BLACKWOOD WIND FARM

Environmental Statement

Volume 3: ES Technical Appendices

February 2012

RSK GENERAL NOTES

Project No.: 190282 02 (01)

Title: Blackwood Wind Farm Environmental Statement Volume 3 Technical Appendices

Client: Force 9 Energy LLP and EDF

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Office: Glasgow

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Date:	06.02.12	Date:	

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INTRODUCTION

Appendix 1.1 Scoping Consultation Responses

Your Ref:

- 5 JUL 2011

Our Ref: 11/E/3/0011

01 July 2011

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Development Management
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Any enquiries please contact

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Dear Sir / Madam

Environmental Impact Assessment (Scotland) Regulations 2011
REQUEST FOR SCOPING OPINION (EIA) FOR ERECTION OF UP TO SIX WIND TURBINES (MAXIMUM TIP HEIGHT OF 150M)
AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES

I refer to the above request.

Please find enclosed a copy of the Council's formal Scoping Opinion in respect of the above Regulations.

Yours faithfully

Steve Rogers

Steve Rogers
Head of Planning & Building Standards Services

Dumfries & Galloway COUNCIL

DUMFRIES AND GALLOWAY COUNCIL

Environmental Impact Assessment (Scotland) Regulations 2011

Scoping Opinion in respect of 6 no. wind turbines (up to 150m to tip) at Blackwood, High Auldgirth, Dumfries

1.0 The scoping request from Knight Frank, received 10 May 2011, relates to the erection of up to 6 no. wind turbines with a maximum ground to tip height of 150m and a generating capacity of up to 18MW at Blackwood, High Auldgith, Dumfries.

2.0 Dumfries and Galloway Council have received consultation responses from The Scottish Government, Historic Scotland, Scottish Natural Heritage, Transport Scotland, Health and Safety Executive, Scottish Water, SEPA, Ministry of Defence, NATS, Prestwick Airport, RSPB, Dumfries & Galloway Constabulary, Auldgirth Community Council, Closeburn Community Council, Keir Community Council, and Thornhill Community Council. Copies of these consultation responses are attached as an Appendix to this report and are self-explanatory.

3.0 Any windfarm development will be considered under Structure Plan policies S21 and S22 and the Wind Energy Diagram (Structure Plan Technical Paper Nr. 5) referred to in policy S22, as well as relevant General Policies of the Nithsdale Local Plan. The Council is currently undertaking public consultation on its Draft Interim Planning Policy for Wind Energy Development. It is advised that progress on this emerging policy is monitored via the Council's website, at http://www.dumgal.gov.uk/index.aspx?articleid=9982.

4.0 The following comments have been received from the Council's internal consultees. You will appreciate that this Scoping Opinion constitutes advice only and is made without prejudice to any decision which the Council as planning authority may choose to make in respect of any future planning application. Furthermore, it should not be assumed that every issue which might impact on any such application has been addressed in this letter. It should also be noted that other issues may come to light as a result of consultation with other relevant bodies in relation to any future planning application.

5.0 Archaeologist

5.1 It is confirmed that there is potential for a proposal of this nature to have significant impact on these cultural heritage assets and therefore these effects will need to be transparently assessed in the environmental impact assessment (EIA).

5.2 The applicant should be aware of that the consultative draft on Interim Planning Policy: Wind Energy Development, June 2011 has considered 'Settlement and Archaeology' as one of the landscape sensitivities informing the landscape capacity study and the resulting spatial framework. The following is an extract from Appendix B: assessment methodology that describes how this has been applied to inform the overall sensitivity category of the landscape character area (Settlement and Archaeology):

Large/medium wind farms, turbines greater than 50m to blade tip:-

Consideration of the pattern, scale and character of settlement and its relationship to the landscape.Assessment of how development might impinge on these characteristics;where there may be scope to attain some visual separation to avoid adverse scale contrasts and minimise effects on settlement setting. Where larger scale industrial buildings are present, the scale relationships between turbines and these is also considered. Archaeological features are considered in respect of their contribution to landscape character and any potential effects on setting.

Small and small- medium turbines, turbines between 12 and 50m to blade tip:-

Consideration of the pattern and size of settlements, farms and estates, and their relationship to the landscape. Identify repeated and consistent patterns which are characteristic of the landscape type. Assessment of how development might impinge on these characteristics; whether it is able to fit with the settlement pattern through association of built development or where visual separation may be required to avoid adverse scale contrast with buildings and minimise effects on settlement setting. Archaeological features are considered in respect of their contribution to landscape character and any potential effects on setting.

5.3 It is noted that the site under consideration at Blackwood, does not fall within a search area for turbines of the height proposed in the Interim Planning Policy. Given this, it is particularly important that any EIA is extremely rigorous in identifying the overall sensitivity of the proposal site in respect of the identified constraints and in relation to the scale of turbines proposed.

5.4 Section 3.2.3 of the submitted document refers to 'Cultural Heritage and Archaeology' and outlines the proposed methodology for assessment. It is confirmed that this is considered appropriate.

5.5 The applicant has already obtained an extract of baseline data extract from Dumfries and Galloway Council Historic Environment Record to inform their proposals. Generally, impacts on the setting of significant historic environment assets, should be lead by the Zone of Theoretical Visibility. In particular impact on the setting of the following cultural assets must be assessed, and to

ensure that they can be confidently assessed independently in due course, illustrated with photomontages:-

- Ellisland Farm, a former home of Robert Burns run as a visitor attraction.
- Inventory Gardens and Designed Landscapes at Dalswinton, Drumlanrig and Cowhill Tower.
- Non –inventory gardens and designed landscapes at Allanton House (World Peace Sanctuary), Closeburn Castle, Friars Carse, Portrack, and Blackwood.
- The Archaeologically Sensitive Area at Whitestanes Moor
- The landscape setting on the bronze sculptures at Glenkiln,
- The Scheduled hill fort at Mullach

5.6 Heritage Tourism. Many visitors who come to the region cite the historic environment and overall environmental quality as reasons for visiting. Valued heritage assets and historic environment features are fundamental to the character and qualities of the region. It is anticipated that turbines of 150 m could be highly visible in many views from the A76 in particular, other main routes for visitors and residents, as well as visitor destinations, such as Ellisland and Glenkiln.

5.7 Policy. Key policy statements that have been issued recently by Scottish Government in elation to the historic environment are:

- Scottish Historic Environment Policy, chapter 1: Scotland's Historic Environment.
- Scottish Planning Policy, paragraphs 110 -124 on Historic Environment, and 182-191 on Renewable Energy, February 2010.
- Managing Change in the Historic Environment: Setting, Historic Scotland October 2010.

These all identify that impact on the historic environment is a material consideration in progressing the development of renewables. In addition to national policy the relevant Council policies governing the historic environment are:

- General Policy 51: Listed Buildings
- General Policy 53a: Historic Gardens and Designed Landscapes
- General Policy 54: Known Archaeological Sites – Including Scheduled Ancient Monuments
- Structure Plan Policy E9: Listed Buildings
- Structure Plan Policy E11: Historic Gardens and designed Landscapes
- Structure Plan Policy E12: Development Affecting Archaeological Sites
- Structure Plan Policy E13: Archaeologically Sensitive Areas

6.0 Development Team Leader (Nithsdale Roads)

6.1 It should be noted that in the supplied Scoping Report (P190282) all references to "highway" should be replaced by "road".

6.2 It is noted that the Scoping Report indicates that:-

- Access to this site is yet to be confirmed but is likely to lead from the A76 at Auldgirth via the unclassified road to Lower Auldgirth". (See Notes 1 & 2 below)
- An electricity transmission line from the site to the local electricity distribution network will also be required, and will be applied for separately by Scottish Power Power Systems. The likely connection location is Dunscore". (See Note 3 below).
- The design of public road junctions and use of signage will be developed to meet the requirements of the relevant authorities with regard to visibility, construction materials, surface water drainage, gradient and safety of other road users". (See Note 4 below).
- Borrow Pits - a preliminary site investigation prior to construction will be required to establish the quality of the sub-grade and site rock, and the sources and quantity of road stone estimated. (See Note 5 below).
- A detailed study may be carried out in terms of assessing the most appropriate mode of transport for moving components, machinery and materials to the site and the capacity of the road network to accommodate such transport. In particular, the study will focus on the requirements for abnormal loads. The routes chosen for turbine components will be assessed through swept path analyses via computer modelling informed by site survey. Any enabling works that are required will be agreed with the local authorities and the impact and level of the works assessed. The volume of all construction traffic movements will then be quantified along with the projected schedule of movements. This will then be used to determine daily vehicle numbers and delivery profile" (See Note 6 below).

6.3 It would be appropriate that any future EIA/ES provide comprehensive details of:-

- The sizes of the prefabricated turbine components and the size and type of delivery vehicles, including predicted route, swept-path tracks and number of trips.
- Any alterations to the existing public road network to accommodate the size and type of delivery vehicles, including passing places in accordance with Council standards and should address the potential impact on utility services lying within the public road boundary.
- The location and route of the proposed grid connection.
- Whether suitable and sufficient borrow pits have been identified within the site.
- A Traffic Management Plan (TMP) for the construction phase to be developed. It would be appropriate that mitigation measures as well as the monthly vehicle movements (see note above) from part of the TMP which should be agreed with the Police and the Local Roads Authority prior to any construction commencing on site.

6.4 Furthermore, it should be noted that:-

- Any above average maintenance expenditure on the public roads as a result

of haulage traffic to the site may be recoverable from the applicant /operator.

- Permits under the Roads (Scotland) Act 1984 will be required for any enabling/alteration works or service connections within the public roads.
- Transport Scotland and Network Rail should be consulted regarding access via the A76 and the railway bridge at the U492n respectively.

6.5 Notes

1. The U492n is locally weak, restricted in terms of horizontal and vertical geometry and visibility, with few passing places and with a restricted junction onto U541 n adjacent to the Auldgirth Inn. Appropriate improvements would not appear feasible. Between the village and Low Auldgirth the public road crosses over the Dumfries to Kilmarnock railway line at a hump back bridge. (this will require to be assessed to ensure vehicles do not ground on the bridge).
2. It should be noted that the U492n public road, at Auldgirth Village, lies between 2 development sites, identified in the finalised Nithsdale Local Plan as sites LN58 and OPP50 respectively. These sites were included in the previous (2002) Local Plan review where the reporters recommendation to the Local Plan Inquiry (Nov. 2005) concluded that "... it is clear that the U492n itself is unsuitable for any significant increase in vehicular movements, and that its upgrading would be difficult, particularly at the bend just north of the public hall". The reporter further agreed with the advice of this office that the only viable option for vehicular access to LN58, was through area OPP50, probably with a junction providing access to the U492n east of this proposed site and the U492n west of this site being stopped-up with a turning head. It was acknowledged that substantial engineering works would be required. I am aware that an Engineering Consultancy has recently drawn up plans for OPP50 that includes just such a realignment of the U492n through a proposed residential development with the stopping up of part of the existing road.
3. It should be noted that the installation of underground cables will have an impact upon public roads where the route follows a road, crosses a road or crosses a bridge on the road.
4. It would be appropriate that prior to any consents being granted, the proposed access route will require to be agreed with the Roads Authority and will require to be tracked for the largest vehicles/component deliveries and an agreed schedule drawn up for any improvements identified.
5. If suitable and sufficient borrow pits are unavailable within the project area and road stone is to be imported, this will have an impact on vehicle movements and access routes.
6. This study will be required and the assessments and conclusions included within the EIA. The conclusions will inform the decision of the selection and choice of access route.

7.0 Flood Risk Management

7.1 The area proposed for development lies outwith the 1:200 fluvial floodplain as detailed on DGi (information from SEPA). There is no record of flooding in this

area. The applicant should take into account pluvial flows from the site so that the flood risk is not increased elsewhere.

8. Environmental Standards

6.1 A site specific noise impact assessment should be carried out following the principles detailed in the Assessment & Rating of Noise from Wind Farms ETSU Report ETSU-R-97, 1996. A noise assessment in relation to construction should also be undertaken following the guidance of BS5228:1997.

9.0 Landscape Architect

9.1 No comment at this stage. The Landscape Architecture Service can be contacted at Landscape Architecture Service, Planning and Environment, Newall Terrace, Dumfries, DG1 1LW, tel. 01387 260149.

APPENDIX

Consultation responses have been received from the following agencies, whose comments are attached in full and are self explanatory:-

- The Scottish Government, Historic Scotland
- Scottish Natural Heritage
- Transport Scotland
- Health and Safety Executive
- Scottish Water
- SEPA
- Ministry of Defence
- NATS
- Prestwick Airport
- RSPB
- Dumfries & Galloway Constabulary
- Auldgirth Community Council
- Closeburn Community Council
- Keir Community Council
- Thornhill Community Council

COMMERCIAL IN CONFIDENCE

MINISTRY OF DEFENCE

Defence Infrastructure Organisation

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Mr Patrick Hanna
Dumfries and Galloway
Planning and Environment Services
Development Management
Kirkbank
English Street
Dumfries
DG1 2HS

23 May 2011

Your Reference: 11/E/3/0011
Our Reference: DE/C/SUT/43/10/1/11733

Dear Mr Hanna,

DE Reference Number: 11733

Site Name: BLACKWOOD (A)

Site Address: High Auldgirth, Dumfries

Planning Application Number: 11/E/3/0011

Thank you for approaching the Ministry of Defence (MOD) for a screening opinion on the above proposal.

The principal safeguarding concerns of the MOD with respect to the development of wind turbines relate to their potential to create a physical obstruction to air traffic movements, and cause interference to air traffic control and air defence radar installations.

Air Traffic Control (ATC) Radar & Range Control Radar

Where wind turbines are visible to ATC radars they have been shown to have detrimental effects on radar performance. These effects include the desensitisation of radar in the vicinity of the turbines, and the creation of "false" aircraft returns which air traffic controllers must treat as real. The desensitisation of radar could result in aircraft not being detected by the radar and therefore not presented to air traffic controllers. Controllers use the radar to separate and sequence both military and civilian aircraft, and in busy uncontrolled airspace radar is the only sure way to do this safely. Maintaining situational awareness of all aircraft movements within the airspace is crucial to achieving a safe and efficient air traffic service, and the integrity of radar data is central to this process. The creation of "false" aircraft displayed on the radar leads to increased workload for both controllers and aircrews, and may have a significant operational impact. Furthermore, real aircraft returns can be obscured by the turbine's radar returns, making the tracking of conflicting unknown aircraft (the controllers' own traffic) much more difficult.

Precision Approach Radar (PAR)

The MOD's PAR is a very accurate radar used by air traffic controllers to guide aircraft down in inclement weather (although the procedure is practised in all weather conditions). The accuracy and integrity of this radar is critical as air traffic controllers must control the aircraft in descent and very close to the ground. Wind turbines constructed in line of sight of the PAR can cause localised "track seduction", leading to aircraft disappearing from the radar. A further possible effect is the overload of the radar's processor, in that wind turbines generate "false plots" which use up processing ability. Once its threshold is reached the radar may be unable to detect smaller targets, which are likely to be aircraft in head-on profile. Technical aspects of the PAR are covered by international arms traffic regulations, and therefore cannot be released by the MOD, but on these grounds the MOD will object to any wind turbine constructed within the PAR's coverage.

Air Defence (AD) radar

Trials carried out in 2005 concluded that wind turbines can have detrimental effects on the operation of radar which include the desensitisation of radar in the vicinity of the turbines, and the creation of "false" aircraft returns. The probability of the radar detecting aircraft flying over or in the vicinity of the turbines would be reduced, and the RAF would be unable to provide a full air surveillance service in the area of the proposed wind farm.

Secondary Surveillance Radar (SSR)

SSR relies on co-operative transmission from aircraft carrying equipment known as transponders. For this reason confusion between returns from aircraft and from other objects is highly unlikely and many of the effects caused to normal radars will not occur. However reflection of transmissions could be caused by wind turbines particularly if they are in close proximity to an SSR site. In this eventuality misidentification or mislocation of aircraft could occur. This could have potential flight safety implications.

Meteorological Office radar

Wind turbines can interfere with Met Office Radars in similar ways to Air Traffic Control Radars as detailed above and impair their ability to detect weather phenomena.

Low Flying

The whole of the UK may be used for military low flying operations. The proliferation of obstacles is not only a safety hazard but also severely impacts on its utilisation for essential low flying training.

The MOD will often request that turbines be fitted with aviation warning lights.

Area Air Traffic Control (ATC) radar

There are 12 National Air Traffic Services (NATS) radars under contract to provide the MOD with airspace monitoring services throughout the UK.

Physical Safeguarding

Turbines constructed within statutory safeguarding zones have the potential to cause physical obstructions which could interfere with the safe operation of defence assets.

Eskdalemuir Seismological Recording Station

Following research jointly commissioned by DTI (now the Department of Business, Innovation and Skills), BWEA (now RenewableUK) and MOD, it has been confirmed that wind turbines of current design generate seismic noise which can interfere with the operational functionality of the array. In order to ensure the UK complies with the Comprehensive Nuclear-Test-Ban Treaty, a noise budget based on the findings of the research has been allocated to a Safeguarding Zone around the array. At present the reserved noise budget has been reached, so the MOD must object to further applications (if they are not accompanied by a MOD approved mitigation scheme).

The allocated noise can alter on a regular basis as new schemes reach planning and others do not obtain consent. We recommend you contact us regularly to ascertain current allocation levels. Any schemes to which the MOD does not object, which subsequently do not gain planning consent, will have their noise quota added back to the available noise budget.

Calculations are based on current turbine designs. If future technological solutions can be applied to turbines and be scientifically proven to reduce or remove the noise generated, the MOD will reassess its policies.

Planning guidance establishes that wind energy developers should assess the affects of their proposed development upon aviation and defence interests and that they should engage in dialogue with the MOD at an early stage to identify concerns and potential mitigation to support of their application.[1]

Accordingly the applicant should take account of MOD aviation and radar operations in completing the EIA particularly in identifying a suitable site for development and the dimensions of the turbines that are to be installed.

We therefore ask that the MOD be consulted about all wind turbine developments with a height of 11m or more or a rotor diameter of 2m or more by the developer at the earliest possible time in the development process in accordance with "Wind Energy & Aviation Interests Interim Guidelines". http://www.bwea.com/pdf/Wind-Energy-and-aviation-interim-guidelines.pdf . This is so that the development can be fully assessed and any MOD concerns be made known to the developer at an early stage of the development process.

We also ask that MOD be consulted by Consenting Authorities regarding all applications for wind turbine developments with a height of 11m or more or a rotor diameter of 2m or more so we can ensure that our concerns are taken into account in the decision making process.

In order to assess a proposed development, we need the following information:

1. Accurate grid coordinates for each turbine to the nearest metre,
2. The height of the turbines to blade tip, hub height and rotor diameter,
3. The number of rotor blades,
4. The wind farm generation capacity,
5. The number of turbines

MOD Safeguarding wishes to be consulted and notified about the progress of planning applications and submissions relating to this proposal to verify that it will not adversely affect defence interests.

[1]Office of the Deputy Prime Minister- Planning Policy Statement 22 – paragraph 25
Scottish Government: National Planning Policy Guidance 6 "Renewable Energy Developments" – Paragraphs 52 to 53
Welsh Assembly Government: Practice Guidance – Planning Implications of Renewable & Low Carbon energy – July 2010 Section 3.4.21 – 3.4.26

I hope this adequately explains our position on the matter. If you require further information or would like to discuss this matter further please do not hesitate to contact me.

Further information about the effects of wind turbines on MOD interests can be obtained from the following websites:

MOD: http://www.mod.uk/DefenceInternet/MicroSite/DIO/WhatWeDo/Operations/ModSafeguarding.htm
Restats: https://restats.decc.gov.uk/cms/aviation-safeguarding-maps/
RenewableUK: http://www.bwea.com/aviation/index.html

Yours sincerely

Rachel Harper
Safeguarding Assistant – Wind Energy
Defence Infrastructure Organisation
http://www.mod.uk/DefenceInternet/MicroSite/DIO/WhatWeDo/Operations/ModSafeguarding.htm

SAFEGUARDING SOLUTIONS TO DEFENCE NEEDS

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PO15 7FL

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F: 01489 444013
E: nerlsafeguarding@nats.co.uk

Dear Sir/Madam,

NERL Wind Farm Pre Planning Services

Thank you for your wind farm pre planning service enquiry.

NATS are committed to supporting wind farm development through the planning process, and in order to improve this process, (NATS (en-route) plc (NERL) have updated their services which are aimed at assisting developers as they prepare for formal planning applications.

The benefits of these advisory services include advance warning of any potential impact on Air Traffic Operations and related major issues and will assist the developer in identifying a mutually acceptable approach to wind farm development. By engaging with the only experts who operate and maintain the en route assets, the NERL pre planning services offer wind farm developers the opportunity to de-risk development projects.

NATS has two distinct divisions with safeguarding responsibilities:

NATS (en route) plc (**NERL**), provides en route Air Traffic Services to aircraft flying in United Kingdom and North Atlantic airspace. NERL operate the radar, communications facilities and navigation aids that support en-route Air Traffic Management. In accordance with our license, NERL is obligated to safeguard its infrastructure and airspace procedures to ensure the integrity of the ATS it provides.

NATS Services Limited (**NSL**) provides ATS at 15 of the UK's major airports under contract to the airport owner. As part of its contractual obligation NSL safeguard the airport systems and operations on behalf of the airport operator.

The two divisions frequently work closely together, as it is not unusual for a particular development to impact upon the assets or operations of both NERL and airports where NSL provide air traffic control services. Consultation with NERL and NSL however does not replace the need to consult with the airport operator.

NERL itself has a range of services aimed at helping developers prepare for formal planning applications. These advisory services are not mandatory and do not replace the formal submission of applications to the relevant planning authorities. Neither do they replace NERL's obligations under the Safeguarding Directives incorporated in the Town and Country Planning Act.

Our Services:

1. **Self Assessment**

The Self Assessment Service is a free service which outlines the potential areas where the siting of wind farms could affect NERL's ATS operations. The provision of this information will enable developers to make their own initial assessment of the likely success or failure of a formal application. This service comprises a suite of maps to download as detailed "zipped" jpeg diagrams. The maps are also available as a set of ESRI shape files compatible with most Geographical Information Systems (GIS).

It is not possible to generate images of all blade/tip heights. Therefore blade tip heights have been generated for a range of tip heights that are understood to be the most representative of the heights of the majority of wind farm developments.

2. **Basic Service**

The Basic Assessment Service provides a technical safeguarding impact assessment of the proposed development against NERL's Communications, Navigation Aids and Radar Systems. This service identifies whether the proposed development would impact NERL's assets and also provides a telephone conversation with a NERL expert to discuss the conclusions and way forward.

3. **Plus Service**

The Plus Service sets out to provide a comprehensive pre planning consultation service which comprises a full technical and operational assessment of the proposal. A technical safeguarding assessment of the proposed development is performed against NERL's assets and expert examination of the outcome is undertaken. The proposed development and its predicted impact is then discussed with the managers of the relevant airspace to ascertain the operational impact assessment. This service also includes a face to face meeting with NERL experts to discuss the report and way forward in more detail.

Please note that where a Basic Assessment Service has already been provided and where the application is unchanged, the cost of the Basic Service will be discounted from the Plus Service.

Full details of all our services including our bespoke option, the Pre Planning Consultancy Wind farm Application Form and our Pre Planning Consultancy Pricing Plan together with our Terms and Conditions can be found at NATS and Windfarms

Please be aware that these services are only intended to assist Wind Farm Developers in de-risking their planning applications prior to formal submission. They do not replace the statutory process nor do they guarantee future acceptance or rejection of a formal application.

NATS recognises the benefits of wind turbines in addressing the UK's commitment to reduction in carbon emissions and is extremely mindful of aviation's impact on the environment. To that end NATS has recently become the first air traffic company in the world to set targets to reduce the amount of CO2 emitted by aircraft under our control, such improvements to the environment forming a core part of our current 'Brand Values' and company strategy.

If you require any further information relating to NERL's pre planning and safeguarding services please email NERLsafeguarding@nats.co.uk or telephone +44 (0)1489 444687.

Yours Sincerely

NERL Safeguarding Office

✓ PH.

Internal Memo

DGFirst – Roads Services, Wayside Depot, Annan Road, Dumfries

31 May 2011

To: Area Planning Manager (Nithsdale) Your ref: 11/E/3/0011

Drop Point: 208

From: Development Team Leader (Nithsdale) Our ref: 11/E/30011 KDD/KM

REQUEST FOR SCOPING OPINION (EIA) FOR ERECTION OF UP TO SIX WIND TURBINES (MAXIMUM TIP HEIGHT OF 150M) AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES

I refer to your consultation dated 19 May 2011 with regard to the above.

Roads

C11n Dumfries – Auldgirth
U492n Low Auldgirth
U541n Auldgirth Inn

Comments

This request for scoping opinion is for the proposed erection of up to six wind turbines, having a maximum tip height of 150m and the formation of access tracks on land at Blackwood, High Auldgirth, Auldgirth, Dumfries.

It should be noted that in the supplied Scoping Report (P190282) all references to "highway" should be replaced by "road".

It is noted that the Scoping Report indicates:-

- "Access to this site is yet to be confirmed but is likely to lead from the A76 at Auldgirth via the unclassified road to Lower Auldgirth". (See Notes 1 & 2 below).
- "An electricity transmission line from the site to the local electricity distribution network will also be required, and will be applied for separately by ScottishPower Power Systems. The likely connection location is Dunscore". (See Note 3 below).
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It would be appropriate that any future EIA/ES provide comprehensive details of:-

- The sizes of the prefabricated turbine components and the size and type of delivery vehicles, including predicted route, swept-path tracks and number of trips.
- Any alterations to the existing public road network to accommodate the size and type of delivery vehicles, including passing places in accordance with Council standards and should address the potential impact on utility services lying within the public road boundary.
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Furthermore, it should be noted that

- Any above average maintenance expenditure on the public roads as a result of haulage traffic to the site may be recoverable from the applicant /operator.
- Permits under the Roads (Scotland) Act 1984 will be required for any enabling/alteration works or service connections within the public roads.
- Transport Scotland and Network Rail should be consulted regarding access via the A76 and the railway bridge at the U492n respectively.

Notes

1. The U492n is locally weak, restricted in terms of horizontal and vertical geometry and visibility, with few passing places and with a restricted junction onto U541n adjacent to the Auldgirth Inn. Appropriate improvements would not appear feasible. Between the village and Low Auldgirth the public road crosses over the Dumfries to Kilmarnock railway line at a hump back bridge. (this will require to be assessed to ensure vehicles do not ground on the bridge).
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4. It would be appropriate that prior to any consents being granted, the proposed access route will require to be agreed with the Roads Authority and will require to be tracked for the largest vehicles/component deliveries and an agreed schedule drawn up for any improvements identified.
5. If suitable and sufficient borrow pits are unavailable within the project area and road stone is to be imported, this will have an impact on vehicle movements and access routes.
6. This study will be required and the assessments and conclusions included within the EIA. The conclusions will inform the decision of the selection and choice of access route.

Internal Memo

Planning & Environment – Environmental Standards

To: Area Planning Manager, Kirkbank, English Street, Dumfries Your ref: 11/E/3/0011

Drop Point: 207

From: Richard Procter, Environmental Health Officer – Housing and Safety Services Our ref: RP/LR/030875

Environmental Impact Assessment(Scotland) Regulations 1999
REQUEST FOR SCOPING OPINION (EIA) FOR ERECTION OF UP TO SIX WIND TURBINES (MAXIMUM TIP HEIGHT OF 150M)
AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES

We have no objections in principal. However, until a site specific noise impact assessment has been carried out following the principles detailed in the Assessment & Rating of Noise from Wind Farms ETSU Report ETSU-R-97, 1996 we would be unable to comment fully as to the expected impacts.

A noise assessment in relation to construction should also be undertaken following the guidance of BS5228:1997.

[redacted]

Environmental Health Officer

Dumfries & Galloway COUNCIL

07 June 2011

Jason Levy
Secretary ADCC
21 Courthill Park
Auldgirth
Dumfries
Dumfriesshire
DG2 0RR

Patrick Hannah
Planning & Environment Services
Kirkbank
English Street
Dumfries
Dg12HS

Auldgirth Community Council response to Blackwood Wind farm
Scoping study 11/E/3/0011

Dear Patrick Hannah
Here is the Auldgirth Community Council response to the report 11/E/3/0011 ADCC Meeting on Friday 03 June 2011

Cables from wind farm

Will cables be overhead or an alternative way?

Access road

How will the turbines get to wind farm, will there be a new access road, will there be an investigation on the access: will trees have to be taken down

Height of Turbines

Can the height of Turbines be reduced?

Safety

What steps have been taken for the welfare and safety of the community?

Site Density

How turbines will be positioned, Rotation Direction, Colour Match.

Cont on next pages

[redacted]

BLACKWOOD WIND FARM SCOPING REPORT

Proximity of proposal to dwellings, workplaces and community facilities. There is about to be a public consultation on a new interim draft wind energy policy for the region so the results of this would also inform the EIA. The neighbouring region of South Ayrshire has a statement that development of wind farms are not supported within 2km of a town or village or within 700m or 10 times rotor blade diameter from a dwelling, workplace or community facility. I will be requesting that D&G's interim policy, out for consultation on 13 June, will include these statements too.
A village and a large number of scattered smaller settlements and individual properties are within 2km of the proposed site. Within 700m are 6 dwellings, 1 workplace and community and tourist facilities of Burntkettle Shooting ground, a Core path and the Community woodland of Clauchrie. Please could the EIA address the impact of visual intrusion, noise and shadow flicker on these sites so it can be determined whether this proposal is acceptable.

The clay pigeon shoot within the site has staff and visitors to it that will need to be considered in the management of access and safety as well as the noise from the construction site and long term the turbines on staff and visitors. The impact on the power and water supplies to this also need to be addressed.

High Auldgirth and Pennyland farm have been identified as within the area of excessive noise levels. Pennyland is still an existing property; even if it is unoccupied at present, as the report seems to suggest, it has the potential to be occupied in the future. High Auldgirth contains 5 separate dwellings not just one as the report suggests.

Mention has not been made of four of the most important local tourist spots in the Auldgirth and District Community Council area. One of the top 100 hundred gardens in the world, The Garden of Cosmic Speculation at Portrack House, which is open to the public and takes visits from pre-booked groups. Secondly the tourist hotel and premier wedding venue Friars' Carse Country House Hotel are close to the site and will see the turbines and possibly hear them. Thirdly, Allanton World Peace sanctuary, which attracts visitors from around the world and has a number of festivals and events throughout the year. The Blackwood Wind Farm would be clearly visible from this site.
Fourthly the Dunscore old churchyard, next to the A76 and the Coldside road, is on the Coventers, Trail as it has the grave of "the wickedest man in Scotland", Grieson of Lag". This is an elevated site and the turbines will be in clear view.

Auldgirth and District Community Council area also has a shop and tea room, and an inn and restaurant and numerous holiday cottages that rely on tourism. The possible impact of the close proximity of a wind farm should be assessed in the EIA.

Grid connection. This has to be applied for separately but I feel the EIA should address the route of overhead power lines and pylons to the substation. It is unclear whether this is the one in Dunscore village or the one between Burnhead and Throughgate . Both are in the Community Council are of Dunscore. These have the potential to be as much a blight on the landscape as the wind farm

Existing wind farms in vicinity. There are a number of omissions in the data on existing and proposed wind farms in the area in the scoping report. Of most concern is the lack of information on the potential neighbouring wind farms of Dalswinton,

Auchencairn, Harestanes/Forest of Ae and Ae. The EIA should place this proposal in the context of existing wind farms.

Major transport and tourist routes. The proposal is within 2km of the A76 and clearly visible travelling north and south along this route. It is also very plainly seen from the A75 Euro route and major tourist route.

Access. Impact and visibility of a new access track up the hillside. Please could the EIA address the impact this will have in constuction and long-term visibility from the identified viewpoints as this will be a permanent and highly visible addition to the hillside. The current public road U492n from Auldgirth village Hall to Low Auldgirth is narrow in place and although the subject of a planning condition for the Burntkettle Shooting Ground at Glenloy within the proposed site has not yet had the two passing places installed. The road runs through farm buildings at Low Auldgirth and this road serves a number of dwellings at Low Auldgirth. The road is used for street parking for community activities at the village Hall. Please could the developer address how these problems are going to be overcome in the EIA.

Site density. The separation of the turbines appears to be closer together than at Dalswinton creating a dense block from distant viewpoints. Details of the style of turbine, colour and direction of rotation should be linked in with Dalswinton to create a united appearance. However the creation of a much larger wind farm will be detrimental to visual amenity.

Noise. There are many other properties closer to the project site than those identified as possible noise receptors and in other EIAs I have read a circumference of 2km is the general accepted testing zone. This will include Auldgirth village, Auchencairn, Auchencairn Cottage, Shieldhill, Birswick and Birswick Cottage, Old School House. There are a large number of homes in the potential noise sensitive zone and adequate testing should take place. Testing should not include Dalswinton as background noise but the cumulative effect of the proposed Blackwood wind farm plus the noise we already experience from Dalswinton. It should be possible to use the pre-Dalswinton data as the baseline for future assessment. The initial report seemed to say that this proposal was going to be 10dcb lower than Dalswinton and so it would be fine. The figures should be added together to make sure the total noise experienced by residents and visitors are within industry standard acceptance levels.
The spacing of the turbines may cause excessive wind shear that will increase the noise from the Blackwood Turbines and also from the existing Dalswinton turbines. The increase in wind turbulence may increase the amplitude modulation leading to disturbance to local residents. The EIA should seek to address whether this could be a problem.

There should be an assessment of how the turbine turbulence will have an effect on the noise created by the shooting ground as this is audible from 3 to 4 km away and the turbines might project or amplify so the shooting ground is noisier at short distances or can be heard further away.

Ecology. I have seen Goshawks in the area and I am concerned at the impact on this rare species.
Bats are an increasing problem around turbines attracted by the insects gathered in the warmed air and deaths are becoming more common. Nearby Allanton House has a regular wildlife festival and has run Bat walks. Any impact needs to be assessed.

View points. The sites chosen as viewpoints are often at the base of hills. The Dalswinton wind farm is clearly visible from a distance.

Some possible viewpoints.
A75 at Collin
A75 above Lochfoot
Jochs loaning, Lincluden
Coldside road. All the properties here have Dalswinton in the middle of their outlook.
Old Dunscore Churchyard
Allanton Mill to Merkland on the C114
East Church on the C113/C114
Gateside of Moat, an elevated group of dwellings on Crawston Hill
Auldgirth village at Ballochan Road
Cairn Farm
Auchencairn
Barburgh Mill

Nithsdale is the area; the valley is the Nith valley.

THORNHILL COMMUNITY COUNCIL

2 Queensberry Brae
Thornhill
DG3 5AQ

10th June, 2011

Patrick Hannah
Planning & Environmental Services
Kirkbank
English Street
Dumfries
DG1 2HS

Thornhill Community Council response to Blackwood Windfarm
Scoping study 11/E/3/0011

Dear Mr. Hannah,

Here is the Thornhill Community Council response to the Scoping report for 11/E/3/001

Overview

Force Energy 9 and EDF wish to build a windfarm at Blackwood estate Auldgirth. This will involve 6 x 450 foot high 2WM turbines that will overhang Auldgirth village and visually impinge on the Nith Valley including the Thornhill Uplands Regional scenic area and the valley south to Dumfries. This windfarm although small in turbines numbers is the first to infringe into the Nith valley proper and will significantly add to the cumulative visual and noise impact of the area when taken with windfarms at Dalswinton (operating), Harstanes (consented) and Auchencairn (application not yet in).

Specific issues

D&G New Wind Energy Plan

The proposed site is not in an area identified as most suitable for wind energy under the new D&G Plan for wind energy just about to go for public consultation. It is in fact in an area adjacent to a Dark Skies/Regional scenic area designation and one that is marked for protection. This proposal would thus go against the new local plan for wind energy generation.

Noise – Peace and tranquillity damage

The scoping report concludes on page 37&38 that the addition of the windfarm will add extra noise to the current levels but that the 6 turbines will be a small proportion of the new total noise levels. This is rubbish and no actual local evidence is provided to support this!! It then goes on to suggest that because of this only High Auldgirth needs noise assessment. Firstly one cannot dismiss the additional noise being generated. Representative actual noise assessment is required at a number of properties around the site as identified in the Fig 8 on page 37. Unlike Auldgirth which is owned by the landowner these dwellings represent real neighbours!

Secondly the unique acoustics of this part of the Nith valley mean noise travels greater distances as demonstrated by the Glenloy Shooting Ground when sited at its previous location. On this occasion noise on shooting days travelled several miles along the Nith River and Clauchrie Burn valleys. The predicted turbine noise levels (page 37) do not take account of this phenomena.

Given the proximity of Auldgirth Village to this site assessments MUST be taken there and at Clauchrie, Shieldhill, Auchencairn, Cairn Farm and in Clauchrie Woodland where a Forest classroom is to be sited close to Clauchrie House.

Cumulative visual Impact

The proposed windfarm will extent the east – west line of Dalswinton turbines as seen from Thornhill in the North and Dumfries in the south so extending the sequential effect of both windfarms. This proposal thus represents a creeping extension of the Dalswinton windfarm. The number of viewpoints is limited and wire diagrams and pictorial viewpoints should be taken from all surrounding houses and farms as detailed above as needing noise assessment.

Carbon balance

No mention is made of the carbon balance of this proposal. As large amounts of concrete are involved in turbine foundations we would be looking for extensive planting of trees to offset the CO2 admissions generated from making the concrete. No mention is made of tree felling.

Clauchrie Woodland – Social and community woodlands & Tourism

The scoping report fails to mention Clauchrie Community Woodlands that are immediately North and next door. Closeburn Community through its local charity Nith Valley LEAF Trust is currently in negotiation with the Forestry Commission Scotland to lease 235ha woodland as a community forest. This will start from early 2012 and is likely to be a 100 year plus leasing arrangement – thus making it effectively permanent and covering the lifespan of the windfarm. The aim of NVLT is to maintain Clauchrie woodlands as a place of tranquillity whilst developing it as a centre for education and training in environmental and wildlife skills. Having turbines sited right on the Clauchrie Woodland boundary would generate intrusive noise and have a potentially serious effect on wildlife including the nesting of protected species like Goshawks nesting locally and badgers using the Clauchrie Burn valley. Tourism would also be significantly affected. Clauchrie Woodland includes D&G Core path 4442. Thornhill, as a neighbouring Community is very much effected by the above.

Errors

The scoping report contains a number of factual errors that throw into doubt the accuracy of all the information provided. Example of errors includes the table on page 19 with details of the status of other windfarms. Harstanes – 19 turbines is NOT consented! Auchencairn has not been submitted! The report also struggles with the geography of the area and states that the Nith Valley lies to the east when it in fact lies WEST of the proposed site (page 14). We are dismayed that professional companies like Force 9 Energy Ltd & RSK cannot get the simplest facts correct and would worry that future evidence would also be incorrect.

In conclusion Thornhill Community Council strongly objects to this proposal and would rigorously oppose this windfarm. The proposal does not fit the new local plan, would have a serious negative impact on the visual amenity and bring additional noise to the area all affecting tourism and the amenity of inhabitants. It would also have a potential serious effect on protected raptors and mammals.

We are very disappointed this scoping report talks only about mitigation when developments like this should aim to bring enhancement and benefits to the surrounding area.

Yours sincerely,

[redacted]

Douglas Watters
CHAIR & SECRETARY
Thornhill Community Council

PHA

Police Headquarters
Cornwall Mount
Dumfries
DG1 1PZ

www.dg.police.uk

Telephone: 0845 600 5701
Textphone: 01387 250701
Email:

Dumfries and Galloway Constabulary

Chief Constable
Patrick J Shearer QPM MA LLB

Our ref:
Your ref: 11/E/0011
Date: 23 May 2011

Area Planning Manager (Nithsdale)
Planning and Environment
Dumfries and Galloway Council
Kirkbank
English Street
DUMFRIES
DG1 2HS

Dear Sir

SCOPING OPINION FOR ERECTION OF UP TO SIX WIND TURBINES (MAX TIP HEIGHT OF 150M) AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES

I refer to the above and to your memorandum dated 19 May 2011.

If full planning permission is granted then early discussions will be required in order that all interested agencies can agree a safe working plan, including the Police escorting the abnormal loads associated with the development.

In addition prior to the start of any construction works I would appreciate if the applicant/construction team met with a Crime Reduction Officer to discuss issues in relation to site security.

Yours faithfully

[redacted]

Inspector Hewitson
Roads Policing
Operational Support Services

HSE

Health and Safety Executive

Hazardous Installations Directorate

Kirsten Laidlaw

Chemical Industries
Belford House
59 Belford Road
Edinburgh
EH4 3UE

Tel: 0131 247 2000
Fax: 0131 247 2041
kirsten.laidlaw@hse.gsi.gov.uk

http://www.hse.gov.uk/

HM Principal Inspector of Health & Safety
Dr G. A. Cook

✓ PH.

Dumfries & Galloway Council
Planning and Environmental Services
Kirkbank
English Street
Dumfries
DG1 2HS

Date: 06 June 2011

Our ref: GC/SO/Auldgirth/4.2.1.1701

Your ref: 11/E/3/0011

Dear Sirs

ENVIRONMENTAL ASSESSMENT FOR UP TO SIX WIND TURBINES AT BLACKWOOD, AULDGIRTH, DUMFRIES.

Thank you for your letter of 19 May 2011 asking what information should be provided in the environmental statement for the proposed development at Blackwood.

Environmental Impact Assessments are concerned with projects which are likely to have significant effects on the environment. HSE's principal concerns are the health and safety of people affected by work activities. HSE cannot usefully comment on what information should be included in the environmental statement of the proposed development. However, the environmental statements should not include measures which would conflict with the requirements of the Health and Safety at Work etc Act 1974 and its relevant statutory provisions.

Yours faithfully

[redacted]

Kirsten Laidlaw
Admin Support

HISTORIC SCOTLAND ALBA AOSMHOR

Patrick Hanna
Planning Officer
Planning and Environment Services
Development Management
Dumfries and Galloway Council
Kirkbank
English Street
Dumfries
DG1 2HS

Longmore House
Salisbury Place
Edinburgh
EH9 1SH

Direct Line: 0131 668 8960
Andrew.stevenson2@scotland.gsi.gov.uk
Switchboard: 0131 668 8600

Case ref: 201101079
Your ref: 11/E/3/0011

10 June 2011

Dear Mr Hanna

The Environmental Impact Assessment (Scotland) Act 1999
Erection of up to Six Wind Turbines at Blackwood, High Auldgirth, Auldgirth, Dumfries
Scoping Report

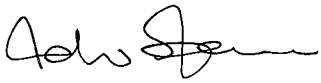
Thank you for your letter of 19 May 2011 seeking our comments on the scope for the assessment of a potential wind energy development at Blackwood, High Auldgirth. The following comments are based on our statutory historic environment interests. That is scheduled monuments and their setting, category A listed buildings and their setting and gardens and designed landscapes in the Inventory. I note and welcome that the developer has previously sought comments from your Council's Conservation and Archaeology Services who will also be able to advise on the potential for significant impacts on the historic environment and of potential impacts and mitigation for any sites of regional and local importance.

As the scoping report notes, the scheduled monument Mullach, fort (Index no. 657) lies approximately 700m to the south of the nearest proposed turbine location. I welcome the recognition of the need to assess the potential impact on this monument from both the proximity of turbines and the cumulative effects on its setting, as well as considering potential mitigation such as turbine locations for any identified impacts. It would be beneficial if either a wireframe or photomontage was also supplied as part of the Environmental Statement to help illustrate this potential impact. For information, I would advise you to consider our recently published guidance on the setting of historic environment assets when carrying out the assessment. The guidance can be found at http://www.historic-scotland.gov.uk/setting-2.pdf."

Should you wish to discuss any issue raised in this response please do not hesitate to contact me at the above details.

HISTORIC SCOTLAND ALBA AOSMHOR

Yours sincerely



Andrew Stevenson
Senior Heritage Management Officer (SEA)

JHM PH

PLANNING & ENVIRONMENT
AREA PLANNING OFFICE : NITHSDALE

CONSULTATION SCHEDULE

19/05/2011
Ref: 11/E/3/0011
CaseOfficer: Patrick Hanna

1. DETAILS OF APPLICATION

Application Type: Scoping opinion

REQUEST FOR SCOPING OPINION (EIA) FOR ERECTION OF UP TO SIX WIND TURBINES (MAXIMUM TIP HEIGHT OF 150M) AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES

Applicant's name and address:-

Knight Frank LLP
120 Bothwell Street
Glasgow
G2 7JS

Agent's name and address:-

Previous Permissions etc.:

2. RESPONSE

Date reply due: 09/06/2011

Y/N No objection

Y/N My report is attached

(Y)/N No objection subject to the following conditions and / or directives:-

please see attached sheet

PLANNING & BUILDING SERVICES
- 8 JUN 2011
KIRKBANK, DUMFRIES

OR: I wish to comment on the application, however for the reason given on the attached note it may not be possible to complete my report within 21 days. I expect to complete my report by :-

.....

Signed :[redacted]

Mrs Alison A Foggie

Keir Community Council

7/6/11.

Keir Community Council has been very divided over this proposal, but the majority vote has opted for no objection at this stage.

However considerable concerns were raised over:-
1) The increasing number of wind farms being sited in the Nith Valley.
2) The visual impact of this proposal on an area of scenic beauty.
3) The noise impact of this wind farm on nearby residents.
4) The negative impact this proposal will have on the local community and area in general.

Obviously, if there is a planning application submitted for this proposed wind farm, then Keir Community Council would have to re-assess their position.

PHA ✓

RSPB nature's voice

Steve Rogers
Planning and Environment Services
Development Management
Kirkbank
English Street
Dumfries
DG1 2HS

RSPB SCOTLAND

08 June 2011

FAO Patrick Hanna

Dear Patrick,

SCOPING OPINION REQUEST FOR PROPOSED WIND FARM DEVELOPMENT AT BLACKWOOD, AULDGIRTH

Thank you for consulting RSPB Scotland on this proposed wind farm development at Blackwood, Auldgirth. RSPB Scotland is supportive of the use of renewable technology as a means of addressing climate change but believes that locations for renewable energy developments must be carefully selected to avoid negative impacts on sites and species of conservation importance.

The site has potential for foraging peregrine, merlin and hen harrier, all Annex 1 species in the EU Birds Directive, throughout the year. We are also aware of breeding waders and goshawk in the general area. Therefore, we would strongly suggest that year-round vantage point watches and breeding bird surveys are undertaken, following the latest SNH guidance in assessing the impacts of wind farms on birds.

RSPB Scotland can provide data searches upon request, contact Clare Bunyard (clare.bunyard@rspb.org.uk) for details. It would also be advisable to contact the Dumfries and Galloway Raptor Study Group (chris.rollie@rspb.org.uk) for further data.

These comments are made without prejudice to any view we may later take regarding this proposal and we reserve the right to object if we feel that it ultimately poses a significant threat to wild birds.

If you require further information, then please do not hesitate to contact me.

Yours sincerely,

[redacted]

Conservation Officer – Dumfries and Galloway

Dumfries & Galloway Office
The Old School
Crossmichael
Castle Douglas
Kirkcudbrightshire DG7 3AP

Tel 01556 670464

www.rspb.org.uk/scotland

BirdLife INTERNATIONAL

Planning and Environment Services
Development Management
Kirkbank
English Street
Dumfries
DG1 2HS

Your ref: 11/E/3/0011
Our ref: CNS REN WF 68808

Date: 8 June 2011

FAO Patrick Hanna

Dear Sirs,

Environmental Impact Assessment (Scotland) Regulations 1999
Request for Scoping Opinion (EIA) for up to Six Wind Turbines (Maximum Tip Height of 150m)
At Blackwood, High Auldgirth, Dumfries

Thank you for your letter dated 19 May 2011 requesting a scoping opinion from Scottish Natural Heritage (SNH) for the above proposal.

Introduction

The proposed development is for up to six windturbines (maximum tip height 150m) located at High Auldgirth approximately 10km north of Dumfries.

SNH consider that in order to assess the impact of the proposed development on the natural heritage information will be required on the following:

a) Ecological impacts, including direct and indirect impacts upon protected species and designated sites;
b) Landscape and visual impacts,
c) Recreational impacts, including positive and negative impacts associated with the development, and;
d) The cumulative impacts of a), b) and c) in combination with other wind turbine proposals in the area.

Our comments below contain specific details, recommended guidance, publications and methodologies which the developer should consider in relation to these issues.

Considerable guidance on information requirements for wind farm applications can be found at:
http://www.snh.gov.uk/planning-and-development/renewable-energy/

This includes detailed guidance on ornithology, landscape and visual impacts, assessment methods and cumulative effects with respect to onshore windfarms, see:
http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/

Our strategic locational guidance provides SNH's broad overview of where there is likely to be greatest scope for wind farm development, and where there are the most
significant constraints, in natural heritage terms this will provide a starting point for the assessment that SNH will make and the advice that it will offer on individual proposals:

http://www.snh.org.uk/pdfs/polstat/ar-ps01.pdf

SNH has produced a Service Level Statement (SLS) for renewable energy consultations. This statement provides information regarding the level of input that can be expected from SNH at various stages of the EIA process. Annex A of the SLS details a list of references that the developer must consider as part of the EIA process.
http://www.snh.org.uk/pdfs/strategy/renewable/RE-SLS.pdf

Please also refer to our "Siting and designing windfarms in the landscape" which can be viewed at:
http://www.snh.gov.uk/docs/A317537.pdf

To assist us, and in response to the request for information about what format we need, we are content to receive a CD copy of the ES text and figures. However, in addition, we also require one hard copy of the Figures relating to the Landscape and Visual Impact Assessment (in particular the visualisations and ZTVs) because we cannot print these off to a high enough quality.

We would like to emphasise that an EIA is an iterative process and that issues may come to our attention later in the process additional to those that are referred to in this letter. We will endeavour to inform the developer as soon as possible of any such new issues. Please also note that this advice we offer here does not prejudice or constrain any future advice we may offer in relation to a subsequent formal planning application, and is based upon our understanding of the project at this time.

SNH Advice - Natural Heritage Impacts

Designated sites

There are no international or national designations within the proposed development site, the site sits on the boundary of the Thornhill Uplands Regional Scenic Area. Designated sites within 20km of the potential development location include:

European Designated Sites – Upper Solway Flats and Marshes Special Protection Area (SPA), Solway Firth Special Area of Conservation (SAC), Castle Loch, Lochmaben SPA, Solway Mosses North SAC, and Upper Nithsdale Woods Special Area of Conservation (SAC).

National Designated Sites – Locharbriggs Quarry Site of Special Scientific Interest (SSSI), Lag Meadow SSSI, Lochmaben Lochs SSSI, Castle Loch SSSI, Black Loch SSSI, Stenhouse Wood SSSI, Milton Loch SSSI, Upper Solway Flats and Marshes SSSI, Longbridge Muir SSSI, Perchhall Loch SSSI, Shiel Dod SSSI, Carron Water and Hapland Burn SSSI, Chanlockfoot SSSI, Nith Estuary National Scenic area (NSA), Caerlaverock National Nature Reserve (NNR) and Kirkconnell Flow SSSI / NNR.

The legislative requirements for European sites are summarised in SE Circular 6/1995 as amended June 2000 and further details are provided in Annex 1 of this letter.

European Protected Species

Otter, great crested newt, and all bat species are listed on Annex IV of EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna ('Habitats Directive') as species of European Community interest and in need of strict protection. The species of animals listed in Annex IV(a) of the Habitats Directive, whose natural range includes any area in Great Britain, are also listed in Schedule 2 of the 1994 Habitats Regulations as 'European Protected Species of Animals' and are fully protected. The legislative requirements relating to

European Protected Species are also detailed in Annex 2 of this letter. Further information on EPS is available at:

http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/legal-framework/habitats-directive/euro/

http://www.snh.gov.uk/planning-and-development/advice-for-planners-and-developers/protected-animals/

Otter

The River Nith and its tributaries are known to host a population of otter. Small streams are commonly used for feeding and as connection routes between water catchments. Desk and field survey work should be carried out to allow an assessment of the impact of the development on otter. A full survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Great Crested Newt

The proposed development site is within the Nith valley which is known to host Great Crested Newt (GCN) where suitable habitat exists. SNH have no specific information for this site. We advise that further desk and field survey work should be carried out at a suitable time of year to ascertain the use of this site by GCN, and to ascertain if GCN are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Bats

Several species of bat are common along the Nith Valley. We advise that further desk and field survey work should be carried out at a suitable time of year to ascertain the proximity of any bat roosts to the site, and to ascertain if foraging bats, or bats moving between roosts throughout the year, are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Nationally Protected Species

Water Vole

The habitat of the water vole is protected under Schedule 5 Section 9 (4) of the Wildlife and Countryside Act 1981 (as amended) regardless of whether occupied by the animal. We advise that further desk and field survey work should be carried out at a suitable time of year to ascertain whether water vole are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Badger

Badgers and their setts are protected in Great Britain by the Protection of Badgers Act 1992, as amended by the Nature Conservation (Scotland) Act 2004, whereby it is an offence to wilfully take, kill or injure a badger: to obstruct, destroy or damage a sett or to disturb a badger whilst occupying a sett, with intent or recklessly.

Badgers are widespread in Dumfries & Galloway and our experience is that representations from the public often include information that badgers or other protected mammal species will be affected. We therefore recommend that a full badger survey is carried out; this should include woodland and pasture land which surrounds the development site. Survey work should

be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Red Squirrel

Red squirrel has been noted on site. Red squirrel and their places of shelter (dreys) are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). If any tree removal is planned we advise that further desk and field survey work should be carried out at a suitable time of year to ascertain whether red squirrel are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Ornithology

The proposed development site is located within an area without a RSPB sensitivity rating.

The proposed development site lies approximately 16km north of the Upper Solway Flats and Marshes SPA / SSSI, and 16km west of Castle Loch, Lochmaben SPA both notified for their ornithological interest in particular for aggregations of geese.

The site may be used by a number of bird species throughout the year. We recommend that a desk survey is commissioned to determine the potential impact of the proposal on birds in particular birds listed on Annex 1 of the Birds Directive, regularly occurring migratory species (in particular geese on migration to the Upper Solway Flats and Marshes SPA/SSSI and Castle Loch, Lochmaben SPA), birds on Schedule 1 of the Wildlife and Countryside Act, and Red-Listed Birds of Conservation Concern. The study should include local knowledge from bird recorders, landowners, Raptor Study Groups, the Wildfowl and Wetlands Trust and the RSPB. If vulnerable species are found to be present on the site where turbines are proposed from the desk study, or if insufficient data is available for the site to inform SNH of the likely ornithological impacts of the wind farm further survey work will be required, guidance on fieldwork requirements can be found at:

http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/

The desk study exercise should be carried out as soon as possible so that if further fieldwork is necessary it can start as soon as possible.

Wind farms can impact upon birds in 3 main ways;

- Displacement through indirect loss of habitat if birds avoid the wind farm area and its surrounding area due to turbine operation and maintenance/visitor disturbance
- Death through collision or interaction with turbine blades
- Direct habitat loss through construction of wind farm infrastructure

An assessment of a potential wind farm's effect on the bird interest of a site should thoroughly consider each of the 3 potential risks for each bird species which uses the site.

Assessing the impacts of this proposal on bird populations will require a high degree of expertise and understanding of bird ecology and their interaction with windfarm development. Experience has shown that submission of robust and qualified ornithological assessments reduces the time taken for SNH to provide advice to the determining authority. We therefore wish to stress the importance of employing a suitably qualified ornithologist.

Habitats

We recommend as a minimum requirement that a Phase 1 habitat survey of the proposed development site is carried out, this should be at a suitable time of year. If the Phase 1 survey

identifies habitats and/or species of note, such as those included on Annex 1 of the EU Habitats Directive 1992 or the Dumfries & Galloway Local Biodiversity Action Plan, a further survey should be conducted using the National Vegetation Classification (NVC) system, along with an outline of mitigation measures, as this will provide more detail in order for SNH to fully assess the impacts of the proposal.

Freshwater Habitats and Species

The proposed development has the potential to impact upon the freshwater environment, particularly during the construction and decommissioning phase when there could be increased sediment runoff from the site into adjacent watercourses, which could alter water quality and impact on species such as brown trout and salmon.

Salmon, brown trout and sea trout are present within the River Nith catchment. Salmon are listed under Annex II of the EC Habitats Directive 1992. Across Great Britain populations of salmon and sea trout have declined significantly over the past 20-30 years. Lamprey are listed on Annex II of the European Habitats Directive 1992. Lamprey are known to occur within the River Nith catchment.

Excessive concentrations of suspended solids in rivers can affect species in a number of ways. For instance, settlement of solids may result in siltation in spawning beds, either preventing spawning, or resulting in failure of the eggs or larvae to develop. In addition, increased solids loading in a river may result in a decrease in abundance of food supply, but may also have direct effects on fish by causing gill clogging or irritation. Available evidence suggests a suspended solids threshold of 25mg/l is recommended in order to protect salmon interests.

Attention should therefore be given to minimising adverse impacts to surface waters. We would advise that these impacts and any necessary mitigation should be adequately assessed to determine the significance of any impact on Atlantic salmon, Lamprey and fish populations. Any mobilisation of sediment or nutrients into surrounding watercourses should be avoided. Mitigation should be identified in consultation with the Scottish Environment Protection Agency (SEPA) to address these issues.

Hydrology, Geology and Soils

Certain activities such as engineering work adjacent to water bodies, waste disposal etc., which may be a requirement of the proposed development now need authorisation from the Scottish Environment Protection Agency (SEPA) under the Water Environment (Controlled Activities) (Scotland) Regulations 2005. We advise early consultation with SEPA regarding all proposed activities on site. We also recommend that technical advice be sought from SEPA on the scope of geological, hydrogeological work, hydrological and soil assessment work that will be required in order to assess and adequately mitigate against impacts from the development on adjacent water courses.

Landscape Character & Visual Impacts

The proposed development site lies on the boundary of zone 1 (low) and zone 3 (medium) sensitivity as described within the Strategic Locational Guidance for Onshore Windfarms in respect of the Natural Heritage (SNH 2006).

The proposed development site lies within the Upland Fringe (4 turbines and access track), Foothills with forest (2 turbines and access track) and Middle Dale (access track) landscape character types as described within The Dumfries and Galloway Landscape Character Assessment (Land Use Consultants 1995).

The proposed development site does not lie within a National Scenic area though the turbines would be visible from the Nith Estuary National Scenic Area. The proposed development site lies approximately 800m east of the Thornhill Uplands Regional Scenic Area.

Upland Fringe

The Ae unit of the upland fringe comprises a narrow band of hill slope between the Nith valley and the higher foothills dominated by the forest of Ae. In the wider landscape context this unit forms a highly visible edge providing a backdrop to adjacent valleys. For this reason the Upland Fringe landscape character type is assessed as having a high landscape and visual sensitivity to larger wind turbine typologies (150-80m), and a high to medium sensitivity to medium wind turbine typologies (80-50m).

Foothills with Forest

The scale of this landscape, simple land cover pattern and sparsely populated character reduce sensitivity to larger wind turbine typologies. Overall landscape sensitivity is assessed as medium for large wind turbine typologies and medium low for medium wind turbine typologies. Visual sensitivity is assessed as medium for the large typologies and low for the medium typologies.

The character of these landscapes at this location is however greatly influenced by the existing Dalswinton wind farm development (15 X 120m turbines) which is sited within the Foothills with Forest landscape character type adjacent to the boundary of the Ae unit of the Upland Fringe landscape character type.

Landscape and Visual Impact Assessment

Based on the information provided within the scoping report the issues noted below are likely to be significant. They should therefore be addressed in greater detail within the Environmental Statement (ES):

- Height of turbines this is of particular importance due to the turbines potentially being at the upper end of the scale for onshore turbines, the presence of other windfarms with different heights of turbines and the aspiration to have two heights within the design.
- Borrow pits should be included in relevant visualisations less than 10km from site.
- Ancillary development – it is preferable for transformers to be contained within turbines.
- National Grid connection - details of options for connection should be provided.
- Cumulative impacts: may be particularly applicable to this proposal and should be fully considered.

We agree with the approach outlined within your scoping report for the landscape and visual assessment.

Zone of Visual Impact Assessment and selection of Viewpoints (VPs)

We feel we cannot comment on the list of viewpoints due to the clarity of the ZTV produced and request a ZTV as per the guidance below. We will then be in a better position to assist with viewpoint selection,

Zone of Theoretical Visibility Map (ZTV)

Maps must be produced at a comprehensible scale. SNH Guidance suggests that it is generally most appropriate to superimpose the ZTV onto an Ordnance Survey base map at 1:50,000 scale, copied at either 1:50000 or 1:100000;

They should be of a high quality resolution and presented as either an A1 sheet or as separate A3 sections (with minimum 1km overlaps);

The initial viewpoints selected should be clearly marked on the map and crossed referenced to a Table of proposed viewpoints, see below;

And the turbine locations and the ZTV 35km radii should also be shown on the ZTV. It should be noted that it is useful to include radii for every 5 or 10km from the centre of the windfarm site.

Table of Proposed viewpoints

The table must provide the name of the viewpoint;
An accurate grid reference;
And brief description as to why it has been selected.

Cumulative landscape and visual impacts

We recommend that you liaise with Dumfries and Galloway Council as per your list of windfarms for inclusion in the cumulative assessment. There is the potential for cumulative effects to occur due to the proximity of windfarm development in the same and adjacent character types. A Design Statement will be required in the ES, setting out the rationale for the layout and turbine heights, and the iterative process by which the final layout has been reached in order to maximise the impact mitigation. The Design Statement must take account of the adjacent windfarm developments in the same landscape type in determining the turbine layout and turbine height.

We are keen to be consulted on further cumulative viewpoints once cumulative ZTV maps have been produced, as this may throw up further viewpoints outwith those selected within the landscape and visual assessment.

Lighting

Should there be a need to install aviation obstruction lighting to some or all of the wind turbines, its visual impact at night will have to be assessed in the ES.

Offsite impacts

The ES should provide information relating to the preferred route options for delivering the turbines and other abnormal loads via the trunk and local road network. SNH wishes the ES to include an assessment of the off-site impacts of improving the public roads to allow access i.e. the landscape and visual impacts of road straightening, widening, levelling, tree and hedgerow removal and the upgrading of junctions.

SNH Guidance

The landscape and visual impact assessment of the development should be undertaken following the approach described within the “Guidelines for Landscape and Visual Impact Assessment” (LI-IEMA, 2002). Assessments need to be informed by the relevant published landscape character assessments for the study area.

The assessment should also consider the landscape recommendations of the following documents:

Nithsdale Local Plan
Dumfries & Galloway Structure Plan
Dumfries & Galloway Landscape Character Assessment

In addition to the above SNH recommend that both the landscape and visual impact assessment, is informed by the guidance found on our web site at

http://www.snh.gov.uk/planning-and-development/renewable-energy/

The scope of what is required for the visual impact assessment and best practice methodologies to use should be guided by the following documents, both available at the above website:

- Visual representations of windfarms: Good Practice Guidance (2006)
- University of Newcastle (2002) Visual Assessment of windfarms

SNH has published guidance on the cumulative effect of windfarms (Version 2 revised 13.04.05) at:

www.snh.org.uk/pdfs/strategy/cumulativeeffectsonwindfarms.pdf

The Scottish Executive's statement 'Securing a Renewable Future - Scotland's Renewable Energy' highlights the likelihood that cumulative impacts may present an eventual limit to the extent of onshore wind development and the need to attach increased importance to consideration of cumulative impact in specific areas.

SNH is aware of the growing importance of intervisibility between wind farm developments and the resulting potentially significant adverse cumulative visual impacts which could arise as a result.

Clearly, assessing the landscape and visual impacts of this proposal in a manner appropriate to the scale of this proposal will require a number of important judgements to be made. We therefore wish to stress the importance of employing a suitably qualified landscape architect on your team and reiterate our view that it would be desirable to discuss the scope of the LVIA with Dumfries & Galloway Council as soon as possible.

Recreation and Access

SNH request that the developer identifies the current recreational activities within the study area and ascertains the significance of any positive and negative impacts that will occur upon such activities as a consequence of the development proposals.

The impact on recreational facilities around the windfarm should be considered in relation to the setting and experience of these places and the changes in view from these facilities and recreational resources. Inclusion of Council access officers, members of the local community and local recreational bodies within the consultation process could be considered.

The ES should outline provisions made regarding public access, having regard for the requirements of the Land Reform (Scotland) Act 2003, clarifying the extent of any access restrictions proposed, if any, during construction or operation, and indicating any new facilities for access to be provided on or off site.

SNH wishes to see a commitment to work with the law and spirit of the Land Reform (Scotland) Act (2003). We will look for an assessment of the significance of any positive and negative impacts that will occur upon local recreational activities as a consequence of the development proposal. Any assessment should not be restricted to the development footprint – that is, the developer should identify opportunities to integrate the site access tracks into the surrounding

network and we encourage the developer to make a commitment to offsite works to make these connections.

SNH Advice - Infrastructure and Grid Connection

As good practice we would expect that the impacts of constructing, installing and operating the following infrastructure components should be considered and assessed by the developer, in particular with respect to landscape and visual impacts;

Substation
On-site access tracks
Potential changes to existing public roads
Cabling (Underground)
Cabling (Overhead)
Monitoring and control centre.

It should be confirmed that the connection from the turbines to the control building will be laid underground (in trenches or mole-ploughed). SNH also recommends that the route corridor for the grid connection from the control station to the substation (which will be the subject of a separate application), is clear as to whether the developer has signed a contract with National Grid for this work, and states whether this connection will be underground or overhead.

SNH Advice - Mitigation

All opportunities for mitigating the impact of the proposed development on the natural heritage should be explored, based on the updated ecological and landscape and visual impact assessments. Mitigation proposals could include opportunities for landscape and habitat benefit both on-site and off-site. There may also be opportunities for habitat creation of nature conservation value within the site.

Conclusion

We have at this preliminary stage only provided an indication of possible concerns. Further advice will be provided when the above requested information is submitted.

If you have any questions regarding this response please do not hesitate to contact me at the above address.

Yours faithfully

Beth Wilson
Operations Officer
Southern Scotland

ANNEX 1

Legislative Requirements for European Sites

Upper Solway Flats and Marshes and Castle Loch, Lochmaben status as classified SPAs under the EC Directive 79/409/EEC on the Conservation of Wild Birds (the "Birds Directive") and Solway Firth, Solway Mosses North, and Upper Nithsdale Woods status as SACs under the EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the "Habitats Directive"), means that the Conservation (Natural Habitats, &c.) Regulations 1994 as amended, (the "Habitats Regulations") apply. The requirements are summarised in SE Circular 6/1995 as amended in June 2000 and include, at paragraph 12:

"The Regulations (48) require that, where an authority concludes that a development proposal unconnected with the nature conservation management of a Natura 2000 site is likely to have a significant effect on that site, it must undertake an appropriate assessment of the implications for the conservation interests for which the area has been designated."

The need for appropriate assessment extends to plans or projects outwith the boundary of a Natura 2000 site in order to determine their implications for the interest protected within the site.

Under Regulation 48 of the Habitats Regulations, this means that Dumfries & Galloway Council as competent authority has a duty to:

- determine whether the proposal is directly connected with or necessary to site management for conservation; and, if not,
- determine whether the proposal is likely to have a significant effect on the site either individually or in combination with other plans or projects; and, if so, then
- make an appropriate assessment of the implications (of the proposal) for the site in view of that site's conservation objectives.

The competent authority can only agree to the proposal under Regulation 48 after having ascertained that it will not adversely affect the integrity of the site. If this is not the case, and there are no alternative solutions, the proposal can only be allowed to proceed if there are imperative reasons of overriding public interest, which in this case can include those of a social or economic nature. If Dumfries & Galloway Council propose to approve the plan on the grounds of imperative reasons of overriding public interest then Regulation 49 states that the Council must inform Scottish Ministers, and you must not issue approval for a period of 21 days after receipt by Scottish Ministers unless notified otherwise. If proposals are allowed to proceed in accordance with Regulation 49 then it should be noted that Regulation 53 requires that Scottish Ministers shall secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected.

ANNEX 2

Protection Afforded to European Protected Species

Regulations 39 and 43 of The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (Habitats Regulations) provide full protection for certain animal and plant species. The species identified above are referred to as European protected species and are listed on Schedules 2 (animals) and 4 (plants) of the Habitats Regulations.

This means it is illegal to:

Deliberately or recklessly capture, injure or kill a European protected species of wild animal or to deliberately or recklessly (i) harass an animal or group of animals; (ii) disturb an animal while it's occupying a structure or place used for shelter or protection; (iii) disturb an animal while it's rearing or otherwise caring for its young; (iv) obstruct access to a breeding site or resting place, or otherwise deny the animal use of the breeding site or resting place; (v) disturb an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; (vi) disturb an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young
Deliberately or recklessly take or destroy its egg
Deliberately or recklessly disturb any cetacean
Damage or destroy the breeding sites or resting places of such animals
Deliberately or recklessly pick, collect, cut, uproot or destroy European protected species of wild plant

Where it is proposed to carry out works which will affect European protected species or their shelter/breeding places, whether or not they are present in these refuges, a licence is required from the licensing authority (in this case likely to be Scottish Government). It is strongly advised that you refer to the Scottish Government information on the current interim licensing arrangements, which can be found in the document *European Protected Species, Development Sites and the Planning System: Interim Guidance for Local Authorities on Licensing Arrangements*, (October 2001) before applying for a licence. Copies of this are available at http://www.scotland.gov.uk/library3/environment/epsg-00.asp or by writing to the Landscapes and Habitats Division, Scottish Government Rural Directorate, Room GH 93, Victoria Quay, Edinburgh EH6 6QQ or by telephoning 0131 244 7140.

As highlighted in the Interim Guidance, three tests must be satisfied before the licensing authority can issue a licence under Regulation 44(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) to permit otherwise prohibited acts. An application for a licence will fail unless all of the three tests are satisfied. The three tests involve the following considerations:

Test 1 - The licence application must demonstrably relate to one of the purposes specified in Regulation 44(2) (as amended). For development proposals, the relevant purpose is likely to be Regulation 44(2)(e) for which Scottish Government is currently the licensing authority. This regulation states that licences may be granted by Scottish Government only for the purpose of *"preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment."*

Test 2 - Regulation 44(3)(a) states that a licence may not be granted unless Scottish Government is satisfied *"that there is no satisfactory alternative".*

Test 3 - Regulation 44(3)(b) states that a licence cannot be issued unless Scottish Government is satisfied that the action proposed *"will not be detrimental to the maintenance of the population*

of the species concerned at a favourable conservation status in their natural range" (Scottish Government will, however, seek the expert advice of Scottish Natural Heritage on this matter).

Consideration of European protected species must be included as part of the planning application process, not as an issue to be dealt with at a later stage. Any planning consent given without due consideration to these species is likely to breach European Directives with the possibility of consequential delays or the project being halted by the EC, as has happened previously.

✓ PHA.

Scottish Natural Heritage

All of nature for all of Scotland

Planning and Environment Services
Development Management
Kirkbank
English Street
Dumfries
DG1 2HS

Your ref: 11/E/3/0011
Our ref: CNS REN WF 68808

Date: 28 June 2011

FAO Patrick Hanna

Dear Sirs

Environmental Impact Assessment (Scotland) Regulations 1999
Request for Scoping Opinion (EIA) for up to Six Wind Turbines (Maximum Tip Height of 150m)
At Blackwood, High Auldgirth, Dumfries

Thank you for your letter dated 19 May 2011 requesting a scoping opinion from Scottish Natural Heritage (SNH) for the above proposal.

Introduction

The proposed development is for up to six windturbines (maximum tip height 150m) located at High Auldgirth approximately 10km north of Dumfries.

SNH consider that in order to assess the impact of the proposed development on the natural heritage information will be required on the following:

a) Ecological impacts, including direct and indirect impacts upon protected species and designated sites;
b) Landscape and visual impacts,
c) Recreational impacts, including positive and negative impacts associated with the development, and;
d) The cumulative impacts of a), b) and c) in combination with other wind turbine proposals in the area.

Our comments below contain specific details, recommended guidance, publications and methodologies which the developer should consider in relation to these issues.

Considerable guidance on information requirements for wind farm applications can be found at:
http://www.snh.gov.uk/planning-and-development/renewable-energy/

This includes detailed guidance on ornithology, landscape and visual impacts, assessment methods and cumulative effects with respect to onshore windfarms, see:
http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/

Scottish Natural Heritage, Carmont House, The Crichton, Bankend Road, Dumfries DG1 4ZF
Email ~~dumfries_galloway~~ Southern_Scotland@snh.gov.uk Tel 01387 247010 Fax 01387 259247 www.snh.org.uk

Our strategic locational guidance provides SNH's broad overview of where there is likely to be greatest scope for wind farm development, and where there are the most significant constraints, in natural heritage terms this will provide a starting point for the assessment that SNH will make and the advice that it will offer on individual proposals:
http://www.snh.org.uk/pdfs/polstat/ar-ps01.pdf

SNH has produced a Service Level Statement (SLS) for renewable energy consultations. This statement provides information regarding the level of input that can be expected from SNH at various stages of the EIA process. Annex A of the SLS details a list of references that the developer must consider as part of the EIA process.
http://www.snh.org.uk/pdfs/strategy/renewable/RE-SLS.pdf

Please also refer to our "Siting and designing windfarms in the landscape" which can be viewed at:
http://www.snh.gov.uk/docs/A317537.pdf

To assist us, and in response to the request for information about what format we need, we are content to receive a CD copy of the ES text and figures. However, in addition, we also require one hard copy of the Figures relating to the Landscape and Visual Impact Assessment (in particular the visualisations and ZTVs) because we cannot print these off to a high enough quality.

We would like to emphasise that an EIA is an iterative process and that issues may come to our attention later in the process additional to those that are referred to in this letter. We will endeavour to inform the developer as soon as possible of any such new issues. Please also note that this advice we offer here does not prejudice or constrain any future advice we may offer in relation to a subsequent formal planning application, and is based upon our understanding of the project at this time.

SNH Advice - Natural Heritage Impacts

Designated sites

There are no international or national designations within the proposed development site, the site sits on the boundary of the Thornhill Uplands Regional Scenic Area. Designated sites within 20km of the potential development location include:

European Designated Sites – Upper Solway Flats and Marshes Special Protection Area (SPA), Solway Firth Special Area of Conservation (SAC), Castle Loch, Lochmaben SPA, Solway Mosses North SAC, and Upper Nithsdale Woods Special Area of Conservation (SAC).

National Designated Sites – Locharbriggs Quarry Site of Special Scientific Interest (SSSI), Lag Meadow SSSI, Lochmaben Lochs SSSI, Castle Loch SSSI, Black Loch SSSI, Stenhouse Wood SSSI, Milton Loch SSSI, Upper Solway Flats and Marshes SSSI, Longbridge Muir SSSI, Perchhall Loch SSSI, Shiel Dod SSSI, Carron Water and Hapland Burn SSSI, Chanlockfoot SSSI, Nith Estuary National Scenic area (NSA), Caerlaverock National Nature Reserve (NNR) and Kirkconnell Flow SSSI / NNR.

The legislative requirements for European sites are summarised in SE Circular 6/1995 as amended June 2000 and further details are provided in Annex 1 of this letter.

European Protected Species

Otter, great crested newt, and all bat species are listed on Annex IV of EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna ('Habitats Directive') as species of European Community interest and in need of strict protection. The species of animals listed in Annex IV(a) of the Habitats Directive, whose natural range includes any area in

Great Britain, are also listed in Schedule 2 of the 1994 Habitats Regulations as 'European Protected Species of Animals' and are fully protected. The legislative requirements relating to European Protected Species are also detailed in Annex 2 of this letter. Further information on EPS is available at:

http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/legal-framework/habitats-directive/euro/

http://www.snh.gov.uk/planning-and-development/advice-for-planners-and-developers/protected-animals/

Otter

The River Nith and its tributaries are known to host a population of otter. Small streams are commonly used for feeding and as connection routes between water catchments. Desk and field survey work should be carried out to allow an assessment of the impact of the development on otter. A full survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Great Crested Newt

The proposed development site is within the Nith valley which is known to host Great Crested Newt (GCN) where suitable habitat exists. SNH have no specific information for this site. We advise that further desk and field survey work should be carried out at a suitable time of year to ascertain the use of this site by GCN, and to ascertain if GCN are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Bats

Several species of bat are common along the Nith Valley. We advise that further desk and field survey work should be carried out at a suitable time of year to ascertain the proximity of any bat roosts to the site, and to ascertain if foraging bats, or bats moving between roosts throughout the year, are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Nationally Protected Species

Water Vole

The habitat of the water vole is protected under Schedule 5 Section 9 (4) of the Wildlife and Countryside Act 1981 (as amended) regardless of whether occupied by the animal. We advise that further desk and field survey work should be carried out at a suitable time of year to ascertain whether water vole are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Badger

Badgers and their setts are protected in Great Britain by the Protection of Badgers Act 1992, as amended by the Nature Conservation (Scotland) Act 2004, whereby it is an offence to wilfully take, kill or injure a badger: to obstruct, destroy or damage a sett or to disturb a badger whilst occupying a sett, with intent or recklessly.

Badgers are widespread in Dumfries & Galloway and our experience is that representations from the public often include information that badgers or other protected mammal species will

be affected. We therefore recommend that a full badger survey is carried out; this should include woodland and pasture land which surrounds the development site. Survey work should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Red Squirrel

Red squirrel has been noted on site. Red squirrel and their places of shelter (dreys) are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). If any tree removal is planned we advise that further desk and field survey work should be carried out at a suitable time of year to ascertain whether red squirrel are likely to be effected by the proposals. Survey should be carried out by a suitably qualified and experienced surveyor and mitigation measures included within the survey report if required.

Ornithology

The proposed development site is located within an area without a RSPB sensitivity rating.

The proposed development site lies approximately 16km north of the Upper Solway Flats and Marshes SPA / SSSI, and 16km west of Castle Loch, Lochmaben SPA both notified for their ornithological interest in particular for aggregations of geese.

The site may be used by a number of bird species throughout the year. We recommend that a desk survey is commissioned to determine the potential impact of the proposal on birds in particular birds listed on Annex 1 of the Birds Directive, regularly occurring migratory species (in particular geese on migration to the Upper Solway Flats and Marshes SPA/SSSI and Castle Loch, Lochmaben SPA), birds on Schedule 1 of the Wildlife and Countryside Act, and Red-Listed Birds of Conservation Concern. The study should include local knowledge from bird recorders, landowners, Raptor Study Groups, the Wildfowl and Wetlands Trust and the RSPB. If vulnerable species are found to be present on the site where turbines are proposed from the desk study, or if insufficient data is available for the site to inform SNH of the likely ornithological impacts of the wind farm further survey work will be required, guidance on fieldwork requirements can be found at:

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The desk study exercise should be carried out as soon as possible so that if further fieldwork is necessary it can start as soon as possible.

Wind farms can impact upon birds in 3 main ways;

- Displacement through indirect loss of habitat if birds avoid the wind farm area and its surrounding area due to turbine operation and maintenance/visitor disturbance
- Death through collision or interaction with turbine blades
- Direct habitat loss through construction of wind farm infrastructure

An assessment of a potential wind farm's effect on the bird interest of a site should thoroughly consider each of the 3 potential risks for each bird species which uses the site.

Assessing the impacts of this proposal on bird populations will require a high degree of expertise and understanding of bird ecology and their interaction with windfarm development. Experience has shown that submission of robust and qualified ornithological assessments reduces the time taken for SNH to provide advice to the determining authority. We therefore wish to stress the importance of employing a suitably qualified ornithologist.

Habitats

We recommend as a minimum requirement that a Phase 1 habitat survey of the proposed development site is carried out, this should be at a suitable time of year. If the Phase 1 survey identifies habitats and/or species of note, such as those included on Annex 1 of the EU Habitats Directive 1992 or the Dumfries & Galloway Local Biodiversity Action Plan, a further survey should be conducted using the National Vegetation Classification (NVC) system, along with an outline of mitigation measures, as this will provide more detail in order for SNH to fully assess the impacts of the proposal.

Freshwater Habitats and Species

The proposed development has the potential to impact upon the freshwater environment, particularly during the construction and decommissioning phase when there could be increased sediment runoff from the site into adjacent watercourses, which could alter water quality and impact on species such as brown trout and salmon.

Salmon, brown trout and sea trout are present within the River Nith catchment. Salmon are listed under Annex II of the EC Habitats Directive 1992. Across Great Britain populations of salmon and sea trout have declined significantly over the past 20-30 years. Lamprey are listed on Annex II of the European Habitats Directive 1992. Lamprey are known to occur within the River Nith catchment.

Excessive concentrations of suspended solids in rivers can affect species in a number of ways. For instance, settlement of solids may result in siltation in spawning beds, either preventing spawning, or resulting in failure of the eggs or larvae to develop. In addition, increased solids loading in a river may result in a decrease in abundance of food supply, but may also have direct effects on fish by causing gill clogging or irritation. Available evidence suggests a suspended solids threshold of 25mg/l is recommended in order to protect salmon interests.

Attention should therefore be given to minimising adverse impacts to surface waters. We would advise that these impacts and any necessary mitigation should be adequately assessed to determine the significance of any impact on Atlantic salmon, Lamprey and fish populations. Any mobilisation of sediment or nutrients into surrounding watercourses should be avoided. Mitigation should be identified in consultation with the Scottish Environment Protection Agency (SEPA) to address these issues.

Hydrology, Geology and Soils

Certain activities such as engineering work adjacent to water bodies, waste disposal etc., which may be a requirement of the proposed development now need authorisation from the Scottish Environment Protection Agency (SEPA) under the Water Environment (Controlled Activities) (Scotland) Regulations 2005. We advise early consultation with SEPA regarding all proposed activities on site. We also recommend that technical advice be sought from SEPA on the scope of geological, hydrogeological work, hydrological and soil assessment work that will be required in order to assess and adequately mitigate against impacts from the development on adjacent water courses.

Landscape Character & Visual Impacts

The proposed development site lies on the boundary of zone 1 (low) and zone 3 (medium) sensitivity as described within the Strategic Locational Guidance for Onshore Windfarms in respect of the Natural Heritage (SNH 2006).

The proposed development site lies within the Upland Fringe (4 turbines and access track), Foothills with forest (2 turbines and access track) and Middle Dale (access track) landscape

character types as described within The Dumfries and Galloway Landscape Character Assessment (Land Use Consultants 1995).

The proposed development site does not lie within a National Scenic area though the turbines would be visible from the Nith Estuary National Scenic Area. The proposed development site lies approximately 800m east of the Thornhill Uplands Regional Scenic Area.

Upland Fringe

The Ae unit of the upland fringe comprises a narrow band of hill slope between the Nith valley and the higher foothills dominated by the forest of Ae. In the wider landscape context this unit forms a highly visible edge providing a backdrop to adjacent valleys. For this reason the Upland Fringe landscape character type is assessed as having a high landscape and visual sensitivity to larger wind turbine typologies (150-80m), and a high to medium sensitivity to medium wind turbine typologies (80-50m).

Foothills with Forest

The scale of this landscape, simple land cover pattern and sparsely populated character reduce sensitivity to larger wind turbine typologies. Overall landscape sensitivity is assessed as medium for large wind turbine typologies and medium low for medium wind turbine typologies. Visual sensitivity is assessed as medium for the large typologies and low for the medium typologies.

The character of these landscapes at this location is however greatly influenced by the existing Dalswinton wind farm development (15 X 120m turbines) which is sited within the Foothills with Forest landscape character type adjacent to the boundary of the Ae unit of the Upland Fringe landscape character type.

Landscape and Visual Impact Assessment

Based on the information provided within the scoping report the issues noted below are likely to be significant. They should therefore be addressed in greater detail within the Environmental Statement (ES):

- Height of turbines this is of particular importance due to the turbines potentially being at the upper end of the scale for onshore turbines, the presence of other windfarms with different heights of turbines and the aspiration to have two heights within the design.
- Borrow pits should be included in relevant visualisations less than 10km from site.
- Ancillary development – it is preferable for transformers to be contained within turbines.
- National Grid connection - details of options for connection should be provided.
- Cumulative impacts: may be particularly applicable to this proposal and should be fully considered.

We agree with the approach outlined within your scoping report for the landscape and visual assessment.

Zone of Visual Impact Assessment and selection of Viewpoints (VPs)

We feel we cannot comment on the list of viewpoints due to the clarity of the ZTV produced and request a ZTV as per the guidance below. We will then be in a better position to assist with viewpoint selection,

Zone of Theoretical Visibility Map (ZTV)

Maps must be produced at a comprehensible scale. SNH Guidance suggests that it is generally most appropriate to superimpose the ZTV onto an Ordnance Survey base map at 1:50,000 scale, copied at either 1:50000 or 1:100000;

They should be of a high quality resolution and presented as either an A1 sheet or as separate A3 sections (with minimum 1km overlaps);

The initial viewpoints selected should be clearly marked on the map and crossed referenced to a Table of proposed viewpoints, see below;

And the turbine locations and the ZTV 35km radii should also be shown on the ZTV. It should be noted that it is useful to include radii for every 5 or 10km from the centre of the windfarm site.

Table of Proposed viewpoints

The table must provide the name of the viewpoint;
An accurate grid reference;
And brief description as to why it has been selected.

Cumulative landscape and visual impacts

We recommend that you liaise with Dumfries and Galloway Council as per your list of windfarms for inclusion in the cumulative assessment. There is the potential for cumulative effects to occur due to the proximity of windfarm development in the same and adjacent character types. A Design Statement will be required in the ES, setting out the rationale for the layout and turbine heights, and the iterative process by which the final layout has been reached in order to maximise the impact mitigation. The Design Statement must take account of the adjacent windfarm developments in the same landscape type in determining the turbine layout and turbine height.

We are keen to be consulted on further cumulative viewpoints once cumulative ZTV maps have been produced, as this may throw up further viewpoints outwith those selected within the landscape and visual assessment.

Lighting

Should there be a need to install aviation obstruction lighting to some or all of the wind turbines, its visual impact at night will have to be assessed in the ES.

Offsite impacts

The ES should provide information relating to the preferred route options for delivering the turbines and other abnormal loads via the trunk and local road network. SNH wishes the ES to include an assessment of the off-site impacts of improving the public roads to allow access i.e. the landscape and visual impacts of road straightening, widening, levelling, tree and hedgerow removal and the upgrading of junctions.

SNH Guidance

The landscape and visual impact assessment of the development should be undertaken following the approach described within the "Guidelines for Landscape and Visual Impact Assessment" (LI-IEMA, 2002). Assessments need to be informed by the relevant published landscape character assessments for the study area.

The assessment should also consider the landscape recommendations of the following documents:

Nithsdale Local Plan
Dumfries & Galloway Structure Plan
Dumfries & Galloway Landscape Character Assessment

In addition to the above SNH recommend that both the landscape and visual impact assessment, is informed by the guidance found on our web site at

http://www.snh.gov.uk/planning-and-development/renewable-energy/

The scope of what is required for the visual impact assessment and best practice methodologies to use should be guided by the following documents, both available at the above website:

- Visual representations of windfarms: Good Practice Guidance (2006)
- University of Newcastle (2002) Visual Assessment of windfarms

SNH has published guidance on the cumulative effect of windfarms (Version 2 revised 13.04.05) at:

www.snh.org.uk/pdfs/strategy/cumulativeeffectsonwindfarms.pdf

The Scottish Executive's statement 'Securing a Renewable Future - Scotland's Renewable Energy' highlights the likelihood that cumulative impacts may present an eventual limit to the extent of onshore wind development and the need to attach increased importance to consideration of cumulative impact in specific areas.

SNH is aware of the growing importance of intervisibility between wind farm developments and the resulting potentially significant adverse cumulative visual impacts which could arise as a result.

Clearly, assessing the landscape and visual impacts of this proposal in a manner appropriate to the scale of this proposal will require a number of important judgements to be made. We therefore wish to stress the importance of employing a suitably qualified landscape architect on your team and reiterate our view that it would be desirable to discuss the scope of the LVIA with Dumfries & Galloway Council as soon as possible.

Recreation and Access

SNH request that the developer identifies the current recreational activities within the study area and ascertains the significance of any positive and negative impacts that will occur upon such activities as a consequence of the development proposals.

The impact on recreational facilities around the windfarm should be considered in relation to the setting and experience of these places and the changes in view from these facilities and recreational resources. Inclusion of Council access officers, members of the local community and local recreational bodies within the consultation process could be considered.

The ES should outline provisions made regarding public access, having regard for the requirements of the Land Reform (Scotland) Act 2003, clarifying the extent of any access restrictions proposed, if any, during construction or operation, and indicating any new facilities for access to be provided on or off site.

SNH wishes to see a commitment to work with the law and spirit of the Land Reform (Scotland) Act (2003). We will look for an assessment of the significance of any positive and negative impacts that will occur upon local recreational activities as a consequence of the development proposal. Any assessment should not be restricted to the development footprint – that is, the

developer should identify opportunities to integrate the site access tracks into the surrounding network and we encourage the developer to make a commitment to offsite works to make these connections.

SNH Advice - Infrastructure and Grid Connection

As good practice we would expect that the impacts of constructing, installing and operating the following infrastructure components should be considered and assessed by the developer, in particular with respect to landscape and visual impacts;

Substation
On-site access tracks
Potential changes to existing public roads
Cabling (Underground)
Cabling (Overhead)
Monitoring and control centre.

It should be confirmed that the connection from the turbines to the control building will be laid underground (in trenches or mole-ploughed). SNH also recommends that the route corridor for the grid connection from the control station to the substation (which will be the subject of a separate application), is clear as to whether the developer has signed a contract with National Grid for this work, and states whether this connection will be underground or overhead.

SNH Advice - Mitigation

All opportunities for mitigating the impact of the proposed development on the natural heritage should be explored, based on the updated ecological and landscape and visual impact assessments. Mitigation proposals could include opportunities for landscape and habitat benefit both on-site and off-site. There may also be opportunities for habitat creation of nature conservation value within the site.

Conclusion

We have at this preliminary stage only provided an indication of possible concerns. Further advice will be provided when the above requested information is submitted.

If you have any questions regarding this response please do not hesitate to contact me at the above address.

Yours [redacted]

Beth Wilson
Operations Officer
Southern Scotland

beth.wilson@snh.gov.uk

ANNEX 1

Legislative Requirements for European Sites

Upper Solway Flats and Marshes and Castle Loch, Lochmaben status as classified SPAs under the EC Directive 79/409/EEC on the Conservation of Wild Birds (the "Birds Directive") and Solway Firth, Solway Mosses North, and Upper Nithsdale Woods status as SACs under the EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the "Habitats Directive"), means that the Conservation (Natural Habitats, &c.) Regulations 1994 as amended, (the "Habitats Regulations") apply. The requirements are summarised in SE Circular 6/1995 as amended in June 2000 and include, at paragraph 12:

"The Regulations (48) require that, where an authority concludes that a development proposal unconnected with the nature conservation management of a Natura 2000 site is likely to have a significant effect on that site, it must undertake an appropriate assessment of the implications for the conservation interests for which the area has been designated."

The need for appropriate assessment extends to plans or projects outwith the boundary of a Natura 2000 site in order to determine their implications for the interest protected within the site.

Under Regulation 48 of the Habitats Regulations, this means that Dumfries & Galloway Council as competent authority has a duty to:

- determine whether the proposal is directly connected with or necessary to site management for conservation; and, if not,
- determine whether the proposal is likely to have a significant effect on the site either individually or in combination with other plans or projects; and, if so, then
- make an appropriate assessment of the implications (of the proposal) for the site in view of that site's conservation objectives.

The competent authority can only agree to the proposal under Regulation 48 after having ascertained that it will not adversely affect the integrity of the site. If this is not the case, and there are no alternative solutions, the proposal can only be allowed to proceed if there are imperative reasons of overriding public interest, which in this case can include those of a social or economic nature. If Dumfries & Galloway Council propose to approve the plan on the grounds of imperative reasons of overriding public interest then Regulation 49 states that the Council must inform Scottish Ministers, and you must not issue approval for a period of 21 days after receipt by Scottish Ministers unless notified otherwise. If proposals are allowed to proceed in accordance with Regulation 49 then it should be noted that Regulation 53 requires that Scottish Ministers shall secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected.

ANNEX 2

Protection Afforded to European Protected Species

Regulations 39 and 43 of The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (Habitats Regulations) provide full protection for certain animal and plant species. The species identified above are referred to as European protected species and are listed on Schedules 2 (animals) and 4 (plants) of the Habitats Regulations.

This means it is illegal to:

Deliberately or recklessly capture, injure or kill a European protected species of wild animal or to deliberately or recklessly (i) harass an animal or group of animals; (ii) disturb an animal while it's occupying a structure or place used for shelter or protection; (iii) disturb an animal while it's rearing or otherwise caring for its young; (iv) obstruct access to a breeding site or resting place, or otherwise deny the animal use of the breeding site or resting place; (v) disturb an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; (vi) disturb an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young
Deliberately or recklessly take or destroy its egg
Deliberately or recklessly disturb any cetacean
Damage or destroy the breeding sites or resting places of such animals
Deliberately or recklessly pick, collect, cut, uproot or destroy European protected species of wild plant

Where it is proposed to carry out works which will affect European protected species or their shelter/breeding places, whether or not they are present in these refuges, a licence is required from the licensing authority (in this case likely to be Scottish Government). It is strongly advised that you refer to the Scottish Government information on the current interim licensing arrangements, which can be found in the document *European Protected Species, Development Sites and the Planning System: Interim Guidance for Local Authorities on Licensing Arrangements*, (October 2001) before applying for a licence. Copies of this are available at http://www.scotland.gov.uk/library3/environment/epsg-00.asp or by writing to the Landscapes and Habitats Division, Scottish Government Rural Directorate, Room GH 93, Victoria Quay, Edinburgh EH6 6QQ or by telephoning 0131 244 7140.

As highlighted in the Interim Guidance, three tests must be satisfied before the licensing authority can issue a licence under Regulation 44(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) to permit otherwise prohibited acts. An application for a licence will fail unless all of the three tests are satisfied. The three tests involve the following considerations:

Test 1 - The licence application must demonstrably relate to one of the purposes specified in Regulation 44(2) (as amended). For development proposals, the relevant purpose is likely to be Regulation 44(2)(e) for which Scottish Government is currently the licensing authority. This regulation states that licences may be granted by Scottish Government only for the purpose of *"preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment."*

Test 2 - Regulation 44(3)(a) states that a licence may not be granted unless Scottish Government is satisfied *"that there is no satisfactory alternative".*

Test 3 - Regulation 44(3)(b) states that a licence cannot be issued unless Scottish Government is satisfied that the action proposed *"will not be detrimental to the maintenance of the population*

of the species concerned at a favourable conservation status in their natural range" (Scottish Government will, however, seek the expert advice of Scottish Natural Heritage on this matter).

Consideration of European protected species must be included as part of the planning application process, not as an issue to be dealt with at a later stage. Any planning consent given without due consideration to these species is likely to breach European Directives with the possibility of consequential delays or the project being halted by the EC, as has happened previously.

03/06/2011

Dumfries & Galloway Council
Development Management Kirkbank, English Street
Dumfries
DG1 2HS

SCOTTISH WATER

Customer Connections
419 Balmore Road
Glasgow
G22 6NU

Customer Support Team
T: 0141 355 5511
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W: www.scottishwater.co.uk
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Dear Patrick Hanna

PLANNING APPLICATION NUMBER: 11/E/3/0011
DEVELOPMENT: Dumfries High Auldgirth Blackw
OUR REFERENCE: 571297
PROPOSAL: 11/E/3/0011 | REQUEST FOR SCOPING OPINION (EIA) FOR ERECTION OF UP TO SIX WIND TURBINES (MAXIMUM TIP HEIGHT OF 150M

Please quote our reference in all future correspondence

Scottish Water has no objection to this planning application. Since the introduction of the Water Services (Scotland) Act 2005 in April 2008 the water industry in Scotland has opened up to market competition for non-domestic customers. Non-domestic Household customers now require a Licensed Provider to act on their behalf for new water and waste water connections. Further details can be obtained at www.scotlandontap.gov.uk

May I also add there is a level of investigation going on in relation to the Scottish Water radio telemetry links and this will be pursued through the later Planning Application processes through OFCOM.

If this development requires the existing network to be upgraded, to enable connection, the developer will generally meet these costs in advance. Scottish Water can make a contribution to these costs through Reasonable Cost funding rules. Costs can be reimbursed by us through Reasonable Cost funding rules

Should the developer require information regarding the location of Scottish Water infrastructure they should contact our Property Searches Department, Bullion House, Dundee, DD2 5BB. Tel – 0845 601 8855.

If the developer requires any further assistance or information on our response, please contact me on the above number or alternatively additional information is available on our website: www.scottishwater.co.uk.

Yours faithfully

Andrew Peacock
Customer Connections Administrator
Tel: 0141 355 5113
Andrew.Peacock2@scottishwater.co.uk

Our ref: PCS 113887
Your ref: 11/E/3/0011

If telephoning ask for:
Julie Gerc

14 June 2011

Patrick Hanna
Dumfries & Galloway Council
Planning and Environment Services
Kirkbank
English Street
Dumfries
DG1 2HS

By email only to: patrick.hanna@dumgal.gov.uk

Dear Mr Hanna

Town and Country Planning (Scotland) Acts
Planning Application: 11/E/3/0011
Request for scoping opinion (EIA) for erection of up to six wind turbines (maximum tip height of 150m)
At Blackwood, High Auldgirth, Auldgirth, Dumfries

Thank you for consulting SEPA on the scoping opinion for the above development proposal by way of your letter of 19 May 2011 which we received on 20 May 2011. We would welcome further dialogue with the applicant at an early stage to discuss any of the issues raised in this letter

Please note that all of the issues below should be addressed in the Environmental Statement (ES), **but there may be opportunities for several of these to be scoped out of detailed consideration.** The justification for this approach in relation to specific issues should be set out within the ES.

In addition SEPA would refer you to *Good Practice During Windfarm Construction* prepared by SNH, SEPA and the windfarm industry and our *Regulatory Position Statement – Developments on Peat*.

1. Flood Risk

1.1 Reviewing the information provided suggest that no consideration for flood risk was given within the submitted scoping report. However due to the close proximity of the site boundary to the River Nith's floodplain along with several small water courses running through the application site we feel that it is appropriate to include flood risk within the proposed Environmental Impact Assessment (EIA). We have also made the following recommendations.

1.2 We have reviewed the information provided in this consultation and it is noted that, the application site (or parts thereof) lies within the 1 in 200 year (0.5% annual probability) flood envelope of the Indicative River & Coastal Flood Map (Scotland), and my therefore be at medium to high risk of flooding from the River Nith.

1.3 Although the proposed turbine locations are out with the 1 in 200 year flood envelope, tributaries of the Pennyland Burn run through the proposed development site and present a potential flood risk. However due to steep topography in this area the flood risk is thought to be minimal.

1.4 The lower end of the application site lies within the 1 in 200 year flood envelope of the River Nith and also lies within an area subject to flooding from the River Nith during the November 1997 flood event. We therefore consider that flood risk should be considered within the proposed EIA. Kaya Consulting Ltd undertook a Flood Risk Assessment (FRA) in this area entitled 'Proposed Residential Development, Riverside Lodge, Auldgirth' dated September 2008. The applicant may wish to contact Kaya Consulting Ltd with respect to the commercial information they hold.

1.5 Flood risk within the application site should also be considered with regards to proposed access tracks, anemometer mast, grid connection building and site office with associated car park. The scoping report states that access tracks are proposed to join the A76 near Auldgrith; this area lies within the floodplain of the River Nith and therefore further consideration of flood risk should be given.

1.6 Possible disturbance and modification of watercourses, existing drainage patterns, and groundwater recharge and flows is identified within the submitted scoping report. If this is likely to occur then the effects upon flood risk should identified.

1.7 Please note that both SPP7: Planning & Flooding and the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (as amended) have been superseded by the single consolidated Scottish Planning Policy and the Water Environment (Controlled Activities) (Scotland) Regulations 2011, respectively. We recommend that these references be updated and that the applicant take full cognisance of the requirements of this revised guidance in any future work for this proposed development.

2. Flood Risk Caveats & Additional Information for Applicant

2.1 The Indicative River & Coastal Flood Map (Scotland) has been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km^2 using a Digital Terrain Model (DTM) to define river cross-sections and low-lying coastal land. The outlines do not account for flooding arising from sources such as surface water runoff, surcharged culverts or drainage systems. The methodology was not designed to quantify the impacts of factors such as flood alleviation measures, buildings and transport infrastructure on flood conveyance & storage. The Indicative River & Coastal Flood Map (Scotland) is designed to be used as a national strategic assessment of flood risk to support planning policy in Scotland. For further information please visit www.sepa.org.uk/flooding/flood_map.aspx.

2.2 We refer the applicant to the document entitled: "*Technical Flood Risk Guidance for Stakeholders*". This document provides generic requirements for undertaking Flood Risk Assessments and can be downloaded from www.sepa.org.uk/flooding/flood_risk/planning__flooding.aspx. Please note that this document should be read in conjunction with Annex B in SEPA Policy 41: "*Development at Risk of Flooding, Advice and Consultation – a SEPA Planning Authority Protocol*", available from www.sepa.org.uk/flooding/flood_risk.aspx.

2.3 Our Flood Risk Assessment checklist should be completed and attached within the front cover of any flood risk assessments issued in support of a development proposal which may

be at risk of flooding. The document will take only a few minutes to complete and will assist our review process. It can be downloaded from www.sepa.org.uk/flooding/flood_risk/planning__flooding/fra_checklist.aspx

2.4 Please note that we are reliant on the accuracy and completeness of any information supplied by the applicant in undertaking our review, and can take no responsibility for incorrect data or interpretation made by the authors.

2.5 The advice contained in this letter is supplied to you by SEPA in terms of Section 72 (1) of the Flood Risk Management (Scotland) Act 2009 on the basis of information held by SEPA as at the date hereof. It is intended as advice solely to Dumfries & Galloway Council as Planning Authority in terms of the said Section 72 (1). Our briefing note entitled: "*Flood Risk Management (Scotland) Act 2009: Flood risk advice to planning authorities*" outlines the transitional changes to the basis of our advice inline with the phases of this legislation and can be downloaded from www.sepa.org.uk/flooding/flood_risk/planning__flooding.aspx

3. Carbon balance and peat management

3.1 Scottish Planning Policy (SPP) recognises that "the disturbance of some soils, particularly peat, may lead to the release of stored carbon, contributing to carbon emissions" (Paragraph 133). In line with SPP and government guidance, we recommend that the ES or planning submission contains a section systematically assessing carbon balance. This assessment should quantify the gains over the life of the project against the release of carbon dioxide during construction. It should include all elements of the proposal, including borrow pits, construction of roads/tracks and other infrastructure and loss of peat bog. Please refer to the Scottish Government guidance Calculating carbon savings from windfarms on Scottish peat lands – A New Approach, which provides a methodology for estimating the impacts of this type of development on carbon dynamics of peat lands. This guidance is currently being updated and a revised version will be available shortly. From April 1 2011 we will validate carbon balance assessments for Section 36 windfarm applications that use the revised version of the tool.

3.2 The ES or planning submission should include preventative/mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, cable trenches, or the storage and re-use of excavated peat. A detailed peat management scheme setting out these measures may be required through a planning condition, to ensure that the carbon balance benefits of the scheme are maximised. In addition to validating any carbon balance appraisals for Section 36 windfarms (based upon the revised guidance) we will provide comment on drainage and waste management aspects of the peat management scheme.

4. Disruption to peatlands

4.1 If there are peatland or mire systems present, the ES or planning submission should demonstrate how the layout and design of the proposal, including any associated borrow pits, hard standing and roads, avoid impact on such areas where possible. For areas where avoidance is impossible details of how impact is minimised and mitigated should be provided, including a detailed map of peat depth for all construction elements that affect peatland habitats. The peat depth survey should include details of the basic peatland characteristics. Peatland impacts that should be considered include those from waste management, drainage, dewatering, excavation and pollution.

4.2 By adopting an approach of minimising disruption to peatland, the volume of excavated peat can be minimised and the commonly experienced difficulties in dealing with surplus peat waste reduced. The generation of surplus peat waste is a difficult area which needs to be addressed from the outset given the limited scope for re-use. Landscaping with waste peat (or soil) may not be of ecological benefit and consequently a waste management exemption may not apply, and the position regarding disposal of waste peat within borrow pits can be very difficult. Early discussion of proposals with us is essential, and an overall approach of minimisation of peatland disruption should be adopted.

5. Disposal of waste peat to borrow pits

5.1 The disposal of surplus peat waste to borrow pits is not encouraged as experience has shown that peat used as cover can suffer from significant drying and oxidation, and that peat redeposited at depth can lose structure and create a hazard when the stability of the material deteriorates. This creates a risk to people who may enter such areas or through the possibility of peat slide and we are aware that barbed-wire fencing has been erected around some sites in response to such risks.

5.2 There are important waste management implications of measures to deal with surplus peat. Peat disposed at depth must be considered in the context of waste being landfilled, and may not be consentable under our regulatory regimes. It is therefore essential that the scope for minimising the extraction of peat is explored and alternative options identified that minimise risk in terms of carbon release, human health and environmental impact. It is also important to discuss options with us at an early stage.

6. Peat slide risk

6.1 Protection of development in relation to unstable land including landslides or landslip is not generally an area within our expertise or remit. This is a matter for the planning and building standards authorities and civil engineers, who will need to consider whether or not a detailed assessment of the risks of peat slide arising from the development should also be undertaken, what it should involve, and the extent to which the peat stability report should influence the layout of the turbines and the outline construction method statement.

6.2 Our main interest relates to the consequences of a peat-slide or bog burst which can result in severe environmental damage including the pollution of the surrounding area. The risk of this occurring should form part of any peat stability report. Guidance on preparing a peat stability report can be found on the Scottish Government website.

7. Wetland ecology (including groundwater dependent terrestrial ecosystems)

7.1 A Phase 1 habitat survey should be carried out for the whole site and the guidance 'A Functional Wetland Typology for Scotland' (currently available for free download on the SNIFFER website) used to help identify all wetland areas. National Vegetation Classification should be carried out for any wetlands identified. Results of these findings should be included in the ES, including appropriate maps with the location of infrastructure clearly marked.

7.2 Generally the layout of the site should be designed to avoid impacts on all wetlands. Peatland (active blanket bog in particular) should be avoided. If impacts on wetlands are likely then details of appropriate mitigation measures are required

7.3 Groundwater dependent terrestrial ecosystems are specifically protected under the Water Framework Directive. The results of the National Vegetation Classification survey and Appendix 2 of our Planning guidance on windfarm developments can be used to identify if wetlands are groundwater dependent terrestrial ecosystems. If any groundwater dependent terrestrial ecosystems are located within a radius of (i) 100m from roads, tracks and trenches or (ii) 250m from borrow pits and foundations the likely impact of these features will require further assessment. This assessment should be carried out whether or not the features in (i) and (ii) occur within or outwith the site boundary in order that micrositing and small changes to site layout do not necessitate further National Vegetation Classification work being carried out during unfavourable weather conditions. The results of this assessment and measures that will be taken to ensure the proposals do not have an unacceptable impact should be included in the ES

7.4 Infrastructure that is within 100m or 250m and likely to have an unacceptable impact on groundwater dependent terrestrial ecosystems identified as highly sensitive (in Appendix 2 of our Planning Guidance on windfarm developments) should be reconsidered. Further detailed studies will be required if infrastructure remains within the buffer zones.

8. Groundwater

8.1 Roads, foundations and other construction works associated with windfarms can disrupt groundwater flow and impact on groundwater abstractions. To address this risk a list of groundwater abstractions sources both within and outwith the site boundary, within a radius of i)100 m from roads, tracks and trenches and ii) 250 m from borrow pits and foundations) should be provided. Further details can be found in our Planning guidance on windfarm developments.

8.2 If groundwater abstractions are identified within the 100m and 250 m radii from development infrastructure, then either the applicant should ensure that the route or location of engineering operations avoid this buffer area or further information and investigations will be required to show that impacts on abstractions are acceptable.

9. Construction Environmental Management Document and pollution prevention

9.1 One of our key interests in relation to major developments is pollution prevention measures during the periods of construction, operation, maintenance, demolition and restoration. The construction phase includes construction of access roads and any other site infrastructure.

9.2 We advise that the applicant, through the EIA process or planning submission, should systematically identify all aspects of site work that might impact upon the environment, potential pollution risks associated with the proposals and identify the principles of preventative measures and mitigation. This will establish a robust Project Environmental Management Process for large scale (eg Major and Environmental Impact Assessment Projects. A draft Schedule of Mitigation should be produced as part of this process. This should cover all the mitigation measures identified to avoid or minimise environmental effects. Details of the specific issues that we expect to be addressed are available on the Pollution Prevention and Environmental Management section of our website.

9.3 A key issue for us is the timing of works. Therefore, the Schedule of Mitigation should include a timetable of works that takes into account all environmental sensitivities, such as fish spawning, which have been raised by SEPA, SNH or other stakeholders. Timing should also be planned to avoid construction of roads, dewatering of pits and other

potentially polluting activities during periods of high rainfall. We can provide useful information such as rainfall and hydrological data through our Access to Information Team.

9.4 A Construction Environmental Management Document is a key management tool to implement the Schedule of Mitigation. We recommend that the principles of this document are set out in the ES drawing together and outlining all the environmental constraints and commitments, proposed pollution prevention measures and mitigation as identified in the ES.

9.5 This document should form the basis of more detailed site specific Construction Environmental Management Plans which along with detailed method statements may be required by planning condition or, in certain cases, through environmental regulation. This approach provides a useful link between the principles of development which need to be outlined at the early stages of the project and the method statements which are usually produced following award of contract (just before development commences).

9.6 We recommend that the detailed Construction Environmental Management Document is submitted for approval to the determining authority at least two months prior to the proposed commencement (or relevant phase) of development to order to provide consultees with sufficient time to assess the information. This document should incorporate detailed pollution prevention and mitigation measures for all construction elements potentially capable of giving rise to pollution during all phases of construction, reinstatement after construction and final site decommissioning. This document should also include any site specific Construction Environmental Management Plans and Construction Method Statements provided by the contractor as required by the planning authority and statutory consultees. The Construction Environmental Management Document and Construction Environmental Management Plan do not negate the need for various licences and consents, eg CAR and PPC, if required. The requirements from the obtained licences and consents should be included within the final Construction Environmental Management Plans.

10. Engineering activities in the water environment

10.1 In order to meet the objectives of the Water Framework Directive of preventing any deterioration and improving the water environment, developments should be designed to avoid engineering activities in the water environment wherever possible. The water environment includes burns, rivers, lochs, wetlands, groundwater and reservoirs. It should be demonstrated that every effort has been made to leave the water environment in its natural state. Engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative. Where a watercourse crossing cannot be avoided unless there is no practicable alternative, bridging solutions or bottomless or arched culverts which do not affect the bed and banks of the watercourse should be used. If the engineering works proposed are likely to exacerbate flood risk then a flood risk assessment should be submitted in support of the planning application and we should be consulted.

10.2 Scottish Planning Policy states “Culverts are a frequent cause of local flooding, particularly if the design or maintenance is inadequate. Watercourses should not be culverted as part of a new development unless there is no practical alternative and existing culverts should be opened whenever possible. If culverts are unavoidable, they should be designed to maintain or improve existing flow conditions and aquatic life. A culvert may be acceptable as part of a scheme to manage flood risk or where it is used to carry a watercourse under a

road or railway" (Paragraph 211). Planning applications should be determined in line with this planning policy.

10.3 A site survey of existing water features and a map of the location of all proposed engineering activities in the water environment should be included in the ES or planning submission. A systematic table detailing the justification for the activity and how any adverse impact will be mitigated should also be included. The table should be accompanied by a photograph of each affected waterbody along with its dimensions. Justification for the location of any proposed activity is a key issue for us to assess at the planning stage.

10.4 The detailed design of engineered structures in the water environment will be considered under regulations administered by us. Where flood risk may be an issue, this will also need to be addressed at the planning stage.

10.5 Further guidance on the design and implementation of crossings can be found in our Construction of River Crossings Good Practice Guide. Best practice guidance is also available within the water engineering section of our website.

11. Water abstraction

11.1 Where water abstraction is proposed we request that the ES, or planning submission, details if a public or private source will be used. If a private source is to be used the information below should be included. Whilst we regulate water abstractions under The Water Environment (Controlled Activities) (Scotland) Regulations 2011, the following information is required at the planning stage to advise on the acceptability of the abstraction at this location:

Source e.g. ground water or surface water;
Location e.g. grid reference and description of site;
Volume e.g. quantity of water to be extracted;
Timing of abstraction e.g. will there be a continuous abstraction;
Nature of abstraction e.g. sump or impoundment;
Proposed operating regime e.g. details of abstraction limits and hands off flow;
Survey of existing water environment including any existing water features;
Impacts of the proposed abstraction upon the surrounding water environment.

11.2 If other development projects are present or proposed within the same water catchment then we advise that the applicant considers whether the cumulative impact upon the water environment needs to be assessed. The ES or planning submission should also contain a justification for the approach taken.

12. Opportunities for Environmental Improvements

12.1 Most windfarms cover a large area and there will usually be opportunities to incorporate improvements in the water environment required by the Water Framework Directive within and/or immediately adjacent to the site either as part of mitigation measures for proposed works or as compensation for environmental impact. We encourage applicants to seek such opportunities to avoid or offset environmental impacts. Improvements which might be considered would include the removal of redundant weirs, the creation of buffer strips and provision of fencing along watercourses. Fencing off watercourses and creating buffer strips both helps reduce the risk of diffuse water pollution and affords protection to the riparian habitat. In addition vegetated buffer strips will help slow river flow and provide space for the lateral movement of watercourses in turn reducing flood risk.

13. Borrow pits

13.1 Detailed investigations in relation to the need for and impact of such facilities should be contained in the ES or planning submission. Where borrow pits are proposed, information should be provided regarding their location, size and nature including the depth of the borrow pit floor and the final reinstated profile.

13.2 The impact of such facilities (including dust, blasting and impact on water) should be appraised as part of the overall impact of the scheme. Information should cover, in relation to water; at least the information set out in Planning Advice Note PAN 50 Controlling the Environmental Effects of Surface Mineral Workings (Paragraph 53). In relation to groundwater, information (Paragraph 52 of PAN 50) only needs to be provided where there is an abstraction or groundwater dependent terrestrial ecosystem within 250m of the borrow pit. Additional information on groundwater is provided in Section 14.

13.3 Details of the proposed depth of the excavation compared to the actual topography, the proposed restoration profile, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement should be submitted. The reinstatement of borrow pits can raise significant waste management issues and it is essential that any proposals are discussed with our regulatory teams as part of the development of the scheme to ensure that such proposals are feasible in terms of cost and regulatory requirements.

14. Air quality

14.1 The local authority is the responsible authority for local air quality management under the Environment Act 1995, and therefore we recommend that Environmental Health within the local authority be consulted. They can advise on the need for this development proposal to be assessed alongside other developments that could contribute to an increase in road traffic. They can also advise on potential impacts such as exacerbation of local air pollution and noise issues, particularly at busy junctions and controlled crossing points. They can advise on the cumulative impact of all development in the local area in the ES or planning submission. Further guidance regarding these issues is provided in NSCA guidance (2006) entitled *Development Control: Planning for Air Quality*.

14.2 Excavation works, particularly through drilling and blasting, may cause nuisance to adjacent land users due to the generation of dust and noise. Comments from local authority Environmental Health Officers should be sought on the potential nuisance to adjacent land users during the construction and decommissioning phases of the project.

If you have any queries relating to this letter, please contact me by telephone on 01355 574200 or by e-mail to planning.ek@sepa.org.uk .

Yours sincerely

Julie Gerc
Planning Officer
Planning Service

Copy to: Leona Wilkie
Knight Frank
120 Bothwell Street,
Glasgow, G2 7JS

PHV

Roy Brannen, Director
Trunk Road and Bus Operations

Buchanan House, 58 Port Dundas Road, Glasgow G4 0HF
Direct Line: 0141 272 7597, Fax: 0141 272 7350
Sally.hartley@transportscotland.gsi.gov.uk

COMHDHAIL ALBA
TRANSPORT SCOTLAND

Planning and Environment Services
Development Management
Kirkbank
English Street
Dumfries
DG1 2HS

Your ref:
11/E/3/0011

Our ref:
EIA/DAG/060

Date:
26 May 2011

FAO – Patrick Hanna

Dear Mr Hanna

ENVIRONMENTAL IMPACT ASSESSMENT (SCOTLAND) REGULATIONS 1999 ERECTION OF UP TO SIX WIND TURBINES AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES (SCOPING OPINION)

I refer to your letter of 19 May 2011, and the accompanying report.

Overall there will be a minimal increase in traffic on the trunk road during the operation of the facility therefore the proposed development is not likely to have a significant impact on the operation of the trunk road network.

However, it is likely that as many of the construction loads may be categorised as abnormal, authorisation from our management organisation BEAR Scotland may be required. It is advisable that BEAR are consulted as to the feasibility of transportation of these items to site. Due to the frequency and number of these loads it is UK policy to restrict these movements via the nearest suitable port.

I trust this meets your requirements.

Yours sincerely,

[redacted]

PLANNING & BUILDING SERVICES
30 MAY 2011
KIRKBANK, DUMFRIES

Sally Hartley
Development Management

cc Rhona Reid SG DBE Planning (Email)

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Steve Rogers
Head of Planning & Building Standards Services
Dumfries & Galloway Council

By e-mail to: patrick.hanna@dumgal.gov.uk

Your ref: 11/E/3/0011
Our ref: 165/11 (EIA/DAG/060)

21 June 2011

Dear Mr Rogers

ENVIRONMENTAL IMPACT ASSESSMENT (SCOTLAND) REGULATIONS 1999 ERECTION OF UP TO SIX WIND TURBINES AT BLACKWOOD, HIGH AULDGIRTH, AULDGIRTH, DUMFRIES (SCOPING OPINION)

I refer to your recent consultation under the 1999 Regulations with the Scottish Ministers about the proposed development named above. I apologise for the delay in responding.

The above Regulations provide that, among others, the Scottish Ministers must make available to the applicant any information they consider relevant to the preparation of an Environmental Statement. This response relates to the Scottish Ministers responsibilities for air quality and noise.

The developer should be made aware of the provisions of Schedule 4, Part I and Part II of the Environmental Impact Assessment (Scotland) Regulations 1999. These Regulations give advice on the type of information required in the preparation of an Environmental Statement. The Regulations can be accessed via the link below.

http://www.hmso.gov.uk/legislation/scotland/ssi1999/19990001.htm

In relation to the above development and without prejudice to any further consideration the Scottish Ministers may be required to give to the application, we have no information available which may be considered relevant to the preparation of an Environmental Impact Assessment.

Yours sincerely

SAMANTHA BARKER
Pollution & Strategic Delivery Team

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Auchencairn Cottage
Closeburn
Thornhill
Dumfriesshire
DG35JU

3 June 2011

Patrick Hannah
Planning & Environmental Services
Kirkbank
English Street
Dumfries
DG12HS

Closeburn Community Council response to Blackwood Windfarm Scoping study 11/E/3/0011

Dear Patrick

Here is the Closeburn Community Council response to the Scoping report for 11/E/3/0011

Overview

Force Energy 9 and EDF wish to build a windfarm at Blackwood estate Auldgirth. This will involve 6 x 450 foot high 3WM turbines that will overhang Auldgirth village and visually impinge on the Nith Valley including the Thornhill Uplands Regional scenic area and the valley south to Dumfries. This windfarm although small in turbines numbers is the first to infringe into the Nith valley proper and will significantly add to the cumulative visual and noise impact of the area when taken with windfarms at Dalswinton (operating), Harstanes (consented) and Auchencairn (application not yet in).

Specific issues

D&G New Wind Energy Plan

The proposed site is not in an area identified as most suitable for wind energy under the new D&G Plan for wind energy just about to go for public consultation. It is in fact in an area adjacent to a Dark Skies/Regional scenic area designation and one that is marked for protection. This proposal would thus go against the new local plan for wind energy generation.

Noise - Peace and tranquillity damage

The scoping report concludes on page 37 &38 that the addition of the windfarm will add extra noise to the current levels but that the 6 turbines will be a small proportion of the new total noise levels. This is rubbish and no actual local evidence is provided to support this!! It then goes on to suggest that because of this only High Auldgirth needs noise assessment. Firstly one cannot dismiss the additional noise being generated. Representative actual noise assessment is required at a number of properties around the site as identified in the Fig 8 on page 37. Unlike High Auldgirth which is owned by the landowner these dwellings represent real neighbours!

Secondly the unique acoustics of this part of the Nith valley mean noise travels greater distances as demonstrated by the Glenloy Shooting Ground when sited at its previous location. On this occasion noise on shooting days travelled several miles along the Nith River and Clauchrie Burn valleys. The predicted turbine noise levels (page 37) do not take account of this phenomena.

Given the proximity of Auldgirth Village to this site assessments MUST be taken there and at Clauchrie, Shieldhill, Auchencairn, Cairn Farm and in Clauchrie Woodland where a Forest classroom is to be sited close to Clauchrie House.

Cumulative visual Impact

The proposed windfarm will extent the east - west line of Dalswinton turbines as seen from Thornhill in the North and Dumfries in the south so extending the sequential effect of both windfarms. This proposal thus represents a creeping extension of the Dalswinton windfarm. The number of viewpoints is limited and wire diagrams and pictorial viewpoints should be taken from all surrounding houses & farms as detailed above as needing noise assessment.

Carbon balance

No mention is made of the carbon balance of this proposal. As large amounts of concrete are involved in turbine foundations we would be looking for extensive planting of trees to offset the C02 admissions generated from making the concrete. No mention is made of tree felling.

Clauchrie Woodland - Social & community woodlands & Tourism

The scoping report fails to mention Clauchrie Community Woodlands that are immediately North and next door. Closeburn Community through its local charity Nith Valley LEAF Trust is currently in negotiation with the Forestry Commission Scotland to lease the 235ha woodland as a community forest. This will start from early 2012 and is likely to be a 100 year plus leasing arrangement – thus making it effectively permanent and covering the lifespan of the windfarm. The aim of NVLT is to maintain Clauchrie woodlands as a place of tranquillity whilst developing it as a centre for education and training in environmental and wildlife skills. Having turbines sited right on the Clauchrie Woodland boundary would generate intrusive noise and have a potentially serious effect on wildlife including the nesting of protected species like Goshawks nesting locally and badgers using the Clauchrie Burn valley. Tourism would also be significantly affected. Clauchrie Woodland includes D&G Core path 4442.

Errors

The scoping report contains a number of factual errors that throw into doubt the accuracy of all the information provided. Example of errors includes the table on page 19 with details of the status of other windfarms. Harstanes - 19 turbines is NOT consented! Auchencairn has not been submitted! The report also struggles with the geography of the area and states that the Nith Valley lies to the east when it in fact lies WEST of the proposed site (page 14). We are dismayed that professional companies like Force 9 Energy Ltd & RSK cannot get the simplest facts correct and would worry that future evidence would also be incorrect.

In conclusion Closeburn Community Council strongly objects to this proposal and would rigorously oppose this windfarm. The proposal does not fit the new local plan, would have a serious negative impact on the visual amenity and bring additional noise to the area all affecting tourism and the amenity of inhabitants. It would also have a potential serious effect on protected raptors and mammals.
We are very disappointed this scoping report talks only about mitigation when developments like this should aim to bring enhancement and benefits to Closeburn and the surrounding area.

Yours sincerely,

Mike Steele

Secretary,
Closeburn Community Council

Polly Bentham

From: Hanna, Patrick
Sent: 08 June 2011 15:00
To: Nithsdale Planning Applications
Subject: CONSULTATION FW: Planning Application 11/E/3/0011 - Blackwood, High Auldgirth, Auldgirth

---

From: Templeton, Brian
Sent: 07 June 2011 16:27
To: Hanna, Patrick
Cc: McLeod, James
Subject: Planning Application 11/E/3/0011 - Blackwood, High Auldgirth, Auldgirth

Pat,

With reference to the Planning Application - 11/P/3/0134 I make the following observations:

- The area proposed for development lies outwith the 1:200 fluvial floodplain as detailed on DGi (information from SEPA),
- There is no record of flooding in this area,

Recommendation:

- I have no objection to the application if a condition is placed on the applicant to take into account pluvial flows from the site so that the flood risk is not increased elsewhere.

Your plans are in the internal mail

Please call if you wish to discuss further

Regards

Brian Templeton
Principal Technician - Flood Risk Management
Tel: 01387 260303 (internal 64303)

brian.templeton@dumgal.gov.uk
www.dumgal.gov.uk

Polly Bentham

From: Hanna, Patrick [IMCEAEX-_O=DGC_OU=DUMFRIES_CN=PLANNING+20AND+20ENVIRONMENTAL+20SERVICES_CN=DEVELOPMENT+20CONTROL_CN=USERS_CN=HANNA+2EPATRICK@
Sent: 09 June 2011 08:38
To: Nithsdale Planning Applications
Subject: CONSULTATION FW: Blackwood Wind Farm, Auldgirth - scoping opinion - 11/E/3/0011

From: Anne Mackenzie [mailto:amackenzie@infratilairports.com]
Sent: 08 June 2011 18:22
To: Hanna, Patrick
Cc: Kirsteen MacDonald
Subject: Blackwood Wind Farm, Auldgirth - scoping opinion - 11/E/3/0011

Dear Patrick

We have reviewed the scoping report prepared on behalf of Force 9 Energy / EDF for this proposed 6 turbine wind farm at Auldgirth in D&G.

From our perspective, the report appears to cover the relevant considerations. We note that the proposed wind farm is over 67km SE of the airport and is entirely terrain shielded from our radar. Consequently, GPA would have no objection on safeguarding grounds to its construction. However, we note that NATS En Route may have objections on the grounds of interference with its Lowther Hill and Great Dun Fell radars, and it is possible that a feed from a new radar at GPA could play a part in any mitigation strategy NERL may require the developer to implement.

Finally, we note that if the turbines reach 150m a.g.l., they will require to be lit as en-route obstacles in accordance with the Air Navigation Order (in summary, medium intensity steady red lights). This may have a landscape and visual implication which the developer may wish to consider.

Kind regards

Anne Mackenzie

Group Manager, Corporate Strategy

Infratil Airports Europe Limited

Aviation House

Prestwick KA9 2PL

United Kingdom

T: +44 1292 511 029

M: +44 798 506 1953

E: amackenzie@infratilairports.com

Chairman: Thomas C Florey
Clerk: Roderick R Styles
Director: James Henderson

Nith District Salmon Fishery Board

22 SEP 2011

Mr Michael Kelly
Associate Director
RSK Environmental Ltd
65 Sussex St
Glasgow
G41 1DX

20th September 2011

Blackwood Windfarm Scoping Report

Dear Sir

I write on behalf of Nith District Salmon Fishery Board (NDSFB) following our recent receipt of the scoping report in relation to the Blackwood Windfarm proposals. The Board has commented on many windfarm proposals throughout their jurisdiction and has worked with constructors, key stakeholders and planning authorities to secure shared goals and successful projects. Indeed the Board have worked on so many of these proposals that we have adopted a policy in relation to all windfarm proposals.

The Board are generally supportive of windfarm proposals provided that they can determine if any, impacts are manifest on species that the Board are statutorily responsible for managing i.e. salmon and sea trout. Renewable energy is a common goal which should be pursued when and where appropriate and in recognising the benefits which can be derived, our Board are keenly aware of the potential for such large scale construction projects to create adverse impacts on fish during the construction phase.

In our experience, during the construction phase, windfarm projects can impact on the aquatic environment via the creation of heavily silt laden water caused by construction activity and associated traffic. Other activities which can prove detrimental are the crossing of minor watercourses which serve to convey material into major arterial watercourses. Inappropriate siting of borrow pits can be troublesome during episodes of heavy rainfall as can the formation of site roads through "challenging" locations.

It is reassuring to note the acknowledgement of some of the potential impacts in the scoping report section 3.2.5.2 and also an acknowledgement that it is important to gather fisheries information, section 3.2.5.3 of the report. NDSFB uses electrofishing survey data to gauge the impact that large scale construction projects have on fish communities throughout the River Nith catchment and has done so in relation to all windfarm proposals to date. It is essential to establish good baseline statistics prior to construction activities commencing. The information gained can be used to, advise on how best to protect fish that may be present close to construction activity. Repeat follow up surveys are used to assess overall impacts caused by the construction project.

37 George Street, Dumfries, DG1 1EB
Tel: 01387 267 222
Fax: 01387 254 775

board@river-nith.com
www.river-nith.com

Nith District
Salmon Fishery Board

The Blackwood Windfarm proposals are obviously in their infancy but NDSFB would like to be included in all appropriate consultations in relation to this project in order that they can ensure that the Board's interests are protected. To that end please do not hesitate to contact me regarding any fishery related information that you require within the River Nith catchment.

Yours sincerely

J. Henderson
Fishery Director

37 George Street, Dumfries, DG1 1EB
Tel: 01387 267 222
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APPENDIX 5
PHYSICAL ENVIRONMENT

Appendix 5.1: Flood Risk Assessment

Flood Risk Assessment (FRA) Checklist

(SS-NFR-F-001 - Version 9 - Last updated 30/08/2010)

This document should be attached within the front cover of any flood risk assessments issued to Local Planning Authorities (LPA) in support of a development proposal which may be at risk of flooding. The document will take only a few minutes to complete and will assist SEPA in reviewing FRAs, when consulted by LPAs. This document should not be a substitute for a FRA.

Development Proposal						
Site Name		Blackwood Wind Farm, Auldgirth, Dumfries				
Grid Reference	Easting:	292550	Northing:	587650		
Local Authority		Dumfries and Galloway Council				
Planning Reference number (if known)						
Nature of the development		Utility Infrastructure		If residential, state type:		
Size of the development site		306 Ha				
Identified Flood Risk	Source:	Fluvial		Source name:	River Nith	
Supporting Information						
Have clear maps / plans been provided within the FRA (including topographic and flood inundation plans)		Yes				
Has a historic flood search been undertaken?		Yes				
Is a formal flood prevention scheme present?		No		If known, state the standard of protection offered		
Current / historical site use		Greenfield with a number of properties across the site and within the site boundary				
Hydrology						
Area of catchment			km^2			
Qmed estimate			m^3/s	Method:	Select from List	
Estimate of 200 year design flood flow			m^3/s			
Estimation method(s) used *		Select from List		If other (please specify methodology used):		
				If Pooled analysis have group details been included	Select from List	
Hydraulics						
Hydraulic modelling method		Select from List		Software used:	Select from List	
If other please specify						
Modelled reach length			m			
Any structures within the modelled length?		Select from List		Specify, if combination		
Brief summary of sensitivity tests, and range:						
variation on flow (%)			%			
variation on channel roughness						
blockage of structure (range of % blocked)			%	Reference CIRIA culvert design guide R168, section 8.4		
boundary conditions:		**Upstream**			**Downstream**	
(1) type		Flow			Select from List	
	Specify if other			Specify if other		
(2) does it influence water levels at the site?		Select from List			Select from List	
Has model been calibrated (gauge data / flood records)?		Select from List				
Is the hydraulic model available to SEPA?		Select from List				
Design flood levels	200 year		m AOD	200 year plus climate change		m AOD

Flood Risk Assessment (FRA) Checklist

(ES-NFR-F-001 - Version 8 - Last updated 26/04/2010)

Coastal						
Estimate of 200 year design flood level			m AOD			
Estimation method(s) used		Select from List	If other (please specify methodology used):			
Allowance for climate change (m)			m			
Allowance for wave action etc (m)			m			
Overall design flood level			m AOD			
Development						
Is any of the site within the functional floodplain? (refer to SPP7 para 16-18)		No		If yes, what is the net loss of storage	0	m^3
Is the site brownfield or greenfield		Greenfield				
Freeboard on design water level (m)			m			
Is the development for essential civil infrastructure or vulnerable groups?		No		If yes, has consideration been given to 1000 year design flood?	Select from List	
Is safe / dry access and egress available?		Vehicular and Pedestrian		Min access/egress level		m AOD
If there is no dry access, what return period is dry access available?			years			
If there is no dry access, what is the impact on the access routes?	Max Flood Depth @ 200 year event:		m	Max Flood Velocity:		m/s
Design levels	Ground level		m AOD	Min FFL:		mAOD
Mitigation						
Can development be designed to avoid all areas at risk of flooding?		Yes				
Is mitigation proposed?		Yes				
If yes, is compenstory storage necessary?		No				
Demonstration of compensatory storage on a "like for like" basis?		Select from List				
Should water resistant materials and forms of construction be used?		No				
Comments						
Any additional comments:						
Approved by:						
Organisation:						
Date:						

Note: Further details and guidance is provided in 'Technical Flood Risk Guidance for Stakeholders' CLICK HERE

**** ReFH not accepted by SEPA for flow estimates in Scotland. Any use of this method should be validated by the use of other, accepted methods.***

Force 9 Energy

Blackwood Wind Farm, Auldgirth, Dumfries

Flood Risk Assessment

131566-R1(0)-FRA

JANUARY 2012

RSK GENERAL NOTES

Project No.: 131566-R1(0)-FRA

Project Title: Blackwood Wind Farm, Auldgirth, Dumfries

Report Title: Flood Risk Assessment

Client: Force 9 Energy

Date: January 2012

Office: Hemel Hempstead

Status: Final

Author	KY Cheng	**Technical reviewer**	F. Arfa-Zangeneh
Signature [delete row if not required]		Signature [delete row if not required]	
Date:	05.01.2012	Date:	05.01.2012
Project manager	C Patmore	**Quality reviewer [optional]**	
Signature [delete row if not required]		Signature [delete row if not required]	
Date:	05.01.2012	Date:	

CONTENTS

FIGURES

APPENDICES

1 EXECUTIVE SUMMARY

RSK Land & Development Engineering Ltd was commissioned by Force 9 Energy to review hydrology and flood risk issues for the proposed Blackwood wind farm development. As part of the investigation, a Flood Risk Assessment (FRA) has been produced to support the planning application.

The assessment has been prepared in accordance with Scottish Planning Policy (SPP) and the SUDS Manual with site-specific advice from Scottish Environment Protection Agency (SEPA) and the client.

The following key points are noted in respect of flood risk and drainage:

- The SEPA Indicative River & Coastal Flood Map confirms that the site is mainly located in an area with minimal risk of flooding from the existing watercourses within the boundary of the site. The western end of the site encroaches into 200-year flood risk zones associated with River Nith and Clauchrie Burn and was affected by flooding in 1997. There have been reports of flooding in Auldgirth village during November 2009 flood, exact locations are not known.
- There is no record to show other parts of the site have been affected by any sources of flooding.
- The Pennyland Burn is situated on the eastern boundary of the site. The Burn is a major tributary of the River Nith, which drains into it at Carnshalloch north of Dumfries.
- Dumfries & Galloway Council has confirmed that they have no record of flooding in this area.
- Communication with Scottish Water indicates that they have no objection to the overall development. Scottish Water has been contacted in regard to their infrastructures in the locality and still awaiting their response.
- Site geology indicates that the glacial sand and gravel soils are present beneath the southwest area of the site. An area of glacial till is indicated in the central northern-western area of the site, to the west of Keepers Cottage. Within the majority of the central site area and across the eastern and northeastern areas, the map information indicates the presence of shallow bedrock. The bedrock geology for the whole site comprises of Silurian aged Gala Group. These comprise predominantly fine to very coarse sandstone, with subordinate siltstones and mudstones. This indicates that on-site shallow infiltration may be possible, but should be confirmed with soakage tests.
- It is possible that a number of Sustainable Drainage Systems (SUDS) features can be introduced, such as swales and infiltration trenches to accommodate surface water runoff from the access road. Features including infiltration basins and soakaways can be located adjacent to turbine foundations to attenuate any surface water flow from these impermeable areas. An overflow connection to a nearby watercourse/ditch, may be required depending on the actual infiltration rate onsite.
- A76 is located within the SEPA identified Floodplain, during constructing an alternative safe/dry access should therefore, be considered within the emergency and site management plans and personnel should be made aware of

such route while onsite. There is an alternative dry access from the existing minor road towards Dalswinton to the southeast.

In summary, the assessment views the site to be at low risk of flooding. The wind farm development at the Blackwood site should be possible with careful consideration of the surface water drainage onsite where the overall drainage regime is considered and most extreme events better controlled.

2 INTRODUCTION

RSK Land & Development Engineering Ltd was commissioned by Force 9 Energy to review hydrology and flood risk issues for the proposed Blackwood wind farm development. As part of the investigation, a Flood Risk Assessment (FRA) has been produced to support the planning application.

The assessment has been prepared in accordance with Scottish Planning Policy (SPP)[(Ref. 1)] and The SUDS Manual [(Ref. 2)] with site-specific advice from the Scottish Environment Protection Agency (SEPA) and the client.

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in Appendix A.

3 CONTEXT AND SCOPE OF WORK

A key element of project development is to prepare a Flood Risk Assessment to establish the risk associated with the proposed development and to propose suitable mitigation, if required to reduce the risk to a more acceptable level.

3.1 Application of Planning Policy

Scottish Planning Policy [(ref. 1)], February 2010, sets out:

- The Scottish Government's view of the purpose of planning;
- The core principles for the operation of the system and the objectives for key parts of the system;
- Statutory guidance on sustainable development and planning under Section 3E of the Planning etc. (Scotland) Act 2006;
- Concise subject planning policies, including the implications for development planning and development management; and
- The Scottish Government's expectations of the intended outcomes of the planning system.

As indicated in SPP paragraph 205, the settlement strategy set out in the development plans should take into account of the potential risks from flooding. Local development plans should:

- Identify sites or areas constrained by flood risk on the basis of the risk framework;
- Safeguard the flood storage and conveyancing capacity of functional flood plains;
- Indicate circumstances where a freeboard allowance should apply;
- Indicate when a drainage assessment will be required because of flood risk; and
- Indicate when water resistant materials and forms of construction will be appropriate.

3.2 Scope of Assessment

The scope of work relating to a flood risk assessment is based on the guidance provided in SPP [(Ref. 1),] in particular paragraph 196 to 211 inclusive on Flooding and Drainage and the following should be taken into account while applying the Risk Framework (TABLE 1).

- The characteristics of the site;
- The use and design of the proposed development;
- The size of the area likely to flood;
- Depth of water, likely flow path, rate of rise and duration;
- Existing flood prevention measures – extent, standard and maintenance regime,
- The allowance for freeboard;
- Cumulative effects of development, especially the loss of flood storage capacity;

- Cross boundary effects and the need for consultation with adjacent authorities;
- Effects of a flood on access including by emergency services;
- Effects of a flood on proposed open spaces including gardens; and
- The extent to which the development, its materials and construction are designed to be water resistant.

3.3 Risk Framework

The Risk Framework in SPP paragraph 204 outlines the application of the risk framework for any development site. It provides a basis for planning decision making relating to flood risk. The risk framework divides flood risk into three categories and outlines an appropriate planning response. The calculated probability of a flood occurring should be regarded as best estimate and not a precise forecast. The annual probabilities referred to in the framework below relate to the land at the time a planning application is made or a development plan is prepared.

TABLE 1: Risk Framework

Little or No Risk
Definition
Annual probability of watercourse, tidal or coastal flooding is less than 0.1% (1:1000)
Appropriate uses
• No constraints due to watercourse, tidal or coastal flooding.
Low to Medium Risk Area
Definition
Annual probability of watercourse, tidal or coastal flooding in the range 0.1% - 0.5% (1:1000 – 1:200)
Appropriate uses
• These areas will be suitable for most development. A flood risk assessment may be required at the supper end of the probability range (i.e. close to 0.5%) or where the nature of the development or local circumstances indicate heightened risk. Water resistant materials and construction may be required depending on the flood risk assessment. Subject to operational requirements, including response times, these areas are generally not suitable for essential civil infrastructure such as hospitals, fire stations, emergency depots etc. where such infrastructure must be located in these areas or is being substantially extended it should be capable of remaining operational and accessible during extreme flooding events.
Medium to High Risk
Definition
Annual probability of watercourse, tidal or coastal flooding greater than 0.5% (1:200)
Appropriate uses

- Generally not suitable for essential civil infrastructure such as hospitals, fire stations, emergency depots etc., schools, care homes, ground-based electrical and telecommunications equipment unless subject to an appropriate long term flood risk management strategy. The policy for development on functional flood plains applies. Land raising may be acceptable.
- If built development is permitted, appropriate measures to manage flood risk will be required and the loss of flood storage capacity mitigated to produce a neutral or better outcome.
- Within built up areas, medium to high risk areas may be suitable for residential, institutional, commercial and industrial development provided flood prevention measures to the appropriate standard already exist, are under construction or are planned as part of a long term development strategy. In allocating sites, preference should be given to those areas already defended to required standards. Water resistant materials and construction should be used where appropriate.
- In undeveloped and sparsely developed areas, medium to high risk areas are generally not suitable for additional development. Exceptions may arise if a location is essential for operational reasons, e.g. for navigation and water based recreation uses, agriculture, transport or some utilities infrastructure and an alternative lower risk location is not achievable. Such infrastructure should be designed and constructed to remain operational during floods. These areas may also be suitable for some recreation, sport, amenity and nature conservation uses provided adequate evacuation procedures are in place. Job-related accommodation (e.g. caretakers and operational staff) may be acceptable. New caravan and camping sites should not be located in these areas. If built development is permitted, measures to manage flood risk are likely to be required and the loss of flood storage capacity minimised. Water resistant materials and construction should be used where appropriate.

As the developable area where the turbines and the access roads will be located within an area identified as Little or No Risk, in accordance to the Risk Framework, there should not be constraints due to watercourse, tidal or coastal flooding.

The southern end of the site near A76 is identified as Medium to High Risk, there will not be any new permanent works at this end of the site, apart from using the existing access road for transportation of staff and equipment during construction and for maintenance access during operation.

3.4 Water Environment (Controlled Activities) (Scotland) Regulations 2011

Under Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR), authorisation is intended to control impacts on the water environment, including mitigating the effects on other water users. Three different types of authorisation under CAR allow for proportionate and risk-based regulations, these are:

- General Binding Rules
- Registration
- Licence (simple or complex)

When an application is being considered for authorisation, SEPA will assess the effect upon ecology, upon other water users and the extent to which the proposals affect flood risk.

4 SITE DESCRIPTION

4.1 Site Location

The site is located approximately 14km north of Dumfries and is located close to the village of Auldgirth as shown in Figure 1. The Blackwood Estate is bounded to the north by the existing Clauchrie Plantation and open fields, to the east by the Dalswinton Estate, upon which the Dalswinton Wind Farm has been developed, to the west by A76 trunk road and to the south by open fields.

The surrounding areas are rural in nature and the site can be located by grid reference NX 925876.

4.2 Site Description

Site area is approximately 305ha but only 2.37ha will ultimately be subject to permanent land take which is located to the north and northeast of the overall site area.

Topography for the site indicates that the southern part of the site generally falls southwest toward River Nith. The northern part falls toward the north and northeast, away from the site and the eastern portion falls toward Pennyland Burn, which runs along the eastern boundary of the site. A site survey is contained in Figure 2.

The site generally consists of rough, semi-improved grassland and conifer plantation and woodland, which run from the southwest to the northeast through the centre of the site.

A number of features are located within the site, which include existing properties and farm building at Low Auldgirth and High Auldgirth, a disused quarry close to Low Auldgirth, the Burntkettle Shooting Ground at Glenloy and the Glasgow South Western railway line, which runs through the western section of the site.

The A76 forms the western boundary of the Site, from which an unclassified road leads east through Low Auldgirth to High Auldgirth. A number of tracks lead from this road to provide access around Blackcraig Hill and to other areas of the Site.

4.3 Site Topography

The highest point lies in the north of the site close to Muirstraploch Wood, at elevation of approximately 244 metre Above Ordnance Datum (mAOD), and the lowest point along the south western boundary, at elevation of approximately 35m AOD, at Auldgirth. Notable peaks within the site include Blackcraig Hill (242m AOD).

4.4 Site Geology

Superficial Deposits

The publicly available geological information does not indicate the presence of any man made deposits, however, it is considered that localised made ground would be present in the western and central areas of the Site around the residential properties and the railway line. Additionally, two quarries are indicated to the south of Low Auldgirth, which may be backfilled with man made deposits.

The map information indicates the presence of alluvium (clay, silt and sand) associated with the River Nith (to the west), which may encroach onto the western Site area. Some localised alluvial soils may be present in association with the streams that flow through the Site.

Glacial sand and gravel soils are indicated to be present beneath the southwest area of the Site, extending from the A76 to the approximate location of the Low Auldgirth properties. The quarries in this area may have worked sand and gravel deposits historically.

An area of glacial till is indicated in the central northern-western area of the Site, to the west of Keepers Cottage. The majority of the central Site area and across the eastern and northeastern areas the map information indicates the presence of shallow bedrock.

Solid Strata

The map information indicates the underlying bedrock to be wacke rocks of the Silurian aged Gala Group. These comprise predominantly fine to very coarse sandstones, with subordinate siltstones and mudstones.

4.5 Site Hydrology

There are three major watercourses in the vicinity of the site, which includes the River Nith, which runs close to the western boundary of the site and the Ballochan Linn (Clauchrie Burn), which is located to the north forming part of the northern boundary of the site. The Pennyland Burn runs along the eastern boundary of the site with a small tributary draining a small hilly northern portion of the site.

Surface water in the southwestern portion of the site mainly drains into River Nith. Surface water generated from the western portion drains into Ballochan Linn (Clauchrie Burn) and eventually into River Nith.

4.6 Existing Flood Defences

SEPA indicates that there are no flood defences in the study area.

4.7 Flood Zones

The Indicative River & Coastal Flood Map (Scotland) indicates that the southern boundary of the site lies adjacent to the 200-year flood outline of the River Nith and therefore at potential risk of fluvial flooding.

The southwestern part of the study area is also potentially at risk of flooding from the Clauchrie Burn and a number of small watercourses.

The Indicative Flood Map is included as Figure 3.

4.8 Historic Flooding

According to SEPA the lower portion of the site was subject to flooding from the River Nith during the November 1997 flood.

There have been reports of flooding in Auldgirth during November 2009 flood. Exact locations are not known.

Dumfries & Galloway Council has confirmed that they have no record of flooding in this area.

5 CLIMATE CHANGE

As stated under paragraph 43 of the SPP [ref. 1], the changing climate will increase the risk of damage to buildings and infrastructure by flood. Development should therefore normally be avoided in areas with increased vulnerability to the effects of climate change, particularly areas at significant risk from flooding, landslip and coastal erosion and highly exposed sites at significant risk from the impacts of storms.

It is anticipated that global climate change may have a significant effect on the frequency and intensity of flood events in Britain and could have wide-ranging impacts on flood risk.

The government established the UK Climate Impacts Programme (UKCIP) to assess the potential impacts as a result of climate change and plan appropriate adaptation strategies.

UKCIP has produced maps showing a range of climate that could be expected for a variety of climate variables under the medium emissions scenario and for three probability levels for Scotland. The UKCIP2009 scenarios published in June 2009 provided climate change predictions for high, medium and low emission scenarios. The maps are included in Appendix B.

For annual increase in precipitations for medium emission scenarios in Scotland, it is stated following:

- By 2020s, with 90% probability level, the mean precipitation will increase by 10% in summer and by 20% in winter.
- By 2050s, with 90% probability level, the mean precipitation will increase by 10% in summer and by 20-30% in winter.
- By 2080s, with 90% probability level, the mean precipitation will increase by 10% in summer and by 40-60% in winter.

As a result, climate change is likely to increase surface water runoff from the site, which can result in increased flows in watercourse/ ditches.

6 DEVELOPMENT PROPOSALS

The total site area is approximately 305ha, although only 2.37ha of this area would ultimately be subject to permanent land take for the project components described below. The proposal of the wind farm consists of the following and the layout is included as Figure 4:

- 5no. wind turbines, each with a capacity of up to 3MW (height to tip will be a combination of 120m and up to 140m depending upon location within the terrain);
- Temporary anemometer mast (location 292900E 588400N);
- Permanent anemometer mast(s);
- Permanent access tracks to gain access to the site and between the turbines;
- Grid connection building and site office;
- Borrow pits.

Grontmij undertook a site access route review in December 2010 [ref. 4]. Access to the site will be from A76, through an existing track that runs up to Low Auldgirth, which is currently serving a farm. A new access is proposed from the existing access from A76 to the north of Low Auldgirth farm and joins the existing track again approximately 500m to the northeast of Low Auldgirth. The existing track from High Auldgirth, i.e. beginning of the existing shooting range access track will be upgraded with a number of new access tracks leading up to the turbines.

7 SOURCES OF INFORMATION

7.1 SEPA Consultation

A scoping response for the site was received in June 2011. A site-specific response from SEPA was also received in September 2011, which is included in Appendix C. Some of the comments have been summarised below:

1. Flood Risk should be included due to the close proximity of the site boundary to the River Nith's floodplain with several small watercourses running through the application site.
2. The application site partly lies within the 1 in 200 year (0.5% annual probability exceedance (APE)) flood envelope of the Indicative River & Coastal Flood Map (Scotland), therefore with a medium to high risk of flooding from the River Nith.
3. Flood risk is generally considered to be minimal due to the steep topography in this area.
4. The lower end of the site is subject to the 1 in 200 year flood envelope of the River Nith. The river flooded the area during the November 1997 flood event.
5. Flood risk within the application site should also be considered with regards to proposed access tracks, anemometer mast, grid connection building and site office with associated car park. The scoping report states that access tracks are proposed to join the A76 near Auldgrith; this area lies within the floodplain of the River Nith and therefore further consideration of flood risk should be given.
6. Possible disturbance and modification of watercourses, existing drainage patterns, and groundwater recharge and flows is identified within the submitted scoping report. If this is likely to occur then the effects upon flood risk should identified.
7. Expansion and construction of roads may require culverting of small watercourses, which may increase flood risk in the area. A CAR licence may be required for the construction of any structures within the vicinity of a watercourse. The main restriction posed by the flood risk areas of the site will be to ensure the increased extent of impermeable surfaces does not increase flood risk elsewhere.

7.1.1 SEPA Flood Zone

SEPA has produced the Indicative River & Coastal Flood Map (Scotland) following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km^2 using a Digital Terrain Model (DTM) to define river cross-sections and low-lying coastal land. The outlines do not account for flooding arising from sources such as surface water runoff, surcharged culverts or drainage systems.

The methodology was not designed to quantify the impacts of factors such as flood alleviation measures, buildings and transport infrastructure on flood conveyance & storage. The Indicative River & Coastal Flood Map (Scotland) is designed to be used as a national strategic assessment of flood risk to support planning policy in Scotland.

For further information please visit http://www.sepa.org.uk/flooding/flood_map.aspx.

7.1.2 SEPA River Levels

SEPA has monitoring stations at 360 sites throughout Scotland located on rivers, there are also data available from tide and lock levels in some locations.

The data are collected automatically through telemetry once a day with the data related to a local datum, therefore not directly providing the depth of water between the riverbed and the surface.

The nearest station to the site is the Friars Carse station on the River Nith, approximately 5km to the southeast of the site.

TABLE 2: Water level in River Nith

Station Name	Catchment	River Name	Lowest Level on record (m)	Average level on record (m)	Highest level on record (m)	Catchment area (km^2)
Friars Carse	River Nith	Nith	0.051	0.672	6.005 (1962)	799

7.1.3 Local Plan Districts and Potentially Vulnerable Areas

The Local Plan District [ref. 5] summary provides information on the main sources of flooding and associated impacts through the National Flood Risk Assessment. The finalised set of Potentially Vulnerable Areas and Local Plan Districts will be published by SEPA and the Scottish Government in December 2011.

The Potentially Vulnerable Area (PVA) Datasheet for the River Nith catchment (extract in Appendix D) indicates that the PVA 14/05 is located within a catchment with a potential impact to a large number of residential and commercial properties. There are also potential impact to minor transport links and high-grade agricultural land and extensive areas of sensitive designated sites with infrequent reports of flooding in the area.

It describes that there is a moderate to high potential of groundwater flooding within part of the catchment.

The impact of climate change has a moderate predicted increase in rainfall with proportionate increase in flooding.

The hydrology of the catchment includes the following:

- Moderate to long peak flood flow response times;
- High catchment flood storage and attenuation capacity;
- Potential for low to moderate underestimation of design flood magnitude; and
- Low erosion hazard potential of flood flows.

The information above is related to the catchment that the site is located in and are not site-specific.

7.2 Dumfries & Galloway Council

Correspondence with the council, contained in Appendix E, confirms that:

- The area proposed for development lies outwith the 1:200 fluvial floodplain as detailed on DGi (Distributed Geographic information from SEPA);
- There is no record of flooding in this area.

The following recommendation has also been suggested by the council:

- The council has no objection to the application if a condition is placed on the applicant to take into account fluvial flows from the site so that the flood risk is not increased elsewhere.

7.3 Relevant Studies

7.3.1 Scotland River Basin Management Plan

The Scotland River Basin Management Plan (Scotland RBMP) was developed and published in December 2009, as part of the requirements of the Water Framework Directive (WFD) (Ref. 6). The river basins consist of all the rivers, lochs, wetlands, groundwater that eventually ends up in the sea, estuaries and adjacent coastal waters.

SEPA has classified the condition of most of the water bodies in Scotland in order to determine the quality of the water environment and where improvements can be made.

7.3.2 The River Nith Catchment Management Plan

The River Nith Catchment Management Plan (River Nith CMP) (ref. 7) is used to identify actions required to encourage environmental improvements. The CMP *"aims to seek to deliver objectives contained within the Wetland Section of the Dumfries and Galloway Local Biodiversity Action Plan, published in 1999. In addition, catchment management planning was seen as a precursor to the then forthcoming requirements of the European Union's Water Framework Directive".*

Under Section 2. Water Management, the objectives include:

- Maintain and enhance the water quality of the Nith catchment;
- Ensure that there is water available for abstraction while protecting the need of the natural environment;
- Ensure all river work operations respect the physical, ecological and aesthetic integrity of the river Nith system; and
- Encourage a catchment-based approach to flood management that helps to protect the people, property and prosperity of the Nith catchment, while respecting its physical, ecological and aesthetic qualities.

The Nith is tidal and discharge directly into the estuary (about 25km south of the site) and the tide can range from 1 to 6m high depending on the lunar cycle.

Flooding is mainly a winter problem and correlate strongly with winter rainfall patterns. The worst flooding incidents in Dumfries recorded by SEPA occurred in October 1977 and December 1982, associated with periods of high rainfall.

A scheme that provides up to 6 hours warning of flooding was set up by the Solway River Purification Board in 1990, this is followed by the launch of the 'Floodline' by SEPA in 2001 to alert local people, businesses and the support services to the likelihood of flooding events.

8 SOURCES OF FLOOD RISK

The flood risk elements that need to be considered for any site as the 'Forms of Flooding' and are listed as:

- Flooding from Rivers (fluvial flood risk)
- Flooding from the Sea (tidal flood risk)
- Flooding from the Land (Overland flood risk)
- Flooding from rising Groundwater
- Flooding from Drainage Systems (sewer and drain exceedance, pumping station failure etc)
- Flooding from Reservoirs, Canals and other Artificial Structures

The following section reviews each of these in respect of the subject site.

8.1 Flooding from Rivers (Fluvial Flood Risk)

The current Indicative River & Coastal Flood Map (Scotland) is reproduced as Figure 3. The latest flood zone map shows that a small part of the site to the southwest is located within an area affected by fluvial flood risk. This is further confirmed by SEPA *"Review of the Indicative River & Coastal Flood Map (Scotland) indicates that the southern boundary of the site lies adjacent to the 200-year flood outline of the River Nith and as such is potentially at risk of fluvial flooding. Parts of the study area are also potentially at risk of flooding from the Clauchrie Burn and a number of small watercourses".*

The southern end of the site that lies within the 1 in 200 year flood extent of the River Nith was flooded in the November 1997 flood event. This is crossed by the access route to the site and there will be a residual risk that at times of flooding the road could be closed.

Furthermore, there is a tributary of the Pennyland Burn running within the site boundary close to the proposed wind farm. However, SEPA further states, *"due to steep topography in this area the flood risk is thought to be minimal".* A site visit by RSK engineers confirmed that the risk is negligible to the area for the proposed wind turbines.

8.2 Flooding from the Sea (Tidal Flood Risk)

As indicated on the SEPA Indicative River & Coastal Flood Map (Scotland), the site is not located within an area at risk of flooding from the sea.

8.3 Flooding from the Land (Overland Flood Risk)

Overland flow occurs when rainfall intensity exceeds the infiltration capacity of the ground, or when the saturated soil cannot accept any more water. Considering the steep topography of land, it is likely that significant flows will result during heavy rainfall. Surface water flooding is likely to occur at the base of hills, and low points in terrain. There will be limited warning before this type of localised flooding occurs.

Any overland flow would follow the site topography and flow toward Pennyland Burn and its tributary. Surface water runoff to the south would eventually reach the Clauchrie Burn and the River Nith.

The site is considered to be at risk of flooding from overland flow. However, because of the steep nature of land the flooding would be shallow and short-lived and would tend to last as long as the rainfall event and flooding from land at this location tends not to have as serious consequences.

8.4 Flooding from Groundwater

SEPA has no groundwater level or quality monitoring points within 5km of the site. However, due to the general high elevation of the site, groundwater flooding to the location of the wind farm site would be minimal.

However, it is possible that due to the lower ground elevation to the southern end of the site, groundwater may reach above ground level when/if the water level in the River Nith and Clauchrie Burn rises. This however, will have little impact on the proposed wind farm turbines, which are to be located to the northern end of the site.

Furthermore, information requested from SEPA on licensed abstraction, discharge points indicate that there are no abstraction points within the site boundary.

8.5 Flooding from Sewers

There are a number of properties located within the site boundary and may be possible that there may be abstraction and discharge points associated with them.

Sewer record plans from Scottish Water contained in Appendix F do not appear to show that there are any sewers within the site boundary.

Furthermore, there is no recorded data to indicate that the site has previously been flooded from sewers, so flooding from this source is considered to be negligible.

8.6 Flooding from Reservoirs, Canals and other Artificial Structures

Flooding from reservoirs and canals are not an issue for this site. The main concern would be the existing culverts under the existing track. There is a risk that the culverts may be blocked that could potentially result in localised flooding and affecting the existing access track.

However, existing culverts will be upgraded where necessary as part of the access track construction works, improving the condition of these culverts. In addition, any blockage will result in localised flooding and is unlikely to spread across a wider area. Therefore, it is not anticipated that the existing culverts will pose a significant flood risk to the site.

9 SURFACE WATER DRAINAGE ASSESSMENT

The SUDS manual currently [ref. 2] provides appropriate guidance on the use of SUDS.

As proposed development will create hardstanding areas, surface water runoff will increase as a result of the proposed access track and wind turbines platform. It is important that the additional runoff are accommodate. The preferred method of dealing with surface water is to contain and treat at source wherever possible.

9.1 Pre-Development Situation

As the site consists of rough, semi-improved grassland and conifer plantation, there is currently no active drainage on site. Therfore, surface water infiltrates into the ground directly or follows the existing site topography and flow into nearby ditches.

The site has been divided into a number of sub-catchments based on the topography of the site and the Institute of Hydrology Report 124 (IoH) method [ref. 8] has been used to estimate the existing runoff from the each sub-catchments. Additional information is contained in Appendix G. Table 3, shows calculated peak flows.

TABLE 3: IoH Peak Surface Runoff Calculations (greenfield)

	Sub-catchment				
	A	B	C	D	E
Area (ha)	38.2	33.1	57.2	120.2	56.3
Peak Flow					
$QBAR_{RURAL}$	241 l/sec	208 l/sec	355 l/sec	687 l/sec	350 l/sec
Receiving watercourse	Pennyland Burn Tributary	Minor drain	Pennyland Burn	Ballochan Linn/ Clauchrie Burn – eventually in River Nith	River Nith

These are the greenfield runoff rates from the existing site for different sub-catchments as shown in Figure 2. The runoff from the site should be maintained at the same levels after development to ensure that proposal does not have an impact to the surrounding environment.

The preferred drainage regime would be to maintain the existing drainage pattern with any additional volume or increase in peak flows generated as a result of development contained within the site by using SUDS methodology. This is to minimise any potential impacts that the development may have to its river wide catchment area.

9.2 Post-Development Situation

Proposal track and turbine foundations will be mainly in sub-catchments A, B and C. Upgrade works will be carried out for part of an existing track and it is not anticipated that a significant increase in impermeable area will result due to the improvement works. The rest of the access will be via the existing track connected to A76 with no proposed upgrade.

It is anticipated that a minimum increase of approximately 2.37ha of impermeable area will be introduced as a result of development, this include the platforms of the turbines and the new access roads (assuming an average width of 5m). It should be noted that although the tracks will be constructed using granular materials only and not sealed, some infiltration into the road surface will be possible. But for the more extreme events surface water runoff would be generated. The following considers these more extreme events.

To calculate the potential storage requirement that would be needed on this site, the catchment has been assessed using the WINDES "QuickStore" calculation. This is an approximation of the storage requirement as a result of development and provides a range of storage volumes.

As the new access roads and the turbines will only be located within sub-catchment A, B and C, there will be no change in surface water runoff nor impermeable area in sub-catchment D and E, therefore they have been excluded from the calculations below. Full calculations are contained in Appendix H.

TABLE 4: Quick Storage Estimates for proposed site

	Sub-catchment		
	A	B	C
Sub-catchment area (ha)	38.2	33.1	57.2
Approximate Proposed Impermeable Area (m^2)	9,670 (track) 540 (turbine)	1,800 (track)	1,000 (track) 135 (turbine)
Pro-rata greenfield runoff from the impermeable area	6.4 l/s	1.1 l/sec	0.7 l/s
Return Period	**Quick Storage Estimate Volume**		
1 in 200 year	481 – 801m^3	44 – 74m^3	104 – 171m^3
1 in 200 year (+20%)	577 – 961m^3	53 – 89m^3	125 – 205 m^3

A maximum total storage of around 1,046m^3 would be required for the proposed site during the 1 in 200 year storm event, if surface water were to be maintained at the existing greenfield runoff rates as shown in TABLE 3. These volumes, however do not take into account the existing site infiltration, interception, evapotranspiration etc, therefore the storage volume is likely to be significantly less.

For surface water drainage there is a possibility that soakaways and other SUDS features could be utilised to provide additional attenuation volume within the site.

It is possible that features including swales and infiltration trench can be incorporated adjacent to access track to accommodate runoff from these surfaces. SUDS features including soakaways, infiltration basins can be located downstream to the proposed turbine foundation to capture runoff from these surfaces.

Depending on the infiltration rate on the existing site, an overflow connection may be required from the SUDS features including overland flow routes for more extreme events allowing safe discharge of the runoff towards watercourse.

9.2.1 Culvert

During site visit, the need of two new culverts was identified. The first culvert would be located on an unnamed small watercourse under the proposed access track at NGR 291582E, 587332N. The second culvert would be located on the unnamed tributary of the Pennyland Burn under the proposed track leading to wind turbine No. 1 and 3 at NGR 293107E, 588545N.

Closed culverts used for river crossings would normally only be justified for single-track roads over small watercourses (<2m in width) as stated in the SEPA Position Statement in Culverting of Watercourses (Ref. 9). For all other crossings, the use of span bridges and bottomless arch structures is recommended by SEPA, where practicable, to minimise any potential impact on the geomorphology of the watercourse. The culverts should be design to the CIRIA Report C689 Culvert Design Guide (Ref. 10).

In addition, all watercourse crossings must be carried out in accordance with the CAR requirements.

9.2.2 Access

The onsite access will join the A76 near Auldgirth. This section of the access road is located within the floodplain of the River Nith. It is not anticipated that any improvement works will be carried out in this section of the access road.

It is important to note that as A76 is partially within floodplain of the River Nith, a safe exit route should be provided for staff in case of flooding. There are a number of existing access routes in the area, staff should be aware of such routes. According to the Auldgirth & District CC Draft Action Plan produced in August 2011 (ref. 11), the Auldgirth village near the River Nith is located above the 1 in 200 year flood levels, therefore, a safe exit can be achieved by going through the village and through a minor road running toward southeast and parallel to A76.

10 CONCLUSIONS AND RECOMMENDATIONS

This assessment concludes that some of the land to the western part of the site is located within the 1 in 200 year (0.5% AEP) flood envelope of the river Nith with medium to high risk of flooding as shown on the indicative River & Coastal Flood Map (Scotland).

The proposed turbine locations will be located outside the SEPA identified Flood Zone for the River Nith. Furthermore, there is a tributary of the Pennyland Burn running through the proposed development site and present a negligible risk of flooding to the site due to deep watercourse valley.

The turbine locations have been offset by a minimum of 50m from any existing watercourses and drains, reducing the potential risk to and from any existing water features.

Assessment indicates that proposed turbine locations will not be affected by tidal, fluvial, overland, groundwater and sewer flooding.

The access to the site via A76 is partially located within the floodplain of the River Nith, therefore a safe access has been suggested by running through the Auldgirth village, via a minor road running toward southeast and parallel to A76. During construction, staff should be made aware of this route as it provides a dry and safe access should flooding from extreme rainfall occurs. This should be considered and included in the construction management plan. A similar recommendation should be included in the site operational documents.

Climate change is unlikely to have a significant impact on the site due to the limited increase of impermeable area and the elevation the turbines are to be located on higher grounds. More intense rainfall could potentially increase the overall river flow in River Nith and Clauchrie Burn, which leads to more area located in the floodplain. As the turbines and proposed access roads are located away from the existing floodplain, the risk of flooding from increased rainfall intensity and flow in watercourses is minimal.

The higher elevation of the turbines will also allow surface water to runoff into lower grounds, minimising any potential impacts from increased surface water runoff.

In summary, this assessment views the site to be at low risk of flooding with a few key recommendations suggested below:

- A76 is located within the SEPA identified Floodplain, an alternative safe/dry access should therefore, be provided and staff should be made aware of such route while onsite.
- Soakaway tests are likely to be required to confirm the existing infiltration rate to determine the efficiency of the use of SUDS soakaway to discharge surface water runoff from the site.
- SUDS including infiltration basins, swales and infiltration trenches should be incorporated as part of the design where feasible to minimise to use of man-made drainage structures, i.e. pipes. In the case of low infiltration rate, SUDS can be used as attenuation prior to discharging the surface water into nearby watercourses/ ditches.

- Inclusion of flood warning advice to both construction staff and operational staff of the residual flood risks related to access via A76.

11 REFERENCES

1. The Scottish Government “Scottish Planning Policy”, February 2010

2. The Scottish Government “Planning Advice Note PAN 61”, July 2001

3. Trustees of the National Museums of Scotland “Highlands Geological Map”, no date

4. Grontmij ‘Force 9 Energy Blackwood Wind Farm, Near Auldgirth, Dumfries – Site Access Route Review’ December 2010

5. Scottish Environment Protection Agency “Local Plan Districts and Potentially Vulnerable Areas – Flood Risk Management (Scotland) Act 2009 14. Solway”, September 2011

6. Natural Scotland Scottish Government “The river basin management plan for the Scotland river basin district 2009-2015”, December 2009

7. Scottish Environment Protection Agency “The River Nith Catchment Management Plan (incorporating the Lochar Water)”, 2003

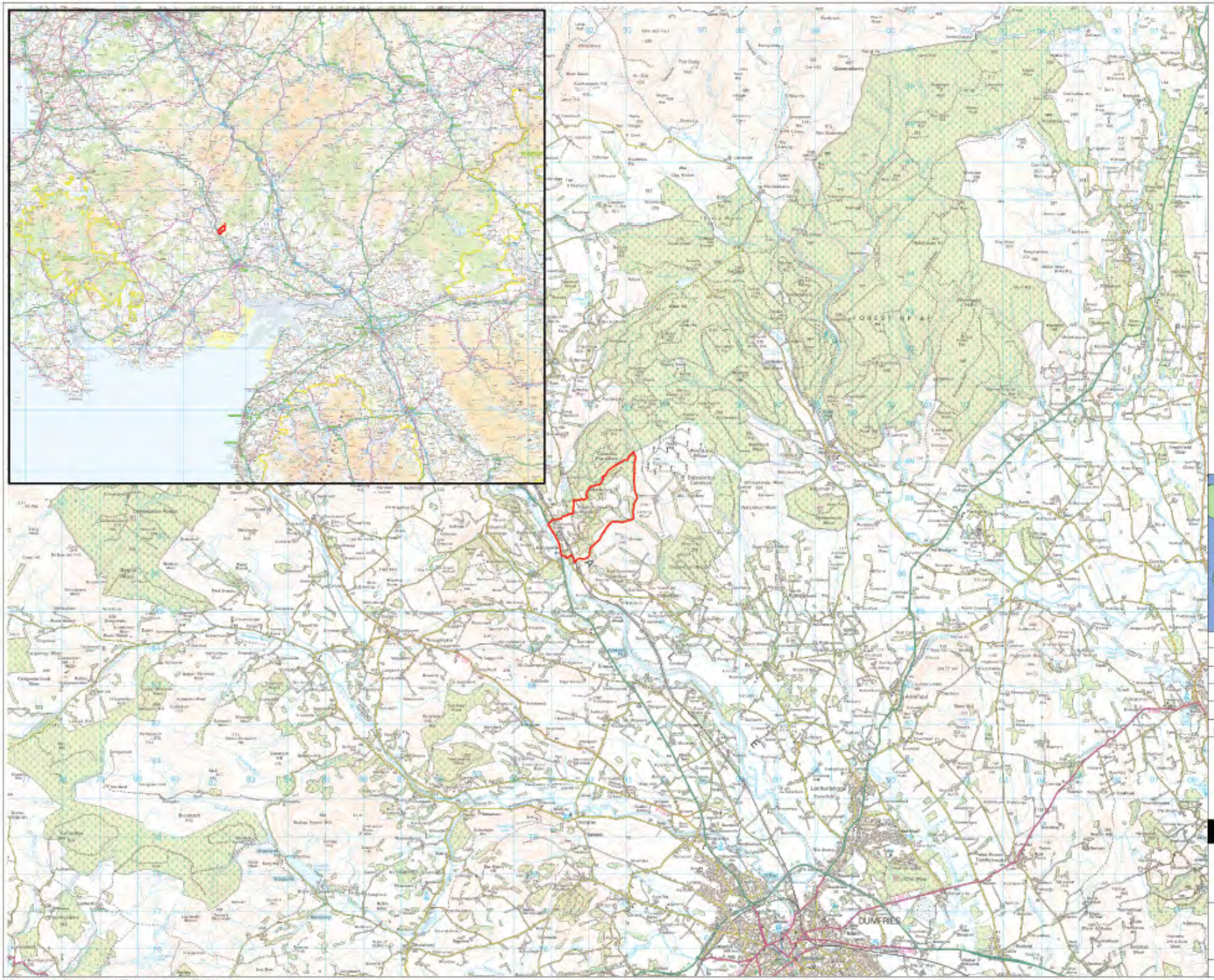
8. Institute of Hydrology (IoH) “Flood Estimation for small catchments” Report 124, 1994

9. Scottish Environment Protection Agency “SEPA Position Statement to support the implementation of the Water Environment (Controlled Activities) (Scotland) Regulations 2005: Culverting of Watercourses”, Dec 2005

10. CIRIA “Culvert design and operation guide” C689, Apr 2010

11. Dumfries & Galloway Small Communities Housing Trust “Affordable Rural Homes to Rebuild Communities – Housing Needs Survey project 2009-11 – Auldgirth & District CC Draft Action Plan”, August 2011

FIGURES



Rev	Date	Description	Drn	Chk	App
00	07.04.11	Site Location	BF	MK	MK

FORCE 9 ENERGY

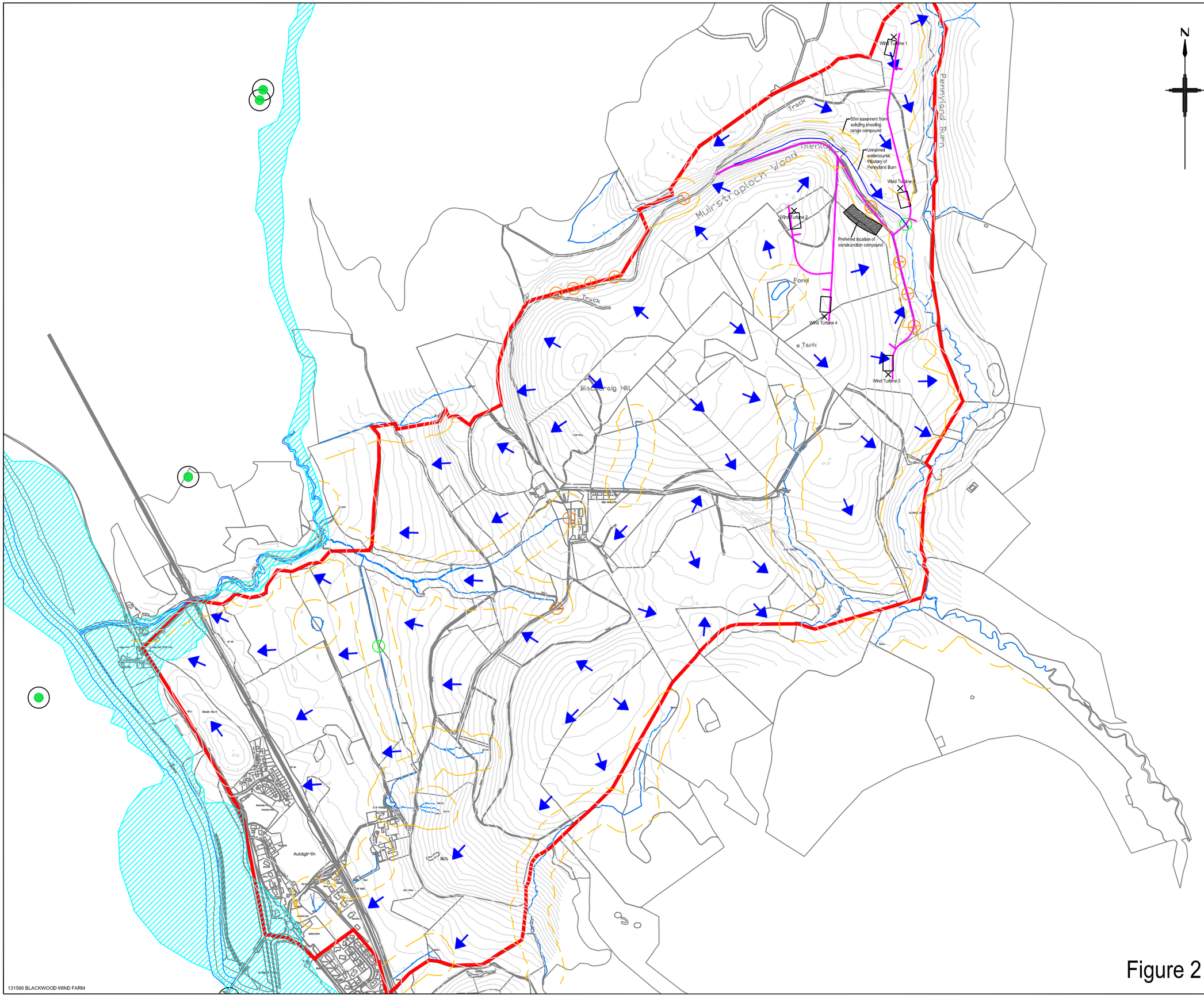
Blackwood Wind Farm

RSK GROUP PLC

Figure 1: Site Location and Boundary

SCALE: 1:100,000 @ A3, Insert 1:1 200,000

FILE NAME: T:\T190000 - RSK Scotland Glasgow\T190283 Dauchries Wind Farm\01 GIS\Figure 1 - Site Location and Boundary Wor



N

LEGEND

- Site Boundary
- 50m easement from any water features
- Scottish Environment Protection Agency flood extent
- Existing overland flow directions
- SEPA abstraction and discharge points
- Approximate location of existing culvert crossings
- Proposed new watercourse crossing
- Proposed construction compound
- Proposed access track

Rev.	Date	Amendment	Drawn	Chkd.	Appd.
P3	09.01.12	Revised number of existing culverts	KYC	FAZ	FAZ
P2	01.12.11	Tributary of Pennyland Burn highlighted and location of construction compound added	KYC	FAZ	FAZ
P1	30.08.11	FIIrst Issue	KYC	MC	MC

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Client: FORCE 9 ENERGY

Project Title: BLACKWOOD WIND FARM
AULDGIRTH, DUMFRIES

Drawing Title: HYDROLOGICAL CONSTRAINT PLAN

Drawn	Date	Checked	Date	Approved	Date
KYC	22.08.11	MC	30.08.11	MC	30.08.11

Scale	Orig Size	Dimensions
1:5000	A1	m

Project No.	Drawing File
131566	10-01.dwg

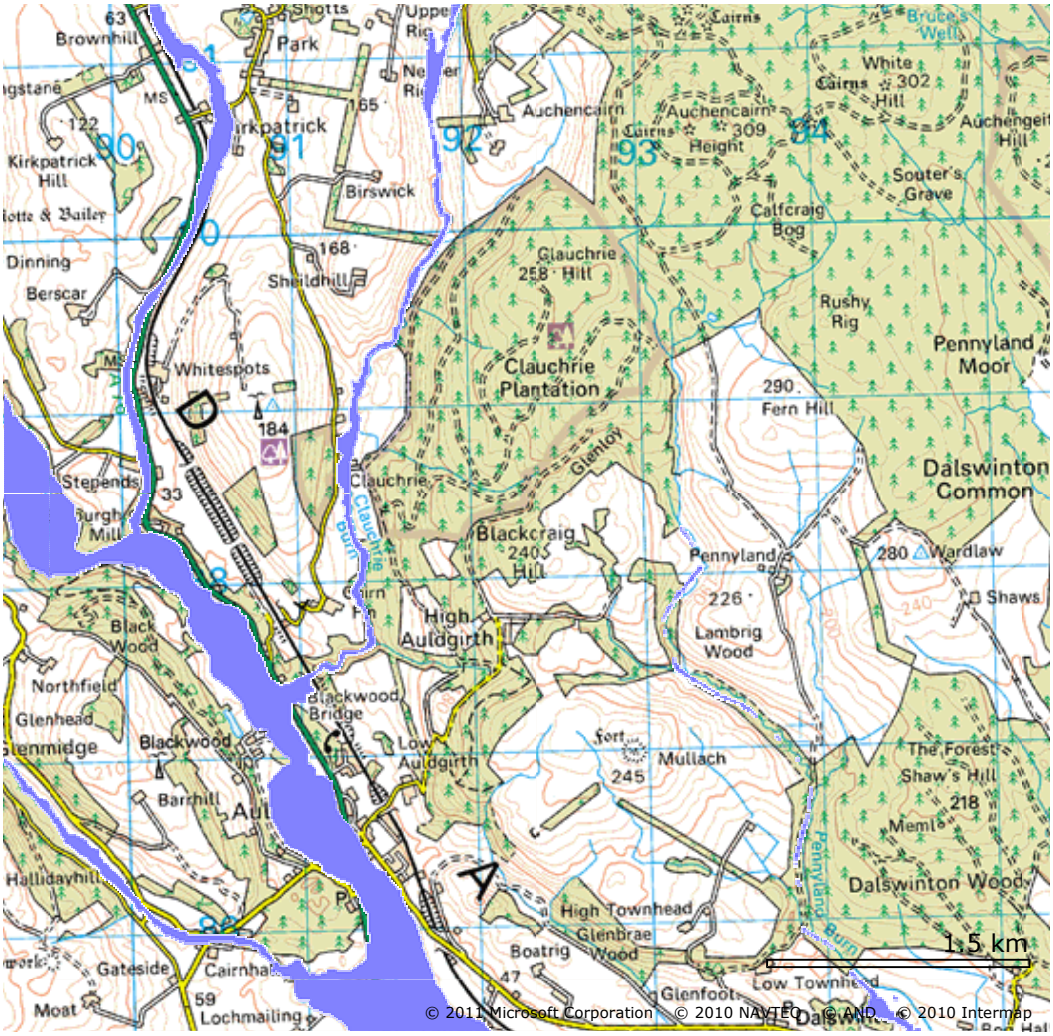
Drawing No.	Rev.
10-01	P3

Scale 1 : 5,000
0 50 100 150 200 250 300 350 400 450 500m

Figure 2

Indicative River & Coastal Flood Map

Please note: the flood map does not take into account all flood defences which may be in place now or in the future.



Some features of the flooding map are based on digital spatial data licences from the Centre for Ecology and Hydrology ©CEH, ©MO, ©NSRI, ©MLURI, ©OSNI, ©DARD(NI), ©Defra and includes material based on Ordnance Survey 1:50,000 maps with permission of the controller of Her Majesty's Stationery Office ©Crown Copyright.

Important Information

By viewing this page you are deemed to have read and understood the important information summarised below. The Indicative River & Coastal Flood Map (Scotland) has primarily been developed to provide a strategic national overview of flood risk in Scotland and does not provide enough detail to show the flood risk to individual properties. Whilst all reasonable effort has been made to ensure that the flood map is accurate for its intended purpose, no warranty is given by SEPA in this regard. SEPA reserves the right to change the information contained in the flood map without notice. Users are required to validate any information provided independently - any reliance upon the flood map is at the user's own risk. The criteria, assumptions and intended purpose of the flood map can be found in the full text of this notice, along with the terms and conditions associated with its use. © SEPA 2010 ALL RIGHTS RESERVED

LEGEND

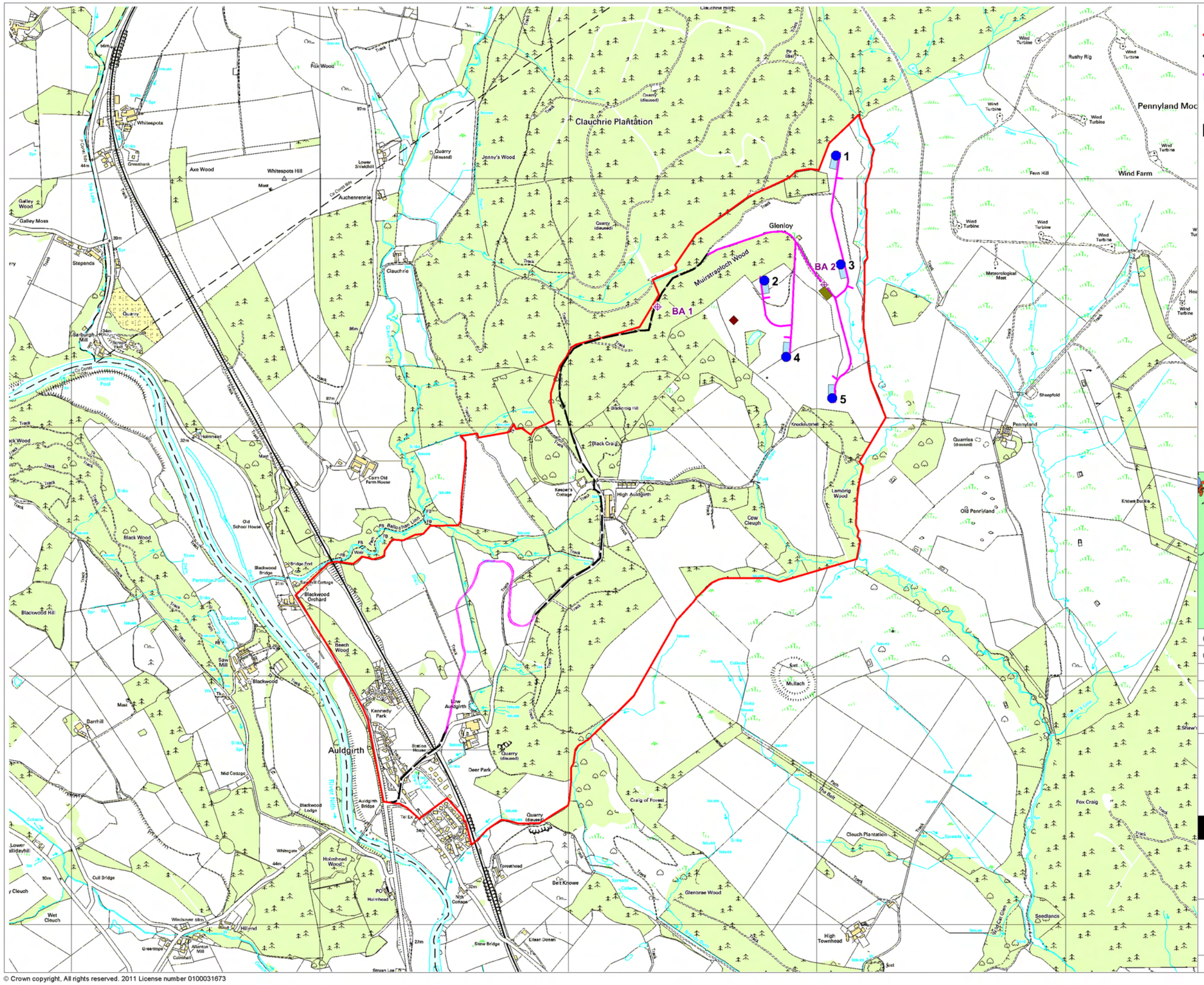
INDICATIVE FLOOD MAP

- Areas at risk of flooding from rivers
- Areas at risk of flooding from the sea
- Areas at risk of flooding from both rivers and the sea

FLOOD DEFENCES

- 44 Defence scheme ref no. and location
- Embankment / Wall
- Channel Improvement
- Area benefiting from flood defence relative to the scheme's standard of protection
- Storage area / Pump
- Culvert / Floodgate

Figure 3



Final Turbine Layout
Proposed Development Boundary
Existing Road to be upgraded
Potential Access Track
Crane Hard Standing
Potential Borrow Area
Proposed Construction Compound including Substation
Proposed Met Mast Location

Figure 4

Rev	Date	Description	Drn	Chk	App
04	22.12.11	Construction Compound	BF	MK	MK
03	15.11.11	Site Access Track	BF	MK	MK
02	03.11.11	Layout	BF	MK	MK
01	10.10.11	Layout	BF	MK	MK
00	15.09.11	Layout	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 3.2 - Wind Farm Layout

SCALE: 1:15,000 @ A3

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APPENDIX A

Service Constraints

RSK GROUP
SERVICE CONSTRAINTS

1. This report and the Drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Force 9 Energy (the "client") in accordance with the terms of a contract between RSK and the "client" dated July 2011. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable Civil Engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B

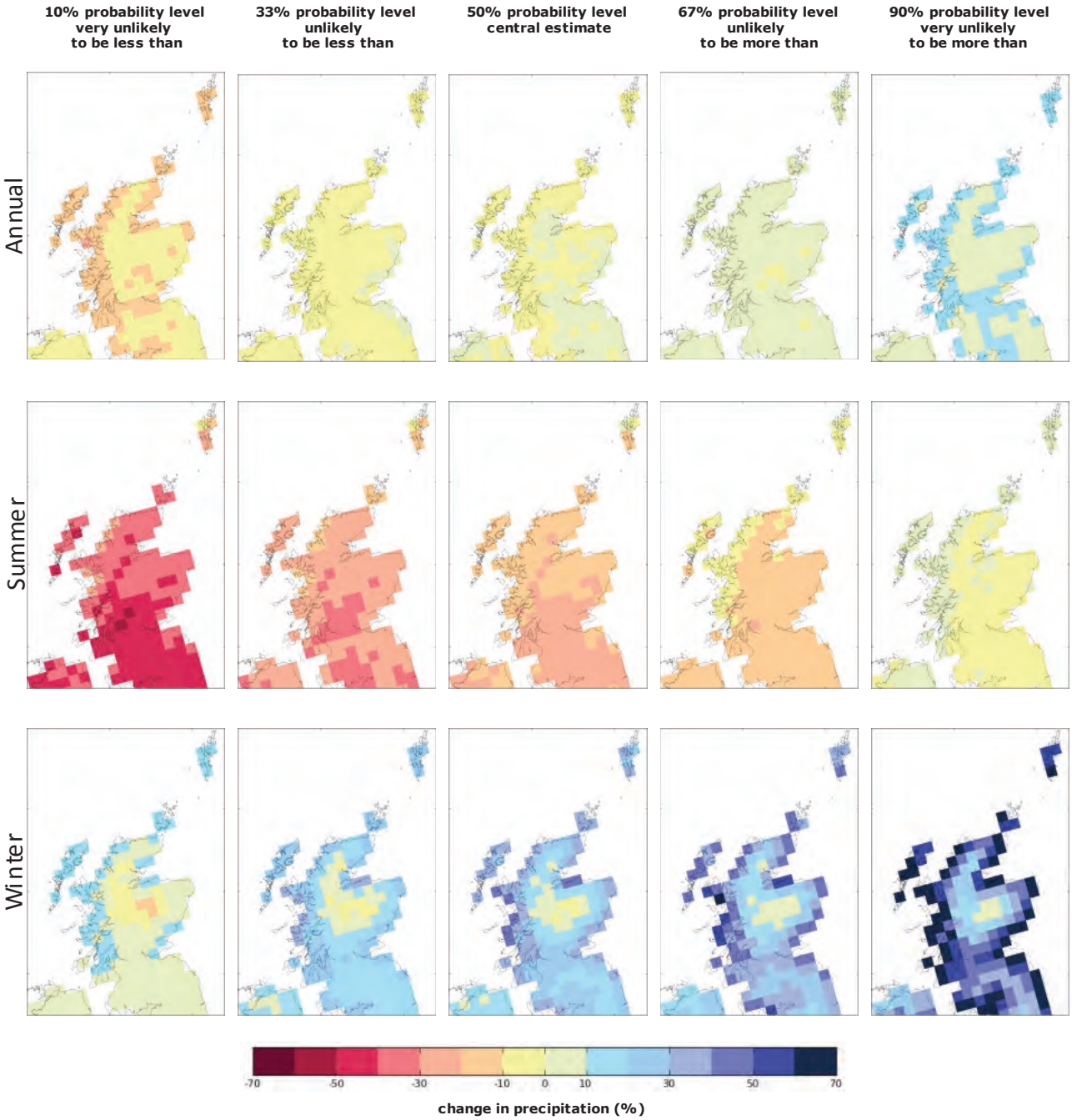
UK Climate Impact Program Maps

SCCIP
scottish climate change impacts partnership

Change in Mean Precipitation (%) 2080s - High Emissions (A1F1)

UK CLIMATE PROJECTIONS

All maps extracted from UKCP09
http://ukclimateprojections.defra.gov.uk/



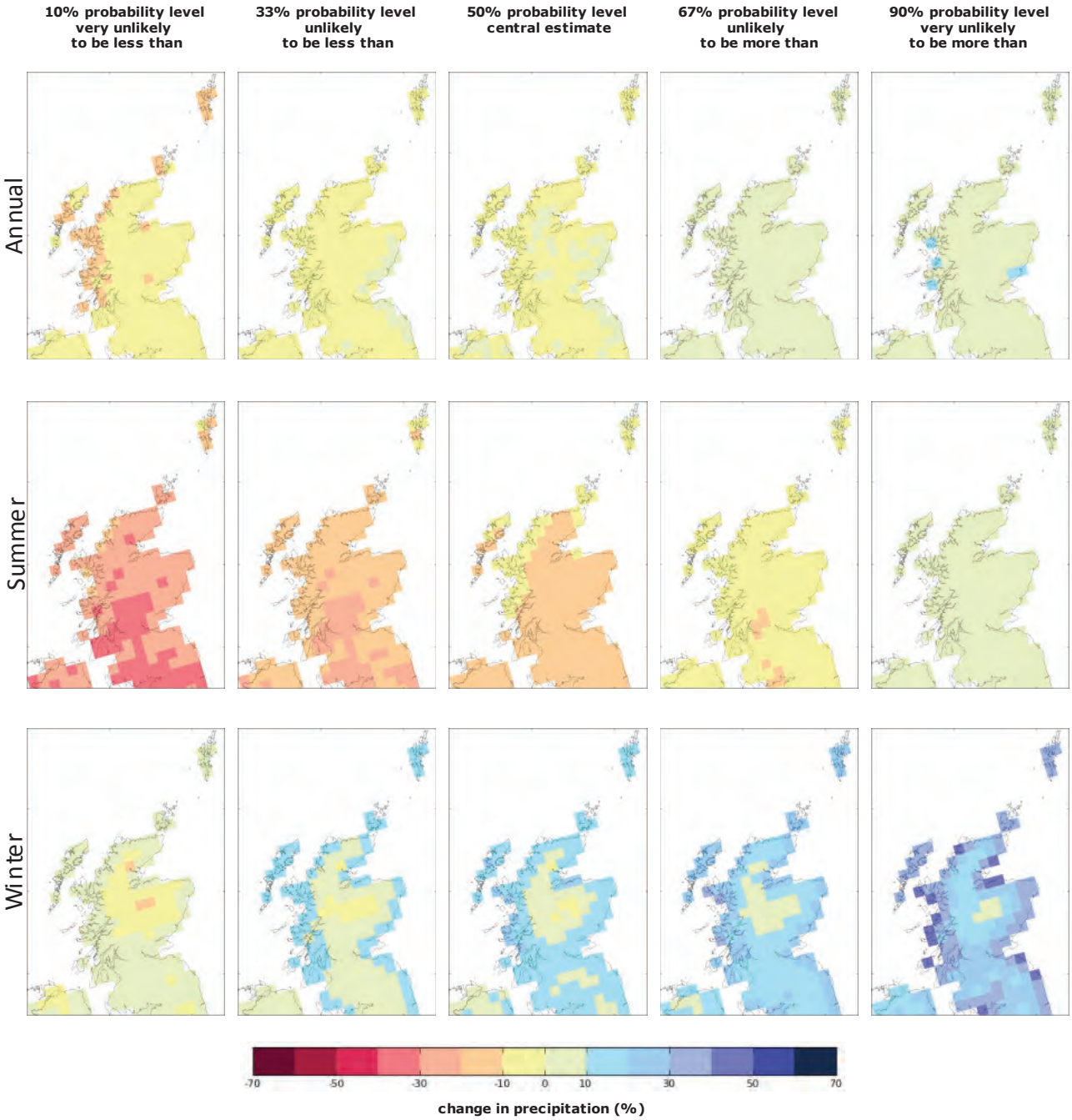
Change in mean precipitation rate (%) (annual, summer and winter averages) for high emissions scenario (A1F1) by the 2080s (2070-2099) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

SCCIP
scottish climate change impacts partnership

UK CLIMATE PROJECTIONS

All maps extracted from UKCP09
http://ukclimateprojections.defra.gov.uk/

Change in Mean Precipitation (%)
2050s - High Emissions (A1F1)



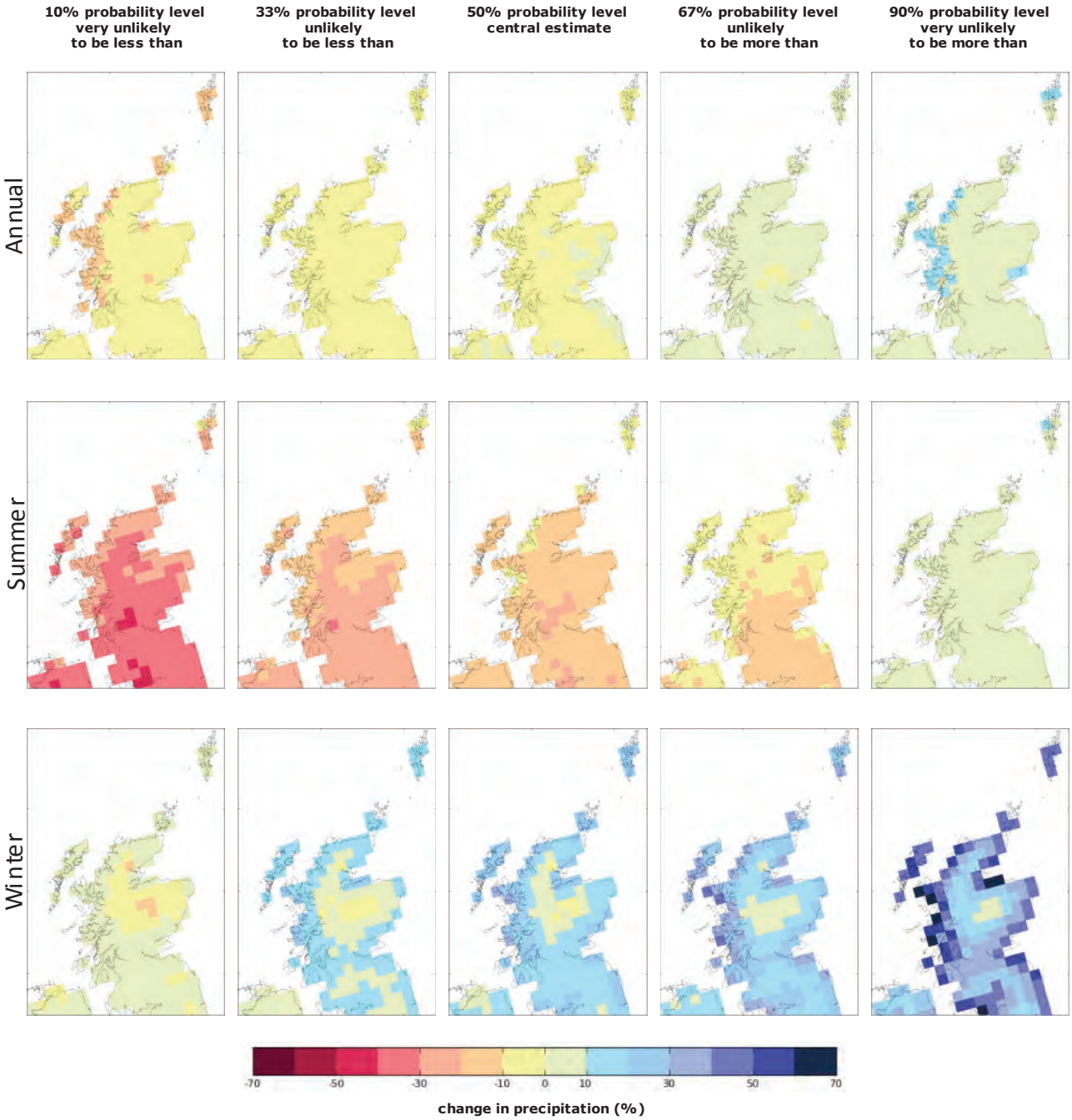
Change in mean precipitation rate (%) (annual, summer and winter averages) for high emissions scenario (A1F1) by the 2050s (2040-2069) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

SCCIP
scottish climate change impacts partnership

UK CLIMATE PROJECTIONS

All maps extracted from UKCP09
http://ukclimateprojections.defra.gov.uk/

Change in Mean Precipitation (%)
2080s - Medium Emissions (A1B)



Change in mean precipitation rate (%) (annual, summer and winter averages) for medium emissions scenario (A1B) by the 2080s (2070-2099) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

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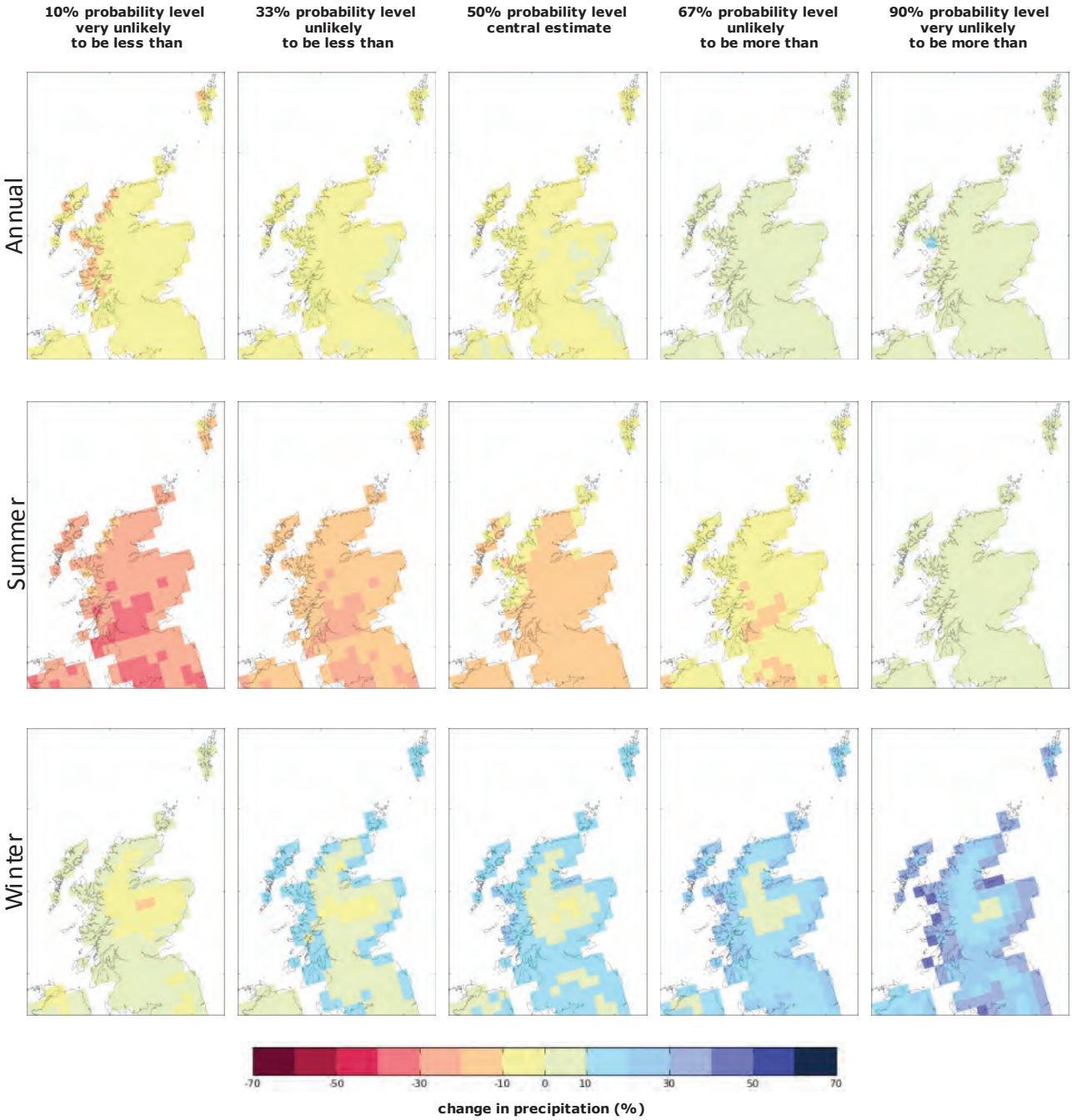
UK CLIMATE PROJECTIONS

All maps extracted from UKCP09
http://ukclimateprojections.defra.gov.uk/

Change in Mean Precipitation (%)
2050s - Medium Emissions (A1B)



Change in mean precipitation rate (%) (annual, summer and winter averages) for medium emissions scenario (A1B) by the 2050s (2040-2069) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

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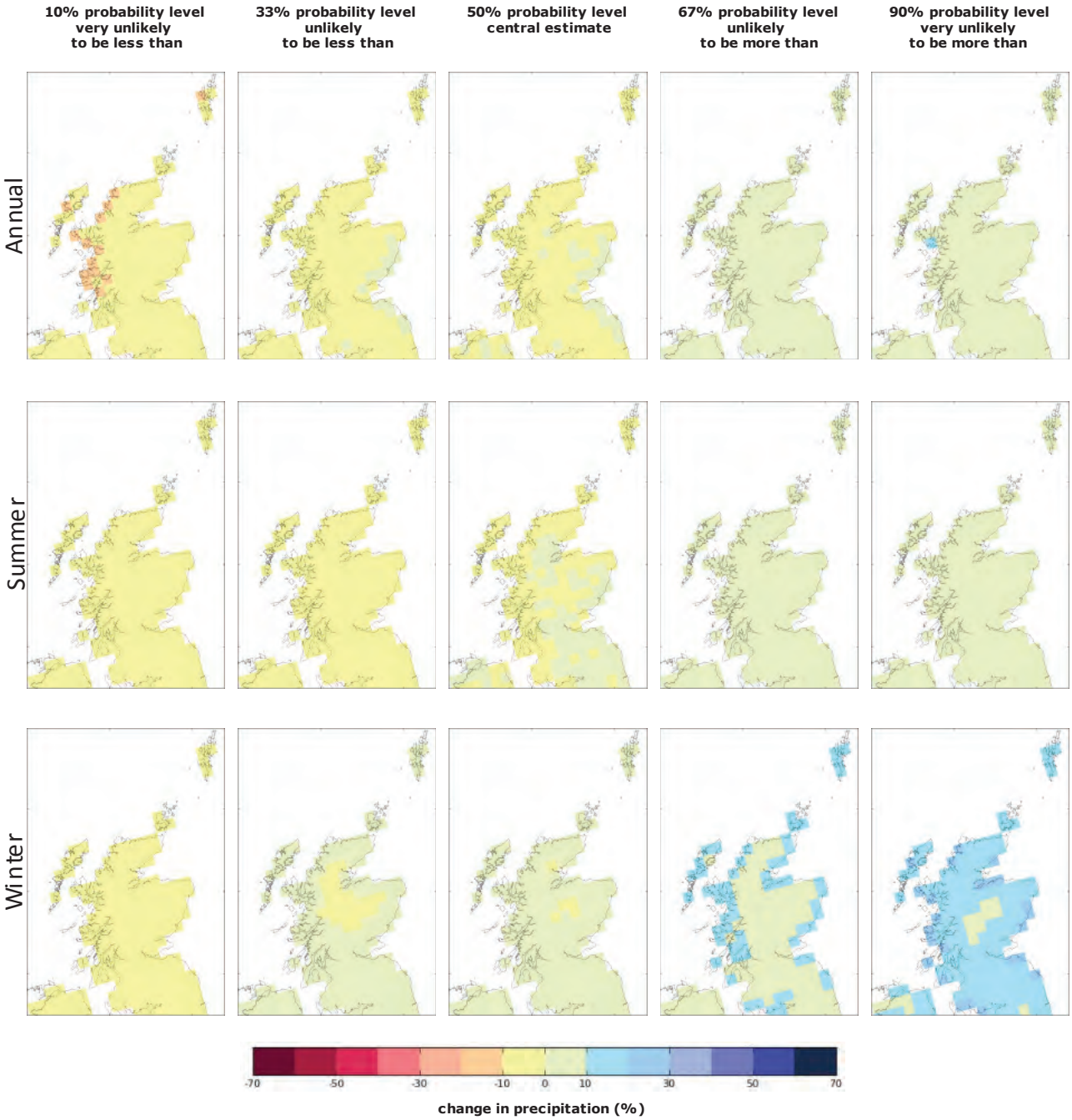
UK CLIMATE PROJECTIONS

All maps extracted from UKCP09
http://ukclimateprojections.defra.gov.uk/

Change in Mean Precipitation (%) 2020s - Medium Emissions (A1B)



Change in mean precipitation rate (%) (annual, summer and winter averages) for medium emissions scenario (A1B) by the 2020s (2010-2039) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

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UK CLIMATE PROJECTIONS

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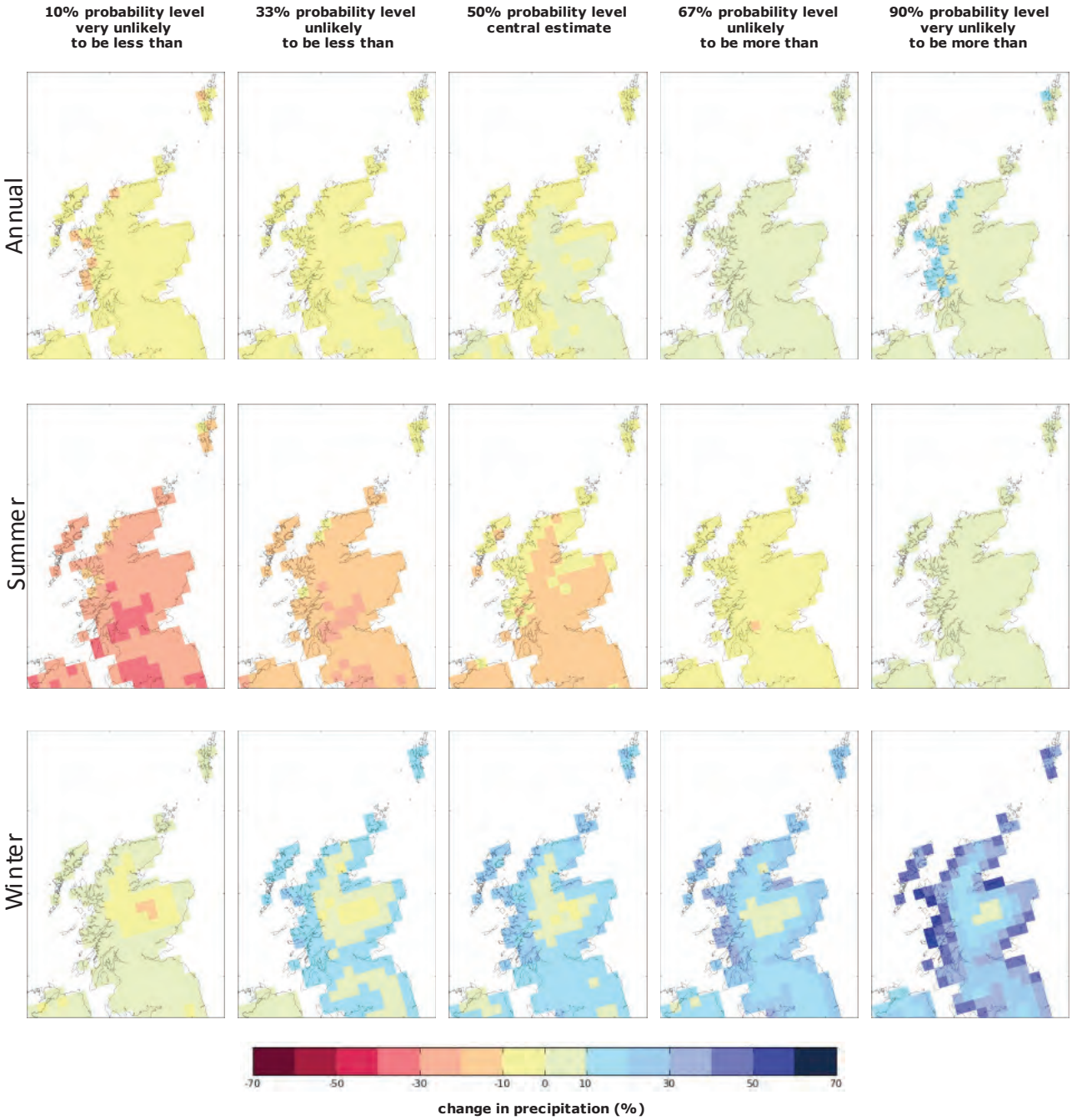
Change in Mean Precipitation (%)
2080s - Low Emissions (B1)



Change in mean precipitation rate (%) (annual, summer and winter averages) for low emissions scenario (B1) by the 2080s (2070-2099) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

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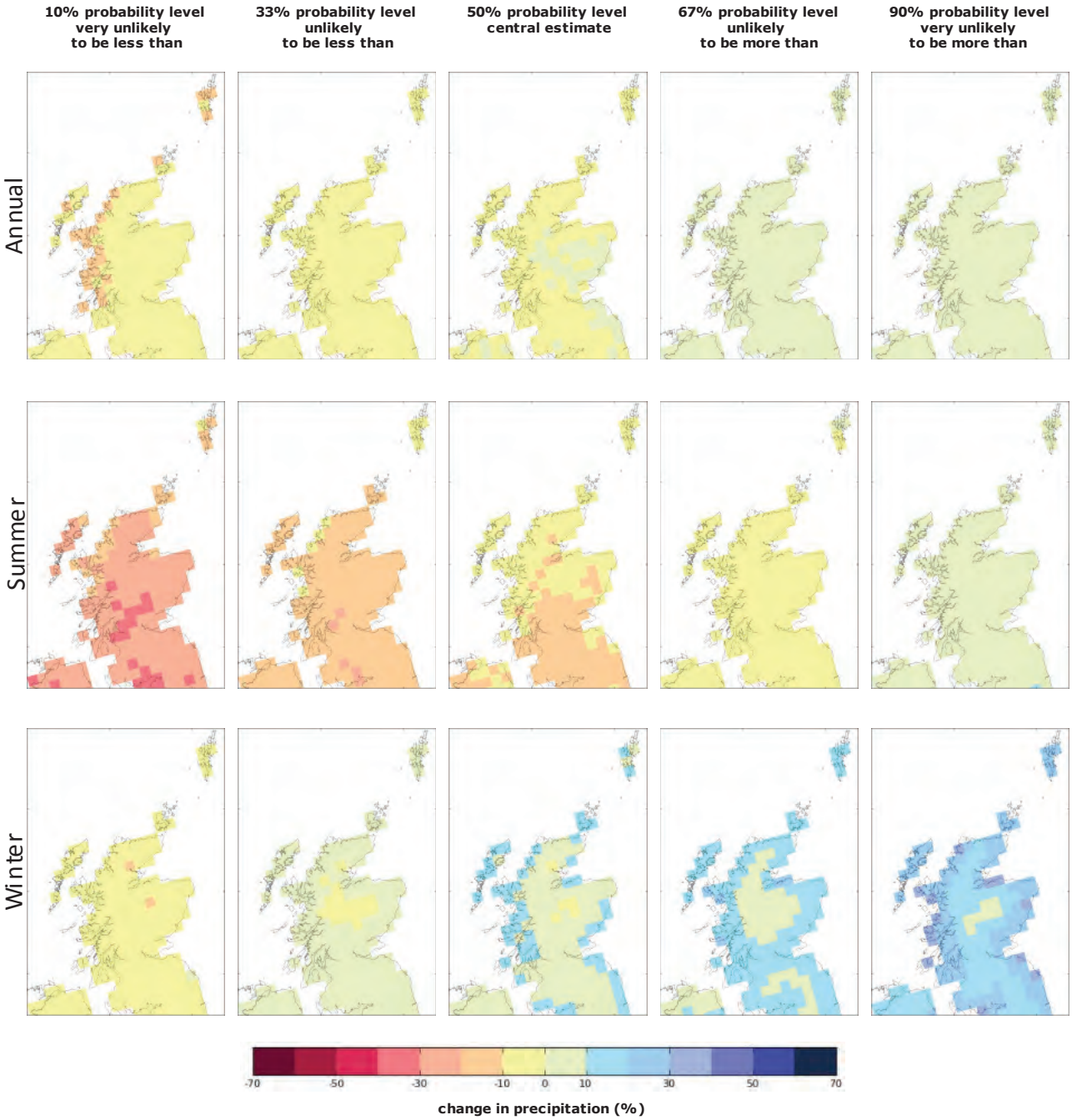
Change in Mean Precipitation (%) 2050s - Low Emissions (B1)

UK CLIMATE PROJECTIONS

All maps extracted from UKCP09
http://ukclimateprojections.defra.gov.uk/



Change in mean precipitation rate (%) (annual, summer and winter averages) for low emissions scenario (B1) by the 2050s (2040-2069) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

APPENDIX C

Scottish Environment Protection Agency Correspondence

Scottish Environment Protection Agency

Our ref: PCS 113887
Your ref: 11/E/3/0011

If telephoning ask for:
Julie Gerc

14 June 2011

Patrick Hanna
Dumfries & Galloway Council
Planning and Environment Services
Kirkbank
English Street
Dumfries
DG1 2HS

By email only to: patrick.hanna@dumgal.gov.uk

Dear Mr Hanna

Town and Country Planning (Scotland) Acts
Planning Application: 11/E/3/0011
Request for scoping opinion (EIA) for erection of up to six wind turbines (maximum tip height of 150m)
At Blackwood, High Auldgirth, Auldgirth, Dumfries

Thank you for consulting SEPA on the scoping opinion for the above development proposal by way of your letter of 19 May 2011 which we received on 20 May 2011. We would welcome further dialogue with the applicant at an early stage to discuss any of the issues raised in this letter

Please note that all of the issues below should be addressed in the Environmental Statement (ES), **but there may be opportunities for several of these to be scoped out of detailed consideration.** The justification for this approach in relation to specific issues should be set out within the ES.

In addition SEPA would refer you to *Good Practice During Windfarm Construction* prepared by SNH, SEPA and the windfarm industry and our *Regulatory Position Statement – Developments on Peat*.

1. Flood Risk

1.1 Reviewing the information provided suggest that no consideration for flood risk was given within the submitted scoping report. However due to the close proximity of the site boundary to the River Nith's floodplain along with several small water courses running through the application site we feel that it is appropriate to include flood risk within the proposed Environmental Impact Assessment (EIA). We have also made the following recommendations.

1.2 We have reviewed the information provided in this consultation and it is noted that, the application site (or parts thereof) lies within the 1 in 200 year (0.5% annual probability) flood envelope of the Indicative River & Coastal Flood Map (Scotland), and my therefore be at medium to high risk of flooding from the River Nith.

1.3 Although the proposed turbine locations are out with the 1 in 200 year flood envelope, tributaries of the Pennyland Burn run through the proposed development site and present a potential flood risk. However due to steep topography in this area the flood risk is thought to be minimal.

1.4 The lower end of the application site lies within the 1 in 200 year flood envelope of the River Nith and also lies within an area subject to flooding from the River Nith during the November 1997 flood event. We therefore consider that flood risk should be considered within the proposed EIA. Kaya Consulting Ltd undertook a Flood Risk Assessment (FRA) in this area entitled 'Proposed Residential Development, Riverside Lodge, Auldgirth' dated September 2008. The applicant may wish to contact Kaya Consulting Ltd with respect to the commercial information they hold.

1.5 Flood risk within the application site should also be considered with regards to proposed access tracks, anemometer mast, grid connection building and site office with associated car park. The scoping report states that access tracks are proposed to join the A76 near Auldgrith; this area lies within the floodplain of the River Nith and therefore further consideration of flood risk should be given.

1.6 Possible disturbance and modification of watercourses, existing drainage patterns, and groundwater recharge and flows is identified within the submitted scoping report. If this is likely to occur then the effects upon flood risk should identified.

1.7 Please note that both SPP7: Planning & Flooding and the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (as amended) have been superseded by the single consolidated Scottish Planning Policy and the Water Environment (Controlled Activities) (Scotland) Regulations 2011, respectively. We recommend that these references be updated and that the applicant take full cognisance of the requirements of this revised guidance in any future work for this proposed development.

2. Flood Risk Caveats & Additional Information for Applicant

2.1 The Indicative River & Coastal Flood Map (Scotland) has been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km^2 using a Digital Terrain Model (DTM) to define river cross-sections and low-lying coastal land. The outlines do not account for flooding arising from sources such as surface water runoff, surcharged culverts or drainage systems. The methodology was not designed to quantify the impacts of factors such as flood alleviation measures, buildings and transport infrastructure on flood conveyance & storage. The Indicative River & Coastal Flood Map (Scotland) is designed to be used as a national strategic assessment of flood risk to support planning policy in Scotland. For further information please visit www.sepa.org.uk/flooding/flood_map.aspx.

2.2 We refer the applicant to the document entitled: "*Technical Flood Risk Guidance for Stakeholders*". This document provides generic requirements for undertaking Flood Risk Assessments and can be downloaded from www.sepa.org.uk/flooding/flood_risk/planning_flooding.aspx. Please note that this document should be read in conjunction with Annex B in SEPA Policy 41: "*Development at Risk of Flooding, Advice and Consultation – a SEPA Planning Authority Protocol*", available from www.sepa.org.uk/flooding/flood_risk.aspx.

2.3 Our Flood Risk Assessment checklist should be completed and attached within the front cover of any flood risk assessments issued in support of a development proposal which may

be at risk of flooding. The document will take only a few minutes to complete and will assist our review process. It can be downloaded from www.sepa.org.uk/flooding/flood_risk/planning__flooding/fra_checklist.aspx

2.4 Please note that we are reliant on the accuracy and completeness of any information supplied by the applicant in undertaking our review, and can take no responsibility for incorrect data or interpretation made by the authors.

2.5 The advice contained in this letter is supplied to you by SEPA in terms of Section 72 (1) of the Flood Risk Management (Scotland) Act 2009 on the basis of information held by SEPA as at the date hereof. It is intended as advice solely to Dumfries & Galloway Council as Planning Authority in terms of the said Section 72 (1). Our briefing note entitled: "*Flood Risk Management (Scotland) Act 2009: Flood risk advice to planning authorities*" outlines the transitional changes to the basis of our advice inline with the phases of this legislation and can be downloaded from www.sepa.org.uk/flooding/flood_risk/planning__flooding.aspx

3. Carbon balance and peat management

3.1 Scottish Planning Policy (SPP) recognises that "the disturbance of some soils, particularly peat, may lead to the release of stored carbon, contributing to carbon emissions" (Paragraph 133). In line with SPP and government guidance, we recommend that the ES or planning submission contains a section systematically assessing carbon balance. This assessment should quantify the gains over the life of the project against the release of carbon dioxide during construction. It should include all elements of the proposal, including borrow pits, construction of roads/tracks and other infrastructure and loss of peat bog. Please refer to the Scottish Government guidance Calculating carbon savings from windfarms on Scottish peat lands – A New Approach, which provides a methodology for estimating the impacts of this type of development on carbon dynamics of peat lands. This guidance is currently being updated and a revised version will be available shortly. From April 1 2011 we will validate carbon balance assessments for Section 36 windfarm applications that use the revised version of the tool.

3.2 The ES or planning submission should include preventative/mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, cable trenches, or the storage and re-use of excavated peat. A detailed peat management scheme setting out these measures may be required through a planning condition, to ensure that the carbon balance benefits of the scheme are maximised. In addition to validating any carbon balance appraisals for Section 36 windfarms (based upon the revised guidance) we will provide comment on drainage and waste management aspects of the peat management scheme.

4. Disruption to peatlands

4.1 If there are peatland or mire systems present, the ES or planning submission should demonstrate how the layout and design of the proposal, including any associated borrow pits, hard standing and roads, avoid impact on such areas where possible. For areas where avoidance is impossible details of how impact is minimised and mitigated should be provided, including a detailed map of peat depth for all construction elements that affect peatland habitats. The peat depth survey should include details of the basic peatland characteristics. Peatland impacts that should be considered include those from waste management, drainage, dewatering, excavation and pollution.

4.2 By adopting an approach of minimising disruption to peatland, the volume of excavated peat can be minimised and the commonly experienced difficulties in dealing with surplus peat waste reduced. The generation of surplus peat waste is a difficult area which needs to be addressed from the outset given the limited scope for re-use. Landscaping with waste peat (or soil) may not be of ecological benefit and consequently a waste management exemption may not apply, and the position regarding disposal of waste peat within borrow pits can be very difficult. Early discussion of proposals with us is essential, and an overall approach of minimisation of peatland disruption should be adopted.

5. Disposal of waste peat to borrow pits

5.1 The disposal of surplus peat waste to borrow pits is not encouraged as experience has shown that peat used as cover can suffer from significant drying and oxidation, and that peat redeposited at depth can lose structure and create a hazard when the stability of the material deteriorates. This creates a risk to people who may enter such areas or through the possibility of peat slide and we are aware that barbed-wire fencing has been erected around some sites in response to such risks.

5.2 There are important waste management implications of measures to deal with surplus peat. Peat disposed at depth must be considered in the context of waste being landfilled, and may not be consentable under our regulatory regimes. It is therefore essential that the scope for minimising the extraction of peat is explored and alternative options identified that minimise risk in terms of carbon release, human health and environmental impact. It is also important to discuss options with us at an early stage.

6. Peat slide risk

6.1 Protection of development in relation to unstable land including landslides or landslip is not generally an area within our expertise or remit. This is a matter for the planning and building standards authorities and civil engineers, who will need to consider whether or not a detailed assessment of the risks of peat slide arising from the development should also be undertaken, what it should involve, and the extent to which the peat stability report should influence the layout of the turbines and the outline construction method statement.

6.2 Our main interest relates to the consequences of a peat-slide or bog burst which can result in severe environmental damage including the pollution of the surrounding area. The risk of this occurring should form part of any peat stability report. Guidance on preparing a peat stability report can be found on the Scottish Government website.

7. Wetland ecology (including groundwater dependent terrestrial ecosystems)

7.1 A Phase 1 habitat survey should be carried out for the whole site and the guidance 'A Functional Wetland Typology for Scotland' (currently available for free download on the SNIFFER website) used to help identify all wetland areas. National Vegetation Classification should be carried out for any wetlands identified. Results of these findings should be included in the ES, including appropriate maps with the location of infrastructure clearly marked.

7.2 Generally the layout of the site should be designed to avoid impacts on all wetlands. Peatland (active blanket bog in particular) should be avoided. If impacts on wetlands are likely then details of appropriate mitigation measures are required

7.3 Groundwater dependent terrestrial ecosystems are specifically protected under the Water Framework Directive. The results of the National Vegetation Classification survey and Appendix 2 of our Planning guidance on windfarm developments can be used to identify if wetlands are groundwater dependent terrestrial ecosystems. If any groundwater dependent terrestrial ecosystems are located within a radius of (i) 100m from roads, tracks and trenches or (ii) 250m from borrow pits and foundations the likely impact of these features will require further assessment. This assessment should be carried out whether or not the features in (i) and (ii) occur within or outwith the site boundary in order that micrositing and small changes to site layout do not necessitate further National Vegetation Classification work being carried out during unfavourable weather conditions. The results of this assessment and measures that will be taken to ensure the proposals do not have an unacceptable impact should be included in the ES

7.4 Infrastructure that is within 100m or 250m and likely to have an unacceptable impact on groundwater dependent terrestrial ecosystems identified as highly sensitive (in Appendix 2 of our Planning Guidance on windfarm developments) should be reconsidered. Further detailed studies will be required if infrastructure remains within the buffer zones.

8. Groundwater

8.1 Roads, foundations and other construction works associated with windfarms can disrupt groundwater flow and impact on groundwater abstractions. To address this risk a list of groundwater abstractions sources both within and outwith the site boundary, within a radius of i)100 m from roads, tracks and trenches and ii) 250 m from borrow pits and foundations) should be provided. Further details can be found in our Planning guidance on windfarm developments.

8.2 If groundwater abstractions are identified within the 100m and 250 m radii from development infrastructure, then either the applicant should ensure that the route or location of engineering operations avoid this buffer area or further information and investigations will be required to show that impacts on abstractions are acceptable.

9. Construction Environmental Management Document and pollution prevention

9.1 One of our key interests in relation to major developments is pollution prevention measures during the periods of construction, operation, maintenance, demolition and restoration. The construction phase includes construction of access roads and any other site infrastructure.

9.2 We advise that the applicant, through the EIA process or planning submission, should systematically identify all aspects of site work that might impact upon the environment, potential pollution risks associated with the proposals and identify the principles of preventative measures and mitigation. This will establish a robust Project Environmental Management Process for large scale (eg Major and Environmental Impact Assessment Projects. A draft Schedule of Mitigation should be produced as part of this process. This should cover all the mitigation measures identified to avoid or minimise environmental effects. Details of the specific issues that we expect to be addressed are available on the Pollution Prevention and Environmental Management section of our website.

9.3 A key issue for us is the timing of works. Therefore, the Schedule of Mitigation should include a timetable of works that takes into account all environmental sensitivities, such as fish spawning, which have been raised by SEPA, SNH or other stakeholders. Timing should also be planned to avoid construction of roads, dewatering of pits and other

potentially polluting activities during periods of high rainfall. We can provide useful information such as rainfall and hydrological data through our Access to Information Team.

9.4 A Construction Environmental Management Document is a key management tool to implement the Schedule of Mitigation. We recommend that the principles of this document are set out in the ES drawing together and outlining all the environmental constraints and commitments, proposed pollution prevention measures and mitigation as identified in the ES.

9.5 This document should form the basis of more detailed site specific Construction Environmental Management Plans which along with detailed method statements may be required by planning condition or, in certain cases, through environmental regulation. This approach provides a useful link between the principles of development which need to be outlined at the early stages of the project and the method statements which are usually produced following award of contract (just before development commences).

9.6 We recommend that the detailed Construction Environmental Management Document is submitted for approval to the determining authority at least two months prior to the proposed commencement (or relevant phase) of development to order to provide consultees with sufficient time to assess the information. This document should incorporate detailed pollution prevention and mitigation measures for all construction elements potentially capable of giving rise to pollution during all phases of construction, reinstatement after construction and final site decommissioning. This document should also include any site specific Construction Environmental Management Plans and Construction Method Statements provided by the contractor as required by the planning authority and statutory consultees. The Construction Environmental Management Document and Construction Environmental Management Plan do not negate the need for various licences and consents, eg CAR and PPC, if required. The requirements from the obtained licences and consents should be included within the final Construction Environmental Management Plans.

10. Engineering activities in the water environment

10.1 In order to meet the objectives of the Water Framework Directive of preventing any deterioration and improving the water environment, developments should be designed to avoid engineering activities in the water environment wherever possible. The water environment includes burns, rivers, lochs, wetlands, groundwater and reservoirs. It should be demonstrated that every effort has been made to leave the water environment in its natural state. Engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative. Where a watercourse crossing cannot be avoided unless there is no practicable alternative, bridging solutions or bottomless or arched culverts which do not affect the bed and banks of the watercourse should be used. If the engineering works proposed are likely to exacerbate flood risk then a flood risk assessment should be submitted in support of the planning application and we should be consulted.

10.2 Scottish Planning Policy states “Culverts are a frequent cause of local flooding, particularly if the design or maintenance is inadequate. Watercourses should not be culverted as part of a new development unless there is no practical alternative and existing culverts should be opened whenever possible. If culverts are unavoidable, they should be designed to maintain or improve existing flow conditions and aquatic life. A culvert may be acceptable as part of a scheme to manage flood risk or where it is used to carry a watercourse under a

road or railway" (Paragraph 211). Planning applications should be determined in line with this planning policy.

10.3 A site survey of existing water features and a map of the location of all proposed engineering activities in the water environment should be included in the ES or planning submission. A systematic table detailing the justification for the activity and how any adverse impact will be mitigated should also be included. The table should be accompanied by a photograph of each affected waterbody along with its dimensions. Justification for the location of any proposed activity is a key issue for us to assess at the planning stage.

10.4 The detailed design of engineered structures in the water environment will be considered under regulations administered by us. Where flood risk may be an issue, this will also need to be addressed at the planning stage.

10.5 Further guidance on the design and implementation of crossings can be found in our Construction of River Crossings Good Practice Guide. Best practice guidance is also available within the water engineering section of our website.

11. Water abstraction

11.1 Where water abstraction is proposed we request that the ES, or planning submission, details if a public or private source will be used. If a private source is to be used the information below should be included. Whilst we regulate water abstractions under The Water Environment (Controlled Activities) (Scotland) Regulations 2011, the following information is required at the planning stage to advise on the acceptability of the abstraction at this location:

Source e.g. ground water or surface water;
Location e.g. grid reference and description of site;
Volume e.g. quantity of water to be extracted;
Timing of abstraction e.g. will there be a continuous abstraction;
Nature of abstraction e.g. sump or impoundment;
Proposed operating regime e.g. details of abstraction limits and hands off flow;
Survey of existing water environment including any existing water features;
Impacts of the proposed abstraction upon the surrounding water environment.

11.2 If other development projects are present or proposed within the same water catchment then we advise that the applicant considers whether the cumulative impact upon the water environment needs to be assessed. The ES or planning submission should also contain a justification for the approach taken.

12. Opportunities for Environmental Improvements

12.1 Most windfarms cover a large area and there will usually be opportunities to incorporate improvements in the water environment required by the Water Framework Directive within and/or immediately adjacent to the site either as part of mitigation measures for proposed works or as compensation for environmental impact. We encourage applicants to seek such opportunities to avoid or offset environmental impacts. Improvements which might be considered would include the removal of redundant weirs, the creation of buffer strips and provision of fencing along watercourses. Fencing off watercourses and creating buffer strips both helps reduce the risk of diffuse water pollution and affords protection to the riparian habitat. In addition vegetated buffer strips will help slow river flow and provide space for the lateral movement of watercourses in turn reducing flood risk.

13. Borrow pits

13.1 Detailed investigations in relation to the need for and impact of such facilities should be contained in the ES or planning submission. Where borrow pits are proposed, information should be provided regarding their location, size and nature including the depth of the borrow pit floor and the final reinstated profile.

13.2 The impact of such facilities (including dust, blasting and impact on water) should be appraised as part of the overall impact of the scheme. Information should cover, in relation to water; at least the information set out in Planning Advice Note PAN 50 Controlling the Environmental Effects of Surface Mineral Workings (Paragraph 53). In relation to groundwater, information (Paragraph 52 of PAN 50) only needs to be provided where there is an abstraction or groundwater dependent terrestrial ecosystem within 250m of the borrow pit. Additional information on groundwater is provided in Section 14.

13.3 Details of the proposed depth of the excavation compared to the actual topography, the proposed restoration profile, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement should be submitted. The reinstatement of borrow pits can raise significant waste management issues and it is essential that any proposals are discussed with our regulatory teams as part of the development of the scheme to ensure that such proposals are feasible in terms of cost and regulatory requirements.

14. Air quality

14.1 The local authority is the responsible authority for local air quality management under the Environment Act 1995, and therefore we recommend that Environmental Health within the local authority be consulted. They can advise on the need for this development proposal to be assessed alongside other developments that could contribute to an increase in road traffic. They can also advise on potential impacts such as exacerbation of local air pollution and noise issues, particularly at busy junctions and controlled crossing points. They can advise on the cumulative impact of all development in the local area in the ES or planning submission. Further guidance regarding these issues is provided in NSCA guidance (2006) entitled *Development Control: Planning for Air Quality*.

14.2 Excavation works, particularly through drilling and blasting, may cause nuisance to adjacent land users due to the generation of dust and noise. Comments from local authority Environmental Health Officers should be sought on the potential nuisance to adjacent land users during the construction and decommissioning phases of the project.

If you have any queries relating to this letter, please contact me by telephone on 01355 574200 or by e-mail to planning.ek@sepa.org.uk .

Yours sincerely

Julie Gerc
Planning Officer
Planning Service

Copy to: Leona Wilkie
Knight Frank
120 Bothwell Street,
Glasgow, G2 7JS

APPENDIX D

Solway – Potentially Vulnerable Area (PVA) Datasheet

Potentially Vulnerable Area Datasheet

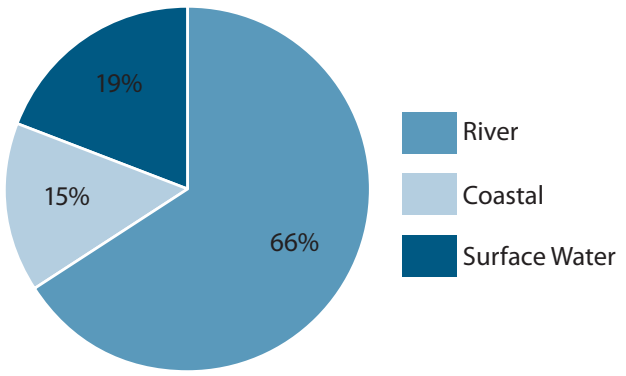
PVA:	Local Plan District:	Main River Catchment:	Local Authority:
14/05	14 – Solway	River Nith	Dumfries and Galloway

Summary of Main Impacts

Assessment of future flood risk and past events shows that the River Nith and Cluden Water and small watercourses present: potential impact to a large number of residential properties; potential impact to a large number of commercial properties; potential impact to minor transport links; potential impact to high grade agricultural land; limited impact to less resilient environmental designation and potential impact to extensive areas of sensitive designated sites, with infrequent reports of flooding in the area for the area.

Estimated Weighted Annual Average Damages	£4,070,000 – £5,390,000

Known Source of Flooding



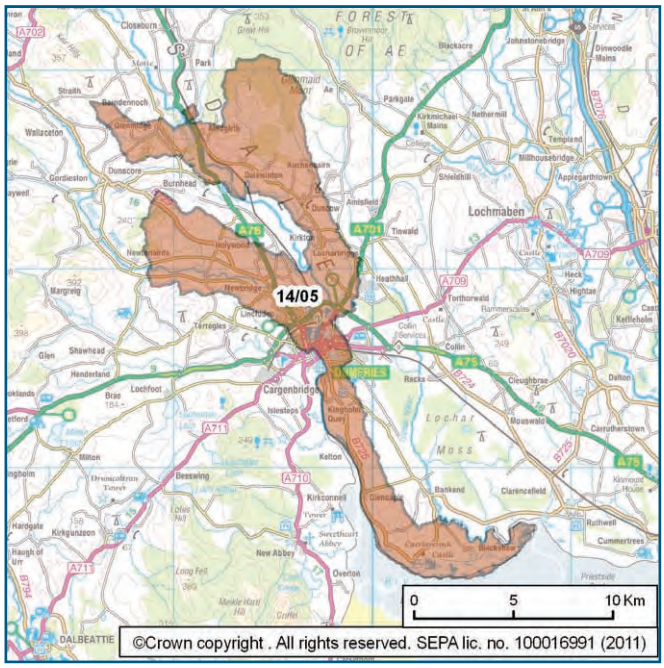
Groundwater Flooding	Potential moderate to high contribution within part of the catchment
Impact of Climate Change	Moderate predicted increase in rainfall with proportionate increase in flooding. Coastline is vulnerable to the impacts of climate change

Proportion of Property Type in PVA

Type	Number	Proportion of All Properties in PVA
Residential	493	4%
Non-residential	128	10%

Towns and Villages with Properties at Risk

50+	Kirkton, Dumfries



PVA Characteristics

Total Area		115.96 km²
Land cover within the PVA	**Urban**	7%
	Agriculture	74%
	Forestry	15%
Includes Flood Defence(s)		No
Catchment Hydrology	• Moderate to long peak flood flow response times; • High catchment flood storage and attenuation capacity; • Potential for low to moderate underestimation of design flood magnitude; • Low erosion hazard potential of flood flows.	
Catchment Morphology	• High proportion of meandering/braided channel types; • High proportion of natural channels and/or unprotected floodplains; • High density of hydraulic structures; • High potential for increased flood risk due to upstream morphological pressures.	

September 2011. Information contained in these datasheets is DRAFT. The final version will be published as part of the National Flood Risk Assessment in December 2011.

APPENDIX E

Dumfries & Galloway Council Correspondence

Ka Yan Cheng

From: Hanna, Patrick
Sent: 08 June 2011 15:00
To: Nithsdale Planning Applications
Subject: CONSULTATION FW: Planning Application 11/E/3/0011 - Blackwood, High Auldgirth, Auldgirth

---

From: Templeton, Brian
Sent: 07 June 2011 16:27
To: Hanna, Patrick
Cc: McLeod, James
Subject: Planning Application 11/E/3/0011 - Blackwood, High Auldgirth, Auldgirth

Pat,

With reference to the Planning Application - 11/P/3/0134 I make the following observations:

- The area proposed for development lies outwith the 1:200 fluvial floodplain as detailed on DGi (information from SEPA),
- There is no record of flooding in this area,

Recommendation:

- I have no objection to the application if a condition is placed on the applicant to take into account pluvial flows from the site so that the flood risk is not increased elsewhere.

Your plans are in the internal mail

Please call if you wish to discuss further

Regards

Brian Templeton
Principal Technician - Flood Risk Management
Tel: 01387 260303 (internal 64303)

brian.templeton@dumgal.gov.uk
www.dumgal.gov.uk

APPENDIX F

Scottish Water Correspondence

03/06/2011

Dumfries & Galloway Council
Development Management Kirkbank, English Street
Dumfries
DG1 2HS

SCOTTISH WATER

Customer Connections
419 Balmore Road
Glasgow
G22 6NU

Customer Support Team
T: 0141 355 5511
F: 0141 355 5386
W: www.scottishwater.co.uk
E: connections@scottishwater.co.uk

Dear Patrick Hanna

PLANNING APPLICATION NUMBER: 11/E/3/0011
DEVELOPMENT: Dumfries High Auldgirth Blackw
OUR REFERENCE: 571297
PROPOSAL: 11/E/3/0011 | REQUEST FOR SCOPING OPINION (EIA) FOR ERECTION OF UP TO SIX WIND TURBINES (MAXIMUM TIP HEIGHT OF 150M

Please quote our reference in all future correspondence

Scottish Water has no objection to this planning application. Since the introduction of the Water Services (Scotland) Act 2005 in April 2008 the water industry in Scotland has opened up to market competition for non-domestic customers. Non-domestic Household customers now require a Licensed Provider to act on their behalf for new water and waste water connections. Further details can be obtained at www.scotlandontap.gov.uk

May I also add there is a level of investigation going on in relation to the Scottish Water radio telemetry links and this will be pursued through the later Planning Application processes through OFCOM.

If this development requires the existing network to be upgraded, to enable connection, the developer will generally meet these costs in advance. Scottish Water can make a contribution to these costs through Reasonable Cost funding rules. Costs can be reimbursed by us through Reasonable Cost funding rules

Should the developer require information regarding the location of Scottish Water infrastructure they should contact our Property Searches Department, Bullion House, Dundee, DD2 5BB. Tel – 0845 601 8855.

If the developer requires any further assistance or information on our response, please contact me on the above number or alternatively additional information is available on our website: www.scottishwater.co.uk.

Yours faithfully

Andrew Peacock
Customer Connections Administrator
Tel: 0141 355 5113
Andrew.Peacock2@scottishwater.co.uk

APPENDIX G

IoH Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	200	Soil	0.400
Area (ha)	38.500	Urban	0.000
SAAR (mm)	1179	Region Number	Region 2

Results l/s

QBAR Rural	241.1
QBAR Urban	241.1
Q200 years	718.4
Q1 year	209.7
Q30 years	457.3
Q100 years	634.0

ICP SUDS Mean Annual Flood

Input

Return Period (years)	200	Soil	0.400
Area (ha)	33.200	Urban	0.000
SAAR (mm)	1179	Region Number	Region 2

Results l/s

QBAR Rural	207.9
QBAR Urban	207.9
Q200 years	619.5
Q1 year	180.9
Q30 years	394.4
Q100 years	546.7

ICP SUDS Mean Annual Flood

Input

Return Period (years)	200	Soil	0.400
Area (ha)	57.600	Urban	0.000
SAAR (mm)	1179	Region Number	Region 2

Results	**l/s**
QBAR Rural	355.1
QBAR Urban	355.1
Q200 years	1058.2
Q1 year	308.9
Q30 years	673.6
Q100 years	933.9

ICP SUDS Mean Annual Flood

Input

Return Period (years)	200	Soil	0.400
Area (ha)	120.900	Urban	0.000
SAAR (mm)	1179	Region Number	Region 2

Results	**l/s**
QBAR Rural	686.9
QBAR Urban	686.9
Q200 years	2047.1
Q1 year	597.6
Q30 years	1303.2
Q100 years	1806.7

ICP SUDS Mean Annual Flood

Input

Return Period (years)	200	Soil	0.400
Area (ha)	56.600	Urban	0.000
SAAR (mm)	1179	Region Number	Region 2

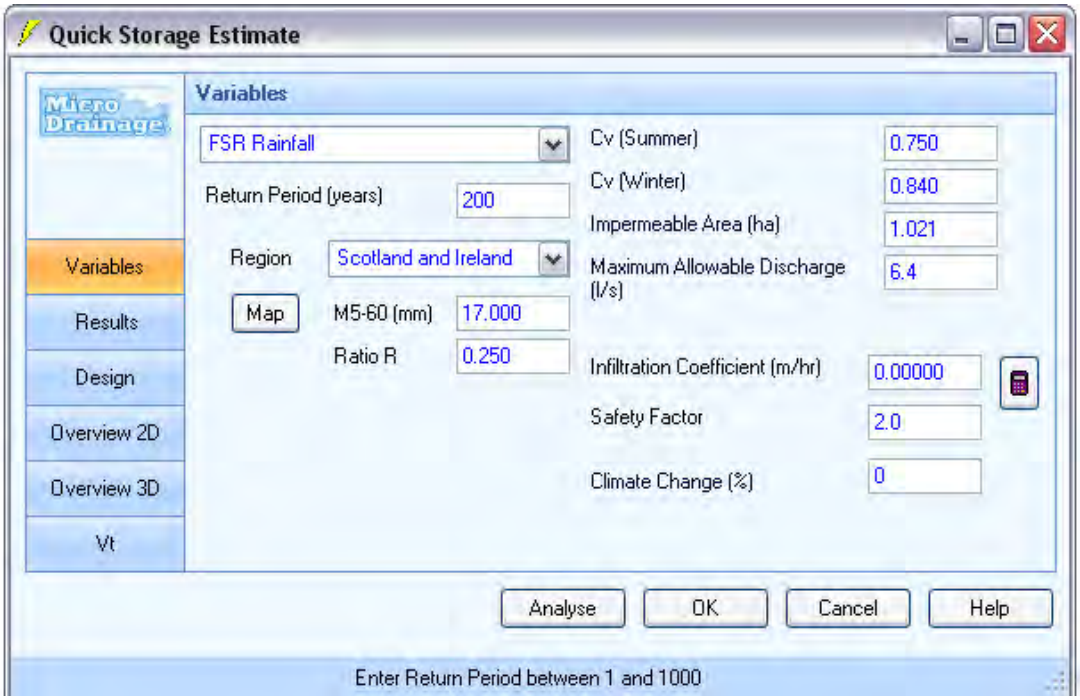
Results	**l/s**
QBAR Rural	349.6
QBAR Urban	349.6
Q200 years	1041.8
Q1 year	304.2
Q30 years	663.2
Q100 years	919.4

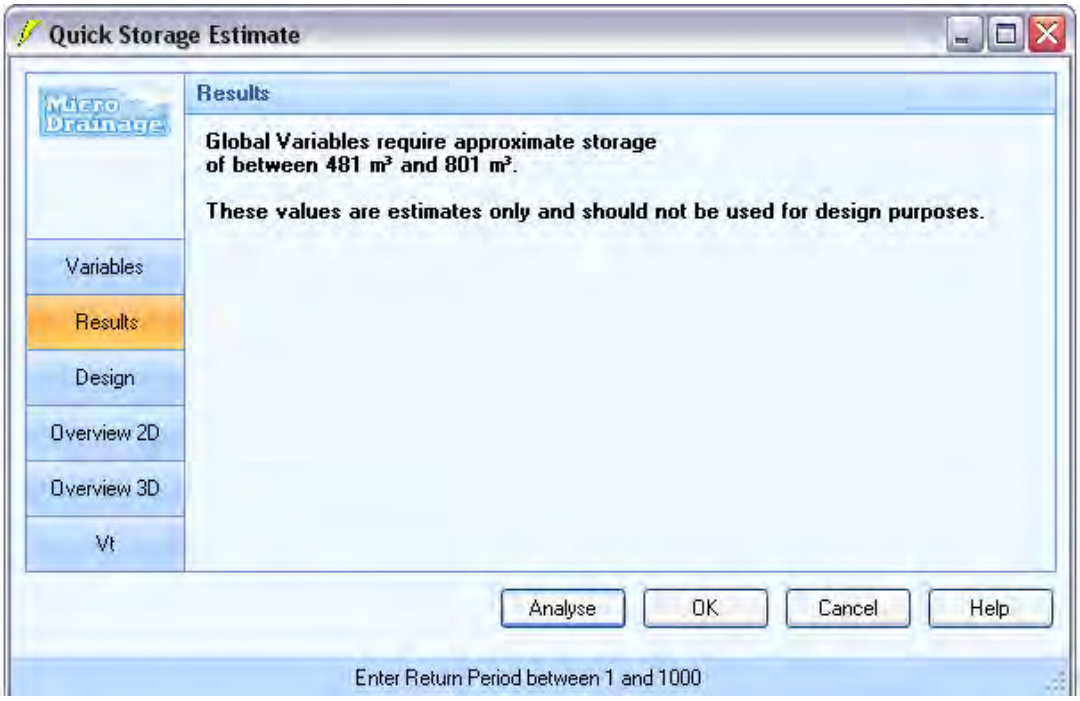
APPENDIX H

Quick Storage Estimate Calculations

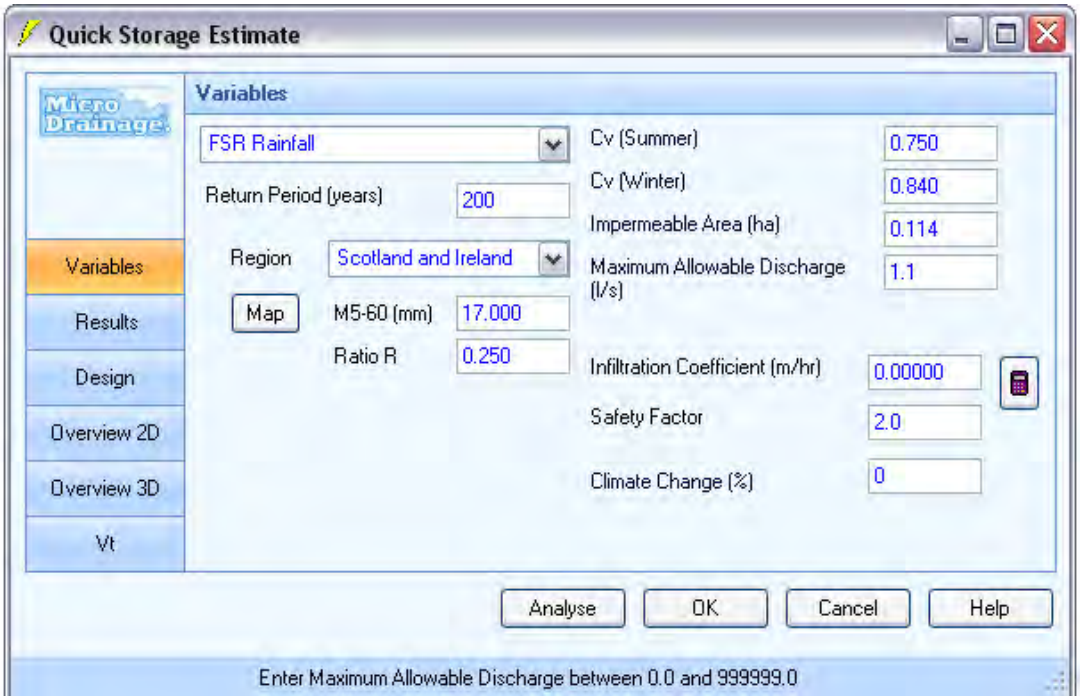
Quick Storage Estimates

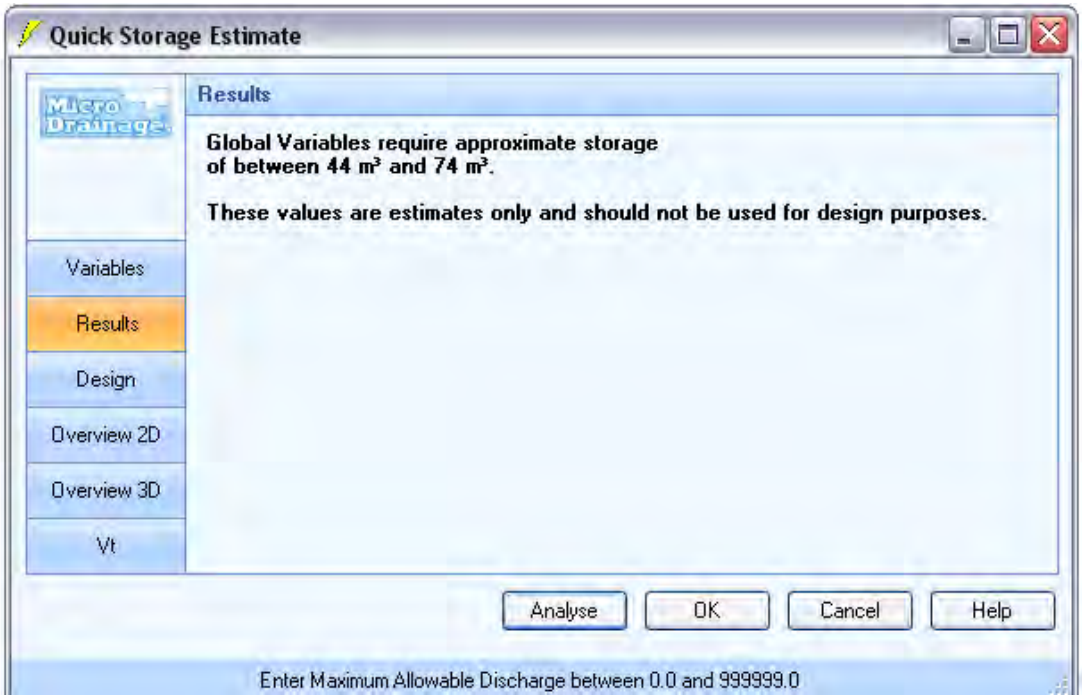
Sub-catchment A



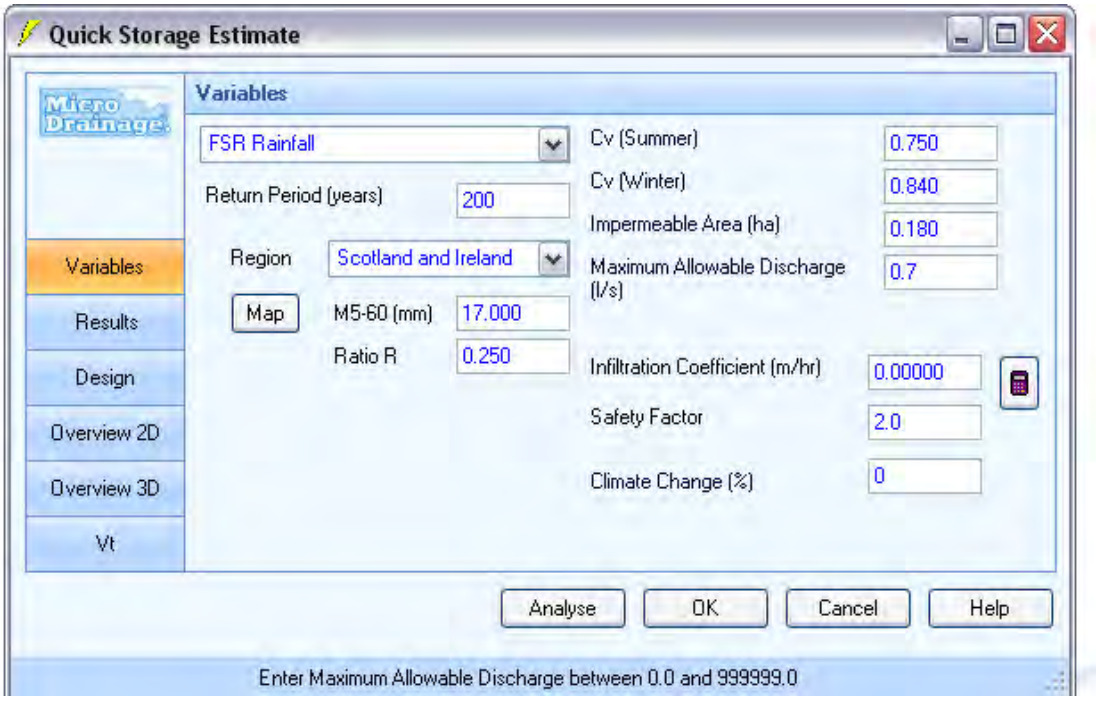


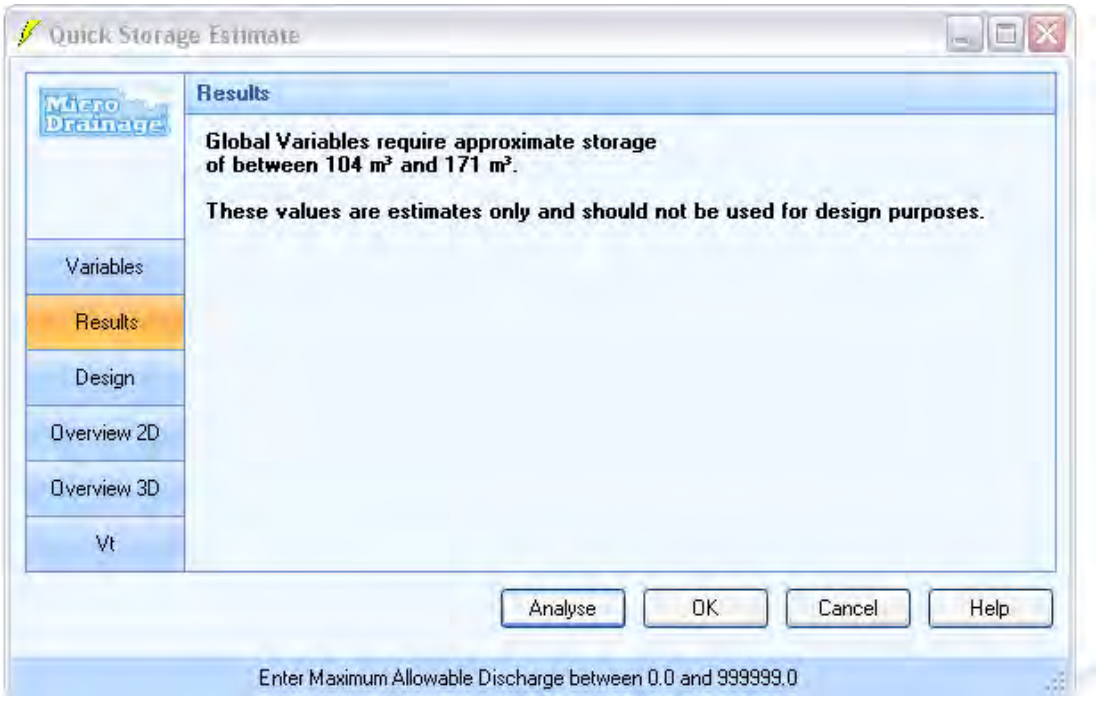
Sub-catchment B





Sub-catchment C





APPENDIX 6
ECOLOGY

Appendix 6.1: Ecology Baseline Report

Force 9 Energy LLP

Blackwood Wind Farm

Appendix 6.1 - Baseline Ecology Report

AMEC Environment & Infrastructure UK Limited

December 2011

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Third-Party Disclaimer

Document Revisions

No.	Details	Date
V1	First Draft – JS	11/11/11
V2	First review – CH	11/11/11
V2a	Second draft – JS	16/11/11
V2b	Additional Phase 1 Data included	24/11/2011

Report for

Force 9 Energy LLP

Main Contributors

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Issued by

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Doc Reg No. 27846/D040/rr017i1

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Force 9 Energy LLP

Blackwood Wind Farm

Appendix 6.1 - Baseline Ecology Report

AMEC Environment & Infrastructure UK Limited

December 2011

Certificate No. FS 13881 Certificate No. EMS 69090

Executive Summary

Purpose of this Report

This report has been produced for the purpose of providing Force 9 Energy LLP (Force 9 Energy) with details of the methods and results of the Extended Phase 1 habitat survey and the protected and notable species surveys undertaken by AMEC Environment and Infrastructure UK Ltd (AMEC) at Blackwood between April and September 2011. The information contained within this report is intended for use to inform the detailed assessment of predicted impacts and effects on these receptors which would be presented in an Environmental Statement (ES). This report could also be used as a consultation document in any subsequent communications with Scottish Natural Heritage (SNH) and other key stakeholders

Contents

1. Introduction

Force 9 Energy LLP (Force 9 Energy) is investigating the opportunity to develop a local-scale wind farm at a site near Auldgirth, Dumfries and Galloway on behalf of EDF Energy Renewables (EDF). The site is located approximately 15km north of the town of Dumfries at NX 92831 88520, at land which forms part of the Blackwood estate, hereafter referred to as Blackwood. AMEC Environment and Infrastructure UK Ltd (hereafter referred to as AMEC) was commissioned to undertake surveys on behalf of RSK Environmental Ltd (hereafter RSK) for the proposed development at Blackwood and this report details the results of the findings. AMEC undertook an Extended Phase 1 habitat survey and surveys for badger (*Meles meles*), otter (*Lutra lutra*), water vole (*Arvicola amphibius*), red squirrel (*Sciurus vulgaris*) and herpetofauna in accordance with the scoping report (RSK, 2011[1]) and following consultation with SNH (Scoping Opinion received from Beth Wilson, SNH Operations Officer for Dumfries and Galloway, dates 28/06/11). Bat surveys were also undertaken; the results of these are presented in a separate report which includes the results of the desk study and a detailed assessment of the potential for trees and/or buildings on the site to contain bat roosts. Similarly ornithological issues have been addressed separately.

1.1 Site Description

The proposed Blackwood wind farm is located in Nithsdale at High Auldgirth, Near Auldgirth, Dumfries and Galloway. The site location and boundary are shown in Figure 1.1 of the ES. The site is bordered to the north by extensive coniferous woodland (Clauchrie Plantation, which forms part of the Forest of Ae), to the east by Fern Hill and Dalswinton wind farm, to the west by Low Auldgirth and to the south by Mullach Hill. The settlement of High Auldgirth lies within the south western corner of the site. The land proposed for the wind farm development is under single ownership.

The Site (defined as the proposed development site) consists primarily of improved grassland which contains grazing livestock. Small areas of conifer plantation are present on site (e.g. around the pond at NX 92757 88376 (TN8), along Pennyland Burn at NX 93156 88767 (TN10)). Areas of broad-leaved, plantation and mixed woodland on site include some of ancient woodland origin (see Figure 3.1). There are four disused quarries within close proximity of the site. Watercourses present on site drain into Pennyland Burn (a tributary of the River Nith).

Surveys have been designed with the proposed layout of five turbines. The development layout is shown in Figure 3.2 of the ES. Access to the site is yet to be confirmed but is likely to lead from the A76 at Auldgirth via the unclassified road to Lower Auldgirth, whereby a new access track will be constructed to High Auldgirth to ensure gradients for turbine delivery vehicles are within acceptable limits. At the time of writing the precise location and construction of this access road has not been confirmed.

[1] RSK Group PLC (2011). Blackwood Wind Farm Scoping Report, prepared on behalf of Force 9 Energy.

2. Methods

2.1 Desk Study

A desk study was undertaken in order to gather information relating to statutory and non-statutory designated sites of nature conservation interest and the presence of protected or notable species, including legally protected habitats and species as well as those listed on the UK Biodiversity Action Plan (UK BAP), Dumfries and Galloway Local Biodiversity Action Plan (LBAP) and the Scottish Biodiversity List (SBL). These desk study features of interest are summarised in Box 2.1.

Box 2.1 Statutory and non-statutory sites of nature conservation value, protected and notable habitats and species.

Statutory Nature Conservation Sites

Scottish Natural Heritage (SNH) notifies specific sites that are of international or national importance for nature conservation as Sites of Special Scientific Interest (SSSI). Other international designations include Special Areas for Conservation (SAC), Special Protection Areas (SPA) or Ramsar sites.

Non-Statutory Nature Conservation Sites

This includes Sites of Importance for Nature Conservation (SINCs), Local Wildlife Sites (LWS) and areas included under the Ancient Woodland Inventory (AWI) or Semi Natural AWI (SNAWI). These sites, which are designated due to the presence of notable species or important habitats broadly, constitute the most important wildlife and geological sites in the county that do not reach the criteria required for SSSI designation, and include Scottish Wildlife Trust (SWT) Reserves, SWT Sites and woodlands listed on the Ancient Woodland Inventory (AWI).

Protected Species

Many species of animal and plant receive legal protection, which for the purposes of this study refer to:

- Species included on Schedule 1, 5 and 8 of the Wildlife and Countryside Act 1981 (WCA) (as amended), excluding species that are only protected in relation to their sale;
- Species included on Schedule 2 and 4 The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007; and
- Badgers, which are protected under the Protection of Badgers Act 1992, as amended by the Nature Conservation (Scotland) Act, 2004.

Notable Habitats and Species

These include habitats and species listed on Annex 1 and Annex 2 of the Habitats Directive, bird species listed on Annex 1 of the Birds Directive, together with habitats and species which are listed on UK and/or LBAPs, the SBL and/or those which are of some other conservation interest based on their status nationally, regionally or locally.

2.1.1 Nature Conservation Designations

Sitelink[2] (SNH's interactive website) was used to acquire information on the location and nature of statutory and non-statutory designated sites within a 2km area from the consultation survey area boundary (shown in Figures 3.1

[2] http://gateway.snh.gov.uk/portal/page?_pageid=53,910284,53_920284&_dad=portal&_schema=PORTAL

and 3.2). Data relating to Scottish Wildlife Trust (SWT) reserves and the location for woodland on the AWI was obtained through searching on the available Geographic Information System (GIS) database for which AMEC holds current licences. Data relating to locally designated sites were obtained through consultation with Dumfries and Galloway Environmental Resources Centre (DGERC).

2.1.2 Protected and Notable Species

The following sources were used for records of protected and notable species within 2km of the consultation survey area boundary:

- Information regarding the presence of protected and notable species was gained through searches on the National Biodiversity Network (NBN) Gateway[3]; and
- DGERC was contacted for records of protected and notable species and habitats.

Desk-based research was also undertaken using Ordnance Survey (OS) maps and aerial photographs to assist with the topographical layout of the site.

Similar sources were used to identify the presence of waterbodies on site such as ponds which may provide suitable habitat for great crested newt (*Triturus cristatus*) within the protected species survey area.

2.2 Extended Phase 1 habitat survey

A Phase 1 habitat survey was undertaken which classifies habitats on the site according to standard Phase 1 categories[4]. As the standard Phase 1 habitat survey methods are, in the main, concerned only with mapping vegetation communities, this survey was extended[5] to determine the suitability of habitats to support fauna that are afforded legal protection or are otherwise considered to be notable. This includes those that are afforded legal protection under the *Conservation (Natural Habitats &c.) Regulations 1994* (as amended), the *Wildlife and Countryside Act (WCA) 1981* (as amended) and the *Protection of Badgers Act 1992*.

An initial site walkover was undertaken on 12 April 2011 by AMEC Principal Ecologist Anita Hogan BSc (Hons), MSc, CEnv and MIEEM during which features of interest were identified which may require further survey effort.

In order to identify areas of botanical importance which may be affected by the proposed development, the habitats within the extended Phase 1 habitat survey area were surveyed by an experienced botanical surveyor, AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM and AMEC Consultant Ecologist Rachel Finan.

The survey area was not subject to a National Vegetation Classification (NVC) survey due to it being modified by agricultural practices and therefore having low floristic diversity. Areas within the survey area were mapped and

[3] www.nbn.org.uk. Accessed July 2011

[4] JNCC, (2007), Handbook for Phase 1 habitat survey - a technique for environmental audit, Revised reprint 2003, reprinted 2007

[5] Institute of Environmental Assessment (1995) '*Guidelines for Ecological Assessment*' Chapman and Hall, London.

small areas of interest and general descriptions of features were made using Target Notes (TNs) (Appendix D). Notes of plant species present were taken (Appendix D and E) and changes in land use were also noted.

The survey was undertaken on 04-05 May 2011 and 01-03 June 2011.

In addition, an extended Phase 1 habitat survey was undertaken in the areas directly adjacent to, and which were likely to be bisected by, the proposed new access track in the south west of the site. The habitats were surveyed by AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc and AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), Msc MIEEM on 03 and 04 August 2011. Habitats within this area were not target noted or subject to detailed botanical survey.

Such surveys represent an ecological snapshot of the site/survey area at the time of survey. The fauna and flora present may subsequently fluctuate in both species composition and numbers, on both a diurnal and seasonal basis. Species that appear at another time in the year may not, therefore have been observed, and thus may remain unrecorded. However, the survey date is considered to be within the suitable season to carry out botanical and protected species surveys on a habitat of this type (i.e. upland grassland/woodland mosaic in Scotland).

Pertinent photographs were taken to supplement the Phase 1 habitat survey results and these are shown in Appendix A.

2.2.1 Survey Conditions

The timing of the extended Phase 1 habitat surveys was optimal for the habitat types present. Survey conditions were variable with spells of occasional rain, but overall conditions were favourable for such a location.

2.3 Protected and Notable Species

Badger

Details of the badger surveys are included in Confidential Appendix I.

Otter and Water Vole

In addition to signs recorded during the Extended Phase 1 habitat survey, a targeted otter and water vole survey was conducted within the protected species survey area which covers the main area where the proposed wind turbines and site infrastructure is located. Surveys were undertaken by AMEC Ecologists Rachel Finan and Claire Hopkins on 04 August 2011 and 15 September 2011. The survey on 04 August 2011 was not undertaken in favourable conditions as the Pennyland Burn was high following a period of heavy rainfall in the preceding days, therefore only the lower reaches of the watercourse were surveyed on this occasion.

Targeted surveys for otter were completed along all waterbodies, streams, drainage ditches and potential foraging habitat within the survey area, where access was safe and possible. Standard methods were followed for the

completion of the surveys[6] which involved searching for evidence of the presence of otter, namely otter field signs such as footprints, otter spraints (faeces) and sprainting sites, otter slides/paths and potential otter habitat e.g. holts, couches and hovers.

The protected species survey area was assessed for the presence of water vole by the completion of targeted surveys along watercourses, streams and drainage ditches within the study area, where access was safe and possible. Standard methods were followed for the completion of the surveys[7] which involved a search for evidence of the presence of water vole, water vole field signs and potentially suitable water vole habitat e.g. footprints, feeding stations of characteristic piles of chewed vegetations, burrows, lawns of grazed vegetation around burrow entrances, latrine sites, droppings, runways through the vegetation, nests at the base of rushes, sedges or reeds or the characteristic sound of the water vole as it enters the water. In addition watercourses were searched for signs of the presence of American mink (*Neovison vison*) which is a non-native species and a predator of water vole.

Red Squirrel

The desk study and walkover survey identified suitable habitat for red squirrel within areas of coniferous woodland both within and adjacent to the Site boundary. In addition red squirrel priority woodlands (a non-statutory conservation priority feature) exist immediately adjacent to the Site to the north. These, coupled with details in the scoping response and recommendations from SNH indicated that targeted surveys would be required for red squirrel given the potential importance of the adjacent forestry to this species. Surveys aimed to identify signs of squirrels e.g. signs of feeding activity, remains of tree seeds or chewed cones and drey presence and to confirm their presence within specific woodland areas within the protected species survey area and to identify the potential for their presence within woodlands in the Extended Phase 1 habitat survey boundary. A targeted survey for red squirrel involving a drey count and search for feeding signs was undertaken within Muirstraploch Wood. Survey methods followed standard protocol[8] and were completed by AMEC Ecologists Claire Hopkins and Rachel Finan on 03-04 August 2011 and 15 September 2011.

Herpetofauna

A general habitat suitability survey was completed at the same time as extended Phase 1 habitat surveys between 04-05 May 2011 by AMEC Consultant Ecologists Jenny Sneddon and Rachel Finan to determine the presence of other protected species including herpetofauna (the collective term for amphibians and reptiles) within the protected species survey area. The surveys aimed to assess the presence/absence of herpetofauna, to identify general areas of potential interest and to assess significant features suitable for use by herpetofauna such as ponds,

[6] Chanin, P (2003). Monitoring the Otter (*Lutra lutra*). Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature, Peterborough.

[7] Strachan, R and Moorhouse, T (2006). The water vole conservation handbook. 2nd Edition, WildCRU, Oxford

[8] Gurnell, J., Lurz, P., McDonald, R. and Pepper, H. (2009). Practical techniques for surveying and monitoring squirrels. Practice Note. Forestry Commission.

microhabitats and hibernation sites. All visual encounters were recorded. Best practice methods were followed during the completion of the surveys[9]. No targeted surveys were undertaken for reptiles.

Habitat Suitability Index

One waterbody (a pond 0.14ha in area) was identified within the protected species survey area and during the walkover survey it was confirmed as offering potentially suitable habitat for amphibian species. The pond was identified as being within 200m of one of the proposed turbine locations (WT4, see Figure 3.2 of the ES) at NX 92876 88283.

The pond was not swamped with vegetation and the surrounding marshy grassland and woodland was observed to offer high quality terrestrial habitat. In order to fully assess the pond for its suitability to support a breeding population of great crested newts a Habitat Suitability Index (HSI) survey and assessment were undertaken on 12 April 2011 by AMEC Principal Ecologist Anita Hogan.

The HSI was calculated according to standard methods[10] based on the following ten features collected from maps and in the field: (i) location, (ii) pond area, (iii) likelihood of pond drying, (iv) water quality, (v) level of shade, (vi) presence of waterfowl, (vii) presence of fish, (viii) other ponds within 1km^2, (ix) terrestrial habitat and (x) macrophyte cover. Water quality was assessed based on the appearance of the waterbody in conjunction with at least three pond net sweeps to identify macro-invertebrate presence; this method also provided a useful indication regarding the level of fish presence in the pond.

The HSI score, which ranges from 0.1-1.0, was calculated with reference to the standard Natural England spreadsheet[11], which is also accepted and used by SNH. The HSI scores are interpreted as follows[12] in relation to their suitability for great crested newt:

- <0.5 = poor;
- 0.5-0.59 = below average;
- 0.6-0.69 = average;
- 0.7-0.79 = good;
- >0.8 = excellent.

9 Edgar, P., Foster, J. and Baker, J. (2010). Reptile Habitat Management Handbook . Amphibian and Reptile Conservation , Bournemouth.

[10] With reference to Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000) Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*). Herpetelogical Journal, Vol. 10 pp.143-155.

[11] http://www.naturalengland.org.uk/conservation/wildlife-management-licensing/docs/WML-A14-2.xls

[12] In accordance with http://www.narrs.org.uk/Documents/nasdocuments/HSI_guidance.pdf.

Field Surveys

Presence/absence surveys for great crested newts were deemed to be necessary at the pond (see Figure 6.1 of the ES, TN4 and Photograph 3). These were carried out by AMEC Consultant Ecologists Jenny Sneddon and Rachel Finan under SNH Licence No. 11644. The pond was surveyed on four separate occasions between May and June 2011 using at least three survey techniques during each visit as required by the great crested newt mitigation guidelines[13].

Survey techniques were as follows:

- Bottle Trapping: Bottle traps were placed at various points around the margins of the water body where the habitat was considered most likely to support newts and the water depth was adequate. Traps were set around the edge of the pond at 2m intervals (or as close to this as health and safety allowed) to maximise trapping efficiency. The traps were set at dusk and then inspected the following morning. The number of traps used per visit was dependent upon the volume of water present and health and safety concerns such as dangerous high water levels due to flooding – furthermore the SNH licence stipulates that "bottle trapping is only to be applied as a survey technique when torching is not practical". Accordingly, bottle traps were primarily placed in areas of dense vegetation, and other areas that would not be readily surveyed during the torch light survey;

- Torch Light Survey: Torch surveys involve slowly walking around the perimeter of a pond, shining the torch into the water and recording the number and species of any newts observed. A one million candle power torch was used to complete these surveys as it provides the best penetration of the water surface to allow for a detailed survey;

- Egg Search: Egg searches are carried out within all areas of suitable habitat surrounding the pond Suitable plants for egg laying are those that have broad, pliable, submerged leaves such as certain grasses and broad-leaved herbs; however, floating debris (e.g. plastic bags) was also checked, as these can be utilised by newts where egg-laying material is not available. Rushes and sedges provide poor egg laying habitat due to their erect nature and the relatively small size of the stems and leaves, nonetheless these were checked where they offered the only suitable egg-laying vegetation.

- Netting: Hand netting involves sweeping the pond with a fine-mesh hand net. The net was dipped repeatedly into the pond, at numerous points around the perimeter (where access was not limited for health and safety reasons), and then examined for newts. This is a particularly suitable method for surveying efts (newt larvae).

Survey techniques used during the four visits are detailed in Table 2.1.

Table 2.1 Methods Used for Newt Surveys on Each Survey Visit

Date	Bottle Trapping	Torch Light Searching	Egg Search	Hand Netting
04-05 May 2011	Yes	Yes	Yes	Yes

[13] Great Crested Newt Mitigation Guidelines. Natural England, August 2001.

Date	Bottle Trapping	Torch Light Searching	Egg Search	Hand Netting
11-12 May 2011	Yes	No	Yes	Yes
01-02 June 2011	Yes	No	Yes	Yes
02-03 June 2011	Yes	No	Yes	Yes

3. Results

3.1 Desk Study

3.1.1 Nature Conservation Designations

Through use of the Sitelink website it has been determined that there are no statutorily designated sites within the search area of 2km.

As described in the Scoping Report (RSK, 2011), the nearest site with potential to be affected by the development is Black Loch (SSSI) which is approximately 6km to the east of the Site and is therefore considered to be located a sufficient distance away for ecology not to be adversely affected by the proposed development.

There are no non-statutory sites within the Site boundary with the closest approximately 3km south west between Broadford and Dunscore and therefore considered to be a sufficient distance from the proposed development not to be affected by it.

Information on the presence of Ancient Woodland was obtained from the DGERC database and is illustrated on Figure 3.1 and shows three areas of Ancient Woodland within the consultation survey area boundary: above Glenloy towards the northern boundary; at Knocknutshell Wood in the centre of the survey area and Lambrig Wood on the south eastern boundary adjacent to Pennyland Burn.

Information regarding red squirrel priority woodlands within 2km of the consultation survey area boundary was received from DGERC and is included on Figure 3.1

3.1.2 Protected and Notable Species

The protected and notable species records within 2km of the consultation survey area boundary provided by consultation with DGREC are shown in Appendix B and Figure 3.2.

The records of protected and notable species collected from NBN Gateway within 2km of the consultation survey area boundary are provided in Appendix C and Figure 3.3.

The search results do not confirm presence or absence of particular species on the Site but do provide some background information regarding the possible occurrence of species within the locality. The search indicated records of the presence of otter, red squirrel, adder (*Vipera berus*) and many invertebrate species within the 2km consultation survey area boundary and badger and slow worm (*Anguis fragilis*) in the wider area.

In addition the search identified a record of American mink at Blackwood dating to 1966 and a more recent (1995) record of this species at Nith Bridge, approximately 5km north of the consultation survey area boundary. Mink is a predator of water vole and its presence reduces the suitability for this species.

3.2 Extended Phase 1 habitat survey

Phase 1 habitat codes were used to provide a broad description of the vegetation types found during surveys. In order to provide a more detailed description of the habitats and to get a better understanding of the botanical species present within the survey area, species present were also noted and are included in a detailed species list in Appendix E.

Figure 6.1 of the ES shows the area which was subjected to Phase 1 habitat survey. The Phase 1 habitat survey TNs are illustrated on this figure and are described in Appendix D. Representative photos are provided in Appendix A. Botanical Latin names are provided in the species list in Appendix E and are only provided in the main text where recognised English alternatives do not exist. Watercourse TNs are illustrated on Figure 6.1 of the ES and in Figure 3.4 and they are described fully in section 3.2.13.

Figure 6.1 of the ES also shows the area adjacent to the proposed new access track in the south west of the Site within the extended Phase 1 habitat survey boundary. No target notes were taken for this area.

3.2.1 Habitats Overview

The Site is located approximately 15km north of Dumfries within the region of Dumfries and Galloway. It is approximately 1.5km from the main road (the A76) and is accessible from the main road by an unclassified road from Auldgirth. The survey area itself (excluding the access track) covers an area of approximately 157ha which includes the steep to moderate slopes of Knocknutshell and Blackcraig Hill and the surrounding undulating landscape. The flat tops and slopes of these hills support heavily modified agricultural land and are bordered by areas of both semi-natural and plantation woodland.

The survey area comprises of improved (I) and semi-improved (SI) fields in addition to some marshy grassland, broad-leaved plantation and semi-natural woodland, coniferous plantation woodland, mixed plantation woodland, watercourses and boundary features. The habitats within this area are generally of low ecological value due to agricultural improvement.

Pennyland Burn defines the eastern boundary of the Site and tributaries/issues flow from the central area of the survey area into Pennyland Burn in the south east corner of the survey area. Commercial plantation woodland is present to the north of the site with smaller areas of coniferous plantation woodland dispersed throughout the site.

The proposed turbine locations are on the hill tops of the intensively farmed agricultural land (see Figure 3.2 of the ES) mainly in the north eastern part of the survey area. These areas would be accessed by upgraded existing access tracks and by the provision of new access tracks e.g. near Low Auldgirth.

In the following sections, Phase 1 habitat codes are used to provide a broad description of the vegetation types found on site within the extended Phase 1 habitat survey boundary, which has been subdivided into the core survey area and the area adjacent to the proposed new access track in the south west of the site.

Core Survey Area

A1.1.1 Broad-Leaved Semi-Natural Woodland

The Pennyland Burn borders the eastern edge of the site boundary where small areas of grey willow are associated with the watercourse, forming small pockets of naturalised woodland (TN12) along its edge.

A1.1.2 Broad-leaved Plantation Woodland

Broad-leaved plantation woodland was identified within the core survey area, and is described in TN3, 19, 22, 26, 29, 39, 42 and 43 TN3 represents a small area of broad-leaved semi natural woodland within Knocknutshell Wood on the crest of the hill towards the centre of the core survey area. This consists mainly of mature beech (*Fagus sylvatica*) stands and is recorded on the AWI (Figure 3.1). The wooded area is enclosed on all but the north western boundary by a stone wall. The mature trees offer high bat roost potential. The ground flora is not very species diverse due to heavy grazing and trampling by livestock.

TN29 contains a small area of Poplar species with some beech trees along a dry ditch running parallel to one of the main access tracks. Larger areas of plantation woodland are found along the watercourses (TN34, TN39 & TN40) where species e.g. willow, birch and alder are found.

TN 39 represents a small area of woodland dominated by alder with a small drain running through the woodland. The ground flora is grass dominated with abundant rough meadow grass in addition to creeping buttercup and common nettle.

Younger areas of plantation are also present e.g. TN42 and 43 are both areas of young broad-leaved plantation estimated to be less than 10 years old. Species present include rowan, ash, birch and oak.

A1.2.2 Coniferous Plantation Woodland

This is the most dominant woodland habitat type within the core survey area and it is found in both extensive blocks and smaller woodland areas throughout the area. Much of the coniferous plantation is newly planted with stumps remaining from previously felled stands. Many of these areas of previously felled plantation offer good habitat potential for reptiles. Many of the more mature coniferous plantations are dominated by one species e.g. Douglas fir or Sitka spruce with ground flora being typically species poor.

A1.3.2 Mixed Plantation Woodland

Five areas of mixed woodland are found within the core survey area. TN5 and TN6 are a continuation of the same woodland but the species composition of the woodland gradually changes with proximity to the watercourse e.g. the southern area of the woodland contains more birch woodland. Tree stands within the area are ~10 years old and a wide variety of species are present including Douglas fir, rowan, birch, willow species and birch. TN9 is similar to TN6 in that the dominant species is birch but this woodland runs along the Burn and is adjacent to a larger area of broad-leaved plantation. Cow Cleugh is also classed as mixed woodland (TN38) with more mature trees of 10-

20 years old. The western side of the plantation is more dominated by coniferous species such as Sitka spruce with broad-leaved species becoming more dominant towards the east.

A2.1 Dense/Continuous Scrub

The main area of scrub identified was along the northern stretches of the Pennyland Burn. This area was heavily overgrown with gorse.

A3.1 Scattered Broad-leaved Trees

Scattered broad-leaved trees were recorded at four locations in association with conifer plantation (TN 15, 24, 25 and 33).

B2.2 Semi-Improved Neutral Grassland

Semi-improved neutral grassland is described in TN1, 2, 14, 28, 31, 40 and TN41. They are isolated areas within the wider grassland habitat and have avoided intensive grazing and management. Species present include cock's foot, common vetch, germander speedwell, smooth meadow grass, Yorkshire fog and sweet vernal grass.

B4 Improved Grassland

Improved grasslands are found throughout the core survey area and constitute most of the main grassland areas. These are meadows and pastures which have been heavily grazed or managed. A very limited species list was identified with only a few common grass species present such as perennial rye grass.

B5 Marshy Grassland

Small areas of marshy grassland occur within the core survey area on gently sloping land along the hillsides and along the watercourses and flushes. Marshy grassland is described in TN2, 7 and 14. Species present include soft rush (*Juncus effusus*), marsh marigold, tufted hair grass (*Deschampsia cespitosa*) and meadowsweet. The vegetation described in TN2 and 14 is supported by the communities' position at the base of slopes which means that water accumulates in these areas creating conditions which favour marshy vegetation. TN 7 describes vegetation associated with the pond (TN4). The pond will maintain an elevated water table, promoting growth of species which favour wet conditions such as soft rush and tufted hair grass.

C1.2 Scattered Bracken

Area of scattered bracken located on the edge of mixed plantation habitat.

C3.1 Tall Ruderal

Isolated areas of ruderal habitat occur throughout the core survey area in small patches and in conjunction with other habitat types such as SI neutral grassland and marshy grassland.

G1 Standing Water

A pond (TN7) is located towards the centre of the core survey area. It is fenced off from grazing and is densely vegetated with marshy grassland along the edges with rush and tufted hair grass with meadowsweet and rosebay willow-herb also present.

G2 Running Water

Figure 3.4 illustrates the results of the watercourse surveys. The survey incorporated a search for otter and water vole, the results of which are documented as in Appendix G. The main watercourse draining the site is the Pennyland Burn which is described below.

Pennyland Burn

The Pennyland Burn flows from south to north from an extensive area of coniferous woodland called Clauchrie Plantation and forms the eastern most boundary of the site. The burn runs downstream along a valley, through agricultural land and Lambrig Wood and leaves the site in the south eastern site boundary. The burn is shallow, approximately 2-4cm deep and 1m wide in the upper stretches and .1m wide in the lower stretches with a stoney substrate, and is heavily vegetated in places. There are numerous obstructions e.g. small waterfalls along the watercourse which are likely to act as barriers to fish movements. The water is fast flowing and there is evidence of poaching along the edges of the watercourse. Otter signs were found along the watercourse during the protected species surveys.

Unnamed Ditch (TN27)

This unnamed dry ditch runs parallel to the main track past High Auldgirth. It is heavily vegetated with perennial rye-grass, Yorkshire fog, pignut creeping buttercup, raspberry and rosebay willow-herb.

Unnamed Burn

An unnamed burn runs from a drain along the main track south through Cow Cleugh Wood and joins up with Pennyland Burn out with the site boundary. This watercourse is very heavily vegetated for the majority of its length and was deemed unsuitable for water vole due to the high number of obstructions along its course.

J1.2 Amenity Grassland

Area of amenity grassland associated with the clay pigeon shooting range.

Protected plant species

No higher plants, moss or liverwort species fully protected under Schedule 8 of the WCA 1981 were identified during this survey. It is a criminal offence to pick, uproot or otherwise damage any of these species. It is considered unlikely that any Schedule 8 protected plant species are present on site.

Biodiversity Action Plan (BAP) plant species

No UKBAP, or Ayrshire LBAP higher plant, moss or liverwort priority species were recorded during the survey.

Threatened, rare &/or notable higher plant species

No threatened, rare or notable higher plant species were identified on site during the survey.

Proposed Access Track

A1.1.2 Broad-leaved Plantation Woodland

A small area of broad leaved- plantation woodland was identified within the survey area where immature broad-leaved plantation exists adjacent to the shelter belt in the centre of the area (NX 91643 87123). This area appears to have previously been plantation woodland which has now been felled and replanted.

A1.2.2 Coniferous Plantation Woodland

As within the core survey area, this is the most dominant woodland habitat type and it is found in both extensive blocks and smaller woodland areas throughout the area. Much of the coniferous plantation is semi-mature or mature plantation with some areas of newly planted woodland with stumps remaining from previously felled stands. Many of the more mature coniferous plantations are dominated by one species e.g. Douglas fir or sitka spruce with ground flora being typically species-poor.

A1.3.2 Mixed Plantation Woodland

Three defined and independent areas of mixed woodland are found within the remainder of the survey area – these all being located in the west of the area in close proximity to Low Auldgirth. Another area of mixed woodland occurs within a much larger area of coniferous plantation to the north of the area which runs along the filed boundary and is likely to be directly affected by the proposed new access track (NX 91805 87474). This area contains a high proportion of broadleaved species within a compact area of the woodland and contains species such as oak, rowan and birch.

A 3.1 Scattered Broad-leaved Trees

Scattered broad-leaved trees were recorded at four locations within the survey boundary. Three of these areas were associated with coniferous plantation woodland and included a shelterbelt of mature trees which is bisected by the proposed access track, and which contains trees which have bat roost potential. The fourth location was the scattered immature and semi-mature broadleaved trees found along the railway embankments to the south west of the site.

B2.2 Semi-Improved Neutral Grassland

Semi-improved neutral grassland was found in two distinct locations within the survey area. Both of these areas were fenced off and isolated from wider grassland habitat and have avoided intensive grazing and management. Both areas were also adjacent to woodland areas.

B4 Improved Grassland

Improved grassland was the main grassland type identified during the surveys within the survey boundary. These areas were heavily grazed by livestock and are botanically species-poor.

C3.1 Tall Ruderal

One main area of tall ruderal vegetation was identified in the previously felled area along the shelter belt. This area was heavily vegetated with rosebay willow-herb and was adjacent to scattered broad-leaved trees along the boundary wall (NX 91610 87261).

G1 Standing Water

An area of standing water exists to the northeast of the buildings at Low Auldgirth at NX91615 86875. However, this was not surveyed during the Extensive Phase 1 habitat survey in August 2011, therefore no assumptions can be made about the likelihood to support protected species.

J1.2 Amenity Grassland

An area of amenity grassland with low biodiversity value was identified in the form of the garden at Low Auldgirth.

J2.6 Unnamed Ditch

A ditch which was dry at the time of the survey was identified running parallel to the shelterbelt of coniferous plantation woodland and the line of scattered trees along the field boundary towards the central part of the survey boundary. This ditch was not surveyed extensively due to the lack of water.

Protected plant species

No higher plants, moss or liverwort species fully protected under Schedule 8 of the WCA 1981 were identified during this survey. It is a criminal offence to pick, uproot or otherwise damage any of these species. It is considered unlikely that any Schedule 8 protected plant species are present on site.

Biodiversity Action Plan (BAP) plant species

No UKBAP, or Ayrshire LBAP higher plant, moss or liverwort priority species were recorded during the survey.

Threatened, rare &/or notable higher plant species

No threatened, rare or notable higher plant species were identified on site during the survey.

3.3 Protected and notable species

Badgers

Badger survey results are documented in the Confidential Badger Appendix I.

Otter and Water Vole

Suitable habitat for otter foraging and commuting was identified along most of the watercourses within the protected species survey and extended Phase 1 habitat survey boundaries. A full description of the watercourses is provided in Section 3.2.13 and full details of the otter survey results are detailed in Appendix G (TN1, TN2, TN3 & TN4). Signs of otter presence and activity (old and fragmented spraints) were identified along Pennyland Burn in the east of the Extended Phase 1 habitat survey boundary.

No signs of water vole were recorded. The habitat present within the core survey area was identified as providing low overall habitat suitability for water vole.

No signs of otter or water vole were recorded along a drainage ditch on the route of the proposed access track.

Red Squirrel

Targeted red squirrel surveys were undertaken on woodland areas (woodland blocks and shelterbelts which have trees of suitable age structure) within the extended Phase 1 habitat survey boundary. Signs of red squirrel presence or activity were identified within these areas, particularly in Muirstraploch Wood to the north of the site where two live red squirrels were recorded in humane squirrel traps and 7 potential dreys were recorded (Appendix G, TN 5 - 14).

The large plantations to the south and east of the site, although extensive, were deemed to contain low potential for red squirrel habitat due to the relative immaturity of the tree stands. Furthermore, the woodland blocks are isolated due to the exposed ground between them, therefore were not deemed optimal for providing habitat connectivity for the species.

Herpetofauna

Habitat Suitability Index

The HSI score obtained is 0.39 which categorises the pond as being ‘poor’ for great crested newts. The results of the HSI are shown in Appendix H. The pond is located within an area determined to be suitable for great crested newt (HSI) however it borders sub-optimal great crested newt habitat. In addition, the habitat surrounding the pond was assessed as providing potentially suitable great crested newt habitat. Therefore, it was determined that it could not be ruled out that great crested newts were not present within this pond and surveys were undertaken.

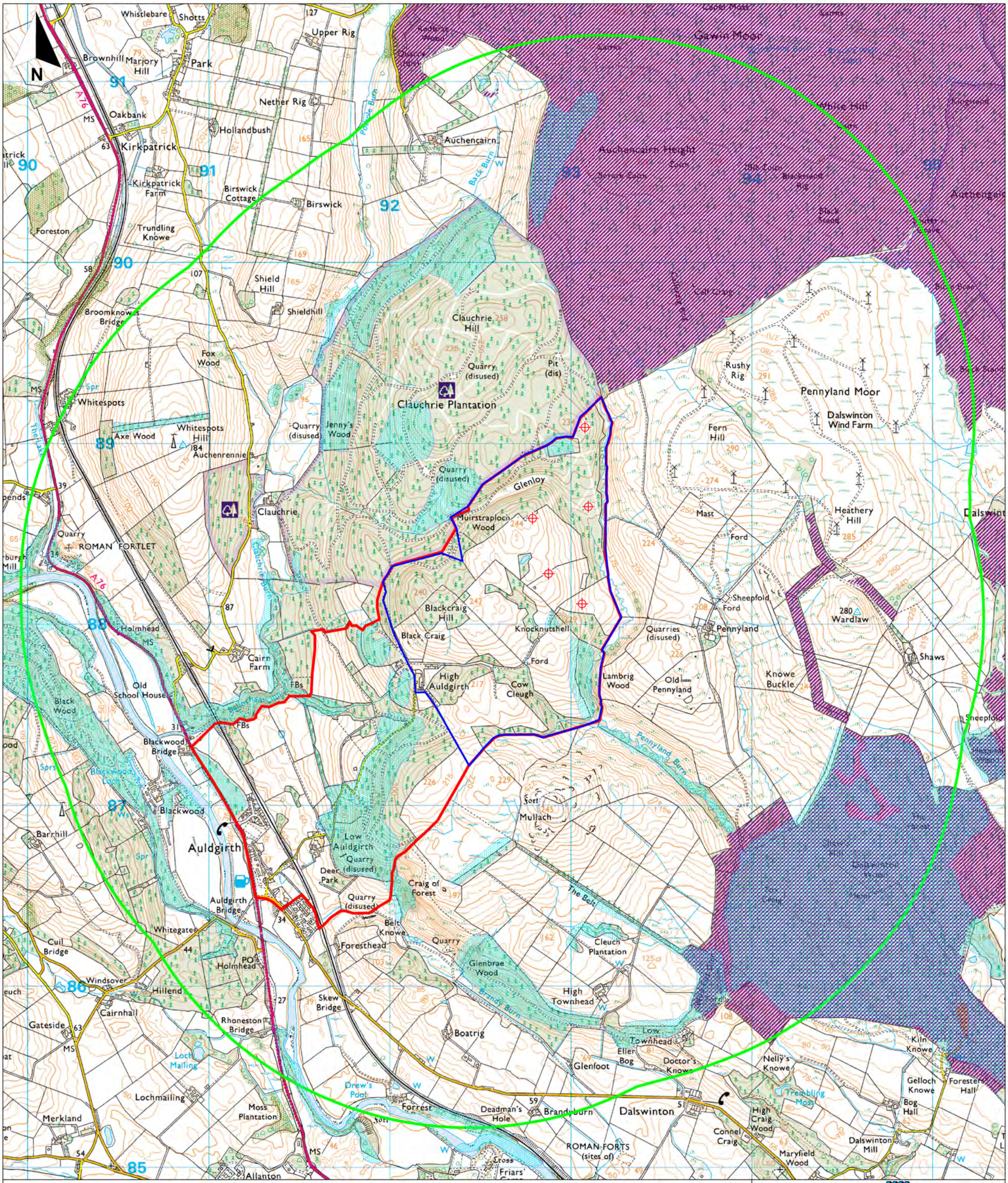
Great Crested Newt Survey

No great crested newts were observed during the surveys. Palmate newts (*Lissotriton helveticus*) were recorded on every survey visit with one smooth newt (*L. vulgaris*) being recorded in the pond during bottle trapping surveys. For detailed results refer to Appendix H.

Reptile

No reptile sightings were recorded, however, suitable reptile habitat is present throughout the core survey area in the form of scrub, stone wall boundaries, tufts of grass and vegetation and rocky outcrops e.g. TN11 and TN17.

Figures



Key:

- Site Boundary
- Proposed Wind Turbine
- 2 km Buffer around Consultation Survey Area
- Consultation Survey Area Boundary
- Red Squirrel Priority Woodlands
- Ancient Woodland

0 m — 1.2 km

Scale 1:20,000 @ A3

FORCE 9 ENERGY

Blackwood Wind Farm
Ecology Baseline Report

Figure 3.1
Designated Nature Conservation Sites

November 2011
27846-E013 fitzs

amec

Key:

- Site Boundary
- Proposed Wind Turbine
- Consultation Survey Area Boundary
- 2 km Buffer around Survey Boundary

- Adder
- Red Squirrel
- Otter
- Ling Heather
- Marsh Thistle
- Pearl-bordered Fritillary
- Pedunculate Oak
- Scarlet Pimpernel
- Small Heath
- Small Pearl-bordered Fritillary
- Spear Thistle

0 km 1.2 km

Scale 1:20,000 @ A3

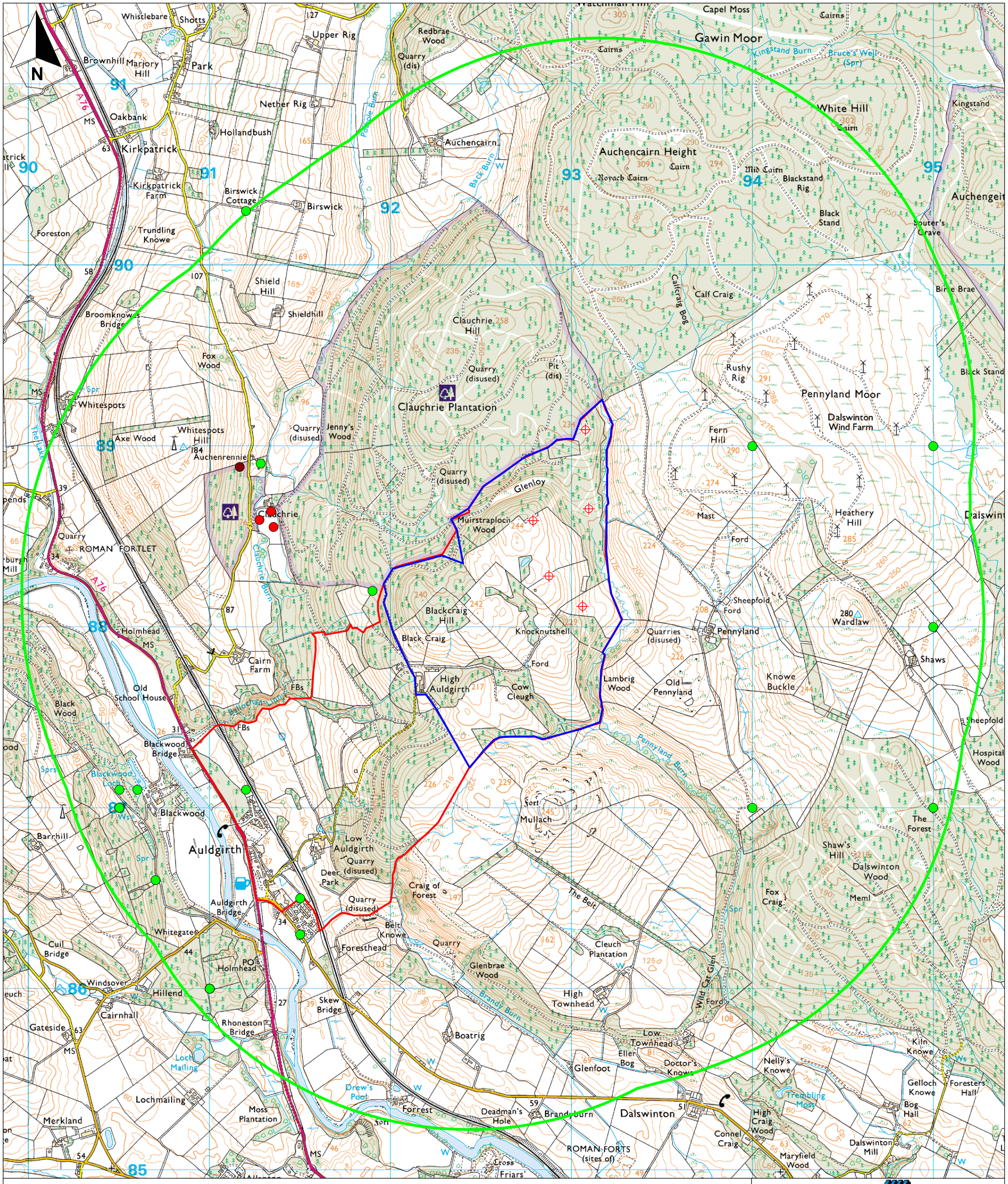
FORCE 9 ENERGY

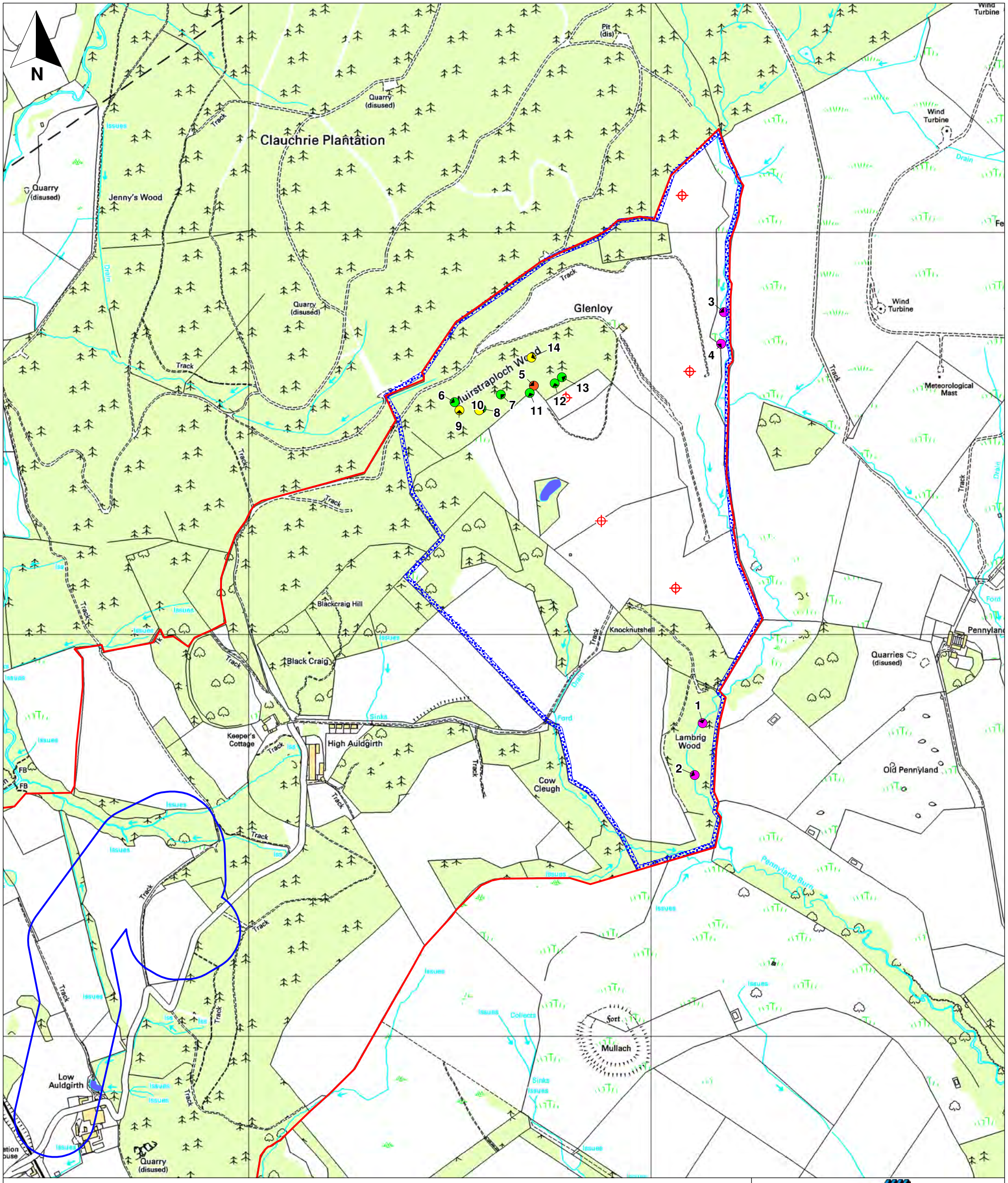
Blackwood Wind Farm
Ecology Baseline Report

Figure 3.2
Consultation Data - DGERC-Protected and Notable Species

November 2011
27846-E016b fitzs

amec





Key:

- Site Boundary
- Proposed Wind Turbine
- Protected Species Survey Area Boundary
- Access Track Survey Area
- Otter Spraint
- Squirrel Drey
- Squirrel Feeding Signs
- Red Squirrel Sightings
- Pond - Amphibian Surveys

0 m — 540 m

Scale 1:9,000 @ A3

FORCE 9 ENERGY

Blackwood Wind Farm
Ecology Baseline Report

Figure 3.4
Protected Species Survey Results

November 2011
27846-E015b fitzs

amec

Appendix A
Site Photographs (Phase 1 habitat survey)

December 2011
Doc Reg No. 27846/D040/rr017i1

Photograph 1 - showing the southern boundary of Blackcraig Hill Wood looking east towards Dalswinton Wind Farm (TN1)

Photograph 2 – showing broad-leaved plantation woodland (TN3) and (TN34)

Photograph 3 – Pond at NX 92757 88376 (TN8)

Photograph 4 – Improved grassland near the pond looking eastwards towards Pennyland Burn and associated woodland areas (TN9 and TN10).

Photograph 5 - Felled and replanted area (TN11)

Photograph 6 - Mature coniferous plantation with felled slope (replanted) (TN13 and TN14)

Photograph 7 – Broad-leaved woodland, neutral grassland and coniferous woodland (TN 28-TN30)

Photograph 8 – Eastern boundary of Cow Cleugh Wood looking south towards the plantation woodland (TN34)

Appendix B
Consultation Data - DGERC

Species	Latin Name	Date	Grid Reference	Location/Habitat	Comments
Otter	*Lutra lutra*	29/11/1978	NX913886	Clauchrie Burn at Clauchrie	
Red Squirrel	*Sciurus vulgaris*	19/03/1996	NX919882	Clauchrie	1 Individuals
Red Squirrel	*Sciurus vulgaris*	24/11/1996	NX9088	Barburgh Mill, Auldgirth.	1 Individuals
Red Squirrel	*Sciurus vulgaris*	Mar-98	NX912871	Auldgirth	1 Individuals
Red Squirrel	*Sciurus vulgaris*	03/09/2000 - 05/09/2000	NX921863		1 individuals
Red Squirrel	*Sciurus vulgaris*	21/05/2003	NX906871	Blackwood Estate, Aulgirth	3+ Individuals
Red Squirrel	*Sciurus vulgaris*	16/01/2005	NX907866	Blackwood Estate, Auldgirth	1 Individuals
Red Squirrel	*Sciurus vulgaris*	25/06/2005	NX915863	Across gardens and common areas in Auldgirth, near Dumfries	1
Red Squirrel	*Sciurus vulgaris*	15/09/2005	NX905871	Blackwood Estate, Auldgirth, nr Dumfries	15
Red Squirrel	*Sciurus vulgaris*	12/05/2006	NX905870	Auldgirth, in garden	1 Individuals
Red Squirrel	*Sciurus vulgaris*	09/09/2006	NX90558700	on road at Blackwood, Auldgirth	1 individual
Red Squirrel	*Sciurus vulgaris*	08/02/2009	NX913891	Auchenrennie	3 Individuals
Adder	*Vipera berus*	-1894	NX907870	Blackwood Estate	
Adder	*Vipera berus*	1999	NX931859	Dalswinton	Several individuals seen regularly
Adder	*Vipera berus*	15/07/2006	NX906869	Blackwood Estate	
Small Pearl-bordered Fritillary	*Boloria selene*	27/06/2002	NX939867	Pennyland Burn, Dalswinton	7 individuals

Species	Latin Name	Date	Grid Reference	Location/Habitat	Comments
Small Pearl-bordered Fritillary	*Boloria selene*	27/06/2002	NX939867	nr Dalswinton	7 individuals
Small Pearl-bordered Fritillary	*Boloria selene*	23/06/2005	NX938865	Loch Capenoch	2 individuals
Small Pearl-bordered Fritillary	*Boloria selene*	16/06/2008	NX936871	Pennyland Burn, Dalswinton	9 individuals
Small Pearl-bordered Fritillary	*Boloria selene*	16/06/2009	NX936872	Near Dalswinton	1 individuals
Small Pearl-bordered Fritillary	*Boloria selene*	17/06/2010	NX9387	Pennyland Burn, Dalswinton	15 Adult
Pearl-bordered Fritillary	*Boloria euphrosyne*	1993	NX937870	Malloch Glen, Dalswinton	1 individuals
Pearl-bordered Fritillary	*Boloria euphrosyne*	1993	NX937870	Malloch Glen, Dalswinton	
Pearl-bordered Fritillary	*Boloria euphrosyne*	06/06/1993	NX939868	Mullagh Glen	10-29 individuals
Pearl-bordered Fritillary	*Boloria euphrosyne*	27/05/1999	NX931874		2-9 individuals
Small Heath	*Coenonympha pamphilus*	01/06/1995	NX9387	Nr Dalswinton	2-9 individuals
Small Heath	*Coenonympha pamphilus*	12/06/1998	NX939869	Mullach Glen, Dalswinton	2-9 individuals
Small Heath	*Coenonympha pamphilus*	27/05/1999	NX931874		2-9 individuals
Small Heath	*Coenonympha pamphilus*	27/06/2002	NX939867	Pennyland Burn, Dalswinton	1 individuals
Small Heath	*Coenonympha pamphilus*	23/06/2005	NX938865	Loch Capenoch	1 individuals
Small Heath	*Coenonympha pamphilus*	16/06/2009	NX936872	Near Dalswinton	1 individuals
Small Heath	*Coenonympha pamphilus*	17/06/2010	NX9387	Pennyland Burn, Dalswinton	10 Adult
Marsh Thistle	*Cirsium palustre*	03/09/2000 - 05/09/2000	NX92348603	Glenbrae	
Marsh Thistle	*Cirsium palustre*	03/09/2000 - 05/09/2000	NX921862	Glenbrae	
Marsh Thistle	*Cirsium palustre*	03/09/2000 - 05/09/2000	NX921862	Glenbrae	
Marsh Thistle	*Cirsium palustre*	03/09/2000 - 05/09/2000	NX921862	Glenbrae	
Marsh Thistle	*Cirsium palustre*	03/09/2000 - 05/09/2000	NX923865	Glenbrae	
Marsh Thistle	*Cirsium palustre*	03/09/2000 - 05/09/2000	NX921863	Glenbrae	

Species	Latin Name	Date	Grid Reference	Location/Habitat	Comments
Spear Thistle	*Cirsium vulgare*	03/09/2000 - 05/09/2000	NX921862	Glenbrae	
Spear Thistle	*Cirsium vulgare*	03/09/2000 - 05/09/2000	NX923865	Glenbrae	
Spear Thistle	*Cirsium vulgare*	03/09/2000 - 05/09/2000	NX919864	Glenbrae	
Spear Thistle	*Cirsium vulgare*	03/09/2000 - 05/09/2000	NX921862	Glenbrae	
Spear Thistle	*Cirsium vulgare*	03/09/2000 - 05/09/2000	NX922863	Glenbrae	
Ling heather	*Calluna vulgaris*	03/09/2000 - 05/09/2000	NX921863	Glenbrae	
Ling heather	*Calluna vulgaris*	03/09/2000 - 05/09/2000	NX923865	Glenbrae	
Ling heather	*Calluna vulgaris*	03/09/2000 - 05/09/2000	NX922863	Glenbrae	
Ling heather	*Calluna vulgaris*	03/09/2000 - 05/09/2000	NX923865	Glenbrae	
Pedunculate Oak	*Quercus robur*	03/09/2000 - 05/09/2000	NX9286	Glenbrae	
Pedunculate Oak	*Quercus robur*	03/09/2000 - 05/09/2000	NX921863	Glenbrae	
Pedunculate Oak	*Quercus robur*	03/09/2000 - 05/09/2000	NX921862	Glenbrae	
Pedunculate Oak	*Quercus robur*	03/09/2000 - 05/09/2000	NX922863	Glenbrae	
Pedunculate Oak	*Quercus robur*	03/09/2000 - 05/09/2000	NX923863	Glenbrae	
Scarlet Pimpernel	*Anagallis arvensis*	03/09/2000 - 05/09/2000	NX919864	Glenbrae	

Appendix C
Consultation Data – NBN Gateway

Species	Latin Name	Date	Grid Reference	Location/Habitat	Comments
Otter	*Lutra lutra*	19781129	NX913886	Clauchrie Burn at Clauchrie	
Otter	*Lutra lutra*	Between 14th May and 15th November, 1984	NX913886	Clauchrie Burn at Clauchrie	
Otter	*Lutra lutra*	Between 3rd September and 7th May, 1991	NX913886	Clauchrie Burn at Clauchrie	
Red Squirrel	*Sciurus vulgaris*	20090202	NX912903	Birswick Farm Cottage	
Red Squirrel	*Sciurus vulgaris*	20030521	NX906871	Blackwood Estate	[Number seen = 3+]
Red Squirrel	*Sciurus vulgaris*	20050915	NX905871	Blackwood Estate	Tree/habitat: broad-leaved [Number seen = 15]
Red Squirrel	*Sciurus vulgaris*	20060512	NX905870	Auldgirth, in garden	
Red Squirrel	*Sciurus vulgaris*	20060909	NX905870	on road at Blackwood, Auldgirth	
Red Squirrel	*Sciurus vulgaris*	20050116	NX907866	Blackwood Estate	
Red Squirrel	*Sciurus vulgaris*	20080916	NX912889	No site name available	RTA - same place as above. 3 Red Squirrels killed on the road near her house in the last ten days!
Red Squirrel	*Sciurus vulgaris*	20080917	NX912889	No site name available	Regular garden visitors
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1996	NX919882	Clauchrie	
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1998	NX912871	Auldgirth	
Red Squirrel	*Sciurus vulgaris*	20100626	NX915865	Auldgirth	
Red Squirrel	*Sciurus vulgaris*	Between 1st and 30th September, 1994	NX9186	No site name available	

Species	Latin Name	Date	Grid Reference	Location/Habitat	Comments
Red Squirrel	*Sciurus vulgaris*	Between 1st and 31st October, 1994	NX9186	No site name available	
Red Squirrel	*Sciurus vulgaris*	Between 1st and 30th November, 1994	NX9186	No site name available	
Red Squirrel	*Sciurus vulgaris*	Between 1st and 31st December, 1994	NX9186	No site name available	
Red Squirrel	*Sciurus vulgaris*	20050625	NX915863	Auldgirth	
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1996	NX9489	Laught Mains Wood, Cample.	
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1996	NX9589	Golf Course Wood Thornhill	
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1996	NX9588	Thornhill Church Wood.	
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1996	NX9587	Wood at Thornhill	
Red Squirrel	*Sciurus vulgaris*	Between 1st January and 31st December, 1996	NX9487	Sewage Wood, Thornhill.	

Appendix D
Phase 1 habitat survey Target Notes

Target Note Number	Grid Reference	Target Notes
1	NX 92811 88584	An area of ruderal/ semi-improved neutral grassland. This includes a fenced off area to prevent sheep grazing with species such as cock's-foot, red fescue (*Festuca rubra*), rosebay willow-herb, common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), clover (*Trifolium* sp) and greater plantain (*Plantago major).*
2	NX 92583 88447	Fenced off area within the field with a depressed section running through the centre of it. The sides of the depressed section are dry with red fescue, common bent (*Agrostis capillaris*), germander speedwell (*Veronica chamaedrys*), sweet vernal grass (*Anthoxanthum odoratum*), lesser stitchwort (*Stellaria graminea*), common sorrel (*Rumex acetosa*), wood anemone (*Anemone nemorosa*) and lady's mantle (*Alchemilla* spp). Within the depressed section there is a marshy area, with *Juncus* sp, marsh marigold (*Caltha palustris*), meadowsweet (*Filipendula ulmaria*), common sorrel, and tufted hair-grass (*Deschampsia cespitosa*).
3	NX 92929 88008	Mature stands of beech trees with open ground underneath (but very heavily grazed). High bat roost potential within tree stands. Ground flora species include common mouse ear (*Cerastium fontanum*) and small patches of common nettle. Rough meadow grass (*Poa trivialis*) is dominant.
4	NX 92752 88369	Pond and surrounding vegetation which consists of a mixture of grass species, *Juncus* sp and ruderal species including tufted hair grass, common bent, common sedge (*Carex nigra*) (O), ling heather (*Calluna vulgaris*) (O and R), foxglove (*Digitalis purpurea*) (O), rosebay willow-herb (F), soft rush *Juncus effusus*, (A) which is abundant around the bank. Bottle sedge (*Carex rostrata*) (A) is present around the pond edge.
5	NX 93068 88030	Mixed plantation woodland. Contains a majority of Douglas fir (*Pseudotsuga menziesii)* (semi-mature, ~10 years old) but rowan (*Sorbus aucuparia)*, birch (*Betula* spp) and goat willow (*Salix caprea) are* also present. Very little ground flora evident but species present include: hairy wood rush (*Luzula pilosa*) (F), Yorkshire fog (*Holcus lanatus*) (A), bracken (*Pteridium aquilinum*) (LA) rosebay willow-herb (LA), creeping buttercup (*Ranunculus repens*), soft rush is present along track, common nettle (F), greater plantain (F), *Viola* spp (O), sweet vernal grass (F), yellow pimpernel (*Lysimachia nemorum*) (O), bugle (*Ajuga reptans*), (O), tormentil (*Potentilla erecta)* (R), ling heather (R), broom (*Sarothamnus scoparius*) (O).
6	NX 93110 87854	The presence of birch woodland increases closer to the Pennyland Burn and the habitat appears more natural but still of plantation origin. A border of marshy ground is present 10m before dense woodland. Plant species include opposite leaved golden saxifrage (*Chrysosplenium oppositifolium*), primrose (*Primula vulgaris*) (O) and meadowsweet.
7(1)	NX 92747 88366	Marshy area bordering the pond. Contains species such as soft rush (A), rosebay willow-herb, sweet vernal grass (F), common sorrel (F), common nettle (LF), Yorkshire fog (A), meadowsweet, tufted hair grass (F) and creeping buttercup (F).
8	NX 92747 88322	Mature Douglas fir plantation
9	NX 93192 88633	Woodland changes to birch plantation (D) but other broad-leaved species present including willow (*Salix* sp.) species.
10	NX 93156 88767	Douglas fir plantation along Pennyland Burn.

Target Note Number	Grid Reference	Target Notes
11	NX 93203 88263	Previously felled area but with new coniferous plantation (~5 years old). The ground within the plantation is still quite open and the ground flora includes rosebay willow-herb (LD), common bent (A), soft rush (A) and tufted hair grass (F). Stumps of the older plantation still remain along with brash. Good reptile habitat. Some broad-leaved plantation is present along Pennyland Burn e.g. oak (*Quercus* spp) and birch ~ 5 years old).
12	NX 93176 88940	Several willow stands along Pennyland Burn. Habitat is marshy with plant species such meadowsweet (A), soft rush (A), water avens (*Geum urbanum*) (O), great wood rush (*Luzula sylvatica*) (O), stitchwort (*Stellaria* spp) (F) and sweet vernal grass present along burn margins where it is level.
13	NX 92913 88968	Mature coniferous plantation
14	NX 92574 88761	Previously felled area on hillside which forms part of clay pigeon shooting area. Plant species include red fescue (A), bracken (F-A), male fern (*Dryopteris filix-mas*) (O), foxglove (R), soft rush (F) present on flat ground, Yorkshire fog (A), carnation sedge (*C. panacea*) (O), heath bedstraw (*Galium saxatile*) and sweet vernal grass (A) are abundant on the hillside. Habitat is marshy within the areas of level ground and at bottom of hillside along the ditch. This area is assumed to be re-planted with conifers in the future.
15	NX 92410 88507	Mature of line of beech trees.
16	NX 92394 88430	New coniferous plantation along track. Habitat similar to that described in TN 11.
17	NX 92359 88464	New coniferous plantation (as in TN 11). Plant species include common sedge, tormentil (A), heath bedstraw, ling heather (O-R). Good adder habitat.
18	NX 92264 87963	Track running through semi-mature sitka spruce (*Picea sitchensis)* plantation woodland. The area contains a vegetated dry ditch. Plant species include ling heather (A), Hair moss species (*Polytrichium* sp) (F), red fescue (F), tormentil and broom (R).
19	NX 92214 87975	Broad-leaved plantation woodland. Tree species present includes oak, rowan, sycamore (*Acer pseudoplatanus*) and ash (*Fraxinus excelsior*). Plant species present includes red fescue (A), heath bedstraw (A), rosebay willow-herb (O), (bracken (LA), ling heather (O) and tormentil (O).
20	NX 92356 88034	Semi-mature coniferous plantation woodland. Vegetated margin present between coniferous woodland edge and adjacent fields of ~4m in width. Plant species present includes cock's foot (F), common sorrel (F), and rough meadow grass (F).
21	NX 92102 87908	Young stand of coniferous plantation woodland.
22	NX 92177 87867	Small area of broad-leaved plantation woodland (~50m x 20m) with only a small number of trees. This adjoins the larger coniferous plantation woodland.
23	NX 92159 87813	Coniferous plantation woodland
24	NX 92182 87764	Ruderal vegetation dominated by rosebay willow-herb. Some scattered trees including elder (*Sambucus nigra*) and willow species. Ground flora includes red campion (*Silene dioica)* (R).
25	NX 92299 87750	Coniferous plantation woodland with broad-leaved stands at the edge. Broad-leaved species include rowan. oak and sycamore, all present in varying ages.
26	NX 92438 87784	Small triangular area of broad-leaved plantation woodland at the corner of the coniferous plantation. Species include young stands of ash and willow. Ground flora includes rosebay willow-herb (A) and bracken (A).
27	NX 92572 87772	Ditch running along track. Ground flora includes perennial rye-grass (*Lolium perenne*), Yorkshire fog, pignut (*Conopodium majus*) creeping buttercup, raspberry (*Rubus idaeus*) and rosebay willow-herb.

Target Note Number	Grid Reference	Target Notes
28	NX 92554 87758	Small triangle of neutral grassland – Ground flora includes sweet vernal grass, Yorkshire fog, rosebay willow-herb, soft rush (R), pignet and rough meadow grass (F),
29	NX 92594 87752	Small area of mature broad-leaved plantation with poplar (*Populu*s spp) woodland with beech stands present also.
30	NX 92724 87610	Semi mature coniferous plantation woodland
31	NX 92781 87479	Semi-improved grassland/ruderal habitat. Plant species present includes rosebay willow-herb (LD) with soft rush, sweet vernal grass (F), creeping buttercup, germander speedwell, tufted hair grass (O), common bent (O) and creeping thistle (*Cirsium arvense*) (O).
32	NX 92846 87417	Coniferous plantation woodland
33	NX 92908 87447	Felled areas which have been replanted with immature Sitka spruce (~ 2 years old). Some scattered birch stands present. Plant species present includes rosebay willow-herb (LD), bracken (A), tufted hair grass and cock's foot (A).
34	NX 93046 87467	Plantation woodland along watercourse consisting of grey willow (D), aspen (*Populus tremuloides*) (O), alder (*Alnus glutinosa*) (O), rowan (O), birch (A).
35	NX 93057 87730	Mature Douglas fir
36		Mixed plantation woodland containing sitka spruce, silver birch (*Betula pendula*) and grey willow.
37	NX 92740 88139	Coniferous plantation woodland
38	NX 92808 88307	Mixed plantation woodland. sitka spruce located on western side of plantation (~10-20 years old). On eastern side species such as willow, birch (F), aspen and rowan are present. Plant species include red fescue (A) in open areas, bracken (A), heath bedstraw (A), rosebay willow-herb (F) and sweet vernal grass (O).
39	NX 92783 87933	Broad-leaved plantation comprised of alder trees located at edge of the woodland area. Stream bisects the woodland with willow, birch and alder bordering it for its entirety. Ground flora includes rough meadow grass (D), creeping buttercup and common nettle (LA).
40	NX 92538 88124	Open area of semi-improved neutral grassland. Plant species present include rosebay willow-herb (LF), pignut (R), cock's foot (F), red fescue (A), common nettle (LD), common bent (F) and bracken (LF).
41	NX 92469 88107	Open area of semi-improved neutral grassland. Species present include cock's foot, common vetch (*Vicia sativa*), germander speedwell, creeping buttercup (O), smooth meadow grass (*P. pratensis*) (A) and common nettle (LF).
42	NX 92412 88147	Broad-leaved plantation woodland (~ 10 years old). Tree species present are birch, rowan, aspen, oak.
43	NX 92405 88086	Broad-leaved plantation woodland with tree species such as ash, rowan and blackthorn (*Prunus spinosa*) present.

Table notes here

Appendix E
Botanical Records – Species List

Species	Latin Name
Alder	*Alnus glutinosa*
Ash	*Fraxinus excelsior*
Aspen	*Populus tremuloides*
Beech	*Fagus sylvatica*
Birch	*Betula spp*
Blackthorn	*Prunus spinosa*
Bottle sedge	*Carex rostrata*
Bracken	*Pteridium aquilinum*
Broom	*Sarothamnus scoparius*
Bugle	*Ajuga reptans*
Carnation sedge	*Carex panacea*
Clover	*Trifolium spp*
Cock's-foot	*Dactylis glomerata*
Common bent	*Agrostis capillaris*
Common sorrel	*Rumex acetosa*
Common sedge	*Carex nigra*
Common vetch	*Vicia sativa*
Common mouse ear	*Cerastium fontanum*
Common nettle	*Urtica dioica*
Creeping buttercup	*Ranunculus repens*
Douglas fir	*Pseudotsuga menziesii*
Elder	*Sambucus nigra*
Foxglove	*Digitalis purpurea*
Germander speedwell	*Veronica chamaedrys*
Goat willow	*Salix caprea*
Great wood rush	*Luzula sylvatica*
Greater plantain	*Plantago major*
Hair moss species	*Polytrichium spp*
Hairy wood rush	*Luzula pilosa*
Heath bedstraw	*Galium saxatile*

Species	Latin Name
Lady's mantle	*Alchemilla spp*
Lesser stitchwort	*Stellaria graminea*
Ling heather	*Calluna vulgaris*
Marsh marigold	*Caltha palustris*
Meadowsweet	*Filipendula ulmaria*
Male fern	*Dryopteris filix-mas*
Opposite leaved golden saxifrage	*Chrysosplenium oppositifolium*
Oak	*Quercus spp*
Perennial rye-grass	*Lolium perenne*
Pignut	*Conopodium majus*
Poplar	*Populus spp*
Primrose	*Primula vulgaris*
Raspberry	*Rubus idaeus*
Red campion	*Silene dioica*
Red fescue	*Festuca rubra*
Rosebay willow-herb	*Epilobium angustifolium*
Rough meadow grass	*Poa trivialis*
Rowan	*Sorbus aucuparia*
Rush species	*Juncus sp*
Silver birch	*Betula pendula*
Sitka spruce	*Picea sitchensis*
Smooth meadow grass	*P. pratensis*
Soft rush	*Juncus effusus*
Stitchwort	*Stellaria spp*
Sweet vernal grass	*Anthoxanthum odoratum*
Sycamore	*Acer pseudoplatanus*
Tormentil	*Potentilla erecta*
Tufted hair-grass	*Deschampsia cespitosa*
Violet sp	*Viola sp*
Water avens	*Geum urbanum*
Willow species	*Salix sp*
Wood anemone	*Anemone nemorosa*
Yellow pimpernel	*Lysimachia nemorum*
Yorkshire fog	*Holcus lanatus*

Appendix F
Site Photographs (Protected and Notable Species Surveys)

December 2011
Doc Reg No. 27846/D040/rr017i1

Photograph 1 – Squirrel feeding signs in Muirstraploch Wood

Photograph 2 – Otter spraint on rock in Pennyland Burn (TN3)

Photograph 3 – Potential squirrel drey in Muirstraploch Wood (TN10)

Appendix G
Protected and Notable Species Target Notes

Target Note Number	Grid Reference	Target Note Type and Details
1	NX 93128 87779	Otter Otter spraint near watercourse
2	NX 93108 87650	Otter Otter spraint near watercourse
3	NX 93181 88802	Otter Otter spraint on rock in watercourse. Dry, old and fragmented
4	NX 93174 88723	Otter Otter spraint near watercourse.
5	NX 92708 88619	Red Squirrel Two live red squirrels identified in traps within Muirstraploch wood.
6	NX 92511 88578	Squirrel Two potential squirrel dreys in two separate trees within close proximity to one another.
7	NX 92626 88597	Squirrel One potential squirrel drey.
8	NX 92578 88562	Squirrel One potential squirrel drey.
9	NX 92523 88558	Squirrel Squirrel feeding signs
10	NX 92572 88557	Squirrel Squirrel feeding signs
11	NX 92698 88601	Squirrel One potential squirrel drey
12	NX 92760 88625	Squirrel One potential squirrel drey
13	NX 92778 88640	Squirrel One potential squirrel drey
14	NX 92702 88689	Squirrel Squirrel feeding signs

Appendix H
HSI Score

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Pond	Location	Pond Area	Pond Drying	Water Quality	Shade (%)	Fowl	Fish	Ponds	Terrestrial Habitat	Macro-phytes (%)	HSI Score
1	0.01	0.9	0.9	0.67	1	0.67	0.33	0.1	0.67	0.9	0.39

Appendix I
Amphibian Survey Results

Table 3.1 Bottle Trap Survey Results

Survey Visit Number	Date of Survey	Night Air Temp (degrees Celcius)	Turbidity (0-5)	Veg Cover (0-5)	Traps In	Traps Out	Male Newts	Female Newts	Larva	Other
1	04-05 May 2011	15.6	1	3	20:30	09:30	Palmate – 15	Palmate 6	0	Toad tadpoles, leeches and diving beetles..
2	11-12 May 2011	13.0	2	3	19:40	09:00	Palmate – 20	Palmate – 4	0	n/a
3	01-02 June 2011	18.1	1	2	20:10	09:30	Palmate – 10 Smooth – 1	Palmate – 12 Smooth - 3	0	Water boatman, leeches, diving bettles, water snail and unidentified invertebrates.
4	02-03 June 2011	22.9	1	2	21:00	09:30	Palmate – 8	Palmate – 3	0	Frog and toad tadpoles, water boatmen, leeches and diving beetles.

Table 3.2 Torch Survey Results

Survey Visit Number	Date of Survey	Night Air Temp (degrees Celcius)	Turbidity (0-5)	Veg Cover (0-5)	Water Temp (degrees Celcius)	pH of water	Male Newts	Female Newts	Larva	Other
1	04 May 2011	15.6	1	3	13.0	7	Palmate – 1	0	0	Small fish (unidentified), tadpoles, leeches.
2	Not completed									

Survey Visit Number	Date of Survey	Night Air Temp (degrees Celcius)	Turbidity (0-5)	Veg Cover (0-5)	Water Temp (degrees Celcius)	pH of water	Male Newts	Female Newts	Larva	Other
3	Not completed									
4	Not completed									

Table 3.3 Egg Search Survey Results

Survey Visit Number	Date	Night Air Temp (degrees Celcius)	Turbidity (0-5)	Veg Cover (0-5)	Egg Present
1	04-05 May 2011	15.6	1	3	No
2	11-12 May 2011	13.0	2	3	No
3	01-02 June 2011	18.1	1	2	No
4	02-03 June 2011	22.9	1	2	No

Table 3.3 Netting Survey Results

Survey Visit Number	Date	Night Air Temp (degrees Celcius)	Turbidity (0-5)	Veg Cover (0-5)	Male Newts	Female Newts	Larva	Other
1	04-05 May 2011	15.6	1	3	Palmate – 1	0	0	Diving beetles, tadpoles, caddis fly, leeches.
2	11-12 May 2011	13.0	2	3	0	0	0	Diving beetles, caddis fly, leeches.

Survey Visit Number	Date	Night Air Temp (degrees Celcius)	Turbidity (0-5)	Veg Cover (0-5)	Male Newts	Female Newts	Larva	Other
3	01-02 June 2011	18.3	1	2	0	0	0	0
4	02-03 June 2011	22.9	1	2	Palmate – 1	0	0	0

December 2011
Doc Reg No. 27846/D040/rr017i1

Appendix 6.2: Bat Survey Report

Force 9 Energy LLP

Blackwood Wind Farm

Appendix 6.2 - Baseline Bat Report



AMEC Environment & Infrastructure UK Limited

December 2011

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Force 9 Energy LLP

Blackwood Wind Farm

Appendix 6.2 - Baseline Bat Report

AMEC Environment & Infrastructure UK Limited

December 2011

Certificate No. FS 13881

Certificate No. EMS 69090

Executive Summary

Purpose of this Report

This report has been produced for the purpose of providing Force 9 Energy LLP (Force 9 Energy) with details of the methods and results of the bat surveys undertaken by AMEC Environment and Infrastructure UK Ltd (AMEC) and Echoes Ecology at Blackwood between May and October 2011. The information contained within this report could be used to inform the detailed assessment of predicted impacts and effects on bats which would be presented in an Environmental Statement (ES). This report could also be used as a consultation document in any subsequent communications with Scottish Natural Heritage (SNH) and other key stakeholders

Contents

1. Introduction

1.1 Background

Force 9 Energy LLP (Force 9 Energy) is investigating the opportunity to develop a local scale wind farm at a site near Auldgirth, Dumfries and Galloway on behalf of EDF Energy Renewables (EDF). The site is located 15km north of at NX 92831 88520, at land which forms part of the Blackwood estate, hereafter referred to as Blackwood. AMEC Environment and Infrastructure UK Ltd (hereafter referred to as AMEC) was commissioned to undertake surveys on behalf of RSK Environmental Ltd (hereafter referred to as RSK) for the proposed development at Blackwood and this report details the results of the findings. AMEC undertook bat surveys with the assistance of Echoes Ecology. The results of the bat surveys are presented in this report which includes the results of a desk study and a detailed assessment of the potential for trees and/or buildings to contain bat roosts and the overall assessment of bat activity.

1.2 site Description

The proposed Blackwood wind farm is located in Nithsdale at High Auldgirth, Near Auldgirth, Dumfries and Galloway, approximately 15km north of Dumfries. The site location and boundary are shown in Figure 1.1 of the ES and the habitats present within the site are described in Appendix 6.1 (Baseline Ecology Survey Report) and in Figure 6.1 of the ES.

The site is bordered to the north by extensive coniferous woodland (Clauchrie Plantation), to the east by Fern Hill and Dalswinton Wind Farm, to the west by Low Auldgirth and to the south by Mullach Hill. The settlement of High Auldgirth lies within the south western corner of the site boundary. The land proposed for the wind farm development is under single ownership.

The site consists primarily of arable land and rough, semi-improved grassland which contain grazing livestock. Areas of conifer plantation are present on site (e.g. at Muirstraploch Wood, around the pond at NX 92757 88376,and along Pennyland Burn). Pennyland Burn is the principle watercourse and there are a number of small ditches and unnamed burns within the site, all of which ultimately drain into the River Nith.

1.3 site Design

At the bat survey planning stage the design of the proposed development envisaged a layout which included five operating wind turbines and associated infrastructure, but the locations the turbines had not been confirmed. At the time of writing of this report, a design freeze had been confirmed on the number and location of the proposed turbines and these are shown in Table 1.1. While the choice of turbine design remains unknown, it is anticipated that each of the five proposed turbines will have a capacity of up to 2.05 MW, to provide a total capacity of up to 10.25MW. Three of the proposed turbines (turbines 1, 3 and 5) would have an approximate height to tip of 140m

while turbines 2 and 4 two would be approximately 120m to tip. Turbines are likely to be installed on reinforced concrete foundations.

Although existing tracks will be upgraded and integrated into the wind farm access infrastructure a new access track will be necessary during the construction and operation of the proposed development. At the time of writing the final route of the proposed access track had not been confirmed however survey work was undertaken on the basis of the design that was proposed in August 2011 with an access to the turbines from the south west near Keeper's Cottage which would bisect agricultural land and some woodland areas within the site boundary. The development layout is shown in Figure 3.2.

Table 1.1 Proposed Turbine Locations

Turbine Number	Grid Reference
1	NX 93077 89093
2	NX 92788 88590
3	NX 93096 88655
4	NX 92876 88283
5	NX 93061 88116

1.4 Legislation

All bat species in Scotland are afforded legal protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended[1]). Any feature used by bats (a European Protected Species [EPS]) for shelter or protection is considered to be a roost. The legislation affords protection to bats during all stages of their life cycle and does not distinguish between an unoccupied or occupied roost. As an EPS, the maintenance of bats at their favourable conservation status (FCS) is a legal requirement and impacts on the FCS of local bat populations should be assessed as part of any impact assessment.

Soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared bat (*Plecotus auritus*), and noctule (*Nyctalus noctula*) are listed as Priority Species on the UK Biodiversity Action Plan (BAP)[2], meaning that they each have individual Species Action Plans (SAPs) written to aid conservation action for these species.

The Scottish Biodiversity List (SBL)[3] is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. Bat species which are listed in the SBL are soprano pipistrelle, bandit pipistrelle (*P. pipistrellus*), Nathusius' pipistrelle (*P. nathusii*), Daubenton's bat (*Myotis*

[1] There have been several amendments to the Regulations which apply only to Scotland: 2004, 2007, 2008(a) and 2008(b).

[2] UK BAP Priority Species http://jncc.defra.gov.uk/page-5170 [Accessed 10/10/2011]

[3] Scottish Biodiversity List http://www.snh.gov.uk/protecting-scotlands-nature/biodiversity-scotland/scottish-biodiversity-list/ [Accessed 10/10/2011]

daubentonii), Natterer's bat, (*M. nattereri*), whiskered bat (*M. mystacinus*), Brandt's bat (*M. brandtii*), brown long-eared bat and noctule

At a local level, Dumfries and Galloway Local Biodiversity Action Plan (LBAP) sets out objectives for the conservation of species. Included on the most current Dumfries and Galloway LBAP (2009)[4] as priority species for local conservation are all eight species of bat found in this region namely, soprano pipistrelle, bandit pipistrelle, Daubenton's bat, Natterer's bat, whiskered bat, noctule, Leisler's (*N. leisleri*) and brown long-eared bat.

[4] Dumfries and Galloway Local Biodiversity Action Plan (2009). Published by Dumfries and Galloway Biodiversity Partnership.

2. Methods

2.1 Desk Study

A desk study was undertaken to collate information regarding the likely presence of bat species within the consultation boundary (as shown in Figures 3.1 and 3.2), including UK BAP priority species, Dumfries and Galloway LBAP priority species and SBL species.

Dumfries and Galloway Environmental Resources Centre (DGERC) was contacted for records regarding local species records within 12km of the consultation boundary following referral from Dumfries and Galloway Bat Group.

Sitelink[5], Scottish Natural Heritage's (SNH's) interactive website and the National Biodiversity Network (NBN) Gateway[6] interactive website was used to gather information on the location of bat records within 15km of the consultation boundary.

2.2 Field Surveys

2.2.1 Overview

The primary objective of the series of bat surveys in 2011 was to identify the use or likely use of the bat survey area by bats throughout the active season in order to allow for an assessment of the potential impacts of the proposed development on the bat species present. In line with the new Bat Conservation Trust (BCT) Guidelines[7] (hereafter referred to as "2011 BCT Guidelines") for surveying for onshore wind farms, efforts were focussed on identifying the areas within the bat survey area where roosts were likely to occur and to identify landscape and habitat features which may be used by bats for commuting and foraging. Surveys aimed to identify the bat species assemblage using the core bat survey area throughout the active season, and in turn to identify the presence of high, medium and low risk species, as categorised in the Interim Guidelines (Natural England, 2009)8. Surveys also aimed to categorise the use of the bat survey area by bats e.g. roosting, foraging, and commuting on a spatial and temporal level, including the distribution of each species across the bat survey area. SNH commented on the proposed methods for the completion of the bat surveys within the site (included in the Blackwood Wind Farm

[6] sitelink http://gateway.snh.gov.uk/sitelink/ [Accessed 16/09/2011]

[6] NBN Gateway http://data.nbn.org.uk/ [Accessed 07/10/2011]

7 BCT (2011) Surveying for Onshore Wind Farms. Bat Surveys – Good Practice Guidelines. 2nd Edition.

8 Natural England (2009) Natural England Technical Information Note TIN051 Bats and Onshore Wind Turbines. Interim Guidance.

Scoping Request, 2011[9]) in their Scoping Opinion (received from Beth Wilson, SNH Operations Officer for Dumfries and Galloway, dated 28/06/2011). Their recommendations were incorporated into the surveys methods in combination with best practice guidelines[10] and the results received from the desk study.

Using the 2011 BCT Guidelines the following assessment was made with regards to the design and planning of surveys within the Blackwood site:

- Quality of habitat – medium-high survey effort required;
- Number of turbines – medium survey effort required initially (due to five turbines being proposed);
- Species likely to use the site – medium-high survey effort required; and
- Known roosts locally – low-medium (no known roosts within the vicinity of the site).

Taking a precautionary approach using the above evaluation and the consultation responses from SNH, the survey strategy was designed for 2011. Surveys at height were not completed due to there not being any available structures suitable for affixing detectors.

2.2.2 Survey Area

Targeted bat surveys were carried out within parts of the site as follows:

Bat roost suitability surveys were undertaken at features likely to be affected by the development within the bat survey area boundary. The bat survey area includes a large area in the north eastern part of the site and is shown in more detail in Figure 3.3. Manual emergence/re-entry surveys were carried out on those features within this area that were identified as having the highest likelihood of bats being present.

Manual bat activity and static Anabat detector surveys were undertaken within the core bat survey area which covers the main area where the proposed wind turbines and site infrastructure is located. The core bat survey boundary is shown in detail in Figures 3.4 – 3.11.

In addition, trees outwith the core bat survey area but within the site boundary which may be affected by the construction or operation of the proposed new access track were assessed for their roosting, foraging and commuting potential. This area appears in more detail in Figure 3.3.

2.2.3 Bat Roost Suitability Survey

A daytime roost assessment survey was undertaken on 23-24 August 2011 by AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc (trainee bat worker) and AMEC Senior Consultant Claire Hopkins BSc (Hons), MSc (SNH Licence Number 12067). The surveys aimed to identify the potential for bats or bat roosts within the trees and built

[9] RSK (2011) Dumfries and Galloway Wind Farm Scoping Request.

[10] BCT (2007) Bat Surveys – Good Practice Guidelines.

structures in order to determine the requirement for additional survey effort. Only trees, woodland and buildings likely to be directly affected by the proposed development were initially included in this assessment. Individual trees and built structures were examined externally and internally - where access was safe and possible - for signs of bats and potential access points, following best practice guidelines (BCT, 2007) and using a powerful torch and binoculars. Structures were assigned a category of having high, medium or low bat roost potential and thorough surveys were completed on trees/structures/woodland areas of medium-high bat roost potential. Surveys were undertaken for features indicative of the presence of a bat roosts e.g. audible squeaking, staining, droppings, scratch marks, smoothing around the access point, etc. Potential access points were noted, including aspect, height and characteristics (where possible) including natural holes, cracks, splits, elbow holes in branches, woodpecker holes, hollows and cavities, the presence of deadwood, bat boxes, heavily vegetated structure, etc. All results were recorded and a Global Positioning System (GPS) was used to record each location.

Additional surveys were undertaken on 24 August 2011 on trees located within 100m of the proposed access track.. Trees were assessed in accordance with the methods outlined above.

2.2.4 Manual Bat Activity Transect Surveys

To investigate the use of the core bat survey area by bats during the active season, particularly for foraging and commuting, monthly manual bat activity transect surveys were competed by Echoes Ecology, an independent locally-based ecological consultant which specialises in bat surveys, as instructed by AMEC.

Standard methods and best practice guidelines were followed for the completion of the surveys, where one predetermined transect route was walked to record the presence of commuting and foraging bats (see Figure 3.4). The transect route was chosen because it covers all habitat types within the core bat survey area. A description of the transect route is provided in Table 2.1. GPS points were used within each transect to act as navigational aids to ensure that each transect was completed in a similar manner. Some deviation was necessary from the set route due to health and safety issues e.g. boggy ground, the presence of livestock.

One bat activity transect survey was completed per month on the following dates: 11 May 2011 (dusk survey), 14 June 2011 (dusk survey), 13 July 2011 (dawn survey), 08 August 2011 (dusk survey), 05 September 2011 (dusk survey) and 18 October 2011 (dusk survey). Each survey team consisted of two surveyors who walked in pairs throughout the survey. Transects were walked in varying directions throughout the survey period to take into account variations in species composition and usage of the core bat survey area and times of emergence/re-entry. A combination of dusk and dawn surveys was completed over the survey period since bats can often be back-tracked to roosts. Each survey began at sunset at lasted approximately 2.5hours with surveyors walking at a continuous and steady pace, stopping only to record bat activity. At the beginning of each manual bat activity transect survey, the time of sunset/sunset, and weather and environmental parameters were recorded (Appendix D). Surveyors used hand held bat detectors (frequency division and heterodyne e.g. Bat Box Duet) which were connected to a suitable recording device (Edirol or Zoom recorders) to allow for continuous recording of information during the survey period. A GPS position was recorded for each bat pass. Desk-based analysis was then completed on each recorded file using the relevant software programme e.g. Analook, Bat Sound, Bat Scan, to confirm the bat species present and to investigate the number of individual passes recorded along with behaviour e.g. commuting, feeding buzzes, and social calls.

Table 2.1 Transect Description

Transect Length: ~6km

Areas Covered by the survey:

Grassland, coniferous plantation woodland, standing water, woodland edge habitat, recently felled and replanted woodland, sloping hill sides which descend into the sheltered valley containing Pennyland Burn, along the Pennyland Burn, mature broad-leaved woodland at the top of Lambrig Wood, down the slope along the woodland edge and return along western edge of the core bat survey area along the woodland boundary.

2.2.5 Bat Emergence/Re-entry Surveys

Bat activity surveys at identified features with medium-high roost potential were undertaken at dusk (emergence survey) and dawn (swarming/re-entry survey) using a combination of visual observation and ultrasound detection techniques during September 2011. Heterodyne recordings of bat calls produced by bat detectors in combination with suitable recording equipment were analysed in the field by Echoes Ecology ecologists to identify all bat species emerging and re-entering or flying within the wider area (Appendix D). As with the manual activity transect surveys, the recordings were also analysed on return to the office to confirm the species present and to allow for continuous recording throughout the survey period.

Emergence and re-entry surveys were completed at the cottages at High Auldgirth (Numbers 1-4), the Keeper's Cottage and associated outbuildings at the complex of outbuildings to the south of High Auldgirth and within the broad-leaved woodland at Knocknutshell Wood in line with best practise guidelines (BCT, 2007). Each building and woodland area was surveyed from at least 20 minutes before sunset to approximately two hours after sunset. For dawn re-entry surveys, the structure was monitored from approximately two hours before sunrise until at least 20 minutes after sunrise. (See Table 3.2 for times of sunset and sunrise)

Surveyors were either stationed adjacent to locations where bats were likely to emerge from or re-enter roosts or at specific locations around the building or woodland area that provided good vantage points for surveyors, allowing surveyors to observe bats and manually record bat activity. The time of bat emergence/re-entry, the location of emergence/re-entry and the behaviour of bats, including the direction of flight and any foraging, social, commuting or patrolling behaviours was recorded. Where behaviour could not be categorised or the bat could not been seen, activity was recorded as a sighting/bat pass.

Surveys completed at each feature are shown in Table 2.2~~Table 2.2~~ and details of weather conditions and sunset/sunrise times are shown in Table 3.1.

Table 2.2 Dates of Emergence and Re-Entry Surveys

Anabat Survey Location	Emergence Survey Date	Re-entry Survey Date
High Auldgirth	08 September 2011	09 September 2011 29 September 2011
Keeper's Cottage and outbuildings	08 September 2011 28 September 2011	09 September 2011

Outbuildings at High Auldgirth	21 September 2011 28 September 2011	22 September 2011
Knocknutshell Wood	21 September 2011	22 September 2011

2.2.6 Static Detector Surveys at Ground Level using SD2 Anabat Detectors

Following recommendations in the 2011 BCT Guidelines, static detector surveys were completed in combination with manual bat activity transect surveys as the minimum level of survey effort required at a multi turbine wind farm site. The 2011 BCT Guidelines recommend that the static detectors be placed "*throughout the developable area, including all turbine locations if known or fixed, plus additional locations identified as features that may be used by bats for comparison*". Individual static detectors (Anabat SD2 CF bat detectors) were deployed simultaneously in four different fixed locations within the core bat survey area to remotely monitor bat activity throughout the active season. The descriptions of detector locations are shown in Table 2.~~Table 2.~~3. All detectors were housed in specially supplied Peli cases for security and protection against damage, which does not affect their efficacy to detect bat activity. Detectors were located in varying environments to allow for comparison to be made between open area and areas with suitable bat features. (see Figure 3.11 for static detector survey locations). All detectors were directed at an angle of 45 degrees across the feature of interest i.e. perpendicular to a landscape feature such as watercourse, tree lines and woodland edges. This was to record bats flying along linear features to assess its use as a commuting route or foraging area.

Static detector surveys were undertaken and supervised by experienced AMEC Consultant Ecologists Rachel Finan BSc (Hons) MSc (trainee bat worker) and Jenny Sneddon BSc (Hons) MSc MIEEM.

Table 2.3 Static Detector Survey Locations

Anabat Survey Location	Grid Reference	Location Description
Location 1	NX 93214 88244	Along Pennyland Burn. The detector was placed on top of the stone wall which formed the eastern boundary to the core bat survey area. Pennyland Burn flows underneath the stone wall at this location within the sheltered valley.
Location 2	NX 92754 88340	Pond. The detector was placed along the southern boundary of the pond facing over the water. It was located within 2m of the woodland edge.
Location 3	NX 92983 87478	Within the conifer plantation. This location was within a narrow strip of mature coniferous plantation woodland through which a tributary of the Pennyland Burn flowed. The detector was placed within 3m of the woodland edge in an area of trees where the canopy was open.
Location 4	NX 93016 89060	Along stone wall boundary and conifer plantation woodland. Detector was placed on top of the stone wall facing out from the woodland.

Static detector surveys were completed monthly between June and September on the following dates: 14-17 June 2011 (deployed for three nights), 27-31 July 2011 (deployed for five nights), 03-08 August 2011 (deployed for five nights) and 28 September – 02 October 2011 (deployed for five nights). Each detector was set to activate one hour before sunset and to continue recording until one hour after sunrise. The sampling time of five consecutive nights per month was deemed an appropriate amount of survey effort given the site was assessed as being medium risk and with five proposed turbine locations, as indicated in the 2011 BCT Guidelines.

Anabat detectors are automatically set to record once triggered by ultrasonic noise during the recording period. The data are saved onto formatted compact flash (CF) cards within the device. Call files may be up to 15 seconds long and contain calls of more than one bat and more than one bat species. However, the Anabats are set up only to record if two bat calls are detected within a default setting of 5 seconds i.e. if only one call is detected within this time, then no call file will be saved. If more than two calls are detected within 5 seconds, a call file will be saved. CF cards are removed from the Anabat detectors and the data are downloaded in the office to allow for analysis using specialist software (AnaLook). The data analysis was completed by a specialist subcontractor, David Dodds Ecology, under the supervision of AMEC. For the purposes of this report, each call file analysed is assessed as being one bat pass. Where more than one species is recorded within the same call file, these are analysed separately so that one pass of each individual species is recorded.

The data collected were then used to estimate relative bat activity both on and across the core bat survey area. Monthly, nightly and where possible, i.e. when enough data were collected, hourly assessments were made.

Bat activity was estimated using: Bat Activity Index (BAI) = bat passes/unit time, as specified by the 2011 BCT Guidelines. This then allowed for interpretation of the data e.g. regarding nightly activity patterns of different species, nightly patterns at different areas within the core bat survey area, relative levels of at activity across the month etc. The BAI was calculated for each night and each hour of successful data collection during each month of recording and for each Anabat location therefore giving the relative bat activity at one location over the course of a recording period. The calculation of the BAI allows for comparison between Anabat locations within the core bat survey area. BAI was also calculated for each hour of recording at each location. Successful recording of bat calls varied from night to night and between locations so that the BAI was being calculated against values ranging from one to four. This allows for identification of any association between bat activity and time e.g. the levels of bat activity in the hours surrounding sunset and sunrise.

2.2.7 Weather

Weather data was recorded by surveyors at the beginning of each manual bat activity transect survey (Appendix D). As no weather recording device was deployed on site throughout the completion of the static detector surveys, data were collected from one of the main weather websites[11] and collated. Tabulated weather data are shown in Appendix C. The nearest weather station to the proposed development was located in Corsock, Kirkcudbright which is ~40km to the south west of the site, therefore, full site-specific data cannot be accurately presented here, but the referenced conditions are included in Appendix E.

[11] Weather Underground Website http://www.wunderground.com/history/airport/EGPK/ [Accessed 29/09/2011].

2.3 Survey Limitations

Daytime roost assessment surveys were limited by the timing of the surveys (August). Due to seasonality, the trees were heavily vegetated therefore making it difficult to complete a full assessment of each tree. Due to this, other features of interest, potential access points or signs of bat activity may have been missed during the surveys. However, general suitability to support roosting bats based on tree species and age led to further survey effort in the area with the highest suitability.

Because the design of the proposed access route had not been finalised at the time of survey work being undertaken, targeted bat surveys such as climb-and-inspect or manual emergence/re-entry surveys have not been carried out at trees which would be felled under the proposals. This represents a gap in the understanding of bat roost status. In addition, no attempt was made, for health and safety reasons associated with working on steep and unstable ground, to access woodland along the route of the track above Low Auldgirth.

Walked bat activity transects aimed to follow pre-determined routes on all occasions. However, this was not always possible due to the presence of livestock or deteriorating ground conditions due to adverse weather.

During each transect, surveyors recorded each bat encountered as a bat “pass”. On occasion, bat passes may refer to more than one bat at the same location, but in many instances repeated passes are likely to be the same bat. It is therefore not generally possible to discern the actual number of individual bats from bat passes, unless the surveyor is able to see the individual bats and give a definitive visual count. Therefore, bat passes are generally used as an indicator of the relative use and activity of the core bat survey area by different species of bat rather than an idea of the total number of bats present.

The full complement of surveys throughout the entire season was not completed during the emergence and re-entry surveys therefore it is possible that larger or more numerous roosts exist within these buildings but due to the time of year and the time within the lifecycle of bats during which the surveys were undertaken, these remain unidentified.

During June the detectors were only deployed for three consecutive nights of recording and at three locations (1, 2 and 3) due to subsequent survey effort being upgraded in line with the publication of the 2011 BCT Guidelines. Given that

Where static surveys were completed, the Anabat detectors did not always record for the fully allocated time due to depletion of battery power. The BAI calculated takes into account the differences in the number of nights/hours the detectors were functioning therefore providing representative figures.

The static detector used at Location 1 during the August surveys did not function correctly and therefore only two bat calls were collected for analysis. As this location consistently produced one of the highest levels of bat activity on other months it is assumed that activity levels may also have been higher at this survey location had the equipment been fully operational. The data have been included in the analyses.

A certain level of subjectivity still remains with call analysis. Where any doubt existed, call analysis was only used to identify to genus level using reputable reference material[12]. In addition, where calls could not be categorised to soprano or bandit pipistrelle due to ambiguity of call frequencies, the rare Nathusius' pipistrelle, which has a distinct frequency signature, was not encountered during any of the surveys. Therefore where a bat pass is categorised as "pipistrelle species" or "unidentified pipistrelle" the activity observed is attributable to either soprano or common pipistrelle.

[12] Russ, J (1999). The Bats of Britain and Ireland. Echolocation Calls, Sound Analysis and Species Identification.

3. Results

3.1 Desk Study

Recent published reports have detailed the presence of breeding noctule bats at Threave House NX 75294 60409, approximately 18km southwest of the consultation boundary[13].

DGERC provided bat records up to 12km from the consultation boundary using data provided to them from the Dumfries and Galloway Bat Group. DGERC returned records for bandit pipistrelle, soprano pipistrelle, unidentified *Pipistrelle* species, Daubenton's bat, Natterer's bat, brown long-eared bat and noctule along with unidentified bat species records and Chiroptera records. These records are presented in Appendix A and Figure 3.1.

Bat records were sought up to 15km from the consultation boundary using the NBN Gateway. The 15km search on NBN provided records for bandit pipistrelle, soprano pipistrelle, unidentified *Pipistrelle* species, Daubenton's bat, Natterer's bat, whiskered bat, brown long-eared bat and noctule. The records did not individually state whether record were of bat activity or roost records and the data did not state the number of individuals per record. NBN Gateway results are presented in Appendix B and Figure 3.2.

3.2 Field Surveys

3.2.1 Bat Roost Suitability Survey

The bat survey area offers numerous opportunities for roosting bats but in very localised areas. Most of the woodland areas and individual trees were assessed as containing low bat roost potential due to the age structure of the woodlands and the absence of suitable roosting features. Other areas of woodland within the bat survey area were assessed collectively as providing high bat roosting habitat potential, but as it is unlikely that they will be directly impacted by the proposals they were not investigated further.

One area of woodland within the core bat survey area was identified as meriting roost suitability surveys. The woodland identified was the area of mature broad-leaved woodland centrally located at the top of Lambrig Wood at NX 92929 88008 (See TN1, Figure 3.3)

Three building complexes were identified within and immediately adjacent to the bat survey area boundary as providing suitable roosting habitat for bats. These were the row of four cottages at High Auldgirth, the Keeper's Cottages and associated buildings (these are just outside the bat survey area and were included due to their proximity to proposed access tracks) and the outbuildings to the south of High Auldgirth. Detailed daytime building surveys were completed on all three building complexes which identified the presence of bat droppings on

[13] http://www.nts.org.uk/Downloads/Threave%20Bat%20Project%20Final%20report.pdf

some of the buildings and potential access points. Full details of the findings of the daytime bat roost suitability surveys on the buildings are included in Appendix C.

An assessment of tree roost suitability was undertaken along the route of the proposed access track (where access was safe and possible – see Survey Limitations). Individual trees along the shelterbelt running from north to south along the field boundary from NX 91536 87543 to NX 91654 87100 but within 100m of the proposed new access track were identified as containing features suitable for use by bats (Appendix C). The proposed access track route appears to enter the woodland at NX 91587 87318 which would potentially require the felling of some mature trees along the field boundary identified as containing high bat roost potential.

3.2.2 Manual Bat Activity Transect Surveys

Detailed survey results of the manual bat activity transect surveys including survey conditions, sunset times, survey times and bat activity records are provided in Appendix D and a summary of the results are provided in Table 3.1 below.

Table 3.1 Summary of Bat Activity within the core bat survey boundary at Blackwood (includes first bat pass/last bat pass per survey – survey dependent)

Species	May	June	July	August	September	October
Date Survey Type Sunset time Sunrise time	11/05/2011 Dusk survey 21:09 n/a	14/06/2011 Dusk survey 21:55 n/a	13/07/2011 Dawn survey n/a 05:03	08/08/2011 Dusk survey 21:05 n/a	05/09/2011 Dusk survey 20:00 n/a	18/10/2011 Dusk Survey 18:09 n/a
Soprano pipistrelle	7 bats 19 passes Commuting, foraging and social calling	13 bats 35 passes Commuting and foraging First bat pass: 22:21	1 bat 1 pass Commuting	1 bat 3 passes Commuting	10 bats 29 passes Commuting and foraging First bat pass: 20:25	0 bats 0 passes
Bandit pipistrelle	4 bats 8 passes Commuting and foraging First bat pass: 21:46	25 bats 70 passes Commuting and foraging	10 bats 20 passes Commuting and foraging Last bat pass: 03:54	2 bats 2 passes Commuting First bat pass: 21:32	15 bats 29 passes Commuting and foraging	0 bats 0 passes
Unidentified *Pipistrellus* species	2 bats 2 passes Commuting	8 bats 11 passes Commuting	2 bats 3 passes Commuting	0 bats 0 passes	0 bats 0 passes	0 bats 0 passes
Myotis species	1 bat 1 pass Commuting	4 bats 5 passes Commuting	0 bats 0 passes	0 bats 0 passes	2 bats 3 passes Commuting	0 bats 0 passes

Species	May	June	July	August	September	October
Total per month	14 bats 30 passes	50 bats 121 passes	13 bats 24 passes	3 bats 5 passes	27 bats 61 passes	0 bats 0 passes

Bat species identified during the manual bat activity transect surveys include: soprano pipistrelle, bandit pipistrelle and unidentified *Myotis* species (with unidentified pipistrelle species, as described in Survey Limitations). During one of the six manual bat activity transect surveys (October transect), no bats or bat passes were recorded. During the five remaining manual bat activity transect surveys, varying levels of bat activity were recorded with the highest number of bats and bat passes being recorded in June (50 bats and 121 bat passes). Bandit pipistrelle bats were the most frequently recorded species during the surveys, being recorded on five out of six of the transects and with a total of 56 bats being recorded and 129 bat passes. Thirty two soprano pipistrelle bats were recorded during five transects with a total of 89 bat passes. Sixteen recorded passes of *Pipistrelle* bats could not be identified beyond genus level and these are recorded as unidentified Pipistrelle species. Very low levels of *Myotis* species were recorded (nine passes) with one of these potentially being a Daubenton's bat but this was unconfirmed. No *Nyctalus*[14] species were identified during the manual bat activity transect surveys.

Low activity relative to the size of the core bat survey area was observed for most of the manual activity transect surveys with one main peak in activity being recorded in June. Activity levels then dropped by 80% to 24 bat passes during the July surveys which continued to decline throughout the period into the August survey. A sharp increase was again recorded during the September survey, going from five bat passes in August to 61 bat passes in September. From the activity that was recorded, the individual bat passes were detected near linear landscape features and edge habitat such as field boundaries and watercourses (see Figures 3.5. to 3.10).

On three of the five manual activity transects during which bats were recorded, the first bat pass was recorded within the first 30 minutes after sunset, two of these being recorded as soprano pipistrelle bat passes and one bandit pipistrelle bat pass. During the May transect, first contact was a soprano pipistrelle at 37 minutes after sunset. During the dawn transect on July, the last bat pass was recorded approximately 1 hour and 9 minutes before sunrise. Using this data, no inferences can be made to the likely proximity of a roost to the core bat survey area using the collected data, only that activity was being recorded within the first hour after sunset therefore roost locations are not known.

Bat activity during the manual surveys was observed to be concentrated along woodland edges and treelines, and along Pennyland Burn, where sheltered foraging and commuting habitat exists. In particular high levels of activity were recorded along the burn in June. Although transect routes were designed to follow habitat features particular concentrations of bat activity were identified where features such as juxtapositions of habitat types (e.g. between the burn and woodland) and at woodland rides exist.

[14] Due to the level of subjectivity relating to call analysis of *Nyctalus* and *Myotis* bats, they are referred to in broad terms within their genus rather than to specific species. This is not a problem, given that the species within these genera belong to the same risk categories in terms of wind turbine collisions.

3.2.3 Bat Emergence/Re-entry Surveys

The results of the emergence/re-entry surveys are shown in Appendix E and summarised in Table 3.2 below.

All three of the building complexes surveyed during the emergence/re-entry survey period were confirmed to contain roosts as bats were recorded entering or leaving. Soprano pipistrelle, bandit pipistrelle, unidentified pipistrelle, a possible Myotis bat and probable brown long-eared bat were recorded roosting as shown in Table 3.2. None of the results indicated the presence of sensitive maternity roosts, based on the small numbers of bats recorded. However 3 commuting passes by *Nyctalus* bats were recorded and high levels of foraging, commuting and social calling in pipistrelles were also observed.

No bat roosts were identified during the emergence/re-entry surveys within Knocknutshell Wood.

Table 3.2 Echoes Ecology Emergence Survey Data

Building/Woodland	**08/09/2011** **Sunset 19:53**	**09/09/2011** **Sunrise 06:34**	**21/09/2011** **Sunset 19:19**	**22/09/2011** **Sunrise 06:57**	**28/09/2011** **Sunset 19:01**	**29/09/2011** **Sunrise 07:10**
High Auldgirth Cottages Numbers 1-4	Dusk Emergence Confirmed emergence. Emergence from the rear (south facing) of cottage No. 2 Species: Soprano pipistrelle.	Dawn Re-entry No confirmed re-entry.	n/a	n/a	n/a	Dawn Re-entry Confirmed re-entry Two roost access points were confirmed. Species: Soprano and bandit pipistrelle
Keepers Cottage and associated buildings	Dusk Emergence Confirmed emergence. One bandit pipistrelle emerged from the south-facing roof of the farm house. Species: Bandit pipsitrelle	Dawn Re-entry No confirmed re-entry.	n/a	n/a	Dusk Emergence Confirmed emergence Three roost access points were confirmed during the survey Species: Soprano pipistrelle and *Myotis* species.	

Building/Woodland	08/09/2011 Sunset 19:53	09/09/2011 Sunrise 06:34	21/09/2011 Sunset 19:19	22/09/2011 Sunrise 06:57	28/09/2011 Sunset 19:01	29/09/2011 Sunrise 07:10
Outbuildings next to High Auldgirth	n/a	n/a	Dusk Emergence Confirmed emergence. Emergence from over the wallhead on the west facing side of the small stone shed at the south end of the outbuildings Species: Soprano pipistrelle and probably brown long-eared	Dawn Re-entry Confirmed re-entry. Three confirmed bat roosting locations were observed Species: Soprano and unidentified pipistrelle.	Dusk Emergence Confirmed emergence. Four confirmed roost exit points were identified Species: Soprano and bandit pipistrelle and unidentified pipistrelle.	n/a
Knocknutshell Woodland	n/a	n/a	Dusk Emergence No confirmed emergence	Dawn Re-entry No confirmed re-entry	n/a	n/a

3.2.4 Static Detector Surveys at ground level using SD2 Anabat Detectors

Passive monitoring surveys were completed within the core bat survey area between June and September 2011. All environmental conditions including sunset and sunrise times are given in Appendix F.

The following species were recorded on the Anabat detectors during this period (see Appendix G for results per location): soprano pipistrelle, bandit pipistrelle, unidentified *Pipistrelle* species, brown long-eared bat, *Myotis* species and *Nyctalus* species. The total number of bat passes recorded between June and September (inclusive) was 4823. Of this, the highest number of passes for any individual species was from the bandit pipistrelle which amounted to 2102 bat passes within the entire recording period

Bat passes throughout the four months of recording varied significantly with a peak in June of 1908 bat passes which constitutes 39.5% of all recorded bat passes recorded in the core bat survey area. This was followed by a slight decrease in July to 32% (1539 bat passes) of total activity recorded. Fluctuations in activity were apparent later in the season with a substantial drop to 11% (529 bat passes) of total bat passes being recorded in August followed by a slight increase to 17% (847 bat passes) in September. When correlated against the weather data, there does not appear to be any consistent relationship between the differences in recorded bat passes or activity levels which could be attributed to weather conditions.

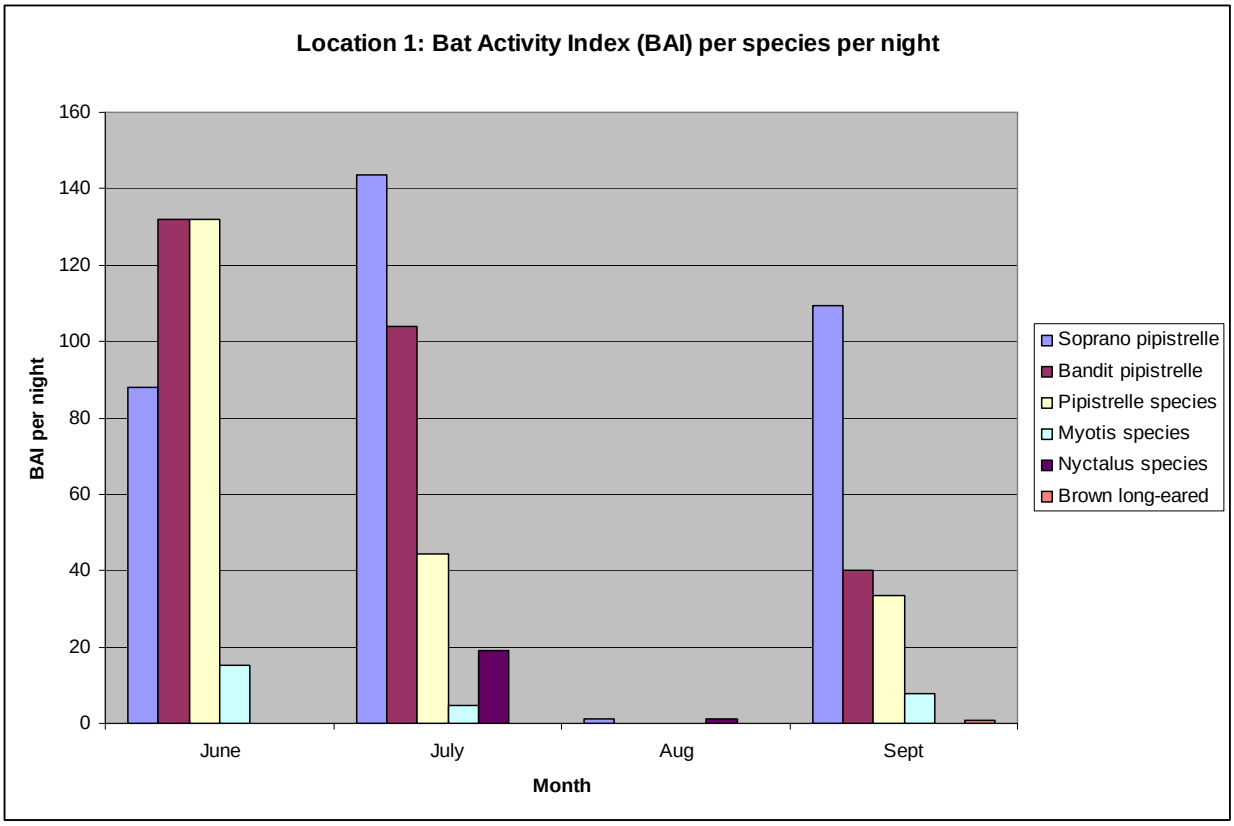
The BAI (see Section 2.4.3) was calculated for each month at each Anabat location (Appendix H). Rather than presenting the results in terms of actual bat numbers of numbers of bat passes, BAI was calculated for each night of

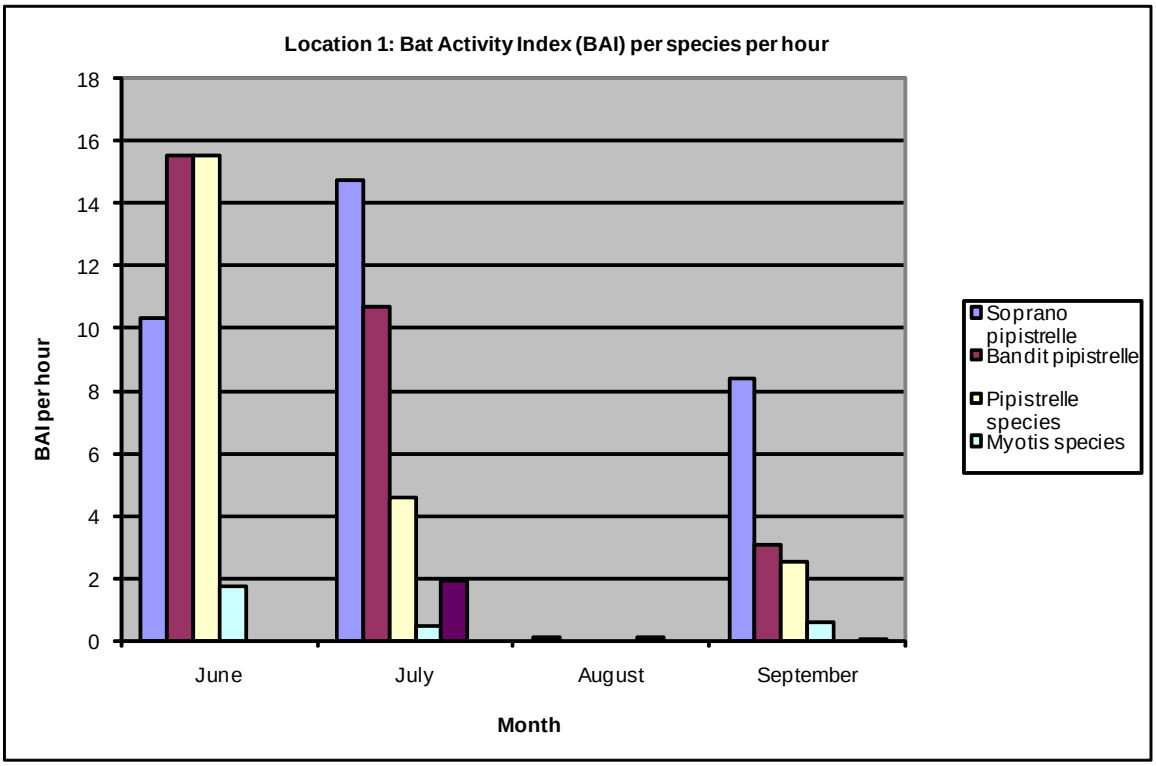
successful data collection and for each hour within those nights to allow for direct comparison of the results. This is presented in tabular form in Appendix G.

Static Detector Surveys at Location 1 – near Pennyland Burn

Overall, this location showed the second highest recorded activity levels from the static survey results with representation from each genus being identified. The results show a high presence of soprano pipistrelles for each nightly recording period throughout the four months, the exception being in August when there was an absence of recorded activity with the exception of 1 soprano pipistrelle call and 1 *Nyctalus* call. Bandit pipistrelle numbers remained fairly constant throughout the survey period (excluding the absence of any data for bandit pipistrelles for August) and it was recorded in fewer numbers than soprano pipistrelles in July and September but was found in greater numbers in June. *Nyctalus*, although identified in small numbers, were recorded in their highest numbers at this location (39 bat calls) with the majority of calls being recorded in during July and a single call in August. Brown long-eared bat were also found in very small numbers with only 2 recordings in September. *Myotis* species were also recorded at this location in their highest numbers, which totalled 47 bat calls throughout the entire recording period, with the exception of August where no *Myotis* calls were recorded. Almost 20% of all call files at this location could not be attributed to a specific species within the genus *Pipistrellus* due to the high level of overlap between the call range of both species. These have been referred to as pipistrelle species.

Recordings within the July and September periods were identified as being in close proximity to the time of sunset. On 27 July, two bandit pipistrelle calls were recorded ~15 minutes after sunset. During the subsequent evening, three bandit pipistrelle calls were recorded within 30-40 minutes after the time of sunset. In September, the first two evenings of recording identified numerous soprano pipistrelle calls within the first 30 minutes following sunset As no data are available on the direction of flight, height of flight and whether these were separate individuals, the likely proximity and size of a potential roost cannot be inferred from the data.





Static Detector Surveys at Location 2 – Pond

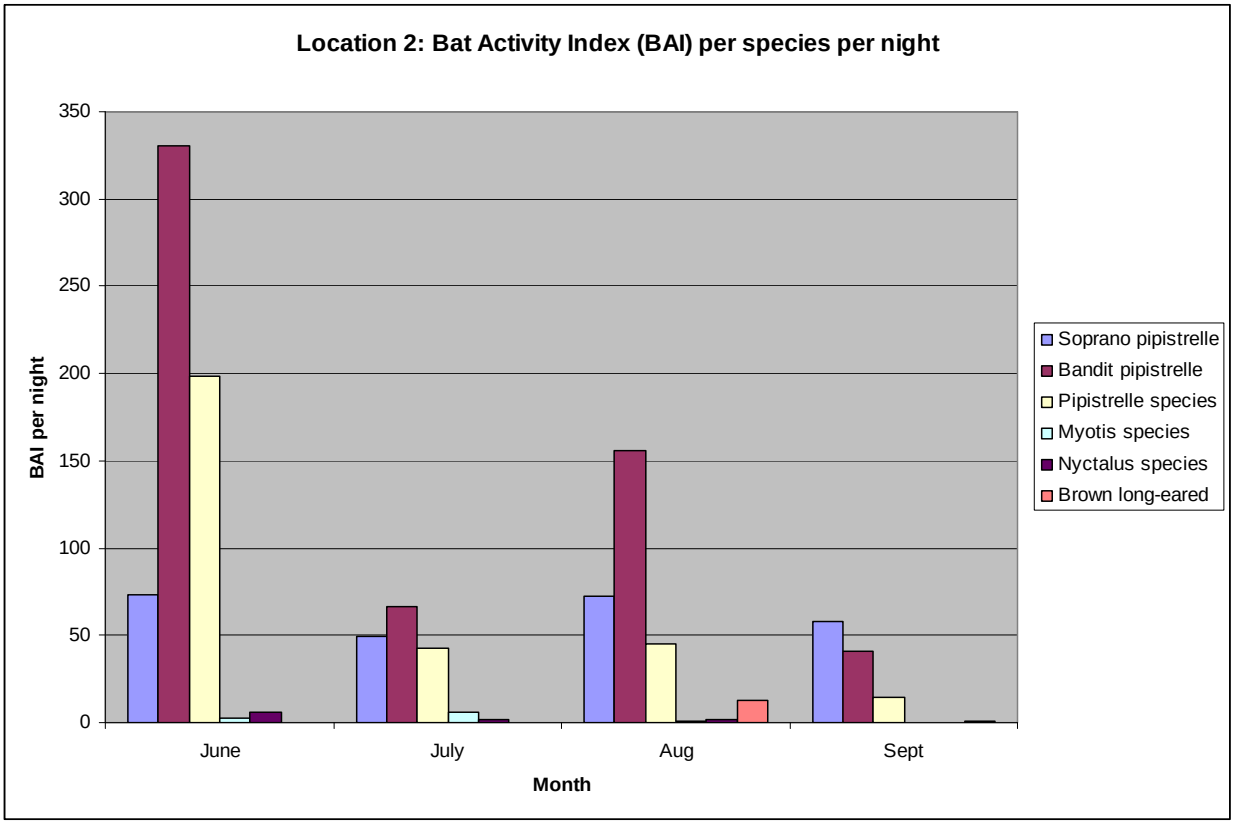
Overall, this location recorded the highest number of bat passes throughout the recording period. A total of 2234 bat passes were recorded (46.3% of total bat passes recorded), and as with Location 1, representatives from all species groups were present.

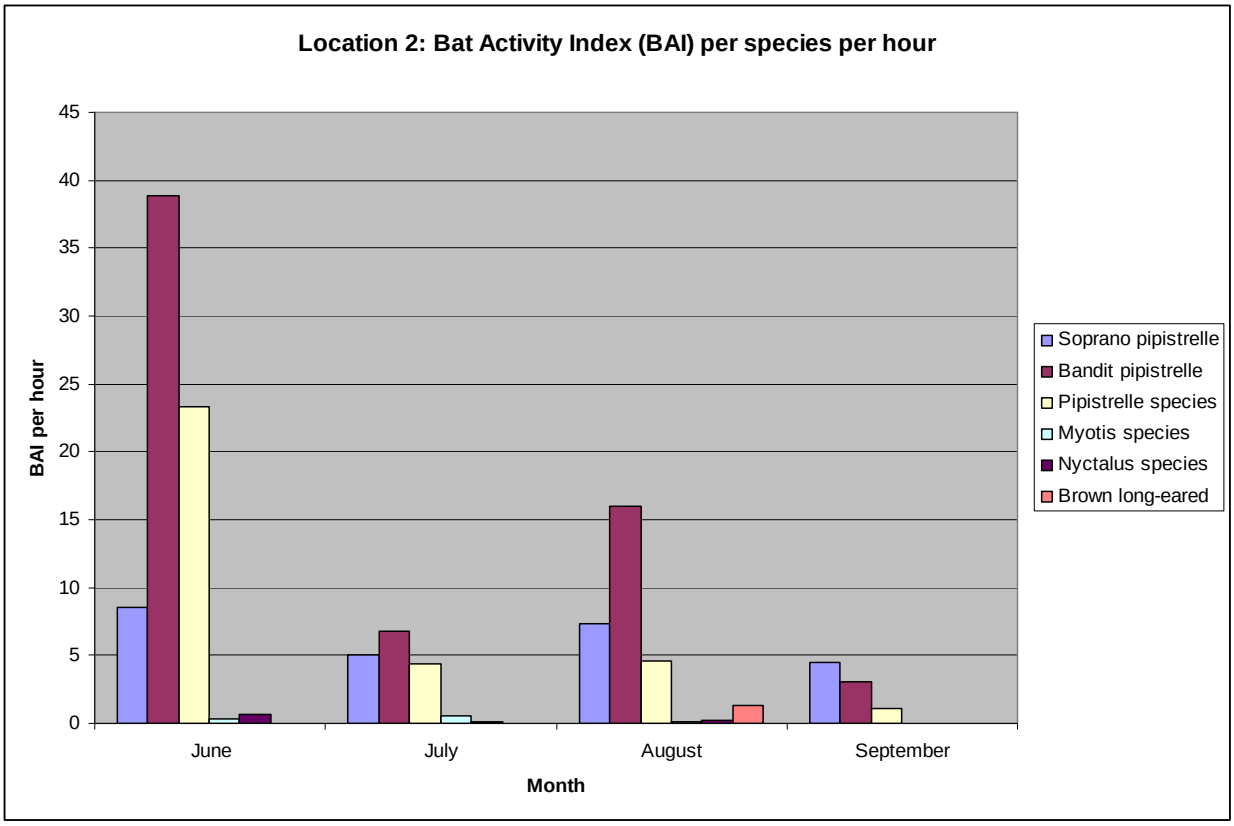
Two peaks were present in the levels of bat passes recorded in June and August with the highest number of bat calls being recorded in June (1221 bat calls).

Bandit pipistrelle was the dominant species (total bat passes 1097) with a peak in activity being recorded in June which coincided with the total levels of peak activity at this location. In addition, a high level of pipistrelle bat calls recorded at this location could not be identified to greater accuracy than genus level (600 bat calls). Soprano pipistrelle was the second most common species (482 bat calls), numbers of which remains constant, excluding a drop in recorded bat calls in August. This location also recorded the highest number of brown long-eared passes (14 bat passes) which all occurred during the August recording period.

Within each month within the recording period, bat passes appear to be spread throughout the night but with activity being detected 30-40 minutes after sunset. While these recordings were predominately pipistrelles, on 29 July, *Nyctalus* calls were recorded within the half hour after sunset and within the hour before sunrise the next morning. As no data are available on the direction of flight, height of flight and whether these were the same

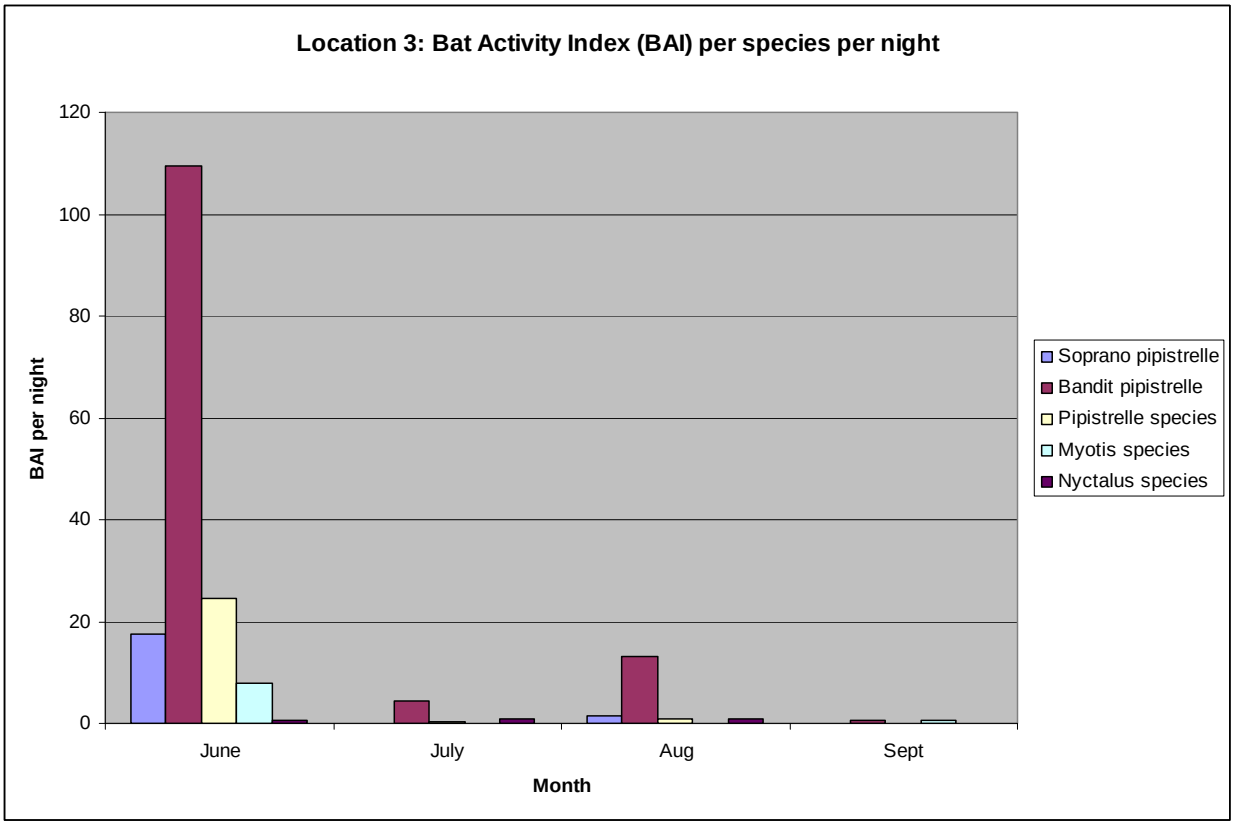
individuals being continuously recorded, the proximity and size of a potential roost cannot be inferred from the data.

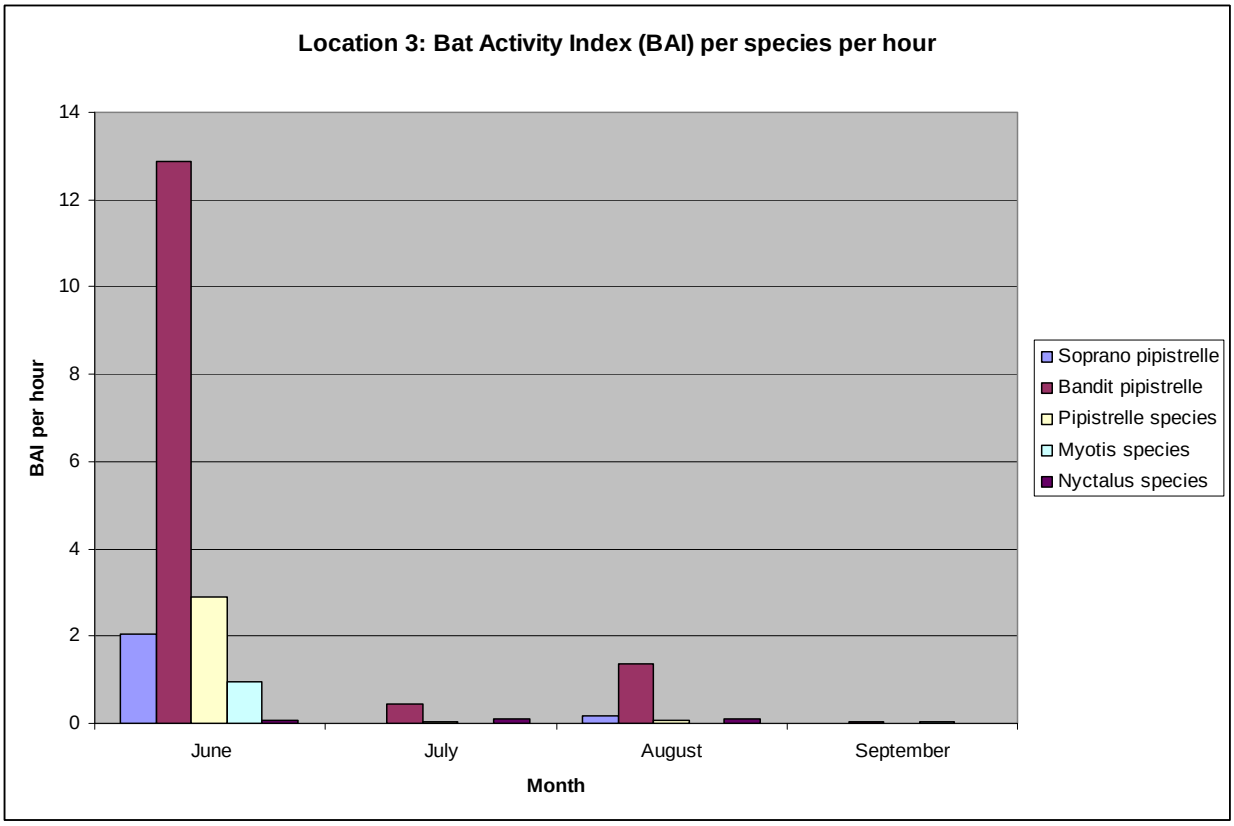




Static Detector Surveys at Location 3 – coniferous plantation

Location 3 had the lowest number of bat passes of all the locations used in the passive monitoring surveys. A total of 410 bat passes were recorded, with the majority of these (320 bat passes) being recorded in June, the majority of these being bandit pipistrelle bat calls (290). The total bat passes recorded at this location amounted to 8.6% of the total bat passes recorded within the core bat survey area during the survey period. Representatives from each species group were present at this location except from brown-long eared i.e. soprano pipistrelle, bandit pipistrelle, *Myotis* species and *Nyctalus* species. The earliest recorded activity at this location was a noctule call recorded during the 27 July recording period which occurred 10 minutes after sunset.





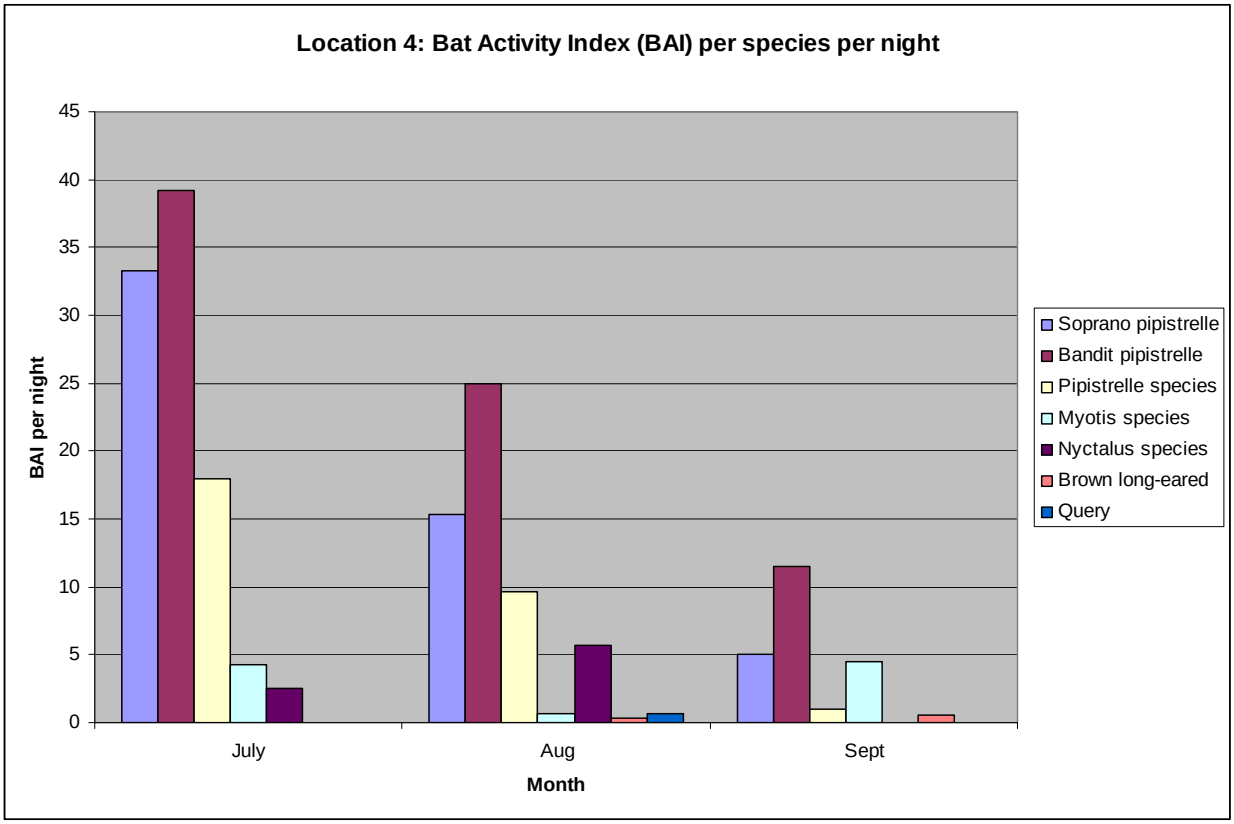
Static Detector Surveys at Location 4 – coniferous plantation and boundary

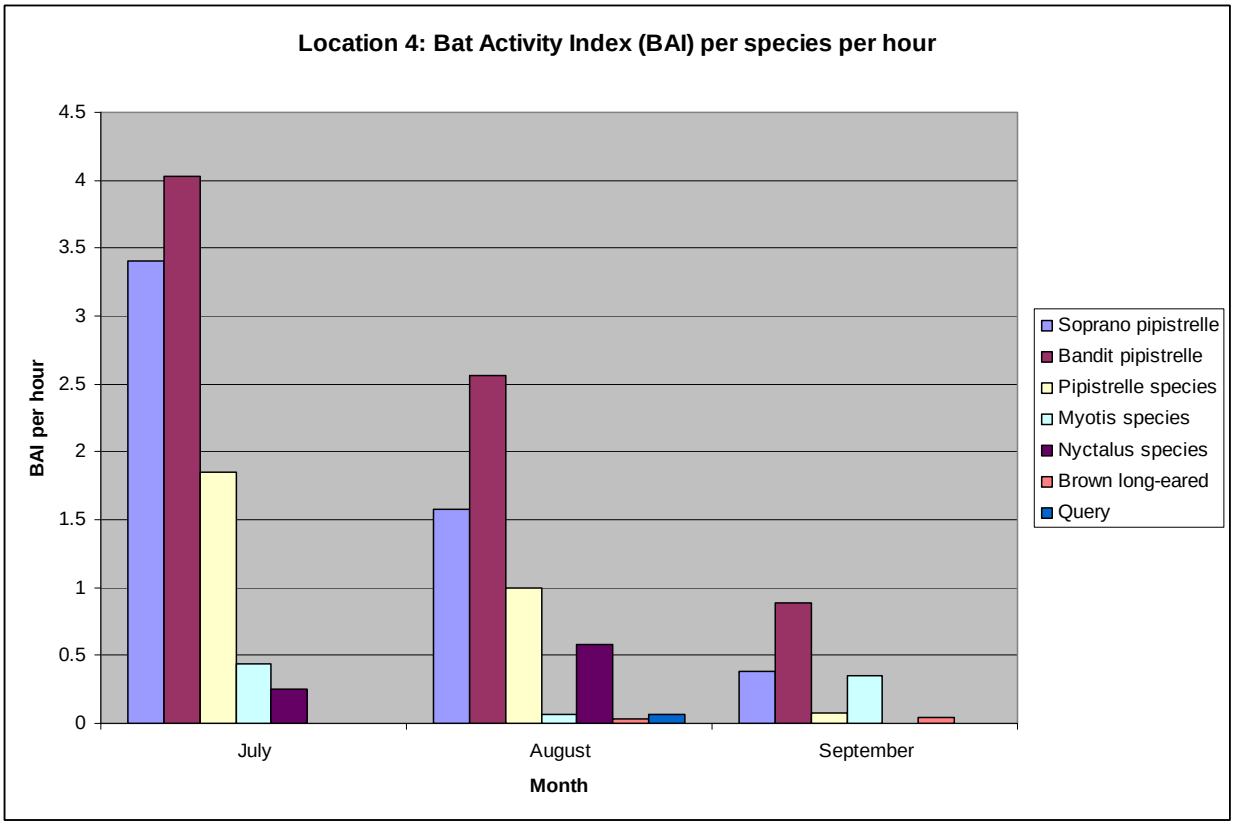
Location 4 shows the second lowest recorded number of bat passes, with a total of 606 passes being recorded (12.6% of total bat passes during the survey period). The results show that the bat passes at this location consist of representatives from all species groups, as with Locations 1 and 2. There are no bat passes recorded for this location for June due to no monitoring being completed at this location, therefore no inferences can be made about activity patterns in that month at that location.

The highest number of bat passes was recorded in July (389), of which almost 60% were bandit pipistrelle calls. Soprano pipistrelle were the second most commonly recorded species (189 bat calls) but very high levels of unidentifiable pipistrelle calls were again recorded in this location (103). This location had the second highest volume of *Nyctalus* calls throughout the core bat survey area from the entire recording period (27 bat calls) the majority of these being recorded in August.

During the June recording period, pipistrelle activity was recorded five minutes after sunset on 14 June and 6 minutes after sunset on 06 June. On the remaining days within June, activity was detected ~20 minutes after sunset. This trend continued through July, where on each evening of recording, pipistrelle activity was detected ~20 minutes after sunset. On 04 August, this again reduced to the first call being recorded 10 minutes after sunset. On the remaining recording nights during August where activity was recorded, first contact was ~20 minutes after sunset.

As no data are available on the direction of flight, height of flight and whether these were the same individuals being continuously recorded, the proximity and size of a potential roost cannot be inferred from the data.





3.3 Results Overview

Records collected in the desk study from Dumfries and Galloway Environmental Record Centre (DGERC) and NBN Gateway identify the site as being situated within an area where seven of the nine bat species in Scotland are known to be present and roosting, including high-risk noctule species.

The bat survey area offers numerous opportunities for roosting bats in localised areas, including mature woodland (e.g. Knocknutshell Wood) and buildings. Roosts were confirmed at High Auldgirth Cottages 1 – 4 (bandit and soprano pipistrelle), Keepers Cottage and outbuildings (bandit and soprano pipistrelle and *Myotis* species) and outbuildings next to High Auldgirth (soprano and bandit pipistrelle and probably brown long-eared) although low numbers of bats (maximum 3) were recorded at each roost entrance. No roosts were identified at Knocknutshell Wood.

The bat survey area has a mosaic of habitat types offering productive foraging habitat including different types and age stands of woodland, semi-improved grassland, a pond and running water. Habitats are closely interlinked with potential commuting routes connecting the different parts of the bat survey area along woodland edges and field boundaries.

Overall low-moderate levels of bat activity were recorded in manual bat activity transects although observations made during emergence and re-entry surveys included recordings of bandit and soprano pipistrelle, *Myotis* and

nyctalus foraging, commuting and social calling. Highest activity levels were recorded in June with another peak in September and no bat passes recorded in October. No bats could be tracked to roosts despite first sightings being made within 30 minutes of sunset on 3 out of the 6 transect surveys.

Bandit pipistrelle was the most commonly recorded species in the Anabat surveys and, combined with soprano and unidentified pipistrelle recordings, account for over 90% of overall bat activity. *Myotis* species, *Nyctalus* species and brown long-eared were also recorded. The highest activity levels were recorded in June with another peak in September, consistent with trends observed in manual activity transects. Of the four locations surveyed Location 1 (Pennyland Burn) recorded the highest *Myotis* and *Nyctalus* activity levels; Location 2 (pond) had the highest total number of bat passes and the highest brown long-eared activity; Location 3 (conifer plantation) included early records of noctule but lowest levels of bat activity; and Location 4 (woodland edge and boundary) included consistently early records of pipistrelle bats.

Bat activity was moderate and it cannot be ruled out that there are roosts for high risk *Nyctalus* species nearby.

4. Evaluation and Discussion

4.1 Bats and Wind Farms – An Overview

When assessing the likely impacts of a proposed wind farm development on bats (on individual bats and on the local bat population), appropriate survey techniques need to be employed. With the provision of the 2011 BCT Guidelines, the basic level of survey effort required per development has been identified and standardised, as being manual bat activity transect surveys and static detector surveys at ground level. While survey design may differ depending on the proposed location of the development and the likely species present, surveys should aim to identify the likelihood of impacts such as direct mortality and disturbance for each proposed development and how this may affect the favourable conservation status of individual bats and the local bat population.

Most effort should focus on bats at a population level i.e. bat populations which are most likely to be affected by direct mortality and may be most threatened as a result of the development. Following the Natural England guidance, these populations are outlined in Table 4.1:

Table 4.1 Populations likely to be threatened due to impacts from wind turbines (from Natural England TIN051 Bats and Onshore Wind Turbines – Interim Guidance, February 2009)

Low	Medium	High
Long-eared bat	**Serotine**	**Nathusius' pipistrelle**
Myotis species	**Barbastelle**	Noctule
Horseshoe bats		**Leisler's**
Soprano pipistrelle		
Bandit pipistrelle		

*bold text indicates those populations from which individuals have been identified as being present within the bat survey area

Impacts to individual species also need to be considered, as different species will exploit different landscape features at different times of the year. Efforts should be made to identify significant concentrations of bats, particularly those species identified as high risk, as indicated in Table 4.2:

Table 4.2 Bat species likely to be at risk from wind turbines (from Natural England TIN051 Bats and Onshore Wind Turbines – Interim Guidance, February 2009)

Low Risk	Medium Risk	High Risk
Myotis species	Bandit pipistrelle	Noctule
Long-eared bat	**Serotine**	**Leisler's**
Horseshoe bat	Soprano pipistrelle	**Nathusius' pipistrelle**
	Barbastelle	

***bold** text indicates those species identified as being present within the bat survey area

High mortality rates have been found within mainly high flying species of which the representatives within Scotland are noctule, Leisler's and Nathusius' pipistrelle. These have been classed as 'high risk species' within the Natural England Guidelines (2009) (see Table 4.2) and subsequently adopted into the 2011 BCT Guidelines. The main reasons for this classification are related to the specific wing morphology and flying behaviour of these particular species which are typically open air and high flying species. They also tend to be the species most often observed flying at turbine rotor height. While many studies have been completed in North America and Europe, there is little published evidence to suggest the effects of wind turbines on bats within the UK. To this respect, many of the papers already published can only provide hypotheses as to what the potential impacts may be for the bat species resident within the UK using similar habitat and landscape features in continental Europe as reference text.

One of the main impacts likely to be associated with wind farms and bats is direct mortality as a result of direct collision with rotor blades or as a result of barotrauma. While this issue is still a contentious one and a great level of uncertainty still exists, effort still needs to be made to identify whether there is a risk of direct mortality as a result of the development to bats using the core bat survey area.

The fatalities of bats found underneath and in proximity to wind turbines seem to be closely linked to rotor movement and barotraumas as bats are not known to be killed by direct collision with stationary rotor blades. Another factor to consider is the evident increase in mortality rates of bat species during August and September. This is likely to be the result of migrating bats moving between lower and higher areas following the insect prey. Accumulated evidence suggests that turbines may affect migratory movements of insect populations, which may in turn cause clouds of insects to gather around the tops of turbines.

4.2 Distribution of Bats Across the Bat Survey Area

4.2.1 Pipistrelle Species

The desk studies revealed numerous records of pipistrelle bats in the 12-15km buffer area surrounding the consultation boundary - the nearest being a pipistrelle record located approximately 2km to the south west of the site near Auldgirth. These records did not categorise the results into sightings and roost

However, the activity recorded throughout the suite of bat surveys was dominated by pipistrelle bats (both soprano and bandit pipistrelle along with unidentified pipistrelle species). Total pipistrelle activity within the core bat survey area amounted to 4595 bat calls which equal 95.3% of total activity recorded throughout the four months. Out of this, the dominant pipistrelle species was the bandit pipistrelle (2102) followed by the soprano pipistrelle (1416). A total of 1077 bat passes were categorised as unidentified *Pipistrelle* bats from the static detector surveys. This was due to their maximum frequency of energy overlapping thus not allowing for distinction between soprano or bandit pipistrelle (see Survey Limitations). These could belong to either species of pipistrelle but this remains undetermined.

While soprano and bandit pipistrelle bats are two of the most common and widespread of all species of bat resident within Scotland, recent changes in agricultural practices throughout the UK have accelerated their decline over recent decades. Populations are being continuously monitored through surveys such the National Bat Monitoring Programme (NBMP) and through data collected in the field by professionals. Bats have also been included as one of the UK Biodiversity Indicators since 2008. Since then, the indicator shows an overall increase in bat populations since 2000, with a significant increase in populations of bandit and soprano pipistrelles from one from various survey methods used in 2010[15]. Soprano and common pipistrelle are listed as priority species in the Dumfries and Galloway LBAP.

Summer roosts of both soprano and bandit pipistrelles tend to be in crevices in newer buildings, the average roost consisting of 200 individuals. However roosts can also be found in trees and bat boxes where pipistrelles can also be found in autumn and over winter. Pipistrelles tend to emerge from their roost 20-30 minutes after sunset and forage mainly on small insects e.g. midges. Soprano pipistrelles appear to have a closer affinity to riparian landscapes where they can be found feeding over wetland habitats.

Soprano and bandit pipistrelle bats have been assessed as being at medium risk at the species level, but their individual populations are assessed as being low risk from wind turbines (see Table 4.1). This coupled with the moderate level of pipistrelle activity recorded allows for the assessment to made that the proposed wind farm is unlikely to have any significant adverse impact on the favourable conservation status of these populations even at a local level (see Table 4.2).

4.2.2 Myotis Species

From the DGERC response and NBN Gateway search (See Appendix A and B and Figures 3.1 and 3.2), the *Myotis* species known to be present within the vicinity of the site are Daubenton's, Natterer's and whiskered bats.

Myotis species recorded during activity surveys (both manual transects and static detector surveys) could only be identified to genus level due to the large overlap in call frequencies within the genus *Myotis* which allows for a level of subjectivity in call identification both in the field and in the office.

[15] BCT (2011). The state of the UK's bats. National Bat Monitoring Programme Population Trends 2011.

All species within the genus *Myotis* are afforded the same level of protection but no *Myotis* species has been included on the UK BAP priority species list or the Scottish Biodiversity List. All *Myotis* bats have been identified as a priority species in the Dumfries and Galloway LBAP.

Myotis bats tend to emerge from roosts later than *Pipistrelle* species, with emergence typically beginning 40 minutes after sunset. *Myotis* bats tend to be found most frequently in colonies in buildings in Scotland but often roost in tunnels and other built structures closely associated with water environments. *Myotis* bats can travel long distances, flying at low altitudes, from their roosts to their foraging grounds, typically up to 6km from their roost. *Myotis* bats are fairly widespread throughout the UK and appear to be increasing over most of their range. *Myotis* bats typically exploit aquatic and wetland habitats with a dietary preference for small flies, caddis flies and mayflies. The presence of *Myotis* bats within the bat survey area, particularly along the coniferous woodland edge and along the path of the watercourses is therefore deemed to be typical of this genus.

Myotis bats were not identified in large numbers throughout the surveys in 2011 (Anabats recorded 115 passes or 2.4% of the bat activity on the bat survey area). As they have been assessed as being at low risk both at a species and population level, it is unlikely that any *Myotis* bats will be adversely affected by the proposed turbines, provided that the turbines are located at least 50m (to tip blade) from the maximum height of the coniferous woodland.

4.2.3 Nyctalus Species

From the DGERC data search, five noctule records were identified within the 12km buffer around the consultation boundary which has been illustrated on Figure 3.1. There were no Leisler's records within 12km of the consultation boundary.

Nyctalus bats are the largest bats in Scotland and can fly at 50km per hour and are known to regularly travel over 10km from their roost to a feeding area. *Nyctalus* emerge from the roost early and can be seen foraging from dusk. Prey items generally consist of small insects such as midges, beetles and moths. Roosts are typically in the crevices within mature trees or woodpecker holes as *Nyctalus* are primarily tree dwellers and trees can be exploited all year round.

Nyctalus species recorded during static detector surveys were only identified to genus level due to the overlap in call frequencies within the genus *Nyctalus* which allows for a level of subjectivity in call identification both in the field and in the office. Given that the site is located within the known distribution of noctule but that no Leisler's records were returned from the data search/consultation it is assumed that the bat passes recorded were from noctule but because there is a degree of uncertainty the results have been left general.

Results from the 2011 surveys indicate that the core bat survey area is used in varying numbers between the locations by *Nyctalus* species with a total of 93 passes recorded throughout the season (1.9% of overall bat activity). Most of the activity appeared to be associated with linear features along the eastern boundary of the bat survey area i.e. along Pennyland Burn at Location 1 and along the boundary of the coniferous plantation at Location 4. *Nyctalus* species are assessed as being at high risk to impacts from wind turbines at both the species and the population level.

It is unlikely that the *Nyctalus* population will be adversely affected by the proposed wind farm development as they tend to fly at height over tree tops and in open habitats. Although the core bat survey area is evidently used on occasion by noctule species there is no apparent trend, and the brief sporadic records suggest that it is an occasional feeding area or situated on a commuting route between foraging sites. The assumption can be made that the bat survey area is of medium importance for foraging, commuting or roosting *Nyctalus* species, however, this can not be confirmed by visual sighting or by results form the manual bat activity transect surveys due to the absence of *Nyctalus* recordings.

Noctule is listed as a priority species on the UK BAP and on the SBL and is listed as a priority species on the Dumfries and Galloway BAP. While both Leisler's and noctule are known to be resident in Scotland, they are largely confined to the south west while elsewhere in the UK their distribution is relatively widespread but declining in places. Declining populations have been attributed to intensive agricultural practices and in turn the loss of suitable feeding habitat e.g. permanent pasture and woodland edge habitat.

4.2.4 Long-eared Species

Brown long-eared bats were identified as bring within the 15km buffer from the consultation boundary from both the NBN Gateway data and the DGERC data. The closest record from these results for brown long-eared was 3.5km to the north west of the site boundary.

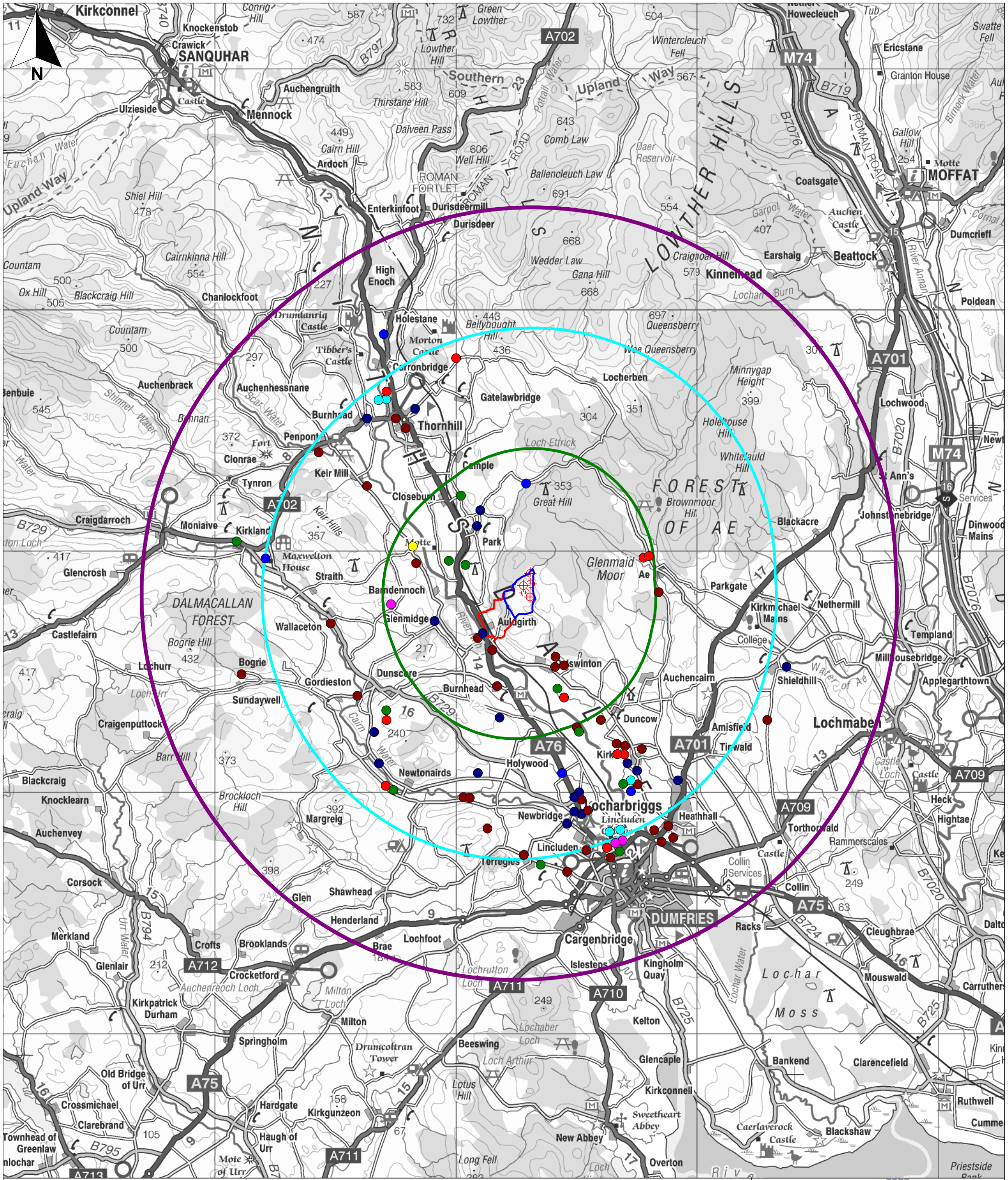
Brown long-eared bat is the only long-eared species resident in Scotland. Their distribution within the UK is widespread, with the exception of some islands in the far north of Scotland. Species numbers have declined in recent years due to changes in agricultural practices and also with the increased number of barn conversions.

Summer roosts are usually located in older buildings, barns, churches and buildings with large apex roof spaces. Long-eared bats do not usually form as large colonies as pipistrelle bats tend to do, and colonies usually comprise ~20 individuals. Long-eared bats are low flyers and tend to pick their insect prey from the ground and taking them to perches.

Brown long-eared bats were recorded in very low numbers in the core bat survey area during the static detector surveys (18 calls, representing 0.4% of the total activity). During the static detector surveys, brown long-eared bats were predominantly found at Anabat location 2 which was a heavily vegetated area surrounding the pond. This may have proved the long-eared bats with suitable habitat for gleaning from the surface of the foliage.

In view of the small number of long-eared bats detected within the bat survey area, it is unlikely that any long-eared bats will be adversely affected by the proposed wind farm provided that the turbines are located at least 50m (to blade tip) from the maximum theoretical height of field boundaries and other vegetation.

Figures



Key:

- Site Boundary
- Consultation Survey Area Boundary
- Proposed Wind Turbine
- 5 km Buffer around Consultation Survey Area
- 10 km Buffer around Consultation Survey Area
- 15 km Buffer around Consultation Survey Area

- Brown Long-eared Bat
- Common Pipistrelle Bat
- Daubenton's Bat
- Natterer's Bat
- Noctule Bat
- Pipistrellus Bat
- Soprano Pipistrelle Bat
- Unidentified Bat

0 km — 9 km

Scale 1:150,000 @ A3

FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.1
Consultation Data - DGERC - Bat Species Records within 12km of site boundary

November 2011
27846-E024 fitzs

amec

Key:

- Site Boundary
- Consultation Survey Area Boundary
- Proposed Wind Turbine
- 5 km Buffer around Consultation Survey Area
- 10 km Buffer around Consultation Survey Area
- 15 km Buffer around Consultation Survey Area

- Brown Long-Eared Bat
- Common Pipistrelle Bat
- Daubenton's Bat
- Myotis sp. Bat
- Natterer's Bat
- Soprano Pipistrelle Bat
- Unidentified Bat
- Whiskered Bat

0 km — 9 km

Scale 1:150,000 @ A3

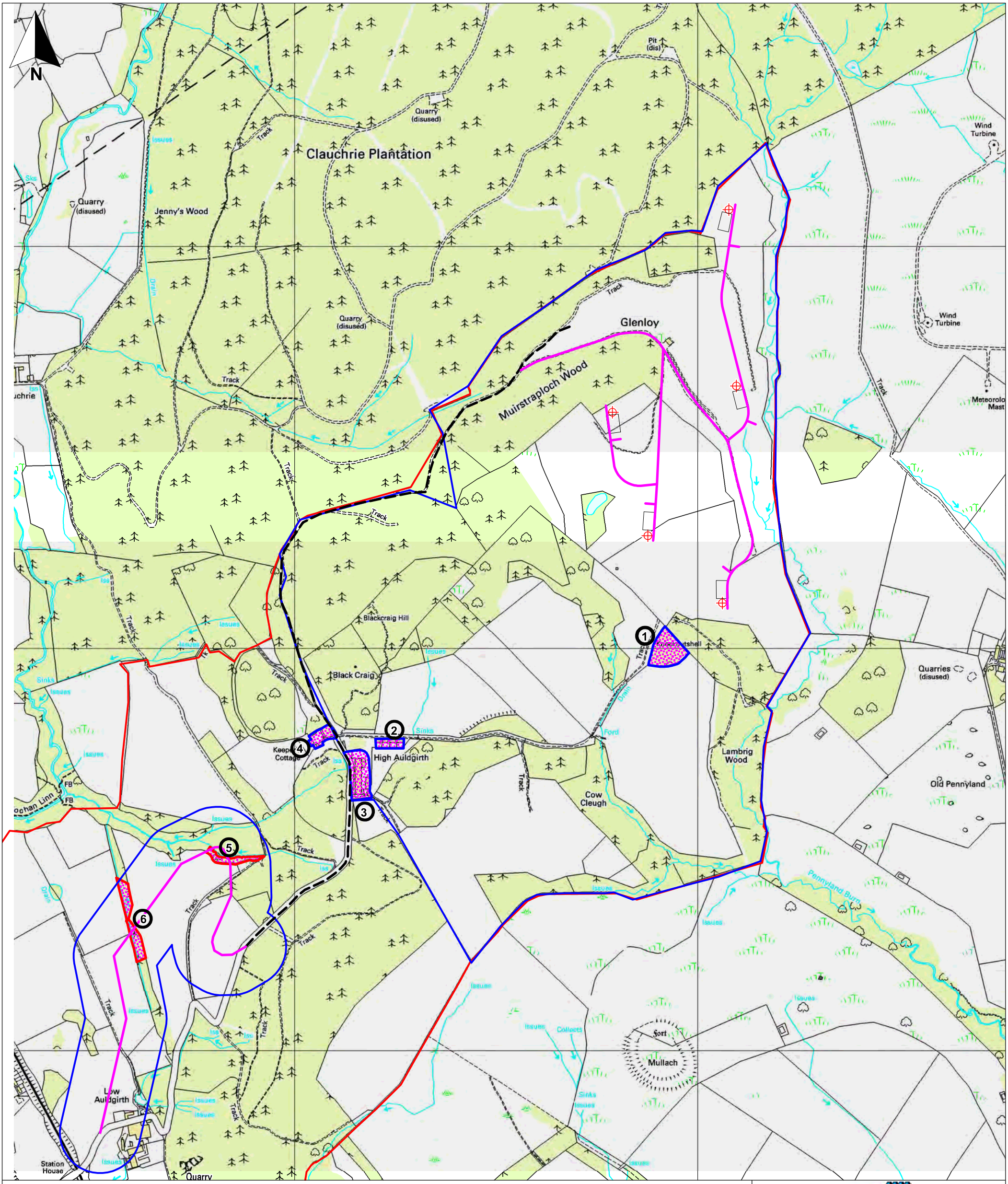
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.2
Consultation Data - Consultation Data - NBN Gateway - Bat Species Records within 15km of site boundary

November 2011
27846-E026 fitzs

amec



Key:

- Site Boundary
- Bat Survey Area Boundary
- Proposed Wind Turbine
- Area of high bat roost potential
- Area of high bat roost potential and emergence survey
- Target note
- Possible Access Road
- Existing Road to be Upgraded

0 km 540 m

Scale 1:9,000 @ A3

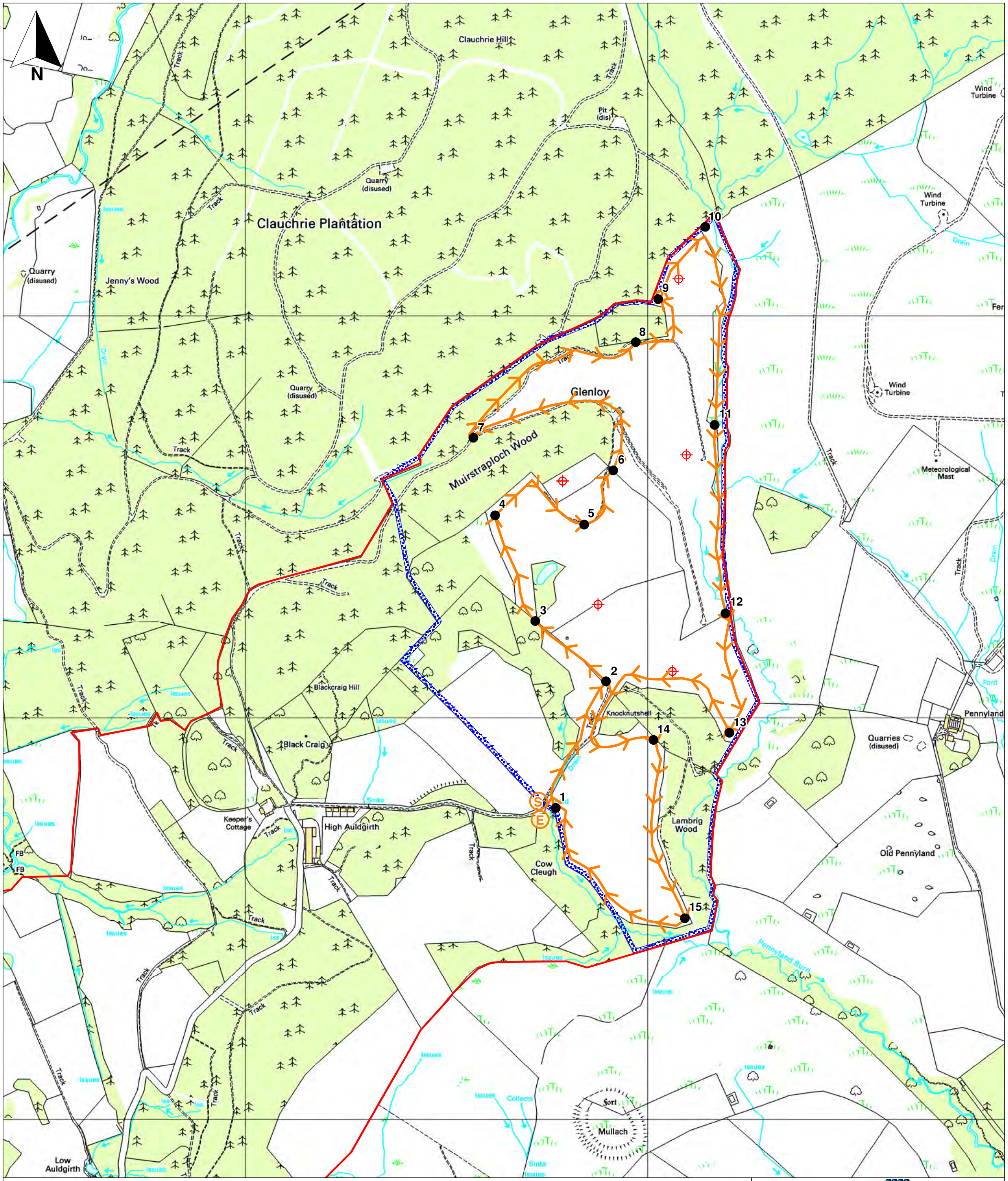
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.3 -
Bat Roost Suitability Surveys and Emergence Surveys - Trees, Woodlands and Buildings

November 2011
27846-E025 fitzs

amec



Key:

- Site Boundary
- Core Survey Area Boundary
- Proposed Wind Turbine
- Start Point
- Transect Route
- End Point
- Navigation Point

0 m — 540 m

Scale 1:9,000 @ A3

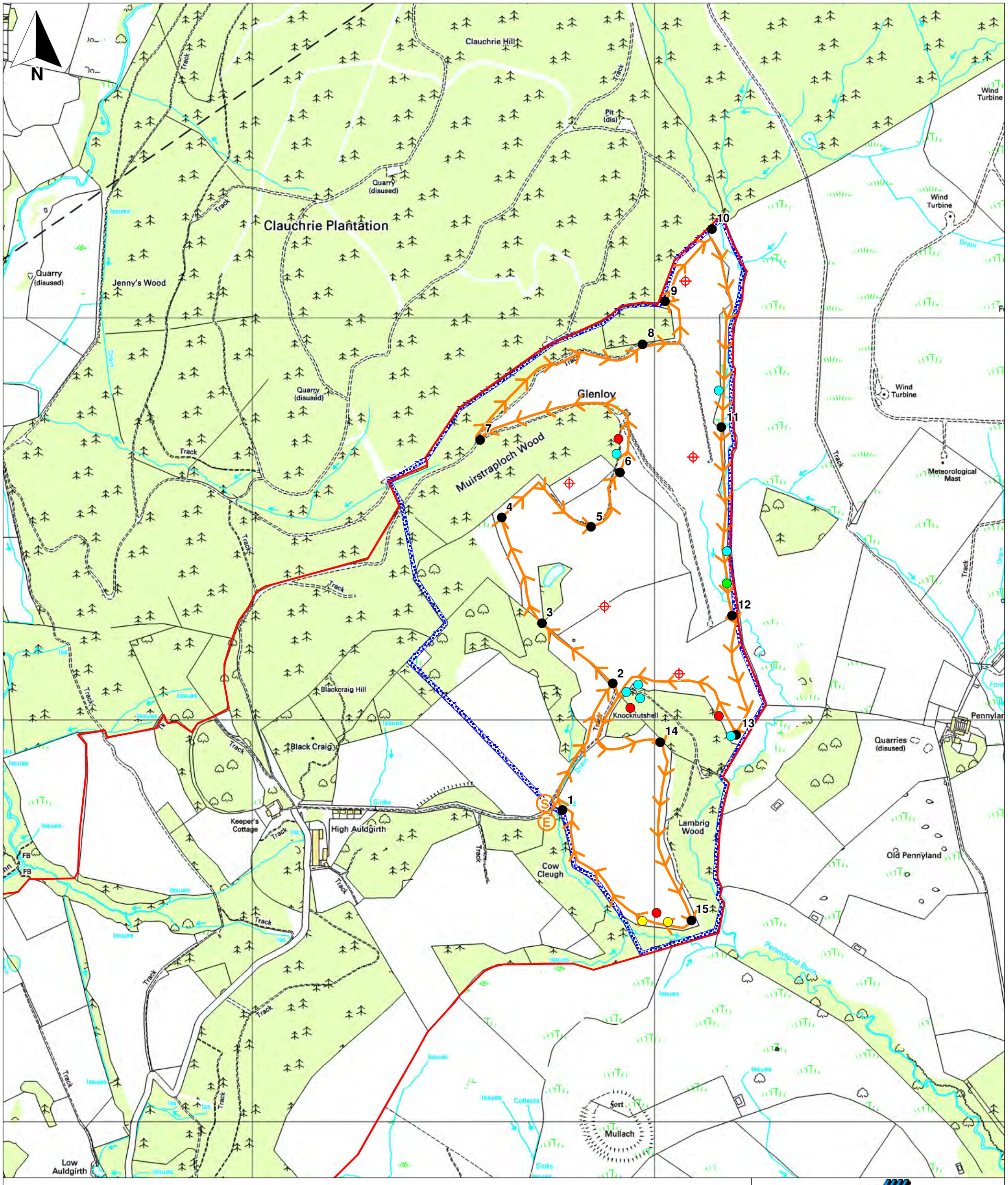
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.4
Bat Activity Survey
Transect Route 2011

November 2011
27846-E026 fitzs

amec



Key:

- Site Boundary
- Proposed Wind Turbine
- Transect Route
- Navigation Point
- Core Survey Area Boundary
- Start Point
- End point
- Bandit pipistrelle Bat
- Myotis Bat
- Pipistrelle - Unidentified Bat
- Soprano pipistrelle Bat

Time of Sunset 21:09

0 m — 540 m

Scale 1:9,000 @ A3

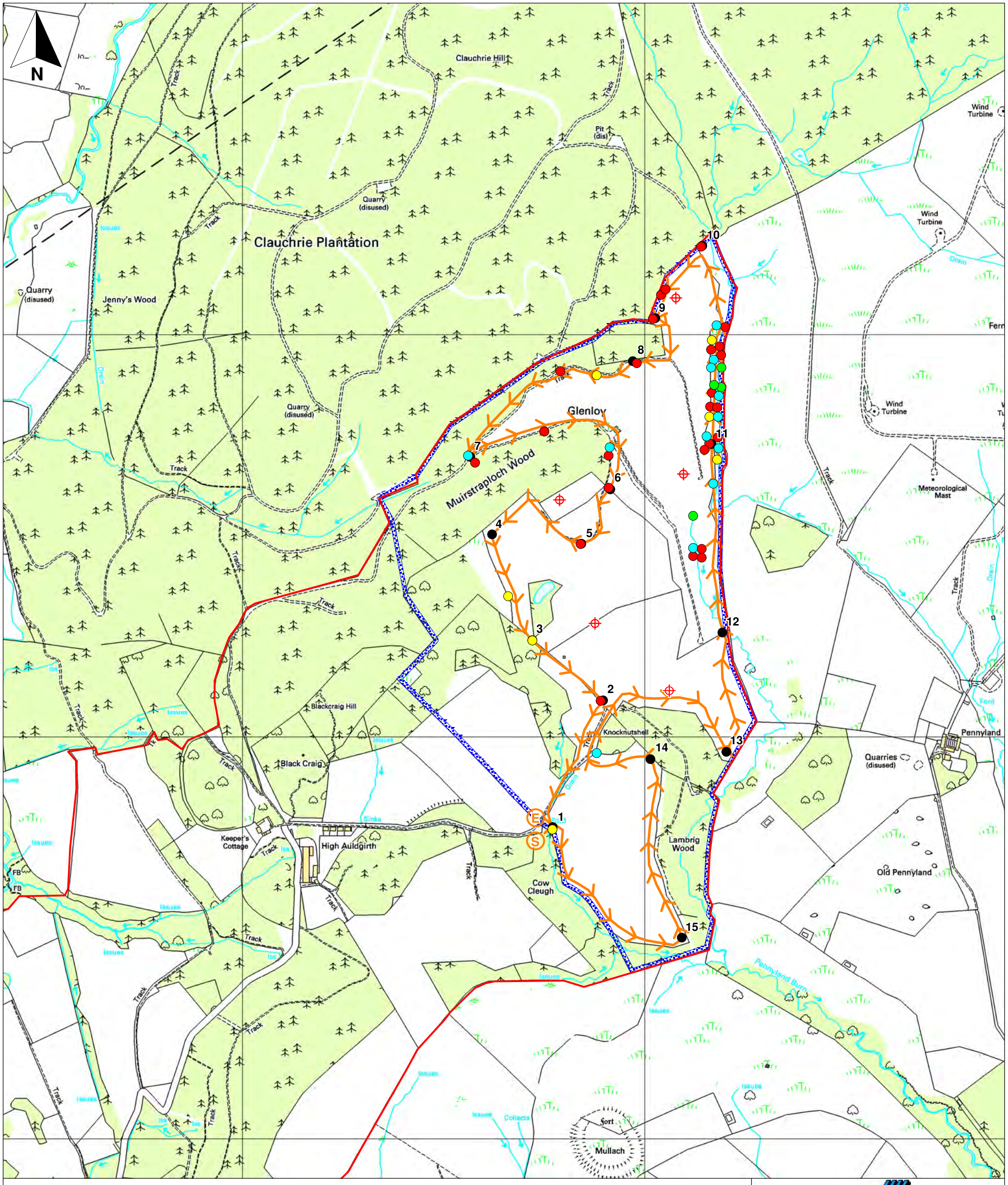
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.5
Bat Activity Survey Results May 2011
Dusk Transect

November 2011
27846-E027 fitzs

amec



Key:

- Site Boundary
- Proposed Wind Turbine
- Transect Route
- Navigation Point
- Core Survey Area Boundary
- Start Point
- End point
- Bandit Pipistrelle Bat
- Myotis Bat
- Pipistrelle - Unidentified Bat
- Soprano Pipistrelle Bat

Time of Sunset 21:55

0 m — 540 m

Scale 1:9,000 @ A3

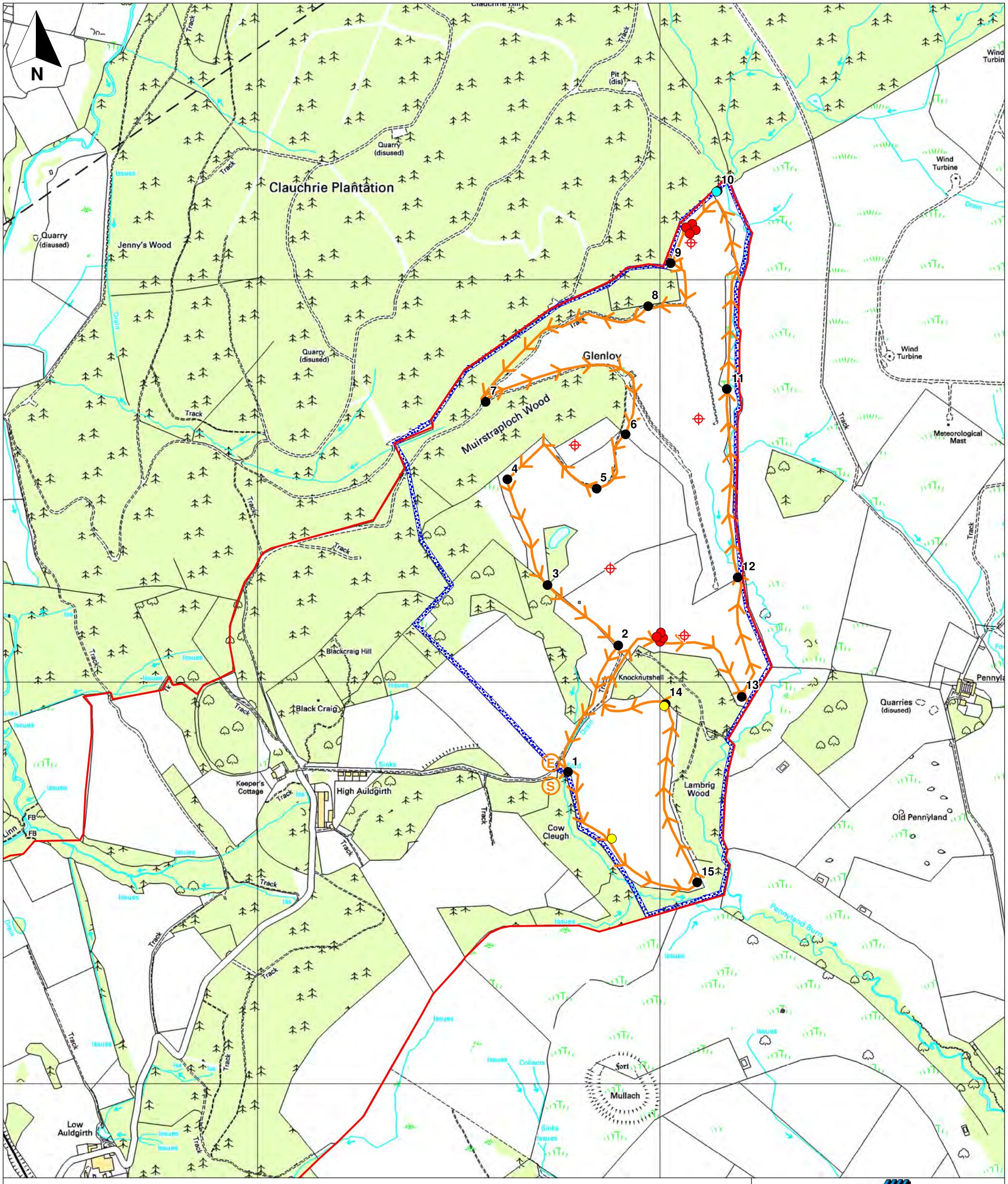
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.6
Bat Activity Survey Results June 2011
Dusk Transect

November 2011
27846-E028 fitzs

amec



Key:

- Site Boundary
- Proposed Wind Turbine
- Transect Route
- Navigation Point
- Core Survey Area Boundary
- Start Point
- End point

Time of Sunrise 05:03

- Bandit Pipistrelle Bat
- Pipistrelle - Unidentified Bat
- Soprano Pipistrelle Bat

0 m — 540 m

Scale 1:9,000 @ A3

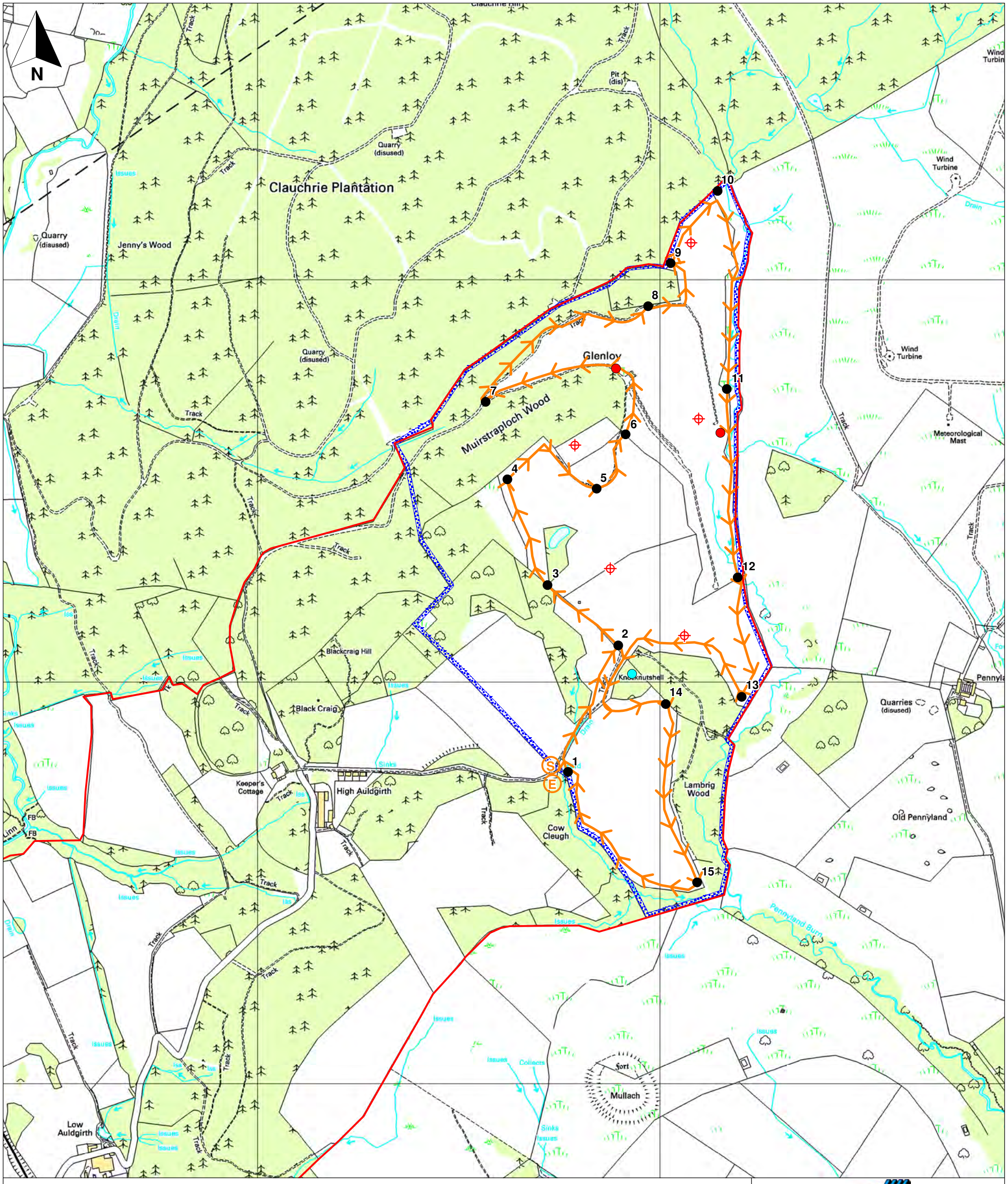
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.7
Bat Activity Survey Results July 2011
Dawn Transect

November 2011
27846-E029 fitzs

amec



Key:

- Site Boundary
- Proposed Wind Turbine
- Transect Route
- Navigation Point
- Core Survey Area Boundary
- Start Point
- End point
- Bandit Pipistrelle Bat
- Soprano Pipistrelle Bat

Time of Sunset 21:05

0 m — 540 m

Scale 1:9,000 @ A3

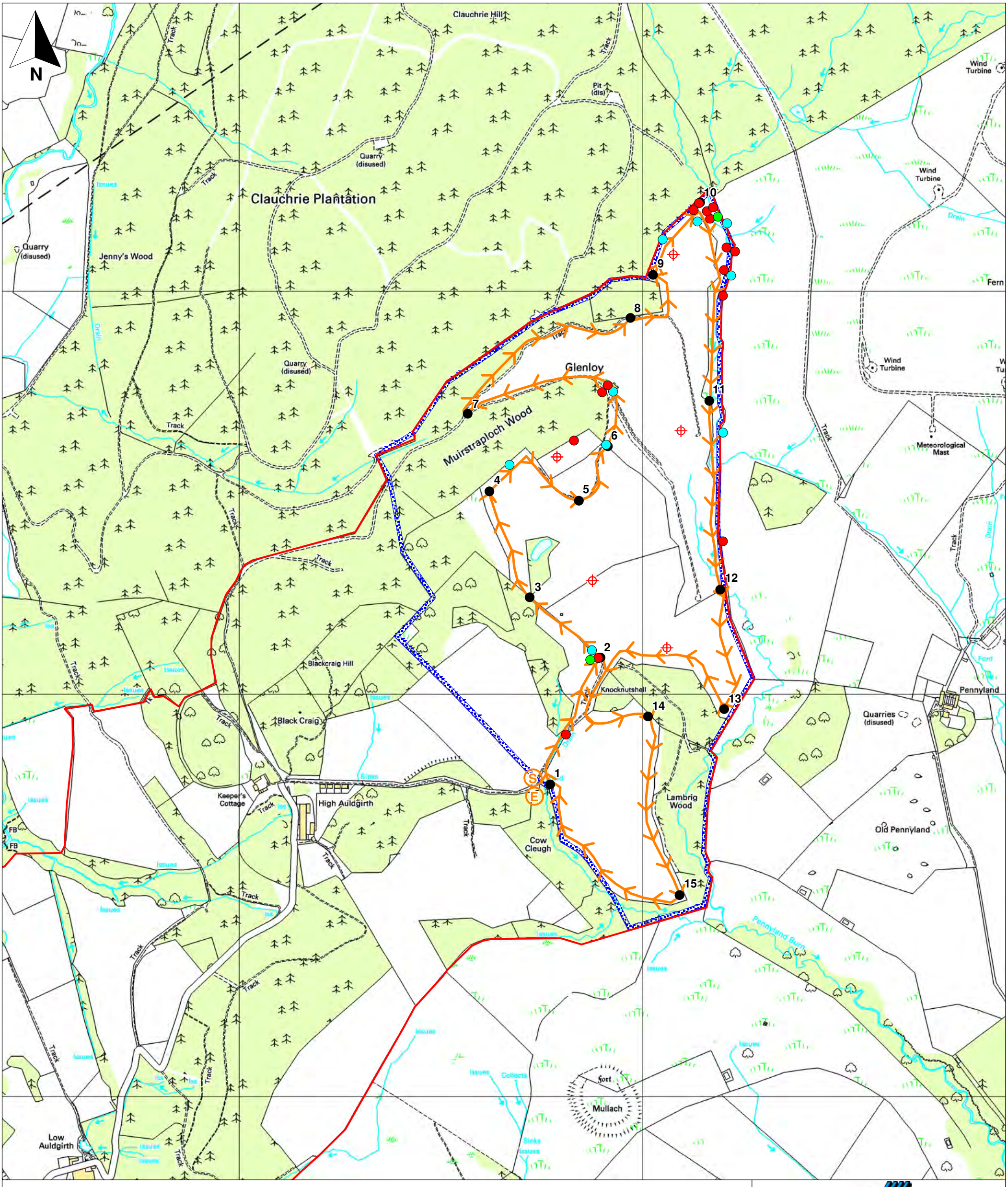
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.8
Bat Activity Survey Results August 2011
Dusk Transect

November 2011
27846-E030 fitzs

amec



Key:

- Site Boundary
- Proposed Wind Turbine
- Transect Route
- Navigation Point
- Core Survey Area Boundary
- Start Point
- End point
- Bandit Pipistrelle Bat
- Myotis Bat
- Soprano Pipistrelle Bat

Time of Sunset 20:00

0 m — 540 m

Scale 1:9,000 @ A3

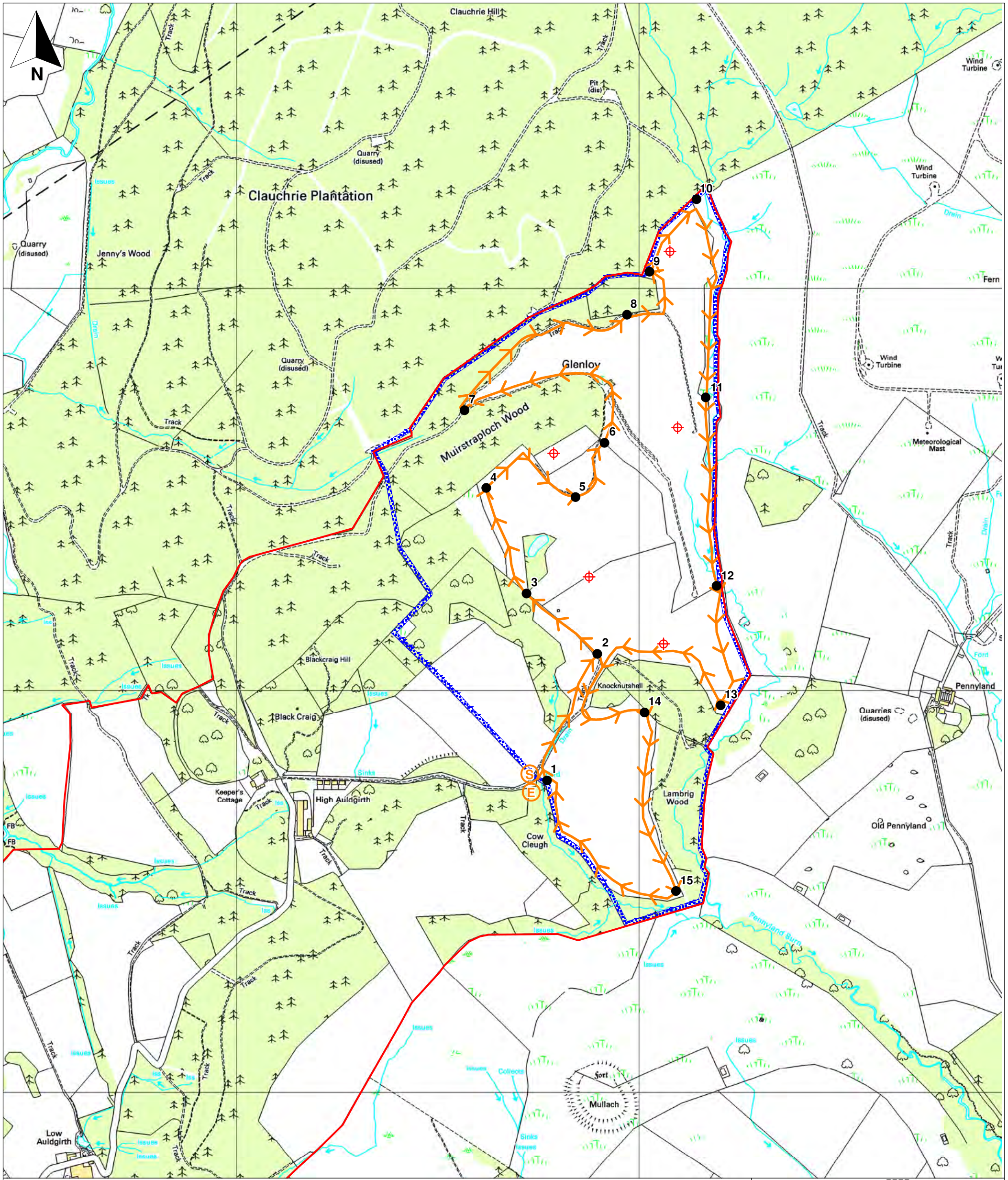
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.9
Bat Activity Survey Results
September 2011
Dusk Transect

November 2011
27846-E031 fitzs

amec



Key:

- Site Boundary
- Core Survey Area Boundary
- Proposed Wind Turbine
- Start Point (S)
- Transect Route
- End point (E)
- Navigation Point

Time of Sunset 18:09

0 m — 540 m

Scale 1:9,000 @ A3

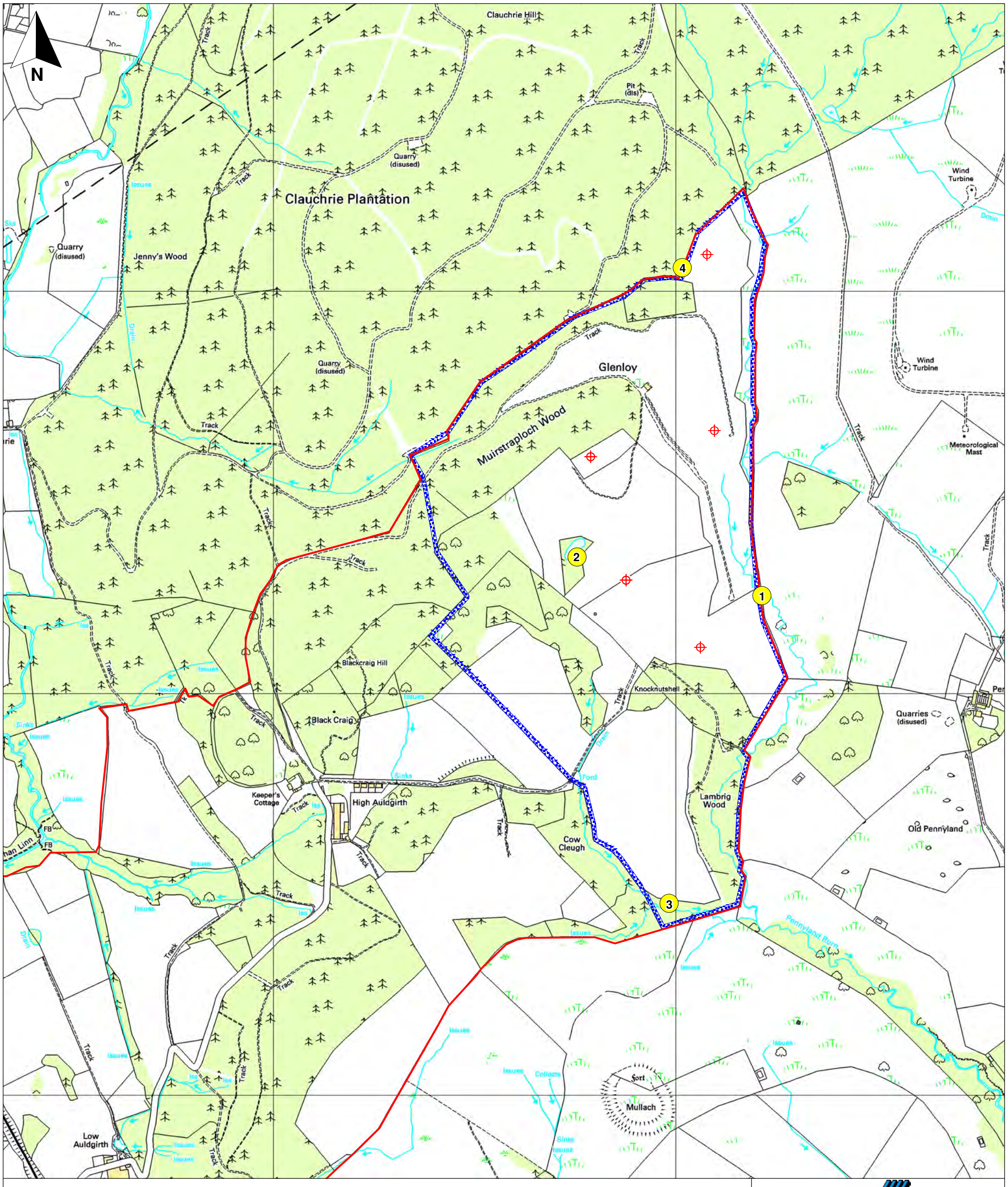
FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.10
Bat Activity Survey Results
October 2011
Dusk Transect

November 2011
27846-E032 fitzs

amec



Key:

- Site Boundary
- Core Survey Area Boundary
- Proposed Wind Turbine
- Anabat Location

Grid References:

1 - NX 93214 88244

2 - NX 92754 88340

3 - NX 92983 87478

4 - NX 93016 89060

0 m — 540 m

Scale 1:9,000 @ A3

FORCE 9 ENERGY

Blackwood Wind Farm
Bat Report

Figure 3.11
Static Detector (Anabat) Survey Locations 2011

November 2011
27846-E033 fitzs

amec

Appendix A
DGERC Data

Table 4.1 Consultation data – records within 12km received from DGERC

Species	Grid Reference	Date of Record	Description
Chiroptera	NX863955	16/07/1996	Roost
Chiroptera	NX911866	03/07/1996	Roost
Chiroptera	NX909808	28/08/1996	Roost
Chiroptera	NX949792	10/06/1997	Roost
Chiroptera	NX883959	29/08/1997	Roost
Chiroptera	NX992805	08/09/1997	Roost
Chiroptera	NX868812	04/06/1998	Roost
Chiroptera	NX866825	22/07/1998	Roost
Chiroptera	NX946787	04/09/1998	Roost
Chiroptera	NX910917	04/07/2000	Roost
Chiroptera	NX971812	13/02/2001	Roost
Chiroptera	NX949798	03/07/2001	Roost
Chiroptera	NX891871	22/08/2001	Roost
Chiroptera	NY037852	22/08/2001	Roost
Chiroptera	NX952791	15/08/2002	Roost
Chiroptera	NX951800	07/01/2004	Roost
Chiroptera	NX975809	07/01/2004	Roost
Chiroptera	NX908913	19/02/2004	Roost
Unidentified Bat	NX918831	21/09/2006	Roost
Daubenton's Bat	NX969780	08/08/2007	field record
Daubenton's Bat	NX966779	25/06/2008	None
Daubenton's Bat	NX873878	03/08/2008	field record
Natterer's Bat	NX882902	26/02/2009	Roost
Noctule Bat	NX871963	02/07/2006	None
Noctule Bat	NX871963	26/07/2007	field record
Noctule Bat	NX968780	08/08/2007	field record
Noctule Bat	NX966779	25/06/2008	None
Noctule Bat	NX971803	30/07/2008	field record
Pipistrellus	NX903798	13/05/1996	Roost

Species	Grid Reference	Date of Record	Description
Pipistrellus	NX946767	26/06/1997	Roost
Pipistrellus	NX973803	22/07/1998	Roost
Pipistrellus	NX915859	05/08/1998	Roost
Pipistrellus	NX909864	13/04/1999	Roost
Pipistrellus	NX913785	24/07/2000	Roost
Pipistrellus	NX9683	20/10/2000	None
Pipistrellus	NX928774	13/06/2001	Roost
Pipistrellus	NX977818	03/07/2001	Roost
Pipistrellus	NX811849	03/07/2001	Roost
Pipistrellus	NX950827	07/08/2001	Roost
Pipistrellus	NX917844	17/08/2001	Roost
Pipistrellus	NX968817	2002 - 2004	Seen
Pipistrellus	NX859840	26/02/2002	Roost
Pipistrellus	NX953791	18/06/2002	None
Pipistrellus	NX954776	21/08/2002	None
Pipistrellus	NX952797	08/01/2004	Roost
Pipistrellus	NX984883	08/01/2004	Roost
Pipistrellus	NX988786	24/05/2004	Roost
Pipistrellus	NY029830	14/07/2004	Roost
Pipistrellus	NX843941	13/07/2004	Roost
Pipistrellus	NX863927	03/08/2004	Roost
Pipistrellus	NX986782	08/09/2004	Roost
Pipistrellus	NX964773	13/12/2004	Roost
Pipistrellus	NX875955	08/06/2006	Roost
Pipistrellus	NX941852	27/11/2006	Roost
Pipistrellus	NX879951	24/11/2006	Roost
Pipistrellus	NX941852	27/11/2006	Roost
Pipistrellus	NX941852	27/11/2006	Roost
Pipistrellus	NX986782	25/02/2007	Roost
Pipistrellus	NX986782	25/02/2007	Roost
Pipistrellus	NX968817	March 2007 - October 2007	Seen
Pipistrellus	NX903798	26/04/2007	Dead
Pipistrellus	NX88348950	15/06/2007	field record
Pipistrellus	NX848870	14/12/2008	Roost

Species	Grid Reference	Date of Record	Description
Common Pipistrelle	NX944808	22/07/2001	None
Common Pipistrelle	NX821897	10/09/2002	None
Common Pipistrelle	NX8799	July 2004 - November 2005	Dead
Common Pipistrelle	NX971803	30/07/2008	field record
Common Pipistrelle	NX929928	2009	Seen
Soprano Pipistrelle	NX902923	13/07/2000	Roost
Soprano Pipistrelle	NX809904	21/04/2006	Roost
Soprano Pipistrelle	NX897896	14/09/2006	Roost
Soprano Pipistrelle	NX897896	14/09/2006	Roost
Soprano Pipistrelle	NX871834	15/08/2007	Roost
Soprano Pipistrelle	NX950827	22/08/2007	Roost
Soprano Pipistrelle	NX966779	25/06/2008	None
Soprano Pipistrelle	NX971803	08/08/2008	Roost
Soprano Pipistrelle	NX935770	29/09/2008	Roost
Soprano Pipistrelle	NX874801	19/02/2009	Roost
Soprano Pipistrelle	NX942843	25/05/2009	Roost
Brown Long-eared Bat	NX968817	2002 - 2004	Seen
Brown Long-eared Bat	NX9098	September 2004 - April 2006	Dead
Brown Long-eared Bat	NX968817	June 2007	Seen
Brown Long-eared Bat	NX871963	26/07/2007	Roost
Brown Long-eared Bat	NX871834	15/08/2007	Roost
Brown Long-eared Bat	NX966779	25/06/2008	None
Brown Long-eared Bat	NX874802	24/02/2009	Roost
Brown Long-eared Bat	NX942843	25/05/2009	Roost
Brown Long-eared Bat	NX980898	25/07/2009	Roost
Brown Long-eared Bat	NX980898	25/07/2010	Roost

Appendix B
NBN Gateway Data

Table 4.2 Consultation data – records within 15km of the consultation boundary obtained from NBN Gateway

Species	Grid Reference	Date of Record	Description
Unidentified	NX89	1970-2007	SNH, bat records for Scotland 1970-2007
Daubenton's	NX881902	11.03.1990	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.
Daubenton's	NX89	1990-1994	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.
Whiskered	NX89	1980-1994	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.
Natterer's	NX89	1980-1994	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.
Soprano pipistrelle	NX89	1970-2007	SNH, bat records for Scotland 1970-2007
Common pipistrelle	NX8599	15.06.2005	BCT, Colony Count Survey
Common pipistrelle	NX8599	20.06.2007	BCT, Colony Count Survey
Brown long-eared	NX8599	21.06.2007	BCT, Colony Count Survey
Unidentified	NX88	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NX88	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NX89	1970-2007	SNH, bat records for Scotland 1970-2007
Long-eared	NX8681	30.07.1986	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.
Unidentified	NX87	1970-2007	SNH, bat records for Scotland 1970-2007
Unidentified	NX88	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NX99	1970-2007	SNH, bat records for Scotland 1970-2007
Unidentified	NX98	1970-2007	SNH, bat records for Scotland 1970-2007
Myotis sp.	NX98	1970-2007	SNH, bat records for Scotland 1970-2007
Daubenton's	NX98	23.08.1881	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.
Soprano pipistrelle	NX98	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NX98	1972	Mammal records from Britain from the Atlas of Mammals (1993) with some subsequent records.

Species	Grid Reference	Date of Record	Description
Unidentified	NX97	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NX97	1970-2007	SNH, bat records for Scotland 1970-2007
Brown long-eared	NX97	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NS987000	22.05.2008	BCT/MRUK Bats and roadside mammals survey
Soprano pipistrelle	NS987000	22.05.2008	BCT/MRUK Bats and roadside mammals survey
Soprano pipistrelle	NS992000	13.07.2008	BCT/MRUK Bats and roadside mammals survey
Unidentified	NT00	1970-2007	SNH, bat records for Scotland 1970-2007
Soprano pipistrelle	NT00	1970-2007	SNH, bat records for Scotland 1970-2007
Unidentified	NY0585	10.08.1998	BCT, Daubenton's waterway survey
Unidentified	NY0585	30.08.1998	BCT, Daubenton's waterway survey
Daubenton's	Ny0585	10.08.1998	BCT, Daubenton's waterway survey
Daubenton's	NY0585	30.08.1998	BCT, Daubenton's waterway survey
Soprano pipistrelle	NY0083	15.06.2009	BCT, Colony Count Survey
Soprano pipistrelle	NY0086	22.06.2009	BCT, Colony Count Survey
Brown long-eared	NY0187	24.04.1980	Glasgow Museums BRC, Mammal Records for Clyde Faunal Area, 1850 to 2007.

Appendix C
Bat Roost Suitability Survey Results

Table 4.3 Bat Roost Suitability Survey Results – Buildings

Survey Location and Grid Reference	Survey Date	Description
High Auldgirth Cottages Number 1 NX 92259 87767 Figure 3.3 Target Note 2	24/08/2011	Detached house. Wooden façade with possible block construction underneath. Single storey building. Roof was tiles on the main building and the adjoining outbuilding. Potential access points underneath the wood cladding on external surfaces, within the cavity under the soffit boards with direct access into the roof space. Full access not taken due to the tenant being absent and the presence of two guard dogs within the grounds of the property. Evidence of bat presence: None identified Roost Potential: High
High Auldgirth Cottages Number 2 NX 92244 87767 Figure 3.3 Target Note 2	24/08/2011	Building is similar construction to number 1. Potential access points under the wood cladding, under the hanging tiles, large gaps in soffit board allowing direct access into roof space. Evidence of bat presence: 1 x dropping on window and 1 x dropping window sill at back of house on window to the right of the back door. 2 x droppings on wooden slat on back of house 5 x droppings on eastern most window on back of house. 2 x droppings on window and 3 x droppings on window sill on eastern side of house. Roost Potential: High
High Auldgirth Cottages Number 3 NX 92209 87767 Figure 3.3 Target Note 2	24/08/2011	Building is similar construction to number 1. Potential access points under the wood cladding, under the hanging tiles. Full access was not taken due to reluctance of tenant. Evidence of bat presence: None identified Roost Potential: High
High Auldgirth Cottages Number 4 NX 92223 87765 Figure 3.3 Target Note 2	24/08/2011	Building is similar construction to number 1. Roof was covered in felt in places (outbuildings) and with tiles on the main building Potential access points underneath the wood cladding on external surfaces, within the cavity under the soffit boards with direct access into the roof space. Evidence of bat presence: 2 x droppings on window sill on the front of the house 1 x dropping on window frame on the eastern face of the house. Numerous droppings on top of the bins at the side of the house. Pers comm with tenant – They regularly see bats flying at the back of the house and at the south eastern corner of the building at night. Roost Potential: High

Survey Location and Grid Reference	Survey Date	Description
Keepers Cottage and associated buildings NX 92041 87767 Figure 3.3 Target Note 4	24/08/2011	Buildings consist of the main dwelling house, garage and outhouses. 60+ years old. Main dwelling is stone construction with whitewash. Garage is stone with a half corrugated iron roof and half tiles roof. Outbuildings are predominantly stone construction with tiled roof. Internally the roof spaces in the garage and outhouses are lines with wooden boards. Potential access points include under hanging tiles, under missing tiles, under flashing, under guttering of outhouse. Evidence of bat presence: 1 x dropping on wall at front of building adjacent to garage Numerous droppings under the guttering of the same building. Roost Potential: High (brown long-eared potential)
Outbuildings next to High Auldgirth NX 92160 87689 (Central Grid Reference) Figure 3.3 Target Note 3	24/08/2011	Complex consists on one outbuilding, one corrugated iron barn, one barn containing asbestos and one cattle shed. Construction between the buildings (brick, stone and cement blocks) is varied with some being in a better state of repair than the others. Some buildings where the roof was not made from corrugated iron there were hanging tiles. Potential access points for bats are likely to be under the guttering, most building had broken windows which allowed direct access and missing tiles and missing wooden boards. No access was taken to inspect the buildings internally due to the presence of asbestos in addition to the poor state of repair of some of the buildings. Evidence of bat presence: None identified Roost Potential: Medium-High

Table 4.4 Bat Roost Suitability Surveys – Woodland and Trees (includes those along the route of the proposed access track)

Survey Location and Grid Reference	Survey Date	Description
Broad-leaved woodland NX 92929 88008 Figure 3.3 Target Note 1	24/08/2011	Area of broad-leaved woodland at the top of Lambrig Wood which contains mainly beech trees (*Fagus sylvatica*). Approximately 20 trees within the woodland; predominantly mature trees with varying degrees of bat roost potential. Individual trees identified as containing high bat roost potential contained features such as splitting bark, dead wood on the main trunk or branches, snag ends, knots and gnarls in the branches and cavities/cracks/holes/gaps allowing direct access into the tree. The woodland was assessed collectively as proving high bat roost potential and high potential to support foraging bats.
Oak tree NX 91606 87371 Figure 3.3 Target Note 5	24/08/2011	Mature Oak tree along field boundary. Many features identified as being suitable for providing bat roosting habitat. Cracks and holes are present in the main trunk of the tree and along the branches. Evidence of bat presence: None Roost Potential: High
Alder tree NX 91587 87342 Figure 3.3 Target Note 6	24/08/2011	Mature alder tree along field boundary adjacent to gate. Identified as providing potential for roosting bats. Elbow hole identified in south facing branch at 2m. Depression in main trunk. Evidence of bat presence: None Roost Potential: High

Survey Location and Grid Reference	Survey Date	Description
Alder tree NX 91580 87317 Figure 3.3 Target Note 6	24/08/2011	Mature alder tree along field boundary adjacent to gate. Some small cracks in main trunk. Evidence of bat presence: None Roost Potential: Medium
Oak tree NX 91597 87258 Figure 3.3 Target Note 6	24/08/2011	Mature alder tree along field boundary adjacent to gate. One large crack in one of the main limbs at 10m. Evidence of bat presence: None Roost Potential: High
Oak Tree x 3 NX 91621 87206 Figure 3.3 Target Note 6	24/08/2011	Three trees adjacent to one another along the field boundary. Numerous features offering roosting potential including cracked bark and holes in limbs. Evidence of bat presence: None Roost Potential: High

Appendix D
Manual Bat Activity Transect Survey Results (Echoes Ecology)

December 2011
Doc Reg No. 27846/D040/rr016i1

Manual Bat Activity Survey – Bat Transect – May 2011 (See Figure 3.5)

site Name	Date	Survey Type	Sunset	OS Grid Ref	Temperature °C	Surveyor(s) (Location Ref)
Blackwood Proposed Windfarm	11.05.11	Dusk Transect	21:09	NX 929 882	min:12	L Davis/C Gould
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind**	
Approx. Sunset until 150mins after Sunset		Mainly Dry	75%	First Quarter	1	
Location (Points Passed = P)	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes (Max of 5 per single bat)**	**Behaviour**	**Additional Notes**
Survey Start Time	21:12			NIL		
P1	21:12			NIL		
P2	21:27			NIL		
P3	21:31			NIL		
P4	21:36			NIL		
P5	21:41			NIL		
P6	21:44			NIL		
Between P6 and P7 NX 9291 8870	21:46 - 21:50	Common/Bandit pipistrelle	1	5	Commuting and Foraging	flying N to S along wood edge and back again
Between P6 and P7 NX 9291 8870	21:46	Soprano pipistrelle	1	1	Commuting	no visual
P7	21:59			NIL		
P8	22:07			NIL		
P9	22:14			NIL		
P10	22:19			NIL		
Between P10 and P11 NX 9316 8882	22:34	Soprano pipistrelle	1	4	Commuting	no visual

P11	22:40			NIL		
Between P11 and P12 NX 9318 8842	22:48	Soprano pipistrelle	1	5	Commuting and Foraging	flying N to S over stream and back again
Between P11 and P12 NX 9318 8834	22:50	*Myotis* possibly Daubenton's	1	1	Commuting	no visual
P12	22:58			NIL		
P13	23:05			NIL		
Between P13 and P14 NX 9319 8796	23:06	Soprano pipistrelle	1	1	Commuting	no visual but loud so sounded to be overhead
Between P13 and P14 NX 9316 8801	23:11	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P13 and P14 NX 9293 8807	23:14	Soprano pipistrelle	1	2	Commuting and social calling	no visual
Between P13 and P14 NX 9293 8807	23:15	Soprano pipistrelle	1	1	Commuting	no visual
Between P13 and P14 NX 9293 8807	23:15 - 23:16	Soprano pipistrelle	1	5	Commuting, foraging and social calling	no visual
Between P13 and P14 NX 9294 8803	23:16	Common/Bandit pipistrelle	1	1	Commuting	no visual
P14	23:22			NIL		
Between P14 and P15 NX 9303 8750	23:28	Pipistrelle - Unidentified	1	1	Commuting	no visual
Between P14 and P15 NX 9303 8750	23:29	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P14 and P15 NX 9297 8750	23:30	Pipistrelle - Unidentified	1	1	Commuting	no visual but loud so sounded to be overhead
P15	23:31			NIL		
Survey End Time	23:38					
Total Survey Time (mins)	146	Overall Activity Totals	14	30		

Results Summary and Conclusions: A small number of bats, mainly Common/Bandit and Soprano pipistrelles were recorded during the transect, often making use of edge features or linear corridors for commuting and foraging e.g. tree edge, stream corridor. One Myotis bat, possibly a Daubenton's, was recorded commuting near the stream at the east of the bat survey area.

Manual Bat Activity Survey – Bat Transect – June (See Figure 3.6)

site Name	Date	Survey Type	Sunset	OS Grid Ref	Temperature ^{o}C	Surveyor(s) (Location Ref)
Blackwood Proposed Windfarm	14.06.11	Dusk Transect	21:55	NX 929 882	min: 12	L Davis/R McLeod
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind**	**0**
Sunset until 169mins after Sunset		Dry	20%	Waxing gibbous	F1	0
Location (Points Passed = P)	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes (Max of 5 per single bat)**	**Behaviour**	**Additional Notes**
Survey Start Time	21:55					
P1 NX 9277 8777	21:55			NIL		
P15 NX 9309 8750	22:05			NIL		
P14 NX 9301 8794	22:17			NIL		
Between P14 and P13 NX 9288 8796	22:21	Soprano pipistrelle	1	1	Commuting	no visual
P13 NX 9320 8796	22:31			NIL		
P12 NX 9319 8826	22:39			NIL		
Between P12 and P11 NX 9312 8845	22:51	Common/Bandit pipistrelle	1	2	Commuting	flew N to S over the trees
Between P12 and P11 NX 9312 8845	22:52	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P12 and P11 NX 9312 8847	22:53	Soprano pipistrelle	1	1	Commuting	faint, no visual
Between P12 and P11 NX 9312 8847	22:54	Common/Bandit pipistrelle	1	1	Commuting	flew SE to NW following track
Between P12 and P11 NX 9312 8855	22:58	*Myotis*	1	1	Commuting	flew S to N over stream
Between P12 and P11 NX 9317 8863	23:07	Soprano pipistrelle	1	1	Commuting	no visual
Between P12 and P11 NX 9318 8869	23:11	Pipistrelle - Unidentified	1	2	Commuting	no visual

P11 NX 9316 8873	23:14	Common/Bandit pipistrelle	1	2	Commuting	no visual
Between P11 and P10 NX 9316 8873	23:15 - 23:18	Soprano pipistrelle	1	1	Commuting	no visual
		Common/Bandit pipistrelle	1	5	Commuting and foraging	no visual
Between P11 and P10 NX 9316 8873	23:18	Common/Bandit pipistrelle	1	5	Commuting and foraging	overhead
		Soprano pipistrelle	1	1	Commuting	overhead
Between P11 and P10 NX 9318 8882	23:21	Common/Bandit pipistrelle	1	2	Commuting and foraging	overhead
Between P11 and P10 NX 9318 8882	23:23	Pipistrelle - Unidentified	1	1	Commuting	no visual
Between P11 and P10 NX 9318 8882	23:23	Common/Bandit pipistrelle	1	2	Commuting	no visual
Between P11 and P10 NX 9318 8882	23:23	Soprano pipistrelle	1	5	Commuting	no visual
Between P11 and P10 NX 9319 8887	23:24	*Myotis*	1	2	Commuting	no visual
Between P11 and P10 NX 9319 8887	23:25	Common/Bandit pipistrelle	1	5	Commuting and foraging	over stream
		Soprano pipistrelle	1	1	Commuting and foraging	over stream
		Myotis	1	1	Commuting	over stream
Between P11 and P10 NX 9319 8895	23:27	Common/Bandit pipistrelle	1	2	Commuting	no visual
	23:28	Pipistrelle - Unidentified	1	1	Commuting	no visual
Between P11 and P10 NX 9319 8895	23:29 - 23:30	Common/Bandit pipistrelle	1	1	Commuting	no visual
		Soprano pipistrelle	1	5	Commuting	no visual
Between P11 and P10 NX 9319 8895	23:30 - 23:32	Common/Bandit pipistrelle	1	5	Commuting	no visual
		Soprano pipistrelle	1	5	Commuting	no visual
Between P11 and P10 NX 9319 8895	23:32	*Myotis*	1	1	Commuting	no visual
Between P11 and P10 NX 9320 8902 - NX 9320 8914	23:34 - 23:41	Common/Bandit pipistrelle	1	5	Commuting	no visual
		Soprano pipistrelle	1	5	Commuting	no visual
P10 NX 9314 8922	23:41			NIL		

Between P10 and P9 NX 9314 8922 - NX 9311 8918	23:41 - 23:44	Common/Bandit pipistrelle	1	5	Commuting	no visual
Between P10 and P9 NX 9304 8910	23:46	Common/Bandit pipistrelle	1	3	Commuting	no visual
Between P10 and P9 NX 9304 8910	23:47	Common/Bandit pipistrelle	1	2	Commuting and foraging	no visual
P9 NX 9302 8904	23:50	Common/Bandit pipistrelle	1	5	Commuting	no visual
P8 NX 9297 8893	23:52			NIL		
Between P8 and P7 NX 9298 8893	23:54	Common/Bandit pipistrelle	1	3	Commuting	no visual
Between P8 and P7 NX 9288 8890	23:56	Pipistrelle - Unidentified	1	1	Commuting	no visual
Between P8 and P7 NX 9279 8891	23:58	Common/Bandit pipistrelle	1	1	Commuting	no visual
P7 NX 9256 8870	00:02	Soprano pipistrelle	1	3	Commuting	no visual
		Common/Bandit pipistrelle	1	3	Commuting	no visual
Between P7 and P6 NX 9275 8876	00:06 - 00:08	Soprano pipistrelle	1	5	Commuting	no visual
		Common/Bandit pipistrelle	1	5	Commuting	no visual
Between P7 and P6 NX 9291 8870	00:10	Common/Bandit pipistrelle	1	2	Commuting	no visual
		Soprano pipistrelle	1	1	Commuting	no visual
P6 NX 9291 8862	00:14			NIL		
Between P6 and P5 NX 9291 8862	00:16	Common/Bandit pipistrelle	1	1	Commuting	no visual
P5 NX 9284 8848	00:17			NIL		
Between P5 and P4 NX 9284 8848	00:18	Common/Bandit pipistrelle	1	1	Commuting	no visual
P4 NX 9262 8850	00:30			NIL		
Between P4 and P3 NX 9266 8835	00:33	Pipistrelle - Unidentified	1	1	Commuting	faint, no visual
P3 NX 9272 8824	00:35	Pipistrelle - Unidentified	1	1	Commuting and foraging	no visual
Between P3 and P2 NX 9289 8809	00:38	Common/Bandit pipistrelle	1	1	Commuting and foraging	no visual
P2 NX 9289 8809	00:39			NIL		
Between P2 and P1 NX 9277 8777	00:43	Pipistrelle - Unidentified	1	3	Commuting	no visual

Between P2 and P1 NX 9277 8777	00:44	Pipistrelle - Unidentified	1	1	Commuting	no visual
P1 NX 9277 8777	00:44			NIL		
Survey End Time	00:44					
Total Survey Time (mins)	169	Overall Activity Totals	50	121		
Results Summary and Conclusions: Bat activity was greater during this survey than on the previous. The majority of bat passes began to be picked up approximately one hour after sunset, upon reaching the stream at the east of the bat survey area. Here, many numerous bat passes of three species (Soprano pipistrelle, Common/Bandit pipistrelle and Myotis species) were recorded, using the stream corridor as a commuting and foraging route.						

Manual Bat Activity Survey – Bat Transect – July (See Figure 3.7)

site Name	**Date**	**Survey Type**	**Sunrise**	**OS Grid Ref**	**Temperature ^{o}C**	**Surveyor(s) (Location Ref)**
Blackwood Proposed Windfarm	13.07.11	Dawn Transect	05:03	NX 929 882	min: 11	J Smith/R McLeod
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind**	
165 mins before Sunrise until Sunrise		Dry	20%	Waxing gibbous	F1	
Location (Points Passed = P)	Time	Species	Max Number of Individual Bats Present	Bat Passes **(Max of 5 per single bat)**	Behaviour	Additional Notes
Survey Start Time	02:18					
P1 NX 9277 8777	02:18			NIL		
Between P1 and P15	02:26	Pipistrelle - Unidentified	1	1	Commuting	faint, no visual
P15 NX 9309 8750	02:31			NIL		

P14 NX 9301 8794	02:42	Pipistrelle - Unidentified	1	2	Commuting	faint, no visual
Between P14 and P13	02:43	Common/Bandit pipistrelle	1	5	Commuting	no visual
Between P14 and P13	02:44	Common/Bandit pipistrelle	1	2	Commuting and foraging	no visual
Between P14 and P13	02:46	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P14 and P13	02:47	Common/Bandit pipistrelle	1	3	Commuting	no visual
P13 NX 9320 8796	02:55			NIL		
P12 NX 9319 8826	03:04			NIL		
P11 NX 9316 8873	03:19			NIL		
Between P11 and P10 NX 9314 8922	03:43	Soprano pipistrelle	1	1	Commuting	no visual
P10 NX 9314 8922	03:44			NIL		
Between P10 and P9	03:46	Common/Bandit pipistrelle	1	1	Commuting	flew E to W along river valley
Between P10 and P9	03:51	Common/Bandit pipistrelle	1	3	Commuting and foraging	at the E edge of the woodland
Between P10 and P9	03:52	Common/Bandit pipistrelle	1	1	Commuting	flew S to N along wood edge
Between P10 and P9	03:54	Common/Bandit pipistrelle	3	4	Commuting and foraging	flew N to S along wood edge
P9 NX 9302 8904	03:58			NIL		
P8 NX 9297 8893	04:05			NIL		
P7 NX 9256 8870	04:12			NIL		
P6 NX 9291 8862	04:19			NIL		
P5 NX 9284 8848	04:22			NIL		
P4 NX 9262 8850	04:32			NIL		
P3 NX 9272 8824	04:43			NIL		
P2 NX 9289 8809	04:48			NIL		
P1 NX 9277 8777	05:03			NIL		

Survey End Time	05:03					
Total Survey Time (mins)	169	Overall Activity Totals	13	24		
Results Summary and Conclusions: Bat activity was lower than during previous surveys. The majority of the bat passes were heard between points 14 and 13 and between points 10 and 9 (both whilst close to woodland edge). Predominantly Common/Bandit pipistrelles were recorded.						

Manual Bat Activity Survey – Bat Transect – August (See Figure 3.8)

site Name	**Date**	**Survey Type**	**Sunset**	**OS Grid Ref**	**Temperature °C**	**Surveyor(s) (Location Ref)**
Blackwood Proposed Windfarm	08.08.11	Dusk Transect	21:05	NX 929 882	min: 11	J Smith/ J Ryan
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind**	
Approx. Sunset until 150mins after Sunset		Dry	2%	First Quarter	3	
Location (Points Passed = P)	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes (Max of 5 per single bat)**	**Behaviour**	**Additional Notes**
Survey Start Time	21:05					
P1 NX 9277 8777	21:05			NIL		
P2 NX 9289 8809	21:14			NIL		
P3 NX 9272 8824	21:17			NIL		
P4 NX 9262 8850	21:22			NIL		
P5 NX 9284 8848	21:27			NIL		

P6 NX 9291 8862	21:29			NIL		
Between P6 and P7 NX 9289 8878	21:32	Common/Bandit pipistrelle	1	1	Commuting	Bat flew south-west, following tree line.
P7 NX 9256 8870	21:37			NIL		
P8 NX 9297 8893	21:46			NIL		
P9 NX 9302 8904	21:52			NIL		
P10 NX 9314 8922	21:59			NIL		
P11 NX 9316 8873	22:27			NIL		
Between P11 and P12 NX 9315 8862	22:36	Common/Bandit pipistrelle	1	1	Commuting	No visual
P12 NX 9319 8826	23:08			NIL		
P13 NX 9320 8796	23:16			NIL		
Between P13 and P14 NX 9293 8802	23:36	Soprano pipistrelle	1	3	Commuting	No visual
P14 NX 9301 8794	23:28			NIL		
P1 NX 9277 8777	23:35			NIL		
Survey End Time	23:35					
Total Survey Time (mins)	150	Overall Activity Totals	3	5		

Results Summary and Conclusions: Bat activity was much less than during previous dusk surveys (May - June). The first bat pass was picked up approximately half an hour after sunset, upon reaching the north-east of the bat survey area at the highest point of the hill. Overall three bats were recorded, 1 Soprano and 2 Bandit pipistrelle, whilst near a tree line and the stream corridor.

Manual Bat Activity Survey – Bat Transect – September (See Figure 3.9)

site Name	Date	Survey Type	Sunset	OS Grid Ref	Temperature °C	Surveyor(s) (Location Ref)
Blackwood Proposed Windfarm	05.09.11	Dusk Transect	20:00	NX 929 882	min: 10	L Davis/R McLeod
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind**	
Approx. Sunset until 144mins after Sunset		Drizzle to light rain	100%	First Quarter	F2/3	
Location (Points Passed = P)	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes (Max of 5 per single bat)**	**Behaviour**	**Additional Notes**
Survey Start Time	20:05					
P1 NX 9277 8777	20:05			NIL		
P2 NX 9289 8809	20:15			NIL		
P3 NX 9272 8824	20:19			NIL		
P4 NX 9262 8850	20:23			NIL		
Between P4 and P6 NX 9267 8857	20:25	Soprano pipistrelle	2	10	Foraging	flew along tree edge SW to NE and back again, circling overhead
Between P4 and P6 NX 9283 8863	20:30	Common/Bandit pipistrelle	1	2	Commuting	no visual
P6 NX 9291 8862	20:34	Soprano pipistrelle	1	2	Commuting	no visual
Between P6 and P7 NX 9290 8875	20:37	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P6 and P7 NX 9290 8875	20:39	Soprano pipistrelle	1	5	Foraging	using edge of tree line
		Common/Bandit pipistrelle	1	5	Foraging	
P7 NX 9256 8870	20:43			NIL		
P8 NX 9297 8893	20:53			NIL		
P9 NX 9302 8904	20:56			NIL		

Between P9 and P10 NX 9305 8913	20:59	Soprano pipistrelle	1	1	Commuting	no visual
Between P9 and P10 NX 9314 8922	21:06	Common/Bandit pipistrelle	1	3	Commuting	no visual
P10 NX 9314 8922	21:08	Common/Bandit pipistrelle	1	2	Commuting	no visual
Between P10 and P11 NX 9316 8920	21:10	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P10 and P11 NX 9316 8920	21:11	Soprano pipistrelle	1	1	Commuting	no visual
Between P10 and P11 NX 9316 8920	21:13	*Myotis*	1	2	Commuting	no visual
Between P10 and P11 NX 9316 8920	21:13	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P10 and P11 NX 9316 8920	21:14	Common/Bandit pipistrelle	1	2	Commuting	no visual
Between P10 and P11 NX 9321 8917	21:17	Soprano pipistrelle	1	1	Commuting	no visual
Between P10 and P11 NX 9323 8910	21:20	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P10 and P11 NX 9323 8910	21:22	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P10 and P11 NX 9322 8904	21:23	Soprano pipistrelle	1	3	Commuting	no visual
Between P10 and P11 NX 9322 8904	21:24	Common/Bandit pipistrelle	1	2	Commuting	no visual
Between P10 and P11 NX 9320 8899	21:27	Common/Bandit pipistrelle	1	1	Commuting	no visual
P11 NX 9316 8873	21:37			NIL		
Between P11 and P12 NX 9320 8865	21:40	Soprano pipistrelle	1	1	Commuting	no visual
Between P11 and P12 NX 9320 8838	21:54	Common/Bandit pipistrelle	1	1	Commuting	no visual
P12 NX 9319 8826	21:56			NIL		
P13 NX 9320 8796	22:09			NIL		
Between P13 and P2 NX 9289 8809	22:17	Common/Bandit pipistrelle	1	5	Commuting	no visual, probably within wood or at edge
		Soprano pipistrelle	1	5	Commuting	
		Myotis	1	1	Commuting	
P2 NX 9289 8809	22:18			NIL		
Between P2 and P1 NX 9281 8790	22:21	Common/Bandit pipistrelle	1	1	Commuting	no visual
P1 NX 9277 8777	22:24			NIL		

Survey End Time	22:24					
Total Survey Time (mins)	144	Overall Activity Totals	27	61		
Results Summary and Conclusions: The first bat pass was picked up approximately half an hour after sunset, upon reaching the wood edge after P4. The majority of the bats were recorded whilst walking along the course of the burn at the east of the bat survey area, between P10 and P12. Predominantly pipistrelles (Soprano and Common/Bandit) were recorded, commuting and foraging, and a couple of Myotis bat passes were also recorded.						

Manual Bat Activity Survey – Bat Transect – October (See Figure 3.10)

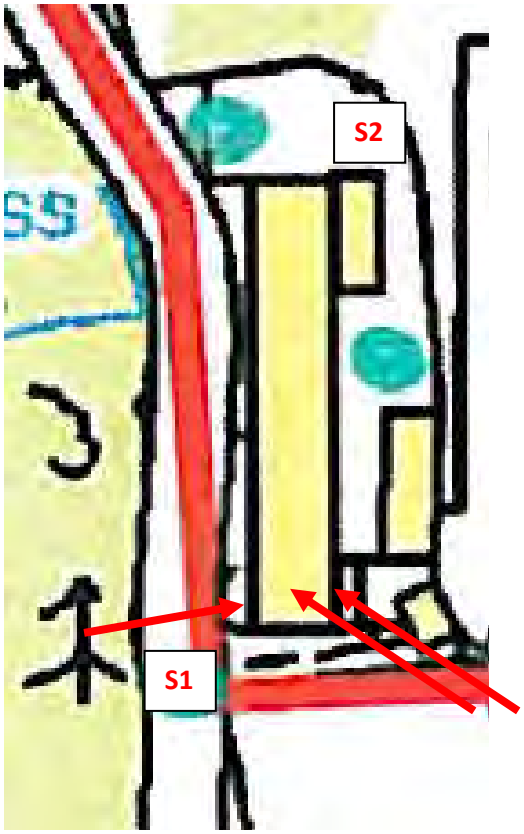
site Name	**Date**	**Survey Type**	**Sunset**	**OS Grid Ref**	**Temperature °C**	**Surveyor(s) (Location Ref)**
Blackwood Proposed Windfarm	18.10.11	Dusk Transect	18:09	NX 929 882	min: 7	J Smith/ D Lynch
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind**	
Sunset until 156mins after Sunset		Drizzle to no rain	20%	Waning Gibous	3	
Location (Points Passed = P)	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes (Max of 5 per single bat)**	**Behaviour**	**Additional Notes**
Survey Start Time	18:09					
P15	18:21					
P14	18:30					
P13	18:43					
P12	18:55					
P11	19:14					
P10	19:40					
P9	19:49					
P8	20:03					

P7	20:09					
P6	20:24					
P5	20:27					
P4	20:32					
P3	20:37					
P3-P2	20:45					
Survey End Time	20:45					
Total Survey Time (mins)	156	Overall Activity Totals	0	0		
Results Summary and Conclusions: No bats were recorded on the transect.						

Appendix E
Emergence-Re-Entry Survey Results (Echoes Ecology)

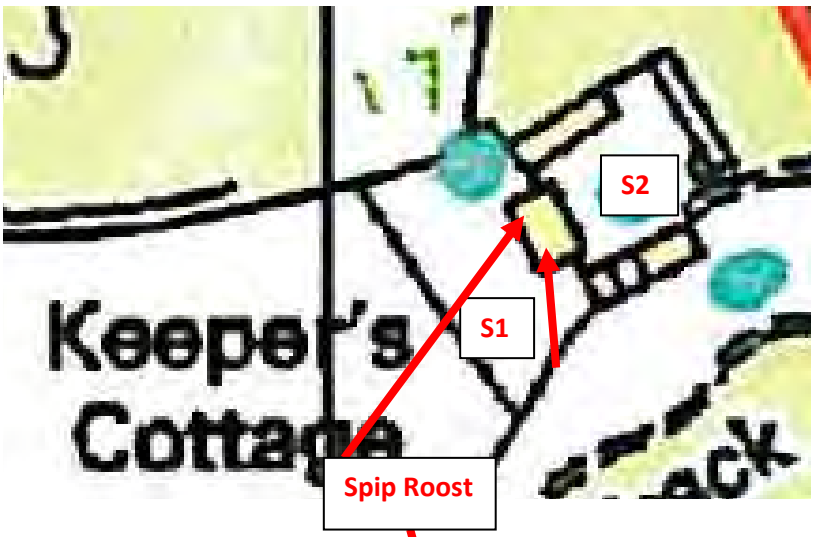
December 2011
Doc Reg No. 27846/D040/rr016i1

Dusk and Dawn 21-22.09.11
Surveyor Positioning and Confirmed Roost Locations - Outbuildings



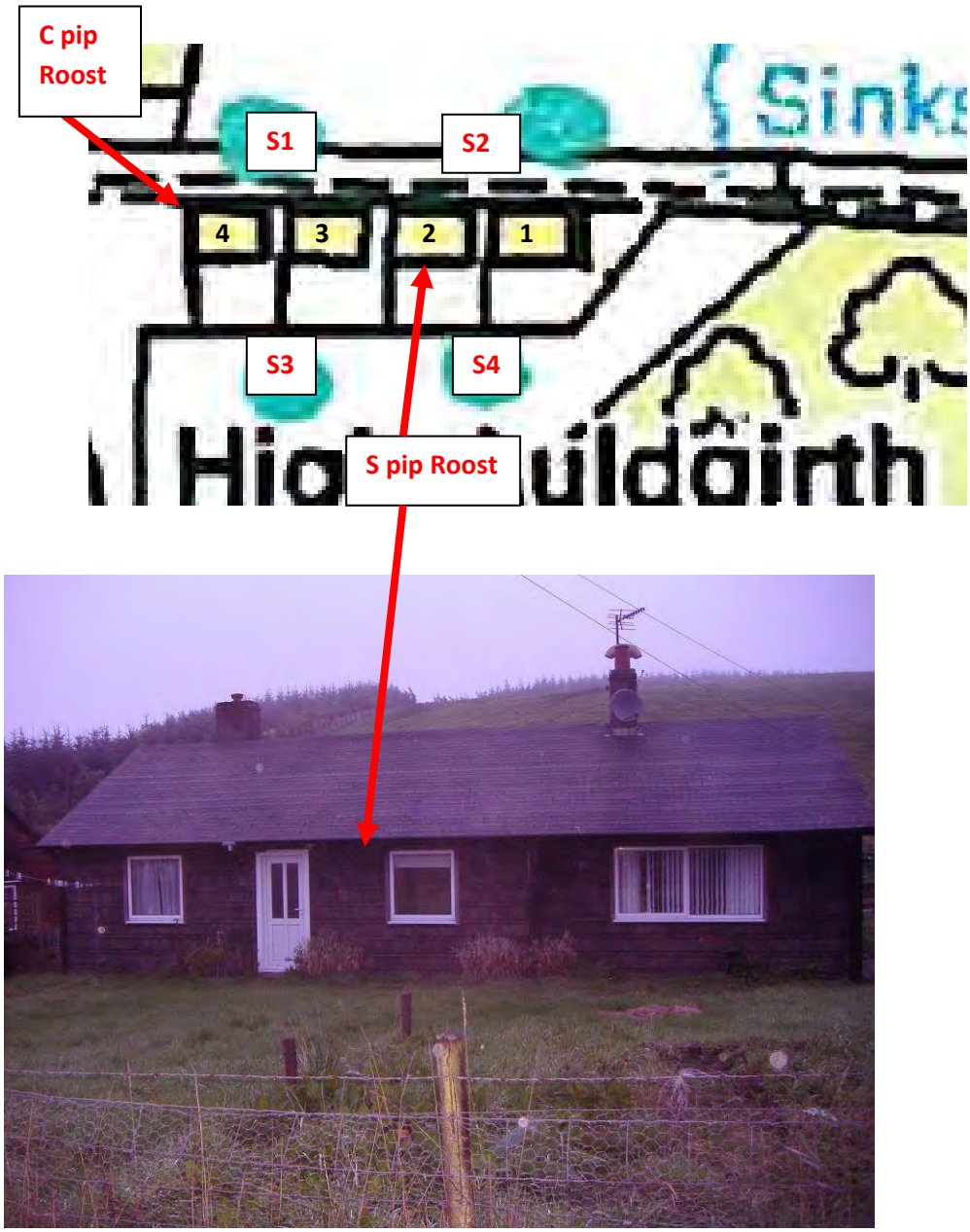
Photograph 1 – 21-22.09.2011. Three roost locations on the south-facing end of the large garage building, and the small stone shed attached to the south end of the garage. Note: the roost point indicated at the apex of the small stone shed is inside the shed

Dusk 28.09.11
Surveyor Positioning and Confirmed Roost Locations - Keeper's Cottage



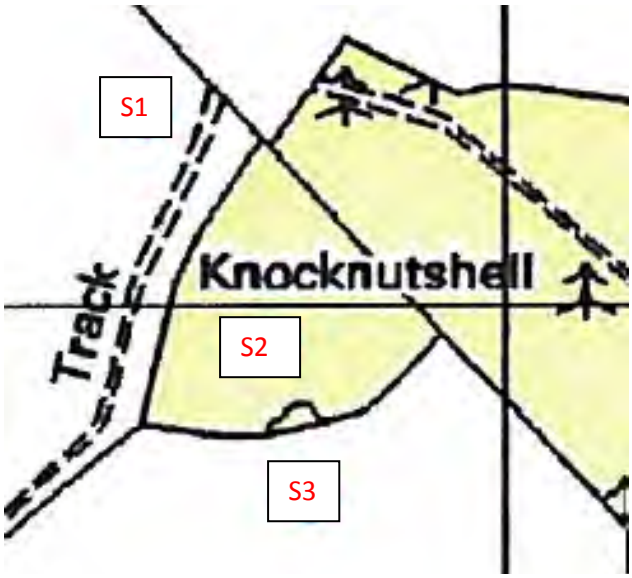
Photograph 2 – 28.09.2011. One Soprano pipistrelle emerged from below the slates to the east side of the chimney.

Dawn 29.09.11
Surveyor Positioning and Roost Locations - High Auldgirth Cottages



Photograph 3 – 29.09.2011 - One Soprano pipistrelle emerged from above the wall head to the right (east) of the door on the rear (south-facing) side of No. 2.

Dusk and Dawn 21-22.09.11
Surveyor Positioning - Knocknutshell Wood



Appendix F
Static Detector Surveys – Weather Data

Table E.1 Weather Data for June 2011 Anabat Surveys

June 2011	Sunrise time	Sunset time	Mean temperature ºC	Min temperature ºC	Mean wind speed (km/h)	Max wind speed (km/h)	Precipitation (cm)
14/06/2011	04:34	21:55	11	2	2	13	0
15/06/2011	04:34	21:56	14	9	4	10	0.20
16/06/2011	04:34	21:56	11	6	5	14	0.20
17/06/2011	04:34	21:57	10	1	4	14	1.37
18/06/2011	04:34	21:57	12	1	5	18	0.18

Source: http://www.wunderground.com/history/ for the nearest weather station with historical data (Corsock). Website accessed 06/10/2011. Source for sunrise/sunset times: http://uk.weather.com/climate/sunRiseSunSet-Dumfries-DG1?month Website accessed 06/10/2011.

Table E.2 Weather Data for July 2011 Anabat Survey

July 2011	Sunrise time	Sunset time	Mean temperature ºC	Min temperature ºC	Mean wind speed (km/h)	Max wind speed (km/h)	Precipitation (cm)
27/07/2011	05:14	21:28	14	6	2	8	0.00
28/07/2011	05:15	21:26	13	8	4	13	0.05
29/07/2011	05:17	21:24	14	8	2	8	0.05
30/07/2011	05:17	21:23	13	5	2	8	0.00
31/07/2011	05:18	21:21	15	10	4	14	0.51

Source: http://www.wunderground.com/history/ for the nearest weather station with historical data (Corsock). Website accessed 06/10/2011. Source for sunrise/sunset times: http://uk.weather.com/climate/sunRiseSunSet-Dumfries-DG1?month. Website accessed 06/10/2011.

Table B.3 Weather Data for August 2011 Anabat Survey

August 2011	Sunrise time	Sunset time	Mean temperature ºC	Min temperature ºC	Mean wind speed (km/h)	Max wind speed (km/h)	Precipitation (cm)
03/08/2011	05:26	21:15	16	13	2	8	0.05
04/08/2011	05:28	21:13	15	13	3	10	0.05

August 2011	Sunrise time	Sunset time	Mean temperature ºC	Min temperature ºC	Mean wind speed (km/h)	Max wind speed (km/h)	Precipitation (cm)
05/08/2011	05:30	21:10	15	10	8	26	0.15
06/08/2011	05:31	21:08	11	1	1	6	0.38
07/08/2011	05:33	21:06	12	1	5	16	0.15
08/08/2011	05:35	21:04	13	7	18	40	0.18

Source: http://www.wunderground.com/history/ for the nearest weather station with historical data (Corsock). Website accessed 06/10/2011. Source for sunrise/sunset times: http://uk.weather.com/climate/sunRiseSunSet-Dumfries-DG1?month. Website accessed 06/10/2011.

Table B.4 Weather Data for September 2011 AnaBat Survey

September 2011	Sunrise time	Sunset time	Mean temperature ºC	Min temperature ºC	Mean wind speed (km/h)	Max wind speed (km/h)	Precipitation (cm)
28/09/2011	07:10	18:59	15	8	5	13	0.00
29/09/2011	07:12	18:56	14	9	2	10	0.03
30/09/2011	07:14	18:54	14	8	3	13	0.05
01/10/2011	07:16	18:52	13	8	2	14	0.00
02/10/2011	07:17	18:51	15	9	2	10	0.15

Source: http://www.wunderground.com/history/ for the nearest weather station with historical data (Corsock). Website accessed 06/10/2011. Source for sunrise/sunset times: http://uk.weather.com/climate/sunRiseSunSet-Dumfries-DG1?month. Website accessed 06/10/2011.

Appendix G
Static Detector Survey Results per Location

Table F.1 Location 1: Total Species Activity

Species	June	July	August	September	Total
Soprano pipistrelle	88	287	1	328	704
Bandit pipistrelle	132	208	0	120	460
Pipistrelle species	132	89	0	100	321
Myotis species	15	9	0	23	47
Nyctalus species	0	38	1	0	39
Brown long-eared	0	0	0	2	2
Query	0	0	0	0	0
Total	367	631	2	573	1573

Table F.2 Location 2: Total Species Activity

Column Heading	June	July	August	September	Total
Soprano pipistrelle	146	148	72	116	482
Bandit pipistrelle	661	199	156	81	1097
Pipistrelle species	397	129	45	29	600
Myotis species	5	17	1	0	23
Nyctalus species	12	4	2	0	18
Brown long-eared	0	0	13	1	14
Query	0	0	0	0	0
Total	1221	497	289	227	2234

Table F.3 Location 3: Total Species Activity

Column Heading	June	July	August	September	Total
Soprano pipistrelle	35	0	6	0	41
Bandit pipistrelle	219	17	53	1	290
Pipistrelle species	49	1	3	0	53
Myotis species	16	0	0	1	17
Nyctalus species	1	4	4	0	9
Brown long-eared	0	0	0	0	0
Query	0	0	0	0	0
Total	320	22	66	2	410

Table F.4 Location 4: Total Species Activity

Column Heading	June	July	August	September	Total
Soprano pipistrelle	0	133	46	10	189
Bandit pipistrelle	0	157	75	23	255
Pipistrelle species	0	72	29	2	103
Myotis species	0	17	2	9	28
Nyctalus species	0	10	17	0	27
Brown long-eared	0	0	1	1	2
Query	0	0	2	0	2
Total	0	389	172	45	606

Appendix H
Bat Activity Index per Night and per Hour for Each Static Detector Survey Location

December 2011
Doc Reg No. 27846/D040/rr016i1

Table G.1 Bat Activity Index (BAI) Calculations per night and per hour using the Actual Number of Bat Calls per species per location

Location	Species	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour
Location 1		June	/1	8.5 x 1	July	/2	9.75 x 2	August	/1	9.75 x 1	September	/3	13 x 3
				8.5			19.5			9.75			39
	Soprano pipistrelle	88	88	10.35294118	287	143.5	14.71794872	1	1	0.102564103	328	109.3333333	8.41025641
	Bandit pipistrelle	132	132	15.52941176	208	104	10.66666667	0	0	0	120	40	3.076923077
	Pipistrelle species	132	132	15.52941176	89	44.5	4.564102564	0	0	0	100	33.33333333	2.564102564
	Myotis	15	15	1.764705882	9	4.5	0.461538462	0	0	0	23	7.666666667	0.58974359
	Nyctalus	0	0	0	38	19	1.948717949	1	1	0.102564103	0	0	0
	Brown long-eared	0	0	0	0	0	0	0	0	0	2	0.666666667	0.051282051
	Query	0	0	0	0	0	0	0	0	0	0	0	0
Location 2		June	/2	8.5 x 2	July	/3	9.75 x 3	August	/1	9.75 x 1	September	/2	13 x 2
				17			29.25			9.75			26
	Soprano pipistrelle	146	73	8.588235294	148	49.33333333	5.05982906	72	72	7.384615385	116	58	4.461538462
	Bandit pipistrelle	661	330.5	38.88235294	199	66.33333333	6.803418803	156	156	16	81	40.5	3.115384615
	Pipistrelle species	397	198.5	23.35294118	129	43	4.41025641	45	45	4.615384615	29	14.5	1.115384615
	Myotis	5	2.5	0.294117647	17	5.666666667	0.581196581	1	1	0.102564103	0	0	0

Location	Species	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour
	Nyctalus	12	6	0.705882353	4	1.333333333	0.136752137	2	2	0.205128205	0	0	0
	Brown long-eared	0	0	0	0	0	0	13	13	1.333333333	1	0.5	0.038461538
	Query	0	0	0	0	0	0	0	0	0	0	0	0
Location 3		June	/2	8.5 x 2	July	/4	9.75 x 4	August	/4	9.75 x 4	September	/2	13 x 2
				17			39			39			26
	Soprano pipistrelle	35	17.5	2.058823529	0	0	0	6	1.5	0.153846154	0	0	0
	Bandit pipistrelle	219	109.5	12.88235294	17	4.25	0.435897436	53	13.25	1.358974359	1	0.5	0.038461538
	Pipistrelle species	49	24.5	2.882352941	1	0.25	0.025641026	3	0.75	0.076923077	0	0	0
	Myotis	16	8	0.941176471	0	0	0	0	0	0	1	0.5	0.038461538
	Nyctalus	1	0.5	0.058823529	4	1	0.102564103	4	1	0.102564103	0	0	0
	Brown long-eared	0	0	0	0	0	0	0	0	0	0	0	0
	Query	0	0	0	0	0	0	0	0	0	0	0	0
Location 4					July	/4	9.75 x 4	August	/3	9.75 x 3	September	/2	13 x 2
							39			29.25			26
	Soprano pipistrelle	n/a	n/a	n/a	133	33.25	3.41025641	46	15.33333333	1.572649573	10	5	0.384615385
	Bandit pipistrelle	n/a	n/a	n/a	157	39.25	4.025641026	75	25	2.564102564	23	11.5	0.884615385
	Pipistrelle species	n/a	n/a	n/a	72	18	1.846153846	29	9.666666667	0.991452991	2	1	0.076923077

Location	Species	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour	Actual Bat Calls Recorded	BAI per night	BAI per hour
	Myotis	n/a	n/a	n/a	17	4.25	0.435897436	2	0.666666667	0.068376068	9	4.5	0.346153846
	Nyctalus	n/a	n/a	n/a	10	2.5	0.256410256	17	5.666666667	0.581196581	0	0	0
	Brown long-eared	n/a	n/a	n/a	0	0	0	1	0.333333333	0.034188034	1	0.5	0.038461538
	Query	n/a	n/a	n/a	0	0	0	2	0.666666667	0.068376068	0	0	0

APPENDIX 7
ORNITHOLOGY

Appendix 7.1: Survey Data

APPENDIX 7.1 ORNITHOLOGICAL SURVEY DATA

Walkover Surveys 2010/11

Common name	**Scientific name**
Barn owl	*Tyto alba*
Blackbird	*Turdus merula*
Blackcap	*Sylvia atricapilla*
Black-headed gull	*Chroicocephalus ridibundus*
Blue tit	*Cyanistes caeruleus*
Brambling	*Fringilla montifringilla*
Bullfinch	*Pyrrhula pyrrhula*
Buzzard	*Buteo buteo*
Carrion crow	*Corvus corone*
Chaffinch	*Fringilla coelebs*
Chiffchaff	*Phylloscopus collybita*
Coal tit	*Periparus ater*
Collared dove	*Streptopelia decaocto*
Common gull	*Larus canus*
Crossbill	*Loxia curvirostra*
Curlew	*Numenia arquata*
Dipper	*Cinclus cinclus*
Dunnock	*Prunella modularis*
Fieldfare	*Turdus pilaris*
Goldcrest	*Regulus regulus*
Goldfinch	*Carduelis carduelis*
Goshwak	*Accipiter gentilis*
Grasshopper warbler	*Locustella naevia*
Great black-backed gull	*Larus marinus*
Great spotted woodpecker	*Dendrocopos major*
Great tit	*Parus major*
Greenfinch	*Carduelis chloris*
Grey heron	*Ardea cinerea*
Greylag goose	*Anser anser*
Herring gull	*Larus argentatus*

Common name	Scientific name
House sparrow	*Passer domesticus*
Jackdaw	*Corvus monedula*
Jay	*Garrulus glandarius*
Kestrel	*Falco tinnunculus*
Lapwing	*Vanellus vanellus*
Lesser black-backed gull	*Larus fuscus*
Lesser redpoll	*Carduelis cabaret*
Linnet	*Carduelis cannabina*
Long-tailed tit	*Aegithalos caudatus*
Mallard	*Anas platyrhynchos*
Meadow pipit	*Anthus pratensis*
Mistle thrush	*Turdus viscivorus*
Moorhen	*Gallinula chloropus*
Oystercatcher	*Haematopus ostralegus*
Peregrine	*Falco peregrinus*
Pheasant	*Phasianus colchicus*
Pied wagtail	*Motacilla alba*
Pink-footed goose	*Anser brachyrhynchus*
Raven	*Corvus corax*
Red-legged partridge	*Alectoris rufa*
Redwing	*Turdus iliacus*
Reed bunting	*Emberiza schoeniclus*
Robin	*Erithacus rubecula*
Siskin	*Carduelis spinus*
Skylark	*Alauda arvensis*
Snipe	*Gallinago gallinago*
Song thrush	*Turdus philomelos*
Sparrowhawk	*Accipiter nisus*
Spotted flycatcher	*Muscicapa striata*
Starling	*Sturnus vulgaris*
Stonechat	*Saxicola torquata*
Swallow	*Hirundo rustica*
Tawny owl	*Strix aluco*
Tree pipit	*Anthus trivialis*
Waxwing	*Bombycilla garrulus*
Wheatear	*Oenanthe oenanthe*

Common name	Scientific name
Whinchat	*Saxicola rubetra*
Whitethroat	*Sylvia communis*
Whooper swan	*Cygnus cygnus*
Willow warbler	*Phylloscopus trochilus*
Woodcock	*Scolopax rusticola*
Woodpigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*

Common Birds Census 2010			
1	21/04/10	07.00 – 13.00	Temp 0-12C, No precipitation, Visibility excellent
2	17/05/10	06.00 – 09.50	Temp 5-10C, No precipitation, Visibility excellent
	26/05/10	06.00 – 09.00	Temp 7-12C, Rain showers, Visibility good
3	22/06/10	07.00 – 10.00	Temp 15-20C, No precipitation, Visibility excellent
	27/06/10	06.00 – 10.00	Temp 14C, No precipitation, Visibility excellent
Point Count Surveys 2010			
1	21/04/10	09.35 – 12.30	Survey points 1 - 6
2	17/05/10	07.14 – 09.25	Survey points 1,2,5 and 6
	26/05/10	06.20 – 08.20	Survey points 3,4,7 and 8
3	22/06/10	06.15 – 09.50	Survey points 1 - 8
4	27/06/10	06.15 – 09.40	Survey points 3,4,6,7 and 8
Winter Walkover Surveys 2010/11			
1	24/09/10	14.00 – 16.00	Wind speed BF4/N, CC 5/8, 14C, Visibility excellent
2	30/09/10	10.15 – 12.15	Wind speed BF2/SSE, CC8/8, 12C, Visibility moderate
3	22/10/10	12.45 – 15.15	Wind speed BF3/WSW, 12C, Visibility good
4	30/10/10	11.05 – 13.05	Wind speed BF1/SW, 8C, Visibility excellent
5	22/11/10	11.15 – 13.30	Wind speed BF2/NNE, 8C, Visibility good
6	27/11/10	11.30 – 13.30	Wind speed BF3/NW, 1C, Visibility excellent
7	14/01/11	11.25 – 13.45	Wind speed BF4/SW, 8C, Visibility good
8	25/01/11	11.00 – 13.30	Wind speed BF4/NW, 9C, Visibility excellent
9	08/02/11	12.35 – 14.35	Wind speed BF1/SE, 6C, Visibility good
10	22/02/11	10.30 – 12.45	Wind speed BF1/ESE, 3C, Visibility moderate-poor
11	07/03/11	13.40 – 15.35	Wind speed BF2/SSW, 6C, Visibility good
12	28/03/11	10.00 – 13.00	Wind speed BF2/S, 12C, Visibility excellent

Vantage Point Surveys 2010/2011

Survey Visit	Date	Survey times	Survey conditions
Breeding Bird Surveys 2010			
1	26/04/10	05.30 – 08.30	Wind BF1/W, CC 7/8, Light rain showers, 8C, Visibility 1-3km+
2	26/04/10	09.00 – 12.00	Wind BF2/W, CC 7/8, No precipitation, 13C, Visibility 3km+
3	17/05/10	10.30 – 13.30	Wind BF2/NW, CC 5/8, No precipitation, 14C, Visibility 3km+
4	26/05/10	09.30 – 12.30	Wind BF2/E, CC 6/8, Light showers, 12C, Visibility 3km+
5	31/05/10	16.00 – 19.00	Wind BF3/ESE, CC 7/8, No precipitation, 14C, Visibility 3km+
6	31/05/10	19.30 – 22.30	Wind BF1/E, CC 8/8, No precipitation, 13C, Visibility 3km+
7	22/06/10	10.45 – 13.45	Wind BF3/S, CC 4/8, No precipitation, 21C, Visibility 3km+
8	27/06/10	10.15 – 13.15	Wind BF4/S, CC 7/8, Light showers, 14C, Visibility 3km+
9	20/07/10	11.45 – 14.45	Wind BF1/SSW, CC 5/8, No precipitation, 17C, Visibility 3km+
10	20/07/10	15.15 – 18.15	Wind BF2/S, CC 6/8, No precipitation, 19C, Visibility 3km+
11	28/07/11	15.50 – 18.50	Wind BF2/W, CC 7/8, Light showers, 15C, Visibility 3km+
12	28/07/10	19.30 – 22.30	Wind BF1/W, CC 8/8, Light showers, 14C, Visibility 3km+
13	21/08/10	05.15 – 08.15	Wind BF4/SW, CC 6/8, No precipitation, 10C, Visibility 3km+
14	21/08/10	08.55 – 11.55	Wind BF4/SW, CC 6/8, No precipitation, 16C, Visibility 3km+
Wintering Bird Surveys 2010			
16	24/09/10	16.20 – 19.20	Wind BF3/N, CC 5/8, No precipitation, 11C, Visibility 3km+
17	30/09/10	06.55 – 09.55	Wind BF1/SSE, CC 8/8, Mist and fog patches, 11C, Visibility 1-3km
18	22/10/10	15.40 – 18.40	Wind BF3/SW, CC 8/8, Light showers, 12C, Visibility 1-3km
19	30/10/10	07.50 – 10.50	Wind BF1/SW, CC 5/8, No precipitation, 6C, Visibility 3km+
20	22/11/10	13.45 – 16.45	Wind BF2/NE, CC 7/8, Rain showers, 5C, Visibility 3km+
21	27/11/10	08.10 – 11.10	Wind BF2/N, CC 3/8, No precipitation, 0C, Visibility 3km+

22	22/12/10	10.00 – 13.00	Wind BF1/NW, CC 1/8, No precipitation, -6C, Visibility 3km+
23	22/12/10	13.30 – 16.30	Wind BF2/NW, CC 3/8, No precipitation, -3C, Visibility 3km+
24	14/01/11	14.00 – 17.00	Wind BF4/SW, CC 7/8, Heavy showers, 8C, Visibility 3km+
25	25/01/11	07.40 – 10.40	Wind BF2/S, CC 8/8, Light showers, 7C, Visibility 3km+
25	08/02/11	14.50 – 17.50	Wind BF2/S, CC 7/8, No precipitation, 3C, Visibility 3km+
26	22/02/11	07.10 – 10.10	Wind BF2/SE, CC 8/8, Light drizzle, 3C, Visibility 1-3km
27	07/03/11	15.45 – 18.45	Wind BF2/SSW, CC 8/8, No precipitation, 4C, Visibility 3km+
28	28/03/11	06.40 – 09.40	Wind BF2/NE, CC 1/8, Ground frost, 0C, Visibility 3km+
Bird Surveys 2011 – Additional Goshawk vantage point watches			
29	10/04/11	07.05 – 10.05	Wind BF2/SE, CC 3/8, No precipitation, 15C, Visibility 3km+
30	18/04/11	07.40 – 10.40	Wind BF1/ESE, CC 5/8, No precipitation, 10C, Visibility 3km+
31	18/04/11	11.20 – 14.20	Wind BF2/SE, CC 5/8, No precipitation, 15C, Visibility 3km+
32	22/04/11	08.30 – 11.30	Wind BF4/ESE, CC 4/8, No precipitation, 10C, Visibility 3km+
33	22/04/11	12.30 – 15.30	Wind BF4/SE, CC 2/8, No precipitation, 15C, Visibility 3km+

1.1.1.1 Point Count Locations

Location 1 – NX92661 87750
Location 2 – NX92732 88199
Location 3 – NX92676 88590
Location 4 – NX92437 88492
Location 5 – NX92366 87736
Location 6 – NX92203 87989

APPENDIX 8
LANDSCAPE

Appendix 8.1: Indicative Wirelines

Figure No.	Figure Title
A1	Moffat Hills (indicative wireline)
A2	Galloway Hill (indicative wireline)
A3	Arbigland HGDL (indicative wireline)
A4	Threave HGDL (indicative wireline)
A5	Type 5: Intimate Pastoral Valleys - Stroqunar (indicative wireline)
A6	Type 11: Upland Glens – Camling (indicative wireline)
A7	Type 16: Upland Fringe – Springfield (indicative wireline)
A8	Type 18: Foothills - Penpot(indicative wireline)
A9	Type 19: Southern Uplands – Wester Hill(indicative wireline)
A10	Type 19: Southern Uplands – Tynroon Doon Fort (indicative wireline)
A11	Type 16: Upland Fringe – Barnmuir (indicative wireline)
A12	VP3: Shawsholm Road, Closeburn (indicative wireline)
A13	VP5: Thornhill (indicative wireline)
A14	Blackcraig Comparative ZTV
A15	Margree Comparative ZTV
A16	Wether Hill Comparative ZTV
A17	Windy Standard Comparative ZTV
A18	Windy Standard Extension Comparative ZTV

Note: indicative wirelines do not take account of vegetation or screening and have been used as an indicative tool only to aid the landscape assessment. The wirelines show a 76 degree viewing angle orientated towards the Development with the wind farms taken forward into the detailed cumulative assessment.

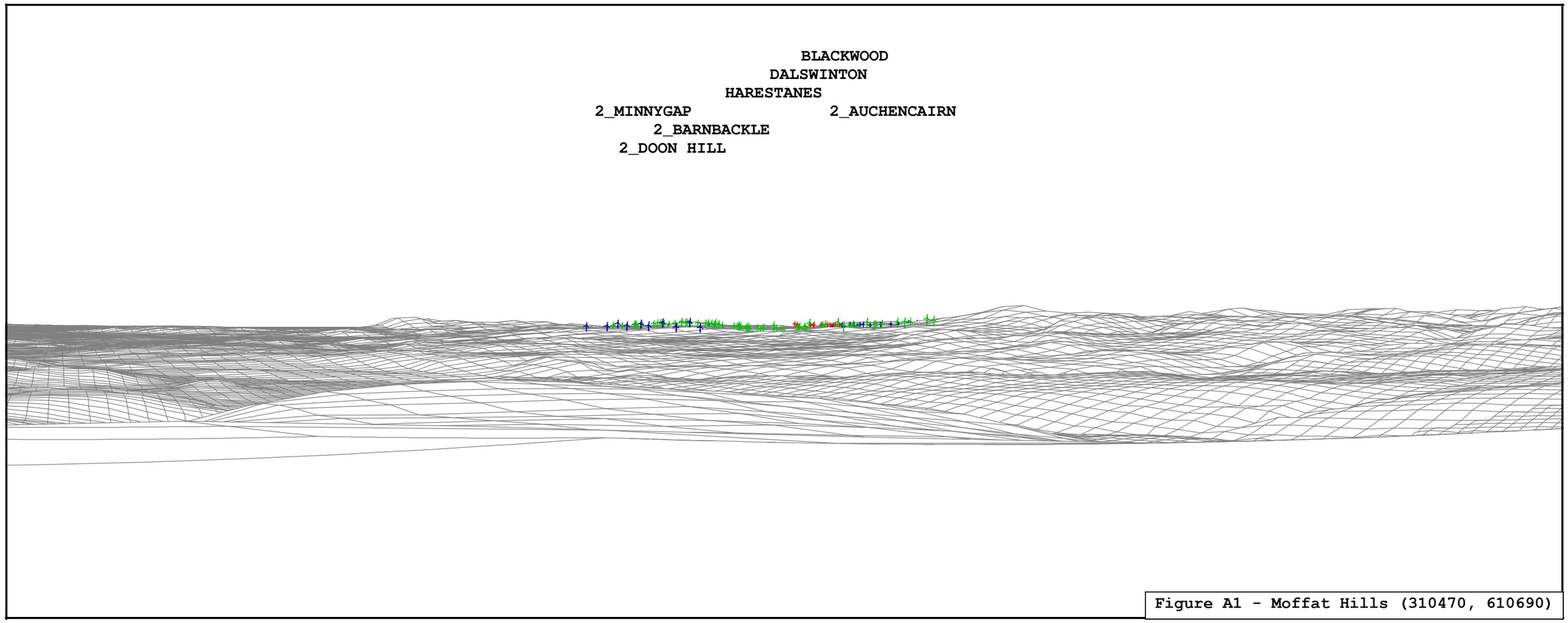


Figure A1 - Moffat Hills (310470, 610690)

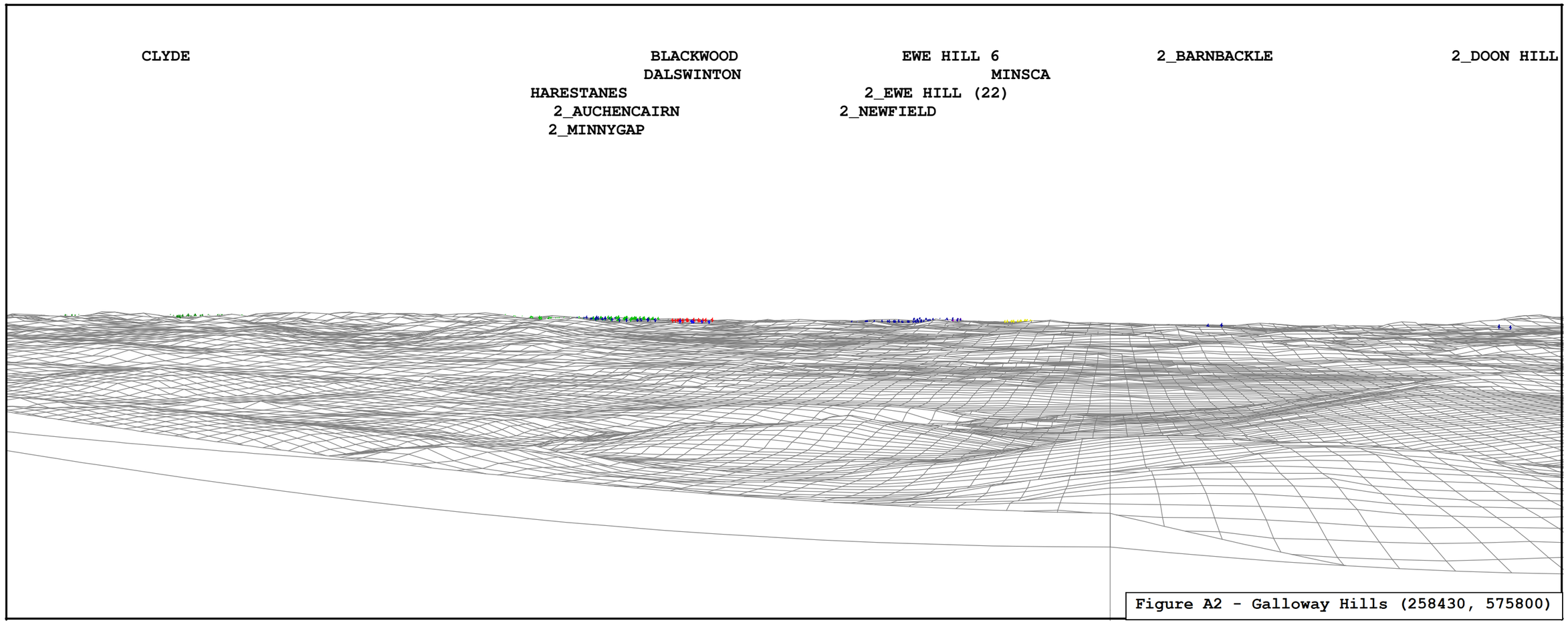


Figure A2 - Galloway Hills (258430, 575800)

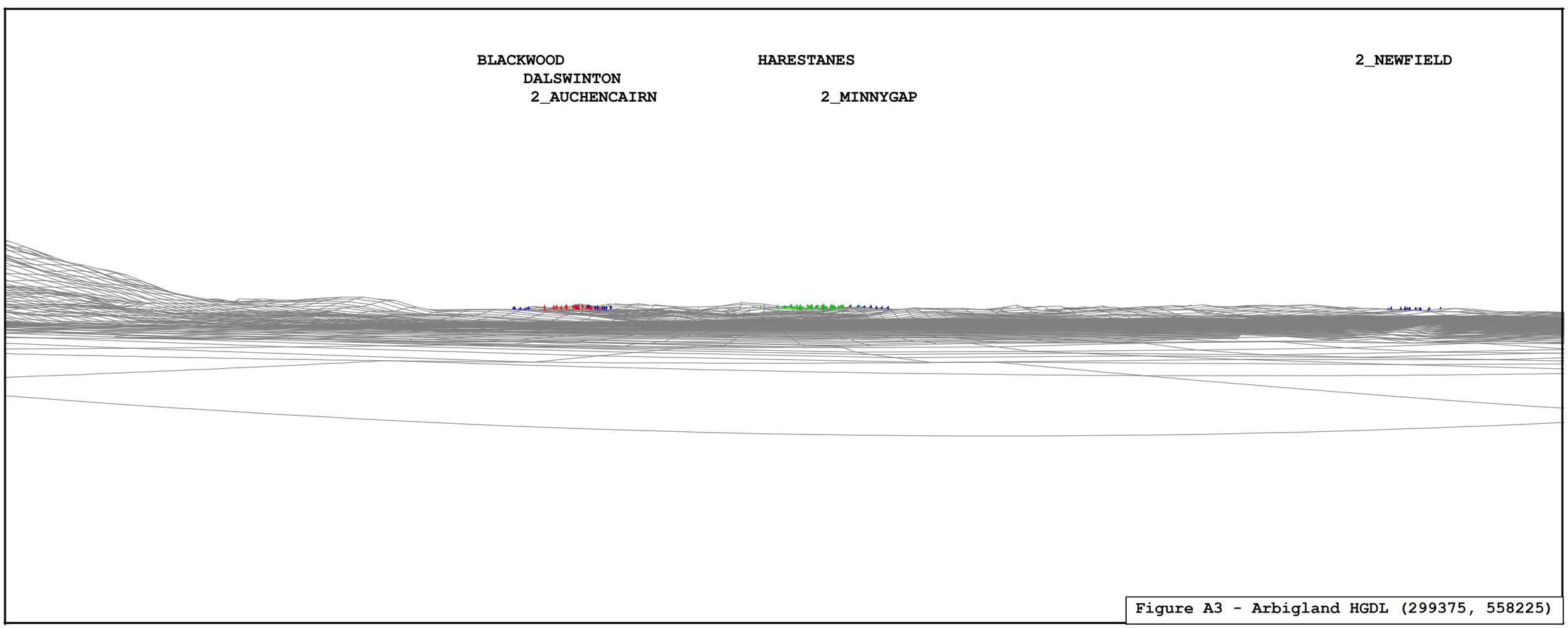


Figure A3 - Arbigland HGDL (299375, 558225)

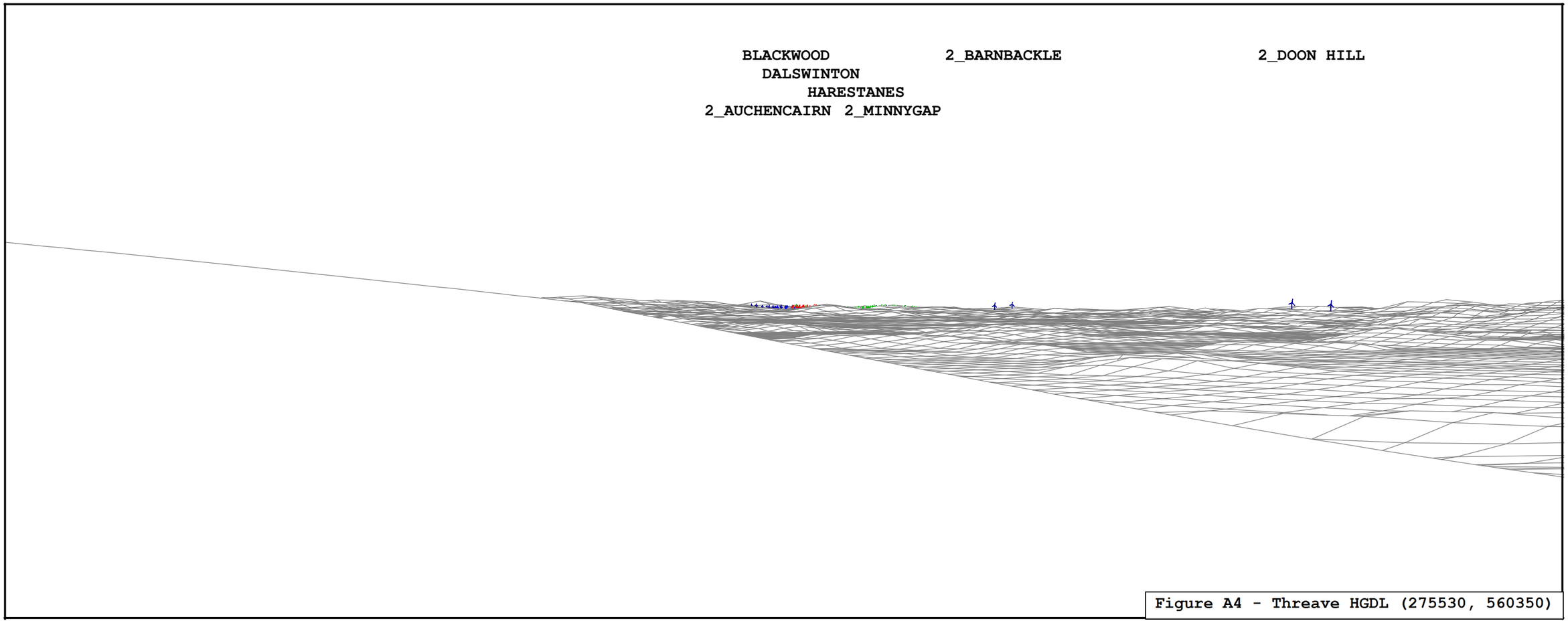


Figure A4 - Threave HGDL (275530, 560350)

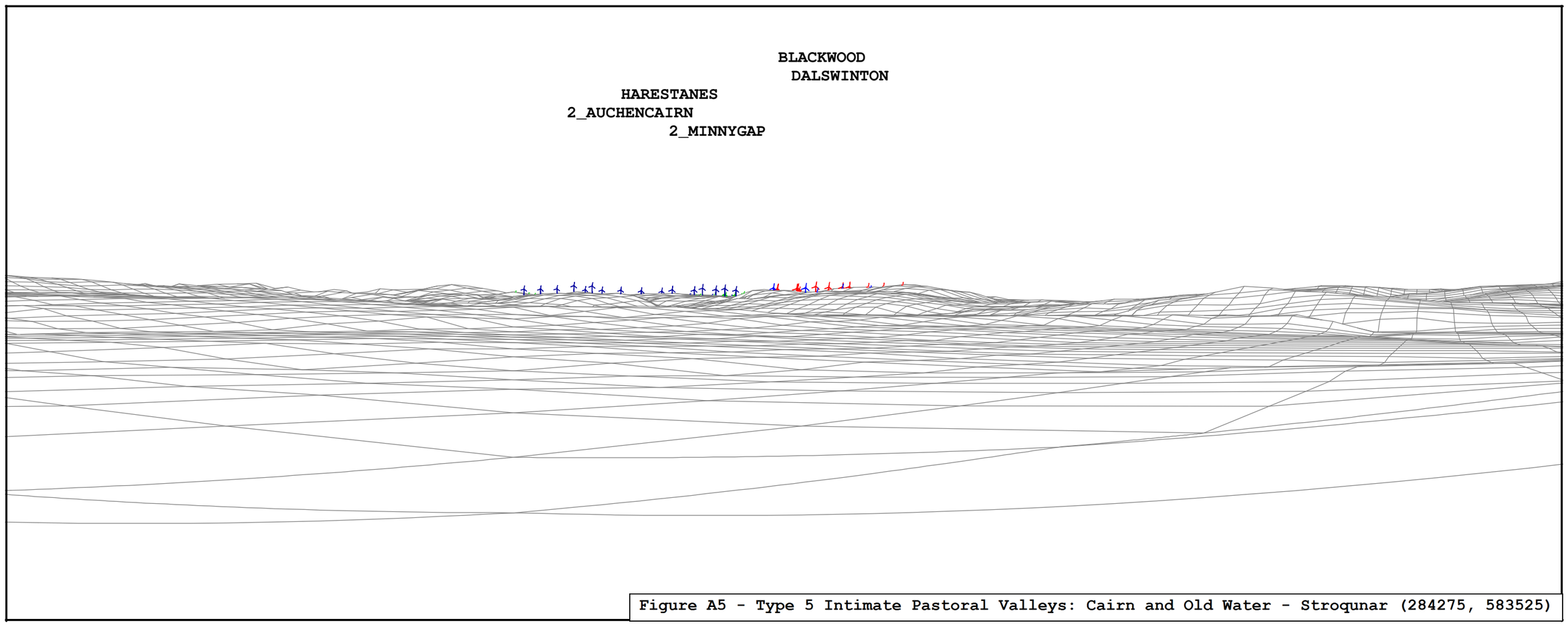


Figure A5 - Type 5 Intimate Pastoral Valleys: Cairn and Old Water - Stroqunar (284275, 583525)

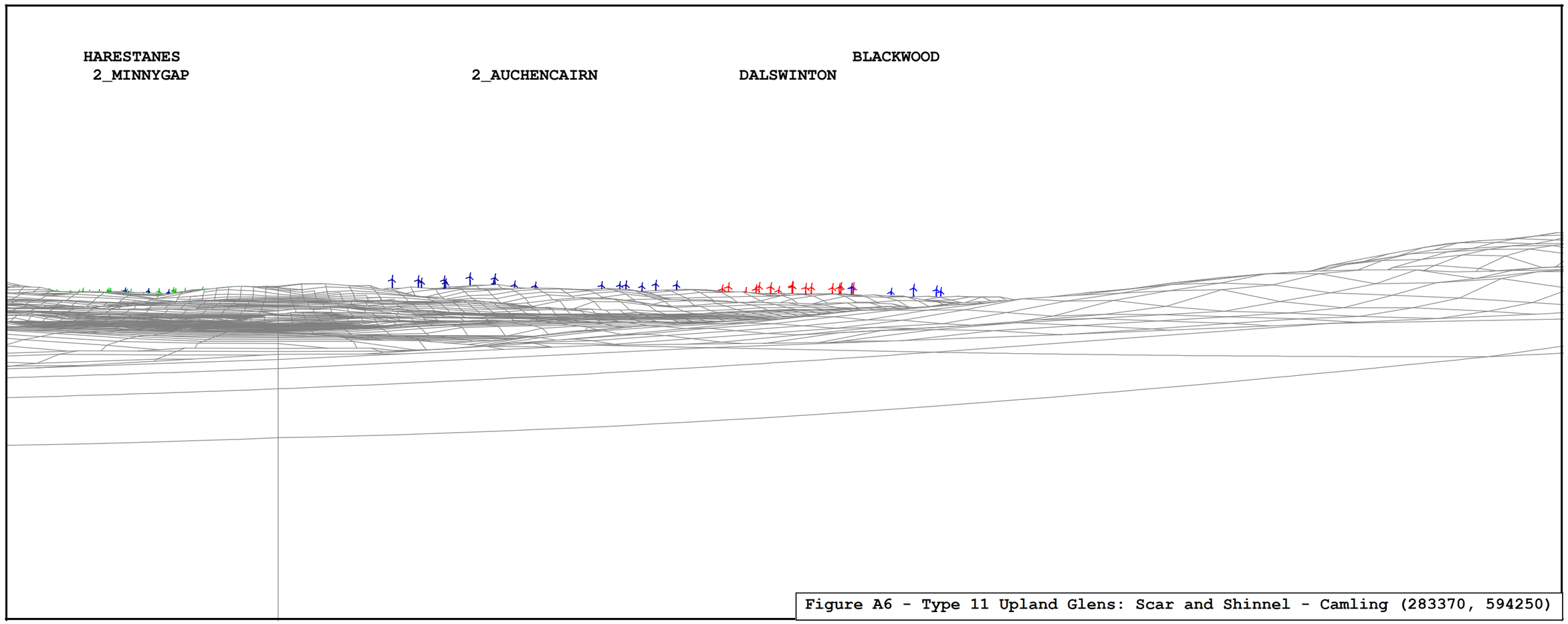


Figure A6 - Type 11 Upland Glens: Scar and Shinnel - Camling (283370, 594250)

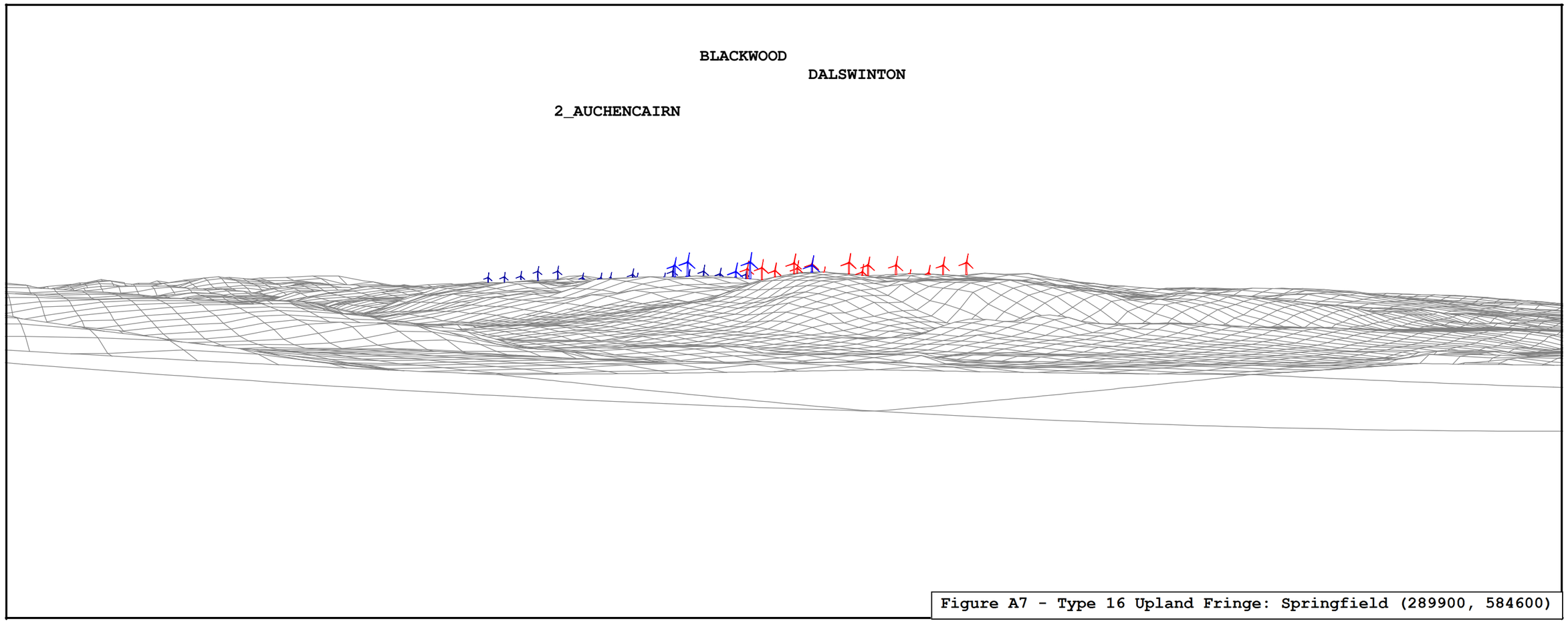


Figure A7 - Type 16 Upland Fringe: Springfield (289900, 584600)

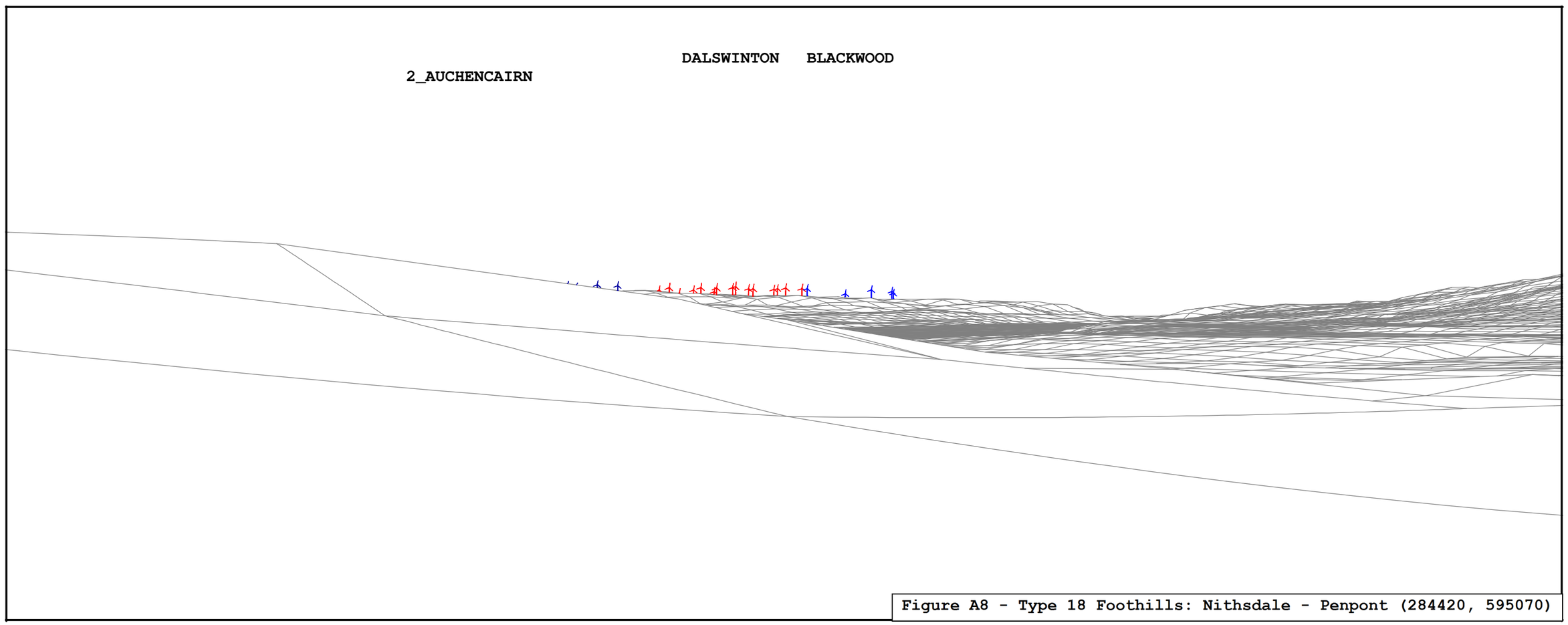


Figure A8 - Type 18 Foothills: Nithsdale - Penpont (284420, 595070)

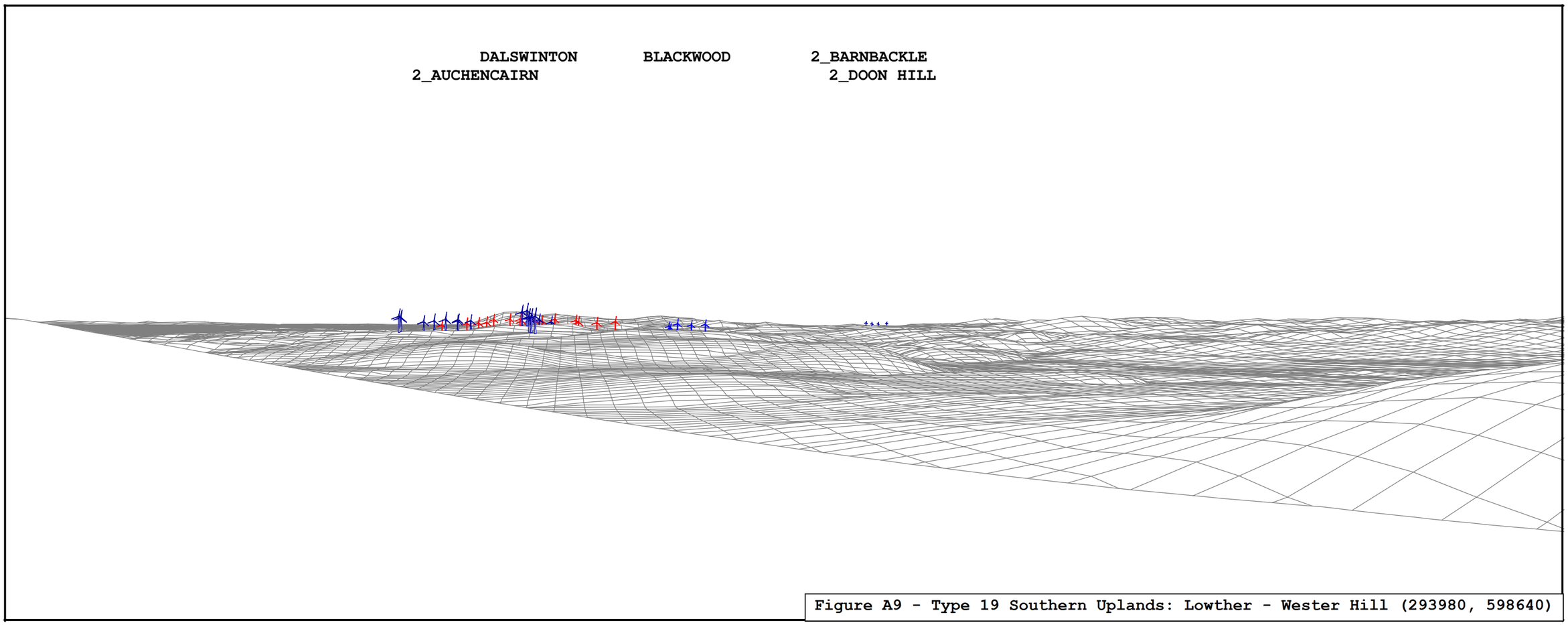


Figure A9 - Type 19 Southern Uplands: Lowther - Wester Hill (293980, 598640)

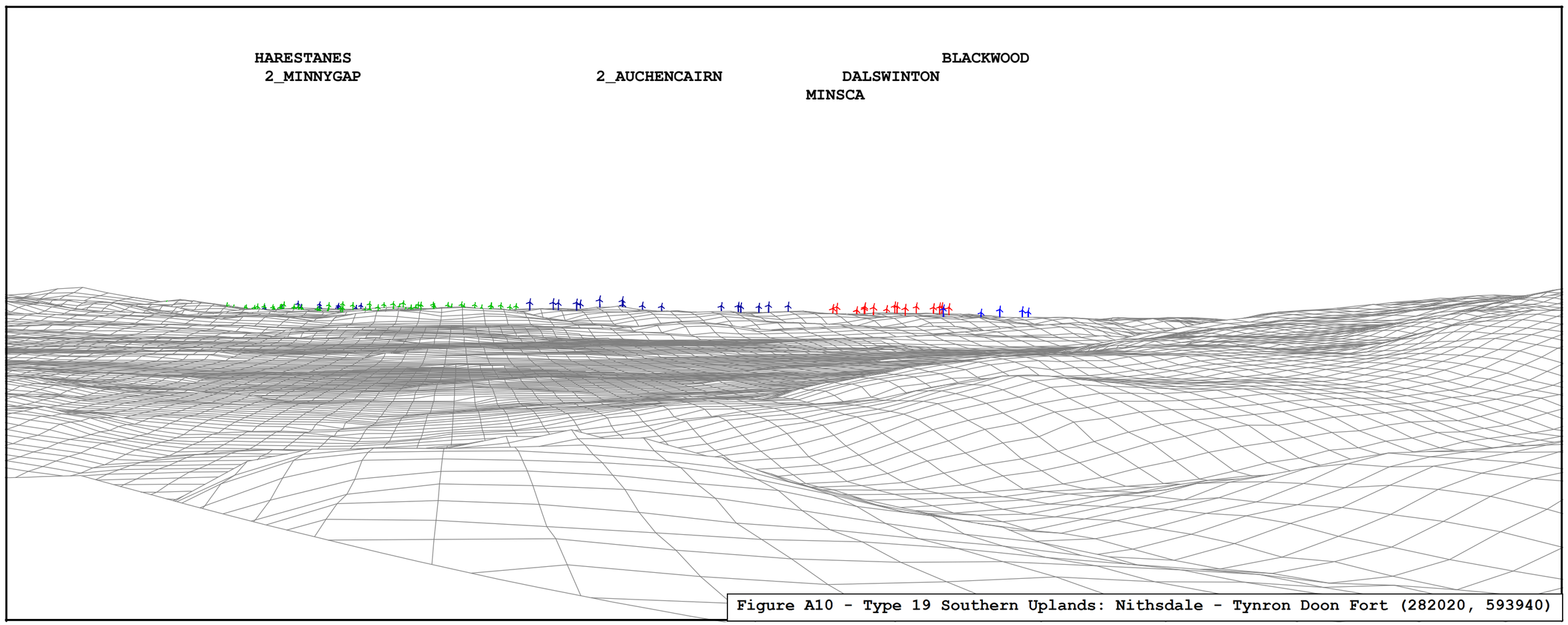


Figure A10 - Type 19 Southern Uplands: Nithsdale - Tynron Doon Fort (282020, 593940)

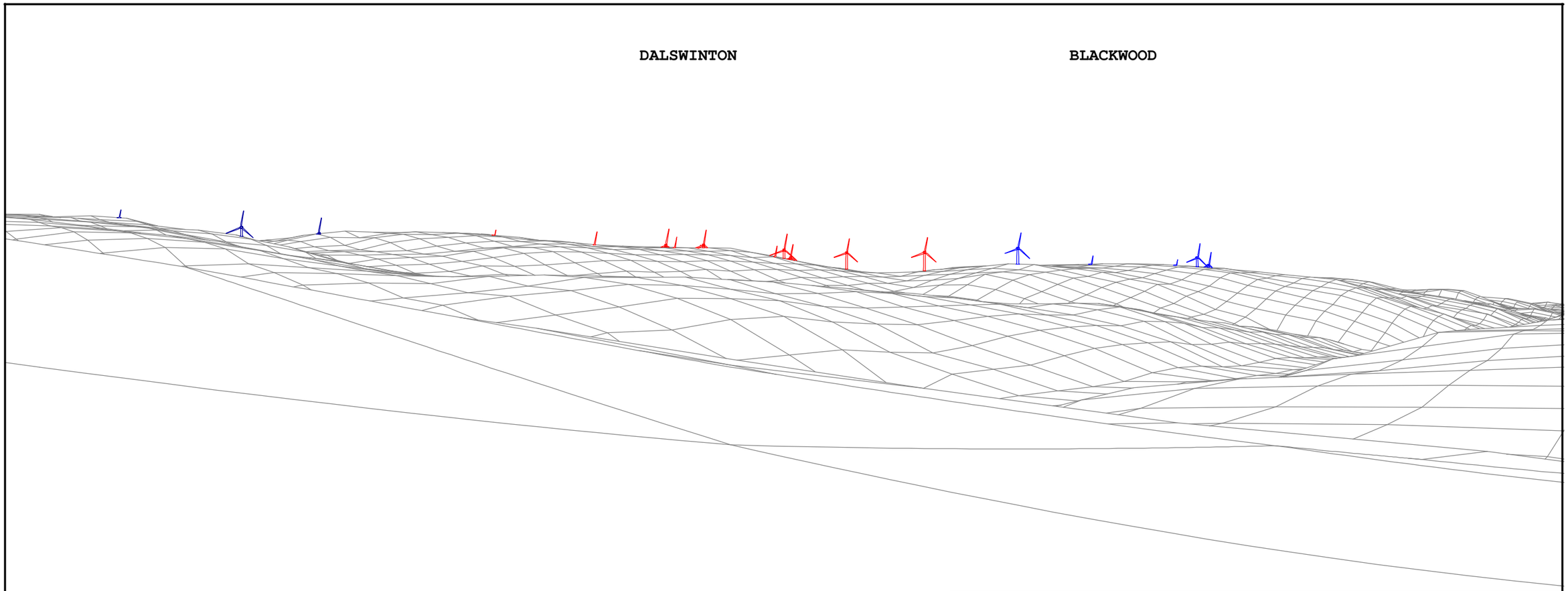


Figure A11 - Type 16 Upland Fringe: Barnmuir (291525, 591675)

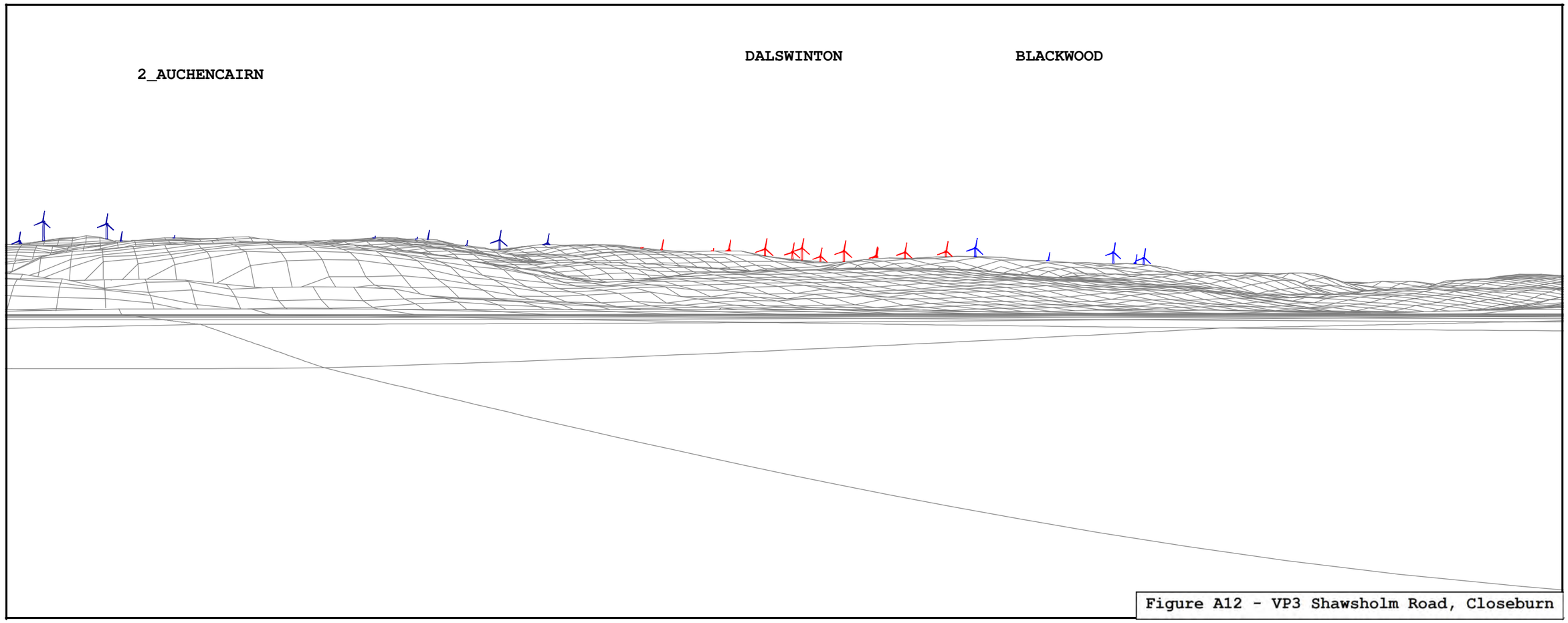


Figure A12 - VP3 Shawsholm Road, Closeburn

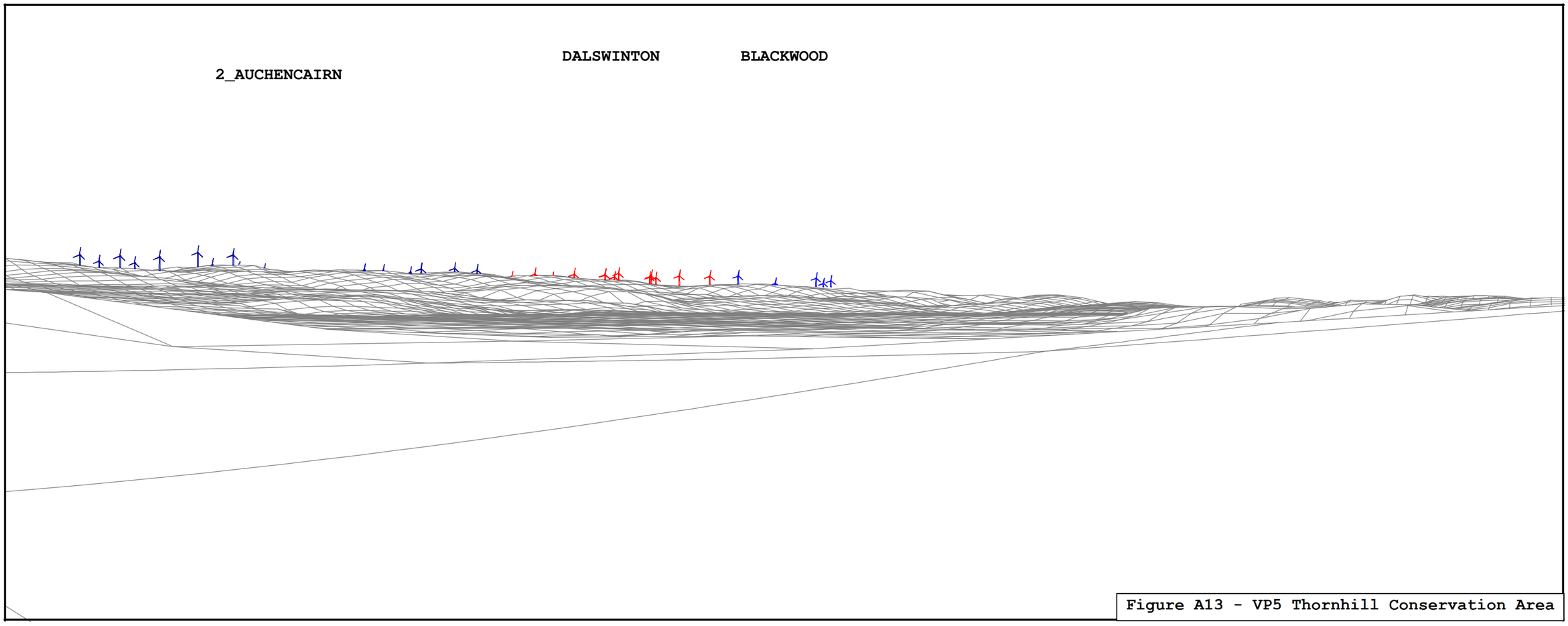
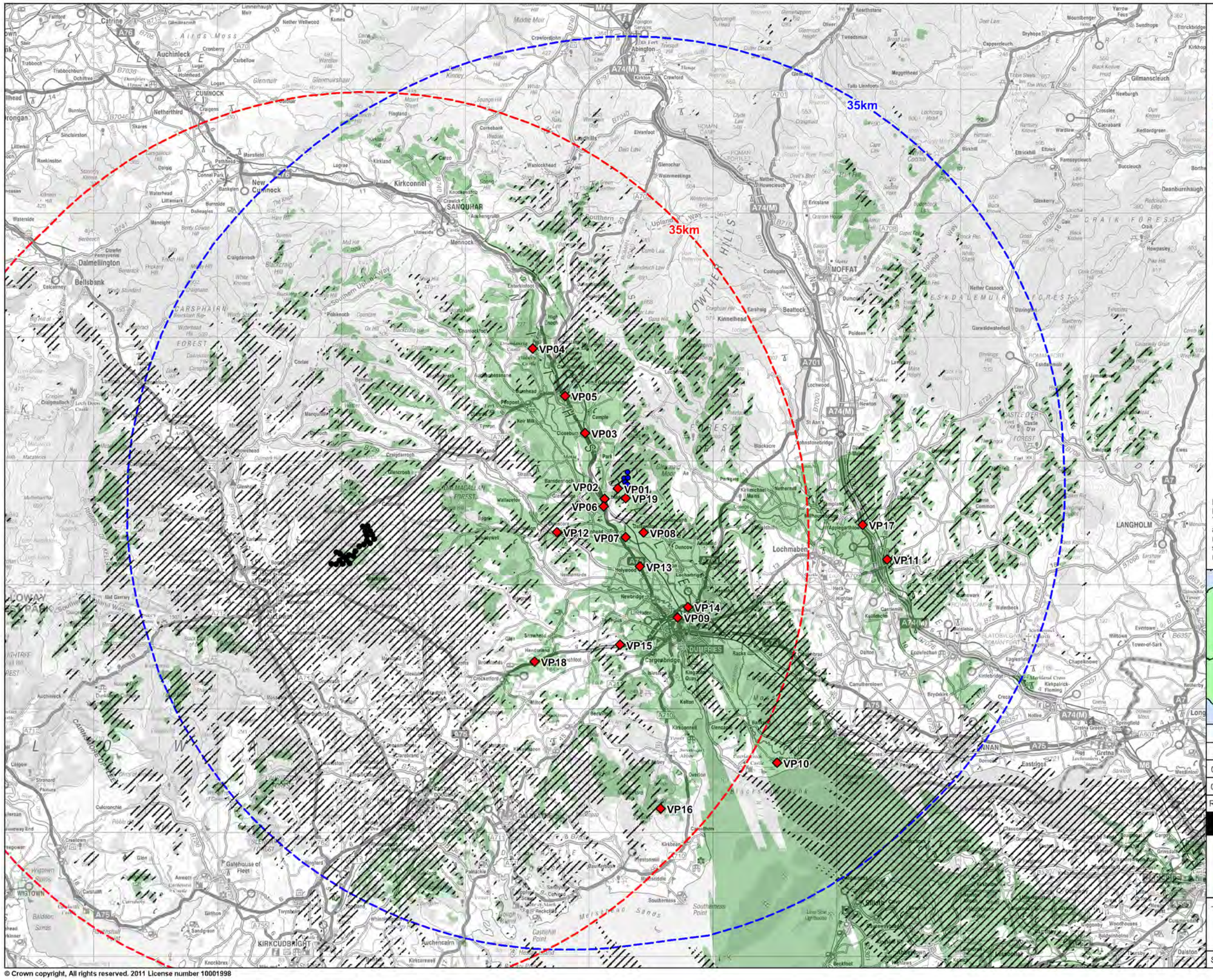
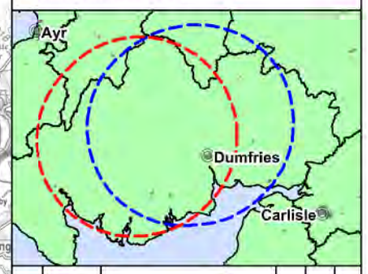


Figure A13 - VP5 Thornhill Conservation Area



It should be noted that the ZTV is based on Land-Form Panorama Ordnance Survey Data. This data only takes into account ground level topography and does not take into account low level screening, which may result due to hedge banks, trees or man-made structures such as buildings, therefore it presents the maximum theoretical visibility.



Rev	Date	Description	Drn	Chk	App
01	24.11.11	Blackcraig 35km Buffer	AJ	NE	MK
00	11.10.11	Layout 10-09-11E	DL	NE	MK

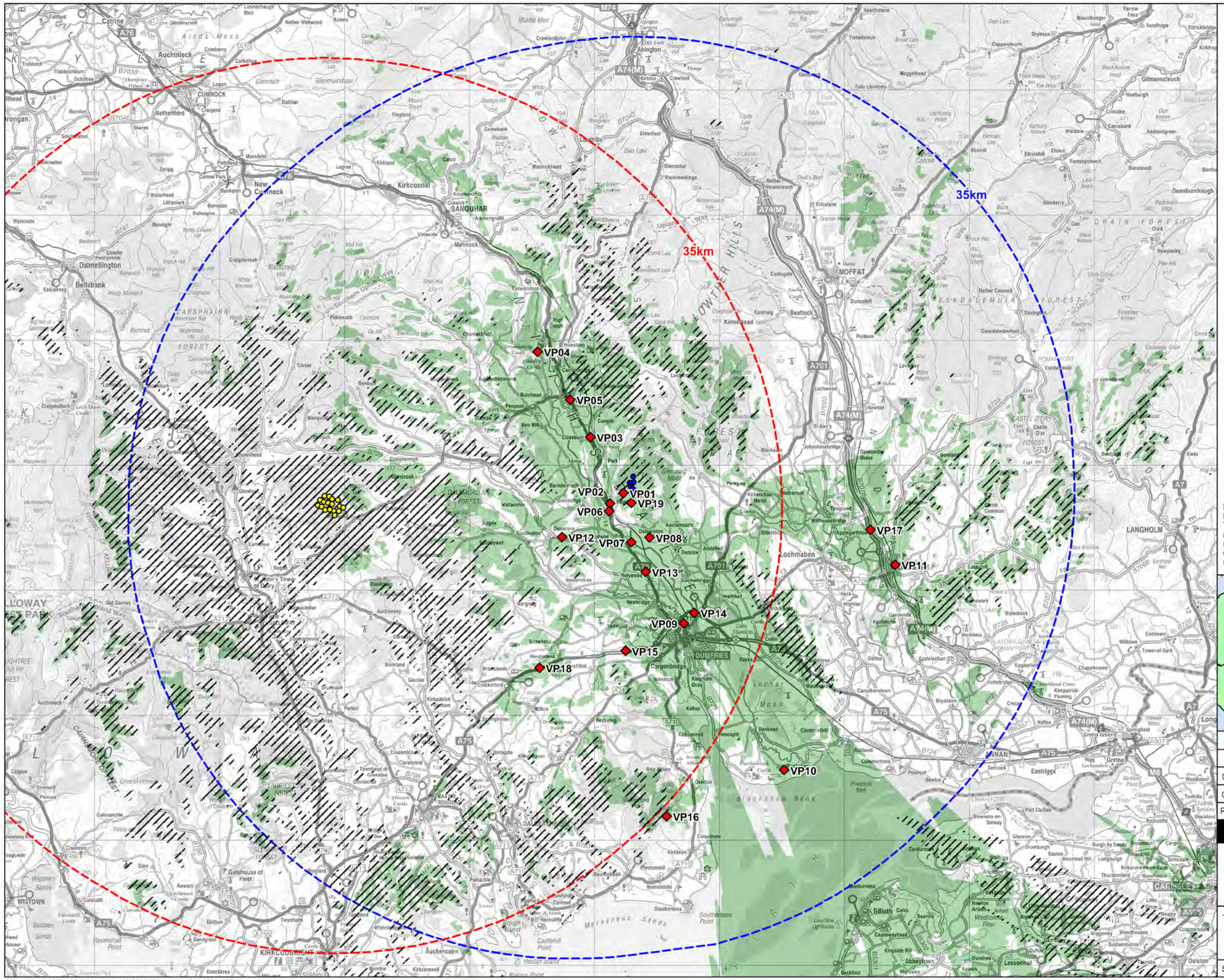
Blackwood Wind Farm

RSK FORCE 9 ENERGY

Title : Figure A14: Cumulative Zone of Theoretical Visibility: Proposed Blackwood Turbines at 120m & 140m to Blade Tip, Blackcraig Turbines - Consented at 110m

Scale : 1:300,000 | REV 01

FILE NAME: P19028\201 GIS\ES_CML_BW_BC_ZTV Wor



Viewpoint Location

Proposed Blackwood Turbine

Margree Turbine - In Planning

35km Distance Marker

Margree 35km Distance Marker

Blackwood Wind Farm Zone of Theoretical Visibility

Zone of Theoretical Visibility: Margree Turbines - Blade Tip at 120m

It should be noted that the ZTV is based on Land-Form Panorama Ordnance Survey Data. This data only takes into account ground level topography and does not take into account low level screening, which may result due to hedge banks, trees or man-made structures such as buildings, therefore it presents the maximum theoretical visibility.

Rev	Date	Description	Drn	Chk	App
01	24.11.11	Margree 35km Buffer	AJ	NE	MK
00	11.10.11	Layout 10-09-11E	DL	NE	MK

Blackwood Wind Farm

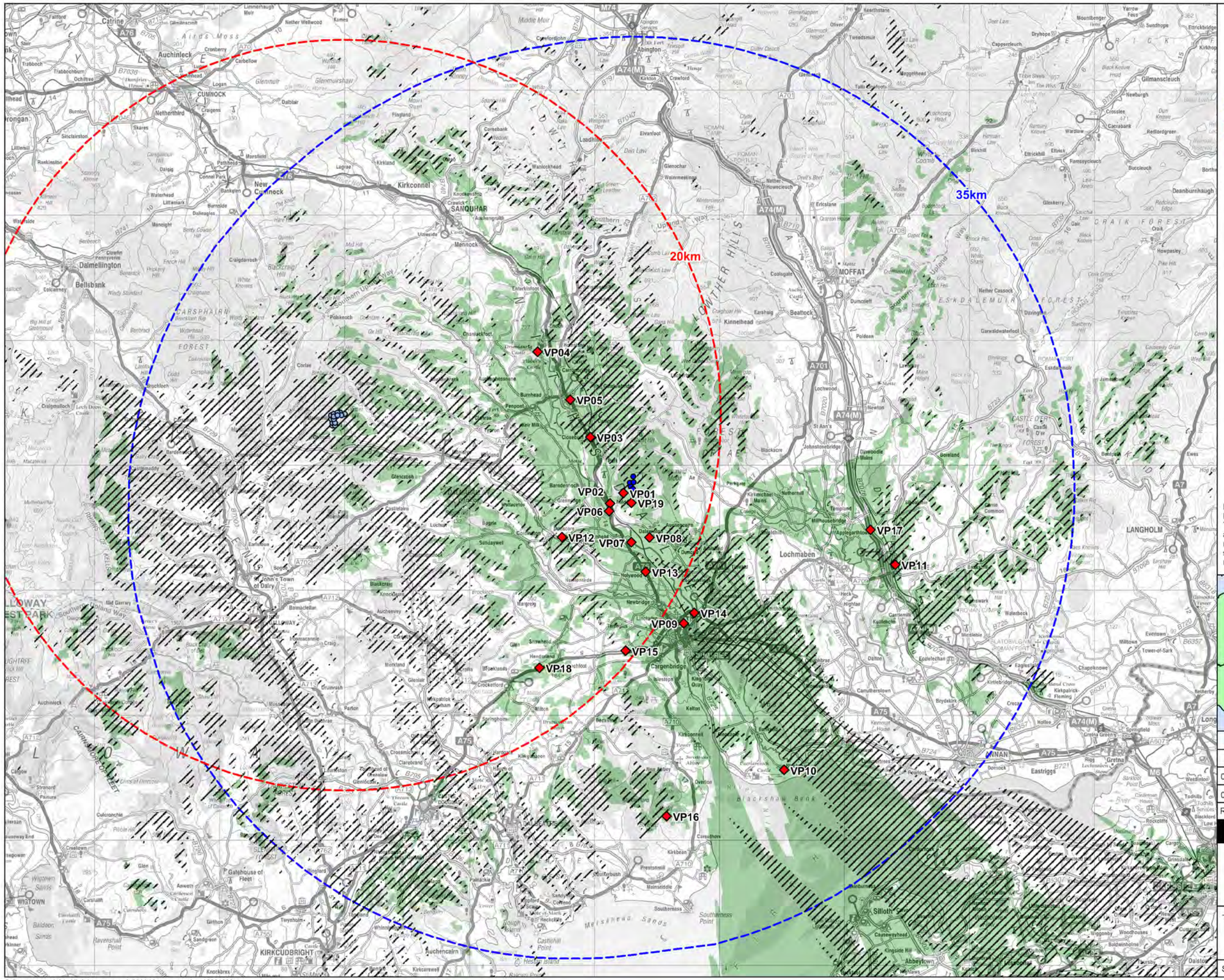
RSK

FORCE 9 ENERGY

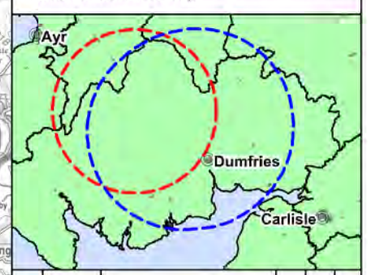
Title : Figure A15 Cumulative Zone of Theoretical Visibility: Proposed Blackwood Turbines at 120m & 140m to Blade Tip, Margree Turbines - In Planning at 120m

Scale : 1:300,000 | REV 00

FILE NAME: P19028201 GIS\ES_CML_BW_MG_ZTV Wor



It should be noted that the ZTV is based on Land-Form Panorama Ordnance Survey Data. This data only takes into account ground level topography and does not take into account low level screening, which may result due to hedge banks, trees or man-made structures such as buildings, therefore it presents the maximum theoretical visibility.



Rev	Date	Description	Drn	Chk	App
01	24.11.11	Wether Hill 20km Buffer	AJ	NE	MK
00	11.10.11	Layout 10-09-11E	DL	NE	MK

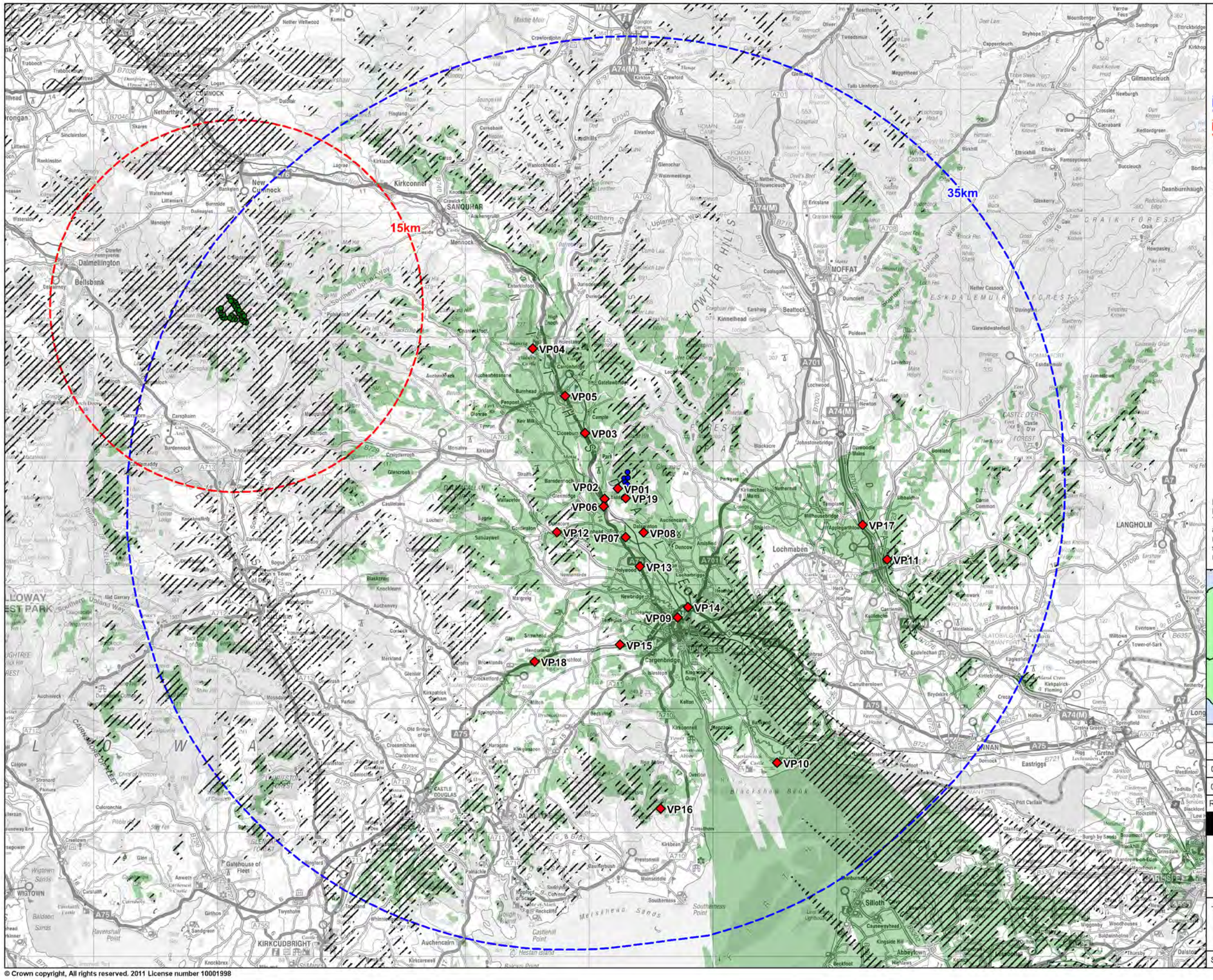
Blackwood Wind Farm

RSK FORCE 9 ENERGY

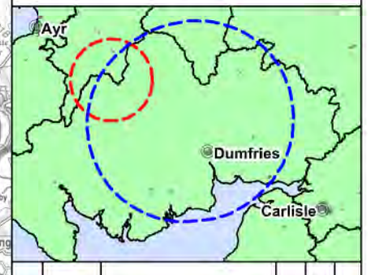
Title : Figure A16 - Cumulative Zone of Theoretical Visibility: Proposed Blackwood Turbines at 120m & 140m to Blade Tip, Wether Hill Turbines - Operational at 91m

Scale : 1:300,000 | REV 01

FILE NAME: P19028201 GISIES_CML_BW_WH_ZTV Wor



It should be noted that the ZTV is based on Land-Form Panorama Ordnance Survey Data. This data only takes into account ground level topography and does not take into account low level screening, which may result due to hedge banks, trees or man-made structures such as buildings, therefore it presents the maximum theoretical visibility.



Rev	Date	Description	Drn	Chk	App
01	24.11.11	Windy Standard 15km Buffer	AJ	NE	MK
00	11.10.11	Layout 10-09-11E	DL	NE	MK

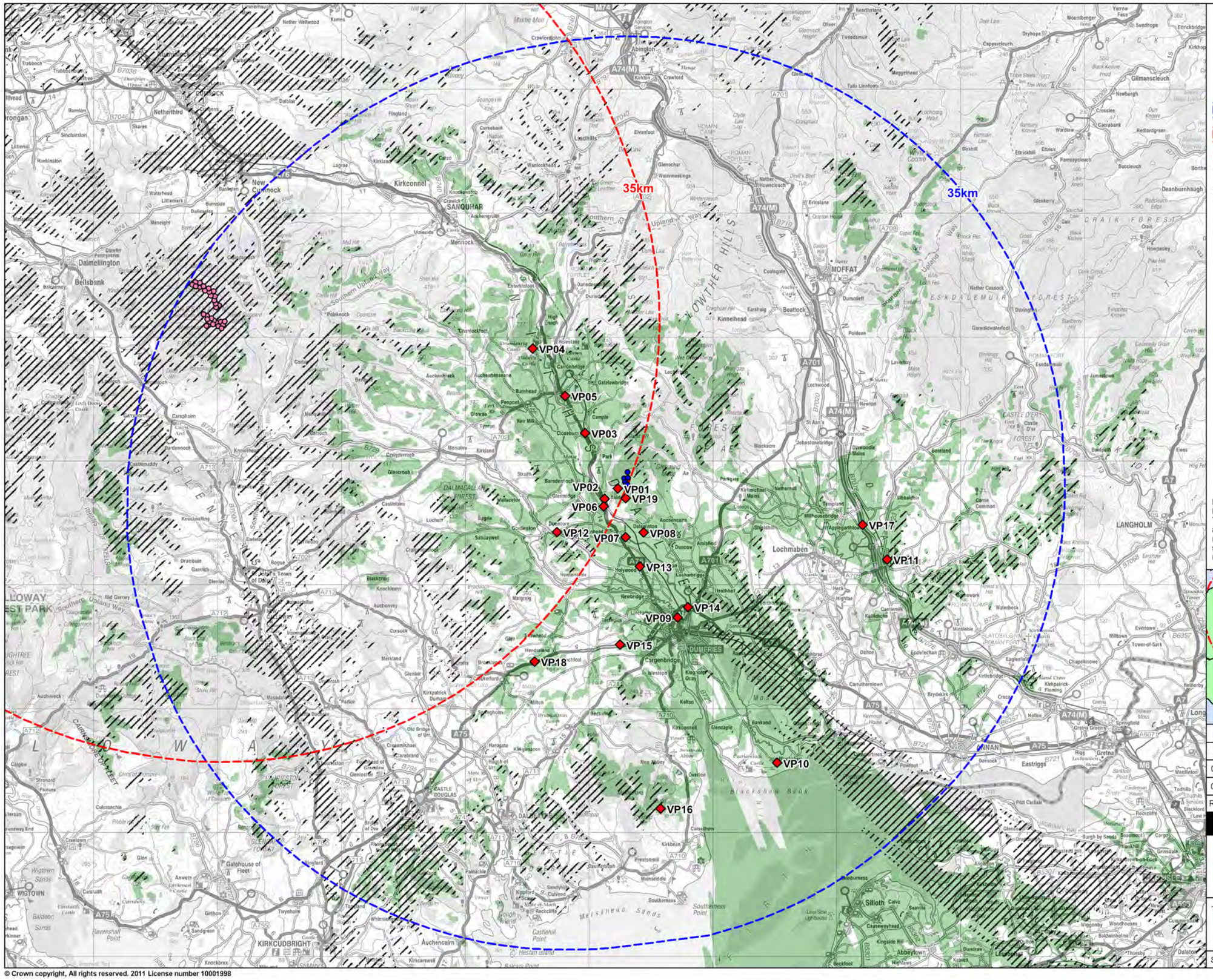
Blackwood Wind Farm

RSK FORCE 9 ENERGY

Title : Figure A17: Cumulative Zone of Theoretical Visibility: Proposed Blackwood Turbines at 120m & 140m to Blade Tip, Windy Standard Turbines - Operational at 35m

Scale : 1:300,000 | REV 01

FILE NAME: P19028201 GIS\ES_CML_BW_WY_ZTV Wor



Rev	Date	Description	Drn	Chk	App
01	24.11.11	WSE 35km Buffer	AJ	NE	MK
00	11.10.11	Layout 10-09-11E	DL	NE	MK

Blackwood Wind Farm

RSK FORCE 9 ENERGY

Title : Figure A18 - Cumulative Zone of Theoretical Visibility: Proposed Blackwood Turbines at 120m & 140m to Blade Tip, Windy Standard Extension Turbines - Under Construction at 110m and 120m

Scale : 1:300,000 | REV 01

FILE NAME: P19028201 GIS\ES_CML_BW_WY_EXT_ZTV Wor

Appendix 8.2: Landscape Character Types Assessment

APPENDIX 8.2 LANDSCAPE CHARACTER ASSESSMENT

8.1 The following sets out the full assessment on LCT where significant landscape impacts have not been identified.

Type 2 Coastal Flats – Nith Coastal Fringe

8.2 The Development is located approximately 15km to the north west of this LCT which comprises a variety of landscape sub types. The ZTV indicates widespread visibility from within this LCT around the mouth of the Nith with limited to no visibility to the east and west along the southern facing Dumfries coastline.

8.3 Vegetation and tree cover is quite widespread, especially away from the immediate coastal edges including areas such as the marshy Caerlaveroch Reserve. Expansive views are obtainable from the coastal edge orientated to the south and away from the development site. Views inland often tend to be screened by localised vegetation due to the flat nature of this LCT however, localised areas of higher ground or areas with an open aspect offer long to medium scale views looking back up Nith Valley.

8.4 There are numerous residential receptors as the area is well settled and the area is popular with tourists due to its scenic coastal nature (within NSA) and served by a network of minor roads and a National Cycle Route (NCR).

8.5 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of this landscape would be directly affected. Key views are generally orientated across the Solway Firth and would remain unaltered. Viewpoint 10 is located within this LCT and typical of elevated long distance views when obtainable. A magnitude of change of very small is anticipated from this viewpoint.

8.6 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~15km) and the Development are very similar in this area. Furthermore, views of Minsca Wind Farm (~15km) to the northeast and the Windy Standard and Wether Hill Wind Farms to the distant northwest may be obtainable from elevated, open viewing positions albeit from a less widespread area closer to the coastline. Furthermore and outwith the 35km study area the offshore Robin Rigg Wind Farm is a prominent feature in open coastal views.

8.7 The Development would form an inconspicuous minor new landscape elements resulting in a very minor alteration to the relationship of the key landscape characteristics. The Development would be seen on the horizon in the context of the existing Dalswinton Wind Farm.

8.8 Magnitude of change: Due to the extent of visibility and representative viewpoint assessment a Very Small magnitude of change is anticipated. Furthermore, none of the key characteristics would be directly affected and key views across the Solway Firth would remain unaltered.

8.9 Assessed sensitivity: Very High which is reflected in the national designation, the flat or gently undulating nature of the landscape which make it very prone to visual intrusions and the well settled nature of the landscape.

8.10 Significance: *Minor (not significant)*

Type 5 Intimate Pastoral Valleys – Cairn and Old Water

8.11 The Development is located approximately 6km to the east of this LCT. The ZTV indicates fragmented visibility from less than a quarter of this landscape, outwith the river valley floors and generally located on the more elevated eastern facing valley slopes. An extensive pattern of broadleaf woodland (shelterbelts, riparian woodland and policy woodland) is anticipated to further reduce actual visibility.

8.12 Views tend to be medium to short scale and focused along the valley in a north to south orientation and away from the Site. However, framed views through woodland and between undulating horizons towards the Site are obtainable from certain locations. Furthermore, more expansive and longer distance views are obtainable from higher up the valley sides. Receptors tend to be isolated residential properties with elevated viewing positions on the valley slopes. Views from the minor road network in the valley floor are less common.

8.13 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of this landscape would be directly affected. Intimate views from the valley floor framed by woodland and landform would typically remain unaltered. Where views are obtainable from the more open valley slopes the operational Dalswinton Wind Farm is typically also apparent. There are no viewpoints from this landscape within the viewpoint assessment however, an indicative wireline from Stroqunar (284275, 583525 see Appendix 8.1) is typical of views from the isolated properties on the eastern facing valley slopes. A magnitude of change of very small is anticipated from this viewpoint.

8.14 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~7km) and the Development are very similar in this area. Minsca Wind Farm (~30km) to the east and Windy Standard (~20km) and Wether Hill (~10km) to the north west may also be apparent however, overlap with the Development ZTV is limited.

8.15 The Development would form an inconspicuous minor new landscape elements resulting in a very minor alternation to the relationship of the key landscape characteristics. The proposed turbines would be seen in front of the existing Dalswinton Wind Farm, appearing as one wind farm on the horizon. Indeed, unless the observer was very familiar with the layout for Dalswinton Wind Farm it would be difficult to discern a noticeable change.

8.16 Magnitude of change: Due to the extent of visibility, nature of the change in views and that none of the key landscape characteristics would be directly affected a Very Small magnitude of change is anticipated.

8.17 Assessed sensitivity**:** due to the intimate nature of views; smaller scale and varied topography; settled and scenic nature of the landscape with a complex pattern of woodland, pastoral enclosures, meandering rivers and scattered properties the assessed sensitivity is High.

8.18 Significance: *Minor (not significant)*

Type 6 Lower Dale – Lower Nithsdale and Lower Annandale

8.19 Of the two sub types within this LCT the Development is located approximately 5km to the north of Lower Nithsdale and 12km to the north west of Lower Annandale. The ZTV indicates extensive visibility across the majority of Lower Nithdale with some pockets of visual screening to the south of this landscape. Within Lower Annandale visibility is much less widespread, as the Torthorwold Ridge screens views towards the development site, with theoretical visibility covering less than a quarter of this landscape and focused to the area around Lockerbie and the M74.

8.20 This landscape has an open character with medium to long distance views, however development and shelterbelts can foreshorten some viewing opportunities. There are numerous residential receptors within the area ranging from isolated properties to small towns including Lockerbie and the northern edges of Dumfries. There is also a well developed road network which includes major and well used national and regional routes such as the M74, A76 and A75.

8.21 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of this landscape would be directly affected. Medium to long distance views are characteristic and views of operational wind farms are not uncommon in this well developed landscape. Viewpoint 9, 13 and 14 are located within Lower Nithsdale and a magnitude of change no greater than medium is predicted from these views. Viewpoint 11 is located within Lockerbie in Lower Annandale and typical of views from more elevated locations within this area and for which a magnitude of change of very small is anticipated.

8.22 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~5km at closest) and the Development are very similar in both these areas. Minsca Wind Farm (~6km) to the east would also be apparent in successive views from within Lower Annandale. Furthermore Windy Standard and Wether Hill to the north west may also be apparent, in longer distance views, from a limited area to the east of Dumfries.

8.23 In Lower Nithsdale the Development would form a conspicuous new landscape element resulting in a partial alternation to the balance of the key landscape characteristics. The Development would be seen in the context of the existing

Dalswinton Wind Farm, as both wind farms are of a similar turbine design and in close proximity. The horizontal angle occupied by turbines would extend on the horizon and typically there is a discernable gap between the existing Dalswinton and Development. However, the magnitude of change would reduce with distance as identified in Viewpoint 9 and 14 as the gap is less obvious and both wind farms become less conspicuous.

8.24 In Lower Annandale the Development would form an inconspicuous minor new landscape element resulting in a very minor alteration to the balance of the key landscape characteristics. The Development would be seen behind Dalswinton Wind Farm, marginally extending the horizontal angle occupied by turbines on the horizon.

8.25 Magnitude of change: Medium but reducing with distance in Lower Nithsdale and Very Small in Lower Annandale due to the extent of visibility, nature of the change in views and that none of the key characteristics would be directly affected.

8.26 Assessed sensitivity: Medium as this is a well developed area, of medium to large scale with a network of communication lines, major roads and railways and where views of wind farms in the distance are already a common feature.

8.27 Significance: Moderate (not significant) and reducing with distance in Lower Nithsdale and Minor/Negligible (not significant) in Lower Annandale.

Type 7 Middle Dale – Mid Annandale

8.28 Of the two sub types within this LCT the Development Farm turbines are located approximately 1km to the east of Mid Nithsdale and 10km to the west of Mid Annandale. Mid Nithsdale is considered the LVIA Chapter. Within Mid Annandale visibility is less widespread, with a patchy pattern covering less than half of the landscape focused around the area north west of Torthorwold Ridge.

8.29 This landscape generally has an open character with medium scale views focused in a north to south orientation along the valleys. However, an extensive pattern of shelterbelts and woodlands is anticipated to reduce actual visibility. There are numerous residential receptors within the area consisting of scattered properties/ farmsteads and small settlements and villages of a high townscape quality. The M74 is also a dominant feature and key receptor along the eastern boundary of Mid Annandale.

8.30 Predicted impacts: Impacts are limited to views of the proposed wind farm which is typically seen in the context of the adjacent Dalswinton Wind Farm. Medium scale views focused up and down the valley would be indirectly affected however, where views of the Development are obtainable typically the operational Dalswinton Wind Farm is also visible.

8.31 Viewpoint 17 is located in Mid Annandale and typical of views from the M74 and for which a magnitude of change of very small is anticipated. However, this viewpoint is located along the eastern edge of this landscape and in closer distance views to the west of this area a magnitude of change rising to small is anticipated.

8.32 There are no operational wind farms located within this landscape however, the operational Dalswinton Wind Farm (~3km) is located adjacent to the eastern boundary of Mid Nithsdale and the ZTV overlap between this wind farm and the Development are very similar in both these landscape sub types. Minsca Wind Farm (~5km) to the east would also be apparent in successive views from within Mid Annandale. Views of other operational wind farms are very limited.

8.33 In Mid Annandale the Development would form an inconspicuous minor new landscape element resulting in a very minor alteration to the relationship of the key landscape characteristics. The Development would be seen on the horizon behind Dalswinton Wind Farm, marginally extending the horizontal angle occupied by turbines on the horizon.

8.34 Magnitude of change: Very Small and reducing with distance in Mid Annandale when you consider extent of visibility, nature of the change in views and that none of the key landscape characteristics would be directly affected.

8.35 Assessed sensitivity: High as this area has medium scale views and often quite an intimate nature with an attractive pattern of woodland, high quality architecture and diverse topography which is reflected in the regional landscape designation to the north of Mid Nithsdale. The area is also well settled.

Significance: *Minor (not significant) in Mid Annandale*

Type 9 Upper Dale – Upper Nithsdale

8.36 The Development is located approximately 9km to the south of this LCT. The ZTV indicates widespread visibility, albeit in a fragmented pattern, from the southern half of this landscape. Visibility from the northern half is very limited. Extensive woodland coverage including riparian woodland associated with the River Nith, policy woodlands associated with Drumlanrig Castle and large scale plantations on the valley sides are anticipated to limit actual visibility. However, this wide valley affords open long views focused south down the valley and towards the development site.

8.37 This area is less densely settled than lower parts of the Nith Valley however, there are numerous scattered farmstead and residential properties. Roads users on the A76, minor road network and people travelling on the Glasgow to Dumfries train are also key receptors. Recreational receptors visiting Drumlanrig Castle and estate are also common.

8.38 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key landscape characteristics would be directly affected. Open, long distance views focused down the valley would be indirectly affected however, where views of the Development are obtainable typically the operational Dalswinton Wind Farm is also visible. Viewpoint 4, from Drumlanrig HGDL is typical of open views looking down the valley (where obtainable). A magnitude of change of small is anticipated from this viewpoint.

8.39 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~8km) and the

Development are very similar. Views of Hare Hill Wind Farm (~3km) are also common to the north of this landscape however the ZTV overlap with Development is limited.

8.40 The Development would form an apparent, small new landscape element resulting in a minor alteration to the relationship of the key landscape characteristics. The Development would be seen on the horizon as an extension to the existing Dalswinton Wind Farm.

8.41 Magnitude of change: Due to the extent of visibility (limited by woodland) and nature of the change in views a Small magnitude of change is anticipated.

8.42 Assessed sensitivity: due to the southern half of this LCT being within an RSA (designated for its complex and varied topography, picturesque pattern of woodland, features of architectural and historic interest and meandering river) the assessed sensitivity of this landscape is High. This is also a well settled landscape of medium scale.

8.43 Significance: *Moderate (not significant)*

Type 11 Upland Glens – Scar and Shinnel

8.44 Both sub types are located approximately 11km to the north west of the Development. The ZTV indicates a limited pattern of fragmented visibility from less than a quarter of both these sub types from the higher valley sides. Plantation woodland on the valley slopes is anticipated to reduce actual visibility, however the majority of areas with potential views are open and elevated. Views are orientated in a strong north west to south east orientation towards the Site. Receptors are very limited to occasional properties/ farmsteads and potentially some recreational walkers.

8.45 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key landscape characteristics would be directly affected. Open, longer distance views from the higher valley sides focused south east along the glens would be indirectly affected views of operational wind farms are not uncommon from these areas where more expansive views are often obtainable. There are no viewpoints within the viewpoint assessment from these landscapes however, an indicative wireline from Camling (283370, 594250 as shown in Appendix 8.1) represents the worst case scenario in views. A magnitude of change of small is anticipated from this viewpoint.

8.46 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~12km) and the Development are very similar (from the limited areas with potential views). Very limited, long distance views of Minsca Wind Farm (~39km) to the south east may be available in combined views. Furthermore, very limited, closer distance, successive views of Hare Hill (~12km), Windy Standard (~11km) and Wether Hill (~6km) may also be obtainable.

8.47 The Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics.

The Development would be seen on the horizon, extending the horizontal angle occupied by turbines in relation to Dalswinton Wind Farm.

8.48 Magnitude of change: Due to the extent of visibility, nature of the change in views and that none of the key characteristics would be directly affected a Small magnitude of change is anticipated.

8.49 Assessed sensitivity: High as the topography, smaller scale and special wild characteristics of this landscape would make any vertical development very intrusive in views.

8.50 Significance: *Moderate (not significant)*

Type 13 Drumlin Pastures – Milton and Deeside

8.51 Of the two LCT sub types within the study area visibility from the more distant Deeside is very limited so the following concentrates on Milton. The ZTV indicates a limited pattern of fragmented visibility from less than a quarter of this landscape. Woodland coverage from areas with potential visibility is limited and due to the undulating topography and views, where obtainable, tend to be more elevated, open and longer distance. Receptors included numerous scattered properties/ farmsteads, small settlements and road users travelling east on the A75.

8.52 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key landscape characteristics would be directly affected. Due to the diverse topography the types of key views are varied. Open, longer distance views from the more elevated ground would be indirectly affected however, views of operational wind farms from these areas are not uncommon. Viewpoint 18, from the A75, is typical of views within this landscape and a magnitude of change of small is anticipated from this viewpoint.

8.53 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~12km) and the Development are very similar in this area. Overlap with Minsca Wind Farm (~30km) to the east is also broadly similar, albeit slightly less widespread.

8.54 The Development would from an apparent new landscape element resulting in a minor alteration to the relationship of the key landscape characteristics, typically seen as an extension to the operational Dalswinton Wind Farm. Furthermore, and from certain viewing locations, the Development would be back dropped by the landform behind, as demonstrated in Viewpoint 18.

8.55 Magnitude of change: Due to the extent of visibility, nature of the change in views and that none of the key landscape characteristics would be directly affected a Small magnitude of change is anticipated.

8.56 Assessed sensitivity: Medium as the topographic variation creates a distinctive landscape with lots of screening potential and the landscape pattern has been somewhat degraded by major road developments. Furthermore there are no landscape designations within this landscape.

8.57 Significance: *Minor (not significant)*

Type 16 Upland Fringe – Torthorwald, Dunscore, Cairn and Annandale

8.58 The Development is located within this LCT, to the centre of the Torthorwald sub type. The LVIA chapter considers impacts on the Torthorwald and Dunscore LCT sub types.

8.59 A fragmented pattern of visibility from the eastern facing slopes, covering less than half of the landscape is apparent from the Cairn sub type, located approximately 8km away to the south west. Annandale is over 15km away from the Development so is considered within the impacts on the wider landscape setting in the LVIA Chapter.

8.60 Within this landscape squared blocks of plantation woodland are a key characteristic, which is anticipated to reduce actual visibility, and increasing forestation is evident. However, panoramic views over the valley lowlands are typical from the numerous scattered farmsteads, and minor road network on the valley slopes.

8.61 Predicted impacts: Impacts are limited to views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. Expansive views over the surrounding settled valleys are a key characteristic of this landscape and as the Development would be seen on the opposite side of the valley from this LCT sub type.

8.62 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~12km from Cairn sub type) and the Development are very similar. Longer distance combined views of Minsca Wind Farm (~28km) to the east would be also be obtainable. Very limited successive views of Hare Hill (~27km), Windy Standard (~13km) and Wether Hill (~24km) would also be obtainable.

8.63 From the Carin sub type Viewpoint 15 is typical of the type of views anticipated and a magnitude of change of very small is anticipated. Closer distance views from within this sub type are obtainable however, a magnitude of change of no greater than small is anticipated.

8.64 The Development would be seen within the context of, and as an extension to Dalswinton Wind Farm, forming an apparent, small new landscape element resulting in a minor alteration to the key landscape characteristics.

8.65 Magnitude of change: Small.

8.66 Assessed sensitivity: High as the majority of these LCT are within RSAs and these areas are highly visible from the surrounding settled lowlands, of medium scale and with numerous residential receptors.

8.67 Significance: Moderate (not significant).

Type 18 Foothills - Annandale, Beattock, Nithsdale, Keir and Dalmacallan

8.68 Of the five LCT sub types within the study are Annandale and Beattock are located to the east of the Development approximately 12km and 20km respectably. The remaining three are located in the western half of the study area with Nithsdale 10km north west, Keir 5km west and Dalmacallan 10km south west. As potential visibility from Beattock is very limited and due to the viewing distance to Annandale, significant landscape impacts are not anticipated so these areas have not been considered further.

8.69 To the west in Nithsdale visibility is more widespread covering over half of this landscape with a notable area of visual screening to the north and centre of this area. A fragmented pattern of visibility is evident in Keir, covering less than half of this landscape and focused at the western and eastern ends. Within Dalmacallan a fragmented pattern of visibility, focused along the northern edges and covering less than half of this landscape is apparent.

8.70 Within all these areas tree cover is limited to sheltered pockets with some copses on the top of hills. Views therefore tend to be open, expansive and long distance. There are many scattered properties/ farmsteads, small settlements and minor roads which constitute the key receptors.

8.71 Predicted impacts: Impacts are limited to distant views of the proposed wind farm which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key landscape characteristics would be directly affected. Open long distance views are a key characteristic of this landscape and would be indirectly affected. However, views of operational wind farms from these areas are not uncommon.

8.72 No viewpoints have been included within the viewpoint assessment however, a worst case scenario wireline from each sub type has been generated. From Nithsdale to the north of Penpont (284420, 595070 see Appendix 8.1) a small magnitude of change is anticipated. From Keir and the summit of Wauk Hill (284150, 590920 see Figure 8.35a-b) a magnitude of change of small is anticipated. From Dalmacallan and the summit of Bishop Forest Hill (284895, 579655 see Figure 8.34a-c) a magnitude of change of small is also anticipated.

8.73 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~ 5km at closest) and the Development are very similar. Longer distance combined views of Minsca Wind Farm (~34km) to the east would also be obtainable from a broadly similar area, albeit slightly less widespread. Limited successive views of Hare Hill (~17km) and other operational wind farms to the north and west would also be obtainable.

8.74 From each sub type the Development would form an apparent small new landscape element resulting in a minor alteration to the relationship of the key landscape characteristics. Due to the general direction of view and viewing distance, Dalswinton is usually always seen just behind the Development so the proposal seems to be a very logical extension which minimises the magnitude of change. Furthermore, and from certain viewing locations the Development would be back dropped by the landform behind due to the elevated viewing position.

8.75 Magnitude of change: generally Small for Nithsdale, Keir and Dalmacallan due to the extent of visibility, nature of the change in views and that none of the key landscape characteristics would be directly affected.

8.76 Assessed sensitivity: High the scale and simplicity of the landscape can accommodate development of this type and the upland exposed nature with long distance views means views of wind farms are already a common feature. However, the majority of this landscape is within the Thornhill Uplands and Terregles Ridge RSA and there are numerous scattered farmsteads and small settlements which increases the sensitivity.

8.77 Significance: *Moderate (not significant)*

Type 18a Foothills with Forest – Ae and Stroan

8.78 Of the two LCT sub types within the study area visibility from the more distant Stroan is very limited, and over 15k from the proposed site, so the following concentrates on Ae. Located directly to the west of the Development the ZTV indicates a limited pattern of fragmented visibility from less than a quarter of this landscape focused to the eastern side of this area. Plantation woodland coverage is widespread, forming a dominate characteristic of the landscape, so actual visibility is greatly reduced foreshortening otherwise elevated, long distance views. Receptors are limited to occasional farmsteads, walkers and forest workers using the forestry tracks.

8.79 Predicted impacts: The Development is located on the edge of this LCT so localised direct landscape impacts are anticipated as a result of the site access tracks. These are discussed further in impacts on landscape fabric. Outwith these impacts are limited to close proximity views of the Development which is typically seen from the cleared area around the adjacent Dalswinton Wind Farm. Longer distance views are typically screened by the abundant plantation woodland coverage, which is a key characteristic of this landscape.

8.80 No viewpoints from this area have been included within the viewpoint assessment as views tend to be screened by plantation woodland. There is an open area to the west of this landscape around the operational Dalswinton Wind Farm for which a magnitude of change of large is anticipated, however this is from a limited area within the context of this LCT and the existing wind farm already has a strong influence over the landscape character and views in this area.

8.81 Longer distance views of other operational within the study area tend to be screened by the surrounding plantation woodland.

8.82 Magnitude of change: despite the proximity to the Development, Small, due to the limited extent of actual visibility and nature of views from an operational wind farm (where views are obtainable).

8.83 Assessed sensitivity: Low as this is a large-scale landscape, which has been degraded by mass forestation which also creates good screening potential.

8.84 Significance: *Minor (not significant)*

Type 19 Southern Uplands – Lowther and Nithsdale

8.85 Lowther is located approximately 7km to the north and Nithsdale 11km to the north west of the Development. In Lowther the ZTV indicates a fragmented pattern of visibility, generally from the southern facing slopes and covering less than a quarter of this large LCT sub type. In Nithsdale a similar fragment pattern is apparent, from the eastern facing slopes, and covering less than a quarter of this LCT. Both sub types have an open and exposed character so expansive, often panoramic views are obtainable. Receptors are generally limited to recreational walkers.

8.86 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key landscape characteristics would be directly affected. Expansive, panoramic views are a key characteristic of this landscape and would be indirectly affected. Whilst this area is quite exposed and remote, views of operational wind farms are not uncommon.

8.87 No viewpoints from this area have been included within the viewpoint assessment so an indicative worst case scenario wireline from Lowther and Nithsdale has been generated. From Lowther at Wester Hill (293980, 598640 see Appendix 8.1) a magnitude of change of small is anticipated. From Nithsdale at Tynron Doon Fort (282020, 593940 see Appendix 8.1) a magnitude of change of small is also anticipated.

8.88 There are no operational wind farms located within these landscapes however, the ZTV overlap between the operational Dalswinton Wind Farm (~5km) and the Development are very similar. Longer distance combined views of Minsca (~27km) and successive views of Hare Hill (~8km), Windy Standard (~7km) and Wether Hill (~7km) would also be obtainable from limited areas.

8.89 The Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of the key landscape characteristics. The Development would extend the horizontal angle occupied by turbines in relation to Dalswinton Wind Farm. Furthermore, and from Lowther, the Development would generally be back dropped by Criffel Hill in views.

8.90 Magnitude of change: Small due to the limited visibility, nature of change in views from both these landscapes and that none of the key landscape characteristics would be directly affected.

8.91 Assessed sensitivity: Medium this is a large scale landscape with few receptors which is able to accommodate development of this type however the lack of development and wild characteristics somewhat raises it sensitivity.

8.92 Significance: Minor (not significant)

Cumulative Impacts on Landscape Character Types

8.93 Within the following assessment of cumulative impacts on LCTs and with regard to predicted impacts only the wind farms with widespread or higher ZTV overlap

within each LCT are referred to (along with the distance and direction of the wind farm from that particular LCT).

Type 2 Coastal Flats - Nith Coastal Fringe

8.94 There are no cumulative viewpoints within this designation however, Viewpoint 10 has aided in the assessment of cumulative impacts. The Development is located approximately 15km to the north and the Development ZTV indicates widespread visibility around the Nith estuary with limited visibility to the east and west along the Dumfries coastline. Vegetation cover is quite widespread and anticipated to reduce actual visibility. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.95 Predicted impacts: Widespread ZTV overlap with Dalswinton (15km north), Ewe Hill (6) (19km north east), Harestanes (17km north), Minsca (15km north east), Whiteside (39km north west) for Scenario 1 wind farms and Auchencairn (16km north), Ewe Hill (22) (16km north east) Minnygap (21km north), Ulzieside (38km north west) for Scenario 2 wind farms is anticipated.

8.96 The Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.97 For Scenario 1 and from open, elevated viewing positions looking in a northern direction Dalswinton is apparent to the centre of view with Harestanes to the right and Whiteside in the longer distance to the left of view. Ewe Hill (6) and Minsca are typically also visible in successive views to the right.

8.98 The Development is typically seen to the left and in the context of Dalswinton, due to the similar turbine design. The Development would form an inconspicuous minor new landscape element.

8.99 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small

8.100 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.101 In Scenario 2, and in views orientated north, Auchencairn Wind Farm is visible behind and to the right of Dalswinton Wind Farm. Minnygap can be seen behind and to the right of Harestanes, Ewe Hill (22) to the right of view and Ulzieside in longer distance successive views to the left. As above, the Development would generally be seen in the context of Dalswinton forming an inconspicuous minor new landscape element.

8.102 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small

8.103 Cumulative Significance (Scenario 2): *Minor (not significant)*

Type 5 Intimate Pastoral Valleys – Cairn and Old Water

8.104 There are no cumulative viewpoints within this designation. The Development is located approximately 6km to the east and the Development ZTV indicates fragmented visibility from less than a quarter of this LCT. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.105 Predicted impacts: Widespread ZTV overlap with Dalswinton (7km east), Harestanes (15km north east) for Scenario 1 wind farms and Auchencairn (8km north east), Minnygap (19km north east) for Scenario 2 wind farms is anticipated.

8.106 The topography, enclosed nature and extensive pattern of broadleaf woodland means views of wind farms are less frequent. However, from more open, elevated positions on the valley sides the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.107 For Scenario 1 and from open, elevated viewing positions generally on the eastern facing valley slopes and looking east a central cluster of wind turbines with Dalswinton to the right and Harestanes to the left and in the longer distance is apparent.

8.108 The Development is typically seen in front of Dalswinton and as such does not extend the horizontal angle occupied by turbines and would appear to be part of the same wind farm. Wider successive views of other wind farms within the study area are generally not obtainable from these areas.

8.109 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small

8.110 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.111 In Scenario 2, and in views orientated east, Auchencairn and Minnygap extends the central cluster of wind farms to the left. As above, the Development would generally be seen in front of Dalswinton.

8.112 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small

8.113 Cumulative Significance (Scenario 2): *Minor (not significant)*

Type 6 Lower Dale – Lower Nithsdale and Lower Annandale

8.114 Viewpoint 14 has been presented as a cumulative viewpoint from within the Lower Nithsdale sub type. Of the two sub types the Development is located approximately 5km to the north of Lower Nithsdale and 12km to the north west of Lower Annandale. The Development ZTV indicates extensive visibility within Lower Nithsdale and limited visibility within Lower Annandale. As determined in the landscape assessment, the assessed sensitivity of this LCT is Medium.

8.115 Predicted impacts: Within Lower Nithsdale widespread ZTV overlap with Dalswinton (5km north), Harestanes (10km north), Whiteside (32km north west) for Scenario 1 wind farms and Auchencairn (6km north), Barnbackle (7km west), Minnygap (8km north), Ulzieside (32km north west) for Scenario 2 wind farms is anticipated.

8.116 Within Lower Annandale widespread ZTV overlap with Clyde (27km north), Dalswinton (12km northwest), Harestanes (9km north west), Minsca (6km east) for Scenario 1 wind farms and Auchencairn (11km northwest), Minnygap (11km north west), Newfield (3km north east) for Scenario 2 wind farms is anticipated.

8.117 Due to the open character and medium to long scale views in this LCT the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.118 For Scenario 1, within Lower Nithsdale and from open, viewing positions looking north Dalswinton would be apparent to the centre of view with Harestanes in the longer distance to the right of view. Views of Whiteside to the left would also be obtainable from more elevated positions.

8.119 The Development would typically be seen to the left and in the context of Dalswinton, extending the horizontal angle occupied by turbines. As previously identified and in closer distance views a slight gap between the Development and Dalswinton becomes apparent but the turbine sizes related well to each other so a magnitude of change not exceeding medium is anticipated.

8.120 For Scenario 1 in Lower Annandale three distinct clusters of wind farms are apparent in wider views of the landscape in views looking north and west. From left to right Dalswinton, Harestanes and Clyde create these three groups. Within this view wind farms are becoming quite a common feature on the horizon particularly as Clyde is such a large wind farm. However, there is still adequate separation between the wind farms so you could not call this a view of a wind farm landscape. The Development marginally extends the horizontal angle occupied by turbines to the left of Dalswinton and is seen as an extension to this wind farm.

8.121 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Medium in Lower Nithsdale and Very Small in Lower Annandale.

8.122 Cumulative Significance (Scenario 1): *Moderate (not significant)* in Lower Nithsdale and *Minor/ Negligible (not significant)* in Lower Annandale

8.123 From Lower Nithsdale in Scenario 2, Auchencairn is typically behind Dalswinton and Minnygap can be seen behind Harestanes. The Development, Dalswinton and Auchencairn are generally viewed as one cluster of wind farms to the centre of view with large gaps on the horizon, free of turbines to either side. As with Scenario 1, the Development continues to represent a medium magnitude of change.

8.124 From Lower Annandale in Scenario 2, Auchencairn further extends the horizontal angle occupied by turbines to the right of Dalswinton and Minnygap is apparent in front of Harestanes. As with Scenario 1, the Development continues to represent a small addition to the horizontal angle occupied by turbines in this view.

8.125 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Medium in Lower Nithsdale and Very Small in Lower Nithsdale.

8.126 Cumulative Significance (Scenario 1): *Moderate (not significant)* in Lower Nithsdale and *Minor/ Negligible (not significant)* in Lower Annandale

Type 7 Middle Dale –Mid Annandale

8.127 Viewpoint 17 has been presented as a cumulative viewpoint from within the Mid Annandale sub type. The Development is located approximately 10km to the west of Mid Annandale. The Development ZTV indicates less widespread visibility within Mid Annandale. An extensive pattern of shelterbelts and woodland is anticipated to reduce actual visibility. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.128 Predicted impacts: Within Mid Annandale widespread ZTV overlap with Clyde (9km northwest), Dalswinton (8km west), Ewe Hill (6) (12km east), Harestanes (4km northwest), Minsca (5km east) for Scenario 1 wind farms and Auchencairn (8km west), Minnygap (5km north), Newfield (2km east) for Scenario 2 wind farms is anticipated.

8.129 This landscape has an open character with medium scale views focused up/ down the valley. The Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.130 For Scenario 1 in within Mid Annandale and in typical views orientated west to north Dalswinton, Harestanes and Clyde are apparent, with noticeable separation between the wind farms. Ewe Hill (6) and Minsca are also apparent in successive views from the higher ground to the west of this landscape. The Development is apparent to the left of Dalswinton, appearing as a logical extension and marginally extending the horizontal angle occupied by turbines.

8.131 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small in Mid Annandale.

8.132 Cumulative Significance (Scenario 1): *Minor (not significant)* in Mid Annandale.

8.133 In Mid Annandale Auchencairn extends the horizontal angle occupied by turbines to the right of Dalswinton and Minnygap is apparent in front of Harestanes. Newfield is also apparent, in close distance successive views. The Development continues to marginally extend the horizontal angle occupied

by turbines to the left of the far left cluster of wind farms (which includes Dalswinton and Auchencairn) appearing as an extension to Dalswinton.

8.134 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small in Mid Annandale.

8.135 Cumulative Significance (Scenario 1): *Minor (not significant)* in Mid Annandale.

Type 9 Upper Dale – Upper Nithsdale

8.136 There are no cumulative viewpoints within this designation. The Development is located approximately 9km to the south and the Development ZTV indicates widespread visibility in a fragmented pattern to the south of this landscape with limited visibility in the north. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.137 Predicted impacts: Widespread ZTV overlap with Dalswinton (8km south), Hare Hill (3km west), Whiteside (5km west) for Scenario 1 wind farms and Auchencairn (6km southeast), Hare Hill Extension (3km west), Ulzieside (3km west) for Scenario 2 wind farms is anticipated.

8.138 This wide valley affords open and long views focused down the valley so and the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.139 For Scenario 1 in views looking south east views of Dalswinton are common to the south of this landscape. Successive views including Hare Hill and Whiteside are more typical to the north of this landscape from the more elevated valley sides. The Development is typically seen to the right of Dalswinton, appearing as a logical extension and forming an apparent, small new landscape element.

8.140 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.141 Cumulative Significance (Scenario 1): *Moderate (not significant)*

8.142 In Scenario 2, in views orientated south east, and as identified in the cumulative assessment of Thornhill Uplands and Mid Nithsdale, Auchencairn is apparent to the left of Dalswinton creating a long string of turbines on the horizon. The Development typically extends this impact however, due to the longer viewing distance, which means a higher percentage of the horizon is free of turbines, a magnitude of change of small is still anticipated.

8.143 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.144 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Type 11 Upland Glens – Scar and Shinnel

8.145 There are no cumulative viewpoints within this designation. Both sub types are located approximately 11km to the north west of the Development and the Development ZTV indicates a limited and fragmented pattern of visibility. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.146 Predicted impacts: Widespread ZTV overlap with Dalswinton (12km southeast), Harestanes (15km east), Whiteside (3km northwest) for Scenario 1 wind farms and Auchencairn (9km southeast), Minnygap (18km east) for Scenario 2 wind farms is anticipated.

8.147 These narrow glens with wild characteristics means views of wind farms are limited. However, from higher viewing positions with longer distance views the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.148 For Scenario 1 Dalswinton and Harestanes, in the longer distance and to the left of view, are apparent in views looking south east. Successive views of wind farms to the north west are more common from the western end of the glens. The Development is typically seen to the right of Dalswinton, appearing as a logical extension and forming an apparent, small new landscape element.

8.149 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.150 Cumulative Significance (Scenario 1): *Moderate (not significant)*

8.151 In Scenario 2, in views orientated south east, Auchencairn is apparent to the left of Dalswinton creating a longer string of turbines on the horizon. The Development typically extends this impact however, due to the longer viewing distance, and limited areas within the context of this landscape where views of this nature are obtainable, a magnitude of change of small is still anticipated.

8.152 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.153 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Type 13 Drumlin Pastures – Milton and Deeside

8.154 There are no cumulative viewpoints within this designation. Visibility within the more distant Deeside is very limited so the following considers the Milton sub type, located approximately 12km to the south of the Development. The Development ZTV indicates a fragmented pattern of visibility from less than a quarter of this landscape. As determined in the landscape assessment, the assessed sensitivity of this LCT is Medium.

8.155 Predicted impacts: Widespread ZTV overlap with Dalswinton (12km northeast), Ewe Hill (6) (37km east), Harestanes (19km northeast), Minsca (30km east), for

Scenario 1 and Auchencairn (14km northeast), Barnbackle (within), Doon Hill (within), Ewe Hill (22) (37km east), Minnygap (23km northeast), Newfield (26km northeast) for Scenario 2 wind farms is anticipated.

8.156 The drumlin topography creates intimate views where wind farms are not a common feature. However, from more elevated areas with open, longer distance views the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.157 For Scenario 1 and where obtainable Dalswinton and Harestanes are seen as a central cluster of turbines. Successive views of turbines to the east are also more common from the highest ground.

8.158 The Development is typically seen marginally extending the horizontal angle occupied by turbines to the left of Dalswinton, appearing as an extension to this wind farm. The Development would introduce apparent, small new landscape elements into the view.

8.159 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.160 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.161 In Scenario 2, in views orientated northeast Auchencairn and Minnygap add to the central cluster of turbines and the Development is seen in front of this. As a result the horizontal angle occupied by turbines is in not extended. The cumulative magnitude of change is still considered to be small.

8.162 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.163 Cumulative Significance (Scenario 2): *Minor (not significant)*

Type 16 Upland Fringe –Cairn and Annandale

8.164 As described in the landscape assessment the Annandale sub type is over 15km away from the Development so is considered within the cumulative impacts on the wider landscape setting. The ZTV indicates a fragmented pattern from less than half of the Cairn sub type (8km south west). As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.165 Predicted impacts: within Cairn widespread ZTV overlap with Dalswinton (9km north), Ewe Hill (6) (35km east), Harestanes (15km northeast), Minsca (28km east) for Scenario 1 wind farms and Auchencairn (10km northeast), Ewe Hill (22) (34km east), Minnygap (16km north east), Newfield (23km east) for Scenario 2 wind farms is anticipated.

8.166 Woodland coverage is a key characteristic within this landscape which is anticipated to reduce theoretical visibility of the Development. However, the

elevated nature of the valley sides means the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.167 For Scenario 1 and within the Cairn LCT sub type, typically Dalswinton and Harestanes are visible centre view, with separation between, and Ewe Hill (6) in longer distance successive views to the right. Minsca is also apparent in longer distance views to the right from the higher ground. The Development is usually seen to the left of Dalswinton, but as one moves north through this landscape the Development is increasingly seen in front of Dalswinton and the horizontal angle occupied by turbines reduces. The cumulative assessment reflects the landscape assessment for which a small magnitude of change is anticipated.

8.168 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small in Cairn.

8.169 Cumulative Significance (Scenario 1): reflects the landscape assessment which is *Moderate (not significant)* from Cairn.

8.170 For Scenario 2 in Cairn, Auchencairn is typically seen behind Dalswinton and the Development which continues to marginally extend the horizontal angle occupied by turbines to the centre of view (however this impact reduces as one moves north) resulting in a small magnitude of change.

8.171 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small in Cairn.

8.172 Cumulative Significance (Scenario 2): *Moderate (not significant)* from Cairn.

Type 18 Foothills - Annandale, Beattock, Nithsdale, Keir and Dalmacallan

8.173 A cumulative wireline from Wauk Hill (284150, 590920 see Figure 8.35a-b) has been presented within the Keir landscape sub type and from Bishop Forest Hill (284895, 579655 see Figure 8.34a-c) within the Dalmacallan landscape sub type. As described in the landscape assessment and due to limited visibility and the viewing distance Beattock and Annandale have not been considered here. The the Development ZTV indicates widespread visibility in Nithsdale (10km northwest), and a fragmented pattern from Keir (5km west) and Dalmacallan (10km southwest). As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.174 Predicted impacts: Within Nithsdale widespread overlap with Dalswinton (9km south east), Harestanes (12km east) for Scenario 1 wind farms and Auchencairn (8km south east), Minnygap (15km east) for Scenario 2 wind farms is anticipated.

8.175 Within Keir widespread overlap with Dalswinton (5km east), Ewe Hill (6) (40km east), Harestanes (11km north east), Minsca (34km southeast) for Scenario 1 wind farms and Auchencairn (6km east), Ewe Hill (22) (40km east), Minnygap

(16km north east), Newfield (28km east) for Scenario 2 wind farms is anticipated.

8.176 Within Dalmacallan widespread overlap with Dalswinton (11km northeast), Ewe Hill (6) (40km east), Harestanes (16km northeast), Minsca (34km east), Whiteside (11km north) for Scenario 1 wind farms and Auchencairn (12km northeast), Ewe Hill (22) (40km east), Minnygap (22km north east), Newfield (28km east), Ulzieside (10km north) for Scenario 2 wind farms is anticipated.

8.177 From each sub type elevated, long distance expansive views are typical and the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.178 For Scenario 1 and from within Nithsdale in views looking south east Dalswinton and Harestanes are apparent and separated by a clear gap. The Development typically extends the horizontal angle occupied by turbines to the right of Dalswinton and is seen as a logical extension to it forming an apparent small new landscape element.

8.179 From Keir typically and in eastern views Dalswinton and Harestanes are also apparent in the view and separated by a clear gap, with Minsca and Ewe Hill (6) visible in the longer distance behind Dalswinton. The Development extends the horizontal angle occupied by turbines to the right of Dalswinton, but is very much viewed as an extension to this wind farm forming an apparent small new landscape element. Distant successive views of Whiteside Hill are also apparent from the higher ground.

8.180 From Dalmacallan and in typical views looking north east a central cluster of wind farms combining Dalswinton and Harestanes is apparent. As one moves north within the LCT sub type a gap appears between these wind farms. Ewe Hill (6) and Minsca are also visible from the higher ground to the right of view and successive views of Hare Hill and Whiteside are common to the north of this LCT. The Development is typically seen in front of Dalswinton forming an apparent small new landscape element.

8.181 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.182 Cumulative Significance (Scenario 1): *Moderate (not significant)*

8.183 For Scenario 2 and from Nithsdale the gap between Harestanes and Dalswinton is reduced in views by Auchencairn. The Development further reduces the open horizon by introducing turbines to the right of Dalswinton, but these would be seen as an extension to the Development.

8.184 From Keir, Auchencairn typically closes the gap between Harestanes and Dalswinton with the Development visible to the right of Dalswinton. Minnygap, Ewe Hill (22) and Newfield are also apparent in combined views with Ulzieside in longer distance successive views.

8.185 From Dalmacallan, Dalswinton, Harestanes, Auchencairn and Minnygap appear as a more contained central mass of wind farms, with the Development visible to the front (and not extending the horizontal angle occupied by turbines). As one moves north in this LCT longer distance but similar cumulative impacts to those identified from Keir are typical.

8.186 It is acknowledged that for Scenario 2 the horizon in views towards the development site from all LCT sub types is becoming busy with wind farms. However, when you consider the often panoramic views which are mostly free from turbines; the small apparent addition the Development makes in views of wind farms within the landscape; and that the Development typically appears as an extension to Dalswinton with a similar turbine design - the cumulative magnitude of change is still considered to be small.

8.187 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.188 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Type 18a Foothills with Forest – Ae and Stroan

8.189 There are no cumulative viewpoints within this designation. Visibility from within Stroan is limited and beyond 15km so the following concentrates on Ae. Located directly to the west of the Development the ZTV indicates a limited pattern of fragmented visibility. Extensive woodland coverage is anticipated to make actual visibility extremely limited. As determined in the landscape assessment, the assessed sensitivity of this LCT is Low.

8.190 Predicted impacts: Widespread ZTV overlap with Dalswinton (within), Harestanes (within), Whiteside (21km north west) for Scenario 1 wind farms and Auchencairn (within), Barnbackle (15km south west), Doon Hill (22km south west), Minnygap (within) for Scenario 2 wind farms is anticipated.

8.191 There are two operational wind farms within this landscape so the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.192 As woodland coverage is anticipated to screen the majority of views of the Development from this landscape cumulative impacts are limited. Where close proximity views are obtainable (from the open ground around Dalswinton Wind Farm) the cumulative impacts reflect those discussed in the landscape assessment.

8.193 Magnitude of Cumulative Change (for Scenario 1 and 2): Small

8.194 Cumulative Significance (Scenario 1 and 2): *Minor (not significant)*

Type 19 Southern Uplands – Lowther and Nithsdale

8.195 There are no cumulative viewpoints within this designation. Lowther is located approximately 7km to the north and Nithsdale 11km to the north west. The Development ZTV indicates a limited and fragment pattern of visibility from both

sub types from the slopes facing the development site. As determined in the landscape assessment, the assessed sensitivity of this LCT is Medium.

8.196 Predicted impacts: Within Lowther widespread ZTV overlap with Dalswinton (5km south), Harestanes (within), Minsca (27km southeast), Whiteside (9km southwest) for Scenario 1 wind farms and Auchencairn (4km south), Hare Hill Extension (8km southwest), Ulzieside (10km south west) for Scenario 2 wind farms is anticipated.

8.197 Within Nithsdale widespread ZTV overlap with Clyde (15km northeast), Dalswinton (12km southeast), Ewe Hill (6) (44km southeast), Harestanes (16km east), Minsca (40km southeast), Minsca (within) for Scenario 1 wind farms and Auchencairn (10km southeast), Doon Hill (23km southwest), Doon Hill (33km southwest), Ewe Hill (22) (44km southeast), Minnygap (20km east), Ulzieside (within) for Scenario 2 wind farms is anticipated.

8.198 These areas have a remote and exposed character but the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.199 For Scenario 1 and from both LCT sub types in views orientated southeast Dalswinton, Harestanes and Minsca are often apparent to the centre of view with Ewe Hill (6) and Minnygap in the distance. Depending on the viewing angle these wind farms can overlap. The Development is typically seen as an extension to the right of Dalswinton, marginally extending the horizontal angle occupied by turbines forming an apparent small new landscape element.

8.200 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.201 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.202 In Scenario 2 Auchencairn and Minnygap add to the central cluster of turbines with Ewe Hill (22) and Newfield apparent in the distance. Auchencairn is typically seen in the gap between Harestanes and Dalswinton or in front of Dalswinton depending on the viewing angle. As with before, the Development is typically seen as an extension to Dalswinton forming an apparent small new landscape element.

8.203 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.204 Cumulative Significance (Scenario 2): Minor (*not significant)*

APPENDIX 9
CULTURAL HERITAGE

Appendix 9.1: Gazetteer

APPENDIX 9.1 GAZETTEER

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
1	SM	SM No. 657; HER No. MDG6267; NMRS No. NX98NW6	Mullach, fort	Beacon, fort	Vitrified fort on summit of Mullach, a prominent hill. Also listed as a beacon stance in 1448 AD. Oval in shape, with two concentric walls, the outer wall only visible as a scarp on the northern side. There is a narrow gap on the SE side. Previously afforested. Comments: discussion within body of Environmental Statement archaeology chapter	IA; MED	292906	586979	High	No change	None	Minor	Moderate
2	LB Category A	LB No. 10244; HER No. MDG17838; NMRS No. NX98NW42	Blackwood House, stables	Country house	Dated 1778 on bronze pennon. Main (east) range of courtyard stables, pyramidal-roofed 3-stage square dovecot tower with long single storey asymmetrical flanking wings. Rubble-built, ashlar dressings, all whitewashed. Tower has pedestrian pend, round-arched at east with band above at eaves level of wings, 2 small square openings (? flight holes) and single window to each face of top stage; octagonal window to east is similar to loft windows on 4-bay east elevation of south wing (round-headed door and square-headed windows at ground). North wing altered, now a cottage. Small axial stacks; slate roofs, swept-roofed ventilator over tower. Interior: dovecot intact, with stone and brick nesting boxes, potence retained. South wing has arched passageway at east side, arched recesses leading off. Comments: discussion within body of Environmental Statement archaeology chapter	PM	290693	587009	High	No change	None	No change	None
3	LB Category A	LB No. 3966; HER No. MDG20276; MDG6251; MDG17813; NMRS No. NX98NW23	Auldgirth Bridge	Road bridge	This bridge carries the former line of a public road across the River Nith between the parishes of Closeburn and Keir. The red sandstone Old Bridge over the Nith was designed by David Henderson and built by William Stewart in 1781-2. Three segmental arches of ashlar. Bow-ended cutwaters of hammer-dressed masonry, each surmounted by a pair of coupled pilasters carrying an entablature topped by a half-dome; this top part forms a refuge in which a pedestrian could crouch to escape the bridge's traffic. Comments: Situated within a significantly altered cultural landscape adjacent to the A76. Setting consists of the turnpike road and its immediate surroundings.	PM	291165	586353	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
4	LB Category B	LB No. 10216; HER No. MDG17810	Windsover Cottages	Cottages	Earlier 19th century. 2 adjoining single storey, 3-bay, centre-doored cottages with hood-moulded openings. Rubble-built (mostly whinstone) with stugged red ashlar dressings, painted margins and gables. Partly-glazed boarded doors; casement windows with wooden mullions (cottage to west retains latticed glazing). Straight skews; end stacks; slate roofs. Comments: Residential LB facing road, with extensive masking by surrounding forestry. Setting consists of the buildings' immediate surroundings	PM	290456	585984	High	No change	None	No change	None
5	LB Category B	LB No. 10243; HER No. MDG17837; NMRS No. NX98NW42	Blackwood House	Country house	Composite country house with tower house nucleus, principal near symmetrical Jacobean-style south front 2 storeys, 7 bays, and built of red ashlar (remainder harled). Tower house altered with 3 regular bays, and extended to west (elaborate lead 1750 rainwater head on north wall indicates work then) and to south. South range built in 2 phases, canted windows, porch, dormer heads and 3 bays to west all added 1927 (dated) (perhaps all re-faced then) (remaining bays earlier 19th century); 2 advanced and gabled inner bays each with 2-storey canted window, pilastered square porch (door with large fanlight) in re-entrant angle; otherwise, hood-moulded cross windows at ground, upper windows with pedimented dormer heads. North elevation extensively altered and extended with asymmetrical wings, some tripartite openings, and loggias. Corniced stacks; slate roofs. Comments: discussion within body of Environmental Statement archaeology chapter	PM	290724	587022	High	No change	None	Negligible	Slight
6	LB Category B	LB No. 10246; HER No. MDG17840; HER No. MDG11659; NMRS No. NX98NW42	Blackwood House, Walled Gardens, Glasshouse and Folly	Country house	Extensive walled garden area to north and to east of house; principal roughly-quadrangular enclosure adjoins house with symmetrical glass house range on north wall, partly walled enclosure to north with castellated former battery on bastion at north corner. High rubble-built walls with ashlar coping. Comments: discussion within body of Environmental Statement archaeology chapter	PM	290743	587070	High	No change	None	No change	None
7	LB Category B	LB No. 10245; HER No. MDG17839; NMRS No. NX98NW42	Blackwood House Lodge	Gate lodge, gate piers(s)	Probably late 18th century. 2-storey lodge. Harled, with raised brick quoins and long and short worked window dressings; all whitewashed. East elevation 3 bays, central door in gabled open porch blind oculus above; inserted venetian window in either flank; piended slate roof with single massive brick apex stack. Lower addition to rear. 2 square, polished ashlar gatepiers with projecting caps.	PM	290893	586445	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
8	LB Category B	LB No. 4041; HER No. MDG20293; NMRS No. NX98NW42	Blackwood House, Cottages and Walled Garden	Cottages, walled garden	Mid/late 18th century. Exceptionally large quadrangular walled garden (? formerly orchard) enclosure with twin-gabled 2-storey house at north east corner, long row of 5 north- facing single storey lean-to cottages adjoining high north wall of garden (some with openings into garden) attics in continuous lean-to roof. All rubble built, house and cottages whitewashed (garden range of house pebble-dashed); house (altered and re-windowed) has 4-bay north elevation with advanced wide inner gable, stacks in roof valley; cottages have battered north wall, boarded doors, small-paned glazing. Roofs all slated. Garden walls have red ashlar coping; east wall sweeps down and turns inward centrally; west side of garden, beside river Nith, largely unwalled. Comments: discussion within body of Environmental Statement archaeology chapter	PM	290898	587261	High	No change	None	No change	None
9	LB Category B	LB No. 3968; HER No. MDG20278; NMRS No. NX98NW61	Ballochan Linn Railway Viaduct	Railway viaduct	Dumfries-Closeburn line, John Millar, engineer, opened 15.10.1849. Railway viaduct, 3 round arches carrying double track above Ballochan Linn. Stugged red ashlar; voussoirs and quoins on battered piers all rusticated. Slightly battered abutments; terminal piers; string below parapet; iron handrail. Comments: railway viaduct within river valley. Setting consists of the railway and its immediate surroundings.	PM	291046	587463	High	No change	None	No change	None
10	LB Category B	LB No. 3965; HER No. MDG20275;	Auchrennie	Farmhouse	Late 18th/early 19th century single storey, centre-doored, 3-bay cottage, set on slope; extended to north 1 bay late in 19th century; single bay shed adjoins south gable. All whitewashed rubble and margins (addition has stugged dressings). Gabled timber porch, sash windows, mostly lying panes (12 panes in addition). End stacks. Shed door has brick jambs. All roofed in diamond-patterned stone slabs. Comments: Residential LB. Setting consists of the LB's curtilage and immediate surroundings	PM	291241	588937	High	No change	None	No change	None
11	LB Category B	LB No. 3967; HER No. MDG20277; NMRS No. NX98NW34	Auldgirth Inn	Inn	Circa 1800. 2-storey, rectangular-plan Inn. Painted rubble and margins. 4 wide bays, all with pointed windows with simple Y-tracery; off-centre square-headed door with rectangular fanlight. Massive, square, central ridge stack built of brick, on rendered base, also painted, with cross- shaped recess to each elevation; end stacks; piended roof with graded slates. Recessed, single bay modern addition to south also has pointed windows; rendered as rubble. Modern low extension to north. The inn is labelled as a smithy on privately held estate mapping from 1804.	PM	291309	586571	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Inn frontage faces west, with no view of the turbines. Setting consists of the LB's curtilage and the village of Auldgirth.								
12	LB Category B	LB No. 4003; HER No. MDG20282;	Claughrie	Farmhouse	Late 18th century single storey centre-doored 3-bay cottage raised a storey probably early 19th century. All painted rubble and margins, stugged dressings at 1st floor. Pedimented mid-19th century porch, boarded door with fanlight; 12-pane sashes. Skews widened below end stacks; roofed with graded slates. Comments: Residential LB. Setting consists of the LB's curtilage and immediate surroundings View of proposed turbines within significantly altered cultural landscape due to tree plantations in close proximity.	PM	291321	588694	High	No change	None	No change	None
13	Site	HER No. MDG9691; NMRS No. NX98NW35	Cairnhill	Farmstead; horse engine; farmhouse	Location of a farmhouse, farmstead and horse engine house recorded on the HER and NMRS	PM	290458	585932	Low	No change	None	No change	None
14	Site	NMRS No. NX98NW29	Hillend	Farmhouse, farmstead, horse engine house	Location of a farmhouse, farmstead and horse engine house recorded on the NMRS	PM	290630	586000	Low	No change	None	No change	None
15	Site	NMRS No. NX98NW42	Blackwood House, Dovecot	Dovecote	Dovecot dating to circa 1778.	PM	290680	587020	Low	No change	None	No change	None
16	Site	NMRS No. NX98NW26	Blackwood Schoolhouse	Schoolhouse	Schoolhouse recorded on NMRS	PM	290788	587609	Low	No change	None	No change	None
17	Site	NMRS No. NX98NW48	Mo-Daidh	Building	One unroofed building of two compartments annotated Ruin is depicted on the 1st edition of the OS 6-inch map (Dumfriesshire 1861, sheet xl). One roofed building is shown on the current edition of the OS 1:10000 map (1982). Information from RCAHMS (SAH) 20 June 2000	PM	290910	587770	Low	No change	None	No change	None
18	Site	NMRS No. NX98NW13	Auldgirth Bridge	Cairn, findspot	Antiquarian references to a Class I axe-hammer and cairn discovered in 1862 during railway works. Axe-hammer is now in the Dumfries Museum; no reference or trace of the cairn is present.	BA	291100	586300	Medium	No change	None	No change	None
19	Site	NMRS No.	Cairn	Cairn	Record of a cairn made in 1901. No surface or cartographic trace of the cairn in	PREH	291100	587800	Mediu	No change	None	No	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NX98NW19			subsequent studies (OS, 1975)				m			change	
20	Site	NMRS No. NX98NW20	Bar Brugh, cairn	Fort (possible)	Antiquarian references in the NMRS to a fort at this location, but no surface or cartographic trace of the fort could be located in subsequent studies (OS, 1975).	PREH	291100	587800	Medium	No change	None	No change	None
21	Site	NMRS No. NX98NW50	Holmhead	Farmstead	A farmstead comprising one unroofed building, three roofed buildings and three enclosures is depicted on the 1st edition of the OS 6-inch map (Dumfriesshire 1861, sheet xl). One partially roofed building and two roofed buildings are shown on the 1982 edition of the OS 1:10000 map. Information from RCAHMS 20 June 2000	PM	291260	586140	Low	No change	None	No change	None
22	Site	NMRS No. NX98NW80	Auldgirth, New Bridge	Road bridge	For (superseded and predecessor) Auldgirth, Old Bridge (adjacent to NW), see NMRS No. NX98NW 23. This bridge carries the present line of the A76 (T) public road across the River Nith to the S of Auldgirth village (NX98NW 79).	MOD	291293	586277	Negligible	No change	None	No change	None
23	Site	NMRS No. NX98NW79	Auldgirth	Village	Village of Auldgirth recorded on the NMRS. Likely to have grown up around the turnpike road and railway station in the 19th century. Auldgirth is named on maps from Pont (1580s), but this is likely to refer to the tower house at Low Auldgirth or settlement of High Auldgirth, with the village itself a subsequent development. Privately held mapping dating to 1804 shows Auldgirth smithy (now the Inn, RSK Site 11), and a farmstead labelled "Hayfield", consisting of five structures, to its northwest, which probably forms the core of the later village.	PM	291316	586564	Medium	No change	None	No change	None
24	Site	HER No. MDG6265; NMRS No. NX98NW4	Rhoneston Bridge	Findspot	A hoard of 83 coins, mostly James II and III and probably buried within a year or two of James III's death in 1488, was found in January 1961 by Mr. Peter Mason during road-widening work on the A76, between Rhoneston Bridge and Rhoneston Burn farm buildings, NX 912 857. They are in the National Museum of Antiquities of Scotland (NMAS)	MED	291348	585771	Low	No change	None	No change	None
25	Site	HER No. MDG22136; NMRS No. NX98NW81	Cairn	Plantation Bank	The plantation bank has been recorded on oblique aerial photographs (RCAHMSAP 2001) and is depicted on 19th century estate mapping, 1st edition of the OS 6-inch map (Dumfriesshire 1861, sheet xl) and on the 1982 edition of the OS 1:10000 map. Information from RCAHMS (MMB) 31 October 2006. The site visit identified the bank as an oval mound surrounded by an in-filled ditch. Three mature oaks remain on the perimeter of the plantation bank.	PM	291394	587391	Low	No change	None	No change	None
26	Site	NMRS No. NX98NW25	Low Auldgirth	Farmhouse	Location of a farmhouse recorded on the NMRS. The farmstead is called "Laigh Auldgirth" and depicted as three structures around a central courtyard in privately held estate mapping dated 1804.	PM	291580	586840	Low	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
27	Site	HER No. MDG6258; NMRS No. NX98NW3	Low Auldgirth	Tower House	Remains of a tower house were located at Low Auldgirth and recorded on the HER and NMRS. The remains have been subsequently demolished.	MED	291592	586848	Medium	No change	None	No change	None
28	Site	NMRS No. NX98NW51	Foresthead	Farmstead	A farmstead comprising one unroofed building annotated Ruin, one roofed building and four enclosures is depicted on the 1st edition of the OS 6-inch map (Dumfriesshire 1861, sheet xl). One roofed building and one enclosure are shown on the current edition of the OS 1:10000 map (1982). Information from RCAHMS (SAH) 21 June 2000	PM	291710	586220	Low	No change	None	No change	None
29	Site	HER No. MDG12861;	High Townhead	Burnt mound	Burnt Mound located during site visit in connection with Woodland Grant Scheme for adjacent shelter belt [JB]. Dumfries and Galloway SMR: Information entered 23/03/2000	BA	292784	586690	Medium	No change	None	No change	None
30	Site	NMRS No. NX98NW52	Old Pennyland	Enclosure, farmstead	A farmstead annotated Old Pennyland (Ruins), comprising two unroofed buildings, one of which is a long building of five compartments, and an enclosure lying approximately 100m to the S are depicted on the 1st edition of the OS 6-inch map (Dumfriesshire 1861, sheet xli). The unroofed long building and the enclosure are shown on the 1982 edition of the OS 1:10000 map (1982). Information from RCAHMS (SAH), 22 June 2000.	PM	293650	587680	Low	No change	None	No change	None
31	Site	NMRS No. NX98NW53	Pennyland	Building	A partially roofed building annotated Ruin is depicted on the 1st edition of the OS 6-inch map (Dumfriesshire 1861, sheet xli). One unroofed building is shown on the current edition of the OS 1:10000 map (1982). Information from RCAHMS (SAH), 22 June 2000. The OS 1st Edition 25" shows a Pennyland as a farmstead comprising seven structures surrounding a square yard. The ruin described lies to the north of the farmstead.	PM	293800	588080	Low	No change	None	No change	None
32	Site	NMRS No. NX98NW39	Shaws	Animal remains	Antiquarian records at Shaws refer to the discovery of animal bones, including reindeer antler and a bear skull, within peat deposits. Given that it reindeer died out before 6000 BC in Scotland, such remains are likely to be Mesolithic in date.	ME	294000	587000	Medium	No change	None	No change	None
33	Map regression		Blackcraig	Quarry	Quarry depicted on OS 1st Ed 25" map labelled "Quarry (whinstone)"	PM	292500	587700	Low	No change	None	No change	None
34	Map regression		Blackcraig Hill	Quarry	Quarry depicted on OS 1st Ed 25" map labelled "Quarry (whinstone)"	PM	292300	588100	Low	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
35	Non-inventory HGDL		Blackwood	Garden	Blackwood non-inventory garden and designed landscape. Extensive gardens around Category A LB. Consists of coniferous and deciduous woodland on slopes overlooking W side of River Nith. Comments: discussion within body of Environmental Statement archaeology chapter	PM	290800	586900	Medium	No change	None	Minor	Slight
36	Aerial Photograph		Knocknutshell	Cultivation marks	Cultivation marks visible on AP 541/A397-3250 around hill of Knocknutshell. Shown as very regular E-W aligned parallel marks to W of Lambrig Wood, and regular NE-SW aligned parallel marks to E of Blackcraig Hill. No marks were visible on the ground from the field during the site visit. Marks were visible in the southernmost field when viewed from an adjacent field to the west in oblique light.	PM	292800	588100	Low	No change	None	No change	None
37	Aerial Photograph		High Auldgirth	Plantation	Circular enclosure identified on AP 543/1698 0237 to the SE of High Auldgirth farm, built into the field boundary. Depicted on modern OS mapping as an area of commercial forestry. Shown on privately held estate mapping as a circular plantation.	PM	292353	587557	Low	No change	None	No change	None
38	Map regression		High Auldgirth	Settlement	Settlement first depicted on Roy's Map (1752-55) of the Lowlands of Scotland. This is shown to consist of the keepers cottages still present on the site in estate mapping from 1804. Subsequent structures, including terraced cottages and farm buildings, were built in the 20th century	PM	292089	587788	Low	No change	None	No change	None
39	Site visit		Pennyland Burn	Earthworks	Series of possible man-made earthworks on shoulder of hill facing Pennyland Burn to the east identified during site visit. Consists of the following: • Large oval earthwork, 8m wide N-S; 9.5m long E-W • Satellite A: circular, 3m diameter, c.40cm high • Satellite B: roughly circular, 5m diameter, c.60cm high • Satellite C: roughly circular, 3.5m diameter, c.40cm high • Satellite D: roughly circular, 2m diameter, c.20cm high • Satellite E: roughly circular, 3m wide, 20cm high with stone near surface • Disturbed lichenated cairn/stone pile, 1m high, 5m diameter • Stone pile, extensively disturbed, possibly modern	UNK	293160 293152 293165 293178 293204 293174 293100 293169	588107 588132 588152 588176 588157 588150 588062 588209	Unknown	No change	None	No change	None
40	Site visit		Muirstraploch Wood	Natural knoll	A natural mound or knoll approximately 1.6m high was observed close to the summit of hill against the northwest field boundary. Likely to be a natural, grassed-over	N/A	292708	588596	Negligible	Major	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					bedrock outcrop								
41	SM	SM No. 644; HER No. MDG6269; NMR No. NX98NW8	The Belt,fort,High Townhead	Fort	A stone-walled promontory fort with several hut foundations recorded within the interior. Now covered in dense vegetation. Comments: discussion within body of Environmental Statement archaeology chapter	IA	293232	585825	High	No change	None	Negligible	Slight
42	SM	SM No. 662; HER No. MDG5560; NMR No. NX88SE1/0	Springfieldhill, fort	Fort, palisaded enclosure	Oval fort consisting of inner and outer ramparts, partly plough-damaged. Comments: discussion within body of Environmental Statement archaeology chapter	BA/IA	289444	584308	High	No change	None	Negligible	Slight
43	SM; LB Category B	SM No. 689; LB No. 10282; ; HER No. MDG17876; MDG6354; NMR No. NX98SW14	Dalswinton Old House	Fortified house	Early 17th century. Surviving fragments of abandoned house, including circular stair turret above northwest angle of vaulted subterranean basement. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294471	584061	High	No change	None	No change	None
44	SM	SM No. 690; HER No. MDG5703; NMR No. NX89SE10	Nithside, motte & bailey 450m ESE of	Motte and Bailey	Recorded in the NMR as a motte and bailey occupying about half the summit of a natural elongated hillock which runs NW-SE and rises to 45' at the higher NW end. The motte is a simple truncated earthen cone, 14' high set at the NW end of the hillock. The summit c 20' across is circular and dished, with the peripheral mound which is slightly broken on the NW. A slight terrace round the NW end of the natural hillock 20' from the base may be artificial. The bailey is oblong 66' by 57' broad enclosed by an earthen rampart slight at the sides but massive towards the SE front, through the centre of which has been the entrance. There is no trench between the motte and the bailey. Comments: outwith ZTV	MED	289175	590125	High	No change	None	No change	None
45	SM	SM No. 697; HER No. MDG5526; NMR No. NX88NE7	Lag Tower	Tower	Recorded in the NMR as the remains of an apparently 16th century tower 29 ft x 6 in by 25 ft, the ground floor walls, 5 ft 10 in, thick. There are three storeys above the basement, and a wheel- staircase rises to the right of the entrance, which is in the S wall. A wall runs for 38 ft from the NW angle and returns southwards 27 ft to an arched gateway 6 ft wider (now no longer visible). Against the walls in the courtyard	MED	288022	586180	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					are traces of out-buildings. Comments: outwith ZTV								
46	SM	SM No. 700; HER No. MDG5523; NMR No. NX88NE5	Moatland, motte	Motte	Recorded in the NMR as a natural hillock which has been converted into a motte by excavating a ditch around it, except on the E where the ground is low and wet. It belonged to a branch of the Cunninghams, relatives of the Earls of Glencairn. Reexamination by the OS (1975) indicated that only the ditch is artificial, with a modern causeway across. Comments: Prominent site within its immediate surroundings, but the windfarm, located 6.9km to the northeast, will not detract from its prominence, with only glimpsed views of blades above Kirkbride Hill.	MED	286410	585675	High	No change	None	No change	None
47	SM	SM No. 2262; HER No. MDG6467; NMR No. NX99SW14	Gawin Moor,cairns and field system,Auchencairn	Cairn	Recorded on NMRS as a cairnfield, consisting of approximately 14 cairns, several of which have been excavated, spread over 3.0 hectares in a gentle hollow on Gawin Moor. Comments: discussion within body of Environmental Statement archaeology chapter.	BA	294412	591568	High	No change	None	Negligible	Slight
48	SM	SM No. 2560; HER No. MDG6350; NMR No. NX98SW10	Bankhead,Roman Fort,Dalswinton	Fort;fort	Recorded in the NMRS as two almost exactly superimposed Flavian forts, each with an annexe attached to its N rampart, revealed by air photography, and subsequently excavated. There are no surface indications of these sites, fields all having been cultivated. The finds from the excavations are on display in Dumfries Museum. Comments: No upstanding remains within a low-lying context. Setting consists of the extent of the scheduled area, and the area between it and adjacent, contemporary Roman sites, such as sites 50 – 54.	RO	293313	584910	High	No change	None	No change	None
49	SM	SM No. 3297; HER No. MDG6236; NMR No. NX98NW1	Whitespots Cottages,enclosure 120m NE of	Pit(s), rectilinear enclosure	The NMR records that at NX 9027 8871 is a hillock measuring some 40.0m NW-SE by 38.0m transversely, around the base of which is a vague depression. The air photographs indicate an almost square ditched enclosure, with a large oval ditched enclosure within. These ditches have been ploughed out and silted-up to make ground interpretation impossible. It was not possible to establish the nature of some of the other crop marks at time of visit. A possible, but uncertain, Romano-British enclosure: visible on RCAHMS air photographs.	RO	290302	588727	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					A short linear cropmark running parallel to a field boundary, and at least three pits, have been identified from recent aerial photographs (RCAHMSAP 1995) in the N corner of the same field as the previously described enclosure. Information from RCAHMS Comments: outwith ZTV								
50	SM	SM No. 4069; HER No. MDG6351; NMR No. NX98SW11	Butterhole Brae, Dalswinton / Butterhole Brae 1 (Bankfoot, three enclosures SM)	Enclosure	The NMR records an enclosure, 160 ft square with rounded angles, possibly a Roman Fortlet. There are no surface indications of this site. Comments: No upstanding remains within a low-lying context. Setting consists of the extent of the scheduled area, and the area between it and adjacent, contemporary Roman sites, such as sites 48 and 51 – 54.	RO	293640	584470	High	No change	None	No change	None
51	SM	SM No. 4069; HER No. MDG6351; NMR No. NX98SW49	Bankfoot,three enclosures	Enclosure	The NMR records a circular ditch, broken by a narrow gap, as in a small signal station. Comments: No upstanding remains within a low-lying context. Setting consists of the extent of the scheduled area, and the area between it and adjacent, contemporary Roman sites, such as sites 48, 50 and 52 – 54.	PREH/ RO	293677	584485	High	No change	None	No change	None
52	SM	SM No. 4069; HER No. MDG6389; NMR No. NX98SW48	Butterhole Brae, Dalswinton / Butterhole Brae 2 (Bankfoot, three enclosures SM)	Enclosure	The NMR records an enclosure less than 40 ft square. Comments: No upstanding remains within a low-lying context. Setting consists of the extent of the scheduled area, and the area between it and adjacent, contemporary Roman sites, such as sites 48, 50, 51 and 53 – 54.	PREH/ RO	293690	584550	High	No change	None	No change	None
53	SM	SM No. 4239; HER	Ellisland,Roman camps	Temporary camp(s)	The NMR records a Roman temporary camp about 200ft square on the W bank of the River Nith, with a tutulus and gateway on the SW side. Further aerial	RO	292863	584197	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		No. MDG6402; NMR No. NX98SW6		(Roman)	photography investigation revealed that there are two small camps having sectors of their NW and SW sides in common. The larger camp measures 375ft from NE to SW by 225ft; the smaller, 195ft by 185ft. Comments: No upstanding remains within a low-lying context. Setting consists of the extent of the scheduled area, and the area between it and adjacent, contemporary Roman sites, such as sites 48, 50 – 52 and 54.								
54	SM	SM No. 4343; HER No. MDG6352; NMR No. NX98SW12	Bankfoot,Roman camps & forts,Dalswinton	Temporary camp	The NMR records two Roman temporary camps lie on the flat river holms beside the Nith. The larger camp measures 1,700' NW-SE by c. 1,550'. Its SE side is overlapped by the N angle of a smaller camp, of which, c. 350' of the N, and 550' of the W sides are visible. There appears to be a N gate furnished with an external clavicula. (Information from J K St Joseph 1949) There are no surface indications of these camps (OS). Comments: No upstanding remains within a low-lying context. Setting consists of the extent of the scheduled area, and the area between it and adjacent, contemporary Roman sites, such as sites 48 and 50 – 53.	RO	293466	584046	High	No change	None	No change	None
55	SM	SM No. 4955; HER No. MDG5527; NMR No. NX88NE8	Moat, enclosure 300m NW of	Earthwork	The NMR records the site of a fort (RCAHMS 1920) or earthwork (R W Feachem 1956) on a low plateau. Otherwise, there are no indications of defences. The Farm 1/4 mile to the SE bears the significant name 'Moat'. A sub-circular earthwork occupying a natural level-topped knoll and measuring about 60.0m N-S by 50.0m. All that can be seen is a scarped edge with a grass-covered scatter of stones. The date and purpose of the earthwork cannot be established though it is not a moat. The situation, high above the Glenmidge Burn, suggests an Iron Age date but the remains are too slight to confirm this. Comments: discussion within body of Environmental Statement archaeology chapter.	IA/ MED	289525	585862	High	No change	None	No change	None
56	SM	SM No. 5662; HER No.	Dalswinton Mains,ring ditch and pit	Ring ditch	Scheduled (with NX98SW 47) as Dalswinton Mains, ring ditch and pit alignments. Comments: discussion within body of Environmental Statement archaeology	BA	294201	584337	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		MDG6387; NMR No. NX98SW46; NX98SW47	alignments		chapter.								
57	SM	SM No. 5677; HER No. MDG5505; NMR No. NX88NE23	Barndennoch,ring ditches 350m N of	Site; ring ditch	Scheduled as Barndennoch, ring ditches. Information from Historic Scotland, scheduled 26 April 1993. Comments: No upstanding remains. Setting consists of the scheduled area.	BA	289083	588834	High	No change	None	No change	None
58	SM	SM No. 5919; HER No. MDG6221; NMR No. NX98NE18	Shaw's Moor,cairnfield and ring-cairn S of Hospital Wood	Cairnfield, enclosed cremation cemetery	Recorded in the NMR as a group of about 50 small "cairns" and a probable enclosed cremation cemetery occupy three hectares of a low ridge at a height of 600 feet OD. The area is separated from another cairn group (NX98NE2) 300.0m to the north east, by marshy ground. The cairns are similar in their size and general distribution to others in the area (NX98NE 2 and NX98NE 5). Although no definite fields can be seen there are two roughly parallel lines of three cairns, with a 15.0m wide stretch of cleared ground between them, and a line of five cairns bordering an area of marsh. There is also a ruined field wall, 0.2m high and spread to 1.5m, running around the edge of some firm rising ground. It does not overlie any of the cairns and has no apparent association with them. There are scatters of stones, possibly field clearance, occupying several of the hollows on the edge of the ridge. Comments: discussion within body of Environmental Statement archaeology chapter:	BA	295521	586922	High	No change	None	No change	None
59	SM	SM No. 5920; HER No. MDG6225; NMR No. NX98NE2	Shaw's Moor,cairnfield and ring-cairns SE of Hospital Wood	Cairnfield, enclosed cremation cemetery, enclosure, field boundary (possible)	At this site, the RCAHMS note 'a considerable group of small cairns with a few associated hut circles of small size which have sunk floors. Two of the cairns have quite recently been dug into, but no record of any observations appears to have been made'. Comments: discussion within body of Environmental Statement archaeology chapter	BA	295641	587137	High	No change	None	No change	None
60	SM	SM No. 6111; HER	Kilroy,enclosures E and NE of	Enclosure	Large sub-rectangular enclosure. Note that there is a very narrow ditch subdividing this enclosure into almost rectangular areas, with access from the main entrance	MED/PM	291939	583539	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		No. MDG4762; NMR No. NX98SW38			only at the inner end of the large enclosure. See also NMRS NX98SW37 which is DGSMR 7943 Comments: Few upstanding remains, with setting consisting of extent of scheduled area. Situated in enclosed fields forming altered cultural landscape, with the setting of the monument defined by the River Nith to the northeast								
61	SM	SM No. 10540; HER No. MDG21016; NMR No. NX99SW66	Auchencairn, cairn 500m NNE of	Cairn	Scheduled as Auchencairn, cairn... visible as a large stone mound.' Information from Historic Scotland, scheduling document dated 30 January 2003. The monument comprises the remains of a large cairn, a burial and ritual monument dating from the Neolithic or Early Bronze Age (around 2500 - 1500 BC), visible as a large stone mound. The cairn lies at around 195m OD on a plateau on the W slope of Watchman Hill. It has been used as a clearance cairn, presumably greatly increasing its size; and the edges have been straightened by the plough. The cairn is roughly circular on plan, measuring about 28m in diameter and standing up to 3m in height. The summit of the cairn has been disturbed, with what appears to be a cart trck climbing to the central hollow from the SE. No structural features such as cists, chambers or kerb can be seen, implying that preservation of the original cairn beneath the later clearance material may be reasonably good, despite the later disturbance. Information from Historic Scotland, scheduling document dated 30 January 2003. Comments: Prominent upstanding monument on slope of hill. Distant views of turbines to the south, but such views will be will not impact on the monument's prominence in the landscape, views to contemporary monuments, and the monument's setting is within an altered cultural landscape (coniferous forestry plantation immediately to south) which define its setting.	NE/BA	292408	591167	High	No change	None	No change	None
62	LB Category B	LB No. 167; HER No. MDG18151	Park Village, Limekilns	Dam(s), lime kilns(s), lime works, wagonway, water wheel(s)	Built circa 1774. Row of 3 limekilns, facing north, and set against steep bank. Squared rubble. 3 segmental-arched openings at base, with brick fireplaces; brick-lined kilns with circular openings above. Comments: Industrial structures located on lower-lying ground close to village of Park. Setting consists of the LB's immediate surroundings and relationship to the village.	PM	290729	591174	High	No change	None	No change	None
63	LB Category	LB No. 169; HER No.	Shawsholm House	House	3 principal building phases; nucleus a late 17th/early 18th century, 2-storey house (now rear wing) doubled in size mid 18th century by piended full-height west-facing	PM	288566	591390	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	B	MDG18335			addition to original gable, thus forming T-plan; piended full-size bay in north re-entrant angle added before mid 19th century. Pebble-dashed; some ashlar margins to north and to south. Comments: Residential LB, with setting consisting of the house's curtilage and immediate surroundings. Shelter-belt of mixed woodland likely to obscure views of the turbines								
64	LB Category C(S)	LB No. 3945; HER No. MDG20264	Gubhill Farmhouse	Farmhouse	Earlier 19th century. 2-storey, 3-bay farmhouse with lower rear wing. Painted rubble, with red ashlar margins and gabled porch. South elevation: ground floor bipartites flank porch; 3 1st floor windows with gabled dormer heads; windows all lying-pane sashes; all gables have saw-toothed skews. Corniced and off-set end stacks; roofed with graded slates. Single storey rear wing with attics; 2 gabled wallhead dormers with lying-pane sashes face west. Comments: outwith ZTV	PM	297235	592172	High	No change	None	No change	None
65	LB Category B	LB No. 3951; HER No. MDG20270, MDG6499; NMR No. NX99SW44	Shotts smithy	Blacksmith's workshop	Smithy. 18th century, altered and heightened 2/3 courses in 19th century. Stone-slab-roofed single storey 5-bay smithy with interior complete, windows in alternate bays with multi-paned glazing, door (with original dressings; enlarged windows with stugged ashlar dressingsand wide vehicle doorway. Whitewashed rubble and ashlar dressings. Main roof swept over wide rear outshot, latter with stack base; axial ventilators; single end stack; modern addition to north gable. Comments: outwith ZTV	PM	290973	591269	High	No change	None	No change	None
66	LB Category B	LB No. 3952; HER No. MDG20271	Townpark	House	Complex building, nucleus an earlier/mid 18th century 2- storey 5-bay house; alterations and additions. Painted rubble and contrasting ashlar margins (original house with broad angle margins window margins chamfered). Converted in 19th century to laundry for Closeburn hall; subsequently used as cottages(2 timber porches to west); now part of farmhouse part farm steading, steep bank at East, 2 doors at 1st floor one with modern porch spanning area, other with forestair. Small-paned windows, mostly sashes. Modern wing at north. End and axial stacks; slate roof. Comments: LB close to Closeburn Mains, facing road. Setting consists of the house's curtilage and buildings in proximity, such as Closeburn Mains (RSK Sites 76	PM	290763	592859	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					and 77). Limited, glimpsed views of turbine tips possible over Castle Wood and hills to south, but no impact on the setting of the LB								
67	LB Category A	LB No. 3953; HER No. MDG20272	Closeburn, Wallacehall Academy & Schoolhouse	School, Schoolhouse	Architect: James Barbour, extensions. 1795 (dated) 3-storey, 3-bay schoolhouse with L-plan rear (east) wing; latter consists of 1724-9 school and former schoolhouse by William Luckup and John Crocket, altered by Walter Newall, 1842, extensions circa 1777 and 1882 (dated). Comments: discussion within body of Environmental Statement archaeology chapter	PM	290251	592409	High	No change	None	No change	None
68	LB Category B	LB No. 3954; HER No. MDG20273	Whistlebare Cottages	Cottages	18th century (northern part not original), remodelled in 19th century and again 1985-6. Long single storey cottage row, originally 5 2-bay cottages (some subsequently altered to 3-bay), now all one house with stone-slab roof part re-instated (remainder of roof slated). Whitewashed rubble openings, some door lintels with house number in recessed elliptical panel; axial stacks. Modern alterations mainly to rear and to interior. Comments: Residential properties are situated within an inwardly focussed urban setting of the village of Park, which form the setting. Long-distance views obscured by vegetation.	PM	290794	591388	High	No change	None	No change	None
69	LB Category C(S)	LB No. 3964; HER No. MDG20274	Auchencairn Farmhouse & Steading	Farmhouse, Farmstead	Late 18th century farmhouse extended probably mid-19th century; steading to rear mostly circa 1830. Comments: Residential low-lying LB. Setting consists of the LB's curtilage and immediate surroundings, with views of turbines likely to be obscured by coniferous shelterbelts to south.	PM	292257	590638	High	No change	None	No change	None
70	LB Category B	LB No. 4000; HER No. MDG20279	Brownhill House & Steading	Farmhouse	Later 18th century, with alterations and additions. Former roadside inn, frequented by Robert Burns, now a private house; stables/steading on opposite (west) roadside. All rubble-built with ashlar dressings; inn now mostly pebble- dashed and with rendered margins. Slate roofs. Comments: Residential LB within steading. Extent of the setting of the LB is the steading on either side of the A76. Masking of turbines from topography and vegetation, with no impact on the setting of the LB.	PM	290238	591080	High	No change	None	No change	None
71	LB	LB No.	Closeburn	Tower	Closeburn Castle built c. 1390 is oblong on plan with 10' thick walls rising 50' to a	MED/P	290759	592136	High	No change	None	No	None

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	Category B	4004; HER No. MDG20283; MDG6483; NMR No. NX99SW3	Castle	House	parapet with modern crenellations. The square caphouse has also been modernised and most of the windows have been enlarged. This fortalice was a stronghold of the Kirkpatrick family; it is in good repair, with modern extensions, and still occupied. Its site was originally a peninsula at the SE end of what was Closeburn Loch, defended on the landward side by a wide moat cut across the peninsula. Comments: discussion within body of Environmental Statement archaeology chapter.	M						change	
72	LB Category C(S)	LB No. 4005; HER No. MDG20284	Closeburn Castle Gatepiers (to East of Castle)	Gate Pier	Early 19th century. 4 corniced octagonal gatepiers at driveway junction. Red ashlar; 2 large inner piers to carriage way, smaller outer piers with pedestrian gates. Wrought-iron gates. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	290847	592169	High	No change	None	No change	None
73	LB Category B	LB No. 4006; HER No. MDG20285	Closeburn Castle South Lodge and Gatepiers	Lodge	Lodge. Early 19th century. Single storey classical gate lodge. L-plan. Polished red ashlar. West elevation: 3 bays; central pedimented porch on 2 Roman Doric columns; 12-pane sashes in outer bays. Eaves course. Single ridge stack; piended roof with graded slates. Single window and bipartite (latter linked to eaves band) with 12-pane sashes to south elevation. Polished red ashlar corniced gatepiers with caps; octagonal inner piers linked by low coping to square outer piers; plain wrought-iron gates and railings. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	290936	591630	High	No change	None	No change	None
74	LB Category B	LB No. 4007; HER No. MDG20286	Closeburn Church	Burial ground, Church, Gate Piers(s)	Closeburn Parish Church. James Barbour of Dumfries, architect. Built 1878. Cruciform- plan Gothic church with tall 3-stage square tower at north west. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	290365	592277	High	No change	None	No change	None
75	LB Category B	LB No. 4008; HER No. MDG20287,	Closeburn Old Church, Kirkpatrick of Closeburn	Burial ground, Church, Cross,	The remains of the former parish church, rebuilt in 1741 incorporating the remains of its predecessor (R M F Watson 1901), and in use until 1878 when its successor (at NX 9037 9227) was built. Norman fragments survive and a 10th.c Anglian cross-shaft (now in Dumfries	MED	290370	592319	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		MDG10829	Mausoleum and Churchyard enclosure	Mausoleum	Museum) and a grave-slab of similar date, preserved in the porch of the modern church in 1920, but now also in Dumfries Museum, are probably from this site, although located only to Closeburn. The remains consist of an E gable wall 30' long and 3' thick with an arched and moulded doorway, a circular window and a belfry with a 1606 bell. Parts of the N and S walls, 2'6" thick, also remain. There was a N transept. "Closeburn" was in 1200 "Kylosbern", said to be a commemoration of an English saint, but Osbran was an Irish bishop and anchorite who died in 752. Comments: discussion within body of Environmental Statement archaeology chapter.								
76	LB Category C(S)	LB No. 4009; HER No. MDG20288	Closeburn Mains (formerly Closeburn Hall stables)	Stables	Probably built circa 1780 (ie contemporary with Closeburn Hall). Stables now used as farm steading and cottages 4 blocks (mostly harled, painted margins) built around quadrangular courtyard, asymmetrical T-plan range linked to rear (east) with second courtyard (latter open at north but now largely filled by haybarn). 2-storeys/lofts. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	290789	592710	High	No change	None	No change	None
77	LB Category C(S)	LB No. 4010; HER No. MDG20289	Closeburn Mains Walled garden	Glasshouse	Mid/late 18th century. Large, quadrangular Walled garden. Tall, rubble-built walls with red ashlar coping, swept up at north. Segmental and square-headed gates north and south. Glass house range against north wall, boiler house and shed behind. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	290810	592624	High	No change	None	No change	None
78	LB Category B	LB No. 4011; HER No. MDG20290	Closeburn School	School	Closeburn Primary School [NAT] James Barbour of Dumfries, architect. School, symmetrically designed, with heavy Jacobean detailing. Snecked red bullfaced ashlar, polished dressings. Mostly 2 storeys. South elevation: 2-stage central bell tower; 2 bays either side (inner bays 3-storey, with parapet; gabled outer bays recessed); tower lower stage battered with 2 depressed-arched doors; obelisk pinnacles over angles, bellcote with pierced openings and pyramidal roof. Windows mostly mullioned; 3rd floor windows have cusped heads. 4-bay north elevation has outer gables and roof glazed over inner windows. Depressed- arched east and west-facing upper windows below wall-head	PM	290151	592386	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					gables. Small paned glazing throughout. Corniced stacks; axial vents; slate roofs. Enclosed by ashlar-coped (mostly rubble-built) walls, simple wrought-iron gates and railings at south, to roadside, and between playgrounds. Comments: discussion within body of Environmental Statement archaeology chapter.								
79	LB Category B	LB No. 4012; HER No. MDG20291	64 Closeburn Village	House	Late 18th century. 2-storey 3-bay house. Painted rubble and margins. Central panelled door with rectangular fanlight; 12- pane sashes; eaves/lintel band (painted); 2 symmetrically placed stacks; re-roofed in slate. Rear additions, roof swept over that to north west; low, gabled wing at south west. Railed area at front. Milestone at south east angle. Comments: Residential properties situated within an inwardly focussed urban setting. Extent of setting consists of Closeburn Village itself. Views are dominated by A76.	PM	289686	592288	High	No change	None	No change	None
80	LB Category C(S)	LB No. 4163; HER No. MDG20329	Throughgate MacPhail Drovers Toll Tower House R J Cessford (house and vetinary surgery)	Tower House	Circa 1800. East-facing row in roughly symmetrical arrangement, comprising single-storey, 3-bay cottage flanked by narrow 2-storey houses, latter with boldly advanced and bowed single bay fronts; altered; earlier 19th century 2-storey, 3-bay house (R J Cessford) adjoins at north. All rubble-built and whitewashed with painted ashlar margins. Main roof of cottage swept over modern shallow porch; porch to flanking houses in either re-entrant angle (diagonally set at south, altered and with forestair at north): bows have 19th century tripartites inserted (upper windows break through eaves, with fish-scale-slated piended dormer heads); raised basement to north bow with additional door. 3-bay house has central door, Veterinary surgery in lean-to at north gable. Sash windows; corniced stacks slate roofs. Comments: Extensively remodelled former toll house located at road junction. Distant views of turbine tips to the northeast possible. Setting consists of the road junction, with sightlines towards the LB along the roads leading southwestwards, east-south-eastwards and west-north-westwards. Views along sightlines not obstructed or affected by turbines.	PM	287423	584208	High	No change	None	No change	None
81	LB Category B	LB No. 4164; HER No.	Upper Kilroy (or High Kilroy) Farmhouse	Farmhouse	Earlier 19th century. Single storey and attic 3-bay farmhouse. East elevation: painted ashlar and margins (remainder painted rubble); recessed central panelled door with decorative fanlight; 12-pane sashes in outer bays. Base course;	PM	291845	583157	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		MDG20330	and steading		eaves/lintel band; plain eaves cornice, 2 piended, 12-pane dormers; straight skews; corniced end stacks; roof with graded slates. Recessed low, 2-bay wing to left. Additional door on west wall. Steading comprises 2 principal blocks; 3-bay, centre-doored former farmhouse to south, with opening cut on east gable; taller barn to west (parallel to present house) has slit vents at lower level, triangular vents above; lower south wing with roof vent. All painted rubble, corrugated or slated roofs. Comments: Farmhouse LB within steading. Extent of the setting of the LB is the steading itself. Distant views of the turbines over the river Nith do not detract from the setting of the LB.								
82	LB Category B	LB No. 4165; HER No. MDG20331	Upper MacCubbington Farmhouse	Farmhouse	Earlier 19th century. Single storey attic farmhouse set on slope, with basement to north and to west. East elevation 3 bays, recessed door, with decorative fanlight, approached by steps; 12-pane sashes. Whin rubble, partly cherry-caulked with contrasting red ashlar dressings and margins. Base course; Eaves/lintel band; cornice; blocking course; 3 pienided dormers (?centre modern); corniced end stacks; roof with graded slates. Recessed, single bay left wing (and remainder of house) painted rubble. Harled modern porch on west wall. Comments: Farmhouse LB within steading. Extent of the setting of the LB is the steading itself. Distant views of the turbines over the river Nith do not detract from the setting of the LB. .	PM	290456	583643	High	No change	None	No change	None
83	LB Category C(S)	LB No. 4228; HER No. MDG20455	Dempsterton Farmhouse	Farmhouse	Early 19th century. 2-storey, 3-bay farmhouse. Harled, with contrasting painted margins. South elevation: pedimented narrow central doorpiece, recessed door with fanlight; sash windows with 4-pane glazing. Straight skews; coped end stacks; roofed with graded slates. Low rear wing. Comments: Outwith ZTV	PM	287334	584920	High	No change	None	No change	None
84	LB Category B	LB No. 4229; HER No.	Dunscore Old Churchyard (Near	Burial ground, Burial Vault,	The first mention of the church occurs in 1412: in 1645 it was so ruinous that it was decided to build a new church, more central to the parish. The churchyard, however, continued to be used.	MED/PM	292654	583228	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		MDG20456; MDG6414; NMR No. NX98SW8	Farthingwell)	Church	Sir Robert Grierson of Lag (1650-1736) is buried in the family burial place in the old churchyard. The earliest date in the enclosure is 1656. The church of Dunscore is mentioned in a monastic dispute in 1257. No certain remains of the church can be identified. The Laird of Lag's Tomb is situated in the eastern part of a burial vault at NX 9267 8323. The inscription on the gravestone states that it was moved here from Lag Tower and gives the date of Sir Robert Grierson's death as 1733. The western part of the burial vault could not be entered at the time of field investigation (OS). Comments: Low-lying churchyard within enclosure close to the A76. Setting is defined by the enclosure of the churchyard.								
85	LB Category C(S)	LB No. 4231; HER No. MDG20458	Dunscore Village Fairview	House	Early 19th century. 2-storey 3-bay house, with central gabled porch on east elevation. Painted rubble and margins. Later porch has barge boards, round-headed window facing west, door in re-entrant angle; 4-pane sashes; straight skews; end stacks; roof has graded slates, and is swept over addition to rear. Comments: outwith ZTV	PM	286757	584361	High	No change	None	No change	None
86	LB Category A; Promoted site	LB No. 4232; HER No. MDG20459	Ellisland Farm	Farmhouse, Farmstead, Museum	Built 1788 for Robert Burns, now run as a visitor attraction. Single storey farmhouse with steading. All painted rubble and dressings; house has painted margins. West elevation of house: 3 bays (central door now a window) with additional (blank) bay at right possibly an early 19th century addition; 4-pane sashes; corniced end stacks: door in re-entrant angle of rear (east) wing. Slate roofs, graded slates over rear wing. 2 parallel steading ranges to west; north range has lofts at west end, 2 lintelled cart openings to courtyard, and loft door flanked by small square openings above; plain south range and nearby range set at right angles both with roof vents. Pyramidal-roofed single storey square shed to north east set on slope above river bank, with door facing west, 2 windows and 2 basement doors facing south. Walled orchard to south of house. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	292987	583850	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
87	LB Category B	LB No. 4233; HER No. MDG20460	Friars carse Burns Hermitage	Hermitage	Burns' Hermitage. 1874 (dated) restoration and re-facing of circa 1790 hermitage. Single storey small rectangular-plan gabled structure. Red sandstone rubble with polished dressings and roll-moulded openings. Door and bipartite to south wall, single window on east gable (all narrow, shouldered lights with splayed cills). Gableted crow steps; skewputts on south wall bear masonic motifs (1 uncarved); single small apex stack; slate roof. Interior: segmental-arched fireplace on west gable, corbel set in wall above bearing heraldic device. Enclosed by plain cast-iron railings. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	292592	584522	High	No change	None	No change	None
88	LB Category B	LB No. 4234; HER No. MDG20465	Friars carse former stables including Beech Cottage	Farmstead, Stables(s)	Mostly early 19th century, but principal (south east) range re-modelled, with tall 2-stage tower built above, probably circa 1873 (ie when house was enlarged). Comments: discussion within body of Environmental Statement archaeology chapter.	PM	292464	584870	High	No change	None	No change	None
89	LB Category C(S)	LB No. 4236; HER No. MDG20487	Lagganhill House and steading wing	Farmhouse, Farmstead	Earlier 19th century. Wide, 2-storey farmhouse with rear wing. Rubble-built and painted, with contrasting ashlar margins. South elevation: unusual window arrangement; inner bay, with central gabled porch & single 1st floor window, flanked by one window at ground (window to right now bipartite) and 2 windows at 1st floor; sash windows with 4-pane glazing. Symmetrically-placed corniced stacks; piended roof, covered with graded slates. Rear wing with stepped roof levels, carved stone incorporated above ground floor bipartite. Comments: outwith ZTV	PM	289138	583738	High	No change	None	No change	None
90	LB Category B	LB No. 4237; HER No. MDG20498	McCheynston Farmhouse	Farmhouse	Probably earlier/mid 19th century. Symmetrical, 2-storey, 3-bay farmhouse with lower 2-storey rear wing forming L-plan. Stugged red coursers and polished dressings. East elevation: central round-arched entrance with deeply recessed panelled door with round-arched fanlight. 12-pane sashes. Cornice; blocking course; straight skews; corniced end stacks; graded slate roof. Rear porch in re-entrant angle. Comments: Farmhouse LB within steading. Extent of the setting of the LB is the steading itself. Distant views of the turbines over the river Nith do not detract from	PM	290601	584270	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					the setting of the LB.								
91	LB Category B	LB No. 6579; HER No. MDG20673	Hearse House	House	Small single-storey red sandstone ashlar and whinstone rubble building on sloping site in angle between two roads. Tall double-leaf boarded door in W gable, which is sandstone. E gable has short coped chimney stack, sandstone skew and rybats. N wall blind, S wall has small window towards E end. E gable has lost skew on N side. Seat at head, probably for ball finial. At W low rubble retainijng wall, now decaying. Comments: outwith ZTV	PM	286821	584319	High	No change	None	No change	None
92	LB Category B	LB No. 10196; HER No. MDG17790	Cowhill House Tower House Addition	Country House	Peddie & Forbes Smith, architects. Dated 1914. 4-storey and attic rectangular-plan full-size "tower house" added to east end of Cowhill house. Tower house: roughly-coursed polygonal red masonry with ashlar dressings and roll-moulded openings, these mostly beneath relieving arches. Door at south of east wall with crest above. Irregularly-placed window openings to elevations, all small-paned sashes. Corbelled and crenellated parapet with spouts and bartizans (1 conical-roofed) encloses east gable; crow-stepped gables; coped end and north wall-head stacks. 2 lower square bays each with south-facing crow-stepped gables 1 on west wall, 1 projecting from south wall. Interior: wooden panelling at ground with Corinthian pilasters; some decorative ceiling plasterwork and chimney pieces. Wheel stair opens into earlier house. Comments: discussion within body of Environmental Statement archaeology chapter.	PM; MOD	295036	582689	High	No change	None	Negligible	Slight
93	LB Category B	LB No. 10198; HER No. MDG17792	Cowhill Former Stables	Stables	Dated 1816. Stables, now mostly converted for domestic/garage use. 3 2-storey ranges built around quadrangular court, latter closed to east, above River Nith, by high wall. Rubble-built with ashlar or modern concrete, margins, rusticated quoins at west, all painted. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	295153	582597	High	No change	None	No change	None
94	LB Category B	LB No. 10220; HER No. MDG17814	Barjarg House	Country House, Tower House	Barjarg Tower: This L-planned tower, dating from the late 16th century, and said to have been given by the Earl of Morton to Thomas Grierson in 1587, forms the E-wing of a mansion built in 1806. Built of red rubble and rising to four storeys and an attic, it has both corbelled angle-turrets and a parapet; the latter may be a	PM	287806	590044	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					modernisation as there has been considerable alteration to the building. The W wing of the modern house is a very fair imitation of the style of the earlier fortalice; it bears a panel dated 1680, which presumably has come from the latter. Comments: See RSK Site 126.								
95	LB Category B	LB No. 10221; HER No. MDG17815	Barjarg House, Drybridge	Country House, Tower House	Built circa 1810. Drybridge, carrying Barjarg house main drive over public road. Built of coursed, stugged and squared rubble, with segmental-archway, coped parapets with pyramidal-capped square terminal piers. Comments: See RSK Site 126.	PM	288003	590021	High	No change	None	No change	None
96	LB Category B	LB No. 10222; HER No. MDG17816	Barjarg House Front Lodge and gateway	Front Lodge and gateway	Front lodge and gateway to Bajarg Tower Comments: See RSK Site 126.	PM	288308	589859	High	No change	None	No change	None
97	LB Category B	LB No. 10223; HER No. MDG17817	Barjarg House back lodge	Back Lodge	Back Lodge to Bajarg Tower Comments: See RSK Site 126.	PM	287837	589902	High	No change	None	No change	None
98	LB Category B	LB No. 10224; HER No. MDG17818	Barjarg House sundial	Country house, Tower house	Sundial to Bajarg Tower Comments: See RSK Site 126.	PM	287762	590026	High	No change	None	No change	None
99	LB Category B	LB No. 10225; HER No. MDG17819	Barjarg House walled garden	Walled garden	Probably built circa 1800. Large quadrangular walled garden. Rubble-built high walls with ashlar dressings and coping, latter swept up at some corners. Wide, pointed-arched gateway central on east wall has 2 gates and arch screen all made of decorative wrought-iron with spikes; upper part of gates have chevron-patterned rails. Small central side gate at north and at south. Comments: See RSK Site 126.	PM	287694	589879	High	No change	None	No change	None
100	LB Category B	LB No. 10226; ; HER No. MDG17820, MDG5750; NMR No.	Barjarg Limekilns	Clamp, kiln, lime kilns	Built circa 1790. Bank of 3 (2+1) limekilns that to north added probably early 19th century. Rubble-built with ashlar dressings. 3 east-facing segmental-arched openings, each with double kiln, smaller north most opening with stugged red ashlar dressings. Rubble-lined flues. Comments: See RSK Site 126.	PM	288448	590256	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NX89SE55											
101	LB Category B	LB No. 10228; HER No. MDG17822; MDG9764	Dalswinton Mill	Watermill	Mid/late 18th century, additions to south and to west early/ mid 19th century. Cornmill built on sloping south bank of Pennyland Burn. 1/2 storeys with basements and lofts. Rubble-built with ashlar dressings, all whitewashed. Essentially 2 adjoining rectangular-plan blocks in joggled plan, (principal) north block with 2 lower wings at west (the larger gabled, pienided low addition in re-entrant angle; main door inserted alongside, above slope); iron breast wheel (dated 1893) on pienided north wall; single window above. South block (raised in height perhaps mid 19th century) has central 2-leaf boarded door on south gable only external opening (broken mill stones as steps to latter). Roofed with graded slates. Some internal machinery and gearing survives. Comments: Watermill adjacent to Pennyland Burn. Setting consists of the mill's immediate surroundings and the burn itself. Distant views of turbines do not detract from its setting	PM	294810	585180	High	No change	None	No change	None
102	LB Category B	LB No. 10229; HER No. MDG17823	Dalswinton Village 1-13 Main Street (houses on South side of road) (odd numbers)	Houses	Circa 1790. Long, single storey terraced row; originally 9 centre-doored 3-bay cottages, but some modern alterations, and now converted to 6 cottages (some doors now windows): all painted rubble and margins: boarded and glazed doors mostly 4-pane sashes. Corniced axial stacks: slate roofs, with straight skews at either gable. Comments: outwith ZTV	PM	293694	585355	High	No change	None	No change	None
103	LB Category B	LB No. 10230; HER No. MDG17824	Dalswinton Village 2-12 Main Street (houses on East side od road)) (even numbers)	Houses	Circa 1790. Teraced row of 6 2-storey 3-bay houses (raised a storey in 19th century). Painted rubble and margins. Each house has central boarded and glazed door, 4-pane ground floor windows, 2 smaller modern plate-glass windows above: corniced axial stacks; slated roofs, with straight skews at centre and at ends of terrace. Small shop against south gable. Comments: outwith ZTV	PM	293682	585380	High	No change	None	No change	None
104	LB Category B	LB No. 10231; HER No. MDG17825	Dalswinton Village Former smithy	Smithy	Probably circa 1790. Single storey, 2-bay side elevation to main road, 6-bay south elevation with off-centre gabled porch; painted rubble and margins, mostly plate glass sashes; 2 symmetrically placed apex stacks; slate roof, pienided to main road, gabled at west.	PM	293733	585333	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: outwith ZTV								
105	LB Category C(S)	LB No. 10232; HER No. MDG17826	Dalswinton Village Former School	School	Mid 19th century. Single storey former school, now a house, with window lintels lowered. Rubble-built with ashlar dressings; whitewashed with contrasting painted margins. West elevation: off-centre boarded door with rectangular fanlight, 4 windows to right in regular bays, single window to left. Bipartite in north gable; roof pienided at south, above lean-to. Single axial stack. Slate roof. Comments: outwith ZTV	PM	293643	585421	High	No change	None	No change	None
106	LB Category B	LB No. 10236; HER No. MDG17830; MDG6355	Isle Tower	Country house; Tower house	Visited by OS (RDL) 25 June 1964. Several building phases, comprising circa 1589 rectangular- plan tower house linked at south east angle to early 19th century house in Z-plan arrangement: rear courtyard formed by outbuildings which extend west from tower house west wall and from south gable of house (former range includes 1700 datestone). All rubble-built with ashlar dressings (house painted). Tower house: 3 storeys with attic, turrets with curved roof corbelled over 2 diametrically opposite angles, door to courtyard with armorial panel above, and yett; gabled wall-head dormer either face; crow-stepped gables: coped end stack. Interior vaulted at ground level, wheel stair within south east angle. House: originally 2 storeys, 3 bays, 2nd floor with pedimented dormer heads added 1882 (dated), Peddie and Kinnear of Edinburgh, architects: east- facing central door and small-paned sash windows (1 bipartite): crow-stepped gables: end stacks. All roofs slated. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	293598	583217	High	No change	None	Negligible	Slight
107	LB Category B	LB No. 10242; HER No. MDG17836	Barndennoch	Farmhouse	Earlier 19th century with mid 19th century alterations. 2- storey 3-bay farmhouse with flanking single bay wings, forming H-plan. Whitewashed rubble, contrasting painted margins. South elevation: square central porch between ground floor bipartites; end stacks; each wing has round-headed window opening in similar shallow panel; left wing 2 storeys, with 2-bay west elevation; sash windows, mostly with horizontal glazing pattern (west-facing ground floor windows enlarged). Roofed with graded slates. Courtyard elevation has swept-roofed outshot linked to wings by low bays. Comments: Farmhouse LB within steading. Extent of the setting of the LB is the	PM	289195	588407	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					steading itself. Distant views of the turbines over the river Nith do not detract from the setting of the LB.								
108	LB Category C(S)	LB No. 10269; HER No. MDG17863; MDG6234	Newlands House	Country house; Castle	Information from RCAHMS (RJCM) October 1996. Completed 1911. Large Scottish Baronial mansion incorporating mid(?) 19th century 2-storey 3-bay house. 2/3 storeys with basements and attics, square tower rises 2 stages above main roofline. Asymmetrical, with strings, corbelled and crenellated parapets, bartizans with spouts (square tower also with cap house), crow-stepped gables, single, bipartite or canted windows, coped or castellated stacks. Snecked red ashlar with polished dressings. South elevation: castellated massive porch with columned doorpiece added centrally to original house, flanking ground floor windows canted; smaller full-height wing recessed at right; tall "L-plan towerhouse" to left is advanced with 2-storey canted window and large corbelled bartizan, modern fire escape at north gable. North wing extends from rear of original house and has canted entrance bay to west with steep-pitched facetted roof. Slate roofs throughout. Comments: Extensively remodelled country house incorporating earlier house. House has mixed woodland grounds surrounding it on all sides which are likely to provide significant masking, and form the setting of the LB.	PM	296217	585135	High	No change	None	No change	None
109	LB Category B	LB No. 10270; HER No. MDG17864	Newlands Lodge at Sunnybrae	Lodge	2 single storey gabled ranges in T-plan, and set on slope; east range dated 1817, other range may be contemporary. Painted rubble, with red ashlar margins. East range: door and window to east wall, Venetian window to south gable, north gable window has dated lintel; wall-head stack at south west. West range has 3-bay south elevation, tripartite (probably mid 19th century; narrow outer lights) flanked by single windows: basement at west, entered in west gable: apex stacks. Mostly sash windows with small panes; straight skews; slate roofs. Comments: Lodge sits within shelter belt providing extent of setting of the LB.	PM	297034	584380	High	No change	None	No change	None
110	LB Category B	LB No. 10273; HER No. MDG17867	Quarrelwood former Cameronian Manse and Chapel	Church	See also NX98SE 112 Manse All probably circa 1798. 2-storey 3-bay manse now linked to (restored) Cameronian chapel. All whitewashed, rubble with red ashlar margins. Manse: panelled door with ogee glazed fanlight in round-arched and moulded central doorway; plain Venetian ground floor windows in outer bays; sashes with 12-pane glazing at 1st floor; straight skews; end stacks; full-height rear wing.	PM	296041	584282	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Chapel: restored from ruinous condition by Anthony Curtis Wolfe, 1969 - now forms library; irregular octagon-plan with facetted roof; 3 tall round-headed windows to south (inner window originally a door; square-headed window to east; blocked door, 2 12-pane sashes and wall-head stack to north. All roofs slated. Comments: extensively remodelled restored manse and chapel offset from road. Setting consists of the manse and chapel themselves, with only distant oblique views of turbines likely.								
111	LB Category B	LB No. 10280; HER No. MDG17874	Clonfeacles Tower	Tower House	Dated 1810. Straight-sided round tower. Rubble-built with red ashlar dressings, on a boulder base. Doorway faces east, with plaque above; 4 upper floor windows and single slit (to light stair); band course below coped parapet. Roofless, and interior now completely gutted. Comments: Prominent tower located on hill to the southwest of the proposed development, with the nearest turbine 4.8km away. It is in a poor state of repair, and cannot be entered. Shared setting with Clonfeacles farmhouse 0.4km to the southwest. Possible views of Blackwood within a cultural landscape substantially altered by coniferous plantation and the Dalwsinton windfarm. There are possible distant views of Blackwood, but these will not detract from the prominence of the receptor in the landscape.	PM	295401	585927	High	No change	None	No change	None
112	LB Category B	LB No. 10281; HER No. MDG17875	Dalswinton House	Country house	Built circa 1785, additions and alterations circa 1920. Symmetrical, originally severely classical, 3-storey mansion house with sunk basement: polished red ashlar, channelled at basement. Original house: 5-bay south elevation with architraved windows corniced at ground, curved 5-light window replaced original central porch, north elevation with full-height central bow; west elevation: 5 narrower bays with platt spanning basement area. Additions to east comprise full-height narrow bay set back at north and south with windows in tall panels and projecting entrance bay set into east facade with channelled pilaster strips, large round- arched mullioned and transomed window over east-facing Doric-columned and open-pedimented doorpiece: panelled 2-leaf door in cavetto reveals. Mutule cornice to all elevations; partly-balustraded parapet; symmetrically placed stacks; shallow-pitched piended slate roof. Curved basement area to east enclosed by cast-iron balustrade; tunnel at north east below main drive.	PM	294330	584088	High	No change	None	Negligible	Slight

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: discussion within body of Environmental Statement archaeology chapter.								
113	LB Category C(S)	LB No. 10283; HER No. MDG17877	Dalswinton House dam at Dalswinton Loch	Country house	Built probably circa 1785 for Patrick Miller of Dalswinton, pioneer of steam navigation. Small straight dam at south east end of Dalswinton Loch. Rubble built, with red ashlar dressings and coping. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294464	584240	High	No change	None	No change	None
114	LB Category B	LB No. 10284; HER No. MDG17878	Dalswinton House Dovecot	Dovecot	Built before 1796. Circular dovecot, divided by band course into 2 storeys: all red ashlar, stugged below band, and droved above: polished dressings. Now roofless and gutted. 2 doors and 2 windows at lower level: flight holes in and below main cornice: corbels above latter (parapet removed). Interior partly brick-lined; nesting boxes destroyed: evidence of an internal stair. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294295	584496	High	No change	None	No change	None
115	LB Category B	LB No. 10285; HER No. MDG17879	Dalswinton House walled garden	Walled garden	Built circa 1790. Quadrangular garden enclosure, having high, rubble-built & ashlar-coped walls with rusticated red ashlar terminal piers at south (unwalled at south); large opening inserted central on east wall; glass houses at north. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294452	584347	High	No change	None	No change	None
116	LB Category C(S)	LB No. 10286; HER No. MDG17880	Dalswinton House back lodge and Gatepiers	Gate Pier(s), Lodge	Earlier/mid 19th century. Single storey lodge. Red sandstone ashlar. South elevation: inner part canted, with 3 windows, and crenellated parapet above eaves level; single window to left, door to right. Margined openings; windows are 4-pane sashes. Central apex stack; piended roof, with graded slates and projecting eaves, continued over rear addtion at north east corner. Square, red ashlar gatepiers are corniced, with flat pyramidal caps; curved quadrant walls (rebuilt?) are snecked, with ashlar cope, re-used 1710 datestone incorporated at south. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294686	584440	High	No change	None	No change	None
117	LB Category B	LB No. 10287; HER No.	Dalswinton House East gate lodges	Lodges, gatepiers	Late 18th century. Pair of similar single storey Classical lodges flanking south gateway. All red ashlar. Each lodge has 3-bay elevation to drive with door nearest main road; single bay flanks, pedimented inner projection to main road with single	PM	294854	584363	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		MDG17881	and gatepiers		window in round-headed opening, and cill band continued as coping of quadrant walls: all windows 12-pane sashes; cornice; blocking course; central apex stack and piended slate roof. Lower, late 19th century addition to rear of each lodge. 2 tall, circular red ashlar gatepiers; each has fluted frieze with rosettes, cornice and large urn finial on stepped base. Modern wrought-iron gates and railings. Quadrant walls clasp flank elevations of lodges. Comments: discussion within body of Environmental Statement archaeology chapter.								
118	LB Category B	LB No. 10288; HER No. MDG17882	Dalswinton House former stables	Farm building(s), Stables(s)	Late 18th century, substantially altered at various dates into later 20th century. Symmetrically planned Classical stable block built around rectangular (cobbled) courtyard, with clock tower over courtyard entrance, and now mostly converted for domestic use. Single storey with lofts/upper floor. Red sandstone ashlar. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294225	584240	High	No change	None	No change	None
119	LB Category B	LB No. 10289; HER No. MDG17883	Dalswinton Barony Chapel	Chapel	Circa 1875. Simple, rectangular-plan 7-bay Gothic chapel. All faced with corrugated iron, except timber barge boards and gabled porch at south end of long east wall; small, simple metal spire over south gable. Pointed window openings with cusped-headed lights to bays, door, and similar large bipartite (leaded glass) to north gable, tripartite to south gable. Faceted and finialed spire on square base, cusped- headed and louvered belfry opening to each face of latter. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294169	584986	High	No change	None	No change	None
120	LB Category C(S)	LB No. 10531; HER No. MDG17992	Portrack House	Country house	An early nineteenth century tri-partite villa, with hood-moulded ground floor windows and square upper windows, was added to in 1879 by the architect, James Barbour, who created a picturesque house of mainly two storeys with an off-centre pyramid-roofed entrance tower, projecting eaves and chimney stacks with cavetto moulding. Information from RCAHMS (MMB), 8 February 2006. James Barbour 1879 (dated), with earlier 19th century tripartite-plan villa incorporated at rear. Rubble-built, ashlar dressings, all painted: roofed with graded slates. ORIGINAL HOUSE: 2 storeys over basement: 3-bay north elevation: hood-moulded ground floor openings with cills lowered to base course; square 1st floor	PM	293855	582955	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					windows with vertical glazing to sashes; cill course; stacks with cavetto cornices; projecting eaves (?re-roofed by Barbour). 1879 HOUSE: picturesque; mainly 2 storeys, pyramidal-roofed 3-storey square entrance tower off-centre, huge cross-window fills bay adjoining to left (hall within); left bay and flanks all with projecting windows gabled above wall-head. Small-paned sash windows. Projecting eaves. Comments: discussion within body of Environmental Statement archaeology chapter.								
121	LB Category B	LB No. 10532; HER No. MDG17993	Portrack House Summer House (Formerly lodge to Mollance House)	Lodge	Circa 1770; re-erected on present site circa 1970. single storey octagonal plan former lodge, now a summerhouse. Rendered, with ashlar margins, eaves course, cornice and blocking course: Octagon-patterned glazing to sash windows and to door: latter faces Portrack House - inscription panel on blind window in opposite face. Corniced octagonal apex stack; facetted slate roof. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	293823	582938	High	No change	None	No change	None
122	HGDL	HGDL No. 130	Dalswinton	Garden	An informal late 18th century design, comprising woodland, parkland and lakes, overlays an earlier formal one. There is an interesting shrub collection in the woodland garden. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	294458	584347	High	No change	None	Negligible	Slight
123	Non-inventory HGDL		Friars carse	Garden	Located 1km S of development boundary, c. 2.5km SW of turbines. Comments: discussion within body of Environmental Statement archaeology chapter	PM	292300	584900	Medium	No change	None	Negligible	None
124	Non-inventory HGDL		Portrack House	Garden	Located c.4.5km SSE of turbines, within ZTV. Comments: discussion within body of Environmental Statement archaeology chapter	PM	293800	583100	Medium	No change	None	Negligible	None
125	Non-inventory HGDL		Allanton House (World Peace Sanctuary)	Garden	Located 1.5km SSW of development boundary, c. 3km SW of turbines. Comments: discussion within body of Environmental Statement archaeology chapter	PM	291200	584900	Medium	No change	None	Negligible	None
126	Non-inventory HGDL		Bajarg (Tower)	Garden	Located 3.5km NW of development boundary Comments: Estate and associated gardens to the west of the Nith. Incorporates Bajarg Tower, drybridge, front lodge and gatepiers, back lodge, sundial, walled	PM	287900	590000	Medium	No change	None	Negligible	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					garden and lime kilns (RSK Sites A52 to A58). The extent of the setting of each LB within the NIDL consists of the extent of the garden, which is extensively wooded to the eastern and southern sections. Glimpses of turbines may be visible from certain locations within the boundary of the NIDL, or from elevated positions (non-principal rooms) within Bajarg Tower. However, sensitive designed vistas / intentional sightlines will not be impacted, and the proposed development will not detract from the NIDL's setting.								
127	Non-inventory HGDL		Closeburn Castle	Garden	Located 3.2km NNW of development boundary. Located 3km to NW of development boundary. 1-2 turbines visible in 140m to tip ZTV. Forestry of Clauchrie Plantation should provide significant masking Comments: discussion within body of Environmental Statement archaeology chapter	PM	290800	592100	Medium	No change	None	Negligible	None
128	ASA		Whitestanes Moor	Archaeologically Sensitive Area	Located 2km west of development, and SE of Dalswinton. Forestry forms E boundary of the ASA, and should mask substantially Comments: discussion within body of Environmental Statement archaeology chapter	PREH	296400	587500	Medium	No change	None	Minor	Slight
129	HGDL	HGDL No. 108	Cowhill Tower	Garden	An attractive designed landscape laid out in the 1850s, with additional gardens created by the Keswick family in the 1950s. It comprises parkland, woodland, an interesting shrub collection in a woodland garden, and some notable architectural features. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	295146	582529	High	No change	None	Negligible	Slight
130	SM	SM No. 633; HER No. MDG5794 ; NMRS No. NX89SW 5	Capenoch Loch,long cairn	Long cairn	Recorded in the NMR as A well-preserved long cairn situated on a gentle hill slope measures 34.0m NE-SW; 16.0m wide at its south-west end tapering to 8.5m. For approximately one third of its length from the north-east it has been robbed to within 0.5m of ground level, elsewhere it is up to 3.1m high. There are intermittent traces of wall face (up to two courses of masonry) visible 1.8m inside the present edge of the cairn near the centre of the south-east side and along the north-east edge for approximately 8.0m from the NE corner. The purpose of this walling is not clear. The cairn appears to have been dug into in several places along its main axis but no evidence of a chamber has been exposed.	NE/ BA	283845	592595	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: outwith ZTV								
131	SM	SM No. 638; HER No. MDG6417; NMRS No. NX99NE2	Poldivan Bridge, cairn 730m ENE of	Cairn	A well-preserved Cairn measuring 16.0m in diameter and 1.5m in height. Visited by OS (WDJ) 4 August 1959 Comments: outwith ZTV	BA	296709	595023	High	No change	None	No change	None
132	SM and Promoted Site	SM No. 641; HER No. MDG6102; NMRS No. NX97NW 19	Twelve Apostles,stone circle	Findspot; Stone circle	Twelve Apostles (NAT) Stone Circle This is a large example of a flattened circle of Prof Thom's Type B. Half of the ring is a true circle with a diameter of 89 m; the other side is composed of an arc of a much larger circle drawn from a point on the circumference of the first one. Comments: Stone circle is low-lying within a pasture field. The extent of the setting of the monument is defined by the area from which it is visible, and visual relationships with contemporary monuments, such as the two Holywood cursus monuments (RSK 147 and 148).	NE/ BA	294702	579405	High	No change	None	No change	None
133	SM	SM No. 642; HER No. MDG5501; NMRS No. NX88NE2	White Cairn,long Cairn,Fleuch larg	Chambered Cairn	Described in the NMR as: 'White Cairn', a long cairn, occupies an uneven site, between 400 and 450 ft OD at the side of the valley of the Cairn Water. It consists mainly of small angular stones, turf-covered for a few feet inwards, though the actual edge is clear all round the cairn. It measures 150 ft NNE-SSW by 44 ft across the N end and 85 ft some 25 ft from the S end, and has a maximum height of 14 ft. Morris (S V Morris), in a limited excavation in 1937, revealed a wall-face near the S end of the cairn, running N. Comments: Prominent feature within the landscape. Distant views of turbines to the east, but such views will be will not impact on the monument's prominence in the landscape, nor views to contemporary monuments.	NE/ BA	285437	587339	High	No change	None	No change	None
134	SM	SM No. 643; HER No. MDG1217	Barrs Hill,fort	Fort	Described in the NMR as: Barrs Hill, fort... is oval measuring 270 ft by 210 ft. within a now ruinous massive rampart with a broad external ditch outside which are two more ramparts with a median ditch, and in the north and west sections of a fourth. The entrance is to	PREH	301516	583452	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		8; NMRS No. NY08SW 2			the east. Comments: Prominent feature within the landscape. Distant views of turbines to the northwest, but such views will be will not impact on the monument's prominence in the landscape, or views to contemporary monuments, e.g. Mullach hillfort (RSK Site 1) or The Belt (RSK Site A1).								
135	SM	SM No. 673; HER No. MDG6347 ; NMRS No. NX98SE8	Carzield,Roman fort	fort	Described in the NMR as: Excavations at Carzield in March 1939 revealed an Antonine cavalry fort measuring some 500 by 560' over the ramparts. The defences are still visible at the SE angle (together with about 300' of each adjacent side), the NE angle, and a sector of the W side. The fort was surrounded by a turf rampart and a double ditch, with a third ditch on the S side, and there appears to have been a small annexe E of the fort. Comments: largely a sub-surface feature with few upstanding remains. Extensively altered cultural landscape, e.g. farmhouse of Carzield to the northwest. Turbines do not interfere with sightlines to likely contemporary monuments, e.g. Bankhead Roman fort (RSK Site 48) and West Gallaberry (RSK Site 136)	RO	296878	581806	High	No change	None	No change	None
136	SM	SM No. 677; HER No. MDG6311 ; NMRS No. NX98SE45	West Gallaberry,Roman camp & native promontory Setterment	Linear feature; enclosure; promontory fort; enclosure	Part of what may be a promontory or circular enclosure and three sides of a smaller rectangular enclosure are visible as cropmarks to the W of the Roman Temporary camp NX98SE 4. A linear cropmark runs from NE to SW in front of the entrance to the camp. Comments: largely a sub-surface feature with few upstanding remains. Extensively altered cultural landscape, e.g. farmhouse of West Gallaberry to the southeast. Turbines do not interfere with sightlines to likely contemporary monuments, e.g. Bankhead Roman fort (RSK Site 48) and Carzield Roman fort (RSK Site 135).	IA	296337	582727	High	No change	None	No change	None
137	SM and Promoted Site	SM No. 680; HER No. MDG5654 ; NMRS	Nith Bridge,cross 180m W of	Cross	This free standing Cross of pink sandstone, situated in a field and surrounded by a railing, is 9' in height and 17" x 8" at base. Its shaft is richly carved on all sides with zoomorphic and foliaceous interlaced work. A late 9th or 10th century date is suggested for it.	EME	286894	595471	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		No. NX89NE6			Comments: Views of turbines to southeast, but such views will be distant and will not impact on the monument's prominence in the landscape								
138	SM; Category A LB and Promoted Site	SM No. 682; LB No. 17233; HER No. MDG18604; MDG6275; NMRS No. NX98SE13	Amisfield Tower	Tower	Amisfield Tower, completed in 1600, is an outstanding example of compact tall building. On plan, the base is almost square, measuring externally 28 1/2 ft N-S by 31 1/2 ft transversely, and rises to a total height of 77 ft. Beneath the wall-head there are four storeys; within the roof is an attic with a garret above. Numbers of turrets of various shapes and sizes have been placed on the upper storeys. Comments: Tower house within estate gardens. Views of turbines to northwest, but such views will be distant and will not impact on the monument's prominence in the landscape	PM	299203	583800	High	No change	None	No change	None
139	SM; Category A LB	SM No. 692; LB No. 10204; HER No. MDG6370; MDG17798; NMRS No. NX98SW3	Fourmerkland Tower	Tower	Described in the NMR as: Fourmerkland Tower is complete and in good repair, though unoccupied. Measuring 23 1/2 ft by 19 ft externally, it stands three storeys and an attic in height, with angle- turrets at the NE and SW corners. A heraldic panel above the door is dated '1590'. The foundations, however, are known to be older (A E Truckell 1961). Comments: outwith ZTV	MED	290857	580756	High	No change	None	No change	None
140	SM	SM No. 699; HER No. MDG5408; NMRS No. NX88NW1	Maxwelton, motte	Motte	Described in the NMR as: The motte at Maxwelton rises from the centre of a natural gravel ridge. Its level, oval summit measures 70 ft NNW-SSE by 60 ft transversely. Some 13 ft below the summit on the SSE is a ditch, 26 ft wide, and an upcast mound 3 ft high on the lower side. As it passes W, it flattens to a terrace, but at the NNW end of the ridge the ditch resumes, 16 ft wide, but shallow, with another, shallower, ditch 30 ft beyond. The E side has been mutilated by cultivation. The counterscarps of the ditches are very stony, as if they had been faced, or more probably surmounted by a wall. There is no sign of a bailey.	MED	281738	589714	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					RCAHMS 1920, visited 1912; R W Feachem 1956 Comments: Outwith ZTV								
141	SM	SM No. 705; HER No. MDG5514; NMRS No. NX88NE3	Orchard Mote,earthwork	Earthwork; Moat	Described in the NMR as: 'Mote', The Orchard, on low-lying ground near the Cairn Water is an earthwork consisting of a slightly raised sub-circular platform, apparently with peripheral stonework, surrounded by a broad double ditch with a massive medial rampart, and another arc of outer rampart on the south. A modern ditch has been cut on the south to drain the outer ditch. Information from OS Recorder (ES) 23 April 1975 Comments: Outwith ZTV	MED	284999	586032	High	No change	None	No change	None
142	SM	SM No. 1075; HER No. MDG6103; NMRS No. NX97NW 2	Hall Hill,fort	Fort	Described in the NMR as: This Fort, 235 ft by 110 ft, lies on a ridge of Hall Hill with precipitous northern slopes. It is defined on the E by a partly rock-cut ditch, about 18 ft wide, and on the W by a trench, now slight, and a rampart which projects along the S flank of the Fort at the edge of a terrace about 8 ft above the base. Stones set into the scarp below the terrace may be revetting or debris from the rampart. The remains of this Fort are generally as described above. The rampart along the S flank is now reduced to a scarp. Within the Fort is a raised oval area 40.0 m by about 12.0 m, defined by a much-reduced scarp. The trench at the W end is just discernible. Comments: Prominent upstanding monument on hill. Distant views of turbines to the north, but such views will not impact on the monument's prominence in the landscape, or views to contemporary monuments.	IA	290593	579497	High	No change	None	Negligible	Slight
143	SM	SM No. 1084; HER No. MDG5447; NMRS No. NX87NE3	McNaugton, Fort	Settlement	Described in the NMR as: 'McNaughton's Fort' was excavated in 1965, and found to consist of a rampart with outer ditch enclosing an area about 60' in internal diameter. Comments: Outwith ZTV	PREH	287350	577867	High	No change	None	No change	None
144	SM	SM No.	Templand	Signal	Described in the NMR as:	IA/R	287663	594803	High	No	None	No	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		2838; HER No. MDG5712; NMRS No. NX89SE2	Mains,Roman signal station 770m NNW of	station?; findspot; Settlement	This homestead, which is visible as a cropmark on oblique aerial photographs (Dewar 75, RCAHMSAP 76, 77, 83, 84) is situated on a low knoll in the gently-rolling land to the S of Thornhill. A penannular ditch about 3m across encloses an area measuring some 20m in diameter; the gap in the ditch is about 6m across and lies on the E. Some 3m from the inner edge of the ditch, and concentric with it, there is a narrow trench, up to 1m across, enclosing an area measuring between 12m and 14m in diameter. There is a gap in the E, in line with the gap in the broader ditch, with a swelling of the terminals of the trench, which has probably held the outer wall of a timber house. Comments: Subsurface remains only. Distant views of turbines to the southeast.	OM				change		change	
145	SM	SM No. 4089; HER No. MDG5746; NMRS No. NX89SE51	Holmhill,enclosure 500m S of	Enclosures	Described in the NMR as: Cropmarks on aerial photographs show two enclosures, one ovoid and the other more circular, in a corner of a field just south of the sewage works. It is not certain what the relationship between the two is, whether they are two separate features or both elements within a more complex structure. Comments: Subsurface remains only. Distant views of turbines to the southeast, within altered cultural landscape (sewage works adjacent).	PREH	287307	594871	High	No change	None	No change	None
146	SM	SM No. 4165; HER No. MDG5728; NMRS No. NX89SE35	Kirkland,Enclosure 300m WNW of	Site; henge?	Described in the NMR as: Enclosure, Kirkland: visible on air photographs. This feature is apparently a two-period house. It lies in close proximity to two palisaded homesteads and a large ring-ditch (also other cropmarks - see NX 89 SE 30-34 & 36). H Welfare 1980 Suggested as possible henge by RCAHMS, the Site comprises a broad circular ditch, with a single entrance on the south-east. Information from DGC [AJN] 3 February 2009 Comments: Subsurface remains only. Distant views of turbines to the southeast.	NE/BA	287692	593055	High	No change	None	No change	None
147	SM	SM No.	Holywood,cu	Cursus	Described in the NMR and HER as:	NE	295064	580156	High	No	None	No	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		4217; HER No. MDG6308 ; NMRS No. NX98SE42	rsus,linear earthwork,pit alignment & Enclosures 975m SE of		The Holywood cursus complex lies to the NW of Dumfries, and represents an important concentration of Neolithic field monuments. It is composed of two cursus monuments and a stone circle, the Twelve Apostles. There are also a number of minor features, which may represent ring-ditches, small enclosures, or ploughed-out mounds. Of the two cursuses, the southern example had squared terminals (NX97NW 23), while the northern one had rounded terminals (NX98SE 42). This difference in morphology may have chronological implications. Excavation in 1997 was intended to test the preservation of the monuments in the face of animal and agricultural damage over a very long period. Nothing is visible of this cursus monument which was discovered by aerial photography and lies on a gently undulating ridge about 150m to the NW of Holywood School. Defined by a broad ditch, it has rounded terminals and measures some 400m from NNE to SSW by 30m overall. For much of its N half, the ditch is flanked internally by a line of pits, spaced at intervals of about 2m at the terminal, but increasing to between 4m and 5m along the sides; at the terminal, the cropmark of one pit is noticeably larger than the rest. The only entrances that have been recorded are the opposed causeways about 130m from the N terminal, but there does not appear to be a corresponding break in the arrangement of the pits. The recorded cropmarks of the S half of the cursus are not well-defined but what may be a large pit lies centrally within the S terminal. The cursus monument is plotted on a distribution map of Neolithic monuments covering southern Scotland (RCAHMS 1997, 115, fig. 110). Comments: Subsurface remains only, with visual relationships between contemporary monuments, such as the second Holywood cursus (RSK Site 148) and Twelve Apostles (RSK Site 132) intrinsic to the setting of the monument. Distant views only of turbines within an altered cultural setting.					change		change	
148	SM	SM No. 4218; HER No. MDG6107 ; NMRS No. NX97NW	Holywood, cursus 1250m SSE of	Cursus	Nothing can now be seen of this cursus monument, which was first discovered by aerial photography. It lies on a terrace below the E edge of a broad gravel plateau immediately to the W of the A76 between Newbridge and Holywood. The cursus has square terminals and is defined by a broad ditch, which is broken by causeways at several points along its sides. It measures about 285m from NNW to SSE by 35m transversely, but narrows to about 22m towards its N end, where it appears to terminate on a slightly higher part of the terrace. It is plotted as a	NE	294892	579650	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		23			cursus monument on a distribution map of Neolithic monuments covering southern Scotland. A ring ditch and a possible circular enclosure are enclosed by the cursus: the former measures about 11m in diameter and lies towards the N end, at a break through the E side of the cursus ditch (NX97NW 38); the latter is about 20m in diameter and lies within the SW corner of the S terminal (NX97NW 44). Two pits are also visible within the enclosure. A ring of elongated pits is situated to the W of the cursus immediately outside the northerly of the two entrance causeways through the W side near its S terminal (NX97NW 45). Information from RCAHMS (ARG), 7 April 1998 RCAHMS 1997. Comments: Subsurface remains only, with visual relationships between contemporary monuments, such as the first Holywood cursus (RSK Site 137) and Twelve Apostles (RSK Site 132) intrinsic to the setting of the monument. Distant views only of turbines within an altered cultural setting.								
149	SM	SM No. 5695; HER No. MDG6391; NMRS No. NX98SW 5	Burnside of Baltersan,Ring ditch,pits and Roman camp 700m S of	Temporary camp	A Roman Temporary camp is visible as cropmarks on air photographs. (Undated) information in NMRS. Comments: Subsurface remains only. Turbines do not interfere with sightlines to likely contemporary monuments, e.g. Bankhead Roman fort (RSK Site 48), Carzield (RSK Site 135) and West Gallaberry (RSK Site 136)	RO	291494	580076	High	No change	None	No change	None
150	SM	SM No. 5695; HER No. MDG6410; NMRS No. NX98SW 66	Fourmerkland	Ring ditch	A ring-ditch is visible as cropmarks within the Roman Temporary camp (NX98SW5). (Undated) information in NMRS. This ring-ditch straddles the S side of the possible cursus monument NX98SW 67. It lies adjacent to the W terminal of the cursus and measures about 10m in internal diameter. Information from RCAHMS (ARG), 22 April 1998 Comments: Subsurface remains only, with distant views of the turbines only.	BA	291500	580030	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
151	Property in care; SM and Promoted Site	Property in Care No. 90200; SM No. 90200; NMRS No. NX97NE5	Lincluden College, motte and precinct	Motte	Described in the NMR as: A Norman motte, later terraced as part of a pleasance, adjoins Lincluden College (NX97NE 4). S Piggott and W D Simpson 1970 This motte, with four terraces, is well-preserved. The oval summit measures 6 m by 4 m; it is 6 m to 8 m high. The earthworks shown on plan E and S of the motte are the banks of an old plantation. Visited by OS (JLD) 6 December 1960 Comments: prominent site, now on the outskirts of Dumfries in an extensively modified cultural landscape. Distant views only of turbines.	MED	296754	577943	High	No change	None	No change	None
152	LB Category A	LB No. 4227; HER No. MDG20454; NMRS No. NX88SE11	Dalgonar Bridge	Bridge	Dated 1818. Segmental-arched bridge, wide single slender span high above Cairn water. Rubble-built, recessed ashlar arch-ring, band course and ramped parapet coping, latter also curved towards approaches. Comments: outwith ZTV	PM	286029	584080	High	No change	None	No change	None
153	LB Category A	LB No. 4230; HER No. MDG20457; NMRS No. NX88SE26	Dunscore Parish Church	Church	James Thomson of Dumfries, architect. Built 1823-4. Simple, rectangular-plan, 3-bay simply buttressed, Gothic church, 3-stage square tower at west gable. Rubble-built, with contrasting painted ashlar dressings, and long and short worked dressings to doors, windows and tower quoins. Comments: outwith ZTV	PM	286661	584340	High	No change	None	No change	None
154	LB Category A	LB No. 10218; HER No. MDG17812; NMRS No.	West Gallaberry	House	Probably mostly early 19th century. 3 single storey, rectangular-plan steading ranges forming U-plan (courtyard closed at (4th) south side by plainer and mostly later structures), octagonal horsemill on outer face of north range. All limewashed rubble and dressings. Comments: Prominent residential LB within its steading. Steading forming extent	PM	296416	582622	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NX98SE69			of setting of the building. Distant views of turbines do not detract from its prominence.								
155	LB Category A	LB No. 10247; HER No. MDG17841; NMRS No. NX89SW42	Capenoch House	House	David Bryce, Architect, 1847-68. Scots Baronial mansion house incorporating circa 1780 square-plan 3-bay house encased and extended to south, 1847/8, further more elaborate additions to north 1855, mullioned conservatory to west 1855/6. Low service court to north west also 1855, extended 1868. Mostly 2 storeys, with raised basements and attics. Comments: Prominent residential LB within extensive wooded grounds. Grounds form the extent of the setting of the building. Distant and masked views of turbines do not detract from the house's prominence.	PM	284344	593811	High	No change	None	No change	None
156	LB Category A	LB No. 10300; HER No. MDG17894; NMRS No. NX98SE84	Carnsalloch House	House	For Carnsalloch, The Mount Chapel, see NX98SE 58. Dated 1759 on north wing. Palladian mansion house; 2 storeys on raised basement with flanking wings. All red ashlar. Comments: Prominent residential LB within extensive grounds. Grounds form the extent of the setting of the building, with relationship with stables (RSK Site 158) also important. Distant and oblique views of turbines do not detract from the house's prominence.	PM	297092	580300	High	No change	None	No change	None
157	LB Category A	LB No. 10301; HER No. MDG17895; NMRS No. NX98SE58	Carnsalloch Chapel at The Mount	Chapel	For Carnsalloch House, see NX98SE 84. E B Lamb, architect, circa 1850. Small private chapel with apse and crypt. Decorated Gothic. Stugged and snecked red ashlar with droved or polished dressings. Comments: Not prominent within the landscape, and surrounded by woodland shelterbelts. Grounds form the extent of the setting of the building.	PM	297467	580953	High	No change	None	No change	None
158	LB Category A	LB No. 10303; HER No. MDG17897; NMRS No. NX98SE84	Carnsalloch House, former stables	Stables	For Carnsalloch, The Mount Chapel, see NX98SE 58. Probably circa 1759 (date of Mansion House). Classical, square-plan stablecourt with single storey ranges wrapped around massive central taller block. Squared red rubble with polished dressings and margins. Comments: Prominent LB within extensive grounds of Carnsalloch House. Grounds form the extent of the setting of the building, with relationship with House (RSK Site 156) also important. Distant and oblique views of turbines do not	PM	297318	580394	High	No change	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					detract from the stables' prominence.								
159	LB Category A	LB No. 17208; HER No. MDG18579; NMRS No. NX97NW83	Terregles House, stables	Stables	Architect probably Sir Robert Smirke, circa 1831. Stables, single storey with lofts, built around large quadrangular courtyard; fine Classical east range, with round-arched central pend, built of polished red ashlar (remainder rubble-built). Comments: Stables within garden to the north of Terregles village. Surrounding grounds and Terregles House form its setting, with only distant views of turbines to south	PM	293155	577637	High	No change	None	No change	None
160	LB Category A	LB No. 17286; HER No. MDG18657; NMRS No. NX89NE71	Nith Bridge (A702 over River Nith)	Bridge	Bridge, Thornhill, late 17th or early 18th century. A handsome two-span Bridge with dressed-stone arch rings and rubble spandrels. The arches are segmental and the triangular cutwaters extended up to form pedestrian refuges. This Bridge carries the A702 public road over the River Nith on the W side of Thornhill. The river here forms the boundary between the parishes of Morton and Penpont. Comments: outwith ZTV	PM	287081	595480	High	No change	None	No change	None
161	LB Category A	LB No. 17337; HER No. MDG18708; NMRS No. NX89NE12	Thornhill, Drumlanrig Street, Market Cross	Cross	Possibly by James Smith. Erected 1714. Red ashlar market cross, comprising single fluted Ionic column having swagged capital supporting (lead) Pegasus; all raised on panelled octagonal drum base and stepped plinth. Comments: Located in centre of village, with buildings obscuring views of turbines.	PM	287879	595478	High	No change	None	No change	None
162	LB Category A	LB No. 26075; HER No. MDG19108; MDG6034; NMRS No. NX97NE4	Abbey Lane, Lincluden Collegiate Church	Nunnery; Church	NMRS records the remains of Lincluden College (NR) on site of Nunnery (NR) (Benedictine - founded 1164). Fragmentary ruins of collegiate church and, to N, of domestic/service block. Comments: prominent site, now on the outskirts of Dumfries in an extensively modified cultural landscape. Distant views only of turbines.	MED	296640	577911	High	No change	None	No change	None
163	HGDL	HGDL	Maxwelton	Garden	An attractive parkland landscape which makes an outstanding contribution to the	PM	282200	589800	High	No	None	No	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	and promoted site	No.272	(Glencairn Castle)		surrounding upland scenery. The specimen trees in the woodland garden, and the knot garden in the terraced lawn are also of note. Comments: outwith ZTV					change		change	
164	HGDL	HGDL No.96	Castlehill	Garden	An attractive garden comprising pondside, terrace and trough plantings, which forms an attractive setting for a Victorian house. Laid out in 20th century. The house is set above a gentle slope to the south and has extensive views across Nithsdale and the Solway plain, and as far as the Lakeland Hills. The house is visible from the minor road to the south but the gardens are screened from view from the surrounding area. Comments: Principal views from the garden are southwards, with the turbines located to the northwest. The setting of the HGDL consists of the boundary of the HGDL and sightlines to the south. Turbines do not interfere with noted architectural features, e.g. listed remains of windmill to south. Glimpses of turbines may be visible from certain locations within the boundary of the designated asset. However, highly sensitive designed vistas / intentional sightlines will not be impacted upon.	MOD	297450	584100	High	No change	None	No change	None
165	HGDL	HGDL No.142	Drumlanrig	Garden	One of Scotland's finest grand designed landscapes ' outstanding in every value ' with terraces and banks dating back to the 17th century and parterres restored to 1747 plans. The castle is listed category A, the stretch of the Nith River within the landscape is a Site of Special Scientific Interest, and as a whole, the site makes a major contribution to the surrounding scenery. Comments: discussion within body of Environmental Statement archaeology chapter.	PM	285400	600500	High	No change	None	Negligible	Slight
166	Promoted site		Glenkiln		Bronze sculptures by Henry Moore located in prominent positions around Glenkiln reservoir, with a path linking them. Comments: outwith ZTV	MOD	284200	577900	Medium	No change	None	No change	None
167	Map regression		Auldgirth	Bridge	Railway bridge depicted on 1st Edition OS. The railway was built in the 1830s (David Matthews *pers. comm.* 2011) through the Blackwood Estate lands. The bridge carries the road linking Auldgirth to Low Auldgirth over two pairs of tracks linking Glasgow and Dumfries. The bridge consists of a single arch of red	PM	291464	586702	Low	Negligible	None	No change	None

RSK ID	Status	Designation(s)	Name	Type	Description	Period	Easting	Northing	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					sandstone, ivy-covered on its southwest side, and is a single carriageway in width.								
168	Map regression		Hayfield	Structure	Single structure depicted in area of woodland to the north of Low Auldgirth on a map of 1804 held privately by the Blackwood Estate. The structure is linked by a track to Auldgirth. The structure and track are not shown on subsequent maps.	PM	291379	587113	Low	No change	None	No change	None

Abbreviation	Period
PREH	Prehistoric (500,000 BC – 43 AD
ME	Mesolithic (12,000 – 4,000 BC)
NE	Neolithic (c. 3,500 – c. 2,000 BC)
BA	Bronze Age (c. 2,000 – 600 BC)
IA	Iron Age (c. 600 BC – 43 AD)
RO	Roman (43 AD – 410 AD)
EME	Early Medieval (411 AD –1123 AD)
MED	Medieval (1124 AD –1500 AD)
PM	Post-medieval (1501 AD – 1900 AD)
MOD	Modern (1901 AD – Present)

Appendix 9.2: Figures, Plates and References

APPENDIX 9.2 FIGURES, PLATES AND REFERENCES

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Plate 10: View southwards from Drumlanrig Castle over formal gardens (RSK Site 165).

Plate 11: View eastwards from Drumlanrig Castle over formal gardens (RSK Site 165).

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National Library of Scotland Digital Map Library

Cartographer	Title/ Description	Date
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Pont, T. and J. Blaeu	Nithia Vicecomitatus, The Shirifdome of Nidis-dail / auctore Timotheo Pont. Map of Nithsdale, based on earlier manuscript versions by Pont and Robert Gordon	1654
Moll, H.	The Shire of Dumfries or Nithisdale	1745
Roy, W.	Roy Military Survey of Scotland – Lowlands	1752-55
Thomson, J	Atlas of Scotland: Dumfriesshire	1832
Ordnance Survey	Dumfries, Sheet XL.8 (Closeburn)	Surveyed 1855; published 1861
Ordnance Survey	Dumfries, Sheet XL1.5 (Closeburn)	Surveyed 1855; published 1861
Ordnance Survey	Dumfries, Sheet XL1.1 (Closeburn)	Surveyed 1855; published 1861
Ordnance Survey	Dumfries, Sheet XL.4 (Closeburn)	Surveyed 1855; published 1861
Ordnance Survey	Dumfries, Sheet XXXII.13 (Closeburn)	Surveyed 1857; published 1861
Ordnance Survey	Dumfriesshire, Sheet XLI	Survey 1855; published 1861
Ordnance Survey	Dumfriesshire, Sheet XL	Survey 1855; published 1861

Additional Mapping

Privately held mapping of the Blackwood Estate held by David Matthews.

Cartographer	Title/ Description	Date
J. Morrison	Plan of the land of Clauchrie, Cairn and Auldgirth the property of W. Copland Esq. Of Collistoun.	1804
Anonymous	Plan of part of the Estate of Blackwood belonging to Wm. Copland Esq. Of Colliston	Undated, *c*.1830s

Vertical Aerial Photographs from the Royal Commission

Library Ref	Sortie #	Date	Frame #
B 0225	541/A/0397	25.5.1948	3250, 3252 4252, 4250 3339, 3337 4017, 4019

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B 0510	543/1698	1962	F22/ 0235-0240 F21/0235-0240
B 0516	543/1818	1962	F21/0100-0106 F33/0100-0106
C 0056	106/G/UK/0150	1946	5002
C 0076	540/A/0382	18.5.1948	5021, 5024, 5027, 5049
C 0107	58/7652	28.10.66	0092-0094
C 0136	543/RAF/1818	13.7.1962	0038, 0045, 0052
C 0186	39/4719	22.5.1975	056, 058
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www.oldmaps.co.uk (Additional Ordnance Survey mapping)

http://ads.ahds.ac.uk (Archaeology Data Service)

http://www.aberdeenshire.gov.uk/archaeology/index.asp
(Aberdeenshire Archaeology Service)

http://hsewsf.sedsh.gov.uk/pls/htmldb/f?p=500:1:1367268110883482
(Historic Scotland Digital Data download)

http://edina.ac.uk/statacc (Statistical Accounts of Scotland Online)

APPENDIX 10
NOISE

Appendix 10.1: Assessment Methodology

APPENDIX 10.1
ASSESSMENT METHODOLOGY

This appendix provides more detail to the summary within Chapter 10 of the ES.

Construction Traffic Assessment

Traffic noise ($L_{A10,T}$) is calculated according to the method of CRTN and is principally determined by the flow, *F* (vehicles per time period), and speed of vehicles, *V*. The method allows for the inclusion of percentage of heavy goods vehicles in the overall flow, such as those that might be associated with construction traffic. The increase in traffic noise generally obeys a 10×log(*F*) function, meaning that a doubling of the traffic flow leads to a 3 dB increase in resulting noise level.

Table 11.4 in the Transport chapter of the ES provides the predicted numbers of vehicles on the A76(T) in 2013. This number of HGVs and other vehicles has been used as a baseline traffic level for the area. CRTN has been used to calculate the $L_{A10,1hour}$ value from the five day average, adjusted to account for the percentage of HGV predicted during construction.

For receptors on the access route into the site a different approach has been taken as existing traffic flows are not known. For the assessment of noise at Low and High Auldgirth, the equation F.6 from BS 5228-1 has been used to predict noise levels from construction traffic:

$$L\text{Aeq} = L\text{WA} - 33 + 10\log10Q - 10\log10V - 10\log10d$$

where:
*L*WA is the sound power level of the plant, in decibels (dB);
Q is the number of vehicles per hour;
V is the average vehicle speed, in kilometres per hour (km/h);
d is the distance of receiving position from the centre of haul road, in metres (m).

The assessment uses an L_{wA} of 111 dB taken from the L_{Amax} Lorry in BS 5228-1, with 1 movement per hour and a speed of 20 kph and a distance to the façade of the residence of 5 metres.

Operation Assessment

Sound Propagation

Using the method of ISO 9613[1], predictions of the combined noise emission from the turbines on the proposed wind farm are made for a range of wind speeds based on octave-band power level data provided by the turbine manufacturer in accordance with the method of IEC 61400-11[2].

The Standard ISO 9613 Part 2 provides a method for predicting various attenuation and enhancement factors, specified in dB, that permit the prediction of noise levels at distances from point sources of known power level specified in octave bands. Of relevance to the prediction of

[1] ISO 9613-2:1996, Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation

[2] IEC 61400-11, 2nd Edition (2002-12) Wind turbine generator systems – Part 11: Acoustic noise measurement techniques

noise emission levels from wind turbines are the following factors that are accounted for in the ISO 9613 method:

- Source strength in octave bands;
- Distance from source to receiver;
- Height of source above ground;
- Height of receiver above ground;
- Sound absorption/reflection properties of the ground;
- Intervening obstructions to direct sound path; and
- Meteorological conditions.

The predicted noise level resulting from this method is a time-average noise level appropriate for "downwind propagation conditions" and "average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occur on clear calm nights". These conditions are favourable for the propagation of noise.

Modelling Parameters

Within the model used for this assessment, the ground absorption is specified by a parameter 'G' that, for this assessment, has been given a value of 0.5 to account for mixed ground. In accordance with advice provided within the IOA Bulletin, a receptor height of four metres has been used in conjunction with this ground absorption value. Barrier attenuation (due to hills between the turbines and the receptors) has been considered within the models, subject to a maximum attenuation of 2 dB(A).

The wind farm pressure level, L_{pw}, at each receptor position is predicted according to ISO 9613 using the octave band noise power levels L_{WA} for each wind speed and a -2 dB adjustment is made to convert the predicted L_{Aeq} to L_{pw}, which is an $L_{A90,10min}$ level.

Noise Survey Equipment

Details of the monitoring equipment used to monitor background noise levels is presented below:

Table A10.1: Monitoring Kit

Location	SLM (s/n)	Microphone (s/n)	Pre-Amp (s/n)	Calibrator
High Auldgirth	Rion NL-32 (00503254)	UC-53A (316659)	NH21 (32868)	CR:511E at 94dB (037732)
Shield Hill	Rion NL-32 (00503257)	UC-53A (316662)	NH21 (32871)	

High Auldgirth, 291921 589876

The monitoring equipment was placed at the eastern end of a small row of houses forming the small settlement of High Auldgirth. In order to achieve a minimum 10m from reflecting surfaces, as required by ETSU-R-97, the equipment was positioned on the fence line of a small paddock.

Blackcraig Hill is to the north of the location and to the south there is an area of trees. A farm to the west is used for clay pigeon shooting. Beyond this and further down into the valley is the settlement of Auldgirth, a railway line and the A76 road.

Shield Hill, 292182 587777

The equipment was placed at the southern end of a small paddock to the south of the house, approximately 25m from the façade, but at a location representative of the front garden. The nature of the property is such that a sheltered location was not available. The southern fence line was chosen to minimise the effect of tree rustle noise from a small row of trees to the west, and potential physical disturbance by animals in the paddock to the east.

Noise measurements were taken in free-field conditions with the microphone positioned at a minimum of 3.5 m from any reflecting structure or façade and 1.2–1.5 m above ground level. The location was, where practical, representative of areas where residents may spend leisure time in the garden areas of their properties.

Definition of Turbine Noise Limit

In order to calculate noise limits, the noise data for the ETSU-R-97 'daytime amenity' and 'night time' periods were plotted against the wind speed at 10m height.

The 'IOA method' states that the wind speed at 10m height should be derived based on measurements at 2 heights, 'H1' (at least 60% of proposed hub height) and 'H2' (between 40 and 50% of proposed hub height). The data is cleaned to remove outlying points, which are unrepresentative of typical noise levels, periods of heavy rainfall and data flagged by the 'SODAR' system as 'poor quality'.

Construction Noise Prediction

Site Preparation and Access

This phase would involve minor earthworks, ground preparation and the laying of an access route capable of withstanding delivery of concrete, the turbines and movements of the necessary craneage and plant. The likely equipment required for this stage is presented in Table A10.2.

Table A10.2: Equipment for Preparation of Site and Access

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
Bulldozer	2.1	75	1	50	72.0
Backhoe loader	2.8	68	1	100	68.0
Excavator	2.19	77	1	100	77.0
Dumper (idling)	4.4	76	1	95	75.8
Dumper (tipping)	4.5	63	1	5	50.0
Tipper Trucks (moving)	2.32	74	1	75	72.8
Tipper Trucks (tipping materials)	2.33	81	1	25	75.0
Dozer Towing Roller	2.36	81	1	50	78.0
Combined Plant Sound Level at 10 m					**83.5**

Excavations

This construction phase would involve excavation by bucket-excavators. It is anticipated that the spoil and arisings would be distributed locally around each turbine location and would therefore not require on or off-site dump-truck or HGV movements. The likely equipment required for this stage is presented in Table A10.3.

Table A10.3: Equipment for Excavations

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
Backhoe loader	2.8	68	1	100	68.0
Excavator	2.19	77	1	100	77.0
Combined Plant Sound Level at 10 m					**77.5**

Construction of Turbines and Lifting Pad Foundations

The currently envisaged foundation design for the turbines involves a cast in situ circular concrete plinth (Φ18.6 m, D2.5 m) to which the turbine tower is bolted. The crane pad also requires a foundation attached to a series of piles at positions where the crane out-riggers pads contact.

This phase would require quantities of concrete to be delivered to each turbine location and deliveries of stone – refer to project description and transport chapter. The concrete may also require consolidation by vibro-mechanical means.

In instances where water fills the foundation during excavation, a pump and power pack may be required to de-water the foundation (this is covered in the next section on overnight work). The likely equipment required for this stage is presented in Table A10.4.

Table A10.4: Equipment for Foundation Excavation

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
Dumper-Truck (idling)	4.4	76	2	95	75.8
Dumper-Truck (tipping)	4.5	63	2	5	50.0
Concrete Lorry (idling)	4.19	71	1	75	69.8
Concrete Lorry (discharging)	4.18	80	1	25	74.0
Concrete Vibrator	4.34	69	1	50	66.0
Combined Plant Sound Level at 10 m					**78.6**

De-Watering of Foundation Excavations

On account of the nature of the Site it is likely that excavated foundations that do not receive a concrete pour on the day of excavation would need to be de-watered overnight in order to prevent them filling with water and collapsing. This would require the overnight operation of pump(s) and associated generator or diesel power pack. The likely equipment required for this stage is presented in Table A10.5.

Table A10.5: Equipment for De-watering of Foundation Excavations

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
Diesel Surface Water Pump	8.22	71	1	100	71.0

Assembly of Turbine

It is anticipated that the turbine components would be delivered to the Site in assemblies that are primarily bolted together, however some welding operations may be necessary. It is assumed that two cranes would be required; a 600 t crane and a 150 t crane. Besides this there would be specialised abnormal load delivery lorries and additional items may include a modest generator and hand tools. The likely equipment required for this stage is presented in Table A10.6.

Table A10.6: Equipment for Turbine Assembly

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
Crane 600 t (lifting)	4.50	71	1	25	65.0
Crane 600 t (idling)	4.51	66	1	75	64.8
Crane 150 t	3.28	67	1	100	67.0
Lorry	2.34	80	2	10	73.0
Generator	3.32	73	1	100	73.0
Welder	3.31	73	1	10	63.0
Hand Tools	4.69	85	1	25	79.0
Combined Plant Sound Level at 10 m					**81.2**

Cable Laying

These works would require modest excavation trenching works and consequently it is likely that this work would be undertaken simultaneously with the preparation of the on-site access tracks, as they would predominantly follow the access routes.

Forestry / sapling clearance.

Table A10.7: Equipment for Turbine Assembly

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
Petrol Chainsaw	D.2.14	86	1	100	86

Noise levels at distances representative of those between construction activities and receptor locations have been predicted based on distance propagation only (the actual levels are likely to be lower due to air absorption, ground absorption and topographical screening). Flat topography with sources at 2 m height and receivers at 1.5 m height have been used in predictions.

Auchencairn Forest Wind Turbine Prediction

The candidate machine used within the Auchencarn Forest Wind Farm ES is the Acciona Wind Power AW82[3]. The noise data used within the cumulative assessment to represent wind turbine noise is presented in Tables A10.8 based on test data plus uncertainty value. Noise emissions for 7 m/s upwards have been predicted at the same noise levels.

Table 10.11: Acciona Wind Turbine Noise Emission Data (80m hub height)

Wind Speed m/s	Octave Frequency Band (Hz) Noise Level dB(A)								Sound Power L_{WA} dB(A)
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*	
6	78.8	88.6	95.2	97.9	97.5	92.2	84.6	72.9	102.5
7	72.8	84.7	90.4	92.9	93.2	86.7	79.5	65.8	72.1

[3] WindTest, report WT 5489/06 (extract from WT 5483/06), December 2006

Appendix 10.2: Wind Speed Modelling

Appendix 10.2 Wind Speed Modelling

In order to establish the comparative wind speeds at Blackwood and Dalswinton at a particular time, a model of wind speeds across the two wind farm areas has been constructed using WAsP[1] running in WindPRO[2].

The modelling has been undertaken for wind speeds form 0.5m/s to 29.5m/s at 1m/s intervals, and this has been completed for wind directions from 0.5 degrees to 359.5 degrees at 1 degree intervals. Assumptions used within the model are listed as follows:

- Digital terrain map based on OS 10m contours;
- Roughness data created from map views and site visit;
- Dalswinton assumed to be populated with Repower MM82 2.0MW turbines, hub height 80m on the as built locations;
- Dalswinton average output assumed to be 64GWh per year, net (highest figure recorded since operations began); and
- Blackwood populated with Repower MM82 2.05MW turbines for the purposes of assessment.

The results of the modelling indicate that on average, simultaneous wind speed variance between Blackwood and Dalswinton is around +/- 0.2 m/s for the turbine operating range. The maximum variances have been modelled as +/- 1.0m/s.

A summary of differences in wind speeds at each location is presented in the table below.

Freestream upwind hub-height windspeed (m/s)	Wind Direction (Degrees)	Mean hub-height windspeed at Blackwood (m/s)	Mean hub-height windspeed at Dalswinton (m/s	Difference (Dalswinton minus Blackwood) (m/s)
5.5	0.5	5.15	5.26	0.11
	45.5	5.11	5.14	0.03
	90.5	5.25	4.85	-0.4
	135.5	5.23	5.15	-0.08
	180.5	5.12	5.26	0.14
	225.5	5.5	5.1	-0.4
	270.5	5.42	4.94	-0.48
	315.5	5.23	5.18	-0.05
6.5	0.5	6.1	6.22	0.12
	45.5	6.05	6.09	0.04
	90.5	6.22	5.75	-0.47
	135.5	6.18	6.1	-0.08
	180.5	6.07	6.22	0.15
	225.5	6.5	6.03	-0.47
	270.5	6.41	5.86	-0.55
	315.5	6.19	6.13	-0.06
7.5	0.5	7.05	7.18	0.13
	45.5	6.99	7.03	0.04
	90.5	7.18	6.64	-0.54
	135.5	7.14	7.04	-0.1
	180.5	7.01	7.19	0.18

[1] http://www.wasp.dk - accessed 01/02/2012
[2] http://www.windpro.dk - accessed 01/02/2012

Freestream upwind hub-height windspeed (m/s)	Wind Direction (Degrees)	Mean hub-height windspeed at Blackwood (m/s)	Mean hub-height windspeed at Dalswinton (m/s	Difference (Dalswinton minus Blackwood) (m/s)
	225.5	7.5	6.96	-0.54
	270.5	7.4	6.77	-0.63
	315.5	7.14	7.08	-0.06
8.5	0.5	8.02	8.16	0.14
	45.5	7.95	8.01	0.06
	90.5	8.15	7.59	-0.56
	135.5	8.12	8.02	-0.1
	180.5	7.97	8.17	0.2
	225.5	8.5	7.93	-0.57
	270.5	8.4	7.73	-0.67
	315.5	8.13	8.05	-0.08
9.5	0.5	9.01	9.16	0.15
	45.5	8.94	9.02	0.08
	90.5	9.15	8.6	-0.55
	135.5	9.13	9.02	-0.11
	180.5	8.96	9.17	0.21
	225.5	9.5	8.94	-0.56
	270.5	9.4	8.73	-0.67
	315.5	9.14	9.06	-0.08
10.5	0.5	10.3	10.18	-0.12
	45.5	9.96	10.03	0.07
	90.5	10.15	9.62	-0.53
	135.5	10.15	10.04	-0.11
	180.5	9.98	10.18	0.2
	225.5	10.5	9.96	-0.54
	270.5	10.4	9.75	-0.65
	315.5	10.16	10.08	-0.08
11.5	0.5	11.05	11.19	0.14
	45.5	10.98	11.06	0.08
	90.5	11.17	10.66	-0.51
	135.5	11.17	11.06	-0.11
	180.5	11	11.2	0.2
	225.5	11.5	10.99	-0.51
	270.5	11.41	10.79	-0.62
	315.5	11.18	11.1	-0.08

Appendix 10.3: Noise Survey Photographs

Figure A10.3.1 Noise monitoring location at High Auldgirth

Figure A10.3.2 Noise monitoring location at Shieldhill

Appendix 10.4: Calibration Certificates

Certificate for Rion Sound Level Meter located at High Auldgirth

Acoustic Calibration Services Limited,
Unit 6F, Diamond Industrial Centre,
Works Road, Letchworth Garden City,
Hertfordshire SG6 1LW

Tel: 01462-610085/87 Fax: 01462-610087
e-mail: cal@acousticcalibration.co.uk
web: www.acousticcalibration.co.uk

ACSL
Acoustic Calibration Services Limited

CERTIFICATE OF CALIBRATION

Model: Rion NL-32 **Serial No:** 00503254

Organisation: RSK Environment Limited, 18 Frogmore Road, Hemel Hempstead Hertfordshire HP3 9RT

Job Number: 1984 **Customer Order Reference:** G Youn

The Sound Level Meter was assessed for conformance with International Standards *IEC 60651* and *IEC 60804* using test procedures described in *BS 7580* Part 1. The meter claims Type 1 accuracy conformance and it was against these requirements that all the results were evaluated.

The sound level meter was fitted with a Rion UC-53A measurement microphone Serial No. 316659 and a Rion NH-21 preamplifier Serial No. 32868. The microphone has a nominal capacitance of 12 pF and the device used to apply electrical signals to the preamplifier was of the same nominal capacitance.

A Cirrus CR:511E Acoustic Calibrator Serial No: 037732 was supplied with the meter and was utilised in establishing the initial acoustic calibration setting.

The sound level meter passed all applied tests with no deviations from Type 1 specification, in accordance with *IEC 60651* and *IEC 60804*. Accordingly, the meter meets the requirements of *BS 7580* Part 1.

The sound level meter should be set to read 93.8dB when used with the associated acoustic calibrator, microphone and preamplifier as detailed above at reference atmospheric pressure.

All ACSL's calibration instrumentation is fully traceable to National Standards. The acoustic references are calibrated by laboratories which are UKAS accredited for the purpose.

Certificate No: **13775**
Date of Issue: **9th August 2011**

Signature: T.J. Lewis
Print Name: **Trevor Lewis**

Registered Office: HW Associates, Portmill House, Portmill Lane, Hitchin, Hertfordshire SG5 1DJ
Registered No: 4143457 VAT No: GB 770505441
Directors: Trevor J Lewis, Owen R Clingan MIOA

Certificate for Rion Sound Level Meter located at Shield Hill

Acoustic Calibration Services Limited,
Unit 6F, Diamond Industrial Centre,
Works Road, Letchworth Garden City,
Hertfordshire SG6 1LW

Tel: 01462-610085/87 Fax: 01462-610087
e-mail: cal@acousticcalibration.co.uk
web: www.acousticcalibration.co.uk

ACSL
Acoustic Calibration Services Limited

CERTIFICATE OF CALIBRATION

Model: Rion NL-32 **Serial No:** 00503257

Organisation: RSK Environment Limited, 18 Frogmore Road, Hemel Hempstead Hertfordshire HP3 9RT

Job Number: 1984 **Customer Order Reference:** G Youn

The Sound Level Meter was assessed for conformance with International Standards *IEC 60651* and *IEC 60804* using test procedures described in *BS 7580* Part 1. The meter claims Type 1 accuracy conformance and it was against these requirements that all the results were evaluated.

The sound level meter was fitted with a Rion UC-53A measurement microphone Serial No. 316658 and a Rion NH-21 preamplifier Serial No. 32867. The microphone has a nominal capacitance of 12 pF and the device used to apply electrical signals to the preamplifier was of the same nominal capacitance.

A Cirrus CR:511E Acoustic Calibrator Serial No: 037732 was supplied with the meter and was utilised in establishing the initial acoustic calibration setting.

The sound level meter passed all applied tests with no deviations from Type 1 specification, in accordance with *IEC 60651* and *IEC 60804*. Accordingly, the meter meets the requirements of *BS 7580* Part 1.

The sound level meter should be set to read 93.8dB when used with the associated acoustic calibrator, microphone and preamplifier as detailed above at reference atmospheric pressure.

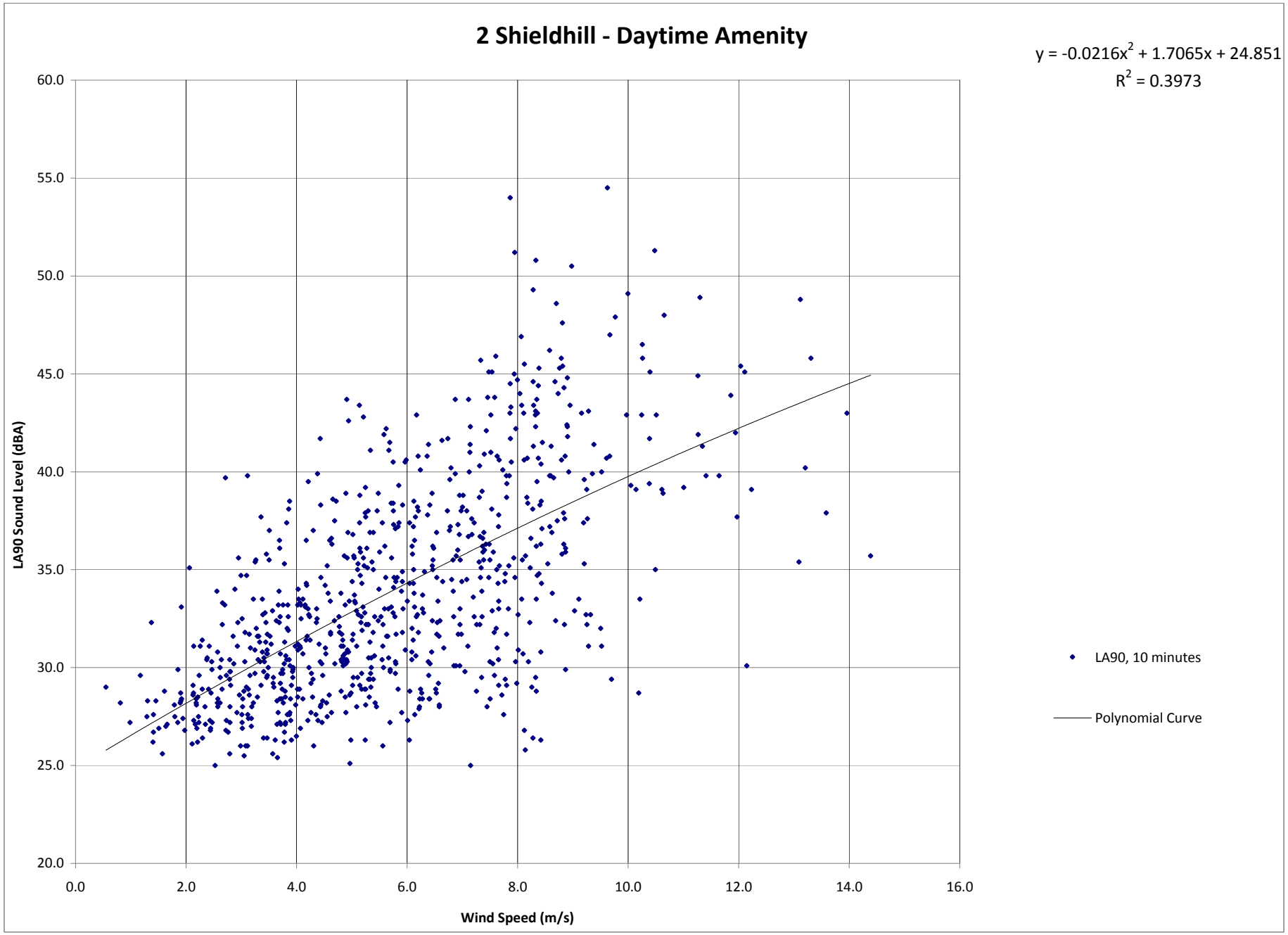
All ACSL's calibration instrumentation is fully traceable to National Standards. The acoustic references are calibrated by laboratories which are UKAS accredited for the purpose.

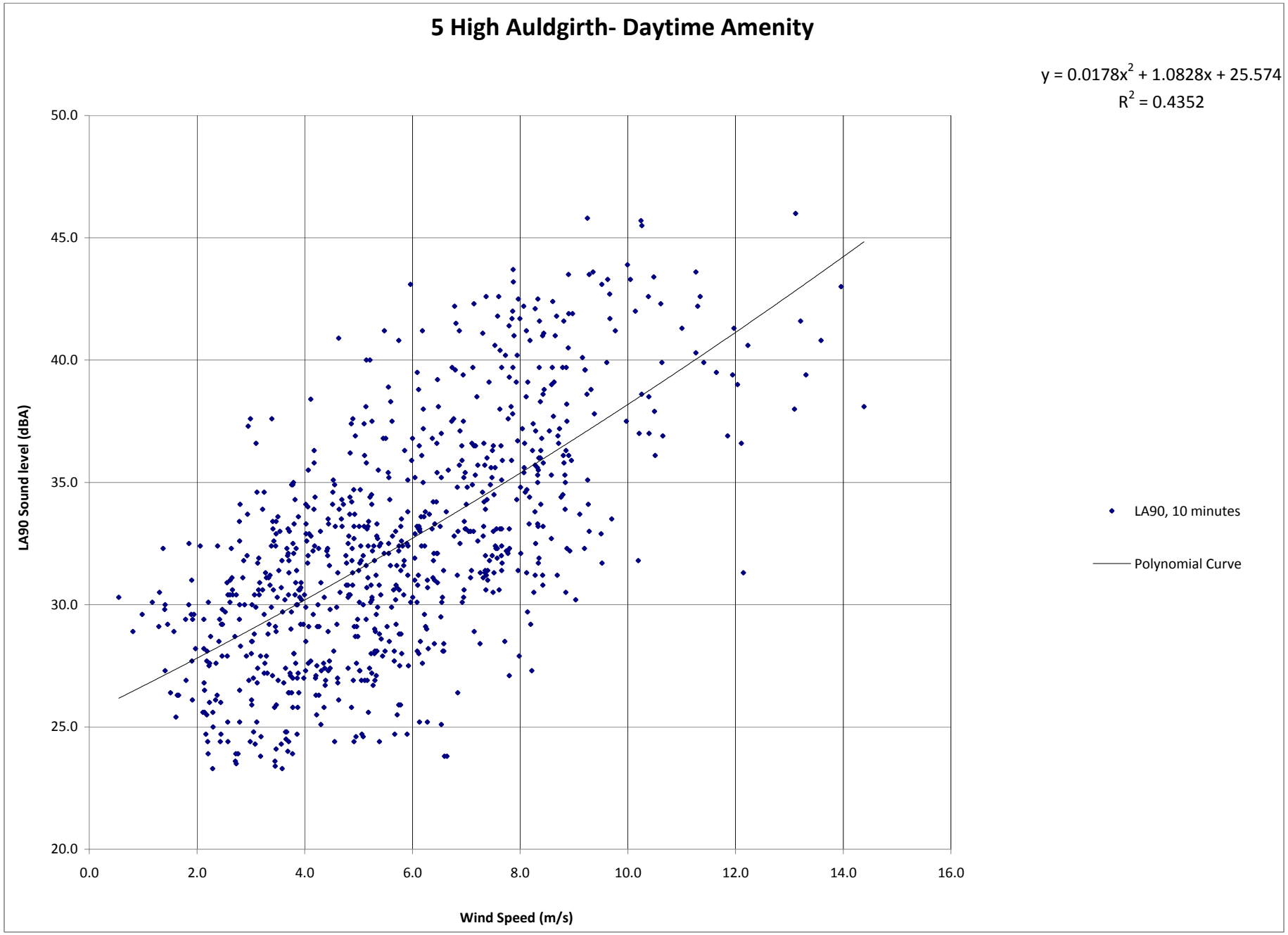
Certificate No: **13773**
Date of Issue: **8th August 2011**

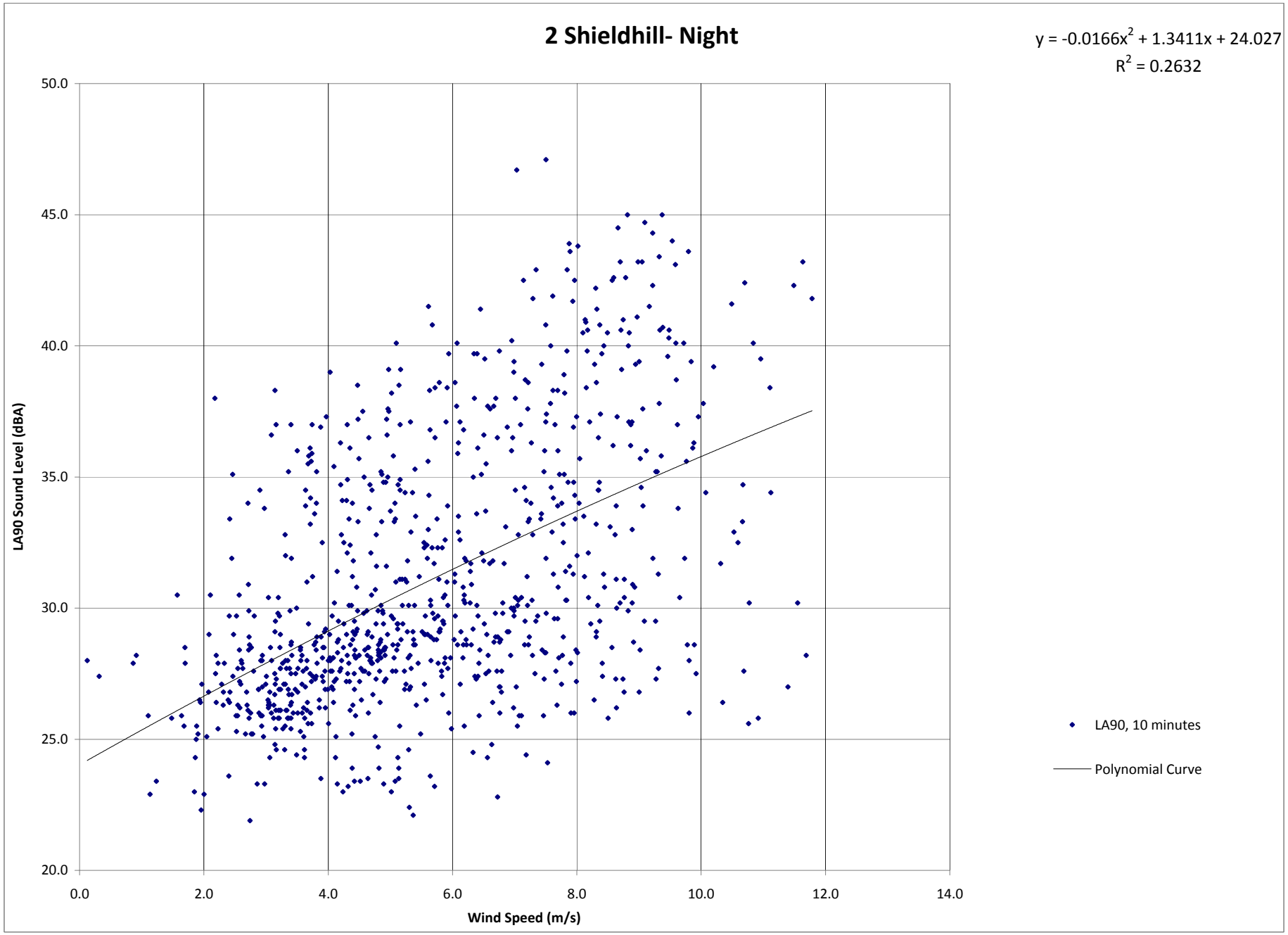
Signature: 
Print Name: **Trevor Lewis**

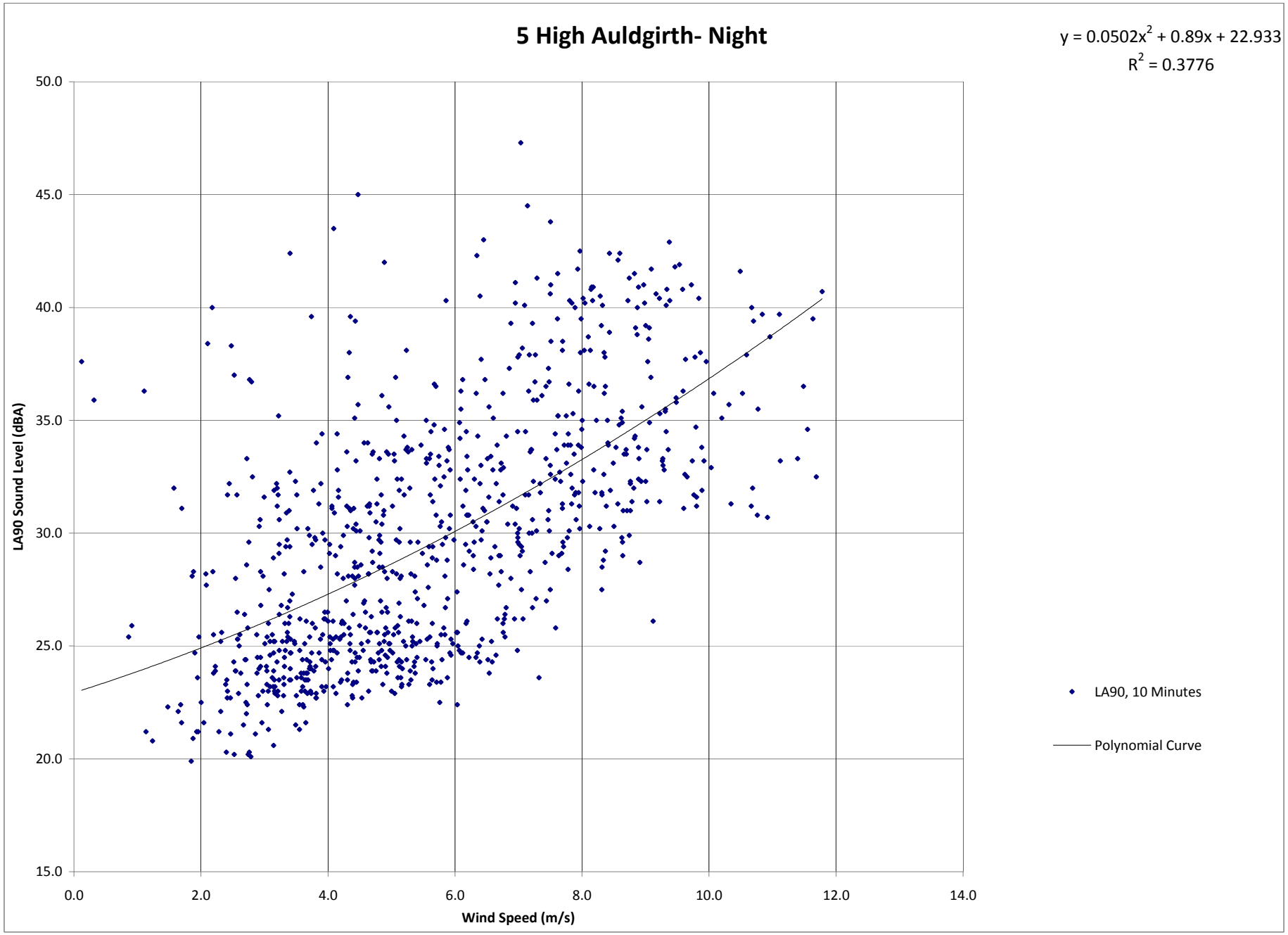
Registered Office: HW Associates, Portmill House, Portmill Lane, Hitchin, Hertfordshire SG5 1DJ
Registered No: 4143457 VAT No: GB 770505441
Directors: Trevor J Lewis, Owen R Clingan MIOA

Appendix 10.5: Regression Curves from Noise and Wind Data


2 Shieldhill - Daytime Amenity
y = -0.0216x2 + 1.7065x + 24.851
R2 = 0.3973
LA90 Sound Level (dBA)
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Wind Speed (m/s)
LA90, 10 minutes
Polynomial Curve

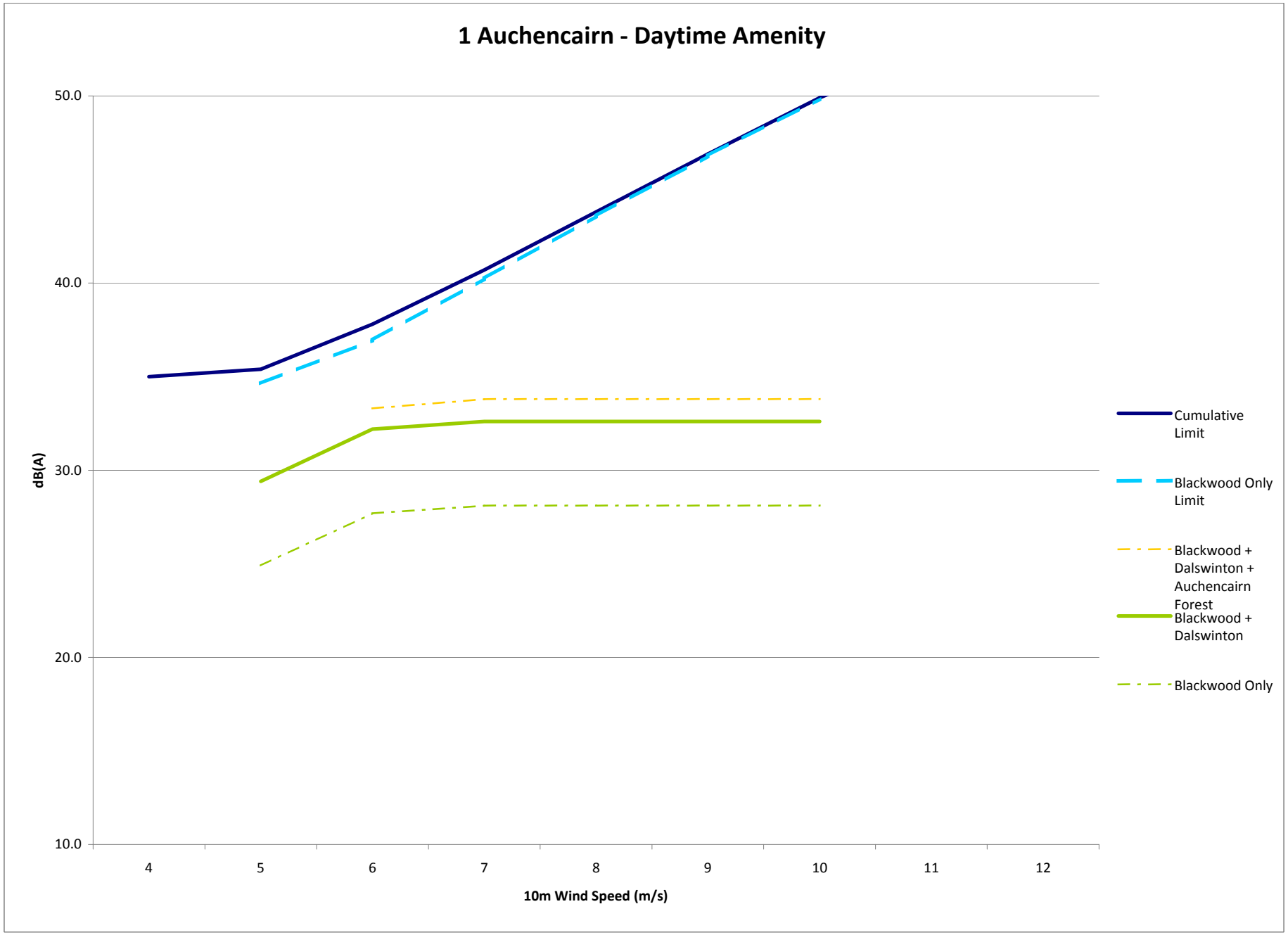

5 High Auldgirth- Daytime Amenity
y = 0.0178x2 + 1.0828x + 25.574
R2 = 0.4352
LA90 Sound level (dBA)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Wind Speed (m/s)
LA90, 10 minutes
Polynomial Curve

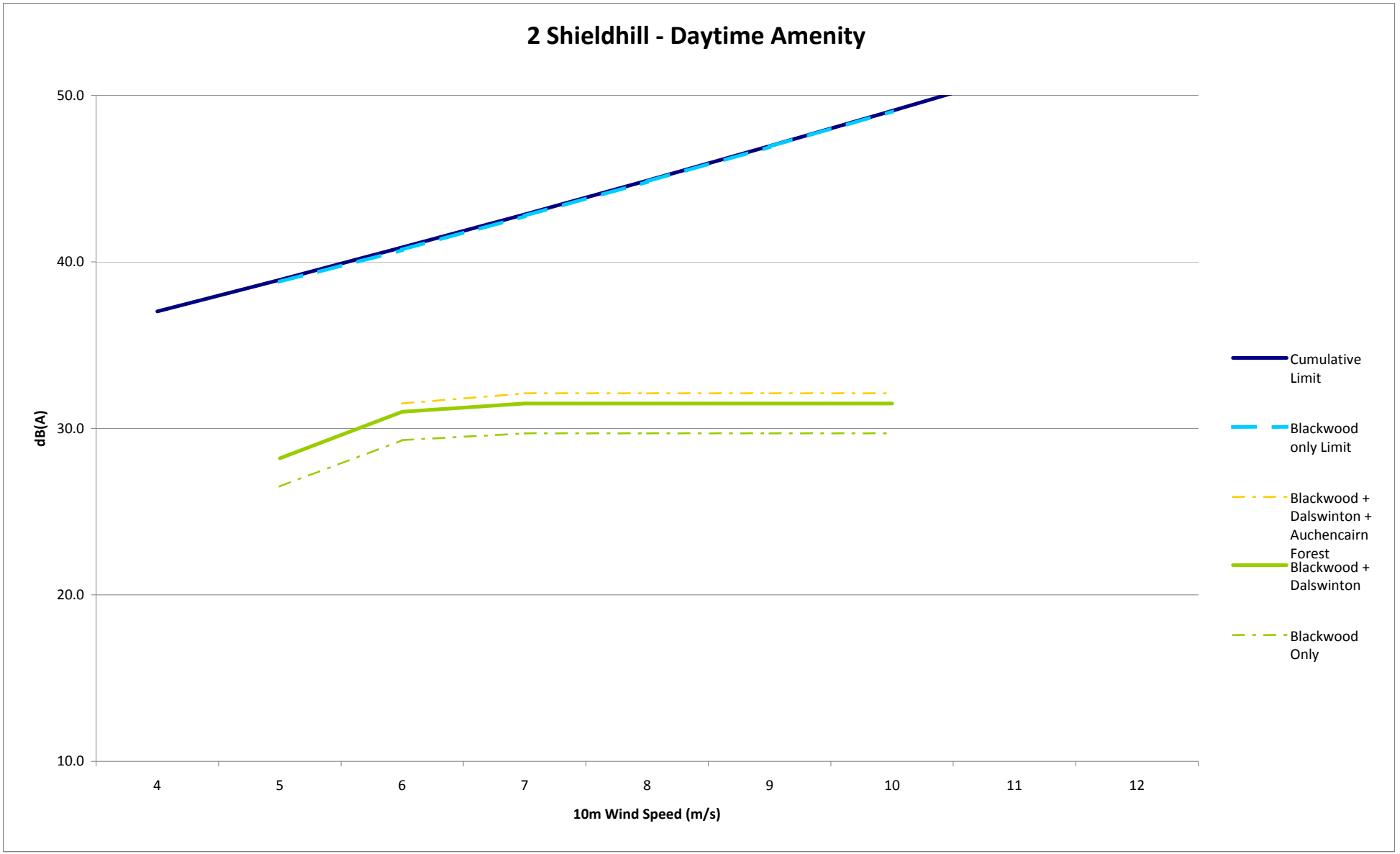

2 Shieldhill- Night
y = -0.0166x2 + 1.3411x + 24.027
R2 = 0.2632
LA90 Sound Level (dBA)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Wind Speed (m/s)
LA90, 10 minutes
Polynomial Curve

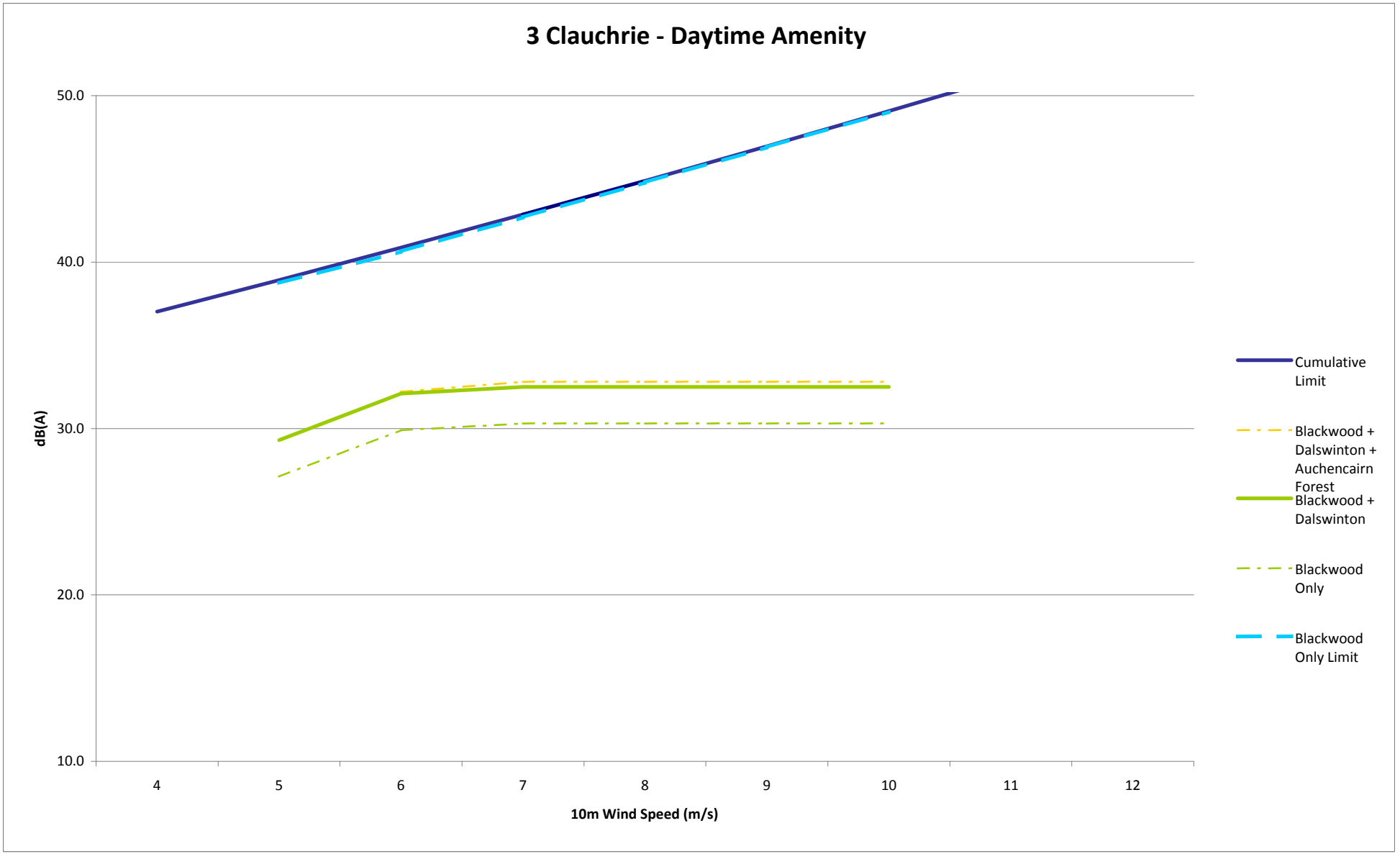

5 High Auldgirth- Night
y = 0.0502x2 + 0.89x + 22.933
R2 = 0.3776
LA90 Sound Level (dBA)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Wind Speed (m/s)
LA90, 10 Minutes
Polynomial Curve

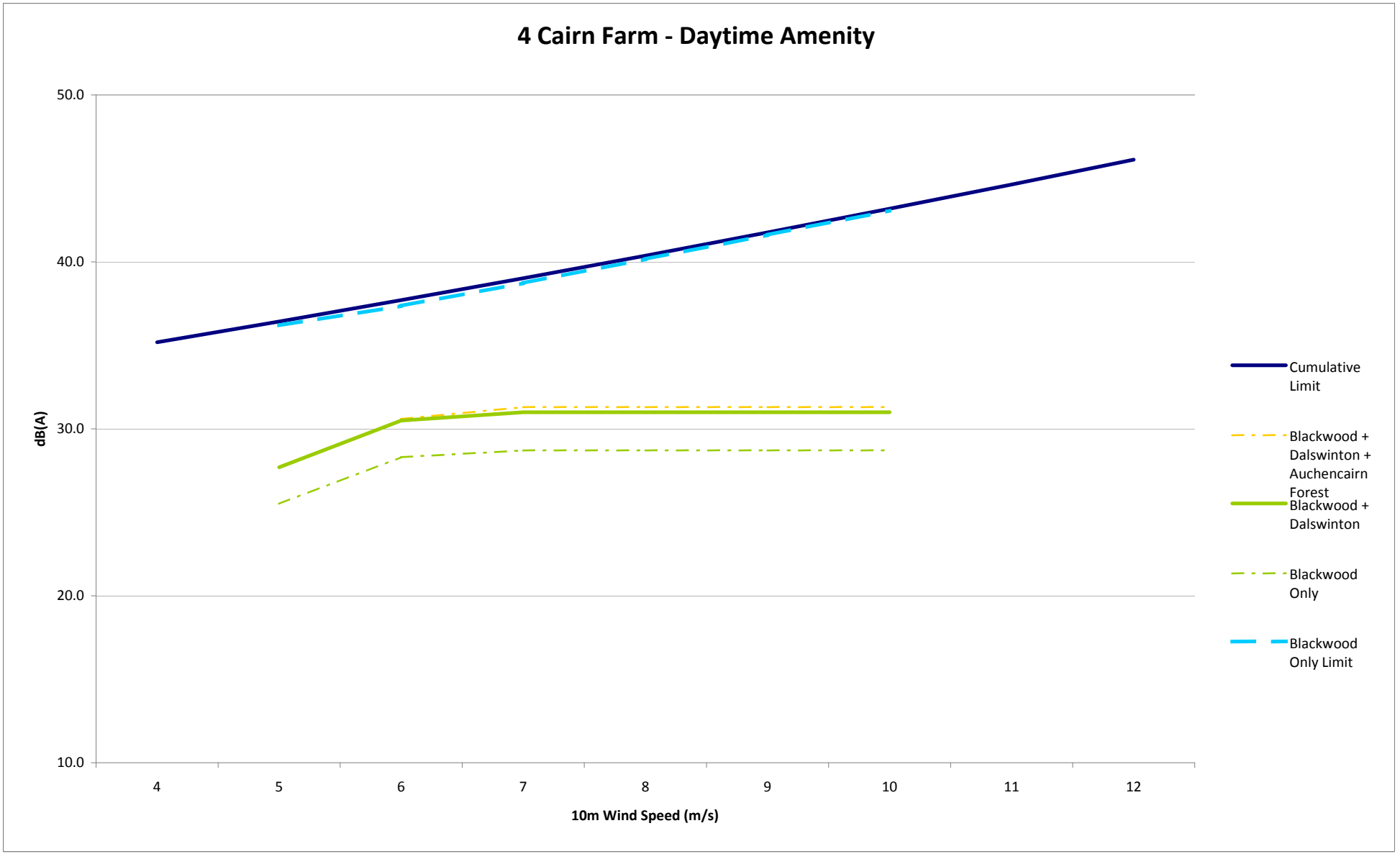
Appendix 10.6: Noise Assessment Graphs

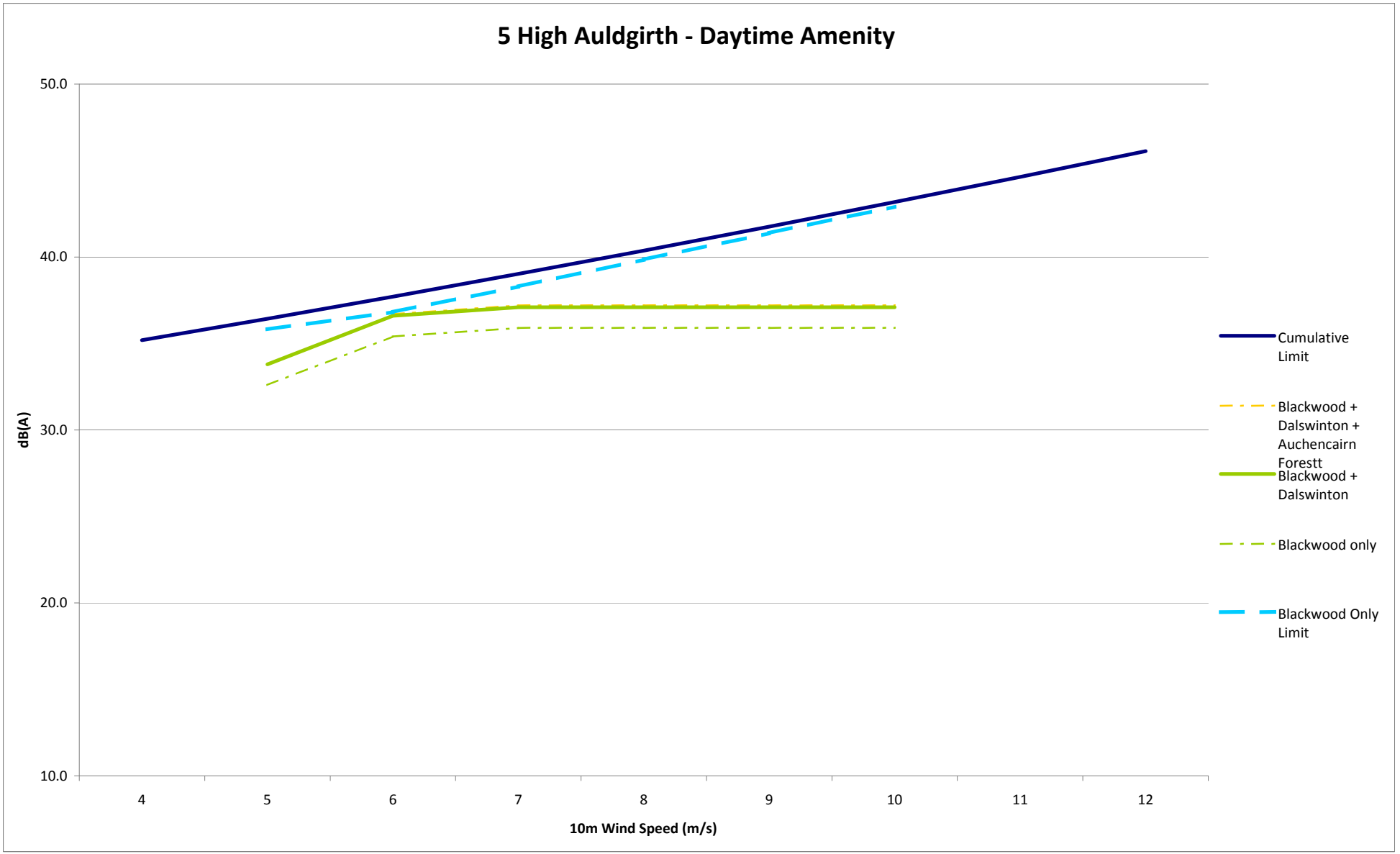
Daytime Amenity

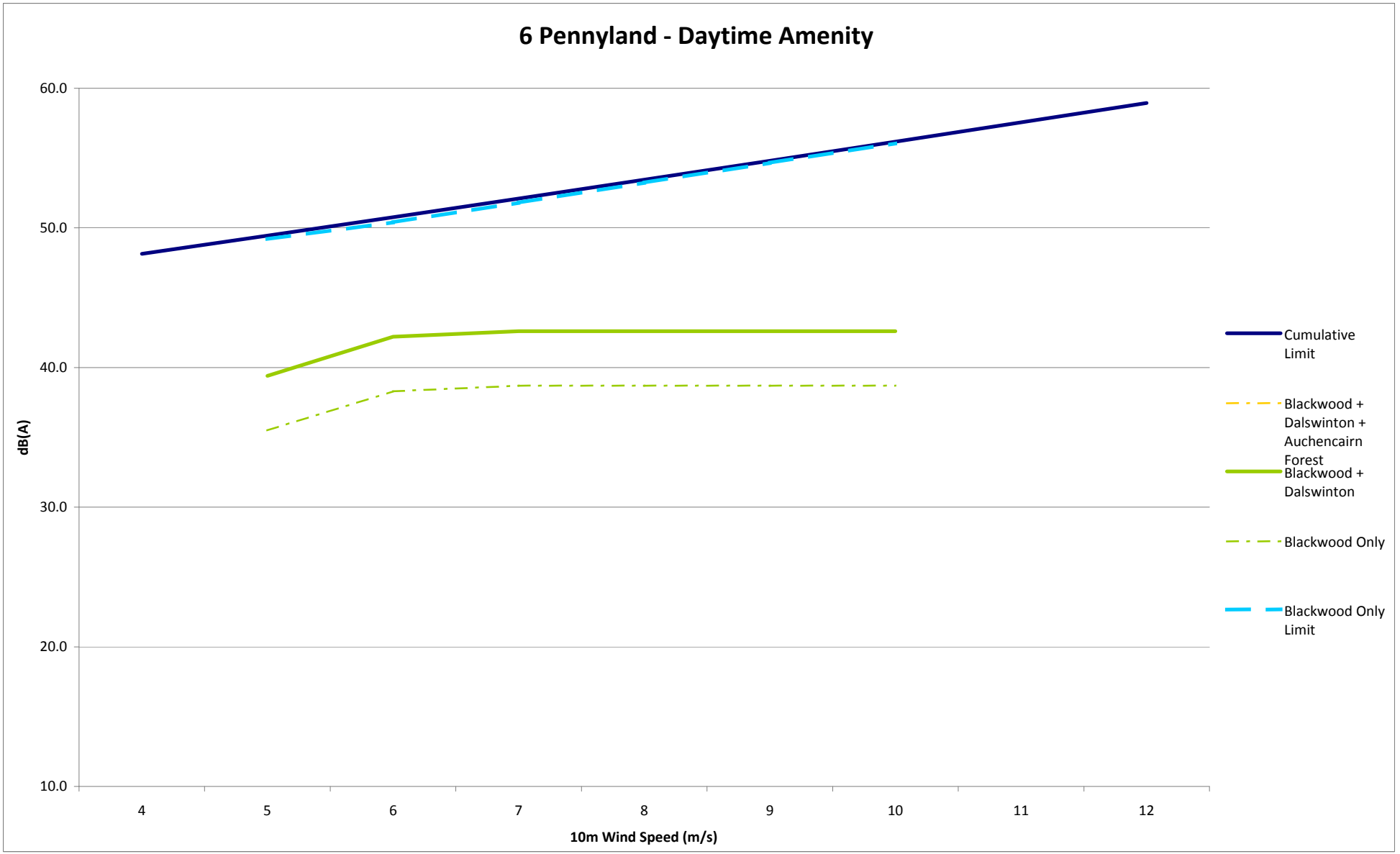


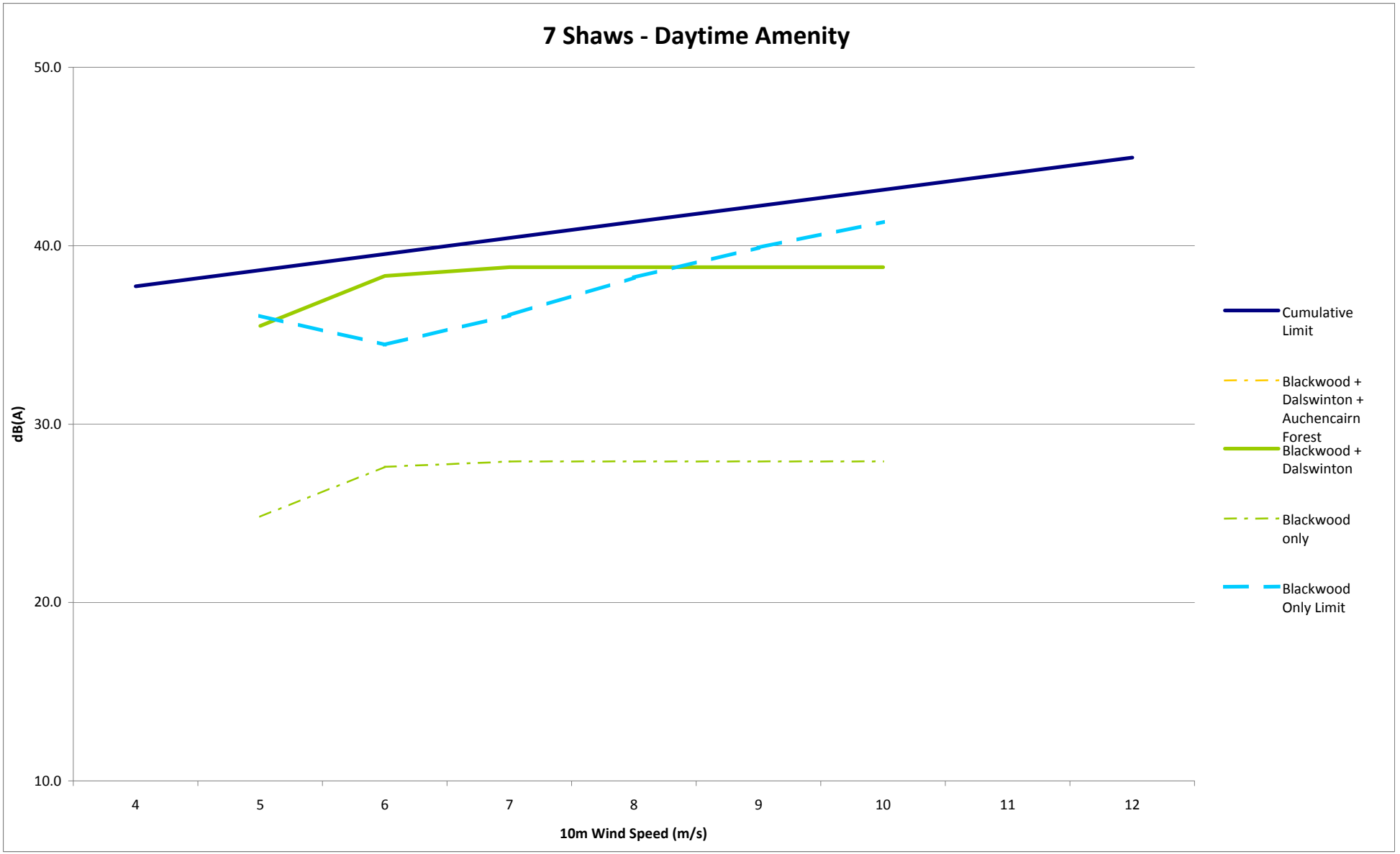

2 Shieldhill - Daytime Amenity
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood only Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only

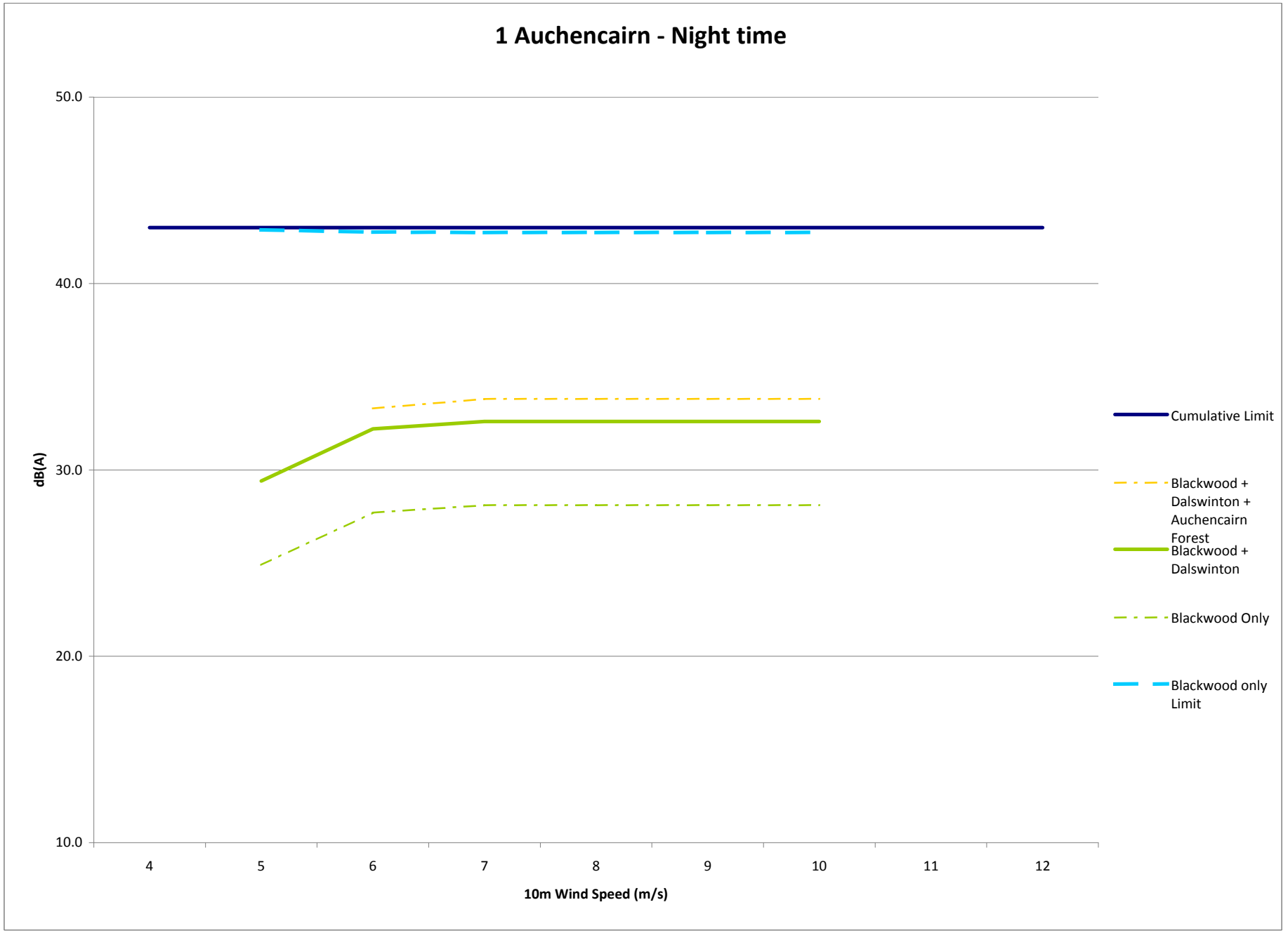

3 Clauchrie - Daytime Amenity
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit

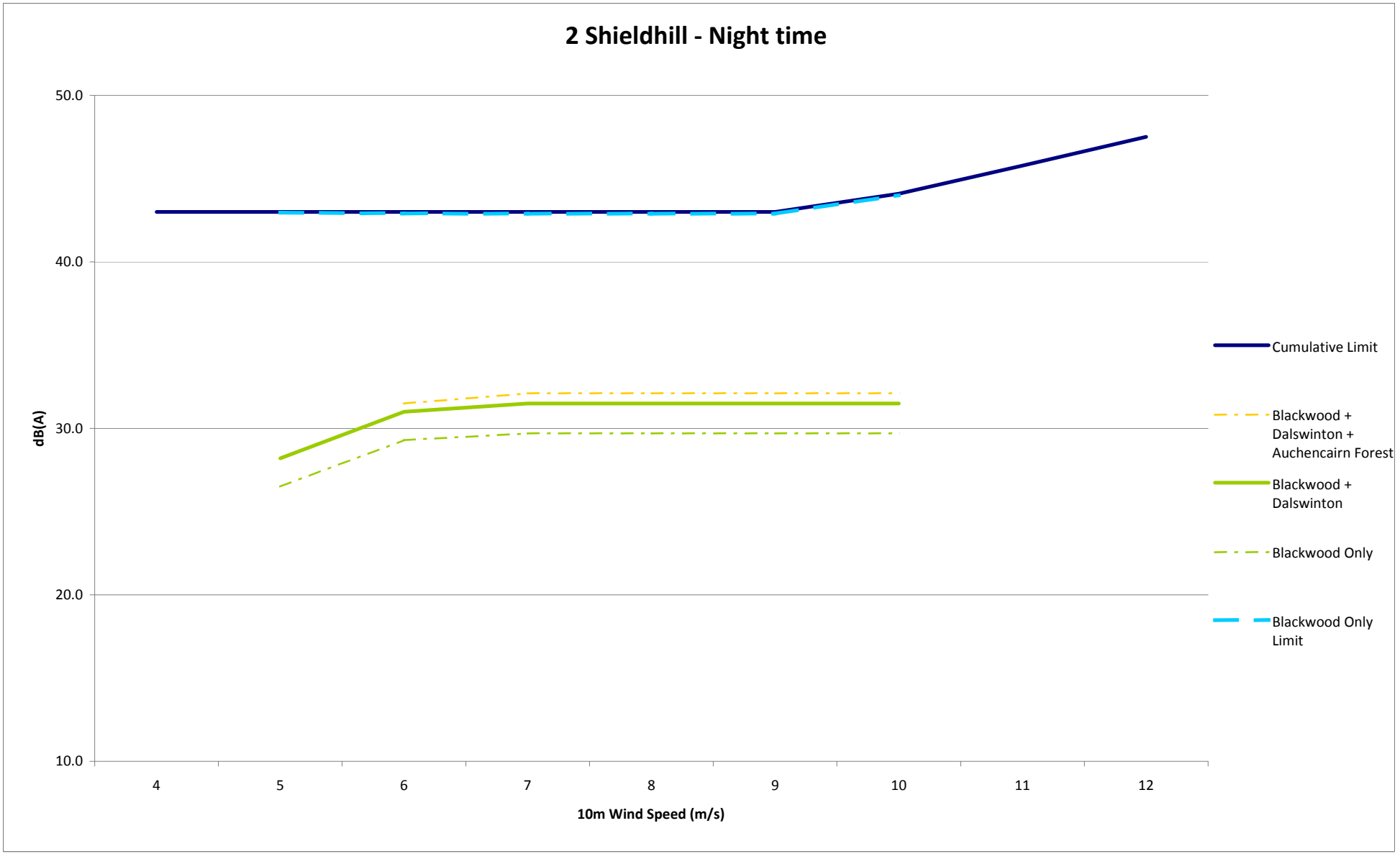

4 Cairn Farm - Daytime Amenity
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit

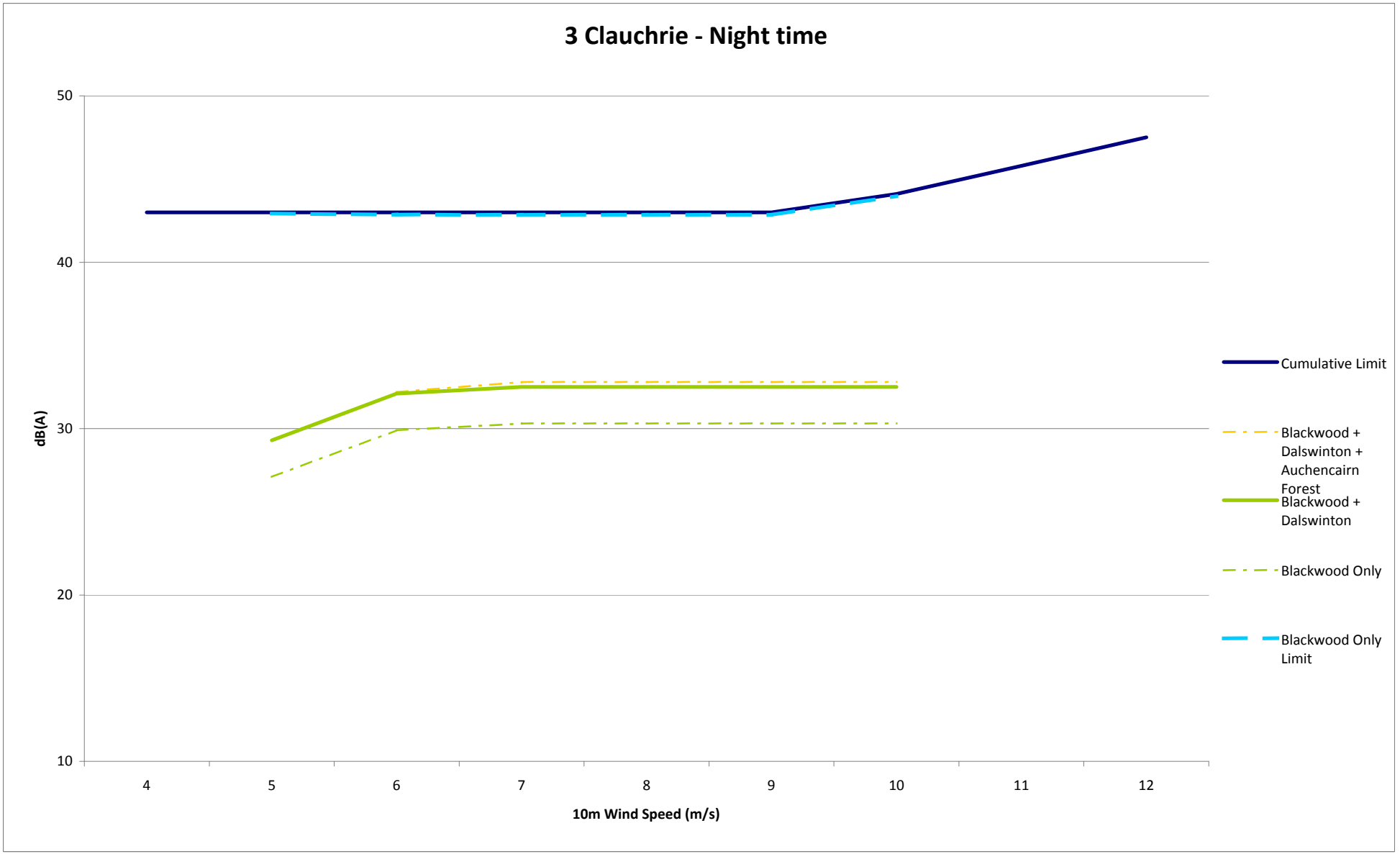

5 High Auldgirth - Daytime Amenity
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forestt
Blackwood + Dalswinton
Blackwood only
Blackwood Only Limit

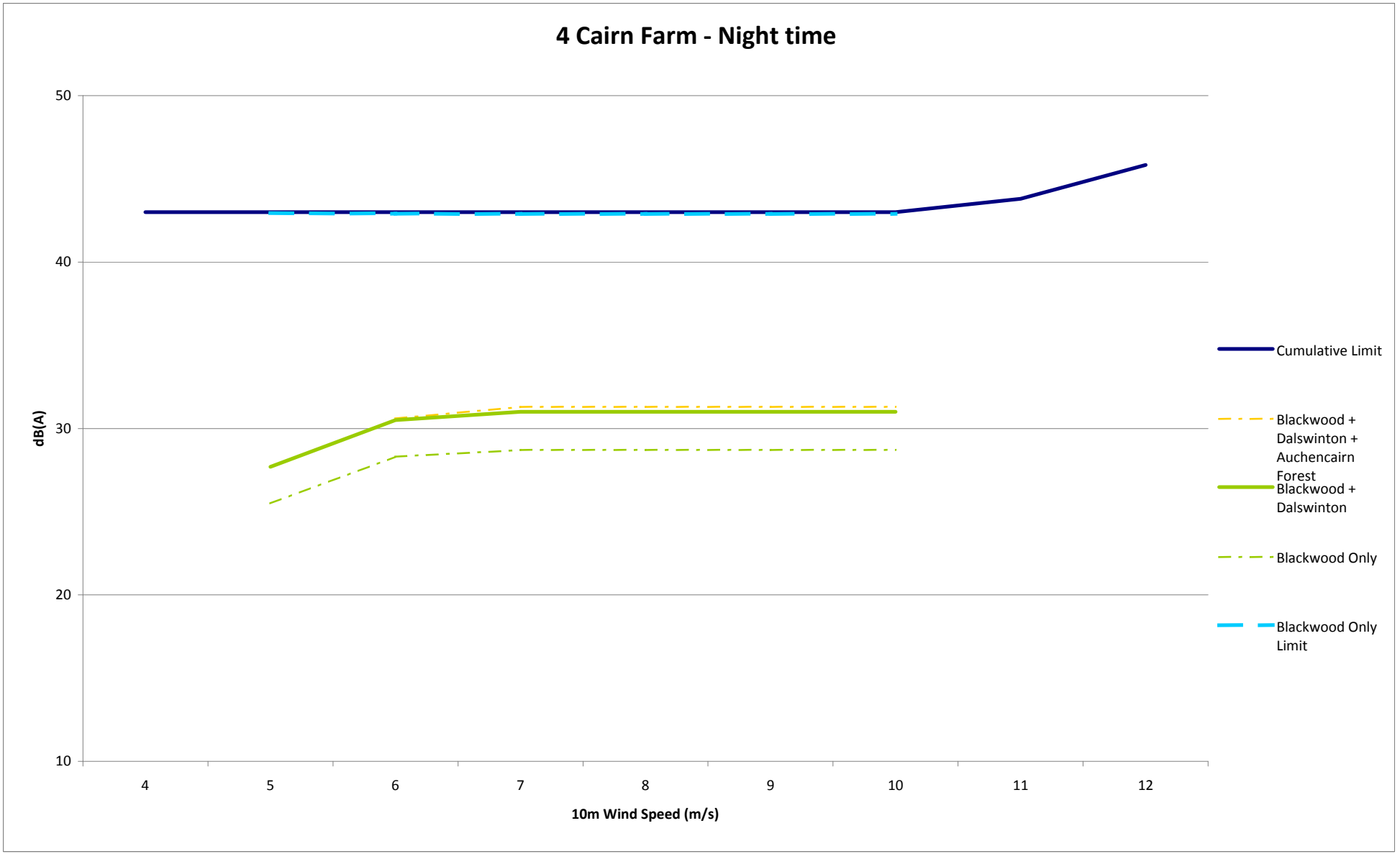

6 Pennyland - Daytime Amenity
60.0
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit

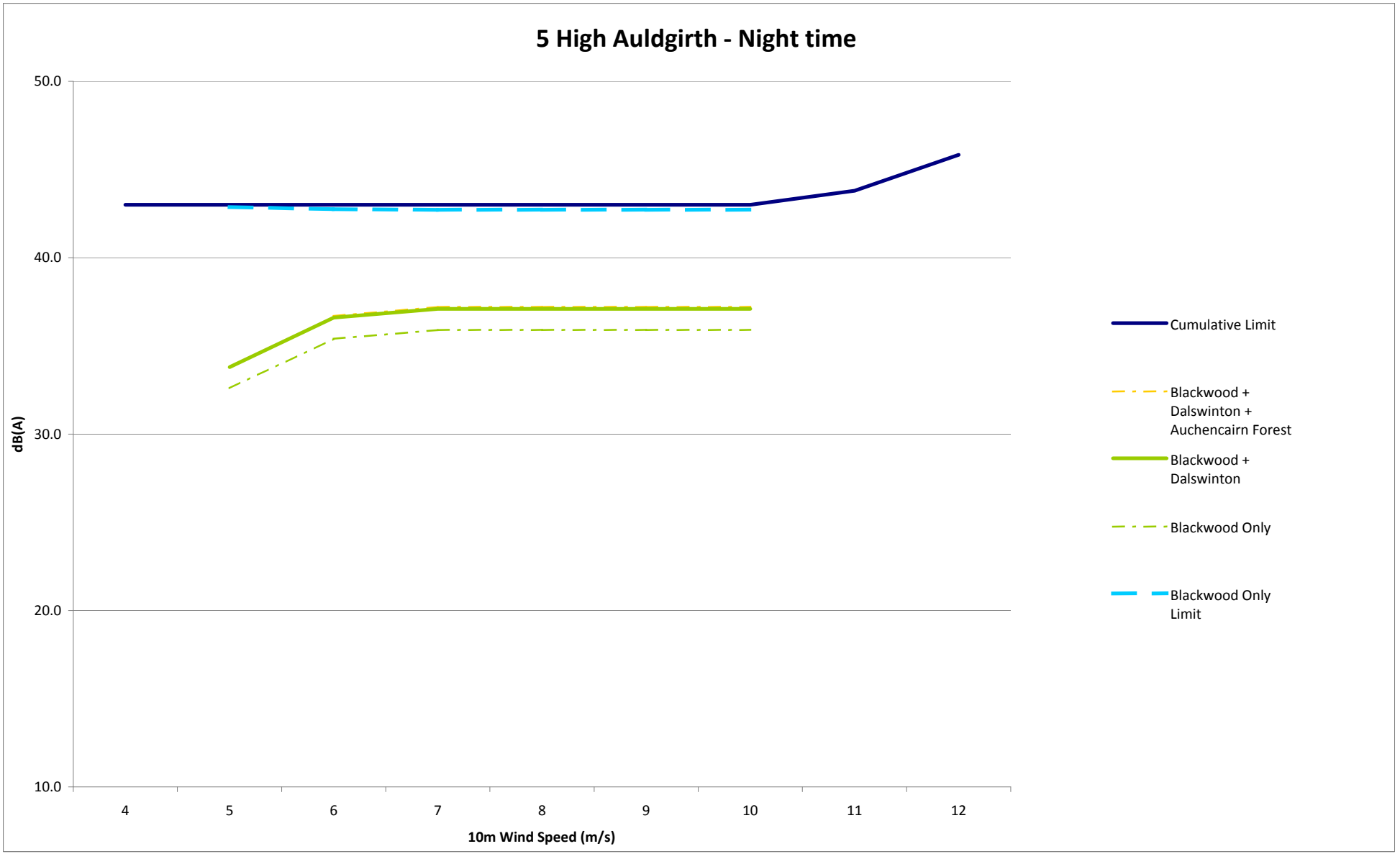

7 Shaws - Daytime Amenity
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood only
Blackwood Only Limit

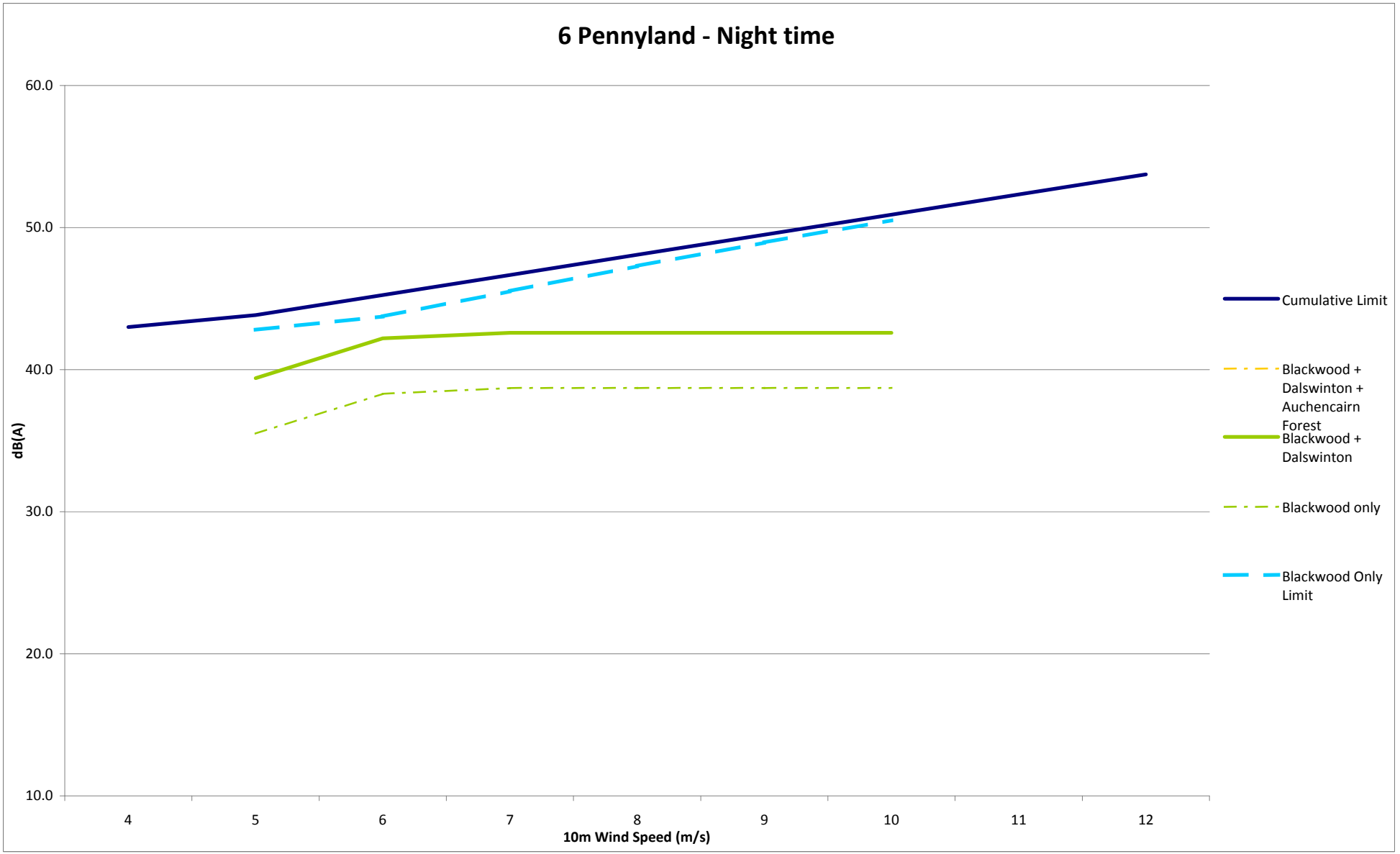

1 Auchencairn - Night time
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood only Limit

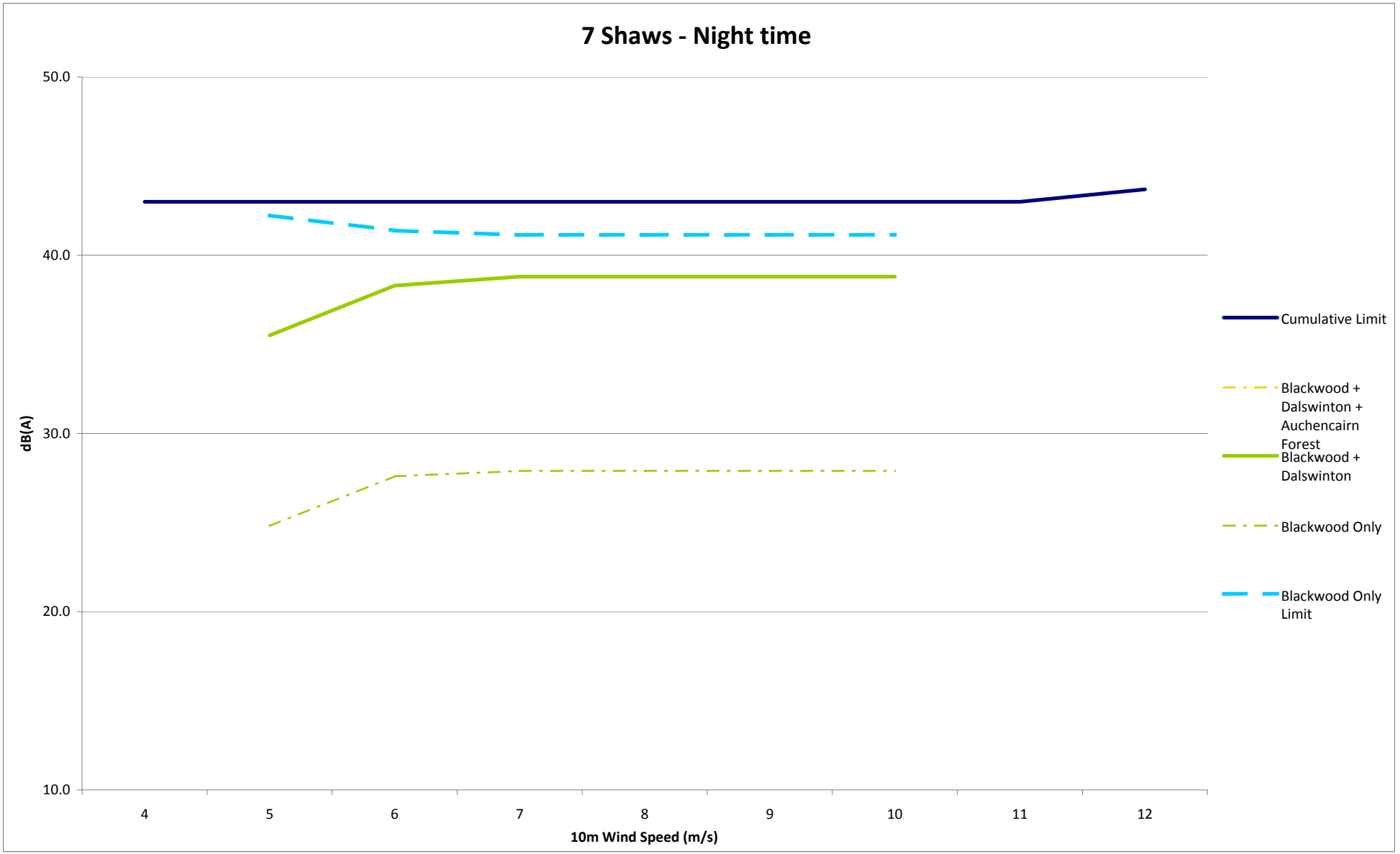

2 Shieldhill - Night time
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit


3 Clauchrie - Night time
50
40
30
20
10
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit


4 Cairn Farm - Night time
50
40
30
20
10
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit


5 High Auldgirth - Night time
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit


6 Pennyland - Night time
60.0
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood only
Blackwood Only Limit


7 Shaws - Night time
50.0
40.0
30.0
20.0
10.0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Cumulative Limit
Blackwood + Dalswinton + Auchencairn Forest
Blackwood + Dalswinton
Blackwood Only
Blackwood Only Limit

APPENDIX 11
TRANSPORT AND ACCESS

Appendix 11.1: Access Study

Force 9 Energy

Blackwood Wind Farm, Near Auldgirth
Dumfries

Site Access Route Review

December 2010

Prepared for:
Force 9 Energy
Woodside House
20-23 Woodside Place
Glasgow
G3 7QF

Prepared by:
Grontmij
Spectrum House
2 Powderhall Road
Edinburgh
EH7 4GB

T +44 (0)131 550 6300
F +44 (0)131 550 6499
E enquiries.uk@grontmij.co.uk

Report Status: Final

Job No: 106008

	Name	Signature	Date
Prepared By:	Allan Mason		January 2011
Checked By:	Alastair Lewis		January 2011
Approved By:	Michael Tavern		January 2011

Appendix A: Site Access Route
Appendix B: Swept Path Analysis Drawings

1 INTRODUCTION

1.1 Background

In October 2010 Grontmij were commissioned by Force 9 Energy to provide a high level review on the viability of site access routes, via the public highway corridor and private land, to a proposed wind farm development site at Blackwood, near High Auldgirth, Dumfries.

This report will review the client identified routes and will include a high level budget cost estimate for each route option considered.

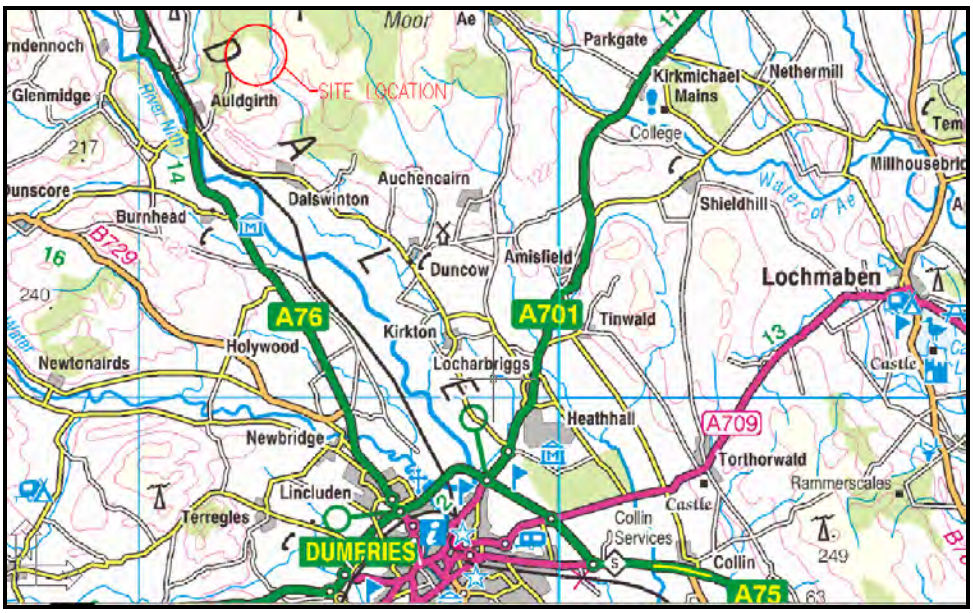
The findings of this report will be used to outline the key constraints, areas of significant engineering works and recommendations for future works for each of the identified routes.

1.2 Site Location

The proposed development site is located at High Auldgirth, approximately 16km North West of Dumfries, Scotland. **Figure 1.1** illustrates the site location.

The National Grid Reference for the site centre is approximately 292500E, 587500N.

Figure 1.1 Site Location



1.3 Client Supplied Information

The following information was supplied by the client to assist with the required access study:

- Identified route (labelled ‘Route 1’ in this report).
- Land Ownership Plan

2 ROUTE REVIEW METHODOLOGY

2.1 Introduction

This chapter describes the methods and concepts used when examining the potential access routes to the boundary of the proposed wind farm site. The proposal includes alternative access routes to the site along with budget costings for each option. The impact on the immediate surrounding environment (ie public highway corridor or adjacent land) was considered when reviewing the access routes. It should be noted that this is a 'high level' report and it is recommended that where there is a likely requirement for additional works a topographical survey, or drive through by an experienced haulage contractor is undertaken to enable a more detailed review to be undertaken.

The Grontmij brief included the following work items, all of which will be addressed in this report:

- Examine site access routes as identified by client and identify constraints along each route.
- Review alternative access routes and identify constraints.
- Budget costings for each access option.

2.2 Methodology

The strategic route review involved a detailed site visit along the client identified delivery route (Access Route 1) in order to identify the geometric and topographical constraints that would impact on the manoeuvring of the turbine delivery vehicles. A further, similar, review was then undertaken on 'Access Route 2' to check suitability. The routes are shown on drawing **106008/BW/001**.

From this it became apparent that access through Low Auldgirth is highly constrained and therefore not considered an option due to the geometry of the existing road / track. The main constraint along this section is where the double 'switch back' bends are located to the west of Low Auldgirth **(plate 1).**

Plate 1: Looking East Toward 'Switchback' bend

As a result of this restriction it is likely that a new access track, by-passing the switchback bends will be required. This alternative is identified as 'Access Route 1' in this report. The alternative access was via the existing Dalswinton Wind Farm site to the east of the proposed site. This is identified as 'Access Route 2' in this report. These routes are indicated on drawing number **106008/BW/001** in **appendix A** and discussed in more detail in **Section 3** of this report.

2.3 Abnormal Loads and Construction Access

Wind turbine components are considered to be abnormal loads due to their size, weight and vehicle movement geometry. These loads are typically transported on specialist delivery vehicles by specialist delivery contractors. In Grontmij's experience the wind turbine blades typically prove to be the most onerous with regard to horizontal geometry and as such Grontmij have used this component when running swept path analysis models. On this basis the vehicle swept path analysis was completed using the following modelled vehicles :

- Typical delivery vehicle transporting a 45m long turbine blade.
- Typical delivery vehicle transporting a 40m long turbine blade
- Typical delivery vehicle transporting a 35m long turbine blade.
- Typical delivery vehicle transporting the nacelle section

It is recognised that actual delivery vehicles used by the appointed turbine component haulage contractor may vary from the modelled vehicles. Recommendation is therefore given that further modelling is undertaken by the haulage contractor upon appointment.

Where there is insufficient space, within the public road corridor and the modelled turbine blade delivery vehicle requires additional land take it is noted that further discussion may be required with 3rd party landowners.

The brief excluded modelling of the any construction plant however from our experience it is recognised that the turbine blade delivery is the most challenging, in terms of vehicle swept path analysis. In this instance no modelling of any construction plant has been undertaken.

The effect on public utilities and any required discussions were outwith the scope of this report. However where it is apparent (ie where overhead cables were visually noted present at the identified 'pinch' points) comments have been expanded to include likely works.

In order to minimise disruption to the road network the Highways Agency recommend that, where possible, abnormal loads are directed from the nearest suitable port facility. Presently no indication has been given on the receiving port. Given this has meant that the point of origin for the route review commences from Auldgirth on the A76 Trunk Road. This has been acknowledged by the client as the point of access from the existing highway infrastructure.

A check was undertaken on the vehicle swept path, at identified 'pinch' points along the route, to ensure turbines blades could also be removed from the site. The results of this are presented in Section 3 of this report.

The swept path analysis undertaken was prepared using Ordnance Survey mapping. The accuracy of this mapping information cannot be guaranteed and recommendation is given that localised topographical surveys are completed on the identified constraint points along the delivery routes.

3 SITE DELIVERY ROUTES

3.1 Access Route 1 – Client Identified Route

This is the route suggested by Force 9 Energy for the initial assessment and is shown on drawing **106008/BW/001** (included **in Appendix A**).

The route assessed is as follows:

- Commences at Auldgirth junction on A76 Trunk road.
- Heading north east through Auldgirth towards Low Auldgirth.
- Leaves existing track and progresses along proposed new access track to through field.
- Re-join existing track to South of High Auldgirth
- Follow existing track through High Auldgirth to the site boundary.

The delivery vehicle swept path modelling has indicated areas where works may be required to facilitate safe, unhindered access. These areas are examined further in this report and are presented in the drawings included in **Appendix B**.

The comments noted in this section of the report are based on the delivery of a 45 metre long turbine blade although drawing numbers **106008/BW/007 to 010, attached in Appendix B**, show the path of a delivery vehicle transporting a 40 metre long turbine blade.

3.1.1 Junction on A76 Trunk Road at Auldgirth

As stated previously it has been assumed that the origin for the route noted as 'Access Route 1' will be the junction on the A76 trunk road at Auldgirth, shown on **plate 2**.

Plate 2: Looking South Towards Auldgirth Junction on A76 (T)

The direction of delivery is unknown at present and as a result the turbine delivery vehicle modelling exercise undertaken was completed from both the North and South approaches. Irrespective of the modelled turbine blade delivery vehicle this has indicated that carriageway widening will likely be required to the West verge of the A76(T) as well as the South side of the access slip road (as per drawing **106008/BW/002**). It has also indicated that the turbine blade delivery vehicle oversails in both these areas.

The swept path analysis completed for removing turbine components from the site highlighted that the additional land required for site deliveries would also be required for removal of turbine components.

A summary of the likely works is included in **Table A** below.

Table A

Modelled Vehicle	Blade Length	Works Required
35m Long Turbine Blade	35m	• Check clearance where overhang occurs to east and west side of A76(T)
40m Long Turbine Blade	40m	• Widening required to North side of slip road. • Check clearance of blade oversail on west verge of A76(T) • Check clearance of blade oversail on west verge of A76(T) along with north and south verge of slip road.
45m Long Turbine Blade	45m	• Possible widening to west verge of existing carriageway (A76 T) • Check clearance where overhang occurs to west side of existing A76(T)road. • Possible widening to south verge of existing carriageway slip road to A76(T)
Nacelle	17.39m (Vehicle length)	• Widening required to North side of slip road. • Check clearance of oversail on west verge of A76(T) • Check clearance of oversail on west verge of A76(T) along with north and south verge of slip road.

3.1.2 Auldgirth to New Access Track

The existing carriageway from Auldgirth to the proposed access track has various potential restrictions along it's length. There are existing overhead services (**see plates 3 + 4**) and associated telegraph poles along this stretch of the existing road. It is likely that most of these telegraph poles will require to be relocated to facilitate deliveries.

The swept path analysis indicates that carriageway widening will be required (based on vehicle modelling completed using a 45m long turbine blade) adjacent to the Auldgirth Inn. The modelling also indicates that blade overhang also occurs at this point (**see plate 3**). The extent of overhang varies between the various modelled turbine delivery vehicles, the 35m blade delivery vehicle may overhang the existing verge whereas the 40m blade delivery vehicle indicates that the overhang may actually be wider than the existing verge. It is likely that consent of the landowner will be required for this oversail.

If 45m long turbine blades are specified it is possible that some form of stabilisation works will be required to the embankment between the existing road and the Auldgirth Inn. This is due to the proximity of the required carriageway wideneing to the embankment. There may be insufficient width in the existing verge to safely construct the widening. The completion of a localised topographical survey would assist in ascertaining the extent of works required.

To the east side of the existing road there is an existing retaining wall at the edge of the garden of the existing dwelling ('Dunduff') as shown on **plate 4**. Based on the delivery vehicle modelling completed on the 45m long turbine blade and the 40m long turbine blade, the overhang from the turbine blade conflicts with the existing wall (see drawings **106008/BW/002** in **Appendix B**). The modelled vehicle wheel path for these delivery vehicles is also very close to the existing retaining wall. Given that the existing stone wall retains the existing private garden it is recommended that a topographical survey and / or a drive through by an experienced haulage contractor is undertaken. This may show that the vehicles could pass unhindered.

Plate 3: Looking North Along Existing Road at Auldgirth Inn

Plate 4: Looking North Towards 'Dunduff'

There is an existing masonry arch railway bridge to cross prior to reaching the proposed new access track (**plates 5, 6 + 7**). The swept path analysis, completed on the horizontal alignment and shown on drawing **106008/BW/003**, indicates that with the 45m long turbine blade delivery vehicles the blade oversails the bridge parapet. The modelled vehicle for the 40m blade would indicate that the blade oversail is close to the parapet wall but no oversail occurs, whereas the 35m blade delivery vehicle does not oversail. Carriageway widening works, within the existing verge of this bridge, will likely be required for the 40 and 45 metre long blade delivery vehicles. Currently no information is available on the vertical alignment of the existing bridge. However the bridge does rise in the centre (**Plate 5**) and as a result this will likely impact on the vertical clearance of the turbine component delivery vehicles. It is therefore strongly recommended that a localised topographical survey is undertaken, along with vertical swept path analysis, to check that delivery vehicles can safely negotiate the vertical alignment of the bridge.

Plate 5: Looking North East Towards Masonry Arch Bridge

Agreement from Network Rail and the Local Authority Highways Department may be required for works in this area. This should include a check on the load capacity of this bridge.

Plate 6: Looking South Towards Existing Railway Bridge

Plate 7: Looking South Towards Existing Railway Bridge

The swept path analysis completed for taking turbine components from the site highlighted that the additional land required for site deliveries would also be required for removal of components. This is with the exception of the 45m turbine blade where further additional land take would be required at the bend located adjacent to 'Dunduff' (location shown on **plate 4**). The area where widening may be required is shown on drawing **106008/BW/002**. The previous recommendation regarding the completion of topographical survey work would enable a detailed assessment in this area.

3.1.3 New Access Track

In order to by-pass the existing 'switch back' bends there will be a requirement to construct a new access track to the west of the existing road (**plate 8**). The location of the proposed access is shown on drawing number **106008/BW/001** included in **Appendix A.**

Plate 8 Looking North East Towards Start Point of Proposed Access Track

Whilst there is no precise topographical survey information available for this proposed route, a high level review was completed based on the OS contouring. The indicative proposals for this route are shown on drawing **106008/BW/0004** included in **Appendix B**. Assuming a maximum gradient of 1V 10H (10%) it is likely that the minimum length of the new access would be circa 1.2Km. As no geotechnical information is available it is unclear if the final track solution would be founded or floating.

The swept path analysis completed for taking turbine components from the site highlighted that the additional land required for site deliveries would also be required for removal of turbine components.

To progress on a more detailed design a topographical survey along with some geotechnical investigations are recommended. **Table B** shows the generally acceptable track gradients from individual turbine suppliers. If gradients steeper than those shown in **Table B** are required this must be agreed in advance by the turbine supplier and the haulage contractor.

Table B

Turbine Supplier	Maximum Access Track Gradient
Siemens	11%
RePower	6%
Enercon	7%
Nordex	6%
Vestas	14%

3.1.4 End of New Access Track to High Auldgirth

Upon leaving the proposed new access track it is proposed that the delivery vehicles would continue along the existing track to High Auldgirth (**plates 9 and 10**).

The swept path modelling undertaken on this part of the route would indicate that the existing track, as shown on the OS background map, is of limited width. The existing track as shown has an approximate width of 3m whereas most haulage companies will require a minimum width of 4m on the straights and 5m through the curves. It is therefore likely the existing track will require to be widened by 1-2 metres along the length (circa 500m in length).

Plate 9 Looking South along access to High Auldgirth

Plate 10: Looking North Towards High Auldgirth

As the existing track passes the existing farm buildings (as shown on **plate 11**) are in close proximity to the swept path of the modelled turbine component delivery vehicle (as shown on drawing number **106008/BW/005** included in **Appendix B**). It is recommended that a topographic survey, or a drive through by an experienced haulage contractor, is completed to ensure safe passage can be achieved.

Plate 11 Looking South Towards Existing Farm Buildings at High Auldgirth

Once the existing track passes the existing farm buildings and head towards High Auldgirth there is a right turn to be performed (**plate 12**). The existing geometry, as shown on **drawing number 106008/005** included in **Appendix B**, is such that widening and re-profiling of existing levels will be required as there is currently insufficient hard area to permit manoeuvring of the turbine component delivery vehicle. Information provided by turbine suppliers, namely Siemens, states that **"Road rise is not acceptable in curves with radius less than 45metres".** It is likely that the radius of any bend would be circa 20 metres and as such special agreement must be sought from the chosen turbine supplier.

The swept path analysis completed for taking turbine components from the site highlighted that the additional land required for site deliveries would also be required for removal of components. This is with the exception of the 45m turbine blade. Further additional land take, outwith the highway boundary, would be required at the bend. The area where widening may be required is shown on drawing **106008/BW/005**. The previous recommendation regarding the completion of topographical survey work would enable a detailed assessment in this area.

A localised topographical survey is recommended to ensure adequate vertical clearance can be achieved within the extents of the works areas shown on drawing **106008/BW/005**.

Plate 12 Looking East Towards Right Turn into High Auldgirth

After the right turn the existing track progresses through High Auldgirth, as shown on drawing **106008/BW/005** and on **plate 13**. The track is of limited width, circa 3.2m, and will require to be widened to permit safe passage of turbine component delivery vehicles. As stated previously the haulage contractor would require a track width of between 4 and 5 metres. Due to the proximity of the existing buildings it is likely that any widening could be completed on the North verge. A full topographic survey would be recommended in this location to ensure that the required clearance and vertical alignment can be achieved.

Plate 13: Looking West Towards High Auldgirth

3.1.5 High Auldgirth to Proposed Site Access

Upon leaving High Auldgirth the construction of the existing access track changes from an asphalt finish to a metalled track (**plate 13**). It is likely that this section of existing track **(plates 14+15)** would require to be upgraded to a suitable specification to permit turbine component delivery vehicles. Also this section of track is between 3.5 and 4 metres wide so it is likely that some widening would also be required. The length of this section of track is circa 450 metres and is shown on drawing number **106008/BW/006**.

Plate 14: Looking South West Along Ex. Access Track from High Auldgirth to Site Entrance

Plate 15: Looking North Towards Existing Gated Site Entrance

3.2 Access Route 1A – Alternative Route from High Auldgirth to Alternate Site Access

3.2.1 South of High Auldgirth to Alternate Site Access (Route 1A)

As the existing access track progresses towards High Auldgirth, at the right turn described in Section 3.1.4, there is a possible alternate access track heading North West through the existing 'Burnkettle' Shooting Ground (**plate 16**). The track continues around Blackcraig Hill and ends towards the East boundary of the proposed wind farm site (**plate 17**). The proposed route would follow the existing track, labelled as '**Route 1A'** on drawing **106008/BW/001.**

Based on the OS information available it is recommended that this route is considered as an alternative to the existing access through High Auldgirth, thus avoiding the need for extensive reprofiling works at this location. This may mean that part of the proposed works, listed in sections 3.1.4 and 3.1.5 are not required. However works may be required along the length of this route. Although access could not be gained along the full route during the site visit, it is suggested as an alternative option to the route through High Auldgirth, subject to a further inspection.

Plate 16: Looking North West Along Existing Access Track Through Shooting Grounds

Plate 17: Looking East Along Existing Access to Shooting Grounds

3.3 Access Route 2 – Through Existing Dalswinton Wind Farm

3.3.1 Access Via Dalswinton Wind Farm

This is the alternate possible access suggested by Force 9 Energy for the initial assessment. The location of the existing windfarm is shown on drawing **106008/BW/001** (included **in Appendix A**).

Although the request was to check possible access from the windfarm no specific route was given. Various potential routes were reviewed using information available, specifically the Ordnance Survey mapping information including the digital contouring shown on the OS mapping.

The topography between the proposed Blackwood Wind Farm and the existing Dalswinton Wind Farm (as shown on **Plates 18 + 19**) is such that there is a steep sided valley with a central, level, base in the middle. There is an existing watercourse running through the valley floor. From the site inspection it would appear that the valley also acts as a flood plain during storm periods. The gradient of the valley slopes (circa 16%) are such that a major 'fill' exercise, within the base of the valley, would be required to achieve adequate approach gradients. The high level review completed indicates that depth of fill could be as much as 7m in some areas. Given that this valley is also a flood plain it is likely that any works in this area would require a CAR Licence, it is unlikely to be issued by the Scottish Environment Protection Agency for these works.

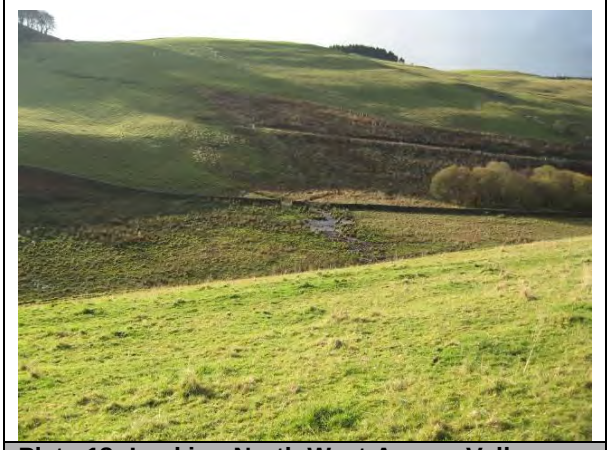


Plate 18: Looking North West Across Valley from Dalswinton Wind Farm

Plate 19: Looking North East (Towards Dalswinton) Across Valley

As a result of the above and due to the engineering implications (cost and practicality) this option was not considered any further.

4 BUDGET COST ESTIMATES

4.1 Access Route 1

Grontmij have developed a high level budgetary cost estimate for this proposed route which is detailed in the following table:

Element	Rate	No.	Budget Estimate	Comments
Junction of A76 (T)	Sum	1	£35,000	The budget figure shown is for the provision of carriageway widening (works described in **Section 3.1.1** of this report. An allowance has been made for temporary traffic signage required during the works. The budget cost for this work element excludes any diversionary / protection works that may be required to existing service apparatus. This item is unquantifiable at present and could reach a significant value should any diversionary / protection works be required.
Auldgirth to Start of Proposed New Access Track	Sum	1	£8,000 (£100,000)	The budget cost provided makes allowance for minor widening works adjacent to 'Dunduff'. Depending on turbine selection it is possible that some stabilisation works may be required to the embankment between the existing road and the Auldgirth Inn. This increased sum is shown in brackets and is likely if the larger turbines are specified as this results in greater carriageway widening at this location **(section 3.1.2).** The budget cost for this work element excludes any diversionary / protection works that may be required to existing service apparatus. This item is unquantifiable at present and could reach a significant value should any diversionary / protection works be required.
New Access Track (Founded access track construction on sloping topography – new)	**£70** per linear metre	1300	£120,000	Subject to conformation of ground conditions & existing track construction. An allowance has also been made for connections into existing road/track and local widenings at bends **(section 3.1.3)**
Installation of culverts (400mmØ – 600mmØ)	**£5,000** per culvert	3	£15,000	The budget cost provided does note make any allowance for catchment assessment studies or hydraulic assessment works. The rate provided is on the basis of a 10m – 12m long culvert.
Existing Track to High Auldgirth(Founded access track construction – widening)	**£60** per linear metre	500	£30,000	Subject to conformation of ground conditions & existing track construction **(section 3.1.4)**
Works required at 'right hand bend' at entrance to High Auldgirth	Sum	1	£35,000	Re grading works and some track widening **(section 3.1.4)**
Existing Track from High Auldgirth to site entrance(Founded access track construction incl. widening)	**£65** per linear metre	450	£29,250	Subject to conformation of ground conditions & existing track construction **(section 3.1.5)**
10% Preparation and Administration Costs	-	-	£27,225 (£35,000)	
		Total	**£299,475** **(£400,675)**	Figures in bracket show costs if stabilisation works are required at Auldgirth Inn

4.2 Access Route 1a

Grontmij have developed a high level budgetary cost estimate for this proposed route which is detailed in the following table:

Element	Rate	No.	Budget Estimate	Comments
Junction of A76 (T)	Sum	1	£35,000	The budget figure shown is for the provision of carriageway widening (works described in **Section 3.1.1** of this report. An allowance has been made for temporary traffic signage required during the works. The budget cost for this work element excludes any diversionary / protection works that may be required to existing service apparatus. This item is unquantifiable at present and could reach a significant value should any diversionary / protection works be required.
Auldgirth to New Access Track	Sum	1	£8,000 (£100,000)	The budget cost provided makes allowance for tminor widening works adjacent to 'Dunduff'. Depending on turbine selection it is possible that some stabilisation works may be required to the embankment between the existing road and the Auldgirth Inn. This increased sum is shown in brackets and is likely if the larger turbines are specified as this results in greater carriageway widening at this location **(section 3.1.2).** The budget cost for this work element excludes any diversionary / protection works that may be required to existing service apparatus. This item is unquantifiable at present and could reach a significant value should any diversionary / protection works be required.
Installation of culverts (400mmØ – 600mmØ)	**£5,000** per culvert	3	£15,000	The budget cost provided does note make any allowance for catchment assessment studies or hydraulic assessment works. The rate provided is on the basis of a 10m – 12m long culvert.
New Access Track (Founded access track construction on sloping topography – new)	**£70** per linear metre	1300	£120,000	Subject to conformation of ground conditions & existing track construction. An allowance has also been made for connections into existing road/track and local widenings at bends **(section 3.1.3)**
Existing Track to High Auldgirth(Founded access track construction – widening)	**£60** per linear metre	500	£30,000	Subject to conformation of ground conditions & existing track construction **(section 3.1.4)**
Works required at Entrance of 'Burnkettle Shooting Ground'	Sum	1	£10,000	Track widening **(section 3.2.1)**
Existing Track Thru' Burnkettle Shooting Ground(Founded access track construction – widening)	**£60** per linear metre	2300	£138,000	Subject to conformation of ground conditions & existing track construction **(section 3.1.5)**
10% Preparation and Administration Costs	-	-	£35,600 (£44,800)	
		Total	**£391,600 (£492,800)**	Figures in bracket show costs if stabilisation works are required at Auldgirth Inn

5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

From the investigations completed it is acknowledged the existing track, that progresses from Auldgirth to Low Auldgirth, has a series of constraints resulting in part of this route being unsuitable for turbine component deliveries. Although the sections of the existing route that cause this problem could likely be bypassed there are other lengths where further, detailed investigations are recommended. These have been identified in Section 3 of this report and budget costings provided in Section 4 for each location.

The main areas where the difficulties are more prevalent are at the existing dwelling 'Dunduff', the existing masonry railway bridge north of this dwelling and also the right turn into High Auldgirth. The difficulties are more apparent with the longer (45 metre long) turbine blades. The major problem at 'Dunduff' is the proximity of the existing stone retaining wall to the existing access road. It is very likely that the wall is impacted by the blade overhang on the turbine component delivery vehicles. Based on the modelled delivery vehicle reducing the blade length does result in increased clearance at this location.

The horizontal swept path analysis undertaken at the existing masonry railway bridge also indicates that the shorter blade lengths progress through this area with greater clearance. Given that no topographical data exists for this area it is difficult to confirm that there is sufficient vertical clearance available to permit safe passage of component delivery vehicles. It is therefore recommended that a localised topographical survey is undertaken to enable a vertical alignment check to be completed.

The right turn into High Auldgirth could be bypassed by utilising Route 1a described earlier in this report.

Along the proposed delivery route there are instances where the turbine blade delivery vehicle requires additional land take outwith the public road corridor. This could result in track widening and /or additional clearance being required. In these instances consultation is recommended with the third party land owner(s). This could be the Local Authority or private land owners.

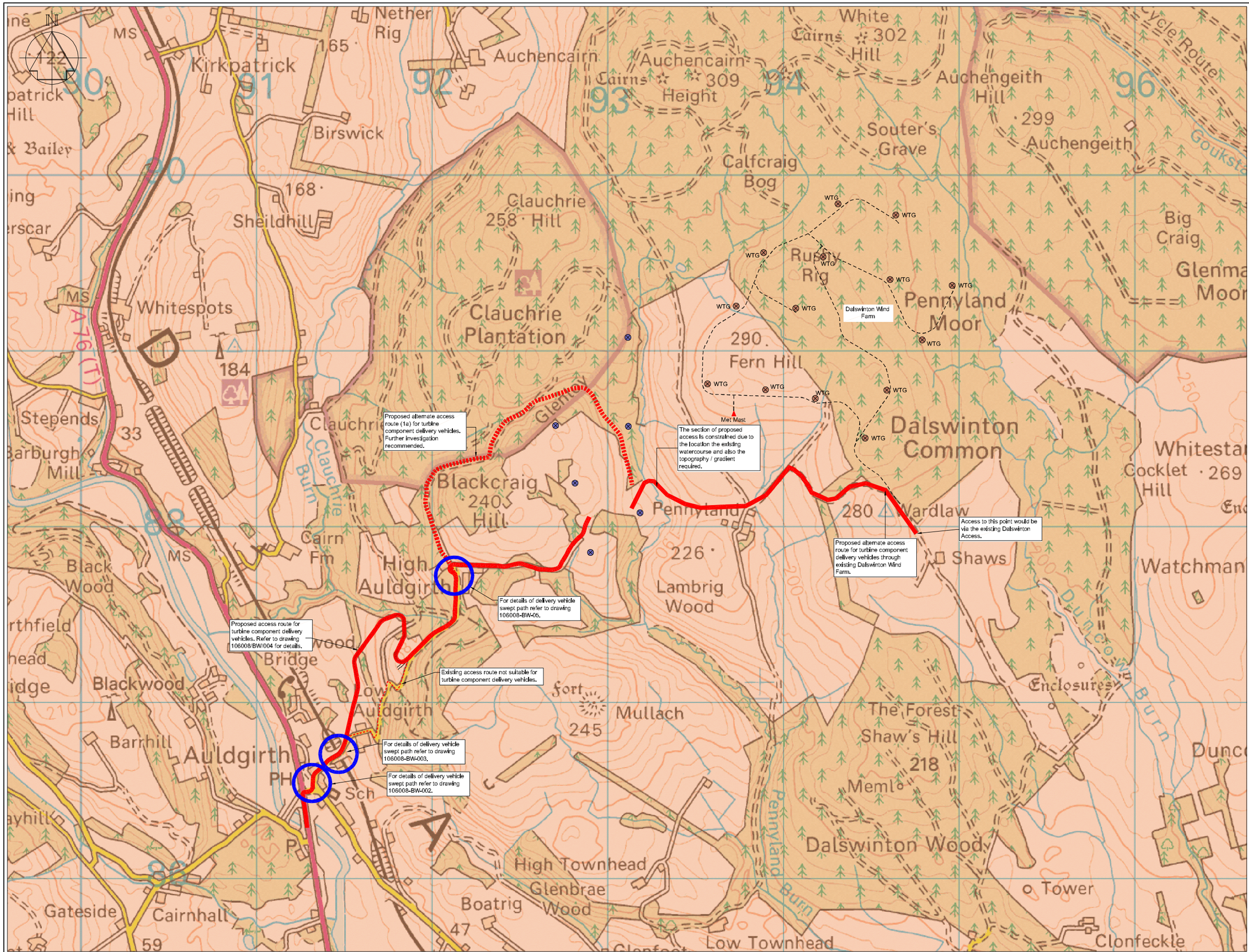
5.2 Recommendations

Due to the variety of obstacles identified on the proposed delivery route(s) and the limitations this places on the final proposals for developing this site the following recommendations are made:

- A more detailed study is recommended into the identified restrictions at 'Dunduff', the existing masonry railway bridge and the right turn into High Auldgirth. This should also include a topographical survey to develop options.
- A walkover of Route 1A described in this report to identify possible constraints and solutions (no access was available during the initial site visit).
- Topographic surveys of identified 'pinch points' and area where proposed new access tracks is required.
- Consultation with Network Rail to establish load carrying capacity of existing masonry arch railway bridge.
- Consultation with Transport Scotland with regards any required works at exist from A76(T).
- Consultation with Local Authority (Transportation and Planning) to confirm acceptance of delivery route including load bearing capacity of bridge crossings and any downtakings required to existing walls.
- Discussions with turbine suppliers are held to check the limitations of the actual delivery vehicles.
- Consultation with utility companies to ascertain extent of any diversionary works
- Consultation with other, interested 3rd party landowners.
- Drive through, by haulage contractor, along the proposed delivery route to check through passage.
- Delivery vehicle modelling to be re-visited by appointed haulage contractor.

APPENDIX A

Site Access Route



Site Plan
Scale 1:10000

SCALE 1 : 10000
100m 0 1000m

NOTES

1. Based Upon Ordinance Survey Mapping With The Permission of The Controller of Her Majesty's Stationary Office, © Crown Copyright. Grontmij Group Licence No: AI 1000 17449
2. Accuracy of Map Image Not Guaranteed Due to Reproduction Methods.

Legend:

- Approximate Location of Proposed Turbines
- Dalswinton Wind Farm Turbines
- Proposed Site Access Route (Route 1)
- Alternative Site Access Route (Route 2)
- Area of works required to accomodate turbine component delivery vehicle

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNER'S RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-
IP09-F01 Design Risk Assessment- Rev 5

CONSTRUCTION PHASE:-

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

REV	DESCRIPTION	DRAWN	CHKD	APPD	DATE
A	Route Via Dalswinton Added	RS	AM	MT	13/01/11
0	For Information	RS	AM	MT	10/12/10

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CLIENT: Force 9 Energy

PROJECT: Blackwood Wind Farm Access Review

TITLE: Swept Path Site Access Plan

STATUS: For Information

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	MT
DATE 10/12/10	DATE 10/12/10	DATE 10/12/10	DATE 10/12/10

DRAWING SCALE: As Shown
ORIGINAL DRAWING SIZE: A1 - 841x594
DRAWING No.: 106008-BW-001
REV.: A

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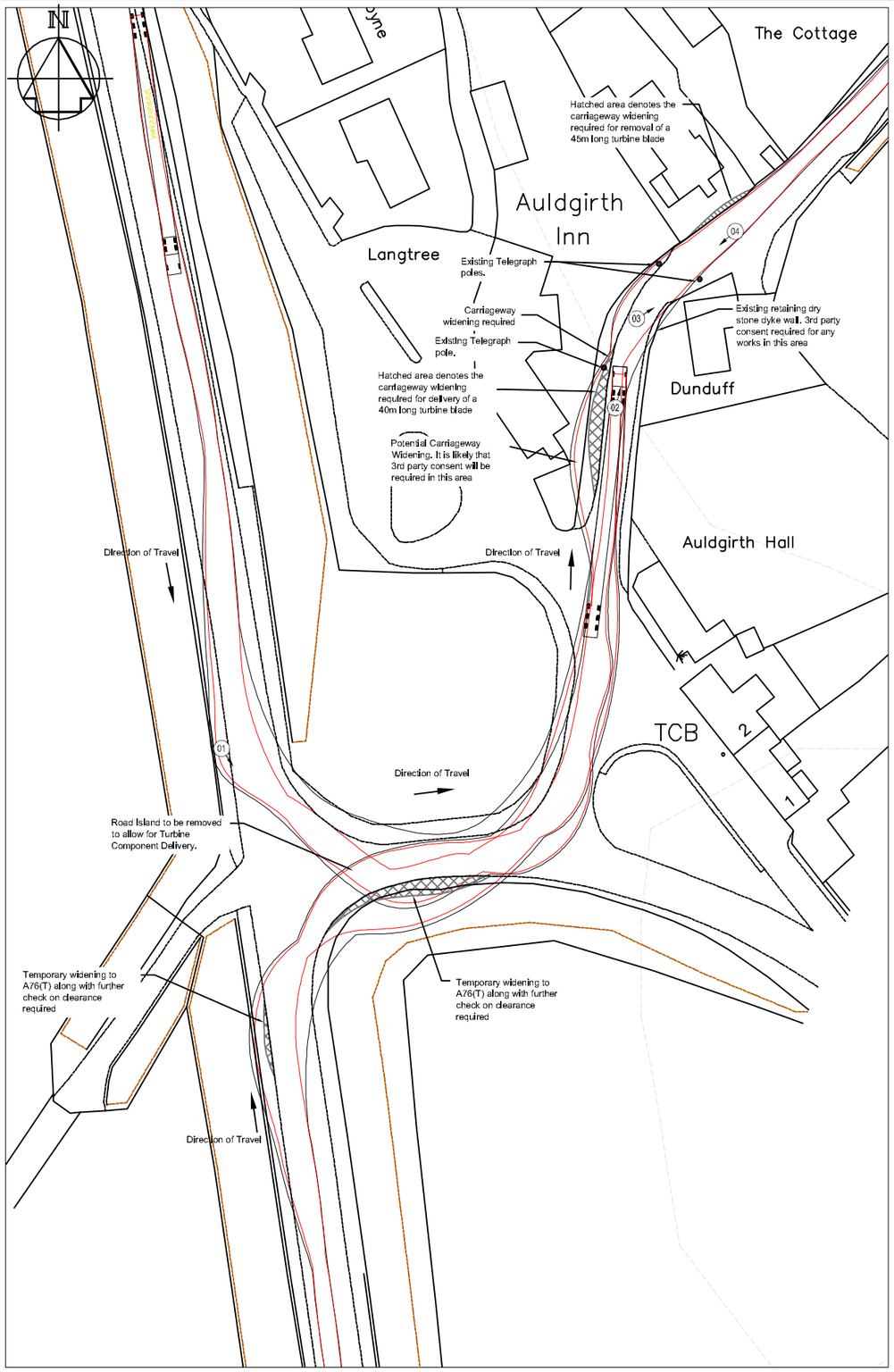
APPENDIX B

Vehicle Swept Path Analysis Drawings



Indicative Vehicle Swept Path (45m long Turbine Blade Delivery Vehicle)

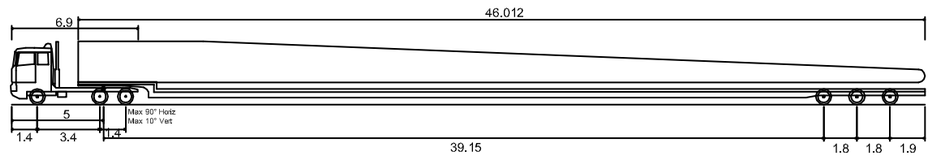
Scale 1:1000

Photo 1: View looking at Auldgirth Junction on A76

Photo 2: View Looking North towards Auldgirth Inn

Photo 3: View looking North East at Auldgirth Inn

Photo 4: View Looking South West at Auldgirth Inn



50.65 Extendible platform vehicle (fully extended)

Overall Length	49.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

NOTES

Notes:

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2. Accuracy of Map Image Not Guaranteed Due to Reproduction Methods.
3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. The swept path analysis for these vehicles have been omitted for clarity.

Legend:

- 00 Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASES:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

Rev	Description	Drawn	Chk'd	App'd	Date

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path
Sheet 1 - Exit from A76(T) to Auldgirth
45m Long Turbine Blade Vehicle

STATUS

Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
15/12/10	16/12/10	21/12/10	

DRAWING SCALE	ORIGINAL DRAWING SIZE
1:1000	A3 - 420x297

DRAWING No.	REV.
10068/BW/002	0

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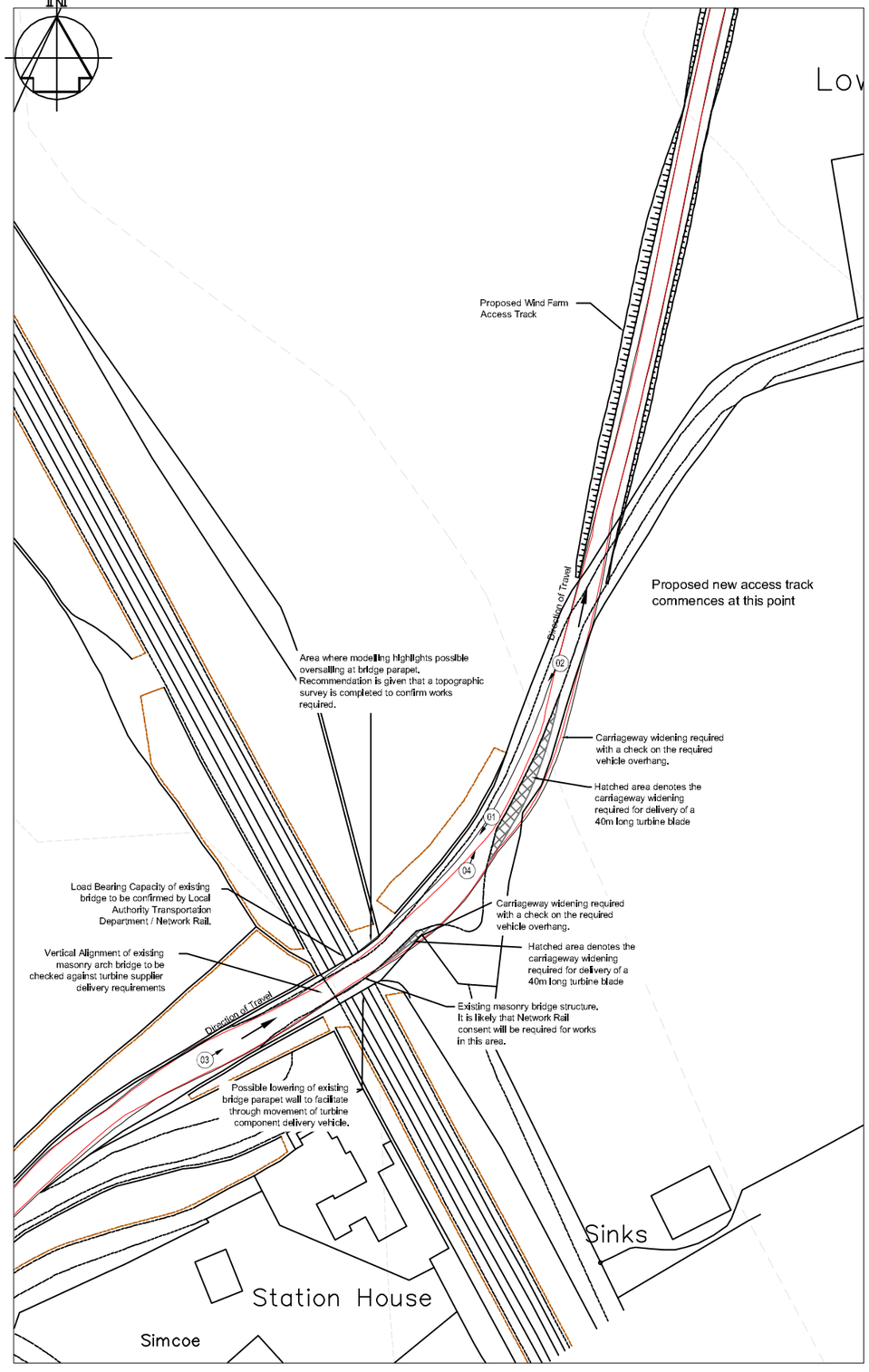


Indicative Vehicle Swept Path (45m long Turbine Blade Delivery Vehicle)

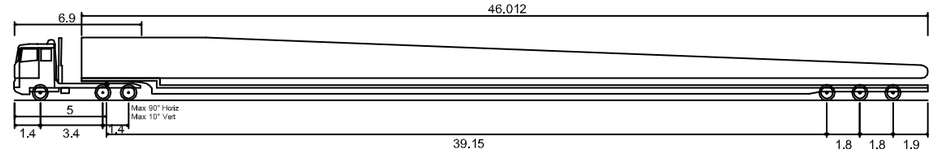
Scale 1:1000

Photo 1: View Looking South Towards Railway Bridge

Photo 1: View Looking South Towards Railway Bridge

Photo 3: View Looking North East Towards Railway Bridge

Photo 4: View Looking NorthTowards Start of Proposed Access Track



50.65 Extendible platform vehicle (fully extended)

Overall Length	49.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

NOTES

Notes:

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3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. The swept path analysis for these vehicles have been omitted for clarity.

Legend:

- Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm
Auldgirth, Dumfrieshire
Access Review

TITLE

Swepth Path
Sheet 2 - Crossing Ex. Railway Bridge
45m Long Turbine Blade Vehicle

STATUS

Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
15/12/10	16/12/10	21/12/10	

DRAWING SCALE	ORIGINAL DRAWING SIZE
1:1000	A3 - 420x297

DRAWING No.	REV.
10068/BW/003	0

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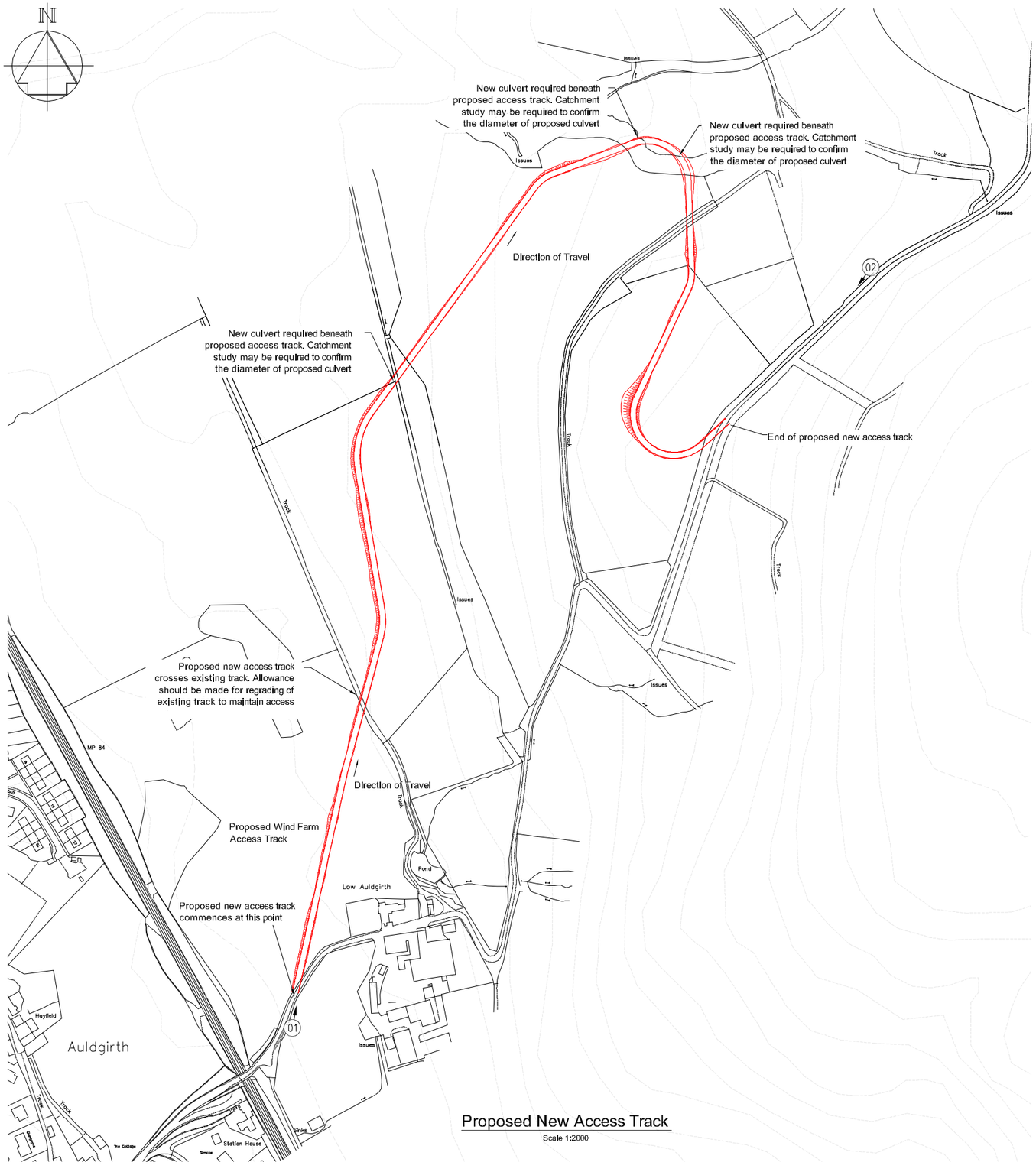

Proposed New Access Track

Scale 1:2000

Photo 1: View Looking North East Towards Start Point of Proposed New Access Track

Photo 2: View Looking South West Towards End Point of Proposed New Access Track

SCALE 1 : 500

10m 0 40m

NOTES

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Legend:

00 Direction of Photo

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNER'S RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment- Rev 5

CONSTRUCTION PHASE:-

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

REV	DESCRIPTION	DRAWN	CHK'D	APP'D	DATE
0	First Issue	RS	AM	MT	10/12/10

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Bristol . Cumbria . Dublin . Edinburgh . Glasgow . Leeds . London Peterborough . Reading . Solihull . Wrexham

CLIENT: Force 9 Energy

PROJECT: Blackwood Wind Farm Access Review

TITLE: Proposed New Access Track

STATUS: Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	MT
DATE 10/12/10	DATE 10/12/10	DATE 10/12/10	DATE 10/12/10

DRAWING SCALE: As Shown

ORIGINAL DRAWING SIZE: A1 - 841x594

DRAWING No. 106008-BW-004

REV. 0

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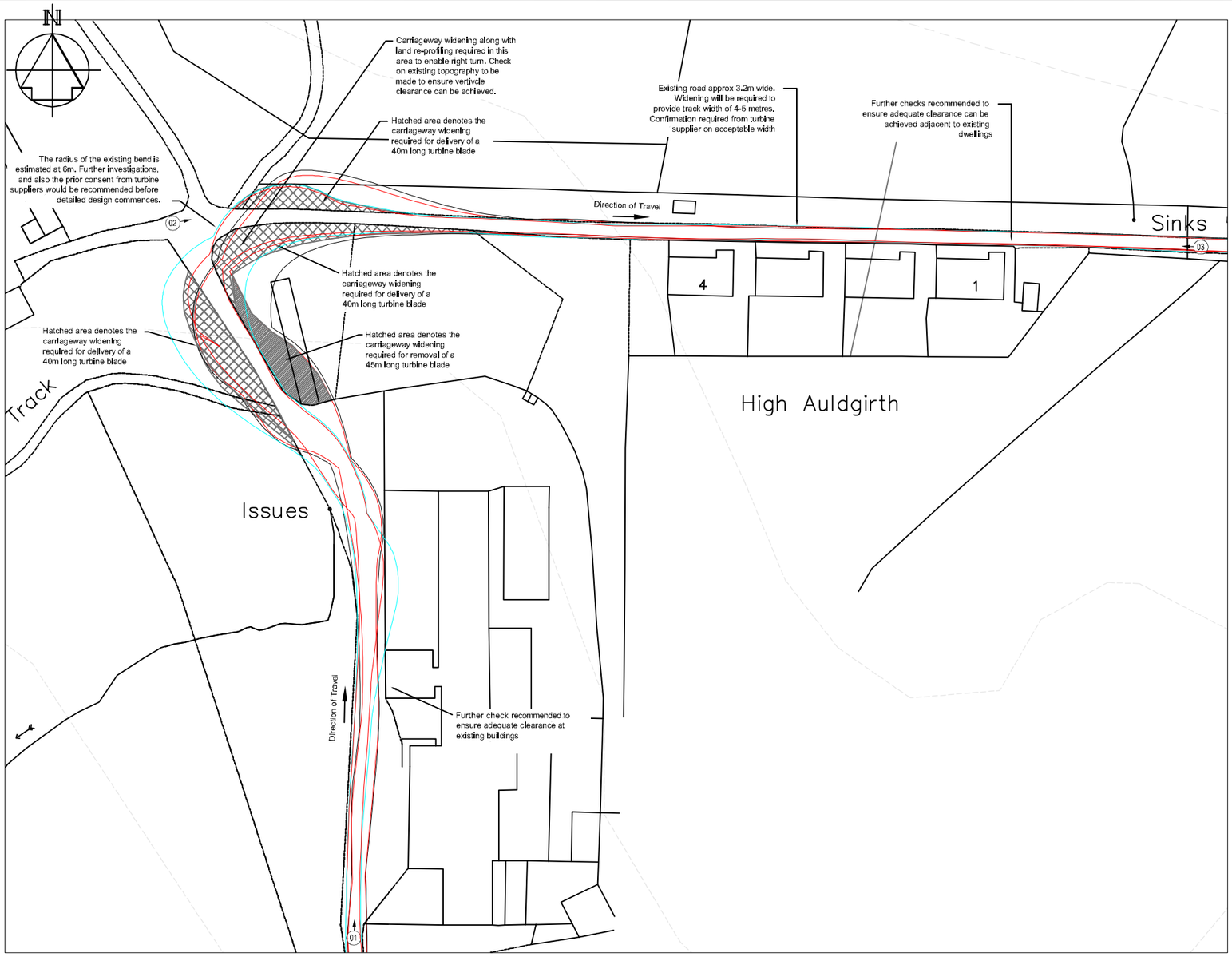
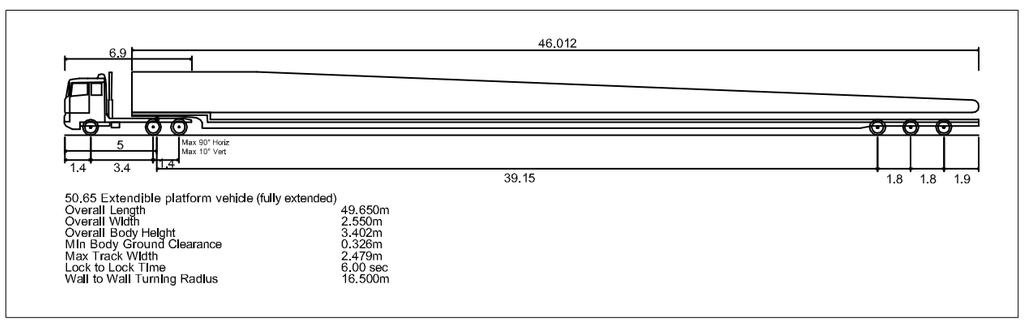


Indicative Vehicle Swept Path (45m long Turbine Blade Delivery Vehicle)

Scale 1:1000



50.65 Extendible platform vehicle (fully extended)

Overall Length	49.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking North Towards Existing Farm Buildings at High Auldgirth

Photo 2: View Looking East at Right Turn into High Auldgirth

Photo 3: View Looking West Through High Auldgirth

NOTES

Notes:

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3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. The swept path analysis for these vehicles have been omitted for clarity.

Legend:

- 00 Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT: Force 9 Energy

PROJECT: Blackwood Wind Farm, Auldgirth, Dumfrieshire Access Review

TITLE: Swept Path Sheet 4 - High Auldgirth 45m Long Turbine Blade Vehicle

STATUS: Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE 15/12/10	DATE 16/12/10	DATE 12/12/10	DATE

DRAWING SCALE: 1:1000

ORIGINAL DRAWING SIZE: A3 - 420x297

DRAWING No.: 10068/BW/005

REV.: 0

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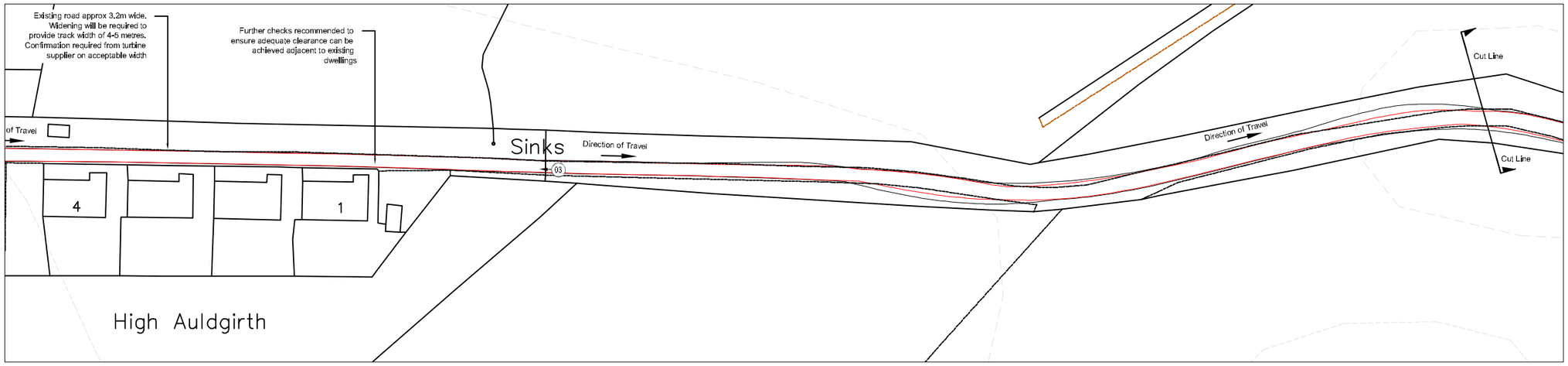
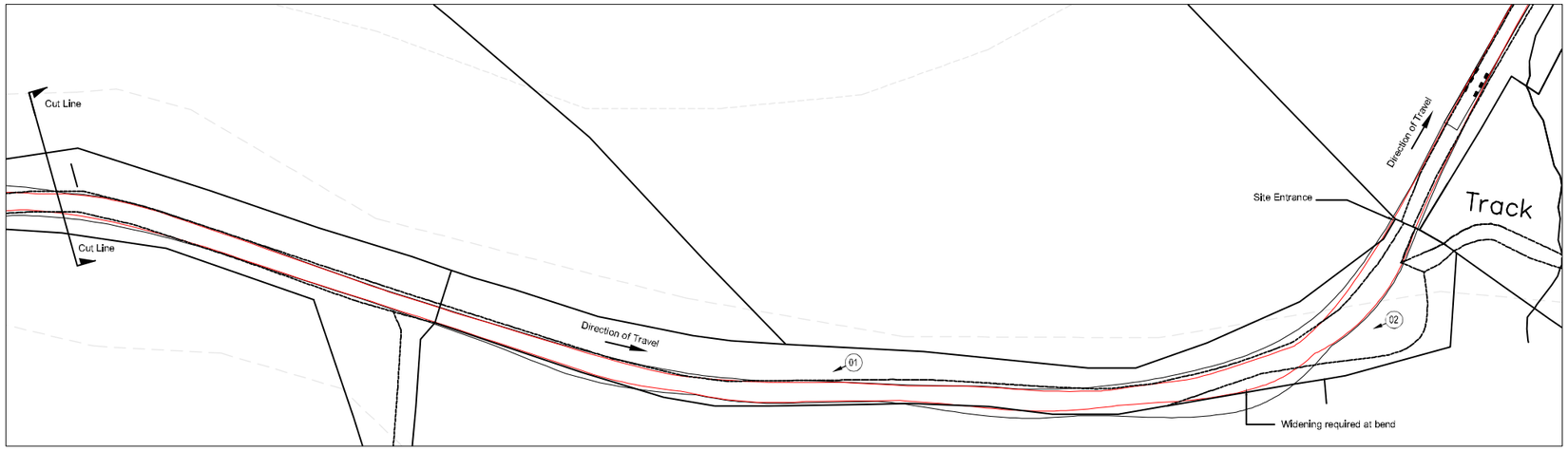


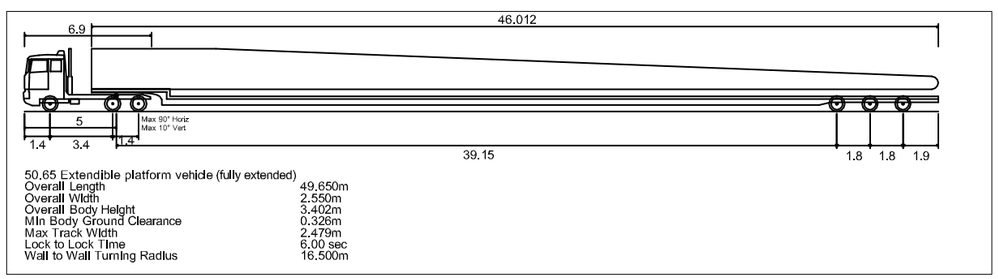
Indicative Vehicle Swept Path (45m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Indicative Vehicle Swept Path (45m long Turbine Blade Delivery Vehicle)

Scale 1:1000



50.65 Extendible platform vehicle (fully extended)

Overall Length	49.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking West Towards High Auldgirth

Photo 2: View Looking West Along Existing Track

NOTES

Notes:

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2. Accuracy of Map Image Not Guaranteed Due to Reproduction Methods.

Legend:

- 00 — Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path
Sheet 5 - High Auldgirth to Site Entrance
45m Long Turbine Blade Vehicle

STATUS

Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
15/12/10	16/12/10	12/12/10	

DRAWING SCALE	ORIGINAL DRAWING SIZE
1:1000	A3 - 420x297

DRAWING No.	REV.
10068/BW/006	0

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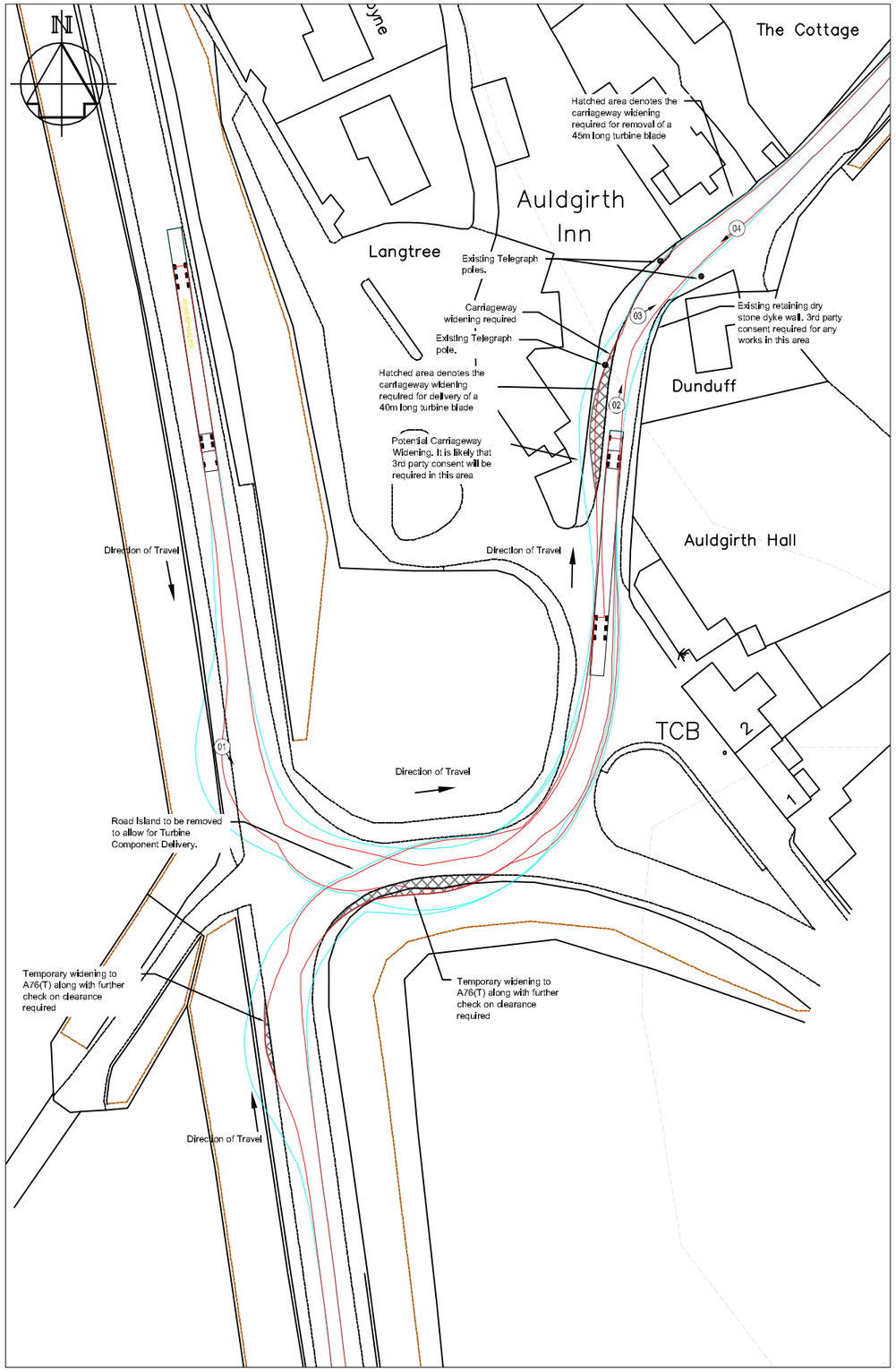


Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

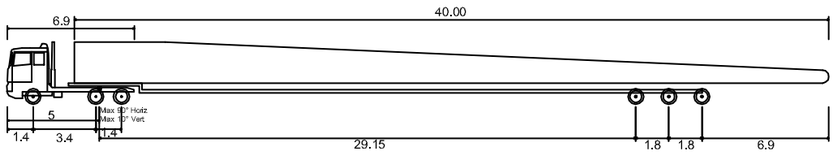
Scale 1:1000

Photo 1: View looking at Auldgirth Junction on A76

Photo 2: View Looking North towards Auldgirth Inn

Photo 3: View looking North East at Auldgirth Inn

Photo 4: View Looking South West at Auldgirth Inn



44.65 Extendible platform vehicle (fully extended)

Overall Length	44.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

NOTES

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3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. This is as per the modelled vehicle shown.

Legend:

- 00 — Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASES:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path - Sheet 6
Exit from A76(T) to Auldgirth
40m Long Turbine Blade Vehicle

STATUS

Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
10/01/11	10/01/11	10/01/11	

DRAWING SCALE	ORIGINAL DRAWING SIZE
1:1000	A3 - 420x297

DRAWING No.	REV.
10068/BW/007	0

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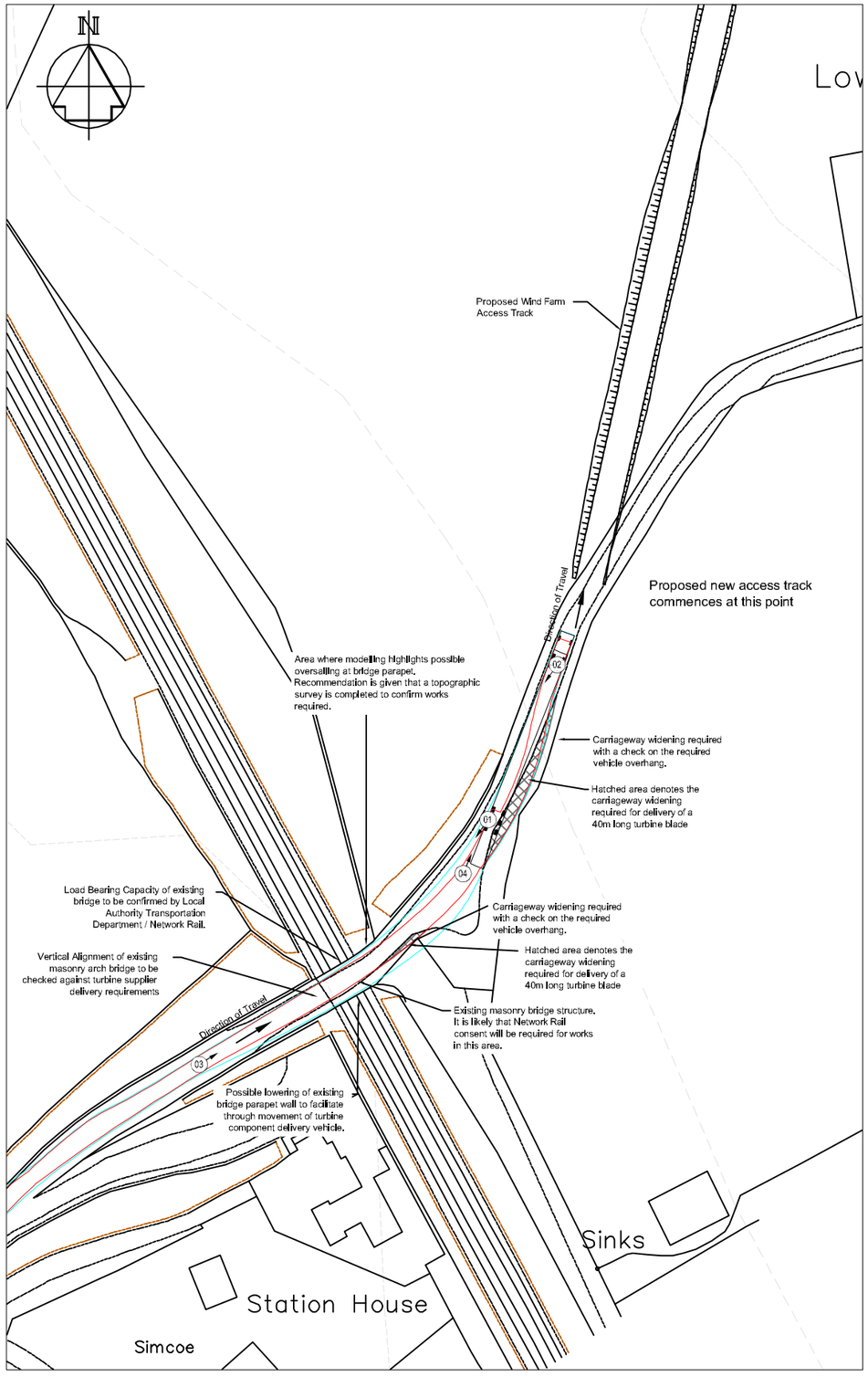


Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

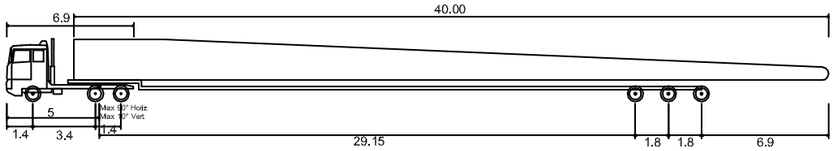
Scale 1:1000

Photo 1: View Looking South Towards Railway Bridge

Photo 1: View Looking South Towards Railway Bridge

Photo 3: View Looking North East Towards Railway Bridge

Photo 4: View Looking NorthTowards Start of Proposed Access Track



44.65 Extendible platform vehicle (fully extended)

Overall Length	44.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.325m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

NOTES

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3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. This is as per the modelled vehicle shown.

Legend:

- Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path - Sheet 7
Crossing Existing Railway Bridge
40m Long Turbine Blade Vehicle

STATUS

Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
10/01/11	10/01/11	10/01/11	

DRAWING SCALE	ORIGINAL DRAWING SIZE
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DRAWING No.	REV.
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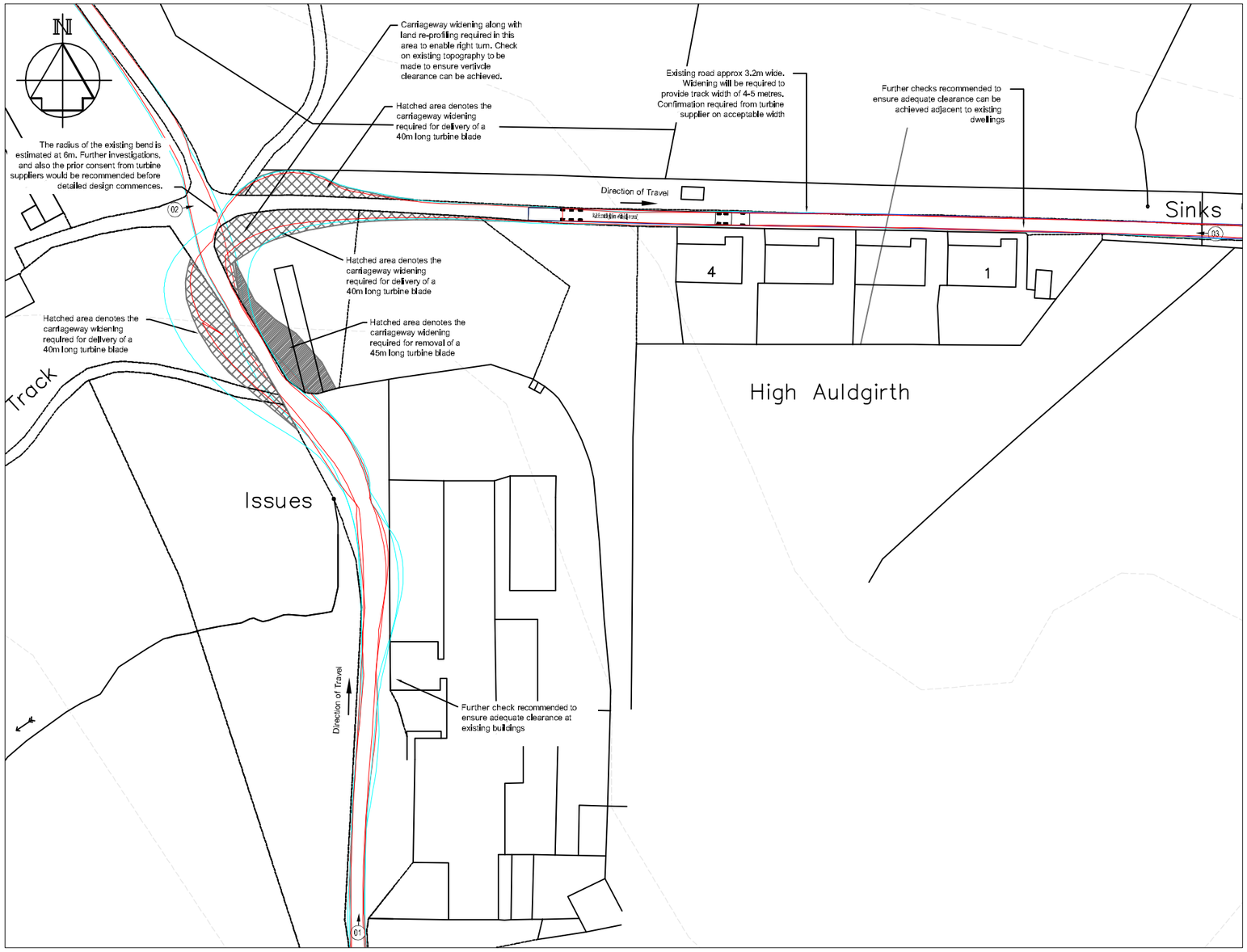
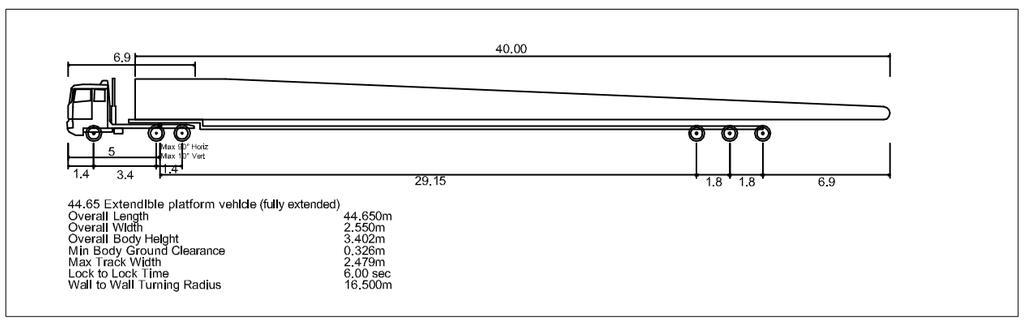


Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



44.65 Extendible platform vehicle (fully extended)

Overall Length	44.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking North Towards Existing Farm Buildings at High Auldgirth

Photo 2: View Looking East at Right Turn into High Auldgirth

Photo 3: View Looking West Through High Auldgirth

NOTES

Notes:

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2. Accuracy of Map Image Not Guaranteed Due to Reproduction Methods.
3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. This is as per the modelled vehicle shown.

Legend:

- 00 — Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT: Force 9 Energy

PROJECT: Blackwood Wind Farm, Auldgirth, Dumfrieshire Access Review

TITLE: Swept Path - Sheet 8 High Auldgirth 40m Long Turbine Blade Vehicle

STATUS: Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
10/01/11	10/01/11	10/01/11	

DRAWING SCALE: 1:1000

ORIGINAL DRAWING SIZE: A3 - 420x297

DRAWING No.: 10068/BW/009

REV.: 0

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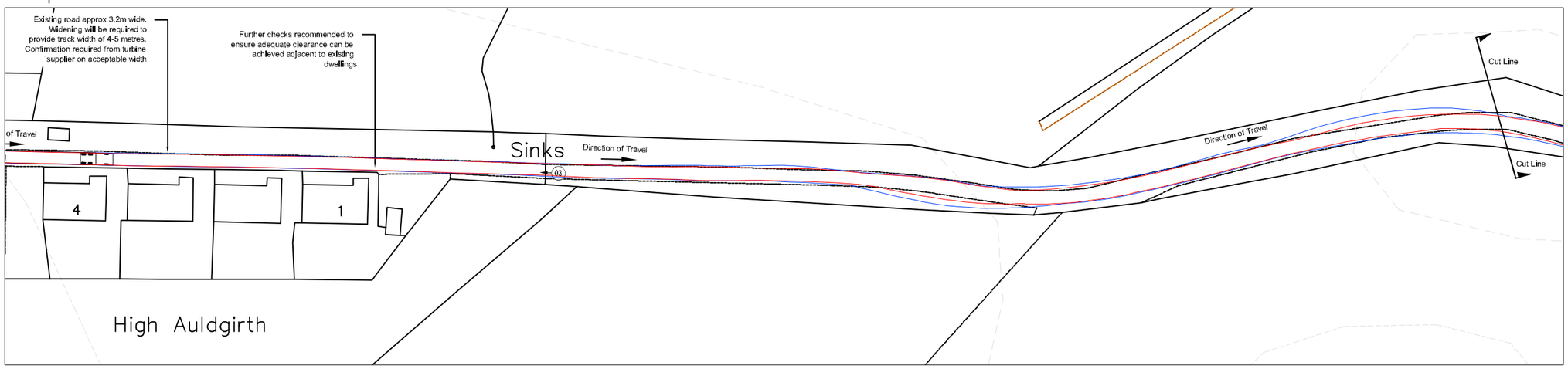
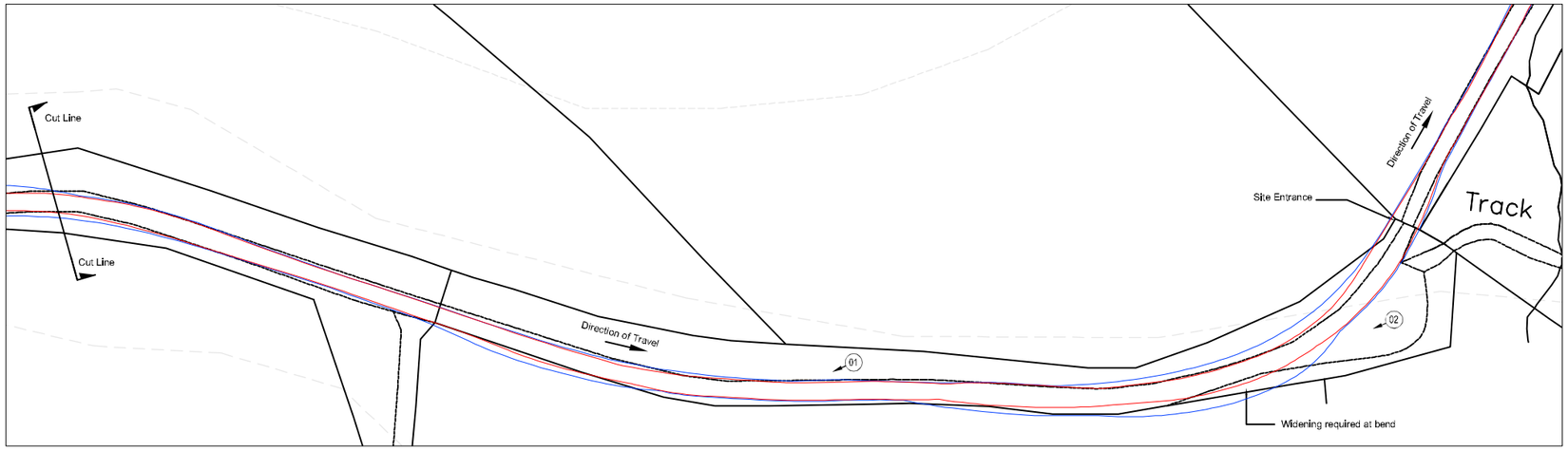


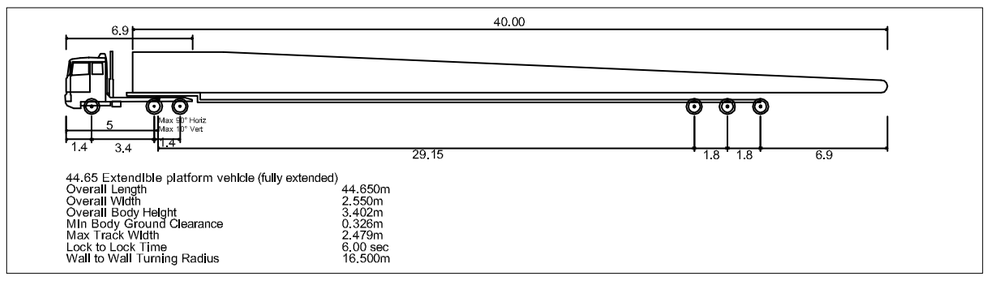
Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



44.65 Extendible platform vehicle (fully extended)

Overall Length	44.650m
Overall Width	2.550m
Overall Body Height	3.402m
Min Body Ground Clearance	0.326m
Max Track Width	2.479m
Lock to Lock Time	6.00 sec
Wall to Wall Turning Radius	16.500m

Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking West Towards High Auldgirth

Photo 2: View Looking West Along Existing Track

NOTES

Notes:

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3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. This is as per the modelled vehicle shown.

Legend:

- 00 — Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path - Sheet 9
High Auldgirth to Site Entrance
40m Long Turbine Blade Vehicle

STATUS

Draft

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	RS	AM	
DATE	DATE	DATE	DATE
15/12/10	16/12/10	12/12/10	

DRAWING SCALE	ORIGINAL DRAWING SIZE
1:1000	A3 - 420x297

DRAWING No.	REV.
10068/BW/010	0

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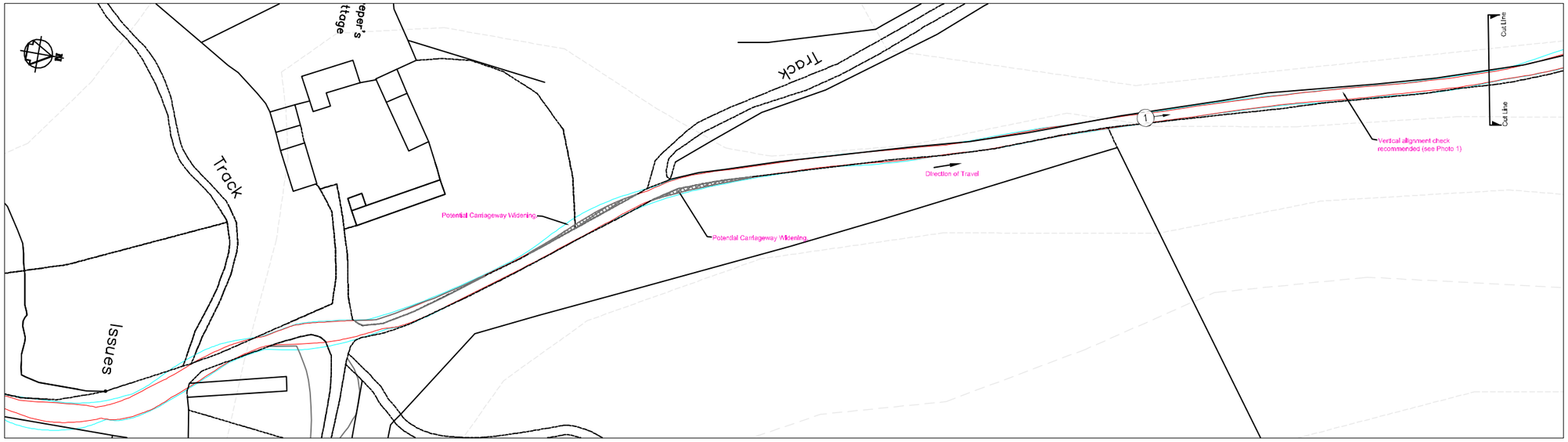
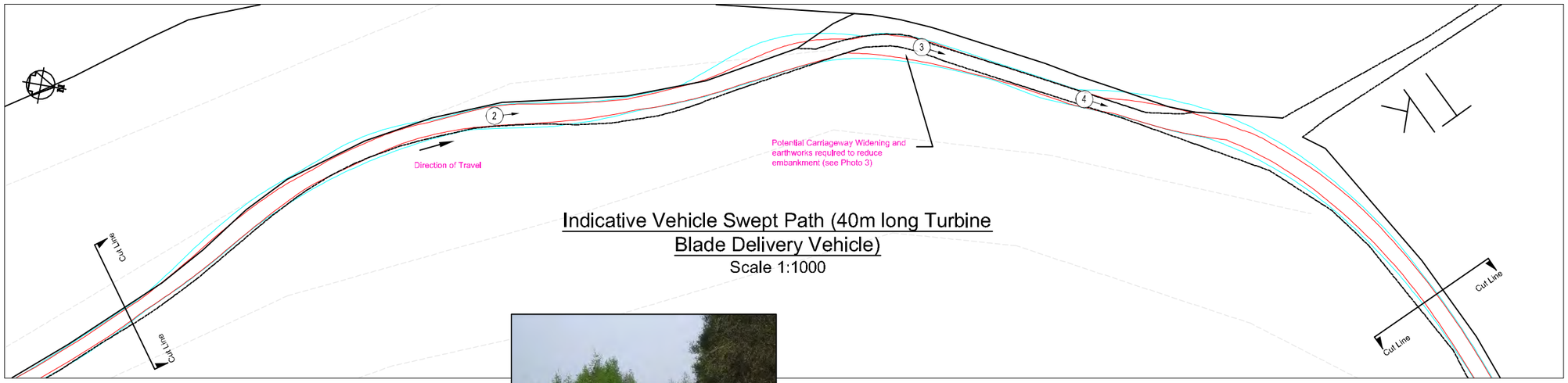


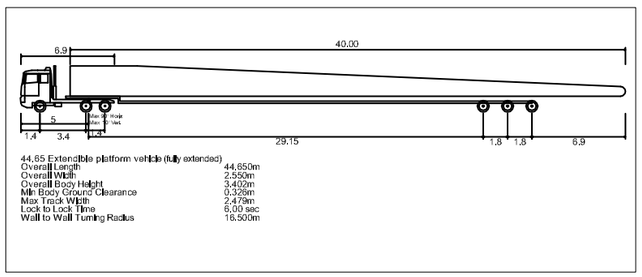
Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking North

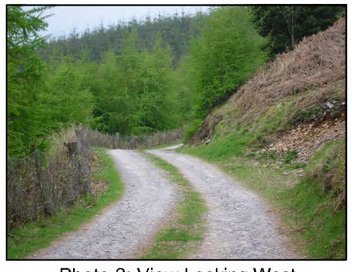


Photo 2: View Looking West

Photo 3: View Looking West

Photo 4: View Looking West

NOTES

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4. No checks on vertical alignment have been undertaken however where there are existing changes in vertical alignment on the existing track recommendation is given that localised vertical checks / topographic surveys are undertaken

Legend:

- Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Delivery Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNER'S RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

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CLIENT

Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path - Sheet 11
Proposed Access Through
Shooting Lodge (1 of 3)

STATUS

For Information

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	DM	CRM	AM
DATE	DATE	DATE	DATE
05/05/11	05/05/11	05/05/11	05/05/11

DRAWING SCALE	ORIGINAL DRAWING SIZE
1:1000	A3 - 420x297

DRAWING No.	REV.
10068/BW/016	0

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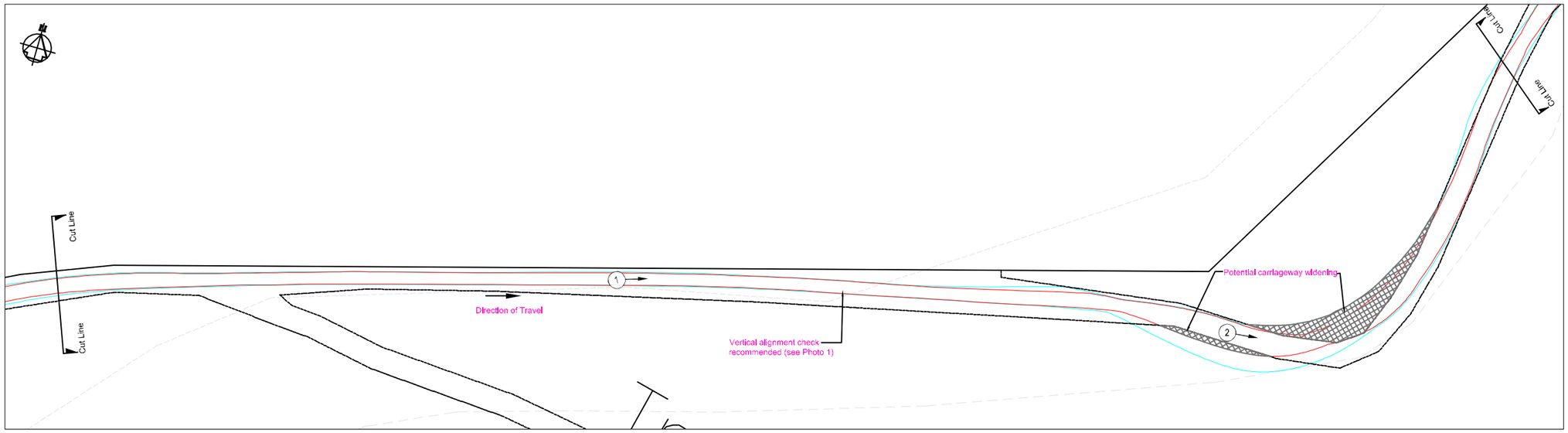
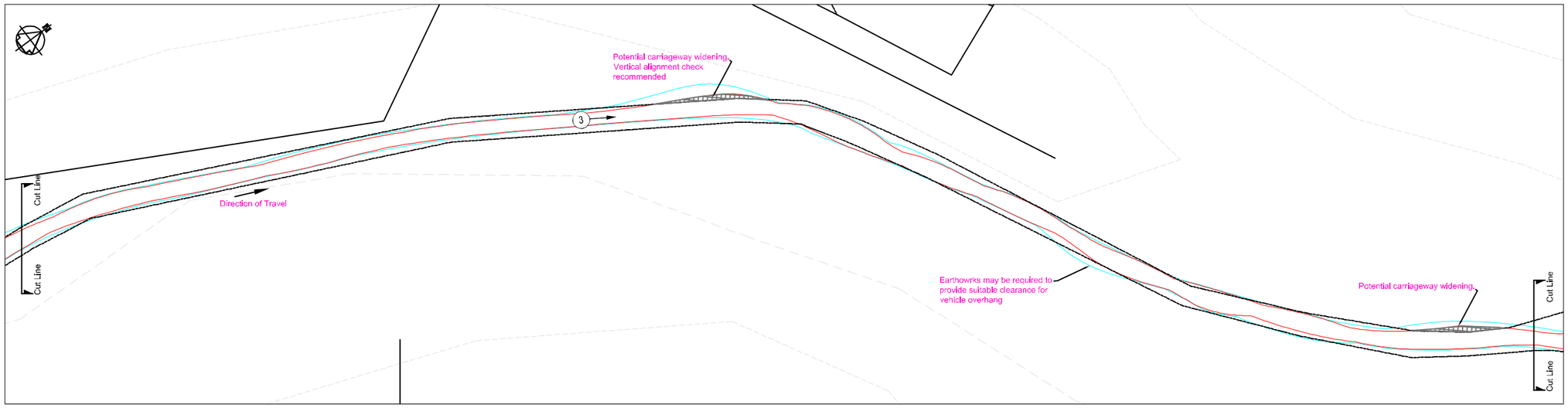


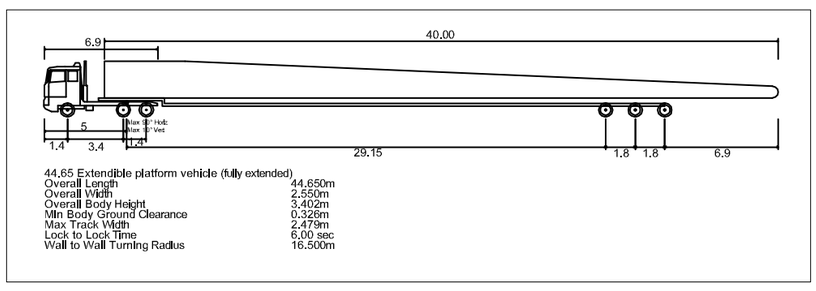
Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking East Showing Vertical Alignment

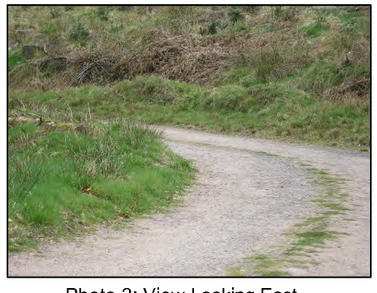


Photo 2: View Looking East

Photo 3: View Looking East before tight radii

NOTES

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4. No checks on vertical alignment have been undertaken however where there are existing changes in vertical alignment on the existing track recommendation is given that localised vertical checks / topographic surveys are undertaken

Legend:

- 00 — Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Delivery Vehicle Over Sail
- Areas where carriageway widening may be required.

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

BP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

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PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path - Sheet 12
Proposed Access Through
Shooting Lodge (2 of 3)

STATUS

For Information

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	DM	CRM	AM
DATE 05/05/11	DATE 05/05/11	DATE 05/05/11	DATE 05/05/11

DRAWING SCALE 1:1000

ORIGINAL DRAWING SIZE A3 - 420x297

DRAWING No. 10068/BW/017

REV. 0

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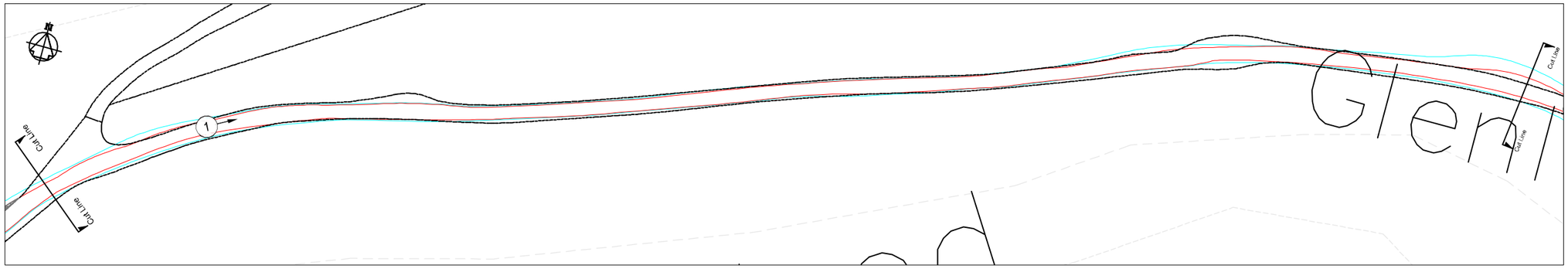
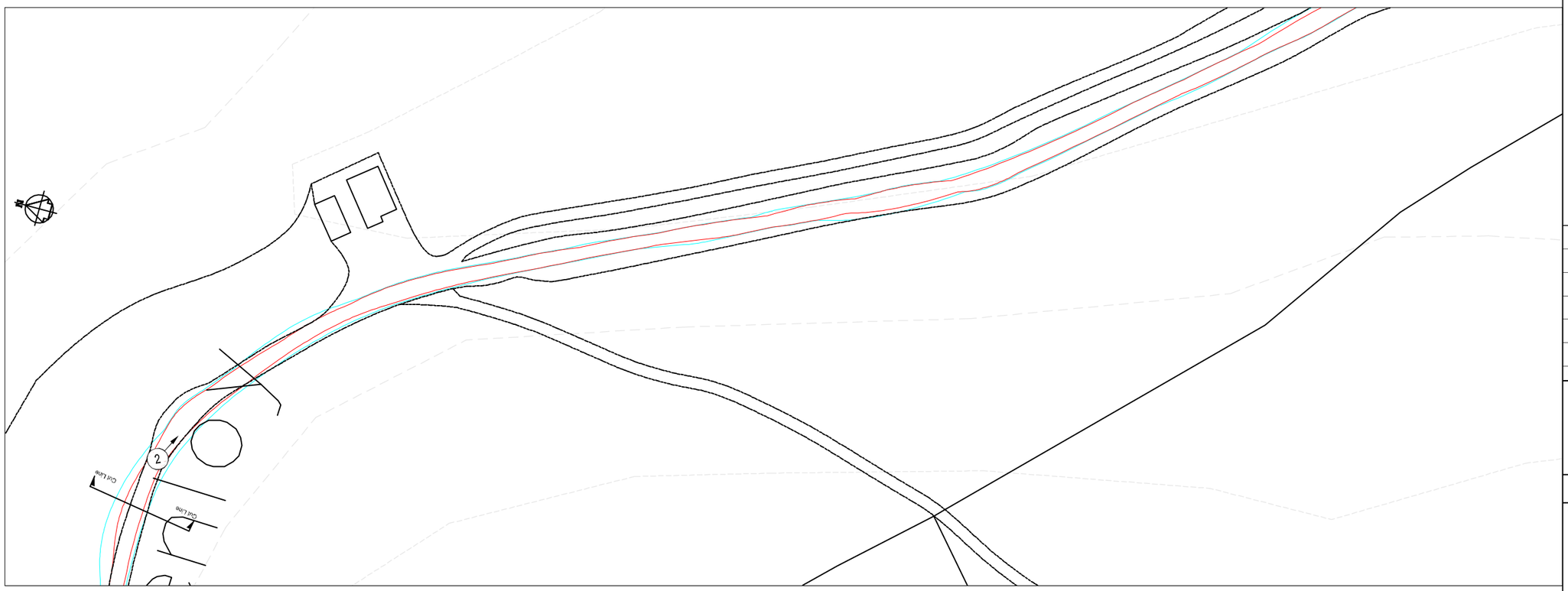


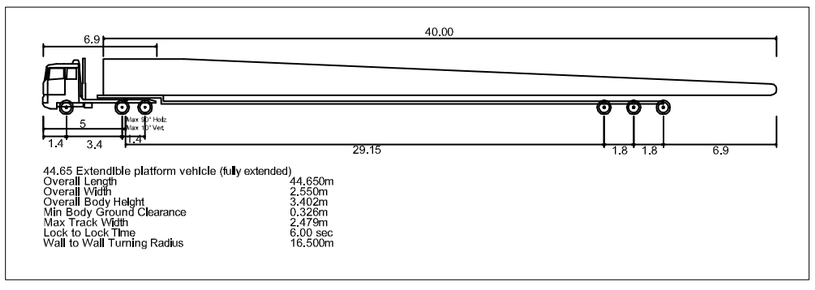
Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:1000



Indicative Vehicle Swept Path (40m long Turbine Blade Delivery Vehicle)

Scale 1:2500



Modelled Turbine Blade Delivery Vehicle

Photo 1: View Looking East

Photo 2: View Looking North East

NOTES

Notes:

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3. Hatched areas indicate extent of widening required for a delivery vehicle transporting a 40m long turbine blade. This is as per the modelled vehicle shown.

Legend:

- Direction of Photo
- Direction of Travel
- Delivery Vehicle Wheel Path
- Deliver Vehicle Over Sail
- Deliver Vehicle Over Sail

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGNERS RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

IP09-F01 Design Risk Assessment - Rev 5

CONSTRUCTION PHASE:-

- Delivery vehicle overhang conflicting with existing features (ie walls, building, services and verge).
- Requirement for 3rd Party Land

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Force 9 Energy

PROJECT

Blackwood Wind Farm,
Auldgirth, Dumfrieshire
Access Review

TITLE

Swept Path - Sheet 13
Proposed Access Through
Shooting Lodge (3 of 3)

STATUS

For Information

ORIGINATED	DRAWN	CHECKED	APPROVED
AM	DM	CRM	AM
DATE	DATE	DATE	DATE
05/05/11	05/05/11	05/05/11	05/05/11

DRAWING SCALE: As Shown

ORIGINAL DRAWING SIZE: A3 - 420x297

DRAWING No.: 10068/BW/018

REV.: 0

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APPENDIX 12
CLIMATE CHANGE

Appendix 12.1: Carbon Balance Datasheet

APPENDIX 12.1 CARBON BALANCE DATASHEET

Input data	Value	Actual / Assumed/ Default?	Comments
Wind farm characteristics			
No. of turbines	5	actual	
Life time of wind farm (years)	25	actual	
Power rating (turbine capacity) (MW)	2.05	actual	
Capacity factor (percentage efficiency)	30%	default	*The average capacity factor between 1998 and 2004 for Scotland was 30% (DTI, 2006, Energy Trends, March 2006), with the best being 34% and the worst 27%. As capacity factor is unknown, the average value of 30% has been assumed*
Extra capacity required for backup (%)	5%	default	*If 20% of national electricity is generated by wind energy, the extra capacity required for backup is 5% of the rated capacity of the wind farm (Dale et al 2004, Energy Policy, 32, 1949-56).*
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10%	default	*Note: Extra emissions due to reduced thermal efficiency of the reserve power generation ≈ 10% (Dale et al 2004, Energy Policy, 32, 1949-56)*
Total CO_2 emissions from turbine life (if known use direct input of emissions from turbine life)	Calculated with respect to installed capacity	default	
Characteristics of peatland before wind farm development			
Type of peatland	acid bog	estimated	The site lies outside sensitive peat areas (Scoping Report Ecology section), however acid bog (rather than "fen") has been assumed as a worst case.
Average air temperature at site (^{o}C)	7.8	estimated	Annual average air temperature for W of Scotland 1914-2008. Source: http://www.metoffice.gov.uk/climate/uk/datasets/Tmean/ranked/Scotland_W
Average depth of peat at site (m)	0.0	actual	Site visit observations and data review
C Content of dry peat (% by weight)	55	default	

Input data	Value	Actual / Assumed/ Default?	Comments
Average extent of drainage around drainage features at site (m)	10	estimated	A number of existing drainage features are present on site including natural watercourses and the existing access tracks. A value of 10m is estimated
Average water table depth at site (m)	2.5	estimated	Water table depth estimated at 2 to 3 m below ground level, hence 2.5m is assumed.
Dry soil bulk density (g cm^{-3})	0.1	estimated	
Characteristics of bog plants			
Time required for regeneration of bog plants after restoration (years)	10	assumed	No bog plants are present for regeneration / restoration hence this is a worst case assumption
Carbon accumulation due to C fixation by bog plants in un-drained peats (tC ha^{-1} yr^{-1})	0.25	default	No bog plants are present for regeneration / restoration hence this is a worst case assumption
Forestry Plantation Characteristics			
Method used to calculate CO_2 loss from forest felling	Enter simple data		
Area of forestry plantation to be felled (ha)	0	actual	No forestry is to be felled
Average rate of carbon sequesteration in timber (tC ha^{-1} yr^{-1})	3.6	assumed	
Counterfactual emission factors			
Coal-fired plant emission factor (t CO_2 MWh^{-1})	0.86	default	
Grid-mix emission factor (t CO_2 MWh^{-1})	0.43	default	
Fossil fuel- mix emission factor (t CO_2 MWh^{-1})	0.607	default	
Borrow pits			
Number of borrow pits	3	actual	
Average length of pits (m)	20	actual	
Average width of pits (m)	20	actual	
Average depth of peat removed from pit (m)	0.0	actual	
Foundation and hardstanding areas associated with each turbine			
Average length of turbine foundations (m)	20	actual	
Average width of turbine foundations(m)	20	actual	Area of foundation excavation
Average depth of peat removed from turbine foundations(m)	0.0	actual	

Input data	Value	Actual / Assumed/ Default?	Comments
Average length of hard-standing (m)	50	actual	Crane
Average width of hard-standing (m)	30	actual	Crane
Average depth of peat removed from hard-standing (m)	0.0	actual	
Access tracks			
Total length of access track (m)	6,300	actual	
Existing track length (m)	2,500	actual	
Length of access track that is floating road (m)	0	actual	
Floating road width (m)	0	actual	
Floating road depth (m)	0	actual	
Length of floating road that is drained (m)	0	actual	
Average depth of drains associated with floating roads (m)	0	actual	
Length of access track that is excavated road (m)	3,380	actual	New access track
Excavated road width (m)	5.0	actual	Worst case (road to be dressed back to 3.5m)
Excavated road depth (m)	1.0	actual	From track construction drawing
Length of access track that is rock filled road (m)	3,380	actual	New access track
Rock-filled road width (m)	5.0	actual	Worst case (road to be dressed back to 3.5m)
Rock-filled road depth (m)	1.0	actual	From track construction drawing
Length of rock-filled road that is drained (m)	3,800	actual	New access track
Average depth of drains associated with rock-filled roads (m)	0.3	actual	From track construction drawing
Cable Trenches			
Length of any cable trench on peat that does not follow access tracks and is lined with a permeable medium (eg. sand) (m)	0.0	actual	No cable trenches are located on peat
Depth of cable trench (m)	1.0	actual	
Peat Landslide Hazard			

Input data	Value	Actual / Assumed/ Default?	Comments
Weblink: Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments	0	actual	No risk of peat slide identified.
Improvement of C sequestration at site by blocking drains, restoration of habitat etc			
Improvement of degraded bog			
Area of degraded bog to be improved (ha)	0	actual	No degraded bog present / improved
Water table depth in degraded bog before improvement (m)	2.5	estimate	No bog present.
Water table depth in degraded bog after improvement (m)	2.5	estimate	No bog improvement.
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	0	actual	No degraded bog present / improved
Improvement of felled plantation land			
Area of felled plantation to be improved (ha)	0	actual	No plantation to be felled or improved
Water table depth in felled area before improvement (m)	2.5	estimate	No improvement proposed.
Water table depth in felled area after improvement (m)	2.5	estimate	No improvement proposed.
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	0	actual	No plantation to be felled
Restoration of peat removed from borrow pits			
Area of borrow pits to be restored (ha)	0.16	actual	All borrow pits assumed to be restored
Water table depth in borrow pit after restoration (m)	2.5	estimated	To be confirmed
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	10	assumed	Worst case assumption
Removal of drainage from foundations and hardstanding			
Water table depth around foundations and hardstanding after restoration (m)	2.5	estimate	
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	10	estimated	Worst case assumption

Input data	Value	Actual / Assumed/ Default?	Comments
Restoration of site after decommissioning			
Will the hydrology of the site be restored on decommissioning?	No	actual	
Will you attempt to block any gullies that have formed due to the windfarm?	No	actual	
Will you attempt to block all artificial ditches and facilitate rewetting?	No	actual	
Will the habitat of the site be restored on decommissioning?	No	actual	
Will you control grazing on degraded areas?	No	actual	
Will you manage areas to favour reintroduction of species?	No	actual	
Choice of methodology for calculating emission factors	IPPC	default	

APPENDIX 15

Appendix 15.1 Shadow Flicker Modelling Results

Project:
Blackwood

Printed/Page
11/01/2012 18:31 / 1

Calculated:
11/01/2012 15:05/2.7.490

SHADOW - Main Result

Calculation: ES Layout

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: Dalswinton.wpo (1)
Obstacles not used in calculation
Eye height: 1.5 m
Grid resolution: 10 m

Scale 1:25,000

New WTG Shadow receptor

WTGs

	BN (AIRY) (Normal) East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
	BN (AIRY) (Normal)		[m]					[kW]	[m]	[m]	[m]	[RPM]
1	293,077	589,093	235.0	REpower MM 82 2000 82.0...	Yes	REpower	MM 82-2,000	2,000	82.0	100.0	1,444	17.3
2	292,788	588,590	239.3	REpower MM 82 2000 82.0...	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
3	293,096	588,655	186.9	REpower MM 82 2000 82.0...	Yes	REpower	MM 82-2,000	2,000	82.0	100.0	1,444	17.3
4	292,876	588,283	227.8	REpower MM 82 2000 82.0...	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
5	293,061	588,116	195.7	REpower MM 82 2000 82.0...	Yes	REpower	MM 82-2,000	2,000	82.0	100.0	1,444	17.3

Shadow receptor-Input

No.	Name	BN (AIRY) (Normal) East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	High Auldgirth, east, ground floor	292,264	587,777	195.6	1.0	1.5	1.0	-180.0	90.0	Fixed direction
B	Pennyland, upstairs, rear	293,754	587,954	204.9	1.0	1.5	4.0	-163.8	90.0	Fixed direction
C	Pennyland, upstairs, front	293,759	587,942	204.8	1.0	1.5	4.0	14.3	90.0	Fixed direction

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	High Auldgirth, east, ground floor	14:55	51	0:23
B	Pennyland, upstairs, rear	25:24	97	0:21
C	Pennyland, upstairs, front	10:00	39	0:22

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	REpower MM 82 2000 82.0 !-! hub: 100.0 m (67)	0:00	
2	REpower MM 82 2000 82.0 !-! hub: 80.0 m (68)	15:52	
3	REpower MM 82 2000 82.0 !-! hub: 100.0 m (69)	0:00	
4	REpower MM 82 2000 82.0 !-! hub: 80.0 m (70)	9:32	
5	REpower MM 82 2000 82.0 !-! hub: 100.0 m (71)	24:54	

Project:
Blackwood

Printed/Page
09/01/2012 13:52 / 1

Calculated:
01/11/2011 16:54/2.7.490

FORCE 9 ENERGY

SHADOW - Calendar

Calculation: ES Layout**Shadow receptor:** A - High Auldgirth, east, ground floor

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

	January	February	March	April		May		June	July		August		September	October	November	December
1	08:41	08:08	07:08	06:49		05:37	06:05 (5)	04:44	04:39		05:22	06:16 (5)	06:19	07:16	07:16	08:16
	15:56	16:50	17:49	19:51		20:50	18 06:23 (5)	21:43	21:59		21:20	17 06:33 (5)	20:10	18:53	16:39	15:52
2	08:41	08:07	07:05	06:47		05:34	06:04 (5)	04:43	04:40		05:23	06:14 (5)	06:21	07:18	07:20	08:18
	15:57	16:52	17:51	19:53		20:52	20 06:24 (5)	21:44	21:58		21:19	19 06:33 (5)	20:08	18:51	16:37	15:51
3	08:41	08:05	07:03	06:44		05:32	06:03 (5)	04:42	04:41		05:25	06:14 (5)	06:23	07:20	07:22	08:19
	15:58	16:54	17:53	19:55		20:54	21 06:24 (5)	21:46	21:58		21:17	20 06:34 (5)	20:05	18:48	16:35	15:50
4	08:41	08:03	07:00	06:42		05:30	06:03 (5)	04:41	04:41		05:27	06:14 (5)	06:25	07:22	07:24	08:21
	16:00	16:56	17:55	19:57		20:56	21 06:24 (5)	21:47	21:57		21:15	20 06:34 (5)	20:03	18:46	16:33	15:49
5	08:40	08:01	06:58	06:39		05:28	06:03 (5)	04:40	04:42		05:29	06:13 (5)	06:27	07:24	07:26	08:22
	16:01	16:58	17:57	19:59		20:57	21 06:24 (5)	21:48	21:57		21:13	21 06:34 (5)	20:00	18:43	16:31	15:49
6	08:40	07:59	06:55	06:36		05:26	06:02 (5)	04:39	04:43		05:31	06:13 (5)	06:29	07:26	07:28	08:24
	16:02	17:01	17:59	20:01		20:59	22 06:24 (5)	21:49	21:56		21:11	21 06:34 (5)	19:58	18:41	16:29	15:48
7	08:39	07:57	06:53	06:34		05:24	06:03 (5)	04:38	04:44		05:32	06:13 (5)	06:31	07:28	07:30	08:25
	16:04	17:03	18:01	20:03		21:01	22 06:25 (5)	21:50	21:55		21:09	22 06:35 (5)	19:55	18:38	16:27	15:48
8	08:39	07:55	06:50	06:31		05:22	06:03 (5)	04:38	04:45		05:34	06:12 (5)	06:33	07:30	07:32	08:26
	16:05	17:05	18:03	20:05		21:03	22 06:25 (5)	21:51	21:54		21:06	22 06:34 (5)	19:53	18:36	16:25	15:47
9	08:38	07:53	06:48	06:29		05:20	06:03 (5)	04:37	04:47		05:36	06:12 (5)	06:35	07:32	07:34	08:28
	16:07	17:07	18:05	20:07		21:05	21 06:24 (5)	21:52	21:54		21:04	22 06:34 (5)	19:50	18:33	16:23	15:47
10	08:37	07:51	06:45	06:26		05:18	06:04 (5)	04:36	04:48		05:38	06:13 (5)	06:36	07:33	07:36	08:29
	16:08	17:09	18:07	20:09		21:07	19 06:23 (5)	21:53	21:53		21:02	20 06:33 (5)	19:47	18:31	16:21	15:46
11	08:37	07:49	06:43	06:24		05:16	06:04 (5)	04:36	04:49		05:40	06:14 (5)	06:38	07:35	07:38	08:30
	16:10	17:11	18:09	20:11		21:09	18 06:22 (5)	21:54	21:52		21:00	19 06:33 (5)	19:45	18:28	16:20	15:46
12	08:36	07:47	06:40	06:21		05:14	06:05 (5)	04:35	04:50		05:42	06:13 (5)	06:40	07:37	07:40	08:31
	16:12	17:13	18:11	20:13		21:11	16 06:21 (5)	21:55	21:51		20:58	18 06:31 (5)	19:42	18:26	16:18	15:46
13	08:35	07:45	06:38	06:19		05:12	06:06 (5)	04:35	04:51		05:44	06:15 (5)	06:42	07:39	07:42	08:32
	16:13	17:15	18:13	20:14		21:12	15 06:21 (5)	21:56	21:50		20:56	15 06:30 (5)	19:40	18:23	16:16	15:46
14	08:34	07:42	06:35	06:16		05:10	06:07 (5)	04:35	04:53		05:46	06:16 (5)	06:44	07:41	07:44	08:33
	16:15	17:18	18:15	20:16		21:14	12 06:19 (5)	21:56	21:48		20:53	13 06:29 (5)	19:37	18:21	16:14	15:46
15	08:33	07:40	06:33	06:14		05:08	06:08 (5)	04:35	04:54		05:47	06:18 (5)	06:46	07:43	07:46	08:34
	16:17	17:20	18:17	20:18		21:16	9 06:17 (5)	21:57	21:47		20:51	9 06:27 (5)	19:35	18:18	16:13	15:46
16	08:32	07:38	06:30	06:12		05:07		04:34	04:56		05:49		06:48	07:45	07:48	08:35
	16:18	17:22	18:19	20:20		21:18		21:57	21:46		20:49		19:32	18:16	16:11	15:46
17	08:31	07:36	06:28	06:09		05:05		04:34	04:57		05:51		06:50	07:47	07:50	08:36
	16:20	17:24	18:21	20:22		21:20		21:58	21:45		20:47		19:29	18:13	16:09	15:46
18	08:30	07:34	06:25	06:07		05:03		04:34	04:58		05:53		06:51	07:49	07:52	08:37
	16:22	17:26	18:23	20:24		21:21		21:59	21:43		20:44		19:27	18:11	16:08	15:46
19	08:28	07:31	06:23	06:04		05:01		04:34	05:00		05:55		06:53	07:51	07:54	08:38
	16:24	17:28	18:25	20:26		21:23		21:59	21:42		20:42		19:24	18:09	16:06	15:46
20	08:27	07:29	06:20	06:02		05:00		04:34	05:01		05:57		06:55	07:53	07:56	08:38
	16:26	17:30	18:27	20:28		21:25		21:59	21:41		20:40		19:22	18:06	16:05	15:47
21	08:26	07:27	06:17	05:59		04:58		04:34	05:03		05:59		06:57	07:55	07:58	08:39
	16:28	17:32	18:29	20:30		21:27		21:59	21:39		20:37		19:19	18:04	16:03	15:47
22	08:24	07:24	06:15	05:57		04:57		04:35	05:05		06:01		06:59	07:57	08:00	08:40
	16:30	17:34	18:31	20:32		21:28		22:00	21:38		20:35		19:16	18:02	16:02	15:47
23	08:23	07:22	06:12	05:55		04:55		04:35	05:06		06:02		07:01	07:59	08:02	08:40
	16:32	17:37	18:33	20:34		21:30		22:00	21:36		20:32		19:14	17:59	16:01	15:48
24	08:22	07:20	06:10	05:52		04:54		04:35	05:08		06:04		07:03	08:01	08:04	08:41
	16:34	17:39	18:35	20:36		21:31		22:00	21:35		20:30		19:11	17:57	15:59	15:49
25	08:20	07:17	06:07	05:50		04:52		04:35	05:09		06:06		07:05	07:03	08:06	08:41
	16:36	17:41	18:37	20:38		21:33		22:00	21:33		20:28		19:09	16:55	15:58	15:49
26	08:18	07:15	06:05	05:48		04:51		04:36	05:11		06:08		07:06	07:05	08:07	08:41
	16:38	17:43	18:39	20:40		21:35		22:00	21:31		20:25		19:06	16:52	15:57	15:50
27	08:17	07:13	06:02	05:45		04:50		04:36	05:13		06:10		07:08	07:08	08:09	08:41
	16:40	17:45	18:41	20:42		21:36		22:00	21:30		20:23		19:04	16:50	15:56	15:51
28	08:15	07:10	05:59	05:43	06:10 (5)	04:48		04:37	05:15	06:21 (5)	06:12		07:10	07:10	08:11	08:42
	16:42	17:47	18:43	20:44	10 06:20 (5)	21:38		22:00	21:28	8 06:27 (5)	20:20		19:01	16:48	15:55	15:52
29	08:14		06:57	05:41	06:08 (5)	04:47		04:38	05:16	06:19 (5)	06:14		07:12	07:12	08:13	08:42
	16:44		19:45	20:46	14 06:22 (5)	21:39		21:59	21:26	10 06:29 (5)	20:18		18:58	16:46	15:54	15:52
30	08:12		06:54	05:39	06:06 (5)	04:46		04:38	05:18	06:17 (5)	06:16		07:14	07:14	08:14	08:42
	16:46		19:47	20:48	16 06:22 (5)	21:40		21:59	21:24	13 06:30 (5)	20:15		16:56	16:44	15:53	15:53
31	08:10		06:52			04:45			05:20	06:16 (5)	06:18			07:16		08:42
	16:48		19:49			21:42			21:22	16 06:32 (5)	20:13			16:41		15:54
Potential sun hours	243	270	366	423		501		519	520		464		383	326	253	225
Total, worst case					40		277			45		278				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Blackwood

Printed/Page
09/01/2012 13:52 / 2

Calculated:
01/11/2011 16:54/2.7.490

FORCE 9 ENERGY

SHADOW - Calendar

Calculation: ES Layout**Shadow receptor:** B - Pennyland, upstairs, rear

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:41	08:08	07:08	06:49	05:36	19:51 (4)	04:44	20:40 (2)	04:39	20:49 (2)	05:21	20:06 (4)	06:19	07:16	07:18	08:16
	15:56	16:50	17:49	19:51	20:50	20 20:11 (4)	21:43	17 20:57 (2)	21:59	16 21:02 (2)	21:20	9 20:15 (4)	20:10	18:53	16:39	15:52
2	08:41	08:06	07:05	06:47	05:34	19:51 (4)	04:43	20:39 (2)	04:40	20:47 (2)	05:23	20:04 (4)	06:21	07:18	07:20	08:17
	15:57	16:52	17:51	19:53	20:52	20 20:11 (4)	21:44	18 20:57 (2)	21:58	16 21:03 (2)	21:18	13 20:17 (4)	20:08	18:51	16:37	15:51
3	08:41	08:05	07:03	06:44	05:32	19:50 (4)	04:42	20:39 (2)	04:40	20:46 (2)	05:25	20:03 (4)	06:23	07:20	07:22	08:19
	15:58	16:54	17:53	19:55	20:54	21 20:11 (4)	21:46	18 20:57 (2)	21:58	17 21:03 (2)	21:17	15 20:18 (4)	20:05	18:48	16:35	15:50
4	08:41	08:03	07:00	06:41	05:30	19:50 (4)	04:41	20:40 (2)	04:41	20:46 (2)	05:27	20:02 (4)	06:25	07:22	07:24	08:21
	15:59	16:56	17:55	19:57	20:55	21 20:11 (4)	21:47	18 20:58 (2)	21:57	17 21:03 (2)	21:15	17 20:19 (4)	20:03	18:46	16:33	15:49
5	08:40	08:01	06:58	06:39	05:28	19:50 (4)	04:40	20:40 (2)	04:42	20:46 (2)	05:29	20:01 (4)	06:27	07:24	07:26	08:22
	16:01	16:58	17:57	19:59	20:57	21 20:11 (4)	21:48	18 20:58 (2)	21:56	17 21:03 (2)	21:13	18 20:19 (4)	20:00	18:43	16:31	15:49
6	08:40	07:59	06:55	06:36	05:25	19:50 (4)	04:39	20:40 (2)	04:43	20:47 (2)	05:31	20:01 (4)	06:29	07:26	07:28	08:24
	16:02	17:00	17:59	20:01	20:59	20 20:10 (4)	21:49	17 20:57 (2)	21:56	17 21:04 (2)	21:11	19 20:20 (4)	19:58	18:40	16:29	15:48
7	08:39	07:57	06:53	06:34	05:24	19:51 (4)	04:38	20:41 (2)	04:44	20:47 (2)	05:32	20:01 (4)	06:31	07:28	07:30	08:25
	16:04	17:03	18:01	20:03	21:01	19 20:10 (4)	21:50	17 20:58 (2)	21:55	17 21:04 (2)	21:08	20 20:21 (4)	19:55	18:38	16:27	15:47
8	08:39	07:55	06:50	06:31	05:22	19:52 (4)	04:38	20:41 (2)	04:45	20:47 (2)	05:34	20:00 (4)	06:33	07:29	07:32	08:26
	16:05	17:05	18:03	20:05	21:03	18 20:10 (4)	21:51	17 20:58 (2)	21:54	17 21:04 (2)	21:06	20 20:20 (4)	19:52	18:35	16:25	15:47
9	08:38	07:53	06:48	06:29	05:20	19:53 (4)	04:37	20:42 (2)	04:46	20:47 (2)	05:36	20:00 (4)	06:34	07:31	07:34	08:28
	16:07	17:07	18:05	20:07	21:05	16 20:09 (4)	21:52	16 20:58 (2)	21:53	17 21:04 (2)	21:04	21 20:21 (4)	19:50	18:33	16:23	15:47
10	08:37	07:51	06:45	06:26	05:18	19:53 (4)	04:36	20:41 (2)	04:48	20:47 (2)	05:38	20:00 (4)	06:36	07:33	07:36	08:29
	16:08	17:09	18:07	20:09	21:07	15 20:08 (4)	21:53	17 20:58 (2)	21:53	18 21:05 (2)	21:02	21 20:21 (4)	19:47	18:30	16:21	15:46
11	08:37	07:49	06:43	06:24	05:16	19:54 (4)	04:36	20:42 (2)	04:49	20:47 (2)	05:40	19:59 (4)	06:38	07:35	07:38	08:30
	16:10	17:11	18:09	20:10	21:09	12 20:06 (4)	21:54	16 20:58 (2)	21:52	18 21:05 (2)	21:00	21 20:20 (4)	19:45	18:28	16:19	15:46
12	08:36	07:47	06:40	06:21	05:14	19:56 (4)	04:35	20:43 (2)	04:50	20:47 (2)	05:42	20:00 (4)	06:40	07:37	07:40	08:31
	16:11	17:13	18:11	20:12	21:11	8 20:04 (4)	21:55	16 20:59 (2)	21:51	18 21:05 (2)	20:58	19 20:19 (4)	19:42	18:25	16:18	15:46
13	08:35	07:44	06:38	06:18	05:12		04:35	20:42 (2)	04:51	20:48 (2)	05:44	20:00 (4)	06:42	07:39	07:42	08:32
	16:13	17:15	18:13	20:14	21:12		21:55	16 20:58 (2)	21:49	17 21:05 (2)	20:56	19 20:19 (4)	19:40	18:23	16:16	15:46
14	08:34	07:42	06:35	06:16	05:10		04:35	20:43 (2)	04:53	20:48 (2)	05:45	20:01 (4)	06:44	07:41	07:44	08:33
	16:15	17:17	18:15	20:16	21:14		21:56	15 20:58 (2)	21:48	17 21:05 (2)	20:53	17 20:18 (4)	19:37	18:21	16:14	15:46
15	08:33	07:40	06:33	06:14	05:08		04:34	20:43 (2)	04:54	20:48 (2)	05:47	20:01 (4)	06:46	07:43	07:46	08:34
	16:17	17:20	18:17	20:18	21:16		21:57	15 20:58 (2)	21:47	17 21:05 (2)	20:51	15 20:16 (4)	19:34	18:18	16:12	15:45
16	08:32	07:38	06:30	06:11	05:06		04:34	20:44 (2)	04:55	20:48 (2)	05:49	20:03 (4)	06:48	07:45	07:48	08:35
	16:18	17:22	18:19	20:20	21:18		21:57	15 20:59 (2)	21:46	16 21:04 (2)	20:49	12 20:15 (4)	19:32	18:16	16:11	15:46
17	08:31	07:36	06:28	06:08	05:05		04:34	20:44 (2)	04:57	20:50 (2)	05:51	20:05 (4)	06:49	07:47	07:50	08:36
	16:20	17:24	18:21	20:22	21:20		21:58	15 20:59 (2)	21:45	15 21:05 (2)	20:46	8 20:13 (4)	19:29	18:13	16:09	15:46
18	08:29	07:33	06:25	06:07	05:03		04:34	20:44 (2)	04:58	20:50 (2)	05:53		06:51	07:48	07:52	08:37
	16:22	17:26	18:23	20:24	21:21		21:58	15 20:59 (2)	21:43	14 21:04 (2)	20:44		19:27	18:11	16:08	15:46
19	08:28	07:31	06:22	06:04	05:01		04:34	20:45 (2)	05:00	20:51 (2)	05:55		06:53	07:51	07:54	08:38
	16:24	17:28	18:25	20:26	21:23		21:59	14 20:59 (2)	21:42	13 21:04 (2)	20:42		19:24	18:09	16:06	15:46
20	08:27	07:29	06:20	06:02	05:00		04:34	20:45 (2)	05:01	20:52 (2)	05:57		06:55	07:53	07:56	08:38
	16:26	17:30	18:27	20:28	21:25		21:59	14 20:59 (2)	21:41	11 21:03 (2)	20:39		19:22	18:06	16:05	15:46
21	08:26	07:27	06:17	05:59	04:58		04:34	20:45 (2)	05:03	20:52 (2)	05:59		06:57	07:55	07:58	08:39
	16:28	17:32	18:29	20:30	21:26		21:59	14 20:59 (2)	21:39	9 21:01 (2)	20:37		19:19	18:04	16:03	15:47
22	08:24	07:24	06:15	05:57	04:57	20:44 (2)	04:34	20:45 (2)	05:04	20:55 (2)	05:00		06:59	07:57	08:00	08:40
	16:30	17:34	18:31	20:32	21:28	7 20:51 (2)	22:00	14 20:59 (2)	21:38	5 21:00 (2)	20:35		19:16	18:01	16:02	15:47
23	08:23	07:22	06:12	05:55	04:55	20:43 (2)	04:35	20:46 (2)	05:06		06:02		07:01	07:59	08:02	08:40
	16:32	17:36	18:33	20:34	21:30	10 20:53 (2)	22:00	14 21:00 (2)	21:36		20:32		19:14	17:59	16:01	15:48
24	08:21	07:20	06:10	05:52	04:54	20:41 (2)	04:35	20:45 (2)	05:08		06:04		07:03	08:01	08:04	08:40
	16:34	17:39	18:35	20:36	21:31	12 20:53 (2)	22:00	15 21:00 (2)	21:34		20:30		19:11	17:57	15:59	15:48
25	08:20	07:17	06:07	05:50	04:52	20:40 (2)	04:35	20:45 (2)	05:09		06:06		07:05	07:03	08:05	08:41
	16:36	17:41	18:37	20:38	21:33	14 20:54 (2)	22:00	15 21:00 (2)	21:33		20:28		19:09	16:55	15:58	15:49
26	08:18	07:15	06:04	05:48	19:58 (4)	04:51	20:40 (2)	04:36	20:46 (2)	05:11	06:08		07:06	07:05	08:07	08:41
	16:38	17:43	18:39	20:40	9 20:07 (4)	21:34	15 20:55 (2)	22:00	15 21:01 (2)	21:31	20:25		19:06	16:52	15:57	15:50
27	08:17	07:12	06:02	05:45	19:56 (4)	04:49	20:40 (2)	04:36	20:45 (2)	05:13	06:10		07:08	07:07	08:09	08:41
	16:40	17:45	18:41	20:42	13 20:09 (4)	21:36	16 20:56 (2)	22:00	16 21:01 (2)	21:29	20:23		19:03	16:50	15:56	15:51
28	08:15	07:10	05:59	05:43	19:54 (4)	04:48	20:40 (2)	04:37	20:46 (2)	05:14	06:12		07:10	07:09	08:11	08:41
	16:42	17:47	18:43	20:44	16 20:10 (4)	21:37	16 20:56 (2)	21:59	15 21:01 (2)	21:26	20:20		19:01	16:48	15:55	15:51
29	08:14		06:57	05:41	19:52 (4)	04:47	20:40 (2)	04:37	20:47 (2)	05:16	06:14		07:12	07:12	08:13	08:42
	16:44		19:45	20:46	18 20:10 (4)	21:39	16 20:56 (2)	21:59	15 21:02 (2)	21:26	20:18		18:58	16:46	15:54	15:52
30	08:12		06:54	05:39	19:52 (4)	04:46	20:40 (2)	04:38	20:46 (2)	05:18	06:16		07:14	07:14	08:14	08:42
	16:46		19:47	20:48	19 20:11 (4)	21:40	17 20:57 (2)	21:59	16 21:02 (2)	21:24	20:15		18:56	16:43	15:53	15:53
31	08:10		06:52			04:45	20:40 (2)			05:20	20:10 (4)	06:17		07:16		08:42
	16:48		19:49			21:42	17 20:57 (2)			21:22	2 20:12 (4)	20:13			16:41	15:54
Potential sun hours	243	270	366	423		501	519		520		464		383	326	253	225
Total, worst case					75	351	473		341			284				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Blackwood

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FORCE 9 ENERGY

Calculated:
01/11/2011 16:54/2.7.490

SHADOW - Calendar

Calculation: ES Layout**Shadow receptor:** C - Pennyland, upstairs, front

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

	January	February	March	April		May		June	July	August		September		October	November	December
1	08:41	08:06	07:08	06:49		05:36	19:27 (5)	04:44	04:39	05:21		06:19	19:30 (5)	07:16	07:18	06:16
	15:56	16:50	17:49	19:51		20:50	9 19:36 (5)	21:43	21:59	21:20		20:10	10 19:40 (5)	18:53	16:39	15:52
2	08:41	08:06	07:05	06:47		05:34		04:43	04:40	05:23		06:21		07:18	07:20	06:17
	15:57	16:52	17:51	19:53		20:52		21:44	21:58	21:18		20:08		18:51	16:37	15:51
3	08:41	08:05	07:03	06:44		05:32		04:42	04:40	05:25		06:23		07:20	07:22	06:19
	15:58	16:54	17:53	19:55		20:54		21:46	21:58	21:17		20:05		18:48	16:35	15:50
4	08:41	08:03	07:00	06:41		05:30		04:41	04:41	05:27		06:25		07:22	07:24	06:21
	15:59	16:56	17:55	19:57		20:55		21:47	21:57	21:15		20:03		18:46	16:33	15:49
5	08:40	08:01	06:58	06:39		05:28		04:40	04:42	05:29		06:27		07:24	07:26	06:22
	16:01	16:58	17:57	19:59		20:57		21:48	21:56	21:13		20:00		18:43	16:31	15:49
6	08:40	07:59	06:55	06:36		05:26		04:39	04:43	05:31		06:29		07:26	07:28	06:24
	16:02	17:00	17:59	20:01		20:59		21:49	21:56	21:11		19:58		18:40	16:29	15:48
7	08:39	07:57	06:53	06:34		05:24		04:38	04:44	05:32		06:31		07:28	07:30	06:25
	16:04	17:03	18:01	20:03		21:01		21:50	21:55	21:08		19:55		18:38	16:27	15:47
8	08:39	07:55	06:50	06:31		05:22		04:38	04:45	05:34		06:33		07:29	07:32	06:26
	16:05	17:05	18:03	20:05		21:03		21:51	21:54	21:06		19:52		18:35	16:25	15:47
9	08:38	07:53	06:48	06:29		05:20		04:37	04:46	05:36		06:34		07:31	07:34	06:28
	16:07	17:07	18:05	20:07		21:05		21:52	21:53	21:04		19:50		18:33	16:23	15:47
10	08:37	07:51	06:45	06:26		05:18		04:36	04:48	05:38		06:36		07:33	07:36	06:29
	16:08	17:09	18:07	20:09		21:07		21:53	21:53	21:02		19:47		18:30	16:21	15:46
11	08:37	07:49	06:43	06:24		19:31 (5)	05:16	04:36	04:49	05:40		06:38		07:35	07:38	06:30
	16:10	17:11	18:09	20:10	11	19:42 (5)	21:09	21:54	21:52	21:00		19:45		18:28	16:19	15:46
12	08:36	07:47	06:40	06:21		19:27 (5)	05:14	04:35	04:50	05:42		19:34 (5)	06:40	07:37	07:40	06:31
	16:11	17:13	18:11	20:12	17	19:44 (5)	21:11	21:55	21:51	20:58	11	19:45 (5)	19:42	18:25	16:18	15:46
13	08:35	07:44	06:38	06:19		19:26 (5)	05:12	04:35	04:51	05:44		19:32 (5)	06:42	07:39	07:42	06:32
	16:13	17:15	18:13	20:14	20	19:46 (5)	21:12	21:55	21:49	20:56	14	19:46 (5)	19:40	18:23	16:16	15:46
14	08:34	07:42	06:35	06:16		19:23 (5)	05:10	04:35	04:53	05:45		19:30 (5)	06:44	07:41	07:44	06:33
	16:15	17:17	18:15	20:16	23	19:46 (5)	21:14	21:56	21:48	20:53	17	19:47 (5)	19:37	18:21	16:14	15:46
15	08:33	07:40	06:33	06:14		19:22 (5)	05:08	04:34	04:54	05:47		19:28 (5)	06:46	07:43	07:46	06:34
	16:17	17:20	18:17	20:18	25	19:47 (5)	21:16	21:57	21:47	20:51	19	19:47 (5)	19:34	18:18	16:12	15:45
16	08:32	07:38	06:30	06:11		19:22 (5)	05:06	04:34	04:55	05:49		19:27 (5)	06:48	07:45	07:48	06:35
	16:18	17:22	18:19	20:20	26	19:48 (5)	21:18	21:57	21:46	20:49	21	19:48 (5)	19:32	18:16	16:11	15:46
17	08:31	07:36	06:28	06:09		19:20 (5)	05:05	04:34	04:57	05:51		19:26 (5)	06:49	07:47	07:50	06:36
	16:20	17:24	18:21	20:22	28	19:48 (5)	21:20	21:58	21:45	20:46	23	19:49 (5)	19:29	18:13	16:09	15:46
18	08:29	07:33	06:25	06:07		19:20 (5)	05:03	04:34	04:58	05:53		19:25 (5)	06:51	07:49	07:52	06:37
	16:22	17:26	18:23	20:24	28	19:48 (5)	21:21	21:58	21:43	20:44	25	19:50 (5)	19:27	18:11	16:08	15:46
19	08:28	07:31	06:22	06:04		19:20 (5)	05:01	04:34	05:00	05:55		19:25 (5)	06:53	07:51	07:54	06:38
	16:24	17:28	18:25	20:26	29	19:49 (5)	21:23	21:59	21:42	20:42	26	19:51 (5)	19:24	18:09	16:06	15:46
20	08:27	07:29	06:20	06:02		19:16 (5)	05:00	04:34	05:01	05:57		19:24 (5)	06:55	07:53	07:56	06:38
	16:26	17:30	18:27	20:28	30	19:48 (5)	21:25	21:59	21:41	20:39	26	19:50 (5)	19:22	18:06	16:05	15:46
21	08:26	07:27	06:17	05:59		19:19 (5)	04:58	04:34	05:03	05:59		19:23 (5)	06:57	07:55	07:58	06:39
	16:28	17:32	18:29	20:30	28	19:47 (5)	21:26	21:59	21:39	20:37	28	19:51 (5)	19:19	18:04	16:03	15:47
22	08:24	07:24	06:15	05:57		19:19 (5)	04:57	04:34	05:04	06:00		19:23 (5)	06:59	07:57	08:00	06:40
	16:30	17:34	18:31	20:32	28	19:47 (5)	21:28	22:00	21:38	20:35	29	19:52 (5)	19:16	18:01	16:02	15:47
23	08:23	07:22	06:12	05:55		19:18 (5)	04:55	04:35	05:06	06:02		19:23 (5)	07:01	07:59	08:02	06:40
	16:32	17:36	18:33	20:34	27	19:45 (5)	21:30	22:00	21:36	20:32	29	19:52 (5)	19:14	17:59	16:01	15:48
24	08:21	07:20	06:10	05:52		19:18 (5)	04:54	04:35	05:08	06:04		19:22 (5)	07:03	08:01	08:04	06:40
	16:34	17:39	18:35	20:36	26	19:44 (5)	21:31	22:00	21:34	20:30	29	19:51 (5)	19:11	17:57	15:59	15:48
25	08:20	07:17	06:07	05:50		19:19 (5)	04:52	04:35	05:09	06:06		19:23 (5)	07:05	07:03	08:05	06:41
	16:36	17:41	18:37	20:38	24	19:43 (5)	21:33	22:00	21:33	20:28	28	19:51 (5)	19:09	16:55	15:58	15:49
26	08:18	07:15	06:04	05:48		19:20 (5)	04:51	04:36	05:11	06:08		19:23 (5)	07:06	07:05	08:07	06:41
	16:38	17:43	18:39	20:40	22	19:42 (5)	21:34	22:00	21:31	20:25	27	19:50 (5)	19:06	16:52	15:57	15:50
27	08:17	07:12	06:02	05:45		19:21 (5)	04:49	04:36	05:13	06:10		19:24 (5)	07:08	07:07	08:09	06:41
	16:40	17:45	18:41	20:42	20	19:41 (5)	21:36	22:00	21:29	20:23	26	19:50 (5)	19:03	16:50	15:56	15:51
28	08:15	07:10	05:59	05:43		19:22 (5)	04:48	04:37	05:14	06:12		19:24 (5)	07:10	07:09	08:11	06:41
	16:42	17:47	18:43	20:44	18	19:40 (5)	21:37	21:59	21:28	20:20	25	19:49 (5)	19:01	16:48	15:55	15:51
29	08:14		06:57	05:41		19:22 (5)	04:47	04:37	05:16	06:14		19:24 (5)	07:12	07:12	08:13	06:42
	16:44		19:45	20:46	16	19:38 (5)	21:39	21:59	21:26	20:18	23	19:47 (5)	18:58	16:46	15:54	15:52
30	08:12		06:54	05:39		19:24 (5)	04:46	04:38	05:18	06:16		19:25 (5)	07:14	07:14	08:14	06:42
	16:46		19:47	20:48	13	19:37 (5)	21:40	21:59	21:24	20:15	20	19:45 (5)	16:56	16:43	15:53	15:53
31	08:10		06:52				04:45		05:20	06:17		19:27 (5)		07:16		06:42
	16:48		19:49				21:42		21:22	20:13	16	19:43 (5)		16:41		15:54
Potential sun hours	243	270	365	423		501		519	520	464		383		326	253	225
Total, worst case					459		9				462		10			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Appendix 15.2 Shadow Flicker Cumulative Modelling Results

Project:
Blackwood

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11/01/2012 18:31 / 1

Calculated:
11/01/2012 15:05/2.7.490

SHADOW - Main Result

Calculation: ES Layout + DS

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: Dalswinton.wpo (1)
Obstacles not used in calculation
Eye height: 1.5 m
Grid resolution: 10 m

WTGs

	BN (AIRY) (Normal) East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
	BN (AIRY) (Normal)		[m]					[kW]	[m]	[m]	[m]	[RPM]
1	293,565	588,791	259.4	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
2	293,870	588,768	268.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
3	294,177	588,726	265.2	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
4	294,465	588,493	280.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
5	293,730	589,253	254.2	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
6	294,062	589,243	282.4	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
7	294,350	589,106	280.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
8	294,955	589,373	237.9	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
9	293,880	589,566	258.1	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
10	294,222	589,538	272.3	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
11	294,607	589,401	258.2	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
12	294,792	589,053	248.7	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
13	294,307	589,846	270.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
14	294,635	589,773	256.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
15	294,592	588,780	270.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
16	293,077	589,093	235.0	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	100.0	1,444	17.3
17	292,788	588,590	239.3	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
18	293,096	588,655	186.9	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	100.0	1,444	17.3
19	292,876	588,283	227.8	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	80.0	1,446	17.3
20	293,061	588,116	195.7	REpower MM 82 2000 82....	Yes	REpower	MM 82-2,000	2,000	82.0	100.0	1,444	17.3

Shadow receptor-Input

No.	Name	BN (AIRY) (Normal) East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	High Auldgirth, east, ground floor	292,264	587,777	195.6	1.0	1.5	1.0	-180.0	90.0	Fixed direction
B	Pennyland, upstairs, rear	293,754	587,954	204.9	1.0	1.5	4.0	-163.8	90.0	Fixed direction
C	Pennyland, upstairs, front	293,759	587,942	204.8	1.0	1.5	4.0	14.3	90.0	Fixed direction

Project:
Blackwood

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Calculated:
09/01/2012 13:48/2.7.490

FORCE 9 ENERGY

SHADOW - Main Result

Calculation: ES Layout + DS

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case: Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	High Auldgirth, east, ground floor	10:40	37	0:22
B	Pennyland, upstairs, rear	25:24	97	0:21
C	Pennyland, upstairs, front	15:40	42	0:30

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	REpower MM 82 2000 82.0 !-! hub: 80.0 m (1)	0:00	
2	REpower MM 82 2000 82.0 !-! hub: 80.0 m (2)	0:00	
3	REpower MM 82 2000 82.0 !-! hub: 80.0 m (3)	0:00	
4	REpower MM 82 2000 82.0 !-! hub: 80.0 m (4)	0:00	
5	REpower MM 82 2000 82.0 !-! hub: 80.0 m (5)	0:00	
6	REpower MM 82 2000 82.0 !-! hub: 80.0 m (6)	0:00	
7	REpower MM 82 2000 82.0 !-! hub: 80.0 m (7)	0:00	
8	REpower MM 82 2000 82.0 !-! hub: 80.0 m (8)	0:00	
9	REpower MM 82 2000 82.0 !-! hub: 80.0 m (9)	0:00	
10	REpower MM 82 2000 82.0 !-! hub: 80.0 m (10)	0:00	
11	REpower MM 82 2000 82.0 !-! hub: 80.0 m (11)	0:00	
12	REpower MM 82 2000 82.0 !-! hub: 80.0 m (12)	0:00	
13	REpower MM 82 2000 82.0 !-! hub: 80.0 m (13)	0:00	
14	REpower MM 82 2000 82.0 !-! hub: 80.0 m (14)	0:00	
15	REpower MM 82 2000 82.0 !-! hub: 80.0 m (15)	0:00	
16	REpower MM 82 2000 82.0 !-! hub: 100.0 m (24)	0:00	
17	REpower MM 82 2000 82.0 !-! hub: 80.0 m (25)	15:52	
18	REpower MM 82 2000 82.0 !-! hub: 100.0 m (26)	0:00	
19	REpower MM 82 2000 82.0 !-! hub: 80.0 m (27)	9:32	
20	REpower MM 82 2000 82.0 !-! hub: 100.0 m (28)	26:20	