

VP11 CROMBIE PARK - PHOTOMONTAGE OF PROPOSAL

76° VIEWING ANGLE
300MM VIEWING DISTANCE



VP11 CROMBIE PARK – 70MM PHOTOMONTAGE OF PROPOSAL



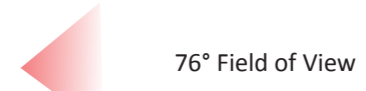
26° VIEWING ANGLE 500MM VIEWING DISTANCE

Project Name: Crofts Farm Wind Turbines

Document Title: VP12 - Pitmuies House

Scale: 1:50,000 @ A3

Key:
● Proposed Turbine Locations



Viewpoint Information

Viewpoint Location: E356920 N749908
Viewpoint Elevation: 51m (A.O.D)
View Direction: 174°
Distance to Turbine: 5.3km

Visibility: 2 Projects

Camera Type: Nikon D3100
Focal Length: 35mm
Effective Focal Length: 54.6mm
Date Taken: 04/04/2013
Time Taken: 11:09
Height above elevation: 1.5m

Visual Impact

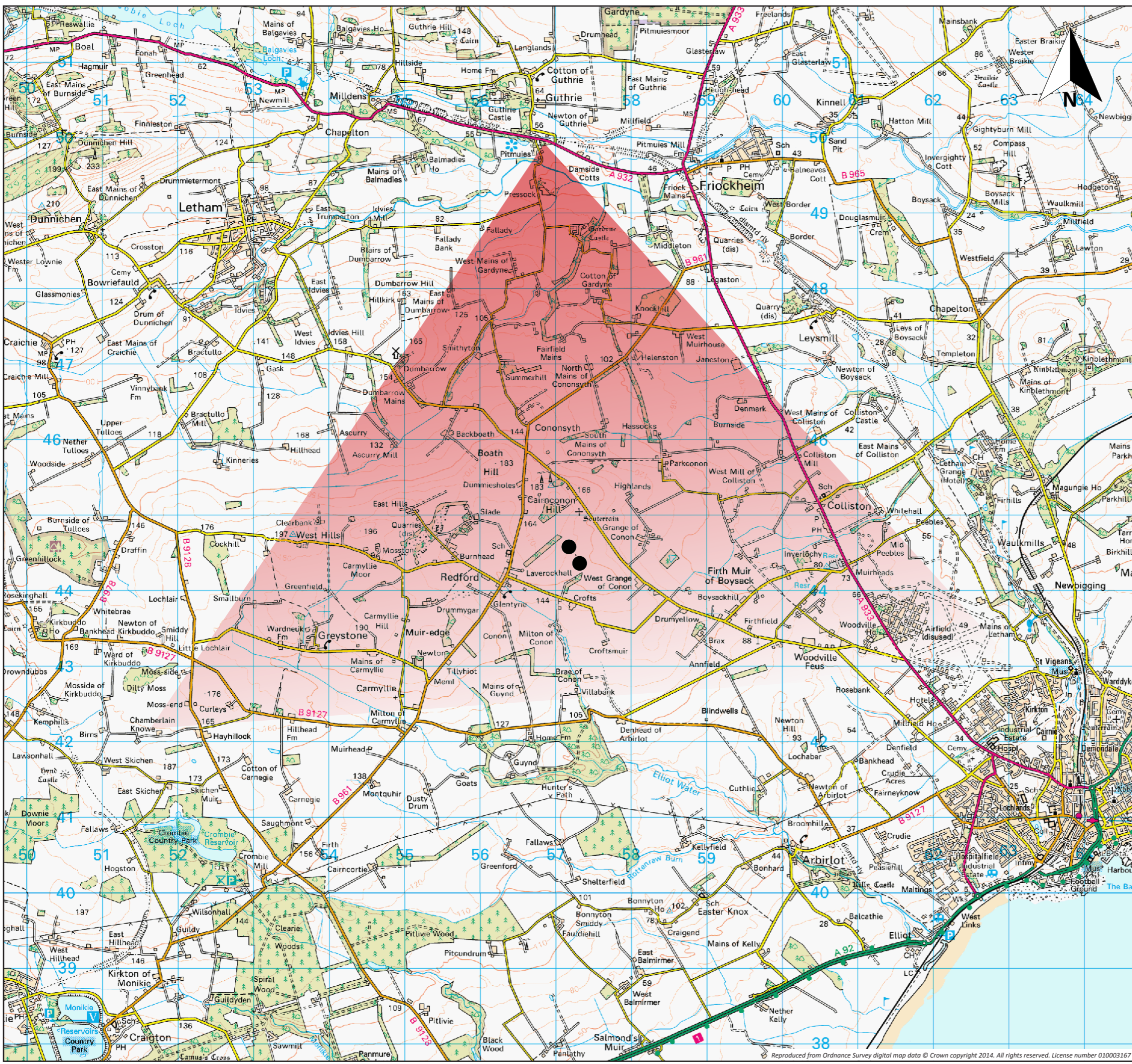
Sensitivity: High
Magnitude: Negligible
Overall: Moderate/Minor

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

Client: Crofts Farm Renewables Ltd.

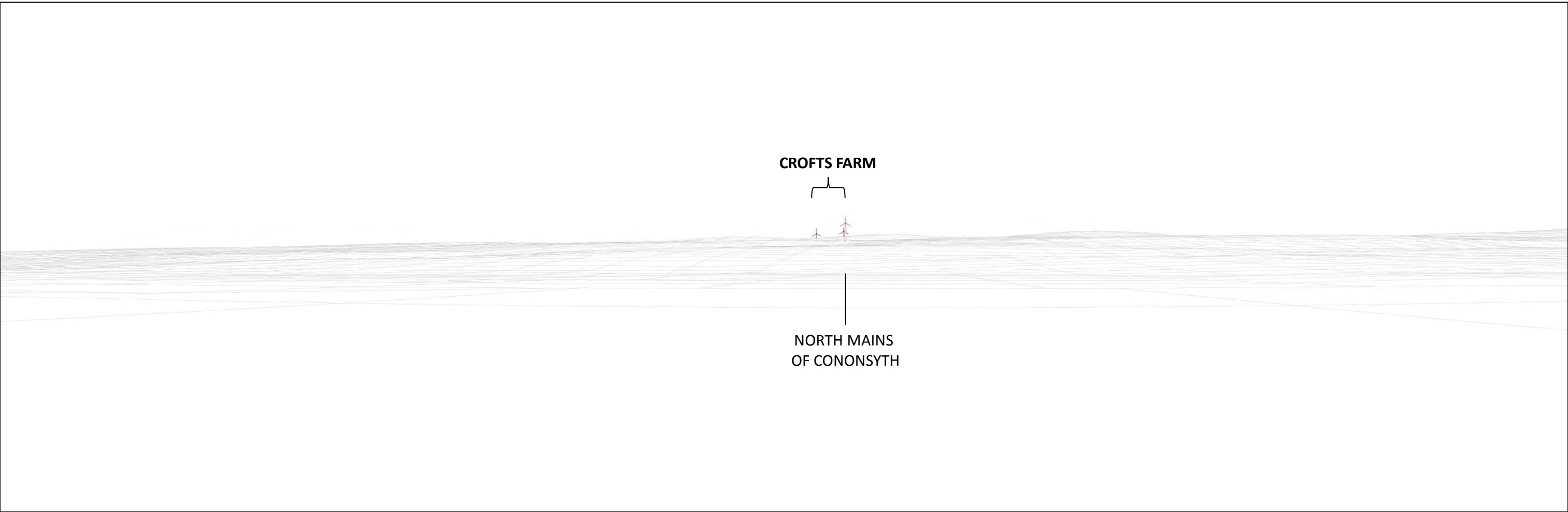
Drawing by: Green Cat Renewables Ltd

Document Number: CO118-183/Fig 7.23
Version: 1.0
Author: SS
Checked by: RC
Approved By: GM
Date: 10/01/2014





VP12 PITMUIES HOUSE - WIRELINE DRAWING



VP12 PITMUIES HOUSE - PHOTOMONTAGE OF PROPOSAL

76° VIEWING ANGLE
300MM VIEWING DISTANCE



VP12 PITMUIES – 70MM PHOTOMONTAGE OF PROPOSAL



26° VIEWING ANGLE 500MM VIEWING DISTANCE

Project Name: Crofts Farm Wind Turbines

Document Title: VP13 - A92 Inverkeilor

Scale: 1:50,000 @ A3

Key:

- Proposed Turbine Locations
- ◀ 76° Field of View

Viewpoint Information

Viewpoint Location: **E366151 N748331**
 Viewpoint Elevation: **21m (A.O.D)**
 View Direction: **263°**
 Distance to Turbine: **9.6km**

Visibility: **2 Projects**

Camera Type: **Nikon D3100**
 Focal Length: **35mm**
 Effective Focal Length: **54.6mm**
 Date Taken: **30/01/2013**
 Time Taken: **13:45**
 Height above elevation: **1.5m**

Visual Impact

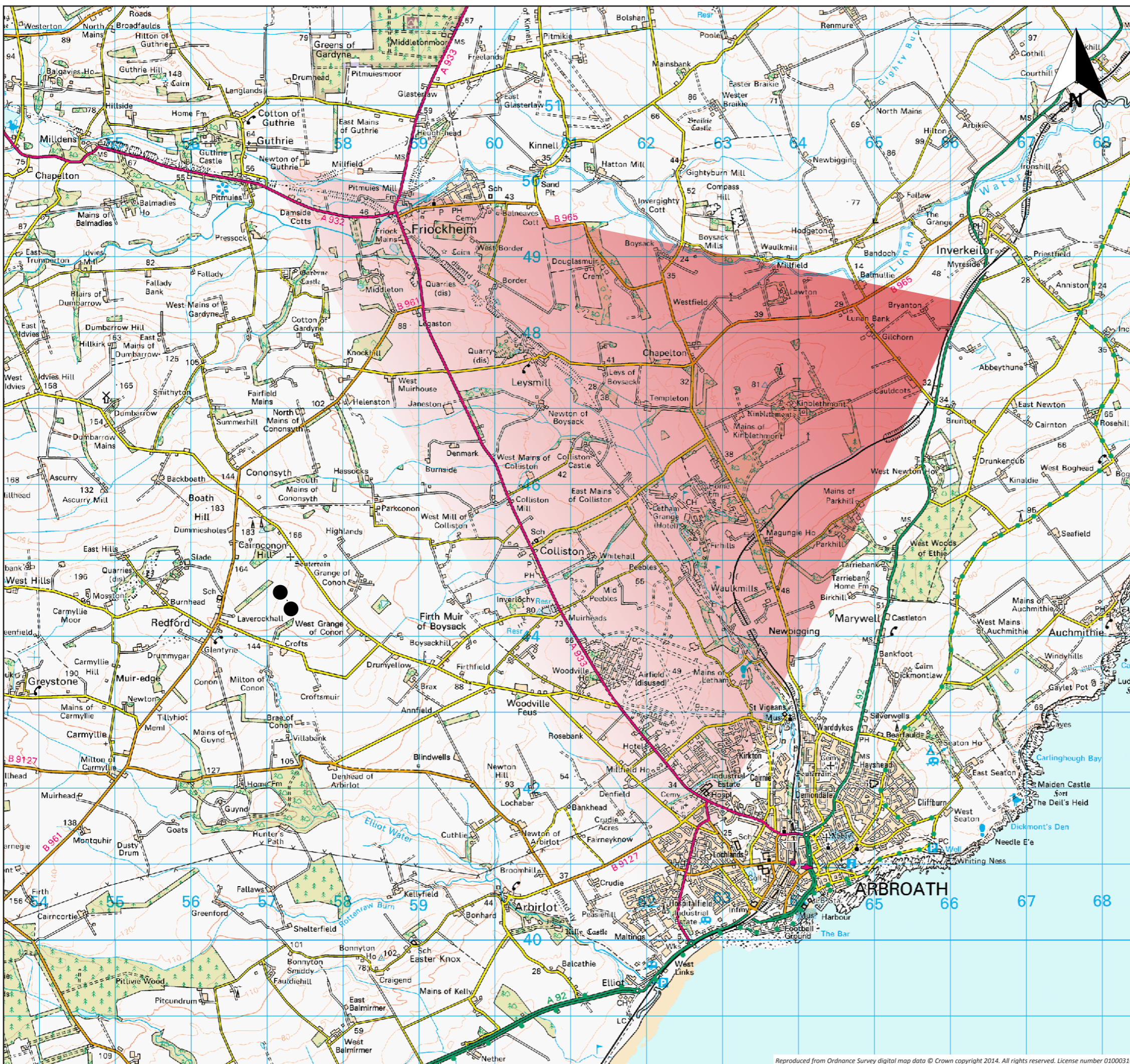
Sensitivity: **Medium**
 Magnitude: **-**
 Overall: **-**

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

Client: Crofts Farm Renewables Ltd.

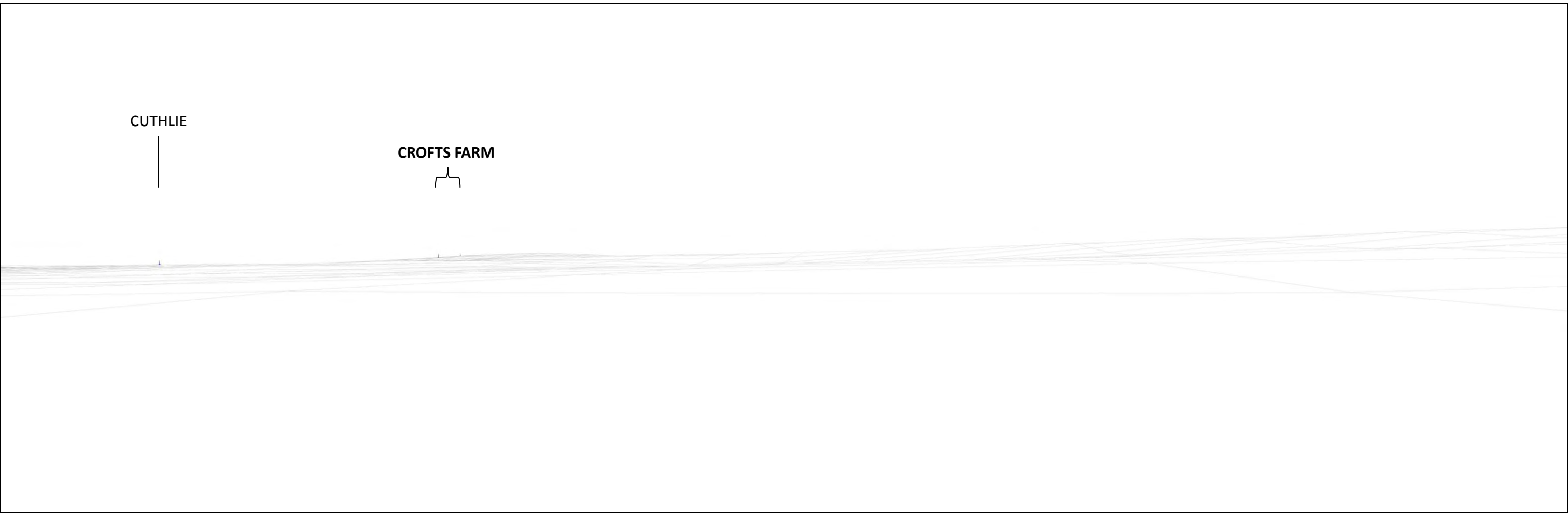
Drawing by: Green Cat Renewables Ltd

Document Number: **CO118-183/Fig 7.24**
 Version: **1.0**
 Author: **SS**
 Checked by: **RC**
 Approved By: **GM**
 Date: **10/01/2014**





VP13 A92 SOUTH OF INVERKEILOR - WIRELINE DRAWING

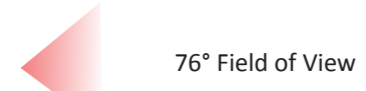


Project Name: Crofts Farm Wind Turbines

Document Title: VP14 - Balmashanner Hill

Scale: 1:50,000 @ A3

Key: ● Proposed Turbine Locations



Viewpoint Information

Viewpoint Location: E345769 N749307

Viewpoint Elevation: 167m (A.O.D)

View Direction: 112°

Distance to Turbine: 12.4km

Visibility: 7 Projects

Camera Type: Nikon D70S

Focal Length: 35mm

Effective Focal Length: 53.4mm

Date Taken: 26/07/2011

Time Taken: 11:52

Height above elevation: 1.5m

Visual Impact

Sensitivity: High

Magnitude: Negligible

Overall: Moderate/Minor

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

Client: Crofts Farm Renewables Ltd.

Drawing by: Green Cat Renewables Ltd

Document Number: C0118-183/Fig 7.25

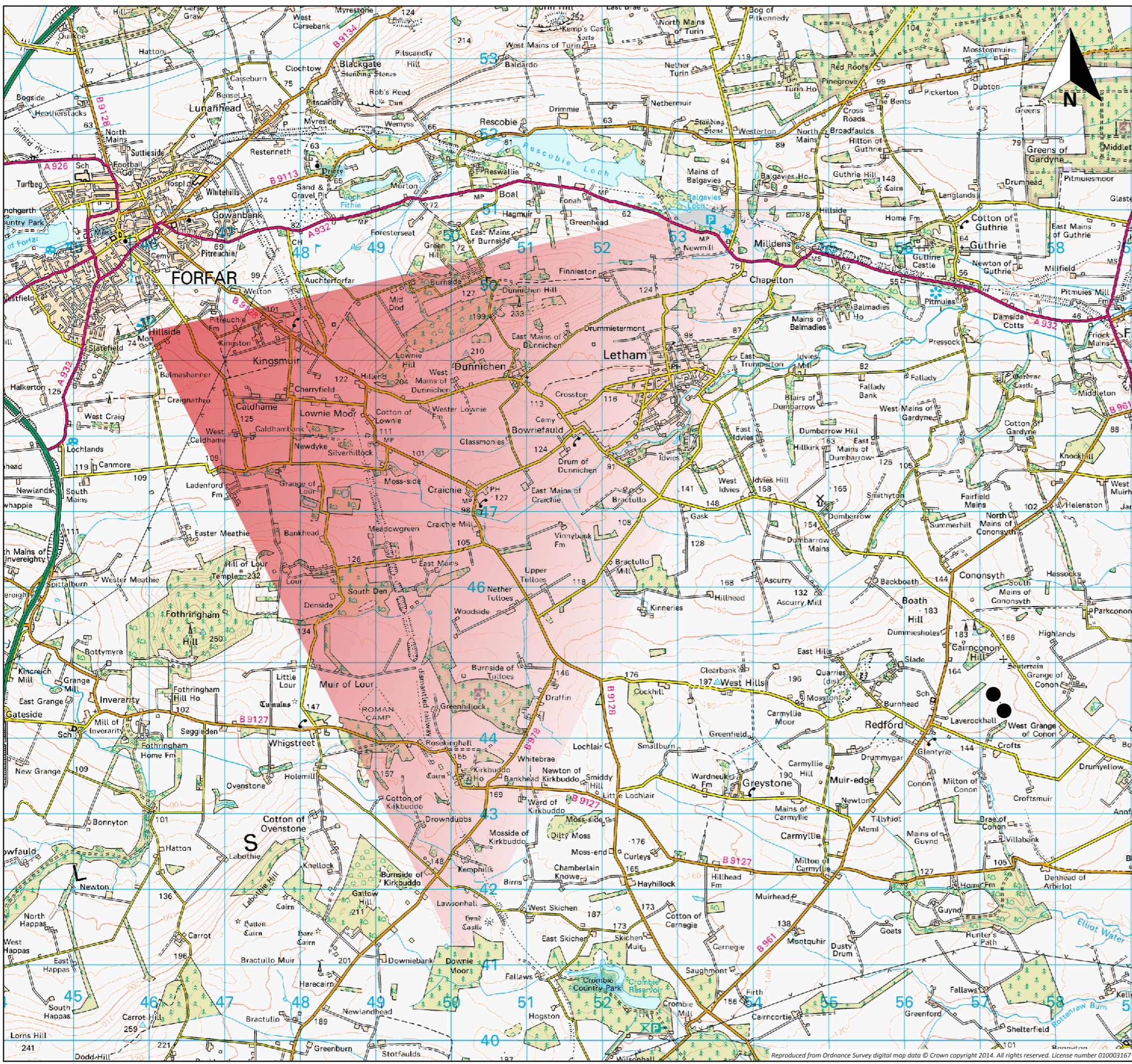
Version: 1.0

Author: SS

Checked by: RC

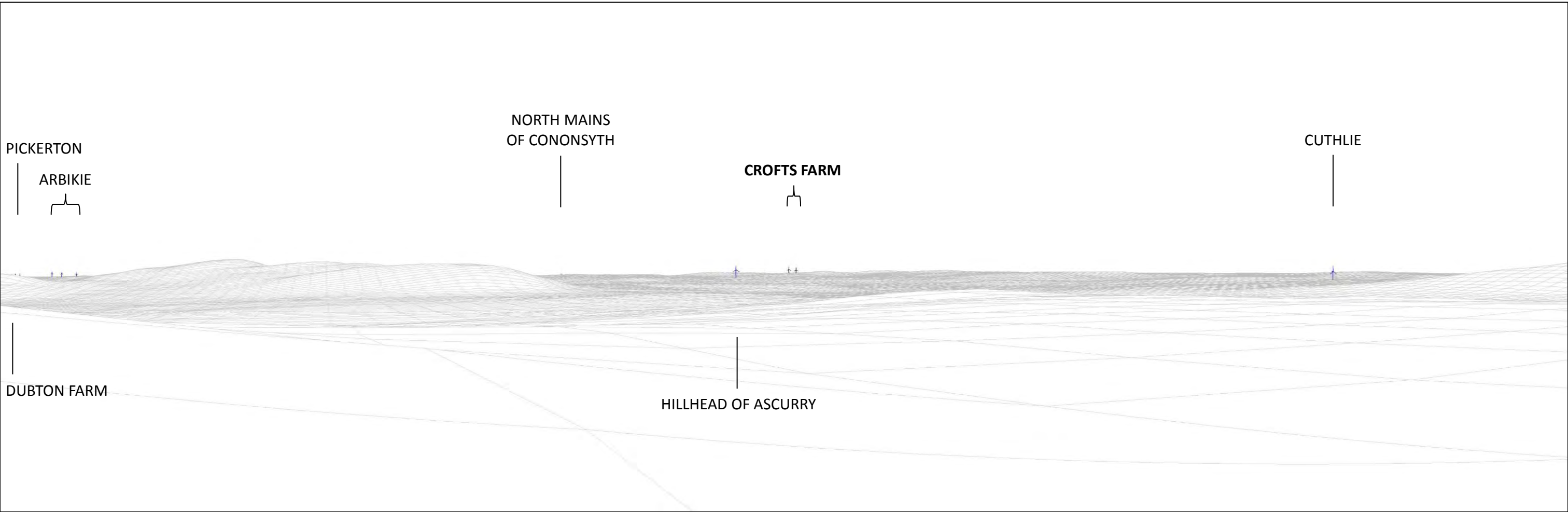
Approved By: GM

Date: 10/01/2014





VP14 BALMASHANNER HILL - WIRELINE DRAWING



VP14 BALMASHANNER HILL - PHOTOMONTAGE OF PROPOSAL

76° VIEWING ANGLE
300MM VIEWING DISTANCE



VP14 BALMASHANNER HILL – 70MM PHOTOMONTAGE OF PROPOSAL



26° VIEWING ANGLE 500MM VIEWING DISTANCE

Project Name: Crofts Farm Wind Turbines

Document Title: VP15 - Turin Hill

Scale: 1:50,000 @ A3

Key: ● Proposed Turbine Locations

◀ 76° Field of View

Viewpoint Information

Viewpoint Location: E351395 N753524
Viewpoint Elevation: 241m (A.O.D)
View Direction: 148°
Distance to Turbine: 10.6km

Visibility: 4 Projects

Camera Type: Nikon D70S
Focal Length: 35mm
Effective Focal Length: 53.4mm
Date Taken: 26/07/2011
Time Taken: 10:18
Height above elevation: 1.5m

Visual Impact

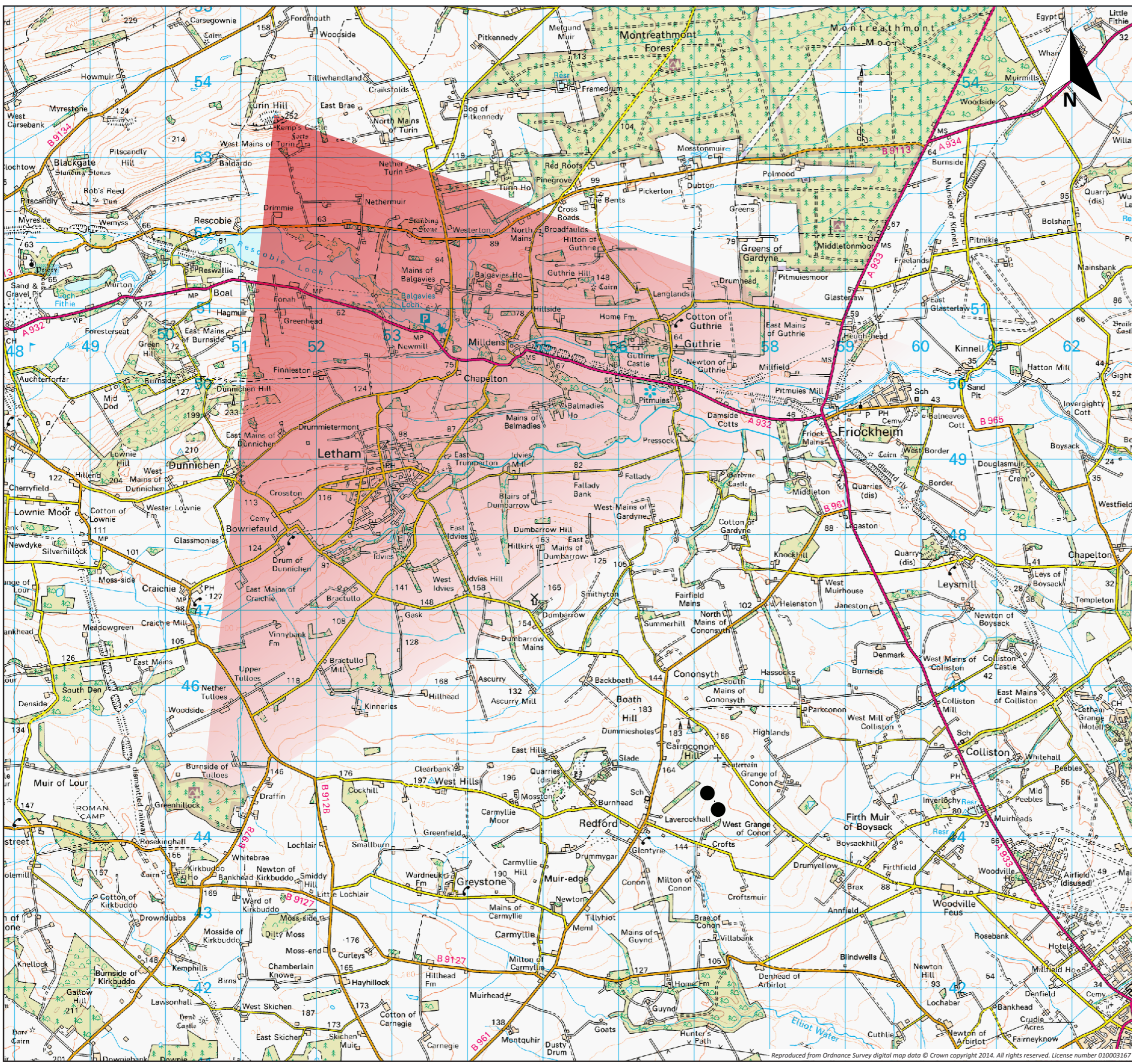
Sensitivity: High
Magnitude: Low
Overall: Moderate

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

Client: Crofts Farm Renewables Ltd.

Drawing by: Green Cat Renewables Ltd

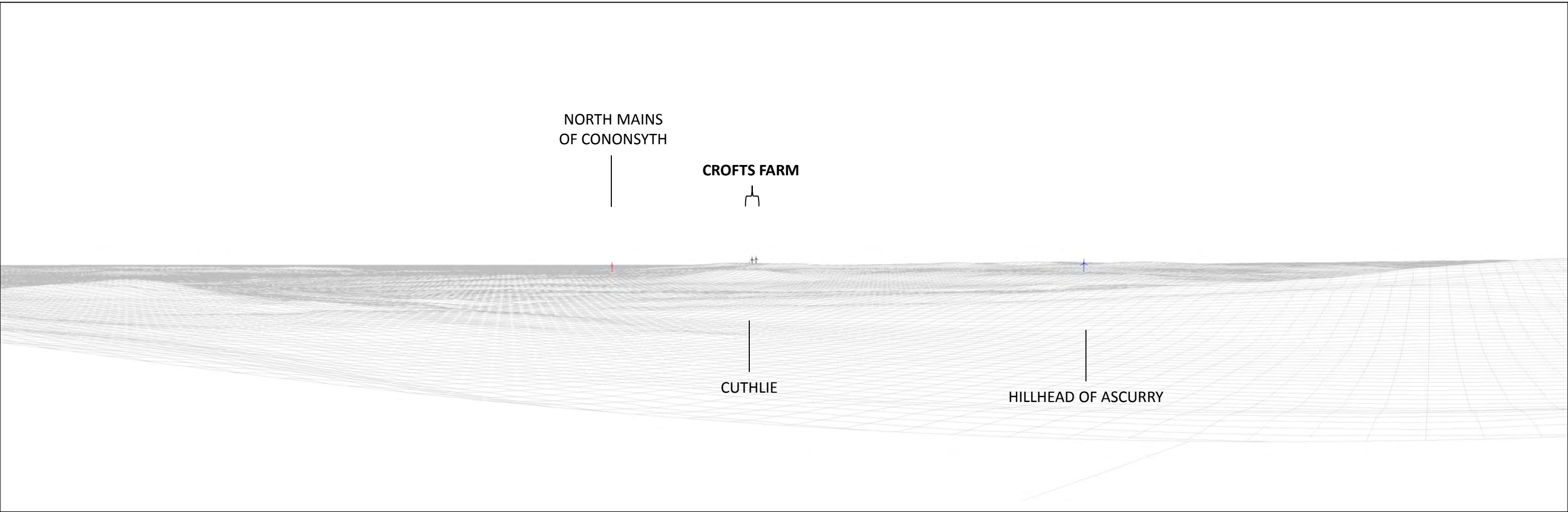
Document Number: CO118-183/Fig 7.26
Version: 1.0
Author: SS
Checked by: RC
Approved By: GM
Date: 10/01/2014



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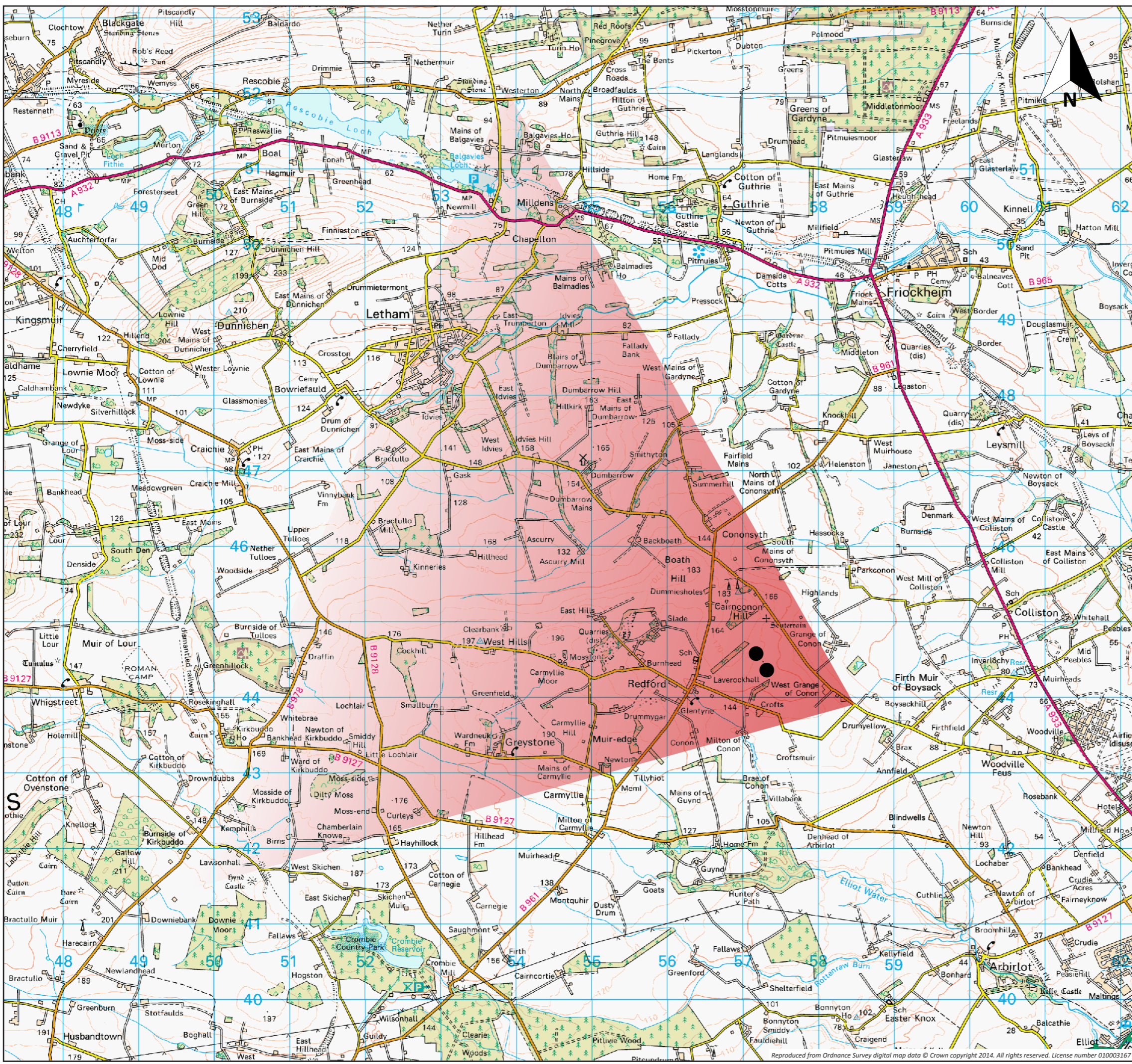
VP15 TURIN HILL - WIRELINE DRAWING



VP15 TURIN HILL - PHOTOMONTAGE OF PROPOSAL

76° VIEWING ANGLE
300MM VIEWING DISTANCE





Project Name: Crofts Farm Wind Turbines
 Document Title: VP16 - North of Drummyellow

Scale: 1:50,000 @ A3

Key:

- Proposed Turbine Locations
- ◀ 76° Field of View

Viewpoint Information

Viewpoint Location: **E358465 N743889**
 Viewpoint Elevation: **126m (A.O.D)**
 View Direction: **294°**
 Distance to Turbine: **1.2km**

Visibility: **2 Hubs**

Camera Type: **Nikon D3100**
 Focal Length: **35mm**
 Effective Focal Length: **54.6mm**
 Date Taken: **30/01/2013**
 Time Taken: **16:23**
 Height above elevation: **1.5m**

Visual Impact

Sensitivity: **High**
 Magnitude: **Medium**
 Overall: **Major/Moderate**

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

Client: **Crofts Farm Renewables Ltd.**
 Drawing by: **Green Cat Renewables Ltd**

Document Number: **CO118-183/Fig 7.27**
 Version: **1.0**
 Author: **SS**
 Checked by: **RC**
 Approved By: **GM**
 Date: **10/01/2014**





VP16 NORTH OF DRUMYELLOW - WIRELINE DRAWING



VP16 NORTH OF DRUMYELLOW - PHOTOMONTAGE OF PROPOSAL

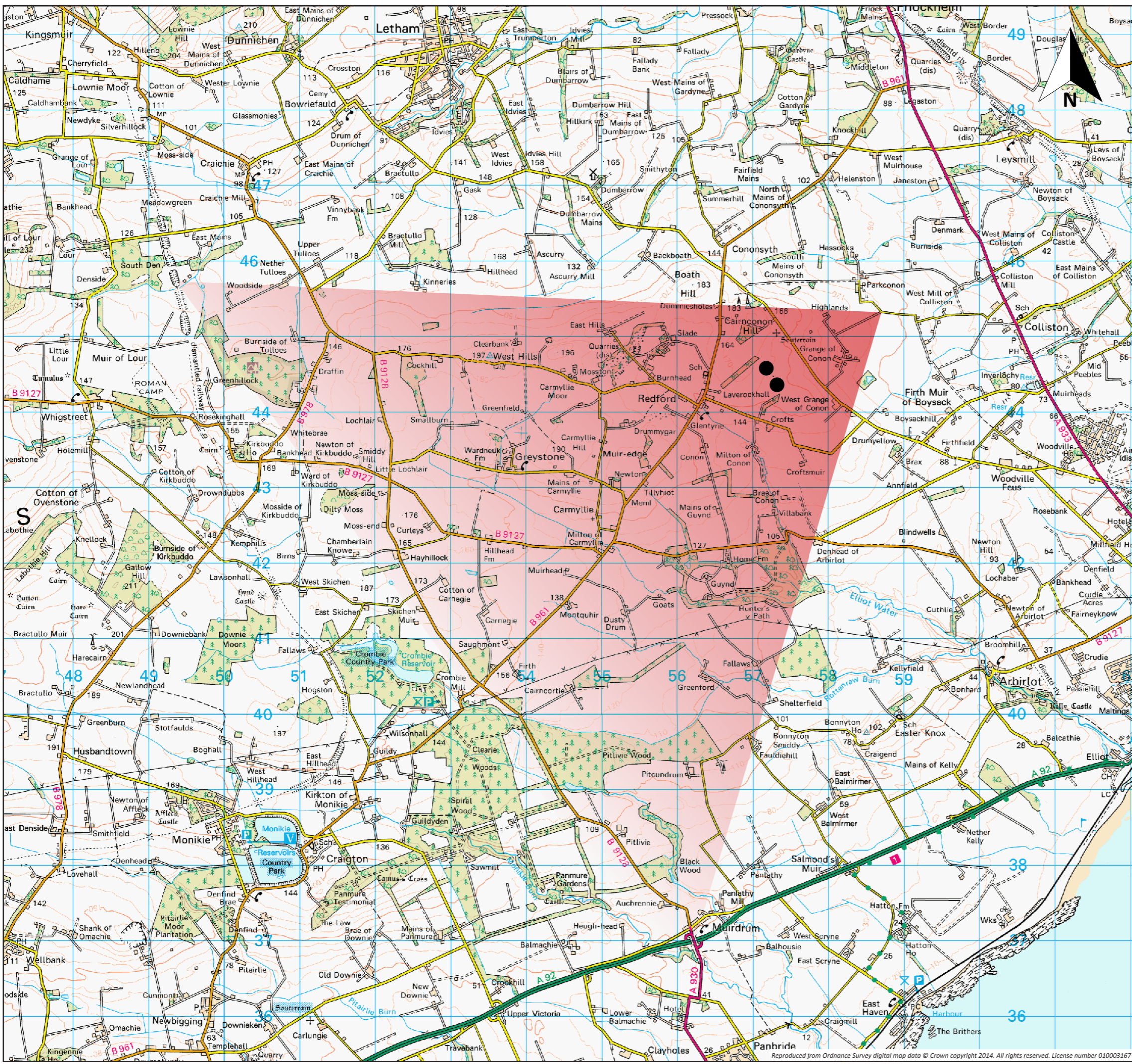
76° VIEWING ANGLE
300MM VIEWING DISTANCE



VP16 NORTH OF DRUMYELLOW – 70MM PHOTOMONTAGE OF PROPOSAL



26° VIEWING ANGLE 500MM VIEWING DISTANCE



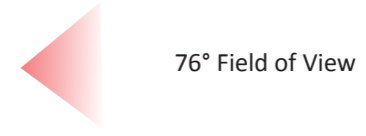
Project Name: Crofts Farm Wind Turbines

Document Title: VP17 - South of Parkconon

Scale: 1:50,000 @ A3

Key:

- Proposed Turbine Locations



Viewpoint Information

Viewpoint Location: E358631 N745376

Viewpoint Elevation: 110m (A.O.D)

View Direction: 235°

Distance to Turbine: 1.6km

Visibility: 2 Hubs

Camera Type: Nikon D3100

Focal Length: 35mm

Effective Focal Length: 54.6mm

Date Taken: 04/04/2013

Time Taken: 11:42

Height above elevation: 1.5m

Visual Impact

Sensitivity: High

Magnitude: High

Overall: Major

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

Client: Crofts Farm Renewables Ltd.

Drawing by: Green Cat Renewables Ltd

Document Number: CO118-183/Fig 7.28

Version: 1.0

Author: SS

Checked by: RC

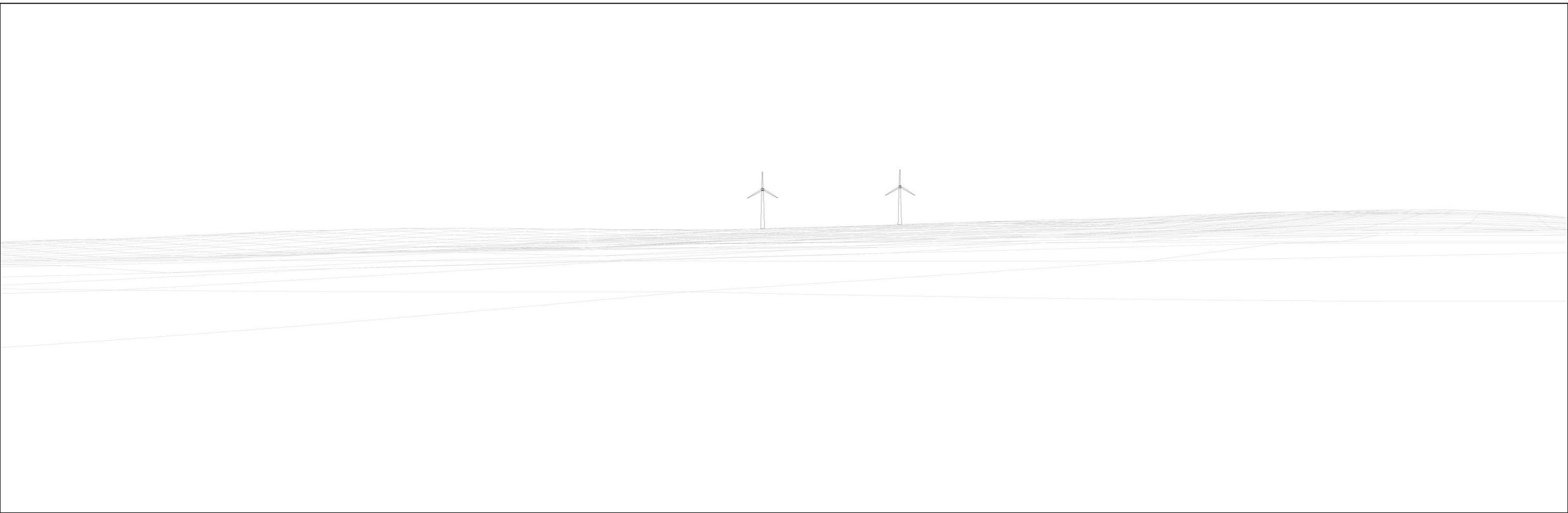
Approved By: GM

Date: 10/01/2014





VP17 SOUTH OF PARKCONON - WIRELINE DRAWING



VP17 SOUTH OF PARKCONON - PHOTOMONTAGE OF PROPOSAL

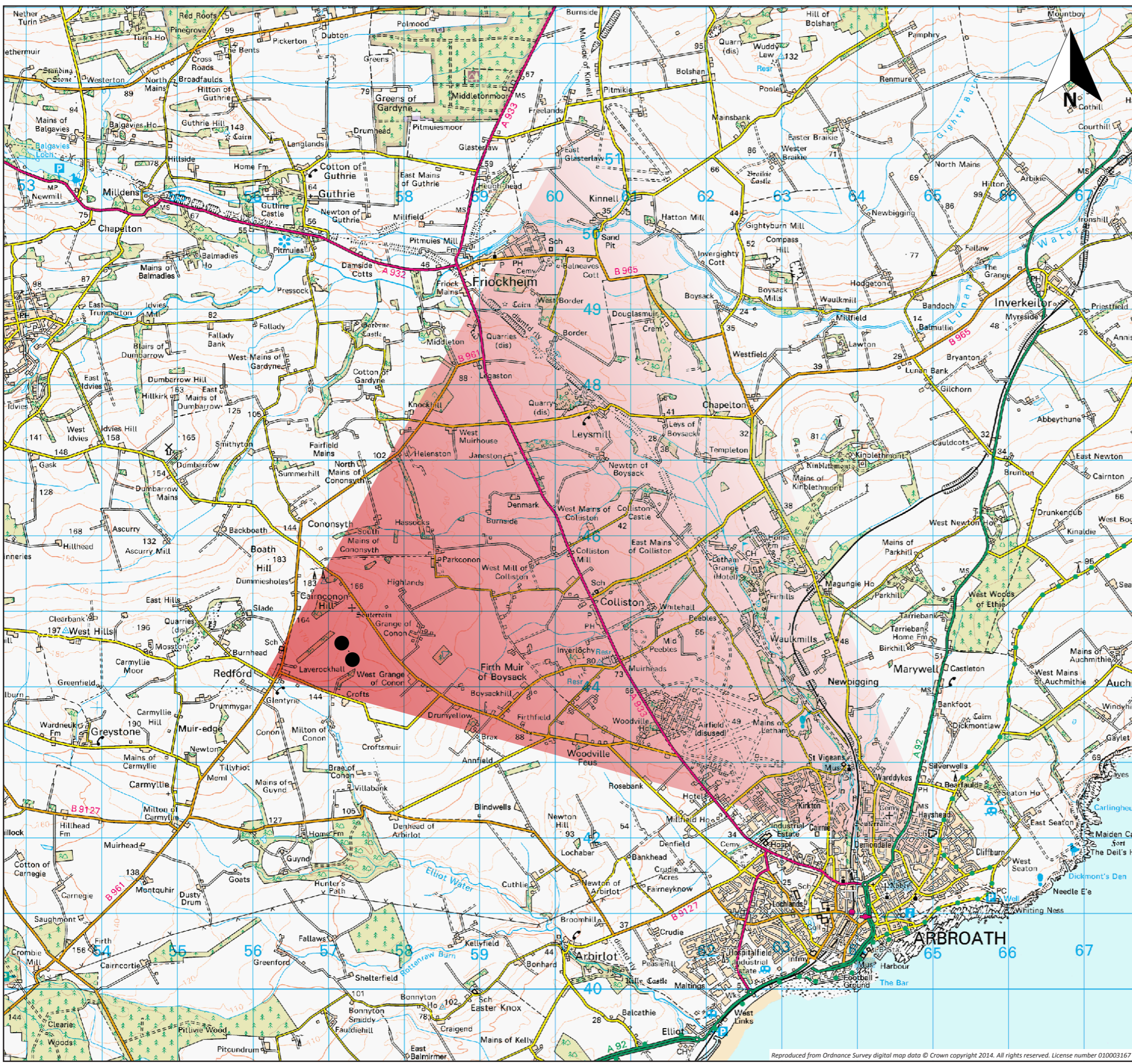
76° VIEWING ANGLE
300MM VIEWING DISTANCE



VP17 SOUTH OF PARKCONON – 70MM PHOTOMONTAGE OF PROPOSAL



26° VIEWING ANGLE 500MM VIEWING DISTANCE



Project Name: Crofts Farm Wind Turbines
 Document Title: VP18 - Redford
 Scale: 1:50,000 @ A3

Key:

- Proposed Turbine Locations
- ◀ 76° Field of View

Viewpoint Information

Viewpoint Location: **E356133 N744163**
 Viewpoint Elevation: **152m (A.O.D)**
 View Direction: **74°**
 Distance to Turbine: **1.1km**

Visibility: **2 Hubs**

Camera Type: **Nikon D3100**
 Focal Length: **35mm**
 Effective Focal Length: **54.6mm**
 Date Taken: **30/01/2013**
 Time Taken: **16:02**
 Height above elevation: **1.5m**

Visual Impact

Sensitivity: **High**
 Magnitude: **Medium**
 Overall: **Major/Moderate**

Please note for a 76° field of view, a viewing distance of 300mm is recommended.

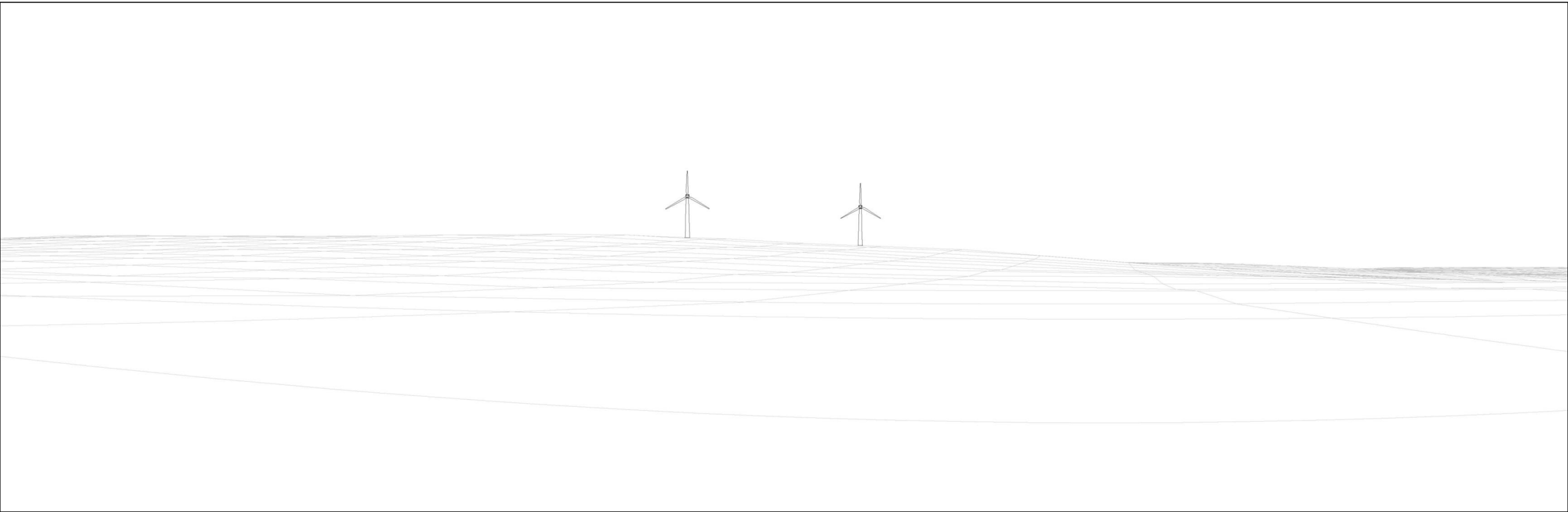
Client: **Crofts Farm Renewables Ltd.**
 Drawing by: **Green Cat Renewables Ltd**

Document Number: **CO118-183/Fig 7.29**
 Version: **1.0**
 Author: **SS**
 Checked by: **RC**
 Approved By: **GM**
 Date: **10/01/2014**





VP18 REDFORD - WIRELINE DRAWING



VP18 REDFORD - PHOTOMONTAGE OF PROPOSAL

76° VIEWING ANGLE
300MM VIEWING DISTANCE



VP18 REDFORD – 70MM PHOTOMONTAGE OF PROPOSAL



26° VIEWING ANGLE 500MM VIEWING DISTANCE



Green Cat Renewables

**CROFTS FARM WIND
TURBINES**

Non-Technical Summary

Crofts Farm Renewables Ltd

January 2014

Prepared for:
Crofts Farm Renewables Ltd

**CROFTS FARM WIND
TURBINES**

Prepared By:
Green Cat Renewables

Non-Technical Summary

Crofts Farm Renewables Ltd

January 2014



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Checked By: Brian Sawers	Date: 16/01/14
Approved By: Glen Moon	Date: 17/01/14

Preface

This Non-Technical Summary (NTS) provides an 'Executive Summary', presented in a non-technical manner, of the Environmental Statement (ES) prepared in support of the planning application for the proposed Crofts Farm wind turbines.

Green Cat Renewables Ltd is a consultancy which is acting as an agent on behalf of the applicant Crofts Farm Renewables Ltd, and is responsible for the studies compiled in the ES. The ES package comprises the following documents:

- Environmental Statement (ES); and
- Non-Technical Summary (NTS);

It is supported by the following separate technical appendix:

- Landscape and Visual Figures.

Hard copies of the ES package can be viewed at:

**Angus Council
County Buildings
Market Street
Forfar
DD8 3WB**

Hard copies of the the ES package (including the NTS and landscape figures documents) can be purchased for £200 per hard copy. Electronic copies (CD-ROM) can be purchased for £10. Please contact:

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1 Introduction

Background

Crofts Farm is owned by the McDonald family, which has farmed in the Redford area for three generations. The farm business comprises 400 acres of owned land together with a further 750 acres of farmland rented from 18 local farming businesses. The business specialises in intensive vegetable production, annually producing and grading 1,500 tonnes of broccoli, 900 tonnes of cauliflower, 450 tonnes of brussel sprouts and 3,000 tonnes of potatoes. All produce from the farm is marketed to leading retailers through local companies including East of Scotland Growers, The Co-operative Farm facility in Carnoustie and Kettle Produce in Fife. Alongside the farm, the business runs an agricultural engineering enterprise, building agricultural equipment for supply throughout the UK.

The business currently employs 8 full time members of staff, 4 part time and 80 seasonal workers during peak harvest periods.

The main aims of the project are to:

- Generate clean electricity. A portion of this will be used to power the farm's cold stores and the remainder will be exported to the National Grid;
- Generate an additional income stream for the business through the sale of any electricity not used by the farm; and
- Reduce the businesses' carbon footprint, which is of increasing importance to major suppliers.

Green Cat Renewables is a Scottish environmental consultancy that has been commissioned by Crofts Farm Renewables Ltd to undertake the required environmental assessments in support of the application.

Renewable energy in Scotland

Recent years have seen the rapid development of strongly pro-renewables policy frameworks at the EU, UK and Scottish levels. The main driver for these policy frameworks has been the ambition to reduce greenhouse gases and dependence on fossil fuels in order to combat climate change, and the requirement to fill the resulting energy gap with low carbon alternatives. A secondary driver within the UK has been energy security, with North Sea oil and gas production steadily in decline and concerns arising about sourcing energy from politically unstable regions. Furthermore, within Scotland many existing power stations are reaching the end of their design lives, thus raising the potential of a shortfall in indigenous electricity generating capacity. The Scottish Government's very ambitious target of 100% of Scotland's electricity demand being generated from renewable sources by 2020 has placed an even greater sense of urgency in the sourcing of environmentally acceptable sites for onshore windfarm developments as other sources such as tidal

and offshore are at an early stage in development and much more expensive at present.

Approach to the Environmental Impact Assessment (EIA)

An Environmental Statement (ES) has been prepared in support of this application in line with the Planning EIA Regulations (the Environmental Impact Assessment (Scotland) Regulations 2011).

The ES addresses the social, economic and environmental issues associated with the proposal, in line with the relevant environmental policies, planning guidance and requirements of the planning authority. The scope of the ES was discussed and agreed with Angus Council, statutory consultees (such as Scottish Natural Heritage) and a wide range of other potentially interested parties. The statement is structured as follows:

- The Proposed Development;
- Planning and Environmental Policy;
- Site Selection & Alternative considered;
- Site Layout;
- Climate change;
- Socio-Economics;
- Ecology and Ornithology;
- Landscape, Visual and Cumulative Impact;
- Noise;
- Cultural Heritage and Archaeology;
- Hydrology;
- Existing infrastructures, telecommunication, Television, Aviation and Electromagnetic safety;
- Shadow flicker; and
- Traffic and Transportation.

The ES includes a description of how the work was undertaken and the assumptions that have been made. It sets out the results of the assessment of likely impacts of the development on the environment and describes measures proposed to reduce any environmental impacts identified (known as ‘mitigation’).

2 The Proposed Development

The proposal is for the installation and operation of two wind turbines with a maximum tip height of 80m. The final turbine selection will be determined at the post-planning stage, but the favoured machine is an Enercon E48, which is classified as being of medium size by comparison to large turbines, which are generally in excess of 100 metres to tip height.

Site Location

The proposed development is located approximately 8km north-west of Arbroath and 1 km north-east of the village of Redford in Angus, as shown in **Figure 2.1** below. This plan can be seen at a larger scale in the Planning Application Drawing (**APP-001**).

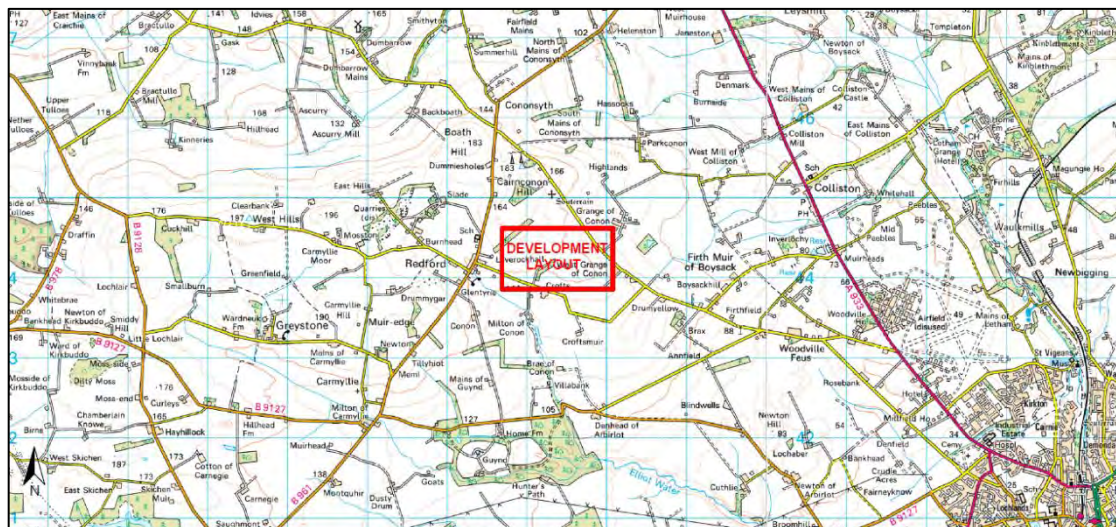


Figure 2.1 – Proposed Development location

The site is located on the south-eastern shoulder of Cairnconon Hill, which rises gently to a height of 183m. The turbines themselves would be located at 155m and 161m altitude respectively. The hill is bounded by the B961 to the west, which connects Redford to Carmyllie in the south and Friockheim in the north, and two further minor roads pass the site to the south and east. Two shelter belts of coniferous trees bound the site to the north-west and north-east respectively, and the communication masts on top of Cairnconon Hill are other noticeable features.

The landscape around the site is described within the '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*¹' as being gently rolling or undulating, with large arable fields in which boundaries have been removed or have become minimal, giving an open, simple character.

The proposed development layout is shown on **Figure 2.2**.

¹ November 2013



Figure 2.2 – Site Layout

Key:	
●	Proposed turbine/foundation
■	Hardstanding
■	Access tracks
■	Substation building
—	Land ownership boundary
—	Application boundary

Ordnance Survey Grid References for the proposed turbines are shown in **Table 2.1**.

Table 2.1 – Turbine national grid references (10m accuracy)

Turbine	Easting (m)	Northing (m)
1	357190	744555
2	357325	744415

The development would have a lifespan of 25 years. At the end of the project's operational life the wind turbines would be decommissioned, the principal elements removed, and the site restored leaving little if any visible trace.

Proposed Turbine

The proposed turbine has a hub height of 56m and a rotor diameter of 48m, producing a maximum tip height of 80m. The nacelle housing contains the generator and other operating equipment. The transformer of this turbine type is usually contained within the tower base. It is proposed that the finish of the wind turbine, tower and blades will be semi-matt and pale grey in colour. **Figure 2.3** below shows the dimensions of the candidate wind turbine.

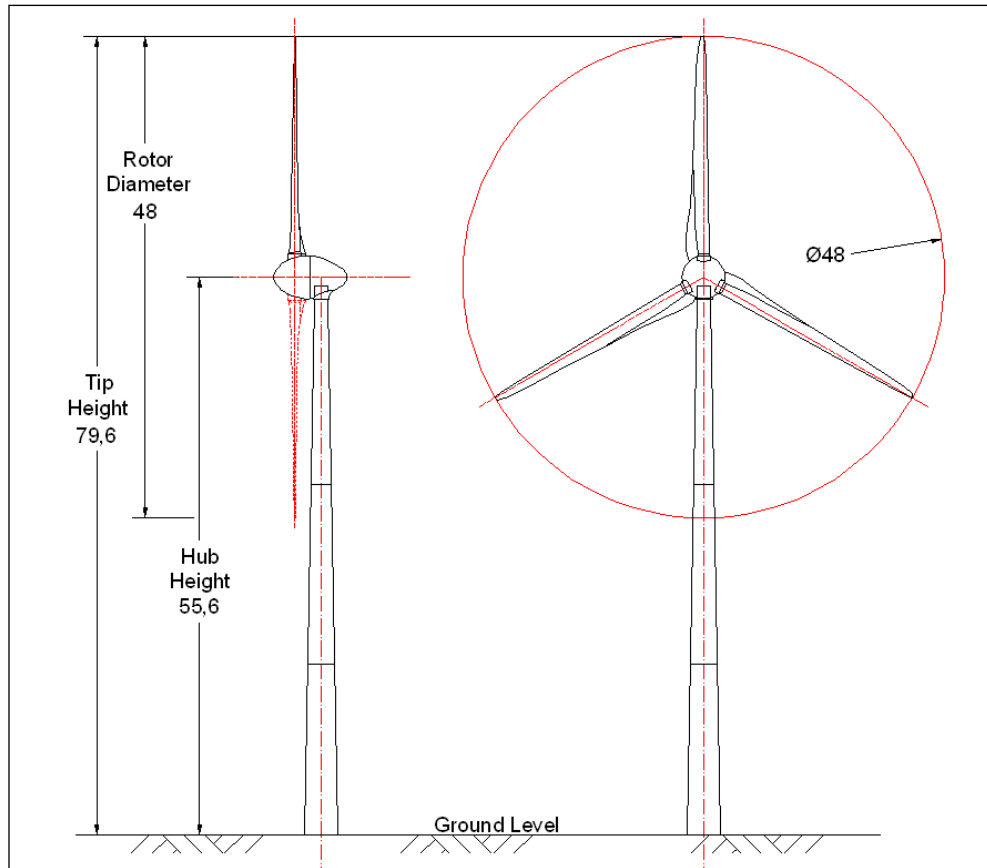


Figure 2-3 –Principal dimensions of maximum impact turbine

Site access

The upgrading of 360m of existing farm track would be required, along with the construction of approximately 750m of new on-site track to provide access to the wind turbines. The tracks would be typically 4.0m wide with 0.5m shoulders on each side and would consist of crushed stone to an average depth of up to 500mm. On corners, it will be necessary to construct wider areas of track to reflect the minimum bend-radii for the longest construction loads (the blades).

Delivery Route

It is intended that the turbines would be landed at Montrose and then transported east to the outskirts of Arbroath on the A92. Here they would head north-west on the A933 before reaching the site on the minor road that skirts the southern edge of the site. It is intended to send all construction traffic to the site via this route to avoid construction vehicles passing through Redford.

3 Planning and Environmental Policy Context

The acceptability of the proposed development will be assessed in the context of:

- National policy and guidance;
- The Local Planning Authority Development Plan; and
- Supplementary Planning Guidance.

National Policy

The Crofts Farm development will:

- Provide enough clean energy per year for approximately 650 homes;
- Assist the UK and Scottish Governments to meet national and international targets for the reduction of emissions including greenhouse gases;
- Help provide secure, diverse, sustainable and competitive energy supplies; and
- Contribute to the Scottish Government's target that 100% of Scotland's electricity demand should be generated by renewable means by 2020.

Local Policy

The key local development documents are:

- TAYplan (Approved 2012); and
- Angus Local Plan Review (Adopted 2009).

In addition to the development plan a number of other publications are also particularly relevant to the consideration of the application. These include:

- Tayside Landscape Character Assessment (1998);
- Angus Council Implementation Guide for Renewable Energy Proposals (2012);
- Angus Windfarms Landscape Capacity and Cumulative Impacts Study (Ironsides Farrar, 2008);
- Strategic Landscape Capacity Assessment for Wind Energy in Angus (prepared by Ironsides Farrar for Angus Council and SNH, November 2013)

Tayside Landscape Character Assessment (TLCA)

The TLCA, published in 1999, identifies that the application site falls within the Dipslope Farmland Landscape Character Type (LCT), which extends over a large area from the Montrose Basin south-westwards as far as the countryside north of Dundee adjoining the Sidlaw Hills. Its key characteristics are its general slope from north-west to south-east; the dominance of productive agricultural land; low woodland cover, except on large estates and along river corridors; a variety of historic sites; and the limited visual impact of Dundee and Arbroath. The landscape is described as being of medium scale, semi-enclosed to open, with extensive arable production on

very fertile land, medium to large fields and a scattered settlement pattern of hamlets and farmsteads.

Angus Windfarms Landscape Capacity and Cumulative Impacts Study (AWLCCIS)

The Study, published in September 2008, provides further information on the characteristics and capacity of the Dipslope Farmland LCT.

The Study suggests that *“the area is considered to have a medium landscape value. Together with a medium sensitivity this gives an **overall medium capacity for windfarm development**. Large or medium windfarms would not be appropriate in this area due to scale and visual sensitivity limitations. Any proposed development should be of limited scale and extent, reflecting the scale and pattern of the local landscape and would be limited by proximity of the settlements and scattered residential population”*.

The study defines a small/medium windfarm as *“A windfarm of more than three turbines up to 20MW output”*, the examples given being four turbines of over 50m, ten turbines of 2MW power or six turbines of 3MW power.

2MW turbines are typically 100m in height, and 3MW turbines around 125m in height. Set against these criteria, the proposed Crofts Farm development, with two turbines of 80m in height, would not be considered a large enough development to be a small/medium scale windfarm, and would fall below this threshold.

Strategic Landscape Capacity Assessment of Wind Energy in Angus (November 2013)

The most recent guidance on landscape capacity is provided by the *‘Strategic Landscape Capacity Assessment (SLCA) for Wind Energy in Angus November 2013’*. This provides specific guidance on each Landscape Character Type (LCT) within the Local Authority Area, and assesses the acceptable future level of change within each area. The Crofts Farm site is fully situated within the ‘Redford Farmland’ sub-section of the ‘Dipslope Farmland’ character type.

The SLCA states that, *“This (character type) has the highest capacity for wind energy in the Dipslope Farmland and can accommodate medium/large turbines, subject to local constraints. Groupings should remain relatively small and well separated to avoid overwhelming the underlying character. Turbines should not interfere with the ridge that marks the break of slope above the A92”*.

In terms of cumulative impact, the Redford LCT is currently described as being *‘Dipslope Farmland with occasional/No wind turbines’*. The SLCA states that the *Redford Farmland landscape character type has the potential to become a ‘Dipslope Farmland with Wind Turbines’*.

The SLCA assesses the Redford landscape area as having a medium capacity for groups of 1-5 turbines up to circa 80m to tip, with a suggested minimum separation distance between clusters of wind turbines or windfarms of around 5-10km.

The SLCA also highlights the sensitive visual nature of The Guynd, which is a Garden and Designed Landscape located ~2.2km south of the Crofts Farm site at its nearest point.

Conclusion

The scale of turbines proposed is in line with that deemed to be acceptable in the latest guidance available in the SLCA, which is consistent with the TLCA and AWLCCIS. Furthermore, the Crofts Farm site is located to the north of the ridge that marks the break of slope above the A92, highlighted within the SLCA as being an important factor.

The impact on The Guynd GDL has been assessed in detail within the ES. The assessment found that there are no predicted views of the turbines from within the property or from the immediate surrounding gardens which form the GDL, and there would be no impact on the setting of the house or gardens. The proposed development would therefore seem to satisfy all of the criteria set out within the SLCA.

The proposed development at Crofts Farm is therefore deemed to comply with national, regional and local policies relating to wind energy.

4 Local Economic Benefit

Construction phase benefits

Excluding the turbine component supply, the typical construction cost of a single turbine of the size and type proposed is in the region of £600,000. Past experience of projects of this size indicates that in fact around 50 % of construction expenditure occurs at a local level through the following:

- Contracts awarded to local firms for electrical works, civil engineering, fencing etc;
- Expenditure on hotels and services in the local area by contractors throughout the construction period; and
- Sourcing of appropriate materials such as crushed stone for the road surfaces and crane hardstandings from local suppliers.

It is the intention of the applicant to actively seek out opportunities to work with contractors and businesses in the local area prior to the construction phase. Preference will be given during any tendering procedures to local firms in order to maximise the extent to which the investment can be channelled into the local economy.

Operational phase benefits

The operational benefits of the turbines are:

- The turbines will generate ~2,900MWh of clean electricity every year, enough to power the equivalent of 650 homes.
- Electricity from the turbines will be used to directly power business operations at Crofts Farm, including two large cold stores, and indirectly a third, offsite cold store.
- The additional revenue from the sale of excess electricity will allow money to be re-invested into the business, providing more job security for existing employees and opening up the possibility of further employment through the expansion of the business.
- The project will co-exist alongside existing farming operations on the site.
- It is estimated that the project will save ~32,000 tonnes of CO₂ over its 25 year lifecycle, helping to contribute to the UK and Scottish Government's environmental targets.
- A total community payment over the life of the project of £162,500 (details below).

Community benefits

As a long-established business in the area, and with strong links to the local community, the applicant is keen to offer a community benefit package as part of the scheme.

It is intended to offer a sum of £5,000 per installed MW to the local community. This would amount to £162,500 over the 25 year lifetime of the project. This will be confirmed during the post-planning process.

Further discussions will be undertaken at the post-planning stage with the Council and Local Community Council to discuss the best way forward.

5 Site Selection and Design Evolution

Site selection

The first project design stage involves confirmation of the site's overall viability. Initial assessments confirmed that there were no 'showstoppers' in terms of developing a turbine scheme. The site was confirmed as:

- Having a viable wind resource;
- Being a suitable location in terms of on-site and nearby planning designations;
- Having the potential to maintain an acceptable separation distance from nearby residences;
- Being unlikely to have a significant impact on on-site or off-site cultural heritage features;
- Having sufficient nearby local grid capacity; and
- Allowing for provision for access for delivery of wind turbine components;

The site at Crofts Farm satisfied all of the above considerations. A potential aviation issue was identified with the radar at RAF Leuchars, and mitigation options have been investigated at an early stage. The site has therefore been through a rigorous assessment before the decision was taken to progress to a planning application.

Detailed Design

Once the overall site had been identified as being suitable for wind development, a more detailed assessment of the on-site conditions was undertaken.

Initially, a three turbine development was considered for the Crofts Farm site with the anticipation of it meeting the above criteria. Upon further assessment, it was determined that a two turbine development would be more comfortably accommodated, taking into account the visual and noise considerations.

A two turbine layout reduces the horizontal extent of the view from properties to the east and west, thereby minimising the residential and landscape visual impact. Initial noise predictions for the three turbine layout also showed that cumulative noise impacts with the operational North Mains of Cononsyth might prove to be restrictive.

The on-site constraints and a resultant layout are shown in **Figure 5.1**.

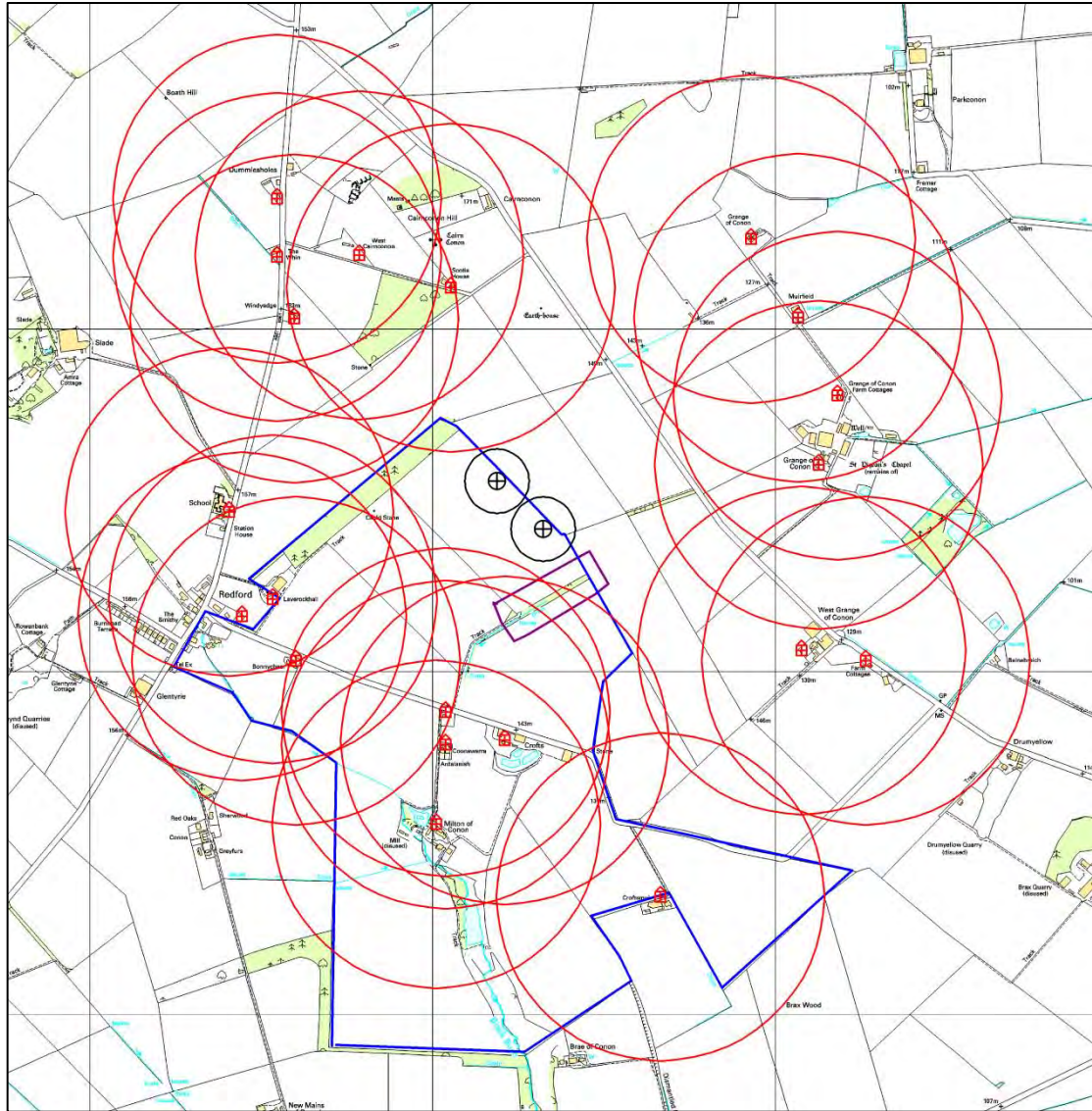


Figure 5.1 – Constraints Map

	10 rotor diameters (480m) boundary		Turbine
	Land ownership boundary		Properties
	Shelter belt separation		4 x Rotor diameter separation

Conclusion

The Crofts Farm site meets all of the outline criteria required for a suitable wind turbine project. The final site layout is the result of an iterative process which has considered a wide range of environmental factors. It has been carefully developed to achieve the best landscape fit from important viewpoints and to satisfy other environmental constraints.

6 Ecology/Fauna

Introduction

A detailed Ecological Impact Assessment (EclA) has been completed to assess the impact of the development upon the plant and animal species that are present at Crofts Farm.

These assessments were carried out by Garry Mortimer PhD, GLM Ecology, an experienced field ecologist with several years' experience of ecological assessments at wind farm sites.

Methodology

This programme of surveys was agreed with SNH, and comprised the following surveys:

- Breeding Birds;
- Geese Vantage Point Surveys;
- Winter Walkovers;
- Bats;
- Badgers; and
- A Phase 1 Habitat Survey.

The surveys were carried out according to current guidance published by the Institute of Ecology and Environmental Management (2006), which is recognised as best practice.

Main findings

Breeding birds

Twenty-four species of birds were recorded as breeding and five as possibly breeding within the survey area. These included the Linnet, Yellowhammer and Song Thrush, as well as Mistle Thrush, Skylark and Willow Warbler.

All of the recorded birds are recorded locally as common residents or summer visitors whose populations are not threatened and are in favorable conservation status in Scotland. No significant impact on high sensitivity species is expected, as the construction footprint is on existing tracks or arable fields.

VP surveys/winter walkover

Common passerines were recorded mostly around the plantations and wooded areas and included flocks of finches, tits, fieldfare and redwing. Wood pigeon, rooks and jackdaws were frequently on and over site. No birds of conservation concern were recorded and no geese or swans were recorded foraging on site.

The VP surveys recorded only two Schedule 1 raptors; a hen harrier in October and a peregrine falcon in December. Neither of these flights was at collision risk height. At various times numbers of flights of geese were recorded offsite. These were predominantly to the east and invariably travelling in an approximate north-south bearing.

Bats

The results reveal a very low usage of the site by bats. Only one species, a single soprano pipistrelle was recorded near Laverockhall Farm. No bats were recorded over open ground or near the proposed turbine locations.

No trees or buildings are to be removed for construction and therefore no significant impact on bats is expected from the two turbines.

Badger

Field signs of badger were recorded including tracks, hair, latrines and small scrapes. Regular tracks/pathways were also recorded in the area. No signs were recorded in the arable fields where the turbine is proposed.

Possible signs of badger were recorded but no setts are present on site within the fields near the proposed turbine locations. As badgers are present in the general area and often wander widely and expand their territories, a number of recommendations have been made to protect this species during the construction stage, including:

- On site speed restrictions for all vehicles;
- The covering of trenches; and
- The inclusion of ramps within trenches that cannot be covered.

Badgers can move into areas and dig setts over a short period of time. Prior to construction commencing a final badger survey will be carried out along the route of the access track and in the vicinity of the turbine.

Conclusion

A range of ecological assessments have been undertaken to investigate the ornithological and other ecological interests of the site. These surveys have shown that there are unlikely to be any adverse effects as a result of the proposal.

7 Landscape & Visual Impact Assessment (LVIA)

Introduction

An LVIA was undertaken to assess the potential effects of the proposed Crofts Farm development on the character of the site and the surrounding landscape.

Methodology

The key visual effects to be addressed include the following:

- Visual effects on the views experienced by local communities and residents;
- Visual effects on the views experienced by users of footpaths and general recreational areas/tourist destinations; and
- Visual effects on the views experienced by road users along the main transport routes.

The methodology for the LVIA adopted the guidelines set out by the Landscape Institute and the Institute for Environmental Management and Assessment, as well as other guidance from Angus Council and Scottish Natural Heritage (SNH). The study considered an area of 35 km radius around the site.



Figure 7.1 – Predicted view from the B961 near Newton

Zones of Theoretical Visibility (ZTV) were used to establish areas from which the development could potentially be seen. Based upon these ZTV's, photomontages for 18 viewpoints were assessed, comprising a selection of settlements, recreational areas and key transport routes. These viewpoints are presented in **Table 7.1**.

Table 7.1 – Viewpoint selection for the proposed Crofts Farm development

The Guynd	White Caterthun
B961 near Newton	Crombie Park
A933 near Colliston	Pitmuies
Minor Road near Woodville Feus	A92 Inverkeilor
Arbroath	Balmashanner Hill
Friockheim	Turin Hill
Dodd Hill	North of Drumyellow
Tentsmuir	South of Parkconon
Kirriemuir	Redford

These photomontages are presented in the separate Landscape Figures document.



Figure 7.2 – Predicted view from Crombie Park

The visual effects on all settlements within 10km of the development were also considered. A detailed assessment of the potential for visual effects from the B961 between Newbigging and the A933 has also been undertaken, as well as an assessment of the impact upon other routes along the A933, A90 and A932.

In order to assess potential cumulative impacts with other wind developments, wind projects within a 60 km radius of Crofts Farm were identified. CZTV's were then produced to show the potential for intervisibility between other projects and the wind cluster. As well as assessing each viewpoint in terms of the visual impact that the Crofts Farm would have, all viewpoints were also assessed cumulatively with other projects.

Main findings

Visual Assessment

Typically the two proposed turbines at Crofts Farm would form a linear balanced layout which would relate well to both the scale of the landscape and the form of the topography. Assessed effects are isolated, only occurring within ~1.6km of the turbines. These relate to the visual impact at one property and to three of the assessed viewpoints. Effects outside this distance quickly diminish.

Out of the eighteen viewpoints assessed, only three, from South of Parkconon, North of Drumyellow and Redford are expected to be significant.

None of the transport routes assessed were expected to be significantly affected by the introduction of the proposed scheme.

Nearest Properties

The impact on each of the twenty-two properties within a radius of 1km of the proposed wind turbines has been assessed. This involved a site visit to each property and an assessment of the likely views from the main living areas and gardens.

Of the assessed properties, only one, Grange of Conon, is expected to experience a significant level of impact.

The primary windows and garden area of this property face the turbines, however the turbines are not considered to be overbearing features and would not constitute an unacceptable change to the quality of living for the residents.



Figure 7.3 – Predicted view from The Guynd

Conclusion

The proposed development is in keeping with the current capacity as set out in the “*Strategic Landscape Capacity Assessment for Wind Energy*” produced by Angus Council. The study states that this area of landscape has capacity for development of between 1-5 turbines up to 80m in height.

The LVIA concluded that the project can be accommodated within the surrounding landscape, with no significant effects being found on either the landscape character or on any designated landscapes.

One of the twenty-two properties within 1km was found to experience significant visual effects.

Overall the project was deemed to have a low level of impact on the landscape, settlements, transport routes and properties.

8 Noise

Introduction

Noise can have an effect on the environment and on the quality of life enjoyed by individuals and communities. The impact of noise is therefore an important consideration in the determination of planning applications.

Methodology

The aim of the noise assessment is to demonstrate that the turbine noise levels do not exceed recommended limits at nearby properties as a result of the Crofts Farm turbines and also when considered in addition to the North Mains of Conynsyth turbine.

The results of the scoping report showed that background noise surveys would be required at three properties to represent the background noise levels for a number of properties in the area. These were:

- Scotia House
- Grange of Conon; and
- Crofts Cottage

Background noise was recorded at a full range of windspeeds, with the specific aim of recording noise levels during quiet daytime (evening and weekends) and night-time periods, the times during which the noise from the turbines might be expected to be most prominent due to quieter background noise levels.

Main findings

Noise constraints based upon the measured background noise levels were established at all nearby properties using the relevant guidance. The additional turbine noise from the Crofts Farm turbines was then added to the recorded background noise levels and compared to the noise limits at each property.

Calculations show that the turbine noise levels from the proposed scheme will remain below the guideline limits at all of the identified properties.

The proposed wind turbines are able to meet these constraints, both when considered alone and in conjunction with the operational turbine at North Mains of Conynsyth. On this basis, noise from the turbines is not expected to have an unacceptable, adverse impact on any nearby sensitive properties.

Conclusion

No adverse impacts on residential amenity due to noise are therefore predicted as a result of the scheme.

9 Cultural Heritage / Archaeology

Introduction

Cultural heritage is represented by a wide range of features, both above and below ground, which result from past human use of the landscape.

These include standing buildings, sub-surface archaeological remains and artefact scatters. These also include earthwork monuments as well as landscape features such as field boundaries and industrial remains.

Methodology

The Cultural Heritage assessment examined the impact of the development on:

- Local archaeological features;
- A and B listed buildings;
- Scheduled Ancient Monuments; and
- Gardens and Designed Landscapes.

Main findings

Direct impact

No features of historical significance are present within 200m of the turbine or 50m of the access track. The closest feature to the development is a findspot at West Grange of Conan located ~250m from the most northerly turbine. This has been recorded as, *“The upper stone of a circular rotary quern, 52.5cm in diameter, found in the field which lies to the S of that containing souterrain NO54NE 12, is now in Dundee Museum (1970-10).”*

Indirect impact

Within 2km

The study has found that there are; 3 ‘B’ listed buildings within 2km of the site. These are:

- Carmyllie East Parish School;
- Earth-House, Cairn Connan; and
- Conansyth Farmhouse

At ~500m from the development the **Earth-House Cairn Connan** is the closest feature of historical significance to the development. The current setting of the cairn is within a modern agricultural field, and the cairn itself is covered by vegetation with no long distance views available.

Only the blade tips of the western-most turbine are expected to be visible from **Carmyllie East Parish School**, with an intervening mature shelter belt of woodland screening most of the turbines.

One hub and a blade tip are predicted to be theoretically visible from **Conansyth Farmhouse**, but an intervening pocket of mature woodland is predicted to screen views of the development.

Between 2km and 5km

The assessment has identified a further 1 'A' listed buildings, 9 SAMs and 1 GDL within 5km of the project.

The tips of the proposed turbines are expected to be visible at ground level in views to the south from **Gardyne Castle**. The castle's associated mature woodland policies are predicted to screen views of the development from ground level. From the upper floors of the castle the development is expected to occupy a narrow extent of the horizontal view.

The comparatively elevated position of **Dumbarrow Hill Fort** (SAM 5) is such that it has an open setting with panoramic views. The proposed wind cluster is expected to occupy a narrow extent of the horizontal views available to the south east, and at a distance of ~3.9km the development is expected to appear as part of the wider landscape.

Cairn Knap is currently covered by vegetation, thus there are no long distance views available from this feature.

The remaining 7 **SAMs** are only discernible as cropmarks on oblique aerial photographs. Consequently the proposed development is not expected to have an adverse indirect visual impact upon these features.

Conclusion

No significant impacts on cultural heritage features are predicted as a result of the scheme.

10 Surface and Groundwater Hydrology

Introduction

Surface water includes watercourses, water bodies and runoff. Groundwater includes all water stored in permeable underground strata (or aquifers). Understanding surface and groundwater environments is critically important to designing a successful project.

Potential Impact

The major potential risk to the water environment is from erosion of exposed ground and the runoff of material into watercourses. There is also a smaller risk from chemical pollution from, for example, oil, or fuel spills and concrete.

Intrusive ground investigations will be completed prior to final design, to confirm groundwater levels, soil permeability and geology. Mitigation measures will be designed according to SEPA best practice.

These measures include:

- The micro-siting of the turbines and access tracks;
- The provision of adequate bunding and storage of any potentially polluting substances;
- The minimisation of individual drain lengths and gradients; and
- Directing the flow of surface water drainage through swales, infiltration trenches and soakaways.

An emergency response plan for potential pollution incidents would be produced as a matter of course.

Hydrological context of the site

The site is positioned on the south face of a shoulder of Cairnconon Hill, with the track and turbines lying at elevations of between approximately 140m and 160m above sea level. There are slopes down from the site of up to 5% to the south east down the face on the shoulder.

Any runoff generated by rainfall on the proposed track and hard standing areas currently flows downhill to the south, into a system of field drains that join to form the Black Burn. This Burn discharges into the Elliot Water approximately 3.3km downstream and south of the site. There are a number of field drains located throughout the study boundary.

In total, two wells were identified in the study area, one of which is extinct and the other which supplies water for irrigation only. All of the houses within 1.2km of the turbine locations have a mains water supply.

Conclusion

The majority of potentially significant negative impacts on water quality are only predicted to occur in the short term through potential increased sedimentation and construction pollution during the construction phase. The adoption of best practice management and control procedures by all site personnel and the implementation of the mitigation methods proposed will manage these risks. There are not predicted to be any impacts on private water supplies as a result of the development.

11 Shadow Flicker

Introduction

Rotating wind turbine blades can cast moving shadows which can affect neighbouring properties. As the blades rotate, alternating light and shadow can result inside buildings, particularly those with small windows. The effect can only occur when the sun is shining or when it is bright, and is worst when the turbine blades are facing the windows concerned.

Methodology

DECC's guidance suggests that an acceptable level of shadow flicker at residential properties is 30 hours per year. Angus Council guidelines suggest that shadow flicker impacts should not be problematic beyond a distance of 10 rotor diameters from a wind turbine.

Main findings

A shadow flicker map has been produced for the Crofts Farm turbines, based on a conservative approach which assumes that the sun is always shining, and that the turbine blades are always rotating and facing towards each property. This is shown in **Figure 11.1**.

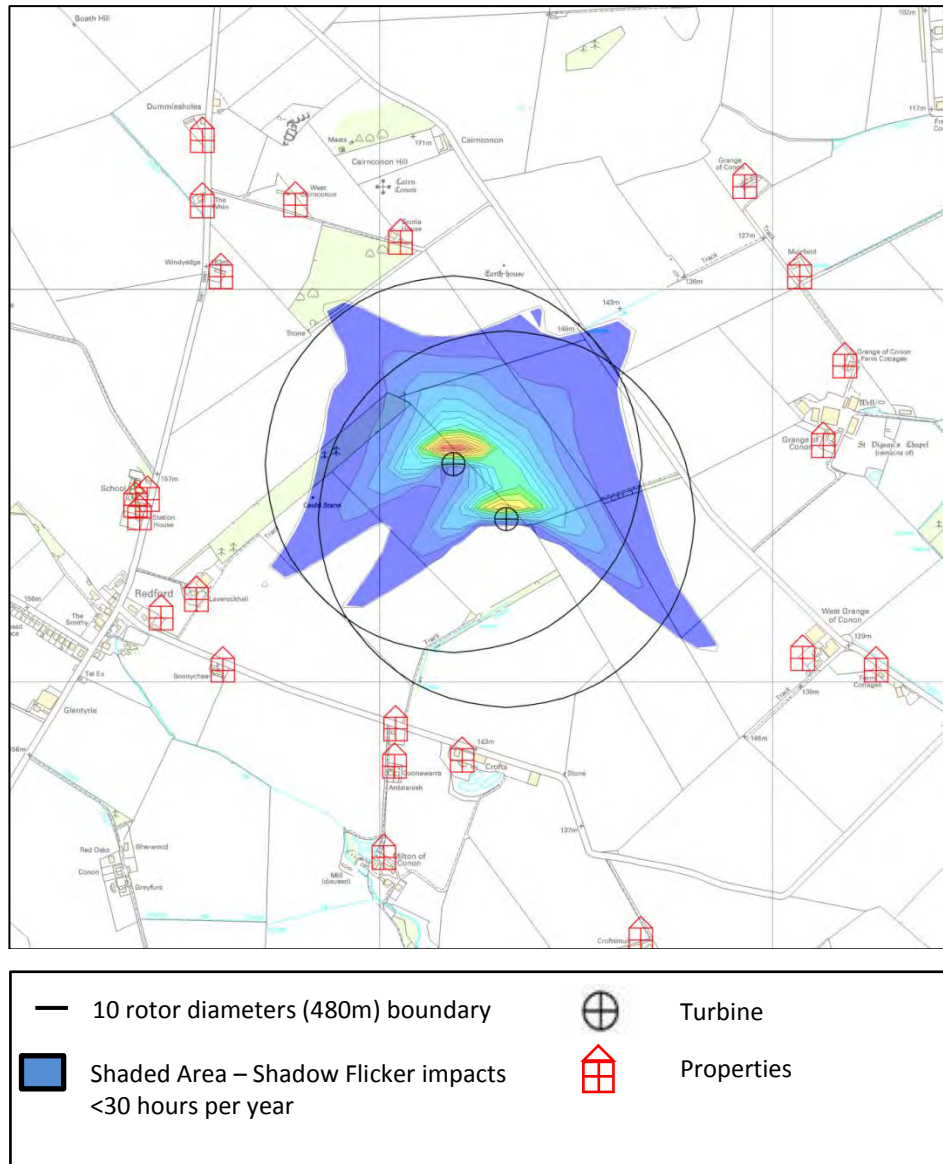


Figure 11.1 – Zone of theoretical shadow flicker (>30hrs per year)

Figure 11.1 demonstrates that:

- There are no properties located within 480m of the turbine locations. The nearest property is Crofts Cottage at 620m from the nearest turbine; and
- No properties are likely to experience shadow flicker in excess of 30 hours per year as a result of the development.

Conclusion

There are not expected to be any significant shadow flicker impacts on the nearest residential properties a result of the scheme.

12 Existing Infrastructure, Telecommunications, Television, Aviation and Electromagnetic Safety

Introduction

The installation of wind turbines can have a number of impacts on operators who use electromagnetic signals for communication and information transfer purposes and aviation or radar interests.

Methodology

Organisations with local interests in telecommunications, television, aviation, safety, defence and infrastructure were consulted to determine whether their systems would be affected.

Main findings

Civil aviation

There are not expected to be any conflicts with civil aviation at this location.

Ministry of Defence (MoD)

The MOD now no longer comments on proposals at the pre-application stage, but a specialist aviation study has identified that the turbines are likely to be visible to the radar at RAF Leuchars. An 'in-fill' mitigation measure is currently being developed by a third party provider, and it is hoped that the MoD will agree to its implementation. This approach has been successfully adopted for other wind developments in the area.

Telecommunication

Ofcom has identified three links in the vicinity of the proposed development, operated by Ericsson and BT. Further correspondence with these organisations established that the turbines would not affect these links.

Atkins and JRC were also contacted, and had no objections to the proposal

Television

In the unlikely event that the wind turbines are found to cause some interference to TV signals there are a number of options open to mitigate the effects.

It is standard practice for the Council to request a television survey as one of the planning conditions. This is undertaken soon after the turbines are built, and if there are found to be any problems then these must be remedied at the developer's expense.

Conclusion

The turbines will be visible to the radar at RAF Leuchars, but a specialist in-fill radar solution is proposed to solve any issues. The details of this will be agreed with the Ministry of Defence as part of the planning process. It is considered unlikely that there will be any problems with television reception, but this issue can be investigated further at the post-planning stage if required.

13 Climate Change

Introduction

Wind developments impact upon CO₂ emissions at two stages of their lifecycle:

- During wind turbine manufacture, construction and decommissioning; and
- During wind turbine operation.

The wind farm manufacture, construction and decommissioning phases will lead to the emission of greenhouse gases.

During operation, the turbines will lead to a reduction in CO₂ levels when compared to the production of electricity by conventional sources such as coal-powered power stations.

Main findings

Estimates show that the Crofts Farm development would result in a carbon saving of ~1,270 tonnes per year when compared to overall grid mix electricity generation.

In addition, the operation of the scheme would also reduce the emissions of the 'acid rain' gases sulphur dioxide and nitrogen oxides.

Conclusion

The development will make a small positive contribution to the reduction of carbon emissions over its 25 year lifecycle.

14 Conclusion

An extensive programme of environmental assessment has been carried out in relation to this proposed development at Crofts Farm. No unacceptably adverse effects have been predicted and it is concluded that the project could be successfully accommodated into the local area.