Appendix 16.1

Input Data for Carbon Calculator

Carbon Calculator Inputs	Dernacart	Explanation
Windfarm characteristics:		
No. of Turbines	8	
Duration of consent	30	
Power rating of 1 turbine (MW)	5	
Capacity factor	35%	
Backup - fraction of output to back up (%)	2	Output is 40MW; 5% is 2
Backup - Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10 (fixed)	
CO2 emissions from turbine life (tCO2/MW)	Calculate wrt installed capacity	
Characteristics of peatland before windfarm development:		
Type of peatland	Acid Bog	
average annual air temp	9.8	
average depth of peat at site (m)	1.2	
C Content of dry peat (% by weight)	49%	
average water table depth (m)	0.3	0.1m during saturated conditions (figure worst case scenario), however site worked and there is drainage so 0.3m or more is more likely.
Dry soil bulk density (g cm-3)	0.114 g cm-3	
Characteristics of bog plants:		
Time required for regeneration of bog plants after restoration (years)	30	Life time of restoration.

Carbon Calculator Inputs	Dernacart	Explanation
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha-1 yr-1)	0.1	0.25 tC ha-1 yr-1 is the value given by SNH guidance (not a sensitive input).
Forestry Plantation Characteristics:		
area of forestry to be felled (ha)	18ha	
Average rate of carbon sequestration in timber (tC ha-1 yr-1)	3.6	This is dependent on the yield class of the forestry. Carbon sequestered for yield class 16 m3 ha-1 y-1 = 3.6 tC ha-1 yr-1
Counterfactual emission factors:		
Fossil fuel-mix emission factor (t CO2 MWh-1)	0.45 (fixed)	The assumption to use this emission factor was made based on the reality that additional wind generation will displace fossil fuel generation and a mix of fossil fuels are used
Borrow pits (if any):		
no. of borrow pits	0	No borrow pits
average length of borrow pits (m)	0	Not applicable (N/A)
average width of borrow pits (m)	0	N/A
average depth of peat removed from pit (m)	0	N/A
Foundations and hard-standing area associated with each turbine:		
Method used to calculate CO2 loss from foundations and hard-standing	Rectangular with vertical walls	
average length of turbine foundation (m)	20	
average width of turbine foundation (m)	20	
average depth of peat removed from turbine foundations (m)	0.8	
average length of hard standing (m)	94	
average width of hard standing (m)	41	
average depth of peat removed from hard-standing (m)	0.8	

Carbon Calculator Inputs	Dernacart	Explanation
Volume of concrete (m3) used in construction of wind farm	4412	
Access tracks:		
Existing track length (m)	5760	Existing access track is 6650Km. However, 0.89km of this is to be upgraded and is therfore included in rock filled road.
length of access track that is floating road (m)	0	No floating roads.
Floating road width (m)	0	N/A
floating road depth (m)	0	N/A
Length of floating road that is drained (m)	0	N/A
Average depth of drains associated with floating roads (m)	0	N/A
Length of access track that is excavated road (m)	5290	Length of new access track on peat and existing to be upgraded on peat (4.4km + 0.89)
Excavated road width (m)	5	Actually 4.5m but the carbon calculator only goes as low as 5m
Average depth of peat excavated for road (m)	1.2	This is the avergae across the site. Depths ranges from between 0.2m to 1.6m
Length of access track that is rock filled road (m)	1360	All new access track not located on peat aswell as any of existing track to be upgraded (if not on peat).
Rock filled road width (m)	5	Actually 4.5m but the carbon calculator only goes as low as 5m
Rock filled road depth (m)	1	
Length of rock filled road that is drained (m)	1360	Total restored and new access track not on peat.
Average depth of drains associated with rock filled roads (m)	0.15	Swale depth.
total length of access track (m)	12410	Total existing (5760-890)+ length of new access on peat/upgraded road on peat (4400-890)+rock filled road (5760-4440) = 12410

Carbon Calculator Inputs	Dernacart	Explanation
Cable Trenches:		
Length of any cable trench on peat that does not follow access tracks and is lined awith a permeable medium eg. sand (m)	0	N/A
Average depth of peat cut for cable trenches (m)	0	N/A
Additional peat excavated (not already accounted above):		
Volume of additional peat excavated (m3)	0	None
Area of additional peat excavated (m2)	0	None
Peat landslide Hazard	negligible	
Improvement of C sequestration at site by blocking drains, restoration of habitat, etc.		
Area of degraded bog to be improved (ha)	0	None
Water table depth in degraded bog before improvement (m)	0	N/A
Water table depth in degraded bog after improvement (m)	0	N/A
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	30	The number of years the wind farm will be operational for;30yr is the max no the calculator will take)
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	30	The number of years the wind farm will be operational for;30yr is the max no the calculator will take)
Area of felled plantation to be improved (ha)	2	While no restoration/regeneration is envisaged, the lowest figure the carbon calculator accepts is 2 years.
Water table depth in felled area before improvement (m)	0	N/A
Water table depth in felled area after improvement (m)	0	N/A
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	30	The number of years the wind farm will be operational for;30yr is the max no the calculator will take)

Carbon Calculator Inputs	Dernacart	Explanation
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	30	The number of years the wind farm will be operational for;30yr is the max no the calculator will take)
Area of borrow pits to be restored (ha)	0	N/A
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0	N/A
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0	N/A
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	1	1 year is the smallest unit the carbon calculator accepts.
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	2	2 years is the smallest unit the carbon calculator accepts
Water table depth around foundations and hardstanding before restoration (m)	0	Not applicable
Water table depth around foundations and hardstanding after restoration (m)	0	Not applicable
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	0.1	0.1 years is the smallest unit the carbon calculator accepts
<u>Restoration of site after decomissioning:</u>		
Will the hydrology of the site be restored on decommissioning - Will you attempt to block any gullies that have formed due to the windfarm?	No	No, site is used as farmland and will continue to be used for farming throughout including after decomissioning
Will the hydrology of the site be restored on decommissioning - Will you attempt to block all artificial ditches and facilitate rewetting?	N/A	N/A
Will the habitat of the site be restored on decommissioning? - Will you control grazing on degraded areas?	N/A	N/A
Will the habitat of the site be restored on decommissioning? - Will you manage areas to favour reintroduction of species?	N/A	N/A