

5. POPULATION & HUMAN HEALTH

5.1 Introduction

This section of the EIA describes the potential impacts and effects of the Proposed Project on population and human health and has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA) in particular the *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA, August 2017). The full description of the Proposed Project is provided in Chapter 4 of this EIA.

One of the principle concerns in the development process is that people, as individuals or communities, should experience no diminution in their quality of life from the direct or indirect impacts arising from the construction and operation of a development. Ultimately, all the impacts of a development impinge on human beings, directly and indirectly, positively and negatively. The key issues examined in this section of the EIA include population and human health but also include employment and economic activity, land-use, residential amenity, community facilities and services, tourism, property values, glint and glare and noise.

The predominant land use beyond the Proposed Project site is that of either bog, forestry or agricultural farmland. The majority of the residential properties within the study area are located along a local road to the east of the site with the closest dwelling approximately 500m from the proposed solar array. Residences comprise one-off houses, in a general linear pattern along local roads.

5.1.1 Statement of Authority

This section of the EIA has been prepared by Órla Murphy and reviewed by Michael Watson, Project Director with MKO. Órla is an Environmental Scientist with over 2 years' experience in private practice in both Scotland and Ireland; where she has completed numerous assessments for EIAs and has experience composing a variety of EIA chapters; particularly relating to wind energy. She holds a BSc (Hons) in Geography and a MSc. in Environmental Protection and Management. Michael Watson is a Project Director with MKO; with over 17 years' of experience in the environmental sector respectively. His project experience includes the management and productions of Environmental Impact Statements (EISs)/EIAs, particularly within the renewable energy sector. Further information on the Project team is references in Chapter 1 Section 1.7.2 and in Appendix 1-1.

5.2 Receiving Environment

5.2.1 Methodology

For the purposes of describing the receiving environment, the Project Boundary was used as the basis for compiling the baseline information. Information regarding human beings and general socio-economic data were sourced from:

- The Central Statistics Office (CSO),
- The Kildare County Development Plan 2017-2023,
- Fáilte Ireland and any other literature pertinent to the area.

The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2011 and 2016,

which is the most recent census and from the CSO website, www.cso.ie. Census information is divided into Republic of Ireland, Kildare and District Electoral Division (DED).

The Proposed Project is located in a number of townlands as listed in Table 1.1 of Section 1.1 of this EIA. The Proposed Project is located in northwest Co. Kildare, approximately 6.5km (kilometres) north of the village of Allenwood, 6km east of Carbury and 3km south of Johnstownbridge. The Proposed Project site location is shown on Figure 1.1.

The Proposed Project comprises a large scale solar PV farm with an export capacity of approximately 70 Megawatts (MW).

It will consist of a solar photovoltaic array and associated infrastructure, battery storage compound, inverters, access roads and parking, site compounds and security fencing, amenity trails and landscaping, peat and subsoil storage areas (repositories), site drainage and all associated works. The Proposed Project will also include the construction of a 110 kV substation within the site. It is then envisaged to connect from this substation to the Derryiron-Maynooth 110 kV overhead line that traverses the southern section of the Timahoe North site.

In order to make inferences about the population and other statistics in the vicinity of the main project site, the Study Area for this section of this EIA was defined in terms of the Electoral Divisions (EDs) within Kildare. The Proposed Project site lies within Dunfirth ED, Drenth ED and Timahoe North ED and is adjacent to Windmill Cross ED and Timahoe South ED, as shown in Figure 5.1. The total Study Area (for the purposes of the Human Beings assessment) has a combined population of 4,191 persons and comprises of a total land area of 104.63km². [Source: CSO Census of the Population 2016].



Electrical Grid Connection Route

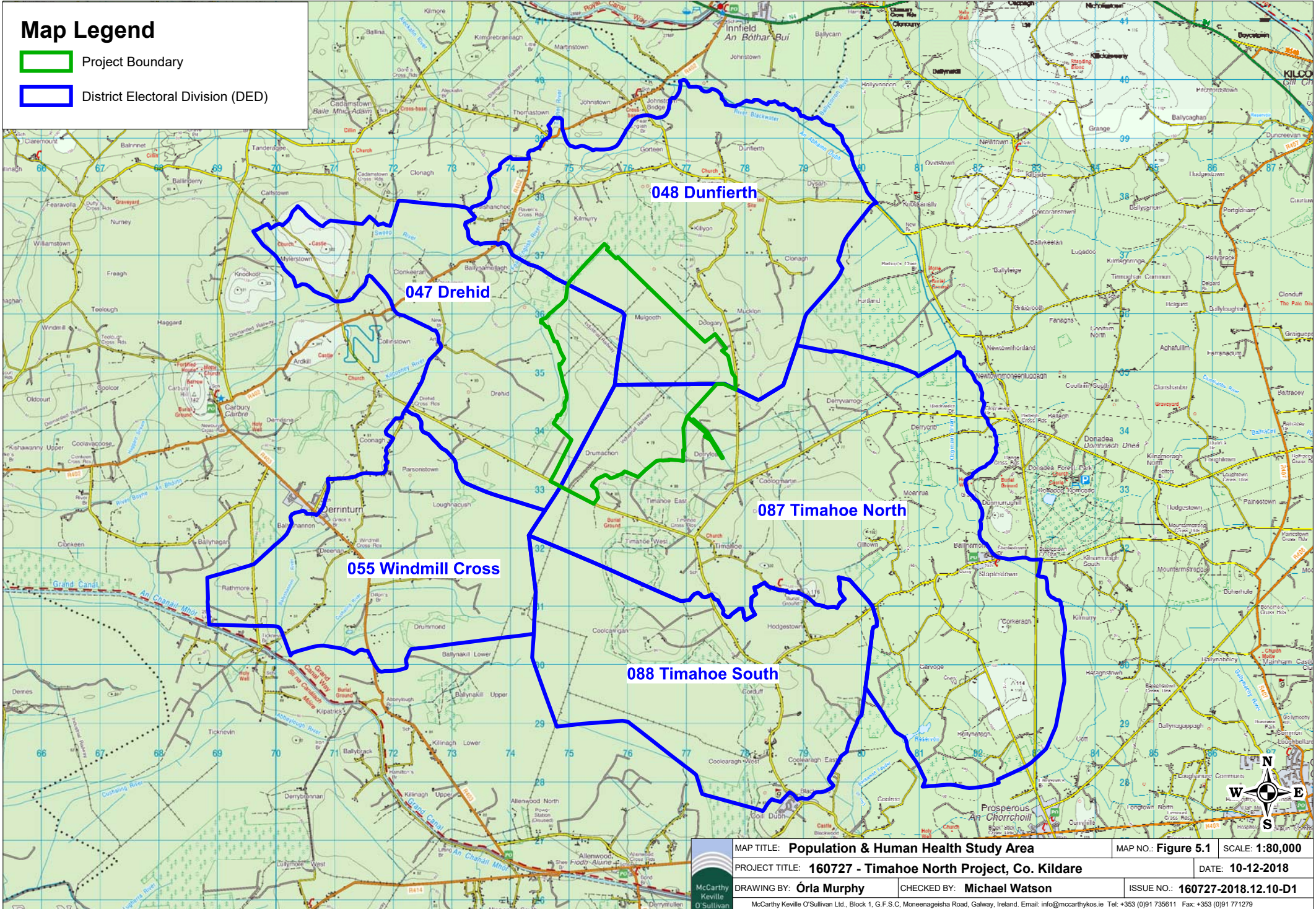
A connection between Proposed Project site and the national electricity grid will be necessary to export electricity from the Proposed Project. As part of the planning application for Proposed Project site, a separate application will be submitted to An Bord Pleanála ('the Board') seeking permission for the 110 kV infrastructure and associated works in accordance with Section 182A of the Planning & Development Act 2000, as amended. Grid connection layout drawings are shown in Appendix 4-1. It is then envisaged to connect from this substation to the Derryiron-Maynooth 110 kV overhead line that traverses the southern section of the Timahoe North site.

The separate application being submitted to Kildare County Council under Section 34 of the same Act for the Solar Farm, battery storage compound and associated works, seeks permission for underground cabling to link with the proposed 110 kV substation via onsite inverters. This is the preferred method of connection to the substation and has been assessed within the EIA.

As the grid connection route is within Proposed Project site and the substation will connect to the Derryiron-Maynooth 110 kV overhead line within the Bord na Móna landowner boundary; the potential impact on population and human health from the grid connection will be low. However, the route will still be assessed in regard to human health, where Proposed Project site is currently used and will in the future be used by the public for recreational activity.

Map Legend

-  Project Boundary
-  District Electoral Division (DED)



MAP TITLE: **Population & Human Health Study Area** MAP NO.: **Figure 5.1** SCALE: **1:80,000**

PROJECT TITLE: **160727 - Timahoe North Project, Co. Kildare** DATE: **10-12-2018**

DRAWING BY: **Órla Murphy** CHECKED BY: **Michael Watson** ISSUE NO.: **160727-2018.12.10-D1**

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5.2.2 Population

5.2.2.1 Population Trends

In the five years between the 2011 and the 2016 Census, the population of Ireland increased by 3.8%. Between 2011 and 2016, the population of Co. Kildare grew by 5.8% to 222,504 persons. Other population statistics for the Republic, County Kildare and the Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 5.1.

Table 5.1 Population 2011 – 2016 (Source: CSO)

Area	Population		% Population Change
	2011	2016	2011-2016
Republic of Ireland	4,588,252	4,761,865	3.8%
County Kildare	210,312	222,504	5.8%
Study Area	4007	4191	4.6%

The data presented in Table 5.1 shows that the population of the Study Area increased by 4.6% between 2011 and 2016. This rate of population growth is 0.8% higher than that recorded in the Republic of Ireland but is 0.8% lower than that recorded at County level between 2011 and 2016.

Of the EDs that make up the Study Area for this assessment, Windmill Cross ED had the highest population of 1,182 in 2016. Timahoe South ED recorded the largest population increase of 9.5% between 2011 and 2016, whereas Dunfierrth ED recorded a decrease in population of 2.4% between 2011 and 2016.

5.2.2.2 Population Density

The population densities recorded within the Republic, County Kildare and the Study Area during the 2016 Census are shown in Table 5.2.

Table 5.2 Population Density in 2011 and 2016 (Source: CSO)

Area	Population Density (Persons per square kilometre)	
	2011	2016
Republic of Ireland	65.6	68.1
County Kildare	107	113.2
Study Area	38.3	40.1

The population density of the Study Area recorded during the 2011 and 2016 Census was 38.3 and 40.1 persons per square kilometre respectively. As can be observed in Table 5.2, this figure is lower than the population density recorded in the Republic of Ireland and County Kildare.

Of the EDs that make up the Study Area for this assessment, Windmill Cross ED recorded a population density of 81.68 persons per square kilometre while Drehid ED recorded a population density of 16.67 persons per square kilometre.

5.2.2.3 Household Statistics

The number of households and average household size recorded within the Republic of Ireland, County Kildare and the Study Area during the 2011 and 2016 Census is shown in Table 5.3.

Table 5.3 Number of Households and Average Household Size in 2011 and 2016 (Source: CSO)

Area	2011		2016	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
Republic of Ireland	1,654,208	2.8	1,702,289	2.7
County Kildare	70,763	2.9	73,596	3.0
Study Area	1,285	3.1	1,352	3.1

In general, the figures in Table 5.3 show that the average persons per household in the Study Area is slightly higher than that observed in the Republic of Ireland and County Kildare, with an average of 3.1 being evident during the 2011 and 2016 census period.

5.2.2.4 Age Structure

Table 5.4 presents the percentages for the Republic of Ireland, County Kildare and the Study Area population within different age groups as defined during the 2016 Census. This data is also displayed in Figure 5.2.

Table 5.4 Population per Age Category in 2016 (Source: CSO)

Area	Age Category				
	0 - 14	15 - 24	25 - 44	45 - 64	65 +
Republic of Ireland	21.1%	12.1%	29.5%	23.8%	13.4%
County Kildare	24.1%	12.6%	30.3%	23.2%	9.9%
Study Area	26.8%	11.0%	27.2%	24.5%	10.4%

The proportion of the Study Area population within each age category is similar to those recorded in the Republic of Ireland and County level. Within the Study Area, the highest population percentage occurs within the 25-44 age category. The lowest population percentage occurs in the over 65 age category, which is consistent with the data for the Republic of Ireland and County level.

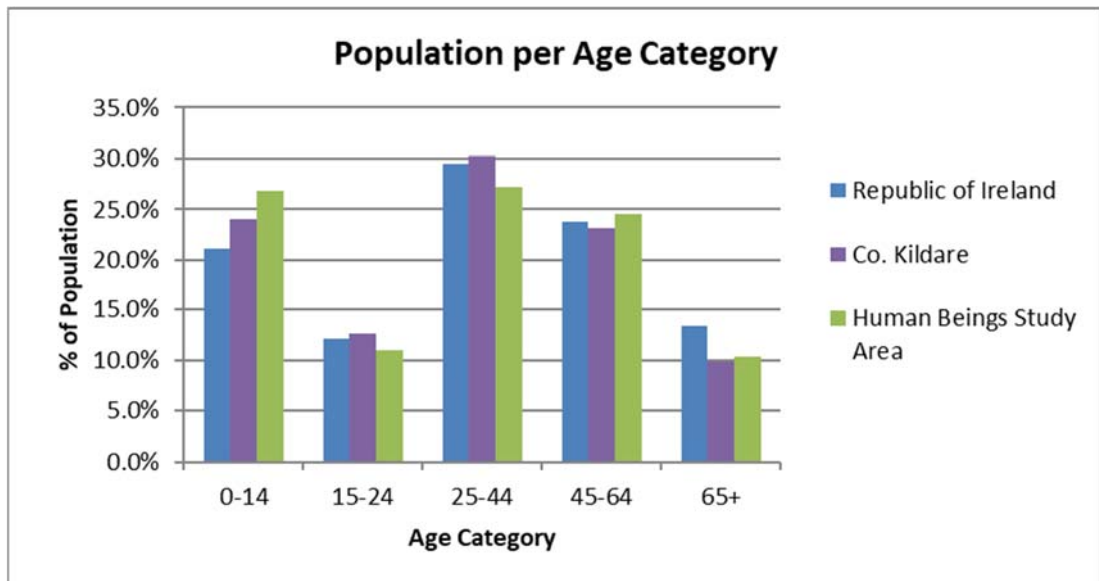


Figure 5.2 Population per Age Category in 2016 (Source: CSO)

5.2.3 Employment and Economic Activity

5.2.3.1 Economic Status of the Study Area

The labour force consists of those who are able to work, i.e. those who are aged 15/16+, out of full-time education and not performing duties that prevent them from working. In 2016, there were 2,304,037 persons in the labour force in the Republic of Ireland. Table 5.5 shows the percentage of the total population aged 15/16+ who were in the labour force during the 2016 Census. This figure is further broken down into the percentages that were at work or unemployed. It also shows the percentage of the total population aged 15/16+ who were *not* in the labour force, i.e. those who were students, retired, unable to work or performing home duties.

Table 5.5 Economic Status of the Total Population Aged 15+ in 2016 (Source: CSO)

	Status	Republic of Ireland	County Kildare	Study Area
% of population aged 15+ who are in the labour force		61.4%	64.1%	62.5%
% of which are:	At work	87.1%	88.6%	88.7%
	Looking for work	1.4%	1.3%	1.0%
	Unemployed	11.5%	10.1%	10.3%
% of population aged 15+ who are not in the labour force		38.6%	35.9%	37.5%
% of which are:	Student	29.4%	33.9%	28.1%
	Family	21.1%	23.9%	29.0%
	Retired	37.6%	31.1%	29.9%
	Unable to work	10.9%	10.3%	12.5%
	Other	1.0%	0.9%	0.5%

Overall, the principal economic status of those living in the Study Area is broadly similar to that recorded in the Republic of Ireland and County level. During the 2016 Census, between 87%-88.6% of those recorded as being in the labour force in the Republic of Ireland and County level were in employment. Within the Study Area, this figure was 88.7%. Of those who were not in the labour force during the 2016 Census, the highest percentage of the Study Area population were Retired. This was similar in

the Republic of Ireland which also recorded the highest percentage of those who were not in the labour force as being Retired, although this was different to County level, which recorded the highest percentage of those who were not in the labour force as being Students.

5.2.3.2 Employment and Socio-Economic Grouping

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. These range from higher professional to unskilled. Employment in the study area falls mainly under employer/manager, non-manual and skilled manual, with a variety of sectors contributing to employment.

5.2.3.3 Employment and Investment Potential in the Irish Solar Energy Industry

5.2.3.3.1 Background

A report entitled *‘A Brighter Future – The Potential Benefits of Solar PV in Ireland’* was published in 2015 by KPMG, in conjunction with the Irish Solar Energy Association (ISEA). This report focused on assessing the potential benefits to the Irish economy. In particular, the ability of solar technology in Ireland to create investment and jobs. In terms of the overall economic benefit to be obtained from solar energy, the report states in its executive summary:

“A thriving domestic solar sector, coupled with Ireland’s existing strengths in high-tech industries, could make Ireland an attractive location for overseas players in the global solar market looking to establish a manufacturing capability in Europe.”

5.2.3.3.2 Employment Potential

The KPMG report (2015) estimated at the time of its publication that the accelerated deployment of solar PV will generate jobs, particularly in the construction and installation sectors. A larger market could enhance Ireland’s offering as a location for firms in the solar PV supply chain, which could bring further jobs and investment in high-tech, exporting industries. Furthermore, the deployment of solar PV will sustain 7,300 jobs annually between 2017 and 2030.

Of the 7,300 jobs estimated to be created through the development of the solar energy sector, the report states the rise in the solar industry will require workers in construction of solar plants, the manufacture of parts and in operations and maintenance

The report further references a 2013 study undertaken by the UK’s Department for Business, Innovation and Skills into the low-carbon economy. It estimated that there were 20,300 direct jobs in the solar PV industry in 2013 in the UK, approximately equating to around 18 direct jobs per MW associated with the development, construction, installation and manufacturing of solar PV modules.

5.2.3.4 Economic Value

The KPMG report states that solar PV will create €2 billion in gross value for the economy:

“...through its operations, indirectly through the production of the goods and services used to create solar energy and through the capital spending required to deploy the technology. The spending of employees will also generate further induced GVA impacts.”

The report comments:

“Solar PV is emerging as the lowest cost and fastest growing new build renewable technology worldwide. Costs are falling quickly (estimated at 70% over the last five years) and are expected to continue falling.”

The report concludes that while providing an economic boost to the Irish economy, solar is generally supported by the public. Furthermore,

“...development of an Irish solar sector would support a significant number of jobs (we estimate up to 7,300 a year in the early 2020s) and Ireland’s attractive business environment could attract major players in the global solar market looking for a European base.”

5.2.4 Land-use

Previous land-use onsite includes commercial scale peat extraction, which ceased in the 1990’s. Currently, there is no industrial activity on site. Land-use includes regenerating woodland, cutover peatland, as well as some ‘turf on the spread’ peat extraction activity taking place to the northeast and south-southeast of the Timahoe North site. Only a portion of this area under lease is actively being cut. The site is also used as an informal site for members of the public for walking.

5.2.5 Services

The Proposed Project site is located 3km south of Johnstownbridge, 6.5km north of the village of Allenwood and 6km east of Carbury and these are the nearest settlements to provide services to the area. Services that would potentially provide for the site include local shops, construction and supplies companies, accommodation and health services.

5.2.5.1 Education

The nearest primary school to the boundary of the site of Proposed Project site is the National School Scoil Treasa, Enfield, Co. Kildare, located approximately 1.65km to the northwest of Proposed Project site. Other primary schools in the area are Scoil Naisiunta Cianog Naofa, Co. Kildare, located approximately 1.9km to the southeast of Proposed Project site and St Patricks National School, located in Johnstownbridge, 2.6km north of Proposed Project site.

The closest secondary school to Proposed Project site is St Farnan’s Post Primary School, Prosperous, located approximately 9km to the southeast of Proposed Project site. St Fintinas Post Primary School is also located approximately 9.2km to the northwest of Proposed Project site.

5.2.5.2 Access and Public Transport

The site of Proposed Project is accessed from the south via the Derrymahon-Drehid local road L1019, which adjoins the R402 Regional Road to the west of the site. The nearest bus routes from which a number of daily connections are available, can be accessed in Derrinturn approximately 3.6km southwest of the site and in the area surrounding Prosperous, approximately 8.1km south of the site.

5.2.5.3 Amenities and Community Facilities

The majority of amenities and community facilities, including GAA and other sports clubs, youth clubs and recreational areas available in the area are located in the centres of settlement throughout the wider area. Retail and personal services within

the vicinity are provided in the larger settlements such as Edenderry, Prosperous and Maynooth.

The nearest designated walking route is the Donadea Forest Park Slí & Walking Trails, and the Barrow Way, located approximately 5.3km east and 5.1km south respectively of Proposed Project site at its nearest point.

The Proposed Project site is unofficially used by locals as a walking route. As part of the development, amenity facilities, including visitor access, car parking and a looped walk are proposed, allowing the area to be used by locals and increasing the amenity options in the wider area.

5.2.6 Tourism

5.2.6.1 Tourist Numbers and Revenue

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. During 2017 (total tourism revenue generated in Ireland was approximately €8.8 billion, an increase of approximately 5.8% from the previous year. Overseas tourist visits to Ireland in 2016 grew by 3.2% to 9 million (‘*Tourism Facts 2017*’, Fáilte Ireland, July 2018).

Ireland is divided into eight tourism regions. Table 5.6 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2017 (‘*Tourism Facts 2017*’, Fáilte Ireland, July 2018)

Table 5.6 Overseas Tourists Revenue and Numbers 2017 (Source: Fáilte Ireland)

Region	Total Revenue (€m)	Total Number of Overseas Tourists (000s)
Dublin	€1,981 m	5,936
Mid-East	€207 m	633
Midlands	€85 m	218
South-East	€271 m	954
South-West	€968 m	2,439
Mid-West	€444 m	1,387
West	€694 m	1,911
Border	€271 m	746
Total	€5,021 m	14,224

The Mid-East region, in which the site of Proposed Project is located, comprises County Kildare, Meath and Wicklow. This Region benefited from approximately 4.5% of the total number of overseas tourists to the country and approximately 4.1% of the total tourism income generated in Ireland in 2017.

Data showing the breakdown of overseas tourist numbers to the Mid-East region and the associated revenue generated for 2017 can be observed in Table 5.7 (Regional tourism performance in 2017, Fáilte Ireland, September 2018). County Kildare had the highest tourism revenue within the Region during 2017.

Table 5.7 Overseas Tourism to Mid East Region during 2016 (Source: Fáilte Ireland)

County	Revenue Generated by Overseas Tourists (€m)	No. of Overseas Tourists (000s)
Kildare	91	211
Meath	44	162
Wicklow	73	275

5.2.6.2 Tourist Attractions

There are no tourist attractions pertaining specifically to the site of the Proposed Project, however there is informal use of the site for amenity purposes and this will be formalised as part of this project.

Tourist attractions within the surrounding area are listed below:

- Ballindoolin House & Gardens, Carbury;
- Donadea Forest Park, Donadea;
- Wallaby Woods, Donadea;
- The Kildare Maze Family Activity Park, Prosperous;
- Bog of Allen Nature Centre, Lullymore and
- Lullymore Heritage & Discovery Park, Lullymore.

5.2.6.3 Tourist Attitudes to Renewable Energy Solar Farms

5.2.6.3.1 Good Energy Survey 2013

Overall, there is lack of information regarding tourist opinions towards solar energy development throughout both Ireland and the UK. In regard to renewable energy, most tourism opinions relate to wind and their impact as a more prominent structure in the environment.

A small study commissioned by Good Energy, was undertaken in Cornwall, south west England in August 2013, with a total of 1,007 visitors questioned about their attitudes to renewable energy installations. The study found that the vast majority of visitors (94%) to Cornwall thought that solar and wind farms had no impact on their visit. Poor weather (17%) and the cost of holidaying (14%) were found to be the largest deterrents for holidaymakers, in contrast to just 2% who listed the presence of solar and wind farms as a reason to be less likely to visit the region.

In comparison to wind farm developments, visitor awareness of the presence of solar farms was much lower, with just over a third (35%) of visitors being aware of solar farms in Cornwall, 71% saying that their presence had no impact while 22% said that they had a positive impact. In contrast, just 7% said that solar farms had a negative impact on their visit.

Overall, there is a lack of research into the impact of solar energy on tourism trends. This study is a small representation of the opinions of tourism on renewable energy, particularly that of solar, and can be used as guidance at a local authority level. The reduced visual impact in comparison to wind energy allows for a more positive tourist response regarding solar farm developments.

5.3 Public Perception of Solar Energy

Although there is not much evidence of research towards public perceptions to solar energy in Ireland; there are a variety of reports within the UK that document the view

of the public towards renewable energy technologies, particularly in regard to solar energy. The most recent and largest survey is summarised below.

- **Solar Power Portal, *New evidence of overwhelming public support for solar, 15th November 2017***

The Ørsted Green Energy Barometer, surveyed more than 26,000 people across 13 countries, asking just over 2,000 people in the UK where they would like to see more of their energy come from. The article notes that:

‘The majority of UK respondents to the largest survey of attitudes towards green energy ever conducted would like to see more solar power used compared to other generation technologies.’

Solar energy was the most common, with 77% of respondents preferring solar technology in comparison to tidal power and offshore wind (71% and 70% respectively). The results of the survey in the UK are detailed below.

Table 5.8: Survey results: Favoured Energy Technologies

Energy Technology	UK (2,020 respondents)
Solar power	77%
Tidal power	71%
Offshore wind	70%
Onshore wind	61%
Sustainably sourced biomass	53%
Natural gas	34%
Nuclear	31%

The article furthermore references the UK Government and the Department for Business, Energy and Industrial Strategy’s public attitudes tracker, which surveys public opinions on a variety of energy issues. They have noted two surveys last year.

- May 2017 – Survey results found that 79% of those surveyed generally supported renewable energy
- November 2017 – Survey identified solar as the ‘*most popular technology in the UK*’ with 85% of those surveyed saying they were in favour of solar PV which is more than any other renewable technology including offshore wind, wave and tidal (79%) and onshore wind (74%).

Conclusions

Solar energy is gaining popularity over other energy technologies, with continuing increase in public perception as being a favourable form of green energy.

5.4 Health Impacts

As identified below, the main health risk associated with electricity, is the impact of electromagnetic fields (EMF). The EirGrid document ‘EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland’ (EirGrid, 2014) and the ESB document ‘EMF & You: Information about Electric & Magnetic Fields and the electricity network in Ireland’ (ESB, 2017) provides further practical information on EMF and is included as Appendices 5-1 and 5-2 of this EIAR.

5.4.1 Solar Farm

Although there are no national guidelines in regard to solar energy in Ireland, solar farms are not known to pose any significant health effects to the general public. The electrical infrastructure for the Solar Farm is of a lower voltage than the Substation and Grid Connection. Therefore, the potential of likely significant effects associated with EMF are related to persons who could have contact with high voltage equipment, which is a Health & Safety issue, rather than an issue of health effects associated with releases to the environment.

Mitigation to protect the public and all workers during the construction and operation of Proposed Project site will be implemented and are described below for reference. These include but are not limited to:

- All requirements arising from statutory obligations, including the Safety, Health and Welfare at Work Act 2005 (as amended) and associated regulations, will be met in full;
- Safety is very important. The nature of Solar PV is such that it always produces energy when exposed to light, so it is crucial that experienced, qualified and trained personnel and products will be used to design and install the system;
- Fencing or other restrictions will be erected for safety. The public will not be able to enter the area containing the solar arrays;
- Ensuring signage and security measures are in place warning of any potential hazards and;
- Installation of security cameras.

5.4.2 Substation & Grid Connection

As part of this assessment, various peer reviewed papers, reports and guidance documents relating to potential health impacts on the public were reviewed and have been summarized below. Peer-reviewed research does not generally support any suggestion of a link between exposure to electromagnetic fields (EMF) and health impacts.

EMF stands for Electromagnetic Fields. Both electric and magnetic fields occur naturally and from man-made sources, the most common and well-known being electricity. EMF is a natural phenomenon, which identifies the earth as having a natural electric field and a magnetic field¹.

The substation & grid connection will include 110 kV power lines and associated electrical infrastructure. The main publications supporting the view that there is either none or inconclusive evidence of any direct link between EMF and health are summarised below.

- **Department of Communications, Marine and Natural Resources, *Expert Group on Health Effects of Electromagnetic Fields, 22 March 2007***

This report was compiled by a group of experts on electromagnetic fields (EMF). The Expert Group was established and funded by the Department of Communications, Marine and Natural Resources with the following terms of reference:

- *The Expert Group will focus on issues of public exposure, rather than examining occupational exposure.*

¹ EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland' (EirGrid, 2014), see also Appendix 5-1.

- *The report produced by the Expert Group will be aimed at the Government and the public, rather than the scientific community.*
- *The Expert Group will consult with Industry, recognised national and international experts and the wider community in order to complete its report.*
- *In future, the Expert Group may be requested to take part in some ongoing monitoring; in order to update the Irish Government's position in light of new scientific publications or report.*

During their assessment, particular summaries and conclusions were reached which relate to health impacts from solar, particularly ELF, EMF and Electromagnetic Hypersensitivity. Conclusions of the Expert Group are consistent with those of similar reviews conducted by authoritative national and international agencies:

ELF - Extremely low frequency (ELF) fields

- *ELF fields induce electric fields and currents in tissues that can result in involuntary nerve and muscle stimulation, but only at very high field strengths. These acute effects form the basis of international guidelines that limit exposure. However, fields found in our environment are so low that no acute effects result from them, except for small electric shocks that can occur from touching large conductive objects charged by these fields. No adverse health effects have been established below the limits suggested by international guidelines*
- *There is limited scientific evidence of an association between ELF magnetic fields and childhood leukaemia.*
- *Epidemiological studies suggest that ELF magnetic fields above 0.3 to 0.4 μ T are associated with an increased incidence of childhood leukaemia, but there is little or no support for this by well conducted laboratory studies. However, we have no understanding of how, or even if, ELF magnetic fields might be associated with leukaemogenesis. Essentially, the evidence for a causal relationship is insufficient*
- *Siting of power lines: As a precautionary measure future power lines and power installations should be sited away from heavily populated areas to keep exposures to people low. The evidence for 50 Hz magnetic fields causing childhood leukaemia is too weak to require re-routing of existing lines, and so these measures should only apply to new lines*

EMF

- *Currently there is no scientific evidence that children, diseased adults or the elderly are any more sensitive to EMF exposure than healthy adults. However, the ICNIRP international guidelines have included an additional safety factor of 5 into their exposure limits to take account of this possibility. At a recent WHO workshop convened to determine whether children were more sensitive than adults, it was concluded that they do not appear to be more sensitive than adults after about 2 years of age, and that the current ICNIRP guidelines seem to provide sufficient protection for children from EMF exposure*

Electromagnetic hypersensitivity (EHS)

- *EHS is a collection of subjective symptoms, such as headaches, sleeplessness, depression, skin and eye complaints, that sufferers attribute to EMF exposure. Symptoms suffered by EHS individuals are real and can be debilitating and require appropriate treatment. Research has not established any link between EMF exposure and the occurrence of EHS symptoms.*

As concluded, the Expert Group conclusions were consistent with those of similar reviews identified by authoritative national and international agencies. Without further research, there is no scientific basis in which to link health issues to ELF and EMF fields. The Expert Group recommends that:

'sufficient funds be made available in Ireland for scientific research on the health effects of exposure to EMF. A requirement for this should be that the research is performed with expertise available in Ireland – the principal investigators should be Irish scientists – but international collaboration should be encouraged and in some cases is a necessity. Research should address topics in the Research Agendas of the WHO International EMF Project, since these provide the most comprehensive and up-to-date list of gaps in knowledge.'

- **World Health Organisation, Extremely Low Frequency Fields Environmental Health Criteria Monograph No.238, 2007**

The World Health Organisation updated the International Agency for Research on Cancer (IARC) report in 2007 with the publication of its comprehensive review of ELF-EMF health research. The conclusions of the World Health Organisation report have been summarised by EirGrid in their document; *'EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland'* (EirGrid, 2014) as follows:

- *The research does not establish that exposure to EMF of the nature associated with power lines causes or contributes to any disease or illness.*
- *There are no substantive health issues related to electric fields at levels generally encountered by members of the public.*
- *While epidemiology studies have reported a weak statistical association between childhood leukaemia and long-term exposures to magnetic fields greater than 0.3-0.4 μ T, this association is not supported by the laboratory studies and has not been considered a causal relationship.*
- *The animal studies as a whole do not show adverse effects, including cancer, among animals exposed to high levels of magnetic fields.*
- *The laboratory studies on cells and tissues have not confirmed any explanation as to how weak magnetic fields could cause disease.*
- *Because the epidemiology studies have limitations and the experimental studies provide little or no support for an association with cancer or mechanisms to cause cancer, the World Health Organisation did not conclude that magnetic fields cause childhood leukaemia. Thus, considering all of the research together, the reviewers for the World Health Organisation did not conclude that magnetic fields cause any long-term, adverse health effects.*
- *The view of the World Health Organisation on ELF-EMF and health issues provided on its website is "based on a recent in-depth review of scientific literature, [we conclude] that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields"*

- **SCENIHR (Scientific Committee on Emerging and Newly Identified Health Risks), *Potential health effects of exposure to electromagnetic fields (EMF)*, 27 January 2015.**

The SCENIHR is asked to continuously monitor new scientific evidence that may influence the assessment of risks to human health in the area of electromagnetic fields (EMF) and to provide regular updates to the Commission.

The purpose of this Opinion is to update the previous SCENIHR Opinions of 2009 in regard to any newly available information and to give special consideration to areas where important knowledge gaps were identified in the previous Opinions.

The report discusses updated knowledge in particular to exposure to EMF and interaction mechanisms, as well as health effects in regard to ELF fields.

The Opinion found that:

- *Overall, the epidemiological studies on RF (Radiofrequency) EMF exposure do not show an increased risk of brain tumours. Furthermore, they do not indicate an increased risk for other cancers of the head and neck region.*
- *Only a few new epidemiological studies on neurodegenerative diseases have been published since the previous Opinion. They do not provide support for the previous conclusion that ELF magnetic field exposure could increase the risk for Alzheimer's disease or any other neurodegenerative diseases or dementia.*
- *The new epidemiological studies are consistent with earlier findings of an increased risk of childhood leukaemia with estimated daily average exposures above 0.3 to 0.4 μ T. As stated in the previous Opinions, no mechanisms have been identified and no support from experimental studies could explain these findings, which, together with shortcomings of the epidemiological studies prevent a causal interpretation.*
- *Symptoms that are attributed by some people to various RF EMF exposure can sometimes cause serious impairments to a person's quality of life. However, research conducted since the previous SCENIHR Opinion adds weight to the conclusion that RF EMF exposure is not causally linked to these symptoms. This applies to the general public, children and adolescents, and to people with idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF).*

The results of current scientific research show that there are no evident adverse health effects if exposure remains below the levels recommended by the EU legislation.

5.4.3 Solar Array Safety

Although there are no specific guidelines in regard to solar energy in Ireland, solar farms are not known to pose any significant health to the general public. The most significant risk posed are to individuals who could have contact with high voltage equipment. This equipment will be situated within the substation development, so as not to cause harm to humans; and will be enclosed with security fencing on which warning, project description and interpretation signage will be attached.

5.4.4 Assessment of Effects on Human Health

5.4.4.1 Solar Farm

As required by the EIA Directive, the consideration of the effects on populations and on human health should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters.

A solar farm is not a recognised source of pollution. It is not an activity that falls within any thresholds requiring Environmental Protection Agency licensing under the Environmental Protection Agency Licensing Act 1992, as amended. As such, a solar

farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects.

Chapter 7, Geology & Soils, Chapter 8 Hydrology and Hydrogeology, Chapter 9 Air & Climate and Chapter 10 Noise provide an assessment of the effects of the Proposed Project on these areas of consideration. There is the potential for negative effects on human health during the Proposed Project construction phase related to potential emissions to air of dust, potential emissions to land and water of hydrocarbons and noise emissions, as noted in the above listed chapters and below in Section 5.7. The assessments however show that the residual impacts are not significant and will not lead to significant effects on any environmental media.

5.4.4.2 Substation & Grid Connection

The provision of electric cables of the capacity proposed is common practice throughout the country and installation to the required specification does not give rise to any specific health concerns.

The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF. Accordingly, there will be no operational impact on properties (residential or other uses) as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables i.e. the proposed cables associated with Proposed Project will not be located near any property in the vicinity and therefore will not have any impact on the local population. The ICNIRP published additional guidance on exposures to DC magnetic fields in 2014 but stated: “The guidelines are not expected to be relevant for the general public because all exposures to intense magnetic fields below 1Hz are currently found at workplaces.”

As noted above, the EirGrid and ESB documents provide further practical information on EMF and is included as Appendix 5-1 and 5-2 of this EIAR.

Further details on the potential impacts of electromagnetic interference to aviation are presented in Section 13.2 of this EIAR.

5.4.4.3 Proposed Project

The Proposed Project is for the development of a renewable energy project consisting of a Solar Farm and associated Substation and Grid Connection, capable of offsetting carbon emissions associated with the burning of fossil fuels. During the operational stage the Proposed Project will have a long term, slight, positive effect on air quality as set out in Chapter 9 which will contribute to positive effects on human health.

Potential health effects are also associated with negative impacts on public and private water supplies and potential flooding. Chapter 8 Water addresses the potential for effects on water supplies and concludes that there will be no residual effects. The proposed site design and layout avoids the areas most prone to flooding. Further mitigation measures ensure that the potential for impacts on the water environment is low.

The assessment of flood risk in Chapter 8 Water has also shown that there is a potential risk of flooding to the proposed Solar Farm. The implementation of the proposed drainage scheme will suitably mitigate both potential and residual flood risk, without impacting the flood risk to adjacent and downstream Third Party lands.

On the basis of the above assessment the potential for negative health effects associated with Proposed Project is negligible.

5.4.5 Vulnerability of Proposed Project to Major Accident/Natural Disaster

Neither the Solar Farm or the Substation and Grid Connection infrastructure are a recognised source of pollution. Should a major accident or natural disaster occur the potential sources of pollution onsite during both the construction and operational phases are limited. Sources of pollution with the potential to cause significant environmental pollution and associated negative effects on health such as bulk storage of hydrocarbons or chemicals, storage of wastes etc. are limited.

There is limited potential for significant natural disasters to occur at the Timahoe North site. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to flooding and fire. The risk of flooding is addressed in Chapter 9. It is considered that the risk of significant fire occurring, affecting the development and causing the Solar Farm and Substation and Grid Connection to have significant environmental effects is limited. As described earlier, there are no significant sources of pollution in Proposed Project site with the potential to cause environmental or health effects. Also, the distance of the development from any properties limits the potential for impacts on human health. The issue of solar safety is addressed in Section 5.4.3.

Major industrial accidents involving dangerous substances pose a significant threat to humans and the environment; such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident.

The Solar Farm does not exceed the required thresholds and is therefore is not regulated under the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances Regulations) Regulations 2015 i.e. SEVESO sites. The Proposed Project is not adjacent or connected to any SEVESO site.

Furthermore, there is risk of an unplanned event i.e. a traffic accident related to the construction phase of the Proposed Project. Major accidents can result in illness, injury or loss of life to construction workers and members of the public. As the construction phase of the Proposed Project takes place within a specified area; only trained staff are permitted to enter, and measures will be implemented to exclude members of the public from the Proposed Project site.

5.5 Glint and Glare

5.5.1 Introduction

Glint and Glare is an impact that is described as the reflection of sunlight from reflective surfaces, in this case the solar array. The other elements of the Proposed Project including the Substation and Grid Connection do not have any potential for glint and glare effects. The effect of glint and glare can occur on many different receptors in both rural and urban area, most particularly to residential property and transport routes. The impact can cause a direct reflection of the sun being experienced by residents in surrounding property and all road users such as motorists.

The following glint and glare assessment was completed by Macro Works and concluded that there will be no potential for effects along surrounding roads or at any residences as a result of glint and glare by the Solar Farm. Macro Works relevant

experience includes nineteen years of analysing the visual effects of a wide range of infrastructural and commercial development types. This experience includes numerous domestic and international wind and solar energy developments. The Glint and Glare analysis model used in this study was developed in conjunction with the Physics Department of the National University of Ireland (NUI), Maynooth. It has successfully replicated results from Federal Aviation Authority (FAA) approved software and has been utilised to assess the effects of glint and glare for more than 70 no. solar development sites throughout Ireland to date. The complete glint and glare assessment can be found in Appendix 5-3.

5.5.2 Background

The frequency of occurrence and the strength of any potential glint and glare impact depends on several factors, each of which is outlined below.

1. Type of surface:

The surface of which sunlight reflects will allow for a certain reflectance. Photovoltaic solar panels are by no means a highly reflective surface but have a flat, polished surface, which omits 'specular' reflectance rather than a 'diffuse' reflectance, which would occur from a rough surface, as shown in Figure 5.3 below. Furthermore, as referenced in Appendix 5-3, photovoltaic panels, in comparison to concentrated solar power, has similar reflectance characteristics to water, which is much lower than the likes of glass, steel, snow and white concrete by comparison.

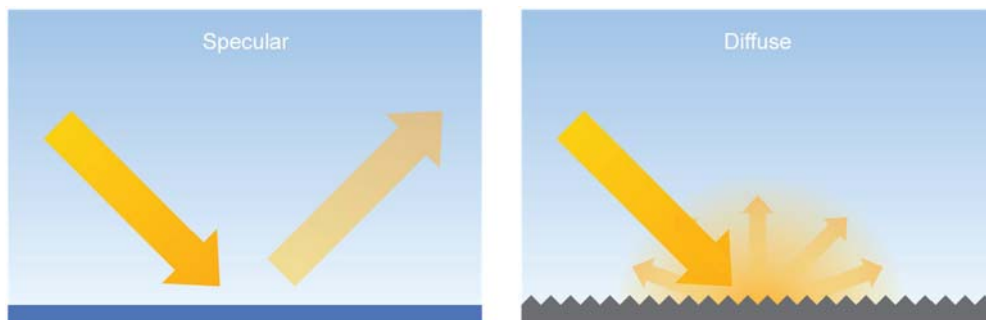


Figure 5.3: Specular vs Diffuse reflection of light from polished and rough surfaces (Source: Federal Aviation Administration, *Technical Guidance for Evaluating Selected Solar Technologies on Airports*, November 2010).

2. The presence of intervening obstructions between the solar panel and receptor:

For glint and glare to occur, potentially affected receptors must have direct visibility of the solar panelling, with no physical obstructions such as buildings, trees and hedgerows, hills or other structures located on the intervening land between the receptor and the panel.

Any obstacles such as trees or buildings located between a receptor and the solar panel will reduce or eliminate the occurrence and/or intensity of the glint and glare.

3. Weather Conditions:

Glint and glare can only occur when weather conditions allow for direct sunlight to hit the photovoltaic panels. Haze, mist, fog and precipitation will all have the effect of both reducing the visibility of the site overall and reducing the intensity of any glare emanating from the Proposed Project site. According to the Met Eireann website (www.met.ie), "Irish skies are completely covered by cloud for well over fifty percent of the time".

While it is difficult to correlate exact periods of sunlight with predicted periods of potential glare, figures for the periods and duration of glare are conservative at best and would likely be subject to a substantial reduction in reality.

4. Location and Timing, i.e. where properties and roads are located relative to solar array and the sun:

Optimum conditions relating to the time of year, the time of day and the relative angles between the sun and the panels will all affect the impact on the relative receptor. If the optimum conditions are not achieved, the potential for any glare from the solar panels will be reduced.

5. Direction and elevation of solar panels:

The photovoltaic panels are to be oriented in a south facing direction to maximise solar gain and will remain in a fixed position throughout the day and year. This will allow for a particular impact upon any ground-based receptors at certain stages of the day. Ground-based receptors (such as houses and transport routes) situated to the west of the solar array can only be affected by morning reflectance, when the sun is rising in the east. Inversely, receptors situated to the east of the Proposed Project site and can only be affected by evening reflectance, when the sun is setting in the west.

In regard to elevation; this depends on the ground level and the overall height of the panel from the ground. In most cases, ground mounted panels are positioned low in the landscape and as with Proposed Project site, a maximum height of 3m allows for reduction of visibility in the surrounding environment.

5.5.3 Guidance

There is currently no specific guidance or standards for the assessment of photovoltaic glint and glare effects on residential and/or transport route (road and rail) receptors in Ireland. Guidance has been prepared, however, by the Federal Aviation Authority² to address the potential hazards that solar developments may pose to aviation activities, and this has been adopted for use by the Irish Aviation Authority. This guidance, concerned with hazard assessment, has relevance to the other receptor types mentioned, and coupled with numerous assessments already carried out across the UK, combine to establish a suitable best practice.

By virtue of their efficiency, the intensity of reflected light from modern PV solar panels is deliberately low and currently equates with that of the reflection from still water, however, studies generally agree that there is still a potential for hazardous effects upon surrounding receptors.

5.5.4 Scoping

Section 2.5 in Chapter 2 of this EIAR describes the scoping and consultation exercise undertaken for Proposed Project site. Comments from the Irish Aviation Authority and the Department of Defence were received in relation to Glint and Glare in response to scoping requests sent out on 9th May 2018. Both responses detailed the need for a glint and glare assessment to include an aviation assessment of aerodromes and these are assessed in Chapter 13 – Material Assets – Telecommunications and Aviation. As a note, none of the scoping responses received to date have requested further information on the potential impact on health associated with glint and glare.

² Harris, Miller, Miller & Hanson Inc.. (November 2010). Technical Guidance for Evaluating Selected Solar Technologies on Airports; 3.1.2 Reflectivity. Technical Guidance for Evaluating Selected Solar Technologies on Airports. Available at: https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide.pdf

5.5.5 Glint and Glare Prediction Methodology

Glint and Glare occurs only under certain, combined circumstances, as detailed above. Where glint and glare does occur, it is generally short-lived. Although there is no set guidance methodology regarding glint and glare, a set methodology was developed by Macro Works when completing their assessment. The Glint and Glare analysis model used in this study was developed in conjunction with the Physics Department of the National University of Ireland, (NUI) Maynooth. It has successfully replicated results from FAA approved software and has been utilised to assess the effects of glint and glare for more than 70 no. solar development sites throughout Ireland to date.

The occurrence of glint and glare can be predicted by carrying out specific 3D analysis using a Digital Terrain Model (DTM) and high-resolution digital surface model (DSM), in combination with the FAA approved Solar Glare Hazard Analysis Tool (SGHAT) (see Appendix 5-3).

To begin, an appropriate study area (radius around the Proposed Project site) within which to assess the potential for glint and glare effects is designated. A buffer extent of 1km is typically used unless otherwise warranted by terrain and receptors. Then, by populating the study area with a regular grid of receptor points (100m centres) a pre-analysis of the study area is carried out, that allows us to determine areas theoretically exposed to glint and glare effects that might warrant further investigation. This pre-analysis is based on a 3D model of the development placed upon a Digital Terrain Model (DTM) for the area.

1st Analysis

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

2nd Analysis

Secondly, execute the glint and glare analysis on the DTM-based 3-D model in respect of each of the theoretically affected receptors. The model theoretically predicts results of glint and glare based on a 'bare ground' scenario which does not account for existing intervening screening and are used only to establish receptors that require more detailed investigation. Any potential glint and glare impact can be modelled to give the times of the day and months of the year that glint and glare could potentially affect receptors in the absence of screening.

3rd Analysis

Once this model has been run, an additional model, using the same calculations is performed using an up-to-date high-resolution digital surface model (DSM) that accounts for the existing screening inherent on and surrounding the Proposed Project site. This offers a truer reflection of the actual glare that is likely to occur and highlights where landscape mitigation may be required. Any potential glint and glare impact will be modelled to give the amount of days and total minutes that glint and glare could potentially affect receptors with existing screening.

If there is any instances of glint and glare after including screening within the model, it needs to be determined whether they are likely to cause a hazard. This is achieved by comparing the periods of glare potential with the 'Magnitude of Glint and Glare

Effects'' table developed by Macro Works (see Table 5.9 below) in combination with SGHAT glare intensity analysis.

Table 5.9 – Macro Works ‘Magnitude of Glint and Glare Effects’ table

Magnitude of Impact	Description
Very High	Hazard / irritant effects emanating from highly reflective surfaces (>50% sunlight reflection) for most of the year (>70% / 255 days) and for significant periods of each day (>45 mins) with no intervening screening.
High	Hazard / irritant effects emanating from moderately reflective surfaces (>30% sunlight reflection) for the majority of days in a year (>50% / 182 days) and for substantial periods of each day (>30 mins) with little or no intervening screening.
Medium	Irritant effects emanating from moderately/low reflective surfaces (>10% sunlight reflection) for a substantial number of days in a year (>30% / 109 days) and for substantial periods of each day (>20 mins) with low levels of intervening screening.
Low	Irritant effects emanating from low reflective surfaces (>5% sunlight reflection) for a modest number of days in a year (<20% / 73 days) and for notable periods of each day (>15 mins) with moderate / low levels of intervening screening.
Very low*	Irritant effects emanating from low reflective surfaces (>5% sunlight reflection) for a small number of days in a year (<10% / 36 days) and for short periods of each day (<15 mins) with moderate to high levels of intervening screening.
None*	Effects not geometrically possible or no visibility of reflecting surfaces likely due to high levels of intervening screening

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

4th Analysis

If a hazardous effect is likely to occur, mitigation is proposed where possible. This might relate to the re-siting of particular panels and/or the provision of additional screening. Once mitigation is applied, the glint and glare calculations will be rerun again, to verify the effectiveness of the proposed mitigation measures and determine if there are any residual glare impacts.

5.5.6 Glint and Glare Assessment Criteria

5.5.6.1 Solar Panel Orientation and Location

Planning permission is being sought for a solar panel array with a maximum export capacity of 70 MW. The panels are to be orientated in a south facing direction to maximise solar gain. They will remain in a fixed position throughout the year.

For the purposes of this assessment, particular parameters were used to inform the model. From the final layout, worst case dimensions of 3m tall panels and a tilt of 20 degrees was modelled.

5.5.6.2 Study Area

There is a total of 105 No. occupied buildings as identified in Figure 5.4, located within a distance of 1 kilometre from the Proposed Project boundary. The area was also the subject of a planning history search, to identify properties that may have been granted planning permission, but which have not yet been constructed.

In regard to the glint and glare assessment, there were a total of 43 occupied dwellings which occur within the 'Area of Consideration for Further Analysis'. The locations of these buildings and reason for inclusion within this assessment are noted in Appendix 5-3. No non-residential buildings were included in the glint and glare assessment.

5.5.6.3 Assumptions and Limitations

The use of computer models to predict the amount of glint and glare that will occur is known to produce an over-estimate of possible impact, referred to as the '*worst-case impact*', due to the following limitations:

- The sun is assumed to be always shining during all daylight hours. This will not occur in reality.

The total theoretical glint and glare calculated for each property assumes 100% sunshine during daytime hours, with full intensity, as referred to above. However, records from the meteorological station at Dublin Airport (with comprehensive historical data on sunshine duration) for months March to August indicate monthly averages of mean daily duration of sunshine as 5.3 hours, or approximately 44% of daylight hours. While we cannot correlate the historic random periods of sunshine with our predicted periods of glare, we can state with a high level of confidence that the weather, more precisely cloud cover, will account for a substantial reduction in all figures quoted in this report i.e. frequency and duration of glare periods.

5.5.7 Glint and Glare Assessment Results

5.5.7.1 Daily and Annual Glint and Glare

The model was used to predict the amount of days and minutes that glint and glare levels will affect the selected properties.

The initial model results assume worst-case conditions, including:

- 100% sunshine during all daylight hours throughout the year,
- 100% sunshine intensity during all daylight hours throughout the year,
- An absence of any screening (vegetation or other buildings),
- The solar panels are assumed to be in operation during all daylight hours.

The model is based on the assumption that daylight hours consist of 100% sunshine at full intensity. This is a conservative assumption which represents a worst-case scenario. From the information above however, we do know that although a sunshine factor was not applied to the model calculation, the proposed site will experience approximately 44% of daylight hours (as an annual average), and therefore any results received from the model are likely to overestimate any glint and glare impacts on the selected receptors.


The final model includes the application of DSM data, which accounts for the existing screening inherent on and surrounding the Proposed Project site. This offers a truer reflection of the actual glare that is likely to occur and highlights where landscape

Map Legend

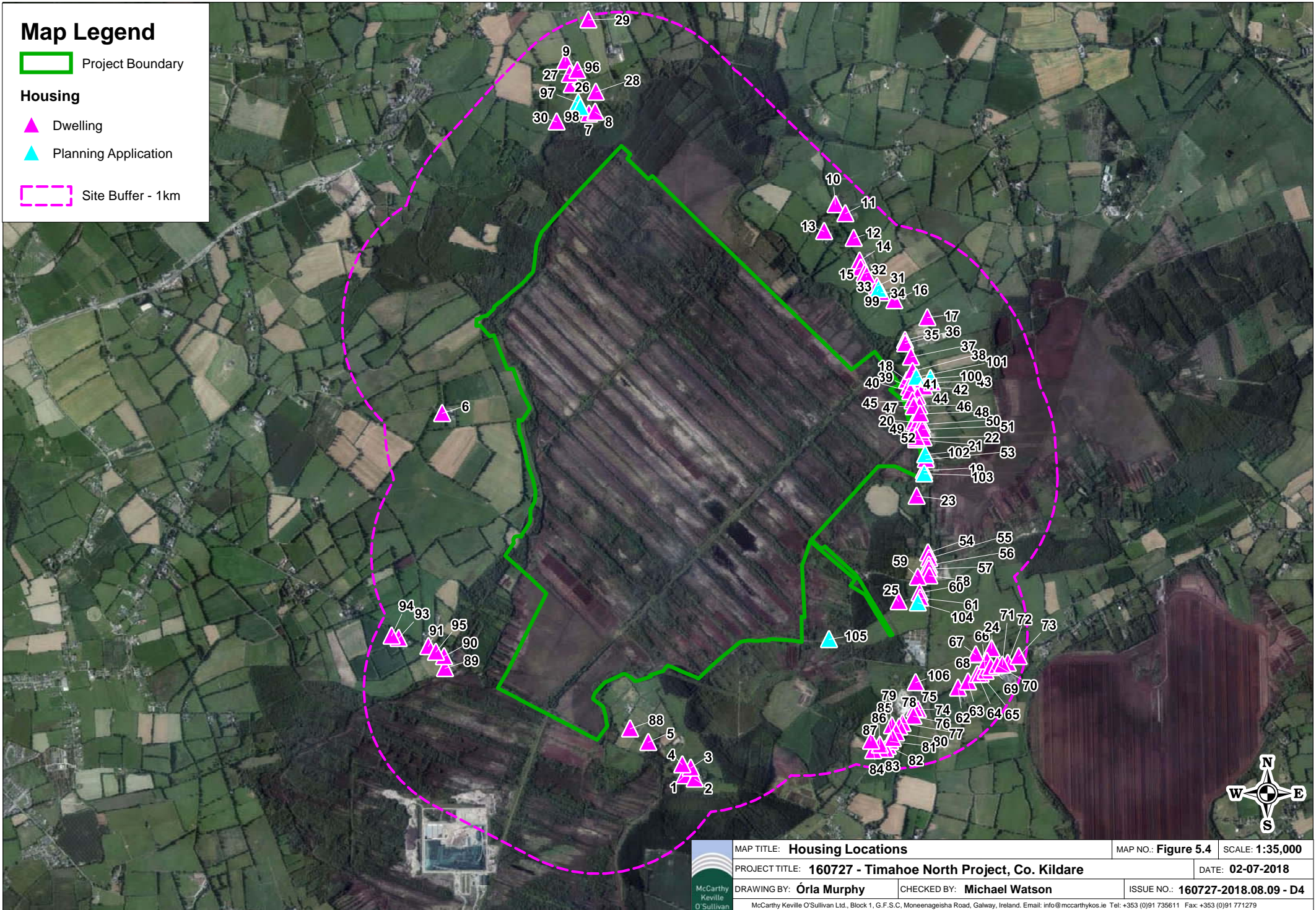
 Project Boundary

Housing

 Dwelling

 Planning Application

 Site Buffer - 1km



	MAP TITLE: Housing Locations		MAP NO.: Figure 5.4	SCALE: 1:35,000
	PROJECT TITLE: 160727 - Timahoe North Project, Co. Kildare			DATE: 02-07-2018
	DRAWING BY: Órla Murphy	CHECKED BY: Michael Watson	ISSUE NO.: 160727-2018.08.09 - D4	
	<small>McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenagisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279</small>			

mitigation may be required. Results identifying the proposed impact on surrounding dwellings and roads is detailed below.

5.5.7.2 Dwellings

Although there are no set national guidelines detailing the maximum daily glint and glare limits, the model uses its own criteria to determine whether there will be a potential impact on selected dwellings.

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

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

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

5.5.7.3 Roads

Receptor Points (R) have been positioned along all the potentially affected roads within the 'Area of Consideration for Further Analysis' as seen in Appendix 5-3, Figure 10.

A total of 47 Receptor Points were examined. Analysis of terrain-level screening (using a digital terrain model - DTM) identified that glint and glare is only theoretically possible at 35 of these. Further analysis, taking account of the existing screening inherent across the study area, using a digital surface model - DSM, determined that only one Receptor Point (R31) actually has the potential to be affected by glint and glare. This indicates that the existing screening afforded by buildings and hedgerows that occurs between receptors and potentially reflecting panels has a significant bearing on the overall glint and glare likely to be experienced.

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

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

The full assessment including associated appendices and results in regard to glint and glare impact on both dwelling and road receptors is available in Appendix 5-3.

5.5.7.4 Cumulative Glint and Glare

For the assessment of cumulative glint and glare, any other existing, permitted or proposed solar farm would be considered where it was located within one kilometre of the Proposed Project. There are no solar farms located in the vicinity of the site which would have the potential to cause glint and glare and therefore a cumulative glint and glare assessment was not required.

5.6 Residential Amenity

Residential amenity relates to the human experience of one's home, derived from the general environment and atmosphere associated with the residence. The quality of residential amenity is influenced by a combination of factors, including site setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced in the residence.

5.6.1 Solar Farm

The proposed Solar Farm is located in an area which is surrounded by forestry on all aspects. The majority of the residential properties within the study area are located along a local road to the east of the Proposed Project site with the closest dwelling approximately 500m from the proposed solar array as shown in Figure 5.4.

When considering the amenity of residents in the context of the Solar Farm, there are three main potential impacts of relevance: 1) Glint and glare 2) Noise and 3) Visual Amenity. Glint and glare and noise are quantifiable aspects of residential amenity while visual amenity is more subjective. Detailed glint and glare and noise modelling have been completed as part of this EIA (Section 5.5 above refers to glint and glare modelling, Chapter 10 of the EIA addresses noise). A comprehensive landscape and visual impact assessment has also been carried out, as presented in Chapter 11 of this EIA.

5.6.2 Substation and Grid Connection

The proposed Substation and Grid Connection infrastructure is located in an area which is surrounded by forestry on all aspects. The nearest property is approximately 460 metres south of the grid connection.

When considering the amenity of residents in the context of the proposed Substation and Grid Connection, the main potential impacts relate to: 1) Noise and 2) Visual Amenity. As described above, noise modelling has been completed as part of this EIA (Chapter 10 of the EIA addresses noise) and a comprehensive landscape and visual impact assessment has also been carried out, as presented in Chapter 11 of this EIA.

Visually, the addition of a short section of additional overhead line from the proposed substation should not overly impact the Proposed Project site; as it connects to the existing Derryiron-Maynooth 110 kV line, which traverses the southern section of the Project Boundary, and which is already in view.

5.6.3 Project

Impacts on human beings during the construction and operational phases of the Proposed Project are assessed in relation to each of these key issues and other environmental factors such as traffic and dust; see Impacts in Section 5.7 below. The impact on residential amenity is then derived from an overall judgement of the combination of impacts due to glint and glare, visual amenity, noise, traffic, dust and general disturbance.

5.7 Likely Significant Impacts and Associated Mitigation Measures

5.7.1 ‘Do-Nothing’ Scenario

If Proposed Project site were not to proceed, the opportunity to capture an even greater part of County Kildare’s valuable renewable energy resource would be lost, as would the opportunity to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions.

5.7.2 Construction Phase – Proposed Project

During the construction phase, all potential impacts are assessed in regard to the entire Project; as construction impacts affect both the Solar Farm and Substation and Grid Connection infrastructure in the same manner and will be occurring essentially simultaneously within the expected construction programme. Other, generally technical, chapters of this EIAR describe and assess the Solar Farm and Substation and Grid Connection works separately, where this is relevant and necessary.

5.7.2.1 Health and Safety – Proposed Project

Construction of Proposed Project site will necessitate the presence of a construction site. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers and members of the public if site rules are not properly implemented. This will have a short-term potential significant negative impact.

Mitigation Measures

During construction of the Proposed Project, all staff will be made aware of and be required by contract to adhere to the Health & Safety Authority’s *‘Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2006’*. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan which will include measures to exclude members of the public from certain areas of the Proposed Project site during construction.

Appropriate health and safety signage will also be erected at locations around the Proposed Project site.

All onsite works and health and safety requirements will be carried out to the contractual specifications of the Applicant.

Residual Impact - Proposed Project

Short-term potential slight negative impact

Significance of Effects – Proposed Project

Based on the assessment above there will be no significant effects.

5.7.2.2 Employment and Investment – Proposed Project

The design and construction of the Proposed Project will provide employment for technical consultants, contractors and maintenance staff. It is estimated that the Proposed Project will create in excess of 150 jobs during the construction phase of the Proposed Project. If possible, construction workers and materials will be sourced locally, thereby helping to sustain employment in the construction trade. This will have a short-term significant positive impact.

The injection of money in the form of salaries and wages to those employed during the construction phase of the Proposed Project has the potential to result in an increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a short-term positive impact on their cash flow. This will have a short-term slight positive indirect impact.

Proposed Project will result in an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive impact on the local skills base. Up-skilling and training of local staff in the particular requirements of the solar energy industry is likely to lead to additional opportunities for those staff as additional solar farms are constructed in Ireland. This will have a long-term moderate positive indirect impact. According to the Irish Solar Energy Association projections (from their *ISEA Factsheet no. 2 11/14 – Jobs in Solar PV*) there were over 1,582 jobs directly related to solar energy in Ireland at the end of 2017 with it 3,545 direct jobs predicted by the end of 2018; more than double than the previous year.

Rates payments per annum for the Proposed Project will contribute funds to Kildare County Council, which will be redirected to the provision of public services within Co. Kildare. These services include provisions such as road upkeep, fire services, environmental protection, street lighting, footpath maintenance etc. along with other community and cultural support initiatives.

5.7.2.3 Population – Proposed Project

Those working on the construction phase of Proposed Project will travel daily to the site from the wider area. The construction phase will have no impact on the population of the area in terms of changes to population trends or density, household size or age structure

5.7.2.4 Land-use – Proposed Project

The Timahoe North site has been out of commercial peat production by Bord na Móna for over 20 years. Land-use includes regenerating woodland, cutover peatland and is used for turf cutting on the spread. The site is also used as an informal site for members of the public for walking. During construction, the public will not have access to the site for safety reasons. There will be no impact on land use during the construction of the Proposed Project

5.7.2.5 Services – Proposed Project

Giving that the site is adjacent to local service areas, namely that of Johnstownbridge, Carberry and Allenwood; the demand for services will increase, resulting in a temporary, slight positive impact during the construction phase.

5.7.2.6 Noise – Proposed Project

The potential noise impacts that will occur during the construction phase of Proposed Project are described in detail in Chapter 10 of this EIAR and summarised here for Proposed Project. There will be an increase in noise levels in the vicinity of Proposed Project site during the construction phase, as a result of heavy machinery and construction work. These impacts will have a short-term slight negative impact. The noisiest construction activities associated with Proposed Project will be the excavation and construction of the solar array, proposed piling, internal roads and substation elements.

Construction noise at any given noise sensitive location will be variable throughout the construction project, depending on the activities underway and the distance from the main construction activities to the receiving properties.

Mitigation Measures

Best practice measures for noise control will be adhered to as a contractual requirement onsite during the construction phase of Proposed Project in order to mitigate the slight short-term negative impact associated with this phase of the development. The measures include:

- Sensitive location of equipment, taking account of local topography and natural screening.
- Working methods: construction noise will be controlled by prescribing by contract that standard construction work will be restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause annoyance. The phasing of works has also been designed with regard to avoidance of noise impacts, where construction of various elements will happen in sequence and not at the same time; thus reducing the overall noise emissions.
- Plant will be selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with relevant E.U. and Irish legislation in relation to noise emissions.
- Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents by term of the contract '*BS 5338: Code of Practice for Noise Control on Construction and Demolition Sites*' and '*BS5228-1:2009+A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites*'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible impacts on noise-sensitive locations will be employed by contractual requirement.
- Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels.

Residual Impact – Proposed Project

Short-term imperceptible negative impact

Significance of Effects – Proposed Project

Based on the assessment above there will be no significant effects.

5.7.2.7 Dust – Proposed Project

Potential dust emission sources during the construction phase of Proposed Project site include upgrading of existing access tracks and construction of new access roads, solar arrays and substation. The entry and exit of construction vehicles from the site may result in the transfer of material to the public road, particularly if the weather is wet. This may cause annoyance to residents and other road users. These impacts will not be significant and will be short-term in duration.

Mitigation Measures

Aggregate material for the construction of access tracks and substation infrastructure will be sourced within the local area; therefore, reducing distance travelled by vehicles carrying construction materials. Truck wheels will be washed to remove mud and dirt before leaving the site. All plant and materials vehicles shall be stored in the dedicated

compound area. Areas of excavation will be kept to a minimum, and stockpiling will be minimised by ensuring all excavated peat is stored in designated storage areas. Construction traffic will be restricted to defined routes and a speed limit will be implemented.

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause annoyance. If necessary, water will be taken from the site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and the temporary site compound to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

Residual Impact

Short-term imperceptible negative impact

Significance of Effects

Based on the assessment above there will be no significant effects associated with the construction phase of Proposed Project.

5.7.2.8 Traffic – Proposed Project

The construction phase of the Proposed Project will last approximately 25 months. While the providers for the various materials and component parts required for the construction of the Proposed Project have yet to be decided, deliveries and construction staff will access the site from the R402 followed by the local highway network, including the L-5025 Derrymahon Road.

Construction traffic will be comprised of Heavy Goods Vehicle (HGV) and Light Goods Vehicle (LGV) movements involved in the delivery of construction materials to the site and the export of excess construction materials and plant from the site. A complete Traffic and Transportation Assessment (TTA) of the Proposed Project has been carried out by Alan Lipscombe Traffic and Transport Consultants. The full results of the TTA are presented in Section 13 of this EIA.

The capacity of the junction most affected (the existing R402 / L-5025 Derrymahon Road junction) was assessed. Results show that additional traffic passing through the junction will have the effect of increasing the maximum ratio of flow to capacity (RFC) at the junction from 19.3% to 38.3% for traffic turning out of the L-5025 onto the R402, but this is well within the acceptable limit of 85%.

Pre-Mitigation Impact

Slight-moderate temporary negative impact

Mitigation Measures

Mitigation measures as noted in Chapter 13, Section 13.1 will minimise the impacts of traffic during the construction phase.

Residual Impact

Slight, temporary negative impact

Significance of Effects

Based on the assessment above there will be no significant effects.

5.7.2.9 Tourism – Proposed Project

Given that there are currently no tourism attractions specifically pertaining to the site there are no impacts associated with the construction phase of the Proposed Project.

5.7.2.10 Glint and Glare – Proposed Project

Glint and glare, which occurs during certain conditions due to the position of the sun, as described in Section 5.5 of this chapter of the EIAR, occurs only during the operational phase of a solar energy development. There are therefore no glint and glare impacts associated with the construction phase of the Proposed Project.

5.7.3 Operational Phase – Solar Farm

During the operational phase, potential impacts are assessed in regard to the Solar Farm, the Substation and Grid Connection and then the entirety of the Proposed Project respectively, as the majority of the potential likely significant impacts during the operational phase, affect either and/or both the Solar Farm and Substation and Grid Connection infrastructure.

5.7.3.1 Noise

A noise assessment of the operational phase of the Solar Farm, in particular the predicted noise associated with the inverters, has been carried out through modelling of the development using noise prediction software. There will be inverters installed at intervals throughout the solar array within the Solar Farm. Inverters for solar arrays will potentially generate relatively low levels of noise. As solar panels produce power only when the sun is shining, inverters will be completely silent for the hours of darkness at night. Levels predicted for the Solar Farm at the closest 10 receptors provided lower levels than those baseline noise levels recorded across the various measurement locations and so there will be no impact associated with noise emissions from this source.

5.7.3.2 Glint and Glare

Glint and glare, which occurs during certain conditions due to the position of the sun, as described in Section 5.5 of this chapter of the EIAR, occurs only during the operational phase of a solar energy development. All receptors within 1km of the site are considered and determined as to whether they will have a potential impact.

Assuming worst-case conditions, analysis recorded a total of 43 occupied dwellings which occur within the 'Area of Consideration for Further Analysis' and a total of 47 Receptor Points along the local transport routes that may be affected by glint and glare. The locations of these buildings and reason for inclusion within this assessment are noted in Appendix 5-3. The nearest residence is approximately 500m from the solar array and all properties are occupied.

Further analysis as noted in Section 5.5, included digital surface modelling (DSM), which took screening into consideration and resulted in all receptors receiving no impact from glint and glare.

Mitigation Measures

The main mitigation measure associated with glint and glare is the introduction of screening. As mentioned in Section 5.5.7.2 and 5.5.7.3 above, there are no receptors that will require glint and glare mitigation strategies due to the presence of screening. If, however any unforeseen issues do arise with any residences in relation to glint and glare, the mitigation measures described below will be used.

If glint and glare exceedances are experienced at sensitive receptors (i.e. where the calculated maximum total minutes in is more than 5 minutes per day for a dwelling receptor or where the calculated total minutes per year exceeds 60 minutes), a site visit will be undertaken firstly to determine the level of occurrence and existing screening. If glint and glare is found to be occurring, suitable mitigation measures such as screening will be employed to limit the incidence or duration of glint and glare at the affected property. In event of an exceedance the procedure for logging public complaints is outlined in the CEMP at Appendix 4-5.

Dwellings

In the event of unpredicted exceedances at occupied dwellings, several screening measures will be proposed to the affected property owner, including the installation of window blinds or curtains in affected rooms, planting of screening vegetation or other site-specific measures agreeable to the affected party.

Roads

In the event of unpredicted exceedances along local transport routes, screening measures will be proposed to the planning authority for its agreement; more specifically planting of screening vegetation or other site-specific measures will be agreed with Kildare County Council.

Residual Impact

Glint and glare will have no negative impact

Significance of Effects

Based on the assessment above and the mitigation measures proposed there will be no significant effects related to glint and glare.

5.7.3.3 Renewable Energy Production and Reduction in Greenhouse Gas Emissions

Emissions from energy production accounted for 20.5% of Ireland's greenhouse gas emissions in 2016 ('Ireland's Final Greenhouse Gas Emissions in 2016', EPA (April 2018)). The National Climate Change Strategy 2007 – 2012 stated that electricity generation from renewable sources provides the most effective way of reducing the contribution of power generation to Ireland's greenhouse gas emissions. The proposed Solar Farm will offer significant benefits in terms of renewable energy production and reductions in greenhouse gas emissions as described within Chapter 9 – Air and Climate. In this regard, it will have a long-term significant positive impact.

5.7.4 Operational Phase – Substation and Grid Connection

5.7.4.1 Noise

A noise assessment of the operational phase of the Substation and Grid Connection, in particular the predicted noise associated with the substation, has also been carried out through modelling of the development using noise prediction software. The proposed substation will be operational on a day to day basis. The noise emission level associated with a typical substation that would support a development of this nature is the order of 93dB(A) Lw. Levels predicted for the Substation and Grid Connection with the closest 10 receptors, provided lower levels than those recorded across the various measurement locations (Locations A, B and C).

5.7.4.2 Electromagnetic Interference

The provision of underground electric cables and overhead grid connection cabling of the capacity proposed is common practice throughout the country and installation to the required specification does not give rise to any specific health concerns.

The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF set by ICNIRP as well as the EU guidelines for human exposure to EMF, identified in Section 5.4.2 above. Accordingly, there will be no operational impact on properties (residential or other uses) as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables.

5.7.5 Operational Phase – Proposed Project

This section assesses the potential impacts of the entire Proposed Project, during the operational phase of the development.

5.7.5.1 Employment and Investment

During the lifetime of Proposed Project, staff will be employed at the site to carry out necessary maintenance, having a long-term slight positive effect.

5.7.5.2 Health and Safety – Proposed Project

The operational phase of Proposed Project poses little threat to the health and safety of the public (i.e. the main threat being human contact with the solar arrays and substation infrastructure). There are no specific safety considerations in relation to the operation of the Solar Farm and Substation and Grid Connection infrastructure.

Mitigation Measures

On site contractual mitigation will ensure that access to the site is limited only to authorised personnel. Mitigation includes:

- Fencing or other restrictions as necessary for safety considerations. The public and animals will not be able to enter the area containing the solar arrays;
- All onsite works and health and safety requirements will be carried out to the contractual specifications of the Joint Venture partners.
- Ensuring signage and security measures are in place warning of any potential hazards (i.e. security fencing on which warning, project description and interpretation signage will be attached) and;
- Installation of security cameras.

Residual Impact - Proposed Project

Short-term potential slight negative impact

Significance of Effects – Proposed Project

Based on the assessment above there will be no significant effects.

5.7.5.3 Population – Proposed Project

The operational phase of Proposed Project will have no impact on the population of the area with regards to changes to trends, population density, household size or age structure.

5.7.5.4 Land-use – Proposed Project

The footprint of the Proposed Project site, including solar arrays and associated infrastructure, Substation and Grid Connection, will occupy only a small percentage of

the total Study Area defined for the purposes of this EIAR. The current land-use includes regenerating woodland and peatland, and this will continue to co-exist with the Proposed Project. Therefore, there will be no impact on land use.

Proposed Project site is informally used by locals as a walking route. As part of the Proposed Project, development of amenity facilities, including visitor access, car parking and a looped walk are proposed, allowing the area to still be used by locals. Further assessment of the amenity proposal is located within Section 5.7.5.9.

5.7.5.5 Services – Proposed Project

During the operational phase of the Proposed Project, services in the area will be utilized by maintenance staff as well as locals and tourists who will make use of the proposed amenity walkway. This will result in a long term, slight positive impact during the operational phase.

5.7.5.6 Noise – Proposed Project

A noise assessment of the operational phase of Proposed Project has also been carried out through modelling of the development using noise prediction software. The predicted noise levels for Proposed Project have been compared with the existing background noise levels.

Details of the noise assessment carried out by AWN Consulting are presented in Chapter 10 of the EIAR. In summary, the noise assessment found that there are no locations where either the Solar Farm or the Substation and Grid Connection exceeds the adopted day and night time noise criteria. It can be concluded that the Proposed Project complies with the appropriate guidance in relation to noise and will have a neutral long-term impact, hence the associated impact is considered acceptable.

5.7.5.7 Traffic– Proposed Project

Employees will enter the proposed Solar Farm and the Substation and Grid Connection during the operational phase of Proposed Project, although due to low volumes of traffic forecast, no mitigation measures are required. The addition of the recreational amenity trail to the site will allow for a slight increase in volumes of amenity traffic generated by the site. While the effects will be long-term they will be imperceptible. A Traffic and Transportation Assessment (TTA) of the Proposed Project has been completed by Alan Lipscombe Traffic and Transport Consultants, the results of which are presented in Section 13 of this EIAR. The TTA found that the traffic impact created during the operational phase of the Proposed Project will be imperceptible.

5.7.5.8 Tourism – Proposed Project

Although there are currently no tourism attractions specifically pertaining to the site, the addition of the proposed amenity walkway has the potential to increase tourist activity within the site, allowing for a long-term, slight, positive impact on tourism.

5.7.5.9 Amenity/Residential Amenity – Proposed Project

The amenity proposals are an integral part of Proposed Project. The Timahoe North site is an attractive area for walkers and those with an interest in Irish ecology. The site currently is used informally by the public as a walking route. The Proposed Project includes on-site amenity facilities which would consist of an amenity loop, complimented by car parking and signage. The proposed amenity facilities are described in Section 4.3 of this EIAR. This represents a moderate positive impact for local amenity.

Potential impacts on residential amenity during the operational phase of the Proposed Project could arise primarily due to noise, glint and glare or changes to visual amenity. Noise modelling has been carried out as part of this EIA, which shows that the Proposed Project will be capable of meeting all required guidelines in relation to noise and thresholds. Glint and glare modelling has been carried out as detailed in Section 5.5 and Appendix 5-3 and identified that there will be no impact on surrounding receptors.

The visual impact of the Proposed Project is addressed comprehensively in Chapter 11 of this EIA. The Proposed Project and potential landscape and visual effects are mitigated by the low-lying and flat nature of the site, as well as the site being enclosed and screened.

Given the design and nature of the site, the Proposed Project will have no significant impact on existing visual amenity at both dwellings and within the surrounding area.

Mitigation Measures

No solar arrays are proposed within approximately 500 metres of any occupied dwelling. All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and telecommunications in this EIA will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Proposed Project.

Residual Impact

The Proposed Project will have an imperceptible impact on residential amenity.

Significance of Effects

Based on the assessment above, and with the addition of the proposed amenity walkway, there will be a moderate positive effect on residential amenity.

5.7.6 Decommissioning Phase – Proposed Project

The solar farm infrastructure proposed as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the solar infrastructure may be replaced, subject to planning permission being obtained, or the Proposed Project may be decommissioned fully. Individual panels may need to be replaced during the lifetime of the Proposed Project and this will occur on an as needed basis. The onsite substation will remain in place as it will be under the ownership of the ESB/EirGrid and part of the national transmission network.

The works required during the decommissioning phase are described in Section 4.11 in Chapter 4 of this EIA. Any impact and consequential effect on that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent.

5.7.7 Cumulative Impact Assessment

For the assessment of cumulative impacts, any other existing, permitted or proposed developments (solar energy or otherwise) and plans have been considered where they had the potential to generate an in-combination or cumulative impact with the Proposed Project. Interaction between various impacts within the Proposed Project have also been assessed. Further information on the developments, plans and projects considered as part of the cumulative assessment are given in Section 2.6 of this EIA. The impacts with the potential to have cumulative impacts on human beings, in particular noise, glint and glare and visual impacts are addressed in the relevant chapters and below.

5.7.7.1 Solar Farm

5.7.7.1.1 Glint and Glare

As discussed in Section 5.7.3.2 above, no cumulative glint and glare will occur at any inhabited non-consenting properties in the vicinity of the proposed Solar Farm.

5.7.7.2 Project

5.7.7.2.1 Employment and Economic Activity

All other existing, permitted or proposed developments (solar energy or otherwise) in the vicinity of the Proposed Project, contribute to short term employment during the construction stages and provide the potential for long-term employment resulting from maintenance operations. This results in a long-term significant positive impact.

Other projects as described in the cumulative assessment in Section 2.6 of this EIAR also have the potential to provide employment in the short term.

5.7.7.2.2 Tourism

The addition of the proposed amenity walkway alongside other tourist attractions within the area; namely the Kildare Maze Family Activity Park, the Bog of Allen Nature Centre and Lullymore Heritage & Discovery Park; have the potential to increase tourist activity within the site, allowing for a long-term, slight, positive impact on tourism.

5.7.7.2.3 Recreation and Amenity

According to the Kildare County Development Plan 2017-2023, their current strategies for the provision of recreation and amenity resources in the county seeks;

- *to ensure that the natural resources which form the basis for countryside recreation are protected and effectively managed; and*
- *To provide and maintain facilities in an economically and environmentally sustainable manner.*

The development of the Proposed Project, alongside other projects being developed within the area; for example, to the south east of the site, an application has been submitted to construct an Equestrian centre; together reflect the Kildare CDP strategies in regard to recreation and amenity resources, thus allowing for a long-term slight positive cumulative impact.

5.7.7.2.4 Traffic

The proposed expansion of the Drehid Waste Management Facility (DWMF) was also considered in the cumulative assessment. It is predicted that there will be a moderate negative impact from construction traffic associated with both developments on a section of the R402 and no effect (as there is no overlap in transport routes) on the L-5025. Cognisance has also been had of a potential wind farm development, Drehid Wind Farm, which has begun a public consultation process and may be located to the west of the Proposed Project site. It is possible that the wind farm project will also use the R402 and the L-5025 if consented.

Mitigation Measures

In the unlikely event that the Drehid wind farm and the Proposed Project are constructed at the same time, coordination will be required and implemented between Proposed Projects and with agreement of Kildare County Council to ensure the network operates within capacity.

For the wind farm development noted above; the delivery of abnormal loads will be controlled by a Traffic Management Plan overseen by the Garda Traffic Corps and so the potential for cumulative impacts does not arise in this instance.

Residual Impact

Short term slight negative impact

Significance of Effects

Based on the assessment above there will be no significant effects.

5.7.7.2.5 Health and Safety

The Proposed Project will have no impacts in terms of health and safety. There is no credible scientific evidence to link solar farms or substations with adverse health impacts.

5.7.7.2.6 Property Values

As there is no statistical evidence that home prices near solar farms are affected post or pre-construction periods after announcing development, a long-term imperceptible cumulative impact is anticipated.

5.7.7.2.7 Services

Potential cumulative impact through injection of money into local services though short and long-term employment. This is expected to be a long-term positive cumulative impact.

5.7.7.2.8 Residential Amenity

In the unlikely event of all permitted and Proposed Projects as described in the cumulative assessment in Section 2.6 of this EIAR being constructed at the same time, there is the potential for a resulting cumulative negative impact to occur on residential amenity.

Mitigation Measures

There are no solar farms or substations and associated infrastructure proposed within approximately 500 metres of any occupied dwellings. Additionally, the proposed extension of the operational Drehid Waste Management Facility (DWMF) south of the Proposed Project site has been considered for the cumulative impact assessment.

All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and telecommunications in this EIAR will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Proposed Project works. It is assumed also that all mitigation measures in relation to the other cumulative projects will also be implemented.

Residual Impact

Proposed Project will have an imperceptible impact on residential amenity.

Significance of Effects

Based on the assessment above there will be no significant effects.

5.8 Summary

Following consideration of the residual impacts (post-mitigation) it is noted that the Proposed Project will not result in any significant effects on Human Beings in the area surrounding the site. Assuming worst-case conditions (i.e. 100% sunshine on days

where glare can pass a receptor, no screening present, etc.) a total of 40 residential properties and 47 transport receptors may experience glint and glare. However, when the assessment is carried out again taking into account screening, no significant glint and glare effects will occur on the selected receptors. Should any problems arise with glint and glare at any receptor, employment of suitable mitigation measures will be implemented as noted in Section 5.7.3.2.

Provided that the Proposed Project is constructed and operated in accordance with the design, best practice and mitigation that is described within this application, significant effects on human beings, population and human health are not anticipated at international, national or county scale.