

Drumdowney Solar Farm Limited

Construction and Environmental Management Plan

PV Solar Farm

Atateemore or Blackneys, Ballyhobuck, Ballyrahan, Carriganurra, Charlestown, Davidstown, Drumdowney Lower, Drumdowney Upper, Gorteens, Grogan, Kilmurry, Nicholastown, Rathpatrick, Scartnamoe, Tinvaucosh and Treanaree in County Kilkenny



Note: This document was prepared for Drumdowney Solar Farm (Kilkenny County Council Reference 25/60391) and is submitted for information.

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APPENDIX A: ELECTRICAL INFRASTRUCTURE - CONSTRUCTION METHODOLOGY BY DRUMDOWNEY SOLAR FARM LIMITED

1. Introduction

1.1 Context

This Construction and Environmental Management Plan (CEMP) is prepared to support a planning application for the development of a ground mounted solar farm by Drumdowney Solar Farm Limited in the townlands of Atateemore or Blackneys, Ballyhobuck, Ballyrahan, Carriganurra, Charlestown, Davidstown, Drumdowney Lower, Drumdowney Upper, Gorteens, Grogan, Kilmurry, Nicholastown, Rathpatrick, Scartnamoe, Tinvaucosh and Treanaree in County Kilkenny. The solar farm will connect to the Great Island to Waterford overhead line by means of a proposed substation, associated underground cable and 2 no. proposed interface towers. The grid connection for the solar farm, including the substation, will be the subject of a separate 'Strategic Infrastructure Development' (SID) application to An Bord Pleanála. Notwithstanding this dual consent process, this report considers the full combined development for the purposes of completing a robust assessment of the entire project. It should be read in conjunction with the 'Drumdowney Solar Farm Electrical Infrastructure - Construction Methodology by Drumdowney Solar Farm Limited' (Appendix A). This document has been updated to reflect Carlow County Council issued Request for Further Information under reference 25/60391.

The purpose of this CEMP is to ensure that all potential construction phase environmental impacts will be addressed in accordance with current legislative requirements and best practice guidelines. It will assist in the control of environmental risks that may arise during construction to ensure that these works do not result in an environmental incident, environmental damage or undue nuisance to the local environment.

The key objectives of this CEMP are to:

- Provide a method of documenting compliance with the Environmental Commitments / Environmental Management / Best Practice Guidelines;
- Ensure compliance with current legislation;
- Effectively minimise any potential adverse environmental effects during construction, including how site-specific method statements will be developed to avoid and minimise construction effects on the environment; and,
- Communicate key environmental obligations that apply to all contractor organisations, their sub-contractors and employees while carrying out any form of construction activity.

This CEMP will be used by the appointed contractor to prepare an updated final CEMP prior to the commencement of any onsite works. If required by the conditions of the grant of planning permission, the updated plan will be approved by the Planning Authority in advance of any works commencing onsite. The approved plan will be implemented for the duration of the construction works to protect the receiving environment from potential impacts arising during the construction works.

1.2 Site Location

The subject site extends across seventeen townlands covering a site area of 189 hectares, inclusive of underground cabling connections on public roads and private lands. The lands are located circa 4.5km northeast of Waterford city. The application site includes four distinct solar farm land parcels (and one addition parcel for the proposed substation) as identified in Figure 1. The subject lands comprise a mix of arable and pasture agricultural farmlands consisting of small to medium sized fields contained by mature tree-lined and well-maintained hedgerow boundaries. Parcel 4 of the solar farm is located

northeast of Port of Waterford, with the local area well served by the strategic road network which includes the N25 and N29 in addition to local roads.



Figure 1 – Site Context

1.3 Development Description

Solar Panels

The working title for the project is Drumdowney Solar Farm. The civil works for the panels themselves use a simple, ground-mounted system that avoids undue ground disturbance and works with the existing site topography. The PV panels will sit on angled racks comprised of galvanized steel arranged in portrait or landscape configuration depending on the final system deployed¹. It is envisaged that these will be screw or driven-piled following geotechnical assessment². The panels will be positioned on the rack at a minimum height of 0.8 m above the ground and rise to a maximum height of up to 3.25 m. The PV panels will be orientated to the south in order to capture maximum solar energy. The panels will be positioned at a tilt angle between 10-25 degrees from the horizontal having regard to natural site topographical and orientation conditions to ensure the best solar absorption. The panels will be stationary with no movable parts. Low voltage direct current cabling will connect the panels to the inverter/transformer stations across the site.

Inverters / Transformers / Ring Main Units

A total of 27 no. inverter/transformer stations are incorporated into the layout to convert direct current generated by the PV panels into alternating current which can be subsequently used by the electricity network. These units are manufactured offsite and delivered installation ready. These will have a maximum floor area of approximately 29.8 m². There will also be 3 no. Ring Main Units. These units are similar to kiosks and will have an area of approximately 2.4m². The design also includes 5 no. equipment containers, also 29.8m² in area, to store spare parts.

Interconnector Cabling

The solar farm comprises four distinct field parcels, which will be connected by means of 5 no. 33kV underground interconnector cables. These will be contained in solar farm access tracks, within private lands and within the L3429, L7523, L7563, L7469, L7466, L3406, L3407, L3414, L3415, L7483, N25 and N29 public roads. The specification for these cable routes is set out in the submitted drawings and Drumdowney Solar Farm Electrical Infrastructure - Construction Methodology. As detailed, the route of underground cabling will include 4 no. horizontal directional drill crossings under the N25 and N29 public roads and the Luffany River.

Access

A compacted gravel access track up to 4.5 metres wide will provide internal access to the solar arrays and associated infrastructure. This will extend to approximately 4,903 linear metres of new track across the land parcels, with 1,384 linear metres of refurbished track also utilised. Stripped soil arising from the construction of these access tracks will be sustainably reused across the site as part of landscaping, filling in the verges of access tracks and grass reinstatement in the areas of temporary construction compounds. As noted above, the access track will require 7 no. drain crossings within Parcel 1, Parcel

1 Refer to technical drawings DWNY-SD-DR-04 for panel and array system options. Final technical specification to be agreed with Kilkenny County Council prior to construction. The final design will be subject to standard micro-siting arising from site survey work.

2 The exact nature of the foundations will be determined at detailed design stage. Other alternative foundations arrangements include ballasting systems and piles. Final foundation type will be confirmed with Kilkenny County Council prior to construction.

3 and Parcel 4 through a 'dry' construction deck crossing, the construction of which requires no in-stream/drain works.

It is proposed to access the proposed solar farm during the construction phase via 5 no. existing entrances for Parcel 1 (L3429), Parcel 2 (L7469), Parcel 3 (L7466) and Parcel 5 (L34142) which will be subject to upgrade works. Separate construction access via either the Port of Waterford or the L4783 are proposed for Parcel 4. These are also existing entrances. Two options are considered in the planning application for construction access to Parcel 4. The Port of Waterford and Suir Shipping have provided agreements in principle to use their lands for accessing Parcel 4 during construction (Access 4b). However, until such time as those agreements are formalised, the Applicant has also considered the scenario where the L4783 is used for construction access (Access 4a). It should be noted that the L4783 is the only option considered for the operational phase of the solar farm.

Other Infrastructure

A perimeter fence up to 2.4 m in height will be erected to provide security and restrict unauthorised entry. This fence will be stock proof in nature, sympathetic to the agricultural character of the site. The footings for the fence will either be pre-moulded or localised in-situ concrete, to be determined once a contractor is appointed. The installed fencing will incorporate mammal friendly access, with a maximum 200 mm gap retained at the bottom between the fence and the ground, as per the submitted technical plans.

The proposed development will be an unmanned facility; however, the facility will be monitored 24 hours a day remotely by the Applicant's operation system and the Engineer Procurement and Construction provider. The site will be subject to routine inspections. The CCTV will be orientated towards this infrastructure rather than any third-party lands. There is no requirement for potable water or wastewater treatment facilities as part of the constructed solar farm³.

The proposed layout includes 5 no. weather monitoring stations. These are centrally located within the solar farm and will reach a maximum height of 5 metres. These stations measure ambient temperatures, wind speeds and direction, direct and diffuse irradiance etc. as part of standard operational monitoring of the solar farm.

Landscaping & Biodiversity

A total of 285 linear metres of hedgerow will be permanently removed throughout the site alongside 191 square metres of scrub/woodland to facilitate site entrance, access tracks and underground cabling. This will be offset by 2,718 linear metres of new hedgerow planting (Type 2), as well as the bolstering of an additional 22,470 linear metres where necessary, to fill any gaps in existing hedgerows. Ecology on the site will be further fostered to deliver significant biodiversity gains to the receiving environment through the establishment of focused ecological biodiversity areas and species rich grasslands.

The solar farm will contribute directly to a carbon dioxide emission reduction of 41,647 tonnes per annum or the equivalent of approximately 1,665,917 tonnes of CO₂ over the 40 year lifetime of the project.

UPDATES TO PROJECT DESIGN

The proposed layout of the solar farm has been amended having regard to the Council's Request for Further Information. These design changes are detailed on the submitted revised site layout plans by Macro Works and comprise the following:

³ There is a requirement for potable water for the substation, the application for which will be made to An Bord Pleanála.

- Removal of 3 no. southern fields from Parcel 4 of the solar farm (area of c.10.5ha) and associated minor amendments to the landscaping proposals.
- The following represents a summary of revised landscaping figures for the proposed solar farm. A total of 285 linear metres of hedgerow will be permanently removed throughout the site alongside 191 square meters of scrub/woodland to facilitate site entrance, access tracks and underground cabling . This will be offset by 2,093 linear metres of new hedgerow planting (Type 2) , as well as the bolstering of an additional 22,022 linear metres where necessary, to fill any gaps in existing hedgerows. Ecology on the site will be further fostered to deliver significant biodiversity gains to the receiving environment through the establishment of focused ecological biodiversity areas and species rich grasslands.

Substation and Grid Connection

The proposed 110kV GIS substation, interface towers and grid connection will be subject to a Strategic Infrastructure Development (SID) application to An Bord Pleanála in accordance with section 182A of the Planning and Development Act 2000. For completeness purposes, this infrastructure is considered in the various technical reports informing the solar farm planning application to Kilkenny County Council.

Substation

The 110kV substation compound will consist of a two storey GIS substation building, IPP Control Room buildings, High Voltage (HV) electrical equipment and associated infrastructure including palisade fences and concrete post and rail fences. The installation of HV electrical equipment will include a transformer with associated equipment along with:

- Lightning Masts (LM);
- Back-Up Diesel Generator;
- Harmonic filters if required by EirGrid;
- Capacitor Bank if required by EirGrid;
- Fire/Blast Wall;
- Telecoms Pole;
- 110kV underground cable which will connect into the existing 110kV Great Island to Waterford overhead line via 2 no. new Interface Towers.

The substation compound has a total area of 5,335m². Earthworks will be undergone so the compound is level.

Further information on the substation and grid connection are described in detail in the 'Drumdowney Solar Farm Electrical Infrastructure - Construction Methodology'.

Grid Connection

The substation will connect into the national grid via a 'loop-in / loop-out' underground 110kV cable grid connection which will connect into the existing Great Island to Waterford overhead line. Two new interface towers are required to achieve this. The interface towers are approximately 15 metres apart, therefore the similar length of the existing Great Island to Waterford line will need to be decommissioned. The proposed substation will connect into each interface tower via an underground 110kV cable. This cable is comprised of 3 no. power ducts, 2 no. telecom ducts and 1 no. earth continuity duct. The cables to each interface tower are 68 and 83 metres in length.

1.5 Summary Construction Works

The main civil works for the solar farm project are:

- *Erection of PV arrays, prefabricated Inverter/Transformer stations, Ring Main Units and Storage Containers:* Piling of frame structures and mounting of panels. The inverters/ transformers and other units come to the site as prefabricated and ready to install;
- *Internal Access Track and Drain Deck Crossing:* The track which provides direct access to the solar arrays consists of compacted gravel. It allows, in particular, small vehicular movement during the operation of the PV plant. For its preparation, a thin layer of topsoil shall be removed before construction build-up is placed. The 'dry' deck crossing will be put in place to cross an existing site drain;
- *Cable trenches:* Narrow cable trenches to a depth of about 1.0 -1.5m will be excavated during construction, where required, but will not be visible after the construction is finished. Underground cabling will be typically confined where possible to the access track to avoid undue soil disturbance in accordance with best practice measures. At areas of the proposed interconnector route which traverse watercourses, Horizontal Direction Drilling (HDD) will be required;
- *Perimeter Fencing:* Secure perimeter fencing will be required as indicated on the planning drawings. This will be stock proof fencing (up to 2.4 m high) with support poles located at approximately 2.5m centres. The footings for the security fencing will be precast or localised in-situ concrete. All final detail for the foundation elements will be developed with the contractor at construction stage. Typical plan details for this fencing and CCTV installations are provided as part of the planning application;
- *Substation and grid connection:* The proposed substation and grid connection will be constructed in parallel with solar farm. This infrastructure will be taken in charge by the ESB and constructed in accordance with ESB specifications and technical standards.

2. Construction Programme

2.1 Construction Timeline

A typical construction timeline is outlined in Figure 2.

The construction of the solar farm will include the installation of PV arrays, prefabricated inverter/transformer stations, storage containers, access track and bridge crossings, cable trenches, fencing, CCTV etc and all associated development works. There are 4 no. district field parcels of solar arrays associated with this solar farm. Construction of the solar farm within each parcel will take approximately 3-5 months with activities overlapping and construction resources shared on individual land parcels, as required. It is expected that the overall programme for construction of the solar farm will be 24 months, inclusive of electrical commissioning and any close out activities.

The substation and grid connection does not form part of the solar farm planning application however in the interests of completeness these are also considered in this CEMP. It is expected that the overall programme for construction of the solar farm and substation/grid connection will be 24 months. The construction traffic will be broadly spread over the construction programme. It is hoped that the solar farm can be energised by 2028 in order to contribute to Irelands 2030 climate and renewable energy electricity targets.

Estimated Construction Programme & Vehicle Numbers

Week	Construction Programme (Months)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Enabling Works	250	250	250																					
Civil Works				20	20	20	20	20	20	20	20	20	15	10	5									
Electrical Works												137	138	138	138									
Civil and Electrical Works												20	20	20	20	138	138							
Pre-Commissioning																								
ESB Commissioning																								
Solar Farm Site Set Up & Installation							323	440	235	287	99	99	99	202	112	112	301	301	298	22	22	4	96	71
Electrical Commissioning																								
Close Out																								
Estimated Vehicles Per Month	250	250	250	20	20	20	342.9	459.6	255.4	307.4	119.2	119.2	251.2	349.6	255.5	300.6	300.6	298	22.05	22.1	104.2	256.1	151	
Estimated Vehicles Per Week	62.5	62.5	62.5	5	5	5	85.72	114.9	63.84	76.84	29.81	29.81	62.81	87.4	63.86	75.15	75.15	74.49	5.513	5.513	26.05	64.02	37.7	
Estimated Vehicles Per Day (5.5 days)	11	11	11	1	1	1	16	21	12	14	5	5	11	16	12	14	14	14	6	6	5	12	7	
Peak Daily Vehicles																								
Peak Hourly Vehicles																								
Average Daily Vehicles																								
Average Hourly Vehicles																								
	1																							

Figure 2 – Indicative Construction Programme

3. Sequence of Solar Farm Construction Activities

The following sections set out the sequence of construction related activities associated with the proposed solar farm. The substation and grid connection will be subject to a separate application to An Bord Pleanála under Section 182A of the Planning and Development Act 2000, as amended. Details on the construction methodology for this development are set out in the 'Electrical Infrastructure - Construction Methodology' report contained in Appendix A.

Site Set Up

This activity will typically take between 4-12 weeks within each land parcel. The initial set up works will involve constructing a 4.5 metre wide compacted gravel access track, and the establishment of temporary construction compounds. The construction of the access track will require the removal of a strip of topsoil, with the outer edges being re-filled following the laying of the gravel. The dry construction deck crossing will be constructed as per the submitted methodology with no in-drain works. Temporary matting will be used for construction compounds to ensure no significant disturbance of soil layers. The location of the construction compounds is identified in Figure 3, as well as on the submitted site layout plan drawings.



Figure 3 – Proposed Location of Temporary Site Compounds

The perimeter fence will be constructed of stockproof fencing and will be up to 2.4 m in height, with mammal access facilitated by way of a maximum 200 mm gap between the erected fence and ground. The access gates will be designed in accordance with standard guidelines for the provision of mammal access (e.g., NRA 2008). The perimeter fence will be set back approximately 5 m from the centreline of the surrounding ditch/hedgerow and a minimum of 5-10 metres from identified drains of ecological importance. All landscape planting will be as per the submitted landscape plans.

Installation of Solar PV Panels

This activity will typically take between 10-13 months. The solar PV panels will be mounted on supporting structures, in the form of metal frames, which are typically anchored by driven or screw piles to a depth of up to 2m, causing minimal ground disturbance and occupying less than 1% of the land area. The angled racks will be anchored to the ground using one of the following methods:

- *Screw piles or rammed piles:* This is the preferred method of founding the racks, as it is the quickest to construct and most economical. This can be considered the default method and it is expected that the vast majority of the site will use screw or rammed piles as anchors;
- *Pre-drilled holes with backfilling/concrete:* In certain cases, geotechnical conditions such as the presence of rock close to the surface may require foundation holes to be pre-drilled prior to ramming the piles. These holes would then be backfilled with concrete or other aggregate. A pre-construction geotechnical assessment will confirm if this type of anchor is required. It is expected that this would only be deployed in localised pockets of land where rock was present, if at all;
- *Ballast foundations:* This foundation type can be used in localised circumstances where penetration of the ground surface is not possible. This method uses concrete anchors to counteract any lift forces generated by wind loading on the modules. Ballast foundations could be deployed in areas of the site in the event of rock near the surface, or where there is potential for sub-surface archaeology.

With the exception of a specific scenario where pre-drilled holes are necessary, there are no concrete works required in the installation process. The anchoring of panels will be followed by DC cabling, connections to inverters/transformers and a period of associated testing.

AC Cable Trenches and Civil Works

The AC or interconnector cable trenching will take place over an extended period given that sections of same are located in public roads. The excavation, installation, and reinstatement process typically take an average of 1 day to complete 100m section depending on the cable configuration. The overall programme assumes interconnector cabling in public roads will take approximately 19 no. weeks. Sections of the proposed interconnector route which involve the undercrossing of the N25, the N29 and the crossing of a watercourse between the L7483 and L3415. These crossings will require the use of a Horizontal Direction Drill (HDD).

Transformer/Inverters Stations & Spare Parts Containers

The 27 no. inverters/transformer stations, 3 no. Ring Main Units and 5 no. spare parts containers will be manufactured offsite and delivered installation ready. Subject to final specification, these units will either be mounted on blocks or laid on pad foundations of shallow depth.

Reinstatement of Excavated Materials/ Landscaping

This task will take place at periodic intervals and will involve the reinstatement of all the excavated materials and associated landscaping works. The reinstatement will include the placement of topsoil as required, for example:

- Areas of disturbed ground;
- Exposed substrata areas as a result of the construction works;
- Adjacent access tracks;

- The construction compound and other temporary works areas and redundant features which are not required as part of the permanent works.

Pre-commissioning/Commissioning

The pre-commissioning survey work will be completed following the construction of the solar farm and will comprise the inspection of all electrical equipment, earthing and bus wiring. All relevant site tests will be completed, including conductivity, resistance, timing and other mechanical operational checks. Follow on commissioning tests will then be completed ahead of energization of the substation.

4. Site Compound

Temporary site compounds shall be provided as shown in the example in Figure 4. It will include the following facilities at a minimum:

- Adequate canteen space to allow for all workers during the peak period;
- Office space with lighting, heating and internet facilities;
- A diesel generator to provide sufficient capacity for all facilities;
- Toilets and adequate welfare facilities for construction staff in accordance with the relevant statutory Health & Welfare guidelines;
- Parking space for both light and heavy vehicles;
- Waste storage area.

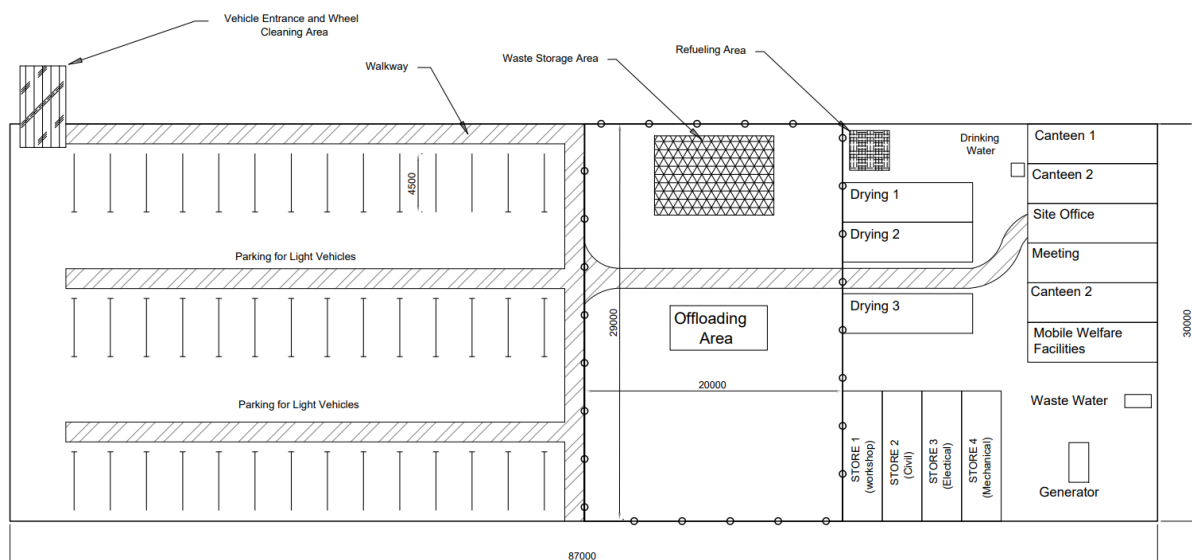


Figure 4 – Indicative Typical Site Compound Layout (refer to drawing DRMDY-SD-DR-07)

The final configuration of the construction compounds will be tailored to the site and will be agreed with the Planning Authority prior to commencement of development. The location of these temporary facilities has been considered as part of the design of the proposal, the layout of which will include a geotextile base and silt fencing as part of environmental controls. On completion of the construction stage the compound areas will be returned to grassland, it is not intended to incorporate these into the solar array area.

All relevant statutory welfare facilities will be provided as part of the temporary construction compound, including canteen facilities and drinking water supply, toilet, wash up and locker facilities, first aid facilities and offices for site engineers and contractors.

Portable toilet and wash facilities will be provided from a licenced sanitation supplier bound by Environmental Protection and Health & Safety legislation. Toilets will be serviced on a weekly basis or where necessary, according to type. A record of servicing will be kept by the operator. Wastewater effluent will be collected and disposed off-site in accordance with the principles contained in the Environmental Protection Act (Duty of Care) Regulations 1991.

Washing and changing areas will be located adjacent toilet facilities and a supply of clean warm and cold water maintained where reasonably practicable. Soap and other means of cleaning and towels or other suitable means of drying will be provided and replenished as part of servicing arrangements by the licenced sanitation supplier. All waste water will be collected and removed from the site. Sufficient ventilation and support lighting will be provided.

A supply of drinking water will be stored and made readily available. Rest facilities will provide shelter from wind and rain. These will have adequate numbers of tables and seating, a means for heating water for drinks and for warming up food will be provided. Rest areas will not to be used to store plant, equipment or materials.



Figure 5 - Sample Welfare/ Sanitation Facilities and Servicing

5. Traffic Management

5.1 Delivery Route

The delivery route options were assessed by CSEA Engineering Advisors in the Site Access Study that accompanies this application. The methodology for the access study included: a desk top study of historic records for the site; a site walkthrough with visual inspection; a site drive-through with a GPS enabled dashboard camera; swept path analysis; and a detailed review of horizontal and vertical geometry in relation to the vehicles proposed for construction stage.

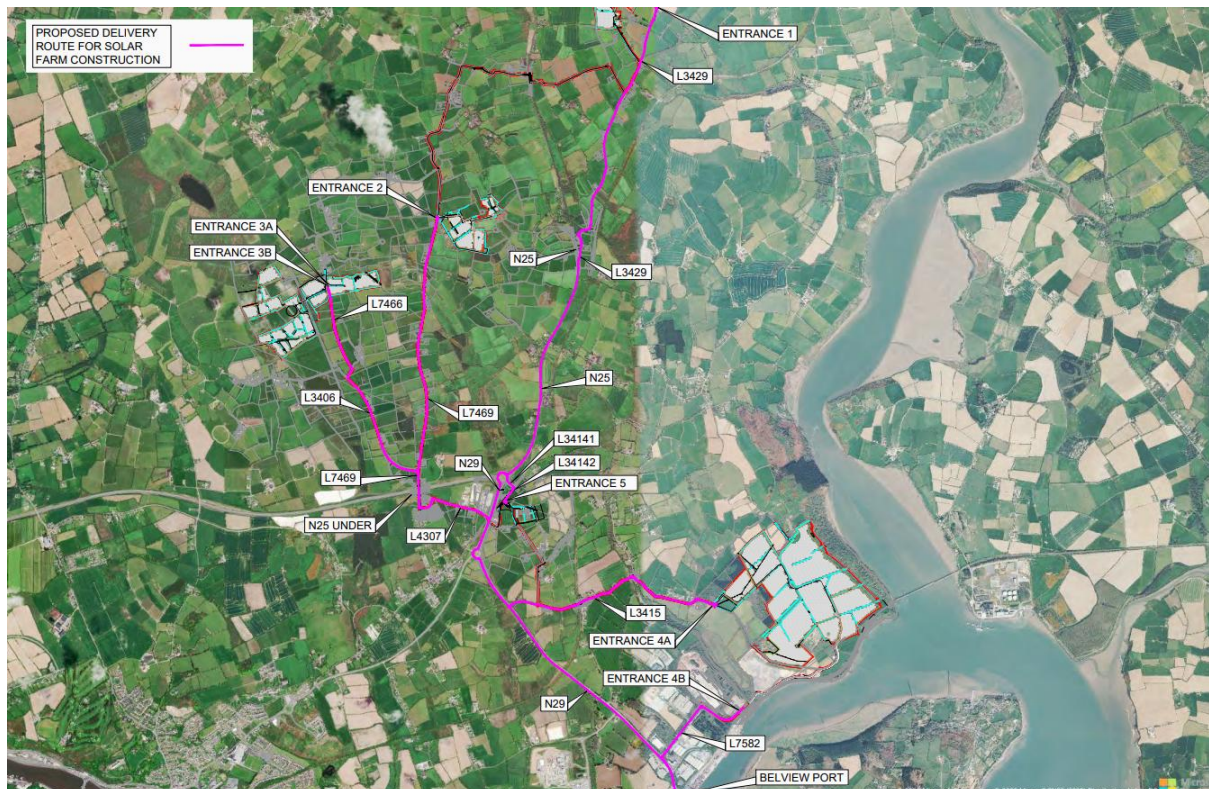


Figure 6 - Proposed Delivery Route (commencing at Belview Port)

A key benefit of the subject solar farm location is its proximity to Belview Port, greatly reducing travel times for deliveries to site during the construction phase. The identified delivery route commences at the Belview Port and follows along the N29. The route will branch off of the N29 onto the local roads L3415 or L7582 in order to access Parcel 4. The delivery route north to service the other three parcels will continue on the N29 from the Slieverue Roundabout before branching into two routes where the L3407 meets the N29. One route will follow the L3407 northward to the L3406. One route will follow the L3406 and L7466 to Entrances 3a and 3b, while the other will follow the L7469 to Entrance 2. At the Luffany Roundabout, one section of the delivery route will exit onto the L34141 and continue onto the L34142 in order to access Entrance 5. Another section of the delivery route will continue northward from the Luffany Roundabout along the N25 and L3429 to access Entrance 1. The map above shows the proposed delivery route to the solar farm site.

Appendix A of the Site Access Report shows a detailed suite of delivery route drawings. The analysis undertaken in the Site Access Study shows that this route poses no challenge to articulated vehicles. There were no locations on any of the routes surveyed where the gradient exceeded 14% (maximum

gradient permitted in the guidance documents) and no significant crests nor dips in the existing alignment were found. The existing horizontal geometry was also found to be generally adequate.

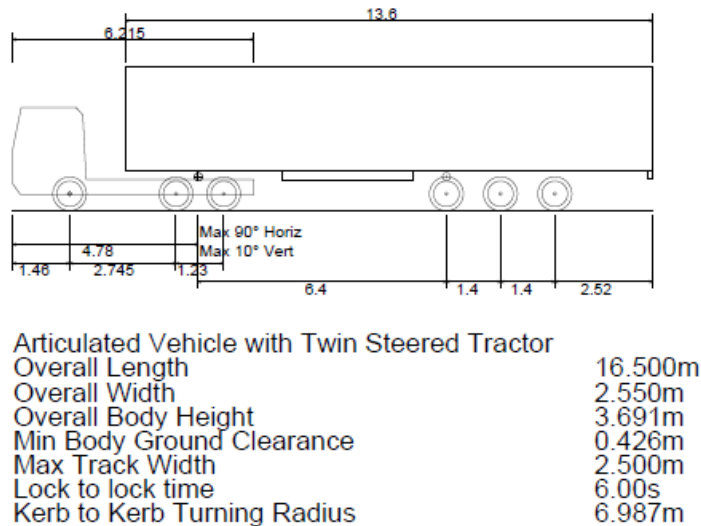


Figure 6a – HGV Specification of the Delivery Vehicles

5.2 Site Entrances

It is proposed to access the proposed solar farm during the construction phase via 5 no. existing entrances for Parcel 1 (L3429), Parcel 2 (L7469), Parcel 3 (L7466) and Parcel 5 (L34142 which will be subject to upgrade works. Separate construction access via either the Port of Waterford or the L4783 are proposed for Parcel 4. These are also existing entrances. Two options are considered in the planning application for construction access to Parcel 4. The Port of Waterford and Suir Shipping have provided agreements in principle to use their lands for accessing Parcel 4 during construction (Access 4b). However, until such time as those agreement are formalised, the Applicant has also considered the scenario where the L4783 is used for construction access (Access 4a). It should be noted that the L4783 is the only option considered for the operational phase of the solar farm

A swept-path analysis has confirmed that HGVs can safely access and egress the site during the construction phase. Please refer to the technical drawings by CSEA Engineering Advisors.

As detailed elsewhere in this document, all site delivery activities will be informed by suitably devised safe systems working arrangements, including intermittent delivery sequencing to mitigate any build-up in traffic congestion and the use of traffic/speed controls on approach including warning signs and flagmen, to be agreed with the Council prior to development as part of the final Construction and Environmental Management Plan, complete with Traffic Management Plan.

5.3 Traffic Considerations

The solar panels and ancillary components are relatively small and are transported in pallets before being assembled on site. The panels comprise of high transmission, low iron, tempered glass and each panel weighs approximately 30 kilograms. The final panels are yet to be chosen but the typical area is between 1.6 and 2 m². A 40-foot high cube container can carry approximately 720 panels, weighing almost 23 tonnes.

Ancillary components such as switchgear and inverter panels will be housed in units and easily transported to site using medium articulated trucks also during the construction phase.

Traffic Volumes

The construction stage of the development (both the solar farm and the substation and grid connection) is anticipated to take approximately 24 months. Materials will be delivered by Heavy Goods Vehicles (HGV) and it is anticipated this will equate to peak daily number of vehicles at 21 no. and the peak hourly traffic volume at 2.6 no. trips. The average daily number of vehicles is 10 no. and the average hourly traffic volume is 1 no. This includes movements for the delivery of all panels and mounting frames and cables, ducting, fencing plus additional movements for the transportation of machinery, building material, access track aggregates and waste management processes.

Onsite construction staffing numbers will vary over the construction period reaching a peak of 180 workers during the construction stage. This traffic will be spread across the entire development site (including the length of the grid connection which will be finalised in the SID application to An Bord Pleanála). Staff will access the development using light vehicles (cars/mini-buses), and car parking facilities will be available to ensure that traffic flows on the local road network in the vicinity will not be impeded. Car-pooling for staff will be encouraged for the duration of the project.

Traffic Access

Access and egress to the site will be controlled by the project manager. Access to the subject site will be taken via the identified entrances, with final arrangements to be discussed and agreed with Kilkenny County Council. On site vehicle tracks will be used to access the inverter/transformer stations and on-site substation which will consist of compacted gravel. These tracks will be principally used during the construction phase with occasional access for routine maintenance during the operational period.

All suppliers undertaking deliveries to the site will be informed of the delivery arrangements and restrictions. The number of construction staff on site will vary over the construction period depending on the activity that is taking place. The majority of staff are expected to share vehicles when travelling to and from the site, or travel in crew buses. Staff vehicles will also follow this designated local route, to gain access to the site.

Traffic Overview

In relation to construction traffic, the volumes are modest given the large development site and associated road network. It should also be noted that the construction phase will be temporary in nature and will be undertaken in accordance with a detailed traffic management plan to be agreed with Kilkenny County Council and An Garda Síochána. This traffic management plan will include advance signage in accordance with Chapter 8 of the Traffic Signs Manual, use of appropriate delivery routes, phasing of site traffic to minimise interference with school runs and the like and be designed, implemented and certified by traffic management professionals in line with current regulations. In line with the TII Standard, a Construction Management Plan is provided with the application documents. Pending planning approval, this Construction Management Plan will be developed further by construction contractors at detailed design stage in consultation with the Kilkenny County Council to ensure construction stage traffic is managed appropriately and with limited local impact.

5.4 Management Measures

Road Signage and Cleaning

Appropriate warning signs adopted from Chapter 8 'Temporary Traffic Measures and Signs for Roadworks' – Road Signs Manual will be erected to advise motorists and others of works affecting the public roads. Mitigation measures will also be put in place to ensure that public roadways are kept free of mud, dust and debris at all times. Such measure will be described in the final construction management plan provided by the contractor prior to construction.



Figure 7 – Sample Road Signage

Delivery Co-ordination

Deliveries of bulk materials such as hardcore, concrete and solar panels will be managed and co-ordinated to minimise disruption to local traffic and activities. In particular these will be scheduled to avoid activities which would attract significant traffic.

Construction Personnel

Standard working hours for construction will be Monday to Friday 08:00 to 18:00 and Saturday 08:00 to 13:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. Construction traffic will not pass through any local towns or villages. All site personnel will be required to wear project notification labelling on high visibility vests and head protection so that they can be easily identified by all workers on-site.

Access Control

A staff presence will be maintained at the site entrance during working hours. One of the functions will be to log all incoming vehicles and personnel and ensure no unauthorised access is permitted.

As an unmanned facility, the proposal will actively give rise to a reduced number of vehicular movements to/from the site once operational, improving the carrying capacity of the road network locally. As such, prospective traffic impacts arising from the development will largely be limited to the short 24-month construction stage. Further to this, a detailed Traffic Management Plan will be prepared at the pre-commencement stage that will facilitate the safe operation of the existing entrance during the construction stage to address and mitigate any concerns arising.

'Stop/Go' Traffic Management System

Where road widths permit, it is proposed to implement a 'Stop/Go' type traffic management system which will allow for one side of the road to be open to traffic at all times at a minimum width of 2.5m.

This would allow for underground cable construction works to continue one side of the road. Temporary traffic signals will be implemented to allow road users safely pass through the works area by directing them onto the open side of the road.

Facilitation of Continued Local Access

Provision of local access to residences along the active works area will be maintained with minimal disruption. This will be coordinated through signposted detour routes, with advance notice given to residents of anticipated works along with dates and further details. Access and egress of residences adjoining the works area of the UGC will be facilitated. The length of closure (as defined on site by signage/cones etc) is intended to be kept to the minimum length practicable for the works to be undertaken where homes are adjacent, and to avoid access restrictions to local residences being in place for multiple working days.

Minimising the closure period of junctions with other local roads will dictate maximum length of any one closure (unless otherwise specified by Kilkenny County Council) to avoid excessive disruption to the local area.

6. Health & Safety

6.1 General

As required by the Safety Health and Welfare at Work (Construction) Regulations 2001-2006, a Project Supervisor Design Process (PSDP) will be appointed by the developer to co-ordinate the design effort and to address and minimise construction risks during the design period. Notification of this appointment will be sent to the HSA by means of their Approved Form 1 (AF1). As design advances and before tender stage, a Preliminary Health and Safety Plan will be drawn up by the PSDP and reviewed by the project team.

This will then be issued with the tender package(s) and ultimately will be passed on to the appointed Project Supervisor Construction Stage (PSCS) to be developed into a full project Health and Safety Plan. Notification of this appointment and the commencement date of construction will be sent to the HSA by means of their Approved Form 2 (AF2).

The construction areas will be delineated and will be under the control of the PSCS who will co-ordinate and supervise all safety aspects of the project. A Safety File will be compiled and maintained on site for the duration of the project and this and the implementation of the Plan will be subject to regular audits.

The main contractor will engage the services of a safety consultant to prepare a site specific health & safety plan, carry out safety risk assessments, notify the HSA of commencement, and carry out audits of the site. All personnel and their subcontractors who will be working on or attending site will attend and comply with a Site Safety Induction Course to be provided by the Site Safety Officer.

All contractors will be requested to provide a sound working environment for all employees involved in the design, construction and operation of the proposed solar farm. This shall take into account all applicable national laws, guidelines and standards.

The Contractors must ensure that the following HSE objectives are met:

- Zero accidents and injuries with respect to all involved workers;
- Zero harm to workers, the public and the environment.

Each Contractor shall prepare and implement the Health, Safety and Environmental (HSE) Plan and associated working instructions and procedures that will govern the contractor's actions at all times. The HSE Plan will cover the following aspects:

- Project Policy Statement;
- Roles and Responsibilities;
- Site regulation, including, for example, housekeeping, barricades, excavations, tools and equipment, electrical work, ladders and scaffolds, etc;
- Risk Management and Hazard Identification;
- HSE training;
- HSE management of subcontractors;
- Work Permit system;
- Personnel Protective Equipment (PPE);
- Inspection and auditing;

- HSE meetings;
- Incident Investigation and Reporting;
- Site security;
- Medical care and first aid.

Furthermore, the Contractors shall develop and implement an emergency response plan outlining all necessary measures and communication procedures in case of emergency situations. The preparation and application of the HSE Plan shall be audited independently throughout the construction period.

7. Construction & Demolition Waste Management Plan

7.1 Waste Management General

The Contractor shall be responsible for developing the Waste Management Plan related to its construction activities. The Plan shall apply to all works carried out by the Contractor and any subcontractors under their control. In preparing the plan, the Contractor shall take into account any measures set out any planning consent document, the relevant legislation, and industry best practice.

The Contractor shall comply with the objectives of the regional waste management plan and establish a system for the management of wastes in accordance with the waste management hierarchy:

- Prevention;
- Minimisation;
- Reuse;
- Recycling and;
- Disposal.

Generally, the waste management goal will be achieved as follows:

- Giving preference to the purchase of materials with minimum packaging;
- Storing materials in designated areas and separate from wastes to minimise damage;
- Returning packaging to the producer where possible;
- Reusing rock/soil on-site during the construction of the project;
- Reusing and recycling materials on site during construction where practicable;
- Recycling other recyclable materials through appropriately permitted / licences contractors and facilities;
- Disposing of only non-recyclable wastes to licensed landfills.

7.2 Wastes Arising & Management

Construction works will be carried out according to best practice with standard environmental controls (see CIRIA 2010). Furthermore, all wastes generated during construction works will be transported off the site by licensed contractors following appropriate classification/segregation. These subcontractors will be identified nearer the commencement of construction. The Site Manager will ensure that the permits / authorisations held by each specialist subcontractor used have the necessary permits in place for each waste type being managed. Kilkenny County Council Environment Section will be consulted to confirm all permits are in order.

During construction, waste containers will be provided and rotated as soon as they are filled. A number of skips (20m³ typical) will be kept in a secure area adjacent the site compound. Waste will be sorted and disposed of as per waste type to a nearby recycling / treatment facilities.

Excavated material (soil and stone — EWC Code 17 05 04) will be re-used in full on site; it is not expected to be taken off site for recovery. Any excavated material stockpiled on site during construction will be stored in such a manner as to ensure no silt or run-off from these stockpiles enters any watercourse or drain.

In order to prevent any damaging run-off from the site, that there will be no stockpiling of soil within 50 m of a watercourse and silt fence/screens are utilised where deemed necessary. This is a standard working practice. The landscape work is to be implemented in tandem with the main building works where possible, further reducing run off to any watercourse located in the vicinity of the site.

As the site is a green field site, it is unlikely that unsuitable material will be discovered during excavation, however if discovered, it will be stored separately and will be carted off site to designated dumping areas, by licenced contractors. This will be done in accordance with the "Waste Management Acts 1996-2008." All excavations will be undertaken in accordance with Building Regulations and Health and Safety standards.

The waste arising likely to be generated during the construction phase are:

- EWC 17 02 01 - Wood
- EWC 17 02 03 - Plastic
- EWC 17 04 05 - Iron & Steel
- EWC 15 01 01 - Paper & Cardboard packaging
- EWC 15 01 06 - Mixed Waste

In relation to foul waste arising from temporary toilet and canteen facilities the contractor will provide temporary storage facilities in the form of a prefabricated tank. The waste from the site toilet facilities will be removed from the site on a regular basis.

Waste generated will be for the duration of the construction period only and there will be no requirement for either potable water or waste water treatment once the solar farm is operational.

7.3 Documentation of Waste

The Contractor shall develop a Waste Documentation System within the overall documentation system for the works. The documentation to be maintained in relation to wastes includes the following (where applicable):

- The names of the agent(s) and the transporter(s) of the wastes;
- The name(s) of the person(s) responsible for the ultimate recovery or disposal of the wastes;
- The ultimate destination(s) of the wastes;
- Written confirmation of the acceptance and recovery or disposal of any hazardous waste consignments;
- The tonnages and European Waste Catalogue (EWC) Code for the waste materials;
- All other statutory recording requirements.

7.4 Hazardous Material

It is not anticipated that there will be any need for hazardous waste on-site, however if required, the management of hazardous waste will comply with current legislation:

- The Waste Management Acts (WMA) 1996 to 2005;
- Waste Management Regulations 1998.

Hazardous waste which may be produced or encountered on site includes:

- Soils contaminated with waste oils or fuels;
- Waste oils and fuels.

8. Environmental Management

8.1 Summary Approach

There are a number of potential sources of pollution from the solar farm construction works, which may impact upon both terrestrial and aquatic ecosystems:

- Silt run-off from exposed ground, e.g., temporary material stockpiles (aggregate and excavated/overburden soil), tracks and haul routes, and recently reinstated areas (road verges etc.);
- Plant washing and vehicle wheel wash areas;
- Fuel storage/refuelling areas;
- Dust emissions from traffic and excavation/construction areas; and
- Sewage and waste water from construction compound building amenities.

Good construction practice and appropriate management and monitoring are therefore essential for prevention of potential pollution from any of these sources.

The following points (not exhaustive) indicate general pollution prevention measures in accordance with those highlighted within the guidelines referenced in this document and application reports. Pollution prevention measures relating to specific tasks are also detailed in the respective sections of this document.

Any material or substance which could cause pollution, including fuels or silty water will be prevented from entering groundwater, surface water drains or watercourses by the appropriate use of and temporary installation of silt fences, cut-off drains, silt traps and drainage to vegetated areas where appropriate. Stilling ponds will be used to minimise the risk of suspended solids, where necessary.

In order to prevent any potential of watercourse pollution the array design ensures a 5-10m to all drains except for small number of localised areas where a fence line or CCTV pole may marginally extend within that buffer. The landscape work is to be implemented in tandem with the main building works where possible, further reducing run off to any drains onsite.

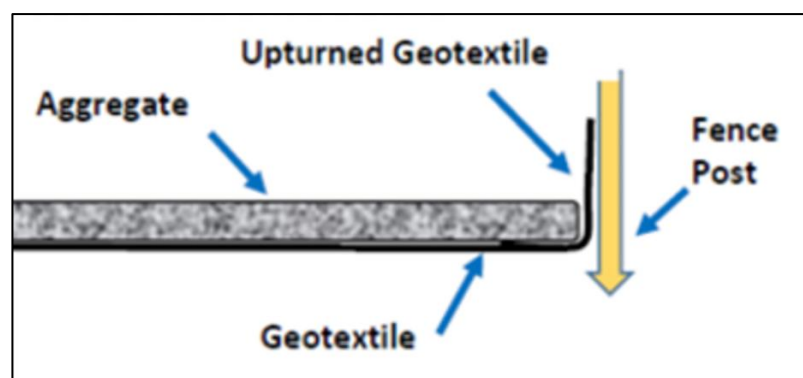


Figure 8 – Geotextile Base Detail for Temporary Compound (note - temporary matting may be used instead)

The temporary construction compound will incorporate these relevant measures, with suitable provision made for a geotextile base and support silt fencing on any downslope edges to watercourses/drains. Stockpiles of soil should be stored well away from the drains on site and (if appropriate) ringed with silt

fences. The contractor will carry out environmental awareness training as part of the site inductions for all staff.

Fuel pipes on plant, outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur. The following precautions will also be installed on fuel delivery pipes:

- Any flexible pipe, tap or valve must be fitted with a lock where it leaves the container and be locked when not in use;
- Flexible delivery pipes must be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use;
- Warning notices including “No smoking” and “Close valves when not in use” shall also be displayed;
- Spill kits will be available within each plant/vehicle on site and also located close to identified pollution sources or sensitive receptors (fuel storage areas, etc.);
- Interceptor drip trays (or similar, e.g. plant nappies, – open metal drip trays are not acceptable) will be available in accordance with standard good practice across the construction industry;
- Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water. Plant and site vehicles are to be well maintained and any vehicles leaking fluids must be repaired or removed from site immediately. Any servicing operations shall take place over drip trays;
- Areas used to store fuel and oil on the site will be appropriately lined and bunded to prevent the downward percolation of contaminants to natural soils and groundwater;
- Fuel for construction vehicles will be stored on an impervious base within a bund able to contain at least 110% of the volume stored. Rainwater will not be allowed to accumulate within the bund and in any way compromise the required 110% volume capacity. No tanks or containers may be perforated or dismantled on site. A competent operator shall empty all contents and residues for safe disposal elsewhere;
- Suitable wheel wash facilities, complete with C/W silt traps will be put in place to ensure vehicles entering/exiting the site do not carry/transport debris;
- It is of paramount importance to minimise disturbance to flora and fauna whilst carrying out the construction works, and to ensure that disturbed habitats will regenerate quickly after completion of the works;
- Topsoil and vegetation must be stored separately from subsoil and shall be retained and reinstated on all areas of stripped ground as soon as possible to prevent erosion and leaching/loss of nutrients.
- Daily environmental toolbox talks / briefing sessions will be conducted for all persons working to outline the relevant environmental control measures and to identify any environment risk areas/works.

8.2 Ecological Protection Measures

An Appropriate Assessment (AA) Screening and Natura Impact Statement (NIS) accompany the planning application. The NIS identifies mitigation measures to be implemented to ensure that any impacts on the receiving environment will be avoided during the project’s construction phase. There is

some overlap in areas with recommended mitigation, which has been included for consistency of approach.

Storage/Use of Materials Plant & Equipment

- Materials, plant and equipment shall be stored in the proposed site compounds. The temporary construction compounds will incorporate these relevant measures, with suitable provision made for a geotextile base and support silt fencing on any downslope edges to watercourses/drains.
- A buffer of 5-10m to all watercourses including drains except for a small number of localised areas where a fence line or CCTV pole may marginally extend within that buffer will be established and clearly marked out prior to the commencement of construction activities where possible. The buffer will be maintained during the construction of the proposed cable interconnectors.
- Plant and equipment will be parked in areas remote from any sensitive locations.
- Re-fuelling of machinery, plant or equipment will be carried out in the site compounds.
- Hazardous liquid materials or materials with potential to generate runoff shall be stored in areas remote from any sensitive locations, including drains.
- All hazardous liquid materials shall be stored in a bunded area and spill containment measures will be in place.
- All oils, fuels and other hazardous liquid materials shall be clearly labelled and stored in an upright position in an enclosed bunded area within the proposed development site compound. The capacity of the bunded area shall conform with EPA Guidelines – hold 110% of the contents or 110% of the largest container whichever is greater.
- Fuel may be stored in the designated bunded area or in fuel bowsers located in the proposed compound locations. Fuel bowsers shall be double skinned and equipped with certificates of conformity or integrity tested, in good condition and have no signs of leaks or drip trays will be turned upside down if not in use to prevent the collection of rainwater.
- Waters collected in drip trays must be assessed prior to discharge. If classified as contaminated, they shall be disposed by a permitted waste contractor in accordance with current waste management legal and regulatory requirements.
- Plant and equipment to be used during works, will be in good working order, fit for purpose, regularly serviced/maintained and have no evidence of leaks or drips.
- No plant used shall cause a public nuisance due to fumes, noise, and leakage or by causing an obstruction.
- Re-fuelling of machinery, plant or equipment will be carried out in the site compound as per the appointed Construction Contractor re-fuelling controls.
- All persons working will receive work specific induction in relation to material storage arrangements and actions to be taken in the event of an accidental spillage.
- Daily environmental toolbox talks / briefing sessions will be conducted for all persons working to outline the relevant environmental control measures and to identify any environment risk areas/works.

Surface Water Mitigation During Construction

The following mitigation measures will be carried out by the Contractor during construction phase to prevent surface water runoff into sensitive drains or watercourses. The interconnector cable will cross streams / drains via 7 no. watercourse/drain deck crossings and 4 no. horizontal directional drill crossings (under the N25 and N29 public roads and the Luffany River).

While there are no watercourses within the application site, there are indirect hydrological links through existing agricultural drains between the subject site and the River Barrow & River Nore and Lower River Suir Special Areas of Conservations (SACs) which are located adjacent to Parcel 4. A significant offset of >100m between the proposed solar arrays and the River Barrow has been incorporated into the design of the proposal to protect local water quality and that of downstream designated sites. Similarly, a buffer zone of 5-10m from all watercourses including drains will be implemented except for a small number of localised areas where a fence line or CCTV pole may marginally extend within that buffer. The buffer will be established and clearly marked out prior to the commencement of construction activities where possible. The buffer will be maintained during the construction of the proposed cable interconnectors.

Any material or substance which could cause pollution, including fuels or silty water will be prevented from entering groundwater, surface water drains or nearby watercourses by the appropriate use of and temporary installation of silt fences, cut-off drains, silt traps and drainage to vegetated areas where appropriate. Stilling ponds will be used to minimise the risk of suspended solids, where necessary.

The temporary construction compounds will incorporate these relevant measures, with suitable provision made for a geotextile base and support silt fencing on any downslope edges to watercourses/drains. Stockpiles of soil will be stored well away from the drains on site and (if appropriate) ringed with silt fences. The contractor will carry out environmental awareness training as part of the site inductions for all staff.

Fuel pipes on plant, outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur. The following precautions will also be installed on fuel delivery pipes:

- Any flexible pipe, tap or valve must be fitted with a lock where it leaves the container and be locked when not in use;
- Flexible delivery pipes must be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use;
- Warning notices including “No smoking” and “Close valves when not in use” shall also be displayed;
- Spill kits will be available within each plant/vehicle on site and also located close to identified pollution sources or sensitive receptors (fuel storage areas, etc.);
- Interceptor drip trays (or similar, e.g. plant nappies, – open metal drip trays are not acceptable) will be available in accordance with standard good practice across the construction industry;
- Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water. Plant and site vehicles are to be well maintained and any vehicles leaking fluids must be repaired or removed from site immediately. Any servicing operations shall take place over drip trays;
- Areas used to store fuel and oil on the site will be appropriately lined and bunded to prevent the downward percolation of contaminants to natural soils and groundwater;

- Fuel for construction vehicles will be stored on an impervious base within a bund able to contain at least 110% of the volume stored. Rainwater will not be allowed to accumulate within the bund and in any way compromise the required 110% volume capacity. No tanks or containers may be perforated or dismantled on site. A competent operator shall empty all contents and residues for safe disposal elsewhere;
- Suitable wheel wash facilities, complete with C/W silt traps will be put in place to ensure vehicles entering/exiting the site do not carry/transport debris;
- Topsoil and vegetation must be stored separately from subsoil and shall be retained and reinstated on all areas of stripped ground as soon as possible to prevent erosion and leaching/loss of nutrients.

Mitigation of Dust during Construction

The main activities that may give rise to dust emissions during construction include the following:

- Excavation and removal of earthworks.
- Materials handling and storage.
- Movement of vehicles (particularly HGV's) and mobile plant.
- Suspended solids in surface water runoff.

The following mitigation measures will be carried out by the Contractor during construction phase to prevent dust entering the drains or nearby watercourses or the surrounding residential areas:

- Construction traffic carrying loose material will be covered to reduce dust generation. This measure will be combined with wheel washing at site access points. A water bowser will be provided for dust suppression on site if necessary and areas of concern can be 'dampened down' during periods of dry weather.
- If necessary, arrangements will be made for sweeping public roads in the vicinity of the site access using a standard road sweeper. The Site Manager will be responsible for determining if additional measures will be required.
- Speed limits on site (15km/h or less) to reduce dust generation and mobilisation. Furthermore, any areas that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions. Measures are to include the following:
 - Truck spraying and hosing down will be carried out during dry periods and as necessary to control dust.
 - A road sweeper operating during the soil-stripping and excavation stage as required.
- The design of the proposed solar farm has incorporated buffer zones around drains and nearby watercourses in order to protect local water quality and that of downstream designated sites. Crossing of drains/minor watercourses will be by way of clear span structures and under the supervision of the ECoW.
- Solar panel cleaning will take place annually or as required. Cleaning will most likely be undertaken using a lightweight tracked machine with a special cleaning attachment. Due to the Irish climate which is relatively mild with high rainfall, solar panel cleaning

is required less than other climates such as hot and dusty conditions. However, we assume an annual cleaning cycle to ensure optimum solar farm performance. The panels will be cleaned with water only, and no chemical products will be used.

- All construction (and decommissioning) works will be carried out according to best practice with standard environmental controls in place to prevent any damaging run-off from the site (see CIRIA 2001, 2010 & 2015). The construction of the proposed development will be implemented in accordance with the Construction Environmental Management Plan (CEMP) for the proposed development.
- All other mitigation measures, biodiversity enhancement and monitoring commitments described in the EclA will be fully implemented.

Ecological Mitigation

The following mitigation measures will be implemented as part of the proposed project in order to minimise the potential effects on the existing ecology as discussed above. These measures are to be read in conjunction with the detailed construction phase commitments presented in the CEMP that accompanies the planning application.

- An Ecological Clerk of Works (ECoW) will be appointed to ensure that the mitigation strategy is correctly implemented both during the construction phase, establishment of the landscaping measures and for the duration of the eventual decommissioning of the project.
- Construction works will be carried out according to best practice with standard environmental controls in place to prevent any damaging run-off from the site (see CIRIA 2010 *Environmental Good Practice on Site. CIRIA, UK*; and CIRIA 2001 *Control of water pollution from construction sites: guidance for consultants and contractors. CIRIA C532. London 2001.*)
- Any silty water generated on site will be settled out as much as possible through drainage mitigation measures (silt traps, silt fences, cut off drains, etc.) and channelled into vegetated areas at least 50 metres from watercourses, to allow the settlement of solids.
- A phased approach will be taken when constructing the substation and access tracks for the site, as per the outlined construction programme. This will include a focused gap between the soil stripping of the substation and access tracks, as part of a precautionary approach.
- As a precautionary measure, the soil stripping and construction of the site access tracks will be carried out outside of periods of wet weather. Scheduling of works will avoid insofar as practicable the wetter months of the year. In addition, appropriate run-off control will be installed and maintained for the duration of the construction phase. It will help minimise the risk of run-off from the site by limiting the earthworks undertaken in the wetter months of the year.
- In advance of the stream crossing works required for the underground interconnector cabling, a staked silt fence shall be installed at a distance of 2-3m from the channel on both banks. The approaching track excavations will be stopped at this distance back from the channel, therefore retaining a vegetated buffer strip between the access track approach and the channel until such time as the dry deck is lifted into place.
- Silt fencing shall be retained on the downslope between the dry deck plinth and the channel until such time as the access track has bedded in and the swales (with check dams in-site) have revegetated.

- The swales alongside the access track approaching the stream crossing deck shall have temporary and permanent gravel check-dams installed to slow velocity and attenuate flow prior to reaching the channel.
- Dust can be created from movement of construction traffic and from general construction activities and can be carried by prevailing winds impacting upon the local area. The air quality management objectives are: Protection of air quality; Use all reasonable and practicable measures to minimise airborne dust and greenhouse gas emissions to minimise impacts on land, flora/fauna, water and air quality; Track and report; Minimise impacts on adjacent residents, land owners and community.
 - Construction traffic carrying loose material will be covered to reduce dust generation. This measure will be combined with wheel washing at site access points. A water bowser will be provided for dust suppression on site if necessary and areas of concern can be 'dampened down' during periods of dry weather.
 - If necessary, arrangements will be made for sweeping public roads in the vicinity of the site access using a standard road sweeper. The Site Manager will be responsible for determining if additional measures will be required.
- The design of the proposed solar farm has incorporated buffer zones around drains within the site and from adjacent watercourses in order to protect local water quality and that of downstream designed sites. Crossing of drains will be by way of clear span structures and under the supervision of the ECoW.
- Solar panel cleaning will take place annually or as required. Cleaning will most likely be undertaken using a lightweight tracked machine with a special cleaning attachment. Due to the Irish climate which is relatively mild with high rainfall, solar panel cleaning is required less than other climates such as hot and dusty conditions. However, we assume an annual cleaning cycle to ensure optimum solar farm performance. The panels will be cleaned with water only, and no chemical products will be used.
- All construction (and decommissioning) works will be carried out according to best practice with standard environmental controls in place to prevent any damaging run-off from the site (see CIRIA 2001, 2010 & 2015). The construction of the proposed development will be implemented in accordance with the Construction Environmental Management Plan (CEMP) for the proposed development.
- All other mitigation, biodiversity enhancement and monitoring commitments described in the EclA will be fully implemented.

Roles and Responsibilities of CEMP

The Site Manager/Environmental Clerk of Works will be responsible for the pollution prevention programme presented in the planning phase CEMP (Appendix 2) and will ensure that routine checks of key construction design measures are carried out to ensure compliance. A record of these checks will be maintained throughout the duration of the project.

The prepared EclA also includes a suite of identified mitigation measures to in order to minimise potential effects on the existing ecology. Some overlap exists in respect of the above referenced measures.

- Detailed mitigation to minimise the risk of run-off or pollution of drains or adjacent watercourses during construction is provided in the CEMP and Construction Method Statement for Electrical Infrastructure which accompany this application. This includes the following commitments:
 - a. A buffer of 5-10 m from the closest drain will be established and clearly marked out prior to the commencement of construction activities where possible. The buffer will be maintained with the exception of localised areas where access, crossing or cable trenching is required.
 - b. Silt fencing will be installed within the works area for the proposed interconnector cables. The silt fence will provide protection from sediment and potential site water runoff.
 - c. The silt fencing will be checked twice daily during construction and once per day thereafter to ensure that it is working satisfactorily until such time as the re-instated ground/material has been fully established.
 - d. If dewatering is required as part of the proposed works e.g., in trenches for underground cabling or in wet areas, water must be treated prior to discharge. The Contractor shall employ best practice settling systems to ensure maximum removal of suspended solids prior to discharge of any surface water or groundwater from excavations to receiving waterbodies. This may include treatment via settlement tanks. There will be no direct pumping of water from the works to any watercourses or drains at any time.
 - e. An emergency-operating plan will be established to deal with incidents or accidents during construction that may give rise to pollution within any nearby watercourses or drains. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (spill kits etc.).
 - f. The contractor will ensure that good housekeeping is always maintained and that all site personnel are made aware of the importance of the nearby estuary/aquatic environments and the requirement to avoid pollution of all types.
- Construction works will be carried out according to the CEMP which will incorporate all of the planning phase commitments along with standard environmental controls to prevent any damaging run-off from the site (see CIRIA 2001, 2010 & 2015).
- A suitably qualified Environmental/Ecological Clerk of Works (ECoW) will be appointed to oversee the implementation of environmental mitigation throughout the construction phase.

Habitats and Flora

- No removal of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff.
- Construction works will be carried out according to best practice with standard environmental controls in place to prevent any damaging run-off from the site (see CIRIA 2001, 2010 & 2015).
- The landscaping commitments in the Biodiversity Management Plan for the proposed development will be implemented. Only native tree, shrub and meadow/wildflower species suited to the locality will be used in the final landscaping plan.
- A pre-construction survey will be undertaken to identify and map the occurrence and extent of any Third Schedule Invasive Plant species within or adjacent to the works footprint. If such species are found to occur at this time an Invasive Species Management Plan (ISMP) to control invasive species shall be developed following best practice guidance (e.g. after NRA 2010 and Fennell *et al.* 2018) with the advice of a suitably qualified ecologist. The ISMP should be

finalised in consultation with and based on advice provided by the appointed specialist contractor, who will continue to review and, if necessary, update the Management Plan, in order to ensure that current relevant guidelines and regulations are followed at the time when the management of these species is implemented.

Fauna

- Pre-construction (and decommissioning) surveys for Badger, Otter and roosting bats shall be carried out prior to the commencement of any works.
 - Prior to the commencement of construction (or vegetation removal) in areas within 200m of an EPA named watercourse the area will be surveyed to record evidence of Otter activity. In the event that a holt is present, no work will be carried out within 200m of the holt until a derogation licence has been sought and granted to permit works according to the recommended protocol and licence conditions.
 - Any trees required to be removed (whether within hedgerow or the scrub/woodland) will be subject to ground-level inspection to record any trees with moderate or higher bat roost potential (Collins, 2016). Any trees with moderate/higher potential will be subject to more detailed assessment, including climbing and direct inspection of potential roost features. In the event that any roosting bats are discovered -the tree will not be removed until such time as a derogation licence is obtained. All recommendations and licence conditions will be implemented under the supervision of the ECoW. As a secondary mitigation, all trees/shrubs that are felled will be left 'sit' for a minimum of 24 hours before being cut/logged or mulched.
 - A pre-works survey will be carried out to assess the activity at the known Badger sett on site and to record any new activity (or setts) that may be present. No construction/decommissioning traffic will be permitted within 50m of an active sett without the advice of a suitably qualified ecologist and in consultation with the National Parks and Wildlife Service. The ecologist will advise on the need for any further consultation or licensing ahead of the commencement of construction. Badger activity will be monitored throughout the construction phase and the ECoW will have 'Stop Works' authority.
- As In the event that protected fauna are found actively using the site for breeding/roosting (e.g. bird nest, bat roosting) during the construction phase, works will cease immediately and the area will be cordoned off until advice is sought from a suitably qualified/experienced ecologist.
- There will be no removal of woody vegetation during the bird breeding season (1st March to August 31st inclusive).
- All excavations/trenches will be covered at night, or a suitable means of escape provided for nocturnal mammals such as Badger and Otter.
- A tree survey shall be performed to identify any trees in dangerous states prior to works commencing. Any trees requiring intervention will be inspected for roosting bats and nesting birds and the ECoW will ensure that any risks to breeding or resting birds and mammals are minimised.
- Security fencing shall have a 200mm gap between the bottom of the fence and the ground, or alternatively mammal gates will be provided at regular intervals (every 150m at a minimum) at the base of the fence to allow free movement of mammals through the solar farm site.

- A total of 50 woodcrete (or recycled plastic) bat boxes will be erected at the site to improve the roosting potential of the site for bats. The boxes will be erected under the supervision of a suitably qualified ecologist. The boxes will be checked and maintained annually by a suitably qualified (and licensed ecologist) and replaced as necessary over the lifetime of the project.
- Two Barn Owl nest boxes will be erected at locations chosen by a suitably qualified ecologist. The boxes will be erected under the supervision of the ecologist. The boxes will be checked and maintained annually by a suitably qualified (and licensed ecologist) and replaced as necessary over the lifetime of the project.

Decommissioning and Restoration Phase Mitigation

At the time of decommissioning and restoration, the Applicant will ensure that any related activities in support of same are undertaken with such due care and diligence in order to reduce or eliminate risk to the environment. The Applicant will lead the decommissioning and restoration process;

- The Applicant will ensure adequate internal and external resources are available to manage and undertake all decommissioning activities required and be required to submit for agreement with the planning authority a Decommissioning and Restoration Plan;
- The date for decommissioning will be well known in advance of the activation of the Decommissioning and Restoration Plan;
- Pre-works walkovers will be carried out by a suitably qualified ecologist to identify any ecological constraints on site and to provide appropriate advice ahead of the mobilisation of the decommissioning contractors.
- All potential negative environmental effects from decommissioning of the project will be mitigated through established measures. These measures include, but are not limited to:
 - The use of erosion and sediment control measures;
 - Maintenance of all existing buffers (hedgerows / treeline, drainage ditches etc.);
 - Timing of decommissioning works to ensure that they do not interfere with wildlife breeding / nesting times; and
 - Measures which will rapidly establish a vegetative cover on any disturbed areas.
- All stored fluids or solid materials, be they chemicals, greases or oils shall be returned to suppliers where appropriate. Alternatively, they will be disposed of off-site to licensed waste facilities;
- Disposal off-site shall mean that licensed removal contractors, licensed removal equipment and licensed reception facilities are utilised where required during decommissioning;
- Disposal off-site shall mean that a full record and log will be maintained of all plant, equipment, finished or raw materials and fluids removed off-site;
- Not all structures will be removed from site. For example, if infrastructure forms parts of the substation or grid connection then ownership of this belongs to ESB Networks and may be retained for future long-term use as part of the national electricity distribution system. In addition, the landowner may choose to retain access tracks within the solar farm for improved access with the farm holding. It should be noted that any structures or land uses which are

proposed to be retained will be advised to Kilkenny County Council in advance of final decommissioning and restoration.

- All contractors engaged in the Decommissioning and Restoration Plan shall be fully licensed, experienced and approved to undertake the activities for which they are engaged; and
- On completion of decommissioning, a Closure Validation Audit Report will be completed and issued to Kilkenny County Council to demonstrate that the site is suitable for use and its condition would not pose a future risk to public health or the environment. This report will be issued to the Council and the site will only be confirmed as fully decommissioned on the Council's confirmation that it is satisfied with the findings from this report.
- After ensuring the solar panels are disconnected from the electrical network, the panels may be individually removed from their frame. The panels can be reused depending on their age and condition. If they are not fit for reuse, they will be disposed of to a suitably licenced waste facility. Storage containers will be available should the panels be reused or disposal containers if they are to be transported to a waste facility.
 - The panels will be mounted on a steel frame system. These can be reused, so they will be stored and taken off site. The mounting system is connected to the ground via a small driven pile system. These driven steel piles will be removed with a rig. These will not be reused so they will be taken off site for recycling.
- The 110kV substation and associated 110kV underground grid connection cabling and transition masts will become the property of ESB Networks once the project is energised and will therefore remain on-site following the decommissioning of the solar farm as per the connection agreement with ESB Networks. This infrastructure will have a future long term use as part of the national electricity transmission system.
- The electrical cabling will be disconnected. The cables and accompanying ducting will then be removed via digger. The cables will be pulled from the ducts and recycled appropriately. The ducting will also be sent to the relevant waste facility.
- Depending on the condition of the inverter and transformer station, they will either be refurbished and reused, or disassembled and recycled. The inverter and transformers will be disconnected from all electrical systems. A crane will then transfer the stations onto a flatbed lorry to be removed from site. The remaining concrete pad foundations, or supporting blocks, will be broken up and removed from site for appropriate recycling. The land will then be filled and re-seeded for full reinstatement.
- Site Security Equipment includes the perimeter fencing and CCTV system. These will be dismantled and removed once all other equipment has been removed from site. The security fence will be removed and depending on its condition, transported for recycling or reuse. The holes from the fencing will be refilled. The CCTV system will be disconnected, and the poles removed from the ground. Similarly, the holes will be refilled and the land reinstated.
- Additional site access tracks constructed as part of the solar farm may add value to the site and as such their removal will be subject to landowner agreement. Should the landowner request that the access tracks be removed, the stone build-up of the road will be broken-up, removed and appropriately recycled. The area will then be covered with a layer of topsoil to allow for the reinstatement of the land.

The site decommissioning and restoration plan will be executed in line with the environmental conditions of the Planning Permission. In advance of final decommissioning and restoration the Applicant will

consult with Kilkenny County Council to agree any additional requirements. Following the decommissioning of the site the agricultural land will be restored to its original state. Should the access tracks be removed, the areas will be covered with topsoil and planted with a grass seed mixture. The vegetation will be monitored by the Applicant to ensure the grass areas are growing sufficiently. If there are any the areas showing poor growth, these will be re-ploughed and re-seeded. All pre-existing drains will be retained in their original state throughout the lifetime of the solar farm. Should any existing drains or ditches become damaged during the decommissioning process, these will be repaired. Please refer to the Construction Environmental Management Plan for further details on site drainage. The land will be reinstated to its original conditions as per the agreement with the landowner.

8.3 Soil Structure Protection

To minimise damage to the soil structure within the solar farm site, construction activities will be confined to periods of suitable weather, with the use of appropriate machinery for such circumstances.

Equipment will be delivered to site by heavy goods vehicles and offloaded in packs by tracked machines or low ground pressure machines, which reduces the risk of compaction. The constructed access tracks which extend to all areas of the site will be the principal means to navigate the site for construction purposes. A delivery sequence of lower pressure vehicles will be devised which minimises repeated journeys over the pasture to reduce rutting and damage to the pasture and soil structure. Temporary ground-protecting access matting will be used in the area of the construction compound, as necessary.

On completion of the works, the pasture will be restored using light farming machines and prepared appropriately for seeding to encourage early growth, restoration of the soil structure and natural creation of meadow grass.

These processes will be supplemented in full by a suite of agreed measures to prevent against silt-laden run off as well as standard good practice site management procedures including routine deployment of wheel washing.



Figure 9 – Typical Low Ground Pressure Screw Pile Vehicle

8.4 Material Excavation and re-use on site

The access track for the inverter/ transformer stations will require the preparation of a heavy-duty track made of compacted layers of material. To this effect, the soil will be stripped to a depth of about 200mm in order to remove the soft top soil and replaced by a layer of coarse gravel/ suitable substrate. This will be undertaken in accordance with agreed practices, with a disaggregated temporary storage area for the appropriate management of same will be set out within the construction compound.

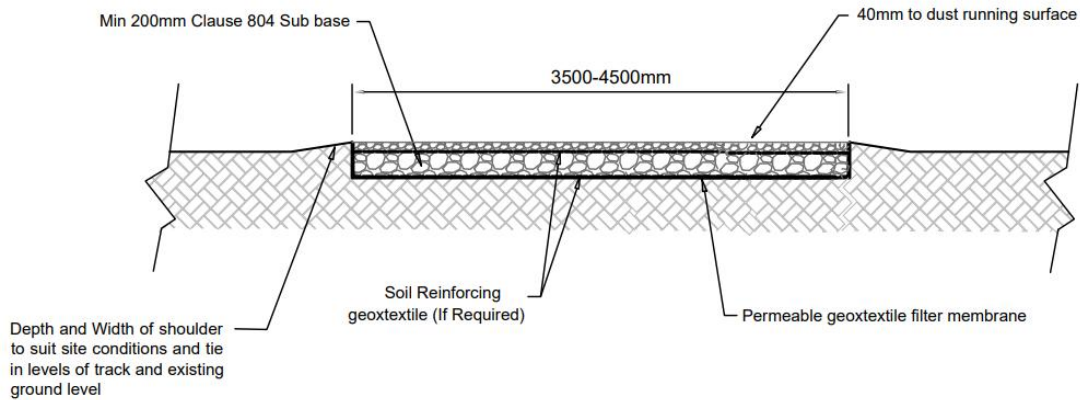


Figure 10 – Typical Access Track Detail

The soil stripping works to facilitate the track excavations will extend to c. 7,078 m³ of soil removal. All of this will be reused on site. The excavated material will be used directly as local fill in focused areas and to fill-in the verges of the internal track once the installation process is complete in accordance with proposed landscaping mitigation measures, with the residual re-tilled in the areas of hedgerow removal and the temporary construction compounds (if needed) to allow for full and active reinstatement for agricultural use.

8.5 Construction of Access Tracks

There will be a requirement to import aggregate for the construction of the access track in the development site. This will be kept to a minimum. The quantity will be determined accurately at construction stage and will largely depend on existing ground conditions. Typical construction details are as per Figure 10.

8.6 Dry Construction Deck

The dry construction drain deck crossing will be constructed as per the submitted methodology, refer to Section 9.1 of the of the Site Access Report by CSEA Engineering Advisors). As per the specification below, the construction of these decks do not require any works in the stream channel itself, rather pre-cast bearing slabs are brought to site on which a reinforced concrete deck is placed bridging the drain below.

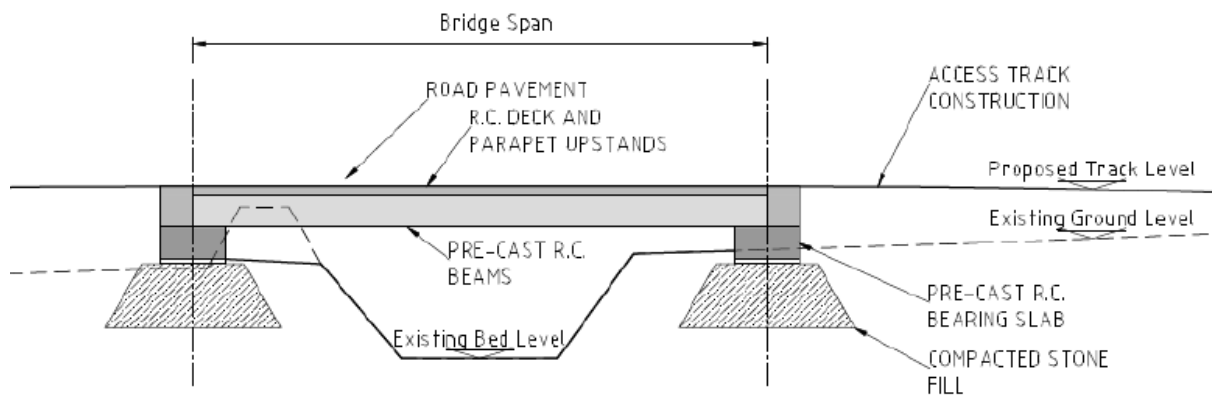


Figure 11 – Cross Section of Typical Agricultural Deck

Further to any grant of planning permission, and as per formal process, engagement will take place with the Office of Public Works in respect of approvals under Section 50 of the Arterial Drainage Act. All requirements of the OPW will be subsumed into the final construction method statement which will be submitted to Kilkenny County Council as part of the final contractor prepared CEMP.

8.7 On-Site Surface water generation and drainage

The proposed development is designed so as to minimise effect on the original drainage and infiltration pattern of the site. The only surfaces where infiltration may be materially impeded are the inverter/transformers and spare parts storage container which extend to a cumulative area of approximately 953.6m² of the total site area. The drainage strategy for the project is detailed in the submitted plans by IE Consulting.

Any existing drainage or ditch network shall be cleaned during construction and maintained on an annual basis by the site owner as per contractual obligation. It will therefore be ensured that the site drainage will constantly be optimal.

It should be noted, that although PV panels may appear as a roof-like structure they do not prevent water from reaching the ground. The grass and original pasture quickly return to its original state as shown in figure below. In fact, grass growth management does not differ from a normal pasture and will allow for sheep grazing. Any soil compaction that may occur during frame and panel installation will be chisel ploughed post construction to ensure there is no formation of rivulets.



Figure 12 – No effect on grass management or drainage requirement

8.8 Treatment of Silt Laden Runoff

Construction works will be carried out according to best practice with standard environmental controls in place to prevent any damaging run-off from the site (see CIRIA 2010 *Environmental Good Practice on Site*. CIRIA, UK; and CIRIA 2001 *Control of water pollution from construction sites: guidance for consultants and contractors*. CIRIA C532. London 2001.)

Any silty water generated on site will be settled out as much as possible through drainage mitigation measures (silt traps, silt fences, cut off drains, etc.) and channelled into vegetated areas at least 50 metres from watercourses, to allow the settlement of solids.

A phased approach will be taken when constructing the substation and access tracks for the site, as per the outlined construction programme. This will include a focused gap between the soil stripping of the substation and access tracks, as part of a precautionary approach.

Specific details will be provided by the contractor on development of the detailed Construction Management Plan at construction stage. As noted in Section 5, these will be agreed in full with the Council's Environmental Department prior to construction.

8.9 Project Connection Works

As outlined, it is proposed to connect the different land parcels by means of an underground cable run on private lands. The specification for these cable routes is set out in the submitted drawings by Drumdowney Solar Farm Limited and associated 'Drumdowney Electrical Infrastructure Construction Methodology'.

The following standard trenching methodology will be implemented:

- Prior to construction the Contractor and the appointed Site Manager will prepare a detailed Method Statement for each section of the cabling based on the detailed design of same. The

Method Statements will take into account any mitigation measures where required, or any planning conditions set out by Kilkenny County Council;

- All works will be subject to a road opening licence from Kilkenny County Council;
- A detailed traffic management plan will be prepared by the appointed contractor and agreed with Kilkenny County Council at construction stage, outlining how traffic will be managed during the course of the works on the public road. Where road closures and diversions are required to facilitate the works, these will be agreed with Kilkenny County Council and An Garda Síochána and the appropriate road closure licenses will be applied for.
- Traffic management measures will be implemented as per the preceding point;
- All existing underground services shall be identified on site prior to the commencement of construction works. Exact locations will be determined via slit trenches as mentioned in Section 3;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be in suitably safe locations and all stockpiling locations will be subject to approval by the Site Manager;
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves.
- The trench will be excavated in 100m sections. The trench will be dug to a 1220mm depth and varying width depending on the cable installation. Following this the trench sections will be trim and smoothed;
- The trench will be laid with a bedding layer for the ducts. This layer will be compacted in accordance with the design specifications;
- The ducts will be lowered into the trench and laid in a trefoil formation. Spacers will be used where appropriate to ensure the ducts are centred within the trench section;
- The ducts will then be carefully covered with the bedding layer and compacted to the required standards, as per the detailed design. The layer will be levelled to the appropriate height. Care will be taken to not damage or displace the ducts;
- A backfill will be placed on top of the bedding layer and compacted as per the detailed design specifications.
- At the required level a yellow warning tape will be laid in accordance with the ESB Code 2955092;
- The ducts will then be cleaned and tested by pulling through a brush and mandrel. Following this a 12mm draw rope will be installed in each duct. The ducts will then be sealed using end seals, each fitted with rope attachment eyes to allow for cable installation;
- All the above works should be witnessed by ESNB Clerk of Works as required;

- Public road trenching will be reinstated in line with Kilkenny County Council requirements and as per the Guidelines for Managing Openings in Public Roads (Purple Book – April 2017);
- Cable lubricant will be applied to jacket (outer sheath) of the cables. This reduces friction between the cable and the rollers and also prevents the cable from snagging;
- The specialised winch will monitor the tension on the cables being pulled, ensuring the cables do not exceed their tensile limit;
- Works will only be conducted in normal working hours of Monday to Friday 08:00 to 18:00 and Saturday 08:00 to 13:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency;
- The excavation, installation and reinstatement process typically take an average of 1 day to complete a 100m section; and
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 2 no. days.

A Horizontal Direction Drill (HDD) will be required for the railway line and M9 Motorway crossing associated with the proposed interconnector route. Confirmation from CIE setting out its agreement in principle to the HDD under the railway line for planning purposes is included in Appendix B of the Drumdowney Electrical Infrastructure Construction Methodology'. The proposed drilling methodology is as follows:

- A works area of approximately 40m² will be fenced on both sides creating an easement/wayleave.
- The drilling rig and fluid handling units located on one side of the crossing will be stored on double bunded 0.5mm PVC bunds which will contain any accidental fluid spills and storm water run-off.
- Entry and exit pits (1m x 1m x 2m) will be excavated; the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
- A 1m x 1m x 2m steel box will be placed in each pit. This box will capture any drilling fluid returns from the borehole.
- The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the stream.
- A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
- When all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
- The steel boxes will be removed, and the drilling fluid disposed of to a licensed facility.
- The ducts will be cleaned and proven and their installed location surveyed.
- The entry and exit pits will be reinstated as per the landowners' requirements.

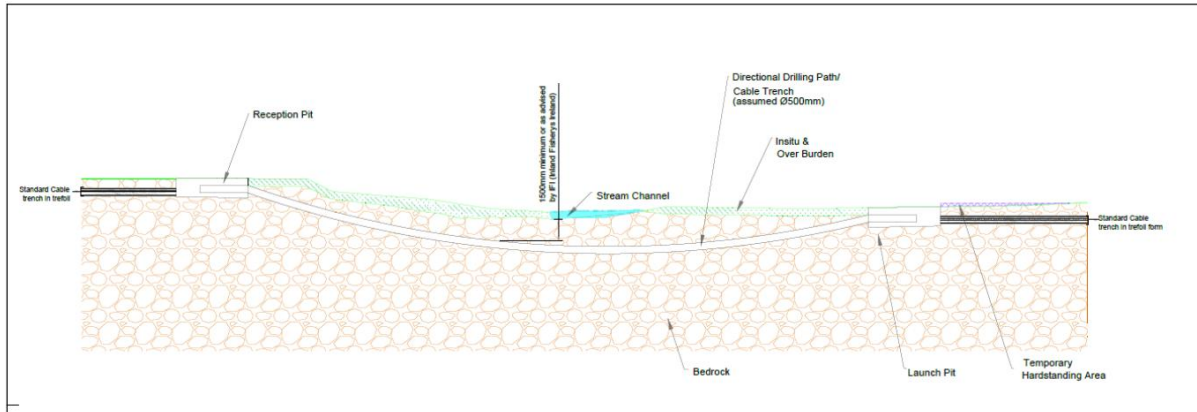


Figure 13 – Typical Horizontal Directional Drill (stream example)

8.10 Noise Management

It is expected that construction hours of operation will be between 08:00 and 18:00 Monday to Friday, and 08:00 and 13:00 on Saturday. No construction activities will occur outside these hours unless agreed in writing with Kilkenny County Council. All plant will be required to conform to the construction noise code of practice BS 5225 and will be properly maintained by contractors.

Potential noise impact will be controlled in accordance with all relevant British Standards Codes of practices such as: BS 5228-1: 1997 “Noise Control on Construction and Open Sites -Part 1”; BS 5228:2009 and AI:2014 “Code of practice for noise and vibration control on construction and open sites”. The applicant is happy to accept a condition limiting construction phase noise to 70dB for construction as per BS5228.

8.11 Air Quality

Dust can be created from movement of construction traffic and from general construction activities and can be carried by prevailing winds impacting upon the local area.

The air quality management objectives are:

- Protection of air quality;
- Use all reasonable and practicable measures to minimise airborne dust and greenhouse gas emissions to minimise impacts on land, flora/fauna, water and air quality;
- Track and report;
- Minimise impacts on adjacent residents, land owners and community.

Construction traffic carrying loose material will be covered to reduce dust generation. This measure will be combined with wheel washing at site access points. A water bowser will be provided for dust suppression on site if necessary and areas of concern can be ‘dampened down’ during periods of dry weather.

If necessary, arrangements will be made for sweeping public roads in the vicinity of the site access using a standard road sweeper. The Site Manager will be responsible for determining if additional measures will be required.

8.12 Adjoining Lands

The layout of the proposed solar farm includes a number of focused design measures such as development buffers, landscaping screening etc to mitigate against any potential for impact on adjoining

residential properties or land uses. The construction phase will be advanced in accordance with best practice measures to ensure there are no undue impacts on agricultural or other activities. Prior to the commencement of construction, local residents will be contacted with key information and the brief of the appointed contractor will include community liaison to record and address any queries arising.

8.13 Archaeology

An Archaeological, Architectural and Cultural Heritage Impact Assessment undertaken for the project includes a suite of construction management measures devised as part of a considered mitigation strategy. Identified measures, including the capacity for preservation in situ by design, and any actions arising from associated findings will be integrated into the final Construction Environmental Management Plan. The proposed layout of the development has been adjusted during the pre-planning design process to take account of findings from an extensive archaeological site inspection undertaken early in the design phase of the project.

The report recommends a pre-commencement (post planning consent) programme of archaeological and geophysical survey in areas where sub-surface excavation works are required, to be followed by programme of pre-development archaeological testing where warranted by geophysical findings. Other areas will be subject to a programme of archaeological monitoring by a suitably qualified archaeologist. Refer to Section 5 of the archaeological report submitted with this application for the proposed archaeological mitigation measures.

8.14 Reinstatement of Excavated Material after Construction Stage

Reinstatement of all excavated materials will occur as close to the site of excavation as possible. Materials will be reinstated on site in restoration and landscaping works.

Where practical, reinstatement and restoration will be carried out during the construction phase, or as soon as is practical after the completion of the works themselves. Early reinstatement and restoration is required to minimise visual impact and temporary storage/stockpiling of soils and to promote vegetation and habitat restoration as early as possible.

Reinstatement involves placement of topsoil as required:

- On any areas of disturbed ground;
- To exposed substrata areas as a result of the construction works;
- Adjacent access tracks;
- To construction compounds and other temporary works areas.

The Contractor is required to provide appropriate plant for undertaking reinstatement, restoration and landscaping works such that no unnecessary disturbance of the ground surface occurs.

The Contractor's plans and method statements will provide details on the timing and predicted extent of any necessary reinstatement, including the design and working methods for reinstatement and restoration of all of these elements.

8.15 HDD Frack-Out Contingency Plan

Frack-out is the condition whereby drilling fluid (mud) is released through sub-surface geology (e.g. fractured bedrock, gravels, karst) reaching the surface environment. Drilling muds consist of largely a bentonite clay-water mix and are non-toxic, but if frack-out occurs under or near a watercourse the resulting suspended solids concentrations can have highly adverse impacts on instream habitats,

plants, invertebrates and fish. Frack-outs most commonly occur near the drilling entry and exit points, but can occur anywhere along the bore.

This contingency plan covers three steps in order of preference to avoid adverse impacts, i.e., prevention, response/containment and clean up.

The objectives are to:

- Minimise potential for frack-out;
- Provide mechanisms for detection of frack-out;
- Protect watercourses and riparian vegetation;
- Ensure a readily mobilised “minimum-impact” response plan is in place;
- Ensure all appropriate incident reporting and follow up are carried out.

Prevention

- Ground investigation works will be carried out well in advance of the drilling operation. These will involve GPR for location of underground services / utilities, plus seismic and core tests to determine sub-surface geology to ensure the bore is set within suitable sub-strata.
- Drilling pressure will be closely monitored in order to ensure: (a) they do not exceed those required to penetrate the site-specific formation, and (b) rapid detection of any drop in fluid pressure which usually signals fluid loss as a result of frack-out.
- Entry and exit pits must be protected using silt fencing and staked strawbales and/or sand bags that act as booms to any drilling mud release.
- Any obvious drains or flow paths between the entry/exit points and the river must also be fitted in advance of works with robust silt control measures, e.g., silt traps and sandbags/staked strawbales.
- A stockpile of silt control materials will be on site and ready for emergency mobilisation at all times, e.g., additional strawbales, sandbags, silt fencing, stakes and a tank for storing any escaped fluid

Water containing silt, mud, bentonite or any other materials shall not be allowed to flow into surface water or drains.

Containment

Any loss of drilling fluid pressure or lack of returns at the drill entrance signals a potential frack-out which will immediately trigger the following:

- Directional drilling will cease immediately;
- Drill bore-stem will be pulled back to relieve pressure on the frack-out location;
- The site supervisor will evaluate the situation, locate the frack-out location and immediately inform the Site Environmental Manager (SEM) and ECoW;
- If the frack-out is minor and fluid has not reached the surface environment and/or not threatening sensitive receptors, a leak-stopping compound can be introduced to the bore to block the frack-out;

- If the frack-out has reached the terrestrial surface, any bentonite contaminated material will be surrounded with booms / berms and removed by hand or vacuum truck and disposed of according to local authority requirements;
- If the frack-out reaches the aquatic environment, every action possible must be undertaken to control and remove the source of the drilling mud contamination within or associated with the bore before notifying Inland Fisheries Ireland (IFI) hotline and Limerick office (see numbers below).
- The SEM and ECoW must record the location, timing and approximate volume of fluid release to water for incident reporting and consultations with IFI.

Clean-up

- All materials and rubbish-construction debris must be removed from site or securely locked on-site at the end of each workday;
- Entry and exit sump pits must be filled and returned to natural grade at the end of works, with all construction and mitigation materials removed, e.g., strawbales, sandbags, silt fences etc.

Incident Reporting

- IFI must be notified immediately if pollution of a drain or watercourse has occurred;
- The SEM will be responsible for preparing an incident report and shall undertake all necessary measures and monitoring as set out by IFI following their notification and conditions.

11. Operational Site Management and Maintenance

Once construction of the solar farm is complete, an operations and maintenance plan will be put in place. This will be agreed with the Planning Authority in advance of implementation. The plan will include for a habitat management plan to monitor the ecological enhancements to ensure they are implemented appropriately and in line with proposals in this planning application.

Once the solar farm is operational, significant maintenance work will not be required. The solar farm will be an unmanned facility which will be remotely monitored by way of CCTV. The solar panels and associated equipment will be monitored remotely by an online system which will show electricity generation, operational statistics and any minor faults in realtime.

Standard maintenance requirements such as occasional panel replacement or maintenance to an inverter will be logged by the online web-based system and a maintenance team will be promptly sent to undertake any works if required. The solar farm will be constructed to provide uninterrupted service insofar as possible for commercial reasons.

Solar panel cleaning will take place annually or as required. Cleaning will most likely be undertaken using a lightweight tracked machine with a special cleaning attachment. Due to the Irish climate which is relatively mild with high rainfall, solar panel cleaning is required less than other climates such as hot and dusty conditions. However, we assume an annual cleaning cycle to ensure optimum solar farm performance. The panels will be cleaned with water only, and no chemical products will be used.



Figure 14 – Solar farm cleaning equipment

Landscaping for mitigation and screening will be maintained as per the Landscape and Visual Impact Assessment and Landscape Mitigation Plan submitted with the planning application. This will ensure that the solar farm is appropriately screened from receptors where required. Internally, there will be light landscape maintenance in order to maintain the natural biodiversity of the site. Wildgrass and wildflower meadows will be cultivated and internal hedgerows will be lightly trimmed once a year. Insofar as possible, vegetation will be allowed to grow without interference to ensure that the natural biodiversity of the site is retained or improved from its previous agricultural use. No weed killers or chemicals will be used within the solar farm site under any circumstances.

The grass and vegetation between the rows of panels will be mowed using a small standard agricultural vehicle for such purposes. Mowing will only take place where necessary to allow access between the panel rows and to ensure grass does not grow to a height which may affect electricity generation.

Overall, it is expected that there will be 2 – 4 vehicle visits per month to the solar farm for technical maintenance, cleaning and landscaping purposes. Vehicles used in these visits will be vans or standard agricultural vehicles.

12. Implementation and Monitoring of CEMP

12.1 Roles and Responsibilities

The implementation of the CEMP will be the responsibility of the Site Supervisor / Construction Manager. A management structure to include an organisational chart encompassing all staff with delegated duties for environmental work will be included in the final CEMP. The Site Supervisor / Construction Manager will be supported by a Site Environmental Manager, with contracted expertise from project ecologists and hydrologists, who will visit the site routinely and report to the Site Environmental Manager.

12.2 Environmental Awareness and Training

All staff members will undergo 'environmental induction' prior to commencement of work on site. This will include encompass the following measures:

- Review of Environmental Management Site Plans and discussion of the key environmental risks and constraints, including processes for site risk assessment / reporting.
- An outline of the CEMP structure.
- Review / discussion of any applicable works method statements.
- Review / understanding of roles and responsibilities of staff, including contractors, in relation to environmental management; and
- Understanding / compliance with all environmental incident reporting and management procedures.

During the construction phase, internal communication on environmental matters will be coordinated by the Site Supervisor / Construction Manager to include regular progress meetings, which will cover the following:

- Training undertaken;
- Progress reports;
- Inspections, audits and non-conformance;
- Complaints received;
- Visits by external bodies and the outcome or feedback from such visits; and,
- Objective / target achievement, including reporting on environmental performance.

12.3 Site Inspections and Environmental Auditing

Routine inspections of construction activities will be conducted on a daily and weekly basis by the Site Environmental Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this Construction & Environmental Management Plan and any consent conditions.

Environmental audits will be conducted during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by

which system and performance improvement opportunities may be identified. Environmental audits will be carried out by contractor staff or alternatively by external personnel acting on their behalf. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the CEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

12.4 Community Liaison

A site representative will be appointed as a liaison officer with the local community for the duration of the construction phase. This individual will be tasked with information dissemination for the construction phase of the project and will act as the dedicated point of contact on all queries and complaints.

Appendix A: Electrical Infrastructure - Construction Methodology by Drumdowney Solar Farm Limited

Please refer to submitted CMS with subject SID Application.