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Moycarn, Balinasloe, Co. Galway.

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Volume III Environmental Impact Statement,
Appendices.

Project Location: Coor and Shanavogh, County Clare.

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EIS APPENDICES
TABLE OF CONTENTS

APPENDIX 1

Quick reference Maps and Planning drawings

APPENDIX 2

Enercon Ltd., Turbine specifications Data Sheets
(EIS Volume II, Chapters 1 and 2)

APPENDIX 3

Flora and Fauna Assessment Tables and Figures
(EIS Volume II, Chapter 4)

APPENDIX 4

Avifauna Maps
(EIS Volume II, Chapter 5)

APPENDIX 5

MosArt Ltd., VRP Selection Report
(EIS Volume II, Chapter 6)

APPENDIX 6

AGEC Ltd., Soils & Geology Assessment Figures
(EIS Volume II, Chapter 7)

APPENDIX 7

AGEC Ltd., Peat Stability Assessment

APPENDIX 8

HYDRO Environmental Services; Figures for Chapter 8 Hydrology & Hydrogeology Assessment (EIS Volume II, Chapter 8)

APPENDIX 9

Noise Impact Assessment Figures

(EIS Volume II, Chapter 9)

APPENDIX 10

Shadow Flicker Assessment Tables and Figures

(EIS Volume II, Chapter 11)

APPENDIX 11

Turbine Delivery Route Selection Survey

(EIS Volume II, Chapter 12)

APPENDIX 12

TVAS Ireland Ltd., Archaeological and Cultural Heritage Assessment Appendices

APPENDIX 13

Aerial Photographic Plates of the Site & Locality

APPENDIX 14

Renewable Power Generation 'Substation design report for proposed 13.8MW Wind Farm Report and drawings'

Lyreco

152.391

FORCE LINE™

PG62189605

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COOR SHANAVOGH
PROPOSED WIND FARM
REGIONAL CONTEXT

N

Figure 1. Regional context, site location.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

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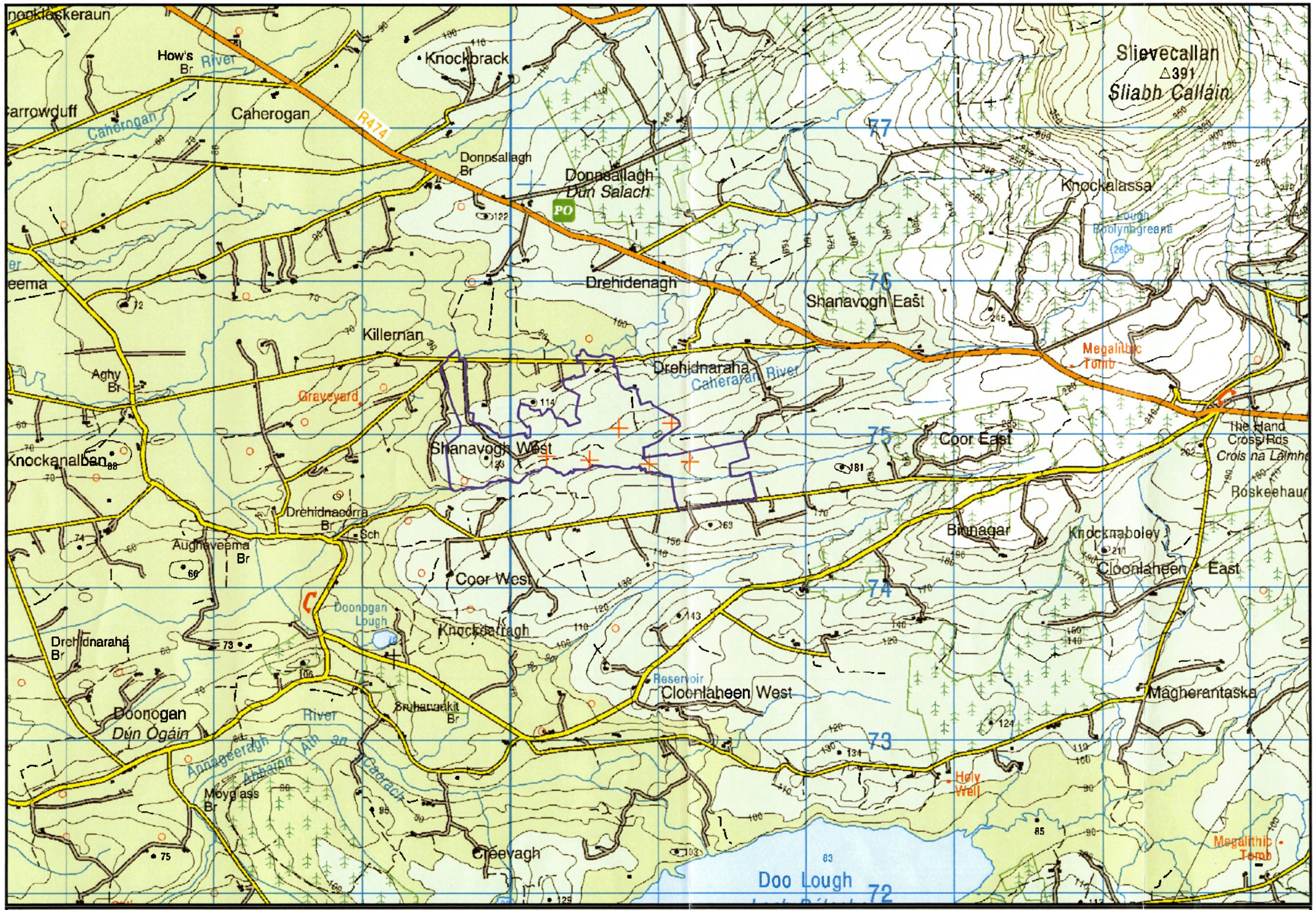
APPENDIX 1

Figures

ENVIRONMENTAL IMPACT ASSESSMENT FIGURES SCHEDULE, APPENDIX 1	
Figure A1.1	Regional context, site location
Figure A1.2	Local context, site location
Figure A1.3	Site layout
Figure A1.4	Local dwellings and distances
Figure A1.5	Turbine details
Figure A1.6	Turbine and crane hardstanding plan
Figure A1.7	Internal access road details
Figure A1.8	Water crossing culvert details
Figure 1.9	Forested areas and areas of clearfell
Figure A1.10	Borrow pit 1
Figure A1.11	Borrow pit 2
Figure A1.12	Borrow pit 3



COOR SHANAVOGH
PROPOSED WIND FARM
LOCAL CONTEXT

N

Landholding boundary

Turbine location

Figure 2. Local context, site location.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

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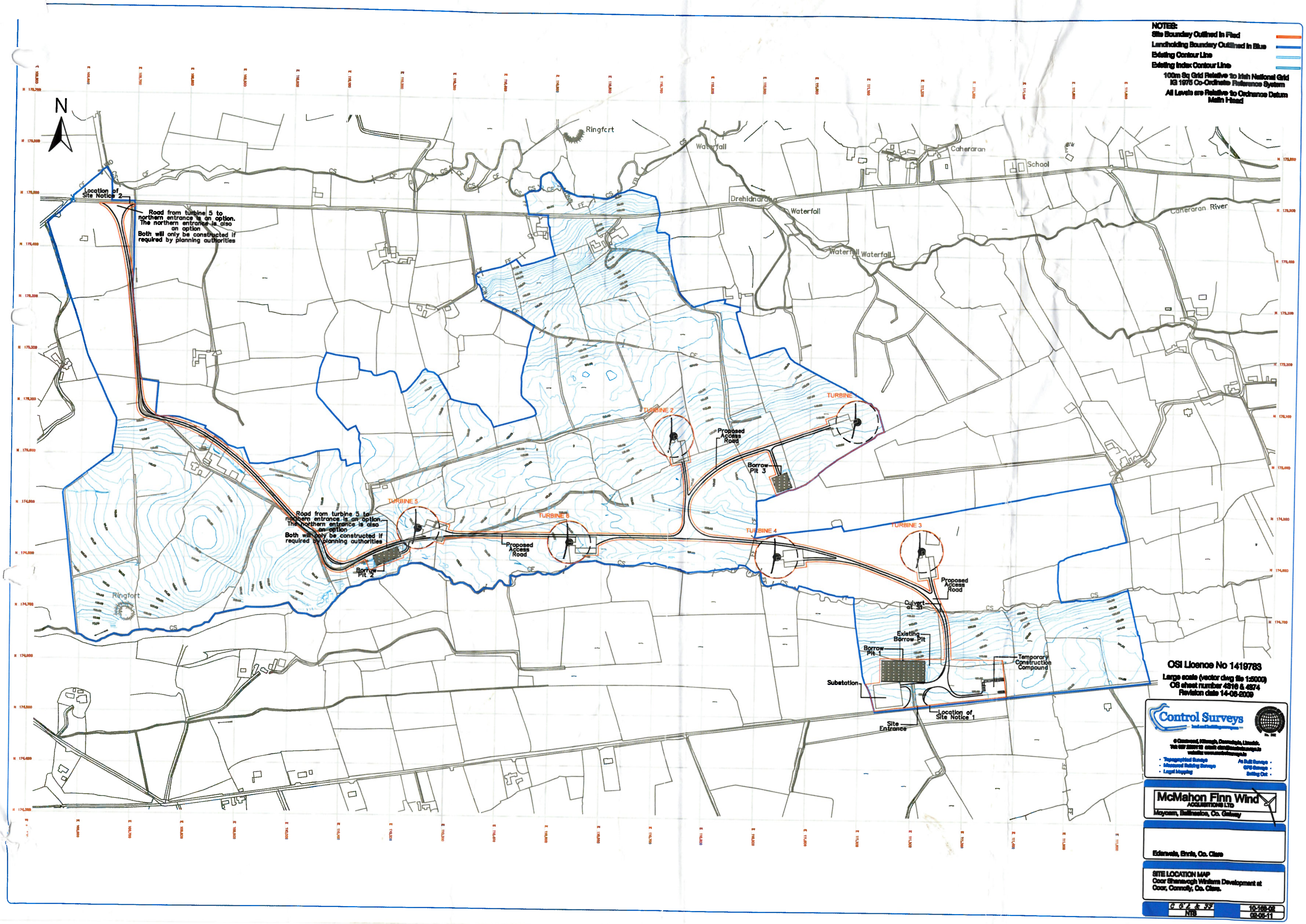
NOTES:
Site Boundary Outlined in Red
Landholding Boundary Outlined in Blue
Existing Contour Line
Existing Index Contour Line
100m Sq Grid Relative to Irish National Grid IG 1975 Co-Ordinate Reference System
All Levels are Relative to Ordnance Datum Malin Head
N
Location of Site Notice 2
Road from turbine 5 to northern entrance is an option. The northern entrance is also an option. Both will only be constructed if required by planning authorities
Ringfort
Waterfall
Caheraran
School
Drehidnaran
Caheraran River
TURBINE 5
TURBINE 6
TURBINE 2
TURBINE 4
TURBINE 3
TURBINE
Proposed Access Road
Borrow Pit 2
Borrow Pit 3
Borrow Pit 1
Existing Borrow Pit
Culvert at S1
Temporary Construction Compound
Substation
Site Entrance
Location of Site Notice 1
OSI Licence No 1419783
Large scale (vector dwg file 1:5000)
OS sheet number 4316 & 4374
Revision date 14-06-2009
Control Surveys
McMahon Finn Wind
ACQUISITIONS LTD
Edenvale, Ennis, Co. Clare
SITE LOCATION MAP
Coor Shanavogh Winfarm Development at Coor, Connolly, Co. Clare.
NTS
10-169-02
02-05-11

DWELLINGS IN THE LOCATION
Coor Shanavogh Wintarm Development at
Coor, Connolly, Co. Clare.

Ederveale, Ennis, Co. Clare

Moycarn, Ballinasloe, Co. Galway

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- Measured Building Surveys
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- GPS Surveys
- Setting Out

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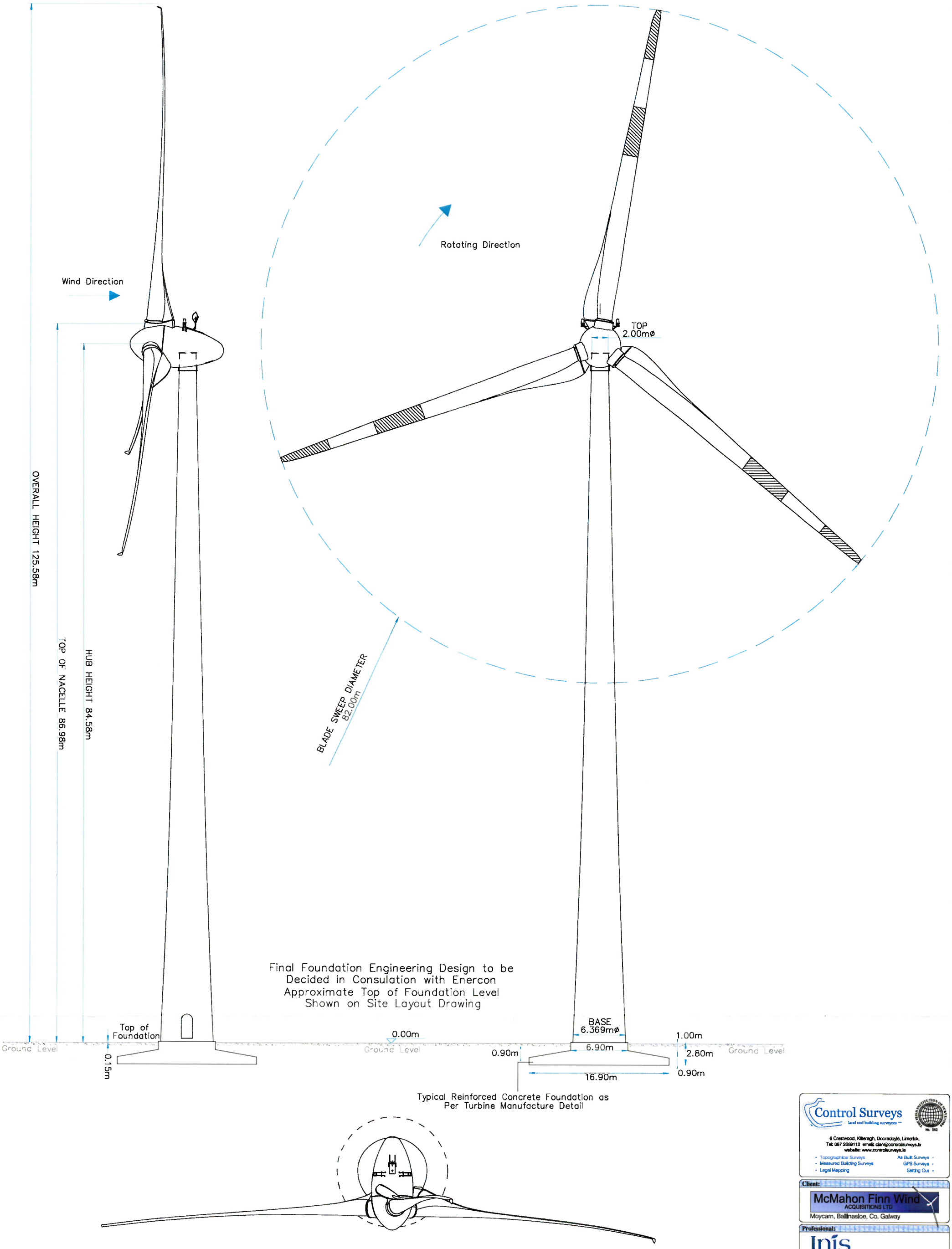
Large scale (vector dwg file 1:5000)
OS sheet number 4316 & 4374
Revision date 14-06-2009

NOTES:
Site Boundary Outlined In Red
Landholding Boundary Outlined In Blue
Party to Application (d)
Other (o)
100m Sq Grid Relative to Irish National Grid
IG 1975 Co-Ordinate Reference System

Scale of 1:3000 Pre-Approved by Mr Gareth Ruane of Clare County Council

Date	02-05-11
Scale	NTS
Drawing No.	10-168-15

NOTES:
Drawings Based on Information Provided by Enercon



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Professional:
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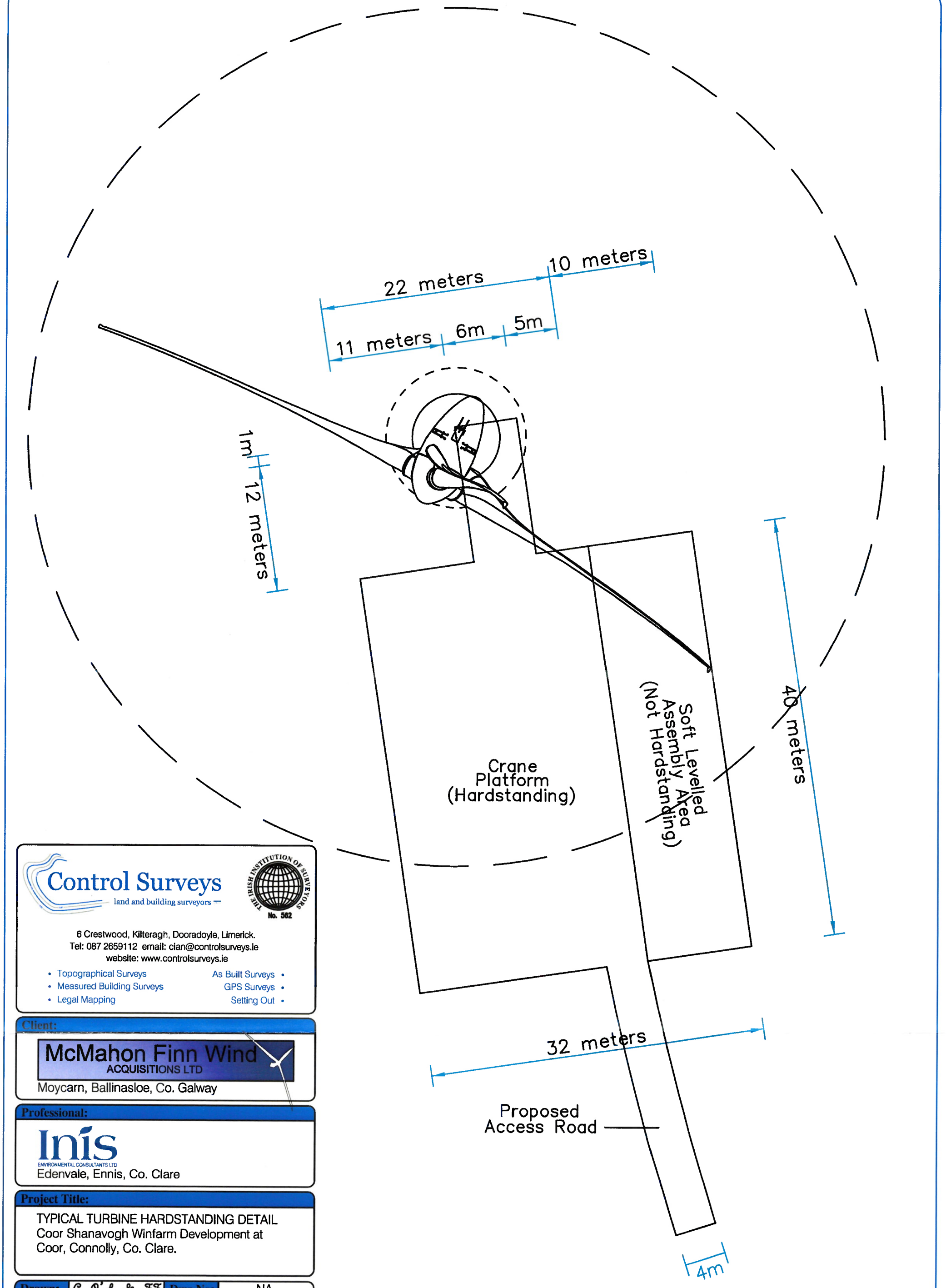
Project Title:
ENERCON E82 WIND TURBINE
Coor Shanavogh Winfarm Development at
Coor, Connolly, Co. Clare.

Drawn:	C O'L & JF	Dwg No:	10-168-16
Scale:	NTS	Date:	02-05-11



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Professional:

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ENVIRONMENTAL CONSULTANTS LTD
Edenvale, Ennis, Co. Clare

Project Title:

TYPICAL TURBINE HARDSTANDING DETAIL
Coor Shanavogh Winfarm Development at
Coor, Connolly, Co. Clare.

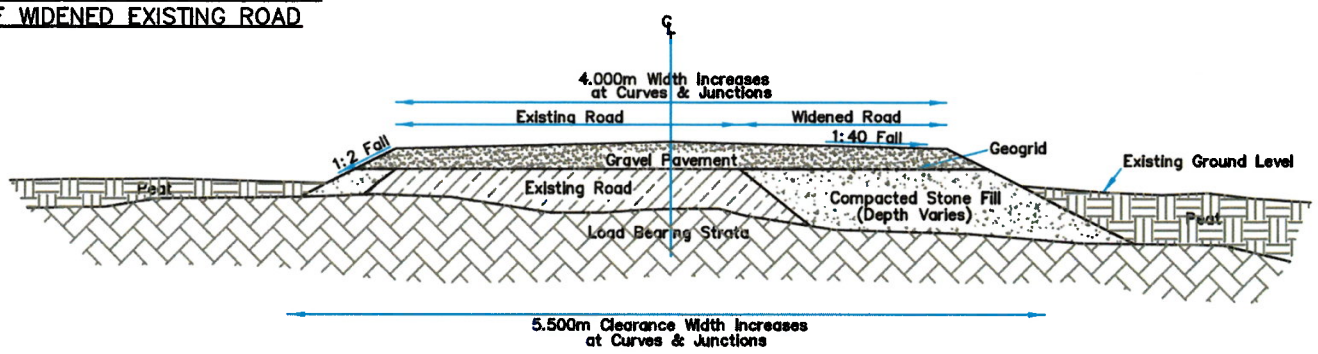
Drawn:	C O'L & FF	**Dwg No:**	NA
Scale:	NTS	**Date:**	02-05-11

NOTES:
Formation level of road to be finali[illegible] site by site engineer

Depth of stone fill varies to allow for the carriage of maximum vehicle weight of 120t

Access road incline not greater than 7%

TYPICAL ROAD CROSS SECTION OF WIDENED EXISTING ROAD



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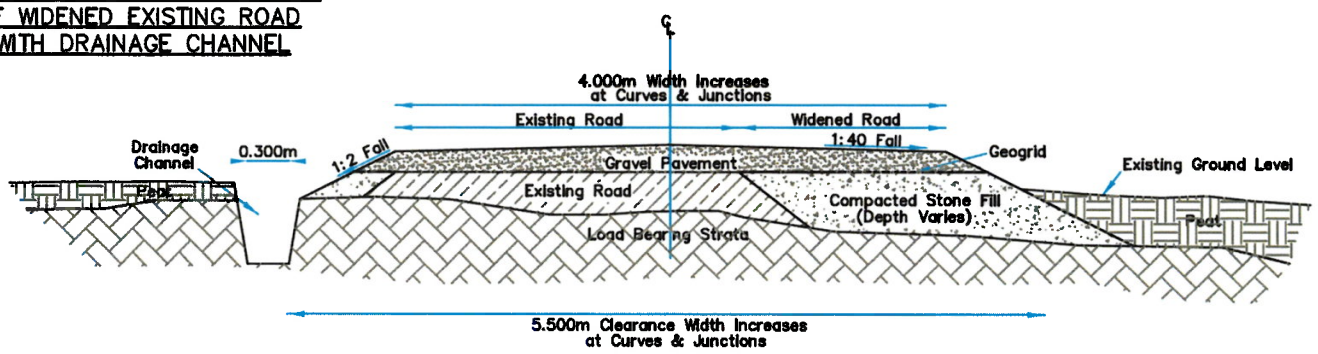
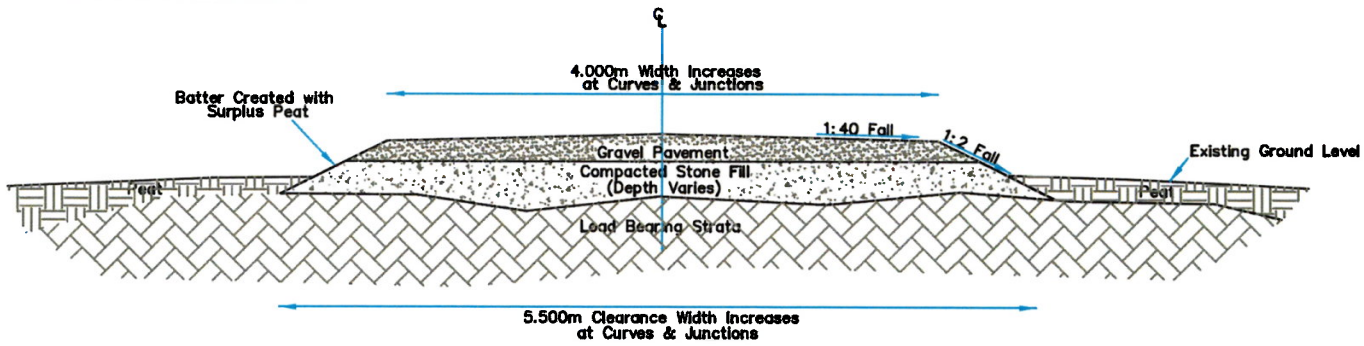
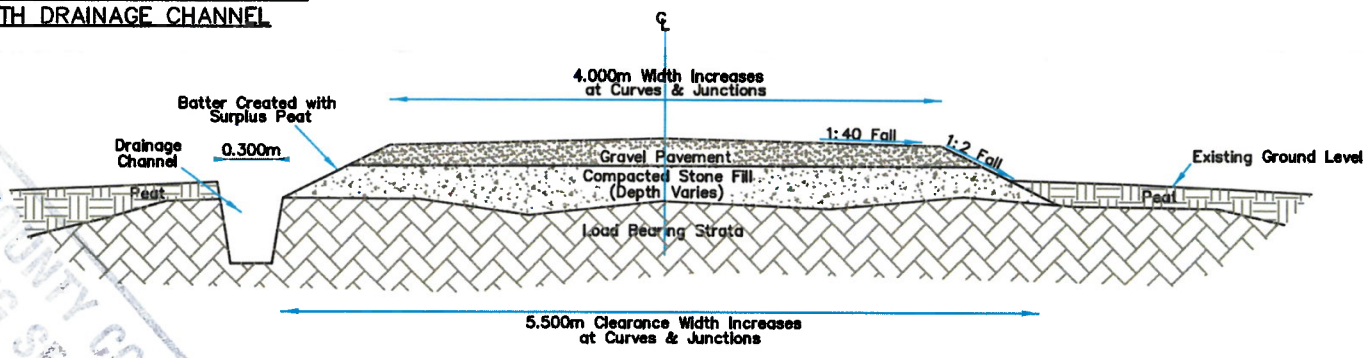


TYPICAL ROAD CROSS SECTION



TYPICAL ROAD CROSS SECTION WITH DRAINAGE CHANNEL



Project Title:
TYPICAL ROAD DETAILS
Coor Shanavogh Winfarm Development at Coor, Connolly, Co. Clare.

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NOTES:
Formation level of road to be finalised on site by site engineer

Depth of stone fill varies to allow for the carriage of maximum vehicle weight of 120t

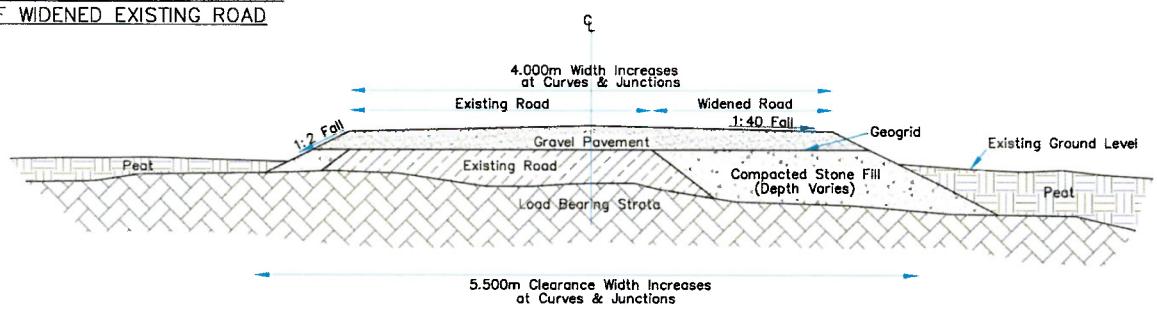
Access road incline not greater than 7%

Invert of culvert to be installed to a depth of 300mm below the natural bed level, or 20% of culvert diameter whichever is greater. Head and tail walls may be required

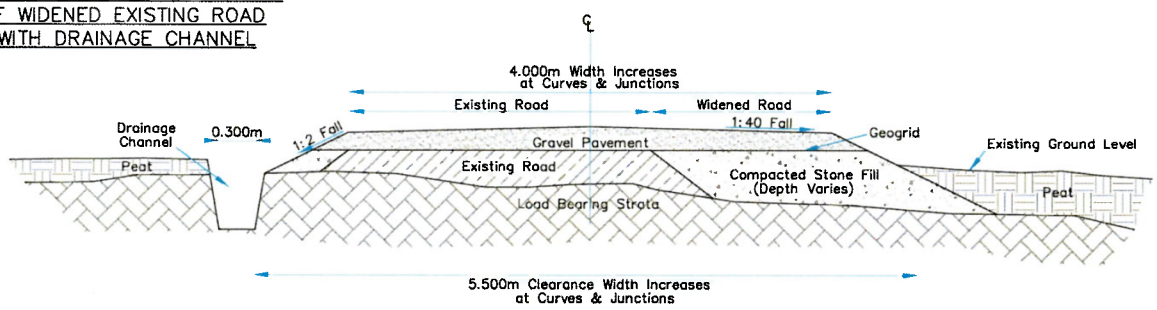
Culvert size to allow for 50 year peak flow

Co-Ordinates are Relative to Irish National Grid IG 1975 Co-Ordinate Reference System

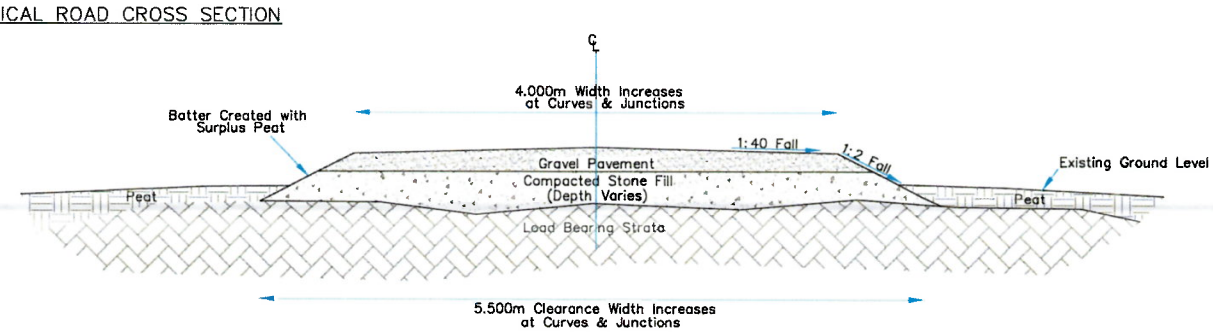
TYPICAL ROAD CROSS SECTION
OF WIDENED EXISTING ROAD



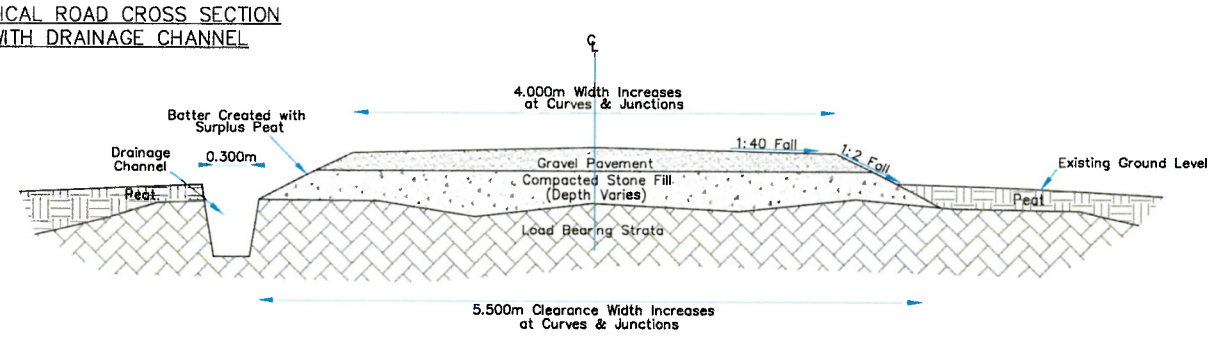
TYPICAL ROAD CROSS SECTION
OF WIDENED EXISTING ROAD
WITH DRAINAGE CHANNEL



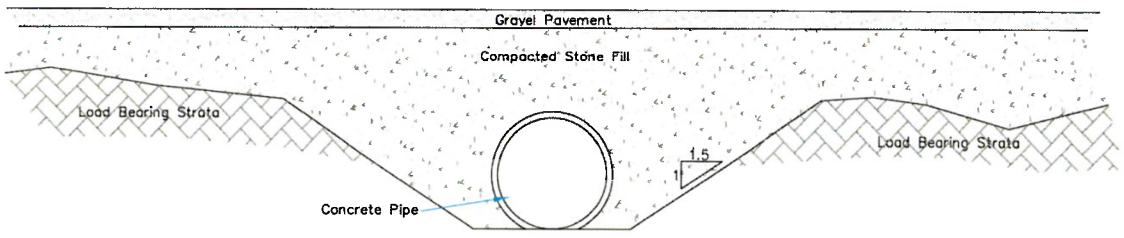
TYPICAL ROAD CROSS SECTION



TYPICAL ROAD CROSS SECTION
WITH DRAINAGE CHANNEL



ROAD CROSS SECTION
THROUGH CULVERT AT S1
Easting 111255
Northing 174710



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McMahon Finn Wind ACQUISITIONS LTD
Moycarn, Ballinasloe, Co. Galway

Professional:
Inis
Edenvale, Ennis, Co. Clare

Project Title:
ROAD & CULVERT DETAILS
Coor Shanavogh Winfarm Development at Coor, Connolly, Co. Clare.

Drawn:	C O'L & JJ	Dwg No:	10-168-17
Scale:	NTS	Date:	02-05-11

NOTES:
Site Boundary Outlined in Red
Landholding Boundary Outlined In Blue

N

Ringfort
Waterfall
Caheraran
School
Caheraran River
Drehidnaraha
Waterfall
Waterfall
Waterfall
Ringfort

CLEARANCE AREA
50 meter clearance centered on Turbine
Area Outlined & Hatched Cyan
4.98 Acres
2.01 Hectares

FOOTPRINT AREA
Area Outlined & Hatched Red
6.58 Acres
2.66 Hectares

FORESTED AREA
Area Outlined in Green
60.99 Acres
24.68 Hectares

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Large scale (vector dwg file 1:5000)
OS sheet number 4316 & 4374
Revision date 14-06-2009

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Edenvale, Ennis, Co. Clare

FORESTED AREAS
Coor Shanavogh Winfarm Development at Coor, Connolly, Co. Clare.

NTS	NA
	02-05-11

Substation

Borrow Pit 1

Existing Borrow Pit

Location of Site Notice 1

SECTION A-A

SECTION B-B

SECTION A–B

SECTION C–D

LOCATION

TURBINE 2

TURBINE 1

N

Site Boundary

Borrow Pit 3

Road Graded to Allow Access into Borrow Pit During Construction

Landholding & Site Boundary

43 Meters

4m

5m

A

B

C

D

137.00 141.00 143.00 145.00 146.00 147.00 148.00 149.00 140.00

E 110,800 E 110,850 E 110,900 E 110,950 E 111,000 E 111,050

N 175,000 N 174,950

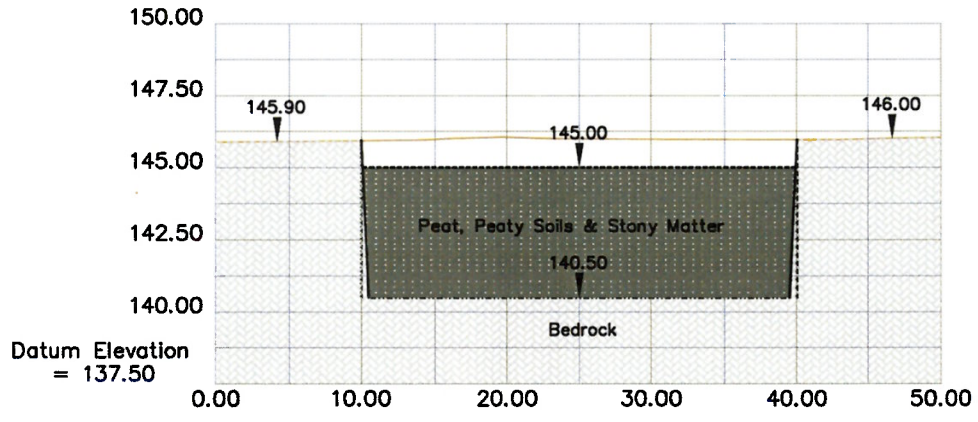
NOTES:
Site Boundary Outlined In Red
Landholding Boundary Outlined In Blue
Existing Contour Line
Existing Index Contour Line
Existing Ground Level
Proposed Ground Level
Peat Fill
Bedrock

50m Sq Grid Relative to Irish National Grid
IG 1975 Co-Ordinate Reference System

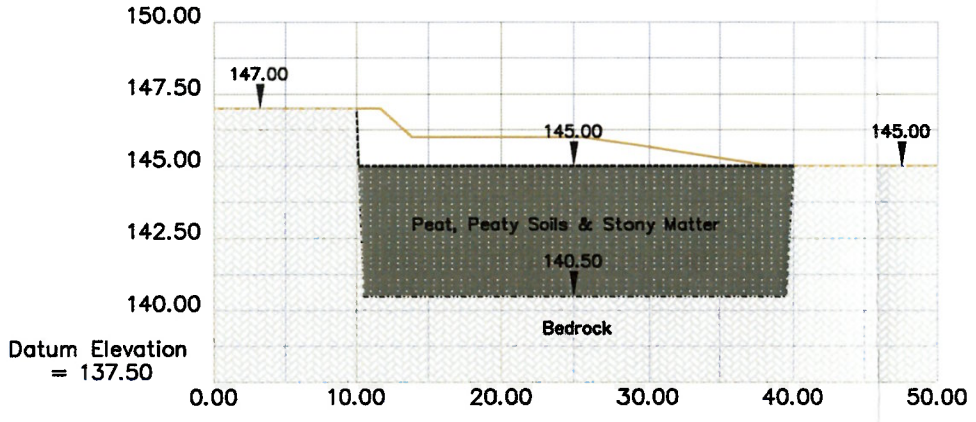
All Levels are Relative to Ordnance Datum Malin Head

SHEET LOCATION

SECTION A–B



SECTION C–D



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BORROW PIT 1 LAYOUT & SECTIONS
Coor Shanavogh Winfarm Development at
Coor, Connolly, Co. Clare.

C 01 & 02
NTS
10-168-12
02-05-11

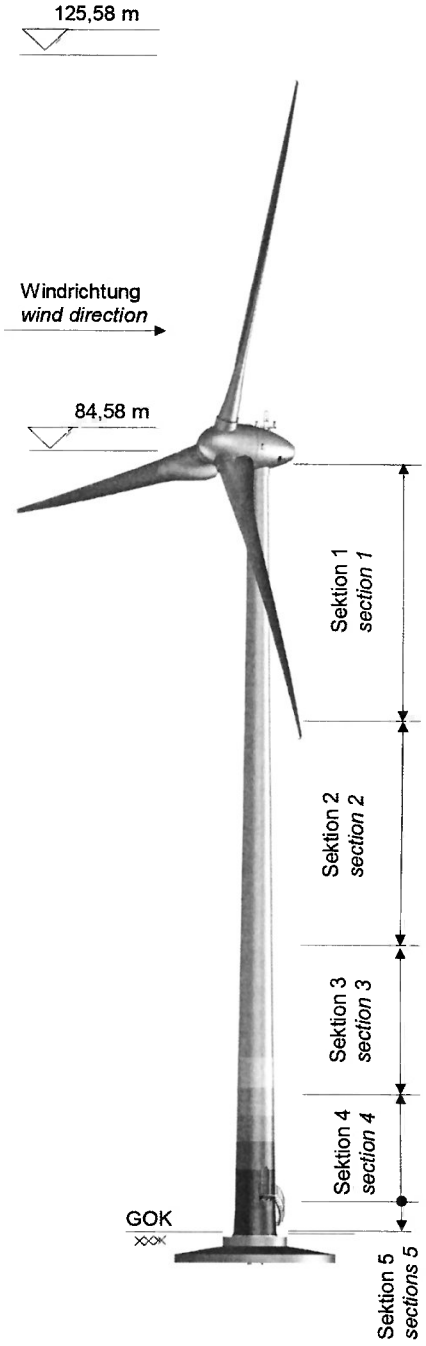
APPENDIX 2

Enercon Ltd., Turbine specifications Data Sheets

ENERCON DATA SHEETS SCHEDULE	
A1.1	E82 Coor Specifications
A1.2	E82 Weights And Dimensions
A1.3	E82 Foundations Data Sheet
A1.4	E82 Delivery, Crane Platforms and Assembly Data Sheet

Model	Enercon E82 – 2.3MW
Rotor Diameter	82m
Hub Height	85m
Height to tip	126m
Rated Power	2,300kw
Sweep Area	5,281m²
Type	Upwind rotor with active pitch control
No of Blades	3
Direction of Rotation	Clockwise
Rotational Speed	Variable 6 – 18rpm
Pitch Control	Single blade pitch system, one per rotor blade.
Cut out wind speed	28 – 34 m/s
Brake System	3 Independent pitch controls Rotor Brake Rotor Lock

ENERCON ENERGY FOR THE WORLD	Gewichte und Abmessungen *Weights and Dimensions* E-82 E2/S/83/5K/01	Page 1 of 1



Gesamthöhe ab Gelände *Total height from territory*	125,58 m
Nabenhöhe ab Gelände *Hub height above ground*	84,58 m
Turmhöhe ab Fundamentoberkante *Tower height above upper foundation edge*	83,03 m
Bauart / *Design*	Stahlturm / *steel tower*
Windzone WZ (DIBt / DIN 1055-4)	WZ III / WZ 4 GK I[2]
WTGS Class (IEC 61400-1)	WTC IIA[2]
Anzahl der Sektionen / *Number of sections*	5 + Fundamentkorb / 5 + foundation basket

	Länge *length*	D_{oben} *diamt*$_{op}$	D_{unten} *diam*$_{bottom}$	Gewicht weight
	m	m	m	to
Sektion 1 / *section 1*	28,500	2,190 / 2,422[3]	2,850	ca. 45
Sektion 2 / *section 2*	24,005	2,850	3,480	ca. 59
Sektion 3 / *section 3*	16,135	3,480	3,950	ca. 61
Sektion 4 / *section 4*	11,330	3,950	4,300	ca. 66
Sektion 5 / *section 5*	3,000	4,300	4,900[3]	ca. 25
Fundamentkorb / *foundation basket*	1,800	4,960	4,890	ca. 10
Gesamtgewicht Turm / *total weight tower*				ca. 266

[1] Typenprüfung vorhanden /*Certification Report available*

[2] Typenprüfung in Arbeit/ *Certification report in process*

[3] Flanschaußendurchmesser / *outside flange diameter*

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Approved / date:	PP / 01.06.2010	Revisor / date:	
Revision / date:	00	Reference:	WRD-K-04-GuA.E-82_E2.S.83.5K.01-Rev00_0-ger-eng.doc

FUNDAMENT-DATENBLATT
FOUNDATION DATA SHEET

E-82 E2/S/83/5K/01
E-82 E3/S/83/5K/01

WZ III (DIBt- Richtlinie Fassung 2004, Anhang B)
WZ 4; GK I (DIN 1055-4: 2005-03)
WTC II A (IEC 61400-1, 3rd edition, 2005-08)
WEA class II A (DIN EN 61400-1, 2006-07)

1536335 TYPENPRÜFUNG Geltungsdauer
5 Jahre/Wiedervorlage bis 31. Aug. 2015

Bauteil: **Fundament -**
Flachgründung ohne Auftriebswirkung
Component: **Foundation -**
Flat Foundation without Buoyancy

In bautechnischer Hinsicht geprüft.
Siehe Prüfbericht vom 26. Aug. 2010
München 26. Aug. 2010
TÜV SÜD Industrie Service GmbH
Prüfamt für Baustatik für Fliegende Bauten
und für Windenergieanlagen
Der Leiter: Der Bearbeiter:

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Revision / date:	2.0 / 23.08.2010	Reference:	WRD-04-FDB_E-82_E2_E3_S_83_5K_01_FoA_Rev2_0-eng

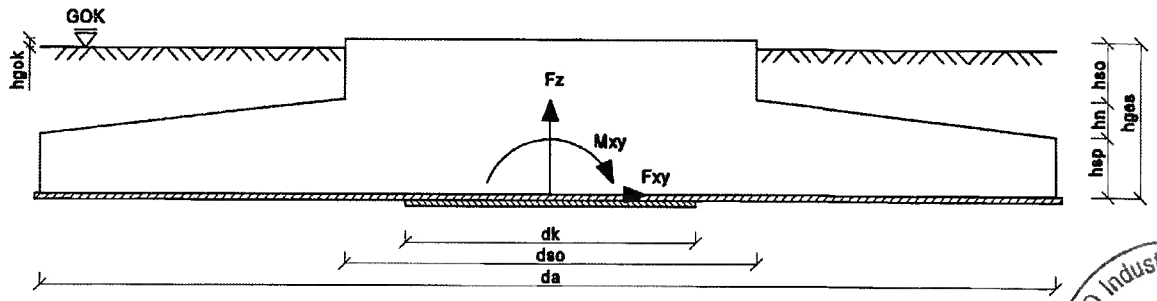
1.0 General information

Design-specific structural analysis:

Structural calculation
E-82 E2/S/83/5K/01
E-82 E3/S/83/5K/01
Flat foundation without buoyancy – Ø 16.90 m
28.07.2010, Order No.: TP10-17

2.0 Foundation dimensions

Outer diameter	da	16.90 m
Base diameter	dso	6.90 m
Compressive layer diameter	dk	4.23 m
Foundation height	hges	2.80 m
Base height	hso	1.00 m
Spur incline height	hn	0.90 m
Spur height	hsp	0.90 m
Difference between foundation top edge and ground level	h_{GOK}	0.15 m
Concrete quality and volume	C 30/37	345 m³
Reinforcement steel and weight	BSt 500 S (A)	34.95 t
Reinforcement steel and weight	BSt 420 S (A)	-



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Approved / date:	MS / 04.08.2010	Revisor / date:	-
Revision / date:	2.0 / 23.08.2010	Reference:	WRD-04-FDB_E-82_E2_E3_S_83_5K_01_FoA_Rev2_0-eng

3.0 Minimum rocking spring stiffness

Observe the following minimum values with regard to elastic clamping between foundation and subsoil:

Total system (tower and foundation)	**kφ,stat** **5000 [MNm/rad]**
	kφ,dyn **40000 [MNm/rad]**

The following applies to circular foundations:

$$k_{\varphi} = \frac{8 \cdot G \cdot r^3}{3 \cdot (1 - \nu)}$$

This means that

$$E_{oed,dyn} = k_{\varphi} \cdot \frac{3}{4} \cdot \frac{1}{r^3} \cdot \frac{(1+\nu) \cdot (1-\nu)^2}{1 - \nu - 2 \cdot \nu^2}$$ where

G = shear modulus
r = radius
ν = Poisson's ratio

4.0 Allowed inclination

Maximum allowed inclination due to subsoil settlement within 20 years, related to the outer diameter.

$$\Delta s \leq 3 \text{ mm/m}$$

5.0 Soil bearing pressure

The in-situ subsoil must be able to bear a minimum pressure of $\sigma_{k,vorh}$ = **250 kN/m²**.

TÜV SÜD Industrie Service GmbH TÜ 12 MÜNCHEN

6.0 Loads at the bottom edge of the foundation

The F_Z loads indicated include the dead weight of the foundation $\gamma = 25$ kN/m³ and soil weight $\gamma = 18$ kN/m³ when dry.

6.1 Characteristic load cases

Load case	($\gamma_{aero}/\gamma_{mass}$)	F_{xy} [kN]	F_z [kN]	M_{xy} [kNm]	M_z [kNm]
DLC 1.0	(1.00/1.00)	573	-16930	37796	-
DLC 6.1	(1.00/1.00)	689	-16707	52289	2620
DLC 6.2	(1.00/1.00)	836	-16837	65241	-3360

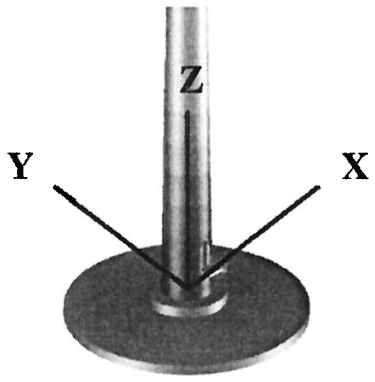
Loads do not include partial safety factor ($\gamma_F = 1.0$)

6.2 Load case design values

Load case	($\gamma_{aero}/\gamma_{mass}$)	F_{xy} [kN]	F_z [kN]	M_{xy} [kNm]	M_z [kNm]
DLC 6.2	(1.00/1.35)	955	-22761	72342	-4290
DLC 6.2	(1.10/0.90)	955	-15152	72559	-4290

All loads include partial safety factors

7.0 Coordinate system



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Access Roads and Crane Platforms

E-82

77m steel tower

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CONTENTS Page

1. Assembling the tower and wind energy converter

The tower and wind energy converter are installed in two stages (work steps):

Step 1
Bolting the tower flanges to assemble the supplied tower sections. The 77m steel tower consists of four tower sections.

Step 2
Preassembly of the supplied converter components and subsequent assembly of the wind energy converter.

2. Crane technology

2.1. Details of crane technology

The following crane technology is required for the work steps described above:

	77m steel tower
Crane type	800t lattice tower crane
Length/basic unit	20 m
Width/basic unit	3 m
Track width	3 m
Supporting base	13 m x 13 m
Working radius	28 m

2.2. Supporting base and working radius

The **supporting base** describes the distance between the four support cylinders arranged in a square (in metres).

The **working radius** is the minimum distance between the crane hook and the crane's live ring. Example: With a working radius of 28 m, the distance from the live ring to the centre of the foundation would be at least 28 m (see 6.2.).

2.3. Installing the lattice tower crane

The following work steps need to be performed:

- Drive crane into position
- Align the crane with the centre of the WEC (taking into account the working radius)
- Use approx. 20 trucks to transport the crane accessories to the crane
- Support the crane on the crane platform using load distribution plates and
- Assemble jib

2.4. Assembling the jib

The individual jib (lattice tower) components should be assembled across a span of 95 m with the aid of an auxiliary crane. It should then be installed. During this process, the auxiliary crane must be positioned to the side of the jib of the main crane.
In order to facilitate consecutive assembly of the individual jib components, a stable roadway will be required for the auxiliary crane to travel along. You are advised to make use of the existing access road for the wind energy converter. If the existing access road is not suitable, a temporary roadway has to be constructed for the purpose of assembling the jib; this roadway has to be agreed with the competent ENERCON Project Manager on a case-by-case basis.

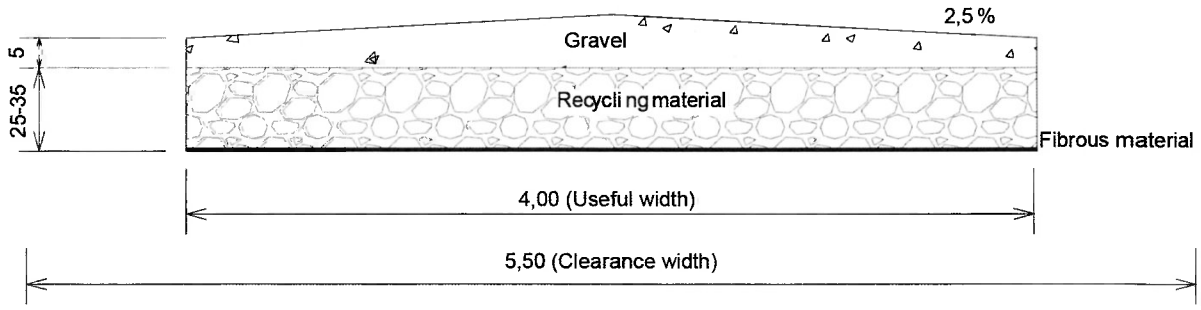
3. Access roads

Any roadways, bridges or access roads have to be able to withstand the transportation of heavy loads up to a maximum axle load of 12t and a maximum overall weight of 120t. Access has to be kept clear at all times. The responsible ENERCON Project Manager has to be informed of any failure to meet these requirements.

3.1. Minimum requirements of access roads

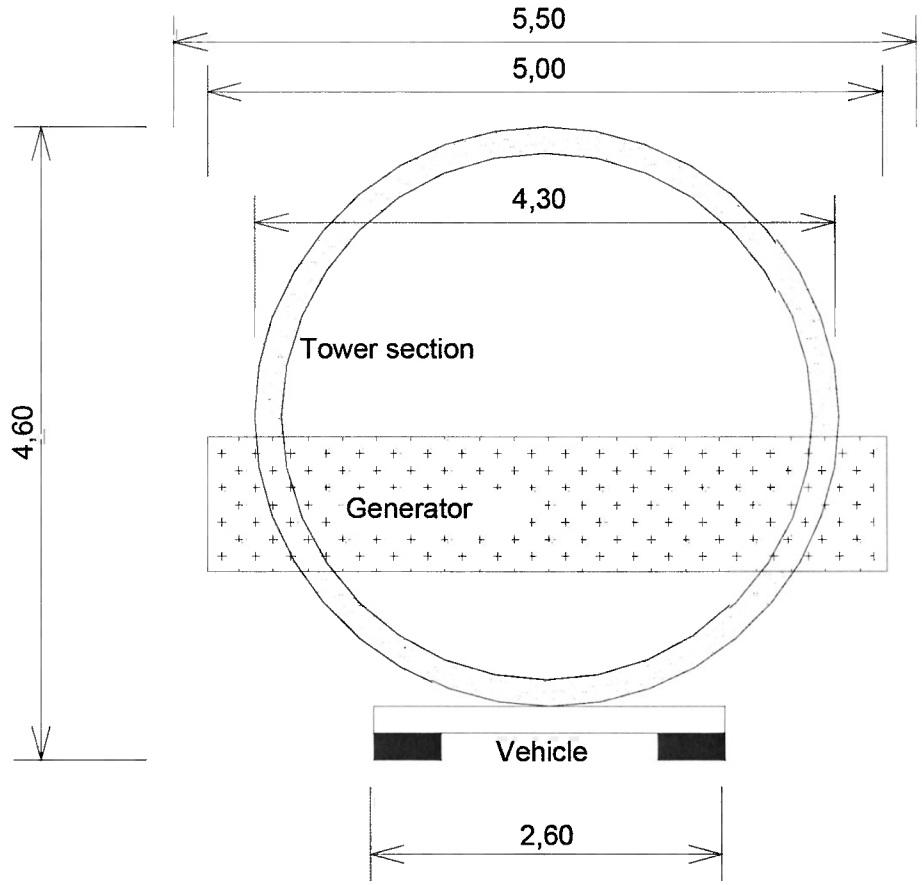
Useful width of carriageway	4 m
Clearance width	5.5 m
Clearance height	4.6 m
Radius of curve, external	28 m
Incline with loose surface	7%
Incline with fixed surface (paved)	12%
Ground clearance of transport vehicles	0.15 m

3.2. Example of access road construction



Caution:
The structure illustrated above is merely an example of average bearing soil. If the subsoil is soft (boggy soil, etc.), it may be necessary to use more backfill, install a geogrid and make use of gravel. ENERCON has always to be consulted prior to any construction work.

3.3. Transport structure clearance



3.4 Access road bearing capacity

In the case of cohesive soils, the use of a geotextile or geogrid is recommended, as this makes for better distribution of the load across the access road's subgrade. It will also increase the access road's service life and durability.
During construction, plate load bearing tests should be carried out to ensure that the necessary bearing capacity is achieved.

Data for soil experts:

Subsoil	$E_{v2} \geq 45$ MN/m²
Base course	$E_{v2} \geq 100$ MN/m²
Maximum axle load of transport vehicles	10t
Maximum axle load of crane	12t
Maximum vehicle weight	120t

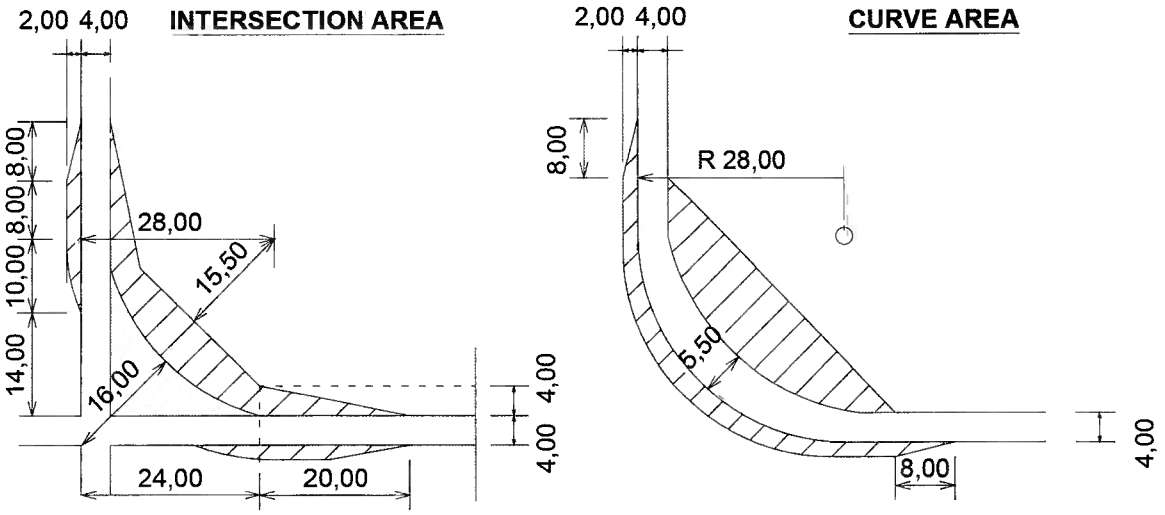
3.5. Basic principles of access road construction

- Useful carriageway width of 4 m
- Able to withstand an axle load of up to 12t
- Able to withstand an overall weight of up to 120t
- Carriageway width of 5.5 m on curves
- No obstacles on inside/outside of curves
- Clearance width of 5 m
- Clearance height of 4.6 m
- Checking of bridge bearing capacity
- Checking of outlets and pipework
- Checking of distances from graves, hollows and watercourses
- Checking of distances from high voltage/electrical/telephone cables and
- Inspection of inclines

4. Radii of curves

4.1. Minimum requirements of intersections and curves

In contrast to intersections, areas involving curves do not require the same degree of reinforcement, as the squinch does not need to be constructed.



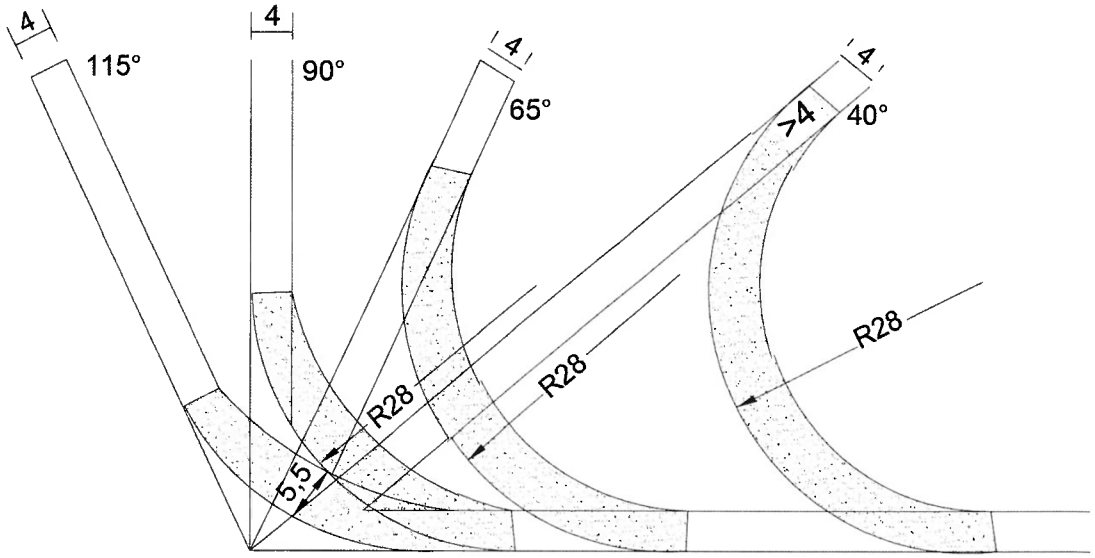
Intersections
The construction method for intersection areas as illustrated above should be used for existing intersections. The stippled area must be stable, or it will need to be reinforced.

The hatched areas have to be free of obstacles, as the load that is being transported may protrude into these areas (for example, rotor blades may protrude from the rear of the vehicle by 7 m during transport).

Curves
The construction method for curve areas as illustrated above should be used for new access roads within the context of any curves.
The hatched areas have to be free of obstacles, as the load that is being transported may protrude into these areas.

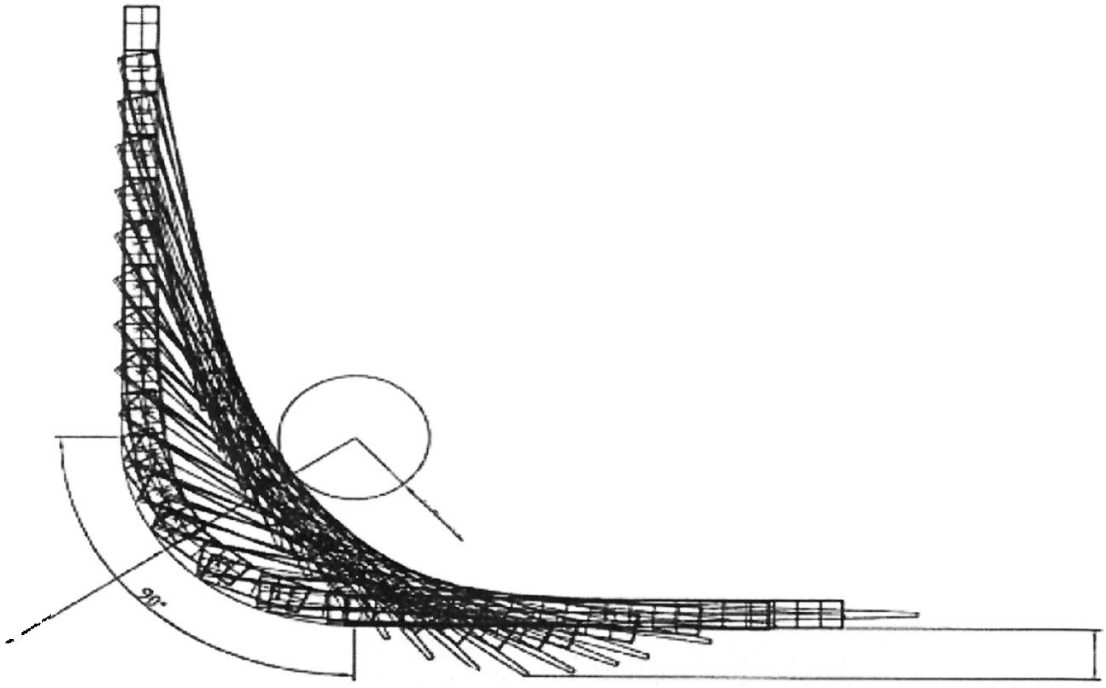
4.2. Radius of curve < 90 degrees

If the angle of the curve under construction is < 90 degrees, the curve moves outwards and the area associated with the necessary carriageway width of 5.5 m has to be enlarged accordingly (see marking). The load again protrudes into the inside and outside areas of the curve (see 4.1).



4.3. Road performance of vehicles in curves

The figure bellow illustrates the movement of blades as they are transported round a curve.



5. Transport and logistics

5.1. Basic principles of transport

It is a basic principle that transport vehicles should not exceed the maximum axle load of 10t. Thus, a transport vehicle with an actual overall weight of 100t has to have at least 10 axles.

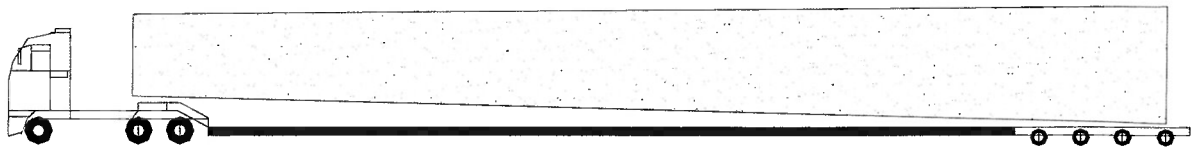
The following vehicles are used on ENERCON construction sites:

- Lowloader trailers
- Drop base vehicles
- Semi trailers and
- Adapter vehicles

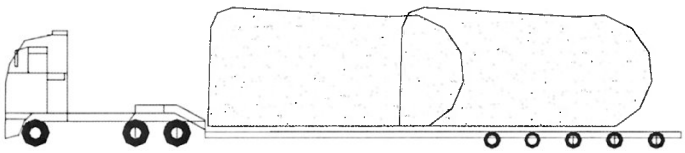
The vehicles vary to some extent in terms of length and width and can be shortened (pushed in) by several metres once they have been unloaded.

5.2. Overview of transport vehicles

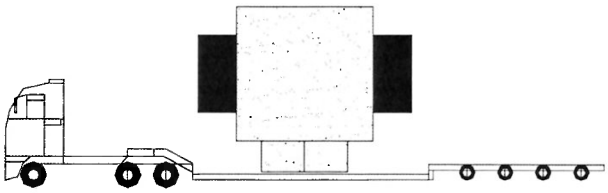
Semi trailer, steel section



Telescopic semi, machine house components

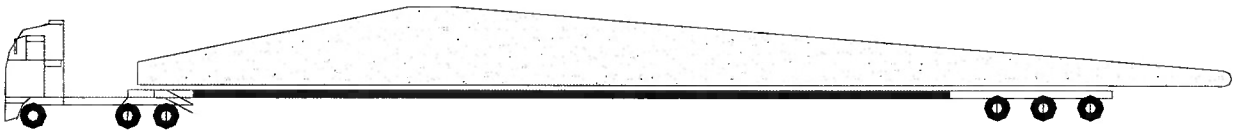


Flatbed trailer, hub



8-axled semi, generator

Semi trailer, rotor blade



6. Crane platforms

6.1. Minimum requirements of crane platforms

The crane platform is the key to ensuring that everything runs smoothly and safely during the construction phase.
It should take the form of a coarse, level surface with a top surface made from recycled materials or mixed minerals with a grain size of 0 – 32 mm.
The crane platform should be located above ground level to ensure that surface water is properly dispersed.
During construction, plate load bearing tests should be carried out to ensure that the necessary bearing capacity is achieved.

Any cranes used have a maximum support pressure of 200t and are supported on the crane platform by means of load distribution plates. Pressures of up to 18.5t/m² may act on the platform as a result of this and the maximum surface pressure is therefore **185 kN/m²**.

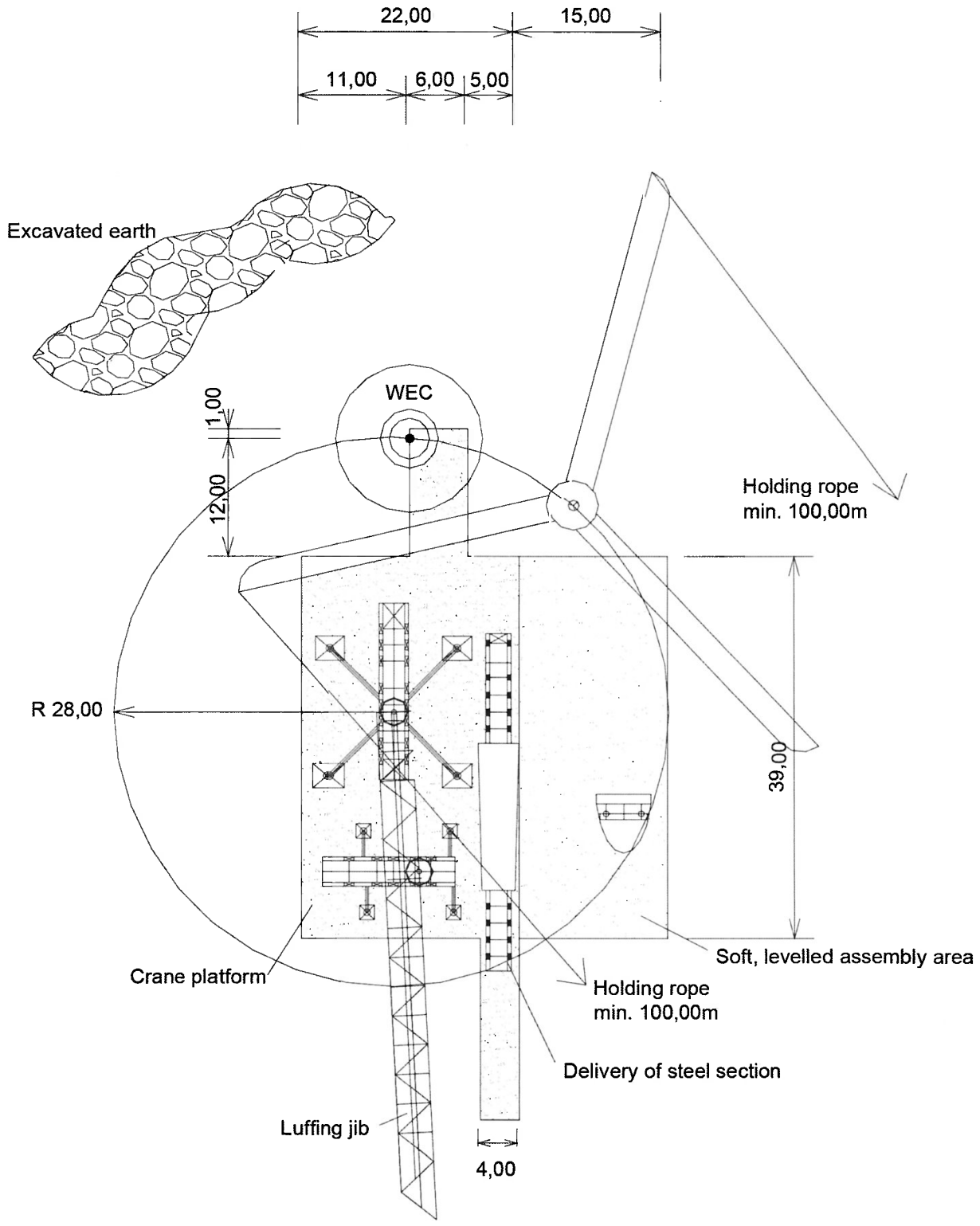
The dimensions of the crane platform should be calculated so that all the work necessary for installing the wind energy converter (including tower) can be carried out in the optimum manner.
The example given in 6.2 provides a basic standard. This can be adapted to local conditions in consultation with the competent ENERCON Project Manager.
The soft, levelled assembly area can be located either to the left or to the right of the crane platform.

To ensure that any components inside the tower can subsequently be replaced and to protect the wind energy converter against ingress of dirt, a 6 m wide and stable access road has to be constructed between the crane platform and the tower once the foundation has been backfilled.

During foundation construction, the crane platform also serves as a storage area for material (e.g. reinforced steel) and machinery.

Any excess earth excavated during the construction phase should always be stored behind the foundation (see 6.2).

6.2. Standard crane platform



APPENDIX 3

Flora and Fauna Assessment Tables and Figures
(EIS Volume II, Chapter 4)

Sub Appendices:

APPENDIX 3.1 Floral species list

APPENDIX 3.2 NPWS Site Synopsis

APPENDIX 3.3 Criteria for Evaluating Ecological Sites

APPENDIX 3.4 Openfield Flora and Fauna Chapter for EIS.

APPENDIX 3.5 Openfield Screening Assessment for EIS.

APPENDIX 3.6 Illustrative plates of onsite habitats.

APPENDIX 3.7 Revised habitat map for finalised wind farm layout.

APPENDIX 3.1

FLORAL SPECIES LIST

Appendix 3.1 – Species lists for surveyed habitats

Species indicated with an asterisk, *, are known to have been introduced to Ireland by humans.

Stone Walls – BL1		**DAFOR**
Hyacinthoides non-scripta	Bluebell	R
Lonicera periclymenum	Honeysuckle	O
Oxalis acetoselia	Wood-sorrel	O
Prunus spinosa	Blackthorn	O
Pteridium aquilinum	Bracken	O
Rubus fruticus	Bramble	A
Sedum anglicum	English stonecrop	O

Earth Bank – BL2		**DAFOR**
*Acer pseudoplantanus**	Sycamore	R
Achillea millefolium	Yarrow	O
Achillea ptarmica	Sneezewort	R
*Aesculus hipposcastanum**	Horse-chestnut	R
Anthoxanthum odoratum	Sweet vernal-grass	F
Arrhenatherum elatius	False oat-grass	F
Bellis perennis	Daisy	O
Blechnum spicant	Hard Fern	R
Brachythecium rutabulum	Rough-stalked feather-moss	O
Calluna vulgaris	Ling heather	R
Carex nigra	Common sedge	O
Cerastium fontanum	Common mouse-ear	O
Cirsium arvense	Creeping thistle	O
Cirsium vulgare	Spear thistle	O
Conopodium majus	Pignut	O
Corylus avellana	Hazel	O
Crataegus monogyna	Hawthorn	O
*Crocosmia x crocosmiflora**	Monbretia	O
Dactylis glomerata	Cock's foot	A
Dryopteris filix-mas	Male Fern	O
Festuca ruba	*Red fescue*	O
Filipendula ulmaria	Meadowsweet	F
Fraxinus excelsior	Ash	R
Galium aparine	Cleavers	O
Galium saxatile	Heath bedstraw	O
Hedera helix	Ivy	R
Holcus lanatus	Yorkshire-fog	F
Hylocomium splendens	Glittering wood-moss	O
Hypnum cupressiforme	Cypress-leaved plait-moss	O
Juncus effuses	Soft rush	O
Ligustrum vulgare	Wild privet	R
Lonicera periclymenum	Honeysuckle	O
Lotus corniculatus	Common bird's-foot-trefoil	O
Luzula campestris	Field wood-rush	O
Lythrum salicaria	Purple-loosestrife	O
Medicago lupulina	Black medick	O
Oxalis acetosella	Wood-sorrel	R
Pedicularis sylvatica	Lousewort	O
Phleum pratense	Timothy	O
Plantago lanceolata	Ribwort Plantain	O
Poa annua	Annual meadow-grass	O

Polygala vulgaris	Common milkwort	O
Potentilla anserine	Silverweed	O
Potentilla erecta	Tormentil	O
Primula vulgaris	Primrose	O
Quercus sp.	Oak	R
Ranunculus bulbosus	Bulbous buttercup	O
Ranunculus ficaria	Lesser Celandine	O
Ranunculus repens	Creeping buttercup	O
Rhytidiadelphus squarrosus	Springy turf-moss	O
Rhytidiadelphys triquetrus	Big shaggy-moss	O
Rubus fruticosus	Bramble	A
Rumex acetosa	Common sorrel	O
Salix cinerea	Grey willow	O
Senecia jacobaea	Common ragwort	R
Stelleria graminae	Lesser stitchwort	O
Taraxacum sp.	Danedlion	O
Ulex europaeus	Gorse	O
Urtica dioica	Common nettle	O
Vaccinium myrtillus	Bilberry	O
Veronica chamaedrys	Germander speedwell	O
Vicia cracca	Tufted vetch	F
Viola riviniana	Common dog-violet	O

Eroding/upland River – FW1	
Cladophoro sp.	Green algae
Hydrocharis norsus-ranae	Frogbit

Wet Heath – HH3		**DAFOR**
Calluna vulgaris	Ling heather	F
Centaurea nigra	Common knapweed	O
Cladonia sp.	Lichens	O
Erica cinerea	Bell heather	O
Eriophorum vaginatum	Hare's-tail cottongrass	O
Molina caerulea	Purple moor-grass	D
Marthecium ossifragum	Bog Asphodel	F
*Picea sitchensis**	Sitka spruce	R
Polytrichum commune	Common haircap	O
Potentilla erecta	Tormentil	O
Sphagnum sp.	Bog mosses	O
Spoil and bare ground – ED2		**DARFOR**
Anthoxanthum odoratum	Sweet vernal-grass	O
Digitalis purpurea	Foxglove	O
Epilobiom angustifoliom	Rosebay willowherb	O
Plantago lanceolata	Ribwort Plantain	O
Ranunculus repens	Creeping buttercup	O
Rubus fruticosus	Bramble	O
Rumex acetosa	Common sorrel	O
Ulex europaeus	Gorse	O

APPENDIX 3.2

NPWS SITE SYNOPSIS

SITE NAME: CRAGNASHINGAUN BOGS NHA
SITE CODE: 002400

Cragnashingaun Bogs NHA consists of a relatively large area of lowland blanket bog located 2 km south of Doo Lough and 11 km south-east of Quilty village in the townlands of Cahermurphy, Glenmore, and Doolough in west Co. Clare. The site is situated on the lower slopes of Cragnashingaun Hill and surrounds Lough Nacrag.

The summit of Cragnashingaun Hill consists of a mosaic of dry heath with occasional rocky outcrops. Intact lowland blanket bog occurs on the deeper peat lens adjacent to the river in the townland of Glenmore. The site is defined to the north west, north and north-east by forestry, to the south-east and south-west by cutaway bog and to the south by forestry and rushy fields. The site includes Lough Nacrag, a number of rivers and streams, areas of heath, cutaway bog and exposed rock. Altitude range on this site is from 110 m to 117 m. Bedrock geology is shale.

The slopes of Cragnashingaun Hill and surrounding Lough Nacrag are dominated by Purple Moor-grass (Molinia caerulea) with Hare's-tail Cottongrass (Eriophorum vaginatum), Common Cottongrass (Eriophorum angustifolium) and Ling Heather (Calluna vulgaris) with occasional Cross-leaved Heath (Erica tetralix), Tormentil (Potentilla erecta) and the lichens Cladonia portentosa and C. ciliata. Deergrass (Scirpus cespitosus) and Bog Asphodel (Narthecium ossifragum) are present on the wetter areas. Bog-myrtle (Myrica gale) and the bog mosses (Sphagnum papillosum and S. capillifolium) are all common while the moss Racomitrium lanuginosum is occasional.

(Drosera rotundifolia) and the Bog Moss (Sphagnum capillifolium). An abundance of Bog Asphodel and Carnation Sedge (Carex panicea) is found on wetter areas, while the moss Camplyopus introflexus is found on the banks of old cutaway. The margins of Lough Nacrag are characterised by quaking mats of bog moss with marginal vegetation of Cottongrasses and Bottle Sedge (Carex rostrata). Bogbean (Menyanthes trifoliata) and Water Lily (Nymphaea alba) occur in the lake. Remains of dried-out, shallow pools are present in the northern portion of the site and the bog surface is wet and quaking with abundant lichen cover (Cladonia portentosa). The banks of old cutaway areas below Cragnashingaun Hill are vegetated with Hard fern (Blechnum spicant), Ling Heather, cottongrasses and Purple Moor-grass with occasional lichen (Cladonia floerkeana), Soft Rush (Juncus effusus), Devil's-bit Scabious (Succisa pratensis), Tormentil and Bilberry (Vaccinium myrtillus). The lowland blanket bog at Glenmore is dominated by Ling Heather, Cottongrasses and Purple Moor-grass with occasional Bog Asphodel and Deergrass in hollows. There are frequent large hummocks of bog mosses (Sphagnum papillosum and S. subnitens) and the surface is wet and quaking. Lichens (Cladonia uncialis and C. portentosa) occur. The margins of this deep, wet bog have been burnt but are still very wet and dominated by bog moss, cottongrasses and Purple Moor-grass.

Hen Harrier nest nearby and use this site for hunting. Red Grouse and Common Frog are recorded. These are Irish Red Data Book species. Sand Martin use the peat banks of Lough Nacrag for nesting.

Landuse of machine and hand cutting of peat threaten both sites, as does drainage.

Conifer plantations surround both sites. Afforestation has significantly reduced blanket bog habitat in Co. Clare and its presence in the vicinity increases the potential for further habitat loss through the invasion of non-native seedlings and through possible hydrological impacts. There have been recent applications for wind power installation on both areas of bog and in surrounding areas. The blanket bog at Glenmore has been burnt in the recent past. Grazing pressure (mainly horses /donkeys) appears low. There is also some dumping of rubbish within the site. Cragnashingaun Bogs NHA is of considerable conservation value as it is a good example of both upland and lowland blanket bog in an area of the country where bog habitat is scarce. The site supports a diversity of flora and fauna within a range of blanket bog microhabitats. Blanket bog habitat is a globally scarce resource and is largely confined to coastal regions with cool, wet, oceanic climates at temperate latitudes. North-west Europe

contains some of the best developed areas of blanket bog in the world. The most extensive areas are found in Ireland, Britain and Iceland. Lowland blanket bog comprises less than 3% of the world's peatlands. In Europe this type of blanket bog is restricted to Ireland, Britain, Norway and Iceland. The lowland blanket bog that occurs in Ireland is considered to be an extreme hyperoceanic variant of the habitat type, found nowhere else in the world except on the coastal fringes of north-west Scotland.

SITE NAME: SLIEVECALLAN MOUNTAIN BOG NHA
SITE CODE: 002397

Slievecallan Mountain Bog NHA is an area of upland blanket bog located 9 km southeast of Miltown Malbay and 12 km north-east of Quilty village in west Co. Clare. The site is situated in the townlands of Boolinrudda, Glennageer, Letterkelly, Knockalassa, Magherabaun, and Doonsallagh East. It is surrounded by forestry plantations except on the south where it is bordered by re-vegetating cutover bog. The altitude range is between 300 m and 391 m and the bedrock geology consists of shale.

The blanket bog at the summit area of Slievecallan Mountain is dominated by Purple Moor-grass (Molinia caerulea), Hare's-tail Cottongrass (Eriophorum vaginatum), Common Cotton-grass (Eriophorum angustifolium) and occasional Tormentil (Potentilla erecta) and Devil's-bit Scabious (Succisa pratensis). There are shallow pools vegetated by Hare's-tail Cottongrass. The eastern slopes of Slievecallan have an abundance of hummocks colonised by Ling Heather (Calluna vulgaris), Purple Moor-grass, Bilberry (Vaccinium myrtillus), Hare's-tail Cottongrass and Common Cottongrass. Devil's-bit Scabious, Heath Wood-rush (Luzula multiflora) and Tormentil are occasional. This eastern area is characterised on the upper slopes by abundant hummocks of bog mosses Sphagnum subnitens and S. papillosum. Heath Rush (Juncus squarrosus) is present but very locally. The western side of the summit is dominated by low growing Ling Heather, Purple Moor-grass, Deergrass (Scirpus cespitosus) and cottongrasses. Hummocks of bog mosses (Sphagnum papillosum and S. subnitens) are frequent and the surface is wet and soft underfoot. Heath Milkwort (Polygala serpyllifolia), Tormentil, Devil's-bit Scabious, Carnation Sedge (Carex panicea) and Bilberry are occasional. The moss Racomitrium lanuginosum and lichens Cladonia ciliata, C. portentosa and C. uncialis are also present. A flushed area on the eastern slopes is vegetated by Purple Moor-grass, Devil's-bit Scabious and occasional rushes.

A small area of revegetating cutover with exposed peat banks is located near the summit. This area is vegetated by the moss (Racomitrium lanuginosum), the lichens (Cladonia portentosa, C. ciliata and C. uncialis), cottongrasses and Purple Moorgrass. Heath Milkwort and Bog Asphodel (Narthecium ossifragum) are frequent.

Irish Red Data Book species, Golden Plover (breeding pair) and Hen Harrier, occur on the site. There are remnants of old peat cutting, a drainage ditch and fresh quad bike tracks near the summit of the mountain. A large track is excavated on the lower slopes exposing bedrock. Forestry plantations encroach on the lower sloes of this mountain. Slievecallan Mountain Bog NHA is of considerable conservation value as it is a good example of an upland blanket bog. The site supports a diverse range of flora and fauna and is one of few intact areas of blanket bog in this part of the country. The mountain is a significant landmark in the locality and is of high scenic value. Blanket bog habitat is a globally scarce resource. It is largely confined to coastal regions at temperate latitudes with cool, wet, oceanic climates. North-west Europe contains some of the best-developed areas of blanket bog in the world. The most extensive areas are found in Ireland and Britain. Upland blanket bogs, due to their exposure to severe climatic conditions at high elevations, are particularly vulnerable to erosion by human activities and extensive areas are currently undergoing active erosion due mainly to overgrazing. The current area of intact upland blanket bog in Ireland represents only a fraction of the original resource, due to the combined impacts of afforestation and overgrazing, and intact examples are therefore extremely valuable for nature conservation. Their long-term survival requires sensitive management.

SITE NAME: CARROWMORE POINT TO SPANISH POINT AND ISLANDS
SITE CODE: 001021

This site extends along the Clare coastline from Spanish Point (3 km west of Milltown Malbay), in a south-south- westerly direction to Carrowmore Point. It comprises a strip of coastline, several offshore islands and rocks (notably Mutton Island), and the open marine water of Mal Bay between the islands and the mainland. Lough Donnell is a lagoon found near Carrowmore Point at the southern end of the site. Underlying the site are Carboniferous grits which are bedded at a low angle and which give rise to surf conditions in places along the coast. The headlands experience some of the most severe conditions of exposure in Ireland.

The site is a candidate SAC selected for lagoon and petrifying springs, both priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for other habitats listed on Annex I of the directive – perennial vegetation of stony banks and reefs.

A further range of marine and coastal habitats are represented on the site, including mud/sandflats, sand dunes, sandy, shingle and boulder beaches, clay and rocky sea cliffs, bedrock shores, the associated wetland communities of the lagoon and a short section of the Annageeragh River.

The priority habitat of petrifying springs with tufa formations is well represented at the site and occurs along the sea cliffs at the south end of Spanish Point beach. Species typical of tufa formations found at the site include Palustriella commutata, Cratoneuron filicinum, Eucladium verticillatum, Leiocolea turbinata and Pellia endiviifolia. The intertidal reefs have both good zonation of communities down the shore and excellent examples of communities which occur in areas very exposed to moderately exposed to wave action. Spanish Point holds a very high number of littoral reef communities (13 different community types). The low shore and subtidal fringe at both Spanish Point and Cloghaunicy Point have high species richness that ranged from 71 to 85 species. Subtidally, the area is important for its deep, exposed reef communities that are characterized erect sponges and the fragile sea fan Eunicella verrucosa. There are a number of rare species present including the sponge Tetilla zetlandica which has only known from 4 localities in Ireland between Galway Bay and the Kerry Head Shoal. Algal communities are well developed, with an excellent diversity of red and brown algae species.

Small sand dune systems are found near Spanish Point, about Lurga Point and further south. The northern dune system is somewhat degraded, while that near Lurga Point is less damaged and more stable, and includes areas of foredune and fixed dune.

Shingle banks are found at the base of cliffs and at the head of bays. Due to their exposure these support a sparse vegetation with species such as Sea Beet (Beta vulgaris subsp. maritima), Orache (Atriplex spp.), Sea Mayweed (Matricaria maritima) Silverweed (Potentilla anserina) and Sea-milkwort (Glaux maritima). This is an important habitat that is listed on Annex I of the EU Habitats Directive.

Lough Donnell is a shallow (generally <1 m), sedimentary lagoon. It has an impressive cobble barrier approximately 7 m high and 40 m wide, modified by installation of a large concrete tunnel which forms a permanent inlet/outlet. Seawater enters through this tunnel, perhaps on most tides and also by percolation through the barrier. A small river, the Annageeragh River enters the lagoon from the east. Salinity is assumed to be oligohaline as relatively large volumes of fresh water entering the lagoon appear to prevent appreciable amounts of seawater entering on most tides. Geomorphologically, Lough Donnell is a classic lagoon with one of the most impressive barriers in the country. Floristically, the most notable feature of the lagoon is the presence of the lagoonal specialist Beaked Taselweed (Ruppia maritima).

Marginal vegetation, which is best developed on the eastern and southern shores, consists mostly of Common Reeds (Phragmites australis), Bulrush (Schoenoplectus tabernaemontani) and Sea Club-rush (Scirpus maritimus). The faunal assemblage reflects the predominance of freshwater over marine influence throughout the lagoon.

A total of 32 aquatic faunal taxa were recorded of which 5 species are regarded as lagoonal specialists (Palaemonetes varians, Sigara stagnalis, Jaera nordmanni, Neomysis integer,

Notonecta viridis). Notonecta viridis is a rare brackish water species in Ireland. A Red Data Book plant species, Corky-fruited Water-dropwort (Oenanthe pimpinelloides), occurs along the Annageeragh River.

The stretch of coastline between Quilty and Lurga Point has extensive areas of mud/sand flats and supports nationally important bird populations. The following counts are average maxima over five winters 1994/95-1998/99: wintering Purple Sandpiper (239i), Dunlin (1540i), Turnstone (476i), Ringed Plover (170i) and Sanderling (189i). Other species which occur in winter include Grey Plover, Oystercatcher, Lapwing, Curlew, Redshank and Golden Plover.

The offshore islands, Mutton Island and Mattle Island, and rocks, Carrickaneelwar and Seal Rock are important for the seabirds that breed on them, i.e. Storm Petrel (Mutton Island and Mattle Island, the only colonies in Clare, though recent studies are uncertain), Cormorant (Mattle Island, 60p in 1990), Shag (Mattle Island and Mutton Island, c. 30p in 1990), Great Black-backed Gull, Lesser Black-backed Gull and Herring Gull. Mutton Island also holds an internationally important wintering flock of Barnacle Geese (c. 350 individuals in 1994, with up to 480 recorded previously). This species is also occasionally seen on Mattle Island and on adjacent parts of the mainland. A variety of 'terrestrial' birds, e.g. Skylark, Meadow Pipit, Rock Pipit, Pied Wagtail, Raven, Swallow, Wheatear, Stonechat, amongst others, also use the islands (mainly Mutton Island) and are presumed to breed there. Lough Donnell is used by a variety of birds, mainly waders (numbers in parentheses are based on a single count in one season between 1984/85 and 1986/87): Wigeon (16), Golden Plover (65), Grey Plover (12), Lapwing (170), Dunlin (65), Curlew (230) and Shag (52). Sand Martin nest in low clay cliffs to the north of the lake. Mutton Island and Mattle Island are designated Special Protection Areas for their birds; the former is also a Wildfowl Sanctuary. Barnacle Goose, Storm Petrel and Golden Plover are listed on Annex I of the E.U. Birds Directive.

Grey Seal are regular in the area and haul out on all of the islands. Mutton Island has a high density of Irish hares. The coastline around Spanish Point is an amenity and tourist resort and the sand dune system here has become degraded by overuse. Other areas of sand dune on the site have been damaged by overgrazing and erosion. The site contains a diversity of habitats, plant and animal communities and species and is notable for the occurrence of several habitats listed on Annex I of the E.U. Habitats Directive, namely reefs, lagoons and perennial vegetation of stony banks. The presence of a lagoon, a habitat accorded priority status on this annex, is of particular significance. The range of birds that use the site and the large populations of several of these that are found add considerably to the importance of the site.
Additionally, the site has been highly rated for the diversity of marine plant and animal species it supports.

SITE NAME: MID-CLARE COAST SPA
SITE CODE: 004182
This site extends along the Co. Clare coastline in a south-south-westerly direction from Spanish Point (3 km west of Milltown Malbay) to just west of Doonbeg Bay, a distance of some 14 km. It comprises the mainland shoreline, Mutton Island and Mattle Island, a series of rocky reefs and the open marine water of Mal Bay between the islands and the mainland. Underlying the site are Carboniferous grits which are bedded at a low angle and which give rise to surf conditions in places along the coast. The headlands and islands experience some of the most severe conditions of exposure in Ireland.
The mainland shoreline is mostly rocky or stony, though there are several sandy beaches and areas of intertidal flats. There are excellent examples of littoral reef communities, which have extremely high species richness and include uncommon species such as Paracentrotus lividus and Bifurcaria bifurcata. Sublittorally, the area is important for its deep, exposed reef communities that are characterized by unusual and delicate, erect sponges, including the fragile anthozoan Eunicella verrucosa, the rare sponge Tetilla zetlandica and the anthozoan Parazoanthus axinellae. Shingle or stony banks are found at the base of cliffs and at the head of bays. Due to their exposure these support a sparse cover of vegetation including such species as Sea Beet (Beta vulgaris subsp. maritima), Orache (Atriplex spp.), Sea Mayweed (Matricaria maritima), Silverweed (Potentilla anserina) and Sea-milkwort (Glaux maritima). Small sand dune systems are found near Spanish Point, about Lurga Point and further south.

The stretch of coastline between Quilty and Lurga Point has extensive areas of mud and sand flats and supports nationally important bird populations. Further intertidal flats occur at Doughmore Bay and Doonbeg Bay.

Mutton Island is a medium-sized, uninhabited, island situated approximately 1 km from Lurga Point. It is a fairly low-lying island, rising to 28 m in the west where some cliffs occur. The south and eastern shores are low-lying and comprised of cobbles and boulders. Several small sandy coves exist. Much of the interior of the island is unmanaged dry grassland with a maritime character. Some of the plants present reflect the past agricultural activities. Wet grassland also occurs and, in places, heath vegetation has developed. A small freshwater pond occurs on the island. The island is grazed in summer. A group of littoral reefs occur to the north, notably Carrickaneelwar and Seal Rock. Mattle Island is a small island situated approximately 2 km south of Mutton Island. It is a low-lying island, rising to only 12 m in the central area. The island is highly exposed to the force of the Atlantic Ocean. The terrestrial component of the island is dominated by maritime grassland.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Barnacle Goose, Ringed Plover, Sanderling, Purple Sandpiper, Dunlin and Turnstone. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.
The site is of ornithological importance for a range of both breeding and wintering birds. Storm Petrel has long been known to breed on Mutton Island, though there has never been a quantitative estimate and there is no recent proof of breeding. Rats are common on the island and if a colony still exists it is likely to be small. It is possible that Storm Petrel could also breed on Mattle Island but there is no proof of this. Mattle Island supports a nationally important breeding colony of Cormorant, with 60 nests present in May 1990. Both Mutton and Mattle have breeding Shag, estimated at less than 40 pairs in total in 1990. Both islands have nesting Herring Gull (probably less than 40 pairs) and Great Black-backed Gull (possibly up to 70 pairs), while Mutton Island has Lesser Black-backed Gull (24 pairs in 1995) and Common Gull (c. 10 pairs in 1995). Black Guillemot breed at least on Mutton Island (7 pairs in 1990). The nesting seabirds utilise the shallow waters which surround the island for foraging and socializing. An up-to-date survey of all breeding seabirds on the islands is required.

An important population of Barnacle Goose winters on Mutton Island, with birds occasionally visiting Mattle Island and feeding sites on the mainland. Mutton provides both feeding and roosting sites. The population is of national importance though at times exceeds the threshold for international importance (350 birds were present in spring 1994 and 215 in spring 1999). The mainland shore is important for wintering waders, especially Ringed Plover (316), Purple Sandpiper (393), Dunlin (2,708), Sanderling (272) and Turnstone (571) - figures given are average peaks for the 5 winters 1995/96-1999/00; all of these populations exceed the respective thresholds for national importance. Other species which occur in winter include Golden Plover, Grey Plover, Oystercatcher, Lapwing, Curlew and Redshank. Some of the waders may commute to the islands. The shallow seas are frequented by both Great Northern Divers and Red-throated Divers.
A variety of terrestrial birds occur on the island and are presumed to breed there. These include Skylark, Meadow Pipit, Rock Pipit, Pied Wagtail, Raven, Swallow, Wheatear and Stonechat.
Grey Seal occur regularly in the area and haul out on the islands. Mutton Island has a high density of hares, and also has rabbits and feral goats.
The presence of rats on Mutton Island, and possibly Mattle, is considered to be an important reason for the relatively low numbers of nesting seabirds. Grazing by goats and rabbits on Mutton Island could lead to soil erosion. Increase in the number of tourists to Mutton Island could also affect breeding birds. This site is of high ornithological importance. It supports a nationally important population of wintering Barnacle Goose, as well as nationally important numbers of five wader species. In summer it has nationally important breeding colonies of Cormorant and Great Black-backed Gull, as well as range of other seabird species. Storm Petrel may still breed. Of particular note is that Barnacle Goose, Storm Petrel, Golden Plover, Great Northern Diver and Red-throated Diver are listed on Annex I of the E.U. Birds Directive.
15.5.2007

APPENDIX 3.3

CRITERIA FOR EVALUATING ECOLOGICAL SITES

Table A1. Criteria used in assessing the ecological importance of ecological features. Adapted from NRA Criteria for accessing ecological sites (2006)

Importance	Criteria
International	An internationally designated site or candidate site (SPA, pSPA, SAC, pSAC, Ramsar Site, Biogenetic Reserve). Also Sites which qualify for designation as SACs or SPAs – this includes sites on the NGO shadow list of SAC's.
National[1]	A nationally designated site or candidate site (NHA, pNHA') (unfortunately there is no published criteria used in selecting these areas). Sites which hold Red Data Book (Curtis and McGough, 1988) plant species.
County	Sites which hold nationally scarce plant species (recorded from less than 65 10 km squares[2]), unless they are locally abundant. Sites which hold semi-natural habitats likely to be of rare occurrence within the county. Sites which hold the best examples of a semi-natural habitat type within the county.
High Local Importance	Sites which hold semi-natural habitats and/or species likely to be of rare occurrence within the local area. Sites which hold the best examples of a high quality semi-natural habitat type within the local area.
Local Importance	Sites which hold high quality semi-natural habitats
Local Value	Any semi-natural habitat

[1] the island of Ireland.

[2] based pro-rata on the British criteria of 100 10 km squares (JNCC, 1995).

Table A2. Criteria for assessing the impact significance of terrestrial sites (taken from NRA, 2006)

Impact Level	A Sites Internationally Important	B Sites Nationally Important	C Sites High Value, Locally Important	D Sites Moderate Value Locally Important	E Sites Low Value, Locally Important
Severe negative	Any permanent impacts	Permanent impacts on a large part of a site	-	-	-
Major negative	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	-	-
Moderate negative	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	-
Minor negative	-	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site
Neutral	No impacts	No impacts	No impacts	No impacts	Permanent impacts on a small part of a site
Minor positive	-	-	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site
Moderate positive	-	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	-
Major positive	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of the site	-	-

Table A3. Criteria for assessing the impact significance of aquatic sites (taken from NRA, 2006).

A Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Major	Severe	Severe	Severe
Localised	Major	Major	Severe	Severe

B Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Major	Major	Severe	Severe
Localised	Moderate	Moderate	Major	Major

C Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Moderate	Moderate	Major	Major
Localised	Minor	Moderate	Moderate	Moderate

D Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Minor	Minor	Moderate	Moderate
Localised	Not significant	Minor	Minor	Minor

E Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Not significant	Not significant	Not significant	Not significant
Localised	Not significant	Not significant	Not significant	Not significant

In line with the EPA Guidelines (EPA 2002) the following terms are defined with quantifying duration:

Temorary: up to 1 year

Short-term: from 1-7 years

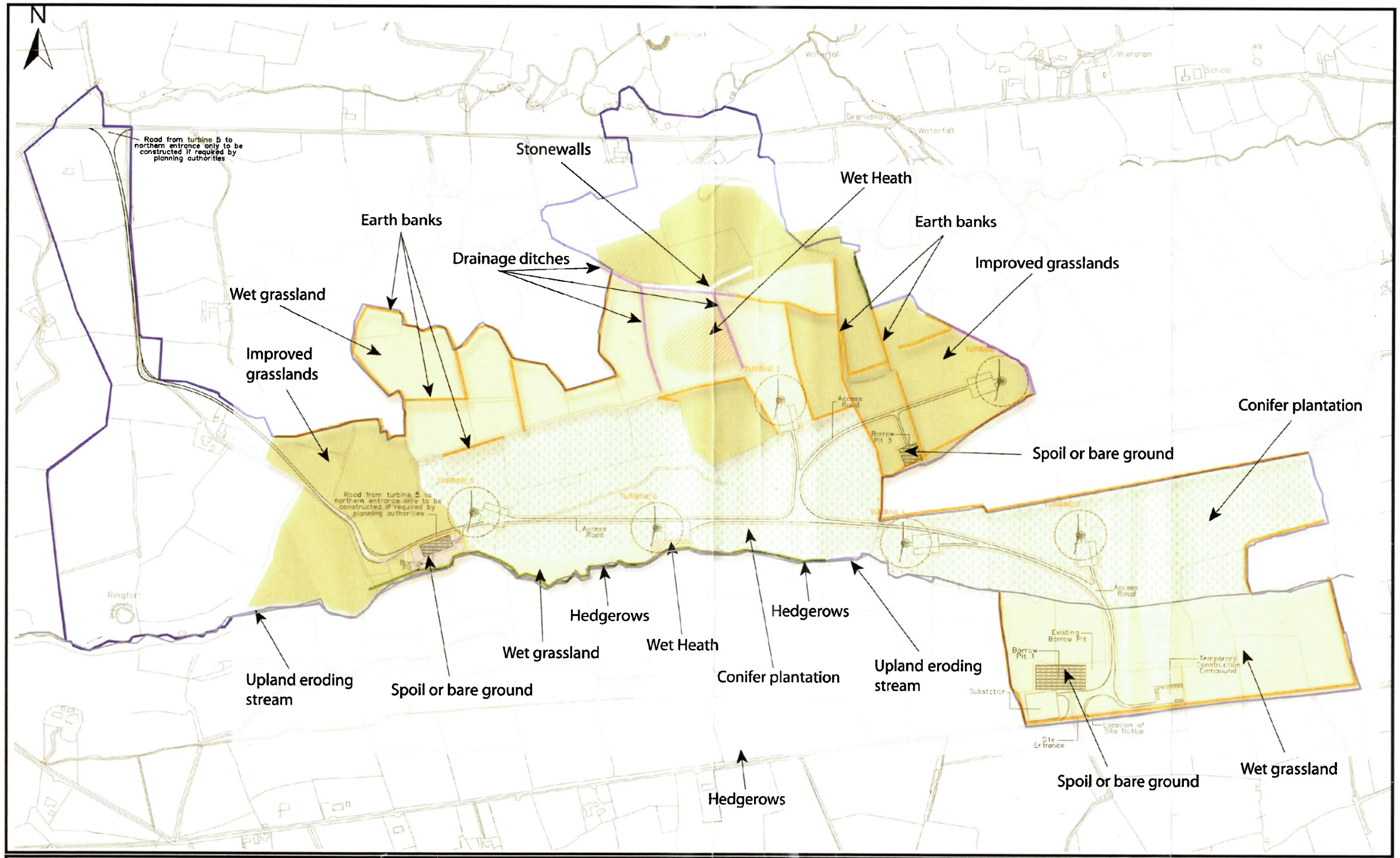
Medium-term: from 7-15 years

Long-term: 15-60 yreas

Permenant: over 60 years

APPENDIX 3.7

Revised habitat map for finalised wind farm layout.



COOR SHANAVOGH
PROPOSED WIND FARM

HABITAT MAP
2011

N

- Landholding boundary
- Earth banks
- Drainage ditches
- Upland eroding stream
- Hedgerows
- Stonewalls

Figure 1. Habitat map 2011.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

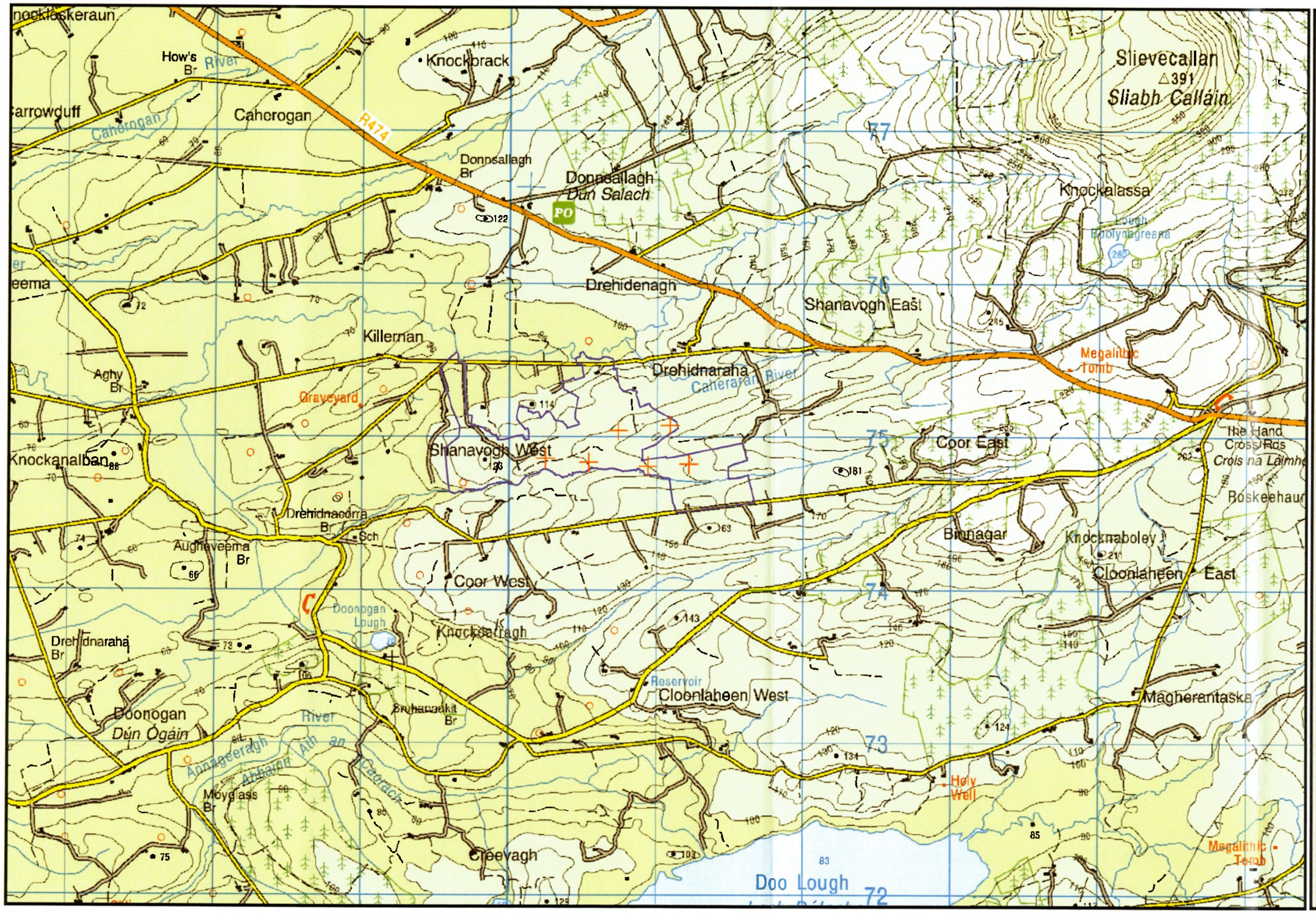
Inis

APPENDIX 4

Avifauna Maps

(EIS Volume II, Chapter 5)

AVIFAUNA FIELD SURVEY MAPS SCHEDULE	
Figure 1	Site location, local context
Figure 2	Raptor flightlines November 2010 to February 2011
Figure 3	Wildfowl flightlines November 2010 to February 2011
Figure 4	Merlin survey 2010 & 2011
Figure 5	Walkover birds survey November 2010
Figure 6	Walkover birds survey December 2010
Figure 7	Walkover birds survey January 2011
Figure 8	Walkover birds survey February 2011



COOR SHANAVOGH PROPOSED WIND FARM

LOCAL CONTEXT

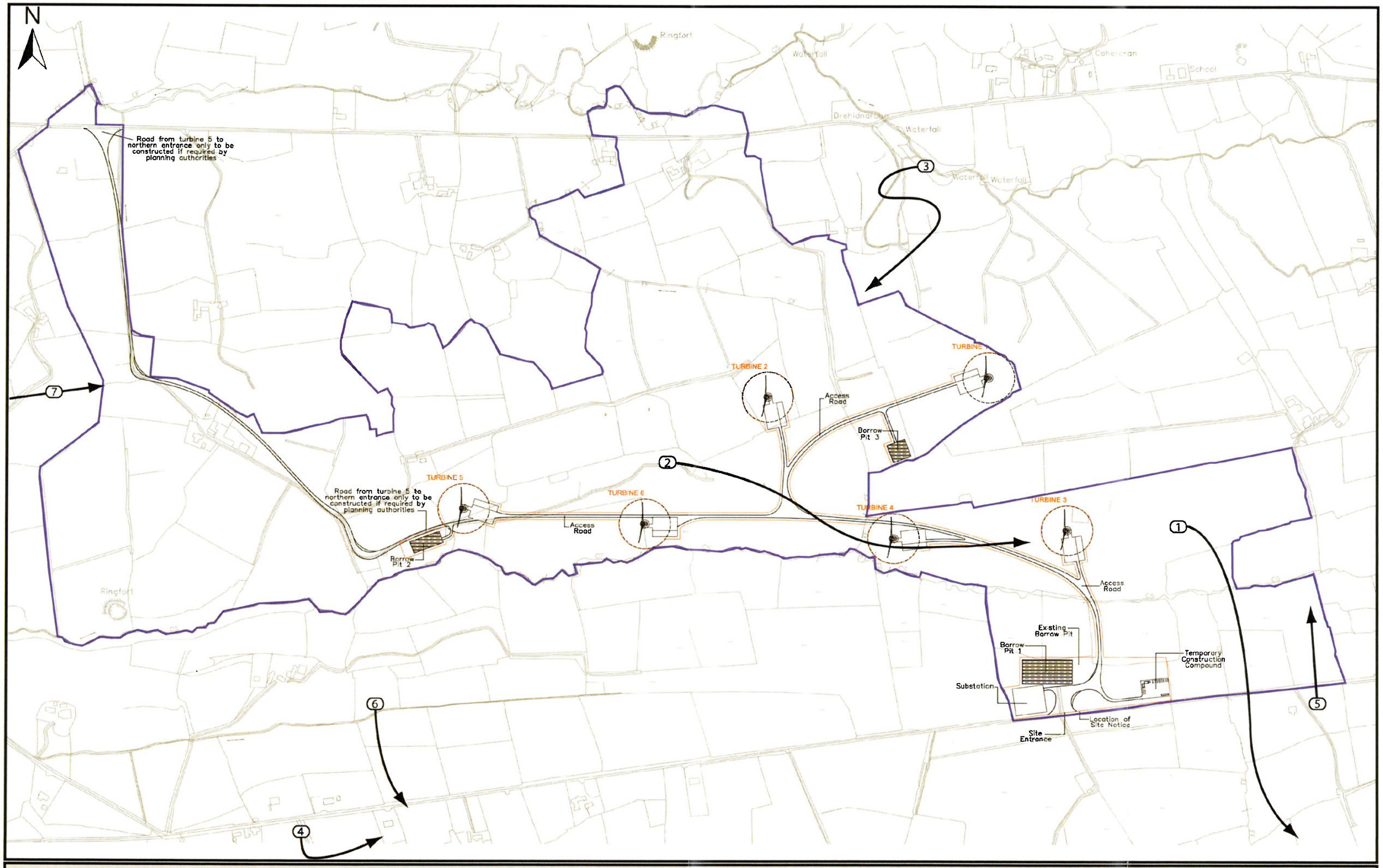
N

Figure 1. Site location, local context.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

RAPTOR FLIGHTLINES 2010/11
NOVEMBER-FEBRUARY

N

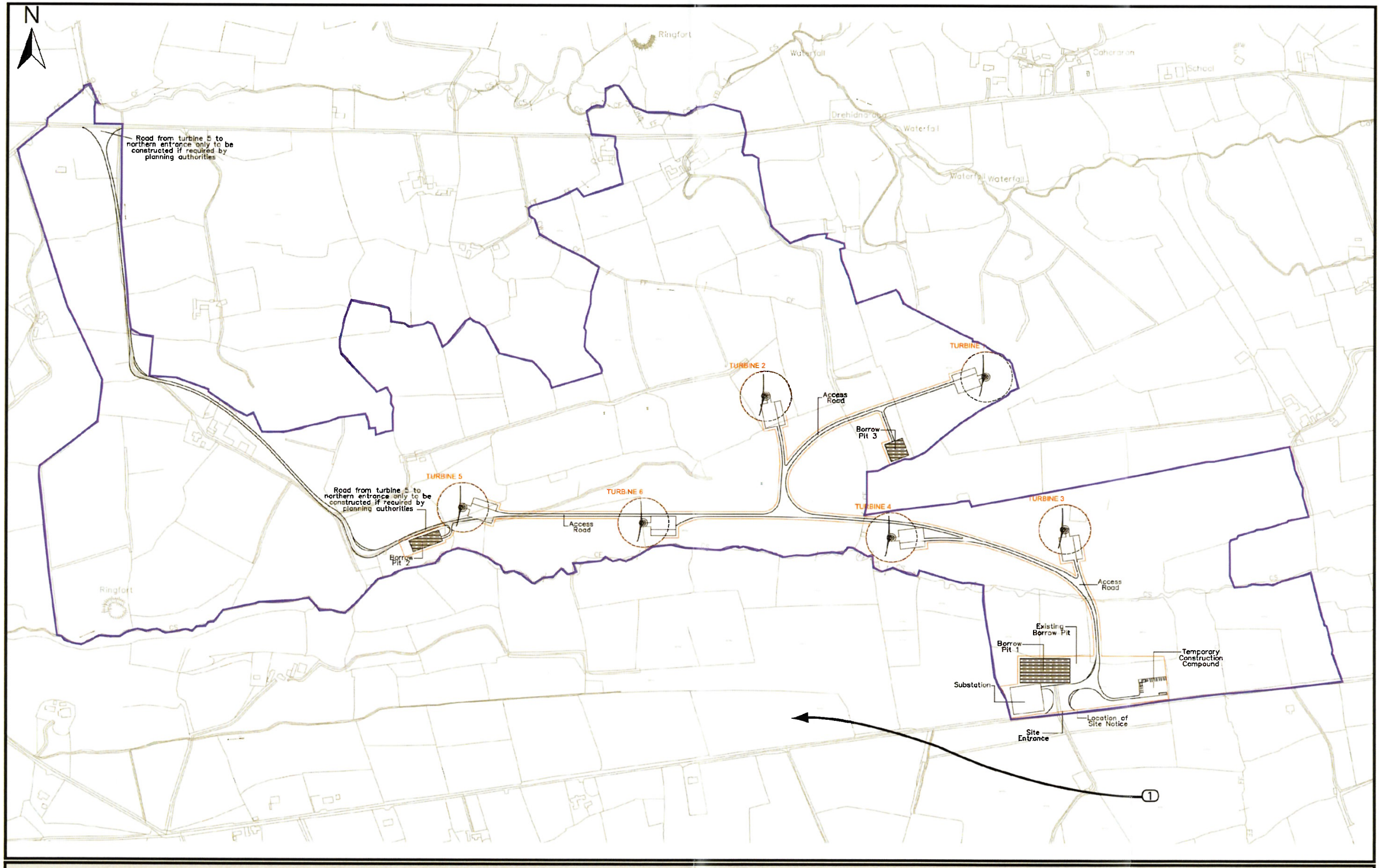
Raptor flightlines

Figure 2. Raptor flightlines November & February 2010/11.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

WILDFOWL FLIGHTLINES 2010/11
NOVEMBER-FEBRUARY

N

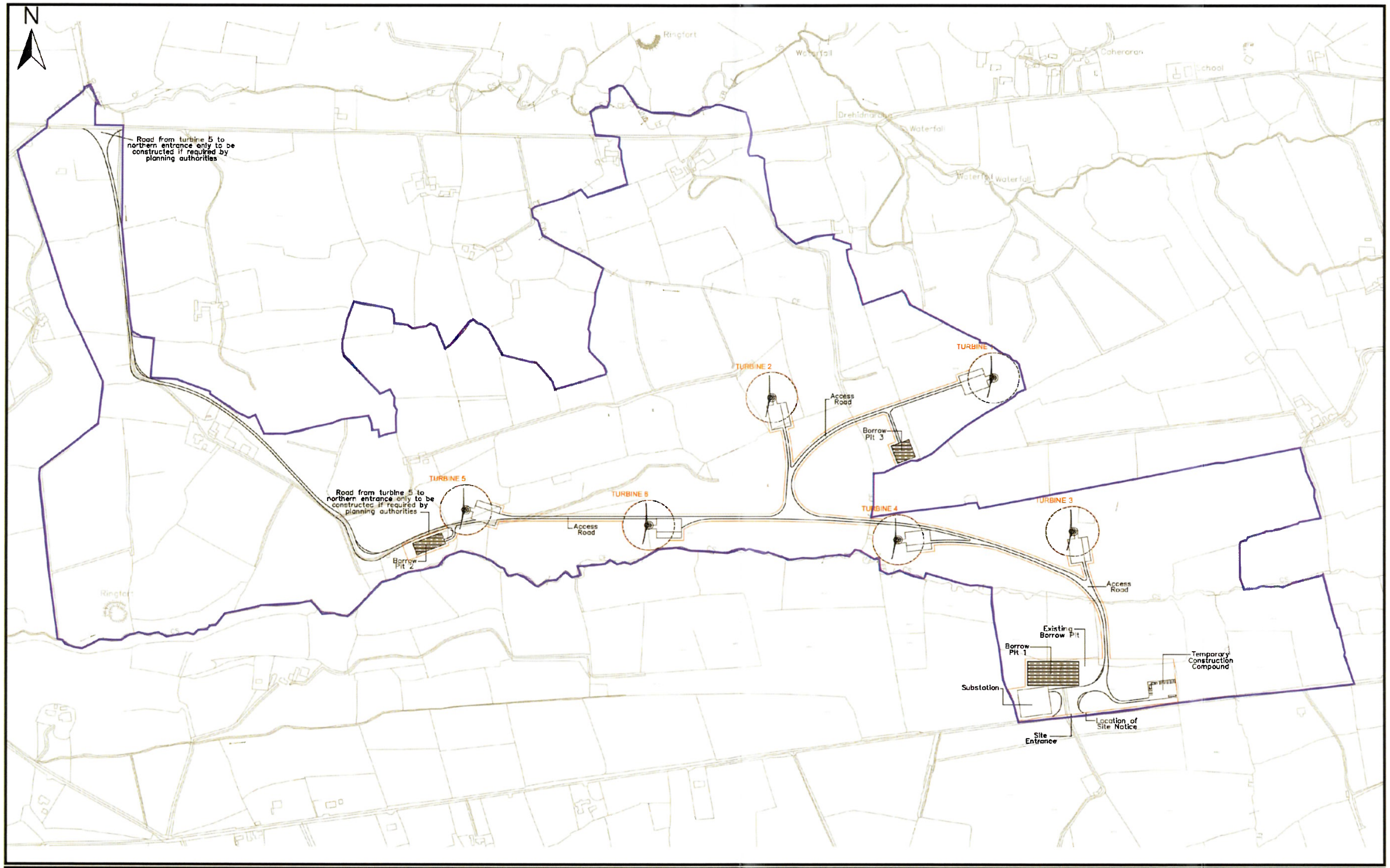
Raptor flightlines

Figure 3. Wildfowl flightlines November & February 2010/11.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

MERLIN SURVEY
JANUARY 2011

N

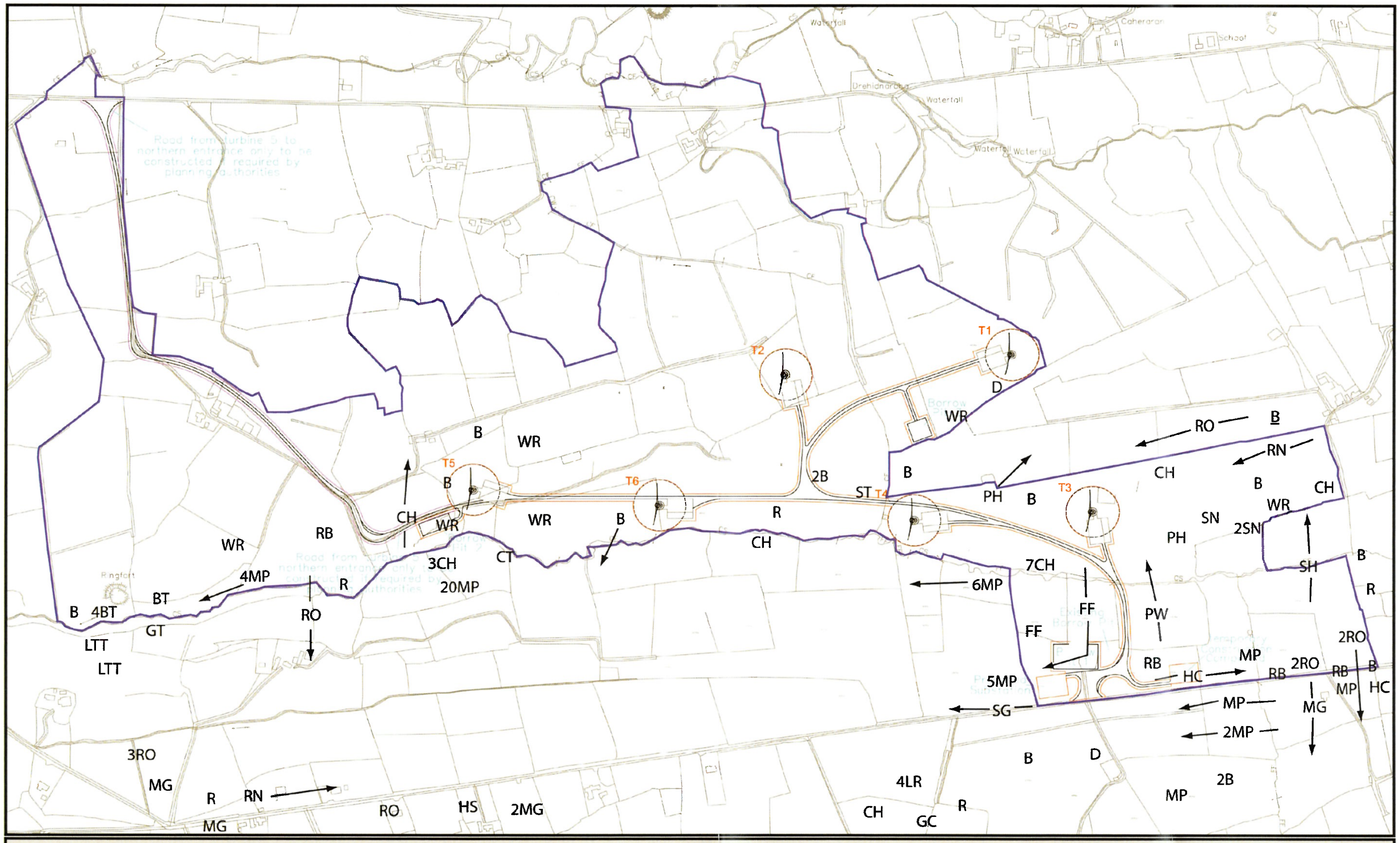
'NIL SIGHTINGS'

Figure 4. Merlin survey 2011.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

WALKOVER BIRD REGISTRATIONS
NOVEMBER 2010

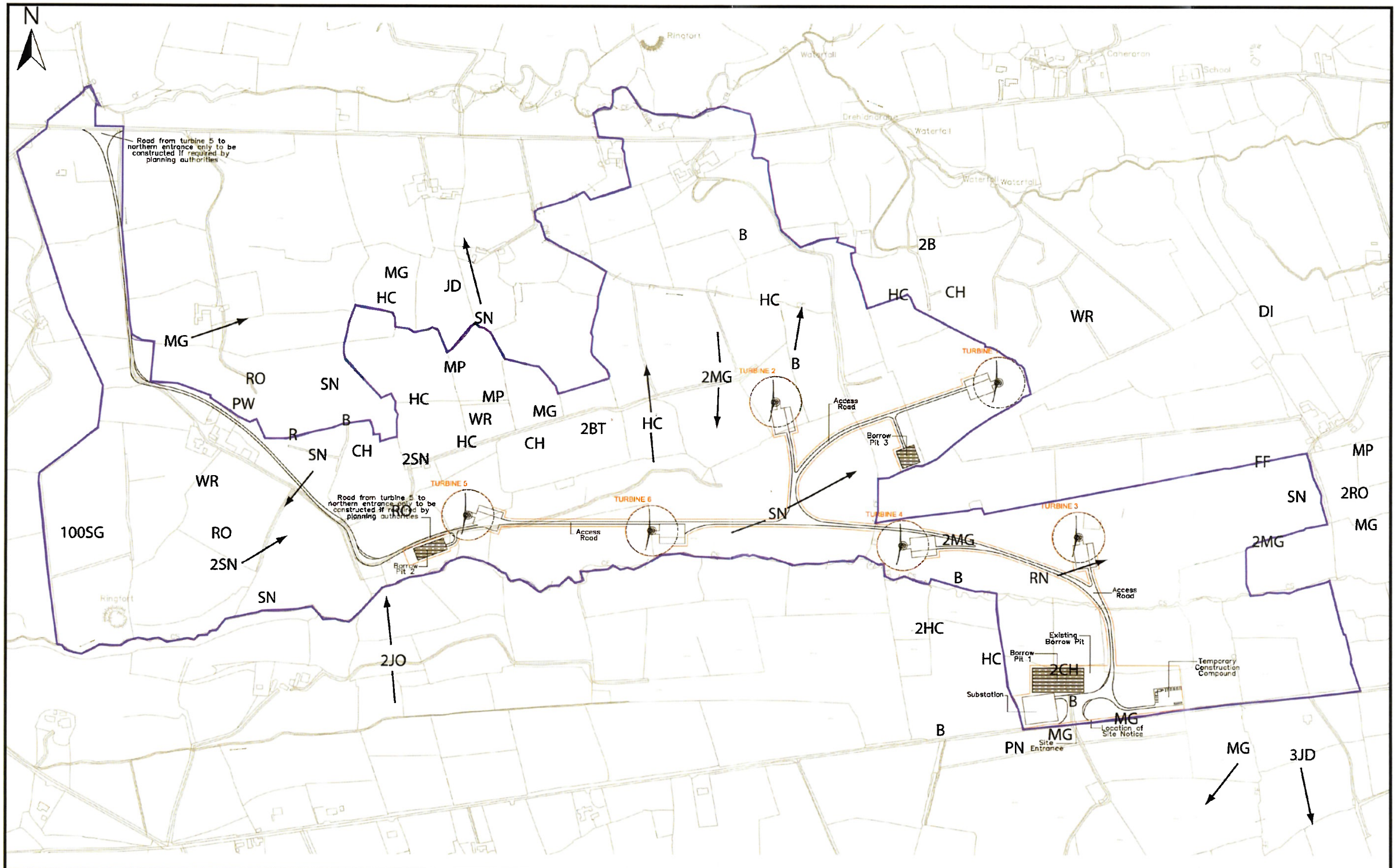
N

Figure 5. Walkover bird registrations November 2010.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

WALKOVER BIRD REGISTRATIONS
DECEMBER 2010

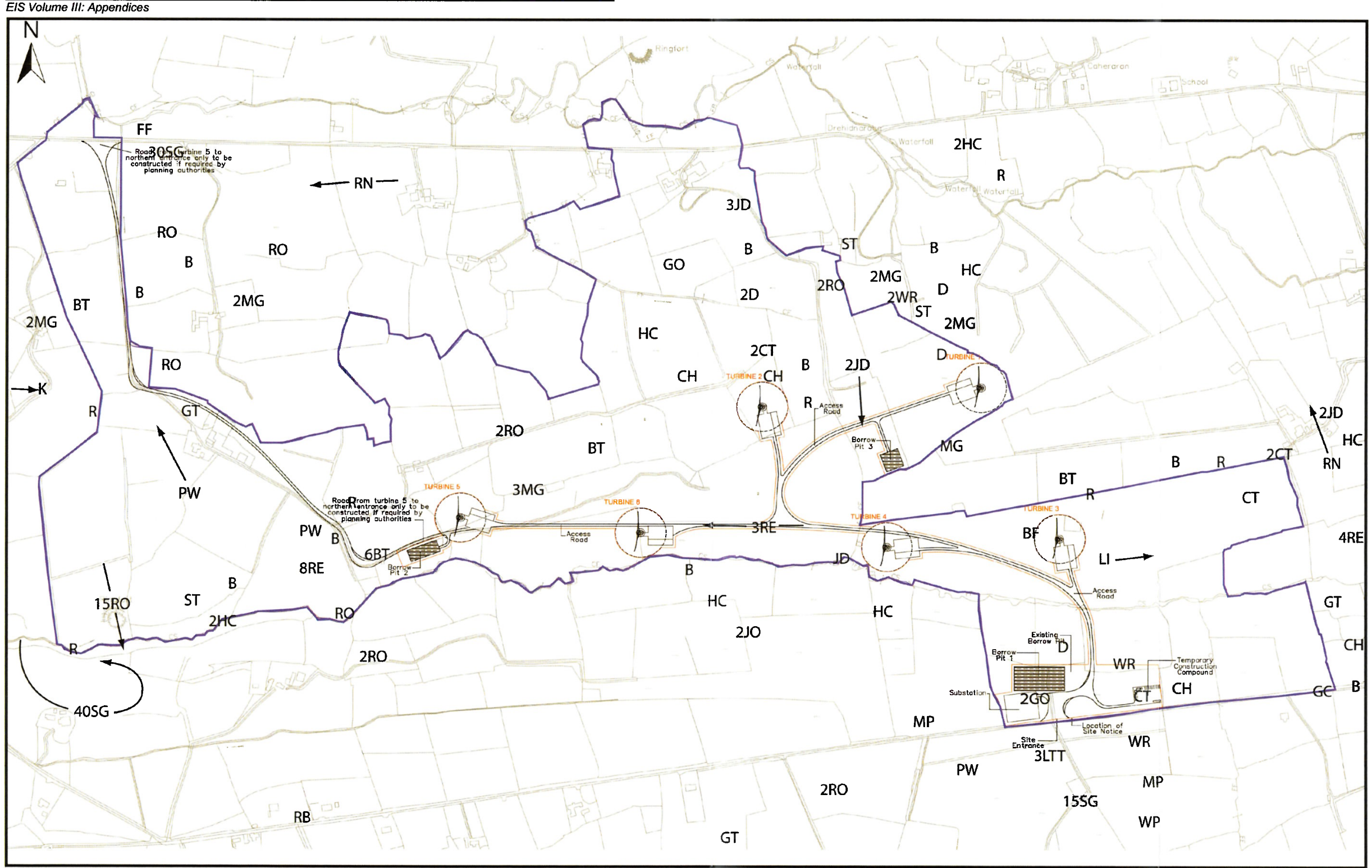
N

Figure 6. Walkover bird registrations December 2010.

Not to scale; for illustration purposes only

Map produced by INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

WALKOVER BIRD REGISTRATIONS
JANUARY 2011

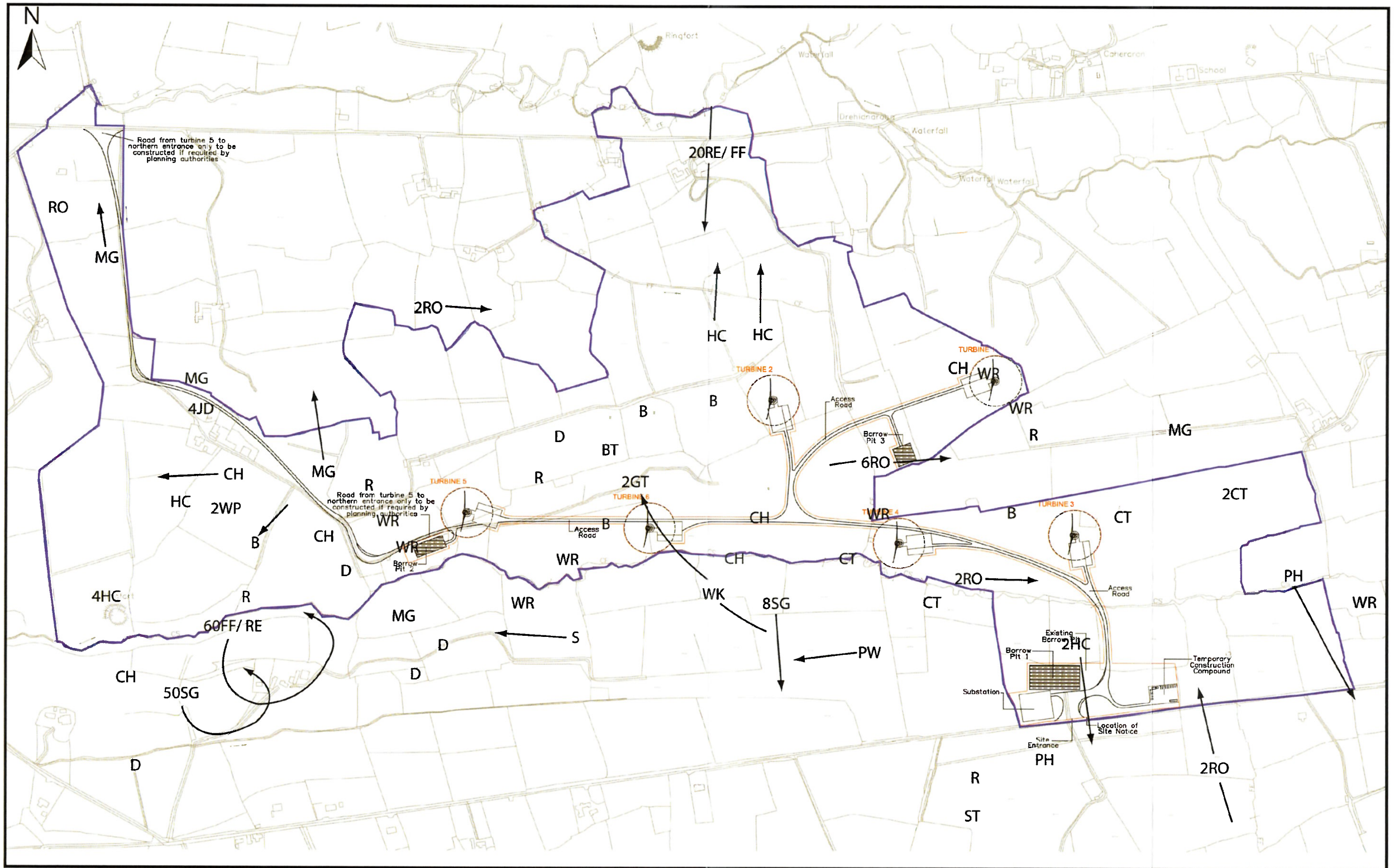
N

Figure 7. Walkover bird registrations January 2011.

Not to scale; for illustration purposes only

Map produced by
INIS Environmental Consultants Ltd

Bird Survey IRELAND



COOR SHANAVOGH
PROPOSED WIND FARM

WALKOVER BIRD REGISTRATIONS
FEBRUARY 2011

N

Figure 8. Walkover bird registrations February 2011.

Not to scale; for illustration purposes only

Map produced by
INIS Environmental Consultants Ltd

Bird Survey IRELAND

APPENDIX 5

MosArt Ltd., VRP Selection Report

Coor Wind Farm, Co. Clare

Viewshed Reference Point Selection Report

for

Paddy Donovan

January 2011

Prepared by MosArt Ltd
Block 6, Broomhall Business Park, Wicklow Co Wicklow , Tel 040425777, www.mosart.ie

Viewshed Reference Point (VRP) Selection

Introduction

This report provides a rationale for the selection of viewshed reference points (VRP's) for the proposed Coor wind farm, which is located to the south west of Slievecallan Hill in Co. Clare. This project comprises 6 No. turbines with a blade tip height of over 100m. The VRP selection is based on computer generated visibility modeling, a desk survey and subsequent field work and uses a set of pre-established criteria to determine the likely relevance and sensitivity of each view.

Methodology

Generation of a *Zone of Theoretical Visibility*

Macroworks Ltd. carried out a computer automated study of the zone of theoretical visibility (ZTV). The purpose of this exercise is to identify the **'theoretical'** extent and degree of visibility of turbines. This is a theoretical exercise because it is based on topography only at 10m contour intervals and does not allow for intermittent screening provided by, for example, hedgerows, forests or buildings and does not involve the actual height of crests (but using the nearest 10m contour below). Thus the ZTV map, assuming no screening, represents a **worse than 'worse-case-scenario'** with respect to viewing exposure. For the purposes of this project a 20km radius study area was used for the ZTV in accordance with the DOEHLG Wind Energy development Guidelines (2006) for turbines in excess of 100m overall height.

Identification of Viewshed Reference Points as a Basis for Assessment

The results of the ZTV analysis provide the basis for selection of key viewpoints from which to study the visual and landscape impact of the proposed wind farm in detail. It is not warranted to include each and every single location that provides a view of the development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the project. Instead, the assessors endeavoured to select a variety of location types that would provide views of the proposed wind farm from different distances, different angles and different contexts. These locations are significant because they comprise, for example, centres of population and important communication routes whether due to traffic volume or their scenic value. An initial broad set of potential views is generated from a desk study using the ZTV map. Each potential VRP is colour coded to identify which of the following receptor types it represents;

- Key Views - from features of international or national importance;
- Amenity Views from important heritage or amenity locations;
- Designated Scenic Routes and Views;
- Local Community views;
- Centres of Population; and
- Major Routes.

Some VRP's may be applicable to several receptor categories, in which case, they will be assessed under the group that best reflects that location's particular sensitivities.

Fieldwork is then undertaken using the broad set of potential VRP's in order to systematically identify those that will actually provide a view of the proposed wind farm and those from which potential views are screened by vegetation or structures. This process involves the use of wireframe images of the proposed turbines within the terrain context of each potential VRP location. It is also an opportunity to experience the character and features of each location and make initial value judgements in relation to the sensitivity and therefore the significance of each VRP. The actual VRP used to carry out the assessment for a given location may not be at the centre of a town or village or fall within a particular designation in a County Development Plan. The VRP is used to represent such areas, locations or routes that are close by but which perhaps do not provide as clear a view. Where two or more potential VRP's are within close proximity to each other, the most sensitive VRP may be selected in lieu of the others to represent the visual impact from that general viewing distance and angle.

VRP selection by other Agencies

It is a common occurrence that VRP locations are suggested or required by Statutory or non-Statutory bodies with stakeholder interest in the site. The most likely source of VRP selection input is from the Local Authority that will assess the planning application or surrounding Local Authorities that may be impacted by the proposal. VRP locations may also be requested by An Taisce or other tourism, heritage or conservation groups with an interest in the area. If a third-party proposes a VRP, it can be evaluated for inclusion.

Final VRP selection and use

The VRP's selected at this stage of the project are those from which MosArt intend to assess the landscape and visual impacts of the proposal within the context of the project EIS. Notwithstanding, this VRP selection report is intended as a discussion document and VRP locations may be added to or removed from this set in consultation with the Planning Authority.

Table 1 provides the grid coordinate location of the selected VRP's for the Coor Wind Farm. The panoramic photographs included thereafter represent each of the selected VRP locations and can be used in conjunction with the grid reference coordinates by the Visualization Specialist to find the precise location of the VRP and to capture their own images required for photomontages.

Coor Wind Farm, Co. Clare

Table 1: Outline Description of Selected Viewshed Reference Points (VRP)

VRP No.	Location	National Grid Coordinates (Eastings and Northings)	Direction of View
DR1	R478 at Cliffs of Moher Car Park	104004.52/ 192261.92	SE
DR2	R474 at Drehidenagh	110428.63/ 176275.37	S
AF1	Burren Way east of Cliffs of Moher	104972.50 / 192502.49	SE
AF2	Seafield Harbour	99572.68/ 174076.23	E
AF3	Dunbeg Golf Club	98628.42/ 167082.45	NE
AF4	Killard Beach west of Dunbeg	95291.02/167394.43	NE
LC1	Local Road to north west of site	107783.60/176046.70	SE
LC2	Local Road at Coor	110473.00/174419.27	N
LC3	Local Road to south west of site	108771.01/173579.02	NE
LC4	Mullagh village	104823.45/172949.87	NE
LC5	Local Road to south of Doo Lough	111061.15/171551.34	N
CP1	Milltown Malbay	105002.25/178623.71	SE
CP2	Spanish Point	103475.06/178078.76	SE
CP3	Quilty	102045.13/175138.87	E
CP4	Doonbeg	97980.22/165704.47	NE
MR1	N67 at Craggaknock	102398.74/169806.84	NE
MR2	N68 at Knockaderren	107039.22/159437.48	N

Table 2: Outline Description of Rejected Viewshed Reference Points (VRP)

VRP No.	Location	Direction of potential view	Initial selection criteria(Desk Study)	Rejection Rationale (From Fieldwork)
A	Local Road at Annagh Cross Roads	E	*Local Community*	*Limited visibility due to local topography and planting*
B	N67 at Kilmurry	NE	*Major Route*	*Similar Aspect to MR1*
C	Mid Clare Way at Lough Nammina	NW	*Designated walking route*	*No views of site due to intervening conifer plantation*
D	Creegh	NE	*Centre of Population*	*Limited visibility due to local topography and planting*
E	Cooraclare	NE	*Centre of Population*	*Limited visibility due to local topography and planting*

Designated Routes

DR1 R478 at Cliffs of Moher Car Park

DR2 R474 at Drehidenagh

Amenity Features

AF1 Burren Way east of Cliffs of Moher

AF2 Seafield Harbour

AF3 Dunbeg Golf Club

AF4 Killard Beach

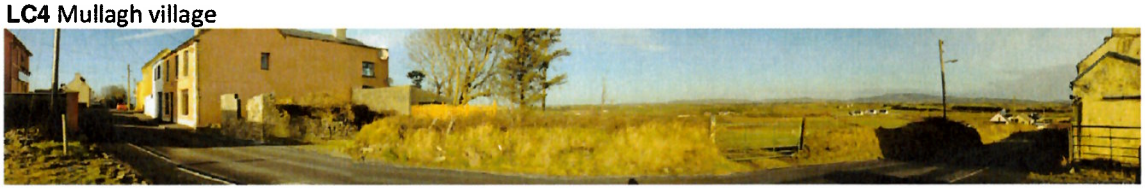
Local Community Views

LC1 Local Road to north west of site

LC2 Local Road at Coor

LC3 Local Road to south west of site

LC4 Mullagh village



LC5 Local Road to south of Doo Lough

Centres of Population

CP1 Milltown Malbay

CP2 Spanish Point

CP3 Quilty

CP4 Doonbeg

Major Routes

MR 1 N67 at Craggaknock

MR2 N68 at Knockaderren

APPENDIX 6

AGEC Ltd., Soils & Geology Assessment Figures
(EIS Volume II, Chapter 7)

Figure 7.1 Subsoil's Geology Plan.
Figure 7.2 Bedrock Geology Plan.
Figure 7.3 Borrow Pit Location Plan.