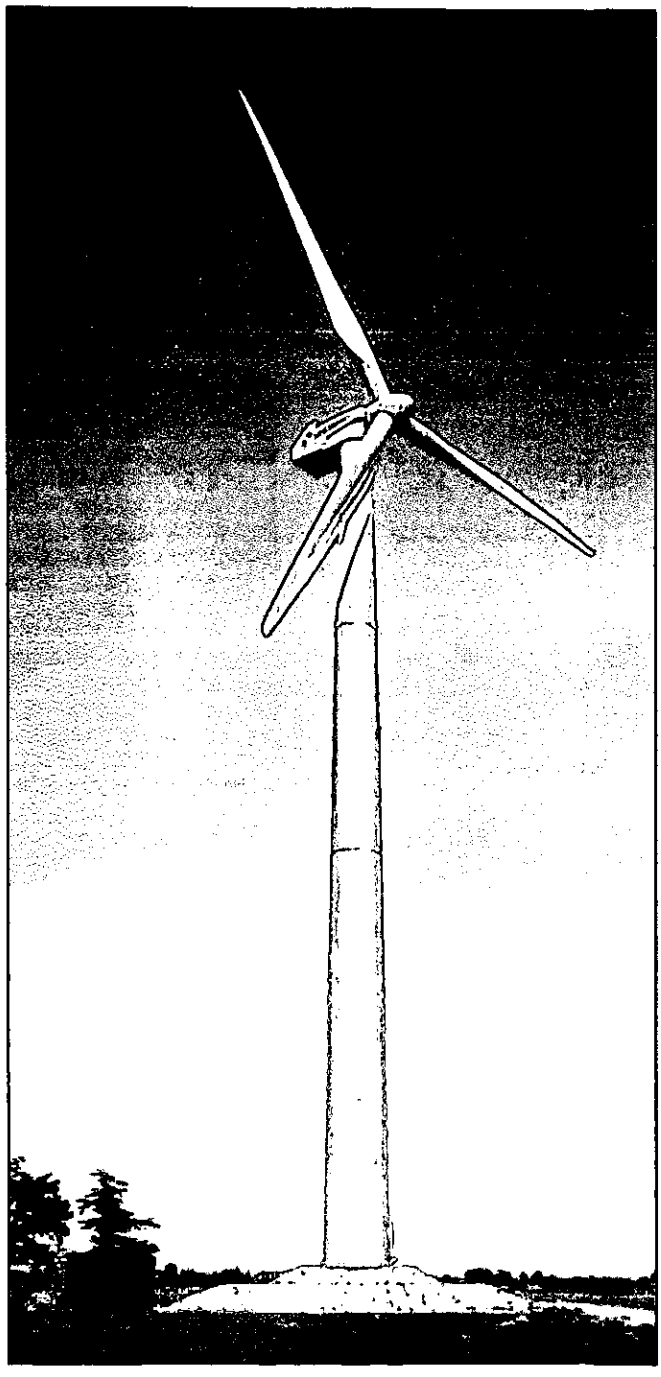
NEW ENERGY Developments

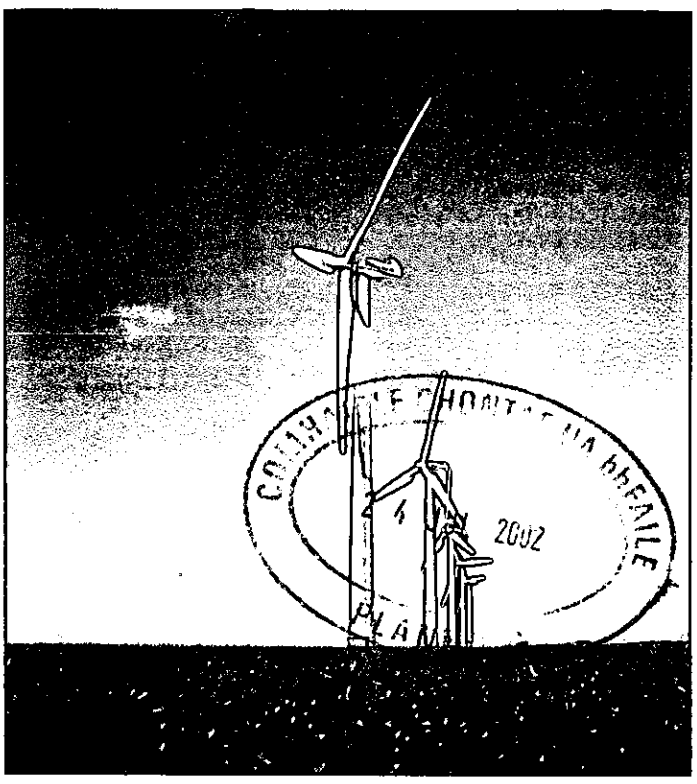
renewable energy development and consultancy

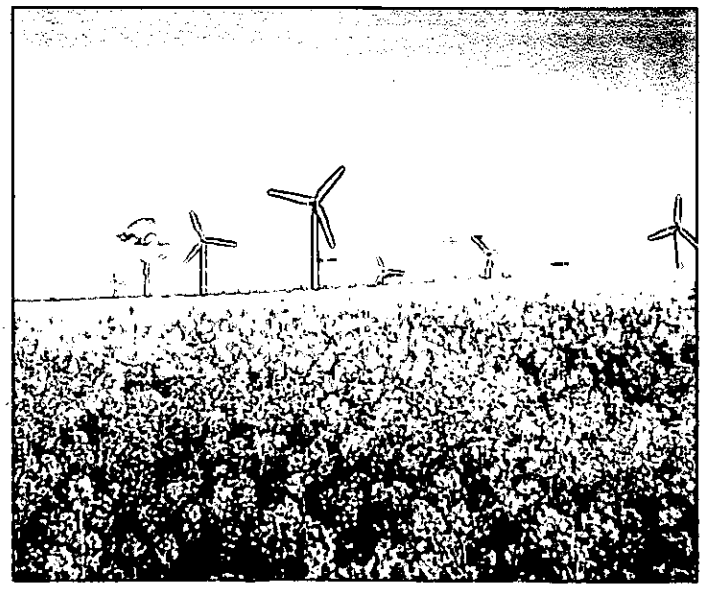
Planning Application for Wind Farm project at:

Leabeg, Co. Offaly.

Client: Natural Envoirnmental Technologies Ltd.







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agents for NEG MICON
for a powerful future

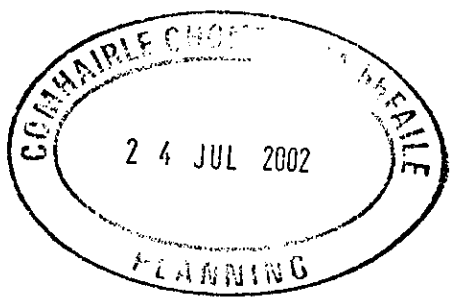
PLANNING PROPOSAL FOR WIND FARM PROJECT AT:

Leabeg, Ferbane, Co. Offaly

This report was prepared by New Energy Developments

on behalf of

New Energy Technologies Limited.



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1. INTRODUCTION

This report was prepared by New Energy Developments following consultations with Offaly County Council regarding the proposal by New Energy Technologies Limited to develop a wind farm at Leabeg, Ferbane, Co. Offaly. An Environmental Impact Assessment is not mandatory for the proposed development as wind farm developments of less than 5 MW and developments with not more than five turbines are exempt under *Schedule 1 of the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999. Part II, section 3. (Energy Industry), paragraph (i).*

This report has been commissioned voluntarily by New Energy Technologies Limited, to evaluate any possible impact this proposed wind farm project could have on the immediate surrounding areas. The site for the wind farm was chosen on the basis of certain criteria both technical and environmental. Wind speeds at the site ensure it has the capacity to generate viable amounts of energy; this combined with a relatively low associated environmental impact makes it a suitable location for a wind farm.

The proposed development is for a wind farm consisting of five wind turbine generators, access roads, a small control building and substation compound and a wind monitoring mast. The installed capacity of the wind farm will be 4.5 MW.

2. GOVERNMENT POLICY ON RENEWABLE ENERGY

Sustainability is a central part of all Department of the Environment's current Policies. With populations expanding rapidly in Ireland and world wide the demand for energy is constantly increasing at an even greater pace. It is anticipated that the energy demand world-wide will increase by 45% over the current consumption by the year 2015. In addition to the threat of climate change from global warming, fossil fuels will become exhausted. This process can only be slowed down if there is increased use of sustainable renewable energy resources.

The production of energy from wind power is both sustainable and indigenous. Ireland, along with Scotland, has the best wind resource in Europe. This can be utilised to provide clean, totally renewable, cost efficient indigenous energy.

In comparison with other European countries we can see that Ireland has not taken full advantage of its wind resources. For Example: Ireland's total installed wind energy is only 5% of Denmark's installed renewable capacity notwithstanding that Denmark is only two-third's of the size of Ireland and has a population density of 119 people per square km compared to 53 people in Ireland.

The National Development Plan, 2000 - 2006, has identified, as a key priority, the compliance with the Kyoto Protocol to the UN Convention on Climate Changes.

Under the Kyoto Protocol, the EU is committed to reducing greenhouse gas emissions to 8% below 1990 levels by the period 2008 – 2012. As a part of a "burden sharing" agreement between EU Member States, Ireland has agreed a national target to limit the increase in greenhouse gas emission to 13% above 1990 levels in the period 2008 – 2012. In a "business as usual" scenario however emissions are projected to grow in excess of 35% between 1990 and 2010.

Greenhouse gases such as Carbon dioxide (C02) and Nitrogen Dioxide N02, are partly produced by generating electricity from non-renewable energy sources, there is pressure on the international community to find alternative ways of generating power, which have less impacts on the environment. The Kyoto conference has reinforced these obligations.

More than 95 percent of man-made C02 emissions in Ireland are as a result of the combustion of fossil fuels (coal, oil and gas). These fuels are used for electricity generation and to meet other energy needs. Carbon Dioxide is the main green house gas implicated in climate change. Ireland, in line with the EU objective, has ado pted a National C02 Abatement Strategy. This strategy is designed to limit the levels of carbon in the atmosphere as a way of reducing the threat of climate change.

The Economic and Social Research Institute's Medium -Term Review 1997 - 2003 commented that the Irish economy is growing more rapidly than the rest of the EU. It also links growth with environmental performance, including the problems of carbon dioxide emissions and the associated global warning. It points out that economic growth may be slowed by the problems of environmental pollution. In this regard, it should be noted that Carbon dioxide levels have already risen by about 15% since 1990.

Dependency on external sources of energy will also increase substantially if indigenous renewable energy sources are not used. Approximately 66% of the primary energy requirements of the country are currently obtained from imported fossil fuels. Unless the proportion of indigenous and renewable energy is increased, this dependency could increase to 96% by th e year 2010. The Government's "A *Programme for the Millennium*" acknowledges the necessity for further action and it is acknowledged that wind energy can play an essential role in providing sustainable energy.

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3. THE COMPANY

New Energy Technologies Limited has been formed for the sole purpose of developing and promoting renewable (green) energy with a concentration on wind energy.
Up to the 18th of August 2000 New Energy Technologies Limited was trading under the name Natural Environmental Technologies Limited (N.E.T.) and under that name the company received full planning permission for two wind farms in County Sligo.

It is anticipated that construction on the two projects in County Sligo will be completed by the end of 2002, which will bring 29.5 MW of wind powered electricity on line. These two projects will produce 74.5 million kWh, which is approximately the electricity consumption of 18,625 households. The ESB International is carrying out the construction of these two projects under a turnkey co ntract for Eirtricity who will operate the projects after completion.
A number of other projects are currently under development by New Energy Technologies Limited and are at various stages of the development process.
All wind energy development work carr ied out by New Energy Technologies Limited is in accordance with the guidelines as set out by the Irish and European Parliament in their "Wind Energy Development Best Practise Guidelines".
Based on these guidelines New Energy Technologies Limited has impl emented a proven development system.

New Energy Technologies Limited is a development company with an established close relationship to various national and international companies who are in the business to build and operate wind farms. After the initial development by New Energy Technologies Limited the project will be constructed in partnership with an established construction company, which will be in the position to supply a turnkey project to the future operator of the wind farm.

4. BACKGROUND TO THE PROPOSED DEVELOPMENT

The proposed development is to construct a wind farm of 4.5 -Megawatt capacity at Leabeg, Ferbane, Co. Offaly, to supply electricity to the National grid. The wind farm will consist of 5 x 0.9 Mw wind turbines, a 60m meteorologica l mast, a small control building and a transformer compound.

The wind farm will make substantial annual savings in the use of fossil fuels; reductions in C02 emissions of about 9,750 tonnes; reductions in SO^2 of about 122 tonnes; reductions of N02 emissio ns of about 36 tonnes and produce sufficient electricity to service around 3,250 households.

4.1 Site Location

The site for the proposed wind farm at Leabeg , Ferbane, Co. Offaly is located along the R357, to the North, between Cloghan and Blue Ball.
(Ordinance Survey discovery map no's. 48 and 54. Co -ordinates: East – 216000 North – 220200)
The site is approximately six kilometres to the South -East of Ferbane village and approximately two kilometres to the West of Leabeg village, which would be the two areas of concentrated settlement adjacent to the site. The site comprises of 42 hectares/104 acres and lies at a level height of 50m.

Site location maps, showing the boundary of the subject lands, are attached as **Fig. 1&2**

4.2 Existing Land Use

The site is situated in an open landscape dominated by Peat harvesting and some agricultural activities of grazing and tillage. There are scattered habitations in the immediate area with the villages of Ferbane, 6 km North West and Leabeg village, 2 km to the East being the nearest concentrated settlement of dwellings.

4.3 Site Context

The River Boora rises approximately 2 km due South of the site and flows along the South Eastern boundary of the location before making it's way 4 km due North into the Rand canal.

The land itself comprises entirely of poor agricultural grazing land on which the landowner currently grazes some dry cattle.

The proposed site is not located in a Special Area of Conservation (SAC) nor is it located in a National Heritage Area (NHA). Furthermore this proposed project will have no impact on any listed views or listed scenic routes as set out in the Offaly Count Development Plan. Please see extract from the Offaly County Development Plan with the site location in **Fig. 3&4**.

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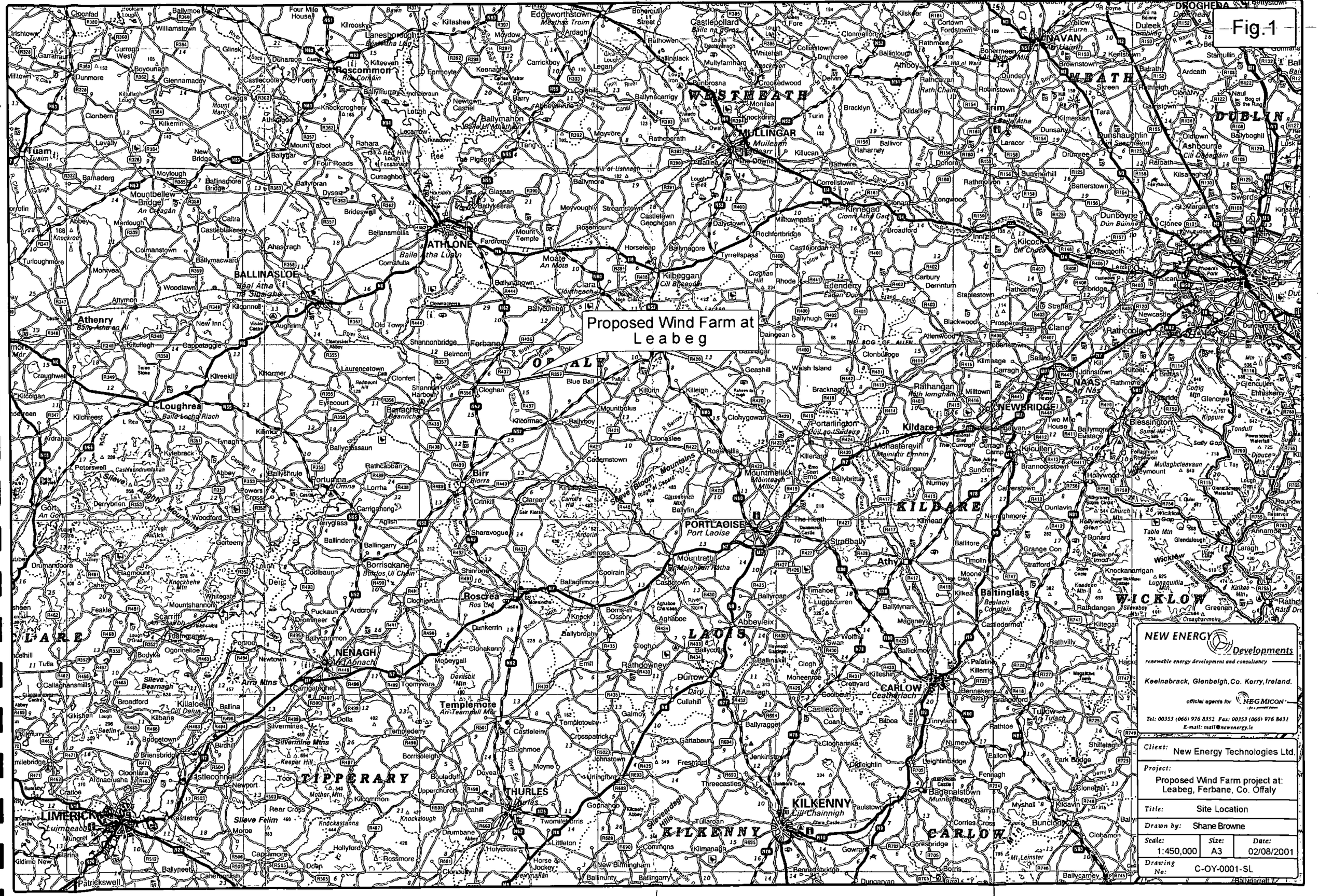
Fig.1



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Client:	New Energy Technologies Ltd.		
Project:	Proposed Wind Farm project at: Leabeg, Ferbane, Co. Offaly		
Title:	Site Location		
Drawn by:	Shane Browne		
Scale: 1:450,000	Size: A3	Date: 02/08/2001	
Drawing No:	C-OY-0001-SL		

Fig.2

Proposed Wind Farm at
Leabeg

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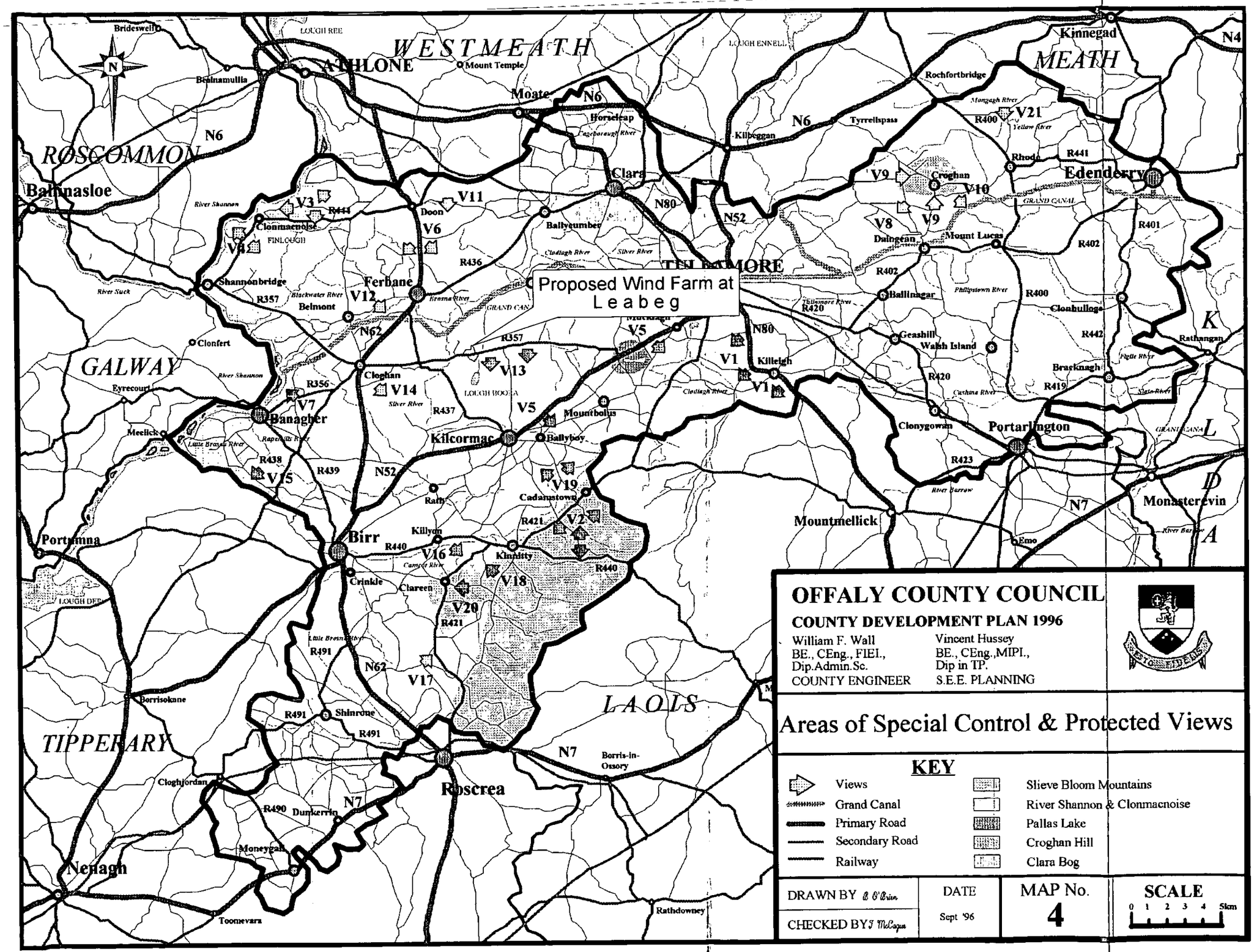
E-mail: mail@newenergy.ie	
Client:	New Energy Technologies Ltd.
Project:	Proposed Wind Farm project at: Leabeg, Ferbane, Co. Offaly
Title:	Site Location & Boundaries
Drawn by:	Shane Browne
Scale: 1:50,000	Size: A3 — Date: 02/08/2001
Drawing No:	C-OY-0001-SB

Fig.3



OFFALY COUNTY COUNCIL

COUNTY DEVELOPMENT PLAN 1996

William F. Wall BE., CEng., FIEI., Dip.Admin.Sc. COUNTY ENGINEER	Vincent Hussey BE., CEng.,MIPI., Dip in TP. S.E.E. PLANNING

Areas of Special Control & Protected Views

KEY

- Views
- Grand Canal
- Primary Road
- Secondary Road
- Railway
- Slieve Bloom Mountains
- River Shannon & Clonmacnoise
- Pallas Lake
- Croghan Hill
- Clara Bog

DRAWN BY	DATE	MAP No.	SCALE
B O'Brien	Sept '96	4	0 1 2 3 4 5km
CHECKED BY J McLoughlin			

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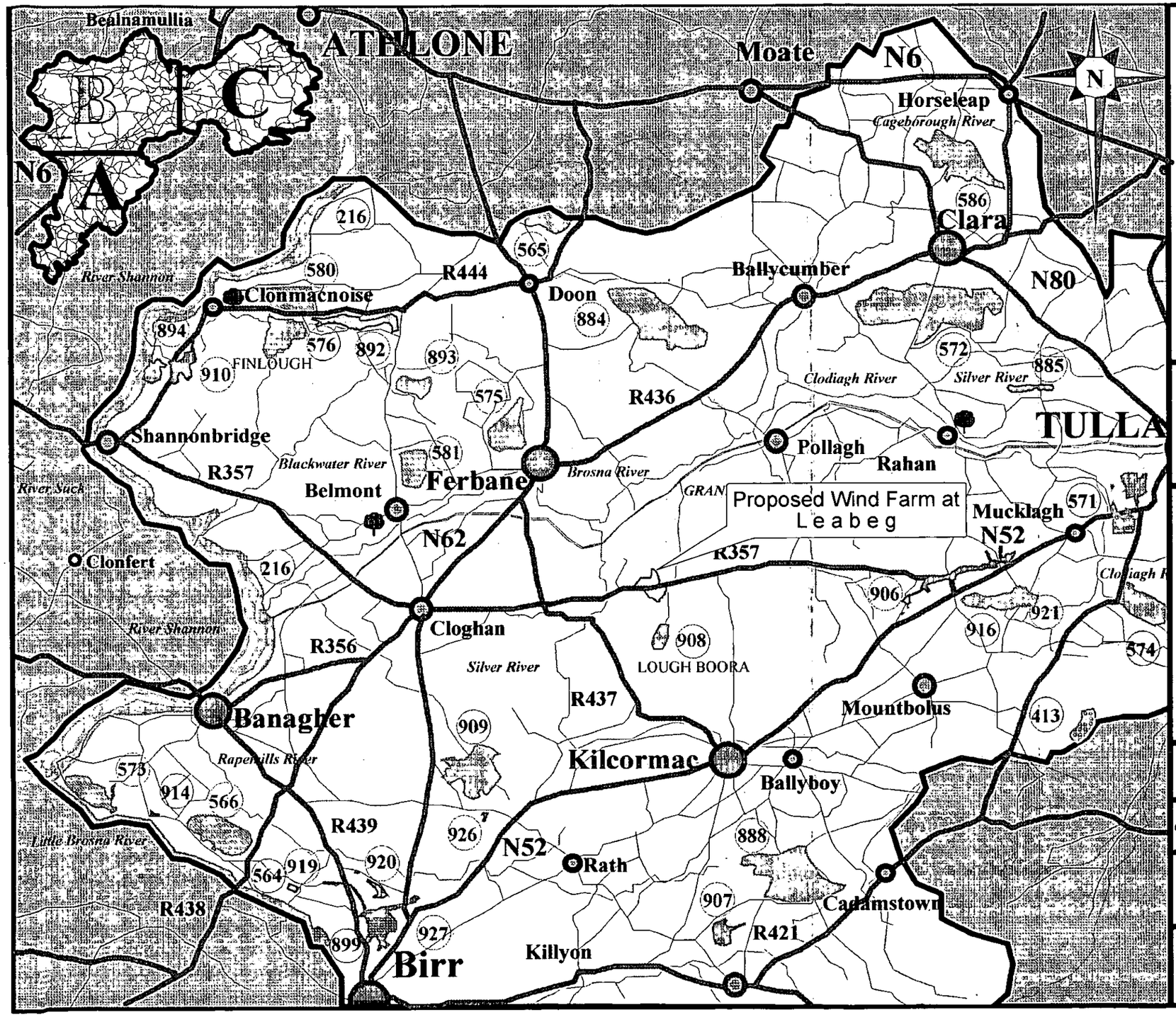
Client:	New Energy Technologies Ltd.
Project:	Proposed Wind Farm project at: Leabeg, Ferbane, Co. Offaly
Title:	Site Location on County Development Plan
Drawn by:	Shane Browne
Scale:	Size: A3 — Date: 02/08/2001
Drawing No:	C-OY-0001-CDP/1

Fig.4



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COUNTY ENGINEER	S.E.E. PLANNING

COUNTY DEVELOPMENT PLAN 1996

Areas of Scientific Interest and Tree Preservation Orders

For percise boundaries of A.S.I's please refer to Offical O.P.W. Register

- Lakes & Rivers
- Bogs
- Woods & Meadows
- Eskers, Mountains & Hills
- Miscellaneous
- Tree Preservation Orders

DRAWN BY: B O'Brien	DATE Sept '96
CHECKED BY: J McLaya	

0 1 2 3 4 5km

MAP No. 5B

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Client:	New Energy Technologies Ltd.
Project:	Proposed Wind Farm project at: Leabeg, Ferbane, Co. Offaly
Title:	Site Location on County Development Plan
Drawn by:	Shane Browne
Scale:	Size: A3 / Date: 02/08/2001
Drawing No:	C-OY-0001-CDP/2B

5. NATURE AND EXTENT OF THE PROPOSED DEVELOPMENT

5.1 Introduction

The proposed development will comprise of a total of 5 no. 0.9 Mw wind turbines, associated access roads and hard standing areas, a 60m meteorological mast, a small control building with an adjacent transformer compound and underground cabling linking the turbines to the control building.

5.2 Turbines

It is proposed to erect five turbines on the site. The turbines are to be located as shown on Drawing "C-OY-0001-SL/1". **(Copy attached as Fig.5)** Each wind turbine will have a maximum output of 0.9 Mw, resulting in a total output from the wind farm of 4.5 MW.

The wind turbines proposed are horizontal axis wind turbines consisting of a cylindrical metal tower, on which the generator and gea rbox will be mounted in a housing known as a nacelle. The height, from ground level to the centre of the hub covering the blade joint assembly, will be 72.3 m as specified on Drawings "NEG - Micon 900/52 – 72.3m" and "C-ot-0001-TE" **(Copies attached as Fig.6&7).** The blade diameter will measure 52.2 m. All of the blades on the turbines will rotate in the same direction and at the same rate of between 14.9 and 22.4 revolutions per minute, dependant on the wind speed. The turbines will start turning at a wind spe ed of 4 metres per second and will operate up to a wind speed of 25 metres per second. **(Please see appendix 1.)**

Each of the turbines will require a transformer, located in the base of the turbine tower, in order to step up the voltage of the electricity p roduced to 20 kV. This transformation is necessary in order to distribute the electricity as efficiently as possible to the control building. It is proposed to locate the transformers inside the base of each of the 5 towers on the site to minimise visual i mpact.

It is intended to accept the manufactures standard colour of the turbines, a matt light grey colour (RAL 7035). This spectrum of colour has been chosen so as to minimise visual impact, particularly as a result of colour change caused by the shadowi ng of the turbines due to different lighting conditions.

The towers of the turbines are to be fixed to a concrete foundation (a square shaped concrete base with cylindrical shaft under the turbine towers), which will measure some 11.3 m x 11.3 m x 3 m approx. at its widest point. The volume of concrete needed for each turbine base would be approximately l2Om ^{3}. Since the depth of each foundation will vary due to the differing depths to ground rock on the site, the extent

of excavation of the foundations wil l vary, lying within the range of 100 - 150m^3. It is intended to locate the top of the foundations at least 300 mm below the existing ground level and to reinstate around the foundations with materials from the surrounding locality.

5.3 Meteorological Mast

A permanent meteorological mast is proposed. The mast will be 60 m high of galvanised steel, latticed tower construction. A concrete base will be provided so as to anchor the mast.

5.4 Control Building And ESB Compound

The proposed control building will measure 10.60 m x 5.70 m on plan.
The building will be finished externally in rendered concrete, painted to blend in with excising buildings in the surrounding area.
The roof will be pitched and will have a blue/black -slated finish.

The building has three main functions:

- To provide housing for switch -gear, control equipment and monitoring equipment necessary for the proper functioning of the wind farm.
- To provide a sub-station for connection to ESB's grid.
- To provide a control room area for servicin g personnel.

The building will comprise three separate areas interconnected:

Switch gear room	5.0 m	x	3.9 m
ESB Metering / Control room	5.0 m	x	2.9 m
Store room	5.0m	x	2.7 m

The equipment to be installed within the control room will include a Super visory Control and Data Acquisition (SCADA) System which will allow for continuous off-site monitoring, via telephone connection, both at the Operators premises and at the headquarters of the Turbine manufacturer. The installation of SCADA System, together with the low number of turbines proposed, avoids the need for staffing the wind farm except during routine planned maintenance visits or during breakdown.

Electricity will leave the ESB's switch room at either 38 kV or 20 kV, as yet to be decided by the ESB. To achieve the above voltages a transformer and ancillary equipment will be necessary and will be provided within a compound adjacent to the building. The compound will be fenced using 2.4m high -galvanised palisade type

fencing. Consideration will be given to the provision of low growing, indigenous trees (suitable for the soil and the area) as screening of the compound.

While a telephone connection is required for the SCADA System, another is required by the ESB so as to read their meters. The teleph one connection is likely to be made by overhead cable to the entrance of the site and will be laid underground between this point and the Control Building. Please see copies of Drawings C -OY-0001 SubS/1 & SubS/2 attached as **Fig. 9 & 10**

5.5 Grid Connections

On -Site

All transmissions on-site, linking the turbines to the control building will be located underground. Cable trenches will be placed parallel with the proposed roadways.

A trench of approximately 360-mm width and 950-mm depth will be excavated. The cables will be laid on a bed of 100 -mm stone dust (sand) with a further 100 -mm stone dust top layer. The trench will then be back filled with the excavated material to approximately 300-mm below surface and compacted. A marker tape will be placed on the compacted surface, which will be covered with further back fill material. The surface will than be reinstated to its original condition.

Off-Site

There is a suitable connection point to the existing but now decommissioned ESB generation station on the opposite side of the R357. This would involve the construction of approximately 2-km of 20 kV or 38 kV overhead line from the wind farm control building to this existing ESB station. This is an ideal situation, with minimal visual intrusion, minimal disturbance of the surrounding lands and relatively lower cost for the wind farm grid connection.

The Electricity Act 1999 states that any connection to the National Grid has to be carried out by the Grid operator i.e. the ESB (Airgrid). In accordance with this Act the ESB will plan and apply for the construction of a connecting line from the control building on the proposed site to the Ferbane power station under a separate planning application to Offaly County Council in due course.

5.6 Access Roads and Hard Standings

The site roads are necessary to allow access for cranes and delivery trucks during construction of the wind farm and also during servicing/repairs to the wind turbines.

The minimum road width required is 4 m although it is desirable to have site roads somewhat wider to allow for subsidence at edges. Thus, a width of *4.5* m is generally provided. Please see road details on drawing "C-OY-0001-SL/2" attached as **Fig. 11**.

The road layout has to be such that no large rocks, trees or posts should be close to the road, especially at bends.

At the end of the construction period, the edge(s) of the road will be covered with peat/topsoil so that the running width is reduced to *3.5* m.

Various hard standings and turning areas are required in the vicinity of each turbine location. Hard standings must allow two cranes to work in the vicinity of a turbine. The pad for the large (350/400 tonne) crane is 14 m x 14 m while the pad for the small crane (80/100 tonne) is 11 m x 10 m. The small crane helps when lifting the bottom of tower sections and the assembled rotor and blades.

Once construction is complete, the edges of the pads will be smoothened off where they are more than 300 mm above the ground and the side covered with topsoil/peat. The pads, as a whole, will be covered with a layer of topsoil/peat, 50 mm thick except for one small parking area, 4 m x 6 m, for a service car.

5.7 Drainage

Some land drains are in place on site, this drainage system will have to be improved to take any excess water from the new road network on site.

Roadside drains along Access Road in within the proposed site shall be discharged to the existing drainage system of the farmland via stilling ponds. This should alleviate any source of pollution to the streams and rivers in the vicinity.

The proposed site access roads and drainage details are detailed on Drawing No. "C-OY-0001-SL/3", **Fig. 12** Roadside drains are to be constructed on the side of the site roads.

5.7.1 Potential Impact of the Proposed Drainage Network

There are four possible areas of activity on site, which are possible sources of pollution. These are:

a) Runoff from roadways introducing silt into local watercourses.
b) Drainage required for the construction of turbine bases, which may contain silt and floating material.
c) Accidental Spillage of Oil.

d) Sewage and waste water resulting from the provision of toilet facilities in the control building.

5.7.2 Measures To Prevent Pollution

The following details the proposed measures to be taken to eli minate the pollution risks associated with the site.

Run Off From Roadways Introducing Silt Into Local Watercourses
Roadside Drains

Roadside drains shall be provided at the edge of the formation along the entire road length. These drains shall have a dou ble benefit namely:

a) The formation and road pavement shall be cambered towards the drain to direct runoff from the roadway so as to avoid flooding or erosion of the road base. This shall encourage any silt washed off the road to enter the drainage netwo rk where it can be treated in the stilling ponds.

b) The runoff from higher ground or any fines washed out from cuttings shall be intercepted by the roadside drains and can again be treated in the stilling ponds.

The roadside drains will be trapezoidal in section and shall normally be 500 mm wide at the top by 750 mm deep, thus providing sufficient capacity to cater for even the heaviest rain events. The roadside drains shall follow the natural falls of the site and shall discharge, via the stilling pond s, to the natural drainage features of the site.

During road construction all drains or streams which have to cross below the proposed road shall be culverted using flat bottomed concrete culverts, of minimum size 500 mm x 600 mm.

5.7.3 Stilling Ponds

Stilling ponds or silt traps shall be constructed as detailed on Drawing No. "C-OY-0001-SL/2" **(see attached copy Fig. 11)** and at the locations shown. Two ponds shall be constructed in sequence at each location. The first of these, the primary stilling pond, shall be constructed using a dam of impermeable soil. This shall reduce the velocity of flows to less than 0.5m/s to encourage settlement of silt. The second stilling pond in the sequence, the final stilling pond, shall be constructed by providing a large r dam, constructed from stone fill and lined with a geotextile layer to entrap any silt particles which may still be present. The final stilling pond shall reduce the velocity, to less than 0.3 m/s. Silt settles at a velocity of 0.3m/s and thus shall settl e 300 mm in

depth over a length of 3 m. The expected maximum depth of flow in the roadside drains is 450mm, thus the length of the final stilling pond shall be 3 m.

5.7.4 Drainage for Construction of Turbine Bases

Formation levels for the turbine bases will generally be at least 1.9 m deep. Any excavation in the natural soils shall serve as a sump for collecting runoff. Obviously the area will require de-watering to allow work to proceed. Any de-watering to such excavations shall be achievable through the use of portable pumping equipment. The resulting discharges shall be directed to the roadside drains and stilling ponds for treatment prior to discharge to any natural watercourse to avoid pollution risk.

It should be noted that the drainage for construction of turbine bases shall be of limited quantity and produced over a relatively short period of time.

5.7.5 Sewerage and Waste Water

Toilet and washing facilities shall be provided in the Control Building. Water for washing etc. shall be sourced from rainwater collected from the roof. Drinking water shall be brought to the site daily in 20 litre containers.

Staff will visit the control building approximately ones ever month for the duration of one to two hours. A Chemical Toilet (Campa Potti XG) will be provided; this toilet system would be appropriate for the purpose. The caretaker of the wind farm will be in charge of disposing of the toilet waste, which can be emptied into any existing septic tank as the chemical used in this toilet "Aqua Kem Green" is non-toxic and biodegradable and complies with OECD (EC) standards. Aqua Kem Green will have no adverse effect on any septic tank system.

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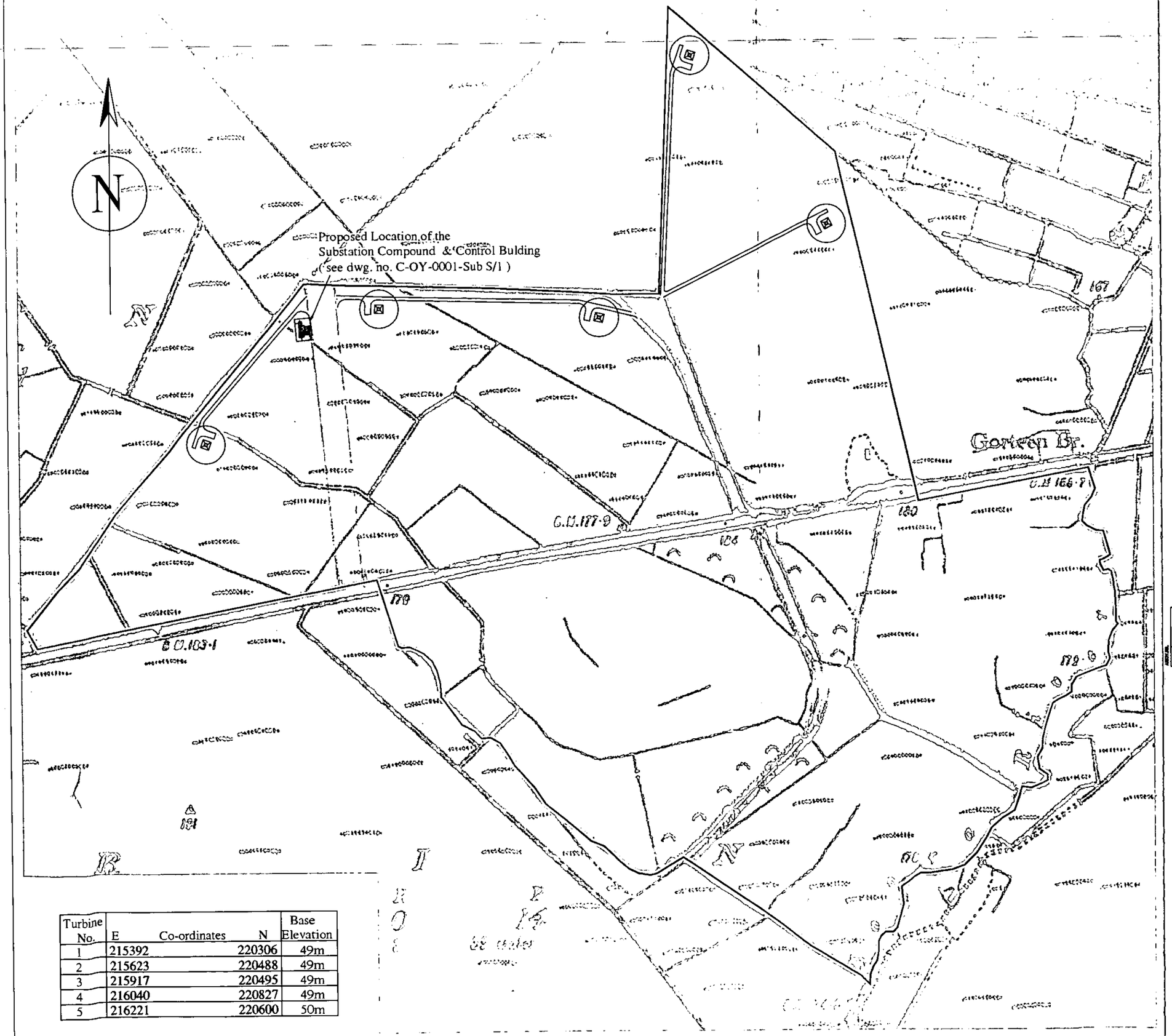
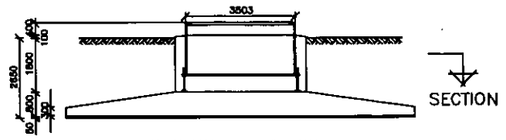
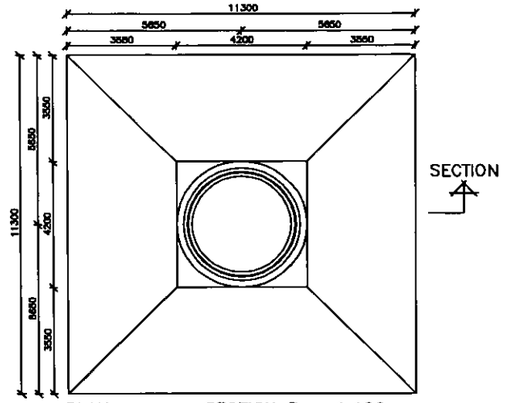
Fig.5



Turbine No.	E Co-ordinates	N	Base Elevation
1	215392	220306	49m
2	215623	220488	49m
3	215917	220495	49m
4	216040	220827	49m
5	216221	220600	50m



SECTION A, 1:100



PLAN, SECTION B, 1:100

Foundation loads:
Document TIC 344'002 GB
Drawing
PAGE/DETAIL:
2 – Section A
3 – Concrete
4 – Reinforcement
5 – Bending schedule
D500 – Sealing
D501 – Earthing

BYGHERRE
EMNE1
TILFØJELSE
EMNE2

CHRISTENSEN & HOFMEISTER
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Foundation no.:
FUNDA:NR:
Revision: REV.
Date: DATO
Page no.:
SIDE:NR:

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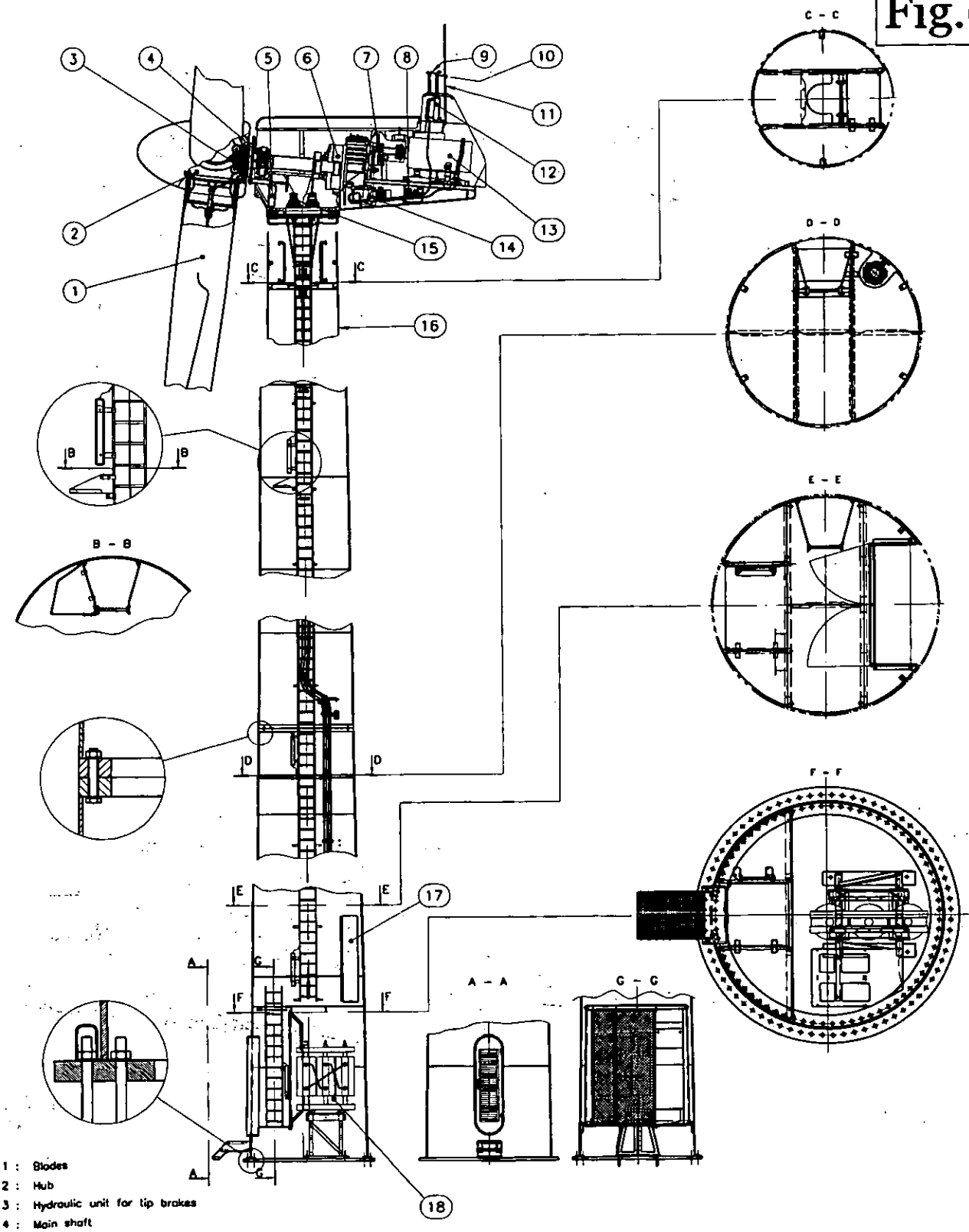
CLIENT
New Energy Technologies Ltd.

PROJECT
Proposed Windfarm at Leabeg, Ferbane, Co. Offaly

TITLE
Site Layout and Foundation Details

DRAWN Shane Browne
SCALE
SIZE A3 DATE 09/08/2001
DRAWING No C-OY-0001-SL/1
STATUS
Issued for Information
O.S. Number OY023

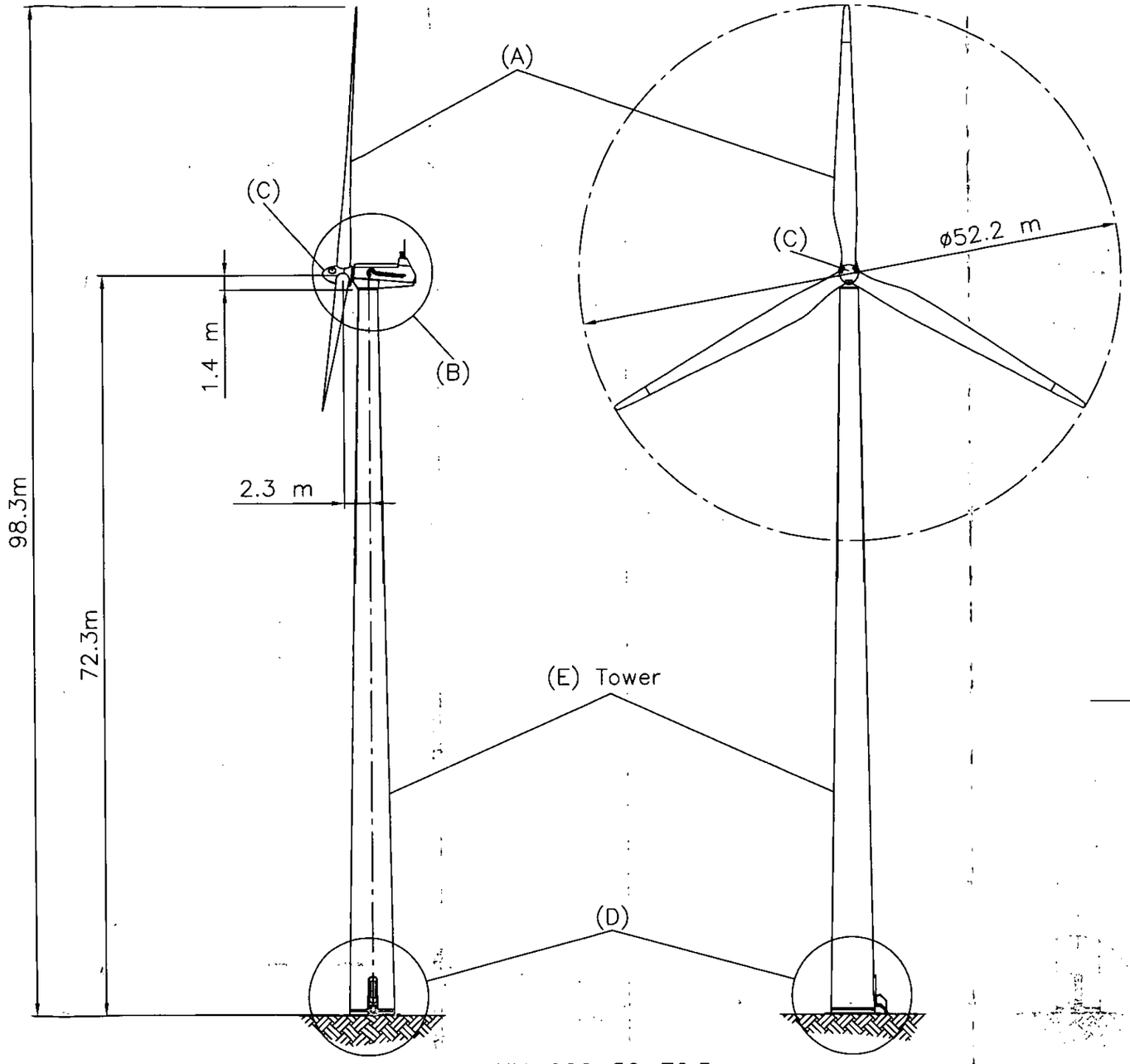
Fig.6



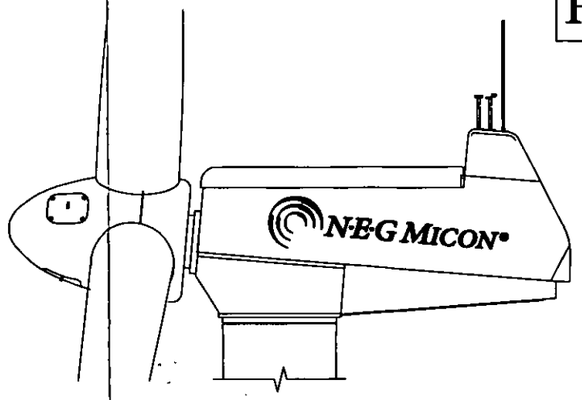
1 : Blades
2 : Hub
3 : Hydraulic unit for tip brakes
4 : Main shaft
5 : Top box
6 : Gear box
7 : Mechanical brake and coupling
8 : Hydraulic unit for mechanical brake
9 : Wind vanes
10 : Anemometer
11 : Lightning conductor
12 : Cooling device
13 : Generator
14 : Circulation pump for oil cooling system
15 : Yaw system
16 : Tower
17 : Power cabinet
18 : Transformer

Basic mat.:			Weight:	kg
Material :	N·E·G MICON®	Drawn	14.07.1999	PCH
		Revised		
		Checked		
		Approved	12.10.1999	JLA
Revised fields :	Part name : Oversigtstegning – NM900 *Position of components – NM900*			
CN (Change note) :		Picture ISO-E	Scale : 1:100	Part No.: 29700-000 / Rev.: 0

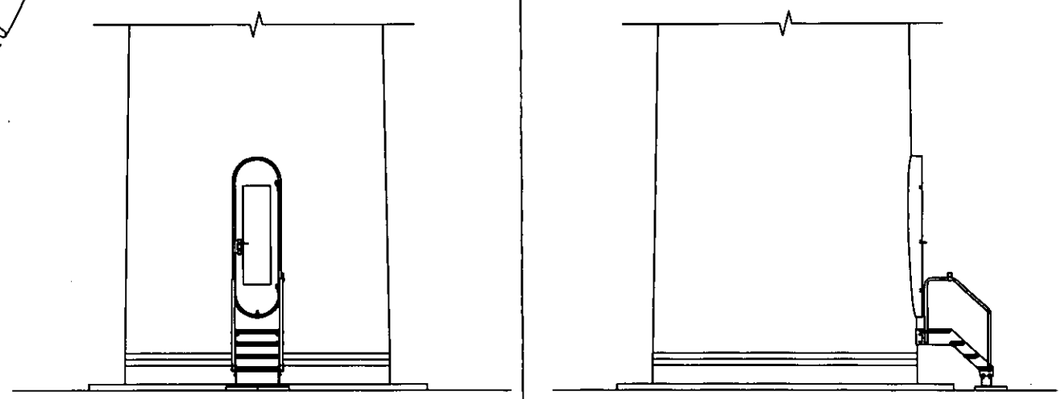
Fig.7



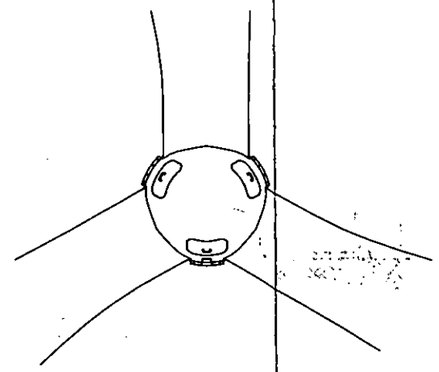
NM-900-52-72.3



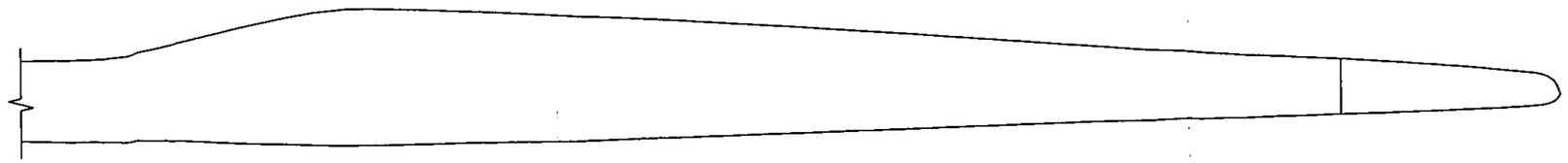
(B) Nacelle



(D) Service Access



(C) Hub with Service Access Doors



(A) Blade

PROJECT	Proposed Windfarm at Leabeg, Co. Offaly
TITLE	NM-900-52-72.3
DRAWN	Shane Browne
SCALE	SIZE A3 DATE 09/01/2002
DRAWING No.	C-OY-0001-TE
STATUS	Issued for Information

Fig.8

Windvane / anemometer arrangement

6.45m | 5.95m | 5.95m | 5.95m | 5.95m | 5.95m | 5.95m | 5.95m | 5.95m | 5.95m | 5.95m

A B C D E F G H I J K

Reinforced concrete foundations

2m

2m

3m

6m

Section K–K

Anemometer and Windvane support

Anemometer and Windvane support

Section A–A
Scale 1:50

460mm

Section B–B
Scale 1:50

607mm

Section C–C
Scale 1:50

754mm

Section D–D
Scale 1:50

900mm

Section E–E
Scale 1:50

1.047m

Section F–F
Scale 1:50

1.195m

Section G–G
Scale 1:50

1.343m

Section H–H
Scale 1:50

1.483m

Section I–I
Scale 1:50

1.656m

Section J–J
Scale 1:50

1.848m

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PROJECT: Leabeg, Ferbane, Co. Offaly

TITLE: 60 m Meteorological Tower

DRAWN: Adam Stack BE, MEngSc.

SCALE: | SIGN: AS | DATE: 05 April 2002

DRAWING No.: C–OY–0001–TE

STATUS: Planning Application

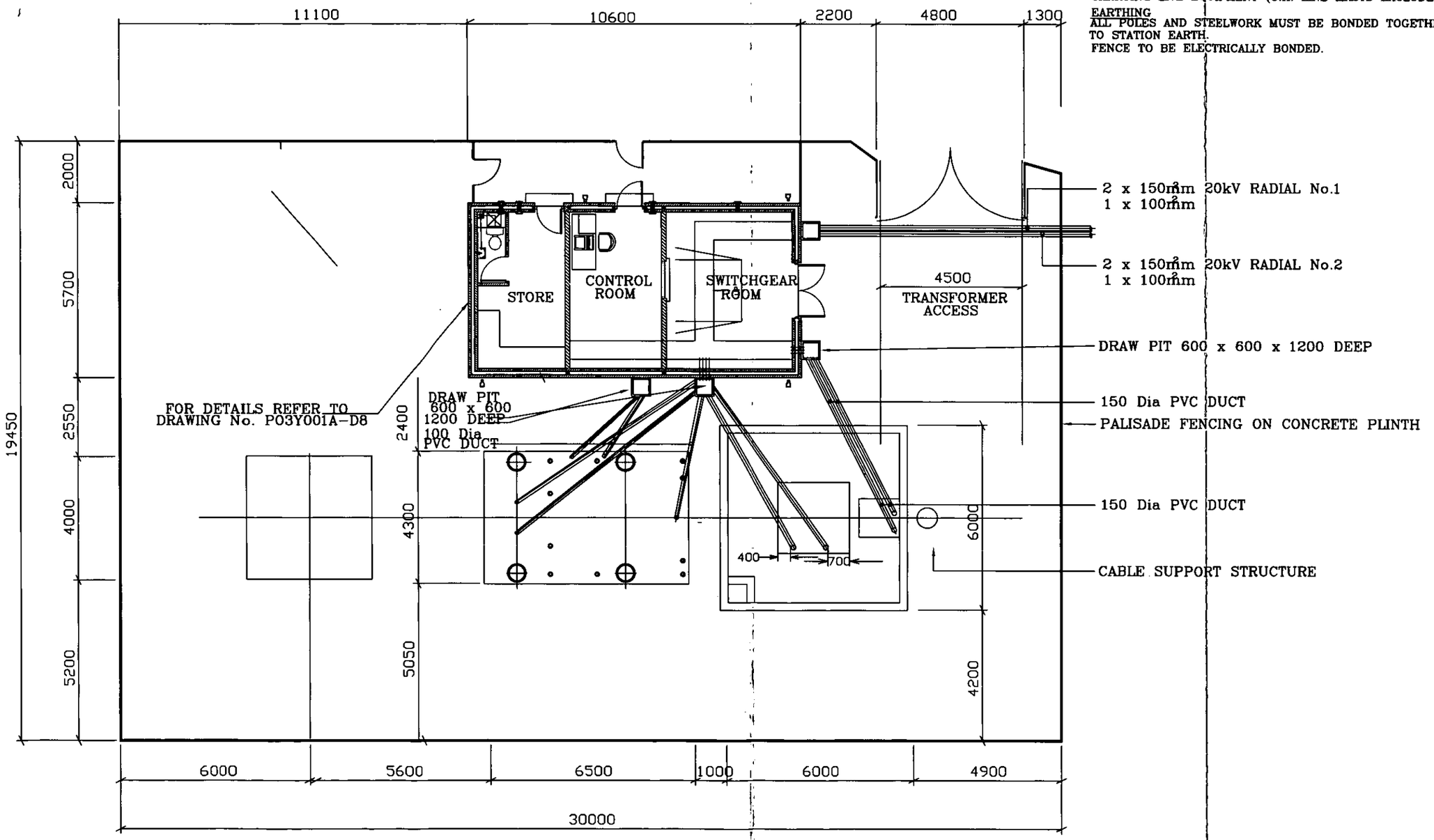
Fig.9

MINIMUM CLEARANCES

38kV PHASE TO PHASE TO EARTH ---------- 470mm
SCREENS TO LIVE METAL ---------- 470mm
LIVE CONDUCTOR FROM GROUND (UNSCREENED) ---------- 2900mm
BOTTOM OF LIVE BUSHING FROM GROUND (UNSCREENED) --2134mm
WHERE A 20kV LINE PASSES A 38kV STRUCTURE
THE CLEARANCE BETWEEN THE 20kV LINE AND 38kV
STRUCTURE IS NOT TO BE LESS THAN ----------3658mm
FENCE TO BE HORIZONTALLY CLEAR OF ANY STRUCTURE
CARRYING LIVE EQUIPMENT (O.H. LINE MASTS EXCLUDED) ----4570mm

EARTHING

ALL POLES AND STEELWORK MUST BE BONDED TOGETHER AND CONNECTED TO STATION EARTH.
FENCE TO BE ELECTRICALLY BONDED.



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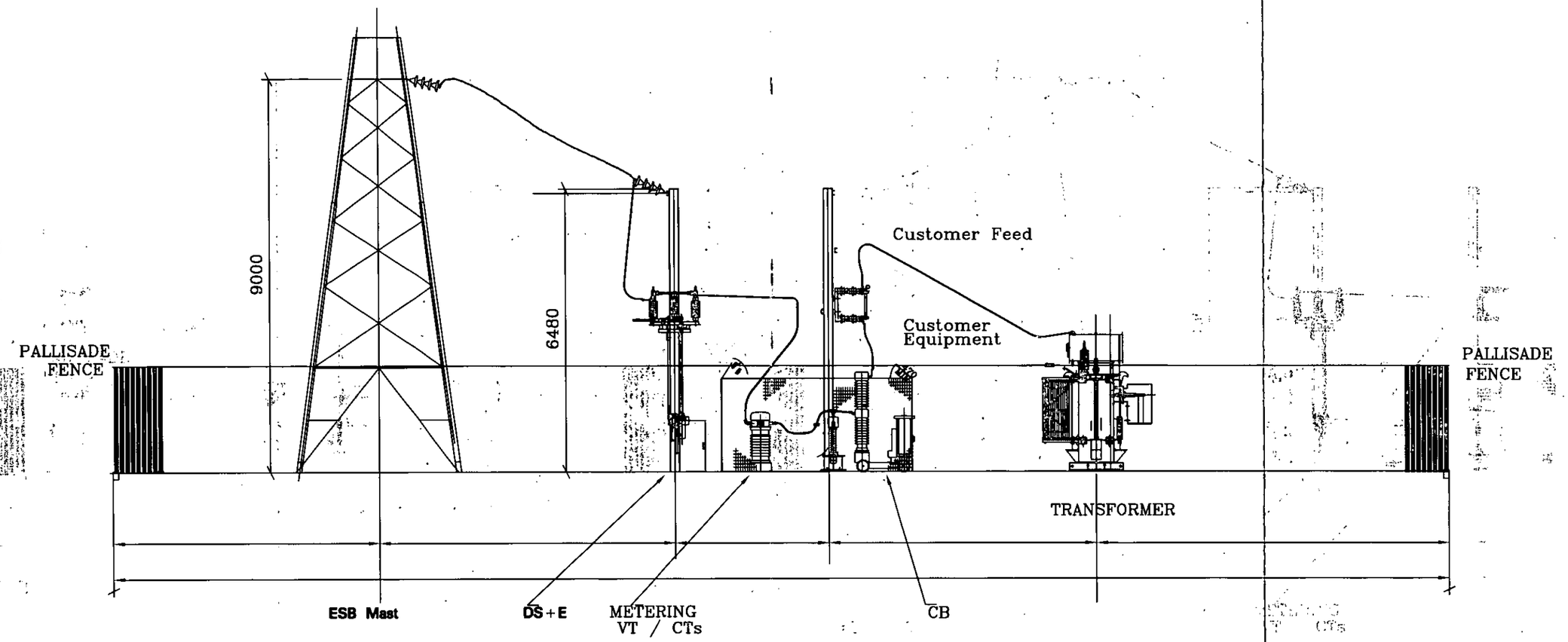
CLIENT: Nee Energy Technologies Ltd.
PROJECT: Proposed Windfarm at Leabeg, Ferbane, Co. Offaly
TITLE: 38kV Substation: plan view
DRAWN: Shane Browne
SCALE: A3 DATE: 10/08/2001
DRAWING No.: C-OY-0001-Sub S/1
STATUS: Issued for Information

Fig.10



MINIMUM CLEARANCES

38kV PHASE TO PHASE AND PHASE TO EARTH	470mm
SCREENS TO LIVE METAL	470mm
LIVE CONDUCTOR FROM GROUND (UNSCREENED)	2900mm
BOTTOM OF LIVE BUSHING FROM GROUND (UNSCREENED)	2134mm
WHERE A 20kV LINE PASSES A 38kV STRUCTURE THE CLEARANCE BETWEEN THE 20kV LINE AND 38kV STRUCTURE IS NOT TO BE LESS THAN	3658mm
FENCE TO BE HORIZONTALLY CLEAR OF ANY STRUCTURE CARRYING LIVE EQUIPMENT (O.H. LINE MASTS EXCLUDED)	4570mm

EARTHING

ALL POLES AND STEELWORK MUST BE BONDED TOGETHER AND CONNECTED TO THE STATION EARTH.

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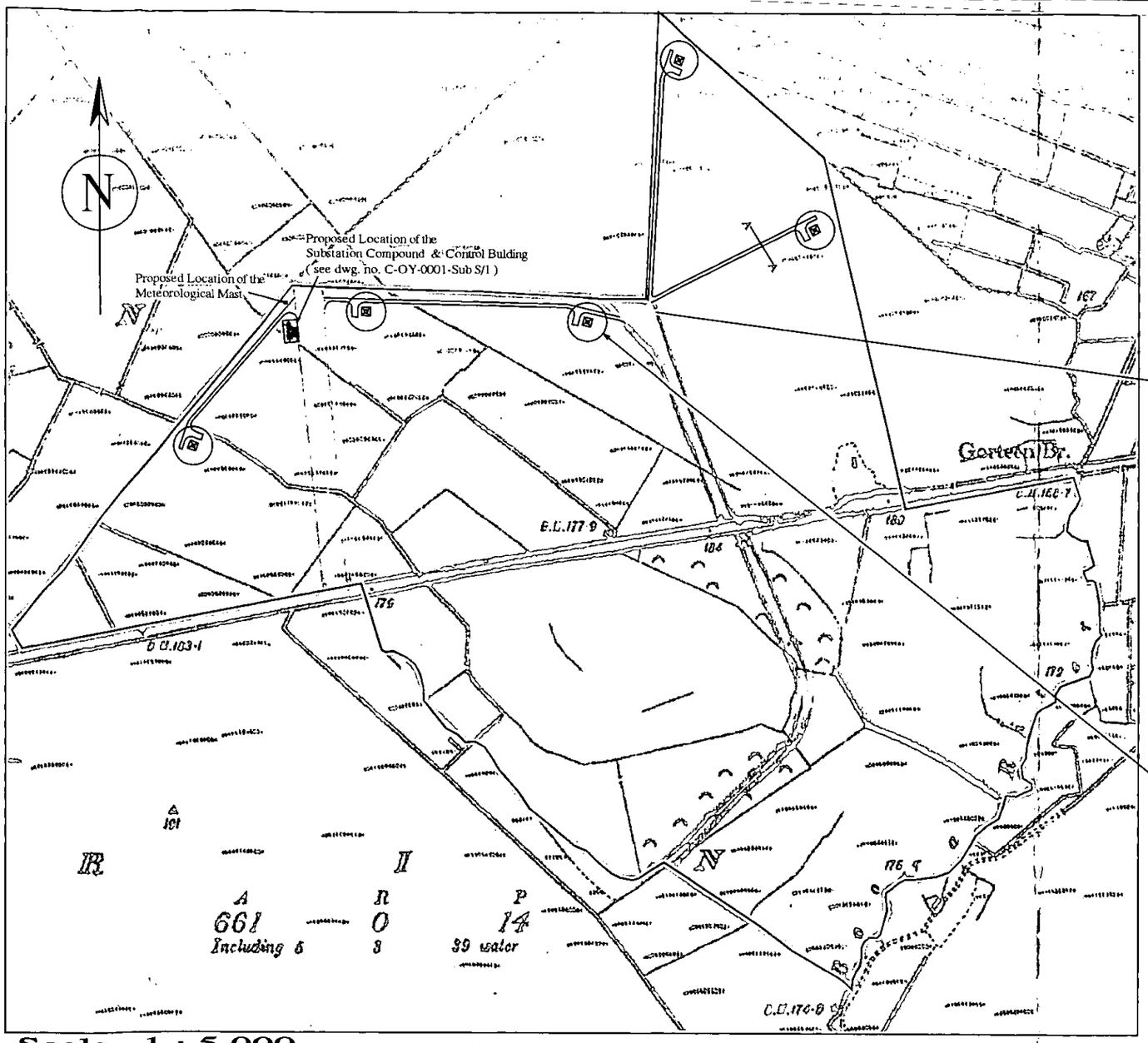
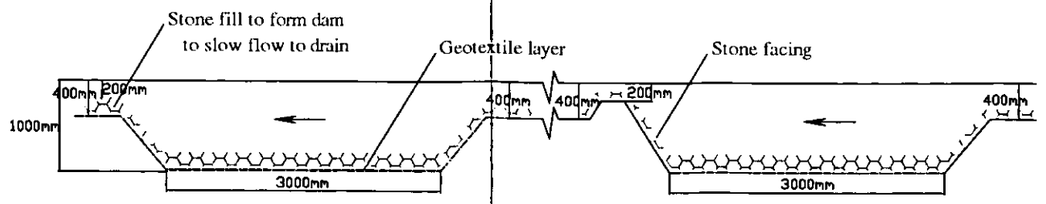
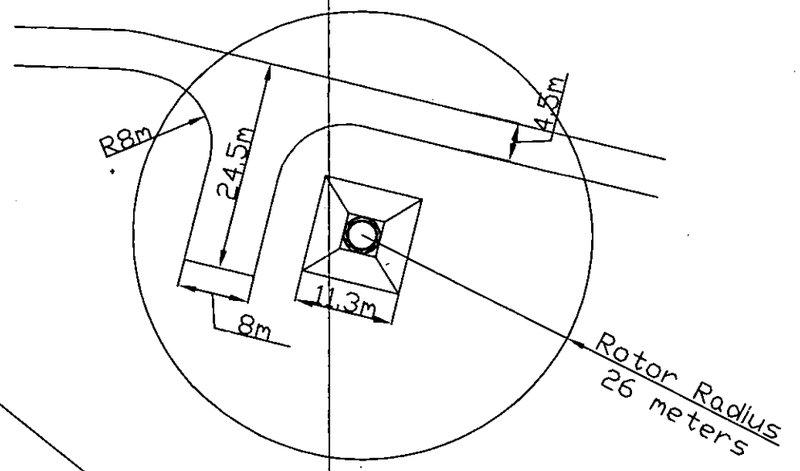
CLIENT	Nee Energy Technologies Ltd.
PROJECT	Proposed Windfarm at Leabeg, Ferbane, Co. Offaly
TITLE	38kV Substation: elevation view
DRAWN	Shane Browne
SCALE	SIZE A3 DATE 10/08/2001
DRAWING No.	C-DY-0001-Sub S/2
STATUS	Issued for Information

Fig.11

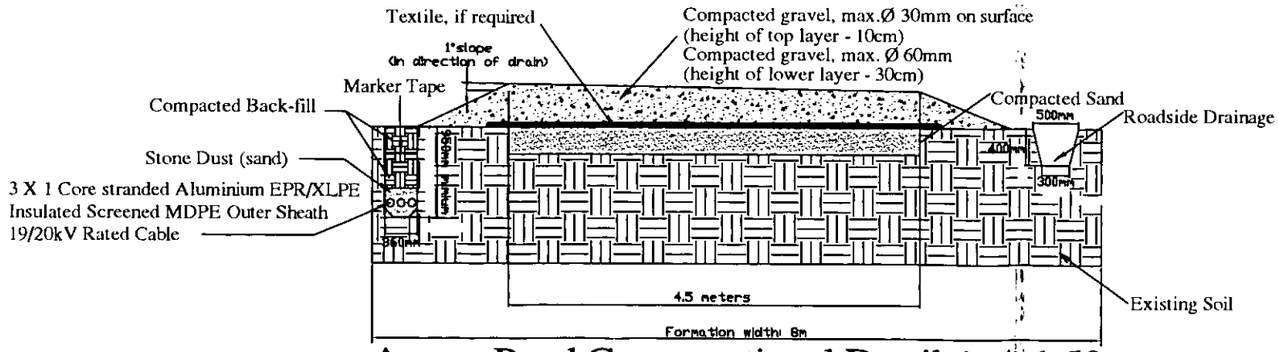




STILLING POND DETAIL 1:50



SPUR DETAIL 1:500



Access Road Cross-sectional Detail A-A 1:50

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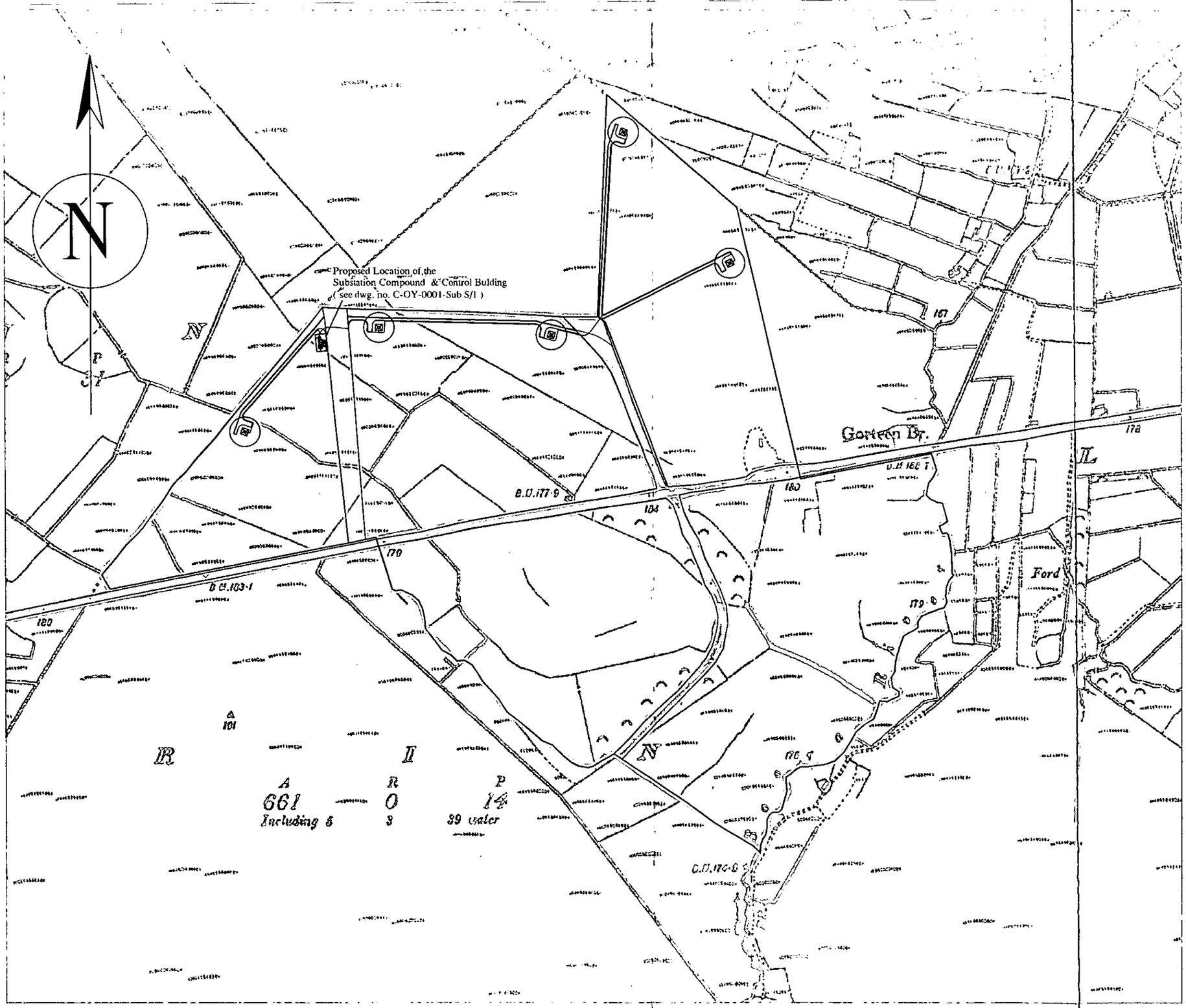
CLIENT	New Energy Technologies Ltd.
PROJECT	Proposed Windfarm at Leabeg, Ferbane, Co. Offaly
TITLE	Site Layout and Road Details
DRAWN	Shane Browne
SCALE	A3 09/08/2001
DRAWING No.	C-OY-0001-SL/2
STATUS	Issued forInformation
OS Number	OY023

Fig.12



Key:
- CABLES
- NEW DRAINAGE
- EXISTING DRAINAGE
- BUILT-UP AREA
- EXISTING ROADS
- SITE BOUNDRY

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CLIENT	New Energy Technologies Ltd.
PROJECT	Proposed Windfarm at Leabeg, Ferbane, Co. Offaly
TITLE	Cable & Drainage Detail
DRAWN	Shane Browne
SCALE	SIZE A3 DATE 03/08/2001
DRAWING No.	C-OY-0001-CDD
STATUS	Issued for Information
O.S. Number	OY023

6. OPERATIONAL PHASE

6.1 Power Purchase Agreement

The Government has recently concluded it's latest "Altern ative Energy Requirement Program (AER V). This Program awarded 15-year contracts to suitable wind farms, which had received full planning permission on or before the 30 th of November 2001. It is anticipated that the Government will offer similar contracts to suitable wind farms under further AER programs on a yearly basis.

Through the deregulation of the electricity generation industry in February 2000 various independent power suppliers are now in the position to offer power purchase agreements to wind farm operators. These contracts can be for the duration of up to 25 years.

A decision on what kind of a power purchase agreement would be suitable for this project would be made after final construction cost is assessed.

6.2 Maintenance

A service contract will be entered into with the turbine manufacturer to facilitate the proper operation and maintenance of the turbines. While routine operation and monitoring will be carried out remotely via the SCADA System, the following visits to site are envisaged: -

Scheduled

- Six-month service, a four day visit by two technicians
- Annual service, a eight day visit by two technicians
- Weekly visits by the Operator to check over the site, notices, maintenance of stilling ponds and drains etc.

Unscheduled

Visits, which may arise as a result of malfunction, damage by lightning, vandalism etc.

During the six-month and annual service visits, some waste lubricating and cooling oils will arise. These will be recorded, drained into designated storage containers, brought off site and delivered to a suitable independent commercial facility for treatment/re-use/disposal in accordance The European Communities (Waste Oils) Regulations, 1992 (S.I. No. 399 of 1992). Any packaging shall be collected and disposed of off site.

As part of the annual service visits, the condition of paintwork will be inspected and documented. It is anticipated that a major touch up/repainting will be necessary to the towers after 10 — 15 years. This will be carried out using access from mobile cranes .

7. DECOMMISSIONING

At the end of the useful life of the turbines, both a commercial and a landscape/environmental appraisal of the project/site will be carried out.

The commercial appraisal will assess whether or not the turbines should be replaced, in their entirety, by new turbines or if the site should be terminated in relation to electricity generation.

If the site is to be redeveloped, it will be subject to a separate Planning Application at that time.

If the site is to be decommissioned, then the environmental appraisal will provide the background to decision making into the extent of the facilities to be removed. Obviously, the turbines, towers, met mast and transformer compound will be removed from site. However, consideration will be given as to whether or not turbine bases, cables, hard standings and access roads should be dug up or should be covered in topsoil/peat. Consideration could also be given to any potential uses for the control building. Consultation will be made with the Planning Section of Offaly County Council at that stage.

Any materials (e.g. turbine components) removed from site will be disposed of in an environmentally friendly manner, for example

Turbine towers can be sent for recycling to steel manufactures
Generator components can be broken down and sent for re -use/recycling where appropriate.

8. CONSTRUCTION

8.1 Introduction

The proposed construction programme has been developed as a result of experience gained in the development of other wind farms. Cognisance h as also been taken of the recommendations of each of the specialists involved in the completion of this - and previous proposals.

8.2 Period of Construction

The approximate period of construction for completion of the total scheme is estimated at three to four months. It is expected that during construction there will be an average of approximately 10 no. Persons employed on site, rising to 15 no. Persons at peak periods.

The total estimated cost of the proposed development is expected to be some € 3.94 million, (IR£ 3.1 million) at current prices.

8.3 Overview of Construction Methodology

Construction of the proposed development will take place in line with the sequence set out below:

- Clear and hardcore area for temporary site offices and mobilise s ame.
- Construct site roads and hard -standings. Use local stone for road construction in so far as is possible. Where rock is encountered, break out using breaker on hydraulic excavator. Construct drainage ditches, culverts etc. integral to road constructio n operations.
- Excavate for turbine bases. Where necessary, de -water excavations. Store soils locally for back filling and re-use. Place blinding concrete to turbine bases. Fix reinforcing steel and anchorage system for turbine tower section. Construct shuttering. Fix any ducts etc. to be cast in. Place concrete to bases by starting from the centre, working out to the edges and finishing with the rising section from the middle. Cure concrete. After 1-2 days, remove shutters.
- Construct sub-station building and bases/plinths for transformers.
- Concrete base for met mast.
- Excavate trenches for site cables, lay cables and backfill. Provide ducts at road crossings.
- Partially backfill foundations where necessary for crane operations.
- Mobilise cranes.
- Mobilise tower sections, nacelles, blades and tower transformers.
- Erect towers, nacelles and blades.
- Mobilise and erect transformers at compound.
- Erect fencing at transformer compound.
- Mobilise and erect met mast.
- Complete earthings to towers and complete back filling to foundations
- Complete electrical installation, SCADA system etc.
- Provide ESB grid connection.
- Commission and test plant.
- Complete site works, tidy up site etc.
- Demobilise offices etc.
- Provide any gates, landscaping, signs etc., which may be required.

A detailed construction schedule will be prepared and submitted to the planning and road section of Offaly County Council well in advance of any construction activities and will incorporate any mitigation measures recommended by the planning and road section of Offaly County Council.

8.4 Machinery Used During Construction

- 2 No. Hydraulic Excavators
- 2 No. Dump Trucks
- 350/400 tonne Crane
- 80/100 tonne Crane
- Concrete Pump (Lorry mounted)
- 2 tonne Dumper
- 150 mm De-watering Pump
- 1 No. Site Offices
- 2 No. Toilets, Portaloo type
- Site Generators
- Cement Mixer
- Miscellaneous Power Tools

8.5 Labour

It is anticipated that some 10 people will be employed full -time on site peaking to 15 people during turbine erection.

8.6 Temporary Site Facilities

It is envisaged that the temporary site offices will be located immediately south of the entrance. An area some 8 m x 10 m will be covered in stone to site the offices and Toilets.

One site office, approximately 6 m x 3 m will be brought to site, which will be divided into two sections. One section will be used by the Site Management team as well as by the various Sub-Contractors. The second part will be for the use of a canteen and drying room. Two "portaloo" type toilets will also be provided. These will be emptied on a weekly basis (or earlier if necessary) under a service contract with the supplier. Water for tea, coffee etc. will be brought on site in a 20-litre container on a daily basis. Power will be provided using 1 diesel driven generators. Telephone communications will be by mobile phone.

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The offices / canteen and toilets will be removed from site at the end of the construction period. The hard -cored area will be removed and the area reinstated by adding further layers of peat/topsoil as may be directed by the Landsc ape Architect.

8.7 Construction Materials

The following table provides a summary of the anticipated quantities, of the main construction materials together with an estimate of the number of truck deliveries to site:

Breakdown of Truck Deliveries to Sit e

MATERIAL	QUANTITY	NO. OF TRUCK DELIVERIES
Geofabric	1,000 m2	1
Quarry Dust	230 tonne	13
Stone	1000 tonne	52
Concrete	600 m3	82
Reinforcing Steel	65 tonne	5
Wind Turbine Components	5 Turbines	25
Transformers, Panels and Cabling	-	5
Miscellaneous (stone, blocks, roofing, palisade fencing etc.)	-	3
TOTAL	-	186

The peak number of deliveries per day will occur during two phases: -

- site road construction
- turbine base construction

During site road construction, some two truck deliveries per ho ur are anticipated. This equates to some 16 — 18 deliveries per day.

During turbine base construction, some 120m ^{3} of concrete will be required during one day. This equates to 18 deliveries. Some other materials may also be delivered on such days so that 20 — 25 deliveries per day is a realistic expectation of peak deliveries.

8.8 Construction Cost

The construction cost, including ESB grid connection etc., is estimated at € 3.94 million, (IRP £3.1 million). However, when various other costs (e.g. financing, professional fees, land agreements etc.) are added, the project cost estimate increases to €4.76 million (IRP £3.75 million).

9. FLORA

Generally wind farm developments such as this proposed project are located on sparsely populated and untouched upland areas where the flora of the landscape is mostly undisturbed. The impact on the vegetation through disturbance during construction and the impact of intense earth movements can have a significant impact on the flora of these areas.
The proposed development at Leabeg, Ferbane, Co. Offaly is located entirely on agriculture land, which would be considered to bear an indigenous and species -poor flora. The proposed development will have minimal negative impact on the development site.

10. FAUNA

10.1 Birds

The greatest potential effect of any wind farm development, whether through installation, disturbance or habitat damage, would be the impact on scarce or uncommon species (internationally, nationally or locally). The proposed development is located in an area dominated by agricultural activities and does not bare any evidence of providing habitat to any scarce or uncommon species.

The conclusions of the recent American National Avian -Wind Power Planning Meeting (Anon., 2001) indicate that, despite a growing number of dedicated research projects on the interactions between birds and wind -farm installations, very little is yet known on how to properly predict or quantify the mortality risk facing birds using these sites. For instance, it is not known whether the level of risk of collision for nocturnally active birds or birds flying during periods of reduced visibility is greatly increased. Delegates to this meeting accepted that wind turbine impact on birds is a site-specific issue and that avoidance of areas with high bird use is the only proven way to avoid high levels of avian fatalities. There is some evidence that disturbance and habitat loss may have a bigger impact on the birds at certain wind -farm sites than actual collisions with turbines (BirdWatch Ireland, 1998).

Studies in the USA and the UK have shown that on a turbine -per-turbine basis bird strike is not particularly high at most wind-farms (California Energy Commission, 1995; Lowther, 1996). Typical quoted estimates from British sites (with 3-24 turbines) are 0 to 1.34 bird strikes per turbine annually (Lowther, 1996). In some cases bird strike of migrant species is thought to be higher. Evidence from other studies suggests

that other man-made structures such as guyed meteorological towers may be the source of greater mortality risk than wind turbines (Anon., 2001). The proposed development is small in scale with 5 planned turbines. In terms of overall conservation importance this proposed project would have a minimal impact on the e xisting bird wild life.

10.2 Mammals

Rabbits, hares, badger, foxes and frogs are found on the proposed development site. The likely impact on the habitat of these species would be considered short term and would incur during construction through increase d in on site traffic. In the long term it is very unlikely that the overall number of any species on or visiting the site will change, provided that the interference with existing habitat features, such as hedge banks and ditches, are kept to a minimum.

11. NOISE

11.1 Construction Phase

The construction phase of this development will last for an estimated 3 to 4 months. Initial construction will involve modifying existing roads and laying concrete foundations followed by the erection of the turbi ne towers. Machinery involved during the initial ground works will involve excavators, dump trucks, concrete pumps and potentially rock-breaking equipment. The prefabricated tubular sections of the turbine towers will be hoisted into place by 2 no. mobile cranes.

There will be vehicular movements to and from the site associated with the employees involved in the construction process. The vehicles will make use of existing roads out of necessity. It is envisaged that the greatest impact from construction tr affic will be during concrete placing when there will be a maximum of approximately 20 deliveries of concrete over a day period.

11.2 Operational Phase

During the operational phase the WTGs will be the dominant source of noise on site. The generated noi se will comprise of both aerodynamic noise from the blades and mechanical noise from the turbine in the nacelle.

There will also be some vehicular movements on site from time -to-time for routine maintenance.

11.3 Layout

Background noise levels in rural areas are proven to be between 20 and 62 dB(A) depending on the proximity to roads, dwellings, forest and industry. In the case of the

proposed project at Leabeg the main source of background would be expected from Peat harvesting and agricultural machine ry. The main source of background noise is however due to wind passing through trees and over obstacles such as fences and stone walls commonly found in areas like this.

It is recommended by the "Wind Energy Development Best Practice Guidelines" that noise levels generated by any wind farm development should not exceed 40 dB(A) at any dwelling.
When considering a layout of this proposed project the existing dwellings, planned dwellings and possible further development of dwellings in the area were taken i nto account. **(See Fig. 13 "Noise Contours)**

Noise levels were calculated using the data supplied by the manufacturer of the NEG – Micon 900/52 turbine with a hub height of 50 meters at wind speeds of 8 meter per second. These calculations do not take back ground noise or noise absorbent obstacles into consideration. Forest, trees, bushes and other vegetation will absorb noise created by turbines. At a distance of 400 meters and a wind speed of 5 meters per second the background noise level in general is hig her than the noise produced by the turbines.

12. SHADOW FLICKER

The shadow cast by each of the proposed turbines was assessed by computer modelling using the 21st of March as the date, which represents the average height of the sun above the horizon. T he shadow cast by the tower, nacelle and rotor were calculated, taking the site topography into account and plotted in plan.
There are very few resided dwellings, located in the close vicinity of the site.
None of the turbines will cast a shadow on any o f the residences nearest to the proposed development. This is as a result of the fact that all of the residences are located sufficiently far away. In this regard, the proposed development will not cause any shadow flicker to occur. **See Fig 14.**

13. ELECTROMAGNETIC INTERFERENCE

13.1 Sources of Electromagnetic Emissions

During the construction phase there are likely to be several sources of electromagnetic emissions. Chief among these will be electrical power tools and electrical generators, which may be brought on site before mains electricity is provided.

The electromagnetic emissions from these devices will not be unusual in any way, all these devices are in common usage on any building site around the country. All these devices are required by Irish a nd European law to comply with the EMC Directive 89/336/EEC. This will ensure that the electromagnetic emissions from these devices will not cause interference to other equipment.

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Fig.13

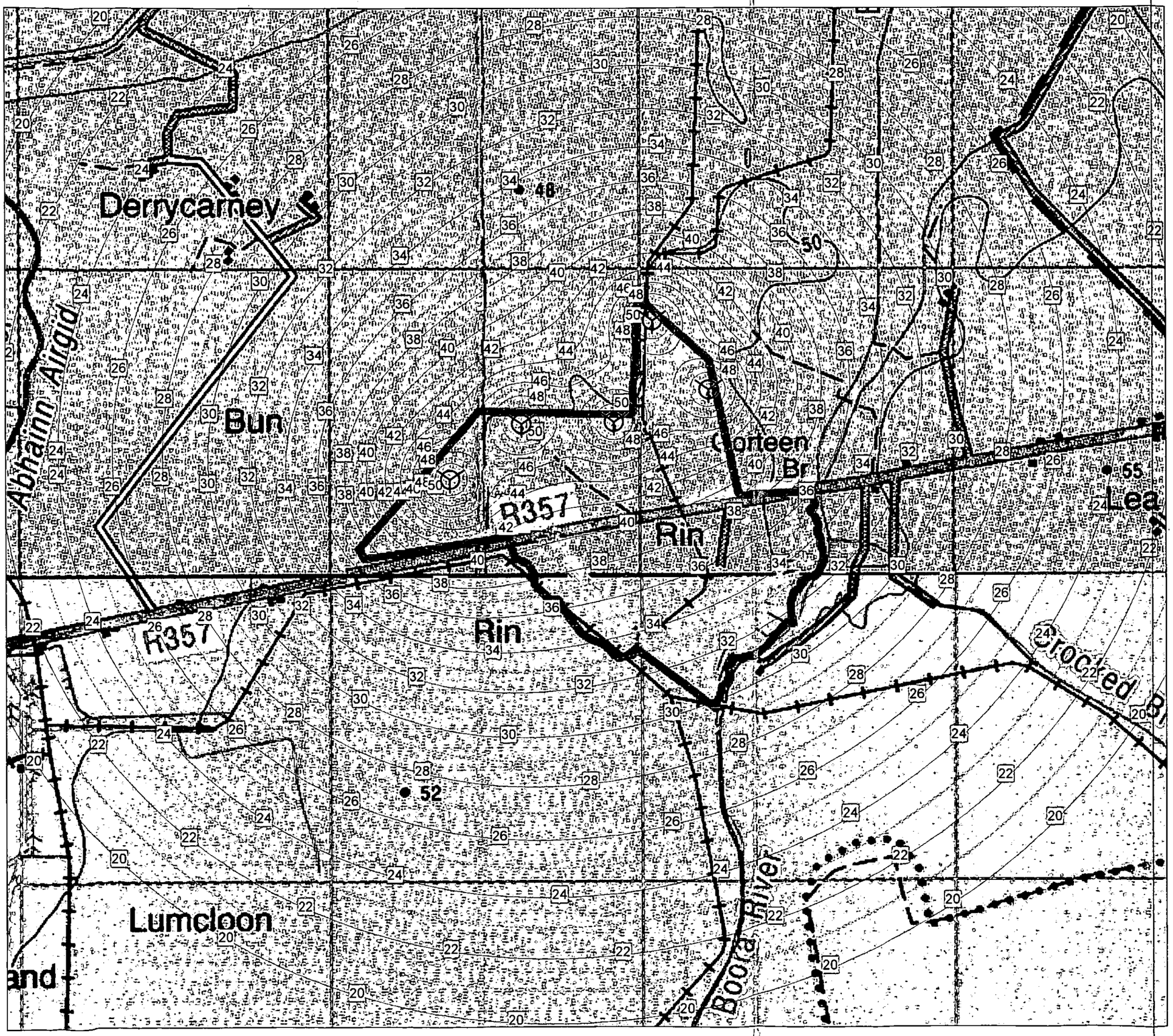
Noise level Contours

Proposed Wind Farm at:

Leabeg,

Ferbane,

Co. Offaly



Key:-

Turbine

Date: April 22, 2002

Scale is 1:12000

Bottom left : 213954 218518

N

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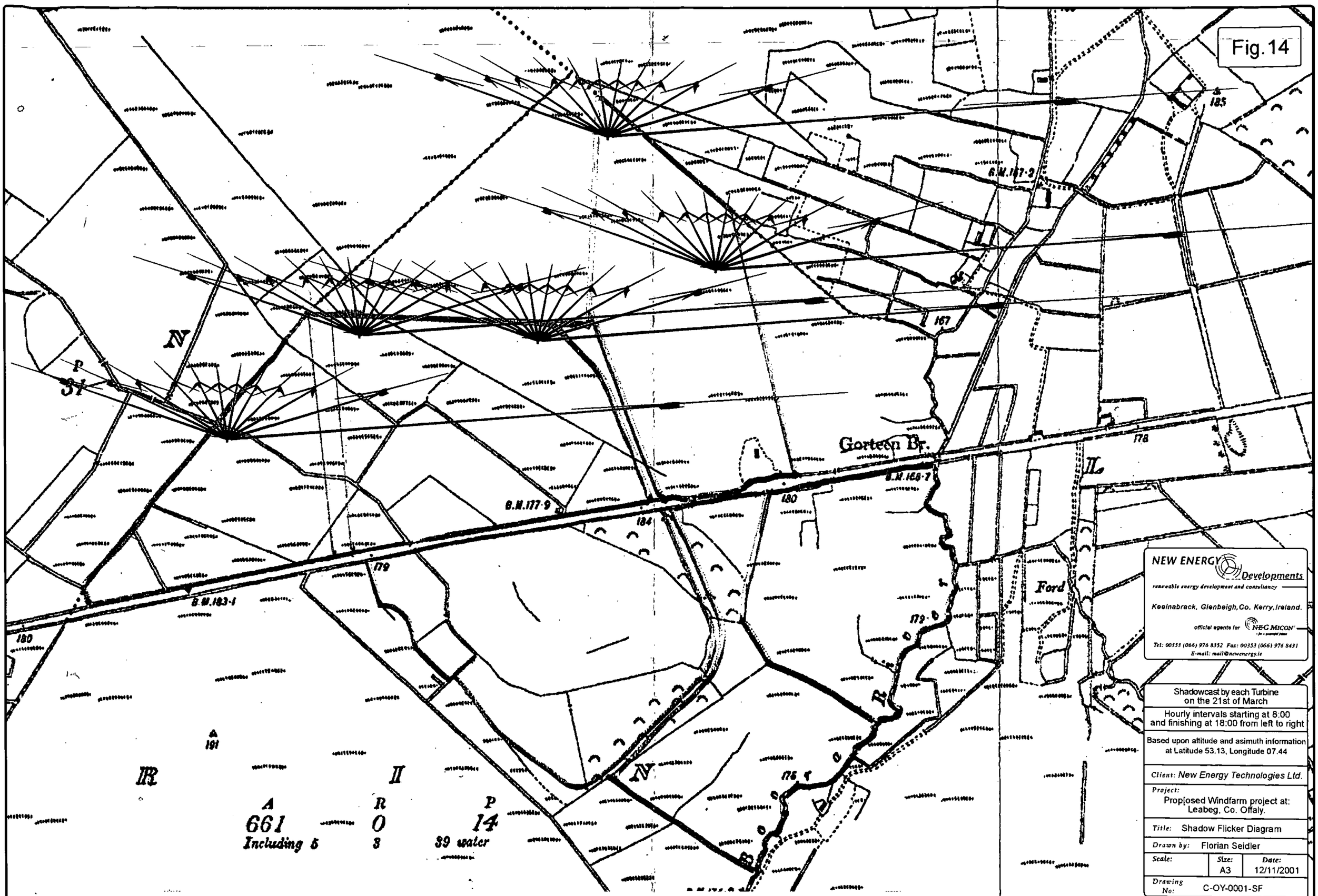
Project: Proposed Windfarm project at: Leabeg, Co. Offaly		
Title: Noise Level Contours		
Drawn by: Shane Browne		
Scale: 1:12,000	Size: A3	Date: 22/04/2002
Drawing No: C-OY-0001-NLC		

Fig.14



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Shadowcast by each Turbine on the 21st of March

Hourly intervals starting at 8:00 and finishing at 18:00 from left to right

Based upon altitude and asimuth information at Latitude 53.13, Longitude 07.44

Client: New Energy Technologies Ltd.

Project: Prop[osed Windfarm project at: Leabeg, Co. Offaly.

Title: Shadow Flicker Diagram

Drawn by: Florian Seidler

Scale:	Size:	Date:
	A3	12/11/2001

Drawing No: C-OY-0001-SF

During the operation phase there will be several sources of electromagnetic emissions. The generators themselves will produce 50Hz. fields, but there is no reason to assume the levels of these (50Hz.) fields will be destructively excessive. The control electronics will be typical of any circuits used by industry or conventional g enerating station. As with the construction phase all electrical components, equipment, apparatus and systems are required by Irish and European law to comply with the EMC Directive 89/336/EEC. This will ensure that the electromagnetic emissions from these devices will not cause interference to other equipment.

13.2 Impact of Electromagnetic Emissions

There are no sources of electromagnetic emissions of sufficient strength to have any impact on the environment during the construction phase. The existing e nvironment contains some areas of agricultural grazing land. There are cattle and sheep grazing on these areas and whether or not they remain during the construction of the wind farm is immaterial from an electromagnetic emissions point of view.

The levels likely to be generated during the construction phase are well below (orders of magnitude below) those specified in ENV 50166-1: "Human exposure to electromagnetic fields. Low frequency (0Hz. To 10kHz.)" and ENV 50166-2: "Human exposure to electromagnetic fields. High frequency (10kHz. to 300GHz.)".

As with the construction phase, during the operation phase all electrical components, equipment, apparatus and systems are required by Irish and European law to comply with the EMC Directive 89/336/EEC.

13.3 Precautions or Treatments

As explained above, during the construction phase, all electrical components, equipment, apparatus and systems are required by Irish and European law to comply with the EMC Directive 89/336/EEC. This will ensure that the electro magnetic emissions from these devices will not cause interference to other equipment. This will cover normal conditions.

There is the possibility of abnormal operation of equipment, or faulty equipment causing higher than normal levels of electromagnetic emissions. This is a situation that can arise anywhere and is not unique to wind farm construction. If high levels of electromagnetic emissions are generated to the extent that they impact on other equipment or on the environment, the effects will be obvio us and appropriate remedial action can be taken.

14. ARCHAEOLOGY

No recorded Archaeological Monuments are identified on the site, however during the excavation work of the turbine foundation the Construction Company will employ an approved archaeologis t to over see all works.

15. VISUAL IMPACT

15.1 Introduction

Frequently the largest impact associated with developments of this kind is the visual impact. This section of the report examines the likely visual impact of developing a wind farm at Leabeg, Ferbane, Co. Offaly. The development is to comprise of five 0.9 MW (900 kW) wind turbines and the associated access roads, control building and a 60m monitoring mast. The visual impact is analysed via a zone of visual influence map and photomontages, prepared using various specialised computer programs, which show the expected appearance of the site after development.

15.2 Types of visual impact

A visual impact is created when a contrast occurs in the landscape. The contrasts that can occur after an area has been developed can be grouped into three categories (Skehan 1991):

- Contrasts of scale,
- Contrasts of Association,
- Contrasts of Harmony.

15.3 Contrasts of Scale

The proposed wind farm will undoubtedly create a contrast of scale. The height of the turbine to the centre of the hub is 72.3 m, this combines with the blade radius to create a maximum height of 98.4 m. The large height of the machines will result in a sharp contrast between the development and the surrounding area. Open areas such as t he site in question are more vulnerable to a negative visual impact than sites with developments nearby. If other developments are present the contrast in scale is less severe.

15.4 Contrasts of Association

Contrasts of association occur when there is a contrast between what we experience and what we expect. Wind farms create a contrast in this respect because of their rarity in the Irish landscape. The impact of this contrast of association is beginning to diminish, as the public becomes more aware of wind energy and more familiar with wind turbines.

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15.5 Contrasts of Harmony

A contrast of harmony occurs when a development dominates all other aspects of the landscape. The development proposed would create a contrast of harmony, to a certain extent, as it is a 'hi-tech' development set against the backdrop of an agricultural rural landscape. It could be argued that a contrast of harmony already exists between the land used for agricultural activities and that used for forestry. Coniferous forest is not native to the landscape and is beginning to attract criticism in this regard. A further significant impact on the contrast of harmony is apparent through the existence of the Ferbane power station (approximately 2 km to the west of the proposed site)

'Anthropocentricity' is the term given to the phenomenon whereby the human eye is directed to man made objects first. Wind turbines are possibly unique in terms of this aspect of visual impact because of the motion of the rotor. This feature of wind turbines tends to increase their visibility significantly. The elements of the vast majority of developments are static and thus do not contrast with the static elements of the landscape.

15.6 Zone of Visual Influence

The zone of visual influence is the area within which a view of the development can be obtained. It is determined primarily by the topography of the area. Additional elements, which provide screening such as buildings, forestry and hedgerows, are not taken into account by the zone of visual influence map.

The zone of visual influence for this wind farm was based on a combination of analysis of the Discovery Series 1:50000 Ordnance Survey maps (Nos. 48 and 54) and field studies. Using the contours on the 1:50000 Ordnance Survey map, a three - dimensional computer model was generated. This allowed the views from known elevations and specific radii from the wind farm to be examined.

The visual impact of the development was examined in detail within a 10 -km radius from the wind farm. This arbitra ry boundary was determined by considering the scale and nature of the development and the topography of the surrounding area. The restriction of the analysis to within a 10 -km radius does not mean that the wind farm will not be visible beyond this distance . However, the most significant visual impacts are likely to occur within this region. Attached are five ZVI maps of which the first four will show a more detailed view of the visual impact on the specific area. This maps are in a scale of 1:50,000 (**Fig. 15, 16, 17 and 18**) whereas **Fig 19** is in a scale of 1:64,000 to show the greater area around the proposed wind farm.

15.7 Photomontages

Four wire frame images and photomontages from points in the surrounding area are provided, which were identified as important views of the wind farm. Please find attached **Fig. 20** the view point location map and the corresponding photomontage and wire frame images 1-4 as **Fig. 21 – 24**.)

15.8 Conclusion

Wind turbines are rural land users, and in the future are likely to be increasingly typical of working rural environments where the wind conditions are favourable. There is no doubt that wind farming will always be subject to visual impact and it will also have an impact on the character of the area.

In the process of planning this Wind Farm these points were taken into account. Even though the Wind Farm is visual from the surrounding area, due to local topography and the coverage, which is provided through bushes, hedges and trees along all roads in the area, the visual impact will not be significant.

The area of the proposed site at Leabeg is visually open in all directions due the nature of the surrounding relatively flat landscape. This will allow long distance views of the proposed wind farm. However, due to this flat landscape, surrounding Infrastructure, Hedgerows, Trees and Forrestation will obstruct views to a large extent.

Compared with similar developments elsewhere, this is an exceptionally good performance.

It is largely a matter for the individual whether the visual impact is a positive or negative one. The visual impact of a wind farm development is heavily dependent upon the type of landscape against which it is set. There is very little that can be done to mitigate against the visual impact of this development any further in terms of layout. Compact developments such as this are more favourable than linear type layouts.

One important aspect should also be taken in consideration. Even though it will take approximately four months to build a wind farm of this size, the decommissioning period for the main structure of a wind farm will only take one day per turbine. The life span of a turbine is twenty-five to thirty years and compared with any other power producing plant it is very easy to handle. With that aspect in mind it can be seen as a temporary installation with very little long-term impact.

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Zone of Visual Influence (ZVI) Map 1

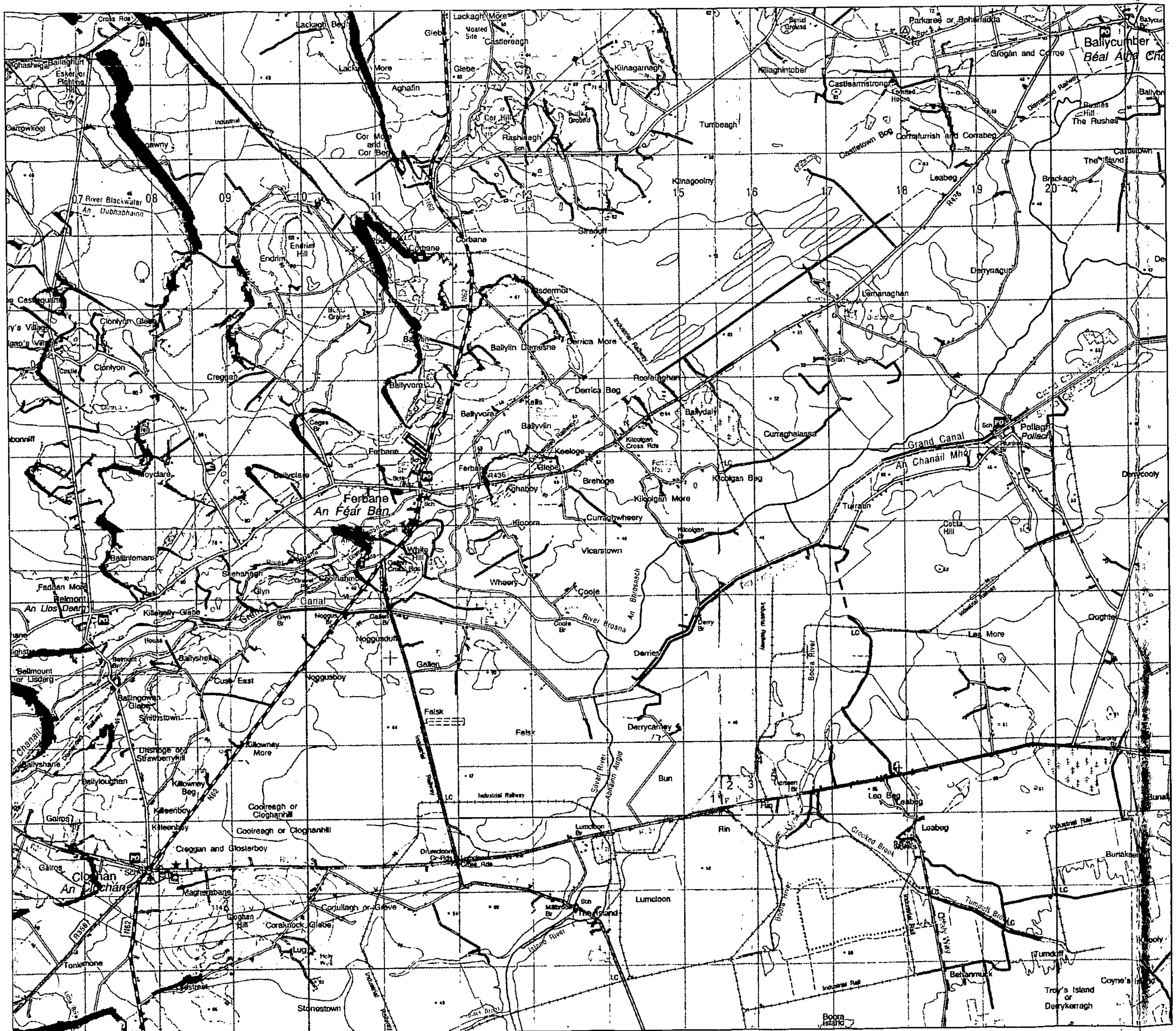
Proposed Wind Farm at:

Leabeg,

Ferbane,

Co. Offaly

Fig. 15



Key:-

Turbine

ZVI (tips visible) :-

- 1 - 1 turbines
- 2 - 2 turbines
- 3 - 3 turbines
- 4 - 4 turbines
- 5 - 5 turbines

Date: April 22, 2002

Scale is 1:50000

Bottom left : 205999 217112

N

Zone of Visual Influence (ZVI) Map 2

Proposed Wind Farm at:

Leabeg,

Ferbane,

Co. Offaly

Fig. 16

Key:-

Turbine

ZVI (tips visible) :-

- 1 - 1 turbines
- 2 - 2 turbines
- 3 - 3 turbines
- 4 - 4 turbines
- 5 - 5 turbines

Date: April 22, 2002

Scale is 1:50000

Bottom left : 210456 217112

N

Zone of Visual Influence (ZVI) Map 3

Proposed Wind Farm at:

Leabeg,

Ferbane,

Co. Offaly

Fig. 17

Key:-

Turbine

ZVI (tips visible) :-

- 1 - 1 turbines
- 2 - 2 turbines
- 3 - 3 turbines
- 4 - 4 turbines
- 5 - 5 turbines

Date: April 22, 2002

Scale is 1:50000

Bottom left : 205999 211705

N

Zone of Visual Influence (ZVI) Map 4

Proposed Wind Farm at:

Leabeg,

Ferbane,

Co. Offaly

Fig. 18

Key:-

Turbine

ZVI (tips visible) :-

- 1 - 1 turbines
- 2 - 2 turbines
- 3 - 3 turbines
- 4 - 4 turbines
- 5 - 5 turbines

Date: April 22, 2002

Scale is 1:50000

Bottom left : 210456 211460

N

Zone of Visual Influence (ZVI) Map 5 (Total)

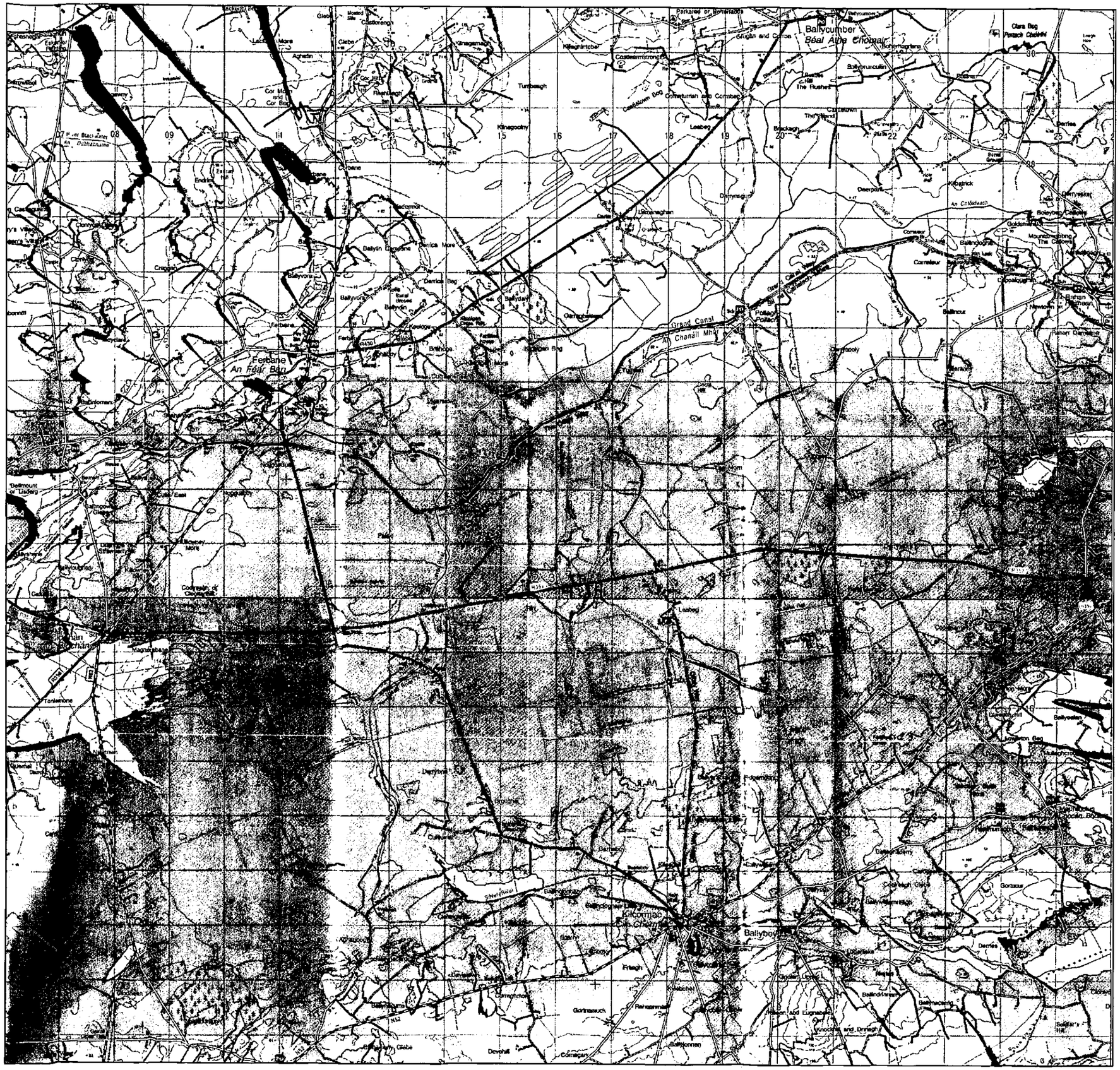
Proposed Wind Farm at:

Leabeg,

Ferbane,

Co. Offaly

Fig. 19



Key:-

Turbine

ZVI (tips visible) :-

- 1 - 1 turbines
- 2 - 2 turbines
- 3 - 3 turbines
- 4 - 4 turbines
- 5 - 5 turbines

N

Date: April 22, 2002

Scale is 1:70000

Bottom left : 205999 211460

Fig. 20

View Pt No.	E Co-ordinates	N	Elevation
1	210270	219380	50
2	211800	219890	49
3	217930	220460	58
4	220370	221320	59
5	220650	222890	51

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Project: Proposed Windfarm Development at: Leabeg, Co.Offaly

Title: View-Point Positions

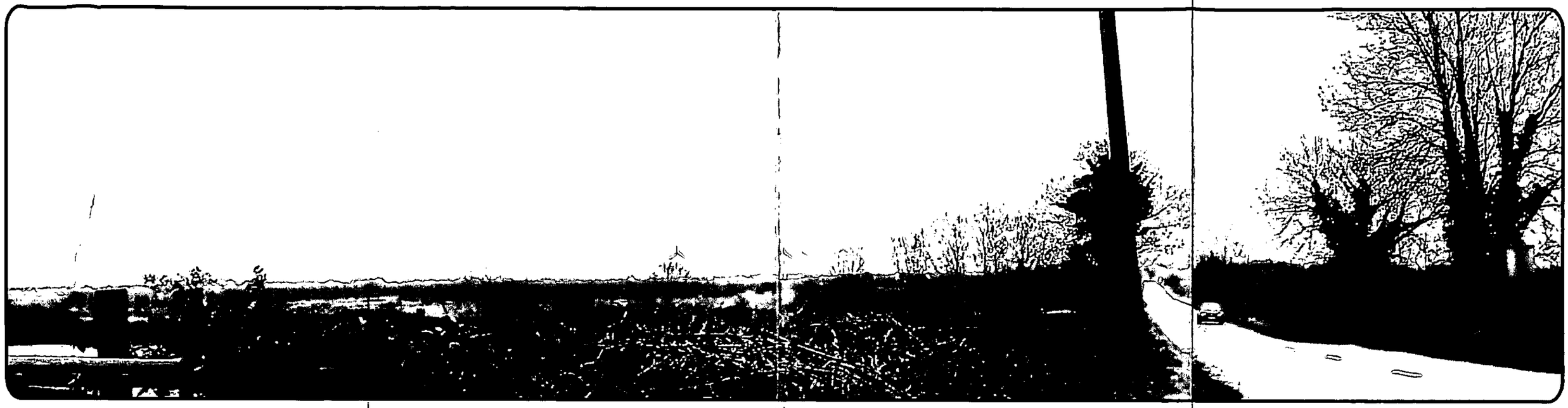
Drawn by: Shane Browne

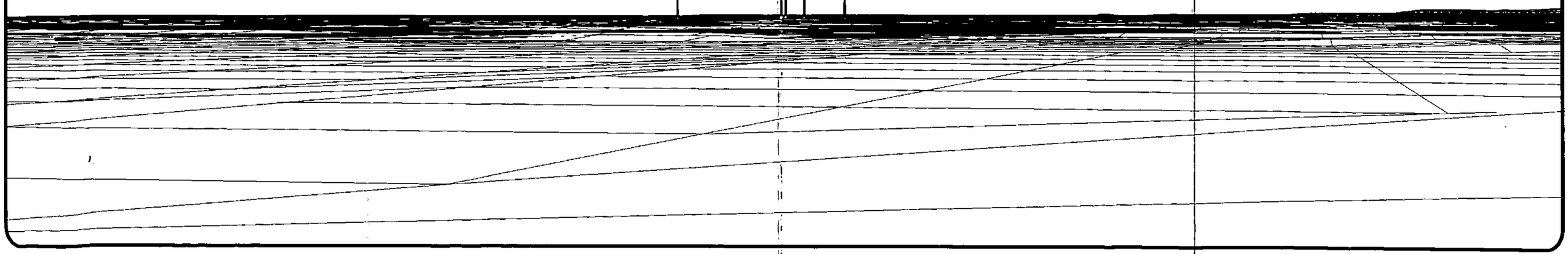
Scale: 1:50,000 | Size: A3 | Date: 18-01-2002

Drawing No: C-OY-0001-VPP

Proposed Wind Farm at Leabeg, Co. Offaly

Fig 21





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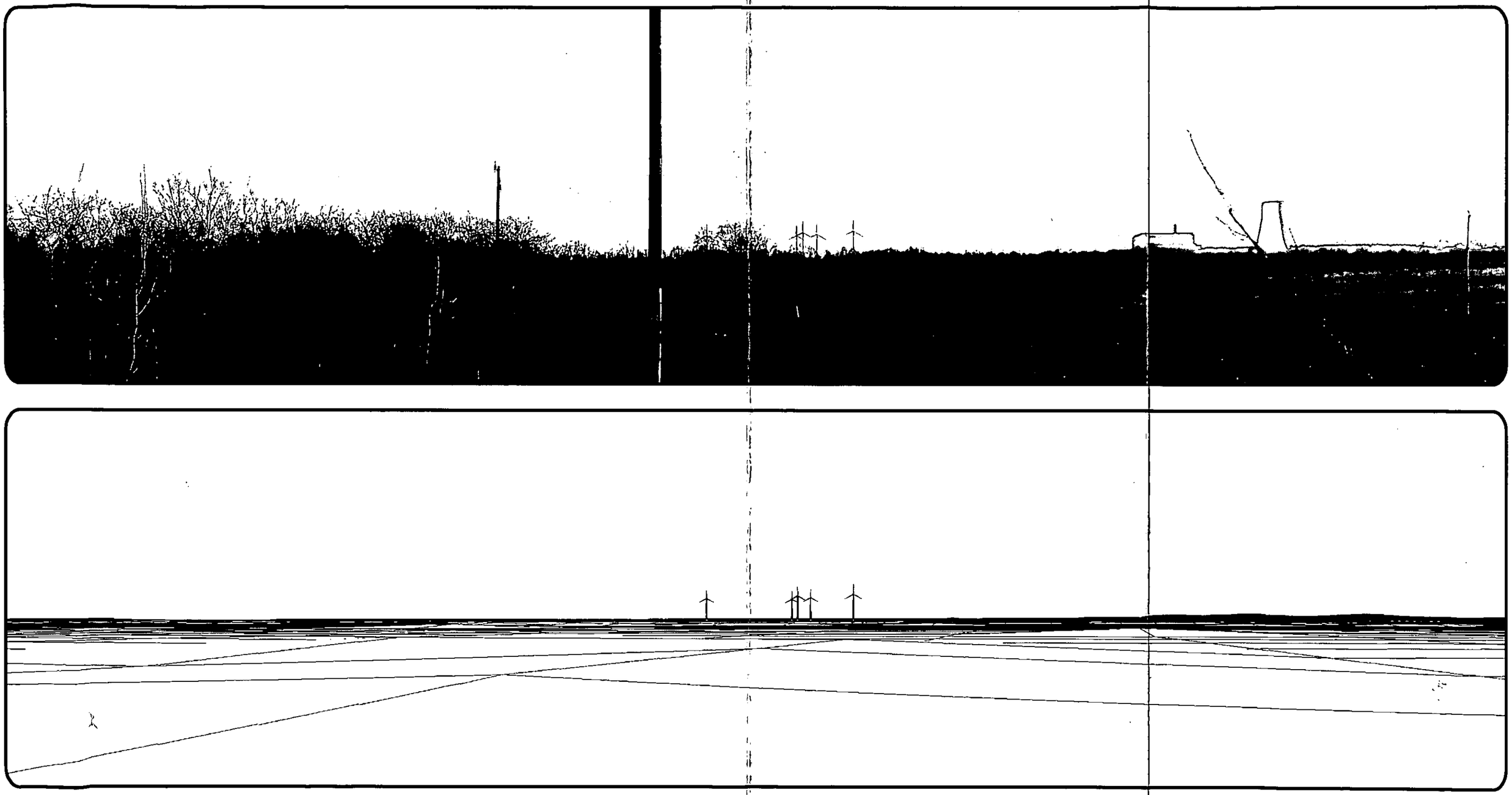
View-Point	Number 1
Position Co-ordinates	East- 210270 North-219380
Height	52 m
Distance to nearest Turbine	5466.47m
Turbine Hubs Visible	5
Turbine Tips Visible	5

Project: Proposed Wind Farm Development at: Offaly, Co. Offaly			
Title: View-Point No. 1			
Drawn by: Florian Seidler			
Scale:	*Size:* A3		*Date:* 14/01/2002
Drawing No: C-OY-0001-VP1			

Proposed Wind Farm at Leabeg, Co. Offaly

Fig 22



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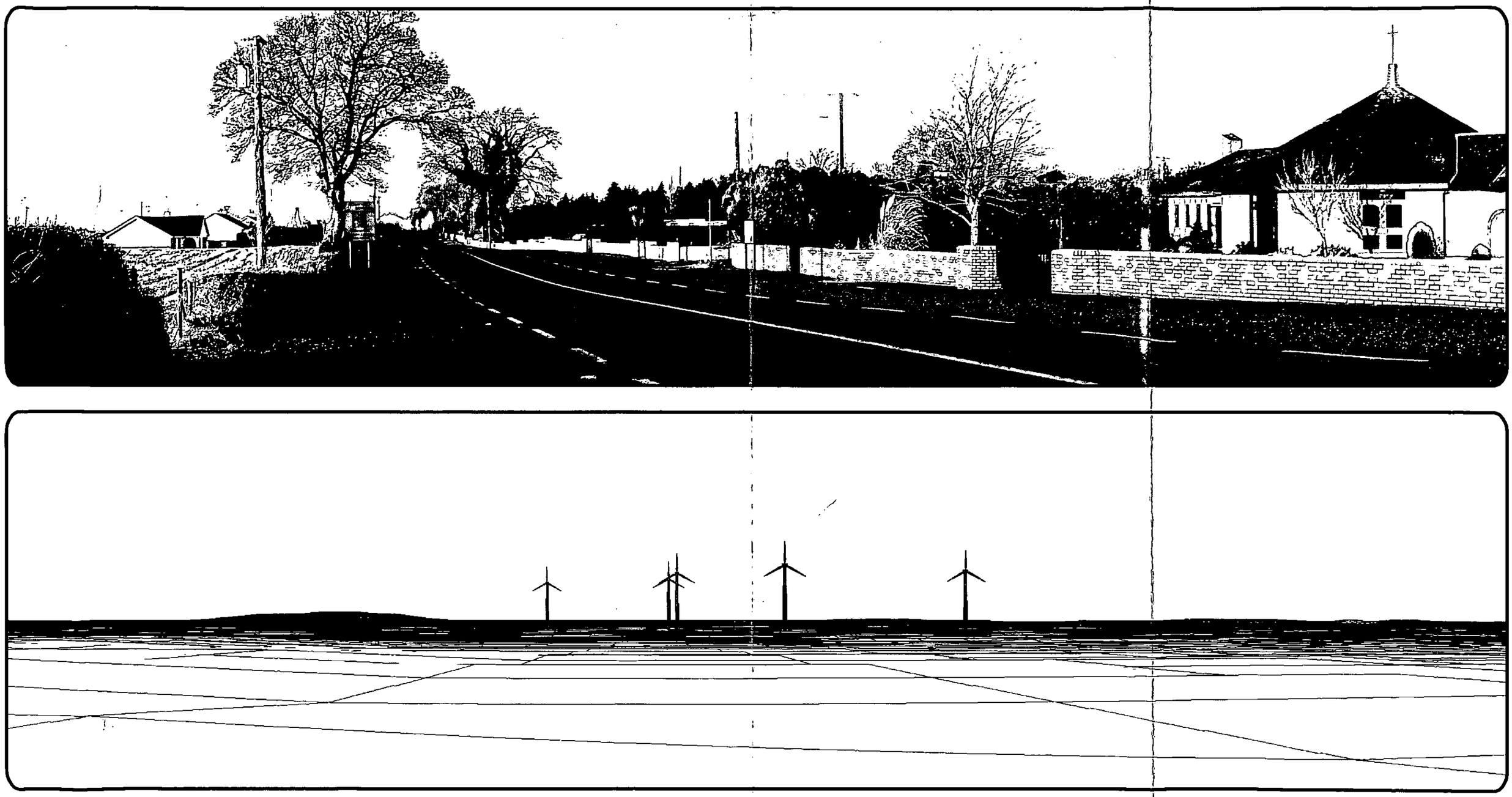
View-Point	Number 2
Position Co-ordinates	East-211800 North-219890
Height	49 m
Distance to nearest Turbine	3616.01m
Turbine Hubs Visible	5
Turbine Tips Visible	5

Project: Proposed Wind Farm Development at: Offaly, Co. Offaly			
Title: View-Point No. 2			
Drawn by: Florian Seidler			
Scale:	*Size:* A3		*Date:* 14/01/2002
Drawing No: C-OY-0001-VP2			

Proposed Wind Farm at Leabeg, Co. Offaly

Fig 23



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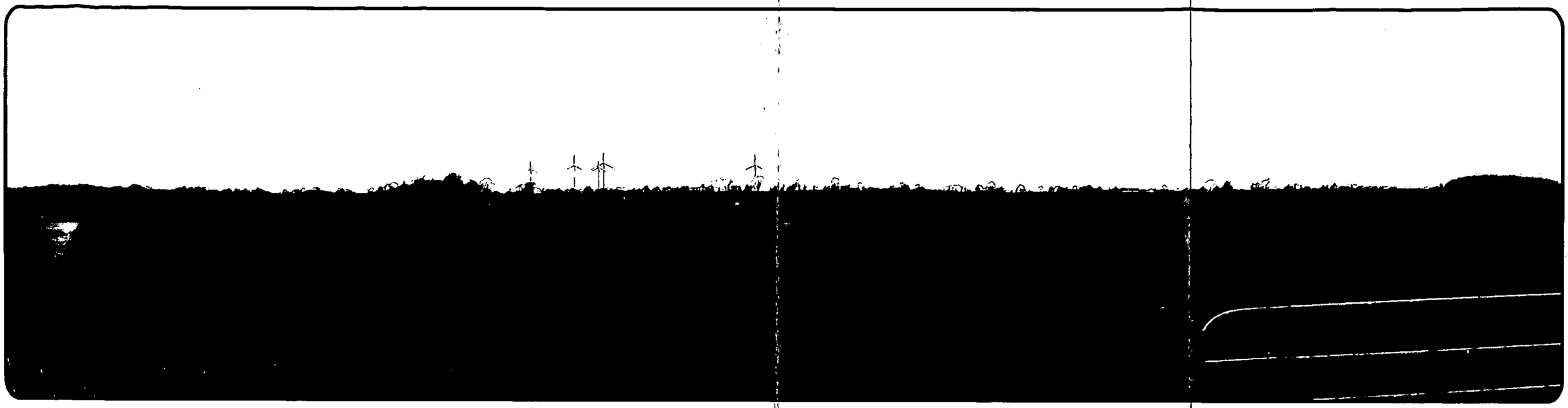
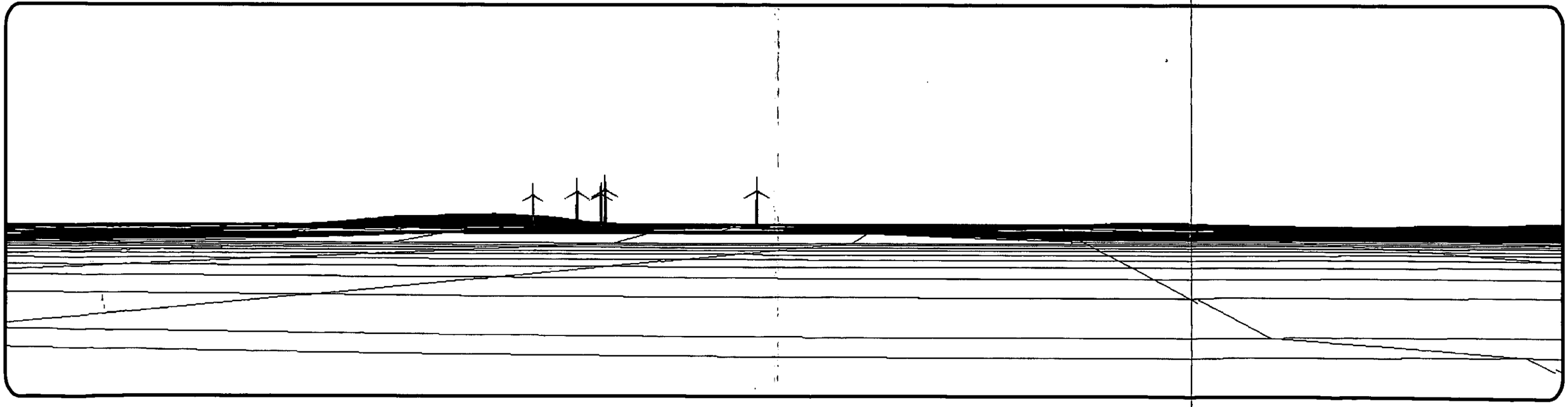
View-Point	Number 3
Position Co-ordinates	East-217930 North-220460
Height	58 m
Distance to nearest Turbine	1715.72m
Turbine Hubs Visible	5
Turbine Tips Visible	5

Project: Proposed Wind Farm Development at: Offaly, Co. Offaly		
Title: View-Point No. 3		
Drawn by: Florian Seidler		
Scale:	*Size:* A3	*Date:* 14/01/2002
Drawing No: C-OY-0001-VP3		

Proposed Wind Farm at Leabeg, Co. Offaly

Fig 24





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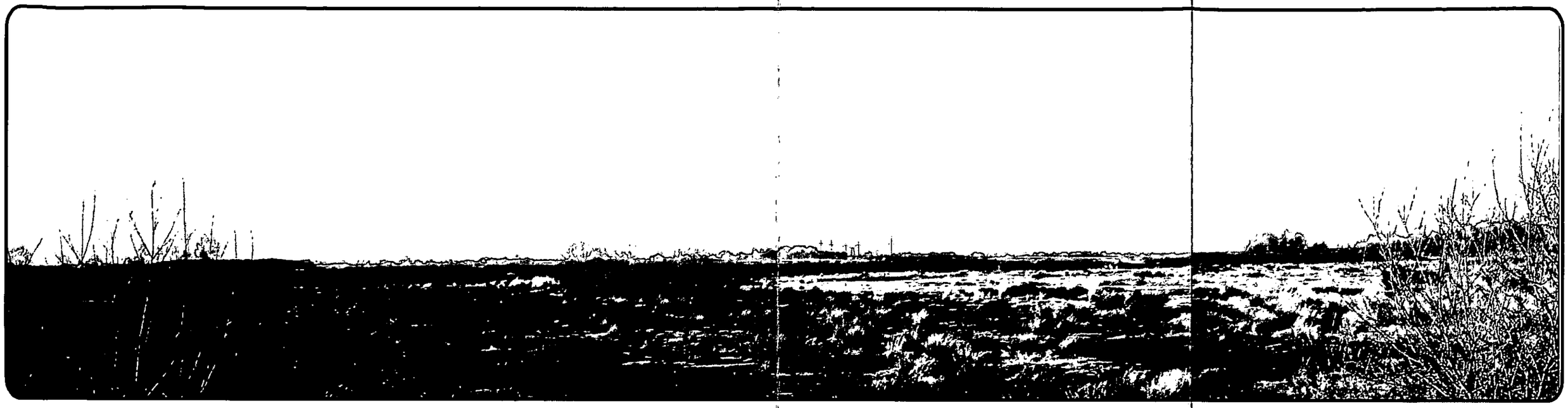
View-Point	Number 4
Position Co-ordinates	East-220370 North-221320
Height	59 m
Distance to nearest Turbine	4211.99m
Turbine Hubs Visible	5
Turbine Tips Visible	5

Project:	Proposed Wind Farm Development at: Offaly, Co. Offaly		
Title:	View-Point No. 4		
Drawn by:	Florian Seidler		
Scale:	*Size:* A3		*Date:* 14/01/2002
Drawing No:	C-OY-0001-VP4		

Proposed Wind Farm at Leabeg, Co. Offaly

Fig 25



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View-Point	Number 5
Position Co-ordinates	East-220650 North-222890
Height	51 m
Distance to nearest Turbine	5050.55m
Turbine Hubs Visible	5
Turbine Tips Visible	5

Project: Proposed Wind Farm Development at: Offaly, Co. Offaly			
Title: View-Point No. 5			
Drawn by: Florian Seidler			
Scale:	Size: A3		Date: 14/01/2002
Drawing No: C-OY-0001-VP5			

Appendix 1.

Turbine Specifications

New Energy Developments,
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Main Specification

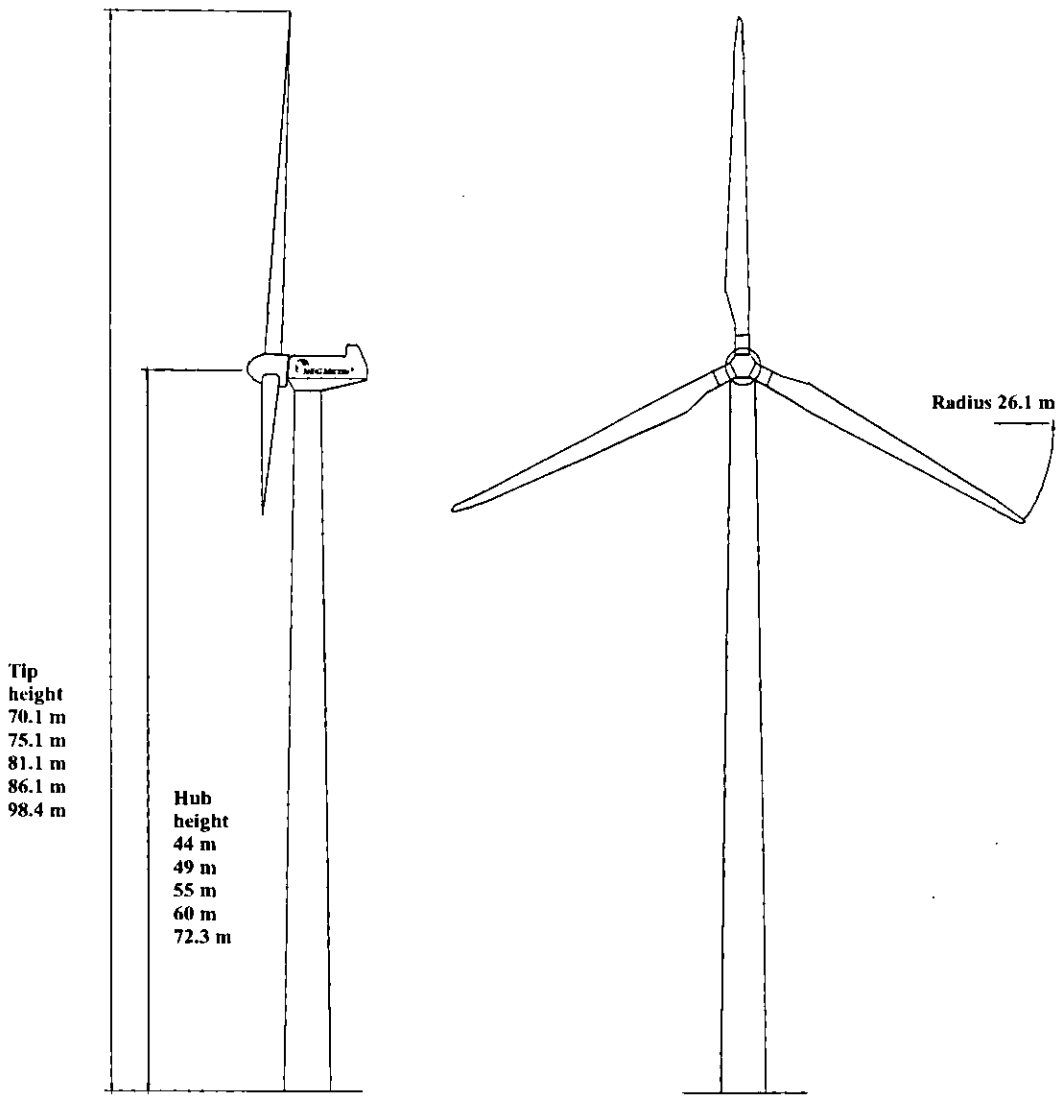
NM 900/52 – 50 Hz

IEC II

TIC 028'008 GB

Will not be updated automatically

0 Illustration



1 Main Data

	Nominal Power	900	kW
	Rotor diameter	52.2	m
	Swept area	2140	m^2
	Hub height	44,49,55, 60, 72.3	m
	Rotational speed	22.4/14.9	rpm

2	**Nacelle Bed**		
	Type description		20 t platform
	Material		EN-GJS-400-18U-LT
	Standard colour		RAL 7035
	Corrosion class, outside		Acc. to DS EN ISO 12944: C5 I
	Weight (without components mounted)	app. 6.5	tons
	Total weight (without rotor and tower)	app. 24.5	tons
3	**Rotor**		
	Number of blades	3	pieces
	Rotor conicity	2	° outwards
	Rotor diameter	52.2	m
	Swept area	2140	m^2
	Rotor speed (rated power)	22.4/14.9	rpm
	Tip speed (synchronous)	61.2	m/s
	Rotor shaft tilt	5	°
	Eccentricity	2221	mm
	Solidity (Total blade area/rotor area)	6.2	%
	Power regulation		Stall
	Rotor orientation		Upwind
	Total weight with hub – LM blades	16.5	tons
4	**Blades – type I**		
	Manufacturer		LM Glasfiber A/S
	Type		LM 25.5
	Blade length	25.5	m
	Material		Glasfiber-UP/Carbon fibre-epoxy
	Type of rotor air brake		Pivotable blade tip
	Blade profiles		NACA 63.4xx, 63.2xx
	Twist	18.66	°
	Tip angle (standard)	-2.7	°
	Largest chord	2.25	m
	Tip length	3.6	m
	Blade area	44.5	m^2
	Weight each	4.2	tons
4b	**Blades – type II**		
	Manufacturer		Aerolaminates
	Type		AL25
	Blade length	25.5	m
	Material		Glasfibre-UP/wood-EP/carbon-EP
	Type of rotor air brake		Pivotable blade tip
	Blade profiles		NACA 63.4xx, 63.2xx
	Twist	20	°
	Tip angle (standard)	-3.2	°
	Largest chord	2.378	m
	Tip length	3.4	m
	Blade area	44.5	m^2
	Weight each	3.5	tons

5	**Hub**		
	Type description		Spherical
	Material		EN-GJS-400-18U-LT
	Corrosion class, outside		Acc. to DS EN ISO 12944: C5 I
	Weight	app. 3.5	tons
6	**Rotor shaft**		
	Type description		Forged shaft and flange
	Material		34CrNiMo6
	Corrosion class		Acc. to DS EN ISO 12944: C2
	Weight	app. 2.4	tons
7	**Main Bearing**		
	Type description		Spherical roller bearing
	Number of	1	piece
8	**Main Bearing Housing**		
	Type description		Pedestal bearing
	Material		EN-GJS-400-18U-LT
	Number of	1	piece
9a	**Gearbox – type I**		
	Manufacturer		Flender
	Type description		1. step planet, 2. step parallel shaft
	Gear house material		Cast iron
	Ratio	1:67.5	
	Mechanical power	970	kW
	Bending strength acc. to DIN 3990		$S_F > 1.6$
	Surface durability acc. to DIN 3990		$S_H > 1.25$
	Scuffing safety acc. to DNV 41.2		$S_S > 1.3$
	Shaft seals		Maintenance free labyrinth-type
	Lubrication		Splash- with lubrication channels
	Oil sump	app. 170	l
	Oil type		Mobilgear SHC XMP 320
	Weight without oil	app. 6.5	tons
9b	**Gearbox – type II**		
	Manufacturer		Jahnel-Kestermann
	Type description		1. step planet, 2. step helical
	Gear house material		Cast iron
	Ratio	1:67.5	
	Mechanical power	970	kW
	Bending strength acc. to DIN 3990		$S_F > 1.6$
	Surface durability acc. to DIN 3990		$S_H > 1.25$
	Scuffing safety acc. to DNV 41.2		$S_S > 1.3$
	Shaft seals		Maintenance free labyrinth-type
	Lubrication		Splash - with lubrication channels
	Oil sump	app. 150	l
	Oil type		Tribol 1710/320
	Weight without oil	app. 5.8	tons

10	**Oil pump**				
	Voltage		3 x 400		V
12	**Water Pump**				
	Voltage		3 x 400		V
14	**Mechanical Brake**				
	Manufacturer				Svendborg Brakes or Sime
	Type description				Fail safe monospring – hydraulic release
	Brake disc				Steel, mounted on high speed shaft
	Number of calipers		1		piece
15	**Hydraulic Power Unit for Mechanical Brake**				
	Voltage		3 x 400		V
	Working pressure range		110-120		bar
	Oil type		SHC 524		Mobil
	Oil capacity		10		l
16	**Coupling**				
	Manufacturer				UniCardan/ZeroMax
	Type description				Flexible coupling, constant velocity
17	**Generator**				
	Manufacturer		Elin, ABB, Leroy Somer or alike		
	Type description				2 speed generator, water cooled
	Rated power	P_N	900	200	kW
	Apparent power	S_N	989	238	kVA
	Rated current	I_N	827	204	A
	Max power at Class F	P_{Fmax}	990	220	kW
	Max current at Class F	I_{Fmax}	910	224	A
	No load current	I_0	238	87	A
	Reactive power consump. at rated power	Q_N	410	140	kVAr (toleranc. acc to IEC 60034-1)
	Reactive power consumption at no load	Q_0	275	104	kVAr (toleranc. acc to IEC 60034-1)
	Number of poles	p	4	6	
	Synchronous rotation speed	n_0	1500	1000	rpm
	Rotation speed at rated power	n_N	1510	1007	rpm
	Slip at rated power	s_N	0.67	0.7	%
	Voltage	U_N	3 x 690		V
	Frequency	f	50		Hz
	Coupling		Δ	Δ	
	Enclosure				IP54
	Insulation class/Temperature increase				Class F/Class B
	Weight		App. 4600		kg
18	**Hydraulic Power Unit for Blade Tip Air Brakes**				
	Voltage		48		VDC
	Working pressure range		127-135		bar
	Relief blow disc		165		bar
	Oil type		SHC 524		Mobil
	Oil capacity		7.5		l
19a	**Yaw System – Slide Bearing Slewing Ring**				
	Type		Pretensioned		Slide bearing

19b	**Yaw System – Yaw Gear and Motors**							
	Gear ratio of yaw gear unit	app. 1:2000						
	Voltage	3 x 400						V
	Rotational speed at full load	900						rpm
	Number of yaw gears	3						pieces
20	**Tower**							
	Material			Welded steel plate				
	Corrosion class, outside			Acc. to DS EN ISO 12944: C5 I				
	Colour			RAL 7035				
	Access conditions			Internal, safety harness, ladder cage				
	Hub height over foundation		44.0	49.0	55.0	60.0	72.3	m
	Tower height		42.2	47.2	53.2		70.5	m
	Top diameter		1.75	1.75	1.75		1.75	m
	Bottom diameter		3.5	3.5	3.5		4.20	m
	Number of sections		2	2	2	3	3	pieces
	Total weight		54	63			104	ton
	all towers with embedded cylinder							
21	**Wind Turbine Controller/Power Panel**							
	Voltage	3 x 690						V
	Cut-in system			Soft with thyristors				
	Maximum power	1010		kW (10 min. average)				
	Weight (total)	900		kg				
21a	**Electrical Grid Requirements**							
	Max. voltage	+10		% (60 sec.)				
	Min. voltage	-10		% (60 sec.)				
	Max. voltage	+12.5		% (0.1 sec.)				
	Min. voltage	-15		% (0.1 sec.)				
	High frequency	+1		Hz (0.2 sec.)				
	Low frequency	- 2		Hz (0.2 sec.)				
	Maximum asymmetri current	15		% (60 sec.)				
	Maximum asymmetri voltage	2		% (60 sec.)				
	Maximum short circuit current	20		kA (at 690 V)				
	Single harmonic	max 1		% of any single harmonic				
	Total harmonic distortion	max 3		% total harmonic distortion				
	Connection	Solidly grounded wye at secondary side of transformer						

22 Power Factor

Preconditions

Rated power	P_N	900	200	kW
Rated voltage	U_N	3 x 690		V
Frequency	f	50		Hz
Reactive power consump. at rated power	Q_N	410	140	kVAr (tolerances acc to IEC 60034-1)
Reactive power consumption at no load	Q_O	275	104	kVAr (tolerances acc to IEC 60034-1)
Capacitor banks:				
Capacitors			275	kVAr, split into steps

Generator G, 4 poles, 900 kW:

Generator load	%	25	50	75	100	110
Power factor before phase compensation (tolerances acc to IEC 60034-1)	cosφ	0,63	0,83	0,88	0,91	0,91
Power factor after phase compensation (tolerances acc to IEC 60034-1)	cosφ	0,99	0,99	0,99	0,98	0,98

Generator g, 6 poles, 200 kW:

Generator load	%	25	50	75	100	110
Power factor before phase compensation (tolerances acc to IEC 60034-1)	cosφ	0,41	0,64	0,76	0,82	0,84
Power factor after phase compensation (tolerances acc to IEC 60034-1)	cosφ	0,98	0,98	0,98	0,99	0,99

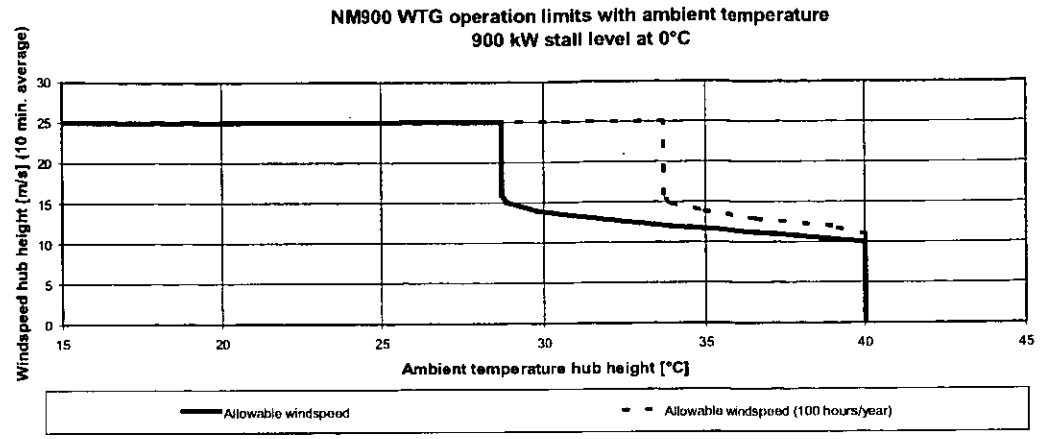
23 Climate and Site Conditions (at hub height)

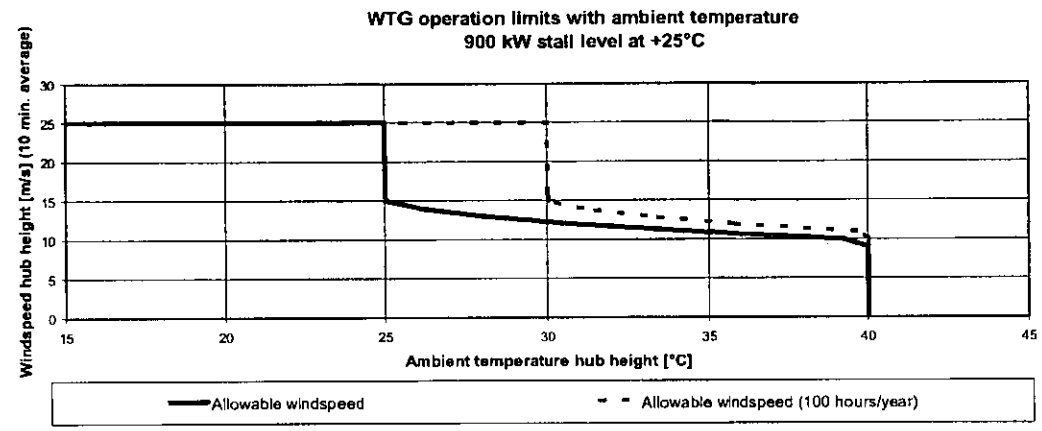
Calculated minimum life	20	years
Temperature interval for operation	-10 to +25	°C
Temperature interval for structure	-20 to +50	°C
A-factor	9.6	m/s
Form factor, c	2.0	
Annual average wind speed	8.5	m/s
Wind shear	0.20	
Extreme wind speed	42.5	m/s (10 min. average)
Survival wind speed	59.5	m/s (2 sec. average)
Automatic stop limit	25	m/s (10 min. average)
Turbulence intensity acc. to IEC high (15 m/s)	18	%
Air density	1.28	kg/m^3
Distance between wind turbines in single rows	3	rotor diameters
Distance between wind turbines in wind farms	5	rotor diameters
Maximum in-flow angle	8	°
Max. air density at 15-20 m/s	1.294	kg/m^3

Note that overproduction and subsequently stop of the turbine will happen in case air density exceeds 1.294 kg/ m^3 provided that stall level wind speeds are present.

Note that air density exceeding 1.294 kg/ m^3 may occur within the temperature interval for operation from –10°C to +25°C depending on site elevation and actual atmospheric pressure.

23 Climate and Site Conditions (at hub height) regarding structural design





Note: Above curves describe WTG upper operational limits given a nominal production of 900 kW at ambient temperature 0°C or + 25°C.

The full line is the normal upper operational limit. Below this curve, the WTG can operate continuously.

The dashed line is the maximum upper operational limit at a maximum of 100 hours per year.

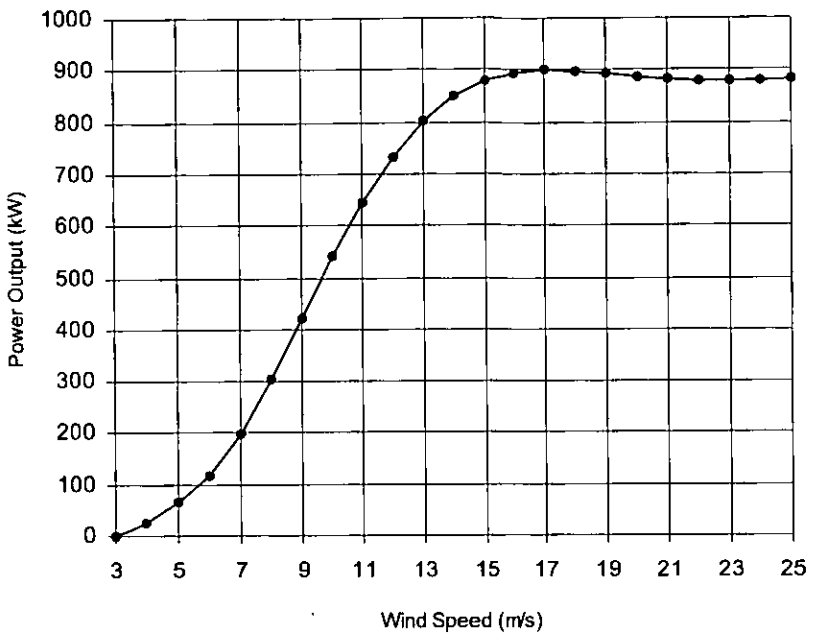
Note! The curves shown above are valid for air density down to 1.1 kg/m^3. Below 1.1 kg/m^3 decrease ambient temperature by 2.5°C per 0.1 kg/m^3

24a Conditions for Power Curve (at hub height)

Air density	1.225	kg/m^3
Wind shear	0.12-0.16	
Turbulence intensity (15 m/s)	11-15	%
Blades	Clean	
Ice/snow on blades	No	
Leading Edge	No damage	
Rain	No	
Terrain	Flat	
Inflow angle (vertically)	0±2	°
Grid frequency	50 ±0.5	Hz
Measured acc. to	IEC 61400-12	
The power curve in this document is only related to air density.		

24b Power Curve

(m/s)	Pe
3	0
4	27
5	67
6	117
7	199
8	303
9	420
10	541
11	644
12	732
13	801
14	849
15	880
16	894
17	900
18	897
19	892
20	887
21	883
22	880
23	879
24	881
25	884
>25	0



25 Sound Level

Verification Reports:		
Official noise level for calculation purpose (at windspeed 8 m/s at 10 meters height) 44m HH	102.0	dB(A)
Official noise level for calculation purpose (at windspeed 8 m/s at 10 meters height) 49m HH	102.0	dB(A)
Official noise level for calculation purpose (at windspeed 8 m/s at 10 meters height) 55m HH	102.2	dB(A)
Official noise level for calculation purpose (at windspeed 8 m/s at 10 meters height) 60m HH	102.3	dB(A)
Official noise level for calculation purpose (at windspeed 8 m/s at 10 meters height) 72.3 HH	102.5	dB(A)
Noise level measured	-	dB(A) +/- 2 dB(A)
Noise levels are given at wind shear = 0.14		