

Appendix 4-5

Construction and Environmental Management Plan (CEMP)

Construction and Environmental Management Plan

Timahoe North Project, Co Kildare



Planning & Environmental Consultants

DOCUMENT DETAILS

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1 INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been prepared by McCarthy Keville O' Sullivan Ltd. on behalf of Bord na Móna Powergen Ltd. and ESB Wind Development Ltd who intend to apply for planning permission to construct a large scale solar farm including a solar photovoltaic (PV) array, and associated infrastructure, a battery storage compound as well as a 110 kV (kilovolt) substation and associated works to connect to the national grid.

This CEMP identifies the key planning and environmental considerations that must be adhered to and will be delivered during site construction and operation. This report is intended as a document that can be used during the future phases of the project, as a consolidated point of reference relating to the construction, environmental and drainage requirements for the Planning Authority, developer and contractors alike. This CEMP outlines range of potential types of construction methods, plant and equipment which may be used by any contractor appointed in order to enable their impacts to be assessed for the purpose of the Planning Authority's assessment and appropriate assessment prior to determining whether to grant planning permission.

Should the project secure planning permission, the CEMP will be updated in collaboration with the building contractor and in line with all conditions and obligations which apply to any grant of permission. The CEMP should be read in conjunction with the EIAR and planning drawings. The CEMP will also require updating by the selected contractor in order to identify, assess and satisfy the contract performance criteria as set out by the various stakeholders. The CEMP due to its structure and nature will also require regular updating and revision throughout the construction period as set out below. Therefore, this is a working document and will be developed further prior to and during construction.

Triggers for amendments to the CEMP will include:

- Where construction methodologies are perceived to require an improved performance in terms of potential environmental impacts;
- As a result of changes in environmental legislation applicable and relevant to the project;
- Where the outcomes from auditing establish a need for change;
- Where Work Method Statements identify changes to a construction methodology to address high environmental risk; and
- As a result of an incident or complaint occurring that necessitates an amendment.

This report provides the environmental management framework to be adhered to during the pre-commencement, construction and operational phases of the Proposed Project and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur.

1.1 Background

The CEMP has been prepared with reference to the following reports, which have been produced in support of the planning application:

- McCarthy Keville O'Sullivan (October 2018). *Timahoe North Solar Farm, Co. Kildare. Environmental Impact Assessment Report*. Doc. File Name: 160727-EIAR-2018.12.07-F.
- McCarthy Keville O'Sullivan (October 2018). *Timahoe North Solar Farm, Co. Kildare. Appropriate Assessment Screening Report*. Doc. File Name: 160727-AASR-2018.12.07-F.
- McCarthy Keville O'Sullivan (October 2018). *Timahoe North Solar Farm, Co. Kildare. Natura Impact Statement*. Doc. File Name: 160727-NIS-2018.12.07-F.

The reports listed above should be consulted for detailed information as required.

1.2 Scope of Construction and Environmental Management Plan

This report is presented as a guidance document for the construction phase of the Proposed Project. Where the term 'site' is used in the CEMP it refers to the area where all works associated with the solar array and associated infrastructure, battery storage compound, substation and associated grid connections works. The CEMP outlines clearly the mitigation measures and monitoring proposals specified in the EIAR and NIS that are required to be adhered to in order to complete the works in an appropriate manner. The report is divided into nine sections, as outlined below.

- Section 1 provides a brief introduction as to the scope of the report.
- Section 2 outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of construction methodologies that will be adopted throughout the Proposed Project.
- Section 3 sets out details of the environmental controls on site which looks at noise and dust controls. Site drainage and a waste management plan are also included in this section.
- Section 4 sets out a fully detailed implementation plan for the environmental management of the Proposed Project outlining the roles and responsibilities of the project team.
- Section 5 outlines the Emergency Response Plan to be adopted in the event of an emergency in terms of site health and safety and environmental protection.
- Section 6 consists of a summary table of all mitigation proposals to be adhered to during the implementation of the Proposed Project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.
- Section 7 consists of an overview of the monitoring requirements for the project.
- Section 8 sets out a programme for the timing of the proposed works.
- Section 9 outlines the proposals for reviewing compliance with the provisions of this report.

1.3 Targets and Objectives

In so far as they have been completed to date, or are to be further completed in future, the construction phase works are designed to approved standards, which include

specified materials, standards, specifications and codes of practice. The design of the project has considered environmental issues and this is enhanced by the works proposals.

The key site targets are as follows;

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the EIAR, AASR, NIS and associated planning documentation;
- Ensure construction works and activities are completed in accordance with all planning conditions for the development and that the CEMP is updated as required;
- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have no adverse effect on the integrity of any European Site;
- Adopt a sustainable approach to construction; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if practicable, *e.g.* excavated stone, clay and peat material;
- Ensure sustainable sources for materials supply where practicable;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the Sustainable Drainage Systems (SuDS) drainage design principles;
- Keeping impact of construction to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment.
- Complying with all relevant water quality legislation; and,
- Ensuring a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2 SITE AND PROJECT DETAILS

2.1 Site Location and Development Description

The site of the Proposed Project is located in northwest Co. Kildare, approximately 6.5km (kilometres) north of the village of Allenwood, 6 kilometres east of Carbury and 3km south of Johnstownbridge. The site will be accessed Via Derrymahon-Drehid local road (L-5025), which adjoins the R402 Regional Road to the west of the site. The Grid Reference coordinates for the centre of the site are E 275,810, N 235,200. The total site area is approximately 807 hectares with the Proposed Project occupying a footprint of approximately 238 hectares. A site location map is shown as Figure 2.1.

The Proposed Project will consist of a solar farm comprising of solar photovoltaic (PV) arrays, battery storage compound, grid connection and associated infrastructure. The solar PV modules are ground mounted on galvanised steel support structures/ frames, with a maximum overall height of up to 3 metres and a tilt ranging between 12-30° tilt. A site layout plan is shown as Figure 2.2.

Electricity produced from the solar arrays is cabled underground to inverters where direct current (DC) is converted to alternating current (AC). The electrical output is exported through switchgear, protection devices and meters to the National Grid. The proposal also includes the provision of security fencing, site entrance, access roads and security CCTV stands.

The main elements of the Proposed Project are summarised below:

- 2 no. areas of solar PV arrays and associated infrastructure;
- Internal solar farm underground cabling;
- 2 no. temporary construction compounds
- Recreation and amenity works, including looped walk (upgrade of existing tracks and provision of new tracks, car parking and vehicular access);
- 1 no. Battery Storage compound
- 1 no. 110 kV onsite Electrical substation with associated electrical plant and equipment and security fencing
- 110 kV overhead grid connection cabling;
- Upgrade of existing tracks and provision of new site access roads;
- Site drainage;
- Forestry felling and replanting;
- Permanent signage; and
- All associated site development and ancillary works

2.2 Construction Management

2.2.1 Introduction

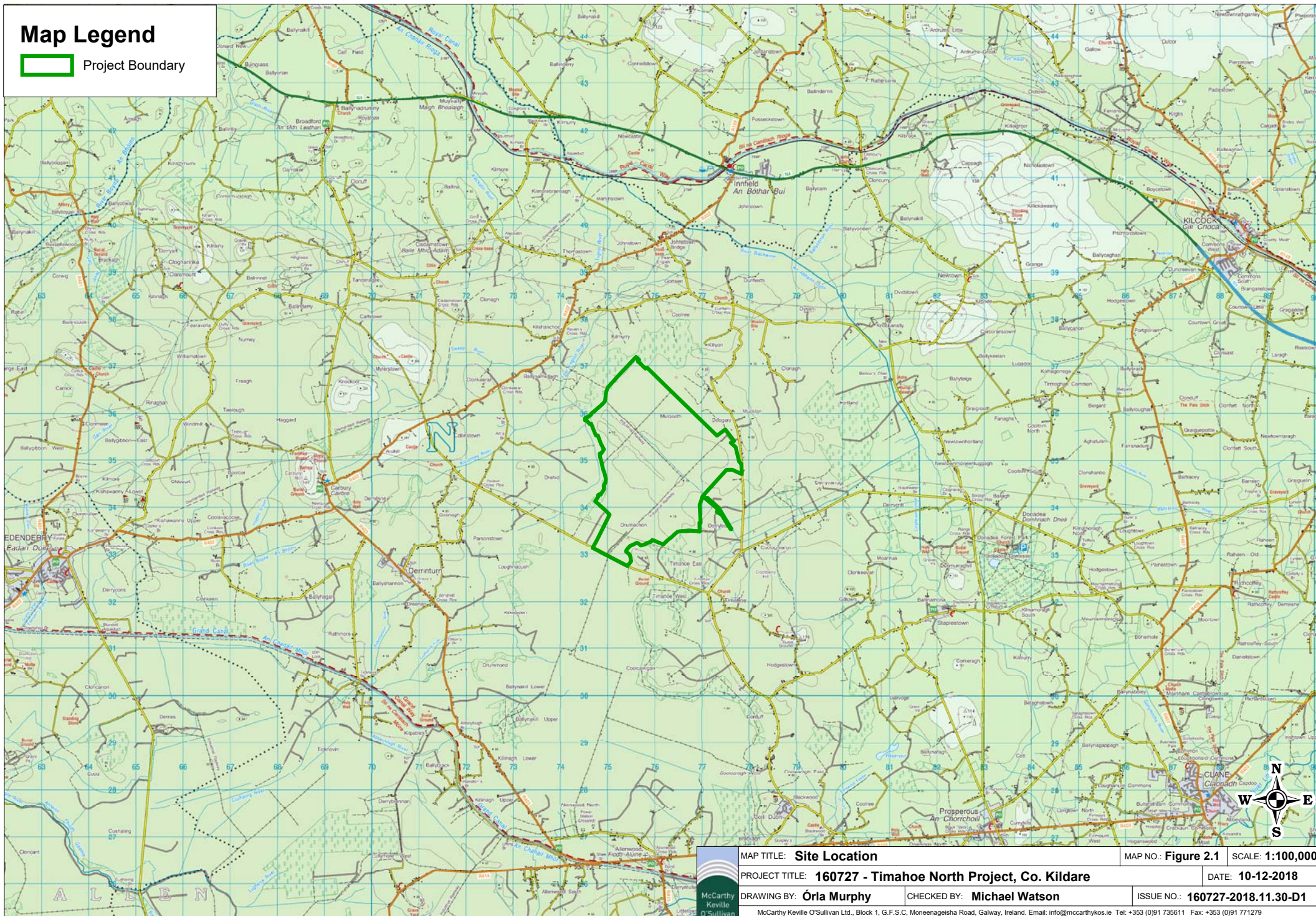
An experienced and competent contractor will be appointed for the civil works for the construction phase. The appointed contractor for the works will be required to comply with this CEMP and any revisions made to this document. An overview of the proposed construction methodologies is provided below.

2.2.2 Proposed Construction Methodology

The construction methodologies for the proposed Solar Farm are summarised under the following headings:












Map Legend

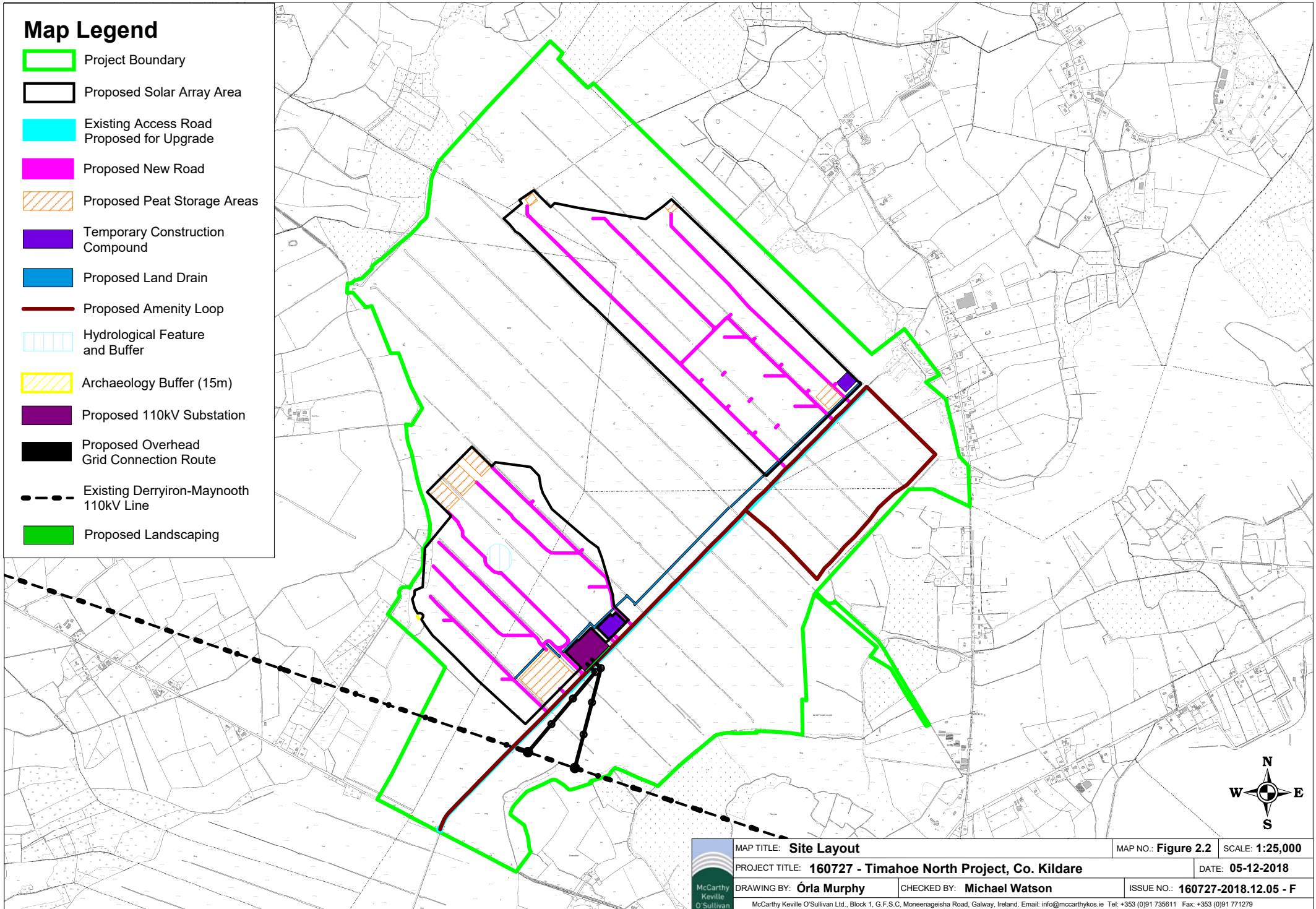
 Project Boundary



	MAP TITLE: Site Location	MAP NO.: Figure 2.1	SCALE: 1:100,000
	PROJECT TITLE: 160727 - Timahoe North Project, Co. Kildare	DATE: 10-12-2018	
	DRAWING BY: Órla Murphy	CHECKED BY: Michael Watson	ISSUE NO.: 160727-2018.11.30-D1
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Map Legend

-  Project Boundary
-  Proposed Solar Array Area
-  Existing Access Road
Proposed for Upgrade
-  Proposed New Road
-  Proposed Peat Storage Areas
-  Temporary Construction Compound
-  Proposed Land Drain
-  Proposed Amenity Loop
-  Hydrological Feature and Buffer
-  Archaeology Buffer (15m)
-  Proposed 110kV Substation
-  Proposed Overhead Grid Connection Route
-  Existing Derryiron-Maynooth 110kV Line
-  Proposed Landscaping



	MAP TITLE: Site Layout	MAP NO.: Figure 2.2	SCALE: 1:25,000
	PROJECT TITLE: 160727 - Timahoe North Project, Co. Kildare	DATE: 05-12-2018	
	DRAWING BY: Órla Murphy	CHECKED BY: Michael Watson	ISSUE NO.: 160727-2018.12.05 - F
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- Construction Compound Area
- Drainage System;
- Site Access Roads;
- Solar PV modules/ panels
- Ground mounted support structures/ frames
- Site cabling and Grid Connection
- Substation and Compounds
- Inverter units
- Battery Storage Compound
- Fencing, Gates and Security Cameras,

2.2.3 Construction Compound Areas

The Proposed Project will include the provision of two construction compounds. The main compound will be located in the south of the site. in the vicinity of the main site access with a smaller temporary construction compound located in the east of the site. The existing site entrance is sufficient so as to facilitate delivery of all construction materials and components. The entrance will be improved to define its location with a timber and post fence and improve its surfacing with a gravel finish. The main construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. This construction compound will also have available space to accommodate one HGV if necessary and provide suitable turning radii to facilitate HGV movements. The temporary construction compound will only be used for storage of construction material until it is fixed in place. This compound will be removed after works in the northern area of the site is complete.

The compounds will typically be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs will be installed around the perimeter;
- The area will be excavated to competent stratum
- The compound will be established using a similar technique as the construction of the site access road as discussed below;
- A layer of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site track and used as vehicle hardstanding during deliveries and for parking;
- If necessary the compound will be temporarily fenced and secured with locked gates, although fencing would only be utilised where significant risk of danger to third parties or vandalism is envisaged;
- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase; and
- Upon completion of construction, the site compound area will be decommissioned and the area will be left to revegetate naturally.

2.2.4 Drainage System

The early establishment of temporary drainage facilities will reduce the potential for impacts on surface water quality during construction. In addition, construction operations will adopt best working practices. The development of the site will need to be phased accordingly. The construction of the drainage will start from the downstream sections

and progress upstream, connecting conveyance systems with other drainage features as each development phase progresses.

Detailed measures to address surface water management based upon the design criteria and philosophy will be implemented. The drainage system will be excavated and constructed in conjunction with the track and hard standing construction. The drainage regime will be installed in accordance with details submitted in the Environmental Impact Assessment Report (EIAR) Sections 4 & 8 that accompanies this application and is further detailed in Section 3 below. The proposed drainage arrangement drawings for the application site are included in Appendix 8-1 of the EIAR.

2.2.5 Watercourse/Drainage Ditch Crossings

It is proposed to install a new crossing over the Mulgeeth Stream as part of the overall site drainage. This crossing will comprise is a 2.4 X 2.4m box culvert section the location of which is presented in Appendix 8-1, Drawing no. QS-00218-01-D453-018 of the EIAR.

The typical construction methodology for the installation of the box culvert is presented below:

- The access points/working area on both sides of the watercourse will be completed as per the methodology for site access roads below.
- All drainage measures outlined in the detailed drainage design along the various site roads and the silt-fences along the banks of the watercourse will be installed.
- The project engineer will determine the span of the culvert but will ensure that the culvert does not impede the flow of water through the watercourse channel and that the natural stream is maintained. This will ensure that all preparatory works are completed with the least possible disruption to the watercourse and within the season as prescribed by Inland Fisheries Ireland (IFI).
- The bed of the river will be excavated to a solid base and a footing formed with suitable stone material and compacted as specified by the design engineer. The culvert will be set down on granular footings within, but slightly below the river bed.
- The culvert will be lowered into place using an excavator or crane if required which will be set up a safe distance back from the watercourse.
- In order to preserve the level of the lake adjacent to the crossing and prevent erosion of the river bed, rock armour will be placed upstream of the culvert at river bed level
- After the culvert installation process has been completed, the excavation around the culvert footing will be backfilled with a rock armour headwall at the inlet and outlet of the culvert on top of which smaller 50mm stone material proposed for the use in the site road construction will be placed.
- The base of the culvert will fill naturally with the granular material from the river bed.
- The deck of the culvert will be weathered with a sealing material prior to the completion of the road crossing over the culvert deck. All this work will be completed above the watercourse with no contact with the water where frequent visual checks and inspection of water quality will be carried out to ensure the watercourse is not being impacted.

In addition, to manage and control the flood outflow from the bog so as not to exceed existing flood runoff rates downstream in the Mulgeeth Stream, a flow control structure is required on the outlet of drainage channel (D7, refer to Appendix 8-2, Figure 5 for drain numbering and locations). This flow control structure is a single 900mm diameter culvert with a concrete spillway set at a crest level of 79.5m OD Malin. The flood control structure

will be designed to throttle flood flows from the site so as not to exceed the existing flood flows. The methodology for installing this culvert is summarised below.

It is proposed to install crossing points over the proposed connector drain where the access roads will traverse this drain. A total of six crossings are required all of which will be completed using piped culvert system. The crossing will be installed as follows:

- The access road on the approach to the drain will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the crossing.
- The installation of the culvert will take place in low flow conditions.
- Where a flow exists, the water running through the drainage channel will be pumped around the water crossing location and back into the drainage channel downstream of the works area.
- Where over pumping is required, measures will be taken to ensure that the pumped water discharge does not disturb the stream bed with the force of water from the discharge. A steel plate to reduce the force of the flow will be used where appropriate.
- The project engineer will determine the required gradient of the culvert. The pipe must be laid at a gradient that will ensure water is contained within the pipe at all times. Where necessary a rock armour dam will be installed within the stream to reduce flow and ensure an acceptable depth of water remains within the pipe. Where a gradient of 1 – 1.5% is identified, the use of a baffle has been recommended.
- The bed of the drainage channel will be excavated, if necessary, to achieve the correct line and to allow the pipe to be embedded 300mm into the base of the existing drain.
- The embedded section will be allowed to fill naturally with existing material within the base of the drain or with suitable drainage material such as gravel or round shingle where deemed applicable.
- The culvert will be lowered into place using an excavator with a lifting mechanism.
- A suitable headwall will be installed where deemed necessary by the detailed drainage design at the inlet and outlets of the culverts to prevent erosion of peat. This will comprise large stone boulders (approx. 400mm) the details of which will be determined by the Project Design Engineer.
- The new access road over the culvert crossings will be completed as per methodology for new site access roads outlined in the sections below.

The watercourse crossing required over the Mulgeeth Stream will be installed outside of the salmonid spawning season, October to June in any year, in accordance with Guidelines on protection of Fisheries During Construction Works in and Adjacent to Waters, inland Fisheries Ireland, 2016. This will ensure no potential impacts on salmonid spawning habitat.

The works will be undertaken in line with Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes, NRA, 2008.

All of the above works will be supervised by the Environmental Manager and the Project Hydrologist.

2.2.6 Upgrade of Existing Access Tracks

The site will be accessed via an existing entrance off the Derrymahon Road. The main access route will be an upgrade of an existing track, which runs east of the proposed substation. The upgrade works will entail widening of the access track to a total running width of approximately 5.5 metres, with wider sections at corners and junctions. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed;
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer and the material used for site restoration and reinstatement;
- Well-graded imported granular fill will be spread and compacted in layers with an overall thickness of up to 300mm to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used. These layers of granular fill will be brought to the same level as the top of the existing road surface;
- A layer of geogrid will be installed directly onto the top of the granular fill layer and the existing road surface where required;
- A layer of finer well graded stone for the running surface will be laid on the geogrid and compacted;
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 4; and,
- Where road widening is required the floating road methodology will be used where the required CBR ratings for floating roads can be achieved.

2.2.7 Proposed New Site Access Roads

It is proposed to install approximately 3.5km of main access roads, approximately 12 km of spur tracks and an amenity trackway of approximately 5km in length. The new access road is required to provide suitable access throughout the site during the construction and operational phases of the project. The access road details are outlined in the Layout Drawings which are included in Appendix 4-1 of the EIAR.

The new access roads will be constructed as follows using both a floating road and excavated site road methodology both of which are summarised below.

2.2.7.1 Floating Roads

The methodology for the installation of floating roads is summarised as follows:

- Prior to commencing the construction of the floating roads, movement monitoring posts will be installed in deep peat areas.
- Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.
- The proposed new site roads shall be to the line and level given in the design requirements with the construction carried out under the supervision of the design engineer.
- Base geogrid is to be laid directly onto the existing surface along the line of the road in accordance with the geogrid provider's requirements.
- The typical make-up of any new floated access road is a layer of coarse granular fill overlying the layer of geogrid.

- Following the detailed design of the floated access roads, it may be deemed necessary to include pressure berms either side of the access road in some of the deeper peat areas. The inclusion of a 2 - 5 metre wide pressure berm (typically 0.5 metres in height) either side of the access road will reduce the likelihood of potential bearing failures beneath the access road.
- The finished road running width will be approximately 5.5 metres.
- Stone delivered to the floating road construction shall be end-tipped onto the constructed floating road. Direct tipping of stone onto the peat shall not be carried out.
- To avoid excessive impact loading on the peat due to concentrated end-tipping, all stone delivered to the floating road shall be tipped over at least a 10 metre length of constructed floating road.
- Where it is not possible to end-tip over a 10 metre length of constructed floating road, dumpers delivering stone to the floating road shall carry a reduced stone load (not greater than half full) until such time as end-tipping can be carried out over a 10 metre length of constructed floating road.
- Following end-tipping a mechanical excavator shall be employed to spread and place the tipped stone over the base geogrid along the line of the road.
- The road is then finished with a 100mm layer of fine gravel. An average overall thickness of about 400 - 750 mm is envisaged.

2.2.7.2 Excavated Site Road

The methodology for the installation of excavated site roads is summarised as follows:

- Prior to commencing the construction of the excavated site roads, movement monitoring posts will be installed in deep peat areas.
- Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.
- The proposed new site roads shall be to the line and level given in the design requirements with the construction carried out under the supervision of the Project Design Engineer.
- Peat and overburden will be excavated to bedrock or a competent stratum as determined by the Project Design Engineer.
- Excavation of materials will be undertaken with respect to control of peat stability.
- All peat shall be placed/spread alongside the excavations.
- Side slopes in peat shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.
- Coarse granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Project Design Engineer based on the characteristics of the material and the compaction plant to be used;
- A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the Project Design Engineer) and at the top of each subsequent layer of granular fill.
- All new roadways will be constructed with a camber to aid drainage of surface water.
- The finished road running width will be approximately 5 metres.
- Road construction will be carried out in sections of approximately 50 metre lengths i.e. no more than 50 metres of access road will be excavated without replacement with stone fill unless otherwise agreed with the Project Design Engineer on site.

- Batters will generally be sloped to between 1:1 and 1:2 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species. Design slopes will be informed by the Project Design Engineer.
- A final unbound surface layer shall be placed over the excavated site road, as per design requirements, to provide a road profile and graded to accommodate construction and delivery traffic.

2.2.8 Solar PV Modules / Panels

The Proposed Project will comprise the installation solar PV modules the specification for which is known as a 60 cells PV module. The modules will be arranged in PV tables with an overall length of 57.44m and a maximum height of all solar panels of up to 3m. The dimensions indicated may be subject to change depending on the manufacturer of solar panels selected which will be determined by a competitive tendering process. These characteristics vary between manufacturers. The proposed solar design for the site is detailed further details are outlined in the Layout Drawings which are included in Appendix 4-1 of the EIAR.

2.2.9 Ground Mounted Support Structures / Frames

The solar modules are installed on a galvanised steel or aluminium support structure/frame. The frame is held in position using galvanised steel posts which are driven into the ground using a piling unit until a suitable depth is reached to provide a secure footing. The methodology ensures there is no alteration to the local surface water hydrology. The PV panels will be bolted on top of the frames to hold them securely in place with the frames arranged in an east to west pattern and face south to avail of maximum light exposure. In addition, the frames ensure the panels are angled up to 30 degrees in order to be of maximum efficiency.

The piling options that are considered for the site include:

- Large bored piles – those constructed by boring methods (e.g. Continuous Flight Auger (CFA) or rotary bored) and with concrete and reinforcement steel.
- Large driven piles – those constructed by driving methods (e.g. impact hammer or vibratory hammer) and with precast concrete or preformed steel sections
- Self-drilled mini-piles – those constructed by boring methods (e.g. heli piles or other screw type piles) and with preformed steel sections
- Driven mini-piles – those constructed by driving methods and with preform steel sections

These piling methodologies are summarised in detail in Appendix 4-4 of the EIAR. Piling options will be selected on their suitability to the potentially varying ground conditions at the site. This will be determined on the completion of more detailed site investigation prior to commencement of construction. Piling will be completed by an experienced piling contractor who method statement will be cognisant of the environmental consideration set out in Section 3 of this document.

The piling outlines listed above provide for using both prefabricated or precast piles (steel or concrete) and reinforced concrete piled foundations cast in-situ on site. Reinforced concrete piled foundations will be completed as follows:

- The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
- No material will be removed from site and placement areas will be stripped of vegetation prior to stockpiling in line with best working practices;

- A piling platform for the piling rig will be constructed. This can be done in two ways depending on the bearing capacity of the underlying soil.
 - The first method is to lay geotextile on the existing surface and a stone layer will then be placed on top of the geotextile by an excavator and compacted in order to give the platform sufficient bearing capacity for the piling rig.
 - The second method is to excavate the soils to a suitable intermediate mineral subsoil and backfill to the formation level.
- The piling rig, fitted with an auger, will then bore through the soft material with a sleeve fitted around the auger to prevent the sidewalls of the peat from collapsing. The borehole is then extended to a suitable depth into the subsoil/bedrock.
- When the auger and the sleeve are removed high tensile steel cages will be lowered into the boreholes. These steel cages will extrude above the level of the top of the concrete pile.
- As the auger is removed concrete is pumped into the borehole.
- Reinforcing steel on the top of the pile will tie to the foundation or pile cap base steel.

Prefabricated steel or precast piles will require the same preparatory works with a piling platform provided. The piles are installed using a mechanical piling unit which will install the pile either impact hammer or mechanical screw depending on the pile type selected. The piling operations will adhere to the procedures for the management of concrete as set out in Section 3.3 particularly with regard to concrete truck washout procedures and the management of surplus concrete.

The placing of solar panels on lightweight floating foundations is an alternative option that may be considered. This will involve anchoring the floating foundations to the underlying subsoils.



Plate 2.1: Example of a solar PV support structure

2.2.10 Inverter Units

A containerised type inverter model will be supplied to the site by a specialist manufacturer as a prefabricated unit therefore the construction aspect associated with these units is minimal other than the installation of concrete plinths or concrete slab foundations and unit assembly on site. A total of 29 no. finished inverter units will be installed and will be encased in a standard 20 ft or 40 ft (or other size) container. The exact location of inverters may be subject to change at the final design stage depending on site specific and technical considerations. An indicative layout is outlined in the Layout Drawings in Appendix 4-1 of the EIAR.

Inverters hardstand areas will be installed in front of the inverter units which will be constructed using the same materials and methodology as that for the site access roads. The purpose of the hardstand area is to provide an area large enough for crane access and turning movements. The hardstands will be 20 X 25 metres in size.

The concrete plinth will be installed once the required access routes to each inverter location and hardstand have been completed. The area of the plinth will be excavated to a competent stratum. The plinth will be shuttered using timber formwork and reinforced steel install as per the Project Engineers design.

Alternatively, a piled foundation solution may be used to minimise the excavating of peat which will encompass a steel platform on which the inverter will be installed. Figure 2.3 shows an example of both concepts.



Figure 2.3 Rock fill with concrete plinth foundation and Piled alternative

Concrete pours will be completed at all inverter plinths by experienced and competent personnel. On completion, concrete delivery trucks will adhere to the concrete washout procedure as set out in Section 3.3.

2.2.11 Substation and Battery Storage Compound

It is proposed to construct a 110 kV electricity substation and a Battery Storage facility in the south of the site entrance, as shown in Figure 2.2. The Battery Storage facility will be located adjacent to the compound of the substation.

The preference will be to utilise a conventional ground bearing slab or raft foundation which will be determined by the site condition. If this foundation type is determined to be unsuited to the ground conditions, then one of the piling methodologies will be selected.

The substation will be constructed as follows:

- The area of the substation will be marked out using ranging rods or wooden posts and the soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises;
- The dimensions of the substation area will be set to meet the requirements of Eirgrid/ESB networks and will include the necessary equipment to safely and efficiently operate the solar farm;
- The foundations will be excavated down to a competent stratum, the level of which will be determined by the project engineer. The foundations will be shuttered and poured with reinforced concrete. An anti-bleeding admixture will be included in the concrete mix;
- If it is determined that a piled foundation is required, this will be completed using one of the preferred piling methodologies outlined in Section 2.2.9.
- Excavated material will remain on site at all times for reuse;
- On completion of the foundation, the substation will be constructed with masonry blockwork. The block work walls will be built up from the footings to Damp Proof Course (DPC) level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane;
- The construction and components of the substation will be to Eirgrid/ESB networks specifications; and
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.

The substation compound will be completed to formation level with an approved stone material with all necessary concrete plinths installed by way of in-situ reinforced concrete or pre-cast concrete.

The Battery Storage infrastructure will comprise ten steel units measuring 13.7 X 2.4 X 2.8m high. These units will be similar to standard shipping containers and will be installed on concrete plinths using a similar methodology to that for the inverter units as outlined above.

2.2.12 Site Cabling and Grid Connection Cabling

Underground cabling ducts will be laid across the site and will link the panel array and inverters to the proposed substation. The panel array and inverters will be linked to the proposed sub-station through a network of buried electrical cables. The ground is typically trenched using a mechanical excavator. The top layer of peat and overburden is removed and saved so that it can be replaced on completion. The cables are laid in a 700mm deep trench bedded with suitable material unless the ground conditions are such that no bedding is required. The depth of the cables is to meet all national and international requirements with suitable marking tape installed between the cables and the finished surface.

Connection between the centralised electrical stations and the proposed substation will also be completed using the underground cabling methodology in a trench depth of 800mm.

All underground cabling will be completed using the following methodology:

- The area where excavations are planned will be surveyed, prior to the commencement of works, with a cable avoiding tool and all existing underground services will be identified.
- A team equipped with tracked excavators, site dumper and a tractor with a stone cart with side-shoot will complete the works.
- The excavator will open a trench at the edge of the road surface, the trench will be a maximum of 600mm wide and 700 - 800mm deep.
- Clay plugs will be installed at 50 metre intervals to prevent the trench becoming a conduit for surface water runoff.
- The excavated material will be loaded into the dumpers to be transported to a designated temporary stockpiling area to be reused as backfilling material where appropriate.
- Once the trench has been excavated, a base layer of blinding will be installed by the tractor and stone cart and compacted by the excavators.
- The ducting along with marker strips will then be placed in the trench as per relevant specifications.
- Blinding will be installed to 75mm above the cable ducting and compacted.
- The remainder of the trench will be backfilled with granular material and compacted.
- The area of the trench excavation will be reinstated as per its original condition prior to the works.

2.2.13 Grid Connection Overhead Line

The Proposed Project includes an application for a 110 kV grid connection cabling between the proposed substation and the national electricity grid. It is intended that the Proposed Project will connect to the national grid by an overhead cable via the existing Derryiron-Maynooth 110 kV line, which traverses the southern section of the Proposed Project site as detailed in Figure 2.2.

This will require the construction of 4 No. steel tower masts at approximately 20-metre height (2 No. masts at the substation and 2 No. masts at the 110 kV line), which will be connected by two overhead lines supported by standard wooden polesets. The poles will measure approximately 18m in height and be spaced approximately every 200 metres.

The construction of the overhead line will be completed using the wooden polesets or steel tower masts. A methodology for each is set out below. The layout of these structures will be determined at detailed design stage with the overhead line designed to Eirgrid/ESB networks specifications.

2.2.13.1 Wood Polesets

The overhead line poles will be delivered as close as possible to the required location. Where poles are to be transported across sensitive areas, low ground pressure tracked machinery will be used to deliver the poles to the required location.

Pole base excavation and erection will be carried out as follows:

- The excavation for each pole will be carried out using a rubber wheeled or tracked excavator.
- Each of the two poles will be lined up with the excavated holes and the machine operator then drives forward pushing the pole up until the pole is on an almost vertical position. The pole will never pass through the point of balance in the vertical position.

- The pole will be supported at all times and the holes manually backfilled to a minimum depth of 1.0m.
- After excavation and erection of the poleset a further excavation, 0.8m deep will be necessary. This will be a linear excavation perpendicular to the line necessary to install wooden sleepers. These sleepers add additional stability to the poleset and are attached to the poleset using a u-bolt.
- Two installed poles will be connected near the top by a steel cross-arm from which three insulators are attached. The conductor is then attached to these insulators during the stringing process.
- Where the line changes direction and in poleset locations with poor ground conditions stay wires will be required. These will add stability to the pole and are supported by means of stay blocks. These stay blocks are made of wooden sleepers and will be buried 1.8m underground.

The average working area for the construction of a poleset will extend 8 metres all around the footprint of the base of the poleset.

2.2.13.2 Steel Tower

The average foundation size for each steel tower leg used on the transmission system is 3.1 x 3.1 x 2.5m (deep). The foundations are constructed as follows:

- Foundations will be excavated using a rubber wheeled or tracked excavator to a competent stratum to be determined by the project design engineer. A larger foundation footing may be required in the case of weak soils.
- Depending on access, a wheeled or tracked dumper may deliver the ready-mix concrete to the excavation.
- Pile foundations may be required in the case of deep bog and reduced footing size foundations may be required in the case of rock being encountered at shallow depths. Pile foundations will be installed using the methodology outlined above.
- In areas of poor ground or a high water table it may be necessary to use sheet piles supported by hydraulic frame to prevent collapse of the sides of the excavation and to prevent the excavation becoming too large.
- The tower foundations will be backfilled one leg at a time with the excavated material. The backfill will be placed and compacted in layers. In areas of peat, the top layer is stored separately and re-instated as the final top layer.
- All dimensions will be checked following the backfilling process.
- On completion of the works, surplus peat and overburden materials will be transported to the nearest of the peat repositories proposed for the site (Section 3.7 below).

The steel for the remainder of the tower will be delivered to the site by lorry and various sections of the tower, depending on the weight and method of construction, are pre-assembled on the ground beside the tower before lifting into position. The tower will be erected using a suitable crane.

2.2.13.3 Stringing of Conductors

Stringing of overhead lines refers to the installation of phase conduction on the supporting poleset or tower structures. The conductor is kept clear of all obstacles along the straight by applying sufficient tension. This method requires the pulling of a light pilot line (nylon rope) which is normally carried by hand into the stringing wheels. This in turn is used to pull a heavier pilot line (steel rope) which is subsequently used to pull in the conductors from the drum stands using a specifically designed puller - tensioner machine.

Once the conductor has been pulled into position, one end of the straight wire is terminated on the appropriate fittings and insulator assemblies. The free end of the straight is then placed in temporary-clamps which take the conductor tension. The conductor is then cut from the puller-tensioner and the conductor is sagged using a chain hoist.

2.2.14 Fencing, Gates and Security Cameras

The site will be secured using 2 metre high deer fencing around the area of the solar panels, with wildlife flaps inserted to allow animals to pass in and out of the site. Considering the nature of the site, it is anticipated that all fencing uprights will be mechanically driven without the need for fencing posts to be set in concrete.

The substation will be enclosed with a palisade security fencing as per Eirgrid/ESB networks specifications. This fencing will comprise galvanised steel uprights which will be set in concrete. Palisade fencing panels will be installed between each upright. The base of each palisade fencing panel will be encased in a concrete plinth.

At the site entrance, a double leaf security gate will be installed. The hanging posts of this gate will be set in concrete within a small excavated trench. There will be several other gates installed to allow access to various parts of the site whilst preserving safety and security.

CCTV cameras will be installed at the site at discreet locations and will be orientated away from external landowners and dwellings. As with the security gate uprights, the CCTV camera upright will need to be held in position securely by setting the uprights in concrete or anchoring to a concrete footing using anchor bolts.

2.3 Decommissioning

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

Upon decommissioning of the Proposed Project, the solar panels would be disassembled in reverse order to how they were erected. All above ground components would be separated and removed off-site for recycling. Foundations would remain in place underground and would be covered with earth and reseeded as appropriate. Leaving the piling in-situ is considered a more environmentally prudent option, as to remove piling could result in significant impact on the peatland habitat. Underground internal collector cables will be removed and sent to an authorised waste recovery facility, and the ducting left in place. The Substation and associated 110kv infrastructure is likely to remain in place as an integral part of the national grid network. A decommissioning plan will be agreed with Kildare County Council in advance of decommissioning the Proposed Project. The anticipated waste materials arising from decommissioning are outlined in Section 3.9 below.

2.4 Health and Safety Management

The Contractor shall be responsible for providing that a construction works Health and Safety plan is implemented and followed on site. The works will be carried out in

accordance with all relevant health and safety legislation and Codes of Practice and site rules relating to the works will be observed.

3 ENVIRONMENTAL MANAGEMENT

3.1 Site Drainage

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering and deciding on the most appropriate drainage proposals for the site of the Proposed Project. The Proposed Project's drainage design has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site, and consequently no impact on downstream catchments and ecological ecosystems. No routes of any natural drainage features will be altered as part of the Proposed Project.

The solar panels are raised above the ground and, as such, any rainfall that is intercepted by the panels will runoff and spread out and infiltrate into the 'rain shadow' beneath the panels. Given that the site is a cutover bog and has only moderate slopes it is not anticipated to result in significant concentration of surface flows.

It is proposed to install interceptor and collector drains either side of the new access road to the main site. These drains will be supported by attenuation and settlement systems such as level spreaders and settlement ponds which are detailed in the sections that follow.

A Site Drainage Report has been prepared and is included in Appendix 8-1 of the EIAR. The construction phase drainage proposals are summarised in the sections that follow.

3.1.1 Connector Drain

It is proposed to install a connector drain adjacent to the access road. This drain will flow towards the Mulgeeth watercourse. Currently, the field ditches flow in a south east direction towards the existing railway line but are not free flowing. The construction of the connector drain will allow for all the field ditches within both sites to become free flowing. This will also allow for the field ditches to drain towards the Mulgeeth watercourse and flow offsite at a controlled rate.

3.1.2 Interceptor Drains

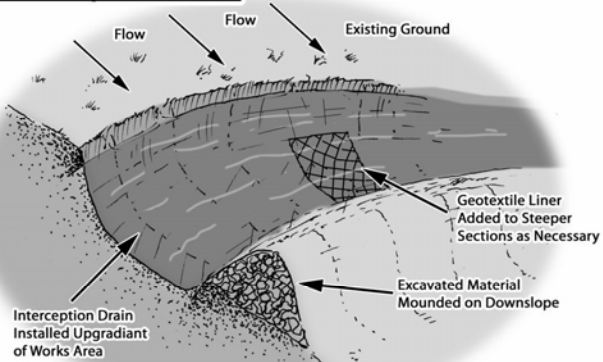
Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area. Figure 3.1 shows an illustrative example of an interceptor drain.

3.1.3 Check Dam

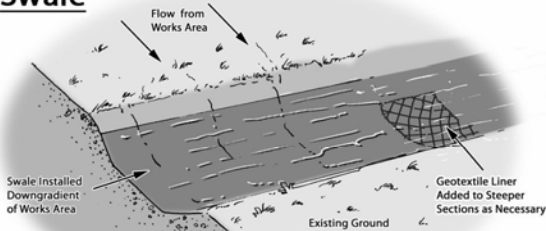
Check dams will be installed for the purpose of restricting flow velocity, minimising channel erosion and promoting sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated.

Check dams are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam. Figure 3.1 shows an illustrative example of a check dam.

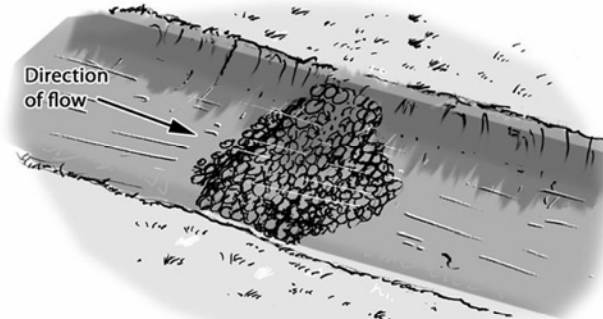
Interceptor Drain



Swale

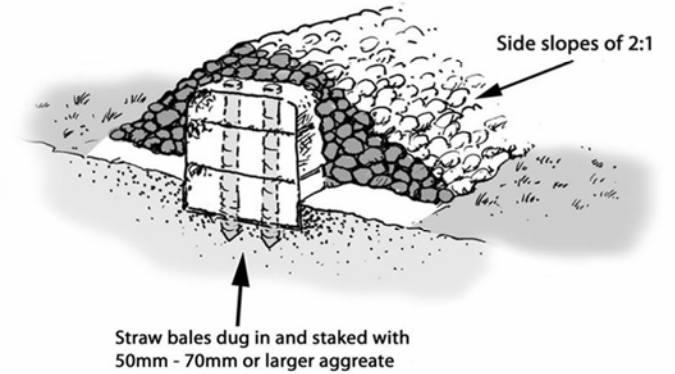


Check Dam (Stone Dam in Drain)

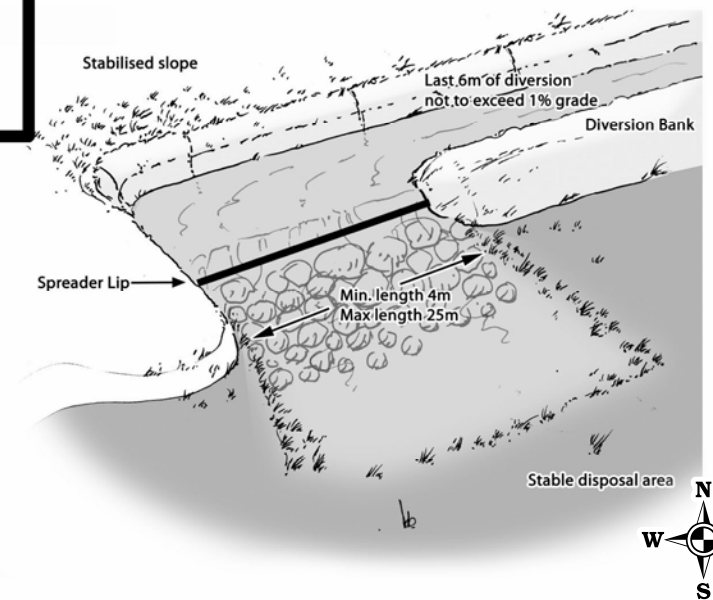


Check Dam

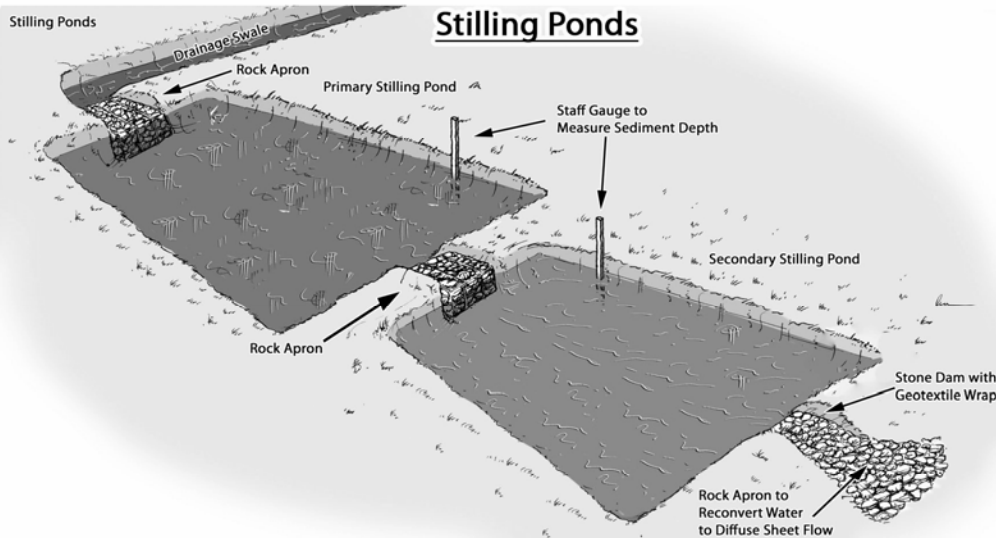
(Straw Bale & Stone Dam - Cross Section)



Level Spreader



Stilling Ponds



	MAP TITLE: Indicative Drainage Design Elements	MAP NO.: Figure 3.1
	PROJECT TITLE: 160727 - Timahoe North Project, Co. Kildare	DATE: 07-12-2018
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3.1.4 Level Spreader

A level spreader will be constructed at the end of interceptor drains where the drain is not discharging into an existing drainage ditch, to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any proposed works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site. Figure 3.1 shows an illustrative example of a level spreader.

3.1.5 Settlement Ponds

Settlement ponds (or Stilling Ponds) will be used to attenuate runoff from works areas of the site during the construction phase and will remain in place to handle runoff from tracks and hardstanding areas of the Proposed Project during the operational phase. The purpose of the settlement ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the settlement ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas. Figure 3.1 shows an illustrative example of a settlement pond system.

3.1.6 Surface Water Mitigation Measures

There are no surface water courses on or in the vicinity of the site other than existing field drains and the Mulgeeth stream. The Proposed Project will adopt General Pollution Prevention Measures which include:

- No refueling of machinery or overnight parking of machinery is permitted in these areas adjacent to on site drainage infrastructure;
- No concrete truck chute cleaning is permitted on site;
- Works shall not take place at periods of high rainfall, and shall be scaled back or suspended if heavy rain is forecast;
- Plant will travel slowly across bare ground at a maximum of 5 km/hr.
- Machinery deliveries shall be arranged using existing structures along access roads;
- Any excess construction material shall be immediately removed from the area and sent to an authorised waste recovery facility;
- Spill kits shall be available in each item of plant required;

3.1.7 Surface Water Monitoring Measures

During the construction phase of the project, water quality at outflows from the drainage system shall be visually monitored on a regular basis during different weather conditions. Issues identified at any outfall will be reportable to the Site Manager immediately. Visual monitoring of the drainage system will continue for one year post construction to ensure the system is operating well and within its capacity and thus ensuring that there is no impacts on the local hydrology as a result of the development.

3.2 Tree Felling

The potential risk of entrainment of suspended solids and nutrient release in surface watercourses will be managed by the implementation of appropriate mitigation measures. These measures are derived from best practice guidance documents as outlined in Section 8 of the EIAR. The water protection measures to be adopted during felling operations are set out as follows:

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling and to minimise soils disturbance;

- Use of buffer zones for aquatic zones (see Table 3.1 below) The aquatic zone is defined as a permanent or seasonal river, stream or lake shown on an Ordnance Survey 6-inch map;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour;
- Sediment traps will be sited outside of buffer zones and will have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction;
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimised and controlled;
- Brush mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brush mat renewal will take place when they become heavily used and worn. Provision will be made for brush mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;
- Timber will be stacked in dry areas, and outside a local 50m stream buffer zone. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Felling works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Table 3.1 Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

3.3 Cement and Concrete Control

The following mitigation measures will be used to avoid release of cement leachate from the site:

- No batching of wet-cement products will occur on site;
- Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only chute cleaning will be permitted, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed.
- Weather forecasting will be used to plan dry days for pouring concrete;
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event;
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 3.1 and 3.2 below. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

The 50m wide river buffer zone and 25m artificial drainage buffer will be emplaced for the duration of the construction phase (See Appendix 8-1 of the EIAR). No construction activity will occur within the buffer zone with the exception of bridge and culvert construction. The buffer zone will:

- Prevent any cement based products accidentally entrained in the construction phase drainage system entering directly into watercourses, achieved in part by ending drain discharge outside the 50m buffer zone and allowing percolation across the vegetation of the buffer zone;
- Provide a buffer against accidental direct run-off to surface waters by any pollutants, or by pollutants entrained in surface water run-off.



Plate 3.1 Concrete washout area



Plate 3.2 Concrete washout area

3.4 Refuelling, Fuel and Hazardous Materials Storage

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- Oils, fuel and all potentially harmful materials will be stored within an impermeable proprietary container.
- Mobile storage such as fuel bowzers will be banded to prevent spills. Tanks for bowzers and generators shall be double skinned.
- No hazardous substance shall be permitted to be left unattended at any time when taken outside the secured storage.
- Potential impacts caused by spillages etc. during the construction phase will be reduced by keeping spill kits and other appropriate equipment on-site.
- All construction vehicles will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.

3.5 Dust Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, *i.e.* soil, sand, overburden, etc and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust.

Proposed measures to control dust include:

- The site tracks and agreed haul route roads adjacent to the site will be regularly inspected by site management for cleanliness, and cleaned as necessary;
- In periods of extended dry weather, dust suppression may be necessary along haul roads and at works areas to ensure dust does not cause a nuisance. If necessary, water will be used from settlement ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- The transport of crushed stone or other material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles where necessary;

- When necessary, sections of approach roads to the site will be swept using a street cleaner and / or damped down with water.
- A designated vehicle wheel wash area will be created adjacent to the main site entrance where all HGV's will be cleaned prior to leaving the site if deemed necessary.
- All plant and materials vehicles shall be stored in dedicated areas (on site).
- Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction.
- Solar panels and construction materials will be transported to the site on specified haul routes only.

3.6 Noise Control

The operation of plant and machinery, including construction vehicles, is a source of potential noise impact that will require mitigation at all locations within the site. Construction work will be scheduled to only occur between the hours of 07:00 to 19:00 on Monday to Friday and 07:00 to 13:00 on Saturday. Construction activities will be restricted to this times except where the nature of particular specialist works requires continuous working for longer periods. Any such exceptions will be agreed in advance with the local authority.

Proposed measures to control noise include:

- Any plant, such as generators or pumps, which is required to operate outside of general construction hours will be surrounded by an acoustic enclosure or portable screen.
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1996;
- Regular maintenance of plant will be carried out in order to minimise noise emissions.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Training will be provided by the site management to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation.
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 11-1 using methods outlined in British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*.

3.7 Peat Management

Peat and material excavated for various components of the development is estimated to be 63,400m³ of which approximately 25,000m³ of this will be from the proposed substation area.

In terms of peat handling and long-term storage, it is proposed to place excavated peat and material into one of the 7 no. proposed peat repositories, the total volume of which is 95,126m³.

The excavated peat material will only be moved short distances from the point of excavation and either be transported to peat repositories for storage or, where levels are permissible, peat will be side casted and revegetated to the side of access roads. Both methods are further described below.

3.7.1.1 Placement of Peat & Material alongside Access Roads

In some areas of the site of the Proposed Project, where it is possible and environmentally sustainable, excavated materials will be placed close to the excavation areas, in particular along access roads.

During the excavation of roads and trenches for site cabling, where appropriate, the vegetation and top 150 mm of peat and overburden will be stripped and laid beside the excavation and will be used to reinstate along the access road edge and as part of cable trench reinstatement.

3.7.1.2 Peat and Material Storage in Peat Repositories

Where large excavations of peat occur, such as that within the area of the substation; peat will be stored within a number of peat repositories within the site as detailed above. The following general methodology will be employed in reinstating of repositories:

- Excavated materials that are surplus to backfill requirements and are deemed unsuitable for reuse in construction will be brought to the repository locations. This will include unsuitable materials generated during all construction stages;
- Excavators will level this material in suitable layers and compact it by tracking. Dead rolling may be carried out if the material is suitable. Volumes of materials generated during the access road, bases for inverters and hardstanding excavations will be stored in repositories. The peat material will be stored at approximately 1 m deep;
- Any mineral soils excavated during construction work will be stored separately in repositories within the site at a depth of approximately 1 m; and
- The previously stripped and separately stored peaty topsoil layer, which contains the remnant seed bank required for restoration, will be placed as the final reinstatement layer. Its fibrous nature will help to promote a stable surface once the vegetation establishes itself.

The method of reinstatement described above has been successfully applied at other renewable developments.

3.7.1.3 Peat Stability Management

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on the development and the surrounding environment. Peat failure excludes localised movement of peat that could occur below an access road, creep movement or erosion type events. In the absence of appropriate mitigation, the consequence of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of access roads;
- Drainage disrupted;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by sediment particulates; and,
- Degradation of the environment.

3.7.1.3.1 General Recommendations for Good Construction Practice

The peat stability assessment indicates that there is insignificant risk of peat failure, although drainage mitigation measures would be required to prevent the buildup of water in the peat and reduce the risk of failure.

The following measures incorporated into the construction phase of the project will assist in the management of the risks for this site:

- Appointment of experienced and competent contractors;
- The site will be supervised by experienced and qualified personnel;
- Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain a managed robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report readings from peat stability monitoring systems;
- Ensure construction method statements are followed or where agreed modified/developed; and,
- Revise and amend the Geotechnical Risk Register as construction progresses.

3.8 Invasive Species Management

A baseline invasive species survey will be carried out at the site to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. 477 of 2011)) by a suitably qualified ecologist prior to the commencement of construction. If the presence of such species is found at or adjacent to the site, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in the following sections.

3.8.1 General Best Practice Control Methods

The following general best practice guidelines in the treatment and control of invasive species during construction works are outlined below having regard to guidance documents particularly those issued by the Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Road Schemes, NRA, 2010.

3.8.2 Site Management

Careful preparation of the site and planning of the works is crucial to successful treatment of invasive species. The following measures, which is not exhaustive, shall be followed by all on-site personnel.

- Only those who have been inducted into biosecurity measures on-site may enter the contaminated zones within the works areas.
- Should any risk of contaminated material escaping be observed by the site supervisor, the management plan for the site must be amended by an appropriately qualified person to mitigate against the risk.

3.8.3 Establishing Good Site Hygiene

The establishment of good site hygiene will assist in the control of invasive species at the site. The following measures are proposed:

- A risk assessment and method statement must be provided by the Contractor prior to commencing works.
- Fences will be erected around areas of infestation, as confirmed by test pits, and warning signs shall be erected.
- A designated wash-down area will be created, where power-washed material from machinery can be contained, collected and disposed of with other contaminated material. This area will contain a washable membrane or hard surface.
- Stockpile areas will be chosen to minimise movement of contaminated soil.
- Stockpiles will be marked and isolated.
- Contaminated areas which will not be excavated will be protected by a root barrier membrane if they are likely to be disturbed by machinery. Root barrier membranes will be protected by a layer of sand above and below and topped with a layer of hardcore.
- The use of vehicles with caterpillar tracks within contaminated areas will be avoided to minimise the risk of spreading contaminated material.
- A suitably qualified ecologist will be on site to monitor and oversee the implementation of invasive species management plans.

Plant and equipment which is operated within an area for the management of materials in contaminated areas will be decontaminated prior to relocating to a different works area. The decontamination procedures will take account of the following:

- Personnel may only clean down if they are familiar with the plant and rhizome material and can readily identify it.
- Decontamination will only occur within designated wash-down areas.
- Vehicles will be cleaned using stiff-haired brush and pressure washers, paying special attention to any areas that might retain rhizomes e.g. wheel treads and arches.
- All run-off will be isolated and treated as contaminated material. This will be disposed of in already contaminated areas.

3.9 Waste Management

This section of the CEMP provides a Waste Management Plan (WMP) which outlines the best practice procedures which will be implemented and followed during the construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage. Disposal of waste will take place as a last resort.

3.9.1 Legislation

The Waste Management Acts 1996 to 2011 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Waste Management Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Waste Management Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of a Waste Manager on the site of the Proposed Project to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, 2006. It is important to emphasise that no demolition will take place at this site however, this document was referred to throughout the process of completing this WMP.

3.9.2 Preliminary Plan

The Department of the Environment guidelines state that, at the design stage of the project, only a preliminary WMP is required,

“Formal production and presentation of the Plan may be at a later stage but a clear ‘waste management philosophy’ needs to be adopted...at the initial conceptual stage of the Project...”

This preliminary WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the Proposed Project.

3.9.3 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing waste in the following order:

Prevention and Minimisation:

The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:

Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new access roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

3.9.4 Construction Phase Waste Management Plan

3.9.4.1 Description of the Works

The Proposed Project will involve the construction of a solar farm with the provision of solar PV Modules on a site with an area of approximately 200 hectares. The modules will be manufactured off site and delivered to development site where assembly will occur.

They are ground mounted on galvanised steel support structures/ frames, which will also be manufactured off site. The infrastructural elements of the development include access roads and a temporary construction compound.

The typical waste types arising from the construction phase of the Proposed Project are outlined in Table 3.2 below.

Table 3.2 Expected waste types arising during the Construction Phase

Materials type	Example	EW Code
Cables	Electrical wiring	17 04 11
Cardboard	Boxes, cartons	15 01 01
Composite packaging	Containers	15 01 05
Metals	Copper, aluminium, lead, iron and steel	17 04 07
Inert materials	Sand, stones, rock	17 01 07
Mixed municipal waste	Daily canteen waste from construction workers, miscellaneous	20 03 01
Plastic packaging	Packaging with new materials	15 01 02
Wooden packaging	Boxes, pallets	15 01 03
Soil & Stone	Soils and subsoils	17 05 04

Plant will not be serviced onsite and so the likelihood of generating hazardous wastes is low. Hazardous wastes that may occur on site during the construction phase of the Proposed Project may include oil, diesel fuel, chemicals, paints, preservatives etc. Any hazardous wastes will be stored in bunded containers before being collected by an authorised waste contractor and brought to an EPA licensed waste facility.

3.9.4.2 Waste Arisings and Proposals for Minimisation, Reuse and Recycling of Construction Waste

Construction waste will arise on the project mainly from unavoidable construction waste including material surpluses and damaged materials and packaging waste.

Appropriate measures will be taken to ensure excess waste is not generated during construction, including;

- Ordering of materials will be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock.
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site.
- Request that suppliers use least amount of packaging possible on materials delivered to the site.
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal
- Ensuring correct sequencing of operations.
- Use reclaimed materials in the construction works.

Hazardous waste will be kept separate from all other construction waste to prevent contamination and removed appropriately.

3.9.4.3 Waste Arising from Construction Activities

The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation or a dedicated waste storage area. Wastes will generally comprise soils and subsoils (unless they have been determined to be a by-product under the EPA Guidance) which will be removed by truck to an authorised recovery facility.

3.9.4.4 Reuse

Many construction materials can be reused a number of times in lieu of or before they have to be disposed of:

- Broken concrete can be reused as aggregate for cable trench backfilling material.
- Plastic packaging etc. can be used to cover materials on site or reused for the delivery of other materials.
- Soils and subsoils will be reused as part of landscaping and site re-instatement.

3.9.4.5 Recycling

If a certain type of construction material cannot be reused on site then recycling is the most suitable option.

All waste that is produced during the construction phase including dry recyclables will be sent directly for subsequent segregation at a remote facility. The low volume of such material that is anticipated to be generated at the Proposed Project is the justification for adopting this method of waste management.

3.9.5 Decommissioning Phase Waste Management

The lengthy time frame between the completion of the construction phase and decommissioning will result in the only materials remaining on site at that time will be infrastructural material such as the foundations the granular material used to construct roads. If the site is decommissioned, all above ground components will be disassembled and removed from site for re-use, recycling or waste disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the development are outlined in Table 3.3 below.

Table 3.3 Expected waste types arising during Decommissioning

Materials type	Example	EW Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead.	17 04 07
Inert materials	Crushed stone,	17 01 07

3.9.6 Wastewater

The removal and disposal of wastewater from the site welfare facilities, will be carried out by a fully permitted waste collector holding valid Waste Collection Permits as issued under the Waste Management (Collection Permit) Regulations, 2007. Information on the appointed permitted contractor and evidence of a maintenance contract having been submitted to the Planning Authority prior to any construction works taking place.

3.9.7 Implementation

3.9.7.1 Roles and Responsibilities for Waste Management

Prior to the commencement of the Proposed Project a member of the on-site construction management staff will be assigned the role of Construction Waste Manager. The Construction Waste Manager will be in charge of the implementation of the objectives of the WMP, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the Proposed Project adheres to the WMP.

3.9.7.2 Training

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the WMP. All employees working on site during the construction phases of the project will be trained in materials management and thereby, shall be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

3.9.7.3 Record Keeping

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system, which the contractor shall implement will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site of the Proposed Project. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Weight of Material
- Site Address of Destination Facility

3.9.8 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy will always be employed when designing the plan to ensure that the least possible amount of waste is produced during the construction phase. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

This preliminary WMP has been prepared to outline the main objectives that are to be adhered to for the preparation of a more detailed WMP to be completed after the planning phase of the Proposed Project.

4 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

4.1 Roles and Responsibilities

The contractor appointed to carry out the works on site will be required to provide a level of supervision on site in the form of an Environmental Manager who will also fulfil the role of Waste Manager. In general, the Environmental Manager will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The Environmental Manager will act as the regulatory interface on environmental matters by reporting directly to the applicant and liaising with Kildare County Council and other statutory bodies as required.

4.2 Construction Manager/Site Supervisor

The Site Supervisor/Construction Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The duties and responsibilities of the Site Supervisor/Construction Manager will include:

- Ensure that all works are completed safely and with minimal environmental risk;
- Approve and implement the CEMP and supporting environmental documentation, and ensure that all environmental standards are achieved during the construction phase of the project;
- Take advice from the Site Environmental Manager on legislation, codes of practice, guidance notes and good environmental working practice relevant to their work;
- Ensure compliance through audits and management site visits;
- Ensure timely notification of environmental incidents; and,
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

4.3 Site Environmental Manager

The appointed contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in construction to fulfil the role of Site Environmental Manager, and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The Site Environmental Manager will report to the Site Supervisor/Construction Manager. The responsibilities and duties of the Site Environmental Manager will include the following:

- Preparation of the CEMP and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required environmental monitoring;
- Generate environmental reports as required to show environmental data trends and incidents and ensure environmental records are maintained throughout the construction period;

- Advise site management/contractor/sub-contractors on:
 - Prevention of environmental pollution and improvement to existing working methods;
 - Changes in legislation and legal requirements affecting the environment;
 - Suitability and use of plant, equipment and materials to prevent pollution;
 - Environmentally sound methods of working and systems to identify environmental hazards;
- Ensure proper mitigation measures are initiated and adhered to during the construction phase;
- Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as is practicable by e-mail;
- Support the investigation of incidents of significant, potential or actual environmental impact, and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties; and,
- Identify environmental training requirements and arrange relevant training for all levels of site based staff/workers.
- The level, detail and frequency of reporting expected from the Site Environmental Manager for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the project.

The actual person that will fulfil the on-site role of the Environmental Manager has not yet been identified. However, the individual who is appointed to this role will make themselves known, in writing and in person, to the Local Authority's Environmental Department prior to commencement of construction.

4.4 Environmental Awareness and Training

4.4.1 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- A copy of the Planning Permission.
- A copy of the Environmental Management Site Plans and discussion of the key environmental risks and constraints;
- An outline of the CMP structure;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the environmental Incident Management Procedure.

4.4.1.1 Toolbox Talks

Toolbox talks will be held by the Site Environmental Manager/Construction Manager at the commencement of each day, or at the commencement of new activities. The aims of the tool box talks are to identify the specific proposed work activities that are scheduled

for that day or phase of work. In addition, the necessary work method statements and sub plans will be identified and discussed prior to the commencement of the day's activities. Site meetings will be held on a regular basis involving all site personnel. The objectives of the site meetings is to discuss the coming weeks proposed activities and identify the relevant work method statements and sub plans that will be relevant to that weeks activities. Additionally, any non-compliance identified during the previous week will also be discussed with the aim to reduce the potential of the same non-compliance reoccurring.

4.5 Water Quality and Monitoring

The water quality programme combines the use of laboratory analysis, water quality instrumentation and visual inspection to develop a comprehensive schedule of monitoring of all watercourses that exist both at the site and the surrounding area. The information collected by this schedule of water monitoring, will inform the pre-commencement baseline before works commence in an area.

This water monitoring programme will be the subject of independent review by the Project Hydrologist who will provide the necessary guidance on the monitoring requirements. The water monitoring programme is outlined in the following sections.

4.5.1 Pre-Construction Drainage Inspection and Monitoring

There is an existing drainage network across the site and runoff drains relatively freely to local watercourses and streams. This existing drainage system will continue to function as it is during the pre-construction phase.

However, prior to commencement of works in sub-catchments across the site main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. These inspections will be done on a catchment by catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously.

Monthly Laboratory Analysis Sampling: Baseline laboratory analysis for the parameters listed below with relevant regulatory limits and Environmental Quality Standards (EQSs) will be undertaken for each watercourse *e.g.* at F1 as outlined in Figure 8.4 of the EIAR. This will not be restricted to just this location and further sampling points may be added as deemed necessary by the Environmental Manager in consultation with the Project Hydrologist.

4.5.2 Construction Phase Drainage Inspection and Monitoring:

Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations and the laboratory analysis sampling points. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, *i.e.* after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the Project Hydrologist who will monitor and advise on the records being received.

The following periodic inspection regime will be implemented:

- Daily general visual inspections of site operations and inspections of all watercourses within the site and in the surrounding area by the Environmental Manager or a suitably qualified and competent person as delegated by the Environmental Manager;

- Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify any maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter will be noted and corrective action implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement;
- Event based inspections by the Environmental Manager as follows:
 - >10 mm/hr (*i.e.* high intensity localised rainfall event);
 - >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
 - Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).
- Monthly site inspections by the Project Hydrologist/ Environmental Manager during construction phase; and,
- Quarterly site inspections by the Project Hydrologist/ Environmental Manager after construction for a period of one year following the construction phase.
- A written record will be maintained or available on-site within this Construction Environmental Management Plan (CEMP) which will be maintained on-site during the construction phase.

4.5.2.1 In-situ field monitoring:

Field chemistry measurements of unstable parameters, (pH, conductivity, dissolved oxygen and temperature) will be taken at all monitoring locations outlined in Figure 8.4 of the EIAR. These analyses will be carried out by either the Environmental Manager or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, *i.e.* after events of >25mm rainfall in any 24-hour period. The Project Hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

4.5.2.2 Monthly Laboratory Analysis Sampling

Laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will continue throughout the construction phase for each watercourse *e.g.* at F1 as outlined in Figure 8.4 of the EIAR. All samples will be sent for analysis to an independent laboratory. This sampling will also be completed on an event based basis, *i.e.* after major rainfall events (>25mm rainfall in any 24-hour period). The Project Hydrologist will monitor and advise on the readings being received from the testing laboratory.

4.5.2.3 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per European Communities Environmental Objectives (Surface Waters) Regulations, 2009, European Communities (Water Policy) Regulations, 2003 as amended by the European Communities (Water Policy) Regulations 2014 and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 to 2018. The likely suite of determinants will include:

- pH (field measured)
- Electrical Conductivity (field measured)
- Temperature (field measured)
- Dissolved Oxygen (field measured)
- Total Suspended Solids (mg/l)
- Ammoniacal Nitrogen as NH₃ (mg/l)
- Ammoniacal Nitrogen as NH₄ (mg/l)
- Nitrite (NO₂) (mg/l)

- Ortho-Phosphate (P) (mg/l)
- Nitrate (NO₃) (mg/l)
- Phosphorus (unfiltered) (mg/l)
- Chloride (mg/l)
- BOD

4.5.3 Post-Construction Monitoring

Monthly sampling for laboratory analysis for a range of parameters as adopted during pre-commencement and construction phases will continue for one year after construction is complete.

5 EMERGENCY RESPONSE PLAN

5.1 Emergency Response

The Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection. The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor / Project Supervisor Construction Stage (PSCS) and suppliers as the Proposed Project progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this document.

This is a working document that requires updating throughout the various stages of the project.

5.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site Manager, will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in Figure 5.1. In a situation where the Site Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 5.1. This will be updated throughout the various stages of the project.

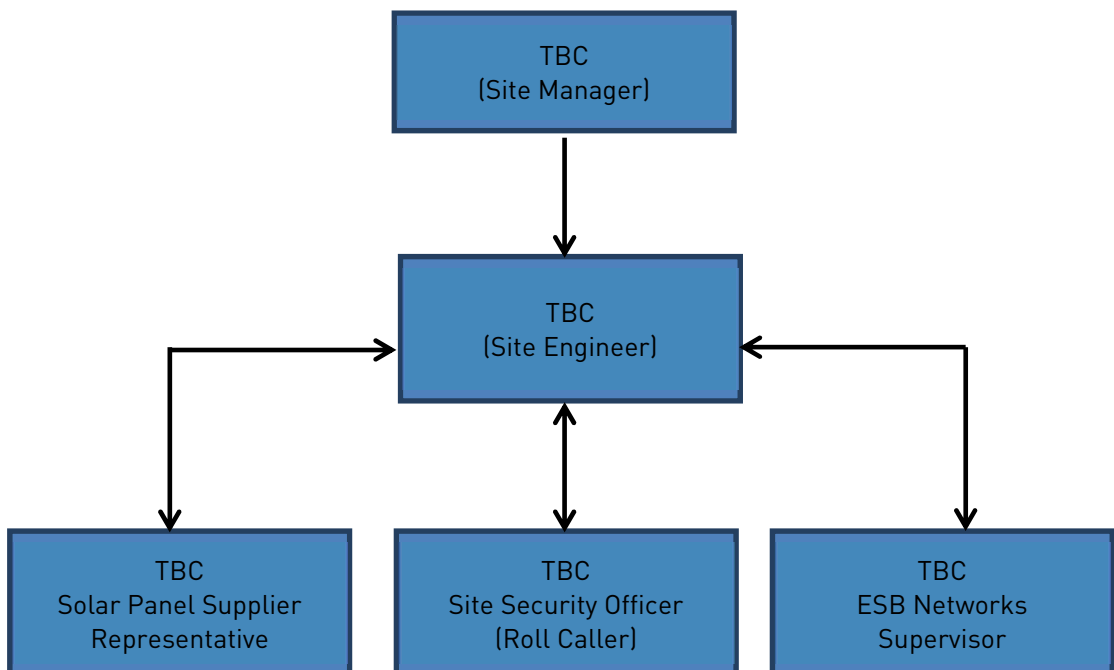


Figure 5.1 Emergency Response Procedure Chain of Command

5.1.2 Initial Steps

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 5.1 Hazards associated with potential emergency situations

Hazard	Emergency Situation
Construction Vehicles: Dump trucks, tractors, excavators, cranes etc.	Collision or overturn which has resulted in operator or third-party injury.
Abrasive wheels/Portable Tools.	Entanglement, amputation or electrical shock associated with portable tools.
Contact with services.	Electrical shock or gas leak associated with an accidental breach of underground services.
Fire	Injury to operative through exposure to fire.
Falls from heights including falls from scaffold towers, scissor lifts, ladders and roofs.	Injury to operative after a fall from a height.
Sickness	Illness unrelated to site activities of an operative e.g. heart attack, loss of consciousness, seizure.

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 5.1 the Site Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/fog horn that activates an emergency evacuation on the site.
- Make safe the area if possible and ensure that there no identifiable risk exists with regard to dealing with the situation e.g. if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone if he is unable to do so. If delegating the task, ensure that the delegated person follows the procedures for contacting the emergency services as set out in Section 5.3.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g. cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g. ESB Networks the numbers for which as provided in Section 5.3.2.
- Contact the next of kin of any injured personnel where appropriate. The procedure for this is outlined in Section 5.3.3.

5.1.3 Site Evacuation/Fire Drill

A site evacuation/fire drill procedure will provide the basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or fog horn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.

- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Manager when all personnel have been accounted for. At this time the Site Manager will decide the next course of action which will be determined by the situation that exists at that time. The Site Manager will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

5.2 Environmental Emergency Response Procedure

5.2.1 Excessive Peat Movement

Where there is excessive peat movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

- All construction activities shall cease within the affected area.
- Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
- Re-commencement of limited construction activity shall only start following a cessation of movement and the completion of a geotechnical risk assessment by a geotechnical engineer.

5.2.2 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational phase of the Proposed Project. Oil/Fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident.

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The Environmental Manager will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.

- The Environmental Manager will notify the appropriate regulatory body such as Kildare County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The Environmental Manager must be immediately notified.
- If necessary, the Environmental Manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures that were used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (pSPA or cSAC), the Environmental Manager will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the Environmental Manager will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the Environmental Manager and the Contractor. These records will be made available to the relevant authorities such as Kildare County Council, EPA if required.

The Environmental Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Contractor as appropriate.

5.3 Contacting the Emergency Services

5.3.1 Emergency Communications Procedure

In the event of requiring the assistance of the emergency services the following steps will be advised to be taken:

Stay calm. It's important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

Know the location of the emergency and the number you are calling from. This may be asked and answered a couple of times but don't get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for some reason you are disconnected, at least emergency crews will know where to go and how to call you back.

Wait for the call-taker to ask questions, then answer clearly and calmly. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

If you reach a recording, listen to what it says. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, *WAIT*. When the next call-taker or dispatcher is available to take the call, it will transfer you.

Let the call-taker guide the conversation. He or she is typing the information into a computer and may seem to be taking forever. There's a good chance, however, that emergency services are already being sent while you are still on the line.

Follow all directions. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and *ask for clarification* if you don't understand.

Keep your eyes open. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

Do not hang up the call until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This will form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

5.3.2 Contact Details

A list of emergency contacts is presented in Table 5.2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 5.2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Derrinturn Health Centre	046 955 2017
Hospital – Naas General Hospital, Naas, Co. Kildare	045 849 500
ESB Emergency Services	1850 372 999
Bord Gais Emergency	1850 20 50 50
Gardaí –Carbury Garda Station	046 955 3002
Health and Safety Coordinator - Health & Safety Services	TBC
Health and Safety Authority	1890 289 389
Project Supervisor Construction Stage (PSCS): TBC	TBC
Project Supervisor Design Stage (PSDS): TBC	TBC
Client – Bord na Móna Powergen Ltd and Electricity Supply Board (ESB) Wind Development Ltd.	TBC

5.3.3 Procedure for Personnel Tracking

All operatives on site without any exception will have to undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

In the event of a site operative becoming involved in an emergency situation where serious injury has occurred, and hospitalisation has taken place, it will be the responsibility of the

Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

5.4 Induction Checklist

Table 5.3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the project.

Table 5.3 Emergency Response Plan Items Applicable to the Site Induction Process

ERP Items to be included in Site Induction
All personnel will be made aware of the evacuation procedure during site induction.
Due to the remoteness of the site it may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This will form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.
All operatives on site without any exception will have undergone a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

6 MITIGATION PROPOSALS

All mitigation measures relating to the pre-commencement, construction and operational phases of the proposed development are set out in the relevant chapters of the EIAR submitted as part of the planning permission application.

The proposed Solar Farm, the Substation and Grid Connection has been assessed and the entirety of the Proposed Project has been assessed cumulatively within this EIAR, the mitigation presented throughout the EIAR are consolidated within this section under the three headings Solar Farm, Substation and Grid Connection and Proposed Project.

It is intended that the CEMP would be updated where required prior to the commencement of the development, to include all mitigations measures, conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and would be submitted to the Planning Authority for written approval.

All mitigation measures which will be implemented during the pre-commencement, construction and operational phases of the project are outlined in Table 6.1. The mitigation measures have been grouped together according to their environmental field/topic and are presented under the following headings:

- Construction Management
- Drainage Design and Management
- Felling
- Peat, subsoils and bedrock
- Flora and Fauna
- Noise
- Air Quality/Dust
- Landscape and Visual
- Traffic
- Cultural Heritage

By presenting the mitigation proposals in the format set out in Table 6.1 below, an easy to audit list that can be reviewed and reported on during the future phases of the project. The proposal for site inspections and environmental audits are set out in Section 9 below. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits.

Table 6.1 Schedule of Mitigation

Ref. No.	Reference Heading	Location	Mitigation Measure
Pre-Commencement Phase			
Solar Farm			
MM1	Archaeology	EIAR Chapter 12	A 15m buffer zone will be established around the recorded monument (KD008-025) from which all ground works, tracking of machinery and materials storage will be excluded.
Substation and Grid Connection			
MM2	Environmental Management	Appendix 4-4	Prior to construction of the substation foundation the drainage and sediment control plan will be fully implemented with the required settlement pond and interceptor drains put in place.
Proposed Project			
MM3	Environmental Management	Appendix 4-3	The contractor appointed to carry out construction works for this project will be required to prepare a site-specific Construction Environmental Management Plan (CEMP) for work within the scope. The CEMP will identify the staff responsible for the various management plans and mitigation measures, as well as the steps and procedures that will be implemented to minimise the environmental impacts resulting from the site preparation, groundworks and plant erection and commissioning phases of the project.
MM4	Environmental Management	Appendix 4-3	A full construction management team will be deployed on site in accordance with routine site construction procedures. This team will consist of a Resident Site Manager and Assistant Engineers as appropriate.
MM5	Environmental Management	Appendix 4-3	An Environmental Manager, who will be supported by an independent Project Ecologist, will be appointed for the duration of the works to ensure compliance with ecological mitigation measures.
MM6	Flora and Fauna	EIAR Chapter 6	Should breeding or resting places of various possible mammals such as badger or otter be recorded in the pre-construction surveys a site-specific mitigation plan shall be prepared and agreed with the NPWS prior to the commencement of works
MM7	Road Pre-Construction Survey	EIAR Chapter 13	A pre-condition survey of roads associated with the Proposed Project will be carried out prior to construction commencement to record the condition of the road
MM8	Information to Local Residents	EIAR Chapter 13	Local residents in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (if required), via letter drops and posters in public places.

Ref. No.	Reference Heading	Location	Mitigation Measure
			Information will include the contact details of the Contract Project Co-Ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.
MM9	Fencing	EIAR Chapter 4	<p>In order to secure the site during the construction phase, the fencing and gates will be installed first for the safety of the workers and public. The permanent site entrance shall be designed to ensure that appropriate sightlines are provided. It will consist of a double leaf security gate constructed of low visual impact fencing in a similar style to the security fence. There will be several other gates to allow access to various parts of the site whilst preserving safety and security. These gates will be constructed of similar design to the fencing to create low visual impact.</p> <p>The fencing will be constructed using 2 m high deer fencing around the area of the solar panels, with wildlife flaps inserted to allow animals to pass in and out of the site. The substation will be fenced around using palisade fencing.</p>
MM10	Culverts	EIAR Chapter 4	These will be suitably designed for base flows and peak flows, with a minimum size to avoid occurrence of blockages and build-up of discharges and to avoid increased flow velocities with the potential to cause erosion. They will also be designed in accordance with the requirements of Inland Fisheries Ireland's Requirements for the Protection of Fisheries Habitats during Construction and Development works at River Sites where required.
MM11	Earthworks	EIAR Chapter 4	Drainage works will be installed prior to the main earthworks activities related to the construction of site tracks, solar panel foundations, cable trenches, crane handstands and the substation.
MM12	Temporary Construction Compound	EIAR Chapter 4	The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs, and associated settlement ponds will be installed around the perimeter.

Ref. No.	Reference Heading	Location	Mitigation Measure
Construction Phase			
Construction Management			
Solar Farm			
MM13	River Crossings	EIAR Chapter 4	The crossing of streams and rivers for the internal solar farm underground cabling will be carried out by open trench method or trenchless methods. The method adopted at particular locations will be implemented only with the approval of Inland Fisheries Ireland (IFI). The construction will take place outside the salmon spawning period from October to April unless otherwise agreed with IFI locally.
Substation and Grid Connection			
MM14	Transformer Delivery	EIAR Chapter 4	The Grid Transformer(s) for the Substation will be delivered on a multi-axle special purpose tractor and trailer transport that will distribute this load over eight or more axles, which results in acceptable loads.
Proposed Project			
MM15	Environmental Management	Appendix 4-3	All construction works will be carried out under appropriate supervision. Works will be carried out by experienced contractors using appropriate and established safe methods of construction.
MM16	Health and Safety	EIAR Chapter 5	During construction of the Proposed Project, all staff will be made aware of and adhere to the Health & Safety Authority's ' <i>Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013</i> '. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan which will include measures to exclude members of the public from certain areas of the site during construction.
MM17	Health and Safety	EIAR Chapter 5	Appropriate health and safety signage will be erected at locations around the site.
MM18	Health and Safety	EIAR Chapter 5	All onsite works and health and safety requirements will be carried out to an agreed standard based on ESB and Bord na Móna specifications.
MM19	Wheel Wash	EIAR Chapter 4	A designated vehicle wheel wash area will be created adjacent to the main site entrance where all HGV's will be cleaned prior to leaving the site are deemed necessary.

Ref. No.	Reference Heading	Location	Mitigation Measure
			The wheel wash will be a proprietary wheel wash approved by the Site Engineer. Wash water will not be allowed to enter local watercourses and will be diverted to a dedicated lagoon by a sealed pipe. Any accumulated resultant sludge within the lagoon will be removed from site by a fully licenced contractor holding relevant waste collection and disposal permits.
MM20	Wastewater Management	EIAR Chapter 4	Foul sewage from the temporary facilities will be routed to covered watertight tanks designed for receiving and storing sewage with no outlet. The tanks will be sized to suit the expected use and will be installed within the construction compound. Contents and residues will be regularly emptied by a fully licenced contractor holding relevant waste collection and disposal permits. With high water tables the tanks will be calculated at design stage to omit the buoyancy risk.
MM21	Tracked Vehicles	EIAR Chapter 4	Tracked dumpers and tracked trailers will be used to transfer materials around the site and where there are suitable bearing stratum double wheeled vehicles will also be used for transport of materials from the holding areas to the work areas. Wide track bog master type excavators and track type trenchers will also be used.
MM22	Reinstatement	EIAR Chapter 4	Some overburden material will be stored temporarily adjacent to the works areas for reinstatement when the main construction activities are completed. Soil will be backfilled outside the drainage channels along track-sides and vegetated sods replaced over the surface, bedded-in, regraded, etc., to re-constitute a stable and settled ground surface on which the natural vegetation can recover and will be resistant to erosion.
MM23	Waste Materials	CEMP Section 3	A fully licensed waste contractor will be employed to remove waste from the site and will be required to provide documented records for all waste dispatches leaving the site of the proposed development.

Drainage Design and Management

Solar Farm

The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.

Substation and Grid Connection

MM24	Earthworks and potential effects on water quality	EIAR Chapter 8	<ul style="list-style-type: none"> ▪ Surface water drainage - The substation drainage will consist of an underground surface water pipe system. This system will include a number of surface water manholes, rain water pipes for the compound building roof, Class 1 Full Retention Oil Separator, an oil sensitive bund dewatering
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Ref. No.	Reference Heading	Location	Mitigation Measure
			<p>system and ACO Drains. The system will discharge into an adjacent field ditch. It is also proposed to construct a land drain, 150 mm in diameter, around the perimeter of the substation. The land drain will discharge into the same location as the surface water system. In accordance with SuDS best practice, it is proposed to include two rainwater harvesting tanks within the surface water system which will comprise of a filter, an underground tank and a pump. The system allows rainwater to run down the roof and into the guttering and downpipes in the normal way before passing through the filter, which removes any leaves and debris. Rainwater is then stored in the underground tank for reuse. The proposed tanks will have a capacity of 3,800 litres.</p> <ul style="list-style-type: none"> • Foul water system – A foul system is proposed within the station to cater for the wastewater generated in the welfare facilities of the control building. The foul system will consist of an underground pipe network, foul manholes and an 18 m³ full retention foul effluent storage tank. The tank will have an associated high-level alarm which will be connected to the control building. A foul holding tank to be maintained and emptied bi-annually is the most preferable means of treating and disposing of foul waste from the site. The licensed contractor charged to empty and dispose of the waste will be the holder of a valid waste collection permit. The foul holding tank will also be vented to the atmosphere to avoid the build-up of noxious and dangerous gases. • Potable water supply - The proposed substation site is remote from the public roadway and the public water supply system. It is proposed to provide the required potable water demand of the station with a well on the site.
Proposed Project			
MM25	Earthworks and potential effects on water quality	EIAR Chapter 8	<p>The main elements of the drainage design include the following:</p> <ol style="list-style-type: none"> 1) Drainage management <ul style="list-style-type: none"> ▪ Solar field drainage – to manage rainwater runoff from below the solar panels and prevent erosion

Ref. No.	Reference Heading	Location	Mitigation Measure
			<ul style="list-style-type: none"> ▪ Connector Drain – will allow field drainage to flow freely across the site and allow management of site discharges at a controlled rate ▪ Invertor drainage – including an approved oil sensitive bund dewatering system, and an approved full retention oil separator at each invertor station ▪ Amenity area drainage – will mimic the current drainage in the area, pedestrian pathways will be permeable floating road construction and culverts will be constructed where required
MM26	Watercourse Buffers	EIAR Chapter 8	A self-imposed buffer zone for peat storage will be established around the existing field drains on site. Also, a buffer zone around field ditches and watercourses where no peat can be stored is being implemented. A 25 m buffer around field ditches and a 50 m buffer around the Mulgeeth watercourse is recommended as per industry best practice.
MM27	Vegetation filter strips	EIAR Chapter 8	Vegetation filters, that is areas of existing vegetation, accepting drainage water issuing from level spreaders as sheet flow, will remove any suspended sediment from water channelled via interceptor drains or any remaining sediment in waters channelled via swales and settlement ponds.
MM28	Swales/Collector drains	EIAR Chapter 8	Swales will be used to intercept and collect run off from construction areas of the site during the construction phase, and channel it to settlement ponds for sediment attenuation as per the drainage design.
MM29	Settlement Ponds	EIAR Chapter 8	Settlement ponds, placed either singly or a pair in series, will buffer volumes of run-off discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to water courses as per the drainage design.
MM30	Check Dams	EIAR Chapter 8	Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be installed at regular intervals along interceptor drains to restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam as per the drainage design.
MM31	Silt Fences	EIAR Chapter 8	Silt fences will be emplaced along drains and parallel to access roads edges as required and at stream / watercourse crossings. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of peat and entrained in surface water runoff.

Ref. No.	Reference Heading	Location	Mitigation Measure
MM32	Interceptor Drains	EIAR Chapter 8	Interceptor drains will be installed up-gradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site. It will then be directed to areas where it can be re-distributed over the ground as sheet flow as per the drainage design.
MM33	Silt Bags	EIAR Chapter 8	Dewatering silt bags will be used which allow the flow of water through while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.
MM34	Drainage Management	EIAR Chapter 8	All surface water runoff from the development will have to pass through existing site drainage features along the boundary of the bog prior to final discharge from the site.
MM35	Environmental Management	Appendix 4-4	Materials from piling operations shall be placed upstream of a cut-off drain and settlement pond as part of the drainage control system. Alternatively, where the material cannot be placed in these areas, it will be placed in a designated repository. All construction works will be undertaken in accordance with the Erosion and Sediment Control Plan developed for the project.
MM36	Environmental Management	Appendix 4-4	Excavated material will not be stockpiled within 10 m of any watercourse
MM37	Excavation Dewatering	EIAR Chapter 8	<ul style="list-style-type: none"> ▪ If required, pumping of excavation inflows will prevent build-up of water in the excavation; ▪ The interceptor drainage will be discharged to the existing field drainage system or onto the bog surface via a settlement pond; ▪ The pumped water will be discharged via settlement pond/silt bags adjacent to excavation areas; ▪ There will be no direct discharge to the existing drainage network and therefore no risk of hydraulic loading or contamination will occur; and,
MM38	Hydrocarbons	EIAR Chapter 8	<ul style="list-style-type: none"> ▪ All bulk storage of fuels, lubricants and hydraulic fluids will occur at the contractor's compound(s), which will be fenced and have a lockable gate, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorised access or vandalism;

Ref. No.	Reference Heading	Location	Mitigation Measure
			<ul style="list-style-type: none"> ▪ The storage area within the compound will contain a small bund lined with an impermeable membrane to prevent any contamination of the surrounding soils and vegetation and of groundwater; ▪ Fuels and oils will be carefully handled to avoid spillages; ▪ Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and disposed of appropriately; ▪ Any waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling;
MM39	Plant and equipment inspections	EIAR Chapter 8	Site plant will be regularly inspected for leaks and fitness for purpose; and, an emergency plan for the construction phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with accidental spillages
MM40	Re-Fuelling	EIAR Chapter 8	<ul style="list-style-type: none"> ▪ Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling will occur at a controlled fuelling station; ▪ On site re-fuelling will be undertaken using a double skinned bowser with spill kits on the ready for accidental leakages or spillages; ▪ On site re-fuelling will be undertaken by suitably trained personnel only; ▪ Fuels stored on site will be minimised. Storage areas where required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor; ▪ The electrical substation will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; ▪ The plant used during construction will be regularly inspected for leaks and fitness for purpose; ▪ An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction and Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.

Ref. No.	Reference Heading	Location	Mitigation Measure
MM41	Spillage of Hydrocarbons	EIAR Chapter 8	Appropriate spill control equipment, such as oil soakage pads, specialist absorbent mats / pillows and granules for containment will be available on site to deal with any accidental spillage and emergency response procedures will be put in place; Designated contractors' personnel will be trained and certified in oil spill control and clean up procedures and in the proper and safe disposal of any waste generated through such an event.
MM42	Wastewater Disposal	EIAR Chapter 8	<ul style="list-style-type: none"> ▪ A self-contained port-a-loo with an integrated waste holding tank will be used at each of the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; ▪ All stored foul water will be removed from site to a licenced facility for appropriate treatment and disposal; and, ▪ No foul water will be discharged at the site.
MM43	Concrete Deliveries and Management	EIAR Chapter 8	No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products will be used and where possible, pre-cast elements for culverts and concrete works will be used.
MM44	Concrete Deliveries and Management	EIAR Chapter 8	No washing out of any plant used in concrete transport or concreting operations will be allowed on-site.
MM45	Concrete Deliveries and Management	EIAR Chapter 8	Where concrete is delivered on site, only the chute need be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water is to be directed into a dedicated lined washout area. This lined area will be removed from site once the construction phase is complete.
MM46	Concrete Deliveries and Management	EIAR Chapter 8	Weather forecasting will be used to plan dry days for pouring concrete. Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event
MM47	Concrete Deliveries and Management	EIAR Chapter 8	Where possible pre-cast elements for culverts and concrete works will be used

Felling

Solar Farm

The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.

Ref. No.	Reference Heading	Location	Mitigation Measure
Substation and Grid Connection			
The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Proposed Project			
MM48	Felling	CEMP Section 3	Machine combinations will be chosen which are most suitable for ground conditions at the time of felling and to minimise soils disturbance
MM49	Felling	CEMP Section 3	Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works
MM50	Felling	CEMP Section 3	Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.
MM51	Felling	CEMP Section 3	In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction
MM52	Felling	CEMP Section 3	Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimised and controlled
MM53	Felling	CEMP Section 3	Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.
Peat, Subsoils and Bedrock			
Solar Farm			
The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			

Ref. No.	Reference Heading	Location	Mitigation Measure
Proposed Project			
MM54	Topsoil/Peat and Subsoil Excavation	EIAR Chapter 7, Appendix 7-1	<ul style="list-style-type: none"> ▪ Placement of project infrastructure that require excavation in areas with shallower peat where possible (mitigation by avoidance); ▪ The peat and subsoil which will be removed during the construction phase will be localised to the infrastructure footprint location and access roads; ▪ The absence of designated sites, such as NHAs and SACs, within the Proposed Project site ensures no impacts to the land, soil or geology within a designated site as a result of the Proposed Project; ▪ A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present on the site due to optimisation of the layout by mitigation by design; ▪ Excavated peat will only be moved short distances from the point of excavation to peat and soil repositories within the site; ▪ Stockpiling of materials and the parking of plant on peat will be avoided; ▪ Tracking machinery on peat will be minimised, and bog mats will be used where required; ▪ Low bearing pressure machines will be used; ▪ The length of unsupported excavations in peat will be minimised; ▪ Side slopes of cuttings in peat will be trimmed back to stable permanent side slopes. In soft potentially unstable peat a berm of mineral soil will be constructed across the top of the cutting slopes to support the peat face; ▪ No work will be carried out down slope of a peat excavation at any time; ▪ Water build up in excavations will be avoided; ▪ Peat excavations will not be left unsupported for extended periods or overnight; ▪ Vibrating rollers will not be used on site (dead weight permitted); ▪ String lines with posts at approximately 10m centres downslope of works in deep peat areas will be installed prior to commencement of construction and remain in place for the duration of the works to monitor for any potential movements; ▪ Upslope cut-off drains will be installed in advance of construction;

Ref. No.	Reference Heading	Location	Mitigation Measure
			<ul style="list-style-type: none"> ▪ The existing drainage patterns in the peat will be maintained as far as is practicable; ▪ There will be no uncontrolled discharges of water onto peat; ▪ Construction of any required settlement ponds will be volume neutral, and all excess material will be used locally to form pond boundary bunds, and for surrounding landscaping;
MM55	Peat Instability and Failure	Appendix 7-1	<ul style="list-style-type: none"> ▪ Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff. ▪ Site Geotechnical Supervisor will be appointed and is to carry out supervision of site works as required. The Site Geotechnical Supervisor will be required to inspect that works are carried out in accordance with the requirements of the PSRA, identifying new risks and ensuring all method statements for works are in place and certified. ▪ Retain a Site Geotechnical Folder which contains all the geotechnical aspects of the site.
MM56	Leakages and Spillages	EIAR Chapter 7	<ul style="list-style-type: none"> ▪ Minimal refuelling or maintenance of construction vehicles or plant will take place on site during the removal of vegetation; ▪ On site re-fuelling will be undertaken using a double skinned bowser with spill kits on the ready for accidental leakages or spillages; ▪ Fuels stored on site will be minimised. Storage areas where required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor; ▪ The electrical control building will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; ▪ The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, ▪ An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental

Ref. No.	Reference Heading	Location	Mitigation Measure
			Management Plan. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.
MM57	Vegetation Removal	EIAR Chapter 7	<ul style="list-style-type: none"> ▪ Minimisation of the site footprint and hence, amount of vegetation clearing required will be undertaken; ▪ Extracted/excavated peat will only be moved short distances from the point of excavation to peat and peat repositories within the site; ▪ Stockpiling of materials and the parking of plant on peat will be avoided; ▪ Tracking machinery on peat will be minimised, and bog mats will be used where required; ▪ Low bearing pressure machines will be used; and, ▪ The existing drainage patterns in the peat will be maintained as far as is practicable.

Flora and Fauna

Solar Farm

The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.

Substation and Grid Connection

The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.

Proposed Project

MM58	Rehabilitation Plan	EIAR Chapter 6	<p>A revised Draft Rehabilitation Plan will be developed taking account of the proposed project. The integration of the site-specific drainage plan and the peatland rehabilitation plan will be a key aspect to the success of any active peatland formation.</p> <p>The implementation of the rehabilitation plan by Bord Na Mona as a component part of the proposal will allow for the generation of areas of <i>Sphagnum</i> rich vegetation in low-lying areas of the site and result in a long-term positive effect. The main aim of the rehabilitation plan would be for the promotion of the development of sphagnum-rich poor fen habitat within the wet areas of the site, outside the development footprint. In order to ensure the measures within the rehabilitation plan work effectively, the Draft Rehabilitation Plan identifies that <i>'there will be annual assessments of the site to determine the progress of the rehabilitation work and requirements for further enhancement measures'</i>.</p>
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Ref. No.	Reference Heading	Location	Mitigation Measure
MM59	Invasive Species	EIAR Chapter 6	<ul style="list-style-type: none"> ▪ All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species ▪ All washing must be undertaken in areas with no potential to result in the spread of invasive species. This process will be detailed in the contractor's method statement. ▪ Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present. ▪ All planting and landscaping associated with the Proposed Project shall avoid the use on invasive shrubs such as Rhododendron. ▪ The bio-security requirements in relation to all plant and equipment, as set out in Inland Fisheries Ireland's Bio-Security Protocol (2010), will be implemented as required. A copy of this Protocol is included with the CEMP in Appendix 3-4.
Noise			
Solar Farm			
The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Proposed Project			
MM60	Construction Phase Noise Control	EIAR Chapter 5	Equipment will be sensitively located, taking account of local topography and natural screening.
MM61	Construction Phase Noise Control	EIAR Chapter 5	Construction noise will be controlled by prescribing that standard construction work will be restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause a nuisance. The phasing of works has also been designed with regard to avoidance of noise impacts.

Ref. No.	Reference Heading	Location	Mitigation Measure
MM62	Construction Phase Noise Control	EIAR Chapter 5	Plant will be selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with relevant E.U. and Irish legislation in relation to noise emissions.
MM63	Construction Phase Noise Control	EIAR Chapter 5	Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise Control on Construction and Demolition Sites' and 'BS5228-1:2009+A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible impacts on noise-sensitive locations will be employed.
MM64	Construction Phase Noise Control	EIAR Chapter 5	Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels.
MM65	Construction Phase Noise Control	EIAR Chapter 10	A site representative shall be appointed who is responsible for matters relating to noise and vibration
MM66	Construction Phase Noise Control	EIAR Chapter 10	<ul style="list-style-type: none"> ▪ The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. ▪ All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. ▪ Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. ▪ Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use. ▪ Any plant, such as generators or pumps, which is required to operate outside of general construction hours will be surrounded by an acoustic enclosure or portable screen. ▪ During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 11-1 using methods outlined in British Standard BS 5228-1:2009+A1:2014 <i>Code of</i>

Ref. No.	Reference Heading	Location	Mitigation Measure
			<p><i>practice for noise and vibration control on construction and open sites – Noise.</i></p> <ul style="list-style-type: none"> The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs weekdays and between 7:00hrs and 13:00hrs on Saturdays. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme it could occasionally be necessary to work out of these hours
MM67	Vibration	EIAR Chapter 10	It is recommended that vibration from construction activities be limited to the values set out in 10.2 of the EIAR.
MM68	Vibration	EIAR Chapter 10	Site access roads need to be kept even to mitigate the potential for vibration from lorries.
Air Quality/Dust			
Solar Farm			
The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Proposed Project			
MM69	Dust Emissions	EIAR Chapter 5,9	Truck wheels will be washed to remove mud and dirt before leaving the site.
MM70	Dust Emissions	EIAR Chapter 5,9	Solar panels and construction materials will be transported to the site on specified haul routes only and a speed limit will be implemented.
MM71	Dust Emissions	EIAR Chapter 5,9	In periods of extended dry weather, dust suppression may be necessary along haul roads and at works areas to ensure dust does not cause a nuisance. If necessary, water will be used from settlement ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
MM72	Dust Emissions	EIAR Chapter 9	<ul style="list-style-type: none"> All plant and materials vehicles shall be stored in dedicated areas (on site).

Ref. No.	Reference Heading	Location	Mitigation Measure
			<ul style="list-style-type: none"> Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. The transport of construction materials to the site that have significant potential to cause dust, will be undertaken in tarpaulin or similar covered vehicles where necessary.
MM73	Exhaust Emissions	EIAR Chapter 9	<ul style="list-style-type: none"> All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise. All machinery will be switched off when not in use. Aggregate materials for the construction of site access tracks and all associated infrastructure will all be locally sourced, where practicable, which will further reduce potential emissions.

Landscape and Visual

Solar Farm

MM74	Glint and Glare	EIAR Chapter 5	If glint and glare exceedances are experienced at sensitive receptors, a site visit will be undertaken firstly to determine the level of occurrence and existing screening. If glint and glare is found to be occurring, suitable mitigation measures such as screening can be employed to limit the incidence or duration of glint and glare at the affected property.
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Substation and Grid Connection

MM75	Visual	EIAR Chapter 11	Additional planting around the substation will also reduce the visibility of the substation.
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Proposed Project

MM76	Visual	EIAR Chapter 11	Extensive screening around the site will be retained
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Traffic

Solar Farm

The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.

Substation and Grid Connection

The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.

Ref. No.	Reference Heading	Location	Mitigation Measure
Proposed Project			
MM77	Sourcing Aggregate	EIAR Chapter 5	Aggregate materials for the construction of any additional site tracks will be obtained from locally within the surrounding area of the project site. This will significantly reduce the distance and number of delivery vehicles required to access the site.
MM78	Phased Development	EIAR Chapter 5	Phased development will be employed to allow for construction traffic to be managed and to minimise the volume of construction traffic using the road network at any one time. The proposed phasing is set out in Section 4.8 of the EIAR.
MM79	Traffic Management Plan (TMP)	EIAR Chapter 13	A detailed Traffic Management Plan (TMP), incorporating all the mitigation measures set out in the Outline TMP submitted as part of the CEMP, included in Appendix 4.4 of this EIAR, will be finalised and confirmatory detailed provisions in respect of traffic management agreed with the roads authority.
MM80	Traffic Management Co-Ordinator	EIAR Chapter 13	A competent Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.
MM81	Liaison with the relevant local authority	EIAR Chapter 13	Liaison with the relevant local authority including the roads section of local authorities that the delivery routes traverse.
MM82	Travel Plans for Construction Workers	EIAR Chapter 13	The construction company will be required to provide a travel plan for construction staff, which will include the identification of a routes to / from the site and identification of an area for parking.
MM83	Temporary traffic signs	EIAR Chapter 13	As part of the traffic management measures temporary traffic signs will be put in place at all key junctions, including the access junction on the N15. All measures will be in accordance with the <i>"Traffic Signs Manual, Chapter 8 - Temporary Traffic Measures and Signs for Road Works"</i> (DoT now DoTT&S) and <i>"Guidance for the Control and Management of Traffic at Roadworks"</i> (DoTT&S). A member of construction staff (flagman) will be present at key junctions during peak delivery times.
MM84	Additional measures	EIAR Chapter 13	Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required.

Ref. No.	Reference Heading	Location	Mitigation Measure
Cultural Heritage			
Solar Farm			
The mitigation measures related to the Solar Farm are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Proposed Project			
MM85	Archaeology	EIAR Chapter 12	If an archaeological site/artefact is detected during monitoring it will be preserved by record (archaeologically excavated) and therefore permanently removed with a full record made of same
Operational Phase			
Solar Farm			
MM86	Flora and Fauna	EIAR Chapter 6	<p>Following construction of the solar array, the underlying peat will be subject to a revegetation plan in order to stabilise the peat, thereby reducing suspended solids generation and erosion.</p> <p>Revegetation will be facilitated through the establishment of semi-natural grassland beneath the solar panels using a wild flower pollinator friendly seed mix or by using 'Green Hay' in combination with fertiliser and nursery crop. The species mix will comprise of a variety of plant species that will grow on peatland and contribute to an enhancement in biodiversity. In some area, facilitation of natural revegetation may occur where ground conditions are suitable and existing vegetation cover sufficient to prevent suspended solids runoff.</p> <p>It is proposed to undertake active management of the raised bog to the north of the development site but within the study area. This will include the removal of invasive conifer species and the blocking of existing drainage channels where feasible and appropriate.</p>

Ref. No.	Reference Heading	Location	Mitigation Measure
Grid Connection			
The mitigation measures related to the Substation and Grid Connection are captured under the 'Proposed Project' heading below as this element is inherently connected and designed for the entire project works areas.			
Proposed Project			
MM87	Exhaust Emissions	EIAR Chapter 9	Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order, thereby minimising any emissions that arise.
MM88	Roads	EIAR Chapter 13	A post construction survey of roads will be carried out. The timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.

7 MONITORING PROPOSALS

All monitoring measures relating to the pre-commencement, construction and operational phases of the proposed development are set out in the relevant chapters of the EIAR submitted as part of the planning permission application.

This section of the CEMP groups together the monitoring measures presented in the EIAR. It is intended that the CEMP would be updated where required prior to the commencement of the development, to include all monitoring measures, conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and will be submitted to the Planning Authority for written approval.

The monitoring element associated with Proposed Project will be focused towards the protection of surface waters to ensure that outfalls from the drainage system adjacent to site tracks are clear with no impact on surface water quality in the immediate vicinity of the site. It is proposed that the monitoring of the drainage system will continue for one year post construction to ensure the system is operating well and within its capacity.

By presenting the monitoring proposals in the below format, it is intended to provide a monitoring schedule that can be reviewed and tracked during all phases of the project to ensure all the required monitoring is completed as required.

Table 9.1 Schedule of Monitoring Measures

Ref. No.	Reference Heading	Reference	Monitoring Measure
Pre-Commencement Phase			
Solar Farm			
The monitoring measures related to the Solar Farm are captured under the 'Proposed Project' heading below as the Drainage Design & Management is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The monitoring measures related to the Solar Farm are captured under the 'Proposed Project' heading below as the Drainage Design & Management is inherently connected and designed for the entire project works areas.			
Proposed Project			
MX1	Site Drainage	CEMP Section 4	Prior to commencement of works in sub-catchments across the site main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. These inspections will be done on a catchment by catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously.
MX2	Water Quality and Monitoring	EIAR Section 8	An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works.
MX3	Water Quality and Monitoring	EIAR Section 8 CEMP Section 4	Baseline sampling will be completed on at least two occasions and these should coincide with low flow and high flow stream conditions.
MX4	Invasive Species	CEMP Section 3	A pre-commencement invasive species survey shall be completed for the site.
MX5	Mammal Survey	EIAR Section 6	A pre-construction mammal survey will be undertaken to identify any Otter holts or Badger setts within the works areas associated with the proposed development. The survey will be undertaken to ensure that Otter or Badger have not taken up residence within or close to the development footprint
MX6	Floating Road Construction	EIAR Section 4	Prior to commencing floating road construction, movement monitoring posts will be installed in areas of deep peat as per the requirement of the Project Engineer.

Ref. No.	Reference Heading	Reference	Monitoring Measure
Construction Phase			
Solar Farm			
The monitoring measures related to the Solar Farm are captured under the 'Proposed Project' heading below as the Drainage Design & Management is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The monitoring measures related to the Solar Farm are captured under the 'Proposed Project' heading below as the Drainage Design & Management is inherently connected and designed for the entire project works areas.			
Proposed Project			
MX7	Water Quality and Monitoring	EIAR Section 8	During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse, and specifically following heavy rainfall events (<i>i.e.</i> weekly, monthly and event based).
MX8	Water Quality and Monitoring	EIAR Section 8	An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling
MX9	Daily Monitoring	EIAR Section 8 CEMP Section 5	Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work should immediately be stopped and a geotechnical assessment undertaken
MX10	Water Quality and Monitoring	CEMP Section 5	The following periodic inspection regime is likely to be proposed: <ul style="list-style-type: none"> ▪ Daily general visual inspections by Environmental Manager/Project Hydrologist; ▪ Weekly (existing & new drains) inspections by the Environmental Manager/Project Hydrologist and/or the site Construction Manager; ▪ Inspection to include all elements of drainage systems and all monitoring. Inspections required to ensure that drainage systems are operating correctly and to identify any maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter should be noted and corrective action should be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be

Ref. No.	Reference Heading	Reference	Monitoring Measure
			<p>completed on plant and equipment, and whether materials such as oil absorbent materials need replacement;</p> <ul style="list-style-type: none"> ▪ Event based inspections (as defined in Chapter 8) by the Environmental Manager/Project Hydrologist as follows: <ul style="list-style-type: none"> ○ >10 mm/hr (<i>i.e.</i> high intensity localised rainfall event); ○ >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or, ○ Half the monthly average rainfall in any 7 days. ▪ Monthly site inspections by the Project Hydrologist during construction phase; and, ▪ Quarterly site inspections by the Project Hydrologist after construction for a period of one year following the construction phase. ▪ A written record will be maintained or available on-site of all construction phase monitoring undertaken.
MX11	Check Dams	EIAR Section 4 CEMP Section 3	Check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.
MX12	Silt traps	EIAR Section 4 CEMP Section 3	Silt traps will be inspected weekly during the construction phase of the project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows with sediment cleaned out of the silt trap as necessary and on a regular basis.
MX13	Drainage swales	EIAR Section 4 CEMP Section 3	Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.
MX14	Settlement Ponds	EIAR Section 4 CEMP Section 3	Settlement ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows. Inspection and maintenance of these of these structures during construction phase is critical to their functioning to stated purpose.
MX15	Culverts	EIAR Section 4 CEMP Section 3	All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.
MX16	Drainage Management	EIAR Section 4 CEMP Section 3	The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Environmental Clerk of Works or Project Hydrologist on-site. The Environmental Manager/Project

Ref. No.	Reference Heading	Reference	Monitoring Measure
			Hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site.
MX17	Plant and Equipment Inspections	EIAR Section 7 CEMP Section 4	The plant used should be regularly inspected for fuel leaks, unnecessary noise generation and general fitness for purpose.
MX18	Drainage Inspection	EIAR Section 8 CEMP Section 5	Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.
MX19	Water Quality Monitoring	EIAR Section 8. CEMP Section 4	During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each watercourse (at F1 as outlined in Figure 8.4 of the EIAR) and specifically following heavy rainfall events (<i>i.e.</i> weekly, monthly and event based). This will be completed in consultation with the Inland Fisheries Board.
MX20	Wheel wash	CEMP Section 3	The effectiveness of the wheel wash will be monitored as part of road cleanliness inspections. The water will be replaced in the wheel wash enclosure as required.
MX21	Archaeological Monitoring	EIAR Section 12	Archaeological monitoring of ground works during the construction phase of the Proposed Project. The monitoring should be carried out under licence from the National Monuments Service of the Dept. of Culture, Heritage and the Gaeltacht and a report on the results shall be compiled and submitted to the relevant authorities on completion of the Proposed Project.

Ref. No.	Reference Heading	Reference	Monitoring Measure
Operational Phase			
Solar Farm			
The monitoring measures related to the Solar Farm are captured under the 'Proposed Project' heading below as the Drainage Design & Management is inherently connected and designed for the entire project works areas.			
Substation and Grid Connection			
The monitoring measures related to the Solar Farm are captured under the 'Proposed Project' heading below as the Drainage Design & Management is inherently connected and designed for the entire project works areas.			
Proposed Project			
MX22	Water Quality and Monitoring	CEMP Section 5	During the operational phase laboratory analysis of a range of parameters will continue for one year after construction is complete.
MX23	Drainage Inspection	EIAR Section 8 CEMP Section 5	Monitoring the effectiveness of drainage measures installed during the construction phase will continue to be monitored into the operational phase. The frequency of drainage system inspections will be reduced following completion of the construction phase of the project. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period. Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed.

8 PROGRAMME OF WORKS

It is estimated that the construction phase will take approximately 25 months. This is typically broken down into a number of phases, from commencing enabling works on site to the commissioning of the solar farm, substation and grid connection.

An example of the programme of works is outlined below. The construction programme will be finalised on appointment of a contractor before commencement of the development. The final programme will be developed in consultation with the Project Supervisor Construction Stage, based on availability of plant, materials and projected delivery dates

- **Stage 1: Site Preparation, Felling and Clearing of Vegetation.** Site enabling works will be carried out at the outset of the construction phase. Clearance of forestry and vegetation which is required to be removed to enable main construction works to proceed. This may also include preparing the perimeter and erecting where necessary a temporary fence. Temporary welfare amenities for construction workers will be installed close to the substation area during this period. A percentage of access roads will be constructed at this stage to facilitate enabling works. The drainage system will be excavated and constructed in conjunction with the track
- **Stage 2: Construction of the Proposed Project.** On completion of site preparation and enabling works, the construction of the solar farm, grid connection and substation will commence. The Works shall include the following activities:
 - Erection of fences & gates
 - Installation of the drainage in advance of works.
 - Preparation of onsite tracks and laydown areas.
 - Construction of inverter pads
 - Installation of piling for the panel supports
 - Delivery of panels, frames, centralised electrical stations
 - Installation of frames and panels
 - Construction of 110 kV Substation
 - Cable trenching and cable laying
 - Erection of security cameras
 - Installation of centralised electrical stations
 - Commissioning of the panels and grid connection
 - Site reinstatement and ecological enhancement
 - Demobilisation from site.

Construction works will be undertaken in approximately the order listed above. However, many of the tasks would be undertaken concurrently in order to minimise the duration of this phase.

Construction work will be scheduled to only occur between the hours of 07:00 to 19:00 on Monday to Friday and 07:00 to 13:00 on Saturday. Construction activities will be restricted to this times except where the nature of particular specialist works requires continuous working for longer periods. Any such exceptions will be agreed in advance with the local authority.

9 COMPLIANCE AND REVIEW

9.1 Site Inspections and Environmental Audits

Routine inspections of construction activities will be carried out on a daily and weekly basis by the Site Environmental Manager and the Construction 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. Only suitably trained staff will undertake environmental site inspections.

9.2 Auditing

Environmental audits will be carried out 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.

9.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction of the Proposed Project:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the EMP.

9.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Construction Manager, as advised by the Site Environmental Manager. Corrective actions may be required as a result of the following:

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental incident or issue occurs on site that requires immediate attention direct communications between the Construction Manager and the Site Environmental Manager will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed immediately after the incident or issue has been neutralised or remediated which will include a summary of the corrective actions completed.

9.5 Construction Phase Plan Review

This CEMP will be updated and reviewed prior to commencement of construction, and also as required thereafter during the construction phase of the project.