Construction Method Statement

Consented Wind Turbine, Myreton, near Keith, Moray

Prepared by Seren Energy Ltd
For Myreton Council and Scottish Natural Heritage

October 2009

Contents

1. Introduction

This document has been prepared by Seren Energy and seeks to provide detailed information regarding the construction method and measures taken to reduce the environmental impact of this construction method, for the installation of a single 800kW wind turbine on the land of Myreton, Keith, Moray.

The information contained within this document is intended to satisfy the request made by Scottish Natural Heritage for a construction method statement in their letter dated 28th August 2007, to the Development Services department at the Moray Council. This document is intended to include measures to protect the environment and wildlife and includes;

- Maps where works will take place
- Timing of work
- Details of previous ecological work undertaken at the site
- Construction details of each section of the build
- Measures to protect water courses from sediment run off and pollution
- Reinstatement of disturbed vegetation

2. Plan of Site

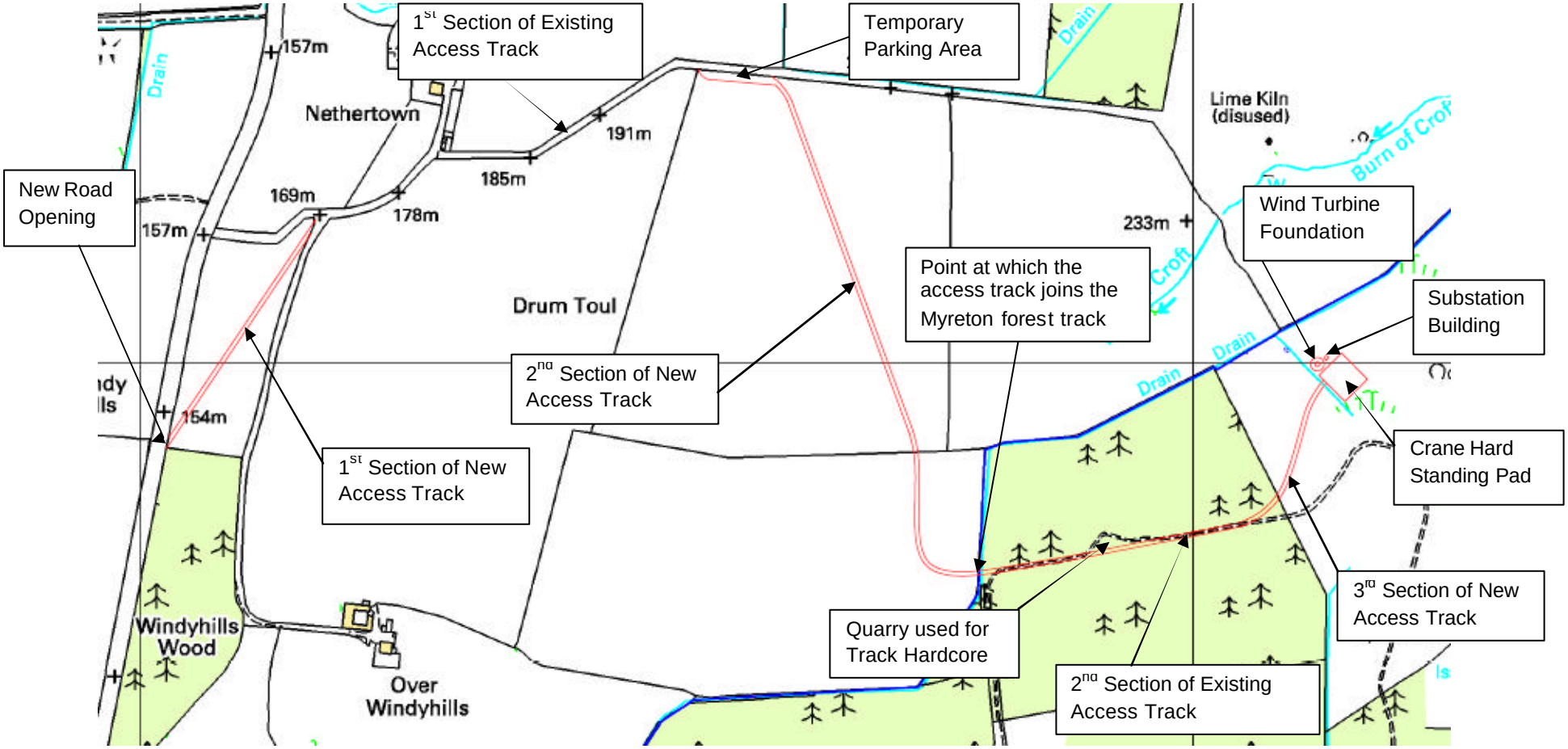

Figure 1: Access Track Layout

3. Timing of Work

The timing of the works involved for the installation of the wind turbine are listed below. These timings are approximate as many factors may affect these such as shipping, delivery, contractor availability, weather etc. Every effort will be made to adhere to the proposed schedule of works but if major problems are encountered that interfere with the timing schedule, Moray Council will be alerted with the changes at the earliest possible convenience.

Date	**Job Description**
September - January 2009	Tree felling around turbine site for access track, turbine foundation and crane pad.
March – April 2010	Access track construction
April 2010	Road opening construction
May 2010	Foundation construction
May 2010	Substation Construction
Jun - July 2010	Turbine installation
July 2010	Turbine commissioning

It is intended that all of the site preparation work will be undertaken by the beginning of April, when the bird breeding season begins, with particular emphasis on the tree felling. The only work that will occur following this date is the foundation construction, the substation construction and the installation of the turbine. These jobs will cause minimum disturbance to the forested site as all of the digging, ground preparation work and track construction will have already taken place.

4. Ecological Work

No ecological survey work was initially included with the application. Scottish Natural Heritage did not object to the project however, as they felt that the natural heritage interests affected by the scheme are not sufficient to warrant an objection. This is partly due to the very small area of the site being affected by the development and the fact that most of the site is laid to small, immature pine trees which provide limited shelter for a diversity of species. It was also due to the large amount of ecological work being undertaken for the nearby Aultmore Wind Farm giving an idea of any likely ecological issues in the area as a whole.

Since this application was granted planning permission, an application for an additional two wind turbines at the site has been submitted, for which a phase 1 habitat survey and biological records search was undertaken in December 2008. The report from this survey can be found in Appendix A of this document and provides a good overall impression of the site.

5. Access Track Construction Method

5.1 Access Track

The construction of the access track will involve two different construction methods. These methods are described below. These cover the construction of new access track over open farmland and the modification of existing access and forestry track. The lengths of new access track are shown in red in Figure 1. A typical access track cross section is shown in Figure 2.

The construction method for the crane hard standing pad is also described.

5.1.1 New Access Track Construction Method

1. Any trees in the route of the track will be felled and removed before the beginning of April 2010.
2. Over the route of the proposed access track, the surface soil will be removed to a depth of 300 - 500mm and to a width of 4m on the straight sections and 5.5m at the corners. This topsoil will be used to level out sections of the track that need it. Some top soil will also be kept for back filling the edges of the track and the widened corners.
3. Depending upon ground conditions, a geotextile layer may be laid as the base for the track foundation. This is labelled as fibrous material in Figure 2.
4. Rough grade hardcore will then be filled to a depth of 350mm and compacted, as shown in Figure 3. This hardcore will be taken from the quarry on the Myreton site highlighted in Figure 1.
5. Finally a layer of medium, even grade gravel will be layered to a thickness of 50 -100mm on the surface of the hardcore foundation and compacted to make a hard even surface.
6. Any excess surface soil initially excavated that will not be uses as back fill at the edges of the track will be spread thinly and evenly over the fields adjacent to the track. This will then either be seeded for grass or ploughed for crops.

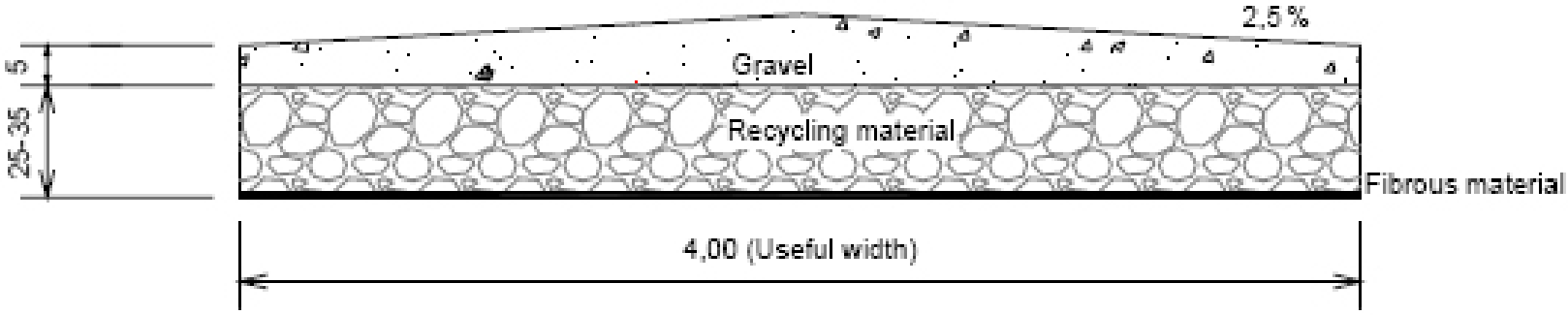

Figure 2: Typical Access Track Cross Section

5.1.2 Existing Forest Track Modification Method

Currently the sections of existing access and forest track intended for use for this wind turbine scheme are not wide enough and will need modification to bring them up to the specifications necessary for the delivery vehicles and cranes involved in the installation procedure. A track with a useful carriageway width of 4m on the straights and 5.5m at the corners is needed for the delivery of the turbines. The following allowances have therefore been made for track upgrading and widening where it is needed:

1. The vegetation either side of the track will be cut back by the necessary amount to provide a minimum track width of 4m or 5.5m.
2. The top of the existing track will be scraped to remove vegetation where necessary.
3. Rough grade hardcore will then be filled either side of the track to a depth of 350mm.
4. A layer of medium, even grade hardcore will then be spread and compacted to a depth of 200mm over the entire new track surface.
5. Where the bends are encountered in the main track, the areas around these will need to be extended to a width of 5m for access and any trees cut to suit requirements. Any tree felling will take place before the beginning of April.
6. A total clearance width of 5m and a clearance height of 4.6m will be needed for delivery vehicles.

5.2 Crane Hard Standing Construction Method

1. The dimensions of the crane platform should be calculated so that all the work necessary for installing the wind turbine can be carried out in the optimum manner. Its dimensions will be up to 30m x 35m.
2. Trees and vegetation will be removed in the area.
3. Layers of compacted stone will then be laid on one half of it to support the main installation crane.
4. The other half will be layered with softer gravel to form an assembly area.
5. A channel will be excavated around the down hill edges of the crane pad to catch any water run-off. This channel will drain into the existing drainage ditch which can be seen in blue in Figure 1.
6. A settlement pond will be excavated near the end of this small drainage ditch to allow any sediment to settle out before the run-off water is passed back into the main drainage ditch marked 'Drain' in Figure 1.
7. Any topsoil removed from the crane hard standing area not used for back fill will be spread thinly and evenly over the land adjacent to the site. This will then either seeded to bring it back to its original condition.

5.3 Road Opening Construction Method

A new road opening will be created where the proposed access track joins the B9018 road. The specific details of this road opening have been agreed upon with Iain Robertson from the Roads Service at Moray Council. These include:

1. The first 5 meters of the road will be constructed in full road construction and surfaced in 75mm thick single course madacam.
2. The B9018 will be surfaced in 40mm thick hot rolled asphalt over its full width over the full width of the road opening.
3. The existing drainage ditch adjacent to the road will be piped using 300mm diameter piping in a concrete surround.
4. In situ headwalls will be constructed at the inlet and outlet of this piping.
5. Drains will be located at on each side at the beginning of the access track to ensure that water does not discharge from the service road onto the B9018. These will drain into the 300mm drainage piping.
6. The side slopes will be graded and any vegetation will be removed to provide visibility splays of 4.5m x 215m in both directions. Any tree removal will be undertaken prior to the beginning of April 2010.

An application for a road opening permit will be made before works commence on this road opening. Figure 3 shows the layout of the new road opening.

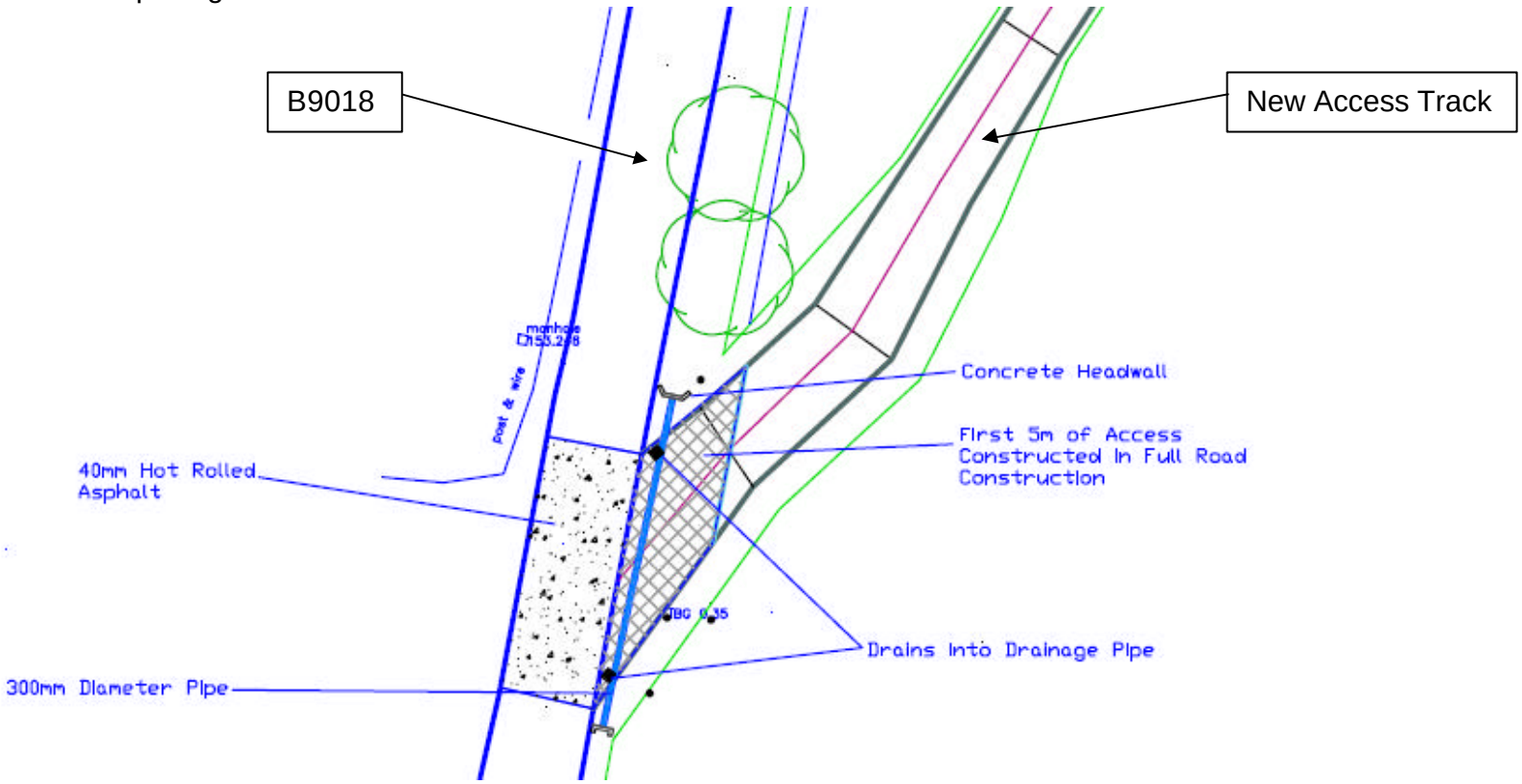

Figure 3: Road Opening of Access Track

5.4 Drainage

The sections of the access track where drainage will be most important are the steep sections. This is because water can quickly accumulate on these sections during a heavy rainfall and begin running down the track. This water can pick up particulate matter from the recently constructed track and potentially transport sediment laden water into local watercourses which is what needs to be avoided.

Several design aspects will be incorporated into the access track to prevent run-off water containing excess sediment from entering local watercourses. Drainage ditches, sediment traps and the track being built with a suitable camber, directing water into areas where sediment settlement will occur easily, such as grassland, will be used within its design.

There will be three areas along the route of the access track where an entirely new track will be built across open land. These are marked in Figure 1. There are also two sections of track that already exist and will only need modification. These are also marked in Figure 1.

The 1st and 2nd sections of the newly constructed access track will be suitably cambered so that any excess water will run off the track, into the adjacent fields where the grass will slow the water and the sediment will settle out. The first section of existing access track that will be modified already has a drainage ditch running adjacent to it as can be seen in Photographs 4 and 5. This will be left undisturbed during construction.

The two forested sections of track will again be constructed so that any excess run-off water will drain into the forest located adjacent to the track. This will provide ground for any excess sediment to settle out of the water before it passes back into the drain surrounding the forest on its western side.

The final section of the works where settlement run-off will need to be considered is from the works associated with the turbine foundation and the crane hard standing pad. An existing forest drain runs to the south west of these works and any run-off water will flow into this drain. To prevent sediment laden water running straight from this drain, into the main drain at the edge of the forest, a sediment trap will be incorporated into the drain as shown in Figure 4. This will require maintenance and emptying at regular intervals.

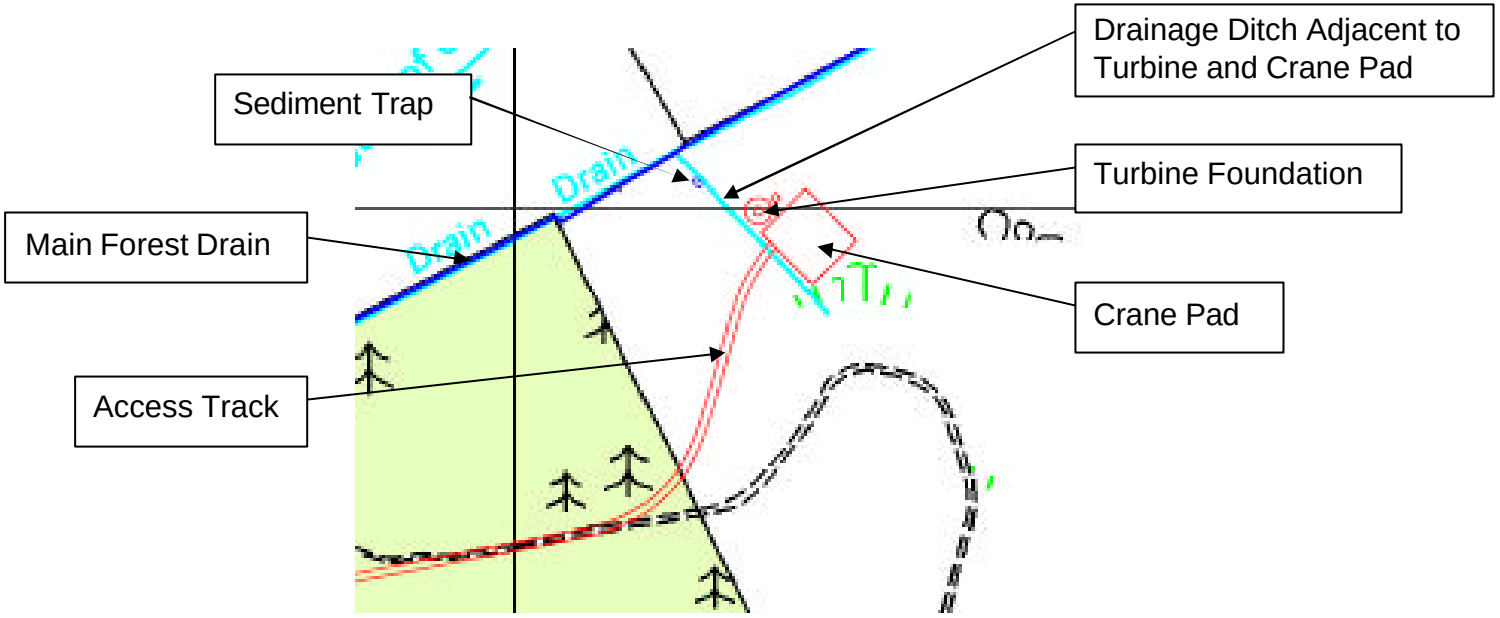

Figure 4: Sediment Trap on Forest Drain

5.5 Photographs Access Track Route

The photographs below show the condition of the land or existing track at different locations along the length of the access track. Each photograph is labelled and has a small description. The locations at which these photographs were taken are shown in Figure 5.

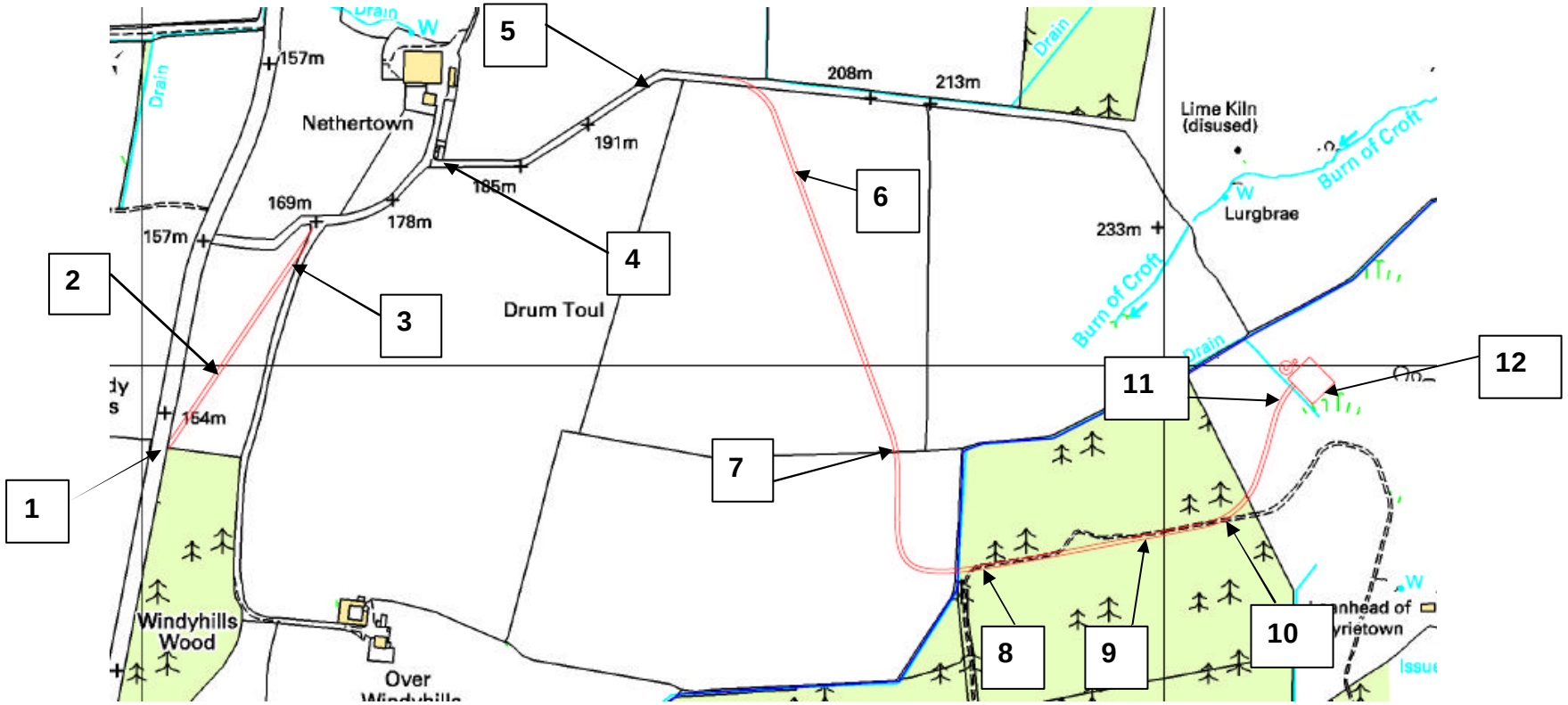

Figure 5: Photograph Locations Along length of Access Track

Photograph 1: This is where the new road opening will be located. The drainage ditch will be bridged with a large bore 300mm pipe and build over. Approximately 12m of hedge row will need to be removed to make way for the construction. This will take place before the beginning of the bird breeding season.

Photograph 2: Looking back towards the road opening. Some of the trees seen in this photograph next to the road will need to be removed to provide adequate visibility for vehicles leaving the access track back onto the B9018. This will be done before April 2010 and the wood produced will be used as a fuel for heating. The field in the foreground is planted to grass for hay.

Photograph 3: Field within which, section 1 of the access track will be constructed. The field is currently planted as a grass monoculture for hay and is therefore unlikely to hold any particular ecological significance.

Photograph 4: Corner of track near Nethertown. This corner will be widened to 5.5m to allow the larger delivery lorries to pass. Following construction this will be returned to it current state by covering it with topsoil and seeding it appropriately. The existing drainage ditch will be re routed to accommodate this corner infill.

Photograph 5: Looking back down part of the access track already in place towards the B9018. Here the track is approximately 3.3m wide as denoted by the yellow arrow. It will require widening of 70cm to bring it up to the access track specifications required by the turbine manufacturer, Enercon. The drainage ditch on the left hand side of the photograph will remain unaffected.

Photograph 6: Looking out over the second field the access track will cross. This field is currently sewn to barley. This monoculture will be ploughed by the time the access track construction begins so it is not anticipated that the construction phase will have any adverse impact on the ecology. The crops will be sew right up to the edges of the access track in future years.

Photograph 7: This is looking towards the point where the access track will turn around to the left and enter the forest. This photograph is taken next to a fence between the fields as can be seen in the photograph. The field in view is also laid to barley and will be ploughed by the time the access track construction commences.

Photograph 8: This shows the corner where the new access track crossing over the fields will join the existing forest track. The forest track will be upgraded and widened slightly to allow passage of the delivery vehicles for the wind turbine construction. These improvements to the existing access track will remain in place allow the logging lorries easier access when the forest is ready for felling.

Photograph 9: Access track within the forest. The quarry where the stone for the access track construction will be taken is visible on the right hand side of the track. The access track will pass to the left of this quarry on a slightly different route to the existing track shown in the photograph. This will involve the removal of some of the small, immature pine trees. The reason for this is that the section of track marked with the yellow arrow is too steep for the delivery vehicles. The new section of track will be graded at a gentler incline.

Photograph 10: Access track within the forest. The width of the lane at his section of the track is 3.6m as denoted by the yellow arrow. It will require widening of 20cm each side to bring it up to the access track specifications required by the turbine manufacturer, Enercon.

Photograph 11: This photograph is taken from the turbine site, back towards the existing access track along the approximate path of the 3rd section of the new access track, as shown in Figure 1. As can be seen it is a mixture of small pine trees, gauze and grassland.

Photograph 12: This photograph shows the site of the proposed wind turbine. The wind turbine will be located where the yellow stick can be seen protruding from the ground. The crane pad will be constructed directly beneath the location where the photograph is taken.

6. Wind Turbine Construction Method

6.1 Foundation

1. The land around the turbine site will be cleared of vegetation.
2. Any pine trees cleared will be used by the landowner living on site for fire wood if possible.
3. A circular hole will be dug into the ground at the location of the turbine approximately 16m in diameter.
4. The topsoil will be separated and stored in a pile adjacent to the circular hole.
5. Some subsoil will be kept for backfilling the foundation hole once it is complete but most will be used for other jobs such a levelling out the crane pad area.
6. The hole will be dug to a depth of 1– 2m depending upon ground conditions which will be frequently tested as the process continues.
7. Once an appropriate depth for the hole has been achieved, shuttering is placed around the edge of the hole in the appropriate dimensions of the foundation which in this case will be 15.1m in diameter.
8. A layer of hardcore will then be layered into the shuttered formwork and compacted to a depth of 0.15m.
9. A thin layer (0.1m) of concrete is then added to the hole.
10. Engineers enter the hole and fix the rebar, creating a nest of steel bars.
11. The base of the turbine called the ‘can’ is added and attached to the rebar in the correct position.
12. The rebar is placed with stresses in mind and acts to reinforce the position of the can, which will then hold the tower.
13. The hole is filled with concrete up to the specified depth of the base plate which in this case is 1m.
14. Electrical cables are then laid and run through special ducts left in the foundation. These will then travel underground to the substation building.
15. More shuttering is then put in place for the visible base, and the concrete is then filled to ground level. The total depth of the concrete in this central section of the foundation is 1.6m.
16. This leaves the suitable base protruding from the concrete foundation for attachment of the turbine tower.
17. The foundation will then be back filled with some subsoil and a layer of topsoil. This area will then be replanted as explained in section 7.

6.2 Electrical Substation

1. A square hole will be dug approximately 5m wide and 1m deep.
2. The electrical cables from the wind turbine will be positioned inside buried ducting so they come up through the floor of the substation building.
3. A layer of hardcore 0.2m deep will then be layered into the hole and compacted.
4. A second layer of concrete, also 0.2m deep, will then be poured into the hole and allowed to set.
5. A pre cast substation building will then be erected on this square pad of concrete.
6. The building will be secured to this pad and the eclectics and earth will be connected.

6.3 Wind Turbine Installation

1. A large crane will be positioned on the load tested crane pad.
2. The lower of the 3 tower sections will be lifted into position by the crane and will be bolted on to the foundation.
3. Sections 2 and 3 of the tower will also be installed in this way.
4. The pre assembled hub of the wind turbine will then be lifted to the top of the assembled tower, and bolted into position.
5. The three turbine blades will be attached to the rotor on the ground using two cranes.
6. Once this rotor assembly has the three blades attached and is fully assembled it will be lifted in once piece by the large crane, and mounted onto the wind turbine hub.
7. The nose cone will then be secured into place on the front of the rotor assembly.
8. The electrical connection will be via underground cabling between the substation building and the foundation of the turbine.
9. The wind turbine will be commissioned once the electronics have all been connected up successfully.

7. Reinstatement of Vegetation

The main areas where disturbed vegetation will be reinstated following the construction of the project will be at the edges of the access track and the temporary parking area. The corners highlighted in Figure 6 will be reduced in width from 5m back to 4m like the rest of the track. The reinstated areas will be covered with a 200mm layer of topsoil and re-seeded with Highland Meadow Mix from Scotia Seeds, the details of which can be found in Appendix B.

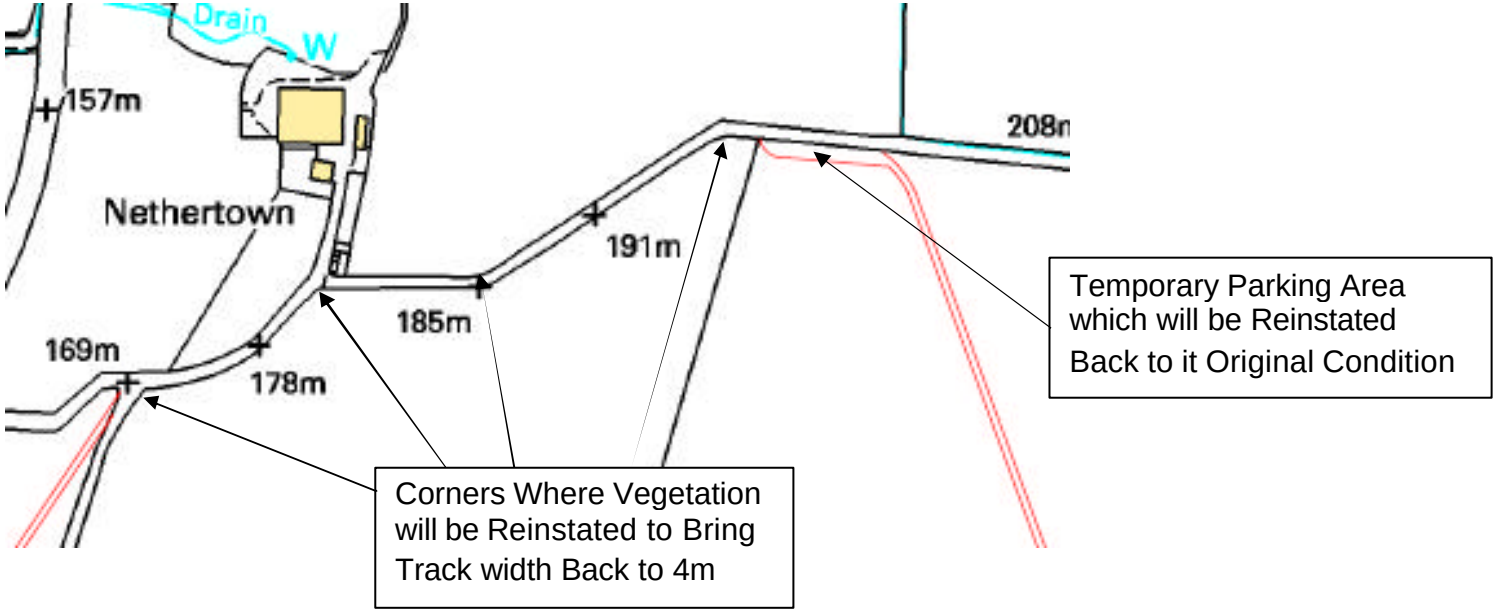

Figure 6: Areas Where Reinstatement of Vegetation will Take Place

The land either side of the 1st section of access track will be reinstated with a layer of topsoil then a commercial agricultural permanent grass mixture. As the temporary parking area and the land either side of the 2nd new section of the access track will be constructed on arable land, these areas will be cropped right up to the edges of the access track. The land at the edges of the forest track will also be seeded with the Highland Meadow Mix mentioned above.

Topsoil will also be filled in over the turbine foundation and re-seeded with the Highland Meadow Mix. The crane pad however will remain in case problems with the turbine are encountered and a crane is needed for repair work.

Appendix A: Phase 1 Habitat Survey at Myreton, Keith (Separate Document)

Appendix B: Grass Seed Mix

SCOTIA SEEDS
Wildflowers of Scotland

Mavisbank, Farnell, Brechin, Angus, DD9 6TR
t:01356 626425 f:01356 629183 e:scotiaseeds@btconnect.com
www.scotiaseeds.co.uk

Highland Meadow Mix

Suitable for upland meadows, this mix recreates a grassland type found on well-drained highland sites with acidic soils.

(It is similar to the calcifugous British Plant Communities U2 and U4)

Species Name	Common Name	Origin	% by weight
wildflowers (20%)			
Achillea millefolium	Yarrow	Fife	2.3
Calluna vulgaris	Heather	Angus	0.5
Erica cinerea	Bell heather	Angus	0.1
Campanula rotundifolia	Bluebell/Harebell	Fife	0.2
Galium verum	Lady's Bedstraw	Fife	2.2
Lotus corniculatus	Bird's-foot Trefoil	Fife	2.5
Plantago lanceolata	Ribwort Plantain	Fife	3.5
Potentilla erecta	Tormentil	Fife	0.1
Prunella vulgaris	Selfheal	Fife	3.1
Ranunculus acris	Meadow Buttercup	Fife	4
Rumex acetosella	Sheep's Sorrel	Fife	1
Succisa pratensis	Devils-bit Scabious	Fife	0.2
Trifolium repens	White Clover	Inverness-shire	0.1
Veronica officinalis	Common Speedwell	Perthshire	0.1
Viola riviniana	Common Dog Violet	Angus	0.1
grasses (80%)			
Agrostis capillaris	Common Bent	Cultivated	5
Anthoxanthum odoratum	Sweet Vernal Grass	Fife	10
Deschampsia flexuosa	Wavy Hair Grass	Angus	30
Festuca ovina	Sheeps Fescue	Fife	20
Poa pratensis	Smooth-stalked Meadow Grass	Cultivated	15