Gains due to site improvement

Note: Note, CO_2 losses are calculated using two approaches: IPCC default methodology and more site specific ec
no site detail. The new equations have been thoroughly tested against experimental data (see Nayak et al, 2008 - F

Selected Methodology =	
Type of peatland =	

Reduction in GHG emissions due to improvement of site

	Improvement of…
1. Description of site	
Period of time when effectiveness of the improvement can be guaranteed (years)	
Area to be improved (ha)	
Average air temperature at site (^oC)	
Depth of peat drained (m)	
Depth of peat above water table before improvement (m)	
Depth of peat above water table after improvement (m)	
2. Losses with improvement	
Flooded period (days $year^{-1}$)	
Time required for hydrology and habitat to return to its previous state on restoration (years)	
Improved period (years)	
Methane emissions from improved land	
Site specific methane emission from improved soil on acid bogs (t CH_4-C ha^{-1} yr^{-1})	
Site specific methane emission from improved soil on fens (t CH_4-C ha^{-1} yr^{-1})	
IPCC annual rate of methane emission on acid bogs (t CH_4-C ha^{-1} yr^{-1})	
IPCC annual rate of methane emission on fens (t CH_4-C ha^{-1} yr^{-1})	
Selected annual rate of methane emission (t CH_4-C ha^{-1} yr^{-1})	
CH_4 emissions from improved land (t CO_2 equiv.)	
Carbon dioxide emissions from improved land	
Site specific CO_2 emission from improved soil on acid bogs (t CO_2 ha^{-1} yr^{-1})	
Site specific CO_2 emissions from improved soil on fens (t CO_2 ha^{-1} yr^{-1})	
IPCC annual rate of carbon dioxide emission on acid bogs (t CO_2 ha^{-1} yr^{-1})	
IPCC annual rate of carbon dioxide emission on fens (t CO_2 ha^{-1} yr^{-1})	
Selected annual rate of carbon dioxide emission (t CO_2 ha^{-1} yr^{-1})	
CO_2 emissions from improved land (t CO_2)	
Total GHG emissions from improved land (t CO_2 equiv.)	
3. Losses without improvement	
Flooded period (days $year^{-1}$)	
Time required for hydrology and habitat to return to its previous state on restoration (years)	
Improved period (years)	
Methane emissions from unimproved land	
Site specific methane emission from unimproved soil on acid bogs (t CH_4-C ha^{-1} yr^{-1})	
Site specific methane emission from unimproved soil on fens (t CH_4-C ha^{-1} yr^{-1})	
IPCC annual rate of methane emission on acid bogs (t CH_4-C ha^{-1} yr^{-1})	
IPCC annual rate of methane emission on fens (t CH_4-C ha^{-1} yr^{-1})	

Selected annual rate of methane emission (t CH_4-C ha^{-1} yr^{-1})
CH_4 emissions from unimproved land (t CO_2 equiv.)
Carbon dioxide emissions from unimproved land
Site specific CO_2 emission from unimproved soil on acid bogs (t CO_2 ha^{-1} yr^{-1})
Site specific CO_2 emissions from unimproved soil on fens (t CO_2 ha^{-1} yr^{-1})
IPCC annual rate of carbon dioxide emission on acid bogs (t CO_2 ha^{-1} yr^{-1})
IPCC annual rate of carbon dioxide emission on fens (t CO_2 ha^{-1} yr^{-1})
Selected annual rate of carbon dioxide emission (t CO_2 ha^{-1} yr^{-1})
CO_2 emissions from unimproved land (t CO_2)
Total GHG emissions from unimproved land (t CO_2 equiv.)
RESULTS **4. Reduction in GHG emissions due to improvement of site**
Total GHG emissions from improved land (t CO_2 equiv.)
Total GHG emissions from unimproved land (t CO_2 equiv.)
Reduction in GHG emissions due to improvement (t CO_2 equiv.)
Additional CO_2 payback time of windfarm due to site improvement
…coal-fired electricity generation (months)
…grid-mix of electricity generation (months)
…fossil fuel - mix of electricity generation (months)

Click here to move to Payback Time Click here

Gains due to site improvement

Note: Note, CO_2 losses are calculated using two approaches: IPCC default methodology and more site specific ec
no site detail. The new equations have been thoroughly tested against experimental data (see Nayak et al, 2008 - F

quations derived for this project. The IPCC methodology is included because it is the established approach, although it contains
Final report).

Site specific (required for planning applications)
Acid Bog

Expected result				
Degraded Bog	**Felled Forestry**	**Borrow Pits**	**Foundations & Hardstanding**	**Degraded Bog**
40	40	40	50	15
6.93	0	3.8	0	0
8.5	8.5	8.5	8.5	8
0.37	0.37	0.20	0.37	0.00
0.10	0.00	0.10	0.00	0.00
0.09	0.00	0.09	0.00	0.00
178	178	178	178	178
10	10	10	2	5
30	30	30	48	10
0.158	0.493	0.158	0.493	0.492
0.231	0.559	0.231	0.559	0.559
0.040	0.040	0.040	0.040	0.040
0.219	0.219	0.219	0.219	0.219
0.158	0.493	0.158	0.493	0.492
491	0	269	0	0
2.19	0.13	2.19	0.13	0.00
6.44	4.83	6.44	4.83	4.55
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
2.19	0.13	2.19	0.13	0.00
233	0	128	0	0
724	**0**	**397**	**0**	**0**
0	0	0	0	0
10	10	10	2	5
30	30	30	48	10
0.139	0.493	0.139	0.493	0.492
0.209	0.559	0.209	0.559	0.559
0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000

0.139	0.493	0.139	0.493	0.492
0	0	0	0	0
2.51	0.13	2.51	0.13	0.00
6.92	4.83	6.92	4.83	4.55
35.20	35.20	35.20	35.20	35.20
35.20	35.20	35.20	35.20	35.20
2.51	0.13	2.51	0.13	0.00
523	0	287	0	0
523	**0**	**287**	**0**	**0**
724	0	397	0	0
523	0	287	0	0
-202	**0**	**-111**	**0**	**0**

0	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**

quations derived for this project. The IPCC methodology is included because it is the established approach, although it contains
Final report).

Minimum result				Maximu
Felled Forestry	**Borrow Pits**	**Foundations & Hardstanding**	**Degraded Bog**	**Felled Forestry**
40	25	50	5	40
0	0	0	6.93	0
8	8	8	12	12
0.00	0.27	0.00	5.80	5.80
0.00	0.10	0.00	0.50	0.00
0.00	0.25	0.00	0.09	0.00
178	178	178	178	178
2	10	3	15	2
38	15	47	0	38
0.492	0.014	0.492	0.170	0.506
0.559	0.045	0.559	0.233	0.562
0.040	0.040	0.040	0.040	0.040
0.219	0.219	0.219	0.219	0.219
0.492	0.014	0.492	0.170	0.506
0	0	0	177	0
0.00	8.76	0.00	3.12	1.06
4.55	24.25	4.55	8.41	6.80
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	8.76	0.00	3.12	1.06
0	0	0	111	0
0	**0**	**0**	**287**	**0**
0	0	0	0	0
2	10	3	15	2
38	15	47	0	38
0.492	0.137	0.492	0.007	0.506
0.559	0.209	0.559	0.002	0.562
0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000

0.492	0.137	0.492	0.007	0.506
0	0	0	0	0
0.00	2.38	0.00	19.20	1.06
4.55	6.64	4.55	56.70	6.80
35.20	35.20	35.20	35.20	35.20
35.20	35.20	35.20	35.20	35.20
0.00	2.38	0.00	19.20	1.06
0	0	0	1331	0
0	**0**	**0**	**1331**	**0**
0	0	0	287	0
0	0	0	1331	0
0	**0**	**0**	**1043**	**0**

0	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**

m result	
Borrow Pits	**Foundations & Hardstanding**
20	50
24	3
12	12
0.27	5.80
0.27	0.30
0.05	0.00
178	178
20	3
0	47
0.275	0.506
0.345	0.562
0.040	0.040
0.219	0.219
0.275	0.506
1483	1241
2.01	1.06
7.23	6.80
0.00	0.00
0.00	0.00
2.01	1.06
370	89
1853	**1331**
0	0
20	3
0	47
0.024	0.018
0.039	0.029
0.000	0.000
0.000	0.000

Note: Methane emissions from acid bogs. Equation derived by regress measurements (Nayak et al, 2009). The equation derived was
R_{CH4} = (1/1000) x (500 × exp(-0.1234 × (Wx100)) + ((3.529 × T)
where R_{CH4} is the annual rate of CH_4 emissions (t CH_4-C (ha)$^{-1}$ yr^{-1}),
T = average annual air temperature (°C) and
W is the water table depth (m).
The equation shows a significant correlation with measurements (r^2 =
Evaluation against 7 independent experiments shows a significant as
average error of 27 t CH_4-C ha^{-1} yr^{-1} (significance not defined due to la

Note: Methane emissions from fens. Equation derived by regression a from 35 measurements (Nayak et al, 2009). The equation derived was
R_{CH4} = (1/1000) x (-10+563.62 x exp(-0.097 x (W x 100))+(0.662 x T))
where R_{CH4} is the annual rate of CH_4 emissions (t CH_4-C (ha)$^{-1}$ yr^{-1}),
T = average annual air temperature (°C) and
W is the water table depth (m).
The equation shows a significant correlation with measurements (r^2 =
Evaluation against 7 independent experiments shows a significant as
an average error of 164 t CH_4-C ha^{-1} yr^{-1} (significance not defined due

R_{CO2} = (3.667/1000) x ((6700 x exp(-0.26 x exp(-0.0515 × ((W
where R_{CO2} is the annual rate of CO_2 emissions (t CO_2 (ha)$^{-1}$ yr^{-1}),
T = average annual peat temperature (°C) and
W is the water table depth (m).
The equation shows a significant correlation with measurements (r^2 =0
Evaluation against 29 independent experiments shows a significant a
an average error of 3023 t CO_2 ha^{-1} yr^{-1} which is non-significant (P<0.0

Note: Carbon dioxide emissions from fens. Equation derived by regres measurements (Nayak et al, 2009). The equation derived was
R_{CO2} = (3.667/1000) x (16244 x exp(-0.175 x exp(-0.073 x ((W
where R_{CO2} is the annual rate of CO_2 emissions (t CO_2 (ha)$^{-1}$ yr^{-1}),
T = average annual peat temperature (°C) and
W is the water table depth (m).
The equation shows a significant correlation with measurements (r^2 =
Evaluation against 18 independent experiments shows a significant a
an average error of 2108 t CO_2 ha^{-1} yr^{-1} (significance not defined due t

Note: Methane emissions from acid bogs. As above

Note: Methane emissions from fens. As above

0.024	0.018
0	0
10.75	12.11
29.71	34.47
35.20	35.20
35.20	35.20
10.75	12.11
3871	1988
3871	**1988**
1853	1331
3871	1988
2018	**658**
0	**0**
-1	**0**
0	**0**

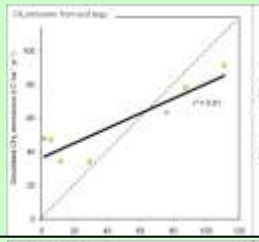
Note: CO_2 emissions from acid bogs. As above

Note: CO_2 emissions from fens. As above

sion analysis against 57

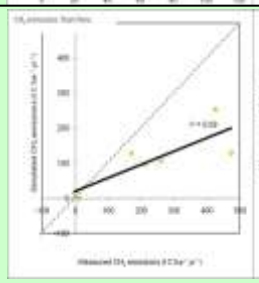
- 36.67))

0.54, *P* > 0.05).
sociation (r^2 = 0.81; P>0.05) and an
ck of replicates - Smith et al, 1997).



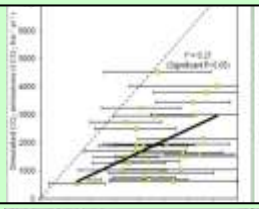
nalysis against experimental data
s

0.41, *P* >0.05).
sociation (r^2 = 0.69; P>0.05) and
to lack of replicate-Smith et al, 1997)



x100)-50)))) + ((72.54 × *T*) - 800))

0.53 *P* > 0.05).
ssociation (r^2 = 0.21; P>0.05) and
05) (Smith et al, 1997).



ssion analysis against 44

x100)-50)))+(153.23 x *T*))

0.42, *P* > 0.05).
ssociation (r^2 = 0.56; P>0.05) and
o lack of replicates-Smith et al, 1997)