

DEUCHRIES WIND FARM

Environmental Statement

Volume 1: Environmental Statement

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RSK GENERAL NOTES

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PREFACE

Force 9 Energy Partners LLP (Force 9 Energy) is seeking planning permission jointly with EDF Energy Renewables (EDF) for the Deuchries Wind Farm. The proposed three turbine wind farm would be located on a site 2km to the north east of Aberchirder, Huntly, Aberdeenshire. All three turbines would be a maximum 100m height to blade tip and would have an individual installed generating capacity of up to 2.3 MW, resulting in a potential maximum installed capacity of 6.9 MW.

The wind farm would also include relevant infrastructure such as new and upgraded access tracks, crane pads, cabling and a substation / control building, with a local connection to the electricity distribution network.

The wind farm would require connection to the local electricity distribution network. This grid connection would be installed under a separate contract by the Distribution Network Operator (DNO), which in this area is SSE Power Distribution, and would be subject to the DNO obtaining the necessary consent. The route for the grid connection is yet to be finalised but at this stage and for the purposes of this Environmental Statement, is assumed to comprise an underground 33kV line that would 't' into the existing 33kV line at the southern edge of the Site.

RSK Environment Ltd was commissioned to undertake an Environmental Impact Assessment (EIA) for the Deuchries Wind Farm on behalf of Force 9 Energy and EDF. The EIA considers the potential environmental effects associated with the construction, operation and decommissioning of the wind farm. This Environmental Statement (ES) reports on the findings of the EIA and accompanies the planning application for the wind farm.

Through the EIA process it was determined that the ES would include the following technical chapters: planning, physical environment, ecology, ornithology, landscape and visual assessment, archaeology and cultural heritage, noise, traffic and transport, climate change, socio-economics and electromagnetic interference, infrastructure, aviation and safety, and shadow flicker.

Force 9 Energy is committed to ensuring that sympathetic and sustainable design principles are embedded into each project design and also to engaging with local stakeholders for their views and inputs on each project. A public consultation programme has been completed, which included a public exhibition in October 2011.

ES Availability

The three volumes of the ES will be available for examination by members of the public at the following location:

Aberdeenshire Council
The Town House
28 Low Street
Banff
AB45 1AS

Aberchirder Pharmacy
55 Main Street
Aberchirder,
Huntly
AB54 7ST

Copies of the ES Non Technical Summary (NTS) will also be available from the council office.

Additional hard copies or electronic (CD) copies of the ES can be purchased at a cost of £200 and £2 respectively. Copies of the ES NTS are available free of charge. Please contact:

RSK Environment Ltd
65 Sussex Street
Glasgow
G41 1DX

Updates on the Deuchries Wind Farm and an electronic copy of the ES NTS to view will be available on the Force 9 website http://www.force9energy.com/projects/current/deuchries/

Any requests for further information on the Deuchries Wind Farm or information relating to Force 9 Energy should be made to Andrew Smith at Force 9 Energy LLP, Woodside House, 20-23 Woodside Place, Glasgow, G3 7QF.

Representations on the ES should be made to Aberdeenshire Council, at the address above.

1 INTRODUCTION

Purpose of the Environmental Statement

1.1 Under the Town and Country Planning (Scotland) Act 1997, as amended by the Planning (Scotland) Act 2006[1], planning permission is required from the relevant planning authority for electricity generation projects that fall below 50 Megawatts (MW).

1.2 Force 9 Energy Partners LLP (herein referred to as Force 9 Energy) is seeking planning permission jointly with EDF Energy Renewables (EDF) for the construction and operation of the Deuchries Wind Farm (hereafter 'the Development'), which would have an installed generating capacity of up to 6.9 MW. The relevant planning authority is Aberdeenshire Council.

1.3 Under the Town and Country Planning (Environmental Impact Assessment (EIA)) (Scotland) Regulations 2011 (hereafter the EIA Regulations)[2],developments of the type and scale proposed require statutory environmental impact assessments if they are considered likely to give rise to significant environmental effects because of their nature, scale or location.

1.4 Force 9 Energy concluded that the Development might give rise to some locally significant impacts on environmental receptors and a formal Screening Opinion on the need for statutory EIA was not sought from Aberdeenshire Council and Environmental Impact Assessment was undertaken voluntarily.

1.5 On behalf of Force 9 Energy RSK Environment Ltd (hereafter RSK) has completed an EIA of the Development, the findings of which are reported in this Environmental Statement (ES). The ES is submitted pursuant to the EIA Regulations, to accompany the planning application for the Development. The information contained in this ES and any subsequent responses to the ES provided by stakeholders will be used by Aberdeenshire Council to inform their decision as to whether to grant planning consent for the Development.

The Site and Proposed Development

1.6 The Development would be located on a site 2km north east of Aberchirder, Huntly, Aberdeenshire (hereafter 'the Site') (see Figure 1.1). The Site is approximately centred on National Grid Reference (NGR) NJ 643 545 and covers an area of approximately 363.3 hectares.

1.7 The Development would comprise three turbines each with an installed electricity generation capacity of up to 2.3 megawatts, together with ancillary infrastructure. No definitive details of the turbines can be given at this stage since they would be subject to a competitive tendering programme. However, the candidate turbine used for the EIA is an Enercon E70, which has dimensions of a maximum 100m height to blade tip and a maximum hub height of 65m. Noting that the configuration of wind turbines being considered for the implementation of the scheme may differ in terms of hub height, and

because longer blade lengths have distinct environmental implications, a turbine with a 60m hub height and 40m blade length has been considered for some of the technical assessments, namely ecology, ornithology, shadow flicker and traffic and transport.

1.8 Further detail on the Development, including other elements such as the permanent anemometry mast and substation / control building, is provided in ES Chapter 3: Project Description.

1.9 It is proposed that the Development would have a 25 year operational lifetime. At the end of this period EDF would have the option to decommission the Site and remove all the turbines or apply for an extension to increase the operational period.

1.10 The wind farm would require connection to the local electricity distribution network. This grid connection would be installed under a separate contract by the Distribution Network Operator (DNO), which in this area is SSE Power Distribution, and would be subject to the DNO obtaining the necessary consent. Current studies show capacity within the 33kV transmission line between Turriff and Aberchirder. For the purposes of the planning application and EIA it is assumed that an underground cable would be installed from the windfarm and a T-connection would be made into the transmission line between Turriff and Aberchirder, at a point approximately 2km to the south of the proposed turbine area, in proximity to the southern boundary of the Site.

1.11 It is calculated that the Development would provide enough energy to power approximately 3,850 homes[1] and the operation of the Development would result in annual GHG savings of 11,007 tonnes carbon dioxide equivalent (CO_2e), with a total saving of 255,362 tonnes CO_2e over its lifetime (refer to Chapter 12: Climate Change for further details).

Force 9 Energy and EDF

1.12 Force 9 Energy is a dedicated wind farm development company based in and with a focus on the UK market. To date Force 9 Energy has taken six developments through planning; four of which have been consented without appeal or Public Inquiry, one of which was consented on appeal, and one of which was refused after public inquiry. Two of those developments are now in operation and two are expected to start construction through 2012 and into 2013. The remaining consented development is likely to be in construction during 2013. Force 9 Energy is continuing to expand its wind farm development portfolio in response to the Government's targets for energy generation from renewable sources and has three planning applications awaiting determination. Further details on Force 9 Energy and its development portfolio can be seen on www.force9energy.com.

1.13 Force 9 Energy has a joint development agreement with EDF Energy Renewables (EDF). Through the agreement Force 9 Energy leads on the development process of wind farm proposals up to the start of construction. Should the wind farm be consented EDF would take the lead during construction and subsequently own and operate the

[1] Calculated using the formula from the renewableuk website http://www.bwea.com/edu/calcs.html

wind farm. Force 9 Energy is supported by EDF both financially and with staff resources requested by Force 9 on issues such as grid studies, access and public relations.

Project Team

1.14 Table 1.1 below summarises the technical specialists who have contributed to the EIA and their respective disciplines.

Table 1.1: EIA and Design Team

Organisation	Role
Amec	Ecological and Ornithological Consultant
Eversheds	Legal review of the ES and support to Force 9
Force 9	Developer.
Grontmij	Engineering consultancy and design advice, including provision of access study, transport assessment and transport ES chapter
PPS	Communications Consultant. Preparation of Statement of Community Involvement and organisers of public consultation exercises.
Roger Tym & Partners	Planning Consultants.
RSK Environment Ltd	EIA Co-ordination. Technical assessment for Landscape and Visual Assessment (and preparation of verified visualisations), Archaeology and Cultural Heritage, Ground Conditions, Flood Risk Assessment and Hydrology, Socio-economics and Climate Change.
The Wind Consultancy	Technical assessment for telecommunications, aviation, television, and other infrastructural assets, and shadow flicker assessment.

Structure of the Environmental Statement

1.15 The ES has been divided into three volumes as follows:

- Volume 1 Main Text and Figures which reports on the findings of the individual technical assessments, cumulative impacts and mitigation measures;
- Volume 2 Landscape and Visual Impact Assessment (LVIA) figures – to accompany the LVIA text in Volume 1; and
- Volume 3 Technical Appendices – these contain technical information to support the various assessments in Volume 1 as follows:
  - Appendix 1.1 Scoping Consultation Responses;
  - Appendix 5.1 Peat Probing Note;
  - Appendix 5.2 Flood Risk Assessment;
  - Appendix 6.1 Baseline Ecology Report;
  - Appendix 6.2 Bat Survey Report;
  - Appendix 7.1 Ornithology Survey Data;
  - Appendix 7.2: Collision Risk Modelling Results – Pink Footed Goose
  - Appendix 7.3: Collision Risk Modelling Results – Greylag Goose
  - Appendix 8.1 Landscape Character Type

- Appendix 8.2 Indicative wirelines;
- Appendix 9.1 Archaeology – Gazetteer;
- Appendix 9.2 Archaeology – Figures, Plates and References;
- Appendix 10.1 Noise Assessment Methodology;
- Appendix 10.2 Noise Monitoring Locations;
- Appendix 10.3 Noise Meter Certificates of Calibration;
- Appendix 10.4 Noise Monitoring Data
- Appendix 10.5; Predicted Noise Level Graphs;
- Appendix 11.1 Access Study;
- Appendix 11.1 Road Traffic Data;
- Appendix 12.1 Climate Change Calculation Sheet; and
- Appendix 15.1 Shadow Flicker Modelling Results.

1.16 The remainder of this Volume I of the ES follows the following structure:

- Chapter 2: Project Alternatives and Design Evolution;
- Chapter 3: Project Description, including a site description and details of the Development;
- Chapter 4: Planning Context;
- Chapter 5: Physical Environment (Geology, Hydrology and Hydrogeology);
- Chapter 6: Ecology;
- Chapter 7: Ornithology;
- Chapter 8: Landscape and Visual Assessment;
- Chapter 9: Archaeology and Cultural Heritage;
- Chapter 10: Noise;
- Chapter 11: Traffic and Transport;
- Chapter 12: Climate Change;
- Chapter 13: Socio-Economics (including potential impacts on recreation and tourism);
- Chapter 14: Electromagnetic Interference, Infrastructure, Aviation and Safety;
- Chapter 15: Shadow Flicker; and
- Chapter 16: Environmental Management.

1.17 In accordance with the EIA Regulations a Non Technical Summary of the ES has also been produced. This stand-alone document provides a concise description of the Development, the predicted environmental effects and mitigation measures in non-technical language.

EIA Methodology

The EIA Process

1.18 EIA is the procedure by which a development's likely significant environmental effects are methodically identified and assessed, for all stages of its lifecycle. The EIA for the Development has been completed in accordance with the EIA Regulations and current best practice guidance including:

- Scottish Government, 2011, Planning Circular 3, The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011;
- Scottish Natural Heritage, 2009, A Handbook on Environmental Impact Assessment; and
- Institute of Environmental Management and Auditing (IEMA), 2004 (and updated 2006), Guidelines for Environmental Impact Assessment.

Screening

1.19 As noted previously a formal 'Screening Opinion' as to the need for an EIA has not been sought from Aberdeenshire Council. Instead the EIA has been undertaken voluntarily to identify where significant effects on the environment may occur to inform design and a comprehensive mitigation strategy for the development

Scoping

1.20 An underlying principle of the EIA process is that it should concentrate on environmental issues where impacts associated with a development proposal have the potential to be significant. The Development was subject to a detailed scoping exercise in April 2011, in order to determine those issues that should be addressed in the EIA and the form that individual assessments should take.

1.21 The scoping exercise involved: a review of available documentation related to the form and status of the existing environment; consultation with statutory and non-statutory agencies and other environmental bodies with knowledge of the proposed development site and surrounding areas; preliminary desk-based and site-based appraisals and surveys; and knowledge of the potential environmental implications of comparable schemes (based on direct past project experience and other published experience and guidance).

1.22 A Scoping Report was produced for the Development that recorded the outcomes of the scoping exercise, specifically identifying the environmental issues of genuine potential significance to be assessed in the EIA and the assessment methodologies to be followed within each technical assessment. The report accompanied a formal request for a Scoping Opinion, submitted to Aberdeenshire Council in May 2011. The Scoping Opinion was received on 20th June 2011.

1.23 The Development would require connection to the local electricity distribution network. Further to the issue of the scoping report, the route for the grid connection is yet to be finalised, since the DNO would obtain a separate consent for the connection. However, the grid connection is critical to the successful operation of the Development and

therefore requires consideration as part of the EIA. For this EIA it is assumed that the grid connection would be made via an underground cable and the route is assumed to fall largely within the planning application boundary. On this basis, it was concluded that the grid connection only require consideration in the physical environment, ecology and archaeology ES chapters.

Environmental Statement

1.24 The ES is a public document that reports on the findings and conclusions of the EIA completed for the proposed Development, identifying mitigation and residual effects. It accompanies the planning application to provide information to stakeholders to help them understand the proposed Development and its likely effects, and allow them to comment on the acceptability of the environmental effects.

1.25 Schedule 4 Part 2 of the EIA Regulations specifies the minimum information requirements for an ES. Schedule 4, Part 1 of the EIA Regulations sets out the information "*as is reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile*". This ES has been formulated to comply with the requirements of Schedule 4 Parts 1 and 2 of the EIA Regulations.

1.26 The content of this ES is based on the Scoping Report and subsequent Scoping Opinion received from Aberdeenshire Council, together with a combination of baseline studies, consultations, calculations and modelling completed as required for the agreed technical assessments.

1.27 The EIA has been completed based on the detailed description of the construction, operation and decommissioning of the Development, as set out in ES Chapter 3: Project Description. Information obtained during the EIA process has been used to inform the Development design, to reduce or avoid likely significant environmental effects as far as is reasonably practicable.

1.28 Throughout the EIA process the likely significant effects of the Development have been considered. Any relevant assumptions made and limitations to the EIA are noted in Paragraph 1.49 and in the individual technical ES chapters.

Consultation

Scoping Consultation

1.29 A copy of the consultation responses received in the Scoping Opinion is contained in Technical Appendix A. A summary of the key points in the responses and the ES chapters in which they are addressed in provided in Table 1.2 below.

Table 1.2: Summary of Scoping Consultation Responses

Organisation	Response	Relevant chapter
Aberdeen Council - Archaeology	Agree with proposed study area distance and methodology.	Chapter 9: Archaeology and Cultural Heritage
Aberdeenshire Council – Environmental Health	Noise - Monitoring locations and data requirements need to be agreed with the EHO. The cumulative effects of this wind farm with other existing or proposed in the area need to be considered. The assessment needs to be carried out in accordance to the ETSU-R-97 guidance.	Chapter 10: Noise
	Ice Throw – details need to be provided in relation to the procedures for ice formation, turbine shut down and re-starting for approval by Aberdeenshire council.	Chapter 14: EMI, infrastructure, aviation and safety
	Shadow Flicker – a detailed shadow flicker assessment should be carried out and submitted at the time of the application. If planning permission is granted then conditions will be set to deal with any complaints.	Chapter 15: Shadow Flicker
	Noise during construction – if approved then conditions will be made in relation to hours of work during construction.	Chapter 10: Noise
Aberdeen Council – Infrastructure Services	Confirmed recent consultation with Historic Scotland and clarified that the assessment of development proposals should include Forglen House, as it is added onto the Inventory of Gardens and Designed Landscapes.	Chapter 9: Archaeology and Cultural Heritage
Aberdeenshire Council – Marr Team	Suggested that the kiosk should be incorporated into the turbine design rather than adjacent to it to reduce the L&V impact	Chapter 3: Project Description
	Queried the need for a permanent anemometer mast and how many are required.	
	Recommend contacting the flood prevention unit with details of watercourse crossing's and including these in the planning application.	Chapter 5: Physical Environment
	Requests that detailed drawings of the borrow pits (including size, location and maximum depth) should be included in the planning application and also considered in the LVIA.	Chapter 3: Project Description and Chapter 8: Landscape and Visual Assessment
	Consult SNH on the extent of the ZTV. Cumulative assessment should include all publicly known projects whether operational, at planning application stage, consented or at scoping/screening stage.	Chapter 8: Landscape and Visual Assessment
	The archaeological assessment should consider 226 listed buildings, 11 scheduled ancient monuments and other archaeological assets within 10km of the site.	Chapter 9: Archaeology and Cultural Heritage
	Additional viewpoints within the Marr Area should be included.	Chapter 8: Landscape and Visual Assessment
Aberdeen Council – Planning	Confirmed that the scoping report addresses the main issues that need to be covered, subject to any additional issues highlighted by the consultees.	

Organisation	Response	Relevant chapter
Aberdeenshire Council – Environmental officer	Advises that there are a lot of badgers in the proposed project area and that mitigation measures should be put in place to ensure that badgers are not harmed or trapped during construction.	Chapter 6: Ecology
Defence Infrastructure Organisation	Confirmed that the Ministry of Defence has no safeguarding objections to the proposal. Lighting: The MOD requests that the masts are fitted with 25 candela omni directional red lighting or infra red lighting at the highest practicable point.	Chapter 3: Project Description
Historic Scotland	The cumulative impact should consider other proposed and consented schemes.	Chapter 9: Archaeology and Cultural Heritage
	Confirm there are no scheduled monuments, category A listed buildings or gardens or designated landscapes within the project area.	
	The ZTV should be used to identify cultural heritage features, rather than the 10km suggested in the scoping report.	
	Attention should be given to North Burreldales, stone circle in the assessment and ZTV visualisation produced.	
	The assessment should refer to the advice contained in HS Managing Change in the Historic Environment guidance note.	
RSPB	Agreement with using the methodology "Survey Methods for Use in the Assessment of the Impact of Proposed Onshore Windfarms on Bird Communities (SNH 2005, revised 2010)" for the extended bird monitoring.	Chapter 7: Ornithology
SEPA	Carbon Balance and Peat Management – It is recommended that the ES contains a section systematically assessing carbon balance.	Chapter 12: Climate Change
	Disruption to Peatlands – If there are peatland or mire systems present the ES should demonstrate how the design (including borrow pits, hard standing, roads) of the project would avoid these areas where possible. If unavoidable appropriate mitigation should be included.	Chapter 2: Alternatives and Chapter 5: Physical Environment
	Disposal of waste peat to borrow pits - Disposal of peat waste in a borrow peat is not advised as the peat can suffer from significant drying and oxidation, and the peat redeposited at depth can lost structure and create a hazard when the stability of the material deteriorates.	Chapter 3: Project Description and Chapter 5: Physical Environment
	Peat Slide Risk – Concerned that a peat-slide or bog burst could result in a severe environmental damage including the pollution of the surrounding area. The risk of this should form part of the peat stability report.	Chapter 5: Physical Environment
	Wetland Ecology – A Phase 1 habitat survey should be carried out for the whole site and the guidance 'A Functional Wetland Typology for Scotland' used. Results should be included in the ES along with maps with the location of infrastructure clearly marked. The wind farm should be designed to avoid impacts on all wetlands.	Chapter 6: Ecology
	Groundwater - A list of groundwater abstractions sources, within and outwith the site boundary, within a radius of I) 100m from roads, trucks and trenches and ii) 250m from borrow pits and foundations should be complied and provided. A full risk assessment should be carried out on all wells within the surrounding area including private water supplies within 250m of turbine foundations or borrow pits, or within 100m of road, trucks or trenches.	Chapter 5: Physical Environment

Organisation	Response	Relevant chapter
	Construction Environmental Management and pollution prevention – The applicant 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.	Chapter 3: Project Description
	Engineering activities in the water environment –, turbines should be located well away from water features on-site in order to minimise impacts. Development should be designed to avoid any engineering activities in the water environment wherever possible.	Chapter 2: Alternatives and Chapter 5: Physical Environment
	Opportunities for environmental improvements – applicants are encouraged to seek opportunities to avoid or offset environmental impacts. Improvements, which might be considered, include the removal of redundant weirs, the creation of buffer strips and provision of fencing along watercourses.	Chapter 5: Physical Environment and Chapter 6: Ecology
	Borrow pits – detailed investigation into the need for and the impact of such facilities should be contained within the ES. Where borrow pits are proposed, information, should be provided regarding their location, size and nature including depth of the borrow pit floor and the final reinstated profile.	Chapter 5: Physical Environment
	Air Quality – advise that the Environmental Health within the local authority is consulted. Excavation works, particularly through drilling and blasting, may cause nuisance to the adjacent land users due to the generation of dust and noise.	Chapter 3: Project Description
	Flood Risk – Suggest that the site is assessed for flood risk from all sources in line with Scottish Planning Policy.	Chapter 5: Physical Environment and Technical Appendix 5.1
Scottish Government – Pollution and Strategic Delivery Team	Further noise monitoring should be undertaken based on the fact that four sensitive noise receptors were identified within 1km of the Site.	Chapter 10: Noise
Scottish National Heritage	Designated Sites –. Due to the fact that some bird species can travel considerable distances from a designated site, an initial consideration of all designated sites and their qualifying interests within a 20km radius of the proposal would be good practice.	Chapter 7: Ornithology
	Birds –Advises that 3 lowland/farmland bird survey visits during the breeding season and 3 during the winter season are required. Full details of bird watched should be provided. Potential impacts of the proposal on raptors and owls should be considered and level of survey scoped accordingly.	Chapter 7: Ornithology
	Contact the NBN Gateway and North- East Scotland Biological Records Centre. If any notable species are identified appropriate survey work should be carried out. Suggested protected species in the area are; bats, water voles, badgers and otters.	Chapter 6: Ecology
	Habitats – recommends that a Phase 1 habitat survey is undertaken within 250m of the site and included as part of the ES. And the ES should also include any areas of carbon rich soils.	Chapter 6: Ecology
	Cumulative Impact - SNH is concerned about the current number of proposed, approved and built wind projects in relatively close proximity to this development. The applicant should consider whether this site has the capacity to support this proposal in addition to other developments, with due regard given to the communities and their settlement settings that are likely to be affected by multiple wind energy developments.	Chapter 8 Landscape and Visual Amenity

Organisation	Response	Relevant chapter
	Infrastructure - Infrastructure such as roads and grid connection can have significant natural heritage impacts of their own. We recommend that the final report covers all aspects of the works that have the potential to have an impact upon the environment.	Chapter 6: Ecology Chapter 7: Ornithology and Chapter 8: Landscape and Visual Assessment
	Decommissioning - We advise that consideration is given in the report as to how the site would be decommissioned.	Chapters 4 to 15
Scottish Water	Confirmed that Scottish Water assets are not affected but the proposed development. Scottish Water requested that they are updated if any public sewers or water mains are found on site.	
Transport Scotland	Transport Scotland suggests that there will be minimal affect on the trunk road traffic during wind farm construction. Advises that the STV are consulted for authorisation of transport of abnormal loads.	Chapter 11: Traffic and Transport

1.30 Further consultation has been undertaken as an integral part of the EIA; the consultations completed are detailed in each of the ES technical chapters 5 to 14.

Public Consultation

1.31 The Development is classed as a "local development" under paragraph 4, Regulation 2(1) of the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009. Statutory pre-application consultation (PAC) with local communities prior to the submission of a planning application is not required for a local development.

1.32 However, in addition to the consultations described above, Force 9 Energy chose to undertake a programme of public consultation on the Development, which included a public exhibition in October 2011. The public consultation is reported separately to the ES in the Statement of Community Consultation (prepared by PPS) but key consultation activities can be summarised as follows:

- Local community councils were sent an introductory letter in the early stages and ongoing correspondence via telephone and email;
- Prior notification of the Public Exhibition: letters containing details of the public exhibition with an invitation to attend were sent out to 1,200 residential addresses in the Aberchirder area and to local stakeholders and politicians. Advertisements were also placed in the Banffshire Journal and Turriff Advertiser;
- Public Exhibition: this was held in the Marnoch church hall, Aberchirder on Thursday 6th October from 11am-8pm; and
- Follow up to public exhibition: letters and emails were issued to local stakeholders and politicians to update them on the Development following the exhibition and a presentation of updated proposals was provided to the community liaison manager.

Technical Assessment and ES Chapter Format

1.33 Once the issues to be addressed in the EIA had been confirmed with Aberdeenshire Council, technical assessments were undertaken to identify potential constraints and opportunities for the Development and inform its design, and assess the likely significant effects of the finalised Development.

1.34 Each environmental issue assessed was assigned a separate chapter in the ES (Chapters 5 to 14) and all technical chapters are structured as set out below:

Introduction

1.35 This section provides a brief summary of the topic and means of assessment in the chapter.

Policy Context

1.36 This section contains a review of relevant legislation and best practice guidance together with reference and due consideration of the adopted and emerging planning policies (national, regional and local) as detailed in Chapter 4: Planning.

Method of Assessment

1.37 This section sets out the approach to the assessment including data sources, consultations, models used and any limitations or assumptions made in the assessment. It also includes a set of assessment significance criteria, specific to the environmental aspect, with details of the criteria sources and justification for their use.

Baseline Environment

1.38 This provides a detailed description of the baseline environment (with relevance to the assessment), which has been established through collation and review of existing information, data and reports, completion of desk top studies and field survey work as necessary. Potential sensitive receptors and resources are also identified and modelled future conditions without the Development are included if appropriate.

Project Characteristics

1.39 A section of the chapter that distils the key construction, operational activities and decommissioning activities of the Development that could cause impacts in respect of the topic to be assessed.

Assessment of Impacts

1.40 This section describes the prediction and/or modelling of future conditions with the Development, identification of the likely significant environmental impacts that would result from the construction, operation and decommissioning of the Development and an evaluation of their magnitude and overall significance of the likely effect. This process uses the most appropriate combination of definitive standards and legislation, technical guidance, best practice and professional judgement.

Mitigation

1.41 This contains a description of the mitigation measures (above and beyond those inherent within the design) committed to in order to counter or offset predicted likely significant impacts.

Residual Effects

1.42 Provides confirmation of the likely significant effects that remain following the implementation of the mitigation measures.

Cumulative Impacts

1.43 Summarises likely cumulative impacts arising from the Development in combination with existing and proposed wind farm developments in the surrounding area.

1.44 Wind farm developments that are operational; have been consented and/or under construction (together termed "committed developments") or are in the planning system have been identified within a 60km radius of the Site, as identified on Figure 8.23. Only committed developments within a 15km radius of the Site have been assessed in detail for the LVIA; further detail on which is provided in ES Chapter 8.

Assessment Criteria

1.45 Schedule 3 of the EIA Regulations notes that the likely significant environmental effects of a development must be considered with regard to the following:

- Extent of the impact (geographical area and size of the affected population);
- Transfrontier nature of the impact (not applicable for the Development);
- The magnitude and complexity of the impact;
- The probability of the impact; and
- The duration, frequency and reversibility of the impact.

1.46 In addition Schedule 4 Part 1 of the EIA Regulations notes that both *'direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development'* should be described in the ES.

1.47 Each technical chapter therefore includes a specific set of assessment criteria to reflect the above requirements. Within this ES the likely significance of effect is generally defined through consideration of the sensitivity of the receptor in combination with the predicted impact magnitude; an example table is provided in Table 1.3. It should be noted that this table varies according to the assessment topic, the assessment guidelines and methodology followed, applicable standards and professional judgement. Specific variations are required for some topics e.g. the noise assessment considers compliance or exceedence of standards rather than a gradation of impact.

1.48 Impact magnitude may be established through consideration of the number of the receptors affected; the scale or extent of impact i.e. local, district, regional or national level; the duration of the impact and whether the impact is direct or indirect, primary or

secondary, reversible or irreversible. The sensitivity of the receptor or receiving environment has generally been determined through assessment of its level of scarcity, value, importance and/or protection. Other factors such as number of visitors for a tourist attraction, or frequency of use, may also be of note for some assessment topics.

Table 1.3: Effect Significance Criteria – Example Table

Impact Magnitude	Receptor Sensitivity				
		High	**Medium**	**Low**	**Negligible**
	High	Major	Moderate	Minor to Moderate	Negligible
	Medium	Moderate	Minor to Moderate	Minor	Negligible
	Small	Minor	Minor	Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

1.49 Within each chapter clarification is also provided on whether the identified likely effects are significant. These conclusions are drawn based on a combination of professional judgement and experience and relevant standards and guidance as appropriate, and vary according to the topic. For some topics only major effects are classed as significant, others include moderate – major and / or moderate effects as significant effects.

Assumptions and Limitations

1.50 The principal assumptions that have been made and any limitations that have been identified during the EIA are set out below. Assumptions specifically relevant to each environmental aspect are set out in the appropriate chapter.

- Baseline comprises the Site as existing in 2011-2012;
- Information received from third parties is assumed to be accurate, complete and up to date;
- The candidate turbine, the Enercon E70, has a maximum 100m height to blade tip and a maximum hub height of 65m. For some of the technical assessments, to allow assessment of a reasonable worst case scenario, it has been necessary to use an alternative candidate machine, with a maximum height of 100m to blade tip and 60m hub height. These alternative turbine dimensions have been used in the ecology, ornithology, shadow flicker and traffic and transport chapters;
- The turbines would be subject to a maximum micrositing tolerance of 30m in any direction, with the exception of areas which such micrositing would impinge on known environmental constraints, as identified in Figure 2.1. The environmental assessment includes consideration of this micrositing tolerance unless specified in the technical ES chapter, and reasoning for the assessment approach is provided; and
- It has been assumed in each assessment that the grid connection would be at 33kV and consist of an underground cable routed within the Site, alongside existing track verges as far as possible. However, the final decision about

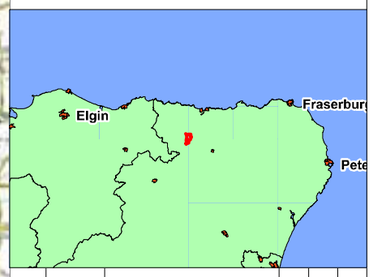
route and whether elements of this would be underground or pole-mounted lies with SSE Power Distribution.

Chapter 1 References

[1] Town and Country Planning (Scotland) Act 1997, as amended by the Planning etc (Scotland) Act 2006 asp 17

[2] Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.





Site Location

Rev	Date	Description	Drn	Chk	App
00	04.09.12	Site Location	BF	ND	PB

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 1.1: Site Location and Boundary

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FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES Fig 1.1 - Site Location and Site Boundary.Wor

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2 SITE SELECTION AND DESIGN EVOLUTION

Introduction

2.1 Under the Town and Country Planning (Environmental Impact Assessment) Scotland Regulations 2011, an Environmental Statement (ES) is required to provide "*an outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for the choice made, taking into account the environmental effects*". In EIA terms, the requirement is to report on alternatives that have been considered and indicate the main reasons for the choice made, taking into account environmental effects. The examination of alternatives in this ES therefore considers the site selection process and the design solutions that were considered for the site.

2.2 This chapter describes the process followed by Force 9 Energy in selecting the Deuchries Site as a potential location for the Development and the evolution of the Development design into that which forms the basis of the planning application (as described in Chapter 3 and shown in Figure 3.1).

2.3 Planning policy and a more detailed discussion of strategy and policy and justification for the Development is further considered in the planning statement that accompanies the planning application, which is not part of this ES.

Site Selection

2.4 Force 9 Energy Partners LLP has a continuous programme of search for sites that may be suitable for a wind farm development. Should a new site become available, a range of commercial, environmental, technical and policy factors are considered before a decision is made on whether to proceed with an environmental assessment and planning application.

2.5 In assessing a potential site the following criteria would usually considered:

- Avoid locations within International environmental designations;
- Avoid locations within national landscape and environmental designations;
- As a preference, avoid locations in locally designated landscapes;
- As a preference, avoid areas that may be susceptible to radar impact;
- As a preference, locate potential developments close to trunk roads and the national grid, but do not discount other areas at this stage on account of access;
- As a preference, avoid areas where other infrastructure may impact on scheme feasibility e.g. pipelines or significant levels of telecommunications traffic, but do not discount areas because of such constraints;

- Locate in preferred areas of search for windfarms in development plan documents where possible;
- Locate in areas where evidence of existing infrastructure defines or contributes to landscape character; and
- Avoid direct impacts to designated heritage assets.

2.6 The Site fits with Force 9 Energy's broad site identification process. Further detail on each criterion for the Site is provided below and a plan showing potential environmental constraints on and near the Site is included as Figure 2.1.

Land Availability

2.7 The Site lies over three farms, Deuchries, North Cranna and Upper Crannabog, each owned by a separate landowner. As part of a pro-active wind farm site search exercise Force 9 Energy applied its site selection criteria to the wider Aberdeenshire area. Through this process the Deuchries site was perceived to fit with those criteria. Given land owner assent to the proposal, Force 9 Energy determined that the land would present an opportunity for wind farm development.

Designated Sites

2.8 The Site is not located within a National Scenic Area (NSA) and the nearest NSAs, Deeside and Lochager and the Cairngorm Mountains are located beyond the 35km zone of theoretical visibility of the Development. The Site is also not located within a regionally designated Area of Great Landscape Value (AGLV).

2.9 There are no statutory ecological designations within the Site; the closest designation being the Site of Scientific interest (SSSI) is Reidside Moss, located 4km northwest of the Site.

2.10 An initial review of statutorily protected sites and areas, such as Listed Buildings, Scheduled Monuments, Conservation Areas and Historic Gardens and Designed Landscapes was undertaken. This showed that there were no designated heritage receptors on the Site, but there are a number of potential heritage receptors in the vicinity of the Site that would require further assessment (refer to ES Chapter 9: Archaeology and Cultural Heritage). It is of note that archaeological features can usually be preserved through wind farm design or mitigated by an appropriate archaeological strategy for excavation.

2.11 The 2005 supplementary planning guidance (SPG) document produced by Aberdeenshire Council "Use of Wind Energy in Aberdeenshire Part 1: Guidance for Developers" remains current. The addendum to the SPG issued in 2009 defines broad areas of search and identifies preferred areas for wind farms greater than 20MW. The SPG as relevant to the Development does not specifically identify preferred areas for this scale of wind farm, but provides general principles on siting of wind farms in a rural setting and therefore provides a steer towards sites that are likely to be preferred. For example it states that wind turbines should not be sited on any internationally or nationally designated sites (unless there are no alternative sites available) and adverse

impacts on regional or local designations should also be avoided. The Site is not located in a designated area of international or national natural heritage, local natural heritage or landscape.

Site Access

2.12 A number of the wind turbine components, notably the blades, tower sections and nacelles, exceed standard dimensions for transportation and are classified as 'abnormal loads'. Abnormal loads would generally travel to the Site in convoys of 3 – 4 vehicles at a time (which would include police escort vehicles), with a maximum of two convoys travelling to the Site in any given day. The highway and site entrance need to be of a suitable size and gradient to accommodate such vehicles and for critical junctions on the proposed access route (identified by on-site inspection), an early 'swept-path' analysis may be conducted. An initial access study including swept path analysis was completed for the Site in February 2011. This showed access to the proposed turbine area via North Cranna from the trunk road (A97) and B road network (B9025) was possible.

Proximity to a Grid Connection Point and Capacity

2.13 The electricity network connection equipment and associated infrastructure required are related to the connection voltage, the size of the wind farm and its distance to the nearest connection point. Furthermore, although the site may be close to an electricity sub-station or power line, there may be insufficient capacity in the infrastructure to accommodate the electricity from the wind farm. An initial study shows that there is capacity on the local grid for a development of the scale and nature of the Deuchries wind farm, and that a connection would be possible into the transmission line between Turiff and Aberchirder. Further details on the grid connection are provided in ES Chapter 3: Project Description.

Aviation

2.14 Wind turbines can affect aviation interests either through physical obstruction to aircraft flight movements or through the blade movements creating "clutter" on radar screens. Consultation with Ministry of Defence, Civil Aviation Authority (CAA) and National Air Traffic Services (NATS) is therefore undertaken early in the development process. The proposed Development area lies outside of any consultation zone for safeguarded aerodromes and outside areas of concern for meteorological radars.

Conclusions

2.15 The Site was concluded to be suitable for further consideration for a wind farm development. This was due to the accessibility and technical suitability of the Site, the landowners agreement and the relatively limited number of environmental constraints within the Site.

Alternatives

2.16 The following section describes the evolution of the wind farm design and presents the alternative layouts considered and design workshop process. The number, output, height and location of turbines were all amended before the layout was finalised.

No Development Alternative

2.17 The 'No Development' alternative refers to the option of leaving the Site in its current state. This option would be likely to result in the following impacts:

- A missed opportunity to contribute to the national and local targets for renewable energy generation;
- No corresponding reduction in greenhouse gas emissions through renewable energy generation;
- No diversification of the landowners activities;
- Landscape and visual impacts of the turbines and associated infrastructure would be avoided; and
- Habitats and species would remain undisturbed.

2.18 Overall, it is considered that the potential benefits of the Development would outweigh the potential adverse impacts that would arise, subject to suitable design, Environmental Assessment and definition of suitable mitigation.

Scheme A – Initial Considerations and Layout

2.19 The initial turbine layout, as shown in Figure 2.2, was developed for inclusion in the EIA Scoping Report, prior to the completion of all the detailed baseline studies. A wind farm of four turbines was proposed, with a proposed height of 110m to tip.

2.20 This initial design was based on the following principles;

- The site terrain and varying wind capacity across the Site;
- A layout that was appropriate in the context of the surrounding wind farms to provide visual continuity;
- Appropriate separation distances between turbines to maximise energy capture. These distances were not fixed and could be relaxed according to environmental constraints on the ground;
- Set backs from residential properties to achieve compliance with ETSU noise limits;
- Avoidance of power lines; and
- Location of turbines and hardstanding areas to avoid watercourses.

Scheme B – Seven Turbine Layout

2.21 Layout B, also shown in Figure 2.2, evolved from the turbine layout in Scheme A. This design looked at the use of a turbine with a reduced height to tip of 100m, but with a greater number of turbines (seven) to maximise the potential energy generation on the Site.

2.22 The southernmost turbine was moved northwards into the Site, to reduce potential visual impacts from Aberchirder.

Scheme C – Revised Four Turbine Layout

2.23 Layout C was influenced by points raised during the scoping report process, a design workshop and a series of surveys and data gathering exercises.

2.24 For the design workshop, all the constraints identified during the baseline data gathering process were mapped, with appropriate buffers, and the turbines sited accordingly so they did not impinge on any of these constraints as far as practicable. Wireline analysis was carried out using computer software to assess the design from a number of different viewpoints.

2.25 From this process it was evident that there were potential noise and landscape and visual impacts associated with the seven turbine layout. The visualisations highlighted that the seven turbines looked very busy and cluttered within the context of the surrounding landscape and thus posed a potential significant impact. Potentially significant adverse noise impacts were also identified.

2.26 The wind farm was therefore reduced in size; three of the turbines were removed. The remaining turbines were located to the eastern slopes of Blacklaw (reducing visibility from the A97 and views further to the west) and along the valley to the east, following the lower slopes of the Crannabog Hills. This created a greatly improved scheme in terms of both landscape and visual and noise impacts, though it was acknowledged that some ecological constraints remained for the easternmost turbine.

Scheme D - Three Turbine Layout

2.27 Following further on-site noise modelling and desk based wire line visualisations and the addition of a noise sensitive receptor to the baseline scenario (Parkside of Cranna) the easternmost turbine was removed from the Development layout. The remaining three turbines were then reconfigured to maximise potential energy generation with due consideration of identified environmental constraints. The final Development layout is shown in Figure 2.2 (and Figure 3.1) and meets required operational noise limits. Further details on the noise limits can be found in Chapter 10 Noise. .

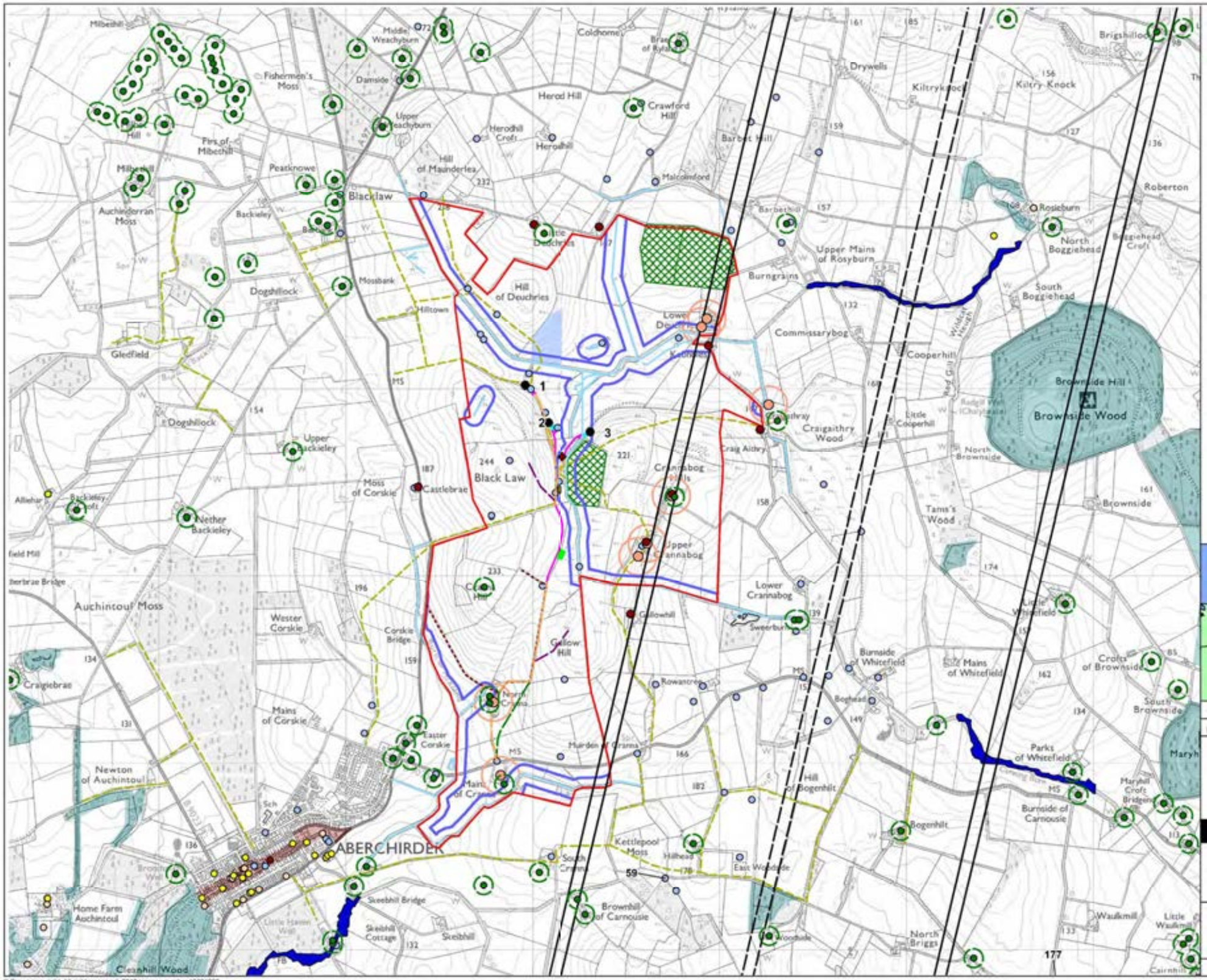
Access Track Options

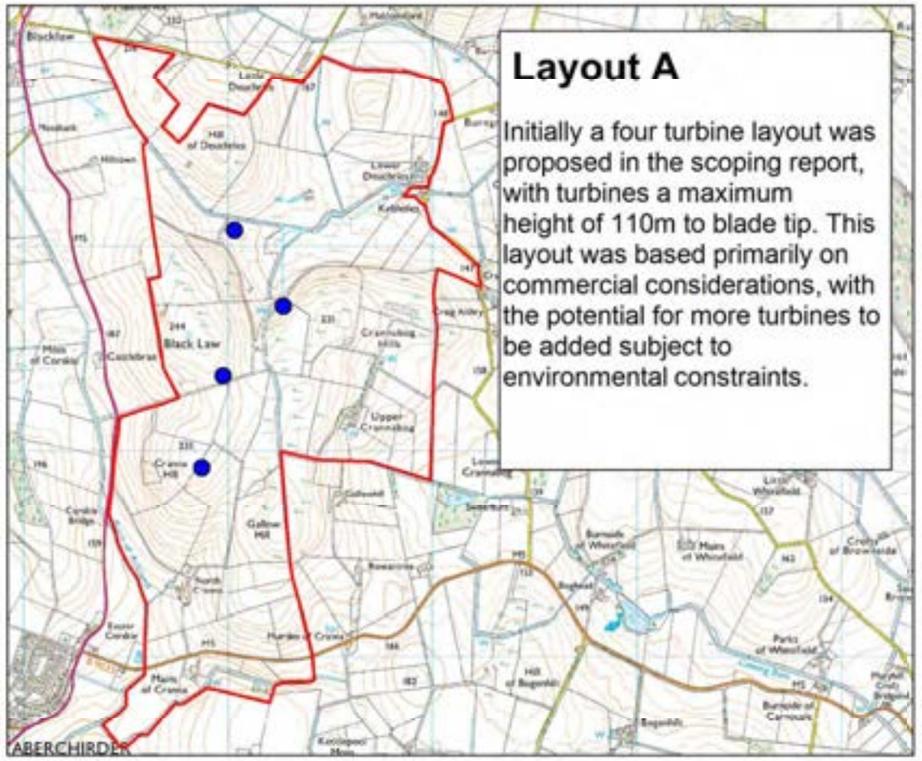
2.28 Access to the proposed turbine area would be taken via an unnamed road that passes through the North Cranna cluster of buildings. An alternative access route has also been developed that avoids routing through the buildings to minimise potential disruption to this property during the construction (and decommissioning) phase. Both options are included as part of the Development as shown in Figure 3.1 and have been considered in the EIA.

Conclusions

2.29 The Development to be submitted for planning has evolved as information has become available on physical and environmental constraints. The position of the turbines in the finalised scheme was chosen to provide a visually coherent layout that fitted within the context of the surrounding landscape, and by reducing the number and height of the proposed turbines the potential environmental impacts were also minimised.

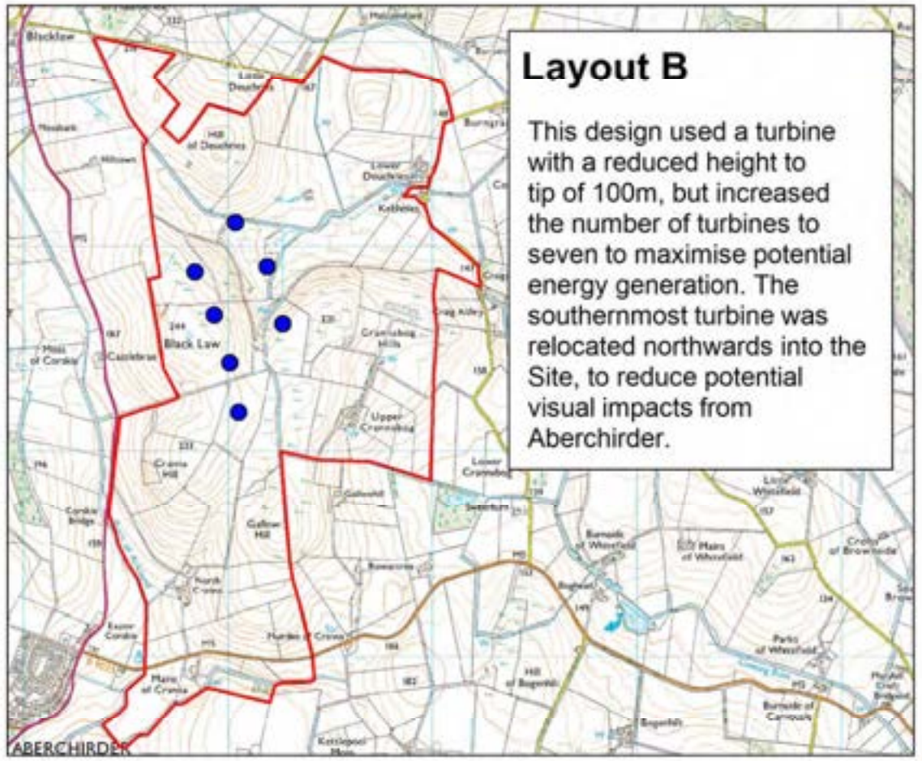
2.30 The final layout is included as Figure 3.1 and is described in detail in Chapter 3: Project Description.


Proposed Turbine
Site Boundary
Existing Road to be upgraded
Potential Access Track
Crane hard standing
Proposed Control Building Compound
Proposed Construction Compound
Proposed Anemometer Mast Location
Proposed Access Track to Identified Borrow Areas
Alternative New Access Track
Scheduled Ancient Monument
Garden and Designed Landscapes
Listed Building Category A
Listed Building Category B
Listed Building Category C
Conservation Areas
Archaeological Undesignated Site
Bat Roost Potential
100m bat roost potential buffer
Geese Field
Ancient and Semi-natural Woodland
50m Easement
Watercourse
SEPA abstraction and dischage points and 50m buffer
Areas at Risk of Flooding from Rivers
Telecoms and buffer zone
Noise Receptor
Scotways Rights of Way
Wider Network Route (Draft Core Path Plan)
Elgin
Fraserbur
Pete
32 05.09.12 Constraints BF ND PB
Rev Date Description Drn Chk App
FORCE 9 ENERGY
Deuchries Wind Farm
RSK
Figure 2.1: Environmenal Constraints
SCALE: 1:20,000 @ A3
REV 02
FILE NAME: P:\ENVIRONMENT\190000 - EA Glasgow\P190203 Deuchries Wind Farm\08 GIS\ES Fig 2.1 - Environmental Constraints Wor
Milbeithill
Middle Weachyburn
Damside
Upper Weachyburn
Herod Hill
Herodhill Croft
Herodhill
Crawford Hill
Coldhome
Drywells
Kiltrykebog
Kiltry Knock
Brigshillock
Fishermen's Moss
Firs of Milbeithill
Milbeithill
Auchenderran Moss
Peatknowe
Blacklaw
Hill of Maunderlea
Malcomford
Barbeth Hill
Barbethill
Little Deuchries
Hill of Deuchries
Upper Mains of Rosyburn
Burngrains
Rosieburn
North Boggiehead
Boggiehead Croft
South Boggiehead
Roberton
Backieley
Mossbank
Hilltown
Dogshillock
Gledfield
Lower Deuchries
Commissarybog
Cooperhill
Little Cooperhill
North Brownside
Brownside Hill
Brownside Wood
Brownside
Craigaithry
Craigaithry Wood
Craig Aithry
Upper Backieley
Moss of Corskie
Castlebrae
Black Law
Crannabog Wells
Tams's Wood
Allieha
Backieley Croft
Nether Backieley
Field Mill
Auchintoul Moss
Wester Corskie
Corskie Bridge
Gallowhill
Gallow Hill
Lower Crannabog
Sweerbuss
Burnside of Whitefield
Mains of Whitefield
Crofts of Brownside
South Brownside
Craigiebrae
Mains of Corskie
Easter Corskie
Murder Cairns
Rowantree
Bogheid
Parks of Whitefield
Burnside of Carnousie
Maryhill Croft
Maryhill Bridge
Newton of Auchintoul
Hill of Bogenhilt
Bogenhilt
ABERCHIRDER
Kettlepool Moss
Hillhead
East Wardside
Brownhill of Carnousie
Woodside
Waulkmill
Little Waulkmill
North Briggs
Home Farm Auchintoul
Skeebhill Bridge
Skeebhill Cottage
Skeebhill
Cleanhill Wood
Sch
M5
A96
177
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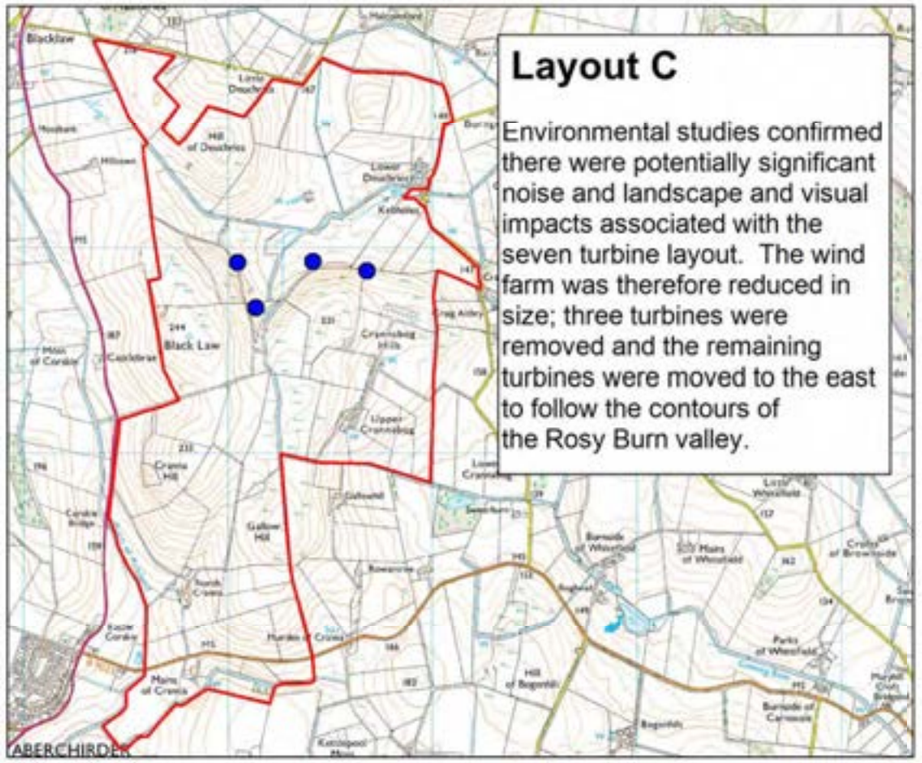
Layout A

Initially a four turbine layout was proposed in the scoping report, with turbines a maximum height of 110m to blade tip. This layout was based primarily on commercial considerations, with the potential for more turbines to be added subject to environmental constraints.



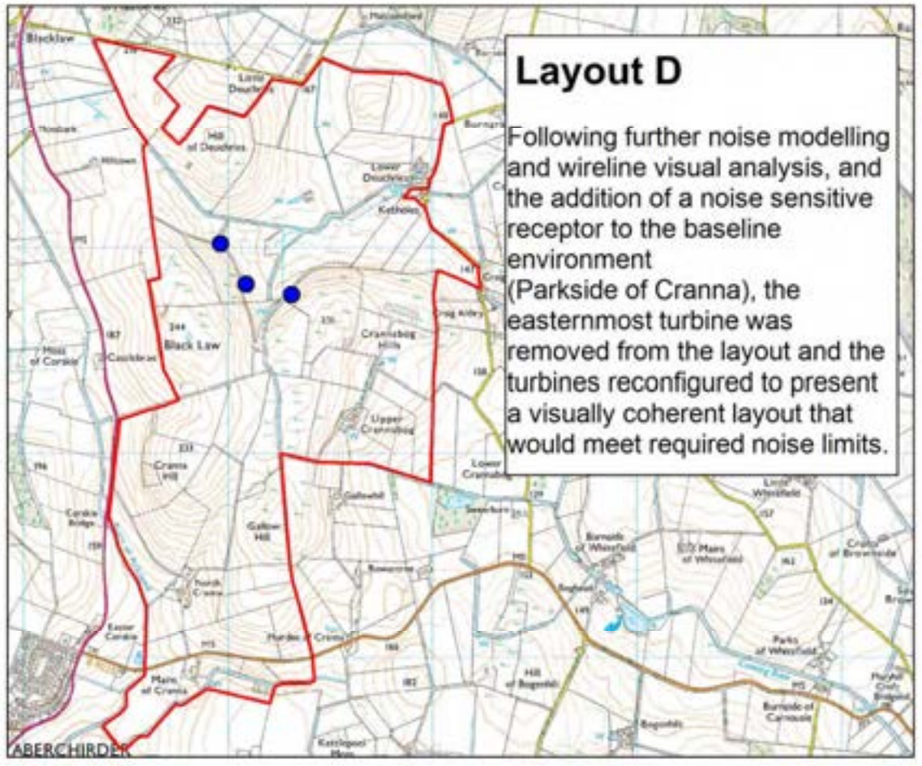
Layout B

This design used a turbine with a reduced height to tip of 100m, but increased the number of turbines to seven to maximise potential energy generation. The southernmost turbine was relocated northwards into the Site, to reduce potential visual impacts from Aberchirder.



Layout C

Environmental studies confirmed there were potentially significant noise and landscape and visual impacts associated with the seven turbine layout. The wind farm was therefore reduced in size; three turbines were removed and the remaining turbines were moved to the east to follow the contours of the Rosy Burn valley.



Layout D

Following further noise modelling and wireline visual analysis, and the addition of a noise sensitive receptor to the baseline environment (Parkside of Cranna), the easternmost turbine was removed from the layout and the turbines reconfigured to present a visually coherent layout that would meet required noise limits.

Proposed Turbine
Site Boundary



Rev	Date	Description	Drn	Chk	App
02	08.08.12	Design Evolution	BF	ND	PB
01	25.07.12	Design Evolution	BF	ND	PB
00	17.01.12	Design Evolution	BF	MK	MK

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 2.2: Design Evolution

SCALE: 1:30,000 @ A3

REV 02

FILE NAME: P:\ENVIRONMENT\119\0000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES Design Evolution.wor

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3 PROJECT DESCRIPTION

Introduction

3.1 This chapter provides details of the proposed Development, including a description of the Site and its surroundings, a description of the main components of the Development and its construction, commissioning, operational and decommissioning activities. An indicative project programme is also provided. This project description forms the basis of the assessment for the EIA.

Site Description

3.2 The Site is located approximately 2km northeast of the Village of Aberchirder, Huntly, Aberdeenshire, as shown in Figure 1.1. The Site covers a valley situated between Crannabog Hills to the east and Black Law to the west and is bounded by the A97 to the west, the B9025 to the south and minor unclassified roads to the east and north. The total Site area is 363.3 hectares (Ha) though a far smaller area would be subject to permanent land take, as described below.

3.3 Land within the Site falls under the ownership of three farms: Deuchries, North Cranna and Upper Crannabog. Land use primarily comprises semi-improved grassland, grassland and arable farmland. The majority of the Site is used for grazing sheep and cattle but crops are also grown in some of the fields. An area on the west side of Blacklaw had previously been quarried during the construction of the adjacent A97, but is now disused and overgrown. There are small areas of scrub in the west and north west of the Site and an area of coniferous plantation along the eastern Site boundary. The land has a 3.2 Macaulay agricultural classification[1], which means that it is capable of supporting mixed agriculture, producing a moderate range of crops.

3.4 A number of individual properties are located within the Site at North Cranna, Upper Crannabog, Main of Cains, Lower Deuchries, Thistle Mill, Kebholes, and Parkside of Cranna, some of which have local shelterbelts of planting.

3.5 A temporary 70m anemometer mast was erected on Site on 27th September 2011. The mast is currently located to the south of the proposed location of turbine 2, on the east side of Black Law.

3.6 Topography of the Site varies, the highest point being located in the north west of the Site at Black Law, where the land peaks at approximately 233m above ordnance datum (AOD). The lowest point lies at Mains of Cranna at approximately 130m AOD. Other notable peaks within the Site include Cranna Hill (233m AOD), Hill of Deuchries (c230m AOD) and Gallow Hill (c230m AOD).

3.7 A network of small watercourses and channels cross the Site; surface water in the north of the Site generally drains into the Rosy Burn, the Cunning Burn receives surface water from the east of the Site, and surface water in the south of the Site flows into

several unnamed drainage features. These features flow in a general southwest direction into the Burn of Auchintoul (via the Arkland Burn). All three burns discharge to the River Deveron which is located circa 3km to the east of the Site, and flows in a generally northerly direction joining the North Sea at Banff. There is an existing 60m culvert on-Site, which forms part of the Headwater into Rosy Burn.

3.8 An unclassified road leads north from the B9025 to the settlement of North Cranna. A farm access track leads north from North Cranna to Cranna Hill and the A97. A second farm track leads into the Site from the minor road to the east, to provide access to the Parkside of Cranna and Upper Crannabog properties.

3.9 There are no statutory designations such as Scheduled Monuments (SM) or Sites of Special Scientific Interest (SSSI) on or in the immediate vicinity of the Site. The nearest SSSI is Reidside Moss, located 4km to the northwest of the Site.

Surrounding Land Use

3.10 The Site is situated in a rural area and surrounding land use is predominantly agricultural land, comprising arable and mixed agriculture[2]. Properties within the local landscape mainly comprise a mix of individual houses, farm buildings and hamlets. Local areas of woodland include the Forestry Commission Scotland Brownside and Maryhill Woods approximately 2km to the east of the Site. Todlaw Wood is located approximately 5km to the east of the Site and Auchintoul Moss approximately 1km to the west of the Site.

3.11 There are two Joint Radio Company links located to the east of the Site (approximately 570m and 640m from the Site boundary), running northwards.

3.12 There are a number of operational wind farm sites within the wider area, the details of which are summarised in Table 3.1 below.

Table 3.1: Operational Wind Farms within the Local Area

Wind Farm Name	Location	Number of Turbines	Turbine Height (to tip)
Boyndie	8.5km north west	8	110.5m
Cairnhill	18km east	3	76m
Gairnieston Farm	15km east	1	100m
Strath of Brydock	5km north	3	100m

The Development

3.13 This section describes the key components of the proposed wind farm ('the Development').

Summary of Key Components

3.14 The main components of the wind farm are shown on Figure 3.1 and would comprise the following:

- Three wind turbines. For the purposes of this ES the candidate turbine is the Enercon E70 turbine, which would have an installed capacity of 2.3 MW to give the Site a total installed capacity of up to 6.9MW. The final installed capacity of the Site would be dependent on the final turbine selection based on a competitive tendering process. All three turbines would have a maximum height to blade tip of 100m;
- Crane hardstanding areas of approximate dimensions 39m x 22m adjacent to each turbine and 15m x 21m adjacent to the permanent anemometer mast location;;
- A permanent anemometer mast, which would be of lattice tower construction, and approximate height 70m located to the south of turbine 2 as shown on Figure 3.1;
- Re-use of existing access tracks and construction of new permanent access tracks to allow construction and maintenance of the turbines;
- A temporary construction compound approximately 30m by 50m located to the south of the turbines;
- Two temporary borrow pits from which stone can be won for the construction and upgrading of tracks on Site; and
- A Site substation and control building where electricity from each turbine is collected and discharged to the grid. Underground electrical cabling would link the turbines to the control building.

3.15 A grid connection would be installed as a separate contract by the Distribution Network Operator (DNO) (which in this area is Scottish and Southern Energy Power Distribution) and would be subject to the DNO obtaining the necessary consent. The connection would comprise an electricity transmission cable (33kV) leading from the Site control building to connect into the local electricity distribution network.

3.16 Current studies show capacity within the 33kV line that runs between Turriff and Aberchirder, approximately 2km to the south of the proposed turbine area, along the southern edge of the application Site boundary. For the purposes of the planning application it is assumed an underground 33kV cable leading from the turbine area would ‘t’ into this existing 33kV line. However, the final decision about the nature and route of the connection would be made by the DNO.

Land Take

3.17 The temporary and permanent land-take for the proposed Development is detailed in Table 3.2 below.

3.18 Two possible options for the access track are to be considered in the EIA, as seen in Figure 3.1. The preferred option is to upgrade the existing track already present on Site that runs northwards via the North Cranna Farm buildings. The alternative access route would require the creation of a new track that bypasses the North Cranna farm buildings

and rejoins the existing track to the north. The corresponding areas of land take for the two track options are presented in Table 3.2.

Table 3.2: Approximate Land Take

Component	Access Route (via North Cranna)		Alternative Access Route	
	Permanent (Ha)	Temporary (Ha)	Permanent (Ha)	Temporary (Ha)
New Access Tracks (7m width allowing for 1m track shoulders)	0.38	0.15	0.6	0.24
Upgraded Access Tracks (existing access track 2.5m, proposed track dimensions as above)	0.48	0.38	0.33	0.26
Temporary Construction Compound and laydown area	0	0.15	0	0.15
Turbine and anemometer mast foundations	0.15	0	0.15	0
Crane hard-standings	0.26	0	0.26	0
Control Building (including parking area)	0.02	0	0.02	0
Borrow Pits	0	0.6	0	0.6
Total Area	**1.29**	**1.28**	**1.36**	**1.25**

Wind Turbines

Turbine Locations and Dimensions

3.19 The turbine locations are illustrated on Figure 3.1. The turbines and ancillary infrastructure would be subject to a maximum micrositing tolerance of 30m in any direction, with the exception of areas where micrositing would impinge on identified environmental constraints (as defined in Figure 2.1) such as local archaeology, ecology and Scotways paths. Any micrositing would be agreed with Aberdeenshire Council through an appropriate planning condition.

3.20 The turbines would have maximum dimensions of 100m height to blade tip and 65m hub height. However, the turbines that would be selected for use in the Development may have a reduced hub height and longer blade length. Since longer blade lengths have distinct environmental implications, a turbine with a 60m hub height and 40m blade length has been considered for some of the technical assessments in the EIA, namely ecology, ornithology, shadow flicker and traffic and transport. Each technical assessment has used the turbine dimensions that represent a reasonable worst case scenario in terms of potential impacts.

3.21 A diagram of the two typical turbine designs considered in the EIA is provided in Figure 3.2.

Turbine Structure

3.22 The wind turbines would be of a typical modern design incorporating tubular towers and three blades (horizontal axis) attached to a nacelle housing the generator, gearbox and other operating equipment. The blades would be made from reinforced fibreglass composite materials such as Glass Reinforced Plastic (GRP) and the turbine towers would be made of steel.

Colour and Finish

3.23 It is proposed that the wind turbines would all be a pale semi-matt off-white colour; this would be confirmed and agreed with Aberdeenshire Council. The turbine structures would be free of external advertising and lettering, except for statutory notices and a turbine number on the tower door.

Rotational Speed

3.24 The rotors of the proposed turbines would turn in the same direction and would have sensors on the turbines to measure wind speed and direction. The measuring device provides data to operate a yaw mechanism, which turns the wind turbine nacelle to face the wind.

3.25 Generally wind turbines would operate during wind speeds between approximately 3/4 metres per second (m/s) and 25 m/s. Modern turbine technology allows the rotational speed of the rotor to vary from the nominal rotational speed. This results in increased production in changing wind conditions. It also minimises undesired fluctuations in the electricity grid and increases annual energy production by around 5% in comparison with turbines without variable rotational speed, which are typically of a less modern design. This system also minimises strain on the gearbox, blades and tower and reduces the noise levels. It is anticipated that rotational speeds would range from around 10 revolutions per minute (rpm) to 18rpm.

Turbine Foundations

3.26 The detailed design specification for each foundation would depend on the ground conditions at each turbine location. However, it is anticipated that each turbine foundation would require an excavation of approximately 22m by 22m to a depth of approximately 3m. This excavation would allow for a reinforced concrete foundation of approximately 20m diameter with sufficient space to allow for shuttering access. Each foundation would require up to 301m^3 of concrete and 550m^3 of stone.

Transformers

3.27 Each turbine requires an electrical transformer. Depending on the final turbine design that is chosen, these would be housed either on the outside of the turbine towers close to the base, or within the turbine itself. If external housing were to be used each would not exceed 4m by 4.6m in footprint.

Crane Hardstanding

3.28 Each wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. This provides a stable base on which to lay down turbine components ready for assembly and erection, and to site the two cranes necessary to lift the turbine components into place. An area of hardstanding approximately 39m x 22m would be constructed adjacent to each turbine, as shown on Figure 3.1.

3.29 The crane hardstanding would be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the Development. The hardstanding would also be utilised during decommissioning of the Development.

Anemometer Masts

3.30 A permanent anemometer mast would be installed as part of the Development, to provide accurate measurement of wind speeds and direction on the Site. The mast would be located at the position indicated in Figure 3.1 and would be a galvanised steel lattice tower construction measuring up to 70m in height. The lattice construction would help to reduce the visual impact of the structure and improve accessibility for maintenance. A typical anemometer design is provided as Figure 3.3.

3.31 The mast would require a concrete foundation measuring approximately 5.7m² and 2.2m in depth. A crane hardstanding of circa 20m x15m would be required for the construction / erection of the mast. Access to the anemometer mast would be obtained via the upgraded access track to Turbines 1 and 2.

3.32 The temporary anemometer mast that is currently on Site would be removed on expiry of the planning consent or prior to completion of construction works, whichever occurs first.

Site Access and Internal Tracks

Delivery of material and wind farm components

3.33 The delivery route for turbine components would follow that used for the construction of the nearby operational wind farms such as Strath of Brydock. Turbine components would arrive at the port facilities at Peterhead and be transported to the Site via the A90 onto the A98 toward Banff, the A97 from the north and onto the B9025. Within the Site, access to the area of the turbines would be gained via the private track that leads north past North Cranna Farm. Further detail is provided in ES Chapter 11: Traffic and Transport.

3.34 An Access Study completed by Grontmij, as contained in Technical Appendix 11.1, has confirmed that some temporary removal or relocation of street furniture such as road sign would be likely to be required to allow delivery of the turbine components, however, these items would be replaced immediately following the turbine movements.

3.35 The swept path analysis completed for the turbine component delivery vehicle indicates that some localised, temporary downtakings of the north east parapet wall of the listed

Banff Bridge would be required, should 40m blades be taken to the Site. This is discussed further in ES Chapter 9: Archaeology and Cultural Heritage. All such works would be designed to meet the requirements of Aberdeenshire Council (as highways authority) and Historic Scotland, as required.

Site Entrance and Access Tracks

3.36 The swept path analysis in the Access Study concluded that the existing Site entrance from the B9025 would require upgrading to accommodate the delivery vehicles.

3.37 The current entrance is constrained and unsuitable for turbine delivery. As such overhead power cable crossing the existing farm access may need to be relocated. This would be likely to result in the diversion of two lengths of overhead cabling. Any such works would be designed to meet the requirements of the Distribution Network Operator SSE.

3.38 The upgrading of the existing entrance would result in a more formalised junction being created. This would include the installation of radius kerbs, surfacing and drainage to the requirements of Aberdeenshire Council. Indicative Site access proposals are included as Figure 3.4.

3.39 The following principles have been applied in the design of the on-site access tracks;

- Tracks make use of existing access tracks as far as possible;
- Track length is kept to a minimum to reduce construction time, the requirement for roadstone and land take;
- Tracks are routed as close to field boundaries as possible to minimise impact on agricultural management;
- Gradients are to be kept to less than 12% where possible to accommodate the requirements of delivery vehicles and also to allow construction plant to move safely around the Site;
- Tracks are routed to avoid sensitive ecological, archaeological and hydrological features where necessary; and
- Tracks are routed to avoid potential areas of peat.

3.40 The access track would generally be unpaved (stone surface) and of 5m width, with a 1m shoulder verge to either side. For the purposes of the EIA it has been assumed that existing tracks within the Site are an average of 2.5m width.

3.41 The length of track to be re-used and upgraded would be dependent on the access track route selected. The route via North Cranna would require approximately 1.92km of upgraded track, while the alternative route would entail approximately 1.3km of track upgrade. Some track stabilisation works may be required, following supplementary detailed studies e.g. topographic survey of the selected route, trial pitting, material sampling and vertical swept path analysis.

3.42 Approximately 0.75km of new access track (or 1.2km if the alternative access route was used) would require construction. A turning head of sufficient size to accommodate

articulated vehicles would also be provided at each turbine location. Some further widening would be necessary along the access track route to allow for passing places/ temporary lay down areas. Temporary passing places (15m x 15m) would be provided every 400m (or as required).

3.43 The access tracks are shown in Figure 3.1 and a typical track cross section is provided in Figure 3.5.

Burn Crossings

3.44 As part of the access track construction and crane hard standing works one culvert would require upgrading and one new crossings would be required. All water crossings (and any work in the vicinity of watercourses on-site) would need to be authorised by Scottish Environment Protection Agency (SEPA) as a controlled activity under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR 2011) and any such authorisations would be obtained.

3.45 The proposed access track to turbine 3 would cross the existing Headwater culvert to the Rosy Burn (dimensions unknown), at approximately NGR 364212E, 854713N. An assessment of the structural condition of the culvert would be undertaken prior to construction to further assess the works required. However an appropriate structural solution would be provided to protect the culvert from the loading of construction traffic and no replacement or works to the culvert are proposed.

3.46 The SEPA position statement on the culverting of watercourses[3] is to be updated to reflect CAR 2011 but SEPA's preference is for open watercourses to be retained and culverting to be discouraged. The position statement states: "*closed culverts used for river crossings would normally only be justified for single track roads over small watercrosses (<2m width)*". In this context a culvert is proposed for the drainage ditch crossing on the Site. Simple culvert type construction would be employed, using a cross sectional area that would not impede flow of water (minimum 400 mm culverts would be used). A typical culvert detail is shown in Figure 3.6 and the construction details are described below.

Construction Compound

3.47 A temporary construction compound and laydown area would be required for the duration of the construction works. The proposed compound would be located to the south of the turbines adjacent to the access track and would comprise:

- Temporary portacabins to be used for the Site offices and welfare facilities for staff including toilets;
- Parking for construction staff, visitors and construction vehicles; and
- Storage areas for construction materials and components.

3.48 The construction compound would have dimensions of approximately 30m by 50m, which would encompass a laydown area of approximate dimensions 30m x 10m. An indicative site compound layout is provided in Figure 3.7.

3.49 Any compound lighting required would be likely to be passive infra-red sensor activated security lighting (with manual override). The lighting would be directional in accordance with ILE guidance[4] and mounted on the individual portacabions.

Borrow Pits

3.50 The total volume of stone required for new tracks, hard standing and turbine foundations would be dependent on the access route is chosen. Table 3.3 details the type of stone and how much is required for each track option.

Table 3.3: Stone Requirements

Stone	Source of Stone	Access Route	Alternative Access Route
		Quantity (m^3)	Quantity (m^3)
Type 1	Imported	2,235	2,200
Type 6N	Imported	1,040	1,038
Type 6F	From Borrow Pits	9,250	9,959
Total volume of stone required		**12,525**	**13,197**

3.51 The maximum quantity of stone required for the new access tracks would be 12,525m^3. This assumes that only Type 6F would be won on site from borrow pits and that Type 1, for the top layer sections of the tracks, and 6N material, structural fill for turbine platforms, would be imported.

3.52 Two preferred locations for borrow pits have been identified and are shown on Figure 3.1. It is currently proposed that borrow pits BA2a and BA4 and the potential rock area beneath the access track to turbine 2, would be used to win material.

3.53 Should stone of suitable quality be obtained on-Site as excavations are completed for the new lengths of access track and turbine foundations, this would reduce the volume of imported material and/or volume of stone required from the borrow pits, and the number of vehicle movements associated with the construction works.

3.54 Prior to the commencement of construction works detailed ground investigation would be undertaken at each proposed borrow pit location, with sampling and grading of rock type to confirm the locations are suitable and the likely volume of stone that could be obtained. It is envisaged that detailed size and specification for each borrow pit including ground water management for each location would be provided within the Construction Management Plan (CEMP) for the Development (refer to the embedded mitigation below).

Cables and Operations Control Building

3.55 The electricity produced by the individual turbines would be at 690 kV and transformed to 33kV by each turbines transformer. Electrical connections between the wind turbines would be made via underground cables to the control building. Detailed construction and trenching specifications would depend on the ground conditions encountered at the time, but typically cables would be laid in a trench 1000mm deep and up to 1200mm

wide, in a substrate of coarse sand or other granular material. The trenches would then be backfilled with excavated soil and sub-soil that has been sieved and graded to remove stones.

3.56 Cables would be collected at the substation and control building, which would also incorporate switchgear and meters, telecommunications equipment, an office, store and welfare facilities for wind farm maintenance staff. The proposed location of the sub-station building is shown on Figure 3.1.

3.57 The control building compound would have dimensions of approximately 30m x 20m. The compound would comprise a hard standing car parking area with maximum dimensions of approximately 15m x 15m and a single storey building approximately 17m x 11m. Figure 3.8 provides indicative elevations of the control building. The materials and colour palette to be used for the control building would be similar to that of local buildings and would be agreed with Aberdeenshire Council.

3.58 A connection to a public water supply at the control building would not be commercially acceptable. It is therefore proposed to include a rain water harvesting system to supply water of a suitable quality for hand washing, showering and toilet facilities. Rainwater would be collected from the roof of the control building and stored in tanks within the roof space. To treat the water to an acceptable level the water supply would then be directed thorough an ultraviolet treatment system followed by a 5µm filter

3.59 Foul drainage from the welfare facilities would be directed to a septic tank located at a suitable distance from the building in order to meet Building Standard (Scotland) Regulations and SEPA's requirements. Foul water sludges within the tank would be regularly emptied by an appropriately licensed contractor. Effluents would be discharged to ground via a linear soakway that would be designed to meet SEPA requirements.

3.60 Any oils, hydraulic fluid and lubricants for maintenance of the wind turbines would be stored in the control building storeroom.

Construction Activities

3.61 This section outlines the main activities for the Development construction, including the programme, the construction process for each component and materials required.

Construction Programme

3.62 The construction of the Development would consist of the following activities, some of which would take place concurrently:

3.63 Construction of the Development would take approximately nine months from commencing work on-site. An indicative construction programme is set out in Table 3.4 below. Many of these construction activities would be carried out concurrently, although predominantly in the order set out in the table below.

Table 3.4: Indicative Construction Programme

Month	1	2	3	4	5	6	7
Site preparation including construction compound and Site welfare facilities							
Construct new site entrance and upgrade existing access track							
Excavate borrow pits and construct new access tracks							
Construct crane hard standings							
Construct turbine foundations & bases							
Install cabling							
Erection of wind turbines and anemometer mast							
Construct Substation/control building and install equipment							
Commissioning							
Site reinstatement							

Construction workforce and terms of working

3.64 A detailed construction workforce schedule i.e. employee numbers throughout the construction programme and likely shift patterns would not be known until the contract for building the wind farm has been granted, however the maximum number of staff likely to be site at any one time would be 20.

3.65 Hours of construction would be from 7am to 7pm Monday to Friday 7am to 1pm on Saturdays unless otherwise agreed with Aberdeenshire Council. Construction hours generally also apply to the delivery of materials. However, delivery of the nacelles and blades to site would require the use of abnormal-sized and slow-moving trucks. These vehicles would require a police escort and the timings of these deliveries may be dictated by the police. Such deliveries would be likely to be out of hours when the road network is at its quietest to minimise traffic disturbance.

Construction Compound

3.66 The temporary construction compound and lay down area would be constructed by first stripping the topsoil which would be stored in a mound for subsequent reinstatement at the end of the construction period. A geotextile would then be placed on the sub-stratum, which would be overlain by a working surface of stone to approximately 600mm thickness.

3.67 Reinstatement would involve removing the stone and underlying geotextile before gently ripping the exposed substrate and replacing the topsoil. The ground surface would then be re-seeded using a seed mix approved by Aberdeenshire Council in consultation with Scottish Natural Heritage (SNH).

Borrow Pits

3.68 At each borrow pit location, topsoil would first be stripped and set aside for reinstatement. On completion of the extraction works borrow pits would be restored.

3.69 Following extraction of all suitable stone, the borrow pits would be reprofiled. Any steep slopes would be graded to a safe angle and excess material from turbine foundation excavations and road cuttings would be used to build up the floor of the pit, to create a landform that blends with the local topography. Topsoil would then be replaced and worked to create a tilth suitable for re-seeding, again using the seed mix agreed with Aberdeenshire Council and SNH.

3.70 Any excavations in shallow rock areas outwith the access track construction areas would also be reinstated with topsoil worked to create a tilth suitable for re-seeding, using the seed mix agreed with Aberdeenshire Council and SNH.

Access Tracks

3.71 In general terms, the construction method would see the topsoil being removed and stored adjacent to the construction area until required for reinstatement, leaving batters to each side of the track. Excavations would then continue to expose a suitable sub-soil or bedrock horizon on which to construct the track. This would be levelled by a cut and fill operation or by benching of the rockhead as required.

3.72 The tracks would be constructed in layers, with a geo-textile overlain by a base layer of coarse stone, and subsequent layers of higher graded stone. Each layer of stone would be compacted and shaped to provide a profile and surface finish of a quality suitable for the turbine construction vehicles. The estimated depth of stone would be 600mm, though the final thickness used would be dependent on local ground conditions and load capacity.

3.73 The need for access track drainage would be established on-site during construction. The access tracks would have a suitable cross-fall to drain run-off and, where gradients are present, lateral drains would intercept any flow along the road. The dimensions of the lateral drains would be matched to the estimated water flow and outlets would be suitably located with erosion protection as required.

3.74 Where ground conditions are of a permeable nature, swales would be utilised alongside the access tracks to allow natural filtering of surface water into the ground. Where areas are less free draining, land drains or drainage ditches would be installed as topography and ground conditions dictate. Drainage filters would be installed at suitable locations to remove silts from the run-off.

3.75 Post-construction, the stripped topsoil would be re-laid along the edges of the access track and seeded. This would allow the edges of the access track to re-vegetate whilst maintaining a suitable track width of approximately 3.5m.

Burn Crossing

3.76 Existing watercourse crossings would be strengthened from above through placement of a geotextile above the crossing to provide reinforcement and use of additional stone. The decision on whether any structural upgrades would be required for the existing culvert would be taken on Site.

3.77 The design of the new culvert and any structural upgrades for the existing culvert would draw on best practice guidance, for example:

- Forestry Commission: The Forests and Water Guidelines, 4th Edition;
- Scottish Executive (2000), River Crossings and Migratory Fish: Design Guidance a Consultation Paper;
- Scottish Government and SEPA (2010), Engineering in the Water Environment:
- Good Practice Guide, River Crossings; and
- CIRIA (2010), Culvert Design Guide C689.

3.78 The new culvert would be designed to accommodate water flows based on a 1 in 200 year return period.

3.79 Typically the culvert would be constructed using a UPVC smooth wall pipe, with a small stone facing or headwall arrangement at each culvert upstream and downstream face. The stone work would use selected rock won from the Site borrow pits, with the culvert face being set back into the stone to minimise potential visual impact.

3.80 The culvert would be positioned such that the culvert pipe is located one quarter of the pipe diameter below the existing watercourse bed. River substrate would then be placed within the culverts. Culverts would be oversized and positioned to have the same longitudinal profile as the existing watercourse.

Crane Hard Standing Areas

3.81 In order to construct the crane hardstanding areas surface vegetation and soil would be removed from the area of the crane pad and laid on the surrounding undisturbed vegetation until required for reinstatement. The area would be covered with a geo-textile overlain with compacted stone to approximately 600mm depth, dependent on ground conditions and load capacity. On completion of the turbine erection approximately a third of the hardstanding area would be dressed back with topsoil and landscaped into the surrounding area.

Turbine Construction

3.82 The wind turbines would be installed on foundations comprising stone and concrete; a typical turbine foundation is illustrated in Figure 3.9. The design specification for the foundations would depend on the ground conditions at each turbine location. A ground investigation would be undertaken prior to construction to determine these requirements.

3.83 Construction of the turbine foundations would first require clearance of any vegetation, followed by removal of topsoil and subsoil, which would be stored on the surrounding undisturbed vegetation until required for reinstatement.

3.84 It is anticipated that each turbine foundation would first require an excavation of approximately 22m x 22m and the depth of the excavation would be approximately 3 m, depending on the depth of the lead bearing strata or bedrock. The sides of the excavation would be battered back to ensure that they remain stable during construction. The load bearing starts or bedrock would be levelled off and blinded prior to the in-situ casting of the steel-reinforced concrete slab that would be approximately 20m in diameter, each foundation would require 301m^3 of concrete and 550m^3 of stone, with reinforced steel.

3.85 A concrete up-stand would then be cast, to which the turbine tower would later be bolted. The excavated area would be backfilled with compacted layers of graded material from the original excavation, and capped with topsoil.

3.86 Turbine excavations may be open for 4 to 8 weeks during the construction programme. During this time, excavations would be kept free from water (rainwater and run-off). If local topography permits, the excavations would be free draining. If not, excavations may be mechanically pumped, with all dewatering works carried out in accordance with SEPA pollution prevention guidelines including discharges through either settling ponds, swales or mechanical silt traps.

3.87 The turbine components would be delivered to Site and stored in the temporary construction compound until weather conditions are appropriate for turbine erection. Typically two large mobile cranes would be used to erect the turbine: the bottom turbine tower sections would firstly be bolted onto the central columns of the foundations, followed by the upper turbine tower sections being crane lifted into place. The cranes would then lift the nacelle into place on the top section of the turbine tower. Two of the blades would be fitted to the rotor hub on the ground and then lifted onto the nacelle. The third blade would then be lifted and fitted to the rotor hub. The transformer units would be placed within transformer houses adjacent to the wind turbines.

Anemometer Mast

3.88 The anemometer mast would arrive on-site in sections, and one of the construction vehicles or cranes on-site would be used to raise the mast in place.

Control building and Compound

3.89 The control building would be of typical masonry construction, with strip foundations and a pitched roof.

3.90 The external hardstanding to the control building would be constructed from site won, crushed and placed rock with a close bound granular topping to act as a running surface to delivery and support staff vehicles etc. The hardstanding would be graded to provide drainage falls. Surface water would run to the edge of the hardstanding where

it would be intercepted by a linear soakaway, or a cut-off ditch which would convey any remaining flows to a soakaway.

Operational Activities

Turbine Monitoring and Control

3.91 Turbines have a proven track record for safety. All turbines are controlled by a Supervisory Control and Data Acquisition (SCADA) system, which would gather data from all the turbines and provide the facility to control them from a central remote location. The SCADA system would gather data from all the turbines via communications cables connecting to each turbine (the cables would be buried in the electrical cable trenches).

3.92 In the case of any fault, including over-speed of the blades, overpower production, or loss of grid connection, the turbines shut down automatically through braking mechanisms. They are also fitted with vibration sensors so that, if, in the unlikely event a blade is damaged, the turbines would again automatically shut down.

Meteorological Effects

3.93 Wind turbines are designed to withstand very high wind speeds; the candidate turbine the Enercon E70 is no different. In terms of structural integrity, wind turbines are certified to one of three classes (Classes I, II & III) by suitable certifying bodies. Each class is defined by a number of parameters, one of which is extreme windspeed. Class I is the highest level of certification and turbines certified to this level are expected to withstand a 1-in-50 year 3-second gust windspeed of 70 metres per second (156 miles per hour, 136 knots). The Enercon E70 is certified to IEC Class I. The maximum wind speed for certification will vary accordingly to the turbine installed and the site-specific conditions.

3.94 Turbines, as with any tall structure, can be susceptible to lightning strike and appropriate measures are included in the turbine design to conduct lightning strike down to earth and minimise the risk of damage to the structure. In the case of a lightning strike on a turbine or blade the turbine would automatically shut down.

3.95 In cold weather, ice can build up on blade surfaces when operating. The turbines can continue to operate with a thin accumulation of snow or ice, but would shut down automatically when there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly.

3.96 As previously discussed local meterological conditions would be monitored by a permanent, free standing anemometry mast, the location of which is shown in Figure 3.1.

Turbine Servicing and Repairs

3.97 Each manufacturer has specific maintenance requirements, however, it is anticipated that routine servicing of the turbines would typically be undertaken twice a year, with a

full annual service and a minor service every six months. In the first year, there is also likely to be an initial three-month service post-commissioning. Individual turbines would be switched off as servicing was ongoing. Maintenance and servicing would include activities such as changing of gearbox oils and individual turbine components.

3.98 Blade inspections would be likely to be required between every two and five years. These would be undertaken using a cherry picker or similar, but may also be performed with a 50T crane and a man-basket. Repairs to blades would use the same equipment. Light winds and warmer, dry condition are required for any blade repairs hence summer (June, July and August) would be the most appropriate period for this work.

3.99 Operational waste would generally be restricted to small volumes of waste generated from machinery repair and maintenance. The maintenance contractors would dispose of any such waste off-site, in line with Scottish waste management regulations and duty of care.

Track Maintenance

3.100 Once the Development is operational the volume of traffic using the access tracks would be low (although heavy plant is particularly wearing). Correspondingly, the need for any track maintenance works is anticipated to be low and infrequent. Any such works required would generally be undertaken during drier conditions in the summer months.

Environmental Management

3.101 EDF's wind energy developments are operated in accordance with documented ISO 14001 environmental management procedures, which ensure compliance with applicable environmental legislation and best practice.

3.102 The Development would be managed by a team of wind energy engineers whose duties include compliance with statutory environmental and health and safety requirements. Where potential environmental or health and safety hazards are identified, a Site specific risk assessment would be completed, and control measures implemented to ensure that the risks are removed or minimised as far as possible.

Land Management

3.103 It is anticipated that long term land management practices on the Site i.e. agricultural practices, would continue unaffected by the Development.

Decommissioning

3.104 The Development is anticipated to have an operational life of 25 years, after which it would be decommissioned and the turbines dismantled and removed. This is the proposed course of operations which is being applied for and any alternative to this action would require separate consent from Aberdeenshire Council and so is not considered in this ES.

3.105 During decommissioning the bases would be broken out to below ground level. All cables would be cut off below ground level, de-energised and left in the ground. Access tracks would be left for use by the landowners. No stone would be removed from the Site. The decommissioning works are estimated to take six months. This approach is considered to be less environmentally damaging than seeking to remove foundations, cables and roads entirely.

3.106 On completion of decommissioning, farming activities could resume over the foundations of the turbines.

Mitigation

3.107 Within the Development there are three levels of mitigation, the details of which are presented below.

- **Embedded design elements** – this level of mitigation encompasses all the environmental constraints and issues that were considered during the design process. These are discussed in ES Chapter 2: Alternatives and Design Evolution;
- **Embedded mitigation** - Along with the design, these mitigation elements comprise standard good practice for construction works and would be implemented by Force 9 and EDF for the Development, subject to agreement with Aberdeenshire Council (refer to paragraph 3.109 for further detail); and
- **Project specific mitigation** - This mitigation is that above and beyond the two elements covered by the embedded mitigation levels above. It covers all project specific impacts and the associated mitigation, for example a specific archaeological scheme of investigation. This level of mitigation can be found within the specific topic chapters.

3.108 Specific detail on the embedded mitigation for the Development is provided in the following section.

Embedded Mitigation

3.109 This section describes the construction procedures and practices that are typically employed by Force 9 and EDF during construction of a wind farm. Should the Development be consented, these 'embedded' mitigation measures would be developed and agreed with Aberdeenshire Council and put into practice throughout the Development, through a planning condition attached to any consent for the Development.

Best Practice Guidance

3.110 The following best practice guidance would be adhered to:

- Forestry Commission: The Forests and Water Guidelines, 4th Edition;
- CIRIA: Report C532 Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors;

- CIRIA Handbook C650 Environmental Good Practice on Site;
- Scottish Government and SEPA (2010), Engineering in the Water Environment: Good Practice Guide, River Crossings;
- Scottish Renewables, Scottish Natural Heritage (SNH), SEPA and Forestry Commission Scotland (FCS), Good Practice During Windfarm Construction, version 1, October 2010;
- SEPA Pollution Prevention Guidelines (PPG);
- CIRIA (2007), The SUDS Manual C69;
- SEPA (2000), Watercourses in the Community, a Guide to Sustainable Watercourse Management in the Urban Environment; and
- SEPA (2000), Ponds, Pools and Lochens, Guidance on Good Practice in the Management and Creation of Small Waterbodies in Scotland.

Pre Construction

3.111 In advance of the construction works, a targeted geotechnical ground investigation would be undertaken in the turbine, borrow pit and access track locations to determine local ground conditions e.g. depth to rock head and quality of stone. The investigation would also be used to confirm the absence of peat at these locations, or any micrositing required to avoid any areas of peat as far as possible.

3.112 A condition survey of the existing culvert would be completed.

3.113 Further consultation would be undertaken with all property owners within the Site, to confirm local private water supply sources, and the locations of any pipes, ditches, tanks, wells etc used in the collection of these supplies. These would be marked up on a plan included in the Construction Environment Management Plan to ensure the supplies would be protected and monitored during the construction works.

3.114 Further consultation and assessment would be undertaken as set out in ES Chapter 11: Traffic and Transport, to ensure safe access and transport of construction components and materials to the Site.

Management Plans

3.115 The following management plans would be prepared and applied for the duration of the construction and decommissioning works:

- Construction Environmental Management Plan (CEMP);
- Site Waste Management Plan (SWMP); and
- Traffic Management Plan (TMP).

3.116 Further detail on the CEMP, SWMP and TMP is provided below.

Construction Environmental Management Plan

3.117 Construction works can cause significant environmental impacts and disruption to neighbours if they are not properly managed. The appointed Principal Contractor(s) would be required to develop and implement a CEMP for both the construction and

decommissioning works. The requirement to work in accordance with the CEMP would be included as part of the contract conditions for each element of the Development. As a minimum the CEMP would include the following requirements:

Protection of Water Features / Sediment Control

- The stripping of established surface vegetation at construction sites to be kept to a minimum;
- Where practicable a buffer zone of at least 5m width would be maintained between Development features and any watercourse, spring / issue point or well;
- Access tracks would be constructed of inert material, of as coarse a grade as possible, to maximise infiltration, minimise run-off and erosion, and minimise requirements for extensive drainage systems;
- Use Sustainable Drainage systems where appropriate in the construction of the Development e.g. for the construction compound and access tracks, again to maximise infiltration;
- Sediment transport control measures (silt-traps, geotextiles/straw bales/brash) to be used in the vicinity of watercourses, springs and wells and/or within the drainage network, with an appropriate inspection scheme put in place to maintain these measures;
- Water features to be monitored throughout the construction period for sedimentation and other pollutants;
- Where practicable, vegetation over the width of the cable trenches to be lifted as turfs, and replaced after trenching operations, to reduce disturbance;
- Access track drains to be kept clear of blockages;
- The movement of construction traffic to be controlled to minimise soil compaction and disturbance. Vehicle movements off the defined tracks and hardstanding areas to be avoided. Where tracks cross soils which are sensitive to erosion, or on steep gradients, the use of a protective surface layer would be considered;
- Refuelling of vehicles and plant to be confined to the construction compound, for mobile plant, and carefully controlled. Where it is not possible or practical to track vehicles back to the construction compound for refuelling, appropriate control measures would be put in place for refuelling of the static and/or remote plant;
- Only emergency maintenance to construction plant would be carried out on-site, in a designated area and on an impermeable surface well away from any water feature or drainage;
- The extent of all excavations to be kept to a minimum. During excavation works, cut-off drains would be used to control water levels, rather than pumping. If dewatering of excavations is required, pumped discharges to be passed through silt traps or over land to capture sediments before release into receiving waters;

- Trenching or excavation activities in open land to be avoided during periods of intense rainfall and temporary bunding to be provided to reduce the risk of oil or chemical spills to the natural drainage system as required;
- Any wash water would be adequately treated to deal with suspended solids and high alkalinity before discharge into lined settlement ponds to prevent direct runoff into watercourses or ditches or infiltration to groundwater; and
- Wheel washing facilities would be located at least 50m from any of the identified watercourses and field drains (as described in ES Chapter 5). It is anticipated that these facilities would be located close to the construction compound.

Chemicals

- Equipment, materials and chemicals not to be stored within or near watercourses;
- Equipment to contain and clean up any chemical spills would be provided, in order to minimise the risk of pollutants entering watercourses, lakes or flush areas;
- Drip trays to be placed under standing machinery to avoid oil and petrol pollution;
- Cement and unset concrete would be kept out of watercourses during construction;
- All fuels, lubricants and chemicals storage would be contained within a properly designed and maintained bunded area, with sufficient capacity to contain a spill in accordance with SEPA Pollution Prevention Guidelines (PPGs); and
- A long term pollution prevention and emergency response plan would be established to address the potential significant long term impact of chemical (and sediment) pollution.

Air quality/Dust management

- Stored soils would be placed so as to minimise the potential for erosion and creation of dust;
- Temporary stockpiles would be covered and permanent storage would be re-instated with vegetation as soon as practicable;
- All vehicles would undergo wheel washing to prevent the transport of mud and debris on the surrounding roads. This would be monitored on a daily basis to ensure that it is effective;
- Site vehicles would not be over revved, or left with engines idling;
- All plant brought on to the Site would be properly maintained and operated in accordance with manufacturers' recommendations; and
- Routine maintenance of vehicles to be carried out off Site.

Noise control

- Implementation of a blasting noise and vibration management plan for all blasting activities at the borrow pits (it is envisaged that excavators would be

used to break out any shallow rock areas so blasting would not be required for these areas);

- All plant and machinery would be properly maintained and silenced in accordance with manufacturer's instructions;
- All on Site vehicles would be restricted to speed restrictions;
- Relevant local residents would be duly warned of noisy activities that could give rise to temporary nuisance e.g. blasting; and
- Hours of working would be restricted to between 7am-7pm Monday to Friday, 7am to 1pm on Saturdays, with no work on Sundays without prior notification to the Aberdeenshire Council and local residents.

Effluent Wastes

- Sanitary facilities would be provided and methods of disposal of all waste would be approved by SEPA;
- All solid and liquid waste materials, including any contaminated soils, would be properly disposed of to controlled landfill sites away from the Site; and
- No unapproved discharge of foul or contaminated drainage from the Site should go to either groundwater or any surface waters, whether direct or via soakaway.

Public Protection/Consultation

- Appropriate signage and fences would be put in place to inform and protect the public during the construction of the wind farm;
- Communication would be maintained with the local community throughout the life of the Development; and
- Temporary closure of Scotways paths would be agreed with Aberdeenshire Council and Scotways post-consent. Notices would be placed at each end of the rights of way informing users of the temporary closure and directions to the alternative routes.

Ecology

- An Ecological Clerk of Works (ECoW) would be appointed to ensure compliance with the CEMP, to provide advice in the event of any unforeseen protected species issues that arise during construction and to oversee the implementation of mitigation requirements.

Waste Management

3.118 A site waste management plan (SWMP) would be implemented as part of the CEMP. The SWMP would include, as a minimum, the following requirements:

- Segregation of wastes in order to prevent co-storage of incompatible materials and the mixing of non-hazardous and hazardous wastes;
- Identification of the type of wastes likely to be generated during construction and decommissioning, to allow early planning of opportunities to re-use or recycle wastes; to gauge the expected quantities, and to allow monitoring;

- Storage of wastes in appropriately labelled containers suitable for the nature of the waste material, on an impermeable surface to minimise the potential for contamination;
- Disposal of any hazardous waste in accordance with the Hazardous Waste Regulations 2005;
- Prohibition of the burning of any waste;
- Covering of waste storage areas to prevent the generation of dust, the spreading of litter and the ingress of rain water;
- All waste carriers to be appropriately licensed; and
- Disposal of waste only at sites licensed to receive and dispose of such wastes in accordance with the relevant legislation.

Traffic Management Plan

3.119 The TMP would be prepared in accordance with guidance such as that found in the Scottish Natural Heritage document 'Good Practice During Windfarm Construction'[5] and would include details such as:

- Confirmation on any local public roads not to be used by construction vehicles;
- The agreed access route for abnormal loads;
- The permitted maximum number of abnormal loads per day;
- Permitted delivery hours;
- The vehicle speeds to be adhered to within the Site;
- Temporary traffic management procedures to be implemented for abnormal loads;
- The procedure to be followed to notify the local community and residents well in advance of abnormal load deliveries;
- Potential constraints within the Site;
- Agreed parking areas;
- Agreed pedestrian crossing points and routes; and
- A commitment to undertaking a pavement condition survey prior to and on completion of the construction works along the B9025 and any other route agreed with Aberdeenshire Council. This would be discussed with Aberdeenshire Council prior to commencement. Any deterioration resulting from the construction works would be rectified, with reinstatement to a standard to be agreed with Aberdeenshire Council.

Chapter 3 References

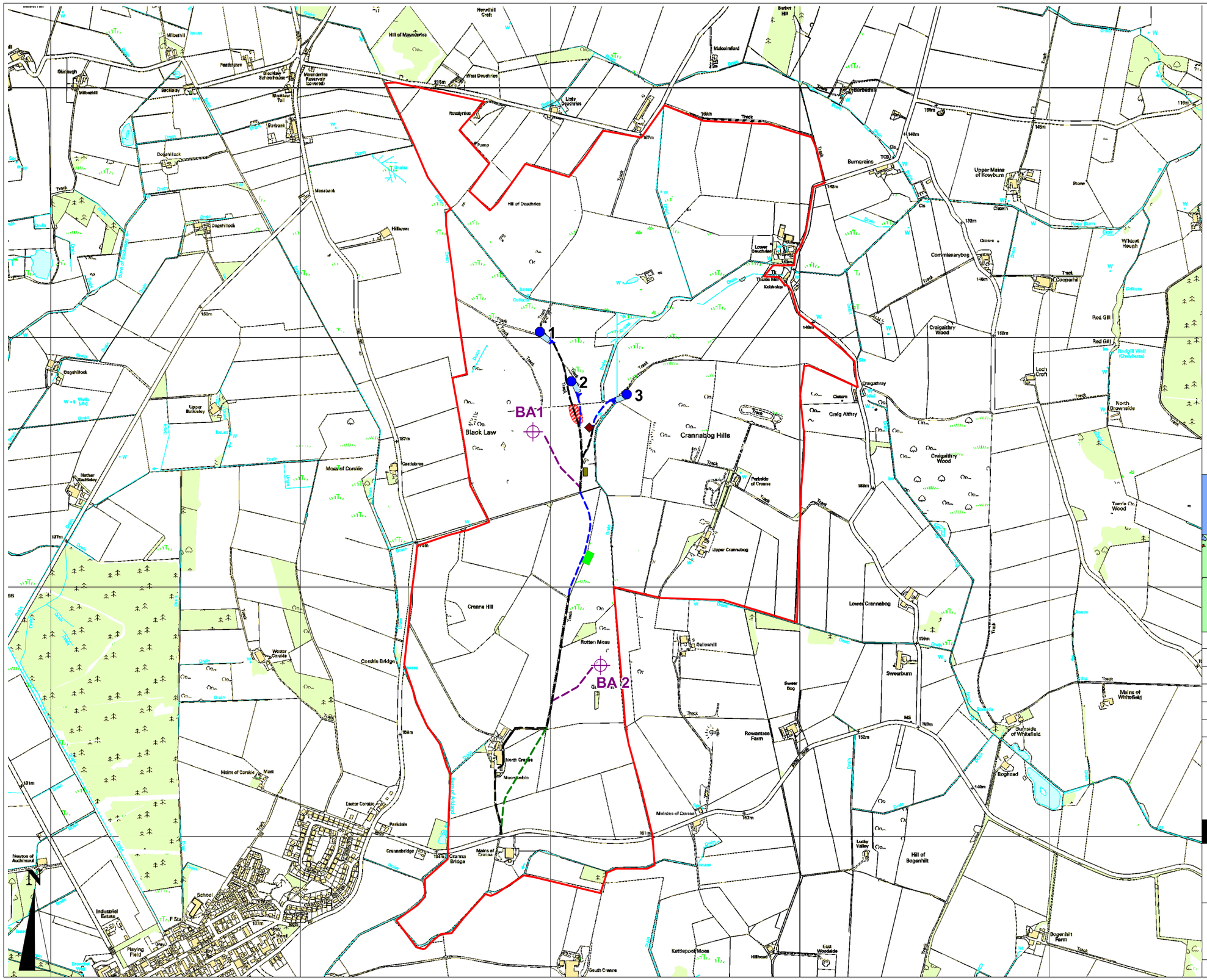
[1] http://www.macaulay.ac.uk/explorescotland/lca_map.pdf (accessed 10th August 2012)

[2] http://www.macaulay.ac.uk/explorescotland/lca.html (accessed 16 December 2011)

[3] The Water Environment (Controlled Activities) (Scotland) Regulations 2011 No. 209

[4] Institute of Lighting Engineers, 2005, Guidance Notes for the Reduction of Obtrusive Light

[5] http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20windfarm%20construction.pdf



Proposed Turbine
Site Boundary
Existing Road to be upgraded
Proposed Access Track to WTGs
Proposed Access Track to Identified Borrow Areas
Crane Hard Standing
Proposed Control Building Compound
Proposed Construction Compound
Potential Borrow Pit Locations
Proposed Met Mast Location
Alternative New Access Track
Identified Potential Shallow Rock

Rev	Date	Description	Drn	Chk	App
05	14.08.12	Borrow Pits	LH	PB	PB
04	03.07.12	New Met Mast Location	LH	PB	PB
03	27.06.12	Final Layout	BF	PB	PB
02	20.04.12	Layout 14	BF	PB	PB
01	29.02.12	Site Location	BF	MK	MK

FORCE 9 ENERGY

Deuchries Wind Farm

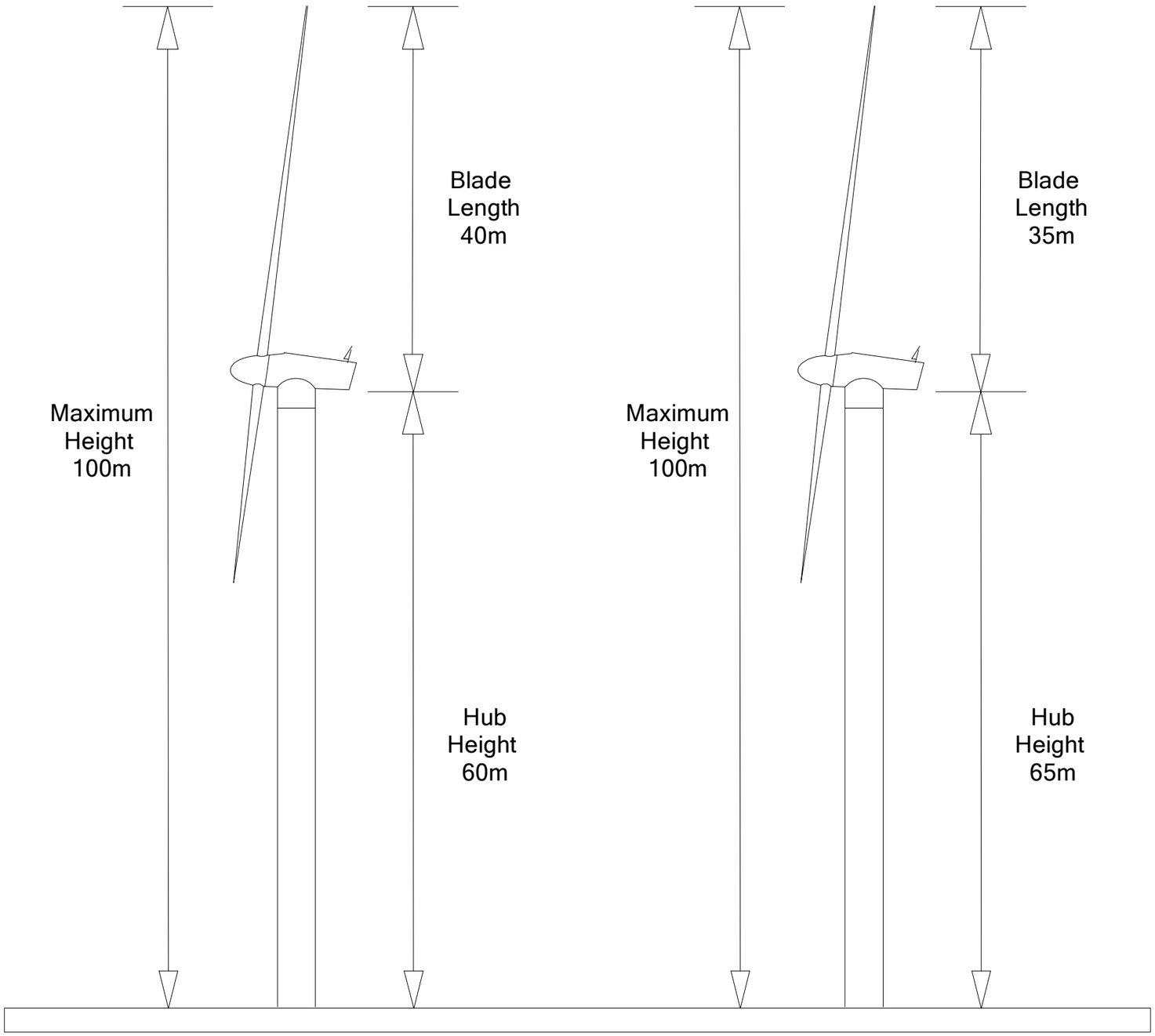
RSK

Figure 3.1 - Wind Farm Layout

SCALE: 1:15,000 @ A3 | REV 05

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES Figure 3.1.Wor

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Rev	Date	Description	Drn	Chk	App
00	21.09.12	Indicative Turbine	BF	ND	PB

FORCE 9 ENERGY

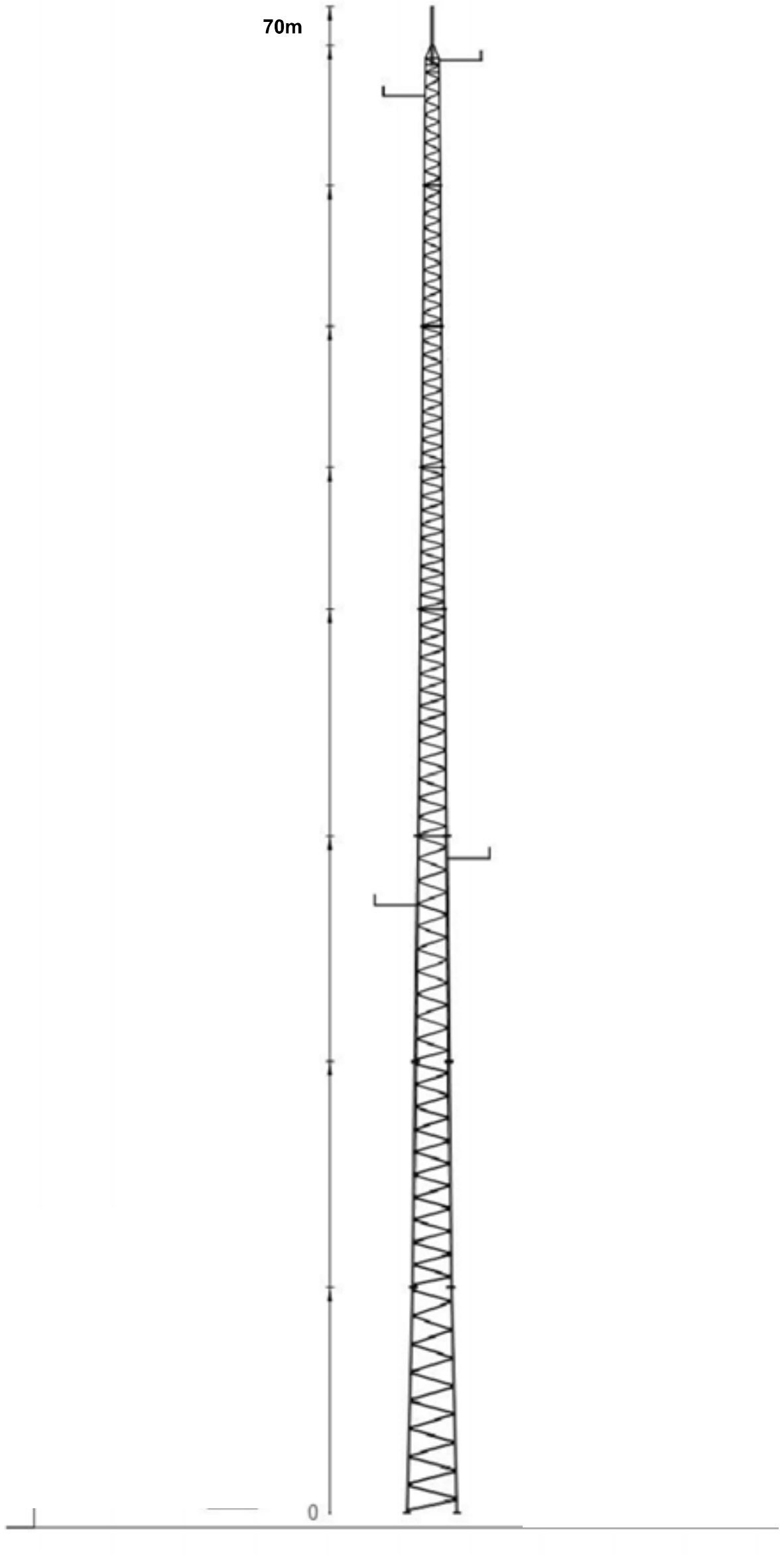
Deuchries Wind Farm

RSK Grontmij

Figure 3.2: Indicative Turbine

Not to Scale | REV 00

FILE NAME: P:\ENVIRONMENT\1190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\Figure 3.3 - Turbine.Wor



FORCE 9 ENERGY

RSK

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Deuchries Wind Farm

Rev	Date	Description	Drn	Chk	App
00	20.09.12	Met Mast	BF	ND	PB

Figure 3.3 Typical Anemometer Mast

As Shown | REV 00

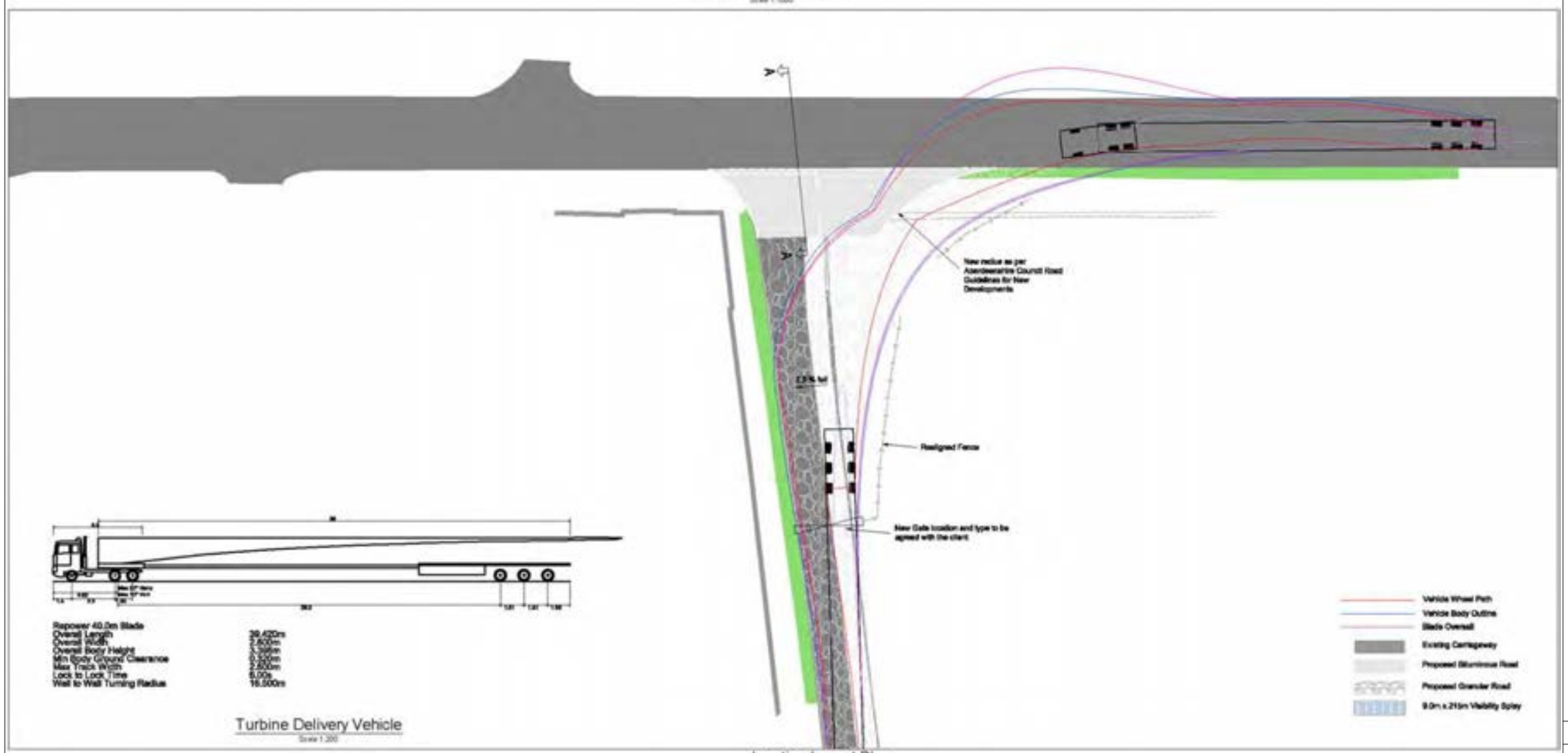
FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES - 3.3 Typical Anemometer Mast.Wor

Figure provided by Grontmij



Junction Visibility Splay

Scale 1:1000

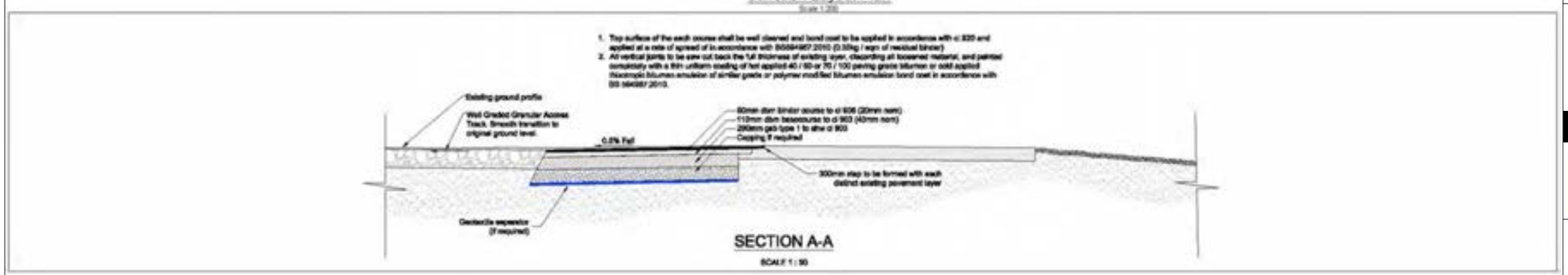


Turbine Delivery Vehicle

Scale 1:200

Junction Layout Plan

Scale 1:200



SECTION A-A

SCALE 1 : 50

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	27.09.12	Site Access Junction	BF	ND	PB

FORCE 9 ENERGY

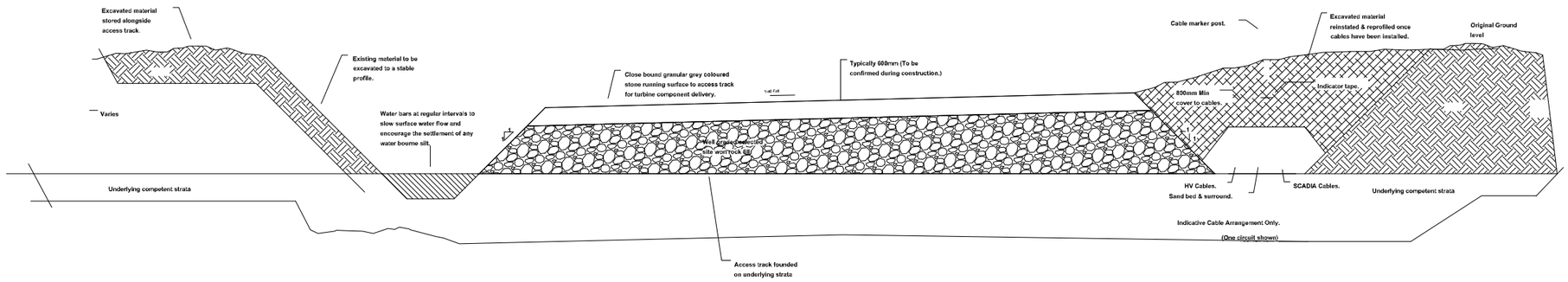
Deuchries Wind Farm

RSK Grontmij

Figure 3.4: Indicative Site Access Junction

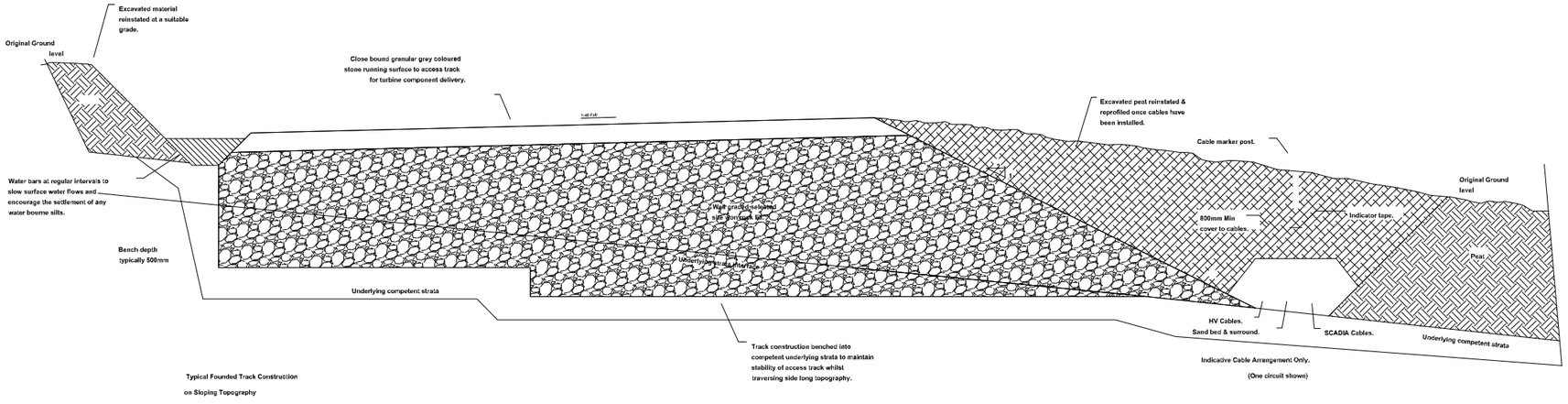
As shown | REV 00

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\Figure 3.4 - Indicative Site Access Junction.Wor



Typical Founded Track Construction.

Scale 1: 45



Typical Founded Track Construction on Sloping Topography

Scale 1: 45

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	04.08.12	Site Compound	BF	ND	PB

FORCE 9 ENERGY

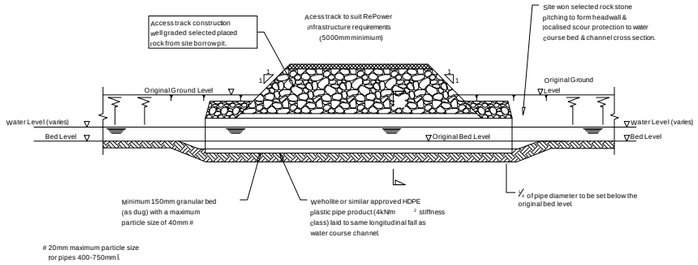
Deuchries Wind Farm

RSK Grontmij

Figure 3.5: Typical Access Track Cross-section

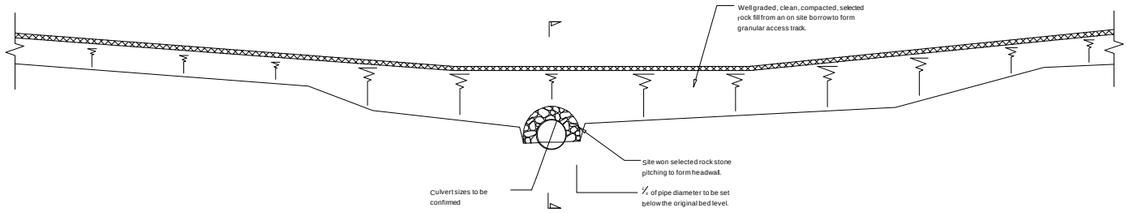
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FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES - 3.5 Typical Access Tracks.Wor



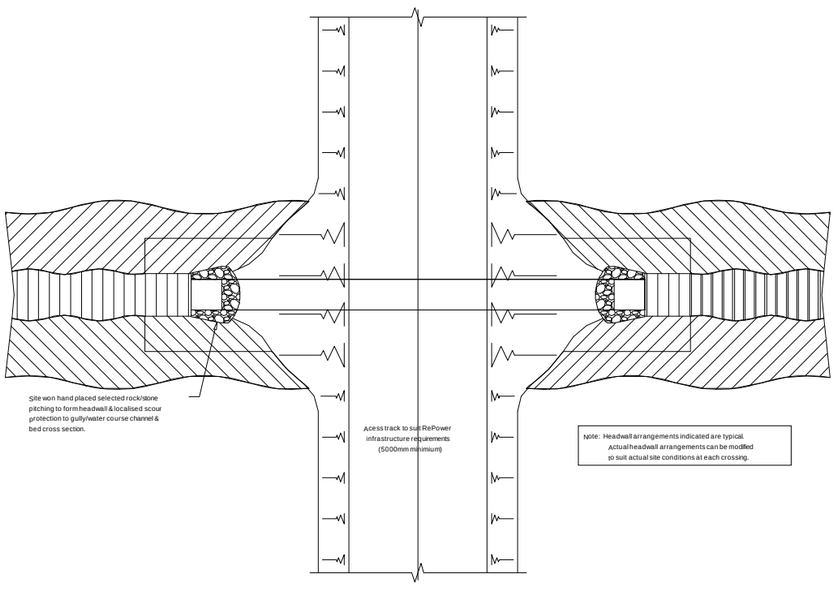
Cross-Sectional Elevation A-A

Scale 1: 200



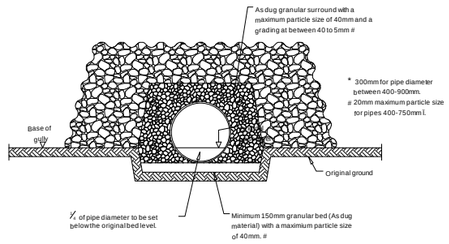
Typical Elevation on Watercourse Crossing

Scale 1: 200



Typical Plan on Watercourse Crossing

Scale 1: 200



Section B-B

Typical Cross Section Through Watercourse

Showing Bedding & Surround Arrangement

Scale 1: 150

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	21.09.12	Culvert Crossing	BF	ND	PB

FORCE 9 ENERGY

Deuchries Wind Farm

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Figure 3.6: Typical Culvert Crossing

As Shown | REV 00

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES - 3.6 Culvert Crossing.Wor

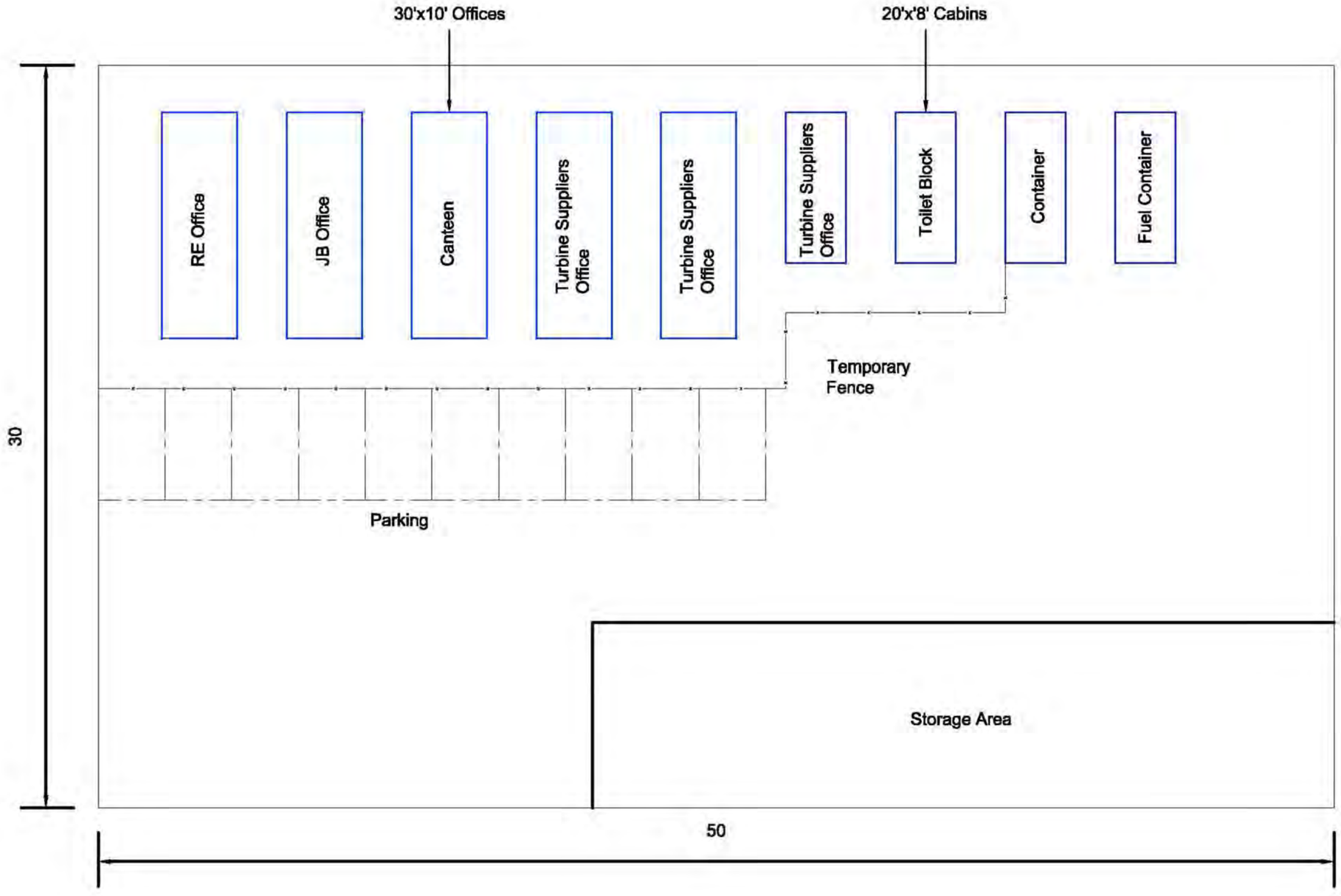


Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	20.09.12	Site Compound	BF	ND	PB

FORCE 9 ENERGY

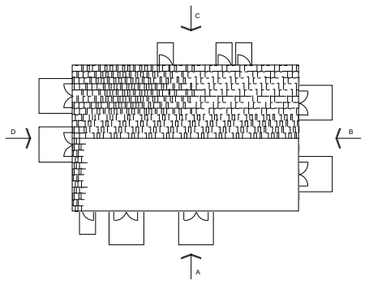
Deuchries Wind Farm

RSK Grontmij

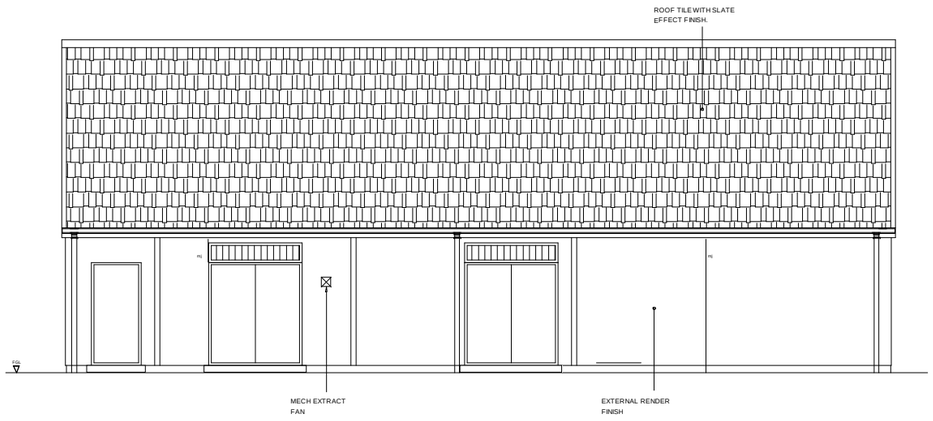
Figure 3.7: Typical Construction Compound

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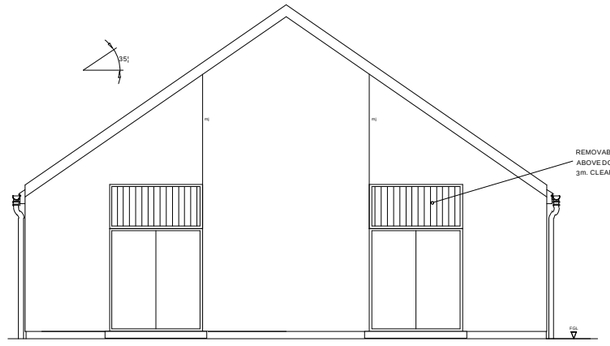


KEY PLAN



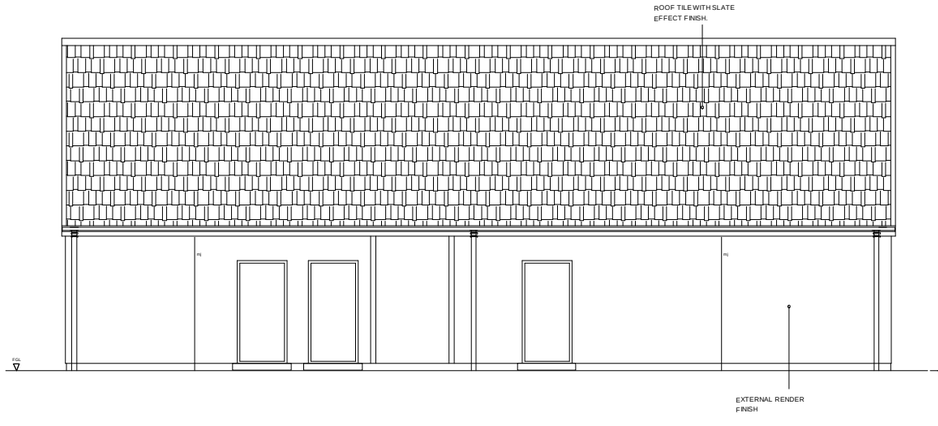
ELEVATION ON A

SCALE 1 : 1250.



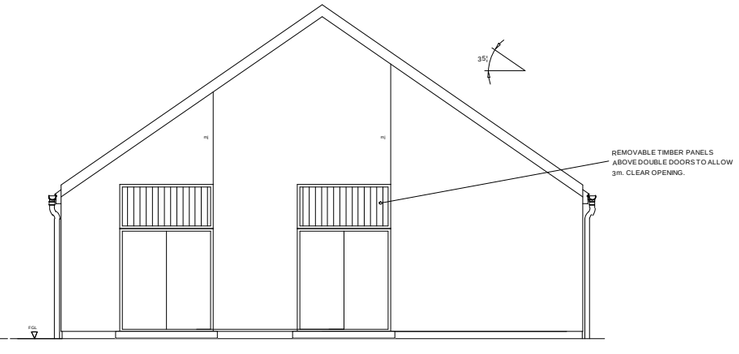
ELEVATION ON B

SCALE 1 : 1250.



ELEVATION ON C

SCALE 1 : 1250.



ELEVATION ON D

SCALE 1 : 1250.

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	21.09.12	Control Building	BF	ND	PB

FORCE 9 ENERGY

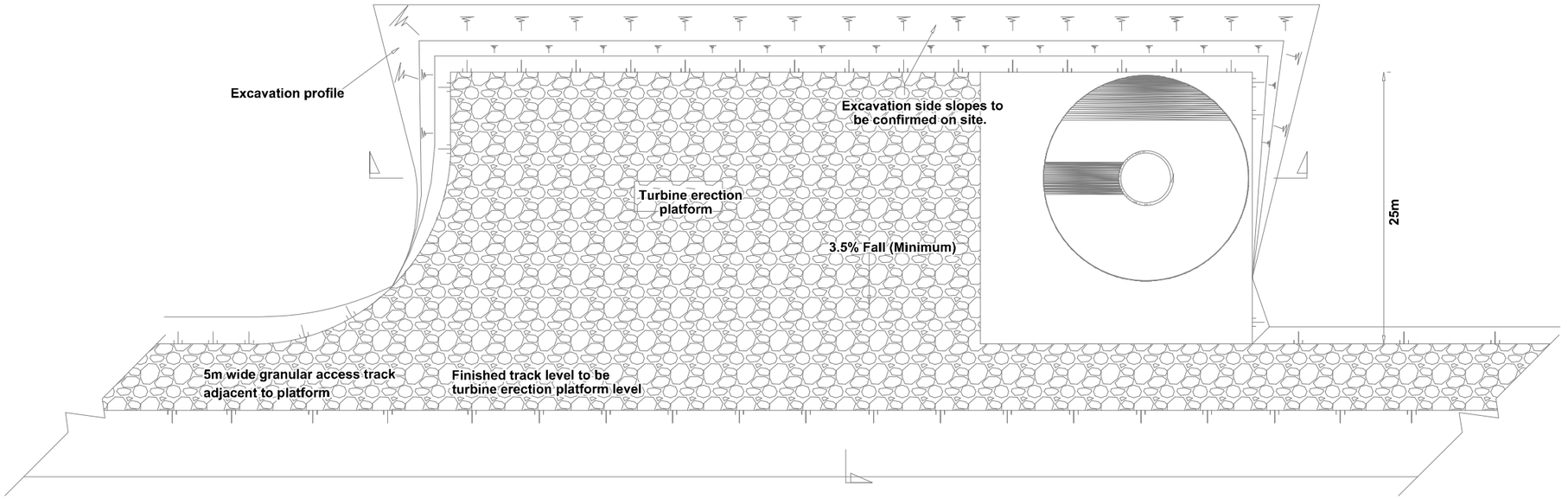
Deuchries Wind Farm

RSK Grontmij

Figure 3.8: Typical Control Building

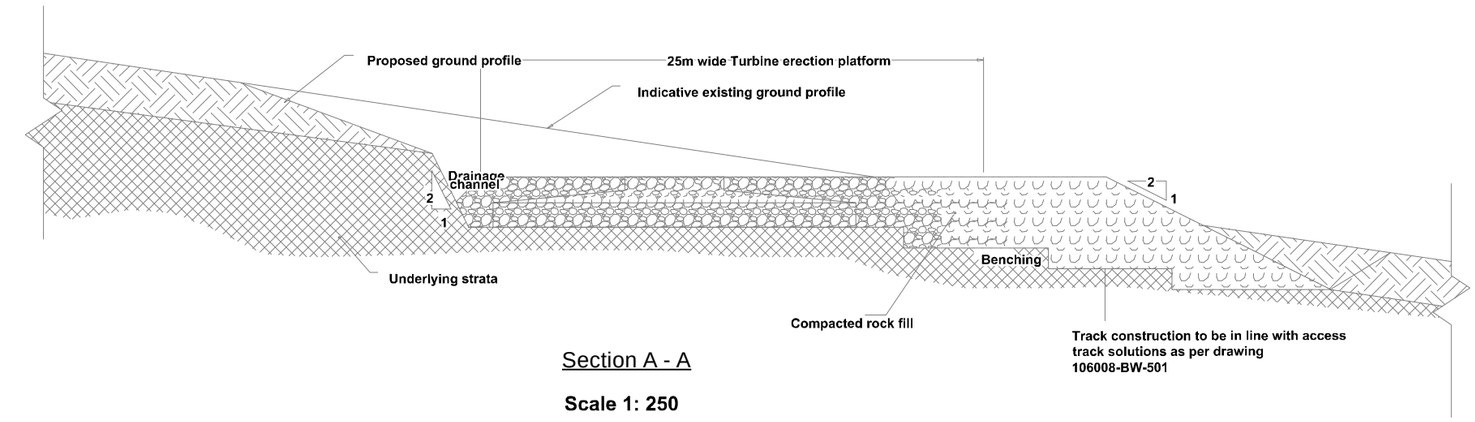
As shown | REV 00

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\Figure 3.8: Typical Control Building .Wor



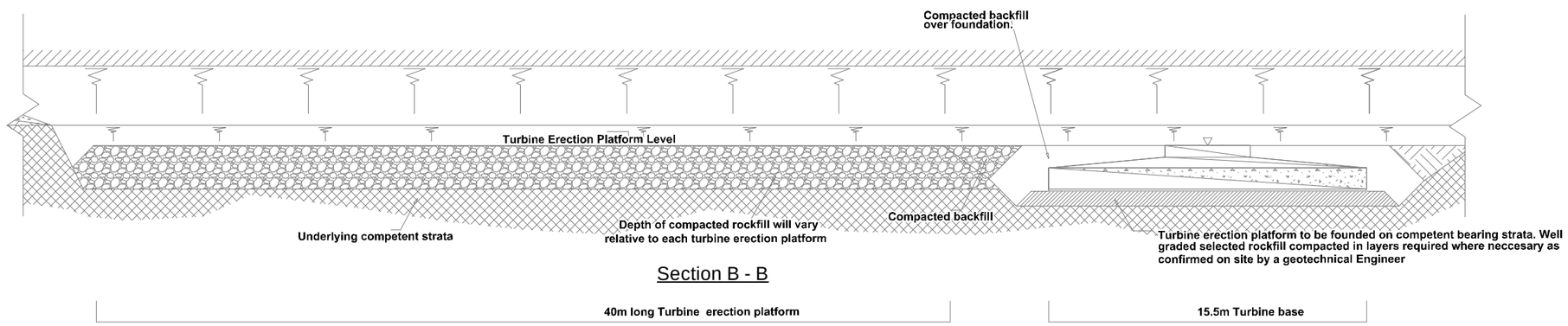
Plan: Typical Turbine Erection Platform Arrangement

Scale 1: 400



Section A - A

Scale 1: 250



Section B - B

Scale 1: 250

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	21.09.12	Turbine Foundation	BF	ND	PB

FORCE 9 ENERGY

Deuchries Wind Farm

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Figure 3.9 Turbine Foundation

As Shown | REV 00

FILE NAME: P:\ENVIRONMENT\1190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES - 3.9 Typical Turbine Base.Wor

4 PLANNING

Introduction

4.1 This chapter details the national and local policy framework for the Development. It summarises the policy framework and details the policies which are considered relevant to the determination of the application.

4.2 There are three strands of applicable policy and guidance: UK energy policy, Scottish energy and planning policy, and local planning policy. Each of these policy areas are examined below.

UK Context

4.3 As part of the Framework Convention on Climate Change (the Kyoto Protocol)[1], the United Kingdom is obliged to reduce greenhouse gas emissions by 12.5% from 1990 levels by 2008-2012.

4.4 Leading on from this the UK Government set out two long-term energy challenges:

"tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and

ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel".

4.5 In order to tackle these challenges, the 2007 White Paper: "Meeting the Energy Challenge"[2] sets out the four key policy goals:

1. To put the UK on a path to cutting Carbon Dioxide (CO_2) emissions by some 60% by about 2050, with real progress by 2020;
2. To maintain the reliability of energy supplies;
3. To promote competitive markets in the UK and beyond; and
4. To ensure that every home is adequately and affordably heated.

4.6 The UK Government's response to this has in part been through the Climate Change Act 2008 and Energy Act 2008. These set a legally binding commitment to reduce the UK's carbon emissions by 80% by 2050 and 34% by 2020 against a 1990 baseline. They also introduce a carbon budgeting system that requires that limits be set on the total amount of emissions in successive five year periods.

4.7 Latest estimates show that in 2009, net UK carbon dioxide (CO_2) emissions were 19.7% below 1990 levels, which were 9.8% lower than 2008[3]. In order to continue this trend, more action is required to further reduce CO_2 emissions.

4.8 The 2009 Renewable Energy Directive (2009/28/EC) calls for the UK to achieve 15% of its energy consumption from renewable resources by 2020. In order to meet this

legally-binding target, The UK Renewable Energy Strategy 2009 (RES)[4], part of the Government's Overall UK Low Carbon Transition Plan[5], sets out a range of measures and calls for UK emissions of CO_2 to reduce by over 750 million tonnes between 2009 and 2030.

4.9 Achieving the goal of 15% renewable energy by 2020 requires an increase from nearly 40 TWh of renewable energy in 2008, to just under 240 TWh in 2020. In achieving this target renewable electricity production is expected to rise to 30% of total generation, from about 5.5% in 2009. Around two thirds of this is anticipated to come from onshore and offshore wind. The Strategy calls for the planning system to encourage the deployment of renewable energy in appropriate places.

4.10 The UK National Renewable Energy Action Plan (NREAP)[6] 2010 follows on from the RES, and details how the UK will reach its 2020 renewable electricity generation targets as a contribution toward legally binding emissions targets. It refines the targets set out in the RES and estimates by 2020 the total renewable capacity of the UK will be c. 38GW, c.14GW of which will be from onshore wind, effectively increasing the targeted amount of renewable energy electricity generated from onshore and offshore wind by approximately 1GW.

4.11 The UK Renewable Energy Roadmap 2011[7] sets out the plan to accelerate the UK's deployment and use of renewable energy. Onshore wind is identified as one of the main technologies required to meet the 2020 target.

4.12 In summary, wind energy is one of the most significant renewable energy sources available to the UK given its substantial wind resource[8]. However, the present levels of consented and operational capacity are below what is required to meet targets. Substantial additional consents are required if wind energy is to play its expected part in meeting the Government's short and medium term targets.

Scottish Context

4.13 While planning for wind energy in Scotland is governed by a number of overarching policy documents, Scottish Government policy demonstrates an increasingly strong commitment to exploitation of renewable energy resources including onshore wind.

Climate Change (Scotland) Act 2009

4.14 The Climate Change (Scotland) Act 2009 received Royal Assent on August 4, 2009. The Act shows the commitment of the Scottish Government to a reduction of greenhouse gas emissions and a transition to a low carbon economy. It sets out a target of a 42% reduction in greenhouse gas emissions by 2020, with an 80% reduction by 2050. Scottish Ministers will set annual targets for interim years.

National Planning Framework (NPF2) (2009)

4.15 The Scottish Government is fully committed to supporting the increased use of renewable energy sources. This is shown in NPF2[9] which set a high target of 50% of Scotland's electricity to be generated from renewable sources by 2020. Due to

developments in the sector and changing expectations, this target has been raised to 100% (Scottish Government, 2011)[10]. NPF2 sets out a strategy that looks to maximise its renewable energy potential whilst safeguarding against negative impacts on the environment and communities. It encourages a mix of renewable energy technologies including growing contributions from onshore wind, wave and tidal energy. It notes the potentially important and valuable role small-scale renewable energy projects can make locally. It also notes that cumulatively they can make a significant contribution in developing a more decentralised pattern of energy generation.

Scottish Planning Policy (2010)

4.16 Scottish Planning Policy (SPP) sets out the Scottish Government's policy on nationally important land use planning matters. This reiterates the targets set out by the Climate Change (Scotland) Act and suggests planning has a key role in supporting achievement of sustainable development. It states that the use of energy efficient, micro-generating and decentralised renewable energy systems will be components in the move towards reducing emissions. Whilst the document sets a target for 50% of Scotland's electricity to be generated from renewable sources by 2020, this has been revised upwards to a 100% target (see paragraph 4.15).

4.17 Development Plans should support all scales of development associated with generation of energy and heat from renewable sources, accounting for economic, social, environmental and transport issues and maximising benefits. Development Plans should also support wider application of medium and smaller scale renewable technologies.

4.18 Planning authorities are required to develop a spatial framework for onshore wind farms, particularly those generating over 20 megawatts. Potential constraints to wind farm development may include: the historic environment; areas designated for regional and local landscape or natural heritage value; tourism and recreation interests; likely impacts on communities, including long term and significant impact on amenity; impact on aviation and defence interests, particularly airport and aerodrome operation, flight activity, tactical training areas, aviation and defence radar and seismological recording; and impact on broadcasting installations, particularly maintaining transmission links.

4.19 Planning authorities should not impose additional zones of protection around areas designated for their landscape or natural heritage value. Areas of search should have no significant constraints on development, including: other natural heritage interests; project viability, including wind speed, site access, ground suitability and other environmental factors; and grid capacity. Existing and approved grid capacity should be maximised wherever possibly, but grid constraints should not be used as a development constraint.

4.20 Development Plans are required to provide a clear indication for wind farms of all scales and set out criteria for deciding applications, which will include: landscape and visual impact; effects on natural heritage and the historic environment; the contribution of the development to renewable energy generation targets; effects on the local and national economy and tourism and recreation interests; benefits and disbenefits for

communities; aviation and telecommunications; noise and shadow flicker; and cumulative impact. Wind farm developments need to reflect the scale and character of the landscape in their design and location. Landscape and visual impact needs to be minimised. Cumulative impacts will be considered, largely relating to the scale and proximity of further development.

4.21 The SPP suggests that it may be appropriate for developers to voluntarily provide a range of benefits to the communities affected by renewable energy developments.

Web-based renewable advice

4.22 In February 2011, Planning Advice Note (PAN) 45 Renewable Energy Technologies and Annex 2 Spatial Frameworks and Supplementary Planning Guidance for Wind Farms were replaced by a series of online supplementary guidance[11]. Relevant to this application is advice on 'Onshore Wind Turbines', and 'Process for preparing spatial frameworks for wind farms'.

4.23 'Onshore Wind Turbines' sets out advice for local authorities on how to formulate onshore wind turbine policy and determine planning applications. In determining applications the guidance asks local authorities to consider:

- *Landscape impact*: Local authorities need to determine whether a landscape can readily absorb a wind turbine development. The visibility of the development must also be assessed. Landscapes that are of rare or valued importance e.g. National Scenic Areas and National Parks, are subject to greater scrutiny;
- *Landscape Assessment*: The guidance calls for applications to carry out in-depth analysis of landscape impact using such tools as a zone of theoretical visibility map. The guidance asks that any landscape assessment takes into account SNH's Landscape Character Assessment, which identifies different landscape characteristics that are sensitive to wind farm development;
- *Impacts on Wildlife and Habitat, Ecosystems and Biodiversity*: The guidance calls for an in-depth analysis of the potential for positive and negative environmental impacts arising from wind farm developments. The guidance states that for any negative impact arising, there is scope for mitigation;
- *Buffer Zones*: No buffer zones are required to be established around areas designated for their natural heritage and proposals should be considered on their merits;
- *Impact on Communities*: The guidance asks for local authorities to assess the potential impact on communities, specifically looking at shadow flicker and noise. Developers are required to determine whether the phenomenon of *shadow flicker* is applicable to their applications. In the assessment of noise, the advice states that the framework for the measurement of wind noise used in The Report 'The Assessment and Rating of Noise from Wind Farms' (Final

Report, Sept 1996, DTI) (ESTU-R-97) should be adhered to by developers [iii] The developer must also show that any wind farm development will not create any significant electro-magnetic interference to communications systems in the local area. Mitigation measures for potential ice throw must also be taken into account by developers;

- *Separation Distances:* whilst an indicative 2km separation is suggested between wind farm developments and the edge of towns, cities and villages, this is only a general guide for the preparation of policy and is not to be used as a development management tool. Consideration of individual developments should take account of specific local circumstances and geography;
- *Aviation Matters:* Local authorities are asked to get developers to look into potential air safety and radar implications of wind farm developments;
- *Military Aviation and Other Defence Matters:* Again developers are asked to make due consideration of potential obstructions to MOD low flying operations and radar impact;
- *Road Traffic Impacts:* Full consideration of the potential road traffic impacts during construction, periodic maintenance and decommissioning phases must be assessed by local authorities;
- *Cumulative Impacts:* The advice calls on local authorities to be more aware of cumulative impacts occurring from wind farm developments, located proximate to one another;
- *Good Practice During Construction:* The advice asks that local authorities encourage developers to appoint Ecological Clerks of Works to make sure approved designs and construction techniques are adhered to; and
- *Decommissioning:* The guidance asks that an appropriate decommissioning strategy is in place once planning consent has expired at a wind farm development site.

4.24 'Process for preparing spatial frameworks for wind farms' notes that whilst local authorities need to set out a spatial framework in the development plan for onshore farms of over 20 MW generating capacity; as there has been a marked increase in developments below this threshold, it may be appropriate for local authorities to also incorporate such schemes into their spatial framework. Local authorities are encouraged to bring forward wind turbines in suitable locations, within the development plan action programme. The goal of the spatial framework is not to create a sequential approach in determining applications. Therefore, wind farm developers with proposals

[i] Since the publication of ETSU-R-97, additional advice has been presented in the Institute of Acoustics Bulletin ('IOA Bulletin'), which clarifies preferred modelling parameters and an updated methodology for predicting windshear during noise monitoring.

[ii] Additional guidance to assess noise during construction is set out in BS 5228-1:2009, "Code of practice for noise and vibration control on construction and open sites".

outside an area of search are not required to show why there are no other suitable locations within it.

Scottish Renewables Action Plan (2009)

4.25 The key objectives of the Scottish Government's Renewables Action Plan (RAP) are: to establish Scotland as a UK and EU leader in the field, ensure maximum returns for domestic energy and to meet Scottish targets for energy from renewable and for emissions reductions to 2020 and beyond.

4.26 The vision for onshore wind is for a continued expansion of the portfolio of wind farms to help meet the renewable target, with a robust planning framework supporting timely processing of consents applications and ensuring wind farms are consented where they are environmentally acceptable. The headline ambitions are: to support the development of onshore wind farms in environmentally acceptable locations; and to maximise community engagement with wind projects and provide support for small and community-scale developments, including encouraging wind-to-heat projects in remote areas off gas grid.

4.27 This guidance was updated and extended through the publication of the 2020 Route Map for Renewables in Scotland in July 2011[12]. This guidance states the Scottish Government new target of meeting an equivalent of 100% demand for electricity from renewable energy by 2020. It reiterates the Scottish Government's goal of becoming Scotland the "*renewables powerhouse of Europe*". Therefore, the guidance is fully supportive of the use of renewable energy technologies in suitable locations.

4.28 Furthermore, specifically for onshore wind generation the guidance states:

"Our ambition is that by 2020, onshore wind developments ranging from small and community-scale to large power utility scale maximise engagement with communities; contribute electricity to renewables targets; and, through displacement of fossil fuel generation, help to reduce fossil fuel consumption".

4.29 The guidance calls on the planning system to find the right balance between protecting the environment and continuing to make progress on renewable targets.

Renewable Obligation Certificates (ROCs)

4.30 The Scottish Government has recently confirmed that it would support onshore wind generation at a level of 0.9 Renewable Obligation Certificates (ROCs) – a reduction of only 10%, in line with proposals in the recent consultation on this issue. This level of support would be maintained regardless of whether DECC decides to make greater reductions at a later date. This underpins the Scottish Government's commitment to ROCs and renewables as a whole in Scotland.

Conclusions

4.31 It has been shown that there is a strategic policy necessity in the UK and Scotland to encourage the use of renewable technologies, and particularly onshore wind, to tackle climate change.

Local Planning Policy Context

4.32 For any renewable energy development to be considered appropriate it must also satisfy local planning policy.

4.33 Sections 25 and 37 (2) of the Town and Country Planning (Scotland) Act 1997 (as amended) require that planning decisions be made in accordance with the development plan, unless other material considerations indicate otherwise.

4.34 The Development Plan relevant for the proposed Development is the Aberdeen City and Shire Structure Plan (2009), the Aberdeenshire Local Development Plan (2012). Material to consideration of the application will be the Use of Wind Energy in Aberdeenshire supplementary guidance. The following sections highlight relevant policy that will be used to assess this application.

Aberdeen City and Shire Structure Plan (2009)

4.35 The purpose of the structure plan is to set a clear direction for the future development of the North East towards which the public and private sectors can work to deliver.

4.36 One of the Plan's main aims is to *'take on the urgent challenges of sustainable development and climate change.'* Relevant objectives include promoting sustainable development to help Aberdeenshire City and Shire *'take the lead in reducing the amount of carbon dioxide released into the air, adapt to the effects of climate change and limit the amount of non-renewable resources it uses.'*

4.37 The Plan identifies a need to tackle both the supply of and demand for energy during the plan period. *'This will involve increasing the supply of energy from renewable sources (making a significant contribution towards meeting Scottish targets) and reducing demand from new developments'*. One of the Plan's main targets is for the city region's electricity needs to be met from renewable sources by 2020. It calls on the local development plans to identify suitable methods and technology available to help meet these goals.

Aberdeenshire Local Development Plan (2012)

4.38 The principal policy in the Local Development Plan relating to wind farm development is **Policy 3 Development in the countryside.** The policy specifies that wind farm development will be approved, in principle, if located, sited, and designed in accordance with the following criteria (relevant chapters of the ES where these issues are covered are noted in brackets):

- Public health and safety should not be compromised (ES Chapters 10, 14 and 15);
- The proposal should be located at a distance at least greater than the height of the turbines from roads and railways (ES Chapters 3 and 11);
- The proposal should not compromise or affect the operations of UK aerodromes, aircraft and airspace (including NATS) (ES Chapter 14);
- Defence assets should not be impacted upon or compromised (ES Chapter 14);
- TV reception or quality of radio reception should not be affected (ES Chapter 14);
- The safeguarding zones for airports, airfields or airstrips should not be affected (ES Chapter 14);
- No detrimental impacts on the amenity of dwelling houses e.g. noise (Chapter 10) and visual effects (ES Chapter 8);
- No significant impacts upon tourism and recreational interests including core paths and public access for walking, cycling or horse riding (ES Chapter 13); and
- Cumulative impacts with other neighbouring turbines, those that have been granted permission or are in the planning system must be taken into consideration (ES Chapters 5 to 15).

4.39 The supplementary guidance that supports this policy (SG Rural Development 2), emphasises the importance of considering visual and landscape effects (covered in ES Chapter 8), the effect on natural heritage and the historic environment (ES Chapter 9) and the potential impact on the local economy (ES Chapter 13). The impacts on local wildlife are also stressed as important and are looked at in ES Chapters 6 and 7.

4.40 The guidance also calls for applicants to provide information on associated infrastructure such as grid connections, borrow pits and access tracks, all of which are covered in ES Chapter 3.

4.41 There are a number of other supplementary policies in the Local Plan that are relevant to this application.

4.42 Whilst **Policy 8 Layout, siting and design of new development** is primarily directed at other forms of development rather than wind farm proposals, there are some aspects that are relevant. The policy calls for new development to take account of its impact on the existing landscape, which is covered in the LVIA chapter (ES Chapter 8). The policy also states that public access is an important consideration. Therefore, the impacts of the Development on routes such as core paths, footpaths and cycleways are considered in ES Chapter 13. The policy is also concerned with any development in areas susceptible to flooding. All hydrology related issues are examined in ES Chapter 5.

4.43 Elements of **Policy 9 Developer contributions** are applicable to this development. Specifically, the supporting guidance for the policy highlights various criteria that have to be met in regard to new accesses. This includes not creating significant transport impacts on existing transport infrastructure or services and not creating access routes, which cannot be safely and conveniently accessed by delivery vehicles. All transport aspects are looked at in ES Chapter 11.

4.44 The policy also asks that developments that involve the creation of hill tracks be done in a way so as to minimise their potential landscape impact. Chapter 3 of this ES provides details on the construction process to be used for the creation of new access tracks and visual impacts are considered in ES Chapter 8.

4.45 **Policy 11 Natural heritage** calls for developments not to create significant biodiversity and geodiversity impacts. Therefore, there is a requirement to carry out relevant assessments/surveys to determine whether there is any habitat, geological feature or species of importance exists within the site of the planning application. Geological impacts are looked at in ES Chapter 5, an ecological assessment is included within ES Chapter 6 and an ornithological assessment is included in ES Chapter 7.

4.46 The primary goal of **Policy 12 Landscape conservation** is to *"promote protection, management and planning of the landscape".* The development site spans two landscape character areas; Knockhill and Aberchirder Agricultural Heartlands and Western Coastal Farmland. The LVIA carried out for this ES assesses whether the scale, location and design of the wind farm is appropriate for these landscape character types and ultimately whether there would be adverse effects. The LVIA also determines if there are any likely significant effects on Aberdeenshire's listed valued views.

4.47 **Policy 13 Protecting, improving and conserving the historic environment** is also applicable to this Development, as consideration of the impact on the setting of historic gardens and designed landscapes and archaeological sites and monuments is required. This is covered in Chapter 9 of this ES.

4.48 Finally, **Policy 14 Safeguarding of resources and areas of search** has significance for the Development. Specifically, any development which causes any negative hydrological impacts will not generally be permitted. The likely significant impacts on nearby water bodies are considered in Chapter 5 of this ES.

4.49 The policy also seeks the protection of any trees or woodland that are classed under Tree Preservation Orders or of significant ecological, recreational, historical or shelter value. The aforementioned biodiversity studies that have been carried out for this ES, consider the likely significant effects on trees and woodlands

4.50 The safeguarding of transportation facilities element of Policy 13 again highlights the importance of preserving core paths and cycle ways. As stated above this area is covered in ES Chapter 13.

Use of Wind Energy in Aberdeenshire Part 1: Guidance for Developers

4.51 Supplementary planning guidance (SPG) produced by Aberdeenshire Council on renewable energy is a material consideration relevant to this application. "Use of Wind Energy in Aberdeenshire Part 1: Guidance for Developers" provides a policy overview and outlines development principles and information requirements.

4.52 Aberdeenshire Council expects supporting information for wind energy applications to make observations in a number of areas so that they can make a full assessment to assess impact and to consider significance of impact:

- *Technical information*: Full technical details of turbines and plans for decommissioning;
- *Site infrastructure*: Details on the access requirements (temporary and permanent) and earthworks proposed;
- *Ecological assessment:* Determination and assessment of the natural habitat and species and an understanding of the agricultural context around a development site;
- *Landscape assessment:* An assessment which provides an understanding of the landscape context, which includes looking at its quality, value and scale;
- *Visual assessment:* A comprehensive visual analysis is required, which includes a viewpoint analysis, zone of theoretical visibility and visual impact evaluation. Photomontages are also recommended. For any negative visual impacts arising, suitable mitigation solutions should be provided;
- *Noise Assessment:* This will be required if any proposed development is either within a settlement, 400m from an occupied dwelling house or where initial noise assessment suggests that there may be significant impact on other dwellings within 1000m of the proposed turbines;
- *Shadow flicker/throw assessment:* For dwellings within a 1000 metre radius, assessments are required throughout the year on potential shadow flicker and throw;
- *Built and cultural heritage assessment:* An understanding of any potential impacts on archaeological sites, listed buildings, conservation areas, historic gardens, designated landscapes or local sites of cultural importance is required;
- *Tourism and countryside access assessment:* This is required to determine whether there are any visual or amenity impacts on tourist and recreation receptors;
- *Public Safety:* Informal risk assessments may be required to mitigate against any health and safety issues that may arise from the development. Potential road safety issues must also be taken into consideration;
- *Electro-magnetic interference (aviation and communication):* Consultation with bodies such as the British Aviation Authority, Civil Aviation Authority, MoD and Office of Communication is deemed necessary. These organisations will be able to highlight any possible impact upon factors such as flight path, radar and navigation aids, and television and radio transmission. Applicants are required to provide suitable mitigation measures for any negative impacts arising;
- *Cumulative impact assessment:* It is at the discretion of the local planning authority to determine what areas will require cumulative impact assessments (e.g. visual or ecological). It is generally the case that cumulative effects will have to be taken into consideration if a proposed development is within close proximity to other wind turbine developments;
- *Wind regime:* In some cases it is deemed necessary to provide evidence that there is enough wind resource to support an application;

- *Grid network:* Applicants will have to provide details on how development proposals will connect to grid; and
- *Other issues:* Other important issues that may be important for consideration, include community consultation, local employment/business considerations, potential community benefits, forestry design and management plans and the visual impacts of borrow pits.

4.53 The SPG also provides comprehensive guidance on where turbines should be sited and located as well as design principles for turbines and ancillary equipment.

4.54 The SPG seeks that, as part of the wider ecological assessment for wind farm proposals, carbon emissions resulting from the disturbance of natural sinks such as peat deposits is evaluated.

4.55 A detailed review of compliance against the guidance contained within the SPG is provided in the planning statement that accompanies the planning application.

Conclusions

4.56 This overview of relevant planning policy and guidance highlights a number of issues relevant to the Development design process, which will be covered within this ES. A summary of the key issues is provided below along with the relevant criteria that need to be met:

Table 4.1: Assessment Criteria

Issue	Criteria to meet	Where covered in this ES
Landscape and Visual impacts	Landscape assessment. Visual assessment. No impacts on international, national and local designations. No impacts on listed views.	Chapter 8
Layout, Siting and Design	Separation distance of at least the height of the proposed turbine from roads and railways. Siting of the development must be shown to respect the character and amenity of the surrounding area. Respects existing natural and built features on site, characteristics of landscape and important public views.	Chapters 2,3 and 8
Noise	Detailed assessment on noise.	Chapter 10
Impact on aviation and defence	Clarification that there will be no likely significant impacts on radar or traffic control performance, defence interests or other air safety considerations. Exclusion zones around airports, airfields or sirstrips should be affected No significant impact on UK aerodromes, aircraft and airspace.	Chapter 14
Associated infrastructure	Provide details on aspects such as grid connections, borrow pits and access tracks.	Chapter 3
Natural Heritage /Biodiversity	No impacts on natural heritage features such as waterfalls and viewpoints Assessment needed of the potential impact on wildlife and habitat, ecosystems and biodiversity. There must be no negative impact on areas of local ecological	Chapters 5,6 and 7

Issue	Criteria to meet	Where covered in this ES
	importance.	
Technical Information	Provide details of scheme and plans for decommissioning	Chapter 3
Public Access	No impacts on routes used for walking, cycling or horse riding.	Chapter 13
Impacts on Forests and Woodlands	Trees and woodland should be protected against significant impacts.	Chapter 6
Impact on historical/ cultural environment	No proposed impact on important historical/cultural sites e.g. listed buildings, conservation areas, archaeological sites or historic gardens.	Chapter 9
Impact on transmitting or receiving systems	No electromagnetic disturbance to be caused by this development.	Chapter 14
Impact on hydrology	Site must not be susceptible to flooding. Acceptable proposals for water, waste and drainage.	Chapter 5
Impact on amenity of nearby dwellings/communities/settlements	Must not affect the amenity on nearby area e.g. in terms of noise and shadow flicker/throw.	Chapters 3, 10,14 and 15
Shadow Flicker	Assessment to show that there will be no shadow flicker affects	Chapter 15
Health and Safety	It should be shown that the development will not have any public safety issues.	Chapters 10,14 and 15
Impact on tourism	No loss of amenity to nearby leisure and recreation receptors.	Chapter 13
Transport and access impacts	An understanding of the potential traffic impacts during construction, maintenance and decommissioning. Provide details of access requirements. New access routes should be accessed by a range of modes of transport.	Chapter 11
Wind regime	Evidence to support that development is viable.	Chapter 2
Cumulative Impacts	Consideration of wider cumulative impacts with other neighbouring renewable energy developments	Chapters 5 to 15

Chapter 4 References

[1] Kyoto Protocol http://unfccc.int/resource/docs/convkp/kpeng.pdf

[2] Department of Trade and Industry, 2007, Meeting the Energy Challenge, a White Paper on Energy, TSO

[3] Department of Energy and Climate Change (DECC), 2009, Final UK Figures http://www.decc.gov.uk/assets/decc/Statistics/climate_change/1214-stat-rel-uk-ghg-emissions-2009-final.pdf

[4] HM Government, DECC, 2009, the UK Renewable Energy Strategy, TSO

[5] HM Government, DECC, 2009, the UK Low Carbon Transition Plan, National Strategy for Climate and Energy, TSO

[6] DECC, 2010, National Renewable Energy Action Plan for the United Kingdom (Article 4 of the Renewable Energy Directive 2009/28/EC)

[7] DECC, 2011, UK Renewable Energy Roadmap, DECC

[8] DECC website, About Wind section http://www.decc.gov.uk/en/content/cms/meeting_energy/wind/wind.aspx

[9] Scottish Government, 2009, National Planning Framework 2, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/npf

[10] Scottish Government website http://www.scotland.gov.uk/About/scotPerforms/indicators/electricity

[11] http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables

[12] The Scottish Government, 2011, 2020 Route Map for Renewables in Scotland, http://www.scotland.gov.uk/Publications/2011/08/04110353/0

5 PHYSICAL ENVIRONMENT

Introduction

5.1 This chapter describes the existing geology, hydrogeology, hydrology, drainage and flood risk on and in the vicinity of the Site and provides an evaluation of likely significant effects on these aspects resulting from the Development. The chapter also considers the methods for managing the quantity and quality of surface water runoff during construction, operation and decommissioning as described in ES Chapter 3: Project Description.

Policy and Legislation

5.2 Relevant national and local planning policy is discussed in ES Chapter 4: Planning. Local planning policy includes specific policies on the protection of groundwater, sustainable urban drainage systems and flood risk and development. The following summarises key legislation that is applicable to the physical environment.

Water Environment (Controlled Activities) (Scotland) Regulations 2011[1]

5.3 Under these regulations (CAR2011) authorisation is required for activities that may impact the water environment. Three different types of authorisation allow for proportionate and risk-based regulations, these are:

- General Binding Rules: These apply to low risk activities that do not need to be notified to SEPA. There are a series of generic conditions contained in the CAR that must be complied with;
- Registrations: These notify SEPA of medium risk activities and enable SEPA to monitor cumulative impacts. A registration authorises the activity as described in the application and so would specify the scale of the activity and its location. SEPA may set additional conditions for such activities; and
- Licence (simple or complex): A licence is required for higher risk activities; this would contain site-specific conditions relating to that activity. A licence requires the identification of a responsible person who is responsible for ensuring compliance with the conditions of the licence.

5.4 When an application is being considered for authorisation, SEPA would assess the impact on ecology, on other water users and the extent to which the activities would affect flood risk.

Flood Risk Management (Scotland) Act 2009[2]

5.5 This act creates a statutory framework to deliver a sustainable and risk-based approach to flood management. This includes the preparation of assessments of the likelihood and impacts of flooding, and catchment focused plans to address these impacts. By 2015, flood risk management plans will be in place across Scotland, which should then be taken into account when development plans are prepared.

5.6 The Act also amends the Town and Country Planning (Development Management Procedure) Regulations (Scotland) 2008, requiring all applicants to provide a flood risk assessment for development that may increase the number of buildings at risk of being damaged by flooding.

Water Environment and Water Services (Scotland) Act 2003[3]

5.7 The Act provides regulatory controls over a wide range of activities in order to protect and improve Scotland's water environment. These include preventing further deterioration of, and protecting and enhancing, the status of aquatic ecosystems and promoting sustainable water use. Thus contributing to mitigating of the effects of floods and droughts.

The Private Water Supplies (Scotland) Regulations 2006[4]

5.8 The overriding objective of the regulations is to ensure the provision of clean and wholesome drinking water and deliver significant health benefits to those using private (non-mains) water supplies. The regulations incorporate the latest advances to improve drinking water quality including the use of risk assessments from 'source to tap' as part of an effective drinking water surveillance programme.

Water Framework Directive, 2000[5]

5.9 The Water Framework Directive (WFD) came into force in December 2000. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers, lakes and lochs), transitional waters (estuaries), coastal waters and groundwater. It aims to ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015.

The River Basin Management Plan for the Scotland River Basin District[6]

5.10 The Site falls within the River Basin Management Plan (RBMP) for Scotland. The RBMP sets the framework for protecting and enhancing the water environment from 2009 to 2015.

5.11 According to RBMP, the Scotland river basin district has fewer environmental problems than most others in the UK. The objectives for the water environment are to build on this achievement. The overall goal of this plan is for 98% of water bodies to be in good or better condition by 2027. To achieve that, water bodies currently at good or high status will be protected from deterioration and action will be taken to enhance and restore others. Improvements have been prioritised over the periods 2009–2015, 2015–2021 and 2021– 2027.

Method of Assessment

General Methodology

5.12 The assessment of impacts on the physical environment has been carried out in accordance with the methodology outlined in the EIA scoping report submitted to SEPA

(dated May 2011) and in accordance with the scoping responses received as described below. As such, the assessment considers the three key areas of flood risk, drainage and hydrology and water quality (surface and groundwater).

5.13 Baseline conditions were determined through desk study and site walkover investigations. This included consultations with SEPA, review of relevant data and published material relating to the local and wider hydrological environment, such as the Strategic Flood Risk Assessment[7], Flood Estimation Handbook CD ROM v3[8] and other relevant studies.

5.14 The assessment has considered all impacts associated with the Development as described in Chapter 3. The route and nature of the grid connection for the Development does not form part of the planning application and is yet to be finalised. However, for the purposes of this ES it is assumed that the grid connection would comprise a 33kV underground cable that would route through the Site, with a 'T' connection into the existing 33kV transmission line between Turriff and Aberchirder, which runs close to the southern boundary of the Site.

5.15 The grid connection would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) as part of the consenting procedure for this element of infrastructure. However, from a preliminary desk based analysis of the area between the proposed turbines and the existing transmission line, and assuming the same embedded mitigation measures for the Development are applied to the grid connection construction works, potential effects associated with the grid connection are considered unlikely to differ from those identified in the following impact assessment.

Consultation and Scoping

Flooding and Hydrology

5.16 Consultations with both Aberdeenshire Council and SEPA were undertaken. Two responses were received from Aberdeenshire Council following initial consultation regarding hydrology and drainage (dated 8th June 2011 and 17th June 2011 – both with the reference ENQ/2011/0810). Their comments include:

- If any watercourse crossings are required, the Flood Prevention unit should be consulted and crossing details should be submitted with the planning application; and
- Further consultation with the Council confirmed that any proposals for surface runoff should be in accordance with the SUDS Manual [9] and SEPA guidance.

5.17 Consultation with SEPA identified few key statements relating to hydrology and flood risk in their response dated 6th June 2011 (reference PCS 113929). These included:

- Flood risk from all sources should be assessed in line with SPP (paragraphs 196 to 211);
- Flood risk should be identified using the Indicative River & Coastal Flood Map (Scotland) available online;

- If a flood risk is identified then a flood risk assessment from all source should be carried out in line with SPP and following the guidance set out in the Annex to the SEPA Planning Authority flood risk protocol; and
- Technical Flood Risk Guidance for Stakeholders outlines the information required to be submitted as part of Flood Risk Assessment and methodologies that may be appropriate for hydrological and hydraulic modelling.

Engineering Activities

5.18 SEPA recommends that Development should be designed to avoid any engineering activities in the water environment wherever possible. If not, Development should be located away from water features and engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative. A site survey of existing water features and a map of the location of all proposed engineering activities should be included in the application together with justification for the activity and any mitigation measures as appropriate.

Water Quality

5.19 SEPA stated that any abstractions, including Private Water Supplies (PWS) within 250m of turbine foundations or borrow pits, or within 100m of roads, tracks or trenches should be fully assessed. The source of any groundwater supply should be clearly identified by NGR coordinates with the type of source and estimated abstraction rate. If any PWS are recognised as being potentially at risk, it is recommended that mitigation measures are in place to ensure that the works do not adversely affect supplies. Mitigation measures may include monitoring of the abstraction points before, during and after the works, and the implementation of appropriate contingency plans to ensure security of supply.

5.20 If other development projects are present or proposed within the same water catchment then SEPA advises that the application consider cumulative impacts upon the water environment.

Flood Risk Assessment

5.21 A Flood Risk Assessment (FRA) has been prepared in accordance with Scottish Planning Policy (SPP)[10] and CAR2011. This establishes the flood risk associated with the Development and to consider if suitable mitigation measures are required, to reduce the risk to a more acceptable level. The FRA is contained as Appendix 5.1.

5.22 The scope of work relating to the FRA comprises the following elements:

- The characteristics of the Site;
- The use and design of the Development;
- The size of the area likely to flood;
- Depth of water, likely flow rate and path, rate of rise and duration;
- Existing flood prevention measures – extent, standard and maintenance regime;
- The allowance for freeboard;

- Cumulative impacts of development, especially the loss of flood storage capacity;
- Potential cross boundary impacts and the need for consultation with adjacent authorities;
- Effects of a flood on access including by emergency services; and
- The extent to which the Development, its materials and construction are designed to be water resistant.

Peat Assessment

5.23 A site walkover was completed by a Grontmij engineer on the 24th November 2011, to assess the potential presence of peat zones and hazards. Several probes were also completed during the walkover to investigate further the soils and strata present.

5.24 The soil probing exercise identified the wetter soft ground, as soft clay or potentially peat, in the lower-lying areas of the Site rather than on the steeper slopes flanking the valley to west and east and concluded that rockhead is likely to be present at shallow depth on the steeper slopes. No problems with respect to peat landslides or peat instability are therefore anticipated. However, the proposed access tracks and turbines have been located to avoid the areas of Site where there is potential for peat as far as practicable and ground investigation would be undertaken at the pre-construction stage to ensure there would be no issue with regard to peat landslides or peat instability.

Drainage and Water Quality

5.25 Water pollution prevention and mitigation measures have been developed based on guidance from the following:

- Sustainable Urban Drainage Systems (SUDS) Manual;
- SEPA publications 'Watercourses in the Community'[11];
- SEPA publication 'Ponds, Pools and Lochans' [12];
- SEPA publication 'Technical Flood Risk Guidance for Stakeholders'[13];
- SEPA publication 'Development at Risk of Flooding, Advice and Consultation – a SEPA Planning Authority Protocol [14]; and
- Scottish Government publication, River Crossings and Migratory Fish [15].

Impact Assessment Criteria

5.26 The significance of effects has been assessed based on the sensitivity of the identified water receptors, which are explained below (including Tables 5.1 to 5.3), and the magnitude of the predicted impacts. The criteria used to assess sensitivity and magnitude are defined in Tables 5.4 and 5.5. Overall significance of effect has been defined as described in Table 5.6.

Flood Risk

5.27 SPP paragraph 204 outlines the application of the flood risk framework for any development site. It provides a basis for planning decision-making relating to flood risk. The framework divides flood risk into three categories and outlines an appropriate

planning response. The calculated probability of a flood occurring should be regarded as a 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 5.1: Flood 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 upper 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; and • 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.

Surface Water Quality Criteria

5.28 Controlled waters are defined in law and are essentially all waters, either above or below ground, which are neither in the drinking water supply pipe or the sewerage network. In consideration of SEPA and RBMP requirements mentioned above, the assessment includes consideration of the impact of the Development on water quality.

5.29 SEPA's Water Quality Classification is defined in SEPA's publication entitled 'National Water Quality Classification 2006[16]. It is based on a five point scale and includes all rivers with a catchment area of 10km^2 or more and specific smaller rivers where known pollution problems exist. This is called the "classification network". The classification network is divided into river stretches based on confluences and pollution pressures. Every stretch is assigned a monitoring point where chemical and/ecological surveys are taken and the aesthetic appearance recorded. The quality or "class" of a length of river is calculated from the monitoring point results. The SEPA's River Water Quality Classification Categories are presented in Table 5.2.

Table 5.2: The River Water Quality Classification Categories

Class	Description
A1	Excellent
A2	Good
B	Fair
C	Poor
D	Seriously Polluted
U	Unclassified

Groundwater

5.30 Groundwater vulnerability can be defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.

5.31 SEPA's groundwater vulnerability is defined in the SNIFFER[17] publication 'Development of a Groundwater Vulnerability Screening Methodology for the Water Framework Directive'. It is based on five vulnerability classes. In the most vulnerable areas, groundwater is vulnerable to most types of pollutant and contamination is rapid. In the least vulnerable areas, groundwater is only vulnerable to conservative pollutants (such as chloride and nitrate) when they have been continually introduced to the subsurface by a persistent activity. Table 5.3 summarises the transport characteristics of common pollutants and those in particular that are susceptible to absorption or degradation.

Table 5.3: Vulnerability Definitions for Potentially Polluting Surface Activities

Vulnerability category	Description	Frequency of activity	Travel Time
5	Vulnerable to most water pollutants with rapid impact in many scenarios	Vulnerable to individual events ↓	Rapid ↓
4	Vulnerable to those pollutants not readily adsorbed or transformed		
3	Vulnerable to some pollutants with many significantly attenuated		
2	Vulnerable to some pollutants, but only when continuously discharged/leached		
1	Only vulnerable to conservative pollutants in the long-term when continuously and widely discarded and leached	Vulnerable only to persistent activity	Very slow

Table 5.4: Receptor Sensitivity

Sensitivity	Definition
Very High	Internationally designated ecological Sites e.g. Special Protection Areas, Special Area of Conservation (SAC), Ramsar Site, EC designated freshwater fisheries. All nature conservation sites of national importance designated by statute including: Sites of Special Scientific Interest (SSSI) and National Nature Reserves. Very highly productive bedrock or superficial aquifers Potable groundwater abstractions. Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 4 and 5** as shown in Table 5.3. Flood Risk: Areas with a 0.5% (1 in 200 year) or greater probability of being flooded in any given year from either rivers or the sea* Excellent and Good surface water quality with pristine or near pristine water quality corresponding to Classes A1*** Surface water flood flow patterns and pathways outside the site area that directly affect peat deposits. Water supply to significant numbers of residential properties (estates, urban settlements etc) and heavy industrial development.

Sensitivity	Definition
High	A site of regional ecological importance i.e. areas of internationally or nationally important habitats that are degraded but are considered readily restored Highly productive bedrock or superficial aquifers Potable groundwater abstractions for local use, i.e. farm buildings Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 3** as shown in Table 5.3 Flood Risk: Areas with a 0.5% (1 in 200 year) or greater probability of being flooded in any given year from either rivers or the sea* Good surface water quality with pristine or near pristine water quality corresponding to Classes A2*** Surface water flood flow patterns and pathways within and outside the site area that affect directly peat deposits. Water supply to residential properties (small estates, villages etc) and medium to heavy industrial development Flood flow capacity of Local watercourses (where additional runoff from the site could lead directly to flooding)
Medium	A site of district importance in ecological terms e.g. Site of Importance for Natural Science, Scottish Wildlife Trust Reserve/Wildlife Site, or a site listed on the Ancient Woodland Inventory (AWI). Moderately productive bedrock or superficial aquifers Areas where no abstractions are recorded but may be viable within a Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 2** as shown in Table 5.3 Flood Risk: Low to Medium risk area (0.1% to 0.5% (1 in 1000 – 1 in 200)) suitable for most development but not essential civil infrastructure* Biological and chemical water quality within rivers and streams, Fair water quality corresponding to Class B*** Surface water flood flow patterns and pathways within and outside the site area that affect indirectly peat deposits. Flood flow capacity of Local watercourses (where additional runoff from the site would be unlikely lead to flooding) Water supply (mains or private) to individual properties, offices and commercial developments.
Low	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration Low productive bedrock or superficial aquifers Areas where no abstractions are recorded but may be possible within a Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 1** as shown in Table 5.3 Flood Risk: Little or no risk area (less than 0.1% (1 in 1000) – no general constraints* Poor surface water quality corresponding to Classes C*** Local watercourses (where additional runoff would not lead to flooding)

Sensitivity	Definition
Negligible	Flood Risk: Little or no risk area (less than 0.1% (1 in 1000) – no constraints* Non-aquifers Water supply to properties used infrequently or discontinued. Seriously Polluted water quality corresponding to Classes D*** Areas outside the Drinking Water Protection Zone
* Flood Risk definitions quoted from SPP ** Based on SEPA's groundwater vulnerability categories *** Based on SEPA's water quality classifications	

Table 5.5: Criteria to Assess Impact Magnitude

Magnitude	Definition
High	Substantial change in terms of flooding, surface water drainage, hydrology or hydrogeology, which may result in greater impact on the environment and require a longer period to recover (>10 years). Substantial change in baseline water quality either by a relatively high amount for a long-term period or by a very high amount for an episode such that watercourse quality is greatly changed. Equivalent to downgrading from Class A to B or C, or from B to D, that will require >10 years to recover.
Medium	Changes to flooding, surface water drainage, hydrology or hydrogeology, which cause inconvenience, which would recover over a medium period of time (5-10 years). Noticeable change in baseline water quality that may be long-term or temporary. Results in a change in the quality of the watercourse, equivalent to downgrading one class, for example from B to C, that will require between 5-10 years to recover.
Low	Slight change where the proposals could occasionally cause a minor flooding, surface water drainage, hydrology or hydrogeology change in the short term. (1-5 yrs). Minor change in water quality baseline conditions with a minor temporary nature such that watercourse quality is slightly affected, equivalent to minor but measurable change within a class. Results in a change in the quality of the watercourse, equivalent to downgrading one class, for example from C to D but would recover within 1-2 years.
Negligible	No impact detectable or a change within the bounds of natural variation. Very slight change in water quality baseline conditions such that there is no detectable impact upon the watercourse's quality, no change in classification.

Table 5.6: Significance of Effect

Magnitude	Sensitivity				
	Very High	High	Medium	Low	Negligible
High	Substantial	Substantial	Major	Moderate	Low
Medium	Substantial	Major	Moderate	Low	Negligible
Low	Major	Moderate	Low	Negligible	Negligible
Negligible	Low	Low	Negligible	Negligible	Negligible
Key	Significant Effect				
	Not Significant Effect				

Baseline Environment

5.32 The total area of the Site is approximately 363ha, of which a relatively small central area of the Site would be developed. The topography of the Site is varied ranging from a minimum elevation of 130m Above Ordnance Datum (AOD) in the southwest near the village of Aberchirder to a maximum elevation of 244m AOD at Black Law Hill in the west. Other notable peaks include Cranna Hill at 233m AOD south of Black Law Hill, Gallow Hill south east of Cranna Hill and a high peak to the west of Crannabog hills at 220m AOD. The topography and physical constraints are shown on Figure 5.1.

Soils and Geology

Soils

5.33 Typically a shallow topsoil is present across the Site, with softer, wet and clayey soils in the low lying areas of the Site. Rockhead is present at surface or beneath a thin layer of topsoil on the steeper valley slopes.

5.34 British Geological Survey mapping suggested one discreet area of peat deposits within the Site, although there are no publicly available borehole records within these deposits to indicate the thickness. The mapping indicates the area of peat is located to the north east of the proposed locations of Turbines 1 and 2, in proximity to the confluence of the two drains as shown on the Ordnance Survey map.

5.35 Soft ground probing results (contained in Appendix 5.1) indicated noticeably boggier ground that may be peat in Fields A and B (as shown on Figure 5.1), again in proximity to the watercourses and drainage ditches i.e. to the north of the proposed turbine and track locations. The Phase 1 Habitat Survey completed for the Site did not flag up any notable i.e. wetland indicator species or habitats that would suggest the presence of peat. The Grontmij peat assessment indicates that Turbines 1 and 2 would be located close to an existing track and the site walkover did not foresee any peat in this area. Turbine 3 would be located close to an existing track on the upper section of the sloping ground.

5.36 Whether the soft ground encountered is peat or soft clay it was encountered in the low lying areas of the Site rather than on the steeper slopes flanking the Rosy Burn valley to the west and east. Grontmij therefore concluded that the Site is not likely to suffer problems with respect to peat landslides or peat instability. These matters are therefore not considered further in this assessment.

Superficial Deposits

5.37 The publicly available geological information does not indicate the presence of any man made deposits across the Site, however, it is considered that localised Made Ground may be present in the areas associated with the existing buildings and tracks within the Site. Additionally, there is an area on the west side of Black Law that had previously been quarried during the construction of the A97, but is now disused and overgrown.

5.38 The majority of the Site is underlain by superficial deposits of till comprising a stiff clay with variable quantities of sand and gravel within it. High ground areas such as Black Law ridge, Gallow Hill ridge are indicated to be free of superficial deposits.

Solid Strata

5.39 The mapped information available indicates the underlying bedrock to be Sandstones with some subsidiary units of pebble rich beds. Within the bedrock some elongated inclusions trending north / south of metamorphosed slates, phyllites and mica-schist are present.

Hydrogeology

5.40 According to SEPA's aquifer maps, the Site lies within an area classified as F, L (Fracture Flow with Low productivity) for bedrock and I, L (intergranular flow with low productivity) for the superficial deposits.

5.41 SEPA's Vulnerability map shows the Site appears to lie within classification 4 (vulnerable to those pollutants not readily adsorbed or transformed) to 5 (vulnerable to most water pollutants with rapid impacts in many scenarios). The area is not located within a Drinking Water Protected Zone (DWPZ).

5.42 The OS map (see Figure 3.1) indicates a total of eight 'Well' features present within the Site boundary, which can be seen on Figure 3.1 and are summarised in Table 5.7.

Table 5.7: Identified Well Features

Property / Location	Approximate Grid Reference	Distance to nearest access track / turbine	Catchment
NE Site area, adjacent to drain, not associated with a property	364442E 855583N	745m to the south west of turbine 1	Rosy Burn
N Site area, adjacent to pond and farm buildings	364292E 855213N	460m to the north east of turbine 2	Rosy Burn
Lower Deuchries properties, two wells	N: 364915E 855343N	880m to the north east of turbine 3	Rosy Burn
	S: 364883E 855300N	825m north east of turbine 3	
Well at approximate location of culvert entrance	364208E 854681N	20m to the south of main access track	Rosy Burn
Parkside of Cranna	364761E 854556N	560m to the south of turbine 3	Cunning Burn
Upper Crannabog	364565E 854111N	420m to the east of the main access track	Cunning Burn
SE Site boundary (N of Gallowhill)	364570E 853948N	505m to the east of the main access track	Cunning Burn

5.43 SEPA has classified the groundwater in this area as having an overall status of Good with High confidence in 2008. There is no trend for pollutants for this groundwater body. SEPA has set the overall environmental objectives for the first, second and third RBMP cycles as shown in Table 5.8.

Table 5.8: Groundwater RBMO Cycles

Year	2008	2015	2021	2027
Overall Status	Good	-	-	-
Chemistry Status	Good	Good	Good	Good
Quantitative Status	Good	Good	Good	Good

5.44 The current status of the water body (groundwater) meets the requirements of the WFD, thus SEPA must ensure that no deterioration from good status occurs, unless caused by a new activity providing significant specified benefits to society or the wider environment.

5.45 Data supplied by SEPA indicates a number of small licensed discharges within the Site boundary. The location points of these discharges are shown on Figure 5.1 and the details are summarised in Table 5.9 below.

Table 5.9: CAR Licensed Activities

Ref	Grid Ref	Name	Description
CAR 1 CAR/R/1079214	364760, 854420	Parkside of Cranna, Forglen, Banff	Parkside Of Cranna, Septic Tank Effluent to soakaway, Forglen. Located E of property.
CAR 2 CAR/S/1088532	363740, 853940	North Cranna & Mains of Cranna,GWR-BH1	North Cranna & Mains of Cranna, Sewage Direct Discharge (1) to land
CAR 3 CAR/R/1056022	363769, 853356	The Bungalow, North Cranna, Aberchirder	The Bungalow, North Cranna, Septic Tank Effluent to soakaway, Huntly. Located N of the property.
CAR 4 CAR/R/1056008	363770, 853319	North Cranna, Aberchirder, By Huntly	North Cranna, Septic Tank Effluent to soakaway, Huntly. Located W of property.

Hydrology

5.46 Topographic gradients influence the direction, rate and velocity of surface runoff and groundwater movement. The proposed turbines would be located within the catchment of the Rosy Burn, a tributary of the River Deveron, with a total catchment area of 0.4km^2.

5.47 The relatively steep sided valley in which the wind turbines would be located drains towards a headwater of the Rosy Burn, which flows in a north easterly direction with a relatively mild gradient. The headwater starts in the form of a ditch at the boundary of three fields (to the south of the proposed turbine area) at NGR 364200, 854400. The ditch runs north for approximately 300m before entering a 60m long culvert (due to thick vegetation and a deep ditch at the inlet and barbed wire fencing at the outlet, it was not possible to confirm the diameter of the culvert at the time of site visit). The culvert emerges in an open channel and continues in a north easterly direction towards the Rosy Burn. Two further field drains flow into the Rosy Burn from the northern area of the Site i.e. to the north of the proposed turbine locations, as shown on Figure 3.1.

5.48 According to the OS mapping the ditch that leads north into the culvert continues further to the north east (towards the proposed location of Turbine 3 as indicated on Figure 3.1), before turning north to run in a straight line to join the Rosy Burn. It was noted during the site visit that this latter section of ditch no longer exists and the section of ditch that runs to the north east of the existing culvert location is understood to be abandoned and flows instead go to the north through the culvert.

5.49 From the headwater drain at NGR 364200, 854400 a second drain flows to the south and east into the Cunning Burn, to eventually join the River Deveron approximately 5.5km to the south east of the Site.

5.50 The Burn of Arkland flows in a southerly direction along the south western Site boundary; a tributary of the burn flows from North Cranna and a second tributary flows west along the southern edge of the Site - the confluence of this with the burn being at the south western corner of the Site.

5.51 The OS map also shows an 'Issues' or spring point and 'Collects' point (where water has collected from a bog or marsh) at approximate NGR 363900, 855170, approximately 120m to the north west of the proposed location of Turbine 1.

5.52 Consultations with the landowners and Aberdeenshire Council to date have confirmed that there are at least 28 properties served by a Private Water Supply (PWS) within a 2km radius of the centrepoint of the Site. Those on or in close proximity to the Site include:

- Parkside of Cranna;
- Upper Crannabog;
- North Cranna property (a spring fed supply) and Mooroonbin;
- Lower Deuchries, Kebholes and Craigathray;
- Little Deuchries; and
- Rowantree.

5.53 Given the location of these PWS it is likely that the Gallowhill property is also supplied by a PWS but this was to be confirmed at the time of report issue.

5.54 There are no designated sites of hydrological interest e.g. Sites of Special Scientific Interest (SSSI) on or in the vicinity of the Site.

Current Water Quality

5.55 SEPA has classified the Rosy Burn water body as having an overall status of Poor with Low confidence in 2008 with overall ecological status of Poor and overall chemical status of Pass.

5.56 SEPA has set environmental objectives for this river over future river basin planning cycles. This is in order that sustainable improvements to its status can be made over time, or alternatively that no deterioration in status occurs, unless caused by a new activity providing significant specified benefits to society or the wider environment. For

the Rosy Burn, SEPA has set the overall environmental objectives for the first, second and third River Basin Management Planning (RBMP) cycles as shown in Table 5.10.

Table 5.10: Rosy Burn RBMP Cycles and Environmental Objective

Year	2008	2015	2021	2027
Status	Poor	Good	Good	Good

5.57 SEPA has established an ongoing programme of monitoring to identify the pressures on this watercourse, which include morphological alterations as result of mixed farming channelisation/ realignment. The objective is to improve the status to Good by 2015, which can be facilitated by improving modified habitat and removing barriers/mechanisms to enable fish migration.

Existing Drainage

5.58 The existing access tracks do not incorporate any positive (piped) drainage systems or significant ditches associated with the control of surface water. Although the track surface is not tarmacked the surface is compacted, hence, rain falling onto the track will result in runoff onto the adjacent soft areas during the more extreme events with some rainfall infiltrating into the track.

Rain Gauge Station

5.59 There is an existing rain gauge station situated almost on the line of the existing culvert at NGR 364212, 854713. Should the Development be granted planning permission and the rain gauge require moving to allow the construction works to be completed; SEPA would be consulted prior to the start of construction works to agree an alternative location within the Site for the rain gauge.

Flood Risk

5.60 The SEPA indicative flood map indicates that the proposed Development does not fall within predicted flood zones of the major rivers in the area. The SEPA indicative flood outline for the Site and local area is shown in Figure 5.2.

5.61 There is no recorded historic flood event within the Site boundary from either SEPA or Aberdeenshire Council.

Water Supplies

5.62 Scottish Water has confirmed that their assets would not be affected by the Development.

5.63 According to the SEPA website, the area is not located within a Drinking Water Protection Zone (DWPZ) and SEPA has not indicated that there are water supply abstractions within the boundary of the Site. However, it should be noted that SEPA has indicated that abstractions for private drinking supplies of less that $10m^3$ a day are covered by CAR General Binding Rule and are not regulated. As a result there may be

additional private water supply abstraction points within the Site boundary that are not officially recorded.

5.64 No water supply pipes were noted during the site visit and no other water supply points or likely connections were observed.

Project Characteristics

5.65 The key components of the Development are detailed in Chapter 3: Project Description and include not only the physical characteristics of the Development (turbines, access tracks etc) but also embedded mitigation, further detail on which is provided below.

5.66 The greatest potential for impacts to the physical environment would occur during the construction phase (and decommissioning works to a lesser extent). Specific construction activities that could cause environmental impact include excavations for the following:

- Turbine and anemometer foundations (each turbine requiring an excavation of approximately 22m x 22m). Each turbine foundation excavation would be likely to be kept open for four to eight weeks during the construction programme, and would be dewatered during this time;
- Crane hard standing areas;
- Access tracks;
- Cable and service trenches (including the route to the grid connection which would be likely to be located within the Site, as described in ES Chapter 3);
- Borrow pits (two preferred locations have been identified as shown on Figure 3.1); and
- Construction compound / substation building

5.67 In addition, the following construction activities may also impact the physical environment:

- General Site clearance - e.g. from stripping the working area of vegetation and topsoil leaving ground surface exposed to erosion by the elements;
- Stockpiling (of topsoil and excavated material);
- Storage of construction materials, fuels and oils etc on-site at the construction compound;
- Concrete pour for the turbine foundations;
- Construction vehicle traffic within the Site;
- Construction of a culvert in accordance with best practice guidance e.g. CIRIA Culvert Design Guide C689, 2010[18]; and
- Borrow pit restoration (to be completed at the end of the construction works).

Embedded Mitigation

Pre-Construction

5.68 The Principal Contractor would undertake further consultation with all property owners prior to commencement of the construction works, to confirm the exact locations of sources of PWS within and in the vicinity of the Site e.g. Lower Deuchries, to ensure they are adequately protected for the duration of the works and water supplies would not be affected.

5.69 In advance of the construction works, a targeted geotechnical ground investigation would be undertaken in the turbine, borrow pit and access track locations to determine local ground conditions e.g. depth to rock head and quality of stone. The investigation would also be used to confirm the absence of peat at these locations, or any micrositing required to avoid any areas of peat as far as possible.

Construction

5.70 As set out in Chapter 3: Project Description the Development includes a level of embedded mitigation. This mitigation includes adherence to best practice guidance including SEPA Pollution Prevention Guidelines (PPGS and implementation of a Construction Environmental Management Plan (CEMP) for the duration of the construction and decommissioning phases of the Development. The CEMP includes minimum requirements for pollution control and drainage design. Guidance in the Aberdeenshire Council note on Buffer Strips Adjacent to Watercourses[19] would also be implemented as appropriate.

Operation

5.71 As stated in the embedded mitigation for the Development, the drainage design for the hard standing areas of the Development would include Sustainable Drainage Systems (SuDS), to provide treatment of surface run-off, protect receiving water quality and control run-off rates.

5.72 SuDS would be in the form of filter trenches, swales and/or infiltration/attenuation basins. Should attenuation basins be included these would be designed to cater for a 1 in 200 year flood event with an appropriate freeboard designed to accommodate a 1 in 200 year plus climate change flood event. The discharge from any attenuation basins would be limited to 1 in 2 year 'greenfield' runoff rates. Overland flow routes would be provided for more extreme events allowing safe discharge of the runoff towards the nearest watercourse. Location and size of the attenuation basins would be determined prior to commencement of construction and subject to agreement with the relevant statutory authorities. It is not anticipated that the basins would be significant in size.

5.73 Track edge drainage in the form of lateral filter drains or swales would be used to control runoff from the running face to lower water levels in the sub-grade, to control surface water and groundwater from adjacent higher ground and carry the flow to the outfall points. Drainage would be designed and constructed in accordance with the

guidance given in the SUDS Manual and the joint publication by Scottish Renewables, Scottish Natural Heritage (SNH), SEPA and Forestry Commission Scotland (FCS).

5.74 As discussed in Chapter 3: Project Description construction activities potentially affecting the minor watercourses within the Site i.e. the construction of a culvert, or any works within a 50m easement of a watercourse, would be subject to authorisation under the CAR 2011 regulations. The CAR application should demonstrate that the works would not cause adverse morphological impact on the minor local watercourses and would not present a risk to the water environment in terms of habitat loss, river geomorphology and impact on fish. CAR 2011 requirements in relation to the culvert works are summarised in Table 5.11 below.

Table 5.11: CAR Requirements

Details	Watercourse/Ditch Crossing	
	Existing Culvert	New Culvert
Watercourse crossing	Access track leading to Turbine No.3.	Beneath Turbine No.3. Crane pad
Grid reference	364212E, 854713N	364266E, 854744N
New/existing	There is an existing culvert, which the proposed access track for turbine 3 will cross at approximately midway on the existing 60m culvert. Watercourse is small, with top width less than 2m. This will require further assessment to establish if any upgrades are required.	New culvert is to be located at a small watercourse, with top width less than 2m.
Type of Activity	See Note*	See Note*
The level of CAR2011 authorisation required	Registration	Registration
Note: * SEPA Position Statement to support the implementation of CAR indicates that closed culverts used for river crossings would normally only be justified for single track roads over small watercourses (<2m in width). For all other crossings, the use of span bridges and bottomless arch structures should be pursued, where practicable.		

Assessment of Impacts

Construction

5.75 During the construction phase, the greatest risk to watercourses in terms of both flooding and contamination would be due to intense rainfall events which could mobilise materials from exposed ground, topsoil stockpiles etc., held within the Site and, if not controlled, these could be conveyed to the headwater and into the Rosy Burn (and/or the Cunning Burn). Implementation of silt management as set out in the CEMP would reduce this risk, resulting in no more than a low magnitude of impact. Based on the quality of the Rosy Burn (currently 'poor') the receptor sensitivity is considered to be 'Low'. The overall effect of silts and other materials reaching the headwater is therefore concluded to be Negligible (not significant) on flooding and flow rate of the watercourse.

5.76 There is also the potential risk of accidental spillages, leakage of liquids (such as fuels and oils from tanks and refuelling areas) and other pollution incidents e.g. during any culvert structural works. Such pollutants may enter local watercourses. Adequate storage, careful management and control of spillage of hazardous materials as contained in the CEMP would reduce the risk to a 'low' magnitude and based on the 'Low' water quality of the receiving waters (Rosy Burn), overall significance of effect would be Negligible (not significant).

5.77 Similarly there is a potential risk of pollution to groundwater from fuel and chemical spills and cement during construction. With the receptor sensitivity (groundwater water quality) considered to be 'Low' (the area is not located within a DWPZ) and with a 'Low' magnitude of impact (following implementation of CEMP), the overall significance of the effect would be Negligible (not significant).

5.78 During the construction phase such pollution incidents may also result in temporary pollution of private water supply sources (groundwater or surface water) to local properties, notably any located within the catchment of the Rosy Burn, and to a lesser extent the catchment of the Burn of Arkland (due to the location of the proposed construction works). The receptor sensitivity is considered 'High', however, proper implementation of the CEMP (including detailed consultation with all property owners prior to commencement of the works) would result in no more than a small magnitude of impact, from which the overall significance of the effect would be Moderate (not significant).

5.79 The uncontrolled discharge of surface runoff from the construction works areas into local drains and burns during storm events has the potential to cause localised flooding and increase the risk of flooding downstream. These changes and the concentration of overland flood flow pathways could result in a temporary increase in water levels within local watercourses. By early establishment of temporary drainage facilities as well as implementation of SUDS methodology, the likely magnitude of any flood event downstream would be 'Negligible'. With the 'Low' sensitivity of the receptors (Rosy Burn and Cunning Burn) to flooding due to the rural environment, the overall significance of effect would be Negligible (not significant).

5.80 No structural works are proposed to the existing culvert and channel of the headwater to the Rosy Burn. However, the structural integrity of the culvert would be checked prior to the start of construction works and renewal or improvement works would be undertaken in accordance with the CAR regulations is required. A new section of culvert would be required for the drainage channel that currently routes beneath the proposed location of turbine no. 3, beneath the crane pad. This drain is of small diameter (less than 2m) and did not contain any water at the time of site visit and a piped culvert is considered likely to be suitable. There would therefore be no effect on the flows and capacities of these watercourses.

5.81 During the construction phase, the turbine foundation excavations would be dewatered. The discharge of this water would be likely to be a point discharge into the headwater of Rosy Burn. This may increase the water levels and peak flows locally in the headwater. The CEMP would include measures and methodologies for dewatering that would

minimise the volumes of water released into the headwater. Based on 'Low' sensitivity of receptor (the Rosy Burn) to changes in flow and level and 'Low' magnitude of impact (volumes and rates of flow), the overall significance of effect would be Negligible (not significant).

5.82 Dewatering also has the potential to alter groundwater patterns locally, which may affect local private water supplies. However, given the distance of the turbine locations from the nearest property (> 565m) no such effects are predicted.

5.83 The works to connect the Development to the local electricity distribution network would comprise the excavation of a shallow trench and laying of sand and cables before backfilling. The cable route would extend between the Site substation and the connection point to the distribution network, at a point close to the southern Site boundary. Whilst the cable route is yet to be finalised (and would be the subject of a separate consent), these works would be located within the Site boundary. The nature of the works is such that similar effects would be anticipated to those described above, in relation to likely pollution incidents and mobilisation of silts. The significance of likely effects associated with the cable route on the physical environment is not predicted to be any greater than for those of the Development.

Operation

5.84 Once the Development is operational there would be occasional vehicles visiting the Site for maintenance and servicing of the turbines, and there would be a permanent change in the impermeable surface area within the Site due to the new lengths of access track and widening of the existing tracks, new crane hard standing areas and turbine foundations. This would create a maximum total new area of hardstanding of 1.36ha, compared with the total area of the Site i.e. 363ha, it equates to just 0.37% of the total Site area.

5.85 The effects of the Development on the physical environment would be minimal during operation. However, the following hydrological and hydrogeological impacts have been considered:

- Risk associated with increase runoff and flooding downstream due to the new impermeable areas; and
- Potential risk associated with spillage of fuels, oils and lubricants by vehicles using the access tracks through the wind farm entering the water environment.

5.86 The uncontrolled discharge of surface runoff from the Development into the Rosy Burn headwater during storm events has the potential to cause localised flooding and increase the risk of flooding downstream. These changes and the concentration of overland flood flow pathways can result in an increase in water level locally. The increase of impermeable land cover (access tracks and turbine bases etc) has the potential to reduce the surface recharge of the groundwater regime by preventing rainfall infiltrating in to the underlying soils. Although the access tracks are stone surfaced, there would be runoff particularly during more extreme rainfall events. However, the implementation of SUDS in controlling the volume and rate of runoff from these areas would minimise the magnitude of change. With the receptor sensitivity

(Rosy Burn and groundwater levels) considered to be 'Low' and the magnitude of impact being 'Negligible', the overall significance of impact would be Negligible (not significant).

5.87 Accidental spillage of fuels, oils and lubricants by maintenance vehicles would have the potential to cause local surface water and/or groundwater pollution. However, operational activities on-site are unlikely to involve large quantities of potentially contaminative materials. With the receptor (Rosy Burn) and groundwater sensitivity to pollution considered 'Low' and the short-term magnitude of impact considered to be 'Negligible', the overall significance of impact would be Negligible (not significant).

Decommissioning

5.88 Decommissioning of the development would give rise to similar effects experienced during the construction phase. However, whilst decommissioning may involve activities similar to the construction works, these would be less intrusive and occur over a shorter period. There would be no track construction or upgrade works and no significant excavations, the turbine foundations would remain in place at subsoil level.

5.89 Similar to the construction phase, the greatest risk would be due to intense rainfall events, which could mobilise materials (excavations, stockpiles, recovered road stone etc). With the application of a CEMP, based on the sensitivity of the Rosy Burn, which is considered to be 'Low' to silt and pollution effects and with a 'Negligible' magnitude of change, the significance of any effect would be Negligible (not significant).

5.90 Similar to the construction phase, there is the potential risk of accidental spillages, leakage of liquids (such as fuels and oils from tanks and refuelling areas) and other pollution incidents. Through implementation of spillage of hazardous materials controls as described in the CEMP and the presence of the SUDS features, this would reduce the risk and based on the 'Low' sensitivity (Rosy Burn) and a 'Low' magnitude of any event, overall the significance of effect would be Negligible (not significant).

5.91 There is a potential risk of pollution to groundwater from fuel and chemical spills during the decommissioning works. With the receptor sensitivity (groundwater) is considered to be 'Low' (the area is not located within a DWPZ), with a 'Low' (implementation of the CEMP and the presence of the SUDS features) magnitude of impact, the overall significance of effect would be Negligible (not significant).

5.92 As for the construction phase, there is the potential risk of accidental spillages and mobilisation of materials, leaching into private water supply sources. Mitigation measures to control hazardous materials as described in the CEMP should be implemented to reduce the risk. Based on the receptor sensitivity is considered 'High' but with a short term magnitude of impact considered 'small', the overall significance of the effect would be Moderate (not significant).

Mitigation Measures

5.93 The Development would include embedded mitigation, as described in Chapter 3, including good working practices during the construction and decommissioning works, the implementation of the CEMP and SWMP and the inclusion of sustainable drainage measures.

5.94 No further mitigation measures are proposed for any phase of the Development.

Residual Effects

5.95 Providing the embedded mitigation is implemented for the Development, residual effects to the physical environment from the construction, operation and decommissioning of the Development would not be significant.

Cumulative Impacts

5.96 Cumulative impacts are those, which result from incremental changes caused by other consented but not constructed or reasonably foreseeable future actions together with the Development.

5.97 Current planning policy by the Scottish Government and SEPA guidance would impose similar environmental constraints on all other developments in terms of attenuation, flood protection levels and discharge quality that are applicable to this Site. Hence, in hydrological and flood risk terms, there would not be any significant cumulative impacts from this Development.

Chapter 5 References

[1] The Water Environment (Controlled Activities), (Scotland) Regulations, 2011

[2] *Flood Risk Management (Scotland) Act 2009*

[3] *Water Environment and Water Services (Scotland) Act 2003*

[4] *The Private Water Supplies (Scotland) Regulations (2006)*

[5] *Water Framework Directive (2000)*

[6] Natural Scotland Scottish Government (2009), *The River Basin Management Plan for the Scotland River Basin District* 2009–2015

[7] Aberdeen City and Shire (2011), *Strategic Flood Risk Assessment*

[8] Institute of Hydrology (1999), *Flood Estimation Handbook, CD ROM,* Wallingford

[9] CIRIA (2007), *The SUDS Manual C697*

[10] The Scottish Government (February 2010), "*Scottish Planning Policy" (SPP)*

[11] SEPA (2000), *Watercourses in the Community*, a Guide to Sustainable Watercourse Management in the Urban Environment

[12] SEPA (2000), *Ponds, Pools and Lochans, Guidance on Good Practice in the Management and Creation of Small Waterbodies in Scotland*.

[13] SEPA (2010), *Technical Flood Risk Guidance for Stakeholders*

[14] SEPA (2000), *Development at Risk of Flooding, Advice and Consultation – a SEPA Planning Authority Protocol*

[15] Scottish Executive (2000), *River Crossings and Migratory Fish*: Design Guidance a Consultation Paper

[16](2006) National Water Quality Classification

[17] SNIFFER (2004), *Development of a Groundwater Vulnerability Screening Methodology for the Water Framework Directive*

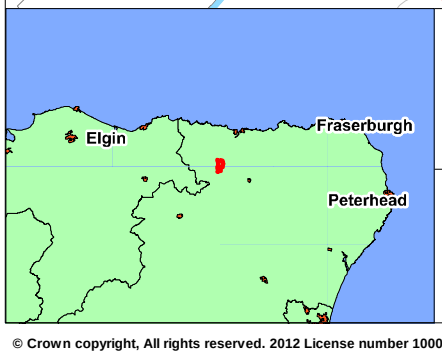
[18] CIRIA (2010), *Culvert Design Guide C689*

[19] Aberdeenshire Council, 2009, Guidance for Developers, Buffers Strips Adjacent to Watercourse and Water Bodies https://www.aberdeenshire.gov.uk/planning/plans_policies/2011_2BufferStripGuidance.PDF

1
2
3
A
B
C
D
This watercourse was not located on site (historical watercourse)
Approximate location of an new culvert
Location of an existing rain gauge
Approximate location of an existing culvert
BA1
BA 2
CAR 1
CAR 2
CAR 3
CAR 4
CAR 5
Approximate location of an existing water trough

Hydrology Legend

- Watercourse
- 50m easement from any water features
- Existing Overland Flow Directions
- Sub-catchemnt Boundary
- SEPA abstraction and discharge points and 50m buffer
- Field Locations of peat investigation
- Approximate location of existing culvert crossing
- Approximate location of new culvert crossing



FORCE 9 ENERGY

RSK

- Proposed Turbine
- Site Boundary
- Existing Road to be upgraded
- Proposed Access Track to WTGs
- Proposed Access Track to Identified Borrow Areas
- Crane Hard Standing
- Proposed Control Building Compound
- Proposed Construction Compound
- Potential Borrow Pit Locations
- Proposed Anemometer Mast Location
- Alternative New Access Track
- Identified Potential Shallow Rock

Deuchries Wind Farm

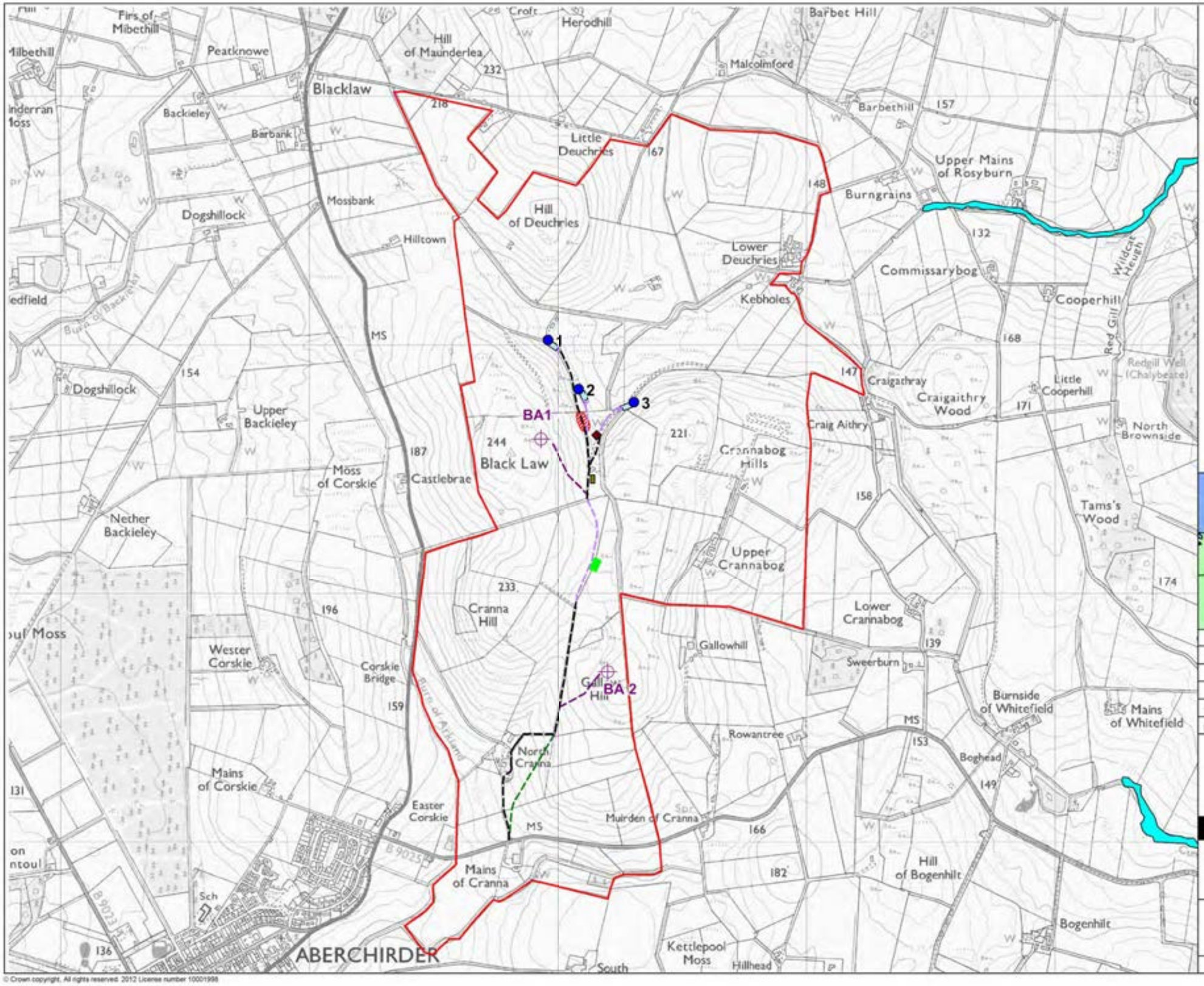
Rev	Date	Description	Drn	Chk	App
01	04.09.12	Hydrology	BF	ND	PB
00	30.07.12	Hydrology	BF	ND	PB

Figure 5.1 - Hydrological Constraint Plan

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6 ECOLOGY

Introduction

6.1 This chapter sets out the methods and findings of the ecological surveys; evaluates the current nature conservation interests at the Site; and assesses the likely impacts on terrestrial ecology (except birds) during construction, operation and decommissioning of the Development. In addition this chapter also presents the mitigation measures that are incorporated into the Development design (embedded mitigation) and the additional measures that are required to mitigate impacts on habitats and species. Finally, the chapter assesses the predicted residual impacts of the Development on flora and fauna. By its nature ecology is closely interlinked with a number of other environmental topics which are fully addressed in other chapters, in particular Chapter 5 - Physical Environment and Chapter 7 - Ornithology.

Legislation and Policy

6.2 The Environmental Impact Assessment (EIA) methodology takes account of the Scottish Planning Circular 3: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. The 2011 Regulations consolidate, update, and replace Part II of the Environmental Impact Assessment (Scotland) Regulations 1999. Details of the UK, Scottish and Local Planning Policies which apply to this chapter are discussed in ES Chapter 4: Planning.

6.3 This chapter takes into account the requirements of, and advice given in:

- The EC Habitats Directive (Directive 92/43/EEC) as translated into UK law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland);
- Surface Waters (Fishlife) (Classification) (Scotland) Regulations 1997 (as amended);
- Wildlife and Countryside Act 1981, as amended (WCA);
- The Protection of Badgers Act 1992;
- Nature Conservation (Scotland) Act 2004;
- The EC Water Framework Directive (Directive 2000/60/EC) with regard to groundwater-dependent terrestrial ecosystems;
- The Wildlife and Natural Environment (Scotland) Act 2011;
- Consolidated Scottish Planning Policy (SPP) (February 2010) and online renewables planning advice[1];
- Planning Advice Note (PAN) 60: Planning for Natural Heritage[2];
- Scottish Executive Guidance on Protected Species (Scottish Executive, 2001[3]);
- Aberdeen City and Shire Structure Plan (2009);

- The UK Biodiversity Action Plan (UK BAP)[4];
- The Scottish Biodiversity List (SBL)[5];
- The North East Scotland Local Biodiversity Action Plan (LBAP)[6];
- Land Use Planning System - SEPA Guidance Note 4: Planning Guidance on Wind farm Developments[7]; and
- Good Practice during Wind farm Construction[8].

6.4 Baseline surveys were undertaken in accordance with nationally recognised guidelines and the ecological impact assessment is based on the Institute of Ecology and Environmental Management guidelines[9] (IEEM Guidelines).

Method of Assessment

The scoping process

6.5 The initial scope of this assessment was defined based on knowledge of wind farm/ecology interactions and the potential for nature conservation receptors to be significantly affected, combined with a desk study and consultation exercise.

6.6 The proposed scope of the ecology surveys was initially detailed in a request for a scoping opinion which was submitted to Aberdeenshire Council on 10 May 2011[10]. Scoping opinions which are relevant to the Ecology chapter were received from Scottish Natural Heritage (SNH) and the Scottish Environment Protection Agency (SEPA).

6.7 SNH indicated in their response that the scope of survey work should include the following aspects:

- Designated sites: a desk study to determine if the proposed Development could have an impact on any designated sites either directly or indirectly;
- Protected species;
- A desk-based search of protected species records from NBN gateway and North East Scotland Biological Records Centre (www.nesbrec.org.uk);
- Appropriate survey work for the following protected species: bat species; otters (*Lutra lutra*); water voles (*Arvicola amphibius*) and badgers (*Meles meles*); and
- Habitats – a Phase 1 habitat survey of all habitats within 250m of the Site. This survey should be supported by a list of any notable species or species of conservation concern, accompanied by an NVC survey of interesting semi-natural habitats on the Site.

6.8 SEPA advised that a Phase 1 habitat survey should be carried out for the whole Site. In recognition of the importance of bog and wetland habitats, SEPA advise that the guidance ‘A Functional Wetland Typology for Scotland’ be used to identify wetland areas. SEPA also recommended an NVC survey of any wetlands identified, with the results of these findings included in the ES along with appropriate maps with the location of infrastructure clearly marked.

Desk study

6.9 Baseline data on the nature conservation interest of the Site and its surroundings, including information on statutory and non-statutory designated nature conservation sites; and protected and notable species, defined in Box 1, were sought from the following sources:

- SNH website[11];
- The National Biodiversity Network website (NBN Gateway)[12];
- The North East Scotland Biological Records Centre (NEBReC) provided information regarding notable habitats and protected and notable species;
- MAGIC the Multi Agency Geographic Information for the Countryside[13]; and
- Ordnance Survey (OS) maps both large-scale 1:10,000 in conjunction with colour 1:25,000 OS map to determine the presence of ponds and other features of potential nature conservation interest.

6.10 A 2km search area from the Site boundary (Appendix 6.1, Figure 3.1; and Appendix 6.2, Figure 3.1) was specified when requesting baseline data. This was increased to 10km with regard to bats (NESBReC) in accordance with accepted guidance[14]. These distances were considered adequate, reflecting the mobility of species that occur outside the Site boundary and which could therefore be affected by the Development.

6.11 Further information relevant to the scoping process, the evaluation of the nature conservation features that could be affected by the Development and the assessment of its impacts on them, was obtained through searches of internet sources (e.g. UK BAP, LBAP) and relevant published literature (i.e. relevant guidance documents and scientific papers).

Box 1 Sites of nature conservation value and protected & notable species

Statutory nature conservation sites

SNH notifies sites that are of national importance for nature conservation as Sites of Special Scientific Interest (SSSIs), although some sites that are of national importance for certain species have not been so designated. Internationally important sites may also be designated as Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Ramsar sites (it should be noted that SSSI designations also apply to most internationally designated sites).

Non-statutory nature conservation sites

In Aberdeenshire non statutory wildlife sites are entitled as Sites of Importance to Natural Science (SINS). A site may qualify as a Site of Importance for Natural Science due to the presence of a notable species or an important habitat. These designations broadly constitute the most important wildlife and geological sites that do not reach the criteria required for SSSI designation, and include Scottish Wildlife Trust (SWT) Reserves and woodlands listed on the Ancient Woodland Inventory (AWI).

Protected species

Many species of animal and plant receive some degree of legal protection. For the purpose of this study, legal protection refers to:

- Species included on Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended) such as red squirrel (*Sciurus vulgaris*) and water vole, excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the proposed development does not include any proposals relating to the sale of species;
- Species included on Schedules 2 and 5 of The Conservation (Natural Habitats, &c)

Box 1	Sites of nature conservation value and protected & notable species

Regulations 1994 as amended in Scotland, such as bats and otter; and

- Badgers, which are protected under the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004).

Notable Species

Species which are listed on UK and/or Local BAPs or those which are of some other conservation interest based on their status nationally, regionally and locally.

Results of the scoping process

6.12 The result of the consultations and collation of baseline data was an assessment scope that encompassed the following:

- Consideration of how the Development may affect the ecology of nearby statutory and non-statutory designated sites of nature conservation importance;
- An extended Phase 1 habitat survey and a range of surveys for protected species that may be present at the Site (badger, bats, otter and water vole). No National Vegetation Classification (NVC) surveys were undertaken because no wetlands or notable areas of semi-natural vegetation were identified within the Site;
- An assessment of the impacts of construction, operation and decommissioning of the wind farm on protected species and sensitive habitats (such as watercourses, wetlands and woodlands), leading to the design of appropriate mitigation where impacts are predicted to occur;
- Consideration of how the development would affect habitats and species included in the UK BAP and LBAP, together with other species and habitats of nature conservation concern, identified by the desk study;
- Incorporation of habitat management / enhancement objectives; and
- Identification of the need for any ecological survey / monitoring prior to or during construction and / or operation.

Field survey methods

6.13 Full details of the ecological surveys undertaken are provided in Appendix 6.1 (Baseline Ecology Report) and Appendix 6.2 (Bat Survey Report). Survey dates and standard guidance documents referred to are provided in Table 6.1. All the surveys were undertaken across the entire Site or along defined transect routes as shown in the figures referenced in Table 6.1.

Table 6.1: Ecological surveys and survey dates

Ecological Survey and Survey Area	Dates	Surveyor(s) and Methodology
Extended Phase 1 habitat survey The survey was undertaken within the Site. Due to access constraints, habitats outside the Site and within 250m where recorded from the Site boundary (see Appendix 6.1 and Figures 3.1a and 3.1b).	11-13 April 2011	AMEC Senior Consultant Ecologist Caroline Mellor BSc (Hons), MSc, MIEEM. The survey followed standard guidance[15,16,17]

Ecological Survey and Survey Area	Dates	Surveyor(s) and Methodology
Badger Survey The survey was undertaken within all suitable habitats across the Site (see Appendix 6.1 Confidential Appendix D). (NB as badgers can be prone to deliberate persecution, information regarding the location of badger setts is excluded from this chapter and has been provided in a confidential annex to Aberdeenshire Council and SNH).	21-22 September 2011	AMEC Consultant Ecologist Jenny Sneddon BSc (Hons), MSc, MIEEM The survey followed accepted standard practice[18].
Bat Surveys: Bat roost suitability surveys within the Site. Manual bat activity surveys along transects, combined with static Anabat surveys (see Appendix 6.2 Figures 2.1 to 2.6).	Bat roost suitability surveys: 11-13 April 2011 Bat activity transect surveys: 25 May (dusk) 28 June (dusk) 21 July (dawn) 31 August (dusk) 27 September (dusk) Static Anabat surveys: 21-26 June 30 June – 7 July 10-16 August (Anabats failed) 27 August – 6 September (Anabats redeployed)	Bat roost suitability surveys: AMEC Senior Consultant Ecologist Caroline Mellor BSc (Hons) MSc MIEEM Bat activity transect surveys: Echoes Ecology Ltd (bat survey specialists). Static Anabat surveys: AMEC Principal Consultant Ecologist Anita Hogan BSc (Hons), MSc MIEEM; AMEC Senior Consultant Eleanor Haresign BSc (Hons), PhD, PgDip, IAH; and Echoes Ecology Ltd. Surveys followed standard guidelines [14, 19]
Otter survey Surveys along all waterbodies, streams, drainage ditches and foraging habitat within the Site (see Appendix 6.1, Figure 3.2)	21-22 September 2011	AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM Standard survey methodology[20].
Water vole survey Surveys along all waterbodies, streams, drainage ditches and foraging habitat within the Site (see Appendix 6.1, Figure 3.2)	21-22 September 2011	AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM Standard survey methodology[21].

Other Species

6.14 The habitats present were assessed for their potential to support great crested newt (*Triturus cristatus*), reptiles and red squirrel and incidental sightings of other species were recorded during the surveys.

Assessment methodology for identifying significance of impacts

Assessment Methodology

6.15 The assessment of the significance of predicted impacts on ecological receptors is based on both the 'value' of a receptor and the nature and magnitude of the impact that the development will have on it. Impacts on biodiversity may be direct e.g. the loss of species or habitats, or indirect e.g. impacts due to noise, dust or disturbance, on receptors located within or outside the application area.

Valuation of Receptors

6.16 This evaluation methodology has been adapted from the IEEM Guidelines[9]. A key consideration in assessing the impacts of any development on flora and fauna is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by changes caused by project activities, however remote from the Site.

6.17 In identifying these receptors, it is important to recognise that a development can affect flora and fauna directly e.g. the land-take required and/or indirectly, by affecting land beyond the development site e.g. through noise generation or hydrological impacts.

6.18 Since it is impractical for an assessment of the ecological impacts of a development to consider every species and habitat that may be affected, it should focus on valued ecological receptors. The approach that has been undertaken throughout this EIA process is therefore to identify 'valued ecological receptors' (VER), which are species and habitats that are both valued in some way and could be affected by the Development.

6.19 The value of species populations and habitats is assessed with reference to:

- Their importance in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations);
- Any social benefits that species and habitats deliver (e.g. relating to enjoyment of flora and fauna by the public); and
- Any economic benefits that they provide.

6.20 Where there is no potential for valued ecological receptors to be affected significantly, it is generally not necessary for them to be considered. However, it should be noted that ecological receptors may benefit from legal protection and these are considered separately.

6.21 Both species' populations and habitats have been valued using the following scale: International; National (UK); Regional; District Level; Local; Less than Local. The approach taken in this assessment is that a species population that is considered to be of District or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore if a species population is considered to be of

local value or less, the Development will not have a significant impact on the receptor in question. Exceptions are if the species population of less than District value has been identified as having a high social or economic value or if the species is legally protected.

6.22 A similar approach is adopted for habitats i.e. if a habitat is considered to be of local value or less, the Development will not have a significant impact on the receptor in question. The exceptions to this would be if;

- The habitat has economic or social value e.g. an open space that is used extensively for informal recreation by local people, where the area's wildlife is an important contribution to this value; or
- The habitat is identified as a Groundwater-dependent terrestrial ecosystem (GWDTE)[22].

6.23 Species' populations and habitats have been valued using the scale set out in Table 6.2, which includes examples of criteria used when defining the level of value.

Table 6.2: Nature conservation valuations together with examples of the criteria used to define the value of ecological receptors

Level of Value	Examples of Criteria
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (or a site proposed for, or considered worthy of such designation); A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive).
National (UK)	A nationally designated site e.g. Site of Special Scientific Interest (SSSI), or a site proposed for, or considered worthy of such designation; A viable area of a habitat type listed in Annex 1 of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; A regularly occurring substantial population of a nationally important species, e.g. listed on Schedules 5 & 8 of the Wildlife and Countryside Act 1981 (as amended); A feature identified as a priority species/habitat in the UK BAP.
Regional (Scotland)	Areas of internationally or nationally important habitats which are degraded but are considered readily restored; A regularly occurring, locally significant population of a species listed as being nationally scarce.
District (Aberdeenshire)	Viable areas of priority habitat identified in the LBAP or smaller areas of such habitat which are essential to maintain the viability of a larger habitat as a whole; A site designated as a non-statutory designated site e.g. Site of Importance for Natural Science, Scottish Wildlife Trust Reserve/Wildlife Site, or a site listed on the Ancient Woodland Inventory (AWI). A regularly occurring, substantial population of a nationally scarce species, including species listed on the UK and Local BAPs e.g. common toad (a UK BAP species).
Local (site and its vicinity, including areas of habitats contiguous with or	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration; A good example of a common or widespread habitat in the local area, e.g. those listed as broad habitats on the LBAP;

Level of Value	Examples of Criteria
linked to those on site)	Species of national or local importance, but which are only present very infrequently or in very low numbers within the subject area.
Less than local	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest; Common and widespread species.

6.24 It should be noted that the approach to this assessment is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself. To illustrate this rationale with reference to Table 6.2, while otter could be considered to be of international value by virtue of being listed on Annex IV of the Habitats Directive, the value of a site with a small and shallow watercourse which was only used occasionally by a single otter would be limited[23]. Therefore, in this case, nature conservation importance of that site would be assessed as being of 'Local' value for otter.

6.25 Therefore, while the importance of the species present is taken into account, in order to assess nature conservation importance, the number of individuals of that species using the site, and the nature and level of this use, is also taken into account. An assessment is then made of the value of the site to that species, based on professional judgement.

Legal Protection of Species

6.26 Notwithstanding what has been said above, there is also a need to identify all legally protected species that could be affected by the Development in order that measures can be taken to ensure that contravention of the relevant legislation is avoided. This may include the adoption of mitigation which is acceptable to SNH. By implication, therefore, it is inappropriate to assess the significance of impacts within the context of species' legal protection – measures to avoid or reduce impacts on such species are legally required to avoid contravention of the law, otherwise the Development cannot be taken forward.

6.27 In certain situations, however, adherence to measures that are designed to ensure that the law is not contravened may not prevent a significant impact relating to a species' biodiversity conservation, social or economic value (i.e. in the context of the species being a 'valued ecological receptor' – see above).

6.28 Even where a protected species is not considered to be a valued ecological receptor, for example badgers which are protected on animal welfare grounds rather than nature conservation value, the measures that will be taken to ensure compliance with the legislation are documented within this chapter.

Nature and Magnitude of Impact

6.29 Impacts can be permanent or temporary; direct or indirect; adverse or beneficial, and can be cumulative. These factors are brought together to assess the magnitude of the impact on the 'conservation status' of the particular valued ecological receptors, and on the 'integrity' of the habitats that support them:

- Integrity is the coherence of the ecological structure and functions of a site or habitat that enables it to sustain its plant and animal communities and populations; and
- Conservation status is the ability of a habitat, a plant or animal community or population to maintain its distribution and/or extent/size.

6.30 Conservation status is therefore largely determined by the extent to which integrity is maintained. It follows that habitats may or may not be valued ecological receptors in their own right.

6.31 Wherever possible, the magnitude of the impact is quantified. Professional judgement is then used to assign the impacts on the receptors to one of four classes of magnitude, defined in Table 6.3.

Table 6.3: Definition of Magnitude Table

Magnitude	Definition
High	A permanent or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.
Medium	A permanent or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial; this is likely to be sustainable but is unlikely to enhance its conservation status.
Low	A short-term but reversible impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the range of variation normally experienced between years.
Negligible	A short-term but reversible impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the normal range of annual variation.

Significance of Impact

6.32 The significance of an impact is largely a product of the value of the ecological receptor and the magnitude of the impact on it, informed by professional judgement.

6.33 Table 6.4 illustrates a matrix based on these two parameters which is used for guidance in the assessment of significance. It should be noted that in terms of the EIA Regulations, it is only impacts that are likely to have significant impacts that require detailed assessment. Those impacts which are shaded in grey in

6.34 Table 6.4 equate to those considered significant under the EIA Regulations with the others constituting an insignificant impact. The category of 'minor' is used in acknowledgement that there are instances whereby there may be an impact, albeit that this is not likely to be significant. It is also used to facilitate assessment of cumulative impacts e.g. where cumulatively several minor impacts could be significant.

Table 6.4: Significance of Impacts Matrix

Value of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
International	Major	Major	Minor	Negligible
National	Major	Major	Minor	Negligible
Regional	Major	Major	Minor	Negligible
District	Major	Minor	Minor	Negligible
Local	Minor	Minor	Negligible	Negligible
Less than Local	Negligible	Negligible	Negligible	Negligible
Key		Significant in terms of the EIA Regulations		
		Not Significant in terms of the EIA Regulations		

Baseline Environment

6.35 The results of the ecological surveys are included in Appendix 6.1 (Phase 1 habitat survey and protected species survey results). The results of the bat surveys are presented in Appendix 6.2 (bat survey results).

Desk Study Results

Nature Conservation Designations

6.36 There are no statutory designated sites within the Site boundary or within 2km of the Site. The closest statutory designated site, Reidside Moss SAC and SSSI, is located approximately 2.6km west of the Site boundary. Reidside Moss is considered to be at a sufficient distance from the Site for the notified habitats and species not to be adversely affected by the proposed scheme and there are no known pathways for effects and therefore this is not considered further in the assessment.

6.37 There are no non-statutory designated sites within the Site boundary or within 2km of the Site.

6.38 The nearest woodland of nature conservation significance to the Site taken from the Ancient Woodland Inventory provided by NESBReC is an unnamed woodland at Woodside, situated approximately 940m to the south of the Site and classed as 'ancient woodland of semi-natural origin'[24].

6.39 NESBReC also provided details from the Raised Bog Inventory (1990-1994) which contains a point of reference for raised bog within the Site. Further information on this record was sought from the Raised Bog Inventory Report[25]. It appears that the area is classified as 'U' meaning 'condition not yet established', defined as 'the information for the designation has come from local knowledge or brief statements in survey reports but nothing else is known about it'.

6.40 The Site is located within Zone 1 (lowest sensitivity) of SNH's Zones of Natural Heritage Sensitivity in relation to designated sites and biodiversity interests[26].

6.41 Table 6.5 details the non-statutory designated sites potentially affected by the Development.

Table 6.5: Statutory and non-statutory nature conservation sites potentially connected to the Site

Site Name	Description	Possible impacts resulting from proposed Wind farm
Ancient woodland of semi-natural origin (near 'Woodside')	No further information available.	940m south of the Site. No connectivity to the Site and therefore no pathway for potential impacts on the woodland habitats. Scoped out of further assessment.
Raised bog identified from the Raised Bog Inventory[25]	Category: U - condition not yet established - no further information available.	Within the Site boundary and within approximately 100m of proposed access track and turbine locations. Impacts possible, included for further assessment.

Protected and notable species

6.42 No records of protected or notable species were returned for the Site. Species recorded outside but within 2km of the Site boundary (10km for bats) which were provided by the NESBReC are listed below:

- Mammal: red squirrel, badger, common pipistrelle bat, Daubenton's bat (*Myotis daubentonii*) and *Myotis* bat species;
- Invertebrates: mouse moth (*Amphipyra tragopoginis*), small square-spot (*Diarsia rubi*), rosy rustic (*Hydraecia micacea*) and sallow (*Xanthia icteritia*); and
- Amphibians: common toad (*Bufo bufo*).

6.43 A search on NBN Gateway indicated records of the presence of otter, red squirrel, adder, common pipistrelle, brown hare, badger, common toad and notable invertebrate species within 2km of the Site.

6.44 Based on this desk study and the habitats present on the Site it was considered that the surveys (i.e. extended Phase 1 habitat survey, bats, badger, otter and water vole along with observations and a site suitability assessment for other notable species such as adder, brown hare and common toad) would be sufficient to form the basis of the ecological impact assessment and no other detailed surveys, such as surveys for red squirrel, were considered necessary.

Local Biodiversity Action Plan

6.45 The North East Scotland LBAP sets out 31 Action Plans[27]. A number of these are relevant to the habitats and species present within the Site, including:

- Broad-leaved woodland;

- Farmland;
- Field margins and boundary habitats;
- Planted Coniferous woodland;
- Rivers and burns; and
- Daubenton's bat.

Field Survey Results

6.46 The results of the extended Phase 1 habitat survey and the protected species survey (excluding bats) are provided in a Baseline Ecology Report within Appendix 6.1. The badger survey results are presented as confidential appendix D within Appendix 6.1, provided to Aberdeenshire Council and SNH. Figures 3.1a and Figure 3.1b in Appendix 6.1 show the habitats present within the Site and up to 250m outside the Site boundary. Figure 3.2 shows the water vole and otter survey results. Confidential Figure 3.3 shows the badger survey results. The Bat Survey Report and associated figures are included as Appendix 6.2.

Phase 1 habitat survey results

6.47 A summary of the habitats identified within and adjacent to the Site is provided in

6.48 Table 6.6. The scientific names of species recorded are provided in Appendix 6.1 and are not reproduced here unless there is no vernacular (English) name.

Table 6.6: Summary of Habitat Types Recorded Within the Site

Habitat	Description
Arable	Arable land is frequent within the Site making up the majority of the land which is not improved or semi-improved grassland.
Improved and poor semi-improved grassland	Improved and poor semi-improved grassland are the predominant habitat types within the Site. These grasslands are typically species-poor supporting only common and widespread plant species, such as perennial rye-grass and red fescue. The grasslands are heavily grazed by sheep and cattle.
Semi-improved neutral grassland	A large area of semi-improved neutral grassland is present in the northern part of the Site. This grassland is dominated by rushes over a variety of grass species such as Yorkshire fog, tufted hair-grass and wavy hair-grass. One area of semi-improved neutral grassland is highlighted within the raised bog inventory report. However, due to an absence of species indicative of bog habitat, it was not subject to an NVC survey. Nevertheless, further investigation into the soil type was necessary to determine if this area is degraded raised bog as highlighted in the desk study. Soft ground probing[28] was undertaken at the Site in the location of the proposed works to investigate the likelihood of peat being present. The results suggest that there may be peat within two out of four fields investigated.
Coniferous plantation woodland	The most common woodland type within the Site is coniferous plantation. All of these are small in area and occur in discrete areas. The woodlands were pine or larch dominated.
Mixed semi-natural woodland	One small area of mixed semi-natural woodland is present in the east of the Site. The woodland is predominantly a mature pine copse, also including ash and horse chestnut and gorse at the edges.

Habitat	Description
Broad-leaved semi-natural woodland	One small area of broad-leaved semi-natural woodland is present within the Site. The woodland is situated in the north of the Site. The woodland is dominated by sycamore with wych elm, Scots pine, elder, apple and beech.
Scattered broad-leaved and coniferous trees	There are a number of individual trees scattered throughout the Site, including ash, alder, silver birch, larch and pine.
Dense and scattered scrub	There are large areas of European gorse scrub within the Site. Scattered gorse also occurs frequently throughout the Site.
Waterbodies	There are two waterbodies within the Site, both were dry during the Phase 1 habitat survey. However the plant species within them indicate that they are likely to hold water for most of the year: rushes, floating sweet grass and water plantain.
Watercourses	Rosy Burn flows through the northern part of the Site from west to east. It varies in structure along its length with a narrow (approximately 1m wide) channel in the western part of the Site with earth banks, flowing into a reinforced section just west of Lower Deuchries Farm. A tributary of this watercourse is present in the centre of the Site. The watercourse here is fast flowing over a pebble substrate, shallow (approximately 20cm deep) and has relatively steep banks. Another watercourse, immediately west of North Cranna Farm, flows beneath conifers and has banks that lack vegetation. This watercourse flows into the Burn of Arkland which is outside the Site and forms part of its western boundary. Another tributary of the Burn of Arkland flows from east to west along the entire southern boundary of the Site. There are two wet ditches within the Site. The first is present along the southern edge of a small area of conifer plantation in the centre of the Site, to the north of Gallow Hill. The second wet ditch is a man-made road drainage ditch at the edge of the Site adjacent to Lower Deuchries Farm. The watercourses have limited plant species diversity. Bankside vegetation species commonly recorded include Cock's foot, soft rush, lesser celandine, gorse, hogweed, common sorrel, tufted hair-grass and wavy hair-grass.

Badger survey results

6.49 The results of the badger survey are provided in confidential appendix D to Appendix 6.1 and shown in Confidential Figure 3.3, which has been provided only to SNH and Aberdeenshire Council, due to the sensitive nature of the information they contain on welfare grounds.

6.50 There is a large area of habitat suitable for foraging badgers and badger sett excavation within the Site. Ten badger setts were recorded within the Site, the number of holes/ entrances plus the level of activity recorded (whether the holes were 'active' in recent use; or 'inactive' not in recent use) is summarised below:

- Sett 1 – One hole outlier (active);
- Sett 2 – One hole outlier (active);
- Sett 3 – Six hole main sett (active);
- Sett 4 – Six hole main sett (five active, one inactive);
- Sett 5 – Five hole main sett (four active, one inactive);
- Sett 6 – Six hole annex sett (active);
- Sett 7 – One hole outlier (active);

- Sett 8 – Eleven hole main sett (five active, six inactive);
- Sett 9 – Main sett with 18 active holes; and
- Sett 10 – One hole outlier (active).

6.51 In addition a number of signs (including hairs trapped on fences and latrines) were identified around the Site indicating probable badger movement corridors between foraging areas and setts.

Bat survey results

6.52 Full details of the bat survey results are provided in Appendix 6.2, with only a summary provided in the following section.

6.53 The majority of the Site provides only limited suitable habitat for bats. The large areas of arable and improved/poor-semi-improved grassland that cover most of the Site offer little foraging habitat as they are likely to support generally low insect abundance and diversity. The Site is poorly connected to adjacent habitats and lacks limited features along which bats often commute and forage. The location of the proposed turbines is generally exposed with no obvious corridors of vegetation that would be used by commuting bats leading to or from the area. There is however semi-natural vegetation close to the proposed turbine locations that provides more suitable foraging habitat for bats than occurs within the wider site, including dense gorse scrub and semi-improved neutral grassland.

6.54 There are a small number of buildings and trees with the potential to support roosting bats within the Site. None of these potential roosts fall within 200m[i] of the proposed turbine locations. Although some of the 'developable area' falls within 200m of buildings or trees with potential to support roosting bats, given the location of the buildings and trees to the proposed turbine locations, it is likely that if bats were present in these structures their activity would be picked up using the other survey techniques. Consequently, buildings and trees were not subject to further survey work to determine the presence/absence of bat roosts.

6.55 There is a minimum of three species of bat within the Site. The species recorded during both the activity transect surveys and static detector surveys are common pipistrelle, soprano pipistrelle and *Myotis* species[ii].

6.56 Low levels of bat activity were recorded in all months during the bat activity transect surveys (18 passes or less) apart from August when moderate levels of bat activity (145 passes) were recorded during the survey. The main area of bat activity was in the centre of the Site around areas of semi-improved grassland, watercourse and scrub habitats situated near the proposed turbine locations. This is likely to be at least partly attributable to insect abundance, which would be higher around these habitats than in the more agriculturally improved areas within the south of the Site. None of the bat

[i] The BCT (2011) guidance states that 'any areas with high potential within 200m of the developable area should be investigated in order to identify potentially important roost sites'.

[ii] It is not possible to separate the *Myotis* species based on the calls recorded from the frequency division bat detector.

contacts were sufficiently close to sunset or sunrise to be able to infer the proximity of a bat roost to the Site.

6.57 Common and soprano pipistrelle bats were recorded commuting throughout the Site with some foraging passes recorded on each survey occasion. An almost equal number of common and soprano pipistrelle bat contacts were recorded between May and September 2011. Most of the bats recorded were not seen during the surveys therefore no inferences can be made regarding the location of roosts through observation of the direction of flight.

6.58 Social calls were recorded on the Site in August and September, once each survey, which is not often enough to confirm the presence of mating roosts near to the Site. A single *Myotis* pass was recorded during the activity transect survey period. This bat was recorded on the 31st August 2011 in the centre of the Site near to the proposed turbine locations. The bat was observed commuting. No high-risk species (noctule, Leisler's bat or Nathusius' pipistrelle) were recorded during the surveys.

6.59 Low to moderate levels of bat activity were recorded within the Site during the static detector surveys. Common pipistrelle was the most regularly recorded species representing 79% of all passes recorded. The number of bat passes was highest at Location 1 in June and Location 2 in August with 109 and 167 bat passes recorded respectively. Few passes were recorded at Locations 3 and 4. The weather conditions were similar throughout the surveys, therefore variation in numbers/ species of bats recorded could not be attributed to weather. None of the passes recorded during the static detector surveys indicated that the locations were near to potential roost sites as none of the passes were recorded close to sunset or sunrise.

Otter survey results

6.60 No evidence of otter was found along watercourses within or immediately adjacent to the Site during the survey. Detailed descriptions of the watercourses surveyed and their suitability for otter is provided in Appendix 6.1 and shown on Figure 3.2. The watercourses are likely to be of limited suitability for otter, due to limited lying-up opportunities; no apparent potential holt locations, and poor water quality[29]. However the watercourses may be used occasionally by otters as a foraging habitat resource for prey such as amphibians. The nearest river, the River Deveron, is 4.6km to the west and 5km to the south of the Site boundary. The Deveron supports a population of otter and, as such, the Site is within commuting distance for foraging otter. Otter has historically been recorded on Rosy Burn at 'Rosyburn', 2km west of the Site[30] and it is possible that otter forage within the Site.

Water vole survey results

6.61 No evidence of water vole activity was found along watercourses within or immediately adjacent to the Site during the survey. Detailed descriptions of the watercourses surveyed and their suitability for water vole is provided in Appendix 6.1 and shown on Figure 3.2. Most of the watercourses within the Site provide limited suitability for water vole due to very little bankside vegetation, which is typically required to provide foraging

habitat and shelter for water voles. There are also historic records of American mink (*Neovison vison*) in the area (identified through NBN Gateway search) which limits the likelihood of water vole being present within the Site.

Other protected species

6.62 Two ponds within the Site which were assessed for their suitability for great crested newt were dry at the time of survey, although other ponds which may be suitable do exist within 500m of the Site boundary. No records of this species were recorded within 2km of the Site during the desk study and despite the presence of potentially suitable shelter/hibernation resource in the form of grass tussocks and piles of debris this species is not considered further in this assessment.

6.63 Although red squirrel records are present within 2km of the Site boundary (see Paragraph 6.42) no woodland areas of suitable size to support populations of this species are present within the Site and linear features between woodland habitats were found to have low potential as movement corridors. As such, this species is also not considered further in this assessment.

6.64 Although adder records are present within the 10km grid square that includes the Site the overall suitability of the habitats within the Site to support this species is low, with refugia limited to areas of semi-improved grassland, woodland edges, scrub and walls. As such, this species is also not considered further in this assessment.

Valuation of ecological receptors in the baseline condition

Evaluation of Habitat for Protected Species

6.65 No evidence of water vole presence was recorded within the Site during surveys and the potential for colonisation by this species is likely to be low given the relatively limited suitability of habitats within the Site for water vole and the nearest record of water vole being almost 4km from the Site boundary. This species is therefore not considered further in this assessment.

6.66 No incidental observations of reptiles were recorded during surveys and there are no records of reptiles within 2km of the Site. Adder has been recorded within 10km of the Site during the NBN gateway search. As most of the habitat within the Site is agricultural land, the majority of which is sub-optimal for reptiles, and as a result of the low level of protection reptile species receive in Scotland, reptiles are not considered further in this assessment.

6.67 The desk study identified no potential fisheries interest within the Site. The scoping responses did not raise any concerns regarding potential impacts on fish and the extended Phase 1 habitat survey did not identify any particularly suitable habitat that could be used by lamprey or migratory fish (such as salmon and trout) for spawning. Although the River Basin Management Plan (RBMP) for Rosy Burn cites the presence of barriers to fish movement as a reason for the burn being given poor ecological status, the mitigation identified in the RBMP has already been implemented. The proposed scheme would not result in any further reduction in the water quality including barriers to

fish movement, as detailed in the sections below. For these reasons, fish are not considered any further in this assessment.

6.68 This section evaluates the nature conservation value of the survey area for its habitats and for the species it supports in terms of its relative importance in a geographical context. As noted in paragraph 6.15 VERs are defined as those which have a value of District level or above (noted in **bold**). All other ecological receptors are not considered further in this ES, apart from where legal protection is taken into account.

Table 6.7: Evaluation of Nature conservation interest

Ecological Receptor	Evaluation Rationale	Site Value
Designated Sites for Nature Conservation		
Raised bog[25]	Lowland raised bog is a LBAP and a UK BAP priority habitat. Intact lowland raised bogs are one of Europe's rarest and most threatened habitats. They occur throughout the UK and have declined since the start of the 19th century from 95,000 ha to 6,000 ha, a decline of 94%. The remaining 6,000 ha resource is scattered across a large number of small sites. The 591 ha of open, active raised bog so far surveyed in Aberdeenshire represents approximately 10% of the total national resource of this habitat[31]. The plant communities recorded within the Site suggests that the area supports no characteristic bog species and consequently that the area could no longer be classified as bog habitat. A peat probing study[28] undertaken within the Site has identified the possible presence of peat in certain areas. As this area does not form part of the intact peat bog resource as listed on the LBAP, it is considered that the presence of peat within the Site is of no more than 'Local' nature conservation value.	Local
Habitats		
Arable	'Farmland' is a LBAP habitat. However arable farmland is common and widespread throughout the UK therefore the Site is likely to be of 'Less than Local' nature conservation value for arable farmland. Field Margins and Boundary Habitats' are LBAP habitats and 'Arable Field Margins' are a UK BAP priority habitat. The farmland within the Site lacks ecologically diverse field margins. There are few hedgerows that would constitute habitat of notable ecological value. Therefore the Site is likely to be of 'Less than Local' nature conservation value for field margins.	Less than Local
Improved and poor semi-improved grassland	Improved grassland and poor semi-improved grassland is common and widespread throughout the UK. These grasslands typically have limited species diversity and are therefore considered of low ecological value. However, the grassland does offer opportunities for foraging badgers and birds. As this habitat is common and widespread, the Site is considered to be of 'Less than Local' nature conservation value for improved and poor semi improved grassland.	Less than Local
Semi-improved neutral grassland	A large area to the north of the Site is semi-improved neutral grassland (approx. 70ha). There is also a small semi-improved field in the south of the Site (less than 0.5ha). The semi-improved grassland within the Site is relatively limited in terms of ecological value with mostly one or two dominant grass and rush species in the sward. It is possible these areas were more diverse in previous years but due to drainage and nutrient enrichment, their	Local

Ecological Receptor	Evaluation Rationale	Site Value
	ecological value has reduced. However, the semi-improved neutral grassland provides good habitat for badgers, birds and invertebrates. Nevertheless, semi-improved neutral grassland is relatively common throughout the UK and consequently the Site is considered of 'Local' nature conservation value for semi-improved grassland.	
Coniferous plantation woodland	Planted coniferous woodland is an LBAP habitat however no action plan is available for this habitat. Coniferous plantation woodland is the predominant woodland habitat type within the Site but is limited in area with only four small unconnected areas, covering a total of approximately 2.4ha. The woodland is densely planted with little or no understorey and is therefore of limited nature conservation value. However, it is likely to provide habitat for a variety of common species. The Site is consequently considered to be of 'Local' nature conservation value for coniferous plantation woodland.	Local
Mixed semi-natural woodland	There is one small area (<0.5ha) of mixed semi-natural woodland within the Site. This area is on the eastern boundary of the Site and is not connected to any larger woodland areas which would improve its ecological value. Mixed semi-natural woodland is affiliated to the UK BAP priority habitat 'Lowland Mixed Deciduous Woodland'. The woodland is likely to provide habitat for a range of common species, however given the size of the woodland and its isolated situation, the Site is considered to be of no more than 'Local' nature conservation value for mixed semi-natural woodland.	Local
Broad-leaved semi-natural woodland	Broad-leaved woodland is an LBAP habitat however no action plan is available for this habitat. There is one small area of broad-leaved semi-natural woodland within the Site which is approximately 0.1ha in area. This area is adjacent to Rosy Burn in the north east of the Site. Broad-leaved semi-natural woodland is affiliated to the UK BAP 'lowland mixed deciduous woodland'. However the area of woodland within the Site is very small and isolated and not connected to any larger woodland areas. The woodland does however provide habitat for birds, badgers and foraging (and potentially roosting) bats. The Site is consequently considered to be of 'Local' nature conservation value for broad-leaved semi-natural woodland.	Local
Scattered broad-leaved and coniferous trees	There are a few small areas of scattered broad-leaved and coniferous trees within the Site including lines or small groups trees associated with watercourses or buildings, and also isolated trees scattered throughout the Site. Although affiliated with the UK BAP priority habitat (Lowland Mixed Deciduous Woodland) these areas are small and isolated. As the trees do not connect to larger areas of woodland and are sparsely distributed and relatively isolated, it is considered that the Site is of 'Local' nature conservation value for scattered trees.	Local
Dense and scattered scrub	The majority of the dense scrub within the Site is gorse scrub. This is present in reasonably large patches throughout the Site. Although not a UK BAP habitat it is valuable to wildlife such as birds, badgers and bats that use gorse to forage, commute and nest/ build setts. As dense and scattered scrub is locally and nationally common and widespread the Site is of 'Less than Local' nature conservation value for dense and scattered scrub.	Less than Local
Waterbodies	Ponds are a UK BAP priority habitat. There are only two waterbodies within the Site and both were dry at the time of survey	Local

Ecological Receptor	Evaluation Rationale	Site Value
	with a poor diversity of aquatic and marginal plant species. Therefore the waterbodies within the Site represent a relatively poor example of this habitat. Consequently, the Site is of no more than 'Local' nature conservation value for waterbodies.	
Watercourses	Watercourses are listed under the UK BAP Priority habitat 'Rivers'. Rosy Burn is present in the north of the Site. The watercourse is predominantly straight and is clearly artificially realigned against field edges along most of its length and has artificial bank reinforcements near Lower Deuchries Farm. The other watercourses within the Site are tributaries of Burns present adjacent to the Site boundary but outside the Site. The watercourses have not been confirmed as supporting protected or notable species. Consequently the Site is of no more than 'Local' nature conservation value for watercourses.	Local
Fauna		
Badger	In the UK, badgers are a relatively common and widespread species. There are a reported 25,000 badgers in Scotland[32] and badgers are listed on the Scottish Biodiversity List (SBL). Badgers are very active throughout the Site. Badgers are protected to prevent persecution rather than for rarity. As badgers are common and widespread the Site is of no more than 'Local' nature conservation value for badgers.	Local
Bats (Common and soprano pipistrelle and *Myotis* species)	All species of bat in the UK receive full legal protection via inclusion on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Soprano and common pipistrelle, Daubenton's, whiskered and Natterer's bats are listed on the Scottish Biodiversity List (SBL) as being of principal importance for biodiversity conservation in Scotland. Soprano pipistrelle and brown long-eared bats are listed as priority species in the UK BAP. Daubenton's bat is listed as a local priority species in the Aberdeenshire LBAP. Although it has a relatively widespread distribution across Scotland, very few maternity roosts are known, with only ten recorded in North East Scotland. Current population estimates[32] are: Common pipistrelle: Native, common across the UK. Population estimate: UK 2,430,000; GB 1,280,000 – breakdowns not available. Soprano pipistrelle: Native, common across the UK. Population estimate: UK 1,300,000; GB 720,000 – breakdowns not available. Natterer's bats: Native, common across the UK. Population estimate: UK 148,000; Scotland 17,500. Daubenton's bat: Native, common throughout much of the UK. Population estimate: UK 560,000; Scotland 40,000. Whiskered bat: Native, locally distributed. Population estimate: UK 64,000; Scotland 1500. Brandt's bat: Native, common in western and northern England, rare/absent elsewhere. Population estimate: UK 30,000, Scotland 500. Brown long-eared bat: Native, common throughout the UK. Population estimate: UK 245,000; Scotland 27,500. *Myotis* roosts are the only known roosts near to the Site. However, given the very low numbers of passes of *Myotis* bats recorded, it is likely that the Site is not a foraging area for large numbers of bats. Although there appear to be a lot of contacts for	Local

Ecological Receptor	Evaluation Rationale	Site Value
	pipistrelle bats, it should be noted that disproportionately high numbers of calls can be recorded during foraging where individual bats pass multiple times. Therefore, it is considered that the Site is of 'Local' value for pipistrelle and *Myotis* species.	
Otter	Otters receive full legal protection via inclusion on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Otters are listed on the SBL as being of principal importance for biodiversity conservation in Scotland. They are a UK BAP priority species and are the subject of a national Species Action Plan (SAP). Scotland is considered a British stronghold for the species with an estimated 90% of the total British population resident here[33]. No signs of otter were recorded within the Site and the watercourses provide limited habitat for otter due to limited lying-up opportunities and no obvious holt locations, and the water quality has been recorded as poor. As otter has been recorded just over 2km from the Site, it is possible that the watercourses may be used occasionally by otters to seek food (such as amphibians). Consequently, the Site is considered to be of 'Local' nature conservation value for otter.	Local
Other Fauna	Common toad is present within 2km of the Site and is a UK BAP priority species. It is likely that common toad is present within the Site. However, common toad is still a relatively common and widespread species and their inclusion on the UK BAP is for serious declines in many populations across large areas of S, E and C England. Consequently, the Site is considered to be of 'Less than Local' nature conservation value for common toad. The survey area is also likely to support low numbers of other common mammals such as brown hare (*Lepus europaeus*). The nearest records of brown hare are approximately 2.5km east of the Site boundary. Brown hare is a UK BAP species although it is common nationally[32]. The Site is considered to be of 'Less than Local' nature conservation value for brown hare.	Less than Local

Trends in the Absence of Development

6.69 In the absence of development, the Site is likely to remain as predominantly agricultural land, potentially with further scrub clearance and nutrient enrichment taking place as part of farming practices. There are no known agricultural grant schemes in place at present. Consequently the status of species/habitats within the Site is likely to remain in their current state. Therefore, in the absence of development, it is considered that there is unlikely to be any substantial change in the ecological value of the Site over the next 25 years.

Information Gaps

6.70 No information gaps affecting the assessment of the potential impacts of the Development have been identified.

Project Characteristics

6.71 The key components of the development are detailed in Chapter 3 – Project Description. As a fundamental part of the assessment of potential impacts of the development on Valued Ecological Receptors (VERs), the following elements of the construction and operation of the Development have been considered during the scope of the assessment, following the establishment of baseline conditions:

- Temporary and permanent habitat loss associated with access tracks, borrow pits, wind turbine and crane pads and other hard standing locations, anemometer mast, contractors compound, control building and electrical substation and other associated infrastructure;
- Habitat damage within areas surrounding construction locations, through changes in the hydrological regime and pollution with dust, silt or chemical contaminants;
- Disturbance and/or damage to watercourses and potential injury, death or disturbance of their associated fauna (e.g. otter) through the construction of infrastructure with close proximity to the bank side;
- Damage/destruction of active badger setts and/ or disturbance of badgers occupying those setts; and
- Collision of bats with turbine blades.

6.72 As detailed in Chapter 3 – Project Description there are a number of embedded design elements that would be developed and agreed with Aberdeenshire Council and implemented throughout the Development. In relation to Ecology the following measures are inherent within the design:

- The layout minimises the number of watercourse crossings: there is an existing culvert where an unnamed minor watercourse crosses the existing farm access track, and which the proposed access track for Turbine 3 would cross. This culvert may require upgrading. A new culvert is proposed for a small branch of the same unnamed watercourse beneath the Turbine 3 crane pad. Watercourse crossings would be designed according to best practice[34]. The exact designs for upgraded and new culvert structures required would be agreed with SEPA prior to construction. Watercourses would be protected during construction through the adoption of a range of mitigation measures e.g. sediment control and pollution prevention measures; see ES Chapter 3: Project Description and ES Chapter 5: Physical Environment;
- Existing access tracks would be upgraded and existing field accesses would be used where possible to minimise habitat loss;
- A project Construction Environmental Management Plan (CEMP) would be developed and implemented to ensure measures are taken to avoid, reduce and mitigate environmental impacts;
- In order to minimise the impacts of construction (e.g. habitat loss or damage), all activity would be limited to clearly defined working areas, and the storage of surplus materials would be confined to areas of hardstanding. Vegetation clearance would be kept to a minimum and, where practicable, vegetation would be lifted as turfs and replaced after trenching operations. An Ecological

Clerk of Works (ECoW) would be appointed to ensure compliance with the CEMP, to provide advice during construction and to oversee the implementation of mitigation;

- Habitats that would be subject to temporary loss e.g. temporary contractors compound and laydown area would be reinstated as soon as possible after construction to replicate habitat which were temporarily lost;
- The development layout avoids woodland and dense scrub areas; and
- Badger setts would be avoided wherever possible. Disturbance of badgers would only be undertaken following approval of an SNH licence and supervised by the ECoW.

6.73 The assessment has considered all impacts associated with the Development as described in ES Chapter 3: Project Description. A separate consent - if required - is to be made for the grid connection by the Distribution Network Operator, SSE Power Distribution, for a 33kV connection from the Development to the local electricity distribution network. Current studies show capacity within the transmission line between Turriff and Aberchirder, and for the purposes of this ES at this stage it is assumed that this would be an underground 33kV cable that would follow new and existing tracks across the Site as far as possible and 't' into the existing 33kV line along the southern boundary of the Site. The predicted impacts are considered to be as for the upgrading and construction of access tracks, discussed below.

Predicted Impacts

Construction Impacts

Habitats

6.74 There would be temporary habitat loss as a result of installation of the proposed contractors compound and the creation of borrow pits. The proposed contractors compound would be located alongside the proposed new access track and would result in the loss of a small area (0.15ha) of poor semi-improved grassland and scattered coniferous trees. Borrow pits are proposed at two potential locations: BA1 is located in an area of poor semi-improved grassland and dense scrub and semi-improved neutral grassland. BA2 and its associated access track are located within an area of improved grassland. Grassland and scrub areas are evaluated at no more than Local nature conservation value therefore the loss of small areas of these habitats would result in impacts of negligible magnitude and an impact of **Negligible** significance in line with the criteria in Table 6.4.

6.75 There would be permanent habitat loss as a result of the upgrading of existing tracks, creation of new access tracks and creation of areas of hard standing for wind turbine construction. There are two potential track options being considered (see Figure 3.1). One of the proposed new access track routes would follow an existing farm track from the B9025 through North Cranna Farm but would be widened and resurfaced resulting in minimal habitat loss. An alternative new access track would bypass North Cranna Farm by turning off the existing track near the B9025 entrance and crossing agricultural

land before rejoining the existing track. The construction of the alternative track would result in the loss of improved grassland, arable farmland and fence of Less than Local nature conservation value. In the north of the Site where the current surfaced farm track ends the construction of the proposed access track (where only one option is being considered) would result in the loss of poor semi-improved and semi-improved neutral grassland and scattered scrub habitats along with short sections of fence and broad-leaved scattered trees. The proposed relatively impermeable groundcover of the access track would result in increased surface water run-off in this area. The improved and semi-improved neutral grassland and scattered scrub that would be lost is of no more than Local nature conservation value and as such loss of these habitats is considered to be of negligible magnitude and **Negligible** significance in line with the criteria in (i.e. not significant in EIA terms).

Protected species

6.76 Two of the ten badger setts identified within the Site are located within 100m of the proposed new access tracks and turbine locations. The proposed layout has been modified to avoid directly impacting any setts however the proposed access track is 41.7m from sett 1, and wind turbine 3 is 65m from sett 4. SNH generally advises that where activities are proposed which can cause indirect disturbance through noise and/or vibration (e.g. blasting or pile driving), such activities are avoided within ~100m of the closest sett entrance[35]. Work that results in disturbance of a badger sett is an offence under the Protection of Badgers Act 1992 (as amended) without a derogation (licence) from SNH. A badger sett is defined in the Protection of Badgers Act (1992) as 'any structure or place which displays signs indicating current use by a badger'. This can include culverts, pipes and holes under sheds, piles of boulders, old mines, quarries, etc. 'Current use' does not simply mean 'current occupation' and for licensing purposes it is defined as 'any sett within an occupied territory regardless of when it may have last been used'. A sett therefore, in an occupied territory, is classified as in current use even if it is only used seasonally or occasionally by badgers and is afforded the same protection in law.

6.77 The SNH guidance also indicates the types of activities which may result in sett disturbance and advises that any such activities within 30m of a sett may require a licence.

6.78 In the absence of mitigation badgers would be subject to direct and indirect impacts as a result of construction, namely the severance of linear features (i.e. ditches and fencelines) which badger use to travel between setts and foraging areas. There would be a risk of injury or death during construction, obstruction of commuting routes and loss of foraging habitat. Temporary disruption is not likely to affect the conservation status of the badger population within the Site therefore, the magnitude of the impact on badgers is considered to be 'low'. Badgers are not a VER within the context of this EIA, and therefore the significance of the impacts of construction of the Development on badgers is considered to be '**Negligible**'. Nevertheless, mitigation measures would be incorporated into the Development to ensure compliance with the relevant legislation (see **Section 6.8**).

6.79 Common and soprano pipistrelle bats and *Myotis* species occasionally forage and commute within the Site. These bats would therefore be subject to temporary and permanent indirect impacts as a result of construction of the Development through loss of small areas of foraging habitat and disturbance as a result of lighting and noise. As the habitat within the Development area is not considered to be an important foraging area or provide important commuting corridors for bats, it is likely that this loss would not affect the conservation status of the local bat population and larger areas of more suitable foraging habitat would continue to be available outside the developable area. Bats are not a valued ecological receptor within the context of this EIA and therefore the significance of the impacts of construction of the Development on bats is considered to be '**Negligible**' in line with the criteria in

6.80 Table 6.4. Nevertheless, mitigation measures would need to be incorporated into the Development to ensure compliance with the relevant legislation (see **Section 6.8**).

6.81 Otters may occasionally forage within the Site and could potentially establish a lying-up site prior to construction. Otters may therefore be affected during construction, as a result of the use of lighting and heavy machinery, and death or injury as a result of entrapment. They may also be indirectly affected through displacement from their feeding areas through noise and lighting during construction. As European Protected Species (EPS), otters and the places they use for shelter and protection are afforded full protection in UK legislation. It is an offence to harm an otter or damage, disturb or obstruct a lying up site. Otters are not a VER within the context of this EIA, and therefore the significance of the impacts of construction of the development on otter is considered '**Negligible**'. Nevertheless, mitigation measures would need to be incorporated into the Development to ensure compliance with the relevant wildlife legislation (see **Section 6.8**).

Operational Impacts

6.82 During the operation of the Development, the potential for chance pollution incidents during routine maintenance activities would be minimised by implementing SEPA pollution prevention guidance (further details are included in ES Chapter 3: Project Description and ES Chapter 5: Physical Environment).

Habitats

6.83 There would be permanent and irreversible loss of small areas of improved and semi-improved grassland and scattered scrub in the locations of the access track upgrade and extension, wind turbine footprint and control building compound as shown in Table 3.2 of **Chapter 3 – Project Description**. As these habitats are of no more than 'local' nature conservation value the permanent loss of these small areas of habitat is not considered to be greater than low magnitude resulting in an impact of '**Negligible'** significance.

Species

6.84 There would be permanent loss of small areas of foraging habitat for badgers due to the construction of access tracks, turbine footprints and other associated Development infrastructure. The Site and surrounding area provides extensive suitable foraging habitat for badgers. Consequently the magnitude of the impacts on badgers is 'negligible' and as badgers are of no more than 'local' value, the significance of these impacts is '**Negligible**'.

6.85 Bats are potentially at risk from collisions with wind turbines with fatalities recorded in a number of European countries, occasionally in high numbers[36]. The majority of fatalities take place in the late summer and autumn and are particularly notable in migratory species[37],[38]) although resident species are also affected. A number of hypotheses have sought to explain why bats are killed by wind turbines, including random collision, acoustic attraction and swarming of insect prey around the nacelle which attracts foraging bats (reviewed in University of Bristol/BCT, 2009[39]). Bats may be at even higher risk of mortality because they can be affected by barotrauma, whereby rapid or excessive changes in pressure resulting from the vortices created by moving turbine blades result in tissue damage in the lungs[40];[41]). This condition is unique to bats as birds have a different respiratory system. Other impacts which could potentially result from the presence of operational wind turbines may include the displacement or exclusion of bats from their foraging areas by the introduction of physical barriers (moving turbine blades) which could interfere with migration, commuting routes or access to roosts.

6.86 The impacts on bat populations are, in cases of high bat mortality, compounded by their low fecundity, resulting in slow population recovery following comparatively small losses which can affect species' conservation status.

6.87 There has been no systematic approach to monitoring bat fatalities or activity patterns at wind farm sites post-construction in the UK and a lack of understanding on migratory behaviour in British bats means that the flight paths and flying altitudes for British species are not known. However, current understanding of migration patterns in Europe from ringing returns[42] and understanding of bat behaviour, flight patterns, foraging strategies and echolocation calls have enabled an assessment of relative collision risk to individuals of each species from wind turbines[43]. This also estimates likely risk to bat populations, based on level of risk to individuals and species population size. The guidance places bat individuals into one of three risk categories: low, medium and high.

6.88 Soprano pipistrelle is the only confirmed species with recorded fatalities in Britain[43]. Both soprano and common pipistrelle are classed as being at medium risk of collision with turbines at a species/individual level, whilst their populations are assessed as being at low risk. According to large-scale studies in Germany, the majority of pipistrelle collisions occur where turbines are located within forests. There are no woodland areas in close proximity to the proposed wind turbines at Deuchries and, as such, collisions as a result of close proximity to woodland areas would not pose a risk.

6.89 *Myotis* species are categorised as being at low risk of collision at both the individual and population level and Rydell *et al*.[37] report that they are generally not at risk as they fly below rotor height. *Myotis* activity was generally very low within the Site.

6.90 As only small numbers of low to medium risk species were recorded within the Site, the magnitude of potential impacts on bat populations is considered to be negligible and as bat populations are of no greater than 'local' value, the significance of these impacts is 'Negligible'.

6.91 There are not predicted to be any adverse operational impacts on otter after mitigation measures to protect watercourses are implemented.

Decommissioning

6.92 During the eventual decommissioning of the Development, potential impacts on nature conservation would be expected to be similar to those during the construction phase and thus similar mitigation measures are likely to be required. Any new legislation or guidelines published prior to decommissioning would be adhered to and incorporated into mitigation design prior to decommissioning taking place.

Mitigation

6.93 No significant impacts are predicted that necessitate mitigation, however in recognition of the sensitivity of some of the species concerned and in the interest of ensuring good working practice and compliance with nature conservation legislation a number of mitigation measures are set out below. The provisions of these mitigation measures would be included in the CEMP or agreed with stakeholders as detailed below.

6.94 Potential impacts on badgers would be mitigated through adoption of the following measures:

- Prior to construction, a badger survey would be undertaken of the construction footprint and surrounding land up to 100m from these areas to establish if any new setts have been excavated that may be affected by the works in accordance with SNH's guidelines[33] . Site infrastructure would be micro-sited up to 30m to avoid direct impacts on badger setts, where appropriate;
- An application for a SNH licence to disturb badgers accompanied by an appropriate mitigation strategy would be submitted to SNH for approval if required. If new setts or entrances are found these will be subject to appropriate mitigation measures (i.e. licensing or ideally avoidance);
- All contractors would be briefed on the restrictions on the proposed works in relation to badgers to ensure compliance with legislation and avoid accidental damage or disturbance; and
- A suitable means of escape (e.g. a long wide wooden or metal plank) from any open trenches and other excavations would be provided. Deeper excavations would be fenced off or covered to prevent wildlife access.

6.95 Potential impacts on bats would be mitigated through adoption of the following measures:

- Currently the proposed tips of the wind turbine blades do not fall within 50m of any linear features that may be used by bats such as hedgerows or woodland. However, should the turbine locations be subject to any micrositing, wind turbines would be constructed with a minimum stand-off distance of 50m between the rotor-swept area of each turbine and features which are often used by bats such as hedgerows and tree lines. This is in accordance with good practice guidance[43] to minimise collision risk to bats. This recognises the fact that bats in the UK generally forage and commute in close proximity to the above habitat features; and
- There is no proposed removal of trees with the suitability to support bats at the Site. However, if the trees within the Site identified as having bat potential require removal or alteration at a later date to facilitate development, the trees would be subject to a survey to determine if roosting bats are present. If bats are found to be present, a licence would be sought from SNH including an appropriate mitigation strategy.

6.96 Potential impacts on otter would be mitigated through adoption of the following measures:

- In order to verify that otters have not established holts, shelters or resting places along the burns during the period between ES preparation and construction, a pre-construction otter survey will be carried out approximately 6 months prior to the works beginning. These surveys would include a search of all suitable habitats up to a minimum of 250m from infrastructure locations and up to a minimum of 100m from all access track routes in accordance with standard guidance[33]. This would include the watercourse that would be crossed during construction and upgrading of the access track. If a place used by otter for shelter/protection is identified SNH would be consulted and an otter mitigation plan and licence application (if required) would be prepared. SNH is the licensing authority for otter in Scotland; and
- SNH guidance states that, while SNH should be consulted to determine whether any proposed measures incorporated into a scheme are sufficient to avoid the need for a licence, disturbance during development works can be minimised by declaring an area within at least 30m of an otter shelter, out of bounds to all site users at all times.

6.97 Even if works would not disturb an otter holt or resting place, there is potential for otters to be harmed/disturbed during the construction period if they move on to the Site during the construction phase. To minimise the potential risk of harming otters, the following measures would be employed:

- Artificial lighting, where used during construction, would be directed away from watercourses, so that it does not disturb otter activity during the hours of darkness;

- Should evidence of otters be found on the Site during construction, a suitable means of escape from any exposed trenches and other excavations would be provided (such as a long wooden or metal plank). Deeper excavations would be fenced off to exclude wildlife; and
- If holts/resting sites become established during the works, all contractors would be briefed regarding their locations to avoid any accidental damage or disturbance.

Residual Impacts

6.98 None of the ecological receptors within the Site are of more then 'Local' nature conservation value within the context of this EIA. Therefore there are no effects that could be significant (i.e. Major significance as defined by the matrix presented in Table 6.4.

6.99 The adoption of best practice during the construction and operation of the Development and the provision of mitigation and enhancement measures outlined above would minimise the potential for adverse impacts on protected species.

6.100 A feature of wind farm developments is a risk of bat mortality due to collision. However only a small number of low to medium risk species have been recorded on the Site and therefore any collisions are unlikely to affect the nature conservation status of bat populations.

Cumulative Impacts

6.101 The impact of the Development on flora and fauna is not likely to extend beyond the Site boundary. The only species/group recorded within the Site that is likely to be susceptible to cumulative impacts are bats, which have home ranges which cover a wide area. Specifically, there is potential for the cumulative impact of increasing numbers of wind turbines on bat mortality and hence bat populations as a result of collision with wind turbines.

6.102 Several species of UK bats are known to be migratory in parts of their range on the continent however little is known about migration in the UK. Short-distance migration (between summer roosts and mating sites/ winter roosts) occurs annually in several bat species, but for many species these migrations take place at relatively low altitude e.g. *Myotis* species (present within the Site) therefore the risk of this species colliding with turbines is likely to be relatively low.

6.103 The risks to pipistrelle species are higher because they tend to fly at heights comparable with the rotor swept path of wind turbines. Direct cumulative impacts of wind farm schemes on individuals of the same *local* population would only be predicted to occur where these schemes are situated on commuting or migratory routes or near important foraging habitats, roosts or hibernacula, and would be expected to be negligible at distances of greater than 5km from the proposed turbines[44] (see Table 6.8 for wind farms that have been included in the assessment).

6.104 In the absence of available data on the existing impacts (in terms of bat mortality) of the operational Strath of Brydock wind farm which is 5km distant from the Site, and without an understanding of the extent to which bats have been able to adapt their behaviour to avoid wind turbines the cumulative impacts on local bat populations is unknown.

6.105 However, no important commuting or migratory routes or important foraging areas or roosts were identified during the surveys and as a result, it is considered that the proposed Development would be unlikely to have any impact on the local bat populations and therefore cumulative impacts on the bat population in the wider area are not likely.

6.106 In conclusion no residual or cumulative impacts that would be judged to be significant in EIA terms have been identified as defined in Table 6.4.

Table 6.8: Possible cumulative impacts on local bat populations

Wind farm - status	Distance/direction from the Site	Number of turbines	Potential impact
Strath of Brydock - operational	5km north	3	Cumulative impacts possible due to proximity to the Site. Site is small and impacts unlikely to be significar
Mains of Auchinderran – approved/under construction	3km west	3	Cumulative impacts possible due to proximity to the Site. Site is small and impacts unlikely to be significant.
Cowie Hill – in planning	3km north east	1	Cumulative impacts possible due to proximity to the Site. Site is small and impacts unlikely to be significant.
Culbirnie Parks – in planning	5km north	1	Cumulative impacts possible due to proximity to the Site. Site is small and impacts unlikely to be significant.

Chapter 6 References

[1] Online renewables planning advice in relation to onshore wind turbines: http://www.scotland.gov.uk/Resource/0039/00392419.pdf

[2] http://www.scotland.gov.uk/Publications/2000/08/pan60-root/pan60.

[3] Scottish Executive (2001). European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements. Scottish Executive. http://www.scotland.gov.uk/Publications/2001/10/10122/File-1 (last modified 4 December 2006)

[4] http://jncc.defra.gov.uk/page-5155.

[5] http://www.biodiversityscotland.gov.uk/advice-and-resources/scottish-biodiversity-list/

[6] http://lbap.macaulay.ac.uk/actionplans/

[7] SEPA (2011). Guidance Note 4: Planning Guidance on Wind Farm Developments. Land Use Planning System.

[8] http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20Windfarm%20construction.pdf

[9] Institute of Ecology and Environmental Management (2006) Guidelines for Ecological Impact Assessment in the United Kingdom.

[10] RSK Ltd (2011). Deuchries Windfarm Scoping Report, May 2011. Prepared on behalf of Force 9 Energy LLP.

[11] http://www.snh.gov.uk/ - accessed December 2011

[12] http://data.nbn.org.uk/ - accessed December 2011

[13] http://magic.defra.gov.uk/ - accessed December 2011

[14] Bat Conservation Trust (BCT) (2011). *Surveying for Onshore Windfarms*. *Bat Surveys – Good Practice Guidelines*. 2nd Edition.

[15] Joint Nature Conservancy Council (JNCC) (2007), Handbook for Phase 1 habitat survey - a technique for environmental audit, Revised reprint 2003, reprinted 2007.

[16] Institute of Environmental Assessment (1995) 'Guidelines for Ecological Assessment'. Chapman and Hall, London.

[17] Edgar, P., Foster, J. and Baker, J. (2010). Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.

[18] Harris, S., Cresswell, P. and Jefferies, D. (1989). Surveying Badgers, An Occasional Publication of the Mammal Society No. 9.

[19] Bat Conservation Trust (2007). *Bat Surveys - Good Practice Guidelines*. Bat Conservation Trust.

[20] Chanin, P. (2003). Monitoring the Otter *Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10. English Nature: Peterborough

[21] Strachan, R. & Moorhouse, T. (2006). Water Vole Conservation handbook, Wildlife Conservation Research Unit

[22] Groundwater Dependent Terrestrial Ecosystems (GWDTEs) are defined in SEPA's land use planning guidelines for wind farm developments (SEPA, 2012). Dewatering of below-ground works as a result of development may change the quantity of groundwater supplying GWDTEs. Such de-watering is controlled by the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). SEPA requires sufficient information in relation to GWDTE to advise the determining authority of the likelihood of an authorisation being granted.

[23] The exception may be if the site was located outside the known range for the species.

[24] Ancient woodland is land that has been continually wooded since at least 1600 AD. Semi-natural ancient woodlands developed naturally on undisturbed soils.

[25] Lindsay, R.A. & Immirzi, C.P. (1996). *An Inventory of Lowland Raised Bogs in Great Britain*. SNH Research, Survey and Monitoring Report. No 78.

[26] SNH (2009). Strategic Guidance for Onshore Windfarms in respect of the Natural Heritage. Policy Statement 02/02.

[27] http://lbap.macaulay.ac.uk/actionplans/

[28] Grontmij (2011). *Deuchries Wind Farm. Note on Peat*.

[29] SEPA water quality interactive map (http://gis.sepa.org.uk/rbmp/) accessed 15/12/2011.

[30] Scotland Otter Survey Database. *Lutra lutra* (European Otter) 1991-09-03/1995-05-07 (Day Range) Site: Rosy burn at Rosyburn.

[31] http://www.nesbiodiversity.org.uk/publications/habactionplan.htm

[32] Battersby, J. (Ed.)(2005). UK Mammals: First Report by the Tracking Mammals Partnership: Species Status and Population Trends.

[33] Scottish Natural Heritage (2007). Otters and Development. http://www.snh.org.uk/publications/on-line/wildlife/otters/default.asp.

[34] CIRIA Culvert Design and Operation Guide [C689] and Scottish Executive River Crossings and Migratory Fish: Design Guidance (http://www.scotland.gov.uk/consultations/transport/rcmf-03.asp)

[35] Scottish Natural Heritage (2002). Badgers and Development. http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=65.

[36] Rodrigues, L., . Bach, L., . Dubourg-Savage, M-J., . Goodwin, J. and . Harbusch, C. (2008): Guidelines for consideration of bats in Wind farm projects. EUROBATS Publication Series No. 3 (English version). UNEP/EUROBATS Secretariat, Bonn, Germany, 51 pp.

[37] Rydell, J., Bach, L., Dubourg-Savage, M., Green, M., Rodrigues, L. and Hedenstrom, A. (2010). Bat mortality at wind turbines in north western Europe. Acta Chiropterologica, 12: 261 – 274.

[38] Arnett, E. B., Brown, W. K., Erickson, W. P. and 11 others (2008). Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72, p. 61 – 78.

[39] University of Bristol. / BCT. (2009). Determining the potential ecological impacts of wind turbines on bat populations in Britain; Scoping and method development report. Report to Defra. http://randd.defra.gov.uk/Document.aspx?Document=WC0742_8026_FRP.pdf

[40] Baerwald, E. F., D'Amours, G. H., Klug, B. J. and Barclay, M. R. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. Current Biology 18 (16), p. 695 – 696.

[41] Grodsky, S., Behr, M., Gendler, A., Drake, D., Dieterle, B., Rudd, R. and Walrath, N. (2011) Investigating the causes of death for wind turbine-associated bat fatalities. Journal of Mammalogy, 92(5) 917-925.

[42] Hutterer, R., Ivanova, T., Meyer-Cords, C. and Rodrigues, L. (2005). Bat migration in Europe – a review of banding data and literature. Federal Agency for Nature Conservation, Bonn, 2005.

[43] Natural England (2009). Technical Information Note TIN051 – Bats and onshore wind turbines Interim Guidance First edition. http://www.snh.gov.uk/docs/B259918.pdf.

[44] Hunting grounds normally average 1.5km although movements of up 15km between nursery roosts has been observed and swarming roosts are visited at up to 22.5km in common pipistrelles (see Dietz, C., von Helversen, O. and Nill, D. (2007). Bats of Britain, Europe and Northwest Africa. Pub. Franckh-Komos Verlags GmBh & Co., Stuttgart. Similarly the soprano pipistrelle uses hunting distances that are more distant than common pipistrelle (average 1.7km) although the total area of foraging grounds is smaller than common pipistrelle.

7 ORNITHOLOGY

Introduction

7.1 This Chapter describes and evaluates the current ornithology interest of the Site and its surroundings and assesses the predicted impacts on the ornithological resource of the Development during construction, operation and decommissioning.

7.2 The key issues relating to birds and wind farms are as follows:

- The impacts of direct habitat loss due to land take by wind turbine bases, tracks and ancillary structures;
- The impacts of indirect habitat loss, resulting from the displacement of birds from the proximity of the wind turbines. Such disturbance may occur as a consequence of construction work, or due to the presence of the wind farm close to nesting or feeding sites or on habitual flight routes; and
- The impacts of collision with rotating turbine blades, overhead wires and guy lines (i.e., killing or injury of birds), which is of particular relevance for sites located in areas known to support raptors or large concentrations of waterfowl.

7.3 In order to assess the potential impacts of a wind farm, both the value of the Site itself to birds and the level of flight activity within and around the Site should be determined. Survey work followed the guidelines detailed in SNH guidance document 'Survey methods for use in the assessment of the impacts of proposed onshore wind farms on bird communities' (SNH, 2010[i]) suggests that assessment should concentrate on target species, for example those specially protected or those which occur at a site in regionally or nationally important numbers. The criteria for the selection of 'target species' under SNH guidance are detailed in paragraph 7.9.

7.4 The following sections of this chapter set out details of the methodological approach to the surveys and assessment, describe the baseline conditions and fully assess the likely significant effects of the Development on birds.

Legislation and Policy

Policy Context and Guidance

7.5 The ornithological assessment has taken account of the requirements of, and/or advice given in:

- Council Directive 2009/147/EC on the conservation of wild birds (the Birds Directive);
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive);
- The Habitats Regulations 1994;
- Wildlife and Countryside Act 1981 (as amended);

- The Countryside and Rights of Way (CROW) Act (2000);
- The Nature Conservation (Scotland) Act (2004);
- Scottish Planning Policy (SPP) Guidance;
- Planning Advice Note (PAN) 60: Planning for Natural Heritage;
- Survey methods for use in assessment of the impact of proposed onshore wind farms on bird communities (SNH 2010);
- Assessing significance of impacts from onshore wind farms on birds outwith designated areas (SNH 2006[ii]);
- Developing field and analytical methods to assess avian collision risk at wind farms (Band et al 2007[iii]); and
- The North East Scotland Local Biodiversity Action Plan.

7.6 A detailed review of relevant planning policy is provided in ES Chapter 4: Planning.

Method of Assessment

Terminology

7.7 With regards to the terminology used in this assessment, 'the Site' refers to the planning application Site boundary, while 'survey area' refers to areas covered by different bird surveys e.g. the survey area for vantage-point watches extends up to 2 km from the observation point.

Guidance

7.8 Given the low levels of recorded collisions and the limited disturbance to the majority of bird species from wind farm developments to date, SNH guidance (2010 and 2006[iv]) on the assessment of the impacts of wind farms on ornithological interests suggests that assessment should concentrate on species within the following categories that are likely to be affected by disturbance or collision:

- Species protected under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended);
- Species listed in Annex 1 of the EC Birds Directive;
- Regularly occurring migratory species; and
- Red-listed Birds of Conservation Concern (BoCC).

7.9 Such species are termed 'target species', though it should be noted that not all species on the above lists would be categorised as such for the purposes of this assessment. For example, most passerine species, some of which may be on the BoCC red list, are not considered to be particularly susceptible to effects from wind farms.

Scope of Assessment

7.10 A desk based study indicated that there are no statutory sites designated for their ornithological features within 5km of the Site. The two statutory sites within 20km are both designated for seabirds. It was considered that the Site was likely to support a

range of breeding and wintering species that are typical of lowland, agricultural land in the local area.

7.11 On this basis it was concluded that breeding bird territory mapping and winter walkover surveys should be undertaken. It was considered that the minimum vantage point survey effort recommended by SNH guidance (SNH 2010), comprising 36 hours of survey effort per VP per season (breeding and wintering), would be sufficient.

7.12 The predicted rate of bird collisions with wind turbines was calculated using the model developed by W. Band (Band et al. 2007), as recommended by SNH (2010[v]). The SNH guidance document *'Windfarms and Birds: Calculating a theoretical collision risk assuming no avoiding action'* (2000) was followed. Avoidance rates were obtained from SNH guidance note 2010.

Consultation

7.13 A scoping report was submitted by RSK Environment Ltd to Aberdeenshire Council in and their response was obtained in June 2011. Responses relevant to this chapter are detailed in Table 7.1.

Table 7.1: Deuchries Scoping Opinion Responses relating to Ornithology

Consultee	Comments/Recommendations	Actions Taken
Aberdeenshire Council	Ornithological issues should be addressed in the ES.	An ornithology chapter was produced.
Scottish Natural Heritage	Designated sites within a 20km radius of the development site should be considered. The initial appraisal by SNH is that there is no connectivity with any European site. Field survey should include three lowland/farmland bird survey visits during the breeding season and three visits during the winter. Potential impacts on raptors and owls should be considered. Request that the total number of Vantage Point survey hours are summarised for each VP and each season.	A search was undertaken for all statutory sites within a 20km radius. Field survey included three breeding bird territory mapping surveys and seven winter walkover surveys. Schedule 1 raptor species and all owl species were included as target species. Vantage point survey effort is summarised within this chapter.
Royal Society for the Protection of Birds (RSPB)	Emphasise the importance of following the SNH 2010 guidance.	The SNH (2010) guidance was consulted when designing the ornithological assessment for the site.

Desk Based Assessment

Statutory Nature Conservation Sites

7.14 It is necessary to ascertain the proximity of sites of conservation importance for birds in relation to a proposed development. The presence of Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs) within 20 km of the Site boundary for which birds were a principal reason for notification or designation was determined by

accessing the Multi-Agency Geographical Information for the Countryside (MAGIC) website. Details of SPAs and Ramsar sites were obtained from the JNCC website, with SSSI details obtained from the SNH SiteLink website.

Bird Records

7.15 The following resources were consulted for information relating to bird species of conservation priority recorded within or close to the Site:

- RSPB; and
- North East Scotland Local Biodiversity Action Plan.

7.16 Additional primary sources of contextual information were:

- The Birds of Scotland (Forrester 2007[vi]); and
- The North East Scotland Bird Reports (2006-09).

Bird Survey Methodology

7.17 Bird surveys comprised vantage point (VP) watches, breeding bird territory mapping surveys and winter walkover/goose 'drive-around' surveys, details of which are provided in the following sections.

Vantage-Point Surveys

7.18 VP surveys, based upon the method statement appended to SNH (2005[vii], revised 2010) were undertaken from April to August 2010 (the breeding season) and from September 2010 to March 2011 inclusive (the winter season). Subsequently a second winter survey season was undertaken September 2011 to March 2012 inclusive. This method focuses on identifying flight-paths of target species such as raptors and wildfowl, and enables regularly used flight lines to be identified, allowing turbine locations to be altered where necessary to reduce collision risk to birds. The data generated can also be used to estimate the theoretical risk of collision with turbines by incorporation into a suitable model.

7.19 The SNH methodology guidance states that VPs should be carefully chosen, to achieve maximum Site visibility from the minimum number of locations such that all parts of the survey area are within 2 km of a VP. A single vantage point was chosen, located at NJ 644 546, looking north-west from the top of Crannabog Hills. This VP is located approximately 250m from the nearest proposed turbine location and the surveyor minimised their effect on bird behaviour by wearing dull clothing and avoiding being silhouetted against the skyline. The approximate view-shed from this VP is illustrated in Figure 7.1.

7.20 A total of 42 hours of VP survey was conducted during each of the 2010 breeding and 2010/11 winter seasons, with a further 81 hours of VP survey undertaken during the 2011/12 winter season. The dates and times of the surveys are provided in Appendix 7.1a to 7.1f. Bird flights were recorded in six height bands: less than 10m, 10-20m, 20-30m, 30-40m, 40-130m and greater than 130m.

Breeding Bird Territory Mapping Surveys

7.21 A three-visit breeding bird territory mapping survey was undertaken in 2010, on the dates and times detailed within Table 7.2. The surveys followed the British Trust for Ornithology (BTO) Common Bird Census (CBC) methodology (Gilbert et al. 1998[viii]). While eight to ten visits are recommended for CBC sites being monitored over the long term, it is generally accepted that for the purpose of assessing potential environmental effects of wind farms, three visits are sufficient to determine the number of breeding bird territories with reasonable accuracy (SNH, 2010). All land within the Site boundary was covered by the breeding bird walkovers.

7.22 Territory mapping surveys were undertaken in suitable weather conditions i.e. good visibility and avoiding winds in excess of Beaufort 5 and all birds were mapped using standard BTO notation.

Table 7.2: 2010 Breeding bird territory mapping surveys undertaken

Date	Survey Period
27/04/2010	0920-1130
11/05/2010	0445-0920
14/06/2010	1425-1800

Winter Walkover Surveys 2010/11

7.23 SNH guidance recommends winter walkover surveys and these were undertaken on a monthly basis during the winter period (September to March inclusive). Seven winter walkover surveys were undertaken at the Site on the dates and times provided in Table 7.3. All sections of the Site and a surrounding 500m buffer zone were scanned and all wildfowl, waders, raptors and other notable bird species recorded. All fields and other parcels of land within the survey area were numbered for ease of recording. Figure 7.2 illustrates the winter walkover survey area and location of numbered fields. Surveys were undertaken in suitable weather conditions i.e. good visibility and avoiding winds in excess of Beaufort 5. A second winter season of survey was subsequently undertaken, with the dates and times of walkover surveys provided in Table 7.4.

Table 7.3: Winter walkover surveys at Deuchries, winter 2010/11

Date	Survey Period	Survey
19/09/2010	1320-1730	1
20/09/2010	1330-1740	1
21/10/2010	0910-1540	2
22/11/2010	1300-1600	3
23/11/2010	1200-1500	3
18/12/2010	0900-1210	4
19/12/2010	1045-1400	4
10/01/2011	1110-1410	5
23/01/2011	0915-1230	5

Date	Survey Period	Survey
06/02/2011	1050-1400	6
22/02/2011	1000-1400	6
20/03/2011	0930-1230	7
26/03/2011	1200-1500	7

Winter Walkover/Goose-Drive Around Surveys 2011/12

Table 7.4: Winter walkover/goose drive-around surveys, winter 2011/12

Date	Survey Period
26/09/2011	0800-1205
15/10/2011	0940-1320
16/10/2011	1130-1450
14/11/2011	0800-1430
12/12/2011	0900-1200
13/12/2011	1145-1430
15/01/2012	1100-1650
13/02/2012	1100-1650
17/03/2012	1200-1800

Incidental Records

7.24 Records were kept of all notable bird species observed outside of formal survey periods, such as when walking to and from vantage points, and are presented within this report.

Assessment Criteria

Predicted Impacts

7.25 There are many variables that affect the responses of individual living organisms, populations, communities and ecosystems to changes in their environment. These are only partially understood or studied, and it is therefore rarely possible to make predictions about the ecological impacts of any form of development with absolute confidence.

7.26 Prediction relies on a synthesis of the information gathered during the baseline surveys and studies of the Site, together with the body of contextual information and knowledge available from written sources (both published and unpublished). Input is also required from those individuals and organisations with expertise in, or local knowledge of, relevant aspects of ornithology.

7.27 Early investigations into the potential for terrestrial wind farms in the UK to cause significant displacement or mortality of birds concluded that this was most unlikely in any but the most exceptional circumstances e.g. Percival 2000[ix] and Gill et al. 1996[x].

Although various post-construction ornithological monitoring studies are being undertaken in the UK, the results of few of these have been made publicly available as formal peer-reviewed scientific papers. An increasing number are, however, becoming available in the 'grey literature' (i.e., they are not formally peer-reviewed) and are available on the internet. In predicting the effects of an individual wind farm, the consultant is therefore obliged to draw on these as well as additional information from studies elsewhere in Europe (again, increasingly available as grey literature).

Evaluation of Effects

7.28 Four criteria have been used in evaluating the ornithological effects of the Development:

- The type of impact, whether it is positive, negative, neutral or uncertain;
- The probability of the impact occurring based on the scale of certain, likely or unlikely;
- The nature conservation importance of the resource under consideration, based on guidelines initially developed by SNH and British Wind Energy Association (BWEA) (Percival et al. 1999[xi]) and expanded on in SNH (2006[xii]) and Percival (2007[xiii]) which are set out in Table 7.5; and
- The magnitude of the impact in relation to the resource which has been evaluated, based on Percival et al. 1999 and Percival 2007 which are set out in Table 7.6.

7.29 A matrix showing how nature conservation importance and impact magnitude are used to derive an assessment of the significance of effects is presented in Table 7.7.

7.30 The guidelines (Percival et al. 1999, Percival 2007) aim to make the evaluation of nature conservation importance straightforward. Both the value of the birds using a site with regard to the percentage of the population under consideration that it supports, and their conservation status (for example Schedule 1/Annex 1 and Scottish Biodiversity Listed species) are used along with other factors to assess the nature conservation importance of a site. These terms only set out to evaluate the importance of species however; habitat is not evaluated. Thus the nature conservation importance of a bird occurring in optimal, and hence possibly more productive, habitat is considered equal to that of a bird in a sub-optimal area.

7.31 It should be noted that the approach of this assessment is to also consider the value of the Site (and/or the airspace above it) for the species under consideration, rather than only considering the nature conservation importance of the species itself. To illustrate the rationale of this approach, while curlew would be considered to be a species of medium conservation importance using the criteria in Table 7.5, by virtue of being a Scottish Biodiversity Listed species, the value of a site which was only used occasionally by low numbers of this species and was not considered to support any breeding territories, is limited. Therefore, in this case, nature conservation importance would be assessed as being 'Low'.

7.32 Therefore, while the importance of the species is taken into account, in order to assess the nature conservation importance of the Site, the number of individuals of that species

using it and the nature and level of this use is also taken into account. An assessment is then made of the importance of the proposed development Site to that species.

Table 7.5: Definition of Terms relating to Nature Conservation Importance

Importance	Definition
Very high	A species which is part of the cited interest of an SPA or an SSSI. Species present in internationally important numbers.
High	Other non-cited species which contribute to the integrity of an SPA or SSSI. Ecologically sensitive species such as rare birds (<300 breeding pairs in the UK) and the less common birds of prey (e.g. golden eagle, honey buzzard, osprey, marsh harrier and hen harrier). A species present in nationally important numbers (>1% UK Population). A species listed on Annex 1 of the EU Birds Directive and/or Schedule 1 of the Wildlife and Countryside Act 1981 Regularly occurring relevant migratory species which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed development.
Medium	Species present in regionally important numbers (>1% of regional population). Species occurring within SPAs and SSSIs, but not crucial to the integrity of the site. Species on the Scottish Biodiversity List.
Low	Species covered above which are present very infrequently or in very low numbers. Any other species of conservation interest not covered above, e.g. species listed on the red or amber lists of Birds of Conservation Concern (Gregory et al. 2002).
Negligible	Species that remain common and widespread

Table 7.6: Definition of Terms relating to Magnitude of Impacts

Magnitude	Definition
Very High	Total loss or very major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether.
High	Major loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post development character/composition/attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation.

7.33 Table 7.7 illustrates a matrix that is used for guidance in the assessment of significance. Those effects that are shaded equate to those considered significant under with the others constituting no effect or an insignificant effect. The use of the category of ‘minor’ is used in acknowledgement that there are instances whereby there may be an effect,

albeit that this is not likely to be significant. It is also used to facilitate assessment of cumulative effects, for example where cumulatively several minor effects could be significant.

Table 7.7: Evaluation of Effects

Magnitude	Importance				
	Very High	High	Medium	Low	Negligible
Very High	Major	Major	Major	Minor	Negligible
High	Major	Major	Moderate	Minor	Negligible
Medium	Major	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Key

Significant in terms of the EIA regulations

Not significant in terms of the EIA regulations

7.34 On identification of a significant effect mitigation measures are then discussed to identify opportunities to reduce the effect. The chapter then concludes by identifying where residual environmental effects may still occur despite the employment of mitigation measures.

Baseline Environment

Designated Sites of Ornithological Importance

7.35 The MAGIC website indicates that the following SPAs, Ramsar sites and ornithological SSSIs are present within 20km of the Site (Table 7.8)

Table 7.8: Statutory Sites of Ornithological Interest within 20km of Deuchries

Site	Approximate distance from site at closest point	Qualifying species	Details
SPAs			
Troup, Pennan and Lion's head SPA	16.5km north-east	Guillemot	Breeding (29,902 pairs, at least 1.3% of E. Atlantic population)
		An internationally important assemblage of seabirds	Including razorbill, kittiwake, herring gull, fulmar and guillemot.
SSSIs			
Gamrie and Pennan Coast SSSI	9.6km north	Breeding seabirds	Guillemot (22,000 pairs), razorbill (2000), kittiwake (15,000) and fulmar (2000), as well as smaller numbers of puffins and shags.

7.36 In addition, the Reidside Moss SSSI is present approximately 2.4kmto the north west of the Site. Whilst birds are not a primary reason for notification, they are mentioned as additional features of interest: the designated site is a valley bog and the surrounding poor fen and scrub woodland supports an unusually wide range of associated birds.

Consultation

7.37 A consultation response was received from the RSPB North East Scotland Conservation Officer in October 2011. The RSPB do not hold detailed information from the search area. The RSPB did however provide the following general information for the area:

"The area holds populations of typical farmland birds found in Aberdeenshire. Of Red and Amber listed species there are breeding and wintering seed eaters such as corn bunting, yellowhammer, tree sparrow, skylark, linnet, reed bunting whilst in the winter there are also snow bunting and twite. Breeding waders include lapwing, curlew and possibly snipe. The area may also hold wintering raptors and owls including short-eared, barn and long eared owls plus merlin, peregrine, hen harrier and other commoner birds of prey. Pink footed geese and whooper swans use the area during the autumn, winter and spring and move widely across much of the farmland. Specially protected breeding species that are likely to occur in this area include barn owl and quail. Ospreys are also recorded within the Deveron Valley" (which is approximately 5km to the south of the site at the closest point) "during the summer months and may move more widely across the area".

Vantage Point Survey Data

Vantage Point Watches – 2010-2011 (breeding and winter seasons)

Target Species Flight Activity

7.38 Target species flight activity was dominated by two species: greylag goose and pink-footed goose. All of the pink-footed goose flights and 15 of the 17 greylag goose flights were recorded during the winter season. The majority of these flights were oriented in an east-west direction over the Site. Most of the birds were recorded commuting over the Site, with a smaller number of low levels flights to and from feeding areas on and adjacent to the Site. Greylag goose flocks ranged in size from 1-300 birds, with pink-footed goose flocks comprising 1-200 birds. No other target species was recorded on more than three occasions. The results of the vantage point watches are summarised in Table **7.**9, with flight lines illustrated in Figures 7.3 and 7.4.

Table 7.9: Summary details for target species flights, breeding season 2010 and winter 2010/11

Species	Total No. of Recorded Flights	Total No. of Flights through Collision Risk Volume (and individual birds)	Conservation Status'
Greylag goose	17	7 (522)	Amber
Pink-footed goose	17	8 (598)	Amber
Whooper swan	3	1 (13)	Annex 1, Schedule 1, SBAP, Amber
Goldeneye	1	0	Amber
Golden plover	2	1 (78)	Annex 1, SBAP. Amber
Peregrine	2	0	Annex 1, Schedule 1, SBAP

'Conservation Status:

Annex 1 = Rare breeding birds in Europe and protected under Annex 1 of the EC Birds Directive.

Schedule 1 = Rare breeding UK bird and protected under the Wildlife and Countryside Act 1981 (as amended).

SBAP = Species identified as being of principal conservation concern and listed on the Scottish Biodiversity List.

Amber = Species identified as being of medium conservation concern by leading conservation organisations (Eaton et al. 2009).

Secondary Species Flight Activity 2010-11

7.39 Three non-target species of raptors were recorded, with regular buzzard (1-3 individuals) and kestrel (1-2) activity throughout the year and a single record of a sparrowhawk during the winter season. Two non-target species of waders were recorded, with curlew activity throughout the year and a small number of snipe records. No other species of wildfowl, waders or raptors were recorded. No significant flocks were recorded, with the highest counts being 100 herring gulls, 100 rooks and 70 woodpigeons.

Vantage Point Watches – 2011-2012 (winter season)

Target Species Flight Activity

7.40 Target species flight activity was dominated by a single species, pink-footed goose. The majority of these flights were oriented in a north-east/south-west direction over the Site. Most of the birds were recorded commuting over the Site. Pink-footed goose flocks comprised 1-120 birds. Other target species include greylag goose, kestrel, golden plover and short-eared owl. The results of the vantage point watches are summarised in Table **7.**10, with flight lines illustrated in Figures 7.5 and 7.6.

Table 7.10: Summary details for target species flights, winter 2011/12

Species	Total No. of Recorded Flights	Total No. of Flights through Collision Risk Volume (and individual birds)	Conservation Status'
Greylag goose	5	2 (58)	Amber
Pink-footed goose	18	8 (278)	Amber
Kestrel	4	1 (1)	Amber
Golden plover	2	0	Annex 1, SBAP. Amber
Short-eared Owl	6	2 (2)	Annex 1, SBAP, Amber

'Conservation Status:

Annex 1 = Rare breeding birds in Europe and protected under Annex 1 of the EC Birds Directive.

Schedule 1 = Rare breeding UK bird and protected under the Wildlife and Countryside Act 1981 (as amended).

SBAP = Species identified as being of principal conservation concern and listed on the Scottish Biodiversity List.

Amber = Species identified as being of medium conservation concern by leading conservation organisations (Eaton et al. 2009).

Secondary Species Flight Activity 2011-12

7.41 Two non-target species of raptors were recorded, with regular buzzard (1-3 individuals) and occasional sparrowhawk activity during the winter season. One non-target species of wader was recorded, with a small number of snipe records. No other species of wildfowl, waders or raptors were recorded. No significant flocks were recorded, with the highest counts being a 100 strong mixed gull flock and 100 starlings.

Field Use by Geese and Swans 2010/11

7.42 Table 7.11 provides details of those records of field use by wildfowl recorded during VP surveys, with the location of flocks illustrated in Figure 7.7.

Table 7.11: Field use by geese and swans recorded during VP surveys

Species	Count	Date	Behaviour/Notes
Greylag goose			
GJ	80	18/12/10	Feeding and roosting/loafing in stubble field, present throughout VP survey
GJ	110	19/12/10	Flew in from west and landed in stubble field
GJ	235	10/01/11	Flew in from north in multiple groups and landed in field
GJ	2000	23/01/11	Mixed group with PG, but mainly GJ, present throughout VP survey.
GJ	500	23/01/11	In field, mixed flock with PG, but mainly GJ, present throughout VP survey

Species	Count	Date	Behaviour/Notes
Pink-footed goose			
PG	7	23/01/11	Landed in field
PG	600	06/02/11	Flew in from north and landed in field (local farmer reported that geese had been using this field for a 'few days')

Winter Walkover 2010-11Survey Data

7.43 The results of the 2010-11 winter walkover surveys are summarised in Table 7.12, with the location of wildfowl flocks illustrated in Figure 7.8.

Table 7.12: Summary of Winter Walkover Survey Results, winter 2010/11

Species	Count	Date	Behaviour	Location	Conservation Status
Whooper Swan	170	22.11.2010	Feeding	Outside of 500m buffer	Annex 1,Schedule 1, SBAP, Amber
	14	10.01.2011	Feeding/loafing	Field 174 (stubble)	
	53	06.02.2011	Feeding/loafing	Field 146 (stubble)	
Greylag goose	4	19.10.2010	Feeding	Field 114 (marshy grassland)	Amber
	95	22.11.2010	Feeding	Field 113 (rough grassland)	
	150	22.11.2010	Feeding	Outside 500m boundary	
	110	19.12.2010	Feeding/loafing	Field 171 (rough grassland)	
	40	06.02.2011	Feeding/loafing	Field 173 (stubble)	
	100	19.12.2010	Feeding/loafing	Field 174 (stubble)	
	260	10.01.2011	Feeding/loafing	Field 174 (stubble)	
	500 (GJ + some PG)	23.01.2011	Feeding/loafing	Field 156 (pasture)	
	500	23.01.2011	Feeding/loafing	Field 145 (stubble)	
	500	23.01.2011	Feeding/loafing	Field 146 (stubble)	
	1000 (GJ + some PG)	23.01.2011	Feeding/loafing	Fields 171 (rough grassland) & 165 (pasture)	
	40	06.02.2011	Feeding/loafing	Field 146 (stubble)	

Species	Count	Date	Behaviour	Location	Conservation Status
Pink-footed goose	700	06.02.2011	Feeding/loafing	Field 89 (stubble and cereal)	Amber
	2000	06.02.2011	Feeding/loafing	Outside 500m buffer	
	350	22.02.2011	Feeding/loafing	Outside 500m buffer	
Mallard	5	-	In Flight	Fields 28 (pasture) & 24 (pasture)	Amber
Teal	90	22.11.2011	Feeding/loafing	Field 113 (rough grassland - flooded)	Amber
	50	23.01.2011	Feeding/loafing	Field 113 (rough grassland - flooded)	
	27	20.03.2011	Feeding/loafing	Field 113 (rough grassland - flooded)	
Buzzard	1	19.10.2010	In flight	Field 88	-
	1	20.10.2010	In flight	Field 9	
	1	20.10.2010	In flight	Field 11	
	1	22.11.2011	In flight	Field 162	
	1	23.11.2011	Perched	Field 66	
	1	23.11.2011	Feeding	Field 66	
	1	06.02.2011	In flight	Field 147	
	1	06.02.2011	In flight	Field 142	
	2	22.02.2011	In flight	Field 48	
	2	20.03.2011	Feeding	Field 81	
Sparrowhawk	1	20.10.2010	In flight	Field 16	-
	1	26.03.2011	In flight	Field 24	
Kestrel	1	19.10.2010	In flight	Field 67	Amber
	1	19.10.2010	In flight	Field 88	
	1	22.11.2010	In flight	Field 125	
	1	23.01.2011	In flight	Field 28	
Peregrine	1	06.02.2011	In flight	Field 154 (stubble)	Annex 1, Schedule 1, SBAP.
Snipe	1	20.10.2011	In flight	Field 131 (marshy grassland)	Amber
	1	19.12.2010	In flight	Field 128 (pasture)	
Oystercatcher	2	20.03.2011	Roosting	Field 113 (rough grassland – flooded)	Amber

Species	Count	Date	Behaviour	Location	Conservation Status
Curlew	1	19.10.2011	In flight	Field 48 (pasture)	SBAP, Amber
	2	21.10.2010	Feeding	Field 69 (rough grassland)	
	3	21.10.2010	In flight	Field 91 (marshy grassland)	
Herring gull	50	21.10.2010	Feeding	Field 72	Red
	100	21.10.2010	Feeding	Field 176	
	100	21.10.2011	Feeding	Field 177	
	100	21.10.2011	Feeding	Field 178	
Starling	50	19.10.2010	Feeding	Field 76	Red
	250	19.10.2010	Feeding	Field 107	
	110	21.10.2010	Feeding	Field 148	
	70	21.10.2011	Feeding	Field 70	
	150	10.01.2011	Loafing	Field 24	
	160	06.02.2011	In flight	Field 81	
Snow bunting	60	22.11.2010	In flight	Field 146	Schedule 1, SBAP, Amber

'Conservation Status:

Annex 1 = Rare breeding birds in Europe and protected under Annex 1 of the EC Birds Directive.

Schedule 1 = Rare breeding birds in the UK and protected under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

SBAP = Species identified as being of principal conservation concern and listed on the Scottish Biodiversity List.

Red = Species identified as being of high conservation concern by leading conservation organisations (Eaton et al. 2009).

Amber = Species identified as being of medium conservation concern by leading conservation organisations (Eaton et al. 2009).

Winter walkover/Goose drive-around 2011-12 Survey Data

7.44 The results of the 2011-12 winter walkover/goose drive-around surveys are summarised in Table 7.13, with the location of wildfowl flocks illustrated in Figure 7.7.

Table 7.13: Summary of Winter Walkover/Goose Drive-Around Survey Results, winter 2011/12

Species	Count	Date	Behaviour	Location	Conservation Status
Whooper Swan	11	14.11.2011	Feeding	Field 146 (stubble field)	Annex 1,Schedule 1, SBAP, Amber
	8	15.01.2012	In flight	Outside 500m buffer; 2.5km south of Site	

Species	Count	Date	Behaviour	Location	Conservation Status
Mute Swan	7	14.11.2011	Feeding/loafing	Outside 500m buffer (Boghead Fishing Loch, 1km south-east of Site)	-
	4	13.02.2012	Loafing	Outside 500m buffer (Boghead Fishing Loch, 1km south-east of Site)	
Pink-footed goose	2000+	15.01.2012	Feeding	Outside 500m buffer; 2.5km south of Site (stubble field)	Amber
	1500+	13.02.2012	Feeding	Outside 500m buffer; 3km south-west of Site (stubble field)	
	500+	17.03.2012	Feeding	Outside 500m buffer; 2.5km south-west of Site (stubble field)	
Wigeon	27	14.11.2011	Feeding/loafing	Outside 500m buffer (Boghead Fishing Loch, 1km south-east of Site)	Amber
	15	13.02.2012	Loafing	Outside 500m buffer (Boghead Fishing Loch, 1km south-east of Site)	
	1	17.03.2012	Loafing	Outside 500m buffer (Boghead Fishing Loch, 1km south-east of Site)	
Mallard	4	14.11.2011	Feeding/loafing	Outside 500m buffer (Boghead Fishing Loch, 1km south-east of Site)	Amber
	10	17.03.2012	Loafing	Field 113 (waterbody/rough grassland)	
Teal	3	26.09.2011	Loafing	Field 114 (waterbody/marshy grassland)	Amber
	50+	14.11.2011	Feeding/loafing	Field 114 (waterbody/marshy grassland)	

Species	Count	Date	Behaviour	Location	Conservation Status
	30+	13.02.2012	Feeding/loafing	Field 113 (waterbody/rough grassland)	
	10	17.03.2012	Loafing	Field 113 (waterbody/rough grassland)	
Buzzard	1	26.11.2011	In flight	Field 91	-
	1	16.10.2011	In flight	Field 54	
	1	12.12.2011	In flight	Field 24	
	1	12.12.2011	Loafing	Field 79	
	1	13.12.2011	In flight	Field 76	
	1	13.12.2011	In flight	Outside 500m buffer	
	1	15.01.2012	In flight	Field 85	
	1	15.01.2012	In flight	Field 86	
	1	13.02.2012	In flight	Outside 500m buffer	
	1	13.02.2012	Loafing	Field 82	
	1	13.02.2012	Loafing/in flight	Outside 500m buffer	
	1	17.03.2012	In flight	Outside 500m buffer	
Sparrowhawk	1	26.09.2011	In flight	Field 153	-
	1	15.10.2011	In flight	Field 152	
Kestrel	1	15.01.2012	In flight	Field 75	SBAP, Amber
	1	13.02.2012	In flight	Outside 500m buffer	
Oystercatcher	2	17.03.2012	Feeding	Field 113 (waterbody/rough grassland)	Amber
Lapwing	12	17.03.2012	Feeding	Field 79 (pasture)	SBAP, Red
Starling	200+	14.11.2011	Roosting in Tree	200m East of Field 108	Red
Fieldfare	50+	14.11.2011	Feeding	Outside 500m buffer (stubble field)	Schedule 1, SBAP, Amber

‘**Conservation Status:**

Annex 1 = Rare breeding birds in Europe and protected under Annex 1 of the EC Birds Directive.

Schedule 1 = Rare breeding birds in the UK and protected under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

SBAP = Species identified as being of principal conservation concern and listed on the Scottish Biodiversity List.

Red = Species identified as being of high conservation concern by leading conservation organisations (Eaton et al. 2009).

Amber = Species identified as being of medium conservation concern by leading conservation organisations (Eaton et al. 2009).

Territory-Mapping Surveys

Breeding Territories

7.45 The results of the 2010 breeding bird territory mapping surveys are illustrated in Figure 7.9 and detailed in Table 7.14. The assemblage of breeding birds is considered to be typical of lowland farmland habitats in the region.

7.46 Within a 200m buffer around the proposed turbine locations, four pairs of grasshopper warbler and three pairs of reed bunting were recorded as breeding within the marshy grassland habitats. In addition, field boundaries and scattered trees within this area were found to support low densities of passerine species of conservation concern, including skylark (two pairs), tree sparrow (one pair), linnet (one pair) and yellowhammer (two pairs).

7.47 Outside of the 200m buffer zone, the assemblage was dominated by skylark and meadow pipit territories within the fields, with a typical range of farmland passerines breeding along field boundaries and within plantation woodlands. Snipe was the only species of breeding wader recorded, in the northern part of the Site. Breeding raptors comprised a single territory each of kestrel and buzzard. Only a single species of breeding wildfowl, mallard, was recorded, on a pond adjacent to the south-western Site boundary.

Table 7.14: Breeding Bird Territories recorded at Deuchries in 2010

Species	Number of territories within Site boundary	Number of territories within 200m buffer of turbines	Conservation Status*
Mallard	1	0	Amber
Buzzard	1	0	-
Kestrel	1	0	SBAP, Amber
Pheasant	14 individuals		-
Snipe	1	0	Amber
Stock dove	1	0	Amber
Woodpigeon	32 individuals		-
Skylark	16	2	SBAP, Red
Swallow	2	0	Amber
House martin	1	0	Amber
Meadow pipit	15 pairs		Amber
Wren	1	1	-
Dunnock	0	1	Amber
Blackbird	1	0	-
Song thrush	2	0	SBAP, Red

Species	Number of territories within Site boundary	Number of territories within 200m buffer of turbines	Conservation Status*
Grasshopper warbler	0	4	Red
Willow warbler	6	2	Amber
Great tit	1	0	-
Carrion crow	3 pairs		-
Starling	5	0	Red
House sparrow	12	0	Red
Tree sparrow	1	0	SBAP, Red
Chaffinch	8 pairs		-
Linnet	3	1	SBAP, Red
Yellowhammer	5	2	Red
Reed Bunting	0	3	SBAP, Red

***Conservation Status:**

SBAP = Species considered to be of principal importance for conservation in Scotland by the Scottish Ministers, satisfying Section 2(4) of the Nature Conservation (Scotland) Act 2004.

Red = Species identified as being of high conservation concern by leading conservation organisations (Eaton et al. 2009).

Amber = Species identified as being of medium conservation concern by leading conservation organisations (Eaton et al. 2009).

Non-breeding Birds

7.48 The following non-breeding birds or groups were recorded during the territory mapping surveys: rook (306 individuals), jackdaw (four individuals) and pied wagtail (four individuals).

Information Gaps

7.49 It is considered that the programme of ornithological surveys undertaken at the Site in 2010 and 2011 is sufficient to enable a robust assessment of the bird assemblage present throughout the year, in line with SNH guidance (2010).

Evaluation of Bird Records

7.50 This section evaluates the ornithological importance of the Development, in regional, national and international contexts. When considering bird populations, importance is often taken as meaning that a site supports at least 1% of a population under consideration at regional, national or international level. With the exception of a few species however, estimates of regional population size are often unavailable, or only occur for one season of the year. In most cases, therefore, professional judgement and extrapolation from national population estimates and breeding ranges, is used to determine whether species present are likely to occur in regionally important numbers. Unless stated otherwise, the 'region' refers to the area within the North-East Scotland recording area covered by the NE Scotland Bird Reports, which includes Aberdeenshire

and Aberdeen. The appropriate Natural heritage Zone is the North-East Coastal Plain, which covers a similar area to the North-East Scotland recording area. National populations refer to the UK.

7.51 The species that have a conservation importance of medium or above (see Table 7.5) are the focus of the evaluation and assessment sections. Low importance species are not considered in detail, as effects on these species cannot be significant in EIA terms.

Target species

Pink-footed goose

7.52 Pink-footed geese were recorded in fields within 200m of proposed turbine locations on a single occasion, comprising a maximum of 700 birds feeding and loafing in a stubble field on 6th February 2011. On the same day, 2,000 pink-footed geese were recorded in a field approximately 3km to the south of the nearest turbine. A flock of 350 were recorded approximately 2km to the north-east of the nearest turbine on 22nd February 2011.

7.53 The species was also recorded using fields as part of mixed flocks with greylag geese on 23rd January 2011 (always as the minority species), with a peak count of 2000 geese, located approximately 1km to the north-east and 1.5km to the north of the nearest turbines. The species was recorded using fields within the survey area on three of the seven walkover surveys in 2010/11. No field utilisation by this species within the site boundary was recorded in winter 2011/12, with three flocks recorded in the survey area (2000, 1500 and 500 individuals respectively) but each at least 2.5km from the Site.

7.54 Vantage point surveys in 2010/11 recorded a total of 17 pink-footed goose flights, mainly of birds commuting over the Site in an east-west plane, with flock sizes ranging from 1 to 200 birds. Six flights were recorded flying through the collision-risk window, comprising 584 individuals. In 2011/12, a total of 18 flights were recorded, comprising 278 individuals through the collision-risk window. The GB population was estimated at 360,000 individuals in 2004/05-2008/09 (Musgrove et al. 2011[xiv]), with approximately 200,000 in Scotland in October, decreasing to 100,000-150,000 during the winter and spring (Forrester et al. 2007).

7.55 The GB population of this species is increasing (WWT, 2011[xv]). The species is a common winter visitor in North East Scotland, with a regional count of 53,068 individuals in November 2010, 35,448 in November 2009 and 40,037 in November 2008 (WWT 2011). The peak count at Loch of Strathbeg in December 2009 was 37,000, with 16,780 at Loch of Skene in the same month and 14,000 at Meikle Loch in October (NE Scotland Bird Report [NESBR] 2009[xvi]). The five year mean (95/96-99/2000) for Loch of Strathbeg is 36,433 individuals and 17,300 at Meikle Loch over the same period (Mitchell & Hearn 2004[xvii]). On this basis the Site and adjacent land is considered to be of medium importance for pink-footed geese.

Greylag goose

7.56 No greylag geese were recorded as using fields within 200m of proposed turbine locations. Between the 200m buffer and the Site boundary, a peak count of 2,000 geese were recorded in a mixed flock of greylag and pink-footed geese, the majority of which were greylags, on 23rd January 2011. Approximately 1,000 greylag geese were recorded in this area on the same day as two single-species flocks. The only other greylags recorded in fields on Site were a group of 40 birds in February 2011.

7.57 Within a 500m buffer of the Site boundary, a peak of 500 greylag geese was recorded on a single day in January 2011. A further six flocks, ranging in size from 4 to 260 birds, were recorded between November and January. Outside of the 500m buffer, a single flock of 150 greylags was recorded. No field utilisation by this species was recorded during walkover surveys in winter 2011/12.

7.58 This species was recorded in flight on 17 occasions during vantage point surveys in 2010/11, comprising flocks of one to 300 birds and generally commuting over the Site in an east-west orientation. Five flights went through the collision-risk window, comprising 514 individual birds. In 2011/12, 58 individuals were recorded passing through the collision-risk window. The UK wintering populations were estimated at 81,900 individuals (Icelandic birds, 1994-99 count), 9,620 individuals (NW Scotland, 1997) and 30,900 individuals (re-established, 1999), giving a total of 122,420 individuals (Baker et al. 2006[xviii]). The Scottish wintering population was estimated at 85,000+ (not including resident breeders comprising c.25,000 post-breeding birds, Forrester et al. 2007) and the species is regarded as a common winter visitor in North East Scotland (NESBR 2009). A peak of 2,046 individuals was recorded from four sites in the region in December 2009 (NESBR 2009).

7.59 The Icelandic-breeding goose count from North-East Scotland totalled 1,154 individuals in November 2010, 522 in November 2009 and 1,615 in 2008 (WWT 2011). It is estimated that the region supports c.200-300 breeding greylag goose individuals (Mitchell et al. 2010[xix]). The peak count of c.2,500 greylag geese is significant in a national context (i.e. >1% of the national population), however, the average count throughout the winter of c.489 birds per month (October to March) is only significant in a regional context. On this basis, the Site is considered to be of medium importance for this species.

Whooper swan

7.60 No whooper swans were recorded in fields within 200m of proposed turbine locations. Three flocks were recorded feeding in fields during winter 2010/11, with 53 birds approximately 800m to the northeast of the nearest proposed turbine, 170 birds approximately 1.5km to the north-east and 14 birds 1.5km to the north. Feeding flocks were recorded in November, January and February. In 2011/12 a single flock of 11 individuals was recorded 1km to the north-east of the nearest turbine, with a flock of eight individuals approximately 2.5km to the south. Vantage Point surveys in 2010/11 recorded three whooper swan flights, comprising four to 13 individuals. No flights were recorded in 2011/12. The UK wintering population was estimated at 6,920 individuals over the period 1994-99 (Baker et al. 2006), the Scottish population at 4,142 individuals

(Forrester et al. 2007) and the species is regarded as a common winter visitor in North East Scotland (NESBR 2009). The survey area is considered to be of medium importance for this species.

Teal

7.61 Teal was recorded on three occasions during the winter season, in an area of flooded ground approximately 1km to the northeast of the nearest turbine. Group size ranged from 27 to 90 individuals. No teal were recorded during VP surveys. The UK wintering population was estimated at 197,000 individuals for the period 1994-99 (Baker et al. 2006), the Scottish population at 37,500 (Forrester et al. 2007) and the species is a common winter visitor in North East Scotland (NESBR 2009). The survey area is considered to be of low importance for this species.

Goldeneye

7.62 Goldeneye was recorded on a single occasion, comprising three birds commuting over the Site in April. This species is a common winter visitor and passage migrant in North East Scotland (NESBR 2009), with a UK population of approximately 35,000 individuals for the period 1994-99 (Forrester et al. 2007). The data indicate that the Site and airspace above it is of negligible importance for this species.

Golden plover

7.63 Two flocks of golden plover were recorded during VP surveys in April and May 2010, comprising 11 and 78 birds. No other golden plovers were recorded. The UK golden plover population was estimated at 310,000 individuals in the period 1981-1992 (Baker et al. 2006), with a Scottish population of 25,000-35,000 individuals in winter (Forrester et al. 2007) and the species is a common passage migrant and winter visitor in North East Scotland (NESBR 2009). The Site is considered to be of negligible importance for this species.

Peregrine

7.64 Two peregrine flights were recorded during VP watches, each of a single bird on the same day in November 2010, flying low through the centre of the Site. A single peregrine flight was recorded during the winter walkover surveys, of a single bird in the north-eastern corner of the 500m buffer (around the proposed turbines) in February. This species was not recorded during the breeding season VP or walkover surveys. The Scottish wintering population was estimated at 2000-2500 individuals (Forrester et al. 2007), and the species is classed as an uncommon resident in North East Scotland (i.e. 5-50 records per year, however 214 records were received in 2009, NESBR 2009). It is concluded that the survey area is of low importance for this species.

Short-eared Owl

7.65 No short-eared owls were recorded in 2010/11. Surveys in winter 2011/12 recorded a total of six flights, two of which were within the collision-risk volume. The short-eared owl population in Great Britain is estimated at 1,000-3,500 breeding pairs (Baker et al. 2006) and the species is regarded as a locally common resident, passage migrant and

winter visitor to coastal areas in the region (NESBR 2009). The Site is considered to be of low importance for this species.

Non-Target Species (Schedule 1 and Scottish Biodiversity List)

Raptors

7.66 It is concluded that the Site formed part of a single kestrel breeding territory in 2010 and the species was regularly recorded in flight throughout the year from VP surveys, with a maximum of two individuals observed. The species was also recorded in flight on four occasions during winter walkover surveys. The UK kestrel population is estimated at 36,800 breeding pairs (2000, Baker et al. 2006), the Scottish population at 7,500-7,800 pairs (Forrester et al. 2007) and the species is a common resident in the region (NESBR 2009). The Site is therefore considered to be of low importance for this species.

Waders

7.67 No curlew breeding territories were confirmed within the Site, however, the species was recorded regularly throughout the year during VP surveys, highlighting the presence of breeding birds in the local area. The species was recorded on three occasions during winter walkovers, with a maximum of three birds observed. Curlew is a common resident and winter visitor in North East Scotland (NESBR 2009), with an estimated UK population of 164,700 individuals in winter (1994-99, Baker et al. 2006). The Site is considered to be of negligible importance for this species.

Others – Passerines

7.68 A flock of 60 snow buntings was recorded flying over the Site in November 2010, however no other records were obtained for this species within the survey area. Snow bunting is a common passage migrant and winter visitor in North East Scotland (NESBR 2009), with an estimated UK wintering population of 10,000-15,000 individuals (1981-84, Baker et al. 2006). The Site is considered to be of negligible importance for this species.

7.69 A total of 18 skylark breeding territories were recorded within the Site in 2010. No post-breeding or wintering flocks were recorded. The UK skylark population was estimated at 1,785,000 breeding territories in 2000 (Baker et al. 2006) and the species is a common resident and partial migrant in the region (NESBR 2009). The Site is therefore considered to be of low importance for skylark.

7.70 Two song thrush breeding territories were recorded on Site in 2010. Song thrush is a common resident species in North East Scotland (NESBR 2009) with an estimated UK population of 1,144,000 breeding territories (Baker et al. 2006). The Site-based population is considered to be of low importance.

7.71 A single tree sparrow breeding territory was recorded on Site in 2010. No wintering flocks of this species were recorded. The UK tree sparrow population was estimated at 68,000 territories in 2000 (Baker et al. 2006) and the species is a locally common

resident in North East Scotland, with most records from rural areas within 20 miles of the coast (NESBR 2009). The Site is considered to be of low importance for this species.

7.72 A total of four linnet breeding territories were recorded in 2010, however no wintering flocks were recorded. The UK Linnet population is estimated at 556,000 breeding territories in 2000 (Baker et al. 2006) and the species is a common resident in the region, being recorded in 46% of the 1km grid squares monitored by the BBS survey in 2009 (NESBR 2009). The Site-based population is therefore considered to be of low importance for this species.

7.73 Three reed bunting breeding territories were recorded on Site in 2010. An estimated 192,000-211,000 reed bunting territories were present in the UK in 2000 (Baker et al. 2006) and the species is a common resident in the region, and was recorded in 33% of BBS squares in 2009 (NESBR 2009). The Site is therefore considered to be of low importance for this species.

7.74 A total of four grasshopper warbler breeding territories were recorded on Site in 2010. The UK population was estimated at 11,750 pairs in the period 1988-91 (Baker et al. 2006) and the species is regarded as an uncommon summer visitor in the region (NESBR 2009). The Site is therefore classified as being of medium importance for this species.

Non-Target Species (Others)

7.75 In addition to those species evaluated above, the Site was found to support 12 breeding species and five wintering species that are red or amber listed. None of these species occur in regionally important numbers and each of the Site-based populations is therefore considered to be of low importance. The survey data indicates that the Site is of negligible importance for each of the remaining species recorded on Site.

Predicted Trends in Absence of the Development

7.76 In the absence of the Development, there are no known plans in place that would significantly alter the habitats present on the Site and adjacent land. It is therefore assumed that without the Development, the bird assemblage would not differ significantly from that characterised by the 2010/11 bird surveys, over the 25 year life-cycle of the Development.

Project Characteristics

Measures to Minimise Impacts that are Inherent in the Development

Site Selection

7.77 The feasibility study indicated that the Development would not lie within or adjacent to a site designated at a European (e.g. SPA) or National (e.g SSSI) level for its ornithological interest. There are no statutory sites of ornithological interest within 2km

of the Site, the closest being Reidside Moss SSSI, approximately 2.4km to the north-west and notified on the basis of the semi-natural habitats present.

Land-Take

7.78 Access tracks would utilise existing roads or tracks wherever possible to minimise land-take, with the majority of the access route located along upgraded, existing routes.

Cabling

7.79 The route and nature of the grid connection does not form part of the Development planning application and is yet to be finalised. However, for the purposes of the planning application it is assumed that the grid connection would comprise a 33kv underground cable that would route through the Site, with a T-connection into the existing 33kV transmission line between Turriff and Aberchirder, which runs close to the southern boundary of the Site.

7.80 The line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) as part of the consenting procedure for this element of infrastructure. However, given the nature of the Development and the cable route through the Site, potential effects associated with the grid connection are considered unlikely to differ from those identified in the following impact assessment.

Generic Mitigation Measures to Protect Breeding Birds

Construction Phase

7.81 Vegetation clearance would be undertaken outside of the core bird breeding season (March to August inclusive) wherever possible. Should vegetation clearance be required during the breeding season, then a survey for nesting birds would be undertaken by an appropriately qualified ecologist and works would only proceed if active nests are absent. Should active nests be found, then works would be avoided in the affected areas, which would be demarcated by fencing.

Predicted Impacts

7.82 This section assesses the likely significant effects of the Development on the bird species recorded at Deuchries, focussing on those three species (pink-footed goose, greylag goose and whooper swan) identified as being of medium importance or above. The magnitude of impacts upon these receptors is determined by reference to the extent to which key elements and/or features of the baseline conditions would be altered by the Development. This is based upon guidelines described in paragraphs 7.33-7.34.

Construction Impacts

Displacement

7.83 Construction activities may temporarily displace some birds using the Site and surrounding areas, the level of impact depending on:

- The timing of potentially disturbing activities;
- The degree of displacement (spatially and temporally);
- The size, suitability and proximity of habitats available for displaced birds to occupy;
- The capacity of alternative habitats to accommodate birds.

7.84 Disturbance impacts on birds due to construction activities of this type have received little attention in the literature. This is largely as a result of two factors:

- Disturbance during construction is generally short-term, occurring over no more than a 12 month period (and would be a period of 7 months for the Development); and
- It is generally accepted that potentially the more significant impacts on birds as a result of wind farms are related to operational disturbance and collision mortality and, therefore, most studies of wind farm - bird interactions focus on these issues.

7.85 It is likely that construction impacts would be greatest on species that are intolerant of noise and other sources of disturbance. Current evidence suggests that impacts on many common species will be relatively low because they are able to habituate to disturbance close to otherwise favourable habitats. Examples include waders such as oystercatcher, ringed plover and common sandpiper that occupy habitats associated with working opencast sites, and curlews which breed close to active opencast voids. Golden plover were recorded breeding within the working area of Farr wind farm in Northern Scotland during both breeding seasons when construction was being carried out (LWP, 2006[xx]). At Hare Hill wind farm (Ayrshire), species such as skylark and meadow pipit continued to breed on site during construction (Shepherd, 2002[xxi] and 2003[xxii]) and this was also observed to be the case at Minsca Wind Farm in Dumfries and Galloway for species including curlew, snipe, skylark and meadow pipit (Entec, 2007[xxiii]).

Pink-footed goose, greylag goose and whooper swan

7.86 Geese and swans are susceptible to disturbance when foraging. For example, a study from Denmark indicates that displacement of pink-footed geese as a result of disturbance from roads used by more than 20 cars per day can extend over a distance of 500m (Madsen 1985[xxiv]). Studies on whooper swans in Scotland found that the most types of disturbance alerted swans at distances between 200 and 350m, for example a car alerted geese at c.200m, a construction vehicle at c.250m and a pedestrian at c. 250m (Rees et al. 2005[xxv]). Only active bird scaring techniques and aircraft disturbed swans at significantly greater distances. Pink-footed geese were recorded using fields within 500m of the proposed turbine locations and access tracks on a single occasion,

with a maximum of 700 individuals in Field 89 only. All other records of foraging and loafing pink-footed geese were from fields located more than 500m from proposed turbine locations and wind farm infrastructure, mainly to the north of the Development area. It is considered that Field 89 would become unavailable to this species for a single winter season as a result of construction disturbance, but that this would constitute an impact of low magnitude, given that the majority of the fields used by this species within the survey area would remain available and that the impact would be temporary. Using the matrix in Table 7.7, the significance of this effect is minor (i.e. not significant in EIA terms).

7.87 No records of greylag geese were recorded from fields within 500m of proposed turbine locations or access roads. The closest record was a flock of 2,000 (including a small number of pink-footed geese) from approximately 800m to the north-east of the nearest turbine. This species was recorded throughout the winter season, with the majority of records from over 1km to the north of any proposed wind farm infrastructure. On this basis, it is considered that the impact of construction disturbance on greylag geese will be negligible. The effect significance is therefore also negligible.

7.88 No field utilisation by whooper swans was recorded within 500m of proposed turbines or wind farm infrastructure, with the closest record being approximately 800m to the north-east. The other two records of field use were from over 1km to the north and north-east of the development area. It is therefore concluded that the impact magnitude of construction disturbance on this species would be negligible. The significance of this effect using the matrix in Table 7.7 is also negligible.

Other target species

7.89 No field utilisation by any other target species of wildfowl or waders was recorded within 500m of the turbines or wind farm infrastructure. Two peregrine flights were recorded within a 200m buffer of the proposed turbines, no hunting behaviour was recorded. Therefore, impacts on the remaining target species are considered to be negligible. The effect significance is therefore also negligible.

Breeding birds of conservation concern

7.90 Seven species of conservation concern were recorded as breeding within 200m of proposed turbine locations, comprising a small number of territories of widespread species that are common on lowland farmland in the region. Studies indicate that the majority of these breeding territories will be tolerant of construction disturbance, and coupled with the short-term nature of the impact, it is considered that the impact magnitude would be low. For grasshopper warbler, the effect significance is minor and not significant in EIA terms. For each of the other species the effect significance is negligible.

Wintering birds of conservation concern

7.91 In addition to target species, the following four species of conservation concern were recorded using fields within the survey area during winter walkover surveys: oystercatcher, curlew, herring gull and starling. The majority of recorded field utilisation

by these species was more than c.500m from proposed turbine locations and infrastructure and the potential impacts of operational disturbance on these feeding and loafing flocks are therefore considered to be negligible. Two of the records were from fields within 500m, with two curlew individuals feeding in Field 69 (approximately 400m from the nearest turbine, 300m from access track) and 70 starlings feeding in Field 70 (approximately 500m from the nearest turbine). It is considered that at these distances and given that these fields were only recorded in use on a single occasion, the impact of construction disturbance on these two species would be negligible. The effect significance is therefore also negligible.

Operational Impacts

Land-Take

7.92 The construction of the Development would result in the permanent loss of approximately 1.36ha, of habitat, primarily semi-improved neutral, species-poor semi-improved and improved grassland. The total Site area is c.363ha, so approximately 0.4% of the Site would be permanently lost. Therefore, the direct loss of nesting and foraging habitat for birds would be very small and it is predicted that the magnitude of this impact and overall effect would be negligible.

Displacement

7.93 Published information (e.g., Vauk 1990[xxvi], Phillips 1994[xxvii], Percival 2000[xxviii] & 2005[xxix] and Devereux et al. 2008[xxx]) and reviews of impacts (e.g. Crockford 1992[xxxi], Benner et al. 1993[xxxii], Winkelmann 1994[xxxiii], Langston and Pullan 2003[xxxiv] and Hötker et al. 2006[xxxv]) suggest that most birds are affected only slightly by the presence of operational wind farms.

7.94 Studies have shown that breeding birds are not affected at distances greater than 300m from a turbine (Gill et al. 1996 and Percival 1998 & 2005). A synthesis of European work (Hötker et al. 2006) discovered no statistically significant negative effect on the population of any bird species (including wader and passerine species similar to those found in the Development area such as skylark and meadow pipit) during the breeding season.

Pink-footed goose, greylag goose and whooper swan

7.95 Research into field utilisation by wintering pink-footed geese in a Danish farmland landscape indicates that avoidance distance of wind farms operates over a distance of c.100m (turbines in lines) and c.200m (turbines in clusters) (Larsen & Madsen 2000[xxxvi]). A follow-up paper presents evidence of habituation of geese to wind turbines (Madsen and Boertmann 2008[xxxvii]). At one wind farm, geese kept a distance of c.100m from turbines and did not enter the wind farm area, at a second they kept a distance of c.40m and foraged between turbines and at a third they kept a distance of c.50m. Other research has recorded reduced densities of white-fronted geese within 600m of turbines in Germany (Kruckenberg and Jaene 1999[xxxviii]) and reduced densities of barnacle geese were recorded on farmland in Germany, with no foraging within 350m (Kowallik and Borbach-Jaene 2001[xxxix]). A study of the same population of barnacle

geese from Sweden recorded foraging within 25m of turbines in saltmarsh habitat (Percival 2003). It was concluded that where few alternative feeding areas are available, geese are forced to forage close to the turbines. Hotker (2006) highlights that geese are particularly sensitive to disturbance from turbines, with the majority of studies recording a minimum avoidance distance of wintering geese to turbines of c.250-450m. A study into the impacts of human disturbance on wintering whooper swans indicates that most types of disturbance (e.g. cars, vans and pedestrians) operate over a distance of 200-350m (Rees et al. 2005).

7.96 Field utilisation by pink-footed geese within 500m of proposed turbines was recorded on only a single occasion, with 600 birds seen flying in and landing in Field 89 and a flock of 700 individuals recorded feeding and loafing within the same field on the same day. The farmer reported that geese had been using this field for a few days. This field is located adjacent to a proposed access track, which would be located along the route of an existing track, and approximately 100m from the nearest turbine at the closest point. Sections of the field are, however, over 250m from the nearest turbine. An additional six flocks of this species were recorded within the survey area, five records between 800m and 2km to the north/north-east and one approximately 3km to the south of the nearest turbine. The research indicates that this species is likely to continue to use sections of this field during the operational phase, given the distance from the nearest turbine. In addition, the magnitude of any disturbance impact is likely to decrease over the life-time of the wind farm as geese habituate to the presence of turbines. As a precaution however, it is concluded that this species would potentially be displaced from Field 89 as a result of operational disturbance, and that each of the other fields within the survey area in which this species has been recorded would remain suitable. Similar agricultural field habitats are however common in the local area and the agricultural field feeding resource is not considered to be a limiting factor on the regional pink-footed goose population. It is considered that this would be an impact of low magnitude, given that Field 89 was only recorded in use on a single occasion (albeit probably for a few consecutive days) during the winter season. This is an effect of minor significance and not significant in EIA terms.

7.97 No records of field utilisation by greylag geese or whooper swans was recorded within 500m of proposed turbine locations, with the closest records for both species from approximately 800m to the north-east of the nearest turbine. It is therefore considered that operational disturbance would have a negligible impact on these two species. The significance of the operational disturbance effect for both species is therefore negligible.

Other target species

7.98 No field utilisation by any other target species of wildfowl or waders was recorded within 500m of the proposed turbines or wind farm infrastructure. Two peregrine flights were recorded within a 200m buffer of the proposed turbines and the results did not indicate that this area is used by this species for foraging. Therefore, impacts on the remaining target species are considered to be negligible. The effect significance is therefore also negligible.

Breeding Birds of conservation concern

7.99 A study by the RSPB found significantly reduced breeding densities within 500m of turbines for the following species recorded as holding breeding territories within 500m of proposed turbine locations at Deuchries: snipe (47.5% reduction), buzzard (41.4% reduction in flight activity) and meadow pipit (14.7% reduction) (Pearce-Higgins et al. 2009[xl]). No significant impact was found for the following species recorded as breeding within 500m of turbine locations at Deuchries: kestrel and skylark. A review by Hotker (2006) indicates that avoidance distances greater than 200m from turbines are exceptional for skylark and reed bunting. A study of wintering farmland birds in East Anglia found that turbine location did not significantly affect the distribution of four groups of birds (seed-eaters, corvids, gamebirds and skylarks) at distance bands ranging from 0-150m to 600-750m from turbines. An analysis of the 0-75m and 75-150m distance bands found no evidence to suggest that birds avoided land close to turbines. These studies indicate that there is likely to be no significant impact of operational disturbance on breeding skylark and kestrel at the Site. Snipe was recorded approximately 600m from the nearest turbine and therefore is likely to be unaffected by disturbance. It is therefore concluded that the impacts of operational disturbance on breeding birds of conservation concern would be negligible, and that any minor displacement would be accommodated by surrounding habitats. The effect significance is therefore negligible.

Wintering birds of conservation concern

7.100 Two additional species of conservation concern were recorded feeding/loafing in fields within 500m of proposed turbine locations during winter walkover surveys, each on a single visit only. Two curlew individuals were recorded feeding in Field 69 (approximately 400m from the nearest turbine) and 70 starlings feeding in Field 70 (approximately 500m from the nearest turbine). At these distances from proposed turbines and given that these fields were recorded in use on only a single occasion, it is considered that the impact of operational disturbance on these two species during the winter season would be negligible. The effect significance is negligible.

Collision with Turbines

7.101 The level of collisions with turbines will depend on the extent to which birds are displaced and the ability of birds to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed outright or fatally injured.

7.102 The indications from studies published to date (reviewed in Crockford 1992, Benner et al 1993, Winkelman 1994 and Hötker et al 2006) are that collisions are rare events and occur mainly at sites where there are unusual concentrations of birds and turbines, or where the behaviour of the birds concerned leads to high-risk situations. Examples include migration flyways, areas where the food resource within the wind farm is exceptional, and “wind wall” turbine layouts. Recently published/publicised information suggests that some species are exceptions to the rule and may be susceptible to collision with turbines, such as red kites in Germany (Dürr 2011[xli]) and white-tailed eagles, that have been recorded colliding with turbines in Norway (Bevanger et al 2009).

7.103 The passerines nesting within the wind farm would be expected to be regularly flying between turbines and could therefore be expected to be most at risk of collision. However, evidence suggests that these birds collide with turbines only infrequently, and most of the species concerned are of low or negligible nature conservation importance. Collision is therefore mainly considered in relation to species of high sensitivity (e.g. target raptor species) and species not particularly manoeuvrable in flight, such as geese and swans (SNH 2002). The following species have been considered at Deuchries: whooper swan, pink-footed and greylag goose, goldeneye, peregrine and golden plover.

7.104 Hötker et al (2006) produced a summary of all known European collision victims based on the work of Tobias Dürr and others (this is regularly updated by Dürr). A summary of the collisions Hötker et al recorded for those target species of medium importance or above recorded during VP watches at the Site is presented in Table 7.15.

Table 7.15: Collisions of species that are found at Deuchries as recorded in European studies (from Hötker 2006 & Dürr 2011)

Species	Collisions (individuals)	Country in which collision occurred	European breeding (b) and wintering (w) population
Whooper swan	2	Germany (1) and Norway (1)	Unavailable. GB wintering population of 11,000 individuals (Musgrove 2011)
Pink-footed goose	-	-	50,000 – 69,000 pairs (Bufield and Van Bommel 2004)
Greylag goose	7	Belgium (1), Germany (3) and Norway (3).	100,000 – 145,000 pairs (Bufield & Van Bommel 2004)
Goldeneye	0	N/A	290,000-380,000 pairs (Bufield & Van Bommel 2004)
Peregrine	9	Belgium (2), Germany (4), Spain (2) and Great Britain (1).	11,000-24,000 pairs (Bufield & Van Bomme 2004)
Golden Plover	20	Germany (14), Netherlands (1), Norway (4) and Sweden (1).	436,000-645,000 pairs (Bufield & Van Bommel 2004)

7.105 SNH guidance recommends that possible bird collisions at proposed wind farms are calculated using the model developed by W. Band (Band et al. 2007[xlii]) and this has been undertaken for both pink-footed goose and greylag goose at Deuchries. The other target species recorded during vantage point watches were either recorded at such low frequencies (whooper swan and golden plover) that their risk of collision with turbines is negligible or, in the case of goldeneye and peregrine, flights were outside of the collision-risk volume. The significance of the collision effect on these species is therefore also negligible.

Pink-footed goose

7.106 Collision-risk modelling predicts an annual collision rate of 2.16 pink-footed goose individuals, using the 99% avoidance rate recommended by SNH. Collision-risk modelling calculations are presented in Appendix 7.2. The CRA was carried out using data from 2010-11, when goose activity was at its' greatest. Comparatively data from 2011-12 produced an annual collision rate of 0.41 pink-footed goose individuals. The

regional population varied between approximately 35,000 and 53,000 individuals (November counts) between 2008 and 2010 and the background mortality rate for this species is approximately 18% for adults and 22.5% for juveniles (Robinson 2005[xliii]). The predicted collision rate is not significant in the context of the regional population (constituting 0.006-0.004% of the regional population) and the background mortality rates for this species. The impact magnitude is considered to be low. The effect significance is therefore minor and not significant in EIA terms.

Greylag goose

7.107 Collision-risk modelling predicts an annual collision rate of 2.43 greylag goose individuals, using the 99% avoidance rate recommended by SNH. Collision-risk modelling calculations are presented in Appendix 7.3. The CRA was carried out using data from 2010-11, when goose activity was at its' greatest. Comparatively data from 2011-12 produced an annual collision rate of 0.06 greylag goose individuals. The Scottish population was estimated at 110,000 individuals during the winter, including both migratory and resident populations (Forrester et al. 2007), with an average regional count of 1,097 individuals between 2008-2010. The background mortality rate for this species is 17% for adults and 44% for juveniles. The additional predicted collision mortality would increase the background mortality rate in the region by 0.22%, which is not significant (i.e. accounts for less than 1% of the population). It is considered however that it is more appropriate to use the Scottish population for comparisons, as there is substantial inter-change between the regional populations during the winter period. Predicted collision mortality would account for approximately 0.002% of the Scottish population. In addition, it is likely that the predicted collision rate is unlikely to be realised, as research indicates that geese tend to avoid flying through wind farms (Patterson 2006[xliv]) and there have been few recorded goose collisions at existing wind farms, relative to the number of birds recorded as potentially at risk of collision (i.e. seven recorded collisions in Europe, Dürr 2011). Furthermore, the collision model assumes that there is 50% overlap in the rotors of separate turbines, however it is more than this at Deuchries and this variable is therefore precautionary. The predicted collision rate is not significant in the context of the regional population and the background mortality rate for this species and the impact magnitude is therefore considered to be low. The effect significance is minor and not significant in EIA terms.

Secondary Species (wildfowl, waders and raptors)

7.108 An additional two non-target species of wildfowl, waders and raptors ('secondary species') were recorded regularly in flight throughout the year at the Site: buzzard and kestrel. In addition, low levels of curlew activity were recorded throughout the year. A total of 96 kestrel collisions have been recorded at wind farms within Europe (Dürr 2011). Kestrel is included on the BoCC amber list, with an estimated UK population of 36,800 pairs in 2000 (Baker et al. 2006) and the species is considered to be a common resident in NE Scotland (NESBR 2009). A total of 167 buzzard collisions have been recorded at wind farms in Europe to date (Dürr 2011). Buzzard is green-listed as a species of low conservation concern, with an estimated UK population of 31,100-44,000 pairs in 2000 (Baker et al. 2006). The species is a widespread resident in NE Scotland, with distribution and numbers having increased in recent years and the species is now

found throughout the majority of the region (NESBR 2009). It is therefore likely that over the life-time of the Development, there would be some collisions of these two species turbines, however it is considered that this would not be significant in the context of the national populations of these species and that the impact magnitude would be low. The effect significance is therefore negligible.

7.109 Curlew was recorded on a small number of occasions spread throughout the year during VP surveys, however, this species was not considered to be breeding on Site and was only recorded on two occasions during winter walkover surveys. The UK curlew population is estimated at 107,000 breeding pairs in the period 1985-98 (Baker et al. 2006) and the species is a common resident and winter visitor in NE Scotland (NESBR 2009). At these levels of activity it is considered that any collision impacts on this species would constitute an impact of negligible magnitude. The effect significance is negligible. No other secondary species was recorded regularly in flight over the Site.

Collision with Electric Cables

7.110 The assessment has considered all impacts associated with the Development, as described in Chapter 3. The grid connection does not form part of the planning application and detail is yet to be finalised. The applicant's preference is for the grid connection cables to be located below ground thus eliminating the risk of bird collisions. Therefore, there would be no additional risk of collision with overhead lines associated with the proposed Development. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) as part of the consenting procedure. The scope of any such assessment would be agreed with Aberdeenshire Council.

Decommissioning Impacts

7.111 Turbine removal may cause disturbance to birds breeding and foraging within the development Site, of similar scope and scale to those experienced during the construction phase, although with a reduced level of ground works. The level of impact would depend on the bird species present at the time of decommissioning, which cannot be reliably predicted at this stage. However, it is likely that impacts would be temporary, affecting one breeding season at most. In view of this, the impacts are predicted to be low. Survey work should be commissioned prior to decommissioning to assess the bird community present and the likely effects resulting from the works.

Mitigation

Construction Phase

7.112 No significant construction effects are predicted and therefore no mitigation measures are required.

Operational Phase

7.113 No significant operational effects are predicted and therefore no mitigation measures are required.

Residual Effects

Construction Phase

7.114 No revisions are proposed to the conclusions in the ‘Predicted Impacts’ section.

Operational Phase

7.115 No revisions are proposed to the conclusions in the ‘Predicted Impacts’ section.

Summary of Effects

7.116 Table 7.16 summarises the ornithological effects of the Development and assesses their significance on the basis of the criteria set out in Table 7.5 to Table 7.7.

Table 7.16: Summary of the Predicted Effects on Ornithological Receptors

Impact	Type of impact	Probability of impact occurring	Nature conservation importance	Magnitude of impact	Significance of effect	
					Level	Rationale
Construction						
Disturbance to pink-footed geese	Negative	Likely	Medium	Low	Minor	Birds likely to be displaced from Field 89, however all other fields within survey area within which the species has been recorded will remain available. The arable field resource is high within the region and the potential loss of a single field is therefore not significant.
Disturbance to greylag geese	Negative	Unlikely	Medium	Negligible	Negligible	No field utilisation recorded within 500m of proposed turbines or wind farm infrastructure
Disturbance to whooper swan	Negative	Unlikely	Medium	Negligible	Negligible	No field utilisation recorded within 500m of proposed turbines or wind farm infrastructure
Disturbance to other target species (goldeneye, teal, golden plover and peregrine)	Negative	Unlikely	Low	Negligible	Negligible	No recorded field utilisation by goldeneye, teal or golden plover within 500m of turbines/infrastructure and no regular use or hunting by peregrine
Disturbance to breeding birds	Negative	Likely	Negligible-Medium	Negligible	Negligible	Studies indicate that the impact of construction disturbance on many common breeding species, including passerines, is low.
Disturbance to wintering (non-target) species of conservation concern	Negative	Unlikely	Low	Negligible	Negligible	Only two records of field utilisation within 500m of proposed turbines or infrastructure.

Impact	Type of impact	Probability of impact occurring	Nature conservation importance	Magnitude of impact	Significance of effect	
					Level	Rationale
Operation						
Disturbance to pink-footed geese	Negative	Likely	Medium	Low	Minor	This species may be displaced from Field 89, where 700 individuals were recorded on a single occasion. All other fields recorded in use by this species will remain available. Arable field habitats are widespread and common in the region.
Disturbance to greylag goose and whooper swan	Negative	Unlikely	Medium	Negligible	Negligible	No field utilisation recorded within 500m of proposed turbine locations.
Disturbance to other target species	Negative	Unlikely	Low	Negligible	Negligible	No recorded field utilisation by goldeneye, teal or golden plover within 500m of turbines/infrastructure and no regular use or hunting by peregrine.
Disturbance to breeding birds of conservation concern	Negative	Likely	Low	Negligible	Negligible	All species of conservation concern recorded as breeding within 200m of turbines are passerines, the majority of which are likely to be tolerant of disturbance or able to re-locate into adjacent areas.
Disturbance to breeding grasshopper warbler and reed bunting	Negative	Likely	Medium	Negligible-Low Beneficial	Negligible	Enhancement measures have been included to create additional habitat for these species within the survey area.
Disturbance to wintering (non-target) species of conservation concern	Negative	Unlikely	Low	Negligible	Negligible	Only two records of field utilisation were recorded within 500m of turbines.
Collisions of pink-footed geese with turbines	Negative	Likely	Medium	Low	Negligible	Predicted annual collision rate of 2.16 birds, which is negligible in the context of the regional population.
Collisions of greylag geese with turbines	Negative	Likely	Medium	Low	Minor	Predicted annual collision rate of 2.17 birds, which is not significant in the context of a regional population of 1,000-2,000 wintering birds, a Scottish population of c.110,000 individuals and background adult mortality of 17%.

Impact	Type of impact	Probability of impact occurring	Nature conservation importance	Magnitude of impact	Significance of effect	
					Level	Rationale
Decommissioning						
Decommissioning	Negative	Likely	Negligible – Medium	Low	Negligible – Minor	Predicted to be an impact of similar magnitude to construction disturbance and will be temporary

Cumulative Impacts

7.117 The combined impacts of multiple wind farms could include an increased risk of bird collisions with turbines or the displacement of birds from a significant area of habitat. It is acknowledged that this is assessment is indicative only, identifying the number of schemes within a 20km radius (as requested by SNH) of the proposed Site and highlighting predicted impacts on key species. Due to the number of schemes within the search area (13 wind farms) it is only practicable to focus on a small number of key species and to provide a brief summary of predicted residual effects. The quality of the assessment is also limited by the difficulties in obtaining ecological data for schemes that are not currently active applications, or that have been recently consented. Non wind farm developments have not been considered, due to difficulties in identifying such developments and in order to keep the assessment to a manageable size. The cumulative assessment has been based on SNH guidance (SNH 2006), using the following five-stage approach:

Target Species

7.118 The following three species, for which the Site is considered to be of medium importance or above, are considered within this assessment: pink-footed goose, greylag goose and whooper swan. The effects on other species are likely to be so low as to not appreciably contribute to effects resulting from multiple developments.

Search Area

7.119 Wind farms that have been built/consented or are in the planning process and that fall within a 20km radius of the proposed Deuchries Site have been considered, where the relevant environmental information can be accessed. The search radius is a compromise between the ecology of the target species and the practicality of the assessment. Single turbine schemes are not considered, as they are unlikely to have a significant adverse impact on birds, rarely have detailed, supporting ornithological information and to make the assessment more practicable

Methods

7.120 The SNH Wind Farms in Scotland map (SNH 2011, updated July 2011) was searched for wind farms within a 20km radius of the Deuchries Site that were at the following stages: installed/approved, application and scoping. This was checked against the cumulative wind farm baseplan produced by RSK Group PLC (Chapter 8: Landscape). The Aberdeenshire and Moray council planning applications websites[xlv], were searched for details of environmental assessments relating to the identified wind farms. Where no information was available a search was also made of the relevant developers' websites.

Results

7.121 The proposed and existing wind farms that were identified within the search area are detailed within Table 7.17..

Table 7.17: Wind farms identified within the 20km radius search area

Site Name	Status	Approximate distance from Deuchries	Developer	Number of turbines	Data available
Schemes Included in the Assessment					
Mains of Auchinderran Farm	Application – Granted	3km W	-	3	Ornithology ES Chapter
Strath of Brydock	Installed	5km N	Green Cat Renewables Ltd	2 (+1 granted as an extension)	Ornithology Chapter
Shielburn Farm	Application	10km S	Green Cat Renewables	3	Ornithology ES Chapter
Cairnhill Farm	Application – Granted	14km E	Green Cat	3	ES Ornithology Chapter
Myreton Crossroads	Application - Granted	12km W	-	2	No ornithology chapter produced
Burnside of Idoch	Application - refused	13km SE	-	3	Refused
Mains of Hatton	Installed/approved	13km SE	Eco2 & A.J. Duncan	3	ES Ornithology Chapter
Gordonstown	Application	18km SE	Novera Energy PLC	5	ES Ornithology Chapter
Aultmore	Application	18km W	Vatenfall (previously Amec Wind)	13	ES Ornithology Chapter
Camaloun	Scoping	19km SE	-	-	None (only at scoping stage)
Little Byth	Application - Granted	20km E	Cameron Sutherland	3 (80m tip height)	ES Ornithology Chapter
Dummuies	Installed/approved (operational in 2007)	20km S	Scottish Power (from Englefield)	-	None
Glens of Foundland	Installed/approved (operational 2005)	20km S	RES	20	None
Schemes Excluded from the Assessment					
Muirake	Application	6km NW	-	2 (24.8m tip height)	Excluded from assessment as small scale
Brydock	Installed/approved	6km N	Green Cat Renewables	1	N/A
Mossford farm	Application – Refused	6km SW	-	1	Refused
Gairnieston Farm	Application	11km E	Green Cat	1	N/A

Site Name	Status	Approximate distance from Deuchries	Developer	Number of turbines	Data available
Boyndie	Application	9km NW	Boyndie Wind Energy Ltd	1	N/A
Myreton	Application	14km W	-	1	N/A
Netherton of Windyhills	Application	17km W	-	1 (Tip height 27m)	N/A
Balnamoon	Installed/approved	17km W	Orkney Renewables	1	N/A
Bogenlea Farm	Application – Granted	18km E	-	1	N/A
Newstead	Installed/approved	18km E	Grant Mackie	1	N/A

7.122 Table 7.18 provides information relating to focal species for those wind farms within the search area for which ornithological information was obtained.

Table 7.18: Environmental information gained for the wind farm sites identified within the search area

Site	Pink-footed goose	Greylag goose	Whooper swan
Mains of Auchinderran Farm	Not recorded during winter walkovers. Collision risk modelling predicts an annual collision rate of 1.5 birds.	Not recorded during winter walkovers. Not recorded in sufficient numbers to warrant a collision risk assessment.	Not recorded during winter walkovers or VP surveys.
Little Byth	Predicted a negligible impact on this species.	No predicted impacts.	Predicted a negligible impact on this species.
Shielburn Farm	Predicted a negligible impact on this species.	Predicted a negligible impact on this species.	Predicted a negligible impact on this species.
Strath of Brydock	No flights through the development area. No significant impacts predicted.	No flights through the development area. No significant impacts predicted.	No impacts predicted.
Cairnhill	Collision modelling predicted a collision rate of 32.1 birds per year, assuming 95% avoidance (approximately 6.4 birds per year at 99% avoidance).	Modelling predicted a collision rate of 0.65 birds per year assuming 95% avoidance.	None recorded.

Site	Pink-footed goose	Greylag goose	Whooper swan
Aultmore	Predicted collision rate of 45 birds per year (2004/05), 0.08 birds (2005/06) and one bird (2006/07) (i.e. an average of 15.36 birds per year over the three years). It was considered that the high level of activity in 2004/05 constituted an exceptional year in terms of pink-footed goose activity over this site.	Modelling predicted a collision rate of 0.032 birds per year for 2004/05 and zero for the two other years of monitoring (i.e. an average of 0.01 over the three years).	No impacts predicted.
Gordonstown	Three flocks (128 birds) recorded flying within 250m of wind farm. Concluded that this species is unlikely to be affected by the proposal.	One flock (five birds) passed within 500m of wind farm. No impacts predicted.	No impacts predicted.
Mains of Hatton	Low numbers were observed on or crossing the site. No significant negative impact predicted.	Low numbers were observed on or crossing the site. No significant negative impact predicted.	No impacts predicted.

Cumulative Impacts

Pink-footed goose

7.123 The schemes for which data were available predict 6.4 collisions per year (Cairnhill), 1.5 collisions per year (Mains of Auchinderran) and 15.36 collisions per year (Aultmore), which added to the predicted 2.16 collisions per year predicted for Deuchries, gives a total of 25.42. Background rates of mortality for this species are 18% for adults and 22% for juveniles. Predicted collision mortality would increase these rates by 0.04-0.07%, which is negligible in the context of the regional population (35,000-53,000 individuals) and the impact magnitude is low. It should be noted, however, that the error associated with each of the predicted collision rates is compounded by adding them together, and that in reality the rates of collision are likely to be lower than predicted, given the evidence from monitoring surveys at operational sites. The significance of this effect is therefore minor and not significant in EIA terms.

Greylag Goose

7.124 The schemes for which data was available predict 0.65 collisions per year (Cairnhill) and 0.01 collisions per year (Aultmore), which combined with the modelled 2.17 collisions per year at Deuchries, gives a total of 2.83. The background mortality rate for this species is 17% for adults and 44% for juveniles. Predicted collision mortality would increase these rates by 0.22% in a regional context and 0.002% in the context of the population in Scotland. This combined rate of mortality is therefore not considered to be significant in a regional or national context and the impact magnitude is low. The effect significance is therefore minor and not significant in EIA terms.

Whooper swan

7.125 No additional impacts were predicted as a result of any of the schemes for which data were available. Effect significance therefore remains negligible.

Statement of Significance

7.126 No residual effects that would be considered as significant in EIA terms are predicted as a result of the Development either alone or in combination with other wind farm developments within a 20km radius.

Chapter 7 References

[i] Scottish Natural Heritage. 2010. Survey methods for use in assessing the impacts of onshore wind farms on bird communities. SNH Guidance Document.

[ii] Scottish Natural Heritage. 2006. Assessing significance of impacts from onshore wind farms on birds outwith designated areas. SNH Guidance Document.

[iii] Band, W., Madders, M. & Whitfield, D.P. 2007. Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M., Janss, G.F.E. & Ferrer, M. (eds). Birds and Wind Farms: Risk assessment and Mitigation, pp259-275. Quercus, Madrid.

[iv] Scottish Natural Heritage. 2006. Assessing significance of impacts from onshore wind farms on birds outwith designated areas. SNH Guidance Document.

[v] Scottish Natural Heritage. 2010. Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model. SNH Guidance Document.

[vi] Forrester, R. & Andrews, I. 2007. The Birds of Scotland. The Scottish Ornithologists' Club.

[vii] Scottish Natural Heritage (2005). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. SNH, Battleby

[viii] Gilbert, G., Gibbons, .D. W. & Evans, J. 1998. Bird Monitoring Methods: A manual of techniques for key UK species. RSPB, Bedfordshire.

[ix] Percival, S.M. (2000). Birds and wind turbines in Britain. British Wildlife 12:1, pp 8-15.

[x] Gill, J.P., Townsley, M. and Mudge, G.P. (1996). Review of the impacts of wind farms and other aerial structures upon birds. SNH Review 21, 68pp.

[xi] Percival, S.M., Band, B & Leeming. (1999). Assessing the ornithological effects of wind farms: developing a standard methodology. Proc of the 21st British Wind Energy Association Conference.

[xii] Scottish Natural Heritage. 2006. Assessing significance of impacts from onshore wind farms on birds outwith designated areas. SNH Guidance Document.

[xiii] Percival, S. M. (2007). Predicting the Effects of Wind Farms on Birds in the UK: The Development of an Objective Assessment Method. In Birds and Wind Farms: Risk Assessment and Mitigation. de Lucas, M, Janss, G. and Ferrer, M. (eds). Lynx Edicions, Barcelona.

[xiv] Musgrove, A.J., Austin, G.E., Hearn, R.D, Holt, C.A., Stroud, D.A. & Wotton, S.R. 2011. Overwinter population estimates of British waterbirds. British Birds, 104, pp 364-397.

[xv] Wildfowl and Wetlands Trust. 2011. The goose and swan monitoring programme. Obtained from http://monitoring.wwt.org.uk/species.php in November 2011.

[xvi] North East Scotland Bird Report. 2009.

[xvii] Mitchell, CR & RD Hearn. 2004. Pink-footed Goose Anser brachyrhynchus (Greenland/Iceland population) in Britain 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

[xviii] Baker, H., Stroud, D.A., Aebischer, N.J., Cranswick, P.A., Gregory, R.D., McSorley, C.A., Noble, D.G. & Rehfisch, M.M. 2006. Population estimates of birds in Great Britain and the United Kingdom. British Birds. 99:25-44.

[xix] Mitchell, C, L Griffin, M Trinder & J Newth. 2010. The population size of breeding Greylag Geese Anser anser in Scotland in 2008/09. WWT Report to Scottish Natural Heritage.

[xx] LWP 2006: Lewis Wind Power Addendum to the Environmental Statement 2006.

[xxi] Shepherd, K. (2002). Hare Hill Windfarm New Cumnock, Ayrshire. Breeding Bird Monitoring 2002. Unpublished report to Scottish Power Plc, Glasgow.

[xxii] Shepherd, K. (2003). Hare Hill Windfarm New Cumnock, Ayrshire. Breeding Bird Monitoring 2003. Unpublished report to Scottish Power Plc, Glasgow.

[xxiii] Entec 2007. Minsca Windfarm 2007 Breeding Bird Survey. Unpublished report by Entec UK Ltd to Minsca Windfarm Scotland Ltd.

[xxiv] Madsen, J. 1985. Impact of disturbance of field utilisation by pink-footed geese in West Jutland, Denmark. Biological Conservation. 33(1):53-63.

[xxv] Rees, E.C., Bruce, J.H. & White, G.T. 2005. Factors affecting the behavioural responses of whooper swans to various humans activities. Biological Conservation. 121:369-382.

[xxvi] Vauk, G. (1990). Biological and ecological study of the effects of construction and operation of wind power sites. Jahrgang/Sonderheft, Endbericht. Norddeutsche Naturschutzakemie, Germany

[xxvii] Phillips, J.F. (1994). The effects of a windfarm on the upland breeding bird communities of Bryn Tytli, mid-Wales: 1993-4. Unpublished report for National Windpower.

[xxviii] Percival, S.M. (1998). Birds and Turbines: managing potential planning issues. Proc. of the 20th BWEA Conference 1998, pp 345-350.

[xxix] Percival, S. M. (2005). Birds and wind farms: what are the real issues? British Birds 98:194-204.

[xxx] Devereux CL, Denny MJH, Whittingham MJ (2008) Minimal effects of wind turbines on the distribution of wintering farmland birds. J Appl Ecol 45:1698–1694.

[xxxi] Crockford, N.J. (1992). A review of the possible impacts of wind farms on birds and other wildlife. JNCC report no. 27, Peterborough.

[xxxii] Benner, J.H.B., Berkhuizen, J.C., de Graaf, R.J. and Postma, A.D. (1993). Impact of wind turbines on birdlife. Report no. 9247. Consultants on Energy and the Environment, Rotterdam, The Netherlands.

[xxxiii] Winkelmann, J.E. (1994). Bird/wind turbine investigations in Europe. Proc. of the National Avian Wind Power Planning Meeting, Denver, Colorado, pp 43-48.

[xxxiv] Langston, R.H.W. & Pullan, J.D., (2003). Wind farms and Birds: An analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues. Birdlife International.

[xxxv] Hötker, H., Thomsen, K-M & Koster, H. (2006). The impact of renewable energy generation on biodiversity with reference to birds and bats – facts, gaps in our knowledge, areas for further research and ornithological criteria for the expansion of renewables. NABU Report, Germany.

[xxxvi] Larsen, J.K. & Madsen, J. 2000. Effects of wind turbines and other physical elements on field utilisation by pink-footed geese: A landscape perspective. Landscape Ecology. 15: 755-764.

[xxxvii] Madsen, J. & Boertmann, D. 2008. Animal behavioural adaptations to changing landscapes,

[xxxviii] Kruckenberg, H. & Jaene, J. 1999. Zum Einfluss eines Windparks auf die Verteilung weidender Bläßgänse im Rheiderland (Landkreis Leer, Niedersachsen). Natur Landsch. 74: 420-427. In Langston & Pullan 2003.

[xxxix] Kowallik, C. & Borbach-Jaene, J. 2001. Impact of wind turbines on field utilization by geese in coastal areas in NW Germany. Vogelkdl. Ber. Niedersachs 33: 97-102.

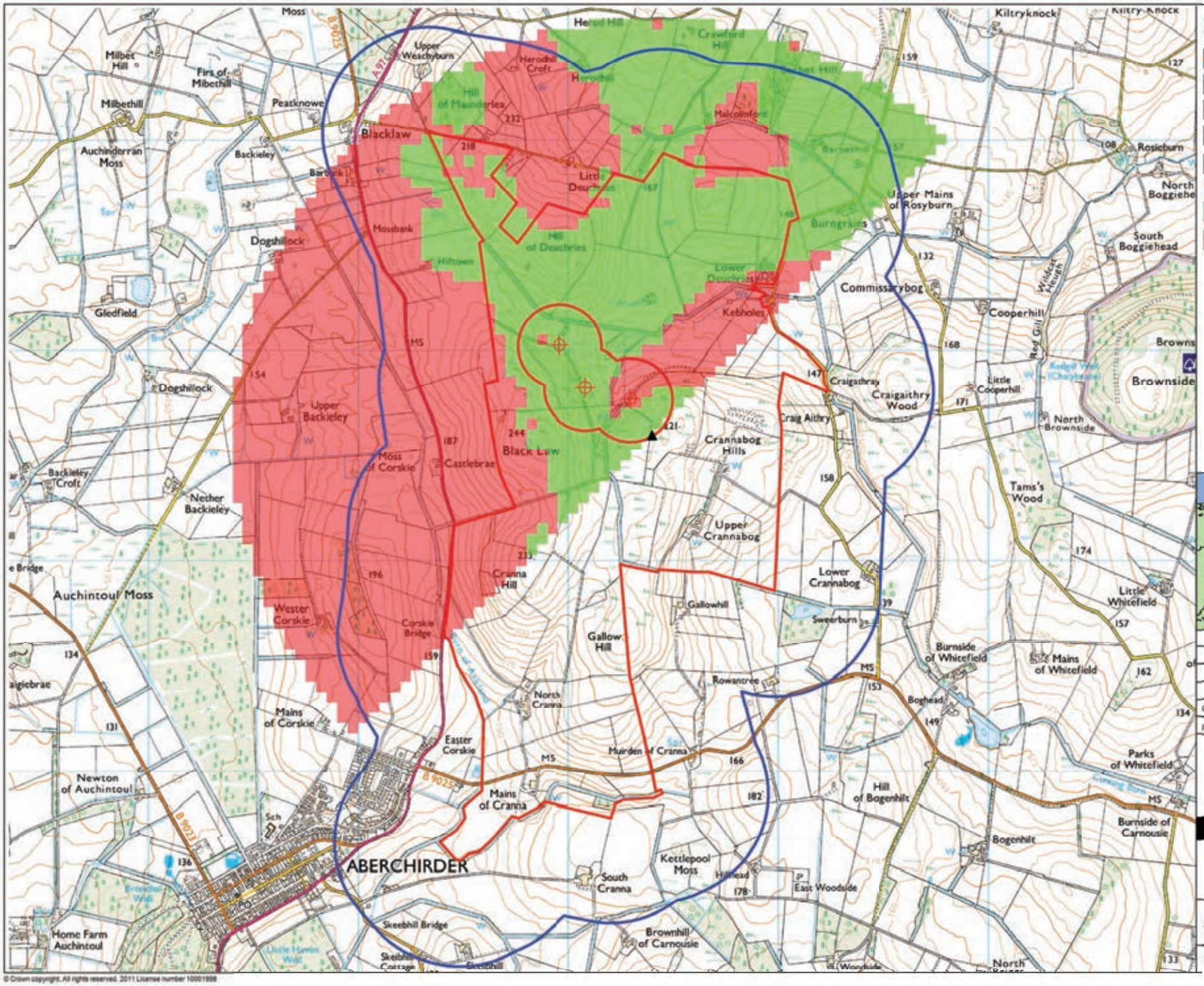
[xl] Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. & Bullman, R. 2009. The distribution of breeding birds around upland wind farms. J. Appl. Ecol. 46: 1323-1331.

[xli] Dürr, T. (2010). Vogelverluste an Windenergieanlagen in Deutschland. Daten aus der zentralen Fundkartei der Staatlichen Vogelschutzwarteim im Landesumweltamt Brandenburg. Unpublished data, Brandenburg State Office for Environment.

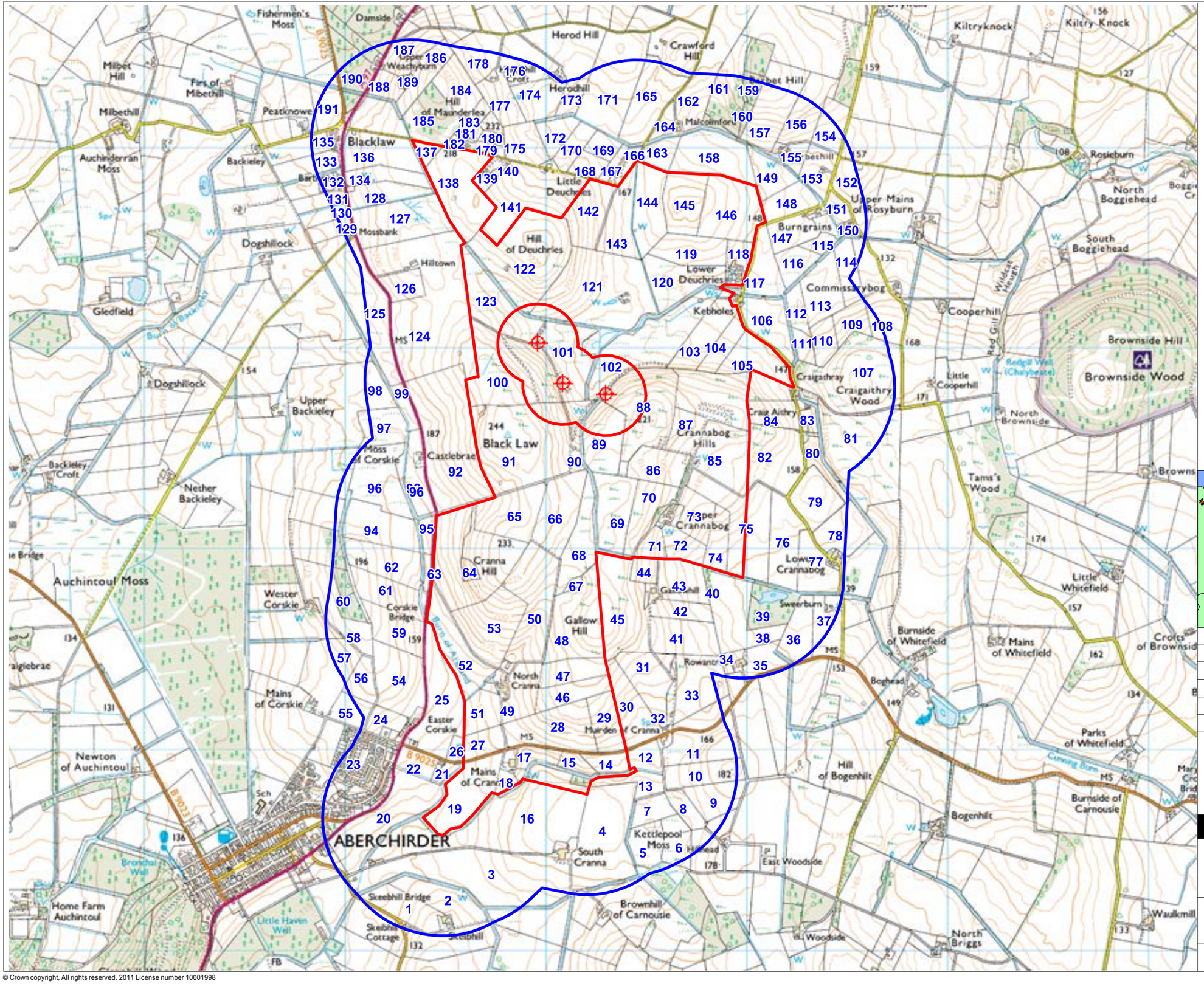
[xlii] Band, W., Madders, M. & Whitfield, D.P. 2007. Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M., Janss, G.F.E. & Ferrer, M. (eds). Birds and Wind Farms: Risk assessment and Mitigation, pp259-275. Quercus, Madrid.

[xliii] Robinson, R.A. (2005) BirdFacts: profiles of birds occurring in Britain & Ireland (BTO Research Report 407). BTO, Thetford (http://www.bto.org/birdfacts, accessed on 01/11/11)

[xliv] Patterson, I.J. 2006. Geese and Wind Farms in Scotland. Report for SNH.



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Rev	Date	Description	Drn	Chk	App
00	21.09.12	27815-R14c Figure 7.2	JB	JW	JW

FORCE 9 ENERGY

Deuchries Wind Farm

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Figure 7.2: Field Numbers for Bird Surveys

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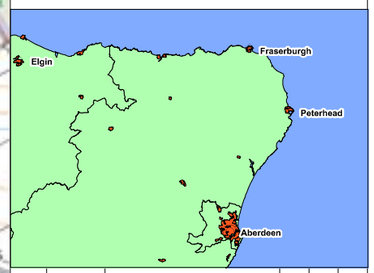
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Key:

- Site Boundary
- 500m Buffer
- Turbine Location
- 200m Turbine Buffer
- Flight below collision-risk height
- Flight at collision-risk height
- Greylag Goose Flights
- Pink-footed Goose Flights



Rev	Date	Description	Drn	Chk	App
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FORCE 9 ENERGY

Deuchries Wind Farm

RSK

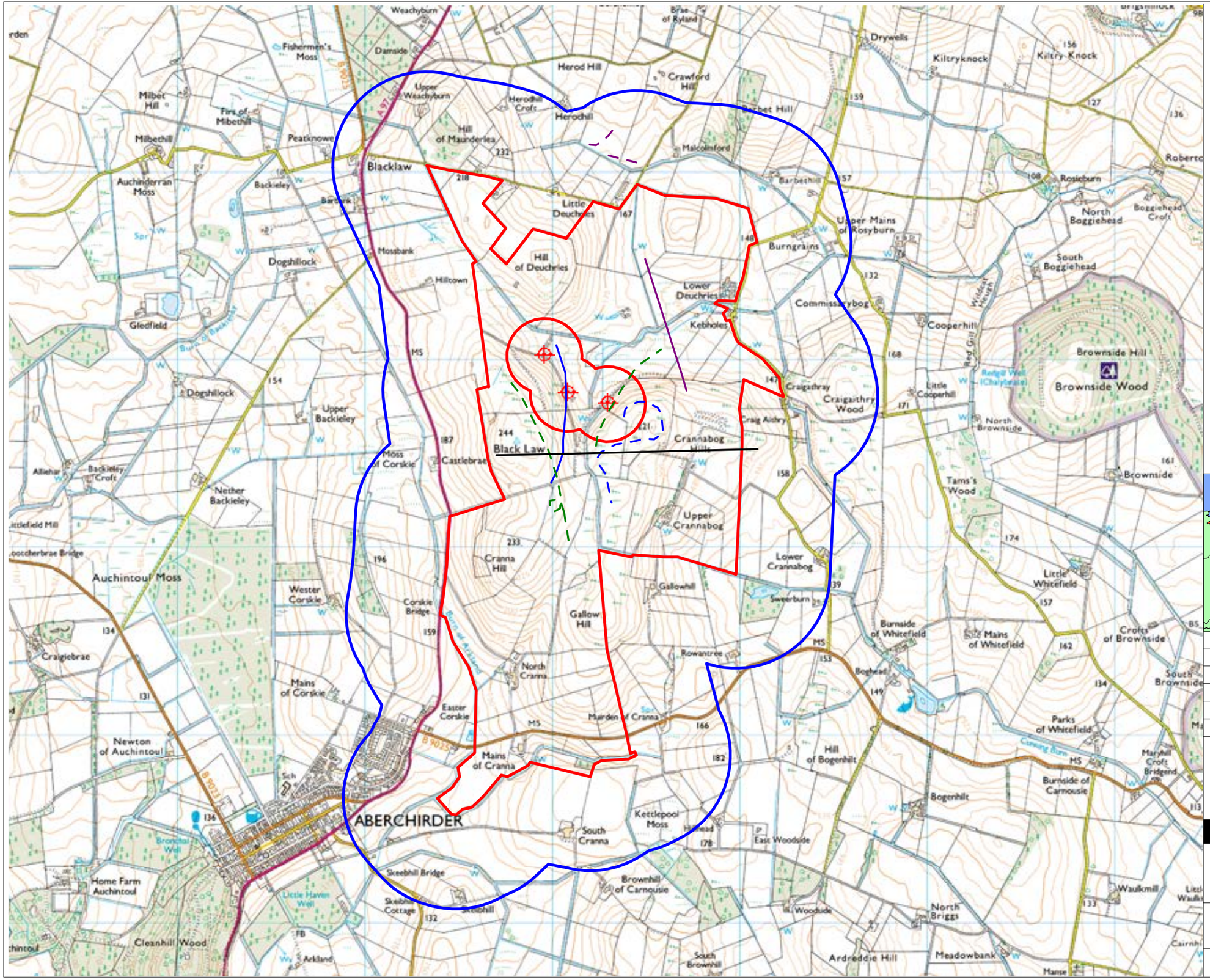
Figure 7.3: Goose Flights, Non-Breeding Season 2010/11

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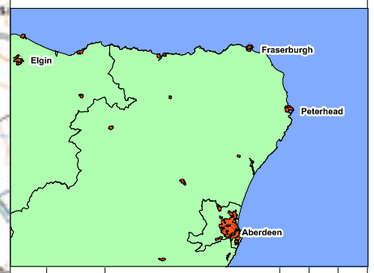
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ABERCHIRDER
Black Law
Blacklaw
Hill of Deuchries
Little Deuchries
Lower Deuchries
Herod Hill
Herodhill
Crawford Hill
Kiltryknock
Kilt'ry-Knock
Drywells
Malcolmford
Burngrains
Upper Mains of Rosyburn
Commissarybog
Kebholes
Cooperhill
Little Cooperhill
Craigathry Wood
Craigathray
Craig Aichry
Crannabog Mills
Upper Crannabog
Lower Crannabog
Brownside Hill
Brownside Wood
North Brownside
Brownside
Tams's Wood
Rosieburn
North Boggiehead
South Boggiehead
Boggiehead Croft
Roberto
Little Whitefield
Burnside of Whitefield
Mains of Whitefield
Crofts of Brownside
Parks of Whitefield
Hill of Bogenhilt
Bogenhilt
Burnside of Carnousie
Marykirk Crofts Bridgend
Waulkmill
North Briggs
Meadowbank
Ardreddie Hill
South Brownhill
Brownhill of Carnousie
Woodside
East Woodside
Kettlepool Moss
South Cranna
Gallowhill
Gallow Hill
Cranna Hill
Sweerburn
Rowantree
Boghead
Mains of Cranna
North Cranna
Easter Corskie
Corskie Bridge
Wester Corskie
Mains of Corskie
Newton of Auchintoul
Auchintoul Moss
Craigiebrae
Home Farm Auchintoul
Cleanhill Wood
Skeebhill Bridge
Skeebhill Cottage
Little Haven Well
Bronchal Well
Auchinderran Moss
Milbet Hill
Milbethill
Firs of Mibethill
Peatknowe
Backieley
Barbrek
Mossbank
Dogshillock
Millcown
Gledfield
Upper Backieley
Nether Backieley
Backieley Croft
Moss of Corskie
Castlebrae
Herodhill Croft
Hill of Maunderlea
Damside
Weachyburn
Upper Weachyburn
Fishermen's Moss
Brae of Ryland
Barbethill
Redgill Well (Chalybeate)
Wildcat Heugh
Red Gill
Burn of Backieley
Burn of Auchintoul
Burn of Cranna
Corsing Burn
A97
B9025
MS
M5
Sch
FB
Spr
Wy
Aekland
Allieha
Littlefield Mill
Boccherbrae Bridge
Barbethill
Bogenhilt
Woodside
Manse
Cairnhill
Waulkmill
Little Waulkmill
South Brownside
Crofts of Brownside
Parks of Whitefield
Marykirk Crofts Bridgend
Burnside of Carnousie
Hill of Bogenhilt
Brownhill of Carnousie
Ardreddie Hill
Meadowbank
North Briggs
Little Whitefield
Mains of Whitefield
Burnside of Whitefield
Rosieburn
North Boggiehead
Boggiehead Croft
South Boggiehead
Roberto
Kiltryknock
Kilt'ry-Knock
Drywells
Brae of Ryland
Weachyburn
Damside
Fishermen's Moss
Upper Weachyburn
Herodhill Croft
Hill of Maunderlea
Peatknowe
Milbet Hill
Milbethill
Firs of Mibethill
Auchinderran Moss
Backieley
Barbrek
Mossbank
Dogshillock
Millcown
Gledfield
Upper Backieley
Nether Backieley
Backieley Croft
Moss of Corskie
Castlebrae
Auchintoul Moss
Wester Corskie
Corskie Bridge
Mains of Corskie
Easter Corskie
Newton of Auchintoul
Craigiebrae
Home Farm Auchintoul
Cleanhill Wood
Skeebhill Bridge
Skeebhill Cottage
Little Haven Well
Bronchal Well
Cranna Hill
Gallow Hill
Gallowhill
Sweerburn
Rowantree
Boghead
Mains of Cranna
North Cranna
Kettlepool Moss
South Cranna
Brownhill of Carnousie
Hill of Bogenhilt
Bogenhilt
Burnside of Carnousie
Marykirk Crofts Bridgend
Waulkmill
North Briggs
Meadowbank
Ardreddie Hill
South Brownhill
Woodside
East Woodside
Lower Crannabog
Upper Crannabog
Crannabog Mills
Craigathray
Craigathry Wood
Craig Aichry
Little Cooperhill
Cooperhill
Red Gill
Wildcat Heugh
Redgill Well (Chalybeate)
Brownside Hill
Brownside Wood
North Brownside
Brownside
Tams's Wood
Burngrains
Upper Mains of Rosyburn
Commissarybog
Kebholes
Lower Deuchries
Little Deuchries
Hill of Deuchries
Herod Hill
Herodhill
Crawford Hill
Barbethill
Malcolmford
Blacklaw

Key:

- Site Boundary
- 500m Buffer
- Turbine Location
- 200m Turbine Buffer
- Flight below collision-risk height
- Flight at collision-risk height
- Greylag Goose Flights
- Pink-footed Goose Flights



Rev	Date	Description	Drn	Chk	App
00	21.09.12	27815-R25b Figure 7.5	JB	JW	JW

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 7.5: Goose Flights, Non-Breeding Season 2011/12

SCALE: 1:17,500 @ A3

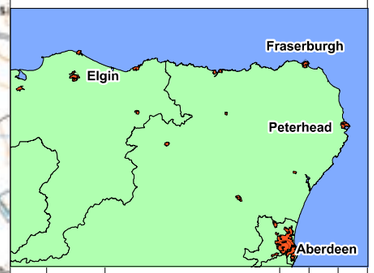
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FIGURE PRDOCUED FOR USE BY FORCE 9 ENERGY
FILE NAME: W:\GWM\DATA\PROJECTS\a-21\27815 Deuchries Wind Farm\D040 Design\drawings\A3 Template\27815-R025b Figure 7.5.wor

Key:

- Site Boundary
- 500m Buffer
- Turbine Location
- 200m Turbine Buffer
- Flight below collision-risk height
- Flight at collision-risk height
- Kestrel Flight
- Golden Plover Flight
- Short-eared Owl Flight



Rev	Date	Description	Drn	Chk	App
00	21.09.12	27815-R26b Figure 7.6	JB	JW	JW

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 7.6: Other Target Species Flights, Non-Breeding Season 2011/12

SCALE: 1:17,500 @ A3

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FIGURE PRDOCUED FOR USE BY FORCE 9 ENERGY
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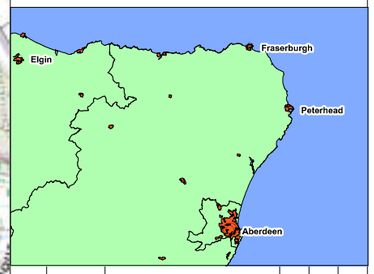
500GJ+PG
80GJ
100GJ
235GJ

2000GJ+PG
7PG

600PG

Key:

- Site Boundary
- 500m Buffer
- Turbine Location
- 200m Turbine Buffer
- 2000PG — Flock Size followed by BTO Species Code
- Denotes Winter 2010/11 Records
- Field location of flock



Rev	Date	Description	Drn	Chk	App
00	21.09.12	27815-R13b Figure 7.7	JB	JW	JW

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 7.7: Vantage Point Survey Results - All Records of Roosting and Feeding Wildfowl, 2010/11

SCALE: 1:20,000 @ A3

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260GJ
40GJ
14WS

1000GJ+PG

500GJ+PG

110GJ

500GJ

350PG
150GJ
170WS

100GJ

500GJ
40GJ
53WS

31.
50T.

11WS

50T.
90T.
27T.
95GJ
4GJ

10T.
>30T.
10MA

700PG

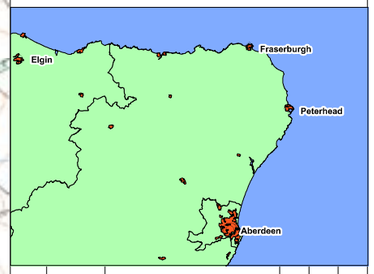
7MS
4MS
15WN
1WN
27WN
4MA

2000PG

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Key:

- Site Boundary
- 500m Buffer
- Turbine Location
- 200m Turbine Buffer
- 2000PG — Flock Size followed by BTO Species Code
- Denotes Winter 2010/11 Records
- Denotes Winter 2011/12 Records
- Field location of flock



Rev	Date	Description	Drn	Chk	App
00	21.09.12	27815-R11b Figure 7.8	JB	JW	JW

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 7.8: Winter Walkover Survey Results - All Records of Roosting and Feeding Wildfowl, 2010/11 and 2011/12

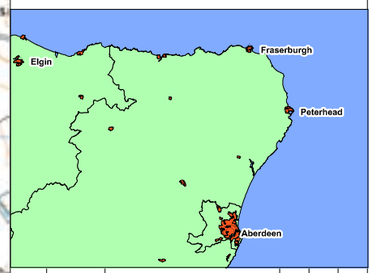
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FIGURE PRDOCUED FOR USE BY FORCE 9 ENERGY
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Key:

- Site Boundary
- 500m Buffer
- Turbine Location
- 200m Turbine Buffer
- CH — BTO Species Code



Rev	Date	Description	Drn	Chk	App
00	21.09.12	27815-R07b Figure 7.9	JB	JW	JW

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 7.9: Approximate Location of Breeding Bird Territories, 2010

SCALE: 1:17,500 @ A3

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FIGURE PRODUCED FOR USE BY FORCE 9 ENERGY
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8 LANDSCAPE AND VISUAL ASSESSMENT

Introduction

8.1 This chapter describes the findings of a landscape and visual impact assessment (LVIA) and cumulative landscape and visual impact assessment (CLVIA) undertaken for the Development.

8.2 Within this chapter, the landscape and visual baseline environment of the Site and its surroundings is described along with the project components. Following this the sensitivity of the landscape and visual receptors is determined along with the anticipated magnitude of change associated with introducing the Development (including embedded mitigation) and an evaluation of the significance of the impacts is provided.

Summary of Key Components

8.3 The main components of the Development, which have been considered within the LVIA are described in Chapter 3 and shown on Figure 3.1.

Policy and Guidance

National Planning Policy and Guidance

8.4 Scottish Planning Policy (SPP), Planning Advice Notes (PAN) and Circulars together provide statements of Government policy and good practice on nationally important land use and other planning matters. Planning policy of relevance to the assessment is listed under ES Chapter 4.

8.5 As a Government advisory body, Scottish Natural Heritage (SNH) has also issued a series of policy guidance, to advise Government and other public bodies on natural heritage matters. Policy Statements of specific relevance to the assessment of landscape and visual impacts comprise the following:

- Policy Statement No. 01/02 - *Renewable Energy Policy*;
- Policy Statement No. 02/02 - *Strategic Locational Guidance For Onshore Wind Farms in Respect of the Natural Heritage* (Updated March 2009);and
- Policy Statement No. 02/03 - *Wildness in Scotland's Countryside*.

8.6 SNH Policy Statement No. 02/02 *Strategic Locational Guidance for Onshore Wind Farms in Respect of the Natural Heritage* (updated March 2009) sets out a number of principles to guide the location of onshore wind farm projects to minimise impacts on the natural heritage. This guidance provides a broad overview of where there is likely to be the greatest scope for wind farm development, and where there are the most significant constraints, in natural heritage terms.

8.7 The Site falls within an area identified as Zone 1 within Policy Statement No. 02/02. Zone 1 areas are described as areas *"with least sensitivity to wind farms, with the greatest opportunity for development, within which overall a large number of developments could be acceptable in natural heritage terms, so long as they are undertaken sensitively and with due regard to cumulative impact".*

Local Planning Policy

8.8 The key designations within the 35km study area (as shown on Figure 8.1) are Areas of Great Landscape Value (AGLV within Moray) and Historic Gardens and Designed Landscapes (HGDL) as shown on Figure 8.3. Further details on these designations with regard to their character, distance from the Development and potential visibility of the Development are in the baseline section of this report.

8.9 With regard to landscape designations in Aberdeenshire, the Aberdeenshire Local Plan (adopted June 2006) has recently been superseded by the Aberdeenshire Local Development Plan (LDP) (adopted June 2012). Accordingly, Areas of Landscape Significance (ALS), as identified within the Local Plan, are no longer current designations. The LDP seeks to protect landscape character using the SNH Landscape Character Area framework as a basis for future planning and management policy. A full assessment of the Development's impacts on SNH landscape character areas is included within this assessment.

8.10 The LDP also identifies valued views; however none of these are predicted to be impacted by the Development and are therefore not considered further in this assessment.

Assessment Method

Approach

8.11 Landscape and visual assessments are two separate, but interlinked, procedures. The baseline landscape, its analysis, and the assessment of character contribute to the baseline for the visual assessment. Assessments are undertaken in parallel and are informed by a combination of desk and site based appraisal techniques and professional judgements.

8.12 There are six key stages to the overall assessment process:

- Analysis and recording of the existing landscape character and visual context of the study area through desk and field based appraisal;
- Appreciation of the nature, forms and features of the Development;
- Assessment of the sensitivity of the existing landscape and identified visual receptors to change and the magnitude of change likely to result from implementation of the Development;
- Evaluation of the significance of the changes identified;
- Identification of mitigation measures appropriate to the Development and the receiving landscape; and

- Assessment of the residual impacts on landscape character and visual receptors.

8.13 In establishing the baseline conditions, the assessment takes account of the presence of existing operational wind energy developments.

8.14 The assessment process is iterative, in which the analysis of baseline conditions and the evaluation of likely effects resulting from the Development can inform the evolution of the design, layout and configuration of turbines and the development and incorporation of mitigation measures. The design of the Development has changed considerably since scoping and details of the design evolution are described in ES Chapter 2.

8.15 The assessments are based on relevant and accepted guidance as set out below, and draw on information provided by statutory consultees, current landscape planning policies and other relevant documentation, computer based visibility analysis and fieldwork observations.

Guidance

8.16 This assessment has been undertaken in accordance with the methods recommended in the following advisory best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment (Second Edition), published by the Landscape Institute and the IEMA (2002). (GLVIA);
- Landscape Character Assessment: Guidance for England and Scotland, published by Scottish Natural Heritage and the Countryside Agency (2002);
- Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments 2012, published by Scottish Natural Heritage March 2012;
- Visual Representation of Wind Farms: Good Practice Guidance, published by Horner and Maclennan and Envision (2006);
- LI Advice Note 01/2011: Photography and photomontage in landscape and visual assessment; and
- Siting and Designing Wind Farms in the Landscape Version 1, published by Scottish Natural Heritage 2009.

Computer Based Visibility Analysis

Zone of Theoretical Visibility

8.17 In order to identify landscape and visual resources within the study area that may be theoretically affected by the Development, a series of Zone of Theoretical Visibility (ZTV) plans have been produced to illustrate the maximum theoretical area of visibility (refer to Figures 8.7a to 8.7d). The term ZTV is used to describe the area over which it may be possible to see some part of the Development. However, ZTVs do not take into account any low level screening which may result from buildings, vegetation or localised variations in topography. Therefore, ZTVs present the maximum theoretical visibility.

8.18 The ZTVs have been modelled on a typical maximum tip height of 100m, with a maximum hub height of 65m. The modelling was based on a digital terrain model (DTM) prepared using Ordnance Survey (OS) data at 1:50,000 scale with contours at 10m intervals to create a 50m cell size DTM and took account of the curvature of the earth.

8.19 Whilst ZTVs indicate theoretical visibility of the Development, the actual visual impact of the Development is assessed through a more detailed analysis of specific viewpoints via field survey observations and the production and analysis of wireline and photomontage visualisations.

Visualisations

8.20 The assessment of likely visibility from selected viewpoints is typically aided by the use of visually representative material. To this end, a series of computer generated wireline images and photomontages were produced for agreed viewpoint locations within the study area.

8.21 A comprehensive photographic study was then undertaken with 360-degree high-resolution digital photography taken at each viewpoint. Viewpoint locations were visited and photographed using a Canon EOS 350D digital SLR camera with a 30mm lens to achieve the same view as that of a 50mm lens on standard 35mm film SLR camera. Photography was then merged using Panorama Factory stitching software.

8.22 3D visualisations (models) of the proposed turbines were then generated, superimposed correctly and to scale onto landform wirelines (constructed using Windfarm software) and/ or digital photography. Within the visualisations the turbines have been modelled to face the viewing direction and the rotors appear in a random synchronisation.

8.23 The photomontage illustrations provide photo-realistic, rendered representations of how the Development would look in the context of the existing landscape. The wireline illustrations together with ZTVs and field surveys are used to assist professional judgement in the robust assessment of the likely impacts and significance of the effects on the landscape and visual resource.

Study Area

8.24 In accordance with best practice the LVIA considers a study area of a 35km radius from the outermost turbines of the Development in order to establish the spatial parameters of the assessment and identify likely landscape and visual impacts. The extent of the LVIA study area is illustrated in Figure 8.1.

8.25 The CLVIA considers a study area of a 60km radius from the outermost turbines of the Development. The extent of this cumulative study area is illustrated on Figure 8.23 which depicts the locations of wind farm projects that are either operational, consented, at planning application stage, or within scoping.

8.26 Not all of the wind farms within the 60km study area have been taken forward within the cumulative assessment, rather those developments within a 15km radius of the Site that are deemed to have key interactions with the Development, and which may result in significant landscape and visual effects. This detailed cumulative assessment study area is shown in Figure 8.24.

Landscape Assessment

8.27 Landscape assessment is based on an evaluation of the sensitivity of the existing landscape, and the magnitude of change associated with the introduction of the Development.

Baseline Landscape Character

8.28 Landscape character is a composite of physical and cultural elements. Aspects such as landform, hydrology, vegetation, land cover, land use, landscape pattern and cultural features/ associations combine to create a common 'sense of place' and identity which can be used to categorise the landscape into definable, homogenous units known as character areas or types. The level of detail and size of a landscape character area or type can be varied to reflect the scale of definition required, and can be applied at a national, regional or localised level.

8.29 For the purposes of this assessment, the SNH national landscape character areas have been utilised. A more localised landscape character assessment of the Site has been undertaken as part of the assessment and is described later in this chapter.

8.30 For the host LCA, impacts relate to the direct impacts on the key characteristic elements of that area. A significant impact to landscape character may occur where the key characteristic elements would be altered to the extent that the Development would form a dominant new key characteristic. Such impacts may give rise to the perception of a wind farm landscape, or a local landscape character sub-type becoming established with a certain distance of the wind farm.

8.31 For non-host LCA landscape character impacts generally relate to the visibility of the Development where views of the landscape (within which the Development is located) are considered to be a key characteristic of the LCA. Therefore, if the key characteristics of the non-host LCA do not include views of the landscape within which the Development is located, then there cannot be an impact on the character of that landscape. A significant impact on landscape character of non-host landscapes may occur where the Development would become a defining characteristic of key views.

Landscape Sensitivity Criteria

8.32 Having established the baseline landscape character areas/ types, the sensitivity of the landscape has then been assessed. The sensitivity of the landscape to change is defined as Very High, High, Medium, Low or Very Low and is based on professional interpretation of the key landscape characteristics and following factors:

- Landscape quality and condition of landscape elements;

- Scale of the landscape/ sense of distance;
- Simplicity/ complexity of the landscape and existing focal points;
- Special landscape interests and existing land-use;
- The nature of skylines/ horizons;
- Visual interruption;
- The nature of views and distribution of visual receptors; and
- Landscape value as reflected through landscape designations.

8.33 A brief description outlining the key reasons for ascribing the level of landscape sensitivity criteria to each landscape character type/ area is provided within the Landscape Assessment section.

Visual Assessment

8.34 Visual impact assessment considers the sensitivity to change of visual receptors within the study area, and the magnitude of change associated with the introduction of the Development into the existing visual context. Sensitive receptors may include the public or community at large, residents, visitors and other groups of viewers.

8.35 The assessment commenced with the preparation of ZTVs to identify theoretical visibility of the Development, leading to identification of representative visual receptors, description of the existing visual context, and evaluation of the visual implications of implementation of the Development.

8.36 The assessment of visual impact from any one location, takes account of the following:

- Sensitivity of the views and viewers (visual receptor) affected;
- Nature, scale and duration of the change;
- Extent of the Development that would be visible;
- Degree of visual intrusion or obstruction that would occur;
- Distance of the view; and
- Change in character or quality of the view compared to the existing one.

Visual Receptors

8.37 A series of ZTVs (see Figures 8.7a to 8.7d) together with site visits and consultation with Aberdeenshire Council have been used to identify and agree likely sensitive visual receptors and to inform the selection of representative viewpoints.

8.38 Visual receptors were initially identified through desk-based review of existing landscape character distribution and the pattern of settlement, land use, access, and transportation within the Development ZTV. Furthermore, a range of fixed viewpoints was initially considered, with emphasis placed on identification and selection of locations with a clear relationship to the Development where visual implications were considered likely to be greatest.

8.39 The key visual receptors include locations within statutory and non-statutory designated or protected areas, cultural heritage resources, residential properties and farmsteads,

recreational/ tourist resources, sequential routes, panoramic hilltop views, focused or directed views along valleys, coastal/ sea views, and cumulative views. Viewpoints have been selected to represent a range of visual receptor types and sensitivities, viewing distances, directions and elevations (refer to Table 8.9).

8.40 Representative viewpoints were then validated by way of field survey, resulting in some preliminary viewpoints either being repositioned to locations offering improved visibility of the Development or being discounted from the assessment due to no actual visibility.

8.41 A series of computer generated 3D wireline images and photomontages were then generated to illustrate how the Development may appear in the context of the existing landscape, and to assist in the assessment of the likely effects on the landscape and visual resource. In addition, representative viewpoints were also used during the design process to determine the appearance of the wind farm.

8.42 From the viewpoints selected, there is only one direct view (within 10km) into the site so borrows pits and tracks have been modelled in this visualisation for Viewpoint 2 – Lower Deuchries. Furthermore, there are anticipated to be no lights on the wind turbines so a night time assessment has not been undertaken. Should aviation consultees request lighting on the turbines it is proposed to use infrared lighting which is not visible to the naked eye.

Visual Sensitivity Criteria

8.43 Visual sensitivity considers the location and existing visual context of the receptor or viewpoint, the expectations and occupation or activity of the receptor, and the importance of the view. Visual receptor sensitivity has been rated on a four-point scale (see Table 8.1 below).

Table 8.1: Visual Receptor Sensitivity

Visual Receptor Sensitivity	Typical Receptors
Very High	Visual receptors with an overriding interest in their surroundings or with continuous viewing opportunities (e.g. public, expansive views from designated vistas and viewpoints such as Munros, hill forts, castles and beacons).
High	Visual receptors with a principal interest in their surroundings or prolonged viewing opportunities (e.g. views from residential properties, nationally recognised cycle ways, important landscape features, vistas, and historic viewpoints).
Medium	Visual receptors with a general interest in their surroundings or tourists /visitors using transient viewing opportunities (e.g. views from strategic and local roads, public transportation corridors, public open spaces, and navigable waterways).
Low	Visual receptors with a limited or passing interest in their surroundings (e.g. views from places of employment, indoor facilities, commercial and industrial buildings, and commuters).

Magnitude of Change

8.44 The magnitude of change on identified landscape and visual receptors has been evaluated using the criteria summarised in Table 8.2.

Table 8.2: Definition of Magnitude of Change

Magnitude	Landscape	Visual
Very Large	The development would form a dominant new landscape element, resulting in a total loss of, or major alteration to the balance or relationship of the key landscape characteristics.	The development would form a dominant element and focal point of the view, resulting in a dramatic change in the quality and character of the view. Commanding, controlling the view.
Large	The development would form a prominent new landscape element, resulting in a substantial loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form a prominent element within the view, resulting in a prominent change in the quality and character of the view. Standing out, striking, sharp, unmistakeable, easily seen.
Medium	The development would form a conspicuous new landscape element, resulting in a partial loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form a conspicuous element within the view, resulting in a conspicuous change in the quality and character of the view. Noticeable, distinct, catching the eye or attention, clearly visible, well defined.
Small	The development would form an apparent, small new landscape element, resulting in a minor loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form an apparent small element within the view, without affecting the overall quality and/or character of the view. Evident, obvious
Very Small	The development would form an inconspicuous minor new landscape element, resulting in a very minor loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form an inconspicuous minor element within the view, without affecting the overall quality and/or character of the view. Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite.
Negligible	The development would be a barely perceptible landscape element, and would not change the balance or relationship of the key landscape characteristics. Would cause a 'no change' situation to the existing landscape.	The development would result in a barely perceptible change in the view, or would cause a 'no change' situation to the existing view. Weak, not legible, near limit of acuity of human eye.

Cumulative Landscape and Visual Impacts

8.45 Cumulative landscape impacts occur when a combination of two or more wind farm developments begin to influence the perception of landscape character. Cumulative visual impacts occur in several ways, either arising when wind farm developments are visible either in combination or succession from a particular viewpoint, or appearing sequentially as multiple developments when moving through the landscape.

8.46 In consultation with Aberdeenshire Council, wind farm developments that have been considered for inclusion within the CLVIA are shown in Figure 8.24. No wind farms at scoping stage have been assessed in detail within the CLVIA in accordance with accepted practice. This is due to the level of uncertainty surrounding the availability of

project details and whether such projects would progress to valid planning applications at a future date.

8.47 Assessment of the cumulative impacts of different wind farm combinations (i.e. those at different stages of the development process) has been considered to provide a better understanding of the likely cumulative impacts of the Development on the receiving landscape and visual context. Where appropriate operational wind farm developments within the study area are considered in the LVIA baseline. The CLVIA therefore considers the following scenarios:

- Scenario 1 involves the assessment of the addition of the Development to the existing baseline operational wind farm developments in conjunction with those granted planning consent i.e. under construction or approved schemes, assuming that they will all be constructed and operational; and
- Scenario 2 involves the assessment of the addition of the Development to a cumulative baseline comprising all schemes identified in Scenario 1, in addition to submitted (but as yet undetermined) wind farm planning applications, assuming they are all constructed and operational. This is presented as a separate scenario due to the uncertainty over the planning schemes being granted consent.

8.48 Cumulative ZTVs have been generated for all wind farms taken forward into the detailed cumulative assessment, in order to determine the extent of the likely cumulative impacts (refer to Figures 8.25a to 8.25an). Distance markers around each cumulative wind farm reflect the turbine height and associated maximum theoretical visibility as follows: turbine height (m)/ buffer size (km) - 51-70m/ 20km, 71-85m/ 25km, 86-100m/ 30km and 100(+)m/ 35km. The assessment criteria for the magnitude of cumulative landscape and visual change reflects the criteria presented in Table 8.2.

Cumulative Sequential Visibility

8.49 Sequential visibility occurs when an observer moving through the landscape along a linear route (e.g. a road) experiences a series of repeated views containing the Development and other wind farms within the area. Following consultation, and with reference to the ZTVs, a series of linear corridors within the study area have been identified to represent likely sequential visibility, as follows:

- A97 which links Macduff to Huntly and beyond;
- A98 which forms the main coastal route within the study area; and
- A947 which links Macduff to Old Meldrum and beyond.

8.50 The assessment of sequential visibility describes the baseline conditions on each route and describes the likely visual effects of the Development and other wind farms. Factors considered in the assessment of sequential impacts along identified routes include:

- Length of the route;
- Distance from the Development;
- Direction of view;
- Relationship to the ZTV coverage in terms of number of turbines visible;

- Extent of the Development visible; and
- Frequency and duration of available views encompassing the Development and other cumulative developments.

Nature of Impacts

8.51 The assessment considers the nature of landscape and visual impacts i.e. whether the change is direct or indirect, the duration of the impact i.e. short, medium, long term/ permanent or temporary and whether the change is reversible. For the purposes of the LVIA and CLVIA, the nature of landscape impacts resulting from the introduction of the Development turbines (outwith the Site) are assessed as being indirect, long term though reversible and adverse unless stated otherwise stated. In addition, the nature of visual impacts resulting from the introduction of the Development turbines are assessed as being direct, long term though reversible. The visual impact of a wind farm on a receptor is highly subjective; however it is acknowledged that some people are likely to consider the appearance of wind turbines to be adverse.

Significance of Effects

8.52 The significance of the landscape or visual effects (including cumulative and sequential) has been determined by assessing the sensitivity against the magnitude of change as indicated by the matrices in Tables 8.3 and 8.4 below. The assessment of significance of residual impacts takes into consideration mitigation measures implemented as part of the Development.

8.53 With reference to the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011, 'Significant' landscape and visual impacts are those assessed to be major or major/moderate and are indicated by shading in Table 8.3 and 8.4 below. These tables are used as a guide only and the assessment of significance of landscape, visual, cumulative and sequential impacts takes into account other modifying factors and professional judgement.

Table 8.3: Significance of Landscape Effects

Magnitude of Change	Sensitivity				
	Very High	High	Medium	Low	Very Low
Very Large	Major	Major	Major/ Moderate	Moderate	Minor
Large	Major	Major	Major/ Moderate	Moderate	Minor
Medium	Major/ Moderate	Major/ Moderate	Moderate	Minor	Minor/ Negligible
Small	Moderate	Moderate	Minor	Minor	Minor/ Negligible
Very Small	Minor	Minor	Minor/ Negligible	Negligible	Negligible
Negligible	Minor/ Negligible	Minor/ Negligible	Negligible	Negligible/ Nil	Negligible/Nil

Table 8.4: Significance of Visual Effects

Magnitude of Change	Sensitivity			
	Very High	High	Medium	Low
Very Large	Major	Major	Major/ Moderate	Moderate
Large	Major	Major	Major/ Moderate	Moderate
Medium	Major/ Moderate	Major/ Moderate	Moderate	Minor
Small	Moderate	Moderate	Minor	Minor
Very Small	Minor	Minor	Minor/ Negligible	Negligible
Negligible	Minor/ Negligible	Minor/ Negligible	Negligible	Negligible/ Nil

Baseline Conditions

Introduction

8.54 The qualities and characteristics of the landscape and visual receptors within the 35km study area are described in the following sections.

Operational Wind Farm Developments

8.55 Table 8.5 below details operational wind farm developments within 15km of the Development (in accordance with the defined scope of the cumulative assessment) and describes the extent of their visibility with reference to the cumulative ZTVs. These wind farm developments are depicted in Figure 8.24.

Table 8.5: Operational Wind Farms within the Study Area

Site Name	Height (to tip)	No. of Turbines	Description
Boyndie (8.5km north west)	100.5m	8	ZTV is focused chiefly to the north of the study area. ZTV overlap is widespread in the north, with some patchy overlap to the south of the study area. Refer to Figure 8.25a.
Cairnhill (18km east)	76m	3	ZTV is focused principally to the centre of the study area, with widespread overlap throughout. Refer to Figure 8.25b.
Gairnieston Farm (15km east)	100m	1	ZTV is focused principally to the centre and north east of the study area. ZTV overlap is relatively widespread, with the exception of north west of Aberchirder and the far west of the study area. Refer to Figure 8.25c.
Strath of Brydock (5km north)	100m	3	ZTV is broadly similar to the Development ZTV, focused generally to the north and east of the study area. ZTV overlap occurs throughout the study area with a noticeable area of visual screening around Aberchirder. Refer to Figure 8.25d.

Landscape Designations

8.56 This section identifies key landscape designations of national and local significance within the 35km study area and with potential visibility of the Development. The locations of identified designated landscapes are shown in Figure 8.3.

Areas of Great Landscape Value

8.57 Areas of Great Landscape Value (AGLV) are regional landscape designations within Moray. With reference to the Moray Local Plan, two AGLVs with potential visibility of the Development have been identified and are listed in Table 8.6.

Table 8.6: Areas of Great Landscape Value

Areas of Great Landscape Value	Distance from Development	Representative viewpoints
River Deveron	4 km south west	VPT 9
Speyside Valley	25 km south west	None

8.58 The ZTV for the Development indicates that there would be visibility from Speyside Valley AGLV. However, this would be over 27km away from the Development and an indicative wireline from Tom Mor (Figure A16 - 340310, 838520 in Appendix 8.2) indicates a Very Small magnitude of change. Furthermore, given that the majority of the landscape designation is outwith the 35km study area it is not anticipated that there would be significant effects as a result of the Development. Therefore, this AGLV is not considered further within the assessment.

8.59 There are currently no specific citations available for AGLVs within Moray. Therefore, a short description of the River Deveron AGLV is provided below which draws on the SNH landscape character assessments and is in the context of the existing wind farms within the study area.

River Deveron AGLV

8.60 The River Deveron AGLV is located within the Uplands LCA within the Moray. The key characteristics of this landscape do not relate to this designation, which is characterised by a well-defined valley with steep sided slopes. The River Deveron meanders through this valley and coniferous plantation is common on the valley sides. Views are generally enclosed and focused along the valley floor. There are currently no operational wind farms within this landscape designation.

Historic Gardens and Designed Landscapes

8.61 Historic Gardens and Designed Landscapes (HGDL) are considered valuable assets at the regional and national level, and such sites are listed in the Inventory of Gardens and Designed Landscapes in Scotland. There are several HGDLs within the study area of which two have potential visibility of the Development, as listed in Table 8.7 below.

Table 8.7: Historic Gardens and Designed Landscapes

Historic Gardens and Designed Landscapes	Distance from Development	Representative viewpoints
Craigston Castle	11 km east	Agricultural Heartland
Fyvie Castle	17 km south east	River Valleys

Craigston Castle HGDL

8.62 Stately home owned by the Urquhart family. The castle architecture is highly eccentric and there are woodland walks and an icehouse and dovecote in the gardens. Open to the public.

Fyvie Castle HGDL

8.63 A landscape of parks, woods and a long artificial loch which was developed in the 18th century around the much older Fyvie Castle. The gardens also contain an interesting range of 18th to 20th century buildings. Both the castle and the gardens are open to the public.

Landscape Character

8.64 This section describes the landscape qualities and characteristics of the study area. A review of the relevant published landscape assessments has also been carried out to identify and describe distinct landscape character Areas (LCA) that are within the study area (refer to Figure 8.5) and fall within the Development ZTV (refer to Figure 8.6).

Landscape Fabric, Landform and Landcover

8.65 Landform across the study areas varies, within three broad landscape character types identified within the study area – Rolling Farmland, Uplands and Coastal Edge, as shown in Figure 8.5. Generally, the landform rises in height as one moves south inland and away from the coastal edge up to a height of around 600m AOD. However, within the western half of the study area the topography rises more steeply from the coast forming the Uplands.

8.66 The Rolling Farmlands, which form the main core and eastern half of the study area and includes the Site, are characterised by undulating and rolling topography varying in height from approximately 50m to 300m AOD. The land cover is dominated by agriculture and there is a mosaic of pasture and arable fields with varied field boundaries including fence lines, hedgerows and occasional stone walls. Small sized blocks of coniferous, and less frequently broadleaf, woodland help to break up the expanse of this agricultural plain.

8.67 The Uplands, located to the west of the study area, steeply rise from the coast and are generally between 300m and 600m AOD. Broad, gently undulating slopes cut with gently graded valleys are typical of this area. The Uplands are often punctuated with distinctive conical hills such as Knock Hill, which form distinctive features within the landscape. Landcover is dominated by semi-improved pasture and moorland and large scale coniferous plantations are common.

8.68 The Coastal Edge, a strip of land running from west to east and located within the northern half of the study area, is dominated by cliff edged headlines. At their extreme, around Troup Head, cliffs can reach up to 110m in height. Narrow inlets and occasional sandy bays also occur within this landscape. Despite the exposed nature of this coastline creeping grasses and wind pruned gorse bushes are common throughout.

The Moray Firth, a wide expanse of open water, is located to the north of the coastal edge.

Scale and Enclosure

8.69 The Rolling Farmlands are of medium to larger scale. The undulating topography often allows open views of the surrounding landscape. However, as one travels around through areas of lower ground the nature of views can change as localised topography, woodland planting and development foreshortens views.

8.70 The Upland landscape typically exhibits an open and larger scale character. This is a transitional landscape between the lower lying agricultural land to the east and the large scale mountainous landscape of the Cairngorms to the south west. Long distance panoramic views are often obtainable over broad, rolling hills.

8.71 The Coastal Edge is a small scale, intimate landscape dominated by rocky cliffs, inlets and sandy bays. Despite the intimate scale of the landscape features, long distance, panoramic views over the Moray Firth give this landscape a large scale, open and exposed feeling. However, views to the south and looking inland tend to be enclosed by localised topography or frequent coastal settlements.

Human Influence

8.72 Human influence has had a strong role in defining the landscape character over most of the study area. The Coastal Edge is heavily developed and there are numerous, and often quite picturesque, towns and villages with a strong connection to the sea through fishing ports and harbours. Caravan parks and golf courses are also a common feature along with infrastructure such as roads and electricity pylons.

8.73 Within the Rolling Farmlands the landscape is dominated by agriculture. Contrasting patterns of arable and pastoral fields with crops such as oil seed rape and its seasonal changes are a defining characteristic. Small blocks of plantation woodland are also common throughout this area.

8.74 Within the Uplands the influence of man is less apparent and this area tends to be less settled. However, large scale blocks of plantation woodland are frequent and geometric patterns created through heather burning are often apparent in the moorlands.

Settlement Pattern

8.75 Along the Coastal Edge there are a number of larger harbour settlements such as Buckie, Portsoy, Banff, Macduff and Rosehearty. Located between these larger settlements are farmsteads, which often have fields abutting the cliff edges along the coast.

8.76 Within the Rolling Farmlands there is a network of scattered farmsteads and larger settlements linked by a complex web of major and minor roads. Larger settlements of note within this area include Aberchirder, to the south west of the Site, Turriff

(approximately 7 km to the south east) and Oldmeldrum and Inverurie, located on the edge of the study area to the south east.

8.77 The Uplands are less densely settled and outwith the more sheltered valleys, settlement tends to be sparse. Key settlements are Keith (approximately 19 km to the west) and Huntly (approximately 15km to the south west).

Communication and Transportation

8.78 The key transport corridors through the study area include:

- The coastal route which is served by the A98;
- The A96 which links Elgin to Aberdeen and passes through Keith, Huntly and Inverurie travelling in a north west to south east direction;
- The A947 which links Macduff and Banff to Aberdeen and passes through Turriff and Oldmeldrum; and
- A number of other A roads such as the A97 (linking Macduff/ Banff to Huntly) and the A95 (linking Keith to Banff).

8.79 Outwith these major routes there is a network of minor roads that provide access to the numerous villages, settlements and individual properties throughout the study area.

8.80 Rail coverage within the study area is limited and there is no coastal railway. However, a railway line, which broadly follows the A96, links Elgin to Aberdeen and passes through Keith, Huntly and Inverurie. This railway also has a spur from Keith, which travels in a south west direction providing a rail link to Dufftown.

National Landscape Character

8.81 The National Programme of Landscape Character Assessment, undertaken by SNH in partnership with local authorities and other agencies, involved the assessment of landscape character for all of Scotland. The study area is covered by the following Landscape Character Assessments:

- Banff and Buchan Landscape Character Assessment (Report No. 37, Cobham Resource Consultants), published by SNH in 1997;
- South and Central Aberdeenshire Landscape Character Assessment (report No. 102, Environmental Resources Management), published by SNH in 1998; and
- Moray and Nairn Landscape Character Assessment (Report No. 101, Turnbull Jeffrey Partnership), published by SNH in 1998.

8.82 The proposed turbines fall within Area 3: Western Coastal Farmland - Coastal Farmland LCA as described in the Banff and Buchan Landscape Character Assessment (refer to Figure 8.5). The key characteristics of this LCA are defined in the SNH assessment as:

- *Large scale landscape with rolling terrain formed by a broad sweeping plain with shallow basins and infrequent rounded hills which form gentle land marks;*
- *Large fields of arable land occasionally give way to pasture with field boundaries of scattered hedges and post and wire fences;*

- *Boggier parts of the plains have been planted with coniferous forestry and the blocky outlines generally absorb the strong grid of the surrounding large fields;*
- *Frequent farmsteads scattered throughout the plains; and*
- *Rolling terrain allows long distance views to the sea.*

8.83 The 35km study area comprises further LCA as shown in Figure 8.5. The key LCA with potential visibility of the Development together with their defined key characteristics are listed in Table 8.8 below. The south of the Site partially falls within the Agricultural Heartlands Area 8: Knock Hill and Aberchirder as described below.

Table 8.8: Surrounding (Non Host) Landscape Character Areas with Potential Visibility of the Development

Landscape Character Area	Key Characteristics
The Coast	***Area 1 – Cliffs of the North Coasts*** *Cliff edged headlands, with narrow inlets and occasional sandy bays;* *Cliffs of the northern coastline form a defined and cohesive edge with cliffs up to 110m in height;* *Despite physical restrictions of this narrow rocky coastline the overall impression is of an open, large scale landscape with wide expanses of sea and sky;* *Short creeping grasses and wind pruned gorse bushes colonise cliff faces; and* *Frequent settlement along this rocky coastline with numerous prosperous fishing ports.*
Coastal Farmland (Common element in determining landscape character is the proximity of the sea which determines orientation of key views)	***Area 4 – Coastal Farmland East of Macduff*** *Open landscape with little change in height definition;* *Bleak and windswept, with a complete absence of woodland;* *Large fields enclosed by fencing or broken lines of gorse hedging;* *No villages and only a few scattered farmsteads; and* *Subtle landscape which lacks a strong definition.*
Agricultural Heartlands (Land bound agricultural plains)	***Area 8 – Knock Hill and Aberchirder (forms southern end of development Site)*** *Low rolling hills and long ridges merging into the foothills of Moray;* *Landscape is dominated by the summit of Knock Hill;* *Views from within the lower valleys are enclosed by the smoothly undulating landform;* *Fringes of shelterbelts and clumps of mature deciduous trees emphasise the distinctive topography;* *Large scale fields divided by post and wire fences, hedges or gorse; and* *Scattered and infrequent farmsteads, main village is Aberchirder.*

Landscape Character Area	Key Characteristics
	Area 9 - Upland Ridges South of the Deveron *Convex slopes of hill ridges lying either side of river valleys;* *Broad hill tops are open and similar in height divided by numerous streams;* *Cultivation is carried out to edge of minor water courses and tree cover is sparse; and* *Tracks along shallow valleys lead to scattered and infrequent farmsteads, with no settlements of note.*
	Area 10 – Agricultural Heartland of Banff and Buchan *Gently rolling landform allows open views of the surrounding landscape;* *Frequent scattering of broad leaved trees and small coniferous blocks combine to enliven this landscape;* *Various field boundaries of fences, hedges and occasional stone walls; and* *Frequent farmsteads and small hamlets.*
River Valleys	***Area 12 – Deveron and Upper Ythan Valleys*** *Deveron and Upper Ythan Rivers meander through predominantly shallow valleys, bounded by broad rolling hill ridges to either side;* *Valleys become steeper nearer the sea;* *Mix of deciduous and coniferous trees a dominant feature;* *Fences and hedges divide the agricultural land which usually leads up to the rivers edge;* *Key views focused up/ down the valley and across the valley from higher valley sides; and* *Valley bottoms well settled and castles / mansion houses contribute to the architectural diversity of the area.*
Coastal Lowlands	*Flat to gently undulating coastal plain;* *Intensive agricultural land use;* *Extensive bands of coniferous plantation and shelterbelts create a backdrop to large, smooth, arable fields and create a simple pattern of vegetation;* *Densely populated; and* *Extensive views out to sea, however views often foreshortened by woodland.*
Straths and Valleys	*Deveron and Bogie Straths* *Distinct valley form, constricted valleys associated with schists, wide valley north and south of Huntly associated with softer rocks;* *Mosaic of diverse land uses - rough sheep grazing, hay fields, commercial forestry plantation and deciduous woodland;* *Neat farmland patchwork on flood plain dominated by pasture with post and wire fencing and hedges;* *Patches of neglected farmland;* *Shallow, rocky rivers lined by broadleaf woods amidst well wooded farmland; and* *Dense settlement within valleys and farmhouses scattered along straths.*

Landscape Character Area	Key Characteristics
Farmed Moorland Edge	*Plateau of low hills with undulating rocky terrain;* *Marginal upland farms with scattered farm buildings;* *Rich mosaic of different textures and features and small scale landscape pattern;* *Interspersed with pockets of Moorland Plateaux which form prominent elevated foci; and* *Derelict buildings and extensive derelict dry-stone walls.*
Uplands	*Broad, gently undulating slopes rising in close proximity to the coast;* *Landcover of semi-improved pasture and moorland;* *Large scale coniferous plantations to the western edge, with smaller scale plantations on the higher hill slopes; and* *Few areas of native woodland concentrated around individual farmsteads.*

Local Landscape Character of the Site

8.84 The Site is located across an area of rolling farmland (see Figure 1.1). Site levels range from approximately 165m AOD to 241m AOD at the top of Black Law Hill. The highest area of the site is defined by a triangulation point, located within an area of gorse and scrub. The Hill of Maunderlea is located to the north of the Site and is 233m in height. From these two main hills within the Site the land generally falls away towards the lower undulations of landform to the east, the A97 to the west and the settlement of Aberchirder to the south.

8.85 The landscape of the site and the immediate surroundings is comprised principally of pastoral grazing and arable fields. There is a large scale field pattern with field boundaries typically formed by post and wire fencing. Where hedges do occur they are often gappy and composed of gorse. Occasional shelterbelts of both coniferous and deciduous trees also exist along field boundaries.

8.86 Dispersed across the landscape in the immediate vicinity of the Site are a number of coniferous plantations. Farms with associated traditional style houses and a variety of farm buildings consistent with modern farming are also scattered in the near vicinity in most directions linked by a network of minor roads.

Baseline for Assessment of Visual Impacts - Representative Viewpoints

8.87 Fifteen representative viewpoints were selected through desk-based review, field study and consultation with Aberdeenshire Council. The representative viewpoints are listed in Table 8.9 below and shown on Figure 8.2. Table 8.9 provides a comprehensive overview of the viewpoints in terms of their type, spatial relationship to the Development and lists the LCA or any designations they are located within and for which they represent.

8.88 In addition to the viewpoints within the landscape and visual assessment the opportunity was made available to the public to view wirelines (which could be

generated from any location) at the public exhibition held in Aberchirder Village Hall in October 2011.

8.89 Baseline views for each of the viewpoints are illustrated on the wireline and photomontage illustrations in Figure 8.8 to 8.22. Field survey and use of the wirelines and photomontages have been used as the basis for assessment of visual impacts.

8.90 Field surveys to identify and assess viewpoints were undertaken between July and September 2011 to record baseline conditions and to evaluate likely landscape and visual effects. Prevailing weather conditions during the surveys was generally fine.

Table 8.9: Representative Viewpoints

VP No	Location	OS Grid Ref	Direction of View	Landscape Receptors		Visual Receptor Type/s	Distance to Nearest Visible Turbine	Rationale for selection
				Landscape Character Area (SNH)	Designation			
1	Whitehills	365824, 865782	190 degrees	Coast	N/a	Recreational	10.9km	Represents views from a nearby settlement and Conservation Area (Figure 8.8)
2	Lower Deuchries	365463, 855743	230 degrees	Coastal Farmland	N/a	Residential	1.5km	Represents views from residential properties adjacent to the Site (Figure 8.9)
3	B9025 towards Hill of Maunderlea	362696, 857552	160 degrees	Coastal Farmland	N/a	Road Users	3.6km	Represents views from road users approaching the Site (Figure 8.10)
4	Junction of A95 and A98	361963, 862399	170 degrees	Coastal Farmland	N/a	Road Users	7.6km	Represents views of road users from two key transport routes near the Site (Figure 8.11)
5	Banff	367582, 863457	200 degrees	Coastal Farmland	N/a	Residential and Road Users	9.2km	Represents views from nearby settlement (Figure 8.12)
6	Mains of Eden	369942, 859125	230 degrees	River Valleys	National Cycle Route	Recreational and Road Users	7.1km	Views representing the River Deveron valley (Figure 8.13)
7	Turriff	372854, 850691	290 degrees	River Valleys	N/a	Residential and Road Users	9.5km	Represents views from nearby settlement (Figure 8.14)
8	South Broomhill (A97)	360344, 846846	30 degrees	River Valleys	N/a	Road Users	8.8km	Represents views for road users on main approach road towards Site (Figure 8.15)
9	Turtory	359832, 849520	40 degrees	Uplands/ Agricultural Heartlands	River Deveron Moray AGLV	Road Users	6.8km	Represents views from Moray AGLV (Figure 8.16)
10	Knock Hill	353710, 855142	90 degrees	Uplands	N/a	Recreational	10.2km	Represents views from high point near Site and local footpath (Figure 8.17)
11	Little Balloch Hill	349334, 850050	70 degrees	Uplands	N/a	Recreational (local users)	15.4km	Represents views from high point near Site and local footpath (Figure 8.18)

VP No	Location	OS Grid Ref	Direction of View	Landscape Receptors		Visual Receptor Type/s	Distance to Nearest Visible Turbine	Rationale for selection
				Landscape Character Area (SNH)	Designation			
12	A68 near Portsoy	359406, 864819	150 degrees	Coastal Farmland	N/a	Road Users	10.8km	Represents road users travelling in south easterly direction (Figure 8.19)
13	Crudie on A98	379628, 857359	260 degrees	Agricultural Heartland	N/a	Road Users	15.5km	Represents residential receptors and road users (Figure 8.20)
14	Greenspot on A947	379638, 831942	330 degrees	Agricultural Heartland	N/a	Road Users	27.5km	Represents road users travelling in a north westerly direction (Figure 8.21)
15	Tap o Noth	348425, 829337	30 degrees	Moorland Plateau	N/a	Recreational	29.9km	Recreational receptors from hill summit (Figure 8.22)

Landscape Impacts

Landscape Fabric of the Site

Construction Phase

8.91 The construction of the Development would have a direct impact on the immediate Site and through gaining access to the Site. The anticipated construction phase would be approximately 7 months, which is relatively short-term.

8.92 The activities and temporary features that may cause an impact on the landscape fabric (i.e. to the land cover and habitats) are described in ES Chapter 6: Ecology. The location and management of these features and activities have been carefully considered, and inherent mitigation measures have been incorporated into the construction programme to limit the transitory impacts of the construction phase as detailed in ES Chapter 3: Project Description.

8.93 No woodland clearance is required to accommodate the scheme and direct landscape impacts on Site would be limited to the loss of a small amount of grassland to accommodate the access tracks, turbine foundations and control building compound. Furthermore, the borrow pits and temporary construction compound and lay down areas would result in a further small loss of similar land cover.

8.94 Grassland is considered to be of Low Sensitivity as it is a widespread resource within the context of the study area and host LCA. Furthermore, the surrounding grassland would still be usable for grazing when construction of the Development is complete, and the construction compound, temporary lay down area and borrow pits would be made good and returned to their former habitats post construction. Therefore, the magnitude of change of permanently removing a small amount of grassland is Small, resulting in an assessed level of significance of Minor (not significant).

8.95 The new access tracks would also be required to cross a small number of field boundaries. Field boundaries within the Site are typically post and wire fences with scrubby vegetation, which are considered to be of Low Sensitivity. As the number of field boundary crossings is limited, resulting in a Small magnitude of change, the assessed level of significance on boundaries is Minor (not significant).

Operational Phase

8.96 Once operational, any activity on the Site would be restricted to servicing the operational Development, i.e. limited to the areas of access tracks and turbines, and due to their transient nature not considered to be significant. In terms of impacts on the landscape fabric, other than the residual permanent impacts as indentified above, no significant impacts are anticipated to occur.

Decommissioning Phase

8.97 The decommissioning would result in similar impacts that are no greater than those described for construction. Landscape and visual impacts during the decommissioning

phase would be minimal, achieved through removing all above ground structures, leaving all below ground structures in place and restoring the ground disturbed by the works.

Landscape Assessment

8.98 The following sections set out the analysis and assessment of the landscape impacts of the Development. For the purposes of this assessment the nature of landscape impacts resulting from the introduction of the Development are assessed as being indirect, long term, reversible and adverse unless otherwise stated.

8.99 The detailed assessment of the impact of the Development on landscape designations is included in Appendix 8.1. No significant landscape impacts are identified on the following key landscape designations:

- River Deveron AGLV;
- Craigston Castle HGDL; and
- Fyvie Castle HGDL.

Landscape Character Areas

8.100 The following section sets out the assessment of impacts on the host and surrounding key LCA with visibility as identified in Table 8.8. Where significant landscape impacts have not been identified the full assessment on each LCA is included in Appendix 8.1. A brief summary table outlining the assessed sensitivity, magnitude of change and significance of impacts for these LCA is included in Table 8.10.

8.101 For the purposes of this assessment, the nature of landscape impacts resulting from the introduction of the proposed turbines are assessed as being indirect (outwith host LCA), long term, reversible and adverse unless stated otherwise.

Area 3: Coastal Farmland - Western

8.102 The Development is located within this LCA, within the more undulating land to the south east of this landscape. The ZTV indicates widespread visibility across this area with some pockets of visual screening to the north of the infrequent hills which form gentle land marks (Durn Hill, Blackhill, Hill of Alvah) and along the shallow valley of the Burn of Boyndie. Woodland coverage is sporadic throughout this LCA; however there are a number of small blocks of plantation woodland, which introduce some areas of visual screening. Frequent farmsteads and a network of minor and major roads contribute to a wide spread of visual receptors who generally experience medium scale views over rolling farmland, with longer distance key views orientated out to sea from the higher ground.

8.103 Predicted impacts: As the Development is located within this LCA direct impacts would include the loss of grassland which is discussed further in impacts on Landscape Fabric. Within the immediate locale of the Site around Rosy Burn valley, rolling farmland - which has a secluded feel due to the nature of the surrounding topography - would turn into rolling farmland with a wind farm (refer to Viewpoint 2 – Figure 8.9)

resulting in a Very Large magnitude of change. However, the rising landform that surrounds the Site to the north, west and south helps to minimise and contain impacts over landscape character in these directions.

8.104 With regard to the wider impacts anticipated as a result of the Development these would be limited to short to medium distance views of the Development over the well settled and managed agricultural landscape. Depending on the viewing location, the Development is typically seen with the upper sections of the wind turbines visible on the horizon. The visual assessment includes three further viewpoints from this area (Viewpoint 3, 4 and 5 – Figures 8.10 to 8.12).

8.105 Generally from this landscape (and as identified in Viewpoints 3, 4 and 5) a magnitude of change no greater than Small is anticipated, which is representative of views from the majority of this LCA to the north and north west of the Development. In closer distance views to the north and west, Black Law Hill and the Hill of Maunderlea partially screen the Development (see Viewpoint 3) and contain impacts on landscape character as the wind farm appears behind a ridge and not sitting within the immediate landscape. In longer distance views such as Viewpoints 4 and 5 the turbines of the Development are less conspicuous.

8.106 The operational three turbine Strath of Brydock and the eight turbine Boyndie are located within this LCA, and are both a common feature in views. Furthermore, the viewing orientation is varied with key views orientated out to sea and in the opposite direction from the Development. Therefore, and from the majority of this landscape, the Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics.

8.107 Assessed sensitivity: Medium as this LCA has quite a simple landscape pattern and topography with medium scale views, over a managed rural landscape of rolling farmland with numerous man-made features (roads, pylons, coniferous plantations and large farm sheds) and where wind farms are already a common feature.

8.108 Significance: generally Minor (not significant) for the majority of this landscape; however Major/Moderate (significant) from a localised area including the Site and Rosy Burn valley to the south east (within approximately 3km) of this landscape where rolling farmland would turn into rolling farmland with a wind farm.

Area 12: River Deveron and Upper Ythan Valleys

8.109 The Development is located approximately 3km to the west of this LCA. The ZTV indicates widespread visibility from within this LCA especially from the more elevated western and southern facing slopes. However, visibility from the valley floors is limited and visibility beyond 10km and within the River Ythan Valley is less widespread.

8.110 Deciduous and coniferous tree cover is a dominant feature of this landscape which is anticipated to reduce actual visibility. However, the valley is well settled with good access through a network of minor roads including a National Cycle Route. The area is also a draw for tourists using the river for fishing. Scenic, medium to smaller scale

enclosed views looking up, down and across the valley characterised by a rich mix of woodland and farmland are typical throughout this LCA.

8.111 There are no operational wind farms located within this landscape and due to the enclosed character, wind farms are less typical in views. However, views of the operational Strath of Brydock and Boyndie to the west and Cairnhill and Gairnieston within the more immediate context to the east are obtainable, more so to the north of the River Deveron.

8.112 Predicted impacts: Impacts are limited to medium to longer distance views of the proposed wind farm and none of the key characteristics of this landscape would be directly impacted. In key views looking across the valley from the minor roads which are typically on the higher valley sides, medium to longer distance views of the Development would be obtainable on the horizon.

8.113 Viewpoints 6, 7 and 8 (refer to Figures 8.13 to 8.15) are located within this LCA and typical of views experienced from along the River Deveron Valley. A magnitude of change of Medium to the north of the River Deveron (Viewpoint 6), reducing to Small to the south of the River Deveron and along the River Ythan (Viewpoints 7 and 8) is anticipated.

8.114 From the majority of this landscape, the Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of the key landscape characteristics when visible (often from the higher valley sides) typically seen in combined views with other operational wind farms.

8.115 However, from a localised area (see Viewpoint 6) to the east of the Site the Development would form a conspicuous new landscape element, resulting in a partial alteration to the balance of the key views from this landscape. This is typically in views looking south west and west across the river valley, from the minor roads on the higher valley slopes between Mains of Eden and Muirden. Combined views with the Development and other operational wind farms are typically not obtainable from this area. To the north and south of this localised area (between Mains of Eden and Muirden) the longer viewing distance lowers the magnitude of change and wind farms are more typical in views.

8.116 Magnitude of change: Small from the majority of this landscape (to the south and very north of the River Deveron and from along the River Ythan) due to the viewing distance, reduced likely visibility and increased opportunity for combined views of operational wind farms. However, from a localised area to the east of the Development (between Mains of Eden and Muirden) - Medium.

8.117 Assessed sensitivity: High due to the high density of visual receptors; intimate, small to medium scale landscape; intricate landscape pattern / varied topography and nature of views where operational wind farms are not overly common (especially from valley floor).

8.118 Significance: Moderate (not significant) from the majority of this landscape. Furthermore, recreational users of the river, including anglers, are not anticipated to

have views of the Development. However, Major/Moderate (significant) from a localised area to the east of the Development (between Mains of Eden and Muirden - see Viewpoint 6) and only with regard to impacts on key views as none of the other key characteristics would be directly impacted. This is due to the Development introducing wind turbines onto the horizon in medium distance key views from the valley side looking in a south westerly direction.

8.119 The following table sets out a summary of the key LCA within 15km and with potential visibility of the Development (as identified in Table 8.8) where significant landscape impacts have not been identified. A full assessment of the landscape impacts on these LCA is included in Appendix 8.1.

Table 8.10: Landscape Character Assessment Summary for LCA where significant impacts have not been identified

Landscape Character Areas	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
The Coast	Area 1: Cliffs of the North Coast	High	Small	Moderate	Site 8km to south of this LCA ZTV indicates patchy visibility Key views orientated out to sea (opposite direction from Site) Views of operational wind farm apparent Development forms an apparent, small new landscape element resulting in a minor alteration to key landscape characteristics
Coastal Farmland	Area 4: East of Macduff	Medium	Small	Minor	Site 8km to south west of this LCA ZTV indicates widespread visibility Longer distance key views orientated out to sea (opposite direction from Site) Views of operational wind farm apparent Development forms an apparent, small new landscape element resulting in a minor alteration to key landscape characteristics
Agricultural Heartlands	Area 8: Knock Hill and Aberchirder	Medium	Small	Minor	Site within this LCA ZTV indicates widespread visibility, reduced by woodland Short to medium scale key views with no focused orientation Views of operational wind farm apparent Development forms an apparent, small new landscape element resulting in a minor alteration to key landscape characteristics
	Area 9: Upland Ridges south of the Deveron	Medium	Small	Minor	Site 6km to north of this LCA ZTV indicates patchy visibility Medium scale views over surrounding farmland with longer views from higher ground (no focused viewing orientation for key views) Views of operational wind farm apparent Development forms an apparent, small new landscape element resulting in a minor alteration to key landscape characteristics

Landscape Character Areas	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
	Area 10: Agricultural Heartlands of Banff and Buchan	Medium	Small	Minor	Site 6km to west of this LCA ZTV indicates widespread visibility in western half Open, medium to longer distance views over surrounding farmland (no focused viewing orientation for key views) Views of operational wind farm apparent Development forms an apparent, small new landscape element resulting in a minor alteration to key landscape characteristics
Coastal Lowlands	Coastal Lowlands	Medium	Small	Minor	Site 11km to south east of this LCA ZTV indicates limited visibility Longer distance panoramic views from the higher ground obtainable; however key views orientated out to sea Views of operational wind farm apparent Development forms an apparent, small new landscape element resulting in a minor alteration to key landscape characteristics
Straths and Valleys	Straths and Valleys	High	Very Small	Minor	Site 10km to north east of this LCA ZTV indicates limited visibility Longer distance views from the higher ground obtainable Views of operational wind farms apparent from higher ground (but not common in key views from enclosed valley floors) Development forms an inconspicuous new landscape element resulting in a very minor alteration to key landscape characteristics
Farmed Moorland Edge	Farmed Moorland Edge	Medium	Very Small	Minor/ Negligible	Site 14km to north east of this LCA ZTV indicates fragmented pattern of limited visibility Elevated long to medium distance views Views of operational wind farm apparent Development forms an inconspicuous new landscape element resulting in a very minor alteration to key landscape characteristics

Landscape Character Areas	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
Uplands	Uplands	Medium	Small	Minor	Site 5km to north east of this LCA ZTV indicates fragmented pattern of visibility Elevated long distance, often panoramic views Views of operational wind farm apparent Development forms an inconspicuous new landscape element resulting in a minor alteration to key landscape characteristics

Landscape Character of the Wider Setting

8.120 Within the wider landscape, beyond approximately 15km from the nearest proposed turbine, the impacts on landscape character would relate to the visibility of the Development. Beyond 15km the ZTV identifies that visibility would be sporadic and fragmented, with the notable exception to the north (and offshore).

8.121 Viewpoints 14 and 15 (refer to Figures 8.21 and 8.22) are located beyond 15km to the south of the Development and typical of longer distance views from roads and upland resources where obtainable. A magnitude of change of Very Small is anticipated from these viewpoints, which is typical of views within the wider landscape.

8.122 Furthermore, where visibility of the Development is anticipated beyond 15km, this tends to be from the more elevated ground from which views of the various operational wind farms throughout the 35km study area are more typical.

8.123 Within the wider landscape the Development would form an inconspicuous new landscape element and would not result in significant landscape impacts.

Visual Impacts

Construction and Decommissioning Impacts

8.124 No significant visual impacts would be associated with the construction phase of the Development because visual effects would be temporary and transient in nature. Furthermore, the landform surrounding the Site would often screen construction works, particularly from the east through south to west and from distances greater than about 2km from the north. Decommissioning visual impacts are anticipated to be similar in nature to construction visual impacts.

Representative Viewpoint Assessment

8.125 The following sections sets out the analysis and assessment of the visual impacts of the Development including representative viewpoints as listed in Table 8.9. The description of the existing outlook and predicted impacts from each viewpoint location is described with reference to the visualisations of the Development depicted on wireline and photomontage illustrations in Figures 8.8 to 8.22.

8.126 It should be noted that the assessment of the predicted impacts is made by reference to the wireline images, photomontages (where produced) and fieldwork. Where photomontage images for selected viewpoints have been produced, this is to illustrate the likely view of the Development as would be seen within a photograph (not as it would appear to the human eye in the field). Photomontages have been produced for all viewpoints within15km and where vegetation cover does not screen views towards the Development.

8.127 Furthermore, the permanent met mast has been shown in all wirelines and photomontages within 5km of the Development. In viewpoints beyond 5km, and due to

the lattice construction of the met mast, this feature of the Development would be difficult to discern so reference has not been made.

8.128 For the purposes of this assessment, the nature of visual impacts resulting from the introduction of the proposed turbines are assessed as being direct, long term, reversible and adverse unless stated otherwise.

VP01: Whitehills (365824, 865782)

8.129 Baseline Views: (Refer to Figure 8.8). This viewpoint is representative of open, oblique views for coastal walkers from a cliff side walk passing through Whitehills along its northern edge. Views from residential properties within Whitehills would generally be limited and screened by localised development. This viewpoint is located within the Coast LCA.

8.130 From this location, medium to longer distance views may be afforded from an open, elevated section of the coastal path looking over the coastal settlement of Whitehills. Direct views to the Site are screened by undulating farmland and woodland in the middle distance. The operational three turbine Strath of Brydock can be seen, clearly breaking the horizon to the left of centre view. In addition the operational 8 turbine Boyndie is visible to the right of the view. This view is highly developed in nature, which contrasts with the surrounding areas of open managed farmland, woodland and coast.

8.131 Predicted View: The wireline indicates that the upper tips of three turbines would be visible at a distance of 10.9km. However, wirelines do not take account of vegetation and woodland in the middle distance on the horizon which would screen the majority of the Development.

8.132 Magnitude of Change: Negligible

8.133 Receptor type/s and sensitivity: Recreational receptors on the coastal walk to the north of Whitehills are considered to be of Medium sensitivity.

8.134 Significance: Negligible (not significant)

VP02: Lower Deuchries (365463, 855743)

8.135 Baseline Views: (Refer to Figure 8.9a and 8.9b.) This viewpoint is representative of uninterrupted, open and direct views from scattered residential properties to the north east of the Site. This viewpoint is located within the Coastal Farmland LCA.

8.136 From this location, short distance, close proximity views may be afforded from the typically single story farmsteads (with various viewing orientations) looking over farmland. Direct views into the Site are also obtainable from this vantage point. No operational wind farms were observed from this viewpoint during field surveys. Whilst the land is managed for agriculture and some scattered farmsteads are visible, this view has a secluded feel.

8.137 Predicted View: The towers, hubs and blades of the majority of all three turbines would be visible, seen against the backdrop of the sky at a distance of 1.5km. Furthermore,

the turbine access tracks, borrow pits and permanent met mast would be apparent due to the close proximity, open and direct views into the Site. However, the three turbine layout would be well balanced within this view, with no overlapping of turbines and most of the access tracks would be screened by woodland and landform.

8.138 Magnitude of Change: Very Large

8.139 Receptor type/s and sensitivity: Residential receptors are considered to be of High Sensitivity.

8.140 Significance: Major (significant)

VP03: B9025 towards Hill of Maunderlea (362696, 857552)

8.141 Baseline Views: (Refer to Figure 8.10.) This viewpoint is representative of uninterrupted, direct and open views for road users, travelling in a southern direction on the B9025 towards Aberchirder. This viewpoint is located within the Coastal Farmland LCA.

8.142 From this location short to medium distance views may be afforded from road users travelling in a southern direction looking over farmland. Direct views towards the Site are obscured by the Hill of Maunderlea, which rises to form the horizon and is topped with a small stand of plantation woodland. The operational Strath of Brydock and Boyndie are also visible from this viewpoint in successive views. This view has a developed, albeit rural coastal character due to flatter topography and the presence of the road.

8.143 Predicted View: The wireline indicates that the tips of two turbines are visible from this viewpoint at a distance of 3.6km. However, wirelines do not take account of vegetation and woodland on the horizon, which would screen the majority of these tips.

8.144 Magnitude of Change: Very Small

8.145 Receptor type/s and sensitivity: Road users on this B road are generally local residents and considered to be of Medium Sensitivity.

8.146 Significance: Minor/ Negligible (not significant)

VP04: Junction at A95 and A98 (361963, 862399)

8.147 Baseline Views: (Refer to Figure 8.11a and 8.11b.) This viewpoint is representative of uninterrupted, oblique and open views for road users travelling on the A98. There is also a bus stop with open, direct views orientated to the south. This viewpoint is located within the Coastal Farmland LCA.

8.148 From this location, medium distance views may be afforded for road users travelling east / west on the A98 or in a southern direction on the A95 looking over farmland. Direct views towards the Site are obstructed by the intervening landform which rises to form the horizon and is clothed in a patchwork of open farmland and woodland. The operational Strath of Brydock is visible in combined views and Boyndie in successive

views to the left of view. This view has a developed, albeit rural coastal character due to the flatter topography and presence of the road.

8.149 Predicted View: The upper most sections of three tips would be visible from this viewpoint at a distance of 7.6km seen against the backdrop of the sky. However, woodland would help to partially screen the turbine to the far left.

8.150 Magnitude of Change: Very Small

8.151 Receptor type/s and sensitivity: Road users and people sitting at the bus stop are considered to be of Medium Sensitivity.

8.152 Significance: Minor/Negligible (not significant)

VP05: Banff, Sandyhills (367582, 863457)

8.153 Baseline Views: (Refer to Figure 8.12a and 8.12b.) This viewpoint is representative of uninterrupted, direct open views from residential properties on the southern edge of the settlement of Banff. However, the majority of residents within the coastal settlement of Banff do not have open views towards the Site. This viewpoint is also representative of oblique views of road users on the minor road network to the south of Banff. This viewpoint is located within the Coastal Farmland LCA.

8.154 From this location medium to longer distance views may be afforded from front aspect, single storey windows from limited individual properties on the edge of Banff looking over the River Deveron Valley. Direct views towards the Site are obstructed by the intervening topography, which rises to form the horizon clothed in a patchwork of farmland and woodland. The operational three turbine Strath of Brydock is a prominent feature seen on the horizon from this vantage point. This view has a managed, rural and scenic quality as a result of the varied topography and broadleaf woodland associated with the River Deveron Valley.

8.155 Predicted View: The hubs and tips of three turbines would be visible, seen against a backdrop of the sky at a distance of 9.2km. The Development would be visible to the left and behind the operational Strath of Brydock, clearly appearing as a separate wind farm in the distance.

8.156 Magnitude of Change: Small

8.157 Receptor type/s and sensitivity: Residential receptors are considered to be of High Sensitivity and road users on this minor road network of Medium Sensitivity.

8.158 Significance: Moderate (not significant) for residential receptors reducing to Minor (not significant) for users of the minor road network.

VP06: Mains of Eden (369942, 859125)

8.159 Baseline Views: (Refer to Figure 8.13a and 8.13b.) This viewpoint is representative of uninterrupted, oblique views for recreational users (such as cyclists) on this minor road,

which is also a National Cycle Route. This viewpoint is located within the River Valleys LCA.

8.160 From this location medium distance views may be afforded for cyclists and road users looking across the River Deveron Valley. In places the high hedge can screen views for road users in cars. Direct views towards the Site are obstructed by the intervening landform which rises to form the horizon and is clothed in a patchwork of farmland and woodland. The operational Boyndie wind farm is visible in successive views to the right of view. The character of the view is managed and rural and the hedgerows, stone walls, woodland cover, historic castle ruins and varied topography combine to create a picturesque view.

8.161 Predicted View: The hubs and tips of three turbines would be visible against the backdrop of the sky at a distance of 7.1km. No other operational wind farms are visible in combined views orientated to the south west. Within this view the three turbine layout is well balanced with no overlapping blades and appears to be located outwith the River Deveron valley, as the tower bases are not visible. Furthermore, the permanent met mast would be difficult to discern at this viewing distance.

8.162 Magnitude of Change: Medium

8.163 Receptor type/s and sensitivity: Recreational receptors such as cyclists on the National Cycle Route are considered to be of High Sensitivity and road users on this minor road network of Medium Sensitivity.

8.164 Significance: Major/moderate (significant) for recreational receptors reducing to Moderate (not significant) for users of the minor road network (where open views are obtainable).

VP07: Edge of Turriff (372854, 850691)

8.165 Baseline Views: (Refer to Figure 8.14a and 8.14b.) This viewpoint is representative of partially filtered, direct views from limited residential receptors of the edge of the settlement of Turriff. Views from within Turriff would generally be limited and screened by localised development. This viewpoint is also representative of partially filtered, oblique views for road users on the minor road network to the east of Turriff. This viewpoint is located within the River Valleys LCA.

8.166 From this location medium to longer distance views may be afforded from typically single storey farmsteads on the edge of Turriff looking over rolling farmland. Direct views towards the Site are obstructed by the intervening landform which rises to form the horizon. The numerous wood pole pylons, gappy hedges, post and wire fences and large industrial looking farm buildings in the foreground create a rural, highly developed character which contributes to the feeling of a fragmented landscape on the edge of a large settlement. The operational Strath of Brydock is visible to the right of view, partially screened by vegetation in the foreground.

8.167 Predicted View: The hubs and tips of three turbines would be visible at a distance of 9.5km seen against the backdrop of the sky, and in combined views to the left of the Strath of Brydock (when not screened by foreground vegetation).

8.168 Magnitude of Change: Small

8.169 Receptor type/s and sensitivity: Residential receptors are considered to be of High Sensitivity and road users on this minor road network of Medium Sensitivity.

8.170 Significance: Moderate (not significant) for residential receptors reducing to Minor (not significant) for users of the minor road network.

VP08: South Broomhill on A97 (360344, 846846)

8.171 Baseline Views: (Refer to Figure 8.15a and 8.15b.) This viewpoint is representative of uninterrupted, direct views from road users travelling in a northern direction on the main approach to the Site. The viewpoint is located within the River Valleys LCA.

8.172 From this location medium to longer distance views may be afforded for road users travelling in a northern direction looking over rolling farmland. Direct views towards the Site are obstructed by the intervening landform which rises to form the horizon and is clothed in a patchwork of farmland and woodland. No other operational wind farms were observed during fieldwork from this viewpoint. The view has a managed rural character.

8.173 Predicted View: The hubs and tips of three turbines would be visible at a distance of 8.8km seen against a backdrop of the sky.

8.174 Magnitude of Change: Small

8.175 Receptor type/s and sensitivity: Road users are considered to be of Medium Sensitivity.

8.176 Significance: Minor (not significant)

VP09 Turtory: (359832, 849520)

8.177 Baseline Views: (Refer to Figure 8.16a and 8.16b.) This viewpoint is representative of uninterrupted, oblique views for road users travelling in a eastern direction along a minor road within the River Deveron Moray AGLV. Along this minor road there are a few residential properties but these are generally set within areas of woodland with limited open views towards the Site. This viewpoint is located on the edge of the Uplands LCA looking into the Agricultural Heartland LCA.

8.178 From this location, medium distant views may be afforded for road users looking across the River Deveron Valley. Direct views towards the Site are obstructed by the intervening landform which rises to form the horizon and is topped with woodland copses. No operational wind farms were observed from this viewpoint during field surveys. The elements of farmland and mature woodland combine to create a scenic view (reflected in the landscape designation). However, woodpole pylons and industrial looking farm buildings somewhat detract from this character.

8.179 Predicted View: The hubs and tips of three turbines would be visible at a distance of 6.8km seen against a backdrop of the sky. The majority of the turbine towers are screened by landform and woodland on the horizon further partially screens views of the turbine blades. Development and wood pole pylons in the foreground and on the horizon in the distance already introduce man made vertical structures into the view.

8.180 Magnitude of Change: Small

8.181 Receptor type/s and sensitivity: Road users are considered to be of Medium Sensitivity.

8.182 Significance: Minor (not significant)

VP10 Knock Hill (353710, 855142)

8.183 Baseline Views: (Refer to Figure 8.17a and 8.17b.) This viewpoint is representative of uninterrupted, direct eastern facing views for recreational walkers on the summit of Knock Hill, a well known land mark due to its higher elevation which also makes it a locally popular upland resource. This viewpoint is located in the Uplands LCA.

8.184 From this location long distance, panoramic views over rolling farmland are afforded. Direct views into the Site are partially screened by Black Law, to the west of the Site. Due to the elevated nature of this vantage point operational developments including of Boyndie, Strath of Brydock, Gairnieston and Cairnhill Farm are visible in combined views with further operational wind farms in the longer distance and successive views. This view has an isolated feel however, and overlooks a highly managed landscape.

8.185 Predicted View: The hubs and tips of all three turbines would be visible at a distance of 10.2km seen against a backdrop of the landscape behind. The Development would be seen between the operational Gairnieston and Cairnhill (though difficult to discern due to viewing distance).

8.186 Magnitude of Change: Small

8.187 Receptor type/s and sensitivity: Recreational receptors on the summit of Knock Hill are considered to be of High Sensitivity.

8.188 Significance: Moderate (not significant)

VP11 Little Balloch Hill (349334, 850050)

8.189 Baseline Views: (Refer to Figure 8.18.) This viewpoint is representative of interrupted, direct views for recreational walkers on a forest track within Balloch Wood. This viewpoint is located in the Uplands LCA.

8.190 From this location long distance views may be afforded for walkers travelling in an eastern direction on this forest track which passes through an area of cleared plantation woodland. Direct views to the Site are obscured by the intervening landform, which rises to form the horizon clothed in a patchwork of farmland and woodland. No other operational wind farms were apparent during fieldwork from this viewpoint. The elevated view has an isolated character looking over managed farmland.

8.191 Predicted View: The tips of three turbines would be visible at a distance of 15.4km seen against the backdrop of the sky.

8.192 Magnitude of Change: Very Small

8.193 Receptor type/s and sensitivity: Recreational receptors on the forest track in Balloch Wood, generally only used by locals and not renowned for its viewing opportunities, are considered to be of Medium Sensitivity.

8.194 Significance: Minor/ Negligible (not significant)

VP12 A68 near Portsoy (359406, 864819)

8.195 Baseline Views: (Refer to Figure 8.19.) This viewpoint is representative of partially screened, direct views for road users travelling in a south easterly direction. This viewpoint is located in the Coastal Farmland LCA.

8.196 From this location medium to longer distance views may be afforded for road users looking over a mix of farmland and plantation woodland. Direct views to the Site are obstructed by the intervening landform which rises to form the horizon. Close proximity views of the operational Boyndie are obtainable plus the Strath of Brydock in longer distance views to the left. This view has a rural character; however there is a degraded feel due to the presence of plantation woodland, the road and overhead power lines, which cross the view and break the horizon.

8.197 Predicted View: The wireline indicates that the tips of three turbines would be visible, seen at a distance of 10.8km against a backdrop of the sky. However, wirelines do not take account of vegetation and coniferous woodland in the middle distance, which would screen views of the majority of the Development.

8.198 Magnitude of Change: Negligible

8.199 Receptor type/s and sensitivity: Road users are considered to be of Medium Sensitivity.

8.200 Significance: Negligible (not significant)

VP13 Crudie on A98 (379628, 857359)

8.201 Baseline Views: (Refer to Figure 8.20.) This viewpoint is representative of interrupted, oblique views for road users travelling in a north westerly direction along the A98. There are some two-storey properties within Crudie (a linear village) with oblique views towards the Site. However, woodland in the foreground screens views from these properties. This viewpoint is located in the Agricultural Heartland LCA.

8.202 From this location, long distance views between woodland blocks may be afforded for road users. Direct views to the Site are screened by the intervening landform which rises to form the undulating horizon. The operational Cairnhill is visible to the left of view plus the single turbine Gairnieston Farm. This view has a rural character; however discordant elements such as wood pole electricity lines, street signs and farm out-

buildings in a poor state of repair contribute to a somewhat developed and degraded character in the foreground.

8.203 Predicted View: The hubs and tips of three turbines would be visible at a distance of 15.5km. The Development would be seen between the operational Gairnieston and Strath of Brydock, where foreground screening does not obscure operational wind farms.

8.204 Magnitude of Change: Small

8.205 Receptor type/s and sensitivity: Road Users are considered to be of Medium Sensitivity.

8.206 Significance: Minor (not significant) for road users.

VP14 Greenspot on A947 (379638, 831942)

8.207 Baseline Views: (Refer to Figure 8.21.) This viewpoint is representative of partially filtered, direct views for road users travelling in a north westerly direction along the A947. The viewpoint is located in the Agricultural Heartland LCA.

8.208 From this location long distance views may be afforded for road users looking over the gently undulating agricultural landscape. Direct views towards the Site are obscured by the intervening landform, which rises to form the horizon. (A single operational turbine at Denhill is visible to the right of view). The elements of farmland and woodland combine to create a rural character, however, the road is a strong presence in the landscape creating a more developed feel.

8.209 Predicted View: The hubs and tips of all three turbines would be visible at a distance of 27.5km seen against a backdrop of the sky. Coniferous woodland in the foreground would partially filter views of the Development.

8.210 Magnitude of Change: Very Small

8.211 Receptor type/s and sensitivity: Road users are considered to be of Medium Sensitivity.

8.212 Significance: Minor/Negligible (not significant)

VP15 Tap o Noth (348425, 829337)

8.213 Baseline Views: (Refer to Figure 8.22.) This viewpoint is representative of uninterrupted, direct north eastern facing views for recreational walkers on the summit of Tap o Noth (a popular upland resource in the area). This viewpoint is located in the Moorland Plateau LCA.

8.214 From this location, long distance, panoramic views may be afforded for recreational walkers looking over a managed landscape dominated by plantation woodland in the foreground and undulating farmland beyond. Elevated views of the numerous operational wind farms throughout the study area are available from this viewpoint. This viewpoint has an isolated character overlooking a managed landscape.

8.215 Predicted View: The hubs and tips of all three turbines would be visible, seen at a distance of 29.9km against the backdrop of the sky / landform between other operational wind farms in the distance.

8.216 Magnitude of Change: Very Small

8.217 Receptor type/s and sensitivity: Recreational receptors on the summit of Tap o Noth are considered to be of High Sensitivity.

8.218 Significance: Minor (not significant)

8.219 The following Table 8.11 sets out a summary of the viewpoint assessment. Limited predicted visibility from the agreed viewpoints (mainly due to screening by the surrounding landform) has resulted in a Medium or above magnitude of change from only two viewpoints.

Table 8.11: Summary of Representative Viewpoints

VP No	Location	Grid Ref	Receptor Type	Receptor Sensitivity	Magnitude of Change	Significance
1	Whitehills	365824, 865782	Recreational	Medium	Negligible	Negligible (not significant)
2	Lower Deuchries	365463, 855743	Residential	High	Very Large	**Major (significant)**
3	B9025 towards Hill of Maunderlea	362696, 857552	Road Users	Medium	Very Small	Minor/ Negligible (not significant)
4	Junction of A95 & A98	361963, 862399	Road Users	Medium	Very Small	Minor/Negligible (not significant)
5	Banff	367582, 863457	Residential and Road Users	High and Medium	Small	Moderate and Minor (not significant)
6	Mains of Eden	369942, 859125	Recreational and Road Users	High and Medium	Medium	**Major/ moderate (significant)** and Moderate (not significant)
7	Turriff	372854, 850691	Residential and Road Users	High and Medium	Small	Moderate and Minor (not significant)
8	South Broomhill (A97)	360344, 846846	Road Users	Medium	Small	Minor (not significant)
9	Turtory	359832, 849520	Road Users	Medium	Small	Minor (not significant)

VP No	Location	Grid Ref	Receptor Type	Receptor Sensitivity	Magnitude of Change	Significance
10	Knock Hill	353710, 855142	Recreational	High	Small	Moderate (not significant)
11	Little Balloch Hill	349334, 850050	Recreational (local users)	Medium	Very Small	Minor/Negligible (not significant)
12	A68 near Portsoy	359406, 864819	Road Users	Medium	Negligible	Negligible
13	Crudie on A98	379628, 857359	Road Users	Medium	Small	Minor (not significant)
14	Greenspot on A947	379638, 831942	Road Users	Medium	Very Small	Minor/Negligible (not significant)
15	Tap o Noth	348425, 829337	Recreational	High	Very Small	Minor (not significant)

Visual Impacts on Settlements

8.220 Settlement pattern within the study area, and outwith the main towns and villages, is characterised by a network of farmsteads and individual residential properties. There are a high number of farmsteads/ properties within the 35km study area and it is difficult to ascertain with certainty the number and location of all properties that may have views of the Development due to:

- Varied viewing orientations of properties and farmsteads;
- Localised screening often offered by out-buildings, fencing, woodland and private gardens; and
- Private nature of these properties which are often set within their own land where access is restricted.

8.221 However, and in accordance with the findings of the viewpoint assessment, significant visual impacts are anticipated from closer proximity properties with clear views towards the Site located to the north and east of the Development. Viewpoint 2 – from Lower Deuchries is typical of the types of view from this area around Cowie Hill and Hill of Mountblairy (and the Rosy Burn valley).

8.222 Furthermore, and due to the dip in landform between Black Law Hill and the Hill of Maunderlea significant visual impacts from limited close proximity properties (with clear views towards the Site on the rising ground to the north west/ west of the Development) are also predicted. An indicative wireline from Milbethill (Figure A17 - 361870, 856090, see Appendix 8.2) is typical of the types of view from this area around Milbethill and Auchintoul Moss.

8.223 Similarly, and from a very limited number of properties on elevated ground to the south of the Development (see indicative wireline Figure A18 from South Brownhill in Appendix 8.2 from 365078, 851363) significant visual impacts are also predicted from

properties with clear views towards the Site from around Skeibhill, Brown Hill and Hill of Bogenhilt.

8.224 However, due to the surrounding landform (which includes the Hill of Maunderlea, Black Law and Gallow Hill) and siting of the Development within the valley between these hills, the Development is mainly screened to the north, south west and south from the majority of closest proximity residential receptors. In addition, where views are obtainable these often only include the tips of the Development due to screening through landform (refer to indicative wireline from Aberchirder - Figure A19, see Appendix 8.2).

8.225 With regard to towns and villages, and in accordance with the findings of the viewpoint assessment, the main settlements within 10km of the Development, with potential visibility and thus where significant visual impacts may be experienced, are listed below in Table 8.12.

8.226 For each settlement the ZTV has been analysed and fieldwork undertaken to confirm likely actual visibility and if this would result in significant visual impacts. Settlements over 10km away have been scoped out as the predicted magnitude of change is not anticipated to exceed Small and therefore would not trigger significant visual impacts.

Table 8.12: Towns and Villages with Potential Visibility of the Development

Settlement (distance and direction from proposed site)	Comments on visibility
Aberchirder (within 1km, south west)	Potential visibility from northern edge of this village (refer to indicative wireline from B9025 – Figure A19 - 363800, 852900 see Appendix 8.2); however the majority of the scheme would be screened behind Black Law Hill with only the tip of one turbine visible (Small magnitude of change resulting in a Moderate (non significant) impact). The ZTV indicates theoretical visibility from the majority of the village; however localised development is predicted to screen views so no significant impacts are predicted.
Turriff (approximately 8km, south east)	Visibility of the Development from the majority of this settlement is predicted to be screened by local development. However, limited views from houses with an open aspect on the elevated ground to the east of this settlement are predicted (refer to Viewpoint 7) resulting in Small magnitude and Moderate (not significant) impacts.
Whitehills (approximately 9km, north)	The ZTV indicates limited visibility to the north of this coastal settlement. However, and as identified in Viewpoint 1, plantation woodland in the middle distance is predicted to screen views of the scheme resulting in a Negligible magnitude of change and no significant impacts.
Banff and Macduff (approximately 9km, north east)	The ZTV indicates visibility to the south of both these coastal towns. Fieldwork has verified that views would largely be screened by local development. From the limited areas where visibility is anticipated, typical views are similar to Viewpoint 5, for which a Small magnitude of change is anticipated. Therefore, significant visual impacts are not predicted.

Settlement (distance and direction from proposed site)	Comments on visibility
Cornhill (approximately 6km, north west)	The ZTV indicates visibility throughout this small village however, local development and woodland to the south and west of the village are anticipated to screen views of the Development resulting in no significant impacts.

8.227 In summary, for the five principal settlements within 10km of the Development no significant visual impacts are anticipated.

Cumulative Landscape and Visual Impacts

8.228 The purpose of the CLVIA is to describe, visually represent and assess the ways in which the Development would have additional impacts when considered together with other existing, consented or proposed wind farms and to identify related significant cumulative impacts arising from the Development.

8.229 The CLVIA considers the following scenarios:

- Scenario 1 involves the assessment of the addition of the Development to the existing baseline operational wind farm developments in conjunction with those granted planning consent i.e. under construction, or approved schemes, and assuming they will all be constructed and become operational; and
- Scenario 2 involves the assessment of the addition of the Development to a cumulative baseline comprising all schemes identified in Scenario 1, in addition to submitted (but as yet undetermined) wind farm planning applications.

Cumulative Wind Farm Developments

8.230 The location of all operational, consented, and proposed wind farms within 60km are depicted in Figure 8.23. Due to the large number of wind farms within 30km, only the single turbines (or greater number) wind farms above 50m in height and within 15km of the Development have been considered within the detailed cumulative assessment. This is intended in the spirit of the revised SNH guidance, which states '*the focus should be on the key cumulative effects which are likely to influence decision making, rather than an assessment of every potential cumulative effect'*.

8.231 The decision to focus the scope of the detailed cumulative assessment to 15km was also a result of:

- The findings of the LVIA where significant impacts are limited to close proximity visual receptors and from a localised area in the host LCA (around the Rosy Burn valley) and one neighbouring LCA (between mains of Eden and Muirden and all well within 15km of the Development);
- The undulating nature of the landscape and fragmented ZTV of the Development beyond 15km; and

- The typical nature wind farms in this part of Aberdeenshire which are generally single turbine schemes/ wind clusters (2 to 3 turbine schemes) which do not exceed 100m in height and therefore have a smaller sphere of influence than larger scale, commercial wind farms with greater turbine numbers/ heights.

8.232 Through seeking agreement over the focused scope of this detailed cumulative assessment, Aberdeenshire Council highlighted one larger wind farm beyond 15km from the Development (the five turbine Hill of Fisherie Wind Farm). Accordingly, this has been considered in the cumulative assessment below (refer to Table 8.13).

8.233 Cumulative ZTV for all wind farms taken forward into the detailed cumulative assessment are included in ES Volume II as Figures 8.25a to 8.25an. Distance markers around each cumulative wind farm reflect the turbine height and associated maximum theoretical visibility as follows: turbine height (m)/ buffer size (km) - 51-70m/ 20km, 71-85m/ 25km, 86-100m/ 30km and 100(+)m/ 35km. Single turbine schemes, wind clusters and wind farms are also generally referred to by their place name only (i.e. Strath of Brydock) and collectively as wind farms.

Table 8.13: Wind Farms within the detailed Cumulative Assessment

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	LCA cumulative wind farm located within	Description
Scenario One Wind Farms					
Boyndie - operational	9km north west	8	100.5m	Area 3: Coastal Farmland – Western	ZTV is focused chiefly to the north of the study area. ZTV overlap is widespread in the north, with some patchy overlap to the south of the study area. Refer to Figure 8.25a
Cairnhill Farm - operational	14km east	3	76m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV is focused to the north and centre of the study area. ZTV overlap is widespread with a notable patch of visual screening in a band to the north of Aberchirder. Refer to Figure 8.25b
Gairnieston Farm - operational	11km east	1	100m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV is focused principally to the centre and north east of the study area. ZTV overlap is relatively widespread, with the exception of north west of Aberchirder and the far west of the study area. Refer to Figure 8.25c
Strath of Brydock - operational	5km north	3	100m	Area 3: Coastal Farmland – Western	ZTV is broadly similar to the Development ZTV, focused generally to the north and east of the study area. ZTV overlap occurs throughout the study area with a noticeable area of visual screening around Aberchirder. Refer to Figure 8.25d
Castle of Auchry – approved/ under construction	14km south east	3	74m	Area 10: Agricultural Heartlands of Banff and Buchan	The ZTV is focused principally to the centre of the study area, with widespread ZTV overlap, aside from some patches of screening north west of Aberchirder and to the far west of the study area. Refer to Figure 8.25e
Mains of Auchinderran - approved/ under construction	3km west	3	79.6m	Area 3: Coastal Farmland – Western	ZTV is focused principally to the west and south of the study area, with patches of visibility to the east near Craigston Castle. ZTV overlap is widespread, aside from the area surrounding Turriff and bounding the A947 heading north of Turriff. Refer to Figure 8.25f
Mains of Hatton - approved/ under construction	13km south east	3	76m	Area 9: Agricultural Heartlands – Upland Ridges South of the Deveron LCA	ZTV focused on the centre and south east of the study area. ZTV overlap predominantly occurs to the east and south east, with fragmented, patchy overlap to the west. Refer to Figure 8.25g

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	LCA cumulative wind farm located within	Description
Muirake - approved/ under construction	8km west	2	99.5m	Area 3: Coastal Farmland – Western	ZTV is focused mainly to the north of the study area. ZTV overlap is limited to the northern coastal areas and to the north west of Aberchirder. Refer to Figure 8.25h
Myreton - approved/ under construction	14km west	1	77m	The Uplands	ZTV is fragmented and focused mainly to the north and west of the study area. ZTV overlap is also fragmented, occurring to the north east and west. Refer to Figure 8.25i
Shieldburn Farm - approved/ under construction	10km south	3	93.5m	Area 9: Agricultural Heartlands – Upland Ridges South of the Deveron	ZTV is focused predominantly on the centre of the study area, with fragmented areas of visibility to the south east and south west. ZTV overlap is widespread aside from to the north west of the study area. Refer to Figure 8.25j
Scenario 2					
Ashogle Farm – in planning	7km east	1	80m	Area 12: Deveron and Upper Ythan Valley	ZTV is focused to the centre and east of the study area with widespread overlap along the River Deveron valley and to the east of the valley. Refer to Figure 8.25k
Backhill Of Culbirnie – in planning	6km north	1	80m	Area 3: Coastal Farmland – Western	ZTV follows similar pattern to Development ZTV with notable area of visual screening in the area around and between Aberchirder and Turriff to south of the Development. Refer to Figure 8.25l
Backhill Of Yonderton – in planning	11km east	2	99.5m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused on fragmented pattern to north of study area with widespread overlap to either side of the River Deveron valley to the east of the Development. Refer to Figure 8.25m
Badentoul – in planning	11km north west	1	67m	Area 3: Coastal Farmland – Western	ZTV focused to the north of the study area with widespread overlap, in a fragmented pattern, to the north of the Development either side of the River Deveron valley. Refer to Figure 8.25n
Balchers Wood – in planning	9km north east	2	55.44m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused to north of the study area with widespread overlap to north east of the Development and in a more fragmented pattern to the south of Turriff. Refer to Figure 8.25o
Cairnhill Farm Extension – in planning	13km east	2	79.6m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV is focused to the north and centre of the study area. ZTV overlap is widespread with a notable patch of visual screening in a band to the north of Aberchirder. Refer to Figure 8.25p

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	LCA cumulative wind farm located within	Description
Cowie Hill – in planning	3km north east	1	80m	Area 3: Coastal Farmland – Western	ZTV follows a very similar pattern to Development with widespread overlap. Notable patch of visual screening in and around Aberchirder. Refer to Figure 8.25q
Culbirnie Parks – in planning	5km north	1	80m	Area 3: Coastal Farmland – Western	ZTV follows a very similar pattern to Development with widespread overlap. Notable patch of visual screening in the area around and between Aberchirder and Turriff to south of the Development. Refer to Figure 8.25r
Dounepark Farm – in planning	10km north east	1	81m	Area 5: Coastal Farmland – Sandstone Ridges and Valley South	ZTV follows very similar pattern to the Development with a notable patch of visual screening in a band to the north of Aberchirder. Refer to Figure 8.25s
Easter Jackston – in planning	14km north east	1	79m	Area 5: Coastal Farmland – Sandstone Ridges and Valley South	ZTV focused to north east of study area. Follows very similar pattern to Development ZTV with notable patch of screening in a band to north of Aberchirder. Refer to Figure 8.25t
Feithhill Farm – in planning	12km south	1	79m	Area 9: Agricultural Heartlands – Upland Ridges South of the Deveron	ZTV focused to centre and south of study area. Widespread overlap with a notable patch of visual screening to north of A95. Refer to Figure 8.25u
Haremoss – in planning	15km east	1	53.5m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV is focused to centre and east of study area with a fragmented pattern of overlap in the landscape around Turriff and to the west of the River Deveron valley. Refer to Figure 8.25v
Hill of Fisherie – in planning	18km east	5	100m	Area 5: Coastal Farmland – Sandstone Ridges and Valley South	ZTV focused to north east of study area. Widespread ZTV overlap, in a fragmented pattern, with a notable patch of visual screening in a band to north of Aberchirder. Refer to Figure 8.25w
Holm and Hollymill – in planning	7km north east	2	99.5m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused to north of the study area with widespread overlap to north east of the Development and in a more fragmented pattern to the south of Turriff. Refer to Figure 8.25x
Ley Farm – in planning	13km north west	1	75m	Area 3: Coastal Farmland – Western	ZTV focused to north and west of study area. Very fragmented pattern of overlap to the north and north west of the Development. Refer to Figure 8.25y

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	LCA cumulative wind farm located within	Description
Little Blairshinnoch – in planning	6km north	1	80m	Area 3: Coastal Farmland – Western	ZTV focused to north of study area. Widespread overlap, albeit in a fragmented pattern, to north west, north and north east of the Development. Refer to Figure 8.25z
Little Hilton Farm – in planning	9km east	2	79.6m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused to centre and east of study area. Widespread overlap in a band to either side of River Deveron valley to the east of the Development. Refer to Figure 8.25aa
Little Whiterashes Farm – in planning	9km east	1	80m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused to centre and east of study area. Widespread overlap in a band to either side of River Deveron valley to the east of the Development. Refer to Figure 8.25ab
Lodge Hill – in planning	6km north east	3	99.5m	Area 3: Coastal Farmland – Western	ZTV focused to north of study area. Widespread overlap to either side of River Deveron valley to north of Development. Refer to Figure 8.25ac
Mid Plough – in planning	13km south west	1	66.7m	Straths and Valleys	ZTV focused to south west of study area. Limited pattern of overlap to east of Huntly with fragmented, patchy overlap elsewhere. Refer to Figure 8.25ad
Milton Of Fisherie – in planning	12km east	2	99.5m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused to centre and east of study area with widespread overlap in a band to either side of River Deveron valley. Refer to Figure 8.25ae
Newton Of Culvie – in planning	6km west	1	79.6m	Area 8: Agricultural Heartlands Knock Hill and Aberchirder	ZTV follows broadly similar pattern to Development with widespread overlap. Notable path of visual screening around the River Deveron valley to east of the Development. Refer to Figure 8.25af
Newton Of Foulzie – in planning	10km north east	2	79m	Area 10: Agricultural Heartlands of Banff and Buchan	ZTV focused to north east of study area. Widespread ZTV overlap, in a fragmented pattern, with a notable patch of visual screening in a band to north of Aberchirder. Refer to Figure 8.25ag
Rivestone – in planning	12km south west	1	60.98m	Straths and Valleys	ZTV focused to south west of study area. Limited pattern of overlap to east of Huntly with fragmented, patchy overlap elsewhere. Refer to Figure 8.25ah

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	LCA cumulative wind farm located within	Description
South Colleonard – in planning	8km north	1	79.6m	Area 3: Coastal Farmland – Western	ZTV focused to north of study area and follows broadly similar pattern of visibility to north of the Development. South of Aberchirder ZTV overlap is limited. Refer to Figure 8.25ai
Towie Barcley Hill – in planning	12km south east	1	86.5m	Area 12: Deveron and Upper Ythan Valley	ZTV focused to north and east of study area with widespread overlap, albeit in a fragmented pattern, to either side of River Deveron valley. Refer to Figure 8.25aj
Upper Pitglassie – in planning	13km south east	1	79.6m	Area 9: Agricultural Heartlands – Upland Ridges South of the Deveron	ZTV focused to east of study area with widespread overlap to east of River Deveron valley and south of Aberchirder. Refer to Figure 8.25ak
Wester Blakeshouse – in planning	14km east	1	79.6m	Area 10: Agricultural Heartlands of Banff and Buchan	Very confined ZTV focused to north east of study area. Widespread overlap, albeit from a limited area, to either side of A98 near Crudie. Refer to Figure 8.25al
Whitestones – in planning	12km north east	1	79m	Area 5: Coastal Farmland – Sandstone Ridges and Valley South	ZTV focused to north and east of study area. Widespread overlap to either side of River Deveron valley with a more fragmented pattern of overlap south of Turriff. Refer to Figure 8.25am
Wrae Farm – in planning	8km east	1	80m	Area 12: Deveron and Upper Ythan Valley	ZTV is focused to the centre and east of the study area with widespread overlap along the River Deveron Valley and to the east of the valley. Refer to Figure 8.25an

Cumulative Landscape Assessment

8.234 The following sections set out the analysis and assessment of the cumulative landscape impacts of the Development. For the purposes of this assessment the nature of landscape impacts resulting from the introduction of the Development are assessed as being indirect (outwith the host LCA), long term, reversible and adverse unless otherwise stated.

8.235 With regard to cumulative impacts on landscape designations, no significant cumulative landscape impacts have been identified. Therefore, the detailed cumulative assessment of these designations is included in Appendix 8.1.

Landscape Character Areas

8.236 Within the following assessment of cumulative impacts on LCA and with regard to predicted impacts only the key wind farms with widespread or higher ZTV overlap within each LCA are referred to (along with the distance and direction of the wind farm from that particular LCA).

8.237 No significant cumulative impacts have been identified outwith those LCA where significant landscape impacts have already been identified. Therefore, the detailed cumulative assessment for these LCA is included in Appendix 8.1. A summary table that outlines the sensitivity, magnitude of change and significance of cumulative impacts is shown in Table 8.16 at the end of this chapter.

Area 3: Coastal Farmland - Western

8.238 Viewpoint 4 has been presented as a cumulative wireline, refer to Figure 8.26a to 8.26c. Indicative cumulative wirelines from viewpoints 2, 3 and 5 have also been presented in Appendix 8.2 (Figure A2 – 3, and A5). Viewpoints 2 and 5 are located to the north east of the Development, while the remaining viewpoints are representative of views north west of the Development.

8.239 The Development is located within this LCA, within the more undulating land to the south east of this landscape. The Development ZTV indicates widespread visibility across the LCA, with some pockets of visual screening to the north of the infrequent hills and valleys. As determined in the landscape assessment, the assessed sensitivity of this LCA is Medium.

<u>Scenario 1</u>

8.240 The cumulative ZTV indicates widespread overlap with the following key wind farms: Boyndie (within LCA, 8 km north), Strath of Brydock (within LCA, 5 km north), Mains of Auchinderran (within LCA, 2.5 km west) and Muirake (within LCA, 8 km north west).

8.241 The rolling and undulating topography and established agricultural landcover mean that woodland coverage is intermittent, and medium to longer distance views are often available throughout this landscape. Given the number of existing wind farms that are

located within this LCA, the Development would not constitute an unfamiliar element in views from this landscape.

8.242 Predicted Impacts: For Scenario 1 and from the open and more elevated viewing positions which occur throughout the LCA, the Development is typically seen in combined views in relation to other Scenario 1 wind farms, most often Strath of Brydock and Mains of Auchinderran. From longer distance views from the north east, Strath of Brydock can appear directly in front of the Development. However, elsewhere throughout the LCA, a distinct separation is apparent between the two schemes.

8.243 In longer distance views from the north west of this LCA the Development and Mains of Auchinderran are typically seen in combined views, but both schemes are partially screened by the landform so only the tips are visible and there is clear separation between. Furthermore, the turbine sizes and elevations between the two schemes relate well to each other and the schemes are both seen on the high ground to either side of the valley which the A97 passes through.

8.244 In closer proximity views to the south west of this LCA, the Development would mostly be screened behind Black Law with only the tips visible. However, where the dip in the landform between Black Law and the Hill of Maunderlea allows the hubs and tips of the Development to be seen, from a localised area around Milbethill, Mains of Auchinderran is very apparent; however only visible in successive views (along with Muirake, in the longer distance). Furthermore, as key views for this LCA tend to be orientated out to sea, these impacts relate to visual impacts.

8.245 In closer proximity views to the south east of this LCA, where the Development would not be screened by Black Law and the Hill of Maunderlea (and where significant landscape impacts were identified in the landscape assessment), views of other Scenario 1 wind farms are limited by the landform so there are no cumulative impacts.

8.246 Magnitude of Cumulative Change (Scenario 1): On balance, across this LCA, the addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small. This is due to the orientation of key views (towards the coast and in the opposite direction from Site) and that wind farms are already a recognised feature from most of this landscape. The Development would result in a minor alteration to the key landscape characteristics.

8.247 Cumulative Significance (Scenario 1): Minor (not significant)

Scenario 2

8.248 The cumulative ZTV indicates widespread overlap with the following key wind farms located within this LCA: Backhill of Culbirnie (6km north of Development), Badentoul (11km north west of Development), Cowie Hill (3km north east of Development), Culbirnie Parks (5km north of Development), Little Blairshinnoch (6km north of Development), Lodge Hill (6km north east of Development) and South Colleonard (8km north of Development).

8.249 Predicted Impacts: In longer distance views from the north east and north west of this landscape, the Development would typically be seen in combined views with Strath of Brydock and Mains of Auchinderran and a number of Scenario 2 wind farms located to the north of the Development, including Cowie Hill, Lodge Hill, Little Blairshinnoch, Backhill of Culbirnie and Culburnie Parks. As the Hill of Maunderlea often partially screens the Development, which is typically seen with clear separation between it and other wind farms, behind the closer proximity Scenario 2 wind farms listed, the cumulative magnitude of change is anticipated to remain Small.

8.250 In closer proximity views to the south west of this LCA the Development would typically be seen in successive views with Mains of Auchinderran and Newton of Culvie (located 6km west of the Development with the neighbouring LCA – Area 8; Agricultural Heartlands of Banff and Buchan). However, as the Development would be partially screened by Black Law and the Hill of Maunderlea, which contains impacts on landscape character, and the other Scenario 1 and 2 wind farms are typically only visible in successive views (and key views for this LCA are orientated towards the coast) the landscape impacts continue to reflect Scenario 1 - Small magnitude of change.

8.251 In closer proximity to the south east of this LCA, where the open landform offers substantial views of the Development, a Very Large magnitude of change was identified within the landscape assessment. As cumulative landscape impacts in combination with Cowie Hill extend the influence of wind farms within this localised area (around the Rosy Burn valley) a Very Large magnitude of change for Scenario 2 is now predicted. From here, the Development would add further wind turbines into an area of secluded farmland, resulting in a major alteration to the character of this landscape from a localised area to the south of the A97.

8.252 Magnitude of Change (Scenario 2): The magnitude of change as a result of the introduction of the Development reflects Scenario 1, except for an area to the south east of this landscape (south of the A97) where a Very Large magnitude of change is predicted.

8.253 Cumulative Significance (Scenario 2): From the majority of this landscape the addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment – Minor (not significant). However, from an area to the south east of this landscape Major/ Moderate (significant) cumulative landscape impacts are predicted, through the cumulative relationship between the Development and the in planning Cowie Hill.

Area 12: River Deveron and Upper Ythan Valleys

8.254 Viewpoint 8, to the west of this landscape, has been presented as a cumulative wireline (refer to Figure 8.27). Viewpoints 6 and 7 are also located in this landscape and indicative cumulative wirelines are presented in Appendix 8.2 (Figure A6 and A7). The Development is located approximately 3km to the east of this LCA. The Development ZTV indicates widespread visibility throughout this area, especially from the more

elevated western and southern facing slopes. As determined in the landscape assessment, the assessed sensitivity of this LCA is High.

Scenario 1

8.255 The cumulative ZTV indicates widespread overlap with the following key wind farms: Cairnhill (6km east of LCA), Gairnieston (1 km east of LCA), Strath of Brydock (2km west of LCA), Castle of Auchry (4km east of LCA), Mains of Hatton (5km south of LCA) and Shieldburn Farm (2.5km south of the LCA)

8.256 There is not currently any operational wind farms within this LCA, and given its well wooded and settled nature, views tend to be enclosed and shorter distance so views of other wind farms are less typical. However, occasional views are available of the operational Strath of Brydock and Boyndie Airfield to the west of this LCA (more so from the northern end of this LCA).

8.257 Predicted Impacts: For Scenario 1, and from the northern spur of this LCA in elevated key views from the valley sides orientated west, Strath of Brydock and Boyndie are often apparent in successive views to the right of the Development. Shieldburn Farm appears in successive views to the left of the Development. As one moves south towards Turriff, Strath of Brydock and Boyndie begin to appear in combined, longer distance views with the Development looking in a north westerly direction. Shieldburn Farm remains in successive views to the left.

8.258 As the key schemes visible in combined key views with the Development have been considered in the landscape baseline, the cumulative assessment reflects the landscape assessment (generally a Small magnitude of change but Medium from a localised area to the centre of the northern spur of this LCA).

8.259 On the western spur of this landscape, in key elevated views from the valley sides looking north, Mains of Auchinderran and the Development appear in combined views. However, there would be clear and distinct separation between the two schemes and the layouts, turbine size and heights relate well to each other. Castle of Auchry and Cairnhill also appear in long distance successive views to the right.

8.260 From the southern spur of this landscape the increased viewing distance, fragmented nature of the Development ZTV and orientation of key views results in no significant landscape or cumulative landscape impacts.

8.261 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms reflects the landscape assessment.

8.262 Cumulative Significance (Scenario 1): Major/Moderate (significant) reflecting the landscape assessment from a localised area within the northern spur of this LCA but generally Moderate (not significant) for the majority of this LCA. Furthermore, and in key views orientated up and down the valley from the River Deveron floodplain no significant cumulative impacts are predicted as the Development would be well screened by landforms.

Scenario 2

8.263 The cumulative ZTV indicates widespread overlap with the following key wind farms located within this LCA: Ashogle Farm (7km east of Development), Towie Barcley Hill (12km south east of Development) and Wrae Farm (8km east of Development). Widespread overlap is also predicted with the following key wind farms, which are located within closer proximity to the east and west of the River Deveron valley in neighbouring LCA: Balchers Wood (2km west of LCA), Cowie Hill (2km west of LCA), Culbirnie Parks (4km west of LCA), Dounepark Farm (1km east of LCA), Holm and Hollymill Farm (1km east of LCA), Little Hilton (2km east of LCA), Little Whiterashes (1km east of LCA), Newton of Foulzie (2km east of LCA), South Colleonard (2km west of LCA) and Whitestones (2.5km east).

8.264 Predicted Impacts: From the western and southern spur of this landscape the Development would typically appear between Mains of Auchinderran, Cowie Hill and Newton of Culvie with clear separation between the schemes. Other Scenario 2 wind farms appear in combined and successive views. Due to the increased viewing distance, clear separation between wind farms and fragmented pattern of ZTV (from the southern spur) the Scenario 2 assessment reflects the Scenario 1 assessment.

8.265 From the northern spur of this landscape significant landscape and Scenario 1 cumulative landscape impacts have been identified from the western facing slopes with key views orientated towards the Site. From here and for Scenario 2, Cowie Hill is typically also apparent in combined views with the Development. Depending on the exact viewing location / localised woodland coverage successive close proximity views of schemes within the more immediate landscape (Balchers Wood, Holm and Hollymill, Little Whiterashes, Ashogle Farm, Wrae Farm and Little Hilton) would also be obtainable having the perception of surrounding the viewer as one moves about this area. As the Development contributes to this cumulative impact an increased magnitude of change of Large is anticipated from the localised area where significant landscape and Scenario 1 impacts have been identified.

8.266 Magnitude of Change (Scenario 2): The Scenario 2 assessment reflects the Scenario 1 assessment; however the magnitude of change from a localised area within the northern spur of this landscape has increased to Large.

8.267 Cumulative Significance (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment, Moderate (not significant) for the majority of this LCA. However, the impacts of the Development are predicted to have a greater significance of impact within the Scenario 2 cumulative context from a localised area. Major (significant) impacts have been identified from the western facing slopes with key views towards the Site in the northern spur of this landscape between Mains of Eden and Muirden.

Representative Cumulative Viewpoints Assessments

8.268 The following section sets out the viewpoint analysis of the cumulative impacts resulting from the introduction of the Development. For the purposes of this assessment the

nature of visual impacts resulting from the introduction of the Development are assessed as being direct, long term, reversible and adverse unless otherwise stated.

8.269 Following a review of all viewpoints (refer to indicative wirelines in Appendix 8.2) and to provide a spread of viewpoints to represent typical cumulative views through the study area the following viewpoints have been considered as cumulative viewpoints:

- Viewpoint 4 – Junction of A95 and A98, as a 360 degree viewpoint to consider cumulative visual impacts from the north of the study area;
- Viewpoint 8 – South Broomhill, as a 120 degree viewpoint to consider cumulative visual impacts from the south of the study area;
- Viewpoint 10 – Knock Hill, as a 360 degree viewpoint to consider cumulative visual impacts from the typically higher elevation west of the study area; and
- Viewpoint 13 – Crudie on A98, as a 360 degree viewpoint to consider cumulative visual impacts from the east of the study area.

8.270 With regard to Viewpoint 13 where there are no wind farms (which have been considered within the detailed cumulative assessment as listed within Table 8.13) within a given 120 degree field of view then a figure has not been provided.

8.271 Viewpoints 2 and 6, where significant visual impacts have been identified within the visual assessment, have not been included as cumulative viewpoints due to the limited number of additional wind farms within the given view.

Cumulative VP04: Junction of A95 and A98 (361936, 862399)

8.272 Baseline Views: (Refer to Figure 8.26a to 8.26c): This viewpoint is representative of road users travelling on the A95 and A98. There is also a bus stop with views orientated to the south. Road users and people sitting at the bus stop are considered to be of Medium sensitivity.

Scenario 1

8.273 Predicted Cumulative View: The tips of Mains of Auchinderran are visible to the right of centre view with Strath of Brydock to the left of view. Muirake is theoretically visible in successive views to the right (but screened by woodland) and Boyndie (majority is screened by woodland) in successive views to the left so for Scenario 1 wind farms currently surround the viewer from this vantage point; however they appear well spaced, with distinct separation between.

8.274 The Development would be seen between Strath of Brydock and Mains of Auchinderran in combined views. Only the tips of the Development would be visible from this viewpoint as it would be well screened behind the Hill of Maunderlea, which greatly reduces the potential for cumulative impacts with Mains of Auchinderran (which is also well screened by the landform). Therefore, the addition of the Development to the Scenario 1 baseline would form an inconspicuous, minor element within the view without affecting the overall quality.

8.275 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.

8.276 Cumulative Significance (Scenario 1): Minor/ Negligible (not significant)

Scenario 2

8.277 Predicted Cumulative View: 11 No. wind farms in the planning process are theoretically visible in combined views with the Development, with Little Blairshinnoch, Backhill of Culbirnie and Culbirnie Parks the most prominent single turbine developments. Three further 'in planning' wind farms are theoretically visible in successive views. The Development would be visible between Culbirnie Parks and Mains of Auchinderran with clear separation between, and the small number of turbines and turbine size of the Development relates well to the other schemes.

8.278 Whilst there are a high number of wind farms visible within the view, the addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is not anticipated to trigger significant cumulative impacts and reflects the Scenario 1 assessment. The Development would be one of the less prominent schemes in this view and would be seen between numerous wind developments; the addition of another small scheme would therefore be less apparent.

Cumulative VP08: South Broomhill on A97 (360344, 846846)

8.279 Baseline Views: (Refer to Figure 8.27): This viewpoint is representative of road users travelling in a northern direction on the main approach to the Site. This viewpoint is located within the River Valleys LCA. Road Users are considered to be of Medium sensitivity.

Scenario 1

8.280 Predicted Cumulative View: Mains of Auchinderran is visible to the centre of view with theoretical visibility of Castle of Auchry and Cairnhill in longer distance views to the right (and screened by woodland on the horizon).

8.281 The Development would be visible to the right of Mains of Auchinderran in combined views. However, there is clear and distinct separation between the schemes. Furthermore, both schemes present a similar linear and uncluttered layout; both with three turbines spread out evenly on the horizon; and with the turbine heights and sizes relating well to each other. Therefore, the addition of the Development to the Scenario 1 baseline would form an apparent small element within the view without affecting the overall quality.

8.282 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.

8.283 Cumulative Significance (Scenario 1): Minor (not significant)

Scenario 2

8.284 Predicted Cumulative View: Eight 'in planning' wind farms are theoretically visible forming two loose clusters of wind farms to the left and right of view. The wind farms to the right of view would be screened by woodland in the foreground.

8.285 The Development would be seen to the right of the cluster of wind farms to the left of view. However, as most of these in planning schemes are well screened by landform (with the notable exception of Newton of Culvie) and the Development is clearly separated from other wind farms the cumulative magnitude of change reflects the Scenario 1 assessment.

Cumulative VP10: Knock Hill (353710, 855142)

8.286 Baseline Views: (Refer to Figure 8.28a to 8.28c): This viewpoint is representative of recreational walkers on the summit of Knock Hill, a well known local landmark and popular upland resource. This viewpoint is located within the Uplands LCA. Recreational receptors on the summit of Knock Hill are considered to be of High sensitivity.

Scenario 1

8.287 Predicted Cumulative View: Mains of Auchinderran, Cairnhill, Castle of Auchry and Gairniston Farm appear centrally within the view. Within this group Mains of Auchinderran is the most prominent, being closest to the viewpoint with the other wind farms seen in the further distance. Separate from this central group Mains of Hatton and Shieldburn Farm are visible in combined views to the right and Strath of Brydock and Boyndie in combined views to the left. Other Scenario 1 wind farms are also apparent in successive views as indicated in Figure 8.28b to 8.28c. It is important to note that from this elevated vantage point other operational and approved wind farms which have not been considered within the detailed cumulative assessment for this Development would also be visible.

8.288 The Development would be visible behind Mains of Auchinderran, within the central grouping of wind farms, but with clear separation between these two schemes and other wind farms in the distance behind. Due to the viewing distance the Development would form an apparent small element within the view and crucially would not cause wind farms to encroach closer into the view from this vantage point. Therefore, the addition of the Development to Scenario 1 wind farms would form an apparent small element within the view without affecting the overall quality.

8.289 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.

8.290 Cumulative Significance (Scenario 1): Minor (not significant)

Scenario 2

8.291 Predicted Cumulative View: 26 No. 'in planning' wind farms are visible in combined views with further visible in successive views. As the Development would continue to form an apparent, small landscape element with clear separation around it, and not cause wind development to encroach further within the view the cumulative magnitude of change reflects the Scenario 1 assessment.

Cumulative VP13: Crudie on A98 (379628, 857359)

8.292 Baseline Views: (Refer to Figure 8.29a to 8.29c): This viewpoint is representative of residential viewers in the village of Crudie and road users travelling in a north westerly direction on the A98. This viewpoint is located within the Agricultural Heartlands LCA. Residential receptors are considered to be of High sensitivity and road users of Medium sensitivity.

Scenario 1

8.293 Predicted Cumulative View: Gairniston Farm, Myreton, Muirake, Strath of Brydock and Boyndie are apparent in combined views. Other Scenario 1 wind farms are visible as shown on Figure 8.29a and 8.29c in successive views where woodland allows open views.

8.294 The Development would be visible in distant views within the central cluster of wind farms forming an apparent, small element within the view and with clear separation between it and other Scenario 1 wind farms.

8.295 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.

8.296 Cumulative Significance (Scenario 1): Minor (not significant)

Scenario 2

8.297 Predicted Cumulative View: 21 No. additional 'in planning' wind farms are theoretically visible within combined views with the Development with further in successive views. There are a high number of wind farms within this view, however, woodland would screen a number of the wind farms within combined views to the right of the Development. Furthermore, from this vantage point the Development would be seen in the distance and not form one of the more prominent schemes such as Backhill of Yonderton.

8.298 The Development would continue to form an apparent, small landscape element and seen between numerous wind developments the change in view is less apparent. Therefore, the addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Representative Cumulative Visibility from Settlements Assessment

8.299 Within the 35km study area there are a range of fixed receptors, these being residential properties and settlements, which are among the most sensitive. As identified in Table 8.12, there are a number of settlements within 10km where significant visual impacts are more likely as a result of the Development. Table 8.14 below summarises the theoretical cumulative visibility from these settlements.

8.300 For settlements beyond 10km from the Site the Development would typically introduce apparent, small new landscape elements generally seen in a landscape where views of other wind farms are not uncommon. As identified within the viewpoint assessment this is unlikely to result in anything greater than a small cumulative magnitude of change, so significant cumulative impacts are not anticipated.

Table 8.14 Theoretical Cumulative Visibility from Settlements

Settlement (distance and direction from proposed site)	Cumulative View
Aberchirder (within 1km, south west)	Very limited open views towards the development Site, so limited potential for cumulative impacts.
Turriff (approximately 8km, south east)	For Scenario 1 Strath of Brydock (11km) and Boyndie (16km) and for Scenario 2 Newton of Culvie (13km), Backhill of Culbirnie (12km), Cowie Hill (7km), Culbirnie Parks (12km), Ashogle Farm (2km) and Wrae (2km) are theoretically visible in combined views looking north west from limited areas on the edge of this settlement (refer to indicative wireline from Viewpoint 7 in Appendix 8.2 – Figure A7). The Development would form an apparent small element within the view, seen in the longer distance behind closer proximity Scenario 2 wind farms, with distinct separation between it and other wind farms. A Small magnitude of change for both Scenario 1 and 2 is anticipated so no significant impacts are predicted.
Whitehills (approximately 9km, north)	Very limited open views towards the development Site, so limited potential for cumulative impacts.
Banff and Macduff (approximately 9km, north east)	For Scenario 1 Strath of Brydock (4km) and for Scenario 2 Cowie Hill (7km), Newton of Culvie (14km), Culbirnie Parks (6km) and Backhill of Culbirnie (6km) are theoretically visible in combined views looking south from limited areas on the southern edges of these settlements (refer to indicative wireline from Viewpoint 5 in Appendix 8.2 – Figure A5). The Development would form an apparent small element within the view, seen to the right of the Strath of Brydock and in the longer distance behind other closer proximity Scenario 2 wind farms. A Small magnitude of change for both Scenario 1 and 2 is anticipated so no significant impacts are predicted.
Cornhill (approximately 6km, north west)	Very limited open views towards the development Site, so limited potential for cumulative impacts.

8.301 In summary, for the principal settlements within 10km of the Site, no significant cumulative visual impacts are identified.

Sequential and Cumulative Sequential Impacts

Linear Route Receptors

8.302 The following linear route corridors within the Development ZTV have been identified for the assessment of sequential and cumulative sequential impacts as shown on Figure 8.30:

- The A97 which links Macduff / Banff on the coast to Huntly and beyond in the south of the study area, and passes along the western boundary of the Site;
- The A98 coastal road which runs between Elgin (outwith the study area to the west) and Fraserburgh to the east; and
- The A947 which links Macduff / Banff on the coast to Oldmeldrum to the south east of the study area.

8.303 The A96 is also a key route through the study area linking Aberdeen to Elgin and Inverness beyond. However, visibility of the Development is very limited from this road (to a short section east of Huntly) and as the Development is approximately 19km away at is closest point, significant cumulative impacts are not anticipated along this route.

8.304 A total of six viewpoints, assessed and described in the LVIA and CLVIA above, are representative of available views from these linear routes:

- Viewpoint 3: B9025 towards Hill of Maunderlea (representative of southbound views from the A97);
- Viewpoint 4: Junction of A95 and A98 (representative of eastbound views on A98);
- Viewpoint 7: Turriff (representative of northbound views on A947);
- Viewpoint 8: South Broomhill (representative of northbound views on A97);
- Viewpoint 12: A98 near Portsoy (representative of eastbound views on A98); and
- Viewpoint 13: Crudie on A98 (representative of westbound views on A98).

8.305 To undertake the sequential assessment each route was driven in both directions. The journey scenarios for the routes are presented below, together with an analysis of the ZTVs for each route which was determined:

- The length (km) of each route within the 35km study area;
- The length (km) of each route within the Development ZTV;
- The distance and nature of views for each key cumulative wind farm;
- Type of views (direct or oblique (at right angles to direction of travel)); and
- Travel speeds for motorists on motorway (113kmph/ 70mph) and A roads (97kmph/ 60mph).

8.306 All wind farms, as identified within Table 8.13 have been considered within the detailed cumulative sequential assessment. Statistical ZTV analysis for each route and cumulative wind farm is included within Appendix 8.1. Where appropriate, and due to

the nature of sequential impacts, reference has been made to other wind farms beyond 15km from the Development which would/ may be visible from the assessed routes.

8.307 For the purposes of the sequential assessment road users and passengers travelling along identified carriageways are considered to have a Medium sensitivity to change.

8.308 No significant sequential or cumulative sequential impacts were predicted from the A98 and A947, so the detailed assessment for these routes is described in Appendix 8.1.

A97 from Banff to Huntly and beyond

8.309 This route links Macduff / Banff, located on the northern coastline of Aberdeenshire, to Huntly and continues on to Lumsden in the south of the study area. Approximately 50km of this road passes through the 35km study area (as shown on Figure 8.30) and is discussed below. At its closest point the Development is located approximately 1km to the east of this route.

8.310 From Banff the road starts in the Coast LCA and development and woodland on the edge of this settlement limit long distance views towards the Site. Travelling in a southerly direction the road passes into the Coastal Farmland LCA picking a route on the slightly elevated ground along the foot slopes of the Hill of Alvah and Black Law. Views from this area tend to be open and medium to long distance, orientated in a north western direction. The road then passes along the eastern boundary of Aberchirder and enters the Agricultural Heartland LCA. Through this section views are short distance and enclosed by the surrounding landform and development / woodland around Aberchirder.

8.311 Continuing in a southern direction and between Aberchirder and Huntly the road passes through the Uplands, River Valleys, Agricultural Heartlands and Straths and Valleys LCA. Through this section the road passes through a broad valley with longer distance views orientated in a strong north to south focus with the direction of travel. Between Huntly and Rhynie the road follows the alignment of the River Bogie passing through the Straths and Valleys and Agricultural Heartland LCA. This is a narrower, more enclosed valley where views continue to be focused in line with the north/ south direction of travel. South of Rhynie the road enters the Farmed Moorland Edge LCA where views are typically more open and longer distance as the road leaves the narrow valley of the River Bogie.

8.312 Journey scenarios for both a northbound and southbound journey have been explored through field work and analysis on the Development and Cumulative ZTV (refer to Figure 8.7a to 8.7d and Figures 8.25a to 8.25an) for sequential and cumulative sequential impacts.

Journey Scenarios

8.313 For northbound journeys starting in Lumsden the route passes through a long stretch of visual screening as defined by the ZTV for approximately 26km to the south of Bogniebrae. The road then enters a stretch of visibility of 5.5km long (which equates to 3 minutes), as the road travels through a broad open valley with prolonged direct views

towards the Site similar to those identified in Viewpoint 8 and for which a Small magnitude of change is predicted. The operational Cairnhill wind farm is also visible in long distance successive views to the right of the Development.

8.314 The road then crosses the River Deveron where visibility becomes more intermittent and there are three shorter sections of visibility which total 6km in length (which equates to just under 4 minutes) between the River Deveron and north of Aberchirder. From these sections a magnitude of change of no greater than Small is predicted. As commuters on the A97 get in closer proximity to the Site, the Development is increasingly screened by Black Law Hill and Gallow Hill to the south and west of the proposed wind farm. Furthermore, from the section of visibility which passes along the southern edge of Aberchirder, woodland and development on the edge of this village would screen direct views towards the Development.

8.315 North of Aberchirder as cars travelling in a northbound direction have now passed the Site, the southbound journey scenario considers the remainder of this route.

8.316 For southbound journeys as the A97 leaves Banff the route is on the fringes of the Development ZTV for a section of just over 1km. However, direct views towards the Site would largely be screened by roadside development and woodland on the edge of Banff. Continuing in a southern direction the route then enters a stretch of visual screening as defined by the ZTV which equates to just under 4km as direct views towards the Site are screened by the Hill of Alvah.

8.317 South of the Hill of Alvah the route enters a stretch of visibility of approximately 4km (which equates to 2.5 minutes). From this section of road a magnitude of change of Medium to Large is anticipated. When not screened by a large beech hedgerow the hubs and tips of all three turbines would be visible, forming a prominent element in the view. Furthermore, the operational Strath of Brydock is also a prominent feature in successive views from this section of the road.

8.318 Continuing south of Ladysheets the route enters another short section of visual screening as the Development is completely screened behind the Hill of Maunderlea. Then as the A97 passes along the western boundary of the Site it enters another stretch of visibility, which lasts for approximately 1.5km (equating to just under 1 minute) where oblique views towards the Site are obtainable. From this short, open section of road the hubs of two and tips of all three wind turbines would be visible between the dip in landform between the Hill of Maunderlea and Black Law resulting in a Large magnitude of change (refer to similar view from Milbethill area in Appendix 8.2 – Figure A17). The operational Glens of Foudland and Dummuie are also visible in long distance direct views from this section.

Summary of Impacts and Significance

8.319 For northbound and southbound journeys, an approximate distance of 18km with potential visibility from the A97 is anticipated (equating to approximately 11 minutes or 36% of the road within the study area). For both journey scenarios views are typically

infrequent, intermittent and direct however, a more prolonged section of visibility is identified in northbound journeys around Viewpoint 8.

8.320 Due to the number of operational wind farms within the study area it is rare that the Development introduces views of turbines where there are currently none. From the majority of this route and from areas with visibility a magnitude of change of Small is anticipated.

8.321 However, there are two short sections in southbound journeys where a magnitude of change of up to Large is anticipated. As road users are considered to be of Medium sensitivity a sequential level of significance of Major/ Moderate is anticipated.

8.322 However, this is only from a short section of the overall route equating to just under four minutes journey time. In the context of the total route that passes through the study area, this is not anticipated to result in significant impacts on the route as a whole.

Cumulative Journey Scenarios

Scenario 1

8.323 For Scenario 1 the key wind farms with theoretical visibility from the A97 (distance/ direction - equating visibility in terms of length of route with visibility (km)/ journey time (mins)/ percentage of route (%)) are as follows:

- Strath of Brydock (1km west - 10km/ 6 mins/ 21%); and
- Mains of Auchinderran (2km west – 11km/ 7 mins/ 21%).

8.324 Other Scenario 1 winds farms are theoretically visible from this route as detailed in the ZTV sequential analysis included in Appendix 8.1 and are referred to, as appropriate, within the assessment below.

8.325 In northbound journeys for Scenario 1 and to the south of the study area, fieldwork identified that the operational Glens of Foundland and Dummuie Wind Farm (shown on Figure 8.23) are visible in oblique views from the road in the area south and north of Huntly where visibility of the Development is not obtainable. Continuing north, widespread ZTV overlap with the Mains of Auchinderran is apparent (refer to Figure 8.25f) which would be seen in combined, direct views with the Development but with clear separation between. Intermittent, longer distance views of other Scenario 1 wind farms (including Shieldburn Farm) would also be available most commonly from the broad open valley to the south of the River Deveron. Visibility of Scenario 1 wind farms around Aberchirder is limited.

8.326 In southbound journeys for Scenario 1 there is widespread visibility of the Strath of Brydock which would be visible in direct views initially changing to oblique, successive views for the stretch of road where the Development becomes apparent. A similar pattern of visibility for Boyndie is also experienced. Widespread ZTV overlap with the Mains of Auchinderran is also predicted with this wind farm becoming most prominent in successive views to the right of the A97 (along with Muirake) along the western boundary of the Site.

Scenario 2

8.327 For Scenario 2 the key wind farms with theoretical visibility from the A97 (distance/ direction - equating visibility in terms of length of route with visibility (km)/ journey time (mins)/ percentage of route (%)) are as follows:

- Backhill of Culbirnie (3km west – 6km/ 4 mins/ 12%);
- Cowie Hill (2km east – 5km/ 3 mins/ 10%);
- Culbirnie Parks (2.5km west – 8.5km/ 5 mins/ 17%);
- Little Blairshinnoch (2.5km west – 5km/ 3 mins/ 10%);
- Newton of Culvie (5km west – 16km/ 10 mins/ 33%);
- Rivestone (4km west – 10km/ 6 mins/ 20%); and
- South Colleonard (1km west – 6km/ 4 mins/ 13%).

8.328 Other Scenario 2 wind farms are theoretically visible from this route as detailed in the ZTV sequential analysis included in Appendix 8.1 and are referred to, as appropriate, within the assessment below.

8.329 In northbound journeys, successive views of Rivestone are obtainable to the north of Huntly which is outwith the Development ZTV. From the prolonged section of road with visibility of the Development (refer to indicative wireline from Viewpoint 8 in Appendix 8.2 – Figure A8) a number of Scenario 2 wind farms are visible in combined views with the Development including Backhill of Culbirnie, Culbirnie Parks and Lodge Hill. However, these are only visible in long distance views and with clear separation between the Development. From the three shorter sections of visibility around Aberchirder views of the Development and other Scenario 2 wind farms would be limited by woodland cover and localised development.

8.330 In southbound journeys South Colleonard, Little Blairshinnoch, Backhill of Culbirnie and Culbirnie Parks are visible in direct turning to oblique views from the section of road to the south of Banff, outwith the Development ZTV. South of the Hill of Alva, where the Development becomes visible and a Medium to Large magnitude of change has been predicted, these wind farms are visible in successive views with the Development which would be seen in combined views with Cowie Hill (resulting in a Large magnitude of change). Along the western boundary of the Site Newton of Culvie is visible in successive views along with Mains of Auchinderran.

Summary of Cumulative Impacts and Significance

Scenario 1

8.331 For Scenario 1, there are limited areas on the 50km stretch of the A97 that passes through the study area where theoretical visibility of Scenario 1 wind farms is not anticipated. The types of views for Scenario 1 key wind farms are as follows – Strath of Brydock (infrequent, prolonged, direct/oblique) and Mains of Auchinderran (infrequent, prolonged direct/oblique).

8.332 The key wind farm for Scenario 1 is the Mains of Auchinderran (as Strath of Brydock is considered within the baseline), which is most prominent in successive views as the A97 passes the western boundary of the Site. This results in a cumulative sequential magnitude of change of Large for Scenario 1 from this short section of the route where sequential impacts relating to the Development have previously been identified.

8.333 Therefore, the cumulative sequential magnitude is assessed to reflect the sequential magnitude of change – Major/Moderate, from a short section of the road to the west and north east of the Site (as the road passes between Strath of Brydock, Mains of Auchinderran and the Development) but generally Minor (not significant) on the route as a whole.

Scenario 2

8.334 For Scenario 2, as with above, there are limited stretches of road where theoretical visibility of turbines is not anticipated. The types of views for Scenario 2 key wind farms are as follows – Backhill of Culbirnie (infrequent, prolonged, direct/oblique), Cowie Hill (infrequent, prolonged, direct), Culbirnie Parks (infrequent, prolonged, direct/oblique), Little Blairshinnoch (infrequent, prolonged, direct/oblique), Newton of Culvie (infrequent, prolonged, oblique), Riveston (infrequent, prolonged, direct) and South Colleonard (infrequent, prolonged, oblique).

8.335 The key wind farm for Scenario 2 is Cowie Hill (refer to Figure 8.25q), which is seen in combined views with the Development in southbound journeys to the south of the Hill of Alva. This results in a cumulative sequential magnitude of change to Large within this area for Scenario 2.

8.336 Furthermore, in southbound journeys as the road passes along the western boundary of the Site, Newton of Culvie is seen in successive views along Mains of Auchinderran. This also results in a Large cumulative sequential magnitude of change for Scenario 2 through this short stretch of road.

8.337 Therefore, the cumulative sequential magnitude is assessed to reflect the sequential magnitude of change – Major/Moderate (significant) from a short section of the road to the west and north east of the Site (as the road passes between Strath of Brydock, Mains of Auchinderran, Cowie Hill, Newton of Culvie and the Development) but generally Minor (not significant) on the route as a whole. Figure 8.31 presents the combined ZTV and visibility from the A97 from these four key wind farms and the Development.

Summary of Impacts and Significance

Landscape Designations and Character Areas

8.338 The landscape assessment indicates that there would not be significant impacts on the character of the study area as a whole, on any designated landscape nor on the majority of landscape character areas within. Indeed only localised significant impacts are identified for two Landscape Character Areas (Area 3: Western Coastal Farmland

and Area 12: River Deveron and Upper Ythan Valleys). Therefore, within the context of the 35km study area significant landscape impacts are relatively limited.

8.339 Generally, the host landscape is well suited to development of this type as the undulating landform offers numerous screening opportunities. Furthermore, the scheme has been well designed to maximise the screening potential offered by the Hill of Maunderlea, Black Law and Gallow Hill. As a result it is often only the tips / upper sections of turbines which are visible and these are often screened by woodland topped ridgelines, a common feature throughout this LCA.

8.340 This is with the exception of the Site and land to the immediate north east of the Site around the Rosy Burn valley (within the Area 3: Western Coastal Farmland LCA). From here, and where the surrounding rising landform does not contain and partially screen, the Development forms a dominant new landscape element. From this localised area secluded rolling farmland would turn into secluded rolling farmland with a wind farm.

8.341 Furthermore, and from a localised area within the River Deveron LCA (between Mains of Eden and Muirden refer to Viewpoint 6) combined views of operational wind farms to the east of the Site are not available in westerly orientated key views from the valley sides. Therefore, the Development results in a partial alteration to key views looking over the river valley towards the Development.

8.342 However, it is worth noting that these impacts are from a localised area within the context of the River Valley LCA, and this decreases with distance as views of other operational wind farms (notably Boyndie and Strath of Byrdock) become more common in combined views. Furthermore, the localised significant impacts relate to key views as none of the other key characteristics of the LCA would be directly impacted.

Cumulative Impacts

8.343 These typically reflect the landscape impacts identified and significant cumulative impacts are only anticipated from the host LCA (for Scenario 2) and Area 12: River Valleys – Deveron and Upper Ythan Valleys.

8.344 Where localised significant landscape impacts have been identified in the landscape assessment within the Western Coastal Farmland LCA these are not anticipated in the Scenario 1 cumulative assessment as from this area the Development is typically the only wind farm visible.

8.345 However, for Scenario 2 the Development and Cowie Hill would combine to introduce turbines into an area of secluded rural farmland (around the Rosy Burn valley) resulting in significant cumulative landscape impacts. As with before, this is only from a localised area to the south of the A97 and reflects the impact significance predicted in the landscape assessment.

8.346 Within the River Deveron LCA, Scenario 1 cumulative impacts reflect landscape impacts and no significant cumulative impacts are anticipated from the majority of this LCA with only localised significant cumulative landscape impacts between Mains of

Eden and Muirden. However, for Scenario 2 and from the same localised area increased cumulative landscape impacts are predicted.

8.347 From here the Development would be seen in combined views with Cowie Hill and depending on the exact viewing location and localised woodland coverage, successive close proximity views of schemes within the more immediate landscape (Balchers Wood, Holm and Hollymill, Little Whiterashes, Ashogle Farm, Wrae Farm and Little Hilton) would also be obtainable. This has the perceived effect of surrounding the viewer increasing the significance of cumulative landscape impacts from a localised area within this more sensitive river valley landscape to Major (significant).

8.348 Within the wider study area the Development represents another small, albeit commercial scale, wind farm which is typically seen with clear separation between it and the other Scenario 1 and Scenario 2 wind farms. Whilst it is acknowledged that there are a high number of wind farms (assuming all obtain consent) within this landscape it is not anticipated that the addition of the Development would trigger any significant cumulative landscape impacts outwith the areas where significant landscape impacts have been identified.

8.349 A key concern with regard to cumulative landscape impacts was the relationship between the recently consented three turbine Mains of Auchinderran Wind Farm and the Development as both these schemes are located in close proximity to each other and within the same LCA.

8.350 However, the cumulative assessment has concluded that Area 3: Western Coastal Farmland has the landscape capacity to include the Development without triggering significant cumulative impacts in relation to this scheme. Typically both would be seen with clear separation between, with the layout, turbine sizes and altitude relating well to each other. Furthermore, in closer proximity views, the Development would often be well screened by the surrounding landscape, with both wind farms typically only apparent in successive views.

8.351 The key issue for the cumulative landscape assessment is the cumulative relationship between the Development and Cowie Hill. However, this single turbine scheme is in planning and may not be granted consent, reducing the certainty of cumulative impacts in relation to the Development.

8.352 A summary of the predicted impacts and cumulative impacts of the Development on designated landscapes and the landscape character is presented in Tables 8.15 and 8.16 below.

Table 8.15: Landscape Designations Assessment Summary

Designation	Name/ Location	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
Area of Great Landscape Value (AGLV)	River Deveron	High	Small	Moderate (not significant)	Small	Moderate (not significant)	Small	Moderate (not significant)
Historic Garden and Designed Landscape (HGDL)	Craigston Castle	High	Small	Moderate (not significant)	Small	Moderate (not significant)	Small	Moderate (not significant)
	Fyvie Castle	High	Small	Moderate (not significant)	Small	Moderate (not significant)	Small	Moderate (not significant)

Table 8.16: Landscape Character Assessment Summary

Landscape Character Area	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
The Coast	Area 1: Cliffs of the North Coasts	High	Small	Moderate (not significant)	Small	Moderate (not significant)	Small	Moderate (not significant)

Landscape Character Area	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
Coastal Farmland	Area 3: Western Coastal Farmland	Medium	Generally Small but Very Large from a localised area to the south east of this landscape	Minor (not significant) from the majority of this landscape but **Major/Moderate (significant)** from a localised area to the south east of this landscape	Small	Minor (not significant)	Generally Small but Very Large from a localised area to the south east of this landscape	Minor (not significant) from the majority of this landscape but **Major/Moderate (significant)** from a localised area to the south east of this landscape
	Area 4: East of Macduff	Medium	Small	Minor (not significant)	Small	Minor (not significant)	Small	Minor (not significant)
Agricultural Heartlands	Area 8: Knock Hill and Aberchirder	Medium	Small	Minor (not significant)	Medium to Small	Moderate to Minor (not significant)	Medium to Small	Moderate to Minor (not significant)
	Area 9: Agricultural Heartlands	Medium	Small	Minor (not significant)	Small	Minor (not significant)	Small	Minor (not significant)
	Heartlands of Banff and Buchan	Medium	Small	Minor (not significant)	Small	Minor (not significant)	Small	Minor (not significant)

Landscape Character Area	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
River Valleys	River Deveron and Upper Ythan Valleys	High	Generally Small but Medium from a localised area to the east of the Site	Moderate (not significant) but **Major/Moderate (significant)** from a localised area to the east of the Site	Generally Small but Medium from a localised area to the east of the Site	Moderate (not significant) but **Major/Moderate (significant)** from a localised area to the east of the Site	Generally Small but Large from a localised area to the east of the Site	Moderate (not significant) but **Major (significant)** from a localised area to the east of the Site
Coastal Lowlands	Coastal Lowlands	Medium	Small	Minor (not significant)	Small	Minor (not significant)	Small	Minor (not significant)
Straths and Valleys	Straths and Valleys	High	Very Small	Minor (not significant)	Very Small	Minor (not significant)	Very Small	Minor (not significant)
Farmed Moorland Edge	Farmed Moorland Edge	Medium	Very Small	Minor/ Negligible (not significant)	Very Small	Minor/ Negligible (not significant)	Very Small	Minor/ Negligible (not significant)
Uplands	Uplands	Medium	Small	Minor (not significant)	Small	Minor (not significant)	Small	Minor (not significant)

Visual Impacts

8.353 Of the 15 representative viewpoints, the assessment finds that the Development would result in significant impacts (Major or Major / Moderate) for the following two viewpoints:

- Viewpoint 2 – Lower Deuchries (residential viewers); and
- Viewpoint 6 – Mains of Eden (only in respect of cyclists on the national cycle route).

8.354 Significant visual impacts relate to those sensitive receptors (residential and recreational) within closer proximity (1.6km for Viewpoint 2 and 7.1km for Viewpoint 6) to the Development. Both of these viewpoints are located to the north east and east of the Development where the landform surrounding the Site is more open, and thus views of a substantial proportion of the Development would be gained. Furthermore, and from both of these viewpoints, combined views with operational wind farms are not apparent so the introduction of the Development would result in a more dramatic change in the character of the view.

8.355 From the majority of the viewpoints, a substantial portion of the Development would be screened by the surrounding landform that rises to the immediate south, west and north west of the Site, helping to reduce the magnitude of change. Indeed, following the design workshop, a number of viewpoints including two in close proximity to the scheme from the edge of the village of Aberchirder were removed from the assessment as views of turbines were no longer obtainable.

8.356 However, significant visual impacts are also anticipated from close proximity residential receptors on the more elevated ground to the west and south of the Development. To the west, around Milbethill, the dip in the landform between Black Law and Hill of Maunderlea would allow views of the upper sections of the turbine hubs and blades. Significant visual impacts, from limited properties with clear views towards the Site from this localised area, would be obtainable.

8.357 Furthermore, to the south and on the higher ground (from where Black Law no longer offers as much screening potential) significant visual impacts are also anticipated from the very limited residential receptors with clear views towards the Site around Brown Hill.

8.358 No significant visual impacts are anticipated from any of the main towns and villages within 10km of the Development.

Cumulative Impacts

8.359 With regards to cumulative impacts and of the four representative viewpoints which were taken forward as cumulative viewpoints, no significant cumulative impacts are anticipated. These four viewpoints were chosen as they represent typical views from the north, east, south and west of the Site.

8.360 Typically, the Development would be seen as a small, quite well screened wind farm within a landscape where views of wind farms are common. There would generally be clear separation between the Development and other Scenario 1 and 2 wind farms and the Development would not cause turbines to encroach in closer proximity to the view. Furthermore, where there are other wind farms visible in close proximity to the Development (most notably Mains of Auchinderran) the layouts, turbine size and altitudes relate well to each other.

Summary of Sequential and Cumulative Sequential Impacts

8.361 Of the three routes assessed (A97, A98 and A947) no significant sequential or cumulative sequential impacts have been identified on the routes as a whole.

8.362 Localised significant impacts have been identified on the A97 as this route passes along the western boundary and to the north east of the Site. This is due to the road passing in close proximity between the operational Strath of Brydock, approved Mains of Auchinderran, in planning Cowie Hill and the Development resulting in a Large magnitude of change and Major / Moderate (significant) localised impacts from this short section of the route.

8.363 However, as the Development is only theoretically visible from 36% of the road which passes through the study area, and Major/Moderate (significant) impacts are only predicted from a short section of the road (with visibility equating to just under 4 minutes) then significant impacts on the route as a whole are not predicted.

8.364 For the A98, theoretical visibility of the Development is anticipated from approximately 37% of the road which passes through the study area. Views are typically infrequent, intermittent and oblique with the Development seen in longer distance views between other Scenario 1 and 2 wind farms. A magnitude of change no greater than Small is anticipated from this road resulting in Minor (non significant) impacts.

8.365 For the A947, theoretical visibility of the Development is anticipated from approximately 40% of the road which passes through the study area. Views are typically infrequent, intermittent and direct but turning to oblique in closest proximity to the Site where the Development would be visible in combined, medium distance views behind Scenario 2 wind farms. A magnitude of change no greater than Medium is anticipated from this road resulting in Moderate (non significant) impacts.

9 ARCHAEOLOGY AND CULTURAL HERITAGE

Introduction

9.1 This chapter describes the impacts of the Development on the archaeological and cultural heritage resources on and around the Site. The assessment comprises an archaeological desk-based assessment, walkover survey and assessment of physical and visual/indirect impacts on heritage assets and their settings as a result of the Development. The scope for this chapter is based upon on the Deuchries Wind Farm Scoping Report[1] and scoping responses received from the Aberdeenshire Council Archaeology Service and Historic Scotland.

Legislation and Policy

Legislation

9.2 This section summarises the statutory legislation relating to the historic environment and relevant to the proposed development.

Table 9.1: Statutory Protection

Legislation	Jurisdiction	Key Issues
Ancient Monuments and Archaeological Areas Act (1979)	Scottish Government /Historic Scotland	Provides statutory protection of ancient monuments. It is a criminal offence to carry out any works on or near a Scheduled Monument without Scheduled Monument Consent
Town and Country Planning (Scotland) Act 1997; Planning etc (Scotland) Act (Scotland) 2006	Scottish Government/ Aberdeenshire Council	Establishes framework for determining planning applications, the role of the local planning authority and the role of Development (Structure and Local) Plans within the process
Planning (Listed Buildings and Conservation Areas) (Scotland) Act (1997)	Scottish Government/ Aberdeenshire Council	Provides for statutory protection of listed buildings and conservation areas. No physical works can be carried out in relation to a listed building and its curtilage without listed building consent. It introduces a requirement to have special regard to the desirability of preserving the building or its setting in considering any proposed development which may affect these. In conservation areas, designation introduces general controls to conserve their character and appearance within the conservation area.
Town and Country Planning (General Development Procedure) Scotland Order 1992, Section 15(1) (j) as amended by the Town and Country Planning (General	Scottish Government/ Aberdeenshire Council	Requires that before granting planning permission for development, a planning authority shall consult with the Scottish Ministers, in the case of development which may affect a historic garden or designed landscape; development which may affect the site of a scheduled monument or its setting, or may affect a category A listed building or its setting.

Legislation	Jurisdiction	Key Issues
Development Procedure) (Scotland) (Amendment (No2) Order 1994, Section (5)		
Protection of Military Remains Act (1986)	Ministry of Defence	Outlines the criteria for designating a military crash site. Certain activities are prohibited at protected sites, without the authority of the Ministry of Defence
Scots Common Law	Procurator Fiscal/ Police	The movement or disturbance of human remains without lawful authority is illegal. Any human remains should be reported to the local police or Procurator Fiscal's office. Further disturbance must cease until permission to continue has been granted by the legal authorities

Policy

9.3 Various other documents also provide non-statutory protection for the historic environment in Scotland. The requirements of these documents have been compiled into the consolidated Scottish Planning Policy (SPP) and supplementary information, which is outlined in Table 9.2 below.

Table 9.2: Policies

Document	Jurisdiction	Key Issues
Planning Advice Note (PAN) 2 / 2011 Planning and Archaeology (published July 27, 2011)	Scottish Government	Supersedes PAN 42 Archaeology – the Planning Process and Scheduled Monuments Procedures. Provides local government officers with advice for treating archaeological sites through the planning process, including consideration of setting and preservation in situ. Sets out Government policy on how archaeological remains and discoveries are dealt with within the existing development plan and development control processes
Scottish Historic Environment Policy (SHEP)	Scottish Government	Defines the Historic Environment and Scottish Government Policy.

Archaeological standards

9.4 This assessment was undertaken in accordance with relevant Standard and Guidance and Code of Conduct (2010) from the Institute for Archaeologists (IfA), and relevant Historic Scotland guidance, which is outlined in Table 9.3. The archaeological assessment was carried out between February 2011 and August 2012.

Table 9.3: Archaeological standards

Document(s)	Jurisdiction	Key Issues
Code of Conduct and Standards and Guidance for Archaeological Desk-based Assessments	Institute for Archaeologists	Sets standards for undertaking archaeological desk-based work and sets principles by which all archaeological work should be undertaken
Managing Change in the Historic Environment Guidance Notes	Scottish Government/ Historic Scotland	Guidance to planning authorities and stakeholders regarding key issues relating to development, the planning process, and key issues pertaining to the historic environment. Most relevant are the guidance notes covering Setting (Oct 2010) and Historic Battlefields (March 2011).

Method of Assessment

Study Areas

9.5 For the purposes of the assessment, two study areas were defined, as follows.

9.6 Study Area A comprised a 1km area from the boundary of the Site, designed to identify potential physical impacts on the known archaeological and cultural heritage resource, and the archaeological potential within the Site through the identification of any heritage assets within, or local trends immediately adjacent to, the Development footprint. This area includes the footprint of the Development, including access tracks, turbine locations and cable routes.

9.7 Study Area B comprised a maximum 10km radius from the Site to identify visual/ indirect impacts on designated heritage assets. Scheduled Monuments, Category A Listed Buildings, Historic Battlefields and inventory Historic Gardens and Designed Landscapes have been assessed up to the maximum 10km, as the significance of such monuments commonly relates to their landscape setting in terms of location, elevation, landscape dominance and prominence and intervisibility, and can thus be influenced by changes within their setting from development of the type proposed. Visual impacts on, Category B/C Listed Buildings and conservation areas have been assessed within a 5km radius of the Site only, since visual/indirect effects are unlikely to be significant beyond this distance for these types of heritage asset.

Data Sources

9.8 The following sources of information were consulted:

- Aberdeenshire Council Sites and Monuments Record (SMR) for known archaeological sites and monuments, previous archaeological interventions, and aerial photographs;
- Historic Scotland's databases of Listed Buildings, Scheduled Ancient Monuments, Historic Gardens and Designed Landscapes and monuments proposed for scheduling;
- The National Monuments Record of Scotland (NMRS) for known archaeological sites and monuments;

- Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) for vertical stereo aerial photographic coverage;
- The National Library of Scotland Map Library for Ordnance Survey map coverage from 1850 onwards, and other early cartographic sources;
- Online resources, principally the Statistical Accounts of Scotland, the Historic Land Use Assessment (through RCAHMS) and Archway;
- Secondary written sources accessed at the University of Glasgow Library; and
- The British Geological Survey for geological maps.

Gazetteer

9.9 A gazetteer has been compiled, using information from the data sources listed above. The gazetteer includes a summary of the known archaeological and cultural heritage resource within Study Areas A and B. The gazetteer is included as Appendix 9.1.

Site Boundaries and Plot Numbering

9.10 Each individual field (plot) where windfarm infrastructure could be placed within the Site boundary was allocated an individual number running from 1–18 for identification, description and assessment. These are shown on Figure 9.1 and referenced later in this chapter.

Site Visit and Assessment of Setting

9.11 The Site was visited on 13th and 14th October 2011 by a qualified RSK archaeologist. Each plot where the Development installations might be located was visited and walked systematically, as was the proposed access route to the Site where this would be new or installed. Notes were taken on topography, land use, field boundaries, the condition of any previously recorded heritage assets, and potential previously unrecorded archaeological sites. The position of any identified sites or features were logged using a Trimble XT GPS, with photographic evidence taken alongside written records.

9.12 The site visit noted the current condition and nature of any recorded heritage assets and the potential for previously unrecorded assets. In addition, site visits were made to any heritage assets where an impact on the setting of the asset had been determined possible, according to the criteria outlined above. Site visits were made to all heritage assets considered sensitive to visual impact in order to provide a baseline description of significance, and an assessment of the contribution of setting to significance. In order to properly assess and communicate considerations regarding significance and setting, baseline data was gathered with regards to sensitivity to visual and indirect change for each heritage asset as follows:

- Asset significance;
- Setting definition;
- Asset character, integrity, appearance and the way in which it is appreciated;
- Relationships with other heritage assets, including group value and shared settings;
- Reasons for designation, and degree to which they contribute to appreciation and significance of the asset;

- Formal design - intended sight lines and vistas, intervisibility with contemporaneous and other heritage assets, and natural features;
- 'Key' (principal/critical) views towards, from, and within heritage asset;
- Topography/landscape situation;
- Asset scale: prominence/dominance;
- Relative scale of proposed development (anticipated);
- Landscape character, particularly unaltered settings; and
- Degree of alteration and significant existing impacts including indirect impacts.

Consultation

9.13 The Aberdeenshire Council Archaeology Service and Historic Scotland were consulted through the EIA scoping process, and a formal response received (see consultation matrix table in Chapter 1). Following the design freeze, Historic Scotland and the Aberdeenshire Council Conservation Officer were consulted regarding Listed Buildings.

Assessment of Impacts

Importance

9.14 The relative importance of each receptor has been determined to provide a framework for comparison between different heritage assets. The categories of importance do not reflect a definitive level of importance or value of a heritage asset, but a provisional one based on a range of factors including current legal status, rarity, completeness, historical and cultural associations, and community, research and place-making potential. Assessing importance requires both professional judgement and consideration of the asset's legal or policy status. When combined, these factors offer representations of the importance of a given resource and provide an analytical tool that can inform later stages of archaeological assessment and the development of appropriate mitigation.

Table 9.4: Criteria for Determining Importance of Heritage Asset

Importance	Definition
Very High	Assets and structures of acknowledged international importance. Examples include World Heritage Sites, and buildings of recognised international importance.
High	Assets and structures of acknowledged national importance. Examples include Scheduled Monuments, Listed Buildings, inventory Historic Gardens and Designed Landscapes, and Conservation Areas.
Medium	Assets and structures of acknowledged regional importance Examples include undesignated assets of value within the SMR.
Low	Assets and structures of acknowledged local importance. Examples include historic (unlisted) buildings, assets of limited value registered in the SMR, and assets compromised by poor preservation.
Negligible	Assets and structures known to be of little archaeological or historical importance. Examples include remains previously subject to large-scale destruction, assets with very little or no surviving archaeological or historic interest and assets that hold little

Importance	Definition
	intrinsic archaeological value.
Unknown	Assets and structures of uncertain character, extent and/or date where the importance cannot be ascertained.

Magnitude

9.15 Physical impacts are defined as damage to the fabric of a heritage asset, which typically could occur during the construction phase.

9.16 Visual impacts are defined as visual change within a heritage asset or its setting as a result of the Development, resulting in an affected ability to interpret, understand or appreciate the asset's significance.

9.17 Indirect impacts are secondary, brought about by knock-on impacts as a result of the Development as proposed, such as machinery noise affecting appreciation of a heritage asset.

9.18 Impacts can be considered to be either positive or negative. The magnitude of impact has been assessed according to the scale set out in Table 9.5 below. Unless expressly stated within the text, all impacts described in the Predicted Impacts section below (Paragraph 9.86 onwards) are adverse impacts.

Table 9.5: Criteria for Determining Magnitude of Physical Impact

Magnitude	Definition
Major	Change to most or all key archaeological elements resulting in a total modification of the asset or structure, or comprehensive alteration to its setting and character.
Moderate	Change to many key archaeological elements resulting in a clear modification to the asset or structure, or considerable alteration to its setting and character.
Minor	Change to key archaeological elements resulting in a noticeable modification to the asset or structure, or slight alteration to its setting and character.
Negligible	Changes to archaeological elements resulting in a barely perceptible modification to the asset or structure, or very slight alteration to its setting and character.
No Change	Assets and structures subject to no change to their fabric or setting

Significance

9.19 The significance of any effect has been assessed by comparing the importance of each known archaeological resource against the magnitude of the impact upon it (i.e. change arising from the implementation of the proposed scheme).

9.20 The significance of effect is quantified below. For the purposes of this chapter, Very Large and Large effects are significant. Moderate and Slight effects are not significant.

Table 9.6: Grading System Defining Significance of Effect

		Importance				
		Very High	High	Medium	Low	Negligible
Magnitude of Impact	Major	Very Large	Very Large	Moderate	Slight	None
	Moderate	Very Large	Large	Moderate	Slight	None
	Minor	Large	Moderate	Slight	None	None
	Negligible	Moderate	Slight	None	None	None
	No Change	None	None	None	None	None

Assessment of Impact on Setting

9.21 Impacts on setting are defined as any perceived change or impact of the Development on the setting of a protected asset, any change in levels of noise, movement or light (flicker) at the known asset (indirect impacts); or any impact on the sightlines to and from protected assets and any impact on the intervisibility between assets or deliberate vistas from assets (visual impacts), where this distracts from the context, integrity or appreciation of the asset affected.

9.22 The methodology for assessment of impact on setting is based on Aberdeenshire Council in their supplementary planning guidance for wind farms[2] (summarised in the tables below); and *Historic Scotland's guidance note, Managing Change in the Historic Environment: Setting* [3], which defines a three-stage process:

Stage 1: identify historic assets

Stage 2: define and analyse setting

Stage 3: assess the impact of the new development

9.23 Receptors considered for visual/indirect impacts in this chapter are: Scheduled Monuments, conservation areas, listed buildings, World Heritage Sites, inventory Historic Gardens and Designed Landscapes, monuments proposed for scheduling, and Historic Battlefields. These sites are all considered to be of 'High' importance against the criteria outlined in Table 9.4 above

9.24 The potential impacts on setting from the Development have been initially assessed through comparison of a defined zone of theoretical visibility (ZTV) against the location of the designated heritage assets, including the assessed extent of the setting of each asset, any shared setting extents if appropriate, and informed by the site visit. For those within the ZTV, the potential visual/indirect impact of the Development has been subsequently assessed by comparing the proposed turbine positions against the location of heritage assets and their settings. The magnitude of impact is quantified according to Table 9.5.

9.25 The significance of effects on setting is therefore a consideration, as per Table 9.6, of the significance of the heritage asset including the direction of its key views and the

extent of its setting, in relation to the magnitude of change brought about by the Development.

Limitations of the Assessment

Data Sources

9.26 Generally, information held by public data sources is usually considered to be reliable; however;

- Any SMR can be limited because opportunities for research, fieldwork and discovery depend on the situation of commercial development, rather than the result of a more desirable structured research framework;
- There can often be a lack of dating evidence for archaeological sites;
- Documentary sources are rare before the medieval period, and many historic documents are inherently biased; and
- Primary sources, especially older records, often fail to accurately locate heritage assets and can be subjective in any interpretation.

Site Visit

9.27 An archaeological walkover survey has inherent limitations primarily because archaeological remains below ground level cannot be identified, and because land-use such as coniferous plantations may mask extant earthworks.

Impact Assessment

9.28 The limitations of the physical impact assessment include:

- The lack of clarity surrounding the extent of some heritage assets. This makes it difficult to provide a precise assessment of potential physical impact;
- The possibility that unknown archaeological sites will be encountered during construction; and
- The assessment has considered all impacts associated with the Development, as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised. However, for the purposes of this planning application it is assumed that the grid connection would comprise a 33kV underground cable that would route through the Site, with a 'T' connection into the existing 33kV transmission line between Turriff and Aberchirder, which runs close to the southern boundary of the Site. The grid connection would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) as part of the consenting procedure for this element of infrastructure. The scope of any such assessment would be agreed with Aberdeenshire Council. However, desk-based information has been used to consider the impact of this proposed cable within the assessment.

Baseline Environment

Location, Topography and Geology

9.29 The location of the Site is described in ES Chapter 3. The topography and geology of the Site are described in ES Chapter 5. A summary of their archaeological relevance is presented below.

9.30 The topography of the area is rolling hills, with Cranna Hill, Black Law, Hill of Deuchries, Gallow Hill and the Crannabog hills being the most prominent within Study Area B. Height varies between 241m above Ordnance Datum (AOD) at the summit of Black Law and 155m AOD at Mains of Cranna, adjacent to the B9025. Current land-use consists of agricultural fields (both arable and pasture) on the southern slopes of Cranna Hill, to the south of North Cranna. All other fields are pasture, with rough grazing over recently-cleared areas of gorse around the summit of Black Law, and poorly-drained areas of marsh predominant in the low-lying central area draining east into Thistle Mill.

Historic Land-use Assessment

9.31 Historic Land-use Assessment data for Study Area A showed that the majority of the Site was rectilinear fields from the 18th and 19th centuries onward. These fields were amalgamated or redefined in places during the 20th century. The area of rough grazing at the summit of Black Law may be an example of a more extended continuity of land-use. Additional examples of landscape use and change is incorporated into the sections below.

Historic Background

Prehistoric (500,000 BC – 43 AD)

9.32 Until relatively recently, very little occupation evidence dating to the Palaeolithic period (500,000 – 12,000 BC) had been recorded from Scotland[4]. However, recent discoveries at Howburn Farm, Biggar, South Lanarkshire[5], provide evidence for occupation during the late Upper Palaeolithic period. It is possible that Palaeolithic activity took place within Study Area B, but archaeological evidence for such occupation will have been destroyed by scouring action of the numerous glacial advances and retreats from 8,000 BC until the beginning of the Holocene geological epoch.

9.33 The first recorded prehistoric human activity in Banff and Buchan occurred in the Mesolithic period (12,000 – 4,000 BC), in the form of flint scatters, such as at Little Gight[6]. The landscape of the Scottish Mesolithic period is generally characterised as consisting of Boreal woodland interspersed with open peatland areas[7].

9.34 The introduction of agriculture and stock-raising characterises the beginning of the Neolithic period (c. 3,500 – c. 2,000 BC)[8]. Within Study Area B, funerary and ritual monuments are in evidence, such as the Stirling long cairn (RSK Site 95). The cup-and-ring marked rocks at Corskellie (RSK Site 194) may also date from this period, or the subsequent Bronze Age. Aberdeenshire is particularly noted for the presence of carved stone balls thought to date from the Neolithic[9]. Landscape change during the

Mesolithic to Neolithic transition is likely to have taken the form of the removal of tree cover due to clearing for agriculture. However, such change, having commenced in the Mesolithic, is unlikely to have been substantial until the later Prehistoric periods, with some clearance of forest as stock-raising began to supplement and replace hunter-gathering subsistence[10]. These episodes of woodland clearance would have been followed by regeneration, with tree and shrub levels returning to their original densities. The beginnings of peat accumulation are also attested to in northeast Scotland, for example at Moss of Cruden in Buchan[11].

9.35 The Bronze Age (c. 2,000 – 600 BC) sees the introduction of copper and bronze metallurgy as well as a variety of changes in material culture and practice, some of which are unique to northeast Scotland. The division between the Neolithic and Bronze Age periods is typically drawn by the introduction of Beaker pottery and its associated cultural suite, such as stone bracers, barb-and-tang arrowheads and short-cist inhumations. Later developments in the Bronze Age see smaller food vessels and a move towards cremation, often in round burial cairns. Most distinctive to Aberdeenshire are the recumbent stone circle monuments, where a large prostrate slab is flanked by tall upright orthostats, often in the southwest quadrant of the circle [12]. Within Study Area B, multiple examples of recumbent stone circles exist, such as at Marnoch (RSK Site 89), Bellman's Wood (RSK Site 91), Rothiemay Castle (RSK Site 192), Yonder Bognie (RSK Site 198), St. Brandan's Stanes (RSK Site 199: cupmarkings are also present), and Cairn Riv (RSK Site 207). These form a distinct concentration of the monument class along the hills overlooking the River Deveron, away from the core area of Donside to the south, where the majority of recumbent stone circles are located [13].

9.36 Landscape change during the Bronze Age followed a similar pattern to the Neolithic, with the continued clearance of primary woodland. From circa 3,000 BC onwards, major reductions of forest cover take place[14]. Elsewhere in Scotland, archaeological and palynological (pollen) evidence indicates that cultivation extended into upland areas for the first time during the Bronze Age, from c. 2500 BC, leading to soil erosion in places, possibly from deforestation. However, the overall picture is of small isolated settlements occupying clearings in the primary woodland[15].

9.37 In comparison to the profusion of monuments of likely Bronze Age date within Study Area B, Iron Age activity (c. 600 BC – 43 AD) is conspicuous by its relative absence. Only a single monument is attributed to the Iron Age; the souterrain and settlement at Boghead (RSK Site 95). Typically, Iron Age settlements are characterised by an emphasis on apparently defensive properties, such as the prominent Tap O'Noth fort to south of Rhynie. The lack of Iron Age monuments within Study Area B suggests that unenclosed settlements were the norm in the area. The Iron Age in Scotland is characterised by a non-uniform funerary tradition[16] and no known burial monuments from the period are located near the Site.

9.38 In terms of associating Banff and Buchan with a documented historical group during the later Iron Age, the contemporary written and cartographic sources are vague and difficult to interpret. Ptolemy's map of the 2nd century AD indicates that a tribe called the Vacomagi occupy the area to the east of the Deveron [17]. The Iron Age in Scotland

witnesses an increase in the overall level of anthropogenic (man-made) landscape change and exploitation, with extensive episodes of woodland clearance, an increase in arable and pastoral farming at the expense of forest, and the expansion of moorland[18].

Roman (43 AD – 410 AD)

9.39 The initial wave of Roman occupation of Britain began in 43AD, but it was not until the campaigns of Agricola (83/84AD) that a Roman military incursion is recorded as extending to Aberdeenshire, culminating in the famous battle of Mons Graupius, at an unrecorded location in the northeast of Scotland[19]. Neither Agricola's campaign, nor the later campaign under emperor Septimius Severus against the Caledonians in 208/9 AD into northeast Scotland, led the long-term establishment of direct Roman rule. However, evidence for Roman military occupation is present in Aberdeenshire through the presence of army camps, some dating to both incursions such as at Ythan Wells to the south of Study Area B.

9.40 Elsewhere in Europe and also in England, the Roman period witnesses extensive changes in settlement pattern and landscape organization. However, evidence for such change in northeast Scotland is not present. Instead, landscape and land-use change during the Roman period is frequently characterised as a continuation of the pattern shown in the late Iron Age and through the Pictish (early medieval) period[20].

Early Medieval (410 AD –1123 AD)

9.41 During the late Roman period and through the majority of the early medieval period, northeast Scotland formed part of the heartland of the Picts, whose territory extended north of the Forth and Clyde as far as Orkney. The Picts are famed for the quality of their sculpture, with Pictish symbol stones being located throughout Aberdeenshire [21]. The evolution of the symbol stones shows the gradual Christianization of the Picts through the unification with the Scots under Kenneth MacAlpin in 843 AD. Sites within Study Area B dating from the early medieval period are ecclesiastical in nature, with parish churches at Marnoch (RSK Site 100), Rothiemay (RSK Site 193) and Den Bridge (RSK Site 216), the latter attributed to the period due to the presence of two Pictish symbol stone fragments within the churchyard (see Gazetteer, Appendix 9.1).

9.42 The evidence for land-use and exploitation during the Early Medieval period shows a wide variation in Scotland. Recent evidence from southern Scotland indicates considerable local variation, with evidence of some areas indicating a thriving rural economy, whereas in adjacent areas there is no continuity of exploitation of the land from the Roman through to the Early Medieval periods [22]. In the area under the political control of the Picts, exploitation of the land was focused on fertile soils in sheltered, well-drained areas [23].

Medieval (1124 AD –1500 AD)

9.43 The medieval period in Scotland is often traced from the kingship of David I (1124 – 1153AD)[24]. This involved the migration of an Anglo-Norman aristocracy to Scotland, with the Comyn and (later) Huntly families particularly notable in the region[25], with royal power focused on the sheriffdom, based in the burgh of Banff. Along with these

changes came the feudal system of landownership and political organisation. The primary local centre was the thanage of Aberchirder[26]. The majority of the population would have lived in small irregular agricultural settlements known as *touns*, the pattern of which is still visible in the distribution of settlements in the early part of the post-medieval period.

9.44 Other monuments of particular prominence in Study Area B are the castles, such as Kinnairdy (RSK Site 101), Boyne (RSK Site 201), Banff (RSK Site 209) and King Edward (RSK Site 217). Ecclesiastical sites are also in evidence, such as Boyndie Kirk (RSK Site 205), St. Mary's Parish Church, Banff (RSK Site 210) and Duff House monastery and chapel (RSK Site 208).

9.45 In terms of landscape and land-use change during the medieval, it is clear that natural changes to the landscape have been far less important than anthropogenic ones[27]. These were caused in part by a general increase in population, leading to a greater demand for arable and pastoral farming. Various dykes and land divisions in the area may date from the fifteenth century. Later divisions of land comprised "infield", representing accessible, good quality land close to townships, and "outfield", which was more marginal. Upland, outfield areas were exploited as summer pasture for livestock, with moorland expanding at the expense of forest. The larger settlements were clustered in the lowland areas, with scattered shielings in the uplands[28].

Post-medieval (1501 AD – 1900 AD)

9.46 The post-medieval period is notable for two particular events that changed the landscape of northeast Scotland, the *agricultural revolution* and the *industrial revolution*. Of the two, given the predominantly rural character of Study Area A, changes associated with the agricultural revolution are the most prominent.

9.47 The nature of high-status settlement sites changes gradually through this period, with the castles of the Middle Ages being abandoned in favour of dwellings which allowed more comfort, such as tower houses (e.g. Inchdrewer Castle RSK Site 102), which in turn were replaced by country houses, such as Dunlugas (RSK Site 103) and Duff House (RSK Site 211). Indeed, some sites were continuously occupied and remodelled over an extended period of time, with Park (RSK Site 98) originating as a castle built in 1292, before being adapted as a tower house in 1563 and extended in the 17th and 19th centuries as a country house.

9.48 The turn of the 18th century was important for landscape change, with legal changes allowing fields using the traditional run-rig system to be reallocated, moving to a more individual-based system of farming, land-use and land-ownership[29]. This agricultural revolution or 'improvement', witnessed increasing investment in agricultural practices by rural landowners and their tenants. The aim was maximising revenue from the land, and led to the draining and exploitation of land previously considered marginal. Turnock identifies that this process was already advanced in Banffshire by the end of the 18th century [30] and the Statistical Account of Scotland (written in 1791-9) describes a peaceful and prosperous rural parish of Marnoch[31]. A further impact of the agricultural revolution is witnessed in the establishment of new, planned villages such

as Aberchirder (RSK Site 1), founded in 1764 by Alexander Gordon of Auchintoul[32]. In the New Statistical Account[33], few indications of industry are detailed in the parish, apart from limited quarrying, while the emphasis in the account is on agricultural improvements. Improvements to infrastructure are also in evidence such as the turnpikes running from Turriff to Portsoy and from Banff to Huntly.

Modern (1901 AD – Present)

9.49 The modern period in Grampian sees considerable and extensive changes in land-use. A review commissioned by Scottish Natural Heritage[34] shows an increase in coniferous plantation and arable agriculture at the expense of heather moorland and grassland. Within Study Area A, heather moorland has been replaced by grassland, and further areas to arable farming and coniferous plantation. Also apparent in recent years has been the introduction of onshore wind turbines (see Figure 8.24), which are now located in or near the north (Boyndie Airfield and extension; Strath of Brydock) east (Cairnhill) south (Glens of Foudland; Dummule) and west (Balnamoon Farm) of Study Area B.

Known Archaeological and Heritage Resources

Scheduled Monuments (SMs)

9.50 There are no SMs within the Site or Study Area A and no monuments proposed for scheduling were identified within Study Area A. There are a total of 33 SMs within Study Area B (Appendix 9.1).

Conservation Areas

9.51 The Site does not lie within a conservation area. There is one conservation area located within Study Area A, comprising the core of the 19th-century planned village of Aberchirder (RSK Site 1). The conservation area is located 2.4km southwest of the nearest turbine. (Figures 9.1 and 9.2).

Listed Buildings (LBs)

9.52 There are 16 listed buildings (LBs) within Study Area A, and all are located within Aberchirder, to the southwest of the Site, as shown in Table 9.7 below.

Table 9.7: Listed Buildings within Study Area A

RSK Site Number(s)	Name	Category	Distance to nearest turbine (km)
2; 3	18 and 19 The Square	B	2.8
4	23 South Street	B	2.9
5	38 South Street	B	2.7
6	Main Street, New Marnoch Church	B	2.4
7	12 The Square	C(S)	2.8
8	69 North Street	C(S)	2.8

RSK Site Number(s)	Name	Category	Distance to nearest turbine (km)
9	The Square, Victoria Fountain	C(S)	2.8
10; 11	Rear, 19 and 20 South Street	C(S)	2.9
12	137 Main Street	C(S)	2.6
13	148 Main Street	C(S)	2.5
14	51 South Street	C(S)	2.5
15	South Street, Kinnairdy Lodge	C(S)	2.5
16	South Street, Gowanlea	C(S)	2.5
17	South Street, Laurelbank	C(S)	2.5

9.53 There are a further 120 LBs within Study Area B, four of which are also SMs. It should be noted that the listed buildings that are also Scheduled Monuments have been annotated as Scheduled Monuments only on Figure 9.2. Listed buildings in Study Area B are concentrated around the settlements of Aberchirder and Banff, with high-status residences such as Park (RSK Site 98) and Forglen House (RSK Site 239) also comprising small concentrations of listed buildings.

Inventory Historic Gardens and Designed Landscapes (HGDLs)

9.54 There are no Inventory Historic Gardens or Designed Landscapes (HGDLs) within the Site or Study Area A. There are two HGDLs within Study Area B:

- The Old Manse of Marnoch (RSK Site 96; also a listed building) located 6.6km southwest of the nearest turbine; and
- Duff House Gardens, (RSK Site 218), located 8.3km to the northeast of the nearest turbine.

9.55 Following consultation with Aberdeenshire Council and Historic Scotland, a garden identified as a candidate for inclusion in the inventory, Forglen House Gardens, was also considered in the assessment. Forglen House gardens (RSK Site 97) is located 5.8km to the east of the nearest turbine.

Non-scheduled Heritage Sites and Monuments

9.56 There are 67 non-scheduled heritage sites and monuments within Study Area A recorded on the Aberdeenshire Council SMR and NMRS. These are grouped by importance below.

Very High Importance

9.57 There are no non-schedule archaeological sites recorded in the SMR or NMRS which are considered to be of very high importance

High Importance

9.58 There are no non-schedule archaeological sites recorded in the SMR or NMRS which are considered to be of high importance.

Medium Importance

9.59 There are four sites recorded as medium importance in the SMR and NMRS:

- Cropmark of a possible double ditched and banked enclosure at Black Law (RSK Site 41), which could be of prehistoric date;
- Mound of Tam's Chamber (RSK Site 50) of man-made but indeterminate origin, may represent prehistoric activity;
- Post-medieval farmstead of Castlebrae and (RSK Site 32);
- Modern Aberchirder War Memorial (RSK Site 22).

Low Importance

9.60 There are 50 sites from the NMRS and SMR interpreted as of low importance. Apart from the remains of rig and furrow at Craigathry Wood (RSK Site 80), which may be of medieval origin, all the sites date from the post-medieval period. These include farmhouses and farmsteads (RSK Sites 25, 31, 34, 37, 42, 45, 48, 51, 53 – 55, 60, 61, 63, 67, 69, 76, 77, 83 and 85). Other rural dwelling-places, such as cottages and crofts, are also recorded (RSK Sites 28, 33, 35, 36, 39, 40, 44, 47, 52, 66, 70, 71, 73, 75, 79 and 82). Further sites include a hotel (RSK Site 18), well (RSK Site 19), parish church (RSK Site 20) and manse (RSK Site 23) in Aberchirder, a pond at Skeibhill (RSK Site 24), a post office and house at Blacklaw (RSK Site 26), a smithy at Smithfield Croft (RSK Site 44), two mill lades at Burngrains (RSK Site 74) and a milestone (RSK Site 78).

Negligible Importance

9.61 There are 14 sites from the NMRS and SMR interpreted as of negligible importance. These include a modern housing estate at Corsie Drive (RSK Site 21), former quarries at Mains of Corskie (RSK Site 29), Skeibhill (RSK Site 30), Foreside (RSK Site 37), Sweerbog (RSK Sites 58 and 62) and Sweerburn (RSK Site 81). Sheepfolds are also recorded at Rotten Moss (RSK Site 43), North Cranna (RSK Site 49) and Craigathry Wood (RSK Site 84).

9.62 Further sites of negligible importance include the site of a now-destroyed building at Crawford Moss (RSK Site 56), and now-removed boundary stones at Hillhead (RSK Site 59), Muirden of Cranna (RSK Site 65) and Sweerburn (RSK Site 72).

Map regression

9.63 Appropriate historic mapping of the area was consulted in order to provide information on the use and development of the land during the later post-medieval and modern periods.

Pont 9: The Coast of Banff (1580s to 1590s)

9.64 Pont's map of the coast of Banff traces the line of the Deveron from Banff. The geographical relationship of different map features is difficult to ascertain, however, townships with the placenames of "Dewchories" (Deuchries, corresponding to RSK Sites 36, 40, 51 or 61) and "Kramach" (possibly corresponding to Cranna, RSK Site 48 or 27) are evident. Aberchirder is not portrayed; instead a settlement called "Monedy of Abyrchyirdurr" is depicted on the banks of the Deveron near Marnoch (to the south of Study Area A). The map shows a concentration of townships on the western and northern sides of the Deveron with Study Area B.

Blaeu's Atlas of Scotland (1654)

9.65 Blaeu's Atlas was based on surveys undertaken by Robert Gordon, and depicts "Dewchries" (corresponding to RSK Sites 36, 40, 51 or 61), Blacklaw (RSK Site 26), Cranna (RSK Site 27) and "Whytfield" (Whitefield, corresponding to RSK Site 83).

Moll, H. The Shires of Bamf [i.e. Banff] and Aberdeen (1745)

9.66 Moll's map shows "Whithfield" (Whitefield, corresponding to RSK Site 83). "Abirkerdir" (Aberchirder) is depicted on the north bank of the Deveron, rather than where the modern village of Aberchirder now lies (RSK Site 1).

Roy's Military Survey of Scotland: Highlands (1752-55)

9.67 Roy's map shows the principal settlements in the vicinity of the Site, in addition to tracks, areas of cultivation, and watercourses, in the period before enclosure and agricultural improvement began in earnest. Several townships are depicted in detail for the first time. "Crannach" (corresponding to South Cranna, RSK Site 27), "Crannach Mains" (corresponding to Mains of Cranna), "Hearty Crannach" (corresponding to North Cranna, RSK Site 241), Blacklaw (RSK Site 26) and "Crannybog" (corresponding to Lower Crannabog, RSK Site 77) are depicted.

9.68 The Site is depicted as unenclosed tilled fields around North Cranna, with three lines of hills corresponding to Cranna Hill and Black Law to the west, Hill of Deuchries to the north, and Gallowhill to the east. These surround a low-lying area shown as bog comprising the centre of the Site. No crofts, shown in subsequent maps (e.g. RSK Sites 36, 37, 40, 51 and 61) are depicted around Gushetbog within the Site, suggesting either that they were not surveyed, or that they are later, 18th or 19th-century sites. Foggyloan, the fermtoun precursor to the planned village of Aberchirder (RSK Site 1) is depicted to the west of the Site.

Thomson's Atlas of Scotland (1832)

9.69 Thomson's Atlas depicts several farmsteads within the Site, including Cranna (likely to correspond to RSK Site 241, North Cranna, and Mains of Cranna). Deuchries (labelled as "Ducharies") is depicted as two settlements, probably corresponding to RSK Sites 51 and 61. Roads are depicted, including the B9025.

Ordnance Survey First Edition (published 1861)

9.70 The first edition Ordnance Survey, surveyed in 1866 and 1868 depicts the Site in considerable detail. The Site is shown as a series of scattered farmsteads and crofts, with a higher density of occupation than that depicted in modern mapping. Cranna Hill is shown as unenclosed, with fewer field boundaries than today. In contrast, a denser concentration of field boundaries than is currently the case are shown around the centre of the Site, dividing the land between Smithfield Croft and Smithy (RSK Sites 44 and 46) and Gushetbog Croft (RSK Site 42), with similar divisions between the West and East Deuchries (RSK Sites 36 and 40). Upper Deuchries (RSK Site 51) is shown as a mill with associated dam, as is Kebholes/ Nether Deuchries (RSK Site 61). Tracks that are also depicted on modern OS mapping link the crofts.

9.71 Newlands Croft (RSK Site 47) is shown as a single, roofed structure. The possible mound or cairn of Tam's Chamber (RSK Site 50) is identified exactly along the division between the parishes of Marnoch and Forglen. Further farmsteads depicted for the first time include Upper Crannabog (RSK Site 55) and North Cranna (RSK Site 241), as well as another site at North Cranna, north of the B9025 (RSK Site 48). Sheepfolds are shown at Rotten Moss (RSK Site 43) and North Cranna (RSK Site 49), with a small quarry also depicted on Black Law (RSK Site 87). The modern B9025 is depicted as a turnpike, with a small structure (probably a booth) located adjacent to it (RSK Site 242). The modern, very linear arrangement of canalised watercourses through the Site is not as prevalent, except where they lead to mills, such as at Kebholes (RSK Site 61).

Aerial Photography

9.72 Aerial photographs from the RCAHMS and the Aberdeenshire SMR for Study Area A were examined, covering 1946 to 1977. These show comparatively little change in land-use over the 20th century, although there is evidence of the clearing of scrub from the summit of Black Law.

9.73 Several previously identified sub-surface or derelict sites are visible in Study Area A, such as the Black Law possible enclosure (RSK Site 41), the destroyed farmstead and circular sheepfold at North Cranna (RSK Sites 48 and 49), the farmstead of Upper Deuchries (RSK Site 51), the former quarry at Mains of Corskie (RSK Site 29), and crofts at West and East Deuchries (RSK Sites 36 and 40), Gushetbog (RSK 42), Smithfield (RSK Site 46) and Newlands (RSK Site 47).

Site visit

9.74 The Site was visited on 13th and 14th October 2011 by a qualified RSK archaeologist. Weather conditions were generally cool and overcast. Visibility for archaeological earthworks was good in pasture fields, and poor in arable fields, heath and reeds.

9.75 The Site is situated on and between a series of hills to the north of Aberchirder, occupying Cranna Hill and Black Law and lying immediately to the south of the Hill of Deuchries and west of Gallow Hill. The hills themselves are generally improved pasture, except at the summit of Black Law, where heath comprising gorse bushes under active management was present. The centre of the Site, around Gushetbog,

consisted of a poorly-drained low-lying area, where it is likely that peat had been extensively removed during the post-medieval period for fuel, thus making way for crofts.

9.76 The site visit identified three new sites. A possible dyke and ditch (RSK Site 64) was identified along the farmer's track adjacent to the former croft of Newlands (RSK Site 47). This is associated with the farmer's track and is likely to have provided revetting and drainage for it (see Plate 1). A negative feature, not identified on historical mapping, was identified near Gushetbog Croft adjacent to the farmer's track (RSK Site 68). This had the appearance of a shallow quarry scoop dug into the side of Black Law, presumably for the purposes of obtaining stone for building or maintaining the track or crofts (see Plate 2). Cultivation marks were visible on the south-facing slopes of the Hill of Deuchries (RSK Site 88). These are likely to be the result of recent (20th or 21st-century) ploughing, but may overlie earlier rigg and furrow (Plate 3). Further details are provided in the gazetteer (Appendix 9.1).

Table 9.8: Summary of archaeological site visit observations

Plot Number	Plot description	Archaeological comments
1	SW-facing improved pasture field. Overhead power cables	Bound by fences to W and N.
2	Undulating improved pasture field	Bound by fences to N and E
3	Improved pasture field Overhead power cables	Bound by fence to E
4	W-facing arable (potato) field	Bound by fences to W and N. Poor visibility of earthworks
5	E-sloping improved pasture field	RSK Site 43 – sheepfold. No remains visible. Bound by fence to N, by a fence and low drystone wall to E and by a hedge to the W
6	Undulating E-sloping improved pasture field	Field clearance present in SW corner. Bound by fence and trees to N, and by fence to E
7	E-sloping undulating field of semi-improved pasture and heath.	RSK Site 41 – enclosure cropmark. Not visible due to vegetation coverage on summit of hill. RSK Site 47 – Newlands Croft, in a largely ruinous state (see Plate 4). RSK Site 64 – possible dyke and ditch (see Plate 1) RSK Site 87 – former quarry. Identified as an overgrown circular depression of around 12m diameter (see Plate 5) Poor visibility of earthworks around summit of Black Law, where gorse bushes dominate. Bound by fences to S and E

Plot Number	Plot description	Archaeological comments
8	E-sloping convex semi-improved pasture field	RSK Site 42: Gushetbog Croft. Upstanding rubble and mortar remains of two structures up to 2.5m high (see Plate 6). RSK Site 44: Smithfield smithy. Visible as an artificial platform and track (see Plate 7). RSK Site 46: Smithfield croft. Visible as an area of grassed-over rubble (see Plate 8). RSK Site 68: possible former quarry (see Plate 2). Bound by fences to N and W
9	W-sloping improved pasture field	RSK Site 50: Tam's Chamber. Visible as a mound, but now surrounded by extensive modern field clearance (see Plate 9). Regular parallel cultivation cropmarks visible in field of modern origin. Bound by fence to W
10	Undulating semi-improved pasture field	Large field clearance pile lines part of the W field boundary, marked on modern OS mapping. Appears recent. Existing modern area of quarrying on the SE edge of field. Bound by fence and track to S and by fence to W.
11	Low-lying flat marshy field	Mill lead channels marked on map leading to Kebholes (RSK Site 61) not visible in field, possibly due to poor visibility (see Plate 10). Bound by fence to S
12	Undulating W-sloping improved pasture field	Stone piles present within field at possible borrow pit location against edge of slope. No dressed stones or structural elements. Upper part of field is gorse-covered.
13	Low-lying semi-improved pasture field	RSK Site 38: gravel pit. No remains visible. RSK Site 39: Hillend croft. Visible as a grassed-over rectangular two-room structure, with footings of walls apparent (see Plate 11). Bound by ditch to N.
14	Undulating semi-improved pasture field	RSK Site 36: West Deuchries. Visible as a grass-covered rectangular structure and steading with mature hawthorn trees (see Plate 12). RSK Site 40: East Deuchries. Visible as a grass- and gorse-covered former farmstead cut into the side of the hill (see Plate 13). Bound by fence to E and N.
15	Undulating improved pasture field	RSK Site 51: Upper Deuchries. Five roofless buildings, but walls standing to two storeys in places. Rubble and lime mortar construction. Sycamores and hawthorn form a shelterbelt (see Plate 14). RSK Site 88: cultivation marks. Visible aligned with slope N-S (see Plate 3). Bound by bank, fences and ditch to E.
16	Low-lying semi-improved pasture field	Bound by fence and watercourse to S.
17	Convex semi-improved pasture field	Bound by fence to N.
18	Convex semi-improved pasture field	Bound by fence to N and W.

Archaeological potential

Prehistoric

9.77 There is a single prehistoric site located within the Site, the possible prehistoric enclosure cropmark on the summit of Black Law (RSK Site 41). The mound of Tam's Chamber (RSK Site 50) may also have prehistoric origins. Therefore, the archaeological potential of the Site in terms of prehistoric periods is low, except around RSK Sites 41 and 50, where it is moderate.

Roman

9.78 There are no Roman-period sites within Study Area A, and no designated assets dating to the Roman period in Study Area B. Given the lack of archaeological sites dating to this period, the archaeological potential of the Site in terms of Roman remains is considered to be negligible.

Early Medieval

9.79 There are no early medieval sites identified within Study Area A. Those designated assets in Study Area B identified as having an early medieval origin are churches or ecclesiastical centres, and is likely that contemporary settlement would have clustered around these foci. The potential for encountering sites of early medieval date within the Site is considered to be low.

Medieval

9.80 There is no confirmed medieval activity within Study Area A, with a single possible medieval or post-medieval site of rig and furrow and field systems at Craigaithry Wood (RSK Site 80) to the east of the Site. However, it is possible that the numerous farmsteads and crofts within the Site have medieval origins. This is most likely for West Deuchries (RSK Site 36), East Deuchries (RSK Site 40) Upper Deuchries (RSK Site 51), Nether Deuchries/ Kebholes (RSK Site 61), and North Cranna (RSK Site 241), as both Cranna and Deuchries are depicted and named in 16th-century mapping of the area. It is likely that the low-lying area comprising the centre of the Site around which turbines 1, 2 and 3 are located – known as Gushetbog on early Ordnance Survey maps – was drained in the late post-medieval period. Therefore, the archaeological potential of the Site in terms of hitherto unknown medieval remains is moderate in the vicinity of the farmsteads and crofts of West Deuchries (RSK Site 36), East Deuchries (RSK Site 40) Upper Deuchries (RSK Site 51), Nether Deuchries/ Kebholes (RSK Site 61), and North Cranna (RSK Site 241), and negligible around proposed turbines 1, 2 and 3.

Post-medieval

9.81 The Site contains numerous post-medieval sites, including farmsteads, cultivation marks, former field boundaries, crofts and quarries. The majority of these are likely to relate to agricultural improvements in the later post-medieval periods. The enclosure of fields is likely to have left archaeological traces of former field boundaries, and the practice of 'night soiling' (or manuring) is likely to leave period artefacts in the topsoil.

While the likelihood of encountering any such remains is high, their importance is expected to be negligible. There is considered to be a moderate potential of discovering structural remains dating to the post-medieval period in the immediate vicinity of crofts and farmsteads (RSK Sites 36, 39, 40, 42, 44, 46, 47, 48, 51, 55 and 61).

Modern

9.82 The modern period is well represented by mapping and it is deemed very unlikely that hitherto unknown heritage assets of this date should exist within the Site. The archaeological potential for this period is therefore considered to be negligible.

Project Characteristics

Likely Physical Impacts of the Proposed Development

9.83 It is anticipated that any physical impacts on archaeological remains would occur during construction. The Development would involve several activities during construction, which have the potential for a physical impact on both buried and above ground archaeological and cultural heritage resources. These activities include:

- Excavations for turbine foundations;
- Excavations for crane hard standing areas;
- Excavations for temporary construction compounds;
- Excavations for access tracks (including improvements to existing road systems to allow for access of construction traffic);
- Excavation for the substation;
- Excavation of service trenches and installation of below ground cables (including the connection to the local electricity distribution network, which as described in ES Chapter 3, would be likely to route within the Site and has been assessed as such); and
- Delivery of materials to the Site.

9.84 A maximum micrositing tolerance of 30m in any direction has been assumed in assessing the potential physical impact of the Development in this chapter.

9.85 Based on the assessment of archaeological potential outlined in Paragraphs 9.75 to 9.80 above, the likelihood of encountering previously unrecorded buried archaeological remains within the footprint of the Development is considered to be low to moderate.

Likely impacts on the Setting of Cultural Heritage Receptors

9.86 The Development may visually impact on the setting of cultural heritage receptors during its operational phase, generically described as follows:

- Interruption of sight lines and monument intervisibility is possible where the heritage asset would be superseded in terms of landscape prominence and/or dominance by the Development, thus diminishing appreciation of the monument

as it was originally intended or has subsequently been perceived. This diminution of appreciation could take place from either the heritage asset in question, the Development, or other locations, such as prominent topographical features or contemporary monuments; and/or

- Views towards, from, and within the area of interest, particularly conservation areas; the visual impact is caused if the Development becomes a significant factor in the views from the protected site or to it from the surrounding landscape. This is especially significant if the designation of the designated area took account of the landscape (or townscape) setting of the designated area.

9.87 Possible indirect impacts can also include changes in levels of noise, movement or light (flicker) at a known asset during the commissioning of the wind farm for receptors within 1 km of a turbine.

Predicted Impacts

Site-specific Physical Impacts

9.88 Of 22 identified potential archaeological sites within or partially within the Site (Figure 9.1), nine are positioned within 30m of a turbine, access track or borrow pit (the micro-siting tolerance for the Development), and thus could suffer an adverse physical impact during the construction phase of the Development. These are considered in Table 9.9 below.

Table 9.9: Archaeological sites within 30m of proposed Development installations.

RSK Site	Site Name	Comments
43	Rotten Moss	Site of a now-destroyed sheepfold, of which no remains are visible. The proposed access track passes along an existing track to the east of the site location. Although the site is located within the 30m micro-siting distance, it is more than 5m away from the existing track, and it is unlikely to be affected by track-widening activities. Considered of negligible importance and subject to a negligible change, no significance of impact is predicted.
44	Smithfield Croft	Site of a rectangular smithy that is depicted on the 1867 1st edition and 1888 2nd edition OS maps. Visible during the site visit as an artificial platform and track. The Development access track passes along the existing farmer's track 10m to the southwest of the platform. Although the site is located within the 30m micro-siting distance, it is more than 5m away from the existing track, and would not be affected by track-widening activities. Considered of low importance and subject to a negligible change, no significance of impact is predicted.
46	Smithfield Croft	Remains of a L-shaped croft that is depicted on the 1867 1st edition OS map. Visible during the site visit as grassed-over rubble. The crane pad/laydown area for Turbine 2 is located approximately 5m west of the archaeological site. Considered of low importance and subject to a moderate impact, resulting in a slight significance of impact.

RSK Site	Site Name	Comments
47	Newlands Croft	Remains of an L-shaped croft, with upstanding remains still visible. The proposed access road passes along an existing farmer's track to the west of the site, and the proposed control building compound would be located to the south of the site. Considered of low importance and subject to a moderate impact, resulting in a slight significance of impact.
64	Newlands Croft	Dyke and ditch identified during site visit forms the western edge of an existing farmer's track. The proposed access road passes along this existing track. Considered of negligible importance and subject to a moderate impact, resulting in no significance of impact.
68	Gushetbog Croft	Possible former shallow quarry scoop identified during site visit. Turbine 1 and its crane pad/laydown area overlie the possible former quarry. Considered of negligible importance and subject to a major impact, resulting in no significance of impact.
87	Black Law	Remains of a former quarry detailed in the OS 1st Edition map. Site visit identified it as an overgrown circular depression in the west-facing side of Black Law of approximately 12m diameter. The site of the former quarry is proposed as a potential borrow pit (BA2). Considered of low importance and subject to a major impact, resulting in a slight significance of impact.
241	North Cranna	North Cranna is an existing and occupied farmstead. One of the proposed access road options passes through the steading on an existing track, and would require the removal of a modern agricultural shed. While no direct impacts on the post-medieval standing buildings are predicted, buried remains associated with the farmstead may be affected by road widening or demolition activities. Considered of medium importance and subject to a minor impact if the access route through the farmstead was to be used, resulting in a slight significance of impact.
242	Corskie	Recorded location of a former tollbooth. No remains are visible, and the structure was likely to have been demolished during widening of the B9025. The proposed access road passes along the existing farm access track adjacent to the site. Considered of negligible importance and subject to a major impact, resulting in no significance of impact.

9.89 In addition, enabling works along the proposed access route to the Site would be necessary. It is possible that the delivery of abnormal indivisible loads (AILs) across the Bridge of Banff over the River Deveron (RSK Site 238) may require temporary downtaking of the parapet wall and lowering the height of the kerb of this Category A Listed Building. The need for any downtakings and kerb-lowering would need to be determined following a dry run of the delivery and following considerations of any alternative methods, such as alternative delivery routes and alternative trailer designs, in consultation with Historic Scotland and the Aberdeenshire Council Roads Department. Should downtakings be required, without mitigation a temporary moderate impact on a receptor of high importance is predicted, resulting in an effect of large significance.

9.90 Although the exact route of the connection from the proposed substation to the local electricity distribution network (described in ES Chapter 3) has not been determined, there are no known, unavoidable archaeological sites identified in this ES that lie

between the substation and the existing 33kV line that runs through the southern part of the Site. Therefore, no further impacts and effects are predicted from the construction of the grid connection.

Assessment of Impact on Setting

9.91 Of the 169 designated heritage receptors within Study Area B, 92 were outwith the ZTV. Descriptions of the settings and assessment of impact on them are provided for all remaining sites within the Gazetteer (Appendix 9.1). A more detailed assessment of impact on a selected number of heritage assets, as necessary, is provided below.

Aberchirder Conservation Area (RSK Site 1) and associated LBs (RSK Sites 2 – 17; 127 – 130; 163; 165 and 167 – 169)

9.92 The conservation area of Aberchirder lies mostly within Study Area A, with the nearest turbine located 2.7km to the northeast, however the northeastern third lies outwith the ZTV. Aberchirder was founded in the 18th century as a planned village, based on a grid pattern around a central square. This historic core of the modern village of Aberchirder comprises the conservation area, which is depicted in Figures 9.1 and 9.2. Subsequent residential development has enveloped the conservation area to the north and south.

9.93 In general, the characters of the conservation area and listed buildings within Aberchirder are inwardly focussed. Long-distance views outward from the conservation area and from the LBs are screened by structures within the village. The setting is therefore defined as the built elements of the village.

9.94 The most sensitive receptor within the village in terms of setting is New Marnoch Church (RSK Site 6; see Plate 15) due to its intended local prominence. This is located outwith the ZTV at ground level, but there may be glimpsed views of turbine tips from the top of the church tower. However, such views are largely screened by later development, and would not detract from the prominence of the church within its setting.

9.95 Therefore, no change is predicted on assets of high importance (listed buildings and the conservation area) within Aberchirder), leading to **no significant impacts**.

Recumbent stone circles (RSK Sites 91, 192, 198, 199 and 204) and stone circles (RSK Sites 89, 94, 195, 196, 202 and 204) within Study Area B

9.96 The archaeological site gazetteer (Appendix 9.1) identifies five recumbent stone circles and seven stone circles within Study Area B, describes their setting and assesses the potential impact of the Development on their settings individually. However, given that recumbent stone circles are a prominent and unique feature of northeast Scotland, explanation of the approach taken to these types of monuments is warranted.

9.97 Recumbent stone circles have a single stone lying on their side, with a pair of flanking standing stones (see an example in Plate 16). The recumbent stone is frequently in the southwestern quadrant of the circle, although various orientations between south-southeast and southwest have been recorded in a recent, comprehensive study[35].

Remains of pyre-burning and a cairn are frequently identified in excavations of the circles' interiors.

9.98 Assessing the setting of recumbent stone circles is problematic and subjective, as a variety of theories has been promoted to explain their form and orientation. Archaeo-astronomical hypotheses have been put forward to explain the orientation of the recumbent stone against lunar, stellar and solar phenomena. The framing or mirroring of hills and terrain through the orientation and arrangement of the recumbent and flanking stones have also been posited, although this was only recognised at Rothiemay (RSK Site 192) within the monuments in Study Area B[36].

9.99 For the purposes of this assessment, the setting of stone circles and recumbent stone circles has been identified as consisting of the vista from the monument in all directions. Key views and sightlines are present between likely contemporary, intervisible monuments, and (in the case of recumbent stone circles) along the centre line azimuths[37] or perpendicular line azimuths[38] over the original position of the recumbent stones.

9.100 In terms of assessing impact on the setting of monuments, interference with views to prominent, intervisible contemporary sites, identified framed or mirrored views, or along key sightlines were considered to impact on the setting of these receptors. Visibility of turbines that did not interrupt or form a backdrop to these views was interpreted as having no impact or a negligible impact on the setting of the receptors. As a result, an impact of slight significance was identified on the setting of the monuments of Bellman's Wood (RSK Site 91) and St. Brandan's Stanes (RSK Site 199).

9.101 According to these criteria, the Development would not interrupt key views or sightlines at any of the stone circles within Study Area B. As a result, **no significant effects** were identified on their settings.

Mitigation

Physical Impacts

9.102 Strategies for archaeological mitigation for potential physical impacts typically consider two options, these are:

- Preservation *in situ*: the preservation without disturbance of sensitive archaeological remains, this can be achieved through engineering solutions (e.g. foundation design) or amendments to the proposed development layout;
- Preservation by record (e.g. excavation): where preservation *in situ* is not feasible or desirable an alternative mitigation is pre-construction archaeological excavation. This consists of a detailed programme of archaeological fieldwork to preserve, by record, the archaeological value of the heritage asset.

9.103 No significant physical effects are predicted from the Development within the Site. Non-significant physical effects on archaeological sites within the Site could be mitigated using the general principles outlined above. Table 9.10 below proposes how such mitigation may be implemented for receptors within the Site.

Table 9.10: Proposed Mitigation of Physical Effects

RSK Site	Site Name	Comments	Mitigation
43	Rotten Moss	Site of a now-destroyed sheepfold, of which no remains are visible. The proposed access road passes along an existing track to the east of the site location.	Unlikely to be affected by the Development but should the proposed access track be microsited so as to impact on the site of the sheepfold, any identified remains could be recorded as part of a watching brief.
44	Smithfield Croft	Site of a rectangular smithy visible during the site visit as an artificial platform and track. The Development access track passes along the existing farmer's track 10m to the southwest of the platform.	Unlikely to be affected by the Development. The extent of the site should be demarcated by temporary fencing in advance of the construction phase of the Development commencing. Should the proposed access track be microsited so as to impact on the site of the smithy, any identified remains should be recorded through survey, excavation and reporting.
46	Smithfield Croft	Remains of a L-shaped croft that visible during the site visit as grassed-over rubble. The crane pad/laydown area for Turbine 2 is located approximately 5m west of the archaeological site.	The extent of the site should be demarcated by temporary fencing in advance of the construction phase of the Development commencing. Should the crane pad/laydown area be microsited so as to impact on the site of the croft, any identified remains should be recorded through survey, excavation and reporting.
47	Newlands Croft	Remains of an L-shaped croft, with upstanding remains still visible.	Preservation *in situ* by ensuring that access track and control building compound are not micro-sited closer to the croft. The extent of the site should be demarcated by temporary fencing in advance of the construction phase of the Development commencing.
64	Newlands Croft	Dyke and ditch identified during site visit forms the western edge of an existing farmer's track.	Record during archaeological watching brief.
68	Gushetbog Croft	Possible former shallow quarry scoop identified during site visit. Turbine 1 and its crane pad/laydown area overlie the possible former quarry.	Record during archaeological watching brief.
87	Black Law	Remains of a former quarry identified as an overgrown circular depression in the west-facing side of Black Law of approximately 12m diameter.	Record during archaeological watching brief.

RSK Site	Site Name	Comments	Mitigation
241	North Cranna	North Cranna is an existing and occupied farmstead. The proposed access road passes through the steading on an existing track.	Preservation *in situ* by ensuring that access track through the steading does not impact on pre-20th century structures. Monitor and record any identified archaeological deposits or features during watching brief on demolition and road-widening activities.
242	Corskie	Recorded location of a former tollbooth. No remains are visible, and the structure was likely demolished during widening of the B9025.	Record during archaeological watching brief.

9.104 Should the dry run for delivery of AILs to the Site and examination of alternative methods of delivery indicate that an impact on Banff Bridge (RSK Site 238) would occur, then Listed Building Consent would be applied for to Aberdeenshire Council and considered on its own merits to undertake a temporary "like for like" taking down and rebuilding of the parapet wall, in consultation with Historic Scotland and the Aberdeenshire Council roads department.

9.105 In terms of addressing the potential for hitherto unidentified archaeological remains being present on the Site, it is proposed that an archaeological watching brief be maintained during topsoil-stripping activities of the construction phase.

9.106 The precise details of any mitigation required for the grid connection would be determined through a separate application process. However, it is envisaged that an archaeological watching brief during ground-breaking activities be maintained during the construction phase of the grid connection, subject to consultation and agreement with Aberdeenshire Council Archaeology Service.

Impacts on setting

9.107 Consideration of the turbine layout has accounted for identified visual impacts on designated heritage assets, with impacts to Aberchirder conservation area (RSK Site 1) and associated LBs (RSK Sites 2 – 17; 127 – 130; 163; 165 and 167 – 169 being of particular importance).

9.108 The design process of the Development is therefore iterative in that impacts are continually predicted and the Development modified accordingly to maximise beneficial impacts and reduce detrimental ones.

9.109 No further mitigation concerning visual effects is proposed.

Residual Effects

9.110 Following implementation of a mitigation programme agreed with Aberdeenshire Council Archaeology Service and Historic Scotland (if an impact to Banff Bridge is predicted), physical archaeological impacts within the footprint of the proposal would be fully neutralised.

9.111 During the operational phase of the Development, slight, non-significant impacts were identified on the setting of two receptors: The White Stone (RSK Site 90), a medieval boundary marker located 5.4km southwest of the Development (see Gazetteer in Appendix 9.1) and Bellman's Wood recumbent stone circle (RSK Site 91; see gazetteer and above). Following decommissioning, these impacts on setting would be fully reversible, leaving no residual effects.

Cumulative Impacts

Physical Impacts

9.112 In terms of physical impacts during construction, the cumulative, incremental physical impacts of other developments would be no greater than that of each individual development on the archaeological resource. Following the implementation of appropriate mitigation in the case of each development, there would be no cumulative impact on the archaeological resource within the Site.

Impacts on Setting

9.113 The assessment of impact on setting in this chapter has concluded no significant impacts on designated cultural heritage receptors located within 10km of the Development.

9.114 Existing wind farms within Study Area B (of which Strath of Brydock is the closest to the Development) are considered to be part of the baseline; cumulative assessment assessed the potential incremental impact of onshore wind farms that are in planning, currently consented, or under construction. Of these, Mains of Auchinderran[39], a three turbine wind farm located approximately 2km to the west of the Development, is the closest consented development. There are also several potential cumulative developments in planning, of which the following lie closest to the Development and have been considered for cumulative impact assessment for cultural heritage receptors:

- Cowie Hill, a one-turbine development 2.8km northeast of the Site[40];
- Culbirnie Park, a one-turbine development 5.3km north-northwest of the Site[41];
- Backhill of Culbirnie, a one-turbine development 5.9km north-northwest of the Site[42];
- Lodge Hill, a three-turbine development 6.1km northwest of the Site[43];
- Newton of Culvie, a one-turbine development 6.1km west of the Site[44]; and
- Little Blairshinnoch, a three-turbine development 6.3km north of the Site.

9.115 The Environmental Report for the Mains of Auchinderran Wind Farm identified impacts of medium significance on the setting of the White Stone (RSK Site 90), Park House (RSK Site 98) and Thorax stone circle (RSK Site 195). A negligible significance of impact is identified for the Category C(S) Listed Building of Mill of Alliehar (RSK Site 161).

9.116 Regarding projects in planning, the Environmental Report for Cowie Hill reports an impact of medium significance on the setting of Hill of Alvah (RSK Site 92). Culbirnie

Park's Environmental Statement and planning documentation were not available at the time of assessment. Backhill of Culbirnie reports impacts of minor significance on the settings of several receptors: Hill of Alvah (RSK Site 92); Stirling Cairn (RSK Site 93) and Inchdrewer Castle (RSK Site 102). Lodge Hill reports a high impact on the setting of St. Brandan's Stanes (RSK Site 199), and Newton of Culvie reports a moderate impact on the setting of Thorax (RSK Site 195).

9.117 As a result of the Development, cumulative impacts are predicted at the White Stone (RSK 90), Hill of Alvah (RSK Site 92), Alliehar Mill (RSK Site 161), Thorax (RSK Site 195) and St. Brandan's Stanes (RSK Site 199).

9.118 In the case of the White Stone (RSK Site 90), a prominent boundary stone located on a hill 5.4km to the southwest of the Development, a cumulative impact of slight significance is predicted. This is based on the increasing numbers of turbines visible within the setting of the monument, when the Development is considered cumulatively with Mains of Auchinderran, located 4.3km to the north of the receptor.

9.119 Hill of Alvah (RSK Site 92) is a SM consisting of two large cairns. The most important element of the receptor's setting consists of its shared setting with Stirling Cairn (RSK Site 93) located 0.7km to the east, but it is also locally prominent. Therefore, views of turbines from the Development (located 5.6km south-southwest), Cowie Hill (located 3.1km south-southwest) and Backhill of Culbirnie (located 3.3km to the west) would amount to a cumulative impact of slight significance on the setting of the receptor.

9.120 For the setting of the Category C(S) LB of Alliehar Mill (RSK Site 161), the potential presence of wind turbines 460m to the north (from the consented Mains of Auchinderran Farm turbines) and 2.6km to the east (from the Development turbines) would result in a slight cumulative significance of impact.

9.121 The setting of the SM stone circle of Thorax (RSK Site 195) consists of the area from which the stone circle is prominent. Views of the Mains of Auchinderran Farm (3.1km to the east), Newton of Culvie (located 0.7km to the southwest) and the Development (3.1km to the east) from the monument introduce changes to the setting of the receptor, and a cumulative impact of slight significance is predicted.

9.122 For St. Brandan's Stanes (RSK Site 199), a scheduled recumbent stone circle, an impact of slight significance is predicted above (see paragraph 9.97 and Appendix 9.1). The Development would be located 6.8km to the south east of the scheduled monument. When the Development is taken into consideration with the proposed Lodge Hill windfarm (where the most prominent wind turbine is located 925m southwest of the receptor), Culbirnie Park turbine, Backhill of Culbirnie turbine, and Little Blairshinnoch turbines (located to the east of the receptor), the incremental cumulative impact caused by multiple developments being located within the setting of the monument results in a negligible cumulative impact on the setting of the receptor. This results in a cumulative impact of slight significance.

9.123 In conclusion no significant cumulative impacts through construction and operation of the Development are predicted.

Chapter 9 References

[1] RSK 2011. Deuchries Wind Farm Scoping Report

[2] *Ibid.*

[3] Historic Scotland 2010 *Managing Change in the Historic Environment: Setting*

[4] Saville, A. 1997. Palaeolithic handaxes in Scotland *Proc Soc Antiq Scot*, 127(1997), 1-16.

[5] Ward, T. 2010. The discovery and excavation of a late Upper Palaeolithic site at Howburn Farm. Biggar Archaeology Group. http://www.biggararchaeology.org.uk; A. Saville, T.B. Ballin & T. Ward 2010. Howburn, Near Biggar, South Lanarkshire: Preliminary Notice of a Scottish Inland Early Holocene Lithic Assemblage *Lithics: The Journal of the Lithic Studies Society* 28: 41 – 49.

[6] Baird, D. and B. Finlayson 1994. A Mesolithic and later flint scatter at Little Gight, Grampian Region. *Proceedings of the Society of Antiquaries of Scotland* 124: 95-101.

[7] Edwards, K. J. and I. Ralston 1984. Postglacial hunter-gatherers and vegetational history in Scotland. *Proceedings of the Society of Antiquaries of Scotland* 114: 15 – 34.

[8] Darvill, T. 1987. *Prehistoric Britain*. B. T. Batsford: London: 48.

[9] Marshall, D.N. 1976-7 Carved Stone Balls. *Proceedings of the Society of Antiquaries of Scotland* 108: 40-72; http://www.aberdeenshire.gov.uk/archaeology/special/balls.asp

[10] Turnock, D. 1995. *The Making of the Scottish Rural Landscape* Aldershot: Scholar Press: 33

[11] Stewart, J. M. and S. E. Durno 1969. Structural Variations in peat. *New Phyto* 68: 167- 82. Cited in Edwards, K. J. and I. Ralston 1984. Postglacial hunter-gatherers and vegetational history in Scotland. *Proceedings of the Society of Antiquaries of Scotland* 114: 15 – 34.

[12] Ritchie, G. and A. Ritchie 1991. *Scotland: Archaeology and Early History*. Edinburgh: Edinburgh University Press: 58f.

[13] Welfare, A. 2011. *Great Crowns of Stone: The Recumbent Stone Circles of Scotland*. RCAHMS: Edinburgh: 31.

[14] Birks, H. J. 1977 The Flandrian forest history of Scotland: a preliminary synthesis. In F. W. Shotton (ed) *British Quaternary Studies: Recent Advances*: 119 – 135. Clarendon: Oxford:

[15] Tipping, R. 1997. Vegetational History of Southern Scotland. *Botanical Journal of Scotland*. 49: 151-162.

[16] Ritchie, G. and A. Ritchie 1991. *Scotland: Archaeology and Early History*. Edinburgh: Edinburgh University Press.

[17] http://www.ambaile.org.uk/en/item/item_maps.jsp?item_id=18248

[18] Morrison, I. A. 1983. Prehistoric Scotland. In G. W. Whittington and I D. Whyte (Eds) *An Historical Geography of Scotland*: 1 – 24. London: Academic Press.

[19] Tacitus 98:368–380, *Life of Agricola*, Ch. 24 - 38.

[20] Morrison, I. A. 1983. Prehistoric Scotland. In G. W. Whittington and I D. Whyte *An Historical Geography of Scotland*: 1 – 24. London: Academic Press.

[21] http://www.aberdeenshire.gov.uk/archaeology/sites/pictish/

[22] Tipping, R. 1997. Vegetational History of Southern Scotland. *Botanical Journal of Scotland*. 49: 151-162.

[23] Small, A. Dark Age Scotland. In G. W. Whittington and I D. Whyte (Eds) *An Historical Geography of Scotland*: 25 – 46. London: Academic Press.

[24] Schofield, J. 1999. Landscapes of the Middle Ages: Towns. In J. Hunter and I. Ralston (eds) *The Archaeology of Britain: An introduction from the Upper Palaeolithic to the Industrial Revolution*: 210 – 227. London: Routledge.

[25] Turnock, D. 1995. *The Making of the Scottish Rural Landscape* Aldershot: Scholar Press: 145

[26] *Ibid*: 167.

[27] Price, R. J. 1983. *Scotland's Environment during the last 30,000 years.* Edinburgh: Scottish Academic Press: 196.

[28] Turnock, D. 1995. *The Making of the Scottish Rural Landscape* Aldershot: Scholar Press.

[29] *Ibid*: 199.

[30] *Ibid*: 209.

[31] Innes, J. 1978. Parish of Marnoch. In D. J. Withrington and I. R. Grant (eds) *The Statistical Account of Scotland: Vol.16, Banffshire, Moray & Nairnshire*

[32] http://www.foggieloan.co.uk/43foundation/foundation.htm

[33] Henry, D. Parish of Marnoch. New Statistical Account of Scotland: http://stat-acc-scot.edina.ac.uk/link/1834-45/Banff/Marnoch/

[34] Mackey, E. C., M. C. Shewry and G. J. Tudor 1998. *Land Cover Change: Scotland from the 1940s to the 1980s.*

[35] Welfare, A 2011. *Great Crowns of Stone: The Recumbent Stone Circles of Scotland*. RCAHMS: Edinburgh: 197ff.

[36] *Ibid*

[37] Definition after Welfare 2011: 196: from the centre of the stone circle ring through the mid-point of the recumbent stone.

[38] Definition after Welfare 2011: 196: perpendicular to the long axis of the recumbent stone.

[39] Planning Reference: Aberdeenshire Council APP/2010/3417.

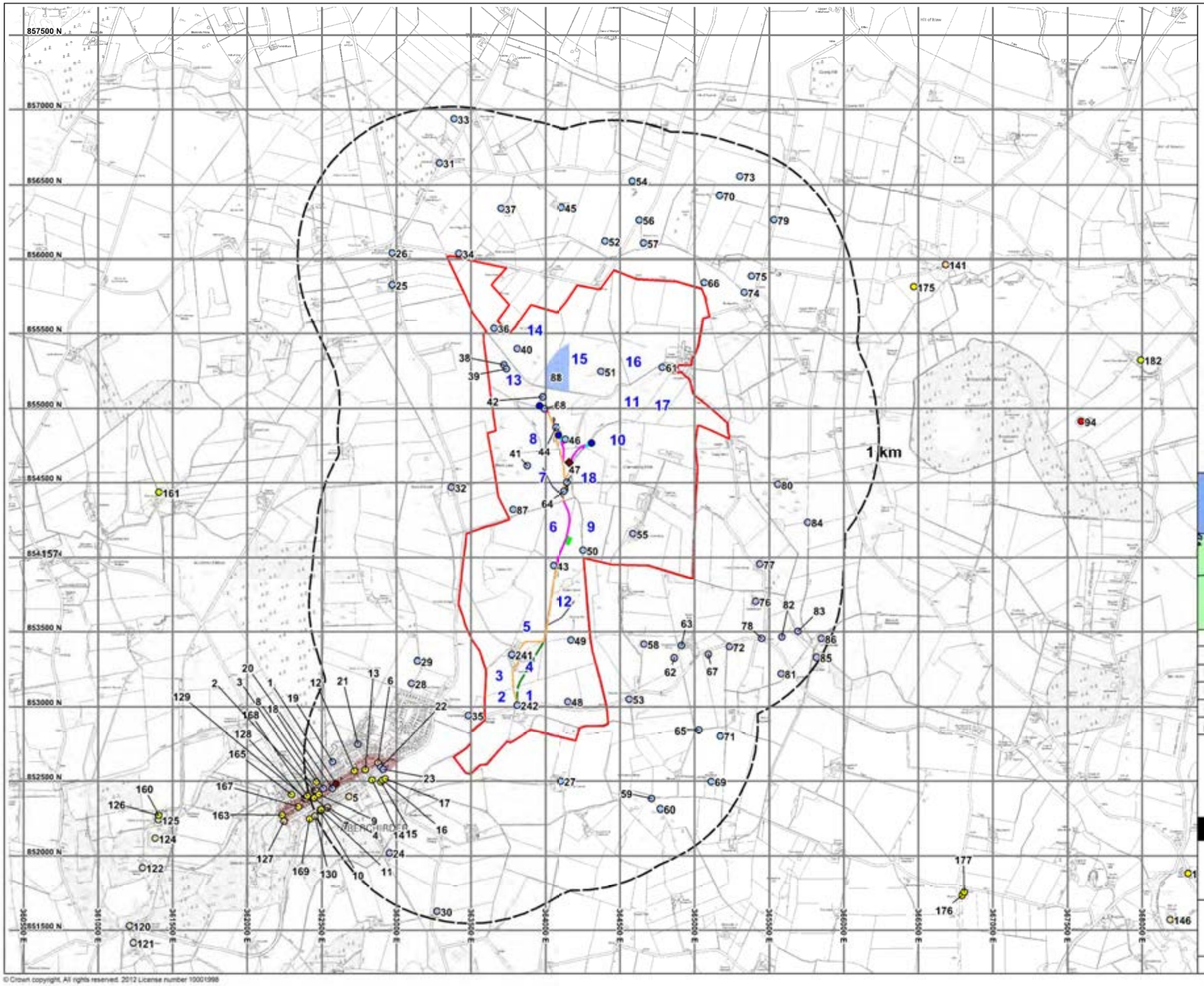
[40] Planning Reference: Aberdeenshire Council APP/2012/0411.

[41] Planning Reference: Aberdeenshire Council APP/2011/0633.

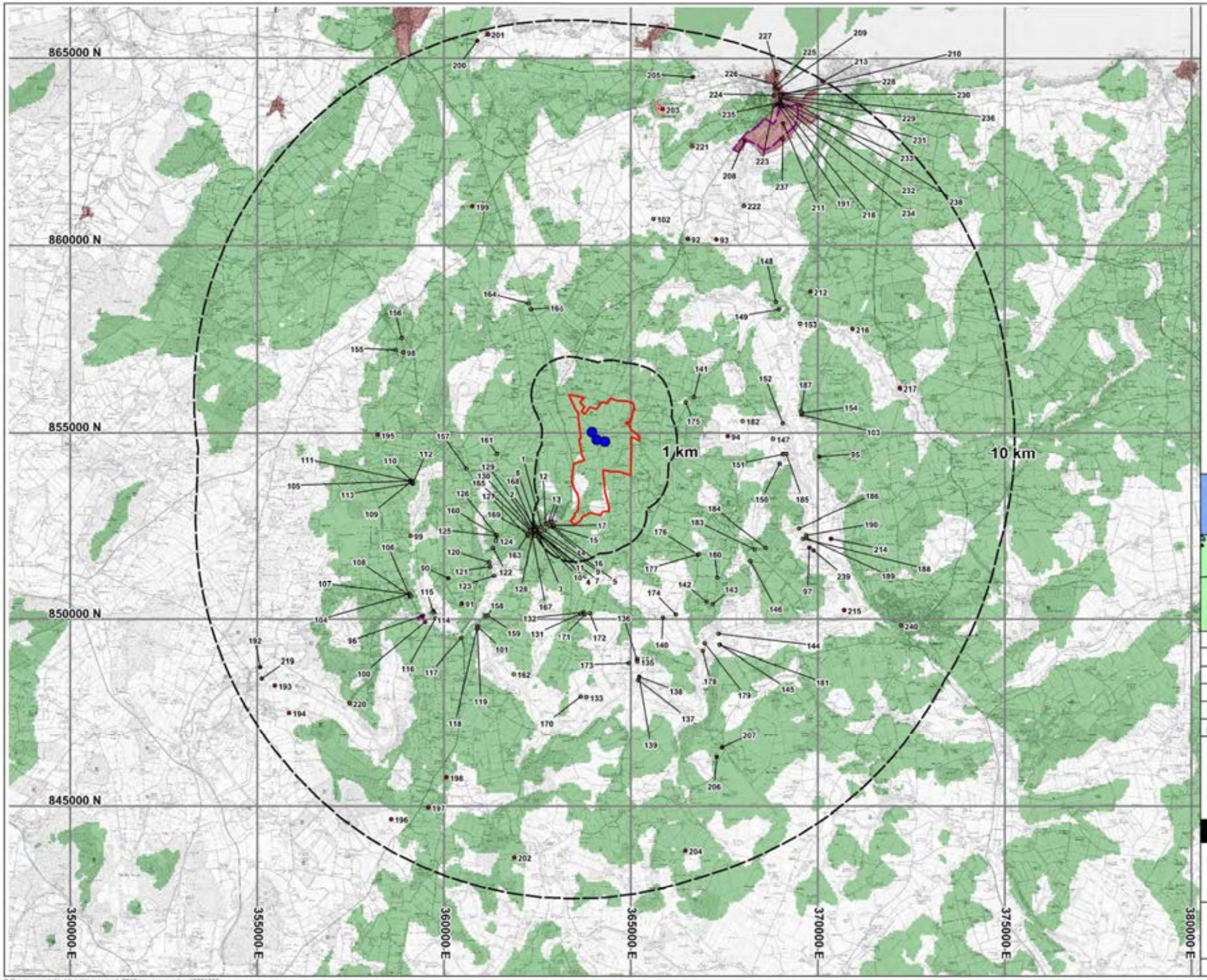
[42] Planning Reference: Aberdeenshire Council APP/2011/0626.

[43] Planning Reference: Aberdeenshire Council APP/2012/1971.

[44] Planning Reference: Aberdeenshire Council APP/2011/3575.



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Proposed Turbine
Site Boundary
1km and 10km distance marker
Scheduled Ancient Monument
Garden and Designed Landscapes
Listed Building Category A
Listed Building Category B
Listed Building Category C
Conservation Areas
Candidate Garden and Designed Landscapes
Zone of Theoretical Visibility

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
30	07.04.11	Site Location	BF	NE	ND

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 9.2: Key visual heritage receptors

SCALE: 1:100,000 @ A3

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\06 GIS\ES 9.1 and 9.2 Wir

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10. NOISE

Introduction

10.1 The Development has the potential to generate noise that might affect local residents. This chapter of the ES assesses the predicted noise emissions from construction, operation, and decommissioning of the Development against relevant standards and guidelines, and the existing background noise climate.

10.2 During construction, noise impacts would be temporary in nature and relate to both moving and static sources, e.g. construction traffic and items of plant. Assessment to British Standard methodology allows these temporary impacts to be understood and for suitable mitigation measures to be identified to minimise any potential adverse effects.

10.3 When operational, wind turbines emit two types of noise: mechanical and aerodynamic. Mechanical noise from a modern wind turbine is negligible as the main sources of this noise are components housed within the nacelle, e.g. the gearbox and generator, and the nacelle is acoustically isolated to prevent structure borne noise. Aerodynamic noise occurs from the movement of the turbine blades passing through the air. At high wind speeds, aerodynamic noise is usually masked by the increasing sound of wind blowing through trees and around buildings. Other, non-wind related sources can also mask turbine noise, e.g. road traffic and flowing water in streams or rivers. The level of masking determines the perceived audibility of the wind farm. The noise impact assessment establishes the relationship between wind turbine noise and other masking noise within the environment and assesses levels against established standards.

Policy and Legislation

10.4 Relevant national and local planning policy is discussed in ES Chapter 4: Planning.

Construction

10.5 Guidance to assess noise from construction is set out in BS 5228-1:2009, "Code of practice for noise and vibration control on construction and open sites".[i] BS 5228-1 contains methodology for predicting noise levels arising from items of mobile plant using haul roads, and details methods of reducing noise emissions from construction sites. The standard contains an updated resource of noise reference data for a wide range of site plant and activities. This data incorporates that published previously by DEFRA[ii].

Operation

10.6 Scottish planning policy advice in respect of noise is provided by Planning Advice Note 1/2011 "Planning and Noise"[iii] (PAN 1/2011). In relation to onshore wind farms, PAN 1/2011 states that an online update[iv] should be followed when assessing noise from onshore wind farms. The update states that:

10.7 "The Report, "The Assessment and Rating of Noise from Wind Farms" (Final Report, Sept 1996, DTI), (ETSU-R-97), describes a framework for the measurement of Wind Farm noise, which should be followed by applicants and consultees, and used by planning authorities to assess and rate noise from wind energy developments, until such time as an update is available. This gives indicative noise levels thought to offer a reasonable degree of protection to Wind Farm neighbours, without placing unreasonable burdens on Wind Farm developers, and suggests appropriate noise conditions", and

"The most conclusive summary of the implications of low frequency Wind Farm noise for planning policy is given by the UK Government's statement regarding the findings of the Salford University report into Aerodynamic Modulation of Wind Turbine Noise. The report concludes that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines."

10.8 Since the publication of ETSU-R-97[v], additional advice has been presented in the Institute of Acoustics Bulletin ('IOA Bulletin')[vi], which clarifies preferred modelling parameters and an updated methodology for predicting windshear during noise monitoring.

10.9 Assumptions used within the assessment have been made with reference to the latest research on comparison between predicted and measured noise from wind farms[vii].

Method of Assessment

Noise Terminology

10.10 The following section provides an overview of the scale and indices used to measure noise, and an explanation of the terminology that is used in the assessment of wind farm noise, specifically tonal noise and wind shear.

10.11 A logarithmic scale, the decibel (dB) scale, is used in noise level measurement, and relates to the fluctuations in air pressure caused by sound waves. The logarithmic scale is used as the ear is able to detect an extremely wide range of pressure changes. Noise is made up of a number of different frequencies of sound waves, and the ear does not 'hear' all frequencies identically, as it has adapted to be more sensitive to the frequencies most used for speech. This response pattern is taken into account during environmental noise studies by using the 'A weighting', which provides a good representation of the performance of the human ear and has been found in many international studies to relate well to human response to noise. The use of the A weighting is notated as dB(A).

10.12 Typical dB(A) noise levels for familiar noises are given in Table 10.1.

Table 10.1: Typical Noise Levels

Noise level at source (dB)	Example
0	Limit of hearing
35	Quiet Bedroom
50	Ordinary Conversation
60	Busy general office
95	Pneumatic drill
140	Threshold of pain
Source: Adapted from Planning Advice Note 1/2011, Scottish Government, March 2011	

10.13 The following indices are used when describing noise:

- L_w is the sound power level and the L_{WA} is the A-weighted sound power level. These are used to quantify the amount of energy emitted by a source as noise;
- L_p is the sound pressure level and used to describe the noise level at an instant in time. If a noise level is not continuous, the sound pressure level can vary significantly over time;
- $L_{eq,\ T}$ is the equivalent continuous sound level over time 'T' and can be considered to be the 'average' noise level. The $L_{Aeq,T}$ is the A-weighted equivalent continuous sound level;
- $L_{A90,\ T}$ index represents the noise level exceeded for 90% of the time-period T and is used to indicate quieter times during the measurement period. It is often used to measure the background noise level and is used within the UK to assess noise from wind turbines. The $L_{A90,\ T}$ is the A-weighted background noise level; and
- L_{Amax} is the A-weighted maximum recorded noise level during the measurement period.

10.14 The ETSU-R-97 guidance includes a specific definition of tones in relation to wind farm noise. Wind turbines typically emit noise over a wide spectrum of frequencies, but the situation can arise when tones are generated. In broad terms, noise generated by a turbine is tonal if a specific pitch of noise is audible over the general wide spectrum noise. Modern turbines are carefully designed to minimise the occurrence of such tones. The assessment point for defining tonality of a wind turbine noise is at the receptor.

10.15 The noise assessment requires consideration of local ground conditions, since noise transmitted will be absorbed or reflected by the ground to a different degree according to surface conditions. The following descriptors are applicable to the assessment:

- Hard Ground – a ground cover which includes paving, water, ice, concrete and all other ground surfaces that are 'good' reflectors of noise;
- Soft Ground – ground cover which includes ground covered by grass, trees or other vegetation, and all other ground surface suitable for the growth of vegetation, such as farming land. These surfaces are 'poor' reflectors of noise; and
- Mixed ground – the surface consists of both hard and soft (porous) ground.

10.16 Noise levels from the same source at the same distance will be less if the intervening ground is soft compared to if the intervening ground is hard. This is because some of the noise will be absorbed by the 'soft' features (e.g. vegetation).

10.17 A final non-acoustic descriptor used in this assessment is wind shear. Wind shear is used to describe the variance of wind speed with height, as normally wind speeds are lower closer to the ground because the air flow near the ground is obstructed by topography, trees and buildings. The wind shear at a location is defined by a coefficient which can be used to convert the wind speed measured at one height to the wind speed at another height.

Scoping Exercise

10.18 The Environmental Impact Assessment (EIA) Scoping Report included a noise section with a methodology for undertaking the baseline noise survey and the subsequent assessment of predicted noise levels at identified sensitive receptors.

10.19 In order to identify receptors requiring further investigation, a noise model was produced with the 35 dB(A) L_{A90} noise contour plotted for the 10m/s wind speed (unless otherwise stated, levels within this chapter refer to the L_{A90} background level index). This identified that there were properties where noise from the wind farm in excess of 35dB(A)$_{LA90}$ might be received. As a result it was decided that background noise measurements should be made. This approach follows the advice in ETSU-R-97.

10.20 The following consultation responses were received in relation to the noise section of the Scoping Report.

Aberdeenshire Council

10.21 The Environmental Heath Officer (EHO) at Aberdeenshire Council was consulted regarding the methodology used to undertake this assessment. Aberdeenshire requested the use of lower fixed limits of 38 dB $L_{A90, 10\ min}$ for night-time, 35 dB $L_{A90, 10\ min}$ for daytime and 40 dB(A) for those residents with financial involvement in the project. This approach is not in accordance with the web-based guidance from the Scottish Ministers to the effect that the rating limits advised in ETSU-R-97 should be used. However, comparisons with these limits have been included within this assessment for information. No other changes were requested to the methodology set out in the scoping report. Parkside of Cranna was identified as an additional receptor after the scoping report was submitted. The EHO officer was present during the installation of sound level meters at Thistle Mill and Parkside of Cranna and confirmed acceptability of the position of the meters at these locations.

10.22 The following aspects of noise and vibration have been scoped out of the assessment as they are not considered to have the potential to cause significant noise and/or vibration for the reasons stated:

- Vibration due to construction works (due to the large distances between areas of construction works and sensitive buildings);
- Vibration due to operation (as wind turbines do not generate significant levels of ground-borne vibration);

- Traffic-related noise changes during operation (traffic generated would be limited to occasional maintenance visits as stated in Chapter 11: Transport and Access); and
- The construction and operation of the substation as its proposed location would be sufficiently screened by local topography and of a distance from the nearest unscreened receptor (1.4km south of Pinefields) that it would not comprise a potential source of noise.

10.23 The following descriptions summarise the assessment approach. Further detail is provided in Appendix 10.1.

Construction Assessment

10.24 The assessment of construction noise has been undertaken with reference to BS 5228-1:2009, "Code of practice for noise and vibration control on construction and open sites". BS 5228 Part 1 does not specify absolute daytime noise limit levels from construction sites, as these are best determined according to local conditions. It does, however, provide two methods of assessment and details the key factors that might affect the acceptability of noise and vibration from construction sites. These factors are:

- Site location;
- Existing ambient noise levels;
- Duration of site operations;
- Hours of work;
- Attitude to site operator; and
- Noise and vibration characteristics of the work.

10.25 In order to calculate changes in traffic noise from the A97 and B9025 as a result of construction activity, the methodology in the Department of Transport technical memorandum "Calculation of Road Traffic Noise" (CRTN)[viii] 1988 has been used. CRTN is widely accepted as the relevant guidance document for the prediction of noise from road vehicles using the public highway. However, CRTN states that the calculation methodology for traffic flows below 50 vehicles per hour is unreliable. As such a different approach is required for the assessment of heavy construction traffic noise along the access route within the Site (the track between Mains of Cranna and North Cranna is predicted to carry a maximum of 15 HGV per day, as set out in ES Chapter 11 Traffic and Transport). The BS 5228 'haul road' methodology has been used to calculate an average traffic noise generated along this route during a day using the worst-case month for traffic flows (15 per day divided by 8 hours working day).

10.26 This method defines an impact as 'significant' (as defined by BS 5228) if the pre-construction ambient noise level plus construction noise exceeds the pre-construction ambient noise by 5 dB or more, subject to defined lower cut-offs of 65, 55 and 45 dB(A) for day, evening and night-time periods.

Operational Assessment

ETSU-R-97

10.27 The assessment within this chapter has followed the methodology within ETSU-R-97 and the most recent advice within the IOA Bulletin Article. The IOA Bulletin Article was prepared by a number of noise consultants who act on behalf of developers, local planning authorities and others. Some of the authors sat on the ETSU Noise Working Group. The document clarifies preferred modelling parameters and provides an updated methodology for predicting wind shear during noise monitoring.

10.28 The ETSU-R-97 assessment methodology takes into account the fact that the noise emissions from wind farms vary with wind speed, as measured at the Site. Background noise levels ($L_{A90,10min}$) are measured at representative sensitive receptor locations. For each 10-minute baseline noise level measurement the simultaneous wind speed and direction are recorded on the Site. A subsequent plot of the background noise level against wind speed allows the trend in noise level with wind speed at the receptor to be determined by fitting a single line to represent the relationship between wind speed and background noise level ('curve fitting' the data).

10.29 ETSU-R-97 states that permissible noise levels (and therefore limits) should relate to a cumulative effect of all wind turbines in the area contributing to noise at receptors. An assessment of the cumulative impact of the Development with the nearest approved wind farm at Mains of Auchinderran Wind Farm is included in this chapter. Review of other operational, consented and proposed wind farms in the area (refer to Figure 8.27) concluded that there is no potential for cumulative noise levels from the proposed Development and other wind farms to result in exceedences of derived limits. Figure 10.1 shows the assessed wind farms in relation to receptor locations.

Identification of Receptors and Noise Monitoring

10.30 The 10m/s wind speed noise contour plot for the Site is presented on Figure 10.2, together with the properties located within (or close to) the area where noise levels are predicted to exceed 35 dB(A).

10.31 In consultation with Aberdeenshire Council, it was determined that five monitoring locations could be used to obtain representative noise data for the receptors identified. The identified receptors are set out in Table 10.2, which also includes the reasons for considering which background monitoring location was representative of the background noise levels at each receptor.

Table 10.2: Noise Receptors and Background Noise Monitoring Locations

Receptor	Background Data Used	Reasoning for use of background data from alternative location
R1 Castlebrae	Castlebrae	Monitoring undertaken at this location.
R2 Pinefields	Pinefields	Monitoring undertaken at this location.
R3 Thistle Mill	Thistle Mill	Monitoring undertaken at this location.
R4 Craigethray	Thistle Mill	Property is located in proximity to Thistle Mill. Both properties have similar noise environments, including trees and stream,

Receptor	Background Data Used	Reasoning for use of background data from alternative location
		and are located on same side of Crannabog Hills.
R5 Upper Crannabog	Gallowhill	Proximity to Gallowhill monitoring location, with distance to noise sources similar. Properties are located on the same side of Gallow Hill. It is possible that the background noise levels would be higher here than at Gallowhill because there are trees surrounding Upper Crannabog.
R6 Gallowhill	Gallowhill	Monitoring undertaken at this location.
R7 Parkside of Cranna	Parkside of Cranna	Monitoring undertaken at this location.

10.32 The baseline noise survey was undertaken from 20th February to 13th March 2012. Photographs of the long-term measurement locations are shown in Appendix 10.2 and calibration certificates for the sound level meters are provided in Appendix 10.3. As required by ETSU-R-97 10-minute L_{A90} noise levels were measured until sufficient noise data at various wind speeds and directions were collected.

10.33 During the course of the monitoring, meteorological data was recorded by a meteorological weather station mast, which measures wind speed and direction at various heights to enable wind shear to be calculated. In addition, the rainfall and temperature data was recorded. Data affected by periods of heavy rainfall was removed for the following periods:

- 22/02/2012 01:00 - 07:00
- 26/02/2012 17:00 - 21:00
- 28/02/2012 12:00 - 18:00

Definition of Turbine Noise Limit

10.34 In order to calculate noise limits, the background noise data for the ETSU-R-97 'daytime amenity' and 'night time' periods were plotted against the wind speed at 10m height.

10.35 Regression analysis of the data was undertaken to derive background noise levels, at successive integer wind speeds, and the data has been used to define noise limits, as recommended in ETSU-R-97 and shown in Table 10.3. ETSU-R-97 defines limits for daytime amenity hours and night-time. The 'daytime amenity' period covers evenings and weekend daytimes and represents those times when the population is most likely to using external areas of their properties e.g. gardens for leisure.

Table 10.3: ETSU-R-97 Noise Limit Criteria

Period	Time of Day (24 hour clock)	Recommended Noise Limit
Night-time	2300 – 0700 hours	43 dB(A) or 5 dB(A) above the prevailing night-time background noise whichever is the greater 45 dB(A) for receptors with financial involvement
Amenity Hours Quiet day	1800 – 2300 hours evenings 1300 – 1800 hours on Saturdays	35-40 dB(A) or 5 dB(A) above the prevailing quiet daytime background noise whichever is the greater

Period	Time of Day (24 hour clock)	Recommended Noise Limit
time	0700 – 1800 hours on Sundays	45 dB(A) for receptors with financial involvement

10.36 Noise limits for the Development have been set based on the criteria set out in Table 10.3. The lowest daytime amenity limit of 35 dB(A) is suggested by the Applicant as appropriate in this case. Upper Crannabog has been identified as a financially involved residence. Noise limits using the criteria preferred by Aberdeenshire have also been defined, for comparison purposes.

10.37 Wind farm noise assessment is part of the overall design process for the wind farm, the aim of which is to achieve a design from which noise emissions meet limits derived following the approach given in ETSU-R-97 *The Assessment and Rating of Noise from Wind Farms*. The overall design of the wind farm, and in particular the layout of the turbines, is chosen to ensure that necessary operational noise limits are met and no mitigation measures are necessary.

Operational Noise Modelling

10.38 In line with the IOA bulletin article, the turbine noise models within this assessment use the algorithm set out within ISO 9613-2 *Acoustics* - Attenuation *of sound during propagation outdoors.* This algorithm was found to be the most robust prediction method of wind turbine noise by a Joint European Commission research project into wind farm noise over large distances. The research found that the ISO 9613-2 algorithm would be likely to over-estimate noise levels at nearby dwellings, but the results it produced are good representations of noise levels at a dwelling when the wind direction is blowing from the turbine towards the dwelling. In conditions when the wind is blowing from the dwelling towards the turbine, the noise level predicted by the ISO 9613-2 algorithm is as much as 10-15 dB(A) above the actual noise level. These recommendations are consistent with recent research undertaken on the subject[ix,x].

10.39 The models take in to account the following parameters

- Geometric divergence (attenuation with distance);
- Air absorption;
- Barriers (including buildings or topography);
- Screening (including vegetation); and
- Ground absorption and reflection. The ground between the turbines and the receptors largely consists of low vegetation a 'mixed ground' absorption factor ('G'=0.5) has been used within the calculations.

10.40 The turbine sound power levels used in the assessment are discussed later in this section and are detailed in Table 10.10.

Baseline Environment

Noise Environment at Monitoring Locations

Castlebrae, 363387 854474
RION NL32 – Serial Number: 01013661

10.41 At the time of the initial visit (installing noise monitoring equipment), a light breeze was resulting in leaf rustle and subsequently an elevated background noise at the rear of the property. Therefore, the noise monitoring equipment was installed in the front garden (in the direction of the proposed development), sheltered from the leaf noise and the predominant wind direction. Other noise sources at this location include low volumes of traffic on the A97.

Pinefields, 364017 855902
RION NL32 – Serial Number: 00682732

10.42 At the time of the initial visit, sources of noise were identified as limited vehicular movement on the unnamed access road. Other noise sources expected but not identified during the installation of equipment would be agricultural noise and leaf rustle.

Thistle Mill, 363931 855244
RION NL32 – Serial Number: 00482656

10.43 At the time of the initial visit, sources of noise were identified as the stream flowing between Lower Deuchries and Thistle Mill, approximately 50 metres to the north of the measurement location. Further to this, the works being carried out to the property included the use of a sheet to cover areas of work from the weather. This sheet was creating noise in the wind. The measurement location was chosen as the furthest practical point away from the stream and the sheet, whilst still representing the noise environment at residents. Other noise sources in the area included leaf rustle from a line of trees bordering the stream, occasional traffic on the unnamed access road and a water spring opposite Kebholes (not audible at the measurement location).

Parkside of Cranna, 364746 854425
RION NL32 – Serial Number: 00103138

10.44 At the time of the initial visit, sources of noise were identified as leaf rustle in the adjacent tree line. Other noise sources expected but not identified during the installation of equipment would be agricultural noise and occasional vehicle movement on the unnamed access road. The measurement equipment was located to the east of the property as far as possible from sources of noise such as a tree line, and fence which may move in the wind.

Gallowhill, 364562 853783

RION NL32 – Serial Number: 00503253

10.45 The measurement at Gallowhill began on the 22nd February due to access requirements. At the time of the initial visit, sources of noise were identified as agricultural noise in adjacent fields and occasional vehicular movement on the B9025. Other noise sources expected but not identified during the installation of equipment would be agricultural noise and nearby leaf rustle. The measurement equipment was

located at the fence line of the field fronting the property in the direction of the Development.

Derivation of Noise Limits

10.46 Noise data from the most appropriate monitoring location has been used to derive regression curves for the background, L_{A90} noise level at each sensitive receptor. The curves for each monitoring location are presented in Appendix 10.4. The derived limits at each windspeed at each receptor are presented in Tables 10.4 and 10.5. Limits derived using the Aberdeenshire preferred criteria are shown in brackets for comparison purposes, but it should be noted that the assessment uses limits derived using the ETSU-R97 methodology as per Scottish Government Guidance.

Table 10.4: Derived Daytime Noise Limits (dB L_{A90})

Wind Speed (m/s)	Receptor							
	1 Castlebrae	2 Little Deuchries	3 Pinefields	4 Thistle Mill	5 Craigathray	6 Upper Crannabog	7 Gallowhill	8 Parkside of Cranna
4	35	35	35	40	40	45 (40)	35	35
5	35	35	35	40	40	45 (40)	35	35
6	35	35	35	40	40	45 (40)	35	35
7	35	35	35	41	41	45 (40)	35	35
8	36	35	35	42	42	45 (40)	35	37
9	38	35	35	43	43	45 (40)	35	40
10	40	36	36	44	44	45 (43)	37	42
11	42	39	39	46	46	46	39	46
12	44	42	42	47	47	50	42	50

Table 10.5: Derived Night-time Noise Limits (dB L_{A90})

Wind Speed (m/s)	Receptor							
	1 Castlebrae	2 Little Deuchries	3 Pinefields	4 Thistle Mill	5 Craigathray	6 Upper Crannabog	7 Gallowhill	8 Parkside of Cranna
4	43 (38)	43 (38)	43 (38)	43 (39)	43 (39)	45 (40)	43 (38)	43 (38)
5	43 (38)	43 (38)	43 (38)	43 (39)	43 (39)	45 (40)	43 (38)	43 (38)
6	43 (38)	43 (38)	43 (38)	43 (39)	43 (39)	45 (40)	43 (38)	43 (38)
7	43 (38)	43 (38)	43 (38)	43 (40)	43 (40)	45 (40)	43 (38)	43 (38)
8	43 (38)	43 (38)	43 (38)	43 (41)	43 (41)	45 (40)	43 (38)	43 (38)
9	43 (38)	43 (38)	43 (38)	43 (42)	43 (42)	45 (40)	43 (38)	43 (38)

10	43 (38)	43 (38)	43 (38)	43	43	45 (40)	43 (38)	43 (39)
11	43 (38)	43 (38)	43 (38)	45	45	45 (43)	43 (38)	43 (43)
12	43 (42)	43 (40)	43 (40)	47	47	47	43 (40)	47

Project Characteristics

10.47 The characteristics of the Development, which includes the 'embedded mitigation' is described in ES Chapter 3: Project Description. Further noise specific detail on the 'embedded mitigation' to be included during the construction and operational phases of the Development is provided in the following sub-sections.

Construction

10.48 It is anticipated that the construction of the Development would involve several stages. These are as follows:

- Preparation of site and access routes to turbine locations including construction of new sections of access track;
- Excavations for borrow pits (including crushing of stone), turbine and permanent met mast foundations and crane pads;
- Construction of foundations and crane pads;
- Dewatering of foundation areas;
- Assembly of turbines; and
- Cable trenches and installation of cables to the substation building.

10.49 Piling would not be required for the Development as the turbines would be supported on concrete foundations directly on bedrock.

Embedded Mitigation during Construction

10.50 The construction work is expected to be generally undertaken during daytime hours i.e. 07:00 – 19:00 (as stated in Chapter 3 Project Description), although there may be specific activities that require continuous 24-hour operation of plant, such as de-watering of excavations. Where absolutely necessary, any 'out of hours' working would be planned and agreed in consultation with the local Aberdeenshire Council EHO.

10.51 The mitigation measures below would be included in a Construction Project Environmental Management Plan (CEMP) adopted by the project to control noise impacts. The CEMP would be implemented during the works and take account of the following:

- The proper use of such plant with respect to minimising noise emissions;
- The proper maintenance of plant, including plant housings and silencers;
- The selection of inherently quiet plant, and use of enclosures and screens around noisy fixed plant;
- The use of plant with super-silenced exhausts, where possible;

- The use of site hoardings, where appropriate to provide up to 10 dB of acoustic protection via screening effects, provided they are of suitable construction and properly installed;
- Where possible, placing noisy plant as far as possible from sensitive receptors;
- Informing local residents and the Aberdeenshire Environmental Protection Department when particularly noisy or potentially disturbing operations are planned;
- Appointing an Environmental Liaison Officer to deal with noise and other environmental matters; and
- Preferred working hours to be agreed with Aberdeenshire Council.

10.52 It is planned to excavate material from Borrow Pits within the site boundary. Due to the geology of the area, blasting would be required to excavate the pits. There is potential for blasting to cause short term disturbance to local residents, but this would be mitigated through the use of blasting noise and vibration management plan, to be agreed with Aberdeenshire Council. The plan is likely to include limits on noise, vibration and air overpressure, and is also likely to include a scheme to publicise dates and times of blasts to minimise concern or alarm amongst local residents.

Embedded Mitigation during Operation

10.53 Turbine noise was considered throughout the turbine layout design process, together with other environmental constraints (as described in ES Chapter 2: Alternatives and Design Evolution). The project team considered several turbine layout options and certain iterations (relating to both the locations and numbers of turbines) were rejected due to preliminary noise modelling indicating that the ETSU-R-97 limits might be exceeded at sensitive receptors.

Predicted Impacts

Construction Impacts

General Construction works

10.54 The construction work would be phased with one of each operation undertaken at any one time, i.e. all three turbine locations could be under construction, but at different phases (assuming cable route trenching is undertaken whilst upgrading and constructing the access tracks). An analysis of the potential plant used and associated noise levels is presented in Appendix 10.1.

10.55 For representative ambient noise levels (in low wind conditions) the following assumptions have been used. Day-time L_{Aeq} noise levels vary depending on location, however a day-time level of 50 dB(A) is generally representative with levels typically varying between 45 and 60 dB(A). It is assumed that night-time works would not be undertaken, with the exception of de-watering equipment which would need to run overnight. An ambient noise level of 30 dB(A) has been assumed for the purposes of the construction noise assessment.

10.56 Table 10.6 gives the levels predicted for a range of distances based on the data presented in Appendix 10.1. For individual construction phases, both daytime and night-time noise levels are predicted to meet the BS5228 criteria.

Table 10.6: Noise Levels Predicted at Representative Distances

Construction Operation	Operation Emission Level at 10 m L_{Aeq} dB(A)	Ambient Background Level L_{Aeq} dB(A)	Increase of Combined Construction and Ambient Noise over Ambient L_{Aeq} dB(A) (Without Mitigation)			
			Distance to Receptor m			
			100	200	500	1000
Site Access	84	50 (day-time)	14	8	3	1
Foundation excavation	78	50 (day-time)	8	4	1	1
De-Watering	71	50 (day-time)	4	1	1	1
		30 (night-time)	21	15	8	4
Concreting foundation	79	50 (day-time)	9	5	1	1
Turbine Assembly	81	50 (day-time)	12	6	2	1

10.57 The combined noise levels from the Site construction phases have been predicted at the unscreened receptor nearest to the largest number of turbines (Thistle Mill), assuming one of each of the three loudest turbine construction phases is underway at turbine locations nearest noise sensitive receptors.

10.58 For each turbine distance, a worst case scenario has been considered, i.e. the phase with highest noise levels predicted at the nearest turbine location, the phase with the second highest noise levels predicted at the second nearest turbine. The results of this assessment are presented in Table 10.7.

Table 10.7: Combined General Construction Phase Noise Predictions at Thistle Mill

Turbine ID	Phase	Operation Emission Level at 10 m L_{Aeq} dB(A)	Distance (m)	Sound Level dB(A) at Receptor
1	Concreting Foundation	79	1000	39
2	Turbine Assembly	81	940	42
3	Site Access	84	780	46
Combined Sound Level and Ambient dB(A)				48

10.59 The results show that at the receptor that would be considered to be most affected by potential construction noise, the combined noise from a worst case scenario, would not

exceed the 65 dB(A) LAeq threshold level. This falls below the threshold for 'significant effect' as defined by BS 5228.

10.60 Data from the traffic assessment has been used to calculate the number of additional vehicle journeys during the construction phase and CRTN used to calculate the increase in $L_{A10,1hour}$ due to the increase in traffic. The calculations are based on a worst-case hour during the peak of the construction generated traffic (i.e. within months 5 and 6 of the construction programme). A summary of the assessment is presented in Table 10.8.

Table 10.8: Traffic Assessment Results

Information	Baseline (A97)	2013 With Construction
Total vehicles (per day)	1549	1599
HGV %	10	11
Speed (kph)	50	50
Predicted $L_{A10, 18 hour}$	61.2	61.6

10.61 During the worst case construction period, the increase in noise levels on the A97 due to construction traffic (both cars and HGVs) would be significantly less than 1 dB(A). This would not be noticeable and is therefore not significant. Whilst the difference between 'With Construction' and Baseline would be anticipated to be higher on the B9025, given the predicted construction traffic volumes as set out in ES Chapter 11 it is considered unlikely that there would be a daily increase of more than 25% of the existing traffic levels on this road and therefore the increase in noise levels would be considered negligible.

Access track from B9025

10.62 To facilitate construction of the Development, it is proposed to upgrade the road that extends from the B9025 to North Cranna and to extend this via an existing track to the location of the proposed wind turbines. Construction vehicles using this track following its completion may affect the properties at North Cranna (and the adjacent Mooroonbin). The alternative access track which runs further to the east of these properties would result in lower noise levels at the properties as vehicles route further away than if using the existing road.

10.63 Table 10.9 shows the calculation for noise from heavy construction traffic using the existing access track through North Cranna (not the alternative track which would result in lower noise levels). The 'CRTN' methodology is not suitable for use on this stretch of road because of the low traffic volume, so the BS 5228 'Haul Routes' methodology has been used as an alternative.

Table 10.9: Construction Traffic Assessment along Access Track within the Site

LwA (dB)	Calculations				L_{Aeq} with façade reflection
	-33 (dB)	+10logQ	-10LogV	-10logd	
111	78	81	68	61	64

10.64 The results show that the predicted hourly noise level from the traffic on the access track would be within the daytime minimum criteria of 65 dB(A) LA_{eq} and as such, significant disturbance would be unlikely.

Operational Impacts

10.65 This section presents the input to the ISO 9613 prediction noise model, the resulting output and the subsequent assessment of operational noise from the Development in accordance with the provisions of ETSU-R-97.

Turbine Locations and Acoustical Data

10.66 The proposed locations of the three turbines are shown on Figure 3.1. The candidate turbine used for this assessment is the Enercon E70, the warranted sound power data for which has been provided by Enercon[xi]. Excerpts of the summary table from the turbine acoustic report are presented in Table 10.10.

10.67 The measurement uncertainty is included within the noise levels provided by Enercon. In order to convert the sound power levels to L_{A90} sound power levels a 2 dB(A) correction has been subtracted from the predicted noise levels.

Table 10.10: Enercon Acoustic Data for the E70 Turbine (65 m 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	81.9	89.6	94.6	93.5	88.7	83.9	79.0	75.8	98.6
7	84.4	91.7	96.2	95.9	91.3	86.3	82.4	79.5	100.7
8	86.9	95.1	98.1	97.0	94.6	90.8	83.9	77.4	102.9
9	86.8	95.7	99.9	99.7	95.2	90.4	86.2	82.7	104.5
10	89.2	97.8	100.3	98.9	97.4	94.1	87.6	79.6	105.3

10.68 The Enercon data states that the tonal audibility parameter is less than 2 dB for all operational wind speeds. As such, no tonal penalty is to be added to the predicted Development noise level to obtain the rating level.

10.69 This octave band noise data has been used to generate the noise model of the Development, treating each turbine as a point source at a height of equal to the relevant hub height above the ground.

Predicted Wind Turbine Noise Emission

10.70 Predicted noise levels from the turbines at each receptor location were plotted with the derived noise limits during the daytime amenity and night-time periods over the range of wind speeds. Noise levels for all residences predicted to be within the 35 dB(A) noise contour (i.e. noise levels over 35 dB(A)) are presented in Tables 10.11 and 10.12, and graphically in Appendix 10.5.

Table 10.11: Noise Assessment - Daytime

Wind Speed (m/s)	6	7	8	9	10
1 Castlebrae					
Background noise curve	27	29	31	33	35
ETSU-R-97 derived noise limit	35	35	36	38	40
Predicted turbine noise	29	32	34	35	36
Margin under noise limit	-6	-4	-2	-2	-4
2 Little Deuchries					
Background noise curve	23	25	27	29	31
ETSU-R-97 derived noise limit	35	35	35	35	36
Predicted turbine noise	28	30	32	33	34
Margin under noise limit	-7	-5	-3	-2	-2
3 Pinefields					
Background noise curve	23	25	27	29	31
ETSU-R-97 derived noise limit	35	35	35	35	36
Predicted turbine noise	29	31	33	35	36
Margin under noise limit	-6	-4	-2	0	-1
4 Thistle Mill					
Background noise curve	35	36	37	38	39
ETSU-R-97 derived noise limit	40	41	42	43	44
Predicted turbine noise	31	33	35	37	37
Margin under noise limit	-10	-8	-7	-7	-7
5 Craigethray					
Background noise curve	35	36	37	38	39
ETSU-R-97 derived noise limit	40	41	42	43	44
Predicted turbine noise	27	29	31	33	33
Margin under noise limit	-14	-12	-11	-10	-11
6 Upper Crannabog					
Background noise curve	27	29	32	35	38
ETSU-R-97 derived noise limit	45	45	45	45	45
Predicted turbine noise	30	32	34	36	37
Margin under noise limit	-15	-13	-11	-9	-8

Wind Speed (m/s)	6	7	8	9	10
7 Gallowhill					
Background noise curve	25	27	28	30	32
ETSU-R-97 derived noise limit	35	35	35	35	37
Predicted turbine noise	26	28	31	32	33
Margin under noise limit	-9	-7	-5	-3	-4
8. Parkside of Cranna					
Background noise curve	27	29	32	35	38
ETSU-R-97 derived noise limit	35	35	37	40	43
Predicted turbine noise	32	34	36	38	38
Margin under noise limit	-3	-1	-1	-2	-5

[#]Negative values indicate turbine noise lies below noise limit

Table 10.12: Noise Assessment – Night-time

Wind Speed (m/s)	6	7	8	9	10
1 Castlebrae					
Background noise curve	22	24	26	28	31
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	29	32	34	35	36
Margin under noise limit	-14	-12	-9	-8	-7
2 Little Deuchries					
Background noise curve	20	22	24	26	29
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	28	30	32	33	34
Margin under noise limit	-15	-13	-11	-10	-9
3 Pinefields					
Background noise curve	20	22	24	26	29
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	29	31	33	35	36
Margin under noise limit	-14	-12	-10	-8	-7
4 Thistle Mill					
Background noise curve	34	35	36	37	38
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	31	33	35	37	37
Margin under noise limit	-12	-10	-8	-7	-6
5 Craigethray					
Background noise curve	34	35	36	37	38
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	27	29	31	33	33

Wind Speed (m/s)	6	7	8	9	10
Margin under noise limit	-16	-14	-12	-10	-10
6 Upper Crannabog					
Background noise curve	22	25	28	31	34
ETSU-R-97 derived noise limit	45	45	45	45	45
Predicted turbine noise	30	32	34	36	37
Margin under noise limit	-15	-13	-11	-9	-8
7 Gallowhill					
Background noise curve	20	22	24	27	29
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	26	28	31	32	33
Margin under noise limit	-17	-15	-13	-11	-10
8. Parkside of Cranna					
Background noise curve	22	25	28	31	34
ETSU-R-97 derived noise limit	43	43	43	43	43
Predicted turbine noise	32	34	36	38	38
Margin under noise limit	-11	-9	-7	-6	-5

[#]Negative values indicate turbine noise lies below noise limit

10.71 The results show that predicted turbine noise levels would be at or below the ETSU and derived limits at all receptors. The turbine noise levels would also fall under limits derived using the Aberdeenshire preferred method at all wind speeds in both day and night time.

Decommissioning Impacts

10.72 The potential impacts of the decommissioning works would be considerably less than the construction works on account of requiring similar equipment and plant, but not requiring the construction of access routes, excavation of stone or construction of foundations (with associated concrete deliveries). As stated in Chapter 3: Project Description it is assumed that the turbine concrete foundation structures would not be removed, as the extraction of large, deep foundations would be a significant undertaking, involving excavation and potentially cutting or mechanical disintegration of concrete.

10.73 Construction traffic figures for the decommissioning phase would also be lower than for the construction phase. Therefore, impacts during construction are unlikely to be significant.

Mitigation

Construction Phase

10.74 Construction mitigation has been embedded as described in Chapter 3: Project Description. No further mitigation would be required.

Operational Phase

10.75 Operational mitigation, in terms of careful siting of the turbines to avoid exceeding noise limits, has been embedded within the Development design. No further mitigation would be required.

Decommissioning Phase

10.76 Mitigation of noise from decommissioning works would be dependent on the extent to which the Site is to be decommissioned and restored. Mitigation methods are considered to be similar to those required for the construction phase, i.e. the application and use of best practical means and best available techniques, along with control of working hours.

Residual Impacts

10.77 As embedded mitigation results in the predicted impacts for all phases of the Development being within acceptable limits, impacts remain unchanged.

Cumulative Impacts

Impacts in Combination with Other Wind Farms

10.78 The review of existing, consented wind farms and those in planning has identified the Mains of Auchinderran Wind Farm as the only development nearby that might result in cumulative impacts with the Development.

Construction

10.79 The Mains of Auchinderran Wind Farm is consented and therefore it is unlikely that construction works would coincide with the Development. However, should some aspects of the construction of both sites overlap, the cumulative construction noise effect would be negligible. Receptors from which the construction works at Deuchries might be audible are screened from the Auchinderran turbine sites by intervening topography.

Operation

10.80 The cumulative noise impacts from the Auchinderran Wind Farm has been predicted and assessed against ETSU-R-97 criteria. Data from the noise assessment contained in the Environmental Report for the Auchinderran Wind Farm[xii] has been used to generate cumulative impact noise models within CadnaA for the 8 m/s wind speed

scenario. The data taken from the Environmental Report, and summarised in Appendix 10.1, includes the following:

- Turbine locations;
- Turbine hub height; and
- Turbine noise emission data for different wind speeds.

10.81 Noise levels from the Mains of Auchinderran wind turbines are predicted to be at least 10 dB less than wind turbine noise from the Deuchries site at identified receptors. Likewise, noise levels from the Deuchries wind turbines are predicted to be at least 10 dB less than wind turbine noise from the Mains of Auchinderran site at the receptors assessed for that site. In addition the receptors in between the two wind farms could not be downwind of both wind farms at the same time. No exceedences of ETSU drived limits are therefore predicted from the two wind farms operating in combination. The details of the assessment are provided in Appendix 10.1.

Decommissioning

10.82 It is considered highly unlikely that the Mains of Auchinderran Wind farm and Deuchries Wind Farm would be decommissioned at the same time. However, as per the construction assessment, there would be no potential for BS5228 limits to be exceeded from the cumulative decommissioning noise impacts of the two wind farms if this was to occur simultaneously.

Chapter 10 References

[i] BS 5228-1:2009: Code of practice for noise and vibration control on construction and open sites

[ii] Update of Noise Database For Prediction of Noise on Construction and Open Sites, DEFRA, 2005

[iii] http://www.scotland.gov.uk/Resource/Doc/343210/0114180.pdf

[iv] http://www.scotland.gov.uk/Resource/Doc/212607/0120077.pdf

[v] ETSU-R-97: The Assessment and Rating of Noise from Wind Farms, The Working Group on noise from Wind Turbines, 1996.

[vi] Prediction and assessment of wind turbine noise" Acoustics Bulletin March/April 2009 pp 35 -37

[vii] "Comparison of predicted and measured wind farm noise levels and implications for assessments of new wind farms". Evans T and Cooper J, Acoustics Australia Volume 40, Number 1 pp 28-36

[viii] Department of Transport, Calculation of Road Traffic Noise, 1988

[ix] Wind Farm Noise Predictions and Comparison with Measurements, A. Bullmore, J. Adcock, M. Jiggins, M. Cand. Proc. Wind Turbine Noise 2009 Conference, Aalborg Denmark, June 2009.

[x] T. Evans and J, Cooper, Comparison of predicted and measured wind farm noise levels and implications for assessments of new wind farms, Proceedings of ACOUSTICS 2011, 2-4 November 2011, Gold Coast, Australia.

[xi] Wind-consult GmbH, Document No.: SIAS-04-SPL E-70 E4 OM II 2_3MW Rev1_0-eng-eng.doc, Dated 01/09/2010

[xii] Auchinderran Farm Ltd, Auchinderran Farm Wind Cluster Environmental Report, Green Cat Renewables, October 2010



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Proposed Turbine
Site Boundary
Noise Receptor
> 35.0 dB
> 43.0 dB

Little Deuchries
Pinefields
Thistle Mill
Craigathray
Parkside of Cranna
Upper Crannabog
Gallowhill
Castlebrae
1
2
3

Elgin

Rev	Date	Description	Drn	Chk	App
00	25.07.12	Noise	BF	NE	PB

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 10.2 - Wind Farm Noise Contours
Wind Speed - 10mls

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11 TRAFFIC AND TRANSPORT

Introduction

11.1 This Chapter assesses the likely traffic and transport effects associated with the construction of the Development, which would be located adjacent to the A97 approximately 13km south of Banff. The local transport network is shown in Figure 11.1. The Chapter includes an assessment of traffic volumes generated by site activities and considers the consequences of changes to traffic volumes on the surrounding road network.

11.2 The chapter is supported by an access study prepared by Grontmij, which is included in the ES as Technical Appendix 11.1.

Policy Context

11.3 Relevant national and local planning policy is discussed in ES Chapter 4: Planning. Planning Advice Note PAN 75 – Planning for Transport[1], advises that all planning applications involving generation of person trips should include information covering the transport implications of the development. The level of detail that the application provides should be appropriate for the complexity and magnitude of the likely impacts of the development.

11.4 PAN 75 includes discussion of travel plans, to encourage sustainable travel once the development is operational. It is not anticipated that a travel plan would be required for the Development, given the low numbers of operational vehicle movements generally associated with this type and scale of development (as described later in this chapter).

11.5 The Aberdeenshire Council Local Transport Strategy (2012)[2] sets objectives for transportation in the area. These objectives include improving transport safety and increasing the uptake of sustainable transport. These objectives are aligned with those in the NESTRANS Regional Transport Strategy for 2021 (published 2008)[3].

Method of Assessment

Guidance

11.6 The assessment has been undertaken with reference to the Institute of Environmental Assessment's (IEA) 'Guidelines for Environmental Assessment of Road Traffic'[4].

Scope of Assessment

11.7 The project description on which the assessment is based is contained in Chapter 3: Project Description, with further detail in the Project Characteristics section below.

11.8 Typically, for a wind farm development, the number of daily vehicle movements during the construction phase is significantly higher than during the operational phase. (Only a small number of vehicle movements would be associated with the operational phase of the Development, to undertake turbine maintenance and repair works). As a result, the assessment focuses on the construction and decommissioning phases.

11.9 The wind farm would require connection to the local electricity distribution network. This grid connection would be installed under a separate contract by the Distribution Network Operator (DNO), which in this area is SSE Power Distribution, and would be subject to the DNO obtaining the necessary consent. Current studies show capacity within the 33kV transmission line between Turriff and Aberchirder. For the purposes of the planning application and EIA it is assumed that an underground cable would be installed from the windfarm and a T-connection would be made into the transmission line between Turriff and Aberchirder, at a point approximately 2km to the south of the proposed turbine area, in proximity to the southern boundary of the Site. A relatively small number of vehicles would be required to deliver the construction plant, cables and sand required for these works and therefore even if the cables were laid during the construction works for the Development, the magnitude of construction impacts as identified in the following impact assessment would be highly likely to remain unchanged.

11.10 The impact of the Development on the A96 trunk road (A96(T)) approximately 20km to the south, has not been included in the assessment. Traffic generated through the construction of the Development is considered unlikely to be noticeable on the trunk road due to the relatively high levels of existing traffic. In this assessment, no specific allowance has been made for base network traffic growth, which is assumed to be insignificant

11.11 The rural nature of the Site means that access by bus, rail and bicycle are not considered feasible options for the transport of staff and/or goods and these transport modes are not considered further in this assessment.

11.12 Potential noise impacts associated with construction traffic are considered in Chapter 10: Noise.

Sources of Information

11.13 This assessment has been informed by site visits; a desk-based study of the surrounding road network; an access study for the Site; and estimates of construction traffic based on Grontmij's experience of previous similar projects. Consultations were carried out during the EIA scoping process and thereafter to gain further information following the scoping response.

11.14 Baseline road traffic data was obtained for the A97 and A98 from Aberdeenshire Council, for the period of 7th to 13th May 2012. No traffic data is available for the B9025 road. Accident data was also received from Aberdeenshire Council and Moray Council. This includes data for four years from 2007 to 2010 for the A97 and B9025.

Consultations

11.15 Transport and access related scoping responses and meeting outcomes are detailed below in Table 11.1.

Table 11.1: Transport Related Scoping Responses

Organisation	Key Comments from Scoping Response
Transport Scotland	The proposed development is not likely to have a significant impact on the operation of the trunk road network.
Scottish National Heritage	Recommended the assessment covered access to the site and delivery of turbines and other components. Information on site decommissioning was also requested.
Aberdeenshire Council	Requested that road safety issues should be addressed along with the impact on the local road network during and after construction work

11.16 Following scoping, further discussions have taken place with Aberdeenshire Council regarding traffic and transport issues relating to deliveries and access to the proposed wind farm. The Council confirmed that there are, at present, no restrictions on vehicle weights or dimensions which may constrain abnormal loads. The exception is Banff Bridge which, due to the combination of the curve and the bridge parapet, may require some modification to accommodate the anticipated abnormal loads. However, detailed proposals would be required once a turbine and haulier are selected. The Council has a preference to prevent disruption in Banff as the A98 is a narrow thoroughfare with parking and shop frontages. Additionally, Banff Academy is close to the A97 and generates significant traffic at certain times of the day.

Assessment Criteria

11.17 The IEA's guidance advises that assessments are undertaken when there is an estimated increase of 30% on baseline traffic flows or the Heavy Goods Vehicle (HGV) volumes increase by 30%. Increases of this order can represent a significant change in environmental conditions.

11.18 Where the predicted increase is less than this threshold the guidelines suggest that the significant of the change to traffic flow is low or insignificant i.e. negligible and does not require further assessment.

Baseline Environment

Surrounding Road Network

11.19 The Site is situated close to the A97 and B9025, with Banff 15km to the north, Turriff 10km to the east and Aberchirder 2km to the south west. The road network in the surrounding area comprises of two lane single carriageway rural roads that are well maintained and laid out to a generally high standard. These roads offer generally good forward visibility and can accommodate two HGVs passing without delay. The B9025 provides a link between Aberchirder and Turriff and is relatively lightly trafficked. The

A97 is a more heavily trafficked route that connects the town of Banff to the north with the A96(T) at Huntly around 20km to the south west of the Site.

11.20 The A96(T) is a trunk road and is, therefore, a strategic route within north-east Scotland. The trunk road is maintained to a high standard and some sections have been upgraded in recent years to modern design standards.

11.21 The A98, which links Fraserburgh with Fochabers (near Elgin), is of a similar standard to the A97 in terms of road layout. It is more heavily trafficked than the A97.

11.22 There are a number of bridges in the surrounding area which are of a lower standard, in terms of width or physical geometry, than the connecting roads. At Cranna, east of the A97/B9025 junction, there is a narrow bridge located at a sag in the road. There is also a narrow bridge on the A97 over the River Deveron, approximately 6.5km south of the B9025 junction. However, both these bridges accommodate HGV movements, although oncoming traffic may, at times, have to give way. There are no known weight or height restrictions on roads or bridges in the surrounding area.

11.23 All junctions around the Site appear to be of a high standard and should be suitable for delivery of turbine components and smaller loads by HGV.

Road Traffic Data

11.24 Data regarding base road traffic was obtained from Aberdeenshire Council for the A97 and A98. The data is summarised below in Table 11.2 and presented in Appendix 11.2. The traffic counts are for average daily one way traffic flows for the week 7th to 13th May 2012.

Table 11.2: Baseline Average 24 Hour Daily Traffic Flows, May 2012 (source: Aberdeenshire Council)

Location	Westbound	Eastbound	Total
A97 at Aberchirder	755	794	1,549
A98 East of Byth (approx. 10 miles south east of Macduff)	1,485	1,482	2,967

11.25 Traffic flows provided by Aberdeenshire Council did not specify the number of HGVs in the base flow on the A97, however if the typical HGV percentage of 10% is used (10% being the average HGV content for rural roads across the UK), this would create a base flow (total) of 155 HGVs.

Accident Data

11.26 Accident data was received from Aberdeenshire Council and Moray Council. This includes data for four years from 2007 to 2010 inclusive for the A97 and B9025.

11.27 There has been one serious accident and ten slight accidents on the B9025 between Aberchirder and Turiff; however these all occurred east of the current Site access.

11.28 Twenty four accidents have occurred on the A97 between Banff and the A96(T) junction, which included one fatal and four serious accidents; the remainder were slight. Only one accident involved an HGV which was struck from the rear.

11.29 Accidents are generally spread uniformly along the route; however, there is a cluster of two accidents each at the unclassified road junction near Mill of Auchintoul and at a bend around 600m south of the B9025 (from A95). Approximate accident and traffic count locations are shown in Figure 11.1.

Project Characteristics

Access

11.30 Wind turbine components are considered to be abnormal loads due to their size, weight and vehicle movement geometry. These loads are typically transported on vehicles by specialist delivery contractors and normally escorted to site by the police

11.31 It is proposed that all vehicles approaching the Site would use the A97 from the A98. The A97 provides a strategic route for deliveries from Banff.

11.32 The Development would be accessed from the B9025 via the existing farm access, which would be upgraded to conform as closely as possible to the appropriate Aberdeenshire Council standard. Where possible, this would use existing farm tracks within the Site. The B9025 would be accessed from the A97 near Aberchirder.

11.33 General traffic arriving at the site, such as HGVs delivering concrete, stone, etc, has been assumed, for the purposes of this assessment, to use the A97/A98 from Banff as quarry and concrete facilities are available in the area. It is also assumed that staff working on the site would reside (or be accommodated) locally and travel from Banff.

11.34 Turbine components would be imported to Peterhead Port, which has received similar components for previous projects in the past. The currently preferred abnormal load delivery route from Peterhead Port to the Site is shown in Figure 11.2. This has been selected for its relatively high standard of road geometry and carriageway width to allow these vehicles to travel whilst causing minimal inconvenience to other road users.

11.35 The delivery route currently selected is: leaving Peterhead, travel south and join the A90 at the Invernettie Roundabout. Travel on the A90 heading north to just south of Fraserburgh before driving around the perimeter of the town using Boothby Road to join the A98 west of Fraserburgh. The delivery route continues on the A98, heading west until past Banff. Due to the combination of road gradient and curvature at the junction abnormal loads would be unable to perform a left turn from the A98 onto the A97. Instead, vehicles would continue to Boyndie Airfield and turn back towards Banff to make a right turn onto the A97. Once on the A97, abnormal loads would travel south to just north of Aberchirder before turning onto the B9025 towards the Site entrance.

11.36 Minor modifications on the chosen abnormal load access route, such as the temporary removal of traffic signs, may be necessary however these items would be replaced immediately following the turbine movements. Some temporary works may also be

needed at Banff Bridge depending on the size of turbine components; however the bridge would be restored to its former condition once abnormal load deliveries have been completed. All temporary work would be subject to approvals by the relevant statutory authorities and assessment of the impact on Banff Bridge (a listed structure) is provided in ES Chapter 09 Archaeology and Cultural Heritage.

Construction Programme and Vehicle Estimates

11.37 The assumed construction programme outlined below in Table 11.3 indicates the durations of various stages of the works. The numbers of staff attending the site daily would depend on activities, however three distinct phases have been identified to ensure a realistic estimate is made.

Table 11.3: Assumed Construction Programme

Task	Month							Duration (months)
	1	2	3	4	5	6	7	
Site Establishment								2
Site Operations								7
Civils								4
Electrical Works								4
Drainage & Culverts								4
Turbine Foundations								3
Turbine Components								2
Crane for Turbines								2
Site Staff Phase 1								4
Site Staff Phase 2								2
Site Staff Phase 3								1

11.38 Traffic flows have been estimated for each of the tasks in the assumed construction programme. The levels of traffic generated are based on Grontmij's experience of similar projects in Scotland. Table 11.4 shows these estimates as both daily and monthly two way traffic movements.

11.39 Monthly totals have been rounded to the nearest ten, while daily totals are rounded to the nearest five (except for abnormal loads). These figures are typical traffic flows – the precise traffic on a particular day would be affected by site activities. The daily flows are based on the Site being operational for 26 days per month – equivalent to six days per week.

Table 11.4: Estimated Construction Traffic

	Vehicle Type	Month						
		1	2	3	4	5	6	7
Site Establishment								
Delivery of plant & accommodation	HGV	20						
Removal of plant & accommodation	HGV							20
Site Operations								
Fuel for site	HGV	7	7	7	7	7	7	7
Water for site	HGV	7	7	7	7	7	7	7
Site waste Disposal	HGV	7	7	7	7	7	7	7
Civils								
Type 1 material	HGV	15	15	15	15			
6F material	HGV	94	94	94	94			
6N material	HGV	11	11	11	11			
Geogrids etc	HGV	5	5	5	5			
Met. mast	HGV	2	2	2	2			
Electrical Works								
Cables, sand	HGV	15	15	15	15			
Substation	HGV				6			
Drainage & Culverts								
Miscellaneous items	HGV	2	2	2	2			
Turbine Foundations								
Reinforcing steel	HGV		3	3	3			
Concrete	HGV		133	133	133			
Turbine Components								
Blades, tower & nacelle (ab. load)	AL					21	21	
Escorts for abnormal loads	LGV					42	42	
Miscellaneous deliveries	HGV					4	4	
Crane for turbines								
Delivery of crane (including 1 abnormal load)	HGV					14		
Removal of crane (including 1 abnormal load)	HGV						14	
Escort for crane delivery	LGV					4		
Escort for crane removal	LGV						4	
Site Staff								
Site staff phase 1	LGV	960	960	960	960			

	Vehicle Type	Month						
		1	2	3	4	5	6	7
Site staff phase 2	LGV					1440	1440	
Site staff phase 3	LGV							480
Month vehicle total (2 way movements)		**1140**	**1260**	**1260**	**1270**	**1550**	**1550**	**520**
Daily vehicle total (2 way movements)		**45**	**50**	**50**	**50**	**60**	**60**	**20**
Month staff total (2 way movements)		**960**	**960**	**960**	**960**	**1440**	**1440**	**480**
Daily staff total (2 way movements)		**35**	**35**	**35**	**35**	**55**	**55**	**20**
Month HGV total (2 way movements)		**180**	**300**	**300**	**310**	**40**	**40**	**40**
Daily HGV total (2 way movements)		**10**	**15**	**15**	**15**	**2**	**2**	**2**
Month abnormal load total (2 way movements)						**70**	**70**	
Daily abnormal load total (2 way movements)						**3**	**3**	

Embedded Mitigation

11.40 As stated in Chapter 3: Project Description, if the Development were to be granted planning consent a Traffic Management Plan (TMP) would be prepared and implemented for the construction and decommissioning works.

11.41 All abnormal loads would be escorted to the Site by police vehicles and would be programmed to avoid peak traffic periods on the local road network. Any temporary traffic management measures required for local roads would be implemented under the appropriate Acts and Agreements to ensure safe access.

11.42 The routes chosen for turbine delivery have been selected to minimise any impacts on the community and other road users as the roads are generally rural in nature.

Predicted Impacts

Construction

11.43 Construction impacts are described below for the B9025, A97 and A98.

11.44 For the B9025, only a short section would be affected and additional 50 vehicles (15 of which are HGVs) would be evident during the busiest month of construction activity.

11.45 Table 11.5 below indicates the estimated increase during month four on the base flow on the A97 north of Deuchries. This month was selected for analysis as it contains the highest number of HGVs.

Table 11.5: Estimated A97 traffic increase, north of Deuchries, Month 4

Traffic	Base	Additional	Combined	% Change
Flow	1549	50	1599	3
HGVs	155	15	170	10

11.46 The table shows the estimated traffic increase on the A97 would be around three percent. In terms of the IEA's guidance, this is considered to be an insignificant effect as the increase would be less than 30%.

11.47 The construction works are estimated to generate up to 15 HGVs per day during months two, three and four of the construction programme. This would result in a percentage increase of around 10% on A97 base HGV flows, which is considered an insignificant effect in the IEA's guidance as the increase would be less than 30%.

11.48 The traffic that would be generated by abnormal loads on the A98 is predicted to create an additional three trips per day (one of which would be an abnormal load and the other two being escorts). This represents an insignificant increase, based on the assessment criteria discussed in paragraphs 11.17 and 11.18, on the baseline flows of 2,967 vehicles per day. Abnormal loads would only use the A98 during months five and six of the construction programme.

11.49 Construction traffic is not anticipated to cause any road safety issues, with abnormal loads being subject to escort.

Operation

11.50 In terms of operation of the Development, traffic movements would be likely to be restricted to occasional maintenance vehicles (typically small vans) accessing the Site for turbine servicing or repair. These movements are unlikely to exceed two to three per week. If more extensive maintenance were to be needed, a crane may be required; however it is expected this would occur on a reactive basis and therefore cannot be predicted. Based on the assessment criteria detailed in paragraphs 11.17 and 11.18, no significant traffic effects are anticipated.

Decommissioning

11.51 The effect of decommissioning the Development at the end of its operational life cycle would depend on the method of decommissioning. The turbines and substation are the only components likely to be removed from the Site. Although these activities would generate some traffic movements, it is unlikely these would be as high as construction traffic and therefore are considered negligible. If necessary, a Traffic Management Plan would be agreed with the road authority to ensure that traffic associated with decommissioning would not create an adverse effect on the surrounding road network.

Mitigation

11.52 In addition to the embedded mitigation as described, the following measures are proposed to reduce or avoid construction effects as far as practicable:

- The arrangements for delivery of turbine components and other abnormal loads during the construction phase would be contained in a Traffic Management Plan (TMP) which would outline the routes, times and vehicle dimensions selected. The content of the TMP would be agreed with Grampian Police, Aberdeenshire Council, the haulage contractor and (where appropriate) the Trunk Road authority. In order to minimise disruption in Banff and Macduff, abnormal loads would pass through between 9.30am and 3.30pm to avoid peak times for both commuters and traffic movements at Banff Academy;
- An assessment of the access route to the site would be undertaken to confirm if any carriageway repair works are required. If necessary, a dilapidation survey would be agreed with Aberdeenshire Council to identify any areas that have been damaged as a result of heavy vehicles travelling to the Site. Any damage found to be caused by the Developer to the local network would be made good by the Developer, under an indemnity agreement with Aberdeenshire Council.
- All abnormal loads would be escorted by both the haulage contractor and the Police. This would ensure inconvenience to road users is minimised.

11.53 As no significant effects were identified for the operational phase of the Development, no further mitigation measures are proposed. Similarly no mitigation is proposed for the decommissioning phase of the Development.

Residual Effects

11.54 Residual effects would not be significant as the mitigation measures outlined in the above section would minimise any consequences of the construction traffic. There would be no permanent impacts on the road network.

11.55 Based on the assessment criteria discussed in paragraphs 11.17 and 11.18 residual effects of the operation and decommissioning of the Development would not be significant.

Cumulative Impacts

11.56 It is not anticipated that there would be overlap between the construction of the proposed Deuchries Wind Farm and other similar projects in the surrounding area. Should these circumstances arise, liaison would take place between the appointed contractor for the Deuchries Wind Farm and other contractors as part of the development of the TMP.

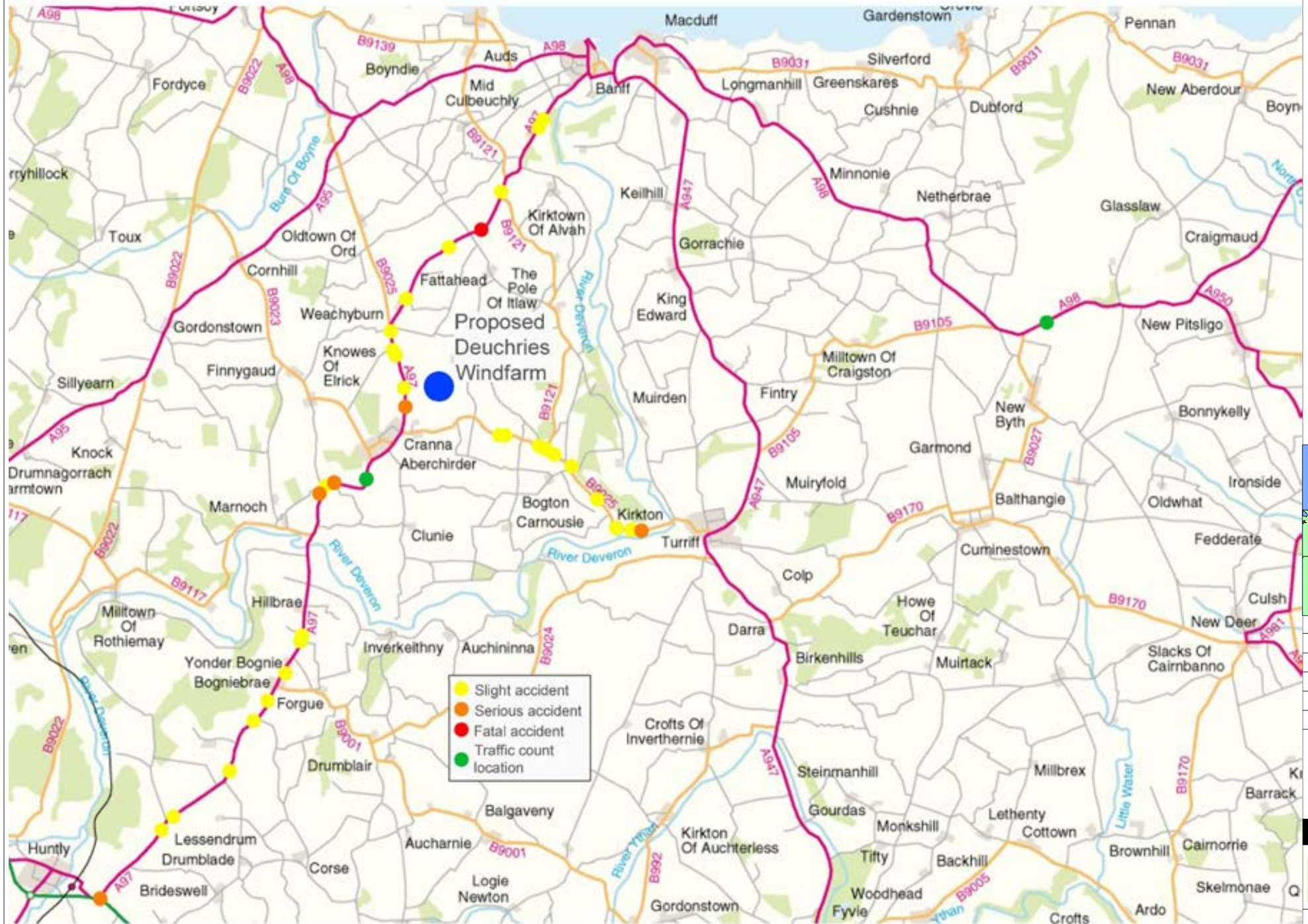
Chapter 11 References

[1] PAN 75 Planning for Transport, Scottish Executive, 2005

[2] Aberdeenshire Council Local Transport Strategy, Aberdeenshire Council, 2012

[3] Regional Transport Strategy 2021, NESTRANS, 2008

[4] Guidelines for the Environmental Assessment of Road Traffic, Institute of Environmental Assessment



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FORCE 9 ENERGY

Deuchries Wind Farm

RSK Grontmij

Figure 11.1: Approximae Accident and Traffic Count Locations

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FORCE 9 ENERGY

Deuchries Wind Farm

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Figure 11.2: Delivery Route
(Map 1 of 2)

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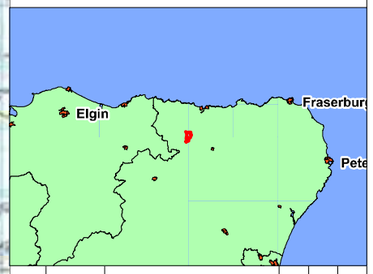
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Site Boundary

Route for Abnormal Loads

Route for General Site Traffic



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FORCE 9 ENERGY

Deuchries Wind Farm

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Figure 11.2: Delivery Route
(Map 2 of 2)

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12 CLIMATE CHANGE

Introduction

12.1 A key benefit of wind farms (as with other renewable energy technologies) is their ability, once operational, to generate electricity without releasing greenhouse gases (GHGs). This contrasts with the majority of electricity distributed on the UK's national grid, which is generated by fossil fuels such as coal and gas, and as a result gives rise to significant releases of GHGs.

12.2 Scientific consensus acknowledges the significant contribution of man-made GHG emissions to climate change, and the range of social, economic and environmental impacts that are predicted unless appropriate action is taken[1]. Reducing GHG emissions ("climate change mitigation") is therefore central to minimising or avoiding climate change and its effects.

12.3 Before they become operational, however, wind farm developments can give rise to GHG emissions from various activities including manufacture of the turbines and site preparation and construction activities. The overall climate change impact of a wind farm (or any other development) is the *net balance* of GHG emissions and emissions savings over its lifecycle, with *net positive* emissions contributing to climate change and *net negative* emissions helping mitigate against climate change impacts[2].

12.4 This ES chapter reports the approach taken, and findings of, a detailed Carbon Balance Assessment undertaken for the Development in order to establish its net GHG impact and therefore its overall climate change effect.

12.5 The terms 'GHG' and 'carbon' have the same meaning in this context due to the six GHGs covered by the Kyoto Protocol[3] being reported in terms of *"CO_2 equivalent"* (CO_2e) which is their global warming potential relative to 1 unit of CO_2.

Table 12.1: Kyoto Protocol Greenhouse Gases (GHGs) and their Global Warming Potential

Greenhouse gas (GHG)	Global Warming Potential (CO_2e)
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298
Hydro fluorocarbons (HFCs)	Depends on specific gas
Sulphur hexafluoride (SF_6)	22,800
Perfluorinated compounds (PFCs)	Depends on specific gas

12.6 For example, 1 kg of methane (CH_4) has the same global warming effect as 25 kg of CO_2, whilst 1 kg of SF_6 has 22,800 times the effect as 22,800 kg (or 22.8 tonnes) of CO_2.

Policy and Guidance

12.7 The national and local policy framework for the Development is summarised in ES Chapter 4: Planning.

Web-based Guidance - Wind Farm Developments on Peat Land

12.8 PAN 45 Renewable Energy Technologies and Annex 2 Spatial Frameworks and Supplementary Planning Guidance for Wind Farms has been replaced with web based renewables advice.

12.9 The Scottish Government has supported the development of a carbon calculator for use in the consideration of carbon savings from wind farm developments on Scottish peatlands[4]. Originally published in 2008, the calculator has been refined (currently version 2.6.0) following feedback and further research in order to provide an even more effective tool. The purpose of the tool is to assess, in a comprehensive and consistent way, the carbon (GHG emissions) impact of wind farm developments. This is done by comparing the carbon costs of wind farm developments with the carbon (GHG emissions) savings attributable to the wind farm. The calculation is summarised as the length of time (in years) it will take the carbon savings to amount to the carbon costs; this is referred to as the payback period.

12.10 Applications for wind farms (or wind farm extensions) submitted under Section 36 (S36) of the Electricity Act (for proposals of more than 50 MW capacity) are screened to establish whether they are on deep peat sites i.e. peat is present at thicknesses greater than 0.5 metres and where loss or disturbance to peat could occur. If the proposal is located on a deep peat site the developer is expected to use the carbon calculator to assess the development and the final carbon assessment will be a material consideration for the S36 application. The Development is not a S36 application since its proposed capacity is below the 50MW threshold. However, the carbon calculator has been used to assess climate change impacts and address the need for a carbon balance assessment, following SEPA's scoping opinion.

Assessment Methodology

Consultation

12.11 SEPA were consulted through the EIA scoping process, and a formal response received (see consultation matrix table in Chapter 1).

Assessment of Impacts

12.12 The latest version (v2.6.0) of the Carbon Balance Assessment method for onshore wind farms on peatland developed for the Scottish Government[4] has been used for the Development, in accordance with SEPA's EIA Scoping Response and requirements of

web-based guidance for Wind Farm Developments on Peat Land. This tool has been used despite the Development not being a Section 36 application or significant peat deposits present on Site.

12.13 RSK and Force 9 have sought to maximise the use of Site and scheme-specific data to ensure an accurate assessment that relates as far as possible to the particular Site conditions and development proposals. It should be noted, however, that default and/or assumed values have been used in some areas where scheme or site specific data is not available. Details of all values used in the carbon balance assessment and their source are provided in Appendix 12.1.

12.14 This methodology accords with IEMA guidance in relation to Climate Change Mitigation and EIA guidance, in that it considers carbon emissions and savings across the Development lifecycle (manufacturing, site preparation, construction, operation and decommissioning). It derives the net carbon impact and period following construction by which operational GHG savings offset carbon losses during construction – otherwise known as the carbon balance period.

12.15 The assessment has also been undertaken in accordance with SEPA s recommendations. This included the assessment incorporating all elements of the proposal, including borrow pits, access tracks, other infrastructure and loss of peat bog, and mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, and cable trenches or the storage and re-use of excavated peat.

12.16 Guidance for determining the level of significance of identified net climate change impacts, be they adverse or beneficial impacts, is not yet available from IEMA or other sources. In the absence of such guidance, the effect of the calculated net climate change impact of the Development is stated to be positive or adverse, with no reference to its relative level of significance.

12.17 The assessment has considered all impacts associated with the Development, as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised. However, for the purposes of this planning application it is assumed that the grid connection would comprise a 33kV underground cable that would route through the Site, with a ‘T’ connection into the existing 33kV transmission line between Turriff and Aberchirder, which runs close to the southern boundary of the Site. The grid connection would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) as part of the consenting procedure for this element of infrastructure. The scope of any such assessment would be agreed with Aberdeenshire Council.

Baseline Environment

12.18 Baseline conditions regarding potential climate change impacts from the Development would relate to existing features at the Site (such as forestry or peat) that could be impacted by the Development and release GHG emissions as a result. These can be summarised as follows:

- Forestry: The Site comprises only small areas of woodland, none of which would be impacted by the Development;
- Peat: A soft ground probing survey has been undertaken. Soft ground probing results (contained in Appendix 5.1) indicated noticeably boggier ground that may be peat in Fields A and B (as shown on Figure 5.1), in proximity to the watercourses and drainage ditches i.e. to the north of the proposed turbine and track locations. However, the Phase 1 Habitat Survey completed for the Site did not flag up any notable i.e. wetland indicator species or habitats that would suggest the presence of peat; and
- Drainage: no permanent changes to water table depth are anticipated as a result of the Development proposals.

Project Characteristics

12.19 Characteristics of the Development have the potential to result in significant GHG emissions and savings, hence climate change impacts both positive and adverse, through the project lifecycle, as summarised below.

Peat

12.20 Changes in local hydro-geological and drainage conditions in areas of peat deposits can result in GHG emissions from the drying of the peat and the release of CO_2 from the oxidation of carbon contained by the peat. The embedded mitigation for the Development includes for ground investigation within the turbine locations and access track routes prior to commencement of construction, to confirm ground conditions are suitable for construction but also to confirm peat deposits are not present in these areas.

Drainage

12.21 Changes to the general water table depth at the Site as a result of construction or decommissioning works could affect habitats and peat deposits present. However, no permanent changes to the general water table depth at the Site are anticipated as a result of the Development.

Predicted Impacts

12.22 The results of the Carbon Balance Assessment carried out for the Development are presented below for each project stage.

Construction and Decommissioning

12.23 Of all project stages, the construction stage would have the greatest potential to cause new GHG emissions from such activities as:

- Manufacture of the wind turbines;
- Loss of soil organic carbon from the construction of new access tracks, borrow pits, turbine foundation and hardstanding areas; and
- Reduced carbon fixing potential of plants following their removal to facilitate the above construction.

12.24 Since the impacts listed above would take place before the Development is operational, net positive GHG emissions i.e. adverse climate change effects, are anticipated during this stage of the Development, which are summarised in Table 12.2 and Figure 12.1.

12.25 Decommissioning provides an opportunity to return the Site to its previous use and condition. For the purposes of this carbon balance assessment, Site decommissioning is assumed to comprise only the removal of the turbines. No new forestry planting is proposed as no mature forestry is proposed to be felled, and the removal of the drainage features associated with the access tracks of the Development is not anticipated.

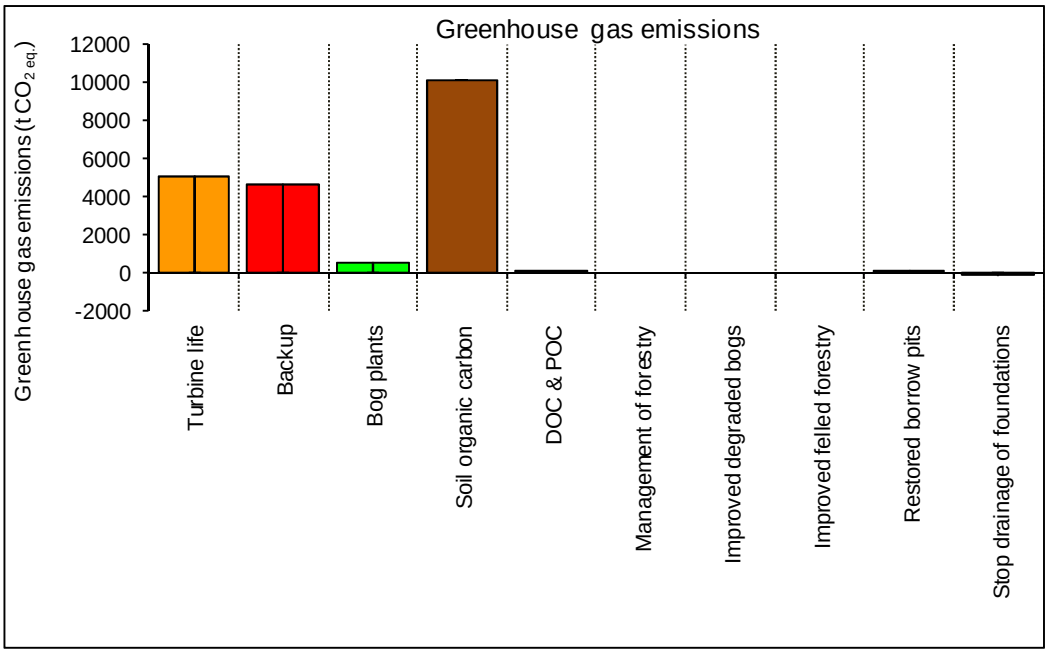
12.26 As such the GHG savings anticipated from decommissioning, are summarised in Table 12.2.

Table 12.2: Expected GHG Losses and Savings from Development Construction and Decommissioning

Source of GHG Emissions / Savings	GHG Emissions (tCO_2e)
Construction	
Turbine manufacture, construction & decommissioning	5,044
Restoration of borrow pits	44
Back-up	4,586
Reduced carbon fixing potential	534
Loss of soil organic matter	10,120
Leaching of Dissolved Oxygen Content (DOC) and Portable Oxygen Content (POC)	17
Forestry felling	0
Sub-total	20,346
Decommissioning	
Improvement of degraded bogs	0
Improvement of felled forestry	0
Removal of drainage from foundations & hardstanding	- 135
Sub-total	- 135
Total	**20,211**

12.27 A total of 20,346 tonnes CO_2e is predicted to be emitted during construction, and GHG savings of 135 tonnes are expected from decommissioning, giving a net GHG effect from these two project stages of the release of 20,211 tonnes CO_2e. These estimated GHG emissions and GHG savings from construction and decommissioning are presented in Figure 12.1.

Figure 12.1 GHG Emissions and Savings from Wind Farm Construction & Decommissioning



12.28 It can be seen that GHG losses from soil organic carbon are the largest source of emissions during construction, followed by emissions from turbine life and back-up.

Operation

12.29 The Development's operational stage would have the most potential to result in GHG savings, and hence positive climate change effects. This is because GHG emissions from construction activities would have ceased, and the operation of the wind turbines would generate zero carbon electricity, saving substantial GHG emissions (0.43kgCO_2e / kWh) when used in place of electricity generated from fossil fuels. The expected GHG savings are summarised in Table 12.3.

Table 12.3: Expected Annual GHG Savings from Development Operation (against 'Fossil Fuel Mix' of Electricity)

Source of GHG Emissions / Savings	GHG Emissions (tCO_2e)
Development operation	- 11,007
Total CO_2 Savings	**- 11,007**

Carbon Payback Period

12.30 The construction and decommissioning stages of the Development would be predicted to result in net GHG emissions of 20,211 tonnes CO_2e. Dividing this by the annual GHG savings predicted from the Development operation (11,007 tonnes CO_2e) gives a carbon payback period of 1.8 years (or 43.2 months) against a fossil fuel grid mix of

electricity. That is, net GHG emissions from construction and decommissioning would be offset by GHG savings from the Development operation at 1.8 years following the commissioning of the Development.

Net GHG Effect

12.31 The Development has a proposed operational lifetime of 25 years, and would therefore continue delivering GHG savings once the 1.8 year carbon payback period is reached. The net GHG effect can be calculated by multiplying the period of time the Development would operate after the carbon payback period (23.2 years) by the annual GHG saving (11,007 tCO_2e) which would give a net positive GHG effect of 255,362 tonnes CO_2e over its lifetime.

Mitigation

Construction

12.32 The key mitigation measure at construction stage in relation to climate change is the avoidance of areas of peat for the Development. This is mitigation built into the design and no further mitigation measures are proposed.

Operation

12.33 The Development itself represents a source of climate change mitigation, and therefore additional mitigation measures are not required.

Decommissioning

12.34 There would be no mitigation measures during decommissioning. Refer to ES Chapter 3 Project Description for further details.

Residual Effects

12.35 As mitigation measures associated with the Development are accounted for in the carbon balance assessment method, residual effects i.e. those following mitigation remain unchanged from the effects as reported above.

12.36 In summary, GHG emissions are predicted from various activities construction activities, particularly turbine manufacture, back-up, and the loss of soil organic matter from the construction of foundations, borrow pits, hardstanding and new access tracks, which would be only slightly offset by the borrow pit restoration at the end of the construction works.

12.37 However, these GHG emissions are predicted to be offset 1.8 years after the Development becomes operational (a fossil fuel grid mix of electricity), and it is predicted that the Development would deliver total GHG savings of some 255,362 tonnes over its proposed 25 year operational lifetime.

12.38 This net GHG effect is considered to represent **a positive and long-term climate change effect**.

12.39 Regarding planning policy requirements, the latest version of the Carbon Balance Assessment tool for Windfarms on Scottish Peatland (v2.6.0) has been applied to the Development proposals, as requested by SEPA's EIA Scoping Response despite the Development not comprising a Section 36 application (in view of it having a total capacity below 50MW).

12.40 The carbon balance assessment undertaken for the Development concludes it would make a net reduction in GHG emissions, and hence have a beneficial effect in relation to climate change mitigation.

12.41 This approach and result of the assessment is considered to accord in full with relevant planning policy at the national and local levels.

Cumulative Effects

12.42 Should all the wind farms, as listed in Chapter 8 and shown on Figure 8.24, be consented and constructed, there would be a net GHG saving and larger positive effects than that of the Development alone

Chapter 12 References

[1] Inter-Governmental Panel on Climate Change (IPCC) 4th Assessment Report; AR4.

[2] Climate Change Mitigation & EIA; IEMA Principles Series; version 1.1; IEMA; 2010.

[3] Kyoto Protocol to the United Nations Framework Convention on Climate Change: (UNFCCC).

[4] Carbon Calculator for Wind Farms on Peatlands; Version 2.6.0; Scottish Government; June 2012.

13 SOCIO-ECONOMICS

Introduction

13.1 This chapter considers the potential impacts of the Development on the local economy (primarily employment and ongoing business operations), tourism including perceptions of visitors to the area and leisure activities.

13.2 The chapter outlines relevant planning policy and strategy, describes the methods used to assess the impacts, summarises existing local conditions, and the potential direct and indirect effects anticipated to result from the construction, operation and eventual decommissioning of the Development.

13.3 This chapter has been prepared by RSK Environment Ltd. Landscape and visual impacts e.g. on recreational and tourist receptors are considered in ES Chapter 8 and noise effects are considered in ES Chapter 10

Policy Content

13.4 Relevant planning policy is discussed in ES Chapter 4: Planning Context and strategy documents are summarised in Table 13.1 below.

Table 13.1: Key Socio-economic Documents

Source	Policy/Title	Description
Scottish Government	The Government Economic Strategy (GES), September 2011[1]	The strategy sets out six priorities to deliver sustainable economic growth: • Transition to a Low Carbon Economy; • Learning, skills and well-being; • Supportive business environment; • Infrastructure development and place; • Effective government; and • Equality. The urgent need to meet emissions targets and to take advantage of the current economics conditions has resulted in the creation of a specific Strategic Priority focused on the low carbon economy; an addition from the 2007 strategy. Energy (including renewables) is one of the seven growth sectors identified in the economic strategy
Scottish Government	The Scottish Economic Recovery Plan: Update February 2011 [2]	It is an integral part of the GES. The strategy considers that the development of a low carbon economy provides a key opportunity for Scotland to develop and maintain a key comparative advantage in the global economy in the long-term. This plan states that to strengthen the economy and secure long term growth the government will focus on the following: • Supporting jobs and communities; • Innovation and industries of the future; and

Source	Policy/Title	Description
		• Strengthening education and skills.
Scottish Government	Government Low Carbon Economic Strategy[3]	Transforming the energy sector in Scotland is seen as pivotal to the development of a low carbon economy, providing benefits including reduced GHG emissions and enhanced energy security.
Aberdeenshire Council	Local Development Plan (Adopted June 2012), SG Rural Development 2: Wind farms and medium to large wind turbines[4]	Policy 3 – Development in the countryside has specific policies in relation to wind farms and renewable energy developments. The supplementary guidance policies states that the proposal should not have a significant adverse effect on *"tourism or recreation interests, including users of any Core Path or other established public access for walking, cycling or horse riding".*

13.5 Scottish Planning Policy[5] states that increasing sustainable economic growth is the overarching purpose of the Scottish Government (achieving a sustainable economy also being an objective of the UK Sustainable Development Strategy[6]). With regard to rural development the aim should be to enable development, which supports prosperous and sustainable communities whilst protecting and enhancing environmental quality.

Method of Assessment

Scope of Works

13.6 In assessing the likely impacts of the Development, the chapter has considered both the Banff and Buchan area local to the Site, and the wider area of Aberdeenshire. However, given the proposed scale of the Development and prevailing baseline conditions (as described below) it is anticipated that impacts would be largely confined to the local area.

13.7 A desk-based study has been completed to compile relevant baseline information for the Site and the local and regional areas. This comprised a review of the following and subsequent activities:

- Ordnance Survey mapping for the Site and local area and compilation of relevant map information (such as identified footpaths and rights of way[7]);
- Review of relevant Scottish Government and Aberdeenshire Council plans and strategy documents;
- An internet-based data search e.g. National Records of Scotland, VisitScotland, the National Trust and the Scottish Rights of Way and Access Society; and
- Recent research on impacts of wind farms on tourism e.g. Scottish Government 2008[8].

13.8 A quantitative assessment has been completed where possible e.g. predicted job numbers are compared to existing employment levels, but the impact assessment is largely qualitative, using experience of previous wind farm projects and professional judgement.

Significance Criteria

13.9 There is no best practice guidance or standard significance criteria relating to socio-economic impacts. The significance of impacts has therefore been determined by assessing the sensitivity of the identified receptors and the potential magnitude of change arising from the Development, as set out in Table 13.2 and Table 13.3.

Table 13.2: Receptor Sensitivity

Receptor Sensitivity	Example
High	Areas noted for their high unemployment rates compared to the national average. Tourist or leisure and recreational features or facilities considered to be of international or national importance, possibly legally protected and/or scheduled, with very high visitor numbers. Land uses considered highly sensitive to change.
Medium	Areas with unemployment rates that are notably above the national average. Tourist or leisure and recreational features or facilities considered to be of regional importance, but not legally protected. Land uses considered moderately sensitive to change.
Low	Areas with unemployment rates that are broadly consistent with the national average. Locally important tourism or leisure features and resources (not legally protected). Land uses considered slightly sensitive to change.
Negligible	Areas noted for their low unemployment rates compared to the national average. Leisure and recreation features and resources which are of low importance (rarely visited). Land uses considered robust to change.

Table 13.3: Impact Magnitude

Magnitude	Example
Large	Complete or almost complete destruction or disruption of the resource. Substantial, permanent effect on the economy, including tourism and recreation facilities and resources. Permanent and large scale changes to employment rates.
Moderate	A moderate to high proportion of the resource destroyed or disrupted. Moderate temporary or permanent effect on the economy, including tourism and recreation facilities and resources. Permanent/ temporary medium scale changes to employment rates.
Small	A small proportion of the environmental resource destroyed or disrupted. Minor temporary or permanent effect on the economy, including tourism and recreation. Temporary short term changes to employment rates.
Negligible	Resource will not be materially affected and no discernable changes in employment.

13.10 The combination of receptor sensitivity and magnitude of change allows impact significance to be determined, as summarised in Table 13.4.

Table 13.4: Socio-economics Significance of Effect

Site Sensitivity	Magnitude of Change			
	Large	Moderate	Small	Negligible
High	Significant	Significant	Not Significant	Not Significant
Medium	Significant	Significant	Not Significant	Not Significant
Low	Not Significant	Not Significant	Not Significant	Not Significant
Negligible	Not Significant	Not Significant	Not Significant	Not Significant

Assumptions and Limitations

13.11 Potential visual impacts of the Development are assessed in detail in ES Chapter 8. For the purposes of this assessment, the magnitude of potential indirect visual effects has been determined using a combination of the visibility of the Development from the feature of interest e.g. footpath, golf course or tourist attraction and anticipated perceptions of the user / visitor, based on published literature and reports on the subject.

Baseline Environment

The Site and Local Area

13.12 The Site is located approximately 2km northeast to the village of Aberchirder in Banff and Buchan area of Aberdeenshire. The larger town of Turriff is located approximately 7km southeast of the Site and Banff and Portsoy are located approximately 13km to the north east and northwest of the Site respectively.

13.13 The Site is split over three farms: Deuchries, Upper Crannabog and North Cranna, each owned by a separate land owner and all consist primarily of semi-improved grassland, grassland and arable farmland. The majority of the land-use is sheep and cattle grazing and to a minor extent arable farming. Areas of the Site have previously been quarried during the construction of the A97, but these have since been allowed to naturally regenerate.

13.14 Surrounding land use also consists primarily of farmland, with occasional areas of woodland in the wider area e.g. the Forestry Commission Scotland Brownside Wood is located approximately 1.2km to the east of the Site.

13.15 Information taken from the National Catalogue of Rights of Way and Other Routes (CROW), from Scotways (the Scottish Rights of Way and Access Society), indicates that there is a network of Rights of Way within and in the immediate vicinity of the Site. These are shown on Figure 13.1.

13.16 There are four Rights of Way (GB97, GB98, GB100 and GB101) within the Site. GB95 and GB96 are situated to the west of the site and GB44, GB46, GB48 and GB51 form a network along the local access tracks to the south of the Site. All these routes are not statutory designations but are considered of local importance.

13.17 Aberdeenshire Council have produced a draft Core Paths Plan in accordance with the Land Reform (Scotland) Act 2003, which is intended to define key paths in the council area. The current Consultation draft (June to September 2009) indicates that there are no existing or new core paths within the Site, though a 'wider network route' is highlighted beginning from the A97 and running along the southern base of Cranna Hill and then northwards between Cranna and Gallow Hill[9].

Population and Local Economy

13.18 Aberdeenshire Council[10] estimate the population of the Banff and Buchan area to be 35,245 in 2011, approximately 14.3% of the population of Aberdeenshire. Aberchirder is the nearest village to the Site and has an estimated population of 1,190 in 2011. The largest settlement in the area is Banff, located approximately 12.5km from the Site with an estimated population of 3,931 in 2011. The most populous settlements within 15km of the Site are: Aberchirder, Turriff, Banff, Portsoy, Whitehills and Macduff.

13.19 Data from the Aberdeenshire Council Profile 2010 suggests that the Aberdeenshire economy is largely based on the services industry, the oil and gas industry and traditional sectors such as fishing and farming (Aberdeenshire provides 29% of Scotland's fisheries related employment.) Tourism related work accounts for 8.2% of employment. The latest statistics for Aberdeenshire show a slight increase in unemployment for the first quarter of 2012, to 1.5%[11], which remains the lowest rate of all the Scottish local authorities and well below the Scottish average of 4.4% for the same period[12].

Tourism and Recreational Activities

Tourism

13.20 One of the key objectives of the Aberdeenshire Economic Strategy[13] is *"to promote Aberdeen City and Shire as a key tourism destination in Scotland and improve the visitor experience by strengthening and supporting the tourism industry"*

13.21 The immediate area around the Site comprises mainly of agricultural land and has limited formal tourist attractions and receptors. However, in the wider area and particularly along the coastline tourism is a vital part of the economy e.g. the Banffshire coastline is marketed as Scotland's Dolphin Coast. Beaches include Boyndie Bay and Links Bay.

13.22 The Visit Scotland website supplies records of registered tourism attractions in the surrounding area of Banff, Buchan, and Turriff[14]. These, together with other local visitor attractions are summarised in Table 13.5 below.

Table 13.5: Visitor Attractions within a 15 km radius of the Site

No.	Attraction	Location	Number of visitors in 2009[15]	Approximate Distance and Direction from Site (km)
1	Glendronach Distillery	Forgue by Huntly	NR	11 SW
2	Delgatie Castle	Turriff	6,572	12 SE
3	Craigston Castle (Historic and Garden Designed Landscape)	Turriff	NR	12 E
4	The Old School Boyndie	Banff	NR	11 N
5	Duff House	Banff	11,041	11 N
6	Banff Museum	Banff	771	11 N
7	MacDuff Distillery	Banff	NR	11NE
8	Macduff Marine Aquarium	Macduff	NR	12 NE
9	Glenglassaugh Distillery	Portsoy	NR	14 NW
NR – Not Recorded				

13.23 Aberdeenshire is well known for its recumbent stone circles, though the Aberdeenshire Council website does not identify any such features within 15km of the Site. The scoping response from Historic Scotland noted the North Burreldales stone circle approximately 2.3km from the site, however, this is considered unlikely to represent a significant local visitor attraction.

13.24 The nearest local visitor accommodation comprises the Hill of Maunderlea Lodges, situated just beyond the north-west corner of the Site, on the south-facing slope of the Hill of Maunderlea. It consists of four lodges providing self-catering accommodation to visitors and walks within 14 acres of woodland[16]. In the wider area visitor accommodation is provided through a range of hotels, guest houses / bed and breakfasts, self-catering accommodation and caravan parks; several of the latter are located along the coastline to the north. Within such establishments some rooms are likely to face towards and may have views of the Site.

13.25 In 2008, the Scottish Government issued a study report on the potential impacts on tourism arising from wind farm developments[9]. The study's findings noted that a significant minority of tourists (20% to 30%) preferred landscapes without wind farms. Of this percentage, however, only a very small proportion would change their intentions about revisiting Scotland. Under all circumstances, the vast majority of those who had seen a wind farm (93-99%) suggested that the experience would not have any impact.

13.26 The study's findings were based on the following case studies, Dumfries and Galloway, Caithness and Sutherland, Stirling, Perth and Kinross and the Scottish Borders. The findings estimated a reduction in general expenditure of tourists of between 1.30% and 1.72%, and a reduction of between 0.48% and 1.59% in expenditure on accommodation. This equates to a predicted economic impact from wind farms on tourism in Scotland (as a whole), as a loss of 211 Full Time Equivalent Jobs (equivalent

to 0.1% of tourism employment in Scotland). In general, this indicates the negative impact of wind farms on tourism at national level is small and any reduction in employment in tourism would be less than the numbers directly employed in the wind power industry.

Outdoor Recreation

13.27 In addition to the local footpaths described above and the specific attractions and venues listed in Table 13.5, visitors to the Banffshire and Turriff area are known to use the local area for outdoor sporting activities including golf, fishing and horse-riding. There are several coastal walks available within the study area, such as the Banff Harbour to Whitehills Harbour Coastal Walk[17].

13.28 There are no national or regional cycle routes on or in the immediate vicinity of the Site. The nearest section of the national cycle route NCN1 from Aberdeen to John O'Groats runs approximately 6km to the east of the Site[18], passing through the River Deveron Valley to Turriff. The North Sea Cycle Route also follows this route. Aberdeenshire Council also has a number of designated local cycle routes, including Circular routes around Turriff, Banff to Boyndie, Portsoy and Aberchirder, the latter routing along the B9025 through the southern section of the Site.

13.29 The watercourses on-site feed into the River Deveron, which is popular with anglers for salmon and brown trout. There is a week long fishing festival hosted every year in April-May in Turriff.

13.30 Golf courses and clubs located within the 15km study area comprise Turriff Golf Club, the Duff House Royal Golf Club at Banff and the Royal Tarlair Golf Club at MacDuff.

13.31 It was noted in the Scottish Government Report[19] that outdoor enthusiasts are likely to have a particular interest in landscape. However, 45% of hill walkers expressed positive views about wind farms rather than negative ones (19%).

Project Characteristics

13.32 As discussed in Chapter 2, the Development design has been through a number of iterations, taking account of the environmental designations and constraints both within and in the vicinity of the Site, thus ensuring that, as far as practicable, negative impacts from the Development are minimised.

13.33 The characteristics of the project are generally set out in Section 3, Project Description. Included in the embedded mitigation is a Construction Project Environmental Management Plan (CEMP), which would be adopted by the project (during both construction and decommissioning) to control environmental impacts such as noise and dust generation. Working hours would also be set and a Traffic Management Plan would be implemented.

13.34 Local facilities and features may be impacted by the following construction activities:

- Construction of the turbines and substation / control building;

- Use of cranes and half-constructed turbines forming a visible feature;
- Excavations for the borrow pits, foundations and access tracks;
- Transportation of materials and labour to and from the construction Site – disturbance and delay;
- Activities at the construction compound; and
- Construction of the substation / control building (disturbance).

13.35 Once operational, the turbines have potential to result in noise impacts on local recreational facilities, and visual impacts to features within the wider local area. These are discussed below.

13.36 A Community Fund is proposed in association with the Development. The exact nature of the fund and the activities to be funded would be subject to negotiation with the local community and Aberdeenshire Council. Further information is available within the Pre-Application Consultation Report submitted as part of the planning application.

Predicted Impacts

Construction Impacts

Employment

13.37 Since unemployment in Aberdeenshire is lower than the national average[20], the area is considered to be a receptor of low sensitivity in relation to employment. In terms of magnitude of impact, approximately 20 staff would be employed on the project during the proposed construction period. Whilst a proportion of those staff would be employed from further afield due to specialist requirements, Force 9 Energy would seek to employ the services of local people and businesses, wherever possible, to support the construction works. This is a small magnitude of change resulting from the creation of jobs and the overall effect would therefore be beneficial but not significant.

Local Economy

13.38 With respect to businesses in the wider community, the Development would result in a small additional contribution to local trade during the construction works through the requirements for local accommodation and use of local services by construction staff. The magnitude of impact is anticipated to be small (given the numbers involved and relatively short term timescale), and with low sensitivity receptors (due to their local nature) the effect would be beneficial but not significant.

Visitor Attractions

13.39 The visitor attractions listed in Table 13.5 and discussed above are considered to range from local to regional, i.e. of low to medium sensitivity. This is due to the nature of the attractions and likely visitor numbers and source of visitors. As several of the attractions have an outdoor focus, there is a corresponding increase in the importance of their visual setting.

13.40 None of the visitor attractions identified in Table 13.5 are located within the Site and all are located a sufficient distance from the Site (greater than 10km) such that there would be no nuisance effects in relation to noise or dust. Given the relatively short-term nature of the construction works, any views of the construction works experienced by visitors to the identified attractions would be temporary and possibly intermittent and the likely indirect visual impact magnitude is considered to be small. The overall effect of the construction of the Development on local visitor attractions is concluded to be not significant.

13.41 Potential indirect impacts may be experienced by visitors travelling along the A97 or B9025, if subject to minor delays due to abnormal load deliveries (refer to Chapter 11: Traffic and Transport). Any such impacts, whilst adverse, would be temporary and of small magnitude i.e. not significant.

Recreation and Community

13.42 The Scotways Rights of Way on and in the vicinity of the Site, together with the proposed core paths in the wider area, are considered to be of local importance i.e. receptors of relatively low sensitivity. During the construction of the Development, the paths within the Site in the vicinity of active construction areas would need to be temporarily closed to ensure the health and safety of local walkers. The annual numbers of users of these rights of way are not known, therefore as a precautionary measure, the CEMP would set out alternative routes for the Scotways paths, to be agreed post-consent with Aberdeenshire Council and Scotways. Notices would be placed at each end of the rights of way informing users of the temporary closure and directions to the alternative routes. The overall impact significance is considered to be not significant, as these would be temporary closures with alternatives provided.

13.43 The ZTV (Figure 8.7 in ES Volume II) indicates that construction activity would be visible from the Scotways paths to the west (GB95 and GB96) and south (GB44, GB46, GB48 and GB51) of the Site. Given the proximity of these paths to the Site and active construction areas the temporary adverse visual impact magnitude is predicted to be moderate to large for these local receptors. The impact significance is therefore determined to be not significant.

13.44 The NCN1 cycle route (and North Sea cycle route) can be considered a receptor of medium (regional) sensitivity and the Aberdeenshire Council cycle routes can be considered a receptor of low sensitivity. During the construction works activity on the Site is considered likely to be intermittently visible along these various routes. Any such sequential, temporary visual impacts would be reduced considerably due to screening by landform and local vegetation. The impact magnitude would therefore be no more than small and the associated visual impacts on the recreational routes would be not significant.

Operational Impacts

Employment

13.45 The operation of the Development would result in negligible beneficial change to local employment, since any maintenance and servicing would be completed by staff associated with the operator of the Development. Employment impact significance would therefore not be significant.

Local Economy

13.46 The operational Development would result in the loss of approximately 1.36ha of land from a total Site area of 363ha i.e approximately 0.4% land take. The current agricultural practices on the Site would continue during the operation of the Development, therefore an effect of negligible significance is predicted in relation to landowner activities and business.

13.47 The Hill of Maunderlea Lodges are a receptor of local importance and the Scottish Government report indicates that most individuals (63% of respondents) preferred a landscape from a hotel bedroom without a wind farm. The ZTV (Figure 8.7 in ES Volume II) indicates that the lodges would have visibility of the Site and the completed Development. There may therefore be a change in views from some rooms of the lodges (and indeed from rooms in other local accommodation). The magnitude of any such change would be dependent on the location of the accommodation, the orientation of the building and the rooms, the duration of stay of any occupant and any local screening (intervening planting and/or buildings). Visitors would not necessarily be aware of any change to the view if it is their first visit to the accommodation.

13.48 Visitors to the area staying in local accommodation are a transient receptor, tending to stay for a relatively short period of time, however, it is possible that a small number of visitors may have an adverse reaction to the presence of the Development. This would be a temporary impact and should alternative rooms be available without such views, any such effect could be immediately addressed.

13.49 Visual effects of the Development are assessed in detail in ES Chapter 8. It is considered that the presence of the Development would be unlikely to have a significant socio-economic effect on local visitor accommodation.

Tourism

13.50 The visitor attractions listed in Table 13.5 are considered to range from local to regional importance i.e. of low to medium sensitivity. There would be no direct impacts to the identified visitor attractions since none are located within the Site and all are located a sufficient distance from the Site such that there would be no operational noise impacts.

13.51 The ZTV (Figure 8.7 in ES Volume II) suggests that views of the Development would be limited to two of the attractions listed in Table 13.5, namely Craigston Castle and The Old School, Boyndie, though the model does not take account of potential screening by intervening buildings and/or vegetation. Given the distance between the Site and

receptors the Development would be unlikely to comprise a significant visual feature in views from these receptors. Visitors are also temporary, transient receptors, with views experienced altering as visitors moved around the attractions. The Scottish Government study indicates that tourist perceptions of an area are unlikely to significantly alter on viewing a wind farm (or prevent a return visit). The impact magnitude is concluded to be small and the overall effect would not be significant.

Recreation and Community

13.52 Once the Development was operational, the Scotways Rights of Way through the Site would be re-opened. Given the proximity of the turbines to the footpaths the visual impact on users of the footpaths would be large, however, as these are local recreational features and receptors of (relatively) low sensitivity, following Table 13.5 the overall impact significance of the Development on these features would be 'not significant'.

13.53 The Scotways rights of way and proposed core paths in the vicinity of the Site are also considered to be locally important i.e. of relatively low receptor sensitivity. The potential visual impact magnitude would be considered to be moderate to large according to the distance to and extent of view of the Development and therefore, the overall significance of effect on these recreational features is determined to be not significant.

13.54 The closest section of the NCN1 cycle route (and North Sea Coastal Route) runs through the River Deveron Valley and the route and recreational users of the valley can be considered as a receptor of medium sensitivity. ES Chapter 8: Landscape and Visual Assessment includes discussion of the visual impact of the operational Development on the River Deveron Valley (Viewpoint VP06: Mains of Eden). It concludes there would be an effect of major/moderate significance on recreational users of the valley, which would be a significant visual effect.

13.55 The ZTV indicates that the Turriff golf course and Duff House Royal Golf Club course would not have views of the Development, but some areas of the Royal Tarlair Golf Club may have views of the Development. Users of the golf course are classed as a receptor of low to medium sensitivity. Given the distance between the golf course and the proposed turbines (approximately 13km) the Development would be unlikely to form a significant feature in any views and the magnitude of potential impact on users of the golf course is concluded to be small. The overall effect of the operational Development on the golf course would therefore be 'not significant'.

Decommissioning

13.56 It is considered that the decommissioning works would have largely the same impacts as those predicted for the construction phase of the Development; i.e. impacts would be not significant.

Mitigation and Residual Effects

13.57 The assessment above takes into account the inherent mitigation within the design and the embedded mitigation as set out in Chapter 3: Project Description. The assessment is also made assuming mitigation measures proposed in other relevant chapters within this ES would be implemented.

13.58 No potentially significant effects have been identified, with the exception of visual effects of the operational Development on recreational users of the Deveron Valley to the east (including users of National Cycle Route 1 / the North Sea Cycle Route).

Cumulative Impacts

13.59 Due to the large number of wind farms within 30km only the single turbines (or greater number) wind farms above 50m in height and within 15km of the Development have been considered within the cumulative assessment. The locations of the identified operational, consented, and proposed wind farms within a 15km radius of the Site are shown in Figure 8.24.

13.60 Should all the proposed wind farms be consented and constructed this would provide a number of jobs and training opportunities, allowing the regional renewable energy skills set to be developed and improved. This would be a cumulative beneficial effect.

13.61 No significant cumulative visual impacts were predicted in ES Chapter 8 Landscape and Visual Impact Assessment. On this basis no significant indirect cumulative effects on local recreational facilities and visitor attractions are predicted.

13.62 The Mains of Auchinderann is a consented wind farm located approximately 3km to the west of the Site. Some cumulative local adverse visual effects between this wind farm and the Development are likely on the proposed core paths and Scotways Rights of Way in the vicinity of the Site.

Chapter 13 References

[1] http://www.scotland.gov.uk/Resource/Doc/357756/0120893.pdf

[2] http://www.scotland.gov.uk/Resource/Doc/342622/0114018.pdf

[3] http://www.scotland.gov.uk/Publications/2010/11/15085756/0

[4] Aberdeenshire Council, 2012, Supplementary Guidance Policies Part 1 http://www.aberdeenshire.gov.uk/planning/plans_policies/SGPOLCIESpart1.pdf

[5] Scottish Government, Scottish Planning Policy http://www.scotland.gov.uk/Publications/2010/02/03132605/12

[6] Department for Environment, Food and Rural Affairs, 2005, Securing the Future, the UK Government Sustainable Development Strategy

[7] http://www.scotways.com

[8] The Economic Impacts of Wind Farms on Scottish Tourism. Available at http://www.scotland.gov.uk/Publications/2008/03/07113554/0

[9] Aberdeenshire Council, 2011, Core Paths Plan Map http://www.aberdeenshire.gov.uk/outdooraccess/core_paths_plan/maps.asp

[10] Aberdeenshire Council, 2011, Statistics by Location http://www.aberdeenshire.gov.uk/statistics/area/index.asp

[11] Aberdeenshire Council, 2012, Labour Market Bulletin, 1st Quarter 2012 http://www.aberdeenshire.gov.uk/statistics/economic/LabourMarketBulletin1Q2012.pdf

[12] National Statistics http://www.statistics.gov.uk/hub/index.html

[13] Aberdeenshire Council, 2011, Economic Development Strategy 2011 - 2016

[14] Visit Scotland http://guide.visitscotland.com/vs/guide/5,en,SCH1/objectId,RGN421vs,curr,GBP,folder,ATTRACTION,season,at1,selectedEntry,sights/sights.html

[15] Moffat Centre Visitor Attraction Monitor 2009

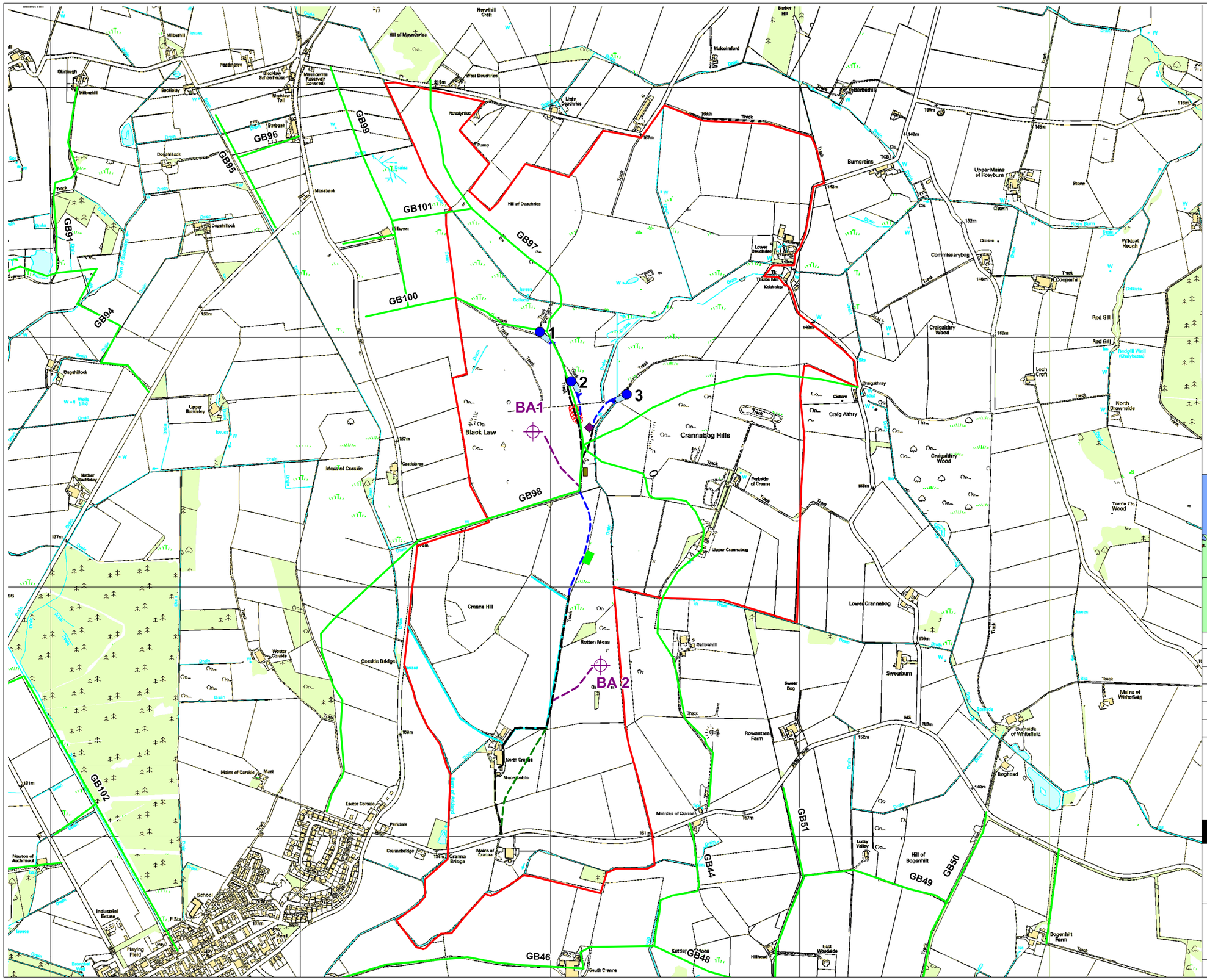
[16]Hill of Maunderlea Lodges, 2012 http://www.aberdeenshireluxurylodges.com/index.html (accessed 18 July 2012)

[17] http://www.walkhighlands.co.uk/aberdeenshire/banff-whitehills.shtml

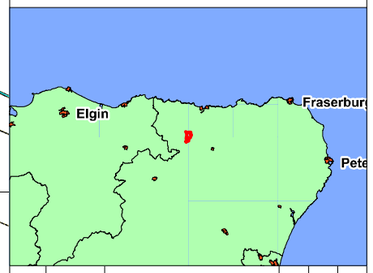
[18] http://www.sustrans.org.uk/

[19] The Economic Impacts of Wind Farms on Scottish Tourism. Available at http://www.scotland.gov.uk/Publications/2008/03/07113554/0

[20] http://www.aberdeenshire.gov.uk/statistics/economic/labour.asp



Proposed Turbine
Site Boundary
Existing Road to be upgraded
Proposed Access Track to WTGs
Proposed Access Track to Identified Borrow Areas
Crane Hard Standing
Proposed Control Building Compound
Proposed Construction Compound
Potential Borrow Pit Locations
Proposed Anemometer Mast Location
Alternative New Access Track
Identified Potential Shallow Rock
Scotways Rights of Way
Wider Network (Draft Core Path Plan)



Rev	Date	Description	Drn	Chk	App
01	10.07.12	Site Layout	BF	ND	PB
00	14.12.11	Site Layout	BF	ND	PB

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 13.1 - Public Rights of Way and Other Routes

SCALE: 1:15,000 @ A3 | REV 01

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES Fig 13.1.Wor

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14 EMI, INFRASTRUCTURE, AVIATION AND SAFETY

Introduction

14.1 This chapter considers the potential impacts of the Development on existing infrastructure, telecommunications, utilities aviation infrastructure and public safety issues. These matters have been investigated through consultation with the relevant system operators and accounted for in the iterative wind farm design process. This design process ensures that wherever possible, turbines are located in areas where there would be no impacts on infrastructure, telecommunications, utilities or aviation safety. Where this is not possible, agreement is sought with the providers of such services for alternative arrangements to be made so that these services would not be affected by the Development.

14.2 This chapter has been written by The Wind Consultancy Service and Force 9 Energy.

Policy Context

14.3 Online Advice regarding Onshore Wind Turbines, published by the Scottish Government (formerly PAN45), notes that wind farms have the potential to disrupt lines of communication and radar, affect television reception and impact on existing infrastructure. The advice suggests applicants should make direct contact with the operators of such infrastructure to ensure their proposals do not impact on services adversely. The advice also deals with matters around public safety.

Method of Assessment

14.4 The infrastructure, telecommunications, utilities and aviation safety assessment is largely based on consultation by The Wind Consultancy Service (TWCS), Force 9 Energy LLP and RSK with a number of organisations known to have an interest in infrastructure, telecommunications, utilities and aviation safety in the proposed area of the Development.

14.5 During 2010/11, The Wind Consultancy Service (TWCS) and Force 9 Energy LLP undertook a desk-based consultation exercise to establish the baseline relating to infrastructure in and around the Site. The following organisations were consulted:

- British Broadcasting Corporation (BBC) (website only consulted);
- Civil Aviation Authority (CAA);
- Joint Radio Committee (JRC);
- Linesearch;
- Ministry of Defence (MOD); and
- Ofcom.

14.6 A qualitative assessment of the potential risks presented to the public from the construction, operation and decommissioning of the Development (due to public access to the Site and general health and safety issues) was completed. This used relevant guidance documents (web-based Planning Advice Note (PAN) on Onshore Wind Turbines[1], previously PAN45: *Renewable Energy Technologies*) and professional judgement obtained during work relating to a large number of previous wind farm projects.

14.7 This chapter concentrates on identifying impacts on existing infrastructure and promoting methods of mitigation so there are no residual impacts.

Baseline Environment

Infrastructure

14.8 An enquiry was entered into the Linesearch facility which "Provides a single point of contact for all initial enquiries relating to the apparatus owned and/or operated by our Members, which now totals some 7,900 kms of pipeline and fibre optic cable ducts". The results of this enquiry showed that the Development was not in the zone of interest for any of the listed organisations.

Telecommunications

14.9 Following consultation with Linesearch, Ofcom and the JRC, Neos Networks (on behalf of Scottish and Southern Energy) provided detailed location information for their telecommunication links which have the potential to be affected by the Development. The closest telecommunication link is located 1.5km to the east of the Site.

14.10 The online BBC Windfarm Tool (which provides an estimate of the population numbers potentially affected by the installation of wind turbines) indicated in March 2011 there may be interference with local transmitters, with the result that no homes may be affected for which an alternative off-air service may be available however one home may be affected for which an alternative was not available.

Aviation Safety

14.11 Under the Civil Aviation Act, the CAA is responsible for providing advice about aviation safety. The Authority's Directorate of Airspace Policy (DAP) has the lead responsibility within the CAA for all wind turbine related issues. The Authority's policy on wind turbine development and related guidance to the UK civil aviation community is set out in CAP 764. The CAA changed its policy regarding pre-planning consultations in December 2010, stating that "*it will no longer process pre-planning enquiries unless submitted as a Scoping Opinion through a Local or National Planning Authority. As completion of the pre-planning process is not a statutory requirement, the CAA's decision will not affect the formal planning process.* "

14.12 No consultation has therefore been undertaken with the CAA.

14.13 Data published by the Department of the Environment and Climate Change[2] has been used to assess the likely impact of the Development on aviation interests. The Development:

- Lies outside any consultation zone for safeguarded aerodromes;
- Lies outside areas of concern for meteorological radars; and
- Lies on the edge of an area where there may be effects on the Secondary Surveillance Radar (SSR) located near Fraserburgh.

14.14 Local planning authorities will consult local aerodromes as follows:

- Officially safeguarded aerodromes: Planning authorities must consult aerodromes on all matters relating to safeguarding (DfT / ODPM / NAFW Circular 1/2003 and Scottish Circular 2/2003 refers); and
- Non-officially safeguarded aerodromes: Aerodrome Operators are advised to establish a consultation process with local planning authorities.

14.15 The MOD was consulted on the scoping wind farm design (refer to ES Chapter 2: Alternative and Design Evolution) by Force 9 Energy LLP in January 2011. The MoD responded confirming no objections to the Development and this was again confirmed verbally in November 2011. The submitted design is more compact and at a lower elevation than the original design and as such, is unlikely to elicit an objection.

Project Characteristics

14.16 The Development was designed with due consideration of telecommunication links and other elements of infrastructure understood to cross the area, based on the consultation responses from relevant organisations.

Predicted Impacts

Construction and Decommissioning

14.17 There would be no predicted impacts on infrastructure, telecommunications, or aviation safety during the construction and decommissioning of the Development.

Public Safety

14.18 Public safety and the safety of site workers is a concern during the construction period. Safety precautions for workers and the general public would be considered under relevant legislation.

Operation

Infrastructure

14.19 Responses from all organisations listed on the Linesearch facility stated that the locations of the turbines as planned would not interfere with the operation of any of the utilities in question. There would therefore be no impact on utilities above and below ground based on the submitted design.

Telecommunications

14.20 Like any large structure, wind turbines have the potential to interfere with electromagnetic signals, a process which can affect communication networks, television reception and the telemetry systems used by utilities providers.

14.21 The web based Planning Advice Note (PAN) on Onshore Wind Turbines, previously PAN45: *Renewable Energy Technologies*, describes how wind turbines produce electro-magnetic radiation and this can interfere with broadcast communications and signals. Turbines affect electromagnetic transmissions in two ways: by blocking or diverting line of sight transmissions, or by scattering signals. These effects can result in the degradation of television reception with a loss of picture quality or acoustic interference. Microwave links and local radio communication systems can be disrupted.

14.22 It is known that wind farms have the potential to adversely affect terrestrial television reception up to a maximum distance of 5km (BBC *et. al.*1999). As there are a number of dwellings within 5km of the proposed turbine locations, this is a matter for further consideration.

14.23 Both analogue and digital television signals are transmitted using Ultra High Frequencies (UHF). There are two main mechanisms whereby a wind farm could potentially interfere with television reception. These are 'shadowing' impacts and 'reflection'/or 'scattering' impacts.

14.24 Just as a solid object causes a shadow to develop in the visible spectrum, a similar effect can occur in the UHF spectrum. If an object is placed between a terrestrial television transmitter (analogue or digital) and a receiver, a 'shadow' zone may develop whereby there is a reduction in signal strength, which may reduce picture and audio quality. In relation to a wind turbine, the size of the shadow is dependent on the blade orientation and is greatest when the axis of the rotor is in line with the direction of the transmitted signal. The signal strength within a shadow caused by a turbine will vary in a cyclic manner related to the rotor frequency. The 'shadow' zone will decrease in overall impact with distance up to a maximum of 5km.

14.25 When a transmitted television signal (analogue or digital) is incident upon a static or moving wind turbine, there is the potential for the signal to be scattered, i.e. reflected. If a receiver then picks up a scattered signal, a time delay would have occurred between the originally received signal and the scattered signal (i.e. it would have travelled a longer path). This can cause a reduction in picture quality through a phenomenon known as 'ghosting' for analogue receivers. This is less likely to occur with digital receivers, which are more robust.

14.26 When several turbines are sited in close proximity, the interactions of these interference mechanisms are complex and difficult to predict. There are, however, several ways that any potential problems can be mitigated. The BBC et al. (1999) recommend that turbines should be sited at least 500m away from a viewer. This will help reduce the likelihood and severity of any interference.

14.27 Development design iterations have aimed to maximise the distance between turbines and residential dwellings and this has resulted in a minimum separation distance to properties of more than 500m. If a reduction in television reception quality occurs in the surrounding area, it is most likely to be noticed when the Development becomes operational.

Aviation

14.28 Like any large structure, wind turbines have the potential to interfere with electromagnetic signals, a process which can affect various systems concerned with civil and military aviation and radar. The web-based Planning Advice Note (PAN) on Onshore Wind Turbines, previously PAN45: *Renewable Energy Technologies*, describes how the rotating blades of wind turbines can create electromagnetic effects, which can degrade the performance of aeronautical systems and cause incorrect information to be received. These effects can cause turbines to appear as returns on radar systems representing 'clutter' for air traffic control services and degrading the signal when tracking aircraft through an area of a wind farm.

14.29 The South West Scotland Regional Aviation Solution Group, Final Radar Feasibility Study 2010 (the SW Scotland Study)[3] notes of Secondary Surveillance Radar (SSR) that:

"SSR requires active two-way communication between radar and aircraft. A transponder onboard the aircraft is interrogated by a series of pulses transmitted by the radar. The spacing of these interrogation pulses represents a question and the aircraft transmits a series of pulses in response.

The time delay between interrogation and the arrival of the response coupled with the radar's antenna direction at the time of reception allow the radar to calculate a 2-dimensional position. From information encoded within the responses the radar can add the third dimension and an identity code.

The newest generation of SSRs are known as Mode-Select (Mode-S) radar. Mode-S radar operate using the same principles as SSR however rather than repetitively broadcasting two questions; "how high are you?", and "what is your ID code?", Mode-S radar have the ability to selectively interrogate individual aircraft and request specific information. Mode-S relies on aircraft being equipped with Mode-S compliant transponders. All SSR should be Mode-S by 2012.

The reliance of SSR on onboard equipment means that aircraft without transponders or those whose transponders are either switched off or faulty will not appear at all on the controllers display unless the aircraft is detected by a supporting PSR."

14.30 It goes on to note that:

At short ranges large objects such as turbines have the potential to disrupt the operation of an SSR; however as turbines do not carry transponders SSRs are not as susceptible as PSR to wind turbine generated false detections and there are very few wind turbine objections raised on SSR grounds.

14.31 There are therefore no predicted impacts on the SSR. Furthermore, as the Site lies outside any area of concern for Primary Radar, there are not expected to be any significant impacts on radar infrastructure in the area.

Public Safety

14.32 As with any tall structure, wind turbines can be susceptible to lightning strike and a very small number of wind turbines have been known to fail due to lightning or mechanical failure, though such incidents are very rare. In cold weather, ice can build up on blade surfaces when operating. The ice could be thrown from the blades without sufficient protection in place.

Mitigation

Infrastructure

14.33 A micrositing provision has been requested such that any turbine can be moved up to 30m taking into account known environmental constraints. Should this provision be granted, it would be used to respond to any additional unforeseen infrastructure constraint.

Telecommunications

14.34 To mitigate any problems with television reception, Force 9 Energy and EDF would accept a planning condition to assess current television signals in advance of the Development and mitigate any post-development problems with television reception arising where impacts are attributable to the Development. Consultation suggests that only one property may be affected where there is no terrestrial solution to the issue. In the unlikely event that interference does occur, this would be localised.

14.35 The planning condition would require Force 9 Energy LLP and EDF to meet the cost of investigating and effectively rectifying any problems should they arise and to implement solutions in a timely manner so as to minimise any inconvenience to residents. It is expected that issues, if they arise, would arise in the first year of operation of the Development and any remedial work would be limited to this period only.

14.36 Viewing quality could be improved by considering each or a combination of the following mitigation techniques:

- Replace or upgrade the receiving aerials (e.g. with directional receiving aerials) for affected households;
- Re-tune the television receivers at affected households;
- Re-align the television aerial to an alternative transmitter and re-tune the receiver at affected households;
- Provision of digital television for affected households (this could be achieved by terrestrial, cable or satellite receivers); and/or
- Provision of a bespoke ‘self-help’ solution (this could comprise a new low powered transmitter, a cable network, a satellite receiver or a combination of these measures).

14.37 By using a solution based around these techniques, any effects from the Development on television reception quality for existing viewers during its operational life would be fully mitigated.

Aviation Safety

14.38 There are no expected impacts on aviation safety and therefore no requirement for mitigation.

Public Safety

Construction

14.39 In order to ensure the risk to public safety is minimised during the construction phase of the proposed development, EDF ER and their Contractors will adhere to the Construction (Design and Management) Regulations 2007[4] and other relevant UK health and safety legislation including:

- Health and Safety at Work Act 1974;
- Management of Health and Safety at Work Regulations 1999;
- Construction (Health, Safety and Welfare) Regulations 2007;
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1995); and
- British Wind Energy Association (BWEA) Health and Safety Guidelines (2007).

14.40 All potentially hazardous areas such as excavations and electrical installation works would be fenced off and all unattended machinery would be stored in the site compound or immobilised to prevent unauthorised use.

14.41 Appropriate warning signage would be installed concerning any hazards, areas where access is restricted or prohibited such as transformers, switchgear and metering systems and to alert any site users to the potential for increased risks under certain meteorological and operating conditions.

Operation

14.42 Wind turbines installed would comply with the BS EN 61400 series which provides the design requirements for onshore wind turbines.

14.43 Wind farms have a proven good public safety track record. As with any tall structure, wind turbines can be susceptible to lightning strike, and a very small number of wind turbines have been known to fail due to lightning or mechanical failure, though such incidents are very rare. Appropriate measures are included in the turbine design to conduct lightning strike down to earth and minimise the risk of damage to turbines. Occasionally however, lightning can strike and damage a wind turbine blade. Modern wind turbine blades are manufactured from a glass-fibre or wood-epoxy composite in a mould, such that the reinforcement runs predominantly along the length of the blade. This means that blades will usually stay attached to the turbine if damaged by lightning, and in all cases, the turbine will automatically shut down if damaged.

14.44 In cold weather, ice can build up on blade surfaces when operating. The turbine can continue to operate with a very thin accumulation of snow or ice, but will shut down automatically as soon as there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly. Once the ice has thawed and the turbine re-starts in circumstances such as this there is a slight possibility that fragments of ice or snow will be released from the rotor and will drop within close vicinity of the turbine. The risk to public safety is considered extremely low due to the initial slow rotational speed of the rotor and because such fragments are sufficiently small and lightweight to allow the rotor assembly to be back in balance before restarting.

14.45 Turbine control and monitoring systems operate with several levels of redundancy to protect the plant from damage. In the case of faults arising, including over-speed of the blades, overpower production, or loss of grid connection, turbines shut down automatically through braking mechanisms. In addition, turbines may be fitted with vibration sensors so that if, in the unlikely event a blade is damaged, the turbine will automatically and immediately shut down.

Residual Impacts

14.46 All potential impacts in respect of infrastructure, telecommunications, utilities, aviation and safety would be mitigated, therefore no significant residual impacts are predicted.

Cumulative Impacts

14.47 As all impacts are mitigated, there are not expected to be any cumulative impacts with other existing or planned wind farms.

Chapter 14 References

[1] http://www.scotland.gov.uk/Resource/Doc/212607/0114118.pdf

[2] https://restats.decc.gov.uk/cms/aviation-safeguarding-maps

[3] South West Scotland Regional Aviation Solution Group, Final Radar Feasibility Study: The Scottish Government Feb 2010

[4] In accordance with UK health and safety legislation Force 9 Energy LLP will undertake a quantitative risk assessment for construction, operation and decommissioning of the proposed Deuchries Wind Farm.

15 SHADOW FLICKER

Introduction

15.1 This chapter presents an assessment of the potential shadow flicker impacts of the Development. Shadow flicker (sometimes referred to as light flicker) is the term used to describe the impact on residential amenity caused by the intermittent reduction in the intensity of light at a particular location by the rotating blades of a wind turbine, seen in the form of a shadow. A more detailed explanation is provided below.

15.2 This chapter quantifies the geographical area over which shadow flicker could potentially occur, sets out an assessment of the duration and timing of these impacts and demonstrates the "worst case" circumstances under which shadow flicker could occur in the vicinity of the Development. It also identifies the measures that could be employed to mitigate any impacts as necessary.

Policy Context

15.3 Scottish Online Planning Advice[1] refers to shadow flicker in relation to wind turbines and states the following:

15.4 "Where this could be a problem, developers should provide calculations to quantify the effect. In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem. However, there is scope to vary layout / reduce the height of turbines in extreme cases."

15.5 Other than the recommendation noted above, there is no national, regional or local policy in respect of limits or standards for shadow flicker, simply a requirement that applicants provide an analysis. Such an analysis is provided in this chapter.

Method of Assessment

Introduction

15.6 Shadow flicker can occur under certain combinations of geographical position, time of day and wind conditions (speed and direction) when the sun passes behind the rotating blades of a wind turbine and casts a shadow over neighbouring properties. As the blades rotate, the shadow flicks on and off when viewed from specific locations; this produces an effect known as "shadow flicker" for the observer. Shadow flicker can occur inside buildings where the flicker appears through a narrow window opening. The likelihood and duration of the impact depends upon:

- Orientation of the property relative to the turbine(s) - in the UK only properties within 130° either side of true north, relative to any turbine can be affected as turbines do not cast long shadows on their southern side;

- Distance from turbine(s) – problematic flicker effects have been shown to only occur within ten rotor diameters of a turbine[2];
- Turbine height and rotor diameter.
- Time of year and day.
- Weather conditions (i.e. cloudy days reduce the likelihood of shadow flicker occurring).
- Wind speed and wind direction – the wind speed at any particular turbine would need to be greater than 3-4m/s (depending on turbine model) and less than 25m/s in order for the blades to rotate. In addition, the shape of the shadow will be determined by the position of the sun relative to the blades (which will be rotated to face into the wind).

15.7 A study into the health related effects of shadow flicker[3] showed that the frequencies which produce disturbance and nuisance to the majority of the population lie above 2.5 Hertz (Hz, the unit of frequency, in this case relating to the frequency of the turbine blade rotation). This is true both of the general population and for the 2% who suffer from epilepsy, 5% of whom i.e. 0.1% of the general population, have exhibited an adverse reaction to flicker effects above 2.5 to 3Hz. This rotational frequency is well above the maximum frequency from turbines within the 80m rotor range as are proposed for the Development, which is typically less than 1Hz and is therefore well below that considered to be the cause of nuisance[4]. In addition the same reference considered that no adverse health impacts will occur as a result of shadow flicker. Even though no adverse health impacts would result from any shadow flicker created by the Development, it is nevertheless important to assess the shadow flicker impacts to ensure that any potential for nuisance is identified and minimised or eliminated from the Development.

Methodology

15.8 Shadow flicker is only a consideration in the operational phase of a wind farm development, as clearly, in both the construction and decommissioning phases, no turbines are installed and no shadow flicker can occur. This chapter is only therefore concerned with the operational phase of the Development.

15.9 The established methodology[4] assesses properties within a ten rotor diameter distance, which normally provides sufficient protection of amenity. Residential properties were identified within this zone, and which lie within 130° either side of true north relative to the proposed turbine locations and within the theoretical shadow of the Development. These are the properties in which shadow flicker could potentially occur under the perfect conditions.

15.10 The assessment has been predominantly desk-based with assumptions made about the location and sizes of windows for individual residential properties. These have been confirmed, as far as reasonably practical, during a site visit. It was not possible to gain access to all properties and reasonable assumptions have been made in those cases.

15.11 The date, times and durations of shadow flicker have been predicted for assumed or confirmed windows of each property using the Shadow Flicker module of EMD's

WindPRO software[5]. The software, which is typical of those in use in the wind energy industry, creates a mathematical model of the Development, its location (in terms of longitude and latitude for sun trajectory calculations), the surrounding terrain and the locations of properties. The following factors are taken into account in the calculation:

- Turbine locations, rotor diameter and hub height;
- Topography;
- Locations of houses/buildings;
- Position, size and orientation of windows on buildings; and
- Latitude and longitude of the Site (used in calculating the position of the sun at any given time during any given day).

"Worst Case" Conditions

15.12 WindPRO's Shadow module calculates the dates and times when the shadow of a wind turbine's rotor would fall on to a window. The following 'worst-case' assumptions are made in the calculation:

- Weather conditions are such that shadows are always cast (i.e. conditions are always bright/clear/sunny at all times of day when the sun is above the horizon and throughout the year);
- There is no vegetation or other structures screening the line of sight from the shadow receptor (i.e. the windows of the properties) to the turbine(s) which would potentially reduce the effects of shadow flicker events;
- The turbine is always operating such that shadows are cast during the entire length of the day (in reality, wind turbines operate for 80-85% of the time depending on the wind regime at the site); and
- At all times, the turbine is facing directly towards the receptor and therefore the shadow is its maximum possible size and circularity rather than elliptical as would be the case if the turbine were orientated at an angle to the receptor (in reality, the wind direction will vary and the turbine will not be facing the receptor for the majority of the time).

Quantification of the Potential Impacts

15.13 The shadow flicker potential impacts have been quantified as follows:

- Duration of impact on each occasion that it occurs (date, start time, end time, turbine causing the shadow);
- Number of impacts occurring per year (days per year); and
- Total number of shadow hours per year.

Assessment Criteria

15.14 Shadow flicker has rarely been a problem in connection with wind farms in the UK and there are currently no guidelines available on what frequency/duration of exposure is acceptable. In order to provide a framework for the acceptability of the Development, in terms of shadow flicker, the figure of thirty hours per year and thirty minutes per day, under 'worst case' conditions is used as an acknowledged acceptable level[678]. Should shadow flicker events be less than this 'rule of thumb' no significant effects would be expected.

Information Gaps

15.15 In the case of the majority of properties, orientation, number of windows and dimensions were based on observations made during site visits. On certain properties, it was necessary to make assumption on window numbers, dimensions, and/or orientation. Windows were assumed to be 1m wide by 1.5m high at ground floor and first floor heights, dimensions of windows are based on observations made during the site visit.

15.16 This information was used in the Shadow Flicker module of EMD's WindPRO software[5] to assess the worst-case scenario of potential shadow flicker events. A recent study has confirmed the suitability of the model[9].

Baseline Environment

15.17 Figure 15.1 and Table 15.1 show the locations of the properties included in the assessment.

Table 15.1 Residential Property Shadow Flicker Assessment Locations

Property name	Easting	Northing	Nearest Turbine	Distance to nearest turbine
Castlebrae	363387	854474	#2	780m
Upper Crannabog	364607	854183	#3	659m
Parkside of Cranna (rear façade)	364751	854426	#3	562m
Kebholes	364958	855264	#3	817m

Project Characteristics

15.18 The Development would comprise three wind turbines with a hub height of up to 65m and a rotor diameter of up to 80m, such that maximum height to the tip of the blade would be 100m.

15.19 A standard design practice to prevent the effects of shadow flicker would be to avoid siting turbines within ten times the rotor diameter of any property (800 m). Only three properties (Castlebrae, Upper Crannabog and Parkside of Cranna) lie within this distance. Aside from these, the next nearest properties are over 800m away, and so it is less likely that there would be any shadow flicker impacts at any other properties. The property at Kebholes is 817m away from the nearest turbine but is also included in the calculations for completeness.

Predicted Impacts

15.20 Results of the modelling of the properties are summarised in Table 15.2 and Figure 15.2. Appendix 15.1 provides a more detailed review of the particular results for each named property, in the form of a 'Shadow Flicker Calendar'.

15.21 It should be noted that the results listed below are based on a "bare earth" model with no intervening vegetation. Given this, and the reduction in the probability of shadow flicker as a result of wind speed, wind direction and sunshine variability, the actual values at the properties are likely to be considerably less in reality. A more realistic case, taking into account weather conditions and operational probabilities could be expected to be between 60 to 70% less than the worst case scenario as assessed below.

15.22 In addition, the location of some of the blocks of forestry on the Site may further reduce shadow flicker impacts. Of particular note is the existing 10-15m high conifer shelter belt approximately 5m from the rear of the property at Parkside of Cranna. Any such reduction in impact may increase over the operational lifetime of the Development, as the plantation blocks continue to grow.

Table 15.2 Results for Property Locations Assessed for Shadow Flicker

Property name	Total potential shadow flicker hours per year (hrs:mins)	Days per year on which shadow flicker may occur	Maximum potential shadow flicker hours in any one day (hrs:mins)
Castlebrae	0:00	0	0:00
Upper Crannabog	0:00	0	0:00
Parkside of Cranna (rear façade)	37:32	85	0:36
Kebholes	22:18	73	0:31

15.23 There are no accepted guidelines for the acceptability of levels of shadow flicker, however in Germany, the figure of thirty hours per year and thirty minutes per day, under "worst case"' conditions is an acknowledged acceptable level not likely to give rise to significant effects and therefore deemed acceptable[6,7]. The results show that one of the properties studied, Parkside of Cranna, would experience higher levels of shadow flicker than is considered acceptable in other countries, under "worst case" conditions. The remaining properties show total theoretical shadow flicker hours of less than thirty hours per year and no more than thirty minutes on any day on which shadow flicker might occur.

15.24 At Castlebrae and Upper Crannabog, no shadow flicker is predicted to to the relative locations of the properties and the turbines.

15.25 At Parkside of Cranna the worst case scenario is that the property could experience shadow flicker for 37 hours and 32 minutes over the year (rear façade). Turbines 2 and 3 could cause the shadows here between May and August, typically between 15:30 - 21:30 local time. These figures do not include the mitigation effects of the shelter belt which is in place at the property.

15.26 At Kebholes the worst case scenario is that the property could experience shadow flicker for 22 hours and 18 minutes over the year (windows of the conservatory to the rear of the property). All three turbines could individually cause the shadows here

between February and March and again in September to November, typically between 15:30 18:20 local time.

15.27 The modelled impacts show that at one of the properties assessed, the maximum potential for shadow flicker falls above the limits considered to trigger the potential for significant effects used in Germany (no specific limit is set in Great Britain) and therefore there is the potential for a significant impact at this location (Parkside of Cranna).

Mitigation

15.28 The simplest form of mitigation for any potential significant shadow flicker event is to physically screen the affected property. In the particular case of the property which has been identified as likely to exceed the accepted limits from other countries, it is noted that that there is already a 10-15m high conifer shelter belt located approximately 5m from the rear of the property and in line with the direction of those turbines predicted to cause shadow flicker. This shelter belt would eliminate the majority of shadow flicker effects on the rear façade of the property and can therefore be considered as suitable mitigation such that there would be no shadows cast on the property and therefore no shadow flicker effect, whilst in situ. The owner of the property does not however retain control over the shelter belt. Should the shelter belt be removed and shadow flicker proves to harm amenity, alternative mitigation controls are available, as set out below.

15.29 If shadow flicker effects occur in practice at a particular property, it does not immediately follow that additional mitigation is required. Such effects would need to occur in a room that was occupied at the time of occurrence and for a duration that caused a nuisance. For example if the effect was predicted to occur for a three week period in the early hours of the morning in a room unlikely to be occupied with each occurrence lasting just a few minutes then it is unlikely that additional measures would be needed.

15.30 Once the location and turbine parameters are confirmed, the periods during which shadow flicker can occur are predictable. Therefore if, following a complaint to the planning authority and following investigation by the operator, shadow flicker is confirmed to result in a loss of amenity at any location then mitigation would be implemented. Effective forms of mitigation would vary to suit the specific circumstances but may include: window screening (with shutters, curtains or blinds); planting or constructing garden screening; or operational controls.

15.31 In the case of operational controls a specific turbine (or turbines) could be programmed to shutdown at specific times when the sun is bright enough to cast nuisance shadows. Solar sensors would be fitted on the nacelles of the turbines to monitor the light intensity to facilitate this function. There is no specific UK guidance regarding the level of light sufficient to cause a shadow flicker event. However, the actual light level that would trigger a turbine shut down can be manually configured on-site following installation, to reflect local conditions.

15.32 A planning condition would provide the opportunity to employ an appropriate form of mitigation to ensure that any complaints will be investigated in a reasonable timescale and that the rectification of any shadow flicker problem that is substantiated will be implemented promptly and effectively. A recent study[9] notes that "Mitigation measures which have been employed to operational wind farms such as turbine shut down strategies, have proved very successful, to the extent that shadow flicker can not be considered to be a major issue in the UK".

Residual Impacts

15.33 Using the mitigation available, no significant impacts are predicted from the Development.

Cumulative Impacts

15.34 There are no other wind farms within distances of the Site that would cause cumulative shadow flicker effects.

Chapter 15 References

[1] Scottish Government (SG). *Online Planning Advice - Onshore Wind Energy*. [Online] Available from: http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables/Onshore [Accessed 27/07/2012].

[2] Great Britain. Department of Communities and Local Government (DCLG). *Planning Policy Statement 22: Planning for Renewable Energy*. A Companion Guide to PPS22, ODPM, 2004. [Online] Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/147444.pdf [Accessed 27/07/2012].

[3] Verkuijlen & Westra, 1984 *Shadow Hindrance by Wind Turbines* (University of Amsterdam).

[4] BIS. [Online] Available from: http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/energy/sources/renewables/planning/onshore-wind/shadow-flicker/page18736.html [Accessed 27/07/2012].

[5] EMD International A/S. [Online] Available from: http://www.emd.dk/windpro [Accessed 27/07/2012].

[6] Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen, Länderausschuss für Immissionsschutz, 2002 (in German).

[7] Cirkulære om planlægning for og landzonetilladelse til opstilling af vindmøller, Miljø- og Energiministeriet, den 10. juni 1999 (in Danish).

[8] Department of the Environment (Northern Ireland) PPS 18 http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/planning_policy_statement_18__renewable_energy__best_practice_guidance.pdf [Accessed 27/07/2012]

[9] PB Power: Update of UK Shadow Flicker Evidence, 2011 [Online]. Available from: http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/ored_news/ored_news/uk_shad_flick/uk_shad_flick.aspx [Accessed 27/07/2012]



Rev	Date	Description	Drn	Chk	App
00	25.07.12	Shadow Flicker	BF	MK	MK

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 15.1: Identified Properties for Shadow Flicker Assessment

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FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES Fig 15.Wor

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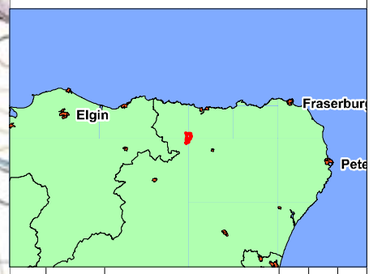
Proposed Turbine

800 m Study Area

30 hous limit

Total Number of Shadow Hours Per Year

0.0 - 10.0 Hours
10.0 - 30.0 Hours
30.0 - 50.0 Hours
50.0 - 100.0 Hours
100.0 - 200.0 Hours
200.0 - 300.0 Hours
300.0 - 400.0 Hours
400.0 - 500.0 Hours
500.0 - 600.0 Hours
600.0 - 800.0 Hours
800.0 - 1,000.0 Hours
1,000.0 - 1,200.0 Hours



Rev	Date	Description	Drn	Chk	App
00	25.07.12	Shadow Flicker	BF	MK	MK

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 15.2: Shadow Flicker Modelling Results

SCALE: 1:15,000 @ A3 | REV 02

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\ES Fig 15.Wor

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16 ENVIRONMENTAL MANAGEMENT

Introduction

16.1 It is the intention of Force 9 LLP and EDF to conduct their activities in such a way that the impact on the environment during construction, operation and eventual decommissioning of the Development is minimised.

16.2 This chapter summarises the commitments for the management of the construction, operation and decommissioning of the Development, as described in this Environmental Statement (ES), in order that legislative and contractual requirements and environmental best practice are implemented.

Embedded Mitigation

Environmental Management during Construction

16.3 From the outset, the project has been designed to limit its environmental impact as far as possible, and all contractors associated with the project would be expected to conduct their activities in such a way that the impact on the environment during construction is minimised.

16.4 This section describes the construction procedures and practices that are typically employed by Force 9 Energy and EDF during construction of a wind farm. Should the Development be consented, these 'embedded' mitigation measures would be developed and agreed with Aberdeenshire Council and put into practice throughout the Development, through a planning condition attached to any consent for the Development.

Best Practice Guidance

16.5 The following best practice guidance would be adhered to:

- Forestry Commission: The Forests and Water Guidelines, 4th Edition;
- CIRIA: Report C532 Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors;
- CIRIA Handbook C650 Environmental Good Practice on Site;
- Scottish Government and SEPA (2010), Engineering in the Water Environment: Good Practice Guide, River Crossings;
- Scottish Renewables, Scottish Natural Heritage (SNH), SEPA and Forestry Commission Scotland (FCS), Good Practice During Windfarm Construction, version 1, October 2010;
- SEPA Pollution Prevention Guidelines (PPG);
- CIRIA (2007), The SUDS Manual C69;
- SEPA (2000), Watercourses in the Community, a Guide to Sustainable Watercourse Management in the Urban Environment; and

- SEPA (2000), Ponds, Pools and Lochens, Guidance on Good Practice in the Management and Creation of Small Waterbodies in Scotland.

Pre Construction

16.6 In advance of the construction works, a targeted geotechnical ground investigation would be undertaken in the turbine, borrow pit and access track locations to determine local ground conditions e.g. depth to rock head and quality of stone. The investigation would also be used to confirm the absence of peat at these locations, or any micrositing required to avoid any areas of peat as far as possible.

16.7 A condition survey of the existing culvert would be completed.

16.8 Further consultation would be undertaken with all property owners within the Site, to confirm local private water supply sources, and the locations of any pipes, ditches, tanks, wells etc used in the collection of these supplies. These would be marked up on a plan included in the Construction Environment Management Plan to ensure the supplies would be protected and monitored during the construction works.

Management Plans

16.9 The following management plans would be prepared and applied for the duration of the construction and decommissioning works:

- Construction Environmental Management Plan (CEMP);
- Site Waste Management Plan (SWMP); and
- Traffic Management Plan (TMP).

16.10 Further detail on the CEMP, SWMP and TMP is provided below.

Construction Environmental Management Plan

16.11 Construction works can cause significant environmental impacts and disruption to neighbours if they are not properly managed. The appointed Principal Contractor(s) would be required to develop and implement a CEMP for both the construction and decommissioning works. The requirement to work in accordance with the CEMP would be included as part of the contract conditions for each element of the Development. As a minimum the CEMP would include the following requirements:

Watercourse Protection/Sediment control

- The stripping of established surface vegetation at construction sites to be kept to a minimum;
- Where practicable a buffer zone of at least 5m width would be maintained between Development features and any watercourse, spring / issue point or well;
- Access tracks would be constructed of inert material, of as coarse a grade as possible, to maximise infiltration, minimise run-off and erosion, and minimise requirements for extensive drainage systems;

- Use Sustainable Drainage Systems where appropriate in the construction of the Development e.g. for the construction compound and access tracks, again to maximise infiltration;
- Sediment transport control measures (silt-traps, geotextiles/straw bales/brash) to be used in the vicinity of watercourses, springs and wells and/or within the drainage network, with an appropriate inspection scheme put in place to maintain these measures;
- Watercourses to be monitored throughout the construction period for sedimentation and other pollutants;
- Where practicable, vegetation over the width of the cable trenches to be lifted as turfs, and replaced after trenching operations, to reduce disturbance;
- Access track drains to be kept clear of blockages;
- The movement of construction traffic to be controlled to minimise soil compaction and disturbance. Vehicle movements off the defined tracks and hardstanding areas to be avoided. Where tracks cross soils which are sensitive to erosion, or on steep gradients, the use of a protective surface layer would be considered;
- Refuelling of vehicles and plant to be confined to the construction compound, for mobile plant, and carefully controlled. Where it is not possible or practical to track vehicles back to the construction compound for refuelling, appropriate control measures would be put in place for refuelling of the static and/or remote plant;
- Only emergency maintenance to construction plant would be carried out on-site, in a designated area and on an impermeable surface well away from any water feature or drainage;
- The extent of all excavations to be kept to a minimum. During excavation works, cut-off drains would be used to control water levels, rather than pumping. If dewatering of excavations is required, pumped discharges to be passed through silt traps or over land to capture sediments before release into receiving waters;
- Trenching or excavation activities in open land to be avoided during periods of intense rainfall and temporary bunding to be provided to reduce the risk of oil or chemical spills to the natural drainage system as required;
- Any wash water would be adequately treated to deal with suspended solids and high alkalinity before discharge into lined settlement ponds to prevent direct runoff into watercourses or ditches or infiltration to groundwater; and
- Wheel washing facilities would be located at least 50m from any of the identified watercourses and field drains (as described in ES Chapter 5). It is anticipated that these facilities would be located close to the construction compound.

Chemicals

- Equipment, materials and chemicals not to be stored within or near watercourses;

- Equipment to contain and clean up any chemical spills would be provided, in order to minimise the risk of pollutants entering watercourses, lakes or flush areas;
- Drip trays to be placed under standing machinery to avoid oil and petrol pollution;
- Cement and unset concrete would be kept out of watercourses during construction;
- All fuels, lubricants and chemicals storage would be contained within a properly designed and maintained bunded area, with sufficient capacity to contain a spill in accordance with SEPA Pollution Prevention Guidelines (PPGs); and
- A long term pollution prevention and emergency response plan would be established to address the potential significant long term impact of chemical (and sediment) pollution.

Air quality/Dust management

- Stored soils would be placed so as to minimise the potential for erosion and creation of dust;
- Temporary stockpiles would be covered and permanent storage would be re-instated with vegetation as soon as practicable;
- All vehicles would undergo wheel washing to prevent the transport of mud and debris on the surrounding roads. This would be monitored on a daily basis to ensure that it is effective;
- Site vehicles would not be over revved, or left with engines idling;
- All plant brought on to the Site would be properly maintained and operated in accordance with manufacturers' recommendations; and
- Routine maintenance of vehicles to be carried out off Site.

Noise control

- Implementation of a blasting noise and vibration management plan for all blasting activities at the borrow pits (it is envisaged that excavators would be used to break out any shallow rock areas so blasting would not be required for these areas);
- All plant and machinery would be properly maintained and silenced in accordance with manufacturer's instructions;
- All on Site vehicles would be restricted to speed restrictions;
- Relevant local residents would be duly warned of noisy activities that could give rise to temporary nuisance e.g. blasting; and
- Hours of working would be restricted to between 7am-7pm Monday to Friday, 7am to 1pm on Saturdays, with no work on Sundays without prior notification to the Aberdeenshire Council and local residents.

Effluent Wastes

- Sanitary facilities would be provided and methods of disposal of all waste would be approved by SEPA;
- All solid and liquid waste materials, including any contaminated soils, would be properly disposed of to controlled landfill sites away from the Site; and
- No unapproved discharge of foul or contaminated drainage from the Site should go to either groundwater or any surface waters, whether direct or via soakaway.

Public Protection/Consultation

- Appropriate signage and fences would be put in place to inform and protect the public during the construction of the wind farm;
- Communication would be maintained with the local community throughout the life of the Development; and
- Temporary closure of Scotways paths would be agreed with Aberdeenshire Council and Scotways post-consent. Notices would be placed at each end of the rights of way informing users of the temporary closure and directions to the alternative routes.

Ecology

- An Ecological Clerk of Works (ECoW) would be appointed to ensure compliance with the CEMP, to provide advice in the event of any unforeseen protected species issues that arise during construction and to oversee the implementation of mitigation requirements.

Waste Management

16.12 A site waste management plan (SWMP) would be implemented as part of the CEMP. The SWMP would include, as a minimum, the following requirements:

- Segregation of wastes in order to prevent co-storage of incompatible materials and the mixing of non-hazardous and hazardous wastes;
- Identification of the type of wastes likely to be generated during construction and decommissioning, to allow early planning of opportunities to re-use or recycle wastes; to gauge the expected quantities, and to allow monitoring;
- Storage of wastes in appropriately labelled containers suitable for the nature of the waste material, on an impermeable surface to minimise the potential for contamination;
- Disposal of any hazardous waste in accordance with the Hazardous Waste Regulations 2005;
- Prohibition of the burning of any waste;
- Covering of waste storage areas to prevent the generation of dust, the spreading of litter and the ingress of rain water;
- All waste carriers to be appropriately licensed; and
- Disposal of waste only at sites licensed to receive and dispose of such wastes in accordance with the relevant legislation.

Traffic Management Plan

16.13 The TMP would be prepared in accordance with guidance such as that found in the Scottish Natural Heritage document 'Good Practice During Windfarm Construction'[1] and would include details such as:

- Confirmation on any local public roads not to be used by construction vehicles;
- The agreed access route for abnormal loads;
- The permitted maximum number of abnormal loads per day;
- Permitted delivery hours;
- The vehicle speeds to be adhered to within the Site;
- Temporary traffic management procedures to be implemented for abnormal loads;
- The procedure to be followed to notify the local community and residents well in advance of abnormal load deliveries;
- Potential constraints within the Site;
- Agreed parking areas;
- Agreed pedestrian crossing points and routes; and
- A commitment to undertaking a pavement condition survey prior to and on completion of the construction works along the B9025 and any other route agreed with Aberdeenshire Council. This would be discussed with Aberdeenshire Council prior to commencement. Any deterioration resulting from the construction works would be rectified, with reinstatement to a standard to be agreed with Aberdeenshire Council.

Environmental Management during Operation

16.14 There would be an operational environmental management plan for the Development.

16.15 During the operation of the Development, any lubricants or other petrochemical products at the Site would be stored on hardstanding areas within the substation / control building. Proper containment procedures would be employed during routine servicing to prevent spillages of lubricants or hydraulic fluid.

16.16 Vehicles visiting sites would be equipped with sand trays to place below any oil/ diesel filling activities and would also be equipped with emergency oil spillage kits. During the course of the operation of the Development, any relevant new legislation and guidance relevant to the protection of the local environment would be complied with.

16.17 In addition, EDF is committed to after-care and monitoring of sensitive habitats as would be reasonably expected of a developer and in accordance with their stated Environment Policy.

Environmental Management during Decommissioning

16.18 It is considered that the environmental management procedures to be followed during decommissioning would follow the principles of those implemented during the

construction phase of the Development. Any such procedures would be in accordance with the relevant legislation and best practice at the time of decommissioning and approved by the relevant statutory authorities.

16.19 EDF would retain responsibility for environmental management during the decommissioning phase of the Development.

Further Mitigation

16.20 The additional project specific mitigation measures identified through the EIA process and described in the ES technical chapters are summarised in the Table 16.1.

Table 16.1: Proposed Mitigation

ES Chapter	Proposed Mitigation
Ecology	All activity would be limited to clearly defined working areas.
	An Ecological Clerk of Works (ECoW) would be appointed to ensure compliance with the CEMP and Habitat Management Plan
	A suitable means of escape for wildlife (e.g. a long wooden or metal plank) would be provided from any exposed trenches and other excavations. Deeper excavations would be fenced off to prevent wildlife access
	Badgers: Prior to construction, a badger survey would be undertaken of the construction footprint and surrounding land up to 100m from these areas. An application for a SNH licence to disturb badgers accompanied by an appropriate mitigation strategy would be submitted to SNH for approval if required. All contractors would be briefed regarding badgers (and other protected species).
	Bats: If the trees within the Site identified as having bat potential require removal or alteration at a later date to facilitate development, the trees would be subject to a survey to determine if roosting bats are present. If bats are found to be present, a licence would be sought from SNH including an appropriate mitigation strategy. Should the turbine locations be subject to any micrositing, wind turbines would be constructed with a minimum stand-off distance of 50m between the rotor-swept area of each turbine and features which are often used by bats such as hedgerows and tree lines.
	Otters: Pre-construction otter survey would be carried out within 6 months prior to works beginning. Disturbance to otters during development works can be minimised by declaring an area within at least 30m of an otter shelter, out of bounds to all site users at all times. If holts/rest areas were found to be established, all contractors would be briefed regarding their locations to avoid any accidental damage or disturbance. Artificial lighting, where used during construction, would be directed away from watercourses, so that it does not disturb otter activity during the hours of darkness.

ES Chapter	Proposed Mitigation
Archaeology	Strategies for archaeological mitigation against physical impacts typically consider two options, these are: • Preservation in situ: the preservation without disturbance of sensitive archaeological remains, this can be achieved through engineering solutions (e.g. foundation design) or amendments to the Development layout; • Preservation by record (excavation): where preservation in situ is not feasible or desirable an alternative mitigation is pre-construction archaeological excavation. This consists of a detailed programme of archaeological fieldwork to preserve, by record, the archaeological value of the heritage asset. The archaeological mitigation strategy to be undertaken for the Development would be agreed with the Aberdeenshire archaeologist in advance of construction works commencing.
	Should the dry run for delivery of AILs to the Site and examination of alternative methods of delivery indicate that an impact on Banff Bridge would occur, then Listed Building Consent would be applied for to Aberdeenshire Council for a temporary "like for like" taking down and rebuilding of the parapet wall, in consultation with Historic Scotland.
Noise	A suitable member of the construction team would be nominated to deal with noise and other matters (such as advertising when blasting would be taking place).
Traffic and Transport	In order to minimise disruption in Banff and Macduff, abnormal loads would pass through between 9.30am and 3.30pm to avoid peak times for both commuters and traffic movements at Banff Academy.
	An assessment of the access route to the site would be undertaken to confirm if any carriageway repair works are required. Any damage found to be caused by the Developer to the local network during the construction or decommissioning works would be made good by the Developer, under an indemnity agreement with Aberdeenshire Council.
EMI, Infrastructure, Safety and Aviation	Force 9 Energy and EDF would accept a planning condition to assess current television signals in advance of Development and mitigate any post-development problems with television reception arising where impacts are attributable to the Development.
Shadow Flicker	A planning condition would ensure that any shadow flicker complaints would be investigated in a reasonable timescale and that mitigation for any shadow flicker problem identified due to the Development would be implemented promptly and effectively.

Chapter 16 References

[1] http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20windfarm%20construction.pdf



DEUCHRIES WIND FARM

Environmental Statement

Volume 3: ES Technical Appendices

September 2012

RSK GENERAL NOTES

Project No.: 190283 02 (FINAL)

Title: Deuchries Wind Farm Environmental Statement Volume 3 Technical Appendices

Client: Force 9 Energy LLP and EDF

Date: September 2012

Office: Glasgow

Author	Natasha Dolecki and Polly Bentham	**Technical reviewer**	Polly Bentham
Date:	28/09/2012	Date:	27/09/2012
Project manager	Natasha Dolecki and Polly Bentham		
Date:	28/09/2012		

RSK Environment Ltd (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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APPENDIX 1
INTRODUCTION

Appendix 1.1 Scoping Consultation Responses

EIA Scoping Opinion - Deuchries Aberchirder - Archaeology Comments
Bruce Mann to: Chris Ormiston 02/06/2011 11 16

Chris,

Proposal: EIA Screening/Scoping Opinion for formal EIA Scoping Opinion - Erection of wind farm
Address: Land at Deuchries, Aberchirder, Huntly

Thank you for your letter of the 18th May regarding the above Scoping Opinion submitted by RSK on behalf of Force 9 Energy. Having read Section 3.2.3 Cultural Heritage and Archaeology, which follows on from earlier telephone conversations between the Archaeology Service and RSK in January of this year, I can confirm the following;

I agree with the stated Study Area of 1km buffer around the site boundary line when considering direct impacts on known archaeological remains, and the 10km radius for known archaeological sites with statutory designations.

I can also confirm that the Method of Assessment, as laid out in 3.2.3.4, is acceptable and will lead to a fully informed chapter within the EIA Report itself.

The data held by ourselves within the Aberdeenshire Sites & Monuments Record, including the vertical aerial photographs of the site, will be made available on request from RSK and their Client when they reach that relevant stage of the assessment.

Should you have any comments or queries on the above then please do not hesitate to contact me.

Best wishes
Bruce

Bruce Mann MA MIFA FSA Scot
Archaeologist
Infrastructure Services
Aberdeenshire Council

Tel: 01224 664731 Internal 725 4731
Fax: 01224 664679
Web Site - www.aberdeenshire.gov.uk

Any "TR" attachments with this email are for Aberdeenshire Council TRIM users only.

Aberdeenshire COUNCIL

Infrastructure Services

Proposal: **EIA Scoping Opinion for erection of a wind farm**

Address: **Land at Deuchries, Aberchirder, Huntly**

Reference No: **ENQ/2011/0810**

Environmental Health Concerns/comments regarding applications for the erection of large wind turbines usually include the following:

- **Ice throw**
- **Shadow flicker**
- **Noise during erection of the turbines**
- **Water supplies**

The application proposes the erection of up to 4 Wind Turbines on land at Deuchries, Aberchirder. REPower MM82 turbines have been stated as the candidate turbines (but this may change).

Turbine Noise

The scoping report indicates the need for a full background noise survey as predicted noise levels from the turbines will exceed an $L_{A90,\ 10\ min}$ of 35 dB at neighbouring residential properties. The monitoring locations will need to be agreed along with other aspects regarding the data required for the noise assessment report to be submitted as part of the application process.

The assessment should be carried out in accordance with the ETSU-R-97 guidance. Wind speeds should be derived for 10m height using a wind speed calculation based on wind speeds measured at two heights, in accordance with the procedure described in the Institute of Acoustics Bulletin dated March/April 2009.

Sound pressure levels $L_{A90,\ 10\ min}$ should be correlated with wind speed using a best fit curve technique at the agreed monitoring locations.

The night-time lower fixed limit adopted by Aberdeenshire Council's Environmental Health Service is 38dB $L_{A90,\ 10\ min}$. The quiet day-time lower fixed limit is 35dB $L_{A90,\ 10\ min}$.

The cumulative effect of the turbines in this application would need to be considered along with other existing, or proposed wind turbines, in the locality at the time the full application is made.

If the application is approved conditions will be recommended regarding permitted noise levels and obtaining warranties regarding sound power levels from the turbine supplier. Conditions will also be recommended in respect of compliance monitoring and procedures in the event of complaint.

Ice Throw

The applicant will be required to submit documented procedures in respect of ice formation, shut down and re-starting for approval by Aberdeenshire Council.

Shadow Flicker

The applicant will be required to carry out an assessment for shadow flicker and submit details at the time of application.

Procedures in respect of dealing with complaints about shadow flicker will be recommended as a condition if the application is approved.

Noise during Construction

If the application is approved a condition will be recommended regarding hours of working during the construction phase.

Water Supplies
Consultants acting on behalf of the agent have been in contact with Environmental Health with a view to carrying out baseline surveys of private water supplies in the area around the turbine locations.

Contact Person

Les Dean
Senior Environmental Health Officer
Town House
Low Street
BANFF, AB45 1AY
Tel: 01261 813279
e-mail: leslie.dean@aberdeenshire.gov.uk

Fw: Inventory of Gardens and Designed Landscapes: Proposed sites in Banff and Buchan

Shaun Norman to: Chris Ormiston 09/05/2011 10:25

History: This message has been forwarded.

Chris,

Inventory of Gardens and Designed Landscapes

Historic Scotland have forwarded the attached communication to follow up their recent consultation and clarify the assessment of development proposals with regards to adding Forglen House onto the Inventory of Gardens and Designed Landscapes.

Kind regards,

Shaun.

Shaun Norman
Infrastructure Services
Gordon House
Inveruria
AB51 3WA

tel 01467 628632
fax 01467 628469

---- Forwarded by Shaun Norman/P&ES PE/Abdnshire on 09/05/2011 08:52 ----

From: <Julie.Candy@scotland.gsi.gov.uk>
To: <shaun.norman@aberdeenshire.gov.uk>
Cc: <Catherine.Middleton@scotland.gsi.gov.uk>
Date: 04/05/2011 17:35
Subject: Inventory of Gardens and Designed Landscapes: Proposed sites in Banff and Buchan

Shaun

Thank-you very much for your telephone call yesterday, and also for your letter of 14 April in which you highlight current planning issues that could potentially have an impact on the proposed designations.

During our telephone conversation, you asked about the status of the proposed sites, and how Aberdeenshire Council might treat them when determining planning applications.

As discussed, a formal decision on the inclusion or otherwise of the four proposed sites in Banff and Buchan will be taken following the close of the consultation period. I should also advise you that if we determine that these sites do meet the criteria for inclusion, they can only gain full Inventory status following the full enactment of the Historic Environment (Amendment) Scotland Act, and accompanying changes to the Town and Country Planning (DMP) Scotland Regulations 2008 (which are scheduled to occur this October).

We will, of course, inform you of the outcome of the Inventory resurvey in Banff and Buchan when the project has been finalised.

In the meantime, we would recommend that the proposed sites in Banff and Buchan are given some material consideration in determining planning applications, despite the fact that they do not yet have full Inventory status. We are also happy to give a view on the level of impact of any proposed development on the designed landscapes in question.

I assume that the details you sent to me regarding current planning issues at Cairness House, Forglen and Halton Castle are for information purposes only as part of Aberdeenshire Council's response to consultation, and do not constitute formal consultations to Historic Scotland on the planning applications.

If any of the above requires clarification, or you have any further questions, please do not hesitate to call me direct on 0131 668 8809.

In the meantime, thank-you again for your letter and telephone call.

Best wishes

Julie Candy

Dr Julie Candy | Landscape Historian

Historic Scotland | Alba Aosmhor
Longmore House, Salisbury Place, Edinburgh, EH9 1SH
t| 0131 668 8809
m| 07920 823749
e| julie.candy@scotland.gsi.gov.uk

www.historic-scotland.gov.uk

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CO.

Aberdeenshire COUNCIL

Our Ref: M/ENQ/2011/0919
Your Ref: enq/2011/0810

Ask for: Aude Chaiban
Direct Dial: 01569-768269
Email: ma.planapps@aberdeenshire.gov.uk

ABERDEENSHIRE COUNCIL
13 JUN 2011
CO

Chris Ormiston
Senior Planner
The Town House
Low Street
Banff
AB45 1AY

08/06/2011

Memorandum

Proposal: EIA Screening/Scoping Opinion for Erection of Wind Farm
Address: Land at Deuchries Aberchirder Huntly

Thank you for providing the Marr Team with an opportunity to comment on the above proposal. Having gone through the scoping report prepared by the RSK Group plc, I would comment as follows:

Project Components

In paragraph 2.3.2, it is stated that the transformers are likely to be located in kiosks adjacent to each turbine. These kiosks have to potential to increase the landscape and visual impact of the wind farm and the applicant should seek to incorporate the transformers into the turbine itself as has been done elsewhere.

In paragraph 2.3.3 it is stated that the scheme will include permanent anemometer mast(s). The need to retain the mast(s) after commissioning should be queried. The statement also seems to suggest that more that one mast may be required. The need for additional masts should also be queried.

In paragraph 2.3.5, it is stated that watercourse crossing may be required. Although it is stated that SEPA's advice will be sought to enable the passage of fish and other wildlife, river crossings and bridges have the potential to affect the flow of water and may create flooding. The views of the Flood Prevention Unit should be sought and details of these crossings submitted with the planning application. In terms of potential impact on wildlife, SNH's advice should also be sought

If you have difficulty in reading this paper please contact Aude Chaiban on 01569-768269

In paragraph 2.3.8, states that borrow pits will be required. Borrow pits can have significant landscape and visual impacts. Therefore, detailed drawings showing the location, size and maximum excavation depth must be submitted. The potential landscape and visual impact must be fully considered in the Environmental Impact Assessment

Environmental Aspects to be Assessed

The size of the ZTV is not specified although it is stated that beyond 10km of the site, the ZTV is fragmented due to the screening effects of intervening hills The extent of the ZTV should be justified and should be determined in consultation with Scottish Natural Heritage.

Cumulative development must take into consideration all wind energy development located within the agreed ZTV that are within the planning system. These must include all publicly known projects whether operational, at planning application stage, consented or at screening/scoping stage.

There are a 226 listed building, 11 scheduled ancient monuments and other archaeological assets within 10km of the site. The potential impact on these assets should be fully considered in the Environmental Impact Assessment.

The landscape and visual impact of the proposal must be assessed from a representative number of viewpoints. It is noted that none of the viewpoints currently suggested are within the Marr Area. The proposal is likely to have an impact on the Marr Area and therefore, additional viewpoints located within the Marr Area must be considered

Aude Chaiban
Planner

Aberdeenshire COUNCIL

20 JUN 2011

Infrastructure Services
Planning & Building Standards
The Town House
Low Street
Banff
AB45 1AY
Tel 01261 813209
Fax 01261 813281
www.aberdeenshire.gov.uk
DX 7 BANFF

Our Ref. ENQ/2011/0810
Your Ref.

Ask for Chris Ormiston
Direct Dial: 01779-483720
Email: bu.planapps@aberdeenshire.gov.uk

Knight Frank
Leona Wilkie
120 Bothwell Street
Glasgow
G2 7JS

17/06/2011

Dear Sir/Madam

The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
Proposal: EIA Screening/Scoping Opinion for Formal EIA Scoping Opinion: Erection of Wind Farm
Address: Land At Deuchries, Aberchirder, Huntly

I refer to your request for a scoping opinion for the above proposal received on 10/05/2011 I am now in receipt of all the necessary consultation responses and I can now offer a scoping opinion under Regulation 14 of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (the Regulations).

Schedule 4 of the Regulations states the information which should be included in an Environmental Statement (ES). These guidelines offer the backbone to the structure of an ES and should be used as the basis for your submission.

In order to make an assessment of the above information there are specific criteria and guidance set out in Schedule 4 of the Regulations. In particular these include characteristics of the development, an outline of any alternative options/sites and the main reasons for the options/sites chosen. Environmental issues are of obvious key importance such as those aspects of the environment that would be likely to be significantly affected. Detailed survey work would be required to inform the ES Following analysis of the aspects of the environment which would be likely to be significantly affected, a detailed assessment of the effects themselves would be required along with mitigation measures proposed.

If you have difficulty in reading this paper please contact Chris Ormiston on 01779-483720

Examples of the types of issues that should be addressed include:

- Climate change
- Local Economic Effect
- Landscape Resource
- Soils and geology
- Visual Amenity
- Ornithology
- Visual Amenity
- Ecology
- Nature Conservation
- European Protected Species
- Hydrology and Water Supplies
- Forestry and Tree Felling
- Transport and Traffic including road safety issues and impact on local road network during and after construction work
- Noise
- Cultural Heritage and archaeology
- Land Use
- Land Ownership
- Tourism and Recreation, including footpaths
- Proposed mitigation measures

Please note that the above list is by no means exhaustive and that other issues might become obvious following public consultations and consultations with statutory consultees.

I can advise that from this Service's point of view your scoping report addresses the main issues to be covered within the EIA subject to any another additional matters highlighted by the following consultees in their responses. Copies are attached for your information.

This advice is based on the Regulations and the consultation responses of the following:

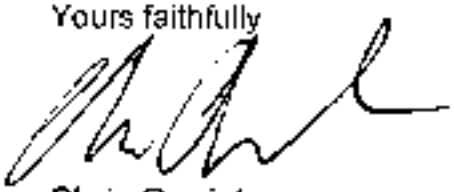
- RSPB
- Scottish Water
- Historic Scotland
- SEPA
- SNH
- Health & Safety Executive
- Transport Scotland
- Aberdeenshire Council Infrastructure Service (Roads)
- Aberdeenshire Council Infrastructure Service (Flood and Coastal Protection)
- Aberdeenshire Council Environment Team (Natural and Built & Cultural Heritage
- Aberdeenshire Council Archaeology
- Aberdeenshire Council (Environmental Health)
- Aberdeenshire Council Infrastructure Services (Marr Area Development Management Team)

Please note that at the time of writing I am still awaiting a response from the Environment Team (Landscape Architect). I will forward on these comments once received.

I hope the above information is of assistance as a formal scoping opinion in respect of the relevant ES. Obviously during the processing of any associated planning application other issues may become obvious following public consultation and consultations with statutory consultees.

This opinion will be held for public inspection for a two year period, or until a planning application is submitted at which time the opinion will be transferred to the planning register with the application.

Yours faithfully



Chris Ormiston
Area Planing Officer (Banff & Buchan)

Enc. Consultation responses

CONSULTATION RESPONSE

ENVIRONMENT RESPONSE TO DEVELOPMENT MANAGEMENT

Planning Reference No:	ENQ/2011/0810	**Grid Ref:**	
Proposal:	EIA Scoping Opinion for erection of Wind Farm		
Address:	Land at Deuchries, Aberchirder, Huntly		
D.M. Officer:	Chris Ormiston		
Environment Officer:	Eleanor Munro	Natural Heritage	
Date of Response:	15th June 2011		

1.	**Issue:**	Ecology / Ornithology	DC FEEDBACK
	Actions:		Applied?
	a)		Yes / No
	b)		Yes / No
	Justification:		Reason for NOT Applying:

ALP Policy Env4 (Biodiversity) - The aim of this policy is to give stronger protection for habitats and species, even when they are not specifically associated with specifically designated nature conservation sites.

Supporting Information:

The ecological surveys identified within the scoping report are largely acceptable.

I note that surveys have already been carried out for breeding and overwintering birds, and that bat surveys will be carried out this summer between May and August.

Despite the lack of records found as part of the desktop survey, there are a lot of badgers in this area. Although the erection of turbines will not result in any significant loss of foraging, mitigation measures will be required during construction to ensure that badgers are not trapped or harmed by the works.

I note that an extended Phase 1 survey will be carried out and that this will identify any areas of additional survey which will be required. This is acceptable in principle.

Date of Feedback Return (to be completed by the DC officer)

CONSULTEE

DRP SCANNED

CO

X

MINISTRY OF DEFENCE

ABERDEENSHIRE COUNCIL
12 JUL 2011
Planning and Environmental Services

Defence Infrastructure Organisation

Safeguarding Department
Statutory & Offshore

Mr Chris Ormiston
Aberdeenshire Council
Planning
Town House
Low Street
Banff, AB45 1AY

Defence Infrastructure Organisation
Kingston Road
Sutton Coldfield
West Midlands
B75 7TZ

Tel: +44 (0)121 311 2259 Tel (MOD): 94421 2259
Fax: +44 (0)121 311 2218
E-mail: desopsnorth-lms7safe@de.mod.uk
www.mod.uk/DIO

Your Reference: **APP/2011/2003**
Our reference: **D/DE/43/20 (2011/1142)**

11 July 2011

Dear Mr Ormiston

MOD Safeguarding – SITE OUTSIDE SAFEGUARDING AREA

Proposal:	Erection of 70 metre temporary meteorological mast
Location:	Little Deuchries, Aberchirder, Huntly, AB54 7PY
Grid Ref:	364079, 854233
Planning Ref:	**APP/2011/2003**

Thank you for consulting Defence Infrastructure Organisation (DIO) on the above proposed development. This application relates to a site outside of Ministry of Defence (MOD) statutory safeguarding areas. We can therefore confirm that the MOD has no safeguarding objections to this proposal.

Lighting

In the interests of air safety, the MOD requests that the mast is fitted with aviation lighting. The mast should be fitted with 25 candela omni directional red lighting or infra- red lighting at the highest practicable point.

However, we appreciate that a development of this nature is usually a precursor / trial for the validity of a windfarm, and we could have concerns should this site be further developed into a windfarm.

Within the Planning Policy Statement 22 (PPS22 for England & Wales) & National Planning Policy Guidelines 6 (NPPG6 for Scotland): Renewable Energy Developments, developers should confirm that MOD & aviation concerns have been addressed. We would appreciate the opportunity to confirm our position should further development be applied for on this site. To confirm the suitability of a windfarm with respect to MOD operational interests please complete the standard windfarm proforma which can be found on the Renewable-UK website (www.renewable-uk.com). Once this has been completed please forward it to DIO at the above address or via e-mail to DEopsNorth-LMSWind@de.mod.uk. Should you need to contact us the number is 0121 311 2025.

Should you wish to discuss this further please do not hesitate to contact me.

Yours sincerely

Richard Brotherton

HISTORIC SCOTLAND ALBA AOSMHOR

Longmore House
Salisbury Place
Edinburgh
EH9 1SH

Direct Line: 0131 668 8657
nicola.hall@scotland.gsi.gov.uk

Mr Chris Ormiston
Planning and Building Standards
Aberdeenshire Council
The Town House
Low Street
BANFF
AB45 1AY

Our ref: AMN/16/GB
Our Case ID: 201101113
Your ref: ENQ/2011/0810

08 June 2011

Dear Mr Ormiston,

Environmental Impact Assessment (Scotland) Regulations 1999
Installation of Wind Farm on Land at Deuchries, Aberchirder, Huntly
Scoping Opinion

Thank you for your letter of 17 May 2011 seeking our comments on the above proposed development. We received it via the Scottish Government's planning decisions division and have treated it as a request for information on the potential scope of any Environmental Impact Assessment (EIA) under the terms of the above Regulations which might be required for the development.

We are an agency within the Scottish Government directly responsible to Scottish Ministers for the protection and promotion of the historic environment. Our comments here concentrate on our statutory remit for scheduled monuments and their setting, category A listed buildings and their setting and gardens and designed landscapes appearing in the Inventory.

Your conservation and archaeological services will also be able to advise on the likely impacts from the development on the historic environment. This includes potential impacts from the scheme on those cultural heritage features mentioned above, as well as on those outwith our remit to comment on, such as unscheduled archaeology and unrecorded/unknown archaeology which could be discovered in previously undisturbed ground.

Our view on the principle of the proposal
We understand that the development comprises a wind farm and associated infrastructure on land at Deuchries, Aberchirder, Huntly. I note that the scoping report does not specify how many turbines will be installed, but understand that the figure is likely to be up to 4 (maximum blade tip of 110m and 40m blade length), and that not all the site is likely to be developed. Without prejudice and on the basis of the information supplied, we can indicate at this stage that it may be possible to accommodate a wind farm development of this nature and scale in this location

without it raising serious issues for our historic environment interests. However, we would expect certain aspects of the proposal to be assessed and this particularly relates to historic environment features listed below. Any ES to be produced should also consider the cumulative impacts of this development proposal in combination with other proposed and consented schemes. Notwithstanding this, please note that our comments here are provisional and we would need to see any ES to give our final view on the proposals.

Potential impacts to be considered
We can confirm that there are no scheduled monuments, category A listed buildings or gardens and designed landscapes appearing in the Inventory within the development site boundary. However, as there are many of these features in the vicinity, any ES to be produced for the development should consider impacts upon these, and on any others which may experience significant impacts. Where significant impacts are predicted, we welcome further consultation to discuss layout, design and mitigation. We generally find it helpful if the assessment contains appropriate visualisations, such as photomontage and/or wireframe views towards and from the development.

I note from the developer's scoping report that a cultural heritage sites will be assessed within a 10 km radius. We generally advise caution with this approach and recommend that developers use the ZTV as a basis for identifying cultural heritage features in the first instance, prior to further assessment.

In this case, particular attention should be given in the scoping exercise and in the ES to impacts on the following historic environment features:

North Burreldales, stone circle (Index No. 343)
The monument is situated E of Brownside Hill within woodland and c. 2.3 km from the development site boundary. A forestry plantation is currently located to the W of the monument and this may provide some screening. However, as it may be theoretically visible from the turbines in the ZTV, impacts on it should be assessed and we recommend a visualisation is produced from the monument looking towards the turbines to help illustrate any impacts.

Other cultural heritage features in the vicinity of the site boundary that are likely to be inter-visible with the turbines should also be assessed in the ES.

In assessing the likely impact from the development proposal on the setting of these features, we recommend the developer refers to the advice contained in our *Managing Change in the Historic Environment* guidance note on setting: http://www.historic-scotland.gov.uk/managingchange The guidance notes explain how to apply the policies contained in the *Scottish Planning Policy* (2010) and the *Scottish Historic Environment Policy* (2009) and have been designed to be

accessible and to offer clear and consistent advice to applicants, developers, the public and professionals.

I hope this response is of assistance to you.

Yours sincerely,

Nicola Hall
Senior Heritage Management Officer

CC Alex Kerr, Planning Decisions Division (North) DBE

ABERDEENSHIRE COUNCIL
16 JUN 2011
IT Services

C0

"Sinclair, Kathleen" <Kathleen.Sinclair@rspb.org.uk>
16/06/2011 14:29

To: <bb.consultations@aberdeenshire.gov.uk>
cc:
Subject: FAO Chris Ormiston, Land at Deuchries, Aberchirder, Scoping Opinion

Dear Chris,

Please find attached a response to the scoping opinion consultation for land at Duchries, Aberchirder.
I have also put a hard copy in the post.
Apologies that this reply is a couple of days late.

Regards,
Kathleen

Kathleen Sinclair
Assistant Conservation Officer, NE Scotland
RSPB Scotland
10 Albyn Terrace
Aberdeen
AB10 1YP
01224 624824

RSPB Scotland is part of the RSPB which speaks out for birds and wildlife, tackling the problems that threaten our environment. Nature is amazing - help us keep it that way. Click here to join today.
www.rspb.org.uk/join

The Royal Society for the Protection of Birds (RSPB) is a registered charity: England and Wales no. 207076, Scotland no. SC037654.

Microsoft Word - Deuchries Wind Farm Aberchirder Scoping Report response June 2011.pdf

LC
16/06/11

ABERDEENSHIRE
16 JUN 2011
Planning and Environmental Services

CO

Chris Ormiston
Senior Planner
Aberdeenshire Council
The Town House
Low Street
Banff
AB45 1AY

15th June 2011

Dear Mr Ormiston,

The Environmental Impact Assessment (Scotland) Regulations 1999 Proposal: EIA Screening/Scoping Opinion for Formal EIA Scoping Opinion: Erection of Wind Farm Address: Land at Deuchries, Aberchirder, Huntly

Thank you for your letter of 17th May, together with the Deuchries Wind Farm Scoping Report, May 2011.

In preparing the Environmental Statement, RSPB Scotland notes the intention of the applicant, as stated on pages 30 and 31 of the Scoping Report, to undertake further bird monitoring following the methodology detailed in the Scottish Natural Heritage guidance document "Survey Methods for Use in the Assessment of the Impact of Proposed Onshore Windfarms on Bird Communities (SNH 2005, revised 2010)". At this stage, RSPB Scotland would like to emphasise the importance of following this methodology in order to gather adequate ornithological data for the Environmental Statement.

RSPB Scotland has no further comments at this stage but would welcome the opportunity to comment on the Environmental Statement.

Thank you for consulting RSPB Scotland.

Yours Sincerely,

Kathleen Sinclair
Assistant Conservation Officer, North-East Scotland

LC
16/06/11

ABERDEENSHIRE COUNCIL
07 JUN 2011

SEPA
Scottish Environment Protection Agency

Our ref: PCS/113929
Your ref: BB/ENQ/2011/0810

If telephoning ask for:
Nicola Abrams

6 June 2011

Chris Ormiston
Aberdeenshire Council
Planning and Environmental Services
Town House
Low Street
Banff
AB45 1AY

By email only to: bb.consultations@aberdeenshire.gov.uk

Dear Chris

Environmental Impact Assessment (Scotland) Regulations 1999
Planning Application: ENQ/2011/0810
EIA screening/scoping opinion for formal EIA scoping opinion - erection of wind farm
Land at Deuchries, Aberchirder, Huntly

Thank you for consulting SEPA on the scoping opinion for the above development proposal by way of your letter of 17 May 2011 which we received on 19 May 2011. We consider that the following key issues should be addressed in the EIA process:

- Engineering activities in the water environment,
- Impacts on groundwater,
- Environmental management and pollution prevention

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.

1. Carbon balance and peat management

1.1 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.

1.2 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.

2. Disruption to peatlands

2.1 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.

2.2 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.

3. Disposal of waste peat to borrow pits

3.1 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.

3.2 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.

4. Peat slide risk

4.1 Protection of development in relation to unstable land including landslides or landslips 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.

4.2 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.

5. Wetland ecology (including groundwater dependent terrestrial ecosystems)

5.1 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.

5.2 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

5.3 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

5.4 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.

6. Groundwater

6.1 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

6.2 It is noted from OS maps that there are numerous wells annotated in and around the area of proposed development. It should be highlighted that any abstractions, including private water supplies (PWS) within 250 m of turbine foundations or borrow pits, or within 100 m of road, tracks or trenches should be fully risk assessed. The source of any groundwater supply should be clearly identified by NGR coordinates with the type of source and

estimated abstraction rate stated. If any PWS are recognised as being potentially at risk, it is recommended that mitigation measures are in place to ensure that the works do not adversely affect supplies. These mitigation measures may include monitoring of the abstraction points before, during and after the works, and the implementation of appropriate contingency plans to ensure security of supply.

7. Construction Environmental Management Document and pollution prevention

7.1 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.

7.2 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.

7.3 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.

7.4 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

7.5 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).

7.6 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.

8. Engineering activities in the water environment

8.1 It is noted that there are a number of water features within the site, turbines should be located well away from such features in order to minimise impacts, it is not clear whether watercourse crossings will be required to create new access tracks. 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 activites in the water environment wherever possible. The water environment includes burns, rivers, lochs, wetlands, groundwater and reservoirs. We require it to 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.

8.2 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.

8.3 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.

8.4 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.

8.5 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.

9. Water abstraction

9.1 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.

9.2 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.

10. Opportunities for Environmental Improvements

10.1 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.

11. Borrow pits

11.1 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.

11.2 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.

11.3 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

12. Air quality

12.1 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*.

12.2 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.

13. Flood risk

13.1 The site should be assessed for flood risk from all sources in line with Scottish Planning Policy (Paragraphs 196-211). Further information and advice can be sought from your Local Authority technical or engineering services department, Scottish Water and from our website. Our Indicative River & Coastal Flood Map (Scotland) is also available to view online. If a flood risk is identified then a flood risk assessment should be carried out following the guidance set out in the Annex to the SEPA Planning Authority flood risk protocol. Our Technical flood risk guidance for stakeholders outlines the information we require to be submitted as part of a Flood Risk Assessment, and methodologies that may be appropriate for hydrological and hydraulic modelling. Further guidance on assessing flood risk and planning advice can be found at our website.

14. Regulatory advice

14.1 Details of regulatory requirements and good practice advice for the applicant can be found on our website at www.sepa.org.uk/planning.aspx. If you are unable to find the advice you need for a specific regulatory matter, please contact a member of the operations team in your local SEPA office at:

28 Perimeter Road, Elgin, IV30 6AF.

If you have any queries relating to this letter, please contact me by telephone on 01224 266698 or e-mail at planningaberdeen@sepa.org.uk

Yours sincerely

Nicola Abrams
Senior Planning Officer
Planning Service

Rural and Environment Directorate
Environmental Quality Division

T: 0131-244 7621 F: 0131-244 0211
E: samantha.barker@scotland.gsi.gov.uk



The Scottish Government

Chris Ormiston
Senior Planner
Aberdeenshire Council
Infrastructure Services
Planning and Building Standards
The Town House
Low Street
Banff
AB45 1AY

Your ref: ENQ/2011/0810
Our ref: 161/11 (EIA/ABS/095)

16 June 2011

Dear Mr Ormiston

ENVIRONMENTAL IMPACT ASSESSMENT (SCOTLAND) REGULATIONS 1999 ERECTION OF WIND FARM ON LAND AT DEUCHRIES, ABERCHIRDER, HUNTLY (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.

Cont'd.....

We note, however, that the results of the initial noise assessment predict that, of those potential noise receptors listed within 1km of the site, four existing noise sensitive receptors would experience noise levels from the proposed development in excess of the ETSU-R-97 minimum noise criteria, using the daytime minimum without tonal penalty based on the 6 turbines proposed in the initial site layout, and it is proposed that further noise monitoring be undertaken.

Yours sincerely

S Barker

SAMANTHA BARKER
Pollution & Strategic Delivery Team

ABERDEENSHIRE CO
20 MAY 20
Planning and Environmental

C-O

Scottish Natural Heritage
All of nature for all of Scotland

Chris Ormiston
Planning & Environmental Services
Aberdeenshire Council
The Town House
Low Street
BANFF
AB45 1AY

20 May 2011

Our Ref: CNS/WF/North

Your Ref: ENQ/2011/0810

Dear Mr Ormiston

EIA Screening/Scoping Opinion for erection of up to four wind turbines 110m to tip Deuchries, Aberchirder, Huntly NJ640649

Thank you for seeking any information that we hold relevant to the preparation of an environmental statement.

We provide the following list of topics that we advise the applicant considers in an Environmental Statement

1. Designated sites (including qualifying features of designated sites)
2. Birds
3. Protected species
4. Habitats
5. Landscape and visual impact assessment
6. Infrastructure
7. Decommissioning

Further details are provided in Annex A to this letter.

We suggest you draw the applicants attention to the recently released Scottish Government policy guidance which includes a replacement for PAN 45. Guidance on onshore wind turbines including securing sufficient information can be found here.

http://www.scotland.gov.uk/Resource/Doc/212607/0114118.pdf

Please do not hesitate to contact me if you need any further information or advice from SNH in relation to this proposal. We should be grateful if you would let us know of the Council's decision or of any further changes to the proposal which would be relevant to our interests.

Yours sincerely

Ewan Lawrie
Area Officer
Aberdeenshire
ewan.lawrie@snh.gov.uk

Annex A: SNH advice on issues to be included in the assessment

LC.
2405/11

Annex A: issues to be included in assessment of Deuchries Wind Cluster

As with all proposals that are to be subject to detailed planning applications supported by an Environmental Statement or an Environmental Report, we recommend that the report covers all aspects of the proposal that have the potential to have an impact upon the environment. Such comprehensive coverage will help to avoid the need for the applicant to be requested for additional information and assessments at a later date, with its attendant delays.

1. Designated sites (including qualifying features of designated sites)

The applicant should consider whether the proposal could have an effect on any designated sites either directly or indirectly.

Maps and citations of designated sites, and lists of operations requiring consent for each SSSI are available from our SNHi website's SiteLink pages at: www.snh.gov.uk/publications-data-and-research/environmental-data. Downloads of Scottish Natural Heritage data such as ESRI Shapefiles or the OGC standard formats GML and KML are also available from the Natural Spaces pages of SNHi.

Due to the fact that some bird species can travel considerable distances from a designated site, an initial consideration of all designated sites and their qualifying interests within a 20km radius of the proposal would be good practice.

If it is considered that the proposal is likely to have a significant effect on the qualifying interests of one or more European sites then an Appropriate Assessment must be carried out by the competent authority (Aberdeenshire Council) to consider the implications of the proposal for these qualifying interests. If the applicant does not consider that the development will have a likely significant effect upon any qualifying interests (or it is very obvious that the Conservation Objectives for the site's qualifying interests will not be undermined despite a connection) then the report should clearly present this information. Full lists of qualifying features may be found in the Conservation Objectives documents.

Our initial appraisal is that there is no connectivity with any European site

2. Birds

Guidance on carrying out bird surveys and assessing the impacts of windfarms is available from SNH's website through the link www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind

Our online guidance includes advice on survey methods for different species of birds and advice on calculating collision risk. We would expect any deviations in the methodology employed (including vantage point watch effort) from our published guidance to be fully justified in the final report.

SNH advises that the applicant considers the guidance on how to assess bird populations on a site and their likely sensitivity. The level of survey effort required should be determined by:

- desk-based study of existing information[1]
- appraisal of habitats and species likely to be present
- reconnaissance survey

[1] Sources of information may include the NBN Gateway (www.nbn.org.uk), North-East Scotland Biological Records Centre (www.nesbrec.org.uk), RSPB (www.rspb.org.uk), Wetland Bird Survey (www.bto.org/webs), and the local Raptor Study Group (www.scottishraptorgroups.org/areas/north_east.php)

SNH advises that the applicant considers undertaking three lowland/farmland bird survey visits during the breeding season and three visits during the winter season. The applicant should also take into account potential impacts of the proposal on raptors and owls and determine what level of survey effort is required through using the three steps above.

Where vantage point watches are used, we would like for the applicant to clearly list the total number of hours of watches for each vantage point individually. If watches cover more than one of the 'periods' set out in our guidance (eg. 'Autumn migration', 'Wintering birds' or 'Spring migration'), we would then like for the applicant to summarise how many hours of watches have been attributed to each "period" at each of the vantage points individually.

3. Protected Species

We recommend that the applicant contacts the NBN Gateway (www.nbn.org.uk) and North-East Scotland Biological Records Centre (www.nesbrec.org.uk) for any records of plant or animal species in the area. If any notable species are identified we advise that appropriate survey work is carried out. Protected species which may occur in the area and we advise should be considered include:

- Bats, which are listed on Schedule 2 of The Conservation (Natural Habitats, &c.) Regulations 1994 as European Protected Species (EPS)[2].
- Otters which are listed on Schedule 2 of The Conservation (Natural Habitats, &c.) Regulations 1994 as European Protected Species (EPS)[3];
- Water voles which are protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended)[4]; and
- Badgers, which with their setts, are protected by the Protection of Badgers Act 1992 (as amended)

Bats
SNH has adopted 'TIN059 - Bats and single large wind turbines. Joint Agencies interim guidance'[5] to inform the requirement for bat surveys for this type of proposal. The guidance contains a list of features around which bat activity is likely to be high and advice on when and how to survey for bats. If one of these features (or other features of interest to bats) occurs within 50 metres of any of the proposed turbine locations then we would advise that a bat survey would be appropriate.

Otters
If there are any water courses adjacent to the development site which may provide suitable habitat for otters and could be affected then we would recommend that an otter survey is carried out.

Water voles
Water voles can be found in water courses of all sizes, including ditches and drains, and so may be present in the area surrounding the proposed development. Water voles are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) in respect in respect of Section 9(4) only. There is no licensing provision within the Wildlife & Countryside Act 1981

[2] SNH website: Protected mammals - Bats
www.snh.gov.uk/protecting-scotlands-nature/protected-species/which-and-how/mammals/bat-protection

[3] SNH website. Protected mammals - Otters
www.snh.gov.uk/protecting-scotlands-nature/protected-species/which-and-how/mammals/otter-protection

[4] SNH website: Protected mammals – Shrew and Water voles
www.snh.gov.uk/protecting-scotlands-nature/protected-species/which-and-how/mammals/shrew-and-vole-protection/

[5] TIN059 - Bats and single large wind turbines: Joint Agencies interim guidance
http://naturalengland.etraderstores.com/NaturalEngland/ShopTIN059

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(as amended) to permit actions that would otherwise constitute an offence in relation to water voles, for the purpose of development. We recommend that a water vole survey is carried out if any works are proposed within 5 meters of a watercourse.

Badgers
Badgers are known to occur widely throughout Aberdeenshire. Activities that could disturb badger setts can be permitted under licence from SNH, but we would normally only grant such a licence where an effective badger protection plan has been agreed with the planning authority prior to the grant of planning permission. If planning permission is granted without such measures, there is a risk that the developer would be unable to make practical use of the planning permission if a licence is not forthcoming.

4. Habitats

We recommend that the report includes a Phase 1 habitat survey of all habitats within 250 metres of the proposed site. This survey should be supported by a species list of any notable species or species of conservation concern. This should be accompanied by a National Vegetation Classification (NVC) survey of any important semi-natural habitats encountered on the site.

The ES should also include information on any areas of carbon rich soils.

5. Landscape and Visual Assessment

SNH provides detailed guidance on good practice in undertaking landscape and visual impact assessment of wind energy developments through the Wind Energy guidance section of our website at www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind. The site also has links to design guidance including our 'Siting and Designing windfarms in the landscape' publication.

Cumulative impacts
SNH is concerned about the current number of proposed, approved and built wind projects in relatively close proximity to this development. The applicant should consider whether this site has the capacity to support this proposal in addition to other developments, with due regard given to the communities and their settlement settings that are likely to be affected by multiple wind energy developments.

6. Infrastructure

Infrastructure such as roads and grid connection can have significant natural heritage impacts of their own. We recommend that the final report covers all aspects of the works that have the potential to have an impact upon the environment. This includes issues such as construction methods, access to site and delivery of turbines and other components, the means of connecting to the grid, details of any sub-station buildings, proposed permanent/temporary tracks, quarrying works and any proposed modifications to existing topography.

Suitably scaled plans and drawings of the proposals should be submitted and proposed mitigation and restoration measures should be fully outlined and assessed in the report.

7. Decommissioning

We advise that consideration is given in the report as to how the site would be decommissioned.

ENQ201101

7th June 2011

Mr Chris Orminston
Aberdeenshire Council
The Town House
Low Street
Banff
AB45 1AY

ABERDEENSHIRE
10 JUN 2011
Planning and Environmental Services

SCOTTISH WATER

419 Balmore Road
Glasgow
G22 6NU

T: 0141 355 5511
F: 0141 355 5449
W: www.scottishwater.co.uk

FAO: Chris Orminston,

Development: Land at Deuchries (Wind Turbine). Ref - 571241

Following a review of your application/enquiry and our resultant investigation, I am pleased to advise you that Scottish Water assets are not affected. However, if you subsequently discover or become aware of any public sewers or water mains, I would ask you to Scottish Water directly at your earliest convenience.

In the meantime, if you have any questions regarding this letter, please contact me at the above address.

Yours faithfully,

Laura Muir
Customer Connections Administrator

LD

Roy Brannen. Director
Trunk Road and Bus Operations

Buchanan House, 58 Port Dundas Road, Glasgow G4 0HF
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AUDA

TRANSPORT SCOTLAND



Aberdeenshire Council
Infrastructure Services
The Town House
Low Street
Banff
AB45 1AY

FAO – Chris Ormiston

Your ref.
ENO/2011/0810

Our ref.
EIA/ABS/005

Date:
24 May 2011

Dear Chris

ENVIRONMENTAL IMPACT ASSESSMENT (SCOTLAND) REGULATIONS 1999
ERECTION OF WIND FARM ON LAND AT DEUCHRIES, ABERCHIRDER, HUNTLY(SCOPING OPINION)

I refer to your letter of 18 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 Scotland TranServ (STS) may be required. It is advisable that STS 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 those movements via the nearest suitable port.

I trust this meets your requirements.

Yours sincerely,

Sally Hartley
Development Management

cc Alex Kerr SG DBE Planning (Email)

LC
24/05/11

APPENDIX 5
PHYSICAL ENVIRONMENT

Appendix 5.1: Peat Probing Note

The proposed Deuchries Wind Farm lies just off the A97 close to the northeast of Aberchirder in Aberdeenshire.

On 24 November 2011 a site walkover was undertaken to assess the presence of peat at the site. Some soft ground probing was undertaken using a thin 1.7m long steel rod; this would not differentiate between peat and other soft ground. Some photographs illustrating the site are appended.

The site comprises four fields referred to here as fields A to D for convenience, as follows.

Field	Location	Description	Proposals
A	364400 854950	A low lying field at the northeast of the site	Two turbines
B	364100 854900	A low lying field at the northwest of the site; separated from Field A by a minor watercourse flowing north	One turbine
C	364050 854200	The field immediately south of A and B	One turbine and a control building
D	364100 854550	The southernmost field; current location of a temporary met mast	Access track only

Fields A and B are the lowest lying area of the site and are surrounded by hills to the west and north and by a comparatively low ridge to the east. The small watercourse which separates the two fields runs northwards between them before flowing away to the northeast.

Field D The field slopes down to the east and gently to the north. It is in grass and contains a temporary met mast near the top of the slope towards the southwest of the field. Peat was not visible here and no probing was undertaken.

Field C The field slopes down to the north and is flanked to the west by a hillside and to the east by a smaller ridge / slope. Features evident in the field include (i) the remains of a building in the middle of the field, and, further north, a chamber cover (where flowing water was heard) and a SEPA monitoring point bounded by fencing.

Probing was undertaken at approximately twenty locations in areas of this field where the vegetation might indicate wetter ground. Probing in the east area of the field, south of the ruin, attained a maximum depth of 0.5m though the stratum is thought to be soft clay rather than peat. Probing in the northern part of the field attained a maximum depth of 0.95m, again thought to be soft clay. The probed depth in this field was typically of the order of 0.3m.

Field B (at northwest) The field is comparatively flat with a fenceline at east separating it from a small watercourse, and a steep high hillside at west with some gorse cover. The vegetation generally indicates wetter conditions.

The access track to the turbine in this field runs along its eastern perimeter near the watercourse before turning westwards towards the turbine. There is likely to be little or no peat at the turbine location near the foot of the ridge.

Probing was undertaken in the body of this field at approximately twenty locations. The typical depth of penetration was less than 1m, often 0.3m to 0.4m in the southern part of the field. However, in and around the area where the proposed access track turns westwards from its northerly alignment, there is noticeably boggier ground nearer the watercourse. Areas here yielded penetrations in excess of 1m. The maximum penetration was 1.7m, though this is the length of the probe used so it is possible that greater depths exist in this area. The stratum here may be peat, particularly where greater penetration was achieved.

Field A (at northeast) The field is comparatively flat with a fenceline at west separating it from the aforementioned small watercourse, and a steep though comparatively low, gorse covered ridge at east. As with Field B, the vegetation generally indicates wetter conditions.

The access track to the two turbines in this field runs along its eastern perimeter at or near the base of the ridge and there is no sign of peat or soft ground here.

Probing was undertaken in the body of this field at approximately twenty locations. The maximum depth of penetration was 0.95m, though typically 0.3m to 0.4m, and getting deeper to the west i.e. in the noticeably boggier ground nearer the watercourse. The stratum here may be peat, particularly where greater penetration was achieved nearer to the watercourse.

General Whether the soft ground is peat or soft clay, it was encountered in the low lying areas rather than on the steeper slopes flanking the valley to west and east. it is thought that rockhead is at shallow depth on the steeper slopes. It is therefore considered that the site would be unlikely to suffer problems with respect to peat landslides or peat instability.

The depth of soft ground or peat is within the range often encountered on wind farm sites and would normally be excavated from beneath the footprint of turbines, other structures and access tracks. Should there prove to be more than, say, 2m of peat or soft ground (e.g. in Field B) then the access track could be floated, though it is more likely that the locally deeper area would be excavated.

Report Revision V1- September 2012 (Based on site layout drawing 106008/DEU/PS001 Rev F)
Since the 1st draft of this report there have been some amendments to the number of proposed turbines (3 down from 4) and the location of the proposed turbines.
The initial review was completed on probing undertaken at the previous locations of the turbines however an update would be as follows:

Turbines 1 and 2 – The location of the proposed turbine is close to / adjacent to an existing track. The site walkover did not foresee any peat in this area.
Turbine 3 – The location of the proposed turbine is close to / adjacent to an existing track on a steep sided slope. The topography is such that the turbine location is on the upper section of the sloping ground where a small drainage channel has been cut adjacent to the location of the proposed crane platform. However the previous investigation has highlighted that the softer ground encountered was in the lower lying areas as opposed to the steeper slopes. Recommendation is given that some additional probing / a visual inspection is made of the area adjacent to the existing drainage channel / proposed crane base.



Looking north from Field C to low lying Fields A and B (at right and left respectively)



North flowing minor watercourse separating low lying Fields A and B

Appendix 5.2: Flood Risk Assessment



Force 9 Energy

Deuchries Wind Farm, Aberchirder, Aberdeenshire

Flood Risk Assessment

131569-R1(2)-FRA

SEPTEMBER 2012

RSK

RSK GENERAL NOTES

Project No.:	131569-R1(2)-FRA
Title of Project:	Deuchries Wind Farm, Aberchirder, Aberdeenshire
Title of Report:	Flood Risk Assessment
Client:	Force 9 Energy
Date:	September 2012
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Author	Emma Evans	**Technical reviewer**	C Patmore
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Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK LDE.

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FIGURES

Figure 1 – Site Location Map
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Figure 3 – SEPA Flood Map

1 EXECUTIVE SUMMARY

Force 9 Energy LLP (Force 9 Energy) commissioned RSK Land and Development Engineering Ltd to carry out a Flood Risk Assessment for the proposed Deuchries wind farm development, near Aberchirder in Aberdeenshire.

The assessment has been carried out in accordance with Scottish Planning Policy (SPP) and the Sustainable Drainage Systems (SUDS) Manual with site-specific advice from Scottish Environment Protection Agency (SEPA), Aberdeenshire Council and the Client, Force 9 Energy.

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

- The SEPA indicative flood map indicates that the Site does not fall within predicted flood zones of the major rivers in the area and is at low risk of fluvial flooding;
- There are no records of historic flooding associated with the Site;
- Other flood risks considered in the assessment included risks from tidal flooding, groundwater, sewers, the proposed drainage system, reservoirs, canals and artificial structures. None are considered to pose a flood risk to the Site;
- SPP requires that the Development does not cause or exacerbate any adverse condition on the Site, downstream of the Site and the environment with respect to flood risk. Hence, it is recommended that the design of the surface water drainage for the Development should include SDS. This would protect the headwater of the Rosy Burn within the Site in terms of water quality and quantity of flow;
- Construction of the access track to Turbine 3 would require replacing part of an existing culvert. The design of a new section of culvert, which would be located underneath the crane pad of turbine 3, would be in accordance with SEPA's publication 'Position Statement in Culverting of Watercourses' and CIRIA Report C689 Culvert Design Guide and would meet the requirements of Water Environment (Controlled Activities) (Scotland) Regulations 2011. As a result there would be no impact on the existing hydrology.

In summary, the assessment concluded that the Site is at low risk of flooding. The Development would result in a minimal increase in the hardstanding surface area within the Site and SUDS would be installed to control the surface runoff from these areas.

2 INTRODUCTION

RSK Land and Development Engineering Ltd (RSK) was commissioned by Force 9 Energy (Client) to produce a Flood Risk Assessment (FRA) report to support the planning application and Physical Environment chapter of the Environmental Statement for the proposed Deuchries wind farm development, near Aberchirder in Aberdeenshire.

The FRA 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), Aberdeenshire Council 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 the project is to prepare a FRA report to establish the flood risk associated with the Development and to propose suitable mitigation, if required, to reduce the risks to a more acceptable level.

3.1 Application of Planning Policy

The SPP sets out:

- The Scottish Government's view of the purpose of planning, core principles for the operation of the system and 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 and Risk Framework

The scope of work relating to a FRA is based on the guidance provided in SPP, in particular paragraphs 196 to 211 inclusive of Flooding and Drainage and the following should be taken into account while applying the Risk Framework (see Table 3.1):

- 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.

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 above relate to the land at the time a planning application is made or a development plan is prepared.

Table 3.1: 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 upper 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 of the site, where the turbines and access tracks will be located are within in an area identified as little or no risk, in accordance with the Risk Framework, there should not be constraints due to watercourses, tidal or coastal flooding.

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

Under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR2011)[(Ref.3)] authorisation is required to control impacts on the water environment, including mitigating impacts on other water users. Three different types of authorisation under CAR2011 allow for proportionate and risk-based regulations, these are:

- General Binding Rules: These apply to low risk activities that do not need to be notified to SEPA. There are a series of generic conditions contained in the CAR that must be complied with;
- Registrations: These notify SEPA of medium risk activities and enable SEPA to monitor cumulative impacts. A registration authorises the activity as described in the application and so would specify the scale of the activity and its location. SEPA may set additional conditions for such activities; and
- Licence (simple or complex): A licence is required for higher risk activities; this would contain site-specific conditions relating to that activity. A licence requires the identification of a responsible person who is responsible for ensuring compliance with the conditions of the licence.

When an application is being considered for authorisation, SEPA would assess the impact on ecology, on other water users and the extent to which the activities would affect flood risk.

4 SITE DESCRIPTION

4.1 Location

The Site is located to the north east of the village of Aberchirder as shown in Figure 1. The Site encompasses a valley situated between Crannabog Hills to the east and Black Law to the west and is bounded by the A97 to the west, the B9025 to the south and minor unclassified roads to the east and north.

4.2 Details

The total Site area (the Site) is approximately 363ha but only a relatively small area on the northern area of the Site would ultimately be subject to permanent land take for the Development. The Site details are summarised below:

- Site name: Deuchries wind farm
- Purpose of Development: 3 wind turbines
- Existing land-use: agriculture and grazing land
- OS NGR: 364168E, 854598N, (centre of the Site)
- Country: Scotland, PPS applies
- Local planning authority: Aberdeenshire Council
- Other authorities: SEPA

4.3 Topography

The topography of the Site is varied ranging from a minimum elevation of 130 metre Above Ordnance Datum (m AOD) in the southwest near the village of Aberchirder to a maximum elevation of 240m AOD at Black Law Hill in the west. Other notable peaks include Cranna Hill at 230m AOD south of Black Law Hill, Gallow Hill south east of Cranna Hill and a high peak to the west of Crannabog hills at 220m AOD.

4.4 Hydrology

The Site falls within the catchments of Rosy Burn within the northern portion of the Site and Burn of Arkland to the south, roughly in equal proportions. Both are minor tributaries (sub-catchments) of the River Deveron.

The Development components (turbines, substation and access tracks) would fall within the catchment of a headwater of the Rosy Burn, which has a total catchment area on site of 0.4km^2. This watercourse flows west to east across the northern half of the Site. Drainage along the field boundaries joins Rosy Burn from the north and south centrally within the Site.

The headwater of the Rosy Burn starts in the form of a ditch at the boundary of three fields (to the south of the proposed turbine area) at NGR 364200, 854400. The ditch runs north for approximately 300m before entering a 60m long culvert (due to thick vegetation and a deep ditch at the inlet and barbed wire fencing at the outlet, it was not possible to confirm the diameter of the culvert at the time of site visit). The culvert emerges in an open channel and continues in a north easterly direction towards the Rosy Burn. Two further field drains flow into the Rosy Burn from the northern area of the Site i.e. to the north of the proposed turbine locations, as shown on Figure 2.

According to the OS mapping the ditch that leads north into the culvert continues further to the north east (towards the proposed location of Turbine 3), before turning north to run in a straight line to join the Rosy Burn. It was noted during the site visit that this latter section of ditch no longer exists and the section of ditch that runs to the north east of the existing culvert location is understood to be abandoned and flows instead go to the north through the culvert.

The total catchment for the whole of the Rosy Burn as far downstream as its confluence with the River Deveron to the east is 11.5km^2.

The Burn of Arkland flows in a southerly direction along the south western Site boundary; a tributary of the burn flows from North Cranna and a second tributary flows west along the southern edge of the Site - the confluence of this with the burn being at the south western corner of the Site. The total catchment of the Burn of Arkland as far downstream as its confluence with the Burn of Auchintout (a tributary of the River Deveron to the south) is 7.39km^2.

The Ordnance Survey (OS) map also shows an 'Issues' or spring point and 'Collects' point (where water has collected from a bog or marsh) at approximate NGR 363900, 855170, approximately 120m to the north west of the proposed location of Turbine 1.

4.5 Geology

The majority of the area is underlain by superficial deposits of till comprising a stiff clay with variable quantities of sand and gravel within it laid down beneath and over consolidated by glaciers. Clay soils are present throughout much of the Site; depths are generally shallow with some deeper deposits to the northwest.

The Site visit by the hydrologist identified an area of potential mire (peat deposits) towards the centre and north of the Site. A Site walkover was subsequently undertaken by Grontmji on 24 November 2011 to further assess the presence of peat at the Site. Results of soft ground probing undertaken during this visit indicated noticeably boggier ground that may be peat in Fields A and B (as shown on Figure 2) again in proximity to the watercourses and drainage ditches i.e. to the north of the proposed turbine and track locations. Soft ground (as potential peat or soft clay) was encountered in the low lying areas of the Site rather than on the steeper slopes flanking the Rosy Burn valley to the west and east.

High ground areas such as Black Law ridge and Gallow Hill ridge are indicated to be free of superficial deposits with the bedrock being present at surface or under a thin layer of topsoil.

The underlying bedrock is sandstones with some subsidiary units of pebble rich beds. Within the bedrock some elongated inclusions trending north / south of metamorphosed slates, phyllites and mica-schist are present.

4.6 Groundwater

There is no borehole information about groundwater levels in this area. A high water table is expected within the clay/peat soils at the valley bases. This could result in flooding problems in these low-lying areas, which would result in a shallow depth of flooding. (The OS map for the Site indicates a total of eight 'Well' features present within the Site boundary.)

4.7 Flood Defences

There are no formal flood defence structures present at the Site.

4.8 Flood Zones

The SEPA indicative flood map indicates that the Site does not fall within predicted flood zones of the major rivers in the area. The SEPA indicative flood outline is shown in Figure 3.

According to the Risk Framework, the Site is located within an area identified as **Little or No Risk,** therefore the Site should not be constrained due to watercourse, tidal or coastal flooding.

4.9 Historic Flooding

Aberdeenshire Council has confirmed that are no formal flooding areas identified either on or within the immediate vicinity of the Site and no recorded flood incidents.

5 CLIMATE CHANGE

As stated under paragraph 43 of the SPP, the changing climate may increase the risk of damage to buildings and infrastructure caused 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 UK 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 summer and winter increases in precipitations for medium emission scenarios in Scotland are as follows:

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

As a result, climate change is likely to increase surface water runoff from the Site, which can result in increased flows in the headwater of the Rosy Burn.

6 DEVELOPMENT PROPOSALS

The total Site area is approximately 363ha, but only a fraction of this area on the northern portion of the Site would ultimately be subject to permanent land take for the proposed Development and associated structures. The wind farm proposals consist of the following and the layout is included as Figure 2.

- Three wind turbines, each with a capacity of up to 2.3MW giving the Site a total installed capacity of up to 6.9MW;
- A permanent anemometer mast;
- Crane pad areas;
- A substation and control building;
- Permanent access tracks to gain access to the Site and between the turbines;
- A temporary construction compound; and
- Two temporary borrow pits.

7 SOURCES OF INFORMATION

7.1 SEPA Consultation

A scoping response for the Site was received in June 2011 from SEPA, which is included in Appendix C. Some of the comments in relation to flood risk have been summarised below:

- Flood risk from all sources should be assessed in line with SPP (paragraphs 196 to 211);
- Flood risk should be identified using the Indicative River & Coastal Flood Map (Scotland) available online; and
- Technical Flood Risk Guidance for Stakeholders outlines the information required to be submitted as part of Flood Risk Assessment and methodologies that may be appropriate for hydrological and hydraulic modelling.

7.1.1 SEPA River Levels

SEPA has monitoring stations at 360 sites throughout Scotland located mainly on rivers. Data is also available for 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.

There are no records for the Rosy Burn, the nearest watercourse to the Site.

7.2 Aberdeenshire Council

Correspondence with Aberdeenshire Council (Council), which is included in Appendix D, confirmed the criteria to be included in the Flood Risk Assessment and Environmental Statement. The Council confirmed that "Hydrology and Water Supplies" are key issues.

A memo from a planner within the Marr Team (Appendix D) states: *if any watercourse crossings are required, the Flood Prevention unit should be consulted and crossing details should be submitted with the planning application. Scottish Natural Heritage (SNH) should also be consulted regarding wildlife impacts*.

Further consultation with the Council confirmed that any proposal for surface runoff should be in accordance with the SUDS Manual and SEPA guidance.

7.3 Relevant Studies

7.3.1 The River Basin Management Plan for the Scotland River Basin

The Site falls within the River Basin Management Plan (RBMP) for Scotland(Ref.5). The RBMP sets the framework for protecting and enhancing the water environment from 2009 to 2015.

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 Flooding in Scotland - A consultation on Potentially Vulnerable Areas and Local Plan Districts (SEPA)

Flooding in Scotland[(Ref.6)] provides an overview of the National Flood Risk Assessment (NFRA) for Scotland and identifies the local plan districts for individual areas. The NFRA considers all sources of flooding (rivers, sea, surface water and groundwater) and the impact upon people, the economy and the environment. The report identifies that 1 in 20 homes and 1 in 14 businesses in Scotland are at risk of flooding.

The NFRA provides a categorisation of flood risk by catchment. According to NFRA, the Site lies within an area classified as "very low" where "one or two residential or business properties affected by flooding".

The Consultation also highlights areas considered at significant risk of flooding, which will be included as Potentially Vulnerable Areas under the Flood Act. The document states that SEPA are proposing to categorise all catchments with a "medium" risk or above, as Potentially Vulnerable Areas. The Site would not be included in one of these areas.

The consultation states that 14 Local Plan Districts have been agreed by SEPA and the aim is to provide more details at a more local level, whilst retaining national coverage. For each Local Plan District, a Lead Local Authority should be identified and a Flood Risk Management Strategy and a Local Flood Risk Management Plan should be produced.

The Site is not identified as a potential vulnerable area within the "Aberdeenshire and Aberdeen City" Local Plan District.

The NFRA report was due to revised in December 2011 (not issued during production of this report), which may provide additional information.

http://www.sepa.org.uk/flooding/flood_risk_management/consultations/flooding_in_scotland.aspx

7.3.3 Local Plan Districts and Potentially Vulnerable Areas (North East)

The Local Plan Districts and Potentially Vulnerable Areas (North East)[(Ref.7)] summary sheets provide information on the main sources of flooding and associated impacts identified through the NFRA. It also provides a summary of Potentially Vulnerable Areas within the Local Plan District and how they are spread between local authorities.

The North East Local Plan District covers the area surrounding the Site. In this district, the document identifies that the rivers are the main source of flood risk accounting for 53% of all risk, with coastal flooding 14% and surface water flooding at 33%.

The document gives specific details of the individual Potentially Vulnerable Areas, none of which cover the Site area.

The Aberdeenshire and Aberdeen City area is identified as a flood alert area. Flood alerts for Aberchirder area can be found on the SEPA website.

7.3.4 Other Relevant Reports

7.3.4.1 Flooding in Aberdeenshire – Seventh Biennial Report

In accordance with the Flood Prevention and Land Drainage (Scotland) Act 1997, Aberdeenshire Council produces a report every two years to provide information on flooding in the Aberdeenshire region. The seventh report was produced November 2009 covering period from 1st November 2007 to 1st November 2009 inclusive and describes flooding issues over the previous two years [(Ref.8)].

The report states that three incidents in 2009 caused the majority of flooding and local flooding was predominantly due to overwhelming of local land or road drainage systems. The report also details the mitigation measures put in place.

The report does not detail any flooding in the area surrounding Aberchirder and the Site.

The report to the end of 2011 had not been issued during production of this report.

8 SOURCE 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 Land (Overland flood risk);
- Flooding from Groundwater;
- Flooding from Drainage Systems (sewer and drain exceedence, pumping station failure etc); and
- 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)

According to the Indicative River and Coastal Flood Map (Figure 3), the Site is not at risk from fluvial flooding. SEPA has no site-specific data to inform of any fluvial flooding risk within the vicinity of the Site. There have been no indications of any fluvial flooding in or around the Site in any other reports.

It is therefore considered that there is a low risk of fluvial flooding to the wind turbines and the access road.

8.2 Flooding from the Sea (Tidal Flood Risk)

As indicated on the SEPA Indicative River and Coastal Flood Map (Figure 3), the Site is not located within an area at risk of flooding from the sea.

8.3 Flooding from 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 and waterlogged nature of the lower lying areas, it is likely that surface water flows will result during heavy rainfall events. There will be limited warning before this type of localised flooding occurs.

Any overland flow would follow the Site topography and flow toward the headwater and drainage into the Rosy Burn. Due to the steep and rural nature of land the flooding would be shallow and short-lived, localised and would tend to last as long as the rainfall event.

The wind turbines and control building are not considered to be at risk of flooding from overland flow as they would be located above the lowest points of the Site and valley features. The access track is considered to be at potential risk of overland flooding should flow paths cross the track. Again, this would be minimal in volume and duration and due to the flood resilience of the track would have limited impact. The low intended operational use of the tracks would also decrease the impact of any flooding.

8.4 Flooding from Groundwater

SEPA has not provided any data on groundwater levels. There is no data to show that the Site has previously been flooded from groundwater.

It is possible that the groundwater may reach the surface at the lower levels where the Headwater is located as the softer soils become saturated. This would have little impact on the proposed wind farm turbines and the control building, which would be located on a higher ground. Hence, it is unlikely that groundwater flooding would affect the Development.

8.5 Flooding from Sewers

Scottish Water has confirmed that their assets are not affected with the Site proposal, (see Appendix E). Therefore, there is no risk of sewer flooding to the Site.

8.6 Flooding from Reservoirs, Canals and other Artificial Structures

Risk of flooding to the Development from existing reservoirs or canals is not an issue at this location.

There is a risk of flooding from blockages or collapse of the existing 60m long Headwater culvert beneath the Site. This may result in shallow, short duration and localised flooding to the proposed access track at this location, but is not considered to pose any significant flood risk due to its relatively short distance to the open section of the Headwater downstream.

8.7 Other Sources of Flooding

8.7.1 Flooding from Proposed Drainage

Flooding from the SUDS proposed as part of the wind farm development could occur as a result of blockages in on-site drainage systems, or as a result of high intensity, short duration, localised extreme event storms which produce runoff rates that cannot be drained into the Headwater quickly enough. Incidents like this would usually be anticipated to result in shallow and localised flooding. No flood risk to the wind turbines and control building is likely and the access track should not be restricted for any significant amount of time.

9 SURFACE WATER DRAINAGE ASSESSMENT

As the Development would create hard-standing areas, surface water runoff would increase as a result of the proposed access track and wind turbines platforms. It is important that the additional runoff is accommodated. The preferred method of dealing with surface water is to contain and treat at source wherever possible.

The proposed surface runoff drainage would be in accordance with the SUDS Manual and SEPA guidance.

9.1 Pre-Development Situation

The Site drains by a single ditch running through the centre of the Site in a northerly direction joining the Headwater at the base of the valley. The catchment area of the Headwater, as far downstream as its confluence with the Rosy Burn, is approximately 0.4km^2 (40ha).

Based on the Institute of Hydrology Report 124(Ref.9) (IoH 124) the peak flows for the rural catchment were calculated and shown in Table 9.1.

Table 9.1: Predicted Peak Flow for the Headwater Catchment before Development

Return Period (1 : year)	Peak Flow (l/sec)
1:2.3 (Qbar)	226
1:2	205
1:10	326
1;30	427
1:100	560
1:200	635
1:200+cc	762

9.2 Post-Development Situation

It is intended that surface water runoff from the proposed Development would be discharged to groundwater through the infiltration techniques (gravel trenches) to closely mimic the existing situation.

It is proposed that any run off caused by additional hard standing would be stored on site next to the source in the form of attenuation structures, for example infiltration trenches alongside new tracks and turbine bases.

There are currently no known points of discharge from the site and it is assumed that any rainfall on the Site either infiltrates into the soils or flows towards the Headwater and then Rosy Burn. The Development would increase the impermeable area by a maximum of 0.37% (approximately 1.36Ha of a 363Ha area) and therefore reduce the potential area for infiltration minimally; as a result there may be a small increase in surface water runoff. As the site has no formal outfall to sewer nor to watercourse directly, there would be no additional runoff into surrounding systems. Mitigation measures should be incorporated to make sure that any additional hard standing has suitable SUDs to reduce any impact.

Table 6.2 below calculates the volume needed for each area of proposed hardstanding, and describes the size of the infiltration trench required and calculates the amount of volume created by the trenches for each area.

Description	Rainfall (m)	Development Area (m^2)	Volume Required (m^3)	Trench Sizing				Volume Created (m^3)
				Slope Slide	Base Width (m)	Depth (m)	Volume (m^3) per m length of perimeter	
New Access Track	0.058m	6000m^2	**348m^3**	1:1	0.75m	0.75m	1.125	**366.5 m^3**
Crane Pad	0.058m	2574m^2	**49.76m^3**	1:1	0.53m	0.53m	0.56	**50.4 m^3**
Turbine Foundation	0.058m	1452m^2	**82.65m^3**	1:1	0.84	0.84	1.4112	**83.8m^3**
Car Parking and Control Building	0.058m	412m^2	**23.89m^3**	1:1	0.7	0.7	0.98	**29.4m^3**

Table 6.2 Volume calculations for surface water trenches

The rainfall data used in the calculations has been gathered from the FEH rainfall database.

The volume (m^3) calculated per metre for the hardstanding perimeter, has been calculated using a void of 0.3 m^3 of the total volume of aggregate in the trench.

The trenches are to be back filled with a suitably sized and sourced aggregate, to allow appropriate infiltration.

9.2.1 New and Existing Culvert

The proposed access track to Turbine 3 would cross the existing Headwater culvert (dimensions unknown), at approximately NGR 364212E, 854713N. The existing culvert requires further investigation to determine if any upgrade work is required. A new culvert would be required underneath the crane pad of Turbine 3.

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. For all other crossings, the use of span bridges and bottomless arch structures should be pursued, 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 this case, it is likely that a closed culvert will be required due to the nature of the development and the small scale of the field drain to be culverted. This would however, be verified on-site at the detailed design stage and agreed with SEPA.

In addition, all watercourse crossings must be designed and constructed in accordance with the CAR 2011 requirements.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

The Site is not at risk from tidal flooding and considered to be at a low risk of fluvial flooding as shown on the indicative SEPA's River and Coastal Flood Map. Other flood risks considered included flooding due to groundwater, sewers, reservoirs and artificial structures. These are not considered to pose a flood risk to the Site.

The Development would result in a minimal increase in the hardstanding surface area within the Site and SUDS would be installed to control the surface runoff from these areas. The properties downstream of the Site would therefore not be at increased risk of flooding as a result of the Development.

Climate change is unlikely to have a significant impact on the fluvial flood level of the headwater over the lifetime of the Development, which is considered to be 25 years.

The Site meets the requirements for flood risk assessment and flood risk reduction. No additional mitigation is required.

Flood Risk Checklist has been included in Appendix F.

10.2 Recommendations

It is recommended that the SUDS solutions discussed within section 9.2 should be incorporated into the surface water drainage design of the Development, to protect the water quality and quantity entering the headwater of the Rosy Burn and other field drainage systems within the Site, and local groundwater.

11 REFERENCES

1. The Scottish Government "Scottish Planning Policy", February 2010

2. CIRIA (Mar 2007), *The SUDS Manual, C697*

3. The Water Environment (Controlled Activities), Scotland) Regulations, 2011

4. Grontmij (June 2011), Deuchries Wind Farm, by Aberchirder, Aberdeenshire, *Site Access and Delivery Route Review*

5. Natural Scotland Scottish Government (2009), *The River Basin Management Plan for the Scotland River Basin District 2009-2015*

6. SEPA (2011), Flooding in Scotland: *A consultation on Potentially Vulnerable Areas and Local Plan Districts*

7. SEPA (2009), *Local Plan Districts and Potentially Vulnerable Areas*, Flood Risk Management (Scotland) Act 2009, North East

8. Aberdeenshire Council (2009), *Flooding in Aberdeenshire – Seventh Biennial Report*

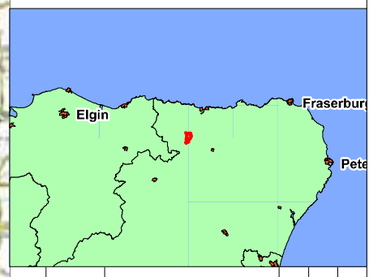
9. Institute of Hydrology (IoH) "Flood Estimation for small catchments" Report 124, 1994

10. CIRIA (2010), *Culvert Design Guide C689*

FIGURES



Site Location



Rev	Date	Description	Drn	Chk	App
00	27.09.12	Site Location	BF	ND	PB

FORCE 9 ENERGY

Deuchries Wind Farm

RSK

Figure 1: Site Location and Boundary

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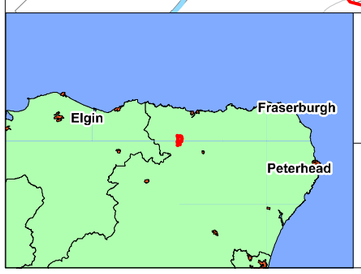
FILE NAME: P:\ENVIRONMENT\1190000 - EIA Glasgow\P190283 Deuchries Wind Farm\08 GIS\FRA Fig 1 - Site Location and Site Boundary.Wor

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1
2
3
A
B
C
D
This watercourse was not located on site (historical watercourse)
Approximate location of an new culvert
Location of an existing rain gauge
Approximate location of an existing culvert
BA1
BA 2
Approximate location of an existing water trough
CAR 1
CAR 2
CAR 3
CAR 4
CAR 5

Hydrology Legend

- Watercourse
- 50m easement from any water features
- Existing Overland Flow Directions
- Sub-catchemnt Boundary
- SEPA abstraction and discharge points and 50m buffer
- Field Locations of peat investigation
- Approximate location of existing culvert crossing
- Approximate location of new culvert crossing



FORCE 9 ENERGY

RSK

- Proposed Turbine
- Site Boundary
- Existing Road to be upgraded
- Proposed Access Track to WTGs
- Proposed Access Track to Identified Borrow Areas
- Crane Hard Standing
- Proposed Control Building Compound
- Proposed Construction Compound
- Potential Borrow Pit Locations
- Proposed Anemometer Mast Location
- Alternative New Access Track
- Identified Potential Shallow Rock

Deuchries Wind Farm

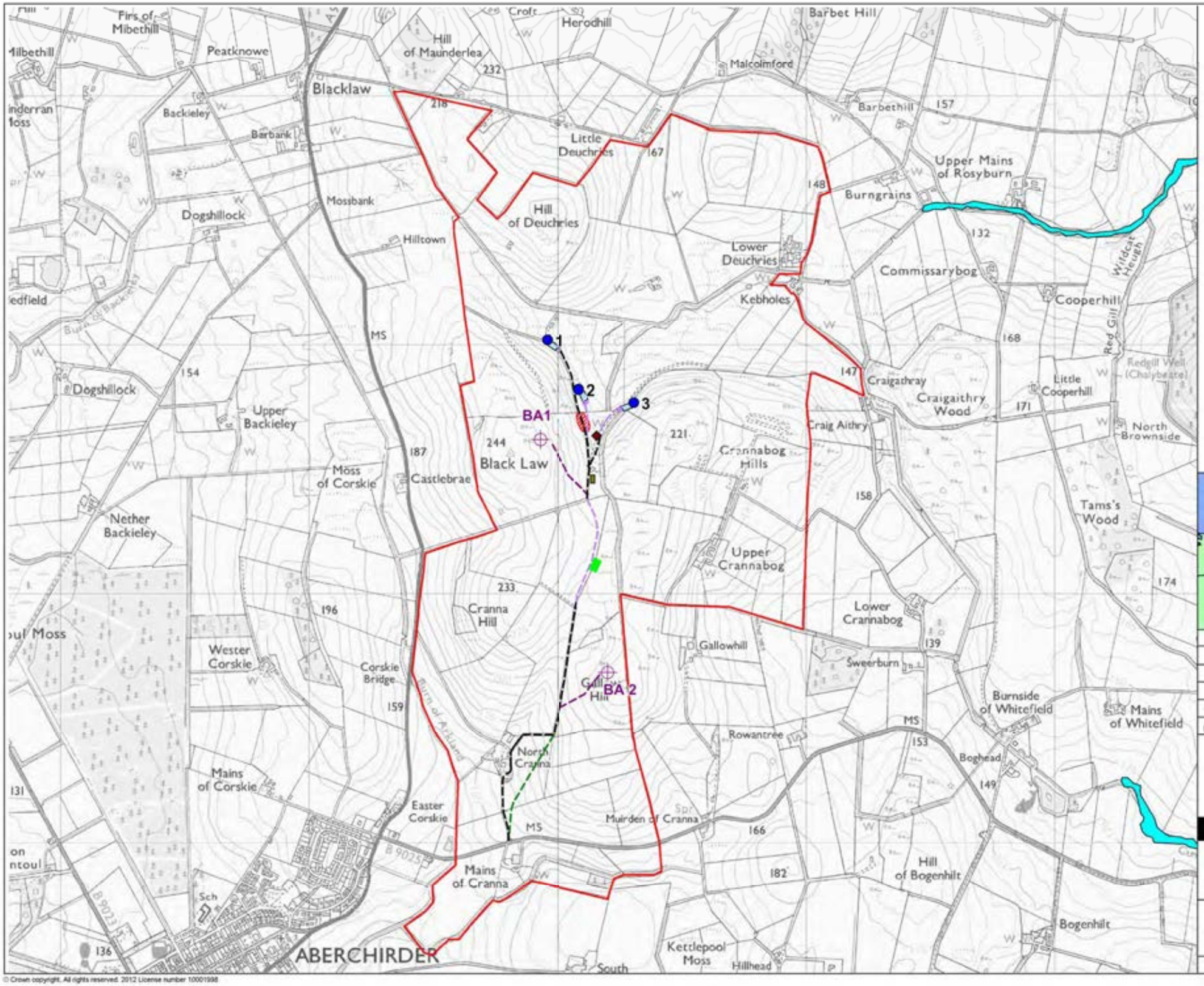
Rev	Date	Description	Drn	Chk	App
00	30.07.12	Hydrology	BF	ND	PB

Figure 2: Hydrological Constraint Plan

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APPENDIX A – SERVICES 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 August 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.

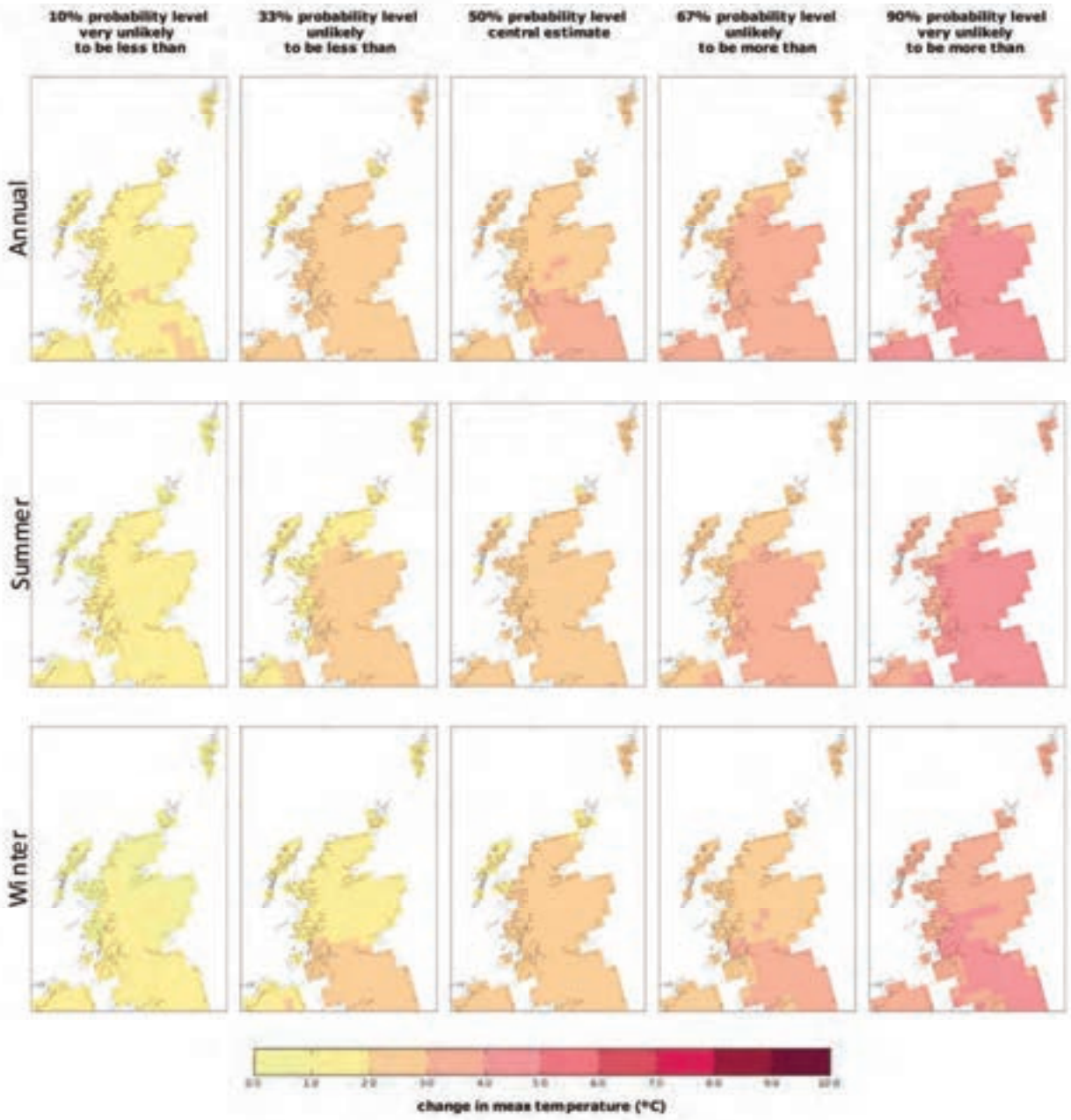
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B – UKCIP 2009, CLIMATE CHANGE MAPS

SCCIP
scottish climate change impacts partnership

UK CLIMATE PROJECTIONS

Change in Mean Daily Temperature (°C) 2080s – Medium Emissions (A1B)

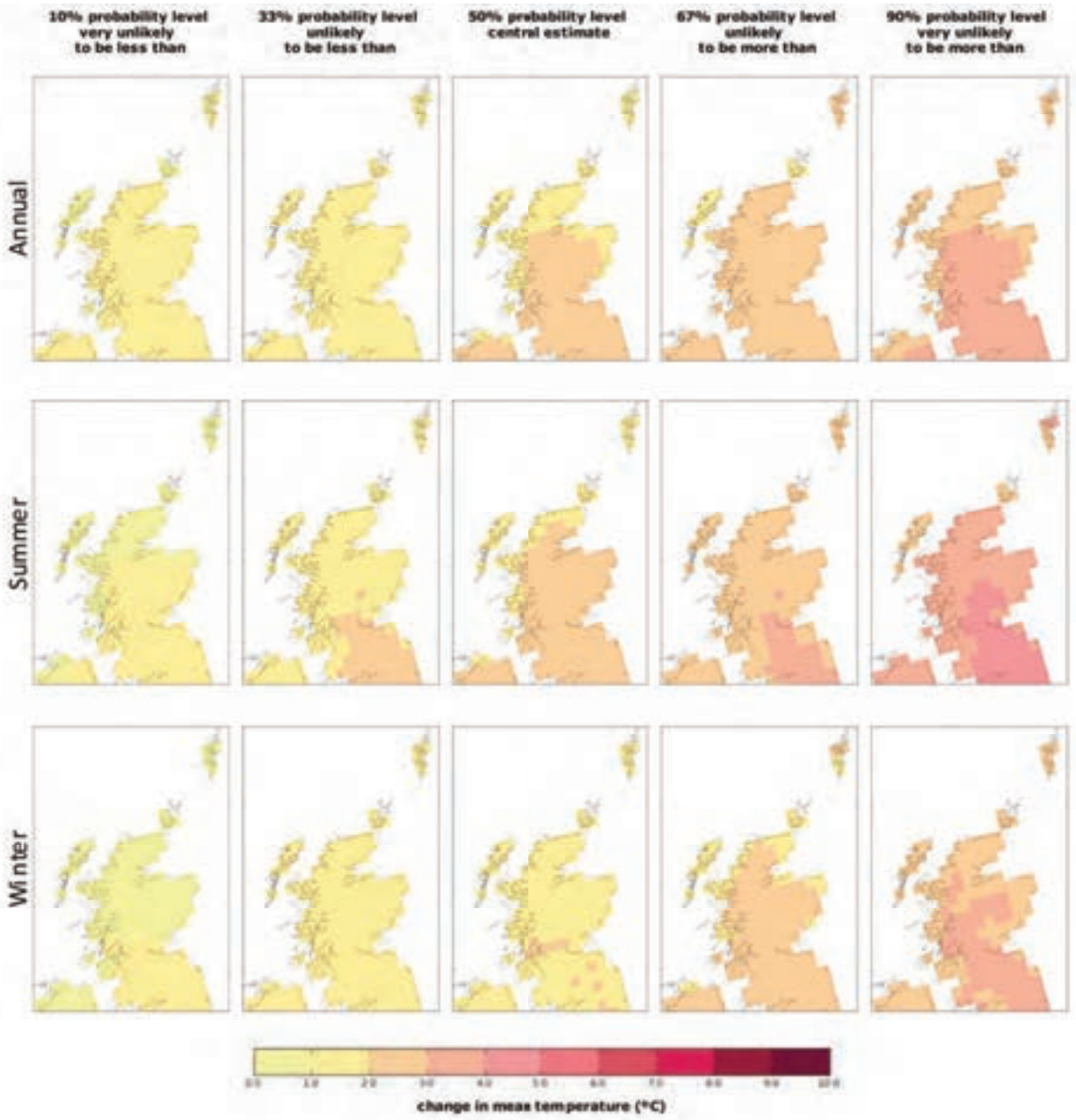


Change in mean daily temperature (°C) (annual, summer and winter averages) for medium emissions scenario (A1B) by the 2080s (2070-2099) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

SCCIP
scottish climate change impacts partnership

UK CLIMATE PROJECTIONS

Change in Mean Daily Temperature (°C) 2050s – Medium Emissions (A1B)

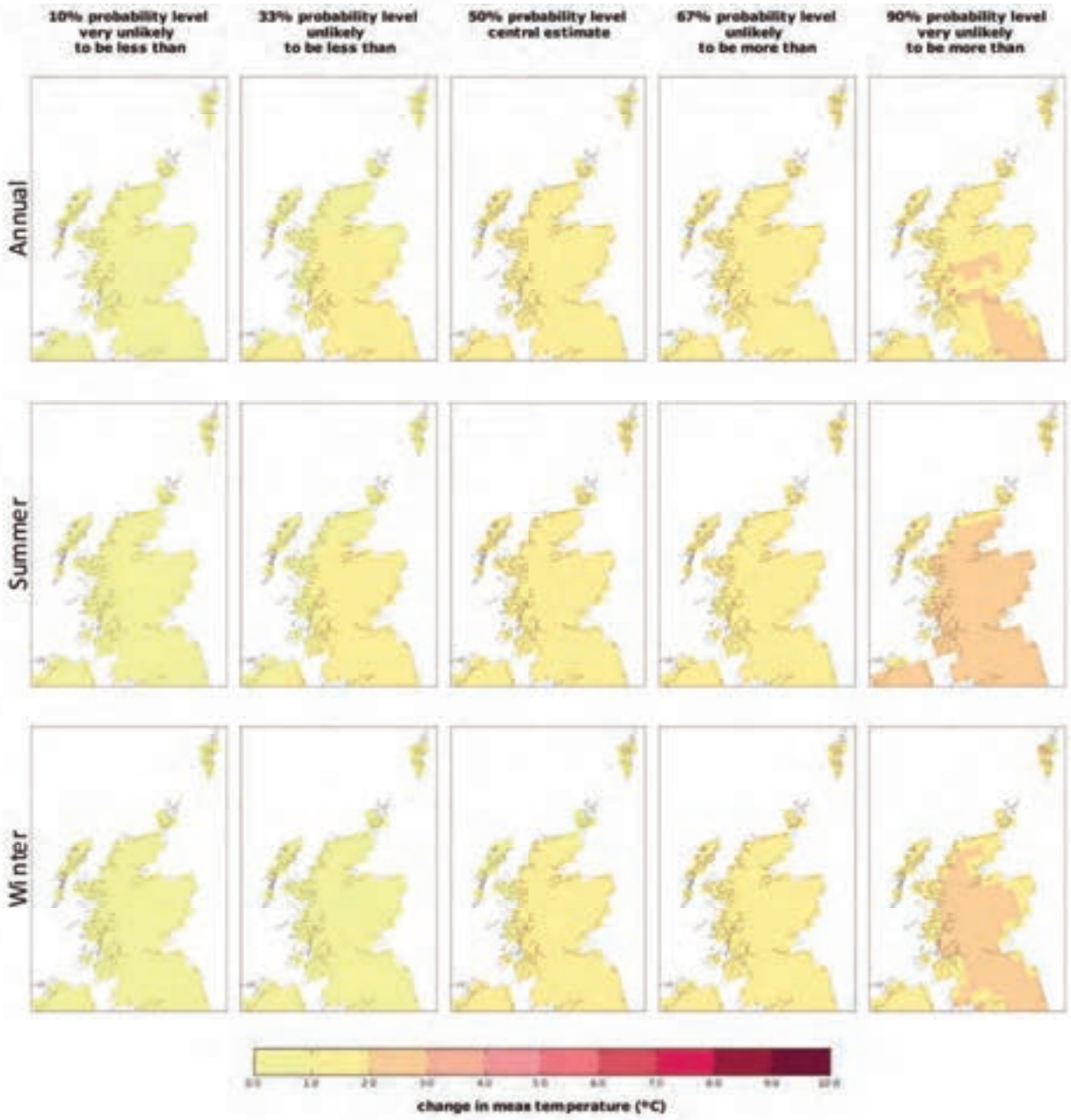


Change in mean daily temperature (°C) (annual, summer and winter averages) for medium emissions scenario (A1B) by the 2050s (2040-2069) relative to the baseline period (1961-1990). These show five different probability levels (10%, 33%, 50%, 67%, 90%). Based on maps extracted from the UKCP09 User Interface.

SCCIP
scottish climate change impacts partnership

UK CLIMATE PROJECTIONS

Change in Mean Daily Temperature (°C) 2020s – Medium Emissions (A1B)



Change in mean daily temperature (°C) (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.

APPENDIX C - SEPA CORRESPONDENCE

ABERDEENSHIRE COUNCIL
07 JUN 2011
Planning and Environmental Services

SEPA
Scottish Environment Protection Agency

Our ref: PCS/113929
Your ref: BB/ENQ/2011/0810

If telephoning ask for:
Nicola Abrams

6 June 2011

Chris Ormiston
Aberdeenshire Council
Planning and Environmental Services
Town House
Low Street
Banff
AB45 1AY

By email only to: bb.consultations@aberdeenshire.gov.uk

Dear Chris

Environmental Impact Assessment (Scotland) Regulations 1999
Planning Application: ENQ/2011/0810
EIA screening/scoping opinion for formal EIA scoping opinion - erection of wind farm
Land at Deuchries, Aberchirder, Huntly

Thank you for consulting SEPA on the scoping opinion for the above development proposal by way of your letter of 17 May 2011 which we received on 19 May 2011. We consider that the following key issues should be addressed in the EIA process:

- Engineering activities in the water environment;
- Impacts on groundwater;
- Environmental management and pollution prevention

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.

1. Carbon balance and peat management

1.1 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.

SGS SGS UKAS
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Dr Campbell Gemmell
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Torry, Aberdeen AB11 9QA
tel 01224 266 600 fax 01224 896 657
www.sepa.org.uk

NKS 07/06/11

1.2 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.

2. Disruption to peatlands

2.1 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.

2.2 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.

3. Disposal of waste peat to borrow pits

3.1 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.

3.2 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.

4. Peat slide risk

4.1 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.

4.2 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.

5. Wetland ecology (including groundwater dependent terrestrial ecosystems)

5.1 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.

5.2 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

5.3 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

5.4 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.

6. Groundwater

6.1 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.

6.2 It is noted from OS maps that there are numerous wells annotated in and around the area of proposed development. It should be highlighted that any abstractions, including private water supplies (PWS) within 250 m of turbine foundations or borrow pits, or within 100 m of road, tracks or trenches should be fully risk assessed. The source of any groundwater supply should be clearly identified by NGR coordinates with the type of source and

estimated abstraction rate stated. If any PWS are recognised as being potentially at risk, it is recommended that mitigation measures are in place to ensure that the works do not adversely affect supplies. These mitigation measures may include monitoring of the abstraction points before, during and after the works, and the implementation of appropriate contingency plans to ensure security of supply.

7. Construction Environmental Management Document and pollution prevention

7.1 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.

7.2 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.

7.3 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.

7.4 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.

7.5 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).

7.6 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.

8. Engineering activities in the water environment

8.1 It is noted that there are a number of water features within the site, turbines should be located well away from such features in order to minimise impacts, it is not clear whether watercourse crossings will be required to create new access tracks. 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. We require it to 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.

8.2 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.

8.3 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.

8.4 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.

8.5 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.

9. Water abstraction

9.1 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.

9.2 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.

10. Opportunities for Environmental Improvements

10.1 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.

11. Borrow pits

11.1 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.

11.2 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.

11.3 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.

12. Air quality

12.1 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*.

12.2 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.

13. Flood risk

13.1 The site should be assessed for flood risk from all sources in line with Scottish Planning Policy (Paragraphs 196-211). Further information and advice can be sought from your Local Authority technical or engineering services department, Scottish Water and from our website. Our Indicative River & Coastal Flood Map (Scotland) is also available to view online. If a flood risk is identified then a flood risk assessment should be carried out following the guidance set out in the Annex to the SEPA Planning Authority flood risk protocol. Our Technical flood risk guidance for stakeholders outlines the information we require to be submitted as part of a Flood Risk Assessment, and methodologies that may be appropriate for hydrological and hydraulic modelling. Further guidance on assessing flood risk and planning advice can be found at our website.

14. Regulatory advice

14.1 Details of regulatory requirements and good practice advice for the applicant can be found on our website at www.sepa.org.uk/planning.aspx. If you are unable to find the advice you need for a specific regulatory matter, please contact a member of the operations team in your local SEPA office at:

28 Perimeter Road, Elgin, IV30 6AF.

If you have any queries relating to this letter, please contact me by telephone on 01224 266698 or e-mail at planningaberdeen@sepa.org.uk

Yours sincerely

Nicola Abrams
Senior Planning Officer
Planning Service

Natasha Dolecki
Environmental Consultant
RSK Environment Ltd
65 Sussex St
Glasgow
G41 1DX

Our Ref: RSK/DEU

If telephoning ask for:
Luke Harrold

18 October 2011

Dear Natasha

Information Request: Deuchries Wind Farm

Below is SEPA's response to your request for information.

Any information relating to the flooding in the study area;

The specified area is too large to provide any detailed useful information about flood risk. Referring to the flood map on SEPA website would be the best step in identifying whether a potential site is at risk or not. The Local Authority may be contacted for any flood protection measures as SEPA do not maintain any.

Any flood protection measures in place, the location and details of any structures maintained by SEPA, any known sources of flood risk including sewers and groundwater and any restrictions imposed by Flood Risk Areas given the location of the works;

As above.

Surface water and groundwater quality data;

See attached spreadsheet.

Licensed abstractions and discharges within the study area;

Already provided.

Please note that abstractions for private drinking supplies of less than 10m³ a day are covered by a General Binding Rule. SEPA does not regulate these, please contact the relevant Local Authority

Any catchment management plans available for the area of search;

None held

Chairman
David Sigsworth
Chief Executive
Dr Campbell Gemmell

Aberdeen Office
Inverdee House, Baxter Street
Torry, Aberdeen AB11 9QA
tel 01224 266 600 fax 01224 896 657
www.sepa.org.uk

Information on aquatic wildlife and fisheries within and downstream from the Area of Search;

Attached is the most recent Ecology (aquatic benthic macro-invertebrate family) data (see attached) for the sites that will potentially be affected from the proposed wind farm at Hill of Deuchries.

Waterbodies

23167 Arkland Burn	2009	overall classification Moderate
23168 Auchintoul Burn	2009	overall classification Good
23157 Rosy Burn	2009	overall classification Poor
23158 Cunning Burn	2009	overall classification Poor

Please find attached a copy of SEPA's Standard Information Notice. It sets out your access and use rights to the data and information we are releasing with this response. Should you wish to use the data other than in terms cited in the Notice, please contact SEPA via the dataenquiries@sepa.org.uk mailbox.

An invoice for £75 will follow under separate cover from our Corporate Office in Stirling. If you have any further queries please call the Aberdeen Office on 01224 266600 or by email adminsupportabdnse@sepa.org.uk.

Yours sincerely,

Luke Harrold
Administration Officer

APPENDIX D - ABERDEENSHIRE COUNCIL CORRESPONDENCE

Aberdeenshire COUNCIL

20 JUN 2011

Infrastructure Services
Planning & Building Standards
The Town House
Low Street
Banff
AB45 1AY
Tel 01261 813200
Fax 01261 813281
www.aberdeenshire.gov.uk
LP-7 BANFF

Our Ref: ENQ/2011/0810
Your Ref:

Ask for: Chris Ormiston
Direct Dial: 01779-483720
Email: bu.planapps@aberdeenshire.gov.uk

Knight Frank
Leona Wilkie
120 Bothwell Street
Glasgow
G2 7JS

17/06/2011

Dear Sir/Madam

The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
Proposal: EIA Screening/Scoping Opinion for Formal EIA Scoping Opinion: Erection of Wind Farm
Address: Land At Deuchries, Aberchirder, Huntly

I refer to your request for a scoping opinion for the above proposal received on 10/05/2011. I am now in receipt of all the necessary consultation responses and I can now offer a scoping opinion under Regulation 14 of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (the Regulations).

Schedule 4 of the Regulations states the information which should be included in an Environmental Statement (ES). These guidelines offer the backbone to the structure of an ES and should be used as the basis for your submission.

In order to make an assessment of the above information there are specific criteria and guidance set out in Schedule 4 of the Regulations. In particular these include characteristics of the development, an outline of any alternative options/sites and the main reasons for the options/sites chosen. Environmental issues are of obvious key importance such as those aspects of the environment that would be likely to be significantly affected. Detailed survey work would be required to inform the ES. Following analysis of the aspects of the environment which would be likely to be significantly affected, a detailed assessment of the effects themselves would be required along with mitigation measures proposed.

If you have difficulty in reading this paper please contact Chris Ormiston on 01779-483720

Examples of the types of issues that should be addressed include:

- Climate change
- Local Economic Effect
- Landscape Resource
- Soils and geology
- Visual Amenity
- Ornithology
- Visual Amenity
- Ecology
- Nature Conservation
- European Protected Species
- Hydrology and Water Supplies
- Forestry and Tree Felling
- Transport and Traffic including road safety issues and impact on local road network during and after construction work
- Noise
- Cultural Heritage and archaeology
- Land Use
- Land Ownership
- Tourism and Recreation, including footpaths
- Proposed mitigation measures

Please note that the above list is by no means exhaustive and that other issues might become obvious following public consultations and consultations with statutory consultees.

I can advise that from this Service's point of view your scoping report addresses the main issues to be covered within the EIA subject to any another additional matters highlighted by the following consultees in their responses. Copies are attached for your information.

This advice is based on the Regulations and the consultation responses of the following:

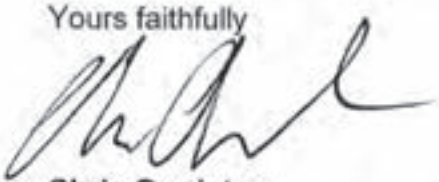
- RSPB
- Scottish Water
- Historic Scotland
- SEPA
- SNH
- Health & Safety Executive
- Transport Scotland
- Aberdeenshire Council Infrastructure Service (Roads)
- Aberdeenshire Council Infrastructure Service (Flood and Coastal Protection)
- Aberdeenshire Council Environment Team (Natural and Built & Cultural Heritage
- Aberdeenshire Council Archaeology
- Aberdeenshire Council (Environmental Health)
- Aberdeenshire Council Infrastructure Services (Marr Area Development Management Team)

Please note that at the time of writing I am still awaiting a response from the Environment Team (Landscape Architect). I will forward on these comments once received.

I hope the above information is of assistance as a formal scoping opinion in respect of the relevant ES. Obviously during the processing of any associated planning application other issues may become obvious following public consultation and consultations with statutory consultees.

This opinion will be held for public inspection for a two year period, or until a planning application is submitted at which time the opinion will be transferred to the planning register with the application.

Yours faithfully



Chris Ormiston
Area Planing Officer (Banff & Buchan)

Enc. Consultation responses

CO.

Aberdeenshire COUNCIL

Our Ref: M/ENQ/2011/0919
Your Ref: ENQ/2011/0810

Ask for: Aude Chaiban
Direct Dial: 01569-768269
Email: ma.planapps@aberdeenshire.gov.uk

ABERDEENSHIRE COUNCIL
13 JUN 2011
CO
Planning and Environmental Ser

Chris Ormiston
Senior Planner
The Town House
Low Street
Banff
AB45 1AY

08/06/2011

Memorandum

Proposal: EIA Screening/Scoping Opinion for Erection of Wind Farm
Address: Land at Deuchries Aberchirder Huntly

Thank you for providing the Marr Team with an opportunity to comment on the above proposal. Having gone through the scoping report prepared by the RSK Group plc, I would comment as follows:

Project Components

In paragraph 2.3.2, it is stated that the transformers are likely to be located in kiosks adjacent to each turbine. These kiosks have to potential to increase the landscape and visual impact of the wind farm and the applicant should seek to incorporate the transformers into the turbine itself as has been done elsewhere.

In paragraph 2.3.3 it is stated that the scheme will include permanent anemometer mast(s). The need to retain the mast(s) after commissioning should be queried. The statement also seems to suggest that more that one mast may be required. The need for additional masts should also be queried.

In paragraph 2.3.5, it is stated that watercourse crossing may be required. Although it is stated that SEPA's advice will be sought to enable the passage of fish and other wildlife, river crossings and bridges have the potential to affect the flow of water and may create flooding. The views of the Flood Prevention Unit should be sought and details of these crossings submitted with the planning application. In terms of potential impact on wildlife, SNH's advice should also be sought.

If you have difficulty in reading this paper please contact Aude Chaiban on 01569-768269

In paragraph 2.3.8, states that borrow pits will be required. Borrow pits can have significant landscape and visual impacts. Therefore, detailed drawings showing the location, size and maximum excavation depth must be submitted. The potential landscape and visual impact must be fully considered in the Environmental Impact Assessment.

Environmental Aspects to be Assessed

The size of the ZTV is not specified although it is stated that beyond 10km of the site, the ZTV is fragmented due to the screening effects of intervening hills. The extent of the ZTV should be justified and should be determined in consultation with Scottish Natural Heritage.

Cumulative development must take into consideration all wind energy development located within the agreed ZTV that are within the planning system. These must include all publicly known projects whether operational, at planning application stage, consented or at screening/scoping stage.

There are a 226 listed building, 11 scheduled ancient monuments and other archaeological assets within 10km of the site. The potential impact on these assets should be fully considered in the Environmental Impact Assessment.

The landscape and visual impact of the proposal must be assessed from a representative number of viewpoints. It is noted that none of the viewpoints currently suggested are within the Marr Area. The proposal is likely to have an impact on the Marr Area and therefore, additional viewpoints located within the Marr Area must be considered.

Aude Chaiban
Planner

APPENDIX E - SCOTTISH WATER CORRESPONDENCE

EN02/0109
CO

7th June 2011

Mr Chris Orminston
Aberdeenshire Council
The Town House
Low Street
Banff
AB45 1AY

ABERDEENSHIRE
10 JUN 2011
Planning and Environmental Services

Scottish Water
Always serving Scotland

SCOTTISH WATER
419 Balmore Road
Glasgow
G22 6NU

T: 0141 355 5511
F: 0141 355 5449
W: www.scottishwater.co.uk

FAO: Chris Orminston,

Development: Land at Deuchries (Wind Turbine). Ref: 571241

Following a review of your application/enquiry and our resultant investigation, I am pleased to advise you that Scottish Water assets are not affected. However, if you subsequently discover or become aware of any public sewers or water mains, I would ask you to Scottish Water directly at your earliest convenience.

In the meantime, if you have any questions regarding this letter, please contact me at the above address.

Yours faithfully,

Laura Muir

Laura Muir
Customer Connections Administrator

APPENDIX F – FLOOD RISK CHECKLIST

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		Deuchrise Wind Farm, Aberchirder, Aberdeenshire					
Grid Reference	Easting:	364168	Northing:	854598			
Local Authority		Aberdeenshire Council					
Planning Reference number (if known)							
Nature of the development		Utility Infrastructure		If residential, state type:			
Size of the development site		365	Ha				
Identified Flood Risk	Source:	Select from List		Source name:	No flood risk		
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		Agriculture and grazing land					
Hydrology							
Area of catchment		0.4	km^2				
Qmed estimate		0.23	m^3/s	Method:	Other		
Estimation method(s) used *		0.64	m^3/s				
		Other		If other (please specify methodology used):	Institute of Hydrology Report 124		
				If Pooled analysis have group details been included	Select from List		
Hydraulics							
Hydraulic modelling method		n/a		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	

PAGE 1 of 2

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:		It is recommended that SUDS solution should be incorporated for the surface water drainage of the site. SUDS should be designed to protect the water quality and quantity entering the Rosy Burn.					

Approved by: F. Arfa-Zangeneh
Organisation: RSK Group
Date: 10/01/2011

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.***

PAGE 2 of 2

APPENDIX 6
ECOLOGY

Appendix 6.1: Ecology Baseline Report

Force 9 Energy Partners

Deuchries Wind Farm

Appendix 6.1 Baseline Report



AMEC Environment & Infrastructure UK Limited

August 2012

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Document Revisions

No.	Details	Date
1	First draft – Caroline Mellor	14/12/2011
2	Draft Report 12031i1	25/01/12
3	Final Report	08/08/2012

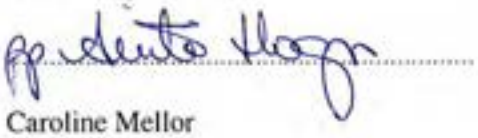
Report for

Force 9 Energy LLP

Main Contributors

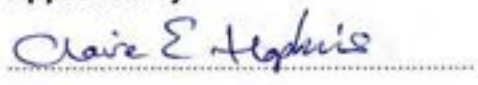
Caroline Mellor

Issued by



Caroline Mellor

Approved by



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Force 9 Energy Partners

Deuchries Wind Farm

Appendix 6.1 Baseline Report

August 2012

AMEC Environment & Infrastructure UK Limited

Certificate No. FS 13881 Certificate No. EMS 69090

In accordance with an environmentally responsible approach, this document is printed on recycled paper produced from 100% post-consumer waste, or on ECF (elemental chlorine free) paper

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Appendix B Phase 1 Habitat Survey Photographs
Appendix C Water Vole and Otter Survey Photographs
Appendix D Badger Survey Results – CONFIDENTIAL

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August 2012
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1. Introduction

1.1 Background

Force 9 Energy Partners are in the process of preparing a planning application for a prospective Wind Farm in Aberdeenshire, Scotland. The Deuchries Wind Farm planning application will be accompanied by an Environmental Impact Assessment (EIA), presented in an Environmental Statement (ES). AMEC Environment and Infrastructure Ltd (AMEC) has been appointed to undertake the assessment of the impacts of the proposed wind farm development on biodiversity.

1.2 Scheme Details

The proposed wind farm will entail construction of three wind turbines along with associated infrastructure, which will include: access tracks, a meteorological mast, external transformers and a substation. The proposed access tracks required during construction predominantly make use of existing farm tracks, which will ensure minimal habitat disturbance/loss during construction.

1.3 Site Context

The proposed wind farm site at Deuchries (hereafter 'the site') covers an area of approximately 3.7km^2 and is located 200m north-east of Aberchirder and 8.5km south-west of Banff. The site is centred on OS grid reference NJ 642 546 (Deuchries Wind Farm ES, Figure 3.1). The site is primarily agricultural land comprising arable crop and improved and semi-improved grassland used for livestock grazing. All of the agricultural land is bordered by post and wire fence with occasional hedgerows, most of which are newly planted. There are a few small areas of woodland and large areas of dense and scattered gorse scrub. The site is surrounded by a similar landscape of primarily agricultural land with large areas of woodland to the east and west.

1.4 Purpose of this Report

This report presents the results of the baseline ecological work completed at the site, comprising; a desk study; an extended Phase 1 survey; and surveys in respect of the protected or notable species (or species groups), which the site was assessed as having potential to support. The species which are included are: badger (*Meles meles*), great crested newt (*Triturus cristatus*), otter (*Lutra lutra*), red squirrel (*Sciurrus vulgaris*), reptile species and water vole (*Arvicola amphibius*). This report does not include an assessment of the biodiversity value of each species/species group or the potential effects of the development, as this is reported in the accompanying ES (Deuchries Wind Farm ES).

This report does not include the methodology or results of the extensive bat and bird survey work that has also been undertaken at the site. The results of the bat survey work is detailed in a separate report (Deuchries Wind Farm ES, Appendix 6.2) and the ornithological survey work and associated EIA is presented in a separate chapter of the ES (Deuchries Wind Farm ES Chapter 7).

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2. Methodology

2.1 Desk Study

An ecology desk study was undertaken in order to gather information relating to statutory and non-statutory nature conservation sites and records of species that are afforded legal protection or are otherwise notable (see **Box 2.1**) within 2km of the site.

The desk study may indicate the presence or potential presence of legally protected and/or notable species that could occur within the survey area or surrounding habitats, and which could be a constraint on the development of the site and could also inform the baseline survey requirements.

The following sources of information were consulted:

- North-East Scotland Biological Records Centre (NESBReC);
- Scottish Natural Heritage website: http://www.snh.gov.uk/;
- Multi Agency Geographic Information for the Countryside (MAGIC) at www.magic.gov.uk;
- The National Biodiversity Network website (NBN Gateway): http://data.nbn.org.uk/.

The geographical context of the site was examined using the relevant Ordnance Survey 1:10 000 scale Ordnance Survey (OS) map and aerial photography, which were viewed via Google Maps (www.google.co.uk/maps). These were used to identify potential migration or dispersal corridors, for legally protected species and/or other species of notable nature conservation value, between the site and surrounding areas. This included consideration of ponds situated within 500m[1] of the site, from which great crested newts could disperse onto the site. The desk study also sought to identify any potential barriers (for example main roads and rivers) to the dispersal of this species between any ponds and the site[2].

[1] Great crested newts are reported to regularly utilise terrestrial habitats up to 500m from their breeding ponds. English Nature (2001) '*Great Crested Newt Mitigation Guidelines*'. English Nature, Peterborough.

[2] This is because this species, which is afforded comprehensive legal protection, breeds in standing ponds, but can also disperse across, and forage/seek refuge within, terrestrial habitats surrounding these ponds.

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Box 2.1 Designated wildlife sites and protected and notable species

Statutory nature conservation sites

SNH notifies sites that are of national importance for nature conservation as Sites of Special Scientific Interest (SSSIs), although some sites that are of national importance for certain species have not been so designated. Internationally important sites may also be designated as Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Ramsar sites (it should be noted that SSSI designations also apply to most internationally designated sites).

Non-statutory nature conservation sites

In Aberdeenshire non statutory wildlife sites are entitled as Sites of Interest to Natural Science (SINS). A site may qualify as a SINS due to the presence of a notable species or an important habitat. These designations broadly constitute the most important wildlife and geological sites 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 some degree of legal protection. For the purposes of this study, legal protection refers to:

Species included on Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended), excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the proposed development does not include any proposals relating to the sale of species;

Species included on Schedules 2 and 5 of The Conservation (Natural Habitats, &c) Regulations 1994 as amended in Scotland; and

Badgers, which are protected under the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004).

Notable Species

Species which are listed on UK and/or Local Biodiversity Action Plans (BAPs) or those which are of some other conservation interest based on their status nationally, regionally and locally.

2.2 Extended Phase 1 Habitat Survey

A Phase 1 habitat survey (JNCC 2010[3]) of the site was undertaken on 11th to 13th April 2011 by AMEC Ecologist Caroline Mellor MSc MIEEM. This survey method involves mapping habitats on and up to 250m from the site at an appropriate scale using standard colour codes and acronyms and according to standard habitat definitions (JNCC 2010). Numbered 'Target Notes' (TN) are added to the maps to record the location of, and describe, notable ecological features of the site. The survey method was extended to include an assessment of the potential for the habitats on/near the site to support legally protected species and/or notable species (as defined in Box 2.1). The methods that are typically used to assess the potential presence of notable species and species groups are summarised in Table 2.1.

[3] JNCC (2010). *Handbook for Phase 1 habitat survey: a technique for environmental audit.* ISBN 0 86139 636 7.

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Table 2.1 Summary of methods employed to assess potential presence of protected and notable species as part of an extended Phase 1 habitat survey

Species/group	Summary of site survey methods
Badger	The site and surrounding land was searched for evidence of badger activity, including setts, paths, footprints, foraging marks/holes, scratch marks, dung pits and guard hairs (Harris, Cresswell and Jefferies 1989[4]). Any badger setts observed during the extended Phase 1 habitat survey were noted in order to inform additional survey requirements at the site.
Great crested newt	Accessible ponds situated within 500m of the site were inspected and the suitability of these ponds for great crested newts was assessed. 500m is the distance great crested newts are known to disperse between ponds (English Nature 2001[5]) and to colonise new ponds. The assessment of pond suitability takes into account for example pond size; macrophyte cover/species; pond permanence/tendency to dry out; proximity to other ponds; surrounding terrestrial habitat types; proximity to barriers to newt dispersal; and presence of fish and waterfowl.
Otter	The watercourses within or close to the site were assessed for their suitability to support otter. Suitable water courses will provide holt or resting sites for otter such as beneath the roots of trees situated on the banks of the watercourse. Watercourses with the potential to provide suitable foraging and commuting routes from other watercourses in the surrounding area were also noted. Direct evidence of otter activity was also noted including holts, lie ups, spraints, footprints and paths through vegetation (Chanin 2003[6])
Red squirrel	The habitats were assessed for their suitability to support red squirrel. The ideal habitat for red squirrel is generally accepted as conifer woodland between 2000 and 5000 hectares (ha) which is suitable to support a population of red squirrel (Pepper and Patterson, 1998[7]). Smaller areas of conifer woodland between 200 and 300 ha in area can support a small population of red squirrel but need significant management and control of grey squirrels in the area. Areas this small are usually connected to other areas suitable conifer woodland.
Reptiles	The site's potential to support reptiles (adder (*Vipera berus*), grass snake (*Natrix natrix*), slow worm (*Anguis fragilis*) or common lizard (*Zootoca vivipara*)) is assessed by considering the presence of potential natural and artificial refugia such as log piles, scrub and tussocky grassland; variable topography; interface or edge habitats; and shade free areas near dense vegetation. Potential reptile refugia such as woody and discarded debris are also examined (Edgar, Foster and Baker 2010[8]).
Water vole	The watercourses within or close to the site were assessed for their suitability to support water vole. Suitable water courses are generally deep (over 1m), slow flowing with wide swaths of marginal and emergent riparian vegetation providing food and shelter (Strachan and Moorhouse,2006[9]). Direct evidence of water vole was also noted including burrows, latrines, feeding stations, footprints and paths through vegetation.
Other Species	The suitability of the habitats on the site for any other protected species and species of notable nature conservation value is also considered, including UK Biodiversity Action Plan (UK BAP); North-East Scotland Local Biodiversity Action Plan (LBAP); or the Scottish Biodiversity List (SBL). The location of any observed stands/areas of invasive, non-native species, such as Japanese knotweed (*Fallopia japonica)* for example, are routinely recorded, reflecting the legal requirement to avoid causing the spread of many invasive non-native species.

[4] Harris, S., Cresswell, P. and Jefferies, D. (1989). Surveying Badgers, An Occasional Publication of the Mammal Society No. 9.

[5] English Nature (2001*). Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough.

[6] Chanin, P. (2003). *Monitoring the Otter Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10. English Nature: Peterborough

[7] Pepper, H. & Patterson, G. (1998). *Red Squirrel Conservation*. Forestry Commission.

[8] Edgar, P., Foster, J. and Baker, J. (2010). *Reptile Habitat Management Handbook*. Amphibian and Reptile Conservation, Bournemouth.

[9] Strachan, R. & Moorhouse, T. (2006). *Water Vole Conservation Handbook*. Second Edition. WildCRU.

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2.3 Species Specific Surveys

Species-specific surveys for badger, water vole and otter were undertaken subsequent to the extended Phase 1 habitat survey based on the results of the habitat assessment.

2.3.1 Badger

A badger survey of the site and the surrounding area (up to 50m where access was permitted and possible) was undertaken on the 21st and 22nd September 2011, the aim of which was to determine the status of badgers on and in close proximity to the proposed development area. The survey area was searched for evidence of badger activity, including setts, paths, footprints, foraging marks/holes, scratch marks, dung pits and guard hairs. Any evidence of badger activity was recorded on a plan and the status (active/inactive; main/subsidiary/annex/outlier sett) of any setts recorded was assessed. The survey area focussed on habitats suitable for badgers such as hedgerows, woodland and sloping banks/bunds.

The approach to the classification of setts applied during the survey is summarised as follows:

- *Main sett*: large, well-established setts, normally in continuous use. Each clan will use only one main sett and it will form the most likely location for the raising of cubs;
- *Annex sett*: these setts are usually found in close association with the main sett, and will often be linked to it by a well-worn path. Where a second litter of cubs is born they will be raised in the annexe sett;
- *Subsidiary sett*: these setts usually have five or more entrances/holes, although not all of these will be in continuous use; and
- *Outlier sett*: these setts are used on an occasional basis and will usually consist of only one to three holes. Spoil heaps will generally be smaller than those associated with the other sett types, indicating a smaller underground structure.

The entrance holes to setts can provide an indication of the level of use of the sett. Entrance holes are classified as follows.

- *Well used*: these holes are in regular use and are therefore free of debris. They may have been recently excavated;
- *Partially used*: debris, including leaves, twigs and other vegetation clutter the hole to these holes, indicating they are not in regular use. The holes can be used after a minimum of clearance; and
- *Disused*: a considerable amount of clearance of debris/earth is needed before these holes can be used. The holes may become so blocked that only a depression in the ground is visible where the hole used to be.

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2.3.2 Otter and Water Vole

All of the watercourses within the site were inspected on the 21st and 22nd September 2011 for any signs of water vole presence. Typical signs of water vole presence include burrows and associated well-grazed 'lawns', latrines/droppings, footprints and feeding stations/remains. Any evidence of water vole was recorded and marked on a plan. The watercourses were also inspected for any signs of otter presence. Typical signs of otter presence include holts, couches, spraints (droppings), footprints and feeding remains. Any evidence of otter was recorded and marked on a plan.

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3. Results

3.1 Desk Study

3.1.1 Designated Sites

There are no statutory sites of nature conservation interest (Special Protection Area (SPA), Special Area for Conservation (SAC), Ramsar site, National Nature Reserves (NNR), Local Nature Reserves (LNR) or Sites of Special Scientific Interest (SSSIs)) within the site boundary.

There are no non-statutory sites of nature conservation interest (Sites of Importance for Natural Science) within the site boundary.

There are no statutory or non-statutory sites of nature conservation interest within 2km of the site boundary.

3.1.2 Legally Protected Species

Badger

Three records of badger setts location within a 2km radius from the site have been provided by NESBReC. The closest record to the site is over 1km from the site.

Great Crested Newts

No records of great crested newts were provided by NESBReC for a 2km radius from the site. Based on a review of Ordnance Survey maps one pond was identified within the site, with two further ponds within 500m outside the site boundary, one to the south east of the site and the other to the south west. There are no physical barriers such as roads or walls to prevent the migration of newts between the site and these ponds.

Otter

No records of otter have been provided by NESBReC for a 2km radius from the site. The NBN gateway holds records of otter on Rosy Burn at 'Rosyburn', approximately 2km west of the Site[10] but these records are over 20 years old.

[10] Scotland Otter Survey Database. *Lutra lutra* (European Otter) 1991-09-03/1995-05-07 (Day Range) Site: Rosy burn at Rosyburn.

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Red Squirrel

There are three records of red squirrel within a 2km radius from the site (provided by NESBReC). The closest record to the site is 1.1km to the south west at Cleanhill Wood.

Reptiles

No reptile records were provided by NESBReC for a 2km radius from the site. The NBN gateway holds records of adder but only to 10km accuracy.

Water vole

No records of water vole have been provided by NESBReC for a 2km radius from the site. The nearest water vole record to the Site is from the NBN gateway and is 3.9km south west of the Site along Cunning Burn. The upper reaches of Cunning Burn are present in the south of the Site south of Upper Crannabog farm.

3.1.3 Other Notable Species

In addition to the legally protected species listed above, a number of other notable species records have been provided by NESBReC for a 2km radius from the site. This includes; one notable amphibian record; five records of notable invertebrate species; and two notable plant species (see Table 3.1). Of these none are shown to occur within the site. A search on the NBN Gateway indicated records of the presence of otter, red squirrel, adder, common pipistrelle, brown hare, badger and common toad and many invertebrate species within 2km of the Site. Table 3.1 below provides further details on these species.

3.1.4 Summary

Table 3.1 summarises the nature conservation statuses afforded to the legally protected species and other notable species that occur within a 2km radius of the site.

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Table 3.1 Nature Conservation Designations of Protected or Notable Species within 2km of the Site

Species	Scientific Name	Nature Conservation Status
Mammals		
Common pipistrelle bat	*Pipstrellus pipstrellus*	Habs Regs
Daubenton's bat	*Myotis daubentonii*	Habs Regs, UK BAP, LBAP
A Myotid bat (species unknown)	*Myotis* sp.	Habs Regs, UK BAP
Red Squirrel	*Sciurus vulgaris*	Habs Regs, UK BAP, LBAP, SBL
Badger	*Meles meles*	Badgers Act, SBL
Otter	*Lutra lutra*	Habs Regs, UK BAP
Brown hare	*Lepus europaeus*	UK BAP
Amphibians		
Common Toad	*Bufo bufo*	UK BAP
Invertebrates		
Mouse Moth	*Amphipyra tragopoginis*	UK BAP
Small Square-spot	*Diarsia rubi*	UK BAP
Rosy Rustic	*Hydraecia micacea*	UK BAP
White Ermine	*Spilosoma lubricipeda*	UK BAP
Sallow	*Xanthia icteritia*	UK BAP
Plants		
Frog Orchid	*Coeloglossum viride*	UK BAP
Large-flowered Hemp-nettle	*Galeopsis speciosa*	SBL S5

The following abbreviated sub-headings are used to describe different levels of importance, with the highest level attributed to each species listed:

Habs Regs - Habitats Regulations 1994

UK BAP - UK BAP list of Priority Species

NE LBAP – North East Scotland LBAP Species

WCA5 – Schedule 5 of Wildlife and Countryside Act 1981

SBL S2 - Scottish Biodiversity List: International Obligations

SBL S3 - Scottish Biodiversity List: Nationally Rare at UK level, found in only 1-15 10km squares

SBL S4 - Scottish Biodiversity List: Present in 5 or fewer 10km squares or sites in Scotland

SBL S5 - Scottish Biodiversity List: Decline of 25% or more in Scotland in last 25 years

Badgers Act - Protection of Badgers Act 1992

3.2 Extended Phase 1 habitat survey

3.2.1 Habitats

Figures 3.1a and 3.1b show the Phase 1 Habitat map of the site and the target notes are set out in **Appendix A** with photographs at **Appendix B**.

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The site predominantly comprises arable crop and improved/semi-improved grassland pasture used for cattle and sheep grazing, which is bordered by post and wire fences. There are occasional small areas of coniferous and broad leaved woodland, along with a number of scattered trees, and large areas of dense and scattered gorse scrub. There are a small number of hedgerows within the site however these are mostly recently planted (last five years or so) and consequently relatively immature. A number of watercourses are present throughout the site along with two dry ponds. The habitat types are described in detail below.

Improved and Poor Semi-Improved Grassland

Improved and poor semi-improved grasslands are the predominant habitat types within the site. The improved grassland is typically dominated by perennial rye-grass (*Lolium perenne*), with other common species such as white clover (*Trifolium repens*) and creeping buttercup (*Ranunculus repens*) abundant. The poor semi-improved grassland within the site is more commonly dominated by other grasses such as Yorkshire fog (*Holcus lanatus*) or red fescue (*Festuca rubra*), but has an equally species-poor range of associated herbs.

Semi-Improved Neutral Grassland

A large area of semi-improved neutral grassland is present in the northern part of the site. This grassland is dominated by rushes (*Juncus* spp.) over a grazed common grass species such as Yorkshire fog or wavy hair-grass (*Deschampsia flexuosa*).

Coniferous Woodland

The most common woodland type within the site is coniferous plantation woodland. However, all of these are small in area and mostly occur in discrete compartments. The woodlands are pine (*Pinus* sp.) or larch (*Larix decidua*) dominated. Each area has been target noted and described in detail in **Appendix B**.

Mixed Semi-Natural Woodland

One small area of mixed semi-natural woodland is present in the east of the site. The woodland is predominantly a mature pine (*Pinus* spp.) copse with ash (*Fraxinus excelsior*) and an immature horse chestnut (*Aesculus hippocastanum*) with gorse (*Ulex europaeus*) at the edges.

Broad-Leaved Semi-Natural Woodland

One small area of broad-leaved semi-natural woodland is present within the site. The woodland lies to the south of Lower Deuchries Farm, which is situated in the north of the site (TN27). The woodland is dominated by sycamore (*Acer pseudoplatanus*), with wych elm (*Ulmus glabra*), Scot's pine (*Pinus sylvestris*), elder (*Sambucus nigra*), apple (*Malus sylvestris*) and beech (*Fagus sylvatica*). The ground flora contains bluebell (*Hyacinthoides non-scripta*) and ground elder (*Aegopodium podagaria*). A fast flowing burn is present to the south of the woodland.

Scattered Broad-Leaved and Coniferous Trees

There are a number of individual trees throughout the site. Species include ash, alder (*Alnus glutinosa*), silver birch (*Betula pendula*), larch and pine.

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Dense Scrub

There are large areas of European gorse scrub within the site. Scattered gorse also occurs frequently within the site.

Watercourses

Rosy burn flows through the northern part of the Site flowing west to east. It varies in structure along its length with a narrow (approximately 1m wide) channel in the western part of the site with earth banks, flowing into a reinforced section just west of Lower Deuchries Farm (TN28). A tributary of this watercourse is present in the centre of the site. The watercourse here is fast flowing over a stony base with a shallow water depth (approximately 20cm) and relatively steep banks.

Another watercourse is present immediately west of North Cranna Farm beneath conifer trees with un-vegetated banks. This watercourse flows into the Burn of Arkland (TN44) which is outside the Site along part of the western boundary. Another tributary of this watercourse flows from east to west along the entire southern boundary of the site (TN15).

There are two wet ditches within the site. The first is present along the southern edge of a small area of conifer plantation in the centre of the site just north of Gallow Hill at TN9. The second wet ditch is a man-made road drainage ditch present on the edge of the site adjacent to Lower Deuchries Farm (TN26). Very few watercourses have any particular marginal or bankside vegetation of note. Species commonly recorded include Cock's foot, soft rush (*Juncus effusus*), lesser celandine (*Ranunculus ficaria*), gorse, hogweed (*Heracleum sphondylium*), common sorrel (*Rumex acetosa*), tufted hair-grass (*Deschampsia cespitosa*) and wavy hair-grass.

Standing Water

Two ponds (TN34 & TN40) were identified within the site during site visits; both were dry at the time of survey. The first pond is at TN34 is a large boggy area approximately 20m x 15m and is dominated by rushes with floating sweet grass (*Glyceria fluitans*) and water plantain (*Alisma plantago-aquatica*). It is likely to hold water for most of the year due to the vegetation present. This pond was identified during the desk study of the site as it is shown on the OS map for the area. The second pond is approximately 3m x 2m and is dominated by floating sweet grass. It had recently dried out at the time of the survey, but is likely to hold water intermittently.

3.2.2 Species

Great Crested Newts

The two ponds identified as present within the site were dry at the time of survey (see 3.2.1). Four further ponds were identified within 500m of the site (an additional two ponds to those identified on the OS map), all of which are within 100m of the site boundary (TN's 14, 42, 43 and 45 **Figures 3.1a and 3.1b**. Full access was not available to these ponds for more detailed inspection due to access restrictions, but all of them held water and were surrounded by suitable terrestrial habitat for newts including; scrub, shrubs, trees or tussocky grassland.

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Although the aquatic habitat on the site is limited, there is suitable terrestrial habitat albeit limited or in isolated patches

Suitable terrestrial habitat for newts to forage and to move through within the site includes the areas of tussocky semi-improved grassland; woodland; shrubs; and dense and scattered scrub. The piles of discarded machinery, containers and rubble surrounding most of the farms also provide suitable hibernacula in additional to the foundations and the bases of walls of the stone built barns. Suitable habitat providing corridors for newts to move along include the banks of watercourses where longer grassland and some marginal species are present, and along the newly planted hedgerows.

Red Squirrel

The site contains only small areas of woodland that are unlikely to be of sufficient size individually or collectively (see Table 2.1) to provide suitable habitat (in terms of food and shelter) to support a population of red squirrel. Additionally, the lack of mature hedgerows within the site reduces the potential for red squirrels to commute through. Therefore, the potential for red squirrel to occur at the site is very low.

Reptiles

There is limited suitable habitat within the site for reptiles. The habitats that could support foraging and basking reptiles include the areas of tussocky semi-improved grassland; woodland edges; and dense and scattered scrub. As with newts, the piles of discarded machinery, containers, rubble, and foundations and the bases of the walls of the stone built barns surrounding most of the farms, provide suitable hibernaculum for reptiles.

Other species

No other species of notable nature conservation value were recorded during the survey.

3.3 Species Specific Surveys

3.3.1 Water vole and Otter

No evidence of water vole or otter activity was recorded during the survey in September 2011. There are a number of watercourses within the site that provide low to moderately suitable habitat to support water vole. The watercourses within the site are considered to provide sub-optimal habitat for otter due to the very limited foraging opportunities and lack of adjacent dense vegetation that could offer lying up places. Nonetheless, given the connectivity of these watercourses to the wider area, and the historical records of otter in the area, they may be used infrequently by otters. The watercourses were surveyed at specific points along their length and are referred to as watercourse reference points. The results of the water vole and otter survey are shown in Table 3.4 and on **Figure 3.2**, and photographs of each watercourse taken during this survey are provided in **Appendix C**.

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Table 3.2 Results of the water vole and otter survey 2011

Watercourse reference and survey point (Figure 3.2)	Description of the watercourse section	Grid reference	Evidence of water vole	Evidence of otter	Potential for the watercourse to support water vole or otter
1 (Photo 1)	The watercourse was dry at the time of survey and does not appear to have held water for some time. The watercourse is covered in dense gorse along the majority of its length with areas of Yorkshire fog, tufted hair grass and common bent.	NJ64251 54233	No evidence found	No evidence found	No suitability for water vole as the watercourse is completely dry and water voles are unlikely to use the watercourse to commute along. Otter may commute along this ditch as it provides connectivity between watercourses in the north and east of the Site.
2A (Photo 2)	Rosy Burn – At this point the watercourse is overgrown with tufted hair grass, floating sweet grass and soft rush with shallow flowing water.	NJ64365 55069	No evidence found	No evidence found	Rosy Burn is predominantly suitable for water vole but the shallow water depth in places makes it less likely to be used by water vole as this species generally prefers deeper watercourses[11]. However there are lots of foraging opportunities with dense rush all along. Suitable for otter passage but limited foraging opportunities and no holt locations.
2B (Photos 3 to 5)	Rosy Burn - At this point the watercourse is variable along its length ranging from densely vegetated with low flows flowing into a steep sided artificially reinforced section, wide (1.5m) with fast flowing water. It is vegetated with soft rush, tufted hair grass, Yorkshire fog, gorse and broom (*Cytisus scoparius*).	NJ64863 55281	No evidence found	No evidence found	
2C (Photo 16)	Rosy Burn – At this point the water course is heavily vegetated but with a short sward height, approximately 0.3m wide, quite fast flowing and shallow.	NJ64005 55127	No evidence found	No evidence found	
2D (Photo 17)	Rosy Burn - Steep sided at this point with fast flowing water, and a narrow channel approximately 0.3m – 0.1m deep.	NJ64146 55102	No evidence found	No evidence found	
2E (Photo 15)	Rosy Burn – At this point the watercourse has low water levels with dense soft rush.	NJ63789 55265	No evidence found	No evidence found	
2F (Photo 14)	Rosy Burn – At this point the watercourse is choked with rush and holds very little water.	NJ63332 56019	No evidence found	No evidence found	

[11] Strachan, R. & Moorhouse, T. (2006). *Water Vole Conservation Handbook*. Second Edition. WildCRU.

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Watercourse reference and survey point (Figure 3.2)	Description of the watercourse section	Grid reference	Evidence of water vole	Evidence of otter	Potential for the watercourse to support water vole or otter
3A (Photo 6)	Burn of Arkland – This watercourse flows into the Burn of Arkland. It is fenced off on both sides with improved grassland fields on either side. Conifer trees are present along the watercourse and have limited the growth of bankside vegetation.	NJ63606 53244	No evidence found	No evidence found	At this location the watercourse has limited suitability for water vole due to the lack of vegetation on the banks and the fast water flow. Unlikely to be used by otter as no foraging opportunities or couch locations and no passage to any other watercourses – terminates under farm buildings.
3B (Photo 7)	The Burn of Arkland runs along the southern and in part the western boundary of the site. The watercourse at this location is approximately 1.5m wide with a steady water flow, a stony base and soil substrate banks. The banks are approximately 2.5m high and vegetated with rosebay willow herb (*Epilobium angustifolium*) and tufted hair grass.	NJ63599 53231	No evidence found	No evidence found	Suitable for water vole with bankside vegetation providing burrowing and foraging opportunities. Suitable for otter passage but limited foraging opportunities and no holt locations.
3C	This watercourse leads off and upstream from the main Burn of Arkland at this location. It is heavily vegetated with common nettle (*Urtica dioica*), thistles (*Cirsium* sp.) and creeping buttercup (*Ranunculus repens*). The banks are quite steep to vertical and the water is fast flowing with a stony substrate base.	NJ63378 52608	No evidence found	No evidence found	Limited suitability for water vole at this location due to the vertical banks, lack of suitable bankside vegetation and fast flowing water, however connects to other more suitable water courses. Suitable for otter passage but limited foraging opportunities and no holt locations.
3D (Photo 8 and 9)	A continuation of the watercourse described at 3C. It is fast flowing, approximately 1m wide with heavily vegetated banks containing thistles, common nettle and creeping buttercup. It is steep sided in places with a stony substrate base.	NJ63750 52770	No evidence found	No evidence found	Limited suitability for water vole at this location due to the steep banks, lack of suitable bankside vegetation and fast flowing water, however connects to other more suitable water courses. Suitable for otter passage but limited foraging opportunities and no holt locations.
3E (Photo 10)	A continuation of the watercourse described at 3D. The watercourse is approximately 0.75m wide, slow flowing, and the banks are vegetated with grasses, creeping buttercup, bird's foot trefoil (*Lotus corniculatus*), Yorkshire fog, false oat-grass (*Arrhenatherum elatius*) and soft rush.	NJ63941 52932	No evidence found	No evidence found	Suitable for water vole with bankside vegetation providing burrowing and foraging opportunities. Suitable for otter passage but limited foraging opportunities and no holt locations.
3F (Photo 11)	A continuation of the watercourse described at 3E. At this location the watercourse is slow flowing with shallow banks.	NJ64379 52870	No evidence found	No evidence found	Suitable for water vole with bankside vegetation providing burrowing and foraging opportunities. Suitable for otter passage but limited foraging

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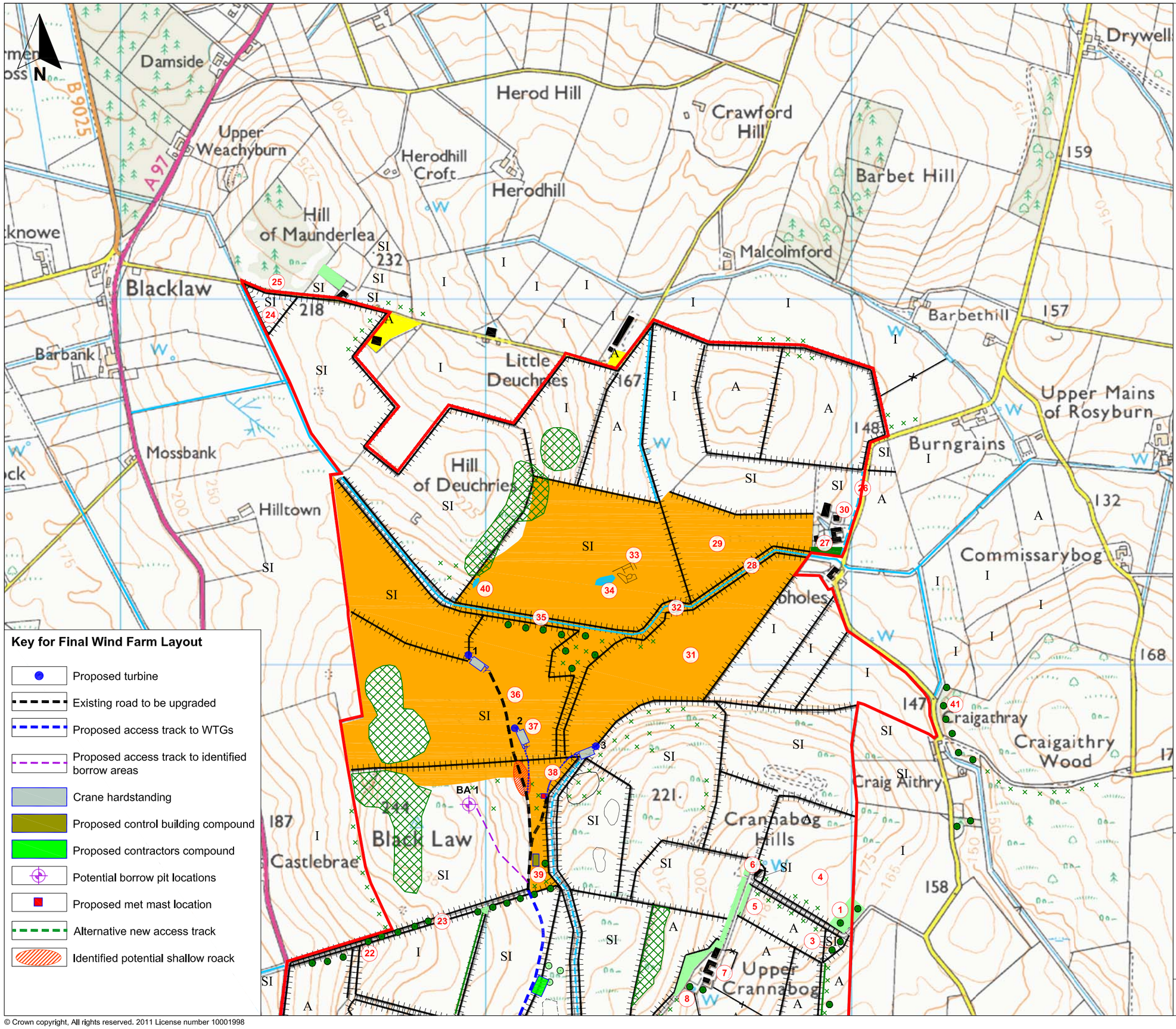
Watercourse reference and survey point (Figure 3.2)	Description of the watercourse section	Grid reference	Evidence of water vole	Evidence of otter	Potential for the watercourse to support water vole or otter
					opportunities and no holt locations.
4A (Photo 13)	This watercourse is very overgrown and is drying out.	NJ64462 55462	No evidence found	No evidence found	Limited suitability for water vole or otter due to the presence of dense vegetation and low water depth which would make dispersal difficult along the watercourse.
4B (Photo 12)	Where 4a joins Rosy Burn, at this point the watercourse has shallow water, steep 7ft banks and is approximately 1.5m in width. There is broom, tufted hair grass, common nettle and soft rush on the banks and brooklime in the watercourse. Soft rush is dominant here with very little water, banks and substrate soil.	NJ64565 55158	No evidence found	No evidence found	Limited suitability for water vole at this location due to the lack of suitable bankside vegetation and water. Suitable for otter passage but limited foraging opportunities and no holt locations.

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3.3.2 Badger

A description of each sett and the other evidence of badger activity discovered are provided in a Table at **Appendix D** and shown on **Figure 3.3**. All badger records are confidential.

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Key for Final Wind Farm Layout

- Proposed turbine
- Existing road to be upgraded
- Proposed access track to WTGs
- Proposed access track to identified borrow areas
- Crane hardstanding
- Proposed control building compound
- Proposed contractors compound
- Potential borrow pit locations
- Proposed met mast location
- Alternative new access track
- Identified potential shallow roack

Key

- Site boundary
- Broad-leaved semi-natural woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Broad-leaved scattered trees
- Coniferous scattered trees
- Dense scrub
- Scattered scrub
- I Improved grassland
- SI Poor semi-improved grassland
- SI Neutral semi-improved grassland
- A Amenity grassland
- A Arable
- Standing water
- Running water
- Dry ditch
- Hedgerow
- Defunct hedgerow
- Boundary removed
- Building
- Fence
- Wall
- 1 Target note

0 m 500 m

Scale 1:10,000 @ A3

FORCE 9 ENERGY

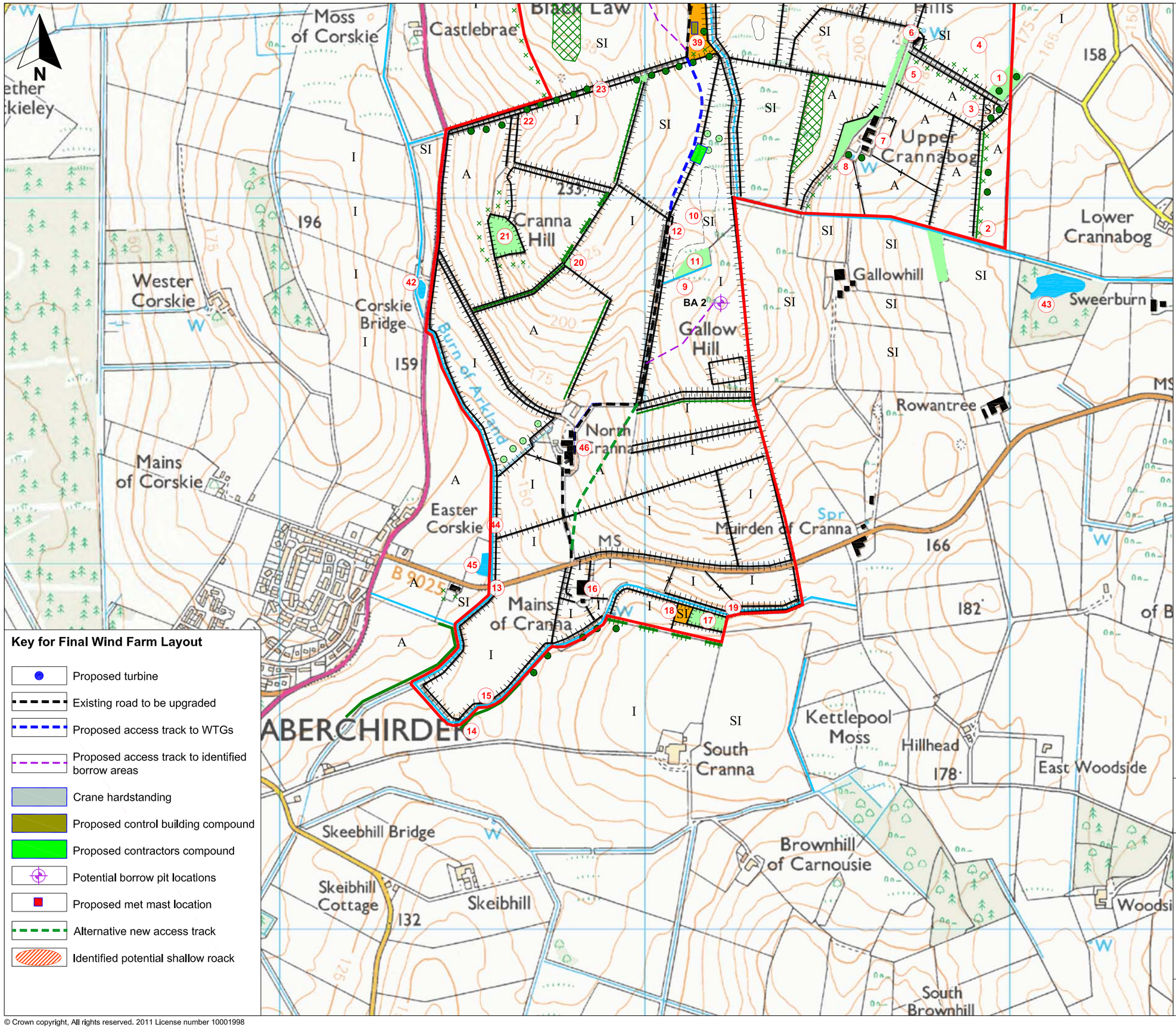
Deuchries Wind Farm

Figure 3.1a
Phase 1 Habitat Map
North

September 2012
27815-R04d.dwg smitv

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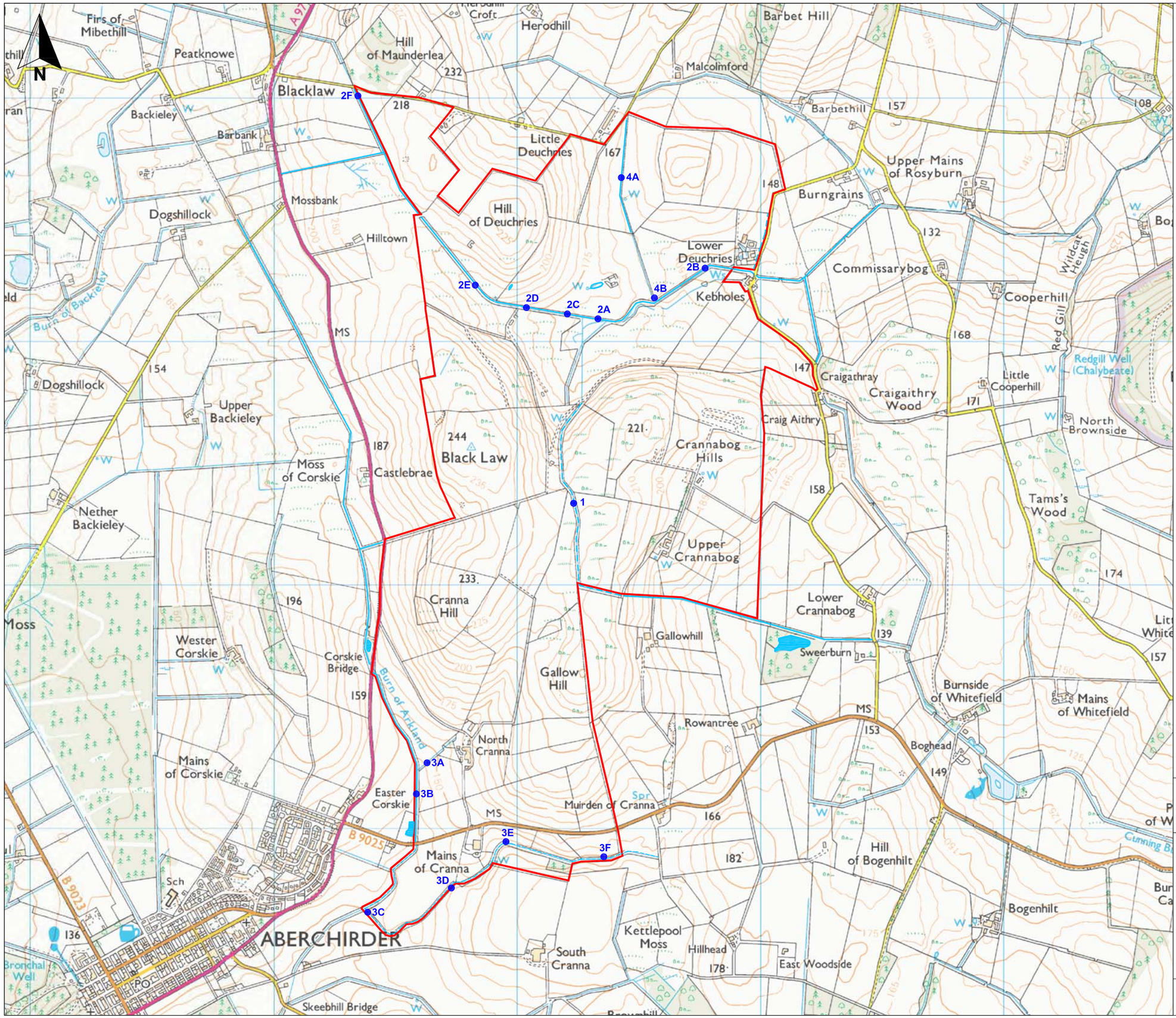
FORCE 9 ENERGY

Deuchries Wind Farm

Figure 3.1b
Phase 1 Habitat Map
South

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4. Conclusions

4.1 Habitats

The largest areas of habitat within the site include arable and improved and poor semi-improved grassland. There are smaller areas of more diverse habitat, the most valuable being the semi-improved neutral grassland; blocks of woodland; the large expanse of gorse scrub; and the watercourses.

4.2 Species

4.2.1 Badger

There are a number of active badger setts within the site. Avoidance of the setts should be incorporated into the design of the development. Where avoidance is not possible, a licence will need to be submitted to permit disturbance or destruction of a badger sett and may require mitigation measures to be implemented well in advance of any proposed works within the site.

4.2.2 Great crested newt

Although there are ponds within close proximity of the site that could support great crested newts, no records great crested newts have been provided by NESBReC. Furthermore, none of the proposed wind turbines or associated infrastructure will occur within 400m of the identified ponds. Therefore, a great crested newt survey is not required as there is negligible risk of encountering a newt terrestrially during construction of the wind farm.

4.2.3 Otter and water vole

No confirmed evidence of water vole or otter was found within the site and no records for either species were provided by NESBReC. There is one record on the NBN gateway of otter at Rosy Burn 2km from the site boundary. Due to the quality of the habitat present, it is unlikely that water vole or otter are present within the site.

4.2.4 Red Squirrel

Although there are records of red squirrel within a 2km radius of the site, the habitats within the site provide very limited suitable habitat for this species and are poorly connected to off-site areas of habitat. Furthermore, no woodland will be affected by the proposed development and therefore red squirrel need not be considered further in respect of the proposed development.

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4.2.5 Reptiles

There is limited suitable habitat for reptiles within the site and no records of reptiles have been provided by NESBReC. It is unlikely reptiles are present within the site.

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Appendix A
Phase 1 Habitat Survey Target Notes

Table 1 Deuchries Target Notes

Target Note	Description
1	Predominantly a mature pine (*Pinus* spp.) copse with ash (*Fraxinus excelsior*), an immature horse chestnut (*Aesculus hippocastanum*) and gorse (*Ulex europaeus*).
2	A strip of gorse scrub with immature horse chestnut and Sots pine (*Pinus sylvestris*) at the edges.
3	Poor semi-improved grassland dominated by Yorkshire fog (*Holcus lanatus*) with ribwort plantain (*Plantago lanceolata*), common nettle (*Urtica dioica*), common sorrel, primrose (*Primula vulgaris*), creeping buttercup (*Ranunculus repens*) and white clover (*Trifolium repens*).
4	Skylarks (*Alauda arvensis*) heard singing overhead.
5	Vehicles, machinery and containers stored on the grass.
6	A modern bungalow.
7	Upper Crannabog Farm - A large group of buildings including a farmhouse with numerous outbuildings comprised of barns and cattle sheds in a fairly dilapidated state.
8	Five mature horse chestnut trees.
9	A wet ditch, <10cm deep, 2m wide, with fairly steep banks with marsh marigold (*Caltha palustris*) and soft rush (*Juncus effusus*).
10	Poor semi-improved grassland dominated by Yorkshire fog with creeping buttercup and common mouse-ear (*Cerastium fontanium*), along with patches of rush (*Juncus* spp.), very boggy.
11	Dense pine woodland.
12	New double fence with recent hawthorn (*Crataegus monogyna*) planting in between.
13	Culvert under busy road. Made of stone and concrete, quite well sealed brick work with lots of loose rocks around it.
14	Off site - A patch of tall ruderal at the end of pine trees, two or three ash and silver birch (*Betula pendula*). A pond is present at this location.
15	A fast flowing watercourse situated along the southern boundary of the site between one and four metres wide (variable) with steep banks. Soft rush is present in occasional patches on the southern banks.
16	Mains of Cranna - A farmhouse with a slate tiled roof and pebble dashed walls. There are some small gaps in the roof providing access for bats. There is also an L-shaped 2-storey barn with stone walls and slate tiled (part) and metal roof.
17	Conifer woodland with a fern and cock's-foot (*Dactylis glomerata*) ground flora. Lots of deadwood present on the floor of the woodland.
18	An area of semi-improved neutral grassland dominated by wavy hair-grass. A deep off-shoot of the burn runs through this area approximately 0.5m to 1m deep with no banks and some aquatic vegetation.
19	The watercourse here is slow flowing, 1m wide and 0.5m deep with Cock's foot, soft rush, gorse, hogweed (*Heracleum sphondylium*), common sorrel, wavy hair-grass on the banks.
20	Larch (*Larix decidua*) dominated woodland with pine and ash. Lots of rocks and common grasses (cock's-foot and Yorkshire fog) beneath.
21	Predominantly coniferous woodland – pine, spruce, larch and ash with gorse scrub around the edges. Very

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Target Note	Description
	dense and heavily shaded, with very limited ground flora.
22	A strip of tussocky grassland with gorse scrub dominated by tufted hair-grass with occasional soft rush.
23	Similar to TN23, a strip of habitat north of TN23 but Yorkshire fog dominated with occasional tufted hair-grass, cock'sfoot, daffodils (*Narcissus* sp.), gorse and broom (*Cytisus scoparius* ssp scoparius) with some scattered semi-mature ash and larch trees.
24	Extensive soft rush within poor semi-improved grassland.
25	Off site – Newly built holiday lodges on the edge of conifer woodland. Deciduous trees are present along the roadside.
26	A wet ditch with many small mammal burrows (too small for water vole). Very little water in the ditch here with poor semi-improved grassland banks.
27	Broad-leaved semi-natural woodland south of Lower Deuchries Farm. The woodland is dominated by sycamore, with wych elm (*Ulmus glabra*), Scot's pine, elder (*Sambucus nigra*), apple (*Malus sylvestris*) and beech (*Fagus sylvatica*). The ground flora contains bluebells (*Hyacinthoides non-scripta*) and ground elder (*Aegopodium podagaria*). A fast flowing burn is present to the south of the woodland, just outside the site boundary at 'Kebholes'.
28	Watercourse 0.5m wide and fast flowing into 2m wide reinforced channel (where it flows adjacent to the buildings) with a gravel base. Lots of lesser celandine and creeping buttercup on the banks along with occasional soft rush, tufted hair-grass and marsh thistle (*Cirsium palustre*).
29	Neutral semi-improved grassland with lots of compact rush and tufted hair-grass.
30	Lower Deuchries Farm - A group of farm buildings including a farmhouse and a number of barns. There is lots of debris (discarded farm vehicles and machinery) around the farm.
31	Neutral semi-improved grassland with large areas of compact rush with gorse and tufted hair grass.
32	Lots of small mammal burrows
33	A number of completely derelict buildings surrounded by mature sycamore trees. A large nest is present in one of the trees.
34	Pond - A boggy area, full of rushes and floating sweet-grass (*Glyceria fluitans*) and water plantain (*Alisma plantago-aquatica*). Currently almost dry but obviously usually holds water for most of the year.
35	A number of small mammal burrows again on the banks of the watercourse.
36	Neutral semi-improved grassland dominated by creeping bent (*Agrostis stolonifera*) with crested dogs-tail (*Cynosurus cristatus*) and Yorkshire fog, ribwort plantain (*Plantago lanceolata*), and creeping buttercup.
37	Derelict buildings, just a few stone walls remaining and piles of stone.
38	SEPA monitoring site.
39	A flock of goldfinch (*Carduelis carduelis*) in a mature ash tree.
40	Pond – nearly dry presently with floating sweet grass. Approximately 3m x 2m.
41	Off site - mature beech trees.
42	Off site - pond – possibly suitable for newts.
43	Off site - Large pond and surrounding woodland and scrub.
44	Watercourse here fast flowing over stones. 3m wide steep banks approximately 20cm deep.
45	Off site - Large pond surrounded by mature trees and scrub. Some marginal and emergent vegetation present.
46	North Cranna Farm - A group of buildings including a farmhouse with numerous outbuildings comprised of barns and cattle sheds. A more modern bungalow also forms part of the farm complex.

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Appendix B
Phase 1 Habitat Survey Photographs



Photograph 1 – TN6



Photograph 4 – TN7



Photograph 2 – TN7



Photograph 5 – TN7



Photograph 3 – TN7



Photograph 6 – TN16

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Photograph 7 – TN16



Photograph 10 – TN30



Photograph 8 – TN30



Photograph 11 – TN46



Photograph 9 – TN30



Photograph 12 – TN46

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Photograph 13 – TN46



Photograph 16 – TN8



Photograph 14 – TN46



Photograph 17 – TN27



Photograph 15 – TN46



Photograph 18 – TN34

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Photograph 19 – TN40



Photograph 22 – TN45



Photograph 20 – TN43



Photograph 23 – TN45



Photograph 21 – TN43



Photograph 24 – TN15

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Photograph 25 – TN28



Photograph 26 – TN44

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Appendix C
Water Vole and Otter Survey Photographs



Photograph 1 – Watercourse 1



Photograph 4 – Watercourse 2B



Photograph 2 – Watercourse 2A



Photograph 5 – Watercourse 2B



Photograph 3 – Watercourse 2B



Photograph 6 – Watercourse 3A

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Photograph 7 – Watercourse 3B



Photograph 10 – Watercourse 3E



Photograph 8 – Watercourse 3D



Photograph 11 – Watercourse 3F



Photograph 9 – Watercourse 3D



Photograph 12 – Watercourse 4B

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Photograph 13 – Watercourse 4A



Photograph 16 – Watercourse 2C



Photograph 14 – Watercourse 2F



Photograph 17 – Watercourse 2D



Photograph 15 – Watercourse 2E

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Appendix 6.2: Bat Survey Report

Force 9 Energy Limited

Deuchries Wind Farm

Appendix 6.2 Bat Report





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August 2012

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2	Review of first draft	18/01/12
3	Draft Report 12032i1	25/01/12
4	Final Report	08/08/12

Force 9 Energy Limited

Deuchries Wind Farm

Appendix 6.2 Bat Report

August 2012

AMEC Environment & Infrastructure UK Limited

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1. Introduction

1.1 Background

Force 9 Energy Partners are in the process of preparing a planning application for a prospective Wind Farm in Aberdeenshire, Scotland. The Deuchries Wind Farm planning application will be accompanied by an Environmental Impact Assessment (EIA), presented in an Environmental Statement (ES). AMEC Environment and Infrastructure Ltd (AMEC) has been appointed to undertake the assessment of the impacts of the proposed wind farm development on biodiversity.

1.2 Scheme Details

The proposed wind farm will entail construction of three wind turbines along with associated infrastructure, which will include: access tracks, a meteorological mast, external transformers and a substation. The site boundary and proposed turbine and infrastructure location is shown on Figure 3.1 of the Deuchries Wind Farm ES. The proposed access tracks required during construction predominantly make use of existing farm tracks, which will ensure minimal habitat disturbance/loss during construction.

1.3 Site Context

The proposed wind farm site at Deuchries (hereafter 'the site') covers an area of approximately 3.7km^2 and is located 200m north-east of Aberchirder and 8.5km south-west of Banff in northern Aberdeenshire. The site is centred on OS grid reference NJ 642 546. The site is primarily agricultural land comprising arable crop and improved and semi-improved grassland used for livestock grazing. All of the agricultural land is bordered by post and wire fence with occasional hedgerows, most of which are newly planted. There are a few small areas of woodland and large areas of dense and scattered gorse scrub. The site is surrounded by a similar landscape of primarily agricultural land with large areas of woodland to the east and west.

1.4 Purpose of this Report

This report presents the results of the bat survey work completed at the site comprising; a desk study; a bat roost suitability survey; bat activity transect surveys; and static bat detector surveys. The aim of these surveys is to evaluate the value of the site to the local bat population in order to support the EIA and any future planning application made in relation to the proposals in terms of ecology and nature conservation.

Two further ecological reports have been completed for the site: Deuchries Baseline Report for habitats and protected species within the site[1] and the Deuchries Ornithology Report[2].

[1] AMEC (2012). Deuchries Baseline Report.

[2] AMEC (2011). Ornithology Report.

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1.5 Legislation and Policy

All bat species in Scotland are afforded legal protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended[3]). 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 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 bats (*Pipistrellus pygmaeus*)[4], brown long-eared bats (*Plecotus auritus*)[5] and noctule bats (*Nyctalus noctula*)[6] are UK priority terrestrial mammal species as a result of undergoing historic declines meaning that they each have individual species accounts, or in the case of the soprano pipistrelle, Species Action Plans (SAPs) written to aid conservation action for these species.

The Scottish Biodiversity List (SBL)[7] 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 daubentonii*), Natterer's bat, (*M. nattereri*), whiskered bat (*M. mystacinus*), Brandt's bat (*M. brandtii*), brown long-eared bat and noctule bat.

Daubenton's bat is also listed on the Aberdeenshire Local Biodiversity Action Plan (LBAP). Although it has a relatively wide spread distribution across Scotland, very few maternity roosts are known of with only ten recorded in North East Scotland. Daubenton's bats are threatened largely through loss of roosts and changes in riparian vegetation and water quality[8].

[3] There have been several amendments to the Regulations which apply only to Scotland: 2004, 2007, 2008(a) and 2008(b).

[4] http://jncc.defra.gov.uk/_speciespages/519.pdf accessed 09/01/2012

[5] http://jncc.defra.gov.uk/_speciespages/2517.pdf accessed 09/01/2012

[6] http://jncc.defra.gov.uk/_speciespages/2459.pdf accessed 09/01/2012

[7] Scottish Biodiversity List http://www.snh.gov.uk/protecting-scotlands-nature/biodiversity-scotland/scottish-biodiversity-list/ [Accessed 09/01/2012]

[8] http://www.nesbiodiversity.org.uk/publications/habactionplan.htm accessed 15/01/2012

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2. Methods

2.1 Desk Study

Information regarding bat species previously recorded within a 10km radius of the site boundary was requested from the following sources:

- North-East Scotland Biological Records Centre (NESBReC); and
- National Biodiversity Network (NBN) Gateway's information service[9].

A search was also undertaken to determine if there are any statutory designated sites for bats within a 10km radius from the site. The following sources were used for this search:

- Multi Agency Geographic Information for the Countryside (MAGIC)[10]; and
- Scottish Natural Heritage's (SNH) interactive Sitelink map facility[11].

2.2 Field Surveys

2.2.1 Overview

The methodology for undertaking the bat survey work followed that advised by Natural England (Bat Mitigation Guidelines, 200412 and Technical Advice Note TIN051[13]) and the Bat Conservation Trust (BCT) (Bat Survey Guidelines, 2007[14] and Bat Survey Guidelines, 2nd Edition, 2011[15]).

Taking into consideration the factors which contribute to the potential risk of impacts on bat populations from turbine strikes the site is considered to be of **low – medium** risk according to the following criteria:

- Habitat quality – **low** (low quality foraging habitat that could be used by small numbers of foraging bats, and isolated site not connected to the wider landscape by prominent landscape features);

[9] http://data.nbn.org.uk/imt/. Accessed January 2012.

[10] http://www.magic gov.uk. Accessed January 2012.

[11] http://www.snh.gov.uk/publications-data-and-research/snhi-information-service/map/

[12] English Nature (now Natural England) (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

[13] Natural England (February, 2009). Technical Advice Note TIN051. *Bats and onshore wind turbines. Interim Guidance*. Natural England.

[14] Bat Conservation Trust (2007). *Bat Surveys - Good Practice Guidelines*. Bat Conservation Trust.

[15] Bat Conservation Trust (May, 2011). *Bat Surveys - Good Practice Guidelines 2nd Edition - Surveying for onshore wind farms*. Bat Conservation Trust.

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- Number of turbines – **medium** (three proposed turbines);
- Species likely to use the site – **low** (low number of several low risk species); and
- Known roost sites - **low** (no known roosts within the site).

Taking a precautionary approach the minimum survey effort for medium risk sites was adopted. No static detector surveys at height were undertaken due to the absence of features on which to attach the detectors, and because the risks of bats flying at height resulting from the presence of woodland are not present on site. The approach to bat surveys was approved in SNH's scoping opinion[16].

2.2.2 Bat Roost Suitability Survey

Habitat suitability

A habitat suitability assessment for bats was carried out at the same time as the extended Phase 1 habitat survey on 11th to 13th April 2011 by AMEC Senior Ecologist Caroline Mellor MSc MIEEM. The extended Phase 1 habitat assessment identified features that offer potential for roosting within the study area (e.g. trees, buildings and other built structures), opportunities for commuting (e.g. provided by structural features such as hedgerow, waterways and woodland edge) and foraging (e.g. over areas of grassland or adjacent to woodland). Features that are likely to reduce the value of a feature or habitat for bats, such as high light levels or large gaps in linear features, were also recorded.

Roost assessment

The most suitable areas of bat habitat provide good roosting locations, an abundance of prey items and well connected links between the roosts and foraging sites, as demonstrated by the features identified as being of high value to bats within Bat Surveys – Good Practice Guidelines (BCT, 2007) are:

- Buildings, trees or other structures with features of particular significance for roosting bats;
- Habitat of high quality for foraging bats e.g. broadleaved woodland, tree-lined watercourses and grazed parkland; and
- Site connected to the wider landscape by strong linear features that would be used by commuting bats e.g. river/stream valleys or hedgerows.

The buildings, trees and other structures within the site identified during the Phase 1 habitat survey undertaken on 11th to 13th April 2011 by AMEC Senior Ecologist Caroline Mellor MSc MIEEM as containing features that could support roosting bats were mapped and detailed notes on them was made. Buildings and trees were graded for their potential to support roosts based on the likely number and suitability of roost spaces present (such as gaps beneath soffits; gable ends; pitched roofs with loft spaces; hanging tiles; cavity walls; cracks in brick work in buildings; and

[16] SNH EIA scoping opinion, received 12/10/2011.

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the presence of cavities, split limbs, cracks, holes, loose bark, or a dense covering of ivy (*Hedera helix)* in trees), and proximity to good commuting and foraging habitat. Factors affecting the likelihood of potential roost sites being used by bats such as high levels of illumination from street lamps and security lighting, were also included in the assessment (as far as is possible during a daytime survey).

2.2.3 Bat Activity Transect Surveys

Bat activity transect surveys were undertaken once a month from May to September 2011 inclusive with the aim of sampling bat activity at the site and, in order to determine if there are any features such as important commuting corridors that may be affected by the proposed development. The surveys were undertaken by specialist sub contractors Echoes Ecology.

The approach to the bat activity transect survey was based on standard methods whereby a pre-determined transect route was walked and bat activity was observed and recorded with the use of bat detectors.

An indicative transect route along farm access tracks within the site, including navigation points, was identified by AMEC Senior Ecologist Caroline Mellor and provided to sub-consultants Echoes Ecology prior to the surveys. The surveyors used the indicative route as a guide and it was necessary to deviate from the identified route on occasions due to the presence of cattle. The exact routes followed during each survey are shown in **Figures 3.3 to 3.7**.

Each transect route was walked at a steady walking speed, stopping only to record species activity notes, whereby each bat encountered is defined as a "contact". Bat calls were recorded during the survey so the species could be subsequently confirmed using computer software. Bat activity was tabulated along with the time, location, species and behaviour (e.g. feeding, social calling) and direction of travel where possible.

Dusk surveys commenced at sunset and finished around 2.5 to 3 hours after sunset. Sunset times for all the surveys were taken from BBC weather[17]. Dawn surveys were started around 2.5 to 3 hours before sunrise and finished at sunrise. These timings coincide with the time when bats are most active in the evening and are widely recognised as an optimal time to survey for bat activity (BCT, 2007[13]). A summary of each survey date, sunset/ sunrise times and weather conditions is shown in **Table 2.1**.

[17] http://news.bbc.co.uk/weather/. Accessed in advance of each survey.

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Table 2.1 Activity survey dates, sunset/ sunrise times and weather conditions

Date	Sunset/ sunrise times	Weather conditions
25th May 2011	21:45	Dry, 100% cloud cover, minimum temperature 8°C
28th June 2011	22:13	Light rain increasing to heavier rain after 1.5hrs, 90% cloud cover, minimum temperature 12°C
21st July 2011	04:44	Light rain but stopped ten minutes into the survey, 5% cloud cover, minimum temperature 13°C
31st August 2011	20:14	Dry, 100% cloud cover, minimum temperature 10°C
27th September 2011	18:59	Dry, 80% cloud cover, minimum temperature 18°C

2.2.4 Static AnaBat Surveys

Surveys using static bat detectors (AnaBats) were undertaken each month between June and September 2011 during the following periods:

- 21 - 26 June 2011;
- 30 June – 7 July 2011;
- 10 – 16 August; and
- 27 August – 6 September.

The sampling duration for each AnaBat varied according to the battery life. The detectors were deployed and collected by AMEC Principal Ecologist Anita Hogan BSc (Hons), MSc, MIEEM; and a non-ecologist specifically trained in deploying and collecting AnaBats (Eleanor Haresign BSc (Hons), PhD, PgDip, IAH). AnaBats were also deployed by specialist sub contractors Echoes Ecology. The aim of the static detector surveys is to sample general bat activity within the site (i.e. bat species and relative abundance). Four static survey points were chosen specifically to target the route of the proposed access track and turbine locations (**Figure 3.8**).

Four AnaBat recorders were left at each survey location per survey period. The AnaBats were set to record for one hour before sunset until one hour after sunrise and sensitivity levels were maintained at around 5 to filter out disturbance, for example from rustling leaves, but to ensure fainter calls would triggered the unit to record. The AnaBat locations are shown on **Figure 3.8** and the description and grid reference of the location of the units are shown in Table 2.2.

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Table 2.2 AnaBat Location, Grid Reference, Description and Proximity to Proposed Wind Turbines and Associated Works

Location	Grid Reference	Description
1	NJ 64088 53779	On the edge of a small area of coniferous plantation woodland positioned facing west out from the woodland. At this location the AnaBat unit was situated approximately 50 metres east of the proposed access track and 990 metres south of the nearest proposed turbine location (Turbine 3).
2	NJ 64199 54390	Within fence lines on the edge of a drainage ditch facing south near a line of trees. At this location the AnaBat unit was situated directly under the proposed access track, approximately 240 metres north of the proposed contractors compound, 400 metres south west of the nearest proposed turbine location (Turbine 3) and 420 metres south of Turbine 2.
3	NJ 64268 54730	Beside the corner post of a fence line on the eastern side of a drainage ditch facing south west. At this location the AnaBat unit was situated within 20 metres of the proposed access track, 90 metres west of the nearest proposed turbine location (Turbine 3) and 105 metres south east of Turbine 2.
4	NJ 64008 55126	On the eastern side of a track that crosses a watercourse and on the south side of a drainage ditch facing north. At this location the AnaBat unit was situated 120 metres north of the proposed access track and 105 metres north of Turbine 1.

AnaBat detectors are triggered by ultrasonic noises (which include bat echolocation calls); each noise will trigger the detector to switch on and record frequency/time data digitally into sound files which are stored on CF cards. Sound files are a maximum of 15 seconds long; the detector will automatically switch off if it is not being continuously fired. As such, each file may, and frequently do, include more than one bat pass, and may indeed include more than one species of bat. File analysis was carried out manually by experienced bat specialists, with notes on behaviour (feeding buzzes and social calls) recorded where these could be discerned.

For the purpose of this report each individual call file is considered to represent a single bat “pass”. Where more than one species or more than one type of behaviour is recorded in a single file, these are analysed separately, so that a file with two species of bats will have two passes.

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 bat 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 according to variation in factors affecting battery life and detector functioning. As such, the BAI (an index of relative bat activity based on the mean number of passes per unit time rather than the absolute number of bats) is strongly influenced by the number of active nights for the BAI per night (up to a maximum of five as this is the maximum number of nights the detectors were deployed for) or active hours for the BAI per hour (corrected according to the number of hours between sunset and sunrise).

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2.2.5 Survey Limitations

In some instances the planned walked transect routes could not be followed due to the presence of livestock. However as the purpose of a walked transect is to provide a sample of bat activity within the site and not to cover the entirety of the site, this will not have altered the conclusions of the survey in any way. During each transect, surveyors recorded each bat encountered as a bat 'contact'. 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 site by different species of bat rather than provide a count of the total number of bats present. This is the same for all bat activity transect surveys undertaken at any site and consequently will not have altered the conclusions of the survey in any way.

The static detectors failed to record correctly on two occasions. For the period 10th to 16th August 2011 the static detectors failed at three locations and the fourth location gathered data but was not comparable across locations so has not been used in the analysis. The static detectors were subsequently redeployed for the period 27th August to 6th September to avoid missing the August period as a result of detector failure. The data from this period did not extend into September. However, the BAI calculated takes into account the differences in the number of nights/hours the detectors were functioning therefore providing representative figures of bat activity.

As the activity transect surveys extended into late September it is not thought that the lack of static survey data will alter the conclusions of the survey.

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[18]. In addition, where calls could not be categorised to for example, common or soprano pipistrelle due to ambiguity of call frequencies, the bat pass is categorised as "pipistrelle species".

[18] Russ, J (1999). The Bats of Britain and Ireland. Echolocation Calls, Sound Analysis and Species Identification.

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3. Results

3.1 Desk Study

There are no statutory sites designated for bats within a 10km radius of the site. Records of two confirmed[19] species of bat were provided by NESBReC: common pipistrelle (*Pipstrellus pipstrellus*) and Daubenton's (*Myotis daubentonii*). Other unspecified *Myotis* species records have been provided but these are not to species level. There are ten confirmed *Myotis* roosts within 10km of the site. The closest known roost is approximately 500m to the south west of the site boundary with no known roosts within the site. There are no confirmed pipistrelle roosts within 10km of the site. Common pipistrelle records are also present on the NBN gateway but give no further information than that provided by NESBReC. The bat records provided by NESBReC are shown on **Figure 3.1**.

3.2 Field Surveys

3.2.1 Habitat survey

The majority of the site provides only limited suitable habitat for bats as the large areas of arable and improved/poor-semi-improved grassland (that cover most of the site) offer little foraging habitat due their generally low insect abundance and diversity. Areas of dense gorse scrub and woodland are likely to support a greater range of invertebrates, but due to their small size are also exposed and isolated and consequently less suitable for bats than if they were interconnected. The site also provides limited connectivity for bats due to the lack of well established features such as mature hedgerows (only a small number of hedgerows are present within the site, all of which were newly planted) and the poor quality of the watercourses (which are exposed and predominantly not bordered by mature trees and shrubs which provide shelter for bats). The location of the proposed turbines is generally exposed with no obvious corridors of vegetation that would be used by commuting bats leading to or from the area. There is however semi-natural vegetation close to the proposed turbine locations that would provide more suitable foraging habitat for bats than in the wider site area including dense gorse scrub and semi-improved neutral grassland.

3.2.2 Bat Roost Suitability Survey

There are a number of buildings and a few trees within the site with the potential to support roosting bats. Only a brief external assessment was carried out on the buildings as it was undertaken during the Phase 1 habitat survey. A description of the buildings and trees is provided in Tables 3.1 and Table 3.2 below and shown on **Figure 3.2** and in photographs 1 to 17 which are provided in **Appendix A.**

[19] Possibly more but some of the records provided were only to genus level.

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Table 3.1 Results of building roost suitability survey

Building Reference	Brief Description	Photograph reference (see Appendix A)	Level of Potential
1	A modern single storey bungalow with a tiled roof and pebble dashed walls. Fascias and soffits are present but appear well sealed. Some small gaps under the ridge tiles that could offer potential access points for bats are visible.	1	Low to Medium
2	Upper Crannabog Farm - A large group of buildings including a farmhouse with numerous outbuildings comprising barns and cattle sheds. The barns are two-storey with stone walls and tin roofs, but are derelict. There are numerous cracks and crevices in the stone work of the barns providing access points for roosting bats. There are also loose ridge tiles and gaps underneath roof tiles providing potential roosting sites. The roofs of the barns have missing velux style windows creating an open void into the upper storey of the barn. The farm is surrounded by mature scattered trees and woodland which provides good foraging and commuting habitat for bats. Many of these have the potential to support roosting bats.	2, 3, 4, 5	Medium to High
3	Mains of Cranna - A farmhouse with a slate tiled roof and pebble dashed walls. There are some small gaps in the roof providing access for bats. There is also an L-shaped 2-storey barn with stone walls and slate tiled (part) and metal roof with potential for bats. However the farm is in a very exposed position with limited connectivity for bats to suitable foraging habitat.	6, 7	Medium
4	Lower Deuchries Farm - A group of farm buildings including: a farmhouse with slate tiled roof and pebble dashed walls; a stone wall and slate tiled roof barn; a concrete wall barn; and a stone wall and tin roof barn. There are gaps in the roof and ridge tiles of the barns and farmhouse. The gaps in the farmhouse roof provide access into the roof void of the house. The barns were open access and had no roof void but had wooden boarding beneath the roof tiles providing a potential roosting site for bats. There are many mature trees surrounding the farm and a fast flowing burn, which is an upper tributary to Rosy Burn, which would provide suitable foraging and commuting habitat for bats.	8, 9, 10	High
5	North Cranna Farm - A group of buildings including a farmhouse with numerous outbuildings comprising barns and cattle sheds. A more modern bungalow also forms part of the farm complex. The farmhouse has a slate tiled roof and pebble dashed walls and hanging tiles, and the bungalow has a clay tiled roof and pebble dashed walls. There are small gaps in the hanging tiles of the farmhouse and underneath the soffits providing access points for bats into potential roosting sites. The cattle sheds are of limited interest for bats as they are open and draughty and provide limited cracks or crevices within which bats could roost. The stone L-shaped, 2-storey barn with stone walls and slate tiled roof is highly suitable for bats with large cracks in the stone work providing access points for bats into potential roost sites. There are also gaps underneath the ridge tiles that would provide access to bats. There are a number of mature trees surrounding the farm providing suitable foraging and commuting habitat for bats and a tributary of the Burn of Arkland which connects to large areas of woodland south west and west of Aberchirder, approximately 1km from the farm.	11, 12, 13, 14, 15	High

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Table 3.2 Results of tree roost suitability survey

Tree Reference	Brief Description	Photograph reference (see Appendix A)	Level of Potential
6	Five mature horse chestnut trees (*Aesculus hippocastanum*) some with flaking bark. There are no major crevices or holes apparent for roosting bats, but the flaking bark may provide opportunities for one or two bats.	16	Low to Medium
7	A small area of broadleaved semi-natural woodland containing a few trees with flaking bark, which may provide opportunities for one or two roosting bats. No features were identified that could support larger numbers of bats. This area is located adjacent to a fast flowing burn and a number of buildings with high potential for roosting bats.	17	Low to Medium
8	Adjacent to the site – A few mature beech trees with some dead wood that may provide possible roosting opportunities for bats.	n/a	Medium

None of the buildings or trees within the site identified as having potential to support roosting bats fall within 200m[20] of the proposed turbine locations. Although some of the 'developable area' falls within 200m of buildings or trees with potential to support roosting bats, given the location of the buildings and trees to the proposed turbine locations, it is likely that if bats were present in these structures their activity would be picked up using the other survey techniques. Consequently, buildings and trees were not subject to further survey work to determine the presence/absence of roosts.

3.2.3 Bat activity transect survey

The activity survey data analysis confirmed that there is a minimum of three species of bat within the site. The species recorded are common pipistrelle, soprano pipistrelle and *Myotis* species[21]. Very low levels of bat activity were recorded in all months (18 passes or less) apart from August when 145 passes were recorded during the survey. The distribution of bat activity recorded and the transect routes walked by month are shown on **Figures 3.3** to **3.7**.

Bats were recorded in the centre of the site, more frequently in the centre and the northern half of the transect routes during the surveys, with more passes recorded at this location than the southern half of the transect. The exception to this was the June survey when all the bats were recorded in the southern half of the transect but they were still towards the central part of the transect route and the site. The majority of the bat passes were over the areas of semi-improved grassland, watercourse and scrub habitats situated near the proposed turbine locations.

[20] The BCT (2011) guidance states that 'any areas with high potential within 200m of the developable area should be investigated in order to identify potentially important roost sites'.

[21] It is not possible to separate the *Myotis* species based on the calls recorded from the frequency division bat detector.

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This is to be expected as insect abundance would be higher around these habitats than in the more agriculturally improved areas to the south.

Common and soprano pipistrelle were recorded mainly commuting throughout the site with some foraging passes recorded on each survey occasion. An almost equal number of common and soprano pipistrelle bat contacts (35 and 37 respectively) were recorded between May and September 2011 during the activity surveys of the site. Most of the bats recorded were not seen during the surveys and therefore no inference can be made to the location of roosts through observation of the direction of flight of the bats between possible roosts and foraging areas. Social calls were recorded on the site in August and September but only once each survey. Late August and September coincides with the time of year when bats gather to mate and social calling is common. However, the limited occurrences of the social calls recorded during the surveys suggest that there is not a mating roost near to where the bats were recorded.

A single *Myotis* pass was recorded during the entire survey period. This bat was recorded on the 31st August 2011 in the centre of the site near to the location of the proposed turbine locations. The bat was observed commuting.

No high-risk species (noctule, Leisler's bat or Nathusius' pipistrelle) were recorded during the surveys.

A summary of bat passes by month along with the proximity to sunset/ sunrise is shown in Table 3.3.

All of the contacts were made at times after sunset or before sunrise where no inferences can really be made regarding the likely proximity to roosts. However, the closest pass to sunrise/sunset was in August and was a soprano pipistrelle recorded 39 minutes after sunset and was recorded commuting north to south between through the centre of the site in a relatively exposed location across an open area of semi-improved grassland (**Figure 3.6**). Soprano pipistrelle is commonly known to emerge approximately 30 minutes after sunset (BCT, 2007) and it is possible that this bat could be roosting within close proximity to the site. However, the low number of passes close to sunset/sunrise in the other months and also generally throughout the surveys suggest that if a roost is present in the vicinity of the site this is most likely to be a small or transitional non-breeding roost otherwise large aggregations of bat activity would be expected to have been recorded.

Table 3.3 Summary of Bat Passes Recorded During Activity Transect Surveys (including first contact after sunset/last before sunrise)

Species	May (Sunset 21:45)	June (Sunset 22:13)	July (Sunrise 04:44)	August (Sunset 20:14)	September (Sunset 18:59)
Common pipistrelle	6	10 (1hr 48mins)	1	56	10
Soprano pipistrelle	7 (50mins)	None	6 (1hr 37mins)	87 (39mins)	2
Pipistrelle sp.	None	1	2	1	5 (44mins)
Myotis sp.	None	None	None	1	None
Unknown	None	None	None	None	1

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3.2.4 Static AnaBat Survey Results

Survey conditions, including weather and sunrise/sunset times, are given in **Appendix B** and the AnaBat locations are shown in **Figure 3.8**. At least three species of bats were recorded during the surveys including: common pipistrelle, soprano pipistrelle, pipistrelle sp. and *Myotis* species[22]. Full details of bat passes by date and location are given in **Appendix D**. The total number of bat passes between June and August 2011 was 376. Common pipistrelle was the most commonly recorded species with passes representing 79% of the total passes recorded throughout the entire recording period. The number of bat passes were highest at Location 1 in June and Location 2 in August with 109 and 167 passes recorded respectively. In July Location 1 had half the number of passes compared with the previous month with 60 passes recorded. There appears to be no apparent relationship between the differences in recorded bat passes or activity levels which could be attributed to adverse or extreme weather conditions as the weather conditions were similar throughout the surveys. The lowest temperatures recorded were between 7°C and 11°C; wind speed between 0 and 5 (light breeze); and precipitation was between 0 and 1.32mm.

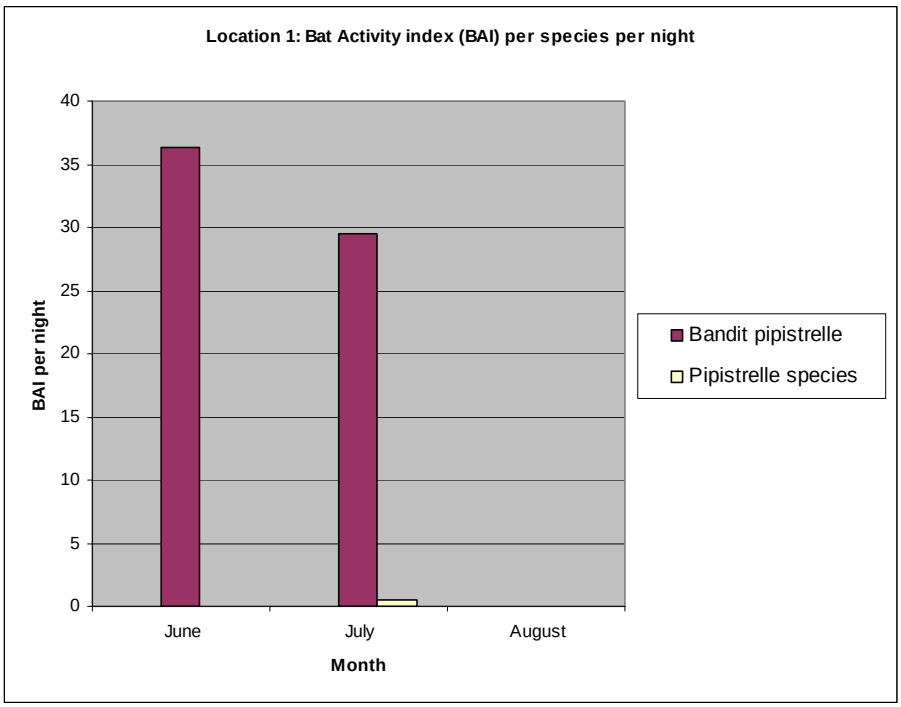
The BAI (see Section 2.2.4) was calculated for each monthly monitoring period at each AnaBat location (**Appendix E**). Rather than presenting the results in terms of actual bat numbers or numbers of bat passes, BAI was calculated for each night of successful data collection and for each hour within those nights to allow for direct comparison of the results between locations. This is presented in tabular form in **Appendix E**.

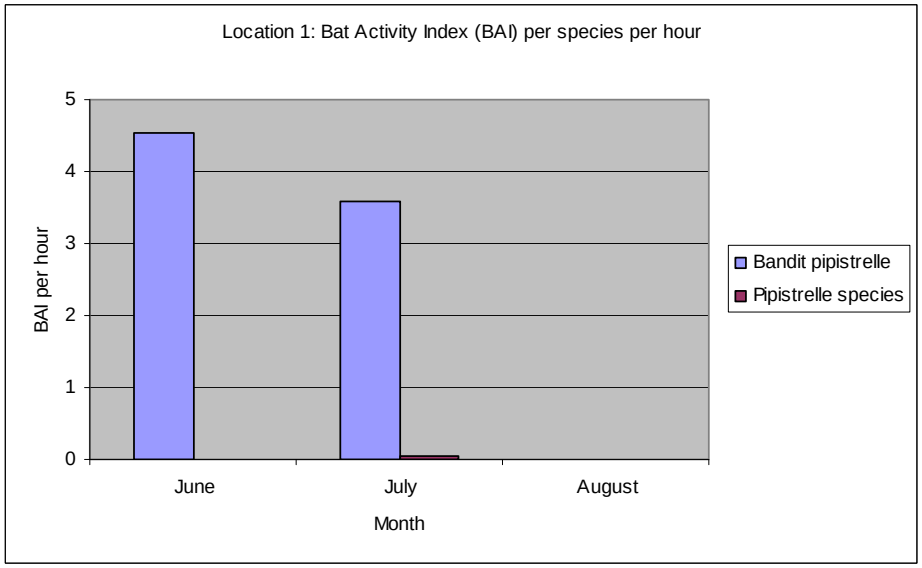
Location 1 Results

Moderate levels of bat activity were recorded at Location 1 with the highest number being in June with 109 passes. The passes were recorded predominantly across two nights out of the five nights recorded in total. All the bat passes recorded at Location 1 in June were common pipistrelle (*Pipistrellus pipistrellus*). No bat passes were recorded at Location 1 in August. Location 1 represents 45% of the total bat activity recorded throughout the survey period across all locations.

[22] It is not always possible to separate the *Myotis* species based on the calls recorded on a frequency division bat detector.

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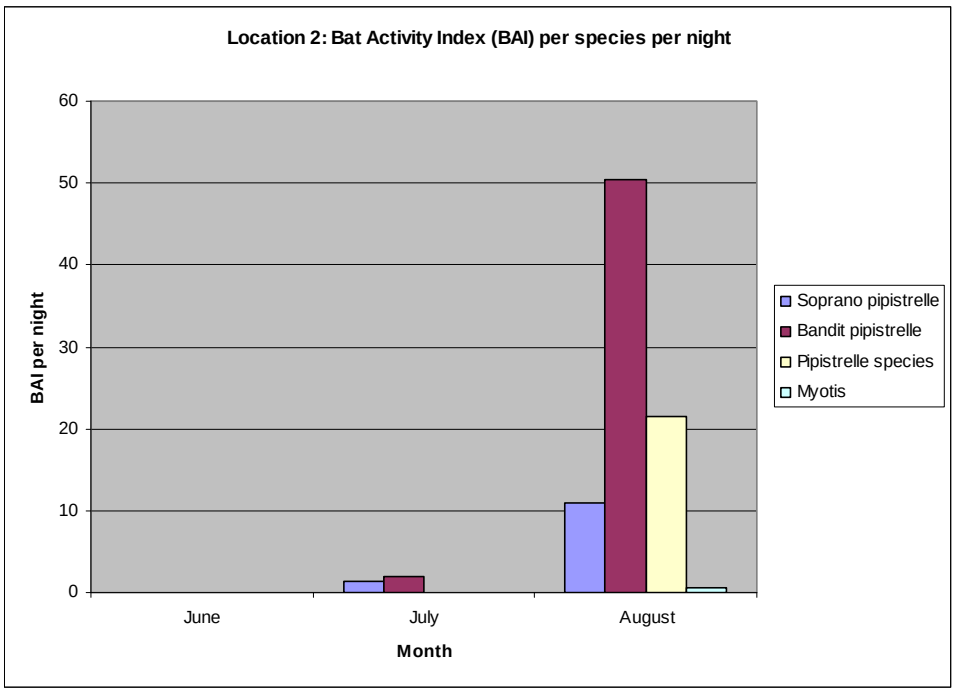


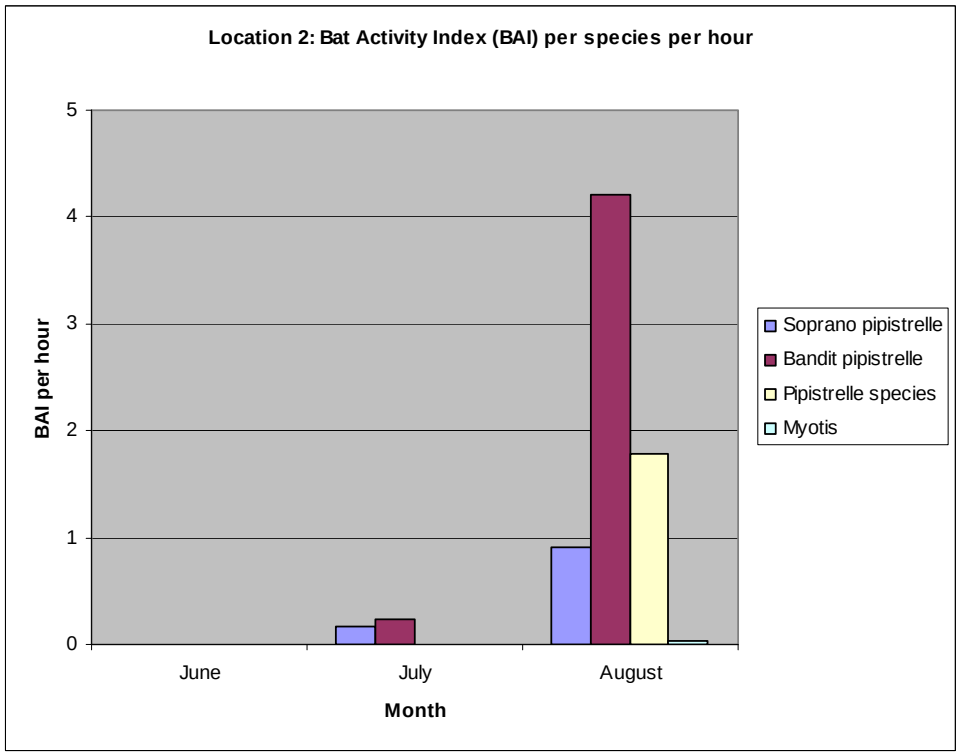


Location 2 Results

Moderate levels of bat activity were recorded at Location 2 in August with 167 passes being recorded. Only ten passes were recorded in July and no passes were recorded in June. All but one of the passes were recorded on one night out of five nights recorded in total on 29th August. All of the passes on the 29th August were from common and soprano pipistrelle and some of the passes were noted as pipistrelle sp. as they were indistinguishable as common or soprano pipistrelle. The highest number of passes were from common pipistrelle. A single *Myotis* pass was recorded on the 27th August but this was the only *Myotis* pass recorded during the static detector surveys. Location 2 represents 47% of the total bat activity recorded throughout the survey period.

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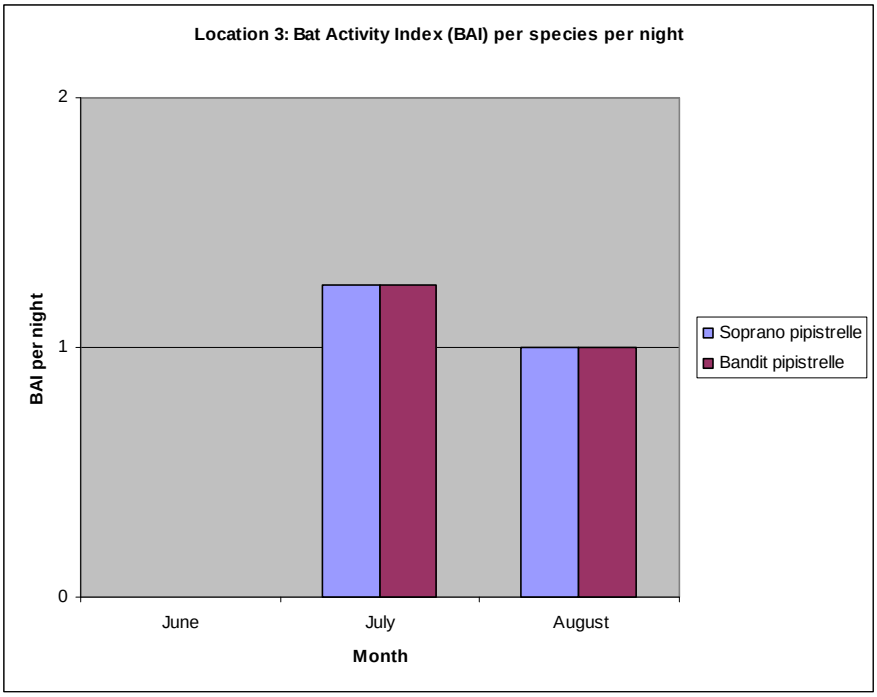


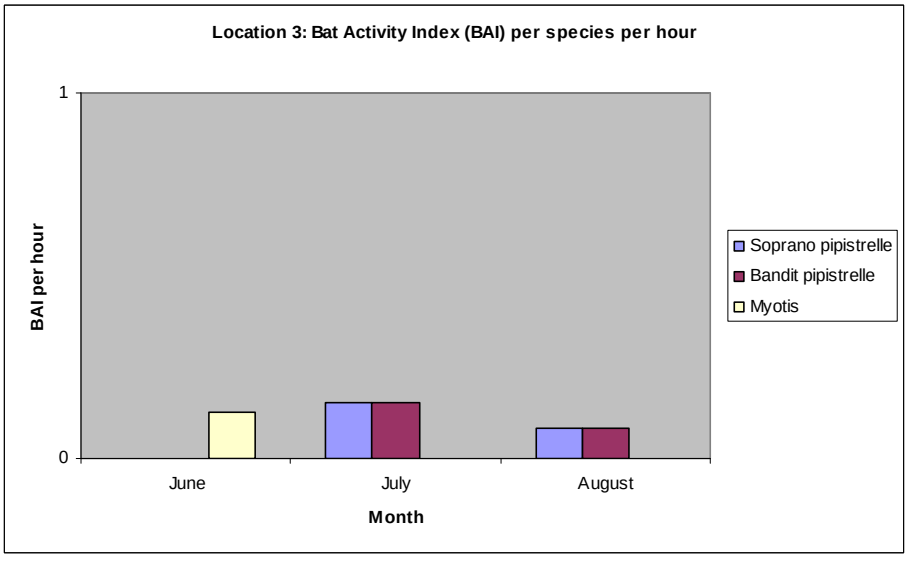


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Location 3 Results

A very low number of bat passes were recorded at Location 3 during the static detector surveys. The most passes recorded in one month was ten and these were recorded in July. The passes were evenly spaced across four of the five nights recorded in total and an equal number of common and soprano pipistrelle bats were recorded. A single *Myotis* pass was recorded in June and two pipistrelle passes were recorded in August. Location 3 represents only 3% of the total bat activity recorded throughout the survey period.

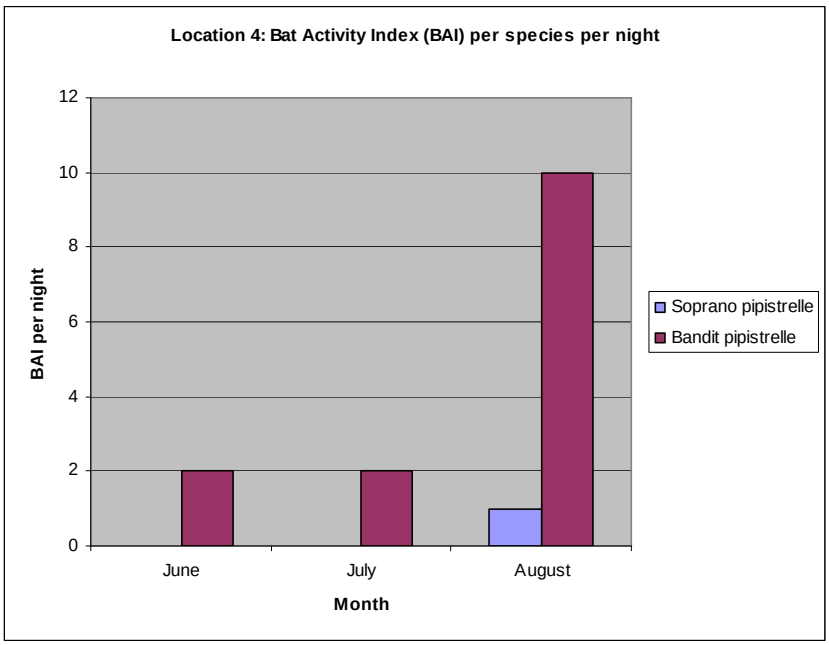


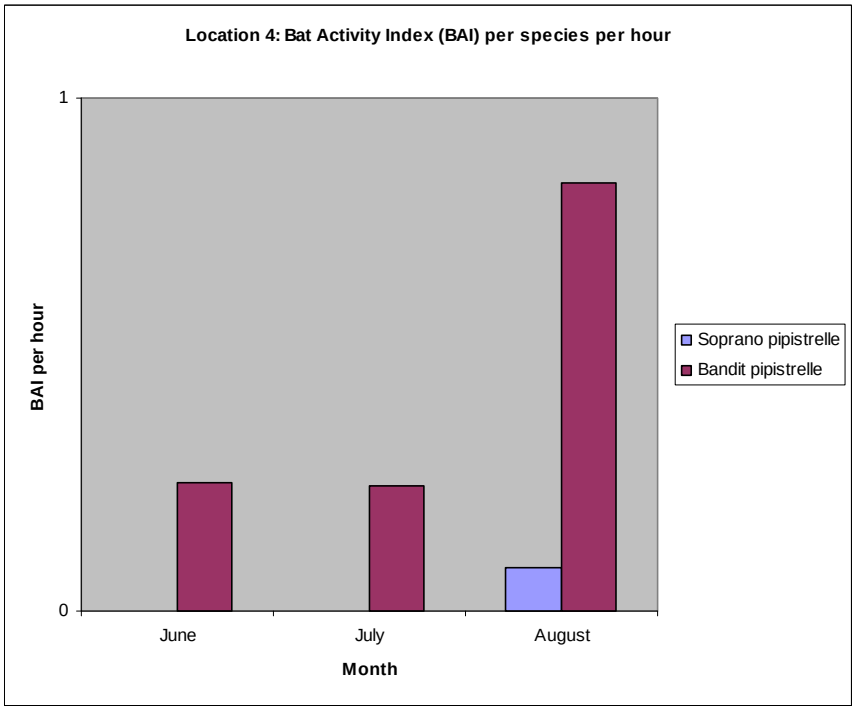


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Location 4 Results

Very low numbers of bat passes were recorded at Location 4. Two common pipistrelle passes were recorded in June; four common pipistrelle passes were recorded in July; and eleven bat passes were recorded in August including ten common pipistrelle passes and one soprano pipistrelle pass on one night. Location 4 represents 4.5% of the total bat activity recorded at all sites throughout the survey period.





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There was no data recorded for September 2011. It is likely that this is due to the failure of the battery during the time that the AnaBat was placed out.

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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[12])

Low	Medium	High
Long-eared bat	Serotine	Nathusius' pipistrelle
***Myotis* species**	Barbastelle	Noctule
Horseshoe bats		Leisler's
Soprano pipistrelle		
Common 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:

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Table 4.2 Bat species likely to be at risk from wind turbines (from Natural England TIN051[12])

Low Risk	Medium Risk	High Risk
Myotis species	**Common 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' in 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 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 documented 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 Survey Area

4.2.1 Pipistrelle Species

Most of the bat (activity transects) and passes (AnaBat surveys) recorded within the site were pipistrelle, both common and soprano pipistrelle in equal numbers. There were a few unidentified pipistrelle passes but given the other data recorded it is assumed this would be an equal number of common and soprano pipistrelle passes. There are no known roosts within the site boundary and no known pipistrelle roosts within 10km of the Site. However, as pipistrelle bats have a preference for roosting in houses (BCT, 2007) it is likely that the bats foraging and commuting within the Site are roosting within the properties of the nearest village of Aberchirder.

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The distribution of pipistrelle activity recorded was predominantly in the central part of the site in the northern part of the transect route.

While common and soprano 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 common and soprano pipistrelles from one from various survey methods used in 2010[23].

Common and soprano 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 low to moderate level of pipistrelle activity recorded within the site 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

The closest known roost to the Site is a *Myotis* roost which is present 500m south west of the Site (highlighted by NESBReC). Three other known *Myotis* roosts fall within 2km of the Site. As a very low number of passes of *Myotis* were recorded during the surveys it is clear that the Site does not form part of the core foraging area for the bats from these roosts.

Only one *Myotis* pass was recorded during the walked transect surveys and two passes were recorded during the static detector surveys. The passes can 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. Nevertheless, all species within the genus *Myotis* are afforded the same level of protection and no *Myotis* species has been included on the UK BAP priority species list or the Scottish Biodiversity List.

Myotis bats are fairly widespread throughout the UK and appear to be increasing over most of their range. The very small number of *Myotis* passes recorded indicates that it is very unlikely that this species will be affected by the proposed development. *Myotis* bats are assessed as being at very low risk both at a species and population level within the site.

[23] BCT (2011). The state of the UK's bats. National Bat Monitoring Programme Population Trends 2011.

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5. Conclusions

No bat roosts are known to be present within the site boundary and the bat activity recorded throughout the surveys did not indicate that bat roosts are located within close proximity to the site. The closest known roost to the site is a *Myotis* roost which is present 500m south west of the site (highlighted by NESBReC). Three other known *Myotis* roosts identified by NESBReC fall within 2km of the site. As a very low number of passes of *Myotis* were recorded during the surveys it is concluded that the site does not form part of the core foraging area for *Myotis* bats from these roosts.

Three species of bat were recorded during both the activity transect and static detector surveys including: common pipistrelle; soprano pipistrelle; and *Myotis* species[24]. During the activity transects, generally low levels of bat activity were recorded apart from August when much higher number of passes were recorded during the survey. During the static detector surveys, the highest numbers of bat passes were recorded in June and August. Locations 1 and 2 of the four locations chosen for the static detector recorded higher levels of bat activity than the other two locations. This suggests that these locations provide more suitable foraging and/or commuting areas for bats. Location 1 is at the edge of an isolated area of conifer woodland, and Location 2 is near a line of scattered trees and small areas of gorse scrub. Such habitats provide more sheltered foraging and commuting habitat for bats compared with the featureless grassland habitats which characterise Locations 3 and 4.

Overall, bat activity across the site was low with no obvious important foraging areas or commuting routes identified.

[24] It is not possible to separate the *Myotis* species based on the calls recorded from the frequency division bat detector.

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Figures

Figure 3.1 Bat Records within a 10km Radius of the Site

Figure 3.2 Features with the Potential to Support Roosting Bats Within the Site

Figure 3.3 Walked Transect Route and Locations of Bat Activity - May 2011

Figure 3.4 Walked Transect Route and Locations of Bat Activity - June 2011

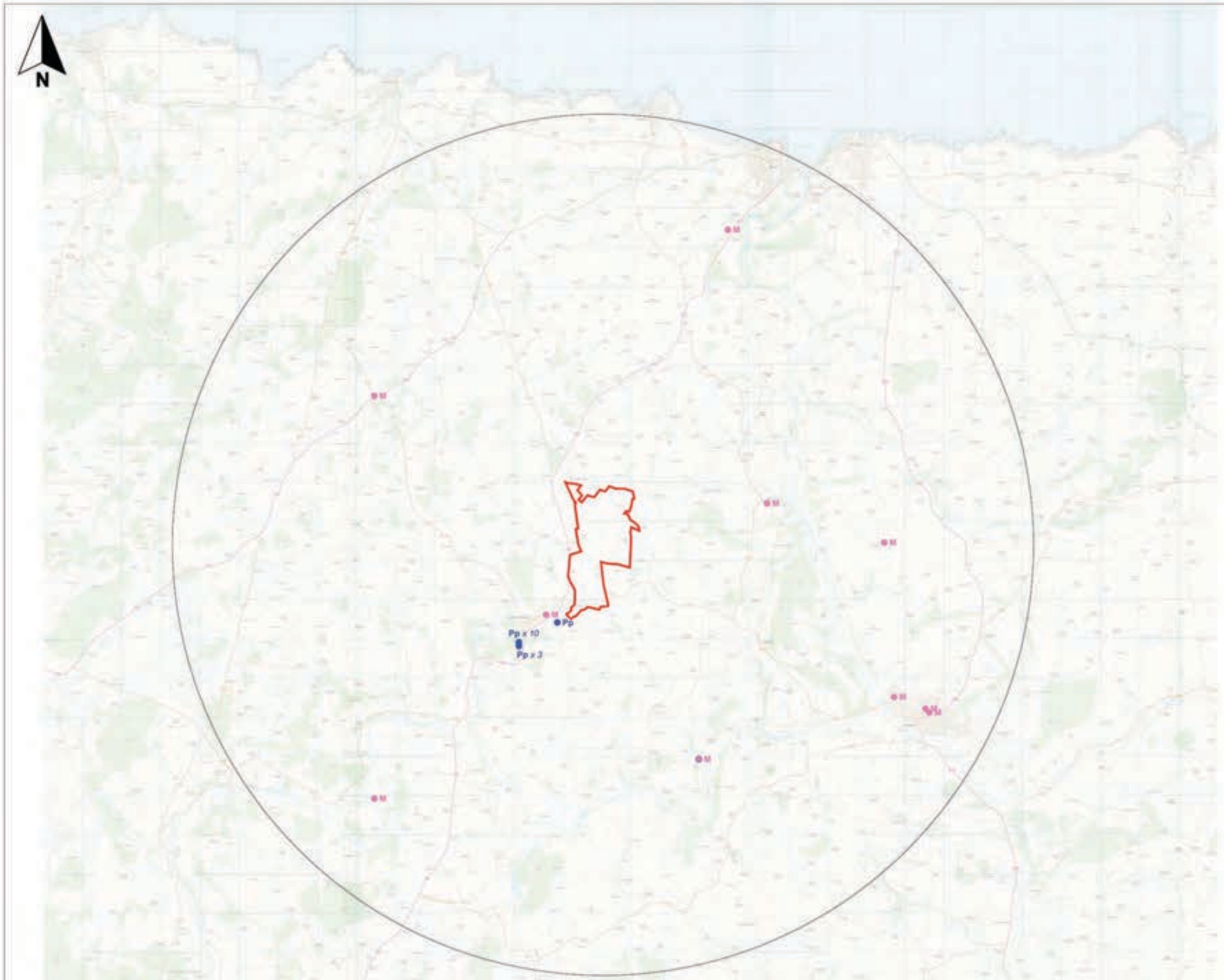
Figure 3.5 Walked Transect Route and Locations of Bat Activity - July 2011

Figure 3.6 Walked Transect Route and Locations of Bat Activity - August 2011

Figure 3.7 Walked Transect Route and Locations of Bat Activity - September 2011

Figure 3.8 Static Survey Locations

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Key

- Site boundary
- 10km radius
- Pp — Common pipistrelle *Pipistrellus pipistrellus*
- M — *Myotis* species
- Md — Daubenton's *Myotis daubentonii*

0 m — 5km

Scale 1:100,000 @ A3

FORCE 9 ENERGY

Deuchries Wind Farm
Bat Survey Report

Figure 3.1
Bat Records within a 10km Radius of the Site

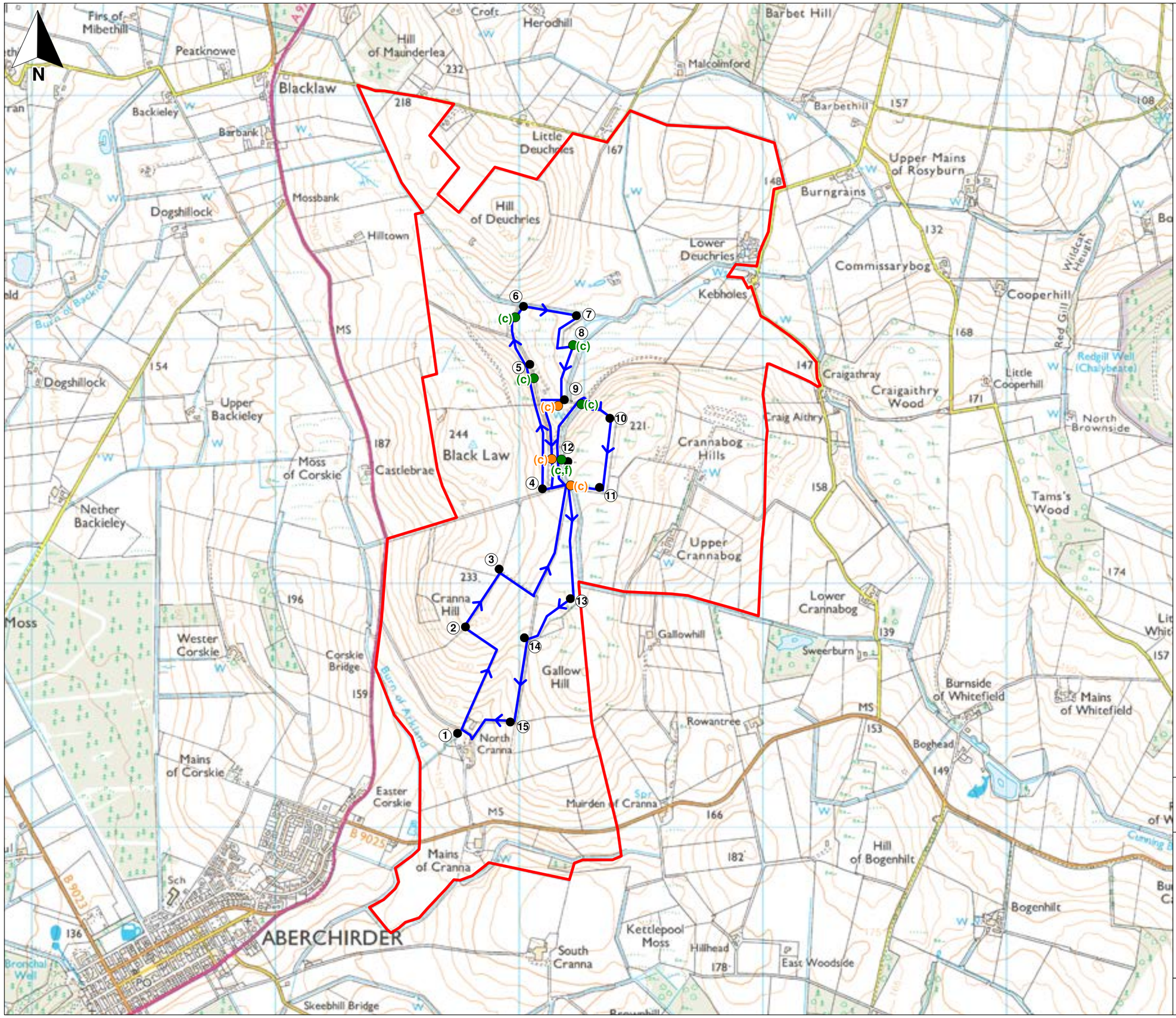
January 2012
27815-R09a.dwg panng

amec

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Key

- Site boundary
- Transect route
- ⑩ Navigation point
- Common pipistrelle pass
- Soprano pipistrelle pass

c - commuting
f - foraging

0 km 1 km

Scale 1:15,000 @ A3

FORCE 9 ENERGY

Deuchries Wind Farm
Bat Survey Report

Figure 3.3
Walked Transect Route and Locations of Bat Activity - May 2011

October 2012
27815-R17b.wor panng

amec

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Key

- Site boundary
- Transect route
- Navigation point
- Common pipistrelle pass
- Pipistrelle species pass

c - commuting
f - foraging

0 km 1 km

Scale 1:15,000 @ A3

FORCE 9 ENERGY

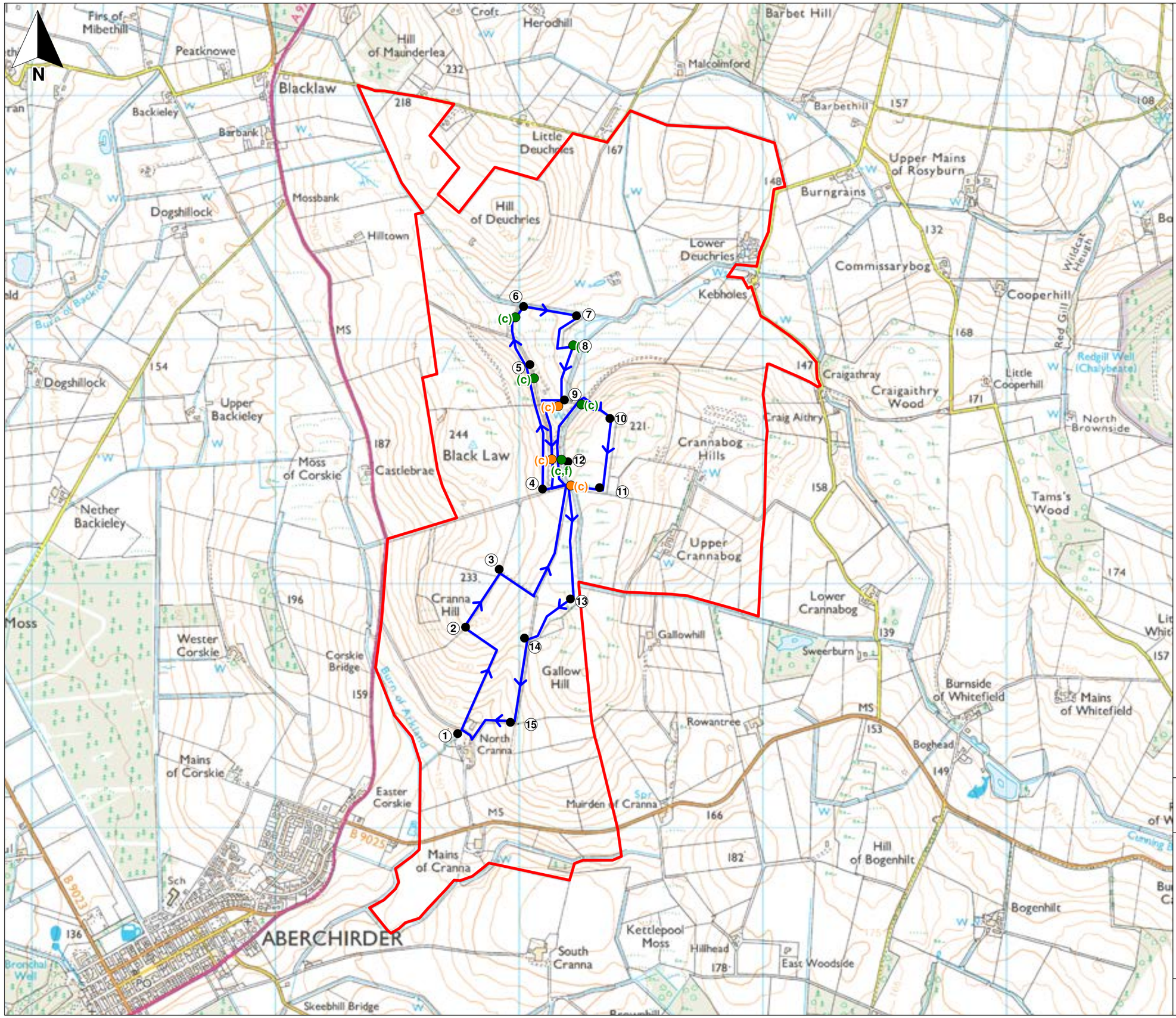
Deuchries Wind Farm
Bat Survey Report

Figure 3.4
Walked Transect Route and Locations of Bat Activity - June 2011

October 2012
27815-R18b.wor panng

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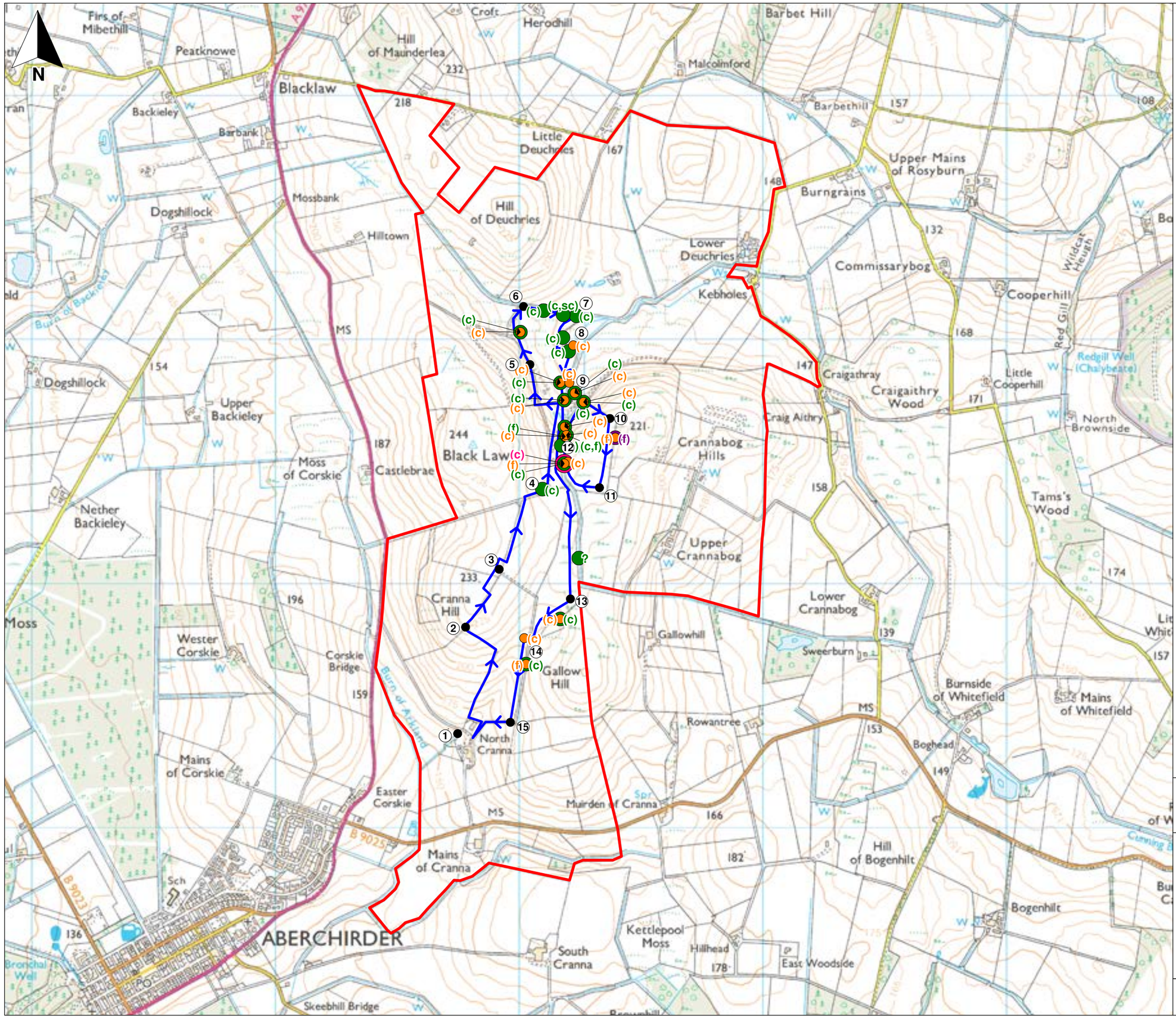
Deuchries Wind Farm
Bat Survey Report

Figure 3.5
Walked Transect Route and Locations of Bat Activity - July 2011

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Key

- Site boundary
- Transect route
- 10 Navigation point
- Common pipistrelle pass
- Soprano pipistrelle pass
- Pipistrelle species pass
- *Myotis* species pass

c - commuting
f - foraging
sc - social calling

0 km 1 km

Scale 1:15,000 @ A3

FORCE 9 ENERGY

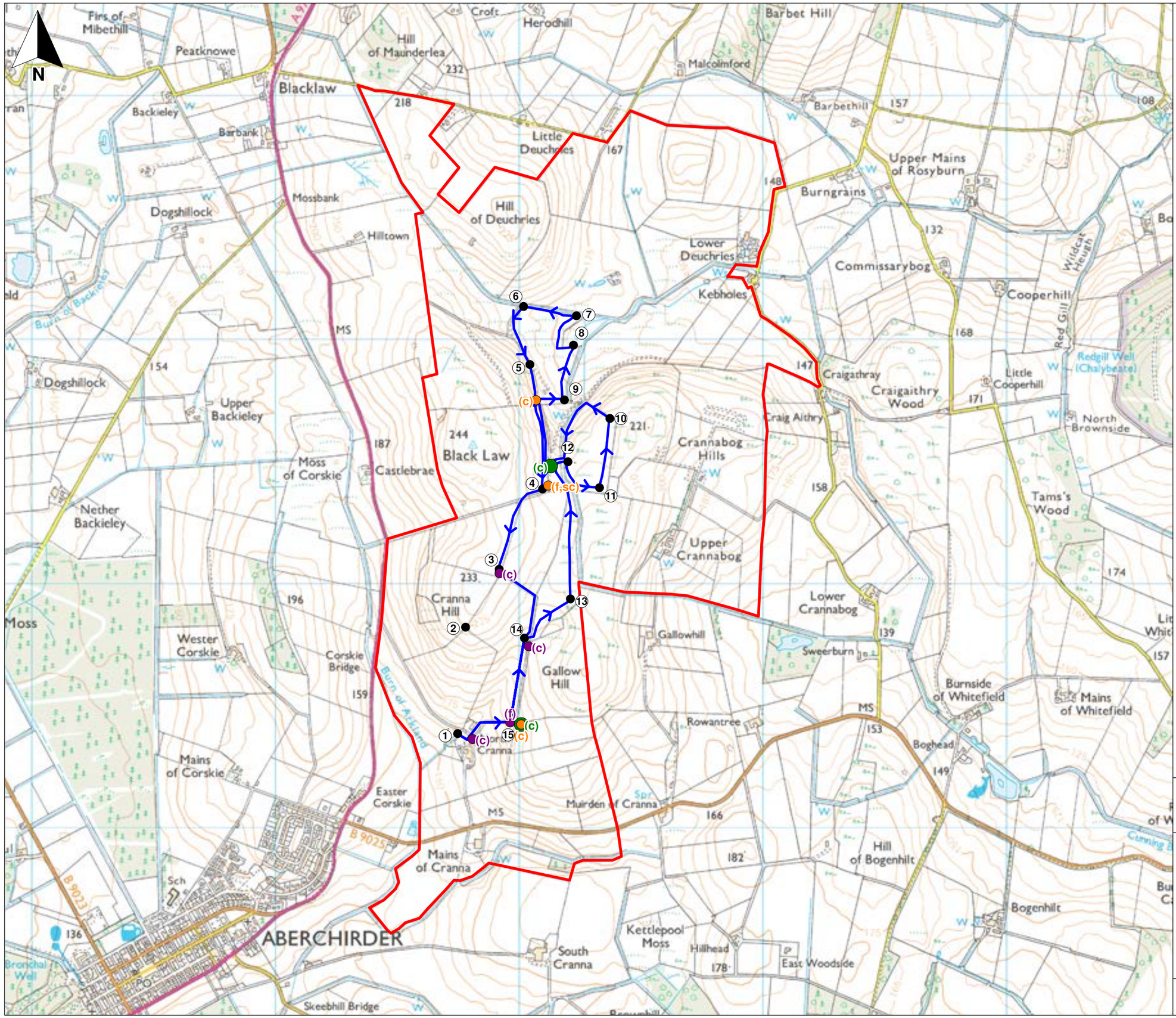
Deuchries Wind Farm
Bat Survey Report

Figure 3.6
Walked Transect Route and Locations of Bat Activity - August 2011

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Key

- Site boundary
- Transect route
- Navigation point (10)
- Common pipistrelle pass
- Soprano pipistrelle pass
- Pipistrelle species pass

c - commuting
f - foraging
sc - social calling

0 km 1 km

Scale 1:15,000 @ A3

FORCE 9 ENERGY

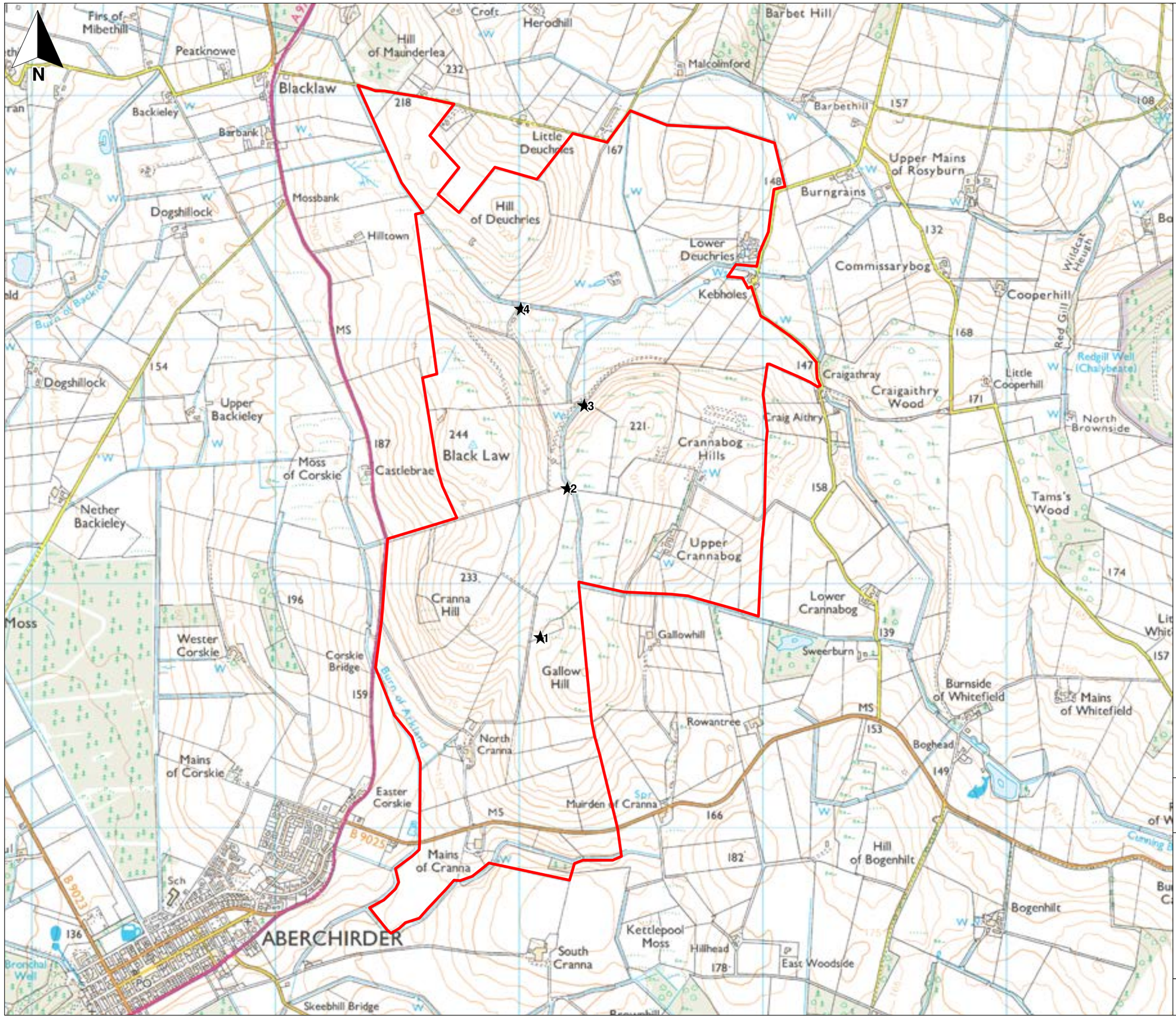
Deuchries Wind Farm
Bat Survey Report

Figure 3.7
Walked Transect Route and Locations of Bat Activity - September 2011

October 2012
27815-R21b.wor panng

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Appendix A
Photographs of Buildings and Trees Containing Features with the Potential to Support Roosting Bats



Photograph 1 – TN1



Photograph 4 – TN2



Photograph 2 – TN2



Photograph 5 – TN2



Photograph 3 - TN2



Photograph 6 – TN3

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Photograph 7 – TN3



Photograph 10 – TN4



Photograph 8 – TN4



Photograph 11 – TN5



Photograph 9 – TN4



Photograph 12 – TN5

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Photograph 13 – TN5



Photograph 16 – TN6



Photograph 14 – TN5



Photograph 17 - TN7



Photograph 15 – TN5

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Appendix B
Manual Bat Activity Transect Survey Results (Echos Ecology)

Table 1 Bat Activity Transect Results - May 2011

Location (Navigation Points Passed = P - See Figure 3.3)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Survey Start Time	21:45					
P1	21:45			NIL		
P2	21:56			NIL		
P3	22:07			NIL		
P4	22:24			NIL		
Between P4 and P5 NJ 6406 5484	22:35	Soprano pipistrelle	1	1	Commuting	no visual
P5	22:37			NIL		
Between P5 and P6 NJ 6398 5509	22:44	Common/Bandit pipistrelle	1	1	Commuting	no visual
P6	22:45			NIL		
P7	22:51			NIL		
P8	22:56			NIL		
Between P8 and P9 NJ 6422 5497	22:59	Soprano pipistrelle	1	1	Commuting	no visual
P9	23:04			NIL		
Between P9 and P10 NJ 6416 5472	23:07	Common/Bandit pipistrelle	1	3	Commuting	no visual
Between P9 and P10 NJ 6413 5450	23:15	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P9 and P10 NJ 6425 5473	23:20	Soprano pipistrelle	1	1	Commuting	no visual
Between P9 and P10 NJ 6425 5473	23:25-23:26	Soprano pipistrelle	1	3	Commuting and Foraging	no visual
	23:26	Soprano pipistrelle	1	1	Commuting	faint, no visual
P10	23:33			NIL		
P11	23:40			NIL		
Between P11 and P12 NJ 6421 5440	23:44	Common/Bandit pipistrelle	1	1	Commuting	no visual
P12	23:46			NIL		

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Location (Navigation Points Passed = P - See Figure 3.3)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
P13	00:01			NIL		
P14	00:09			NIL		
P15	00:14			NIL		
Survey End Time	00:18					
Total Survey Time (mins)	153	Overall Activity Totals	9	13		

Table 2 Bat Activity Transect Results - June 2011

Location (Navigation Points Passed = P - See Figure 3.4)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Survey Start Time	21:58					
P15	22:03			NIL		
P14	22:09			NIL		
P13	22:14			NIL		
P12	22:28			NIL		
P11	22:33			NIL		
P10	22:41			NIL		
P9	23:05			NIL		
P8	23:11			NIL		
P7	23:18			NIL		
P6	23:25			NIL		
P5	23:37			NIL		
P4	23:49			NIL		
Between P4 and P3 NJ 6405 5434	23:51	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P4 and P3 NJ 6399 5427	23:54	Common/Bandit pipistrelle	1	3	Commuting	circled overhead and flew S
Between P4 and P3 NJ 6398 5423 to NJ 6392 5406	23:55 - 00:01	Common/Bandit pipistrelle	1	5	Foraging and commuting	flying up and down fenceline N to S and back again
P3	00:01			NIL		

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Location (Navigation Points Passed = P - See Figure 3.4)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Between P3 and P2 NJ 6386 5394	00:05	Common/Bandit pipistrelle	1	1	Commuting	no visual
P2	00:11					
Between P2 and P1 NJ 6391 5071	00:17	Pipistrelle - Unidentified	1	1	Commuting	faint, no visual
P1	00:27			NIL		
Survey End Time	00:31					
Total Survey Time (mins)	153	Overall Activity Totals	5	11		

Table 3 Bat Activity Transect Results - July 2011

Location (Navigation Points Passed = P - See Figure 3.5)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Survey Start Time	02:25					
P1	02:25			NIL		
Between P1 and P15 NJ 6393 5342	02:34	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P1 and P15 NJ 6393 5342	02:34	Soprano pipistrelle	1	2	Commuting and Foraging	no visual
P15	02:35			NIL		
P14	02:40			NIL		
P13	02:45			NIL		
Between P13 and P12 NJ 6420 5439	02:55	Pipistrelle - Unidentified	1	2	Commuting	no visual
P12	02:58			NIL		
Between P12 and P11 NJ 6428 5436	03:02	Soprano pipistrelle	1	3	Commuting and Foraging	no visual
P11	03:04			NIL		
Between P11 and P10 NJ 6433 5439	03:07	Soprano pipistrelle	1	1	Commuting	no visual
P10	03:15			NIL		
P9	03:27			NIL		

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Location (Navigation Points Passed = P - See Figure 3.5)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
P8	03:33			NIL		
P7	03:40			NIL		
P6	03:46			NIL		
P5	03:59			NIL		
P9	04:13			NIL		
P12	04:19			NIL		
P4	04:22			NIL		
P3	04:30			NIL		
P14	04:35			NIL		
P15	04:39			NIL		
P1	04:42			NIL		
Survey End Time	04:42					
Total Survey Time (mins)	138	Overall Activity Totals	5	9		

Table 4 Bat Activity Transect Results - August 2011

Location (Navigation Points Passed = P - See Figure 3.6)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Survey Start Time	20:14					
P2	20:26			NIL		
P3	20:35			NIL		
P4	20:47			NIL		
Between P4 and P5 NJ 6419 5449	20:53	Soprano pipistrelle	1	1	Commuting	flew N to S overhead
	20:53	Common/Bandit pipistrelle	1	1	Commuting	flew S to N
Between P4 and P5 NJ 6419 5460	20:55	Soprano pipistrelle	1	5	Foraging	no visual
	20:55	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P4 and P5 NJ 6427 5474	21:00	Soprano pipistrelle	1	1	Commuting	no visual
		Common/Bandit pipistrelle	1	2	Commuting	no visual
	21:01	Soprano pipistrelle	1	1	Foraging	no visual

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Location (Navigation Points Passed = P - See Figure 3.6)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Between P4 and P5 NJ 6423 5478	21:05	Soprano pipistrelle	1	1	Commuting	no visual
	21:05	Common/Bandit pipistrelle	1	2	Commuting	no visual
	21:05	Soprano pipistrelle	1	1	Commuting	no visual
Between P4 and P5 NJ 6417 5482	21:11	Common/Bandit pipistrelle	1	1	Commuting	no visual
		Soprano pipistrelle	1	1	Commuting	no visual
P5	21:14			NIL		
Between P5 and P6 NJ 6401 5503	21:17	Common/Bandit pipistrelle	1	1	Commuting	no visual
	21:17	Soprano pipistrelle	1	4	Commuting	overhead
	21:17	Soprano pipistrelle	1	2	Commuting	faint, no visual
P6	21:21			NIL		
Between P6 and P7 NJ 6410 5512	21:28	Soprano pipistrelle	1	2	Commuting	flew along stream W to E, then poss back W
	21:29	Soprano pipistrelle	1	1	Commuting	no visual, prob over stream
Between P6 and P7 NJ 6418 5510	21:32	Soprano pipistrelle	1	5	Commuting and social calling	no visual
P7	21:33			NIL		
Between P7 and P8 NJ 6424 5510	21:33	Soprano pipistrelle	1	2	Commuting	no visual
	21:34	Soprano pipistrelle	1	2	Commuting	no visual
Between P7 and P8 NJ 6418 5501	21:37	Soprano pipistrelle	1	1	Commuting	no visual
Between P7 and P8 NJ 6420 5495	21:39	Soprano pipistrelle	1	3	Commuting	no visual
Between P7 and P8 NJ 6422 5498	21:40	Common/Bandit pipistrelle	1	1	Commuting	no visual
P8	21:41				NIL	
Between P8 and P9 NJ 6422 5498	21:41	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P8 and P9 NJ 6421 5482	21:44	Common/Bandit pipistrelle	1	1	Commuting	no visual
	21:44	Common/Bandit pipistrelle	1	5	Commuting	no visual
P9	21:46	Soprano pipistrelle	1	5	Commuting	faint, no visual
Between P9 and P10 NJ 6419 5475	21:49	Soprano pipistrelle	1	1	Commuting	no visual
	21:50	Common/Bandit	1	4	Commuting	no visual

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Location (Navigation Points Passed = P - See Figure 3.6)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
		pipistrelle				
Between P9 and P10 NJ 6419 5464	21:53	Common/Bandit pipistrelle	1	3	Commuting	no visual
	21:54	Soprano pipistrelle	1	5	Commuting	one bat flew SE, then both flew S
		Common/Bandit pipistrelle	1	5	Commuting	
Between P9 and P10 NJ 6417 5456	21:55 - 21:56	Soprano pipistrelle	2	10	Commuting	no visual
Between P9 and P10 NJ 6417 5449	21:56	Soprano pipistrelle	1	5	Commuting	no visual
	21:58 - 21:00	Soprano pipistrelle	1	5	Foraging	commuting and foraging in vicinity of tree
		Common/Bandit pipistrelle	1	5	Foraging	
		Myotis	1	1	Commuting	
Between P9 and P10 NJ 6420 5461	22:02	Soprano pipistrelle	1	5	Commuting	no visual
		Common/Bandit pipistrelle	1	1	Commuting	no visual
	22:02	Common/Bandit pipistrelle	1	1	Commuting	no visual
	22:03	Soprano pipistrelle	1	2	Foraging	no visual
	22:04	Common/Bandit pipistrelle	1	1	Commuting	no visual
P10	22:05			NIL		
Between P10 and P11 NJ 6440 5460	22:07	Common/Bandit pipistrelle	1	1	Foraging	no visual
P11	22:10	Pipistrelle - Unidentified	1	1	Commuting	faint, no visual
Between P11 and P12 NJ 6419 5449	22:14	Common/Bandit pipistrelle	1	2	Foraging	no visual
P12	22:15	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P12 and P13 NJ 6420 5450	22:16	Common/Bandit pipistrelle	1	2	Commuting	no visual
Between P12 and P13 NJ 6410 5439	22:18	Soprano pipistrelle	1	1	Commuting	no visual
Between P12 and P13 NJ 6425 5410	22:24 - 22:27	Soprano pipistrelle	1	5		flew to E
Between P12 and P13 NJ 6417 5385	22:29	Common/Bandit pipistrelle	1	5	Commuting	no visual
	22:29	Soprano pipistrelle	1	5	Commuting	no visual
	22:30	Common/Bandit pipistrelle	1	2	Commuting	no visual

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Location (Navigation Points Passed = P - See Figure 3.6)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
	22:31	Common/Bandit pipistrelle	1	1	Commuting	no visual
P13	22:32			NIL		
P14	22:36	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P14 and P15 NJ 6403 5367	22:38	Common/Bandit pipistrelle	1	5	Foraging	both bats were seen flying S along the track
		Soprano pipistrelle	1	5	Commuting	
P15	22:41			NIL		
Survey End Time	22:44					
Total Survey Time (mins)	150	Overall Activity Totals	57	145		

Table 5 Bat Activity Transect Results - September 2011

Location (Navigation Points Passed = P - See Figure 3.7)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Survey Start Time	21:45					
P1	21:45			NIL		
P2	21:56			NIL		
P3	22:07			NIL		
P4	22:24			NIL		
Between P4 and P5 NJ 6406 5484	22:35	Soprano pipistrelle	1	1	Commuting	no visual
P5	22:37			NIL		
Between P5 and P6 NJ 6398 5509	22:44	Common/Bandit pipistrelle	1	1	Commuting	no visual
P6	22:45			NIL		
P7	22:51			NIL		
P8	22:56			NIL		
Between P8 and P9 NJ 6422 5497	22:59	Soprano pipistrelle	1	1	Commuting	no visual
P9	23:04			NIL		
Between P9 and P10 NJ 6416 5472	23:07	Common/Bandit pipistrelle	1	3	Commuting	no visual

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Location (Navigation Points Passed = P - See Figure 3.7)	Time	Species	Max Number of Individual Bats Present	Bat Passes (Max of 5 per single bat)	Behaviour	Additional Notes
Between P9 and P10 NJ 6413 5450	23:15	Common/Bandit pipistrelle	1	1	Commuting	no visual
Between P9 and P10 NJ 6425 5473	23:20	Soprano pipistrelle	1	1	Commuting	no visual
Between P9 and P10 NJ 6425 5473	23:25-23:26	Soprano pipistrelle	1	3	Commuting and Foraging	no visual
	23:26	Soprano pipistrelle	1	1	Commuting	faint, no visual
P10	23:33			NIL		
P11	23:40			NIL		
Between P11 and P12 NJ 6421 5440	23:44	Common/Bandit pipistrelle	1	1	Commuting	no visual
P12	23:46			NIL		
P13	00:01			NIL		
P14	00:09			NIL		
P15	00:14			NIL		
Survey End Time	00:18					
Total Survey Time (mins)	153	Overall Activity Totals	9	13		

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Appendix C
Static Detector Weather Conditions

Table 1 Weather Data from Turriff Weather Station (www.wunderground.com) and Sunset/ Sunrise Times from www.thetimeandplace.info

Date	Sunrise	Sunset	Temp (°C) High	Temp (°C) Average	Temp (°C) Low	Wind Max. Speed (km/hr)	Wind Max. Gust Speed (km/hr)	Precipitation (cm)
21/06/2011	04:07	22:16	16	13	10	0	5	0.79
22/06/2011	04:07	22:17	11	10	9	0	5	1.32
23/06/2011	04:08	22:17	14	11	8	3	10	0.00
24/06/2011	04:08	22:17	9	9	8	2	5	0.08
25/06/2011	04:08	22:17	No data provided for this day					
30/06/2011	04:12	22:15	No data provided for this day					
01/07/2011	04:13	22:15	No data provided for this day					
02/07/2011	04:14	22:14	16	13	9	0	0	0.08
03/07/2011	04:15	22:13	22	15	7	3	6	0.00
04/07/2011	04:16	22:13	15	12	10	3	8	0.00
27/08/2011	05:59	20:24	19	14	9	2	0	0.00
28/08/2011	06:01	20:21	15	13	9	3	2	0.15
29/08/2011	06:03	20:19	16	13	9	3	1	0.00
30/08/2011	06:05	20:16	19	14	11	3	8	0.00
31/08/2011	06:07	20:13	17	13	11	5	3	0.00

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Appendix D
Static Detector Survey Results By Location

Table 1 Nightly Bat Passes June 2011

June 2011 per night	Location 1 (5 nights)		Location 2 (5 nights)		Location 3 (5 nights)		Location 4 (5 nights)	
	Species	**Number of passes**	**Species**	**Number of passes**	**Species**	**Number of passes**	**Species**	**Number of passes**
21 - 22 June	Common pipistrelle	1						
22 - 23 June	Common pipistrelle	45						
23 - 24 June					*Myotis* sp.	1		
24 - 25 June	Common pipistrelle	63					Common pipistrelle	2
25 - 26 June								
TOTAL		**109**				**1**		**2**

Table 2 Nightly Bat Passes July 2011

July 2011 per night	Location 1 (5 nights)		Location 2 (5 nights)		Location 3 (5 nights)		Location 4 (5 nights)	
	Species	**Number of passes**	**Species**	**Number of passes**	**Species**	**Number of passes**	**Species**	**Number of passes**
30 June - 01 July	Common pipistrelle	2	Soprano pipistrelle	2	Soprano pipistrelle	1		
			Common pipistrelle	1	Common pipistrelle	1		
01 - 02 July	Common pipistrelle	57	Soprano pipistrelle	2	Soprano pipistrelle	1		
	Pipistrelle sp.	1	Common pipistrelle	4				
02 - 03 July					Soprano pipistrelle	3	Common pipistrelle	1
					Common pipistrelle	1		
03 - 04 July			Common	1	Common	3	Common	3

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July 2011 per night	Location 1 (5 nights)		Location 2 (5 nights)		Location 3 (5 nights)		Location 4 (5 nights)	
	Species	Number of passes	Species	Number of passes	Species	Number of passes	Species	Number of passes
			pipistrelle		pipistrelle		pipistrelle	
04 - 05 July								
TOTAL		**60**		**10**		**10**		**4**

Table 3 Nightly Bat Passes August 2011

August 2011 per night	Location 1 (0 nights)		Location 2 (5 nights)		Location 3 (5 nights)		Location 4 (5 nights)	
	Species	Number of passes	Species	Number of passes	Species	Number of passes	Species	Number of passes
27 - 28 August	No data recorded		*Myotis* sp.	1			Soprano pipistrelle	1
							Common pipistrelle	10
28 - 29 August								
29 - 30 August			Soprano pipistrelle	22	Soprano pipistrelle	1		
			Common pipistrelle	101	Common pipistrelle	1		
			Pipistrelle sp.	43				
30 - 31 August								
31 August - 01 Sep								
TOTAL				**167**		**2**		**11**

September 2011

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Appendix E
Bat Activity Index per Night and per Hour for Each Static Detector Survey Location

Table 1 BAI Calculations - Location 1

Location 1	June (No of passes)	No of nights recording	X hours per each night	July (No of passes)	No of nights recording	X hours per each night	August (passes)	No of nights recording	X hours per each night
		3	8x3=24		2	8.25x2=16.5	No data		
Common pipstrelle	109	36.33333	4.541667	59	29.5	3.57576			
Soprano pipistrelle	0			0					
Pipistrelle	0			1	0.5	0.06061			
Myotis	0			0					

Table 2 BAI Calculations - Location 2

Location 1	June	No of nights recording	X hours per each night	July	No of nights recording	X hours per each night	August	No of nights recording	X hours per each night
	No data	-	-		3	8.25x3=24.75		2	2x12=24
Common pipstrelle				6	2	0.24242	101	50.5	4.20833
Soprano pipistrelle				4	1.33333	0.16162	22	11	0.91667
Pipistrelle				0			43	21.5	1.79167
Myotis				0			1	0.5	0.04167

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Table 3 BAI Calculations - Location 3

Location 1	June	No of nights recording	X hours per each night	July	No of nights recording	X hours per each night	August	No of nights recording	X hours per each night
		1	8		4	8.25x4=33		1	12
Common pipstrelle	0			5	1.25	0.15152	1	1	0.08333
Soprano pipistrelle	0			5	1.25	0.15152	1	1	0.08333
Pipistrelle	0			0			0		
Myotis	1	1	0.125	0			0		

Table 4 BAI Calculations - Location 4

Location 1	June	No of nights recording	X hours per each night	July	No of nights recording	X hours per each night	August	No of nights recording	X hours per each night
		1	8		2	16.5		1	12
Common pipstrelle	2	2	0.25	4	2	0.24242	10	10	0.83333
Soprano pipistrelle	0			0			1	1	0.08333
Pipistrelle	0			0			0		
Myotis	0			0			0		

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APPENDIX 7
ORNITHOLOGY

Appendix 7.1: Survey Data

APPENDIX 7.1A: DATES AND TIMES OF VANTAGE POINT SURVEYS, BREEDING SEASON 2010

Date	Survey Period	Duration (hours)
27/04/2010	1130-1430	3
28/04/2010	1620-1920	3
29/04/2010	0532-0832	3
10/05/2010	1455-1755	3
11/05/2010	1005-1305	3
25/05/2010	0505-0805	3
14/06/2010	1125-1425	3
15/06/2010	1230-1530	3
16/06/2010	1250-1550	3
28/06/2010	1410-1710	3
16/07/2010	1525-1825	3
17/07/2010	1040-1340	3
17/07/2010	1610-1910	3
26/08/2010	1010-1310	3
Total		42

APPENDIX 7.1B: DATES AND TIMES OF VANTAGE POINT SURVEYS, WINTER 2010/11

Date	Survey Period	Duration (hours)
27/09/2010	1305-1605	3
28/09/2010	1115-1415	3
19/10/2010	0920-1220	3
20/10/2010	1000-1300	3
22/11/2010	0930-1230	3
23/11/2010	0850-1150	3
18/12/2010	1220-1520	3
19/12/2010	0740-1040	3
10/01/2011	0800-1100	3
23/01/2011	1330-1630	3
06/02/2011	0730-1030	3
22/02/2011	1430-1730	3
20/03/2011	0615-0915	3
26/03/2011	1500-1800	3
Total		42

APPENDIX 7.1C: DATES AND TIMES OF VANTAGE POINT SURVEYS, WINTER 2011/12

Date	Survey Period	Duration (hours)
26/09/2011	1515 - 1815	3
27/09/2011	0830 - 1000	3
27/09/2011	1115 - 1245	3
15/10/2011	1530 - 1830	3
16/10/2011	0720 - 1020	3
31/10/2011	0720 - 1020	3
31/10/2011	1105 - 1405	3
13/11/2011	0920 - 1220	3
13/11/2011	1340 - 1640	3
27/11/2011	0945 - 1245	3
27/11/2011	1315 - 1615	3
12/12/2011	1300 - 1600	3
13/12/2011	0810 - 1110	3
17/12/2011	0930 - 1230	3
17/12/2011	1300 - 1600	3
14/01/2012	1330 - 1630	3
17/01/2012	1215 - 1515	3
28/01/2012	0930 - 1230	3
28/01/2012	1310 - 1610	3
12/02/2012	0840 - 1140	3
12/02/2012	1220 - 1520	3
25/02/2012	0915 - 1215	3
25/02/2012	1245 - 1545	3
19/03/2012	0730 - 1030	3
19/03/2012	1100 - 1400	3
28/03/2012	1030 - 1330	3
28/03/2012	1430 - 1730	3
Total		81

APPENDIX 7.1D: VANTAGE POINT SURVEY DATA, BREEDING SEASON 2010

VP	Date	Flight No.	Time	Species	No. of birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m	Comments
1	27/04/2010	1	12.02	GD	3			60				Three females.
1	29/04/2010	2	05:32	GP	11	30						-
1	29/04/2010	3	05:59	GJ	2				45			-
1	29/04/2010	4	08:12	GJ	9				90			-
1	10/05/2010	5	16:23	GP	c.78				45			-

APPENDIX 7.1E: VANTAGE POINT SURVEY DATA, WINTER SEASON 2010/11

Flight No	Date	Time	VP	Species	Number of Birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m	Comments
11	19/10/2010	1105	1	PG	1			75				
12	9/10/2010	1129	1	PG	30			30				
13	20/10/2010	1048	1	PG	130				120			
14	20/10/2010	1120	1	PG	30			45				
15	22/11/2010	1027	1	GJ	1				75			
16	22/11/2010	1029	1	GJ	300				135			
6	23/11/2010	903	1	PE	1	30	15					
17	23/11/2010	945	1	GJ	36			90				
18	23/11/2010	1000	1	GJ	140					135		
19	23/11/2010	1005	1	GJ	6			90				
7	23/11/2010	1008	1	PE	1	60						
20	23/11/2010	1058	1	GJ	6				60			
21	23/11/2010	1111	1	PG	7			120				
22	23/11/2010	1123	1	PG	150					90		
23	9/12/2010	1015	1	GJ	110	60						Landed in stubble field
8	10/01/2011	911	1	WS	9	30						
24	10/01/2011	915	1	GJ	24	45						
25	10/01/2011	923	1	GJ	120	30	30					
9	10/01/2011	930	1	WS	4	75						
26	10/01/2011	930	1	GJ	16	15	75					
27	10/01/2011	948	1	GJ	80	15	15	15				
28	10/01/2011	1006	1	GJ	30			180				
29	10/01/2011	1039	1	GJ	19	15						
30	23/01/2011	1356	1	GJ	32				45			

Flight No	Date	Time	VP	Species	Number of Birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m	Comments
31	23/01/2011	1437	1	GJ	41				45			
32	23/01/2011	1541	1	PG	7	15	15	15	45			
33	06/02/2011	730	1	PG	200+	15						Calling and landing 100-200m from VP; according to farmer, the geese were there a few days
34	06/02/2011	755	1	PG	200+	15	15	15	15			
35	06/02/2011	805	1	PG	200+	15	15	15	15			
36	06/02/2011	951	1	PG	15	30	15					
37	06/02/2011	957	1	PG	5	45						
38	06/02/2011	959	1	PG	14	60						
39	06/02/2011	1002	1	PG	8	45						
40	06/02/2011	1009	1	PG	8	45	30					Flew in and joined flock; possibly previous flock (flight 35 returning)

APPENDIX 7.1F:VANTAGE POINT SURVEY DATA, WINTER SEASON 2011/12

Flight No	Date	Time	VP	Species	Number of Birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m	Comments
43	26/09/2011	1520	1	K.	1					45		
44	26/09/2011	1531	1	K.	1		30					
59	27/11/2011	1431	1	K.	1	15						
76	28/03/2012	1059	1	K.	1				60			Flying NE direction, hunting/hovering
45	15/10/2011	1815	1	PG	25					45		
46	16/10/2011	849	1	PG	32					60		Flying SW direction
47	16/10/2011	914	1	PG	1				45			Flying SW direction
48	16/10/2011	918	1	PG	5					45		Flying SW direction
49	16/10/2011	933	1	PG	75					120		Flying SW direction
50	16/10/2011	943	1	PG	7				60			Flying SW direction
51	16/10/2011	953	1	PG	53					210		Flying SW direction
52	16/10/2011	1000	1	PG	40				75			Flying SW direction
53	31/10/2011	941	1	PG	120					75		
54	31/10/2011	959	1	PG	1				45			
55	31/10/2011	1113	1	PG	40					60		
56	31/10/2011	1133	1	PG	100					60		
64	14/01/2012	1521	1	PG	10					30		
69	12/02/2012	937	1	PG	27					30		
70	12/02/2012	959	1	PG	16					15		

Flight No	Date	Time	VP	Species	Number of Birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m	Comments
73	19/03/2012	1102	1	PG	28					30		
74	19/03/2012	1102	1	PG	13					30		
75	19/03/2012	1318	1	PG	8					45		
57	13/11/2011	1100	1	GP	16	15						
72	19/03/2012	1005	1	GP	63				30			
58	27/11/2011	1324	1	GJ	30				150			Birds flying into wind
60	17/12/2011	1017	1	GJ	23						30	
61	17/12/2011	1045	1	GJ	12		15					Birds then landed
71	12/02/2012	1102	1	GJ	28					75		
77	28/03/2012	1644	1	GJ	2					30		
62	14/01/2012	1504	1	SE	1	30						
63	14/01/2012	1513	1	SE	1	30						
65	14/01/2012	1522	1	SE	1			15				
66	17/01/2012	1402	1	SE	1	15						
67	17/01/2012	1408	1	SE	1	30						
68	28/01/2012	1334	1	SE	1					255		

Appendix 7.2: Collision Risk Modelling Results – Pink Footed Goose

Appendix 7.2: Deuchries, Pink-footed Goose Collision-Risk Modelling
Stage 1 Calculation

Risk Window

Cross sectional area (W) m^2 of risk window

1 49760

Max distance between turbines being approached+blade length (m)

622

height of 20-100m 'collision risk band'

80

mean number of geese per hour (see table 1)

2 14.24

3 Number of hours geese active (T) (see table 2)

2819.4

Based on geese flying all days between Oct and April and flying 25% of time between dusk and dawn

4 Number of geese through window (n)

40142.89

5 Area of windfarm rotors (A)

20106.19

Number of rotors in windfarm (N)

4

rotor radius

40

Area of windfarm rotors (with assumed 50% overlap)

10053.10

6 Proportion of risk window occupied by rotors

0.20

7 Number of geese assumed to pass through rotors

8110

Stage 2 calculation

Stage 2 assuming turbines off for 25% of time (%)

3.0%

Estimated number of geese through turbines that will die

244 (stage 1*stage 2)

Final

95% avoidance

12

99% avoidance

2.44

Table 1

	Month							Mean
	J	F	M	A	O	N	D	
Hours of observation	6	6	6	9	6	6	6	
monthly total of geese	7	403	30	0	1	157	0	
Geese hr^{-1}	1.17	67.17	5.00	0.00	0.17	26.17	0.00	14.24

Table 2

	J	F	M	A	O	N	D	
Mean Daylight hours	7.5	9.5	11.75	14.25	10.5	8.25	6.45	
mean nocturnal hrs x25%	4.125	3.625	3.0625	2.4375	3.375	3.9375	4.3875	
combined daily mean	11.625	13.125	14.8125	16.6875	13.875	12.1875	10.8375	
no of days birds present	31	28	31	30	31	30	31	
total hours	360.375	367.5	459.1875	500.625	430.125	365.625	335.9625	2819.4

Appendix 7.2: Deuchries, Pink-footed Goose. CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA

Only enter input parameters in blue W Band 01/12/2011

K: [1D or [3D] (0 or 1)	0		
NoBlades	3		
MaxChord	3.5	m	
Pitch (degrees)	7		
BirdLength	0.68	m	
Wingspan	1.52	m	
F: Flapping (0) or gliding (+	0		
Bird speed	17	m/sec	
RotorDiam	80	m	
RotationPeriod	4.00	sec	
Bird aspect ratioo: β	0.45		

Calculation of alpha and p(collision) as a function of radius

			Upwind:			Downwind:		
r/R	c/C	α	collide		contribution	collide		contribution
radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
0.025	0.575	10.82	16.45	0.73	0.00091	16.45	0.73	0.00091
0.075	0.575	3.61	5.48	0.24	0.00181	5.48	0.24	0.00181
0.125	0.702	2.16	3.29	0.15	0.00181	3.29	0.15	0.00181
0.175	0.860	1.55	2.35	0.10	0.00181	2.35	0.10	0.00181
0.225	0.994	1.20	1.83	0.08	0.00181	1.83	0.08	0.00181
0.275	0.947	0.98	1.50	0.07	0.00181	1.50	0.07	0.00181
0.325	0.899	0.83	1.27	0.06	0.00181	1.27	0.06	0.00181
0.375	0.851	0.72	1.10	0.05	0.00181	1.10	0.05	0.00181
0.425	0.804	0.64	0.97	0.04	0.00181	0.97	0.04	0.00181
0.475	0.756	0.57	0.87	0.04	0.00181	0.87	0.04	0.00181
0.525	0.708	0.52	0.78	0.03	0.00181	0.78	0.03	0.00181
0.575	0.660	0.47	0.72	0.03	0.00181	0.72	0.03	0.00181
0.625	0.613	0.43	0.68	0.03	0.00188	0.68	0.03	0.00188
0.675	0.565	0.40	0.68	0.03	0.00203	0.68	0.03	0.00203
0.725	0.517	0.37	0.68	0.03	0.00218	0.68	0.03	0.00218
0.775	0.470	0.35	0.68	0.03	0.00233	0.68	0.03	0.00233
0.825	0.422	0.33	0.68	0.03	0.00248	0.68	0.03	0.00248
0.875	0.374	0.31	0.68	0.03	0.00263	0.68	0.03	0.00263
0.925	0.327	0.29	0.68	0.03	0.00278	0.68	0.03	0.00278
0.975	0.279	0.28	0.68	0.03	0.00293	0.68	0.03	0.00293

Overall p(collision) = Upwind 4.0% Downwind 4.0%

Average 4.0%

inc shut-dowr 3.0% (25% shut-down time)

Appendix 7.3: Collision Risk Modelling Results - Greylag Goose

Appendix 7.3: Deuchries, Greylag Goose, Collision-risk Modelling
Stage 1 calculation

Risk Window

Cross sectional area (W) m^2 of risk window

1 49760

Max distance between turbines being approached+blade length (m)

622

height of 20-100m 'collision risk band'

80

mean number of geese per hour (see table 1)

2 12.41

3 Number of hours geese active (T) (see table 2)

2819.4

Based on geese flying all days between Oct and April and flying 25% of time between dusk and dawn

4 Number of geese through window (n)

34996.36

5 Area of windfarm rotors (A)

20106.19

Number of rotors in windfarm (N)

4

rotor radius

40

Area of windfarm rotors (with assumed 50% overlap)

10053.10

6 Proportion of risk window occupied by rotors

0.20

7 Number of geese assumed to pass through rotors

7070

Stage 2 calculation

Stage 2 assuming turbines off for 25% of time (%)

3.4%

Estimated number of geese through turbines that will die

243 (stage 1*stage 2)

Final

95% avoidance

12

99% avoidance

2.43

Table 1

	Month							Mean
	J	F	M	A	O	N	D	
Hours of observation	6	6	6	9	6	6	6	
monthly total of geese	73	0	0	2	0	447	0	
Geese hr^{-1}	12.17	0.00	0.00	0.22	0.00	74.50	0.00	12.41

Table 2

	J	F	M	A	O	N	D	
Mean Daylight hours	7.5	9.5	11.75	14.25	10.5	8.25	6.45	
mean nocturnal hrs x25%	4.125	3.625	3.0625	2.4375	3.375	3.9375	4.3875	
combined daily mean	11.625	13.125	14.8125	16.6875	13.875	12.1875	10.8375	
no of days birds present	31	28	31	30	31	30	31	
total hours	360.375	367.5	459.1875	500.625	430.125	365.625	335.9625	2819.4

Appendix 7.3: Deuchries, Greylag Goose, Collision risk Modelling CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA

Only enter input parameters in blue W Band 01/12/2011

K: [1D or [3D] (0 or 1)	0		
NoBlades	3		
MaxChord	3.5	m	
Pitch (degrees)	7		
BirdLength	0.82	m	
Wingspan	1.64	m	
F: Flapping (0) or gliding (+	0		
Bird speed	17	m/sec	
RotorDiam	80	m	
RotationPeriod	4.00	sec	
Bird aspect ratioo: β	0.50		

Calculation of alpha and p(collision) as a function of radius

			Upwind:			Downwind:		
r/R	c/C	α	collide		contribution	collide		contribution
radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
0.025	0.575	10.82	17.75	0.78	0.00098	17.75	0.78	0.00098
0.075	0.575	3.61	5.92	0.26	0.00196	5.92	0.26	0.00196
0.125	0.702	2.16	3.55	0.16	0.00196	3.55	0.16	0.00196
0.175	0.860	1.55	2.54	0.11	0.00196	2.54	0.11	0.00196
0.225	0.994	1.20	1.97	0.09	0.00196	1.97	0.09	0.00196
0.275	0.947	0.98	1.61	0.07	0.00196	1.61	0.07	0.00196
0.325	0.899	0.83	1.37	0.06	0.00196	1.37	0.06	0.00196
0.375	0.851	0.72	1.18	0.05	0.00196	1.18	0.05	0.00196
0.425	0.804	0.64	1.04	0.05	0.00196	1.04	0.05	0.00196
0.475	0.756	0.57	0.93	0.04	0.00196	0.93	0.04	0.00196
0.525	0.708	0.52	0.85	0.04	0.00196	0.85	0.04	0.00196
0.575	0.660	0.47	0.82	0.04	0.00208	0.82	0.04	0.00208
0.625	0.613	0.43	0.82	0.04	0.00226	0.82	0.04	0.00226
0.675	0.565	0.40	0.82	0.04	0.00244	0.82	0.04	0.00244
0.725	0.517	0.37	0.82	0.04	0.00262	0.82	0.04	0.00262
0.775	0.470	0.35	0.82	0.04	0.00280	0.82	0.04	0.00280
0.825	0.422	0.33	0.82	0.04	0.00298	0.82	0.04	0.00298
0.875	0.374	0.31	0.82	0.04	0.00317	0.82	0.04	0.00317
0.925	0.327	0.29	0.82	0.04	0.00335	0.82	0.04	0.00335
0.975	0.279	0.28	0.82	0.04	0.00353	0.82	0.04	0.00353

Overall p(collision) = Upwind 4.6% Downwind 4.6%

Average 4.6%

inc shut-dowr 3.4% (25% shut-down time)

APPENDIX 8
LANDSCAPE

Appendix 8.1: Landscape Character Types Assessment

APPENDIX 8.1: LANDSCAPE CHARACTER TYPES ASSESSMENTS

8.1 This technical appendix sets out the detailed assessment on landscape receptors (Landscape Character Areas (LCA) and Landscape Designations) where significant landscape impacts have not been identified within the following sections:

- Section 1 – Landscape Designations (page 1);
- Section 2 – Non-host LCA (page 4);
- Section 3 - Landscape Designations Cumulative Assessment (page 11);
- Section 4 – Non-host LCA Cumulative Assessment (page 15); and
- Section 5 – Sequential Assessment and ZTV statistical analysis (page 22).

Landscape Impacts - Landscape Designations

8.2 The following section sets out the detailed assessment on Landscape Designations where significant landscape impacts have not been identified.

River Deveron AGLV

8.3 The Development is located approximately 4km to the north east of the River Deveron AGLV at its nearest point. The ZTV indicates widespread visibility from approximately half of this landscape designation, generally from the eastern facing slopes of the valley. However, two areas of woodland (Woodfold Wood and around Gallow Hill) are anticipated to reduce actual visibility. Furthermore, visibility from the River Deveron and immediate surrounding floodplain is limited.

8.4 Predicted impacts: Impacts are limited to views of the Development and none of the special qualities of the AGLV would be directly affected. Key views are medium to short scale, focused up/ down the river valley and are not orientated towards the Site from this area. However, longer distance views are often obtainable from the more elevated valley sides and the Development would be visible from these locations.

8.5 The viewpoint assessment has included one viewpoint (Viewpoint 9) from within this AGLV for which a magnitude of change of Small is anticipated as a result of the Development.

8.6 As indentified in Viewpoint 9, views from within the River Deveron AGLV typically do not include views of any operational wind farms. However, views from the open high ground of wind farms including the Strath of Brydock, Boyndie, Cairnhill and Gairnieston in the more immediate study area are not

uncommon. Therefore, the Development would form an apparent, small new landscape element resulting in a minor alteration to the relationship of the key landscape characteristics.

8.7 Magnitude of change: Small

8.8 Assessed sensitivity: Woodland coverage within the valley is extensive, which is anticipated to reduce visibility; however due to the settled nature of the landscape (medium to small scale) and good accessibility, the assessed sensitivity is High.

8.9 Significance: Moderate (not significant)

Craigston Castle HGDL

8.10 The Development is located approximately 11km to the west of this HGDL. The ZTV indicates extensive potential visibility from within this HGDL. However, widespread mature broadleaf woodland within, and around the boundary of this designation, is anticipated to screen the majority of views towards the Site. This is with the notable exception of an area of open agricultural land located to the north of this HGDL.

8.11 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this designation would be directly affected. Key views looking down the main vista from the castle entrance are orientated towards the Site. However, mature broadleaf woodland screen views towards the Development so this view would remain unaltered. The viewpoint assessment included no viewpoints from within this designation so an indicative wireline from the open field to the north has been generated (Figure A20 - 376480, 855510 see Appendix 8.2) and for which a magnitude of change of Small is anticipated.

8.12 Furthermore, and in views from this open area, the operational single turbine scheme at Garnieston Farm (within 1km to the east) is a dominant feature in closer distance views. Therefore, and limited to the open area of farmland to the north of this designation, the Development would result in the introduction of an apparent, small new landscape element. However, this would be seen within medium scale views within the context of a managed rural landscape where other wind farm developments are already a feature. Furthermore, key views from the castle would remain unaltered.

8.13 Magnitude of change: Small

8.14 Assessed sensitivity: High as this designed landscape is open to the public and set within mature broadleaf woodland which creates an intimate landscape character.

8.15 Significance: Moderate (not significant) where views are obtainable from the open farmland to the north of the site (and outwith the core of the designed landscape).

8.16 The Development is located approximately 17km to the north west of this HGDL. The ZTV indicates limited potential visibility from the elevated western facing slopes along the eastern boundary of this designed landscape and to the north of Home Farm. Woodland is anticipated to greatly reduce actual visibility from within this landscape designation.

8.17 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this designation would be directly affected. Key views looking down the main vista from the castle entrance are orientated to the south and away from the Site so would remain unaltered. No viewpoints have been included in the viewpoint assessment from this area; however an indicative wireline from the open hill to the east of Old Home Farm (Figure A21 - 376880, 839400 see Appendix 8.2) has been produced to represent a typical view of the Development when obtainable.

8.18 From this viewpoint a magnitude of change of Small is predicted. Views of existing wind farms are generally not obtainable from this area; however the tips of the operational Strath of Brydock are apparent from the open higher ground. The Development would result in the introduction of an apparent, small new landscape element resulting in a minor alteration in open, long to medium scale views, over a rural managed landscape (albeit from a very limited area within this designed landscape). Furthermore, key views from the castle would remain unaltered.

8.19 Magnitude of change: Small

8.20 Assessed sensitivity: High as this designed landscape is open to the public and scenic views of undulating parkland, artificial lochs and mixed woodland surrounded by undulating farmland are obtainable.

8.21 Significance: Moderate (not significant) where limited views are obtainable from the open, elevated land to the east of this designed landscape.

Landscape Impacts - Landscape Character Areas

8.22 The following section sets out the detailed assessment on non-host LCA where significant landscape impacts have not been identified.

Area 1: Cliffs of the North Coasts

8.23 The Development is located approximately 8km to the south of this LCA. The ZTV indicates patchy visibility from within this LCA, generally from the southern facing sloping ground from less than half of this landscape. Tree cover is limited and this area is highly developed including the settlements of Portsoy, Whitehills and Banff. However, principal views are generally orientated out to sea, and views from within the main settlements towards the Site are limited.

8.24 Receptors are limited to scattered farmsteads/ properties and users of the road network which includes a National Cycle Route passing through this area. Typical views orientated inland are medium to long distance and characterised by rolling farmland; however numerous man made features such as roads, electricity infrastructure and housing create a well developed character.

8.25 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly affected. Key views are generally orientated out to sea and would remain unaltered. Viewpoint 1 is located within this LCA and Viewpoint 5 is on the southern edge, and typical of inward looking (non key) views. A magnitude of change no greater than Small is anticipated from these viewpoints.

8.26 There are no operational wind farms located within this landscape; however views of the operational Boyndie and the Strath of Brydock are common within the more immediate context. The Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of the key landscape characteristics.

8.27 Magnitude of change: Small when you consider extent of visibility and representative viewpoint assessment.

8.28 Assessed sensitivity: High due to the frequent settlements and scenic nature of the narrow rocky coastline.

8.29 Significance: Moderate (not significant)

Area 4: Coastal Farmland - East of Macduff

8.30 The Development is located approximately 8km to the south west of this LCA. The ZTV indicates widespread visibility from across this LCA with some pockets of visual screening in the depression in landform around the Burn of Myrehouse, Bog of Minnonie and to the north of the higher ground around Cairns of Melrose. Woodland coverage is sparse, and this is a bleak open landscape with receptors limited to scattered farmsteads and road users who experience long distance views over a broad sweeping agricultural landscape.

8.31 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly affected. Key views are generally open and long distance orientated out to sea and in the opposite direction from the Development. No viewpoints have been included in the viewpoint assessment from this area, however an indicative wireline from Whitehills (Figure A22 - 372940, 862320 see Appendix 8.2) represents typical (non key) views from this landscape and for which a magnitude of change of Small is predicted.

8.32 There are no operational wind farms within the LCA; however in views orientated south and west the operational Strath of Brydock and Boyndie are a common feature in the more immediate landscape context. Therefore, the Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics.

8.33 Magnitude of change: Small when you consider the representative viewpoint assessment, orientation of key views and nature of views where wind turbines are not uncommon.

8.34 Assessed sensitivity: Medium as this LCA is an open, simple landscape with which lacks strong definition and has relatively low population.

8.35 Significance: Minor (not significant)

Area 8: Agricultural Heartlands – Knock Hill and Aberchirder

8.36 The Site is located within this LCA; however the nearest turbine is outwith this area approximately 1km to the north. The ZTV indicates widespread visibility throughout this LCA with some pockets of visual screening along the shallow valley of the Burn of Boyndie and on some southern facing slopes to the south of this LCA.

8.37 Frequent fringes of shelterbelts, clumps of mature deciduous trees and blocks of plantation woodland are anticipated to reduce actual visibility. The area is reasonably well populated (including the settlement of Aberchirder) and two major A-roads and a network of minor roads link settlements and scattered farmsteads. Residential receptors and road users experience medium to small scale views, often enclosed by surrounding landform, over undulating managed farmland with frequent areas of woodland. There is generally no focused viewing orientation for key views across this LCA.

8.38 Predicted impacts: As the Development is located within this LCA direct impacts would include the loss of a small amount of grassland, mostly associated with the access track, which is discussed further impacts on Landscape Fabric.

8.39 Within the wider landscape impacts are limited to views of the Development. Views are short to medium scale, enclosed in nature and generally with the tips of the Development seen in views on the horizon. No viewpoints have been included from this area however, an indicative wireline from the B9025 (Figure A19 - 363770, 852990 see Appendix 8.2) represents close distance views and

views from the northern edge of the settlement of Aberchirder. From this viewpoint a magnitude of change of Very Small is anticipated as only the tip of one turbine is visible. From here the Development is located behind Blacklaw Hill in views from this landscape.

8.40 Viewpoint 9 is located just beyond the southern edge of this LCA and thus represents typical views from the more settled valleys within the wider area of this landscape. A magnitude of change of Small is anticipated from this viewpoint. There are no operational wind farms within the LCA and limited views of them from the more settled valley floors. However, from the higher ground where greater visibility of the Development is anticipated views of operational wind farms including the Strath of Brydock, Boyndie, Cairnhill and Gairnieston Farm within the more immediate landscape, are more common.

8.41 Magnitude of change: Very Small in close proximity views but increasing to Medium to Small in longer distance views from the settled valley and higher ground. On balance, when considering the spread of visibility, nature of key views and that wind farms are not an uncommon feature from the higher ground (where greater visibility of the Development is obtainable) a magnitude of change of Small is anticipated.

8.42 Assessed sensitivity: Medium as this area is well settled and the nature of views are often short scale, intimate and quite enclosed from the valley floor. However, from the higher ground to the west this landscape is less settled and large to medium scale views which include operational wind farms are not uncommon.

8.43 Significance: Minor (not significant)

Area 9: Agricultural Heartlands – Upland Ridges South of the Deveron

8.44 The Development is located approximately 6km to the north west of this LCA. This character area is split into two within Banff and Buchan and also spreads into South and Central Aberdeenshire. The ZTV indicates patchy visibility throughout these areas, generally from the northern facing slopes and covering less than half of the LCAs.

8.45 Woodland coverage from areas with potential visibility is sparse within Banff and Buchan; however larger blocks of plantation woodland are more common within the Agricultural Heartlands in South and Central Aberdeenshire. Receptors are generally limited to infrequent farmsteads and views from minor roads. Views tend to be medium scale looking over the surrounding undulating farmland with longer distance views from the elevated, open hillsides.

8.46 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly affected. In medium scale views from the lower ground the Development would be seen at a distance on the horizon and partially screened by landform. From more elevated viewing positions more of the Development would be apparent; however views of other operational wind farms in the area are also available.

8.47 No viewpoints have been included in the viewpoint assessment from this area. A representative wireline from Westfield (Figure A23 - 364810, 844830 shown in Appendix 8.2) indicates a magnitude of change of Small is predicted from within this LCA (as a worst case scenario from the northern edge).

8.48 Operational wind farms within this LCA include Dummuie and Glens of Foudland (refer to Figure 8.23) and in views orientated north the Strath of Brydock is often apparent. Therefore, the Development would from an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics.

8.49 Magnitude of change: Small when you consider extent of visibility and representative viewpoint assessment. However, this would reduce with distance.

8.50 Assessed sensitivity: Medium due to the low density of visual receptors and nature of views where operational wind farms are already a common feature from more elevated land.

8.51 Significance: Minor (not significant) and reducing with distance.

Area 10: Agricultural Heartlands of Banff and Buchan

8.52 The Development is located approximately 6km to the west of this LCA. The ZTV indicates widespread visibility from the western half of this LCA with a large areas of visual screening around the Burn of Monquhitter Valley and smaller pockets in the depressions and eastern facing slopes.

8.53 Woodland coverage from areas with potential visibility is limited to small, localised clumps with occasional larger areas of plantation. Receptors are typically scattered farmsteads and road users (minor road network and the A947 passes along the western edge of this LCA). Open, medium to long distance views over the gently rolling agricultural landscape are typical.

8.54 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly affected. In medium scale views from the lower ground the Development would be seen at a distance on the horizon and partially screened by landform. From more elevated viewing positions more of the scheme would be apparent; however views of other operational wind farms in the area are also available.

8.55 Viewpoint 13 is located within this LCA and typical of views from the western half of this LCA where there is the most widespread visibility. A magnitude of change of Small is anticipated from this viewpoint; however this is anticipated to rise to Medium within closer proximity views.

8.56 Operational wind farms within this LCA include Gairnieston and Carinhill and in views orientated to the west Boyndie and Strath of Brydock are a common feature within the more immediate landscape context. Generally the Development would form an apparent, small new landscape element, resulting in a minor alteration to the key landscape characteristics.

8.57 Magnitude of change: Small when you consider extent of visibility and representative viewpoint assessment.

8.58 Assessed sensitivity: Medium due to the low density of visual receptors, medium scale, simplicity of the landscape and nature of views where operational wind farms are already a common feature.

8.59 Significance: Minor (not significant) and reducing with distance

Coastal Lowlands

8.60 The Development is located approximately 11km to the south east of this LCA. The ZTV indicates limited visibility from within this LCA along the western edge and from an area to the south of Portknockie. There are extensive bands of plantation woodland within the areas with potential visibility so actual visibility is anticipated to be extremely limited. Where actual visibility is anticipated, from the higher open ground, medium to long scale views characterised by rolling farmland and plantation woodland are typical.

8.61 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly impacted. Key views are generally orientated out to sea and would remain unaltered. No viewpoints have been included in the viewpoint assessment from this area. A representative wireline from Cultain (Figure A24 - 353120, 861960 shown in Appendix 8.2) indicates a magnitude of change of Small is predicted from within this LCA.

8.62 There are no operational wind farms within this LCA; however in views orientated south east the Strath of Brydock is often apparent from elevated open slopes. From the limited areas with predicted actual visibility the Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics.

8.63 Magnitude of change: Small when you consider the limited extent of visibility, representative viewpoint assessment and unaltered nature of key views.

8.64 Assessed sensitivity: Medium due to the medium to large scale, extensive tracts of coniferous plantation and nature of skylines where operational wind farms are already apparent.

8.65 Significance: Minor (not significant)

Straths and Valleys

8.66 The Development is located approximately 10km to the north east of this LCA. The ZTV indicates limited visibility from within this LCA from the area to the east of the A97, from the open elevated around 15km away from the Development. Where potential visibility is anticipated from the higher valley sides, medium to long scale views characterised by rolling farmland and plantation woodland are typical.

8.67 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly impacted. Key views are generally short distance, enclosed views from the valley floors which would remain unaltered. However, from the more elevated valley sides medium to long distance views of the tips of the Development are typical.

8.68 No viewpoints have been included in the viewpoint assessment from this area. A representative wireline from Waterton (Figure A25 - 356150, 839900 shown in Appendix 8.2) indicates a magnitude of change of Very Small is predicted from within this LCA as a worst case scenario.

8.69 There are no operational wind farms within this LCA and views of wind farms are not typical, especially from the more enclosed and more populated valley floor. From the limited areas with predicted visibility the Development would introduce an inconspicuous new landscape element resulting in a very minor alteration to the balance of key landscape characteristics.

8.70 Magnitude of change: Very Small when you consider the limited extent of visibility and representative viewpoint assessment.

8.71 Assessed sensitivity: High due to the settled nature, distinct topography, and enclosed nature of views from the valley floor where operational wind farms are generally not apparent.

8.72 Significance: Minor (not significant)

Farmed Moorland Edge

8.73 The Development is located approximately 14km to the north east of this LCA. The ZTV indicates a fragmented pattern of visibility from less than half of this LCA. Furthermore, extensive areas of plantation woodland are anticipated to reduce actual visibility.

8.74 Elevated, long to medium scale views over rolling farmland and woodland are typical for the scattered residential receptors, recreational walkers using forest tracks and minor road users in this area.

8.75 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly impacted. Key views are generally long to medium scale with the tips of the Development seen on the horizon.

8.76 No viewpoints have been included in the viewpoint assessment from this area; however Viewpoint 11, just to the north of this LCA represents a typical view and for which a magnitude of change of Very Small is anticipated. There are no operational wind farms within this LCA; however views of Strath of Brydock, Dummuie and Glens of Foudland (refer to Figure 8.23) are sometimes obtainable depending on the vantage point location and viewing direction.

8.77 Therefore, the Development would form an inconspicuous new landscape element, resulting in a minor alteration to the balance of the key landscape characteristics.

8.78 Magnitude of change: Very Small when you consider the representative viewpoint assessment, spread of visibility and nature of change in key views.

8.79 Assessed sensitivity: Medium due to large to medium scale, limited receptors and nature of views where operational wind farms are often apparent.

8.80 Significance: Minor/Negligible (not significant)

Uplands

8.81 This is a large LCA which stretches west outwith the study area; however at its closest point the Development is within 5km to the south west. The ZTV indicates fragmented potential visibility across the extent of this landscape covering less than a quarter. Furthermore, there is widespread plantation woodland which is anticipated to reduce actual visibility.

8.82 Elevated large-scale views over semi improved pasture, moorland, rolling farmland and plantation woodland are typical for upland recreational receptors. Receptors are generally scattered farmsteads and minor road users on the lower valley slopes.

8.83 Predicted impacts: Impacts are limited to distant views of the Development and none of the key characteristics of this landscape would be directly impacted. Key views are generally long distance and panoramic with the Development seen back clothed by the landform behind.

8.84 Viewpoint 9, 10 and 11 are located within this LCA. For typical views experienced by upland recreational receptors (Viewpoint 10 and 11) a magnitude of change no greater than Small is anticipated. From the minor road network on the lower ground to the east of this area (Viewpoint 9) a predicted magnitude of change of Small is also anticipated.

8.85 The operational Balnamoon Farm (refer to Figure 8.23) is located within this LCA and due to the upland exposed nature views of other wind farms including Strath of Brydock, Boyndie, Dummuie and Glens of Foudland are a common feature from open, elevated vantage points.

8.86 Generally, the Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics.

8.87 Magnitude of change: Small when you consider the representative viewpoint assessment and limited potential visibility across the whole of this LCA.

8.88 Assessed sensitivity: Medium due to the large scale, limited receptors, extent of woodland coverage and nature of views where operational wind farms are often apparent.

8.89 Significance: Minor (not significant)

Cumulative Landscape Impacts - Landscape Designations

8.90 The following section sets out the detailed cumulative assessment on Landscape Designations where significant landscape impacts have not been identified.

River Deveron AGLV

8.91 Viewpoint 9 has been presented as an indicative cumulative viewpoint within the River Deveron AGLV (refer to Figure A9 - Appendix 8.2). The Development is located approximately 4 km to the north east of the River Deveron AGLV at its nearest point.

8.92 The Development ZTV indicates widespread visibility from approximately half of this AGLV, generally from the eastern facing slopes of the valley. Visibility from the lower lying River Deveron and immediate surrounding floodplain is limited. As determined in the landscape assessment, the assessed sensitivity of the AGLV is High.

8.93 As identified in the indicative cumulative viewpoint presented for this designation, views from within the River Deveron AGLV typically do not include views of operational wind farms.

8.94 Scenario 1

8.95 The cumulative ZTV indicate widespread overlap with the following key wind farms: Mains of Auchinderran (5km north) and Shieldburn Farm (9km south east).

8.96 In views orientated north east, Mains of Auchinderran appears in combined views to the left of the Development. The two schemes appear at equal heights from Viewpoint 9, with sufficient spacing between the two so that they retain clear visual separation. Furthermore, the turbine size of both schemes looks similar at this distance.

8.97 Shieldburn Farm would also be apparent in successive views with other Scenario 1 wind farms from the more elevated valley sides. With the area being generally well wooded, actual visibility is likely to be reduced, but when visible the Development would typically form an apparent small landscape element within the view.

8.98 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.

8.99 Cumulative Significance (Scenario 1): Minor (not significant)

8.100 Scenario 2

8.101 The cumulative ZTV indicate widespread overlap with the following key wind farms: Feithhill Farm (8km south east) and Newton of Culvie (5km north west).

8.102 In views orientated north east from the valley floor views of other Scenario 2 wind farms are limited (refer to Figure A9 in Appendix 8.2). From the higher ground on the valley sides a number of Scenario 2 wind farms would be visible in combined views with the Development with Feithill Farm and Newton of Culvie in successive views within the more immediate landscape context. Depending on the exact viewing location Cowie Hill appears directly behind the Development but this is only from very limited areas on the highest ground within this designation.

8.103 As with before there is typically clear visual separation between all the schemes and due to the viewing distance the magnitude of change as a result of the introduction of the Development reflects Scenario 1.

8.104 Cumulative Significance (Scenario 2): The addition of the proposed development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Craigston Castle HGDL

8.105 The viewpoint assessment included no viewpoints from within this designation so an indicative cumulative wireline from the open field to the north has been generated (Figure A20 - 376480, 855510 see Appendix 8.2) to inform the assessment.

8.106 The Development is located approximately 11 km to the west of the Craigston Castle HGDL at its nearest point. The Development ZTV indicates widespread potential visibility from within this designation. However, mature broadleaf woodland within and around the boundary of this designation is anticipated to screen the majority of views towards the Development. As determined in the landscape assessment, the assessed sensitivity of the HGDL is High.

8.107 The Development would not constitute an unfamiliar element in views from this designated landscape as the operational Gairnieston Farm is already a recognisable feature in the landscape.

8.108 <u>Scenario 1</u>

8.109 The cumulative ZTV indicates widespread overlap with the following key wind farms: Cairnhill (2.5km south west), Gairnieston (1km west) and Shieldburn Farm (11km south west).

8.110 In views orientated west from an area of open agricultural land, Gairniston Farm appears to the right of the Development, as an prominent feature in the landscape in closer proximity combined views. Woodland screening in the area is predicted to screen successive views of other wind farms so the cumulative assessment reflects the landscape assessment for which a Small magnitude of change was predicted.

8.111 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.

8.112 Cumulative Significance (Scenario 1): Minor (not significant)

8.113 Scenario 2

8.114 The cumulative ZTV indicate widespread overlap with the following key wind farms: Ashogle Farm (5km south west), Backhill of Yonderton (1km west), Cowie Hill (10km west), Little Hilton Farm (3km south west) and Little Whiterashes Farm (3km south west).

8.115 In Scenario 2, and in views orientated west the wind farms listed above are visible in combined views with the Development. Successive views of further Scenario 2 wind farms are generally limited by localised woodland cover. The Development continues to be seen at distance from a very limited area within the context of this designation. The Development forms a small landscape element, with clear separation between it and other wind farms within the Scenario 2 baseline. Therefore, the magnitude of change as a result of the introduction of the Development reflects Scenario 1.

8.116 Cumulative Significance (Scenario 2): The addition of the proposed development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Fyvie Castle HGDL

8.117 The viewpoint assessment included no viewpoints from within this designation; an indicative wireline from the open hill to the east of Old Home Farm has been generated (Figure A21 - 376880, 839400 see Appendix 8.2) to help inform the assessment.

8.118 The Development is located approximately 17 km to the north west of the Fyvie Castle HGDL at its nearest point. The Development ZTV indicates limited potential visibility from the elevated western facing slopes along the eastern boundary of this designation. Woodland is anticipated to greatly reduce actual visibility from within this landscape designation. As determined in the landscape assessment, the assessed sensitivity of the HGDL is High.

8.119 The Development would not constitute an unfamiliar element in views from this designated landscape as long distance views of the Strath of Brydock are available from the open high ground.

8.120 Scenario 1

8.121 The cumulative ZTV indicates widespread overlap with the following key wind farms: Strath of Brydock (24km north west), Mains of Hatton (8km north west) and Shieldburn Farm (10km north west).

8.122 From the higher ground in views orientated north west, Strath of Brydock, Mains of Hatton and Shieldburn Farm appears in combined views with the Development. The Development is seen between Shieldburn Farm and the Strath of Brydock at distance, and with clear separation between.

8.123 Where clear views are obtainable the Development would form an apparent, small new landscape element. However, woodland surrounding Fyvie Castle is widespread and would greatly reduce actual visibility from within this designation.

8.124 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

8.125 Cumulative Significance (Scenario 1): Minor (not significant)

8.126 Scenario 2

8.127 The cumulative ZTV indicates widespread overlap with the following key wind farms: Cowie Hill (20km north west), Feithhill Farm (10km west), Towie Barclay Works (7km north west) and Upper Pitglassie (7km west).

8.128 From the higher ground in views orientated north west Cowie Hill and Towie Barclay Works are visible in combined views with the Development in the long distance. Feithill Farm and Upper Pitglassie are also visible in successive views to the left within the more immediate landscape context. Clear separation between the Development and all schemes within the Scenario 2 baseline is apparent from the limited areas where open views are obtainable. Therefore, the magnitude of change as a result of the introduction of the Development reflects Scenario 1.

8.129 Cumulative Significance (Scenario 2): The addition of the proposed development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Cumulative Landscape Impacts - Landscape Character Areas

8.130 The following section sets out the detailed cumulative assessment on LCA where significant landscape impacts have not been identified.

Area 1:Cliffs of the North Coasts

8.131 Indicative cumulative wirelines from Viewpoints 1 and 5 have been presented in Appendix 8.2 (refer to Figure A1 and A5). Viewpoint 1 is located within the LCA and viewpoint 5 is located on the southern edge and is representative of inward looking views.

8.132 The Development is located approximately 8 km to the south of this LCA and the ZTV indicates fragmented visibility from within this landscape, generally from the southern facing sloping ground from less than half of this area. As determined in the landscape assessment, the assessed sensitivity of this LCA is High.

8.133 Tree cover throughout this LCA is limited and key views tend to be oriented in the opposite direction from Site out to sea. The area is extensively developed including the settlements of Portsoy, Whitehills and Banff; however views from within the main settlements towards the Development are restricted. Where views are available, such as from the southern facing sloping ground of this LCA, the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.134 Scenario 1

8.135 The cumulative ZTV indicates widespread overlap with the following key wind farms: Boyndie (1 km south), Strath of Brydock (3.5 km south), Mains of Auchinderran (9km south) and Muirake (7km south).

8.136 Predicted Impacts: For Scenario 1 and from open, elevated viewing positions generally on the southern facing slopes and looking south, the Development is typically seen in combined views with Boyndie, Strath of Brydock and Mains of Auchinderran depending on the viewing location. Wider successive views of other wind farms within the study area including Muirake are also available from the higher ground within this LCA.

8.137 The Development is seen at distance, behind the Strath of Brydock and Boyndie and depending on the location of the view, the turbines can at times appear to extend the horizontal angle occupied by turbines on the horizon in relation to the Strath of Brydock. However, as the Boyndie and the Strath of Brydock are the key wind farms visible from this area (and have been considered in the landscape baseline) the cumulative magnitude of change reflects that identified in the landscape assessment.

8.138 Magnitude of Cumulative Change (Scenario 1): The addition of the proposed development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.139 Cumulative significance (Scenario 1): Minor (not significant)

8.140 Scenario 2

8.141 The cumulative ZTV indicates widespread overlap with the following key wind farms: Backhill of Culbirnie (3km south), Cowie Hill (7km south), Culbirnie Parks (4km south), Little Blairshinnoch (3km south), Lodge Hill (5km south) and South Colleonard (1km south)

8.142 Predicted Impacts: In views orientated south the wind farms listed above are typically visible in combined views with the Development. Further Scenario 2 wind farms are visible in successive views/ combined views depending on the exact viewing location within this elongated LCA. Despite the high number of wind farms the Development is seen at distance and does not cause turbines to encroach further within the view so the magnitude of change as a result of the introduction of the Development reflects Scenario 1.

8.143 Cumulative Significance (Scenario 2): The addition of the proposed development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Area 4: Coastal Farmland – East of Macduff

8.144 The viewpoint assessment included no viewpoints from within this designation; however an indicative cumulative wireline from Whitehills has been generated (Figure A22 - 372940, 862320 see Appendix 8.2) to inform the assessment. The Development is located approximately 8 km to the south west of this LCA and the ZTV indicates widespread visibility from across the LCA, with some pockets of visual screening. Woodland coverage is sparse, and this is generally an open landscape with few receptors. As determined in the landscape assessment, the assessed sensitivity of this LCA is Medium.

8.145 Tree cover throughout this LCA is limited resulting in an open landscape, with views generally experienced by receptors in the scattered farmsteads that occupy the landscape and road users. Where views are available, they tend to be long distance and sweeping, and although there are no wind farms within the LCA, in views orientated to the south and west, the operational Strath of Brydock and Boyndie are a common feature. Therefore, the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.146 Scenario 1

8.147 The cumulative ZTV indicates widespread overlap with the following key wind farms: Boyndie (7.5 km west), Cairnhill (5km south), Gairnieston (2.5km south), Strath of Brydock (5km west), Castle of Auchry (7km south), Mains of Hatton 17km south west), Muirake (15km west), Myreton (21km west) and Shieldburn Farm (15km south west)

8.148 Predicted Impacts: From open, elevated viewing positions generally available throughout the LCA and looking south and west, wind farms appear well

dispersed throughout the landscape. The indicative cumulative wireline from this area indicative that combined views including Mains of Auchinderran, Boyndie, Muirake, Myreton and Strath of Brydock are available.

8.149 The Development typically appears to the left of Mains of Auchinderran with clear separation between the schemes forming an apparent small new landscape element.

8.150 Magnitude of Cumulative Change (Scenario 1): The addition of the proposed development to a future baseline comprising operational and consented wind farms is assessed as being Small.

8.151 Cumulative Significance (Scenario 1): Minor (not significant)

8.152 Scenario 2

8.153 The following wind farms in planning are within this landscape: Dounepark Farm, Easter Jackson, Hill of Fisherie and Whitestones. Views of further Scenario 2 wind farms, located outwith this landscape, are also obtainable (refer to Viewpoint 13 – Figure 8.29a to 8.29c)

8.154 Predicted Impacts: In views orientated south and west the Development typically appears in long distance combined views with Cowie Hill, Newton of Culvie and further Scenario 2 wind farms. However, distant views of wind farms are already a feature of this landscape so effects on landscape character are more likely to be the result of wind farms located within this LCA. Furthermore, key views are orientated out to sea and in the opposite direction from Site. Therefore, the magnitude of change as a result of the introduction of the Development reflects Scenario 1.

8.155 Cumulative Significance (Scenario 2): The addition of the proposed development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Area 8: Agricultural Heartlands – Knock Hill and Aberchirder

8.156 An indicative cumulative wireline from Viewpoint 9, located just beyond the southern edge of the LCA, has been presented in Appendix 8.2 (refer to Figure A9). The Site is located within this LCA; however the nearest turbine is outwith this area approximately 1 km to the north. The ZTV indicates widespread visibility throughout the LCA with some pockets of visual screening along the shallow valley of the Burn of Boyndie and on some southern facing slopes to the south of the LCA. As determined in the landscape assessment, the assessed sensitivity of this LCA is Medium.

8.157 Although the ZTV indicates widespread visibility throughout the LCA, frequent fringes of shelterbelts, clumps of mature deciduous trees and blocks of plantation woodland are anticipated to reduce actual visibility, resulting in limited visibility of surrounding wind farms. However, from higher ground where greater visibility is anticipated, the Development would not constitute an unfamiliar

element in views from this landscape as existing wind turbines are already a recognisable feature.

8.158 Scenario 1

8.159 The cumulative ZTV indicates widespread overlap with the following key wind farms: Mains of Auchinderran (northern edge of LCA), Mains of Hatton (9 km south east) and Shieldburn Farm (5km south).

8.160 Predicted Impacts: In views orientated north combined views of the Development and Auchinderran are anticipated with clear and distinct visual separation between the schemes. Both schemes relate well to each other in terms of turbine elevation and with the turbine sizes looking similar at the viewing distance. In closer proximity views the Development becomes increasingly screened by Black Law Hill with Main of Auchinderran moving into successive views to the left (when localised development and vegetation allow open views).

8.161 From more open, elevated viewing positions to west of this LCA other Scenario 1 wind farms would be visible. The Development is typically seen behind the Mains of Auchinderran (which is within the more immediate landscape context) with the layout, turbine number and size relating well to each other.

8.162 Magnitude of Cumulative Change (Scenario 1): The addition of the proposed development to a future baseline comprising operational and consented wind farms is assessed as being no greater than Medium (from higher ground to west where more of the Development is visible). This would reduce in closer proximity views from the lower ground as the Development becomes increasingly screened by localised woodland / development and Black Law.

8.163 Cumulative Significance (Scenario 1): Moderate to Minor (not significant)

8.164 Scenario 2

8.165 Newton of Culvie is located within this LCA and the cumulative ZTV indicate widespread overlap with the following key wind farms: Feithhill Farm (6km south east) and Upper Pitglassie (7.5km south east).

8.166 Predicted Impacts: ZTV overlap with other Scenario 2 wind farms is limited from within this LCA and most typically occurs from the higher ground to the west of this landscape (where views of the Development are longer distance and wind farms are already a common feature). The Scenario 2 wind farms with widespread overlap identified above generally appear in successive views with the Development.

8.167 From the higher ground to the west, and depending on the exact viewing location, Newton of Culvie forms a prominent scheme with the Development seen in the longer distance behind Mains of Auchinderran with further Scenario 2 wind farms beyond. However, a magnitude of change no greater than Medium is anticipated from this LCA with regards to the introduction of the Development. This is due to the increased viewing distance (where Newton

Culvie become a prominent scheme in combined views) and that the Development does not cause turbines to encroach further with the view. Furthermore, there is no focused viewing orientation for key views from this landscape.

8.168 Therefore the Scenario 2 assessment reflects Scenario 1 - Moderate to Minor (not significant).

Area 9: Agricultural Heartlands – Upland Ridges South of the Deveron

8.169 The Development is located approximately 6 km to the north west of this LCA. This character area is split into two within Banff and Buchan and also spreads into south and central Aberdeenshire. The Development ZTV indicates a fragmented pattern of visibility throughout these areas, generally from the north facing slopes and covering less than half of the LCA.

8.170 This landscape is similar in character to Area 8 assessed above and due to the increased viewing distance and less widespread visibility no significant cumulative landscape impacts are anticipated on this LCA. Typically the Development would be visible from limited areas in long distance (non key) views where wind farms are already a common feature, forming a small landscape element.

8.171 Area 10: Agricultural Heartlands of Banff and Buchan

8.172 Viewpoint 13, located within this LCA, is presented as the cumulative wireline (refer to Figure 8.29a to 8.29c) and represents typical views from the western half of this LCA. The ZTV indicates widespread visibility from the western half of this LCA with a large area of visual screening around the Burn of Monquhitter Valley and smaller pockets in depressions and eastern facing slopes. As determined in the landscape assessment, the assessed sensitivity of this LCA is Medium.

8.173 Operational wind farms within this LCA include Cairnhill and Gairnieston Farm and in views to the west Boyndie and Strath of Brydock are often apparent. Therefore, the Development would not appear as an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.174 <u>Scenario 1</u>

8.175 The cumulative ZTV indicates widespread overlap with the following key wind farms: Boyndie (8km north east), Cairnhill (within LCA), Gairnieston Farm (within LCA), Strath of Brydock (4km west), Castle of Auchry (within LCA), Mains of Hatton (6km south west) and Shieldburn Farm (6km west).

8.176 Predicted Impacts: From open, elevated viewing positions looking west, Mains of Auchinderran (tips only), Gairnieston Farm, Myreton, Muriake, Strath of Brydock and Boyndie would be available in combined views. Depending on the viewing angle the Development and Mains of Auchinderran would at times appear to combine with each other. However, as the majority of Mains of

Auchinderran is screened by the landform and both schemes are seen at a distance this is not considered to result in significant cumulative impacts.

8.177 Magnitude of Cumulative Change (Scenario 1): The addition of the proposed development to a future baseline comprising operational and consented wind farms is assessed as being Small.

8.178 Cumulative Significance (Scenario 1): Minor (not significant)

8.179 Scenario 2

8.180 The following wind farms in planning are within this landscape: Balchers Wood, Backhill of Yonderton, Cairnhill Farm Extension, Haremoss, Holm and Hollymill, Little Hilton Farm, Little Whiterashes Farm, Milton of Fisherie, Newton of Foulzie and Wester Blakeshouse. Further Scenario 2 wind farms located outwith this LCA are also visible in longer distance views (refer to Figure 8.29a to 8.29b).

8.181 Predicted Impacts: In views orientated west the Development is typically apparent in long distance views with numerous Scenario 2 wind farms as shown in Figure 8.29b. Due to the high number of wind farms within this landscape it is those which are anticipated to result in significant impacts on landscape character and not a scheme visible in long distance views where wind farms are already a common feature. Therefore, the magnitude of change, as a result of the introduction of the Development reflects Scenario 1.

8.182 Cumulative Significance (Scenario 2): The addition of the proposed development to a future baseline comprising all Scenario 1 and proposed wind farms reflects the Scenario 1 assessment.

Coastal Lowlands

8.183 The Development is located approximately 11 km to the south east of this LCA. The ZTV indicates limited visibility from within this LCA along the south western edge and from an area to the south of Portknockie. Given the limited potential visibility of the Development; limited associated potential for cumulative ZTV overlap; and focus of key views (out to sea and in opposite direction from the Site) the cumulative assessment is predicted to reflect the landscape assessment where significant impacts have not been identified.

Straths and Valleys

8.184 The Development is located approximately 10km to the north east of this LCA. The ZTV indicates very limited visibility from within this LCA from the area to the east of the A97. Given the very limited potential visibility of the Development and limited associated potential for cumulative ZTV overlap the cumulative assessment is predicted to reflect the landscape assessment where significant impacts have not been identified.

Farmed Moorland Edge

8.185 The Development is located approximately 14 km to the north east of this LCA. The ZTV indicates a fragmented pattern of visibility from less than half of this

area. Widespread ZTV overlap with all Scenario 1 wind farms is generally not obtainable. Widespread overlap with Scenario 2 wind farms is limited to Mid Plough, Newton of Culvie and Rivestone. From the limited areas with visibility, typically from the higher ground where views of wind farms are already a common feature, the Development would form a minor element within the view. Therefore significant cumulative impacts are predicted to reflect the landscape assessment where significant impacts have not been identified.

Uplands

8.186 This is a large LCA which stretches west outwith the study area; however at its closest point the Development is within 5km to the south west. The ZTV indicates fragmented, very limited potential visibility within the context of this whole LCA. Given the limited potential visibility of the Development; limited associated potential for cumulative ZTV overlap; and nature of this landscape where long distance views of wind farms are already a common feature the cumulative assessment is predicted to reflect the landscape assessment where significant impacts have not been identified.

Sequential Assessment

8.187 The following section sets out the detailed sequential and cumulative sequential assessment from the A98 and A947. The statistical analysis of the Development and various cumulative wind farm ZTV over these two routes and the A97 is included at the end of this section. The Development ZTV is shown in Figure 8.7a to 8.7d and Cumulative ZTV in Figures 8.25a to 8.25an.

A98 from Elgin to Fraserburgh

8.188 This route links Elgin in the west (and just outwith the study area) to Fraserburgh in the east. Approximately 57km of this road passes through the study area and is discussed below. At it's closest point the Development is located approximately 7km to the south of this route.

8.189 Between Elgin and just east of Cullen the road travels through the Coastal Lowlands LCA whilst briefly passing through the River Valleys LCA where the A98 crosses the River Spey. There are numerous areas of woodland (often large areas of plantation woodland) throughout this landscape which would screen views towards the Site. However, where open views are obtainable these tend to be long distance and looking over the flatter agricultural coastal landscape with hills rising in the distance.

8.190 To the east of Cullen the road enters The Coast LCA where again smaller blocks of plantation woodland limit open views towards the Site. Where views are obtainable these tend to be short distance as Dum Hill screens longer distance views towards the Site. The route then kinks inland entering the Coastal Farmland LCA where views tend to be open, medium to longer distance and the horizons formed by the undulating agricultural landscape in the medium distance.

8.191 Continuing east the road again enters The Coast LCA passing through the coastal towns of Banff and Macduff. Through this section of road views to Site are screened by localised development. East of Macduff the road again kinks inland away from the coast in a sweeping arc between Macduff and Fraserburgh. Views from the section of the road are typically medium to longer distance, looking inland over the undulating agricultural landscape.

8.192 Journey scenarios for both a westbound and eastbound journey have been explored for sequential and cumulative sequential impacts.

Journey Scenarios

8.193 For eastbound journeys starting east of Elgin the road passes through a long stretch of visual screening of approximately 32km. Within the section there is a brief area of potential visibility (1km in length) south of Portnockie; however this is within an area of plantation woodland so open views towards the Site would not be obtainable. Continuing east and on the western approach to Portsoy the road enters an area of potential visibility of approximately 1.5km; however development and woodland on the edge of the town would screen open views towards the Site.

8.194 East of Portnockie, and as the A98 kinks inland, prolonged and direct views towards the Site are obtainable from a stretch of road approximately 5km long, which equate to around 3 minutes. Viewpoints 12 and 4 are typical of views from this stretch of road where the Development is seen in direct and combined views with the Strath of Brydock with clear separation between the wind farms. A magnitude of change of no greater than Very Small is anticipated from this stretch of road as a result of the introduction of the Development.

8.195 Continuing east the road enters a patch of visual screening where it passes the Development to the south so the remainder of this route is considered in westbound journeys.

8.196 For westbound journeys, and as the A98 leaves the town of Fraserburgh, the route passes through a long stretch of visual screening approximately 21km in length. The road then kinks in a north west direction, as it heads back towards the coast, and enters a longer stretch of broken visibility (approximately 11km equating to a total time of visibility of just over 6 minutes). Viewpoint 13 is typical of views from this stretch of road where the Development is seen in oblique, combined views with the operational Gairniston Farm, Strath of Brydock and Boyndie. A magnitude of change of Small is anticipated from this area as the Development would form an apparent, small element within the view without affecting the overall quality.

8.197 Continuing west visibility of the Development around Banff and Macduff is very limited, and would be screened by localised development. To the west of Banff and for the remainder of westbound journeys between here and the junction of the A98 and A95 there are some short sections of intermittent visibility from the road. However, these are on the fringes of the Development ZTV and only the upper tips of the Development would be visible resulting in a Very Small to Negligible magnitude of change.

Summary of Impacts and Significance

8.198 For eastbound and westbound journeys, an approximate distance of 21km with potential visibility from the A98 is anticipated (equating to approximately 13 minutes or 37% of the road within the study area).

8.199 For eastbound journeys views are typically infrequent, prolonged and direct. For westbound journeys views are typically infrequent, prolonged and oblique. In both journey scenarios the Development is seen in combined views with other operational wind farms in the area, most notably Strath of Brydock.

8.200 A magnitude of change no greater than Small is anticipated from areas of this road where views are obtainable. When you consider this with the limited actual visibility of the proposed wind farm in the context of the whole route and widespread overlap with the Strath of Brydock a magnitude of change of Small is anticipated. As road users are considered to be of Medium sensitivity a sequential level of significance of no greater than Minor (not significant) is anticipated.

Cumulative Journey Scenarios

8.201 Scenario 1

8.202 For Scenario 1 the key wind farms with theoretical visibility from the A98 (distance/ direction – equating visibility in terms if length of route with visibility (km)/ journey time (mins)/ percentage of route(%)) are as follows:

- Boyndie (2km north – 30km/ 19mins/ 53%);
- Cairnhill Farm (4km south west – 14km/ 9 mins/ 25%);
- Gairnieston Farm (4km south west – 11km/ 7 mins/ 19%);
- Strath of Brydock (3km south – 23km/ 14 mins/ 41%);
- Mains of Auchinderran (7km south – 12km/ 7 mins/ 21%);
- Muirake (7km south – 16km/ 10 mins/ 29%); and
- Myreton (8km south – 11km/ 7 mins/ 20%).

8.203 In eastbound journeys for Scenario 1 to the west of this route views of wind farms are limited. Boyndie, which is located on the coast between Portsoy and Banff, is the wind farm which is most often visible from the A98 to the west of the study area.

8.204 Where the road enters the Development ZTV there is also widespread ZTV overlap with Mains of Auchinderran, Muirake and the Strath of Brydock. Intermittent views of other Scenario 1 wind farms are available from this route. The Development is typically seen in direct combined views between the Strath of Brydock and Mains of Auchinderran, with clear separation between, and forming an inconspicuous minor element within the view.

8.205 In westbound journeys for Scenario 1 views of other Scenario 1 wind farms are limited from the prolonged stretch of road outwith the Development ZTV. As the road enters the Development ZTV there is widespread overlap with all the key Scenario 1 wind farms indentified above and further Scenario 1 wind farms as shown on Figure 8.29a to 8.29c. As identified at Viewpoint 13 the Development is typically seen in intermittent, oblique, combined views with a number of Scenario 1 wind farms forming an apparent small element in the view.

8.206 Scenario 2

8.207 For Scenario 2 the key wind farms with theoretical visibility from the A98 (and equating visibility in terms of journey times/ distance and direction are as follows:

- Backhill of Culbirnie (2km south – 23km/ 14 mins/ 40%);
- Badentoul (3km south – 24km/ 15 mins/ 41%);
- Balchers Wood (3km south west – 12km/ 8 mins/ 21%);

- Cairnhill Farm Extension (4km south west – 14km/ 9 mins/ 25%);
- Cowie Hill (7km south – 17km/ 10 mins/ 29%);
- Culbirnie Parks (2km south east – 22km/ 14 mins/ 39%);
- Dounepark Farm (1km south west – 19km/ 12 mins/ 33%);
- Easter Jackson (1km north east – 22km/ 13 mins/ 38%);
- Hill of Fisherie (2km north – 34km/ 21 mins/ 59%);
- Ley Farm (2km south – 18km/ 11 mins/ 31%);
- Little Blairshinnoch (2km south west – 21km/ 13 mins/ 37%);
- Lodge Hill (2km south – 22km/ 13 mins/ 38%);
- Milton of Fisherie (1km south west – 13km/ 8 mins/ 23%);
- Newton of Foulzie (3km south west – 14km/ 9 mins/ 24%);
- South Colleonard (1km south – 23km/ 14 mins/ 40%) and
- Whitestones (1km south – 23km/ 14 mins/ 40%).

8.208 In eastbound journeys and from the long section of road with no visibility of the Development, Ley Farm and Badentoul introduce views of turbines to road users. Continuing east, as the road enters the stretch of visibility with prolonged and direct views towards the Site, the Development is visible in combined views with Backhill of Culbirnie, Culbirnie Parks, Little Blairshinnoch and Lodge Hill. There is clear separation between the Development and other wind farms and the closer proximity Scenario 2 wind farms are the most prominent from this section of the road (with the Development mostly screened behind landform).

8.209 In westbound journeys and from the long section of road with no visibility of the Development, Hill of Fisherie is the key wind farm which introduces views of turbines to road users. Continuing west, as the road enters the long stretch of broken visibility with prolonged, oblique views towards the Site, the Development is visible in combined views with numerous Scenario 1 and 2 wind farms (refer to Viewpoint 13). However, the closer proximity Scenario 2 wind farms are the most prominent from this section of the road. The Development continues to form an apparent, small landscape element and seen between numerous wind developments the change in view is less apparent.

Summary of Cumulative Impacts and Significance

8.210 Scenario 1

8.211 There are limited areas on this road where the Development introduces views of turbines outwith the areas where there are currently none. This is mainly due to widespread ZTV overlap with the Strath of Brydock. For westbound journeys Scenario 1 wind farms are typically visible in direct, infrequent, prolonged views

and for eastbound journeys in oblique, infrequent, prolonged views. For both the Development is seen at a distance and typically with clear separation between it and other wind farms in the landscape.

8.212 Scenario 2

8.213 As with Scenario 1 there are limited areas on this road where the Development introduces views of turbines outwith the areas where there are currently none. Furthermore, Badentoul, Ley Farm and Hill of Fisherie introduce views of turbines to the far east and west of the road. For westbound journeys Scenario 2 wind farms are typically visible in direct, infrequent, prolonged views and for eastbound journeys in oblique, infrequent, prolonged views. The Development continues to be seen at distance and given the high number of wind farms within the view (from the areas with visibility of the Development) the change in view is less apparent.

8.214 Therefore, the magnitude of change for Scenario 1 and Scenario 2 wind farms is anticipated to reflect the sequential magnitude of change and a sequential level of significance of no greater than Minor (not significant) is anticipated for this route.

A947 From Banff to Oldmeldrum

8.215 This route links Banff / Macduff in the north to Oldmeldrum in the south east. Approximately 47km of this road passes through the study area and is discussed below. At its closest point the Development is located approximately 7km to the west of this route.

8.216 Starting in the north of the study area the road quickly leaves the Coast LCA and enters the Coastal Farmland and Agricultural Heartland LCA. Views are typically medium distance over the surrounding, undulating farmland. To the south of Turriff the road enters the River Valleys LCA where views are more enclosed in nature and focused in a northern/ southern direction and typically do not include views of the Site from the road. Continuing south of Fyvie Castle the road again enters the Agricultural Heartlands LCA where longer distance views over the undulating farmland are available.

8.217 Journey scenarios for both northbound and southbound journeys have been explored for sequential and cumulative sequential impacts.

Journey Scenarios

8.218 For northbound journeys this road enters the study area to the south of Oldmeldrum. Passing through this settlement and continuing north the road is in an area of visual screening. As the route passes Greenspot it enters a stretch with intermittent visibility and direct views towards the Site. This stretch last for approximately 6km, which equates to just under 4 minutes (but there are patches of screening). The Development is approximately 22km away from this area of road so only a Very Small magnitude of change is anticipated (refer to Viewpoint 14). Operational wind farms including Cowhill, St. Johns Well and

Denhill are prominent in closer distance views to either side of the road from this section (refer to Figure 8.23).

8.219 Continuing north the road enters a longer stretch of visual screening between Fyvie and Turiff which lasts for 14km. There are limited, very short patches of visibility of the Development through this area but these would only offer brief glimpses.

8.220 Around and through Turiff and north of this town the road enters a further two sections with potential visibility for 4.5km and 2km. However, localised development in Turiff would screen views to the Site so only oblique views, from the north of Turiff from sections of road approximately 4km long (which equates to 2.5 minutes) are avaiable. Viewpoint 7 is typical of the type of views experienced through this section and for which a magnitude of change of Small is anticipated. The operational Strath of Brydock is also visible in combined views from this area.

8.221 The remainder of this route is now considered in southbound journeys.

8.222 For southbound journeys as this road leaves Banff/ Macduff the route is in an area of visual screening as Comfort Law screens views towards the Site. There are two brief flashes of visibility to the west of Comfort Law; however woodland on the edge of Banff would screen open views towards the site. Between Doun Park and King Edward the road then enters a prolonged stretch of visibility for approximately 6km (which equates to just under 4 minutes) with oblique, open views towards the Site. Viewpoint 6 is representative of the type of views through this section (albeit from slightly closer proximity) and for which a Medium magnitude of change is anticipated. Successive views of Boyndie, Strath of Brydock and Gairnieston are also anticipated from this section.

Summary of Impacts and Significance

8.223 For northbound and southbound journeys, an approximate distance of 19km with potentially visibility from the A947 is anticipated (equating to approximately 12 minutes or 40% of the road within the study area).

8.224 For northbound journeys views are typically infrequent, intermittent and direct but becoming oblique with closer proximity to the site. For southbound journeys views are typically infrequent, prolonged and oblique. In both journey scenarios the Development is seen in combined or successive views with other operational wind farms in the area, most notably Cowhill, St. John's Well, Denhill to the south and Strath of Brydock and Gairnieston Farm to the north.

8.225 A magnitude of change no greater than Medium is anticipated from areas of this road where views are obtainable. As road users are considered to be of Medium sensitivity a sequential level of significance of no greater than Moderate (not significant) is anticipated.

Cumulative Journey Scenarios

8.226 <u>Scenario 1</u>

8.227 For Scenario 1 the key wind farms with theoretical visibility from the A947 (distance/ direction - equating visibility in terms of length of route with visibility (km)/ journey time (mins)/ percentage of route (%)) are as follows:

- Boyndie (7km west – 12km/ 8 mins/ 26%);
- Cairnhill Farm (4km east – 23km/ 14 mins/ 48%);
- Gairniston Farm (2km east – 18km/ 11 mins/ 39%);
- Strath of Brydock (6km west – 20km/ 12 mins/ 43%);
- Castle of Auchry (4km east – 20km/ 12 mins/ 42%);
- Mains of Hatton (5km west – 13km/ 8 mins/ 28%); and
- Shieldburn (6km west – 16km/ 10 mins/ 34%).

8.228 In northbound journeys for Scenario 1 operational wind farm and approved such as St. John's Wells Extension (see Figure 8.23) would all be visible to the south east of the study area from sections of this road where theoretical visibility of the Development is not anticipated. From the section of visibility north of Greenspot the Development would be visible in long distance combined views with Mains of Hatton, Shieldburn Farm, Mains of Auchinderran, Strath of Brydock, Gairnieston Farm and Cairnhill Farm. However, the Development would only form an inconspicuous minor element within the view from here.

8.229 From the section of road with visibility north of Turriff there is widespread ZTV overlap between the Development and Cairnhill Farm, Gairnieston and Strath of Brydock with the Development seen in combined views with the Strath of Brydock (other wind farms in successive views) forming an apparent small landscape element. Furthermore, it is rare that the Development introduces views of wind turbines from any stretch of road on northbound journeys where there are currently none.

8.230 For southbound journeys the operational Boyndie is theoretically visible in successive views from the north of this road were visibility of the Development is not obtainable. From the section of visibility between Doun Park and King Edward there is widespread ZTV overlap between the Development and Boyndie, Strath of Byrdock, Mains of Hatton and Shieldburn. The Development typically appears in oblique views with other Scenario 1 wind farms visible in successive views resulting in a magnitude of change no greater than Medium. Again, it is rare that the Development introduces views of wind turbines from any stretch of road where there are currently none.

8.231 <u>Scenario 2</u>

8.232 For Scenario 2 the key wind farms with theoretical visibility from the A947 (distance/ direction - equating visibility in terms of length of route with visibility (km)/ journey time (mins)/ percentage of route (%)) are as follows:

- Ashogle Farm (2km west – 17km/ 10 mins/ 35%);

- Balchers Wood (1km east – 11km/ 7 mins/ 24%);
- Cairnhill Farm Extension (4km east – 23km/ 14 mins/ 48%);
- Cowie Hill (6km west – 19km/ 12 mins/ 41%);
- Culbirnie Parks (8km west – 13km/ 8 mins/ 28%);
- Dounepark Farm (1km west – 11km/ 7 mins/ 22%);
- Easter Jackson (4km east – 18km/ 11 mins/ 37%);
- Feithhill Farm (7km west – 12km/ 8 mins/ 26%);
- Haremoss (5km east – 11km/ 7 mins/ 24%);
- Holm and Hollymill (1km west – 18km/ 11 mins/ 38%);
- Little Hilton Farm (1km west – 25km/ 15 mins/ 53%);
- Little Whiterashes Farm (1km west – 24km/ 15 mins/ 52%);
- Milton of Fisherie (4km east – 20km/ 12 mins/ 42%);
- Newton of Foulzie (2km east – 12km/ 8 mins/ 26%);
- Towie Barcley Hill (1km west – 9km/ 6 mins/ 20%);
- Upper Pitglassie (4km west – 13km/ 8 mins/ 28%);
- Whitestones (2km east – 13km/ 8 mins/ 29%); and
- Wrae Farm (2km west – 18km/ 11 mins/ 38%)

8.233 In northbound journeys for Scenario 1 and from the section of visibility north of Greenspot the Development would be visible in long distance combined views with numerous Scenario 2 wind farms (refer to indicative wireline from Viewpoint 14 (Figure A14) in Appendix 8.2). However, the Development would continue to form an inconspicuous minor element within the view. Indeed the change in view would be less apparent due to the high number of wind farms.

8.234 From the section of road with visibility north of Turriff the Development would be seen in combined views between Newton of Culvie and Cowie Hill forming a small landscape element. However, the closer proximity Ashogle Farm and Wrae single turbines would be the most prominent wind farms in views from here.

8.235 For southbound journeys and from the section of visibility between Doun Park and King Edward the Development typically appears in oblique, combined views behind Cowie Hill resulting in a Medium magnitude of change. Other Scenario 2 wind farms within the more immediate landscape context (including Balchers Wood, Newton of Foulzie and Holm and Hollymill) form the more prominent schemes in successive views from this section of the road.

8.236 Scenario 1

8.237 There are limited areas on this road where views of other wind farms are not anticipated. The types of views for key Scenario 1 wind farms are as follows – Boyndie (infrequent, prolonged, oblique), Cairnhill (infrequent, prolonged, direct), Gairniston Farm (infrequent, intermittent, direct), Strath of Brydock (infrequent, prolonged, oblique), Castle of Auchry (infrequent, intermittent, direct), Mains of Hatton (infrequent, intermittent, direct) and Shieldburn Farm (infrequent, prolonged, direct).

8.238 The Development is typically seen in intermittent, combined, direct views with Strath of Brydock in northbound journeys. Other Scenario 1 wind farms are also typically apparent in successive views with clear separation between. In southbound journeys the Development is typically visible in prolonged, oblique successive views with other Scenario 1 wind farms including Boyndie, Strath of Brydock, Gairnieston Farm and Cairnhill Farm.

8.239 The magnitude of change as a result of the introduction of the Development is never greater than Medium. A cumulative sequential level of significance of no greater than Moderate (not significant) is anticipated for Scenario 1 for this route.

8.240 Scenario 2

8.241 As with Scenario 1 there are limited areas on this road where the Development introduces views of turbines outwith the areas where there are currently none. Furthermore, there are a high number of Scenario 2 wind farms in close proximity to the road, and it is these which are predicted to be the most prominent and eye catching in views from the road.

8.242 For northbound journeys Scenario 2 wind farms as typically seen in infrequent, intermittent direct views and for south bound journeys in infrequent, prolonged direct turning to oblique views. The Development is typically seen in long distance direct views and medium distance oblique views between and behind Scenario 2 wind farms.

8.243 As with Scenario 1, the magnitude of change as a result of the introduction of the Development is never greater than Medium. A cumulative sequential level of significance of no greater than Moderate (not significant) is anticipated for Scenario 2 for this route.

Wind Farm Name	Receptor	Distance in ZTV (km)	Duration (mins)	Percentage of Route %
Deuchries	A97	17.77	11	36
	A947	18.78	12	40
	A98	21.09	13	37
Boyndie	A97	4.135	3	8
	A947	12.21	8	26
	A98	30.44	19	53
Cairnhill Farm	A97	3.71	2	7
	A947	22.56	14	48
	A98	14.07	9	25
Gairnieston Farm	A97	3.844	2	8
	A947	18.39	11	39
	A98	10.85	7	19
Strath of Bydock	A97	10.34	6	21
	A947	20.21	12	43
	A98	23.22	14	41
Castle of Auchry	A97	2.311	1	5
	A947	19.64	12	42
	A98	10.16	6	18
Mains of Auchinderan	A97	10.56	7	21
	A947	0.7	0	1
	A98	11.9	7	21
Mains of Hatton	A97	0.64	0	1
	A947	13.31	8	28
	A98	4.096	3	7
Muirlake	A97	5.967	4	12
	A947	0.375	0	1
	A98	16.28	10	29
Myreton	A97	4.54	3	9
	A947	1.084	1	2
	A98	11.197	7	20
Shielburn Farm	A97	7.641	5	15
	A947	16.21	10	34
	A98	7.081	4	12
Ashogle Farm	A97	1.396	1	3
	A947	16.59	10	35
	A98	5.494	3	10
Backhill of Culbirnie	A97	5.813	4	12
	A947	8.835	5	19
	A98	22.54	14	40
Backhill of Yonderton	A97	0.9489	1	2
	A947	1.368	1	3
	A98	2.564	2	4
Badentoul	A97	2.149	1	4
	A947	1.911	1	4
	A98	23.6	15	41
Balchers Wood	A97	5.477	3	11
	A947	11.26	7	24
	A98	12.23	8	21

Cairnhill Farm Extension	A97	4.328	3	9
	A947	22.55	14	48
	A98	14.36	9	25
Cowie Hill	A97	5.168	3	10
	A947	19.35	12	41
	A98	16.78	10	29
Culbirnie Parks	A97	8.454	5	17
	A947	13.08	8	28
	A98	22.32	14	39
Dounepark Farm	A97	5.93	4	12
	A947	10.55	7	22
	A98	18.69	12	33
Easter Jackston	A97	6.111	4	12
	A947	17.57	11	37
	A98	21.55	13	38
Feithhill Farm	A97	4.808	3	10
	A947	12.24	8	26
	A98	4.899	3	9
Haremoss	A97	0.744	0	1
	A947	11.21	7	24
	A98	2.297	1	4
Hill of Fisherie	A97	7.345	5	15
	A947	17.95	11	38
	A98	33.68	21	59
Holm and Hollymill	A97	3.492	2	7
	A947	17.71	11	38
	A98	8.669	5	15
Ley Farm	A97	2.013	1	4
	A947	1.155	1	2
	A98	17.86	11	31
Little Blairshinnoch	A97	5.173	3	10
	A947	5.73	4	12
	A98	20.82	13	37
Litle Hilton Farm	A97	4.06	3	8
	A947	24.98	15	53
	A98	6.981	4	12
Little Whiterashes Farm	A97	4.086	3	8
	A947	24.43	15	52
	A98	8.764	5	15
Lodge Hill	A97	6.445	4	13
	A947	5.831	4	12
	A98	21.84	13	38
Mid Plough	A97	0.2018	0	0
	A947	12.94	8	28
	A98	3.811	2	7
Milton of Fisherie	A97	6.726	4	13
	A947	19.82	12	42
	A98	13.37	8	23
Newton of Culvie	A97	16.26	10	33
	A947	9.264	6	20

	A98	17.88	11	31
Newton of Foulzie	A97	5.716	4	11
	A947	12.32	8	26
	A98	13.82	9	24
Rivestone	A97	9.816	6	20
	A947	n\a	n\a	n\a
	A98	n\a	n\a	n\a
South Colleonard	A97	6.388	4	13
	A947	8.713	5	19
	A98	22.7	14	40
Towie Barcley Hill	A97	1.907	1	4
	A947	9.453	6	20
	A98	6.008	4	11
Upper Pitglassie	A97	0.2018	0	0
	A947	12.94	8	28
	A98	3.811	2	7
Wester Blakehouse	A97	1.09	1	2
	A947	n\a	n\a	n\a
	A98	3.283	2	6
Whitestones	A97	6.085	4	12
	A947	13.45	8	29
	A98	22.79	14	40
Wrae Farm	A97	2.052	1	4
	A947	18.05	11	38
	A98	5.91	4	10

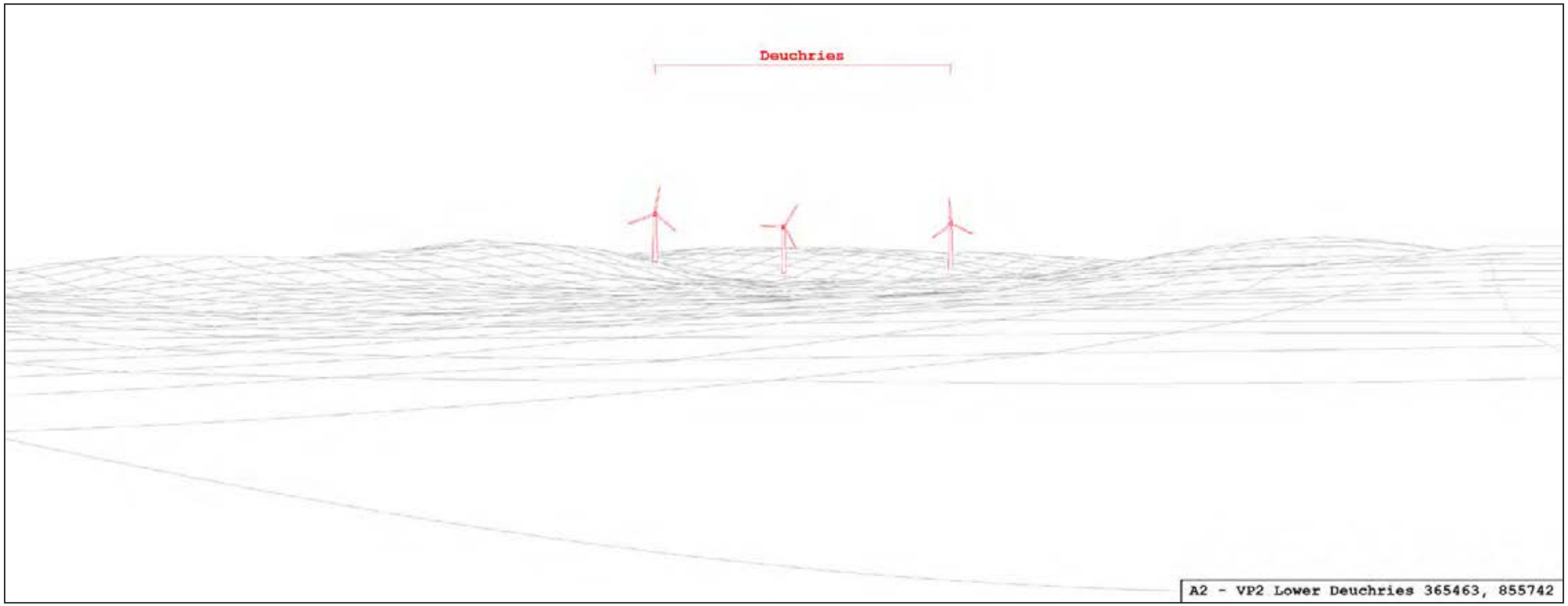
Appendix 8.2: Indicative Wirelines

Figure No.	Figure Title
A1	VP1 Whitehills
A2	VP2 Lower Deuchries
A3	VP3 B9025 towards Hill of Maunderlea
A4	VP4 Junction of A95 and A98
A5	VP5 Banff, Sandyhills
A6	VP6 Mains of Eden
A7	VP7 Edge of Turriff
A8	VP8 South Broomhill
A9	VP9 Turtory
A10	VP10 Knock Hill
A11	VP11 Little Balloch Hill
A12	VP12 A68 near Portsoy
A13	VP13 Crudie on A98
A14	VP14 Greenspot on A9478
A15	VP15 Tap o Noth
A16	Speyside Valley AGLV Tom Mor
A17	Milbethill
A18	South Brownhill
A19	Area 8: Agricultural Heartlands B9025 Aberchirder
A20	Craigston Castle
A21	Fyvie Castle
A22	Area 4 Coastal Farmland Whitehills
A23	Area 9 Agricultural Heartlands Westfield
A24	Coastal Lowlands, Cultain
A25	Straths and Valleys Wateron

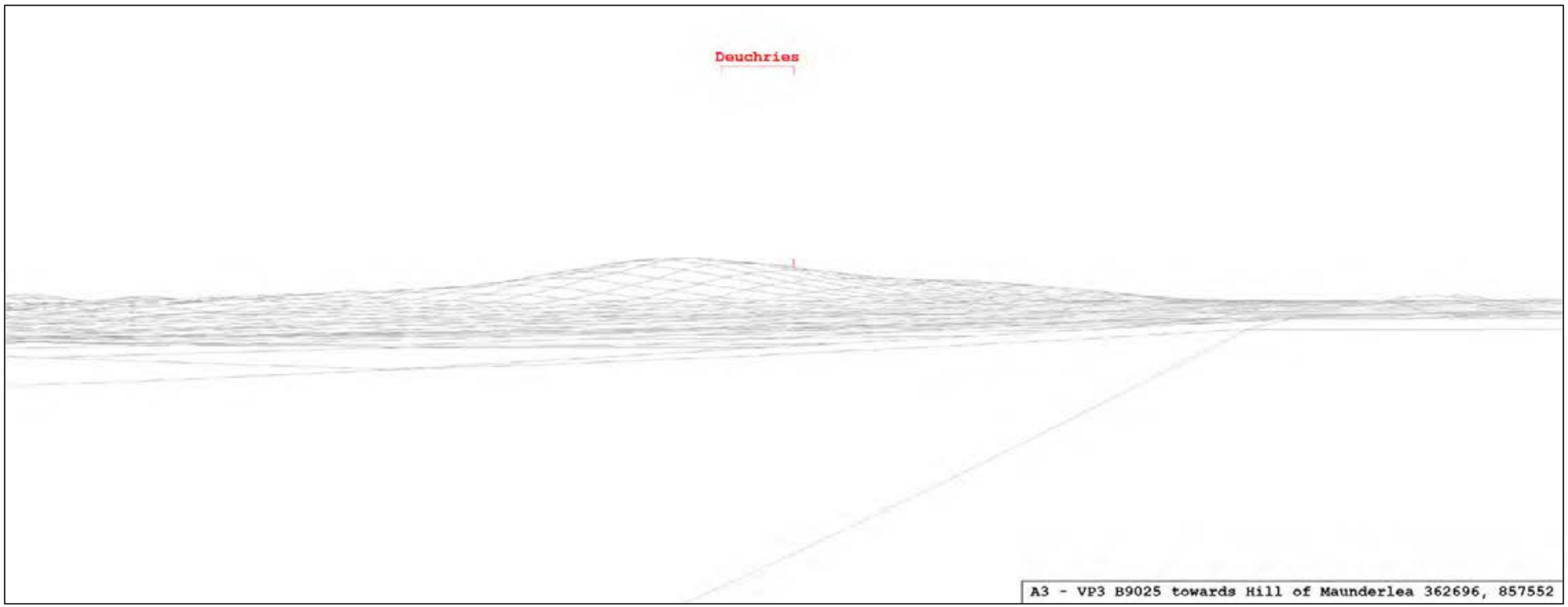
Note: indicative wirelines do not take account of vegetation or screening and have been used as an indicative tool only to aid the landscape assessment. The wirelines show a 76 degree viewing angle orientated towards the Development with the wind farms taken forward into the detailed cumulative assessment



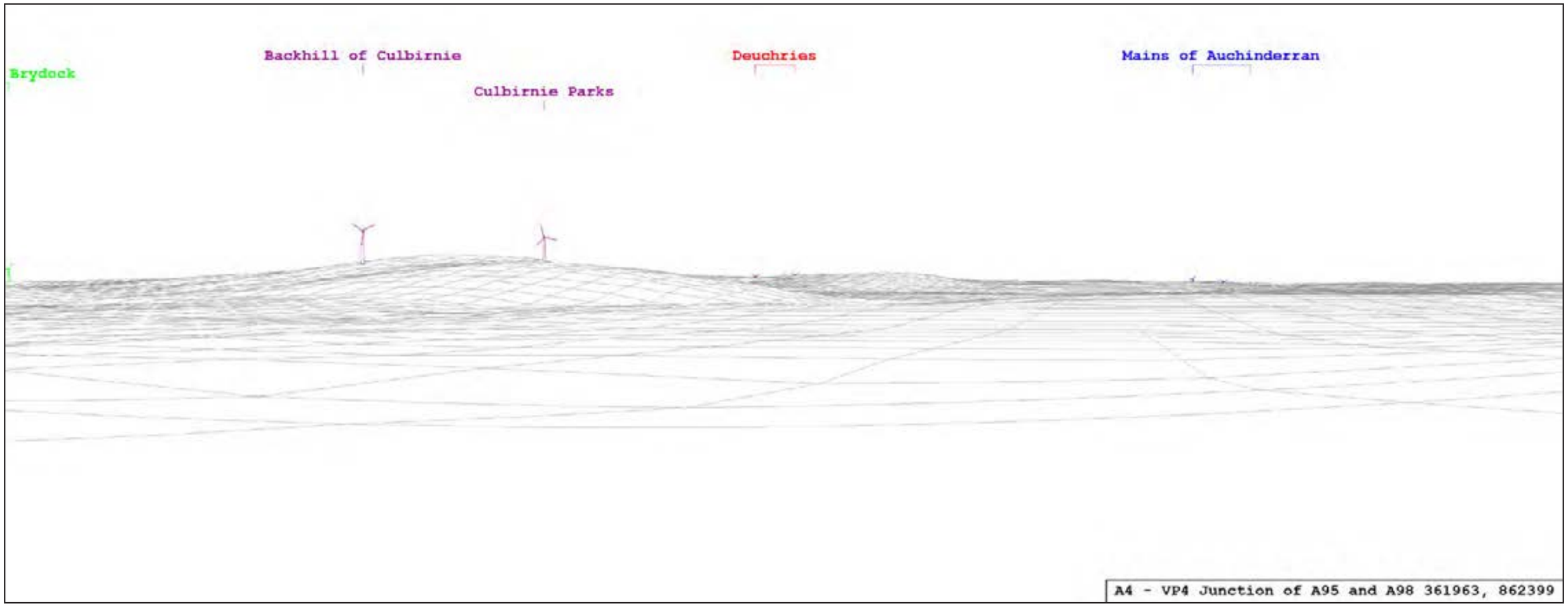
A1 - VP1 Whitehills 365824, 865782



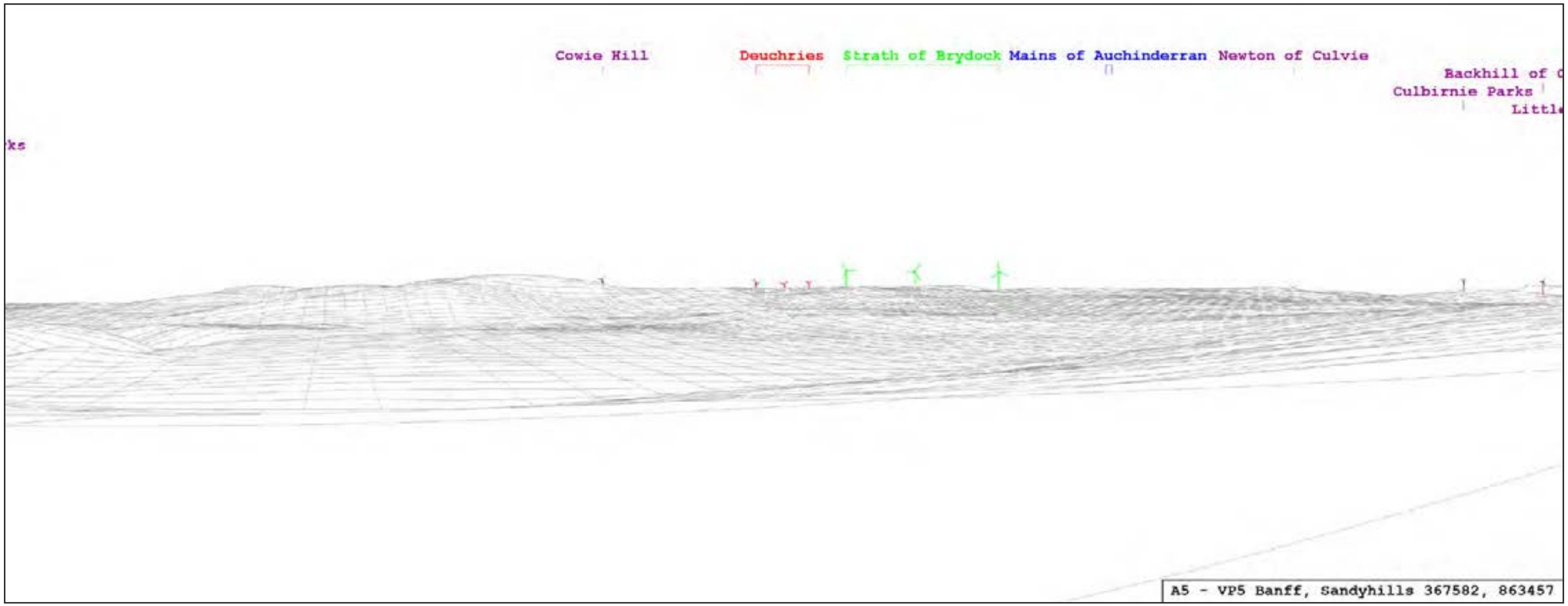
A2 - VP2 Lower Deuchries 365463, 855742



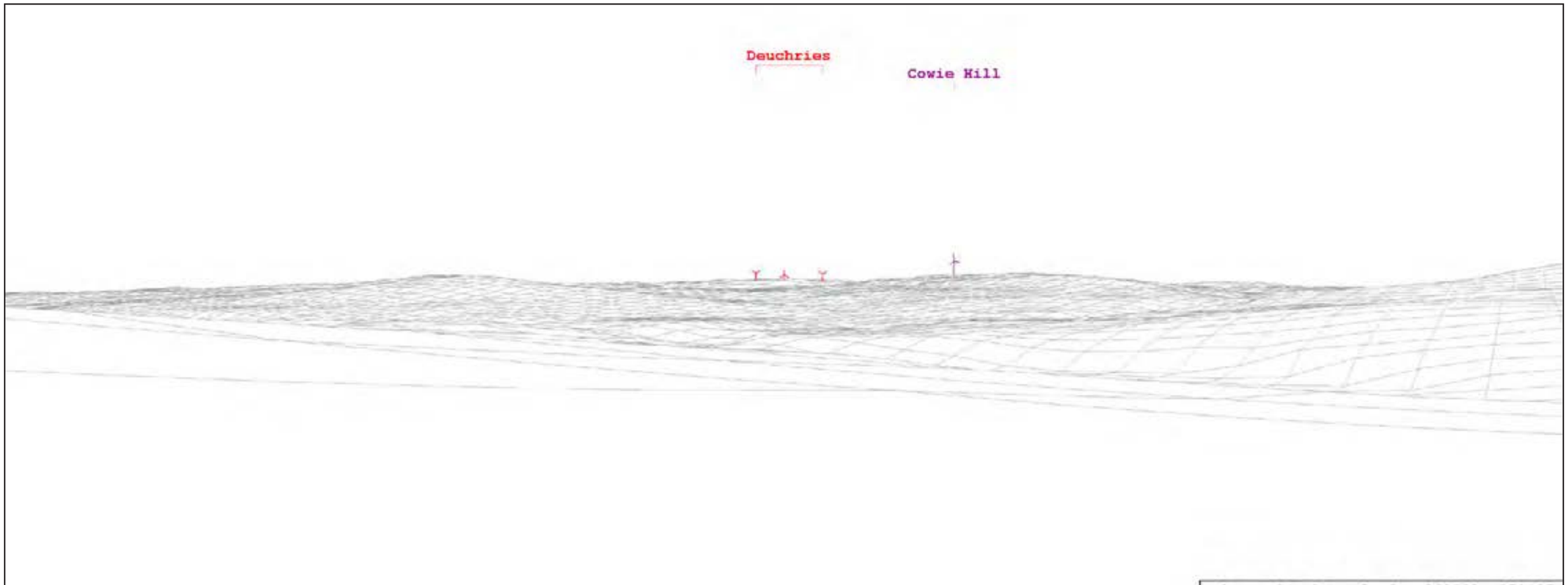
A3 - VP3 B9025 towards Hill of Maunderlea 362696, 857552



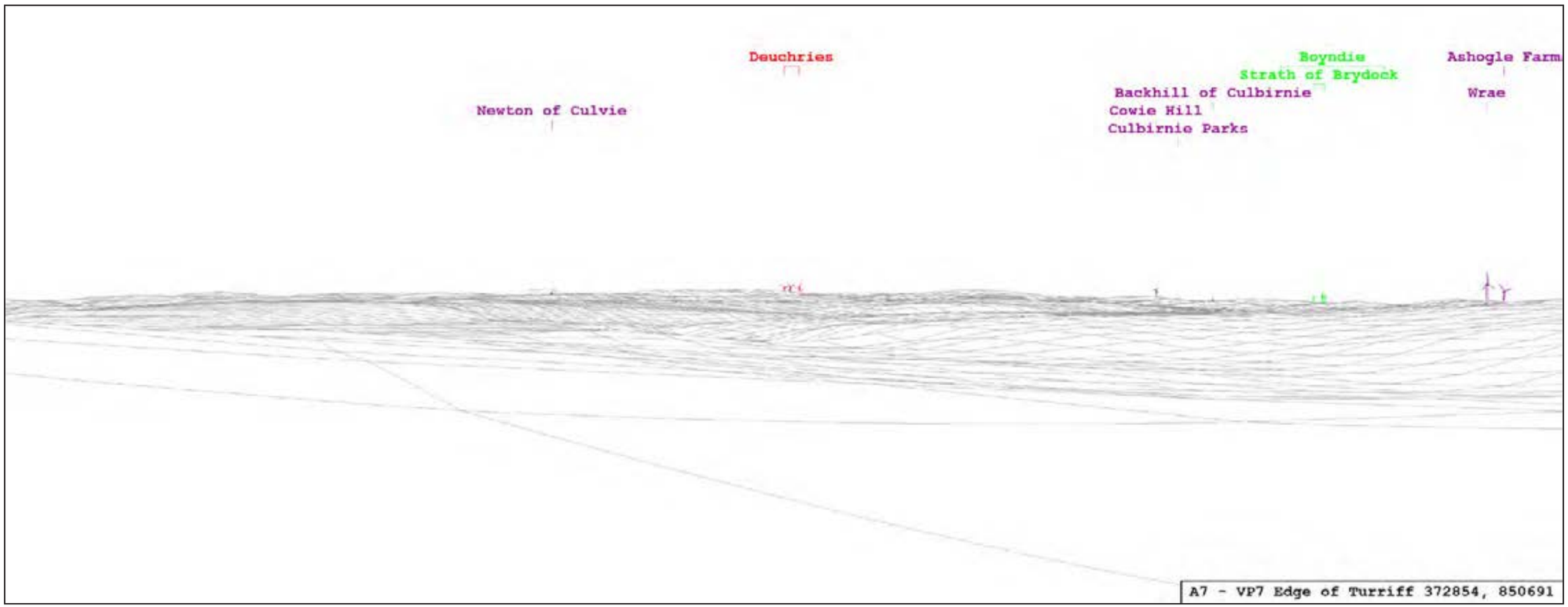
A4 - VP4 Junction of A95 and A98 361963, 862399

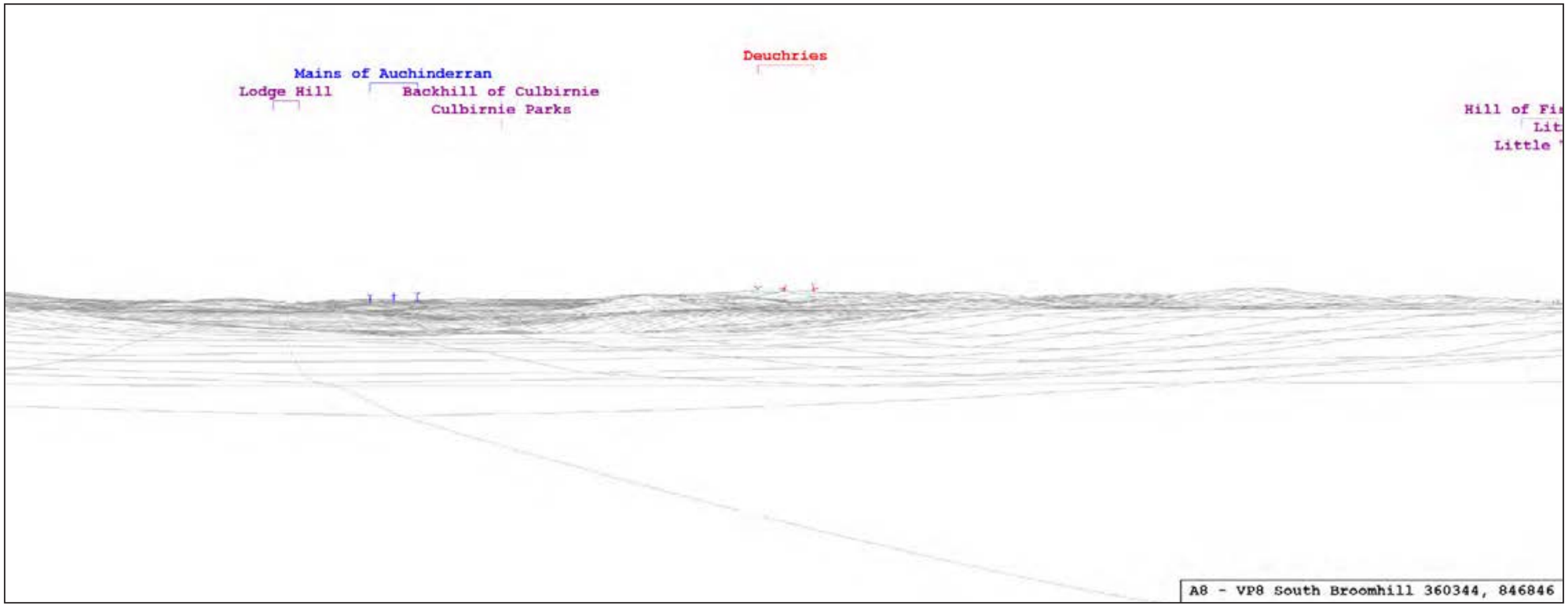


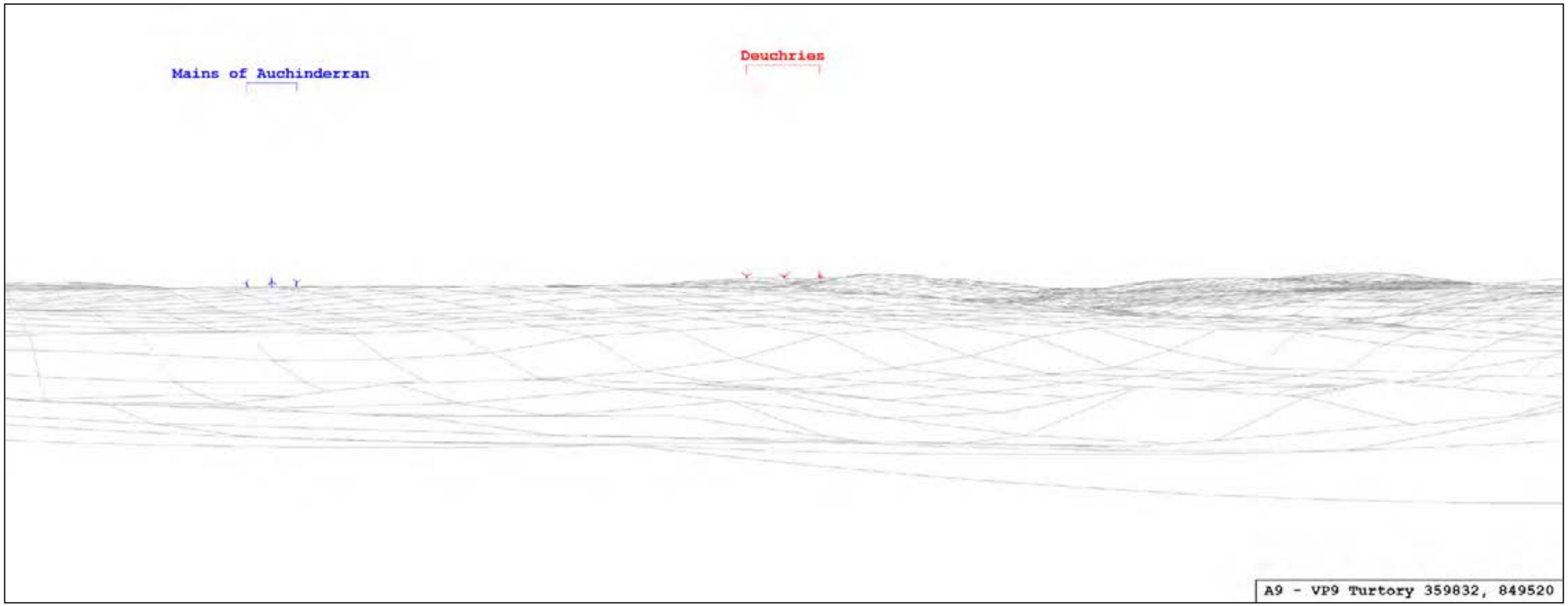
A5 - VP5 Banff, Sandyhills 367582, 863457



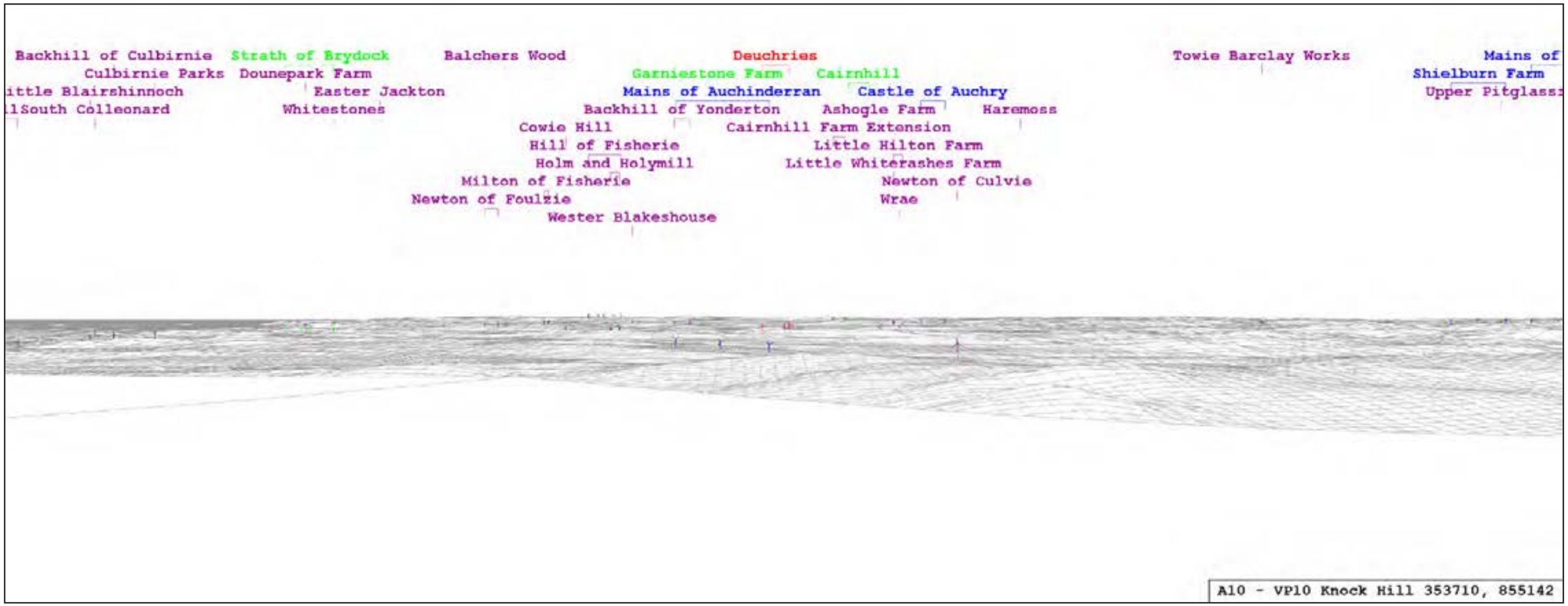
A6 - VP6 Mains of Eden 369942, 859125

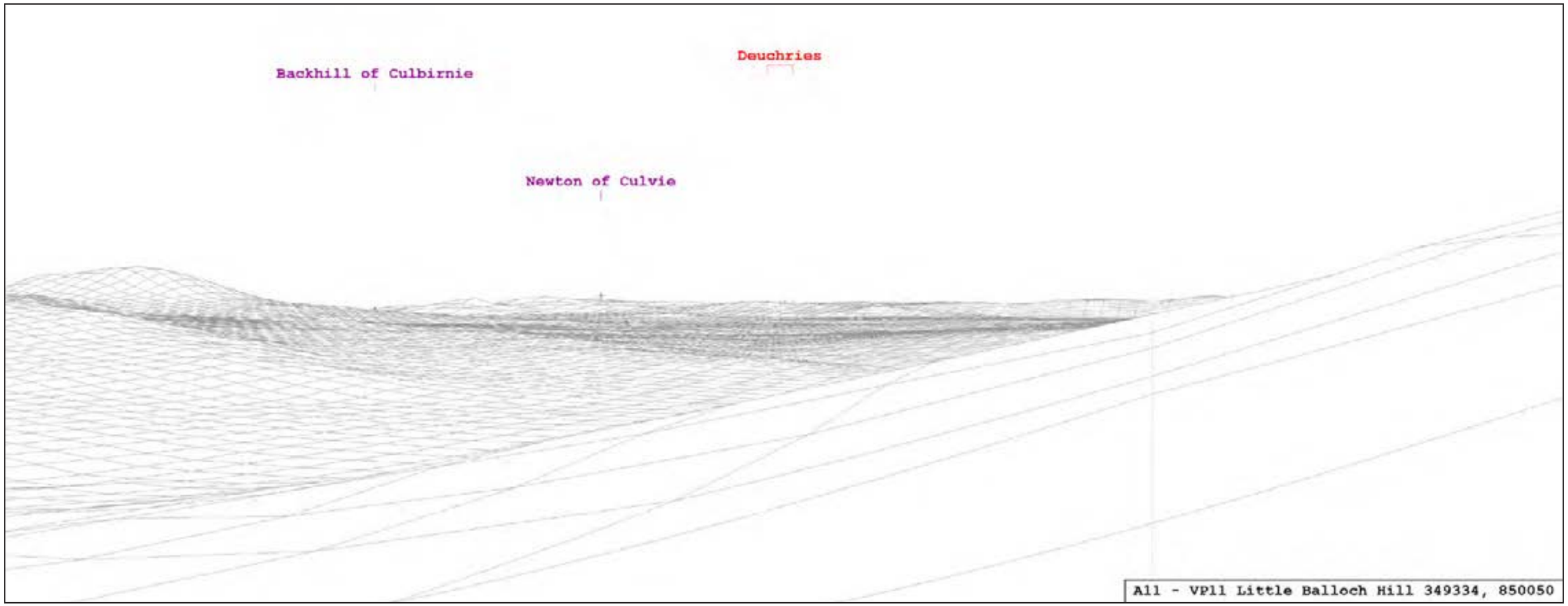

Deuchries
Boyndie
Ashogle Farm
Strath of Brydock
Backhill of Culbirnie
Wrae
Newton of Culvie
Cowie Hill
Culbirnie Parks
A7 - VP7 Edge of Turriff 372854, 850691


Deuchries
Mains of Auchinderran
Lodge Hill
Backhill of Culbirnie
Culbirnie Parks
Hill of Fi
Lit
Little
A8 - VP8 South Broomhill 360344, 846846



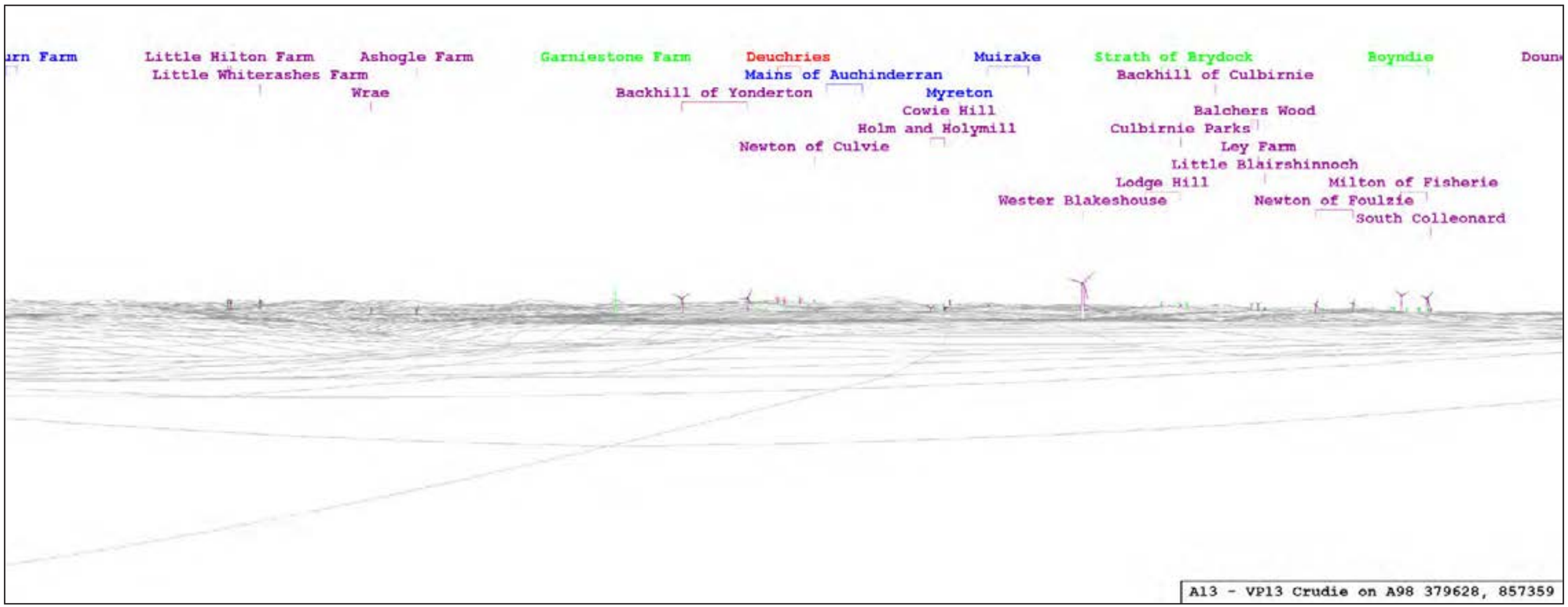
A9 - VP9 Turtory 359832, 849520


Backhill of Culbirnie
Strath of Brydock
Balchers Wood
Deuchries
Towie Barclay Works
Mains of
Culbirnie Parks
Dounepark Farm
Garniestone Farm
Cairnhill
Shielburn Farm
ittle Blairshinnoch
Easter Jackton
Mains of Auchinderran
Castle of Auchry
Upper Pitglassi
lSouth Colleonard
Whitestones
Backhill of Yonderton
Ashogle Farm
Haremoss
Cowie Hill
Cairnhill Farm Extension
Hill of Fisherie
Little Hilton Farm
Holm and Holymill
Little Whiterashes Farm
Milton of Fisherie
Newton of Culvie
Newton of Foulzie
Wrae
Wester Blakeshouse
A10 - VP10 Knock Hill 353710, 855142

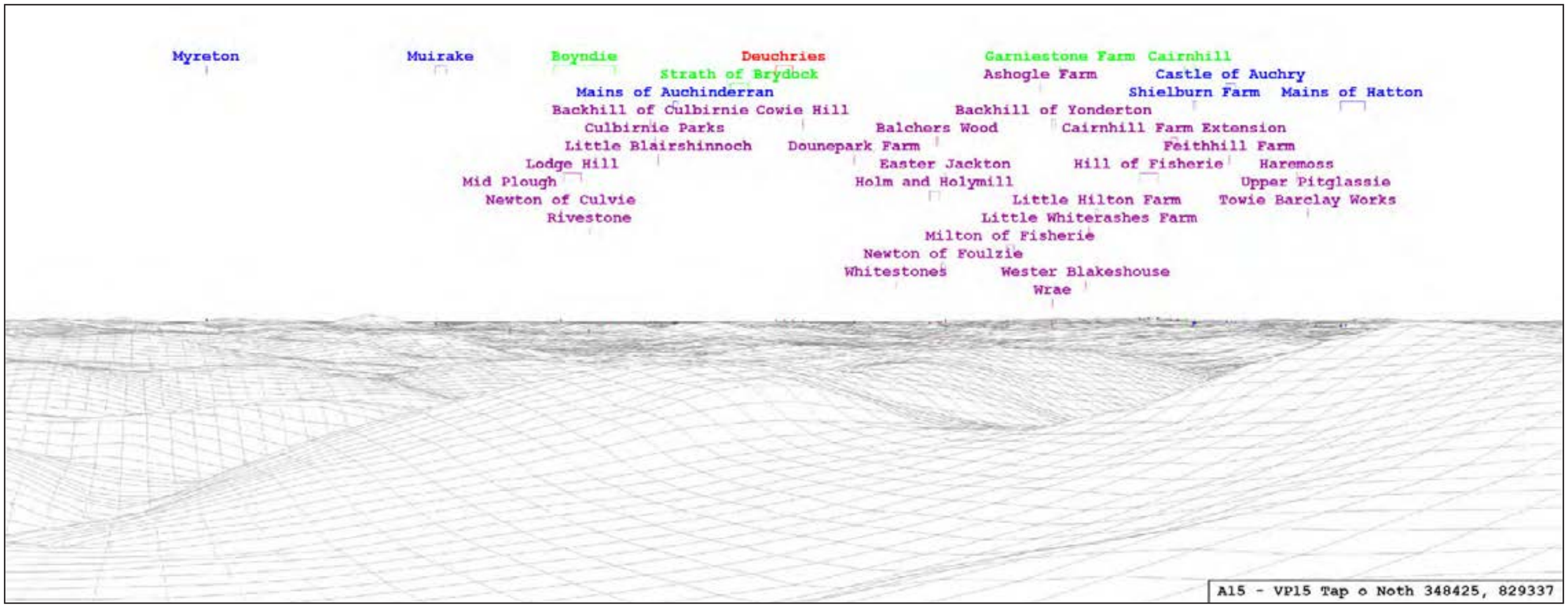

Backhill of Culbirnie
Deuchries
Newton of Culvie
A11 - VP11 Little Balloch Hill 349334, 850050

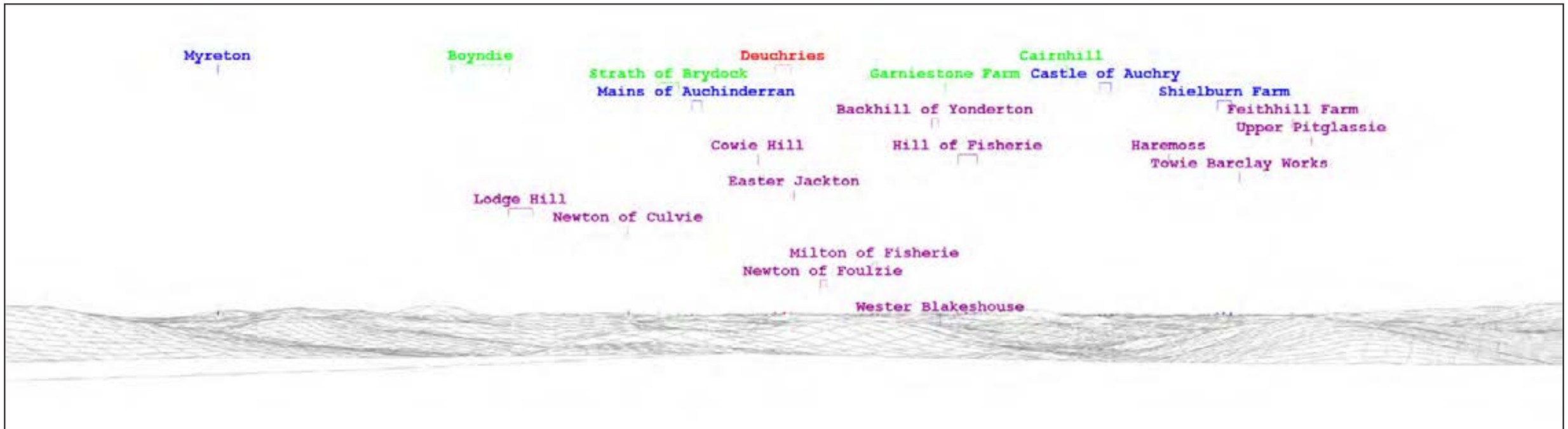


A12 - VP12 A68 near Portsoy 359406, 864819

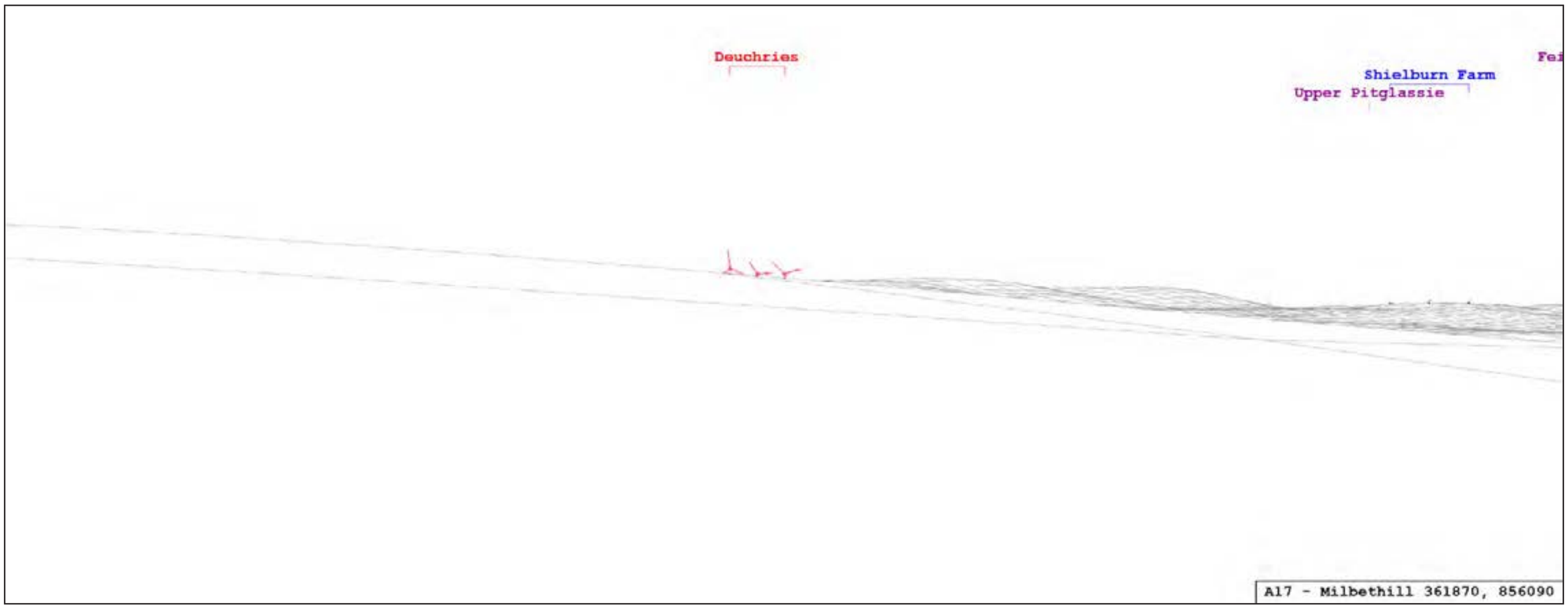

Little Hilton Farm
Ashogle Farm
Garniestone Farm
Deuchries
Muirake
Strath of Brydock
Boyndie
Little Whiterashes Farm
Mains of Auchinderran
Backhill of Culbirnie
Wrae
Backhill of Yonderton
Myreton
Balchers Wood
Cowie Hill
Holm and Holymill
Culbirnie Parks
Newton of Culvie
Ley Farm
Little Blairshinnoch
Lodge Hill
Milton of Fisherie
Wester Blakeshouse
Newton of Foulzie
South Colleonard
A13 - VP13 Crudie on A98 379628, 857359

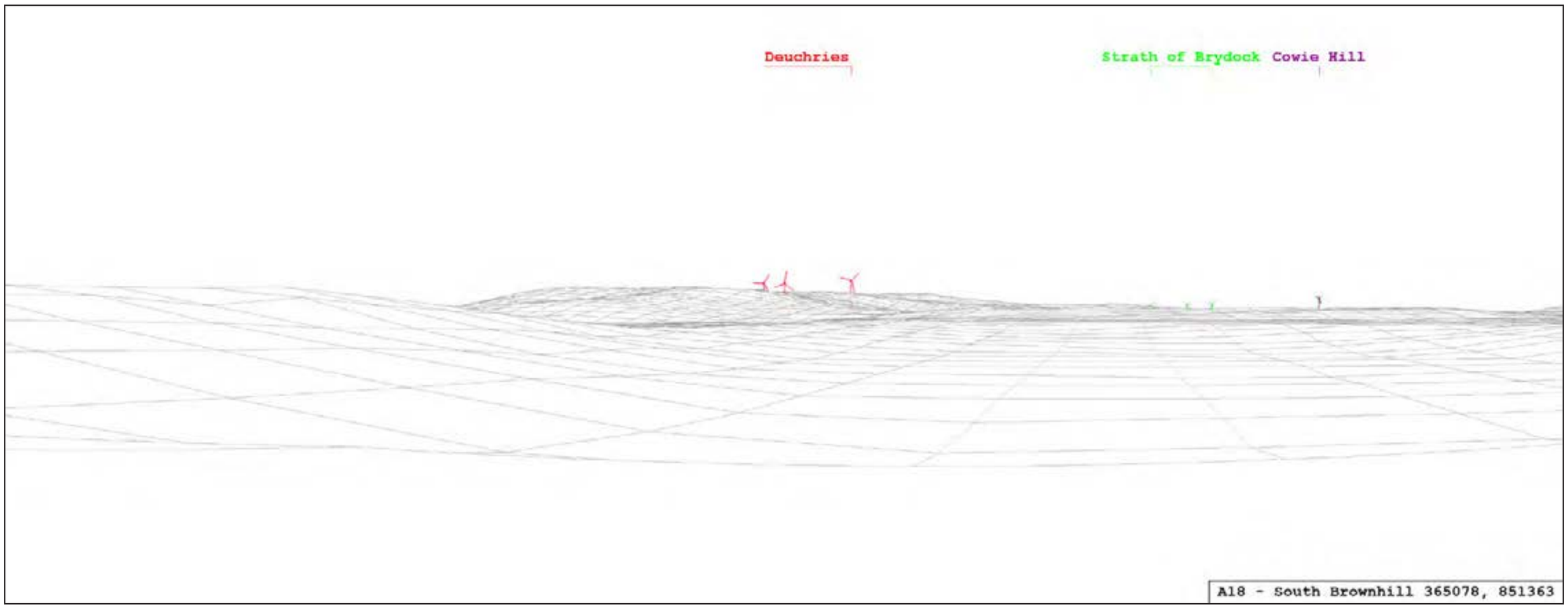

Deuchries
Boyndie
Garniestone Farm
Cairnhill
Hi
Mains of Auchinderran
Strath of Brydock
Castle of Auchry
Mains of Hatton
Ashogle Farm
Backhill of Yonderton
Cowie Hill
Cairnhill Farm Extension
Shielburn Farm
Culbirnie Parks
Easter Jackton
Holm and Holymill
Haremoss
Little Hilton Farm
Newton of Culvie
Little Whiterashes Farm
Upper Pitglassie
Milton of Fisherie
Wrae
Wester Blakeshouse
Towie Barclay Works
Whitestones
A14 - VP14 Greenspot on A9478 379638, 831942


Myreton
Muirake
Boyndie
Deuchries
Strath of Brydock
Mains of Auchinderran
Backhill of Culbirnie
Cowie Hill
Culbirnie Parks
Little Blairshinnoch
Lodge Hill
Mid Plough
Newton of Culvie
Rivestone
Garniestone Farm
Cairnhill
Ashogle Farm
Castle of Auchry
Shielburn Farm
Mains of Hatton
Backhill of Yonderton
Balchers Wood
Cairnhill Farm Extension
Dounepark Farm
Feithhill Farm
Easter Jackton
Hill of Fisherie
Haremoss
Holm and Holymill
Upper Pitglassie
Little Hilton Farm
Towie Barclay Works
Little Whiterashes Farm
Milton of Fisherie
Newton of Foulzie
Whitestones
Wester Blakeshouse
Wrae
A15 - VP15 Tap o Noth 348425, 829337



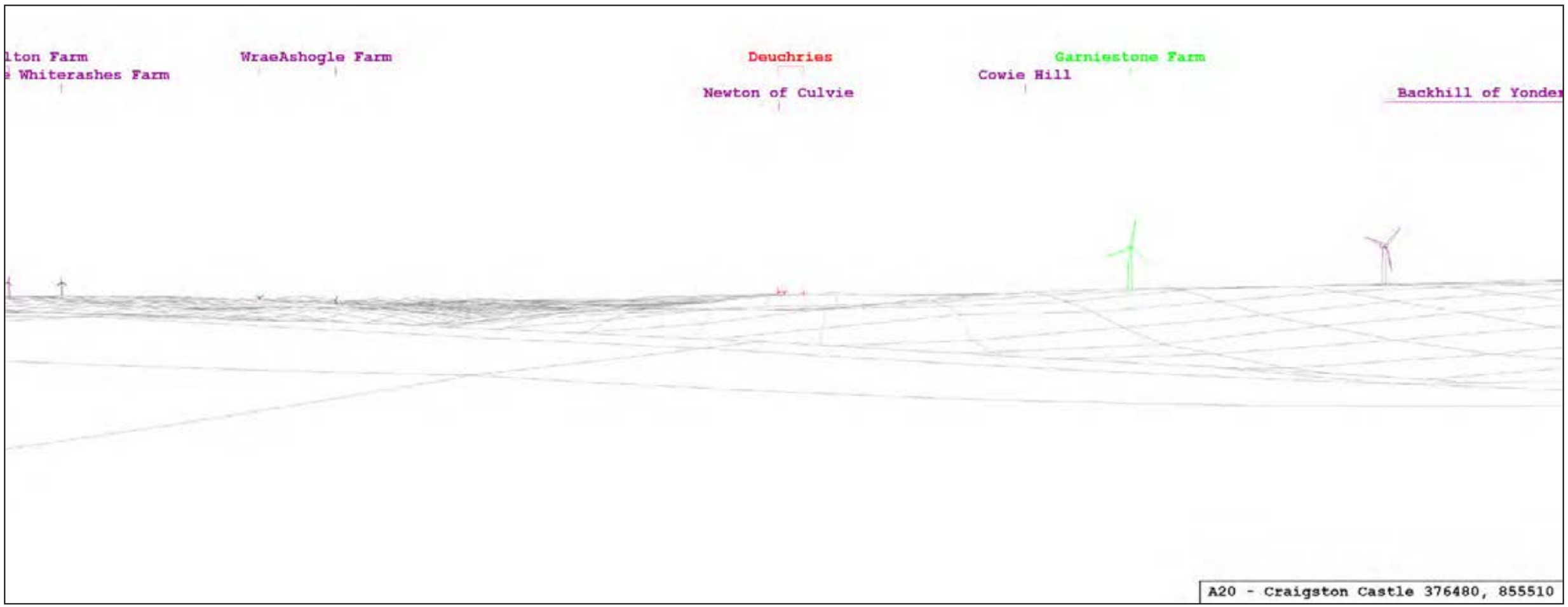
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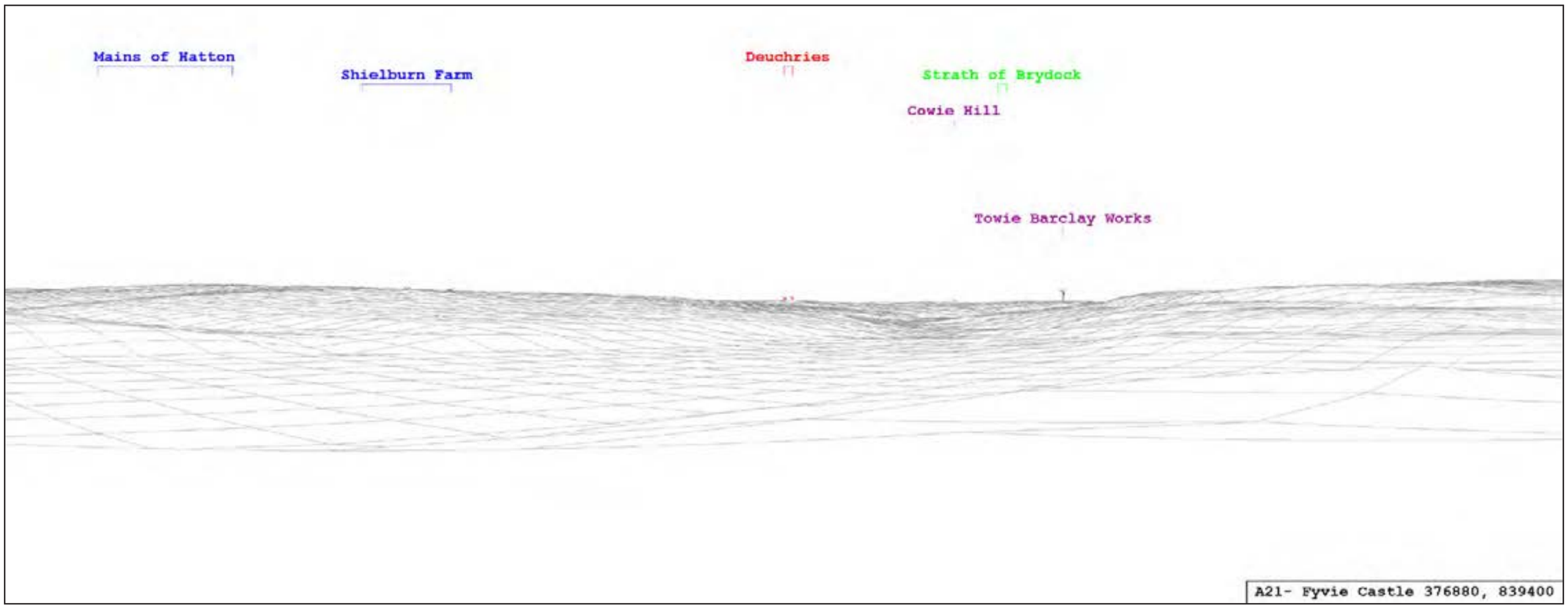

Deuchries
Shielburn Farm
Upper Pitglassie
A17 - Milbethill 361870, 856090


Deuchries
Strath of Brydock
Cowie Hill
A18 - South Brownhill 365078, 851363

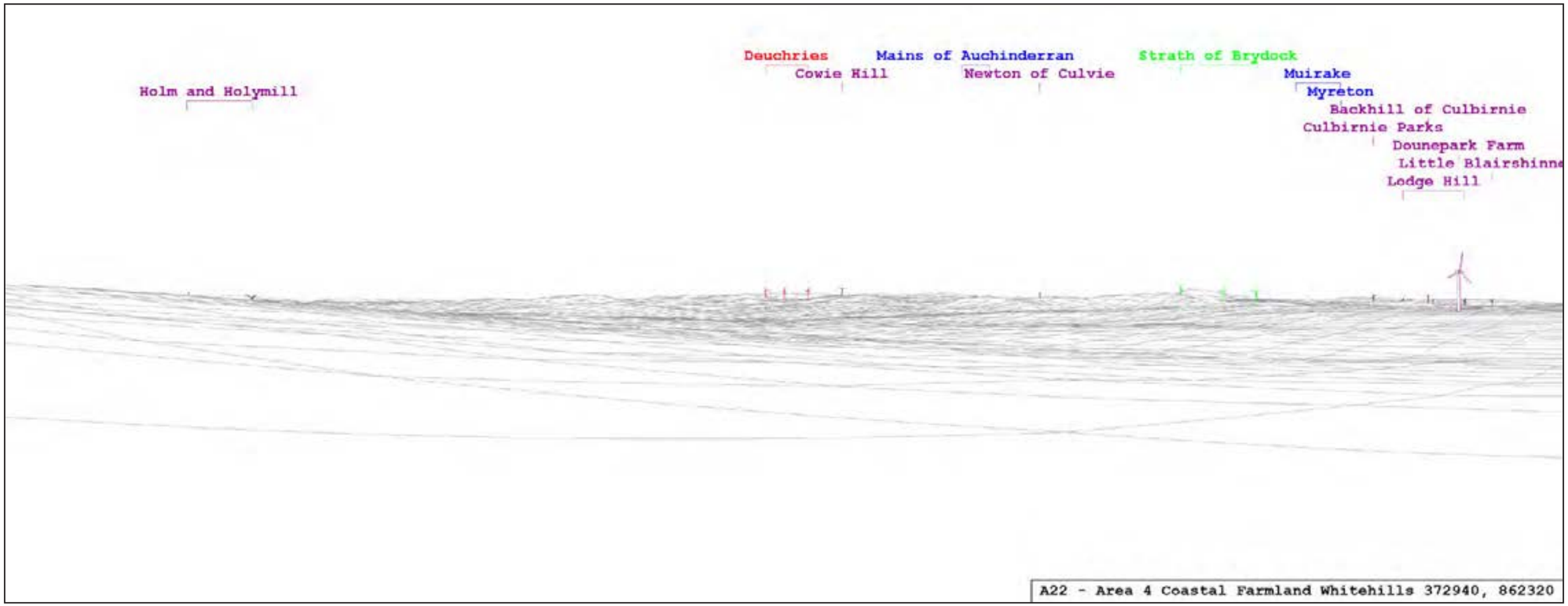


A19 - Area 8: Agricultural Heartlands B9025 Aberchirder 363800, 852900

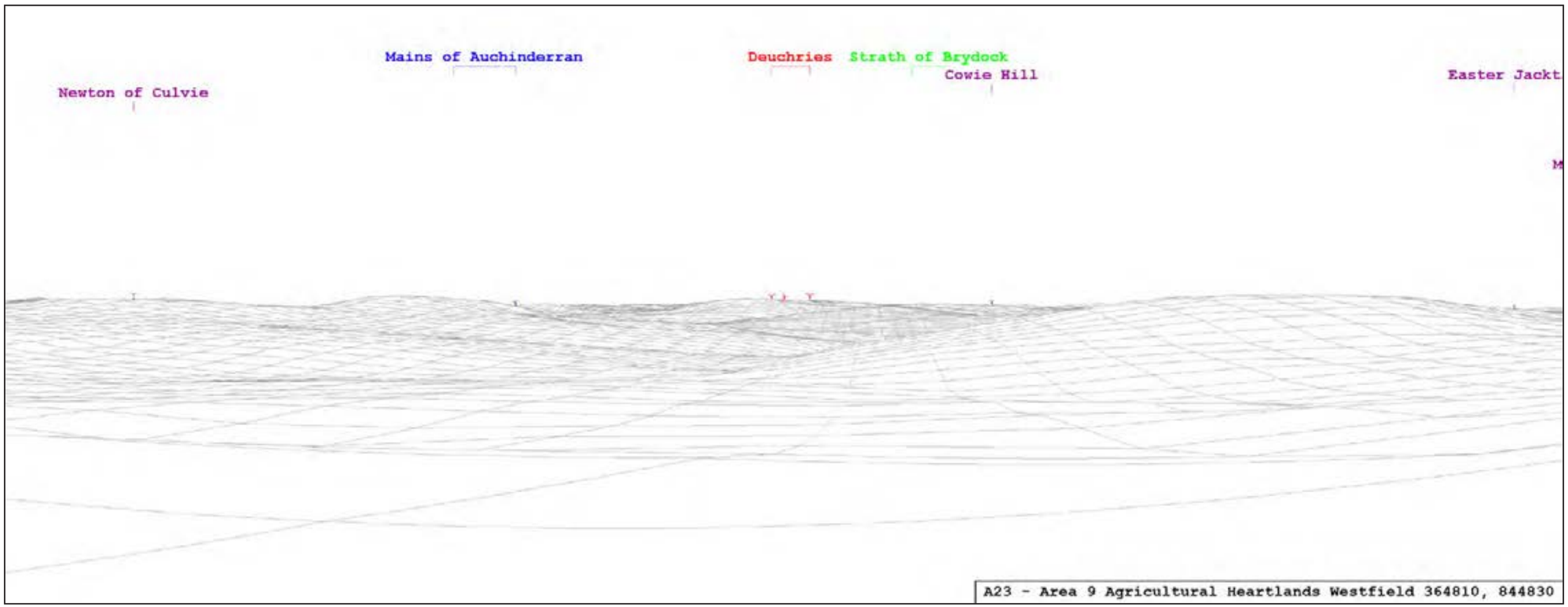

lton Farm
Whiterashes Farm
WraeAshogle Farm
Deuchries
Newton of Culvie
Garniestone Farm
Cowie Hill
Backhill of Yonder
A20 - Craigston Castle 376480, 855510



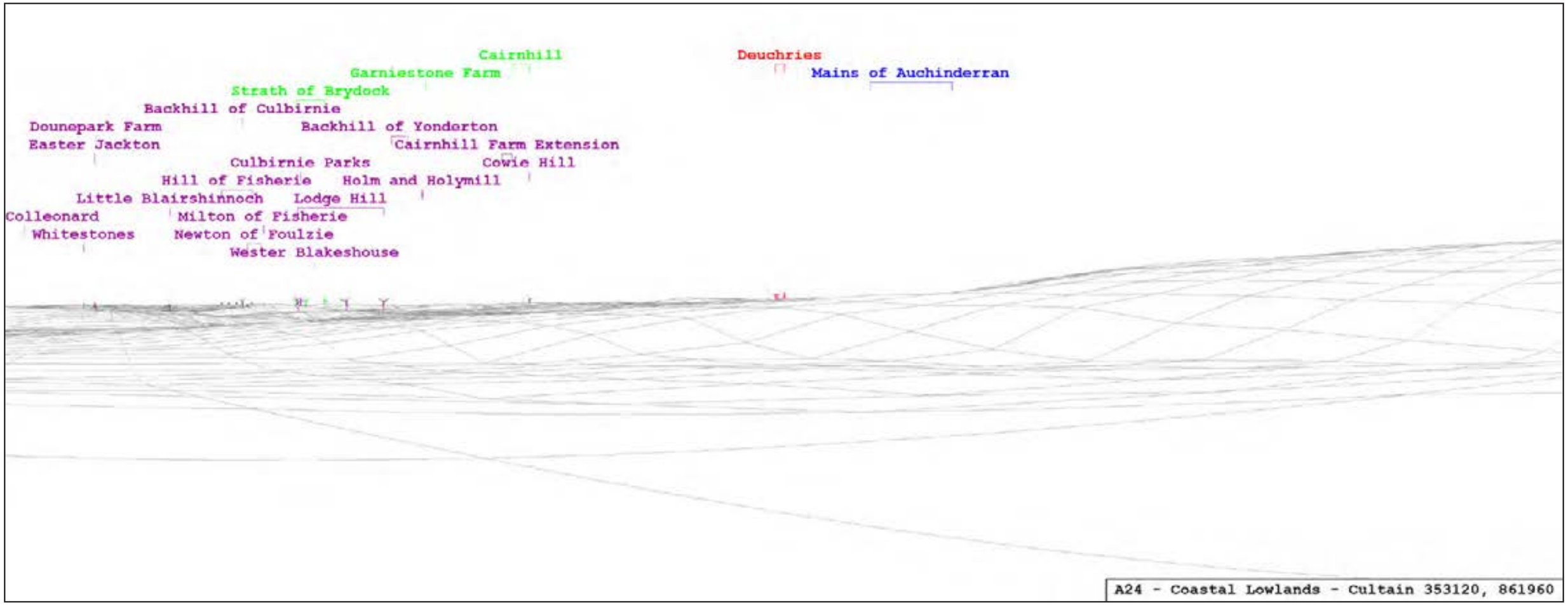
A21- Fyvie Castle 376880, 839400

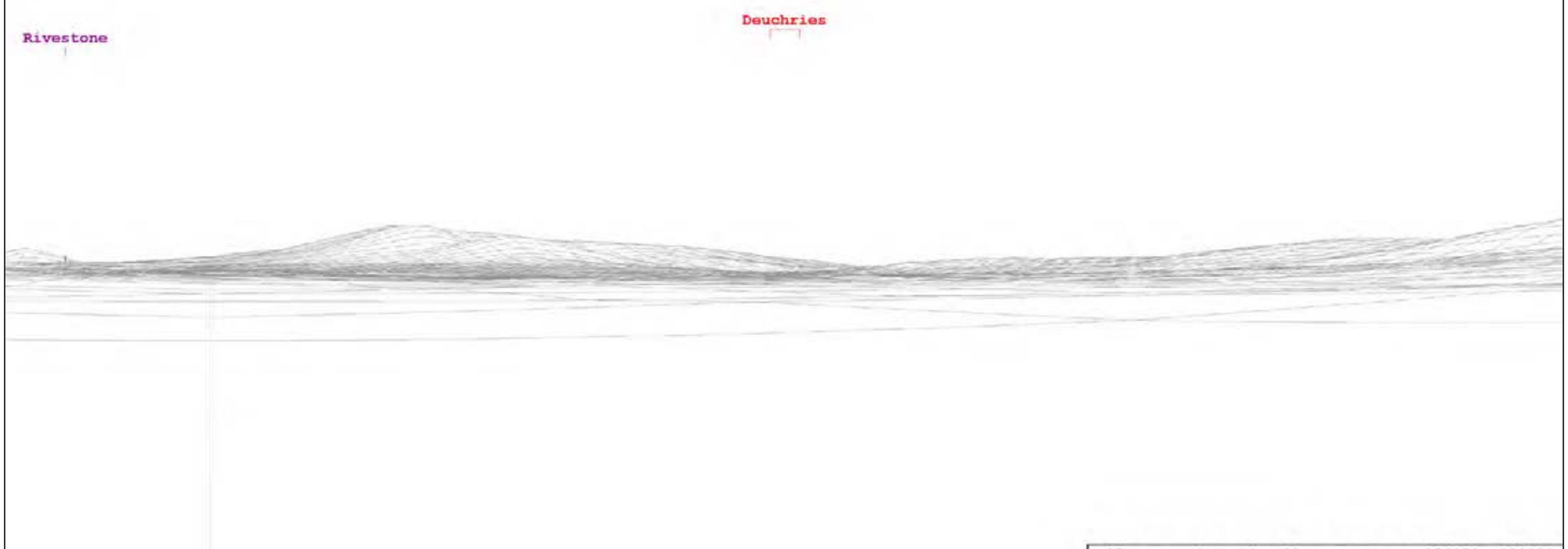


A22 - Area 4 Coastal Farmland Whitehills 372940, 862320



A23 - Area 9 Agricultural Heartlands Westfield 364810, 844830


Cairnhill
Deuchries
Garniestone Farm
Mains of Auchinderran
Strath of Brydock
Backhill of Culbirnie
Dounepark Farm
Backhill of Yonderton
Easter Jackton
Cairnhill Farm Extension
Culbirnie Parks
Cowie Hill
Hill of Fisherie
Holm and Holymill
Little Blairshinnoch
Lodge Hill
Colleonard
Milton of Fisherie
Whitestones
Newton of Foulzie
Wester Blakeshouse
A24 - Coastal Lowlands - Cultain 353120, 861960



A25 - Straths and Valleys Waterton 856150, 839900

APPENDIX 9
ARCHAEOLOGY CULTURAL HERITAGE

Appendix 9.1: Gazetteer

APPENDIX 9.1: ARCHAEOLOGICAL SITE GAZETTEER

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
1	CA	NMRS No. NJ65SW16	Aberchirder	Village	Planned village, founded in 1764 by Alexander Gordon of Auchintoul, forms the core of the conservation area. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362594 852482	High	No change	None	No change	None
2	LB Category B	LB No.19934	18 and 19 The Square	House	LB entry records the following: Mid 19th century. 2-storey, 4-bay terrace of 2 houses, with later alterations, single storey wing at rear. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362450 852434	High	No change	None	No change	None
3	LB Category B	LB No.19934	18 and 19 The Square	House	LB entry records the following: Mid 19th century. 2-storey, 4-bay terrace of 2 houses, with later alterations, single storey wing at rear. Coursed ashlar, base course, cill course and cornice. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362458 852438	High	No change	None	No change	None
4	LB Category B	LB No.19928	23 South Street	House	LB entry records the following: Early 19th century. 2-storey, 3-bay house on raised ground. Squared and coursed granite with ashlar dressings, base course and eaves course. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362536 852323	High	No change	None	No change	None
5	LB Category B	LB No.19931	38 South Street	House	LB entry records the following: Early 19th century. 2-storey, 3-bay house at street corner. Squared	PM	362681 852395	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					and coursed stugged granite with ashlar dressings; heavily pointed. Door to centre, windows flanking at ground, 3 windows at 1st floor, close under eaves. Window at ground and 1st floor out-of-line to W with cement surrounds. Sash and case windows with 4-pane glazing patterns. Grey slates, ashlar coped skews and stacks with decorative cans; thackstanes. Comments: Discussion within body of Environmental Statement archaeology chapter							
6	LB Category B	LB No.19914; NMRS No. NJ65SW35	Main Street, New Marnoch Church (Church of Scotland) with boundary wall	Church	LB entry records the following: James Henderson, 1841. New Marnoch Church, formerly Free church of Scotland. 2-storey hall church, gabled rectangular-plan with octagonal 4-stage entrance tower to S, single storey gabled vestry to N. Random rubble, ashlar dressings with eaves course, ashlar tower. Tall round-arched windows. TOWER: entrance to S: 4-panelled 2-leaf door with blinded fanlight en suite, 4 additional fixed doors flanking. Tall, slender round-arched windows above in pilastered bays with cornice, clock with moulded surround to 3rd stage, bell tower above with 8 round-arched louvred narrow openings, eaves course, cornice and ogival lead roof with wrought-iron weathervane. NAVE: entrance tower flanked by single windows, 4 windows to E and W elevations. 2 smaller windows to N with stained glass. VESTRY: adjoining to N, single storey, adapted to accommodate N windows of nave. 2 round-arched windows to N, Door to E, window E and W. Lying-pane and border glazing. Grey slates, coped ashlar skews and stack to vestry, later brick stack and flue to N elevation of nave. INTERIOR: pulpit to N, with arcaded balustrade, panelled sounding board above with small bracketted canopy. Stained glass with New Testament scenes to flanking windows. Panelled raked gallery supported on cast-iron columns to 3 sides, painted pews, pine altar furniture. Marble memorial plaques in entrance hall to Mr and Mrs Stronach,	PM	362876 852624	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					and Rev D Henry (see notes). BOUNDARY WALL TO CHURCHYARD: ashlar coped, random rubble. Comments: Discussion within body of Environmental Statement archaeology chapter							
7	LB Category C(S)	LB No.19933	12 The Square	House	LB entry records the following: Mid 19th century possibly incorporating earlier fabric, later raised. 2-storey, 3-bay house with attic on corner of town square and Main Street. Squared and coursed granite with base course. Door to centre with letterbox fanlight, window to left. Later door enlarged from former window to right, with modern window opening to outer right. 3 windows at 1st floor. Wallhead raised 3 courses to accommodate attic with 2 canted, piend-roofed dormers in outer bays. Sash and case windows, 4-pane glazing pattern to 1st floor; 1 modern window at ground. Blue-grey slates, ashlar coped skews and stacks with decorative cans. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362447 852388	High	No change	None	No change	None
8	LB Category C(S)	LB No.19921	69 North Street	House	LB entry records the following: Earlier 19th century. 5-bay former pair of single storey cottages (bays grouped 3-2) now merged as 1, harled with painted ashlar margins, rubble sides and rear. 2-leaf boarded doors with letterbox fanlights, window to centre, windows to outer bays. Sash and case windows with 12-pane glazing pattern. Grey slates, 3 small skylights. Red sandstone coped skews and ridge, skewputts and stacks. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362463 852496	High	No change	None	No change	None
9	LB Category C(S)	LB No.19932; NMRS No. NJ65SW75	The Square, Victoria Fountain	Drinking fountain	LB entry records the following: Dated 1897. Presented by W Achinachie, Provost of Aberchirder	PM	362480 852410	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					(see notes). Situated on S side of The Square, polished Peterhead and grey granite drinking fountain; 3 granite steps to cylindrical base with bowed basins to E and W, inscriptions to N and S. Carved urn above encircled by 6 columns on decorative corbels. Crowned by incised dome and large ball finial. Comments: Discussion within body of Environmental Statement archaeology chapter							
10	LB Category C(S)	LB No.19927	Rear, 19 and 20 South Street	House	LB entry records the following: Late 18th to early 19th century. Terrace of 2 single storey, 3-bay cottages behind 19 and 20 South Street. Random rubble, rough dressings. Doors to centre, windows flanking. Sash and case windows with 4-pane glazing pattern. Grey slates, small skylights to roof, coped skews and stacks, some decorative cans. Comments: Outwith ZTV. Discussion within body of Environmental Statement archaeology chapter	PM	362487 852305	High	No change	None	No change	None
11	LB Category C(S)	LB No.19927	Rear, 19 and 20 South Street	House	LB entry records the following: Late 18th to early 19th century. Terrace of 2 single storey, 3-bay cottages behind 19 and 20 South Street. Random rubble, rough dressings. Doors to centre, windows flanking. Sash and case windows with 4-pane glazing pattern. Grey slates, small skylights to roof, coped skews and stacks, some decorative cans. Comments: Outwith ZTV. Discussion within body of Environmental Statement archaeology chapter	PM	362494 852309	High	No change	None	No change	None
12	LB Category C(S)	LB No.19915	137 Main Street with boundary wall	House	LB entry records the following: Early-earlier 19th century with later 19th century additions. Single storey, 3-bay gabled cottage with later attic. Harl pointed rubble with ashlar dressings. Door at centre, letterbox fanlight; stone consoled cornice. Tripartite windows flanking (enlarged from single windows'). Slate-hung, canted, piend-roofed dormers to outer bays above with billet moulding. 4-pane glazing pattern in sash and case windows.	PM	362716 852570	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Grey slates. Single rooflight. Ashlar coped skews, and gablehead stacks. Decorative cans. Ashlar coped rubble boundary wall. Comments: Discussion within body of Environmental Statement archaeology chapter							
13	LB Category C(S)	LB No.19916	148 Main Street	House	LB entry records the following: Mid 19th century. Single storey, 3-bay, gabled cottage with attic breaking eaves. Harled with painted ashlar dressings. Door at centre with border-glazed upper panel and letterbox fanlight; stone consoled cornice. Windows in flanking bays and attic window with finialled, gabled dormerheads above. Blank return gable to right. 4-pane glazing pattern in sash and case windows. Grey slates. Ashlar coped skews and gableheads with skewputts. Ashlar coped end stacks. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362791 852577	High	No change	None	No change	None
14	LB Category C(S)	LB No.19929	51 South Street with boundary wall and railings	House	LB entry records the following: Late 19th century. Single storey and attic, 3-bay, T-plan cottage. Harled, with ashlar dressings. Door to centre with letterbox fanlight. Canted bays flanking at ground with billet moulding, 2 canted, piend-roofed, slate-hung dormers above to attic also with billet moulding. Sash and case windows with 4-pane glazing pattern. Grey slates, ashlar coped skews with moulded skewputts, coped ashlar stacks with decorative cans; thackstanes. Low ashlar coped rubble retaining wall with decorative, cast-iron railings and gate. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362834 852508	High	No change	None	No change	None
15	LB Category C(S)	LB No.19924	South Street, Kinnairdy Lodge with boundary wall and railings	Lodge	LB entry records the following: Late 19th century. Single storey and attic, 3-bay, T-plan cottage. Stugged ashlar with ashlar dressings. Panelled door to centre with letterbox fanlight and stone bracketted cornice. Canted windows	PM	362895 852496	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					flanking at ground. 2 canted, piend-roofed, slate-hung dormers to attic with billet moulding. Unfortunate modern glazing. Grey slates to raised roof. Ashlar coped skews, moulded skewputts, coped ashlar stacks with decorative cans. Low ashlar coped rubble wall to front garden with decorative, cast-iron railings and gate, rubble walls to sides, rubble coped. Comments: Discussion within body of Environmental Statement archaeology chapter							
16	LB Category C(S)	LB No.19923; NMRS No. NJ65SW86	South Street, Gowanlea with boundary wall and railings	House	LB entry records the following: Late 19th century. Single storey and attic, 3-bay, T-plan cottage. Squared and snecked granite with ashlar dressings. Panelled door to centre with stone bracketted cornice and letterbox fanlight. Canted windows flanking at ground. 2 canted, piend-roofed slate-hung dormers above to attic with billet moulding. Sash and case windows with 4-pane glazing pattern. Grey slates, ashlar coped skews with moulded skewputts, coped ashlar stacks with decorative cans. Low ashlar coped wall to front garden with decorative, cast-iron railings and gate; rubble coped, rubble walls to side. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362905 852507	High	No change	None	No change	None
17	LB Category C(S)	LB No.19925; NMRS No. NJ65SW87	South Street, Laurelbank	Cottage (19th Century)	LB entry records the following: Late 19th century with early 20th century porch. Single storey and attic, 3-bay, T-plan cottage. Squared and snecked granite with ashlar dressings. Door to centre; elaborate projecting later addition of painted wooden porch with pilasters, round and narrow windows and cornice. Canted bays flanking at ground. 2 canted, piend-roofed, slate-hung dormers above to attic with billet moulding. Sash and case windows with 4-pane glazing pattern. Grey slates, ashlar coped skews with moulded skewputts, coped ashlar stacks with decorative cans. Low ashlar coped rubble front garden wall with spear-head, cast-iron railings and gate. Comments: Discussion within body of Environmental Statement	PM	362923 852516	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					archaeology chapter							
18	Site	NMRS No. NJ65SW55	Aberchirder, The Square, Fife Arms Hotel	Hotel	Hotel recorded in the NMRS Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362510 852450	Low	No change	None	No change	None
19	Site	SMR No. NJ65SW0020; NMRS No. NJ65SW17	Aberchirder, Taylor Drive, Back Spoot Well	Well	Site of a Well; known locally as the Back Spoot Well. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362570 852630	Low	No change	None	No change	None
20	Site	NMRS No. NJ65SW39	Aberchirder, Marnoch Parish Church Hall	Hall	Church Hall associated with Marnoch Parish Church (RSK Site 6). Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362570 852450	Low	No change	None	No change	None
21	Site	NMRS No. NJ65SW63	Aberchirder, Corsie Drive, Cruden Housing	Housing Estate (20th Century)	Modern housing estate recorded in the NMRS Comments: Undesignated site, and not considered for assessment of impact on setting.	MOD	362740 852750	Negligible	No change	None	No change	None
22	Site	SMR No. NJ65SW0025	Aberchirder War memorial	Standing Structure	The Aberchirder War memorial stands opposite the parish church between Main Street and the A92. It is a tall rectangular obelisk of rough-hewn granite with a panel near the top within which is the carving of a rampant lion within a shield. Below it is the inset flat surface containing the inscriptions and names above which is a cross, also inset. It stands on a tapering solid basal plinth with another inset panel containing a crossed sabre and spear. At the front, below this, is an additional triangular block which contains the inscriptions for World War II. At the top of the monument cut into part of the face and the back, but not the sides, is a pitched mock roof. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362894 852595	Medium	No change	None	No change	None
23	Site	NMRS No. NJ65SW25	Aberchirder,Old Free Church Manse	Manse	For adjacent Old Free Church (New Marnoch Parish Church), see NJ65SW 35. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362910 852580	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
24	Site	SMR No. NJ65SW0033;	Skeibhill	Standing Structure	Remains of a rectangular curling pond that is depicted on the 1888 2nd edition OS map but not on the 1867 1st edition one. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362951 852022	Low	No change	None	No change	None
25	Site	NMRS No. NJ65NW15	Barbank	FarmhouseFarmstead	Farmhouse and steading recorded in the NMRS Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362970 855830	Low	No change	None	No change	None
26	Site	NMRS No. NJ65NW9	Blacklaw, Post Office and house	Post Office	Post office and house recorded in the NMRS. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	362970 856040	Low	No change	None	No change	None
27	Map regression		South Cranna	FarmhouseFarmstead	The farmstead of Cranna is depicted for the first time on Pont's map, corresponding to "Kramach". By the time of the 1st Edition OS, it is named as "South Crannach". Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364100 852500	Medium	No change	None	No change	None
28	Site	SMR No. NJ65SW0045	Mains of Corskie	Documentary Record Only	Site of a now destroyed Cottage that is shown only on the 1st edition OS map. It is depicted as a small rectangular building within a garden. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363100 853157	Low	No change	None	No change	None
29	Site	SMR No. NJ65SW0044	Mains of Corskie	Crop Mark (Includes Soil Mark)	Site of a now destroyed quarry which is shown on the 1st edition OS map. It was partially destroyed by the construction of the road which crosses the site. It is not marked on the 2005 map, but is visible on vertical aerial photographs taken in 1977 and 1988 as a cropmark. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363139 853307	Negligible	No change	None	No change	None
30	Site	SMR No. NJ65SW0034	Skeibhill	Earthwork	Remains of a disused quarry that is depicted on the 1867 1st edition and 1888 2nd edition OS maps. Comments: Undesignated site, and not considered for assessment	PM	363271 851629	Negligible	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					of impact on setting.							
31	Site	SMR No. NJ65NW0051;	Damside	Standing Structure	Farmstead depicted on the 1st edition OS map as a U-plan steading open to the SE with a further 3 or 4 buildings to the SE. On the 2nd edition map, only one building is shown to the SE. Both the steading and building to the SE appear to survive, but have been altered and extended. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363288 856648	Low	No change	None	No change	None
32	Site	SMR No. NJ65SW0056;	Castlebrae	Standing Structure	Farmstead still in use which is shown on the OS maps from the 1st edition map onwards. On both the 1st and 2nd edition maps it is depicted as a C-shaped steading, with the court open to the south and a horsemill attached to the west wing, and a smaller building to the south. The 2006 map shows that the steading has been roofed over and that both buildings have been modified. The remains of the horsemill platform are still shown. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363366 854469	Medium	No change	None	No change	None
33	Site	SMR No. NJ65NW0038;	Witchyburn	Documentary Record Only	Site of a now destroyed L-shaped Croft that is depicted on the 1867 1st edition OS map as being named 'Moss of Banff', and on the 1888 2nd edition map as being 'Witchyburn' Comments: Undesignated site, and not considered for assessment of impact on setting..	PM	363385 856939	Low	No change	None	No change	None
34	Site	SMR No. NJ65NW0014;	Wester Maunderlee	Documentary Record Only	Site of a now destroyed Farmstead depicted on the 1864 1st edition OS map. It shows an L-shaped building, a rectangular building and an enclosure. The enclosure does not appear on the OS 2nd edition map. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363416 856037	Low	No change	None	No change	None
35	Site	SMR No. NJ65SW0046;	Crannach Bridge	Standing Structure	Cottage still in use which is shown on both the 1st and 2nd edition OS maps. It is depicted as a small building within a garden. Comments: Undesignated site, and not considered for assessment	PM	363481 852942	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					of impact on setting.							
36	Site	SMR No. NJ65NW0024;	West Deuchries	Standing Structure	Remains of a L-shaped Croft that is depicted on the 1867 1st edition OS map. Visible on 1946 AP as a roofless structure Visible during site visit as a grass-covered rectangular structure and steading with mature hawthorn trees Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363653 855537	Low	No change	None	No change	None
37	Site	NMRS No. NJ65NW7	Herodhill Croft	Farmstead	NJ65NW 7 6370 5634 A farmstead comprising one unroofed and one roofed building is depicted on the 1st edition of the OS 6-inch map (Banffshire 1871, sheet x). Two roofed buildings are shown on the current edition of the OS 1:10000 map (1989). Information from RCAHMS (SAH), 18 March 1999. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363700 856340	Low	No change	None	No change	None
38	Site	NMRS No. NJ62NW192	Foreside, gravel pit	Sand and gravel workings	NJ62NW 192 6372 5529 Nothing is now visible of this gravel pit, which is first depicted on the 2nd edition of the OS 6-inch map (Aberdeenshire, 1901, sheet xliv.SW); its site lies in a cultivated field about 50m W of Foreside Farmsteading (NJ62NW 193). Visited by RCAHMS (JRS), 26 May 1999. Nothing visible during site visit. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363720 855290	Negligible	No change	None	No change	None
39	Site	SMR No. NJ65NW0026	Hillend	Documentary Record Only	Site of a now destroyed Croft that is depicted on the 1867 1st edition OS map but not on the 1888 2nd edition. The map shows two possible roofless rectangular buildings. Visible during site visit as a grassed-over rectangular two-room	PM	363737 855263	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					structure, with footings of walls apparent Comments: Undesignated site, and not considered for assessment of impact on setting.							
40	Site	SMR No. NJ65NW0025	East Deuchries	Standing Structure	Remains of a U-shaped Croft that is depicted on the 1867 1st edition OS map. Visible on 1954 AP as a roofless structure. Visible during site visit as a grass- and gorse-covered former farmstead cut into the side of the hill Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363808 855398	Low	No change	None	No change	None
41	Site	SMR No. NJ65SW0019; NMRS No. NJ65SW15	Blacklaw	Crop Mark	NJ65SW 15 6388 5466 A possible ditched and embanked double enclosure was identified on the top of the hill while checking aerial photographs held by Grampian Regional Council. M Greig 1993. Enclosure; a double enclosure on summit of hill; appears to be ditched & embanked. Visible on 1954 AP. Recorded as visible in NMR AP JASAIR NJ 65 07.88.209 (6.5.88). Not visible during site visit – extensive coverage by gorse. Comments: Undesignated site, and not considered for assessment of impact on setting.	PREH	363876 854616	Medium	No change	None	No change	None
42	Site	SMR No. NJ65NW0027; NMRS No. NJ65NW16	Gushetbog Croft	Farmhouse, Farmstead	NJ56NW16 NJ 6398 5508 The farmsteading and farmhouse of Gushetbog Croft are shown on the 1:10 560 2nd Edition 1905, Banffshire XVI NW, surveyed 1865 and revised 1902. 2 unroofed nameless buildings appear at the site on plan NJ6355, 1966 (AC October 2000). Remains of a rectangular Croft that is depicted on the 1867 1st edition OS map. Visible on 1946 AP as a roofless structure. Visible during the site visit as an upstanding rubble and mortar remains of two structures up to 2.5m high.	PM	363980 855080	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Undesignated site, and not considered for assessment of impact on setting.							
43	Site	SMR No. NJ65SW0028	Rotten Moss	Documentary Record Only	Site of a now destroyed square sheepfold that is depicted on the 1867 1st edition OS map. No remains visible during site visit. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364053 853946	Negligible	Negligible	None	No change	None
44	Site	SMR No. NJ65SW0031	Smithfield Croft	Documentary Record Only	Site of a rectangular smithy that is depicted on the 1867 1st edition and 1888 2nd edition OS maps. Visible during the site visit as an artificial platform and track Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364068 854875	Low	Negligible	None	No change	None
45	Site	SMR No. NJ65NW0017	Herodhill	Documentary Record Only	Site of a now destroyed farmstead, mill pond and lade that are depicted on the 1867 1st edition map but not on the 1888 2nd edition. The map shows two rectangular buildings, and a U-shaped range of buildings all of which are roofless. The mill pond and lade lie to the SE. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364104 856346	Low	No change	None	No change	None
46	Site	SMR No. NJ65SW0032	Smithfield Croft	Standing Structure	Remains of a L-shaped croft that is depicted on the 1867 1st edition OS map. Visible on 1946 AP as a roofless structure. Visible during the site visit as grassed-over rubble. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364132 854795	Low	Moderate	Slight	No change	None
47	Site	SMR No. NJ65SW0030	Newlands Croft	Standing Structure	Remains of a L-shaped Croft that is depicted on the 1867 1st edition OS map. Visible on 1946 AP as a roofless structure. Still visible as a ruined structure during site visit. Landowner indicated that is was occupied until the early 20th century. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364142 854503	Low	Moderate	Slight	No change	None
48	Site	SMR No.	North Cranna	Documentary	Site of a now destroyed Farmstead that is depicted on the 1867 1st	PM	364148	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NJ65SW0026		Record Only	edition OS map. It shows two rectangular buildings with a shelter belt of trees and another rectangular building to the south. None of these features appear on the OS 2nd edition map. Visible on 1963 AP as a area of disturbed ground Comments: Undesignated site, and not considered for assessment of impact on setting.		853035					
49	Site	SMR No. NJ65SW0027	North Cranna	Documentary Record Only	Site of a now destroyed circular sheepfold that is depicted on the 1867 1st edition OS map. Visible on 1963 AP as an area of disturbed ground, and on subsequent APs as a circular cropmark Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364170 853445	Negligible	No change	None	No change	None
50	Site	SMR No. NJ65SW0001; NMRS No. NJ65SW1	Upper Crannabog, Tam's Chamber	Mound	Possible cairn; remains of an artificial mound of earth & stones. It is mutilated by infilling & defaced by a ditch so that positive classification is impossible. However, one old tradition, no longer in vogue, is that it was made as a refuge, but due to its exposed position this is probably erroneous. It is also thought to have been a parish boundary marker, but as it is too big & does not occur on a bend of the boundary, this is probably wrong as well. Visible in the site visit, but surrounded by extensive modern field clearance. Comments: Undesignated site, and not considered for assessment of impact on setting.	UNK	364250 854050	Medium	No change	None	No change	None
51	Site	SMR No. NJ65NW0023	Upper Deuchries	Standing Structure	Remains of a Farmstead and mill pond that is depicted on the 1867 1st edition OS map. The map shows the Farmstead consisting of a L-shaped range of buildings and two rectangular ones. A mill dam and millpond lay immediately to the west and also appears on the 2nd edition sheet By the time of the 2nd edition map a west wing has been added to the range resulting in a U-plan. The southernmost building now has a small attached enclosure. The pond is still shown on current OS maps, although on recent aerial photographs appears to be an area of wet ground rather than waterfilled. The buildings are all roofed, the walls standing to various heights and in part reduced to footings. Visible on 1946 AP as a	PM	364372 855246	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					roofless structure. Visible during site visit as five roofless buildings, but walls standing to two storeys in places. Rubble and lime mortar construction. Sycamores and hawthorn form a shelter belt Comments: Undesignated site, and not considered for assessment of impact on setting.							
52	Site	SMR No. NJ65NW0020	Malcolmford	Documentary Record Only	Site of a now destroyed Croft that is depicted on the 1867 1st edition OS map but not on the 1888 2nd edition OS map. The map shows two small rectangular buildings, one of which is set within a garden. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364398 856120	Low	No change	None	No change	None
53	Site	SMR No. NJ65SW0049; NMRS No. NJ65SW49	Muirden of Cranna	Farmstead	NJ65SW 49 6458 5305 Farmstead still in use. On the 1st edition OS map it is shown as -Little Crannach-. It consists of possibly five buildings, one of which is a substantial L-shaped building, and two with attached enclosures, one to the north of the L-shaped building and the other within the court of the L-shaped building. To the west lies a pond with sluice, mill dam and possible mill building. By the 2nd edition OS map the pond and related features have been removed and the farm has its current name. The L-shaped building and the northern building with enclosure are still in use. A small building to the east of the L-shaped building is shown as disused. There is a small rectangular enclosure to the west of the farmstead, possibly the truncated remnant of the pond. The 2006 map shows that the L-shaped building and the northernmost building with an enclosure are still in use in modified condition. The site of the pond has not been redeveloped. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364560 853052	Low	No change	None	No change	None
54	Site	SMR No. NJ65NW0018	Crawford Hill	Standing Structure	Remains of a farmstead that is depicted on the 1867 1st edition OS maps. The 1st edition shows two rectangular buildings, the smaller probably the farmhouse. By the time of the 2nd edition a west wing	PM	364580 856527	Low	No change	None	No change	None

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					had been added to the range, resulting in an L-plan. This is now roofless, although the Cottage appears roofed on recent aerial photographs and maps. Comments: Undesignated site, and not considered for assessment of impact on setting.							
55	Site	SMR No. NJ65SW0050; NMRS No. NJ65SW48	Upper Crannabog	FarmHouse, Farmstead	NJ65SW 48 centred 6460 5416 Farmstead still in use. On the 1st edition OS map it is shown as a C-shaped steading with horse-mill attached to the north. To the north-west is another building and there are two possible small outbuildings to the east. To the immediate south-west of the steading is a disused building with attached rectangular enclosure. By the 2nd edition OS map all buildings except the steading have been removed. There is an additonal building to the south of the steading. The horse-mill and the enclosure have also been removed and there are two enclosures shown to the south-west of the steading. The 2006 map shows that the two buildings are still in use in modified condition. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364585 854162	Low	No change	None	No change	None
56	Site	SMR No. NJ65NW0019	Crawford Moss	Documentary Record Only	Site of a now destroyed rectangular building and enclosure that are depicted on the 1867 1st edition and 1888 2nd edition OS maps. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364628 856263	Negligible	No change	None	No change	None
57	Site	SMR No. NJ65NW0021	Malcolmford	Standing Structure	Remains of a Farmstead that is depicted on the 1867 1st edition OS map. It shows two rectangular buildings and a L-shaped one. The layout remained the same at the time of the 2nd edition map. In the 20th century another building, a House, was constructed to the north and the larger of the rectangular buildings was widened. Recent aerial photography indicate that the House remains roofed, although it appears to be disused. The remaining buildings are roofless. Comments: Undesignated site, and not considered for assessment	PM	364656 856107	Low	No change	None	No change	None

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					of impact on setting.							
58	Site	SMR No. NJ65SW0047	Sweerbog	Earthwork	Remains of two quarries. They are not shown on the 1st or 2nd edition OS maps, but are visible on vertical aerial photographs taken on 1977 and marked on the 2006 map. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364659 853419	Negligible	No change	None	No change	None
59	Site	SMR No. NJ65SW0036	Hillhead	Documentary Record Only	Site of a boundary stone that is depicted only the 2nd edition OS map. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364709 852384	Negligible	No change	None	No change	None
60	Site	SMR No. NJ65SW0035	Hillhead	Standing Structure	Boundary stone still in use which is shown on the OS maps from the 1st edition map onwards. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364769 852316	Low	No change	None	No change	None
61	Site	SMR No. NJ65NW0022	Kebholes	Standing Structure	The farmstead of Nether Deuchries is depicted on the OS map of 1867 as an almost rectangular steading with a central open court. A millpond lies immediately to the NW and another lies c350m to the west with a lade leading to the farm. To the south of the farm is another farmstead called Kebholes, which consists of an L-shaped building with a house and enclosure to the east. A millpond lies to the west with a lade leading to the farm. By the 1888 edition Nether Deuchries farmstead remains much the same, although the mill pond in the west has gone. The name has changed to Lower Deuchries. A house lies to the west of the farm. To the south Kebholes has been altered slightly with the addition of another small range at the northern end. The lead and pond are still in existence. Today only the pond at Kebholes appears to survive as a small stone walled enclosure through which a burn runs. None are visible at Deuchries. Visible on 1946 AP as a roofed structure The mill lead to the mill (in 1st Edition OS) was not apparent during the site visit, possibly due to vegetation coverage. Comments: Undesignated site, and not considered for assessment	PM	364781 855274	Low	No change	None	No change	None

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					of impact on setting.							
62	Site	SMR No. NJ65SW0048	Sweerbog	Earthwork	Remains of a quarry which is shown on the 1st and 2nd edition OS maps, but not on the 2006 map. It is visible on the vertical aerial photograph GIS overlay at the Aberdeenshire SMR and on vertical aerial photographs taken in 1977 where it shows signs of infilling. By the 2nd edition OS map it is marked as disused. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364861 853327	Negligible	No change	None	No change	None
63	Site	NMRS No. NJ65SW68	Sweerbog	Farmhouse, farmstead	NJ65SW 68 NJ6491 5341, Sweerbog It is possible that collection items DM1900/21 (Rowantree Steading and Dwelling House Alterations) relate to this site as it is depicted on the 1:10 560 OS 2nd edition (Banffshire XVI NE 1866-7 revision 1902) rather than to the site named Rowantree on that map. See NJ65SE 66 NJ6509 5335, Rowantree (AC January 29 2001). Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364910 853410	Low	No change	None	No change	None
64	Site visit		Newlands Croft	Dyke and ditch	Dyke and ditch identified running towards the NNE adjacent to the croft of Newlands (RSK Site 47) along farmer's track Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364121 854443	Negligible	Moderate	None	No change	None
65	Site	SMR No. NJ65SE0073	Muirden of Cranna	Documentary Record Only	Site of a now removed -Pile of Stones- which is shown only on the 1st edition OS map. It probably have formed part of the former parish boundary between Marnoch on the west and Forglen on the east. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365026 852844	Negligible	No change	None	No change	None
66	Site	SMR No. NJ65NE0050	Burngrains	Documentary Record Only	Site of a now destroyed Croft that is depicted as being roofless on the 1867 1st edition OS map. It shows a single rectangular building. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365062 855846	Low	No change	None	No change	None

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67	Site	NMRS No. NJ65SE66	Rowantree	Farm	NJ65SE66 6509 5335 Rowantree is depicted as a single roofed building on 2nd Edition (1866-7,1902 revision) 1:10 560 Banffshire XVI NE, but does not appear on the current 1:10 000 map. It is possible that the collection items DM1900/21 relate to the nearby Farm, Sweerbog. See NJ65SW68 NJ6491 5341 Sweerbog. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365090 853350	Low	No change	None	No change	None
68			Gushetbog Croft	Possible quarry	Possible former site of a shallow quarry scoop dug into the side of Black Law adjacent to the track leading to Gushetbog Croft (RSK Site 42). Its location suggests it was used for building stone for the structures in the immediate vicinity, or building and maintaining the farmer's track. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363989 855000	Negligible	Major	None	No change	None
69	Site	SMR No. NJ65SE0040; NMRS No. NJ65SE45	East Woodside	Standing Structure	Remains of a ruined Farmstead. It is shown on the OS 1st and 2nd edition maps as an L-shaped and a rectangular building. The smaller building has since been removed and only the L-shaped building appears on the current OS map. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365109 852498	Low	No change	None	No change	None
70	Site	SMR No. NJ65NE0066	Drywell	Documentary Record Only	Site of a now destroyed Croft that is depicted on both the 1867 1st edition and the 1888 2nd edition OS maps. They show two rectangular buildings, one of which has a horse-gang, and the other an attached rectangular enclosure. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365167 856426	Low	No change	None	No change	None
71	Site	SMR No. NJ65SE0060	Ludoyvalley	Documentary Record Only	Site of a now destroyed Croft that is depicted on the 1867 1st edition OS map. It shows two rectangular buildings and a rectangular enclosure.	PM	365172 852805	Low	No change	None	No change	None

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					Comments: Undesignated site, and not considered for assessment of impact on setting.							
72	Site	SMR No. NJ65SE0080	Sweerburn	Documentary Record Only	A boundary stone is depicted on the first edition OS map of 1867, but is not depicted on later editions. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365233 853401	Negligible	No change	None	No change	None
73	Site	SMR No. NJ65NE0065	Drywell	Documentary Record Only	Site of a now destroyed Croft that is depicted on the 1867 1st edition OS map. The map shows a L-shaped building with an attached rectangular enclosure and a small rectangular building to the east. By the 1888 2nd edition map the two buildings have become one U-shaped range. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365303 856558	Low	No change	None	No change	None
74	Site	SMR No. NJ65NE0051	Burngrains	Documentary Record Only	Remains of two mill leads that are depicted on the 1867 1st edition OS map. It also shows a small mill pond and sluice which are now destroyed. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365332 855779	Low	No change	None	No change	None
75	Site	SMR No. NJ65NE0099	North Burngrains	Standing Structure	The Croft is still in use. It is depicted on the 1st edition OS map of 1867 as 2 rectangular perpendicular buildings forming an L-shape open to the south with an attached enclosure to the south and wells to the north and south. On the 2nd edition of 1888, the wells are not depicted. The original buildings appear to survive. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365381 855890	Low	No change	None	No change	None
76	Site	SMR No. NJ65SE0084	Sweerburn	Standing Structure	A Farmstead is depicted on the first edition OS map of 1867 as 2 rectangular buildings forming an L-plan, with small building to the east and a small Farmhouse with attached enclosure to the south. By the second edition, a U-shaped steading open to the east has replaced the earlier buildings. This has since been considerably enlarged or replaced.	PM	365409 853705	Low	No change	None	No change	None
77	Site	SMR No.	Nether	Standing	A Farmstead is depicted on the first edition OS map of 1867 as a T-	PM	365436	Low	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NJ65SE0085	Crannabog	Structure	shaped steading with additional small building to the east and enclosure to the southwest. By the second edition of 1888, the main building has been replaced by a square steading with open courtyard and entranceway at the southeast corner; the other buildings have been removed and a new building has been added in the enclosure. The second phase buildings appear to survive, with additions to the north and east. Comments: Undesignated site, and not considered for assessment of impact on setting.		853957					
78	Site	SMR No. NJ65SE0081	Sweerburn	Standing Structure	A roadside milestone showing Aberdeen 40 miles is depicted on the second edition OS map, and is depicted on the current edition (2006). Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365449 853457	Low	No change	None	No change	None
79	Site	SMR No. NJ65NE0067	Drywell	Documentary Record Only	Site of a now destroyed rectangular building that is depicted on both the 1867 1st edition and the 1888 2nd edition OS maps. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365531 856264	Low	No change	None	No change	None
80	Site	SMR No. NJ65SE0075	Craigaithry Wood	Earthwork	Remains of Rig & Furrow and a field bank which are visible on vertical aerial photographs taken in 1976. The rigs run roughly SW-NE apart from a small patch at the north-west corner which runs E-W. A possible field bank is also visible at the south-east of the former wooded area which is shown as woodland on both the 1st and 2nd edition OS maps. Comments: Undesignated site, and not considered for assessment of impact on setting.	MED/PM	365557 854488	Low	No change	None	No change	None
81	Site	SMR No. NJ65SE0082	Sweerburn	Documentary Record Only	A quarry, labelled as an 'Old' quarry is depicted on the second edition OS map of 1888, but not on the current edition. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365579 853224	Negligible	No change	None	No change	None
82	Site	SMR No.	Whitefield	Documentary	Site of small Croft depicted on the first edition OS map of 1867, but	PM	365584	Low	No change	None	No change	None

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		NJ65SE0083		Record Only	not on later editions. Comments: Undesignated site, and not considered for assessment of impact on setting.		853466					
83	Site	SMR No. NJ65SE0077	Burnside of Whitefield	Documentary Record Only	Site of an enclosure and buildings which are shown only on the 1st edition OS map. It is depicted as two small rectangular buildings and a square enclosure. They may possibly represent a mill as the westernmost building appears to be connected to the lade which runs to the south. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365692 853504	Low	No change	None	No change	None
84	Site	SMR No. NJ65SE0076	Craigaithry Wood	Documentary Record Only	Site of a now destroyed sub-oval sheepfold which is shown only on the 1st edition OS map. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365758 854240	Negligible	No change	None	No change	None
85	Site	SMR No. NJ65SE0079	Boghead	Standing Structure	Farmstead still in use which is shown on the OS maps from the 1st edition map onwards. On the 1st edition map it is depicted as a compact L-shaped building with enclosure attached to the south front and two rectangular buildings. By the 2nd edition map the two rectangular buildings have been joined to form a large L-shaped building. The 2006 map shows that the small L-shaped building survives. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	365816 853332	Low	No change	None	No change	None
86	Site	SMR No. NJ65SE0078	Burnside of Whitefield	Standing Structure	Farmstead still in use which is shown on the OS maps from the 1st edition map onwards. On the 1st edition map it is depicted as having a square formal garden, to the west are an L-shaped building and a small rectangular building with an enclosure to the north. Further to the south-west are a long rectangular building and a pond with mill dam and sluice. By the 2nd edition map the long rectangular building has been removed and the L-shaped building has had a west wing added, making it a C-shaped steading with the court open to the south. The 2006 map shows that the steading has been	PM	365849 853455	Low	No change	None	No change	None

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					roofed over and further extended and that the pond has been drained, but the site has not been redeveloped. Comments: Undesignated site, and not considered for assessment of impact on setting.							
87	Map regression		Black Law	Earthwork	Remains of a former quarry detailed in the OS 1st Edition map. Visible in APs as an oval earthwork in field shown in AP OS63-165 021. Earlier APs (pre-1963) show rough grazing or unimproved pasture. 021 appears to show the field as recently cleared of overgrowth. Shown in a similar state on subsequent APs, e.g. OS68-212 319. Site visit identified it as an overgrown circular depression in the west-facing side of Black Law of approximately 12m diameter. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363780 854320	Low	Major	Slight	No change	None
88	Site visit		Hill of Deuchries	Cropmark	North to South oriented parallel cultivation marks visible on the south-eastern slope of Hill of Deuchries (Plot 15) when viewed from the south. Likely recent arable cultivation or ploughing, possibly overlaying earlier rig and furrow Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	364000 855220	Low	No change	None	No change	None
89	SM	SM No.342; NMRS No. NJ55SE6	Marnoch Church, standing Stones	Standing Stone(s), Stone circle (possible)	NMRS entry records the following: The standing stone (St Marnan's Chair), situated on top of a hill within the walled churchyard, is almost certainly all that remains of a stone circle, probably one of the pillar stones of a recumbent stone circle centred to the NE where the church stands. The standing stone to the N is obviously not in its original position. Visited by OS (NKB) 22 January 1968. Comments: Within ZTV, but no visibility of turbines from SM due to local masking by trees and churchyard wall. Welfare (2011) discounts the stone as forming part of a recumbent stone circle. No change to the setting of the receptor from the Development.	BA	359708 850230	High	No change	None	No change	None

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90	SM	SM No.2131; NMRS No. NJ65SW3	White Stone, medieval land boundary, Whitemuir Farm	Stone	NMRS entry records the following: The White Stone, White muir, is a block of white quartz, 2ft 7ins high, roughly hexagonal in plan, and 12ft in girth. Traditionally it covers a hoard of gold. Scheduled: medieval land boundary. F R Coles 1906. This Stone is as described above. Many smaller stones, from field clearance, have been dumped around it. Resurveyed at 1/2500. Visited by OS (WDJ) 15 September 1964. Comments: Prominent site within its immediate surroundings. The setting of the monument consists of its immediate surroundings. No vistas to relevant contemporary monuments (e.g. other medieval boundary stones) were identified within Study Area B, and it is unclear from the available evidence what boundary the stone defines, as it does not lie on a parish boundary. Altered cultural setting due to dumping of field clearance around the monument. The windfarm, located 5.4km to the northeast, will not detract from the receptor's prominence. Development introduces elements that could be visible but not intrusive in views, and do not significantly affect the overall quality of the setting of the receptor. A slight cumulative impact is also predicted (see chapter).	MED	360109 851101	High	No change	None	Negligible; negligible cumulative impact	Slight; Slight cumulative impact
91	SM	SM No.346; NMRS No. NJ65SW4	Bellman's Wood, Stone circle	Recumbent stone circle	NMRS entry records the following: Bellman's Wood. The E Pillar of this stone circle remains on its original site but it is inclined to the SSE. The W Pillar is prostrate and there is a space for a Recumbent Stone of nearly 10ft in length. There are 5 other blocks of stone but none is large enough to have been one of the Standing Stones of the circle. As a dike runs within 20ft of the circle it is probable that most of the circle stones have been used in building it. Though the rest of the stones must have been to the N of the present remains, there are no surface indications of their positions, so removal at a distant date may be presumed. F R Coles 1906.	BA	360468 850430	High	No change	None	Negligible	Slight

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					The remains of this stone circle consist of two large stones described by Coles (1906) as the E and the W pillars. The E pillar is c.1.6m high and almost square, measuring 0.8m x 0.7m. The prostrate W pillar is 2.3m long by 1.6m broad and 0.8 high. Many smaller stones lie around these two stones but are almost certainly field stones. No likely stones were seen in the stone dyke to the South of the circle, most of it being hidden by an earthen bank. Re-Surveyed at 1/2500. Visited by OS (WDJ) 15 September 1964. The 'E pillar' has now fallen. Another smaller earthfast stone 4.0m NW of the 'W pillar' may not be in situ. The 'W pillar' has certainly been displaced, and there is now no evidence that it and the 'E pillar' have been flankers to a recumbent stone. Visited by OS (NKB) 24 August 1967. Comments: Recumbent stone circle, in a much-degraded condition, located in a prominent position on a hilltop adjacent to Bellman's Wood. Nearest turbine is located 5.6km to northeast. The area from which it is visible defines the extent of the setting of the monument, but this has been affected by the construction of a drystone wall field boundary around the south and east of the monument. Views to the southern sky (between where two flanking stones formerly sat) and to contemporary monuments in the vicinity, such as the standing stones at Marnoch Church (RSK Site 89), located 0.8km to the southwest. Visibility of the Development to the northeast will not detract from the prominence of the monument in its landscape, does not intrude on key views, and does not impact on its setting.							
92	SM	SM No.11034; NMRS No. NJ66SE6	Hill of Alvah, cairns 1350m WSW of Mill of Alvah	Cairn(s) (Bronze age)	NMRS entry records the following: Two large tumuli or mounds of earth and stones: one still remains entire but a large quantity of stone has been removed from the other although the foundation still remains. Nothing of antiquarian interest has been found in the latter. Name Book 1867.	PREH	366522 860176	High	No change	None	No change; Negligible cumulative impact	None; Slight cumulative impact

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					Situated on the west shoulder of the Hill of Alvah at NJ 6656 6018 is a large grass covered mound of earth and small stones. It measures c.16.0m in diameter and has a maximum height of c2.0m. The top of the mound is level and slightly hollowed and measures c.70 x c6.0m. Several large stones protrude from the SE side of the mound. No evidence of a cist or a kerb was seen. Situated at NJ 6649 6017 are the mutilated remains of a probable cairn. The cairn has been almost completely cleared out and all that remains is a mutilated area c 20.0m in diameter with traces of stones here and there. No evidence of a cist or kerb was seen. Visited by OS (WDJ) 3 October 1961. Comments: Pair of cairns lying on the western shoulder of Hill of Alvah, with the nearest Development turbine located 5.6km to the south-southwest. It shares its setting with Stirling Cairn (RSK Site 93), located 0.7km to the E, and is prominent within the landscape. The existing Strath of Brydock wind farm lies 0.9km to the southwest, creating a heavily altered cultural landscape. The setting of the monument consists of the extent of the scheduled area, views across to Stirling Cairn (RSK Site 93), and the area surrounding the monument, extending to the immediate surrounding hills of Alvah, Itlaw, Firfold and Boyndie. Visibility of the Development will not detract from the prominence of the monument in its landscape does not intrude on key views, and does not impact on its setting. Development introduces elements that could be visible but not intrusive in views, and do not affect the overall quality of the setting of the receptor. Cumulative impacts are addressed in the ES chapter.							
93	SM	SM No.11035; NMRS No. NJ66SE1	Stirling Cairn, cairn 750m SW of Mill of Alvah	Long Cairn (Neolithic)	NMRS entry records the following: On the eastern brow of the hill of Alvah there is a large tumulus or cairn, of small stones and earth. It is of an elliptical form, covering an area of about 20 falls, and about 7 or 8 feet high in the centre. 'It has never been sufficiently opened to disclose any remains of antiquity', New Statistical Account (NSA) 1845.	NE	367287 860162	High	No change	None	No change	None

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					All that remains of this cairn is a mutilated hollowed-out mound about 19.0m in diameter and about 1.2m in height. The mound consists of earth and stones, now covered with turf and gorse. Some large stones can be seen protruding from the side of the mound and two earthfast stones on the SW side may be part of a kerb. There is no sign of a cist. Visited by OS (WDJ) 3 October 1961. Stirling Cairn, apparently a long cairn, c.64.0m long, and orientated N-S. The most well-preserved part of the cairn is as described by Johnston, and gives the appearance of a round cairn. However, attached to, and extending N from this is a much reduced ridge which tapers to a minimum width of c.7.0m and a height of 0.3m at its N extremity. The plough has revealed a sandier soil and a slightly heavier stone content than in the surrounding area. No finds are known; the name is still known locally. Revised at 1/2500. Visited by OS (NKB) 31 January 1968. This monument is situated on the eastern brow of a hill at an altitude of 145m OD. [Air photograph: AAS/86/04/S6/10, flown 20 August 1986]. NMRS, MS/712/36. Comments: Outwith ZTV							
94	SM	SM No.343;NMRS No. NJ65SE1	North Burreldales, Stone circle	Stone circle	NMRS entry records the following: There are four stones of this circle still in situ and the term 'Site of' on the Ordnance map is misleading. All stones are of grey granite and the S stone, 'A', has fallen inwards. The diameter N-S from this stone would be 21ft and the E-W diameter 20ft. The W stone, 'B', is 3ft 4ins high and leans slightly inwards. The N stone, 'C', is vertical and the same height. The E stone, 'D', is less regular and only 1ft 9ins clear of the ground. Near the S stone are several comparatively small blocks of stone. The whole of the interior shows evidence of having been disturbed.	BA	367590 854916	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					F R Coles 1906. The remains of the stone circle are as described above. Dimensions of stones using Coles (1906) lettering are: 'A' 0.9m high 1.0m long 0.4m thick (fallen). 'B' 1.1m high, 1.2m. long 0.4m thick. 'C' 0.9m high 1.0m long 0.5m thick. 'D' 0.5m high 0.9m long 0.2m thick. Revised at 1/2500. Visited by OS (WDJ) 18 September 1964. The small diameter of the circle, suggests the kerb of a ring-cairn rather than a stone circle. No other remains exist. Revised at 1/2500. Visited by OS (NKB) 24 August 1967. '4-Poster'. Information contained in letter from H A W Burl (AO/SC/X/B) 24 November 1970. Comments: Outwith ZTV							
95	SM	SM No.5780; NMRS No. NJ75SW26	Boghead, souterrain & settlement 400m SSE of	Ring ditch(s), settlement, souterrain	NMRS entry records the following: Souterrain, visible as a cropmark in an arable field 400m SSE of Boghead. Other cropmarks near the souterrain may indicate further broadly contemporary remains. Information from Historic Scotland, November 1993. (Location cited as NJ 701 543). Air photography (AAS/94/17/G34/14-15 and AAS/94/17/G35/1-9) has recorded ring-ditches. NMRS, MS/712/21. (Location cited as NJ 701 543) Air photography (AAS/82/13/R16/8-9 and AAS/89/06/S18/5-12) has recorded the cropmarks of a field-system (to the S of the burn) and a ring-ditch (to the N) in arable ground on a slight SW-facing spur at an altitude of about 60m OD.	IA	370036 854357	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					NMRS, MS/712/36. Comments: Subsurface remains only.							
96	HDGL and LB Category B	LB No.19612; HDGL No. 363; NMRS No. NJ55SE50	Marnoch, old Manse of Marnoch with Outbuildings and garden walls	garden wall, Manse, outbuilding	LB entry records the following: 1805, additions and alterations by A and W Reid of Elgin, 1867. 2-storey, 3-bay manse with attic and raised basement, with 1-bay addition to E extending in rear wing to N by A and W Reid, 1867. Squared and coursed sandstone rubble with galleting, stugged ashlar dressings, stone mullions to bipartites. For Marnoch, Old Parish Church (NJ 5970 5021), see NJ55SE 48. Comments: Outwith ZTV	PM	359400 850090	High	No change	None	No change	None
97	Candidate HDGL	SMR No. NJ65SE0030; NMRS No. NJ65SE30	Forglen House	Garden	HER entry records the following: Mansion house with walled garden. The house was designed by James Smith of Aberdeen; circa 1840. It is a 3-storey Tudor mansion built on site of, and possibly incorporating, an earlier house. Lying to the north-west of the house is a late 19th century walled garden. It is almost square in perimeter (approx 15 x 15m) compartmented with E-W dividing wall of ashlar coped rubble whinstone approx 3m high. There are lean-to rubble potting sheds to outer side of N wall and lean-to greenhouses to innerside. A round-arched gateway is in the centre of dividing wall in ashlar panel and Turriff sandstone ashlar with a moulded surround, keystone flanking pilasters and cornice. Cast and wrought-iron gates to S. (Listed C(S)). To the east of the house is a memorial standing in the middle of a field. It commemorates members of the Abercromby family who died in different wars, campaigns and also includes one member of the family who drowned when the Lusitania sank in 1915. Comments: Outwith ZTV	PM	369772 851931	Medium/ High	No change	None	No change	None
98	LB Category	LB No.19597;	Park	Country house	LB entry records the following:	MED	358903	High	No change	None	No change;	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	A	NMRS No. NJ55NE8			Much extended and altered house, with complex building history; 16th century Z-plan tower as core, with additions made throughout the 18th and 19th centuries in various styles. 3-storey, with vaulted basement, and attic. Currently H-plan with symmetrical advanced gables to N front, classical centre front regrettably demolished in late 1970s. Main entrance currently to NW. Harled with ashlar dressings. NJ 589 571 A watching brief was maintained in January 2003 while two small squares were excavated in the ground floor of the W wing of the building, now known as Castle of Park, in order to insert new roof supports. The mansion originated in 1292, was rebuilt as a Z-plan tower house in 1563, was extended in 1723, and again in the 19th century. A small section of stone flag flooring was uncovered in the square on the S side of the room, which pre-dated the 19th-century extension. No other archaeological features or finds were evident. Archive to be deposited in the NMRS. Sponsor: Mr Bill Breckon. J C Murray 2003 ARCHITECT: Archibald Simpson c.1822 Comments:LB lies within extensive woodland estate of mature deciduous forestry, which provides extensive masking of the Development from the receptor. No change to the setting of the receptor from the Development.		857142				low	
99	LB Category A	LB No.19602; NMRS No. NJ55SE10	Crombie Castle	Tower house	NMRS entry records the following: Crombie Castle is basically an L-shaped 16th century tower-house, which has been modified and enlarged probably in the 17th century, with modern additions. Visited by OS (NKB) 22 January 1968. Comments: Outwith ZTV	PM	359102 852250	High	No change	None	No change	None
100	LB Category A	LB No.19610; NMRS No. NJ54NE3	Marnoch graveyard with watchhouse,	Burial ground, Church	NMRS entry records the following: For Marnoch, Old Parish Church (NJ 5970 5021), see NJ55SE 48.	EME-PM	359491 849928	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
			burial enclosures and gravestones.		For Aberchirder, New Marnoch Parish Church (NJ 6288 5262), see NJ65SW 35. (NJ 5949 4992) St Marnoch's Church (NR) (Site of) OS 6" map, Banffshire, 2nd ed., (1904) St Marnoch's Church (NR) (Remains of) (Rectangular pecked enclosure shown) OS 6" map, Banffshire, 1st ed., (1867) The remains still to be seen in the old Churchyard consist of a small portion of what appears to have been a side door which must have been a comparatively modern addition to the original structure. There are no records of the original building extant prior to the date of the Reformation, but it has passed thro' several changes, being first a Roman Catholic place of worship, next Episcopalian and latterly Presbyterian. St Marnoch is buried in the churchyard. (Traditional belief.) Name Book 1867. 'The church is very old and in ruinous condition.' Statistical Account (OSA) 1791-9. 'This church was dedicated to St Marnan , who was buried here about the middle of the seventh century and here his relics were preserved, and were the object of pilgrimages till the sixteenth century (information from De. Scotor Fortitudine, p108-9)...Just beneath the church is St Marnan's Ford (NJ 599 498) and on a hill hard by is, or was, a stone called Saint Marnan's chair (Spalding Club 1843). (See NJ55SE 6). J Stuart 1859; Spalding Club 1843. No trace of any foundations could be found and the 'remains' would appear to be part of a burial enclosure to the West of the siting symbol on the OS 25" map. Visited by OS (JTT) 11 September 1964.							

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					No change Visited by OS (NKB) 16 January 1968. Comments: Outwith ZTV							
101	LB Category A	LB No.19606; NMRS No. NJ64NW1	Kinnairdy Castle with outbuildings	Castle, motte and bailey, outbuilding(s)	NMRS entry records the following: Kinnairdy Castle was first a motte and bailey, the bailey being formed by what is now the long lawn. A small structure, possibly a tower, occupied the highest point of the motte, and is now encased within the internal masonry of the tower. It was surrounded by a curtain wall with a high arched entrance in the NW corner. The outline of this arch is still seen in the W wall of the tower. The second stage in development was a six-storey tower with a flat battlemented roof occupying the NW corner of the enclosure and erected about 1420. In 1725 the two upper storeys of the tower were removed, with the battlements, and crow-stepped gables substituted. 'The Palace', as the building stretching east from the tower is described in 18th century and subsequent title deeds, may date from about 1500, although it may be later. Doorways in the E gable, as well as foundations inside, suggest that it extended eastwards. The S and E curtain-walls have been demolished and the N curtain has been replaced by a garden wall. The W curtain still exists to a height of about 10ft, and the remains of it can be traced, circling the motte towards the Castleton cottage at the W extremity of the steading. The massive walling forming the rear portion of the dairy at the W end of the steading, is probably part of the E wall of the Gate House. T Innes 1939. Kinnairdy Castle is as described above. Above the door of the low building abutting the E side of the tower is the date of renovation, '1935'. At NJ 6087 4975 are the ruins of a dovecot, 4.5m square. The interior is lined with brick pigeon-boxes, and the dove-cot may be early-18th century. Revised at 1/2500.	MED	360892 849812	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Visited by OS (WDJ) 16 September 1964. Comments: Kinnairdy castle is located within the ZTV, within low-lying ground adjacent to the confluence of the Burn of Auchintoul and the River Deveron. There is thick tree cover around the monument's north and northeast side along the banks of the burn. The setting of the monument consists of the extent of the scheduled area and the castle's surroundings, including a shared setting with the dovecot and walled garden (RSK Sites 118 and 119) to the south. The nearest turbine lies 5.7km to the northeast, and visibility of a single turbine tip are likely to be extensively screened by local vegetation. No impact on the monument's setting is predicted.							
102	LB Category A	LB No.3049; NMRS No. NJ66SE2	Inchdrewer Castle	Tower house	NMRS entry records the following: Inchdrewer Castle: standing structure on gentle slope at 104m OD. Built c. 1542, remodelled 1557, destroyed by fire 1713; rebuilt 20th century and now restored. L-shaped tower of c. 1542. In the late 16th century a round tower containing a staircase was added to the S and a long row of buildings on the N and S of the courtyard. The entrance door was originally in the re-entrant angle but during the remodelling period this was changed to the W so as to front the courtyard. The projecting tower at the SW angle of the courtyard has shotholes each provided with three openings. There was probably a similar tower at the NW angle of the courtyard. Air photograph: AAS/77/11/SQ/37, flown 17 August 1977. NMRS, MS/712/35. Comments: Outwith ZTV	PM	365598 860714	High	No change	None	No change	None
103	LB Category A	LB No.2888; NMRS No. NJ65NE22	Dunlugas House	Country House	LB entry records the following: Dated 1793, with earlier house dated 1680, adjoining at irregular angle to rear. Work by John Smith of Aberdeen, circa 1820. Interior work by John Fowler, circa 1965. 1680 House: orientated E-W; 2-storey, 4 irregular bays, with later	PM	369560 855491	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					piend-roofed additional bay to E, adjoined to 1793 house at W with cluster of 19th century linking blocks. Harled, with Turriff red sandstone margins; chamfered reveals. Door to S, windows flanking at ground, windows at 1st floor close under eaves. 4 windows to each floor at rear, mostly enlarged. Garages inserted in piend-roofed addition. 1793 House: 2-storey raised over basement, 5-bay. Squared and coursed whinstone with galletting, suggesting block and sneck pattern; polished red and cream sandstone dressings; band course, eaves course, raised margins, rusticated quoins. Comments: Outwith ZTV							
104	LB Category B	LB No.16029; NMRS No. NJ55SE25	Ardmeallie walled garden with summerhouse and sundial	Walled garden, summerhouse	LB entry records the following: 18th century. Walled garden with summerhouse, approximately 30m x 40m. Harl-pointed rubble. Pyramidal roofed rectangular-plan. Gothick summerhouse set into N wall; door at ground floor, pointed arched windows at 1st floor, red pantiles, lean-to potting shed at rear. SUNDIAL: detached, copper dial with inscription, gnomon of interlocking circular copper strips forming hollow globe. Reset on granite pedestal. Comments: Within ZTV, but shelter belt of coniferous forestry to the east of the receptor masks the Development. No change to the setting of the receptor is predicted from the Development.	PM	359059 850683	High	No change	None	No change	None
105	LB Category B	LB No.19603; NMRS No. NJ55SE25	Culvie with steading and walled garden	Walled garden, steading	LB entry records the following: Steading: to W, mid 19th century. Cartshed and granary L-plan range, with dovecot, piend-roofed cattle courts to W. Comments: Within ZTV, but shelterbelts of deciduous forestry to the east of the receptor mask the Development. No change to the setting of the receptor is predicted from the Development.	PM	359081 853701	High	No change	None	No change	None
106	LB Category	LB No.16028;	Ardmeallie	House	LB entry records the following:	PM	359087	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	B	NMRS No. NJ55SE25	House with steading range, Coachhouse, boundary walls and gatepiers		Boundary walls and gatepiers: Rubble garden walls, and ashlar gatepiers to N, corniced with ball finials. Comments: Within ZTV, but shelterbelt of coniferous forestry to the east of the receptor masks the Development. No change to the setting of the receptor is predicted from the Development.		850611					
107	LB Category B	LB No.16028; NMRS No. NJ55SE25	Ardmeallie House with steading range, Coachhouse, boundary walls and gatepiers	House	LB entry records the following: Coachhouse:to N of house. Single storey, with segmental arch to W gable, ashlar belfry above with weathervane. Comments: Within ZTV, but shelter belt of coniferous forestry to the east of the receptor masks the Development. No change to the setting of the receptor is predicted from the Development.	PM	359087 850672	High	No change	None	No change	None
108	LB Category B	LB No.16028; NMRS No. NJ55SE25	Ardmeallie House with steading range, Coachhouse, boundary walls and gatepiers	House	LB entry records the following: House: Circa 1750, with additions by A Marshall Mackenzie, 1900. 2-storey, 5-bay lairds house with raised basement, pienided roof. Coursed whinstone rubble with galleting, probably formerly harled. Raised granite ashlar margins, rusticated quoins, modillioned cornice. Basement and rear harled. Comments: Within ZTV, but shelterbelt of coniferous forestry to the east of the receptor masks the Development. No change to the setting of the receptor is predicted from the Development.	PM	359104 850621	High	No change	None	No change	None
109	LB Category B	LB No.19603; NMRS No. NJ55SE26	Culvie with steading and walled garden	Farmhouse	LB entry records the following: 17th century, with later additions. 2-storey and attic farmhouse, of 4-irregular bays, probably incorporating earlier house. Harled, ashlar margins droved to front, chamfered reveals to sides and rear. Comments: Within ZTV, but shelterbelts of deciduous forestry to the east of the receptor mask the Development. No change to the setting of the receptor is predicted from the Development.	PM	359135 853692	High	No change	None	No change	None
110	LB Category B	LB No.19603; NMRS No.	Culvie with steading and	Farmhouse	LB entry records the following:	PM	359140 853704	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NJ55SE26	walled garden		17th century, with later additions. 2-storey and attic farmhouse, of 4-irregular bays, probably incorporating earlier house. Harled, ashlar margins droved to front, chamfered reveals to sides and rear. Comments: Within ZTV, but shelterbelts of deciduous forestry to the east of the receptor mask visibility of the Development. No change to the setting of the receptor is predicted from the Development.							
111	LB Category B	LB No.19603; NMRS No. NJ55SE26	Culvie with steading and walled garden	Farmhouse	LB entry records the following: 17th century, with later additions. 2-storey and attic farmhouse, of 4-irregular bays, probably incorporating earlier house. Harled, ashlar margins droved to front, chamfered reveals to sides and rear. Comments: Within ZTV, but shelterbelts of deciduous forestry to the east of the receptor mask the Development. No change to the setting of the receptor is predicted from the Development.	PM	359146 853691	High	No change	None	No change	None
112	LB Category B	LB No.19603; NMRS No. NJ55SE26	Culvie with steading and walled garden	Walled garden/ summerhouse	LB entry records the following: Walled garden: 18th century; squared and pinned rubble with turf coping, approximately 70m x 25m, rounded corners to S. Octagonal, slated summerhouse to S wall. 18th century wrought-iron gates. Comments: Within ZTV, but shelterbelts of deciduous forestry to the east of the receptor mask visibility of the Development. No change to the setting of the receptor is predicted from the Development.	PM	359163 853623	High	No change	None	No change	None
113	LB Category B	LB No.19603; NMRS No. NJ55SE26	Culvie with steading and walled garden	Walled garden/ summerhouse	LB entry records the following: Walled garden: 18th century; squared and pinned rubble with turf coping, approximately 70m x 25m, rounded corners to S. Octagonal, slated summerhouse to S wall. 18th century wrought-iron gates. Comments: Within ZTV, but shelterbelts of deciduous forestry to the east of the receptor mask the Development. No change to the setting of the receptor is predicted from the Development.	PM	359164 853640	High	No change	None	No change	None
114	LB Category	LB No.19611;	Marnoch, old	Church,	NMRS records the following:	PM	359706	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	B	NMRS No. NJ55SE48	church with retaining wall, standing stones and mounting block	mounting block	For (predecessor) Marnoch, Old Parish Church and Burial-ground (NJ 5949 4992), see NJ54NE 3. For adjacent standing Stones, see NJ55SE 6. For old Manse of Marnoch (NJ 5938 5006), see NJ55SE 50. For (successor) Aberchirder, New Marnoch Parish Church (NJ 6288 5262), see NJ65SW 35. Comments: Located on a hilltop overlooking the River Deveron, the setting of the old church and retaining walls consists of the LB's cartilage and its immediate surroundings, including shared views to the southwest to the Manse garden (RSK Site 96). The church sits within an altered cultural landscape, with the farmstead of Cairnhill located immediately to the northeast. The receptor lies within the ZTV of the Development, but no change in the setting of the receptor is predicted from the Development.		850222					
115	LB Category B	LB No.19611; NMRS No. NJ55SE48	Marnoch, old Church with retaining wall, standing stones and mounting block	Church, mounting block	NMRS records the following: For (predecessor) Marnoch, Old Parish Church and Burial-ground (NJ 5949 4992), see NJ54NE 3. For adjacent standing Stones, see NJ55SE 6. For old Manse of Marnoch (NJ 5938 5006), see NJ55SE 50. For (successor) Aberchirder, New Marnoch Parish Church (NJ 6288 5262), see NJ65SW 35. Comments: See RSK Site 114 above.	PM	359709 850199	High	No change	None	No change	None
116	LB Category B	LB No.19613; NMRS No. NJ55SE49	Marnoch, old schoolhouse	school	Early 19th century. 2-storey, 3-bay former schoolhouse, harled with ashlar margins. Comments: Outwith ZTV	PM	359771 850033	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
117	LB Category B	LB No.15609; NMRS No. NJ64NW21	Bridge of Marnoch (over River Deveron)	Road bridge	NMRS records the following: For adjacent tollhouse (NJ 6045 4946), see NJ64NW 20. (Location cited as NJ 604 495). Early 19th century. A 2-arch masonry bridge with dressed-stone voussoirs and rubble spandrels and wing walls. The larger arch is segmental, the smaller semicircular. J R Hume 1977. This Bridge carries the public road (A 97) from Huntly to Banff across the River Deveron, which here forms the boundary between the parishes of Rothiemay (Moray District) and Marnoch (Banff and Buchan District). Information from RCAHMS (RJCM), 2 May 1996. Comments: Low-lying bridge, with distant, glimpsed visibility of single turbine possible, although local vegetation may provide further masking. No change to the setting of the receptor is predicted from the Development.	PM	360467 849513	High	No change	None	No change	None
118	LB Category B	LB No.19607; NMRS No. NJ64NW1	Kinnairdy Castle, dovecot and walled garden	dovecot	NMRS entry records the following: At NJ 6087 4975 are the ruins of a dovecot, 4.5m square. The interior is lined with brick pigeon-boxes, and the dove-cot may be early-18th century. Revised at 1/2500. Visited by OS (WDJ) 16 September 1964. No change. Visited by OS (RL) 16 January 1968. Comments: Outwith ZTV	PM	360875 849760	High	No change	None	No change	None
119	LB Category B	LB No.19607; NMRS No. NJ64NW1	Kinnairdy Castle, dovecot and walled garden	Walled garden	LB entry records the following: Walled garden: remains of contemporary, (17th-century) rubble walls now ruinous, enclosing small area, adjoining dovecot.	PM	360885 849750	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Outwith ZTV							
120	LB Category B	LB No.16020	Auchintoul, South Lodge with gates and gatepiers	Lodge	LB entry records the following: Circa 1800. Octagonal-plan, single storey gate lodge; harled with ashlar margins, base course and eaves course. 2-leaf boarded door to W, window to each elevation; blocked to S. Comments: Within ZTV, but shelterbelts of deciduous forestry surrounding the receptor mask the Development. No change to the setting of the receptor is predicted from the Development.	PM	361209 851532	High	No change	None	No change	None
121	LB Category B	LB No.16033	Auchintoul, Mill of Auchintoul	Mill	LB entry records the following: 1848. 2-storey, 5-bay former sawmill, built into rising ground. Squared and coursed rubble, stugged ashlar dressings. Comments: Within ZTV, but a shelterbelt of deciduous forestry to the north of the receptor masks the Development. No change to the setting of the receptor is predicted from the Development.	PM	361236 851418	High	No change	None	No change	None
122	LB Category B	LB No.16030; NMRS No. NJ65SW7	Auchintoul with courtyard walls	Castle, tower	NMRS records the following: The older part of Auchintoul House dates from about the 16th century. The walls of this part are immensely thick and strong. The Eastern wing of the House was built in 1711-12. Anon 1916. A plain rectangular mansion. No date-Stones were seen on the building and little evidence of antiquity with the exception of the walls of the west wing which are probably of the 16th century. The whole building has the style of early 18th century. The House is now semi-derelict and empty. Visited by OS (WDJ) 15 September 1964. Comments: Receptor lies within ZTV, but extensive deciduous forestry to the northeast masks turbines. No change to the setting of the receptor is predicted from the Development.	PM	361297 851922	High	No change	None	No change	None
123	LB Category	LB No.19605;	Janefield	Farmhouse	LB entry records the following:	PM	361331	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	B	NMRS No. NJ65SW96			Early 19th century. 2-storey and attic, 5-bay farmhouse. Harled, with ashlar margins. Comments: Outwith ZTV.		851174					
124	LB Category B	LB No.16021	Auchintoul, walled garden and sundial	Walled garden	LB entry records the following: Circa 1800. Squared and coursed, granite ashlar walled garden approximately 90m x 90m, with shaped ashlar coping. Rubble exterior to N wall, central dividing wall. Large pointed arched gateway to S with moulded architraves, set in advanced panel with corbel course. Ruinous pavilion to N with large segmental arch. Comments: See RSK Site 126.	PM	361382 852120	High	No change	None	No change	None
125	LB Category B	LB No.19771; NMRS No. NJ65SW64	Auchintoul, Mains of Auchintoul - steading	Farmstead	LB entry records the following: 1790-1800. Large, quadrangular-plan steading. Squared and coursed granite ashlar with pinnings (cherry-cocking), ashlar dressings, band course. Stables, byres, threshing floor. Cattle courts to centre now partly demolished. Comments: See RSK Site 126.	PM	361402 852245	High	No change	None	No change	None
126	LB Category B	LB No.16031; NMRS No. NJ65SW64	Auchintoul, Mains of Auchintoul, Farmhouse with garden walls	Farmhouse	LB entry records the following: Later 19th century. 2-storey, 3-bay T-plan farmhouse, sited to N of earlier steading. Harled, with ashlar margins. Comments: Setting of the farmhouse, steading, walled garden and smithy consists of the Auchintoul farmsteading. An extensive shelterbelt forms the east boundary of the steading and masks turbines, located 3.6km to the northeast. No change to the setting of the receptor is predicted from the Development.	PM	361403 852275	High	No change	None	No change	None
127	LB Category B	LB No.19922; NMRS No. NJ65SW54	St Marnan's Episcopal chapel with school,	Church	LB entry records the following: 1824-6; interior recast 1876 by A Ross, Inverness. Single-storey, rectangular-plan chapel on rising ground, with free-standing single	PM	362245 852235	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
			retaining wall and gatepiers		storey former school to NE. Squared and coursed stugged granite, ashlar dressings. Plate tracery. CHAPEL, N ELEVATION: later, gabled porch to N, probably 1876; trefoil-headed bipartite to N, round-arched doorway to W re-entrant angle with chamfered reveals and 2-leaf boarded door with decorative iron-work hinges. Rose window (wheel tracery) to gable above porch, ashlar birdcage bellcote with ogee stone roof, 2-bulb stone finial and bell, possibly re-used. E AND W ELEVATIONS: 3 tall round-headed windows to E with plate tracery. 2 windows to W; centre window blocked, lean-to vestry to right. S ELEVATION: circa 1895, large round-headed, 3-light window. Door to vestry at left. Diamond, lead-pane glazing. Grey slates, ashlar coped skews, cross-finial to S gable. Coped stack to vestry. INTERIOR: remodelled 1876 by Alexander Ross. Whitewashed walls, coffered, wooden pitched roof. Pre-Raphaelite School stained glass in S window signed Jones and Willis 1895/6; Crucifixion and Resurrection, as memorial to Rev G Boyes. SCHOOL: 1877, to NE, built into churchyard walls. Single storey, 3-bay, with later, slightly lower single bay addition to S. Random rubble, enlarged windows. Rendered porch projecting to W. 2 windows to E, 1 window to N gable. Later, multi-pane casement and pivot windows. Grey slates, coped skews with small finials, beak skewputts. RETAINING WALL: random rubble, rubble coped with ashlar, dome-capped gatepiers to N; simple wrought-iron gates. Comments: Discussion within body of Environmental Statement archaeology chapter							
128	LB Category B	LB No.19913	Main Street, Bank House and Clydesdale Bank		LB entry records the following: 1838, with early 19th century alterations. 2-storey with attic, 5-bay terrace of 2 houses (bays grouped 3-2); in use as a bank and accommodation. Harled, with ashlar margins. 2 doorways (in 2nd and 4th bays) with pilastered timber jambs and cornice, letterbox fanlight and 2-leaf panelled doors. 2-bay bank to right with enlarged window at ground to outer bay. 3-bay Bank House to left with 2	PM	362383 852384	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					windows out-of-line to outer left. Regular fenestration at 1st floor. 2 canted dormers to attic of Bank House. 4-pane glazing pattern to sash and case windows. Grey slates, ashlar coped skews, ashlar stacks with some decorative cans. Comments: Discussion within body of Environmental Statement archaeology chapter							
129	LB Category B	LB No.19913	Main Street, Bank House and Clydesdale Bank		LB entry records the following: 1838, with early 19th century alterations. 2-storey with attic, 5-bay terrace of 2 houses (bays grouped 3-2); in use as a bank and accommodation. Harled, with ashlar margins. 2 doorways (in 2nd and 4th bays) with pilastered timber jambs and cornice, letterbox fanlight and 2-leaf panelled doors. 2-bay bank to right with enlarged window at ground to outer bay. 3-bay Bank House to left with 2 windows out-of-line to outer left. Regular fenestration at 1st floor. 2 canted dormers to attic of Bank House. 4-pane glazing pattern to sash and case windows. Grey slates, ashlar coped skews, ashlar stacks with some decorative cans. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362393 852384	High	No change	None	No change	None
130	LB Category B	LB No.19930	10 South Street	House	LB entry records the following: Late 18th century. 2-storey, 3-bay, detached house. Squared and coursed stugged granite and dressings. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362451 852269	High	No change	None	No change	None
131	LB Category B	LB No.16025; NMRS No. NJ65SW9	Clunie	Country House	LB entry records the following: 1825-30, possibly William Robertson, Elgin. Single storey, 5-bay villa, with raised basement, and classical portico. Granite ashlar, squared and coursed rubble to basement with slate pinnings. Band course, eaves course, cornice, tall windows with recessed aprons to principal floor. Broad angle pilasters.	PM	363645 850145	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Residential LB within steading. Extent of the setting of the LB is the steading. Masking of turbines (located 4.6km to north) from topography and structures, with no impact on the setting of the LB.							
132	LB Category B	LB No.16027; NMRS No. NJ65SW9	Clunie Home Farm	Farmstead, stable(s)	LB entry records the following: Circa 1825-30. 2-storey carriage house and stables with central gabled pend. 2-storey range of outbuildings to S. Harled, with ashlar margins. Now serving as Home Farm of Clunie. Comments: See RSK Site 131.	PM	363732 850187	High	No change	None	No change	None
133	LB Category B	LB No.16022; NMRS No. NJ64NW38	Auldtown of Netherdale with Coachhouse	Villa (19th century)	LB entry records the following: 1853. A and W Reid of Elgin. Single storey, 5-bay villa with raised basement on ground falling to SW. Harled, with Turriff sandstone dressings; base course, band course, cornice, consoled at corners. Tall windows at principal floor with recessed aprons. Comments: Outwith ZTV	PM	363805 847929	High	No change	None	No change	None
134	LB Category B	LB No.19620; NMRS No. NJ64NE28	Netherdale walled garden, Summerhouse sundial and gatepiers	Gate pier(s), walled garden	LB entry records the following: Circa 1800. Walled garden, sited to N of Netherdale House. Ashlar coped rubble, brick-lined with pink wash, approximately 120m x 140m. Comments: Outwith ZTV	PM	365168 848949	High	No change	None	No change	None
135	LB Category B	LB No.19620; NMRS No. NJ64NE28	Netherdale walled garden, Summerhouse sundial and gatepiers	Gate pier(s), walled garden	LB entry records the following: Circa 1800. Walled garden, sited to N of Netherdale House. Ashlar coped rubble, brick-lined with pink wash, approximately 120m x 140m. Comments: Outwith ZTV	PM	365171 848885	High	No change	None	No change	None
136	LB Category B	LB No.19620; NMRS No. NJ64NE28	Netherdale walled garden, Summerhouse	Gate pier(s), walled garden	LB entry records the following: Circa 1800. Walled garden, sited to N of Netherdale House. Ashlar	PM	365172 848884	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
			sundial and gatepiers		coped rubble, brick-lined with pink wash, approximately 120m x 140m. Comments: Outwith ZTV							
137	LB Category B	LB No.19618; NMRS No. NJ64NE28	Netherdale House	House	LB entry records the following: Possibly William Robertson, circa 1825. 2-storey, 5-bay x 3-bay classical house with raised basement. 2-storey single bay, recessed wing and rear additions and alterations by A and W Reid of Elgin, dated 1856 (to rhone at rear) and porch addition circa 1900. Coursed granite ashlar with rusticated quoins to principal floors, band course, cill course and entablature; cornice to taller windows at principal floor to S, and architraved windows. Harled sides to rear and rear elevation. Comments: Outwith ZTV	PM	365197 848385	High	No change	None	No change	None
138	LB Category B	LB No.19619; NMRS No. NJ64NE28	Netherdale House, Coachhouse stable and Coachman's House, and garage	Coach house, coachmans cottage, stable	LB entry records the following: Early 19th century. 2-storey, 7-bay coachhouse, pend at centre with stables to left, coachman's house to right. Squared and coursed rubble with ashlar dressings. Depressed arched pend in advanced, pedimented bay; blind bulls-eye window to pediment. Comments: Outwith ZTV	PM	365218 848477	High	No change	None	No change	None
139	LB Category B	LB No.19619; NMRS No. NJ64NE28	Netherdale House, Coachhouse Stable and Coachman's House, and garage	Coach house, coachmans cottage, stable	LB entry records the following: Early 19th century. 2-storey, 7-bay coachhouse, pend at centre with stables to left, coachman's house to right. Squared and coursed rubble with ashlar dressings. Depressed arched pend in advanced, pedimented bay; blind bulls-eye window to pediment. Comments: Outwith ZTV	PM	365218 848465	High	No change	None	No change	None
140	LB Category B	LB No.9600; NMRS No. NJ65SE48	Carnousie, Auld Town of Carnousie	Farmhouse	LB entry records the following: 18th century, 2-storey farmhouse, re-orientated in early 19th century with single storey and attic, 3-bay addition, raised over basement.	PM	365853 850048	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Squared and coursed rubble, raised ashlar margins, classical detail. Comments: Outwith ZTV							
141	LB Category B	LB No.6658; NMRS No. NJ65NE23	Rosieburn, former mission hall	House	LB entry records the following: Mid 18th century. Single storey, piend-roofed single chamber building; former Mission Hall, probably built as pavilion to mansion house. Roughly squared rubble, ashlar dressings; probably formerly harled. Comments: LB within courtyard. Extent of the setting of the LB is the courtyard in which the hall is located. Masking of turbines (located 2.6km to southwest) from tree cover and structures, with no impact on the setting of the LB.	PM	366681 855966	High	No change	None	No change	None
142	LB Category B	LB No.9602; NMRS No. NJ65SE61	Mains of Carnousie - steading	Farmstead	NMRS records the following: For Carnousie House (NJ 6740 4971) and associated buildings, see NJ64NE 41.00. The Threatened Buildings Survey of the RCAHMS recorded this large steading on 19 June 2007 prior to its conversion into housing. The steading was built for General Duff who lived at Carnousie 1790-1804. Simpson (W D Simpson "Carnousie" TBFC (1936) p192.) records a date Stone of 1797 on the tower which is now indecipherable. Comments: Residential LB within courtyard. Extent of the setting of the LB is courtyard and immediate surroundings. Masking of turbines (located 5.0km to northwest) from structures, with no impact on the setting of the LB.	PM	367027 850467	High	No change	None	No change	None
143	LB Category B	LB No.9601; NMRS No. NJ65SE18	Carnousie, Mains of Carnousie	Tower house, well(s)	NMRS records the following: The castellated mansion, which is occupied as the farmhouse of Carnousie Mains, is the Old House of Carnousie, built by the Ogilvies. The original part of the house is a perfectly preserved example of a castle on the Z-plan, one of the towers being round and the other square. The square tower bears the date 1577.	PM	367186 850408	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					The exterior of the castle is more ornate than is usual, and is certainly one of the best examples of its kind in Scotland. An oblong building was added to the west gable about 1757. Eastward, part of the old massive garden wall still exists. Immediately to the north-west is an ancient well about 5 feet square and 20 feet deep. This well is still in use for supplying the house. Further down the slope is another, circular well. W D Simpson 1936. Carnousie Castle is as described above although no date-stone was seen on the square tower. The castle is now in a semi-derelict condition and is used as a farm-store. The two wells are at NJ6717 5043 and NJ 6714 5051. The Northernmost well is enclosed in concrete and with a small pump house along side. The other well is capped with stone flagging and is probably now connected to the other to supply the farm steading at NJ 6702 5048. The garden wall stretches from NJ 6725 5035 to NJ 6728 5035 and formed part of the N wall of the now derelict garden whose W, S and E walls have been demolished. Visited by OS (WDJ) 14 September 1964. Comments: LB within steading. Extent of the setting of the LB is the steading, as far as the gate lodges to north and south (RSK Sites 179 and 180). Masking of turbines (located 5.2km to northwest) from structures, with no impact on the setting of the LB.							
144	LB Category B	LB No.9606; NMRS No. NJ64NE41	Carnousie, Walled garden with pavilions	Walled garden	LB entry records the following: Early 19th century. Walled garden, approx m x m, terraced, on rising ground to N of River Deveron. Rubble walls brick-lined or harled to garden, with Turriff sandstone quoins and coping. Pointed-arched gateways to N and S corners to E and W walls, with stone overthrows (missing to SW) and with spear-headed cast-iron gates. Walls rising in curved gable to N elevation; supporting lean-to, wood-framed greenhouses. Doorway to underground stair in terrace; possibly to potting shed. Comments: Outwith ZTV	PM	367348 849611	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
145	LB Category B	LB No.9607; NMRS No. NJ64NE41	Carnousie, Waterside, East cottage	Cottage	LB entry records the following: Circa 1880, possibly remodelling of earlier cottage. Single storey and attic, 3-bay cottage beside River Deveron. Harled, with Turriff sandstone dressings. Door to S, on E return of central, advanced, gabled porch. Windows flanking at ground. 3 windows at ground to rear, 2 gabled dormers to attic, breaking eaves. Small window to W gable at ground, bipartite with stone mullion to attic. Casement windows with lying-pane glazing. Grey slates; bracketed eaves, exposed rafters; coped central stack with 4 corniced, ashlar diamond flues. Comments: Outwith ZTV	PM	367379 849330	High	No change	None	No change	None
146	LB Category B	LB No.12874; NMRS No. NJ65SE37	Mill of Ribrae	Watermill	NMRS records the following: (Location cited as NJ 681 516). Mill of Ribrae, 18th to 19th century. Though wheel-less, a handsome example of a simple rectangular rubble mill, with kiln at one end. J R Hume 1977. What is probably the associated mill-pond is situated 170m NNW of the mill, and further up the Cunning Burn, at NJ 6809 5179. Information from RCAHMS (RJCM), 6 October 1998. Comments: Watermill adjacent to Chalybeate Spring. Setting consists of the mill's immediate surroundings and the burn itself. Visibility of turbines 5.0km to northwest do not detract from its setting	PM	368187 851573	High	No change	None	No change	None
147	LB Category B	LB No.6655; NMRS No. NJ65SE31	Mountblairy gatepiers, gates, railings and quadrant walls	Gate(s), gate pier, lodge, wall(s)	LB entry records the following: Early to mid 19th century. Square granite ashlar gatepiers, stop-chamfered, with pyramidal caps. Coped ashlar quadrant walls. Cast-iron scrolled Jacobethan style gates and railings with finials. Rubble policy walls adjoined with saddleback coping. Comments: Outwith ZTV	PM	368797 854842	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
148	LB Category B	LB No.2893; NMRS No. NJ65NE21	Mains of Auchinbadie	Farmhouse	LB and NMRS entries record the following: Later 18th century, with alterations and additions. 2-storey farmhouse of 3 broadly spaced bays, white painted harl. Mains of Auchinbadie. Site refers to House marked on 1:10 560 map. Collection items also relate to the Farm steading. Comments: Residential farmhouse LB, with the steading defining the extent of the setting of the LB. Visibility of turbines 5.9km to west do not detract from its setting.	PM	368876 858503	High	No change	None	No change	None
149	LB Category B	LB No.2894	Mill of Auchinbadie	Mill	LB entry records the following: Late 18th century. 2-storey mill with overshot wheel and adjoining kiln, built into bank, derelict since 1914. Rectangular plan; kiln roofless. Coursed rubble with stugged sandstone dressings. Doorway to S, breaking eaves in piended dormerhead, small window to kiln. Waterwheel to W gable, window to gablehead. Irregular fenestration to N. Comments: Outwith ZTV	PM	368965 858298	High	No change	None	No change	None
150	LB Category B	LB No.6656; NMRS No. NJ65SE35	Mountblairy Bridge	Road bridge	LB entry records the following: John Smith of Aberdeen, 1836. Triple arched bridge carrying road over tributary of River Deveron. Coursed, stugged granite with ashlar voussoirs to 3 equal, narrow arches, band course above, swept ashlar coped parapet terminating in pyramidal capped piers. Comments: Outwith ZTV	PM	368974 854165	High	No change	None	No change	None
151	LB Category B	LB No.6652; NMRS No. NJ65SE31	Mountblairy Home Farm	Farmhouse, farmstead	LB entry records the following: 1791-1800 quadrangular steading, with 1835 Greek Revival Stables added to E by John Smith of Aberdeen. Comments: Outwith ZTV	PM	369064 854425	High	No change	None	No change	None
152	LB Category	LB No.6653;	Mountblairy	Mausoleum	LB entry records the following:	PM	369066	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	B	NMRS No. NJ65NE26	Mausoleum with Memorial, boundary walls and railings		Circa 1860. Possibly A and W Reid of Elgin. Single storey, rectangular plan mausoleum, orientated E-W with small tower adjoining Comments: Outwith ZTV		855257					
153	LB Category B	LB No.9400; NMRS No. NJ65NE43	Eden, Bridge of Eden	Road bridge	NMRS entry records the following: This Bridge carries an unclassified public road over the Burn of King Edward to the S of the Mill of Eden (NS65NE 36). Information from RCAHMS (RJCM), 12 May 2010. Comments: Outwith ZTV	PM	369526 857909	High	No change	None	No change	None
154	LB Category B	LB No.2886; NMRS No. NJ65NE22	Dunlugas Bridge and gatepiers	Bridge	Described in LB entry as: Late 18th century. Bridge over burn, sited to N of Dunlugas house. Small segmental arch. Random rubble, ashlar coped bridge with ashlar voussoirs, raised impost blocks and keystone. Parapet adjoining pair of ashlar gatepiers to NE, with stepped caps. Comments: Outwith ZTV	PM	369559 855542	High	No change	None	No change	None
155	LB Category C(S)	LB No.19599	Park Home Farm	Farm	LB entry records the following: Dated 1867. Home farm comprised of steading block, residential block and bothy. Whinstone rubble with some pinning (cherry cocking) and stugged ashlar dressings. Comments: LB lies within extensive woodland estate of mature deciduous forestry, which provides extensive masking of the Development from the receptor. No change to the setting of the receptor is predicted from the Development.	PM	358706 857211	High	No change	None	No change	None
156	LB Category C(S)	LB No.19598	Park gate lodge and gatepiers	Lodge	LB entry records the following: Mid 18th century gatepiers and quadrants, with 19th century single storey, 2-bay gate lodge to N.	PM	358862 857516	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments:LB lies within extensive woodland estate of mature deciduous forestry, which provides extensive masking of the Development from the receptor. No change to the setting of the receptor is predicted from the Development.							
157	LB Category C(S)	LB No.19609	Lootcherbrae, Smithy	Smithy	LB entry records the following: Early-mid 19th century. Single-storey, 6-bay smithy. Roughly squared rubble, wooden lintels. Comments: Residential LB, with the enclosed fields to W and buildings on opposite side of B9023 road defining the extent of the setting of the LB. Visibility of turbines 3.5km to ENE do not detract from its setting	PM	360592 854032	High	No change	None	No change	None
158	LB Category C(S)	LB No.19616; NMRS No. NJ65SW100	Mill of Kinnairdy, Miller's House	Mill house	LB entry records the following: Earlier 19th century. 2-storey, 3-bay miller's house (with 1st floor breaking eaves). Squared coursed and pinned (cherry-cocked) rubble, stugged ashlar dressings. Door to centre with 6-pane fanlight. Windows flanking at ground. 3 windows to 1st floor, small at centre, outer windows enlarged and raised to break eaves in gabled wooden dormerheads. Lean-to additions and outbuildings at rear. Small firebox opening to S gable. Sash and case windows with 4-pane glazing pattern. Ashlar coped skews, ridge and stacks; graded grey slates. Comments: Setting of low-lying LB consists of the receptor's cartilage. Visibility of turbines 5.6km to northeast will not affect the setting of the receptor.	PM	361102 850088	High	No change	None	No change	None
159	LB Category C(S)	LB No.19615; NMRS No. NJ65SW95	Mill of Kinnairdy Bridge	Bridge	LB entry records the following: Early-mid 19th century. Stone bridge over Burn of Auchintoul. Single, semicircular arch. Comments: Outwith ZTV	PM	361177 850094	High	No change	None	No change	None
160	LB Category	LB No.16032	Auchintoul,	Smithy	LB entry records the following:	PM	361404	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
	C(S)		Mains of Auchintoul - Smithy		Early 19th century. Single storey, piend-roofed Smithy. Squared, coursed and pinned (cherry-cocked) rubble, ashlar lintels. 5 broad openings supported by ashlar pillars, window to left. Ashlar coped stack to W, forge below inside. Grey slates to piended roof. Comments: See RSK Site 126.		852275					
161	LB Category C(S)	LB No.19614	Mill of Alliehar	Mill	LB entry records the following: Early 19th century. Former mill and kiln, now disused. Random rubble, hail pointed. 2-storey, rectangular-plan, mill to W, kiln to E. Comments: Mill adjacent to Burn of Backieley. Setting consists of the mill's immediate surroundings and the burn itself. Visibility of turbines 2.7km to east does not detract from its setting. Cumulative assessment has identified a low impact due to the proximity of the Auchinderran Farm windfarm, located approximately 0.5km to the northwest of the receptor, leading to a slight cumulative significance of impact to the receptor.	PM	361407 854435	High	No change	None.	No change; Low cumulative impact	None; Slight cumulative impact
162	LB Category C(S)	LB No.19608	Longlaugh	House	LB entry records the following: Dated 1910. 2-storey farmhouse on banks of River Deveron. Coursed and whinstone pinned, stugged (cherry-cocked) granite, with base course, stone mullions to bipartites. Door to centre with date plaque above. Bipartites flanking at ground, windows to outer bays at 1st floor, breaking eaves in gabled dormerheads with ball finials. Single-storey addition at right angles at rear with clasping roof. Greenhouse lean-to on gable end. Sash and case windows with 2- and 4-pane glazing pattern. Ashlar coped skews with beak-bracketed skewputts, coped ashlar stacks, purple slates. Comments: Outwith ZTV	PM	361863 848550	High	No change	None	No change	None
163	LB Category C(S)	LB No.19917	Main Street, Woodside cottage	Cottage	LB entry records the following: Mid 19th century. Single storey, L-plan 3-bay cottage on rising ground at head of Main Street; former Police Station and jail. Harled	PM	362231 852278	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					with ashlar margins, base course. Door to centre with letterbox fanlight and windows flanking. Sash and case windows with later 4-pane glazing pattern. Regrettable modern door and shutters. Grey slates, small rooflights, ashlar coped stacks and skews. Comments: Discussion within body of Environmental Statement archaeology chapter							
164	LB Category C(S)	LB No.6660	Manse of Ord, Strathord	Manse	LB entry records the following: 1835-6 with late 19th century wing, 2 storey L-plan house of irregular cruciform plan. Harled, tooled granite margins. Original E facing symmetrically fronted 3-bay house with shallow 2-storey rear wing. Original frontage largely masked by 2-storey wing with ground floor drawing room lit by bipartite in E gable. Wide main doorway in re-entrant angle. 4- and 12-pane glazing; coped end and wallhead stacks; slate roofs. Comments: Residential LB located at crossroads of B9025. Setting consists of the LB, its curtilage, and immediate surroundings, including Beechgrove, the former church associated with the LB (RSK Site 166). Visibility of turbines 3.8km to southeast do not detract from its setting.	PM	362248 858447	High	No change	None	No change	None
165	LB Category C(S)	LB No.19920	North Street, United Presbyterian Church	Church	LB entry records the following: Duncan MacMillan, circa 1890. L-plan, single-storey former Presbyterian Church and latterly petrol station. Squared and coursed stugged granite, ashlar dressings, base course, eaves course. Round-arched windows. Advanced, gabled porch to S, round-arched doorway with keystone in re-entrant angle to E, with deep-set 2-leaf panelled door, window to S. Large elliptical-arched window to E gable with hoodmould and keystone, ashlar birdcage bellcote above with ball finial. Square-pane leaded glazing with some coloured glass. Grey slates, ashlar coped skews with bracket-skewputts, finials to gables. Corniced ashlar stack to porch. Clay ridge tiles. Comments: Discussion within body of Environmental Statement	PM	362295 852410	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					archaeology chapter							
166	LB Category C(S)	LB No.3047; NMRS No. NJ65NW11	Beechgrove, (Former Ord Church of Scotland) and War Memorial	Church	NMRS entry records the following: Ord Church of Scotland Chapel of Ease, Banff Parish, 1835-1836. Re-cast, vestry added, James Duncan, Architect, Turriff, 1899. Ref. 1899 drawings in possession of current owners. Church now secularised and named 'Beechgrove'. -Information from Mrs. Elizabeth Beaton, 4.7.1994. Comments: Former church, now a residence located on B9025. Setting consists of the LB, its curtilage, and immediate surroundings, including the neighbouring manse (RSK Site 164). Visibility of turbines 3.6km to southeast do not detract from its setting.	PM	362316 858302	High	No change	None	No change	None
167	LB Category C(S)	LB No.19918	30 and 32 Main Street	House	LB entry records the following: Early 19th century. 2-storey, 5-bay terrace of 2 houses. Harled with ashlar margins. 5-bays at ground; 2 doorways (2nd and 4th bays) door with 2-pane fanlight to left, 2-leaf boarded door to right. Window to centre, windows to outer bays. 3 windows at 1st floor (1st, 3rd and 5th bays), close under eaves. Sash and case windows with later plate glass glazing. Grey slates, coped ashlar skews and stacks with decorative cans. Comments: Discussion within body of Environmental Statement archaeology chapter	PM	362341 852329	High	No change	None	No change	None
168	LB Category C(S)	LB No.19919	North Street, steading	Steading	LB entry records the following: Earlier 19th century. 2-storey, 8-bay rectangular-plan granary with vehicle access, at right angles to street. Opposite former market ground. Random rubble with ashlar dressings. 3 large wooden sliding doors at ground floor, divided by, 2 mirrored stone forestairs to loading doorways at 1st floor breaking eaves in gabled dormerheads. Platt of forestairs cantilevered out to facilitate loading. 6 small windows to granary at 1st floor. Boarded doors and shutters. Blue-grey slates, ashlar ridge and coped skews, end stack to N.	PM	362400 852400	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Discussion within body of Environmental Statement archaeology chapter							
169	LB Category C(S)	LB No.19926	7 South Street	House	LB entry records the following: Early 19th century. 3-bay, 2-storey house with attic at corner of Huntly Road. Stugged granite ashlar with raised and polished in-and-out quoins; rubble to sides and rear. 3 windows at 1st floor; eaves course. 2 slate-hung, piend-roofed canted dormers to outer bays of attic. Later, single-storey, lean-to addition to right with plate glass shop-front. Comments: Outwith ZTV. Discussion within body of Environmental Statement archaeology chapter	PM	362416 852249	High	No change	None	No change	None
170	LB Category C(S)	LB No.16023;	Auldtown of Netherdale steading	Steading	LB entry records the following: Circa 1845. Long, 10-bay steading range, orientated NW-SE, possibly extended later, with off-centre 2-stage entrance tower with pend, loft and dovecot. Roughly squared, coursed rubble with stugged ashlar dressings. Comments: Outwith ZTV	PM	363655 847947	High	No change	None	No change	None
171	LB Category C(S)	LB No.19601; NMRS No. NJ65SW9	Clunie walled garden	Walled garden	LB entry records the following: Circa 1825-30. Roughly rectangular-plan, random rubble walled garden with saddleback coping; approximately 70m x 30m. Canted summerhouse to SE; rubble, with door to W, pointed arched windows flanking slated roof. Comments; Outwith ZTV	PM	363761 850132	High	No change	None	No change	None
172	LB Category C(S)	LB No.16026; NMRS No. NJ65SW9	Clunie dovecot	dovecot	NMRS entry records the following: NJ 6390 5016. An un-roofed dovecot, 3.3m square - almost certainly of 18th century date. Visited by OS (WDJ) 16 September 1964.	PM	363903 850162	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: See RSK Site 131.							
173	LB Category C(S)	LB No.19617; NMRS No. NJ64NW35	Netherdale, barnyards of Netherdale, dovecot	dovecot	LB entry records the following: Dated 1774. Cylindrical, 2-stage dovecot. Squared and pinned (cherry-cocked) rubble, granite ashlar dressings, encircling alighting course. Door to E, marriage stone above to left dated 1774, with initials J I and H G (see notes). Small opening to S, semi-circular flight-hole with voussoirs to W above. Roofless. Comments: Outwith ZTV	PM	364937 848847	High	No change	None	No change	None
174	LB Category C(S)	LB No.9603; NMRS No. NJ65SE55	Carnousie, Mill of Carnousie	watermill	NMRS entry records the following: (Location cited as NJ 662 501). Pump, Mill of Carnousie, early 20th century. In a small, flat-roofed concrete shed, a 4-spoke, overshot, all-iron wheel, 10ins (0.25m) wide by 30ins (0.76m) diameter, driving a horizontal pump. J R Hume 1977. Comments: Outwith ZTV	PM	366200 850131	High	No change	None	No change	None
175	LB Category C(S)	LB No.2889	Dunlugas, walled garden	Walled garden	LB entry records the following: Early 19th century walled garden. Ashlar coped, red brick-lined sandstone rubble, approximately 60m x 80m rhomboid. Potting sheds and lean-to greenhouses to N. Gateway to S; corniced overthrow with blocking course. Comments: The setting of the walled garden extends to the boundary of the walled garden. Distant visibility of turbines will not detract from the setting of the LB. Accuracy of the recorded coordinates (taken from Historic Scotland spatial data download) is doubtful, as they mark a point within an open arable field.	PM	366468 855817	High	No change	None	No change	None
176	LB Category C(S)	LB No.12878; NMRS No. NJ65SE60	United Free Manse	Manse	LB entry records the following: Circa 1865. Probably James Duncan of Turriff. 2-storey, 3-bay, L-plan manse. Harled, with Turriff sandstone dressings. Comments: Outwith ZTV	PM	366791 851736	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
177	LB Category C(S)	LB No.12877; NMRS No. NJ65SE54	United Free Church	Church	LB entry records the following: 1843-6. Rectangular plan, 3-bay church, orientated E-W, with single storey vestry adjoining to E. Harled, with cream ashlar dressings; hoodmoulds, margins and bellcote. Comments: Outwith ZTV	PM	366807 851759	High	No change	None	No change	None
178	LB Category C(S)	LB No.9609; NMRS No. NJ64NE56	Carnousie, Woodhead	Cottage	LB entry records the following: Later 19th century probably remodelling earlier cottage. Single-storey, 3-bay Arts and Crafts Cottage, built on rising ground. Harled with Turriff sandstone ashlar margins, stop-chamfered reveals, timber mullions to bipartites. Comments: Outwith ZTV	PM	366917 849156	High	No change	None	No change	None
179	LB Category C(S)	LB No.9605; NMRS No. NJ64NE41	Carnousie,red loge and gatepiers	Gate pier(s), Lodge	LB entry records the following: Circa 1890. Single storey and attic, L-plan gate lodge and gate piers. Harled, with Turriff sandstone ashlar margins, stone mullions. Comments: Outwith ZTV	PM	366971 849358	High	No change	None	No change	None
180	LB Category C(S)	LB No.9604; NMRS No. NJ65SE62	Carnousie, North Lodge and gatepiers	Gate pier(s), Lodge	LB entry records the following: Circa 1880. Single storey and attic, L-plan lodge with 2 sets of ashlar gatepiers. Bull-faced granite with ashlar dressings, chamfered reveals, shaped architraves. Comments: Setting consists of the receptor's immediate surroundings, in particular the approach to Carnousie by road. Shares a setting with Carnousie tower (RSK Site 143) and Carnousie Red Lodge (RSK Site 179). Visibility of turbines 4.7km to northwest will not detract from this setting.	PM	367313 851122	High	No change	None	No change	None
181	LB Category C(S)	LB No.9608; NMRS No. NJ64NE41	Carnousie, Waterside, West cottage	Cottage	LB entry records the following: Mid 19th century, modified circa 1880 in style of adjacent East Cottage, Waterside. Single storey and attic, 3-bay cottage beside	PM	367367 849320	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					River Deveron. Rubble, with Turriff sandstone dressings. Door to S, windows flanking at ground. Single windows to centre at rear, 2 later, gabled wooden dormers to attic. Casement windows with lying-pane glazing. Renewed purple slates, bracketed eaves to gables, clay ridge tiles, coped stacks. Comments: Outwith ZTV							
182	LB Category C(S)	LB No.6657	North Burreldales	House	LB entry records the following: Circa 1850. 2-storey, 3-bay farmhouse with single storey, possibly earlier 19th century wing at right angles to rear. Harled, with ashlar margins. Comments: Outwith ZTV	PM	367990 855323	High	No change	None	No change	None
183	LB Category C(S)	LB No.13607; NMRS No. NJ65SE57	Forglen Memorial hall and War Memorial	War Memorial (20th century)	LB entry records the following: Dated 1921, possibly by W L Duncan of Turriff. Single storey and basement hall with piended roof, raised over basement, roughly T-plan, with service wings at rear. Harled, Turriff sandstone cills, ashler coping and eaves course. Comments: Low-lying LB at road junction of B9025. Setting consists of the hall and war memorial's immediate surroundings, with vegetation providing masking of turbines located 4.9km to northwest.	MOD	368306 851884	High	No change	None	No change	None
184	LB Category C(S)	LB No.13611; NMRS No. NJ65SE30	Forglen, Westwood	Cottage	LB entry records the following: Mid-19th century. Single-storey, 3-bay estate cottage with later porch. Harled, with Turriff sandstone margins. Door to centre with letterbox fanlight, later gabled wooden porch with finial and tree trunk columns; painted windows flanking, window to left return. Sash and case windows with 12-pane glazing pattern. Ashlar coped skews, corniced stacks, grey slates, skylights to attics. Comments: Within ZTV, but shelterbelts to west provide masking of turbines.	PM	368605 851925	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
185	LB Category C(S)	LB No.6654; NMRS No. NJ65SE31	Mountblairy walled garden	Walled garden	LB entry records the following: Early 19th century. Approximately 100m square, walled garden with dividing wall, built on sloping ground to E of Home Farm (listed separately). Roughly squared and coursed rubble, sneck harled with ashlar gablet coping. Dividing wall running E-W, with depressed arched opening and ashlar coping. 2-storey, lean-to potting sheds to exterior of N wall. Comments: Outwith ZTV	PM	369159 854429	High	No change	None	No change	None
186	LB Category C(S)	LB No.13598; NMRS No. NJ65SE30	Forglen, Crossbrae	Cottage	LB entry records the following: Mid 19th century, single storey and attic, 3-bay estate cottage with later porch. Harled, with Turriff sandstone margins. 4-panelled door to centre with letterbox strip fanlight, later wooden gabled porch addition with decorative, scrolled barge boards, supported by tree trunk columns; painted. Windows flanking at ground floor, 2-canted tripartite dormers to outer bays of attic with piended roofs, skylight to centre. Sash and case windows with 4-pane glazing pattern. Grey slates, ashlar coped skews and stacks; some decorative cans Comments: Outwith ZTV	PM	369491 852454	High	No change	None	No change	None
187	LB Category C(S)	LB No.2887; NMRS No. NJ65NE22	Dunlugas cottages	Cottages	LB entry records the following: Late 18th century. Range of 2 cottages sited to N of Dunlugas House. Former stables. Random rubble with ashlar dressings; some concrete. modern swept dormers to attic, corrugated asbestos roof. Small windows at 1st floor, blocked at front, open to rear, indicating former hayloft use. Hayloft door and stone forestair to gable end. Comments: Outwith ZTV	PM	369547 855577	High	No change	None	No change	None
188	LB Category C(S)	LB No.13601; NMRS No. NJ65SE30	Forglen, garden cottage	cottage	LB entry records the following: Mid 19th century. Single storey and attic, 3-bay estate cottage with later "rustic" porch. Harled, with Turriff sandstone margins. Door to centre with letterbox strip fanlight, later gabled, wooden porch with	PM	369600 852167	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					tree trunk column, painted. Windows flanking at ground floor, 2 canted piend-roofed, tripartite dormers to outer bays of attic, skylight to centre. Sash and case windows with 4-pane glazing pattern. Grey slates, ashlar coped skews with angled skewputts. Shouldered stacks with paired, polygonal, corniced flues; possibly later additions Comments: Outwith ZTV							
189	LB Category C(S)	LB No.13610; NMRS No. NJ65SE30	Forglen, walled garden cottage	cottage	LB entry records the following: Mid 19th century with later addition. Single storey, 3-bay gardener's cottage adjacent to walled garden with further bay added to S. Squared and coursed whinstone rubble, harled, with Turriff sandstone margins, sturdy stone mullions to bipartites. Comments: Outwith ZTV	PM	369690 852196	High	No change	None	No change	None
190	LB Category C(S)	LB No.13604; NMRS No. NJ65SE30	Forglen, ice House	icehouse	Early 19th century. Ice house, rectangular-plan built into steep bank near former fish ponds. Random rubble, Turriff sandstone margins to door. Entrance at top of bank. Currently overgrown. Comments: Outwith ZTV	PM	369691 852268	High	No change	None	No change	None
191	Property in Care No. 90104	NMRS No. NJ66SE8	Duff House, Banff, Collie Road, Collie Lodge	Gate Lodge	Lodge on Collie Road. Built as a lodge for Duff House, possibly by William Robertson of Elgin. Comments: Outwith ZTV	PM	368929 863785	High	No change	None	No change	None
192	SM	SM No. 344; NMRS No. NJ54NE6	Rothiemay Castle, stone circle,400m NNW of	Recumbent stone circle	NMRS entry records the following: Remains of a Recumbent stone circle. Some of the standing stones were removed about 1845, and two were dumped near the field gateway (Ritchie 1918). Remains of a recumbent stone circle. Some of the standing stones were removed about 1845, and two were dumped near the field gateway (Ritchie 1918). Four stones (about 6" high each) and the recumbent stone survived.	BA	355078 848738	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Coles (1903) estimates that there were originally 12 stones, and both he and the ONB (1867) remark on a possible inner circle, the latter saying 'it would appear that when entire there was generally an outer and inner circle with a sort of intervening embankment, carried round the circle to the east and north east then ditches were turned off to form a sort of avenue by which the circle was approached'. Both the recumbent stone and the standing stone to its east had cupmarks, the former a great many and the latter 7, 6 near its base (Ritchie 1918; Coles 1903). J Ritchie 1918; F R Coles 1903; Name Book 1867; Information from Estate Plan 1782. The recumbent stone circle of Rothiemay is situated in a field to the S of the B9117 road some 0.5km E of the village of Milltown of Rothiemay. At present only four upright stones remain, two on either side of a large recumbent stone which has no flankers. The position of the recumbent stone, at the SW extreme of the arc formed by the monument stones, is typical of such monuments in the area. The heights of the upright stones all approximate to 2m, whilst the recumbent measures about 4 x 1.2m by 1.7m high. A Aspinall 1998 Comments: Outwith ZTV. Recumbent stone frames the Hillhead of Avochie, a hill located over the southern banks of the Deveron to the south of the monument (Welfare 2011), and is oriented to the south.							
193	SM	SM No. 5475; NMRS No. NJ54NE8	Rothiemay, St Drostan's Church	Church, well	NMRS entry records the following: St Drostan founded a church here in the 6th century; and the mediaeval church which was dedicated to St Peter (Scott-Moncrieff 1888) probably remained on the same site. The church was pulled down in 1752. The OS 6" Map is mistaken showing the site of the church on the east side of Kirktown Burn. It should, in fact, be in the Graveyard, where excavation has exposed the foundations. A little above the Church is St Peter's Well, a spring within a stone lintel bearing the date 1580, which does not seem to be in situ. W D Simpson 1935; S Scott-Moncrieff 1888.	EME	355472 848242	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					W D Simpson (1935) does not commit himself into saying that the later medieval church was dedicated to St Peter, and also, that it is not certain if St Drostan's Chapel occupied the same site. The only authority found for the dedication 'St Peter', is Scott-Moncrieff (1888) - possibly only derived from the proximity of 'Peter's Well'. Simpson, without support, calls this 'St Peter's Well.' Visited by OS (JLD) 26 June 1964. Comments: Outwith ZTV							
194	SM	SM No. 6197; NMRS No. NJ54NE33	Corskellie, cup & ring-marked stone 90m SSE of	Cup and ring marked stone	NMRS entry records the following: (Location cited as NJ 558 475). In 1990, Mr Robertson, Corskellie, when clearing ground for a new farm building, turned over a large boulder with many cup-marks on its lower face. It had been set up on a bank with other unmarked boulders, between the public road and the new building, close to where it was found. The stone is wedge-shaped, 1.1m thick at the top, 0.15m at the bottom, and measures 1.9m by 2.7m across the widest and longest parts of the carved face. There are at least 56 cup-marks, ranging from 5cm to 19cm in diameter. About a quarter (mostly on one half of the stone) have a tail between the cup and the ring, and many of the cups in this half are symmetrically deeper at one side, with small weathered grooves on the opposite side. Three parallel narrow veins of quartzite cross the cup-marked face. A Miles 1993. Located by Grampian Regional Council at NJ 5586 4751. It was found in agricultural ground on a NW-facing slope. NMRS, MS/712/10. Comments: Outwith ZTV	NE/BA	355851 847509	High	No change	None	No change	None
195	SM	SM No. 347; NMRS No. NJ55SE1	Thorax, stone circle 280m W of	Cup marked stone, stone circle	NMRS entry records the following: This stone circle is unsymmetrical and composed of six stones. A dike has been built between the stones and trees have been planted in the centre. All stones are upright.	NE/BA	358221 854953	High	No change	None	No change; Negligible cumulative impact	None; Slight cumulative impact

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					The great stone to the NW (?B) has 22 cup marks on its inside face, the largest is 4-inches in diameter and an inch deep. F R Coles 1906. The circle which was scheduled as an Ancient Monument on 19th May 1964 is generally as described by Coles (1906). The largest stones are from 1.3m to 1.8m high. There is no trace of the ring cutting noted by Simpson (1868). 17.6 metres to the west of the circle is an almost buried stone, with three cup marks on its upper face. Revised at 1/2500. Visited by OS (JTT), 17 September 1964. As described above, except that the stone to the W has three other faint cup-marks in addition to those noted by Todd. Visited by OS (NKB), 22 January 1968. Comments: Situated on east-facing hillslope of improved pasture field. Prominent feature within the landscape. Distant visibility of turbines 5.8km to the east, but such views will be will not impact on the monument's prominence in the landscape, nor views to contemporary monuments, and are partly masked by a shelter belt of mature trees 150m to the east of the monument. Mains of Auchinderran windfarm would appear within the same view, approximately 3.1km to the east of the monument. Cumulative impacts are addressed in the ES chapter.							
196	SM	SM No. 11; NMRS No. NJ54SE1	Cairnton, stone circle 400m NE of	Recumbent stone circle	NMRS entry records the following: One of the stones has lost about a third of its original mass. One stone measures 9 feet 10 inches long by 3 feet broad and 6 feet 3 inches in height. The other a 'pillar' is 8 feet 3 inches in height. F R Coles 1903. The remains of the stone circle are, generally as described above. The pillar stone is 2.2m in height and the second stone 1.7m in height. A mound of stones surrounds the two large stones but this is	BA	358580 844674	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					a result of field clearance. Visited by OS (EGC) 2 October 1961. This recumbent stone circle is situated on sloping ground about 510m WNW of Westertown farmhouse. Only two stones of the circle survive, the W flanker and the recumbent; the former measures 2.3m in height and the other is 2.9m long and 1.6m high. Field gathered stones have been piled in the interior of the circle. Although known as the Cairnton recumbent stone circle the site lies on Westertown ground. Visited by RCAHMS (JBS) 9 November 1983. Comments: Outwith ZTV							
197	SM	SM No. 5899; NMRS No. NJ54NE13	Conzie Castle and Doocot	Tower house	NMRS entry records the following: The castle is a rectangular structure, the entire east and south walls still standing to roof level, but only a part of the north and west walls remain. The architectural details confirm its late 17th century date of erection. There seems to be some confusion in the name of this house (Ordnance Survey Name Book [ONB] 1871; Jervise 1875-9; Temple 1886), but local enquiries failed to confirm if it had ever been known by any name other than 'Conzie', the only information being that it was originally situated on land belonging to the farm of Conzie, but now belongs to Bognie. No evidence was found for a second site for the castle. Visited by OS (EGC) 2 October 1961. A tall four storey rectangular un-vaulted palatial structure, with crowstep gables and the remains of corner turrets. The window facings appear to have been removed for use elsewhere, leaving only the relieving arches. Nearby are the ruins of a dovecot (NJ54SE 3). Comments: Situated on a prominent location adjacent to the A97 road. Tower is not climbable and is in a poor state of repair. Two existing windfarms are visible to the south (probably Glens of Foudland and Dummule). Distant visibility of the Development is	PM	359577 844976	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					likely, with the nearest turbine located 10.8km to the northeast. The asset's setting consists of the scheduled area (both tower house and dovecote), and the monument's immediate surroundings. Visibility of the Development will not detract from the prominence of the receptor in the landscape and do not impact on its setting.							
198	SM	SM No. 56; NMRS No. NJ64NW15	Yonder Bognie, stone circle 220m S of	Recumbent stone circle	NMRS entry records the following: Yonder Bognie. A circle of Standing Stones has been constructed from large whinstone boulders on ground sloping very gently to the E. The Recumbent Stone and the tall stone to the E seem to be resting on a ridge but this is merely an accumulation of weeds (information from Mr Shand, Yonder Bognie). The E pillar stone has fallen and is partly grass covered. There is a space of 1-ft between the Recumbent Stone and the W pillar. The first stone (clockwise) is standing and there is a half-sunken stone close to it on the N. The second stone has a long slope to the W. The third stone has fallen inwards and its probable site is marked on the plan with a cross. The fourth stone faces the Recumbent Stone giving a diameter to the circle of 71 1/2ft. The fifth and sixth stones are missing and the seventh lies within a foot or two of its original position. A fragment of what is probably the eighth stone lies on the SE arc, but its original position cannot definitely be laid down. The ninth stone is the larger of two whose bases are shown close together. Just in front of the Recumbent Stone are some earthfast stones which appear to be integral parts of the circle. Others (the largest is marked 'S') possibly formed part of a concentric setting but have been moved out of their places, whilst the group marked 'B' is suggestive of cists. There is no indication whatever of a mound in the centre. F R Coles 1903. The circle is generally as described above, although it is smaller than Coles (1903) states, 16.0m between the stones he mentions and 20.0m between the second and ninth, this being the greatest diameter of the circle. The largest of the stones, the recumbent one, measures 3.4 long, X 1.5 thick X 1.6 high, the rest are much smaller but stand to heights of 1.0m to 1.8m. Re-surveyed at 1/2500.	BA	360059 845778	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Visited by OS (JTT) 9 September 1964. Comments: Recumbent stone circle, with recumbent stone oriented to South according to centre line azimuth. Generally in a poor state, with recent field clearance material banked against it. The area from which it is visible defines the extent of the setting of the monument, and visual relationships with contemporary monuments, such as Cairnton stone circle (RSK Site 196) 1.8km to the southwest and Raich (RSK Site 202) 2.8km to the southeast. The southern orientation of the recumbent stone provides a sightline in this direction. Distant visibility of the Development, with the nearest turbine located 9.8km to the northeast, will not detract from the prominence of the receptor in the landscape and does not impact on its setting.							
199	SM	SM No. 345; NMRS No. NJ66SW1	St Brandan's Stanes, stone circle	Cup marked stone, recumbent stone circle, cinerary urn	NMRS entry records the following: St Brandan's Fair was originally held in the neighbourhood of these stones. Anon 1883. An urn, containing very defaced coins, was found under one of these stones, some years ago. They are commonly called 'The Brannan Stanes' NSA 1845; Name Book 1866. St Brandan's Stanes. The few stones remaining of this stone circle are situated on the farm of Templeton, at the south extremity of a long strip of fir plantation running down from Bankhead Farm. The ground plan shows two pillars with, between them, a recumbent stone 8 feet long. In front of the pillars lie four large blocks and, close to the east face of the east pillar, an almost square block, vertical and apparently earth fast. This may be the beginning of an inner stone-setting. The east pillar shows signs of having been split and part-removed, in modern times. The west pillar has eight cupmarks near its base. In or before 1866 there were twelve, but some may have been obscured by the growth of grass and weeds around the base.	NE/BA	360750 861055	High	No change	None	Negligible; Negligible cumulative impact	Slight; Slight cumulative impact

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					J Y Simpson 1868; F R Coles 1906. An oval site raised about 1 foot higher than the surrounding ground, approximately 28 feet by 19 feet. The stones vary in height between 9 inches and 5 feet 6 inches, and in length between 2 feet and 4 feet 6 inches. OS Reviser S L J Easton 8 September 1955. These stones are generally as described by Coles (1906). The two largest stones measure about 1.5m long by 0.7m wide by 1.9 m high and about 1.3m long by 0.6m wide by 1.2 m. high. Only two good cupmarks could be seen near the base of the west pillar stone. The stones are situated in a small rough patch in a cultivated field and stones and weeds from the field have been dumped on the site. It is probable that the stones are the remains of a stone circle. Visited by OS (WDJ) 27 September 1961. The two stones described by Johnston, and still known locally as St Brandan's Stanes, are almost certainly the 'flankers' of a recumbent stone, of which there is now no trace. Several large broken stones at the corner of a dyke to the NE may have come from the circle. Revised at 1/2500. Visited by OS (NKB) 26 January 1968. Comments: Recumbent stone circle, with flanking stones to east and west, located in a prominent position on the northern slopes of Lodge Hill, 6.8km to the northwest of the nearest turbine. The area from which it is visible defines the extent of the setting of the monument. Visual relationships with possible contemporary sites, such as the barrows and enclosures of Hills of Boyndie (RSK Site 203) located 5.7km to the northeast, are also relevant. The perpendicular line azimuth is oriented almost due south. The eastern field boundary of the field in which St. Brandan's Stanes lies is lined with mature trees, which would mask views towards the Development from the asset. Distant views of the Development (over 6km to the south southeast) will not detract from the prominence of the receptor in the landscape, does not intrude on							

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					any sightlines, and does not impact on its setting. Cumulative impacts are addressed in the ES chapter.							
200	SM	SM No. 11112; NMRS No. NJ66NW4	Scotsmill, Enclosure 150m WNW of	Enclosure, pit(s)	NMRS entry records the following: (Location cited as NJ 6088 6549; classified as site of Regional Significance). Air photography has recorded the cropmark of an Enclosure on a gentle slope at an altitude of 45m OD. It is hexagonal on plan, measures about 21m by 18m, and has an internal feature about 5m square. [GRC/AAS air photographic imagery listed]. NMRS, MS/712/35. Scheduled as Scotsmill, Enclosure. Information from Historic Scotland, scheduling document dated 9 February 2004. Comments: Outwith ZTV	PREH	360884 865479	High	No change	None	No change	None
201	SM	SM No. 354; NMRS No. NJ66NW1	Boyne, Castle	Castle (Medieval)	NMRS entry records the following: Boyne Castle is protected on three sides by the Boyne Water, and on the south side by a dry moat nearly 60ft wide. The castle is all of one design, having been built about the end of the 16th century. It consists of a courtyard forming a parallelogram with a projecting round tower 22ft in diameter at each angle. The enceinte walls average 5ft in thickness. There have been ranges of buildings on the east, west and south sides of the quadrangle, but not on the north which was enclosed by a wall. The walls of the west side are still standing but those of the south side are greatly destroyed, while the eastern range has been almost entirely demolished. The approach to the castle from the south is through the gardens and orchards, of which some of the walls still remain. The moat is crossed by a causeway on the level of the principal entrance which is in the centre of the south front. The gateway is flanked by two circular towers, and was no doubt protected by a drawbridge in the raised causeway. D MacGibbon and T Ross 1887-92.	MED	361169 865649	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					The remains of the castle are generally described by MacGibbon and Ross (1887-92). The walls of the western range of buildings and the towers still stand to a height of c.10m. The remains are in a dilapidated and ruinous condition, overgrown with vegetation. Revised at 1/2500. Visited by OS (WDJ) 25 September 1961. Comments: Outwith ZTV							
202	SM	SM No. 42; NMRS No. NJ64SW1	Raich, stone circle 380m W of	Four poster stone circle	NMRS entry records the following: A small stone circle set on a sharply-defined stony mound, now turf-covered. The circle, only about 18' in diameter, is composed of blue whinstones, the settings of some of which suggested to Coles (1903) possible remains of cists. These lie on the north, close to the edge and are two earthfast blocks 19" high, an erect stone 4'2" high to the east and an earthfast block close beside it. Four well-set stones still stand erect on the south arc, the most easterly being 4'8" high, the middle two, 3', and the most westerly 2'5". F R Coles 1903. This is a good example of the type of monument known as a "four-poster"; it measures 4.3m NW-SE by 3.3m NE-SW overall. The W corner has been destroyed by ploughing, but the rest survives in good order and comprises an upright stone in each of three corners with a straight kerb of boulders on edge between them. The N and E stones are both 1.4m high and the S is 1.1m. The kerb varies in height between 0.9m and 0.2m. There has been no attempt to level the site, nor are the stones set on a mound as described by Coles (1903). The interior is filled to a height of about 0.6m by turf-covered earth and stones (un-certainly original), with additional recent field clearance. One large loose boulder in the centre, 0.9m long, may be the missing NW block, whilst other boulders may be from the kerb. Coles has misinterpreted displaced stones as the remains of cists.	BA	361878 843648	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Resurveyed at 1:2500. Visited by OS (ISS) 9 January 1973. Comments: Four-poster stone circle in a prominent position. 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 Cairnton stone circle (RSK Site 196) 3.4km to the east and Yonder Bognie (RSK Site 202) 2.8km to the northwest.. Distant visibility of the Development will not detract from the prominence of the receptor in the landscape and does not impact on its setting.							
203	SM	SM No. 5779; NMRS No. NJ66SE89, NJ66SE68, NJ66SE101	Hills of Boyndie, barrows & Enclosures 700m SW of Mill of Boyndie	Barrow(s), Enclosure(s), square barrows	NMRS entry records the following: A group of ring ditches and square Enclosures, probably burial mounds or barrows and settlement, possibly of more than one period, is visible as cropmarks on the Hills of Boyndie, 700m SW of Mill of Boyndie. Information from Historic Scotland, November 1993. SE of Ladysbridge Hospital, in a slight hollow, a cropmark of a small square feature, possibly a barrow, surrounded by two concentric circular traces. I Shepherd 1989l. Comments: Subsurface remains only.	PREH	365849 863654	High	No change	None	No change	None
204	SM	SM No. 338; NMRS No. NJ64SE1	Hare Stone, stone circle 480m NW of Feith-Hill	Stone circle	NMRS entry records the following: The Harestanes, the remains of a stone circle, now consist of 2 stones, a recumbent stone and the fallen west pillar. On what is now the upper suNJ64SE 1 6645 4383. The Harestanes, the remains of a stone circle, now consist of 2 stones, a recumbent stone and the fallen west pillar. On what is now the upper surface of the fallen stone are six plain cup-marks. Several cists were removed form the area of the circle which was very stony. F R Coles 1903; J Ritchie 1918.	BA	366454 843829	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					The Harestanes now comprise Coles' (1903) recumbent stone, an approximately square flat slab about 0.3 metres thick about 1.5 metres square leaning to the NE, and to the W an upright stone about 1.4 metres high, with at least 6 cup-marks. These stones appear to have been moved since the last 25" resurvey, although the farmer knows nothing of this or of cists found. Re-Surveyed at 1/2500. Visited by OS (RL) 7 September 1967. No change. Visited by OS (ISS) 4 January 1973. Comments: Stone circle located in a prominent position on the northeast-facing slope of Feith Hill in a poorly-preserved state, with two stones remaining. Welfare (2011) discounts the site as a recumbent stone circle. Key sightlines for recumbent stone circles are usually to the southwest, with views to contemporary monuments, such as Backhill of Drachlaw (RSK Site 206) and Cairn Riv (RSK Site 207) located 2.6km and 2.9km to the NNE also important. The setting of the monument consists of the area from which it is visible. The southern part of the scheduled area lies outwith the ZTV. The visibility of turbines located 11.2km to the NNW would not detract from the prominence of the receptor in the landscape, and turbines are not located along any sightlines.							
205	SM	SM No. 5668; NMRS No. NJ66SE17	Boyndie Old Kirk, Church 200m NW of Boyndie Bridge	Burial ground (post Medieval), Church (post Medieval)	NMRS entry records the following: The Church of St Brandan was mentioned in 1211 and 1214. It was abandoned in 1773 and since then has fallen into decay. The only reasonably preserved portions are the west wall and the belfry, which seem to be 17th century date. D MacGibbon and T Ross 1887-92. All that remains of this Church is the west gable which contains a small rectilinear window above an entrance which bears the date '1723'. Above this window are the remains of an old belfry which has been superseded by a later plain belfry complete with bell.	MED	366655 864512	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Revised at 1/2500. Visited by OS (WDJ), 2 October 1961. Comments: Outwith ZTV							
206	SM	SM No. 335; NMRS No. NJ64NE6	Backhill of Drachlaw, stone circle	Stone circle	NMRS entry records the following: (NJ 6729 4633) stone circle (NR) OS 6" map, Banffshire, 2nd ed., (1905). Not to be confused with Carlin Stone or Cairn Riv, possible stone circle (NJ 6744 4659) or stone circle (NJ 6709 4630) at Backhill of Drachlaw, for which seeNJ64NE 6 6729 4633 Backhill of Drachlaw, East Circle. This is a small circle, diameter 28 ft, devoid of a Recumbent Stone, consisting of 6 very large massive stones. The interior is level and smooth. Stones are from 2ft 7ins to 4 ft 10ins high. The stone 'E' has broken and the top half has fallen forward. No tampering with the stones or ploughing within the enclosure was found. F R Coles 1903. As described above. Resurveyed at 1/2500. Visited by OS (WDJ) 7 September 1964. Resurveyed at 1/2500. Visited by OS (RL) 4 September 1967. Scheduled as Backhill of Drachlaw, stone circle. Information from Historic Scotland, scheduling document dated 9 November 2000. Comments: Stone circle located on southeast shoulder of Drachlaw, overlooking a section of the River Deveron running south to north, 1.1km to the north. Shares a setting with Cairn Riv, a possible recumbent stone circle located 0.3km to the northeast. The area from which it is visible defines the maximum extent of the setting of	BA	367295 846334	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					the monument, and visual relationships with Cairn Riv (RSK Site 207) and other contemporary monuments such as Hare Stone (RSK Site 204) are particularly important. Visibility of the Development, with the nearest turbine located 9.0km to the northwest, will not detract from the prominence of the receptor in the landscape and does not impact on its setting.							
207	SM	SM No. 336; NMRS No. NJ64NE4	Carlin Stone, or Cairn Riv, stone circle, Backhill of Drachlaw	Recumbent stone circle (possible)	NMRS entry records the following: Not to be confused with possible stone circle (NJ 6709 4630) and stone circle (NJ 6729 4633) at Backhill of Drachlaw, for which see NJ64NE 5 and 6 respectively. Cairn Riv is said to have been surrounded by a chain of stone circles (of which NJ64NE 5, 6, and 7 comprise part.) A portion of a gold chain and a gold ring were found in Cairn Riv. The older spelling of the 'Carlin Stone' was 'Caerlin'. Name Book 1866. The Cairn-rieve stone is now the only one that remains of a large cairn which stood partly in Inverkeithny and partly in Turriff. About the year 1820, hundreds of loads of stones were carted from this cairn to build dikes on the farm of Raecloch. At that period the cairn was about 32 yards in diameter. 'In old times a road, about 12 feet broad and edged with slates led from the Cairn-rieve stone to a Druidical Circle at Drachlaw, not far distant - a circle that is still extant.' J B Pratt 1901. Cairn Riv. A dotted ring some 95ft in diameter is shown on the Ordnance map and on the S arc is an enormous stone named Carlin Stone. There are 3 stones in line, the Carlin Stone between 2 others quite small in comparison. In addition, there are 2 set stones projecting inwards from the Carlin Stone. This boulder, rugged, unshapely, and most unusual in height though it be, should be accepted as the Recumbent Stone of a circle that certainly once existed here, and partly because, through the information derived from the tenant of Backhill (Mr Anderson), the	BA	367440 846588	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					following facts were obtained. In Mr Anderson's father's time, there were several stones, none so huge as the Carlin, 'in a circle, within which was a very low mound or cairn, not a cairn in the true sense, but only 3ft or so in height, spreading over a great space'. The other stones were removed and the mound of stones were carried away for making dikes. In or near the circle were found a small perforated axe-hammer, portions of 3 bronze armlets, flint chips and a jet button. Mr Anderson gave Coles (1903) the button for presentation to the NMAS. F R Coles 1903. The Carlin Stone is 8ft high and 9ft long. There is now nothing to indicate the circle or the 'road' mentioned by Pratt (1901). At the base of the Carlin Stone are a number of stones cleared from the field. No information was obtained regarding the finds associated with the site. Revised at 1/2500. Visited by OS (WDJ) 7 September 1964. Scheduled as Carlin Stone or Cairn Riv, stone circle, Backhill of Drachlaw. Information from Historic Scotland, scheduling document dated 9 November 2000 Comments: Stone circle or cairn located between the hills of Drachlaw to the west and Cleftbog to the southeast, overlooking a section of the River Deveron running south to north, 0.9km to the north. Shares a setting with Backhill of Drachlaw, a stone circle located 0.3km to the southwest. The area from which it is visible defines the maximum extent of the setting of the monument, and visual relationships with Backhill of Drachlaw (RSK Site 206) and contemporary monuments such as Hare Stone (RSK Site 204) are relevant. The perpendicular line azimuth is oriented almost due south, forming a key sightline in this direction. Visibility of the Development, with the nearest turbine located 8.9km to the northwest, will not detract from the prominence of the receptor in the							

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					landscape and does not impact on its setting.							
208	SM and LB Category A	SM No. 3008; LB No.21988; NMRS No. NJ66SE8	Duff house, mausoleum 300m SW of the Orchard	Chapel, holy well, Mausoleum, Monastery	NMRS entry records the following: Our Lady Chapel near Banff was bestowed upon the Carmelite Friars in 1321 by Robert I who confirmed it to them in 1324 along with land for the erection of a church and monastery. In 1574 James VI granted the lands, buildings and revenues formerly belonging to this house to King's College, Aberdeen. D E Easson 1957. This is the actual site of the convent of the Carmelites. It is confirmed locally that the foundations of the old church or chapel of St Mary were where the Fife Mausoleum now stands. The churchyard is described as having been of large extent. A G Smith 1895. The water of St Marys Well is piped into a small stone basin on the pathway beneath. This basin was probably the holy water font belonging to the chapel for it is said to have been dug out of its ruins. Chisholm 1884. No traces of St Mary's Chapel can now be found. The Mausoleum built on the site is probably of early 19th century date. St Mary's Well consists of a wall of mortared stone c.5.0m long and c.1.4m high built in to the natural slopes at NJ 6797 6278. In the centre of the wall is a small stone lined U-shaped niche at the bottom of which is a pool of water. A narrow stone ledge runs along the face of the wall on either side of the Aisle. Visited by OS (WDJ) 5 October 1961. Site as described by Johnston (1961). Against the W wall of the Fife Mausoleum, probably built c.1750 at the same time as Duff House (information from Mr R Cairns, Banff Education Department), there is a medieval tomb or monument with reclining figure, incorporating a modern plaque verifying the information provided by Easson	MED	368040 862830	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					(1957). Mr Cairns believes that the Carmelite Monastery was probably in the vicinity of Carmelite Street in Banff, possibly at 6898 6397 where a pieta was unearthed during excavations for a new building some years ago. The pieta is in Banff Museum. Visited by OS (NKB) 1 February 1968. 'NJ66SE 8.04 68043 62826 and 67974 62786 Comments: Outwith ZTV							
209	SM and LB Category A	SM No. 2927; LB No.21957; NMRS No. NJ66SE23	Banff Castle	Castle (Medieval), house (Medieval), motte (Medieval)	NMRS entry records the following: The north wall and parts of the east and west walls of the castle remain. The north wall is 144 feet long, the east 82 feet and the west 36 feet. The walls are 18ft high and 6 feet 4 inches thick and are formed of solid masonry. In front of the house is a well 33 feet deep, which was probably within the ancient courtyard. It is lined with dressed freestone, and holds water to a depth of 16 feet. The part of the moat remaining forms two sides of a rectangle. The northern limb is 250 feet long, the eastern 156 feet, and the depth 20 feet. The width across the top is 44 feet and across the bottom 19 feet. Many antiquarians consider that it was a dry moat. The present house was built in 1750. A part of the house, built by Archbishop Sharp's father was pulled down about 1816. The modern castle remains very much as it was built in 1750. Mahood 1919. (NJ 6882 6421) The remains of the castle are as described in Mahood (1919). The dry moat, in good preservation has a maximum depth of 3.4m on the NW side. The steep scarp on the north and east sides of the ditch has a maximum height of 5.4m at the NE angle. The well is at NJ 6892 6418. It is covered with a concrete slab and a dome-shaped structure, 2.4m in diameter and c.3.5m in height, has been built over it. To the NW of the castle, beyond the moat, there is a large garden (NJ 6888 6427) surrounded by a high wall. The remains of the wall of the castle attain a height of 3.2m. The present house, built in 1750, is a plain, harled building of three storeys, it is now a	MED	368927 864191	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					community centre. Revised at 1/2500. Visited by OS (EGC) 10 October 1961. The remains of Banff Castle are as described by Mahood (1919) and Cameron. According to a note about the castle (source unknown) which is framed and hung up in the community centre, a castle is mentioned in the 12th century, and Edward I stayed at a castle in Banff in 1296. The rolled moulding on a round-arched sally port in the N curtain wall suggests a 16th century date for the existing remains. A shallow discontinuous depression running E-W across the lawn to the S of the community centre, almost certainly indicates the course of the moat with a possible central causeway. The name 'Castle' as applied to the community centre is obsolete. Visited by OS (NKB) 1 February 1968. Comments: Outwith ZTV.							
210	SM and LB Category A	SM No. 6645; LB No. 22003; NMRS No. NJ66SE42	Banff, St Mary's parish Church and Burial ground	Burial aisle, Burial ground, Church	NMRS entry records the following: The old church of Banff, dedicated to St Mary, was erected in 1471 and demolished in 1797 leaving only a south aisle. Name Book 1867; A Ramsay 1886. All that remains of St Mary's Church is the so-called south aisle, which is a burial vault of the Ogilvies containing 16th century graves and part of the N wall, incorporating grave-slabs erected before 1797, when the church was mostly demolished. The graveyard is disused. Visited by OS (NKB) 1 February 1968. NJ 6903 6404 A project for the restoration and conservation of the Banff (Ogilvie) Aisle made provision for limited archaeological observation and excavation to lower and level the ground both inside and outside the aisle. The work was carried out in March and June 2003. No archaeological features or finds were evident during the lowering of the exterior ground level. However, reduction of the 20th-century	MED	369054 864047	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					floor level within the aisle exposed the lowest detail of the Ogilvie tomb. It was evident that the interior ground level was made up, to a depth exceeding 0.75m, by using material from the late 18th-century landscaping of the surrounding graveyard. This fill contained small amounts of disarticulated human bone and a single coin - a copper turner or twopence of Charles I, dated between 1642-50. Above this, a hard-packed layer of black sandy clay formed the floor level, with reused red sandstone slabs placed beneath the columns of the tomb and in front of the doorway into the aisle. Archive to be deposited in the NMRS. Sponsor: Aberdeenshire Historic Kirkyards Project. J C Murray 2003 'NJ66SE 42 69048 64056 Comments: Outwith ZTV							
211	SM and LB Category A	SM No. 90104; LB No.21985; NMRS No. NJ66SE8	Duff house	Country house	LB entry records the following: William Adam, 1735-40; George Jamieson, mason; John Burn, specialised carving. Substantial Baroque mansion; square plan (9 x 8-bay), 3-storey on raised basement (mezzanine to side elevations) with advanced corner towers, breaking eaves, and with domed roofs and cupolas. Finest ashlar, rusticated basement, dividing cornice above, band course at 1st floor, substantial mutuled cornice above frieze, below attic floor; wallhead balustrade with panelled and urn-finialled dies on cornice and blocking course. Fluted Corinthian pilasters rising through principal and 1st floors and to towerheads. Architraved windows, pedimented to principal floor, corniced to 1st floor, keystoned to 2nd, attic floor, round-arched and keystoned below swags and tablet panels in towerheads, keystoned and blinded to tower basements, aprons to principal and 1st floor windows; basket-arched, windows to tower basements. Carved ornament to blocking course of towerheads with urn finials to angles; corniced, octagonal, panelled, ashlar, lantern stacks to centres of domed roofs. Comments: Outwith ZTV	PM	369072 863274	High	No change	None	No change	None
212	SM	SM No. 5638; NMRS No.	Eden Castle	Castle	NMRS entry records the following:	PM	369798 858781	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
		NJ65NE15			Eden Castle is of the period between 1542 and 1700. In the sixteenth century the lands belonged to the Meldrums, by whom the castle may have been built. In 1676-7 it seems to have been extensively repaired by George Leslie, to whom it then belonged. This date is carved on some parts of the castle. The edifice is now very ruinous, and the buildings which adjoined the main block to the north have been entirely demolished. The original plan seems to have been that of a main central building, with two towers at diagonally opposite angles. That at the south-west angle still remains. The castle seems to have been extended to the northwards with a round tower at the north-west angle of the existing building, and may perhaps have formed a courtyard. D MacGibbon and T Ross 1887-92. As described above. The North face of the main central building has now partially collapsed while the remains of the small round tower at the NW angle are now incorporated in the modern field wall. A modern stone shed abuts the South side of the SW tower. Visited by OS (WDJ) 22 September 1964. Comments: Within ZTV, but adjacent farmhouse of Mains of Eden and conifers mask visibility of turbines from the monument.							
213	SM	SM No. 2221; NMRS No. NJ76SW2	Macduff, market cross	Market Cross	NMRS entry records the following: Macduff market Cross bears an inscription to the effect that it was rebuilt in 1783. It rests on a square pedestal fixed on the top of a high wall. The shaft is rectangular in section and the head is of a peculiar formation, havinNJ75SW 2 7414 5001. A large sepulchral mound, 6 or 8yds in diameter, and about 4ft high, was formerly situated about 20 chains to the north east of Upper Smiddyseat. The centre of the mound contained a considerable quantity of wood ash. About 35 years ago (about 1836) this tumulus was levelled by ploughing. Name Book 1871. Comments: Outwith ZTV	MED	370132 864390	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
214	SM	SM No. 5781; NMRS No. NJ75SW25	Haughs of Ashogle, circular Enclosure 300m WNW of	Enclosure, ring ditch(s)	NMRS entry records the following: The monument comprises a circular Enclosure, probably the remains of a ditched Enclosure, appearing as a cropmark in an arable field. The circular Enclosure shows as a broad circular trace, suggesting that the ditch is quite substantiNJ75NW 25 742 595 Air photography (AAS/96/14/G37/1-4, flown 15 August 1996) has recorded the very faint trace of a possible sub-circular Enclosure and four dark cropmarks of 'blob' form on a gentle W-facing slope in an area of arable ground. Information from Aberdeenshire Archaeological Service, October 1996. NMRS, MS/712/12. Comments: Outwith ZTV	PREH	370353 852169	High	No change	None	No change	None
215	SM	SM No. 5782; NMRS No. NJ75SW27	Boat of Muiresk,circular Enclosure 200m N of	Enclosure	NMRS entry records the following: A circular palisaded enclosure is visible as a cropmark situated in an arable field, 200m N of Boat of Muiresk, on a ridge at the edge of a high scarped terrace of the River Deveron. Information from Historic Scotland, November 1993 Comments: Outwith ZTV	BA	370701 850248	High	No change	None	No change	None
216	SM	SM No. 5617; NMRS No. NJ75NW2	King Edward Old Parish Church, Church 220m SW of Den Bridge	Burial ground, Church, Pictish symbol stone(s) (Pictish)	NMRS entry records the following: This is the old parish church of King Edward, in which the last service took place on 25th June 1848. The patron saint of the Celtic Church of King Edward was St Aidan, who died about 651. 'The close proximity of the Old Parish Church to the lands of Eden suggests that the first religious cell had been on that historic site, a situation within the bend or crook of a river repeatedly found at old Celtic religious centres. In close proximity is Balchers, the town of the cross, where a cross was erected for Christian worship.' That a church and parish had been erected at King Edward in 1124 is almost certain. The west gable and parts of the north and south	EME	370928 857763	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					walls of this church still stand. It was the 'Church of the Blessed Apostle Peter'. The church was lengthened by Robert Keith in 1570 and his initials and coat of arms with the date are on the east gable. The south transept was added in 1619. The belfry is probably 18th century. The churchyard gateway was built in 1621 by John Urquhart of Craigston, whose arms it bears. Two symbol stone fragments were found in the churchyard. J Godsman 1948. Fragmentary, with 1619 belfry, 1755 Mowat bell and 1621 kirkyard gateway. G Hay 1957. The remains of the church are as described above. The walls are c.1.0m thick, the west gable and parts of the north and south walls stand to their original heights. The coat of arms of Robert Keith was not seen. No information was found regarding the two symbol stone fragments found in the churchyard. Visited by OS (WDJ) 22 September 1964. Comments: Outwith ZTV							
217	SM	SM No. 2458; NMRS No. NJ75NW1	Castle of King Edward	Castle, motte (possible)	NMRS entry records the following: King Edward Castle: The ruins of what was probably a castle of the period between 1200 and 1300. The name associates it with Edward and his invasion, but it is believed to be a corruption of a much older name - Kinedar. The castle seems to have been built by the Comyns, and was probably dismantled by Bruce, afterwards passing through many hands. It appears to have been re-built by Lord Forbes early in the 16th century. D MacGibbon and T Ross 1887-92. From the ground plan that remains, the castle appears to have belonged exclusively to the 13th century. Its enclosing walls had no angle towers.	MED	372192 856195	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					The castle was protected on the south by the Burn of King Edward; on the east and west the sides were precipitous, and on the NW angle a deep ditch was dug which severed the neck of the peninsula. The ditch was spanned by a drawbridge which served a gateway, a massive portion of the base of which is the most conspicuous remaining fragment of the castle. Within the courtyard can still be traced the rooms and towers of the castle. Three chambers flanked either side of the courtyard, and at the east end, opposite the gate, the two sides were closed by a chamber of quite large dimensions. Foundations for that part of the building that did not rest on solid rock were found down the face of the promontory. Carved stones etc from the castle are preserved at Castleton Farm. J Godsman 1952. The remains of this castle, as described above, consist of fragments of walling now from 0.5m - 5.0m high, with the outline of a rectangular courtyard in the centre. The ditch on the NW side is more likely to be a natural, rather than an artificial, gully. The Castle Hill is now much overgrown, and the remains of the castle are further obscured by piles of rubble, apparently spoil from excavations. One stone said to be from the castle was seen inserted in the steading wall at Castleton; there are others now obscured or hidden by extension to the steading. Revised at 1/2500. Visited by OS (WDJ) 23 September 1964; Information from Mr W Sharp, farmer, Castleton. Comments: Outwith ZTV							
218	HDGL	146; NMRS No. NJ66SE8	Duff house, Duff house gardens	Walled garden	HGDL entry records the following: A later 18th-century designed landscape of woods, walks, parks and ornamental architecture, celebrated for its picturesque qualities and associated with William Adam's flamboyant classical mansion, Duff House.	PM	369054 863729	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Outwith ZTV							
219	LB Category A	LB No.15618; NMRS No. NJ54NE7	Rothiemay house, Kiln barn	Kiln barn	NMRS entry records the following: There are references to a kiln barn existing at Rothiemay in 1634 but the existing building appears to date from 1742 as there is a contract for its construction, of that date, between William Duff and Alexander and George Gaylor (Duff House Papers, Special Libraries and Archives, University of Aberdeen; MS 3175/648). The design was prepared by William Anderson. The kilnbarn is described in detail by Harry Gordon Slade ("Rothiemay: An 18th Century Kiln Barn," in Vernacular Building 4 (1978)) - it consists of two storeys and a slate roof, with the circular kiln in the western end. There was a threshing area and granary on the ground floor and a drying loft above. The walls are harled field-gathered rubble with granite quoins and dressings around the openings. The roof collapsed in the 1990s and it is now in a ruinous state. For further details regarding this and neighbouring sites lying within the policies of Rothiemay Castle, see the Kirkton of Rothiemay Survey Report, linked to this record.Information from William Reid, May 2011. Comments: Outwith ZTV.	PM	355122 848430	High	No change	None	No change	None
220	LB Category A	LB No.15610; NMRS No. NJ54NE24	Mains of Mayen	Farmhouse, Farmstead and sundial (possible), Tower house	NMRS and LB entries record the following: Not to be confused with Mayen house (NJ 5798 4787), for which see NJ54NE 24. (Location cited as NJ 5747 4777). A restored 17th century house with a date stone, 1680. Visited by OS 8 September 1964. The sundial depicted in MS 5741/8/7 was removed from Davidston near Huntly, to Old Mayen, where it was photographed in 1990, but it is not known whether it is still there. (A Cassells, 28 January 2010).	PM	357465 847769	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Dated 1680. 2-storey, L-plan house with circular stair turret in re-entrant angle; 3 builds circa 1600, 1680 and mid-later 19th century. Harled, whinstone and granite ashlar dressings, substantial boulder footings to earliest portion of house at N. N-S rectangular block with main E elevation comprises circa 1600 build at N and 1680 at S, with simple doorway in E front under dated and inscribed plaque. Mid-later 19th century 2-storey, 3-bay block at right angles with projecting gabled porch in N face and enlarged ground floor windows. Circular stair tower with 2 windows and diminutive gabletted wallhead dormers; bellcast slated roof. Varied fenestration with small gabletted dormers breaking wallhead in older portion, 1 dormer at E having gablet dated 1680. Substantial early ridge stack in early block (probably circa 1600) with end stacks, small ridge stack in mid-later 19th century wing; slate roofs; crowstepped gables. Comments: Residential LB located on shoulder of hill above the River Deveron. The extent of the LB's setting consists of the farmhouse, steading and its associated fields. Visibility of the turbines, located 9.6km to the northeast, would be partially masked by shelterbelt to the north of the receptor, and would not impact on the receptor's setting.							
221	LB Category A	LB No.6662; NMRS No. NJ66SE212	South Colleonard with urns, gates and gatepiers	Farmhouse, Farmstead	NMRS and LB entries record the following: John Gordon, architect, Glasgow, c.1870. Ref: 'Cottage and Villa Architecture' Published Blackie and Sons, Glasgow, late 1860's, illustrated as Oakleigh Villa, plates vii and viii. Information from Mrs Elizabeth Beaton,NJ66SE 212 66635 62668 After John Gordon, circa 1870. Tall Italianate house on SE facing sloping site. 2-storey and attic over raised battered basement, roughly L-plan with S re-entrant angle infilled in early 20th century with glazed conservatories. White harled with self-coloured painted ashlar dressings. Comments: Residential LB located on southeast-facing hillslopes overlooking the A97 and the River Deveron to the southwest of	PM	366635 862668	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Banff. The extent of the LB's setting consists of the farmhouse, steading and fields extending to the A97 to the southeast. Visibility of the turbines, located 8.1km to the SSW, would not impact on the receptor's setting.							
222	LB Category A	LB No.2883; NMRS No. NJ66SE98	Bridge of Alvah	Road Bridge	NMRS entry records the following: (Location cited as NJ 680 612). Bridge of Alvah, built 1772. A magnificent semicircular rubble arch, with a chamber in the W abutment. J R Hume 1977. Bridge of Alvah (1722). An unusual feature of this bridge is the room incorporated within the structure for the toll collector. C McKean 1990. This bridge carries an estate track over the River Deveron within the policies of Duff house (NJ66SE 8.00). The location assigned to this record indicates the apparent midpoint of the structure. The available map evidence indicates that it extends from NJ c. 68007 61077 to NJ c. 68025 61062. Information from RCAHMS (RJCM), 6 June 2006. Comments: Outwith ZTV	PM	368020 861067	High	No change	None	No change	None
223	LB Category A	LB No.22035; NMRS No. NJ66SE130	Institution Terrace, Banff Primary School (former Banff Academy) with lamp standards	School	NMRS entry records the following: Greek neo-classical, single storey of 15 bays with Ionic portico and later rear addition. ARCHITECT: William Robertson of Elgin (1837-8). Recorded by RCAHMS in 2000 as part of the Survey of Schools Comments: Outwith ZTV	PM	368814 863761	High	No change	None	No change	None
224	LB Category A	LB No.21885; NMRS No. NJ66SE169	11 Boyndie St, Banff Town and Country Club and enclosing walls.	Country club	LB entry records the following: Mid to later l8th century, probably of slightly different builds. 2 and 3-storey, U-plan town house of considerable quality. S elevation to Boyndie Street but main entrance front reached from Kingswell	PM	368832 864023	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Lane. Comments: Outwith ZTV							
225	LB Category A	LB No.21941; NMRS No. NJ66SE143	31, 33, 35 Castle St and 2, Seafield Street, Town Hall	Masonic Hall, Town Hall	LB entry records the following: Thomas Mackenzie, Elgin, I851-4. Italianate, tall 2-storey, symmetrical 5-bay building to Castle Street with wide return bay and lower, narrower 2-storey, 3-bay wing to Seafield Street. Dark whinstone with contrasting polished sandstone ashlar dressings and margins. Comments: Outwith ZTV.	PM	368838 864205	High	No change	None	No change	None
226	LB Category A	LB No.22098; NMRS No. NJ66SE353	1 St Catherine Street, St Catherine's	House	LB entry records the following: Circa 1830, style of Archibald Simpson, Aberdeen. Austere 2-storey over raised basement, 5-bay mansion. Grey granite ashlar, bull-faced granite raised basement frontage and return E gable (to Castle Street); harled rear and W return gable with sandstone ashlar margins. Comments: Outwith ZTV.	PM	368842 864326	High	No change	None	No change	None
227	LB Category A	LB No.22077; NMRS No. NJ66SE49	Quayside Banff Harbour and pillbox	Harbour	NMRS entry records the following: (Location cited as NJ 689 648). Banff Harbour. A large basin formed by an L-plan pier and a straight pier, and subdivided by two straight piers into three basins. The piers are all rubble-built, with much of the masonry vertically set. Now badly silted. The inner harbour was built in 1775 and the outer pier added in 1816 by engineer Thomas Telford. J R Hume 1977. Comments: Outwith ZTV.	PM	368883 864581	High	No change	None	No change	None
228	LB Category A	LB No.22111; NMRS No. NJ66SE77	2 Water Path, Inglenuek House, Garden Walls and	House (17th Century)	LB entry records the following: Later I7th century. 2-storey and dormerless attic house, 5-bay W garden front, irregular 3-bay E entrance front as part of L-plan range	PM	368981 864066	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
			Garden Summer House		with No 3 Waterpath. Harled rubble, painted chamfered margins. Wide doorway with double-leaf panelled doors; irregular fenestration with some small windows. Larger windows and doorway to 5-bay garden elevation. Varied glazing in timber sash and case windows. Crowstepped N gable to street; coped end stack at N gable apex, massive harled rubble square stack at S (serving kitchen hearth); slate roof. Comments: Outwith ZTV							
229	LB Category A	LB No.22063; NMRS No. NJ66SE434	34 Low Street, Townhouse	Town house	NMRS entry records the following: NJ 6898 6396 The floorboards and most of the joists in the ground floor rooms to the N and S of the main entrance of Banff Town house (NJ66SE 434), built in 1796, were fully recorded in November and December 2004 prior to being renewed. When the floor and underlying rubble in the N room was removed, c 4.6m of an earlier wall, running E¿W, was revealed. This wall foundation pre-dates the Town house and it has been suggested that it might be the remains of Banff Palace, the town house of Lord Banff, reported to have been destroyed by Munro in 1642. No other archaeological features or finds were evident. Report lodged with Aberdeenshire SMR and NMRS. Sponsor: Aberdeenshire Council. 'NJ66SE 434 68988 63963 Architect: James Reid, 1796. Comments: Outwith ZTV	PM	368988 863963	High	No change	None	No change	None
230	LB Category A	LB No.22111; NMRS No. NJ66SE77	2 Water Path, Ingleneuk House Garden Walls and Garden Summer House	House	LB entry records the following: Later I7th century. 2-storey and dormerless attic house, 5-bay W garden front, irregular 3-bay E entrance front as part of L-plan range with No 3 Waterpath. Harled rubble, painted chamfered margins. Wide doorway with double-leaf panelled doors; irregular fenestration with some small windows. Larger windows and doorway to 5-bay garden elevation. Varied glazing in timber sash and case windows. Crowstepped N gable to street; coped end stack at N gable apex, massive harled rubble square stack at S (serving kitchen hearth);	PM	368988 864055	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					slate roof. Comments: Outwith ZTV							
231	LB Category A	LB No.22062; NMRS No. NJ66SE52	Low Street, Tollbooth Steeple	Steeple, tollbooth	NMRS entry records the following: Town Steeple, 1764-7. (Undated) information in NMRS.NJ66SE 52 68989 63949 Comments: Outwith ZTV	PM	368989 863949	High	No change	None	No change	None
232	LB Category A	LB No.22056; NMRS No. NJ66SE153	8-16 (Even Nos..) Low Street, ((former Fife Arms), Fife house	House	NMRS entry records the following: ARCHITECT(S): William Burn (& David Bryce), 1844. From 'Edinburgh Evening Courant' (Dec 7, 1844) Comments: Outwith ZTV	PM	368992 863864	High	No change	None	No change	None
233	LB Category A	LB No.22056; NMRS No. NJ66SE153	8-16 (Even Nos..) Low Street, (former Fife Arms), Fife house	House	NMRS entry records the following: ARCHITECT(S): William Burn (& David Bryce), 1844. From 'Edinburgh Evening Courant' (Dec 7, 1844) Comments: Outwith ZTV	PM	368995 863845	High	No change	None	No change	None
234	LB Category A	LB No.22056; NMRS No. NJ66SE153	8-16 (Even Nos..) Low Street, (FORMER Fife ARMS), Fife house	House	NMRS entry records the following: ARCHITECT(S): William Burn (& David Bryce), 1844. From 'Edinburgh Evening Courant' (Dec 7, 1844) Comments: Outwith ZTV	PM	368996 863813	High	No change	None	No change	None
235	LB Category A	LB No.22056; NMRS No. NJ66SE153	8-16 (Even Nos..) Low Street, (FORMER Fife ARMS), Fife house	House	NMRS entry records the following: ARCHITECT(S): William Burn (& David Bryce), 1844. From 'Edinburgh Evening Courant' (Dec 7, 1844)	PM	368996 863834	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Outwith ZTV							
236	LB Category A	LB No.22004; NMRS No. NJ66SE108	1 High Shore	Bank, Police Station	LB entry records the following: Dated 1675. 3-storey, 3-bay house with 2 return bays to Carmelite Street. Harled, ashlar margins and dressings. Comments: Outwith ZTV	PM	369011 864008	High	No change	None	No change	None
237	LB Category A	LB No.2885; NMRS No. NJ66SE8	Duff house, Fishing Temple	Fishing Bothy	NMRS entry records the following: ARCHITECT: William Adam c.1743 Was situated on an island in the River Deveron. (Undated) information in NMRS. Comments: Outwith ZTV	PM	369065 862848	High	No change	None	No change	None
238	LB Category A	LB No.21893; NMRS No. NJ66SE97	Bridge of Banff over River Deveron	Road Bridge	NMRS entry records the following: (Location cited as NJ 696 638). Bridge of Banff, built 1779 by engineer John Smeaton and widened 1881 by engineer John Willet. A seven-span bridge with dressed-stone arch rings, and rubble spandrels with oculi. The original arches have a smaller radius than those added during widening. Both areas segmental. J R Hume 1977. The first bridge across the dangerous and unpredictable River Deveron (near Old Market Place) was completed in 1765 but was washed away only three years later. The replacement ferry boat was lost in 1773, and the new (present) seven-arched bridge with its blind baroque roundels was completed by John Smeaton in 1779. Access to the centre of the town is gained via Bridge Street. C McKean 1990. This bridge carries the A98 (T) public road across the River Deveron to the E of Banff (NJ66SE 45). The river here forms the boundary between the parishes of Banff (to the W) and Gamrie (to the E). The location assigned to this record indicates the apparent midpoint	PM	369473 863779	High	Moderate	Large	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					of the structure. The available map evidence indicates that it extends from NJ c. 69406 63773 to NJ c. 69544 63783. Information from RCAHMS (RJCM), 6 June 2006. Comments: Outwith ZTV							
239	LB Category A	LB No.13603; NMRS No. NJ65SE30	Forglen House	Country house	LB entry records the following: James Smith of Aberdeen, circa 1840. 3-storey, Tudor mansion on site of, and possibly incorporating earlier house. Picturesque, asymmetrical massing, with corner and square, off-centre towers, around central courtyard. Rubble whinstone, harled, with cream ashlar dressings, Turriff sandstone dressings to rear. Moulded string course between 1st and 2nd floor of SE and NE fronts. Taller 1st floor windows to principal rooms. Ashlar mullions and transoms. Canted bays with cornice and parapet with ball finials. 2nd floor windows breaking eaves in gabled dormerheads. All windows with stone mullions and transoms. Comments: Outwith ZTV	PM	369887 851856	High	No change	None	No change	None
240	LB Category A	LB No.42163; NMRS No. NJ74NW12	Old Parish Church of St. Congan (Coav), Castle Street and Putachie Path	Church	NMRS and LB entries record the following: Ruin of E. end of long rectangular church; mediaeval walls, red rubble, rich 1636 double bellcote with double pendant arches, ogce top; several notable wall monuments, one 1580, 2 17th century. Short section at E. end roofed. 10-head sculptured stone (Earl and Countess of Buchan etc.) from Hospital of Turriff inserted in E. gable; 1556 bell; 1797 clock brought from Carnousie 1828. St Congan's Church was granted before AD 1214 to the Monks of Arbroath. The old parish church of St Congan was a long narrow structure, 120ft, in length, by 18ft wide. When the new church was erected in 1794 the earlier building was left to decay and the eastern end, still known as 'the quire' is all that now remains. The erection of the choir can be satisfactorily assigned to the first part of the 16th century. In 1861 portions of the choir were taken away, and on removing the	MED	372231 849831	High	No change	None	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					stones from a window in the south wall which had been built up, there appeared on the splay of one side the figure of a bishop painted on the plaster in bright colours. An inscription in Gothic letters above read 'S Ninianus'. A similar painting on the other splay of the window was destroyed before it could be drawn or photographed - there is reason to believe that there was a series of similar pictures around the church. J Stuart 1869. This church was probably established in the 7th century by a follower of St Columba. D MacGibbon and T Ross 1896-72. The old parish church of Turriff still stands on the site of the church which St Congan founded. (but see NJ74NW 22 ? Monastery). A B Scott 1918. The remains of the old church consist of the north and south walls and the entire east gable of the choir, and measures 16.0m E-W by 7.5m transversely. The north and south walls stand to their original height of c.6m, and an interior cross wall of similar height blocks off the east half of the choir. No trace remains of the paintings mentioned by Stuart (1869). The north and south walls are extended westwards 5.0 and 12.0m respectively by walls of a later period c.2.0m high. Visited by OS (WDJ), 13 December 1962. Comments: Remains of a church without surviving spire or tower in the centre of Turriff. Any visibility of turbines located 9.5km to the northwest likely to be masked by surrounding buildings within a heavily-altered cultural setting.							
241			North Cranna	Farmhouse, mill dam	Farmhouse, steading and mill dam depicted on the 1st Edition OS and labelled “Mid Crannah”. Labelled “Hearty Cranna” on Roy’s Map. Farmhouse depicted on 1st Edition OS as a C-shaped building, with the mill dam and sluice to the north. The modern farm is larger, with tin-roofed cowsheds, and the pond has been filled in.	PM	363772 853349	Medium	Minor	Slight	No change	None

RSK ID	Status	Designations	Name	Type	Description	Period	NGR	Importance	Physical Impact	Significance of Physical Impact	Setting Impact	Significance of Setting Impact
					Comments: Undesignated site, and not considered for assessment of impact on setting.							
242			Corskie	Building	Building labelled “Corskie TP” (turnpike) labelled on 1st Edition OS. Likely to be a tollbooth associated with the turnpike, now the modern B9025 road. Likely to have been destroyed during widening of the B9025 – no remains identified during site visit. Comments: Undesignated site, and not considered for assessment of impact on setting.	PM	363809 853012	Negligible	Major	None	No change	None

Appendix 9.2: Figures, Plates and References

APPENDIX 9.2: FIGURES, PLATES AND REFERENCES

List of Figures

Figure 9.1: Archaeological Constraints within Study Area A (A3)
Figure 9.2: Key visual heritage receptors (A3)

List of Plates



Plate 1: View of possible dyke and ditch running parallel to farmer's track from the south (RSK Site 64).



Plate 2: View of possible quarry scoop (RSK Site 68).



Plate 3: View of likely modern cultivation marks, possibly overlying earlier marks in plot 15 (RSK Site 88)



Plate 4: Newlands Croft (RSK Site 47) viewed from the south.



Plate 5: Former post-medieval quarry at Black Law.



Plate 6: Remains of Gushetbog Croft (RSK Site 42).



Plate 7: Smithfield Smithy (RSK Site 44) visible as a track and artificial platform only.



Plate 8: Smithfield Croft (RSK Site 46) visible as a grassed over rubble.



Plate 9: Tam's Chamber (RSK Site 50) in plot 9.



Plate 10: Typical visibility in Plot 11.



Plate 11:View of Hillend croft (RSK Site 39).



Plate 12: View of West Deuchries (RSK Site 36).



Plate 13: View of East Deuchries (RSK Site 40).



Plate 14: View of farmstead and mill of Upper Deuchries (RSK Site 51).



Plate 15: View of the rear New Marnoch Church (RSK Site 6) and into the Aberchirder conservation area and 18th-century planned village (RSK Site 1) from the east.



Plate 16: View of the recumbent stone circle of Yonder Bognie (RSK Site 197) taken from the north.

References

National Library of Scotland Digital Map Library

Cartographer	Title/ Description	Date
Pont, T.	Pont 9: Coast of Banff	1580 – 1590s
Gordon, R. and J. Blaeu	Duo Vicecomitatus Aberdonia & Banfia, una cum Regionibus & terrarum tractibus sub iis comprehensis / Auctore Roberto Gordonio à Straloch. Description of the two Shyres Aberdene and Banf, with such Countreys and Provinces as ar comprehended un	1654
Moll, H.	The Shires of Bamf [i.e. Banff] and Aberdeen	1745
Roy, W.	Roy Military Survey of Scotland – Highlands	1752-55
Thomson, J	Atlas of Scotland: Banff	1832
Ordnance Survey	Banff, SheetXVI.6	Surveyed 1868; published 1871
Ordnance Survey	Banff, SheetXVI.2	Surveyed 1868; published 1871
Ordnance Survey	Banff, SheetXVI.3	Surveyed 1868; published 1871
Ordnance Survey	Banff, Sheet X.14	Surveyed 1866; published 1871

Vertical Aerial Photographs from the Royal Commission

Library Ref	Sortie #	Date	Frame #
B0078	106G/05/46	08/05/46	3092, 3094, 3096 3256, 3258 4256, 4258
B0364	58/1327	16/12/1953	F22/ 0058, 0057 F21/ 0055, 0057
B0396	82/1052	05/11/1954	F21/0069, 0071, 0073
B0603	542/0074	26/10/1954	F21/0157, 0155
B0642	58/1222	19/7/1953	F21/ 0020, 0022 F22/0020, 0022
C0252	ASS/607/88	06/05/1988	207, 208, 209
OS63-164	0S63-164	20/7/1963	101 – 103 65 – 68
OS63-165	0S63-165	20/7/1963	19 – 22
OS65-045	OS65-045	22/4/1965	001 - 003
OS68-212	OS68-212	14/6/1968	319, 320, 367, 368

Vertical Aerial Photographs from Aberdeenshire Council

Council Ref	Date	Frame #
NJ65 S	26/6/1977	2723118 – 2723120
NJ65 S	07/7/1977	2730177 – 2730178
NJ65 N	23/8/1976	2648164 – 2648166
	2/06/1977	2719098 – 2719101

Additional Sources

Aberdeenshire Council 2005. *Use of Wind Energy in Aberdeenshire. Part Two: Guidance for Assessing Wind Energy Developments. August 2005*.

Baird, D. and B. Finlayson 1994. A Mesolithic and later flint scatter at Little Gight, Grampian Region. *Proceedings of the Society of Antiquaries of Scotland* 124: 95-101.

Birks, H. J. 1977 The Flandrian forest history of Scotland: a preliminary synthesis. In F. W. Shotton (ed) *British Quaternary Studies: Recent Advances*: 119 – 135. Clarendon: Oxford:

Darvill, T. 1987. *Prehistoric Britain*. B. T. Batsford: London.

Edwards, K. J. and I. Ralston 1984. Postglacial hunter-gatherers and vegetational history in Scotland. *Proceedings of the Society of Antiquaries of Scotland* 114: 15 – 34.

Henry, D. Parish of Marnoch. New Statistical Account of Scotland: http://stat-acc-scot.edina.ac.uk/link/1834-45/Banff/Marnoch/

Historic Scotland 2010 *Managing Change in the Historic Environment: Setting*

Innes, J. 1978. Parish of Marnoch. In D. J. Withrington and I. R. Grant (eds) *The Statistical Account of Scotland: Vol.16, Banffshire, Moray & Nairnshire*

Mackey, E. C., M. C. Shewry and G. J. Tudor 1998. *Land Cover Change: Scotland from the 1940s to the 1980s*.

Marshall, D.N. 1976-7 Carved Stone Balls. *Proceedings of the Society of Antiquaries of Scotland* 108: 40-72

Morrison, I. A. 1983. Prehistoric Scotland. In G. W. Whittington and I D. Whyte (Eds) An Historical Geography of Scotland: 1 – 24. London: Academic Press.

Price, R. J. 1983. *Scotland's Environment during the last 30,000 years*. Edinburgh: Scottish Academic Press.

Saville, A. 1997. Palaeolithic handaxes in Scotland *Proceedings of the Society of Antiquaries of Scotland* 127: 1-16.

Ritchie, G. and A. Ritchie 1991. *Scotland: Archaeology and Early History*. Edinburgh: Edinburgh University Press

RSK 2011. *Deuchries Wind Farm: Scoping Report*

Schofield, J. 1999. Landscapes of the Middle Ages: Towns. In J. Hunter and I. Ralston (eds) *The Archaeology of Britain: An introduction from the Upper Palaeolithic to the Industrial Revolution*: 210 – 227. London: Routledge.

Saville, A. 1997. Palaeolithic handaxes in Scotland *Proc Soc Antiq Scot,* 127(1997), 1-16.

Small, A. Dark Age Scotland. In G. W. Whittington and I D. Whyte (Eds) *An Historical Geography of Scotland*: 25 – 46. London: Academic Press.

Stewart, J. M. and S. E. Durno 1969. Structural Variations in peat. *New Phyto* 68: 167- 82. Cited in Edwards, K. J. and I. Ralston 1984. Postglacial hunter-gatherers and vegetational history in Scotland. *Proceedings of the Society of Antiquaries of Scotland* 114: 15 – 34.

Tacitus, *Life of Agricola*.

Tipping, R. 1997. Vegetational History of Southern Scotland. *Botanical Journal of Scotland*. 49: 151-162.

Turnock, D. 1995. *The Making of the Scottish Rural Landscape.* Aldershot: Scholar Press.

Ward, T. 2010. *The discovery and excavation of a late Upper Palaeolithic site at Howburn Farm. Biggar Archaeology Group*. http://www.biggararchaeology.org.uk;

Welfare, A. 2011. *Great Crowns of Stone: The Recumbent Stone Circles of Scotland.* RCAHMS: Edinburgh.

Websites

www.nls.co.uk (National Library of Scotland digital map service)

www.oldmaps.co.uk (Additional Ordnance Survey mapping)

http://ads.ahds.ac.uk (Archaeology Data Service)

www.nas.gov.uk (National Archives of Scotland)

http://hsewsf.sedsh.gov.uk/pls/htmldb/f?p=500:1:1367268110883482 (Historic Scotland Digital Data download)

http://www.ambaile.org.uk/en/item/item_maps.jsp?item_id=18248 (online map resource)

http://www.aberdeenshire.gov.uk/archaeology (Aberdeenshire Council Archaeology Service webpage)

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 $10\times\log(F)$ function, meaning that a doubling of the traffic flow leads to a 3 dB increase in resulting noise level.

The Traffic and Transport chapter of the ES provides the predicted numbers of vehicles on the A97 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 North Cranna and Mooroonbin, the equation F.6 from BS 5228-1 has been used to predict noise levels from construction traffic:

$$L\text{Aeq} = L\text{WA} - 33 + 10\log 10Q - 10\log 10V - 10\log 10d$$

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

[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

point sources of known power level specified in octave bands. Of relevance to the prediction of 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	Type	SLM (s / n)
Castlebrae	RION NL-32	01013661
Pinefields	RION NL-32	00682732
Thistle Mill	RION NL-32	00482656
Parkside of Cranna	RION NL-32	00103138
Gallowhill	RION NL-32	00503253

The monitoring equipment was placed to the east of the main house in the front garden 5.5 m from the house, 4 m from an agricultural shed and approximately 7 m from the A97. Although within 10 metres of surfaces, the locations was chosen as it was sheltered from the trees to the rear of the building which would have otherwise elevated background noise levels. Conversely, during the site visit, the A97 was not perceived as a busy road and not likely to be a significant noise source in elevating background noise levels during the amenity daytimes and night-times.

Pinefields, 364017 855902

The equipment was placed at the southern boundary (the direction of the proposed wind turbines) of the front garden of the house, 8 m from the façade of the building. This location was on the other side of the building than the green houses and agricultural activity that might take place to the rear of the building.

Thistle Mill, 363931 855244

The equipment was positioned to the north-west of the property to distance the microphone from the stream to the east of the property and construction sheeting at the property.

Parkside of Cranna, 364746 854425

The measurement equipment was located to the east of the property on the as far as possible from sources of noise such as a tree line, and fence which may move in the wind.

Gallowhill, 364562 853783

The equipment was positioned the fence line of the field fronting the house in the direction of the proposed wind farm.

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 and periods of heavy rainfall.

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

Equipment	BS 5228 Ref	Sound Level at 10m dB(A)	Qty	% On Time	Total Sound Level dB(A)
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.

Cumulative Wind Farm Turbine Prediction

The candidate machine used within the Auchenderran Wind Farm ES is the Enercon E48 and the machine used within the Strath of Brydock Wind Farm is the Enercon E70.

The noise data used within the cumulative assessment to represent wind turbine noise from Auchenderran is presented in Tables A10.7 based on test data plus uncertainty value. Noise emissions for 10 m/s upwards have been predicted at the same noise levels.

Table A10.7: Enercon E48 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	74	75	88.7	92.2	93.3	88.1	83	80.0	97.9
7	76.8	77.8	91.5	95	96.1	90.9	85.8	82.8	100.7
8	77.8	78.8	92.5	96	97.1	91.9	86.8	83.8	101.7
9	78.2	79.2	92.9	96.4	97.5	92.3	87.2	84.2	102.1
10	78.6	79.6	93.3	96.8	97.9	92.7	87.6	84.6	102.5

Appendix 10.2: Noise Monitoring Locations

APPENDIX 10.2: NOISE SURVEY PHOTOGRAPHS

Figure A10.2.1 Noise monitoring location at Castlebrae



Figure A10.2.2 Noise monitoring location at Pinefields



Figure A10.2.3 Noise monitoring location at Thistle Mill



Figure A10.2.4 Noise monitoring location at Parkside of Cranna



Figure A10.2.5 Noise monitoring location at Gallowhill



Appendix 10.3: Noise Meter Calibration Certificates

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Certificate Number	**CAL121127**
Date of Issue	**16/12/2011**
Customer	**RSK STATS Geoconsult Ltd**
	Description of Instrument
Sound Level Meter	Rion NL-32 Sound Level Meter [Serial No. 01013661] with Rion UC-53A Microphone [Serial No. 318676] and Rion NH-21 Preamplifier [Serial No. 36169] Fitted with a WS-10 foam windshield. The instrument successfully completed the Class 1 Periodic Tests of BS EN 61672.
Associated Calibrator	Rion NC-74 [Serial No. 34615260] with ½" adaptor type NC-74-002 fitted. This calibrator was calibrated by ANV Measurement Systems on 16/12/2011 [Certificate No. CAL121126].
Date of Calibration	16/12/2011.
Test Procedure	..\..\..\Calibration Results Sheets\Current Approved Results Sheets\NL-31 Master 61672-3 Approved Issue 6 (BK 2590976).xls Test procedures in accordance with BS EN 61672-3:2006. NOTE: Test 10.1 (Self Generated Noise with Microphone Installed) omitted.
Test Engineer	Amrat Patel

APPROVED SIGNATORY .....

Les Jephson ☐ / Mike Breslin ☐

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ACOUSTICS NOISE AND VIBRATION LIMITED. REGISTERED IN ENGLAND NO. 3549028. REGISTERED OFFICE AS ABOVE.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. CAL121127.
DATE OF ISSUE 16/12/2011.

Information relating to the operation and adjustment of the sound level meter were obtained from the data contained in the Rion Instruction Manual 32005 and associated Technical Notes 32042. Additional information relating to measurement uncertainties required by clause 11.3 has been provided by the Rion European Office and is available for inspection upon request.

Results

Tests on the Sound Level Meter were principally performed on the Main Channel. Limited tests were also performed using the Sub-Channel.

When the Acoustic Calibrator supplied with the instrument was applied the Sound Level Meter initially read 94.0 dB (A).Derived from the supplied calibration certificate for the calibrator at the indicated frequency of 1000 Hz.No adjustment was made to the meter.

The environmental conditions at the start and end of the calibration were within the specified range for calibration and were noted to be as follows:

Conditions	Measured Value at Start	Measured Value at End
Temperature	23.2 °C	23.9 °C
Relative Humidity	38.1 %	37.0 %
Atmospheric Pressure	97.8 kPa	97.9 kPa

The self generated noise levels of the instrument with the microphone replaced by the electrical input device were:

09.7 dB (A);
16.7 dB (C); and
22.2 dB (Z).

These measured levels were within the specified limits defined within the instruction manual.

The Sound Level Meter submitted for testing has successfully completed the Class 1 Periodic Tests of BS EN 61672, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about the conformance of the Sound Level Meter to the full requirements of BS EN 61672-1:2003 because evidence was not publically available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements of BS EN 61672-1:2003 and because the periodic tests of BS EN 61672-3:2006 only cover a limited subset of the specifications in BS EN 61672-1:2003.

The calibration incorporated the windshield corrections supplied by the manufacturer and the results are therefore applicable to the instrument with the microphone and pre-amplifier attached with the windscreen fitted.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL121127.**
DATE OF ISSUE **16/12/2011.**

No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006, of the adjustment data given in the instruction manual or obtained from the manufacturer of the Sound Level Meter, or the manufacturer of the Microphone, or the manufacturer of the multi-frequency Sound Calibrator was published in the instruction manual or made available by the manufacturer or supplier. The uncertainty of measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the Sound Level Meter may not conform to the requirements of IEC 61672-1:2002.

The total expanded measurement uncertainties associated with the calibration equipment and procedures is based on a standard uncertainty multiplied by a coverage factor k=2 to provide a confidence of approximately 95% in the results. The assessment of uncertainty has been carried out in accordance with national and international guidance upon the calculation of uncertainties in metrology.

Notes

1. The tests were conducted principally on the main channel, with a limited number of tests conducted for the sub channel. The Peak C sound level measurements were carried out for the sub channel as they are only available on this channel.

2. The instrument was running firmware version 1.400.

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:** 00503253

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. 316662 and a Rion NH-21 preamplifier Serial No. 32871. 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: **13774**
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: 4143157 VAT No: GB 779505441
Directors: Trevor J Lewis, Owen R Clingan MIOA

Rion NL-32 (Type 1) : Calibration Results

Customer Name: RSK Environment Limited

Service Reference Number: 1984

Date of Calibration: 8th August 2011

Instrument Details:

	Model	Serial Number
SLM	**Rion NL-32**	00503253
Preamplifier	**Rion NH-21**	32871
Microphone	**Rion UC-53A**	316662
Acoustic Calibrator	**Cirrus CR:511E**	037732

Preliminary Inspection

BS EN 60651: Type 1[BS EN 60804: Type 1 Instrument Functional Checks: **PASS**

Setting Up

Reference B&K 4231 Calibrator - Serial No: 1883557 T/E No: **005**

Calibrator SPL: **94.07 dB** Microphone Correction: **- 0.2 dB**

Initial Reading: 94.2dB

Adjusted Readings:

1) 93.9dB 2) 93.9dB 3) 93.9dB 4) 93.9dB 5) 93.9dB

Average Reading: 93.9dB Total Spread: 0.0 dB Test: **PASS**

Self Generated Noise

Time Constant: **SLOW** Instrument Range: **20 - 80 dB**

dB(A)	dB(C)	dB(LIN)
7.7	11.5	18.8

Test **PASS**

Linearity

Reference Range: 30 – 120 dB

Linearity – Leq

Difference from REFERENCE	Instrument Reading (dB)	Error (dB)
-64.0	30.0	0.0
-63.0	30.9	-0.1
-62.0	32.0	0.0
-61.0	32.9	-0.1
-60.0	33.9	-0.1
-59.0	34.9	-0.1
-55.0	39.0	0.0
-50.0	44.0	0.0
-45.0	49.1	0.1
-40.0	54.1	0.1
-35.0	59.0	0.0
-30.0	64.0	0.0
-25.0	69.0	0.0
-20.0	74.0	0.0
-15.0	79.0	0.0
-10.0	84.0	0.0
-5.0	89.0	0.0
REF	**94.0**	**0.0**
5.0	99.0	0.0
10.0	104.0	0.0
15.0	109.0	0.0
20.0	114.0	0.0
21.0	115.0	0.0
22.0	116.0	0.0
23.0	117.0	0.0
24.0	118.1	0.1
25.0	119.0	0.0
26.0	120.0	0.0

Test **PASS**

Linearity

Reference Range: 30 – 120 dB

Linearity – SPL:

Difference from REFERENCE	Instrument Reading (dB)	Error (dB)
-64.0	30.0	0.0
-63.0	30.9	-0.1
-62.0	32.0	0.0
-61.0	32.9	-0.1
-60.0	33.9	-0.1
-59.0	34.9	-0.1
-55.0	39.0	0.0
-50.0	44.0	0.0
-45.0	49.1	0.1
-40.0	54.1	0.1
-35.0	59.0	0.0
-30.0	64.0	0.0
-25.0	69.0	0.0
-20.0	74.0	0.0
-15.0	79.0	0.0
-10.0	84.0	0.0
-5.0	89.0	0.0
REF	**94.0**	**0.0**
5.0	99.0	0.0
10.0	104.0	0.0
15.0	109.0	0.0
20.0	114.0	0.0
21.0	115.0	0.0
22.0	116.0	0.0
23.0	117.0	0.0
24.0	118.1	0.1
25.0	119.0	0.0
26.0	120.0	0.0

Test **PASS**

Reference Point Check, Other Ranges:

Range	Error (dB)
40 – 130	0.1
20 – 110	0.0
20 – 100	0.0

Test **PASS**

Inter-Range Linearity:

SLM Range	Error	Largest Positive	Largest Negative	Max Positive Overall	Max Negative Overall
40 – 130	0.0	0.1	0.1	0.1	0.1
20 – 110	0.0			0.1	0.1
20 – 100	0.0			0.1	0.1
20 – 90	0.1			0.2	0.1
20 – 80	0.1			0.2	0.1

Test **PASS**

Frequency Weightings

Reference Level: 94 dB / 1 kHz

Frequency (Hz)	Instrument Range	Instrument Reading dB(A)	Instrument Reading dB(C)	Instrument Reading dB(LIN)
1,000	30 – 120	94.0	94.0	94.0
31.5	30 – 120	54.3	90.8	93.8
63	30 – 120	67.6	93.2	93.9
125	30 – 120	77.7	93.8	93.9
250	30 – 120	85.2	93.9	93.9
500	30 – 120	90.7	94.0	94.0
2,000	30 – 120	95.2	93.8	94.1
4,000	30 – 120	95.1	93.3	94.1
8,000	30 – 120	92.9	91.0	93.9
12,500	30 – 120	90.0	88.1	93.8

Test **PASS**

Time Weightings - Fast and Slow

Initial SLM setting: 106.0 dB

Time Weighting	Instrument Reading (dB)
FAST	105.0
SLOW	101.9

Test **PASS**

RMS Accuracy

Initial SLM setting: 108.0 dB

Attenuator Setting	Instrument Reading (dB)
- 6.6 dB	108.0
-17.0 dB	107.6

Test **PASS**

Overload Indicator:

	Instrument Reading (dB)	Difference
1dB below overload	120.2	3.0
4dB below overload	117.2	

Test **PASS**

Time Averaging

Initial SLM setting: 80.0 dB

Repetition Period	Sound Level Meter Reading (dB)
04×10^{3}	79.9
04×10^{4}	69.9

Test **PASS**

Pulse Range:

Test: **PASS**

Sound Exposure Level:

Test: **PASS**

Peak Response: Frequency Weighting used: LIN

	Frequency	Instrument Reading (dB)	Difference Between Readings
Positive Pulse	50Hz	109.0	0.1
	5KHz	108.9	
Negative Pulse	50Hz	109.0	0.0
	5KHz	109.0	

Test **PASS**

Comments:

OVERALL: **PASS**

Calibration Certificate Number:	**13774**
Issued By:	**T J Lewis**
Date:	**8th August 2011**

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Certificate Number	**CAL021206**
Date of Issue	**02/02/2012**
Customer	**ANV Measurement Systems**
	Description of Instrument
Sound Level Meter	Rion NL-32 Sound Level Meter [Serial No. 00103138] with Rion UC-53A Microphone [Serial No. 316491] and Rion NH-21 Preamplifier [Serial No. 31875] Fitted with a WS-10 foam windshield. The instrument successfully completed the Class 1 Periodic Tests of BS EN 61672.
Associated Calibrator	B & K 4226 S/N 2590976.
Date of Calibration	02/02/2012.
Test Procedure	..\..\..\Calibration Results Sheets\Current Approved Results Sheets\NL-31 Master 61672-3 Approved Issue 6 (BK 2590976).xls Test procedures in accordance with BS EN 61672-3:2006. NOTE: Test 10.1 (Self Generated Noise with Microphone Installed) omitted.
Test Engineer	Amrat Patel

APPROVED SIGNATORY .....

Les Jephson ☐ / Mike Breslin ☑

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ACOUSTICS NOISE AND VIBRATION LIMITED. REGISTERED IN ENGLAND NO. 3549028. REGISTERED OFFICE AS ABOVE.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL021206.**
DATE OF ISSUE **02/02/2012.**

Information relating to the operation and adjustment of the sound level meter were obtained from the data contained in the Rion Instruction Manual 32005 and associated Technical Notes 32042. Additional information relating to measurement uncertainties required by clause 11.3 has been provided by the Rion European Office and is available for inspection upon request.

Results

Tests on the Sound Level Meter were principally performed on the Main Channel. Limited tests were also performed using the Sub-Channel.

No Acoustic Calibrator was supplied with the instrument. When ANV Measurement Systems' B&K 4226 s/n 2590976 was initially applied the Sound Level Meter read 94.0dB (A).
Derived from the current calibration certificate for the calibrator at the indicated frequency of 1000 Hz.No adjustment was made to the meter.

The environmental conditions at the start and end of the calibration were within the specified range for calibration and were noted to be as follows:

Conditions	Measured Value at Start	Measured Value at End
Temperature	23.1 °C	24.0 °C
Relative Humidity	31.1 %	31.2 %
Atmospheric Pressure	102.7 kPa	102.7 kPa

The self generated noise levels of the instrument with the microphone replaced by the electrical input device were:

11.6 dB (A);
16.9 dB (C); and
22.5 dB (Z).

These measured levels were within the specified limits defined within the instruction manual.

The Sound Level Meter submitted for testing has successfully completed the Class 1 Periodic Tests of BS EN 61672, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about the conformance of the Sound Level Meter to the full requirements of BS EN 61672-1:2003 because evidence was not publically available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements of BS EN 61672-1:2003 and because the periodic tests of BS EN 61672-3:2006 only cover a limited subset of the specifications in BS EN 61672-1:2003.

The calibration incorporated the windshield corrections supplied by the manufacturer and the results are therefore applicable to the instrument with the microphone and pre-amplifier attached with the windscreen fitted.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL021206.**
DATE OF ISSUE **02/02/2012.**

No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006, of the adjustment data given in the instruction manual or obtained from the manufacturer of the Sound Level Meter, or the manufacturer of the Microphone, or the manufacturer of the multi-frequency Sound Calibrator was published in the instruction manual or made available by the manufacturer or supplier. The uncertainty of measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the Sound Level Meter may not conform to the requirements of IEC 61672-1:2002.

The total expanded measurement uncertainties associated with the calibration equipment and procedures is based on a standard uncertainty multiplied by a coverage factor k=2 to provide a confidence of approximately 95% in the results. The assessment of uncertainty has been carried out in accordance with national and international guidance upon the calculation of uncertainties in metrology.

Notes

1. The tests were conducted principally on the main channel, with a limited number of tests conducted for the sub channel. The Peak C sound level measurements were carried out for the sub channel as they are only available on this channel.

2. The instrument was running firmware version 1.400AN1003.

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Certificate Number	**CAL021213**
Date of Issue	**07/02/2012**
Customer	**ANV Measurement Systems**
	Description of Instrument
Sound Level Meter	Rion NL-32 Sound Level Meter [Serial No. 00682732] with Rion UC-53A Microphone [Serial No. 314652] and Rion NH-21 Preamplifier [Serial No. 28040] Fitted with a WS-10 foam windshield. The instrument successfully completed the Class 1 Periodic Tests of BS EN 61672.
Associated Calibrator	B & K 4226 S/N 2590976.
Date of Calibration	07/02/2012.
Test Procedure	..\..\..\Calibration Results Sheets\Current Approved Results Sheets\NL-31 Master 61672-3 Approved Issue 6 (BK 2590976).xls Test procedures in accordance with BS EN 61672-3:2006. NOTE: Test 10.1 (Self Generated Noise with Microphone Installed) omitted.
Test Engineer	Amrat Patel

APPROVED SIGNATORY .....

Les Jephson ☐ / Mike Breslin ☑

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL

☎ 01908 642846 🖷 01908 642814

✉ info@noise-and-vibration.co.uk 💻 www.noise-and-vibration.co.uk

ACOUSTICS NOISE AND VIBRATION LIMITED. REGISTERED IN ENGLAND NO. 3549028. REGISTERED OFFICE AS ABOVE.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL021213.**
DATE OF ISSUE **07/02/2012.**

Information relating to the operation and adjustment of the sound level meter were obtained from the data contained in the Rion Instruction Manual 32005 and associated Technical Notes 32042. Additional information relating to measurement uncertainties required by clause 11.3 has been provided by the Rion European Office and is available for inspection upon request.

Results

Tests on the Sound Level Meter were principally performed on the Main Channel. Limited tests were also performed using the Sub-Channel.

No Acoustic Calibrator was supplied with the instrument. When ANV Measurement Systems' B&K 4226 s/n 2590976 was initially applied the Sound Level Meter read 94.0dB (A).
Derived from the current calibration certificate for the calibrator at the indicated frequency of 1000 Hz.No adjustment was made to the meter.

The environmental conditions at the start and end of the calibration were within the specified range for calibration and were noted to be as follows:

Conditions	Measured Value at Start	Measured Value at End
Temperature	22.7 °C	23.9 °C
Relative Humidity	29.2 %	30.1 %
Atmospheric Pressure	103.0 kPa	103.0 kPa

The self generated noise levels of the instrument with the microphone replaced by the electrical input device were:

11.2 dB (A);
18.3 dB (C); and
23.7 dB (Z).

These measured levels were within the specified limits defined within the instruction manual.

The Sound Level Meter submitted for testing has successfully completed the Class 1 Periodic Tests of BS EN 61672, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about the conformance of the Sound Level Meter to the full requirements of BS EN 61672-1:2003 because evidence was not publically available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements of BS EN 61672-1:2003 and because the periodic tests of BS EN 61672-3:2006 only cover a limited subset of the specifications in BS EN 61672-1:2003.

The calibration incorporated the windshield corrections supplied by the manufacturer and the results are therefore applicable to the instrument with the microphone and pre-amplifier attached with the windscreen fitted.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL021213.**
DATE OF ISSUE **07/02/2012.**

No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006, of the adjustment data given in the instruction manual or obtained from the manufacturer of the Sound Level Meter, or the manufacturer of the Microphone, or the manufacturer of the multi-frequency Sound Calibrator was published in the instruction manual or made available by the manufacturer or supplier. The uncertainty of measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the Sound Level Meter may not conform to the requirements of IEC 61672-1:2002.

The total expanded measurement uncertainties associated with the calibration equipment and procedures is based on a standard uncertainty multiplied by a coverage factor k=2 to provide a confidence of approximately 95% in the results. The assessment of uncertainty has been carried out in accordance with national and international guidance upon the calculation of uncertainties in metrology.

Notes

1. The tests were conducted principally on the main channel, with a limited number of tests conducted for the sub channel. The Peak C sound level measurements were carried out for the sub channel as they are only available on this channel.

2. The instrument was running firmware version 1.400AN1003.

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Certificate Number	**CAL051113**
Date of Issue	**24/05/2011**
Customer	**ANV Measurement Systems**
	Description of Instrument
Sound Level Meter	Rion NL-32 Sound Level Meter [Serial No. 00482656] with Rion UC-53A Microphone [Serial No. 314031] and Rion NH-21 Preamplifier [Serial No. 27760] Fitted with a WS-10 foam windshield. The instrument successfully completed the Class 1 Periodic Tests of BS EN 61672.
Associated Calibrator	B & K 4226 S/N 2590976.
Date of Calibration	24/05/2011.
Test Procedure	..\..\..\Calibration Results Sheets\Current Approved Results Sheets\NL-31 Master 61672-3 Approved Issue 6 (BK 2590976).xls Test procedures in accordance with BS EN 61672-3:2006. NOTE: Test 10.1 (Self Generated Noise with Microphone Installed) omitted.
Test Engineer	Amrat Patel

APPROVED SIGNATORY .....

Les Jephson ☐ / Mike Breslin ☑

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL

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ACOUSTICS NOISE AND VIBRATION LIMITED. REGISTERED IN ENGLAND NO. 3549028. REGISTERED OFFICE AS ABOVE.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL051113.**
DATE OF ISSUE **24/05/2011.**

Information relating to the operation and adjustment of the sound level meter were obtained from the data contained in the Rion Instruction Manual 32005 and associated Technical Notes 32042. Additional information relating to measurement uncertainties required by clause 11.3 has been provided by the Rion European Office and is available for inspection upon request.

Results

Tests on the Sound Level Meter were principally performed on the Main Channel. Limited tests were also performed using the Sub-Channel.

No Acoustic Calibrator was supplied with the instrument. When ANV Measurement Systems' B&K 4226 s/n 2590976 was initially applied the Sound Level Meter read 94.1dB (A).
The meter was adjusted to read 94.0 dB (A) derived from the current calibration certificate for the calibrator at the indicated frequency of 1000 Hz.

The environmental conditions at the start and end of the calibration were within the specified range for calibration and were noted to be as follows:

Conditions	Measured Value at Start	Measured Value at End
Temperature	23.9 °C	24.3 °C
Relative Humidity	36.9 %	34.7 %
Atmospheric Pressure	101.6 kPa	101.6 kPa

The self generated noise levels of the instrument with the microphone replaced by the electrical input device were:

09.8 dB (A);
16.9 dB (C); and
22.4 dB (Z).

These measured levels were within the specified limits defined within the instruction manual.

The Sound Level Meter submitted for testing has successfully completed the Class 1 Periodic Tests of BS EN 61672, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about the conformance of the Sound Level Meter to the full requirements of BS EN 61672-1:2003 because evidence was not publically available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements of BS EN 61672-1:2003 and because the periodic tests of BS EN 61672-3:2006 only cover a limited subset of the specifications in BS EN 61672-1:2003.

The calibration incorporated the windshield corrections supplied by the manufacturer and the results are therefore applicable to the instrument with the microphone and pre-amplifier attached with the windscreen fitted.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO. **CAL051113.**
DATE OF ISSUE **24/05/2011.**

No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006, of the adjustment data given in the instruction manual or obtained from the manufacturer of the Sound Level Meter, or the manufacturer of the Microphone, or the manufacturer of the multi-frequency Sound Calibrator was published in the instruction manual or made available by the manufacturer or supplier. The uncertainty of measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the Sound Level Meter may not conform to the requirements of IEC 61672-1:2002.

The total expanded measurement uncertainties associated with the calibration equipment and procedures is based on a standard uncertainty multiplied by a coverage factor k=2 to provide a confidence of approximately 95% in the results. The assessment of uncertainty has been carried out in accordance with national and international guidance upon the calculation of uncertainties in metrology.

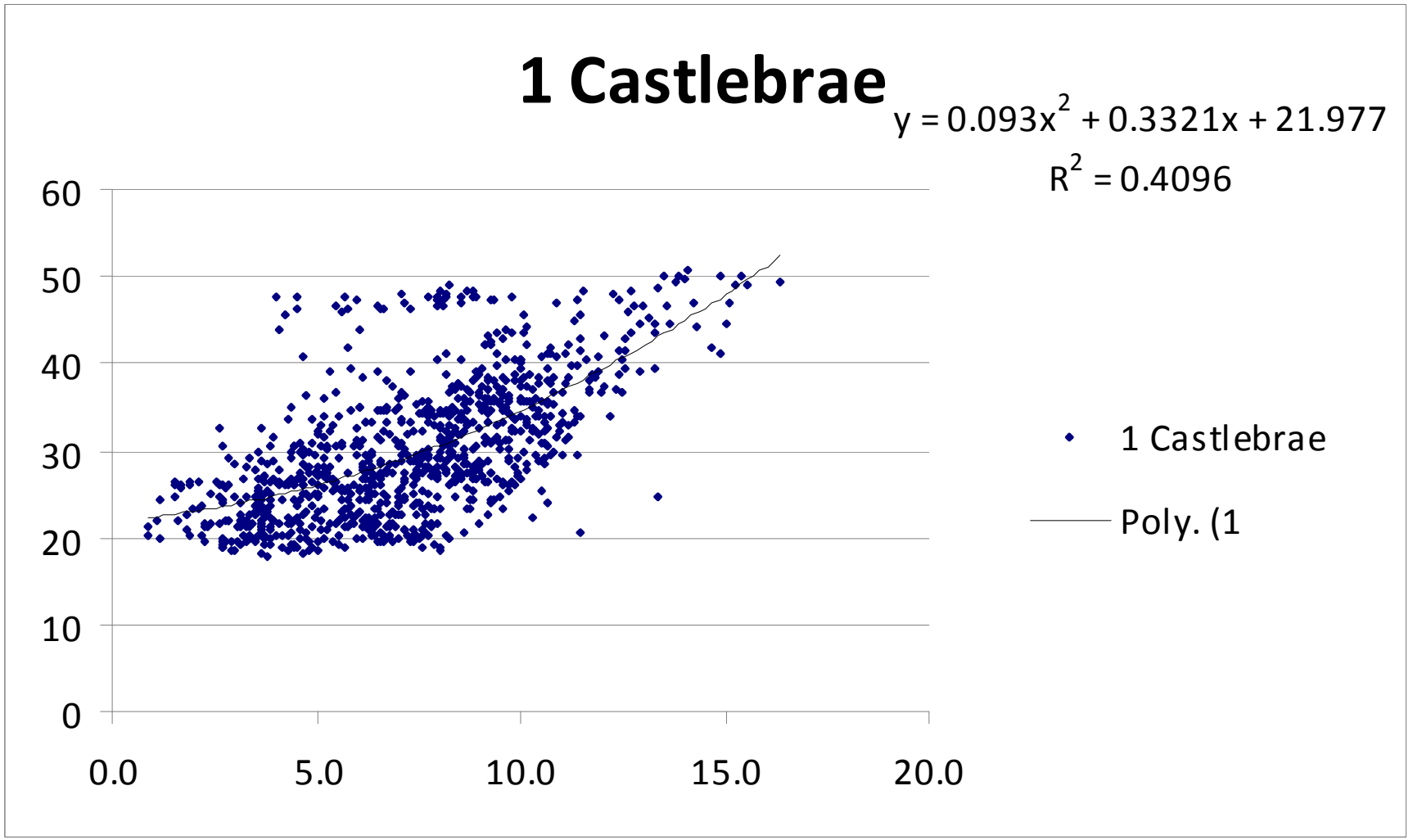
Notes

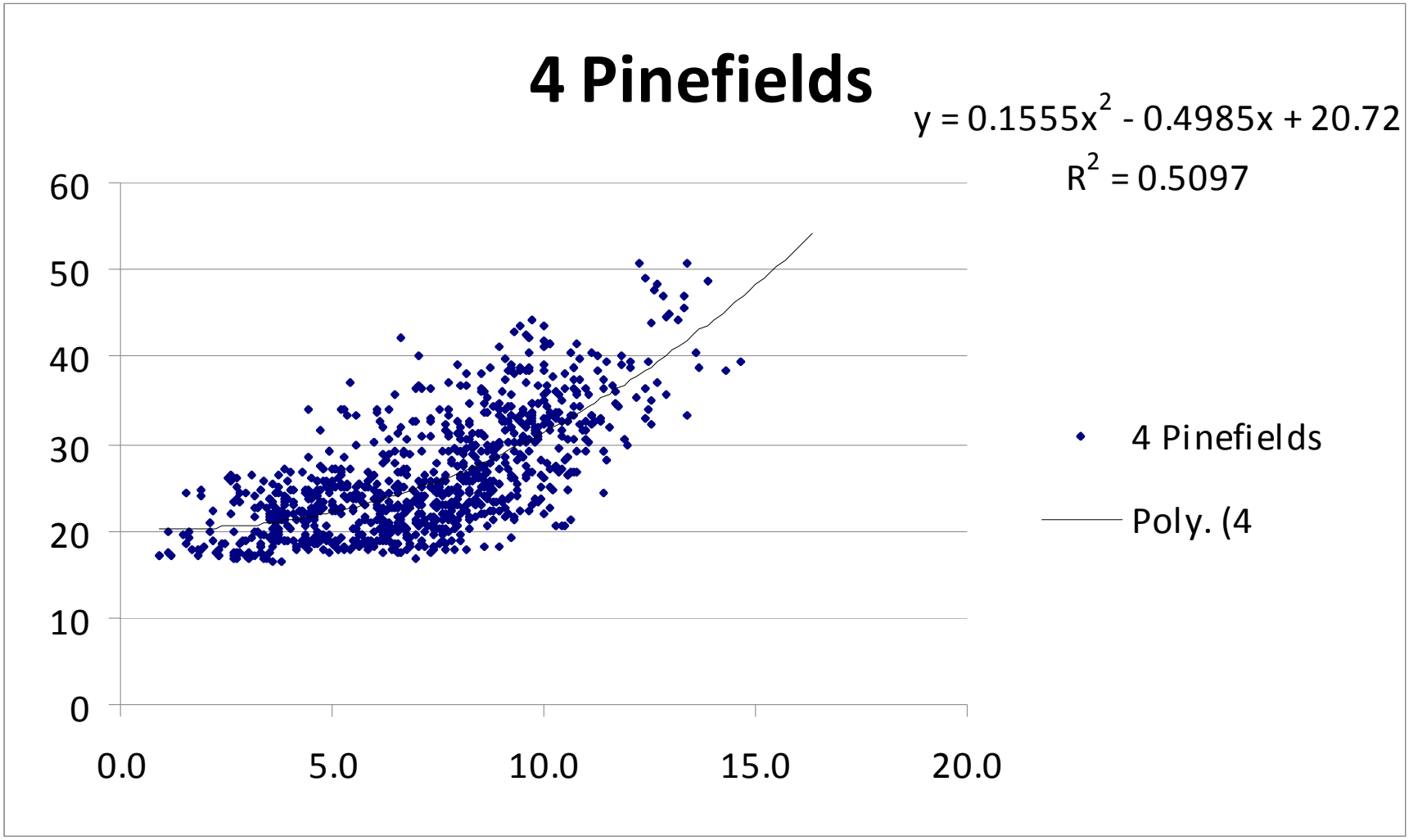
1. The tests were conducted principally on the main channel, with a limited number of tests conducted for the sub channel. The Peak C sound level measurements were carried out for the sub channel as they are only available on this channel.

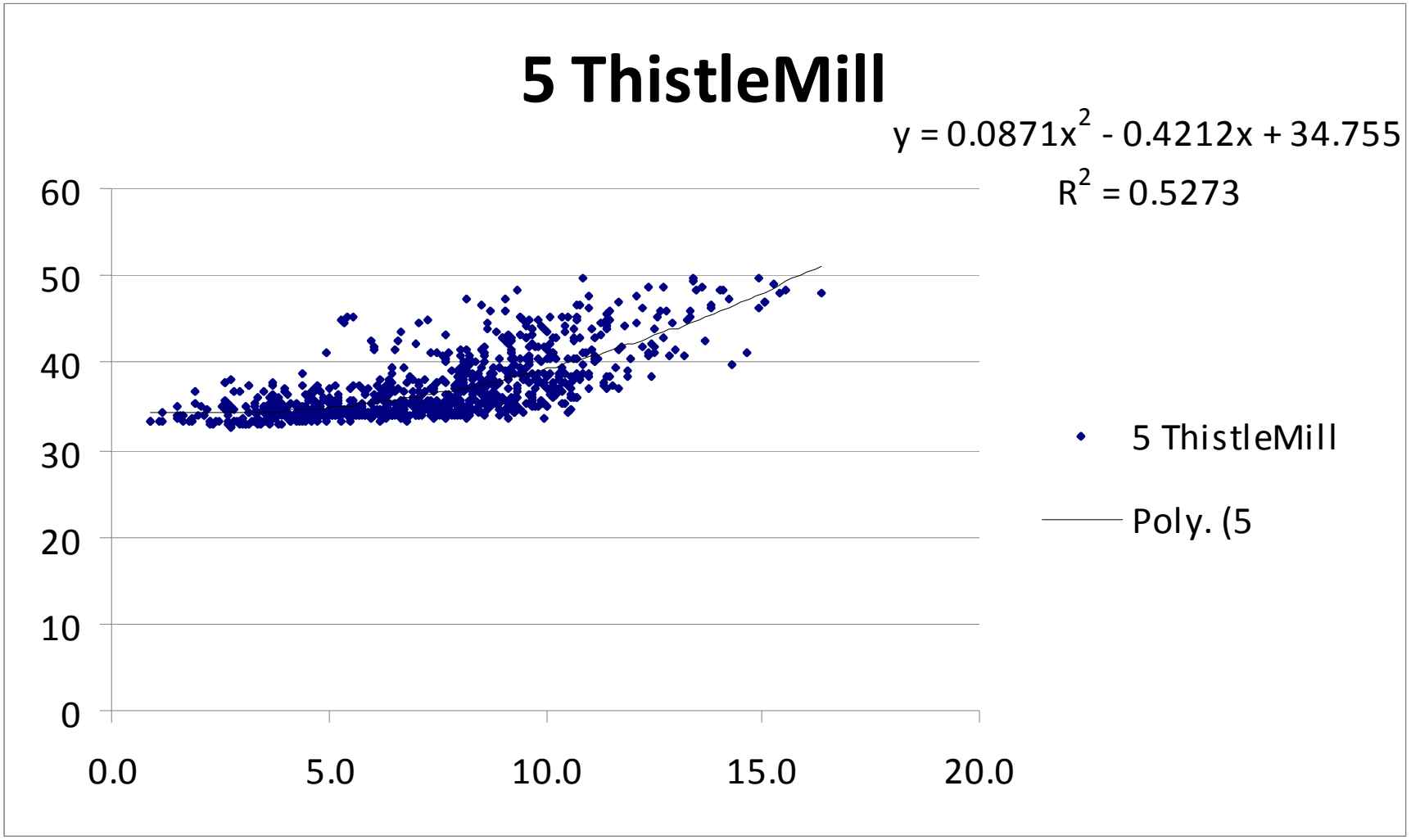
2. The instrument was running firmware version 1.400AN1003.

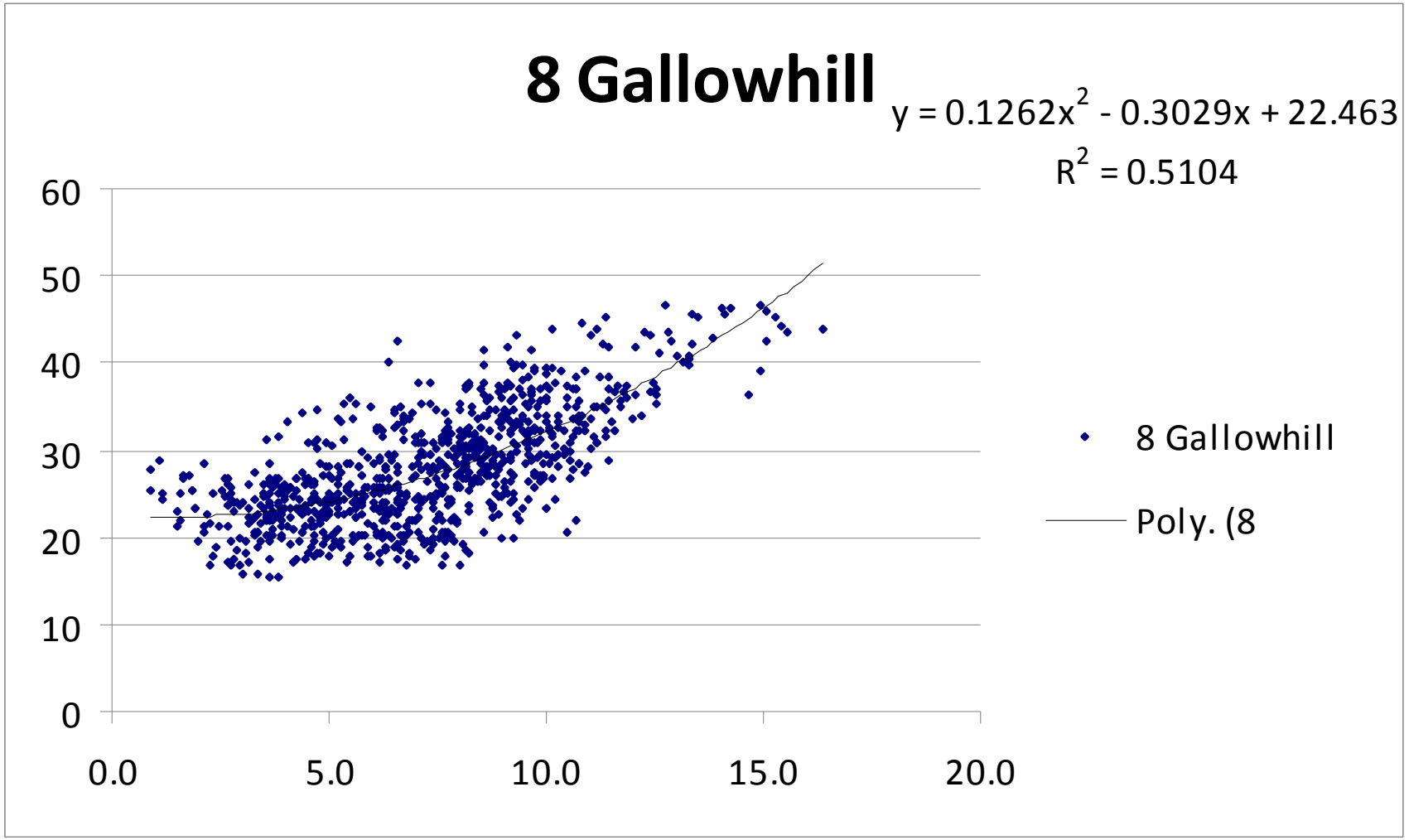
Appendix 10.4: Regression Curves from Noise and Wind Data

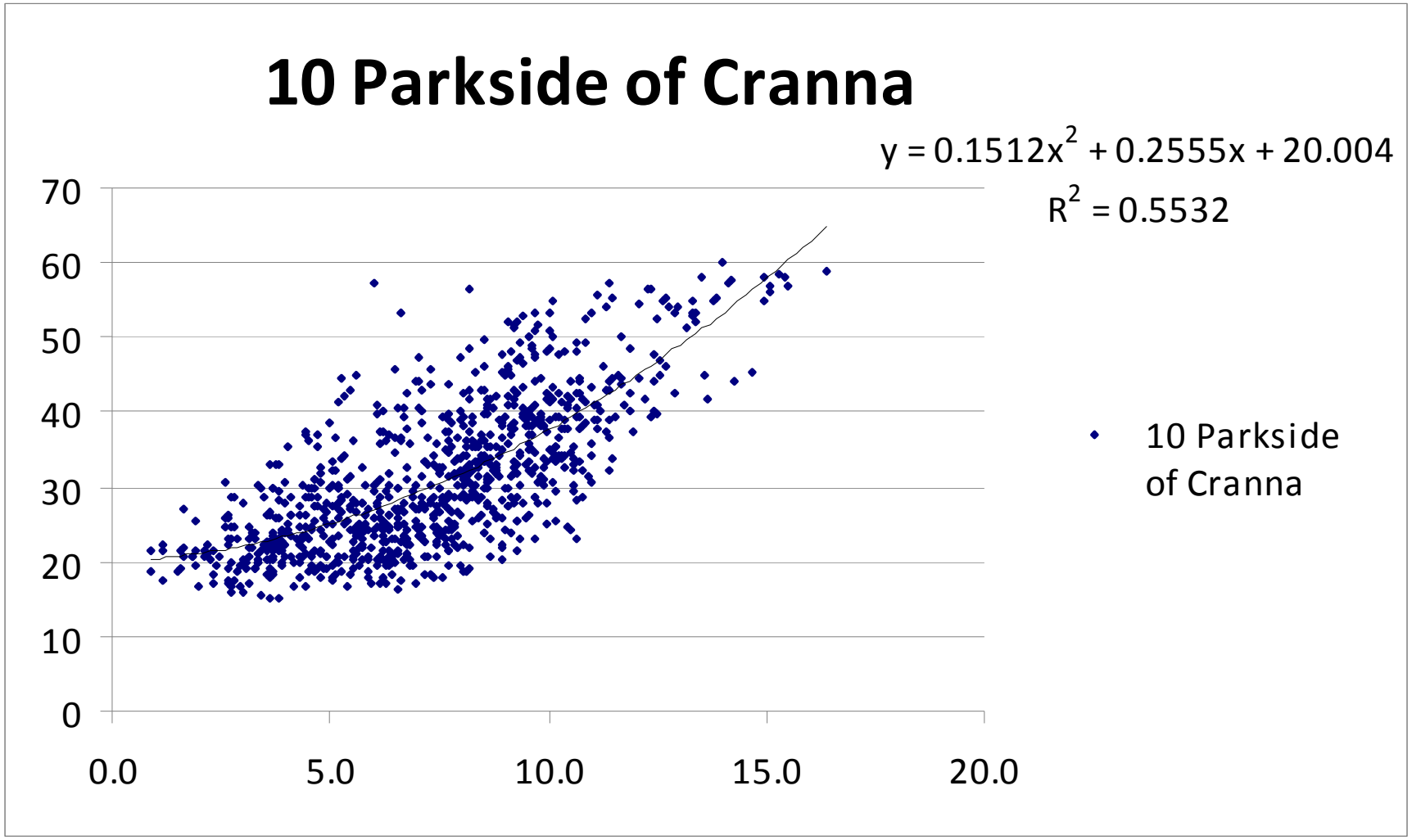
APPENDIX 10.4A: DAYTIME REGRESSION CURVES



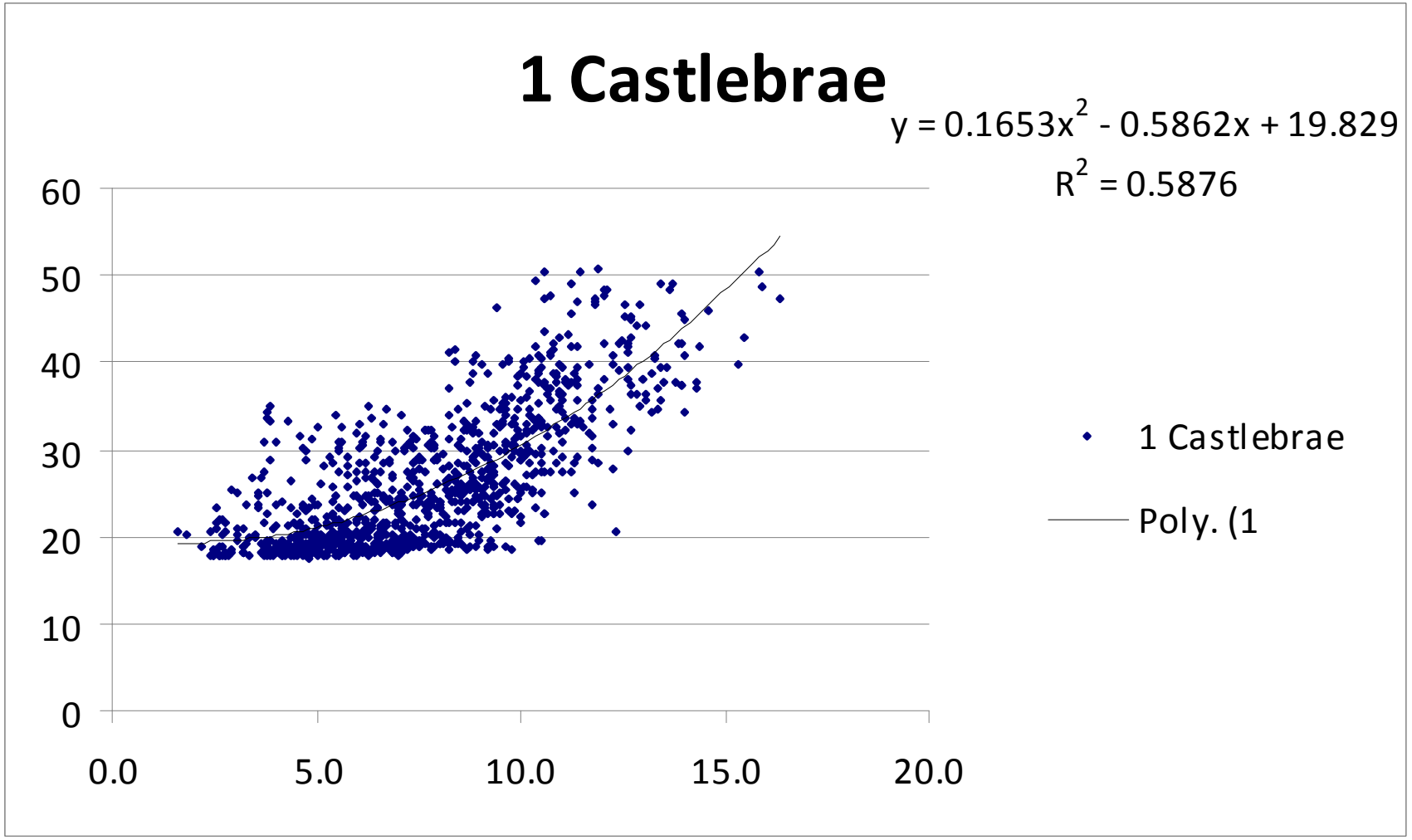

4 Pinefields
y = 0.1555x2 - 0.4985x + 20.72
R2 = 0.5097
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
4 Pinefields
Poly. (4

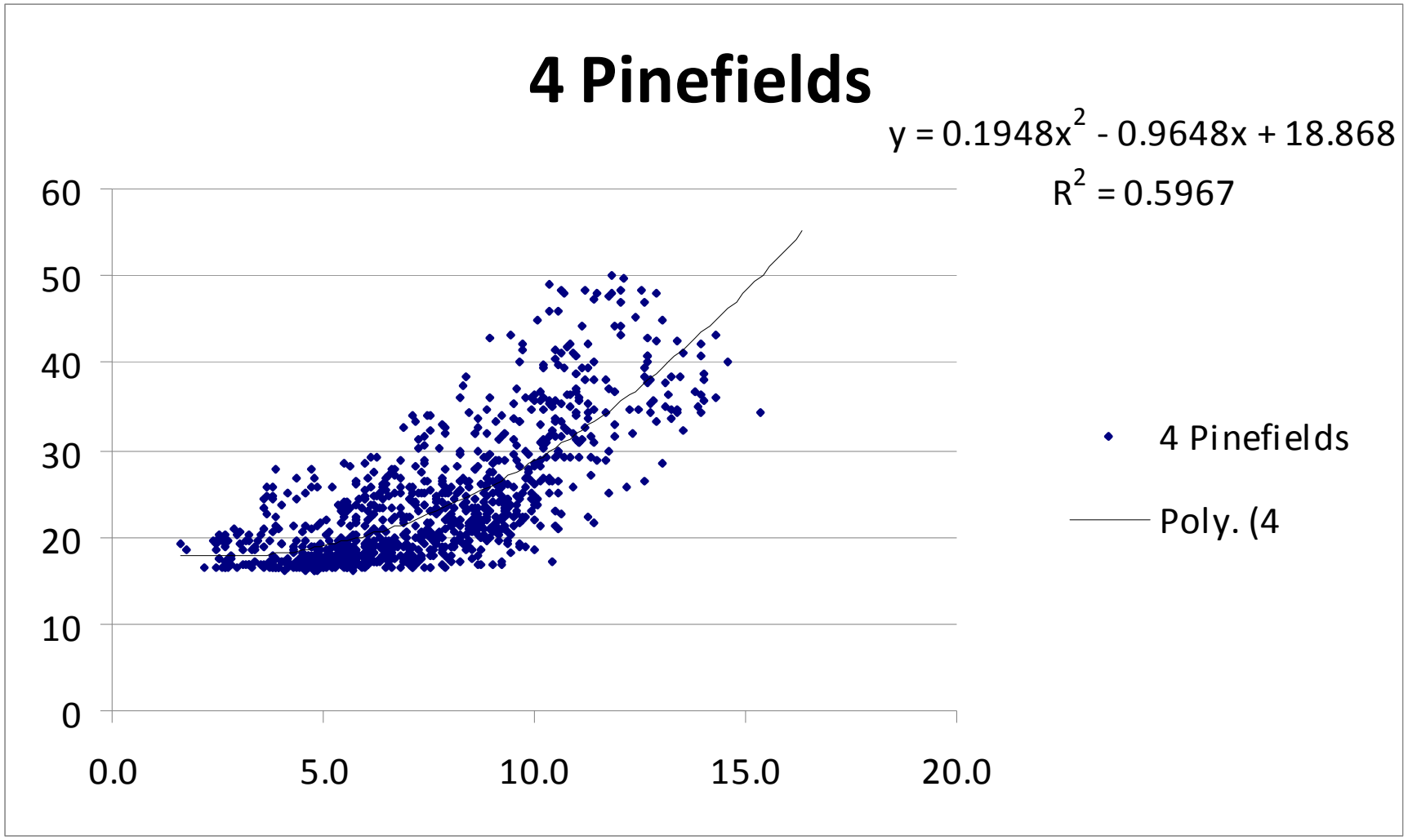

5 ThistleMill
y = 0.0871x2 - 0.4212x + 34.755
R2 = 0.5273
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
5 ThistleMill
Poly. (5

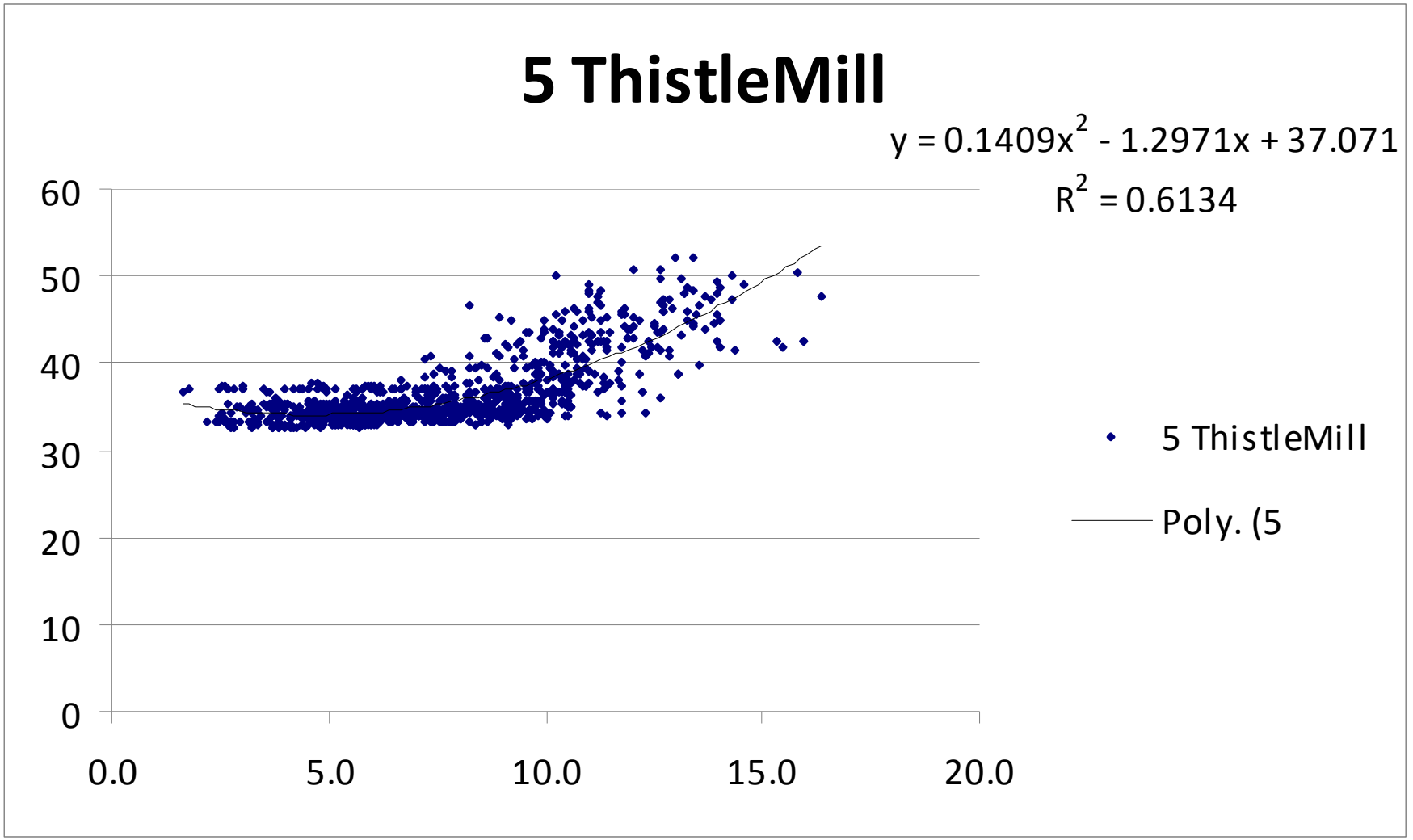

8 Gallowhill
y = 0.1262x2 - 0.3029x + 22.463
R2 = 0.5104
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
8 Gallowhill
Poly. (8

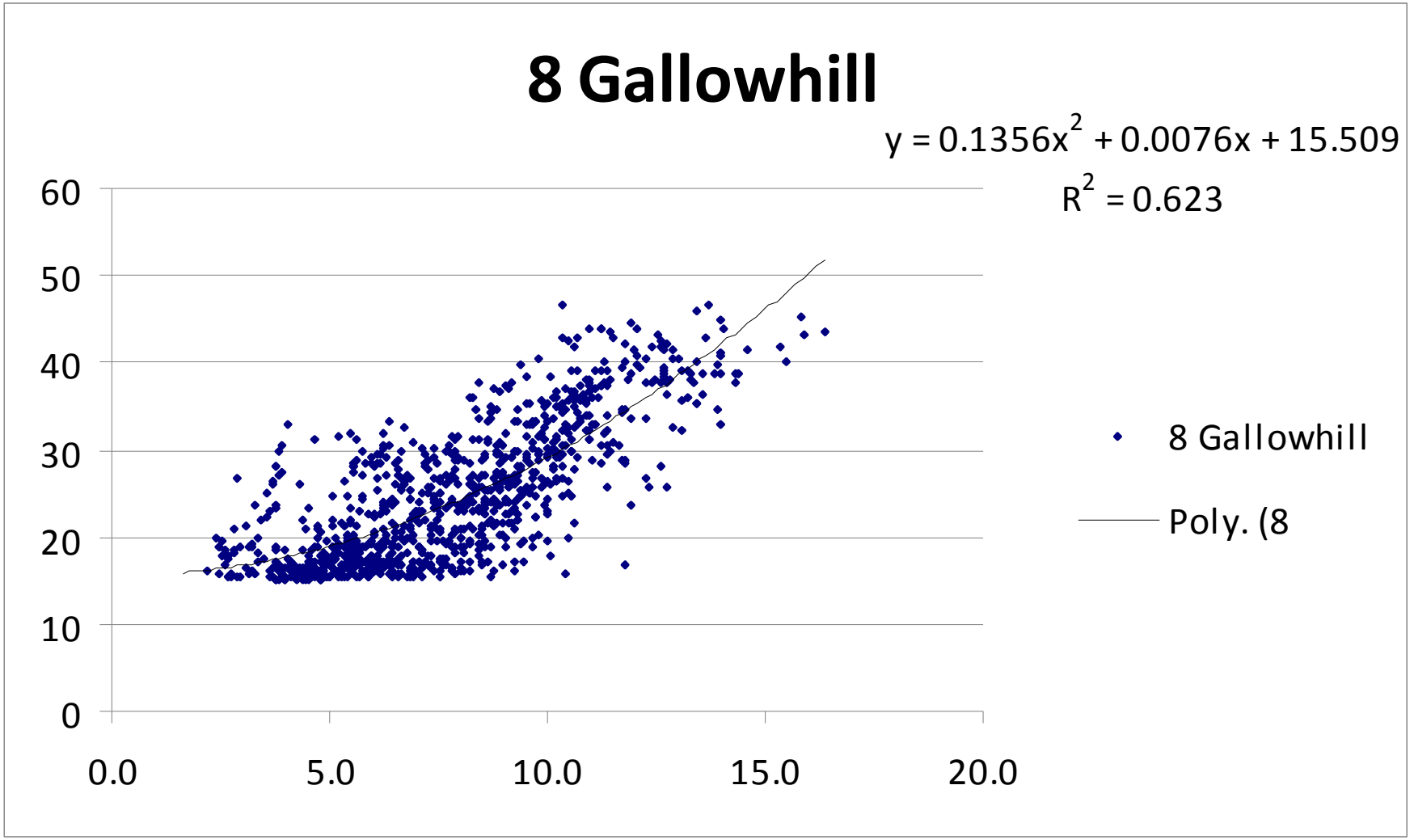

10 Parkside of Cranna
y = 0.1512x2 + 0.2555x + 20.004
R2 = 0.5532
70
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
10 Parkside of Cranna

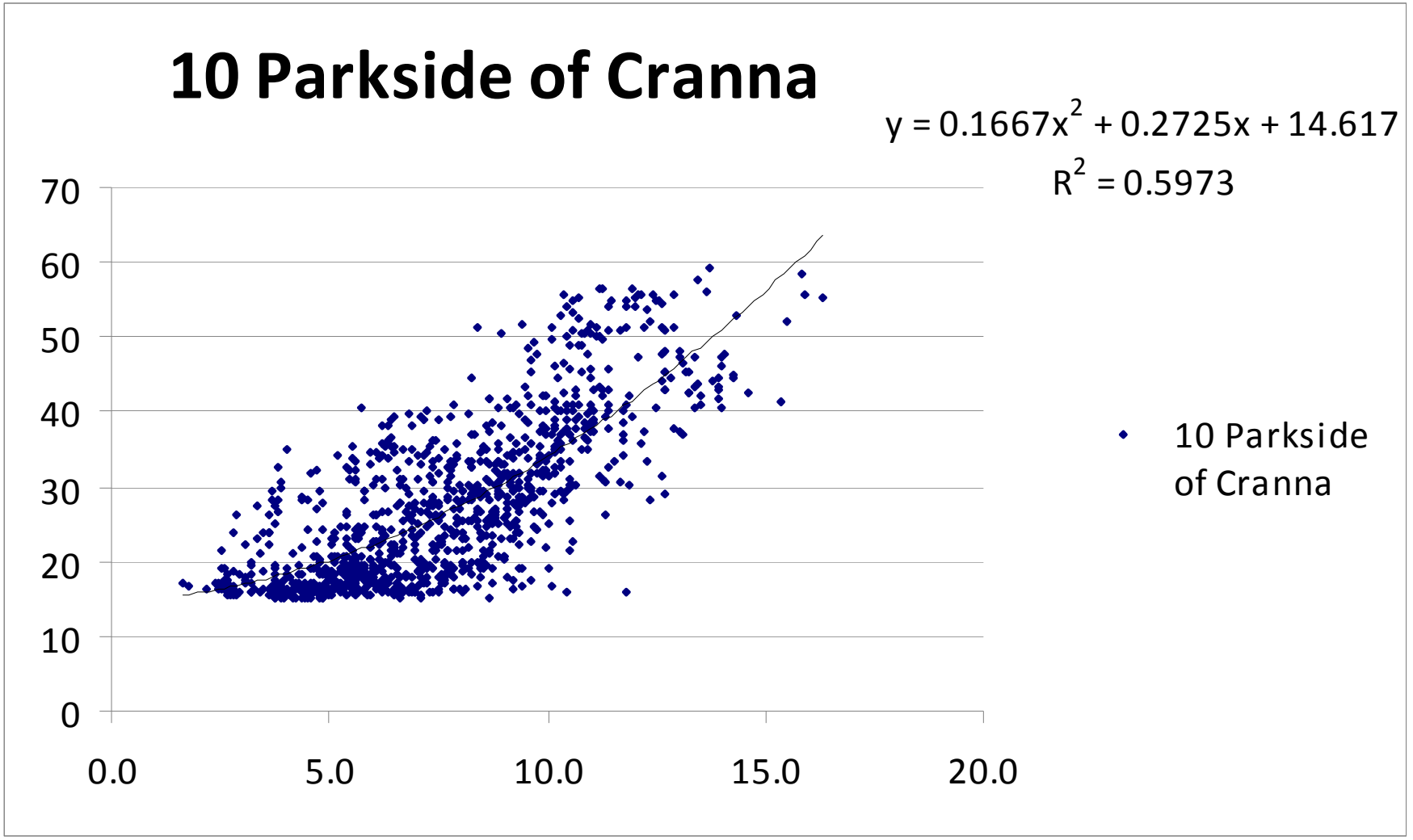
APPENDIX 10.4B: NIGHT TIME REGRESSION CURVES




4 Pinefields
y = 0.1948x2 - 0.9648x + 18.868
R2 = 0.5967
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
4 Pinefields
Poly. (4

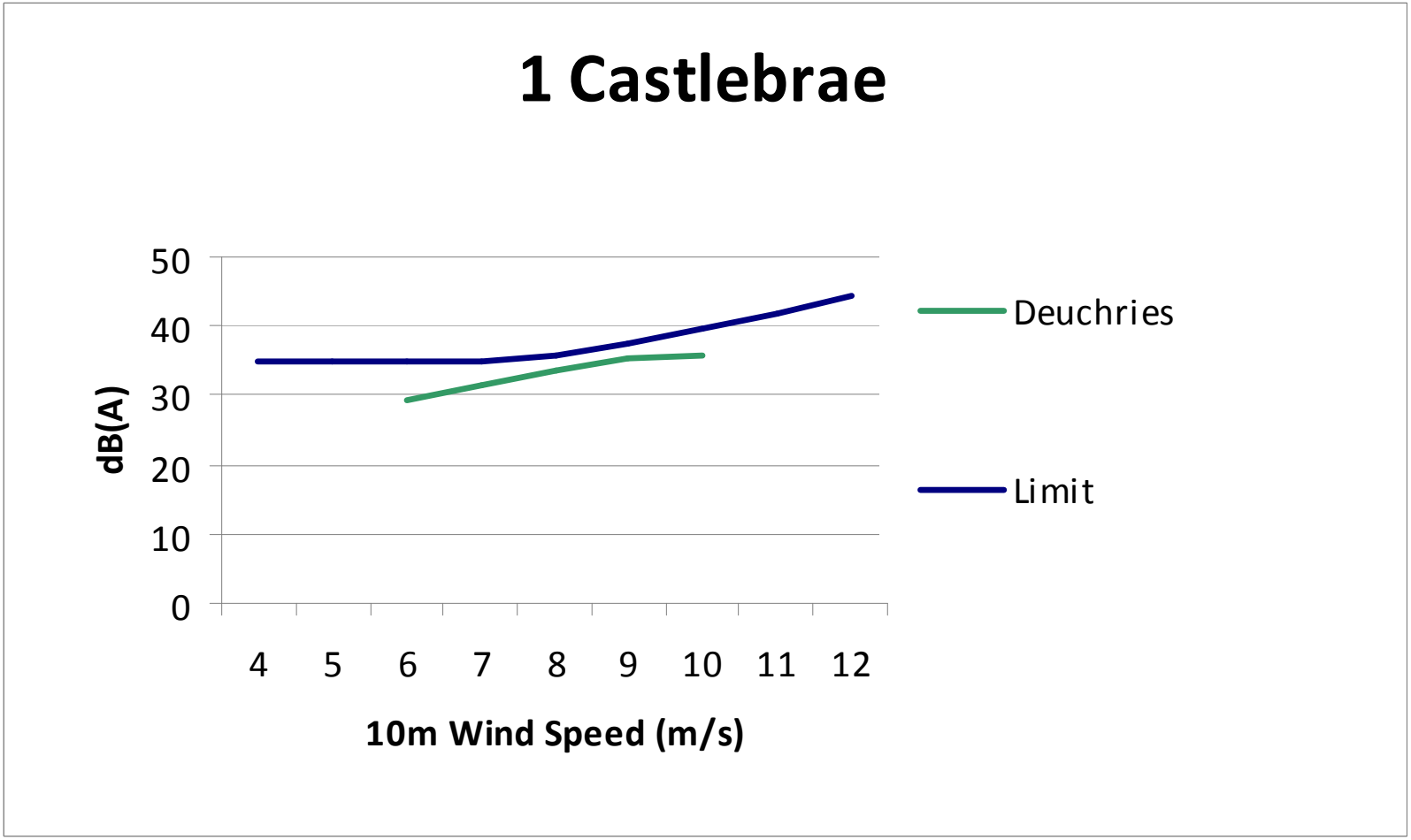

5 ThistleMill
y = 0.1409x² - 1.2971x + 37.071
R² = 0.6134
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
5 ThistleMill
Poly. (5

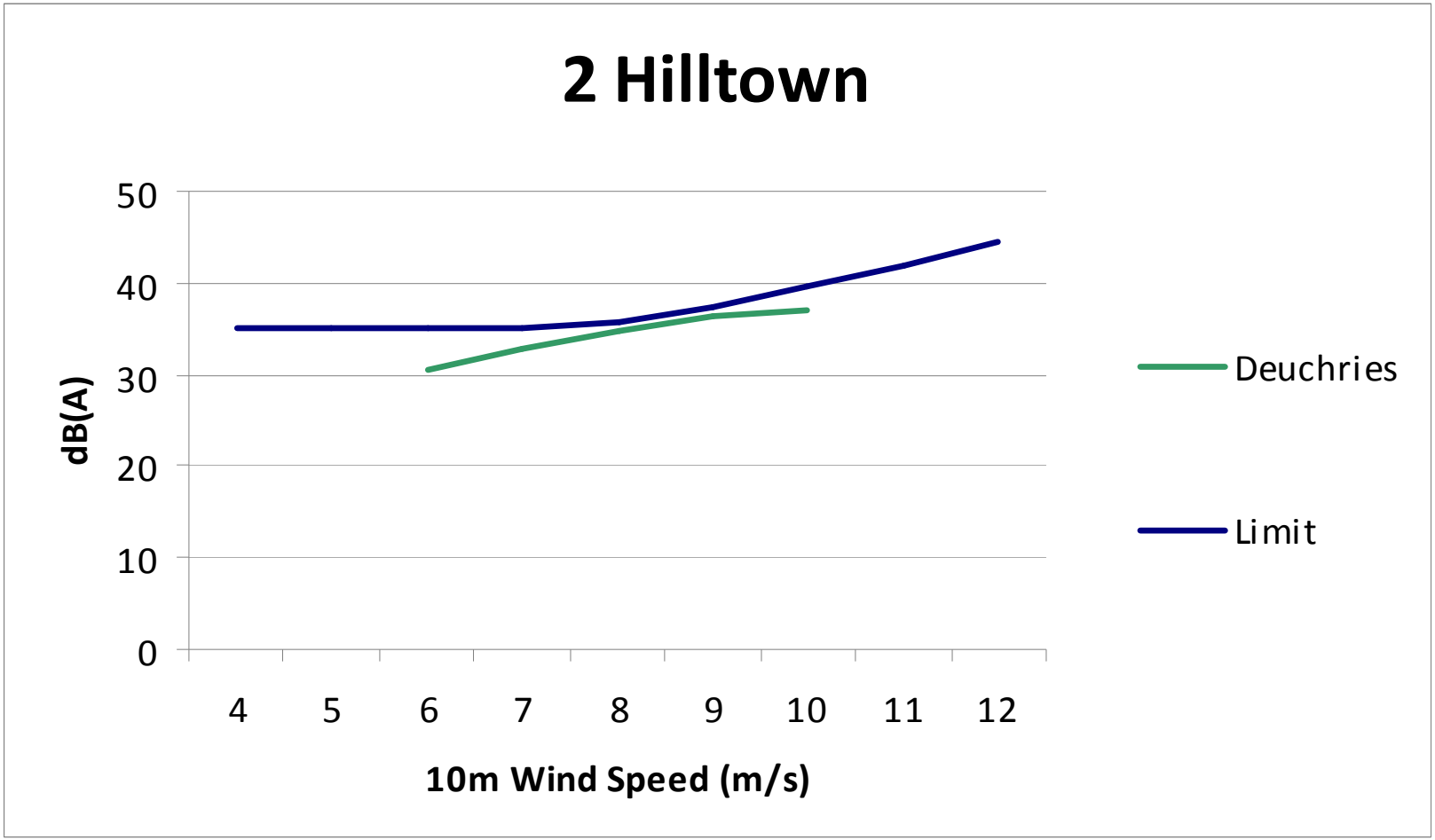

8 Gallowhill
y = 0.1356x2 + 0.0076x + 15.509
R2 = 0.623
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
8 Gallowhill
Poly. (8

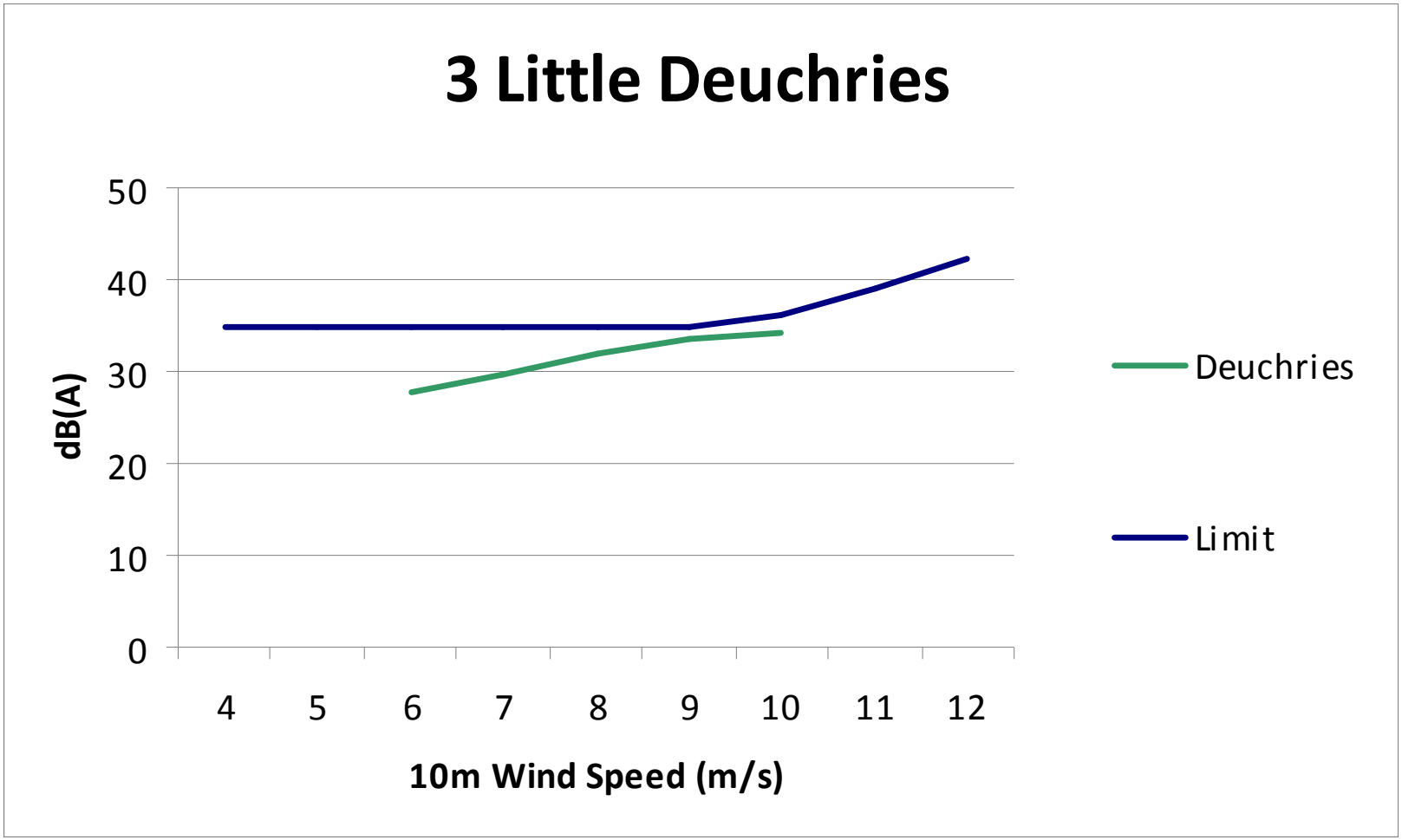

10 Parkside of Cranna
y = 0.1667x2 + 0.2725x + 14.617
R2 = 0.5973
70
60
50
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
10 Parkside of Cranna

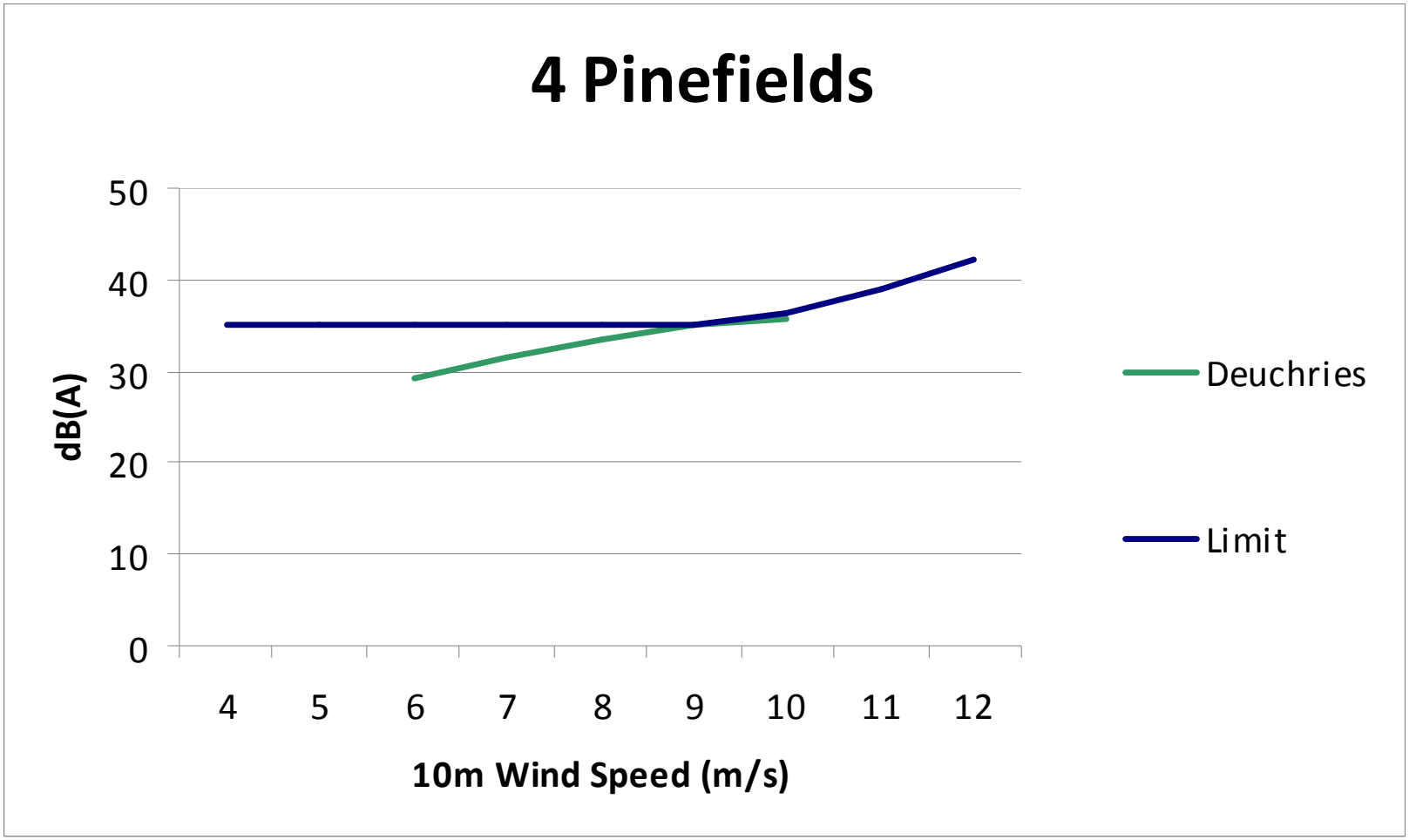
Appendix 10.5: Noise Assessment Graphs

APPENDIX 10.5A: DAYTIME GRAPHS

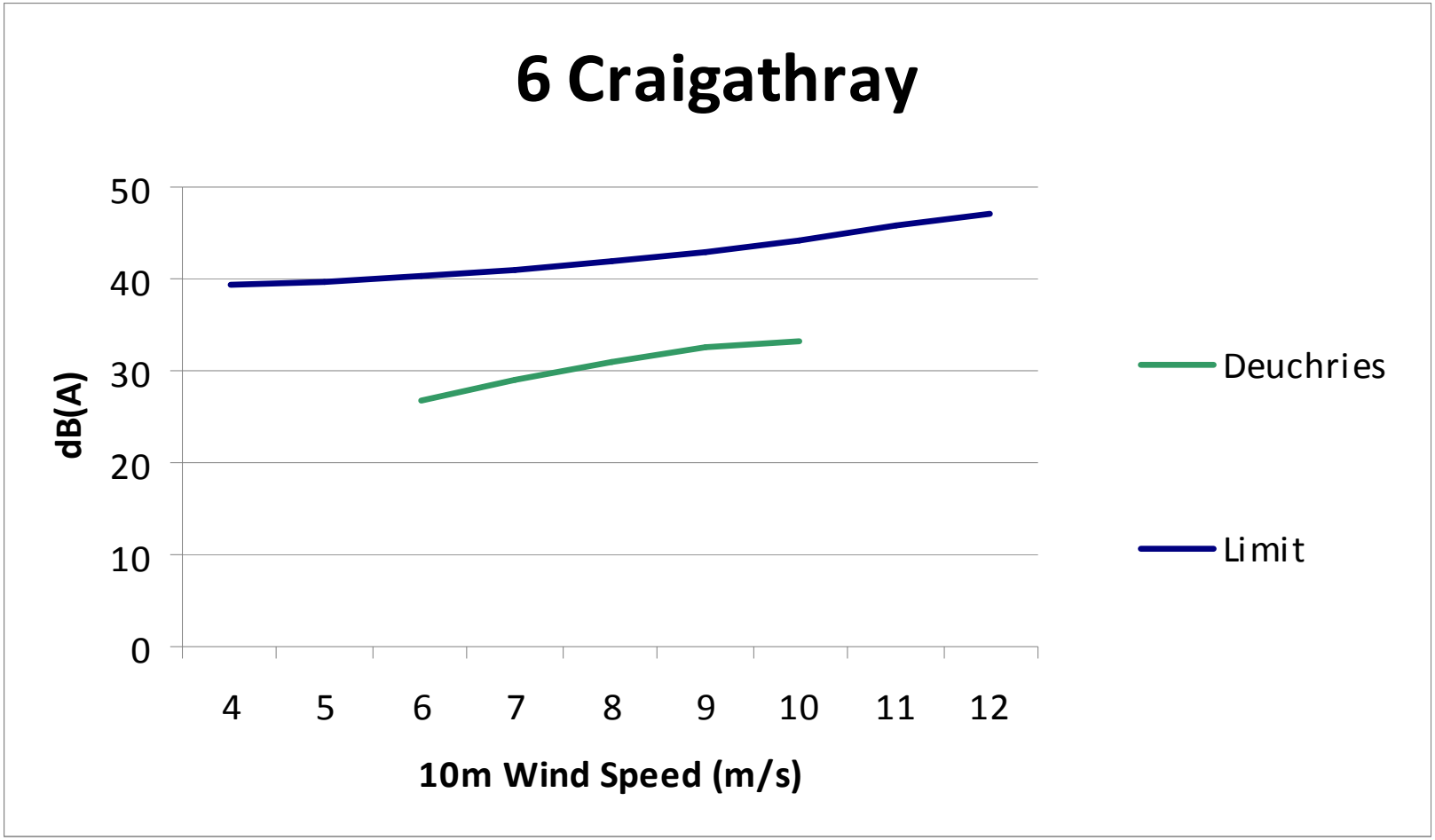


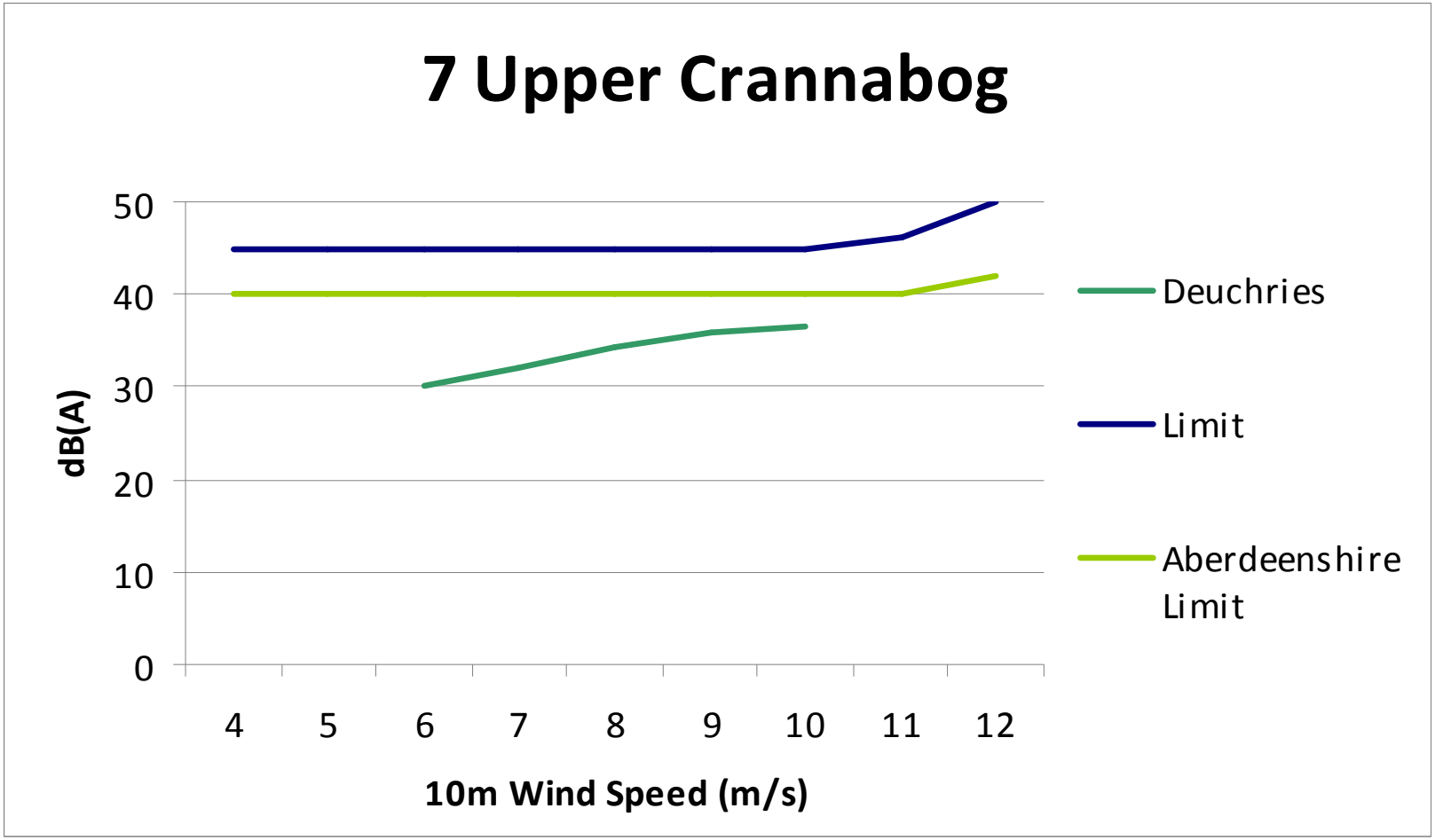

2 Hilltown
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit

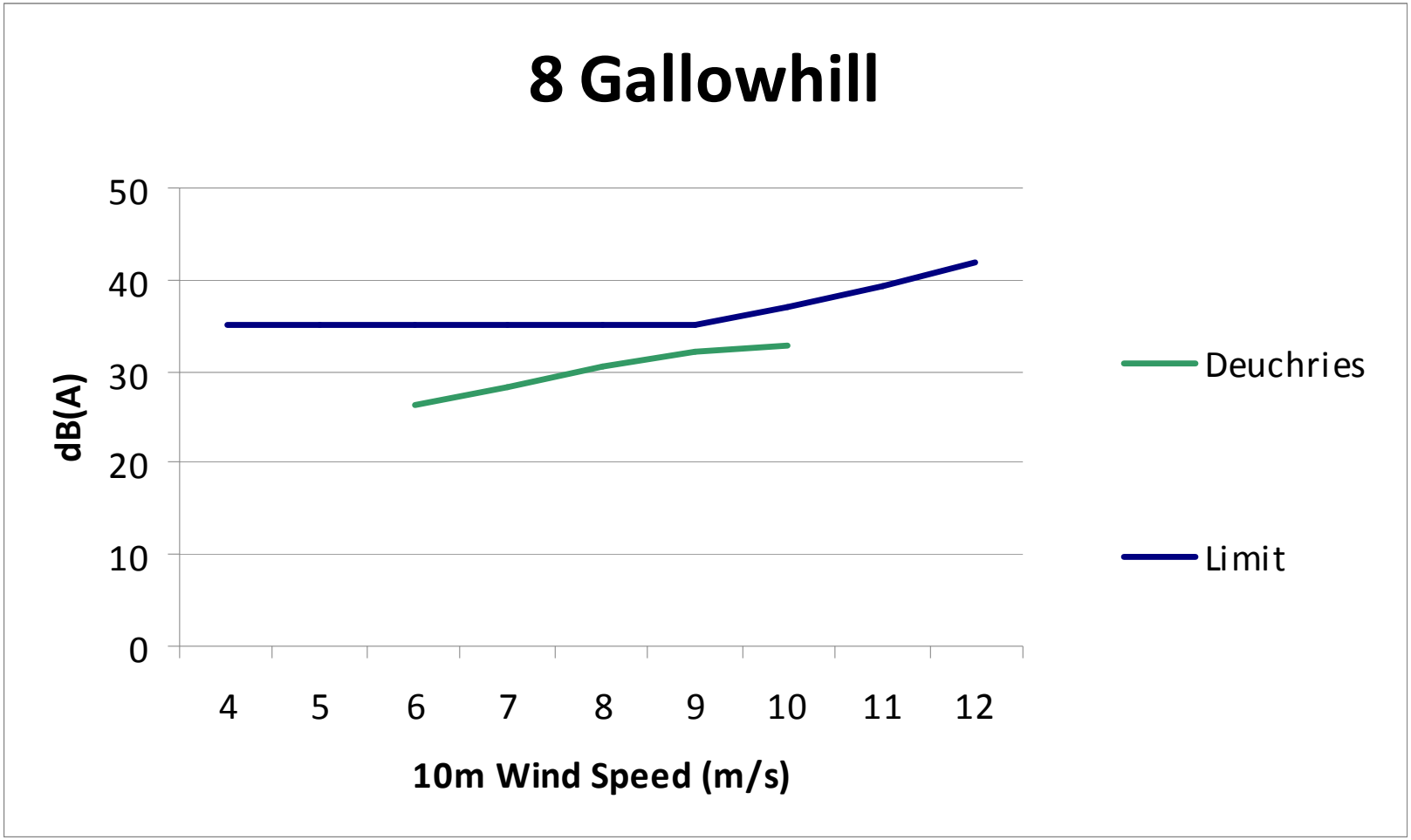

3 Little Deuchries
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit

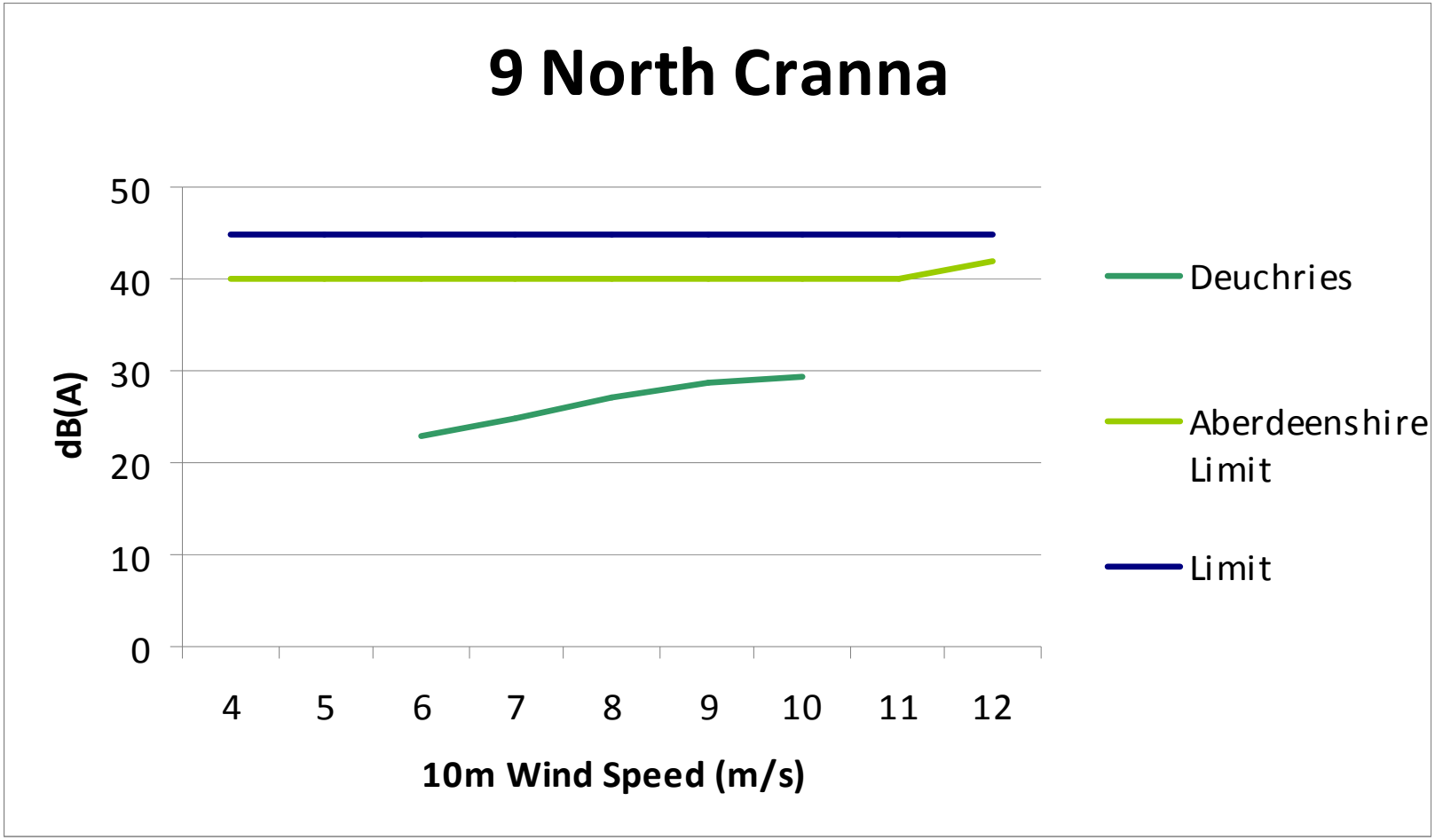

4 Pinefields
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit

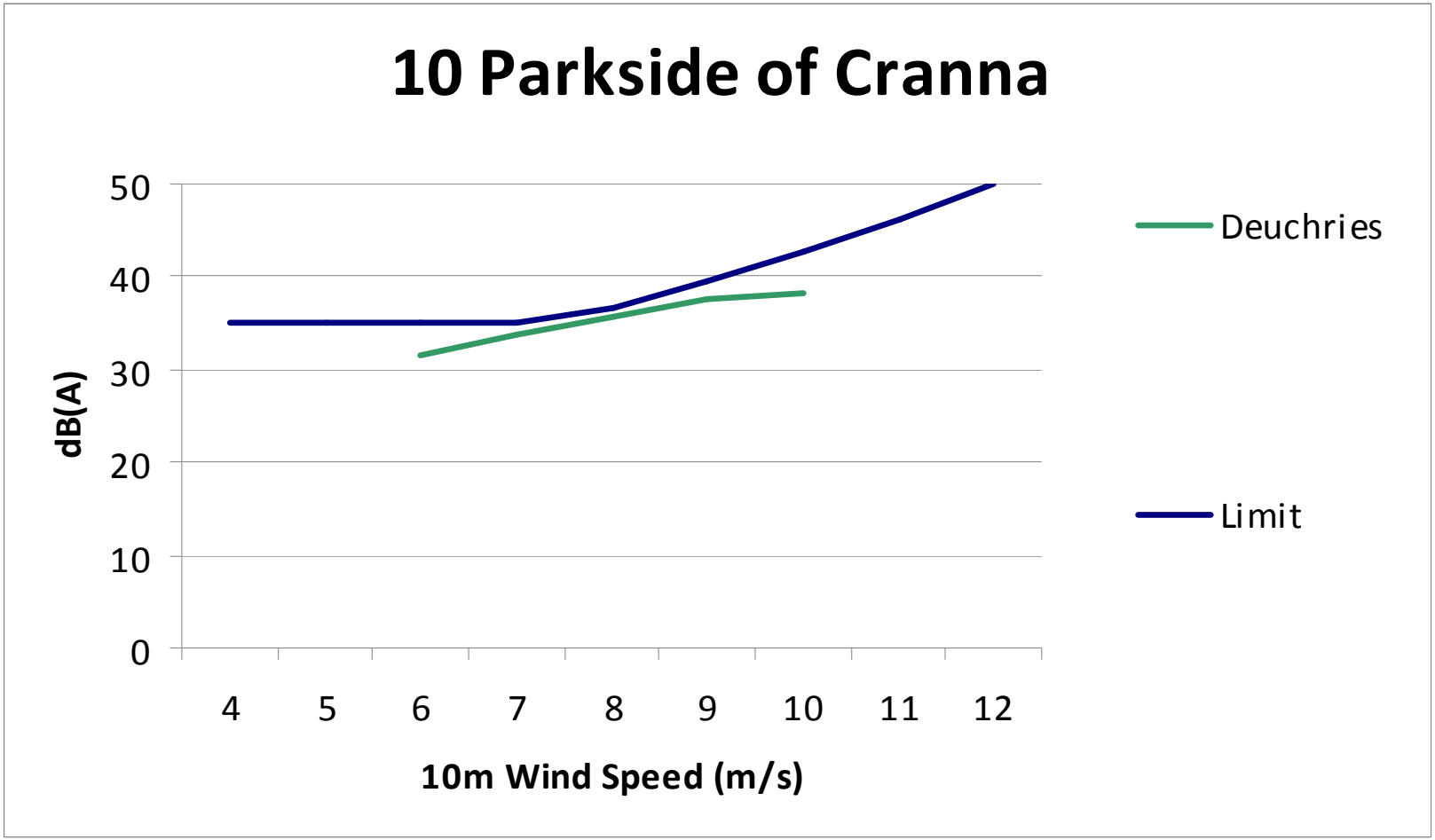

5 ThistleMill
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit


6 Craigathray
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit

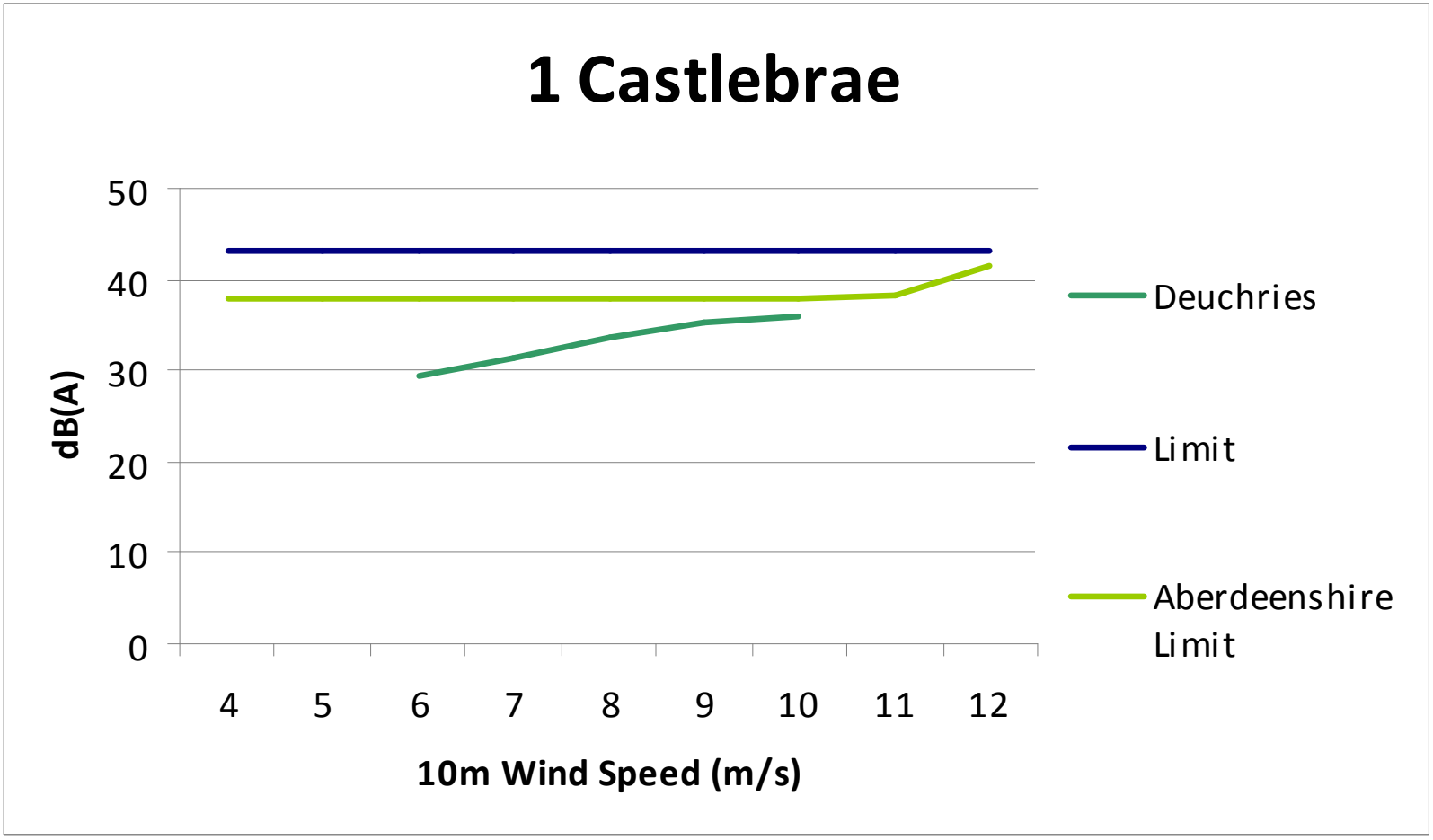

7 Upper Crannabog
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit

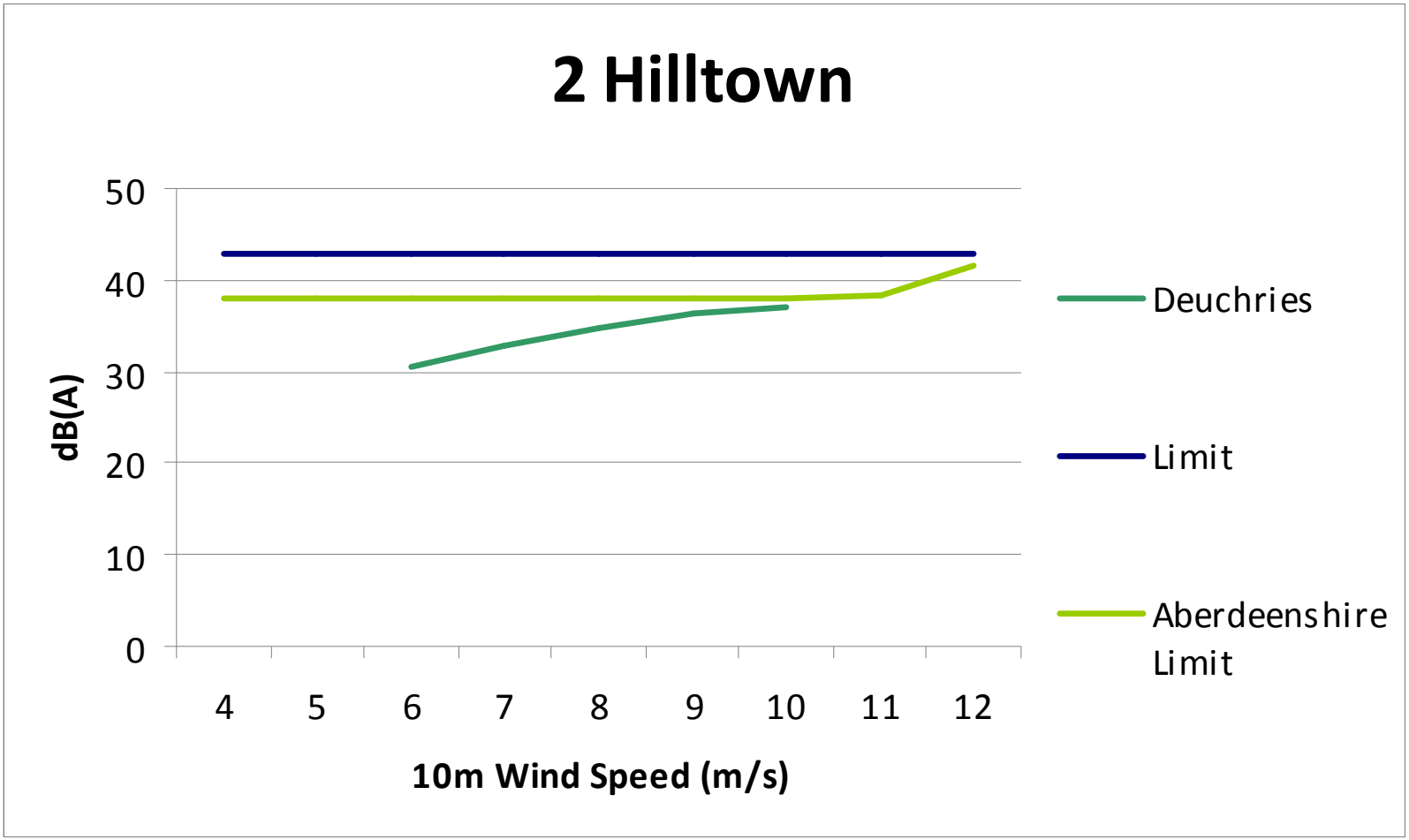

8 Gallowhill
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit

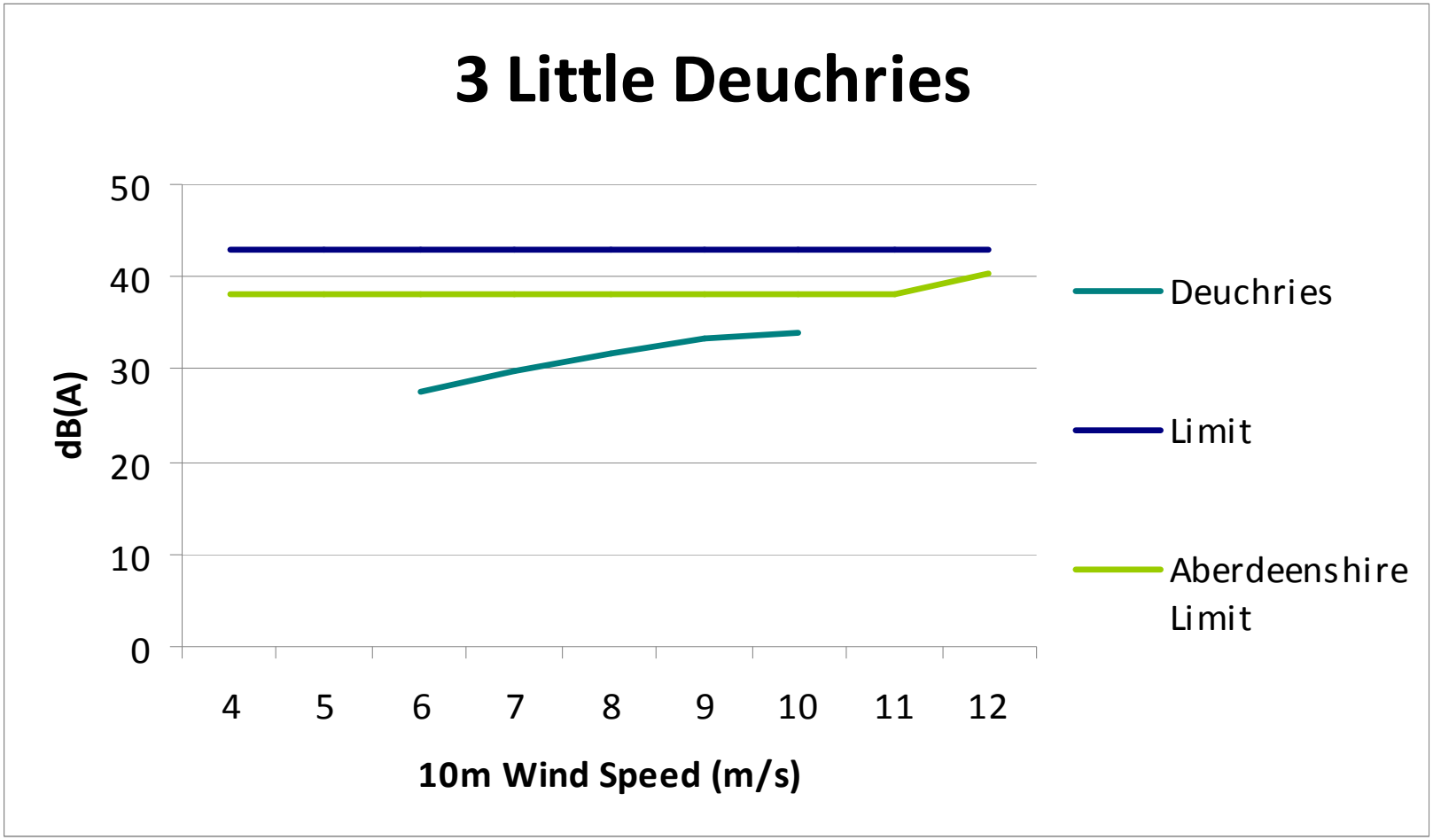

9 North Cranna
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Aberdeenshire Limit
Limit

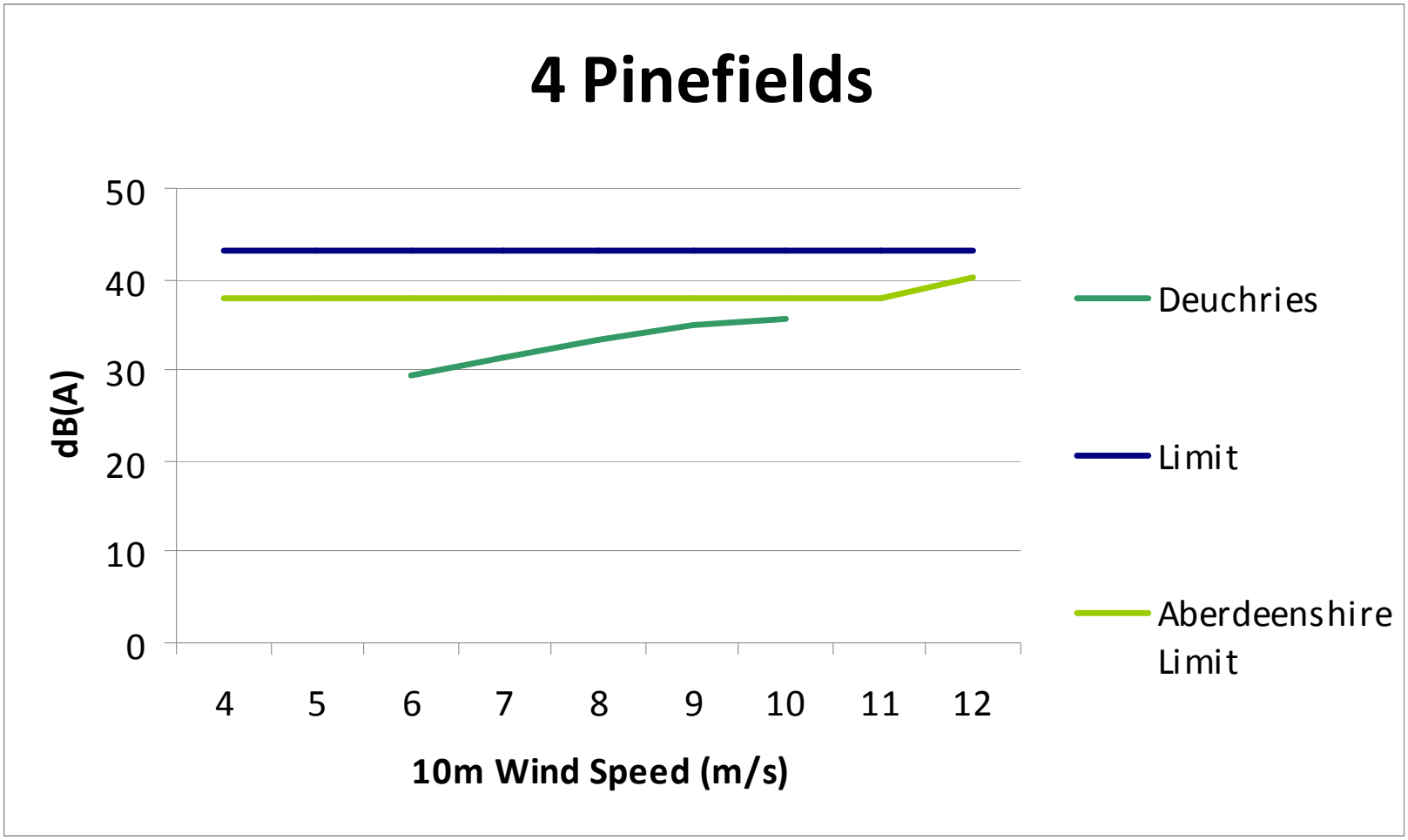

10 Parkside of Cranna
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit

APPENDIX 10.5B: NIGHT TIME GRAPHS

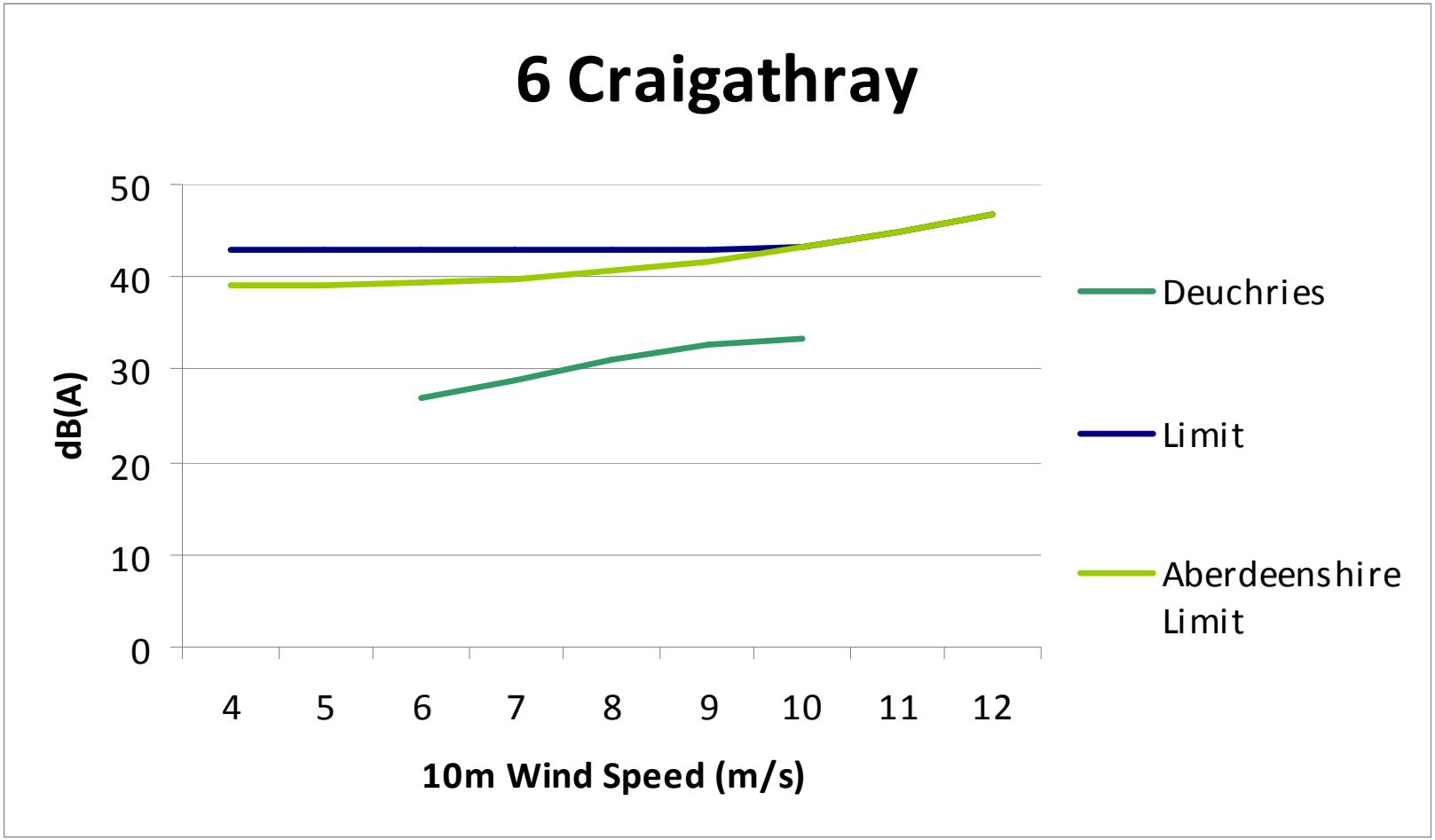


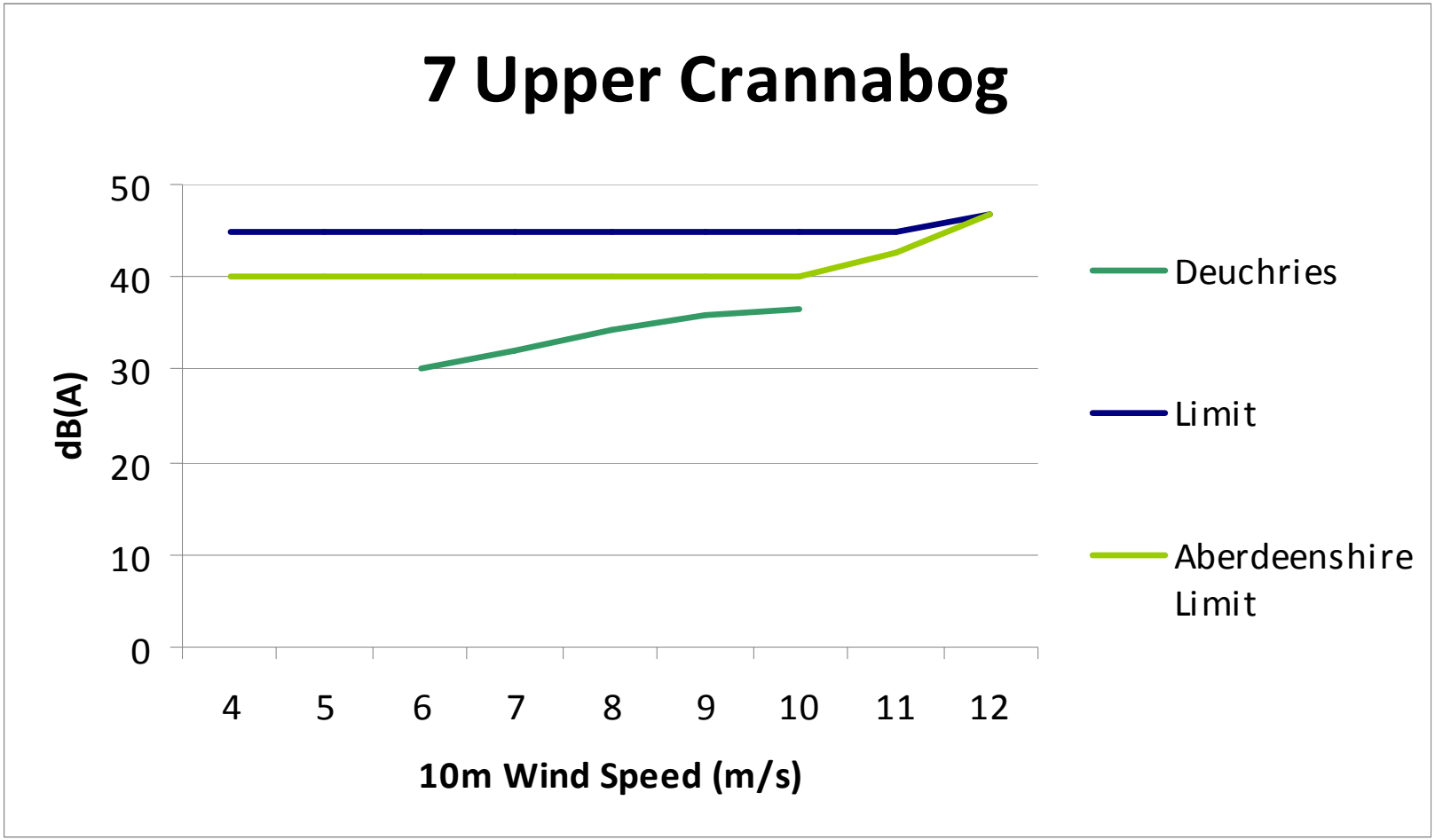

2 Hilltown
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit

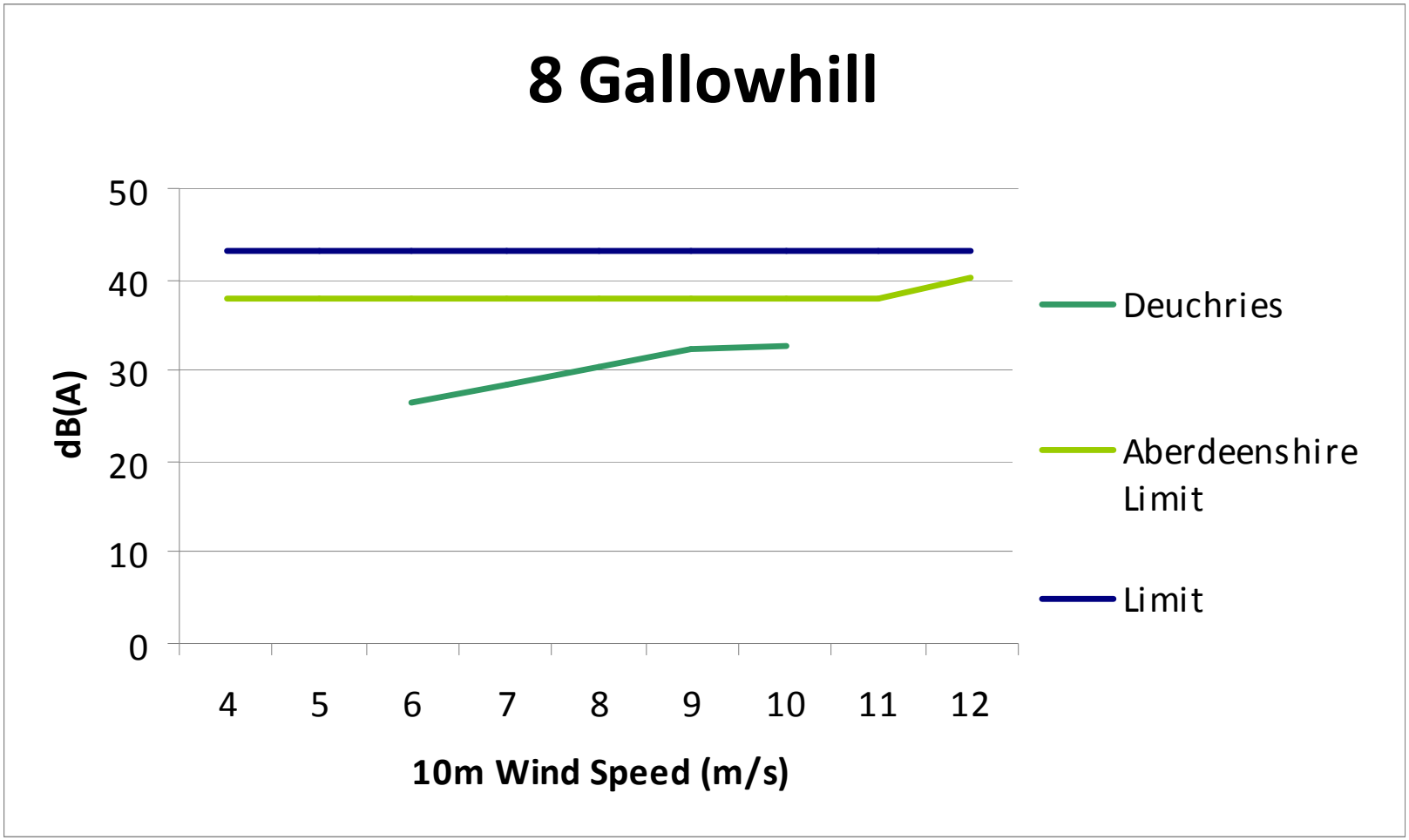

3 Little Deuchries
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit

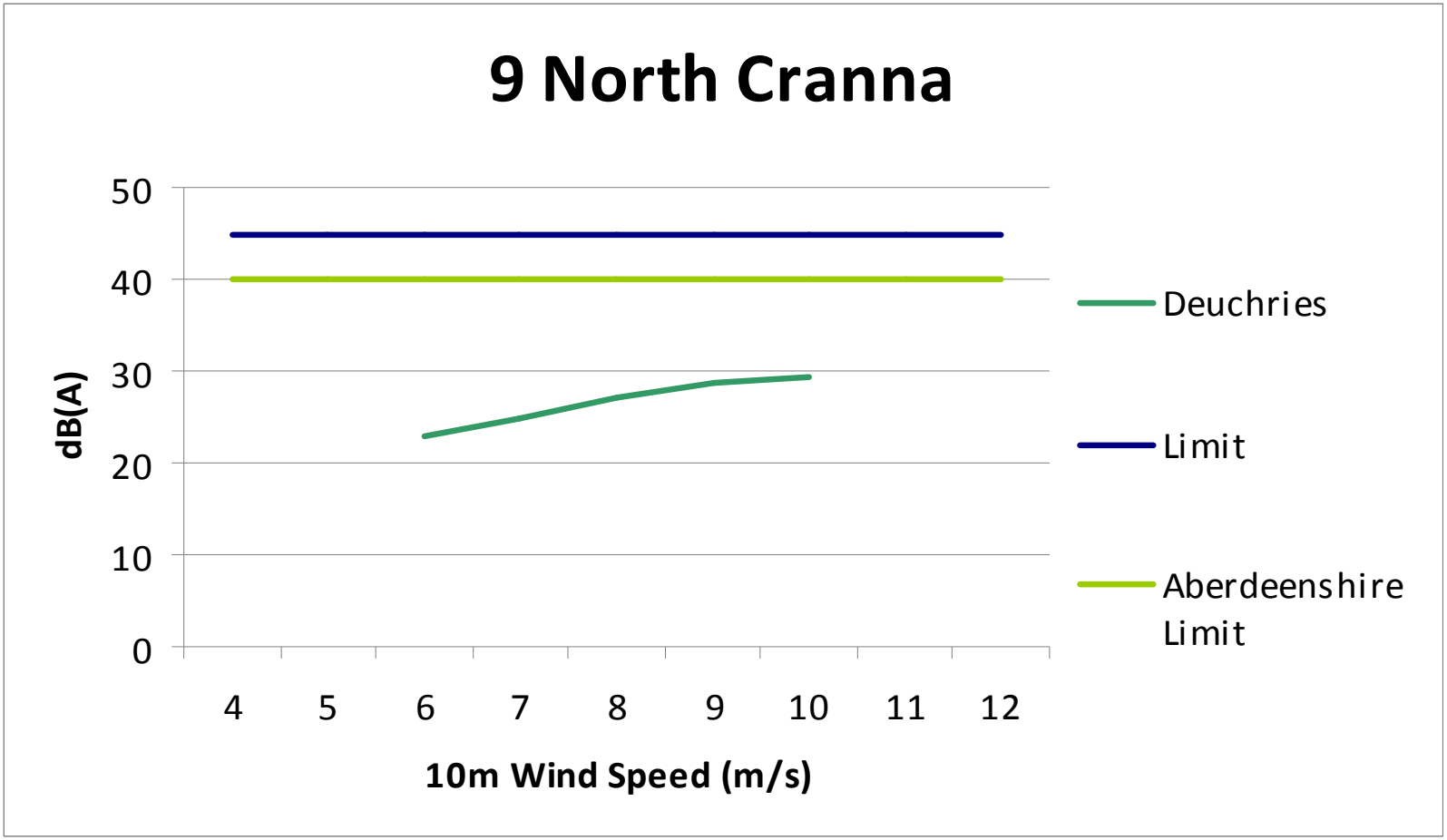

4 Pinefields
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit

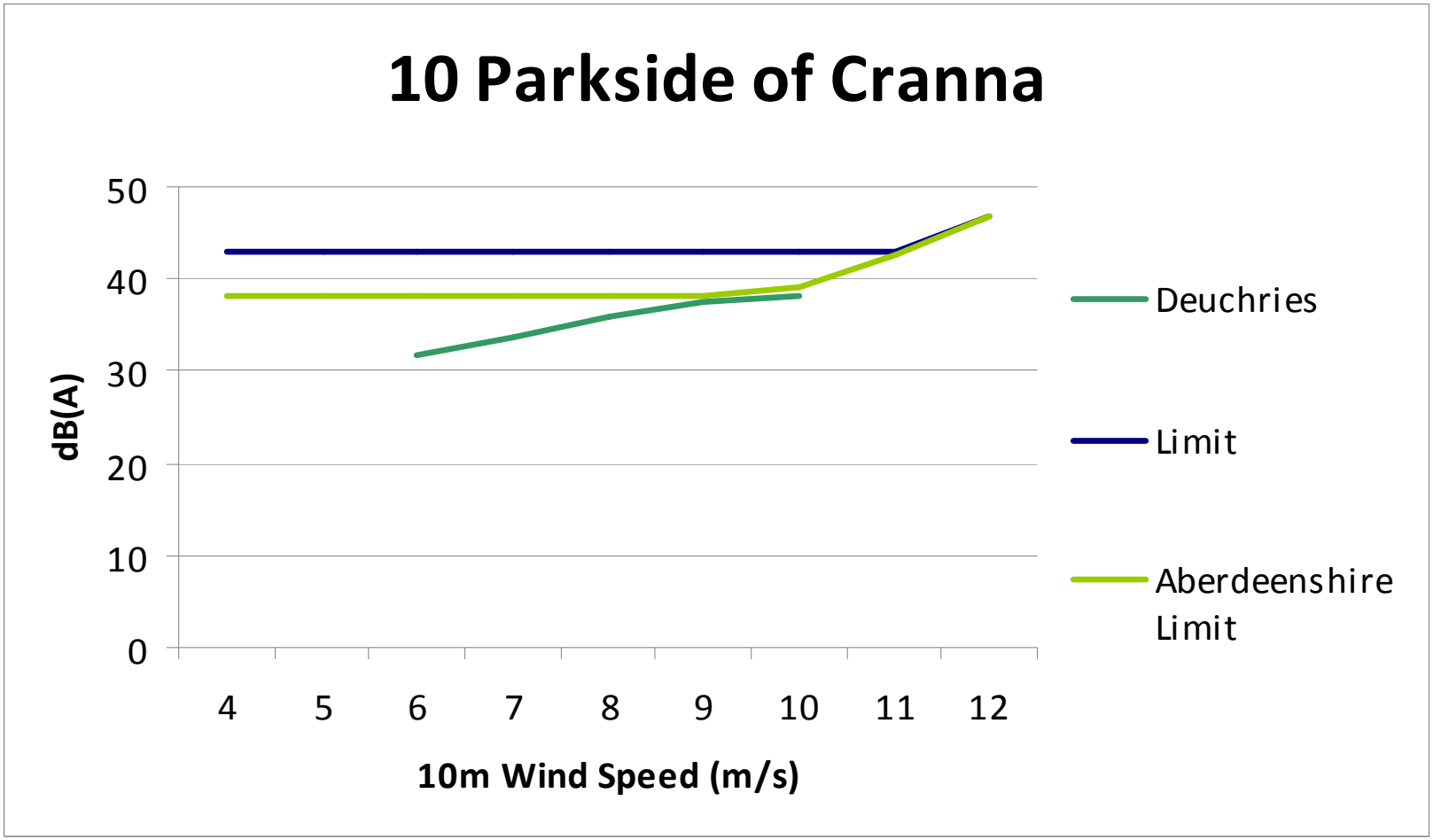

5 ThistleMill
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit


6 Craigathray
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit


7 Upper Crannabog
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit


8 Gallowhill
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Aberdeenshire Limit
Limit


9 North Cranna
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit


10 Parkside of Cranna
50
40
30
20
10
0
dB(A)
4
5
6
7
8
9
10
11
12
10m Wind Speed (m/s)
Deuchries
Limit
Aberdeenshire Limit

APPENDIX 11
TRANSPORT AND ACCESS

Appendix 11.1: Access Study

Appendix 11.2: Road Traffic Data

A97 Aberchirder

Westbound

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	5-Day	7-Day
	07/05/2012	08/05/2012	09/05/2012	10/05/2012	11/05/2012	12/05/2012	13/05/2012	Av	Av
Totals									
12H,7-19	701	628	682	676	695	649	378	676	630
16H,6-22	786	730	787	773	809	719	430	777	719
18H,6-24	799	743	797	786	825	744	437	790	733
24H,0-24	829	767	819	807	843	765	456	813	755
Am	11:00	08:00	11:00	09:00	07:00	11:00	11:00		
Peak	69	70	65	79	60	61	39	69	63
Pm	14:00	16:00	17:00	16:00	17:00	13:00	14:00		
Peak	78	70	74	65	75	69	50	72	69

Eastbound

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	5-Day	7-Day
	07/05/2012	08/05/2012	09/05/2012	10/05/2012	11/05/2012	12/05/2012	13/05/2012	Av	Av
Totals									
12H,7-19	789	699	741	703	719	651	457	730	680
16H,6-22	882	791	832	789	825	730	521	824	767
18H,6-24	896	809	841	799	837	752	531	836	781
24H,0-24	907	816	850	815	848	770	553	847	794
Am	11:00	08:00	08:00	08:00	08:00	11:00	11:00		
Peak	78	75	74	69	63	73	34	72	67
Pm	13:00	16:00	17:00	16:00	17:00	15:00	14:00		
Peak	98	70	90	75	83	65	64	83	78

A98 E of Byth

Eastbound

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	5-Day	7-Day
	07/05/2012	08/05/2012	09/05/2012	10/05/2012	11/05/2012	12/05/2012	13/05/2012	Av	Av
Totals									
12H,7-19	1339	1322	1307	1366	1346	1094	906	1336	1240
16H,6-22	1499	1533	1521	1581	1558	1254	1046	1538	1427
18H,6-24	1521	1549	1539	1608	1590	1292	1064	1561	1452
24H,0-24	1552	1573	1570	1636	1623	1327	1096	1591	1482
Am	11:00	08:00	08:00	08:00	08:00	10:00	11:00		
Peak	92	179	178	188	162	101	72	160	139
Pm	15:00	16:00	16:00	16:00	16:00	14:00	16:00		
Peak	208	128	129	139	124	123	138	146	141

Westbound

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	5-Day	7-Day
	07/05/2012	08/05/2012	09/05/2012	10/05/2012	11/05/2012	12/05/2012	13/05/2012	Av	Av
Totals									
12H,7-19	1207	1380	1461	1467	1492	1197	829	1401	1290
16H,6-22	1330	1534	1624	1615	1660	1308	947	1553	1431
18H,6-24	1346	1562	1649	1636	1702	1333	969	1579	1457
24H,0-24	1396	1591	1668	1657	1723	1360	1003	1607	1485
Am	11:00	08:00	08:00	08:00	08:00	11:00	11:00		
Peak	177	121	122	128	112	131	70	132	123
Pm	13:00	17:00	16:00	16:00	16:00	12:00	13:00		
Peak	139	179	200	182	197	144	103	179	163

APPENDIX 12
CLIMATE CHANGE

Appendix 12.1: Carbon Balance Calculation Sheet

APPENDIX 12.1
CARBON BALANCE DATA

Input data	Value	Actual / Assumed / Default?	Comments
Wind farm characteristics			
No. of turbines	3	Actual	
Life time of wind farm (years)	25	Actual	
Power rating (turbine capacity) (MW)	2.3	Actual	Enercon E70 turbine
Capacity factor (percentage efficiency)	30%	Default	*The average capacity factor between 1998 and 2004 for Scotland was 30% (DTI, 2006, Energy Trends, March 2006).., the best (34%) and worst case capacity factors for Scotland (27%). As capacity factor is unknown at this point in time 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). If it is assumed that less than 20% of national electricity is generated by wind energy, a lower percentage should be entered (0%).*
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	*Note: Emissions from turbine life. Note, if total emissions for the windfarm are unknown, emissions will be calculated according to turbine capacity. The normal range of CO2 emissions is 394 to 8147 t CO2 MW (White & Kulcinski, 2000. Fusion Eng. Des. 48, 473-48; White, 2007, Natural Resources Research. 15, 271 - 281.)*
Characteristics of peatland before wind farm development			

Input data	Value	Actual / Assumed / Default?	Comments
Type of peatland	acid bog	Assumed	Acid bog (rather than "fen") has been assumed to ensure a worst case assessment
Average air temperature at site (^{o}C)	7.8	Assumed	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)	0.9	Assumed	Peat depths range from 0.2 to 0.9 m. Hence worst case assumption.
C Content of dry peat (% by weight)	55	Assumed	
Average extent of drainage around drainage features at site (m)	30	Assumed	30 to 50m depending on scale and depth of feature.
Average water table depth at site (m)	1	Assumed	Inferred by peat probing and ecology surveys
Dry soil bulk density (g cm^{-3})	0.2	Assumed	
Characteristics of bog plants			
Time required for regeneration of bog plants after restoration (years)	10	Assumed	
Carbon accumulation due to C fixation by bog plants in un-drained peats (tC ha^{-1} yr^{-1})	0.25	Default	
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	It is understood that 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			

Input data	Value	Actual / Assumed / Default?	Comments
Number of borrow pits	3	Actual	
Average length of pits (m)	65	Actual	
Average width of pits (m)	35	Actual	
Average depth of peat removed from pit (m)	0.2	Actual	
Foundation and hardstanding areas associated with each turbine			
Average length of turbine foundations (m)	17.73	Actual	Proposed foundations are circular have a diameter of 20m. Using πr^2 gives the area of this circle as 314m^2. A square foundation of 17.73m x 17.73m gives a comparable area of 314.4m^2.
Average width of turbine foundations(m)	17.73	Actual	
Average depth of peat removed from turbine foundations(m)	0.35	Assumed	
Average length of hard-standing (m)	39	Actual	
Average width of hard-standing (m)	22	Actual	
Average depth of peat removed from hard-standing (m)	0.3	Assumed	
Access tracks			
Total length of access track (m)	2,580	Actual	
Existing track length (m)	1,865	Actual	
Length of access track that is floating road (m)	1,250	Actual	
Floating road width (m)	5.5	Actual	
Floating road depth (m)	0.6	Actual	
Length of floating road that is drained (m)	1,250	Actual	
Average depth of drains associated with floating roads (m)	0.6	Actual	
Length of access track that is excavated road (m)	100	Actual	
Excavated road width (m)	5.5	Actual	

Input data	Value	Actual / Assumed / Default?	Comments
Excavated road depth (m)	0.6	Actual	
Length of access track that is rock filled road (m)	715	Actual	All new access tracks will be rock-filled
Rock-filled road width (m)	5.5	Actual	
Rock-filled road depth (m)	0.6	Actual	
Length of rock-filled road that is drained (m)	715	Actual	
Average depth of drains associated with rock-filled roads (m)	0.6	Actual	
Cable Trenches			
Length of any cable trench that does not follow access tracks and is lined with a permeable medium (eg. sand) (m)	0	Actual	
Depth of cable trench (m)	1	Actual	
Peat Landslide Hazard			
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	Assumes no degraded bog is present or will be improved
Water table depth in degraded bog before improvement (m)	1	Assumed	Inferred by peat probing and ecology surveys.
Water table depth in degraded bog after improvement (m)	1	Assumed	Inferred by peat probing and ecology surveys.
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	0	Actual	Assumes no degraded bog is present or will be improved
Improvement of felled plantation land			

Input data	Value	Actual / Assumed / Default?	Comments
Area of felled plantation to be improved (ha)	0	Actual	Assumes no plantation felled or improved
Water table depth in felled area before improvement (m)	1	Assumed	Inferred by peat probing and ecology surveys.
Water table depth in felled area after improvement (m)	1	Assumed	Inferred by peat probing and ecology surveys.
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	10	Assumed	Worst case assumption
Restoration of peat removed from borrow pits			
Area of borrow pits to be restored (ha)	0.6	Assumed	
Water table depth in borrow pit after restoration (m)	1	Assumed	
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)	1	Assumed	
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	10	Assumed	Worst case assumption
Restoration of site after decommissioning			
Will the hydrology of the site be restored on decommissioning?	Yes	Actual	.
Will you attempt to block any gullies that have formed due to the windfarm?	Yes	Actual	
Will you attempt to block all artificial ditches and facilitate rewetting?	No	Actual	Only those ditches deemed appropriate will be blocked, not all ditches.
Will the habitat of the site be restored on decommissioning?	Yes	Actual	.

Input data	Value	Actual / Assumed / Default?	Comments
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:
Deuchries

Description:
Project Evaluation

Printed/Page
05/09/2012 13:54 / 1

Licensed user:
The Wind Consultancy Service
17 Ford Lane, Morton, Bourne
GB-LINCOLNSHIRE PE10 0RQ

Calculated:
27/07/2012 13:33/2.8.552

SHADOW - Calendar

Calculation: Final Layout - 80m rotor**Shadow receptor:** A - Castlebrae

Assumptions for shadow calculations

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	08:54	08:15	07:07	06:42	05:23	04:22	04:16	05:05	06:10	07:13	07:22	08:26
	15:35	16:35	17:41	19:49	20:55	21:56	22:13	21:29	20:11	18:48	16:27	15:33
2	08:53	08:12	07:05	06:39	05:20	04:21	04:17	05:07	06:12	07:15	07:24	08:28
	15:36	16:38	17:43	19:52	20:57	21:57	22:12	21:26	20:08	18:45	16:24	15:32
3	08:53	08:10	07:02	06:37	05:18	04:20	04:18	05:09	06:14	07:17	07:26	08:30
	15:38	16:40	17:45	19:54	21:00	21:59	22:12	21:24	20:06	18:42	16:22	15:31
4	08:52	08:08	06:59	06:34	05:15	04:19	04:19	05:11	06:16	07:19	07:28	08:32
	15:39	16:42	17:48	19:56	21:02	22:00	22:11	21:22	20:03	18:39	16:20	15:30
5	08:52	08:06	06:57	06:31	05:13	04:18	04:20	05:13	06:18	07:21	07:31	08:33
	15:41	16:45	17:50	19:58	21:04	22:02	22:10	21:20	20:00	18:37	16:18	15:29
6	08:51	08:04	06:54	06:28	05:11	04:17	04:21	05:15	06:20	07:24	07:33	08:35
	15:42	16:47	17:52	20:00	21:06	22:03	22:10	21:18	19:57	18:34	16:15	15:28
7	08:51	08:02	06:51	06:26	05:08	04:16	04:22	05:17	06:22	07:26	07:35	08:36
	15:44	16:49	17:54	20:03	21:08	22:04	22:09	21:15	19:55	18:31	16:13	15:28
8	08:50	07:59	06:49	06:23	05:06	04:15	04:23	05:19	06:25	07:28	07:38	08:38
	15:45	16:52	17:57	20:05	21:10	22:05	22:08	21:13	19:52	18:28	16:11	15:27
9	08:49	07:57	06:46	06:20	05:04	04:14	04:25	05:21	06:27	07:30	07:40	08:39
	15:47	16:54	17:59	20:07	21:13	22:06	22:07	21:11	19:49	18:26	16:09	15:26
10	08:48	07:55	06:43	06:17	05:02	04:14	04:26	05:23	06:29	07:32	07:42	08:41
	15:49	16:56	18:01	20:09	21:15	22:07	22:06	21:08	19:46	18:23	16:07	15:26
11	08:47	07:53	06:40	06:15	04:59	04:13	04:27	05:25	06:31	07:34	07:44	08:42
	15:51	16:59	18:03	20:11	21:17	22:08	22:05	21:06	19:44	18:20	16:05	15:25
12	08:46	07:50	06:38	06:12	04:57	04:13	04:29	05:27	06:33	07:37	07:47	08:43
	15:52	17:01	18:06	20:14	21:19	22:09	22:03	21:03	19:41	18:18	16:03	15:25
13	08:45	07:48	06:35	06:09	04:55	04:12	04:30	05:30	06:35	07:39	07:49	08:45
	15:54	17:04	18:08	20:16	21:21	22:10	22:02	21:01	19:38	18:15	16:01	15:25
14	08:44	07:46	06:32	06:07	04:53	04:12	04:32	05:32	06:37	07:41	07:51	08:46
	15:56	17:06	18:10	20:18	21:23	22:11	22:01	20:58	19:35	18:12	15:59	15:25
15	08:43	07:43	06:29	06:04	04:51	04:11	04:33	05:34	06:39	07:43	07:53	08:47
	15:58	17:08	18:12	20:20	21:25	22:12	21:59	20:56	19:32	18:10	15:57	15:25
16	08:42	07:41	06:27	06:01	04:49	04:11	04:35	05:36	06:41	07:45	07:56	08:48
	16:00	17:11	18:14	20:22	21:27	22:12	21:58	20:53	19:30	18:07	15:55	15:25
17	08:40	07:38	06:24	05:58	04:47	04:11	04:36	05:38	06:43	07:48	07:58	08:49
	16:02	17:13	18:17	20:24	21:29	22:13	21:56	20:51	19:27	18:04	15:53	15:25
18	08:39	07:36	06:21	05:56	04:45	04:11	04:38	05:40	06:45	07:50	08:00	08:50
	16:04	17:15	18:19	20:27	21:31	22:13	21:55	20:48	19:24	18:02	15:51	15:25
19	08:37	07:33	06:18	05:53	04:43	04:11	04:40	05:42	06:48	07:52	08:02	08:50
	16:06	17:18	18:21	20:29	21:33	22:14	21:53	20:46	19:21	17:59	15:50	15:25
20	08:36	07:31	06:16	05:51	04:41	04:11	04:42	05:44	06:50	07:54	08:04	08:51
	16:08	17:20	18:23	20:31	21:35	22:14	21:52	20:43	19:18	17:56	15:48	15:25
21	08:34	07:28	06:13	05:48	04:39	04:11	04:43	05:47	06:52	07:57	08:06	08:52
	16:11	17:22	18:25	20:33	21:37	22:14	21:50	20:41	19:16	17:54	15:46	15:26
22	08:33	07:26	06:10	05:45	04:38	04:11	04:45	05:49	06:54	07:59	08:09	08:52
	16:13	17:25	18:28	20:35	21:39	22:15	21:48	20:38	19:13	17:51	15:45	15:26
23	08:31	07:23	06:07	05:43	04:36	04:11	04:47	05:51	06:56	08:01	08:11	08:53
	16:15	17:27	18:30	20:38	21:41	22:15	21:46	20:35	19:10	17:49	15:43	15:27
24	08:30	07:20	06:04	05:40	04:34	04:12	04:49	05:53	06:58	08:03	08:13	08:53
	16:17	17:29	18:32	20:40	21:42	22:15	21:45	20:33	19:07	17:46	15:42	15:27
25	08:28	07:18	06:02	05:38	04:33	04:12	04:51	05:55	07:00	07:06	08:15	08:53
	16:19	17:32	18:34	20:42	21:44	22:15	21:43	20:30	19:04	16:44	15:40	15:28
26	08:26	07:15	05:59	05:35	04:31	04:12	04:53	05:57	07:02	07:08	08:17	08:54
	16:22	17:34	18:36	20:44	21:46	22:15	21:41	20:27	19:02	16:41	15:39	15:29
27	08:24	07:13	05:56	05:33	04:29	04:13	04:55	05:59	07:04	07:10	08:19	08:54
	16:24	17:36	18:39	20:46	21:48	22:14	21:39	20:25	18:59	16:39	15:37	15:30
28	08:22	07:10	05:53	05:30	04:28	04:14	04:57	06:01	07:07	07:12	08:21	08:54
	16:26	17:38	18:41	20:49	21:50	22:14	21:37	20:22	18:56	16:36	15:36	15:30
29	08:20		06:50	05:28	04:26	04:14	04:59	06:03	07:09	07:15	08:23	08:54
	16:28		19:43	20:51	21:51	22:14	21:35	20:19	18:53	16:34	15:35	15:31
30	08:19		06:48	05:25	04:25	04:15	05:01	06:06	07:11	07:17	08:25	08:54
	16:31		19:45	20:53	21:53	22:13	21:33	20:17	18:50	16:32	15:34	15:33
31	08:17		06:45		04:24		05:03	06:08		07:19		08:54
	16:33		19:47		21:54		21:31	20:14		16:29		15:34
Potential sun hours	229	263	366	429	515	538	537	474	385	321	242	208
Total, worst case												

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:
Deuchries

Description:
Project Evaluation

Printed/Page
05/09/2012 13:54 / 2

Licensed user:
The Wind Consultancy Service
17 Ford Lane, Morton, Bourne
GB-LINCOLNSHIRE PE10 0RQ

Calculated:
27/07/2012 13:33/2.8.552

SHADOW - Calendar

Calculation: Final Layout - 80m rotor**Shadow receptor:** B - Kebholes

Assumptions for shadow calculations

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	08:54	08:14		07:07	16:36 (2)	06:42	05:22	04:22	04:16	05:04	06:10		07:13	18:00 (1)	07:21	15:36 (3)	08:26
	15:35	16:35		17:41	19 16:55 (2)	19:49	20:55	21:56	22:13	21:29	20:11		18:48	13 18:13 (1)	16:27	4 15:40 (3)	15:33
2	08:53	08:12		07:05	16:36 (2)	06:39	05:20	04:21	04:17	05:06	06:12		07:15	18:02 (1)	07:24		08:28
	15:36	16:38		17:43	19 16:55 (2)	19:52	20:57	21:57	22:12	21:26	20:08		18:45	8 18:10 (1)	16:24		15:32
3	08:53	08:10		07:02	16:36 (2)	06:36	05:18	04:20	04:17	05:09	06:14		07:17		07:26		08:30
	15:38	16:40		17:45	17 16:53 (2)	19:54	21:00	21:59	22:12	21:24	20:06		18:42		16:22		15:31
4	08:52	08:08		06:59	16:37 (2)	06:34	05:15	04:19	04:18	05:11	06:16		07:19		07:28		08:32
	15:39	16:42		17:47	15 16:52 (2)	19:56	21:02	22:00	22:11	21:22	20:03		18:39		16:20		15:30
5	08:52	08:06		06:57	16:39 (2)	06:31	05:13	04:18	04:20	05:13	06:18		07:21		07:31		08:33
	15:41	16:45		17:50	12 16:51 (2)	19:58	21:04	22:01	22:10	21:20	20:00		18:37		16:18		15:29
6	08:51	08:04		06:54	16:42 (2)	06:28	05:11	04:17	04:21	05:15	06:20		07:24		07:33		08:35
	15:42	16:47		17:52	6 16:48 (2)	20:00	21:06	22:03	22:10	21:17	19:57		18:34		16:15		15:28
7	08:51	08:02		06:51		06:25	05:08	04:16	04:22	05:17	06:22		07:26		07:35		08:36
	15:44	16:49		17:54		20:02	21:08	22:04	22:09	21:15	19:55		18:31		16:13		15:27
8	08:50	07:59		06:48		06:23	05:06	04:15	04:23	05:19	06:24		07:28	17:16 (2)	07:37		08:38
	15:45	16:52		17:56		20:05	21:10	22:05	22:08	21:13	19:52		18:28	9 17:25 (2)	16:11		15:27
9	08:49	07:57		06:46		06:20	05:04	04:14	04:24	05:21	06:27		07:30	17:13 (2)	07:40		08:39
	15:47	16:54		17:59		20:07	21:12	22:06	22:07	21:10	19:49		18:26	14 17:27 (2)	16:09		15:26
10	08:48	07:55	16:06 (3)	06:43		06:17	05:02	04:14	04:26	05:23	06:29		07:32	17:11 (2)	07:42		08:41
	15:49	16:56	5 16:11 (3)	18:01		20:09	21:15	22:07	22:06	21:08	19:46		18:23	16 17:27 (2)	16:07		15:26
11	08:47	07:53	16:03 (3)	06:40	17:26 (1)	06:15	04:59	04:13	04:27	05:25	06:31		07:34	17:10 (2)	07:44		08:42
	15:50	16:59	12 16:15 (3)	18:03	4 17:30 (1)	20:11	21:17	22:08	22:04	21:06	19:43		18:20	18 17:28 (2)	16:05		15:25
12	08:46	07:50	16:01 (3)	06:38	17:22 (1)	06:12	04:57	04:12	04:29	05:27	06:33		07:37	17:10 (2)	07:47		08:43
	15:52	17:01	16 16:17 (3)	18:05	11 17:33 (1)	20:13	21:19	22:09	22:03	21:03	19:41		18:17	19 17:29 (2)	16:03		15:25
13	08:45	07:48	15:59 (3)	06:35	17:20 (1)	06:09	04:55	04:12	04:30	05:29	06:35		07:39	17:09 (2)	07:49		08:45
	15:54	17:03	19 16:18 (3)	18:08	14 17:34 (1)	20:16	21:21	22:10	22:02	21:01	19:38		18:15	19 17:28 (2)	16:01		15:25
14	08:44	07:45	15:59 (3)	06:32	17:19 (1)	06:06	04:53	04:12	04:32	05:32	06:37		07:41	17:08 (2)	07:51		08:46
	15:56	17:06	20 16:19 (3)	18:10	16 17:35 (1)	20:18	21:23	22:11	22:01	20:58	19:35		18:12	20 17:28 (2)	15:59		15:25
15	08:43	07:43	15:58 (3)	06:29	17:19 (1)	06:04	04:51	04:11	04:33	05:34	06:39		07:43	17:09 (2)	07:53		08:47
	15:58	17:08	22 16:20 (3)	18:12	17 17:36 (1)	20:20	21:25	22:12	21:59	20:56	19:32		18:09	19 17:28 (2)	15:57		15:24
16	08:42	07:41	15:58 (3)	06:27	17:18 (1)	06:01	04:49	04:11	04:35	05:36	06:41		07:45	16:37 (3)	07:56		08:48
	16:00	17:10	23 16:21 (3)	18:14	18 17:36 (1)	20:22	21:27	22:12	21:58	20:53	19:29		18:07	26 17:27 (2)	15:55		15:24
17	08:40	07:38	15:57 (3)	06:24	17:17 (1)	05:58	04:47	04:11	04:36	05:38	06:43		07:48	16:33 (3)	07:58		08:49
	16:02	17:13	24 16:21 (3)	18:17	19 17:36 (1)	20:24	21:29	22:13	21:56	20:51	19:27		18:04	30 17:25 (2)	15:53		15:25
18	08:39	07:36	15:57 (3)	06:21	17:17 (1)	05:56	04:45	04:11	04:38	05:40	06:45		07:50	16:32 (3)	08:00		08:49
	16:04	17:15	23 16:20 (3)	18:19	18 17:35 (1)	20:27	21:31	22:13	21:55	20:48	19:24		18:02	31 17:25 (2)	15:51		15:25
19	08:37	07:33	15:57 (3)	06:18	17:17 (1)	05:53	04:43	04:11	04:40	05:42	06:47		07:52	16:30 (3)	08:02		08:50
	16:06	17:18	24 16:21 (3)	18:21	17 17:34 (1)	20:29	21:33	22:14	21:53	20:46	19:21		17:59	30 17:22 (2)	15:49		15:25
20	08:36	07:31	15:57 (3)	06:15	17:19 (1)	05:50	04:41	04:11	04:41	05:44	06:50		07:54	16:28 (3)	08:04		08:51
	16:08	17:20	23 16:20 (3)	18:23	14 17:33 (1)	20:31	21:35	22:14	21:52	20:43	19:18		17:56	24 17:17 (2)	15:48		15:25
21	08:34	07:28	15:57 (3)	06:13	17:20 (1)	05:48	04:39	04:11	04:43	05:46	06:52		07:56	16:28 (3)	08:06		08:52
	16:10	17:22	23 16:20 (3)	18:25	11 17:31 (1)	20:33	21:37	22:14	21:50	20:40	19:15		17:54	23 16:51 (3)	15:46		15:26
22	08:33	07:26	15:58 (3)	06:10	17:23 (1)	05:45	04:37	04:11	04:45	05:49	06:54	18:05 (1)	07:59	16:27 (3)	08:09		08:52
	16:13	17:25	27 16:49 (2)	18:27	5 17:28 (1)	20:35	21:39	22:14	21:48	20:38	19:13	10 18:15 (1)	17:51	24 16:51 (3)	15:45		15:26
23	08:31	07:23	15:59 (3)	06:07		05:43	04:36	04:11	04:47	05:51	06:56	18:03 (1)	08:01	16:27 (3)	08:11		08:53
	16:15	17:27	31 16:52 (2)	18:30		20:38	21:41	22:15	21:46	20:35	19:10	14 18:17 (1)	17:49	24 16:51 (3)	15:43		15:27
24	08:29	07:20	16:00 (3)	06:04		05:40	04:34	04:11	04:49	05:53	06:58	18:01 (1)	08:03	16:27 (3)	08:13		08:53
	16:17	17:29	31 16:53 (2)	18:32		20:40	21:42	22:15	21:45	20:33	19:07	16 18:17 (1)	17:46	24 16:51 (3)	15:41		15:27
25	08:28	07:18	16:03 (3)	06:01		05:37	04:32	04:12	04:51	05:55	07:00	18:00 (1)	07:05	15:27 (3)	08:15		08:53
	16:19	17:31	29 16:55 (2)	18:34		20:42	21:44	22:15	21:43	20:30	19:04	18 18:18 (1)	16:44	24 15:51 (3)	15:40		15:28
26	08:26	07:15	16:07 (3)	05:59		05:35	04:31	04:12	04:53	05:57	07:02	17:59 (1)	07:08	15:27 (3)	08:17		08:54
	16:21	17:34	22 16:55 (2)	18:36		20:44	21:46	22:15	21:41	20:27	19:01	18 18:17 (1)	16:41	23 15:50 (3)	15:39		15:29
27	08:24	07:13	16:36 (2)	05:56		05:32	04:29	04:13	04:55	05:59	07:04	17:59 (1)	07:10	15:27 (3)	08:19		08:54
	16:24	17:36	19 16:55 (2)	18:38		20:46	21:48	22:14	21:39	20:25	18:59	18 18:17 (1)	16:39	22 15:49 (3)	15:37		15:29
28	08:22	07:10	16:35 (2)	05:53		05:30	04:28	04:13	04:56	06:01	07:06	17:59 (1)	07:12	15:28 (3)	08:21		08:54
	16:26	17:38	20 16:55 (2)	18:41		20:49	21:49	22:14	21:37	20:22	18:56	18 18:17 (1)	16:36	21 15:49 (3)	15:36		15:30
29	08:20			06:50		05:27	04:26	04:14	04:58	06:03	07:09	17:59 (1)	07:15	15:29 (3)	08:23		08:54
	16:28			19:43		20:51	21:51	22:14	21:35	20:19	18:53	17 18:16 (1)	16:34	18 15:47 (3)	15:35		15:31
30	08:18			06:48		05:25	04:25	04:15	05:00	06:05	07:11	18:00 (1)	07:17	15:31 (3)	08:24		08:54
	16:31			19:45		20:53	21:53	22:13	21:33	20:17	18:50	15 18:15 (1)	16:31	15 15:46 (3)	15:34		15:32
31	08:16			06:45			04:24		05:02	06:08			07:19	15:32 (3)			08:54
	16:33			19:47			21:54		21:31	20:14			16:29	11 15:43 (3)			15:33
Potential sun hours	228	263		366		429	515	538	537	474	385		321		242		208
Total, worst case			413		252							144		525		4	

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:
Deuchries

Description:
Project Evaluation

Printed/Page
05/09/2012 13:54 / 3

Licensed user:
The Wind Consultancy Service
17 Ford Lane, Morton, Bourne
GB-LINCOLNSHIRE PE10 0RQ

Calculated:
27/07/2012 13:33/2.8.552

SHADOW - Calendar

Calculation: Final Layout - 80m rotor **Shadow receptor:** C - Parkside of Cranna

Assumptions for shadow calculations

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	08:53	08:14	07:07	06:42	05:23		04:22	20:38 (2)	04:16	21:02 (3)	05:05	20:47 (2)	06:10	07:13	07:21	08:26
	15:35	16:35	17:41	19:49	20:55		21:56	35 21:16 (3)	22:13	28 21:30 (3)	21:29	6 20:53 (2)	20:11	18:48	16:27	15:33
2	08:53	08:12	07:05	06:39	05:20		04:21	20:39 (2)	04:17	21:03 (3)	05:07	20:47 (2)	06:12	07:15	07:24	08:28
	15:36	16:38	17:43	19:52	20:57		21:57	35 21:17 (3)	22:12	27 21:30 (3)	21:26	3 20:50 (2)	20:08	18:45	16:24	15:32
3	08:53	08:10	07:02	06:37	05:18		04:20	20:40 (2)	04:18	20:52 (2)	05:09		06:14	07:17	07:26	08:30
	15:38	16:40	17:45	19:54	20:59		21:59	35 21:18 (3)	22:12	31 21:30 (3)	21:24		20:06	18:42	16:22	15:31
4	08:52	08:08	06:59	06:34	05:15		04:19	20:41 (2)	04:19	20:50 (2)	05:11		06:16	07:19	07:28	08:32
	15:39	16:42	17:47	19:56	21:02		22:00	35 21:19 (3)	22:11	33 21:29 (3)	21:22		20:03	18:39	16:20	15:30
5	08:52	08:06	06:57	06:31	05:13		04:18	20:41 (2)	04:20	20:50 (2)	05:13		06:18	07:21	07:31	08:33
	15:41	16:45	17:50	19:58	21:04		22:01	35 21:20 (3)	22:10	34 21:29 (3)	21:20		20:00	18:37	16:18	15:29
6	08:51	08:04	06:54	06:28	05:11		04:17	20:42 (2)	04:21	20:49 (2)	05:15		06:20	07:24	07:33	08:35
	15:42	16:47	17:52	20:00	21:06		22:03	35 21:21 (3)	22:10	34 21:28 (3)	21:17		19:57	18:34	16:15	15:28
7	08:51	08:02	06:51	06:25	05:08		04:16	20:44 (2)	04:22	20:48 (2)	05:17		06:22	07:26	07:35	08:36
	15:44	16:49	17:54	20:02	21:08		22:04	34 21:23 (3)	22:09	35 21:27 (3)	21:15		19:55	18:31	16:13	15:27
8	08:50	07:59	06:48	06:23	05:06		04:15	20:45 (2)	04:23	20:47 (2)	05:19		06:24	07:28	07:37	08:38
	15:45	16:52	17:57	20:05	21:10		22:05	33 21:23 (3)	22:08	36 21:26 (3)	21:13		19:52	18:28	16:11	15:27
9	08:49	07:57	06:46	06:20	05:04		04:14	20:46 (2)	04:24	20:47 (2)	05:21		06:27	07:30	07:40	08:39
	15:47	16:54	17:59	20:07	21:12		22:06	32 21:24 (3)	22:07	35 21:25 (3)	21:10		19:49	18:26	16:09	15:26
10	08:48	07:55	06:43	06:17	05:02	20:38 (2)	04:14	20:49 (2)	04:26	20:47 (2)	05:23		06:29	07:32	07:42	08:41
	15:49	16:56	18:01	20:09	21:15	2 20:39 (2)	22:07	29 21:25 (3)	22:06	35 21:25 (3)	21:08		19:46	18:23	16:07	15:26
11	08:47	07:53	06:40	06:15	04:59	20:37 (2)	04:13	20:58 (3)	04:27	20:46 (2)	05:25		06:31	07:34	07:44	08:42
	15:51	16:59	18:03	20:11	21:17	4 20:41 (2)	22:08	28 21:26 (3)	22:04	36 21:24 (3)	21:06		19:43	18:20	16:05	15:25
12	08:46	07:50	06:38	06:12	04:57	20:36 (2)	04:13	20:58 (3)	04:29	20:46 (2)	05:27		06:33	07:37	07:47	08:43
	15:52	17:01	18:05	20:13	21:19	7 20:43 (2)	22:09	29 21:27 (3)	22:03	34 21:23 (3)	21:03		19:41	18:18	16:03	15:25
13	08:45	07:48	06:35	06:09	04:55	20:36 (2)	04:12	20:59 (3)	04:30	20:46 (2)	05:29		06:35	07:39	07:49	08:44
	15:54	17:03	18:08	20:16	21:21	9 20:45 (2)	22:10	29 21:28 (3)	22:02	33 21:22 (3)	21:01		19:38	18:15	16:01	15:25
14	08:44	07:45	06:32	06:06	04:53	20:35 (2)	04:12	20:58 (3)	04:32	20:45 (2)	05:32		06:37	07:41	07:51	08:46
	15:56	17:06	18:10	20:18	21:23	12 20:47 (2)	22:11	30 21:28 (3)	22:01	33 21:21 (3)	20:58		19:35	18:12	15:59	15:25
15	08:43	07:43	06:29	06:04	04:51	20:34 (2)	04:11	20:58 (3)	04:33	20:44 (2)	05:34		06:39	07:43	07:53	08:47
	15:58	17:08	18:12	20:20	21:25	15 20:49 (2)	22:11	31 21:29 (3)	21:59	32 21:19 (3)	20:56		19:32	18:10	15:57	15:25
16	08:41	07:41	06:27	06:01	04:49	20:34 (2)	04:11	20:59 (3)	04:35	20:45 (2)	05:36		06:41	07:45	07:55	08:48
	16:00	17:11	18:14	20:22	21:27	16 20:50 (2)	22:12	30 21:29 (3)	21:58	30 21:19 (3)	20:53		19:29	18:07	15:55	15:25
17	08:40	07:38	06:24	05:58	04:47	20:33 (2)	04:11	20:59 (3)	04:36	20:44 (2)	05:38		06:43	07:48	07:58	08:49
	16:02	17:13	18:17	20:24	21:29	19 20:52 (2)	22:13	31 21:30 (3)	21:56	28 21:17 (3)	20:51		19:27	18:04	15:53	15:25
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	16:04	17:15	18:19	20:27	21:31	20 20:54 (2)	22:13	31 21:30 (3)	21:55	27 21:16 (3)	20:48		19:24	18:02	15:51	15:25
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24	08:29	07:20	06:04	05:40	04:34	20:34 (2)	04:11	21:00 (3)	04:49	20:43 (2)	05:53		06:58	08:03	08:13	08:53
	16:17	17:29	18:32	20:40	21:42	25 20:59 (2)	22:15	32 21:32 (3)	21:45	23 21:06 (2)	20:33		19:07	17:46	15:42	15:27
25	08:28	07:18	06:02	05:38	04:32	20:34 (2)	04:12	21:01 (3)	04:51	20:44 (2)	05:55		07:00	07:05	08:15	08:53
	16:19	17:31	18:34	20:42	21:44	25 20:59 (2)	22:15	31 21:32 (3)	21:43	21 21:05 (2)	20:30		19:04	16:44	15:40	15:28
26	08:26	07:15	05:59	05:35	04:31	20:35 (2)	04:12	21:01 (3)	04:53	20:44 (2)	05:57		07:02	07:08	08:17	08:54
	16:21	17:34	18:36	20:44	21:46	26 21:07 (3)	22:14	31 21:32 (3)	21:41	20 21:04 (2)	20:27		19:02	16:41	15:39	15:29
27	08:24	07:13	05:56	05:32	04:29	20:35 (2)	04:13	21:02 (3)	04:55	20:45 (2)	05:59		07:04	07:10	08:19	08:54
	16:24	17:36	18:38	20:46	21:48	28 21:08 (3)	22:14	30 21:32 (3)	21:39	17 21:02 (2)	20:25		18:59	16:39	15:37	15:29
28	08:22	07:10	05:53	05:30	04:28	20:36 (2)	04:13	21:01 (3)	04:57	20:44 (2)	06:01		07:06	07:12	08:21	08:54
	16:26	17:38	18:41	20:49	21:49	30 21:10 (3)	22:14	30 21:31 (3)	21:37	16 21:00 (2)	20:22		18:56	16:36	15:36	15:30
29	08:20		06:50	05:27	04:26	20:36 (2)	04:14	21:02 (3)	04:59	20:45 (2)	06:03		07:09	07:15	08:23	08:54
	16:28		19:43	20:51	21:51	32 21:12 (3)	22:14	29 21:31 (3)	21:35	13 20:58 (2)	20:19		18:53	16:34	15:35	15:31
30	08:18		06:48	05:25	04:25	20:37 (2)	04:15	21:03 (3)	05:00	20:45 (2)	06:06		07:11	07:17	08:24	08:54
	16:31		19:45	20:53	21:53	33 21:13 (3)	22:13	28 21:31 (3)	21:33	11 20:56 (2)	20:17		18:50	16:31	15:34	15:32
31	08:16		06:45		04:24	20:38 (2)			05:02	20:46 (2)	06:08			07:19		08:54
	16:33		19:47		21:54	33 21:14 (3)			21:31	9 20:55 (2)	20:14			16:29		15:34
Potential sun hours	229	263	366	429	515		538		537		474		385	321	242	208
Total, worst case						459		948		836		9				

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:
Deuchries

Description:
Project Evaluation

Printed/Page
05/09/2012 13:54 / 4

Licensed user:
The Wind Consultancy Service
17 Ford Lane, Morton, Bourne
GB-LINCOLNSHIRE PE10 0RQ

Calculated:
27/07/2012 13:33/2.8.552

SHADOW - Calendar

Calculation: Final Layout - 80m rotor**Shadow receptor:** D - Upper Crannabog

Assumptions for shadow calculations

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	08:53	08:14	07:07	06:42	05:23	04:22	04:16	05:05	06:10	07:13	07:21	08:26
	15:35	16:35	17:41	19:49	20:55	21:56	22:13	21:29	20:11	18:48	16:27	15:33
2	08:53	08:12	07:05	06:39	05:20	04:21	04:17	05:07	06:12	07:15	07:24	08:28
	15:36	16:38	17:43	19:52	20:57	21:57	22:12	21:26	20:08	18:45	16:24	15:32
3	08:53	08:10	07:02	06:37	05:18	04:20	04:18	05:09	06:14	07:17	07:26	08:30
	15:38	16:40	17:45	19:54	20:59	21:59	22:12	21:24	20:06	18:42	16:22	15:31
4	08:52	08:08	06:59	06:34	05:15	04:19	04:19	05:11	06:16	07:19	07:28	08:32
	15:39	16:42	17:47	19:56	21:02	22:00	22:11	21:22	20:03	18:39	16:20	15:30
5	08:52	08:06	06:57	06:31	05:13	04:18	04:20	05:13	06:18	07:21	07:31	08:33
	15:41	16:45	17:50	19:58	21:04	22:01	22:10	21:20	20:00	18:37	16:18	15:29
6	08:51	08:04	06:54	06:28	05:11	04:17	04:21	05:15	06:20	07:24	07:33	08:35
	15:42	16:47	17:52	20:00	21:06	22:03	22:09	21:17	19:57	18:34	16:15	15:28
7	08:51	08:02	06:51	06:25	05:08	04:16	04:22	05:17	06:22	07:26	07:35	08:36
	15:44	16:49	17:54	20:02	21:08	22:04	22:09	21:15	19:55	18:31	16:13	15:27
8	08:50	07:59	06:48	06:23	05:06	04:15	04:23	05:19	06:24	07:28	07:37	08:38
	15:45	16:52	17:57	20:05	21:10	22:05	22:08	21:13	19:52	18:28	16:11	15:27
9	08:49	07:57	06:46	06:20	05:04	04:14	04:24	05:21	06:27	07:30	07:40	08:39
	15:47	16:54	17:59	20:07	21:12	22:06	22:07	21:10	19:49	18:26	16:09	15:26
10	08:48	07:55	06:43	06:17	05:02	04:14	04:26	05:23	06:29	07:32	07:42	08:41
	15:49	16:56	18:01	20:09	21:15	22:07	22:06	21:08	19:46	18:23	16:07	15:26
11	08:47	07:53	06:40	06:15	04:59	04:13	04:27	05:25	06:31	07:34	07:44	08:42
	15:51	16:59	18:03	20:11	21:17	22:08	22:04	21:06	19:43	18:20	16:05	15:25
12	08:46	07:50	06:38	06:12	04:57	04:13	04:29	05:27	06:33	07:37	07:47	08:43
	15:52	17:01	18:05	20:13	21:19	22:09	22:03	21:03	19:41	18:18	16:03	15:25
13	08:45	07:48	06:35	06:09	04:55	04:12	04:30	05:30	06:35	07:39	07:49	08:44
	15:54	17:03	18:08	20:16	21:21	22:10	22:02	21:01	19:38	18:15	16:01	15:25
14	08:44	07:45	06:32	06:06	04:53	04:12	04:32	05:32	06:37	07:41	07:51	08:46
	15:56	17:06	18:10	20:18	21:23	22:11	22:01	20:58	19:35	18:12	15:59	15:25
15	08:43	07:43	06:29	06:04	04:51	04:11	04:33	05:34	06:39	07:43	07:53	08:47
	15:58	17:08	18:12	20:20	21:25	22:11	21:59	20:56	19:32	18:10	15:57	15:25
16	08:41	07:41	06:27	06:01	04:49	04:11	04:35	05:36	06:41	07:45	07:55	08:48
	16:00	17:11	18:14	20:22	21:27	22:12	21:58	20:53	19:29	18:07	15:55	15:25
17	08:40	07:38	06:24	05:58	04:47	04:11	04:36	05:38	06:43	07:48	07:58	08:49
	16:02	17:13	18:17	20:24	21:29	22:13	21:56	20:51	19:27	18:04	15:53	15:25
18	08:39	07:36	06:21	05:56	04:45	04:11	04:38	05:40	06:45	07:50	08:00	08:49
	16:04	17:15	18:19	20:27	21:31	22:13	21:55	20:48	19:24	18:02	15:51	15:25
19	08:37	07:33	06:18	05:53	04:43	04:11	04:40	05:42	06:47	07:52	08:02	08:50
	16:06	17:18	18:21	20:29	21:33	22:14	21:53	20:46	19:21	17:59	15:50	15:25
20	08:36	07:31	06:15	05:50	04:41	04:11	04:42	05:44	06:50	07:54	08:04	08:51
	16:08	17:20	18:23	20:31	21:35	22:14	21:52	20:43	19:18	17:56	15:48	15:25
21	08:34	07:28	06:13	05:48	04:39	04:11	04:43	05:46	06:52	07:56	08:06	08:52
	16:10	17:22	18:25	20:33	21:37	22:14	21:50	20:40	19:15	17:54	15:46	15:26
22	08:33	07:26	06:10	05:45	04:38	04:11	04:45	05:49	06:54	07:59	08:08	08:52
	16:13	17:25	18:28	20:35	21:39	22:14	21:48	20:38	19:13	17:51	15:45	15:26
23	08:31	07:23	06:07	05:43	04:36	04:11	04:47	05:51	06:56	08:01	08:11	08:53
	16:15	17:27	18:30	20:38	21:41	22:15	21:46	20:35	19:10	17:49	15:43	15:27
24	08:29	07:20	06:04	05:40	04:34	04:12	04:49	05:53	06:58	08:03	08:13	08:53
	16:17	17:29	18:32	20:40	21:42	22:15	21:45	20:33	19:07	17:46	15:42	15:27
25	08:28	07:18	06:02	05:38	04:32	04:12	04:51	05:55	07:00	07:05	08:15	08:53
	16:19	17:31	18:34	20:42	21:44	22:15	21:43	20:30	19:04	16:44	15:40	15:28
26	08:26	07:15	05:59	05:35	04:31	04:12	04:53	05:57	07:02	07:08	08:17	08:54
	16:21	17:34	18:36	20:44	21:46	22:14	21:41	20:27	19:02	16:41	15:39	15:29
27	08:24	07:13	05:56	05:32	04:29	04:13	04:55	05:59	07:04	07:10	08:19	08:54
	16:24	17:36	18:38	20:46	21:48	22:14	21:39	20:25	18:59	16:39	15:37	15:30
28	08:22	07:10	05:53	05:30	04:28	04:14	04:57	06:01	07:06	07:12	08:21	08:54
	16:26	17:38	18:41	20:49	21:49	22:14	21:37	20:22	18:56	16:36	15:36	15:30
29	08:20		06:50	05:27	04:26	04:14	04:59	06:03	07:09	07:15	08:23	08:54
	16:28		19:43	20:51	21:51	22:14	21:35	20:19	18:53	16:34	15:35	15:31
30	08:18		06:48	05:25	04:25	04:15	05:01	06:06	07:11	07:17	08:24	08:54
	16:31		19:45	20:53	21:53	22:13	21:33	20:17	18:50	16:31	15:34	15:32
31	08:16		06:45		04:24		05:03	06:08		07:19		08:54
	16:33		19:47		21:54		21:31	20:14		16:29		15:34
Potential sun hours	229	263	366	429	514	538	537	474	385	321	242	208
Total, worst case												

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)