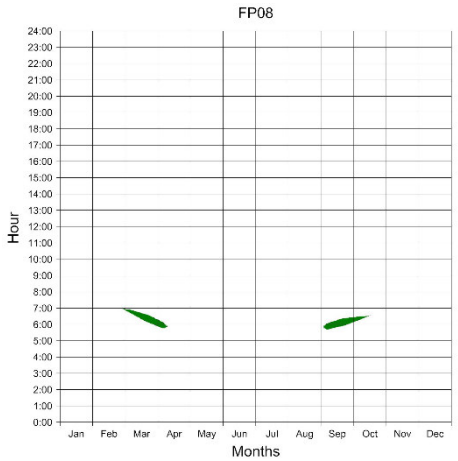
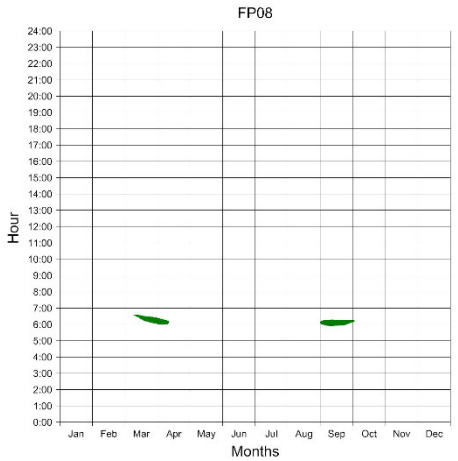
	
	

Tilt 10 deg.	Tilt 30 deg.
	No reflections
	
	

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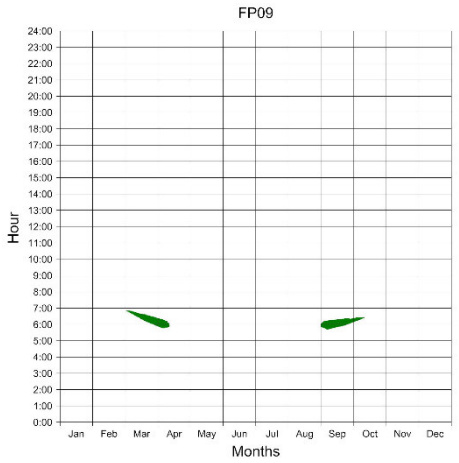	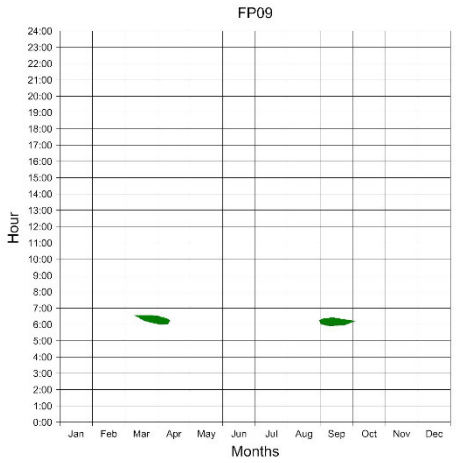
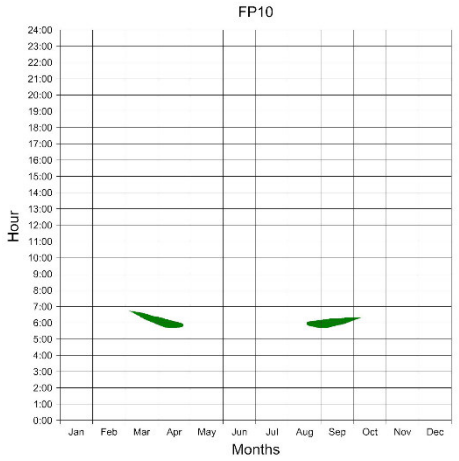	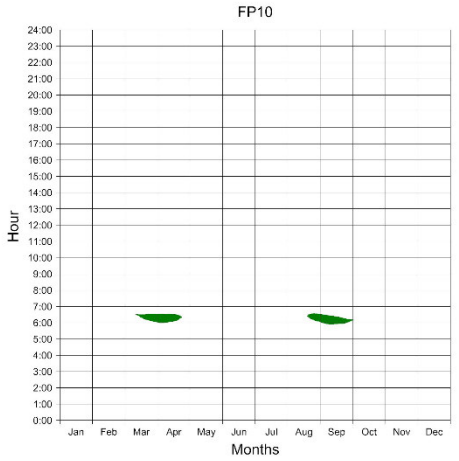
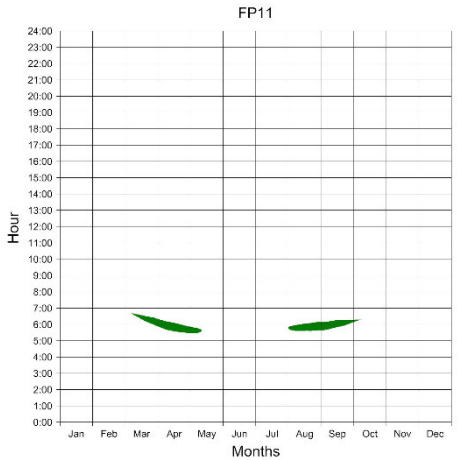	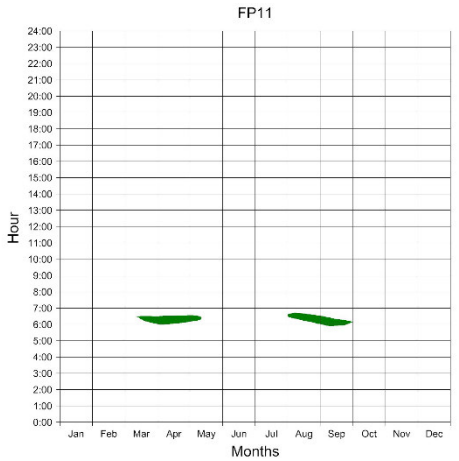

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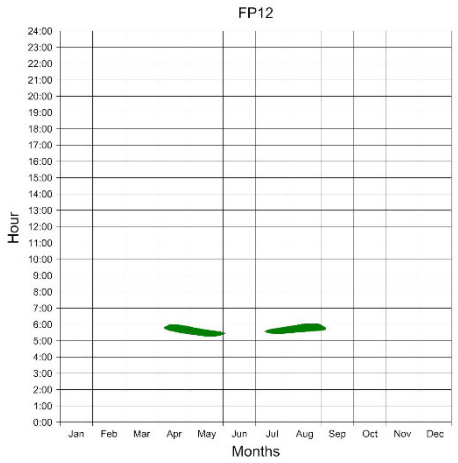	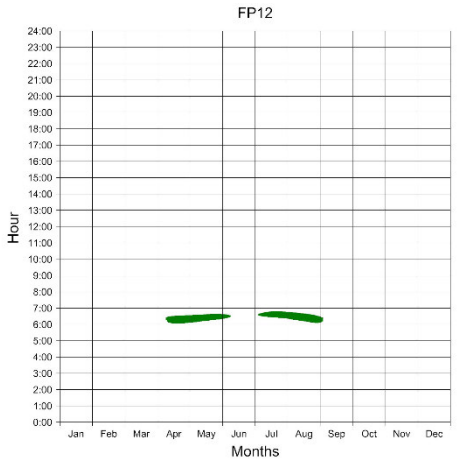

Table B.2: Annual retinal glare hazard for railway receptors

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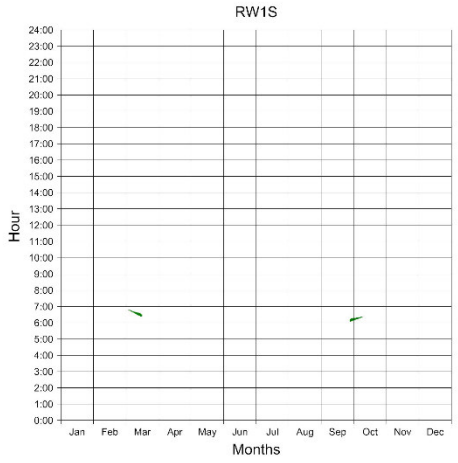	No reflections

Table B.3: Daily and annual glare frequency for building receptors

		Max. minutes/day		Hours/year	
Code	Name	Tilt 10º	Tilt 30º	Tilt 10º	Tilt 30º
BL01	Pond Farm	57	42	82.8	74.4
BL02	Pond Farm	28	25	81.8	70.6
BL03	Calvert Cottages	10	0	2.5	0.0

		Max. minutes/day		Hours/year	
Code	Name	Tilt 10º	Tilt 30º	Tilt 10º	Tilt 30º
BL04	Calvert Cottages	8	0	1.7	0.0
BL05	Rosehill Farm	0	0	0.0	0.0
BL06	Shepherd's Furze Farm	0	0	0.0	0.0
BL07	Knowlhill Farm	0	0	0.0	0.0
BL08	Finemerehill House	0	0	0.0	0.0
BL09	Dry Leys Farm	0	0	0.0	0.0
BL10	The Ox House	0	0	0.0	0.0
BL11	Hill Cottage Farm	25	0	16.6	0.0
BL12	Hogshaw Farm	24	23	39.0	48.6
BL13	Oak Cottages	25	21	32.2	24.6
BL14	Borshaw Farm	0	0	0.0	0.0
BL15	Unknown	22	22	9.5	10.7
BL16	Staplers Piace	22	21	18.5	13.6
BL17	Berry Lees Farm	0	0	0.0	0.0
BL18	Tuckey Farm	0	0	0.0	0.0
BL19	Station House	0	0	0.0	0.0
BL20	Sion Hill Farm	28	23	84.6	68.9
BL21	House in Churchway	0	0	0.0	0.0
BL22	Whitehouse Farm	22	21	9.1	9.2
BL23	Burnwood Farm	48	43	57.9	59.1
BL24	Touchwood	24	0	16.4	0.0
BL25	2 Botyl Road	35	29	80.2	69.8
BL26	12 Botyl Road	26	23	69.3	68.4

		Max. minutes/day		Hours/year	
Code	Name	Tilt 10º	Tilt 30º	Tilt 10º	Tilt 30º
BL27	Botyl Road	30	22	64.3	65.6
BL28	1-23 Orchard Way (odd)	20	21	6.5	7.6
BL29	Muxwell Farm	0	0	0.0	0.0
BL30	Claydon House	0	0	0.0	0.0
BL31	Catherine Farm	13	8	4.3	1.5
BL32	Blackmore Hill Farm Cottages	0	0	0.0	0.0
BL33	4-7 Catherine Cottages	0	0	0.0	0.0
BL34	Winters Tale Farmhouse	0	0	0.0	0.0
BL35	13-17 Brackley Lane	29	25	76.0	67.9
BL36	South Lodge	7	0	1.3	0.0
BL37	The Leys Cottage	27	22	35.6	35.0
BL38	Rookery Farm	0	0	0.0	0.0
BL39	Ricall Farm	25	22	33.3	30.2

Rosefield
Solar Farm

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Application Document Ref: EN010158/APP/6.4
Planning Inspectorate Scheme Ref: EN010158