Appendix 3.1

Carbon Balance and Generation

1.1 Potential Contribution of the Proposed Development to Government Objectives

Energy Yield

1.1.1 The Proposed Development comprises up to 14 wind turbines along with associated ancillary infrastructure as detailed in Chapter 3: Project Description and Construction Methods in the Environmental Impact Assessment Report (EIAR).

1.1.2 The installed capacity of the Proposed Development is estimated to be 92.4 MW (assuming 14 x 6.6 MW machines). Calculations of the likely electricity generation of the turbines are dependent on the 'capacity factor', which involves an assessment of the actual output of the Proposed Development against its installed capacity[1]. On this basis, the amount of electricity produced by the Proposed Development is estimated to be 215 GWh per year[2] based on the capacity factor of 26.6%[3].

1.1.3 The 26.6% capacity factor has been used to calculate potential annual energy yield for the Proposed Development, shown in **Table 1.1** below.

Carbon Dioxide Savings & Electricity Generation

1.1.4 It is widely accepted that electricity produced from wind energy has a positive benefit with regard to reducing CO_2 emissions. However, there has been much debate about the actual level of emissions savings that might arise from a wind farm development. In estimating the actual saving it is important to consider the mix of alternative sources of electricity generation, for example, coal, oil and gas powered. To represent this energy mix, Renewable UK recommend the use of a static figure of 446g of CO_2 saved for every kWh generated (Renewable UK, UKWED Figures explained, 2020). A figure of 446g of CO_2 savings per kWh has therefore been assumed for the purposes of this assessment, with savings of CO_2 estimated on a range of capacity factors.

1.1.5 The Department for Business, Energy and Industrial Strategy (BEIS) produces a range of statistics detailing electricity consumption across the UK. The average domestic consumption in the UK (as of December 2019) is 3,618 kWh[4].

1.1.6 The electricity generated by the Proposed Development will enter the National Grid, and therefore cannot be tracked to the individual consumer. Therefore, it is relevant to consider electricity demand in the context of Scotland as a whole, rather than within the surroundings of the Proposed Development.

[1] The net capacity factor of a wind farm is the ratio of its actual energy output (after energy losses within the wind farm have been accounted for) over a defined period of time (typically a year) to its energy output, had it operated at maximum power output continuously, over the same period of time.
[2] Estimated electricity generation based on the rolling Scottish average capacity factor of 26.6% is 215,307 MWh.
[3] Long term average figures for Scotland and the UK published by Department of Energy and Climate Change (DECC), Energy Trends Section 6: Renewables (ET6.1 Renewable Electricity Capacity and Generation, March 2019. Capacity factor for UK- https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437811/et6_1.xls.
[4] BEIS publication "Energy Consumption in the UK" (2020)

1.1.7 The potential electricity generation and 'Homes Equivalent' electricity generation figure (based on 3,618 kWh annual domestic consumption in UK) are provided in **Table 1.1.** Also presented, are the potential CO_2 savings with the Proposed Development generating electricity instead of conventional power stations, using an assumed 446g CO_2 per kWh generated.

Table 1.1 Potential CO_2 Savings and Electricity Generation

Capacity Factor (%)	Electricity Generation (MWh per year)[5]	Homes Equivalent (based on average consumption)[6]	Carbon dioxide savings (Tonnes of CO_2 per year) based on Renewable UK savings figure
26.6%	215,307	59,509	96,027

1.2 Carbon Balance of the Proposed Development

Overview

1.2.1 The following sections outline the specific values for the carbon losses and carbon gains associated with the Proposed Development. For each input parameter (as outlined in **Annex A** to this document), an expected minimum and maximum value is required to provide an expected, minimum and maximum scenario for the carbon payback.

1.2.2 For this application, version 1.6.1 of the online calculator was used on 30/11/2020, the reference number is not supplied in this document, but has been communicated separately to the Scottish Government's Energy Consents Unit (ECU) and relevant consultees.

1.2.3 A table containing the values for each scenario and the justification for the values used for the carbon balance calculations is found as **Annex A.**

Carbon Losses

1.2.4 The manufacturing, construction and installation (including the use of concrete) of the wind turbines as part of the Proposed Development has an associated carbon cost. Using figures from the online calculator, the expected carbon emission losses associated with the manufacturing, construction and decommissioning of 14 turbines (assuming 92.4 MW capacity), is 82,885 tonnes CO_2 equivalent (t CO_2e), which equates to approximately 42.0% of total CO_2 losses.

1.2.5 The carbon payback model attributes carbon losses due to the requirement for extra capacity to back up wind power generation at times of peak demand. This is quantified as a percentage of total capacity, which was input as 10% for this case (the recommended figure within the carbon payback model) and equates to 63,742t CO_2e (i.e. approximately 32.3% of total CO_2 losses).

1.2.6 Carbon losses associated with CO_2 release from soil organic matter for the expected scenario amount to 25,442t CO_2e which equates to approximately 12.9% of total CO_2 losses. These losses result from peat removal and drainage effects following excavation for items of infrastructure, notably turbine foundations, hard standings and access tracks, as well as borrow pits. It is worth noting that this figure assumes 100% loss of CO_2 from removed/disturbed peat, as this is the default value within the carbon payback model and cannot be amended. In reality, losses are likely to be considerably less than this, as it is expected that the majority of the peat would be used in reinstating the Site (see Appendix 12.2 Peat Management Plan [PMP]).

[6] This is calculated using the most recent statistics from BEIS showing that annual UK average domestic household consumption is 3,618kWh.

1.2.7 Carbon losses associated with CO_2 release from the proposed forestry to be felled is 24,532 t CO_2e which equates to approximately 12.4% of total CO_2 losses.

1.2.8 Small carbon losses are generated by the reduction of carbon fixing potential which occurs due to the potential loss of bog plants as a result of the construction of the Proposed Development. For the expected scenario, this is 920t CO_2e, which equates to 0.5% of total CO_2 losses.

Carbon Gains

1.2.9 There are very small carbon gains due to the potential reinstatement of peat within the borrow pits, and improvements in peatland quality elsewhere. Within the PMP it is anticipated that peat will be re-used for habitat restoration wherever practicable.

1.3 Carbon Payback of the Proposed Development

1.3.1 To calculate the carbon payback period, the online calculator uses three different fossil fuel displacement scenarios, which are updated automatically using data from the Digest of UK Energy Statistics (DUKES), prepared by BEIS:

- Grid mix, the mix of electricity sources supplying the UK as a whole;
- Coal fired for coal fired electricity generation; and
- Fossil fuel mix for fossil fuel sourced electricity generation alone.

1.3.2 Nayak *et al* 2011[7] recommend using the fossil fuel sourced grid mix scenario as the most appropriate for calculating the carbon payback time (the counterfactual). Based on this scenario, the payback for the Proposed Development is predicted to be 2 years for the expected outcome.

1.3.3 The payback period could be as low as 1 year for the minimum scenario but increases to 3.2 years for the maximum scenario for fossil fuel mix and 5.8 years for grid mix. The carbon payback for each scenario is shown in **Table 1.2** below.

Table 1.2 Payback in years for each Scenario used in the Carbon Calculator

Fuel source	Carbon payback time (years) Expected value	Carbon payback time (years) Minimum value	Carbon payback time (years) Maximum Value
Coal fired	1.0	0.5	1.6
Grid mix	3.6	1.8	5.8
Fossil fuel mix	2.0	1.0	3.2

[7] Nayak, D. R., Miller, D., Nolan, A., Smith, P. and Smith, J. (2008) Calculating carbon savings for wind farms on Scottish peatlands – A new approach, Corrected in 2010 (updated paper by Smith et al 2011).

1.4 Summary

1.4.1 It is predicted that the carbon loss from developing the Proposed Development will be paid back in approximately 2 years (5.7% of the 35 year operational life) based upon the fossil fuel mix and the expected scenario. Even considering the maximum scenario, the Proposed Development will have achieved carbon balance within approximately 5.8 years (16.5% of the 35-year operational life).

1.4.2 On the basis of potential annual CO_2 savings of 96,027 tonnes/year (based on figure of 446g of CO_2 savings per kWh and a load factor of 26.6%), the Proposed Development could result in a total carbon saving of approximately 3.36M tonnes over its 35 year operational life, and generate electricity to annually supply the equivalent of 59,509 average homes in UK.

Annex A

Carbon Calculator - Justification for Values Used

Input data	**Craiginmoddie Wind Farm (Proposed Development)**			**Comments/Assumptions**
	Expected	**Minimum**	**Maximum**	
Wind Farm Characteristics				
Dimensions				
No. of turbines	14	14	14	Number of turbines included in Proposed Development.
Lifetime of wind farm	35	35	35	The lifetime is 35 years – stated in Chapter 3: Project Description and Construction Methods of the EIA Report.
Power rating of turbines	6.6MW	6.6MW	6.6MW	6.6MW is the power rating of the proposed candidate turbine as outlined in Chapter 3: Project Description and Construction Methods of the EIA Report.
Capacity factor	26.6	20	30	Chapter 3: Project Description and Construction Methods of the EIA Report. Onshore wind load factor (BEIS). Maximum and minimum chosen as a range
Extra capacity required for back up	5	0	5	Following the guidance provided by *Nayak et al, UK Energy in brief 2013*[8] which confirms that wind energy accounts for less than 20% of total national electricity generation therefore 0% could be used however 5% has been used to reflect a worst case scenario 0% is entered as a minimum value.
Additional emissions due to thermal inefficiency of back up generation (%)	10	10	10	Default used by *Nayak et al 2011.*
Carbon dioxide emissions from turbines' life	Calculate w.r.t installed capacity			Total CO_2 emission calculated using installed capacity (default equation provided in spreadsheet).
Peatland Characteristics before wind development				
Average annual air temperature at site (oC)	10.0	7	12.9	Average annual temperature taken for Girvan Met Office station 1981-2010. Expected value calculated using average of minimum and maximum average temperatures.

[8] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224130/uk_energy_in_brief_2013.PDF

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	Minimum	Maximum	
Average peat depth at site	0.75	0.60	0.9	Expected value calculated as average value of all 1,193 peat depth measurements taken at site. Minimum and maximum values chosen as a range.
Content of dry peat % by weight	55	49	62	Calculated using typical values provided in carbon calculator tool
Average extent of drainage around drainage features at site (m)	7.5	5	10	No site-specific measurements available, precautionary values used.
Average water table depth at site (m)	0.6	0.4	0.8	Based on estimates of water table depth (Natural Power)
Dry soil bulk density (gcm^{-3})	0.25	0.20	0.3	Indicative figures from National Soil Inventory of Scotland have been used.
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	3	2	5	Estimated values, based on condition of the current vegetation.
Carbon accumulation due to C fixation by bog plants in undrained peat ($tC\ ha^{-1}\ yr^{-1}$)	0.25	0.12	0.31	Apparent C accumulation rate in peatland is 0.12 to 0.31 tC ha-1 yr-1 (Turunen et al., 2001; Botch et al., 1995). The SNH guidance uses a value of 0.25 tC ha-1 yr-1 .
Forestry Plantation Characteristics				
Enter simple data				
Area of forestry plantation to be felled (ha)	53.1	42.48	63.72	Chapter 13: Forestry in EIA Report. Minimum and maximum entered as a 20% range to allow for variations following detailed site investigation.
Average rate of carbon sequestration in timber	3.6	3.4	3.8	Figures from Cannell, 1999. min and max entered as a range.
Counterfactual emission factors				
Coal-fired plant emission factor tCO_2MWh^{-1}	0.920	0.920	0.920	Values provided automatically by online calculator, updated annually based on DUKEs.
Grid mix emission factor tCO_2MWh^{-1}	0.25358	0.25358	0.25358	Values provided automatically by online calculator, updated annually based on DUKEs.
Fossil fuel mix emission factor tCO_2MWh^{-1}	0.450	0.450	0.450	Values provided automatically by online calculator, updated annually based on DUKEs.
Borrow Pits				
Number of Areas	2	2	2	Chapter 3: Project Description and Construction Methods of the EIA Report.
Average length of area (m)	100.00	80.00	120.00	Chapter 3: Project Description and Construction Methods of the EIA Report. Maximum and minimum calculated as 10% range.
Average width of areas (m)	170.00	136.00	204.00	Chapter 3: Project Description and Construction Methods of the EIA Report. Maximum and minimum calculated as 10% range.

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Average depth of peat removed from area (m)	0.60	0.48	0.72	EIA Report - Technical Appendix 12.2. Peat Management Plan. Maximum and minimum calculated as 20% range
Access tracks				
Total length of access tracks (m)	10480	10365	10605	Chapter 3: Project Description and Construction Methods of the EIA Report. Minimum and maximum entered as a range to allow for variations following detailed site investigation.
Existing tracks length (m)	1240	1225	1265	Chapter 3: Project Description and Construction Methods of the EIA Report. Minimum and maximum entered as a range to allow for variations following detailed site investigation.
Length of access tracks that is floating road (m)	1870	1850	1890	Chapter 3: Project Description and Construction Methods of the EIA Report. Minimum and maximum entered as a range to allow for variations following detailed site investigation.
Floating road width (m)	5	5	5	Chapter 3: Project Description and Construction Methods of the EIA Report. Minimum value that the carbon calculator allows is 5 m
Floating road depth (m)	0	0	0	0 as no sinking expected.
Length of floating road that is drained (m)	0	0	0	Assume no drains required alongside floating roads
Average depth of drains associated with floating roads (m)	0	0	0.5	Assume no drains required alongside floating roads. Maximum drain depth of 0.5m required for worst case scenario.
Length of access track that is excavated road (m)	7370	7290	7450	Chapter 3: Project Description and Construction Methods of the EIA Report. Minimum and maximum entered as a range to allow for variations following detailed site investigation.
Excavated road width (m)	5	5	5	Tracks width 4.5m: Chapter 3: Project Description and Construction Methods of the EIA Report. Minimum value that the carbon calculator allows is 5 m
Average depth of peat excavated from road (m)	0.6	0.48	0.72	EIA Report - Technical Appendix 12.2. Peat Management Plan. Minimum and maximum entered as a 20% range to allow for variations following detailed site investigation.
Length of access track that is rock filled road (m)	0	0	0	Assumed that road on peat depth <1m is peat excavated and hence there is no rock filled road.
Rock filled road width (m)	5	5	5	N/A. Minimum Value that Carbon Calculator Tool Allows is 5m
Rock filled road depth (m)	0	0	0	No peat excavated for these tracks.

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Length of rock filled road that is drained (m)	0	0	0	N/A
Average depth of drains associated with rock filled roads (m)	0	0	0.5	N/A
Cable Trenches				
Length of any cable trench on peat that does not follow access track and is lined with a permeable material (m)	0	0	0	Assume full length of cable route to follow access track. EIA Report Technical Appendix 12.3: Peat Slide Risk Assessment.
Depth of cable trench	0.50	0.50	1.00	EIA Report Technical Appendix 12.3: Peat Slide Risk Assessment.
Additional peat excavated (not accounted for above)				
Volume of additional peat excavated (m3)	2040	1836	2244	Technical Appendix 12.2. Peat Management Plan. Maximum and minimum chosen as a range. The calculations do not include the temporary construction compound as it is anticipated all peat will be reinstated following completion of construction phase or used elsewhere i.e. peatland restoration.
Area of additional peat excavated (m2)	2400	2160	2640	Technical Appendix 12.2. Peat Management Plan. Maximum and minimum chosen as a range. The calculations do not include the temporary construction compound as it is anticipated all peat will be reinstated following completion of construction phase or used elsewhere i.e. peatland restoration.
Peat Landslide hazard				
Peat landslide hazard risk assessment	Negligible	Negligible	Negligible	Fixed value.
Improvement of C sequestration at site by blocking drains, restoration of habitat etc.				
<u>Improvement of degraded bog</u>				
Area of degraded bog to be improved (ha)	0	0	0	No bog restoration works proposed other than those in the borrow pits – see below.
Water table depth in degraded bog before improvement (m)	n/a	n/a	n/a	n/a
Water table depth in degraded bog after improvement (m)	n/a	n/a	n/a	n/a
Time required for hydrology and habitat of bog to return to its previous state on restoration (years)	n/a	n/a	n/a	n/a
Period of time when effectiveness of the improvement in degraded	n/a	n/a	n/a	n/a

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
bog can be guaranteed (years)				
Improvement of felled plantation	0	0	0	
Area of felled plantation to be improved (ha)	0	0	0	No expected improvement of felled plantation areas
Water table depth in felled area before improvement (m)	0	0	0	N/A
Water table depth in felled area after improvement (m)	0	0	0	N/A
Time required for hydrology and habitat of felled plantation to return to its previous state on restoration (years)	0	0	0	N/A
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	0	0	0	N/A
<u>Restoration of peat removed from borrow pits</u>				
Area of borrow pits to be restored (ha)	3.40	3.06	3.40	Restoration principally involves using peat excavated from elsewhere within the site as outlined in Technical Appendix 12.2. Peat Management Plan. Minimum = 10% less, maximum = the same as expected (full area of Borrow Pit).
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.6	0.4	0.8	Estimated water table depth in borrow pit before restoration. Using average water table depth values provided by Natural Power.
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0.3	0.2	0.4	Estimated restored water table depth expected
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	3	2	4	Estimated time input for the expected scenario, minimum and maximum entered as a range.
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	35	34	35	The restoration measures are expected to last the lifetime of the wind farm (i.e. following restoration to previous state).
<u>Removal of drainage from foundations and hardstanding</u>				
Water table depth around foundations and hardstanding before restoration	0	0	0	Assume no removal of drainage.

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Water table depth around foundations and hardstanding after restoration	0	0	0	N/A
Time to completion of backfilling, removal of any surface drains and full restoration of the hydrology (years)	0	0	0	No bog restoration works proposed other than those in the borrow pit – see below.
Restoration of site after decommissioning				
Will you attempt to block any gullies that have formed due to the wind farm?	Yes	Yes	No	Assumes that any gullies caused by construction of the wind farm would be blocked to maintain habitats except worst case scenario (maximum column).
Will you attempt to block all artificial ditches and facilitate rewetting?	No	No	No	No
Will the habitat of the site be restored on decommissioning				
Will you control grazing on degraded areas?	Yes	Yes	Yes	If required.
Will you manage areas to favour reintroduction of species	No	No	No	No
Construction Input Data				
Area 1 - Construction Input Data for turbines in organic matter <0.5m deep				
Number of turbines in this area	3	3	3	Number of turbines included in area.
Turbine foundations				
Depth of hole dug when constructing foundations	0.35	0.15	0.46	Average peat depth across turbines in this area. Technical Appendix 12.2. Peat Management Plan.
Approximate geometric shape of hole dug when constructing foundations	circular	circular	circular	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation.
Length at surface (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation.
Width at surface (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation.
Length at bottom (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation.

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Width at bottom (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Volume of concrete used in the entire area (m3)	2100	1680	2520	EIA Report Chapter 11: Traffic and Transportation.
Hardstanding				
Depth of hole dug when constructing hardstanding	0.5	0.4	0.6	Average peat depth across turbines in this area. Technical Appendix 12.2. Peat Management Plan.
Approximate geometric shape of hole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.7 - Typical Crane Hardstanding
Length at surface (m	55	55	55	EIA Report Chapter 11: Traffic and Transportation.
Width at surface (m)	35	35	35	EIA Report Chapter 11: Traffic and Transportation.
Length at bottom (m)	55	55	55	EIA Report Chapter 11: Traffic and Transportation.
Width at bottom (m)	35	35	35	EIA Report Chapter 11: Traffic and Transportation.
Is piling used?	No	No	No	Piling not likely to be used.
Area 2 - Construction Input Data – Turbines in peat between 0.5m and 1m				
Number of turbines in this area	8	8	8	Number of turbines included in Area.
Turbine foundations				
Depth of hole dug when constructing foundations	0.63	0.5	0.75	Average peat depth across turbines in this area. Technical Appendix 12.2. Peat Management Plan.
Approximate geometric shape of hole dug when constructing foundations	circular	circular	circular	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Length at surface (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Width at surface (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Length at bottom (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Width at bottom (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Volume of concrete used in the entire area (m3)	5600	4480	6720	EIA Report Chapter 11: Traffic and Transportation.
Hardstanding				
Depth of hole dug when constructing hardstanding	0.63	0.5	0.75	Average peat depth across turbines in this area. Technical Appendix 12.2. Peat Management Plan.
Approximate geometric shape of hole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.7 - Typical Crane Hardstanding
Length at surface (m	55	55	55	EIA Report Chapter 11: Traffic and Transportation.
Width at surface (m)	35	35	35	EIA Report Chapter 11: Traffic and Transportation.
Length at bottom (m)	55	55	55	EIA Report Chapter 11: Traffic and Transportation.
Width at bottom (m)	35	35	35	EIA Report Chapter 11: Traffic and Transportation.
Is piling used?	No	No	No	Piling not likely to be used.
Area 2 - Construction Input Data – Turbines in peat greater than1m				
Number of turbines in this area	3	3	3	Number of turbines included in Area.
Turbine foundations				
Depth of hole dug when constructing foundations	1.50	1.13	2.2	Average peat depth across turbines in this area. Technical Appendix 12.2. Peat Management Plan.
Approximate geometric shape of hole dug when constructing foundations	circular	circular	circular	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Length at surface (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Width at surface (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation

Input data	Craiginmoddie Wind Farm (Proposed Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Length at bottom (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Width at bottom (m)	20	20	20	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.3 - Typical turbine foundation
Volume of concrete used in the entire area (m3)	2100	1680	2520	EIA Report Chapter 11: Traffic and Transportation.
Hardstanding				
Depth of hole dug when constructing hardstanding	1.50	1.13	2.2	Average peat depth across turbines in this area. Technical Appendix 12.2. Peat Management Plan.
Approximate geometric shape of hole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Chapter 3: Project Description and Construction Methods of the EIA Report. Figure 3.7 - Typical Crane Hardstanding
Length at surface (m	55	55	55	EIA Report Chapter 11: Traffic and Transportation.
Width at surface (m)	35	35	35	EIA Report Chapter 11: Traffic and Transportation.
Length at bottom (m)	55	55	55	EIA Report Chapter 11: Traffic and Transportation.
Width at bottom (m)	35	35	35	EIA Report Chapter 11: Traffic and Transportation.
Is piling used?	No	No	No	Piling not likely to be used.