Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 3: Appendices

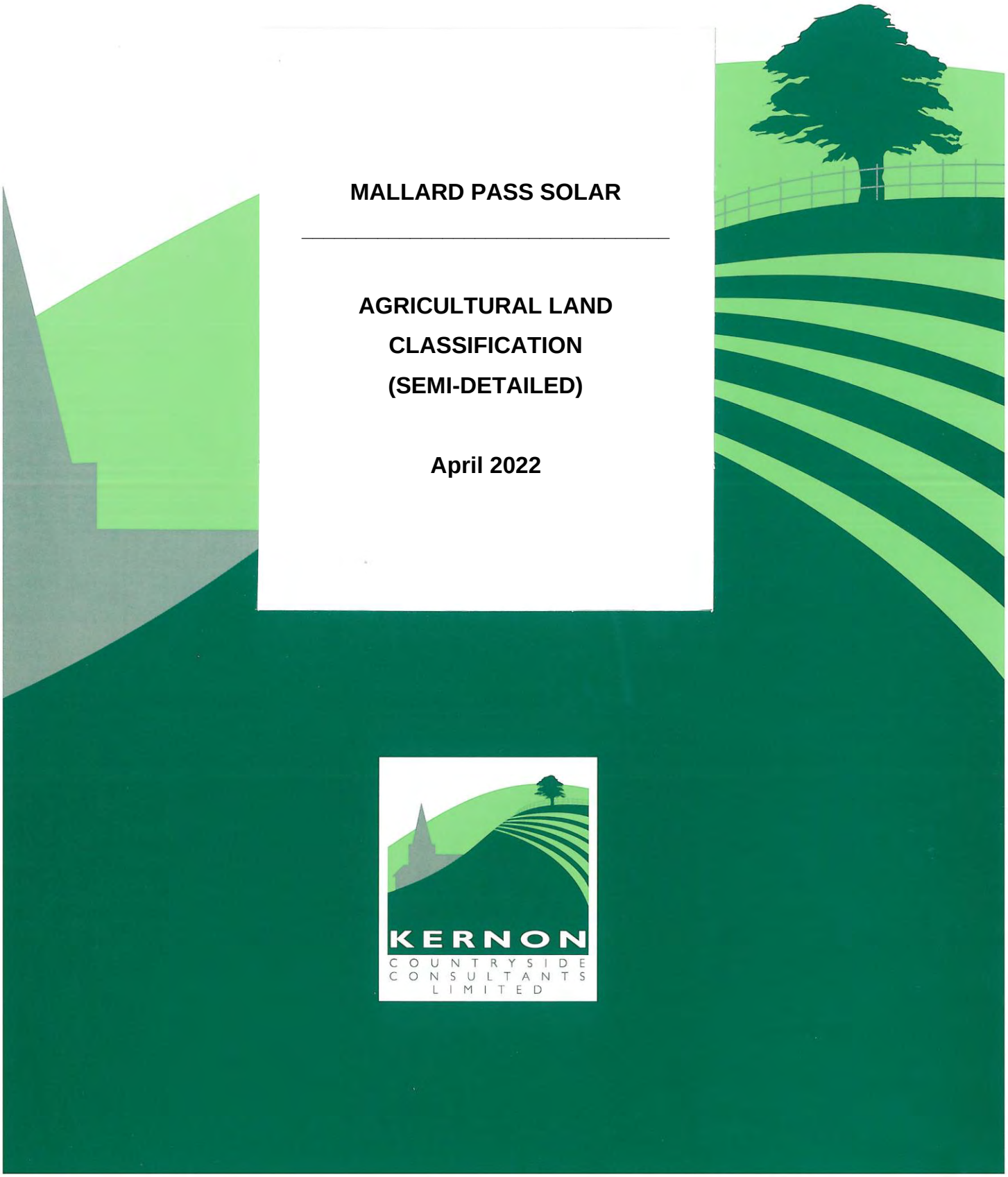
Appendix 13.1: Agricultural Land Classification

May 2022

MALLARD PASS SOLAR

AGRICULTURAL LAND CLASSIFICATION (SEMI-DETAILED)

April 2022



KERNON
COUNTRYSIDE CONSULTANTS LIMITED

MALLARD PASS SOLAR

AGRICULTURAL LAND CLASSIFICATION (SEMI-DETAILED)

April 2022

Authorised By APK 04/22

Greenacres Barn, Stoke Common Lane, Purton Stoke, Swindon SN5 4LL
T: 01793 771333 Email: info@kernon.co.uk Website: www.kernon.co.uk

---

*Directors - **Tony Kernon** BSc(Hons), MRAC,, MRICS, FBIAC **Sarah Kernon***
*Chartered Surveyor – **Sam Eachus** BSc(Hons), MRICS, MBIAC*
*Consultant – **Ellie Chew** BSc(Hons)*

CONTENTS

Annexes

Plans

1 INTRODUCTION

1.1 This report sets out the results of a semi-detailed Agricultural Land Classification (ALC) of 906 hectares of land near the villages of Essendine and Ryhall.

1.2 The survey has been carried out at a semi-detailed level of survey, involving 217 auger samples on a regular 200m by 200m grid, with the fieldwork carried out in December 2021.

1.3 The Site comprises a mixture of land qualities, with Grades 2, Subgrades 3a and 3b, and Grade 4 in addition to farm woodland and some non-agricultural land.

1.4 This report is structured as follows:

(i) section 2 describes the methodology;
(ii) section 3 describes the known and predictive land quality of the wider area;
(iii) section 4 describes the relevant factors in delivering ALC;
(iv) and section 5 sets out the results.

2 METHODOLOGY

2.1 The work has been carried out by a Chartered Scientist (CSci), who is a Fellow (F. I. Soil Sci) of the British Society of Soil Science (BSSS). This ALC survey has been carried out by a soil scientist who meets the requirements of the BSSS Professional Competency Standard (PSC) scheme for ALC (see BSSS PCS Document 2 '*Agricultural Land Classification of England and Wales*'[1]). The BSSS PSC scheme is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).

2.2 This assessment is based upon the findings of a study of published information on climate, geology and soil in combination with a soil investigation carried out in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF)[2] '*Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land*', October 1988 (henceforth referred to as the 'the ALC Guidelines').

2.3 The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the '*best and most versatile*' (BMV) category as defined in Annex 2 of the National Planning Policy Framework (NPPF), revised July 2021. Further details of the ALC system and national planning policy implications are set out by Natural England in its Technical Information Note 049[3].

2.4 A semi-detailed ALC survey was carried out in December 2021. The survey involved examination of the soil's physical properties at 217 auger bore locations on a 200m by 200m grid, as shown on **Plan KCC3051/01A**. For the purpose of the ALC survey, the Site was divided up into 11 parcels, labelled A to K on **Plan KCC3051/01A**. Each parcel contained approximately 20 auger-bore locations, and represents the area covered by one ALC surveyor per day.

[1] British Society of Soil Science. Professional Competency Scheme Document 2 'Agricultural Land Classification of England and Wales'. Available online @ https://www.soils.org.uk/sites/default/files/events/flyers/ipss-competency-doc2.pdf Last accessed February 2022

[2] The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in November 2001

[3] Natural England (December, 2012). 'Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)'. Available online @ http://publications.naturalengland.org.uk/publication/35012 Last accessed February 2022

2.5 Two soil pits (i.e., Pit 1 near auger-bore D90 and Pit 2 near auger-bore G105) were excavated with a spade to examine certain soil physical properties, such as stone content and subsoil structure, in more detail.

2.6 A sample of topsoil was collected at three auger-bore locations, i.e., E64, G119 and H149, as shown on **Plan KCC3051/01A**. The samples were sent to an accredited laboratory for particle size analysis, i.e., the proportions of sand, silt and clay. This is to determine the definitive texture class of the topsoil.

2.7 The sample locations were located using a hand-held Garmin E-Trec Geographic Information System (GIS) to enable the sample locations to be relocated for verification, if necessary.

2.8 The soil profile was examined at each sample location to a maximum depth of approximately 1.2 m by hand with the use of a 5 cm diameter Dutch (Edleman) soil auger. The soil profile at each sample location was described using the '*Soil Survey Field Handbook: Describing and Sampling Soil Profiles*' (Ed. J.M. Hodgson, Cranfield University, 1997). Each soil profile was ascribed a grade following the ALC Guidelines.

3 KNOWN AND PREDICTIVE LAND QUALITY

BMV Generally

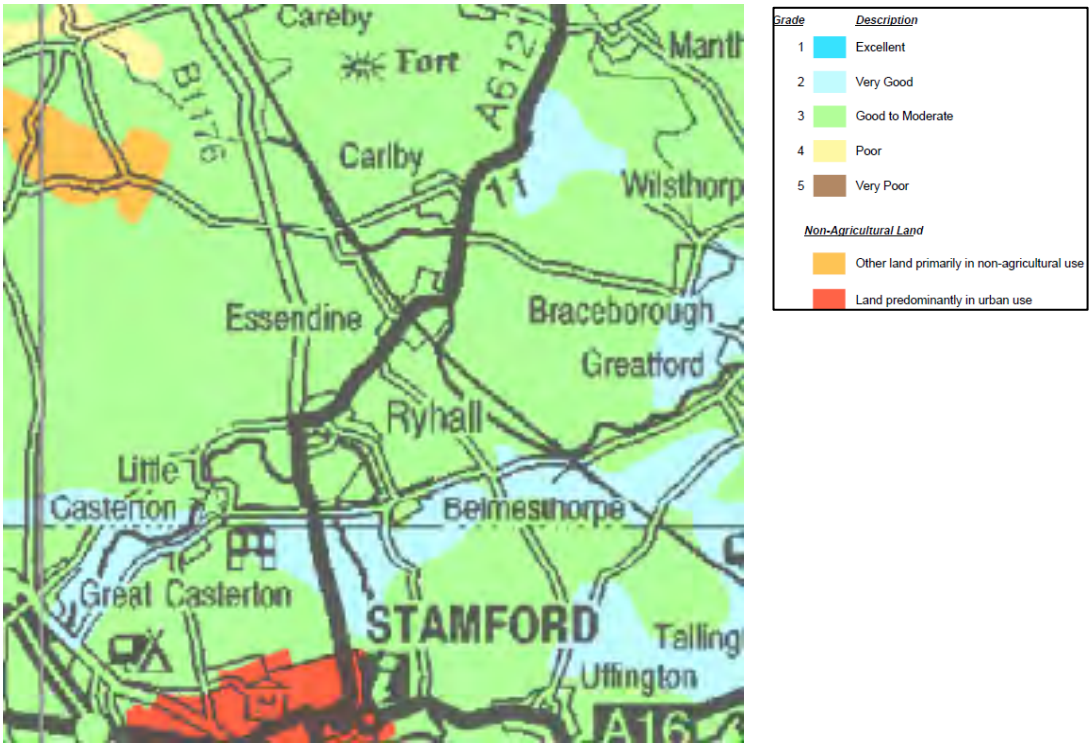
3.1 The best and most versatile (BMV) agricultural land is that in Grades 1, 2 and 3a of the ALC (see 2.3 above).

3.2 Nationally across England BMV is estimated to account for 42% of agricultural land (see Natural England's Technical Information Note TIN049, 2012) reproduced in **Annex 1**). It is not, therefore, a particularly rare resource.

Published ALC Data

3.3 In the 1970's MAFF published "provisional" ALC maps. As described in TIN 049, these were not based on extensive survey, and are not suitable for site-specific analysis. The survey area is shown as mostly undifferentiated Grade 3.

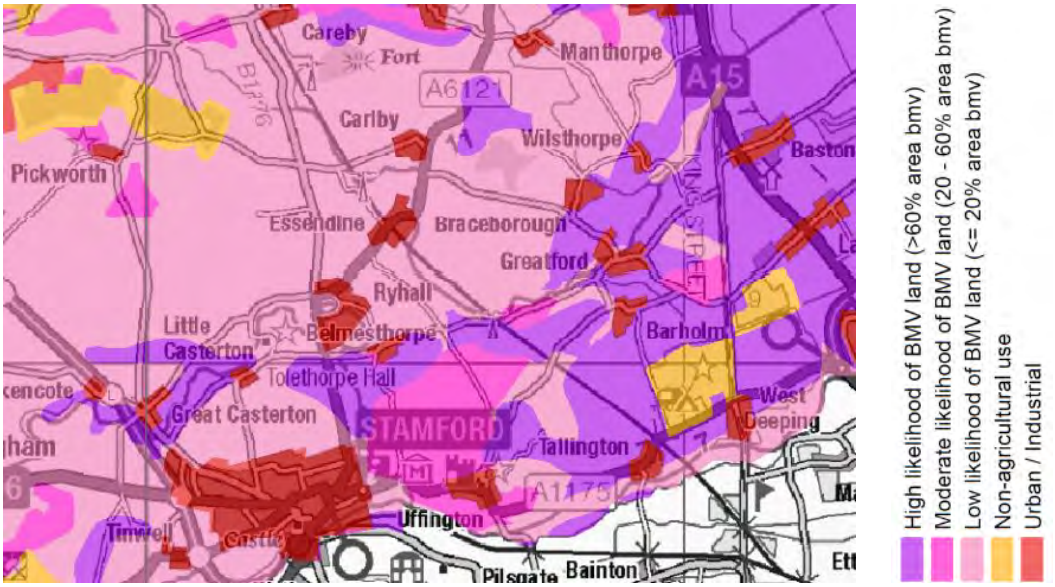
Insert 1: Extract from Provisional ALC (original plan at 1:250,000 scale)



Predictive BMV Maps

3.4 In 2017 Natural England published predictive BMV maps, dividing England into areas according to the percentage of land likely to be of BMV quality. They are categorised as low (<20% area BMV), medium (20-60% area BMV) and high (>60% area BMV). This area is mostly in the low probability of bmv, as shown below.

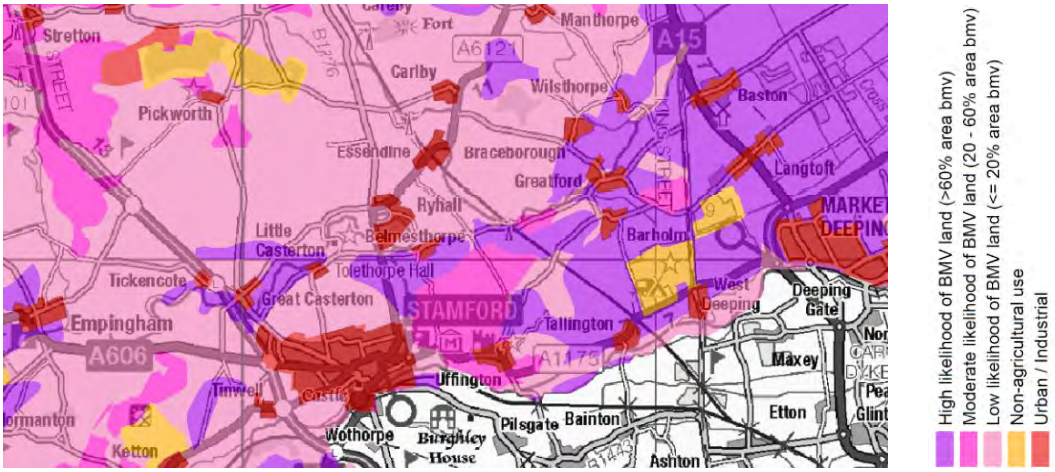
Insert 2: Extract from Predictive BMV Map



(Original plan at 1:250,000)

3.5 In the wider context, as shown below, the area is some of the poorest quality available.

Insert 3: Wider Predictive BMV Map



Available Survey Results

3.6 Where MAFF has carried out ALC survey results they are available on the Multi-Agency Geographic Information for the Countryside website www.magic.co.uk.

3.7 No survey results are available for the area within the Site, however those in the wider area generally comprise a mix of Subgrades 3a and 3b. The map is reproduced in **Annex 2**, with an extract below.

Insert 4: Available ALC Data

KEY	
	Grade 1
	Grade 2
	Grade 3a
	Grade 3b
	Grade 4
	Grade 5
	Non-agricultural
	Urban
	Not surveyed

Not to scale

4 FACTORS AFFECTING LAND QUALITY

4.1 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:

- climatic limitations;
- site limitations;
- soil limitations; and
- interactive limitations.

4.2 These factors are considered in turn below.

Climatic Limitations

4.3 Interpolated climate data relevant to the determination of the ALC grade of land at the Site is given in Table 1 below.

Table 1: ALC Climate Data for Mallard's Pass [(1)]

Climate Parameter	**Grid Ref:** TF025138 (Area A, North)	**Grid Ref:** TF053113 (Area I, Central)	**Grid Ref:** TF051096 (Area K, South)
Average Altitude (m)	53	21	41
Average Annual Rainfall (mm)	589	575	584
Accumulated Temperature above 0˚C (January – June)	1394	1431	1409
Moisture Deficit (mm) Wheat	111	117	114
Moisture Deficit (mm) Potatoes	104	111	107
Field Capacity Days (FCD)	118	112	114
Grade according to climate	1	1	1

[(1)] Climatological Data for Agricultural Land Classification, The Met. Office (1989)

4.4 Agricultural land quality within the Site is not limited by climate with reference to Figure 1 '*Grade according to climate*' on page 6 of the ALC Guidelines. In this case, agricultural land within the Site could be Grade 1 without any additional limitations.

4.5 The soil profiles across the Site are predicted to be at field capacity (i.e., the amount of soil moisture or water content held in the soil after excess water has drained away) for approximately 112 - 118 Field Capacity Days (FCD) per year, mainly over the late autumn, winter and early spring. The climate interacts with soil physical properties, i.e., soil texture

and wetness class, and can limit agricultural land quality due to soil wetness as per Table 6 of the ALC Guideline '*Grade according to soil wetness'*. It should be noted that the number of FCD at this Site just falls in the FCD category <126 for determining the grade according to wetness; this indicates the land in this climate area is drained/workable for quite a long period over the year in comparison with central lowland England which has approximately 150 FCD.

Site Limitations

4.6 As shown on **Plan KCC3051/01A**, the Site is located to north east of Stamford, on the Rutland-Lincolnshire border. The Site is mainly surrounded by agricultural land, with residential development of Essendine to the north, and a railway through the centre of the Site between Essendine and Tallington. The approximate centre of the Site is located at British National Grid (BNG) reference TF 052115.

4.7 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:

- gradient;
- micro-relief (i.e., complex change in slope angle over short distances); and
- risk of flooding.

4.8 **Gradient and Micro Relief.** The land in the Site is undulated and reaches and elevation of approximately 69 metres (m) Above Ordnance Datum (AOD) at the highest point in the north and western regions. The lowest ground occurs in the centre at an elevation of approximately 20 mAOD. The quality of agricultural land over the Site is not limited by gradient, which does not exceed 7°. No part of the Site is limited by micro-relief (i.e., complex changes in slope angle and direction over short distances).

4.9 **Risk of Flooding.** From the Government Flood Map for Planning website[4], the Site is mainly located in Flood Zone 1, with a region of Flood Zone 2 and 3 in the centre bordering the course of the West Glen River. However, there are no records (data) to show that agricultural land in any part of the Site is limited by flooding, according to the criteria for frequency and/or duration in Table 2 '*Grade according to flood risk in summer*' and/or Table 3 '*Grade according to flood risk in winter*' of the ALC Guidelines.

[4] Government Flood Map for Planning website. Available online @ https://flood-map-for-planning.service.gov.uk/ Last accessed January 2022

Soil Limitations

4.10 **Geology/Soil Parent Material.** From British Geological Survey (BGS) maps at 1:50,000 scale, the land in the Site is underlain by limestone in the Blisworth Limestone Formation and the Rutland Formation (argillaceous rocks with subordinate sandstone and limestone). The land in the north west is underlain by limestone in the Upper Lincolnshire Limestone Member. The eastern and southern parts of the Site are underlain by mudstone in the Kellaways Clay Member and Blisworth Clay Formation, with small areas of limestone in the Cornbrash Formation.

4.11 Most of the bedrock is not covered by any superficial deposits, but there is a narrow band of Alluvium (clay, silt, sand and gravel) and River Terrace Deposits (sand and gravel) bordering the West Glen River. There are also smaller regions of Glaciofluvial Deposits (Mid Pleistocene; sand and gravel) in the east and south, with an isolated region of glacial Till (Mid Pleistocene; diamicton) in centre of the Site.

4.12 **Published Information on Soil.** Soil information is available only at a small scale (1:250,000) on the National Soil Map published by the Soil Survey of England and Wales (SSEW) in 1983. This provisional soil map indicates that land at the Site is covered soils grouped in the Elmton 1, Elmton 3, Denchworth, Fladbury 1 and Sherborne Association.

4.13 As described by the SSEW, the Elmton 1 Association is found on gently undulating plateaux or dipslopes dissected by dry valleys. Although there is wide variation in the component soils because of the range of parent materials, the association consists mainly of shallow brown soils with small areas of deeper brown calcareous soils. These soils are permeable and well drained (Wetness Class I).

4.14 The Elmton 3 Association consists of shallow loamy and clayey soils over limestone and deeper slowly permeable clayey soils on clay-shale. These soils are well drained (Wetness Class I) but, in places, receive seepage or run-off water from adjacent Denchworth, Haselor and Evesham soils.

4.15 The Denchworth Associaiton is extensive on Jurassic and Cretaceous clays and clay shales in the Midlands, South West and South East England. It consists mainly of wet clayey soils, that are stoneless, strongly mottled and waterlogged for long periods in winter (Wetness Class IV and V).

4.16 The Fladbury 1 Association comprise deep clayey alluvial soils and prominently mottled directly below the topsoil. The subsoils are usually slowly permeable, however the primary source of waterlogging is groundwater which fluctuates seasonally with changes in the river

level and the duration of waterlogging is often related to elevation. In winter months, these soils often suffer prolonged waterlogging (Wetness Class V).

4.17 The Sherborne Association soils is extensive in South West England and occurs in small patches in Oxfordshire, Warwickshire, Cambridgeshire, Lincolnshire and Northamptonshire. This Association is developed on Jurassic limestone with thin interbedded clays giving a varied soil pattern. These soils are soils are very permeable and naturally well drained (Wetness Class I).

4.18 **Soil Survey**. The semi-detailed soil survey carried out in December 2021 determined that the soils within the Site are predominantly developed over limestone (several different geological types, as described above) and are accordingly quite variable spatially over short distances, e.g., due to variations in soil depth to impenetrable rock, stone/rock content and wetness class. This leads to a quite complex pattern of ALC Grade 2, Subgrade 3a, Subgrade 3b and Grade 4 due to a combination of factors, particularly soil droughtiness and topsoil stone content on Elmton and Sherbroune soils over limestone, and soil wetness on wetter and heavier (clayey) Denchworth soils over mudstone and Fladbury soils developed in river alluvium.

4.19 A log of all the soil profiles recorded on the Site is given as **Annex 3**. Two soil pits were excavated with a spade to examine certain soil physical properties, such as subsoil structure, in more detail. The first pit (Pit 1) was located in Area D near auger-bore 90, and Pit 2 was located in Area G near auger-bore 105, as shown on **Plan KCC3051/01A**. A description of the soil pits is given in **Annex 4**.

4.20 In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, three samples of topsoil were collected over the Site (i.e., auger locations E64, G119 and H149, **Plan KCC3051/01A**). The topsoil sample was sent to an accredited laboratory for analysis of particle size distribution (PSD), based on the British Standard Institution particle size grades. The certificate of analysis is provided as **Annex 5**. The findings of the PSD analysis are shown in Table 2 below.

Table 2: Topsoil Texture (re Table 10, ALC Guidelines)

Topsoil Sample Location (See Plan KCC3051/01A)	**% sand 0.063-2.0 mm***	**% silt 0.002-0.063 mm**	**% clay <0.002 mm**	**ALC Soil Texture Class**
Area D, AB64	32	34	34	Heavy Clay Loam
Area G, AB119	39	43	18	Medium Sandy Silt Loam
Area H, AB149	20	43	37	Clay

Interactive Limitations

4.21 From the information above, together with the findings of the semi-detailed soil survey (see Soil Profile Log given as **Annex 3**), it has been determined that the quality of agricultural land in many soil profiles over the Site is limited by soil wetness where there are heavy (clayey) and slowly permeable and seasonally waterlogged soil developed from mudstone and alluvium. Some land is limited by soil droughtiness where it has calcareous and stony soils developed over limestone. These interactive limitations are described in more detail below.

4.22 **Soil Wetness.** From the ALC Guidelines, a soil wetness limitation exists where '*the soil water regime adversely affects plant growth or imposes restrictions on cultivations or grazing by livestock*'. Agricultural land quality at the Site is limited by soil wetness as per Table 3 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines).

Table 3: ALC Grade According to Soil Wetness

Wetness Class	Texture of the Top 25 cm	<126 Field Capacity Days
I	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	1
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	1
	Heavy Silty Clay Loam/Heavy Clay Loam**	2
	Sandy Clay/Silty Clay/Clay	3a(2)
II	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	1
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	2
	Heavy Silty Clay Loam/Heavy Clay Loam**	3a(2)
	Sandy Clay/Silty Clay/Clay	3a(2)
III	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	2
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	3a(2)
	Heavy Silty Clay Loam/Heavy Clay Loam**	3b(3a)
	Sandy Clay/Silty Clay/Clay	3b(3a)
IV	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	3a
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	3b
	Heavy Silty Clay Loam/Heavy Clay Loam**	3b
	Sandy Clay/Silty Clay/Clay	3b
V	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	4
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	4
	Heavy Silty Clay Loam/Heavy Clay Loam**	4
	Sandy Clay/Silty Clay/Clay	4
Key * 18% to <27% clay; and ** 27% to 35% clay		

4.23 In a climate area with <126 FCD, profiles which are slowly permeable and seasonally waterlogged (Wetness Class III) are limited by soil wetness to Subgrade 3a where the topsoil is non-calcareous, medium clay loam. Where the topsoil has been determined by hand-texturing and laboratory analysis to be non-calcareous heavy clay loam, profiles in Wetness Class III are limited by soil wetness to Subgrade 3b.

4.24 **Soil Droughtiness.** From the ALC Guidelines, a soil droughtiness limitation exists '*in areas with relatively low rainfall or high evapotranspiration, or where the soil holds only small reserves of moisture available to plant roots*.' The ALC grade according to soil droughtiness is shown in Table 4 below (based on Table 8 '*Grade According to Droughtiness'* in the ALC Guidelines). To be eligible for Grades 1 to 3b the moisture balances (MBs) must be equal to, or exceed, the stated minimum values for both wheat and potatoes. If the MB for either crop is less (i.e. more negative) than that shown for Subgrade 3b, the soil is Grade 4 on droughtiness).

Table 4: ALC Grade According to Droughtiness (re Table 8 of the MAFF ALC Guidelines)

Grade/Subgrade	**Moisture Balance (MB) Limits (mm)**	
	Wheat	Potatoes
1	+30	+10
2	+5	-10
3a	-20	-30
3b	-50	-55
4	<-50	<-55

4.25 It has been calculated that Moisture Balance (MB) values are sufficient to limit agricultural land over the Site, but predominantly in areas underlain by limestone, to a mixture of Grade 2, Subgrade 3a, and Subgrade 3b. Some land in Area H (see **Plan KCC3051/01A**) which is shallow and brashy (stony) over limestone is limited by soil droughtiness to Grade 4.

5 ALC GRADING OF THE SITE

5.1 The area and proportion of agricultural land in each ALC grade has been measured from an ALC map given as **Plan KCC3051/02A**. The findings are reported in Table 5 below.

5.2 As described above, the semi-detailed soil survey carried out in December 2021 determined the soils at within the Site are predominantly developed over limestone (several different geological types, as described above) and are accordingly quite variable spatially over short distances, e.g., due to variations in soil depth to impenetrable rock, stone/rock content and wetness class. This leads to a quite complex pattern of ALC Grade 2, Subgrade 3a, Subgrade 3b and Grade 4 due to a combination of factors, namely: soil droughtiness and topsoil stone content on Elmton and Sherbroune soils over limestone. Some land is limited by soil wetness to Subgrade 3a and Subgrade 3b, where the soils are slowly permeable and seasonally waterlogged (Wetness Class III). These include clayey Denchworth soils developed in mudstone, and silty-clay Fladbury soils developed in river alluvium flanking the West Glen River which flows through the central parts of the Site.

Table 5: Agricultural Land Classification

ALC Grade	**Area (Ha)**	**Area (% of Total Site)**
Grade 1 (Excellent)		
Grade 2 (Very Good)	110	12
Subgrade 3a (Good)	320	36
Subgrade 3b (Moderate)	415	47
Grade 4 (Poor)	10	1
Grade 5 (Very Poor)		
Non-agricultural / Other land	30	3
Urban	4	<1
Total	**889**	**100**

Annex 1

Natural England Technical Information Note TIN049

Natural England Technical Information Note TIN049

Agricultural Land Classification: protecting the best and most versatile agricultural land

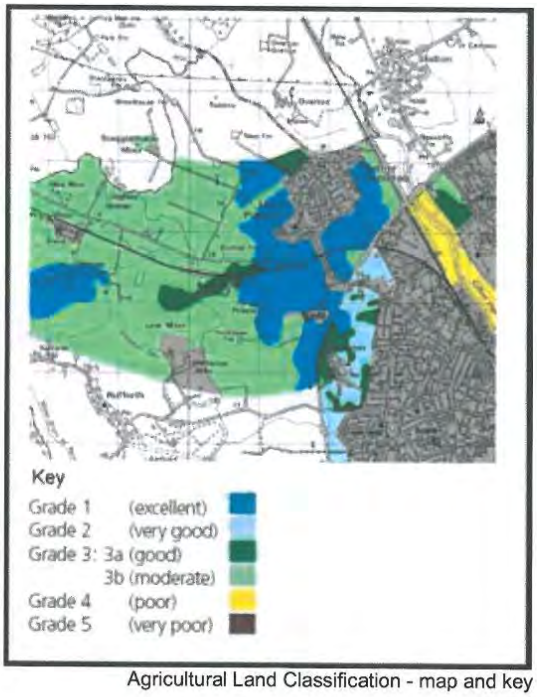
Most of our land area is in agricultural use. How this important natural resource is used is vital to sustainable development. This includes taking the right decisions about protecting it from inappropriate development.

Policy to protect agricultural land

Government policy for England is set out in the National Planning Policy Framework (NPPF) published in March 2012 (paragraph 112). Decisions rest with the relevant planning authorities who should take into account the economic and other benefits of the best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of higher quality. The Government has also re-affirmed the importance of protecting our soils and the services they provide in the Natural Environment White Paper The Natural Choice:securing the value of nature (June 2011), including the protection of best and most versatile agricultural land (paragraph 2.35).

The ALC system: purpose & uses

Land quality varies from place to place. The Agricultural Land Classification (ALC) provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system. It helps underpin the principles of sustainable development.



Agricultural Land Classification - map and key

Second edition 19 December 2012
www.naturalengland.org.uk

NATURAL ENGLAND

Agricultural Land Classification: protecting the best and most versatile agricultural land

The ALC system classifies land into five grades, with Grade 3 subdivided into Subgrades 3a and 3b. The best and most versatile land is defined as Grades 1, 2 and 3a by policy guidance (see Annex 2 of NPPF). This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non food uses such as biomass, fibres and pharmaceuticals. Current estimates are that Grades 1 and 2 together form about 21% of all farmland in England; Subgrade 3a also covers about 21%.

The ALC system is used by Natural England and others to give advice to planning authorities, developers and the public if development is proposed on agricultural land or other greenfield sites that could potentially grow crops. The Town and Country Planning (Development Management Procedure) (England) Order 2010 (as amended) refers to the best and most versatile land policy in requiring statutory consultations with Natural England. Natural England is also responsible for Minerals and Waste Consultations where reclamation to agriculture is proposed under Schedule 5 of the Town and Country Planning Act 1990 (as amended). The ALC grading system is also used by commercial consultants to advise clients on land uses and planning issues.

Criteria and guidelines

The Classification is based on the long term physical limitations of land for agricultural use. Factors affecting the grade are climate, site and soil characteristics, and the important interactions between them. Detailed guidance for classifying land can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988):

- **Climate:** temperature and rainfall, aspect, exposure and frost risk.
- **Site:** gradient, micro-relief and flood risk.
- **Soil:** texture, structure, depth and stoniness, chemical properties which cannot be corrected.

The combination of climate and soil factors determines soil wetness and droughtiness. Wetness and droughtiness influence the choice of crops grown and the level and consistency of yields, as well as use of land for grazing livestock. The Classification is concerned with the inherent potential of land under a range of farming systems. The current agricultural use, or intensity of use, does not affect the ALC grade.

Versatility and yield

The physical limitations of land have four main effects on the way land is farmed. These are:

- the range of crops which can be grown;
- the level of yield;
- the consistency of yield; and
- the cost of obtaining the crop.

The ALC gives a high grading to land which allows more flexibility in the range of crops that can be grown (its 'versatility') and which requires lower inputs, but also takes into account ability to produce consistently high yields of a narrower range of crops.

Availability of ALC information

After the introduction of the ALC system in 1966 the whole of England and Wales was mapped from reconnaissance field surveys, to provide general strategic guidance on land quality for planners. This Provisional Series of maps was published on an Ordnance Survey base at a scale of One Inch to One Mile in the period 1967 to 1974. These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended and can be downloaded from the Natural England **website**. This data is also available on 'Magic', an interactive, geographical information website **http://magic.defra.gov.uk/**.

Since 1976, selected areas have been re-surveyed in greater detail and to revised

guidelines and criteria. Information based on detailed ALC field surveys in accordance with current guidelines (MAFF, 1988) is the most definitive source. Data from the former Ministry of Agriculture, Fisheries and Food (MAFF) archive of more detailed ALC survey information (from 1988) is also available on **http://magic.defra.gov.uk/**. Revisions to the ALC guidelines and criteria have been limited and kept to the original principles, but some assessments made prior to the most recent revision in 1988 need to be checked against current criteria. More recently, strategic scale maps showing the likely occurrence of best and most versatile land have been prepared. Mapped information of all types is available from Natural England (see *Further information* below).

New field survey

Digital mapping and geographical information systems have been introduced to facilitate the provision of up-to-date information. ALC surveys are undertaken, according to the published Guidelines, by field surveyors using handheld augers to examine soils to a depth of 1.2 metres, at a frequency of one boring per hectare for a detailed assessment. This is usually supplemented by digging occasional small pits (usually by hand) to inspect the soil profile. Information obtained by these methods is combined with climatic and other data to produce an ALC map and report. ALC maps are normally produced on an Ordnance Survey base at varying scales from 1:10,000 for detailed work to 1:50 000 for reconnaissance survey

There is no comprehensive programme to survey all areas in detail. Private consultants may survey land where it is under consideration for development, especially around the edge of towns, to allow comparisons between areas and to inform environmental assessments. ALC field surveys are usually time consuming and should be initiated well in advance of planning decisions. Planning authorities should ensure that sufficient detailed site specific ALC survey data is available to inform decision making.

Consultations

Natural England is consulted by planning authorities on the preparation of all development plans as part of its remit for the natural environment. For planning applications, specific consultations with Natural England are required under the Development Management Procedure Order in relation to best and most versatile agricultural land. These are for non agricultural development proposals that are not consistent with an adopted local plan and involve the loss of twenty hectares or more of the best and most versatile land. The land protection policy is relevant to all planning applications, including those on smaller areas, but it is for the planning authority to decide how significant the agricultural land issues are, and the need for field information. The planning authority may contact Natural England if it needs technical information or advice.

Consultations with Natural England are required on all applications for mineral working or waste disposal if the proposed afteruse is for agriculture or where the loss of best and most versatile agricultural land agricultural land will be 20 ha or more. Non-agricultural afteruse, for example for nature conservation or amenity, can be acceptable even on better quality land if soil resources are conserved and the long term potential of best and most versatile land is safeguarded by careful land restoration and aftercare.

Other factors

The ALC is a basis for assessing how development proposals affect agricultural land within the planning system, but it is not the sole consideration. Planning authorities are guided by the National Planning Policy Framework to protect and enhance soils more widely. This could include, for example, conserving soil resources during mineral working or construction, not granting permission for peat extraction from new or extended mineral sites, or preventing soil from being adversely affected by pollution. For information on the application of ALC in Wales, please see below.

Further information

Details of the system of grading can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

Please note that planning authorities should send all planning related consultations and enquiries to Natural England by e-mail to **consultations@naturalengland.org.uk**. If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Natural England
Consultation Service
Hornbeam House
Electra Way
Crewe Business Park
CREWE
Cheshire
CW1 6GJ

ALC information for Wales is held by Welsh Government. Detailed information and advice is available on request from Ian Rugg (**ian.rugg@wales.gsi.gov.uk**) or David Martyn (**david.martyn@wales.gsi.gov.uk**). If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Welsh Government
Rhodfa Padarn
Llanbadarn Fawr
Aberystwyth
Ceredigion
SY23 3UR

Natural England publications are available to download from the Natural England website: **www.naturalengland.org.uk**.

For further information contact the Natural England Enquiry Service on 0300 060 0863 or e-mail **enquiries@naturalengland.org.uk**.

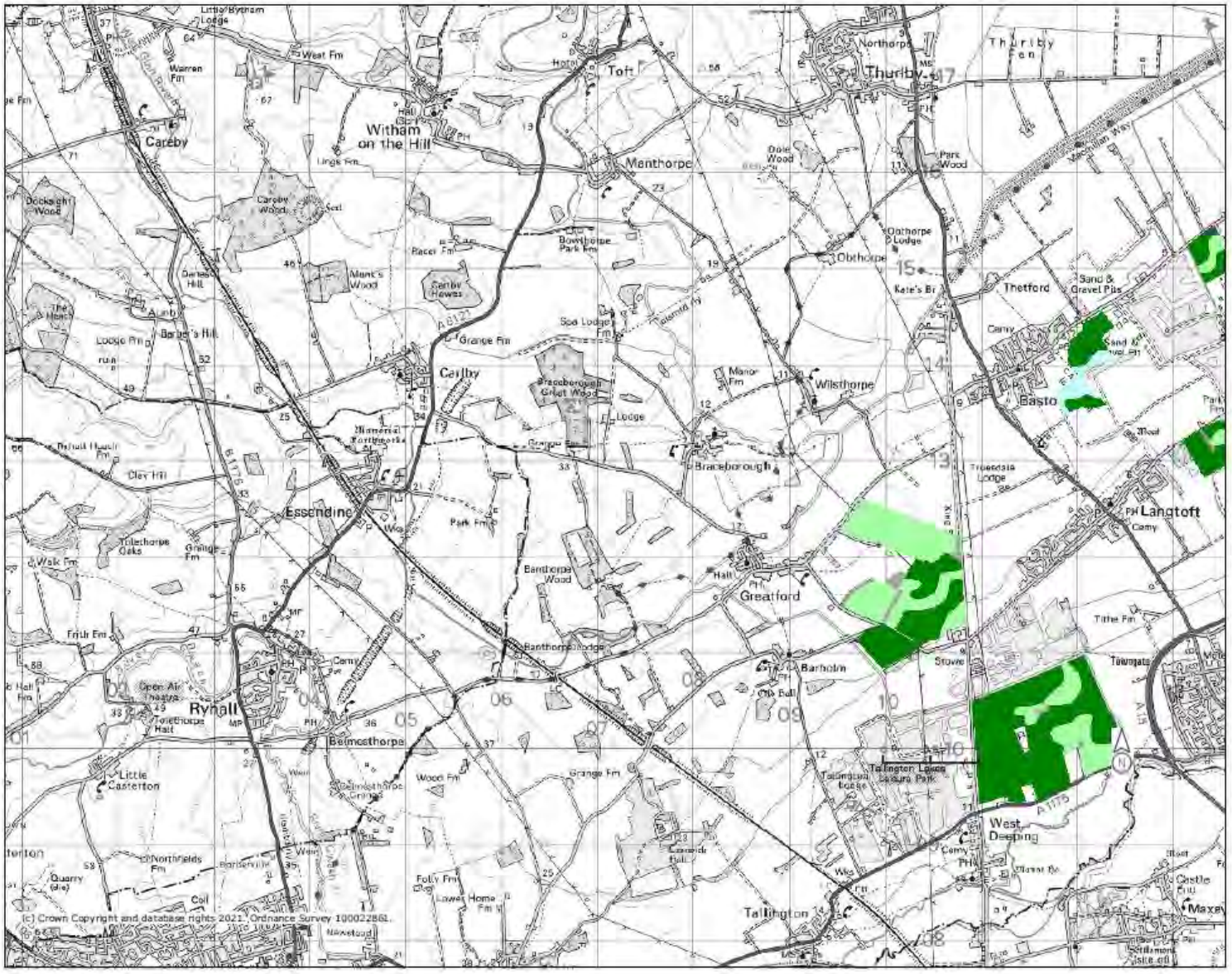
Copyright

Annex 2

Available ALC from www.magic.gov.uk

MAGIC

Essendine



Legend

Post 1988 Agricultural Land Classification (England)

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Not Surveyed
- Other

Projection = OSGB36
xmin = 492000
ymin = 305000
xmax = 522300
ymax = 320400

Map produced by MAGIC on 28 July, 2021.
Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

Annex 3
Soil Profile Log

Site A

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	TF 02400 14200	502400	314200	58	≤7	S		0	35	35	10YR4/6					No	HCL - Cla	7	7	3	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	VC - Ve	No	No	-26	82	3b	WC I	2	Droughtiness			3b
								35	45	10	10YR6/3					Yes	MZCL - S	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	VC - Ve	No	No									
								45	55	10							MZCL - S	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
								55	120	65							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
2	TF 02600 14200	502600	314200	58	≤7	S		0	30	30	10YR4/4					No	C - Clay	6	6	4	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	VC - Ve	No	No	-44	62	3b	WC I	2	Droughtiness			3b
								30	35	5	10YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	VC - Ve	No	No									
								35	45	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
								45	120	75							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
3	TF 02400 14000	502400	314000	58	≤7	S		0	40	40	7.5YR4/4					No	C - Clay	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	MC - Mi	No	No	-24	86	3b	WC I	2	Droughtiness			3b
								40	50	10	7.5YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	VC - Ve	No	No									
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
								60	120	60							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
4	TF 02600 14000	502600	314000	53	≤7	S		0	38	38	10YR4/3					No	C - Clay	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	MC - Mi	No	No	-36	70	3b	WC I	2	Droughtiness			3b
								38	40	2	10YR5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	VC - Ve	No	No									
								40	50	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
								50	120	70							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
5	TF 02800 14000	502800	314000	53	≤7	S		0	38	38	7.5YR4/6					No	HCL - Cla	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	MC - Mi	No	No	-34	72	3b	WC I	2	Droughtiness			3b
								38	50	12						No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								50	120	70							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
7	TF 02400 13800	502400	313800	49	≤7	S		0	40	40	10YR4/4					No	C - Clay	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	MC - Mi	No	No	-24	86	3b	WC I	2	Droughtiness			3b
								40	50	10	10YR4/6					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
								60	120	60							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate			No									
8	TF 02600 13800	502600	313800	40	≤7	S		0	40	40	10YR4/3					No	C - Clay	1	1		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	-10	107	3a	WC II	3a	Droughtines:Wetness			3a
								40	55	15	7.5YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	No	No									
								55	75	20	10YR6/3	MD - I	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Poor	NON - I	No	Yes									
								75	120	45							IMP - Im	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Poor	NON - I	No	Yes									
9	TF 02800 13800	502800	313800	37	≤7	S		0	35	35	10YR4/3					No	C - Clay	1	1		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	-7	111	3a	WC I	3a	Droughtines:Wetness			3a
								35	70	35	7.5YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	No	No									
								70	80	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	No	No									
								80	120	40							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	No	No									
16	TF 02400 13600	502400	313600	46	≤7	S																															N/A			
17	TF 02600 13600	502600	313600	43	≤7	S																															N/A			
18	TF 02880 13600	502880	313600	39	≤7	S																															N/A			
28	TF 02400 13400	502400	313400	46	≤7	S																															N/A			
29	TF 02600 13400	502600	313400	43	≤7	S																															N/A			
30	TF 02800 13400	502800	313400	46	≤7	S																															N/A			
41	TF 02400 13200	502400	313200	40	≤7	S																															N/A			
42	TF 02600 13200	502600	313200	51	≤7	S																															N/A			
43	TF 02800 13200	502800	313200	51	≤7	S		0	38	38	7.5YR4/6					No	HCL - Cla	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	SC - Sli	No	No	-9	106	3a	WC I	2	Droughtiness			3a
								38	40	2	7.5YR4/6					No	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	SC - Sli	Yes	No									
								40	60	20	5YR4/6					No	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	SC - Sli	No	No									
								60	70	10							HCL - Cla	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								70	120	50							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
44	TF 03000 13200	503000	313200	42	≤7	S		0	38	38	7.5YR4/6					No	HCL - Cla	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	SC - Sli	No	No	-9	106	3a	WC I	2	Droughtiness			3a
								38	40	2	7.5YR4/6					No	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	SC - Sli	Yes	No									
								40	60	20	5YR4/6					No	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	SC - Sli	No	No									
								60	70	10							HCL - Cla	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								70	120	50							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
55	TF 02400 13000	502400	313000	56	≤7	S		0	40	40	10YR4/3					No	MCL - Cla	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	12	115	2	WC I	1	Droughtiness			2
								40	70	30	10YR5/3	CD - C	10YR5/6			Yes	MCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								70	80	10	10YR5/2	CD - C	10YR5/6			Yes	MCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								80	90	10							MCL - Cla	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								90	120	30							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
56	TF 02600 13000	502600	313000	52	≤7	S		0	35	35	10YR4/4					No	MCL - Cla	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	-18	91	3a	WC I	1	Droughtiness			3a
								35	50	15	10YR5/6					No	MCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								50	60	10							MCL - Cla	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								60	120	60							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
57	TF 02800 13000	502800	313000	52	≤7	S		0	35	35	7.5YR4/6					No	HCL - Cla	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	-8	110	3a	WC I	2	Droughtiness			3a
								35	65	30	7.5YR5/6	CD - C	10YR5/6			No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	Yes	No									
								65	75	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								75	120	45							IMP - Im	51			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
58	TF 03000 13000	503000	313000	46	≤7	S		0	38	38	7.5YR4/6					No	HCL - Cla	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	-18	91	3a	WC I	2	Droughtiness			3a
								38	50	12	7.5YR5/6	CD - C	10YR5/6			No	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	Yes	No									
								50	60	10							HCL - Cla	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								60	120	60							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
72	TF 02600 12800	502600	312800	51	≤7	S		0	40	40	7.5YR4/6					No	HCL - Cla	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratche								Not Appli	NON - I	No	No	-8	107	3a	WC I	2	Droughtiness			3a
								40	60	20	7.5YR5/6					No	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate	NON - I	Yes	No									
								60	70	10							HCL - Cla	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
								70	120	50							IMP - Im	50			HR - All hard rocks or stones (i.e. those which cannot be scratche								Moderate		No	No									
	END																																							

SITE B

Point	Grid ref. NGR	X	Y	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Bttm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Gley	Texture	Stones - type 1 %	>2cm	>6cm	Type	Stones - type 2 %	>2cm	>6cm	Type	Ped Strength	Size	Shape	SUBS STR	CaCO3	Mn C	SP=	Drought	MBw	MBp	Gd	Wet WC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
6	TF 01100 13800	501100	313800	65	≤7	SE		0	35	35	7.5YR4/4					No	MCL - Clay loam (medium)	8	8	4	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-40	-33	3b	WC I 1	Droughtiness			3b
								35	45	10							MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								45	120	75							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
10	TF 01000 13600	501000	313600	68	≤7	SE		0	30	30	2.5Y3/6					No	HCL - Clay loam (heavy)	6	6	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-19	-9	3a	WC I 2	Droughtiness			3a
								30	50	20	2.5Y3/6					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								50	60	10							MCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								60	120	60							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
11	TF 01200 13600	501200	313600	59	≤7	SE		0	35	35	5YR4/4					No	HCL - Clay loam (heavy)	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	-26	-15	3b	WC I 2	Droughtiness			3b
								35	40	5	5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
								40	60	20	5YR4/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								60	120	60							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
12	TF 01400 13600	501400	313600	55	≤7	SE		0	30	30	5YR4/4					No	HCL - Clay loam (heavy)	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-33	-26	3b	WC I 2	Droughtiness			3b
								30	38	8	5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	Yes	No								
								38	50	12	5YR4/4						HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								50	120	70							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
13	TF 01600 13600	501600	313600	48	≤7	SE		0	38	38	7.5YR4/4					No	MCL - Clay loam (medium)	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-36	-29	3b	WC I 1	Droughtiness			3b
								38	45	7	5YR4/4					No	MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	Yes	No								
								45	120	75							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
14	TF 02000 13600	502000	313600	52	≤7	SE		0	30	30	7.5YR4/4					No	MCL - Clay loam (medium)	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-47	-40	3b	WC I 1	Droughtiness			3b
								30	40	10	5YR4/4					No	MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	Yes	No								
								40	120	80							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
15	TF 02200 13600	502200	313600	51	≤7	SE		0	39	39	7.5YR4/4					No	MCL - Clay loam (medium)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-35	-28	3b	WC I 1	Droughtiness			3b
								39	45	6	5YR4/4					No	MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	Yes	No								
								45	120	75	5YR4/4						IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)		No								
21	TF 01000 13400	501000	313400	69	≤7	SE		0	35	35	5YR4/6					No	HCL - Clay loam (heavy)	6	6	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	1	14	3a	WC I 2	Droughtiness			3a
								35	70	35	5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
								70	80	10	5YR4/4						HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								80	120	40							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
22	TF 01200 13400	501200	313400	65	≤7	SE		0	35	35	5YR4/6					No	HCL - Clay loam (heavy)	6	6	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	1	14	3a	WC I 2	Droughtiness			3a
								35	70	35	5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
								70	80	10	5YR4/4						HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								80	120	40							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
23	TF 01400 13400	501400	313400	63	≤7	SE		0	38	38	5YR4/4					No	HCL - Clay loam (heavy)	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No	-27	-19	3b	WC I 2	Droughtiness			3b
								38	48	10	5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	Yes	No								
								48	120	72							IMP - Impenetrable to roots	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
24	TF 01600 13400	501600	313400	53	≤7	SE		0	48	48	7.5YR4/4					No	MCL - Clay loam (medium)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No	-19	-10	3a	WC I 1	Droughtiness			3a
								48	58	10							MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								58	120	62							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
25	TF 01800 13400	501800	313400	45	≤7	SE		0	38	38	5YR4/1					Yes	MCL - Clay loam (medium)	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-37	-30	3b	WC I 1	Droughtiness			3b
								38	42	4							MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								42	120	78							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
26	TF 02000 13400	502000	313400	44	≤7	SE		0	45	45	7.5YR4/4					No	HCL - Clay loam (heavy)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-18	-7	3a	WC I 2	Droughtiness			3a
								45	50	5	5YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								60	120	60							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
27	TF 02200 13400	502200	313400	48	≤7	SE		0	30	30	7.5YR4/4					No	MCL - Clay loam (medium)	8	8	6	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-48	-41	3b	WC I 1	Droughtiness			3b
								30	40	10							MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								40	120	80							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
37	TF 01400 13200	501400	313200	63	≤7	SE		0	40	40	5YR4/4					No	MCL - Clay loam (medium)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	0	16	3a	WC I 1	Droughtiness			3a
								40	80	40	5YR5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								80	120	40							IMP - Impenetrable to roots	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
38	TF 01600 13200	501600	313200	62	≤7	SE		0	38	38	5YR4/4					No	HCL - Clay loam (heavy)	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-26	-17	3b	WC I 2	Droughtiness			3b
								38	43	5	5YR5/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								43	55	12							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								55	120	65							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
39	TF 01800 13200	501800	313200	59	≤7	SE		0	38	38	5YR5/4						HCL - Clay loam (heavy)	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-29	-22	3b	WC I 2	Droughtiness			3b
								38	40	2	5YR5/4						HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								40	50	10							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								50	120	70							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
40	TF 02200 13200	502200	313200	42	≤7	SE		0	45	45	7.5YR4/4					No	HCL - Clay loam (heavy)	3	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	34	18	1	WC I 2	Wetness			2
								45	80	35	5YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								80	120	40							C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	Yes								
54	TF 01600 13000	501600	313000	61	≤7	SE		0	40	40	5YR5/4					No	HCL - Clay loam (heavy)	4	4	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	MC - Moderately calcareous (5 - 10% CaCO3)	No	No	-29	-22	3b	WC I 2	Droughtiness			3b
								40	50	10	5YR5/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								50	120	70							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
	END																																								

SITE C

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
19	TF 03000 13600	503000	313600	33	≤7	SE		0	40	40	7.5YR4/4					No	MCL - Clay loam (medium)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-28	-22	3b	WC I	1	Droughtiness			3b
								40	45	5	7.5YR4/4					No	MCL - Clay loam (medium)	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								45	55	10							MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								55	120	65							IMP - Impenetrable to roots	70			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
31	TF 03000 13400	503000	313400	33	≤7	SE		0	35	35	7.5YR4/6					No	C - Clay	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-28	-19	3b	WC I	2	Droughtiness			3b
								35	50	15	7.5YR4/6					No	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								60	120	60							IMP - Impenetrable to roots	51			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
32	TF 03200 13400	503200	313400	31	≤7	SE		0	40	40	7.5YR4/6					No	HCL - Clay loam (heavy)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-29	-22	3b	WC I	2	Droughtiness			3b
								40	45	5	5YR4/6					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								45	55	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								55	120	65							IMP - Impenetrable to roots	51			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
33	TF 03400 13400	503400	313400	33	≤7	SE		0	45	45	7.5YR4/6					No	HCL - Clay loam (heavy)	3	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-48	-39	3b	WC I	2	Droughtiness			3b
								45	50	5	7.5YR4/6					No	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								60	120	60							IMP - Impenetrable to roots	51			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
34	TF 03600 13400	503600	313400	28	≤7	SE		0	40	40	7.5YR3/4					No	HCL - Clay loam (heavy)	3	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-15	2	3a	WC I	2	Droughtiness			3a
								40	60	20	7.5YR4/6					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								60	70	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								70	120	50							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
35	TF 03800 13400	503800	313400	31	≤7	SE		0	40	40	7.5YR4/4					No	MCL - Clay loam (medium)	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	MC - Moderately calcareous (5 - 10% CaCO3)	No	No	-1	7	3a	WC I	2	Droughtiness			3a
								40	60	20	5YR4/4					No	HCL - Clay loam (heavy)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No									
								60	80	20	5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No									
								80	120	40							IMP - Impenetrable to roots	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No									
45	TF 03200 13200	503200	313200	35	≤7	SE		0	35	35	7.5YR4/6					No	HCL - Clay loam (heavy)	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	-31	-23	3b	WC I	2	Droughtiness			3b
								35	45	10	7.5YR4/6					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No									
								45	55	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								55	120	65							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
46	TF 03400 13200	503400	313200	32	≤7	SE		0	40	40	7.5YR4/6					No	HCL - Clay loam (heavy)	3	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	MC - Moderately calcareous (5 - 10% CaCO3)	No	No	-23	-14	3b	WC I	2	Droughtiness			3b
								40	50	10	7.5YR4/6					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								60	120	60							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
47	TF 03600 13200	503600	313200	29	≤7	SE		0	30	30	7.5YR4/6					No	MCL - Clay loam (medium)	3	3	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable		No	No	-14	1	3a	WC I	1	Droughtiness			3a
								30	40	10	7.5YR4/6					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								40	60	20	5YR4/6					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								60	70	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								70	120	50							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
48	TF 03800 13200	503800	313200	31	≤7	SE		0	35	35	7.5YR4/6					No	MCL - Clay loam (medium)	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	NON - Non-calcareous (<0.5% CaCO3)	No	No	-2	10	3a	WC I	1	Droughtiness			3a
								35	50	15	7.5YR4/6					No	MCL - Clay loam (medium)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No									
								50	70	20	7.5YR5/6					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		Yes	No									
								70	80	10							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								80	120	40							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
49	TF 04000 13200	504000	313200	32	≤7	SE		0	38	38	10YR4/3					No	HCL - Clay loam (heavy)	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	NON - Non-calcareous (<0.5% CaCO3)	No	No	-19	-5	3a	WC III	3b	Wetness			3b
								38	60	22	10YR5/3	MD - Many Distinct	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes									
								60	70	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	Yes									
								70	120	50							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	Yes									
59	TF 03200 13000	503200	313000	41	≤7	SE		0	35	35	7.5YR4/6					No	MCL - Clay loam (medium)	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	-12	2	3a	WC I	1	Droughtiness			3a
								35	45	10	7.5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No									
								45	60	15	7.5YR4/6					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No									
								60	70	10							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								70	120	50							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
60	TF 03600 13000	503600	313000	30	≤7	SE		0	38	38	7.5YR4/4					No	HCL - Clay loam (heavy)	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	-29	-22	3b	WC I	2	Droughtiness			3b
								38	45	7	7.5YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No									
								45	55	10							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								55	120	65							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
61	TF 03800 13000	503800	313000	35	≤7	SE		0	38	38	2.5Y4/2					Yes	C - Clay	3	3	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	13	-4	2	WC III	3a	Wetness			3a
								38	60	22	2.5Y5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	VC - Very calcareous (>10% CaCO3)	No	Yes									
								60	120	60							C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	Yes									
62	TF 04000 13000	504000	313000	36	≤7	SE		0	38	38	10YR4/3					No	C - Clay	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-27	-18	3b	WC I	2	Droughtiness			3b
								38	50	12	10YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								60	120	60							IMP - Impenetrable to roots	51			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
76	TF 04000 12800	504000	312800	44	≤7	SE		0	35	35	10YR4/3					No	C - Clay	7	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-40	-35	3b	WC I	2	Droughtiness			3b
								35	40	5	10YR4/3					No	C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No									
								40	50	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
								50	120	70							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No									
	END																																							

SITE D

Point	Grid ref. NGR	X	Y	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Bttm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Gley	Texture	Stones - type 1 %	> 2cm	> 6cm	Type	Stones - type 2 %	> 2cm	> 6cm	Type	Ped Strength	Size	Shape	SUBS STR	CaCO3	Mn C	SPL	Drought MBw	MBp	Gd	Wet WC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
73	TF 03200	12800	503200	312800	39	≤7	SE	0	28	28	7.5YR4/6					No	HCL - Clay loam (heavy)	5	5		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-50	-43	4	WC I	2	Droughtiness			4
								28	30	2	7.5YR4/6						HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								30	40	10							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								40	120	80							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
74	TF 03400	12800	503400	312800	37	≤7	SE	0	35	35	7.5YR4/6					No	MCL - Clay loam (medium)	3	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-36	-29	3b	WC I	1	Droughtiness			3b
								35	38	3	7.5YR4/6						HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								38	48	10							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								48	120	72							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
75	TF 03600	12800	503600	312800	32	≤7	SE	0	38	38	7.5YR4/6					No	HCL - Clay loam (heavy)	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-12	3	3a	WC I	2	Droughtiness			3a
								38	60	22	7.5YR5/6						HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								60	65	5							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								65	120	55							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
90	TF 03400	12600	503400	312600	35	≤7	SE	0	40	40	10YR4/3					No	C - Clay	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-20	-5	3a	WC I	2	Droughtiness			3a
								40	55	15	10YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								55	65	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								65	120	55							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
91	TF 03600	12600	503600	312600	39	≤7	SE	0	35	35	10YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	28	12	2	WC I	3a	Wetness			3a
								35	60	25	7.5YR5/6					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								60	65	5	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								65	120	55							C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
92	TF 03800	12600	503800	312600	42	≤7	SE	0	35	35	10YR4/4					No	C - Clay	5	5	3	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	18	3	2	WC III	3b	Wetness			3b
								35	50	15	10YR5/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								50	60	10	10YR5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
								60	120	60							C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
93	TF 04000	12600	504000	312600	46	≤7	SE	0	38	38	10YR4/3					No	C - Clay	1	1		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	NON - Non-calcareous (<0.5% CaCO3)	No	No	20	5	2	WC II	3a	Wetness			3b
								38	50	12	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								50	60	10	10YR5/3	MD - Many Distinct	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	Yes								
								60	120	60							C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	Yes								
106	TF 03400	12400	503400	312400	50	≤7	SE	0	38	38	10YR4/3					No	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-8	11	3a	WC I	2	Droughtiness			3a
								38	50	12	10YR5/3					Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								50	70	20	2.5Y5/3	MD - Many Distinct	10YR5/6			Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								70	80	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	No								
								80	120	40							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor		No	No								
107	TF 03600	12400	503600	312400	51	≤7	SE	0	36	36	10YR4/4					No	HCL - Clay loam (heavy)	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-29	-20	3b	WC I	2	Droughtiness			3b
								36	43	7	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	Yes	No								
								43	53	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								53	120	67							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
108	TF 03800	12400	503800	312400	50	≤7	SE	0	29	29	10YR4/3					No	C - Clay	3	3	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-25	-13	3b	WC I	2	Droughtiness			3b
								29	50	21	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								50	60	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								60	120	60							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
109	TF 04000	12400	504000	312400	48	≤7	SE	0	30	30	10YR4/4					No	C - Clay	7	7	4	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-34	-23	3b	WC I	2	Droughtiness			3b
								30	40	10	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								40	60	20	10YR4/3						C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								60	120	60							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
121	TF 03600	12200	503600	312200	52	≤7	SE	0	38	38	10YR4/4					No	C - Clay	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-36	-29	3b	WC I	2	Droughtiness			3b
								38	40	2	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								40	50	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								50	120	70							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
122	TF 03800	12200	503800	312200	51	≤7	SE	0	35	35	10YR4/3					No	C - Clay	5	5	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-37	-30	3b	WC I	2	Droughtiness			3b
								35	40	5	7.5YR4/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VC - Very calcareous (>10% CaCO3)	No	No								
								40	50	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								50	120	70							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
123	TF 04000	12200	504000	312200	44	≤7	SE	0	38	38	2.5Y4/3					No	C - Clay	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	SC - Slightly calcareous (1 - 5% CaCO3)	No	No	-16	3	3a	WC I	2	Droughtiness			3a
								38	50	12	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								50	60	10	10YR5/3	FF - Few Faint	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								60	70	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								70	120	50							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
134	TF 04600	12020	504600	312020	24	≤7	SE	0	30	30	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Not Applicable	VC - Very calcareous (>10% CaCO3)	No	No	-50	-43	4	WC I	2	Droughtiness			4
								30	40	10							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
								40	120	80							IMP - Impenetrable to roots	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate		No	No								
	END																																							

SITE E

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	>2cm	>6cm	Type	%	>2cm	>6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
50	TF 05400 13200	505400	313200	34	≤7	SE		0	22	22	10YR4/3						C - Clay	10	4		SLST - Soft oolitic or dolomitic limestones								SC - Slightly calcareous (1 - 5% CaCO3)			5	-10	3a	WC I	2	Droughtiness			3a
								22	38	16	7.5YR5/4					No	C - Clay	5			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								38	120	82	7.5YR5/5					No	C - Clay	30			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
51	TF 05600 13200	505600	313200	36	≤7	SE		0	27	27	10YR4/3						C - Clay	20	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-48	-38	3b	WC I	2	Droughtiness			3b
								27	40	13	10YR6/3	CD - Common Distinct	10YRS/6			Yes	C - Clay	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
								40	60	20	10YRS/5					No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No								
52	TF 05800 13200	505800	313200	36	≤7	SE		0	25	25	10YR4/3						HCL - Clay loam (heavy)	10			SLST - Soft oolitic or dolomitic limestones								MC - Moderately calcareous (5 - 10% CaCO3)			-36	-25	3b	WC I	1	Droughtiness			3b
								25	35	10	10YRS/4					No	C - Clay	20			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								35	65	30	10YR6/4					No	SCL - Sandy clay loam	50			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
63	TF 05200 13000	505200	313000	24	≤7	SE		0	27	27	10YR4/2						MCL - Clay loam (medium)	10	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-12	-10	3a	WC I	1	Droughtiness			3a
								27	48	21	7.5YR4/4					No	MCL - Clay loam (medium)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No								
								48	60	12	7.5YR4/4					No	MSL - Medium sandy loam	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No								
								60	90	30	7.5YR5/4					No	SCL - Sandy clay loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
64	TF 05400 13000	505400	313000	34	≤7	SE		0	25	25	10YR4/3						C - Clay	10	3		SLST - Soft oolitic or dolomitic limestones								SC - Slightly calcareous (1 - 5% CaCO3)			14	-3	2	WC I	2	Droughtiness	Wetness		2
								25	35	10	10YR4/4					No	C - Clay	5			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								35	120	85	10YRS/4					No	C - Clay	10			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
65	TF 05600 13000	505600	313000	36	≤7	SE		0	25	25	10YR4/2						MCL - Clay loam (medium)	40	18		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								MC - Moderately calcareous (5 - 10% CaCO3)			-60	-51	4	WC I	1	Droughtiness			4
								25	40	15	10YR4/4					No	MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								40	60	20							MCL - Clay loam (medium)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
66	TF 05800 13000	505800	313000	36	≤7	SE		0	25	25	2.5Y4/3						C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			6	-11	3a	WC III	3b	Wetness			3b
								25	120	95	2.5Y5/3	CD - Common Distinct	10YRS/6			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
67	TF 06000 13000	506000	313000	37	≤7	SE		0	28	28	10YR4/3						C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			12	-5	2	WC III	3b	Wetness			3b
								28	50	22	2.5Y5/3	MP - Many Prominent	10YRS/6			Yes	HCL - Clay loam (heavy)	10			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								50	120	70	5Y5/1	CP - Common Prominent	10YRS/6			Yes	C - Clay	0			SLST - Soft oolitic or dolomitic limestones							Poor	SC - Slightly calcareous (1 - 5% CaCO3)		Yes								
77	TF 05200 12800	505200	312800	23	≤7	SE		0	30	30	7.5YR4/2						MCL - Clay loam (medium)	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-47	-39	3b	WC I	1	Droughtiness			3b
								30	40	10	7.5YR4/4					No	SCL - Sandy clay loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								40	60	20							SCL - Sandy clay loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
78	TF 05400 12800	505400	312800	33	≤7	SE		0	28	28	10YR4/2						C - Clay	30	16		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								MC - Moderately calcareous (5 - 10% CaCO3)			-58	-48	4	WC I	1	Droughtiness			4
								28	40	12	10YR4/4					No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								40	60	20							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
79	TF 05600 12800	505600	312800	34	≤7	SE		0	28	28	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			13	-4	2	WC II	3a	Wetness			3a
								28	50	22	10YR5/4					No	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								50	120	70	10YR5/3	CD - Common Distinct	10YRS/6			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	SC - Slightly calcareous (1 - 5% CaCO3)		Yes								
80	TF 05800 12800	505800	312800	33	≤7	SE		0	25	25	10YR4/3						C - Clay	50	25		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								MC - Moderately calcareous (5 - 10% CaCO3)			-77	-71	4	WC I	2	Droughtiness			4
								25	30	5	10YR4/4					No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								30	50	20							C - Clay	70			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
81	TF 06000 12800	506000	312800	34	≤7	SE		0	28	28	10YR4/3						MCL - Clay loam (heavy)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			12	-5	2	WC III	3b	Wetness			3b
								28	120	92	2.5Y6/1	CP - Common Prominent	10YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
82	TF 06200 12800	506200	312800	37	≤7	SE		0	28	28	10YR4/3						MCL - Clay loam (heavy)	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			-31	-22	3b	WC I	2	Wetness			3b
								28	40	12	10YR6/3	CD - Common Distinct	10YRS/6			Yes	HCL - Clay loam (heavy)	30			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
								40	75	35	2.5Y6/3	CD - Common Distinct	10YRS/6			Yes	SCL - Sandy clay loam	50			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Very calcareous (>10% CaCO3)		No								
95	TF 05600 12600	505600	312600	32	≤7	SE		0	25	25	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								VSC - Very slightly calcareous (0.5 - 1% CaCO3)			10	-3	2	WC I	3a	Wetness			3a
								25	55	30	10YR4/4					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
								55	120	65	10YRS/2	CD - Common Distinct	10YRS/6			Yes	C - Clay	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
96	TF 05800 12600	505800	312600	32	≤7	SE		0	25	25	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								VSC - Very slightly calcareous (0.5 - 1% CaCO3)			6	-10	2	WC III	3b	Wetness			3b
								25	35	10	10YR5/4					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
								35	120	85	2.5Y5/3	CD - Common Distinct	2.5Y6/1	CD - Common Distinct	10YRS/6	Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes								
97	TF 06000 12600	506000	312600	32	≤7	SE		0	25	25	10YR4/2						C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								VSC - Very slightly calcareous (0.5 - 1% CaCO3)			8	-8	2	WC III	3b	Wetness			3b
								25	38	13	10YR6/4					No	SCL - Sandy clay loam	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No								
								38	120	82	5Y5/3	CD - Common Distinct	5Y6/1			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	SC - Slightly calcareous (1 - 5% CaCO3)		Yes								
98	TF 06200 12600	506200	312600	34	≤7	SE		0	25	25	7.5YR4/3						MCL - Clay loam (medium)	25	12		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			27	-8	2	WC I	1	Droughtiness			2
								25	35	10	7.5YR4/4					No	MCL - Clay loam (medium)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								35	65	30	7.5YR5/8					No	MSL - Medium sandy loam	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								65	120	55	7.5YR5/8					No	SCL - Sandy clay loam	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
114	TF 06000 12400	506000	312400	28	≤7	SE		0	25	25	10YR4/3						C - Clay	2			SLST - Soft oolitic or dolomitic limestones								SC - Slightly calcareous (1 - 5% CaCO3)			-11	-10	3a	WC I	2	Droughtiness			3a
								25	35	10	10YR4/4	CD - Common Distinct	2.5Y6/1			Yes	C - Clay	4			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No								
								35	55	20	10YR5/6					No	SCL - Sandy clay loam	10			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No								
								55	85	30	10YR6/4	CD - Common Distinct	10YRS/6			Yes	MSL - Medium sandy loam	50			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
115	TF 06200 12400	506200	312400	28	≤7	SE		0	25	25	10YR4/3						C - Clay	20	10		SLST - Soft oolitic or dolomitic limestones								NON - Non-calcareous (<0.5% CaCO3)			3	-13	3a	WC III	3b	Wetness			3b
								25	45	20	2.5Y5/3	CD - Common Distinct	2.5Y6/1			Yes	C - Clay	2			SLST - Soft oolitic or dolomitic limestones							Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	No								
								45	55	10	2.5Y5/4					No	C - Clay	10			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No								
								55	120	65	5Y5/2	CD - Common Distinct	10YRS/6			Yes	C - Clay	2			SLST - Soft oolitic or dolomitic limestones							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
130	TF 06000 12200	506000	312200	24	≤7	SE		0	28	28	10YR4/4						C - Clay	2			SLST - Soft oolitic or dolomitic limestones								SC - Slightly calcareous (1 - 5% CaCO3)			-26	-16	3b	WC I	2	Droughtiness			3b
								28	40	12	10YR5/6					No	C - Clay	20			SLST - Soft oolitic or dolomitic limestones							Poor	MC - Moderately calcareous (5 - 10% CaCO3)	Yes	No								
								40	60	20	10YR5/5					No	C - Clay	40			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
								60	80	20							C - Clay	50			SLST - Soft oolitic or dolomitic limestones							Moderate			No								
	END																																						

SITE F

Point	Grid ref. NGR	X	Y	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Bttm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Gley	Texture	Stones - type 1 %	> 2cm	> 6cm	Type	Stones - type 2 %	> 2cm	> 6cm	Type	Ped Strength	Size	Shape	SUBS STR	CaCO3	Mn C	SPL	Drought MBw	MBp	Gd	Wet WC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
68	TF 06200 13000	506200	313000	38	≤7	E		0	30	30	10YR4/3						MCL - Clay loam (medium)	40	20		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-26	-40	3b	WC I	1	Droughtiness			3b
								30	40	10	10YR4/6					No	HCL - Clay loam (heavy)	40			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								40	120	80							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
69	TF 06400 13000	506400	313000	35	≤7	E		0	30	30	10YR4/3						MCL - Clay loam (medium)	28	16		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			12	-14	3a	WC I	1	Droughtiness			3a
								30	120	90	10YR4/6					No	MCL - Clay loam (medium)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
70	TF 06600 13000	506600	313000	33	≤7	E		0	30	30	10YR4/3						HCL - Clay loam (heavy)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			13	-4	2	WC III	3b	Wetness			3b
								30	120	90	10YR5/2	CP - Common Prominent	7.5YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
83	TF 06400 12800	506400	312800	35	≤7	E		0	38	38	10YR4/3						MCL - Clay loam (medium)	25	16		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-13	-27	3a	WC I	1	Droughtiness			3a
								38	45	7	10YR4/4					No	HCL - Clay loam (heavy)	25			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								45	120	75							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
84	TF 06600 12800	506600	312800	34	≤7	E		0	25	25	2.5Y4/3						C - Clay	5	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			7	-10	2	WC III	3b	Wetness			3b
								25	120	95	2.5Y6/1	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
99	TF 06400 12600	506400	312600	35	≤7	E		0	25	25	10YR4/3						MCL - Clay loam (medium)	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-2	-14	3a	WC I	1	Droughtiness			3a
								25	40	15	10YR4/4					No	MCL - Clay loam (medium)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								40	60	20	10YR4/6					No	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								60	120	60							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate			No								
100	TF 06600 12600	506600	312600	34	≤7	E		0	25	25	2.5Y4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			8	-9	2	WC III	3b	Wetness			3b
								25	120	95	2.5Y6/1	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
101	TF 06800 12600	506800	312600	34	≤7	E		0	25	25	10YR4/3						MCL - Clay loam (medium)	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			10	-7	2	WC III	3a	Wetness			3a
								25	120	95	2.5Y6/2	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
116	TF 06400 12400	506400	312400	34	≤7	E		0	24	24	10YR4/3						C - Clay	30	16		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-56	-46	4	WC I	1	Droughtiness			4
								24	35	11	10YR4/4					No	C - Clay	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								35	40	5	10YR4/6					No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								40	60	20							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate			No								
117	TF 06600 12400	506600	312400	36	≤7	E		0	30	30	10YR4/3						MCL - Clay loam (medium)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			9	-8	2	WC III	3a	Wetness			3a
								30	120	90	2.5Y6/1	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
118	TF 06800 12400	506800	312400	37	≤7	E		0	25	25	10YR4/3						MCL - Clay loam (medium)	8	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			8	-9	2	WC III	3a	Wetness			3a
								25	120	95	2.5Y6/1	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
131	TF 06400 12200	506400	312200	33	≤7	E		0	25	25	10YR4/3						C - Clay	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-29	-16	3b	WC II	2	Droughtiness			3b
								25	60	35	10YR5/3					No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
								60	80	20							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate			No								
132	TF 06600 12200	506600	312200	35	≤7	E		0	30	30	10YR4/3						MCL - Clay loam (medium)	30	18		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-51	-42	4	WC I	1	Droughtiness			4
								30	40	10	10YR4/6					No	HCL - Clay loam (heavy)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								40	60	20							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate			No								
142	TF 06400 12000	506400	312000	35	≤7	E		0	30	30	10YR4/3						C - Clay	35	18		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-60	-49	4	WC I	2	Droughtiness			4
								30	40	10	10YR5/4					No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
								40	60	20							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate			No								
	END																																							

SITE G

Point	Grid ref. NGR	X	Y	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Bttm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Ochreous Mottles Munsell colour	Grey Mottles Form	Grey Mottles Munsell colour	Gley	Texture	Stones - type 1 %	> 2cm	> 6cm	Type	Stones - type 2 %	> 2cm	> 6cm	Type	Ped Strength	Size	Shape	SUBS STR	CaCO3	Mn C	SPs	Drought MBw	MBp	Gd	Wet WC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
20	TF 06580 13600	506580	313600	35	≤7	SE		0	30	30	10YR4/3						HCL - Clay loam (heavy)	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			21	5	2	WC II	3a	Wetness			3a
								30	42	12	10YR4/4					No	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								42	60	18	2.5Y6/4	CP - Common Prominent	10YRS/6			Yes	MZCL - Silty clay loam (medium)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								60	120	60	5Y6/2	CP - Common Prominent	7.5YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
36	TF 06600 13400	506600	313400	32	≤7	SE		0	28	28	10YR4/3						MCL - Clay loam (medium)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			8	-11	3a	WC III	3a	Droughtiness	Wetness		3a
								28	50	22	10YR6/3	CP - Common Prominent	7.5YRS/6			Yes	HCL - Clay loam (heavy)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
								50	120	70	2.5Y6/2	CP - Common Prominent	7.5YRS/8			Yes	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
53	TF 06600 13200	506600	313200	33	≤7	SE		0	28	28	10YR4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			8	-9	2	WC III	3b	Wetness			3b
								28	120	92	10YR6/1	MP - Many Prominent	7.5YRS/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
71	TF 06800 13000	506800	313000	33	≤7	SE		0	25	25	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			6	-11	3a	WC III	3b	Wetness			3b
								25	120	95	2.5Y6/2	CP - Common Prominent	10YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
85	TF 06840 12800	506840	312800	33	≤7	SE		0	30	30	10YR4/3						C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			9	-8	2	WC III	3b	Wetness			3b
								30	120	90	2.5Y6/1	MP - Many Prominent	10YRS/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
86	TF 07000 12800	507000	312800	32	≤7	SE		0	35	35	10YR4/3						MCL - Clay loam (medium)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			35	4	2	WC II	2	Droughtiness	Wetness		2
								35	55	20	10YR6/2	CP - Common Prominent	10YRS/8			Yes	MCL - Clay loam (medium)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								55	120	65	2.5Y6/1	CP - Common Prominent	10YRS/8			Yes	HCL - Clay loam (heavy)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
87	TF 07200 12800	507200	312800	31	≤7	SE		0	26	26	10YR4/3						HCL - Clay loam (heavy)	8	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			7	-10	2	WC III	3b	Wetness			3b
								26	120	94	5Y6/1	CP - Common Prominent	10YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
88	TF 07400 12800	507400	312800	30	≤7	SE		0	25	25	10YR4/3						MCL - Clay loam (medium)	10	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			14	-10	2	WC I	1	Droughtiness			2
								25	50	25	10YR4/4					No	HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								50	120	70	7.5YR4/6					No	SCL - Sandy clay loam	25			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
89	TF 07600 12800	507600	312800	28	≤7	SE		0	30	30	10YR4/2						HCL - Clay loam (heavy)	10	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			8	-9	2	WC III	3b	Wetness			3b
								30	120	90	2.5Y6/2	CP - Common Prominent	10YRS/6	CD - Common Distinct	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
102	TF 07000 12600	507000	312600	31	≤7	SE		0	25	25	10YR4/3						MCL - Clay loam (medium)	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			17	0	2	WC III	3a	Wetness			3a
								25	55	30	10YRS/2	MP - Many Prominent	7.5YRS/8			Yes	HCL - Clay loam (heavy)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No								
								55	120	65	2.5YS/2	CP - Common Prominent	10YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
103	TF 07200 12600	507200	312600	30	≤7	SE		0	28	28	10YR4/3						MCL - Clay loam (medium)	8	3		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			18	1	2	WC II	2	Droughtiness	Wetness		2
								28	60	32	2.5Y5/2	CP - Common Prominent	10YRS/6			Yes	MCL - Clay loam (medium)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No								
								60	120	60	2.5Y6/1	MP - Many Prominent	7.5YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes								
104	TF 07400 12600	507400	312600	27	≤7	SE		0	30	30	10YR4/2						HCL - Clay loam (heavy)	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			11	-6	2	WC III	3b	Wetness			3b
								30	120	90	2.5Y5/2	CP - Common Prominent	10YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
105	TF 07600 12600	507600	312600	25	≤7	SE		0	22	22	10YR4/2						HCL - Clay loam (heavy)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			6	-11	3a	WC III	3b	Wetness			3b
								22	120	98	2.5YS/2	CP - Common Prominent	10YRS/6			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
119	TF 07000 12400	507000	312400	35	≤7	SE		0	28	28	10YR4/3						MCL - Clay loam (medium)	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			39	7	2	WC II	2	Droughtiness	Wetness		2
								28	120	92	2.5Y7/1	CP - Common Prominent	10YRS/6			Yes	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
120	TF 07200 12400	507200	312400	32	≤7	SE		0	28	28	10YR4/3						MCL - Clay loam (medium)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			19	3	2	WC III	3a	Wetness			3a
								28	55	27	10YRS/2	CP - Common Prominent	7.5YRS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)		No								
								55	120	65	5Y6/2	MP - Many Prominent	7.5YS/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes								
133	TF 04000 12000	504000	312000	52	≤7	SE		0	30	30	10YR4/3						MCL - Clay loam (medium)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			37	3	2	WC II	2	Droughtiness	Wetness		2
								30	120	90	2.5Y6/1	CP - Common Prominent	10YRS/6			Yes	SCL - Sandy clay loam	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)							Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
	END																																							

SITE H

Point	Grid ref. NGR	E	N	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Btm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Dizzy	Texture	Stones - type 1 %	>2cm	>6cm	Type	Stones - type 2 %	>2cm	>6cm	Type	Ped Strength	Size	Shape	G.085 STR	CaCO3	Min C	SPL	Drought MBw	MBp	Gd	Wet WC	Dw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
94	TF 05400 12600	505400	312600	33	c7	SE		0	30	30	10YR4/3						C - Clay	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-39	-24	3b	WC I	2	Droughtiness			3b
								30	38	8	10YR4/4					No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								38	50	12	10YR6/4						C - Clay	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								50	70	20							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
110	TF 05200 12400	505200	312400	34	c7	SE		0	25	25	10YR4/3						C - Clay	30	16	8	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-48	-38	3b	WC I	2	Droughtiness			3b
								25	35	10	10YR4/4					No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								35	50	15	10YR6/4						MSL - Medium sandy loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								50	70	20							MSL - Medium sandy loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
111	TF 05400 12400	505400	312400	34	c7	SE		0	30	30	10YR4/3						C - Clay	20	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-47	-34	3b	WC I	2	Droughtiness			3b
								30	40	10	10YR4/4					No	C - Clay	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								40	45	5	10YR5/4						C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								45	65	20							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
112	TF 05600 12400	505600	312400	34	c7	SE		0	28	28	10YR4/3						MCL - Clay loam (medium)	15	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-56	-49	4	WC I	1	Droughtiness			4
								28	35	7	10YR4/4					No	MCL - Clay loam (medium)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
								35	60	25							MCL - Clay loam (medium)	80			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
113	TF 05800 12400	505800	312400	31	c7	SE		0	30	30	10YR4/3						MCL - Clay loam (medium)	15	9		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-57	-49	4	WC I	1	Droughtiness			4
								30	33	3	10YR4/4					No	MCL - Clay loam (medium)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
								33	60	27							MCL - Clay loam (medium)	80			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
125	TF 05050 12200	505050	312200	25	c7	SE		0	30	30	10YR3/2						HCL - Clay loam (heavy)	20	12	8	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-51	-42	4	WC I	2	Droughtiness			4
								30	35	5	10YR7/2					No	SCL - Sandy clay loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
								35	60	25							SCL - Sandy clay loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
126	TF 05200 12200	505200	312200	29	c7	SE		0	25	25	2.5Y4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			19	1	2	WC II	2	Droughtiness	Wetness		2
								25	120	95	2.5Y6/3	CP - Common Prominent				Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No							
127	TF 05400 12200	505400	312200	33	c7	SE		0	25	25	10YR4/4						C - Clay	25	16		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-58	-48	4	WC I	2	Droughtiness			4
								25	35	10	10YR6/4					No	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								35	60	25							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
128	TF 05600 12200	505600	312200	30	c7	SE		0	25	25	10YR4/3						HCL - Clay loam (heavy)	25	16		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-62	-54	4	WC I	1	Droughtiness			4
								25	35	10	10YR4/4					No	C - Clay	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
								35	60	25							C - Clay	80			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
129	TF 05800 12200	505800	312200	25	c7	SE		0	32	32	10YR4/3						MCL - Clay loam (medium)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			20	3	2	WC III	3a	Wetness			3a
								32	55	23	2.5Y5/3	CP - Common Prominent	10YR5/6			Yes	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No							
								55	120	65	5Y5/3	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	Yes							
137	TF 05400 12000	505400	312000	28	c7	SE		0	28	28	10YR4/3						C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			10	-7	2	WC III	3a	Wetness			3a
								28	38	10	10YR4/4					No	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								38	65	27	2.5Y6/4	CP - Common Prominent	10YR5/6	CD - Common Distinct	2.5Y6/1	Yes	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes							
								65	120	55	5Y5/1	CP - Common Prominent	10YR5/6			Yes	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)		Yes							
138	TF 05600 12000	505600	312000	23	c7	SE		0	30	30	10YR4/4						C - Clay	25	12		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-30	-23	3b	WC I	2	Droughtiness			3b
								30	55	25	7.5YR4/4					No	C - Clay	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								55	65	10	10YR6/6					No	HCL - Clay loam (heavy)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								65	85	20							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
139	TF 05800 12000	505800	312000	22	c7	SE		0	34	34	10YR4/3						HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-35	-27	3b	WC I	2	Droughtiness			3b
								34	45	11	10YR4/5					No	HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								45	50	5	10YR7/4					No	MSL - Medium sandy loam	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								50	70	20							MSL - Medium sandy loam	80			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
140	TF 06000 12000	506000	312000	26	c7	SE		0	25	25	10YR4/3						HCL - Clay loam (heavy)	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			18	-9	2	WC I	2	Droughtiness	Wetness		2
								25	35	10	10YR4/4					No	HCL - Clay loam (heavy)	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								35	120	85	10YR6/4					No	SCL - Sandy clay loam	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
141	TF 06220 12000	506220	312000	33	c7	SE		0	35	35	10YR4/2						HCL - Clay loam (heavy)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			40	8	2	WC II	3a	Wetness			3a
								35	120	85	10YR5/3	CD - Common Distinct	10YR5/6			Yes	HCL - Clay loam (heavy)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No							
147	TF 05450 11800	505450	311800	22	c7	SE		0	22	22	10YR4/2						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								MC - Moderately calcareous (5 - 10% CaCO3)			13	-4	2	WC III	3a	Wetness			3a
								22	45	23	2.5Y6/2	CP - Common Prominent	10YR5/6			Yes	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								45	120	75	5Y6/3	CP - Common Prominent	10YR5/6	CD - Common Distinct	5Y6/1	Yes	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes							
148	TF 05600 11800	505600	311800	21	c7	SE		0	25	25	10YR4/3						MCL - Clay loam (medium)	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			22	5	2	WC II	2	Droughtiness	Wetness		2
								25	35	10	10YR4/4					No	MCL - Clay loam (medium)				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								35	65	30	7.5YR4/4					No	HCL - Clay loam (heavy)				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	No							
								65	120	55	10YR5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes							
149	TF 05800 11800	505800	311800	21	c7	SE		0	25	25	10YR4/3						C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			5	-12	3a	WC III	3a	Droughtiness	Wetness		3a
								25	120	95	5Y5/3	CP - Common Prominent	10YR5/6			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	Yes							
150	TF 06000 11800	506000	311800	27	c7	SE		0	28	28	10YR4/3						MCL - Clay loam (medium)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			36	5	2	WC I	1	Droughtiness			2
								28	50	22	10YR4/5					No	MCL - Clay loam (medium)	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								50	120	70	7.5YR4/5					No	HCL - Clay loam (heavy)	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
156	TF 05600 11600	505600	311600	21	c7	SE		0	28	28	10YR4/2						MCL - Clay loam (medium)	20	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			-30	-35	3b	WC I	1	Droughtiness			3b
								28	48	20	10YR4/4					No	SCL - Sandy clay loam	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								48	120	72	10YR5/4					No	LMS - Loamy medium sand	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
157	TF 05800 11600	505800	311600	21	c7	SE		0	30	30	10YR4/3						MCL - Clay loam (medium)	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			43	6	2	WC I	1	Droughtiness			2
								30	60	30	10YR4/4					No	MCL - Clay loam (medium)	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No							
								60	80	20	2.5Y6/4					No	SCL - Sandy clay loam	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No							
								80	120	40	5Y5/1					No	MSL - Medium sandy loam	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)		No							
158	TF 06000 11600	506000	311600	27	c7	SE		0	30	30	10YR4/2						MCL - Clay loam (medium)	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			-27	-35	3b	WC I	1	Droughtiness			3b
								30	40	10	10YR4/4					No	MCL - Clay loam (medium)	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								40	120	80	10YR5/4					No	LMS - Loamy medium sand	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
163	TF 05800 11400	505800	311400	23	c7	SE		0	26	26	7.5YR4/2						MCL - Clay loam (medium)	15	9		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			6	-4	2	WC I	1	Droughtiness			2
								26	70	44	7.5YR4/4					No	MSL - Medium sandy loam	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								70	120	50	7.5YR5/4					No	LMS - Loamy medium sand	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
164	TF 06000 11400	506000	311400	32	c7	SE		0	30	30	7.5YR4/2						MCL - Clay loam (medium)	30	18		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			-44	-31	3b	WC I	1	Droughtiness			3b
								30	40	10	7.5YR4/4					No	HCL - Clay loam (heavy)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								40	65	25	7.5YR5/4					No	HCL - Clay loam (heavy)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
	END																																								

SITE I

Point	Grid ref. NGR	E	N	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Btm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Gley	Texture	Stones - type 1 %	> 2cm	> 6cm	Type	Stones - type 2 %	> 2cm	> 6cm	Type	Ped Strength	Size	Shape	Cubes STR	CaCO3	Mn C	SPL	Drought Mbw	MBp	Std	Wet AC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
124	TF 04600 12300	504600	312300	29	s7	E		0 22 22 2.5Y4/3 22 50 28 2.5Y5/4 50 120 70 5Y6/2				CP - Common Prominent 10YR5/6				No Yes	C - Clay C - Clay C - Clay	0 0 0												NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3)			21 3 2		WC II	3a	Wetness			3a
135	TF 04800 12000	504800	312000	24	s7	E		0 30 30 2.5Y4/3 30 50 20 2.5Y5/4 50 120 70 2.5Y5/3				CD - Common Distinct 10YR5/6		CD - Common Distinct 2.5Y6/1		No Yes	C - Clay C - Clay C - Clay	2 0 0												VSC - Very slightly calcareous (0.5 - 1% CaCO3) VSC - Very slightly calcareous (0.5 - 1% CaCO3) VSC - Very slightly calcareous (0.5 - 1% CaCO3)			21 3 2		WC II	3a	Wetness			3a
136	TF 05200 12000	505200	312000	26	s7	E		0 26 26 10YR4/3 26 70 44 7.5YR4/4 70 120 50 7.5YR5/4								No No	C - Clay C - Clay C - Clay	8 2 5 50												SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-3 -3 3a		WC I	2	Droughtiness			3a
143	TF 04600 11800	504600	311800	24	s7	E		0 32 32 10YR4/3 32 60 28 7.5YR4/4 60 75 15 7.5YR4/5 75 120 45 7.5YR4/5								No No No	C - Clay C - Clay C - Clay C - Clay	10 2 2 20												NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			9 -2 2		WC I	3a	Wetness			3a
144	TF 04800 11800	504800	311800	24	s7	E		0 28 28 2.5Y4/2 28 120 92 5Y5/2				CP - Common Prominent 10YR5/6				Yes	C - Clay C - Clay	2 0												SC - Slightly calcareous (1 - 5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			7 -10 2		WC III	3a	Wetness			3a
145	TF 05000 11800	505000	311800	25	s7	E		0 25 25 10YR4/2 25 45 20 10YR4/3 45 60 15 10YR5/4 60 120 60 10YR6/4								No No No	HCL - Clay loam (heavy) HCL - Clay loam (heavy) HCL - Clay loam (heavy) HCL - Clay loam (heavy)	10 5 5 50												NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			3 -8 3a		WC I	2	Droughtiness			3a
146	TF 05180 11800	505180	311800	22	s7	E		0 28 28 10YR4/3 28 45 17 10YR4/5 45 120 75 10YR5/5								No No No	MCL - Clay loam (medium) HCL - Clay loam (heavy) SCL - Sandy clay loam	15 8 10 50												NON - Non-calcareous (<0.5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-8 -23 3a		WC I	1	Droughtiness			3a
151	TF 04600 11600	504600	311600	36	s7	E		0 30 30 2.5Y4/1 30 120 90 2.5Y6/3				CP - Common Prominent 10YR5/6				Yes	C - Clay C - Clay	5 0												NON - Non-calcareous (<0.5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3)			20 2 2		WC III	3b	Wetness			3b
152	TF 04800 11600	504800	311600	32	s7	E		0 30 30 10YR4/3 30 45 15 10YR5/4 45 65 20 2.5Y5/4								No No	C - Clay C - Clay C - Clay	10 6 20 50												NON - Non-calcareous (<0.5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3)			-41 -28 3b		WC I	3a	Depth			3b
153	TF 05000 11600	505000	311600	25	s7	E		0 38 38 10YR4/2 38 62 24 10YR5/4 62 120 58 2.5Y5/4								No No	C - Clay C - Clay C - Clay	5 15 0												VSC - Very slightly calcareous (0.5 - 1% CaCO3) VSC - Very slightly calcareous (0.5 - 1% CaCO3) VSC - Very slightly calcareous (0.5 - 1% CaCO3)			16 -4 2		WC I	3a	Wetness			3a
154	TF 05200 11600	505200	311600	22	s7	E		0 28 28 10YR4/2 28 120 92 10YR5/1				CP - Common Prominent 5YR4/6				Yes	C - Clay C - Clay	3 1												NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3)			6 -11 3a		WC III	3b	Wetness			3b
155	TF 05400 11600	505400	311600	25	s7	E		0 40 40 10YR4/2 40 60 20 10YR4/4 60 120 60 10YR5/5								No No	MCL - Clay loam (medium) HCL - Clay loam (heavy) LMS - Loamy medium sand	12 4 8 50												NON - Non-calcareous (<0.5% CaCO3) NON - Non-calcareous (<0.5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-14 -14 3a		WC I	1	Droughtiness			3a
159	TF 04800 11400	504800	311400	35	s7	E		0 25 25 10YR4/3 25 40 15 10YR4/4 40 50 10 10YR6/4 50 70 20								No No	C - Clay C - Clay HCL - Clay loam (heavy) HCL - Clay loam (heavy)	8 5 80 80												VSC - Very slightly calcareous (0.5 - 1% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-46 -37 3b		WC I	3a	Droughtiness			3b
160	TF 05020 11400	505020	311400	24	s7	E		0 22 22 2.5Y4/3 22 120 98 2.5Y5/3				CP - Common Prominent 10YR5/6		CD - Common Distinct 2.5Y6/1		Yes	C - Clay C - Clay	2 0												SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3)			5 -12 3a		WC III	3a	Droughtiness Wetness			3a
161	TF 05200 11400	505200	311400	21	s7	E		0 25 25 10YR4/3 25 40 15 10YR4/4 40 45 5 10YR5/4 45 65 20								No No	HCL - Clay loam (heavy) HCL - Clay loam (heavy) HCL - Clay loam (heavy) HCL - Clay loam (heavy)	8 10 50 50												VSC - Very slightly calcareous (0.5 - 1% CaCO3) VSC - Very slightly calcareous (0.5 - 1% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-17 -26 3b		WC I	2	Droughtiness			3b
162	TF 05400 11400	505400	311400	20	s7	E		0 28 28 2.5Y4/3 28 60 32 10YR5/1 60 70 10 10YR5/6 70 90 20				MP - Many Prominent 5YR5/6				Yes No	C - Clay C - Clay SCL - Sandy clay loam SCL - Sandy clay loam	8 0 50 50												VSC - Very slightly calcareous (0.5 - 1% CaCO3) NON - Non-calcareous (<0.5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-15 -9 3a		WC III	3b	Wetness			3b
165	TF 05400 11200	505400	311200	25	s7	E		0 25 25 10YR4/3 25 30 5 10YR4/4 30 35 5 10YR5/4 35 60 25								No No	C - Clay C - Clay C - Clay C - Clay	15 8 10 50 80												SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-61 -53 4		WC I	2	Droughtiness			4
166	TF 05620 11200	505620	311200	21	s7	E		0 26 26 10YR4/3 26 40 14 10YR4/4 40 50 10 10YR4/5 50 70 20								No No	C - Clay C - Clay C - Clay C - Clay	15 8 10 40 50												SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3)			-40 -26 3b		WC I	2	Droughtiness			3b
167	TF 05400 11000	505400	311000	28	s7	E		0 25 25 10YR4/3 25 35 10 10YR4/4 35 45 10 10YR5/4 45 65 20								No No	C - Clay C - Clay C - Clay C - Clay	15 8 15 50 80												SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-53 -44 4		WC I	2	Droughtiness			4
168	TF 05600 11000	505600	311000	22	s7	E		0 26 26 10YR4/3 26 46 20 10YR4/4 46 50 4 10YR5/4 50 70 20								No No	HCL - Clay loam (heavy) HCL - Clay loam (heavy) HCL - Clay loam (heavy) HCL - Clay loam (heavy)	2 1 50 50												VSC - Very slightly calcareous (0.5 - 1% CaCO3) NON - Non-calcareous (<0.5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-25 -13 3b		WC I	2	Droughtiness			3b
169	TF 05400 10800	505400	310800	33	s7	E		0 30 30 10YR4/3 30 60 30									C - Clay C - Clay	30 18 80												SC - Slightly calcareous (1 - 5% CaCO3)			-70 -62 4		WC I	2	Droughtiness			3b
170	TF 05600 10800	505600	310800	27	s7	E		0 30 30 10YR4/3 30 38 8 10YR4/4 38 45 7 10YR6/4 45 65 20								No No	C - Clay C - Clay C - Clay C - Clay	5 5 20 50												SC - Slightly calcareous (1 - 5% CaCO3) SC - Slightly calcareous (1 - 5% CaCO3) MC - Moderately calcareous (5 - 10% CaCO3)			-36 -24 3b		WC I	2	Droughtiness			3b
171	TF 05800 10800	505800	310800	24	s7	E		0 30 30 10YR4/3 30 60 30									C - Clay C - Clay	20 12 50												SC - Slightly calcareous (1 - 5% CaCO3)			-54 -44 4		WC I	2	Droughtiness			4
	END																																							

SITE J

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Clay	Texture	Stones - type 1				Stones - type 2		Peat		SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	E	N					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape				Mtbw	Pwby	Eqt	WC	Dw	Limitation 1	Limitation 2	Limitation 3	Grade
172	TF 05600 10600	505600	310600	29	c7	S		0	25	25	10YR4/3					C - Clay		3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			14	-3	2	WC II	3a	Wetness			3a
								25	55	30	10YR5/4					No	C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								55	120	65	10YR5/3	CD - Common Distinct	10YR4/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes							
173	TF 05800 10600	505800	310600	29	c7	S		0	25	25	7.5YR4/3						HCL - Clay loam (heavy)	35	18		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-65	-59	4	WC I	2	Droughtiness			4
								25	50	25							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)		No							
174	TF 06000 10600	506000	310600	25	c7	S		0	30	30	10YR4/2						C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			16	4	2	WC II	3a	Wetness			3a
								30	120	90	10YR3/3	CD - Common Distinct	7.5YR5/6			Yes	HCL - Clay loam (heavy)	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No							
175	TF 06200 10600	506200	310600	21	c7	S		0	25	25	10YR4/3						HCL - Clay loam (heavy)	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								VSC - Very slightly calcareous (0.5 - 1% CaCO3)			12	5	2	WC I	2	Droughtiness	Wetness		2
								25	65	40	10YR5/3	FD - Few Distinct	10YR5/6			Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No							
								65	120	55	10YR5/6					No	SCL - Sandy clay loam	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
176	TF 06400 10600	506400	310600	20	c7	S		0	25	25	10YR4/3						HCL - Clay loam (heavy)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-14	-24	3a	WC I	2	Droughtiness			3a
								25	45	20	10YR5/1					Yes	SCL - Sandy clay loam	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								45	120	75	10YR5/4					Yes	LMS - Loamy medium sand	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
177	TF 05600 10400	505600	310400	33	c7	S		0	25	25	10YR4/3						HCL - Clay loam (heavy)	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-30	-21	3b	WC I	2	Droughtiness			3b
								25	35	10	10YR4/4					Yes	HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								35	55	20	10YR5/4					Yes	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								55	60	5	10YR6/2					No	HCL - Clay loam (heavy)	70			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								60	80	20	10YR6/2					No	HCL - Clay loam (heavy)	70			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
178	TF 05800 10400	505800	310400	32	c7	S		0	30	30	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			15	-9	2	WC I	3a	Wetness			3a
								30	120	90	10YR5/4					Yes	HCL - Clay loam (heavy)	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
179	TF 06000 10400	506000	310400	31	c7	S		0	30	30	10YR4/3						C - Clay	30	16	10	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-15	-29	3a	WC III	3a	Droughtiness	Wetness		3a
								30	120	90	10YR6/2	CD - Common Distinct	10YR5/6			Yes	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	MC - Moderately calcareous (5 - 10% CaCO3)	Yes	Yes							
180	TF 06200 10400	506200	310400	23	c7	S		0	20	20	10YR4/3						C - Clay	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-4	-20	3a	WC III	3a	Droughtiness	Wetness		3a
								20	30	10	10YR5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	Yes	Yes							
								30	120	90						Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes							
181	TF 06400 10400	506400	310400	21	c7	S		0	30	30	10YR4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			16	1	2	WC II	3a	Wetness			3a
								30	65	35	10YR5/4					No	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								65	120	55	2.5Y6/2	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes							
185	TF 05800 10200	505800	310200	32	c7	S		0	25	25	2.5Y4/3						C - Clay	20	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								VSC - Very slightly calcareous (0.5 - 1% CaCO3)			5	-15	3a	WC II	3a	Droughtiness	Wetness		3a
								25	40	15	2.5Y4/4					Yes	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								40	75	35	2.5Y6/2	CD - Common Distinct	10YR5/6			Yes	HCL - Clay loam (heavy)	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								75	120	45	2.5Y6/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	No	Yes							
186	TF 06000 10200	506000	310200	33	c7	S		0	30	30	10YR4/2						C - Clay	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			10	-5	2	WC II	2	Droughtiness	Wetness		2
								30	65	35	10YR5/3					No	C - Clay	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								65	120	55	10YR5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes							
187	TF 06200 10200	506200	310200	27	c7	S		0	28	28	10YR4/3						C - Clay	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			9	-4	2	WC II	2	Droughtiness	Wetness		2
								28	70	42	10YR5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								70	120	50	10YR5/3	CD - Common Distinct	10YR5/6	CD - Common Distinct	10YR5/1	Yes	C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes							
188	TF 06400 10200	506400	310200	25	c7	S		0	30	30	10YR4/3						C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			19	2	2	WC I	3a	Wetness			3a
								30	120	90	10YR5/4					No	C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
190	TF 05820 10000	505820	310000	38	c7	S		0	20	20	10YR4/3						C - Clay	15	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-35	-21	3b	WC I	2	Droughtiness			3b
								20	25	5	10YR4/4					No	C - Clay	20			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								25	30	5	10YR4/6					No	C - Clay	40			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								30	60	30						No	C - Clay				HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
191	TF 06000 10000	506000	310000	33	c7	S		0	20	20	10YR4/3						C - Clay	15	8		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			14	-12	3a	WC II	2	Droughtiness			3a
								20	70	50	10YR6/2	CD - Common Distinct	10YR5/6			Yes	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								70	120	50						Yes	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
192	TF 06200 10000	506200	310000	27	c7	S		0	25	25	10YR4/3						HCL - Clay loam (heavy)	50	30	22	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-71	-65	4	WC I	2	Droughtiness			4
								25	50	25						No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
193	TF 06400 10000	506400	310000	25	c7	S		0	28	28	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			12	-4	2	WC I	2	Droughtiness	Wetness		2
								28	120	92	10YR5/4					Yes	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
197	TF 06000 09800	506000	309800	37	c7	S		0	25	25	10YR4/3						HCL - Clay loam (heavy)	10	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			10	-1	2	WC I	2	Droughtiness	Wetness		2
								25	40	15	10YR4/5					No	HCL - Clay loam (heavy)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
								40	120	80						No	HCL - Clay loam (heavy)	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
198	TF 06200 09800	506200	309800	31	c7	S		0	25	25	10YR4/4						HCL - Clay loam (heavy)	15	10	6	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			17	-10	2	WC I	2	Droughtiness	Wetness		2
								25	120	95						No	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
199	TF 06400 09800	506400	309800	28	c7	S		0	30	30	10YR4/3						C - Clay	15	11	6	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			3	-11	3a	WC I	2	Droughtiness			3a
								30	120	90						No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
203	TF 06200 09600	506200	309600	30	c7	S		0	25	25	10YR4/4						HCL - Clay loam (heavy)	30	18	12	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			-5	-26	3a	WC I	2	Droughtiness			3a
								25	120	95						Yes	HCL - Clay loam (heavy)	30			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
204	TF 06400 09600	506400	309600	29	c7	S		0	28	28	10YR4/3						C - Clay	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			6	-8	2*	WC I	2	Droughtiness	Wetness		2
								28	50	22	10YR5/3					No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								50	120	70						No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
208	TF 06220 09400	506220	309400	32	c7	S		0	25	25	10YR4/3						HCL - Clay loam (heavy)	25	12	6	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			13	-14	3a	WC I	2	Droughtiness			3a
								25	40	15	10YR5/5					No	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No							
								40	120	80						No	HCL - Clay loam (heavy)	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No							
209	TF 06400 09400	506400	309400	31	c7	S		0	28	28	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			16	-1	2*	WC I	2	Droughtiness	Wetness		2
								28	40	12	10YR5/4					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								40	120	80	10YR5/3					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
211	TF 06400 09200	506400	309200	30	c7	S		0	28	28	10YR4/3						C - Clay	10	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								SC - Slightly calcareous (1 - 5% CaCO3)			53	-4	2*	WC II	3a	Wetness			3a
								28	50	22	10YR5/4					Yes	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No							
								50	120	70	10YR6/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	Yes	No							
								70	120	50						Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	Yes	No							
213	TF 06450 09000	506450	309000	32	c7	S		0	28	28	10YR4/2						MCL - Clay loam (medium)	25	12		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								NON - Non-calcareous (<0.5% CaCO3)			11	-17	3a	WC I	1	Droughtiness			3a
								28	120	92	10YR4/4					No	SCL - Sandy clay loam	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No							
END																																						

SITE K

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			%UBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	>2cm	>6cm	Type	%	>2cm	>6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
182	TF 05280	10200	505280	310200	37	≤7	E	0	28	28	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									VSC - Very slightly calcareous (0.5 - 1% CaCO3)			13	-3	2	WC II	3a	Wetness			3a
								28	35	7	10YR4/4					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
								35	52	17	10YR5/4					No	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								52	120	68	5Y5/3	CP - Common Prominent	10YR5/6	CD - Common Distinct	5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	MC - Moderately calcareous (5 - 10% CaCO3)	No	Yes								
183	TF 05400	10200	505400	310200	36	≤7	E	0	26	26	10YR4/3						C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-35	-19	3b	WC II	3a	Droughtiness			3b
								26	38	12	2.5Y5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								38	70	32	2.5Y5/3	CD - Common Distinct	10YR5/6			Yes	C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
184	TF 05600	10200	505600	310200	33	≤7	E	0	28	28	10YR4/3						C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			25	8	2	WC I	3a	Wetness			3a
								28	120	92	7.5YR4/6					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
189	TF 05400	10000	505400	310000	38	≤7	E	0	28	28	10YR4/3						C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			14	-2	2	WC III	3b	Wetness			3b
								28	38	10	10YR5/4	FD - Few Distinct	7.5YR5/6			No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	Yes	No								
								38	50	12	2.5Y5/3	MP - Many Prominent	7.5YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
								50	120	70	5Y5/3	MP - Many Prominent	7.5YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
194	TF 05000	09800	505000	309800	45	≤7	E	0	26	26	10YR4/3						C - Clay	12	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									VSC - Very slightly calcareous (0.5 - 1% CaCO3)			-17	-23	3a	WC I	3a	Droughtiness	Wetness		3a
								26	40	14	10YR4/5					No	C - Clay	15			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
								40	120	80							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
195	TF 05200	09800	505200	309800	43	≤7	E	0	20	20	2.5Y4/3						C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									VSC - Very slightly calcareous (0.5 - 1% CaCO3)			16	0	2	WC II	3a	Wetness			3a
								20	45	25	2.5Y5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
								45	120	75	2.5Y5/3	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	Yes								
196	TF 05400	09800	505400	309800	43	≤7	E	0	28	28	10YR4/3						C - Clay	10	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			11	-5	2	WC II	2	Droughtiness	Wetness		2
								28	45	17	10YR5/4					No	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								45	70	25	2.5Y5/3	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	MC - Moderately calcareous (5 - 10% CaCO3)	No	Yes								
								70	120	50	2.5Y6/3	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	NON - Non-calcareous (<0.5% CaCO3)	Yes	Yes								
200	TF 04850	09600	504850	309600	47	≤7	E	0	28	28	10YR4/3						MCL - Clay loam (medium)	8	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			6	-5	2	WC I	1	Droughtiness			2
								28	60	32	10YR6/4					No	HCL - Clay loam (heavy)	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								60	120	60							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
201	TF 05000	09600	505000	309600	44	≤7	E	0	25	25	10YR4/3						MCL - Clay loam (medium)	25	18	10	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-48	-37	3b	WC I	1	Stoniness	Droughtiness		3b
								25	40	15	7.5YR4/4					No	HCL - Clay loam (heavy)	25			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								40	60	20							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
202	TF 05200	09600	505200	309600	43	≤7	E	0	36	36	10YR4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									VSC - Very slightly calcareous (0.5 - 1% CaCO3)			13	-3	2	WC III	3b	Wetness			3b
								36	120	84	2.5Y6/3	CP - Common Prominent	10YR5/6	CD - Common Distinct	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	Yes								
205	TF 04800	09400	504800	309400	50	≤7	E	0	30	30	2.5Y4/3						C - Clay	8	4		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-9	-8	3a	WC I	3a	Droughtiness	Wetness		3a
								30	60	30	2.5Y4/4					No	C - Clay	8			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								60	120	60	2.5Y5/4					No	C - Clay	60			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
206	TF 05000	09400	505000	309400	48	≤7	E	0	26	26	10YR4/3						C - Clay	20	12		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									VSC - Very slightly calcareous (0.5 - 1% CaCO3)			-14	-19	3a	WC I	3a	Droughtiness	Wetness		3a
								26	50	24	7.5YR4.4					No	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	VSC - Very slightly calcareous (0.5 - 1% CaCO3)	No	No								
								50	120	70							C - Clay	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
207	TF 05200	09400	505200	309400	43	≤7	E	0	30	30	10YR4/3						HCL - Clay loam (heavy)	10	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									VSC - Very slightly calcareous (0.5 - 1% CaCO3)			1	-12	3a	WC I	2	Droughtiness			3a
								30	50	20	7.5YR4/4					No	HCL - Clay loam (heavy)	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								50	120	70	7.5YR4/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
210	TF 05200	09200	505200	309200	43	≤7	E	0	30	30	10YR4/3						C - Clay	25	16	10	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-57	-48	4	WC I	2	Droughtiness			4
								30	40	10	10YR4/4					No	C - Clay	25			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								40	60	20							C - Clay	80			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
212	TF 05400	09000	505400	309000	40	≤7	E	0	28	28	10YR4/3						HCL - Clay loam (heavy)	12	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-45	-35	3b	WC I	1	Droughtiness			3b
								28	40	12	10YR6/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								40	60	20							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
214	TF 05400	08800	505400	308800	40	≤7	E	0	28	28	10YR4/3						HCL - Clay loam (heavy)	12	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-45	-35	3b	WC I	1	Droughtiness			3b
								28	35	7	10YR6/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								35	60	25							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
215	TF 05400	08600	505400	308600	37	≤7	E	0	28	28	10YR4/3						C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			-34	-21	3b	WC I	2	Droughtiness			3b
								28	40	12	10YR5/4					No	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)	No	No								
								40	50	10	10YR6/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
								50	70	20							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
216	TF 05400	08400	505400	308400	38	≤7	E	0	26	26	10YR4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									NON - Non-calcareous (<0.5% CaCO3)			-27	-13	3b	WC I	3a	Droughtiness			3b
								26	45	19	7.5YR4/4					No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	NON - Non-calcareous (<0.5% CaCO3)	No	No								
								45	50	5	10YR6/4					No	HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate	MC - Moderately calcareous (5 - 10% CaCO3)		No								
								50	70	20							HCL - Clay loam (heavy)	50			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Moderate			No								
217	TF 05600	08400	505600	308400	38	≤7	E	0	25	25	10YR5/2						C - Clay	10	6		HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)									SC - Slightly calcareous (1 - 5% CaCO3)			3	-14	3a	WC II	2	Droughtiness			3a
								25	55	30	10YR5/5					No	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	SC - Slightly calcareous (1 - 5% CaCO3)	No	No								
								55	120	65	5Y5/6	CP - Common Prominent	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)								Poor	MC - Moderately calcareous (5 - 10% CaCO3)	No	Yes								
	END																																							

Annex 4
Description of Soil Pits

Project	Location	Date	Surveyor(s)	Company
C810	KCC3051 Mallards Pass Area D	09-Dec-21	RM	Askew Land and Soil

Pit	WC	Grade	Limitation(s)	Notes
1	I		limestone present	

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation
TF	032	128	39m	D90	<7					Cereals	Cold	Cloudy	Slight	Showers

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form	>0.5mm	
1	0	28	m/hcl		7.5YR4/6												VC		wk	f	sab	friable	clear	wavy	>0.5%	N
2	28	30	hcl		7.5YR4/6							10		hr					wk	f	sab	friable	clear	wavy	>0.5%	N
3	30		limestone																							

Pit	WC	Grade	Limitation(s)	Notes

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		

Project	Location	Date	Surveyor(s)	Company
C810	KCC3051 Mallards Pass Area G	09-Dec-21	AR	Askew Land and Soil

Pit	WC	Grade	Limitation(s)	Notes
Pit 2	III	3b	Wetness and Workabilty	Borderline WCII/III, due to variability in subsoil structure development. This is caused by mix of plastic C with more loamy lenses.

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation
TF	07601	12603	21	G105	1°	East	flat	wheat crop	conventional	wheat	Cold	Cloudy	Slight	Showers

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form	>0.5mm	
1	0	25	HCL		10YR4/2							5		HR			NC						clear	wavy		
2	25	50	C		2.5Y5/2			7.5YR5/6	CD		7.5YR5/6	2		HR			NC	None	Weak/adl	Coarse/very c	SAB	Firm			<0.5%	Y

Pit	WC	Grade	Limitation(s)	Notes

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		

Annex 5
Certificate of Analysis

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 17/01/2022

0998

Contract	**Mallards Pass**
Serial No.	**40007_1**

Client:

Kernon Countryside Consultants Limited
Greenacres Barn,
Stoke Common Lane,
Purton Stoke,
Swindon
SN5 4LL

Soil Property Testing Ltd

15, 16, 18 Halcyon Court, St Margaret's Way, Stukeley Meadows, Huntingdon, Cambridgeshire, PE29 6DG

Tel: 01480 455579
Email: enquiries@soilpropertytesting.com
Website: www.soilpropertytesting.com

Samples Submitted By:

Kernon Countryside Consultants Limited

Samples Labelled:

Mallards Pass

Approved Signatories:

☑ **J.C. Garner B.Eng (Hons) FGS**
Technical Director & Quality Manager

☐ **W. Johnstone**
Materials Lab Manager

Date Received: 11/01/2022	**Samples Tested Between:** 11/01/2022 **and** 17/01/2022

Remarks:

For the attention of Sarah Kernon
Your Reference No: C810

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.
5. The results within this report only relate to the items tested or sampled.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 17/01/2022

0998

Contract	**Mallards Pass**		
Serial No.	**40007_1**	**Target Date**	25/01/2022
Scheduled By	Kernon Countryside Consultants Limited		
Schedule Remarks			

Bore Hole No.	Type	Sample Ref.	Top Depth	Particle Size Distribution (BS1377)	Sample Remarks
AB119	G	-	0.00	1	
AB149	H	-	0.00	1	
AB64	E	-	0.00	1	
Totals				**3**	**End of Schedule**

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 17/01/2022

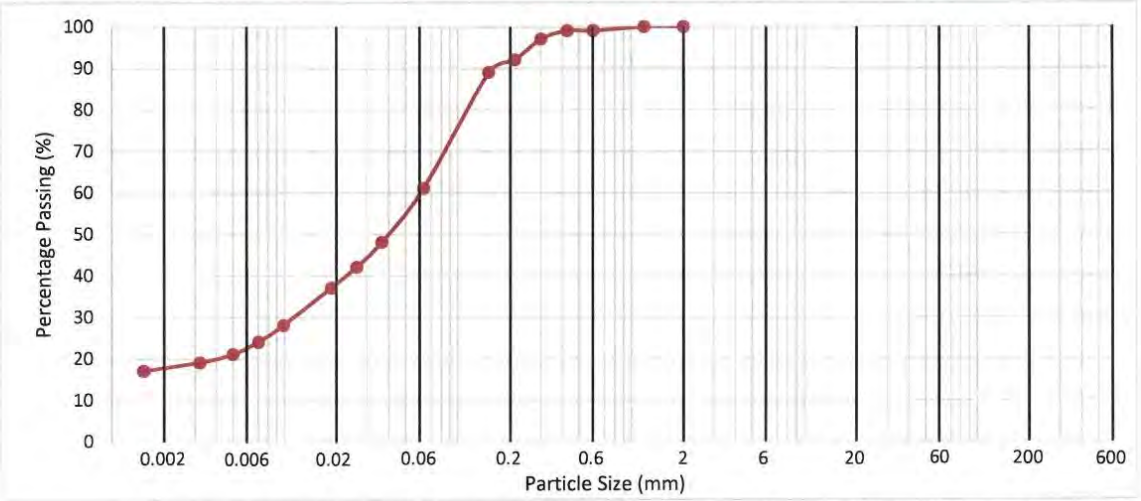
0998

Contract	Mallards Pass
Serial No.	40007_1

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
AB119	0.00 - 0.25	G	-	Brown sandy SILT/CLAY	Material greater than 2mm removed before test

Method of Test:	Hydrometer + Pre-sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer

Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
0.0363	48	43
0.0260	42	
0.0186	37	
0.0098	28	Clay by Dry Mass (%)
0.0070	24	
0.0050	21	
0.0032	19	18
0.0015	17	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	100	39
1.18	100	
0.600	99	
0.425	99	
0.300	97	
0.212	92	
0.150	89	
0.063	61	

Fines By Dry Mass (%)	
<0.063mm	61

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		0
125		
90		
63		
50		
37.5		
28		
20		
14		
10		
6.3		
5		

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 17/01/2022

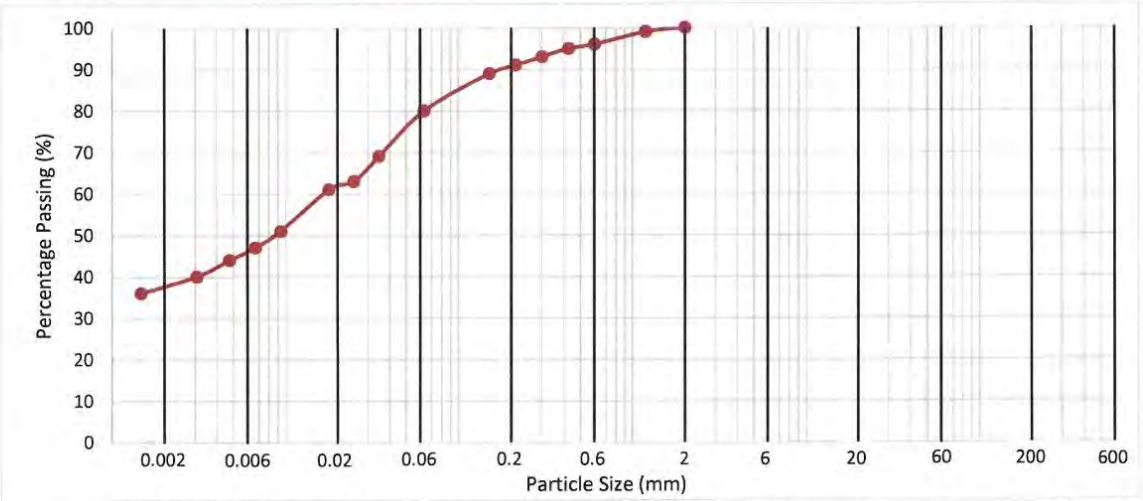
0998

Contract	Mallards Pass
Serial No.	40007_1

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
AB149	0.00 - 0.25	H	-	Brown slightly sandy silty CLAY with rare fine gravel and recently active roots	Material greater than 2mm removed before test

Method of Test:	Hydrometer + Pre-sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer

Particle Size (mm)	Passing (%)
0.0346	69
0.0248	63
0.0177	61
0.0094	51
0.0067	47
0.0047	44
0.0031	40
0.0015	36

Silt by Dry Mass (%): 43

Clay by Dry Mass (%): 37

Sieve Size (mm)	Passing (%)
2.00	100
1.18	99
0.600	96
0.425	95
0.300	93
0.212	91
0.150	89
0.063	80

Sand By Dry Mass (%): 20

Fines By Dry Mass (%)	
<0.063mm	80

Sieve Size (mm)	Passing (%)
300	
125	
90	
63	
50	
37.5	
28	
20	
14	
10	
6.3	
5	

2mm+ By Dry Mass (%): 0

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 17/01/2022

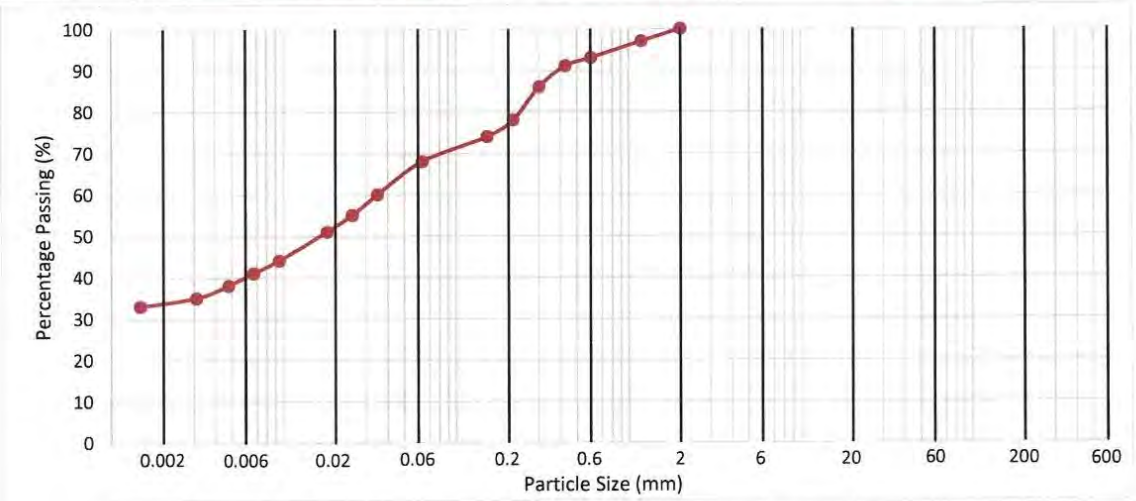
0998

Contract	Mallards Pass
Serial No.	40007_1

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
AB64	0.00 - 0.25	E	-	Yellowish brown slightly gravelly slightly sandy silty CLAY with rare fossil debris and recently active roots. Gravel is fine and medium limestone fragments	Material greater than 2mm removed before test

Method of Test:	Hydrometer + Pre-sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer

Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Clay by Dry Mass (%)
0.0348	60	34	
0.0249	55		
0.0178	51		
0.0094	44		34
0.0067	41		
0.0048	38		
0.0031	35		
0.0015	33		

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	100	32
1.18	97	
0.600	93	
0.425	91	
0.300	86	
0.212	78	
0.150	74	
0.063	68	

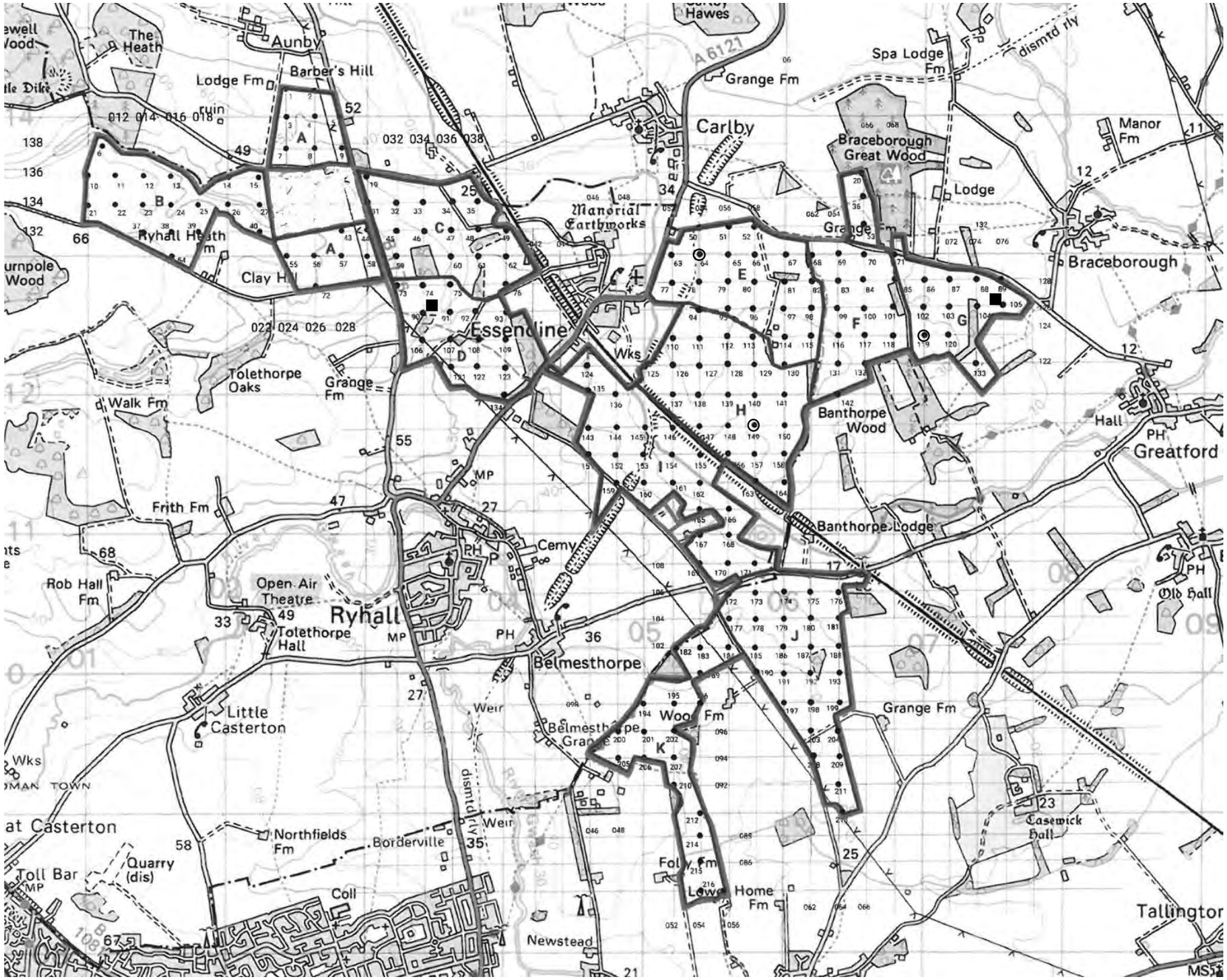
Fines By Dry Mass (%)	
<0.063mm	68

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		0
125		
90		
63		
50		
37.5		
28		
20		
14		
10		
6.3		
5		

Method of Preparation:	BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test:	BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

Plan KCC3051/01A

Auger Point Plan



KEY

- ● Auger sample location
- ○ Topsoil texture sample
- ■ Soil Pit

PLAN	**Figure 13.2 (Plan KCC3051/01A)**		
TITLE	**Auger Points Plan**		
SITE	Mallard Pass		
CLIENT	LDA Design		
NUMBER	**KCC3051/01A 04/22hr**		
DATE	April 2022	**SCALE**	NTS

KERNON COUNTRYSIDE CONSULTANTS LTD
GREENACRES BARN, PURTON STOKE, SWINDON, WILTSHIRE SN5 4LL
Tel 01793 771 333 Email: info@kernon.co.uk

Plan KCC3051/02A

Agricultural Land Classification Plan

KEY		Ha	%
	Grade 1		
	Grade 2	110	12
	Grade 3a	320	36
	Grade 3b	415	47
	Grade 4	10	1
	Grade 5		
	Non-agricultural	30	3
	Urban	4	<1
	Not surveyed		

PLAN	**Figure 13.1 (Plan KCC3051/02A)**		
TITLE	Provisional Agricultural Land Classification Plan - Solar PV and Enhancement Areas		
SITE	Mallard Pass		
CLIENT	LDA Design		
NUMBER	**KCC3051/02A 04/22hr**		
DATE	April 2022	**SCALE**	NTS

KERNON COUNTRYSIDE CONSULTANTS LTD
GREENACRES BARN, PURTON STOKE, SWINDON, WILTSHIRE SN5 4LL
Tel 01793 771 333 Email: info@kernon.co.uk

Greenacres Barn, Stoke Common Lane, Purton Stoke, Swindon, Wiltshire SN5 4LL
Telephone: 01793 771333 • Email: info@kernon.co.uk • Website: www.kernon.co.uk

Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 3: Appendices

Appendix 13.2: Agricultural Land Use Assessment Methodology

May 2022

Appendix 13.2: Agricultural Land Use Assessment Methodology

1.1. Methodology for the Assessment of Effects

1.1.1. This Appendix sets out the criteria used to determine sensitivity (Table 1) and magnitude (Table 2) for agricultural soils followed by the matrix used to determine the resulting significance of effects (Table 3). These criteria are based upon the Institute of Environmental Management & Assessment (IEMA) Guide: A New Perspective on Land and Soil in Environmental Impact Assessment (2022).

Table 1: Methodology for Determining Sensitivity for Agriculture and Soils

Sensitivity	ALC/biomass production[1]	Sensitivity of topsoil and subsoil[2]	Agricultural businesses
Very high	Land of ALC Grades 1 and 2	-	-
High	Land of ALC Subgrade 3a	High clay soils where the FCD[3] is >150, or medium textured soils where the FCD is >225	-
Medium	Land of ALC Subgrade 3b	High clay soils where the FCD is <150, or medium textured soils where the FCD is <225	Full-time businesses, and farm businesses where the location of land is particularly important such as dairy farms. Farms affected outwith the site boundary.
Low	Land of ALC Grades 4 and 5	Soils with a high sand	Part-time farms or farms with low

Sensitivity	ALC/biomass production[1]	Sensitivity of topsoil and subsoil[2]	Agricultural businesses
		fraction where the FCD is <225	sensitivity to change, eg arable land held on short-term arrangements.
Negligible	Land of ALC Grades 4 and 5 with only indirect links	-	Agricultural land that is not farmed or does not form part of a farm business.

[1] IEMA Table 2

[2] IEMA Table 4. For the full list please refer to the IEMA Guide (2022) Table 4

[3] Field Capacity Days, i.e. days when the soil is replete with water

Table 2: Methodology for Determining Magnitude of Change for Agriculture and Soils

Magnitude of Effect	Definition	
	Effects on Agricultural Land (Soils)	**Effects on Farm Businesses (agricultural businesses)**
Major	The Proposed Development would directly lead to the permanent irreversible loss of one or more soil functions or soil volumes (including permanent sealing or land quality downgrading) of over 20 hectares of soil-related features; or potential for improvement in one or	The impact of development would render a full-time agricultural business non-viable.

Magnitude of Effect	Definition	
	Effects on Agricultural Land (Soils)	**Effects on Farm Businesses (agricultural businesses)**
	more soil functions over an area of more than 20 ha.	
Moderate	The Proposed Development would directly lead to the permanent irreversible loss of one or more soil functions or soil volumes (including permanent sealing or land quality downgrading) over an area of between 5 and 20 hectares of soil-related features; or potential for improvement in one or more soil functions over an area of between 5 ha and 20 ha.	The impact of the development would require significant changes in the day-to-day management of a full-time agricultural business, or closure of a part-time agricultural business. Loss of buildings or impacts on drainage or water supplies affecting the potential for at least 5 ha of adjacent land to be farmed fully.
Minor	The Proposed Development would directly lead to the permanent irreversible loss over less than 5 hectares or a temporary, reversible loss of one or more soil functions or soil volumes), or temporary, reversible loss of soil-related features or more	Land take would require only minor changes in the day-to-day management / structure of a full-time agricultural business or land take would have a significant effect on a part-time business. Minor effects, direct or indirect, on surrounding land beyond the boundaries of the Site.

Magnitude of Effect	Definition	
	Effects on Agricultural Land (Soils)	**Effects on Farm Businesses (agricultural businesses)**
	soil functions over an area of less than 5 ha.	
Negligible	No discernible loss or reduction or improvement of soil functions or volumes.	Land take would require only negligible changes in the day-to-day management of a full-time agricultural business or land take would require only minor changes to a part-time farm business

Table 3: Methodology for Determining Sensitivity

		Sensitivity of Receptor / Receiving Environment to Change / Effect				
		Very high	**High**	**Medium**	**Low**	**Negligible**
Magnitude of change/effect	**Major**	Very large	Large or very large	Moderate or large	Slight or moderate	Slight
	Moderate	Large or very large	Moderate or large	Moderate	Slight	Neutral or slight
	Minor	Moderate or large	Slight or moderate	Slight	Neutral or slight	Neutral or slight
	Negligible	Slight	Slight	Neutral or slight	Neutral or slight	Slight

	No Change	Neutral	Neutral	Neutral	Neutral	Neutral

Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 3: Appendices

Appendix 14.1: Solar Photovoltaic Glint and Glare Study

May 2022

PAGERPOWER
Urban & Renewables

Solar Photovoltaic Glint and Glare Study

LDA Design Consulting Ltd

Mallard Pass Solar Farm

May 2022

ADMINISTRATION PAGE

Job Reference:	10430C
Date:	May 2022
Author:	Hannah McNaul; Michael Sutton
Telephone:	01787 319001
Email:	hannahm@pagerpower.com; michael@pagerpower.com

Reviewed by:	Aaron Williams; Kai Frolic; Danny Scrivener
Email:	aaron@pagerpower.com; kai@pagerpower.com; danny@pagerpower.com

Issue	Date	Detail of Changes
1	04 April 2022	Initial issue
2	08 April 2022	Administrative revisions
3	09 May 2022	Further 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 the proposed Mallard Pass Solar Farm, located at Essendine, Stamford, Lincolnshire. This assessment pertains to the possible effects upon road users, residential amenity, aviation activity, and railway operations and infrastructure.

The modelling has considered both fixed and single-axis tracker solar panel layouts.

Pager Power

Pager Power has undertaken over 800 glint and glare assessments in locations such as the UK, Australia, India and Europe. 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 upon surrounding aviation activity is predicted for either fixed or tracker panel layouts.

Significant impacts upon residential amenity and railway operations and infrastructure are predicted for both fixed and tracker panel layouts under baseline conditions. Significant impacts upon road users are predicted for the fixed panel layout but not predicted for the tracker panel layout under baseline conditions.

Mitigation in the form of screening has been recommended to remove these significant impacts.

Guidance and Studies

Pager Power has produced guidance for glint and glare and solar photovoltaic developments, which was published in early 2017, with the third edition originally published in 2020[1]. The guidance document sets out the methodology for assessing roads, dwellings, aviation activity, and railway operations and infrastructure with respect to solar reflections from solar panels.

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. For aviation activity, where a solar reflection is predicted, solar intensity calculations are undertaken in line with the Sandia National Laboratories' Federal Aviation Authority methodology. 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.

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

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 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 – RAF Wittering

ATC Tower

The modelling has shown that no solar reflections are geometrically possible towards the ATC Tower at RAF Wittering from both fixed and tracker panel layouts.

No impacts upon ATC personnel are predicted and no mitigation is required.

Approach Paths

The modelling has shown that no solar reflections are geometrically possible towards either of the 2-mile approach paths for runway 07/25 at RAF Wittering from both fixed and tracker panel layouts.

No impacts upon approaching aircraft are predicted and no mitigation is required.

Assessment Results – High Level Aviation

Detailed modelling of Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore is not recommended as all potential solar reflections are predicted to be acceptable in accordance with the associated guidance and industry best practice – see Section 9.

No significant impacts upon Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore are predicted.

Assessment Result – Roads

Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards road users along approximately 2.3km of the B1176 and 2.6km of the A6121. For most of these sections of road, mitigation is not recommended because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of a road user's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Mitigation is recommended for an approximately 100m section of the A6121 due to effects originating from directly in front of a road user.

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

Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards road users along approximately 2.8km of the B1176 and 5.2km of the A6121. However, no mitigation requirement has been identified because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of a road user's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Assessment Results – Dwellings

Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards 127 of the 179 assessed dwelling receptors. Solar reflections towards most of these dwellings are predicted to be significantly screened or do not occur for a duration that could be considered significant.

Solar reflections towards 19 of these dwellings occur for a duration which requires further consideration. Mitigation is not recommended for 17 of these dwellings because:

- The distance between the observer and the closest reflecting panel area is such that the proportion of an observer's field of vision that is taken up by the reflecting area is significantly reduced;
- Views are only predicted for observers above the ground floor, which is not considered to be the main living space of a dwelling; and/or
- Effects will coincide with direct sunlight, which is a far more significant source of light compared to a solar reflection.

Mitigation is recommended for two dwellings due to the duration of effects and the lack of sufficient mitigating factors to reduce the level of impact.

Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards 165 of the 179 assessed dwelling receptors. Solar reflections towards most of these dwellings are predicted to be significantly screened or do not occur for a duration that could be considered significant.

Solar reflections towards 15 of these dwellings occur for a duration which requires further consideration. Mitigation is not recommended for 14 of these dwellings because:

- The distance between the observer and the closest reflecting panel area is such that the proportion of an observer's field of vision that is taken up by the reflecting area is significantly reduced;
- Views are only predicted for observers above the ground floor, which is not considered to be the main living space of a dwelling; and/or
- Effects will coincide with direct sunlight, which is a far more significant source of light compared to a solar reflection.

Mitigation is recommended for one dwelling due to the duration of effects and the lack of sufficient mitigating factors to reduce the level of impact.

Assessment Results – Railway

Signals

No railway signals have been identified on the assessed section of railway line. No impacts upon railway signals are predicted.

This report will be updated if railway signals are identified by Network Rail at a later date.

Train Drivers (Fixed Panels)

The modelling has shown that solar reflections are geometrically possible towards train drivers along approximately 4.9km of railway line. For most of these sections of railway line, mitigation is not recommended because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of train driver's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Mitigation is recommended for an approximately 300m stretch of railway line due to effects originating from directly in front of a train driver.

Train Drivers (Tracker Panels)

The modelling has shown that solar reflections are geometrically possible towards train drivers along approximately 5.1km of railway line. For most of these sections of railway line, mitigation is not recommended because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of train driver's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Mitigation is recommended for two stretches of railway line totalling approximately 750m due to effects originating from directly in front of a train driver.

Mitigation Overview

The optimal mitigation strategy is likely to involve the provision of screening to significantly obstruct visibility of the reflecting panels – see Section 8. The proposed screening will be secured through the Landscape Ecological Management Plan (LEMP).

Where screening is not a viable option, changes to the panel configuration could be explored to eliminate the impacts. For fixed panels, this may involve altering the azimuth angle, elevation angle (tilt), panel footprint. For tracking panels, it is likely to involve altering the resting angle as all reflections are predicted when the panels are laying horizontally at sunrise or sunset.

PAGERPOWER
Urban & Renewables

LIST OF CONTENTS

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 Australia.

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 the proposed Mallard Pass Solar Farm, located at Essendine, Stamford, Lincolnshire. This assessment pertains to the possible effects upon road users, residential amenity, aviation activity, and railway operations and infrastructure.

The modelling has considered both fixed and single-axis tracker solar panel layouts.

This report contains the following:

- Solar farm details;
- Explanation of glint and glare;
- Overview of relevant guidance;
- Overview of relevant studies;
- Overview of Sun movement;
- Assessment methodology;
- Identification of receptors;
- Glint and glare assessment for identified receptors;
- Results discussion; and
- High-level overview of mitigation options.

The relevant technical analysis is presented in each section. Following the assessment, conclusions and recommendations are made.

1.2 Pager Power's Experience

Pager Power has undertaken over 800 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 is as follows:

- Glint – a momentary flash of bright light typically received by moving receptors or from moving reflectors; and
- 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 Draft National Policy Statement for Renewable Energy Infrastructure. The term 'solar reflection' is used in this report to refer to both reflection types i.e. glint and glare.

2 PROPOSED SOLAR FARM LOCATION AND DETAILS

2.1 Proposed Development Location

The location of the proposed development is shown in Figure 1 below. The solar panel areas referred to in this assessment are also shown.

Field 52 (orange filled areas) has now been removed from the Solar PV Site. This field has been assessed within this glint and glare assessment; however, the analysis will be updated prior to the submission of the DCO Application.

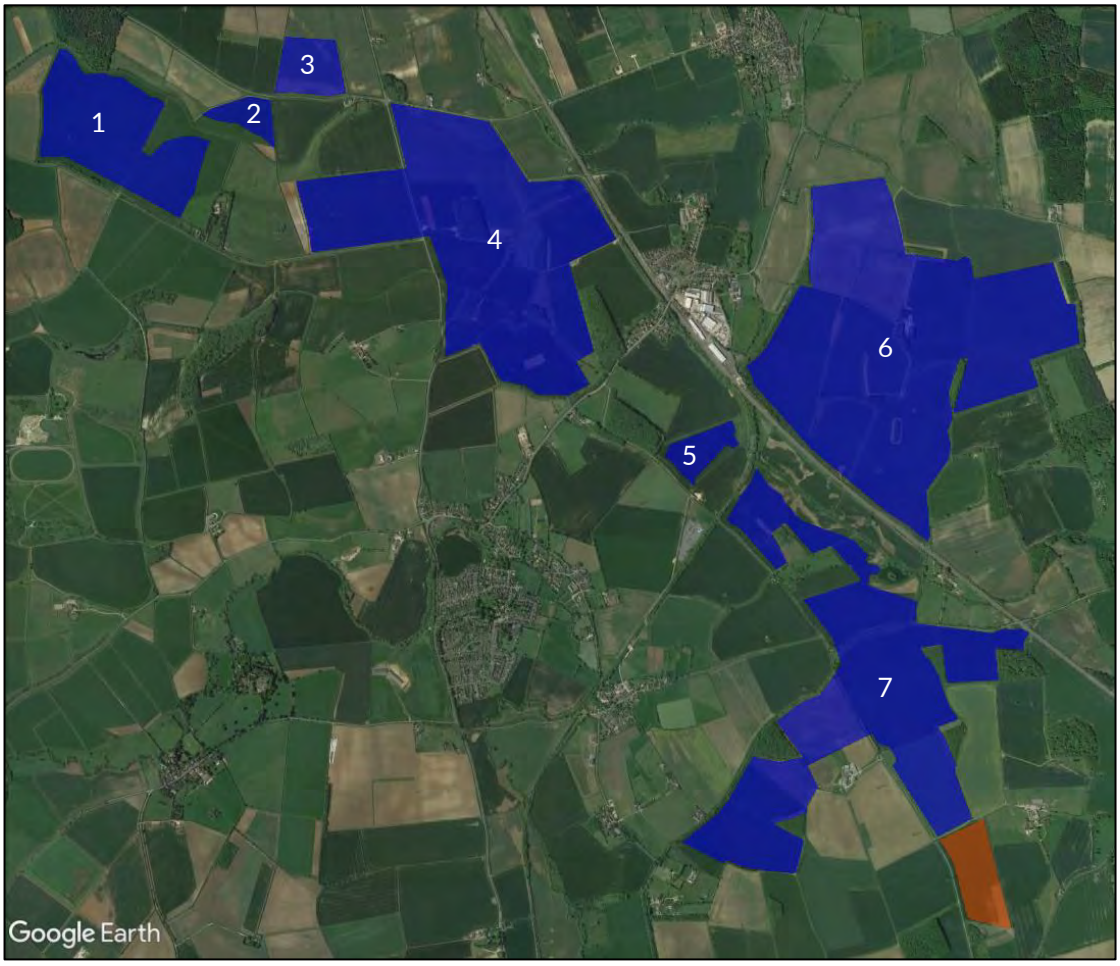


Figure 1 *Proposed development location*

2.2 Proposed Development Masterplan

The proposed development masterplan is shown in Figure 2 below. Field 52 is circled in orange for reference.

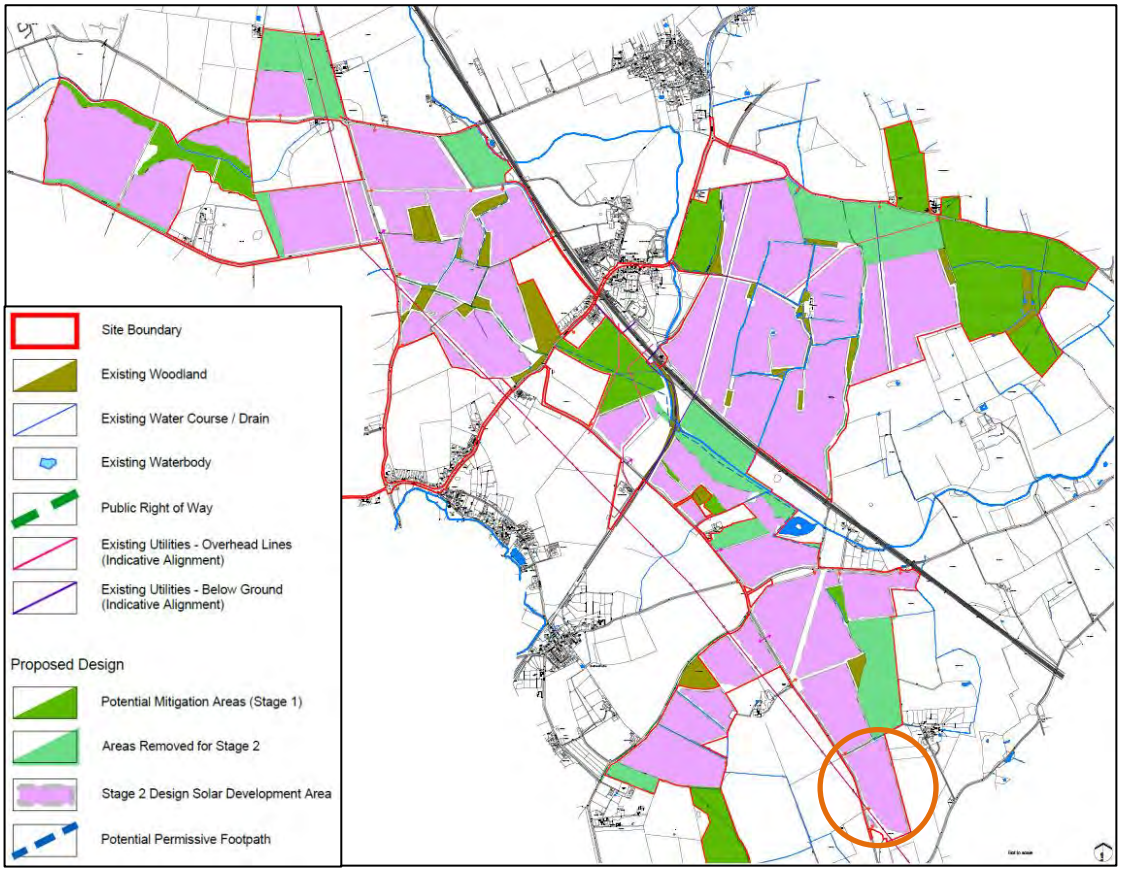


Figure 2 *Proposed development masterplan*

2.3 Fixed Solar Panel Information

The technical information used for the modelling of the fixed solar panels are presented in Table 1 below. The centre of the solar panel has been used as the assessed height in metres above ground level (agl).

Fixed Solar Panel Technical Information	
Azimuth angle	180°
Elevation angle (tilt)	20°
Assessed centre height (agl)	2.15m

Table 1 *Fixed solar panel information*

[3] 7863_Landscape_Offsets_S2_Masterplan-SK_240_Overview Plan_Rev A (edited).

2.4 Tracker Solar Panel Information

The technical information used for the modelling of the tracker solar panels are presented in Table 2 below.

Tracker Solar Panel Technical Information	
Assessed centre-height (m)	2.0 agl (above ground level)
Tracking	Horizontal Single Axis tracks Sun East to West
Tilt of tracking axis (°)	0
Orientation of tracking axis (°)	180
Offset angle of module (°)	0
Tracker Range of Motion (°)	±60
Resting angle (°)	0
Surface material	Smooth glass without an ARC (anti-reflective coating)

Table 2 *Tracker solar panel information*

2.4.1 Solar Panel Back Tracking

Shading considerations dictate the panel tilt. This is affected by:

- The elevation angle of the Sun;
- The vertical tilt of the panels;
- The spacing between the panel rows.

This means that early in the morning and late in the evening, the panels will not be directed exactly towards the Sun, as the loss from shading of the panels (caused by facing the sun directly when the Sun is low in the horizon), would be greater than the loss from lowering the panels to a less direct angle in order to avoid the shading Figure 3 on the following page illustrates this.

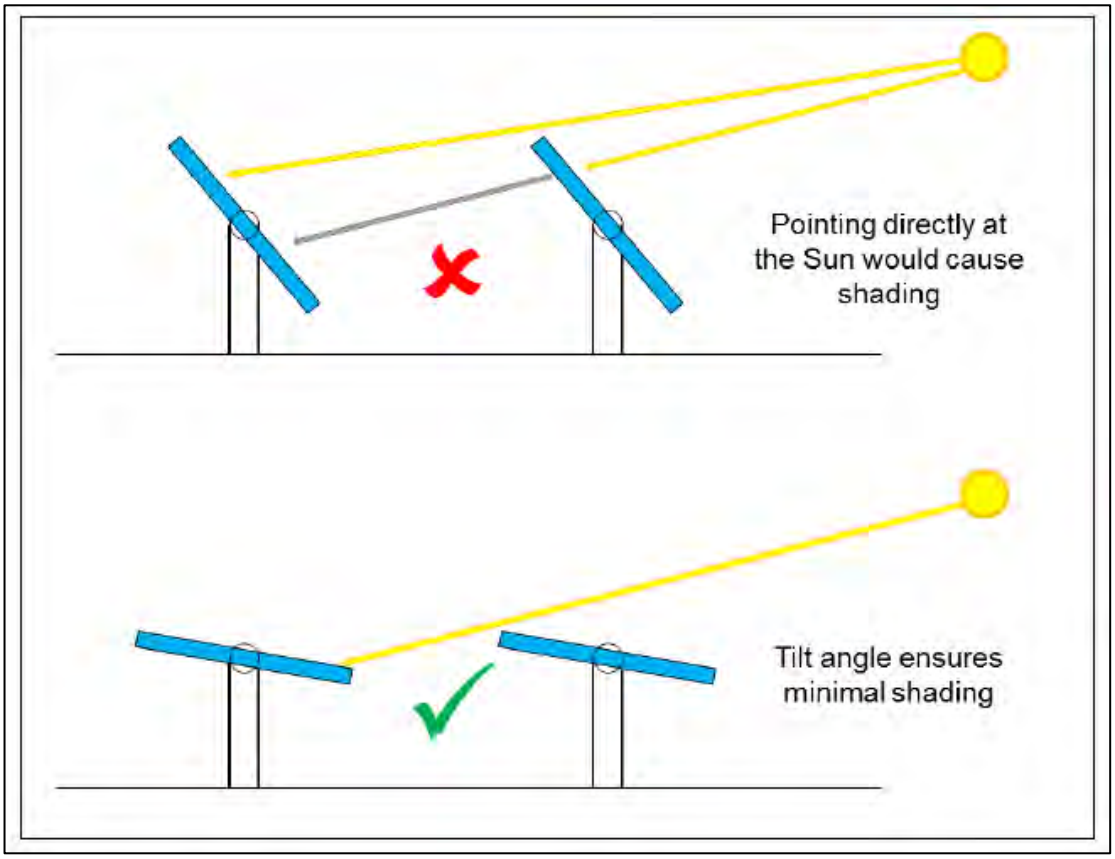


Figure 3 *Shading considerations*

Later in the day, the panels can be directed towards the Sun without any shading issues. This is illustrated in Figure 4 below.

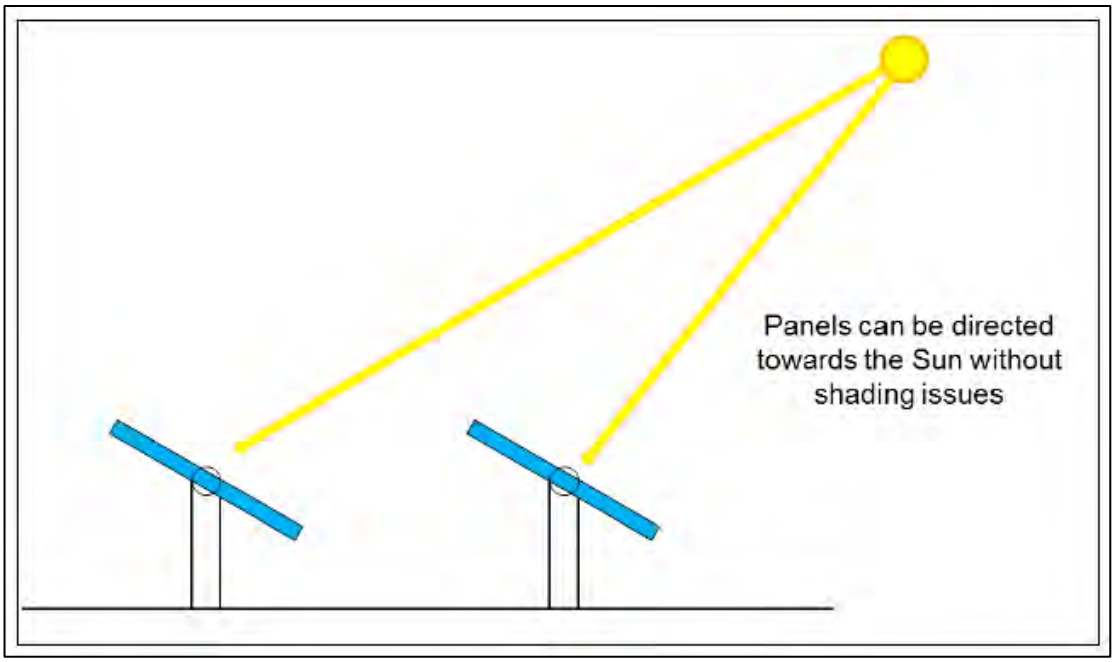


Figure 4 *Panel alignment at high solar angles*

Note that in reality, the lines from the Sun to each panel would be effectively parallel due to the large separation distance. The two previous figures are for illustrative purposes only.

The solar panels backtrack (where the panel angle gradually declines to prevent shading) by reverting to 0 degrees (flat) once the maximum elevation angle of the panels (60 degrees) becomes ineffective due to the low height of the Sun above the horizon and to avoid shading.

2.4.2 Back Tracking Solar Panel Model

Back tracking systems are sensitive to panel length, row spacing, topography and the level of shading which varies throughout the year. The Forge Solar model used in this assessment is a widely accepted model within this area. The model approximates a back tracking system by assuming the panels instantaneously revert to its resting angle of 0 degrees whenever the sun is outside the rotation range (60 degrees in this instance). Panels with a maximum tracking angle of 60 degrees and resting angle of 0 degrees would therefore lie horizontally from sunrise until the Sun enters the rotation range, and immediately after the sun leaves the rotation range until sunset daily. This definition is taken from Forge (see Appendix E) and by rotation range it is assumed the panels remain at 0 degrees until the Sun reaches 30 degrees above the horizon – when the Sun is at right angles to the panels at 60 degrees. It is understood that this option was created specifically to account for back tracking to the extent possible.

Whilst this model simplifies the back tracking process to be used by the solar panels within the solar development, panels that revert back to their resting angle immediately in many cases present a worst-case scenario for reflectors. This is because flatter panels can produce solar reflections in a much greater range of azimuth angles at ground level. The results would in most cases be more conservative than modelling a detailed back tracking system.

3 RAF WITTERING DETAILS

3.1 Overview

The following sections present general details regarding RAF Wittering.

3.2 Aerodrome Information

RAF Wittering is a Ministry of Defence (MoD) aerodrome and is the main operating base and headquarters for the RAF A4 Force.

The aerodrome is located approximately 6.7km south of the proposed development.

3.3 Runway Details

RAF Wittering has one runway:

- 07/25 – 2,757m by 56m (Asphalt).

The runway is shown in Figure 5[4] (aerodrome chart) on the following page.

3.4 Air Traffic Control Tower

RAF Wittering has an Air Traffic Control (ATC) Tower located approximately 240m south of the centre of runway 07/25 and is circled in red in Figure 5.

[4] Source: https://www.aidu.mod.uk/aip/pdf/ad/EGXT-Wittering-Combined.pdf

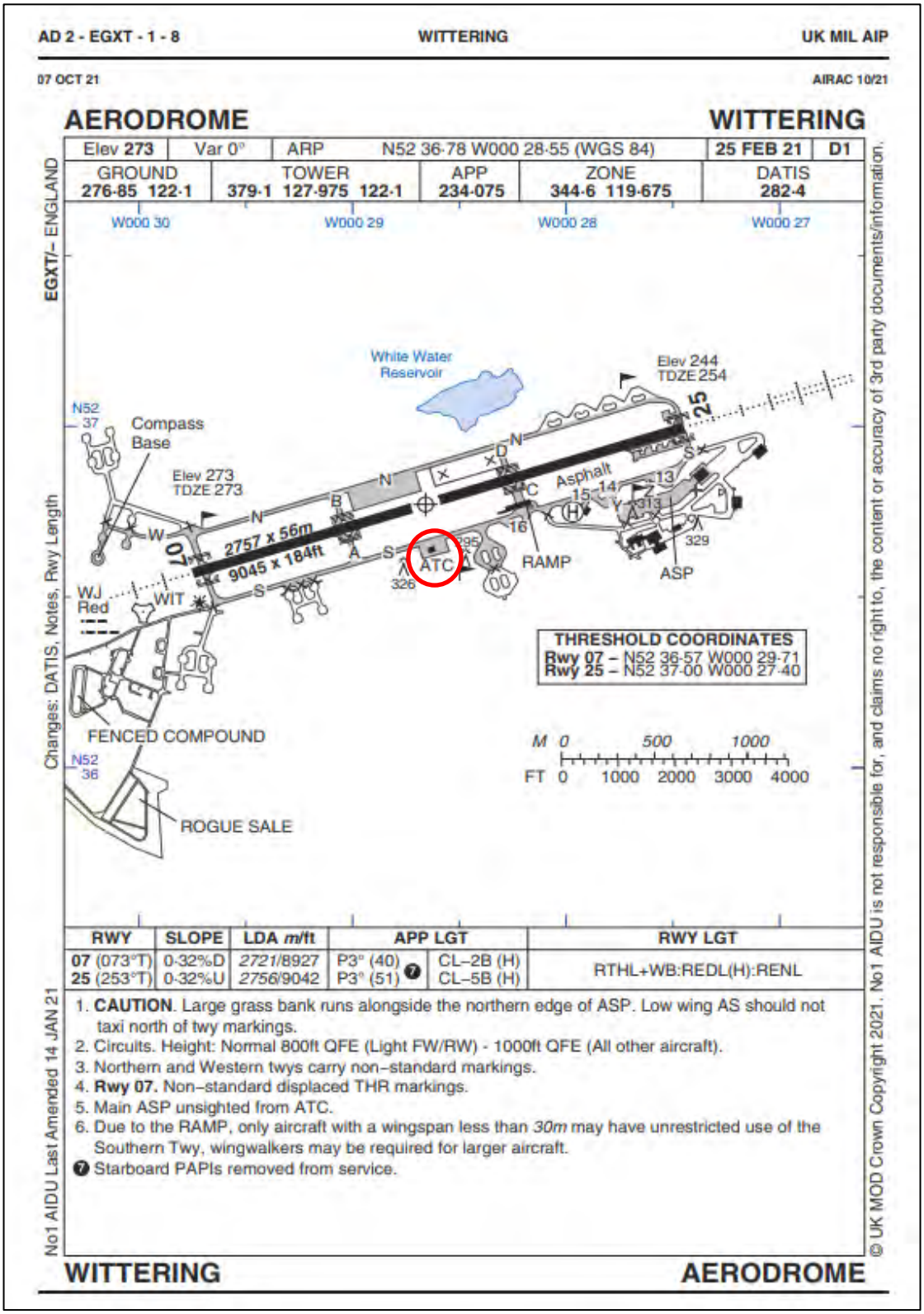


Figure 5 *RAF Wittering aerodrome chart*

4 GLINT AND GLARE ASSESSMENT METHODOLOGY

4.1 Guidance and Studies

Appendices A and B present a review of relevant guidance and independent studies regarding 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; and
- 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.

4.2 Background

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

4.3 Pager Power's 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 this glint and glare assessment 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;
- 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;
- 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 – including intensity calculations where appropriate; and
- 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. Further technical details relating to the methodology of the geometric calculations and limitations are presented in Appendix E and F.

5 IDENTIFICATION OF RECEPTORS

5.1 Aviation Receptors

The aviation receptor details are presented in the following sub-sections. The receptor details are presented in Appendix G and the terrain elevations have been interpolated based on Ordnance Survey of Great Britain (OSGB) 50m Panorama data.

5.1.1 Air Traffic Control (ATC) Tower

It is important to determine whether a solar reflection can be experienced by personnel within the ATC Tower.

The coordinates and height of the ATC tower have been extrapolated from aerial and online imagery.

5.1.2 Approaching Aircraft

It is Pager Power's methodology to assess whether a solar reflection can be experienced on the approach paths for the associated runways. This is considered to be the most critical stage of the flight. The Pager Power approach for determining receptor (aircraft) locations on the approach path is to select locations along the extended runway centre line from 50ft above the runway threshold out to a distance of 2 miles. The height of the aircraft is determined by using a 3-degree descent path relative to the runway threshold height.

Figure 6 on the following page shows the assessed aviation receptor locations

Figure 6 *Assessed aviation receptors at RAF Wittering*

5.2 Ground-Based Receptors

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, shows that a 1km assessment area from the proposed panel area is appropriate for glint and glare effects on ground-based receptors (road users and dwellings), and a 500m assessment area is appropriate for railway receptors. The combined assessment areas are shown in the figures in the following sub-sections for ease of reference.

Potential receptors within the assessment areas are identified based on mapping and aerial photography of the region. The initial judgement is made based on 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.

Terrain elevation heights have been interpolated based on OSGB 50m Panorama data. Receptor details can be found in Appendix G.

5.2.1 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 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.

Geometric 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 accordance with the guidance presented in Appendix D.

The analysis has therefore considered major national, national, and regional roads that:

- Are within the 1km assessment area; and
- Have a potential view of the panels.

The assessed receptors along the B1176 (1 – 39) and the A6121 (40 – 79); totalling approximately 8km of road, are shown in Figure 7 on the following page. The inset shows the specific numbering of the road receptors.

Receptors are taken approximately every 100m and a height of 1.5 metres above ground level has been taken as typical eye level of a road user[5].

[5] Consideration of views of elevated drivers are also considered in the results discussion, where appropriate.

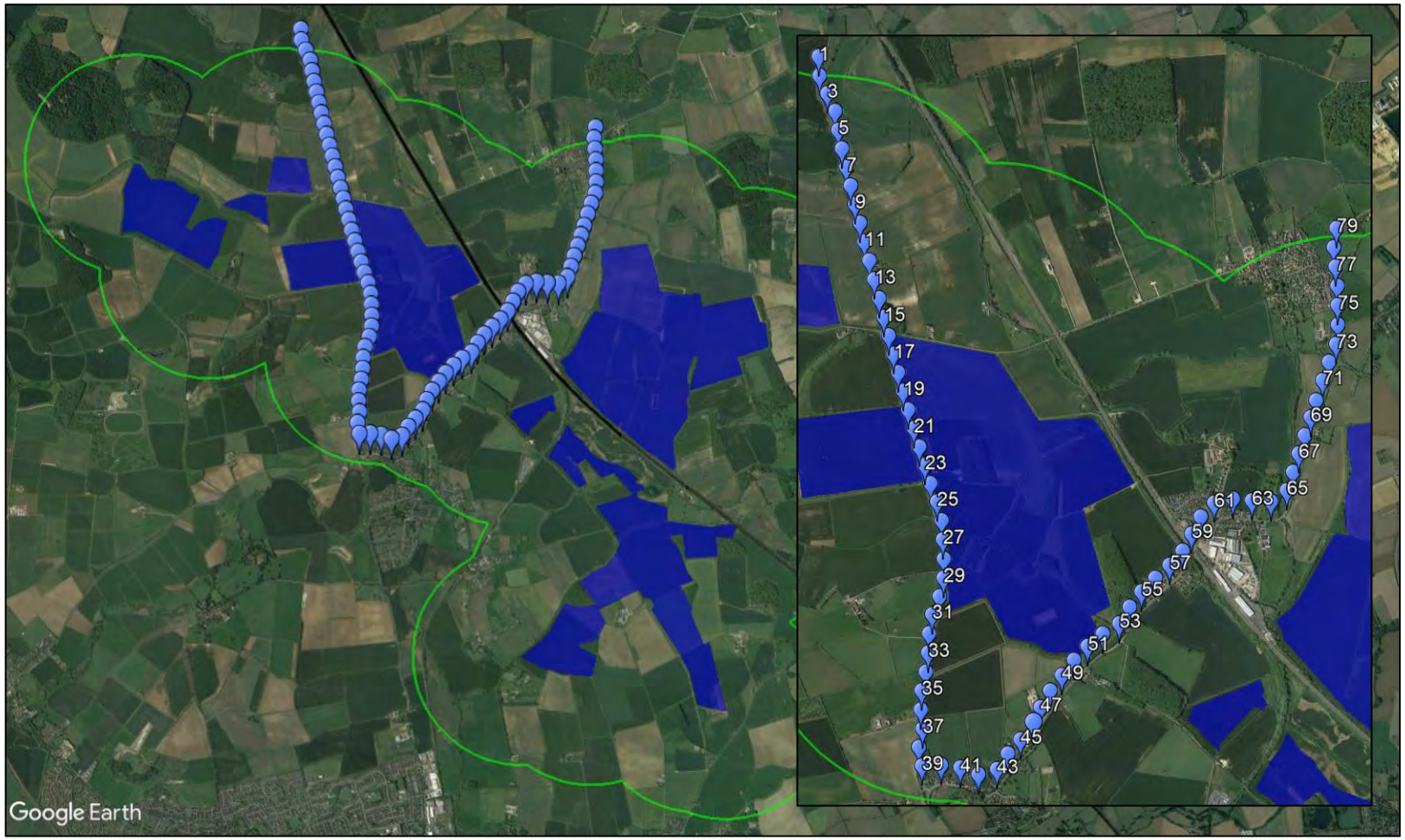


Figure 7 *Assessed road receptors*

5.2.2 Dwelling Receptors

The analysis has considered dwellings that:

- Are within the 1km assessment area; and
- Have a potential view of the panels.

An overview of the assessed dwelling receptor locations are shown in Figure 8 below. A total of 179 dwelling locations have been assessed and a height of 1.8m above ground level is used in the modelling to simulate the typical viewing height of a ground floor window[6].

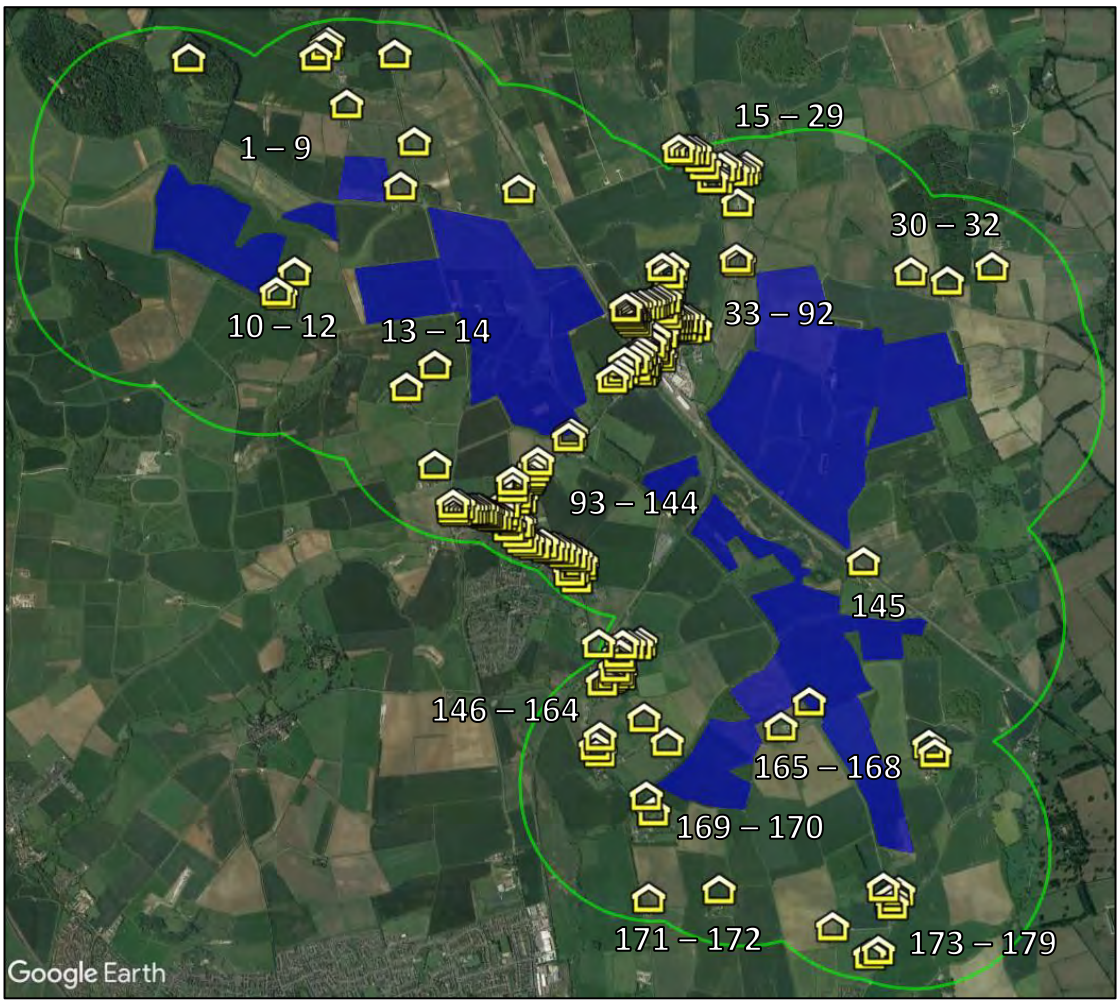


Figure 8 *Assessed dwelling receptor overview*

[6] Consideration of views from upper floors are also considered in the results discussion, where appropriate.

In residential areas with multiple layers of dwellings, only the outer dwellings have been considered for assessment. This is because they will mostly obscure views of the solar panels to the dwellings behind them, which will therefore not be impacted by the proposed development because line of sight will be removed or will experience comparable effects to the closest assessed dwelling.

Additionally, in some cases, a single receptor point may be used to represent a small number of separate addresses. In such cases, the results for the receptor will be representative of the adjacent observer locations, such that the overall level of effect in each area is captured reliably.

Close up images of the assessed dwelling receptors are shown in Figures 9 to 23 below and on the following pages.

Figure 9 *Assessed dwelling receptors 1 to 6*

Figure 10 *Assessed dwelling receptors 7 to 9*

Figure 11 *Assessed dwelling receptors 10 to 14*

Figure 12 *Assessed dwelling receptors 15 to 29*

Figure 13 *Assessed dwelling receptors 30 to 32*

Figure 14 *Assessed dwelling receptors 33 to 92*

Figure 15 *Assessed dwelling receptors 93 to 100*

Figure 16 *Assessed dwelling receptors 101 to 125*

Figure 17 *Assessed dwelling receptors 126 to 144*

Figure 18 *Assessed dwelling receptor 145*

Figure 19 *Assessed dwelling receptors 146 to 159*

Figure 20 *Assessed dwelling receptors 160 to 164*

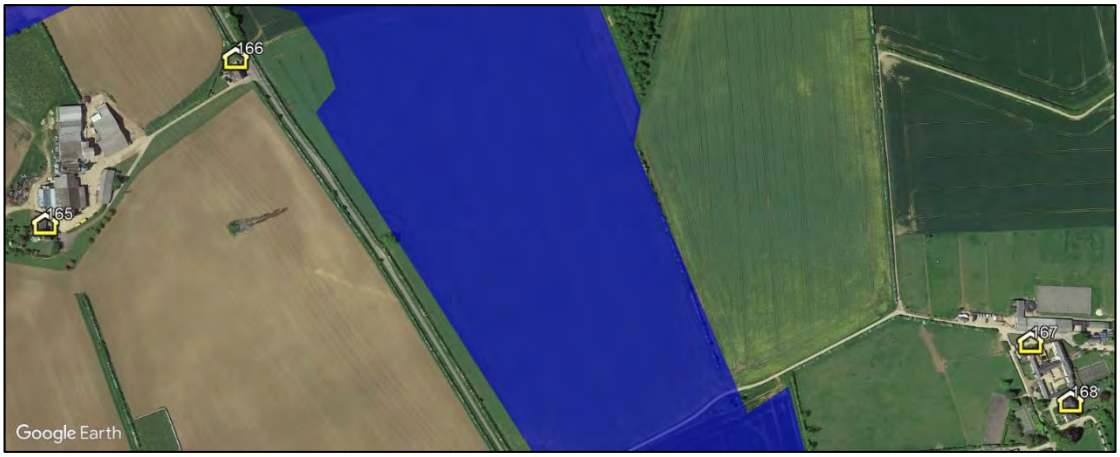


Figure 21 *Assessed dwelling receptors 165 to 168*

Figure 22 *Assessed dwelling receptors 169 to 172*

Figure 23 *Assessed dwelling receptors 173 to 179*

5.2.3 Railway Receptors

Railway Signals

The analysis has considered railway signals that:

- Are within the 500m assessment area;
- Have a potential view of the panels.

No railway signals have been identified on the assessed section of railway line. No impacts upon railway signals are predicted.

This report will be updated if railway signals are identified by Network Rail at a later date.

Train Drivers

The analysis has considered train driver locations that:

- Are within the 500m assessment area;
- Have a potential view of the panels.

The locations of the assessed train driver receptors along approximately 5.1km of railway line are shown in Figure 24 on the following page. The inset shows the specific numbering of the train driver receptors.

Receptors are taken approximately every 100m and the driver's eye level is assessed at 2.75m above rail level[7].

[7] This height may vary based on driver height however this figure is used as the industry standard.

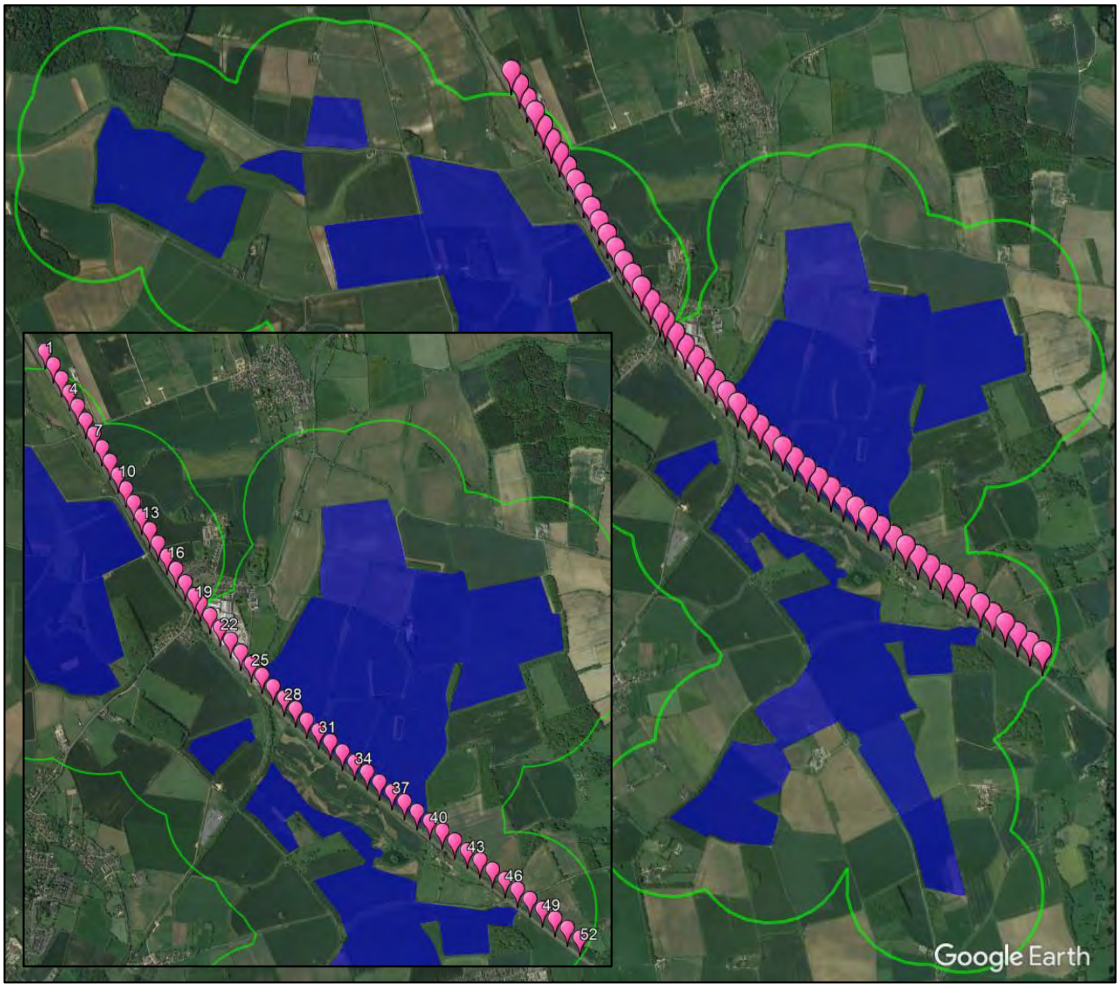


Figure 24 *Assessed train driver receptors*

6 ASSESSED REFLECTOR AREAS

6.1 Reflector Areas

A number of representative panel locations are selected within the proposed reflector areas. The number of modelled reflector points is determined by the size of the reflector areas and the assessment resolution. The bounding co-ordinates for the proposed solar development have been extrapolated from the site plans and can be found in Appendix G. All ground heights have been based on OSGB36 terrain data.

A resolution of 30m has been chosen for this assessment. This means that a geometric calculation is undertaken for each identified receptor every 30m 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 solar development.

For the purpose of this report, the panel areas have been split into two sections. The first section compromises panel areas 1-4 and the second section compromises panel areas 5-7. Modelling has been undertaken for receptors which are within the relevant assessment areas of each section. Where appropriate, solar reflections from both sections have been modelled towards the receptors.

The assessed reflector areas are shown in Figure 25 below.

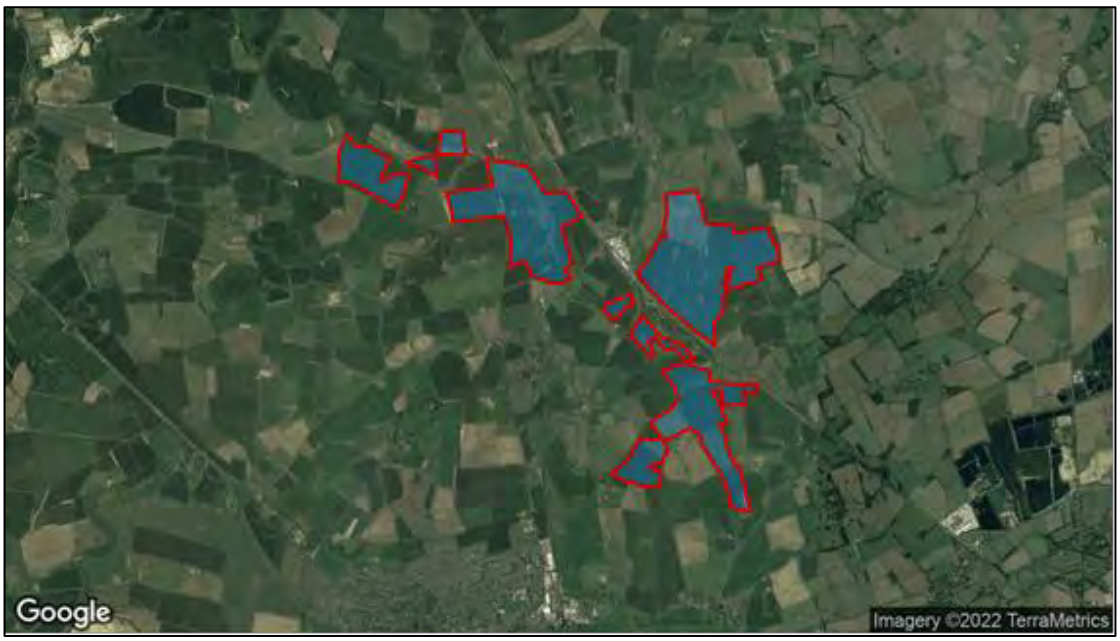


Figure 25 *Assessed reflector areas*

7 ASSESSMENT RESULTS AND DISCUSSION

7.1 Overview

The following sub-sections present the modelling results as well as the significance of any predicted impact in the context of existing screening and the relevant criteria set out in each sub-section. The criteria are determined by the assessment process for each receptor, which are set out in Appendix D.

When determining the visibility of the reflecting panels for an observer, a conservative review of the available imagery is undertaken, whereby it is assumed views of the panels are possible if it cannot be reliably determined that existing screening will remove effects.

The modelling output showing the precise predicted times and the reflecting panel areas for key receptors are presented in Appendix H.

7.2 Aviation Results

Where solar reflections are predicted for the aviation receptors, intensity calculations in line with Sandia National Laboratories' methodology are undertaken by a third-party model[8]. This model calculates the expected intensity of a reflection with respect to the potential for an after-image (or worse) occurring.

The designation used by the model is presented in Table 3 below along with the associated colour coding.

Coding Used	Intensity Key
Glare beyond 50°	Glare beyond 50 deg from pilot line-of-sight
Low potential	Low potential for temporary after-image
Potential	Potential for temporary after-image
Potential for permanent eye damage	Potential for permanent eye damage

Table 3 *Glare intensity designation*

This coding has been used in the table where a reflection has been calculated and is in accordance with Sandia National Laboratories' methodology.

[8] Forge Solar

In addition, the intensity model allows for assessment of a variety of solar panel surface materials. In the first instance, a surface material of 'smooth glass without an anti-reflective coating' has been assessed. Other surfaces that could be modelled include:

- Smooth glass without an anti-reflective coating;
- Light textured glass without an anti-reflective coating;
- Light textured glass with an anti-reflective coating; or
- Deeply textured glass[9].

7.2.1 ATC Tower

The results of the geometric modelling have shown that no solar reflections are geometrically possible towards the ATC tower at RAF Wittering from both fixed and tracker panel layouts.

No impacts upon ATC personnel are predicted and no mitigation is required.

7.2.2 Runway 07 Approach

The results of the geometric modelling have shown that no solar reflections are geometrically possible towards the runway 07 approach path from both fixed and tracker panel layouts.

No impacts upon approaching aircraft are predicted and no mitigation is required.

7.2.3 Runway 25 Approach

The results of the geometric modelling have shown that no solar reflections are geometrically possible towards the runway 25 approach path for both fixed and tracker panels.

No impacts upon approaching aircraft are predicted and no mitigation is required.

7.3 Road Results

In accordance with Pager Power's glint and glare guidance, the key considerations for quantifying impact significance for road users along major national, national, and regional roads are:

- Whether a reflection is predicted to be experienced in practice;
- The location of the reflecting panel relative to a road user's direction of travel.

Where reflections are not predicted to be experienced by a road user in practice, no impacts are predicted, and mitigation is not required.

Where reflections are predicted to be experienced from outside of a road user's primary field of view (50 degrees either side of the direction of travel) or the closest reflecting area is over 1km from the dwelling, the impact significance is low, and mitigation is not required.

Where reflections are predicted to be experienced from inside of a road user's field of view but there are mitigating circumstances, expert assessment of the following mitigating factors is required to determine the mitigation requirement:

[9] Not believed to be commercially viable for solar panels currently.

- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers (such as HGVs) along dual carriageways and motorways compared to other types of road;
- Whether the solar reflection originates from directly in front of a road user – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side;
- The separation distance to the panel area – 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.

Where reflections are predicted to be experienced originate from directly in front of a road user and there are no further mitigating circumstances, the impact significance is high, and mitigation is required.

7.3.1 Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards road receptors 12 – 35 and 44 – 70, along approximately 2.3km of the B1176 and 2.6km of the A6121.

Table 4 below summarises the predicted impact significance and mitigation requirement for the road receptors where solar reflections are geometrically possible. Cases where mitigation is recommended are shown in red for ease of reference and discussed further in Section 8.2.

Road Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
12 – 35	Existing vegetation. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
44 – 62				
63	Existing vegetation. Partial views of the reflecting panels are considered possible.	Moderate.	Effects do not originate from directly in front of a road user. The distance to the closest reflecting panel is approx. 340 metres. Effects would coincide with direct sunlight.	No.

Road Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
64	Existing vegetation. Partial views of the reflecting panels are considered possible.	Moderate.	Effects originate from directly in front of a road user. The distance to the closest reflecting panel is approx. 340 metres. Effects would coincide with direct sunlight.	Yes – for approx. 100m of road.
65 – 70	Existing vegetation. Partial views of the reflecting panels are considered possible.	Low.	N/A	No.

Table 4 *Assessment of impact significance and mitigation requirement – road receptors (fixed)*

7.3.2 Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards all 79 road receptors, along approximately 2.8km of the B1176 and 5.2km of the A6121.

Table 5 below summarises the predicted impact significance and mitigation requirement for the road receptors where solar reflections are geometrically possible.

Road Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
1 – 38	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
39 – 47	Existing vegetation and surrounding dwellings. Predicted to significantly obstruct views of the reflecting panels.			

Road Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
48 – 55	Existing vegetation. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
56 – 62	Existing vegetation and surrounding dwellings. Predicted to significantly obstruct views of the reflecting panels.			
63	Existing vegetation. Partial views of the reflecting panels are considered possible.	Moderate.	Effects do not originate from directly in front of a road user. The distance to the closest reflecting panel is approx. 340 metres. Effects would coincide with direct sunlight.	No.
64 – 79	Existing vegetation. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.

Table 5 *Assessment of impact significance and mitigation requirement – road receptors (tracker)*

7.4 Dwelling Results

In accordance with Pager Power's glint and glare guidance, the key considerations for quantifying impact significance for dwelling receptors are:

- Whether a 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 not predicted to be experienced by an observer in practice, no impacts are predicted, and mitigation is not required.

Where reflections are predicted to be experienced for less than 3 months per year and less than 60 minutes per day or the closest reflecting area is over 1km from the dwelling, 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, expert assessment of the following mitigating factors is required to determine the mitigation requirement:

- The separation distance to the panel area – 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.
- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity.
- Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact.

Where reflections are predicted to be experienced for more than 3 months per year and more than 60 minutes per day, the impact significance is high, and mitigation is required.

7.4.1 Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards dwelling receptors 08 – 14, 30 – 106, 108, 128, and 132 – 172; totalling 127 of the 179 assessed dwelling receptors.

Table 6 on the following page summarises the predicted impact significance and mitigation requirement for the dwelling receptors where solar reflections are geometrically possible. Cases where mitigation is recommended are shown in red for ease of reference and discussed further in Section 8.3.1.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
08	Existing vegetation and intervening terrain Partial views from above the ground floor considered possible.	Moderate.	The distance to the closest reflecting panel is approx. 60 metres. Effects would mostly coincide with direct sunlight. Effects only predicted to be experienced from above ground floor. Windows are not facing the reflecting panels.	No.
09 – 13	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
14	Existing vegetation and intervening terrain. Predicted to sufficiently reduce the duration of effects to acceptable levels.	Low.	N/A	No.
30	Existing vegetation. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
31	Intervening terrain. Partial views from above the ground floor cannot be ruled out based on the available imagery.	Low.	N/A	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
32 – 34	Existing vegetation. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
35	Existing vegetation and other dwellings. Predicted to significantly obstruct views of the reflecting panels.			
36	Existing vegetation and surrounding buildings. Partial views of the reflecting panels to the east predicted.	Low.	N/A	No.
37 – 38	Existing vegetation and surrounding buildings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
39 – 40	Existing vegetation and intervening terrain. Views of the reflecting panels to the east predicted.	Moderate.	The distance to the closest reflecting panel is approx. 320 metres. Effects would mostly coincide with direct sunlight. Effects predicted to be experienced from all floors.	No.
41 – 55	Existing vegetation, intervening terrain, and other dwellings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
56 – 63	Existing vegetation, intervening terrain, and other dwellings. Views of the reflecting panels to the east cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 470 metres. Effects would mostly coincide with direct sunlight. Effects only predicted to be experienced from above ground floor.	No.
64 – 78	Existing vegetation, other dwellings, and surrounding buildings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
79 – 81	Existing vegetation, intervening terrain, and other dwellings. Partial views from above the ground floor to the west cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 470 metres. Effects would mostly coincide with direct sunlight. Effects only predicted to be experienced from above ground floor.	No.
82 – 92	Existing vegetation and other dwellings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
93 – 106	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
108 128 132 – 164	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
165	Existing vegetation. Partial views from above the ground floor to the east cannot be ruled out based on the available imagery. Views of the reflecting panels to the west cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 130 metres. Effects would mostly coincide with direct sunlight. Effects predicted to be experienced from all floors.	Yes – for reflecting panels to the west.
166	Existing vegetation. Views of the reflecting panels to the east predicted.	Moderate.	The distance to the closest reflecting panel is approx. 80 metres. Effects would mostly coincide with direct sunlight. Effects predicted to be experienced from all floors. Windows are facing the reflecting panels.	Yes.
167 – 168	Inconclusive. Views of the reflecting panels cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 300 metres. Effects would mostly coincide with direct sunlight. Effects predicted to be experienced from all floors.	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
169	Existing vegetation. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
170	Existing vegetation. Views of the reflecting panels cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 580 metres. Effects would mostly coincide with direct sunlight. Effects predicted to be experienced from all floors.	No.
171 – 172	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.

Table 6 *Assessment of mitigation requirement – dwelling receptors (fixed)*

7.4.2 Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards dwelling receptors 1 – 20, 23 – 32, 35 – 63, 65 – 166, and 169 – 172; totalling 165 of the 179 assessed dwelling receptors.

Table 7 below summarises the predicted impact significance and mitigation requirement for the dwelling receptors where solar reflections are geometrically possible. Cases where mitigation is recommended are shown in red for ease of reference and discussed further in Section 8.3.2.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
01 – 06	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
07	Existing vegetation. Partial views from above the ground floor cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 215 metres. Effects would coincide with direct sunlight. Effects only predicted to be experienced from above ground floor. Windows are facing the reflecting panels.	No.
08	Existing vegetation and surrounding buildings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
09 – 13	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.			
14	Existing vegetation and intervening terrain. Partial views from above the ground floor cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 260 metres. Effects would coincide with direct sunlight. Effects only predicted to be experienced from above ground floor.	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
15 – 20	Existing vegetation and other dwellings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
23 – 29				
30 – 32	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.			
35	Existing vegetation. Views of the reflecting panels predicted.	Moderate.	The distance to the closest reflecting panel is approx. 480 metres. Effects would coincide with direct sunlight. Effects predicted to be experienced from all floors. Windows are facing the reflecting panels.	No.
36 – 38	Existing vegetation and surrounding buildings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
39 – 40	Existing vegetation and intervening terrain. Views of the reflecting panels to the east predicted.	Moderate.	The distance to the closest reflecting panel is approx. 320 metres. Effects would coincide with direct sunlight. Effects predicted to be experienced from all floors.	No.

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
41 – 55	Existing vegetation, intervening terrain, and other dwellings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
56 – 63	Existing vegetation, intervening terrain, and other dwellings. Views of the reflecting panels to the east cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 470 metres. Effects would coincide with direct sunlight. Effects only predicted to be experienced from above ground floor.	No.
65 – 144	Existing vegetation, other dwellings, and surrounding buildings. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.
145 – 164	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.			

Dwelling Receptor	Identified Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
165	Existing vegetation. Partial views from above the ground floor cannot be ruled out based on the available imagery.	Moderate.	The distance to the closest reflecting panel is approx. 350 metres. Effects would coincide with direct sunlight. Effects only predicted to be experienced from above ground floor.	No.
166	Existing vegetation. Views of the reflecting panels to the east predicted.	Moderate.	The distance to the closest reflecting panel is approx. 80 metres. Effects would coincide with direct sunlight. Effects predicted to be experienced from all floors. Windows are facing the reflecting panels.	Yes.
169 – 172	Existing vegetation and intervening terrain. Predicted to significantly obstruct views of the reflecting panels.	No impact.	N/A	No.

Table 7 *Assessment of mitigation requirement – dwelling receptors (tracker)*

7.5 Train Driver Results

In accordance with Pager Power's glint and glare guidance, the key considerations for quantifying impact significance for train driver receptors are:

- Whether a reflection is predicted to be experienced in practice;
- The location of the reflecting panel relative to a train driver's direction of travel.

Where reflections are not predicted to be experienced by a train driver in practice, no impacts are predicted, and mitigation is not required.

Where reflections originate from outside of a train driver's primary field of view (30 degrees either side of the direction of travel), or the closest reflecting area is over 500m from the train driver, the impact significance is low, and mitigation is not required.

Where reflections originate from inside of a train driver's field of view but there are mitigating circumstances, expert assessment of the following mitigating factors is required to determine the mitigation requirement:

- Whether the solar reflection originates from directly in front of a train driver – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side;
- The separation distance to the panel area – 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;
- Whether a signal, station, level crossing, or switching point is located within the reflection zone – a train driver with a higher workload will be more impacted than a train driver with a lower workload.

Where reflections originate from directly in front of a train driver and there are no further mitigating circumstances, the impact significance is high, and mitigation is required.

7.5.1 Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards train driver receptors 3 – 52, along approximately 4.9km of railway line.

Table 8 below summarises the predicted impact significance and mitigation requirement for the train driver receptors where solar reflections are geometrically possible. Cases where mitigation is recommended are shown in red and discussed further in Section 8.4.1.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
3 – 10	Many layers of existing vegetation. Predicted to completely obstruct views of the reflecting panels.	No impact.	N/A	No.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
11 – 19	Existing vegetation. Views of the reflecting panels may be filtered or significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Low.	N/A	No.
20 – 23	Large areas of existing vegetation, surrounding dwellings, and surrounding buildings. Predicted to completely obstruct views of the reflecting panels.	No impact.	N/A	No.
24 – 28	Existing vegetation. Views of the reflecting panels may be filtered or significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Low.	N/A	No.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
29 – 34	Existing vegetation. Views of the reflecting panels may be filtered or significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Moderate.	Effects do not originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 300 metres. Effects mostly coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	No.
35 – 39	Inconclusive. Views of the reflecting panels considered possible.			
40 – 46	Many layers of existing vegetation. Predicted to completely obstruct views of the reflecting panels.	No impact.	N/A	No.
47 – 50	Inconclusive. Views of the reflecting panels considered possible.	Moderate.	Effects originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 50 metres. Effects mostly coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	Yes – for approx. 300m of railway line.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
51 – 52	Inconclusive. Views of the reflecting panels considered possible.	Moderate.	Effects originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 280 metres. Effects mostly coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	No.

Table 8 *Assessment of mitigation requirement – train driver receptors (fixed)*

7.5.2 Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards all 52 train driver receptors, along approximately 5.1km of railway line.

Table 9 below summarises the predicted impact significance and mitigation requirement for the train driver receptors where solar reflections are geometrically possible. Cases where mitigation is recommended are shown in red and discussed further in Section 8.4.2.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
1 – 10	Many layers of existing vegetation. Predicted to completely obstruct views of the reflecting panels.	No impact.	N/A	No.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
11 – 19	Existing vegetation. Views of the reflecting panels may be filtered or significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Low.	N/A	No.
20 – 23	Large areas of existing vegetation, surrounding dwellings, and surrounding buildings. Predicted to completely obstruct views of the reflecting panels.	No impact.	N/A	No.
24 – 28	Existing vegetation. Views of the reflecting panels may be filtered or significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Moderate.	Effects originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 90 metres. Effects coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	Yes – for approx. 450m of railway line.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
29 – 33	Existing vegetation. Views of the reflecting panels may be filtered or significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Low.	N/A	No.
34 - 39	Inconclusive. Views of the reflecting panels considered possible.	Moderate.	Effects do not originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 340 metres. Effects coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	No.
40 – 44	Many layers of existing vegetation. Predicted to completely obstruct views of the reflecting panels.	No impact.	N/A	No.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
45 – 46	Existing vegetation. Views of the reflecting panels predicted to be significantly obstructed. As this vegetation could be removed, it is assumed views of the reflecting panels are possible.	Low.	N/A	No.
47 – 50	Inconclusive. Views of the reflecting panels considered possible.	Moderate.	Effects originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 50 metres. Effects coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	Yes – for approx. 300m of railway line.

Train Driver Receptors	Existing Screening (desk-based review)	Predicted Impact Classification	Relevant Factors	Mitigation Recommended?
51 – 52	Inconclusive. Views of the reflecting panels considered possible.	Moderate.	Effects originate from directly in front of a train driver. The distance to the closest reflecting panel is approx. 280 metres. Effects coincide with direct sunlight. No views signals, stations, level crossings, or switching points required.	No.

Table 9 *Assessment of mitigation requirement – train driver receptors (tracker)*

8 HIGH-LEVEL MITIGATION OVERVIEW

8.1 Overview

It is possible that a site survey or other detailed screening analysis would reveal that the reflecting areas are already significantly obscured from view relative to the identified receptors. Ordinarily, mitigation for ground-based receptors is achieved where necessary via screening in the form of planting to obstruct views. The optimal strategy may therefore include:

- Provision of screening (planting or opaque fence) within the site boundary – this is the preferred solution by stakeholders as the screening is under the developer's control;
- Provision of screening (planting or opaque fence) outside of the site boundary – less favoured by stakeholders but is still a suitable solution if it can be maintained.

The relevant reflecting areas that should be obscured from view (yellow areas) and potential screening locations (pink lines), have therefore been defined in this section. The required height will depend on the relative elevation of the receptors, the base of the planting itself, and the reflecting panels. For dwelling receptors, views of the reflecting panels should be obstructed from the ground floor at the minimum. Consideration of this should inform the landscaping aspect of the proposal.

Where screening is not a viable option, changes to the panel configuration could be explored. For fixed panels, this may involve altering the azimuth angle, elevation angle (tilt), panel footprint. For tracking panels, it is likely to involve altering the resting angle as all reflections are predicted when the panels are laying horizontally at sunrise or sunset.

8.2 Roads

The reflecting panel area and potential screening location for the fixed panel layout are shown in Figure 26 below.

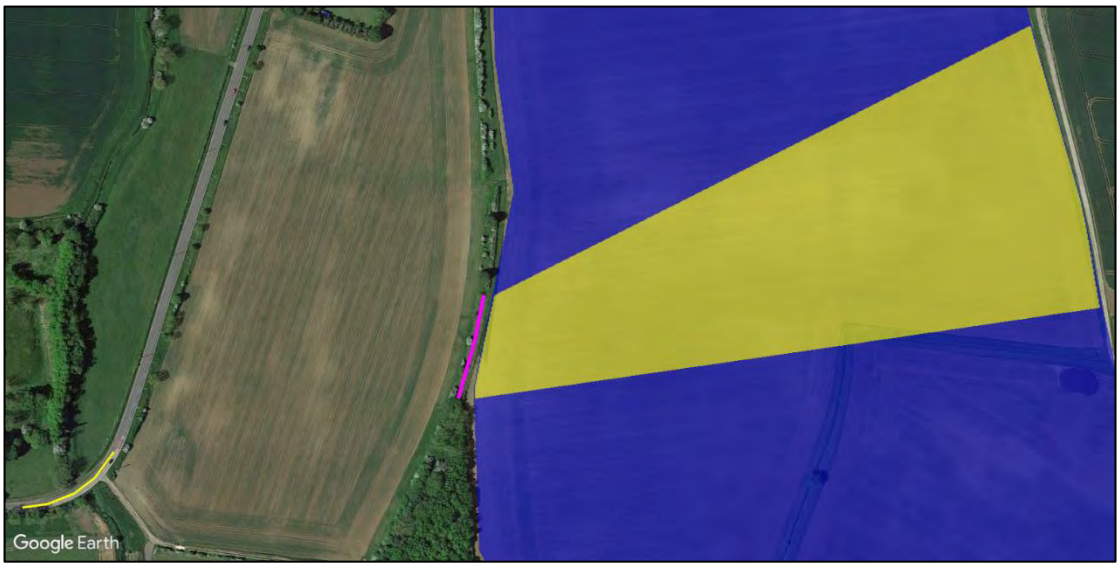


Figure 26 *Reflecting panel area and potential screening location for road receptor 64 (fixed)*

8.3 Dwellings

8.3.1 Fixed Panels

The reflecting panel areas and potential screening locations for the fixed panel layout are shown in Figures 27 and 28 below.

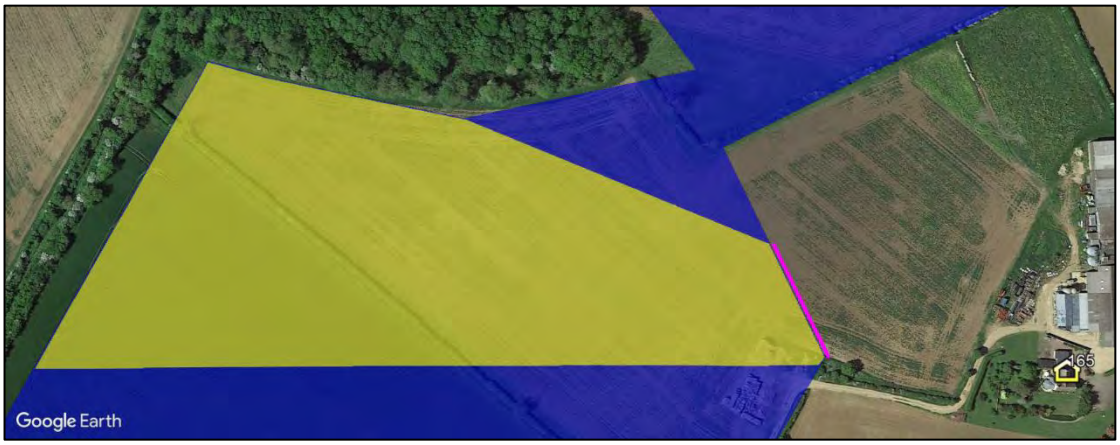


Figure 27 *Reflecting panel area and potential screening location for dwelling receptor 165 (fixed)*

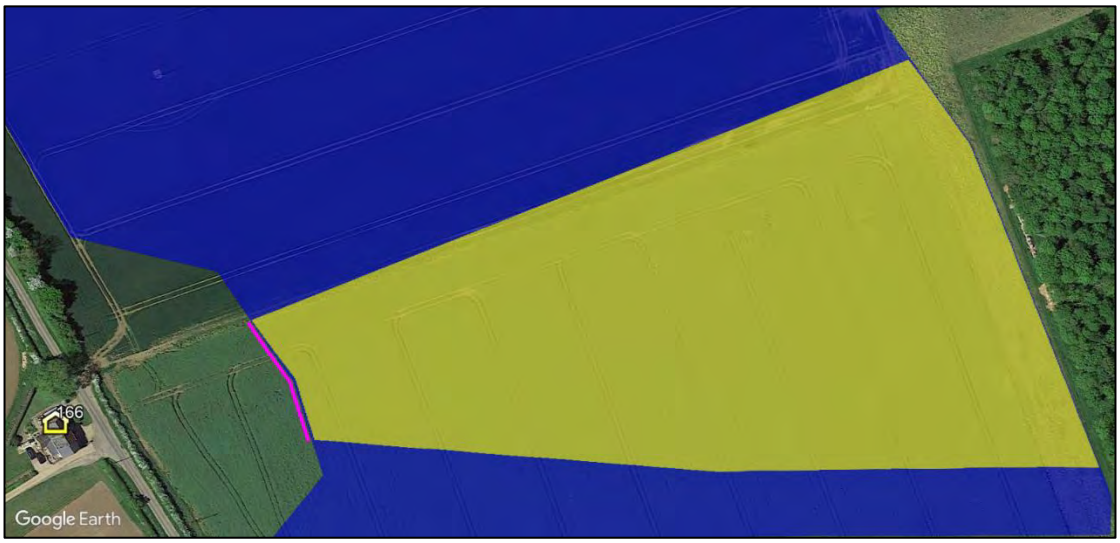


Figure 28 *Reflecting panel area and potential screening location for dwelling receptor 166 (fixed)*

8.3.2 Tracker Panels

The reflecting panel areas and potential screening locations for the tracker panel layout are shown in Figure 29 below.

Figure 29 *Reflecting panel area and potential screening location for dwelling receptor 166 (tracker)*

8.4 Railway

8.4.1 Fixed Panels

The reflecting panel area and potential screening location for the fixed panel layout are shown in Figure 30 below.

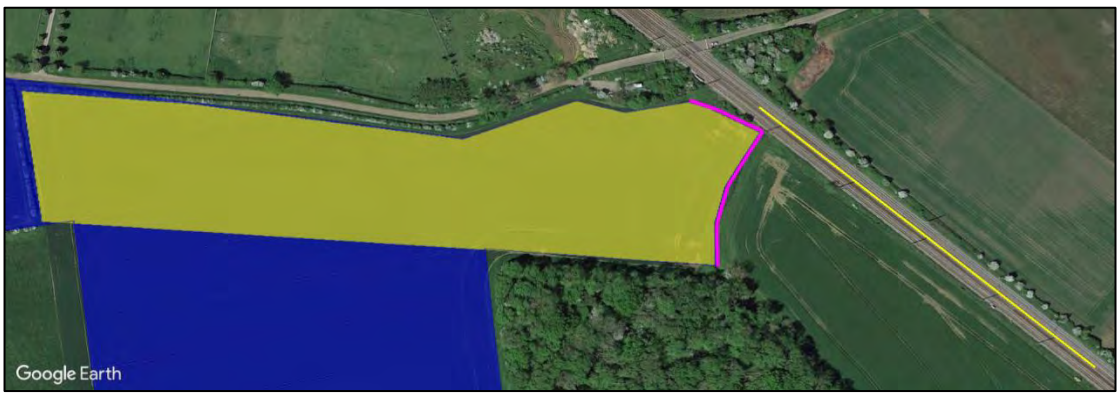


Figure 30 *Reflecting panel area and potential screening location for train driver receptors 47 to 50 (fixed)*

8.4.2 Tracker Panels

The reflecting panel area and potential screening location for the tracker panel layout are shown in Figures 31 and 32 below.

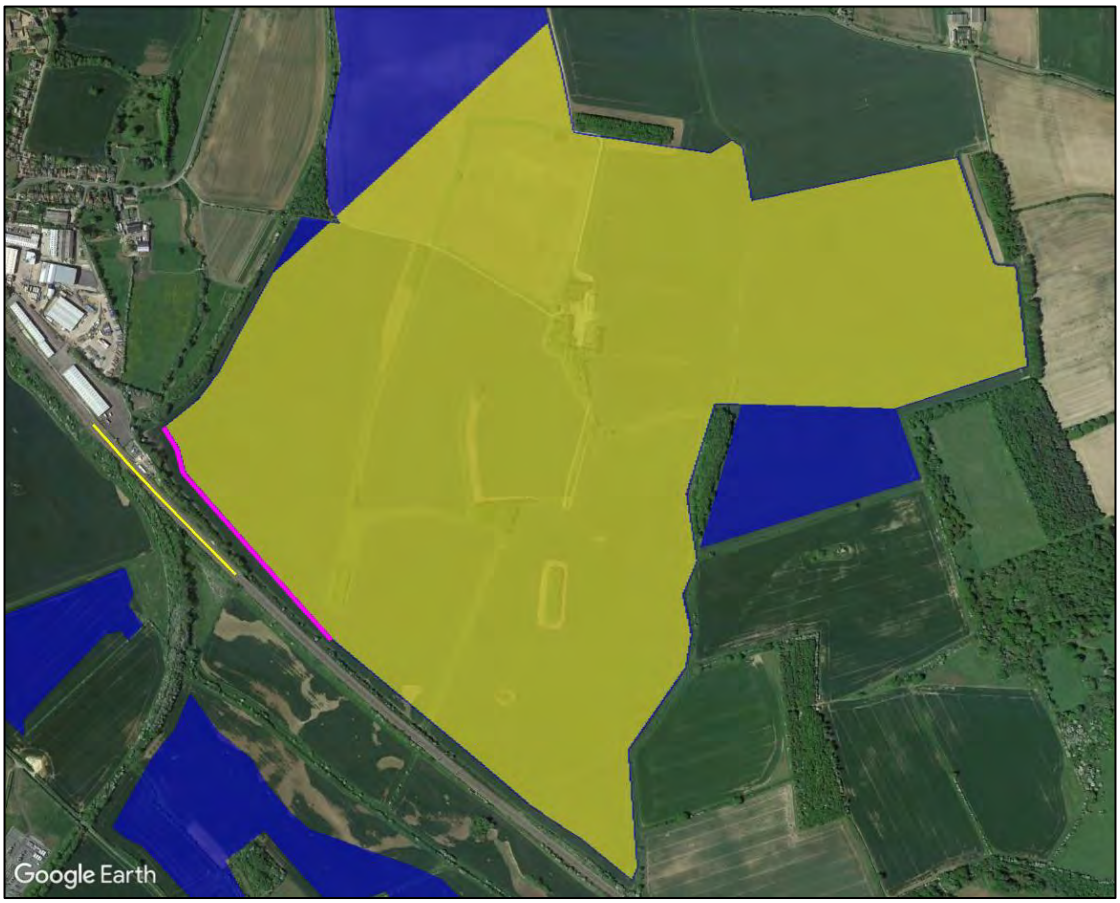


Figure 31 *Reflecting panel area and potential screening location for train driver receptors 24 to 28 (tracker)*

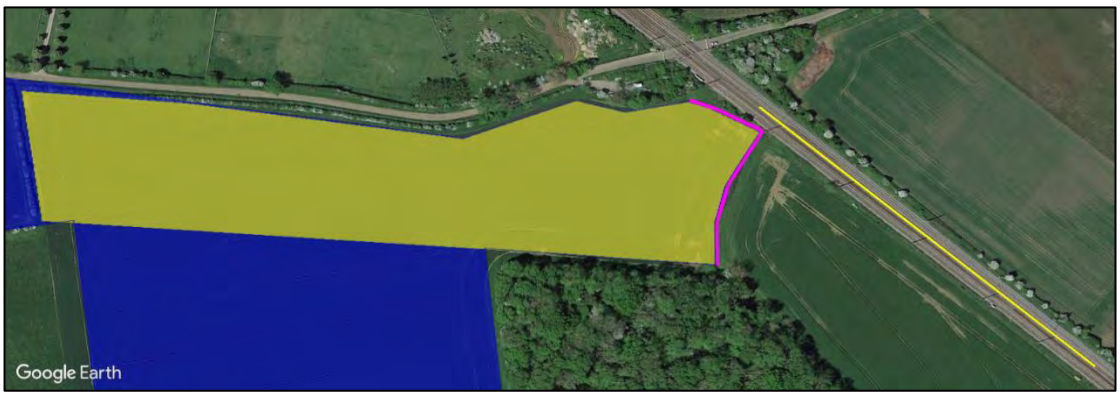


Figure 32 *Reflecting panel area and potential screening location for train driver receptors 47 to 50 (tracker)*

9 HIGH-LEVEL AVIATION CONSIDERATIONS

9.1 Overview

Shacklewell Airfield is an unlicensed aerodrome located approximately 8.3km southwest of the proposed solar panel areas, which is understood to not have an ATC Tower. The airfield has one runway:

- 06/24 – 700 metres (Grass).

Castle Bytham Airfield is an unlicensed aerodrome located approximately 7.7km north northwest of the solar panel areas, which is understood to not have an ATC Tower. The airfield has one runway:

- 15/33 – 500 metres (Grass).

RAF Cottesmore is an MoD aerodrome located approximately 10.0km northwest of the proposed solar panel areas and has an ATC Tower. The airfield has one runway:

- 04/22 – 2,744 metres (Asphalt)

The locations of Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore relative to the proposed development are shown in Figure 33 on the following page.

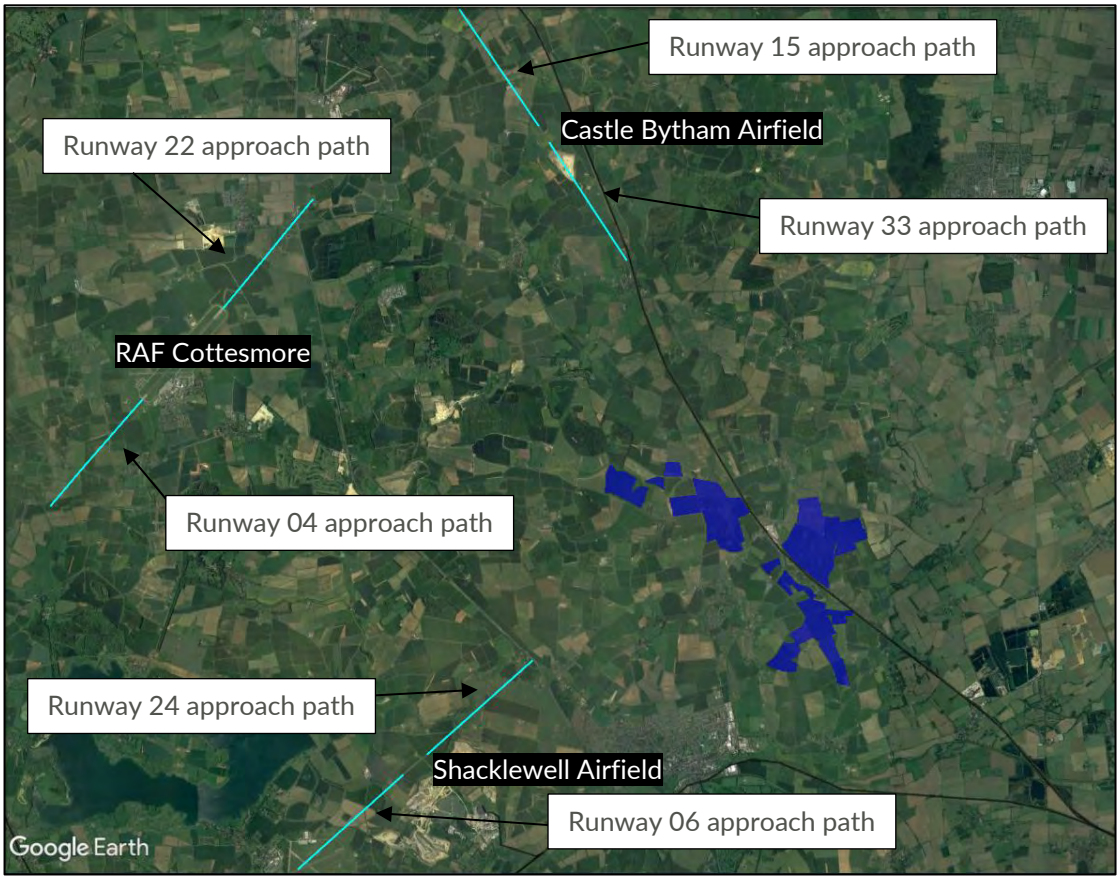


Figure 33 *Identified aerodromes relative to the proposed development*

9.2 High-Level Conclusion

Considering the size of the proposed development, its location relative to Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore, and its distance from the aerodromes, the following is applicable:

- It can be safely presumed that any predicted solar reflections towards pilots approaching runway thresholds 04, 06, and 15 and would have intensities no greater than 'low potential for temporary after image', which is acceptable in accordance with the associated guidance and industry best practice;
- The proposed development will be outside a pilot's primary field of view (50 degrees either side of the approach bearing) along the 2-mile approach path towards runway thresholds 22, 24, and 33 which is acceptable in accordance with the associated guidance and industry best practice;
- Views of the proposed development from the ATC Tower at RAF Cottesmore are not considered possible considering its height above ground level, the separation distance, and the screening.

Therefore, no significant impacts upon aviation activity associated with Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore are predicted for both fixed and tracking layout plans, and no further detailed modelling is recommended.

10 OVERALL CONCLUSIONS

10.1 Assessment Results – RAF Wittering

10.1.1ATC Tower

The modelling has shown that no solar reflections are geometrically possible towards the ATC Tower at RAF Wittering from both fixed and tracker panel layouts.

No impacts upon ATC personnel are predicted and no mitigation is required.

10.1.2Approach Paths

The modelling has shown that no solar reflections are geometrically possible towards either of the 2-mile approach paths for runway 07/25 at RAF Wittering from both fixed and tracker panel layouts.

No impacts upon approaching aircraft are predicted and no mitigation is required.

10.2 Assessment Results – High Level Aviation

Detailed modelling of Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore is not recommended as all potential solar reflections are predicted to be acceptable in accordance with the associated guidance and industry best practice.

No significant impacts upon Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore are predicted.

10.3 Assessment Result – Roads

10.3.1Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards road users along approximately 2.3km of the B1176 and 2.6km of the A6121. For most of these sections of road, mitigation is not recommended because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of a road user's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Mitigation is recommended for an approximately 100m section of the A6121, despite some mitigating factors being present, due to effects originating from directly in front of a road user.

10.3.2Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards road users along approximately 2.8km of the B1176 and 5.2km of the A6121. However, no mitigation requirement has been identified because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of a road user's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

10.4 Assessment Results – Dwellings

10.4.1 Fixed Panels

The modelling has shown that solar reflections are geometrically possible towards 127 of the 179 assessed dwelling receptors. Solar reflections towards most of these dwellings are predicted to be significantly screened or do not occur for a duration that could be considered significant.

Solar reflections towards 19 of these dwellings occur for a duration which requires further consideration. Mitigation is not recommended for 17 of these dwellings because:

- The distance between the observer and the closest reflecting panel area is such that the proportion of an observer's field of vision that is taken up by the reflecting area is significantly reduced;
- Views are only predicted for observers above the ground floor, which is not considered to be the main living space of a dwelling; and/or
- Effects will coincide with direct sunlight, which is a far more significant source of light compared to a solar reflection.

Mitigation is recommended for two dwellings due to the duration of effects and the lack of sufficient mitigating factors to reduce the level of impact – see Section 8.3.1.

10.4.2 Tracker Panels

The modelling has shown that solar reflections are geometrically possible towards 165 of the 179 assessed dwelling receptors. Solar reflections towards most of these dwellings are predicted to be significantly screened or do not occur for a duration that could be considered significant.

Solar reflections towards 15 of these dwellings occur for a duration which requires further consideration. Mitigation is not recommended for 14 of these dwellings because:

- The distance between the observer and the closest reflecting panel area is such that the proportion of an observer's field of vision that is taken up by the reflecting area is significantly reduced;
- Views are only predicted for observers above the ground floor, which is not considered to be the main living space of a dwelling; and/or
- Effects will coincide with direct sunlight, which is a far more significant source of light compared to a solar reflection.

Mitigation is recommended for one dwelling due to the duration of effects and the lack of sufficient mitigating factors to reduce the level of impact – see Section 8.3.2.

10.5 Assessment Results – Railway

10.5.1 Signals

No railway signals have been identified on the assessed section of railway line. No impacts upon railway signals are predicted.

This report will be updated if railway signals are identified by Network Rail at a later date.

10.5.2Train Drivers (Fixed Panels)

The modelling has shown that solar reflections are geometrically possible towards train drivers along approximately 4.9km of railway line. For most of these sections of railway line, mitigation is not recommended because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of train driver's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Mitigation is recommended for an approximately 300m stretch of railway line, despite some mitigating factors being present, due to effects originating from directly in front of a train driver – see Section 8.4.1.

10.5.3Train Drivers (Tracker Panels)

The modelling has shown that solar reflections are geometrically possible towards train drivers along approximately 5.1km of railway line. For most of these sections of railway line, mitigation is not recommended because:

- Views of the reflecting panels are predicted to be significantly obstructed;
- Solar reflections will occur outside of train driver's primary field of view; or
- There are sufficient mitigating factors to reduce the level of impact.

Mitigation is recommended for two stretches of railway line totalling approximately 750m, despite some mitigating factors being present, due to effects originating from directly in front of a train driver – see Section 8.4.2.

10.6 Mitigation Overview

The optimal mitigation strategy is likely to involve the provision of screening to significantly obstruct visibility of the reflecting panels. The proposed screening will be secured through the Landscape Ecological Management Plan (LEMP).

Where screening is not a viable option, changes to the panel configuration could be explored to eliminate the impacts. For fixed panels, this may involve altering the azimuth angle, elevation angle (tilt), panel footprint. For tracking panels, it is likely to involve altering the resting angle as all reflections are predicted when the panels are laying horizontally at sunrise or sunset.

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

Renewable and Low Carbon Energy

The National Planning Policy Framework under the planning practice guidance for Renewable and Low Carbon Energy[10] (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.'

[10] Renewable and low carbon energy, Ministry of Housing, Communities & Local Government, date: 18 June 2015, accessed on: 01/11/2021

Draft National Policy Statement for Renewable Energy Infrastructure

The Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)[11] sets out the primary policy for decisions by the Secretary of State for nationally significant renewable energy infrastructure. Section 2.52 states:

'2.52.1 Solar panels may reflect the sun's rays, causing glint and glare. Glint is defined as a momentary flash of light that may be produced as a direct reflection of the sun in the solar panel. Glare is a continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the panel. The effect occurs when the solar panel is stationed between or at an angle of the sun and the receptor.

2.52.2 In some instances, it may be necessary to seek a glint and glare assessment as part of the application. This may need to account for 'tracking' panels if they are proposed as these may cause differential diurnal and/or seasonal impacts. The potential for solar PV panels, frames and supports to have a combined reflective quality should be assessed. This assessment needs to consider the likely reflective capacity of all of the materials used[12] in the construction of the solar PV farm.

2.52.3 Applicants should consider using, and in some cases the Secretary of State may require, solar panels to be of a non-glare/ non-reflective type and the front face of the panels to comprise of (or be covered) with a non-reflective coating for the lifetime of the permission.

2.52.4 Solar PV panels are designed to absorb, not reflect, irradiation. However, the Secretary of State should assess the potential impact of glint and glare on nearby homes and motorists.

2.52.5 There is no evidence that glint and glare from solar farms interferes in any way with aviation navigation or pilot and aircraft visibility or safety. Therefore, the Secretary of State is unlikely to have to give any weight to claims of aviation interference as a result of glint and glare from solar farms.'

Consultation to determine whether EN-3 provides a suitable framework to support decision making for nationally significant energy infrastructure ended in November 2021. Pager Power is aware that aviation stakeholders were not consulted prior to the publication of the draft policy and understands that they will still request a glint and glare assessment on the basis that glare may lead to impact upon aviation safety. It is possible that the draft policy will change in light of the consultation responses from aviation stakeholders.

Finally, it should be noted that the EN-3 relates solely to nationally significant renewable energy infrastructure and therefore does not apply to all planning applications for solar farms.

[11] Draft National Policy Statement for Renewable Energy Infrastructure (EN-3), Department for Business, Energy & Industrial Strategy, date: September 2021, accessed on: 01/11/2021.

[12] In Pager Power's experience, the solar panels themselves are the overriding source of specular reflections which have the potential to cause significant impacts upon safety or amenity.

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 upon 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 stakeholder consultation. Further information can be found in Pager Power's Glint and Glare Guidance document[13] which was produced due to the absence of existing guidance and a specific standardised assessment methodology.

Aviation Assessment Guidance

The UK Civil Aviation Authority (CAA) issued interim guidance relating to Solar Photovoltaic Systems (SPV) on 17 December 2010 and was subject to a CAA information alert 2010/53. The formal policy was cancelled on September 7th, 2012[14] however the advice is still applicable[15] until a formal policy is developed. The relevant aviation guidance from the CAA is presented in the section below.

CAA Interim Guidance

This interim guidance makes the following recommendations (p.2-3):

'8. It is recommended that, as part of a planning application, the SPV developer provide safety assurance documentation (including risk assessment) regarding the full potential impact of the SPV installation on aviation interests.

9. Guidance on safeguarding procedures at CAA licensed aerodromes is published within CAP 738 Safeguarding of Aerodromes and advice for unlicensed aerodromes is contained within CAP 793 Safe Operating Practices at Unlicensed Aerodromes.

10. Where proposed developments in the vicinity of aerodromes require an application for planning permission the relevant LPA normally consults aerodrome operators or NATS when aeronautical interests might be affected. This consultation procedure is a statutory obligation in the case of certain major airports, and may include military establishments and certain air traffic surveillance technical sites. These arrangements are explained in Department for Transport Circular 1/2003 and for Scotland, Scottish Government Circular 2/2003.

11. In the event of SPV developments proposed under the Electricity Act, the relevant government department should routinely consult with the CAA. There is therefore no requirement for the CAA to be separately consulted for such proposed SPV installations or developments.

---

[13] Pager Power Glint and Glare Guidance, Third Edition (3.1), April 2021.
[14] Archived at Pager Power
[15] Reference email from the CAA dated 19/05/2014.

12. If an installation of SPV systems is planned on-aerodrome (i.e. within its licensed boundary) then it is recommended that data on the reflectivity of the solar panel material should be included in any assessment before installation approval can be granted. Although approval for installation is the responsibility of the ALH[16], as part of a condition of a CAA Aerodrome Licence, the ALH is required to obtain prior consent from CAA Aerodrome Standards Department before any work is begun or approval to the developer or LPA is granted, in accordance with the procedures set out in CAP 791 Procedures for Changes to Aerodrome Infrastructure.

13. During the installation and associated construction of SPV systems there may also be a need to liaise with nearby aerodromes if cranes are to be used; CAA notification and permission is not required.

14. The CAA aims to replace this informal guidance with formal policy in due course and reserves the right to cancel, amend or alter the guidance provided in this document at its discretion upon receipt of new information.

15. Further guidance may be obtained from CAA's Aerodrome Standards Department via aerodromes@caa.co.uk.'

FAA Guidance

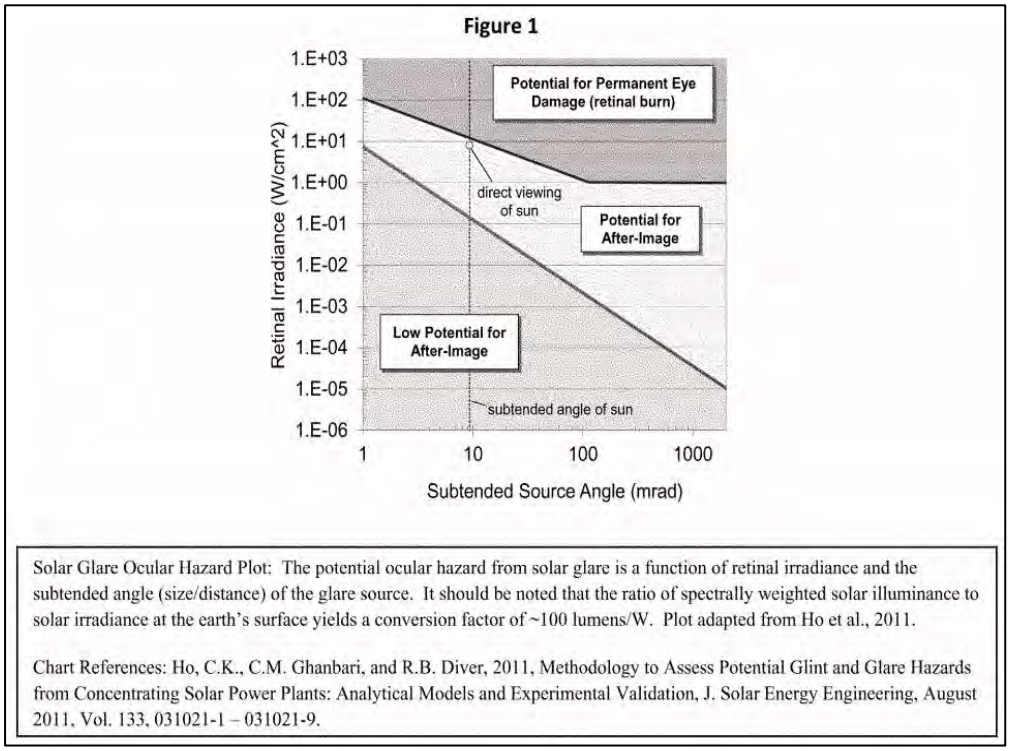
The most comprehensive guidelines available for the assessment of solar developments near aerodromes were produced initially in November 2010 by the United States Federal Aviation Administration (FAA) and updated in 2013.

The 2010 document is entitled '*Technical Guidance for Evaluating Selected Solar Technologies on Airports'*[17] and the 2013 update is entitled '*Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports'*[18]. In April 2018 the FAA released a new version (Version 1.1) of the '*Technical Guidance for Evaluating Selected Solar Technologies on Airports'*[19].

An overview of the methodology presented within the 2013 interim guidance and adopted by the FAA is presented below. This methodology is not presented within the 2018 guidance.

- *Solar energy systems located on an airport that is not federally-obligated or located outside the property of a federally-obligated airport are not subject to this policy.*
- *Proponents of solar energy systems located off-airport property or on non-federally-obligated airports are strongly encouraged to consider the requirements of this policy when siting such system.*
- *FAA adopts the Solar Glare Hazard Analysis Plot…. as the standard for measuring the ocular impact of any proposed solar energy system on a federally-obligated airport. This is shown in the figure below.*

[16] Aerodrome Licence Holder.
[17] Archived at Pager Power
[18] Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports, Department of Transportation, Federal Aviation Administration (FAA), date: 10/2013, accessed on: 20/03/2019
[19] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019



Solar Glare Hazard Analysis Plot (FAA)

- *To obtain FAA approval to revise an airport layout plan to depict a solar installation and/or a "no objection" … the airport sponsor will be required to demonstrate that the proposed solar energy system meets the following standards:*
- *No potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATC) cab, and*
- *No potential for glare or "low potential for after-image" … along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath.*
- *Ocular impact must be analysed over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon.*

The bullets highlighted above state there should be 'no potential for glare' at that ATC Tower and 'no' or 'low potential for glare' on the approach paths.

Key points from the 2018 FAA guidance are presented below.

- *Reflectivity refers to light that is reflected off surfaces. The potential effects of reflectivity are glint (a momentary flash of bright light) and glare (a continuous source of bright light).*

These two effects are referred to hereinafter as "glare," which can cause a brief loss of vision, also known as flash blindness[20].

- *The amount of light reflected off a solar panel surface depends on the amount of sunlight hitting the surface, its surface reflectivity, geographic location, time of year, cloud cover, and solar panel orientation.*
- *As illustrated on Figure 16*[21]*, flat, smooth surfaces reflect a more concentrated amount of sunlight back to the receiver, which is referred to as specular reflection. The more a surface is polished, the more it shines. Rough or uneven surfaces reflect light in a diffused or scattered manner and, therefore, the light will not be received as bright.*
- *Because the FAA has no specific standards for airport solar facilities and potential glare, the type of glare analysis may vary. Depending on site specifics (e.g., existing land uses, location and size of the project) an acceptable evaluation could involve one or more of the following levels of assessment:*
    - *A qualitative analysis of potential impact in consultation with the Control Tower, pilots and airport officials;*
    - *A demonstration field test with solar panels at the proposed site in coordination with FAA Tower personnel;*
    - *A geometric analysis to determine days and times when an impact is predicted.*
- *The extent of reflectivity analysis required to assess potential impacts will depend on the specific project site and system design.*
- ***1. Assessing Baseline Reflectivity Conditions** – Reflection in the form of glare is present in current aviation operations. The existing sources of glare come from glass windows, auto surface parking, rooftops, and water bodies. At airports, existing reflecting surfaces may include hangar roofs, surface parking, and glassy office buildings. To minimize unexpected glare, windows of air traffic control towers and airplane cockpits are coated with anti-reflective glazing. Operators also wear polarized eye wear. Potential glare from solar panels should be viewed in this context. Any airport considering a solar PV project should first review existing sources of glare at the airport and the effectiveness of measures used to mitigate that glare.*
- ***2. Tests in the Field** – Potential glare from solar panels can easily be viewed at the airport through a field test. A few airports have coordinated these tests with FAA Air Traffic Controllers to assess the significance of glare impacts. To conduct such a test, a sponsor can take a solar panel out to proposed location of the solar project, and tilt the panel in different directions to evaluate the potential for glare onto the air traffic control tower. For the two known cases where a field test was conducted, tower personnel determined the glare was*

[20] Flash Blindness, as described in the FAA guidelines, can be described as a temporary visual interference effect that persists after the source of illumination has ceased. This occurs from many reflective materials in the ambient environment.

[21] First figure in Appendix B.

not significant. If there is a significant glare impact, the project can be modified by ensuring panels are not directed in that direction.

- ***3. Geometric Analysis** – Geometric studies are the most technical approach for reflectivity issues. They are conducted when glare is difficult to assess through other methods. Studies of glare can employ geometry and the known path of the sun to predict when sunlight will reflect off of a fixed surface (like a solar panel) and contact a fixed receptor (e.g., control tower). At any given site, the sun moves across the sky every day and its path in the sky changes throughout year. This in turn alters the destination of the resultant reflections since the angle of reflection for the solar panels will be the same as the angle at which the sun hits the panels. The larger the reflective surface, the greater the likelihood of glare impacts.*
- *Facilities placed in remote locations, like the desert, will be far from receptors and therefore potential impacts are limited to passing aircraft. Because the intensity of the light reflected from the solar panel decreases with increasing distance, an appropriate question is how far you need to be from a solar reflected surface to avoid flash blindness. It is known that this distance is directly proportional to the size of the array in question22 but still requires further research to definitively answer.*
- ***Experiences of Existing Airport Solar Projects** – Solar installations are presently operating at a number of airports, including megawatt-sized solar facilities covering multiple acres. Air traffic control towers have expressed concern about glint and glare from a small number of solar installations. These were often instances when solar installations were sited between the tower and airfield, or for installations with inadequate or no reflectivity analysis. Adequate reflectivity analysis and alternative siting addressed initial issues at those installations.*

Air Navigation Order (ANO) 2016

In some instances, an aviation stakeholder can refer to the ANO 2016[23] with regard to safeguarding. Key points from the document are presented below.

Lights liable to endanger

224. (1) A person must not exhibit in the United Kingdom any light which—

(a) by reason of its glare is liable to endanger aircraft taking off from or landing at an aerodrome; or

(b) by reason of its liability to be mistaken for an aeronautical ground light is liable to endanger aircraft.

[22] Ho, Clifford, Cheryl Ghanbari, and Richard Diver. 2009. Hazard Analysis of Glint and Glare From Concentrating Solar Power Plants. SolarPACES 2009, Berlin Germany. Sandia National Laboratories.
[23] The Air Navigation Order 2016. [online] Available at: <https://www.legislation.gov.uk/uksi/2016/765/contents/made> [Accessed 4 February 2022].

(2) If any light which appears to the CAA to be a light described in paragraph (1) is exhibited, the CAA may direct the person who is the occupier of the place where the light is exhibited or who has charge of the light, to take such steps within a reasonable time as are specified in the direction—

(a) to extinguish or screen the light; and

(b) to prevent in the future the exhibition of any other light which may similarly endanger aircraft.

(3) The direction may be served either personally or by post, or by affixing it in some conspicuous place near to the light to which it relates.

(4) In the case of a light which is or may be visible from any waters within the area of a general lighthouse authority, the power of the CAA under this article must not be exercised except with the consent of that authority.

Lights which dazzle or distract

225. A person must not in the United Kingdom direct or shine any light at any aircraft in flight so as to dazzle or distract the pilot of the aircraft.'

The document states that no 'light', 'dazzle' or 'glare' should be produced which will create a detrimental impact upon aircraft safety.

Endangering safety of an aircraft

240. A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft.

Endangering safety of any person or property

241. A person must not recklessly or negligently cause or permit an aircraft to endanger any person or property.

Railway Assessment Guidelines

The following section provides an overview of the relevant railway guidance with respect to the siting of signals on railway lines. Network Rail is the stakeholder of the UK's railway infrastructure. Whilst the guidance is not strictly applicable in Ireland, the general principles within the guidance is expected to apply.

A railway operator's concerns would likely to relate to the following:

1. The development producing solar glare that affects train drivers; and
2. The development producing solar reflections that affect railway signals and create a risk of a phantom aspect signal.

Railway guidelines are presented below. These relate specifically to the sighting distance for railway signals.

Reflections and Glare

The extract below is taken from Section A5 – Reflections and glare (pages 64-65) of the 'Signal Sighting Assessment Requirements'24 which details the requirement for assessing glare towards railway signals.

Reflections and glare

Rationale

Reflections can alter the appearance of a display so that it appears to be something else.

Guidance

A5 is present if direct glare or reflected light is directed into the eyes or into the lineside signalling asset that could make the asset appear to show a different aspect or indication to the one presented.

A5 is relevant to any lineside signalling asset that is capable of presenting a lit signal aspect or indication.

The extent to which excessive illumination could make an asset appear to show a different signal aspect or indication to the one being presented can be influenced by the product being used. Requirements for assessing the phantom display performance of signalling products are set out in GKRT0057 section 4.1.

Problems arising from reflection and glare occur when there is a very large range of luminance, that is, where there are some objects that are far brighter than others. The following types of glare are relevant:

a) *Disability glare, caused by scattering of light in the eye, can make it difficult to read a lit display.*
b) *Discomfort glare, which is often associated with disability glare. While being unpleasant, it does not affect the signal reading time directly, but may lead to distraction and fatigue.*

Examples of the adverse effect of disability glare include:

a) *When a colour light signal presenting a lit yellow aspect is viewed at night but the driver is unable to determine whether the aspect is a single yellow or a double yellow.*
b) *Where a colour light signal is positioned beneath a platform roof painted white and the light reflecting off the roof can make the signal difficult to read.*

Options for militating against A5 include:

a) *Using a product that is specified to achieve high light source: phantom ratio values.*
b) *Alteration to the features causing the glare or reflection.*
c) *Provision of screening.*

[24] Source: Signal Sighting Assessment Requirements, June 2016. Railway Group Guidance Note. Last accessed 18.10.2016.

Glare is possible and should be assessed when the luminance is much brighter than other light sources. Glare may be unpleasant and therefore cause distraction and fatigue, or may make the signal difficult to read and increase the reading time.

Determining the Field of Focus

The extract below is taken from Appendix F - Guidance on Field of Vision (pages 98-101) of the 'Signal Sighting Assessment Requirements'25 which details the visibility of signals, train drivers' field of vision and the implications with regard to signal positioning.

Asset visibility

The effectiveness of an observer's visual system in detecting the existence of a target asset will depend upon its:

a) *Position in the observer's visual field.*
b) *Contrast with its background.*
c) *Luminance properties.*
d) *The observer's adaptation to the illumination level of the environment.*

It is also influenced by the processes relating to colour vision, visual accommodation, and visual acuity. Each of these issues is described in the following sections.

Field of vision

The field of vision, or visual field, is the area of the visual environment that is registered by the eyes when both eyes and head are held still. The normal extent of the visual field is approximately 135o in the vertical plane and 200o in the horizontal plane.

The visual field is usually described in terms of central and peripheral regions: the central field being the area that provides detailed information. This extends from the central point (0°) to approximately 30° at each eye. The peripheral field extends from 30o out to the edge of the visual field.

F.6.3 Objects positioned towards the centre of the observer's field of vision are seen more quickly and identified more accurately because this is where our sensitivity to contrast is the highest. Peripheral vision is particularly sensitive to movement and light.

[25] Source: Signal Sighting Assessment Requirements, June 2016. Railway Group Guidance Note. Last accessed 28.08.2020.

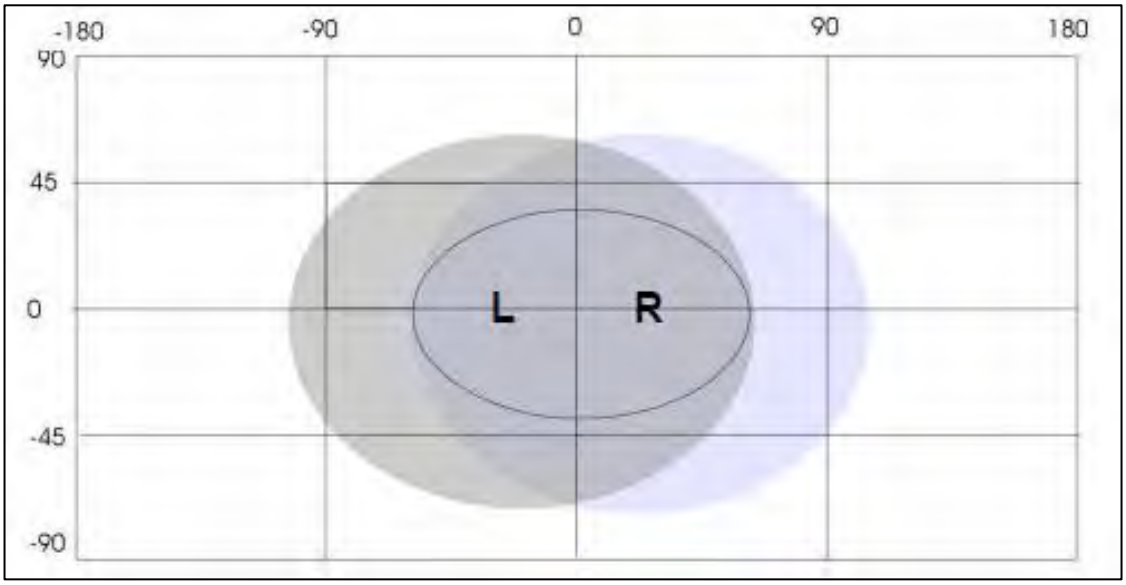


Figure G 21 - Field of view

In Figure G 21, the two shaded regions represent the view from the left eye (L) and the right eye (R) respectively. The darker shaded region represents the region of binocular overlap. The oval in the centre represents the central field of vision.

Research has shown that drivers search for signs or signals towards the centre of the field of vision.

Signals, indicators and signs should be positioned at a height and distance from the running line that permits them to be viewed towards the centre of the field of vision. This is because:

- *a) As train speed increases, drivers become increasingly dependent on central vision for asset detection. At high speeds, drivers demonstrate a tunnel vision effect and focus only on objects in a field of + 8° from the direction of travel.*
- *b) Sensitivity to movement in the peripheral field, even minor distractions can reduce the visibility of the asset if it is viewed towards the peripheral field of vision. The presence of clutter to the sides of the running line can be highly distracting (for example, fence posts, lamp-posts, traffic, or non-signal lights, such as house, compatibility factors or security lights).*

Figure G 22 and Table G 5 identify the radius of an 8o cone at a range of close-up viewing distances from the driver's eye. This shows that, depending on the lateral position of a stop signal, the optimal (normal) train stopping point could be as far as 25 m back from the signal to ensure that it is sufficiently prominent.

The dimensions quoted in Table G 5 assume that the driver is looking straight ahead. Where driver-only operation (DOO) applies, the drivers' line of sight at the time of starting the train is influenced by the location of DOO monitors and mirrors. In this case it may be appropriate to provide supplementary information alongside the monitors or mirrors using one of the following:

- *a) A co-acting signal.*
- *b) A miniature banner repeater indicator.*
- *c) A right away indicator.*

d) *A sign to remind the driver to check the signal aspect.*

In order to prevent misreading by trains on adjacent lines, the co-acting signal or miniature banner repeater may be configured so that the aspect or indication is presented only when a train is at the platform to which it applies.

'Car stop' signs should be positioned so that the relevant platform starting signals and / or indicators can be seen in the driver's central field of vision.

If possible, clutter and non-signal lights in a driver's field of view should be screened off or removed so that they do not cause distraction.

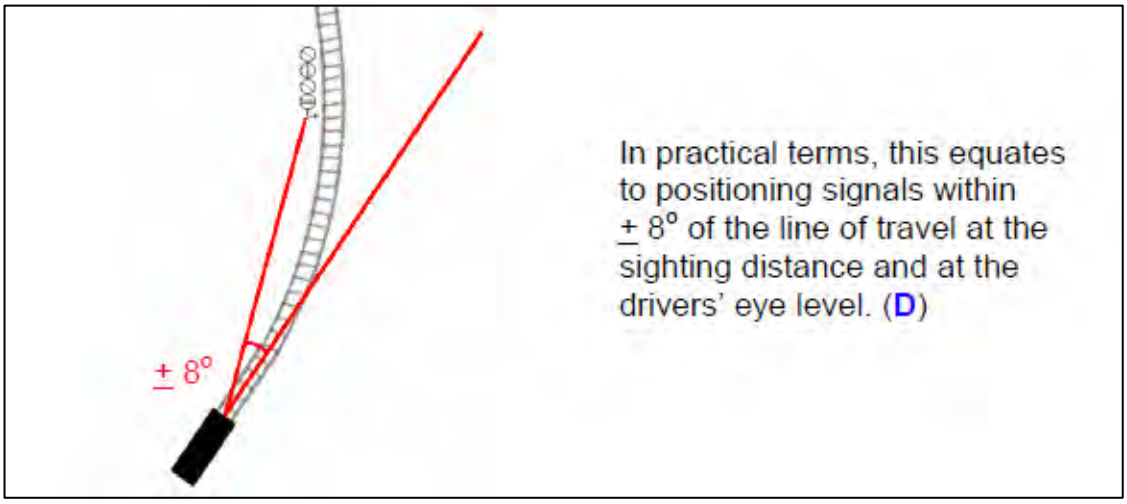


Figure G 22 - Signal positioning

'A' (m)	'B' (m)	Typical display positions
5	*0.70*	-
6	*0.84*	-
7	*0.98*	-
8	*1.12*	-
9	*1.26*	-
10	*1.41*	-
11	*1.55*	-
12	*1.69*	-
13	*1.83*	-
14	*1.97*	-

15	*2.11*	*A stop aspect positioned 3.3 m above rail level and 2.1 m from the left hand rail is within the 8º cone at 15.44 m in front of the driver*
16	*2.25*	*-*
17	*2.39*	*-*
18	*2.53*	*A stop aspect positioned 5.1 m above rail level and 0.9 m from the left hand rail is within the 8º cone at 17.93 m in front of the driver*
19	*2.67*	*-*
20	*2.81*	*-*
21	*2.95*	*-*
22	*3.09*	*-*
23	*3.23*	*-*
24	*3.37*	*-*
25	*3.51*	*A stop aspect positioned 3.3 m above rail level and 2.1 m from the right hand rail is within the 8º cone at 25.46 m in front of the driver*

Table G 5 – 8º cone angle co-ordinates for close-up viewing

The distance at which the 8° cone along the track is initiated is dependent on the minimum reading time and distance which is associated to the speed of trains along the track. This is discussed below.

Determining the Assessed Minimum Reading Time

The extract below is taken from section B5 (pages 8-9) of the 'Guidance on Signal Positioning and Visibility' which details the required minimum reading time for a train driver when approaching a signal.

'B5.2.2 Determining the assessed minimum reading time GE/RT8037

The assessed minimum reading time shall be no less than eight seconds travelling time before the signal.

The assessed minimum reading time shall be greater than eight seconds where there is an increased likelihood of misread or failure to observe. Circumstances where this applies include, but are not necessarily limited to, the following:

a) the time taken to identify the signal is longer (for example, because the signal being viewed is one of a number of signals on a gantry, or because the signal is viewed against a complex background)

b) the time taken to interpret the information presented by the signal is longer (for example, because the signal is capable of presenting route information for a complex layout ahead)

c) there is a risk that the need to perform other duties could cause distraction from viewing the signal correctly (for example, the observance of lineside signs, a station stop between the caution and stop signals, or DOO (P) duties)

d) the control of the train speed is influenced by other factors (for example, anticipation of the signal aspect changing).

The assessed minimum reading time shall be determined using a structured format approved by the infrastructure controller.'

The distance at which a signal should be clearly viewable is determined by the maximum speed of the trains along the track. If there are multiple signals present at a location then an additional 0.2 seconds reading time is added to the overall viewing time.

Signal Design and Lighting System

Many railway signals are now LED lights and not filament (incandescent) bulbs. The benefits of an LED signal over a filament bulb signal with respect to possible phantom aspect illuminations are as follows:

- An LED railway signal produces a more intense light making them more visible to approaching trains when compared to the traditional filament bulb technology[26];
- No reflective mirror is present within the LED signal itself unlike a filament bulb. The presence of the reflective surfaces greatly increases the likelihood of incoming light being reflecting out making the signal appear illuminated.

Many LED signal manufacturers[27,28,29] claim that LED signal lights significantly reduce or completely remove the likelihood of a phantom aspect illumination occurring.

[26] Source: Wayside LED Signals – Why it's Harder than it Looks, Bill Petit.
[27] Source: http://www.unipartdorman.co.uk/assets/unipart_dorman_rail_brochure.pdf. (Last accessed 21.02.18).
[28] Source: http://www.vmstech.co.uk/downloads/Rail.pdf. (Last accessed 21.02.18).
[29] Source: Siemens, Sigmaguard LED Tri-Colour L Signal – LED Signal Technology at Incandescent Prices. Datasheet 1A-23. (Last accessed 22.02.18).

APPENDIX B – OVERVIEW OF GLINT AND GLARE STUDIES

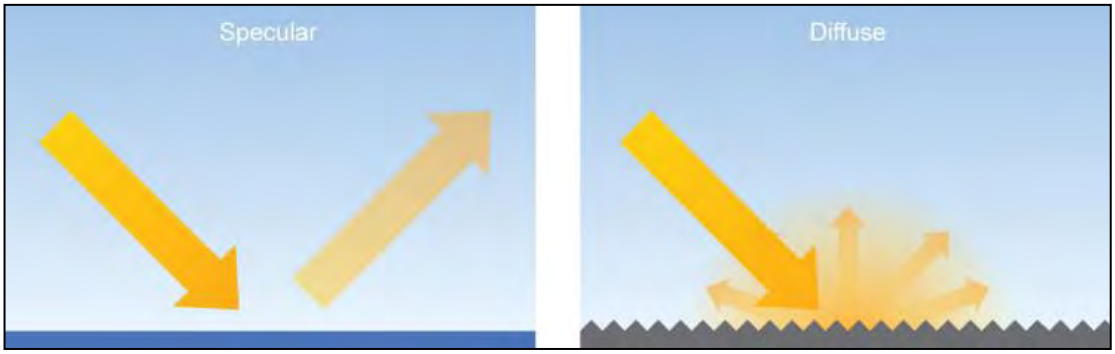
Overview

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

There are no specific studies for determining the effect of reflections from solar panels with respect to roads and dwellings. 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[30], taken from the FAA guidance, 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

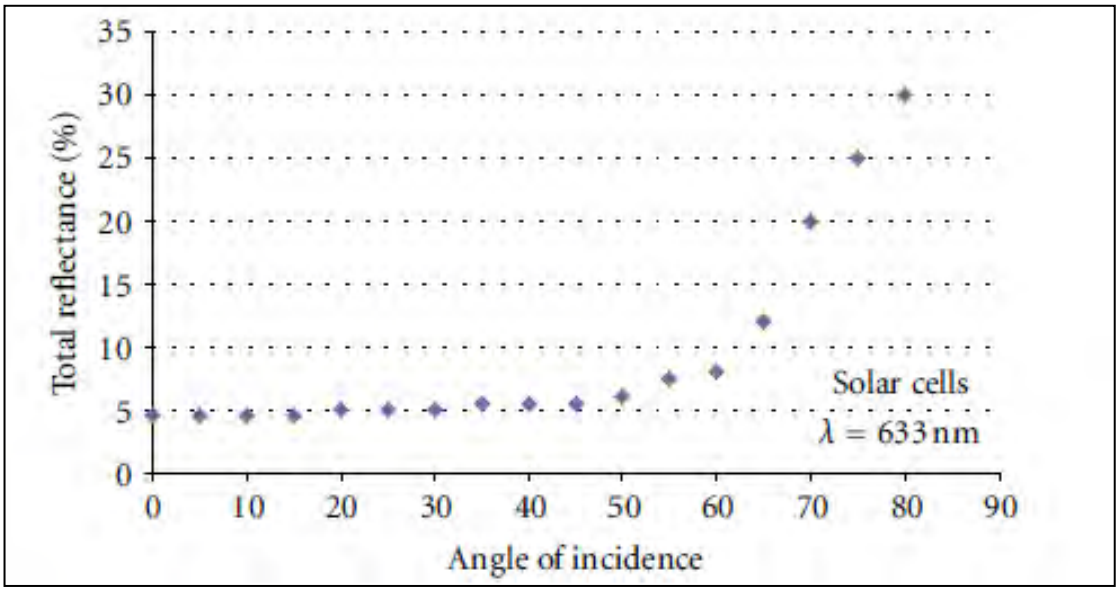
[30] http://www.faa.gov/airports/environmental/policy_guidance/media/airport_solar_guide_print.pdf

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*[31]". 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.

[31] 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"[32]

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[33] within the FAA guidance, is presented below.

Surface	Approximate Percentage of Light Reflected[34]
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.

[32] FAA, November (2010): *Technical Guidance for Evaluating Selected Solar Technologies on Airports.*
[33] http://www.faa.gov/airports/environmental/policy_guidance/media/airport_solar_guide_print.pdf
[34] Extrapolated data, baseline of 1,000 W/m^2 for incoming sunlight.

SunPower Technical Notification (2009)

SunPower published a technical notification[35] to '*increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment'*. The study revealed that the reflectivity of a solar panel is considerably lower than that 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.

Figures within the document show the relative reflectivity of solar panels compared to other natural and manmade materials including smooth water, standard glass and steel. 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 produced from these surfaces.

[35] Technical Support, 2009. SunPower Technical Notification- Solar Module Glare and Reflectance.

APPENDIX C – OVERVIEW OF SUN MOVEMENTS AND RELATIVE REFLECTIONS

Overview

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).

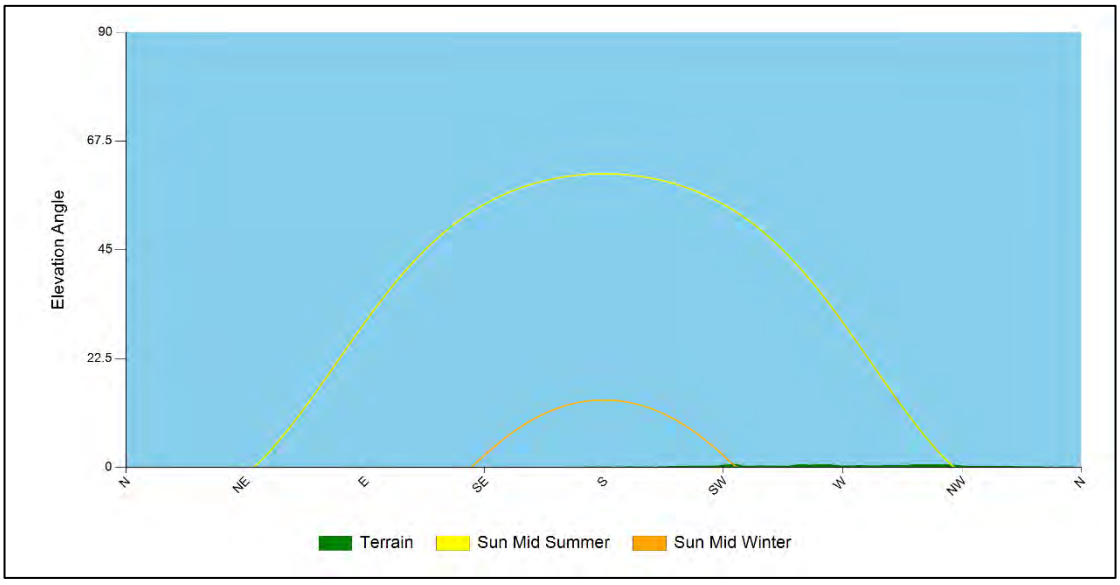
The Sun's position can be accurately calculated for a specific location. The following data being used for the calculation:

- 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 reaching a maximum elevation of approximately 60-65 degrees (longest day);
- On 21 December, the maximum elevation reached by the Sun is approximately 10-15 degrees (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 from the proposed development location as well as the sunrise and sunset curves throughout the year.



Sunrise and sunset curves throughout the year

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.

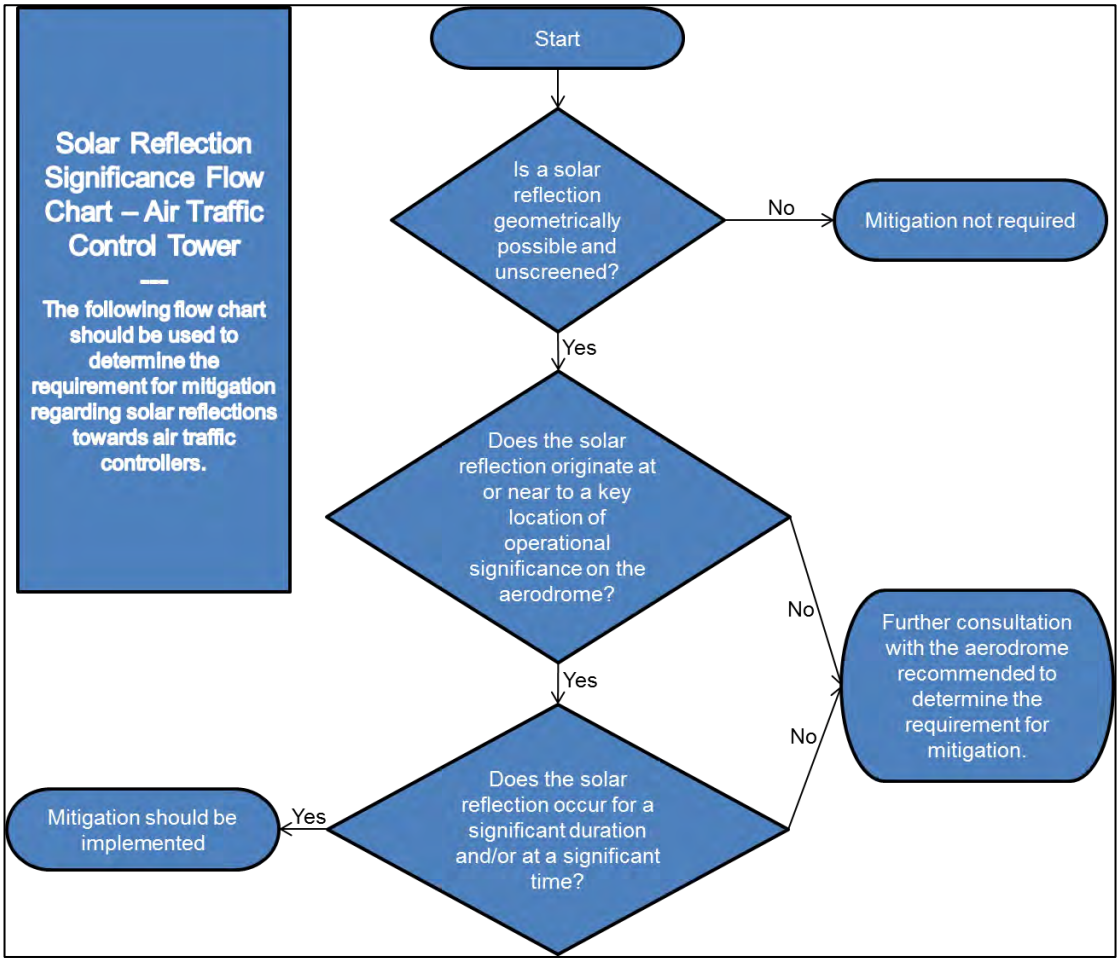
Impact Significance	Definition	Mitigation Requirement
No Impact	A solar reflection is not geometrically possible or will not be visible from the assessed receptor.	No mitigation required.
Low	A solar reflection is geometrically possible however any impact is considered to be small such that mitigation 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. Mitigation and consultation is recommended.	Mitigation will be required if the proposed solar development is to proceed.

Impact significance definition

The flow charts presented in the following sub-sections have been followed when determining the mitigation requirement for the assessed receptors.

Impact Significance Determination for an ATC Tower

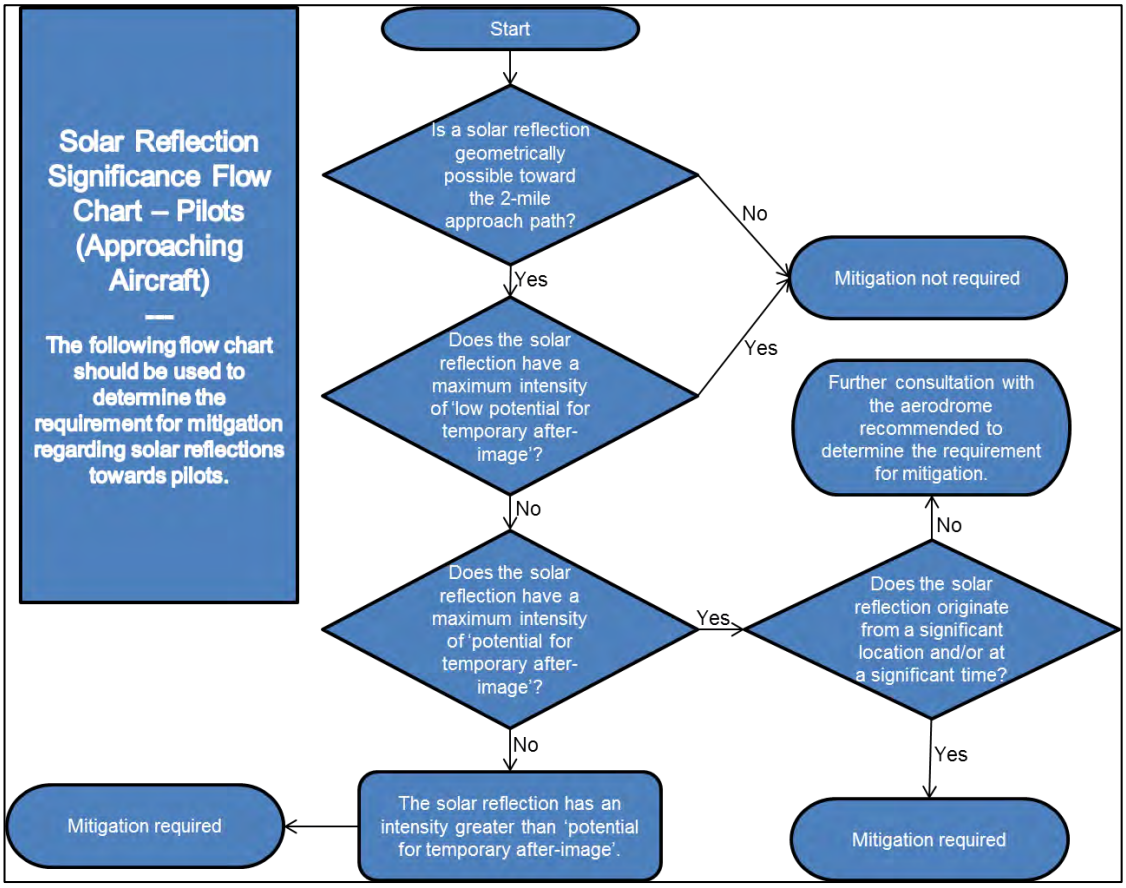
The flow chart presented below has been followed when determining the mitigation requirement for an ATC Tower.



ATC Tower mitigation requirement flow chart

Impact Significance Determination for Approaching Aircraft

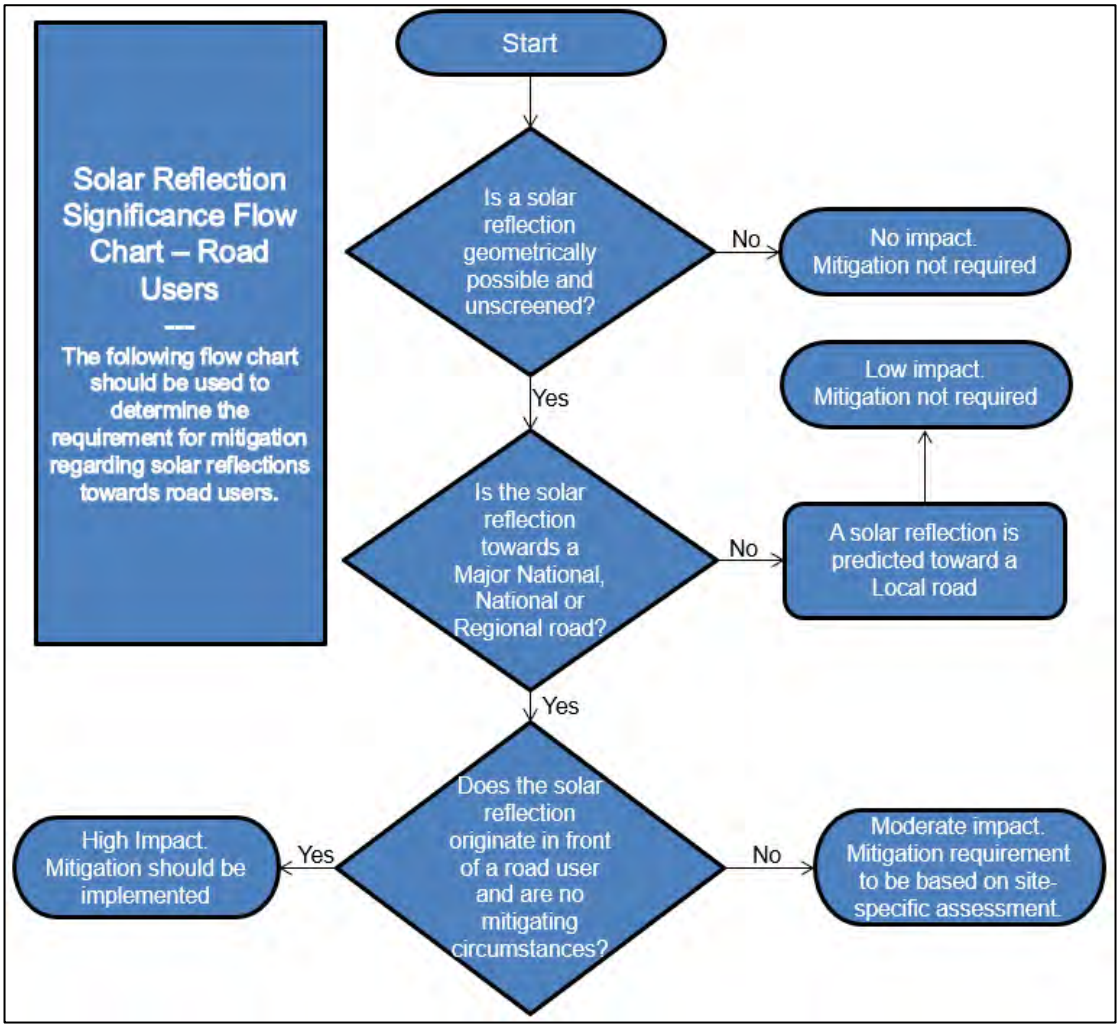
The flow chart presented below has been followed when determining the mitigation requirement for approaching aircraft.



Approaching aircraft receptor mitigation requirement flow chart

Impact Significance Determination for Road Receptors

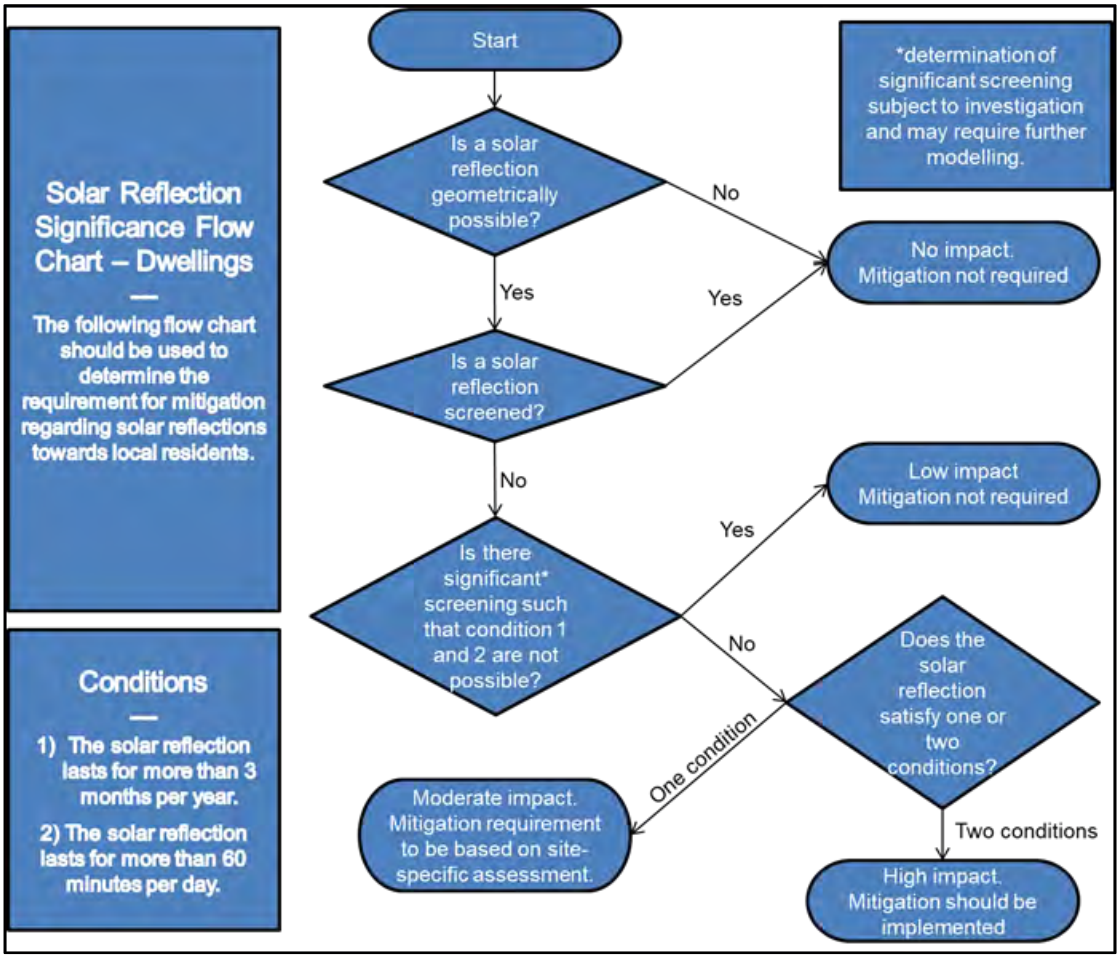
The flow chart presented below has been followed when determining the mitigation requirement for road receptors.



Road receptor mitigation requirement flow chart

Impact Significance Determination for Dwelling Receptors

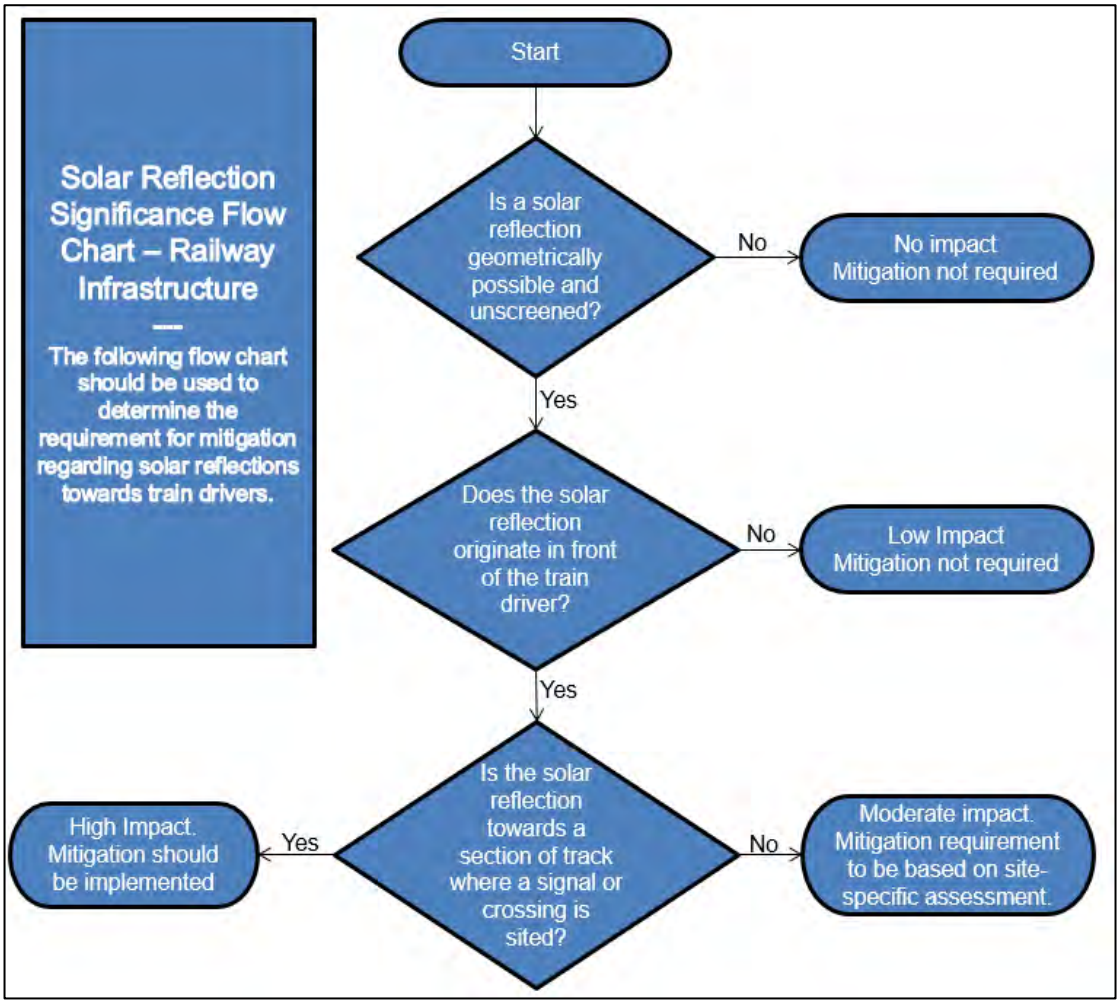
The flow chart presented below has been followed when determining the mitigation requirement for dwelling receptors.



Dwelling receptor mitigation requirement flow chart

Impact Significance Determination for Railway Receptors

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



Railway receptor impact significance flow chart

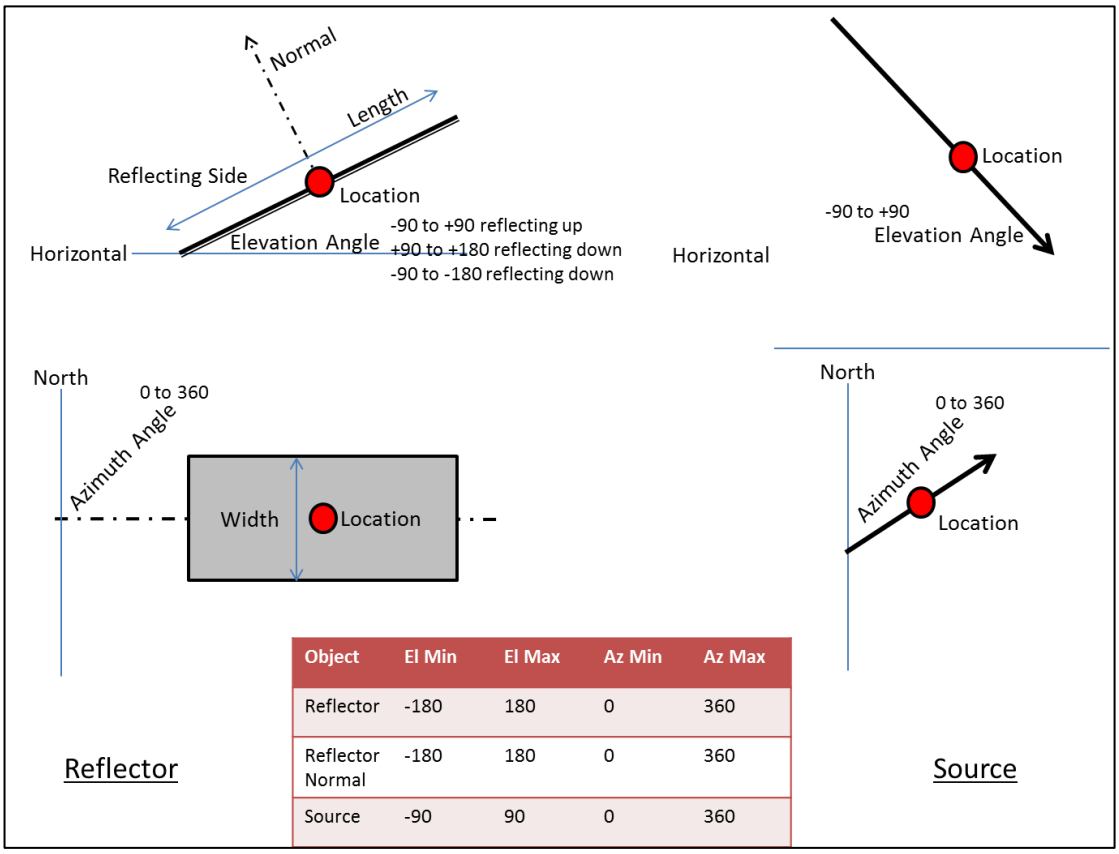
APPENDIX E – REFLECTION CALCULATIONS METHODOLOGY

Pager Power 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

Reflection calculation process

The following process is used to determine the 3D azimuth and elevation of a reflection:

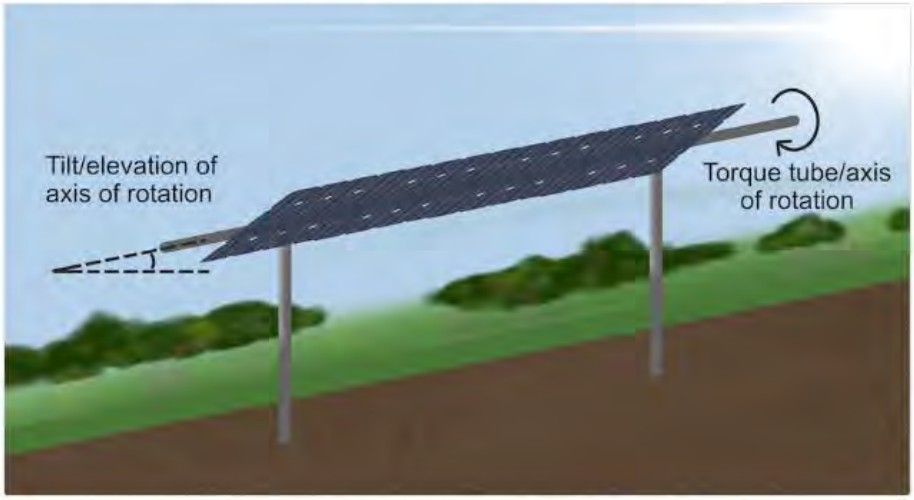
- Use the Latitude and Longitude of reflector as the reference for calculation purposes;
- Calculate the Azimuth and Elevation of the normal to the reflector;
- Calculate the 3D angle between the source and the normal;
- If this angle is less than 90 degrees a reflection will occur. If it is greater 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.

Forge Reflection Calculations Methodology

Extracts taken from the Forge Solar Model.

Tracking System Parameters

Single-axis module tracking systems are described by a unique set of parameters. These angular inputs model the tracking axis, rotation range and backtracking behavior. Dual-axis module tracking systems are assumed to track the sun at all times.



Single-axis tracking system with torque tube tilted due to geography

Tilt of tracking axis (°)
Tilt above flat ground of axis over which panels rotate (e.g. torque tube). System on flat, level ground would have axis tilt of 0°.

Orientation of tracking axis (°)
Azimuthal angle of axis over which panels rotate. Angle represents the facing of the axis and system. For example, typical tracking system in northern hemisphere has tracking axis oriented north-south with an orientation of 180°, allowing panels to rotate east-west with potential south-facing tilt. Typical tracking system in southern hemisphere runs south-north with axis orientation of 0°, yielding east-west rotation with potential north-facing tilt.

Offset angle of module (°)
Additional tilt angle of PV module elevated above tracking axis/torque tube. Offset angle is measured from the torque tube.

Maximum tracking angle (°)
Maximum angle of rotation of tracking system in one direction. For example, a typical system with a 120° range of rotation has a *max tracking angle* of 60° (east/west).

Resting angle (°)
Angle of rotation of panels when sun is outside tracking range. Used to model backtracking. Panels will revert to the position described by this rotation angle at all times when the sun is outside the rotation range. Setting this equal to the *maximum tracking angle* implies the panels do not backtrack.

ForgeSolar utilizes a simplified model of backtracking which assumes panels instantaneously revert to the *resting angle* whenever the sun is outside the rotation range. For example, panels with *max tracking angle* of 60° and *resting angle* of 0° would lie flat from sunrise until the sun enters the rotation range, and immediately after the sun leaves the rotation range until sunset daily.

Tracking System Parameters

APPENDIX F – ASSESSMENT LIMITATIONS AND ASSUMPTIONS

Pager Power's Model

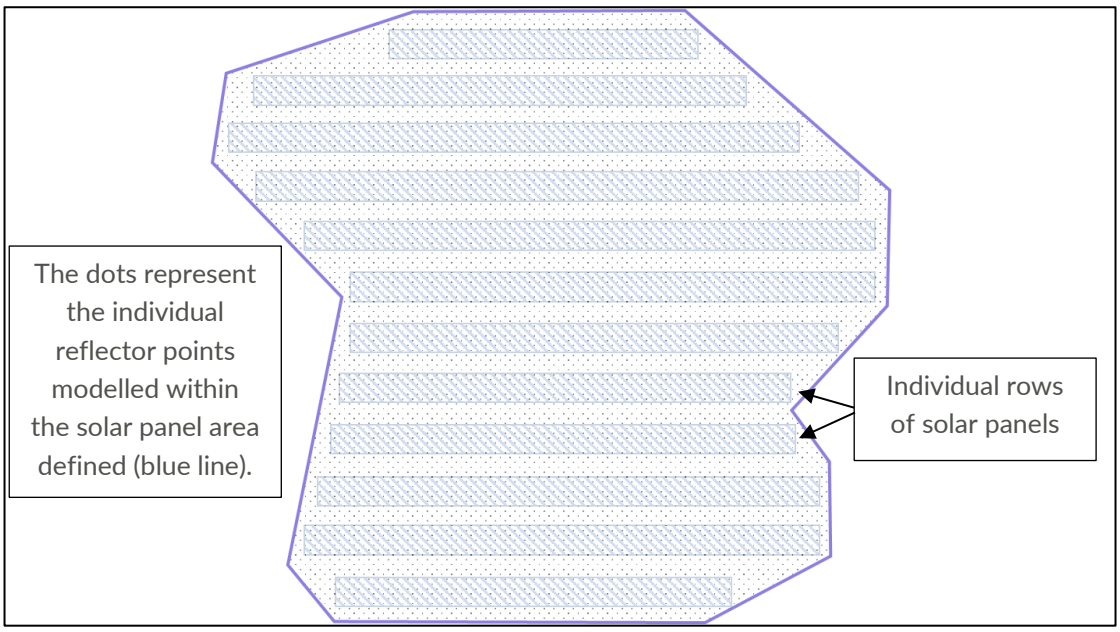
It is assumed that the panel elevation angle provided by the developer represents the elevation angle for all of the panels within each solar panel area defined.

It is assumed that the panel azimuth angle provided by the developer 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 of the solar panel has not been considered.

The model assumes that a receptor can view the face of every panel within the proposed 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 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.



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.

Forge's Sandia National Laboratories' (SGHAT) Model[36]

Summary of assumptions and abstractions required by the SGHAT/ForgeSolar analysis methodology

1. Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
2. Result data files and plots are now retained for two years after analysis completion. Files should be downloaded and saved if additional persistence is required.
3. The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
4. Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects analyses of path receptors.
5. Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
6. The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
7. The algorithm assumes that the PV array is aligned with a plane defined by the total heights of the coordinates outlined in the Google map. For more accuracy, the user should perform runs using minimum and maximum values for the vertex heights to bound the height of the plane containing the solar array. Doing so will expand the range of observed solar glare when compared to results using a single height value.
8. The algorithm does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
9. The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
10. The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
11. The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
12. Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
13. Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
14. Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
15. PV array tracking assumes the modules move instantly when tracking the sun, and when reverting to the rest position.

[36] https://www.forgesolar.com/help/#assumptions

APPENDIX G – RECEPTOR AND REFLECTOR AREA DETAILS

Aviation Receptor Data

ATC Tower

The table below presents the data for the ATC Tower.

Longitude (°)	Latitude (°)	Ground Height (m amsl)	Observer Height (m agl)	Assessed Altitude (m amsl)
-0.476662	52.610596	76.00	9.00	85.00

ATC tower receptor details

Runway 07 Approach

The table below presents the data for the assessed locations for aircraft on approach to runway 07.

ID	Longitude (°)	Latitude (°)	Assessed Altitude (metres amsl)
Receptor 01 –Threshold	-0.495122	52.609519	181.10
Receptor 02	-0.497405	52.609100	189.93
Receptor 03	-0.499688	52.608680	199.36
Receptor 04	-0.501971	52.608261	207.78
Receptor 05	-0.504253	52.607842	217.20
Receptor 06	-0.506536	52.607422	227.86
Receptor 07	-0.508819	52.607003	238.05
Receptor 08	-0.511102	52.606584	247.23
Receptor 09	-0.513385	52.606164	256.63
Receptor 10	-0.515668	52.605745	266.32
Receptor 11 – 1 mile	-0.517951	52.605326	274.74
Receptor 12	-0.520234	52.604906	282.16
Receptor 13	-0.522516	52.604487	290.04
Receptor 14	-0.524799	52.604068	299.01
Receptor 15	-0.527082	52.603648	306.92

ID	Longitude (°)	Latitude (°)	Assessed Altitude (metres amsl)
Receptor 16	-0.529365	52.603229	312.29
Receptor 17	-0.531648	52.602810	314.80
Receptor 18	-0.533931	52.602390	315.70
Receptor 19	-0.536214	52.601971	315.56
Receptor 20	-0.538497	52.601552	315.91
Receptor 21 – 2 miles	-0.540779	52.601132	315.19

Assessed receptor (aircraft) locations on the approach path for runway 07

Runway 25 Approach

The table below presents the data for the assessed locations for aircraft on approach to runway 25.

ID	Longitude (°)	Latitude (°)	Assessed Altitude (metres amsl)
Receptor 01 –Threshold	-0.456686	52.616592	164.39
Receptor 02	-0.454403	52.617011	169.81
Receptor 03	-0.452119	52.617429	175.51
Receptor 04	-0.449835	52.617848	179.70
Receptor 05	-0.447552	52.618266	183.35
Receptor 06	-0.445268	52.618685	191.65
Receptor 07	-0.442984	52.619104	199.82
Receptor 08	-0.440701	52.619522	202.24
Receptor 09	-0.438417	52.619941	205.05
Receptor 10	-0.436134	52.620359	206.31
Receptor 11 – 1 mile	-0.433850	52.620778	222.56
Receptor 12	-0.431566	52.621197	232.15
Receptor 13	-0.429283	52.621615	240.25
Receptor 14	-0.426999	52.622034	253.73
Receptor 15	-0.424716	52.622452	263.58

ID	Longitude (°)	Latitude (°)	Assessed Altitude (metres amsl)
Receptor 16	-0.422432	52.622871	271.00
Receptor 17	-0.420148	52.623290	278.23
Receptor 18	-0.417865	52.623708	283.85
Receptor 19	-0.415581	52.624127	289.27
Receptor 20	-0.413298	52.624545	294.69
Receptor 21 – 2 miles	-0.411014	52.624964	300.01

Assessed receptor (aircraft) locations on the approach path for runway 25

Road Receptor Data

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

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-0.483095	52.722753	41	-0.472103	52.689350
2	-0.483038	52.721847	42	-0.470701	52.689029
3	-0.482427	52.721014	43	-0.469268	52.689280
4	-0.481824	52.720182	44	-0.468420	52.690025
5	-0.481569	52.719285	45	-0.467430	52.690700
6	-0.481273	52.718403	46	-0.466424	52.691368
7	-0.480921	52.717526	47	-0.465888	52.692212
8	-0.480556	52.716649	48	-0.465148	52.692994
9	-0.480206	52.715771	49	-0.464234	52.693717
10	-0.479830	52.714897	50	-0.463299	52.694427
11	-0.479484	52.714018	51	-0.462242	52.695075
12	-0.479108	52.713138	52	-0.461086	52.695654
13	-0.478740	52.712258	53	-0.459808	52.696132
14	-0.478377	52.711379	54	-0.459011	52.696905
15	-0.478024	52.710500	55	-0.458091	52.697621
16	-0.477647	52.709633	56	-0.457020	52.698257

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
17	-0.477267	52.708766	57	-0.455918	52.698863
18	-0.476904	52.707900	58	-0.454913	52.699529
19	-0.476512	52.707028	59	-0.454212	52.700327
20	-0.476122	52.706152	60	-0.453509	52.701132
21	-0.475684	52.705280	61	-0.452463	52.701784
22	-0.475260	52.704414	62	-0.451005	52.701963
23	-0.474835	52.703552	63	-0.449522	52.701882
24	-0.474410	52.702691	64	-0.448035	52.701838
25	-0.473901	52.701839	65	-0.446808	52.702359
26	-0.473538	52.700957	66	-0.446333	52.703221
27	-0.473437	52.700063	67	-0.445889	52.704089
28	-0.473357	52.699158	68	-0.445424	52.704946
29	-0.473375	52.698273	69	-0.444958	52.705802
30	-0.473676	52.697409	70	-0.444545	52.706590
31	-0.474243	52.696569	71	-0.444044	52.707534
32	-0.474477	52.695679	72	-0.443572	52.708393
33	-0.474548	52.694779	73	-0.443017	52.709234
34	-0.474732	52.693881	74	-0.442887	52.710142
35	-0.475046	52.693011	75	-0.442904	52.711061
36	-0.475113	52.692110	76	-0.442921	52.711967
37	-0.474986	52.691211	77	-0.443051	52.712876
38	-0.475295	52.690328	78	-0.443182	52.713782
39	-0.475076	52.689437	79	-0.442975	52.714686
40	-0.473585	52.689467			

Road Receptor data

Dwelling Receptor Data

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

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-0.503395	52.719127	91	-0.457184	52.698503
2	-0.489796	52.719288	92	-0.457765	52.698217
3	-0.488500	52.720279	93	-0.462162	52.694656
4	-0.488776	52.719984	94	-0.462477	52.694382
5	-0.481330	52.719478	95	-0.465799	52.692806
6	-0.486413	52.716142	96	-0.466133	52.692426
7	-0.479136	52.713708	97	-0.466486	52.692078
8	-0.480660	52.710828	98	-0.466642	52.691914
9	-0.467933	52.710649	99	-0.466753	52.691765
10	-0.492012	52.705195	100	-0.466925	52.691593
11	-0.493978	52.703885	101	-0.468518	52.691523
12	-0.493484	52.703701	102	-0.468503	52.691068
13	-0.479943	52.697653	103	-0.468146	52.690689
14	-0.476905	52.699108	104	-0.467591	52.690369
15	-0.450624	52.713271	105	-0.468122	52.690403
16	-0.450010	52.713131	106	-0.468320	52.690309
17	-0.449499	52.713178	107	-0.469387	52.690053
18	-0.448851	52.713152	108	-0.476876	52.692567
19	-0.448347	52.712682	109	-0.474977	52.690013
20	-0.447833	52.712196	110	-0.474364	52.689962
21	-0.447065	52.711332	111	-0.474929	52.689706
22	-0.446425	52.711301	112	-0.474640	52.689556
23	-0.446138	52.712076	113	-0.473873	52.689674
24	-0.445545	52.712172	114	-0.473466	52.689642

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
25	-0.444756	52.711781	115	-0.473051	52.689654
26	-0.444179	52.711768	116	-0.472748	52.689683
27	-0.443619	52.711859	117	-0.472257	52.689691
28	-0.443286	52.712166	118	-0.471817	52.689583
29	-0.444244	52.709763	119	-0.471576	52.689487
30	-0.425525	52.705240	120	-0.471316	52.689420
31	-0.421579	52.704645	121	-0.470797	52.689263
32	-0.416750	52.705578	122	-0.470288	52.689231
33	-0.444407	52.706111	123	-0.469760	52.689222
34	-0.444112	52.705917	124	-0.469586	52.689510
35	-0.452407	52.705526	125	-0.469172	52.689116
36	-0.451261	52.705560	126	-0.468980	52.688534
37	-0.451660	52.705044	127	-0.468164	52.688756
38	-0.451633	52.704207	128	-0.467811	52.688797
39	-0.451868	52.703832	129	-0.468021	52.688113
40	-0.452061	52.703482	130	-0.467527	52.687734
41	-0.452726	52.703377	131	-0.466956	52.687543
42	-0.453243	52.703288	132	-0.466178	52.687367
43	-0.453568	52.703159	133	-0.465368	52.687432
44	-0.453837	52.703121	134	-0.464731	52.687196
45	-0.454308	52.703034	135	-0.464151	52.687184
46	-0.454784	52.703051	136	-0.463505	52.687073
47	-0.455315	52.702931	137	-0.462966	52.686817
48	-0.455747	52.702939	138	-0.462229	52.686735
49	-0.456317	52.702859	139	-0.461712	52.686567
50	-0.456187	52.702742	140	-0.461165	52.686255

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
51	-0.456050	52.702612	141	-0.461111	52.685975
52	-0.455900	52.702419	142	-0.461927	52.685796
53	-0.455704	52.702289	143	-0.462354	52.685581
54	-0.455457	52.702071	144	-0.461655	52.685138
55	-0.455126	52.701901	145	-0.430645	52.686253
56	-0.452019	52.703095	146	-0.459263	52.680872
57	-0.452308	52.702746	147	-0.456667	52.680821
58	-0.451890	52.702443	148	-0.455970	52.680780
59	-0.451632	52.702127	149	-0.455148	52.680766
60	-0.451208	52.702123	150	-0.454717	52.680977
61	-0.450831	52.702134	151	-0.457038	52.680244
62	-0.450200	52.702175	152	-0.456874	52.679971
63	-0.449580	52.702108	153	-0.457466	52.679313
64	-0.448810	52.701644	154	-0.457146	52.679119
65	-0.449675	52.701502	155	-0.456932	52.678867
66	-0.450333	52.701662	156	-0.457627	52.678867
67	-0.450916	52.701676	157	-0.457930	52.678703
68	-0.451329	52.701652	158	-0.458212	52.678570
69	-0.451693	52.701666	159	-0.458840	52.678388
70	-0.452100	52.701680	160	-0.459071	52.674801
71	-0.452309	52.701409	161	-0.459598	52.674176
72	-0.452414	52.701178	162	-0.459097	52.673768
73	-0.453265	52.700969	163	-0.454329	52.676019
74	-0.453720	52.700526	164	-0.451831	52.674460
75	-0.453404	52.700313	165	-0.439550	52.675458
76	-0.453295	52.700158	166	-0.436506	52.677076

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
77	-0.452859	52.699910	167	-0.423578	52.674265
78	-0.452609	52.699661	168	-0.422927	52.673677
79	-0.454666	52.700055	169	-0.454077	52.670920
80	-0.455101	52.699727	170	-0.453310	52.669909
81	-0.455513	52.699469	171	-0.453830	52.664229
82	-0.454817	52.699357	172	-0.446230	52.664784
83	-0.454414	52.699307	173	-0.428499	52.664900
84	-0.454202	52.699080	174	-0.426835	52.664614
85	-0.454447	52.698885	175	-0.427659	52.664199
86	-0.454671	52.698682	176	-0.427537	52.663753
87	-0.455101	52.698730	177	-0.433987	52.662335
88	-0.455271	52.698995	178	-0.429975	52.660484
89	-0.456446	52.699341	179	-0.429040	52.660755
90	-0.456598	52.698801			

Dwelling receptor data

Railway Receptor Data

The table below presents the data for the assessed railway receptors.

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-0.468040	52.714083	27	-0.446678	52.695109
2	-0.467283	52.713309	28	-0.445643	52.694466
3	-0.466543	52.712531	29	-0.444573	52.693853
4	-0.465778	52.711753	30	-0.443514	52.693213
5	-0.465015	52.710971	31	-0.442418	52.692610
6	-0.464266	52.710190	32	-0.441319	52.691999
7	-0.463505	52.709409	33	-0.440178	52.691423
8	-0.462760	52.708639	34	-0.439036	52.690842

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
9	-0.461988	52.707857	35	-0.437867	52.690281
10	-0.461213	52.707087	36	-0.436712	52.689712
11	-0.460473	52.706298	37	-0.435523	52.689173
12	-0.459726	52.705522	38	-0.434354	52.688612
13	-0.458976	52.704744	39	-0.433167	52.688057
14	-0.458202	52.703979	40	-0.431976	52.687505
15	-0.457412	52.703217	41	-0.430812	52.686949
16	-0.456578	52.702478	42	-0.429648	52.686386
17	-0.455725	52.701743	43	-0.428470	52.685833
18	-0.454864	52.700994	44	-0.427281	52.685286
19	-0.453995	52.700262	45	-0.426102	52.684736
20	-0.453477	52.699841	46	-0.424923	52.684188
21	-0.452568	52.699130	47	-0.423757	52.683627
22	-0.451628	52.698436	48	-0.422589	52.683075
23	-0.450665	52.697755	49	-0.421410	52.682529
24	-0.449706	52.697075	50	-0.420238	52.681977
25	-0.448729	52.696408	51	-0.419076	52.681428
26	-0.447718	52.695752	52	-0.417894	52.680881

Railway receptor data

Modelled Reflector Areas

The tables in the following sub-sections present the data for the modelled reflector areas.

Area 1

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-0.506706	52.710469	19	-0.497683	52.707917
2	-0.506769	52.709567	20	-0.498017	52.707832
3	-0.506798	52.708966	21	-0.498650	52.708118

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
4	-0.507041	52.708443	22	-0.496719	52.710520
5	-0.506978	52.708076	23	-0.497329	52.710806
6	-0.507061	52.707814	24	-0.497910	52.710838
7	-0.505033	52.707832	25	-0.498218	52.710990
8	-0.500009	52.706244	26	-0.498964	52.711343
9	-0.495374	52.704697	27	-0.499664	52.711546
10	-0.494694	52.705563	28	-0.500112	52.711833
11	-0.494168	52.705967	29	-0.501453	52.711927
12	-0.494086	52.706303	30	-0.501696	52.712077
13	-0.493814	52.707009	31	-0.503328	52.711990
14	-0.493276	52.708121	32	-0.503770	52.712241
15	-0.492982	52.708645	33	-0.504317	52.712896
16	-0.494321	52.708864	34	-0.504916	52.713262
17	-0.495292	52.708847	35	-0.505491	52.713290
18	-0.496724	52.708541	36	-0.506852	52.711224

Reflector area 1 data

Area 2

ID	Longitude	Latitude	ID	Longitude	Latitude
1	-0.491131	52.709565	7	-0.489377	52.710894
2	-0.490595	52.709575	8	-0.489712	52.710881
3	-0.489284	52.709060	9	-0.492804	52.710267
4	-0.488602	52.708915	10	-0.493067	52.710184
5	-0.487484	52.708312	11	-0.493556	52.709979
6	-0.487831	52.710709	12	-0.492456	52.709733

Reflector area 2 data

Area 3

ID	Longitude	Latitude	ID	Longitude	Latitude
1	-0.485915	52.711147	5	-0.482346	52.713768
2	-0.484065	52.711045	6	-0.486477	52.713930
3	-0.482978	52.710965	7	-0.487390	52.711113
4	-0.481530	52.711136			

Reflector area 3 data

Area 4

ID	Longitude	Latitude	ID	Longitude	Latitude
1	-0.484230	52.702963	13	-0.462672	52.702472
2	-0.474303	52.703830	14	-0.458661	52.703646
3	-0.472866	52.701314	15	-0.461344	52.706321
4	-0.472955	52.697659	16	-0.461733	52.706604
5	-0.470042	52.698349	17	-0.462213	52.706668
6	-0.468335	52.696429	18	-0.466063	52.706540
7	-0.466266	52.696166	19	-0.469459	52.709664
8	-0.465302	52.695727	20	-0.477641	52.710595
9	-0.462620	52.695679	21	-0.476240	52.707248
10	-0.460919	52.696213	22	-0.485582	52.706545
11	-0.462052	52.697378	23	-0.484557	52.704361
12	-0.460532	52.697887			

Reflector area 4 data

Area 5

ID	Longitude	Latitude	ID	Longitude	Latitude
1	-0.453236	52.691749	8	-0.448786	52.693609
2	-0.452074	52.691076	9	-0.448612	52.693867
3	-0.452074	52.691390	10	-0.448891	52.694358
4	-0.449516	52.693040	11	-0.450219	52.694004
5	-0.448984	52.693132	12	-0.454017	52.693131
6	-0.448758	52.692935	13	-0.454450	52.692491
7	-0.448300	52.693219	14	-0.453811	52.692218

Reflector area 5 data

Area 6

ID	Longitude	Latitude	ID	Longitude	Latitude
1	-0.441781	52.704263	21	-0.430575	52.695806
2	-0.442286	52.702763	22	-0.429662	52.697592
3	-0.442211	52.701529	23	-0.428784	52.697561
4	-0.441855	52.701132	24	-0.430118	52.694762
5	-0.443048	52.701257	25	-0.423009	52.696110
6	-0.445787	52.698222	26	-0.423816	52.697483
7	-0.446507	52.697674	27	-0.419521	52.698324
8	-0.447592	52.697150	28	-0.419899	52.700291
9	-0.447137	52.696700	29	-0.420592	52.700328
10	-0.446934	52.696226	30	-0.421789	52.702432
11	-0.442115	52.692929	31	-0.428457	52.701585
12	-0.435729	52.689694	32	-0.428765	52.702622
13	-0.434012	52.689041	33	-0.429098	52.702765
14	-0.432347	52.688212	34	-0.429810	52.702522
15	-0.432176	52.688478	35	-0.434229	52.702924

ID	Longitude	Latitude	ID	Longitude	Latitude
16	-0.432462	52.690779	36	-0.434663	52.704182
17	-0.430607	52.692390	37	-0.435390	52.705772
18	-0.430401	52.693062	38	-0.436054	52.706792
19	-0.430686	52.693834	39	-0.442076	52.706295
20	-0.430234	52.694506	40	-0.442015	52.705261

Reflector area 6 data

Area 7

ID	Longitude	Latitude	ID	Longitude	Latitude
1	-0.448264	52.688918	54	-0.429961	52.676710
2	-0.447786	52.688630	55	-0.430918	52.678165
3	-0.446517	52.687770	56	-0.431492	52.678660
4	-0.445086	52.686772	57	-0.429741	52.679064
5	-0.444229	52.687087	58	-0.430512	52.679710
6	-0.445571	52.688599	59	-0.430982	52.680417
7	-0.444325	52.689186	60	-0.431190	52.680876
8	-0.443164	52.688372	61	-0.431448	52.681313
9	-0.442014	52.687600	62	-0.431757	52.681649
10	-0.440417	52.687982	63	-0.432116	52.682020
11	-0.437748	52.686163	64	-0.432672	52.682391
12	-0.442760	52.685182	65	-0.432967	52.682739
13	-0.440304	52.683257	66	-0.431001	52.682915
14	-0.439558	52.681892	67	-0.430651	52.681187
15	-0.440188	52.681272	68	-0.430514	52.680941
16	-0.441362	52.680299	69	-0.426332	52.681077
17	-0.442491	52.680052	70	-0.426658	52.682734
18	-0.443459	52.679708	71	-0.424227	52.682628

ID	Longitude	Latitude	ID	Longitude	Latitude
19	-0.445055	52.678955	72	-0.424227	52.682896
20	-0.442765	52.677119	73	-0.424118	52.683129
21	-0.444794	52.676860	74	-0.423756	52.683478
22	-0.446514	52.677077	75	-0.424274	52.683626
23	-0.447008	52.677163	76	-0.424514	52.683670
24	-0.449049	52.674979	77	-0.425176	52.683605
25	-0.450020	52.674236	78	-0.425695	52.683678
26	-0.452961	52.672811	79	-0.426886	52.683438
27	-0.449516	52.671718	80	-0.433389	52.683961
28	-0.449377	52.671925	81	-0.433261	52.685081
29	-0.448493	52.671708	82	-0.437438	52.685926
30	-0.447785	52.671534	83	-0.437291	52.686050
31	-0.445888	52.671332	84	-0.437379	52.686320
32	-0.443472	52.671222	85	-0.437082	52.686518
33	-0.442815	52.672868	86	-0.436640	52.686480
34	-0.445402	52.673731	87	-0.436343	52.686713
35	-0.442576	52.674278	88	-0.436549	52.686913
36	-0.442596	52.674645	89	-0.437378	52.686985
37	-0.441655	52.675606	90	-0.437584	52.687255
38	-0.442544	52.676708	91	-0.437377	52.687452
39	-0.441191	52.677118	92	-0.438591	52.688207
40	-0.436962	52.678372	93	-0.439599	52.688477
41	-0.436429	52.677809	94	-0.442917	52.689197
42	-0.435539	52.677679	95	-0.443509	52.689520
43	-0.435077	52.677268	96	-0.444221	52.690024
44	-0.434899	52.676921	97	-0.444811	52.690598

ID	Longitude	Latitude	ID	Longitude	Latitude
45	-0.435218	52.676683	98	-0.445405	52.690886
46	-0.431332	52.672979	99	-0.445908	52.691156
47	-0.430102	52.671628	100	-0.446764	52.691856
48	-0.428924	52.668850	101	-0.447226	52.691171
49	-0.425620	52.668334	102	-0.447920	52.690648
50	-0.425238	52.668366	103	-0.448237	52.690307
51	-0.427548	52.673968	104	-0.449196	52.689264
52	-0.428223	52.673707	105	-0.448776	52.689056
53	-0.430081	52.676366			

Reflector area 7 data

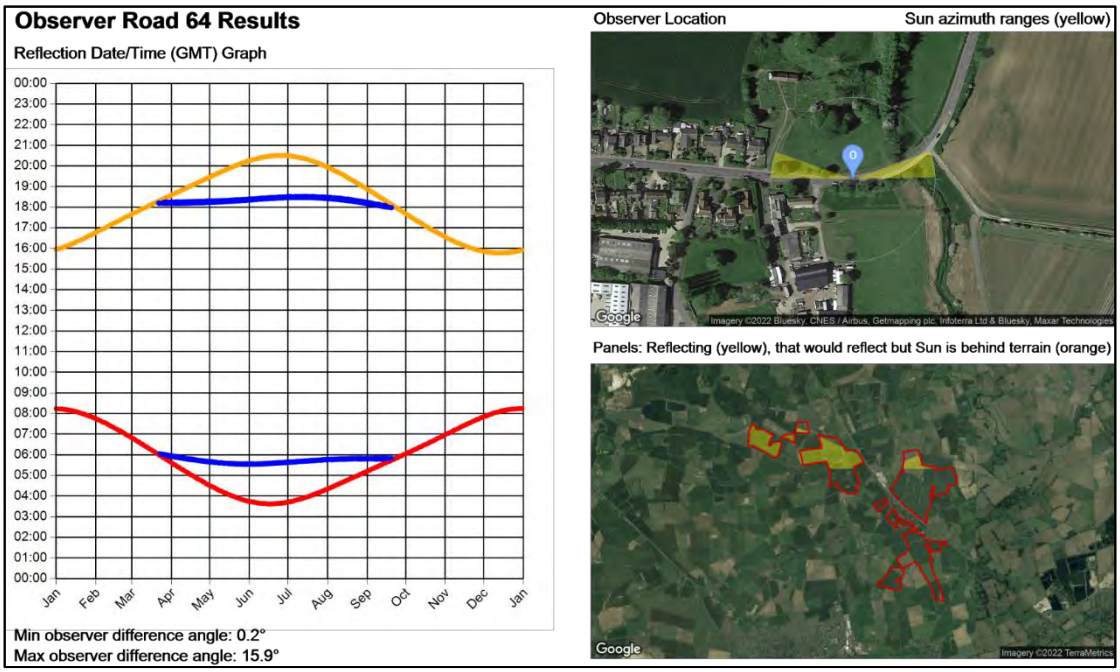
APPENDIX H – GEOMETRIC CALCULATION RESULTS

Fixed Panels

The charts for the receptors for which mitigation has been recommended are shown on the following pages. 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).

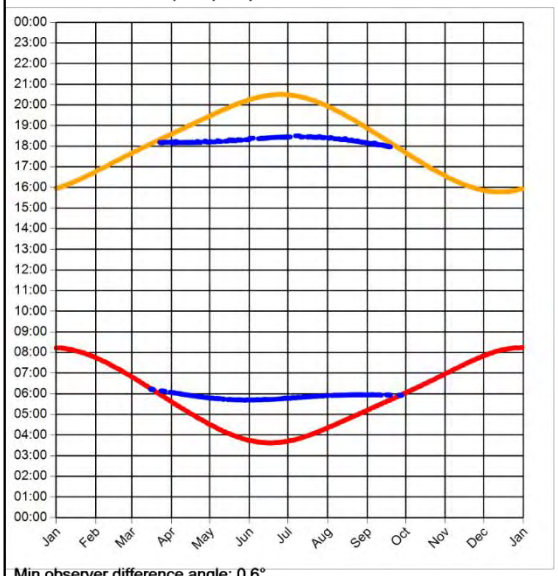
Road Receptors



Dwelling Receptors

Observer Dwelling 165 Results

Reflection Date/Time (GMT) Graph



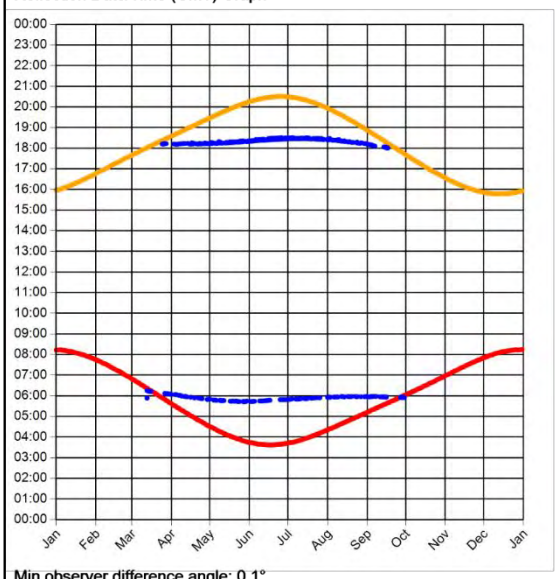
Min observer difference angle: 0.6°
Max observer difference angle: 17.8°

Observer Location — Sun azimuth ranges (yellow)

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

Observer Dwelling 166 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 18.7°

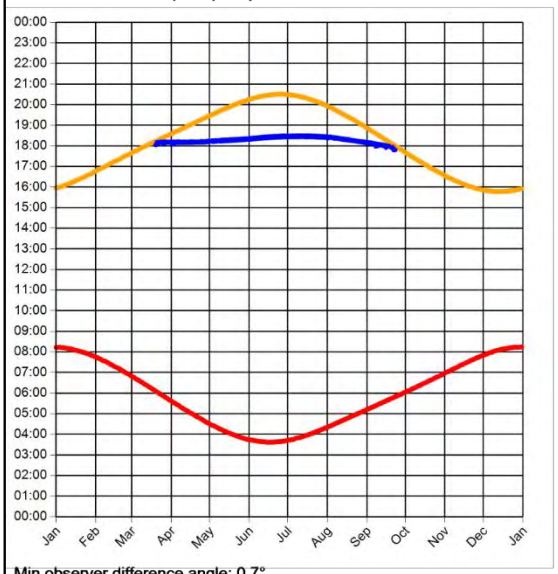
Observer Location — Sun azimuth ranges (yellow)

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

Train Driver Receptors

Observer Train Driver 47 Results

Reflection Date/Time (GMT) Graph



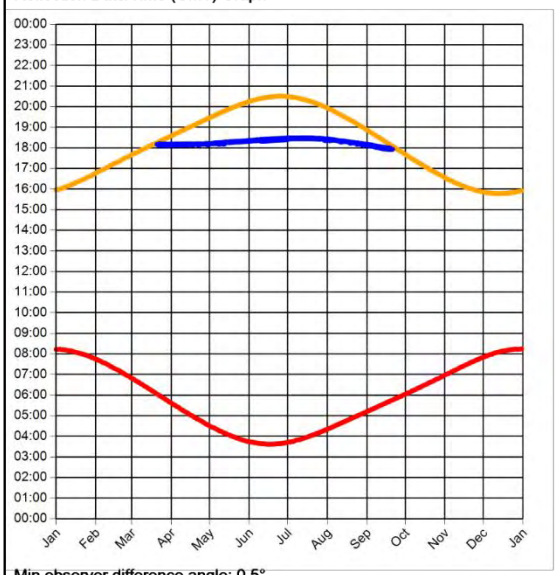
Min observer difference angle: 0.7°
Max observer difference angle: 16.2°

Observer Location — Sun azimuth range is 268.7° - 289.3° (yellow)

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

Observer Train Driver 48 Results

Reflection Date/Time (GMT) Graph



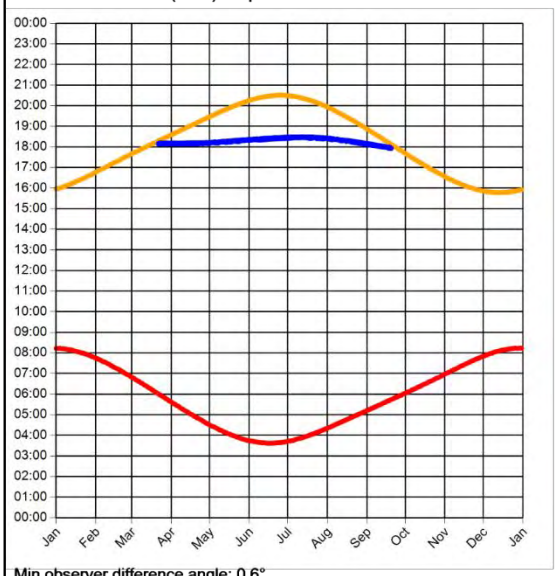
Min observer difference angle: 0.5°
Max observer difference angle: 17.6°

Observer Location — Sun azimuth range is 270.5° - 289.1° (yellow)

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

Observer Train Driver 49 Results

Reflection Date/Time (GMT) Graph



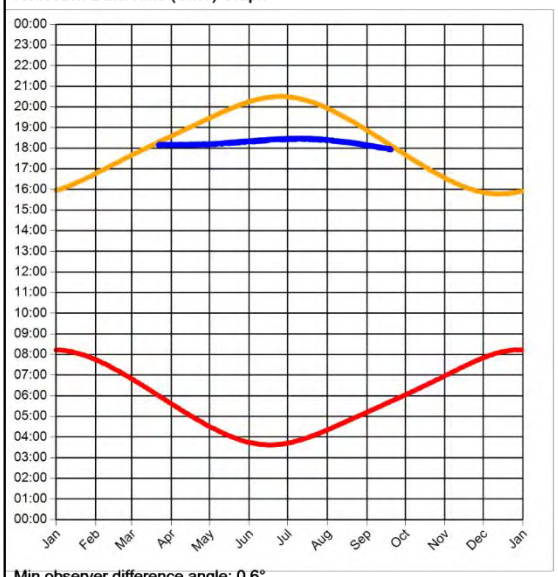
Min observer difference angle: 0.6°
Max observer difference angle: 17°

Observer Location Sun azimuth range is 270.6° - 289.1° (yellow)

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

Observer Train Driver 50 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.6°
Max observer difference angle: 17°

Observer Location Sun azimuth range is 270.6° - 289.1° (yellow)

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

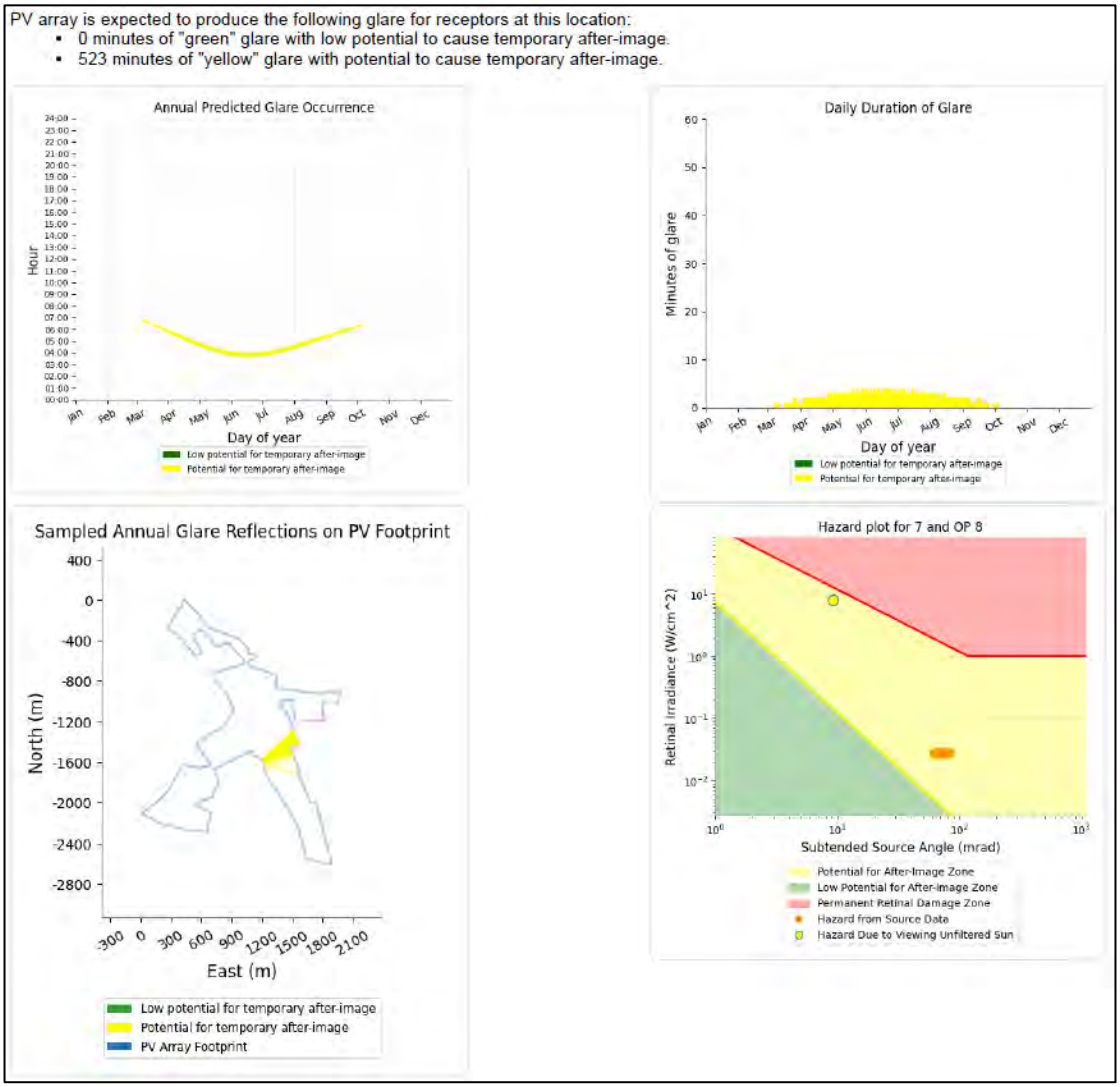
Tracker Panels

The charts for the receptors for which mitigation has been recommended are shown on the following pages. Each chart shows:

- The reflection date/time graph – top left graph. This relates to reflections from the yellow areas;
- The daily duration of glare – top right image;
- Hazard plot categorising the glare – bottom right image;
- The reflecting panels – bottom left 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.

Dwelling Receptors

Dwelling 166

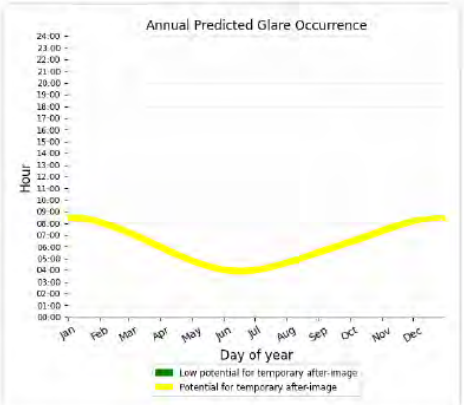


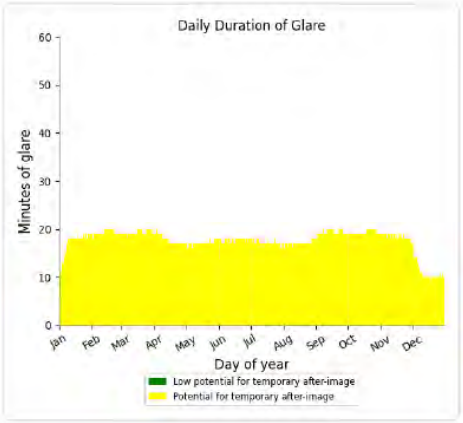
Train Driver Receptors

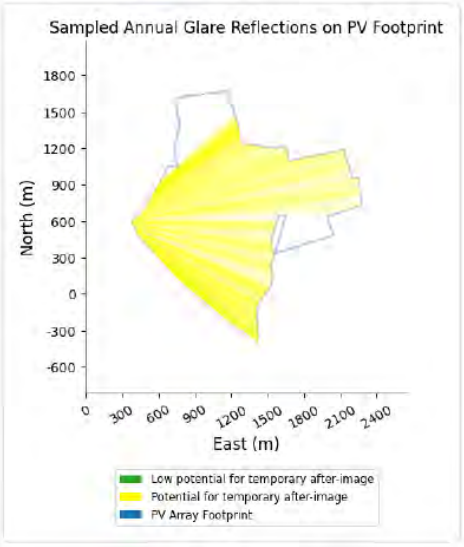
Train Driver 24

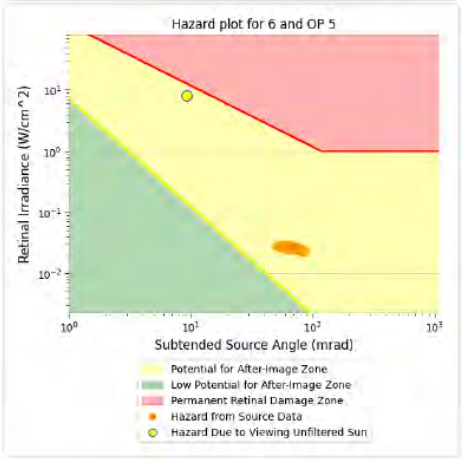
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 6,394 minutes of "yellow" glare with potential to cause temporary after-image.



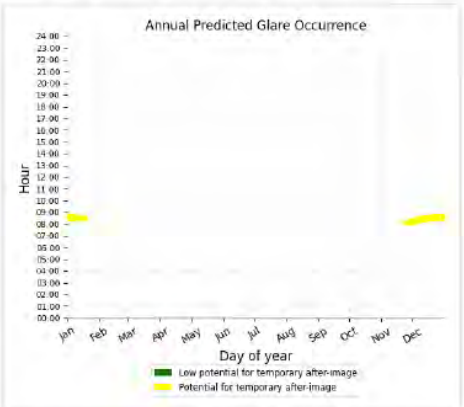


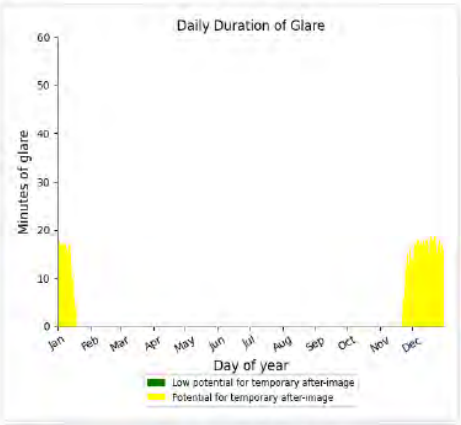


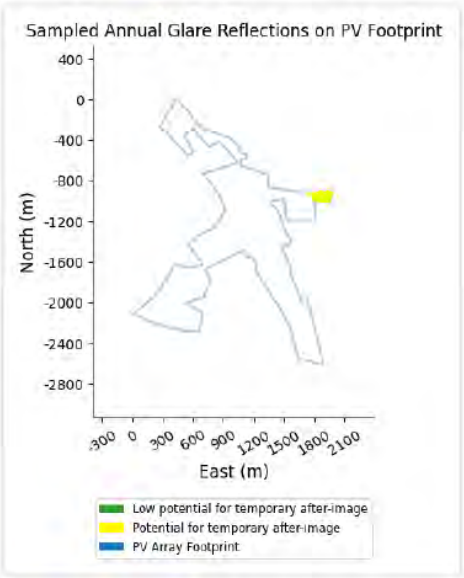


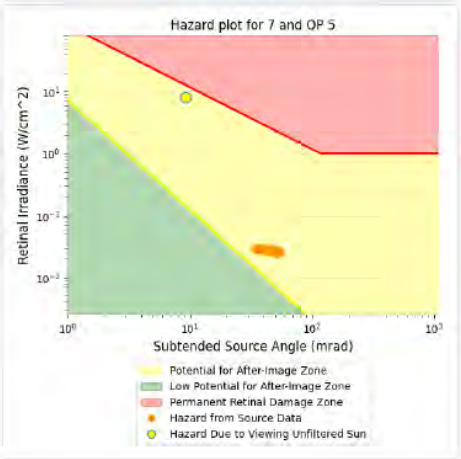
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 887 minutes of "yellow" glare with potential to cause temporary after-image.





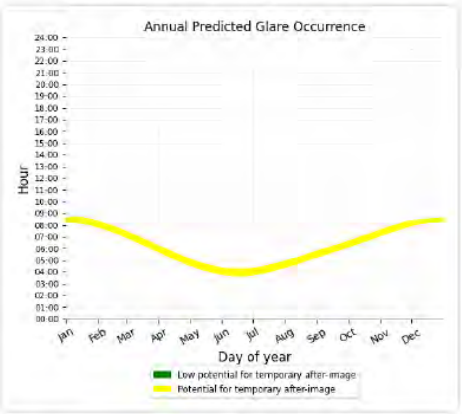


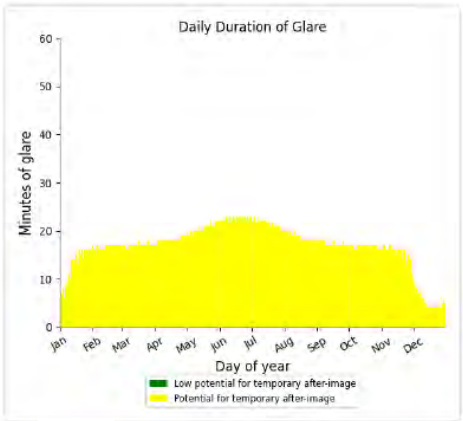


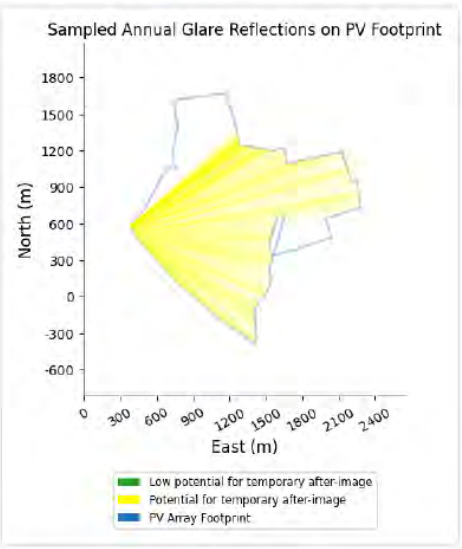
Train Driver 25

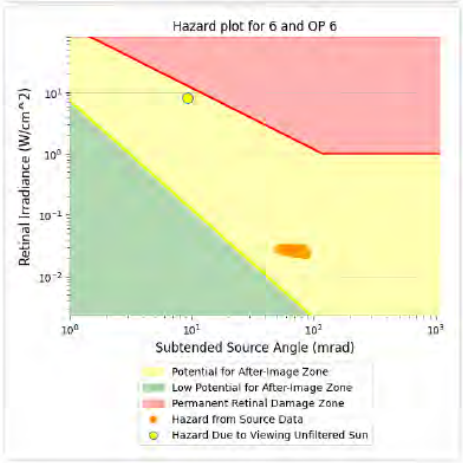
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 6,173 minutes of "yellow" glare with potential to cause temporary after-image.



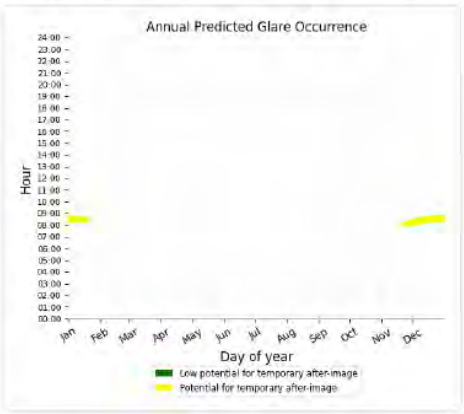


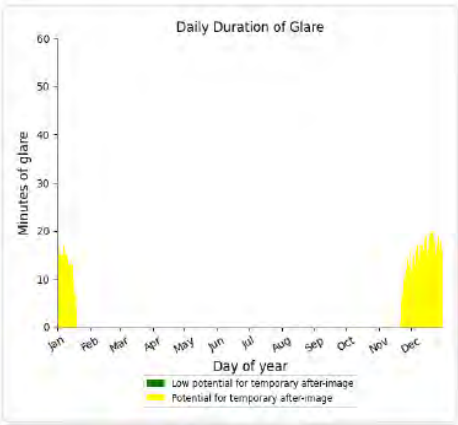


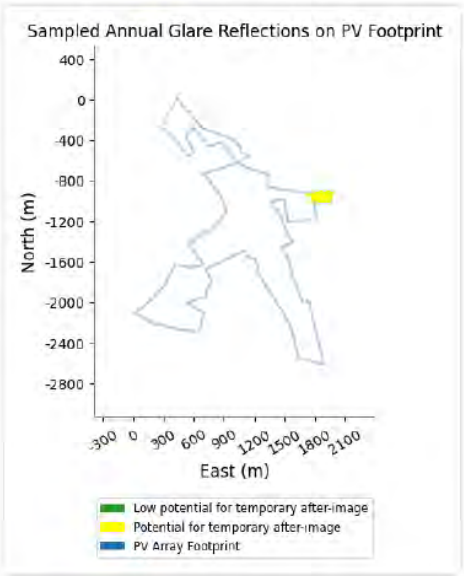


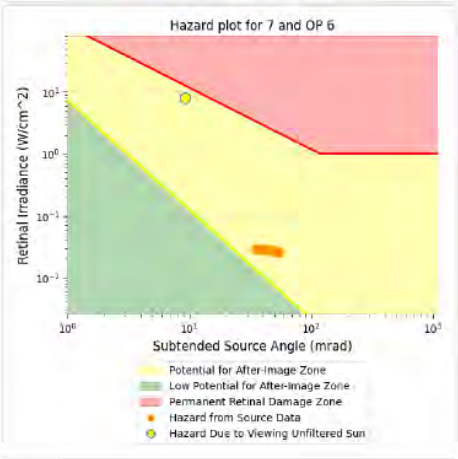
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 862 minutes of "yellow" glare with potential to cause temporary after-image.





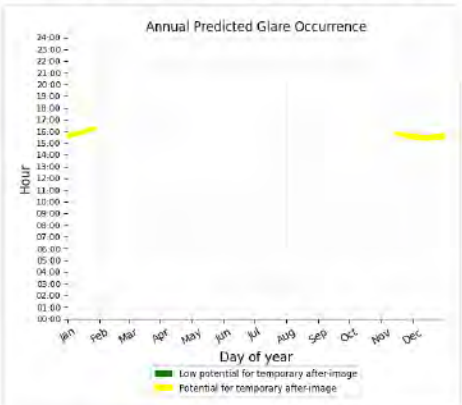


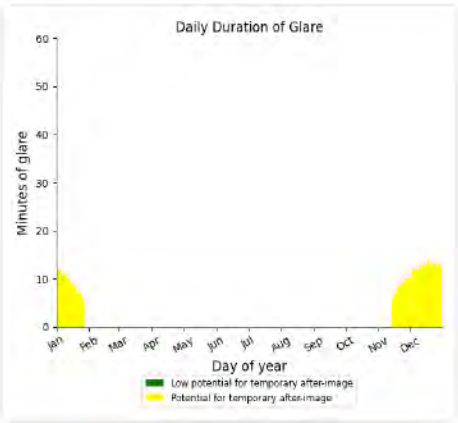


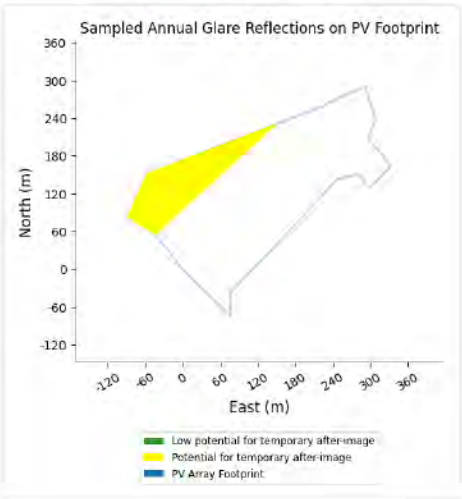
Train Driver 26

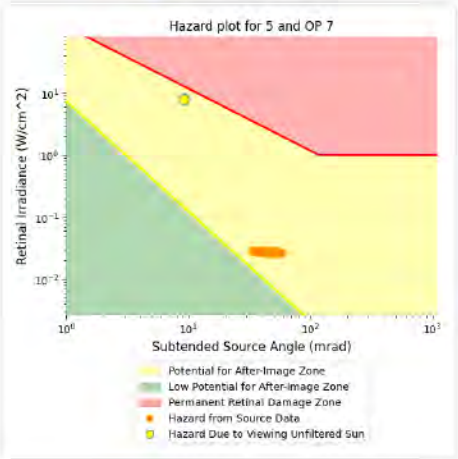
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 783 minutes of "yellow" glare with potential to cause temporary after-image.



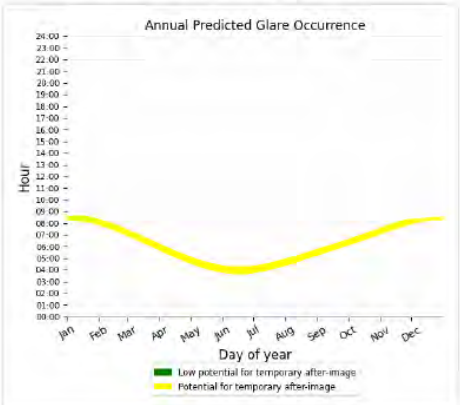


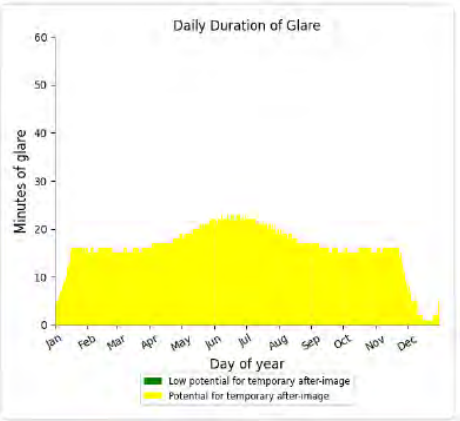


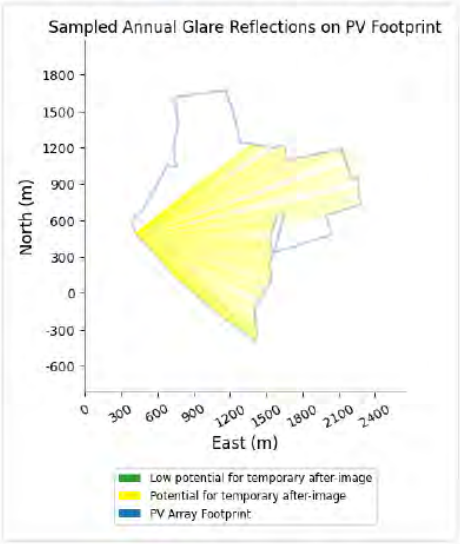


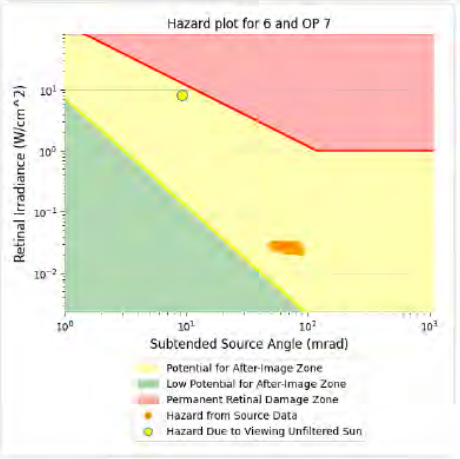
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 5,822 minutes of "yellow" glare with potential to cause temporary after-image.



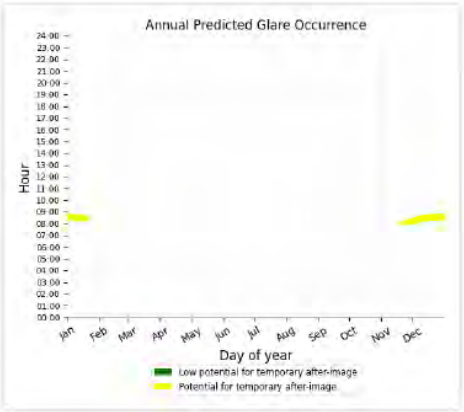


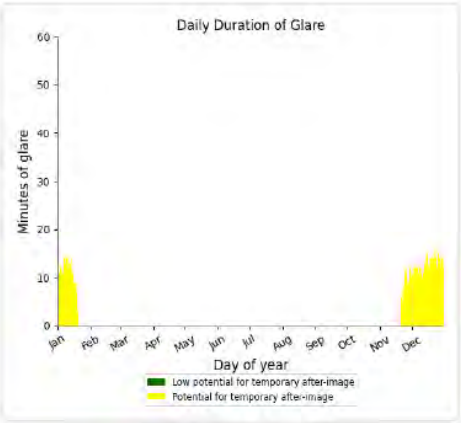


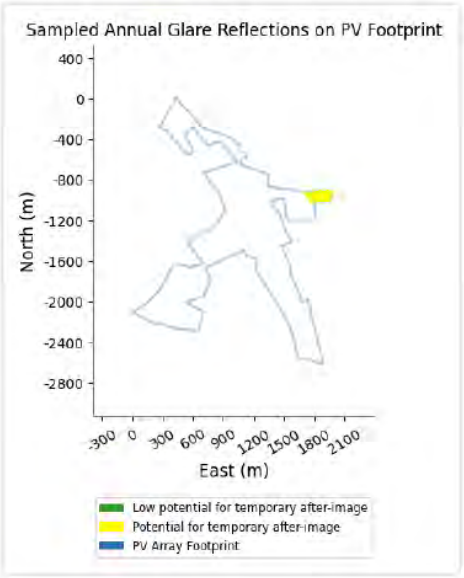


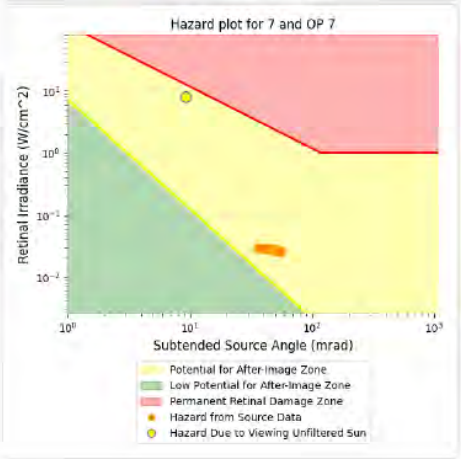
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 712 minutes of "yellow" glare with potential to cause temporary after-image.





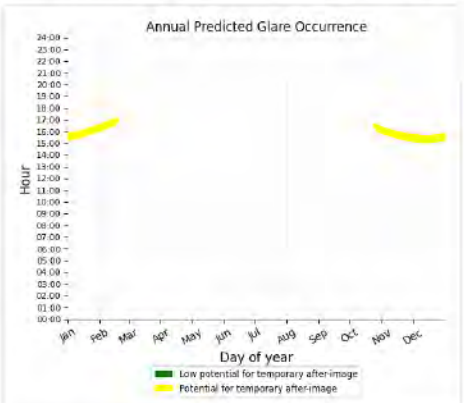


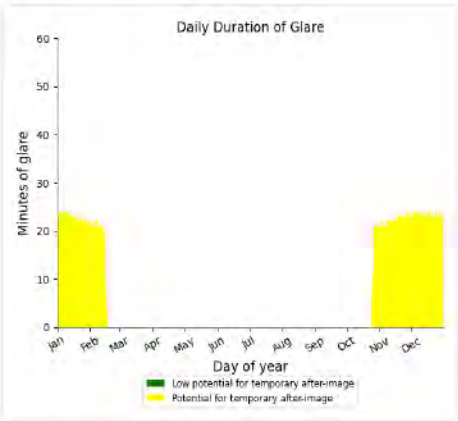


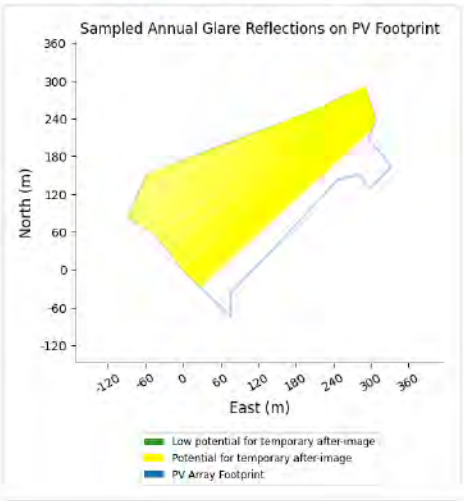
Train Driver 27

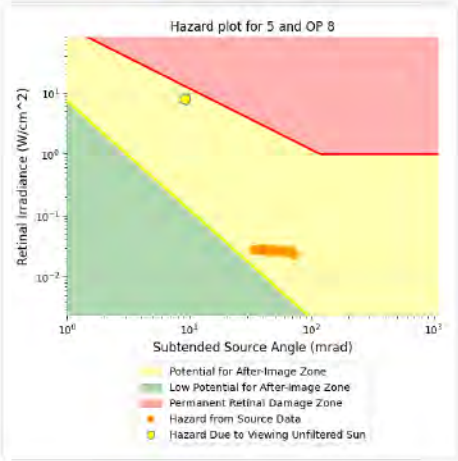
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 2,558 minutes of "yellow" glare with potential to cause temporary after-image.



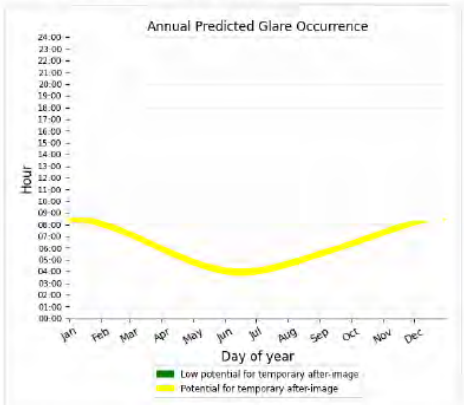


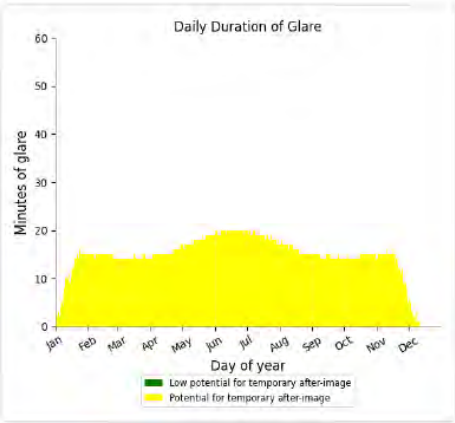


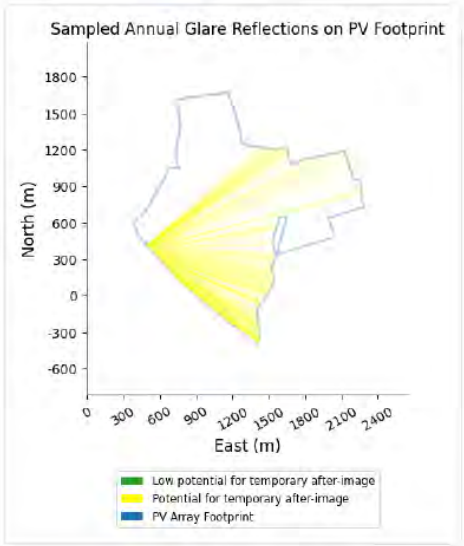


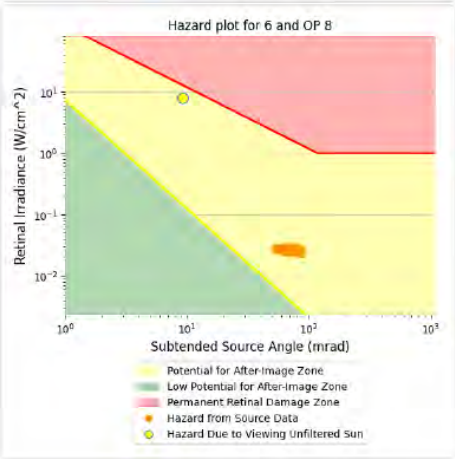
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 5,166 minutes of "yellow" glare with potential to cause temporary after-image.



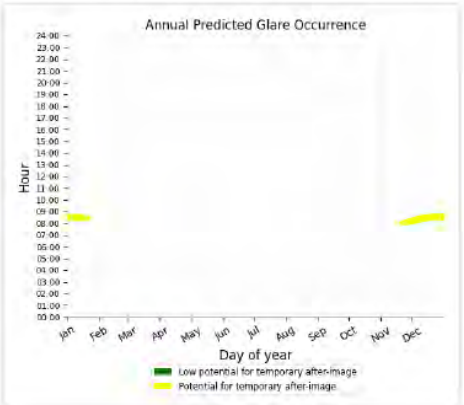


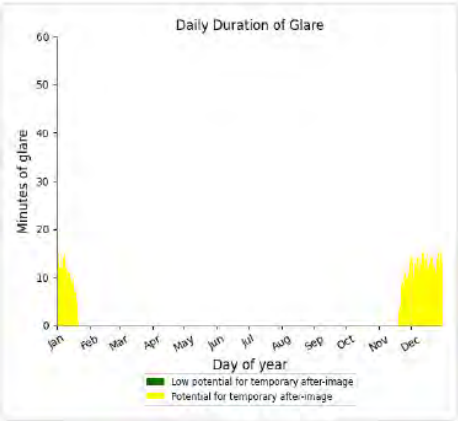


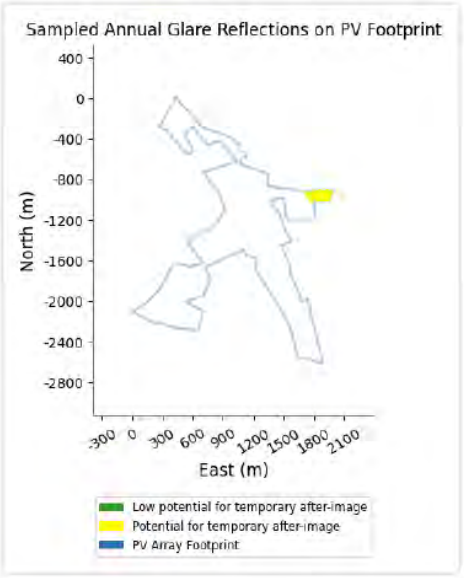


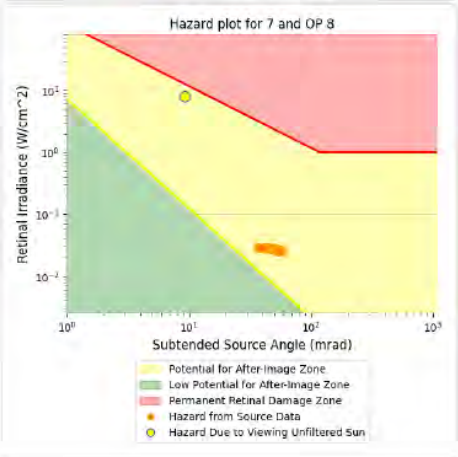
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 734 minutes of "yellow" glare with potential to cause temporary after-image.





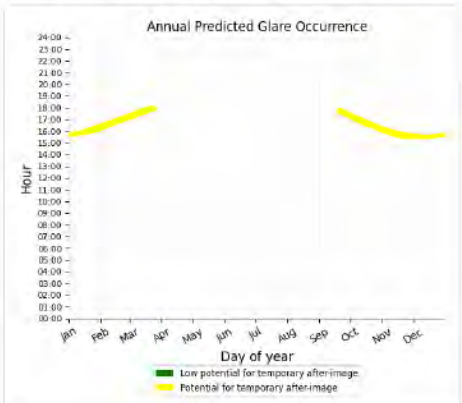


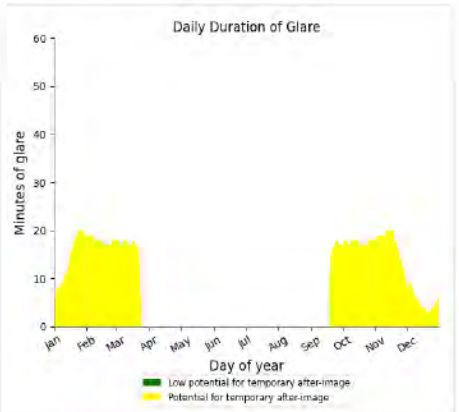


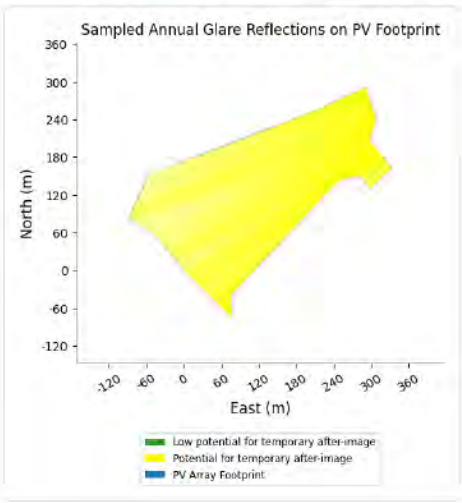
Train Driver 28

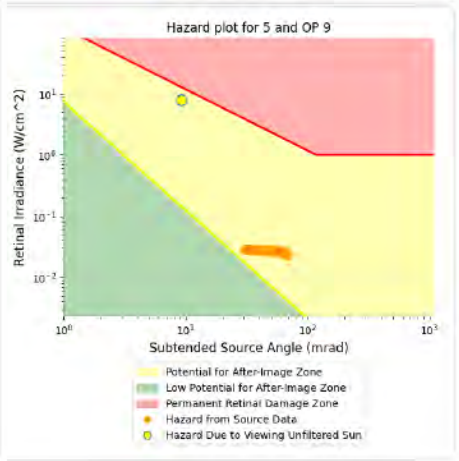
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 2,760 minutes of "yellow" glare with potential to cause temporary after-image.



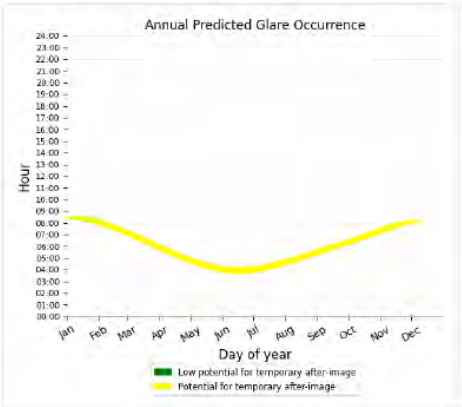


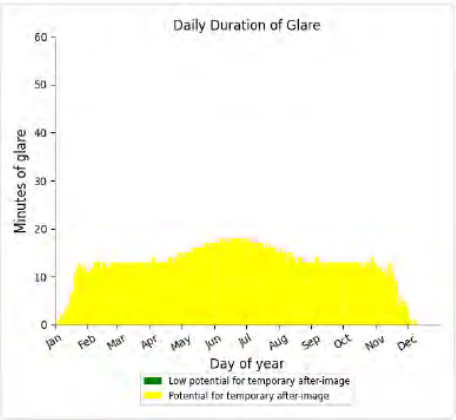


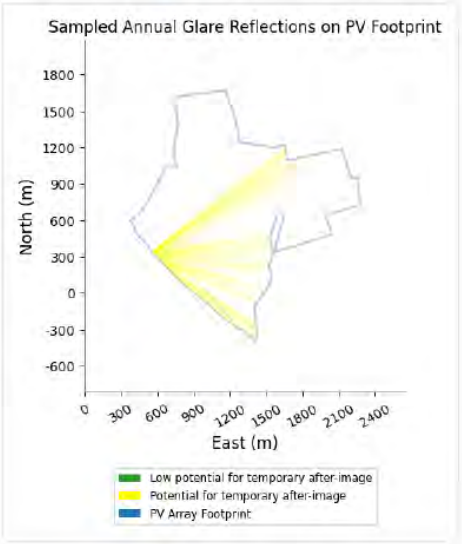


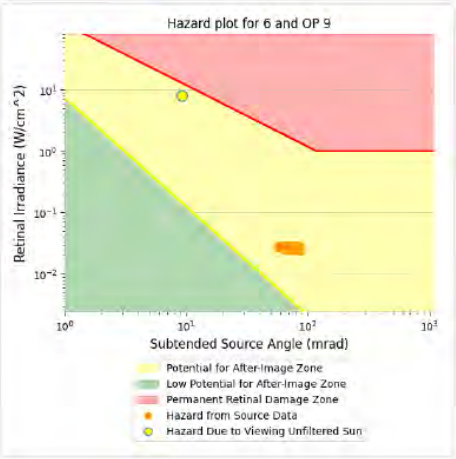
PV array is expected to produce the following glare for receptors at this location:

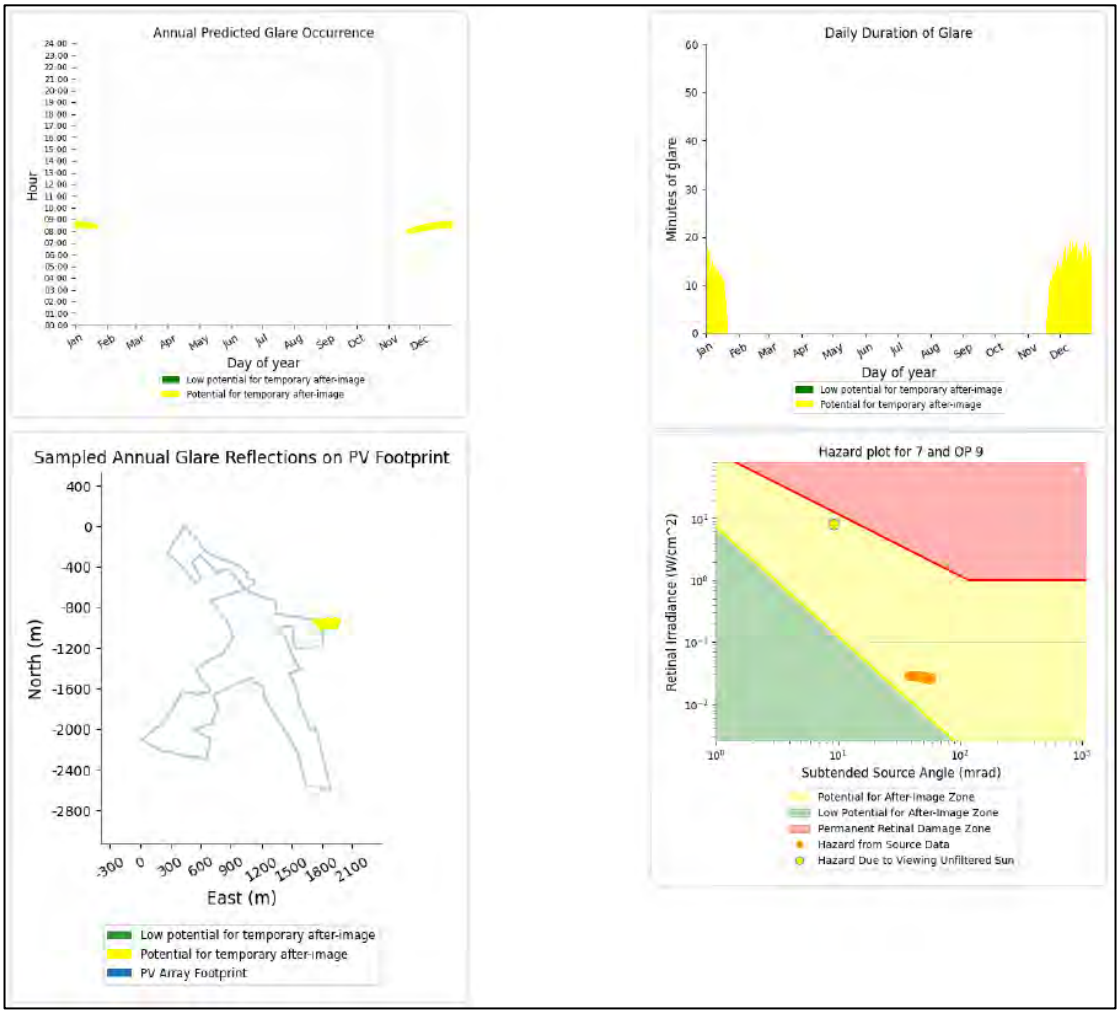
- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 4,427 minutes of "yellow" glare with potential to cause temporary after-image.







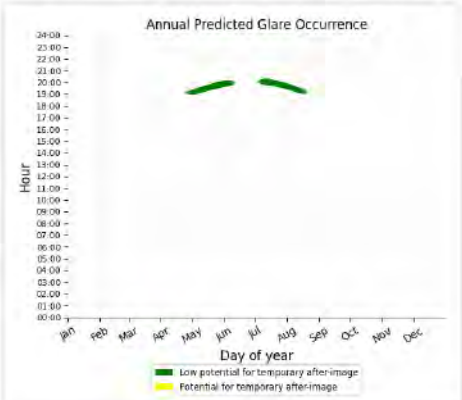


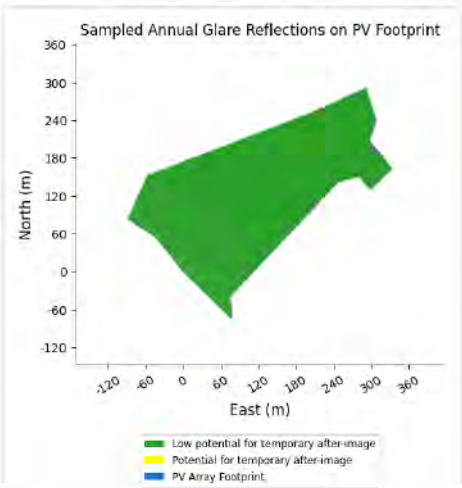

Annual Predicted Glare Occurrence
Hour
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Day of year
Low potential for temporary after-image
Potential for temporary after-image
Daily Duration of Glare
Minutes of glare
0 10 20 30 40 50 60
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Day of year
Low potential for temporary after-image
Potential for temporary after-image
Sampled Annual Glare Reflections on PV Footprint
North (m)
400 0 -400 -800 -1200 -1600 -2000 -2400 -2800
-300 0 300 600 900 1200 1500 1800 2100
East (m)
Low potential for temporary after-image
Potential for temporary after-image
PV Array Footprint
Hazard plot for 7 and OP 9
Retinal Irradiance (W/cm^2)
Subtended Source Angle (mrad)
Potential for After-Image Zone
Low Potential for After-Image Zone
Permanent Retinal Damage Zone
Hazard from Source Data
Hazard Due to Viewing Unfiltered Sun

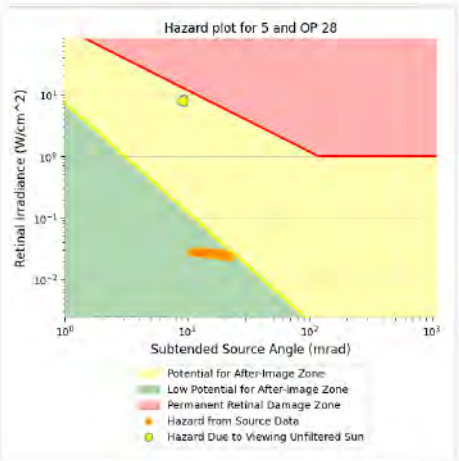
Train Driver 47

PV array is expected to produce the following glare for receptors at this location:

- 1,064 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.

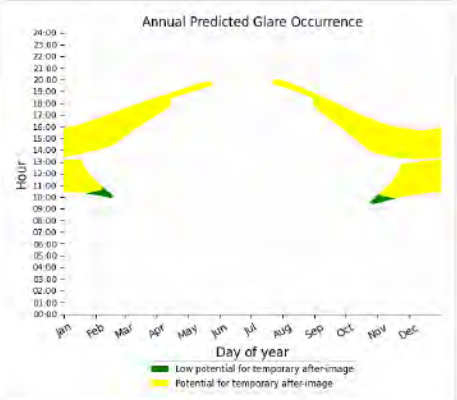


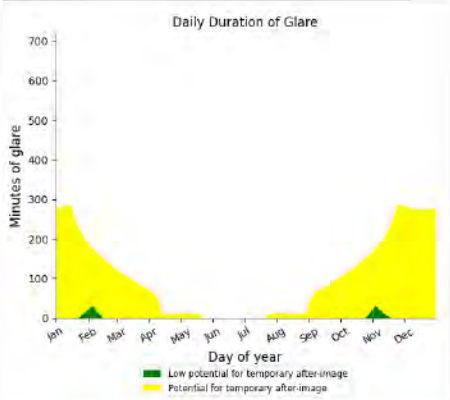


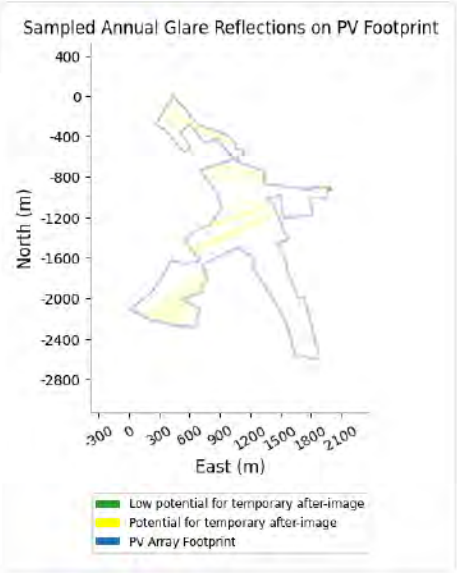


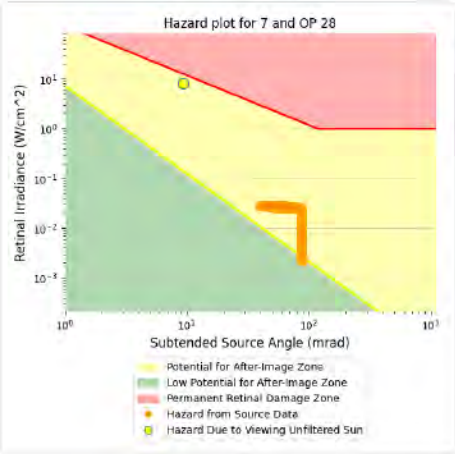
PV array is expected to produce the following glare for receptors at this location:

- 729 minutes of "green" glare with low potential to cause temporary after-image.
- 37,898 minutes of "yellow" glare with potential to cause temporary after-image.





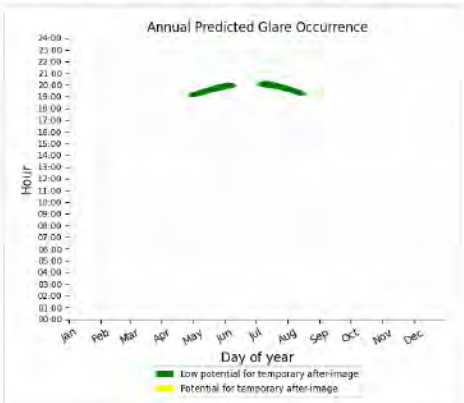


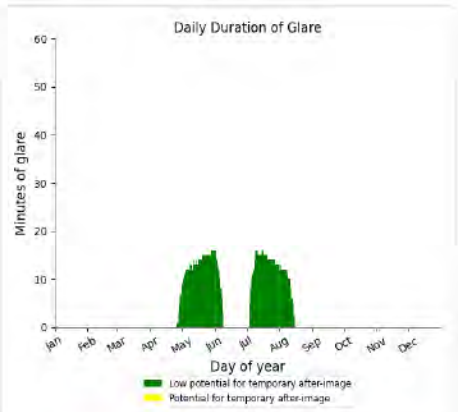


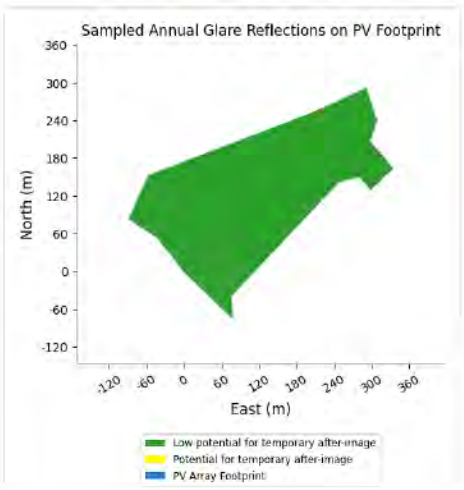
Train Driver 48

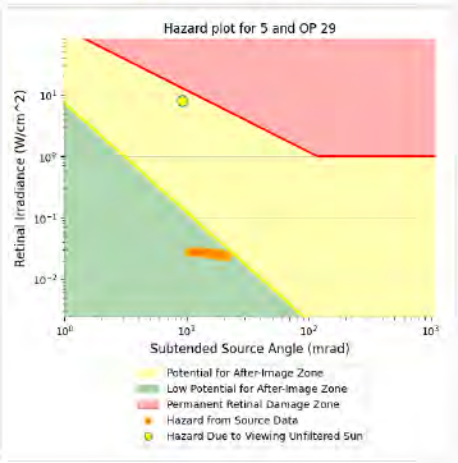
PV array is expected to produce the following glare for receptors at this location:

- 1,060 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



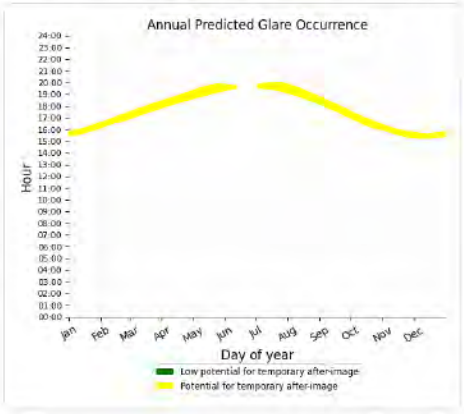


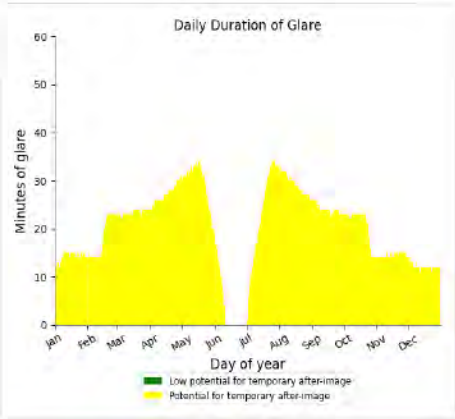


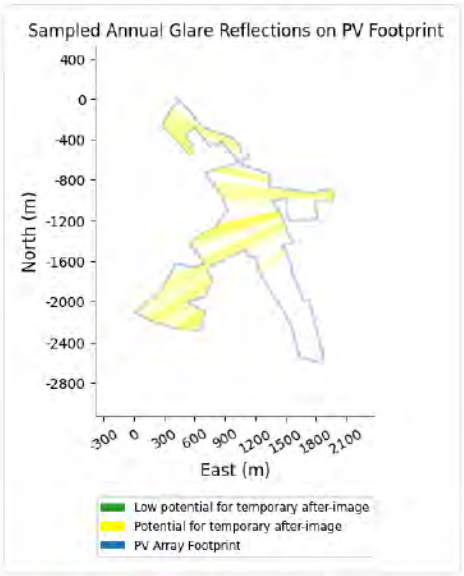


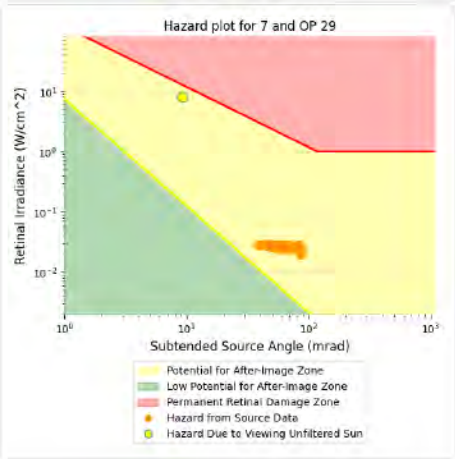
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 7,306 minutes of "yellow" glare with potential to cause temporary after-image.





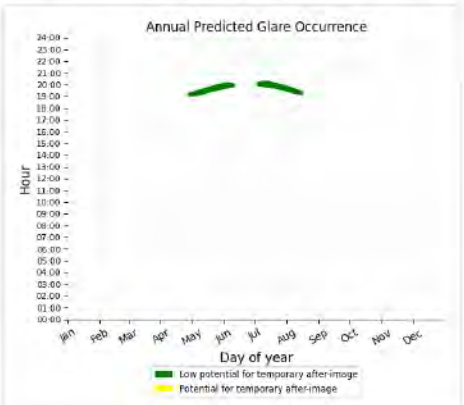


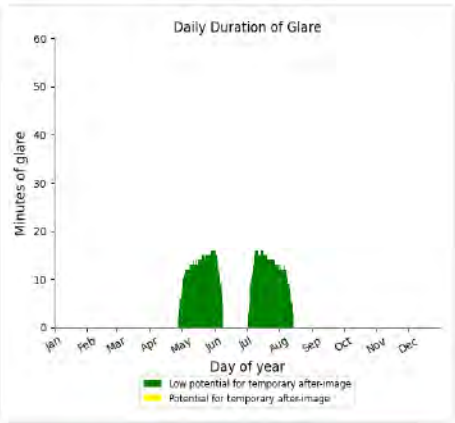


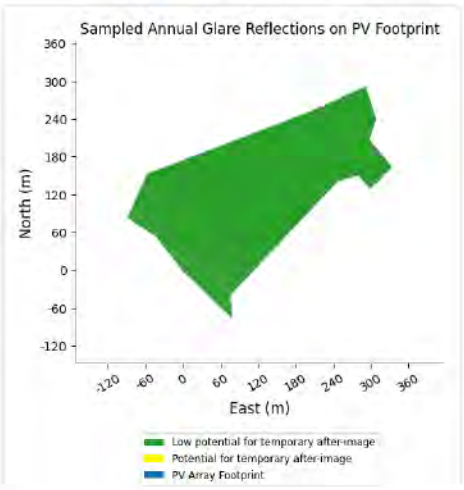
Train Driver 49

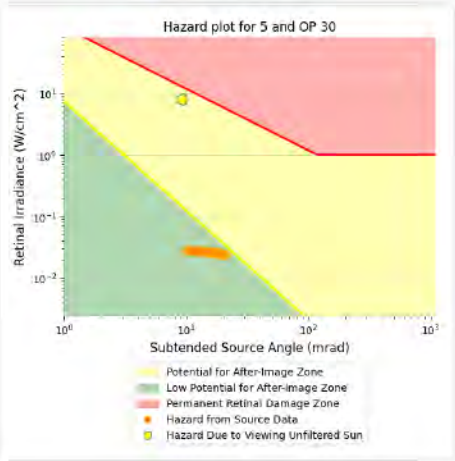
PV array is expected to produce the following glare for receptors at this location:

- 1,058 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



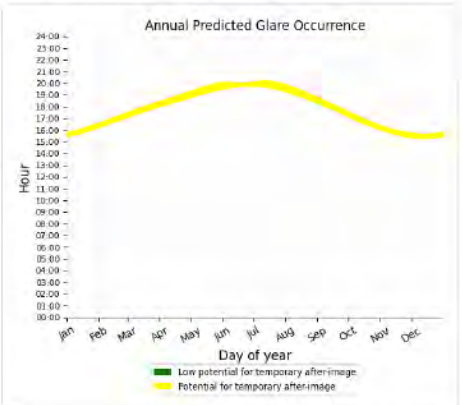


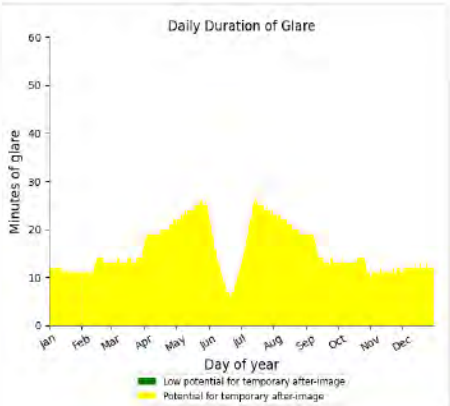


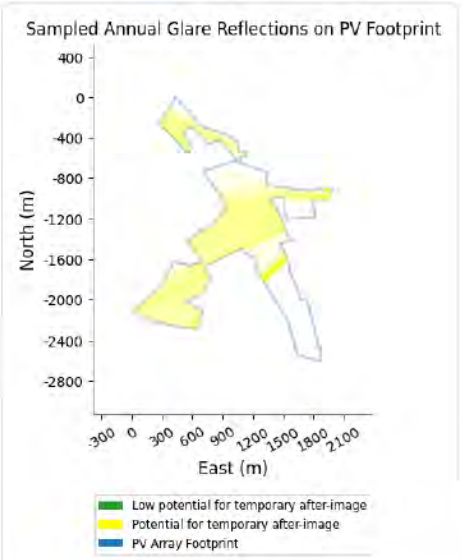


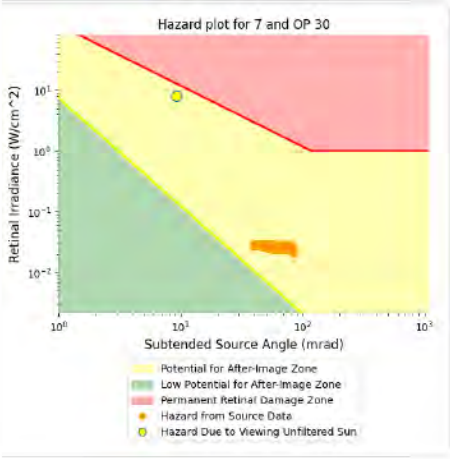
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 5,707 minutes of "yellow" glare with potential to cause temporary after-image.





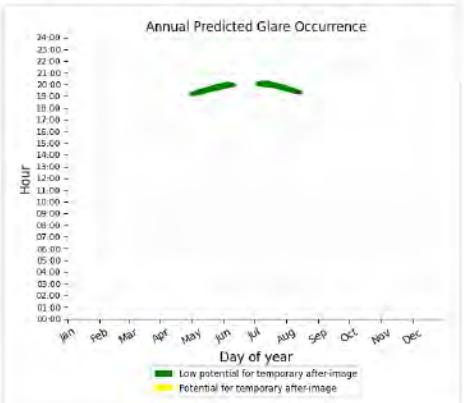


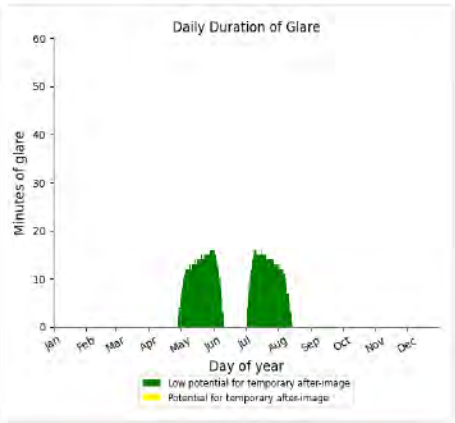


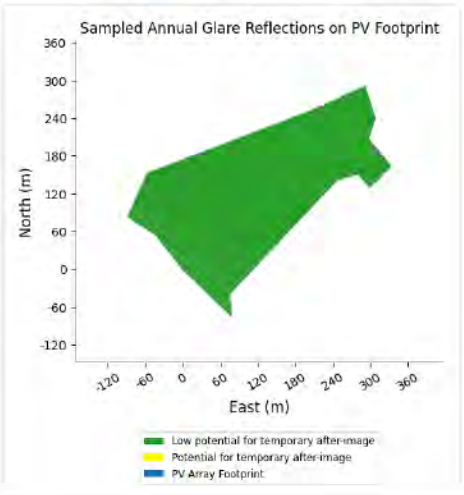
Train Driver 50

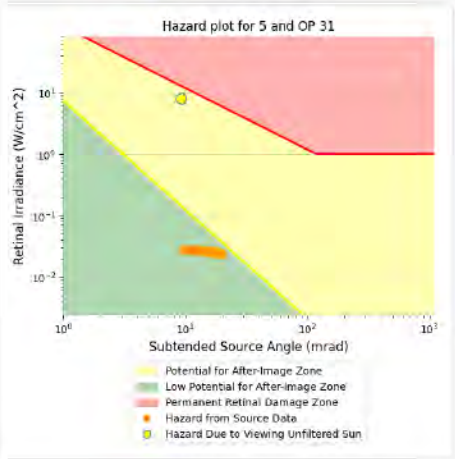
PV array is expected to produce the following glare for receptors at this location:

- 1,040 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



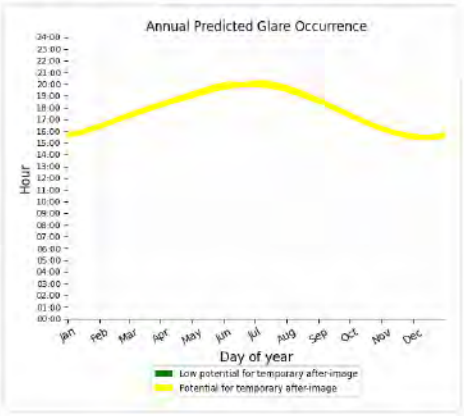


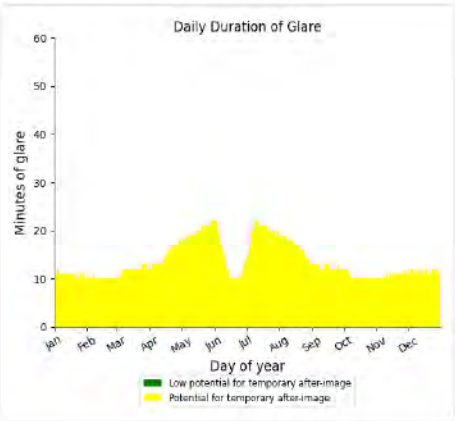


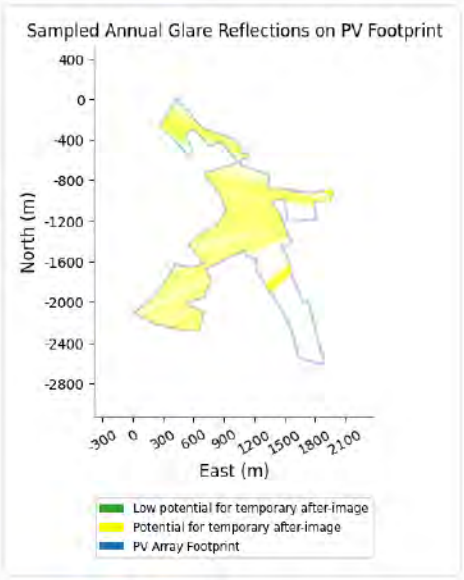


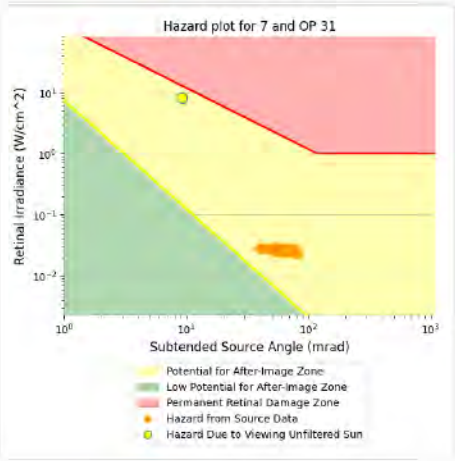
PV array is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 4,958 minutes of "yellow" glare with potential to cause temporary after-image.









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

Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 3: Appendices

Appendix 16.1: Socio-economics Assessment Methodology

May 2022

Appendix 16.1: Socio-economics Assessment Methodology

1.1. Methodology for the Assessment of Effects

1.1.1. The scope of the socio-economic assessment is in accordance with the EIA Scoping Report submitted by the Applicant and takes into account comments received from the Planning Inspectorate.

1.1.2. The assessment focusses on the employment and linked GVA effects associated with the construction and operation of the Proposed Development, as well as the potential effects on the local tourism economy and visitor receptors. These are discussed below

Construction and Operation Phase Employment

1.1.3. The number of full-time construction, operation and decommissioning phase workers involved in the Proposed Development have been estimated by the Applicant based on the experience.

1.1.4. Additionality[1] has been calculated by considering the overall jobs gains in the area, the level of leakage, number of displaced jobs and multiplier effects, such as supply chain and worker spending related jobs. These calculations are informed by the Homes and Communities Agency (HCA) Additionality Guidance (2014). The factors and values are provided in Table 1 below.

Table 1: HCA Additionality Factors and Values

Additionality factor	Value	Justification
Leakage (percentage of jobs that benefit residents living outside	50%	The Applicant will aim to employ as many local residents as possible and source from study area suppliers. However, given the proximity of large

[1] Additionality is the difference between what would happen anyway and the change resulting from the delivery of the project i.e. net change

Additionality factor	Value	Justification
the study area of the Proposed Development)		urban centres and the highly specialised equipment required in the construction of the Proposed Development it is assumed that a proportion of benefits will be leaked from the study area.
Displacement (percentage of jobs that result in a reduction in related jobs in the study area of the Proposed Development)	25%	It is considered that the levels of unemployment in the study area and the existing construction workforce mean that there is enough flexibility in the study area economy to minimise displacement levels.
Multiplier (jobs supported in the wider economy by further construction worker household spend and supplier purchases)	2.33	Centre of Economics and Business Research analysis (2014) of the economic impact of large-scale solar developments concluded that every 1 direct FTE generates 1.33 additional indirect and induced jobs in the wider economy. This multiplier is broken down between 0.78 indirect FTEs generated through supply chain spend and a further 0.55 FTEs supported by the household spend of indirect FTEs on goods and services.

Gross Value Added

1.1.5. GVA is calculated by multiplying the number of jobs created by the Proposed Development by the current GVA per head of construction workers in the study area.

Tourism

1.1.6. The perceived effect of a solar farm on tourism receptor is closely linked to whether or not the PV Arrays can be clearly seen from it. Therefore, the assessment of effects on tourism receptors is closely linked with the

findings of the Landscape and Visual chapter of the PEIR (Chapter 6) and Amenity and Recreation Assessment (Appendix 6.5).

Sensitivity

1.1.7. The assessment draws upon a combination of measurable indicators and considers the importance of the receptor in policy terms in order to understand its sensitivity. This is considered alongside the weight attached to these issues in local policy.

1.1.8. Table 2 identifies the magnitude of impact criteria which have been used to assess the socio-economic receptors relating to employment, GVA and tourism. The magnitude of change has been determined by considering the predicted deviation from baseline conditions

Table 2: Receptor Sensitivity Criteria

Sensitivity	Evidence for sensitivity assessment
High	Evidence of direct and significant socio-economic challenges relating to the receptor. Change relating to the receptor is a high priority in local and/or national economic policy
Medium	Some evidence of socio-economic challenges relating to the receptor is a medium priority in local and/or national economic policy
Low	Little evidence of socio-economic challenges relating to the receptor. Change relating to the receptor is a low priority in local and/or national economic policy
Negligible	No socio-economic challenges relating to the receptor. Change relating to the receptor is not a priority in local and/or national economic policy

Magnitude of Impact

1.1.9. The magnitude of effect will then be determined with reference to the baseline conditions, using the criteria provided in Table 3.

Table 3: Magnitude of Impact

Magnitude of Impact	Description
High	Proposals would cause a large change – judged beneficial or adverse – to baseline socio-economic conditions in terms of absolute and/or percentage change
Medium	Proposals would cause moderate change – judged as beneficial or adverse – to existing socio-economic conditions in terms of absolute and/or percentage change
Low	Proposals would cause a slight change – judged as beneficial or adverse – to existing socio-economic conditions in terms of absolute and/or percentage change
Negligible	An impact that has very little change from baseline conditions where the change is barely distinguishable

Significance of Effects

1.1.10. Socio-economic effects are a reflection of the relationship between the sensitivity of the affected receptor and the magnitude of the impact. Table 4 shows how the assessment of the significance of effects has been determined.

Table 4: Significance of Effect

Magnitude of Impact	Sensitivity of Receptor			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Minor

Magnitude of Impact	Sensitivity of Receptor			
	High	**Medium**	**Low**	**Negligible**
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

1.1.11. The following criteria are applied:

- Moderate or Major effects are classed as 'significant';
- Minor effects are classed as not 'significant', although they may be a matter of local concern;
- Negligible effects are classed as 'not significant'.

Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 3: Appendices

Appendix 19.1: Cumulative Developments

May 2022

Appendix 19.1: Cumulative Developments

1.1.1. The table below presents the identified long list of existing and/or approved developments within the search area and sets out the threshold criteria applied to identify the preliminary short list of existing and/or approved developments for each environmental topic.

Table 1: Cumualtive Developments

No.	Project / Planning Reference	Description of other existing and/or approved development	Distance to Site	Status of Project	Tier/Confidence of Data	Relevant Authority	Temporal Overlap			Within ZoI for topics (Spatial)														Scale and nature of development likely to have a significant effect?	Potential Cumulative Effect (effect-pathways-receptor)?												Included within shortlist? Y/N	Professional Judgement on Potential Significant Effects
							Construction (2026 - 2028)	Operation (2028-2068)	Decommissioning (2068 - 2070)	Landscape & Visual (2km)	Ecology & Biodiversity (1Okm)	Cultural Heritage and Archaeology (1km)	Access & Highways	Noise & Vibration (800m)	Air Quality (5km)	Climate Change	Water Resources (5km)	Ground Conditions (5km)	Soil Resources (NCC & SKDC)	Socio-economics (NCC & SKDC)	Glint & Glare (1km)	Is the cumulative development considered as an EIA Development? If yes, then consideration of whether potential significant cumulative effects are likely for those environmental topics within which the developments falls within the corresponding ZOI.	Landscape & Visual	Ecology & Biodiversity	Cultural Heritage and Archaeology	Access & Highways	Noise & Vibration	Air Quality	Climate Change	Water Resources	Ground Conditions	Soil Resources	Socio-economics	Glint & Glare		
Planning Applications within 10km																																					
1	2019/0433/FUL	Big Pit Quarry Bidwell Lane Clipsham Rutland: Southern extension to Clipsham Quarry (primarily to release blockstone reserves); restoration of the southern extension through the importation of restoration material; continuation of aggregate extraction including flooring and walling stone along with Lincolnshire Limestone within the existing quarry; and erection of stone working facility to be operated ancillary to the continued blockstone extraction and processing operations.	3.4km north-west	Approved	Tier 1 a - High	Rutland CC	X	X	X		X				X					X	X		**Y - EIA was submitted with the application**						X		X			X		Y	**Socio-economics** - The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant. **Air Quality -** The only potential impacts with regard to air quality will be from traffic during the construction phase for the scheme. The Trsnport Statement for the scheme concludes that there will be very limited impacts of the proposed extended mineral operations on the highways network genertae by the scheme. Therefore cumulative efects to air quality are not anticipated. **Access & Highways:** unlikelyto give rise to cumulative effects, as no change from existing operation - so minimal uplift **Water Resources & Ground Conditions** - Potential cumulaive effects on groundwater (surface water unlikely to be considered due to distance of receptors from Clipsham Quarry).
2	2020/0297/MIN	North Western extension to Greetham Quarry including the extraction of Limestone and building stone and importation of suitable inert material. | Greetham Quarry Stretton Road Greetham Rutland LE15 7NP	7.5km noth-west	Awaiting decision	Tier 1 c - High/Med	Rutland CC		X			X									X	X		**Y - EIA was submitted with the application**											X		Y	**Socio-economics** - There will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant.
3	2021/0170/MAO	Outline planning application for 30 residential dwellings (Class C3), with all matters reserved except for access. | Greetham Quarry Stretton Road Greetham Rutland LE15 7NP	7.8km west	Awaiting decision	Tier 1 c - High/Med	Rutland CC	X	X			X									X	X		**Y - EIA was submitted with the application**											X		Y	**Socio-economics -** The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant.
4	2021/0171/MAO	Outline planning permission with all matters reserved except access for a maximum of 94,000m2 of Class B8 and Class B2 and E(g) and ancillary business and service space (Class E). | Greetham Quarry Stretton Road Greetham Rutland LE15 7NP	7.4km north-west	Awaiting decision	Tier 1 c - High/Med	Rutland CC	X	X			X									X	X		**Y - EIA was submitted with the application**											X		Y	**Socio-economics -** The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant.
5	2021/0379/MAF	New warehouse (Class B8 Storage/Distribution). | Land Adjacent To Buildings 25 And 26 Meadow Park Industrial Estate Essendine Rutland	150m east	Approved	Tier 1 a - High	Rutland CC		X		X	X	X	X	X	X		X	X	X	X		**N - below the EIA Thresholds but will be considered as immediately adjacent to the Site.**				X	X								Y	**Noise -** No likely risk of cumulative noise impacts given current baseline situation in Essendine and relative location of nearest noise-sensitive receptors. **Access & Highways -** The scheme is unlikely to give significant rise to cumulative effects as construction phases do not overlap. The overlap of the cumulative development is only during the operational phase, when impacts of proposed development are negligible.
6	2020/1263/MAF (& Allocation H5)	Erection of 21 residential dwellings alongside associated access, parking and landscaping | Land Adj To Chater House High Street Ketton Rutland	7.7km south-west	Awaiting decision	Tier 1 c - High	Rutland CC		X			X								X	X		**N - below the EIA Thresholds**													N	
7	2020/1262/MAF and Allocation H7	Erection of 50 dwellings together with associated access, parking and landscaping. | Land At The Crescent High Street Ketton Rutland	7.3km south-west	Awaiting decision	Tier 1 c - High	Rutland CC		X											X	X		**N - below the EIA Thresholds**													N	
8	2021/1101/MAF - and Allocation H8	Residential development comprising 36 no. dwellings with associated estate roads, open space and landscaping. | Land North Of Wotton Close Ketton Rutland	8.4km south-west	Awaiting decision	Tier 1 c - High	Rutland CC		X			X								X	X		**N - below the EIA Thresholds**													N	
9	2021/0751/MAO	Outline application for up to 16 houses. | Land To The Rear Of 52 Luffenham Road Ketton Rutland	8.5km south-west	Awaiting decision	Tier 1 c - High/med	Rutland CC		X			X								X	X		**N - below the EIA Thresholds**													N	
10	2020/1254/MAF and Allocation H6	Demolition of Existing Modern Buildings, Conversion and Extension of Barns to 6 no. Dwellings and 2 no. offices, Erection of 9 no. Dwellings, and Alteration to Access. | Home Farm High Street Ketton Rutland	7.8km south-west	Awaiting decision	Tier 1 c - High/Med	Rutland CC		X			X									X		**N - below the EIA Thresholds**													N	
11	2020/1480/MAF	Erection of 60 leisure lodges for occupation on a non-continuous basis, renovation and conversion of existing barns to form a leisure suite including gym, swimming pool and ancillary spaces including staff accommodation, renovation and alteration of the existing Clubhouse, erection of a new maintenance facility, alterations to the grounds including changes to the golf course and construction of lakes for leisure and ecological purposes, and ancillary works including alterations to the access drive, provision of a visitor check-in kiosk, alterations to car parking, creation of a circular walk, alteration and extension of the noise bund, and consequential landscape works. | Woolfox Golf And Country Club Hardwick Farm Lane Empingham Rutland PE9 4NJ	3.4km west	Approved	Tier 1 b - High	Rutland CC		X			X			X		X	X	X	X	X		**Y- above EIA thresholds but no EIA submitted with the application**							X		X				Y	**Water Resources & Ground Conditions**- The Scheme and Proposed Development are located in the same catchment as works associated with access route to Site. Will occur during operational period of Proposed Development. **Socio-economics** - There will be some additional operational employment generated from the upcoming employment premises, tourism developments and quarry extensions. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
12	2021/0793/MAF	Development of a new houseblock; new workshop, office, extended multi-faith building and extension to the car park at HMP Stocken. | HMP Stocken Stocken Hall Road Stretton Rutland LE15 7RD	5.3km north-west	Approved	Tier 1 b - High	Rutland CC		X											X	X		**N - below the EIA Thresholds**													N	
13	2019/0469/FUL	Casterton Lane Yard, Holme Close, Tinwell: 14 resi units	4.9km	approved under construcion	Tier 1 b - High	RCC		X			X			X		X	X	X	X		**N - EIA not submitted with application**													N	
14	2021/1268/FUL	Residential Development of 11 Dwellings. | River Gwash Trout Farm Belmesthorpe Lane Ryhall Rutland PE9 4JZ	700m south-west	awating decision	Tier 1 c - Med	RCC		X		X	X	X		X	X		X	X	X	X	X	**N - EIA not submitted with application**													N	
15	S18/0567	Use of land for the siting of 20 touring caravans, change of use of part of building to club house and erection of toilet block, all associated with proposed commercial water skiing and wakeboarding facility on the site. Mooreiake House Barholm Road Tallington Lincolnshire PE9 4RJ	3km south-east	Approved	Tier 1 b - High	SKDC		X			X					X		X	X	X	X		**N - below the EIA Thresholds**													N	
16	S20/2201 & S21/2146	Submission of details reserved by condition 11 (materials) of S20/2201 (Demolition of existing pavilion, erection of new sports centre, change of use of agricultural land to sports pitch, installation of 2 replacement sports pitches and floodlights, and alteration to access) Stamford Junior School Kettering Road Stamford PE9 2LR	3km south-west	Approved	Tier 1 a - High	SKDC		X			X					X		X	X	X	X		**N - above thresholds but EIA not submitted with application**													N	
17	S21/0938	Erection of 200 dwellings with associated infrastructure and landscaping Land To The North Of Uffington Road, Stamford PE9 1TX	1.3km south-west	Approved	Tier 1 b - High	SKDC		X		X	X				X		X	X	X	X		**N - above thresholds but EIA not submitted with application**													N	
18	S21/1764	Demolition of existing buildings and construction of proposed clubhouse building, changing rooms and associated facilities. Stamford Rugby Club Hambleton Road Stamford PE9 2RZ	3.6KM south-west	Approved	Tier 1 b - High	SKDC		X			X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
19	s21/0683	Redevelopment of site for mixed use development comprising Class C3(a) Residential and Class E(c)(ii) Office uses (outline planning permission considering appearance, layout and scale) Ross Thain & Co Ltd Belton Street Stamford PE9 2EF	2.2km south-west	Awaiting decision	Tier 1 c - High	SKDC		X			X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
20	s20/0955 & S21/0329	Erection of a food retail store (Class A1) with associated access, car parking, servicing and landscaping. Land Off Uffington Road Stamford	1km south-west	Approved	Tier 1 b - High	SKDC	X	X	X				X		X		X	X	X	X		**N - below the EIA Thresholds**													N	
21	S20/2056	Demolition of existing factory premises (excluding original factory building at south western edge of site). Erection of a high quality mixed use development comprising; Class E development of offices and workshops (10,000m2 (GIA)), local foodstore and café; c190 dwellings including 30% affordable housing (Class C3); a retirement village including ancillary facilities (Class C2); public open space including strategic landscaping at the eastern end of the site; and all associated infrastructure. Means of access provided off Barnack Road through adaptation of existing vehicular access points as necessary. Secondary pedestrian and cycle access via Edgar Gardens Land North Of Barnack Road Stamford	1.3km south-west	Approved	Tier 1 b - High	SKDC		X		X	X				X		X	X	X	X		**N - EIA not submitted as part of the application**													N	
22	S20/2201	Demolition of existing pavilion, erection of new sports centre, change of use of agricultural land to sports pitch, installation of 2 replacement sports pitches and floodlights, and alteration to access Stamford Junior School Kettering Road Stamford Lincolnshire PE9 2LR	3km south-west	Approved	Tier 1 b - High	SKDC		X		X	X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
23	S20/0118	New multi deck car park, to replace existing ground level car park. Stamford And Rutland Hospital Ryhall Road Stamford PE9 1UA	1.6km south-west	Approved	Tier 1 b - High	SKDC		X		X	X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
24	S19/1475	Erection of 31 affordable dwellings and associated works including access and landscaping. Land Off Cherryholt Road Cherryholt Road Stamford PE9 2EP	1.9km south-west	Awaiting Appeal decision	Tier 1 c - High/Med	SKDC		X		X	X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
25	S19/1165	Change of Use from Residential to Mixed Use including residential and wedding and events venue, civil ceremonies and reception and the temporary use of marquees, including creation of a new access and designated car parking. Molecey House And Mill And The Granary Stamford Road West Deeping PE6 9JD	5.7km south-east	Approved	Tier 1 b - High	SKDC		X			X								X	X		**N - EIA not submitted as part of the application**													N	
26	S19/0011 & S17/2220	New Warehouse and Office Facility including Car Parking and Service Yard. Cummins Generator Technologies Stamford Business Park Ryhall Road Stamford PE9 1XT	1.4km south-west	Approved	Tier 1 a - High	SKDC		X		X	X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
27	S17/0829	Demolition of garages and storage buildings and construction of 32-bed boarding house for Stamford Endowed Schools. Land Off East Street Stamford	2km south-west	Approved	Tier 1 b - High	SKDC		X		X	X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
28	S17/0613	Outline application for residential development of up to 100 dwellings with all matters reserved except for access. Land Off Uffington Road Stamford	1.3km south-west	Approved	Tier 1 b - High	SKDC		X		X	X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
29	S17/0519	Residential development including demolition of existing buildings, erection of 11 dwellings with garage and associated works Former Hindmarch Garage Uffington Road Stamford PE9 2EX	1km south-west	Approved	Tier 1 a - High	SKDC		X		X	X	X			X		X	X	X	X		**N - below the EIA Thresholds**													N	
30	S19/2160	Outline planning application in respect of up to 81 dwellings across Plots A and B with all matters reserved except for accesses off Station Road. The Old Quarry Station Road Castle Bytham	5km north-west	Awaiting decision	Tier 1 b - High	SKDC		X			X				X		X	X	X	X		**Y - EIA was submitted with the application**							X		X				Y	**Water Resources & Ground Conditions** - The scheme and Proposed Development are located in the Thames Water waterbody catchment upstream of the development in the Glens management catchment **Socio-economics** - There will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
31	s19/2142 & S17/1134	Reserved matters sought for appearance, landscaping and scale for 18 dwellings in plot A pursuant to S17/1134	5km north-west	Approved	Tier 1 b - High	SKDC		X			X				X		X	X	X	X		**N - below the EIA Thresholds**													N	
32	S19/1377	Erection of roadside services, hotel and petrol filling station with associated parking, landscaping, and access works. The Fox Great North Road South Witham Lincolnshire NG33 5LN	9km north-west	Awaiting decision	Tier 1 c - High/Med	SKDC		X											X	X		**N - below the EIA Thresholds**													N	
33	S21/0113 & s21/2075	Reserved matters application for details relating to external appearance, layout, scale, and landscaping, with associated open space and infrastructure for the erection of 373 new dwellings, pursuant to Outline Planning Permission under application ref: SK.94/0125/12. Land South Of Harvey Close And West Of Wincanton Way Bourne PE10 9PQ	6.5km north-east	Approved	Tier 1 b - High	SKDC		X			X					X	X	X	X	X	X		**N - EIA not submitted as part of the application**													N	
34	S21/1841	Erection of 199 dwellings with associated infrastructure, access and open space Land South Of Bourne Road, North Of Swinstead Road Corby Glen	10km north	Awaiting decision	Tier 1 c - High/Med	SKDC		X											X	X		**N - EIA not submitted as part of the application**													N	
35	S19/2235 & S21/1633 (see Allocation LV-H5)	Residential development of 66 dwellings with associated infrastructure, access and open space Land Adjacent Fire Station Off Bourne Road Corby Glen	10km north	Approved	Tier 1 b - High	SKDC		X											X	X		**N - below the EIA Thresholds**													N	
36	S16/2285 & S21/1174	Residential development for up to 19dwellings (outline) Falcon Way Bourne PE10 0FF	6.9km north-east	Approved	Tier 1 b - High	SKDC		X											X	X		**N - below the EIA Thresholds**													N	
37	S18/1588 & S21/0866	Reserved matters application for the erection of 34 dwellings and associated infrastructure with Elsea Park Zone 3 persuant to SK.94/0125. Land To The West Of Sandown Drive Elsea Park Bourne Bourne PE10 0WP	6.3km north-east	Approved	Tier 1 a - High	SKDC		X											X	X		**N - below the EIA Thresholds**													N	
38	S18/0937	Reserved matters application for 174 dwellings and associated infrastructure pursuant to SK94/0125/12 Elsea Park - Zone 9 Land East Of A151, Raymond Mays Ways Bourne	6.5km north-east	Approved, under constcution	Tier 1 a - High	SKDC		X											X	X		**N - EIA not submitted as part of the application**													N	
39	S20/0368	Reserved matters application for 384 dwellings and associated infrastructure pursuant to SK.94/0125/12 Land At Elsea Park Bourne - Zone 8	6.3km north-east	Approved	Tier 1 a - High	SKDC		X											X	X		**N - EIA not submitted as part of the application**													N	
40	S18/0655	Reserved matters application for 78 dwellings on Zones 4 and 6 and associated development pursuant to SK94/0125/12. Land At Elsea Park, Bourne (Zones 4 And 6 In Part)	6.2km north-east	Approved; construction started	Tier 1 a - High	SKDC		X											X	X		**N - EIA not submitted as part of the application**													N	
41	S17/0420	Erection of 131 Dwellings, associated Access Roads and Garages to Zone 6, Elsea Park. Zone 6 (Phase B) Elsea Park Bourne PE10 9PQ	7km north-east	Approved, under constructon	Tier 1 b - High	SKDC		X											X	X		**N - below the EIA Thresholds**													N	
42	S20/1192 & S21/0309	Erection of 14 industrial units including storage, warehouse and associated works. The Bungalow Northfield Road Market Deeping Lincolnshire PE6 8LG	6.4km east	Approved	Tier 1 b - High	SKDC		X			X								X	X		**N - below the EIA Thresholds**													N	
43	S21/2138	Erection of a new discount foodstore (Use Class E) with access, car parking, landscaping and other associated works Land To The East Of Peterborough Road Market Deeping PE6 8GQ	5.5km east	Awaiting decision	Tier 1 c - High/Med	SKDC					X								X	X		**N - below the EIA Thresholds**													N	
44	s16/0112 & S21/1686	240 dwellings, including vehicular access, pedestrian and cycle links, public open space, car parking, landscaping, drainage and associated works	6.4km east	Approved	Tier 1 b - High	SKDC		X			X								X	X		**N - EIA not submitted as part of the application**													N	
45	S18/2263 & S21/0750	Erection of roadside services to include a petrol filling station with ancillary retail floor space. Land Adjacent To The A15/A1175 Roundabout Peterborough Road Market Deeping	5.4km east	Approved	Tier 1 b - High	SKDC		X			X								X	X		**N - below the EIA Thresholds**													N	
46	s17/1728 & S19/1001	Conversion of existing public house and motel and erection of 2 no. buildings to create 29 dwellings, with access, car parking, and landscaping The Towngate Inn 3 Towngate East Market Deeping Lincolnshire PE6 8DP	5.7km east	Approved	Tier 1 b - High	SKDC		X			X								X	X		**N - below the EIA Thresholds**													N	
47	s18/0452 & S21/1210	Residential Development (25 dwellings) Ferndale House Swinstead Road Corby Glen NG33 4NU	10km north	Approved	Tier 1 b - High	SKDC		X			X								X	X		**N - below the EIA Thresholds**													N	
48	s22/0033	Request for an EIA Screening Opinion for a Solar Farm with a Battery Energy Storage Scheme	5km north-east	Screening Opinion - non-EIA development	low	SKDC		X			X						X	X	X	X		**N - below the EIA Thresholds**													N	
49	S20/1235	Land West of Linchfield Road, Deeping St James 135 units	6km east	approved	Tier 1 a - High	SKDC		X			X								X	X		**N - EIA not submitted with application**													N	
50	S22/0073	Former Gravel Works, Stowe Road 35 units	3.8km south-east	awaiting decision	Tier 1 c - Med	SKDC		X			X					X	X	X	X	X		**N - EIA not submitted with application**													N	
51	NE/21/01459/FUL	Demolition and removal of existing buildings and structures and to level bunds to facilitate the use of the site for storage and distribution as approved under application EN/09/01000/FUL | Collyweston Great Wood Peterborough Road Duddington Northamptonshire PE9 3QA	8.6km south-west	Awaiting decision	Tier 1 c - High/Med	ENC		X			X								X	X		**N - below the EIA Thresholds**													N	
52	88/00377/REM & 20/00659/NONMAT	Reserved matters approval relating to appearance, landscaping, layout and scale for 80 dwellings with associated landscaping, public open space, surface water drainage and access pursuant to outline planning permission reference APP/0540/W/16/3153303 | Land To The West Of Uffington Road Barnack Stamford	3.3km south-east	Approved; under construction	Tier 1 a - High	PCC		X			X					X	X	X	X	X		**N - below the EIA Thresholds**													N	
NSIPs within 10km																																					
53	A47 Wansford to Sutton	Upgrading of approximately 2.6km of single carriageway on the A47 between Wansford and Sutton and associated works to enable the Proposed Scheme to connect into the strategic road network.	7.6km south	Examination stage	Tier 2 d - Medium	PINS		X			X								X	X		**Y - EIA was submitted with the application**													Y	**Socio-economics** - There will be some additional operational employment generated f. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
54	East Northants Resource Management Facility Western Extension	Extension in the area and timescales for the operation of the site including an extension to the west of the existing site and increasing the throughput of the waste treatment and recovery facility.	9km south-west	pre-Examination	Tier 2 d - Medium	PINS		X			X								X	X		**Y - EIA was submitted with the application**													Y	**Socio-economics** - There will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
Solar NSIPs (beyond 10km) as identified in PINS scoping Opinion																																					

No.	Project / Planning Reference	Description of other existing and/or approved development	Distance to Site	Status of Project	Tier/Confidence of Data	Relevant Authority	Temporal Overlap			Within ZoI for topics (Spatial)														Scale and nature of development likely to have a significant effect?	Potential Cumulative Effect (effect-pathways-receptor)?												Included within shortlist? Y/N	Professional Judgement on Potential Significant Effects
							Construction (2026 - 2028)	Operation (2028-2068)	Decommissioning (2068 - 2070)	Landscape & Visual (2km)	Ecology & Biodiversity (10km)	Cultural Heritage and Archaeology (1km)	Access & Highways	Noise & Vibration (600m)	Air Quality (5km)	Climate Change	Water Resources (5km)	Ground Conditions (5km)	Soil Resources (NCC & SKDC)	Socio-economics (NCC & SKDC)	Glint & Glare (1km)	Is the cumulative development considered as an EIA Development? If yes, then consideration of whether potential significant cumulative effects are likely for those environmental topics within which the developments falls within the corresponding ZOI:	Landscape & Visual	Ecology & Biodiversity	Cultural Heritage and Archaeology	Access & Highways	Noise & Vibration	Air Quality	Climate Change	Water Resources	Ground Conditions	Soil Resources	Socio-economics	Glint & Glare		
55	Land at Six Hundreds Farm (Heckington Fen)	Proposed ground mounted solar photovoltaic (PV) electricity generation and energy storage facility (the "Energy Park") with an approximate capacity of 500 megawatts (MW) with a further 200- 400MW of energy storage capacity on an area of agricultural land	33.5km north-east	pre-examinatioin (scoping)	Tier 2 d - Medium	PINS	x	x	x										x			Y									x	x		Y	**Agricultural Land Use** - The cumulative loss of BMV land is not considered to be significant in the context of the regional BMV resource. The cumulative scheme is recognised to be largely reversible and would result in limited loss of the BMV land. **Socio-economics** - The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant.
56	Little Crow	construction, installation, operation and decommissioning of a ground mounted solar park with a maximum design capacity of up to 150MWp (megawatts peak) and up to 90 Megawatts of batterybased electricity storage facility. There will also be electrical connection infrastructure and the point of connection into the local electricity grid is directly to the 132KV electricity overhead pylon which already runs through the development site.	95km north	Examination (post-scoping)	Tier 2 d - Medium	PINS	x	x	x										x			Y									x	x		Y	**Agricultural Land Use** - The cumulative loss of BMV land is not considered to be significant in the context of the regional BMV resource. The cumulative scheme is recognised to be largely reversible and would result in limited loss of the BMV land. **Socio-economics** - The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant.
57	Gate Burton	Installation of solar photovoltaic (PV) generating panels and on-site energy storage facilities across a proposed site in Lincolnshire (hereafter referred to as the 'Site') together with grid connection infrastructure (hereafter referred to as the 'Grid Connection Corridor Options'). The Scheme would allow for the generation, storage and export of up to 500 megawatts (MW) electrical generation capacity.	70km	pre-examinatioin (scoping)	Tier 2 d - Medium	PINS	x	x											x			Y									x	x		Y	**Agricultural Land Use** - The cumulative loss of BMV land is not considered to be significant in the context of the regional BMV resource. The cumulative scheme is recognised to be largely reversible and would result in limited loss of the BMV land. **Socio-economics** - The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant.
58	West Burton	The Scheme consists of four electricity generating stations each with a capacity of over 50 megawatts (MW) comprising of ground mounted solar arrays; and 'Associated Development' comprising of energy storage, grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance of the Scheme.	63km north	pre-examinatioin (scoping)	Tier 2 d - Medium	PINS	x	x	x										x			Y									x	x		Y	**Agricultural Land Use** - The cumulative loss of BMV land is not considered to be significant in the context of the regional BMV resource. The cumulative scheme is recognised to be largely reversible and would result in limited loss of the BMV land. **Socio-economics** - The construction of cumulative developments is likely to bring considerable additional employment and linked GVA to the Rutland County Council and South Kesteven District Council areas. However, the scale of the construction employment and linked GVA cannot be readily quantified based on the information submitted with each planning application. In the absence of quantifiable evidence it is considered that the overall cumulative effect of the developments coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant. All other effects resulting from the cumulative developments are considered to remain negligible and non-significant.
59	Cottam Solar Park	The Scheme consists of three electricity generating stations each with a capacity of over 50 megawatts (MW) comprising of ground mounted solar arrays; and 'Associated Development' comprising of energy storage, grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance of the Scheme.	67km north	pre-examinatioin (scoping)	Tier 2 d - Medium	PINS	x	x	x										x			Y									x	x		Y	**Agricultural Land Use** - The cumulative loss of BMV land is not considered to be significant in the context of the regional BMV resource. The cumulative scheme is recognised to be largely reversible and would result in limited loss of the BMV land. **Socio-economics** - There will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
Hybrid Bills (wthin 10km)																																					
	NONE																																				
Development Plan Documents - Allocations identified within 10km																																					
RCC Site Allocations and Policies DPD 2014																																					
60	W1	Cottesmore, Burley Road: Small scale preliminary treatment facilities	6km west	n/a	Tier 3 f - Low						x								x	x		Y									x		Y	**Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
61	W2	Greetham, Wood Lane: Small scale preliminary treatment facilities	5.9km west	n/a	Tier 3 f - Low						x								x	x		Y									x		Y	**Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
RCC Minerals Core Strategy and Development Control Policies 2010																																					
62	MCS Policy 5	Limestone primarily for Aggregate Purposes	2.5km north-west	n/a	Tier 3 g- Very low	RCC		x		x	x			x					x	x		Y									x		Y	**Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated f. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
63	MCS Policy 4	Limestone and clay primarily for Cement Purposes	1.5km south-west	n/a	Tier 3 g- Very low	RCC		x		x	x				x	x	x	x	x	x		Y							x		x		Y	**Water Resources & Ground Conditions**- There is the requirement of the Proposed Development to comply with MCS Policy 4, i.e. excavation for cement works, could result in cumulative effects of chemical pollution or sedimentation to downstream receptors. However, there is no live application associated with this allocation and therefore no available information. As such this scheme is not considered further in the cumulative effects assessment. **Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
South Kesteven Local Plan 2020																																					
64	STM1-H1	Stamford North SKLP257, 258, 240 1,300 units at 30dph	690m south-west	n/a	Tier 3 f - Low	SKDC		x		x	x	x	x	x	x	x	x	x	x	x	x	Y				x	x			x		x		Y	**Access & Highways -** The scheme is unlikely to give significant rise to cumulative effects as construction phases do not overlap. The overlap of the cumulative development is only during the operational phase, when impacts of proposed development are negligible. Note, as an allocated site this will be accounted for within TEMPRO, so has likely already been factored into the traffic numbers. **Noise & Vibration** - The scheme will introduce new noise-sensitive receptors but they are unlikely to be affected by the Proposed Development, given separation distance from solar PV areas of approximately 1km or more. Any new sources of noise introduced as part of the Stamford North development would have localised effects which would not interact cumulatively with those of the Proposed Development. **Water Resources & Ground Conditions** - The scheme is located within the same waterbody catchment as the Proposed development and therefore potential cumulative effects could occur. However, there is no live application associated with this allocation and therefore no available information. As such this scheme is not considered further in the cumulative effects assessment. **Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
65	STM2-H2	Stamford East SKLP300,318 162 units at 30dph	1.25km south-west	n/a	Tier 3 f - Low	SKDC		x		x	x				x				x			Y									x		Y	**Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
66	DEP1-H1	Towngate West SKLP254 73 units at 23dph	5.85km south-east	n/a	Tier 3 f - Low	SKDC		x			x								x	x		**N - below the EIA Thresholds**													N	
67	DEP2-H2	Land off Linchfield Road SKLP 680 units at 30dph	6.5km south-east	n/a	Tier 3 f - Low	SKDC		x			x								x	x		Y									x		Y	**Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant
68	BRN1-H1	Manning Road 107 units at 30dph	8.2km north-east	n/a	Tier 3 f - Low	SKDC		x			x								x	x		**N - below the EIA Thresholds**													N	
69	LV-H12	Part of Elm Farm Yard SKLP16 50 units at 25dph	5.7km north-east	n/a	Tier 3 f - Low	SKDC		x			x								x	x		**N - below the EIA Thresholds**													N	
PCC Minerals and Waste Local Plan 2021																																					
70	M033: Land off Main Road, Maxey	Mineral Extraction: Sand and Gravel 33ha	7.5km south-east	no live application		PCC		x			x								x	x		Y									x		Y	**Socio-economics** - Should the operation of the scheme coincide with the Proposed Development, there will be some additional operational employment generated. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant

Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 3: Appendices

Appendix 19.2: Intra Project Effect Interactions

May 2022

Appendix 19.2: Intra Project Effect Interactions

1.1. Introduction

1.1.1. This Appendix addresses the potential for intra project effect interactions as a result of the Proposed Development.

1.1.2. Intra project effect interaction may occur where several different effects resulting from the Proposed Development have the potential to affect a single receptor. The assessment draws upon the findings of the assessments provided within Chapters 6 to 17 of this PEIR.

1.2. Legislation and Planning Policy

1.2.1. Regulation 5(2) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, requires that EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on: population and human health; biodiversity; land, soil, water, air and climate change; material assets, cultural heritage and the landscape; and the interaction between these factors.

1.2.2. The Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011) states that: "*The energy NPSs set out mitigation for cumulative negative effects by requiring the IPC to consider accumulation of effects as a whole in their decision-making on individual applications for development consent*" (paragraph 1.7.3) and that "*the Infrastructure Planning Commission (IPC) should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy and community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place*" (paragraph 4.2.6).

1.2.3. There is no policy relevant to intra-related effects in the NPS for Renewable Energy Infrastructure (NPS EN-3) or the NPS for Electricity

Networks Infrastructure (NPS EN-5). The Draft EN-3 does not include any specific reference to intra effects.

1.2.4. No further guidance or requirement beyond the need for an assessment of the inter-relationships between types of effect is provided.

1.3. Approach to Assessment

1.3.1. The approach to assessing intra-effect interactions has followed a four-stage process, as outlined in the following paragraphs.

Stage 1: Topic-specific Assessments

1.3.2. The first stage of the assessment is presented in each of the individual environmental topic chapters and comprises the individual assessments of residual effects on receptors across the construction, operation and decommissioning phases of the Proposed Development. The embedded design mitigation and additional mitigation, where proposed in other technical chapters, is assumed to be implemented before consideration of the effects in this chapter. Therefore, residual effects identified in Chapters 6 to 17 of this PEIR have been considered in this chapter.

1.3.3. The findings of the assessment are presented in Chapter 6 -17 of this PEIR.

Stage 2: Identification of Receptors

1.3.4. Stage 2 involves a review of the assessments undertaken in the topic-specific chapters to identify ‘receptor groups’ requiring assessment within the effect interactions assessment. The term ‘receptor group’ is used to highlight that the approach taken for the effect interactions assessment does not assess every individual receptor assessed at the EIA stage, but rather potentially sensitive groups of receptors identified through the EIA process. Only receptors that are expected to incur more than one potential effect have been included in the assessment (e.g.

noise and dust). Receptors predicted to be affected by only a single effect (e.g. only noise) are excluded because there is considered to be no potential for effect interactions to take place. It should be noted that uncertainty in the assessment of effects, for most of the technical chapters in this PEI Report, is dealt with by making conservative, or worst-case, assumptions. The receptor groups identified within this PEIR can be broadly categorised as follows:

- Landscape and visual resources: landscape character; visual receptors (residents; users of public rights of way; other visual receptors);
- Ecology and biodiversity: ecologically designated sites;
- Historic environment: settings of designated heritage assets;
- Access and highways: road users, residents; pedestrians/cyclists; sensitive local uses (e.g. schools, hospitals, local facilities);
- Noise and vibration: residents, users of public rights of way; users of other land uses (e.g. places of work);
- Air quality: residents; ecological designated sites;
- Water resources and Ground conditions: flood risk, land/soils;
- Agriculture: agricultural land; farm businesses; and
- Socio-economics: employment levels and tourism.

1.3.5. The potential for effect interactions is considered within Stage 3.

Stage 3: Identification of potential effect interactions on receptor groups

1.3.6. Consideration is given to the potential for multiple effect interaction to arise for each of the identified receptor groups across the construction, operation and decommissioning of the Proposed Development (as described below:

- **Receptor-led effects:** Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor or receptor group. As an example, all effects on a given receptor such as local residents – construction dust and noise, increased traffic and visual change etc. may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

1.3.7. Table 1 identifies the potential for receptor led effects to occur and considers whether any potential effects are already considered within the PEIR.

1.3.8. It should be noted that the residual effects presented in Table 1, reflect the preliminary findings of the EIA undertaken at this stage. As such, continued statutory consultation on this PEIR and consideration of the feedback received, will further refine the design of the Proposed Development as part of an iterative process throughout the EIA process, which will be reported in the Environmental Statement (ES).

Table 1: Potential for Receptor Led effects from the Proposed Development

Receptor Group	Potential for Significant Receptor Led In-Combination Effects
Landscape character	Chapter 6 (Landscape and Visual) of this PEIR identifies that there may be moderate to major (significant) residual effects to Rutland Plateau (Dii) Clay Woodlands and Kesteven Uplands LCA landscape character areas within the Site from the construction and operation of the Proposed Development. Minimal (non-significant effects) are predicted to across the Rutland Plateau (Dii) Clay Woodlands and Kesteven Uplands LCAs as a whole. As set out in Chapter 17 (Arboriculture), the existing woodlands, trees and hedgerows will be retained within the Solar PV Site. Chapter 15 (Climate Change) identifies that an increase in precipitation is unlikely to change the landscape and Chapter 6 identifies that the planting specification will consider the potential impact of a rise in temperatures. It is not considered that there are any combined effects on these receptors beyond those assessed within the LVIA Chapter.
Visual receptors	Chapter 6 (Landscape and Visual) of this PEIR identifies that there may be moderate to major (significant) residual effects to visual receptor group (RG1) from the construction and operation of the Proposed Development. For all other receptor groups, the effects are considered to be non-significant. The Residential Visual Amenity Assessment (Appendix 6.4) of this PEIR identifies that there is the potential for slight to moderate effects (non-significant) residual effects to residential dwellings with 100m of the Site as a result of all phases of the Proposed Development. The Chapter 14 (Glint and Glare) of this PEIR identifies that there would be minor residual effects (non-significant) on two residential receptors which the proposed green infrastructure design has taken account of by incorporating the recommendations within the Glint and Glare modelling.

Receptor Group	Potential for Significant Receptor Led In-Combination Effects
	It is considered that the in-combination effects have been adequately mitigated through embedded mitigation and the proposed green infrastructure design and that in combination effects would not increase the level of effect presented within the individual chapters.
Ecologically designated sites	Chapter 7 (Ecology and Biodiversity) of this PEIR identifies that there are potential (non-significant) residual effects on national and local designated sites as a result of localised cabling and highways work during the construction phase. Chapter 7 (Ecology and Biodiversity) of this PEIR concludes that direct noise impacts to SSSIs are unlikely to occur. Chapter 11 (Air Quality) of this PEIR identifies that there would be a negligible residual effect (non-significant) to sensitive ecological receptors during the construction and decommissioning phases of the Proposed development. Chapter 12 (Water Resources & Ground Conditions) of the PEIR identifies that the Ryhall Pastures and Little Warren Verges SSSI is hydraulically connected to the Site and there would be negligible residual effects during the construction phase. With regard to the scale and duration of any impact, it is considered that the in-combination effects have been adequately mitigated through embedded mitigation, the proposed green infrastructure design and control documents such as the OCEMP, OEMP and ODEMP and that in combination effects would not increase the level of effect presented within the individual chapters.
Road users, pedestrians and cyclists, users of public rights of way, railway operations, train drivers, aviation operations	Appendix 6.5 (Amenity and Recreation Assessment) of this PEIR identifies that there is the potential for moderate to major residual effects (significant) to users of PRoW (Bridleways E169 and E182 / BrAW/1/1) through the construction and decommissioning phases of the Proposed Development. The A&R Assessment considers the experience people have when using recreational resources due to perceptual or actual changes to views, noise, air quality or traffic movements in construction, operation and decommissioning Chapter 9 (Access and Highways) of this PEIR identify that there are negligible residual effects (non-significant) to this receptor group through all phases of the Proposed Development. Chapter 14 (Glint and Glare) of this PEIR

Receptor Group	Potential for Significant Receptor Led In-Combination Effects
	identifies that there would be minor residual effects (non-significant) on road users and train drivers and the mitigation recommendations have been incorporated into the proposed green infrastructure design. It is therefore considered that these in-combination effects would not be significant taking into the account the embedded mitigation and the proposed green infrastructure design.
Residents and users of other land uses (e.g. places of work, heritage based visitor attractions)	Chapter 6 (Landscape and Visual) of this PEIR identifies that there may be moderate (non-significant) residual effects on visual receptor group RG2 and slight to minimal (non-significant) residual effects to visual receptor groups from all phases of the Proposed Development outside of the Site (RG3 – RG13). The Residential Visual Amenity Assessment (Appendix 6.4) of this PEIR identifies that there is the potential for slight to moderate residual effects (non-significant) to residents as a result of all phases of the Proposed Development. The Chapter 8 (Cultural Heritage) identified that there would be negligible to no effect on the setting of designated culture heritage assets. Chapter 9 (Highways and Access) has identified that there would be a negligible residual effect for all receptors as a result of increases in traffic on the local road network. Chapter 10 (Noise and Vibration) of this PEIR identifies that there are places of work present in close proximity but due to their sensitivity and likely levels of impact they are not considered. The residual noise and vibration impacts arising from construction, construction traffic, operation and decommissioning on residential properties is negligible to minor and non-significant. Chapter 11 (Air Quality) identifies that the level of traffic movements associated with the Proposed Development fall well below the screening thresholds set out in the EPUK/ IAQM guidance and the impacts would negligible and non-significant. Chapter 14 (Glint and Glare) identifies minor residual (non-significant) effects on two residential properties and the recommendations of the Glint and Glare Assessment have been incorporated into the proposed Green Infrastructure design in order to reduce and avoid potential impacts. Given the minor significance of the residual effects and time period of which these minor (non-significant effects) would occur, it is therefore considered that these in-combination effects would not be significant taking into

Receptor Group	Potential for Significant Receptor Led In-Combination Effects
	account the embedded mitigation, proposed green infrastructure design and measures implemented in the control documents such as the CEMP, OEMP and DEMP.
Flood risk	Chapter 12 (Water Resources and Ground Conditions) of this PEIR identifies that there would be negligible residual effects (non-significant) on flood risk. The effects of climate change have been factored into the flood risk modelling and therefore the in-combination effects have already been assessed within Chapter 12 (Water Resources and Ground Conditions) of this PEIR.
Land/soils (contamination)	Chapter 12 (Water Resources and Ground Conditions) of this PEIR identifies that there would be negligible residual effects (non-significant) from contamination as result of all phases of the Proposed Development. Chapter 13 (Agriculture) identifies a slight (non-significant) residual effect on soils and BMV as a result of minimal permanent loss of BMV and the impact soil quality / structure. It is therefore considered that these in-combination effects would not be significant taking into account the measures implemented in the control documents such as the CEMP, OEMP and DEMP.
Employment and tourism	Chapter 16 (Socio-economics) of this PEIR identifies that there would be negligible to minor beneficial residual effects (non-significant) upon tourism and employment as a result of the Proposed Development. Chapter 13 (Agriculture) identifies that there would be a slight (non-significant) residual effect on agricultural business during the operational phase of the Proposed Development. Appendix 6.5 (Amenity and Recreation Assessment) of this PEIR identifies that there is the potential for major/moderate residual effects (significant) to users of the Bridleways (BrAW/1/1 / E182 and E169) within the Solar PV Site from construction and decommissioning phases of the Proposed Development. For all other users of amenity resource, the effect would be moderate (non-significant) or below. Chapter 8 (Cultural Heritage) of this PEIR identifies that there would be negligible to no effect on the setting of designated culture heritage assets. Chapter 6 (LVIA) of this PEIR identifies that there would be

Receptor Group	Potential for Significant Receptor Led In-Combination Effects
	moderate (non-significant) effects limited to Receptor Group 2 and slight to minimal (non-significant) residual effects on all other receptor groups beyond the Site (RG3 – 13). Beyond the Solar PV Site the potential impacts of the Proposed Development are minimal and therefore it is considered that these in-combination effects on employment and tourism would not be significant taking into account the embedded mitigation and proposed green infrastructure design.

Summary

1.3.9. The assessment of intra effect interactions identified above has been based upon the preliminary assessments of individual effects presented in the topic chapters (Chapters 6 - 17) of the PEIR.

1.3.10. The in-combination assessment has not identified any significant effects beyond those identified within the topic chapters and the embedded mitigation measures along with the measures set out in the oCEMP, oLEMP and oDEMP are sufficient to mitigate and control the potential adverse impacts.

References

Department of Energy and Climate Change (DECC) (2011) The Overarching National Policy Statement (NPS) for Energy (EN-1) [online]. Available: 1938-overarching-nps-for-energy-en1.pdf (publishing.service.gov.uk) [accessed 25/04/2022].

Planning Inspectorate (PINS) (2019) Advice Note Seventeen: Cumulative Effects Assessment [online]. Available: Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects | National Infrastructure Planning (planninginspectorate.gov.uk) [accessed: 25/04/2022].