Little Crow
Solar Park

Little Crow Solar Park, Scunthorpe

ENVIRONMENTAL STATEMENT: TECHNICAL APPENDICES

APPENDIX 4.5

AIR QUALITY AND CARBON ASSESSMENT

Revision:	**Submission**
APFP Reg:	**5(2)(a)**
PINS Reference:	**EN010101**
Author:	**BV**
Date:	**October 2020**

On behalf of INRG Solar (Little Crow) Ltd

Document			
Document Properties			
Prepared By	BV		
Title	Environmental Statement: Technical Appendices – Appendix 4.5 Air Quality and Carbon Assessment		
Document Reference	7.12 LC TA4.5		
Version History			
Date	**Version**	**Status**	**Description/Changes**

INRG Solar (Little Crow) Ltd.
Proposed Development,
Little Crow Solar Park
Air Quality and Carbon Assessment

August 2020

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Document Control Sheet

Identification	
Client	INRG Solar (Little Crow) Ltd.
Document Title	Air Quality and Carbon Assessment for the proposed Little Crow Solar Park, Scunthorpe
Bureau Veritas Job Ref No.	6473981

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Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
1	20/07/2018	Hannah Smith	Final Issue	Final
2	22/11/2018	Jo Davies	Final Issue	Final
3	05/08/2020	Hannah Smith	Submission Issue	Final

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Executive Summary

Bureau Veritas UK Ltd has been commissioned by INRG Solar (Little Crow) Ltd. to undertake an air quality assessment of construction traffic emissions together with a carbon offset assessment as a result of the proposed Little Crow Solar Park. The development site is located to the east of Scunthorpe, adjacent to the Harsco Steel works and is accessed via the B1208. The nearby settlement of Raventhorpe (<5 miles south of the proposed development) contains an existing 78.5ha solar farm

The development site currently consists of disused grassland/farmland and is bordered by the proposed construction traffic route, which is to run along the B1208 in the direction of the A18, A15 and M180. This route bypasses a number of pollution receptors; residential properties in Broughton, located 1km east of the Order Limits. The closest properties to the site consists of two farm structures with at least one structure being used as a residential dwelling and are located east of the site and North of Broughton at distances of 280m and 415m from the Order Limits. The Solar Park area is located within the boundary of an Air Quality Management Area (AQMA) declared by North Lincolnshire Council. The AQMA was declared due to exceedances of the 24-hour mean air quality objective for PM_{10}. The most recently recorded annual mean concentration of PM_{10} from the closest monitoring site, CM3, reported an annual mean concentration of 22µg/m³ in 2016 together with 25 exceedances of the 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times a year). All nearby monitoring locations also reported below the PM_{10} annual mean AQS objective of 40µg/m³. Furthermore, there were no reported exceedances of the NO_2 annual mean air quality objective at any monitoring location within the council area.

Defra's 2017 background air pollution data for the proposed site suggests an annual mean background concentration of 11.2µg/m³ for NO_2 and 15.2µg/m³ for PM_{10}, which are both below the respective objectives (40µg/m³).

A qualitative dust and air quality assessment has been prepared to determine the significance of air quality and construction traffic dust impacts during the construction and operational phases of the proposed development, in addition to an assessment of the carbon footprint and potential savings introduced as a result of the site's introduction.

A qualitative assessment of impacts of construction activities upon air quality was undertaken following the Institute of Air Quality Management (IAQM) guidance methodology.

The main findings of the air quality assessment are summarised as follows:

- Following the construction dust assessment the development site is found, in relation to dust soiling, to be **negligible** during the construction phase of the proposed site. For the earthworks and trackout activities, the impact was found to be a **low risk.** In relation to human health impacts, the risk ratings are the same as with dust soiling for each of the three activities.

- Providing effective mitigation measures are implemented, such as those outlined in Section 5.1 of this report, impacts from dust emissions during the construction phase would be **not significant**.

- The estimated CO_2 offset from the Little Crow Solar Park is at least 34,577 tonnes for the first year taking into consideration the CO_2 produced as a result of the construction vehicle movements during the construction phase. The following years CO_2 offset will be greater as the construction phase works will have been completed.

1 Introduction

Bureau Veritas UK Ltd has been commissioned by INRG Solar (Little Crow) Ltd. to undertake an air quality assessment of construction traffic emissions together with a carbon offset assessment as a result of the proposed Little Crow Solar Park. The development site is located to the east of Scunthorpe, adjacent to the Harsco Steel works and is accessed via the B1208. The proposed Solar Park is approximated at 225ha, with the ground mounted solar park and associated battery storage to have an intended design capacity of over 50MWp (megawatts peak). The nearby settlement of Raventhorpe (<5 miles south of the proposed development) contains an existing 78.5ha solar farm.

The most significant source of air pollution is likely to derive from construction related traffic during the construction phase of the development. The construction traffic route is proposed to run along the B1208 in the direction of the A18, A15 and M180. This route bypasses the closest pollution receptors; residential properties in Broughton, located to the east of the Order Limits.

North Lincolnshire Council has declared an Air Quality Management Area (AQMA), which incorporates part of Scunthorpe town centre and an area east of Scunthorpe, including the Harsco Steel works site. The proposed Solar Park is located within this AQMA. The AQMA was declared due to exceedances of the 24-hour mean air quality objective for PM_{10}. The most recently recorded annual mean concentration of PM_{10} from the closest monitoring site, CM3, reported an annual mean concentration of 22µg/m³ in 2016 together with 25 exceedances of the 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times a year). All nearby monitoring locations also reported below the PM_{10} annual mean AQS objective of 40µg/m³. Furthermore, there were no reported exceedances of the NO_2 annual mean air quality objective at any monitoring location within the council area.

1.1 Scope of Assessment

Defra's 2017 background air pollution data for the proposed site suggests an annual mean background concentration of 11.2µg/m³ for NO_2 and 15.2µg/m³ for PM_{10}, which are both below the respective objectives (40µg/m³).

As it is anticipated that the proposed development will introduce additional road traffic and construction dust and, with consideration to the nearby AQMA, a construction phase impact assessment is to firstly be undertaken together with the carbon offset assessment. The scope of this assessment is therefore to undertake:

- A qualitative assessment of dust and air quality impacts during the construction works. The construction dust assessment will involve the use of a Geographic Information System (GIS) and be undertaken with reference to current best-practice guidance, such as those published by the Institute of Air Quality Management (IAQM).

- Construction related road traffic emissions will be considered relative to published guidance. Based upon the outline construction traffic management plan and indicative flows provided therein, Bureau Veritas do not consider there to be a requirement for detailed assessment of the road traffic emissions, rather a screening based assessment against IAQM criteria is considered sufficient.

- Mitigation measures during the construction phase including measures to control the emission of dust and dirt during construction and demolition.

- The carbon footprint of the construction phase activities, in the context of the associated traffic generation, will be calculated and subtracted against the carbon savings associated with the generation of electricity via solar power.

The order limits and location is illustrated in Figure 1.1.

Figure 1.1 – Order Limits (Indicative Only)

Legend

Order Limits

Air Quality
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Location	Little Crow Solar Park, Scunthorpe
Title	Site Location
By	JD
Approved	JC
Scale	Not to Scale
Job Ref	6473981
Date	February 2018
Figure No.	1.1

2 Air Quality – Legislative Context

2.1 Air Quality Strategy

The importance of existing and future pollutant concentrations can be assessed in relation to the national air quality standards and objectives established by Government. The Air Quality Strategy (AQS) provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations to protect human health. The air quality objectives incorporated in the AQS and the UK Legislation are derived from Limit Values prescribed in the EU Directives transposed into national legislation by Member States.

The CAFE (Clean Air for Europe) programme was initiated in the late 1990s to draw together previous directives into a single EU Directive on air quality. The CAFE Directive[1] has been adopted and replaces all previous air quality Directives, except the 4th Daughter Directive[2]. The Directive introduces new obligatory standards for $PM_{2.5}$ for Government but places no statutory duty on local government to work towards achievement of these standards.

The EU Limit Values are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites).

The air quality objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. Typically these include residential properties and schools/care homes for long-term (i.e. annual mean) pollutant objectives and high streets for short-term (i.e. 1-hour) pollutant objectives. Table 2.1 taken from LAQM.TG(16) provides an indication of those locations that may or may not be relevant for each averaging period. Typically these include residential properties and schools/care homes for long-term (i.e. annual mean) pollutant objectives and high streets for short-term (i.e. 1-hour mean) pollutant objectives.

This assessment focuses on, NO_2, PM_{10} and $PM_{2.5}$ as these are the pollutants of principal concern arising from road traffic and construction dust.

Table 2.1 – Examples of where the Air Quality Objectives should apply

Averaging Period	AQ Objectives should apply at:	AQ Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

[1] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

[2] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic hydrocarbons in ambient air.

Averaging Period	AQ Objectives should apply at:	AQ Objectives should generally not apply at:
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens of residential properties[1].	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. Any outdoor locations at which the public may be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-minute mean	All locations where members of the public might reasonably be expected to spend a period of 15 minutes or longer.	

Note [1] For gardens and playgrounds, such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

Table 2.2 – Relevant National AQ Objectives for the Assessed Pollutants

Pollutant	AQS Objective	Concentration Measured as:	Date for Achievement
Nitrogen Dioxide (NO_2)	200µg/m³ not to be exceeded more than 18 times per year	1-hour mean	31 December 2005
	40µg/m³	Annual mean	31 December 2005
Particles (PM_{10})	50µg/m³ not to be exceeded more than 7 times per year	24-hour mean	31st December 2004
	40µg/m³	Annual mean	31st December 2004
Particles ($PM_{2.5}$)	25µg/m³	Annual mean	2020
	Target of 15% reduction in concentrations at urban background	Annual Mean	2020

2.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995[3] places a statutory duty on local authorities to periodically Review and Assess the current and future air quality within their area, and determine whether they are likely to meet the objectives set down by Government for a number of pollutants – a process known a Local Air Quality Management (LAQM). The objectives that apply to LAQM are defined for seven pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide and particulate matter.

Where the results of the Review and Assessment process highlight that problems in the attainment of health-based objectives for air quality will arise, the authority is required to declare an AQMA – a

[3] http://www.legislation.gov.uk/ukpga/1995/25/part/IV

geographic area defined by high concentrations of pollution and exceedances of health-based standards.

Where an authority has declared an AQMA, and development is proposed to take place either within or near the declared area, further deterioration to air quality resulting from a proposed development can be a potential barrier to gaining consent for the development proposal. Similarly, where a development would lead to an increase of the population within an AQMA, the protection of residents against the adverse long-term impacts of exposure to existing poor air quality can provide the barrier to consent. As such, after a high number of declarations across the UK, it has become standard practice for planning authorities to require an air quality assessment to be carried out for a proposed development (even where the size and nature of the development indicates that a formal Environmental Impact Assessment (EIA) is not required).

One of the objectives of the LAQM regime is for local authorities to enhance integration of air quality into the planning process. Current LAQM Policy Guidance[4] clearly recognises land-use planning as having a significant role in terms of reducing population exposure to elevated pollutant concentrations. Generally, the decisions made on land-use allocation can play a major role in improving the health of the population, particularly at sensitive locations – such as schools, hospitals and dense residential areas.

2.3 Air Quality Guidance for Construction Sites

There are a number of regulatory and legislative constraints in place to control pollution from construction and demolition activities. The Building Act 1984 and subsequent Building Regulations 2000 are in place to ensure the safety of people in and around the building during work. Part III of the Environmental Protection Act (EPA) 1990 identifies the emission of dust from construction sites as having the potential to be a statutory nuisance and requires its control under Section 80.

A number of best practice guides are available[5], which provide a basis against which Codes of Construction Practice may be benchmarked. The Greater London Authority (GLA) in partnership with London Councils has produced a guidance document[6] that recommends mitigation measures, depending upon the scale of development and its location, to control nuisance dust from various activities during construction and demolition phases.

BRE (Building Research Establishment) has also produced a report[7] that outlines the measures to control the emissions of nuisance dust.

In December 2011, the IAQM published a guidance document to assess the impact of construction on air quality. The guidance was reviewed in January 2012[8] and updated in February 2014 to incorporate new evidence[9]. The approach adopted in this assessment is based on adopting the methodology published in the 2014 version of the IAQM guidance.

The significance of the impact of the construction phase on air quality has been determined through application of the criteria outlined in IAQM construction guidance.

[4] LAQM Policy Guidance LAQM.PG(16) – April 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

[5] Kukadia, Upton, Grimwood and Yu (2003) BRE Pollution Control Guides: Controlling particles, vapours and noise pollution from construction sites. BRE Publications.

[6] Mayor of London (2014). The control of dust and emissions during construction and demolition – Supplementary Planning Guidance. Produced in partnership by the Greater London Authority and London Councils.

[7] Kukadia V, Upton S, Hall D (2003). Control of dust from construction and demolition activities. BRE Publications.

[8] Institute of Air Quality Management (IAQM) (2012) *Guidance on the Assessment of the Impacts of Construction on Air*

[9] Institute of Air Quality Management (IAQM) (2014) *Guidance on the Assessment of Dust from Demolition and Construction.*

2.4 Background Concentrations Used in the Assessment

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution. The data sets include annual average concentration estimates for NO_x, NO_2, PM_{10} and $PM_{2.5}$, using a base year of 2015. The Pollution Climate Mapping (PCM) model on which these are based is semi-empirical in nature; it uses the National Atmospheric Emissions Inventory (NAEI) emissions to model-predict the concentrations of pollutants at the centroid of each 1km grid square, but then calibrates these concentrations in relation to actual monitoring data.

Annual mean background concentrations for use in this assessment for NO_x, NO_2, $PM_{2.5}$ and PM_{10} have derived from the background maps available on the Defra UK-Air website[10]. Sample locations include 1km grid squares within the proposed development itself and two receptor sites located 280m and 1km east of the proposed site.

The mapped background concentrations for the base year of 2017 and the sample year of 2020 are presented in Table 2.3.

Table 2.3 – Defra Background Pollutant Concentrations

Grid Square (X,Y)	2017 Annual Mean Background Concentration (µg/m³)				2020 Annual Mean Background Concentration (µg/m³)			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
494500, 410500	15.2	11.2	15.2	9.5	13.9	10.3	15.0	9.3
494500, 409500	15.0	11.1	14.8	9.4	13.6	10.1	14.5	9.1
494500, 408500	14.8	10.9	13.5	8.7	13.1	9.8	13.2	8.5
AQS objective	-	***40***	***40***	***25***	-	***40***	***40***	***25***

All of the mapped background concentrations presented are well below the respective annual mean air quality objectives.

[10] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015

3 Assessment Methodology

The approach applied to this assessment has been based on the following:

- A qualitative assessment of dust and air quality impacts during the construction works. The construction dust assessment will involve the use of a Geographic Information System (GIS) and be undertaken with reference to current best-practice guidance, such as those published by the Institute of Air Quality Management (IAQM).

- Construction related road traffic emissions will be considered relative to published guidance. Based upon the outline construction traffic management plan and indicative flows provided therein, Bureau Veritas do not consider there to be a requirement for detailed assessment of the road traffic emissions, rather a screening based assessment against IAQM criteria is considered sufficient.

- Mitigation measures during the construction phase including measures to control the emission of dust and dirt during construction and demolition.

- The carbon footprint of the construction phase activities, in the context of the associated traffic generation, will be calculated and subtracted against the carbon savings associated with the generation of electricity via solar power.

3.1 Construction Effects

The assessment of potential dust/PM_{10} effects in relation to the development's construction phase has been undertaken qualitatively in accordance with IAQM Guidance[11]. The guidance proposes a method to assess the significance of construction dust impacts by considering the annoyance due to dust soiling, as well as harm to ecological receptors and the risk of health effects due to significant increases in dust/PM_{10} concentrations.

Construction site activities are divided into four types to reflect their different potential impacts. These activities are:

- Demolition – an activity involved with the removal of an existing structure or structures;

- Earthworks – the processes of soil-stripping, ground-levelling, excavation and landscaping;

- Construction – an activity involved in the provision of a new structure; and

- Trackout – the transport of dust and dirt from the site onto the public road network. This arises when lorries leave site with dusty materials or transfer dust and dirt onto the road having travelled over muddy ground on-site.

A detailed assessment is required where a sensitive human receptor is located within 350m from the Order Limits and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the Site entrance(s).

There are no notable ecological receptors within a 200m vicinity of the development. There are, however, two residential properties less than 350m from the Order Limits. There are a number of properties approximately1km of the Site, notably the residential town of Broughton, located east of the proposed development.

[11] Institute of Air Quality Management (IAQM) (2014) *Guidance on the Assessment of Dust from Demolition and Construction.*

The first step of the detailed assessment is to assess the risk of dust impacts. This is undertaken separately for each of the four activities (demolition, earthworks, construction and trackout) and takes account of:

- The scale and nature of the works, which determines the potential dust emission magnitude; and
- The sensitivity of the area.

These factors are combined to give an estimate of the risk of dust impacts occurring. Risks are described in terms of there being a low, medium or high risk of dust impact for each of the four separate potential activities. Where there are low, medium or high risks of an impact, then site specific mitigation will be required, proportionate to the level of risk.

Based on the threshold criteria and professional judgment, one or more of the groups of activities may be assigned a 'negligible' risk. Such cases could arise, for example, because the scale is very small and there are no receptors near to the activity.

Site-specific mitigation for each of the four potential activities is then determined based on the risk of dust impacts identified. Where a local authority has issued guidance on measures to be adopted at demolition/construction sites, these should also be taken into account. Professional judgment is then employed to examine the residual dust effects assuming mitigation to determine whether or not they are significant.

In regards to construction phase vehicle movements, the Land-Use Planning & Development Control: Planning for Air Quality IAQM guidance has been used to assess the change in traffic flow during the construction period. The development will cause a significant change in Heavy Duty Vehicles (HDVs) if the change of HDV flow is greater than 100 annual average daily traffic (AADT) outside of an AQMA. Estimated vehicle numbers as specified in the Construction Management Transport Plan will be compared against this criterion to assess whether construction vehicles will result in a significant impact on the surrounding area.

3.2 Carbon Footprint

There are various degrees of detail which can be employed to calculating the carbon offset of a development. However, due to the nature of the site and the type of construction phase activities undertaken, the carbon offset assessment will focus on the traffic generation associated with the construction phase.

The carbon dioxide (CO_2) generated from the construction traffic will be calculated using the UK Government Greenhouse Gas (GHG) conversion factors provided by Defra for company reporting[12]. The most recent factors were published in July 2018 and are deemed to be the most relevant for the study. Factors were provided for a breakdown of vehicle types. The total CO_2 produced was calculated based on the total kilometres/miles each vehicle type travelled.

The total CO_2 generated as a result of the construction phase vehicle movements will be subtracted against the carbon saving associated with the generation of electricity via solar power. The carbon savings will be quantified based on a direct comparison against the amount of CO_2 produced if an equal amount of electricity was produced using alternative fuels operated on the National Grid. The July 2018 GHG conversion factor spread sheet includes an estimated average amount of CO_2 emitted for each kWh of electricity produced for the grid assuming a range of energy sources e.g. coal, gas and renewable electricity generation.

The total annual CO_2 offset from the Little Crow Solar Park will then be calculated taking into account the CO_2 generated during the construction phase.

[12] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

4 Results

4.1 Construction Phase

4.1.1 Dust/PM_{10} Emissions

This assessment of dust/PM_{10} presents the effects which are likely to be relevant both prior to and following the use of the appropriate mitigation measures on-site, which would be outlined by the site contractor and in a site Dust Management Plan (DMP). As per the IAQM guidance[12], the risk associated with the site to potentially generate dust/PM_{10} is identified. Potential unmitigated effects at receptor locations are determined, and site-specific recommendations are then made to ensure residual dust/PM_{10} effects associated with the construction phase are not significant.

The assessment of construction dust will focus on dust arising from three of the dust producing construction activities outlined in the IAQM guidance[12] (i.e. earthworks, construction and trackout). No demolition is proposed on site and therefore has been scoped out of the assessment.

Earthworks

Potential sources of impacts associated with earthworks/ground preparation activities include fugitive dust/PM_{10} emissions resulting from disturbance of dusty materials by construction plant, the construction materials used, vehicle movements and wind action. The total site area is greater than 10,000m^2 and although it is not anticipated that there will be anything larger than a moderate number of earth moving vehicles on site at any one time, the worst case scenario has been assumed due to the scale of the site. The dust emission magnitude for earthworks is therefore considered to be large.

Construction

Potential sources of impacts associated with construction activities include fugitive dust/PM_{10} emissions resulting from disturbance of dusty materials by construction plant, the construction materials used, vehicle movements and wind action. Construction activities at the development site are expected to include a total building volume of less than 25,000 with a low potential for dust release as the solar panels to be installed will be largely metal structures secured with metal bolts into the ground. The dust emission magnitude for construction is therefore considered to be small.

Trackout

Dust emissions during trackout from the site may occur from the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. The number of predicted outward HDV (i.e. >3.5 tonne) movements in any one day is not anticipated to be in excess of 50 at any point during construction, however as the unpaved roadways are in excess of 100m, a worst case assumption must be employed. The dust emission magnitude for trackout is therefore considered to be large.

Summary

A summary of the dust emission magnitude for the four activities is detailed in Table 4.1.

Table 4.1 – Construction Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Large
Construction	Small
Trackout	Large

Sensitivity of the Area

The residential area of Broughton is located in excess of 1km east of the site and resides a population of over 5,000 residents, which is supported by a relative number of properties and services[13]. The closest properties to the proposed site consists of two farm structures with at least one structure being used as a residential dwelling and are located east of the proposed site and North of Broughton at distances of 280m and 415m from the Order Limits. These two properties are accessible from the main site access route B1207 road and are bordered to the north by a narrower loose tracked road which is also to be used for site access during and following construction. Due to the nature and proximity of nearby properties, given the low number of nearby receptors identified, the sensitivity of the area with respect to the dust soiling effects on people and property in relation to earthworks, construction and trackout activities is therefore considered to be low.

The existing background PM_{10} concentration is 15.2µg/m^3; which is below the AQS objective. Given the above information regarding the number of receptors in excess of 200m of the Order Limits and within 60m from the main access route, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is therefore low.

There are no designated ecological sites within 50m of the development Site as listed on the Defra Magic Map resource[14]. In accordance with the IAQM methodology[12], there is no need to consider potential dust effects on ecological receptors further as part of this assessment.

A summary of the sensitivity of the surrounding area is detailed in Table 4.2 below.

Table 4.2 – Sensitivity of Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low
Human Health	Low	Low	Low

Risk of Dust Impacts

The risk of dust impacts is defined using Tables 7, 8 and 9 in the IAQM guidance[12] for earthworks, construction and trackout respectively. The dust emission magnitude classes in Table 4.1 combined with the sensitivity of surrounding area classes in Table 4.2, result in the site risk categories as shown in Table 4.3.

Table 4.3 – Summary of Dust Risk

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Negligible	Low Risk
Human Health	Low Risk	Negligible	Low Risk

Following the construction dust assessment, the development Site is found to be, at worst, a Low Risk in relation to dust soiling effects on people and property and a Low Risk in relation to human health impacts, as summarised in Table 4.3.

Due to the above designation, mitigation measures are required to ensure that any potential impacts arising from the construction phase of the proposed development are reduced and, where possible, completely removed. Providing effective mitigation measures are implemented, such as those outlined in Section 5.1, construction dust impacts are considered to be not significant.

[13] https://www.ons.gov.uk/help/localstatistics

[14] Magic Maps (2017), available online at http://www.natureonthemap.naturalengland.org.uk/

4.1.2 Construction Vehicle Emissions

The construction phase is proposed to take place over a 47 week period, with a 26 week period identified for site deliveries[15]. During this period there will be a number of HDV movements delivering materials for construction activities on site. It is estimated that the total number of two-way vehicle movements during the construction phase of both the solar farm and battery storage facility will be 4,106. It is expected the majority of these will be associated with the delivery of the solar modules and mounting structures. In total a maximum of 25 AADT is expected during the construction phase period.

The average number of two-way vehicle movements per day is well below the 100 AADT criteria. Therefore it is not considered that there will be any potential for significant air quality effects from development related road traffic emissions during the construction phase. Furthermore, the construction vehicle designated route to the site actively avoids residential areas to minimise impacts. Such potential impacts have therefore been scoped out from requiring a detailed assessment on the basis of their low and negligible impacts.

4.2 Operational Phase

General maintenance of the site will be carried out by the existing farm tenant and additional equipment maintenance performed approximately four times a year. Therefore it is unlikely that the number of vehicle movements during the operational phase will exceed those of the construction phase. As a result, operational phase impacts associated with road traffic emissions are deemed to be not significant and therefore scoped out of requiring a detailed assessment.

[15] Paragraph 5.1 of TPA's 'Construction Traffic Management Plan', August 2019

5 Recommended Mitigation Measures

5.1 Short-term Impacts during Construction

As discussed in Section 4, construction impacts associated to the proposed development would result in the generation of a small magnitude of dust and PM_{10}. It is considered that employment of construction best practice should ensure that no problematic dust or PM_{10} concentrations occur during the construction process.

IAQM guidance[12] outlines a number of site specific mitigation measures based on the assessed site risk. The measures are grouped into those which are 'highly recommended' (i.e. should be employed) and those which are 'desirable' (i.e. should be considered under best practice).

As the site is classed as low risk the following mitigation measures are highly recommended:

- With respect to communications:
    - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
    - Display the head or regional office contact information.
- With respect to site management:
    - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
    - Make the complaints log available to the local authority when asked.
    - Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
- With respect to monitoring:
    - Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
    - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- With respect to preparing and maintaining the site:
    - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
    - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- With respect to operating vehicle/machinery and sustainable travel:
    - Ensure all vehicles switch off engines when stationary - no idling vehicles.
    - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

- With respect to operations:
    - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
    - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
    - Use enclosed chutes and conveyors and covered skips.
    - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- With respect to waste management:
    - Avoid bonfires and burning of waste materials.
    - Additionally as the site is classed as low risk the following mitigation measures are desirable:
- With respect to communications:
    - Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real time PM_{10} continuous monitoring and/or visual inspections.
- With respect to monitoring:
    - Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- With respect to preparing and maintaining the site:
    - Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
    - Keep site fencing, barriers and scaffolding clean using wet methods.
    - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
    - Cover, seed or fence stockpiles to prevent wind whipping.
- With respect to operating vehicle/machinery and sustainable travel:
    - Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the

approval of the nominated undertaker and with the agreement of the local authority, where appropriate).

- With respect to operations:
    - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

As the site is classed as low risk for earthworks no mitigation measures are required with respect to earthworks.

As the site is classed as low risk for trackout the following mitigation measures are desirable:

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

6 Carbon Footprint

Based on the candidate design, the Little Crow Solar Park is expected to generate 150MW of clean, renewable energy from the photovoltaic panels installed at the solar park each year, with an additional 90MW battery storage capability. It is estimated the power generated will be able to service 36,000 homes a year. The electricity generated will connect to the existing local 132kVA electrical network which runs through the proposed site.

In order to assess the carbon savings from solar panels, a calculation can be used which assumes that all of the generated solar electricity directly displaces 'grid' electricity. In regards to the Little Crow Solar Park, the calculation will assume the power stations producing 'grid' electricity will be producing up to 150MW/h less electricity. In order to calculate the saving the 'average grid carbon intensity' i.e. the average amount of CO_2 emitted for each kWh of electricity produced for the grid, is required. According to the July 2018 recommended conversion factors provided by Defra as part of its Environmental Reporting Guidelines[16], it is estimated that approximately 0.283kg of CO_2 is produced per kWh of electricity from the grid. The assessment is based on the candidate 420 watts module.

Table 6.1 shows the expected kWh profile for the first calendar year from January to December (based on a 135MWp) installation. The total CO_2 savings over the year is therefore 0.283kg x 125,834,402kWh = 35,611,136kg CO_2 (35,611 tonnes per year). The efficiency of the solar panels has been calculated as approximately 10%, based on the provided information. This is considered a conservative assumption of the efficiency of the solar panels per annum.

Table 6.1 – Expected kWh Profile

Month	kWh
Jan	3,797,939
Feb	6,074,880
Mar	9,739,809
Apr	14,161,443
May	16,605,001
Jun	16,313,813
Jul	17,167,282
Aug	15,302,901
Sep	11,252,122
Oct	7,832,672
Nov	4,686,762
Dec	2,899,778
Total	125,834,402

The construction of the solar park will inevitably generate CO_2 emissions. Therefore, CO_2 generated needs to be factored into the total CO_2 savings from the park. The most significant source of CO_2 emissions during the construction phase will be derived from the construction vehicles travelling to and from the site. The number of construction vehicles expected to be in use during the 47 week construction period have been derived from the Construction Transport Management Plan (Ref.7.36 LC TA9.2). Table 6.2 provides details with regards to the estimated total amount of CO_2 generated by the construction vehicles providing materials for construction of the solar farm. The estimated kg CO_2 per km for each vehicle type has been derived from the July 2018 recommended conversion factors provided by Defra. Table 6.3 provides the worst-case scenario, accounting for a 5% buffer in the vehicle numbers associated with the solar farm construction.

In addition, there will also be a number of construction vehicles travelling to and from site carrying components for development of the battery storage facility. Table 6.4 provides details with regards to

[16] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

the estimated total amount of CO_2 generated by the construction vehicles providing materials for construction of the battery storage facility.

Table 6.2 – Construction Vehicle Generated CO_2 – Solar Farm

Vehicle Type	Total km travelled*	kg CO_2 per km	Total Number of Vehicles	Total kg CO2
Rigid HGVs	200	0.80746	332	52000
Articulated HGVs	200	0.93428	3816	713042
Vans	200	0.25299	3948	199761
			Total Tonnes of CO_2	**965**

Notes:
* As no distance information was available a distance of 200km has been assumed for each vehicle.
[1] All rigids and average laden
[2] All artics and average laden
[3] Assumed 50% diesel and 50% petrol vans

Table 6.3 – Construction Vehicle Generated CO_2 (5% Buffer) – Solar Farm

Vehicle Type	Total km travelled*	kg CO_2 per km	Total Number of Vehicles	Total kg CO2
Rigid HGVs	200	0.80746	338	54600
Articulated HGVs	200	0.93428	4007	748695
Vans	200	0.25299	4145	209749
			Total Tonnes of CO_2	**1013**

Notes:
* As no distance information was available a distance of 200km has been assumed for each vehicle.
[1] All rigids and average laden
[2] All artics and average laden
[3] Assumed 50% diesel and 50% petrol vans

Table 6.4 – Construction Vehicle Generated CO_2 – Battery Storage Facility

Vehicle Type	Total km travelled*	kg CO_2 per km	Total Number of Vehicles	Total kg CO2
Rigid HGVs	200	0.80746	65	10497
Articulated HGVs	200	0.93428	56	10464
Vans	200	0.25299	4	202
			Total Tonnes of CO_2	**21**

Notes:
* As no distance information was available a distance of 200km has been assumed for each vehicle.
[1] All rigids and average laden
[2] All artics and average laden
[3] Assumed 50% diesel and 50% petrol vans

Overall, the total CO_2 offset as a result of the Little Crow Solar Park, taking into account the CO_2 generated as a result of the above construction vehicle activities, is at least 34,577 tonnes. It should be noted that the CO_2 generated as a result of the construction vehicles will be a onetime occurrence and should not be factored into future years.

7 Conclusions

Bureau Veritas UK Ltd has been commissioned by INRG Solar (Little Crow) Ltd. to undertake an air quality assessment of construction traffic emissions together with a carbon offset assessment as a result of the proposed Little Crow Solar Park. The development site is located to the east of Scunthorpe, adjacent to the Harsco Steel works and is accessed via the B1208.

An air quality assessment has been prepared to determine the significance of air quality impacts during the construction and operational phases of the proposed development, in addition to confirming the suitability of the Site for the proposed use.

A qualitative assessment of impacts of construction activities upon air quality was undertaken following the Institute of Air Quality Management (IAQM) guidance[12]. methodology. A quantitative assessment of from the impact of road traffic emissions on air quality was undertaken following IAQM dust guidance[12].

The carbon footprint of the construction phase activities, in the context of the associated traffic generation, was calculated and subtracted against the carbon savings associated with the generation of electricity via solar power. The CO_2 generated from the construction traffic was calculated using the UK Government Greenhouse Gas (GHG) conversion factors provided by Defra for company reporting[17].

The carbon saving from generating electricity via solar power was further quantified based on a direct comparison against the amount of CO_2 produced where an equal amount of electricity is produced using alternative fuels operated on the National Grid. The July 2018 GHG conversion factor spread sheet includes an estimated average amount of CO_2 emitted for each kWh of electricity produced for the grid assuming a range of energy sources e.g. coal, gas and renewable electricity generation. The total annual CO_2 offset was calculated based on this factor.

The following section provides the conclusions of this assessment.

7.1 Construction Effects

The assessment of dust/PM_{10} effects from the construction phase of the development was subject to a qualitative assessment following IAQM guidance[12]. Following the construction dust assessment the development site is found, in relation to dust soiling, to be at worst low risk from earthworks, construction and trackout. In relation to human health impacts, the development Site is found to be at worst low risk for all three activities.

In regards to construction phase vehicle movements, the average number of two-way HDV movements per day is expected to be well below the 100 AADT criteria. Therefore it is not considered that there will be any potential for significant air quality effects from development related road traffic emissions during the construction phase. Such potential impacts have therefore been scoped out from requiring a detailed assessment on the basis of their low and negligible impacts.

Effective mitigation measures were not specified as there is no risk defined. Furthermore, impacts from dust emissions during the construction phase would be **not significant,** which is supported by the low levels of annual mean emissions as detailed in Section 2.4. It is considered that despite there not being a defined risk present, it is still advisable that a number of good practice measures are implemented, such as considerate traffic speed and observing minimal dust dispersion where at all possible during construction and transport activities.

7.2 Operational Effects

Maintenance vehicles are only expected to visit the site four times a year. Therefore it is unlikely that the number of vehicle movements during the operational phase will exceed those of the construction

[17] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

phase. As a result, operational phase impacts associated with road traffic emissions are deemed to be not significant and therefore scoped out of requiring a detailed assessment.

7.3 Carbon Footprint

Based on the calculations in Section 6, it is estimated the Little Crow Solar Park will offset at least 34,577 tonnes of CO_2 in the first year. This value has taken into consideration the estimated amount of CO_2 generated as a result of the construction vehicles transporting materials to and from the site during the construction phase. A greater carbon saving will be experienced in the future years as all construction activities would have been completed by the end of the first year.