A4. DEVELOPMENT DESCRIPTION

A4.1 INTRODUCTION

Chapter 4 of the 2009 ES described the proposed Viking Wind Farm in terms of the numbers and locations of turbines and other associated infrastructure. Since 2009 a number of changes have been made to the proposed design. This Addendum chapter describes the changes, and the reasons for which they have been put in place. This chapter should be read in conjunction with Chapter 4 of the 2009 ES. Figures A4.1.1 and A4.1.2 illustrate the proposed revised wind farm layout, and Figures A4.1.1b and A4.1.2b illustrate the features which have been deleted; and a list of turbine and anemometry mast co-ordinates (indicating deleted features) is provided at Appendix A4.2.

It is very important to read Chapter A1, the Introduction to this ES Addendum, before reading this Chapter A4. Chapter A1 describes the background to the changes, the philosophy and approach which guided them, and the extensive (and continuing) consultations with stakeholders which inform the changes.

With two exceptions, all changes to the infrastructure of the proposed wind farm consist of deletions of components. These deletions include a total of 23 turbines, 14 km of access track, two anemometer masts and one construction compound. All of the development proposed for the Collafirth quadrant (north of the B9071 and east of the A968) has been deleted.

One turbine (number N132 in south Nesting) would move by about 200m to the north-east in the revised project design. Adjustments would also be made to the access track which services it.

Three "primary borrow pit areas of search" and eight "secondary" areas have been deleted from the proposals, due to reduced requirement for aggregate and greater certainty about the site conditions. Please see paragraph A4.3.2 for further details.

One new area of search for a borrow pit has been added and assessed in detail.

A4.2 CORE DEVELOPMENT COMPONENTS

A4.2.1 Turbines

The proposed number of turbines has been reduced by 23 turbines from 150 to 127. Details of the turbines themselves are as published in the 2009 ES. Suitable wind turbines have a capacity of 3 MW to 3.6 MW, which means that the maximum overall electrical capacity for the proposed wind farm is reduced from 540MW to 457.2MW.

In the 2009 ES the turbines were numbered from 1 to 150 with a prefix letter indicating their quadrant location: D for Delting, C for Collafirth, K for Kergord and N for Nesting. In the revised design the numbering scheme remains unchanged. Table A4.2 below lists the turbines which have been deleted and the main reasons for their deletion.

A single turbine, N132, has been moved by 200m to the north-east of its 2009 proposed location. This adjustment has been made possible through the deletion of four nearby turbines - N133 to N136 - from the proposed design. This provides the opportunity to move N132 thus increasing the distance from neighbouring Nesting settlements, shortening the length of track required to access it and giving a more productive location. Table A4.1 below gives details of the revised location.

Table A4.1: Revised details of turbine N132

Turbine No.	Original			New		
	East	North	Location	East	North	Change
N132	444225	1156040	Flamister	444379	1156174	200m NE

Table A4.2: Deleted turbines

Turbine No.	East	North	Location	Main Reason(s) for deletion
D1	440543	1172273	Hill of Graven	Impacts on radar at Scatsta Airport; impacts on the settings of certain cultural heritage assets; impacts on ornithology (in particular diver, whimbrel and merlin); visual impacts on nearby residences.
D2	440769	1171937	Green Hill	
D3	440509	1171471	Green Hill	
D4	439202	1170442	Meadow of Fitchin	
D8	440546	1170793	Meadow of Fitchin	Risk of impacts on red-throated diver through displacement and collision.
D19	438757	1170561	Hill of Trondavoe	As for Turbines D1-D4.
D20	439141	1169375	Dalescord Hill	As for Turbine D8.
D21	438824	1168942	Dalescord Hill	Conflict with aviation interests at Scatsta.
D22	439139	1168585	Dalescord Hill	
C34	442373	1166236	E of Hill of Susetter	Impacts on ornithology and non-avian ecology; disturbance of peat; impacts on landscape character and visual amenity.
C35	442886	1166253	E of Hill of Susetter	
C36	442727	1165758	E of Hill of Susetter	
C37	442681	1165233	E of Hill of Susetter	
C38	442210	1165397	E of Hill of Susetter	
C39	442083	1164673	E of Hill of Susetter	
C40	442524	1164723	E of Hill of Susetter	
C41	443006	1164784	E of Hill of Susetter	
K65	436858	1154189	SW of Truggles Water	Risk of collision for whimbrel.
N133	444039	1155540	Flamister	Risk of collision for whimbrel and red throated diver; impacts on landscape character and visual amenity.
N134	444511	1155631	Flamister	
N135	445047	1155790	Flamister	
N136	444754	1156134	Flamister	
N146	446237	1156924	SW of Black Water	

A4.2.2 Tracks

The proposed track network has been reduced in length by approximately 14 km, from about 118 km to about 104 km. In almost every case this has been achieved by deleting track where it is no longer required due to turbine deletion. However, 2,704 m of track from the B9071 near Setter, leading southwards towards Marro Field and West Kame, has also been deleted following a review of construction and operational access requirements. Following consultation with Shetland Islands Council Roads Service and nearby residents the operational access at Newing, and associated 789 m of track, has also been deleted to remove the risk of construction traffic disturbance to local residents at Newing and Catfirth on the B9075.

The single additional section of track is in the south-west part of Nesting quadrant, near to Flamister. Here, four turbines (N133 to N136) have been deleted, and one turbine (N132) moved by 200m to the north-east as described above. This provides the opportunity to delete 2,741 m of track which serviced the original proposed locations of the deleted turbines, and to replace it with 655 m of track following the contours on the more direct route between the new location of N132 and N137, approximately 637 m to the north-east. The net reduction in track length in this area is therefore 2,086m.

The track design has been changed since the 2009 ES, in that double-width tracks would now be constructed to 10m running width, compared with 12m in the 2009 design. This would result in:

- Reduced effect on the natural heritage
- Reduced excavation of peat
- Reduced requirement for aggregate from borrow pits for road construction
- Reduced construction activity and lorry movements
- Reduced carbon footprint for the project
- Reduced landscape character and visual impact

Furthermore, VEP commits to restoring all of the double-width tracks to single-width at the end of the construction phase, thereby reducing ongoing visual impacts.

All other details of the track network remain unchanged, including methods of construction and drainage. The 2009 ES provided tabulated details of the lengths of track which would be constructed by different methods. That table is updated here and provided as Table A4.3:

Table A4.3: Track construction method

The following table distinguishes between "cut" and "fill" track construction methods based on the assumption that tracks will be constructed using the "cut" method where underlying peat is up to 1m deep, and using the "float" method where the peat is deeper.

Track Method	**Delting**		**Kergord**		**Nesting**		**Collafirth***		**Totals**		**Total**
	Cut (km)	Floating (km)	Cut (km)	Floating (km)	Cut (km)	Floating (km)	Cut (km)	Floating (km)	**Cut (km)**	**Floating (km)**	**TOTAL (km)**
Single Width (mainly 6m width, but including 1.36km of lower specification Borrow Pit Access at 3.5m width)	4.97	16.91	8.46	20.06	2.77	24.18			**16.20**	**61.15**	**77.35**
Double Width (10m width, reducing to 6m post-construction)	3.85	3.80	1.53	5.49	3.86	8.62			**9.24**	**17.91**	**27.15**
TOTAL	**8.82**	**20.71**	9.99	25.55	**6.63**	**32.8**			**25.44**	**79.06**	**104.5**

* The Collafirth quadrant has been deleted in its entirety from the design presented in the 2009 ES. No tracks will be constructed in this area.

A4.2.3 Stream crossings

Because of the reduced length of tracks, the number of new stream crossings required has fallen by 18, from 97 to 79. The stream crossings no longer required comprise nine CAR-regulated crossings and nine unregulated crossings. See Addendum Chapter A14 for further details.

A4.2.4 On-site cabling

The length of on-site cabling required would be reduced from about 118 km to about 104 km due to the reduced number of turbines and the altered track network.

A4.2.5 Anemometers

Two permanent anemometer masts have been deleted from the proposed layout, as detailed in Table A4.4. The grid references of the remaining masts are detailed in Table A4.5.

Table A4.4: Deleted anemometer masts

East	**North**	**Location**
438559	1170449	Hill of Trondavoe
441955	1164615	SE of Hill of Susetter

Table A4.5: Retained anemometer masts

East	North	Location
442159	1171782	Hill of Neegarth
438390	1166600	Duddin Hill
444171	1161728	Riven Hill
442088	1158798	Hoo Kame
446208	1158337	Hill of Area
442586	1155513	Crooka Dale
440901	1155783	Whaa Field
437272	1152641	South Mid Field
437300	1156667	North Mid Field

A4.3 ASSOCIATED DEVELOPMENTS

A4.3.1 Connection and High Voltage Direct Currant (HVDC) converter stations

The Viking Wind Farm would require a transmission connection to the national electrical grid. A proposed connection has been developed by the regional electricity company, Scottish Hydro Electric Transmission Ltd (SHETL). SHETL has submitted various consent applications for component parts of that connection, accompanied by their own Environmental Statements. Although the projects are mutually dependent, the applications are separate and are being dealt with by separate planning processes. SHETL has received outline consent for an HVDC converter station in Moray and consent under Section 34 of the Coast Protection Act for a sub-sea cable. A sister HVDC converter station in Shetland is awaiting determination.

A4.3.2 Borrow pits

23 "areas of search" for borrow pits (quarries for the winning of aggregate, mainly for use in access track construction) were discussed in the 2009 ES (see for example Figures 4.1.1 and 4.1.2 in that document). These consisted of 15 "primary" areas of search and eight "secondary" areas of search. The primary areas of search were shown with a pink fill on those figures, and the secondary areas with a green fill. Of the 15 primary areas of search, 14 were assessed in detail and the assessments reported in Appendix 14.2, the Borrow Pit Report. The primary area of search which, for operational reasons, was not subjected to detailed assessment in 2009 was that on the east side of the A970 at Hamarigrind Scord.

The changes to the wind farm design described in this ES Addendum mean that less aggregate is required. Consequently, three primary areas of search (including that at Hamarigrind Scord) and all eight secondary areas of search have been deleted from the proposals, as listed in Table A4.6. One additional area of search has been set in Kergord, as listed in Table A4.7. 13 borrow pit areas of search are therefore now proposed, compared with 23 in the 2009 proposals. (Only 12 borrow pits would actually be opened – see Table A4.8.)

In the 2009 ES the total area which would be affected by the wind farm was calculated including the whole of the areas of search for borrow pits. More than 12 months on, greater certainty about the aggregate requirements and site conditions has allowed VEP to

provide more refined detail about the likely extent of each of the borrow pits, and this information is provided in Table A4.8.

Table A4.6: Deleted areas of search for borrow pits

East	North	Location	Primary/secondary
441739	1166027	South-east of Easterscord	Primary
441547	1160314	East of A970 at Hamarigrind Scord	Primary
446560	1155720	North-west of B9075 at Newing	Primary
439325	1170549	Meadow of Fitchin	Secondary
439254	1170194	West of Burn of Westerbutton	Secondary
441489	1167092	North of Gardie Hill	Secondary
441847	1166236	East of Easterscord	Secondary
442581	1160460	Mossy Hill	Secondary
444604	1156733	Hill of Flamister	Secondary
438615	1157336	Scalla Field	Secondary
438490	1156440	North-east of Lamba Water	Secondary

Table A4.7: Additional area of search for borrow pits

East	North	Location
439130	1155950	South of Vats Houll, Kergord

Table A4.8: Indicative extents of remaining borrow pits

ID	Width (m)	Length (m)	Area (m^2)*	Estimated peat depth (m)	Comments
DBP01	65	87	2,981	0.8	Due to the existing SSSI this BP would not be restored using peat.
DBP02	114	174	17,190	0.6	
DBP03	109	124	12,130	0.5	
KBP01	65	200	12,350	0.8	
KBP02	116	130	14,140	0.8	
KBP03	123	130	14,690	0.9	
KBP04	112	128	13,410	0.3	
KBP05	65	94	5,725	0.9	New in 2010: NGR 439130, 1155950
NBP01	126	228	25,360	1.1	
NBP03	90	93	7,403	0.8	Either NBP03 or NBP04 would be used, not both.
NBP04	68	130	9,371	0.8	
NBP05	114	208	21,700	0.4	
NBP06	150	160	21,460	0.7	
Total area (with NBP03)			**168,539**		
Total area (with NBP04)			**170,507**		

* Calculated area may not match a simple calculation of width by length as actual borrow pit design may be irregular.

A4.3.3 Modifications to public roads

Chapter 4 of the 2009 ES described changes which would be made to the public road network to allow turbine components to be delivered to the site. No changes are proposed to the arrangements described then, except that the access to the Collafirth quadrant from the A968 near Garth of Susetter would now not be required.

In addition, two operational accesses have been removed that would have involved the introduction of minor junctions to existing b-roads near Setter, south-west of Voe, and at Newing, in South Nesting.

SNH suggested three changes to the plan to protect Sandwater SSSI. These changes have been adopted and include that any relevant road alterations will take place on the north side of the existing B9075, so that the works do not encroach into the SSSI. It has also been agreed that construction methods, pollution prevention measures and details of water crossings and culverting will be fully agreed with SEPA, and ultimately implemented and controlled by the Ecological Clerk of Works. The third accepted suggestion related to toilet, washroom and kitchen facilities for workers at the construction compound, near to Sandwater, which will now be in the form of sealed units which are regularly maintained and emptied to ensure no waste water spills from them. Further details of these measures are given in chapter A15, Roads and Traffic.

A4.4 CONSTRUCTION DETAILS

A4.4.1 Construction activities, programme, workforce and working hours

Although the proposed wind farm would be smaller than had been envisaged, at this stage it is felt unlikely that any significant change would be made to the methods of construction or the expected construction duration. However, with an extensive construction period it is possible that improved techniques will be developed. If VEP proposes to adopt different methods they will first be discussed with and approved by the relevant statutory consultees.

A4.4.2 Construction workforce

Since the 2009 ES was submitted permission has been granted for Total to construct a new gas processing plant at Sullom Voe. The construction period for this large scale development may overlap slightly with that for the Viking Wind Farm, restricting the availability of locally provided rental accommodation. Total intend to develop a temporary workforce accommodation campus at Sella Ness which may offer possibilities for retention and re-use before removal.

A4.4.3 Construction infrastructure requirements

(a) Site compounds

One satellite site compound would no longer be required, as shown in Table A4.9:

Table A4.9: Deleted site compound

East	North	Location
441246	1166060	Easter Scord, at north end of track to Hill of Susetter

(b) **Concrete batching**

The requirement for concrete would be reduced compared with the 2009 application, mainly due to the smaller number of turbine foundations and revised estimates of concrete required per foundation. The total amount of concrete required would be likely to be in the region of 62,897m^3. This would require a total of about 6,596 delivery vehicle movements.

A4.4.4 Construction traffic

Table A4.10 summarises the estimated revised construction traffic movements which would result from the revised design. Changes arise from the reduced amount of concrete required, the reduced number of turbine components, and the reduced length of cable trenching requiring cabling sand. The number of construction lorry vehicle movements would be reduced to about 10,072.

Table A4.10: Estimated construction traffic

	Revised figures		
Movement	**Total number**	**Delivery days**	**Average per day***
Construction plant (in)	35	7	5
Construction plant (out)	35	7	5
Concrete - Aggregate	2,866	704	6
Concrete - Cement	864	704	2
Concrete - Sand	2,866	704	6
Cabling Sand	1,988	704	3
Steel reinforcement	31	31	1
Transformers	4	4	1
Control room equipment	5	5	1
Substation plant	10	10	1
Cable	48	48	1
Fuel	26	26	1
Turbine components	1,270	254	5
Other	24	24	1

Total Vehicles	**10,072**		

* Average per day does not include delivery of construction plant, the movements of which would be mainly in the first and last weeks of the construction phase.

A4.5 DESIGN ALTERNATIVES

The 2009 ES described the process through which the original wind farm design was developed, starting from a proposal consisting of 192 turbines and arriving at the final layout of 150 turbines. Following comments received from statutory and other consultees since the 2009 application and ES were submitted, every aspect of the proposed wind farm has been reconsidered. The redesign process is described in Chapter A1 but has encompassed:

- Extensive (and continuing) consultation with SNH and RSPB generally, but more specifically in relation to impacts on birds and landscape;
- Further modelling of the potential effects on birds following agreement on methods with SNH and RSPB;
- The development of new methodologies to improve the scientific robustness of modelling associated with the birds assessments;
- A great deal of additional ornithological survey work to refine our knowledge of the baseline conditions;
- Immediate sharing of produced data relating to birds with RSPB and SNH to aid consultation and add to existing knowledge stores;
- Extensive consultation with Historic Scotland and Shetland Amenity Trust in relation to heritage;
- Development of a Site Environmental Management Plan (SEMP) in accordance with the Institute of Environmental Management and Assessment (IEMA) Practitioner "Environmental Management Plans" (Best Practice Series, Volume 12, December 2008);
- Extensive consultation with SEPA in relation to peat and waste matters, and subsequent inclusion of relevant plans within the SEMP and ES Appendix;
- Appointment of the consultancy arm of the Macaulay Land Use Research Institute to provide additional advice on peat, habitat management and carbon payback; and
- Meetings between the developers, the design team and their environmental consultants and advisors to determine the required changes to the project.

The product of these further activities is a proposed layout which is significantly smaller than the 2009 proposals, as described above.

A4.6 DISTURBANCE FOOTPRINT

The total area affected by the development, including areas temporarily affected by construction, would be 232 Ha (1.24 per cent of the 18,700 Ha planning application area). This compares with 314 Ha in the 2009 design. Note that this is the *absolute worst case*

scenario, because it assumes that the entire borrow pit "areas of search" would be affected (even if not actually excavated). Section A4.3.2 above describes the actual indicative extents of the borrow pits.

The difference between the 2009 and the 2010 figures is accounted for by:

- Reduced number of turbines
- Reduced length of tracks
- Reduced width of tracks
- Reduced number of borrow pits
- Reduced number of construction compounds and laydown areas.

The total area affected by the development following the recovery of areas temporarily affected by construction would be 104 Ha (0.56 per cent of the planning application area). This compares with 252 Ha in the 2009 application. The difference is accounted for by the factors listed above, with the additional factors (not accounted for in 2009) listed below:

- Double-width tracks would be restored from 10m running width to 6m running width at the end of construction
- The calculation uses the indicative areas of actual borrow pits listed in Table A4.8 above, rather than the entire "areas of search" which is used in the calculation for the construction period. This is because although the wider "areas of search" may be mildly affected during the course of determining the final sites for borrow pits, the actual excavated areas would be much smaller as indicated in Table A4.8.

A4.7 MITIGATION

Changes to the proposed wind farm design have been developed with regard to the "mitigation hierarchy" which ranks the mitigation of predicted adverse effects in a standardised way. The ranking is as follows, in declining order of preference:

- Avoid the impact by redesigning or moving the cause;
- Minimise the effect by appropriate design or construction method;
- Abate (at source or at receptor), for example by providing screening at the development site or at the receptor location;
- Compensate (in kind or by other means), for example by providing elsewhere enhanced habitat to compensate directly for equivalent habitat lost at the development site; or by providing some other form of environmentally desirable enhancement not directly comparable to that which has been lost;
- Enhance, for example by improving some aspect of the environment which is not otherwise affected by the proposed development project.

Details of how the 2009 wind farm design developed in accordance with this hierarchy were provided in Chapter 4 of the 2009 ES.

The mitigation hierarchy and the changes proposed were considered in the context of the hierarchy of EIA assessment approaches; namely

- the statutory requirements of the Electricity Works (Environmental Impact Assessment) Regulations 2000, which define the information to be supplied within an Environmental Statement;
- Scottish Planning Policy (The Scottish Government 2010) which includes guidance on how planning applications are to be considered; and
- PAN 58, Environmental Impact Assessment (Scottish Executive 1999) which includes general guidance on EIA.

Changes to the proposed design in the 2010 proposals have concentrated on further *avoidance* of effects (the preferred method of reducing impacts), by removing problematic turbines and associated infrastructure from the 2009 layout; by minor *minimisation* and *abatement*, by proposing adjustments and screening for access tracks; and *compensation in kind*, by providing significantly more improved habitat, both in quantity and in variety, than would be adversely affected by the proposed wind farm. In particular, the extensively re-written and expanded Habitat Management Plan (HMP) promotes improved blanket bog and separately improved habitats for three different species of important breeding birds.

A4.8 CONCLUSION

The proposed Viking Wind Farm has been reduced in size by about 15% in terms of the number of turbines and installed capacity compared with the 2009 application proposals; and by about 26% in terms of the area affected during construction. These changes have been directed specifically at addressing the comments of statutory and other consultees following submission of the 2009 application. In addition the mitigation of adverse environmental effects has been strengthened, in particular through the enhancement of the Habitat Management Plan.