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Document :	TV IMPACT REPORT	
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# GORDONBUSH EXTENSION WIND FARM

## TV IMPACT REPORT


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	Name :	Position :	Signature :
Prepared by :	Darren MacIntyre	Electrical Design	
Checked by :	Douglas Allan	Electrical Engineering Manager	
Reviewed by:	Michael Walker	Project Manager	
Comment :			

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## 2 TECHNICAL DESCRIPTION

### 2.1 Digital Transmitters

2.1.1 Currently there is only one main transmitter that provides a service to the area surrounding Gordonbush Wind Farm, which is defined as the Rosemarkie Transmitter. Rosemarkie is situated in the Scottish Highlands and is approximately 48.8km due south of the site (see Figure 2 below).


2.1.2 Below is a table which shows the current digital multiplex information for Rosemarkie:

Gp	BBC A		D3&4		BBC B		SDN		Arqiva A		Arqiva B	
	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP
wv	45	20kW	49	20kW	42	20kW	43	10kW	46	10kW	50	10kW

2.1.3 Digital signals are less susceptible to interference as there are only two states to a TV picture, which is either a good picture or no picture. The chances of a wind farm affecting the TV signal is dramatically reduced unless the receiving aerial is in the Rumster Forest shadow of the wind farm.



Figure 2: Transmitters

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#### 2.1.4 The following channels are transmitted within each multiplex:

##### **BBC A**


BBC One	1
BBC Two	2
BBC Three	7
BBC Four (Border region only)	9
CBBC Channel	70
CBeebies (Border region only)	71
BBC News	80
BBC Parliament (Border region only)	81
BBC Red Button (text)	105
BBC Radio Scotland (Scotland and Border region only)	719
BBC Radio Ulster (Northern Ireland only)	719
BBC Radio Wales (Wales only)	719
BBC Radio nan Gàidheal (Scotland and Border region only)	720
BBC Radio Foyle (Northern Ireland only)	720
BBC Radio Cymru (Wales only)	720

##### **D3&4**


ITV1	3
Channel 4 (except Wales)	4
ITV2	6
Channel 4 (Wales only)	8
ITV3	10
Channel 4 +1	13
More 4	14
ITV4	24
E4	28
Teletext	100
Teletext Holidays (Wales only)	101
Rabbit (text)	102
DirectGov (text)	106
U105 (radio, Northern Ireland only)	726
Heart (radio, not Scotland or Northern Ireland)	728

##### **SDN**

S4C (Wales only)	4
Five (not Border region)	5
Tele G (Scotland and Border region only)	8
QVC	16
G.O.L.D.*	17
Bid TV	23
UKTV Style*	26
British Eurosport*	33

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Setanta Sports*	34
Five USA	35
Fiver	36
Top Up TV Anytime 1*	38
Top Up TV Anytime 2*	39
Top Up TV Anytime 3*	40
GemsTV1	44
Smile TV (not Wales)	46
Quest	47
Super Casino (not Wales or Northern Ireland)	48
Rocks & Co (not Wales or Northern Ireland)	49
CITV (not Wales)	72
CNN	84
S4C2 (Wales only)	86
Teachers' TV	88
TVX/Red Hot*	97
Teletext Holidays (not Wales)	101
Teletext Casino (not Wales)	103
1-2-1 Dating (text) (not Wales)	104
Smash Hits! (not Wales)	712
<b>BBC B</b>	
Five (Border region only)	5
BBC Four (not Border region)	9
CBeebies (not Border region)	71
BBC Parliament (not Border region)	81
Community Channel	87
BBC Red Button (extra video)	301
BBC Red Button (extra video)	302
BBC Red Button (extra video)	303
BBC Red Button (extra video)	305
BBC Radio 1	700
BBC 1Xtra	701
BBC Radio 2	702
BBC Radio 3	703
BBC Radio 4	704
BBC Radio 5 Live	705
BBC 5 Live Sports Extra	706
BBC 6 Music	707
BBC Radio 7	708
BBC Asian Network	709
BBC World Service	710


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## Arqiva A

Sky Three	11
Dave	19
E4 +1	29
SmileTV	37
Sky News	82
Sky Sports News	83
SkyText	108
TalkSPORT (radio)	723
Premier Christian Radio	725
Absolute Radio	727

## Arqiva B

Yesterday	12
Film Four	15
4Music	18
Virgin 1	20
TMF The Music Factory	21
Ideal World	22
Dave ja vu	25
ITV2 +1	27
Top Up TV Anytime 4*	41
GemsTV	43
National Lottery Xtra	45
Russia Today	85
4TV Interactive Services	300
The Hits Radio	711
Kiss (radio)	713
Heat (radio)	714
Magic (radio)	715
Q (radio)	716
Smooth Radio	718
Kerrang! (radio)	722

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2.1.5 The transmitted signals of which the wind farm could affect would come from the following transmitter:

Mast	X	Y
Rosemarkie	276207	862271

Table 1      Rosemarkie Transmitter co-ordinates

2.1.6 The signal level at the receiver should be between 45 and 65 dB $\mu$ V and the level should not be allowed to drop below 45 dB $\mu$ V at any point throughout a TV system.

2.1.7 The Carrier to noise ratio (C/N) should also be better than 26dB in order for it to be classed as a reliable signal. This will give a good enough ratio, so that if the signal is amplified, the noise won't be amplified along with it, to an unworkable level.

2.1.8 The Bit Error Ratio (BER) is the ratio of bits that the detector in the demodulator is unable to detect against the number of bits transmitted. An acceptable level is 2E-4 (2 bits in every 10,000).

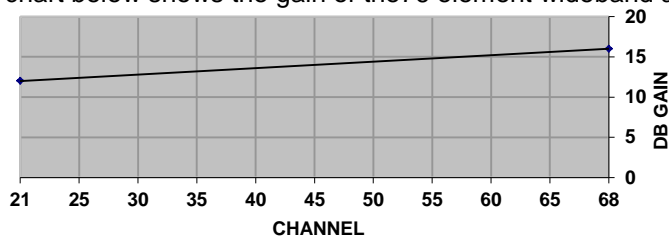
### 3 SURVEY

#### 3.1 Equipment

3.1.1 The equipment used to carry out this survey is detailed below:


- 76 element high gain WB aerial with a gain of 12 – 16 dBs
- 3m of WF100 double screened coax with a total loss of 1.025dB @ 860MHz
- Promax TV Explorer 2+
- X2 F Type connectors
- GPS system

3.1.2 The chart below shows the gain of the 76 element wideband aerial used:



3.1.3 The Antenna was always 3m off the ground which gives a fairly good representation while acting in a safe and controlled manner.



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### 3.2 Surveyed Areas

3.2.1 The area's below were plotted on the map to be tested to see the TV signal strength, as they were deemed the most populated areas around the wind farm of which could be affected:

AREA	X	Y
Gordonbush	284967	909150
Balnacoil	282095	911055
Brora	289276	905279
Helmsdale	301452	916440


Table 2      Plotted test areas

### 3.3 Method

3.3.1 Using GIS tools it was possible to plot the transmitters on a map which would then highlight the transmitter or transmitters that were predicted to be distributing the signal in the required area. Therefore it was possible to plot test sites with a prediction of where the signal would be coming from.

3.3.2 The test took place using the following method:

- Locate built up areas around the perimeter of the wind farm to give a good idea which transmitters are being used and to highlight areas of potential impact.
- Erect the equipment and take a GPS reading.
- An initial 360° horizontal analogue search for the main transmitters was carried out and any data readings were recorded.
- When a signal was found, the transmitting antenna was identified using a map and compass.
- A further 360° search for digital signals was carried out.
- The aerial was then rotated from the horizontal plane through to the vertical plane.
- A further 360° search was repeated for digital signals.

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### 3.4 Results

#### 3.4.1 Gordonbush




Gordonbush is located approximately 3km south of the Development site. All aerials in Gordonbush are pointing towards the Rosemarkie transmitter, which has gone through digital switch over and receives all 6 multiplexes and is facing away from the proposed wind farm. It was found that the signal strength in the area was good and that the wind farm will have no impact on the TV reception due to the topology.

#### 3.4.2 Balnacoil



Balnacoil is located south-west of the proposed wind farm and is approximately 3km from the nearest turbine. The TV signal is received from the Rosemarkie transmitter which has gone through digital switch over and receives all 6 multiplexes, which is facing away from the proposed wind farm. It was found that the signal strength in this area was poor. The majority of the properties have satellite dishes

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which will not be affected. Due to the signal being received away from the wind farm it is predicted that there will be no impact from the turbines on the local TV signal.

### 3.4.3 Brora




Brora is approximately 9.5km south-east of the nearest turbine. The area receives its signal from the Rosemarkie transmitter which was found to be good. Due to the signal being received away from the wind farm it is predicted that there will be no impact from the turbines on the local TV signal.

### 3.4.4 Helmsdale



Helmsdale is the most populated area surveyed and is situated 17km north-east of the Development. The area receives its signal from the Rosemarkie Transmitter and the signal strength in the area was found to be poor, unless an elevated aerial were in use. The wind farm will have no impact on the TV

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signal in the Helmsdale area due to the Development being situated away from where the signal is being received from.

### 3.5 Mitigation Methods

3.5.1 If it was found that once operational, the wind farm caused interference to a TV signal, validation of this claim would be required. This would involve a survey being carried out at the location of the complaint, as well as a full system check of the occupants TV system. The 2 outcomes of this would be:

- TV receiving equipment needs realigned/upgraded.
- TV signal is affected by the wind farm.

3.5.2 If the TV receiving equipment needs upgrading and if the wind farm is found to be causing degradation to the signal then the equipment would need to be upgraded to improve the signal strength. This could also be achieved by realigning the aerial to another transmitter or increasing the aerial's height to improve the signal strength.

3.5.3 If the signal is being affected by the wind farm and upgrading the aerial does not improve the signal level, then other measures would be investigated by the Applicant and could include.


- Installation of a Digital Satellite system; and
- Community Self Help Relay – This is a receiving aerial which is located away from the property at a higher level in order to receive a good signal. This signal is then amplified and re-transmitted down to the area affected. This system is suitable for a small community as it will involve renting an area of land/mast as well as electricity to run the amplifier and Multiplex if required.

## 4 CONCLUSION

4.1.1 The area around Gordonbush Extension Wind Farm was surveyed in order to understand the potential impact the Development may have on the surrounding TV signal once operational.

4.1.2 Four test sites were plotted using GIS tools and then the area around the site was surveyed to get a better understanding of the TV signal in the area. It was found that there is only one main transmitter covering the area around the wind farm and that is the Rosemarkie Transmitters, which have already gone through the digital switchover. Three out of the four areas surveyed; Gordonbush, Balnacoll and Brora, picked up the full multiplexes. The signal strength at Helmsdale was poor, however, if the aerial was elevated and a higher gain aerial was used, all multiples would have been received.

4.1.3 It is predicted that the wind farm would have no impact on the TV signal in the four areas around the wind farm due to the direction of the signal received from the transmitter being away from the proposed turbines.

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## 5 REFERENCE DOCUMENTS

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