



ARCUS

**APPENDIX 4.1
OUTLINE CONSTRUCTION ENVIRONMENTAL MANAGEMENT
PLAN FOR SHEPHERDS' RIG WIND FARM**

INFINERGY



Prepared By:

Arcus Consultancy Services

7th Floor
144 West George Street
Glasgow
G2 2HG

T +44 (0)141 221 9997 | **E** info@arcusconsulting.co.uk
w www.arcusconsulting.co.uk

Registered in England & Wales No. 5644976

TABLE OF CONTENTS

1	INTRODUCTION	1
2	AIMS AND OBJECTIVES	1
	2.1 Project Environmental Policy	1
	2.2 CEMP Objectives.....	2
	2.3 CEMP Review Process.....	2
3	DESCRIPTION OF THE PROPOSED DEVELOPMENT	2
	3.1 Site Description	2
	3.2 Development Description	3
	3.3 Key Sensitivities	3
	3.4 Development Programme.....	3
4	CONSTRUCTION MANAGEMENT	4
	4.1 Developer	4
	4.2 Contractor	4
	4.3 Ecological Clerk of Works	4
	4.4 Geotechnical Advisor	5
	4.5 Owner's Engineer	5
	4.6 Principal Designer	5
5	PRELIMINARY SURVEYS AND GROUND INVESTIGATIONS	5
	5.1 Protected Species Surveys	6
	5.2 Bird Surveys	6
	5.3 Water Quality Monitoring.....	6
	5.4 Ground Investigations.....	6
6	CONSTRUCTION METHODOLOGIES	6
	6.1 Construction Working Hours	6
	6.2 Health and Safety	6
	6.3 Public Safety.....	6
	6.4 Construction Compounds and Laydown Areas.....	7
	6.5 Borrow Pits.....	7
	6.6 Internal Access Tracks	7
	6.7 Drainage Design	7
	6.8 Watercourse Crossings & Road Construction near Watercourses	7
	6.9 Substation Compound	7
	6.10 Cabling.....	8

6.11	Wind Turbine Foundations	8
6.12	Hardstanding Areas	8
6.13	Assembly of Wind Turbines	8
6.14	Decommissioning	8
7	ENVIRONMENTAL MANAGEMENT	8
7.1	Forestry	9
7.2	Ecology	9
7.3	Ornithology	9
7.4	Cultural Heritage	10
7.5	Geology and Peat	10
7.6	Hydrology	10
7.7	Noise	11
7.8	Traffic and Transport	11
8	APPENDIX– WATER CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN	12
8.1	Introduction	12
8.2	Scottish Water Drinking Water Protected Area	13
8.3	The Management of Sediment and Surface Waters	13
8.3.1	Location of Silt Traps and Silt Matting	13
8.3.2	Location of Check Dams	15
8.3.3	Location of Settlement Lagoons	16
8.3.4	Outflow Monitoring From Settlement Lagoons	17
8.3.5	Provision for Storm Events	18
8.3.6	Foul Drainage	18
8.4	The Management and Movement of Fresh Concrete	19
8.4.1	Accidental Spillage within Construction Compounds	19
8.4.2	Accidental Spillage outside Construction Compounds	19
8.4.3	Vehicle Washing	19
8.4.4	Concrete Pouring For Turbine Foundations	21
8.5	Hydrocarbon Contamination	22
8.5.1	Vehicle Maintenance	22
8.5.2	Chemical Storage	22
8.6	Borrow Working Drainage	22
8.6.1	Pre Earthworks Drainage	22
8.6.2	Earthworks Drainage	23
8.6.3	Management of Drainage from Surplus Materials	23
8.7	Dust Suppression and Control	24
8.8	Access Track Construction and Use	24
8.8.1	Management of Surface Water	24
8.8.2	Loose Track Material	25

8.8.3	Material Excavated During Track Construction	25
8.8.4	Watercourse Crossings	26
8.9	Felling Measures.....	26
8.10	Handling of Mineral Soils.....	27
8.10.1	General Good Practice Measures	27
8.10.2	Measures To Protect Groundwater Dependent Terrestrial Ecosystems and Abstractions 27	
8.11	Disposal of Waste Materials	28
8.12	Monitoring Programme	28
8.12.1	Surface Water Monitoring	28
8.12.2	Monitoring Reporting	28
8.12.3	Operational Phase Monitoring	28
8.12.4	Monitoring Programme Summary	29
8.13	Decommissioning	29
8.14	Conclusions and Recommendations.....	29

1 INTRODUCTION

SETT Wind Development Limited (the applicant) is seeking consent from the Scottish Ministers under Section 36 of the Electricity Act 1989 (as amended), along with deemed planning permission under Section 57(2) of the Town and Country Planning (Scotland) Act 1997, to develop the Shepherds' Rig Wind Farm ("the Development") within the Smittons and Craigengillan plantations, located approximately 5 kilometres (km) east of Carsphairn in Dumfries and Galloway

This Outline Construction Environmental Management Plan (OCEMP) forms an appendix to the Environmental Impact Assessment Report (EIA Report) for the Development. This OCEMP provides a draft framework, from which a detailed site-specific Construction Environmental Management Plan (CEMP) would be produced as part of the required discharge of conditions associated with the consent of the Development.

The CEMP will be maintained and updated throughout the construction process as a live document. It will be augmented by design specifications and construction documentation and will provide comprehensive information on environmental management appropriate to the stage of development. This document is outline only at this point of the process, as construction methods, further site investigations, etc. would be required as part of the discharge of conditions, and these elements of work would further inform the CEMP. The final CEMP would be subject to approval by Dumfries and Galloway Council with further consultation undertaken with Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH).

The OCEMP is structured as follows:

- Aims and Objectives of the CEMP;
- Description of the Proposed Development;
- Construction Management;
- Construction Methodologies;
- Environmental Management; and
- Water Construction Environmental Management Technical Appendix.

2 AIMS AND OBJECTIVES

Potential environmental sensitivities on a wind farm construction site need to be identified and given consideration prior to the start of the construction. Potential effects identified within the EIA Report, including embedded mitigation in the form of best practice, must be adhered to during construction.

2.1 Project Environmental Policy

The Development should be delivered in accordance with good construction practice, both in its approach to the management of effects on the environment and its support of local communities.

In doing so, the following approach has been developed and is delivered through the implementation of the OCEMP and associated plans and reports:

- The Developer, the Contractor, the Designers and other parties to the construction process will act collaboratively and cooperatively to achieve the best environmental outcomes;
- The works will progress in accordance with the requirements of the EIA Report, and methods agreed with the Planning Authority and Consultees;
- The Developer undertakes to appoint a Contractor that is competent, and is experienced in constructing projects similar in nature to the Development;

- The Developer undertakes to appoint a Contractor that is experienced in delivering works in environments similar to those of the Development site, and in implementing mitigation works of a similar nature to those defined in the EIA Report;
- The Contractor plans the work integrating from the outset the objectives of the Development, and the environmental requirements defined in the EIA Report;
- The Contractor programmes the work in a manner that is safe and that the work and mitigation measures have the greatest opportunity to be effective;
- The Contractor develops contingency plans for reasonably foreseeable events. The Developer, the Designer and other parties take reasonable steps to support the development of the Contractor's plans taking into account responsibilities;
- The Contractor shall take reasonable steps to notify local communities of operations during the Development that may impact on domestic or business activity, and will use appropriate methods to manage the impact; and
- In all operations, management of the environment and control of effects will be an integral part of the design, management and construction process.

2.2 CEMP Objectives

The objective of the CEMP is to contribute to the successful delivery of the Development, achieved through a structured approach to good construction management taking into account information and researches documented in the EIA Report, whilst incorporating flexibility to accommodate unforeseen conditions and innovation.

A copy of this CEMP and related files and reports will be kept in the site offices of the Contractor for the duration of the site works and will be made available for review at any time.

Upon completion of the construction works, the Contractor will submit a complete copy of the final set of information to the Developer for their records. This information will include electronic scans of all hard copy reports, data, field records and correspondence which are gathered over the course of the construction works, and updates to this CEMP.

It is intended that the CEMP be a live document that is regularly reviewed and updated to reflect conditions experienced on site.

2.3 CEMP Review Process

Where the Contractor has standard documents within their own Company or Corporate Environmental Management Plan which might cover a particular requirement of this CEMP, this will be provided to the Developer and the relevant corresponding documents will be made available.

A checklist will be issued providing the Contractor with a summary of the minimum information to be provided to the Developer pre, during and post-construction.

The Developer will undertake review and acceptance of the Contractor's provided information prior to commencement of construction works.

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 Site Description

The Site lies in northern Dumfries and Galloway, approximately 5 kilometres (km) to the east of Carsphairn, 10 km north of St John's Town of Dalry and 14 km to the west of Moniaive. Figure 2.1 of the EIA Reports shows the location and wider context of the site.

The application Site area totals 752 hectares (ha), and largely consists of commercial Sitka spruce plantation. The Site rises from approximately 200 m above ordnance datum (AOD, approximately equivalent to sea level) along Dry Burn (in the southern section of the Site)

to 380 m at Marscalloch Hill in the south-western part of the Site and 400m at Craigengillan Hill in the northern part of the site. The Site is shown in detail in Figure 2.2 of the EIA Report.

3.2 Development Description

The application is for a wind energy development comprising of the erection, 25-year operation and subsequent decommissioning of up to 19 turbines. 17 of the turbines would have an estimated maximum output of 4.2 megawatts (MW), whilst two of them would have an estimated maximum output of 3.6 MW.

In summary, the main components of the Proposed Development to which the OCEMP relates are:

- 19 wind turbines with a maximum blade tip height of 149.9 m (Turbines 1 and 3 are 125 m to tip);
- One substation compound with battery storage;
- Two control buildings;
- 8 km of new site access track;
- 3 km of existing upgraded forest track;
- 9 watercourse crossings;
- A temporary site compound; and
- Two borrow workings.

3.3 Key Sensitivities

The EIA Report notes that the Development would have potential effects upon a small number of key environmental sensitivities including:

- Water environment; and
- Areas of peat.

Specific mitigation for the above receptors is primarily contained in the Outline Peat Management Plan (PMP), which would constitute a sub-section of the CEMP.

3.4 Development Programme

The construction works are expected to be completed over a period of 21 months.

Construction activity would be as follows:

- Off-site remedial works;
- Site compound set up;
- Establish borrow pits;
- Construction of site tracks;
- Construction of turbine crane hardstandings;
- Construction of turbine foundations
- Construction of control building/substation;
- Site cabling installation;
- Installation of switchgear/metering;
- Installation of transformer and externals;
- Turbine erection;
- Grid connection commissioning;
- Turbine and SCADA commissioning;
- Performance testing; and
- Site reinstatement.

4 CONSTRUCTION MANAGEMENT

This section details the responsibilities of the various roles involved in the construction of the Proposed Development. All those involved would be responsible for compliance with the CEMP.

4.1 Developer

The Developer will appoint an appropriately competent person or persons to undertake relevant environmental tasks as detailed in this document prior to, during and upon completion of the construction works. This person will be the Developer's Site Environmental Representative.

The competence of the Developer's Site Environmental Representative will be demonstrated to the Developer via submission of relevant information (e.g. CV, training records, membership records or similar) for review and acceptance prior to commencement of construction works.

The Developer will be responsible for obtaining all necessary consents, licences and permissions for their activities as required by current legislation governing the protection of the environment.

4.2 Contractor

The Contractor, also known as the Balance of Plant (BoP) Civil & Electrical Contractor, will undertake the earthworks, install the on-site cabling, construct the access tracks and hardstandings, construct the substation compound and control buildings and construct turbine foundations.

The Contractor will be deemed to be the Principal Contractor for the purposes of the Construction (Design and Management) Regulations 2015 (CDM Regulations).

The Contractor will have a proven track record in successfully implementing similar projects.

The Contractor will consider all of the mitigation measures and best practice construction methods detailed within this CEMP in their design and in any detailed environmental plans as required by the Contract. Where any mitigation measures or construction methods described in other documents deviate in any way from those contained within this document, the Contractor will abide by whichever is the most onerous and stringent in terms of environmental protection and identify this to the Developer.

The Contractor will submit to the Planning Authority final layouts of temporary working areas (works compounds, borrow pits and other temporary construction areas) to demonstrate compliance with the EIA Report and this CEMP.

Where approaches, methods or designs deviate from the EIA Report or this CEMP, these should be notified to the Developer and the Planning Authority to confirm that they achieve the objectives of the Development.

4.3 Ecological Clerk of Works

A suitably qualified and experienced Ecological Clerk of Works (ECoW) will be appointed to provide ecological and environmental advice during construction. The ECoW would monitor construction to ensure compliance with the CEMP and help to reduce risks and delays. Any breaches of the CEMP will be reported to the Project Manager who would have the authority to stop construction works.

The ECoW will be a professionally qualified individual possessing the following skills:

- Knowledge and experience of typical construction practices;

- Assertiveness and strong communication skills, in particular an ability to relay environmental information at both a technical and layman level;
- Robust understanding of relevant scientific principles; and
- A sound understanding of the environmental/ecological legislation (and licensing) and how it applies to construction sites.
- ECoW responsibilities will include (but not be limited to): Thoroughly understanding the ecological issues and best practice relevant to the Development.
- Planning (as far in advance as possible) for known ecological issues, and responding to new ones, appropriately.
- Fulfilling the requirements of the CEMP and associated documents, including surveys and watching briefs where appropriate.
- Educating relevant personnel (principally site staff and contractors) about ecologically sensitive features, legal obligations, best practice, and relevant procedures.
- Advising on the location of sensitive ecological features and the type of protection or mitigation required,
- Supervising and monitoring the implementation of mitigation measures to ensure legal compliance and safeguard sensitive ecological receptors.
- Regular surveying to monitor environmental/ecological sensitivities at the site. These may be sensitive receptors such as a protected watercourse, fixed sensitivities such as badger setts, or more transient features such as nesting birds.
- Monitoring construction activities in close proximity to sensitive environmental receptors to ensure impacts are minimised (e.g. monitoring pollution prevention measures).
- Liaising with, and reporting to, the construction project management team, site personnel and contractors, and relevant stakeholders about ecological issues.
- Directing the sensitive micro siting and placement of turbines, borrow pits, bridges, compounds and tracks where appropriate.

4.4 Geotechnical Advisor

The Geotechnical Advisor is an engineering design consultant appointed by the Contractor to assess the suitability of the Developer's site information, assess rock quality and to assess the bearing capacities of formations.

The Geotechnical Advisor will scope any additional surveys or investigations required to complete the design and construction, and will oversee, review and certify the design and construction as complying with the project requirements, best practice and all appropriate design standards of relevance to the location and EU member state.

The Geotechnical Advisor will have a proven track record in the assessment, design and construction supervision/inspection of similar projects.

4.5 Owner's Engineer

The Owner's Engineer is the engineering design consultant appointed by the Developer to review the Contractors designs and conduct on-site testing works.

4.6 Principal Designer

The Principal Designer will be appointed by the Developer to oversee the works in accordance with its duties under CDM2015 Regulations.

5 PRELIMINARY SURVEYS AND GROUND INVESTIGATIONS

This section details the surveys and ground investigations that would be conducted after consent and prior to the start of construction. These surveys would inform the design of the Development and any additional required environmental mitigation to be implemented during the construction phase.

5.1 Protected Species Surveys

Pre-construction surveys for protected species will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation to be incorporated into the CEMP.

5.2 Bird Surveys

Pre-construction surveys for wild birds will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation to be incorporated into the CEMP.

5.3 Water Quality Monitoring

A surface water and groundwater monitoring programme will be established prior to the construction phase of the Development. An indicative monitoring programme is set out in Section 8.12.

5.4 Ground Investigations

Ground investigations and topographic surveys would be conducted post-consent. The findings of these surveys would provide more detailed, location specific ground conditions to help optimise micro-siting of turbine locations and associated infrastructure by identifying environmental or technical constraints.

6 CONSTRUCTION METHODOLOGIES

Upon appointment of a Construction Manager, a detailed construction methodology will be proposed. These outline methods will inform the Contractor's detailed method statements produced as the development progresses. This section will be updated as appropriate.

6.1 Construction Working Hours

Construction work would be limited to the hours of 0700 to 1900 Monday to Friday and 0700 to 1800 hours on Saturdays, with no working on Sundays or public/bank holidays. Quiet on-site working activities such as electrical commissioning are assumed to extend outside the core working times, noted above, where required.

Work outside of these hours is not usual, though if it was required to meet specific short term demands (e.g. during foundation pours or to undertake work which is highly weather dependent, such as low wind speed needed for turbine erections), the planning authority would be informed, as required.

6.2 Health and Safety

The purpose of this section is to provide background information about safety policies and to describe how safety issues are to be managed during the construction, operation and decommissioning of the Proposed Development. Upon appointment the Construction Manager will be responsible for the Health and Safety Policy, in line with current legislation and guidance.

6.3 Public Safety

The Proposed Development site is currently not crossed by any formal footpaths, sits within privately woodland and will be enclosed with locked gates. Mitigation measures for public safety during construction on site are not necessary. Upon appointment the Construction Manager will be responsible for the Health and Safety Policy in regards to public safety.

6.4 Construction Compounds and Laydown Areas

Upon appointment of a Construction Manager a detailed Construction Plan would be drafted which would include any construction compounds and laydown areas.

6.5 Borrow Pits

This Preliminary Borrow Pit Assessment (BPA) has been prepared initially to provide details of potential borrow pit locations or aggregate extraction areas required for the construction of the wind farm.

Based on the desk-based assessment, it is anticipated that there are adequate locations on site to position proposed borrow pits which would achieve the required aggregate quantities for the development.

Considerations for the assessment of borrow pits following consent of the Development include:

- Ground investigations and relevant geo-environmental analysis undertaken prior to finalising borrow pit proposals.
- Three-dimensional design should be undertaken following detailed design and ground investigations to confirm the capacity of the proposed borrow pits.
- Detailed profiles of borrow pit excavations including existing ground levels, proposed excavation levels and a conceptual restoration profile for each borrow pit should be produced once final borrow pit extents have been agreed.

Prior to the construction of the windfarm, design and best practices and any required mitigation measures would be set out in full within a Construction Environmental Management Plan and agreed with the statutory bodies.

6.6 Internal Access Tracks

A total of approximately 11 km of on-site access tracks would be required for the Proposed Development. Two teams are expected to operate during access track construction. A detailed plan of internal access tracks based upon site specific conditions will be put in place by the Construction Manager.

Internal track maintenance is anticipated to be a relatively infrequent activity. Any track maintenance that is required would be undertaken where possible in the summer months.

6.7 Drainage Design

Drainage within the temporary site compound, where construction vehicles would park and where any diesel fuel would be stored, would be directed to an oil interceptor to prevent pollution if any spillage occurred.

6.8 Watercourse Crossings & Road Construction near Watercourses

Nine watercourse crossings have been included in the project design, although four of them are existing. Three types of watercourse crossing are proposed for the Development: bridges, box culverts and pipe culverts. However, the use of each of these types of structure would be determined individually to minimise potential effects based on a site-specific assessment, which would account for topographic, hydrological and ecological attributes at each proposed crossing point. Upon appointment of a Construction Manager a detailed Construction Plan would be drafted which would include decisions on these water crossings.

6.9 Substation Compound

The electricity substation compound would comprise a fenced hardstanding with maximum dimensions of approximately 145 m x 24 m. The area for the substation compound would be prepared by removing the topsoil and subsoil down to competent bearing strata, and

concrete foundations would be required to take the weight of the components. An electrical earth network would be buried around the building. Details of this will be confirmed by the Construction Manager, upon appointment.

6.10 Cabling

Electrical cabling for wind farm power distribution will require to be delivered and will constitute 48 HGV movements over the period of delivery. Underground electrical cabling linking all of the turbine unit transformers will be installed.

The method of installation would be selected to have minimum disturbance to the peat at the time of installation and afterwards. The following methods would be used where appropriate:

- burial in ducts across the tracks;
- fitted in ducts along bridges;
- burial in trenches; and
- ploughing.

6.11 Wind Turbine Foundations

Construction of turbine foundations would involve the excavation of the ground to expose the underlying load bearing strata or bedrock, then backfilling with concrete. The intention is for the wind turbine foundations to be formed mainly from concrete batched onsite. In the eventuality that ready mix concrete is used, each foundation will be poured in one continuous session over a single day, with 19 non-consecutive days required in total over the 20 week duration of this element of works. After appointment the construction contractors would determine detailed procedures for this construction stage.

6.12 Hardstanding Areas

Crane hardstanding areas will be constructed for each wind turbine, these will then be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the wind farm. These could also be utilised during decommissioning at the end of the wind farm's life. After appointment the construction contractors would determine detailed procedure for this construction stage.

6.13 Assembly of Wind Turbines

During the construction phase, heavy lifting cranes will be used to install the wind turbines. The crane type would be confirmed when the specific turbine type has been selected. After appointment the construction contractors would determine the actual cranes used, together with the exact programme and number of teams on site.

6.14 Decommissioning

The Proposed Development has been designed with an operational life of 25 years. At the end of the operational period, it would be decommissioned and the turbines dismantled and removed. Any alternative to this action would require consent from Dumfries and Galloway Council.

7 ENVIRONMENTAL MANAGEMENT

An EIA has been undertaken for the Development in support of the Section 36 application. The following sections describe mitigation controls that have been incorporated to protect the environment. Detailed proposals for such measures will be documented prior to construction. This should be used for reference only, with specific information sourced in the EIA report itself.

7.1 Forestry

There will be some instances of tree felling which will be conducted in lines with the Wind Farm Forest Plan as well as the forestry management practices and standards and guidance detailed in Chapter 7 of the EIA Report.

7.2 Ecology

An Ecological Clerk of Works (ECoW) will be appointed to provide ecological and environmental advice during pre-construction and construction. This will include the monitoring of compliance with the recommendations of the EIA Report and planning conditions. The ECoW would be required, along with the project hydrologist, to undertake a review of design and drainage plans, to minimise the potential for effects to habitats of conservation concern, and to assist in the identification of appropriate locations for commencement of habitat restoration works.

Pre-construction surveys for protected species will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation.

A Construction Biosecurity Plan (CBP) will be written and implemented ahead of the commencement of the construction phase. The CBP will be subject to approval by the local planning authority and will aim to ensure works do not facilitate the spread of signal crayfish.

Measures to maintain hydrological connectivity during construction will be put in place, and good practice measures for the management and storage of peat (including appropriate use of vegetated turves) will be undertaken to ensure effective re-use as part of reinstatement works.

An offset distance of 50 m between bat habitats, such as riparian features and forest edges and turbines blade tips will be implemented and maintained throughout the life of the Proposed Development. Any proposed restocking will ensure incorporation of a 50 m separation distance through inclusion in the finalised restocking plan design.

No additional bat mitigation is required. Should the updated guidance confirm a requirement for post-construction monitoring, a programme should be developed to identify and minimise the risk of collision to bats and detailed within a bat monitoring and mitigation plan.

7.3 Ornithology

Pre-construction surveys for wild birds will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation. Should an active nest site of a Schedule 1 bird be located, all construction works within 500 m of the nest site should be halted immediately and a disturbance risk assessment prepared. Should the nest of any other wild bird not listed on Schedule 1 be located, construction activities within 50 m of the nest site should be halted and the Ecological Clerk of Works (ECoW) informed immediately.

Potential operation effects, the loss of life for birds whose flight path intercepts the turbines, is considered negligible for all noted bird species.

If decommissioning is to occur during times of the year when breeding birds might be affected, best practice measures, like those used during construction, will be put into place.

7.4 Cultural Heritage

It is proposed that a programme of planting be undertaken around Craigengillan Cairn with the aim of enhancing its setting (post-felling of the current Sitka crop due in the 2019-2023 programme).

A number of post-medieval features are recorded within the Site (in particular, within the southern section). These provide evidence for the agricultural exploitation of the area. Due to the presence of forestry, these may already have been damaged and destroyed. If present, they may be impacted by the Proposed Development infrastructure layout. It is proposed that a programme of survey and recording be undertaken based on upon the final infrastructure layout to establish whether any such remains survive, and to appropriately record them. This will lead to their preservation by record (if they are still extant features).

It is proposed that an appropriate scheme could be set out and agreed in the form of a Written Scheme of Investigation, to be agreed with the Council Archaeologist. Such a scheme will include reference to appropriate analysis of the archive generated by fieldwork and dissemination of any results. The survey work could be carried out post-consent and prior to principal construction.

7.5 Geology and Peat

Turbines T4, T6, T8, T10, T13, and T16 are all situated within zones of peat greater than 1.0 m. Mitigation states that turbines will be micro-sited outwith the deep peat areas in order to reduce the overall impact on peat and loss of soils.

Slope stability monitoring will occur during pre-construction and construction phases of work, including for both peat stability and non-peat related stability.

Best practice measures for managing excavated peat and peaty soils are detailed in the Outline Peat Management Plan.

7.6 Hydrology

A detailed account of the hydrology environmental management can be found in the Water Construction Environmental Construction Plan (Section 8). A brief summary can be found below.

The Development is situated within a Scottish Water Drinking Water Protected Area (DWPA). All site personnel will be aware they are working in a DWPA and Scottish Water will be notified without delay in the event of a pollution incident.

Sediment and surface water run-off generated during the construction phase of the Development will be managed through good practice construction techniques. Drainage from the site will include elements of Sustainable Drainage Systems (SuDS) design, where appropriate. SuDS replicate natural drainage patterns and have a number of benefits:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream;
- SuDS will treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into natural drainage network; and
- SuDS measures, such as lagoons or retention ponds, correctly implemented will produce suitable environments for wildlife.

Best practice management will be put in place for chemical storage and use including fuel, oils and concrete. This will include bunding of the construction compound, use of spill kits and absorbent pads and use of impermeable geotextile membranes in chemical storage areas.

Best practice measures will be put in place to protect private water supplies including absorbent spill pads / kits and other measures highlighted within the outline CEMP. Best practice construction methods including speed limits and regular vehicle and machine maintenance will be employed.

Best practice felling measures will be put in place and any felling in sensitive areas will be approved by the ECoW.

Best practice drainage and sediment management measures will be put in place including the use of check dams, silt fencing / mats.

A programme of water quality monitoring will be carried out during the pre-construction, construction and post-construction periods.

Best practice measures will be employed to manage drainage from access tracks and stored soils, and to manage dust from haul roads and access tracks.

Best practice measures will be followed during design and installation of watercourse crossings. All crossings will be agreed with SEPA at detailed design phase.

7.7 Noise

To ensure construction noise is minimised, operations shall be limited to times agreed with Dumfries and Galloway Council. This includes the delivery of turbines both within agreed times and by agreed routes. The site contractors will also be required to undertake all works in accordance with British Standard (BS) 5228.

Where practicable the following will be implemented to further minimise construction noise:

- The work programme will be phased, which would help to reduce the combined effects arising from several noisy operations.
- Noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens.
- Where practicable, Night-time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g. turbine erection.

7.8 Traffic and Transport

The Development would be accessed via the A713 and the B729. Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public highways that would provide access to the site to ensure they are suitable, and to identify any modifications required to facilitate access.

A Traffic Management Plan would be prepared prior to construction. This would address the identified potentially significant effect which relates to pedestrian amenity near to schools in Carsphairn, Dalmellington and Patna.

Recommended mitigation measures, for adoption in the TMP, are as follows:

- As far as reasonably possible deliveries should be scheduled outside of school opening and closing times;
- Drivers of all delivery vehicles to be made aware during induction of the presence of schools within these settlements and that formal pedestrian crossing facilities are not present; and
- Dalmellington and Carsphairn have part-time 20 mph speed limits which should be in force during school opening and closing times. Drivers to be made aware of this during induction and reminded that strict adherence to these speed limits is expected.

8 APPENDIX– WATER CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

This outline Water Construction Environmental Management Plan (WCEMP) has been incorporated into the Construction Environmental Management Plan (CEMP) that will be maintained and updated throughout the construction process as a live document. The CEMP will be augmented by design specifications and construction documentation and will provide comprehensive information on environmental management appropriate to the stage of development.

Whilst the preparation of the CEMP is the responsibility of the construction contractor, the outline WCEMP presented in this document is intended to demonstrate measures that will be used across the Development site to adequately protect the hydrological environment and related resources. Detailed proposals for such measures will be documented prior to construction and will provide the same or greater protection for the water environment as those described in this document. The measures are proportionate to the risk and, where greater risk is highlighted at specific locations prior to construction, specific measures would be agreed for those locations. This document provides a high level outline WCEMP, and as part of the iterative process, it would be further developed into a CEMP throughout the construction programme, which will detail the exact location of measures to protect the hydrological environment.

The methods set out in the oWCEMP are based on good practice measures agreed with the Scottish Environment Protection Agency (SEPA) for several constructed wind farms and the following guidance:

- Forestry Commission, 'The UK Forestry Standard, 2017'¹;
- Scottish Renewables (SR) and SEPA. Guidance on the Assessment of Peat volumes, Reuse of Excavated Peat and the Minimisation of Waste (2012)²;
- Scottish Natural Heritage, Good Practice During Wind Farm Construction, (2013)³;
- The Construction Industry Research and Information Association (CIRIA), 'Environmental Good Practice On Site (C741)' (2015)⁴; and
- CIRIA, 'Control of Water Pollution from Construction Sites (C532)' (2001)⁵.

The oWCEMP takes into account specific activities during the construction and operational phases of the Development, including:

- Access roads;
- Borrow workings;
- Turbine foundations; and
- Hardstanding areas and buildings (including crane hardstanding, construction compounds and associated infrastructure).

The appropriate methodologies to cover water control and the means of drainage from all hard surfaces and structures within the site are described in the following sections.

¹ The UK Forestry Standard: Forests and Water [online] Available at: [https://www.forestry.gov.uk/pdf/FCFC001.pdf/\\$FILE/FCFC001.pdf](https://www.forestry.gov.uk/pdf/FCFC001.pdf/$FILE/FCFC001.pdf) [Accessed 07/08/2018].

² SR and SEPA (2012). Guidance on the Assessment of Peat volumes, Reuse of Excavated Peat and the Minimisation of Waste [online] Available at: http://www.scottishrenewables.com/media/uploads/publications/a4_developments_on_peatland.pdf [Accessed 07/08/2018].

³ SNH (2013) Good Practice During Windfarm Construction, [online] Available at: <http://www.snh.gov.uk/docs/A1168678.pdf> [Accessed 07/08/2018].

⁴ The Construction Industry Research and Information Association (CIRIA), (2015), Environmental Good Practice on Site Guide (C741), CIRIA: London

⁵ CIRIA, (2001), Control of Water Pollution from Construction Sites (C532), CIRIA: London.

8.2 Scottish Water Drinking Water Protected Area

The WCEMP also acknowledges the location of the Development within a Scottish Water Drinking Water Protected Area (DWPA) and has taken account of measures advised in the Scottish Water List of Precautions for Drinking Water Assets⁶ in compiling this document. Scottish Water will be contacted in advance of any works commencing on site.

All site personnel will be made aware that they are working within a DWPA and that in the event of a pollution incident Scottish Water are to be notified without delay via an agreed telephone number. This will be communicated to site personnel during toolbox talks.

8.3 The Management of Sediment and Surface Waters

This section addresses the management of sediment and surface water run-off generated during the construction phase of the Development, through good practice construction techniques.

Major construction works will be minimised during heavy precipitation events.

Drainage from the site will include elements of Sustainable Drainage Systems (SuDS) design, where appropriate. SuDS replicate natural drainage patterns and have a number of benefits:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream;
- SuDS will treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into natural drainage network; and
- SuDS measures, such as lagoons or retention ponds, correctly implemented will produce suitable environments for wildlife.

8.3.1 Location of Silt Traps and Silt Matting

Silt traps may be utilised to trap and filter sediment-laden run-off from excavation works at the Development, including turbine bases and access roads. They will be installed in drainage ditches but will be sited to avoid slopes with a gradient greater than 1 in 20.

Good practice will be followed prior to placement of silt traps adjacent to watercourses. Silt matting may be placed at the outfall of settlement lagoons to filter sediment during times of heavy rainfall.

The silt traps and silt matting will be monitored by the Ecological Clerk of Works (ECoW) and replaced when necessary.

Plates 1, 2 and 3 of this document display typical silt fencing, silt traps and silt matting.

⁶ 70.04.01.02.04.03. SW List of Precautions for Drinking Water and Assets – Wind Farms EdA, [online] Available at: <http://www.scottishwater.co.uk/-/media/about-us/files/corporate-responsibility/swlistofprecautionsfordrinkingwaterandassetswindfarmseda.pdf?la=en> [Accessed 16/08/2018].

Plate 1: Typical silt fencing



Plate 2: Typical silt traps



Plate 3: Typical silt mat to be placed at lagoon outfalls



8.3.2 Location of Check Dams

Check dams will be installed within drainage ditches at regular intervals, where appropriate. Check dams will facilitate the settlement of suspended solids by slowing the flow of water within the drainage ditches. Appropriately sized stone pitching will be used within the dam in order to provide a rough surface for water within the drainage ditch to pass over.

Plate 4 of this document displays a typical check dam.

Plate 4: Typical check dams - to be installed in drainage ditches adjacent to the access track



8.3.3 Location of Settlement Lagoons

Settlement lagoons will be implemented, where appropriate, at turbine excavations.

All settlement lagoons will be actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall. If required to achieve the necessary quality of the final run-off, further measures may include the use of flocculent to further facilitate the settlement of suspended solids. The appropriateness of flocculent use would be discussed with SEPA prior to its introduction into settlement lagoons

Plate 5 of this document displays a typical settlement lagoon and flocculent station.

Plate 5: Typical lagoon and flocculent station



8.3.4 Outflow Monitoring From Settlement Lagoons

Settlement lagoon outflow will be regularly inspected and discharge may be pumped, when required, for maintenance purposes. Any pumping activities will be supervised and authorised by the Contractor's Project Manager.

Treated water will be discharged onto vegetated surfaces and directed away from surface watercourses. Within all the catchments, irrigation techniques, which may include the use of perforated discharge hoses or similar, will be employed to rapidly distribute discharge across a vegetated slope. This will be carried out in consultation with the ECoW.

Plate 6 of this document displays typical pumping operations.

Plate 6: Typical 'Siltbuster' and settlement lagoon



8.3.5 Provision for Storm Events

The site itself is not considered to be at risk from flooding. In extreme storm events, there would be elevated levels of run-off from the hardstanding elements of the Development relative to greenfield flow rates, which has the potential to contribute to down-stream, off-site, flood risk. The areas of new hardstanding, in terms of the percentage of the relevant catchments that may be affected, are small.

In the baseline scenario, the water table is not at the ground surface, and hence some infiltration would be expected. The Development proposals could raise the water table, and therefore infiltration would reduce. Notwithstanding this, measures are proposed in this document that would limit run-off rates.

Temporary storage volume for storm run-off from the turbine foundations and crane hardstanding areas would be provided via settlement lagoons.

Along the access tracks, drainage channels on the down-slope would shed track run-off to adjacent rough ground approximately every 30 m, to attenuate flow and allow natural filtration to remove sediments. In areas within 50 m of a watercourse marked on an Ordnance Survey 1:50,000 scale map or where cross-slopes exceed 1 in 20, drainage channels will be bunded and outflow will be monitored daily in areas with on-going construction activity.

Appropriate licensing and discharge consents will be sought (under Water Environment (Controlled Activities) (Scotland) Amended Regulations 2013 (CAR)⁷) before the construction phase of the Development.

8.3.6 Foul Drainage

The substation building may house a single toilet facility and / or hand basin for visiting maintenance staff during the operational phase. Should this facility be required rainwater will be collected from the roof of the building via a gutter and inlet pipe to fill a rain water harvesting tank. Waste will be held in a closed system or a septic tank and pumped out as necessary via a tanker. The system shall be designed and approved by SEPA prior to construction.

⁷ The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 [online] Available at: http://www.legislation.gov.uk/ssi/2013/176/pdfs/ssi_20130176_en.pdf [Accessed 17/05/2016].

Effluent and waste from onsite construction personnel will be treated at a package sewage treatment plant or a septic tank and discharged into a properly designed and sized drainage field, in accordance with GPP4. The system will be designed prior to the construction phase of the Development.

8.4 The Management and Movement of Fresh Concrete

If concrete batching is carried out on-site, rather than being imported to the site ready-mixed, the following management measures are proposed.

8.4.1 Accidental Spillage within Construction Compounds

The construction compound will have a bunded area and this area will be underlain by an impermeable ground membrane layer. The bund will have a 110 % capacity to attenuate stored liquids (including fresh concrete). This will reduce the potential for accidental spillages to contaminate surface water or groundwater. An appropriately sized spill kit(s) will be provided and maintained on site. This will contain materials, such as absorbent granules and pads, absorbent booms and collection bags. These are designed to halt the spread of spillages and will be deployed, as necessary, should a spillage occur elsewhere within the construction compounds.

8.4.2 Accidental Spillage outside Construction Compounds

Speed limits for vehicles transporting concrete will be set at a maximum of 15 miles per hour (mph) and will be monitored. Maximum vehicle load capacities will not be exceeded. Although tracks will be maintained in good condition, vehicle loads will be reduced when a rougher surface is identified prior to track maintenance.

Spill kits will also be located at strategic points across the site, as displayed in Plate 7.

Plate 7: Spill Kits to be located across the Development



Measures to manage fresh concrete during pouring operations are described in Section 8.4.4: Concrete Pouring for Turbine Foundations.

8.4.3 Vehicle Washing

There will be a wash-out facility within the construction area consisting of a sump overlain with an impermeable geosynthetic membrane. The geosynthetic membrane will filter out the concrete fines leaving clean water to pass through to the sump. The sump water will be pumped to a licenced carrier and taken off-site for approved disposal.

No washing of concrete-associated vehicles will be undertaken outside the wash out facilities, and the area will be signposted, with all site contractors informed of the locations. The frequency of concrete plant washout may also be reduced through the use of retarders. Plate 8 displays a typical concrete wash-out facility.

Plate 8: Typical concrete washout facility



In the event that plant and wheel washing is required, dry wheel wash facilities and road sweepers will be provided to prevent (as far as is practicable) mud and debris being carried from within the site onto the public road.

Signage will be put in place to direct all vehicles to use wheel wash facilities. The track section between the wash facility and the public road will be surfaced with tarmac or clean hardcore and the area surrounding the facilities will be kept clean and in good condition.

The wheel wash facility, which will work on a closed cycle, shall be operated throughout the construction period. Wheel wash facilities will be located within a designated area of hardstanding at least 50 m from the nearest watercourse or 20 m from the nearest surface drain. It is expected that these facilities shall be sited adjacent to the site entrance, as shown in Plate 9.

Should debris be spread onto the site access or public road adjacent to the wind farm, then road sweepers will be quickly utilised to clean affected areas. Loose debris will also be periodically removed from on-site tracks. Also, all HGVs taking construction materials to and from the site will be sheeted to prevent the spillage or deposit of material on the highway.

Plate 9: Example of a dry ramp wheel wash facility



8.4.4 Concrete Pouring For Turbine Foundations

Methods to protect surface and groundwater from the batching and transportation of concrete are considered above.

To prevent pollution it is important that all concrete pours are planned and that specific procedures are adopted where there may be a risk of surface water or groundwater contamination, in accordance with CIRIA C532. These procedures will include:

- Ensuring that all excavations are sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and
- Ensuring that covers are available for freshly placed concrete to avoid the surface of the concrete washing away during heavy precipitation.

Typical foundation shuttering is shown in Plate 10 of this document.

Plate 10: Typical wooden shuttering – to be deployed around the turbine foundations during concrete pours



The excavated area will be back-filled with compacted layers of graded material from the original excavation, where this is suitable, and capped with peat or soil. Locally, around the turbines, the finished surface will be capped with crushed aggregate to allow for safe personnel access around the base of the turbine. The management of run-off from these areas is described in Section 3: The Management of Sediment and Surface Waters.

8.5 Hydrocarbon Contamination

8.5.1 Vehicle Maintenance

During the operation of the excavations, excavation machinery will be regularly maintained to ensure that there is minimal potential for fuel or oil leaks / spillages to occur. All maintenance will be conducted on suitable absorbent spill pads to minimise the potential for groundwater and surface water pollution. All machinery will be equipped with drip pans to contain minor fuel spillage or equipment leakages.

Appointed refuelling personnel will be trained in the correct methods of refuelling on site to ensure that pollution incidents are prevented and a quick response plan is implemented, should a spill occur, to minimise the impact of spills.

Plates 11 and 12 of this document display examples of dip pans and bunds.

Plates 11 and 12: examples of drip trays and bunds



8.5.2 Chemical Storage

Potentially contaminating chemicals stored on site will be kept within a secure bunded area to prevent any accidental spills from affecting hydrological resources. The bunded area will be within the construction compound and will be underlain by an impermeable ground membrane layer to reduce the potential pathways for contaminants to enter watercourses and groundwater.

Oil storage areas will be covered in order to prevent rainwater collecting within the bunded area.

Further detail is presented in Section 8.4.1: Accidental Spillage within Construction Compounds.

The chemicals storage area would be kept secure to prevent theft or vandalism. A safe system for accessing the storage area would be implemented by the Construction Contractor.

8.6 Borrow Working Drainage

Existing borrow workings used for the operational forestry would be extended and used for the Development. The following drainage measures will adequately protect the hydrological and hydrogeological resource.

8.6.1 Pre Earthworks Drainage

Temporary interception bunds and cut-off drainage ditches ('clean water drains') will be constructed upslope of the borrow pits and cuts to prevent surface water runoff entering the excavation.

SuDS measures, such as swales or retention ponds, will be implemented to convey and attenuate excess surface water flow away from borrow pits and excavations. Swales will be kept to a minimum length, depth and gradient with check dams, silt traps and buffer strips also utilised to minimise erosion, sedimentation at peak flows, where appropriate.

Swales to collect runoff will be placed on the downslope of borrow pits and overburden / stockpiles and will be designed to treat potentially silty runoff before discharging back into the drainage system.

The use of peat and soil stockpiles will be minimised by earthworks planning. However, where stockpiles are used, silt fences and straw bales wrapped in hessian or semi-permeable lining can be used to intercept sediment laden surface runoff in addition to swales and infiltration trenches.

8.6.2 Earthworks Drainage

Due to the low permeability of the overlying peaty soil deposits, it is unlikely that groundwater ingress from peat will be significant in borrow pit or earthworks areas. However, the bases of borrow pits and earthworks will have a gravity drainage system and all water will drain to an adequately sized sump.

If dewatering of borrow pits or excavations is necessary, waste water will be treated by designed settlement lagoons and retention ponds. 'Siltbusters' will be used to treat pumped / surplus water from lagoons or retention ponds during periods of heavy or persistent rainfall.

Flocculent could be employed in settlement lagoons and retention ponds to further facilitate the settlement of fine suspended solids before waste water is discharged to rough vegetation.

Waste water discharge onto vegetated surfaces from borrow workings and earthworks areas will be directed away from watercourses and drainage ditches to avoid direct and extended the treatment phases. Any sediment suspended within the treated water will be deposited amongst the rough surface vegetation. The Contractor's site manager will ensure that excessive sediment on vegetated surfaces does not accumulate.

Silt mats may be used at the outfalls of settlement lagoons and retention ponds to further aid the settlement of sediment from earthworks drainage.

During the operation of the borrow workings and during earthworks operations, excavation machinery will be regularly maintained to ensure that there is minimal potential for fuel or oil leaks / spillages to occur. All maintenance will be conducted on a bunded geotextile layer to reduce the potential for groundwater and surface water pollution.

8.6.3 Management of Drainage from Surplus Materials

Careful consideration will be given to the location of topsoil and subsoil storage areas for all areas of the Development during construction. Storage areas will be either in a flat dry area away from watercourses, or be protected by the addition of cut off drains above the storage areas to minimise the ingress of water.

Mineral soils will not be allowed to dry out and silt fences and mats will be employed to minimise sediment levels in run-off.

All stockpiled material will be stored at least 50 m from watercourses in order to reduce the potential from sediment to be transferred into the wider surface water system and will be regularly inspected to ensure that erosion of the material is not taking place.

8.7 Dust Suppression and Control

Water needed for dust suppression on the haul roads during periods of dry weather and the compound vehicle wash will be clean water. Clean water may be obtained from re-circulated clean or treated drainage waters.

Where required, water may be extracted from local watercourses or groundwater. In these instances, the Contractor will liaise with SEPA beforehand to agree abstraction locations, rates and CAR authorisation requirements.

Good practice measures will be adopted during construction to control the generation and dispersion of dust such that significant impacts on neighbouring habitats will not occur. The hierarchy for mitigation will be prevention, suppression then containment.

The following mitigation measures will be implemented to control the movement of dust within the Development site:

- Excavation and earthworks areas will be stripped as required in order to minimise exposed areas;
- During excavation works, drop heights from buckets will be minimised to control the fall of materials reducing dust escape;
- Completed earthworks and other exposed areas will be covered with topsoil and re-vegetated as soon as it is practical in order to stabilise surfaces.
- During stockpiling of loose materials, stockpiles shall exist for the shortest possible time;
- Material stockpiles will be low mounds without steep sides or sharp changes in shape;
- Material stockpiles will be located away from the site boundary, sensitive receptors, watercourses and surface drains;
- Material stockpiles will be sited to account for the predominant wind direction and the location of sensitive receptors;
- Water bowsers will be available on site and utilised for dust suppression during roadworks/ vehicle movements when and where required;
- Daily visual inspections will be undertaken to assess need for use of water bowsers; and
- Daily visual inspections will be undertaken to assess the condition of the junction of the site track with the B729 and its approaches.

8.8 Access Track Construction and Use

Prior to access track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow so that site drainage design will maintain hydrological connectivity. Site drainage design will be produced in advance of construction.

Floating roads will be used in areas of deeper peat in accordance with SNH guidance, Good Practice during Wind Farm Construction. Set out in the following sections are measures that will be incorporated into the design and installation of the access tracks.

8.8.1 Management of Surface Water

Access tracks will be designed to have adequate cross fall to avoid ponding of rainwater and surface run-off. Run-off from the access tracks and existing drainage ditches will be directed into swales that will be designed to intercept, filtrate and convey the runoff.

Check dams will be installed within the swales and existing drainage ditches in order to increase the attenuation of run-off.

Permanent swales and drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel and, therefore, reduce the potential for erosion. Further measures could include the use of

settlement ponds or possibly flocculent to further facilitate the settlement of suspended solids.

The Contractor would be responsible for the management of all surface water run-off, including the design and management of a drainage scheme compliant with SuDS principles. This may include settlement lagoons and retention ponds, incorporating natural or assisted attenuation.

8.8.2 Loose Track Material

Loose material from the use of access tracks will be prevented from entering watercourses by utilising the following measures:

- Silt fences will be erected between areas at risk of erosion and watercourses;
- Silt fences and swales will be inspected daily and cleaned out as required to ensure their continued effectiveness;
- Silt matting if required will be checked daily and replaced as required;
- Excess silt will be disposed of in designated areas at least 50 m away from any watercourses or drainage ditches;
- Cut off ditches will be implemented on slopes greater than 1 in 20;
- Swales and drains will be checked after periods of heavy precipitation;
- The inlets and outlets of settlement lagoons, retention basins and extended detention basins will be checked on a daily basis for blockages;
- The access tracks will be inspected on a daily basis for areas where water collects and ponds; and
- An example of a semi-permeable geotextile layer is shown in Plate 13 of this document.

Plate 13: semi-permeable geotextile layer



8.8.3 Material Excavated During Track Construction

Material excavated during track construction will either be stored adjacent to the track or within agreed spoil deposition areas and compacted in order to limit instability and erosion potential. Peat will not be allowed to dry out and silt fences will be employed if required to minimise sediment levels in run-off. Material will be stored at least 50 m from

watercourses in order to reduce the potential for sediment to be transferred into the wider hydrological system.

8.8.4 Watercourse Crossings

The use of in-situ fresh concrete in the construction of watercourse crossings will be avoided where possible by the use of pre-cast elements. Existing culverts may be upgraded and anticipated to be replaced with suitable pre-cast culvert designs. Ready-made concrete 'box style' or bottomless arched concrete or plastic culverts will be used.

Prior to access track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow. These sections may be spanned with plastic pipes if required to ensure hydraulic conductivity under the road, and reduce water flow over the road surface during heavy precipitation.

Culverts will be designed based on best practice^{8,9,10} in order to minimise effects of developments on the natural integrity and continuity of water courses. The design will incorporate the following criteria:

- Culverts will be well bedded to avoid settlement and protected by an adequate cover of road material;
- The substrate and side/ head walls will be reinforced in order to prevent erosion;
- The culverts will be designed such that it does not cause a barrier to movement of fish or other aquatic fauna;
- Culvert floors will have the same gradient (not exceeding a slope of 3 %) and level, and carry similar bed material and flow, as the original stream;
- There shall be no hydraulic drop at the culvert inlet or outlet;
- The width of the culvert will be greater than the active channel width of the watercourse;
- Culverts will be used to conduct water under the wind farm tracks; and
- Any fences or screens fitted on the inlet or outlet of the culvert will be designed to allow at least 230 mm of space between the bars of the screen of fence, up to the high water level.

8.9 Felling Measures

The following measures will be implemented during tree felling as part of the Development to ensure that harvesting methods are in accordance with good practice:

- Timber will be stacked on drier slopes at least 50 m from watercourses and not blocking roadside drains;
- Brash will not be stockpiled within 50 m of a watercourse;
- The area within 50 m of watercourses shall be regarded as a "sensitive area";
- During felling operations within "sensitive areas", silt traps or temporary dams will be used in local ditches to prevent sediment entering watercourses, and silt fences will be constructed locally between working areas and watercourses;
- Any work in "sensitive areas" to be approved by the Infrastructure Contractor's Project Manager and the Ecological Clerk of Works;
- If felling is to occur in the riparian zone (the interface between land and a flowing surface water body) of a watercourse, trees will be felled away from the watercourse;
- Brash mats will be used for vehicle trafficking to protect bare soils;

⁸ *Forest and Water Guidelines, 5th Edition*, Forestry Commission, 2011. [online] Available at: <http://www.forestry.gov.uk/website/forestry.nsf/byunique/inf8-8bvgx9> [Accessed 17/05/2015].

⁹ *Construction of River Crossings*, SEPA, 2008. [online] Available at: <http://www.sepa.org.uk/planning.aspx> [Accessed 17/05/2016].

¹⁰ *Culverting of Water courses: Position Statement*, SEPA, 2006. [online] Available at: http://www.sepa.org.uk/planning/engineering-water_environments.aspx [Accessed 17/05/2016].

- Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20;
- Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation; and
- Silt matting if used to be checked on a daily basis and replaced as required.

8.10 Handling of Mineral Soils

8.10.1 General Good Practice Measures

The excavation of each turbine foundation will generate excess material, the majority of which will typically be mineral soils. Excess material from other infrastructure will also be predominantly mineral soils.

As mentioned in Section 7: Access Track Construction and Use of this oWCEMP, floating roads will be used in areas of deeper peat in line with SNH guidance.

At turbine foundations topsoil will be stripped separately to sub soils, where possible aiming to keep the top layer of turf intact. This material will be stored adjacent to the base working area and will be limited in height to 2 m to minimise the risk of overheating. Subsoil will then be stripped and stored, keeping this material separate from the topsoil in accordance with guidance by SNH and SEPA.

In accordance with BS 3882 'Specification for Topsoil and Requirements for Use', any long term stockpiling of topsoil should not exceed 2.0 m in height with a maximum side slope of 1 in 2. In its dry non plastic state, topsoil can be stockpiled in a 'loose tipped' manner and tracked in a compactive method reducing water ingress. Wetter soils can be stored in windrows for drying and later stockpiled for re-use. The re-wetting of peat will be carried out, if there is a potential risk of the peat drying out.

8.10.2 Measures To Protect Groundwater Dependent Terrestrial Ecosystems and Abstractions

The following measures will ensure that water quality and the flow supply of groundwater and near-surface water are maintained during the construction and operational phase of the Development. Key measures include:

- Silt traps may be deployed to trap and filter sediment-laden run-off throughout the construction phase of the Development;
- Settlement lagoons may be constructed and actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall. The location and management of the settlement lagoons is essential and will not be sited within vulnerable wetland areas where they may cause drying out and direct loss of habitat;
- Flush areas, depressions or zones which may concentrate water flow, will be identified in advance of construction and a suitable drainage design shall be developed to address each location, to ensure hydraulic connectivity
- Site drainage design will avoid any severance of saturated areas to ensure hydrological connectivity is maintained. Site drainage design will be produced in advance of construction;
- The length of time excavations are kept open and the duration of any dewatering will be minimised;
- All excavations will be sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and

- Water from dewatering activities are generally treated by settlement lagoons and will be discharged onto vegetated surfaces, ensuring no net loss of water from the hydrological system. If ponding of water is observed during the discharge onto vegetated surfaces, additional measures may be employed.

8.11 Disposal of Waste Materials

Waste such as timber, metal, general waste *etc.* will be segregated on-site, and disposed of in a licenced waste facility off-site.

8.12 Monitoring Programme

A surface water and groundwater monitoring programme will be established prior to the construction phase of the Development. An indicative monitoring programme is set out below.

8.12.1 Surface Water Monitoring

Surface water monitoring would be undertaken at locations on the principal watercourses downstream of the Development infrastructure and upstream of other non-natural influences, where possible.

Regular visual inspections of surface watercourses are proposed, especially during major excavation works, as these allow rapid identification of changes in levels of suspended solids that could indicate construction related effects are occurring upstream. Potential effects can then be investigated and remedial action taken to prevent further effects, if necessary.

To supplement the visual inspections, it is anticipated that there would be a number of surface water monitoring points for extractive sampling and analysis. Details will be agreed in advance of construction.

The following sampling frequency is proposed in order to establish baseline hydrochemical conditions of surface water constituents:

- Once every month for twelve months prior to the construction phase.

The following sampling frequencies are proposed in order to monitor surface water conditions against baseline conditions:

- Once a week during ground breaking works and concrete works, e.g., access track construction, turbine foundations;
- Twice a month during minor construction works; and
- Twice a month for three months then once a month for a further 3 months during the post construction phase.

Establishing baseline conditions for surface waters will enable any trends in levels of critical parameters to be assessed and deviations from the norm identified and rectified through water management measures.

8.12.2 Monitoring Reporting

The results of all laboratory analysis of water samples will be tabulated and reports submitted to the client and contractor on a monthly basis.

8.12.3 Operational Phase Monitoring

Sampling and testing will be carried out during the operational phase when any major maintenance or construction works are undertaken that may give rise to pollution of surface water.

8.12.4 Monitoring Programme Summary

Any activity proving detrimental to water quality will be detected at the earliest opportunity during the construction and operational phases of the Development. This will allow action to be taken to prevent any further effect on water quality.

8.13 Decommissioning

During the decommissioning phase of the Development it is anticipated that access tracks would be removed and the area allowed to naturally re-vegetate. A full drainage reinstatement plan would be developed in advance of decommissioning the wind farm. Decommissioning activities will be undertaken in accordance with good practice at the time, and agreed with the relevant consultees in advance of the works commencing.

8.14 Conclusions and Recommendations

The purpose of this outline WCEMP is to detail appropriate water management measures to control surface water run-off, and drain infrastructure during the construction and operation of Shepherds' Rig Wind Farm. The measures detailed throughout this report would ensure that any effects on the surface and groundwater environment are minimised.

This document would be adapted to meet the additional requirements of the construction contractor and Ecological Clerk of Works, when appointed, to ensure that all measures implemented are effective and site-specific.

The WCEMP is considered to be a live document, such that modifications can be made following additional information and advice from consultees.

