
**Representative Viewpoint 13 (Proposed Winter Yr. 1): PRoW Southeast of Highfields Farm, looking north (Footpath ref: Clifton Campville 0.338)**

| | | | |
|---|---|---|---|
| **Highfields Farm Solar Farm**<br>JSL3331 | Date of photograph: 16/03/2021<br>OS Grid Ref: 424433, 308408 | Horizontal field of view: 53.5$^{0}$<br>To be viewed at comfortable arms length | Distance to site: 30m<br>**Figure: 6e(ii)** |

# APPENDICES

Appendix A

# Landscape & Visual Impact Assessment Methodology

## Assessment Methodology

A1.1 The Landscape and visual assessment considers the potential effects of the development upon:

- Individual landscape features and elements
- Landscape character; and
- Visual amenity and the people who view the landscape or townscape.

### Distinction between Landscape and Visual Effects

A1.2 In accordance with the '*Guidelines for Landscape and Visual Impact Assessment Third Edition'* 2013 by the Landscape Institute and Institute of Environmental Management and Assessment, landscape and visual effects have been assessed separately, although the procedure for assessing each of these is closely linked. A clear distinction has been drawn between landscape and visual effects as described below:

- Landscape effects relate to the effects of the project on the physical and other characteristics of the landscape and its resulting character and quality
- Visual effects relate to the effects on views experienced by visual receptors (e.g. residents, footpath users, tourists etc.) and on the visual amenity experienced by those people

### Duration of Landscape and Visual Effects

A1.3 The assessment evaluates the short-term effects of the construction phase and the long-term effects relating to the projects operational phase of the proposed development.

A1.4 Consideration has been given to the likely seasonal variations in the visibility of the development in a context including deciduous vegetation.

A1.5 Consideration has been given to changes in the level of effects likely to take place as new planting, proposed as part of the project, and existing planting matures.

### Landscape and Visual Assessment Process

A1.6 The assessment of the landscape effects of the project has followed a recognised process set out below:

- Identify the baseline landscape resource (e.g. individual elements and character) and its value
- Identify forces for change in the landscape of the surrounding area;
- Evaluate the sensitivity of the landscape resource and its susceptibility to change as a result of the type of development proposed;
- Identify potential landscape effects of the project through review of initial plans;
- Develop measures to avoid, reduce and ameliorate adverse effects and to maximise the positive benefits of the project;

- Identify scale or magnitude of likely impact of the project;
- Assess the level of effects of the project on the landscape, taking into account the designed in mitigation measures proposed; and
- Report the findings of the assessment.

A1.7 The assessment of visual effects follows a similar recognised process set out below:

- Identify potential visual receptors of the project (i.e. people who will have views of the development);
- Select an appropriate number of representative or sensitive viewpoints to be illustrated through photography and to reflect the full range of different views towards the project;
- Describe the nature of the baseline views towards the project for each representative viewpoint;
- Identify forces for change in the visual amenity of the surrounding area;
- Evaluate the sensitivity of the visual receptors and their susceptibility to change as a result of the project represented by the viewpoints;
- Identify potential visual effects of the project through review of initial plans;
- Develop measures to avoid, reduce and ameliorate adverse effects and to maximise the positive benefits of the project;
- Identify the scale or magnitude of the likely impact of the project;
- Assess the level of effects on the receptors from representative viewpoints, taking into account the visual context of the development and the mitigation measures proposed;
- Assess the level of effects on overall visual amenity; and
- Report the findings of the assessment.

A1.8 The assessment of representative viewpoints has been supplemented by scheduling of specific visual receptors to determine visual effects upon those likely to be affected to the greatest degree.

## Assessment Criteria

A1.9 The purpose of the assessment is to evaluate the magnitude of change to landscape and visual resources to enable the likely key effects of the project to be identified.

A1.10 Published guidance states that the level of effects is ascertained by professional judgement based on consideration of the intrinsic sensitivity of the baseline landscape, townscape or visual receptor, the receptors susceptibility to the development and the magnitude of change as a result of the project.

### Value

A1.11 Landscape value is defined in the glossary of the GLVIA (2013) at paragraph 5.44 as the "*the value of the Landscape Character Type or Areas that may be affected, based on review of any designations at both national and local levels, and, where there are no designations, judgements based on criteria that can be used to establish landscape value" and "the value of individual contributors to landscape character, especially the key characteristics, which may include elements of the landscape, particular landscape features, notable aesthetic, perceptual or experiential qualities, and combinations of these contributors.*"

A1.12 The value of certain landscapes has been recognised, e.g. the national designations of National Park (NP). Some landscapes are locally designated, e.g. Special Landscape Area (SLA). The aspects/special qualities of the landscape that led to the designations have been noted, as has the degree to which that aspect is present in the particular area under consideration.

A1.13 Other landscapes are undesignated but, valued locally for specific reasons or specific elements / features. The value of an area of landscape is expressed both through designation and also other criteria, such as tranquillity, remoteness, wildness, scenic beauty, cultural associations and conservation interests. These aspects have been summarised in the main assessment.

A1.14 How that value might be affected by a development is classified on a four point scale (low, medium, high and very high) as set out in Table 1 below. The table can only illustrate general categories, as the effects on an area or element of landscape is specific to the development proposed and that particular aspect affected.

**Table 1: Landscape Value (primarily expressed through designation)**

| Value | Designation | Example |
|---|---|---|
| Very High | International/ National | Exceptional scenic quality (and/or special qualities), no or limited potential for substitution.<br>E.g. World Heritage Site, National Park, AONB or key elements features within them well known to the wider public. |
| High | National/Regional/ Local | Very attractive or attractive scenic quality, high or good landscape quality, limited potential for substitution.<br>E.g. National Park, AONB, SLA or key elements within them. |
| Medium | Regional/Local | Typical and commonplace or in part unusual scenic quality, ordinary landscape quality, potential for substitution,<br>E.g. Locally designated (SLA) or undesignated, but value expressed through literature and cultural associations or through demonstrable use. |
| Low | Local | Dull, degraded or damaged scenic quality, poor landscape quality, can be readily substituted.<br>E.g. Undesignated. Certain individual landscape elements or features may be worthy of conservation or landscape identified would benefit from restoration or enhancement. |

## Condition

A1.15 The evaluation of condition is based on judgements about the physical state of the landscape resource. It reflects the state of repair of individual features and elements, as indicated by the categories within Table 2 below, or can be applied to the intactness of the resource as a whole outlined by the corresponding descriptions:

**Table 2: Landscape Condition**

| Condition | Example |
|---|---|
| Very Good | Strong structure; very attractive with distinct features worthy of conservation; strong sense of place; no detracting features. |
| Good | Recognisable structure; attractive with many features worthy of conservation; occasional detracting features. |

| Condition | Example |
|---|---|
| Ordinary | Distinguishable structure; common place with limited distinctiveness and features worthy of conservation; some detracting features. |
| Poor | Weak structure; evidence of degradation; lacks distinctiveness and sense of place; frequent detracting features. |
| Very Poor | Damaged structure; evidence of severe disturbance or dereliction; no distinctiveness; detracting features dominate. |

## Sensitivity of Receptor

A1.16 The sensitivity of a landscape to change varies according to the nature of the existing resource and the nature of the proposed change. Considerations of value, integrity and capacity are all relevant when assessing sensitivity. For the purpose of this assessment, these terms are defined as follows:

- Value: the relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons. Landscapes can be recognised through national, regional or local designation. Views tend not to be designated, but value can be recognised through a named location shown on a map, or through the creation of a parking lay-by or location of a bench to appreciate a view;
- Integrity: the degree to which the value has been retained, the condition and integrity of the landscape or the view; and
- Capacity: the ability of a landscape or view to accommodate the proposed change while retaining the essential characteristics which define it.

A1.17 Sensitivity is not readily graded in bands. However, in order to provide both consistency and transparency to the assessment process, Table 3 defines the criteria which have guided the judgement as to the sensitivity of the receptor and the susceptibility to change.

**Table 3: Sensitivity of Receptor**

| | Landscape Receptor | Visual Receptor |
|---|---|---|
| Low | Landscape value is low, with no designations; landscape/townscape integrity is low, with a poor condition and a degraded character with the presence of detractors such as dereliction; and the landscape has the Capacity to potentially accommodate significant change. | May include people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who may therefore be potentially less susceptible to changes in view. Occupiers of vehicles whose attention may be focused on the road. |
| Medium | Landscape value is recognised or designated locally; the landscape is relatively intact, with a distinctive character and few detractors; and is reasonably tolerant of change. | Viewers' attention may be focused on landscape, such as users of secondary or urban footpaths, and people engaged in outdoor sport or recreation. e.g. horse riding or golf. Occupiers of vehicles in scenic areas or on recognised tourist routes. |

| | Landscape Receptor | Visual Receptor |
|---|---|---|
| High | Landscape value recognised by national designation. Sense of tranquility or remoteness specifically noted in Landscape Character Assessment. High sensitivity to disturbance specifically noted in Landscape Character Assessment.<br><br>The qualities for which the landscape is valued are in a good condition, with a clearly apparent distinctive character and absence of detractors. This distinctive character is susceptible to relatively small changes. | Large number or high sensitivity of viewers assumed. Viewers' attention very likely to be focused on landscape.<br><br>E.g. Residents experiencing views from dwellings; users of strategic recreational footpaths, rural footpaths and cycleways; people experiencing views from important landscape features of physical, cultural or historic interest, beauty spots and picnic areas. |

## Magnitude of Change

A1.18 The magnitude of change affecting landscape or visual receptors depends on the nature, scale and duration of the particular change within the landscape/townscape, the location of it and the overall effect on a particular view. This may be very small if the development is at some distance. In a landscape, the magnitude of change will depend on the loss or change in any important feature or characteristic or a change in backdrop to, or outlook from, a landscape that affects its character. The angle of view, duration of view, distance from the development, degree of contrast with the existing characteristics of the view, prominence of the development and the extent of visibility can all influence the magnitude of the change in view. In addition, the general visibility and combination of effects of elevation and topography on openness and degree of obstruction by trees and buildings affect the magnitude of change.

**Table 4: Magnitude of Change**

| | Landscape Impacts | Visual Impacts |
|---|---|---|
| Negligible | The effect of change on the perception of the landscape the physical features or the character is barely discernible or there is no change. | There is either no view or the character of the view will not be altered by the proposed development. The proposed development is at such a distance as to be barely perceptible, and may only be visible in clear conditions. May go unnoticed. |
| Small | Changes to the physical landscape, its character and the Perception of the landscape/townscape are slight.<br>Long distance to affected landscape with views toward the character area/type the key characteristic. | Visible, but not prominent. Minor component and no marked effect on view. |

| | Landscape Impacts | Visual Impacts |
|---|---|---|
| Medium | The proposed development forms a visible and recognisable feature in the landscape.<br>Proposed development is within or adjacent to affected character area/type.<br>Scale of development fits with existing features. | Prominent.<br>Has an important, but not defining influence on view; is a key element in the view. |
| Large | Where there are substantial changes affecting the character of the landscape, or important elements through loss of existing features.<br>Proposed development within or close to affected landscape.<br>Scale, mass and form of development out of character with existing elements. | Dominant.<br>Has a defining influence on view. |

A1.19 The following considerations are relevant when evaluating the magnitude of visual change:

- Distance: the distance between the receptor and the development. Generally, the greater the distance, the lower the magnitude of change;
- Extent: the extent of the proposal which is visible;
- Proportion: the arc of view occupied by the development in proportion to the overall field of view. A panoramic view, where the development takes up a small part of it, will generally be of lower magnitude than a narrow, focussed view, even if the arc of view occupied by the proposal is similar;
- Duration: the duration of the effect. An effect experienced in a single location over an extended period of time is likely to result in a higher magnitude of change than an effect which is of a short duration, such as a view from a road;
- Orientation: the angle of the view in relation to the main receptor orientation, where there is a dominant direction to the vista; and,
- Context: the elements, which in combination provide the setting and context to the proposal.

## Level of Effect

A1.20 The level of the landscape and visual effects are assessed through consideration of the sensitivity or susceptibility of the receptor and the magnitude of change. The following table outlines the broad approach adopted to assess the level of effect, together with professional judgement. This may lead some effects falling between two categories.

**Table 5 – Level of Effect**

| Landscape and Visual Sensitivity or Susceptibility | Magnitude of Change | | | |
|---|---|---|---|---|
| | Large | Medium | Small | Negligible |
| High | Substantial | Major or Moderate | Moderate or Minor | Minor or Negligible |
| Medium | Major or Moderate | Moderate | Minor or Negligible | Negligible |
| Low | Moderate or Minor | Minor or Negligible | Negligible | Negligible |

A1.21 The effect of relevant aspects of the project on the landscape and townscape has been described and evaluated against the following criteria, defined as:

- Substantial adverse: Where the proposed changes cannot be mitigated; would be completely uncharacteristic and would substantially damage the integrity of a valued and important landscape.
- Major adverse: Where the proposed changes cannot be fully mitigated; would be uncharacteristic and would damage a valued aspect of the landscape.
- Moderate adverse: Where some elements of the proposed changes would be out of scale or uncharacteristic of an area.
- Minor adverse: Where the proposed changes would be at slight variance with the character of an area.
- Negligible adverse: Where the proposed changes would be barely discernible within the landscape.
- Neutral: Where the proposals would be in keeping with the character of the area and/or would maintain the existing quality or where on balance the proposals would maintain quality (e.g. where on balance the adverse effects of the proposals are off-set by beneficial effects).
- Negligible beneficial: Where the proposed changes would be barely discernible within the landscape.
- Minor beneficial: Where the proposed changes would reflect the existing character and would slightly improve the character and quality of the landscape.
- Moderate beneficial: Where the proposed changes would not only fit in well with the existing character of the surrounding landscape, but would improve the quality of the resource through the removal of detracting features.
- Major beneficial: Where the proposed changes would substantially improve character and quality through the removal of large-scale damage and dereliction and provision of far reaching enhancements.

A1.22 The effect of relevant aspects of the project on views has been described and evaluated as follows:

- Substantial adverse: Where the proposed changes would form the dominant feature, or would be completely uncharacteristic and substantially change the scene in highly valued views
- Major adverse: Where the proposed changes would form a major part of the view, or would be uncharacteristic, and would alter valued views.
- Moderate adverse: Where the proposed changes to views would be out of scale or uncharacteristic with the existing view.

- Minor adverse: Where the proposed changes to views would be at slight variance with the existing view.
- Negligible adverse: Where the proposed changes would be barely discernible within the existing view.
- Neutral: Where the project would be imperceptible or would be in keeping with and would maintain the existing views or, where on balance, the proposals would maintain the quality of the views (which may include adverse effects of the proposals which are off set by beneficial effects for the same receptor).
- Negligible beneficial: Where the proposed changes would be barely discernible within the existing view.
- Minor beneficial: Where the proposed changes to the existing view would be in keeping with and would improve the quality of the existing view.
- Moderate beneficial: Where the proposed changes to the existing view would not only be in keeping with but, would greatly improve the quality of the scene through the removal of visually detracting features.
- Major beneficial: Where the proposed changes to existing views would substantially improve the character and quality through the removal of large scale damage and dereliction and provision of far reaching enhancements.

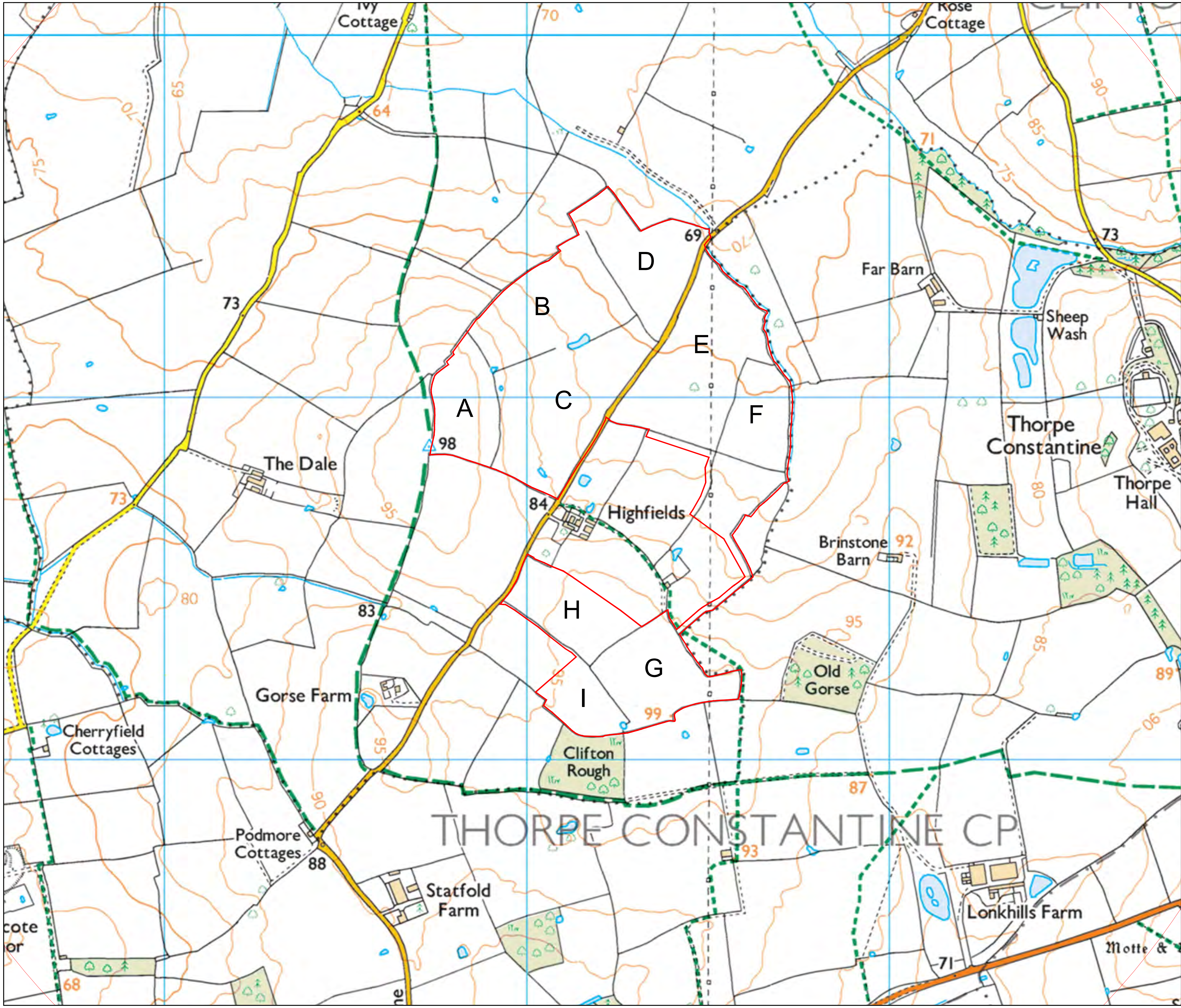
A1.23 The level of effects is described as substantial, major, moderate, minor or negligible. Where negligible adverse and beneficial effects occur within the same view or same landscape/townscape, the effect can be described as neutral on balance. The level of effects varies according to individual circumstances and the baseline situation, for example the presence of landscape designations and/or visual detractors.

A1.24 A conclusion regarding the significance of each effect on a landscape or visual receptor needs to combine separate judgements about the sensitivity of receptors and magnitude of change as a result of the proposed development. The GLVIA (2013) states at paragraph 5.55 that a sequential approach can be taken to assessment of significance; *"susceptibility to change and value can be combined into an assessment of sensitivity for each receptor, and size/scale, geographical extent and duration and reversibility can be combined into an assessment of magnitude for each effect. Magnitude and sensitivity can then be combined to assess overall significance"*.

A1.25 In the assessment those levels of effect indicated as being 'substantial' or 'major' may be regarded as significant effects. An accumulation of individual 'moderate' effects, for instance experienced as a sequence during a journey, may also be regarded as significant.

# Appendix B

## Proposed Development



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Lakesbury House, Hiltingbury Road, Chandlers Ford, Hampshire SO53 5SS
T: 02380 810 440 E: rpsso@rpsgroup.com

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**Specimen Tree Planting**

Planted within proposed hedgerow infill planting and to avoid RPAs of existing trees. Planted at 5 - 7m (linear meter) spacing's to allow for mature canopy growth. Species groups of 2 - 3.

- Acer campestre 12-14cm girth
- Quercus robur 12-14cm girth

**Existing Trees and Shrubs**

- Where existing trees & shrubs are to be retained they should be subject to a full arboricultural inspection for safety.
- Any surgery required shall be in accordance with BS 3998 (2010) 'Tree Work - Recommendations', shall comply with any existing T.P.O requirements and shall require the prior approval of the Landscape Architect.
- Avoid damage to branches, trunks and roots of trees. All existing trees & hedges to be retained are subject to BS 5837 (2012) 'Trees in relation to design, demolition and construction - Recommendations', and should be fully fenced off, prior to the commencement of any works, in accordance with Figure 2 (p20) at the full extent of the root protection area, as determined by section 4.6 (p10-11) and Annex D (p40).
- No storage of materials, disposal of rubbish, site fires, spillage of oil and chemicals, ground compaction, excavation or changes in level shall be carried out within existing tree / hedge canopies.

**Native Hedgerow Planting Requirements**

"Double staggered row in two rows about 25cm apart with plants at approximately 35cm in each row. This would equate to 6 plants per linear metre."

Typical Stock specification would be as below ie. 80-100mm whips, best planted from November to March as bareroot stock, providing not freezing / waterlogged conditions.

**Native Hedgerow Planting Mix**

Native hedgerow to be Hawthorn dominant mix as follows:

- Crataegus monogyna: 60%
- Corylus avellana:10%
- Ilex aquilfoium: 10%
- Prunus spinosa: 10%
- Acer campestre: 10%

**Native Hedgerow Specification Notes**

Planting Depths:

- Cultivation Depth: 300mm deep
- Topsoil Depths :300mm deep

Rabbit Protection:

"Bareroot plants within native hedge planting mixes to be protected from rabbit damage with the installation of 1No. shrub shelter and 25mm softwood stake per shrub / tree. Type 'Shelterguard', colour GREEN as supplied by Tubex www.tubex.com or similar and approved. Shrub species to receive 110mm diameter x 60cm high shelter, hedgerow tree species to receive a clear spiral guard."

**Native Hedgerow Maintenance Requirements**

- Enhance visual amenity.
- Enhance biodiversity.
- Provide habitat connectivity
- Integrate with surrounding landscape and character
- Screening to the built form, including means of enclosure and other structures.
- Define differing areas and routes.

**Native Hedgerow Management Objectives**

- Hedgerows that adjoin footpaths therefore likely to cause obstruction if growth is left unchecked should be cut back annually outside the bird breeding season (March to August inclusive) to a neat and consistent finish to maintain a vigour with all arisings removed off site.
- All other native hedgerows on site are to be cut every 2-3 years (on rotation) to allow flowering and fruiting and the development of a structure of benefit to wildlife, outside the bird breeding season (March to August inclusive). Remove arisings off site.
- Clip to form a neat, compact hedgerow with a tapering top. Maintain at approx height of 2.5 - 3m.
- Remove any dead, dying and damaged growth or growth obstructing pedestrian or vehicular routes outside of bird breeding season (March to August inclusive).
- Check condition of stakes, ties, guys and shelters and replace broken or missing items until such a time as they become redundant. Adjust if necessary to allow for growth and prevent damage to bark.
- Re-firm any plants that have been disturbed by adverse weather or interference.

BS 4428: Code of practice for general landscape operations

BS 7370-4: Grounds maintenance

**Hedgerow Specimen Trees Maintenance Requirements**

- Reinforce site layout and legibility.
- Enhance visual amenity.
- Enhancement of the site's microclimate.
- Enhance biodiversity.
- Provide habitat connectivity

**Wild Bird Cover Seed Mix Planting**

- "Time of sowing: end of August to mid-September
- Depth of sowing: 2.5cm
- Check the soil pH which must be a minimum of 6.0 (below this you will need to add lime).
- Use of a stale seedbed is advised
- "Suitable for planting in the early autumn on challenging sites or where heavy soil types have previously caused establishment problems. Contains: barley, Coleor kale (treated with Synergy), fodder radish, forage rape, Gold of Pleasure, Kings kale rape, linseed, phacelia, Stand and Deliver (perennial chicory), Vittasso brown mustard and triticale."

Fertiliser:

Assuming your situation allows the use of fertiliser:

- 30 kilograms per hectare (24 units per acre) Nitrogen
- 30 kilograms per hectare (24 units per acre) Phosphorous
- 30 kilograms per hectare (24 units per acre) Potassium

Where soil nutrient reserves are unknown, apply the above to the seedbed and incorporate pre-drilling. Where soil nutrient reserves are known adjust this rate accordingly. Always take into account nutrients from organic manures that have been applied."

*(Taken from KingCrops Growing Guide)*

**Hedgerow Specimen Trees Management Objectives**

- Screening to the built form, including means of enclosure and other structures.
- Maintain a well-balanced crown, shape and character typical of the species, clear of any crossing or rubbing growth allowing a clear stem, 2m above ground level (retain if field tree feathered to ground).
- Remove any dead, dying and damaged branches or growth obstructing pedestrian or vehicular routes (obtain advice from an ecologist regarding possible presence of bat roosts prior to undertaking work).
- Check condition of stakes, ties and guys and replace broken or missing items until such a time as they become redundant. Adjust if necessary to allow for growth and prevent damage to bark.
- Under take Pest and Disease Control using suitable pesticides or fungicides as advised, only if severe infestation occurs.
- Maintain a weed free area at the base of all trees, 1m diameter mulch area for trees in grass or planting.BS 3998: Recommendations for tree work

*The Arboricultural Association Standard Conditions of Contract and Specification for Tree Works Sept.*

**Planting**

All plants and planting to comply with the requirements of all current / relevant British Standard specifications including BS 8545 (2014) 'Trees from Nursery to Independence in the Landscape', BS 3936: Part 1 (1992), Part 2 (1990) and Part 4 (2007) and BS 4043 (1989) where applicable, BS 4428 (1989). All plants to be supplied in accordance with the plant schedule and with regard to imported stock and notifiable diseases within the Plant Health Act 1967 (revised 2009). Any plant material planted outside the recognised planting season (Nov-Feb), to be containerised stock and supplied at the sizes specified. Where possible, trees and shrubs of UK provenance are preferred.

**Plant Material Treatment**

- NB All to be British grown stock and fully hardened off.
- Root Dip - Proprietary Root Dip applied to all bare rooted stock (1) at time of lifting at nursery and (2) prior to planting.
- Anti-Desiccant - Proprietary anti-desiccant to be applied to foliage of allcontainerised / rootballed material in leaf, specimen conifers and evergreens etc. (1) prior to transportation and (2) during any delay in planting.
- Pruning - Allow for pruning of all deciduous trees and shrubs by 1/3rd following planting at Landscape Architects direction or as indicated in the planting schedule.
- Tree Stakes & Ties - Stakes to be pressure treated, round, smooth and peeled Larch or Chestnut, not less than 100mm in diameter. Advanced nursery stock - double staked with cross bar.

**Ecological Meadow Buffer & Grazing Mixture Planting**

- "Good preparation is essential to success so aim to control weeds and produce a good seed bed before sowing.
- Overgrown hedgerows which have been recently cut back or laid sometimes offer up a strip of open bare ground ready for seeding
- To prepare a seed bed first remove weeds using repeated cultivation.
- Then plough or dig to bury the surface vegetation, harrow or rake to produce a medium tilth, and roll, or tread, to produce a firm surface.
- Cultivation close to established trees and shrubs can be damaging to their root systems so take care not to dig too deep, keeping disturbance to the minimum required to expose fresh soil.
- Seed is best sown in the autumn or spring but can be sown at other times of the year if there is sufficient warmth and moisture. The seed must be surface sown and can be applied by machine or broadcast by hand. To get an even distribution and avoid running out, divide the seed into two or more parts and sow in overlapping sections. Do not incorporate or cover the seed but firm in with a roll, or by treading, to give good soil/seed contact."

**Ecological Meadow Buffer First Year Management**

- "Most sown meadow wild flower and grass species are perennial; they will be slow to germinate and grow and will not usually flower in their first growing season. There will often be a flush of annual weeds from the soil in the first growing season which may grow up and obscure the meadow seedlings beneath. This annual weed growth is easily controlled by topping or mowing.
- Mow newly sown meadows regularly throughout the first year of establishment to a height of 40-60mm, removing cuttings if dense. This will control annual weeds and help maintain balance between faster growing grasses and slower developing wild flowers.
- Avoid cutting in the spring and early summer if the mixture has been sown with a nurse cover of cornfield annuals, or is autumn sown and contains Yellow Rattle. These sown annuals should be allowed to flower, then in mid-summer cut back and the cut vegetation removed. It is important to cut back cornfield annuals before they die back, set seed or collapse: this cut will reveal the developing meadow mixture and give it the space it needs to develop.
- Dig out any residual perennial weeds such as docks."

**Ecological Meadow Buffer Management Once Established**

- "Hedgerows, woodland edges, rides, glades and other semi-shaded communities usually sit on the boundary between one habitat type (eg open grassland) and another (eg closed tree canopy). The management requirements of established hedgerow mixtures can be tailored to light levels and to fit in with adjacent vegetation types.
- Zoned management of hedgerow margins frequently produces the best diversity of habitat structure: areas closest to the hedge or woodland boundary and those which are more shaded are left uncut in most years. Areas that are further from the margin and more open can be managed as grassland habitat. For example in a 6 metre sown margin the 2-3 metres against the boundary could be left uncut, the next 3-4 metres cut once or twice a year.
- Hedgerow vegetation that is not mown or grazed each year will become rough and "tussocky" in character. It can form useful refuge habitat on corners and margins of a site. To control scrub and bramble development these tussocky areas may need cutting every 2-3 years between October and February. For wildlife this cutting is best done on a rotational basis so that no more than half the area is cut in any one year leaving part as a undisturbed refuge.
- Hedgerows and margins that are cut regularly can be managed as grassland."

**Grazing Mixture First Year Management**

- "In good growing conditions (warm soils and adequate rainfall) the grass will establish and need its first management around 6-10 weeks from sowing, by which time grass will have reached around 10cm height.
- Light grazing with livestock can be introduced at this stage. Sheep are to be preferred as they have lighter feet and nibble grass back neatly and so encourage the grass to thicken up by tillering at the base. Cattle are likely to damage a young sward by tugging at the grass, and from their heavy hooves. Graze for short periods initially to avoid over grazing and allow time for the grass to recover. Avoid grazing if the soil is saturated with water.
- Alternatively, top initial growth (sown species and weeds) to encourage the sward to thicken up and restrict any weed growth. Remove or disperse cuttings so as not to leave mulched patches which will kill young grass."

**Grazing Mixture Management Once Established**

- "Once the sward is well established with good ground cover and strong roots livestock can be introduced freely to graze as appropriate to the season and amount of growth.
- Do not over-stock to avoid sward damage and poaching. Rotating grazing round different fields or sub-dividing fields is a good way of preventing over-grazing and allowing the sward recovery time. Aim to keep a sward height of at least five centimetres through most of the grazing period, and not less than two to five centimetres at the end of a grazing period.
- Remove animals from pastures if the ground is very wet or waterlogged as their hooves will very quickly destroy the sward and churn up the ground. Such poaching destroys the sward and opens it up to invasion of problem weeds like thistles and ragwort.
- Control any weeds like docks and thistles.
- Top any un-grazed tall growth in pastures with a rotary or flail mower (or a scythe) each year in late June to early July. This topping will help keep weeds like thistles at bay, and even up the sward, inhibiting tussock formation from grasses like cocksfoot. Note: If you have nesting birds using the pasture delay topping until they have fledged in late July.
- Chain harrow in early spring as soon as the ground dries enough to even out mole hills, remove dead grass and reinvigorate the sward. Over-seed any significant bare areas.
- These grazing mixtures can be used to produce a hay crop from the second year onward if required Shut up the pasture removing livestock from spring through to midsummer. Take a hay cut late June/July. After the hay crop has been removed return livestock to graze the aftermath."

*(Taken from the Emorsgate Seeds Growing Guide)*



Notes

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2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. Where applicable Ordnance Survey (c) Crown Copyright 2021



## Key

Proposed elements

- APPLICATION SITE BOUNDARY
- 2 x 12 = 24 MODULE PANEL (12m)
- 2 x 24 = 48 MODULE PANEL (24m)
- PRIVATE CABLE
- SECURITY FENCE Extent of 5m Ecological Buffer
- 3.5m ACCESS TRACK
- INVERTER SUBSTATION
- A — FIELD REFERENCE FOR LVIA

SOFT LANDSCAPE

Proposed elements

- SPECIMEN NATIVE TREE PLANTING
- NATIVE HEDGEROW PLANTING
- ECOLOGICAL MEADOW BUFFER EH1 - Hedgerow Mixture (Emorsgate), or similar and approved
- WILD BIRD COVER SEED MIX Enhanced Autumn Sown Wild Bird Seed Mix KEAUT1 (KingsCrops), or similar and approved
- GRAZING MIXTURE EG26/27 - Old Fashioned Grazing Mixture (Emorsgate), or similar and approved
- MEADOW GRASS MIXTURE EG5 - Meadow Grass Mixture for Loamy Soils (Emorsgate), or similar and approved
- MEADOW MIXTURE EM5 - Meadow Mixture for Loamy Soils (Emorsgate), or similar and approved

BIODIVERSITY ENHANCEMENTS

- ECOLOGICAL ENHANCEMENTS As per ecological report: including marginal planting, thinning of vegetation, retaining mixed species etc.

Existing features

- APPROXIMATE LOCATION OF EXISTING TREE
- EXISTING HEDGEROW
- EXISTING TREE & SHRUB GROUP
- EXISTING POND
- EXISTING PRoW

| Rev | Description | By | CB | Date |
|---|---|---|---|---|

MAKING COMPLEX EASY


Lakesbury House, Hiltingbury Road, Chandlers Ford, Hampshire SO53 5SS

T: 02380 810 440 E: rpsso@rpsgroup.com


Client: Elgin Energy Esco Ltd

Project: Highfields Farm Solar Farm

Title: Landscape Masterplan

| Status | Drawn By | PM/Checked by |
|---|---|---|
| Final | DA | KH |
| **Job Ref** | **Scale @ A0** | **Date Created** |
| JSL3331 | 1:2,500 | JUL 21 |

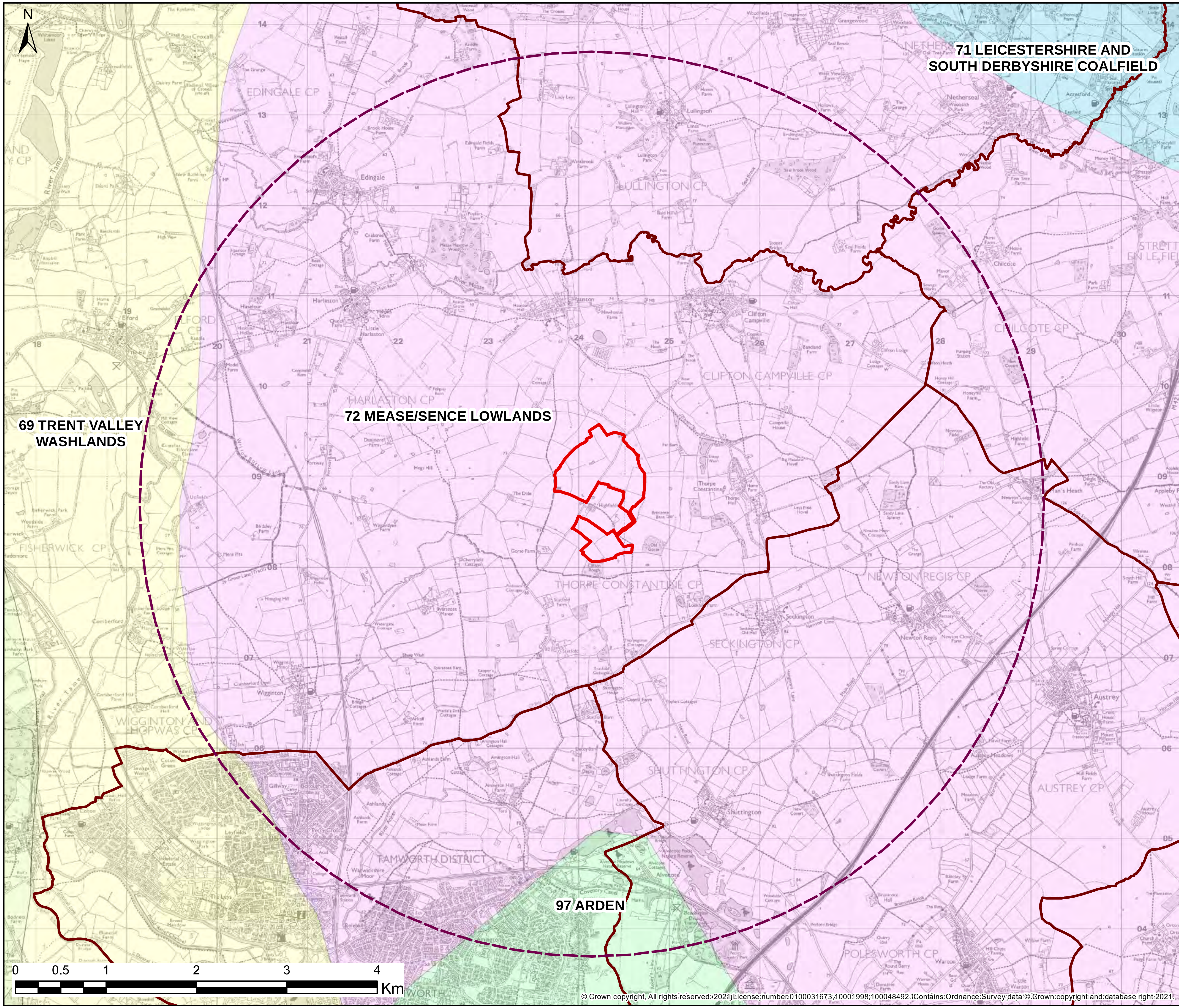
RPS Drawing / Figure Number: 101

Rev: -

rpsgroup.com

Appendix C

# Landscape Character Data






P:\3300 Series\JSL3331 - Highfield Farm, Thorpe Estates\Tech\GIS\JSL3331_Fig1.1 LCA National.mxd



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**Legend**

- Study Area (5km
- Application Site Boundary
- District Boundary

**National Character Areas**

- ARDEN
- CANNOCK CHASE AND CANK WOOD
- LEICESTERSHIRE AND SOUTH DERBYSHIRE COALFIELD
- MEASE/SENCE LOWLANDS
- TRENT VALLEY WASHLANDS

| Rev | Description | By | CB | Date |
|---|---|---|---|---|

MAKING COMPLEX EASY

Lakesbury House, Hiltingbury Road, Chandlers Ford, Hampshire SO53 5SS
T:02380 810 440 E: rpsso@rpsgroup.com

Client: ELGIN ENERGY EsCO LTD

Project: Highfields Farm Solar Farm

Title: National Landscape Character Areas

| Status | Drawn By | PM/Checked By |
|---|---|---|
| Final | KH | PE |
| **Project Number** | **Scale @ A3** | **Date Created** |
| JSL3331 | 1:40,000 | OCT 2021 |

Figure Number: 1.1

Rev: -

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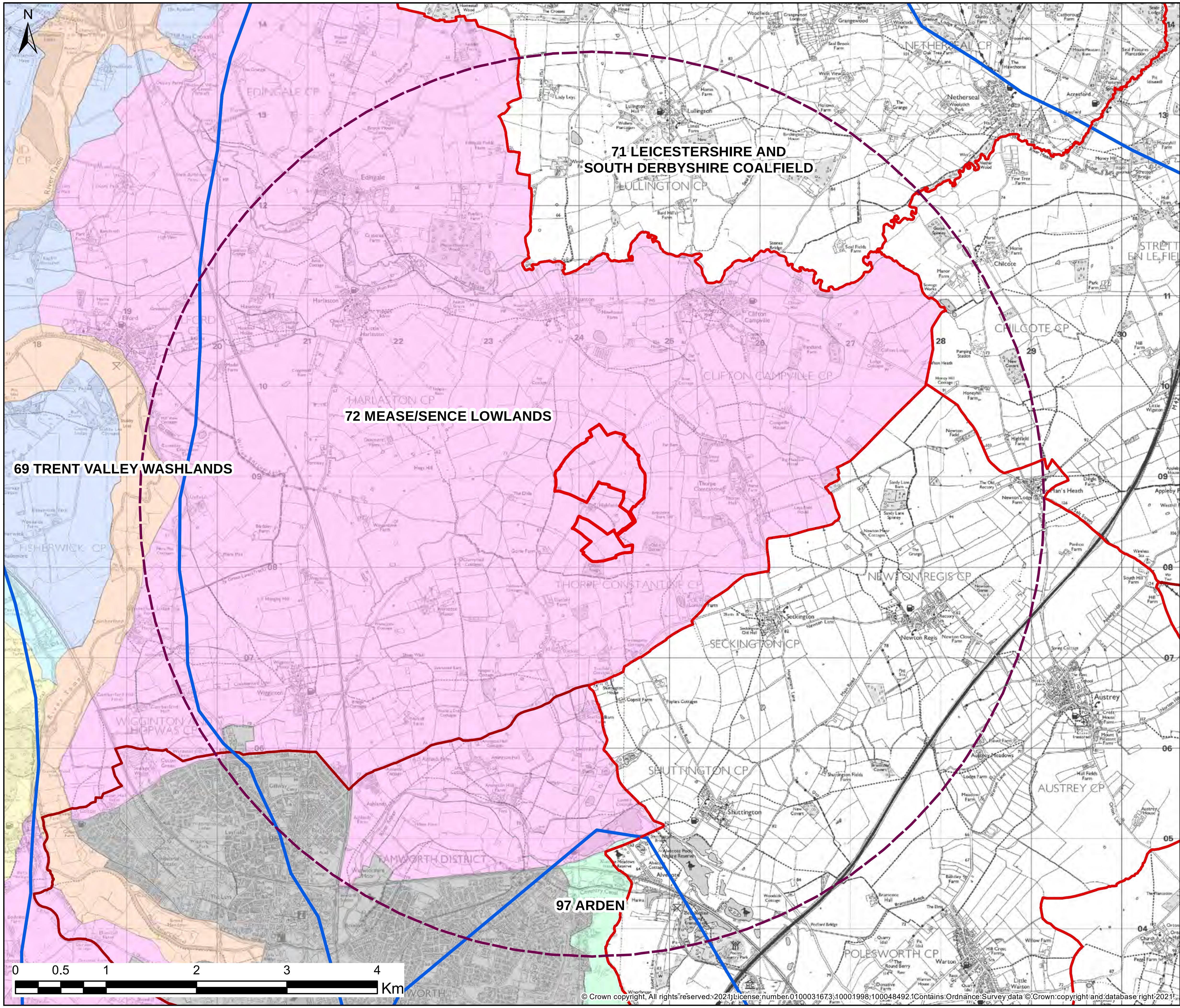




## Legend

- Study Area (5km radius)
- Application Site Boundary
- District Boundary

**SCC Draft Landscape Character 2018 for Lichfield and Tamworth**

**Draft Landscape Character Types**

- Coalfield Farmlands
- Lowland Village Farmlands
- River Meadowlands
- River Terrace Farmlands
- Sandstone Hills & Heaths
- Settled Farmlands
- Urban

| Rev | Description | By | CB | Date |
|---|---|---|---|---|

RPS MAKING COMPLEX EASY

Lakesbury House, Hiltingbury Road, Chandlers Ford,Hampshire SO53 5SS
T:02380 810 440 E: rpsso@rpsgroup.com

Client ELGIN ENERGY EsCO LTD

Project Highfields Farm Solar Farm

Title Landscape Character Types

| Status | Drawn By | PM/Checked By |
|---|---|---|
| Final | KH | PE |
| **Project Number** | **Scale @ A3** | **Date Created** |
| JSL3331 | 1:40,000 | OCT 2021 |

Figure Number 1.2

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# Appendix D

## Glint and Glare Study Pager Power

PAGERPOWER
Urban & Renewables

# Solar Photovoltaic Glint and Glare Study

RPS Group PLC

Thorpe Estate

**October 2021**

# ADMINISTRATION PAGE

| | |
|---|---|
| **Job Reference:** | 10899A |
| **Date:** | September 2021 |
| **Author:** | Waqar Qureshi |
| **Telephone:** | 01787 319001 |
| **Email:** | waqar@pagerpower.com |

| | |
|---|---|
| **First Reviewer:** | Michael Sutton |
| **Second Reviewer:** | Andrea Mariano |
| **Date:** | September 2021 |
| **Telephone:** | 01787 319001 |
| **Email:** | michael@pagerpower.com; andrea@pagerpower.com |

| Issue | Date | Detail of Changes |
|---|---|---|
| **2** | **October, 2021** | **Second Issue - Administrative Revisions** |



*Stour Valley Business Centre, Brundon Lane, Sudbury, CO10 7GB*

T:*+44 (0)1787 319001* E:*info@pagerpower.com* W: *www.pagerpower.com*

# EXECUTIVE SUMMARY

## Report Purpose

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) development located within the Thorpe Estate, Tamworth, B79 0LH, UK. This glint and glare assessment concerns the possible impact on surrounding road users and dwellings. A high-level overview of aviation concerns considering Catton Airfield, Grangewood Airfield, and Twycross Airfield has also been presented.

## Pager Power

Pager Power has undertaken over 700 glint and glare assessments internationally. The company's own glint and glare guidance is based on industry experience and extensive consultation with industry stakeholders, including airports and aviation regulators.

## Conclusions

No significant impacts are predicted on roads or dwellings in the surrounding area. Therefore, no mitigation requirement has been identified.

No significant impacts are predicted on aviation activity at Catton Airfield, Grangewood Airfield, and Twycross Airfield. No mitigation requirement has been identified.

## Guidance and Studies

Guidelines exist in the UK (produced by the Civil Aviation Authority) and in the USA (produced by the Federal Aviation Administration) with respect to solar developments and aviation activity. However, a specific methodology for determining the impact on road safety, residential amenity, and aviation activity has yet to be established. Therefore, Pager Power has reviewed existing guidelines and the available studies (discussed below) in the process of defining its own glint and glare assessment guidance and methodology[1]. This methodology defines the process for determining the impact on road safety, residential amenity, and aviation activity.

Pager Power's approach is to undertake geometric reflection calculations and, where a solar reflection is predicted, consider the screening (existing and/or proposed) between the receptor and the reflecting solar panels. The scenario in which a solar reflection can occur for all receptors is then identified and discussed, and a comparison is made against the available solar panel reflection studies to determine the overall impact.

The available studies have measured the intensity of reflections from solar panels with respect to other naturally occurring and manmade surfaces. The results show that the reflections

[1] Source: Pager Power Glint and Glare Guidance, Third Edition (3.1), April 2021

produced are of intensity similar to or less than those produced from still water and significantly less than reflections from glass and steel[2].

## Assessment Results

**Roads**

The modelling has shown that solar reflections are not geometrically possible towards the assessed section of road. No impacts are predicted, and no mitigation is required.

**Dwellings**

The modelling has shown that solar reflections are geometrically possible towards six of the seven assessed dwellings. Following a review of the available imagery and local topography, any solar reflections that are geometrically possible towards these dwellings are predicted to be significantly screened. No impacts are predicted, and no mitigation is required.

**High-Level Aviation**

Significant impacts are not predicted for aviation receptors at Catton Airfield, Grangewood Airfield, and Twycross Airfield because:

- Any reflections towards aircraft on approach to the runway at Catton Airfield would be outside a pilot's primary horizontal field of view for the final two miles, which is acceptable in accordance with the associated guidance and industry best practice.
- Any reflections towards aircraft on approach to the runway at Grangewood Airfield would be outside a pilot's primary horizontal field of view for the final two miles, which is acceptable in accordance with the associated guidance and industry best practice.
- Any reflections possible towards aircraft on approach to the runway at Twycross Airfield would likely at worst have a 'low potential for temporary after-image', based on Pager Power's extensive previous experience of assessing airfields at this distance and relative location. This is acceptable in accordance with the associated guidance and industry best practice.

Technical modelling is not recommended.

[2] SunPower, 2009, SunPower Solar Module Glare and Reflectance (appendix to Solargen Energy, 2010).

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## LIST OF FIGURES

# LIST OF TABLES

# ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 51 countries within Europe, Africa, America, Asia and Australasia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems.

Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

# 1 INTRODUCTION

## 1.1 Overview

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) development located within the Thorpe Estate, Tamworth, B79 0LH, UK. This glint and glare assessment concerns the possible impact on surrounding road users and dwellings. A high-level overview of aviation concerns considering Catton Airfield, Grangewood Airfield, and Twycross Airfield has also been presented.

This report contains the following:

- Solar development details;
- Explanation of glint and glare;
- Overview of relevant guidance;
- Overview of relevant studies;
- Overview of Sun movement;
- Assessment methodology;
- High-level aviation assessment;
- Identification of receptors;
- Glint and glare assessment for identified receptors;
- Results discussion;

Following this, a summary of findings and overall conclusions and recommendations from the desk-based analysis is presented. No site survey has taken place at this stage.

## 1.2 Pager Power's Experience

Pager Power has undertaken over 700 Glint and Glare assessments in the UK and internationally. The studies have included assessment of civil and military aerodromes, railway infrastructure and other ground-based receptors including roads and dwellings.

## 1.3 Glint and Glare Definition

The definition of glint and glare can vary however, the definition used by Pager Power 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.

These definitions are aligned with those of the Federal Aviation Administration (FAA) in the United States of America. The term 'solar reflection' is used in this report to refer to both reflection types.

# 2 PROPOSED SOLAR DEVELOPMENT LOCATION AND DETAILS

## 2.1 Proposed Development Site Layout Plan

The site layout plan of the proposed solar development is shown in Figure 1[3] below.


Figure 1 *Site layout plan*

[3] Source: Authored by and received from RPS.

## 2.2 Solar Panel Technical Information

The technical characteristics used for the modelling are presented in Table 1[4] below.

| Solar Panel Technical Information | |
|---|---|
| Azimuth angle (°) | 180 (south-facing) |
| Assessed centre height (m agl[5]) | 2 |
| Elevation angle (°) | 25 |

Table 1 *Solar panel technical information*

[4] Based on information received from RPS.

[5] above ground level

# 3 GLINT AND GLARE ASSESSMENT METHODOLOGY

## 3.1 Guidance and Studies

Appendices A and B present a review of relevant guidance and independent studies with regard to glint and glare issues from solar panels. The overall conclusions from the available studies are as follows:

- Specular reflections of the Sun from solar panels are possible.
- The measured intensity of a reflection from solar panels can vary from 2% to 30% depending on the angle of incidence.
- Published guidance shows that the intensity of solar reflections from solar panels are equal to or less than those from water. It also shows that reflections from solar panels are significantly less intense than many other reflective surfaces, which are common in an outdoor environment.

## 3.2 Background

Details of the Sun's movements and solar reflections are presented in Appendix C.

## 3.3 Methodology

The glint and glare assessment methodology has been derived from the information provided to Pager Power through consultation with stakeholders and by reviewing the available guidance and studies. The methodology for a glint and glare assessments is as follows:

- Identify receptors in the area surrounding the solar development.
- Consider direct solar reflections from the solar development towards the identified receptors by undertaking geometric calculations and intensity calculations where required.
- Consider the visibility of the panels from the receptor's location. If the panels are not visible from the receptor then no reflection can occur.
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur.
- Assess the glare intensity if applicable.
- Consider both the solar reflection from the solar development and the location of the direct sunlight with respect to the receptor's position.
- Consider the solar reflection with respect to the published studies and guidance.
- Determine whether a significant detrimental impact is expected in line with the process presented in Appendix D.

Within the Pager Power model, the solar development area is defined, as well as the relevant receptor locations. The result is a chart that states whether a reflection can occur, the duration and the panels that can produce the solar reflection towards the receptor.

## 3.4 Assessment Limitations

Further technical details regarding the methodology of the geometric calculations and limitations are presented in Appendices E and F.

# 4 HIGH-LEVEL AVIATION ASSESSMENT

## 4.1 Overview

Glint and glare analysis is often undertaken for solar developments that are adjacent to large aerodromes. The most common concerns are:

1. Potential reflections towards an Air Traffic Control (ATC) tower.
2. Potential reflections towards approaching pilots for the final two miles of the approach.

With regard to Point 2, these reflections are typically evaluated in the context of:

- Whether they are in a pilot's primary horizontal field of view (50° either side of the direction of travel).
- The intensity of the solar reflection.

There is no formal buffer distance within which aviation effects must be modelled. However, in practice, concerns are most often raised for developments within 10km of a licensed airport. Requests for modelling at ranges of 10-20km are far less common. Assessment of aviation effects for developments over 20km away is a very unusual requirement. A high-level aviation assessment has been undertaken considering the nearest aerodromes to the proposed development.

## 4.2 Catton Airfield

Catton Airfield is located approximately 5.16km west north-west of the proposed development. It appears to have one runway and no ATC Tower. An aerial image is shown in Figure 2[6] below.

Figure 2 *Catton Airfield – aerial image*

---

[6] Source: Copyright © 2021 Google.

## 4.3 Grangewood Airfield

Grangewood Airfield is located approximately 6.7km north-east of the proposed development. It appears to have one runway and no ATC Tower. An aerial image is shown in Figure 3[7] below.

Figure 3 *Grangewood Airfield – aerial image*

## 4.4 Twycross Airfield

Twycross Airfield is located approximately 11.5km east south-east of the proposed development. It appears to have one runway and no ATC Tower. An aerial image is shown in Figure 4[8] below.

Figure 4 *Twycross Airfield – aerial image*

[7] Source: Copyright © 2021 Google.
[8] Source: Copyright © 2021 Google.

The locations of these airfields relative to the proposed development are shown in Figure 5[6] below, with the last 2-miles of the runway approach paths represented by the red lines.


Figure 5 *Airfields relative to the proposed development*

## 4.5 High-Level Assessment Conclusions

Significant impacts are not predicted for aviation receptors at Catton Airfield, Grangewood Airfield, and Twycross Airfield because:

- Any reflections towards aircraft on approach to the runway at Catton Airfield would be outside a pilot's primary horizontal field of view for the final two miles, which is acceptable in accordance with the associated guidance and industry best practice.
- Any reflections towards aircraft on approach to the runway at Grangewood Airfield would be outside a pilot's primary horizontal field of view for the final two miles, which is acceptable in accordance with the associated guidance and industry best practice.
- Any reflections possible towards aircraft on approach to the runway at Twycross Airfield would likely at worst have a 'low potential for temporary after-image', based on Pager Power's extensive previous experience of assessing airfields at this distance and relative location. This is acceptable in accordance with the associated guidance and industry best practice.

Technical modelling is not recommended.

# 5 IDENTIFICATION OF GROUND-BASED RECEPTORS

## 5.1 Overview

There is no formal guidance with regard to the maximum distance at which glint and glare should be assessed. From a technical perspective, there is no maximum distance for potential reflections. The significance of a reflection however decreases with distance because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. Terrain and shielding by vegetation are also more likely to obstruct an observer's view at longer distances.

The above parameters and extensive experience over a significant number of glint and glare assessments undertaken show that consideration of receptors within 1km of panel areas is deemed appropriate for glint and glare effects on roads and dwellings. The panels are fixed south facing and solar reflections at ground level towards the north at this latitude are highly unlikely. Therefore, the assessment area has been designed accordingly as a 1km boundary from solar panels for roads and dwellings (yellow outlined areas on the proceeding figures). The area to the north of the north-most solar panels has been excluded.

Potential receptors are identified based on mapping and aerial photography of the region. The initial judgement is made based on a high-level consideration of aerial photography and mapping i.e. receptors are excluded if it is clear from the outset that no visibility would be possible. A more detailed assessment is made if the modelling reveals a reflection would be geometrically possible.

An overview of the one-kilometre assessment area is presented in Figure 6[9] on the following page.

[9] Source: Copyright © 2021 Google.

Figure 6 *One-kilometre assessment area overview – aerial image*

## 5.2 Road Receptors

Road types can generally be categorised as:

- Major National – Typically a road with a minimum of two carriageways with a maximum speed limit of up to 70mph. These roads typically have fast-moving vehicles with busy traffic.
- National – Typically a road with a one or more carriageways with a maximum speed limit of up to 60mph or 70mph. These roads typically have fast-moving vehicles with moderate to busy traffic density.
- Regional – Typically a single carriageway with a maximum speed limit of up to 60mph. The speed of vehicles will vary with a typical traffic density of low to moderate; and
- Local - Typically roads and lanes with the lowest traffic densities. Speed limits vary.

Technical modelling is not recommended for local roads, where traffic densities are likely to be relatively low. Any solar reflections from the proposed development that are experienced by a road user along a local road would be considered low impact in the worst case in accordance with the guidance presented in Appendix D. The analysis has considered any major national, national, and regional roads that:

- Are within the one-kilometre assessment area.
- Have a potential view of the panels.

A 0.48km section of B5493 was identified for assessment. This section is identified by the light blue line in Figure 7[9] below. In total, 13 associated receptors were identified, distanced circa 40m apart.

A height of 1.5 metres above ground level has been taken as a typical eye level for a road user[10]. This height has therefore been added to the ground height at each receptor location. Visibility and direction of travel is considered in the assessment of all receptors.


Figure 7 *Assessed road section and receptors – aerial image*

## 5.3 Dwelling Receptors

The analysis has considered dwellings that:

- Are within the one-kilometre assessment area.
- Have a potential view of the panels.

In total, seven dwellings were identified for assessment. A height of 1.8 metres above ground level has been taken as typical eye level for an observer on the ground floor of the dwelling since this is typically the most occupied floor of a dwelling throughout the day. Visibility from all storeys is considered for receptors where effects are possible based on the technical modelling.

An overview of all assessed dwelling receptors is shown in Figure 8[9] on the following page.

[10] This height is chosen for modelling purposes, elevated drivers are considered in the results discussion where appropriate.

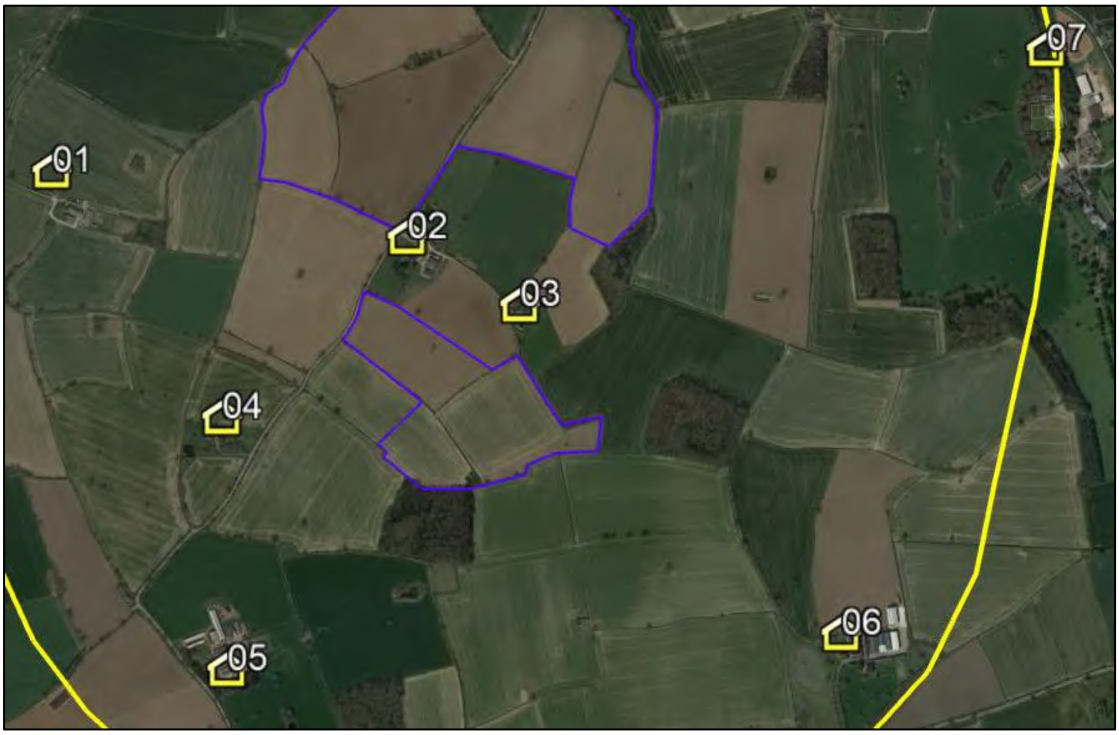



Figure 8 *Assessed dwelling receptors overview – aerial image*

# 6 ASSESSED REFLECTOR AREAS

## 6.1 Reflector Areas

A number of representative panel locations are selected within the proposed reflector areas with the number of modelled points being determined by the size of the reflector areas and the assessment resolution. The bounding coordinates for the proposed solar farm development have been extrapolated from the site plans. The data can be found in Appendix G.

A resolution of 20m has been chosen for this assessment. This means that a geometric calculation is undertaken for each identified receptor every 20m from within the defined areas. This resolution is sufficiently high to maximise the accuracy of the results – increasing the resolution further would not significantly change the modelling output. If a reflection is experienced from an assessed panel location, then it is likely that a reflection will be viewable from similarly located panels within the proposed development.

Figure 9 below shows the assessed reflector areas that have been used for modelling purposes.


Figure 9 *Assessed reflector areas – aerial image*

# 7 GLINT AND GLARE ASSESSMENT – TECHNICAL RESULTS

## 7.1 Technical Results Overview

The tables in the following subsections present the results of the technical analysis for the ground-based receptors.

The predicted glare times are based solely on bare-earth terrain i.e. without consideration of screening from buildings and vegetation. The final column summarises the predicted impact considering the level of identified screening based on a desk-based review of the available imagery. The significance of any predicted effects has been evaluated in accordance with Pager Power's published guidance document[11].

The flowcharts setting out the impact characterisation and presented in Appendix D. The list of assumptions and limitations are presented in Appendix F. The modelling output for key receptors showing the precise predicted times and the reflecting panel area(s) can be found in Appendix H.

When evaluating visibility in the context of glint and glare, it is only the *reflecting* panel area that must be considered. For example, if the western half of the development is visible, but reflections would only be possible from the eastern half, it can be concluded that the reflecting area is not visible and no impacts are predicted. This is why there can be instances where visibility of the development is predicted, but glint and glare issues are screened.

Receptors are included within the assessment based on the potential visibility of the development as a whole, among other factors. Once the modelling output has been generated, the assessment can be refined to evaluate the visibility of the reflecting panel area specifically.

[11] Source: Pager Power Glint and Glare Guidance, Third Edition (3.1), April 2021

## 7.1 Geometric Calculation Results Overview – Road Receptors

The results of the geometric calculations towards the road receptors are presented in Table 2 below.

| Receptors | Reflection possible towards the receptor(s)? (GMT) | | Comments |
|---|---|---|---|
| | am | pm | |
| 1 – 13. | No. | No. | Solar reflections are not geometrically possible.<br>No impact is predicted. |

Table 2 *Geometric analysis results – road receptors*

## 7.2 Geometric Calculation Results Overview – Dwelling Receptors

The results of the geometric calculations towards the dwelling receptors are presented in Table 3 below.

| Receptors | Reflection possible towards the receptor(s)? (GMT) | | Comments |
|---|---|---|---|
| | am | pm | |
| 1. | Yes. | No. | Any solar reflections that are geometrically possible are predicted to be significantly screened by intervening terrain and vegetation.<br>No impacts are predicted. |
| 2. | Yes. | No. | Any solar reflections that are geometrically possible are predicted to be significantly screened by surrounding buildings.<br>No impacts are predicted. |
| 3. | No. | Yes. | Any solar reflections that are geometrically possible are predicted to be significantly screened by intervening terrain, existing vegetation, and proposed vegetation planting.<br>No impacts are predicted. |

| Receptors | Reflection possible towards the receptor(s)? (GMT) | | Comments |
|---|---|---|---|
| | am | pm | |
| 4. | Yes. | No. | Any solar reflections that are geometrically possible are predicted to be significantly screened by intervening vegetation.<br>No impacts are predicted. |
| 5. | No. | No. | Solar reflections are not geometrically possible.<br>No impact is predicted. |
| 6. | No. | Yes. | Any solar reflections that are geometrically possible are predicted to be significantly screened by intervening terrain and vegetation.<br>No impacts are predicted. |
| **7.** | No. | Yes. | Any solar reflections that are geometrically possible are predicted to be significantly screened by intervening terrain and vegetation.<br>No impacts are predicted. |

Table 3 *Geometric analysis results – dwelling receptors*

# 8 GEOMETRIC ASSESSMENT RESULTS DISCUSSION

## 8.1 Roads

The modelling has shown that solar reflections are not geometrically possible towards the assessed section of road. No impacts are predicted, and no mitigation is required.

## 8.2 Dwellings

The modelling has shown that solar reflections are geometrically possible towards six of the seven assessed dwelling receptors (1 – 4 and 6 – 7). The modelling output for these receptors showing the precise predicted times and the reflecting panel area(s) can be found in Appendix H.

The process for quantifying impact significance is defined in the report appendices. For dwelling receptors, the key considerations are:

- Whether a significant reflection is predicted to be experienced in practice.
- The duration of the predicted effects, relative to thresholds of:
    - 3 months per year.
    - 60 minutes per day.

Where reflections are geometrically possible but expected to be screened, no impact is predicted, and mitigation is not required.

Where effects occur for less than 3 months per year and less than 60 minutes per day[12], the impact significance is low, and mitigation is not required.

Where reflections are predicted to be experienced for more than 3 months per year or for more than 60 minutes per day[13], the impact significance is moderate and expert assessment of the following mitigating factors is required to determine the mitigation requirement:

- The separation distance to the panel area[14]. Larger 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. The Sun is a far more significant source of light.
- 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.

[12] Based on the modelling results or whereby (following a conservative assessment) screening is predicted to reduce the duration of effects within this threshold.

[13] Or if effects last for less than 3 months per year but more than 60 minutes per day, which is a scenario that is almost never seen in practice but could occur in theory.

[14] Which is often greater than the nearest panel boundary, because not all areas of the site cause specular reflections towards particular receptor locations.

- Whether the dwelling appears to have windows facing the reflecting areas. An observer may need to look at an acute angle to observe the reflecting areas.

Where effects last for more than 3 months per year and more than 60 minutes per day, the impact significance is high, and mitigation is required.

In the case of the proposed development, there are no instances of low, moderate or high impact, even under worst-case conditions.

Following a review of the available imagery and local topography, any solar reflections that are geometrically possible towards these receptors are predicted to be significantly screened. The screening is broken down in the list below:

- Dwelling Receptor 01 - screened by intervening terrain and vegetation.
- Dwelling Receptor 02 - screened by surrounding buildings.
- Dwelling Receptor 03 - screened by intervening terrain, existing vegetation, and proposed vegetation planting.
- Dwelling Receptor 04 - screened by intervening vegetation.
- Dwelling Receptor 06 - screened by intervening terrain and vegetation.
- Dwelling Receptor 07 - screened by intervening terrain and vegetation.

No impacts are predicted, and no mitigation is required.

## 8.3 Overall Conclusions

No significant impacts are predicted on roads or dwellings in the surrounding area. Therefore, no mitigation requirement has been identified.

No significant impacts are predicted on aviation activity at Catton Airfield, Grangewood Airfield, and Twycross Airfield. No mitigation requirement has been identified.

# APPENDIX A – OVERVIEW OF GLINT AND GLARE GUIDANCE

## Overview

This section presents details regarding the relevant guidance and studies with respect to the considerations and effects of solar reflections from solar panels, known as 'Glint and Glare'.

This is not a comprehensive review of the data sources, rather it is intended to give an overview of the important parameters and considerations that have informed this assessment.

## UK Planning Policy

National Planning Policy within the planning practice guidance for Renewable and Low Carbon Energy[15] (specifically regarding the consideration of solar farms, paragraph 013) states:

*'What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic Farms?*

*The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.*

*Particular factors a local planning authority will need to consider include:*

…

- *the proposal's visual impact, the effect on landscape of glint and glare (see guidance on landscape assessment) and on **neighbouring uses and aircraft safety**;*
- *the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun.*

…

*The approach to assessing cumulative landscape and visual impact of large-scale solar farms is likely to be the same as assessing the impact of wind turbines. However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero.'*

## Assessment Process – Ground-Based Receptors

No process for determining and contextualising the effects of glint and glare are, however, provided for assessing the impact of solar reflections on surrounding roads and dwellings. Therefore, the Pager Power approach is to determine whether a reflection from the proposed solar development is geometrically possible and then to compare the results against the relevant guidance/studies to determine whether the reflection is significant. The Pager Power approach has been informed by the policy presented above, current studies (presented in Appendix B) and

[15] Renewable and low carbon energy, Ministry of Housing, Communities & Local Government, date: 18 June 2015, accessed on: 17/06/2020

stakeholder consultation. Further information can be found in Pager Power's Glint and Glare Guidance document[16] which was produced due to the absence of existing guidance and a specific standardised assessment methodology.

[16] Source: Pager Power Glint and Glare Guidance, Third Edition (3.1), April 2021

# APPENDIX B – OVERVIEW OF GLINT AND GLARE STUDIES

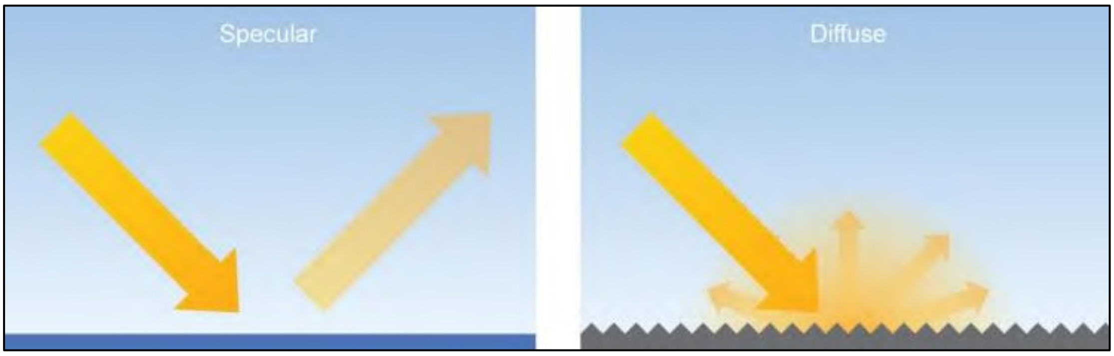
## Overview

Studies have been undertaken assessing the type and intensity of solar reflections from various surfaces including solar panels and glass. An overview of these studies is presented below.

The guidelines presented are related to aviation safety. The results are applicable for the purpose of this analysis.

## Reflection Type from Solar Panels

Based on the surface conditions reflections from light can be specular and diffuse. A specular reflection has a reflection characteristic similar to that of a mirror; a diffuse will reflect the incoming light and scatter it in many directions. The figure below, taken from the FAA guidance[17], illustrates the difference between the two types of reflections. Because solar panels are flat and have a smooth surface most of the light reflected is specular, which means that incident light from a specific direction is reradiated in a specific direction.




*Specular and diffuse reflections*

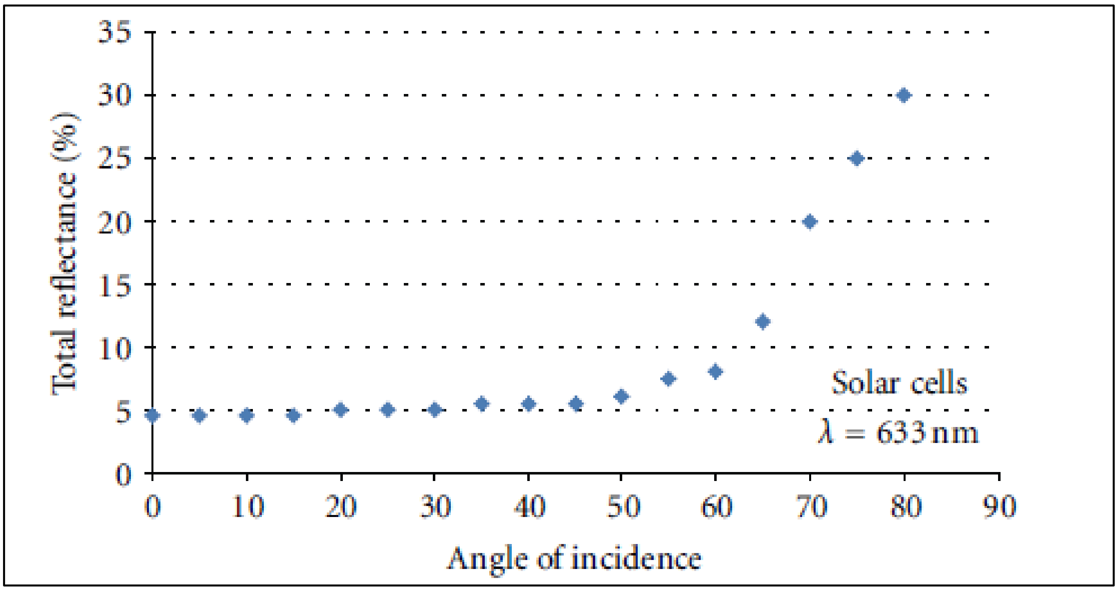
[17] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019.

## Solar Reflection Studies

An overview of content from identified solar panel reflectivity studies is presented in the subsections below.

**Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems"**

Evan Riley and Scott Olson published in 2011 their study titled: *A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems*[18]". They researched the potential glare that a pilot could experience from a 25 degree fixed tilt PV system located outside of Las Vegas, Nevada. The theoretical glare was estimated using published ocular safety metrics which quantify the potential for a postflash glare after-image. This was then compared to the postflash glare after-image caused by smooth water. The study demonstrated that the reflectance of the solar cell varied with angle of incidence, with maximum values occurring at angles close to 90 degrees. The reflectance values varied from approximately 5% to 30%. This is shown on the figure below.




*Total reflectance % when compared to angle of incidence*

The conclusions of the research study were:

- The potential for hazardous glare from flat-plate PV systems is similar to that of smooth water;
- Portland white cement concrete (which is a common concrete for runways), snow, and structural glass all have a reflectivity greater than water and flat plate PV modules.

[18] Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems," ISRN Renewable Energy, vol. 2011, Article ID 651857, 6 pages, 2011. doi:10.5402/2011/651857

**FAA Guidance – "Technical Guidance for Evaluating Selected Solar Technologies on Airports"[19]**

The 2010 FAA Guidance included a diagram which illustrates the relative reflectance of solar panels compared to other surfaces. The figure shows the relative reflectance of solar panels compared to other surfaces. Surfaces in this figure produce reflections which are specular and diffuse. A specular reflection (those made by most solar panels) has a reflection characteristic similar to that of a mirror. A diffuse reflection will reflect the incoming light and scatter it in many directions. A table of reflectivity values, sourced from the figure within the FAA guidance, is presented below.

| Surface | Approximate Percentage of Light Reflected[20] |
|---|---|
| Snow | 80 |
| White Concrete | 77 |
| Bare Aluminium | 74 |
| Vegetation | 50 |
| Bare Soil | 30 |
| Wood Shingle | 17 |
| Water | 5 |
| Solar Panels | 5 |
| Black Asphalt | 2 |

*Relative reflectivity of various surfaces*

Note that the data above does not appear to consider the reflection type (specular or diffuse).

An important comparison in this table is the reflectivity compared to water which will produce a reflection of very similar intensity when compared to that from a solar panel.

The study by Riley and Olsen study (2011) also concludes that still water has a very similar reflectivity to solar panels.

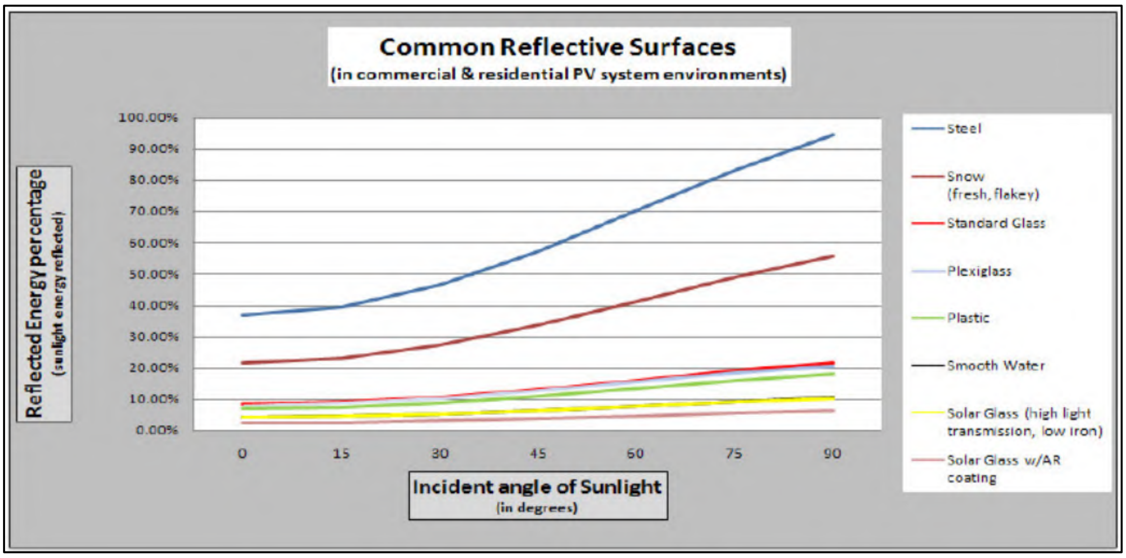
[19] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019.

[20] Extrapolated data, baseline of 1,000 W/m$^2$ for incoming sunlight.

**SunPower Technical Notification (2009)**

SunPower published a technical notification[21] to ‘increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment’.

The figure presented below shows the relative reflectivity of solar panels compared to other natural and manmade materials including smooth water, standard glass and steel.




*Common reflective surfaces*

The results, similarly to those from Riley and Olsen study (2011) and the FAA (2010), show that solar panels produce a reflection that is less intense than those of ‘*standard glass and other common reflective surfaces*’.

With respect to aviation and solar reflections observed from the air, SunPower has developed several large installations near airports or on Air Force bases. It is stated that these developments have all passed FAA or Air Force standards with all developments considered “No Hazard to Air Navigation”. The note suggests that developers discuss any possible concerns with stakeholders near proposed solar farms.

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[21] Source: Technical Support, 2009. SunPower Technical Notification – Solar Module Glare and Reflectance.

# APPENDIX C – OVERVIEW OF SUN MOVEMENTS AND RELATIVE REFLECTIONS

The Sun's position in the sky can be accurately described by its azimuth and elevation. Azimuth is a direction relative to true north (horizontal angle i.e. from left to right) and elevation describes the Sun's angle relative to the horizon (vertical angle i.e. up and down).

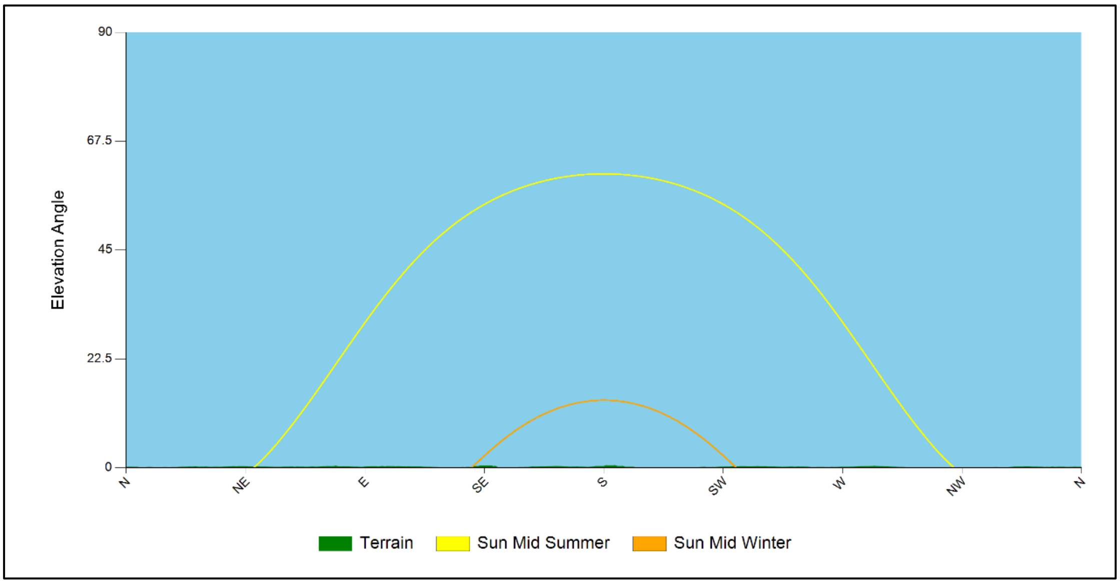
The Sun's position can be accurately calculated for a specific location. The following data being used for the calculation:

- Time.
- Date.
- Latitude.
- Longitude.

The following is true at the location of the solar development:

- The Sun is at its highest around midday and is to the south at this time.
- The Sun rises highest on 21 June (longest day).
- On 21 December, the maximum elevation reached by the Sun is at its lowest (shortest day).

The combination of the Sun's azimuth angle and vertical elevation will affect the direction and angle of the reflection from a reflector. The figure below shows terrain at the horizon as well as the sunrise and sunset curves throughout the year from lon: -1.642908 lat: 52.676747.




*Terrain elevation at the horizon*

# APPENDIX D – GLINT AND GLARE IMPACT SIGNIFICANCE

## Overview

The significance of glint and glare will vary for different receptors. The following section presents a general overview of the significance criteria with respect to experiencing a solar reflection.

## Impact Significance Definition

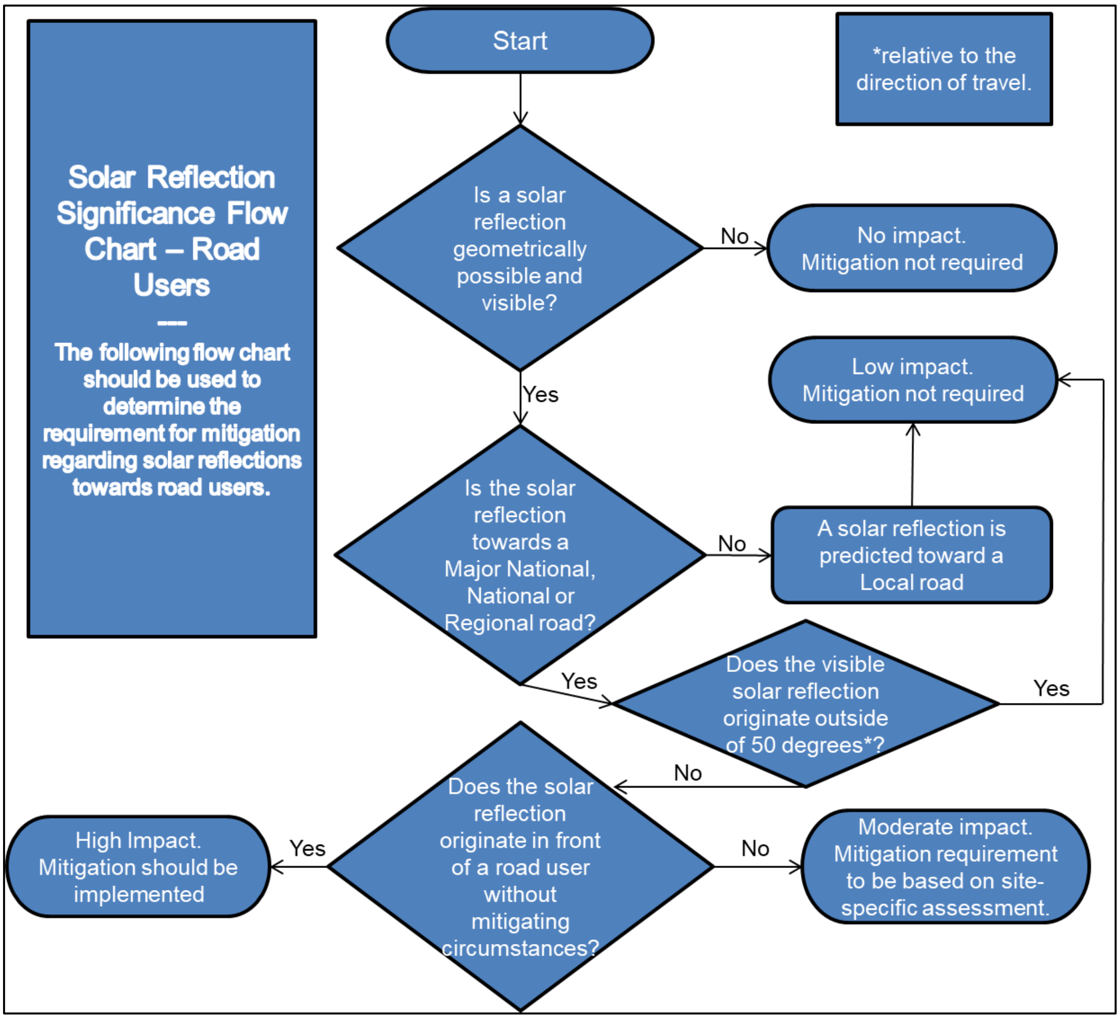
The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

| Impact Significance | Definition | Mitigation Requirement |
|---|---|---|
| No Impact | A solar reflection is not geometrically possible or will not be visible from the assessed receptor. | No mitigation required. |
| Low | A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels. | No mitigation required. |
| Moderate | A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case. | Whilst the impact may be acceptable, consultation and/or further analysis should be undertaken to determine the requirement for mitigation. |
| Major | A solar reflection is geometrically possible and visible under conditions that will produce a significant impact.<br>Mitigation and consultation is recommended. | Mitigation will be required if the proposed solar development is to proceed. |

*Impact significance definition*

## Assessment Process for Road Receptors

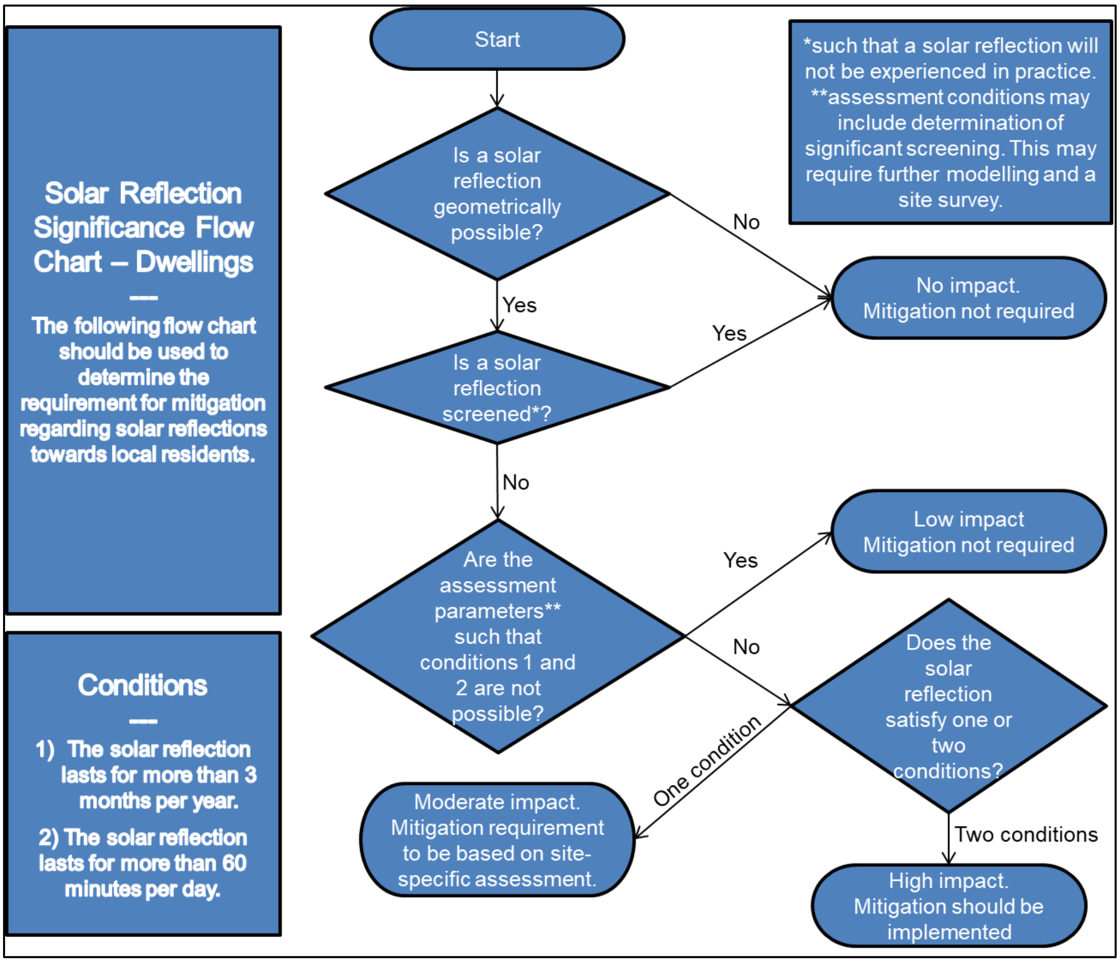
The flow chart presented below has been followed when determining the mitigation requirement for road receptors.




*Road receptor mitigation requirement flow chart*

## Assessment Process for Dwelling Receptors

The flow chart presented below has been followed when determining the mitigation requirement for dwelling receptors.




*Dwelling receptor mitigation requirement flow chart*

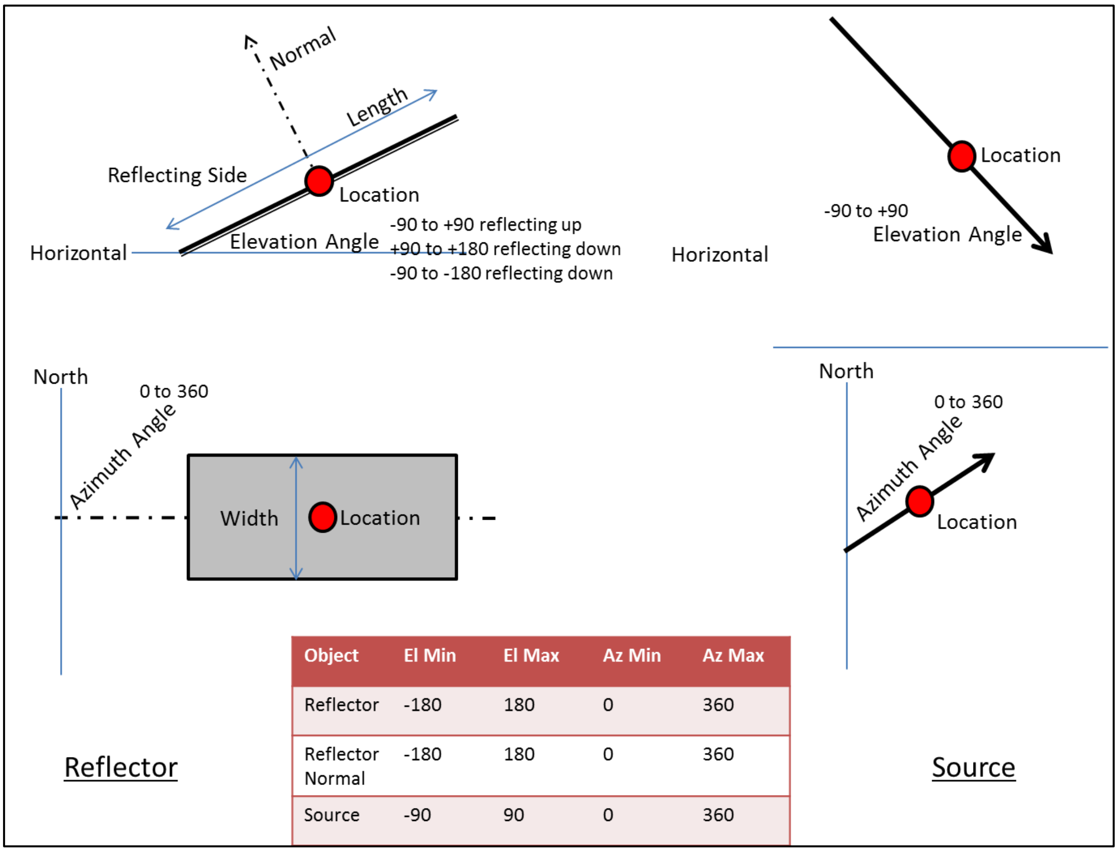
# APPENDIX E – REFLECTION CALCULATIONS METHODOLOGY

## Pager Power's Reflection Calculations Methodology

The calculations are three dimensional and complex, accounting for:

- The Earth's orbit around the Sun;
- The Earth's rotation;
- The Earth's orientation;
- The reflector's location;
- The reflector's 3D Orientation.

Reflections from a flat reflector are calculated by considering the normal which is an imaginary line that is perpendicular to the reflective surface and originates from it. The diagram below may be used to aid understanding of the reflection calculation process.




| Object | El Min | El Max | Az Min | Az Max |
|---|---|---|---|---|
| Reflector | -180 | 180 | 0 | 360 |
| Reflector Normal | -180 | 180 | 0 | 360 |
| Source | -90 | 90 | 0 | 360 |

The following process is used to determine the 3D Azimuth and Elevation of a reflection:

- Use the Latitude and Longitude of reflector as the reference for calculation purposes;
- Calculate the Azimuth and Elevation of the normal to the reflector;
- Calculate the 3D angle between the source and the normal;

- If this angle is less than 90 degrees a reflection will occur. If it is greater than 90 degrees no reflection will occur because the source is behind the reflector;
- Calculate the Azimuth and Elevation of the reflection in accordance with the following:
    - The angle between source and normal is equal to angle between normal and reflection;
    - Source, Normal and Reflection are in the same plane.

# APPENDIX F – ASSESSMENT LIMITATIONS AND ASSUMPTIONS

## Pager Power's Model

The model considers 100% sunlight during daylight hours which is highly conservative.

The model does not account for terrain between the reflecting solar panels and the assessed receptor where a solar reflection is geometrically possible.

The model considers terrain between the reflecting solar panels and the visible horizon (where the sun may be obstructed from view of the panels)[22].

It is assumed that the panel elevation angle assessed represents the elevation angle for all of the panels within each solar panel area defined.

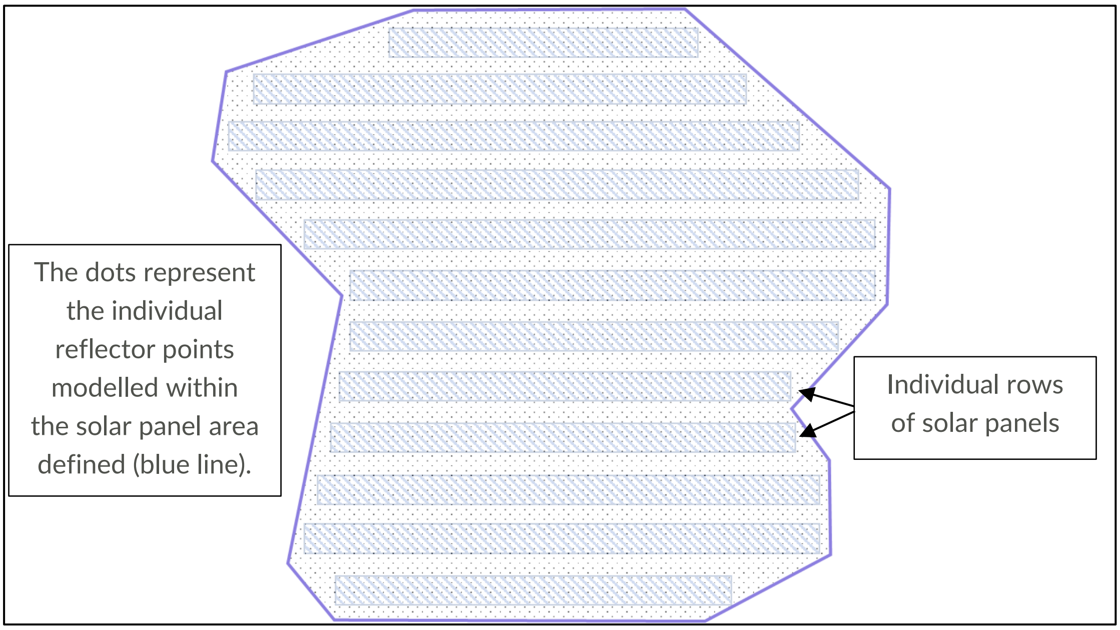
It is assumed that the panel azimuth angle assessed represents the azimuth angle for all of the panels within each solar panel area defined.

Only a reflection from the face of the panel has been considered. The frame or the reverse or frame of the solar panel has not been considered.

The model assumes that a receptor can view the face of every panel (point, defined in the following paragraph) within the development area whilst in reality this, in the majority of cases, will not occur. Therefore any predicted solar reflection from the face of a solar panel that is not visible to a receptor will not occur in practice.

A finite number of points within each solar panel area defined is chosen based on an assessment resolution so that a comprehensive understanding of the entire development can be formed. This determines whether a solar reflection could ever occur at a chosen receptor. The model does not consider the specific panel rows or the entire face of the solar panel within the development outline, rather a single point is defined every 'x' metres (based on the assessment resolution) with the geometric characteristics of the panel. A panel area is however defined to encapsulate all possible panel locations. See the figure below which illustrates this process.

[22] UK only.




*Solar panel area modelling overview*

A single reflection point is chosen for the geometric calculations. This suitably determines whether a solar reflection can be experienced at a receptor location and the time of year and duration of the solar reflection. Increased accuracy could be achieved by increasing the number of heights assessed however this would only marginally change the results and is not considered significant.

The available street view imagery, satellite mapping, terrain and any site imagery provided by the developer has been used to assess line of sight from the assessed receptors to the modelled solar panel area, unless stated otherwise. In some cases, this imagery may not be up to date and may not give the full perspective of the installation from the location of the assessed receptor.

Any screening in the form of trees, buildings etc. that may obstruct the Sun from view of the solar panels is not within the modelling unless stated otherwise. The terrain profile at the horizon is considered if stated.

# APPENDIX G – RECEPTOR AND REFLECTOR AREA DETAILS

## Terrain Height

Terrain Height was calculated from Pager Power's database (established on OS Panorama 50m DTM) based on the coordinates of the point of interest.

## Road Receptor Data

The table below presents the coordinates for the assessed road receptors.

| Location | Longitude (°) | Latitude (°) | Location | Longitude (°) | Latitude (°) |
|---|---|---|---|---|---|
| 1 | -1.634421 | 52.66196 | 8 | -1.631094 | 52.6634 |
| 2 | -1.633975 | 52.662214 | 9 | -1.630514 | 52.663528 |
| 3 | -1.633535 | 52.662459 | 10 | -1.629945 | 52.663638 |
| 4 | -1.633099 | 52.662681 | 11 | -1.629385 | 52.663734 |
| 5 | -1.632626 | 52.662894 | 12 | -1.628825 | 52.663815 |
| 6 | -1.632114 | 52.663097 | 13 | -1.628146 | 52.663913 |
| 7 | -1.631623 | 52.663251 | | | |

*Road Receptor Data*

## Dwelling Receptor Data

The table below presents the coordinates for the assessed dwelling receptors.

| Location | Longitude (°) | Latitude (°) | Location | Longitude (°) | Latitude (°) |
|---|---|---|---|---|---|
| 1 | -1.658231 | 52.676562 | 5 | -1.651641 | 52.665283 |
| 2 | -1.644936 | 52.675052 | 6 | -1.628726 | 52.666083 |
| 3 | -1.640728 | 52.673521 | 7 | -1.621116 | 52.67929 |
| 4 | -1.651815 | 52.670977 | | | |

*Dwelling Receptor Data*

## Northern Panel Area Boundary Data

The table below presents the coordinates of the boundary points for the assessed northern panel area.

| Location | Longitude (°) | Latitude (°) | Location | Longitude (°) | Latitude (°) |
|---|---|---|---|---|---|
| 1 | -1.644329 | 52.682281 | 19 | -1.638671 | 52.676883 |
| 2 | -1.645135 | 52.681975 | 20 | -1.638857 | 52.676338 |
| 3 | -1.645099 | 52.681804 | 21 | -1.638837 | 52.675752 |
| 4 | -1.646269 | 52.681412 | 22 | -1.637394 | 52.675332 |
| 5 | -1.647542 | 52.680765 | 23 | -1.635888 | 52.676207 |
| 6 | -1.648776 | 52.679904 | 24 | -1.635718 | 52.677254 |
| 7 | -1.649341 | 52.679330 | 25 | -1.635560 | 52.678526 |
| 8 | -1.649515 | 52.679022 | 26 | -1.636407 | 52.679314 |
| 9 | -1.650169 | 52.678751 | 27 | -1.636588 | 52.680011 |
| 10 | -1.650332 | 52.678467 | 28 | -1.636495 | 52.680360 |
| 11 | -1.650219 | 52.677851 | 29 | -1.637555 | 52.680929 |
| 12 | -1.650408 | 52.676836 | 30 | -1.638248 | 52.681132 |
| 13 | -1.649395 | 52.676751 | 31 | -1.639057 | 52.681961 |
| 14 | -1.647670 | 52.676391 | 32 | -1.638826 | 52.682343 |
| 15 | -1.645156 | 52.675662 | 33 | -1.640432 | 52.682619 |
| 16 | -1.643063 | 52.677623 | 34 | -1.641763 | 52.682367 |
| 17 | -1.641478 | 52.677438 | 35 | -1.643068 | 52.683427 |
| 18 | -1.640633 | 52.677280 | 36 | -1.644581 | 52.682727 |

*Northern Panel Area Boundary Data*

## Southern Panel Area Boundary Data

The table below presents the coordinates of the boundary points for the assessed southern panel area.

| Location | Longitude (°) | Latitude (°) | Location | Longitude (°) | Latitude (°) |
|---|---|---|---|---|---|
| 1 | -1.644368 | 52.671807 | 10 | -1.637822 | 52.670690 |
| 2 | -1.646006 | 52.670862 | 11 | -1.637679 | 52.671478 |
| 3 | -1.645673 | 52.670674 | 12 | -1.639183 | 52.671291 |
| 4 | -1.645809 | 52.670568 | 13 | -1.640828 | 52.672846 |
| 5 | -1.644381 | 52.669848 | 14 | -1.641764 | 52.672539 |
| 6 | -1.642581 | 52.669849 | 15 | -1.645309 | 52.673980 |
| 7 | -1.640526 | 52.670175 | 16 | -1.646538 | 52.674312 |
| 8 | -1.640467 | 52.670374 | 17 | -1.646810 | 52.673708 |
| 9 | -1.639419 | 52.670656 | 18 | -1.647318 | 52.673213 |

*Southern Panel Area Boundary Data*

# APPENDIX H – DETAILED MODELLING RESULTS

## Overview

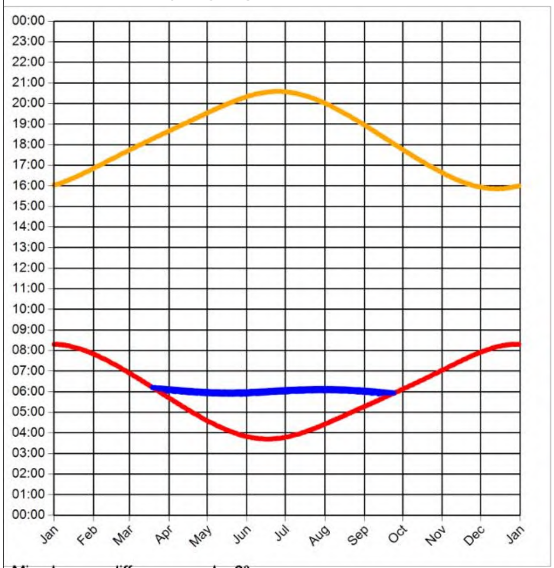
The charts for the potentially affected receptors are shown on the following pages for completeness. Each chart shows:

- The receptor (observer) location – top right image. This also shows the azimuth range of the Sun itself at times when reflections are possible. If sunlight is experienced from the same direction as the reflecting panels, the overall impact of the reflection is reduced as discussed within the body of the report;
- The reflecting panels – bottom right image. The reflecting area is shown in yellow. If the yellow panels are not visible from the observer location, no issues will occur in practice. Additional obstructions which may obscure the panels from view are considered separately within the analysis;
- The reflection date/time graph – left hand side of the page. The blue line indicates the dates and times at which geometric reflections are possible. This relates to reflections from the yellow areas;
- The sunrise and sunset curves throughout the year (red and yellow lines).

## Dwelling Receptors

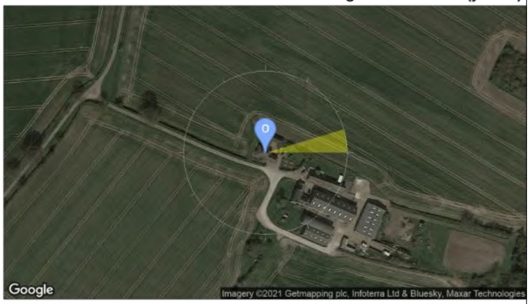
**Observer Dwelling Receptor 01 Results**

Reflection Date/Time (GMT) Graph




Min observer difference angle: 0°
Max observer difference angle: 20°

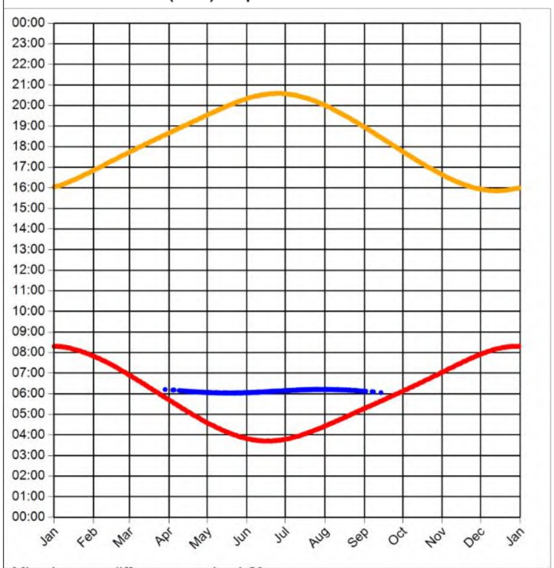
Observer Location — Sun azimuth range is 73.3° - 90° (yellow)




Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


**Observer Dwelling Receptor 02 Results**

Reflection Date/Time (GMT) Graph



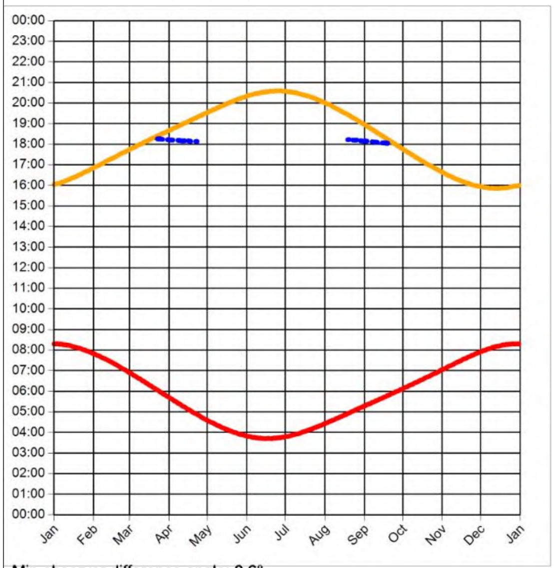

Min observer difference angle: 4.3°
Max observer difference angle: 21.2°

Observer Location — Sun azimuth range is 75° - 88.2° (yellow)


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

## Observer Dwelling Receptor 03 Results

Reflection Date/Time (GMT) Graph



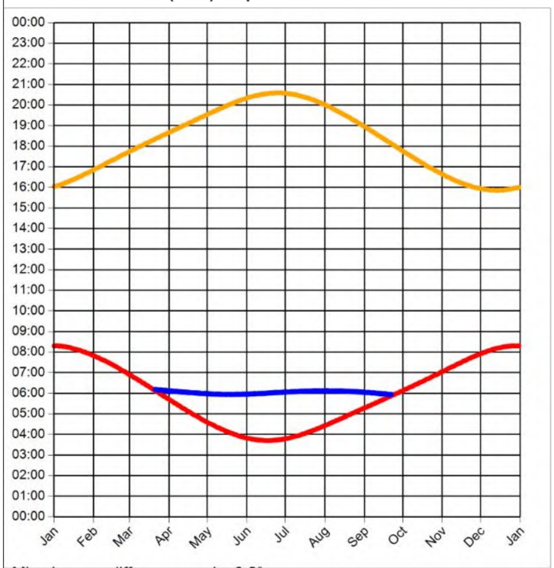

Min observer difference angle: 0.6°
Max observer difference angle: 10.2°

Observer Location | Sun azimuth range is 271.2° - 278.4° (yellow)


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


## Observer Dwelling Receptor 04 Results

Reflection Date/Time (GMT) Graph



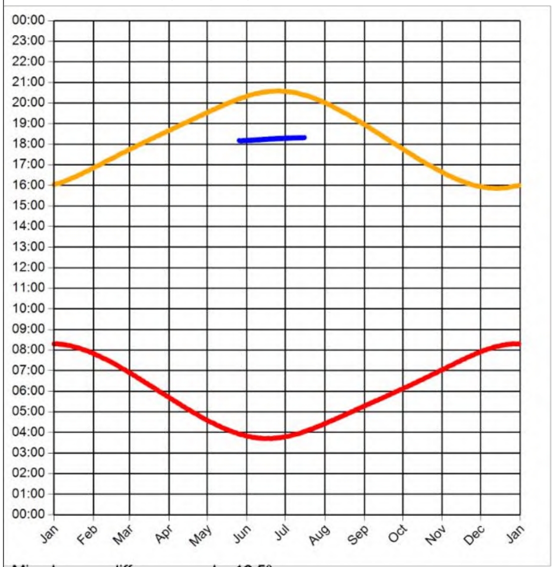

Min observer difference angle: 0.2°
Max observer difference angle: 19°

Observer Location | Sun azimuth range is 73.9° - 89.4° (yellow)


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

## Observer Dwelling Receptor 06 Results

Reflection Date/Time (GMT) Graph



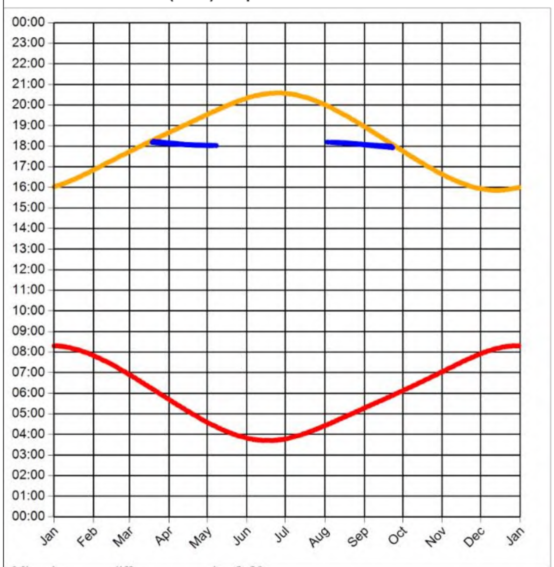

Min observer difference angle: 16.5°
Max observer difference angle: 18.5°

Observer Location    Sun azimuth range is 284.6° - 286.2° (yellow)


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


## Observer Dwelling Receptor 07 Results

Reflection Date/Time (GMT) Graph




Min observer difference angle: 0.6°
Max observer difference angle: 16.1°

Observer Location    Sun azimuth range is 269.2° - 280.6° (yellow)


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

PAGERPOWER
Urban & Renewables

**Pager Power Limited**
Stour Valley Business Centre
Sudbury
Suffolk
CO10 7GB

**Tel:** +44 1787 319001 **Email:** info@pagerpower.com **Web:** www.pagerpower.com

# REFERENCES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