



INTERNATIONAL

**Planning Ref.: 08.PA0044**

**Grousemount Wind Farm  
County Kerry**

**Additional Information**

March 2016

**Part 3 of 3**

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**Planning Ref.: 08.PA0044**  
**Grousemount Wind Farm, County Kerry**  
**Additional Information**

**Part 3 of 3**

**Contents**

**Appendix B to Peat Stability Risk Assessment at  
Grousemount Wind Farm**

**Barnastooka Wind Farm – Site Investigation Report**

**Grousemount Wind Farm – Site Investigation Report**

**Appendix D to Peat Stability Risk Assessment at  
Grousemount Wind Farm**

**Correspondence from Byrne Looby**



INTERNATIONAL

# PEAT STABILITY RISK ASSESSMENT

Appendices B & D

## Grousemount Wind Farm

W78035-F105-018-R-0001

August 2015

**ESB Wind Development Ltd.**

## CONTENTS

### Appendix B

**Barnastooka Wind Farm – Site Investigation Report**  
**Grousemount Wind Farm – Site Investigation Report**

**Appendix D - Correspondence from Byrne Looby**

## APPENDIX B

### Barnastooka Wind Farm Site Investigation Report

**IGSL Ltd**

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**Barnastooka Wind Farm  
Site Investigation**

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**Geotechnical Site Investigation  
Report (Factual) for Proposed  
Windfarm Development in  
Barnastooka, Co. Kerry**

**Project No. 18312**

**July 2015**



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**DOCUMENT ISSUE REGISTER**

<b>Distribution</b>	<b>Copies</b>	<b>Rev.</b>	<b>Date of Issue</b>	<b>Prepared By:</b>	<b>Approved By:</b>
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## TABLE OF CONTENTS

Foreword

1. Introduction

2. Contract Outline & Objectives

3. Fieldworks

3.1 General

3.2 Rotary Core Drillholes

3.3 Trial Pitting

3.4 Geophysical Surveying

3.5 Surveying of Exploratory Locations

4. Laboratory Analysis

References

### Figures

Figure 1 - Site Location Plan  
Figure 2 - Turbine Locations  
Figure 3 - Rotary Coring Rig Set up

### Appendices

Appendix 1 - Rotary Core Drillhole Records & Photographs  
Appendix 2 - Trial Pit Records  
Appendix 3 - APEX Geophysical Report  
Appendix 4 - Laboratory Test Records (Soils)  
Appendix 5 - Laboratory Test Records (Rock)  
Appendix 6 - Site Plan / Drawings



## **FOREWORD**

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

### **Standards**

The ground investigation works for this project (**Barnastooka Wind Farm**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930:1999 +A2:2010 and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

### **Reporting**

This report has been prepared for ESB International and the information should not be used without prior written permission of either party. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

### **Boring Procedures**

Unless otherwise stated, 'shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variations is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

### **Rotary Drilling Procedures**

Rotary drilling methods are used to recover very heavily over-consolidated glacial till and bedrock samples in line with Section 3.5 of IS EN 1997-2:2007 and IS EN ISO 22475-1. Open hole drilling methods (odex or symmetrix) are utilized to advance the drillholes through granular dominant superficial deposits, with coring in hard ('cemented') fine grained or cohesive glacial deposits and bedrock. In this particular project, the key objective of the rotary coring operations was to advance and sample the high strength glacial till and underlying granite bedrock.

### **In-Situ Testing**

Standard penetration tests are conducted by IGSL strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio ( $E_r$ ) is defined as the ratio of the actual energy  $E_{meas}$  (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy ( $E_{theor}$ ) as calculated from the drive weight assembly. The measured number of blows ( $N$ ) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

### **Groundwater**

The depth of entry of any influx of groundwater is recorded during the course of boring or drilling operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

### **Soil Sampling**

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Where appropriate Class 1 thin wall undisturbed tube samples (UT100) are obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

**Table A – Details of Sample Quality Requirements**

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

#### **Engineering Logging**

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

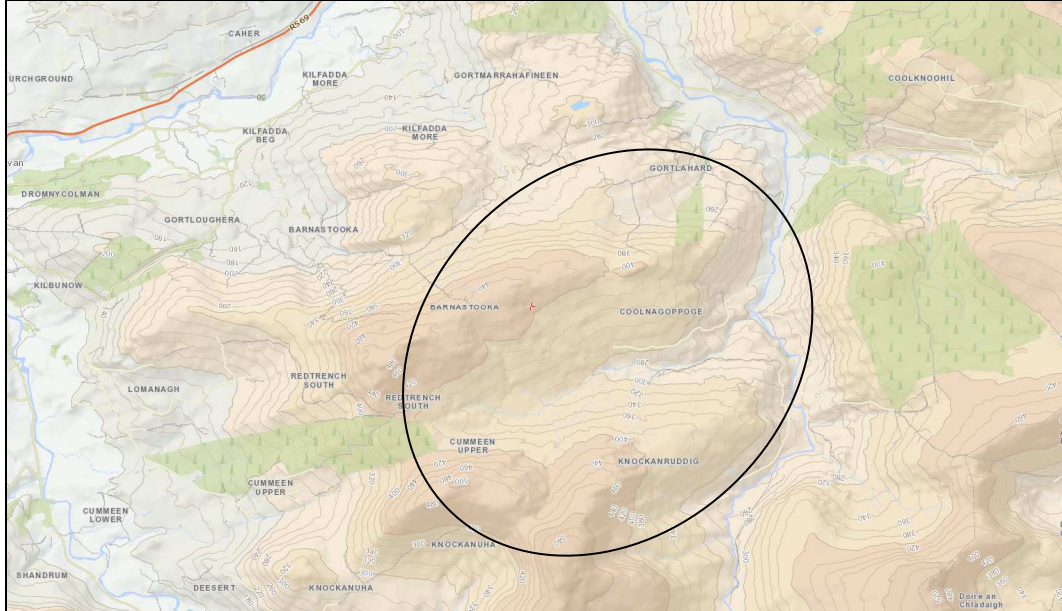
#### **Retention of Samples**

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is company policy to discard soil samples one month after submission of our final report.

## 1. INTRODUCTION

At the instruction of ESB International, IGSL has undertaken a programme of geotechnical site investigation works for a proposed Wind Farm Development 4.5km east of the village of Kilgarvan, in southeast Kerry. It is understood that the scheme will involve the construction of fourteen turbines and associated infrastructure. The proposed development is to be located in the townland of Barnastooka, Co. Kerry and occupies a site envelope of approximately 3.5km x 2.0km.

**Figure 1 – Site Location Plan**



The investigations comprised rotary coreholes, trial pitting and a geophysical survey. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (1999+A2:2010) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing. Geotechnical laboratory testing was carried out on a range of bulk disturbed samples and rotary core samples as agreed with ESBI. Testing has been performed in accordance with BS 1377, 1990 & IRSM Rock Characterization Testing and Monitoring, respectively. This included particle size distributions, moisture contents, Atterberg Limits, pH and sulphate analysis. Point load strength index (PLSI) and unconfined compressive (UCS) tests were performed on the rock cores. To assess the re-use potential of the rock on the site, a suite of performance tests comprising Ten per cent fines, Slake durability and Magnesium Sulphate Soundness testing was undertaken on the rock also. The ‘as-built’ co-ordinates and ground levels are shown on the exploratory hole logs with a full list of the coordinates provided in Appendix 6. Exploratory hole drawings are to be included in future versions of this report.

This report presents the factual geotechnical data acquired from the 2015 investigation.

## 2. CONTRACT OUTLINE & OBJECTIVES

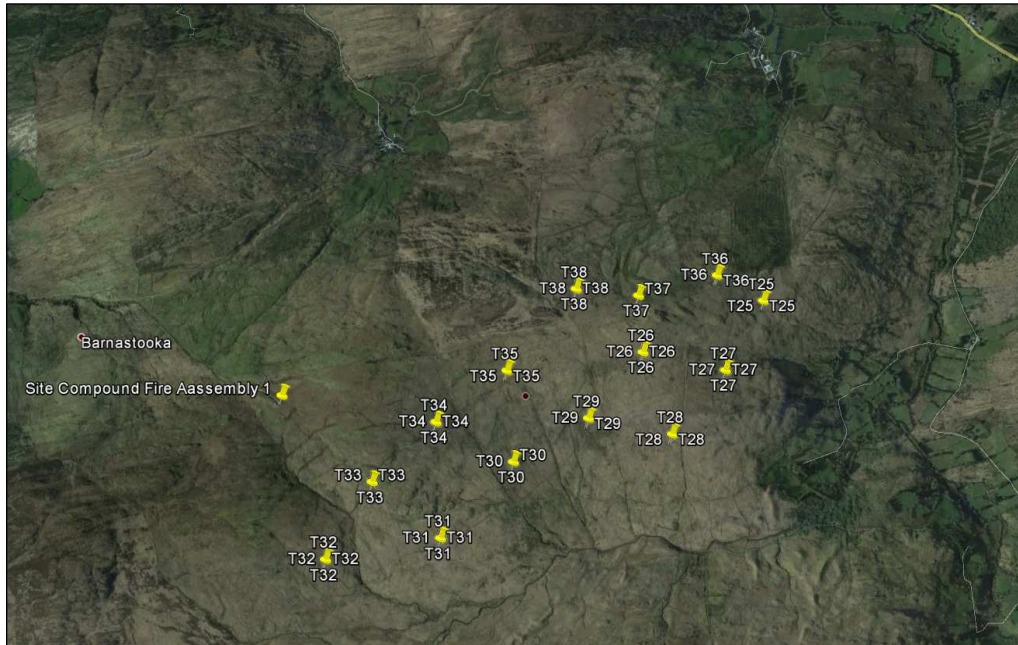
The contract was carried out in one phase and comprised rotary core drillholes and machine excavated trial pits.

The primary objectives of the works were as follows:

- Determine the composition, consistency and strength / stiffness of the superficial soils
- Establish the rockhead elevation, weathering profile, discontinuity characteristics and strength of the bedrock
- Recover samples for geotechnical laboratory testing in accordance with the requirements of the Employer's Representative

This factual report presents all fieldwork records and the results of laboratory testing.

**Figure 2 – Turbine Locations** (Adapted from Google Earth 2014)



### **3.3 Trial Pitting**

The trial pits were undertaken using a 13 tonne tracked hydraulic excavator. The pits were logged and sampled by an IGSL geotechnical engineer. Representative disturbed bulk samples were taken as the pits were excavated, these were placed in heavy-duty polyethylene bags and tubs and returned to the site laboratory for examination and laboratory testing.

The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of the Employer's Representative. The trial pit logs are presented in Appendix 2 and include engineering descriptions of the soils encountered, samples recovered, groundwater strikes and stability of the pit sidewalls.

### **3.4 Geophysical Surveying**

APEX Geoservices carried out the geophysical survey at the site. The key aim of the survey was to map rockhead and to identify any anomalous ground conditions. A combination of techniques was utilised. It included 2D Electrical Resistivity Tomography [ERT], Seismic Refraction Profiling and Multichannel Analysis of Surface Waves [MASW]. The findings of the geophysical survey are incorporated in Appendix 3.

### **3.5 Surveying of Exploratory Locations**

Following completion of the exploratory boreholes and trial pits, surveying was carried out using Realtime Kinetic GPS techniques. Co-ordinates (x, y) were measured to national grid and ground level (z) established relative to OD Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs. The 'as-constructed' locations are listed in Appendix 6. The exploratory hole plan is to be included in future versions of this report.

#### 4. LABORATORY ANALYSIS

Laboratory analysis was performed on a selection of soil and core samples to validate consistency and establish strength and chemical characteristics. The laboratory test results are presented in Appendices 4 (soil) and 5 (rock).

The geotechnical testing was carried out in accordance with BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990 and ISRM unless otherwise stated. The following suites of tests were undertaken for this project:

##### **Moisture Content**

The moisture contents of representative disturbed samples (sealed bags, tubs) were carried out in accordance with BS1377 Part 2:1990.

##### **Atterberg Limits**

The liquid limits were determined using the cone method as described in BS 1377 Pt.2:1990. In the majority of cases, the specimens for liquid and plastic limit determination were obtained at their natural state by removal of particles greater than 425  $\mu\text{m}$ . This is the definitive method, as stated in BS1377: Part 2: 1990, Clause 4. Where this was considered impractical, specimens were air-dried and sieved, as recommended in BS 1377.

While BS 1377 suggests that the results should include the percentage of material passing the 425 micron sieve, this information can be misleading in the case of coarse soils such as the glacial till encountered on this site. In the laboratory the percentage can only be related to the sample presented for testing while the actual soil stratum may contain coarse gravel and cobbles which would not necessarily be contained in the sample. Inclusion of coarse soil in a small sample would also distort the proportions.

##### **Particle Size Distributions**

Particle size distribution tests were carried out to BS1377: Part 2: 1990, method 9.2 (Wet sieving). Hydrometer tests to BS1377: Part 2: 1990, Method 9.5 were conducted on some samples to establish the percentage of silt and clay present.

To obtain particle size distributions, wet sieving methods were used, as specified. Large cobble and boulder size material was excluded from all tests while, in some instances the maximum particle size was further limited to take into account the mass of the sample. BS 1377 suggests that, for specimens with less than 10% retained on the 20mm sieve a sample mass of 2.5 kg should be used. This compares with a sample mass of 17 kg for specimens with less than 10% retained on the 37.5mm sieve. This is of particular importance for borehole samples in coarse soils.

##### **Sulphate, pH & Chloride**

Determination of pH values, sulphate content and Chloride content of soil were conducted by a nominated accredited environmental laboratory (Jones Environmental Laboratory) and results are presented in Appendix 4.

**Aggregate Testing on Rock Core Samples**

Materials testing was carried out on samples of rock core in order to assess the reusability potential of excavated bedrock. Tests performed included:

- Ten per cent fines (TPF) – in accordance with BS812: Part 111:1990
- Slake Durability – in accordance with ISRM Part 2 (1981)

The TPF tests were carried out on rock core samples which were broken down into pieces of between 10 and 14 mm diameter. The tests were then performed in order to provide a relative measure of the resistance of the resulting aggregate to crushing under a gradually applied compressive load.

**Unconfined Compressive Strength (UCS) on Rock Core Samples**

Unconfined compression tests were performed on intact lengths of rock, in accordance with ASTM standards. The specimens are prepared as right circular cylinders with a length to diameter ratio of 2.0 to 2.5 and the ends are saw cut and ground to eliminate irregularities. The load is applied through a hydraulic ram and the compressive strength is defined as the maximum load recorded immediately at the point of crushing (load at failure) divided by the cross-sectional area.

UCS tests were conducted in the IGSL materials laboratory.

**Point Load Strength Index**

The Point Load Index Test provides an assessment of strength cores or lump samples and unlike the Uniaxial Compression test (UCS) does not require careful preparation of intact lengths of core. The test specimen is compressed between two cones loaded from a hydraulic hand pump. The core fails due to the tensile forces over the diametral area between the points. The strength at failure is expressed as the point load index  $I_s$ .

For purposes of comparison, the  $I_s$  values are corrected to give the equivalent strength for a 50 mm diameter specimen. Recommended correction factors vary between 18 and 24 to estimate the  $I_{S50}$  value.



### References

1. BS 5930 (1999) Code of Practice for Site Investigation, British Standards Institution (BSI).
2. BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.
3. Brown E.T., (1984) Rock Characterization Testing and Monitoring, ISRM Suggested Methods.
4. Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

## **Appendix 1**

### **Rotary Core Drillhole Records & Photographs**



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC25A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,791.03 E  
572,314.03 N

**GROUND LEVEL (mOD)** 326.78

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 09/06/2015  
**DATE LOGGED** 11/06/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.25	326.53		
1	29	0	0					CORING: Poor recovery, returns of purple and green clayey GRAVEL.				N = 25 (4, 4, 7, 6, 7, 5)
1.40								CORING: Poor recovery, returns of purple clayey GRAVEL.	1.40	325.38		
2	100	0	0									
2.00												
2.60	50	0	0									N = 29 (7, 7, 6, 5, 8, 10)
3.00	38	18	0						2.90	323.88		
3.80	100	100	68					Strong, thickly to thinly bedded, blueish grey (with penetrative brown iron-oxide staining), fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
4.35	100	80	80					Discontinuities are medium to closely spaced, smooth to rough, planar. Apertures are tight to moderately open, locally clay-smearing, strong penetrating iron-oxide staining, local quartz-veining. Dips are 30° and locally sub-vertical.				
5.00	100	55	26									
5.60	100	87	40									
6												
7	100	85	67									
7.10												
8	92	92	9									
8.40								End of Borehole at 8.40 m	8.40	318.38		

**REMARKS**  
Hole cased 0.00-8.40m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC25B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,765.78 E  
572,314.99 N

**GROUND LEVEL (mOD)** 331.50

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 11/06/2015  
**DATE LOGGED** 12/06/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			CORING: Poor recovery returns of PEAT.	0.40	331.10		
1		36	0	0			(Symbol: irregular shapes)	CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.				N = 30 (3, 3, 7, 6, 8, 9)
2							(Symbol: irregular shapes)	CORING: Poor recovery, returns of purple and green GRAVEL.	2.00	329.50		
3	2.80						(Symbol: irregular shapes)					N = 27 (3, 4, 5, 7, 8, 7)
4		33	0	0			(Symbol: irregular shapes)					
5	4.30						(Symbol: irregular shapes)					N = 36 (7, 6, 9, 8, 10, 9)
6	5.30						(Symbol: dots)	Medium strong to strong, medium to thin bedded, blueish green, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
7	5.60	100	100	100			(Symbol: dots)					
8	5.85	100	100	100			(Symbol: dots)					
9	6.70	100	100	44			(Symbol: dots)	Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 70° and locally sub-vertical.				
10	7.20	100	100	76			(Symbol: dots)		7.20	324.30		
								End of Borehole at 7.20 m				

**REMARKS**  
Hole cased 0.00-7.20m.

**INSTALLATION DETAILS**

Date	Tip Depth	RZ Top	RZ Base	Type

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded
GROUNDWATER DETAILS					
Date	Hole Depth	Casing Depth	Depth to Water	Comments	

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC26A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,248.04 E  
572,057.97 N

**GROUND LEVEL (mOD)** 382.48

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 08/05/2015  
**DATE LOGGED** 08/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT. Returns of stiff, brown sandy slightly gravelly CLAY/SILT	0.20	382.28		N = 14 (2, 2, 3, 2, 5, 4)
1		18	0	0								N = 26 (3, 3, 5, 7, 6, 8)
2									2.60	379.88		
2.80								CORING: Poor recovery, returns of purple and green clayey GRAVEL.	2.90	379.58		N = 29 (5, 8, 7, 8, 6, 8)
3		100	73	0				Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
3.50												
4		83	47	15				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained. Dips are 60° and locally sub-vertical.				
4.70												
5		100	61	37								
5.70												
6		100	69	34								
7												
7.20		100	100	0								
8												
8.10		100	97	76								
8.90								End of Borehole at 8.90 m	8.90	373.58		
9												

**REMARKS**  
Hole cased 0.00-8.90m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC26B
<b>CO-ORDINATES</b> 507,238.98 E 572,077.95 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 385.68	<b>RIG TYPE</b> Casagrande	<b>DATE DRILLED</b> 11/05/2015
<b>CLIENT</b> ESBI	<b>FLUSH</b> Air/Mist	<b>DATE LOGGED</b> 11/05/2015
<b>ENGINEER</b> ESBI	<b>INCLINATION (deg)</b> -90	<b>DRILLED BY</b> IGSL
	<b>CORE DIAMETER (mm)</b> 88	<b>LOGGED BY</b> D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT. CORING: Poor recovery, returns of purple and green clayey GRAVEL.	0.20	385.48		N = 12 (1, 1, 2, 3, 2, 5)
1		14	0	0								N = 21 (4, 5, 4, 6, 5, 6)
2												N = 50/75 mm (14, 9, 38, 12)
2.90												
3	3.30	100	0	0				Medium strong to strong, medium to thin bedded, dark green, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	3.30	382.38		
4		100	50	0				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are 30° and locally sub-vertical.				
4.30												
5		100	98	42								
5.70												
6		100	95	24								
7	7.20											
8		100	60	48								
8.70								End of Borehole at 8.70 m	8.70	376.98		
9												

<b>REMARKS</b> Hole cased 0.00-8.70m.					<b>WATER STRIKE DETAILS</b>						
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments	
										No water strike recorded	
<b>INSTALLATION DETAILS</b>					<b>GROUNDWATER DETAILS</b>						
					Date	Hole Depth	Casing Depth	Depth to Water	Comments		
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC27A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,614.00 E  
572,000.92 N

**GROUND LEVEL (mOD)** 344.85

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 15/06/2015  
**DATE LOGGED** 18/06/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.				
1	10	0	0					CORING: Poor recovery, returns of purple and green clayey GRAVEL.	1.00	343.85		N = 14 (1, 3, 3, 3, 4, 4)
2	2.00											
3	2.90	33	11	0					2.75	342.10		N = 21 (3, 5, 5, 6, 5, 5)
4	3.30	100	53	0				Medium strong to strong, medium to thinly bedded, greenish purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
5	4.10	100	51	0				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 30° and locally sub-vertical.				
6	4.85	100	96	19								
7	5.15	100	27	0								
8	5.85	100	81	0								
9	6.85	100	98	81								
10	7.30	100	33	0								
11	8.30	100	100	94					8.30	336.55		
12	8.30							End of Borehole at 8.30 m				

**REMARKS**  
Hole cased 0.00-8.30m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS				
INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC27B
<b>CO-ORDINATES</b> 507,595.97 E 572,006.96 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 346.32	<b>RIG TYPE</b> Casagrande	<b>DATE DRILLED</b> 18/06/2015
<b>CLIENT</b> ESBI	<b>FLUSH</b> Air/Mist	<b>DATE LOGGED</b> 19/06/2015
<b>ENGINEER</b> ESBI	<b>INCLINATION (deg)</b> -90	<b>DRILLED BY</b> IGSL
	<b>CORE DIAMETER (mm)</b> 88	<b>LOGGED BY</b> D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT. CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	0.20	346.12		N = 37 (5, 7, 9, 8, 9, 11)
1	24	0	0									
2	1.70							Medium strong to strong, medium to thinly bedded, greenish purple becoming blueish green from 4.20-7.65m, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	2.00	344.32		
3	2.90	100	30	0				Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are sub-horizontal and locally sub-vertical.				
4	3.70	100	79	0								
5	4.50	100	83	33								
6	5.50	100	65	32								
7	6.15	100	97	54								
8	7.65	100	98	68				End of Borehole at 7.65 m	7.65	338.67		

<b>REMARKS</b> Hole cased 0.00-7.65m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15





# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC28A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,363.96 E  
571,710.00 N

**GROUND LEVEL (mOD)** 340.73

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 06/05/2015  
**DATE LOGGED** 06/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.35	340.38		
1		40	0	0				CORING: Poor recovery, returns of purple and green clayey GRAVEL.				N = 50/15 mm (10, 50)
2	2.00											
	2.40	50	0	0								N = 45 (7, 9, 9, 11, 13, 12)
	2.90	100	0	0								
3	3.00	100	80	80				Medium strong to strong, medium to thinly bedded, dark green, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	3.00	337.73		N = 46/225 mm (3, 4, 4, 7, 14, 21)
	3.40	100	96	53				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained. Dips are 30° and locally sub-vertical.				
4	4.20											
5	5.60	100	94	55								
6		100	97	61								
7	7.10											
		100	83	51								
8	8.30							End of Borehole at 8.30 m	8.30	332.43		
9												

**REMARKS**  
Hole cased 0.00-8.30m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC28B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,363.97 E  
571,733.00 N

**GROUND LEVEL (mOD)** 345.12

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 07/05/2015  
**DATE LOGGED** 07/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.50	344.62		
								Returns of stiff, brown sandy slightly gravelly CLAY/SILT	0.80	344.32		
1	55	0	0					CORING: Poor recovery, returns of purple and green clayey GRAVEL.				N = 22 (3, 3, 4, 5, 7, 6)
2												N = 22 (2, 3, 5, 4, 6, 7)
3	54	15	0						3.10	342.02		N = 49/75 mm (6, 8, 22, 27)
4	100	58	13					Medium strong to strong, medium to thin bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
5								Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained. Dips are 45°.				
6	100	67	34									
7												
8	100	100	77									
9												
									8.50	336.62		
								End of Borehole at 8.50 m				

**REMARKS**  
Hole cased 0.00-8.50m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC29A
<b>CO-ORDINATES</b> 507,005.94 E 571,776.98 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 351.50	<b>RIG TYPE</b> Casagrande	<b>DATE DRILLED</b> 01/05/2015
<b>CLIENT</b> ESBI	<b>FLUSH</b> Air/Mist	<b>DATE LOGGED</b> 01/05/2015
<b>ENGINEER</b> ESBI	<b>INCLINATION (deg)</b> -90	<b>DRILLED BY</b> IGSL
	<b>CORE DIAMETER (mm)</b> 88	<b>LOGGED BY</b> A. Chryst

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.25	351.25		
1	15	0	0					CORING: Poor recovery, returns of purple slightly clayey angular GRAVEL and cobbles				N = 22 (4, 4, 5, 4, 6, 7)
2	20	0	0					CORING: Poor recovery, returns of purple clayey GRAVEL.	2.00	349.50		N = 31 (2, 5, 7, 8, 7, 9)
3	38	0	0									N = 34 (4, 7, 7, 8, 10, 9)
4	100	23	0					CORING: Returns of brown sandy gravelly CLAY.	3.80	347.70		N = 39 (3, 6, 8, 10, 11, 10)
5	100	100	100					CORING: Returns of purple weathered SANDSTONE/SILTSTONE	4.50	347.00		
6	100	96	58					Medium strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded purple SILTSTONE. Fresh to slightly weathered.	5.00	346.50		
7	100	100	100					Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred. Dips are sub-vertical.				
8	100	96	70									
9	100	100	30									
9.70								End of Borehole at 9.70 m	9.70	341.80		

<b>REMARKS</b> Hole cased 0.00-9.70m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC29B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,005.97 E  
571,799.03 N  
**GROUND LEVEL (mOD)** 354.41

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 05/05/2015  
**DATE LOGGED** 05/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** A. Chryst

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.40	354.01		
1								CORING: Poor recovery, returns of purple slightly clayey angular GRAVEL and cobbles				N = 7 (1, 1, 1, 2, 2, 2)
2	16	0	0									N = 8 (2, 2, 2, 1, 2, 3)
3												N = 13 (2, 3, 3, 4, 3, 3)
3.70								Medium strong, medium to thinly bedded, greenish, fine-grained SANDSTONE with interbedded greenish SILTSTONE. Fresh to slightly weathered.	3.70	350.71		
4	100	100	43					Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred. Dips are sub-vertical and locally vertical.				
4.85												
5	100	82	60									
5.50												
6	100	93	0									
6.20												
7	82	59	16									
7.30												
8	100	42	0									
8.50								End of Borehole at 8.50 m	8.50	345.91		
9												

**REMARKS**  
Hole cased 0.00-8.50m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC30A  
**SHEET** Sheet 1 of 2

**CO-ORDINATES** 506,695.96 E  
571,596.99 N  
**GROUND LEVEL (mOD)** 346.76

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 20/04/2015  
**DATE LOGGED** 21/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.				
1	30	0	0									N = 4 (1, 1, 1, 1, 1)
2	2.00								2.40	344.36		N = 5 (1, 1, 1, 2, 1, 1)
3	13	0	0					CORING: Poor recovery, returns of purple and green clayey GRAVEL.				
4	3.50											N = 30 (4, 7, 7, 6, 7, 10)
5	25	0	0					Returns of stiff, brown sandy slightly gravelly CLAY/SILT	4.30	342.46		N = 40 (4, 5, 7, 11, 9, 13)
6	4.30											
7	27	0	0									
8	5.40							Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	5.40	341.36		N = 50/75 mm (7, 8, 32, 18)
9	6.90	100	99	45				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, strongly iron-oxide stained, locally quartz-veined (1-50mm). Dips are 40° and locally sub-vertical.				
10	100	85	25									
11	8.40											
12	100	91	61									
13	9.30											

**REMARKS**  
Hole cased 0.00-10.65m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC30A
<b>CO-ORDINATES</b> 506,695.96 E 571,596.99 N		<b>SHEET</b> Sheet 2 of 2
<b>GROUND LEVEL (mOD)</b> 346.76		<b>DATE DRILLED</b> 20/04/2015
		<b>DATE LOGGED</b> 21/04/2015
<b>CLIENT</b> ESBI		<b>DRILLED BY</b> IGSL
<b>ENGINEER</b> ESBI		<b>LOGGED BY</b> D.O'Shea
<b>RIG TYPE</b> Casagrande		
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.65	100	100	100	0 250 500			End of Borehole at 10.65 m	10.65	336.11		
11												
12												
13												
14												
15												
16												
17												
18												
19												

<b>REMARKS</b> Hole cased 0.00-10.65m.					<b>WATER STRIKE DETAILS</b>						
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments	
										No water strike recorded	
					<b>GROUNDWATER DETAILS</b>						
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments		
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC30B
<b>CO-ORDINATES</b> 506,685.99 E 571,615.03 N		<b>SHEET</b> Sheet 1 of 2
<b>GROUND LEVEL (mOD)</b> 348.70		<b>DATE DRILLED</b> 21/04/2015
<b>CLIENT</b> ESBi		<b>DATE LOGGED</b> 22/04/2015
<b>ENGINEER</b> ESBi		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.65	348.05		
1	25	0	0					CORING: Poor recovery, returns of purple and green clayey GRAVEL.				N = 12 (1, 2, 3, 2, 3, 4)
2	35	0	0									N = 9 (8, 2, 2, 1, 3, 3)
3	60	0	0									N = 17 (2, 2, 4, 4, 4, 5)
4												N = 33 (4, 5, 6, 7, 9, 11)
5	16	0	0									
6								No recovery, observed by driller as returns of gravel	5.40	343.30		N = 28 (4, 6, 6, 8, 5, 9)
7												
8	100	94	62					Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	7.30	341.40		
9	100	89	72					Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, strongly iron-oxide stained, locally quartz-veined (1-50mm). Dips are 40° and locally sub-vertical.				

<b>REMARKS</b> Hole cased 0.00-12.90m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC30B  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 506,685.99 E  
571,615.03 N  
**GROUND LEVEL (mOD)** 348.70

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 21/04/2015  
**DATE LOGGED** 22/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.30							Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.  Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, strongly iron-oxide stained, locally quartz-veined (1-50mm). Dips are 40° and locally sub-vertical. <i>(continued)</i>				
11		100	98	57								
12												
12.90		100	100	56					12.90	335.80		
13								End of Borehole at 12.90 m				
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-12.90m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15





# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC31A
<b>CO-ORDINATES</b> 506,387.05 E 571,276.96 N		<b>SHEET</b> Sheet 1 of 2
<b>GROUND LEVEL (mOD)</b> 343.87		<b>DATE DRILLED</b> 10/04/2015
<b>CLIENT</b> ESBI		<b>DATE LOGGED</b> 13/04/2015
<b>ENGINEER</b> ESBI		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.				
1	39	0	0					CORING: Returns of boulder	1.00	342.87		N = 18 (1, 2, 3, 4, 5, 6)
2	1.55							CORING: Poor recovery, returns of purple slightly clayey angular GRAVEL and cobbles	1.55	342.32		N = 40 (6, 6, 9, 11, 12, 8)
3	23	0	0						3.30	340.57		N = 50/0 mm (25, 5, 50)
4	3.30							Medium strong to strong, medium to thin bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
5	4.20	100	6	0				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, strongly iron-oxide stained, locally quartz-veined (1-25mm). Dips are 30° and locally sub-vertical.				
6	100	55	24									
7	5.70											
8	6.80	100	55	20								
9	7.60											
10	7.60	100	64	15								
11	7.60											
12	8	100	91	45								
13	9.10											
14	100	70	32									

<b>REMARKS</b> Hole cased 0.00-12.00m.					<b>WATER STRIKE DETAILS</b>						
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments	
										No water strike recorded	
					<b>GROUNDWATER DETAILS</b>						
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments		
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC31A  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 506,387.05 E  
571,276.96 N

**GROUND LEVEL (mOD)** 343.87

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 10/04/2015  
**DATE LOGGED** 13/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.40				[REDACTED]			Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
11		100	89	77	[REDACTED]			Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, strongly iron-oxide stained, locally quartz-veined (1-25mm). Dips are 30° and locally sub-vertical. <i>(continued)</i>	11.90	331.97		
12								End of Borehole at 11.90 m				
13												
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-12.00m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC31B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,380.93 E  
571,276.96 N

**GROUND LEVEL (mOD)** 345.89

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 14/04/2015  
**DATE LOGGED** 14/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.50	345.39		
1	30	0	0					CORING: Poor recovery, returns of purple clayey GRAVEL.				N = 27 (7, 8, 7, 6, 8, 6)
2	2.00											
3	38	0	0									
4	3.30							Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	3.30	342.59		
5	4.10	100	89	16				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, abundant quartz-veining. Dips are 30° and locally sub-vertical.				N = 33 (7, 9, 7, 7, 8, 11)
6	100	88	0									
7	5.60											
8	100	81	28									
9	7.10											
8	100	91	37									
8.60								End of Borehole at 8.60 m	8.60	337.29		

**REMARKS**  
Hole cased 0.00-8.60m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC32A
<b>CO-ORDINATES</b> 505,908.15 E 571,182.87 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 365.53	<b>RIG TYPE</b> Casagrande	<b>DATE DRILLED</b> 26/06/2015
<b>CLIENT</b> ESBI	<b>FLUSH</b> Air/Mist	<b>DATE LOGGED</b> 30/06/2015
<b>ENGINEER</b> ESBI	<b>INCLINATION (deg)</b> -90	<b>DRILLED BY</b> IGSL
	<b>CORE DIAMETER (mm)</b> 88	<b>LOGGED BY</b> D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT. CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	0.20	365.33		N = 31 (4, 6, 6, 7, 8, 10)
1		25	0	0								N = 31 (5, 4, 7, 8, 7, 9)
2	2.40											
3		67	0	0					3.50	362.03		N = 50/75 mm (9, 11, 36, 14)
4		100	75	13				Medium strong to strong, medium to thinly bedded, purple, fine-grained SILTSTONE/MUDSTONE with interbedded subordinate SANDSTONE. Fresh to slightly weathered.				
5	4.30							Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are 45° and locally sub-vertical.				
6		100	87	57								
7	5.80											
8		100	97	32								
9	7.30											
10		100	85	16								
11	8.40							End of Borehole at 8.40 m	8.40	357.13		

<b>REMARKS</b> Hole cased 0.00-8.40m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC32B
<b>CO-ORDINATES</b> 505,902.04 E 571,208.01 N		<b>SHEET</b> Sheet 1 of 2
<b>GROUND LEVEL (mOD)</b> 369.34		<b>DATE DRILLED</b> 30/06/2015
<b>CLIENT</b> ESBI		<b>DATE LOGGED</b> 01/07/2015
<b>ENGINEER</b> ESBI		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.40	368.94		
1		25	0	0				CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.				N = 25 (3, 5, 6, 7, 7, 5)
2	2.40											N = 31 (4, 5, 7, 8, 7, 9)
3												
4		13	0	0								N = 29 (3, 7, 7, 6, 7, 9)
5	4.80											N = 27 (7, 7, 5, 7, 8, 7)
6												
7		21	7	0								N = 39 (6, 7, 11, 9, 10, 9)
8	7.65							Medium strong to strong, medium to thinly bedded, purple, fine-grained SILTSTONE/MUDSTONE with interbedded subordinate SANDSTONE. Fresh to slightly weathered.				
9	8.70	100	92	0				Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are 70° and locally sub-vertical.				
9.85		100	57	19								

<b>REMARKS</b> Hole cased 0.00-12.10m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC.FI.10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC32B  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 505,902.04 E  
571,208.01 N

**GROUND LEVEL (mOD)** 369.34

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 30/06/2015  
**DATE LOGGED** 01/07/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10		100	88	18				Medium strong to strong, medium to thinly bedded, purple, fine-grained SILTSTONE/MUDSTONE with interbedded subordinate SANDSTONE. Fresh to slightly weathered.				
11	11.00							Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 70° and locally sub-vertical. <i>(continued)</i>				
12	12.10	91	58	0				End of Borehole at 12.10 m	12.10	357.24		
13												
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-12.10m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC33A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,100.01 E  
571,507.05 N

**GROUND LEVEL (mOD)** 388.88

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 08/04/2015  
**DATE LOGGED** 08/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT. CORING: Poor recovery, returns of purple and green clayey GRAVEL.	0.20	388.68		
1	1.25	40	0	0								
2	2.10	29	0	0								
3	2.80	43	0	0								
4	3.30	100	0	0								
5	4.20	78	17	0				Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.  Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 30° and locally sub-vertical.	4.10	384.78		
6	5.20	100	70	36								
7	6.70	100	89	31								
8	8.20	100	89	43								
9	9.70	100	91	14					9.70	379.18		
End of Borehole at 9.70 m												

**REMARKS**  
Hole cased 0.00-9.70m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS				
INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC33B  
**SHEET** Sheet 1 of 2

**CO-ORDINATES** 506,094.01 E  
571,528.03 N

**GROUND LEVEL (mOD)** 390.84

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 08/04/2015  
**DATE LOGGED** 08/03/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** A. Chryst

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.				
1.00	40	0	0					CORING: returns of fine to coarse angular GRAVEL with many cobbles.	1.00	389.84		N = 7 (1, 1, 2, 2, 1, 2)
2.00	75	0	0				N = 35 (4, 4, 6, 7, 13, 9)					
3.10	45	0	0									
3.55	100	0	0				N = 46 (6, 9, 11, 11, 10, 14)					
3.90	86	0	0									
4												
5.40	20	0	0						5.40	385.44		N = 50/95 mm (6, 7, 10, 40)
6								Medium strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded purple SILTSTONE. Fresh to slightly weathered.				
6.90	100	100	27					Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred. Dips are sub-vertical.				
7												
8.40	100	73	12									
9												
9.90	100	93	29									

**REMARKS**  
Hole cased 0.00-3.55m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15





# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC33B  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 506,094.01 E  
571,528.03 N

**GROUND LEVEL (mOD)** 390.84

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 08/04/2015  
**DATE LOGGED** 08/03/2015

**CLIENT** ESBi  
**ENGINEER** ESBi

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** A. Chryst

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.45	100	100	82	[REDACTED]			End of Borehole at 10.45 m	10.45	380.39		
11												
12												
13												
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-3.55m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC34A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,375.94 E  
571,763.06 N

**GROUND LEVEL (mOD)** 389.08

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 15/04/2015  
**DATE LOGGED** 16/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.40	388.68		
1		22	0	0				CORING: Poor recovery, returns of purple and green clayey GRAVEL.				N = 21 (4, 5, 4, 6, 6, 5)
2	2.30											
	2.90	83	0	0								
3	3.30	50	0	0								
	3.80	60	0	0					3.80	385.28		N = 50/150 mm (7, 12, 28, 17, 5)
4								Medium strong to strong, medium to thinly bedded, greenish purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
5	5.40	100	88	38				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained. Dips are 30° and locally sub-vertical.				
6												
	6.90	100	91	41								
7												
	8.40	100	100	81								
8												
	9.90	100	100	60					9.90	379.18		

**REMARKS** End of Borehole at 9.90 m

Hole cased 0.00-9.90m.	<b>WATER STRIKE DETAILS</b>					
	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						No water strike recorded

<b>GROUNDWATER DETAILS</b>									
<b>INSTALLATION DETAILS</b>									
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC34B  
**SHEET** Sheet 1 of 2

**CO-ORDINATES** 506,358.91 E  
571,779.03 N  
**GROUND LEVEL (mOD)** 392.33

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 16/04/2015  
**DATE LOGGED** 20/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			CORING: Poor recovery returns of PEAT.	0.45	391.88		
1		26	0	0				Returns of stiff, brown sandy slightly gravelly CLAY/SILT				N = 26 (4, 4, 6, 7, 6, 7)
2	2.30							CORING: Poor recovery, returns of purple clayey GRAVEL.	2.30	390.03		N = 30 (3, 6, 6, 8, 9, 7)
3		30	0	9								
4	4.30							Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	4.00	388.33		
5	4.80	100	68	40				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained. Dips are 70° and locally sub-vertical.				
6	5.80	100	51	13								
7	7.30	100	100	17								
8	8.80	100	99	9								
9		100	66	35								

**REMARKS**  
Hole cased 0.00-10.10m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC34B  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 506,358.91 E  
571,779.03 N

**GROUND LEVEL (mOD)** 392.33

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 16/04/2015  
**DATE LOGGED** 20/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.10				0 250 500			End of Borehole at 10.10 m	10.10	382.23		
11												
12												
13												
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-10.10m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC35A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,668.91 E  
571,980.08 N

**GROUND LEVEL (mOD)** 389.18

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 27/04/2015  
**DATE LOGGED** 27/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.				
1	40	16	6					Returns of stiff, brown sandy slightly gravelly CLAY/SILT	1.00	388.18		N = 6 (2, 2, 1, 1, 2, 2)
								CORING: Poor recovery, returns of purple clayey GRAVEL.	1.50	387.68		
2.00								Medium strong to strong (becoming stronger 4.00-5.30m), thickly to thinly bedded, grey/green/brown, fine to medium-grained, SANDSTONE (metamorphosed, possibly interbedded with Ryholitic Volcanics), fresh to slightly weathered.	1.65	387.53		
2.80	100	56	0					Discontinuities are medium to closely spaced, smooth to rough, planar. Apertures are tight to moderately open, locally clay-smearred, strong penetrating iron-oxide staining, local quartz-veining. Dips are 30° and locally sub-vertical.				
3	100	54	13									
4.00	100	89	64									
4.70	100	100	100									
5	100	100	100									
5.30								End of Borehole at 5.30 m	5.30	383.88		
6												
7												
8												
9												

**REMARKS**  
Hole cased 0.00-5.30m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC35B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,658.07 E  
571,997.30 N

**GROUND LEVEL (mOD)** 392.00

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED**  
**DATE LOGGED**

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			CORING: Poor recovery returns of PEAT.	0.50	391.50		
1	50	0	0					Returns of stiff, brown sandy slightly gravelly CLAY/SILT				
2												
3	100	0	0									
4	50	0	0									
4								Medium strong to strong, thickly to thinly bedded, grey/green/brown, fine to medium-grained, SANDSTONE (metamorphosed, possibly interbedded with Ryholitic Volcanics), fresh to slightly weathered.	4.00	388.00		
5	100	61	14					Discontinuities are medium to closely spaced, smooth to rough, planar. Apertures are tight to moderately open, locally clay-smearred, strong penetrating iron-oxide staining, local quartz-veining. Dips are 30° and locally sub-vertical.				
6												
7	100	93	26									
8	100	94	40									
8	100	99	68									
8	8.45							End of Borehole at 8.45 m	8.45	383.55		
9												

REMARKS					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments	

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC36A
<b>CO-ORDINATES</b> 507,573.96 E 572,441.01 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 364.69		<b>DATE DRILLED</b> 05/06/2015
<b>CLIENT</b> ESBI		<b>DATE LOGGED</b> 08/06/2015
<b>ENGINEER</b> ESBI		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.20	364.49		
1	67	29	0					CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	1.20	363.49		N = 50/0 mm (9, 15, 50)
2	2.10							Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
3	2.90	100	84	19				Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 70° and locally sub-vertical.				
4	3.50	100	93	25								
5	4.30	100	100	80								
6	5.45	100	93	27								
7	6.70	100	100	94				End of Borehole at 6.70 m	6.70	357.99		

<b>REMARKS</b> Hole cased 0.00-6.70m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC36B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 507,563.94 E  
572,420.97 N

**GROUND LEVEL (mOD)** 368.47

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 09/06/2015  
**DATE LOGGED** 09/06/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.30	368.17		
								CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	0.55	367.92		
1	94	65	51					Medium strong to strong, medium to thinly bedded, greenish purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				N = 50/0 mm (25, 50)
1.60								Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are 30° and locally sub-vertical.				
2	100	94	78									
2.70												
3	100	100	31									
4	100	97	82									
4.20												
5	100	100	18									
5.30												
5.90									5.90	362.57		
6								End of Borehole at 5.90 m				
7												
8												
9												

**REMARKS**  
Hole cased 0.00-5.90m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15





# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC37A
<b>CO-ORDINATES</b> 507,211.00 E 572,348.97 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 393.00	<b>RIG TYPE</b> Casagrande	<b>DATE DRILLED</b> 28/05/2015
<b>CLIENT</b> ESBI	<b>FLUSH</b> Air/Mist	<b>DATE LOGGED</b> 02/06/2015
<b>ENGINEER</b> ESBI	<b>INCLINATION (deg)</b> -90	<b>DRILLED BY</b> IGSL
	<b>CORE DIAMETER (mm)</b> 88	<b>LOGGED BY</b> D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.40	392.60		
								Returns of stiff, brown sandy slightly gravelly CLAY/SILT				
1	56	0	0						1.50	391.50		N = 29 (4, 5, 6, 7, 7, 9)
1.80								CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.				
2	50	17	0						2.30	390.70		N = 50/90 mm (7, 9, 20, 30)
2.40								Medium strong to strong, medium to thinly bedded, blueish grey, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
2.80	75	28	0					Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are 30° and locally sub-vertical.				
3	100	91	22									
3.25												
4	100	77	41									
4.00												
4.70	100	96	64									
5	100	70	28									
5.10												
5.90	100	95	30									
6												
6	100	93	70									
7												
7.20	100	100	100						7.45	385.55		
7.45								End of Borehole at 7.45 m				

<b>REMARKS</b> Hole cased 0.00-7.45m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RC37B
<b>CO-ORDINATES</b> 507,221.01 E 572,326.00 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 396.64		<b>DATE DRILLED</b> 03/06/2015
<b>CLIENT</b> ESBI		<b>DATE LOGGED</b> 05/06/2015
<b>ENGINEER</b> ESBI		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.45	396.19		
1		42	0	0				Returns of stiff, purpleish grey sandy slightly gravelly CLAY/SILT				N = 24 (3, 4, 4, 7, 6, 7)
2	2.40							CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	2.40	394.24		N = 30 (2, 6, 6, 8, 7, 9)
3	3.30	22	0	0				Medium strong to strong, medium to thin bedded, blueish grey, fine-grained SANDSTONE. Fresh to slightly weathered.	3.45	393.19		N = 15/0 mm (10, 15)
4	4.00	100	79	41				Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 30° and locally sub-vertical.				
5	4.90	100	100	100								
5	5.35	100	100	84								
6	5.90	100	100	58								
7	7.40	100	100	100								
8	8.50	100	92	74								
9								End of Borehole at 8.50 m	8.50	388.14		

<b>REMARKS</b> Hole cased 0.00-8.50m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC38A  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,957.99 E  
572,376.95 N

**GROUND LEVEL (mOD)** 392.55

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 27/05/2015  
**DATE LOGGED** 28/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.55	392.00		
1.00	60	0	0					CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	1.50	391.05		N = 27 (4, 6, 7, 6, 7, 7)
2.60	40	0	0					Medium strong to strong, medium to thin bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
3.85	91	88	56					Discontinuities are medium to closely spaced, smooth to rough, planar. Apertures are tight to moderately open, locally clay-smeared, slightly iron-oxide stained, local quartz-veining. Dips are sub-horizontal and locally sub-vertical.				
4.30	100	62	18									
4.85	100	71	0									
5.25	100	91	75									
5.25	100	100	100					End of Borehole at 5.25 m	5.25	387.30		

REMARKS				
Hole cased 0.00-5.25m.				

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RC38B  
**SHEET** Sheet 1 of 1

**CO-ORDINATES** 506,952.90 E  
572,353.99 N

**GROUND LEVEL (mOD)** 396.45

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 26/05/2015  
**DATE LOGGED** 27/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								Returns of stiff, purpleish grey sandy slightly gravelly CLAY/SILT	0.50	395.95		N = 17 (1, 2, 2, 3, 5, 7)
1		45	0	0				Returns of stiff, brown sandy slightly gravelly CLAY/SILT				
2.00								Medium strong to strong, medium to thin bedded, greenish purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	2.00	394.45		
2.80		88	88	58				Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are sub-horizontal and locally sub-vertical.				
3												
4.30		100	96	61								
5												
5.65		100	99	67								
6												
6		100	86	75								
7.10								End of Borehole at 7.10 m	7.10	389.35		

**REMARKS**  
Hole cased 0.00-7.10m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RCR1
<b>CO-ORDINATES</b> 507,101.03 E 572,120.98 N		<b>SHEET</b> Sheet 1 of 2
<b>GROUND LEVEL (mOD)</b> 392.41		<b>DATE DRILLED</b> 12/05/2015
<b>CLIENT</b> ESBI		<b>DATE LOGGED</b> 13/05/2015
<b>ENGINEER</b> ESBI		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.35	392.06		
	50	0	0					Returns of stiff, brown sandy slightly gravelly CLAY/SILT				
1.00								CORING: Poor recovery, returns of purple and green clayey GRAVEL.	1.00	391.41		N = 32 (5, 6, 7, 7, 8, 10)
2												N = 32 (5, 4, 7, 8, 8, 9)
3												N = 41 (4, 6, 9, 11, 12, 9)
3.90												N = 39 (3, 5, 9, 9, 11, 10)
4												
5												
5.30												
5.80	40	0	0						5.80	386.61		N = 27 (4, 5, 5, 7, 7, 8)
6								Medium strong to strong, medium to thin bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
6.60	100	90	40					Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained. Dips are 60° and locally sub-vertical.				
7												
7.30	100	87	64									
8												
8.60	100	98	55									
9												
9.75	100	99	99									

<b>REMARKS</b> Hole cased 0.00-11.00m.					<b>WATER STRIKE DETAILS</b>						
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments	
										No water strike recorded	
					<b>GROUNDWATER DETAILS</b>						
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments		
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RCR1  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 507,101.03 E  
572,120.98 N

**GROUND LEVEL (mOD)** 392.41

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 12/05/2015  
**DATE LOGGED** 13/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10		100	100	90								
10.45												
11.00		100	100	73					11.00	381.41		
11								End of Borehole at 11.00 m				
12												
13												
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-11.00m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RCR2  
**SHEET** Sheet 1 of 2

**CO-ORDINATES** 506,827.00 E  
571,633.97 N  
**GROUND LEVEL (mOD)** 341.78

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 22/04/2015  
**DATE LOGGED** 24/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.				
1	25	0	0					Returns of stiff, brown sandy slightly gravelly CLAY/SILT	1.40	340.38		N = 5 (1, 1, 1, 1, 1, 2)
2	2.80								2.80	338.98		N = 22 (2, 2, 4, 6, 5, 7)
3		20	0	0				CORING: Poor recovery, returns of purple and green clayey GRAVEL.				N = 20 (4, 5, 4, 5, 6, 5)
4	4.30											N = 26 (3, 5, 7, 8, 6, 5)
5	5.50	33	0	0								N = 35 (3, 7, 7, 8, 9, 11)
6	6.70	33	0	0								N = 33 (4, 7, 8, 7, 9, 9)
7	7.30	100	0	0								
8	8.10	38	0	0					8.15	333.63		N = 50/0 mm (25, 50)
8.80		100	89	80				Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
9.10		100	100	80				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained. Dips are 60° and locally sub-vertical.				
		100	92	37								

**REMARKS**

Hole cased 0.00-12.90m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Tip Depth	RZ Top	RZ Base	Type	Comments
24-04-15	12.90	0.50	12.90	50mm SP	

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RCR2  
**SHEET** Sheet 2 of 2

**CO-ORDINATES** 506,827.00 E  
571,633.97 N

**GROUND LEVEL (mOD)** 341.78

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist

**DATE DRILLED** 22/04/2015  
**DATE LOGGED** 24/04/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.20							Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.				
11	11.15	100	92	64				Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained. Dips are 60° and locally sub-vertical. <i>(continued)</i>				
12	12.20	100	97	64								
	12.90	100	87	66				End of Borehole at 12.90 m	12.90	328.88		
13												
14												
15												
16												
17												
18												
19												

**REMARKS**  
Hole cased 0.00-12.90m.

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type
24-04-15	12.90	0.50	12.90	50mm SP

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 18312.GPJ IGSL.GDT 13/7/15





# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

**18312**

<b>CONTRACT</b> Barnastooka Windfarm		<b>DRILLHOLE NO</b> RCR3
<b>CO-ORDINATES</b> 506,624.99 E 571,415.02 N		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (mOD)</b> 339.12		<b>DATE DRILLED</b> 22/06/2015
<b>CLIENT</b> ESBI		<b>DATE LOGGED</b> 24/06/2015
<b>ENGINEER</b> ESBI		<b>DRILLED BY</b> IGSL
<b>RIG TYPE</b> Casagrande		<b>LOGGED BY</b> D.O'Shea
<b>FLUSH</b> Air/Mist		
<b>INCLINATION (deg)</b> -90		
<b>CORE DIAMETER (mm)</b> 88		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.35	338.77		
1.00	60	0	0					CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.				N = 43 (5, 7, 9, 9, 11, 14)
2.00	40	0	0					CORING: Poor recovery, returns of purple and green GRAVEL.	2.00	337.12		N = 70/75 mm (11, 14, 20, 50)
2.80	50	0	0									
3								Medium strong to strong, medium to thinly bedded, purple, fine-grained SANDSTONE with interbedded subordinate SILTSTONE. Fresh to slightly weathered.	3.10	336.02		
4								Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are sub-horizontal and locally sub-vertical.				
4.30	100	77	41									
5												
5.60	100	98	91									
6												
6.45	100	100	100									
7												
7.00	100	100	100									
8												
8.20	83	81	53					End of Borehole at 8.20 m	8.20	330.92		

<b>REMARKS</b> Hole cased 0.00-8.20m.					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					<b>GROUNDWATER DETAILS</b>					
<b>INSTALLATION DETAILS</b>					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
24-06-15	8.00	1.00	8.20	50mm SP						

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** RCR4  
**SHEET** Sheet 1 of 1

**CO-ORDINATES**

**GROUND LEVEL (mOD)**

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 02/07/2015  
**DATE LOGGED** 02/07/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								CORING: Poor recovery returns of PEAT.	0.40			
1	8	0	0					CORING: Poor recovery, returns of purple and green clayey sandy GRAVEL.	1.80			N = 50/5 mm (18, 7, 50)
2	2.40							Medium strong to strong, medium to thinly bedded, purple, fine-grained SILTSTONE/MUDSTONE with interbedded subordinate SANDSTONE. Fresh to slightly weathered.				
3	3.20	100	45	0				Discontinuities are medium to closely spaced, smooth to rough, planar and locally stepped. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained, local quartz-veining. Dips are 70° and locally sub-vertical.				
4	4.00	100	70	59								
5	4.60	100	30	0								
6	5.40	100	35	0								
7	6.85	100	84	18				End of Borehole at 6.85 m	6.85			

**REMARKS**  
Hole cased 0.00-6.85m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** **RCSUB1**  
**SHEET** Sheet 1 of 1

**CO-ORDINATES**

**GROUND LEVEL (mOD)**

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 06/05/2015  
**DATE LOGGED** 07/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: No recovery, observed by driller as returns of peat	0.30			
1								OPEN HOLE DRILLING: No recovery, observed by driller as returns of green/blue sandy gravelly clay with occasional cobbles	1.50			
2	2.00							OPEN HOLE DRILLING: No recovery, observed by driller as returns of weathered rock	2.00			
3		100	88	26				Medium strong to strong, thickly to thinly bedded, purple, fine-grained SILTSTONE/MUDSTONE with interbedded subordinate SANDSTONE. Fresh to slightly weathered.  Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained. Dips are 45° and locally sub-vertical.				
4	3.40											
5	5.00											
6	6.50	100	84	38								
7	7.00	100	78	34								
		100	100	62								
								End of Borehole at 7.00 m	7.00			

**REMARKS**  
Hole cased 0.00-2.00m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC Fl 10M 18312.GPJ IGSL.GDT 13/7/15



# GEOTECHNICAL CORE LOG RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**DRILLHOLE NO** **RCSUB2**  
**SHEET** Sheet 1 of 1

**CO-ORDINATES**

**GROUND LEVEL (mOD)**

**RIG TYPE** Casagrande  
**FLUSH** Air/Mist  
**INCLINATION (deg)** -90  
**CORE DIAMETER (mm)** 88

**DATE DRILLED** 07/05/2015  
**DATE LOGGED** 08/05/2015

**CLIENT** ESBI  
**ENGINEER** ESBI

**DRILLED BY** IGSL  
**LOGGED BY** D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: No recovery, observed by driller as returns of peat	0.60			
1								OPEN HOLE DRILLING: No recovery, observed by driller as returns of green/blue sandy gravelly clay with occasional cobbles				
2												
3								OPEN HOLE DRILLING: No recovery, observed by driller as returns of gravel and cobbles	3.00			
3.80								OPEN HOLE DRILLING: No recovery, observed by driller as returns of weathered rock	3.50			
4	100	100	100					Medium strong to strong, medium to thinly bedded, purple, fine-grained SILTSTONE/MUDSTONE with interbedded subordinate SANDSTONE. Fresh to slightly weathered.	3.80			
4.40								Discontinuities are medium to closely spaced, smooth to rough, planar and undulating. Apertures are tight to moderately open, locally clay-smearred, slightly iron-oxide stained. Dips are 45° and locally sub-vertical.				
5	100	95	57									
6.00								End of Borehole at 5.00 m	6.00			
7												
8												
9												

**REMARKS**  
Hole cased 0.00-3.80m.

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC F1 10M 18312.GPJ IGSL.GDT 13/7/15

18312 – Barnastooka Windfarm – Rock Core Photographs

RC25A Box 1 of 3



RC25A Box 2 of 3



18312 – Barnastooka Windfarm – Rock Core Photographs

RC25A Box 3 of 3



RC25B Box 1 of 2



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC25B Box 2 of 2**

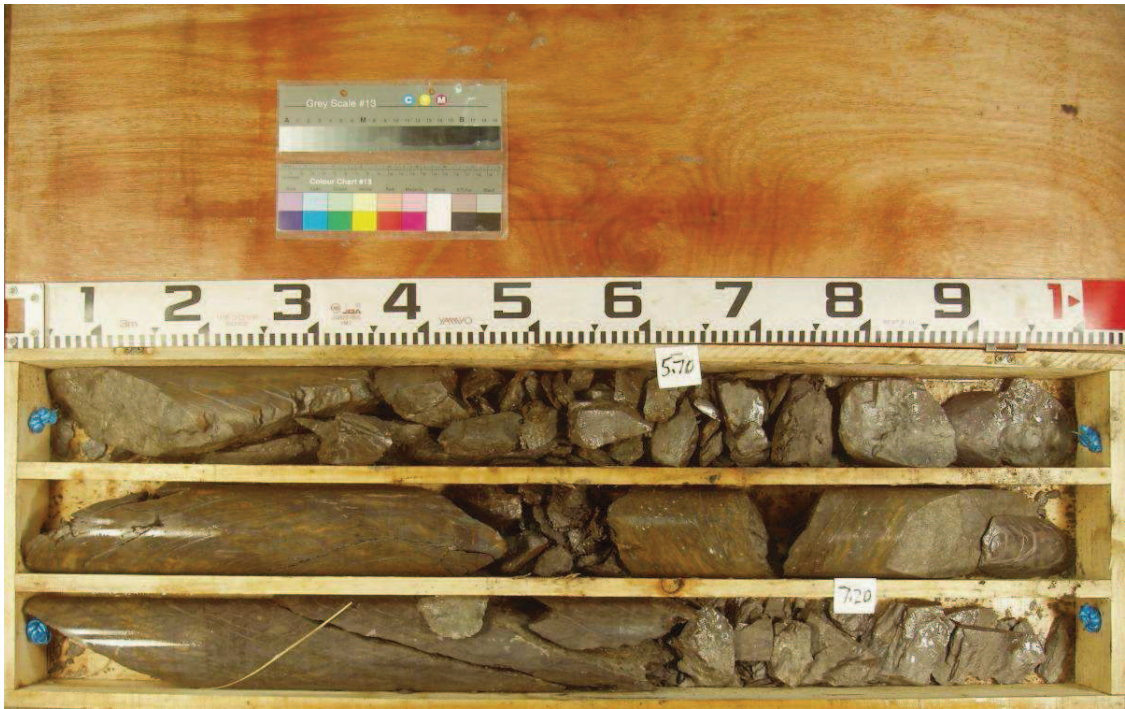


**RC26A Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC26A Box 2 of 3**



**RC26A Box 3 of 3**





18312 – Barnastooka Windfarm – Rock Core Photographs

**RC26B Box 1 of 3**

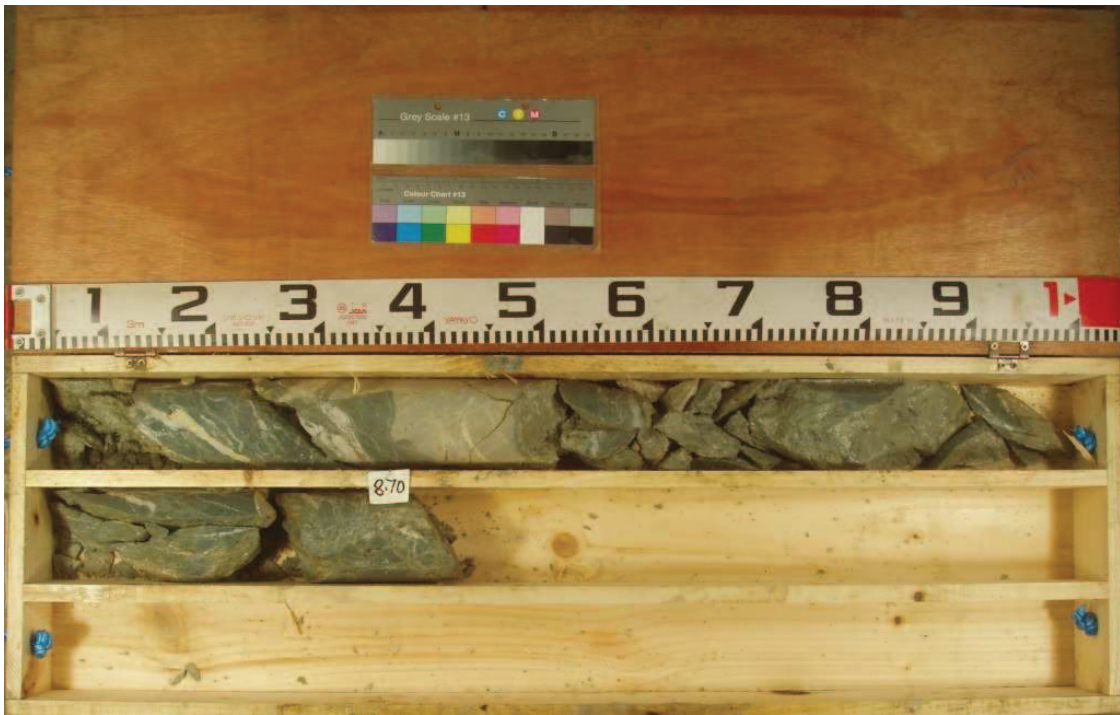


**RC26B Box 2 of 3**

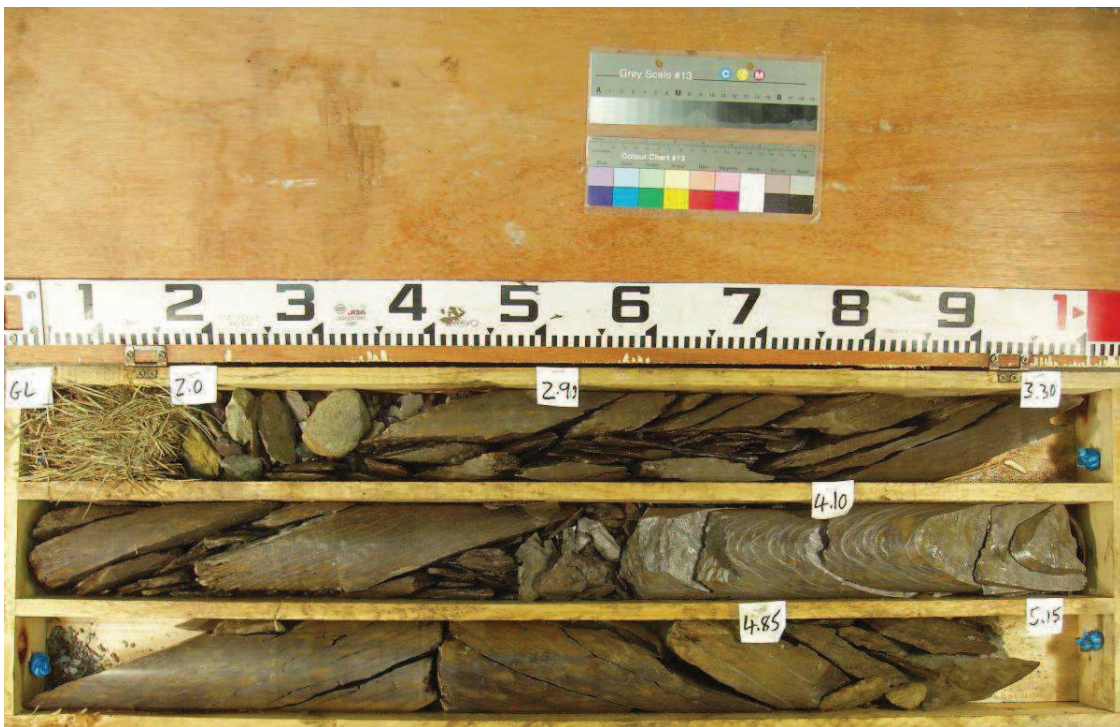


18312 – Barnastooka Windfarm – Rock Core Photographs

RC26B Box 3 of 3



RC27A Box 1 of 3



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC27A Box 2 of 3**

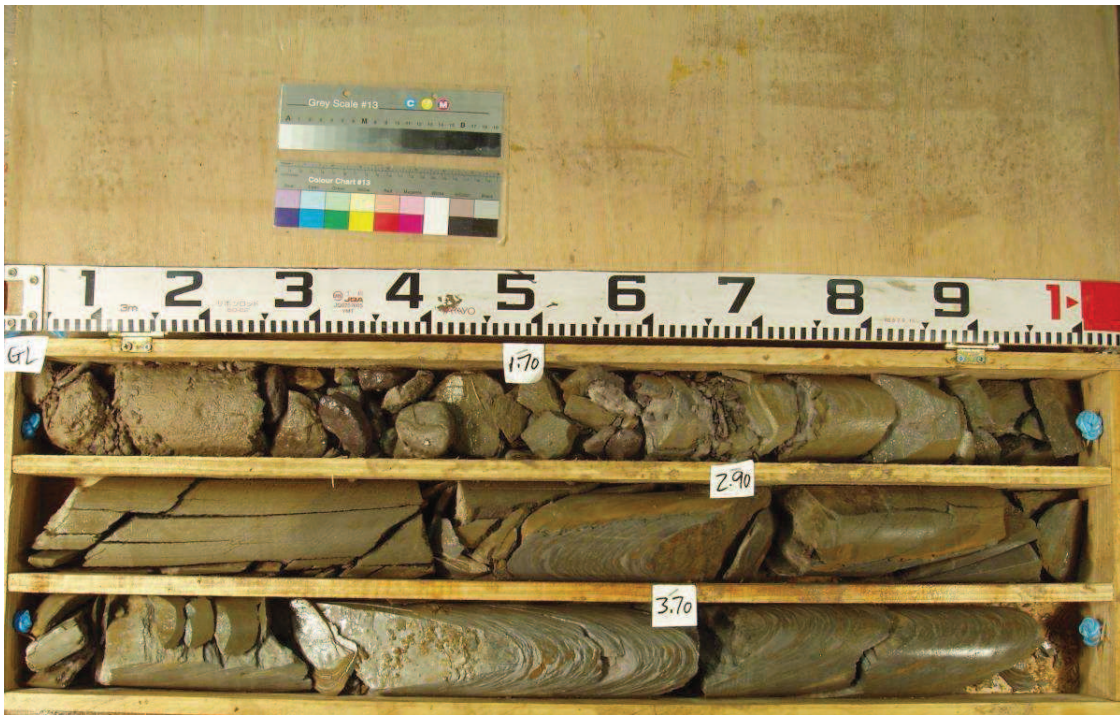


**RC27A Box 3 of 3**

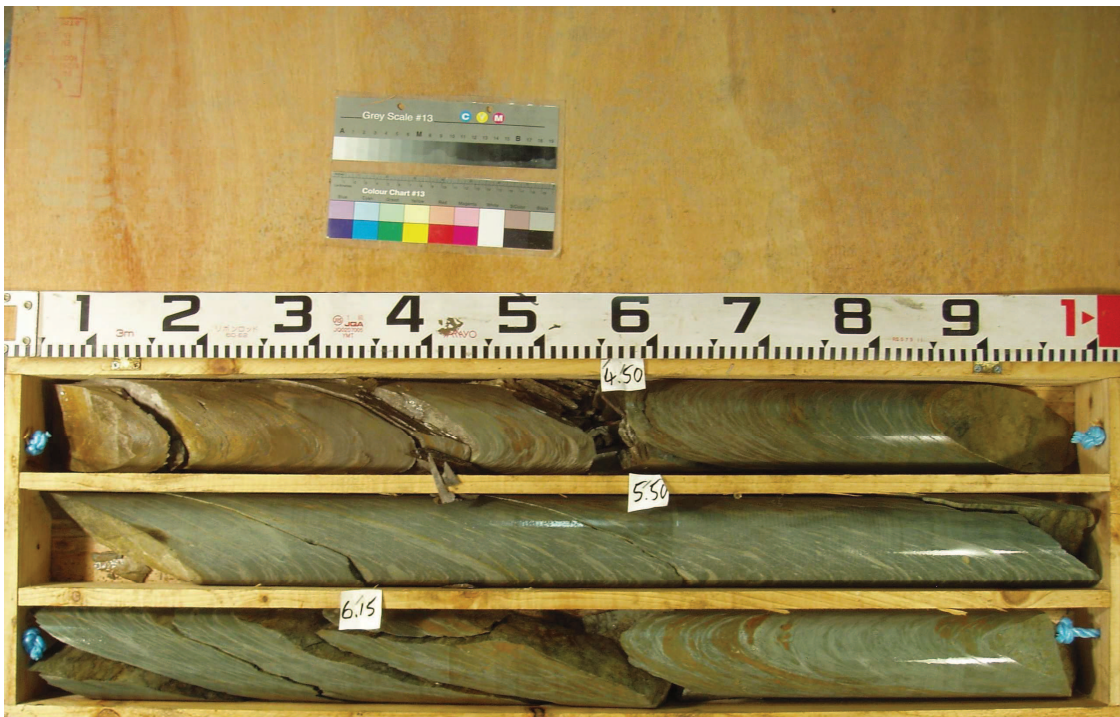


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC27B Box 1 of 3**



**RC27B Box 2 of 3**

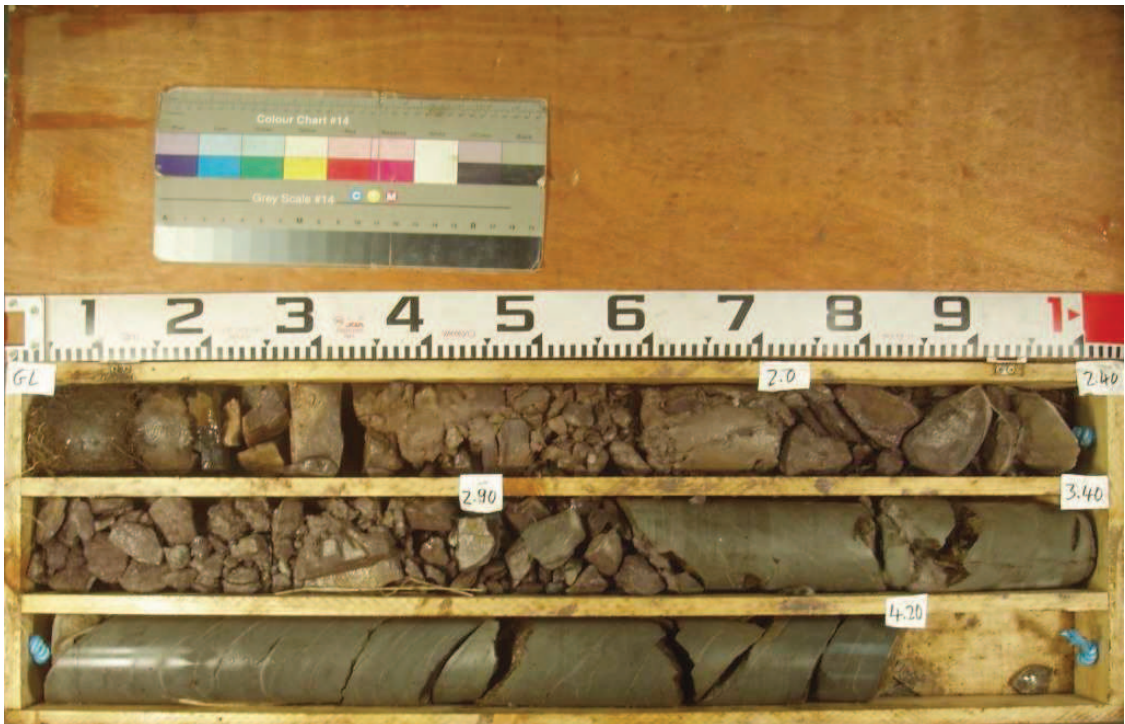


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC27B Box 3 of 3**

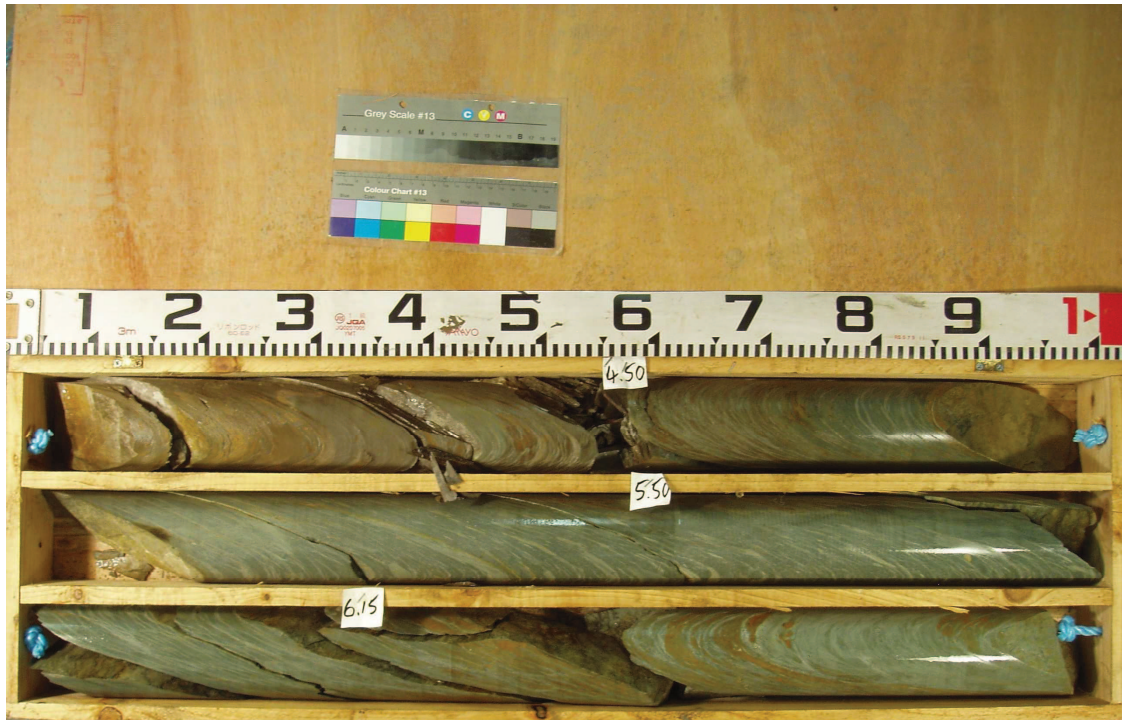


**RC27B Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC27B Box 2 of 3**



**RC27B Box 3 of 3**

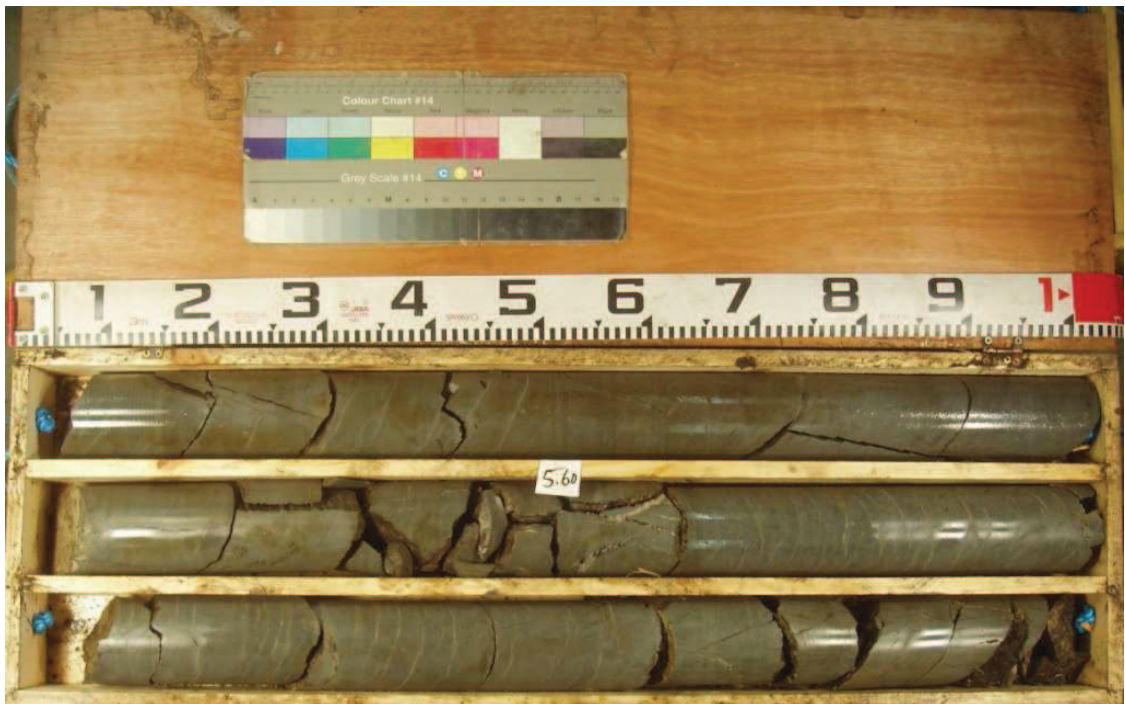


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC28A Box 1 of 3**

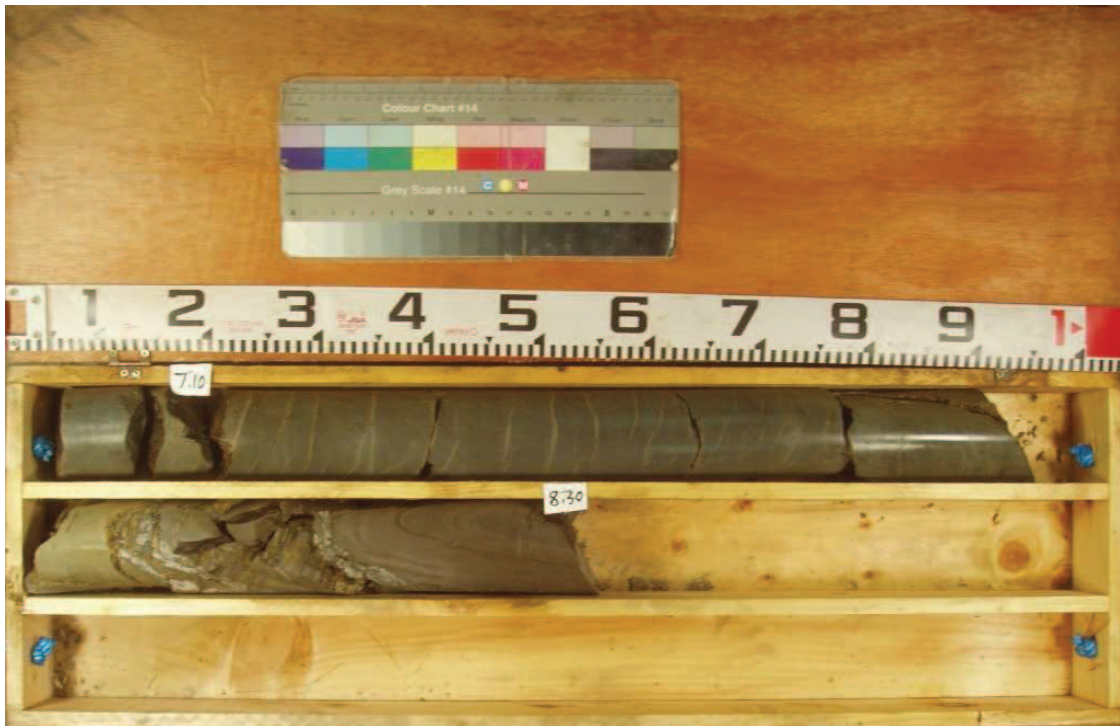


**RC28A Box 2 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC28A Box 3 of 3**



**RC28B Box 1 of 3**





18312 – Barnastooka Windfarm – Rock Core Photographs

RC28B Box 2 of 3



RC28B Box 3 of 3



18312 – Barnastooka Windfarm – Rock Core Photographs

RC29A Box 1 of 3



RC29A Box 2 of 3

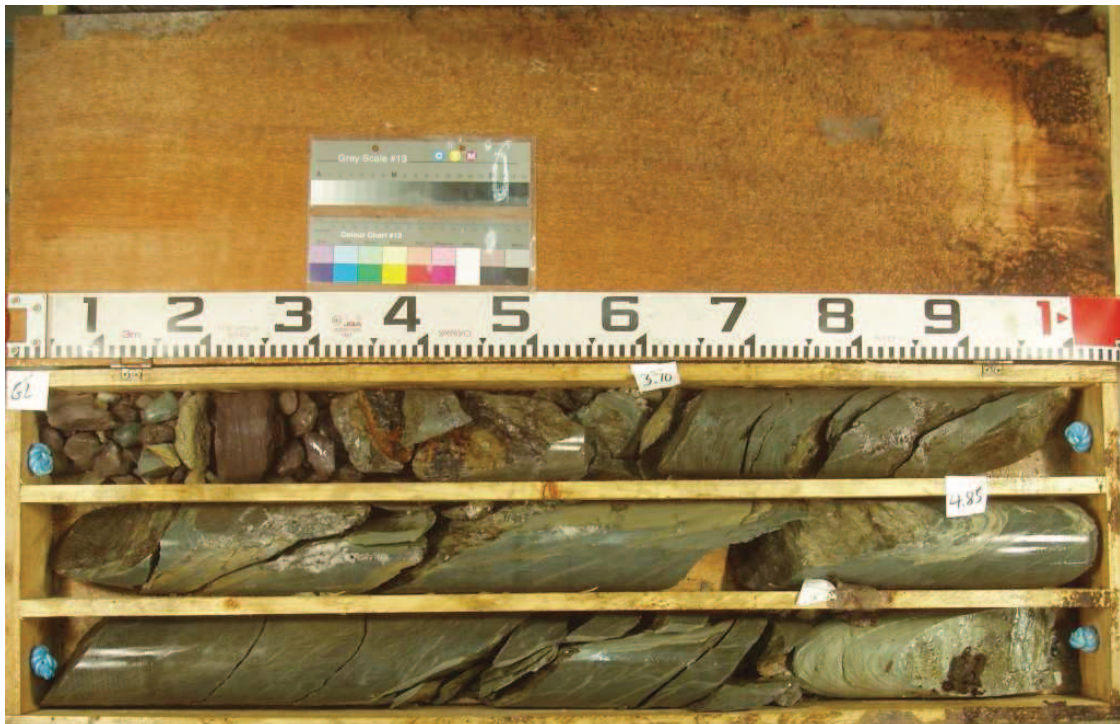


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC29A Box 3 of 3**



**RC29B Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC29B Box 2 of 3**



**RC29B Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC30A Box 1 of 3**



**RC30A Box 2 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

RC30A Box 3 of 3



RC30B Box 1 of 3



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC30B Box 2 of 3**



**RC30B Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC31A Box 1 of 4**



**RC31A Box 2 of 4**



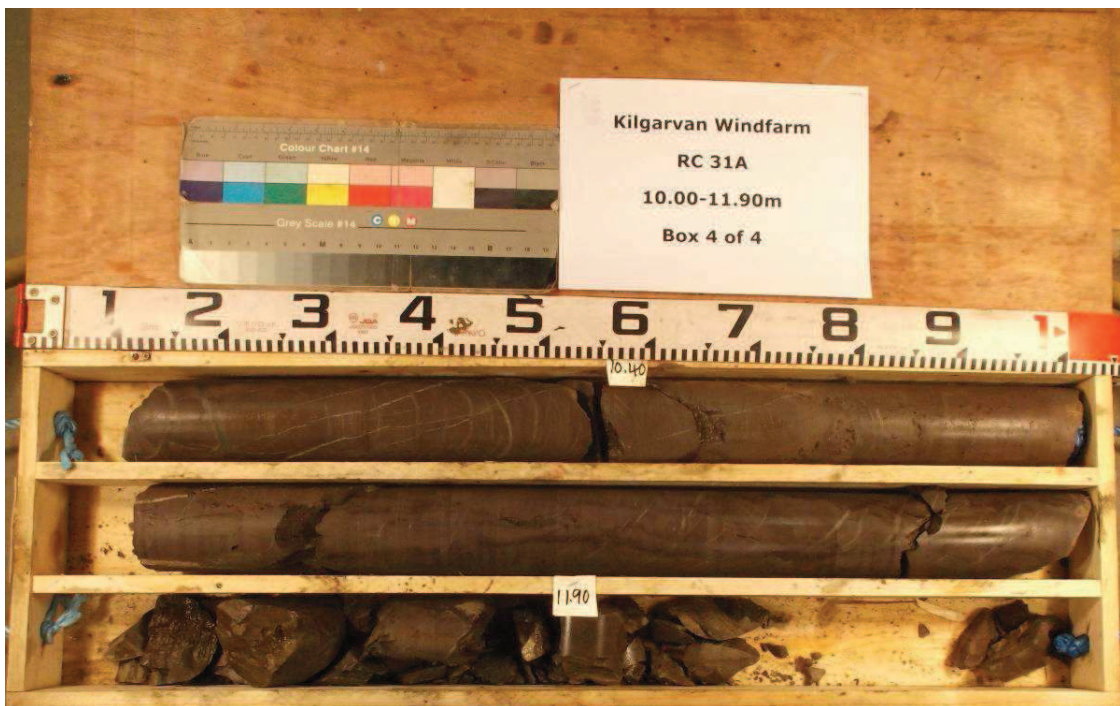


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC31A Box 3 of 4**



**RC31A Box 4 of 4**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC31B Box 1 of 3**



**RC31B Box 2 of 3**

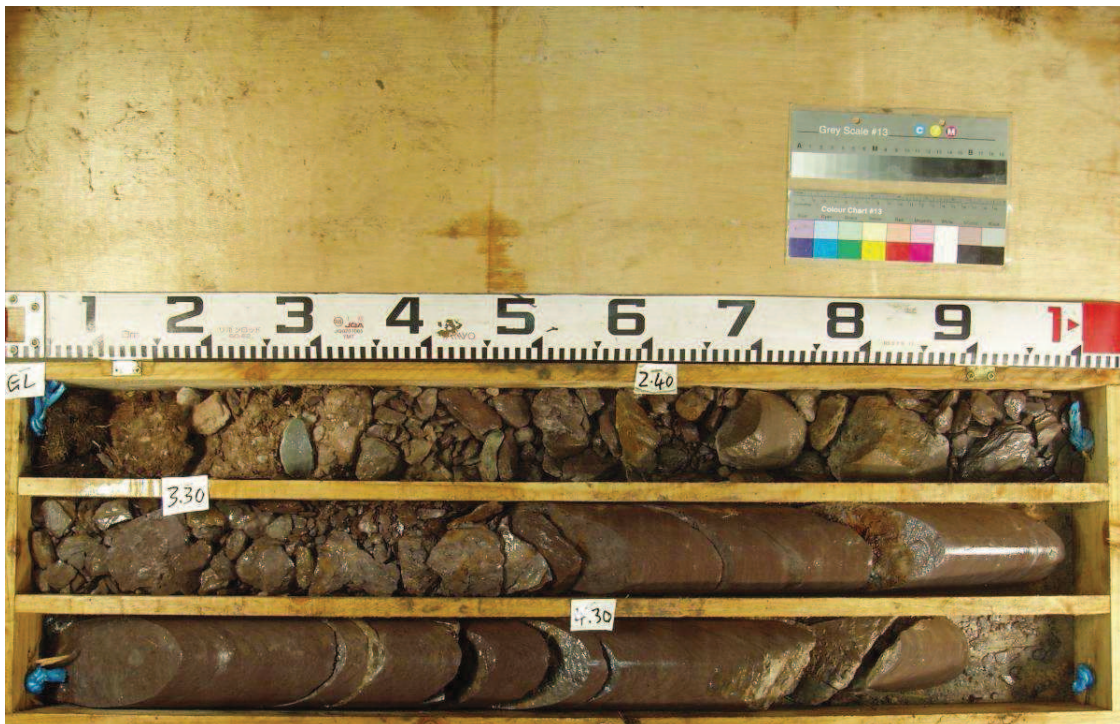


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC31B Box 3 of 3**



**RC32A Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC32A Box 2 of 3**

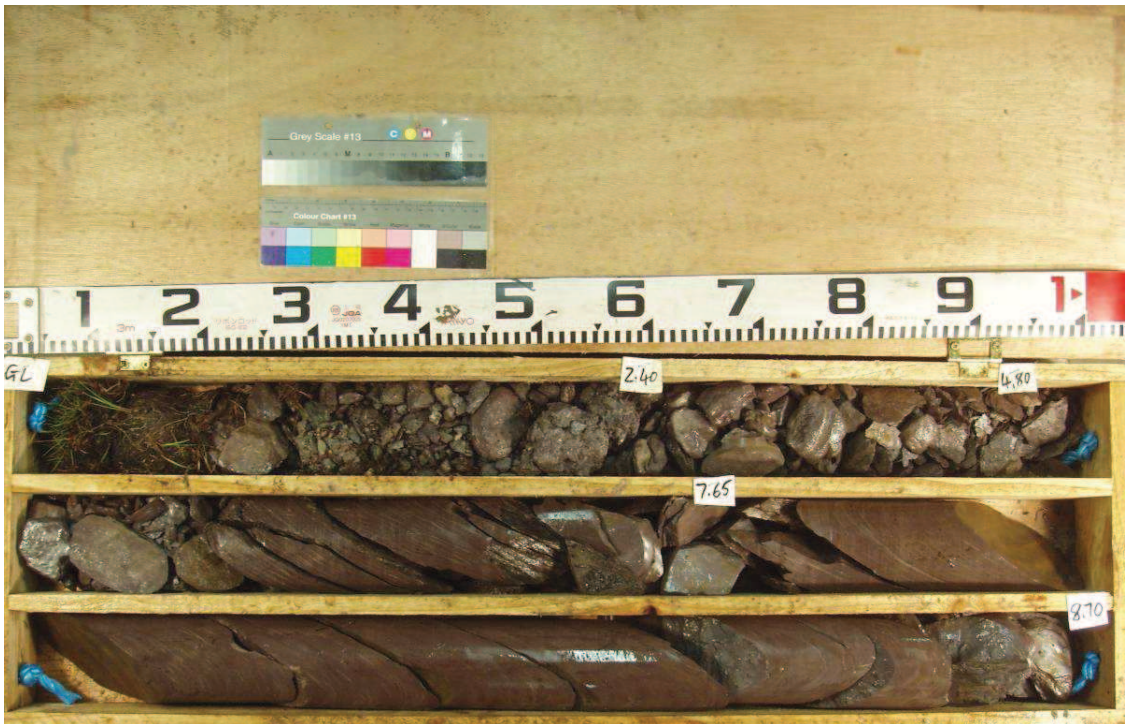


**RC32A Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

RC32B Box 1 of 3

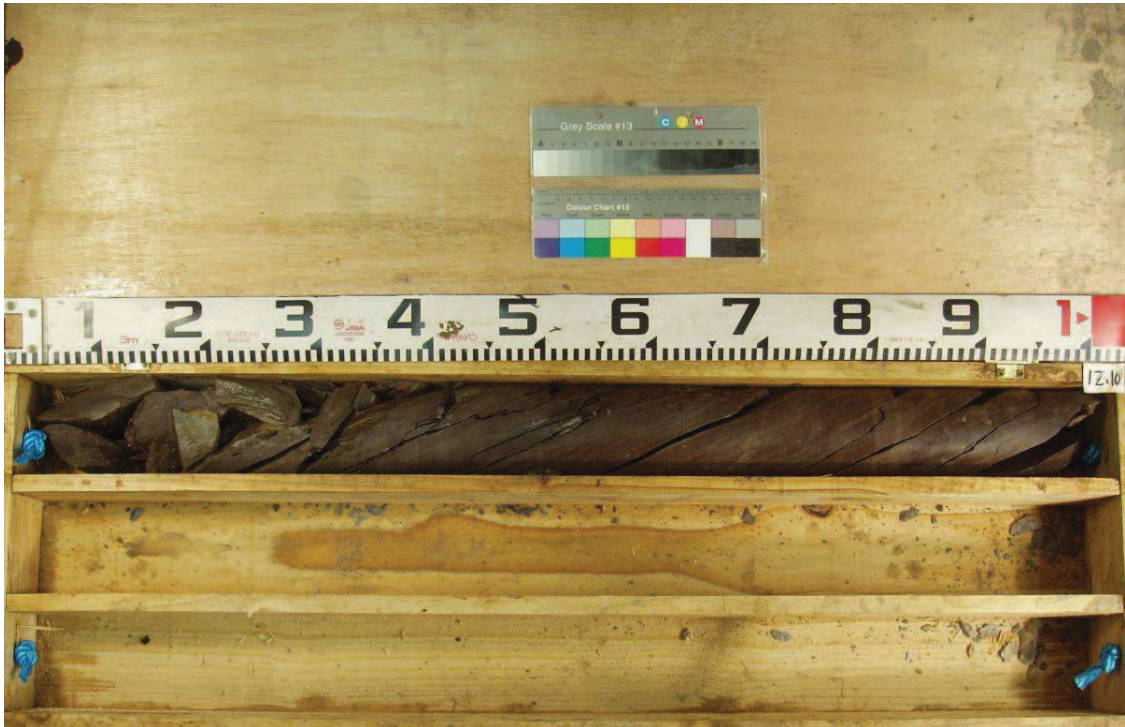


RC32B Box 2 of 3

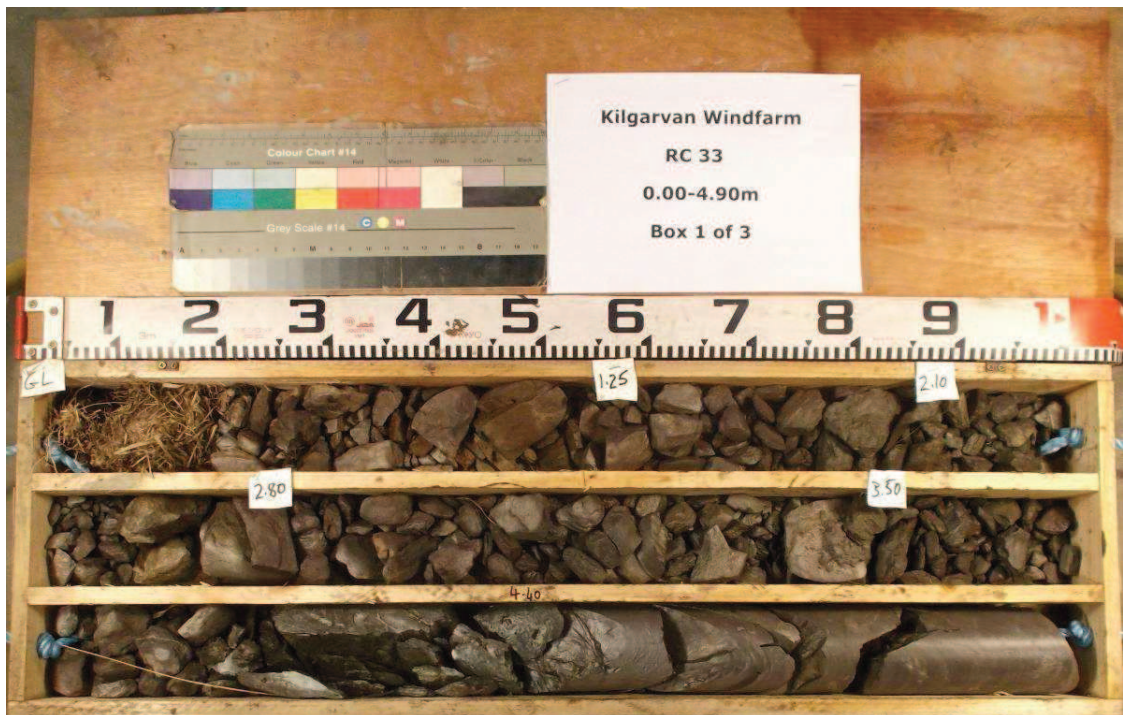


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC32B Box 3 of 3**

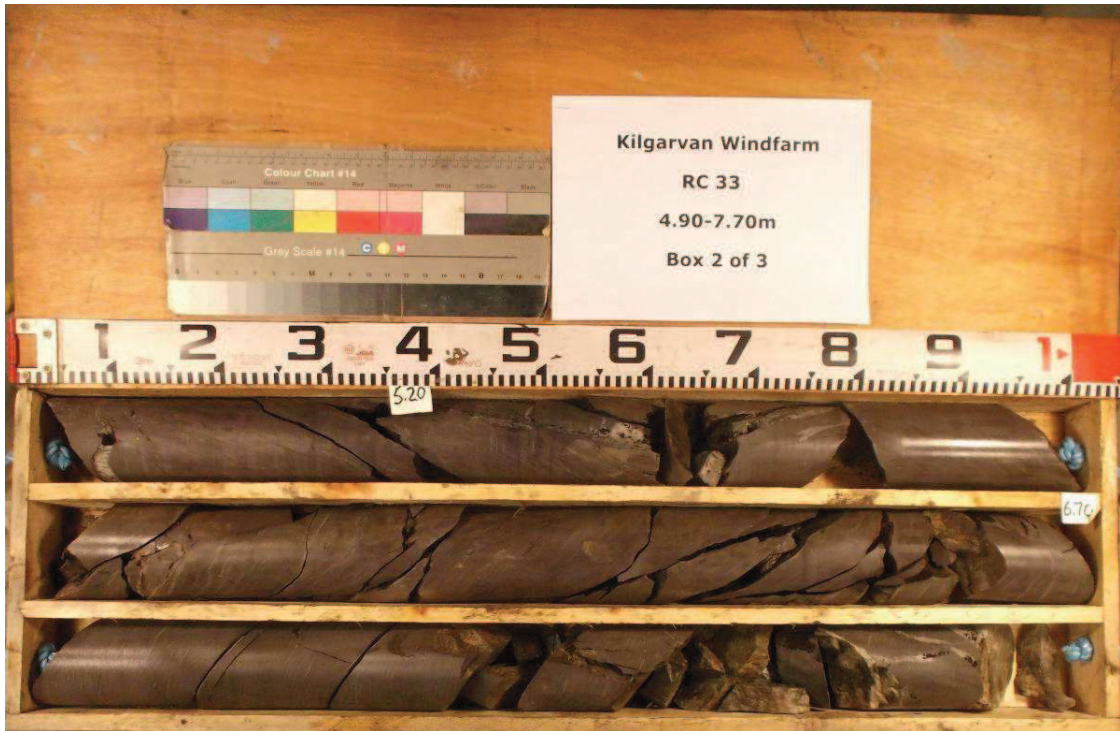


**RC33A Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC33A Box 2 of 3**

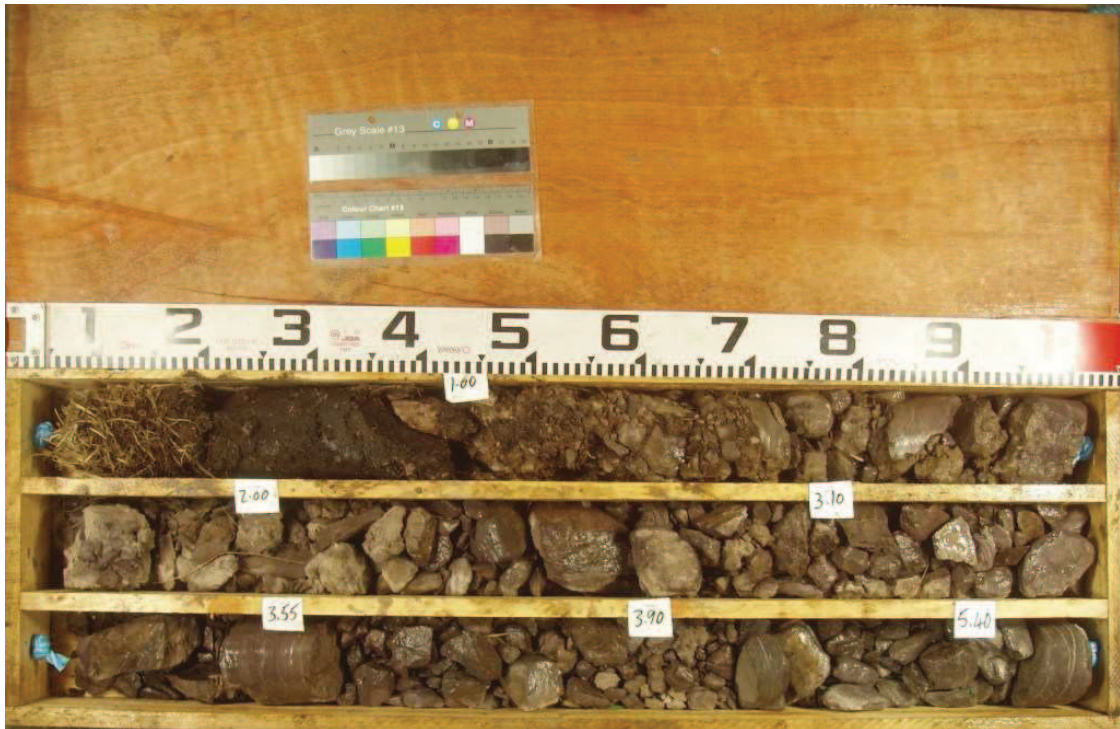


**RC33A Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC33B Box 1 of 3**



**RC33B Box 2 of 3**



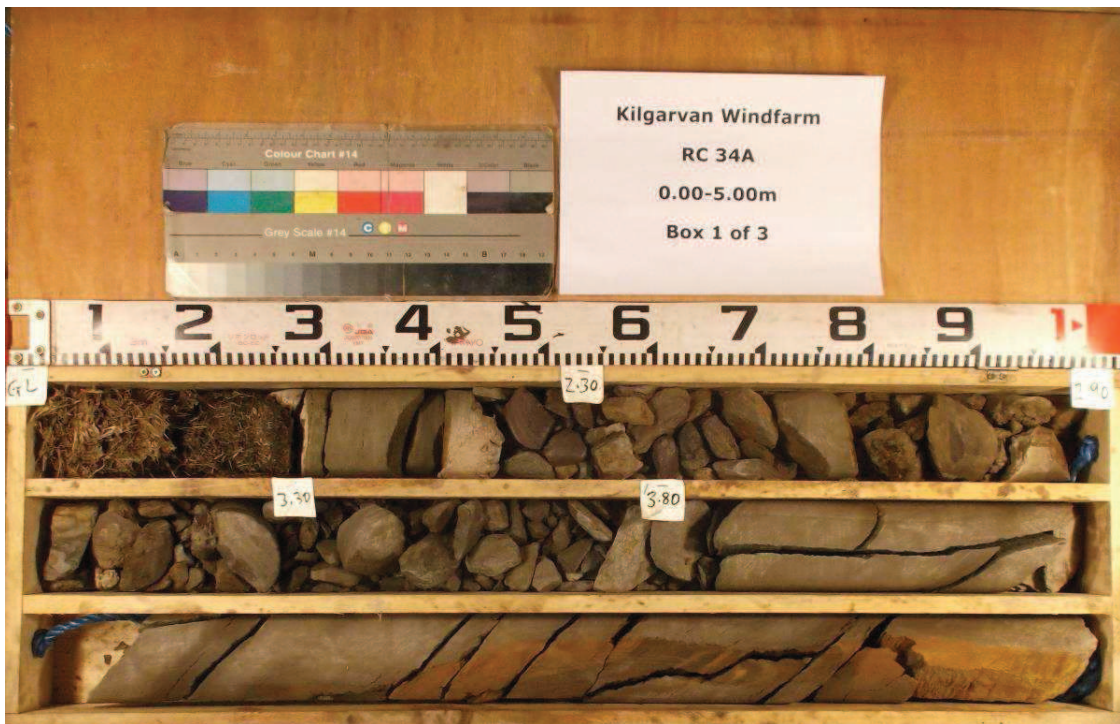


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC33B Box 3 of 3**



**RC34A Box 1 of 3**

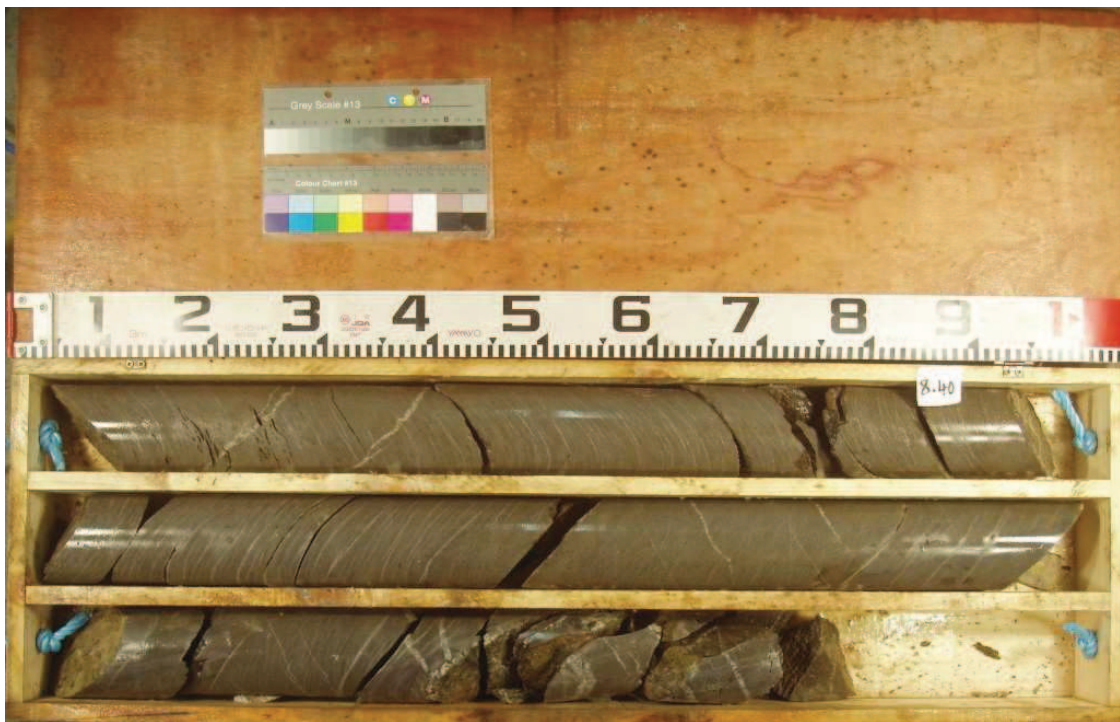


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC34A Box 2 of 3**



**RC34A Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC34B Box 1 of 3**



**RC34B Box 2 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC34B Box 3 of 3**



**RC35A Box 1 of 2**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC35A Box 2 of 2**

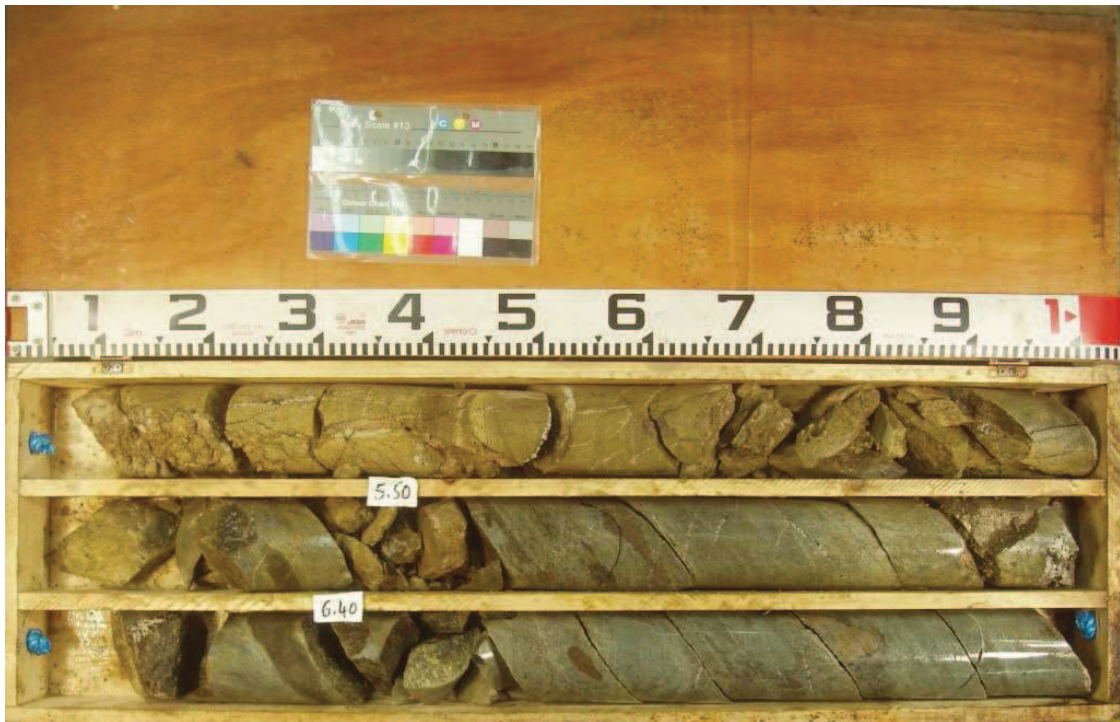


**RC35B Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC35B Box 2 of 3**



**RC35B Box 3 of 3**

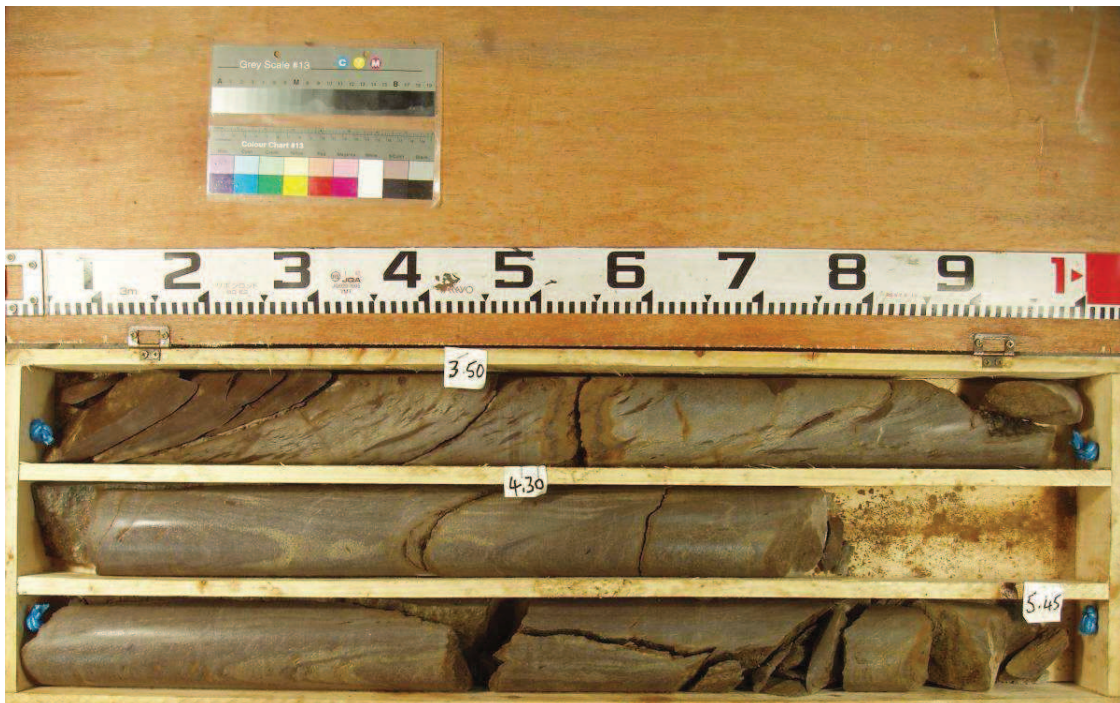


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC36A Box 1 of 3**

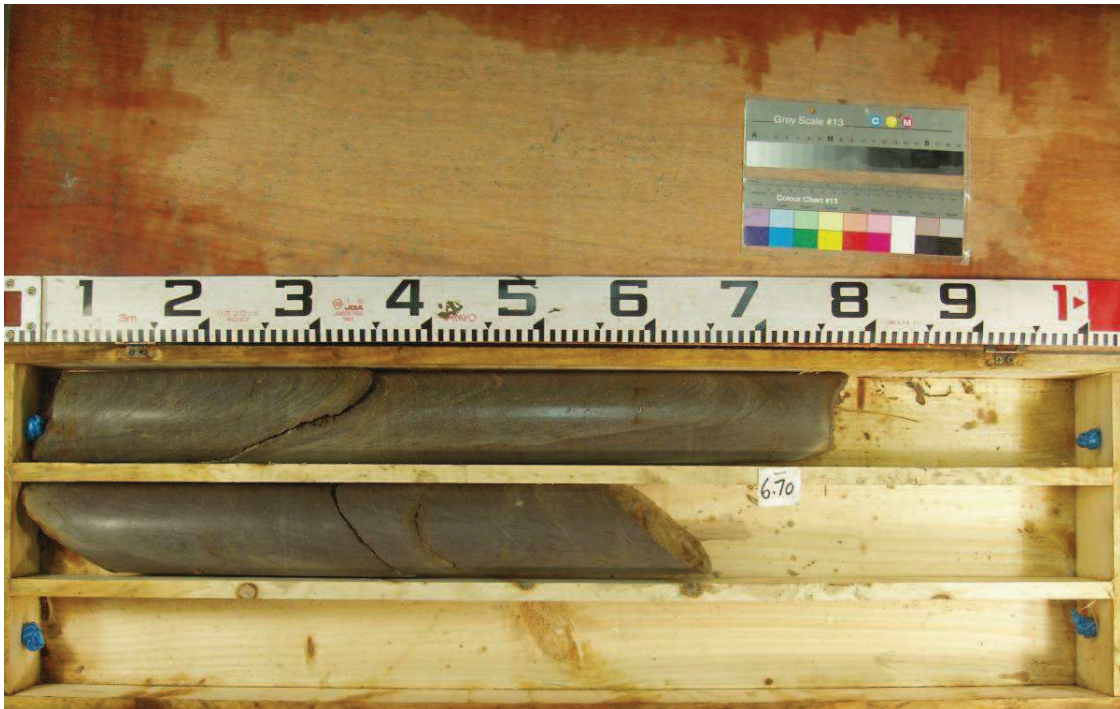


**RC36A Box 2 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

RC36A Box 3 of 3



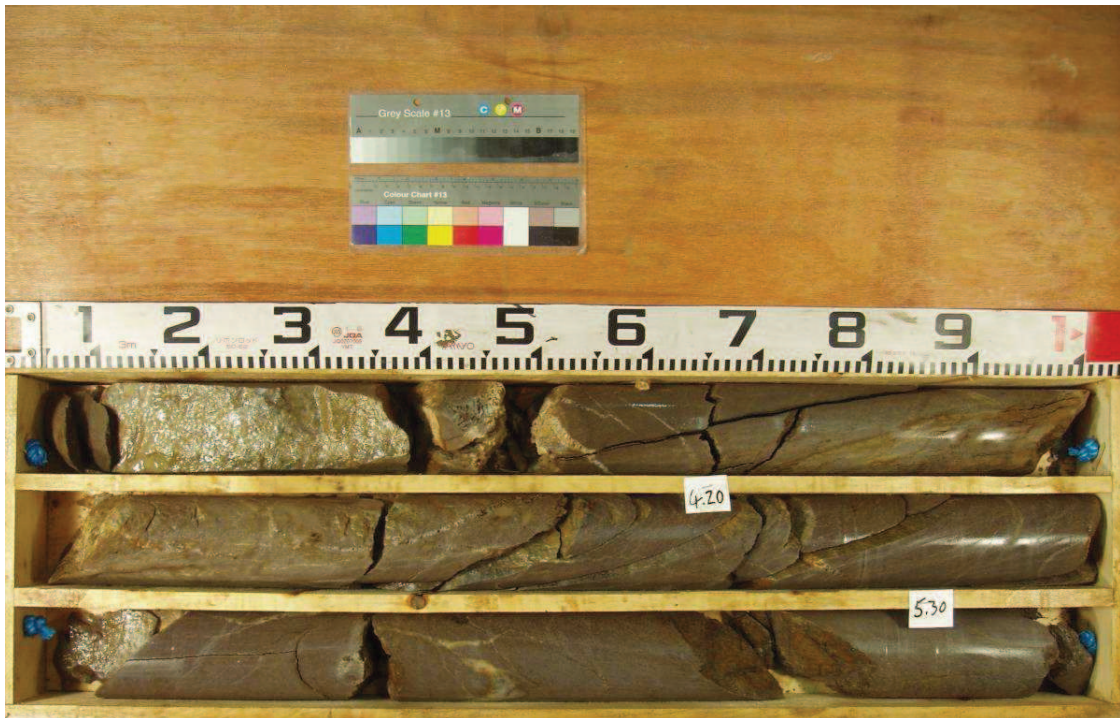
RC36B Box 1 of 3



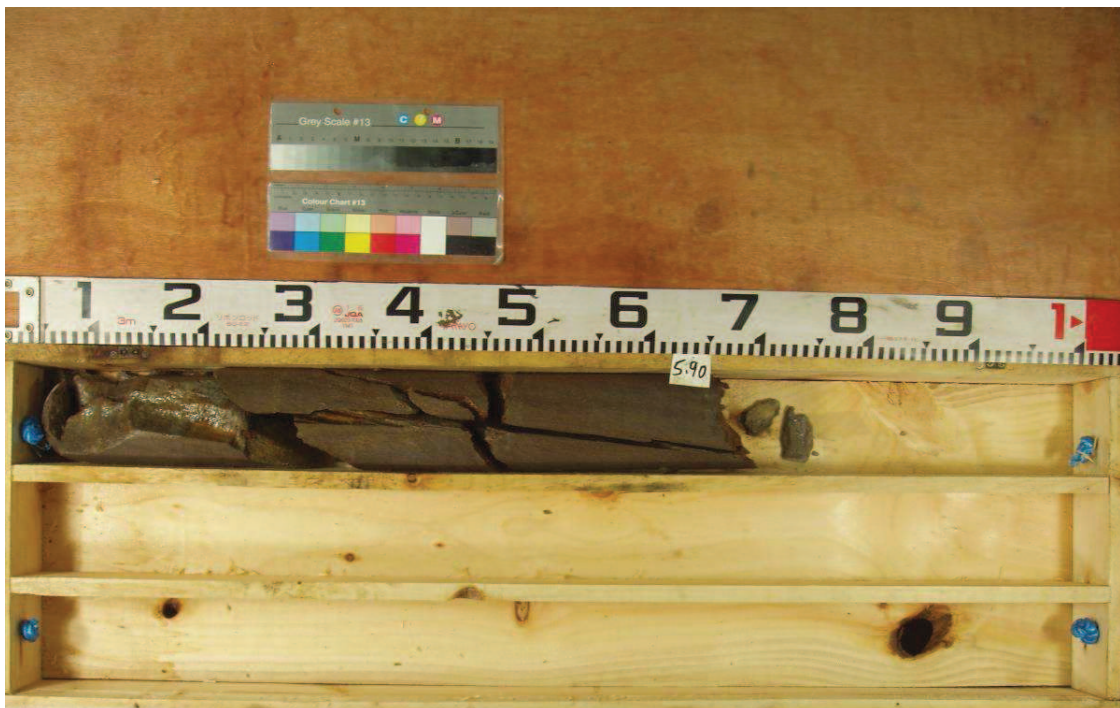


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC36B Box 2 of 3**



**RC36B Box 3 of 3**

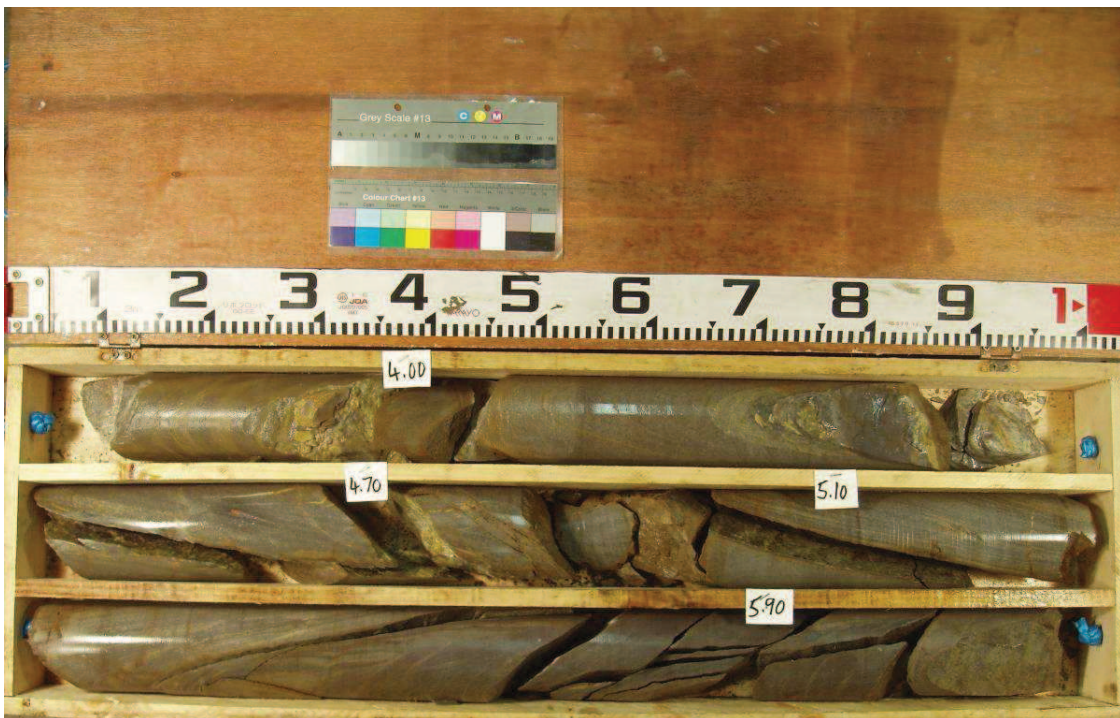


18312 – Barnastooka Windfarm – Rock Core Photographs

RC37A Box 1 of 3

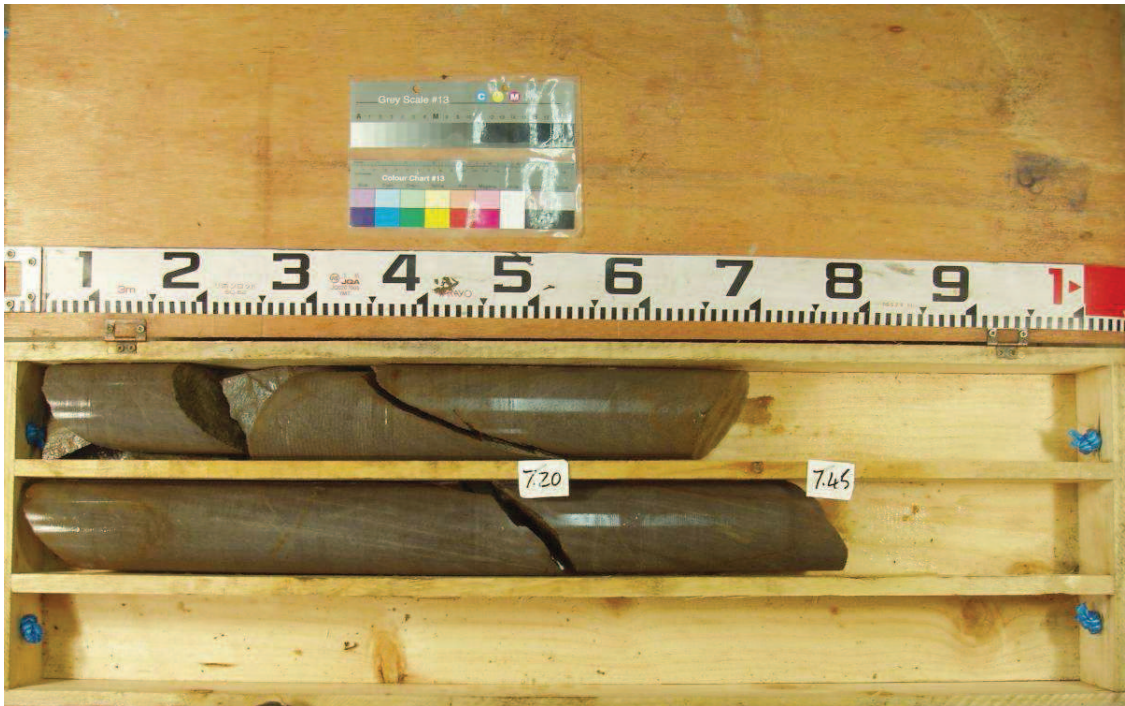


RC37A Box 2 of 3



18312 – Barnastooka Windfarm – Rock Core Photographs

RC37A Box 3 of 3



RC37B Box 1 of 3

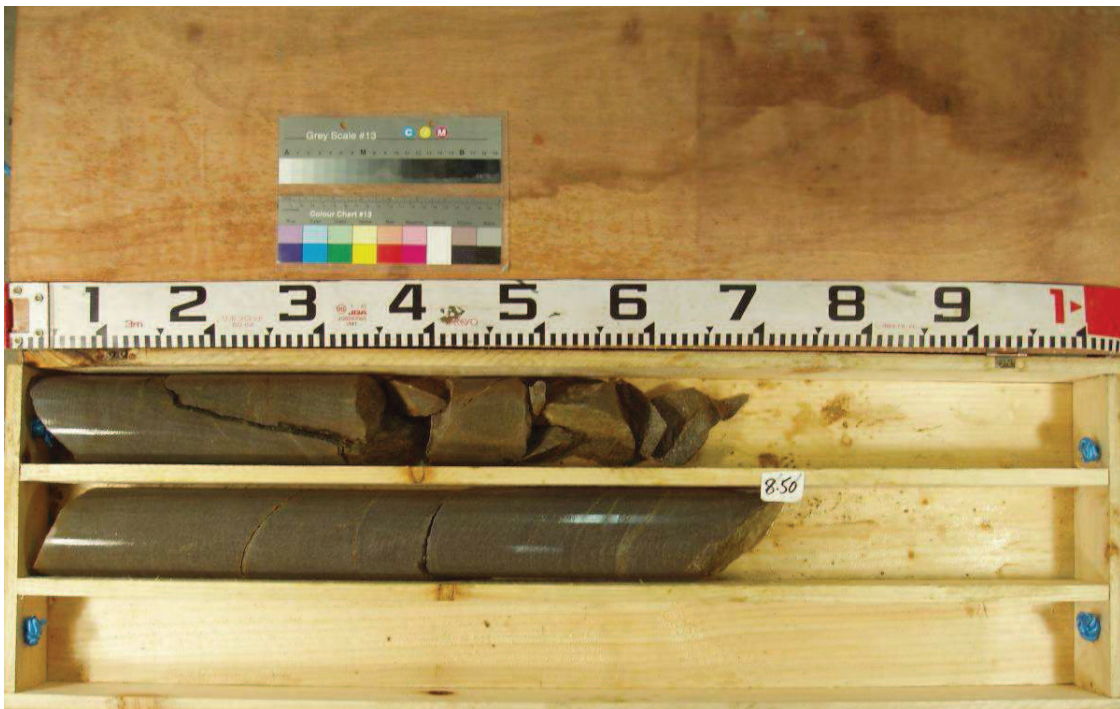


18312 – Barnastooka Windfarm – Rock Core Photographs

**RC37B Box 2 of 3**



**RC37B Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

RC38A Box 1 of 2



RC38A Box 2 of 2



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC38B Box 1 of 3**



**RC38B Box 2 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RC38B Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

RCR1 Box 1 of 3



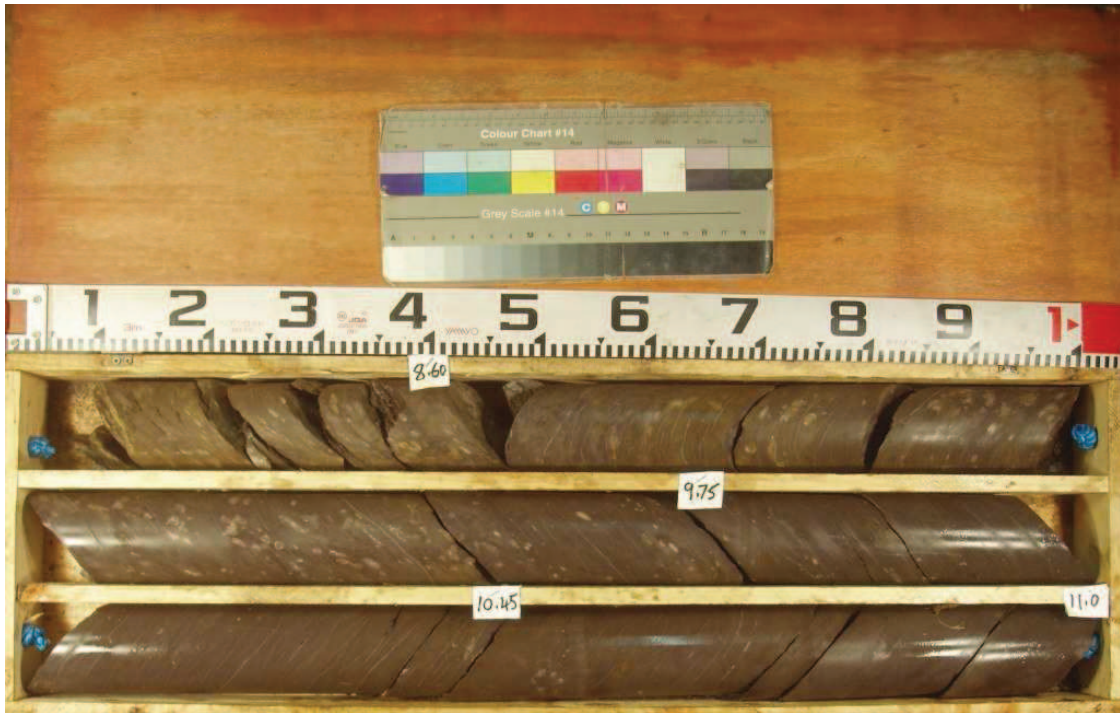
RCR1 Box 2 of 3





18312 – Barnastooka Windfarm – Rock Core Photographs

RCR1 Box 3 of 3



RCR2 Box 1 of 3



18312 – Barnastooka Windfarm – Rock Core Photographs

**RCR2 Box 2 of 3**

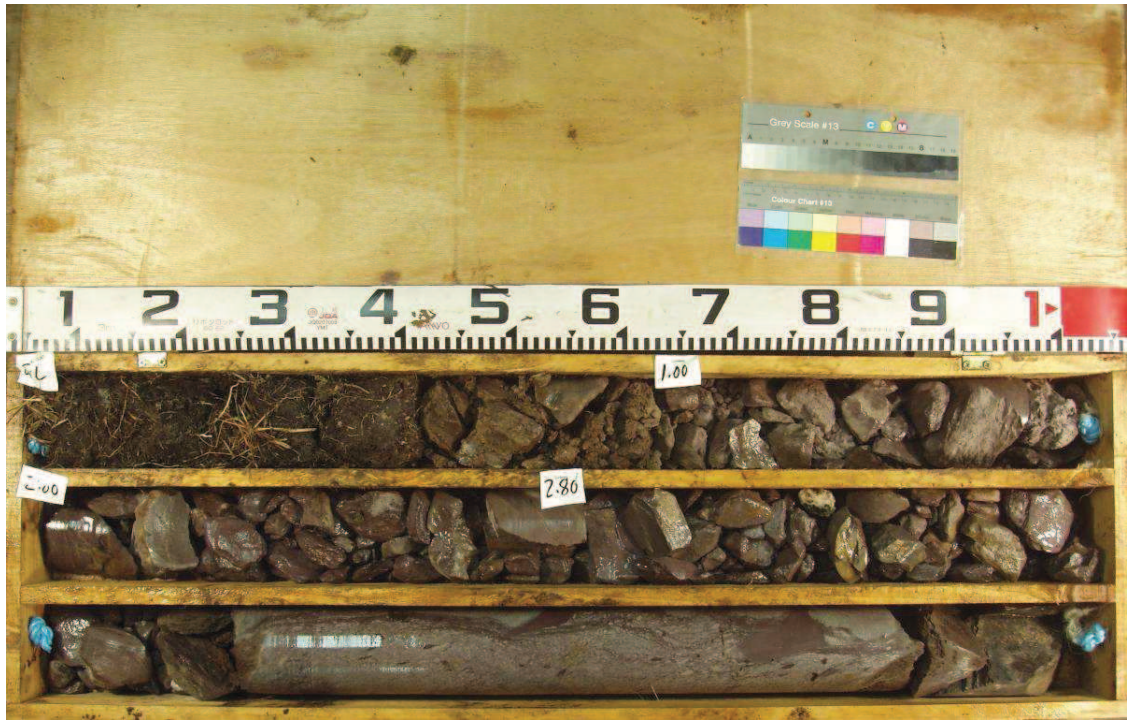


**RCR2 Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RCR3 Box 1 of 3**

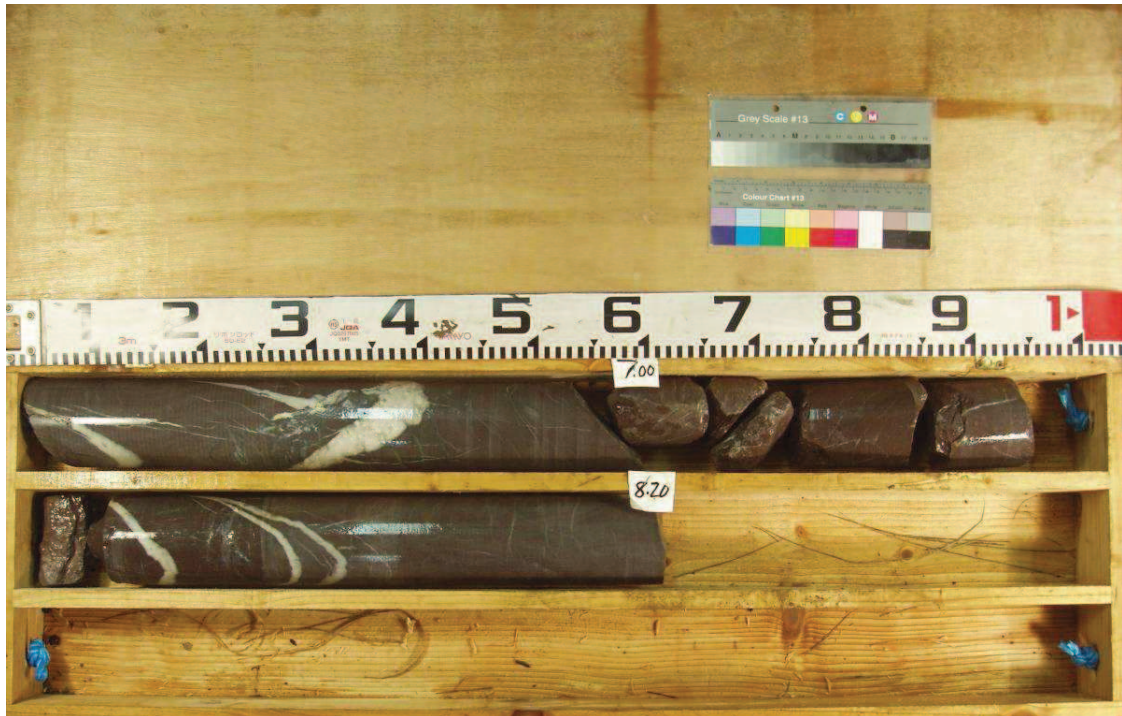


**RCR3 Box 2 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RCR3 Box 3 of 3**

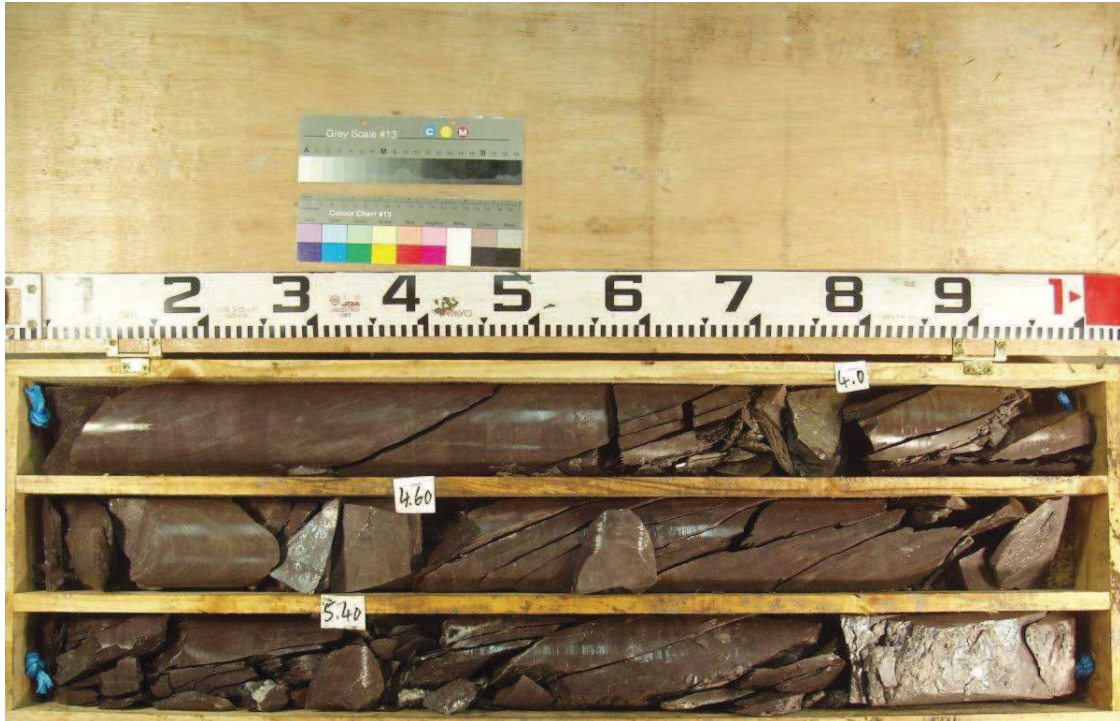


**RCR4 Box 1 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

**RCR4 Box 2 of 3**

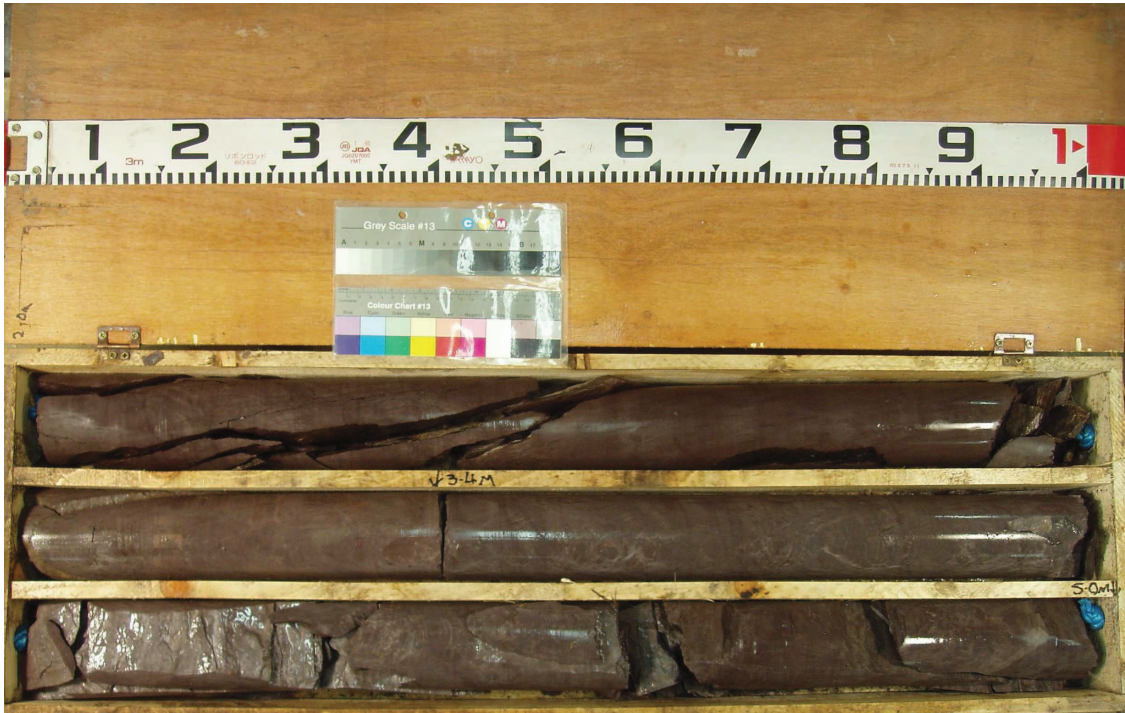


**RCR4 Box 3 of 3**



18312 – Barnastooka Windfarm – Rock Core Photographs

RCSUB1 Box 1 of 2



RCSUB1 Box 2 of 2



**RCSUB2 Box 1 of 1**



## **Appendix 2**

### **Trial Pit Records**





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP001
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 508,624.65 E 572,488.18 N		<b>DATE STARTED</b> 21/05/2015
<b>GROUND LEVEL (m)</b> 193.29		<b>DATE COMPLETED</b> 21/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Peaty TOPSOIL		0.20	193.09	↓ (Slow)					
1.0	Soft to firm grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.					AA34558	B	0.80-0.80	10 [R]	
2.0	Obstruction - Possible rock End of Trial Pit at 1.70m		1.70	191.59						

**Groundwater Conditions**  
Water ingress at 0.20m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP002

**LOGGED BY** F.C

**CO-ORDINATES** 508,579.60 E  
572,427.77 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 21/05/2015

**DATE COMPLETED** 21/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 187.55

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Peaty TOPSOIL									
	Soft dark brown fibrous PEAT (H4-H7)		0.30	187.25						
						AA34556	B	0.60-0.60	8	-[R]
1.0	Soft to firm grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		1.00	186.55	↓ (Slow)					
						AA34557	B	1.60-1.60	12	-[R]
2.0	Obstruction - Possible rock End of Trial Pit at 2.00m		2.00	185.55						
3.0										
4.0										

**Groundwater Conditions**  
Water ingress at 1.00m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm	<b>TRIAL PIT NO.</b> TP003
<b>LOGGED BY</b> F.C	<b>SHEET</b> Sheet 1 of 1
<b>CLIENT ENGINEER</b> ESBI	<b>DATE STARTED</b> 20/05/2015
<b>CO-ORDINATES</b> 508,524.00 E 572,344.02 N	<b>DATE COMPLETED</b> 20/05/2015
<b>GROUND LEVEL (m)</b> 189.10	<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
1.0										
1.20	Soft to firm blue/grey very sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are subangular.		1.20	187.90		AA19324	B	1.00-1.00	20 8[R]	
2.0										
2.40	Obstruction - Possible rock End of Trial Pit at 2.40m		2.40	186.70		AA19325	B	2.00-2.00	12 2[R]	
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP004

**LOGGED BY** F.C

**CO-ORDINATES** 508,480.02 E  
572,256.08 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 20/05/2015

**DATE COMPLETED** 20/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 195.36

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
			Sample Ref	Type	Depth		
0.0							
0.30	195.06					30	12[R]
1.10	194.26		AA19326	B	1.00-1.00		
2.00			AA19327	B	2.00-2.00		
2.50	192.86	↓ (Slow)					
3.00	192.36						

**Groundwater Conditions**  
Water ingress at 2.50m

**Stability**  
Pit sides unstable due to water ingress

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP005

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,419.99 E  
572,172.98 N

**DATE STARTED** 20/05/2015

**DATE COMPLETED** 20/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 196.41

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	196.31	↓ (Rapid)					
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.40	196.01						
1.0	Soft to firm blue/grey slightly sandy slightly gravelly SILT with rootlets to 1.00m. Sand is fine to coarse. Gravel is subrounded.					AA19328	B	1.00-1.00		
2.0						AA19329	B	2.50-2.50		
3.0	End of Trial Pit at 3.00m		3.00	193.41						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP006

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,364.51 E  
572,094.92 N

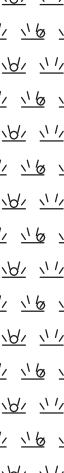
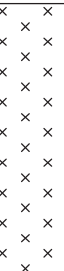
**DATE STARTED** 20/05/2015

**DATE COMPLETED** 20/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 200.51

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with pockets of gravelly silt and large timber logs at 1.50m									
1.0										
2.0										
2.20	Soft grey SILT		2.20	198.31		AA19330	B	1.50-1.50	26 8[R]	
3.0										
3.40	End of Trial Pit at 3.40m		3.40	197.11		AA19331	B	3.00-3.00	14 2[R]	10 0[R]
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP007</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 20/05/2015	
<b>CO-ORDINATES</b> 508,295.87 E 572,028.15 N		<b>DATE COMPLETED</b> 20/05/2015	
<b>GROUND LEVEL (m)</b> 204.02		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown sandy gravelly silty CLAY with rootlets to 0.30m. Sand is coarse. Gravel is subrounded.									
1.0	(Medium dense to dense) Grey very sandy silty GRAVEL with cobbles. Sand is coarse. Gravel is subrounded to rounded. Cobbles are subrounded.		1.00	203.02		AA19332	B	0.80-0.80		
2.0										
3.0	End of Trial Pit at 3.00m		3.00	201.02		AA19333	B	2.50-2.50		
4.0										

**Groundwater Conditions**  
Water ingress at 2.60m

**Stability**  
Pit sides unstable due to water ingress

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

REPORT NUMBER

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP008

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,198.86 E  
571,984.68 N

**DATE STARTED** 20/05/2015

**DATE COMPLETED** 20/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 209.26

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
			Sample Ref	Type	Depth		
0.0		(Seepage)					
1.0			AA19334	B	1.00-1.00		
1.50	207.76						
2.0			AA19335	B	2.50-2.50		
3.0	206.16						
3.10							
4.0							

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
Pit sides unstable due to water ingress

**General Remarks**





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP009</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 508,117.56 E 571,902.55 N		<b>DATE STARTED</b> 20/05/2015	
<b>GROUND LEVEL (m)</b> 217.21		<b>DATE COMPLETED</b> 20/05/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded.									
0.60	Soft brown/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subrounded. Cobbles are subangular to subrounded.		0.60	216.61		AA19336	B	1.00-1.00		
1.80	Obstruction - Possible rock End of Trial Pit at 1.80m		1.80	215.41						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP010</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 508,144.83 E 571,809.71 N		<b>DATE STARTED</b> 20/05/2015	
<b>GROUND LEVEL (m)</b> 223.17		<b>DATE COMPLETED</b> 20/05/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Sandy gravelly CLAY. Sand is coarse. Gravel is subrounded.									
0.40	Loose brown silty sandy GRAVEL with cobbles and pockets of fine sand. Sand is coarse. Gravel and cobbles are subrounded.		0.40	222.77		AA19337	B	1.00-1.00		
1.60	Dense brown sandy GRAVEL. Sand is coarse. Gravel is subrounded.		1.60	221.57		AA19338	B	2.00-2.00		
3.00	End of Trial Pit at 3.00m		3.00	220.17						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP011</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 508,095.39 E 571,725.36 N		<b>DATE STARTED</b> 20/05/2015
<b>GROUND LEVEL (m)</b> 232.18		<b>DATE COMPLETED</b> 20/05/2015
<b>CLIENT</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown sandy gravelly CLAY with rootlets. Sand is coarse. Gravel is subrounded.									
0.70	Soft brown sandy gravelly CLAY with cobbles. Sand is coarse. Gravel is subrounded to rounded. Cobbles are subrounded.		0.70	231.48		AA19339	B	1.00-1.00		
1.80	(Medium dense to dense) Clayey sandy GRAVEL with cobbles. Sand is coarse. Gravel is subrounded to rounded.		1.80	230.38		AA19340	B	2.00-2.00		
3.00	End of Trial Pit at 3.00m		3.00	229.18						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP012</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 508,027.06 E 571,641.75 N		<b>DATE STARTED</b> 21/05/2015
<b>GROUND LEVEL (m)</b> 238.31		<b>DATE COMPLETED</b> 21/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL with roots									
	Soft to firm brown/grey slightly gravelly CLAY with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.20	238.11						
	Soft to firm grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.50	237.81		AA34594	B	0.40-0.40		
1.0										
	Obstruction - Possible large boulders End of Trial Pit at 1.20m		1.20	237.11		AA34595	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP013</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,965.68 E 571,555.72 N		<b>DATE STARTED</b> 21/05/2015
<b>GROUND LEVEL (m)</b> 245.69		<b>DATE COMPLETED</b> 21/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL with roots									
0.25	Soft to firm grey/brown slightly gravelly CLAY with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.25	245.44						
0.50	Soft to firm grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.50	245.19		AA34552	B	0.40-0.40	9	-[R]
1.00						AA34553	B	1.00-1.00	10	-[R]
1.40	Obstruction - Possible large boulders End of Trial Pit at 1.40m		1.40	244.29	↓ (Slow)					

**Groundwater Conditions**  
Water ingress at 1.30m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP014</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 21/05/2015	
<b>CO-ORDINATES</b> 507,907.92 E 571,490.05 N		<b>DATE COMPLETED</b> 21/05/2015	
<b>GROUND LEVEL (m)</b> 265.25		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Soft to firm brown/grey slightly gravelly CLAY with cobbles and boulders		0.30	264.95					9 -[R]	
						AA34651	B	0.60-0.60	10 -[R]	
	Obstruction - Possible large boulders End of Trial Pit at 0.80m		0.80	264.45					7 -[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Water ingress at 0.60m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP015</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 07/04/2015	
<b>CO-ORDINATES</b> 507,807.05 E 571,463.02 N		<b>DATE COMPLETED</b> 07/04/2015	
<b>GROUND LEVEL (m)</b> 282.72		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
0.40	Soft grey blue slightly sandy gravelly SILT with lenses of soft brown gravelly clay		0.40-0.40	282.32		AA21682 AA21682T	B D	0.40-0.40 0.40-0.40	35 10[R]	
1.20	Loose brown very sandy silty GRAVEL with medium cobble content. Gravel and cobbles are subrounded to angular.		1.00-1.00 1.00-1.00	281.52		AA21683 AA21683T	B D	1.00-1.00 1.00-1.00		
2.00			2.00-2.00 2.00-2.00			AA21684 AA21684T	B D	2.00-2.00 2.00-2.00		
3.20	End of Trial Pit at 3.20m		3.20-3.20 3.20-3.20	279.52		AA21685 AA21685T	B D	3.20-3.20 3.20-3.20		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Trial Pit unstable from 1.2mbgl

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP016</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 01/04/2015	
<b>CO-ORDINATES</b> 507,703.97 E 571,442.93 N		<b>DATE COMPLETED</b> 01/04/2015	
<b>GROUND LEVEL (m)</b> 284.58		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
1.0										
1.30	Soft grey blue sandy very gravelly SILT with medium cobble content. Gravel is subangular to angular		1.30	283.28	 (Moderate)	AA21679 AA21679T	B D	0.60-0.60 0.60-0.60	14 4[R]	
2.0										
3.0						AA21680 AA21680T	B D	1.60-1.60 1.60-1.60	16 2[R]	
3.10	End of Trial Pit at 3.10m		3.10	281.48		AA21681 AA21681T	B D	2.70-2.70 2.70-2.70		
4.0										

**Groundwater Conditions**  
Groundwater observed at 1.3mbgl

**Stability**  
Trial Pit unstable from 1.3mbgl

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP017</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 507,593.96 E 571,433.03 N	
<b>GROUND LEVEL (m)</b> 292.27		<b>DATE STARTED</b> 01/04/2015	
		<b>DATE COMPLETED</b> 01/04/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft brown sandy gravelly CLAY with rootlets/organics		0.20	292.07		AA21676 AA21676T	B D	0.20-0.20 0.20-0.20	8 2[R]	
						AA21677 AA21677T	B D	0.60-0.60 0.60-0.60		
1.0	Firm grey blue sandy very gravelly SILT with cobbles and boulders. Gravel is subrounded to subangular		0.90	291.37						
	Obstruction -possible bedrock End of Trial Pit at 1.70m		1.70	290.57		AA21678 AA21678T	B D	1.60-1.60 1.60-1.60		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP018</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,486.11 E 571,438.00 N		<b>DATE STARTED</b> 01/04/2015
<b>GROUND LEVEL (m)</b> 297.09		<b>DATE COMPLETED</b> 01/04/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown sandy gravelly CLAY with rootlets/organics									
0.80	Firm grey blue sandy very gravelly SILT with medium cobble and boulder content. Gravel is subrounded to subangular			296.29		AA21674 AA21674	B D	0.50-0.50 0.50-0.50	20 2[R]	
2.0	Obstruction -possible bedrock End of Trial Pit at 2.00m			295.09		AA21675 AA21675	B D	1.50-1.50 1.50-1.50		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP.LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP019

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 507,384.99 E  
571,470.00 N

**DATE STARTED** 01/04/2015

**DATE COMPLETED** 01/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 303.96

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)		0.20	303.76					24 6[R]	
	Soft/firm grey blue sandy very gravelly SILT with medium cobble and boulder content					AA21672	B	0.50-0.50		
	Rootlets/Organics present from GL to 0.7mbgl					AA21672T	D	0.50-0.50		
	Becoming silty GRAVEL from 1.3mbgl									
1.0										
						AA21673	B	1.50-1.50		
						AA21673T	D	1.50-1.50		
2.0	Obstruction -possible bedrock End of Trial Pit at 1.80m		1.80	302.16						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP020</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 01/04/2015	
<b>CO-ORDINATES</b> 507,279.84 E 571,485.04 N		<b>DATE COMPLETED</b> 01/04/2015	
<b>GROUND LEVEL (m)</b> 309.21		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
	Soft grey brown sandy gravelly CLAY with rootlets/organics		0.40	308.81		AA21670 AA21670T	B D	0.40-0.40 0.40-0.40	30 2[R]	
	Firm grey blue sandy gravelly SILT with cobbles and boulders. Gravel is subrounded to subangular.		0.80	308.41	↓ (Moderate)					
1.0	Becoming stiff from 1.3mbgl					AA21671 AA21671T	B D	1.40-1.40 1.40-1.40		
1.80	End of Trial Pit at 1.80m		1.80	307.41						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Groundwater observed at 0.8mbgl

**Stability**  
Trial Pit unstable from 0.8mbgl

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP021	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 01/04/2015	
<b>CO-ORDINATES</b> 507,181.71 E 571,504.27 N		<b>DATE COMPLETED</b> 01/04/2015	
<b>GROUND LEVEL (m)</b> 310.19		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)		0.10	310.09						
	Soft brown sandy gravelly CLAY with rootlets/ organics		0.30	309.89		AA21668 AA21668T	B D	0.20-0.20 0.20-0.20		
	Firm, stiff grey blue very sandy very gravelly SILT with medium cobble and boulder content									
	Becoming silty GRAVEL from 0.7mbgl					AA21669 AA21669T	B D	0.60-0.60 0.60-0.60		
1.0	Obstruction -possible bedrock End of Trial Pit at 1.00m		1.00	309.19						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP022

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 507,081.96 E  
571,496.00 N

**DATE STARTED** 01/04/2015

**DATE COMPLETED** 01/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 313.54

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
0.40	Stiff grey blue sandy very gravelly SILT with occasional cobbles and boulders. Gravel, cobble and boulders are subrounded to subangular		0.40	313.14		AA21666	B	0.40-0.40	22 8[R]	
						AA21666T	D	0.40-0.40		
0.70	Obstruction -possible bedrock End of Trial Pit at 0.70m		0.70	312.84		AA21667	B	0.60-0.60		
						AA21667T	D	0.60-0.60		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP023

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 506,979.00 E  
571,484.00 N

**DATE STARTED** 01/04/2015

**DATE COMPLETED** 01/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 314.32

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft brown sandy gravelly CLAY with rootlets		0.20	314.12						
						AA21664 AA21664T	B D	0.50-0.50 0.50-0.50	16 4[R]	
1.0	Soft grey blue very sandy very gravelly SILT with medium cobble and boulder content. Gravel, cobbles and boulders are subangular to subrounded  Becoming firm/stiff from 1.5mbgl		1.00	313.32	↓ (Moderate)					
						AA21665 AA21665T	B D	1.50-1.50 1.50-1.50		
2.0	Obstruction -possible bedrock End of Trial Pit at 1.90m		1.90	312.42						
3.0										
4.0										

**Groundwater Conditions**  
Groundwater observed at 1.0m

**Stability**  
Unstable from 1.0mbgl

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP024</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 31/03/2015
<b>CO-ORDINATES</b> 506,883.06 E 571,457.99 N		<b>DATE COMPLETED</b> 31/03/2015
<b>GROUND LEVEL (m)</b> 319.09		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)		0.10	318.99						
	Soft grey blue sandy gravelly SILT with cobbles and boulders. Gravel is subangular to angular									
1.0	Becoming silty GRAVEL from 0.9mbgl					AA21663 AA21663T	B D	0.60-0.60 0.60-0.60		
1.20	Obstruction -possible bedrock End of Trial Pit at 1.20m		1.20	317.89						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP025

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 506,782.02 E  
571,441.97 N

**DATE STARTED** 31/03/2015

**DATE COMPLETED** 31/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 322.32

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)				↓ (Slow)					
1.0	Soft/firm grey blue sandy gravelly SILT with rootlets/organics		1.10	321.22		AA21661 AA21661T	B D	0.50-0.50 0.50-0.50	12 0[R]	
	Dense/very dense grey sandy angular GRAVEL and COBBLES - possible weathered rock		1.50	320.82						
2.0	Obstruction -possible bedrock End of Trial Pit at 1.80m		1.80	320.52						
3.0										
4.0										

**Groundwater Conditions**  
Groundwater observed at Ground Level

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP.LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP026

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 506,684.03 E  
571,397.01 N

**DATE STARTED** 31/03/2015

**DATE COMPLETED** 31/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 329.59

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)	\ / \ / \ /								
	Soft brown sandy gravelly CLAY with rootlets	\ / \ / \ /	0.30	329.29					28	
	Medium dense sandy clayey silty GRAVEL with medium cobble and boulder content	\ / \ / \ /	0.80	328.79		AA21659 AA21659T	B D	0.90-0.90 0.90-0.90		
1.0	Soft/firm grey blue sandy gravelly SILT	x o x x	1.40	328.19		AA21660 AA21660T	B D	1.60-1.60 1.60-1.60		
2.0	Obstruction -possible bedrock End of Trial Pit at 2.00m	x o x x	2.00	327.59						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP027</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,591.00 E 571,361.00 N		<b>DATE STARTED</b> 31/03/2015
<b>GROUND LEVEL (m)</b> 337.30		<b>DATE COMPLETED</b> 31/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
0.30	Firm grey blue sandy very gravelly SILT with medium cobble and boulder content. Gravel, cobble and boulders are angular		0.30	337.00		AA21654 AA21654T AA32059 AA32060	B D B B	0.20-0.20 0.20-0.20 0.30-0.30 0.60-0.60	20 4[R]	
1.40	Obstruction -possible bedrock End of Trial Pit at 1.40m		1.40	335.90		AA21655 AA21655T AA32061	B D B	1.20-1.20 1.20-1.20 1.60-1.60		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm	<b>TRIAL PIT NO.</b> TP028	<b>SHEET</b> Sheet 1 of 1
<b>LOGGED BY</b> C.Killaly	<b>CO-ORDINATES</b> 506,506.99 E 571,318.97 N	<b>DATE STARTED</b> 30/03/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>GROUND LEVEL (m)</b> 339.60	<b>DATE COMPLETED</b> 30/03/2015
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft brown sandy gravelly CLAY with rootlets		0.30	339.30						
	soft grey blue sandy gravelly SILT with medium cobble and boulder content. Gravel, cobble and boulder are subangular to angular		0.60	339.00		AA21652 AA21652T	B D	0.60-0.60 0.60-0.60		
1.0										
	Becoming silty GRAVEL from 1.7mbgl					AA21653 AA21653T	B D	1.80-1.80 1.80-1.80		
2.0										
	Obstruction -possible bedrock End of Trial Pit at 2.20m		2.20	337.40						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP029
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,326.09 E 571,240.22 N		<b>DATE STARTED</b> 30/03/2015
<b>GROUND LEVEL (m)</b> 341.46		<b>DATE COMPLETED</b> 30/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)	\ / \ / \ /			↓ (Slow)					
0.45	Soft brown sandy gravelly CLAY with rootlets	\ / \ / \ /	0.45	341.01		AA16698 AA16698T	B D	0.40-0.40 0.40-0.40	16 4[R]	
0.90	Soft/firm grey blue sandy gravelly SILT. Gravel is subangular	x o x o x o	0.90	340.56						
1.80	Becoming firm to stiff from 1.8mbgl	x o x o x o				AA16699 AA16699T	B D	1.80-1.80 1.80-1.80		
2.50	Obstruction -possible bedrock End of Trial Pit at 2.50m	x o x o x o	2.50	338.96						

**Groundwater Conditions**  
Groundwater observed between GL and 0.9mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP030</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,234.02 E 571,190.96 N		<b>DATE STARTED</b> 30/03/2015
<b>GROUND LEVEL (m)</b> 341.32		<b>DATE COMPLETED</b> 30/03/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)	\ \ \ \ \								
0.50	Soft brown sandy gravelly CLAY. Gravel is subangular	\ \ \ \ \	0.50	340.82		AA16696 AA16696T	B D	0.50-0.50 0.50-0.50	22 6[R]	
1.00	Soft/firm grey blue sandy gravelly SILT with medium cobble content. Gravel is subangular	\ \ \ \ \	1.00	340.32						
2.00		\ \ \ \ \				AA16697 AA16697T	B D	2.00-2.00 2.00-2.00		
2.40	Obstruction -possible bedrock End of Trial Pit at 2.40m	\ \ \ \ \	2.40	338.92						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP031</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 30/03/2015	
<b>CO-ORDINATES</b> 506,139.04 E 571,152.83 N		<b>DATE COMPLETED</b> 30/03/2015	
<b>GROUND LEVEL (m)</b> 342.71		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)	\ / \ / \ /			↓ (Slow)					
0.50	Soft brown sandy gravelly CLAY. Gravel is subangular	\ / \ / \ /	0.50	342.21		AA16694	B	0.50-0.50	30 6[R]	
0.70	Firm grey blue sandy very gravelly SILT. Gravel is subangular	x o x o x o	0.70	342.01		AA16694T	D	0.50-0.50		
1.60		x o x o x o				AA16695	B	1.60-1.60		
1.60		x o x o x o				AA16695T	D	1.60-1.60		
2.20	Obstruction -possible bedrock End of Trial Pit at 2.20m	x o x o x o	2.20	340.51						

**Groundwater Conditions**  
Groundwater observed between GL and 0.5mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP032</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,035.96 E 571,149.96 N		<b>DATE STARTED</b> 15/05/2015
<b>GROUND LEVEL (m)</b> 352.21		<b>DATE COMPLETED</b> 15/05/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.30	351.91		AA20479	B	0.30-0.30	22	10[R]
0.90	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.		0.90	351.31		AA20480	B	0.90-0.90		
2.50						AA20481	B	2.50-2.50		
3.00	End of Trial Pit at 3.00m		3.00	349.21						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP033

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 505,925.02 E  
571,334.97 N

**DATE STARTED** 15/05/2015

**DATE COMPLETED** 15/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 382.26

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	382.16						
	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.									
	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel and cobbles are angular to subangular.		0.60	381.66		AA20484	B	0.50-0.50		
1.0										
2.0										
						AA20485	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	379.26						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP034</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 505,967.04 E 571,335.01 N		<b>DATE STARTED</b> 15/05/2015
<b>GROUND LEVEL (m)</b> 377.51		<b>DATE COMPLETED</b> 15/05/2015
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.60	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.		0.60	376.91		AA20486	B	0.50-0.50	24	10[R]
2.50						AA20487	B	2.50-2.50		
3.00	End of Trial Pit at 3.00m		3.00	374.51						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP035
<b>LOGGED BY</b> F.C.		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,010.74 E 571,421.09 N		<b>DATE STARTED</b> 15/05/2015
<b>GROUND LEVEL (m)</b> 375.70		<b>DATE COMPLETED</b> 15/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft/firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.		0.70	375.00		AA21582	B	0.50-0.50	22	8[R]
2.60						AA21583	B	2.60-2.60		
3.00	End of Trial Pit at 3.00m		3.00	372.70						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm	<b>TRIAL PIT NO.</b> TP036
<b>LOGGED BY</b> F.C	<b>SHEET</b> Sheet 1 of 1
<b>CLIENT ENGINEER</b> ESBI	<b>DATE STARTED</b> 27/03/2015
<b>CO-ORDINATES</b> 506,121.17 E 571,570.42 N	<b>DATE COMPLETED</b> 27/03/2015
<b>GROUND LEVEL (m)</b> 399.93	<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
0.60	Loose brown peaty silty GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.60	399.33		AA19308	B	0.50-0.50	3	[R]
1.40	Loose grey silty sandy GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		1.40	398.53		AA19309	B	1.20-1.20	11	[R]
2.20						AA19310	B	2.20-2.20		
3.00	End of Trial Pit at 3.00m		3.00	396.93						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**  
\*Pit moved 30m to avoid ancient stone circle

IGSL TP LOG -18312 FINAL TP.LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP037

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,194.00 E  
571,628.97 N

**DATE STARTED** 27/03/2015

**DATE COMPLETED** 27/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 400.41

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown/Black fibrous PEAT (H4-H7)									
0.30	(Loose) Brown GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.30	400.11						
0.60	(Loose) Brown/grey silty GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.60	399.81		AA19311	B	0.50-0.50		
1.00	(Loose) Brown GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.									
1.30	(Loose) Brown/grey silty GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		1.30	399.11						
	Obstruction - Possible rock End of Trial Pit at 1.30m									
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Slight water ingress at 0.30m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP.LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP038
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,262.00 E 571,696.04 N		<b>DATE STARTED</b> 27/03/2015
<b>GROUND LEVEL (m)</b> 398.54		<b>DATE COMPLETED</b> 27/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown PEAT (H4-H7)									
0.20	Soft to firm grey sandy gravelly SILT with cobbles. Cobbles are subangular to subrounded.		0.20	398.34		AA19313	B	0.50-0.50	6 -[R]	
1.0									14 -[R]	
2.0	(Loose to medium dense) Brown sandy GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		2.00	396.54		AA19314	B	1.50-1.50		
2.50										
3.0	End of Trial Pit at 2.50m		3.00	395.54		AA19315	B	2.50-2.50		
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP039</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,412.96 E 571,816.90 N		<b>DATE STARTED</b> 27/03/2015
<b>GROUND LEVEL (m)</b> 389.21		<b>DATE COMPLETED</b> 27/03/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
0.60	Firm grey sandy gravelly SILT with cobbles. Cobbles are subangular to subrounded.		0.50-0.50	388.61		AA19320	B		3	-[R]
1.0			1.00-1.00			AA19321	B		14	-[R]
2.0			2.20-2.20			AA19322	B			
2.60	(Loose) Brown silty GRAVEL with cobbles. Cobbles are subangular to subrounded.			386.61						
3.0	End of Trial Pit at 3.00m		3.00	386.21		AA19323	B	3.00-3.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15







# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP041</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 10/04/2015	
<b>CO-ORDINATES</b> 506,551.95 E 571,901.98 N		<b>DATE COMPLETED</b> 10/04/2015	
<b>GROUND LEVEL (m)</b> 385.99		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft blue/grey sandy gravelly SILT with occasional cobbles and boulders. Sand is coarse. Gravel is subangular to subrounded. Cobbles and boulders are subangular.		0.60-0.60 0.60-0.60	385.29		AA25450 AA25450T	B D		20 2[R]	
2.20	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.20m		1.90-1.90 1.90-1.90	383.79		AA27904 AA27904T	B D			

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP042

**LOGGED BY** F.C

**CO-ORDINATES** 506,828.02 E  
571,533.99 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 09/04/2015

**DATE COMPLETED** 09/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 333.60

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽▽								
0.50	Soft blue/grey sandy gravelly SILT with occasional cobbles. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subrounded)	▲▲▲	0.50	333.10		AA25430 AA25430T	B D	0.50-0.50 0.50-0.50	14 6[R]	
1.50		▲▲▲				AA25431 AA25431T	B D	1.50-1.50 1.50-1.50		
2.80		▲▲▲				AA25432 AA25432T	B D	2.80-2.80 2.80-2.80		
3.10	End of Trial Pit at 3.10m	▲▲▲	3.10	330.50						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP043

**SHEET** Sheet 1 of 1

**LOGGED BY** PF

**CO-ORDINATES** 506,891.99 E  
571,600.00 N

**DATE STARTED** 09/04/2015

**DATE COMPLETED** 09/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 335.82

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Soft brown gravelly CLAY with cobbles and abundant rootlets. Gravel and cobbles are angular.		0.50	335.32		AA26422	B	0.50-0.50	22	4[R]
1.0	Obstruction - Possible rock End of Trial Pit at 1.10m		1.10	334.72		AA26423	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No groundwater observed

**Stability**  
No instability observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP044</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,940.96 E 571,676.03 N		<b>DATE STARTED</b> 09/04/2015
<b>GROUND LEVEL (m)</b> 341.61		<b>DATE COMPLETED</b> 09/04/2015
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with occasional cobbles. Cobbles are subrounded.	(Symbol: circle with cross)								
0.50	Firm to stiff blue/grey sandy very gravelly SILT. Sand is coarse. Gravel is subrounded.	(Symbol: circle with cross)	0.50	341.11		AA25434 AA25434T	B D	0.50-0.50 0.50-0.50	20 4[R]	
0.90	Obstruction - possible boulders/bedrock	(Symbol: circle with cross)	0.90	340.71		AA25435 AA25435T	B D	0.80-0.80 0.80-0.80		
1.0	End of Trial Pit at 0.90m									

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP045</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 09/04/2015	
<b>CO-ORDINATES</b> 506,996.00 E 571,730.08 N		<b>DATE COMPLETED</b> 09/04/2015	
<b>GROUND LEVEL (m)</b> 345.64		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	345.54						
	Soft blue/grey sandy gravelly SILT. Sand is coarse. Gravel is angular to subrounded.									
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.70m		0.70	344.94		AA25436 AA25436T	B D	0.50-0.50 0.50-0.50	30 8[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm**TRIAL PIT NO.** TP046**SHEET** Sheet 1 of 1**LOGGED BY** F.C**CO-ORDINATES** 507,134.76 E  
571,765.11 N**DATE STARTED** 09/04/2015**DATE COMPLETED** 09/04/2015**CLIENT ENGINEER** ESBI  
ESBI**GROUND LEVEL (m)** 347.01**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft blue/grey sandy gravelly SILT. Sand is fine to coarse. Gravel is subangular to subrounded.		0.20	346.81		AA25440 AA25440T	B D	0.50-0.50 0.50-0.50	38 10[R]	
1.80	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.80m		1.80	345.21		AA25441 AA25441T	B D	1.60-1.60 1.60-1.60		

**Groundwater Conditions**  
No Groundwater Observed**Stability**  
No instability Observed**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP047</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 09/04/2015	
<b>CO-ORDINATES</b> 507,223.00 E 571,753.13 N		<b>DATE COMPLETED</b> 09/04/2015	
<b>GROUND LEVEL (m)</b> 349.29		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Soft blue/grey sandy gravelly SILT with occasional cobbles and boulders. Sand is coarse. Gravel is subangular to subrounded. Cobbles and boulders are subangular.	x x x x x o o o o o x x x x x	0.50	348.79		AA25442 AA25442T	B D	0.50-0.50 0.50-0.50	20 2[R]	
1.70	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.70m	x x x x x o o o o o x x x x x	1.70	347.59		AA25443 AA25443T	B D	1.50-1.50 1.50-1.50		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER****18312**

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP048</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 507,426.00 E 571,751.00 N		<b>DATE STARTED</b> 09/04/2015	
<b>GROUND LEVEL (m)</b> 345.82		<b>DATE COMPLETED</b> 09/04/2015	
<b>CLIENT ENGINEER</b> ESBI ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.30	345.52		AA25446	B	0.30-0.30	1	
	Soft blue/grey sandy gravelly SILT					AA25446T	D	0.30-0.30		
1.0	Obstruction End of Trial Pit at 1.10m		1.10	344.72		AA25447	B	1.00-1.00		
						AA25447T	D	1.00-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP049

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 507,520.00 E  
571,799.01 N

**DATE STARTED** 07/04/2015

**DATE COMPLETED** 07/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 346.69

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
0.50	Soft grey blue sandy gravelly SILT with medium cobble content. Gravel and cobbles are subangular to subrounded.	(X) (O) (x) (o)	0.50-0.50	346.19		AA21686 AA21686T	B D	0.50-0.50 0.50-0.50	40 10[R]	
1.50			1.50-1.50			AA21687 AA21687T	B D	1.50-1.50 1.50-1.50		
1.90	Loose grey sandy GRAVEL with cobbles. Gravel and cobbles are angular	(X) (O) (x) (o)	1.90	344.79						
2.20	Obstruction -possible bedrock End of Trial Pit at 2.20m	(X) (O) (x) (o)	2.20	344.49	↓ (Moderate)	AA21688 AA21688T	B D	2.20-2.20 2.20-2.20		

**Groundwater Conditions**  
Groundwater observed at 2.1mbgl

**Stability**  
trial Pit slightly unstable at 1.5mbgl

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP050</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,559.02 E 571,886.01 N		<b>DATE STARTED</b> 07/04/2015
<b>GROUND LEVEL (m)</b> 350.97		<b>DATE COMPLETED</b> 07/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft light brown sandy gravelly CLAY with rootlets/organics		0.30	350.67		AA21689 AA21689T	B D	0.30-0.30 0.30-0.30	60 20[R]	
	Soft grey blue sandy gravelly SILT with medium cobble and boulder content. Gravel, cobbles and boulders are subangular to subrounded.		0.60	350.37						
1.0										
2.0						AA21690 AA21690T	B D	1.50-1.50 1.50-1.50		
3.0	Obstruction -possible bedrock End of Trial Pit at 2.80m		2.80	348.17		AA21691 AA21691T	B D	2.80-2.80 2.80-2.80		
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP051</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,585.01 E 571,959.99 N		<b>DATE STARTED</b> 07/04/2015
<b>GROUND LEVEL (m)</b> 348.23		<b>DATE COMPLETED</b> 07/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft brown sandy gravelly CLAY with rootlets throughout. Sand is coarse. Gravel is subrounded.		0.20	348.03					50 10[R]	
	Firm to stiff blue/grey sandy gravelly SILT with occasional cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subrounded.		0.50	347.73		AA21692	B	0.50-0.50		
1.0										
						AA21693	B	1.60-1.60		
2.0	Obstruction -possible bedrock End of Trial Pit at 2.00m		2.00	346.23						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP052

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,635.95 E  
572,131.00 N

**DATE STARTED** 07/04/2015

**DATE COMPLETED** 07/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 344.92

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ / \ /								
0.30	Soft brown sandy slightly gravelly CLAY with abundant rootlets. Sand is coarse. Gravel is subangular.	\ / \ / \ / ○ ○ ○ ○	0.30	344.62					8	
0.60	Soft to firm blue/grey sandy gravelly SILT with occasional cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.	\ / \ / \ / ○ ○ ○ ○ x x x x	0.60	344.32		AA21697 AA21697T	B D	0.50-0.50 0.50-0.50		
1.00		\ / \ / \ / ○ ○ ○ ○ x x x x								
1.20	Obstruction -possible bedrock End of Trial Pit at 1.20m	\ / \ / \ / ○ ○ ○ ○ x x x x	1.20	343.72		AA21698 AA21698T	B D	1.00-1.00 1.00-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP053</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 07/04/2015	
<b>CO-ORDINATES</b> 507,729.99 E 572,175.00 N		<b>DATE COMPLETED</b> 07/04/2015	
<b>GROUND LEVEL (m)</b> 331.42		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Angular grey GRAVEL		0.30	331.12		AA21699 AA21699T	B D	0.30-0.30 0.30-0.30	30 10[R]	
	Obstruction -possible bedrock End of Trial Pit at 0.70m		0.70	330.72		AA21700 AA21700T	B D	0.60-0.60 0.60-0.60		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15

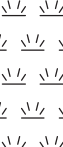
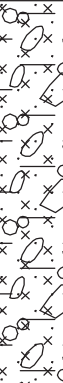


# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP054</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 507,642.00 E 572,240.98 N	
		<b>GROUND LEVEL (m)</b> 353.48	
		<b>DATE STARTED</b> 07/04/2015	
		<b>DATE COMPLETED</b> 07/04/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft blue/grey sandy gravelly SILT with occasional cobbles and boulders. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles and boulders are subrounded.		0.70	352.78		AA25418 AA25418T	B D	0.70-0.70 0.70-0.70	20 8[R]	
2.0						AA25419 AA25419T	B D	2.00-2.00 2.00-2.00		
2.40	Obstruction - possible boulders/bedrock End of Trial Pit at 2.40m		2.40	351.08						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP055</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 507,550.04 E 572,200.99 N		<b>DATE STARTED</b> 08/04/2015	
<b>GROUND LEVEL (m)</b> 363.10		<b>DATE COMPLETED</b> 08/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
0.50	Soft brown/grey sandy gravelly CLAY with occasional boulders. Sand is fine. Gravel is subangular. Boulders are subangular.		0.50	362.60		AA25420	B	0.50-0.50	12	
0.70			0.70	362.40		AA25420T	D	0.50-0.50		
1.0	Soft to firm blue/grey sandy gravelly SILT with occasional cobbles and boulders. Sand is fine. Gravel is subangular to subrounded. Cobbles and boulders are subrounded.									
2.0							AA25421 AA25421T	B D	1.60-1.60 1.60-1.60	
2.10	Obstruction - possible boulders/bedrock End of Trial Pit at 2.10m		2.10	361.00						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP056</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,456.93 E 572,155.99 N		<b>DATE STARTED</b> 30/04/2015
<b>GROUND LEVEL (m)</b> 367.99		<b>DATE COMPLETED</b> 30/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark black/brown fibrous PEAT (H4-H7)									
0.40	Soft to firm grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.40	367.59		AA32156	B	0.20-0.20	5	[R]
1.0						AA32157	B	1.20-1.20	11	[R]
2.0	Obstruction - Possible boulders/rock End of Trial Pit at 2.00m		2.00	365.99						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP057

**LOGGED BY** F.C

**CO-ORDINATES** 507,359.99 E  
572,125.03 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 378.11

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.90	Soft to firm grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.90	377.21	 (Moderate)	AA32154	B	0.50-0.50	2 -[R]	
1.50						AA32155	B	1.50-1.50	11 -[R]	
2.10	Obstruction - Possible rock End of Trial Pit at 2.10m		2.10	376.01						

**Groundwater Conditions**  
Water ingress at 0.90m

**Stability**  
No instability Observed

**General Remarks**






# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP058</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 06/05/2015	
<b>CO-ORDINATES</b> 507,604.01 E 572,315.93 N		<b>DATE COMPLETED</b> 06/05/2015	
<b>GROUND LEVEL (m)</b> 363.02		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.80	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.		0.80	362.22		AA12652	B	0.80-0.80	22 10[R]	
2.40			2.40	360.42		AA12653	B	2.40-2.40		
2.60	Obstruction End of Trial Pit at 2.60m		2.60	360.42						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP059

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,505.94 E  
572,418.97 N

**DATE STARTED** 06/05/2015

**DATE COMPLETED** 06/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 372.83

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ \ \ \ \								
	Soft brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.	x x x x x o o o o o	0.30	372.53		AA34757	B	0.30-0.30	24	8[R]
1.0	Angular COBBLES and BOULDERS (Possible weathered rock)	o o o o o x x x x x	0.90	371.93		AA34758	B	0.90-0.90		
	Obstruction - Possible rock End of Trial Pit at 1.20m		1.20	371.63						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP060</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,419.97 E 572,388.96 N		<b>DATE STARTED</b> 06/05/2015
<b>GROUND LEVEL (m)</b> 386.10		<b>DATE COMPLETED</b> 06/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft to firm brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel and cobbles are angular to subangular.		0.20	385.90						
	Angular COBBLES and BOULDERS (Possible weathered rock)		0.80	385.30		AA34756	B	0.60-0.60	18 4[R]	
1.0	Obstruction - Possible rock End of Trial Pit at 1.20m		1.20	384.90						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP061</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 06/05/2015	
<b>CO-ORDINATES</b> 507,331.11 E 572,368.93 N		<b>DATE COMPLETED</b> 06/05/2015	
<b>GROUND LEVEL (m)</b> 393.23		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
0.80	Soft brown sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.		0.80	392.43		AA34754	B	0.50-0.50	22 8[R]	
2.0						AA34755	B	2.00-2.00		
2.30	Obstruction - Possible rock End of Trial Pit at 2.30m		2.30	390.93						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP062

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,166.99 E  
572,308.00 N

**DATE STARTED** 06/05/2015

**DATE COMPLETED** 06/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 394.70

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft to firm blue/grey slightly sandy gravelly SILT with rootlets to 1.00m. Sand is fine. Gravel is angular to subangular.		0.40	394.30		AA34750	B	0.40-0.40	16 4[R]	
2.0	Stiff blue/grey slightly sandy gravelly SILT. Sand is fine. Gravel is angular to subangular.		2.00	392.70		AA34751	B	1.90-1.90		
3.0	End of Trial Pit at 3.00m		3.00	391.70						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP072</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,750.06 E 570,866.99 N		<b>DATE STARTED</b> 27/03/2015
<b>GROUND LEVEL (m)</b> 333.92		<b>DATE COMPLETED</b> 27/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
0.20	Soft grey brown sandy gravelly CLAY with occasional rootlets. Gravel is subangular to angular		0.20	333.72		AA16692 AA16692T	B D	0.50-0.50 0.50-0.50	12 0[R]	
0.80	Soft grey blue sandy very gravelly SILT with medium angular cobble content. Gravel is angular to subangular		0.80	333.12					14 2[R]	
1.50						AA16693 AA16693T	B D	1.50-1.50 1.50-1.50		
2.00	Obstruction -possible bedrock End of Trial Pit at 2.00m		2.00	331.92						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP079</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,738.01 E 570,767.05 N		<b>DATE STARTED</b> 27/03/2015
<b>GROUND LEVEL (m)</b> 335.18		<b>DATE COMPLETED</b> 27/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
0.50	Soft grey brown sandy gravelly CLAY. Gravel is subangular to subrounded.		0.50	334.68		AA16688 AA16688T	B D	0.50-0.50 0.50-0.50	16 0[R]	
0.90	Soft grey blue sandy gravelly SILT with medium cobble and boulder content. Gravel is subangular to angular		0.90	334.28	↓ (Seepage)	AA16689 AA16689T	B D	0.90-0.90 0.90-0.90	18 0[R]	
2.0						AA16690 AA16690T	B D	2.00-2.00 2.00-2.00		
2.70	Obstruction -possible bedrock End of Trial Pit at 2.70m		2.70	332.48		AA16691 AA16691T	B D	2.70-2.70 2.70-2.70		

**Groundwater Conditions**  
Seepage at 0.9mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP080

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 509,711.91 E  
570,669.90 N

**DATE STARTED** 27/03/2015

**DATE COMPLETED** 27/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 337.14

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
						AA16685	B	0.50-0.50	22	
						AA16685T	D	0.50-0.50	8[R]	
1.0	Soft grey brown SILT with abundant rootlets. Gravel is subrounded to subangular		1.00	336.14					10	
						AA16686	B	1.50-1.50		
						AA16686T	D	1.50-1.50		
2.0	Blue grey SILT		1.70	335.44						
						AA16687	B	2.80-2.80		
						AA16687T	D	2.80-2.80		
3.0	Trial Pit terminated End of Trial Pit at 3.10m		3.10	334.04						

**Groundwater Conditions**  
Seepage at 0.5mbgl

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP081</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 27/03/2015	
<b>CO-ORDINATES</b> 509,666.49 E 570,583.54 N		<b>DATE COMPLETED</b> 27/03/2015	
<b>GROUND LEVEL (m)</b> 335.89		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
0.30	Soft grey brown slightly sandy very gravelly CLAY with rootlets		0.30	335.59		AA16682 AA16682T	B D	0.30-0.30 0.30-0.30	32 10[R]	
0.80	Soft grey blue sandy very gravelly SILT. Gravel is subangular to angular		0.80	335.09		AA16683 AA16683T	B D	0.80-0.80 0.80-0.80		
2.0	Becoming firm/stiff from 1.9m					AA16684 AA16684T	B D	2.00-2.00 2.00-2.00		
2.30	Obstruction -possible bedrock End of Trial Pit at 2.30m		2.30	333.59						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP.LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP082
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,634.10 E 570,489.93 N		<b>DATE STARTED</b> 26/03/2015
<b>GROUND LEVEL (m)</b> 336.35		<b>DATE COMPLETED</b> 26/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft reddish brown slightly sandy gravelly CLAY. Gravel is subrounded to subangular		0.30	336.05						
	Soft grey blue sandy gravelly SILT with medium cobble content. Gravel and cobbles are subrounded to subangular		0.60	335.75						
1.0	Medium dense grey GRAVEL and COBBLES. Gravel and cobbles are angular- Possible weathered rock		1.10	335.25						
2.0										
	Obstruction -possible bedrock End of Trial Pit at 2.40m		2.40	333.95						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP083

**LOGGED BY** C.Killaly

**CO-ORDINATES** 509,639.71 E  
570,389.09 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 26/03/2015

**DATE COMPLETED** 26/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 337.95

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
1.0	Soft grey brown sandy gravelly CLAY. Gravel is subangular		0.90	337.05	 (Moderate)	AA16676	B	0.50-0.50	20	
						AA16676T	D	0.50-0.50	6[R]	
	Soft grey blue sandy very gravelly SILT with medium cobble content. Gravel and cobbles are subangular to angular		1.10	336.85						
	Dense grey sandy GRAVEL and COBBLES with silt horizons - possible weathered bedrock		1.50	336.45						
						AA16677	B	1.50-1.50		
						AA16677T	D	1.50-1.50		
2.0	End of Trial Pit at 2.00m		2.00	335.95						

**Groundwater Conditions**  
Groundwater observed at 0.9mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP084

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 509,657.99 E  
570,291.05 N

**DATE STARTED** 26/03/2015

**DATE COMPLETED** 26/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 336.65

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
0.40	Soft grey brown sandy gravelly CLAY. Gravel is subangular		0.40	336.25						
0.50	Soft/firm grey blue very gravelly SILT. Gravel is angular		0.50	336.15		AA16674	B	0.40-0.40	28 10[R]	
						AA16674T	B	0.40-0.40		
0.70	Obstruction -possible bedrock End of Trial Pit at 0.70m		0.70	335.95		AA16675	B	0.70-0.70		
						AA16675T	B	0.70-0.70		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TP085

**SHEET** Sheet 1 of 1

**LOGGED BY** C.Killaly

**CO-ORDINATES** 509,729.96 E  
570,221.99 N

**DATE STARTED** 26/03/2015

**DATE COMPLETED** 26/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 339.18

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
0.40	Soft grey brown sandy gravelly CLAY with medium cobble content. Gravel is subangular to angular		0.40	338.78		AA16671	B	0.40-0.40	22 6[R]	
0.60						AA16671T	D	0.40-0.40		
0.70	Soft grey blue sandy very gravelly SILT. Gravel is angular		0.70	338.48		AA16672	B	0.60-0.60		
0.60						AA16672T	D	0.60-0.60		
1.0	Possible weather rock from 1.0mbgl					AA16673	B	1.00-1.00		
1.20	Obstruction -possible bedrock End of Trial Pit at 1.20m		1.20	337.98		AA16673T	D	1.00-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP086	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 26/03/2015	
<b>CO-ORDINATES</b> 509,743.05 E 570,123.96 N		<b>DATE COMPLETED</b> 26/03/2015	
<b>GROUND LEVEL (m)</b> 333.27		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)	\ / \ / \ /			↓ (Slow)					
0.90	Soft grey brown sandy gravelly CLAY. Gravel is subangular to angular	o . x	0.90	332.37		AA16669	B	0.50-0.50	10	
1.10	Soft grey blue sandy very gravelly SILT. Gravel is angular	x o x	1.10	332.17		AA16669	D	0.50-0.50	6[R]	
1.80	Obstruction -possible bedrock	x o x	1.80	331.47		AA16670	B	1.50-1.50		
2.00	End of Trial Pit at 2.00m	x o x	2.00	331.27		AA16670	D	1.50-1.50		

**Groundwater Conditions**  
Groundwater observed between GL and 1.1mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP087
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,750.65 E 570,013.37 N		<b>DATE STARTED</b> 26/03/2015
<b>GROUND LEVEL (m)</b> 340.01		<b>DATE COMPLETED</b> 26/03/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽								
1.20	Soft grey brown sandy gravelly CLAY with medium cobble and boulder content	○●	1.20	338.81		AA16666 AA16666T	B D	1.00-1.00 1.00-1.00	10 0[R]	18 6[R]
1.40	Soft grey blue sandy gravelly SILT . Gravel is subangular to angular	x○	1.40	338.61						
2.0	Becoming stiff/very stif from 2.2mbgl	x○				AA16667 AA16667T	B D	2.00-2.00 2.00-2.00		
2.80	Obstruction -possible bedrock End of Trial Pit at 2.80m	x○	2.80	337.21		AA16668 AA16668T	B D	2.80-2.80 2.80-2.80		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP091</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 26/03/2015	
<b>CO-ORDINATES</b> 509,692.80 E 569,925.91 N		<b>DATE COMPLETED</b> 26/03/2015	
<b>GROUND LEVEL (m)</b> 343.31		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT									
0.40	Soft grey brown sandy gravelly CLAY. Gravel is angular		0.40	342.91		AA16663 AA16663T	B D	0.40-0.40 0.40-0.40	28 10[R]	
0.80	Soft grey blue very sandy very gravelly SILT with medium cobble content		0.80	342.51						
1.20						AA16664 AA16664T	B D	1.20-1.20 1.20-1.20		
2.20	Obstruction -possible bedrock End of Trial Pit at 2.20m		2.20	341.11		AA16665 AA16665T	B D	2.20-2.20 2.20-2.20		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TP092</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 509,648.28 E 569,838.94 N	
<b>GROUND LEVEL (m)</b> 342.62		<b>DATE STARTED</b> 25/03/2015	
		<b>DATE COMPLETED</b> 25/03/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
1.0										
1.20	Soft grey brown sandy gravelly CLAY. Gravel is angular		1.20	341.42		AA16660 AA16660T	B D	1.00-1.00 1.00-1.00	18 6[R]	4 0[R]
1.40	Soft grey blue sandy very gravelly SILT. Gravel is angular		1.40	341.22						
2.0						AA16661 AA16661T	B D	2.00-2.00 2.00-2.00		
3.0	Trial Pit terminated End of Trial Pit at 3.00m		3.00	339.62		AA16662 AA16662T	B D	3.00-3.00 3.00-3.00		
4.0										

**Groundwater Conditions**  
Groundwater observed between GL and 1.4mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TP093	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 509,563.41 E 569,861.54 N	
<b>GROUND LEVEL (m)</b> 342.67		<b>DATE STARTED</b> 25/03/2015	
		<b>DATE COMPLETED</b> 25/03/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black brown fibrous PEAT (H6-H7)	▽▽			↓ (Slow)				80[R]	
1.0		▽▽				AA16657 AA16657T	B D	1.00-1.00 1.00-1.00	40[R] 20[R]	
1.60	Medium dense grey sandy GRAVEL with medium cobble and boulder content. Gravel is angular	○●	1.60	341.07						
2.0	Soft grey blue sandy very gravelly SILT with medium cobble content. Gravel is angular	○●	2.00	340.67		AA16658 AA16658T	B D	2.00-2.00 2.00-2.00		
3.0	End of Trial Pit at 3.00m	○●	3.00	339.67		AA16659 AA16659T	B D	3.00-3.00 3.00-3.00		
4.0										

**Groundwater Conditions**  
Groundwater observed between GL and 2.0mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TPT025A
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,775.02 E 572,271.03 N		<b>DATE STARTED</b> 07/04/2015
<b>GROUND LEVEL (m)</b> 330.02		<b>DATE COMPLETED</b> 07/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft grey sandy gravelly SILT with pockets of brown clay. Sand is fine. Gravel is subrounded.		0.30	329.72		AA25416 AA25416T	B D	0.30-0.30 0.30-0.30	12 20[R]	
1.10	Obstruction -possible bedrock/boulders End of Trial Pit at 1.10m		1.10	328.92		AA25417 AA25417T	B D	1.00-1.00 1.00-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TPT026A
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,619.01 E 572,045.97 N		<b>DATE STARTED</b> 30/04/2015
<b>GROUND LEVEL (m)</b> 343.29		<b>DATE COMPLETED</b> 30/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.45	Soft to firm very gravelly sandy SILT with cobbles. Cobbles are subangular to subrounded.		0.45	342.84		AA32151	B	0.25-0.25		
1.20						AA32152	B	1.20-1.20		
2.20						AA32153	B	2.20-2.20		
2.30	Obstruction - Possible boulders/rock End of Trial Pit at 2.30m		2.30	340.99						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TPT027A

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,322.00 E  
571,727.03 N

**DATE STARTED** 07/04/2015

**DATE COMPLETED** 07/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 344.89

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Rapid)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly CLAY with rootlets throughout. Sand is coarse. Gravel is subrounded.		0.30	344.59		AA21694	B	0.30-0.30	12	2[R]
	Soft to firm blue/grey sandy gravelly SILT with occasional cobbles and boulders. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles and boulders are subangular.		0.70	344.19						
1.0						AA21695	B	1.30-1.30		
2.0	Angular grey GRAVEL		2.20	342.69		AA21696	B	2.30-2.30		
	Obstruction -possible bedrock End of Trial Pit at 2.20m		2.60	342.29						
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from surface

**Stability**  
Trial Pit was unstable

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TPT028A

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,244.99 E  
572,343.02 N

**DATE STARTED** 09/04/2015

**DATE COMPLETED** 09/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 397.11

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
0.50	Soft grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subrounded to subangular.		0.50	396.61	 (Moderate)	AA25444 AA25444T	B D	0.40-0.40 0.40-0.40	18 0[R]	
2.0						AA25445 AA25445T	B D	1.80-1.80 1.80-1.80		
2.40					 (Seepage)	AA25446 AA25446T	B D	2.40-2.40 2.40-2.40		
3.00	End of Trial Pit at 3.00m		3.00	394.11						

**Groundwater Conditions**  
Moderate water at 0.3mbgl, Slight water seepage at 2.40mbgl

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPT029A</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,269.94 E 572,083.98 N		<b>DATE STARTED</b> 09/04/2015
<b>GROUND LEVEL (m)</b> 385.22		<b>DATE COMPLETED</b> 09/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular to subrounded.		0.30-0.30	384.92		AA25437 AA25437T	B D	0.30-0.30 0.30-0.30	28 8[R]	
1.80			1.80-1.80			AA25438 AA25438T	B D	1.80-1.80 1.80-1.80		
3.10	End of Trial Pit at 3.10m		3.00-3.00	382.12		AA25439 AA25439T	B D	3.00-3.00 3.00-3.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TPT030A
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,413.98 E 571,297.04 N		<b>DATE STARTED</b> 09/04/2015
<b>GROUND LEVEL (m)</b> 343.94		<b>DATE COMPLETED</b> 09/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ \ \ \ \ \ \ \ \ \								
	Light brown fibrous PEAT (H4-H5)	\ \ \ \ \ \ \ \ \ \	0.20	343.74						
	Obstruction - possible boulders/bedrock End of Trial Pit at 0.40m	\ \ \ \ \ \ \ \ \ \	0.40	343.54		AA25433 AA25433T	B D	0.30-0.30 0.30-0.30	22 6[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TPT031A
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 505,903.16 E 571,208.02 N		<b>DATE STARTED</b> 30/03/2015
<b>GROUND LEVEL (m)</b> 369.19		<b>DATE COMPLETED</b> 30/03/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)				Water Strike ↓ (Slow)					
	Soft brown sandy gravelly CLAY with rootlets		0.25	368.94		AA16700 AA16700T	B D	0.20-0.20 0.20-0.20	60 18[R]	
	Soft/firm grey blue sandy gravelly SILT. Gravel is subangular		0.60	368.59						
1.0	Becoming firm/stiff from 1.2mbgl									
	Obstruction -possible bedrock End of Trial Pit at 1.50m		1.50	367.69			AA21651 AA21651T	B D	1.20-1.20 1.20-1.20	

**Groundwater Conditions**  
Groundwater observed between GL and 0.6mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TPT032A

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,038.25 E  
571,796.83 N

**DATE STARTED** 15/05/2015

**DATE COMPLETED** 15/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 354.47

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ (Seepage)					
0.20	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel and cobbles are subangular to subrounded.		0.20	354.27		AA20482	B	0.20-0.20	18	
2.0						AA20483	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	351.47						

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TPT033A

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,075.24 E  
571,494.47 N

**DATE STARTED** 27/03/2015

**DATE COMPLETED** 27/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 390.34

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
			Sample Ref	Type	Depth		
0.0							
0.60	389.74		AA19305	B	0.50-0.50	5 -[R]	
1.00			AA19306	B	1.00-1.00	11 -[R]	
1.50	388.84						
2.40	387.94		AA19307	B	2.40-2.40		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** **TPT034A**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,342.91 E  
571,743.96 N

**DATE STARTED** 27/03/2015

**DATE COMPLETED** 27/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 391.56

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H6)					AA19316	B	0.20-0.20		
	(Loose to medium dense) Brown sandy GRAVEL with a high cobble and boulder content. Cobbles and boulders are subangular to subrounded.	(O) (X)	0.60	390.96		AA19317	B	0.50-0.50	5 -[R]	
1.0	Soft to firm grey sandy very gravelly SILT with a high cobble and medium boulder content. Cobbles and boulders are subangular to subrounded.	(O) (X)	1.00	390.56		AA19318	B	1.30-1.50	10 -[R]	
		(O) (X)				AA19318	B	1.50-1.50	10 -[R]	
2.0		(O) (X)								
		(O) (X)				AA19319	B	2.50-2.50		
2.80	Obstruction - Possible rock End of Trial Pit at 2.80m	(O) (X)	2.80	388.76						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> TPT035A
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,635.03 E 571,796.83 N		<b>DATE STARTED</b> 10/04/2015
<b>GROUND LEVEL (m)</b> 389.35		<b>DATE COMPLETED</b> 10/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	389.25						
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.									
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.60m		0.60	388.75		AA27905 AA27905T	B D	0.50-0.50 0.50-0.50		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TPT036A

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,581.01 E  
572,403.96 N

**DATE STARTED** 06/05/2015

**DATE COMPLETED** 06/05/2015

**CLIENT ENGINEER** ESBi  
ESBi

**GROUND LEVEL (m)** 366.83

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.		0.20	366.63					16	
	Obstruction - Possible rock End of Trial Pit at 0.70m		0.70	366.13		AA34759	B	0.60-0.60		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPT037A</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBi		<b>DATE STARTED</b> 06/05/2015	
<b>CO-ORDINATES</b> 506,990.03 E 572,359.03 N		<b>DATE COMPLETED</b> 06/05/2015	
<b>GROUND LEVEL (m)</b> 393.62		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
1.0	Soft grey sandy gravelly SILT with rootlets to 1.40m. Sand is coarse. Gravel is subangular.		1.00	392.62		AA34752	B	0.50-0.50	16 4[R]	
2.0	Obstruction - Possible rock End of Trial Pit at 2.20m		2.20	391.42						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** TPT038A

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,766.02 E  
572,315.01 N

**DATE STARTED** 06/05/2015

**DATE COMPLETED** 06/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 331.51

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Silty angular COBBLES and BOULDERS		0.30	331.21						
	Obstruction End of Trial Pit at 0.50m		0.50	331.01						
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPR001</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,023.99 E 572,153.99 N		<b>DATE STARTED</b> 01/05/2015
<b>GROUND LEVEL (m)</b> 396.00		<b>DATE COMPLETED</b> 01/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)								40 10[R]	
1.0	Soft grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.90	395.10		AA25424 AA25424T	B D	1.00-1.00 1.00-1.00	22 6[R]	18 2[R]
2.0	(Medium dense) Brown coarse GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		2.10	393.90		AA25425 AA25425T	B D	2.00-2.00 2.00-2.00		
	Obstruction - Possible rock End of Trial Pit at 2.40m		2.40	393.60						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** **TPR002**  
**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,157.97 E  
572,113.98 N

**DATE STARTED** 01/05/2015  
**DATE COMPLETED** 01/05/2015

**CLIENT ENGINEER** ESBI  
 ESBI

**GROUND LEVEL (m)** 390.71

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown/black fibrous PEAT (H4-H7)									
0.40						AA25422	B	0.40-0.40	18 0[R]	
0.40						AA25422T	D	0.40-0.40		
1.0	Soft grey very gravelly sandy SILT with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		0.90	389.81		AA25423	B	0.80-0.80		
1.0						AA25423T	D	0.80-0.80		
1.70	(Medium dense) Grey/brown coarse GRAVEL with cobbles and boulders. Cobbles and boulders are subangular to subrounded.		1.70	389.01						
1.90	Obstruction - Possible rock End of Trial Pit at 1.90m		1.90	388.81						

**Groundwater Conditions**  
Water ingress at 1.90m

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** **TPR003**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,826.98 E  
571,698.99 N

**DATE STARTED** 08/04/2015

**DATE COMPLETED** 08/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 345.98

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/grey slightly sandy gravelly CLAY with occasional cobbles, boulders and rootlets. Sand is coarse. Gravel is subangular. Cobbles and boulders are subrounded.									
0.70	Soft blue/grey slightly sandy gravelly SILT. Sand is coarse. Gravel is subangular.		0.70	345.28		AA25426 AA25426T	B D	0.60-0.60 0.60-0.60		
2.00	Firm to stiff blue/grey slightly sandy gravelly SILT. Sand is coarse. Gravel is subangular.		2.00	343.98		AA25427 AA25427T	B D	1.80-1.80 1.80-1.80		
2.40	Obstruction - possible boulders/bedrock End of Trial Pit at 2.40m		2.40	343.58						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPR004</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,775.01 E 571,609.99 N		<b>DATE STARTED</b> 08/04/2015
<b>GROUND LEVEL (m)</b> 342.69		<b>DATE COMPLETED</b> 08/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
0.60	Soft to firm blue/grey sandy gravelly SILT with occasional cobbles, boulders and rootlets. Sand is fine to coarse. Gravel is angular to subangular. Cobbles and boulders are subrounded.		0.60-0.60	342.09		AA25428 AA25428T	B D	0.60-0.60 0.60-0.60	12 0[R]	
2.00			2.00-2.00			AA25429 AA25429T	B D	2.00-2.00 2.00-2.00		
2.50	Obstruction - possible boulders/bedrock End of Trial Pit at 2.50m		2.50	340.19						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPR005</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,672.03 E 571,419.98 N		<b>DATE STARTED</b> 31/03/2015
<b>GROUND LEVEL (m)</b> 331.69		<b>DATE COMPLETED</b> 31/03/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with rootlets (H4-H7)									
	Soft brown sandy gravelly CLAY with rootlets		0.20	331.49					10	
	Firm grey brown sandy very gravelly SILT with medium cobble and boulder content. Gravel is subangular to angular		0.70	330.99		AA21657 AA21657T	B D	0.50-0.50 0.50-0.50		
1.60	Obstruction -possible bedrock End of Trial Pit at 1.60m		1.60	330.09		AA21658 AA21658T	B D	1.50-1.50 1.50-1.50		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPR006</b>	
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 506,571.06 E 571,409.91 N	
<b>GROUND LEVEL (m)</b> 343.07		<b>DATE STARTED</b> 31/03/2015	
		<b>DATE COMPLETED</b> 31/03/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)									
0.60			0.60-0.60			AA21656	B			
0.60			0.60-0.60			AA21656T	D			
1.30	Obstruction -possible bedrock End of Trial Pit at 1.30m		1.30	341.77						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPR007</b>	
<b>LOGGED BY</b> JOC		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 03/07/2015	
<b>CO-ORDINATES</b> 506,358.02 E 571,449.21 N		<b>DATE COMPLETED</b> 03/07/2015	
<b>GROUND LEVEL (m)</b> 369.07		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽▽								
0.90	Light brown silty GRAVEL with a high cobble content. Cobbles are subangular to subrounded.	▽▽▽ ○	0.90	368.17	↓ (Slow)	AA11419	B	0.50-0.50	9 -[R]	
1.20	(Medium dense) Grey slightly gravelly COBBLES and BOULDERS. Cobbles and boulders are subangular to subrounded.	○	1.20	367.87		AA11420	B	1.00-1.00		
1.50	End of Trial Pit at 1.50m		1.50	367.57						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Slow ingress at 0.90m

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm	<b>TRIAL PIT NO.</b> TPR008
	<b>SHEET</b> Sheet 1 of 1
<b>LOGGED BY</b> JOC	<b>CO-ORDINATES</b> 506,238.11 E 571,449.64 N
	<b>DATE STARTED</b> 03/07/2015
	<b>DATE COMPLETED</b> 03/07/2015
<b>CLIENT ENGINEER</b> ESBI	<b>GROUND LEVEL (m)</b> 379.07
	<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H6)									
	Soft brown gravelly SILT with a high cobble content. Cobbles are subangular to subrounded.		0.50	378.57		AA11416	B	0.40-0.40		
1.0	(Loose to medium dense) Grey brown gravelly COBBLES and BOULDERS. Cobbles and boulders are angular to subangular.		1.00	378.07		AA11417	B	1.00-1.00	11	
	End of Trial Pit at 1.40m		1.40	377.67		AA11418	B	1.40-1.40	-[R]	

**Groundwater Conditions**  
Dry

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL.GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm	<b>TRIAL PIT NO.</b> <b>TPS001</b>
<b>LOGGED BY</b> C.Killaly	<b>SHEET</b> Sheet 1 of 1
<b>CLIENT ENGINEER</b> ESBI	<b>DATE STARTED</b> 25/03/2015
	<b>DATE COMPLETED</b> 25/03/2015
<b>GROUND LEVEL (m)</b>	<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black brown fibrous PEAT (H5-H7)	▽▽▽▽			↓ (Slow)					
0.60	Soft grey brown sandy very gravelly CLAY with low medium cobble and boulder content. Gravel is angular	▽▽▽▽ ○●○●	0.50-0.50			AA16651 AA16651T	B D	0.50-0.50 0.50-0.50		
1.0	Soft grey blue sandy very gravelly SILT with medium cobble content. Gravel is angular	▽▽▽▽ ○●○● ××××	1.00-1.00			AA16652 AA16652T	B D	1.00-1.00 1.00-1.00	10	0[R]
1.60	Soft grey blue sandy very gravelly SILT with medium cobble content. Gravel is angular	▽▽▽▽ ○●○● ××××	2.00-2.00			AA16653 AA16653T	B D	2.00-2.00 2.00-2.00		
3.0	End of Trial Pit at 3.00m	▽▽▽▽ ○●○● ××××	3.00			AA16654 AA16654T	B D	3.00-3.00 3.00-3.00		

**Groundwater Conditions**  
Groundwater observed between GL and 0.6mbgl

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Barnastooka Windfarm		<b>TRIAL PIT NO.</b> <b>TPS002</b>
<b>LOGGED BY</b> C.Killaly		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,528.95 E 569,905.99 N		<b>DATE STARTED</b> 25/03/2015
<b>GROUND LEVEL (m)</b> 335.10		<b>DATE COMPLETED</b> 25/03/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft/soft black brown fibrous PEAT (H4-H7)				↓ (Slow)					
1.0									120[R]	
1.20	Soft grey blue sandy very gravelly SILT with medium cobble content. Gravel is angular		1.20	333.90		AA16655 AA16655T	B D	1.00-1.00 1.00-1.00	60[R]	
2.0						AA16656 AA16656T	B D	2.00-2.00 2.00-2.00		
2.50	End of Trial Pit at 2.50m		2.50	332.60						

**Groundwater Conditions**  
Groundwater observed between GL and 1.2mbgl

**Stability**  
Trial Pit unstable from Ground Level

**General Remarks**  
trial Pit terminated due to excavator stability

IGSL TP LOG 18312 FINAL TP LOC.GPJ IGSL\_GDT 15/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Barnastooka Windfarm

**TRIAL PIT NO.** **TPS003**  
**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 15/04/2015  
**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
 ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)				↓ (Seepage)					
						AA27939	B	0.50-0.50	24	
						AA27939T	D	0.50-0.50	4[R]	
0.70	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.70m									
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
 Water seepage from G.L

**Stability**  
 No instability Observed

**General Remarks**

**Appendix 3**

**APEX Geophysical Report**

**AGL14327\_02**

**REPORT ON THE  
GEOPHYSICAL SURVEY  
AT  
BARNASTOOKA WIND FARM  
FOR  
IGSL/ESBI**



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**15TH JULY 2015**

## **PRIVATE AND CONFIDENTIAL**

*THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOSERVICES LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.*

<b>PROJECT NUMBER</b>	AGL14327		
<b>AUTHOR</b>	<b>CHECKED</b>	<b>REPORT STATUS</b>	<b>DATE</b>
EURGEOL SHANE O'ROURKE P.GEO., M.Sc (GEOPHYSICS)	TONY LOMBARD, M.Sc. (GEOPHYSICS)	V.02	15 <sup>TH</sup> JULY 2015

## CONTENTS

<b>1.</b>	<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>2.</b>	<b>INTRODUCTION .....</b>	<b>3</b>
2.1	Survey Objectives .....	3
2.2	Site Background .....	3
2.2.1	Geology .....	4
2.2.2	Soils .....	5
2.2.3	Aquifer .....	6
2.2.4	Vulnerability .....	7
2.2.5	Direct Investigation Data .....	8
2.3	Survey Rationale .....	9
<b>3.</b>	<b>RESULTS .....</b>	<b>10</b>
3.1	ERT .....	10
3.2	Seismic Refraction Profiling.....	10
3.3	MASW .....	11
3.4	Soil Resistivity Testing .....	12
<b>4.</b>	<b>REFERENCES .....</b>	<b>13</b>
<b>5.</b>	<b>APPENDIX A: DRAWINGS &amp; TURBINE SUMMARIES .....</b>	<b>14</b>
<b>6.</b>	<b>APPENDIX B: SEISMIC PLATES.....</b>	<b>17</b>
<b>7.</b>	<b>APPENDIX C: DETAILED METHODOLOGY.....</b>	<b>31</b>
7.1	Electrical Resistivity Tomography (ERT) .....	31
7.1.1	Principles .....	31
7.1.2	Data Collection .....	31
7.1.3	Data Processing.....	31
7.2	Seismic refraction profiling .....	32
7.2.1	Principles .....	32
7.2.2	Data Collection .....	32
7.2.3	Data Processing.....	33
7.3	Multichannel Analysis of Surface Waves (MASW) .....	33
7.3.1	Principles .....	33
7.3.2	Data Collection .....	34
7.3.3	Data Processing.....	34
7.3.4	Relocation .....	35
7.4	Soil Resistivity.....	35
7.4.1	Principles .....	35
7.4.2	Data Collection .....	35
7.4.3	Data Processing.....	35
7.4.4	Relocation .....	36



## 1. EXECUTIVE SUMMARY

APEX Geoservices Limited was requested by IGSL & ESBI to carry out a geophysical investigation as part of the ground investigation prior to the development of the Barnastooka Wind Farm, 15km east of Kenmare.

Barnastooka Wind Farm involves the design and construction of fourteen wind turbines (T25-T38) and associated infrastructure on the site.

The geophysical investigation consisted of Electrical Resistivity Tomography, Seismic Refraction, and MASW at the turbine bases to provide geotechnical parameters on the sub-peat soils and bedrock.

Peat probing has been carried out upon each of the ERT Profiles and this shows a thin covering of peat which has been plotted on each of the sections.

The centre of Turbine T25 has been interpreted as medium dense-very dense clayey gravel from 0.2-3.7m followed by slightly weathered-fresh sandstone/shale.

The centre of Turbine T26 has been interpreted as very dense clayey gravel from 0.5-1.4m followed by slightly weathered-fresh sandstone.

The centre of Turbine T27 has been interpreted as very dense clayey gravel from 0.4-2.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T28 has been interpreted as loose-very dense clayey gravel from 0.4-3.0m followed by slightly weathered-fresh sandstone.

The centre of Turbine T29 has been interpreted as very dense clayey gravel from 0.7-2.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T30 has been interpreted as very dense clayey gravel from 1.7-3.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T31 has been interpreted as loose-very dense clayey gravel from 0.4-3.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T32 has been interpreted as medium dense-very dense clayey gravel from 0.4-4.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T33 has been interpreted as medium dense-very dense clayey gravel from 0.3-3.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T34 has been interpreted as medium dense-very dense clayey gravel from 0.4-3.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T35 has been interpreted as dense-very dense clayey gravel from 0.5-2.7m followed by slightly weathered-fresh sandstone.

---

The centre of Turbine T36 has been interpreted as very dense clayey gravel from 0.3-1.3m followed by slightly weathered-fresh sandstone.

The centre of Turbine T37 has been interpreted as medium dense-very dense clayey gravel from 0.6-3.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T38 has been interpreted as medium dense-very dense clayey gravel from 0.7-2.9m followed by slightly weathered-fresh sandstone.

Sharp lithological contacts and/or faults may result in zones of lower quality bedrock (increased weathering/fracturing) being present that could increase the risk to excavation.

Changes in bedrock lithology with depth may represent a perpendicular change in bedrock properties. These lithological boundaries would pose a possible risk to the excavation of the turbine foundation due to lateral variations in the bedrock quality.

Soil Resistivity measurements have been carried out at T33 and T36.

## 2. INTRODUCTION

APEX Geoservices Limited was requested by IGSL & ESBI to carry out a geophysical investigation as part of the ground investigation prior to the development of the Barnastooka Wind Farm, 15km east of Kenmare.

Barnastooka Wind Farm involves the design and construction of fourteen wind turbines and associated infrastructure on the site. The turbine bases investigated were T25-T38.

The geophysical investigation consisted of Electrical Resistivity Tomography, Seismic Refraction and MASW at the turbine bases to provide geotechnical parameters on the sub-peat soils and bedrock. Soil Resistivity measurements were carried out at bases T33 and T36.

This report details the findings from the turbine bases investigation utilising ERT, seismic refraction and MASW.

### 2.1 Survey Objectives

The objectives of the investigation were to:

- Provide information on the type and thickness of the overburden
- Estimate the overburden stiffness
- Assess the depth to and quality of the bedrock
- Identify the type of bedrock
- Measure the soil resistivity values at two locations

### 2.2 Site Background

The site is located 15km east of Kenmare and 5km north of the Slaheny River Bog, and is also approximately 6km west of the Cork-Kerry border.

The majority of the site is set in a mountainous area with undulating topography ranging from 230 mOD in the north of the site, to 460 mOD in the south of the site. The surrounding land is used both for agriculture and for forestry. Several bogs exist in the area; the Doughill and Slaheny Bogs to the south and the Sillahertane Bog the north-east.

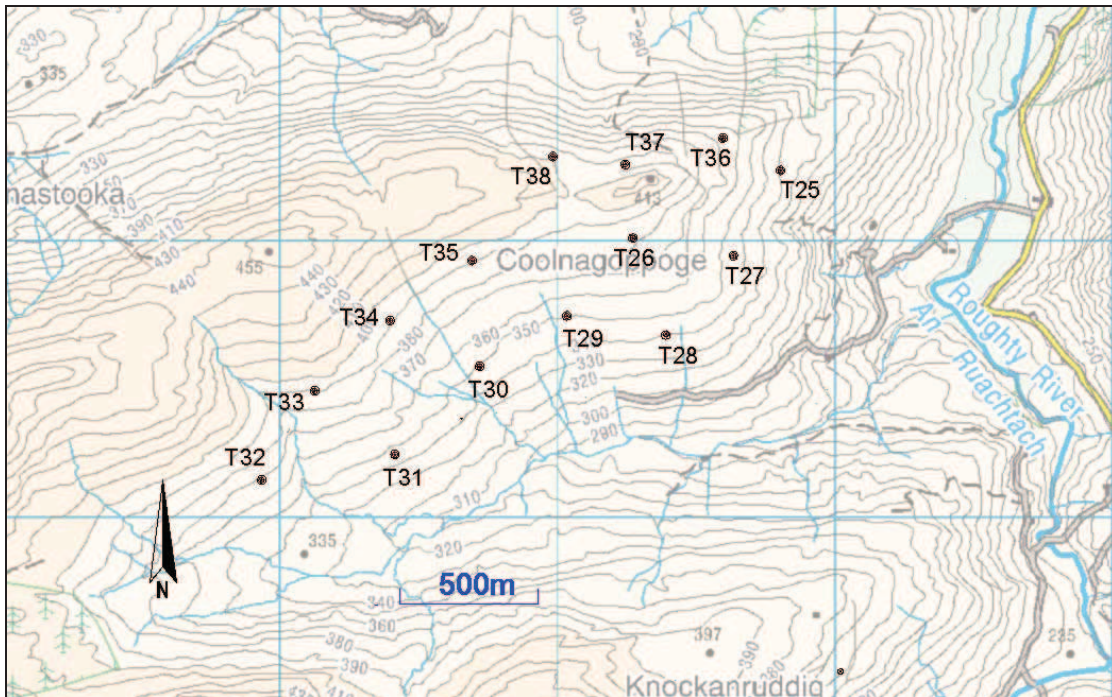


Fig 2.1: Location map.

### 2.2.1 Geology

Bedrock geology for the site comprises the Bird Hill Formation (Fig.2.2) which is made up of purple siltstone and fine sandstone and strikes approximately east-west, and dips steeply to the north. It is offset by several sinistral faults that trend north-south. These faults also offset the Slaheny Sandstone Formation to the north which is made up of cross-bedded sandstones and siltstone.

The turbine bases are located in the Bird Hill Formation, but may encounter the Slaheny Sandstone Formation at depth because this formation dips 40° to the south at the Bird Hill-Slaheny contact. A number of the turbine bases are close to the geological faults which transect the site in a north-south orientation.

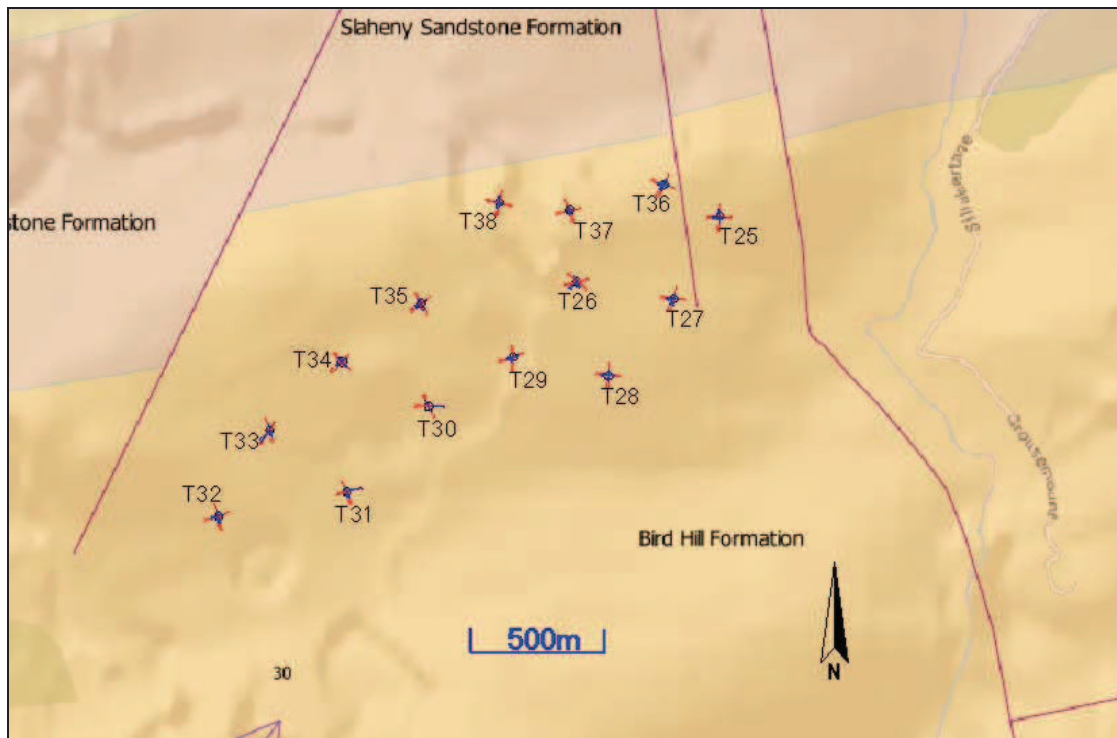


Fig 2.2: The GSI bedrock map showing the geology as the Bird Hill Formation (light brown).

### 2.2.2 Soils

The soil for the predominant part of the site is a layer of blanket peat on rock, with some Devonian sandstone till to the east of the site (Fig.2.3).

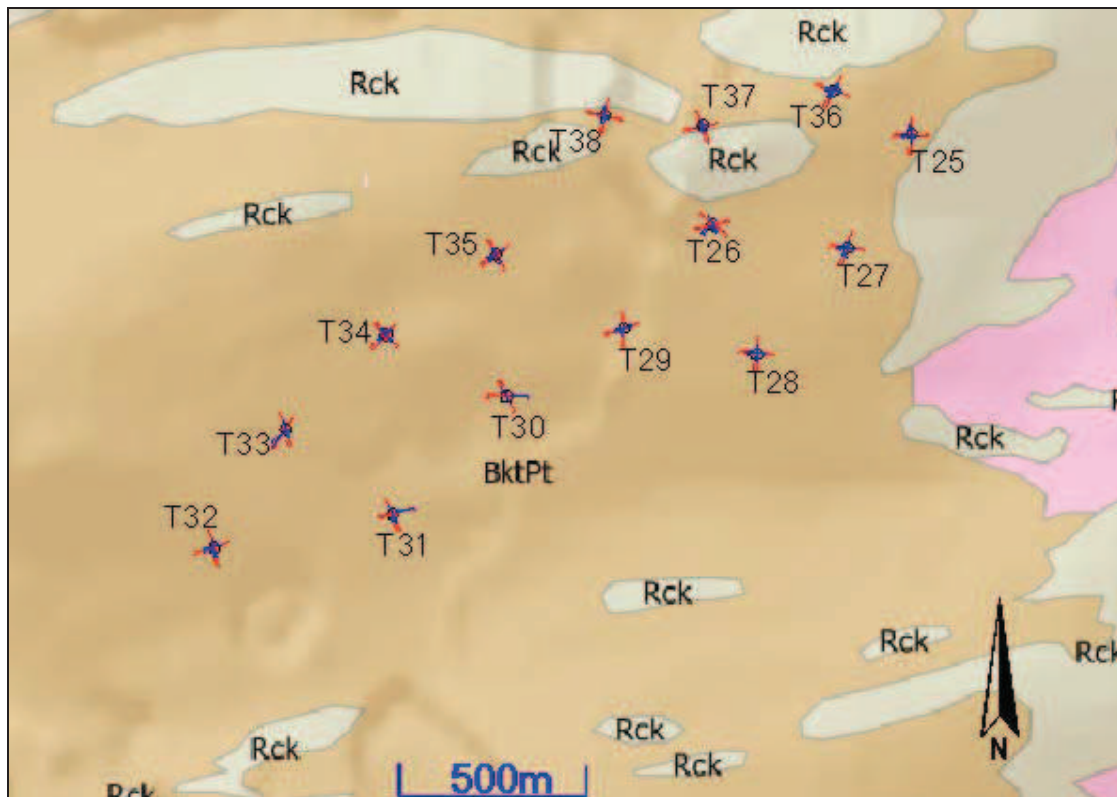


Fig. 2.3: The Teagasc soil map with blanket peat (brown), rock at surface (grey), and Devonian sandstone till (magenta).

### 2.2.3 Aquifer

The site of the Barnastooka Wind Farm is described as a “Poor Aquifer – Bedrock which is Generally Unproductive except in Local Zones” (Fig.2.4).

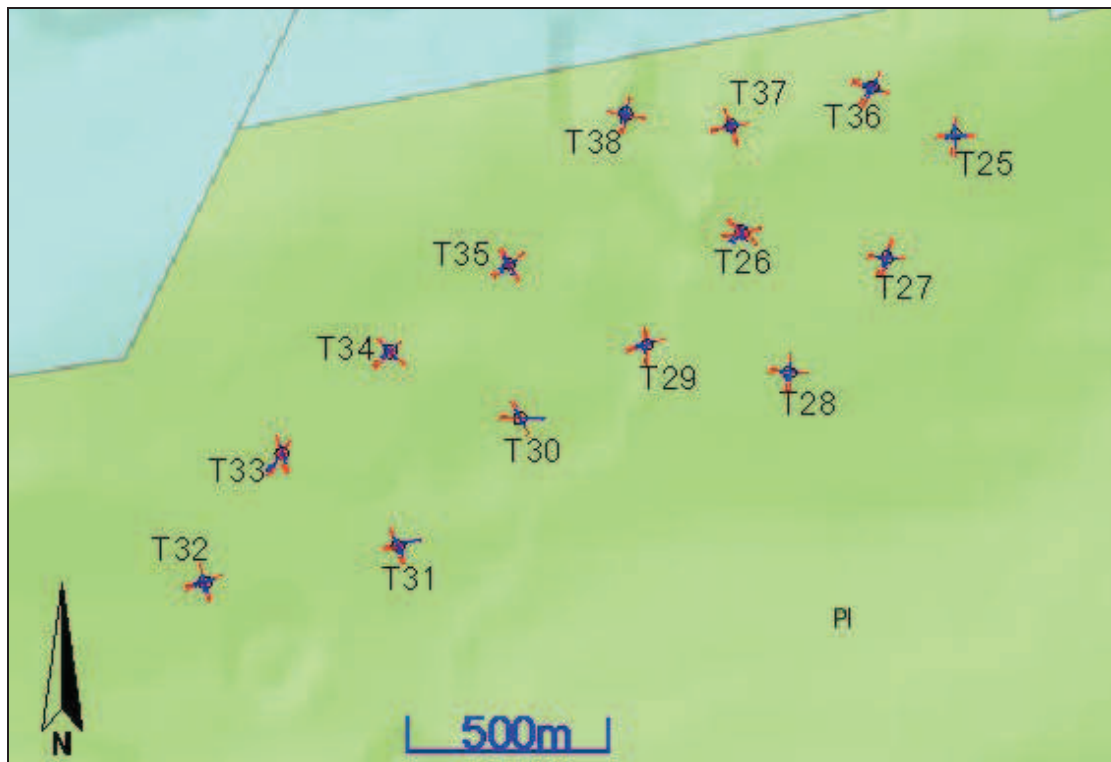


Fig. 2.4: Aquifers map for the site. Green = Poor Aquifer – Bedrock which is Generally Unproductive except in Local Zones. Cyan = Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones.

#### 2.2.4 Vulnerability

The vulnerability for the site is either high or extreme, and also contains sections where there is rock near to the surface (Fig.2.5).

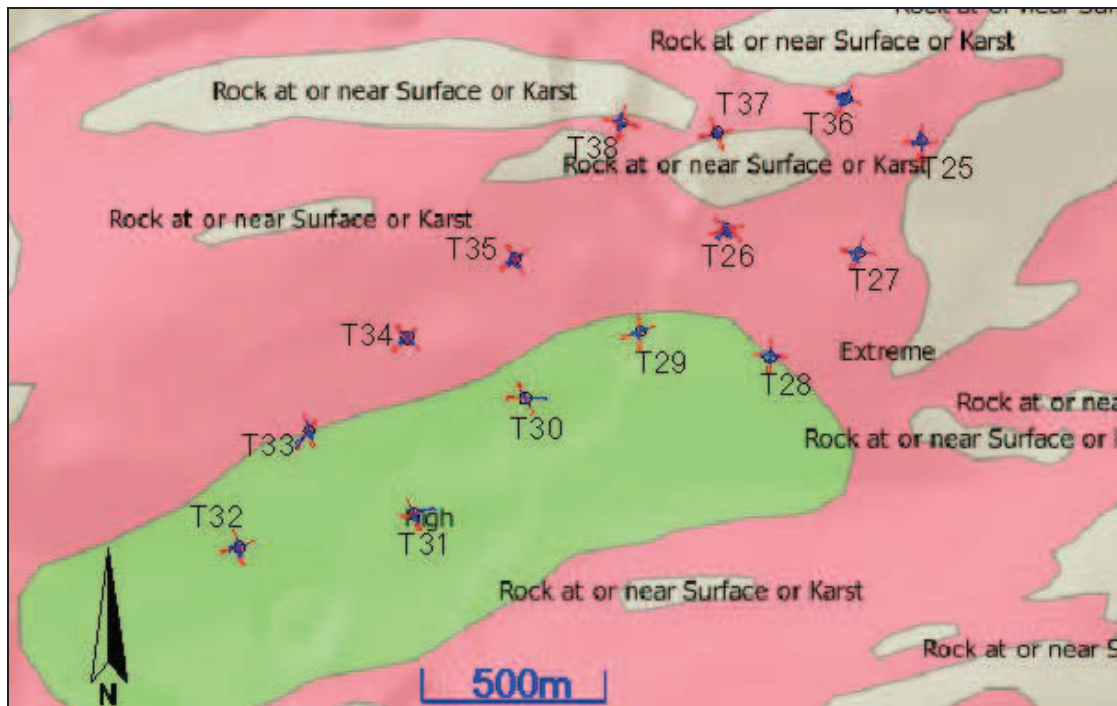


Fig. 2.5: Vulnerability map for the site. Green = High. Red = Extreme. Grey = Rock at or near the surface.

### 2.2.5 Direct Investigation Data

No. 2 rotary core boreholes have been carried out by the client on either side of each base centre, and summary logs for these boreholes have been incorporated into the geophysical sections and consulted during the geophysical interpretation.



### 2.3 Survey Rationale

The following techniques have been employed to achieve the objectives of the survey:

**Electrical Resistivity Tomography (ERT)** soundings will outline variations in overburden/bedrock type and depth to the top of the bedrock along profiles which were 93m in length. ERT profiles will also map any sharp lateral changes in bedrock topography, and changes in bedrock lithology.

**Seismic Refraction Profiling** will confirm the depth to the top of the bedrock based upon an increase in seismic velocity for the more competent rock, compared to less competent overburden. When combined with the resistivity method, it is possible to interpret variations in seismic velocity as variations in overburden / bedrock type.

The **MASW** method is used to estimate shear-wave (S-wave) velocities in the ground material to indicate possible soft zones. Overburden material with an S-wave velocity of <175 m/s is generally classified as soft. The depth of investigation for this method will depend on the source type and geophone spacing.

The **Soil Resistivity Measurements**, using the Wenner Array, as described in IEEE Std 81-1983 (Guide for measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System) is a standard method used for measuring vertical variations in subsurface resistivity. These measurements are used in the design of earthing systems. For ESBI, the "A" spacings are used are 0.3, 0.5, 0.7, 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40, 50, 60, 80 and 100m.

### 3. RESULTS

The findings from the investigation have been presented in ACAD Drawing No's AGL14327\_T25\_01 to AGL14327\_T38\_01 and corresponding A4 report tables.

#### 3.1 ERT

Two orthogonal Electrical Resistivity Tomography (ERT) profiles were acquired at each turbine base. Each of the profiles, 93m in length with a 3m electrode spacing, image to a depth of 15m.

The resistivity values are in the range 100 - 1700 Ohm.m and the results and interpretation are shown in Drawings AGL14327\_T25\_01 to AGL14327\_T38\_01.

The resistivity data has been generally interpreted on the following basis:

Resistivity	Interpretation
100-314	Sandy Gravelly CLAY
314-985	Clayey GRAVEL/GRAVEL
459-1700	SANDSTONE
214-673	SILTSTONE
100-214	SHALE

#### 3.2 Seismic Refraction Profiling

Two P-wave seismic refraction profiles were recorded at each of the turbine bases. These were each 46m in length with a 2m geophone spacing, with the exception of Profile S1 at T29, Profiles S1-S2 at T37 and Profile S1 at T38 which were 23m in length.

The locations are indicated on Drawing No's AGL14327\_T25\_01 to AGL14327\_T38\_01.

The tomographically processed seismic data indicates p-wave velocities in the range 300–4000 m/s for the fourteen turbine bases over a depth range of 0-25m (Appendix B).

### 3.3 MASW

Two 1D MASW profiles were acquired with a 1m geophone spacing, and centered at each proposed turbine location.

Data was recorded to 1 second and 1D end shots for each profile were selected for office based data analysis.

The data describes the estimated stiffness of the overburden layers and velocity of the top of the top of rock.

The data shows S-wave velocities in the range 175-1200 m/s over a depth range of 1.5m – 11m bgl.

The results and interpretation are shown in detail in Appendix A (Turbine Summaries). For T26-T30, T33 & T36-T38 an insufficient surface wave was generated to allow MAWS processing. This is sometimes the case in areas of very shallow bedrock. For these profiles the shear wave velocities were calculated from the seismic refraction results (all of excellent quality) using a Poissons Ratio of 0.46 (a Poissons Ratio of 0.46 was found to be the most applicable based on the results for turbines with a sufficient surface wave).

The following table summarises shear wave velocity, soil cohesion and bedrock type.

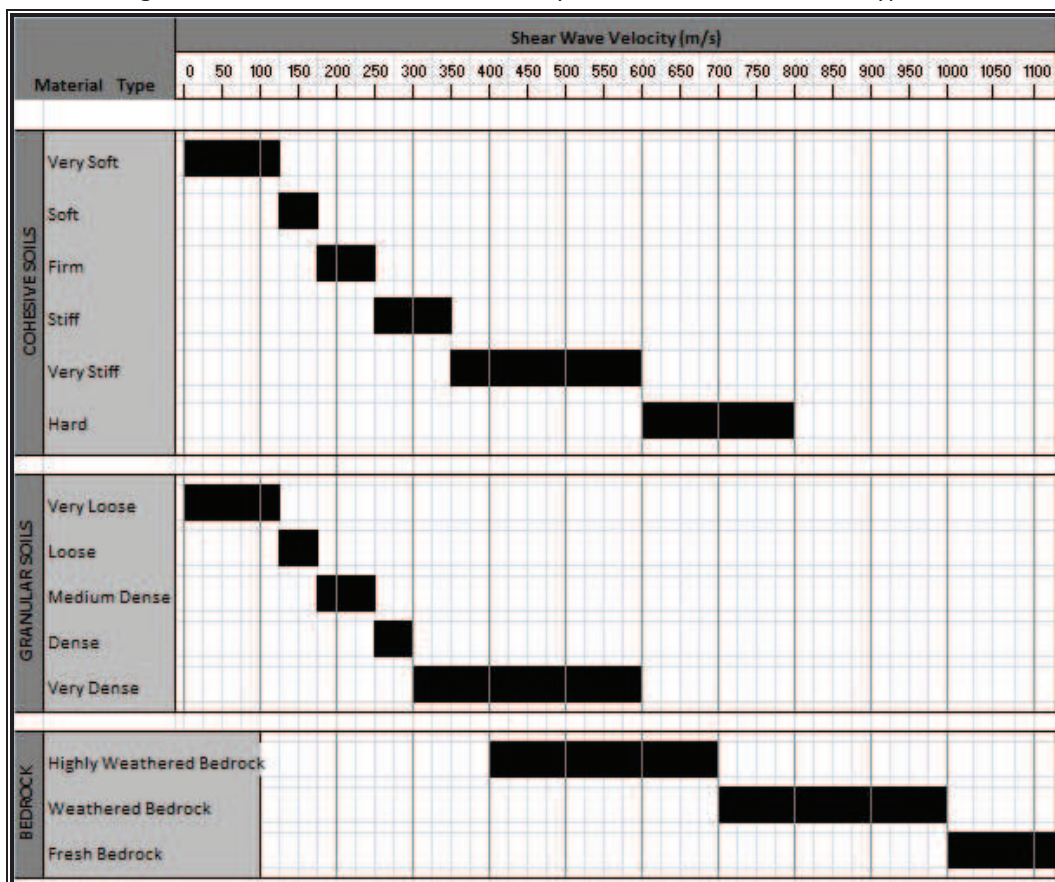


Fig.3.1. Shear-wave velocity and corresponding soil cohesion.

### 3.4 Soil Resistivity Testing

Soil resistivity measurements were taken at T33 & T36 as follows:

T33 "A" Spacing	Resistance (ohms)	Resistivity (Ohm-m)
0.3	94.38	177.81
0.5	99.25	311.65
0.7	97.52	428.70
1	73.6	462.21
2	46.83	588.18
3	34.87	656.95
4	27.27	685.02
5	23.01	722.51
7	17.84	784.25
10	15.2	954.56
15	13.2	1243.44
20	11.65	1463.24
30	9.5	1789.80
40	7.045	1769.70
50	5.95	1868.30
60	5.241	1974.81
80	3.761	1889.53
100	2.945	1849.46

T36 "A" Spacing	Resistance (ohms)	Resistivity (Ohm-m)
0.3	119.6	225.33
0.5	59.64	187.27
0.7	52.5	230.79
1	52.65	330.64
2	47.37	594.97
3	44.95	846.86
4	42.04	1056.04
5	37.81	1187.23
7	32.78	1441.01
10	25.04	1572.51
15	15.48	1458.22
20	9.102	1143.21
30	8.378	1578.42
40	3.912	982.69
50	2.577	809.18
60	2.439	919.02
80		
100	1.904	1195.71

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Park, C.B., Miller, R.D., and Xia, J., 1999;  
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IEEE., 1983; 'Std 81-1983, Guide for measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System', Institute of Electrical and Electronics Engineers.

## 5. APPENDIX A: DRAWINGS & TURBINE SUMMARIES

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

### T25

AGL14327_T25_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T25_02	Geophysical Investigation Summary T25	A4 Spreadsheet
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### T26

AGL14327_T26_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T26_02	Geophysical Investigation Summary T26	A4 Spreadsheet
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### T27

AGL14327_T27_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T27_02	Geophysical Investigation Summary T27	A4 Spreadsheet
-----------------	---------------------------------------	----------------

### T28

AGL14327_T28_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T28_02	Geophysical Investigation Summary T28	A4 Spreadsheet
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### T29

AGL14327_T29_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T29_02	Geophysical Investigation Summary T29	A4 Spreadsheet
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**T30**

AGL14327_T30_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T30_02	Geophysical Investigation Summary T30	A4 Spreadsheet
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**T31**

AGL14327_T31_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T31_02	Geophysical Investigation Summary T31	A4 Spreadsheet
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**T32**

AGL14327_T32_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T32_02	Geophysical Investigation Summary T32	A4 Spreadsheet
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**T33**

AGL14327_T33_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T33_02	Geophysical Investigation Summary T33	A4 Spreadsheet
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**T34**

AGL14327_T34_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T34_02	Geophysical Investigation Summary T34	A4 Spreadsheet
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**T35**

AGL14327_T35_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T35_02	Geophysical Investigation Summary T35	A4 Spreadsheet
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**T36**

AGL14327_T36_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3
AGL14327_T36_02	Geophysical Investigation Summary T35	A4 Spreadsheet

**T37**

AGL14327_T37_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3
AGL14327_T37_02	Geophysical Investigation Summary T37	A4 Spreadsheet

**T38**

AGL14327_T38_01	Fig.1 Barnastooka Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3
AGL14327_T38_02	Geophysical Investigation Summary T38	A4 Spreadsheet



FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

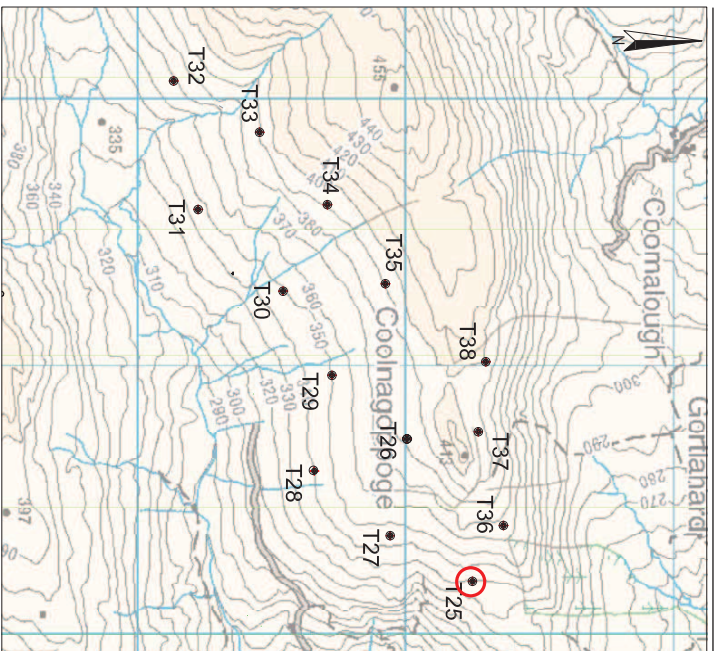


FIGURE 2: TURBINE MAP: Scale 1:1250@A3

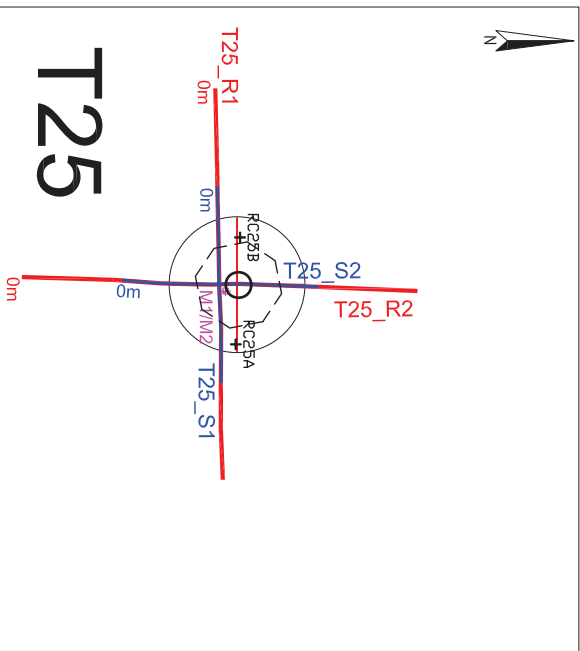
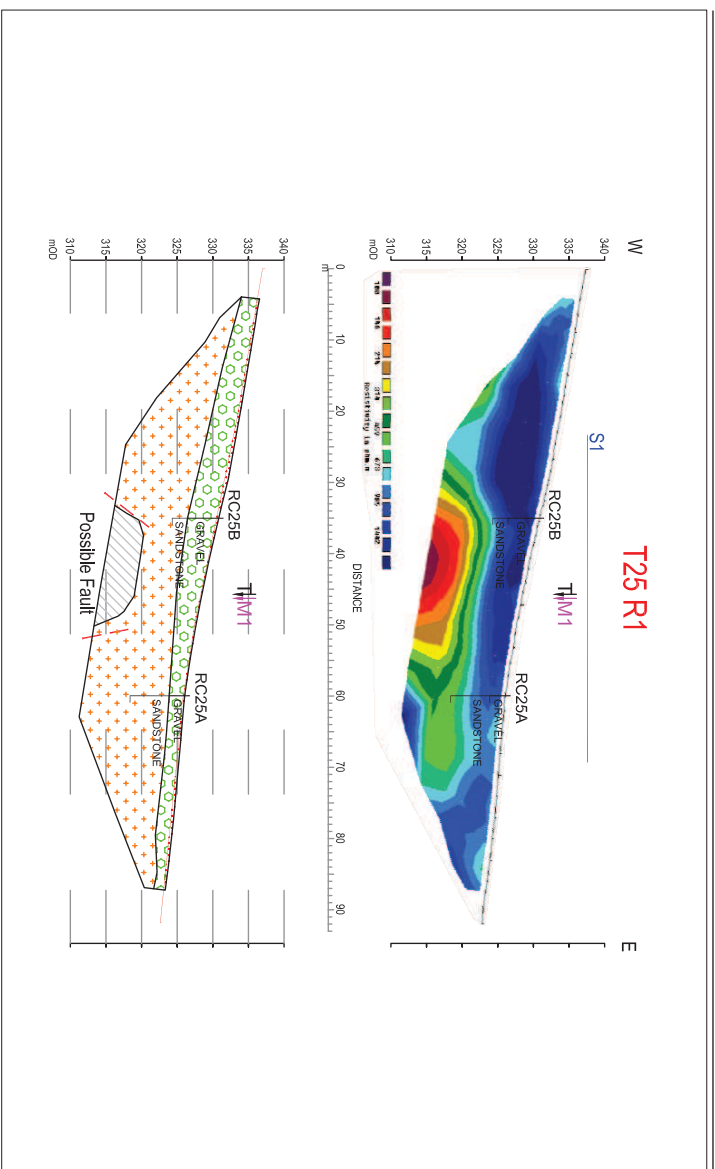
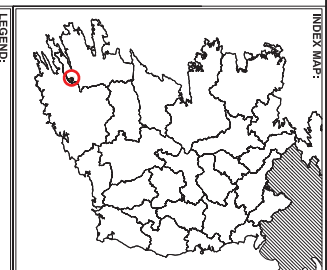
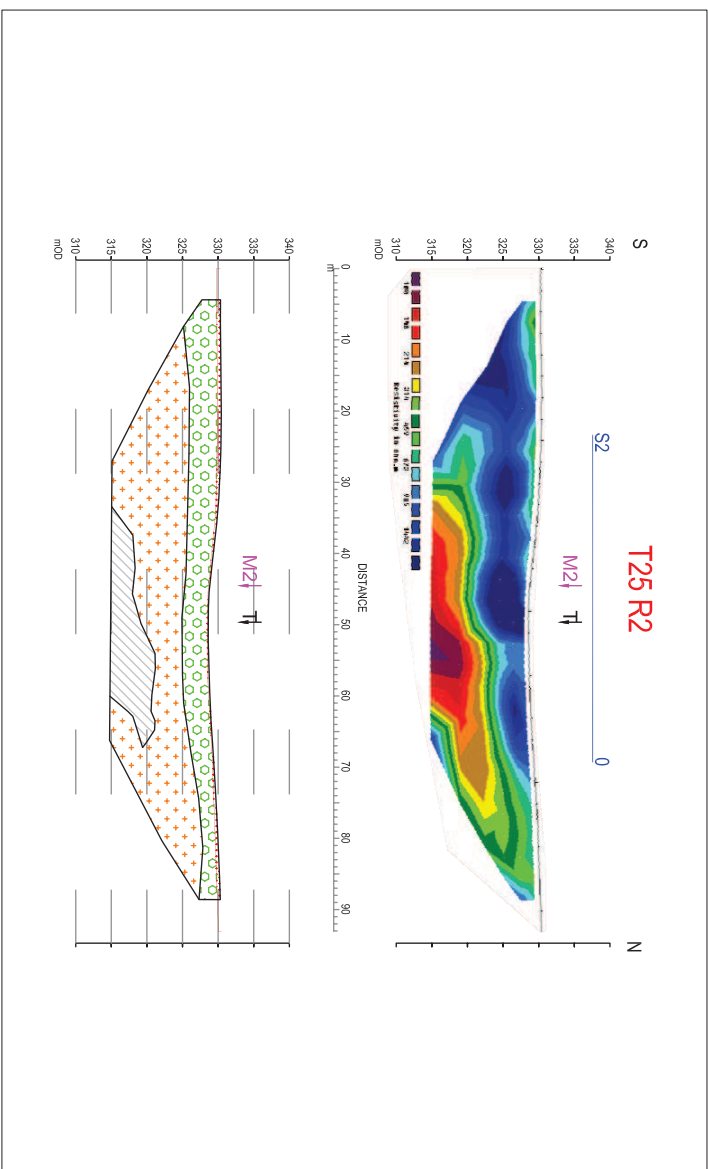


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 25

FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 1D MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Slightly Weathered/Fresh SANDSTONE
- Slightly Weathered/Fresh SILTSTONE
- Slightly Weathered/Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- RC38A Borehole



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 E [info@apexgeoservices.co.uk](mailto:info@apexgeoservices.co.uk)  
[www.apexgeoservices.co.uk](http://www.apexgeoservices.co.uk)

PROJECT:		BARNASTOOKA WIND FARM	
DRAWING NO.:		AGL14827_T25_01 TURBINE 25	
DATE:		21 MAY 2015	
CLIENT:		ISSUES/REVISIONS	
SCALE:	AS INDICATED @ A3	DATE:	21 MAY 2015
VERSION:	DATE	BY	REVISION
1	21.05.15	SOR	TL
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	T25

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507777
Northing	572314
Elevation (mOD)	328.4

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.2	314	-	-	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.2	2.0	1442	163	600	2000	0.46	53.39	0.16	1.86	Clayey GRAVEL	MEDIUM DENSE	Diggable
2.0	2.8	1442	200	1282	2000	0.49	79.77	0.24	3.73	Clayey GRAVEL	MEDIUM DENSE-DENSE	Diggable
2.8	3.7	985	462	1628	2000	0.46	426.90	1.24	57.30	Clayey GRAVEL	VERY DENSE	Diggable
3.7	4.9	985	560	1965	2700	0.46	847.26	2.47	177.46	Slightly Weathered -Fresh SANDSTONE	VERY POOR	Break / Blast
4.9	6.4	673	698	2670	2700	0.46	1316.18	3.85	370.20	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
6.4	8.0	459	852	3618	2700	0.47	1961.77	5.77	721.11	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
8.0	9.8	214	990	4048	2700	0.47	2644.73	7.77	1177.30	Slightly Weathered -Fresh SHALE	EXCELLENT	Heavy Break / Blast

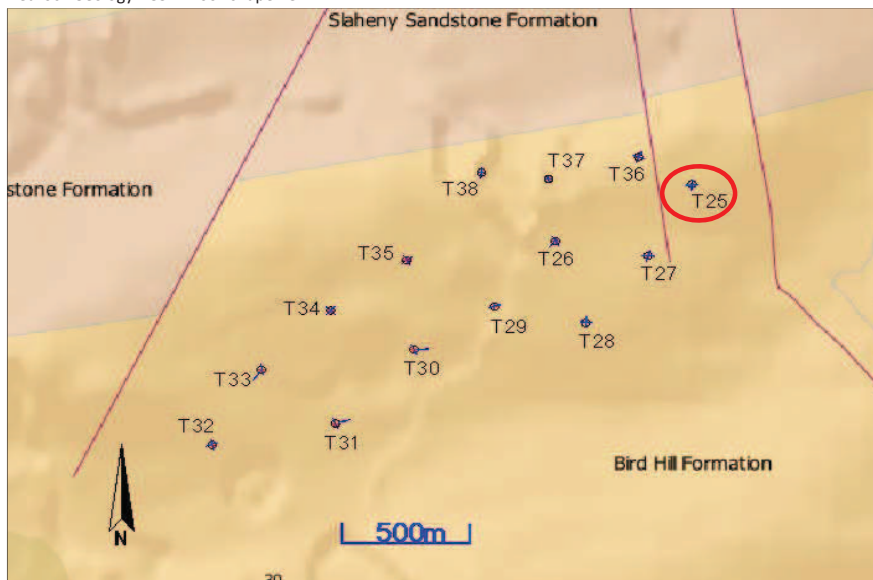
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T25**

Discussion
A possible fault have been marked in the centre of Profile R1, which could be a north-south trending fault which is marked on the geology map.
The base centre is chacterised by medium dense-very dense clayey gravel from 0.2-3.7m bgl followed by slightly weathered-fresh sandstone.

Recommendations

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

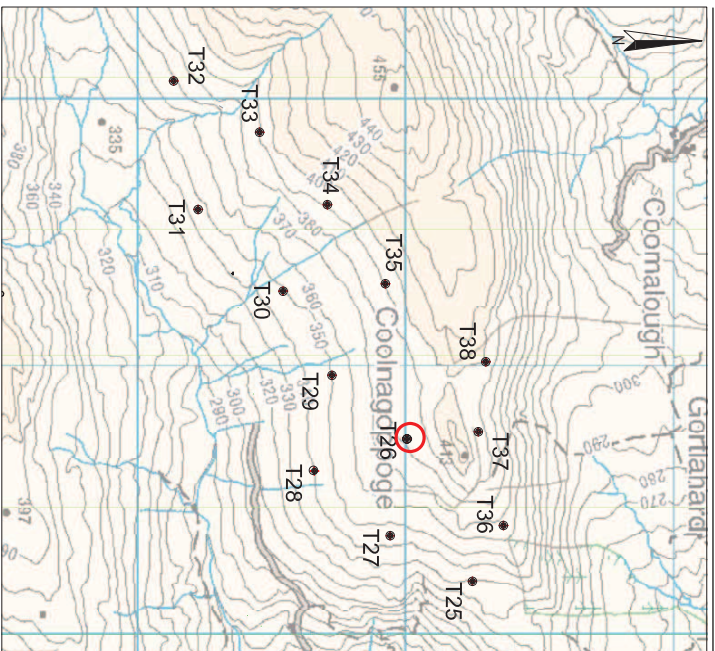
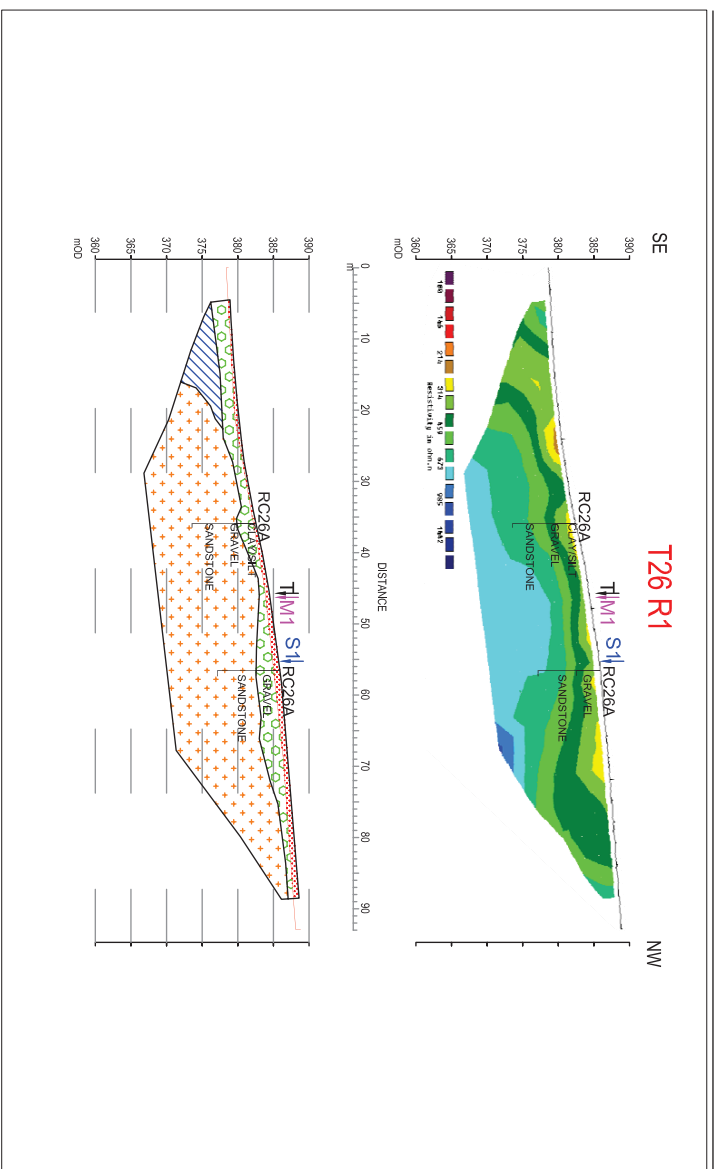


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 26

INDEX MAP:

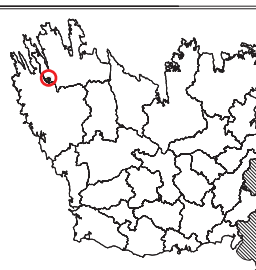


FIGURE 2: TURBINE MAP: Scale 1:1250@A3

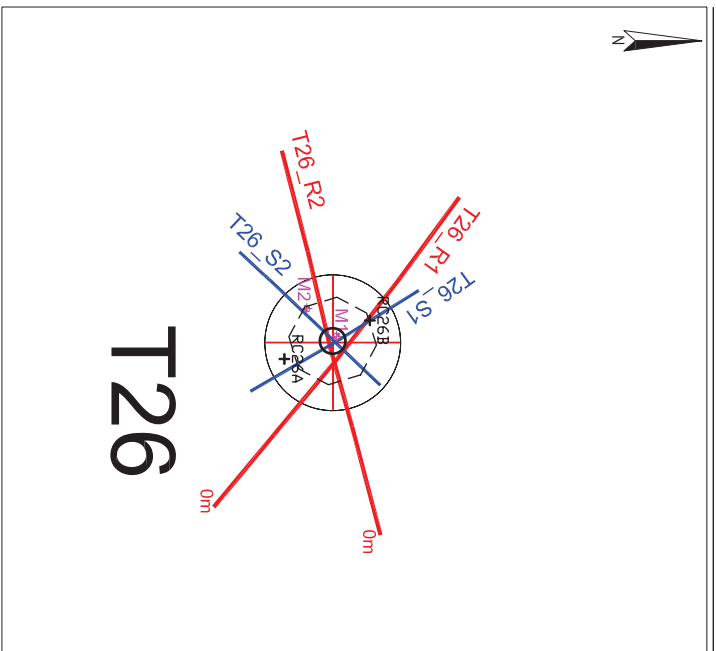
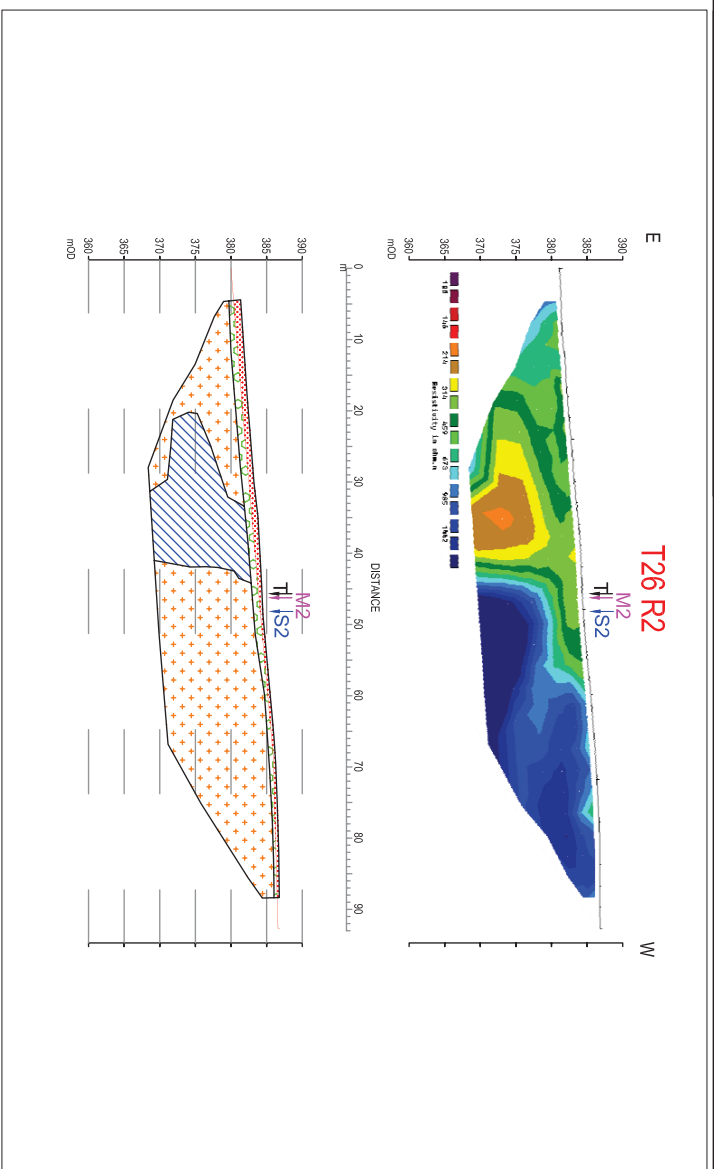


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



		<p>6 Knockmullin Business Park, Regus House, Herald Way                  Galway, Co. Galway                  Ireland                  T +353 (0)021 8182 F +353 (0)021 8184                  E info@apexgeoservices.ie E info@apexgeoservices.co.uk                  www.apexgeoservices.ie www.apexgeoservices.co.uk</p>																			
<p>PROJECT: BARNASTOOKA WIND FARM</p>		<p>DRAWING No.: AGL4827_T26_01_TURBINE 26                  DATE: 21 MAY 2015</p>																			
<p>SCALE: AS INDICATED @ A3</p>		<p>CLIENT: ISSUES/REVISIONS</p>																			
<table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> <tr> <td>1</td> <td>21.05.15</td> <td>SOR</td> </tr> <tr> <td>2</td> <td>10.07.15</td> <td>SOR</td> </tr> </table>	NO.	DATE	DESCRIPTION	1	21.05.15	SOR	2	10.07.15	SOR	<table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> <tr> <td>1</td> <td>21.05.15</td> <td>SOR</td> </tr> <tr> <td>2</td> <td>10.07.15</td> <td>TL</td> </tr> </table>	NO.	DATE	DESCRIPTION	1	21.05.15	SOR	2	10.07.15	TL	<p>ISSUES/REVISIONS</p>	
NO.	DATE	DESCRIPTION																			
1	21.05.15	SOR																			
2	10.07.15	SOR																			
NO.	DATE	DESCRIPTION																			
1	21.05.15	SOR																			
2	10.07.15	TL																			

Site	Barnastooka Wind Farm
Turbine Base	<b>T26</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507244
Northing	572069
Elevation (mOD)	384.4

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.5	314	-	865	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.5	1.4	314	<b>446</b>	1638	2000	0.46	397.46	1.16	51.14	Clayey GRAVEL	VERY DENSE	Diggable
1.4	2.3	459	<b>746</b>	2740	2700	0.46	1501.80	4.39	458.51	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
2.3	3.2	459	<b>832</b>	3056	2700	0.46	1867.80	5.45	657.10	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
3.2	4.1	459	<b>988</b>	3631	2700	0.46	2636.83	7.70	1160.71	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
4.1	5.0	459	<b>1067</b>	3918	2700	0.46	3071.18	8.97	1492.76	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.0	5.9	673	<b>1107</b>	4067	2700	0.46	3308.72	9.66	1688.01	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.9	9.7	985	<b>1143</b>	4200	2700	0.46	3529.63	10.31	1877.98	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

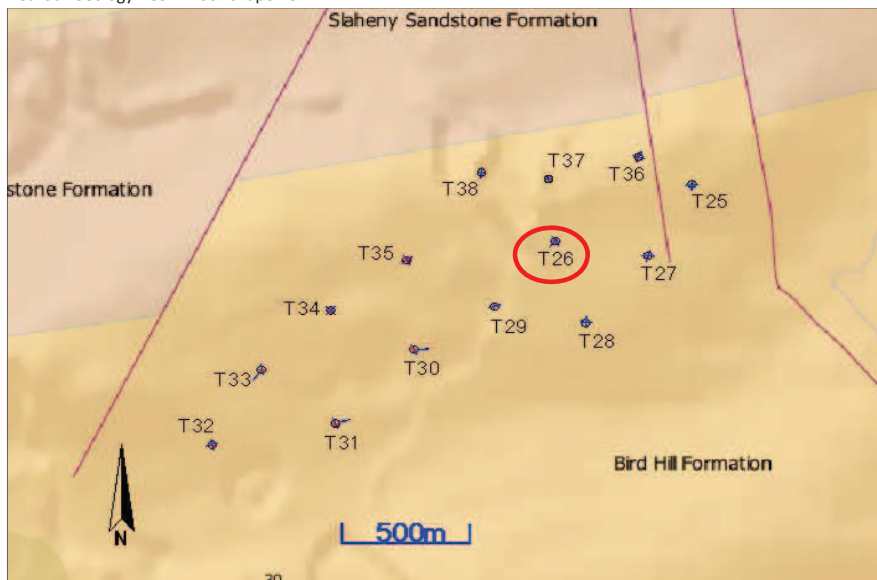
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T26**

Discussion
The base centre is characterised by very dense clayey gravel from 0.5-1.4m bgl followed by slightly weathered-fresh sandstone.

Recommendations

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

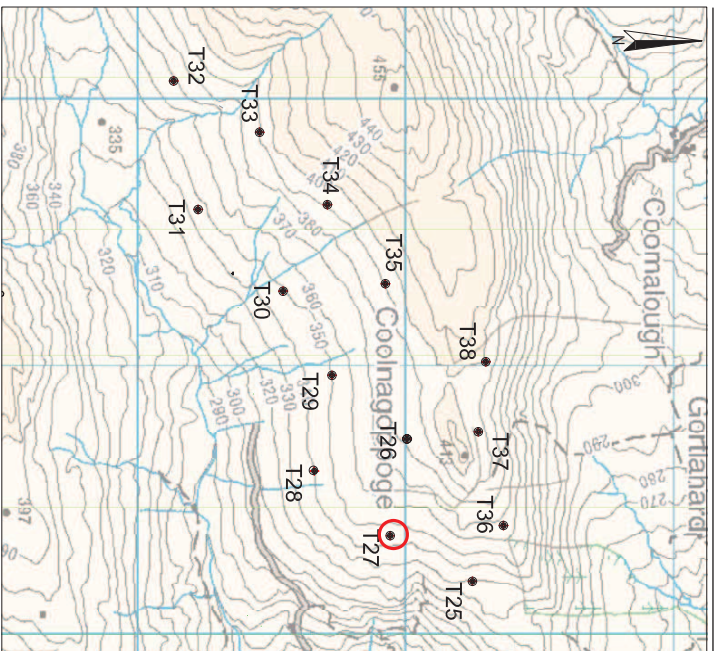
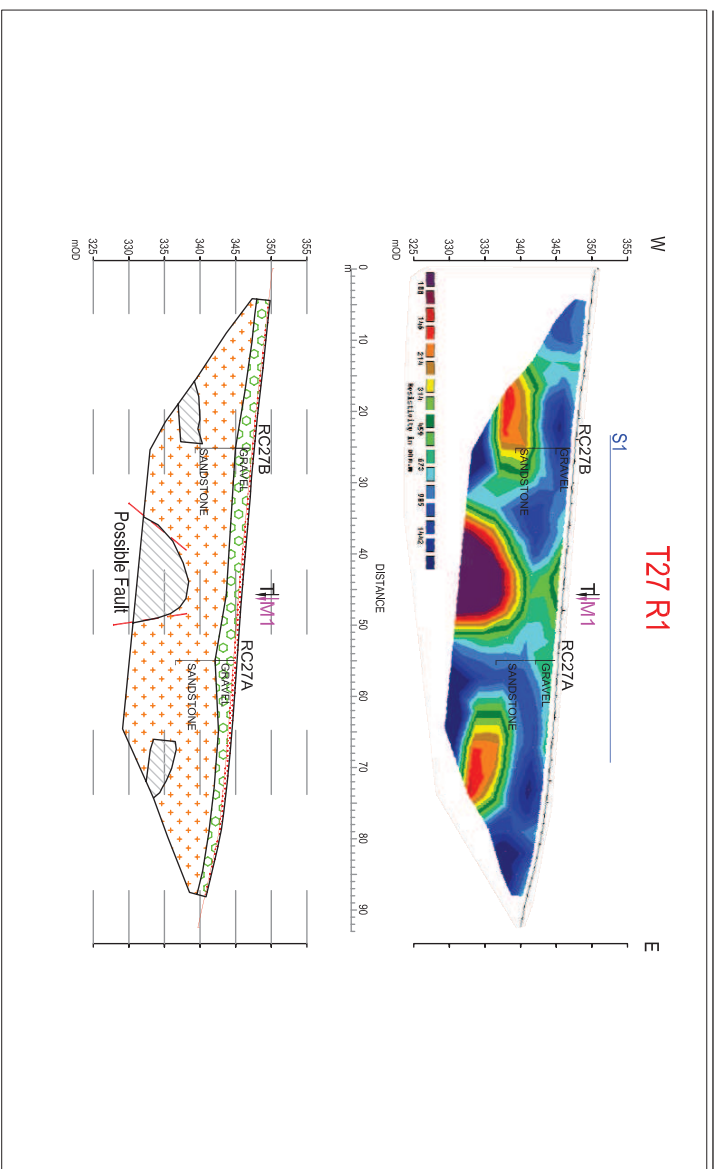
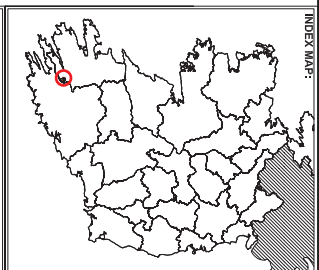


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 27



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 10 MASIV PROFILE
- PEAT
- Sandy Gneiss CLAY
- Clayey GRAVEL/GRAVEL
- Slightly Wetness-Fresh SANDSTONE
- Slightly Wetness-Fresh SILTSTONE
- Slightly Wetness-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 10 MASIV Profile
- RC38A Borehole

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

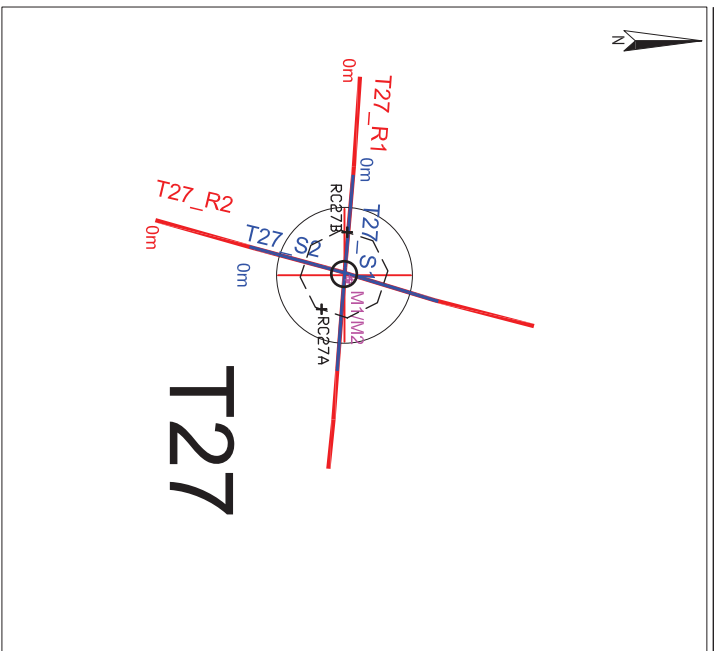
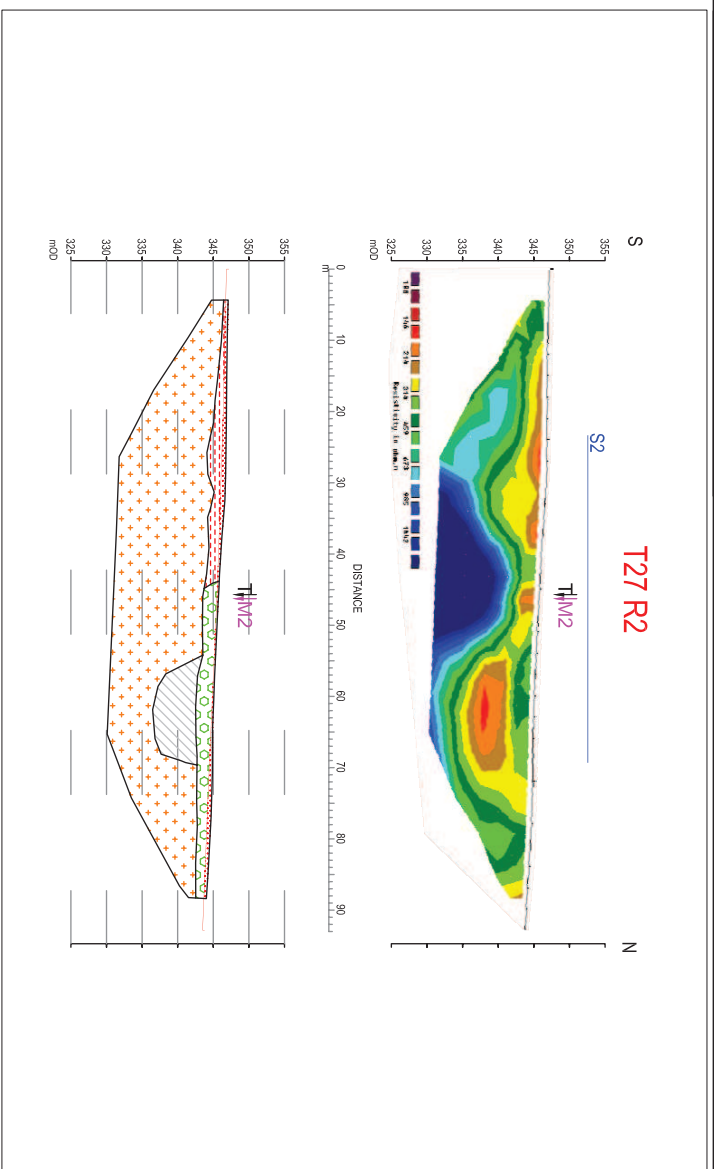


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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PROJECT: BARNASTOOKA WIND FARM

---

DRAWING NO: AGL14827\_T27\_01 TURBINE 27

DATE: 21 MAY 2015

CHECKED: ISSUES BY:

SCALE: AS INDICATED @ A3

NO.	DATE	DESCRIPTION	BY
1	21.05.15	SOR	TL
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T27</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507606
Northing	572006
Elevation (mOD)	345.8

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	314	-	804	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.4	1.3	254	<b>359</b>	1318	2000	0.46	257.38	0.75	24.97	Clayey GRAVEL	VERY DENSE	Diggable
1.3	2.2	254	<b>596</b>	2189	2000	0.46	710.32	2.07	133.30	Clayey GRAVEL	VERY DENSE	Diggable
2.2	3.1	314	<b>777</b>	2856	2700	0.46	1631.45	4.76	525.64	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
3.1	4.0	459	<b>996</b>	3658	2700	0.46	2676.67	7.82	1189.78	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
4.0	4.8	673	<b>1063</b>	3905	2700	0.46	3051.15	8.91	1476.73	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
4.8	5.7	985	<b>1093</b>	4017	2700	0.46	3227.66	9.42	1620.32	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.7	9.4	1442	<b>1143</b>	4199	2700	0.46	3527.87	10.30	1876.43	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

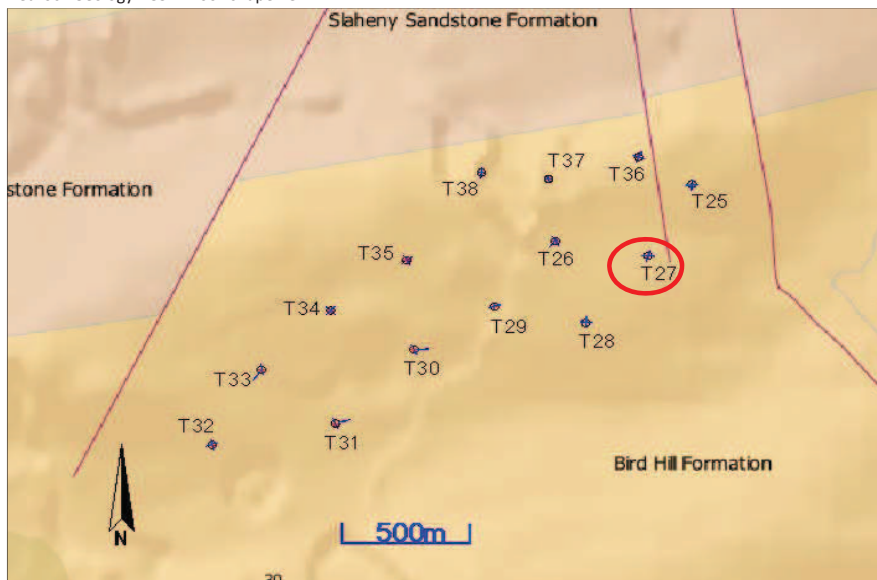
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T27**

Discussion
A possible fault have been marked in the centre of Profile R1, which could be a north-south trending fault which is marked on the geology map.
The base centre is chacterised by very dense clayey gravel from 0.4-2.2m bgl followed by slightly weathered-fresh sandstone.

Recommendations

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

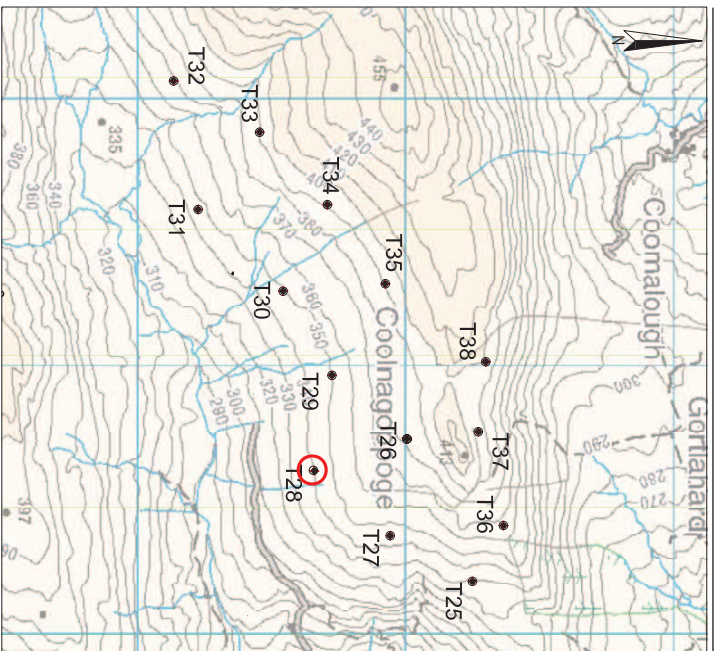


FIGURE 2: TURBINE MAP: Scale 1:1250@A3

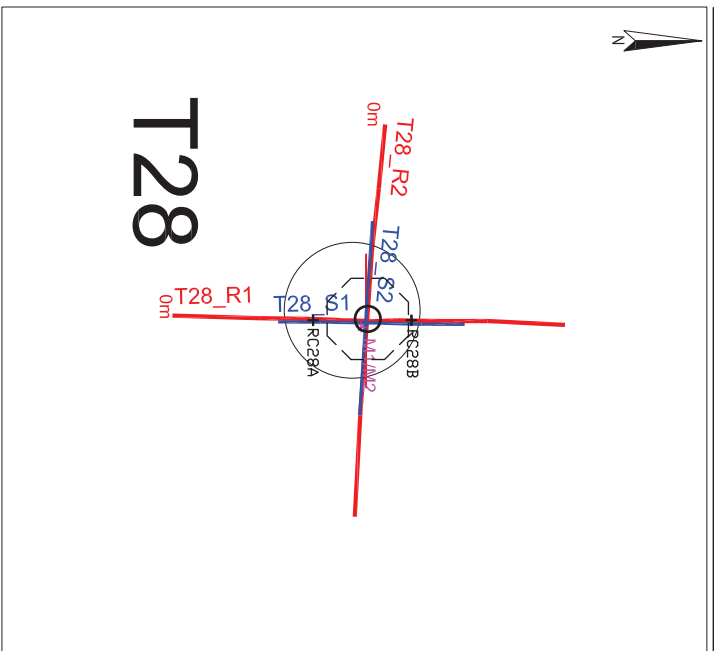
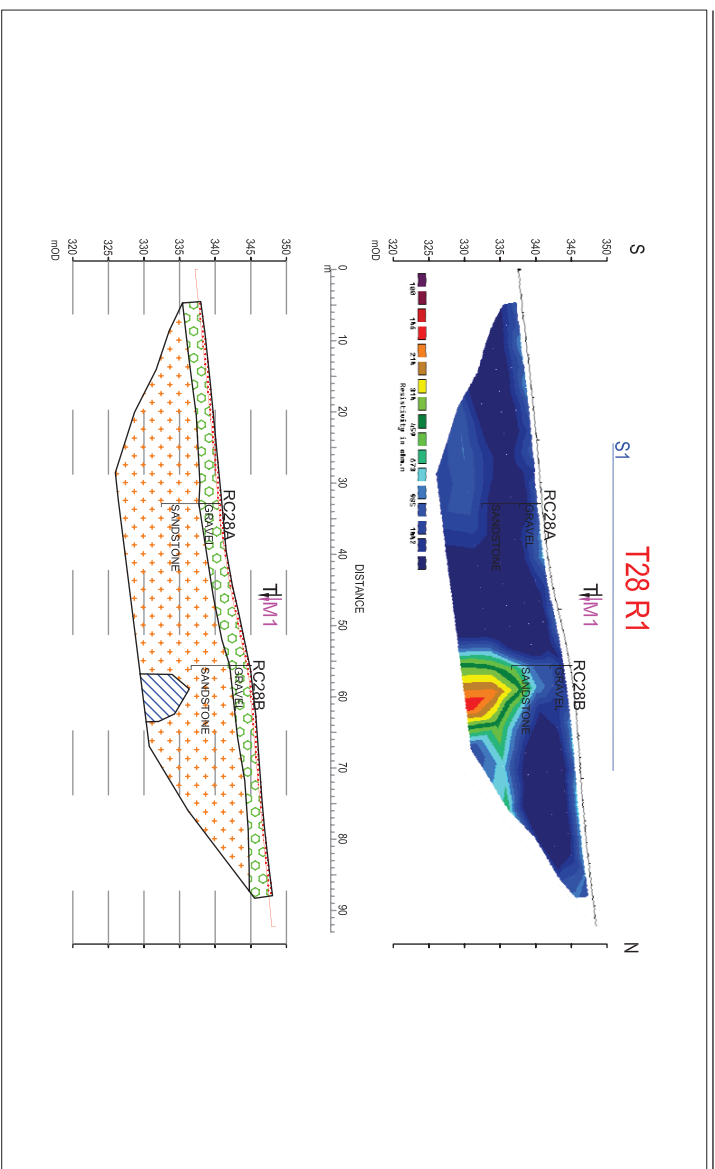
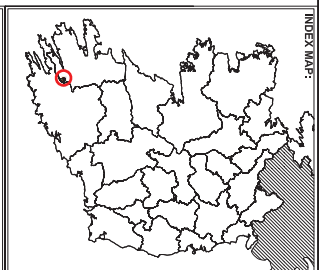
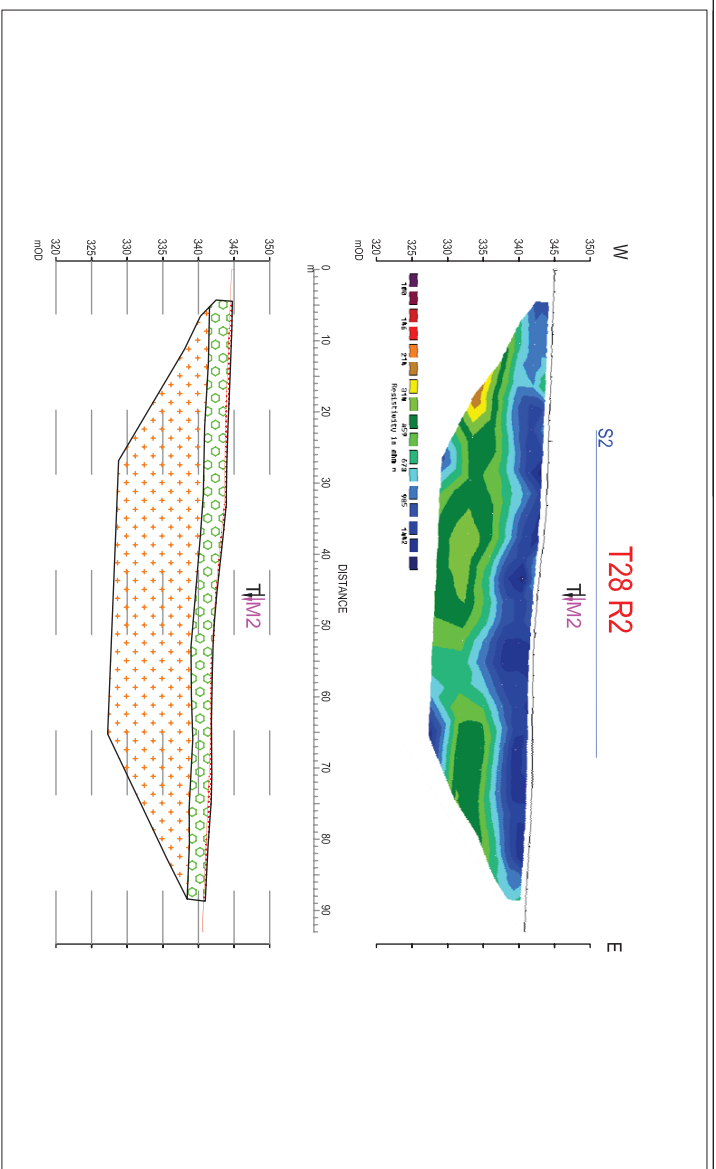


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 28

FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

	SOIL RESISTIVITY LOCATION
	ERT PROFILE
	SEISMIC REFRACTION PROFILE
	10 MASH PROFILE
	PEAT
	SANDY GRENELL CLAY
	CLAYEY GRAVEL/GRAVEL
	Slightly Weathered-Fresh SANDSTONE
	Slightly Weathered-Fresh SILTSTONE
	Slightly Weathered-Fresh SHALE
	Peat Probe Depth
	Possible Fault
	Turbine Centre
	10 MASH Profile
	RC28A Borehole

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 F +353 (0)4024 1843  
 E info@apexgeoservices.co.uk  
 www.apexgeoservices.co.uk

PROJECT: BARNASTOOKA WIND FARM

DRAWING NO: AGL14827\_T28\_01\_TURBINE 28

DATE: 21 MAY 2015

CHECKED: ISSUESB1

SCALE: AS INDICATED @ A3

VERSION:	DATE:	CHANGED BY:
1	21.05.15	SOR
2	10.07.15	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T28</b>

Methodology	
Seismic Refraction	24 ch. @ 1&2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507364
Northing	571722
Elevation (mOD)	342.2

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	314	-	333	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.4	1.4	673	160	587	2000	0.46	51.04	0.15	1.73	Clayey GRAVEL	LOOSE	Diggable
1.4	2.3	985	374	1374	2000	0.46	279.59	0.82	28.62	Clayey GRAVEL	DENSE-VERY DENSE	Diggable
2.3	3.0	1442	621	2281	2000	0.46	771.15	2.25	152.66	Clayey GRAVEL	VERY DENSE	Diggable
3.0	4.1	1442	832	3057	2700	0.46	1870.05	5.46	658.41	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.1	5.0	1442	1058	3886	2700	0.46	3021.52	8.82	1453.14	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.0	7.8	1442	1114	4091	2700	0.46	3348.49	9.78	1721.62	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.8	9.8	1443	1143	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

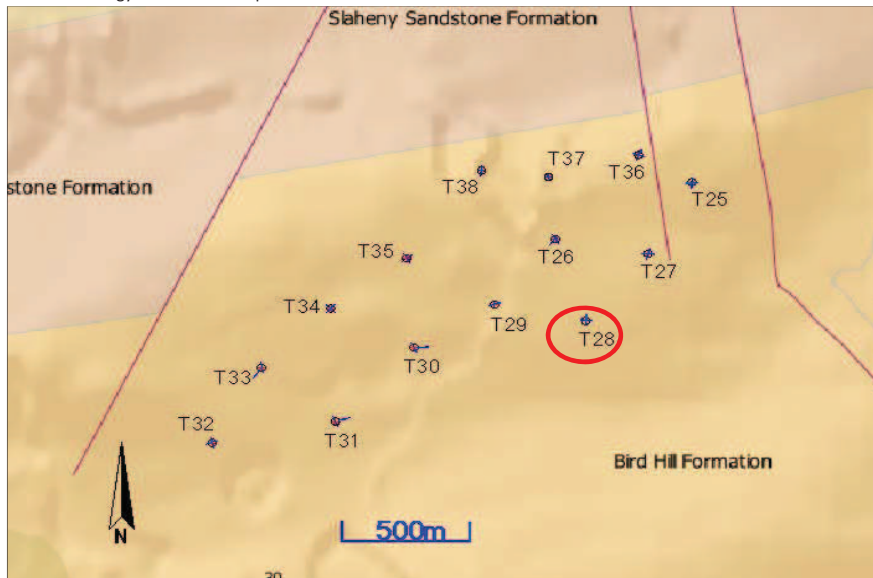
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T28**

Discussion
The base centre is characterised by loose-very dense clayey gravel from 0.4-3.0m bgl followed by slightly weathered-fresh sandstone.

Recommendations



FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

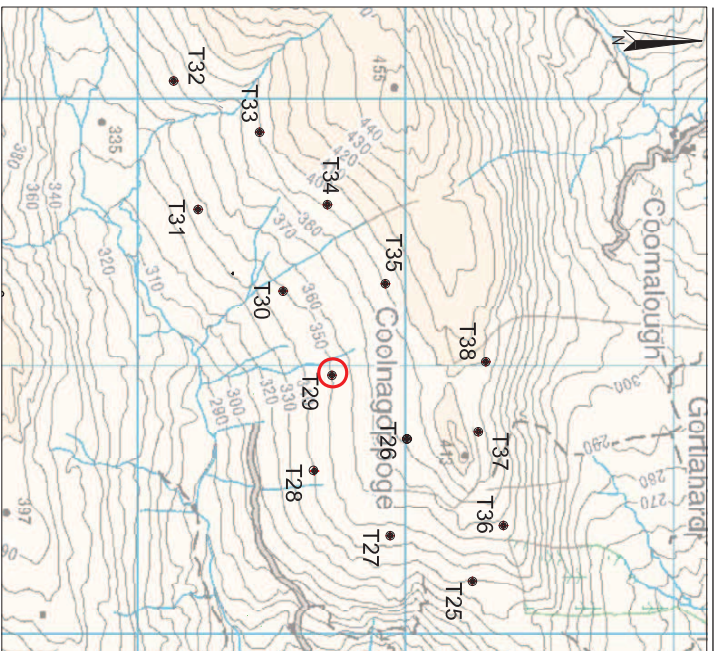
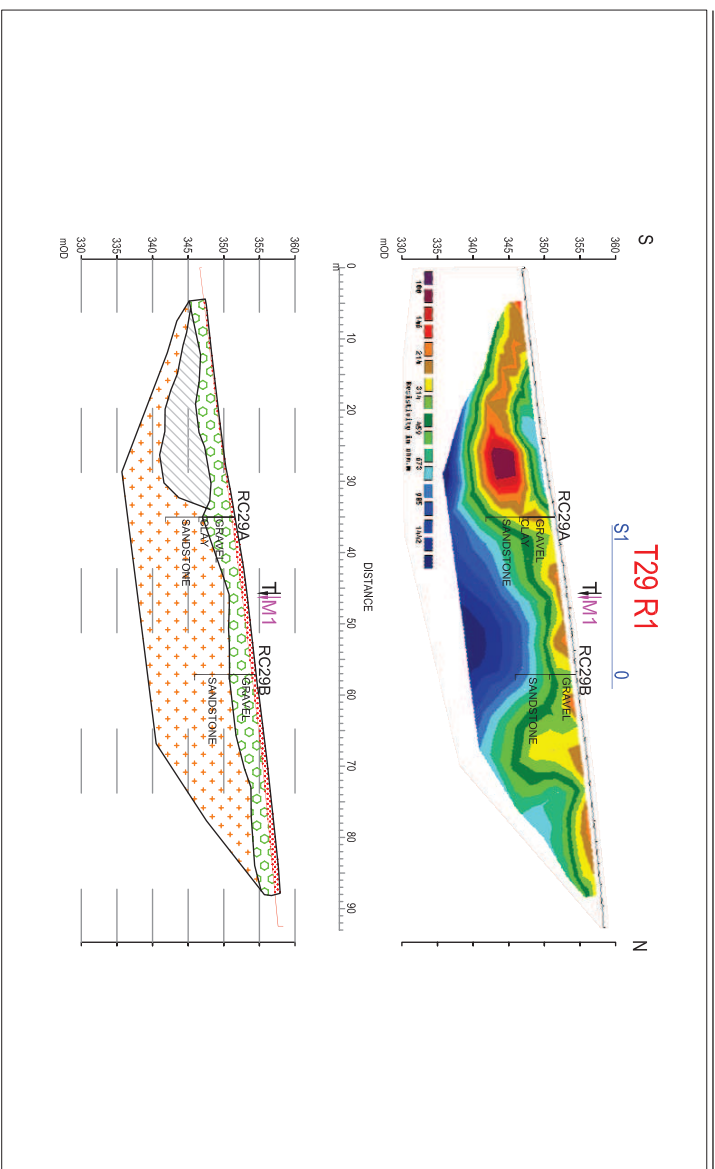


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 29

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

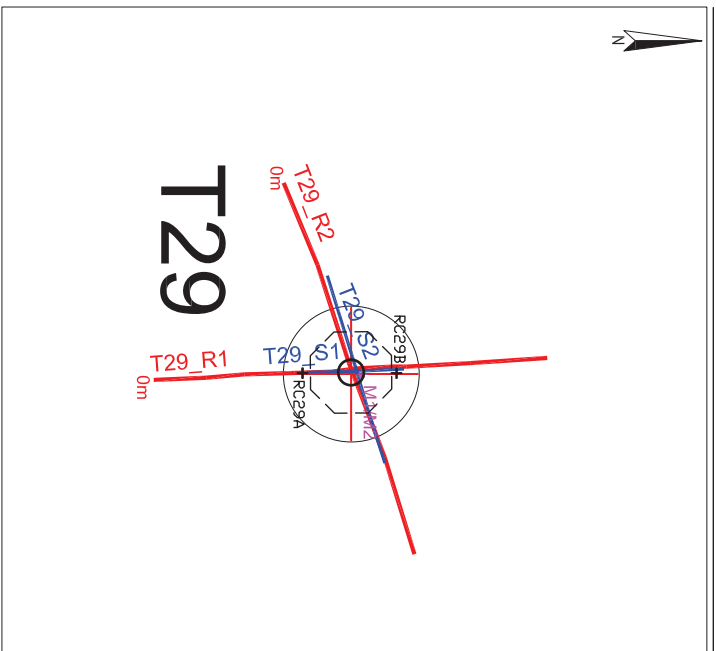
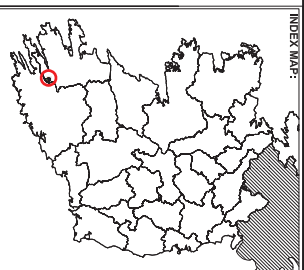
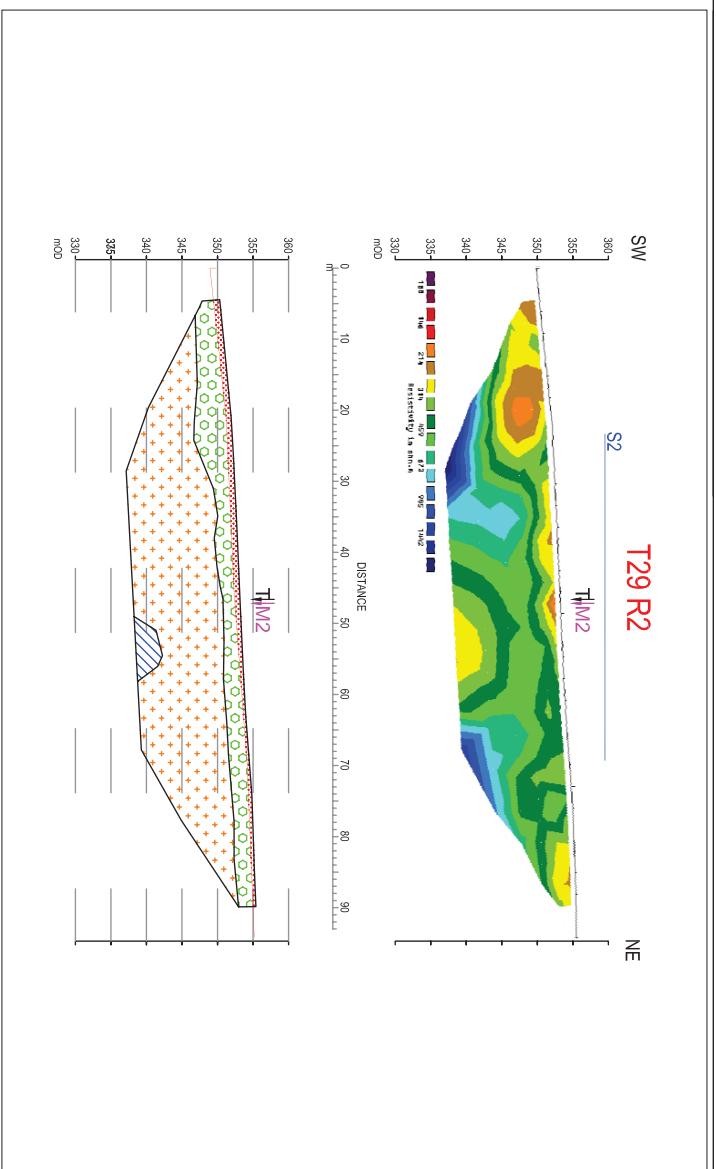


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 10 MASIV PROFILE
- PEAT
- Sandy Gravely CLAY
- Clayey GRAVEL/GRAVEL
- Slightly Weathered-fresh SANDSTONE
- Slightly Weathered-fresh SILTSTONE
- Slightly Weathered-fresh SHALE
- Peat Profile Depth
- Possible Fault
- Turbine Centre
- + 10 MASIV Profile
- + RC38A Borehole



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DRAWING NO:		AGL4827_T29_01 TURBINE 29	
DATE:		21 MAY 2015	
CLIENT:		ISSUESB1	
SCALE:		AS INDICATED @ A3	
VARIANT:	DATE:	ISSUES:	CHANGED:
1	21.05.15	SOR	TL
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T29</b>

Methodology	
Seismic Refraction	24 ch. @ 1&2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507006
Northing	571788
Elevation (mOD)	353.3

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.7	314	-	808	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.7	1.4	375	<b>397</b>	1457	2000	0.46	314.43	0.92	34.74	Clayey GRAVEL	VERY DENSE	Diggable
1.4	2.5	459	<b>536</b>	1968	2000	0.46	574.03	1.68	93.80	Clayey GRAVEL	VERY DENSE	Diggable
2.5	3.3	673	<b>652</b>	2396	2700	0.46	1148.48	3.35	294.54	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.3	4.2	985	<b>731</b>	2686	2700	0.46	1442.98	4.21	429.25	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.2	5.2	985	<b>960</b>	3528	2700	0.46	2489.50	7.27	1055.65	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
5.2	6.1	985	<b>1006</b>	3695	2700	0.46	2731.57	7.98	1230.32	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
6.1	8.1	1442	<b>1120</b>	4113	2700	0.46	3383.90	9.88	1751.76	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
8.1	10.0	1442	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

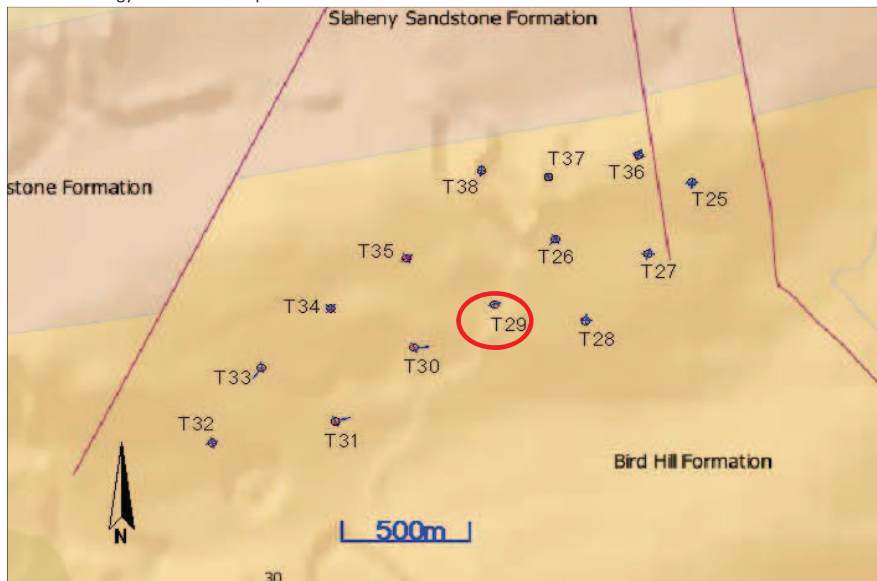
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T29**

Discussion	The base centre is characterised by very dense clayey gravel from 0.7-2.5m bgl followed by slightly weathered-fresh sandstone.

Recommendations	

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

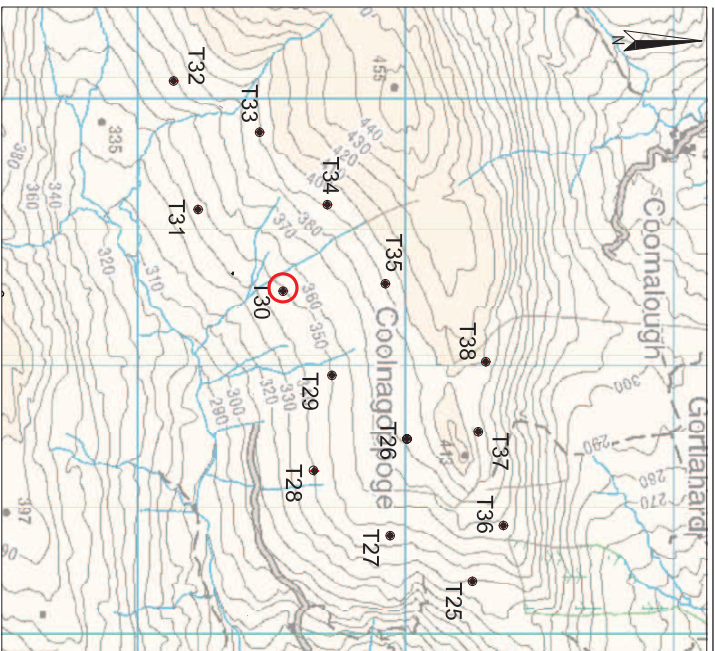
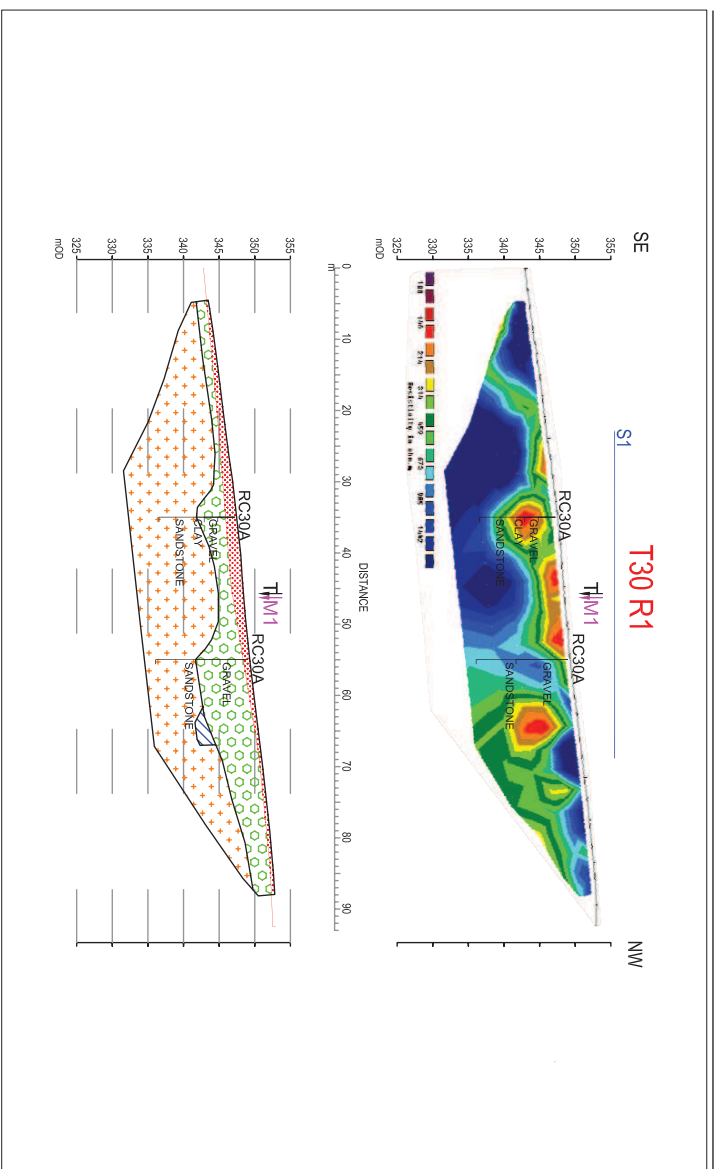


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 30

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

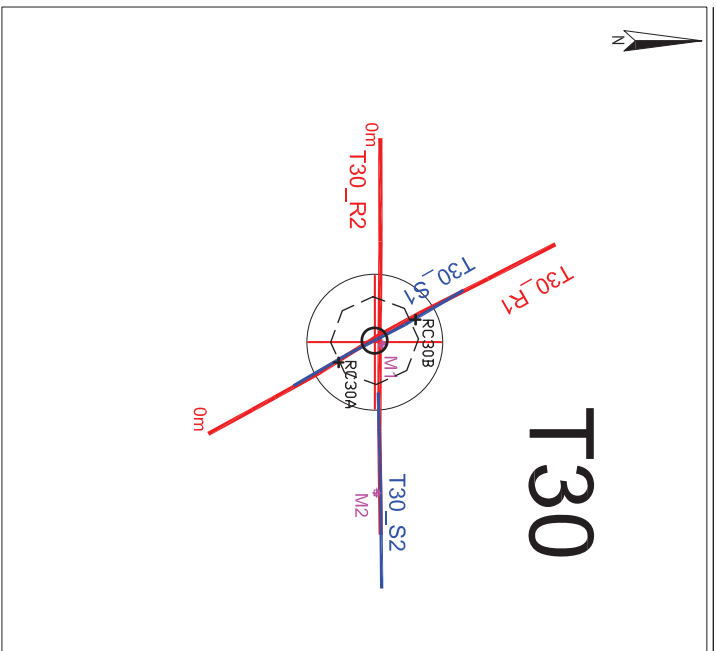
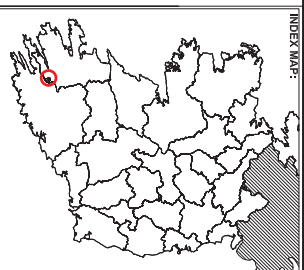
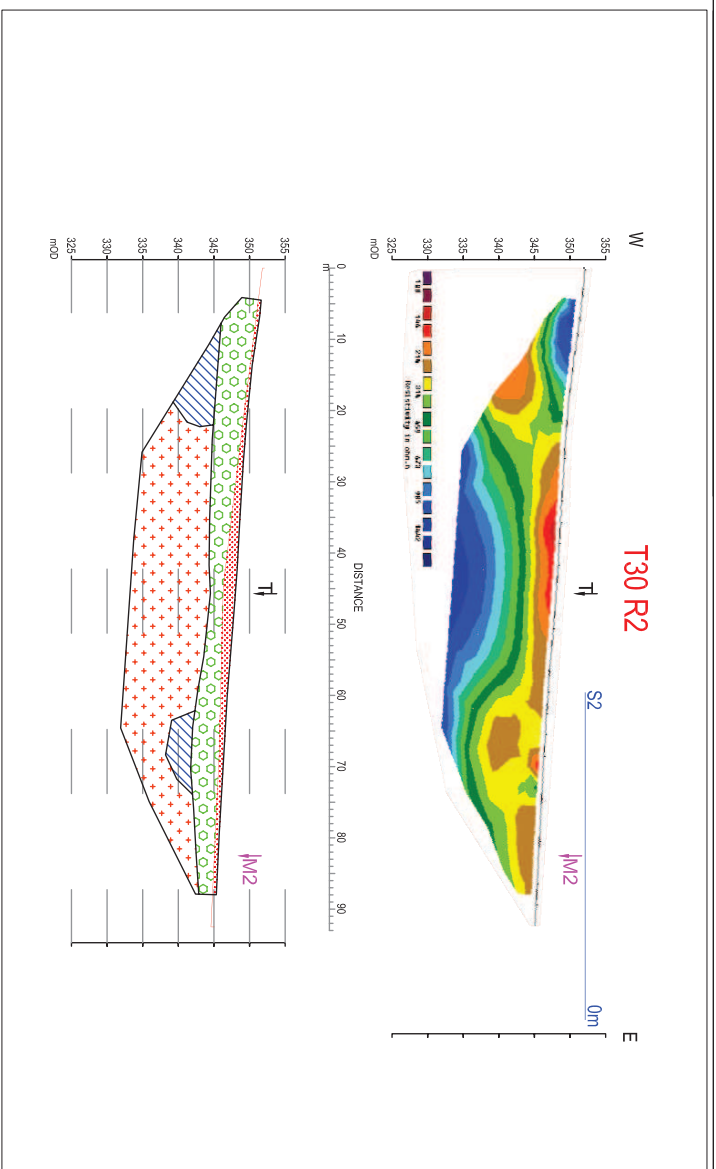


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY/LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 10 MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 10 MASW Profile
- RC38A Borehole



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www.apexgeoservices.co.uk

PROJECT:		BARNASTOOKA WIND FARM
DRAWING NO.:		AGL4827_T30_01 TURBINE 30
DATE:		21 MAY 2015
CLIENT:		ISSUES#1
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	21.05.15	SOR
2	10.07.15	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T30</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	506691
Northing	571605
Elevation (mOD)	348.1

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	1.7	314	-	854	2000	-	-	-	-	PEAT	VERY SOFT	Diggable
1.7	2.5	314	<b>424</b>	1557	2000	0.46	359.04	1.05	43.24	Clayey GRAVEL	VERY DENSE	Diggable
2.5	3.5	314	<b>537</b>	1972	2000	0.46	576.29	1.68	94.41	Clayey GRAVEL	VERY DENSE	Diggable
3.5	4.6	459	<b>632</b>	2323	2700	0.46	1079.36	3.15	265.87	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.6	5.6	459	<b>788</b>	2894	2700	0.46	1675.56	4.89	549.29	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
5.6	6.6	673	<b>876</b>	3219	2700	0.46	2073.09	6.05	780.47	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
6.6	8.7	985	<b>1130</b>	4152	2700	0.46	3448.85	10.07	1807.58	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
8.7	10.8	1442	<b>1139</b>	4184	2700	0.46	3501.81	10.23	1853.61	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

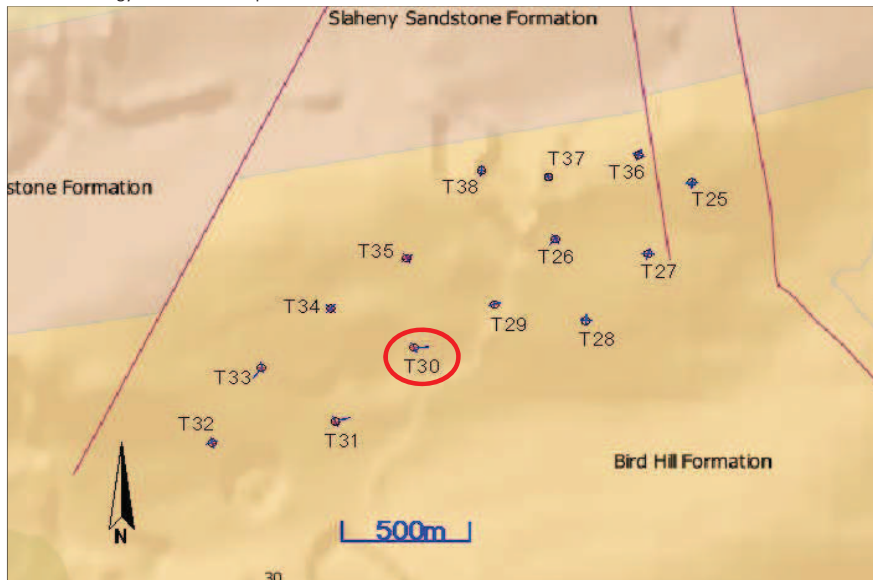
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T30**

Discussion
The base centre is characterised by very dense clayey gravel from 1.7-3.5m bgl followed by slightly weathered-fresh sandstone.

Recommendations

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

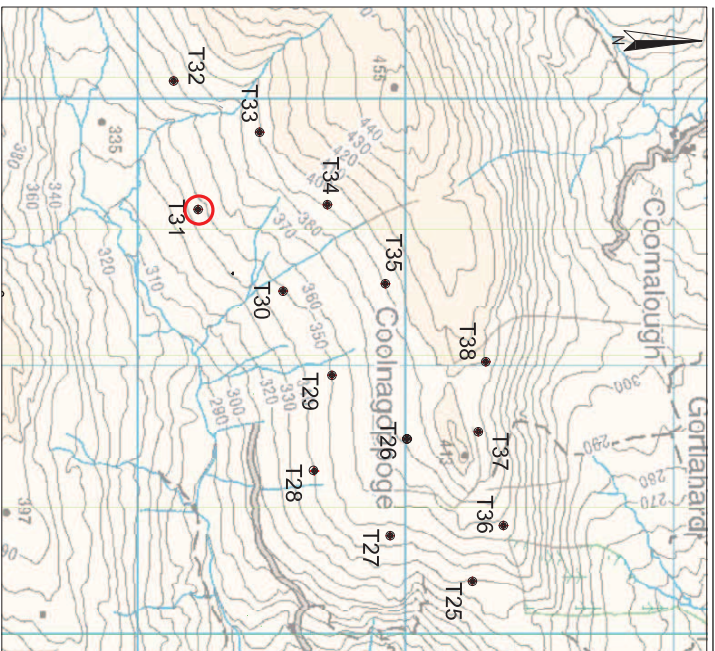
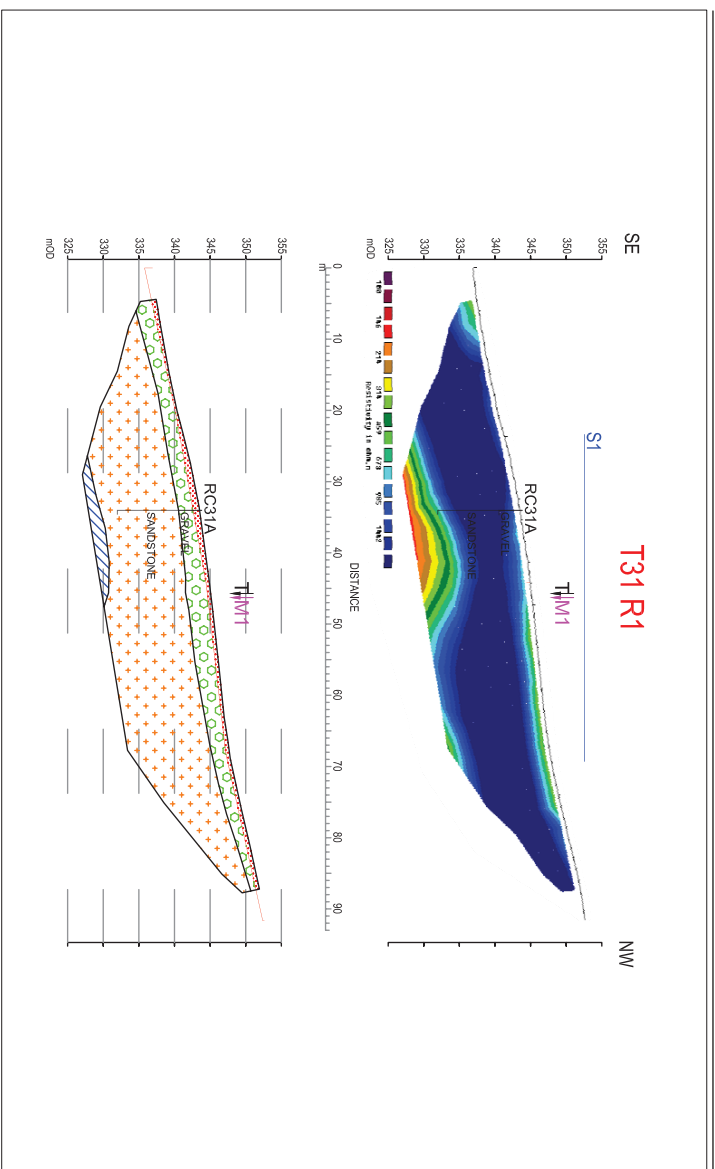


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 31

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

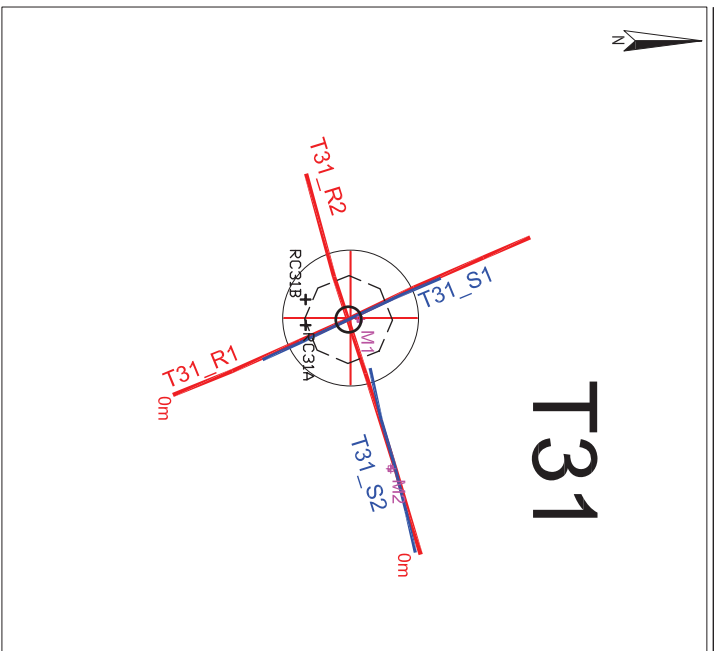
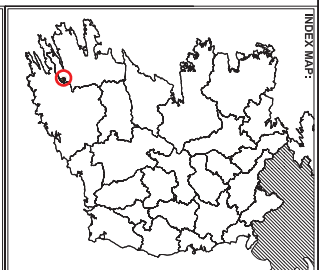
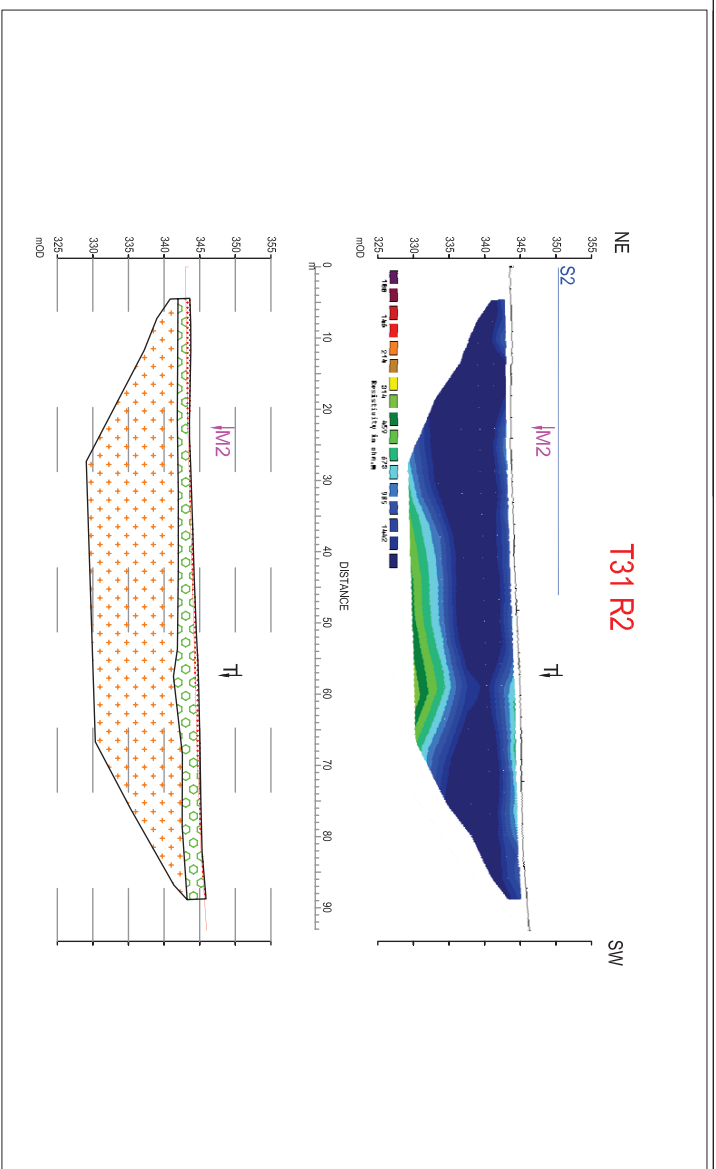


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- Peat Profile Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- +RC38A Borehole
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/SANDVEL
- Slightly Weathered/Fresh SANDSTONE
- Slightly Weathered/Fresh SILTSTONE
- Slightly Weathered/Fresh SHALE



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DRAWING No.:		AGL14827_T31_01 TURBINE 31
DATE:		21 MAY 2015
CLIENT:		ISSUES/1
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	21.05.15	SOR
2	10.07.15	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T31</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	506385
Northing	571288
Elevation (mOD)	345.1

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	314	-	402	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.4	0.8	985	135	497	2000	0.46	36.65	0.11	1.00	Clayey GRAVEL	LOOSE	Diggable
0.8	1.1	1442	203	593	2000	0.43	82.12	0.24	3.68	Clayey GRAVEL	MEDIUM DENSE	Diggable
1.1	1.5	1442	421	977	2000	0.39	354.01	0.98	38.78	Clayey GRAVEL	DENSE-VERY DENSE	Diggable
1.5	2.0	1442	524	1169	2000	0.37	550.04	1.51	79.08	Clayey GRAVEL	DENSE-VERY DENSE	Diggable
2.0	2.7	1442	547	1395	2000	0.41	597.36	1.68	94.50	Clayey GRAVEL	VERY DENSE	Diggable
2.7	3.5	1442	619	1858	2000	0.44	765.21	2.20	146.94	Clayey GRAVEL	VERY DENSE	Diggable
3.5	4.4	1442	1051	2430	2700	0.39	2980.75	8.26	1302.57	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.4	7.7	1442	948	3484	2700	0.46	2427.83	7.09	1012.86	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
7.7	9.6	1442	1143	4200	2700	0.46	3529.04	10.30	1877.45	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

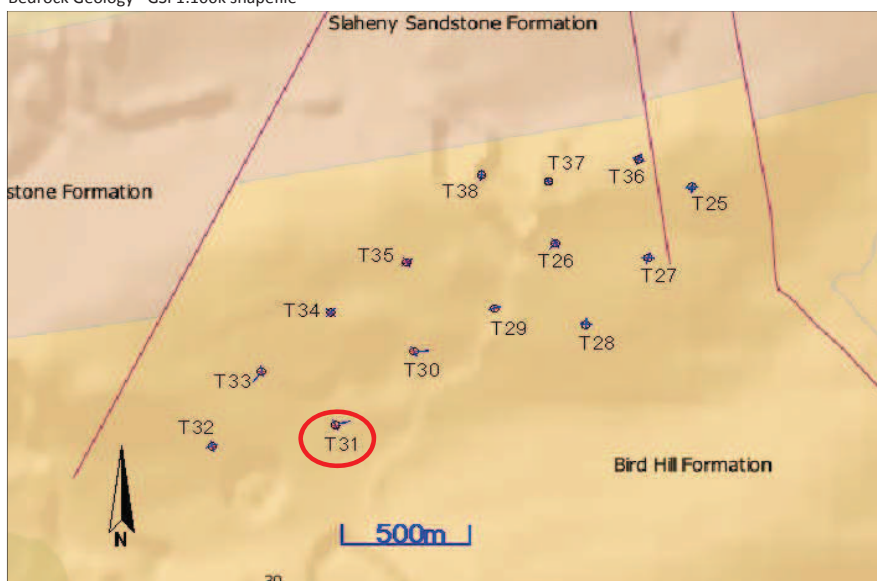
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T31**

Discussion	
The base centre is characterised by loose-very dense clayey gravel from 0.4-3.5m bgl followed by slightly weathered-fresh sandstone.	

Recommendations	

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

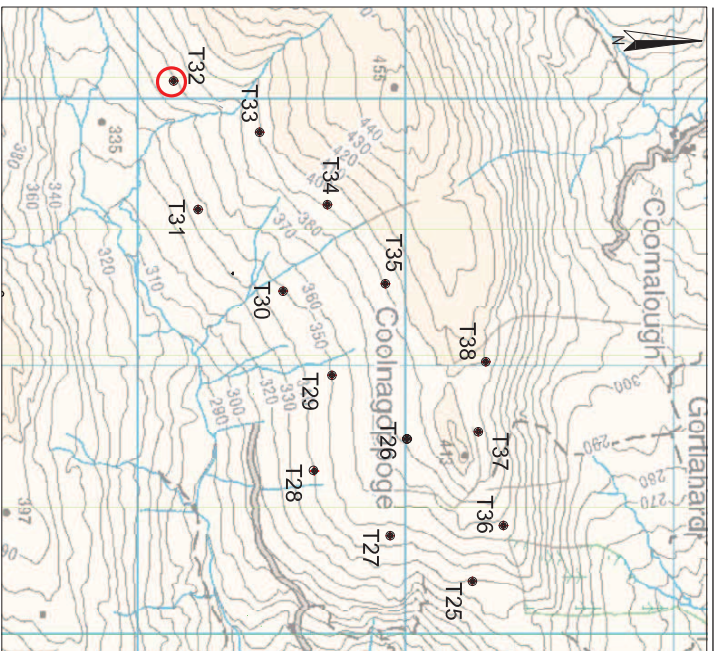
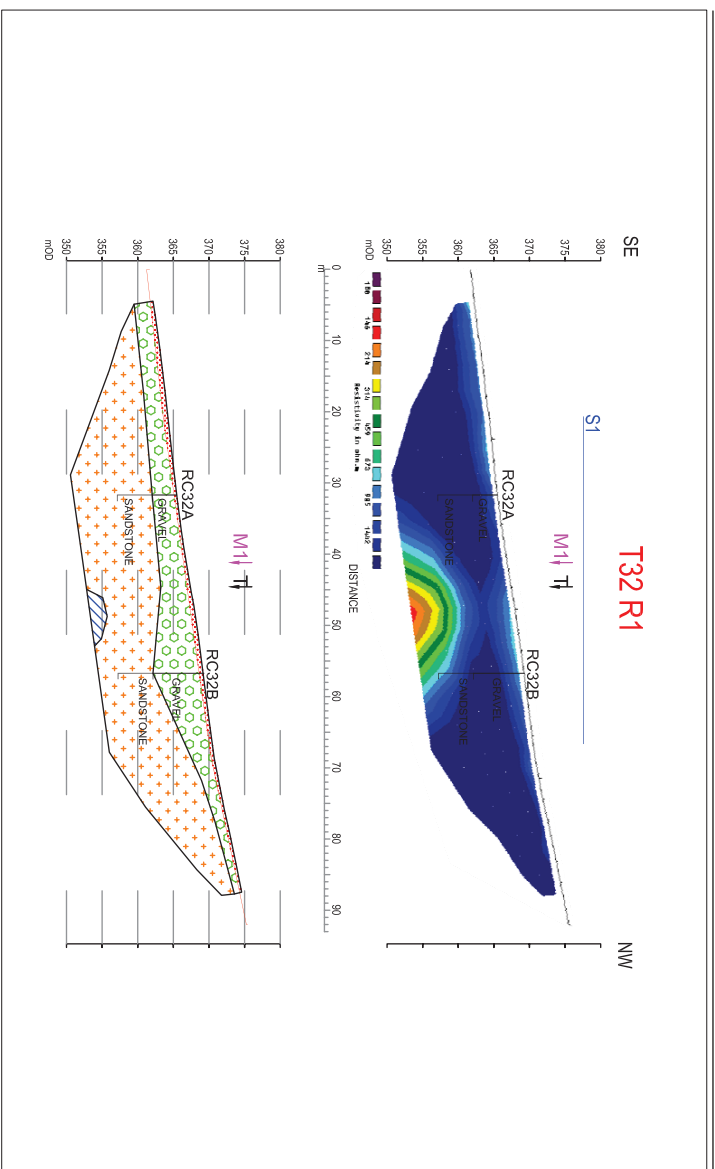
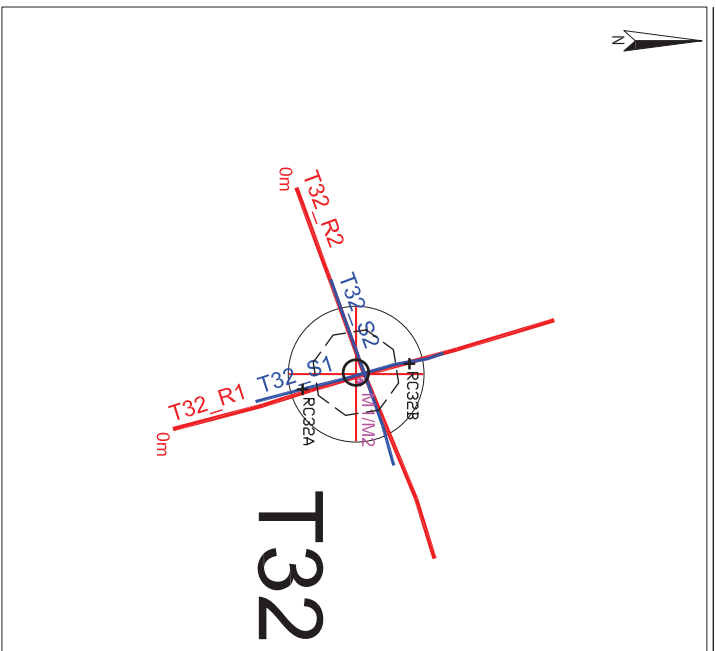


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3

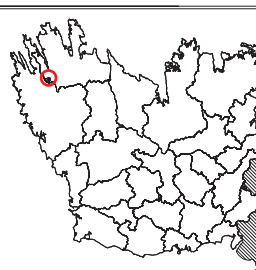


BARNASTOOKA TURBINE 32

FIGURE 2: TURBINE MAP: Scale 1:1250@A3



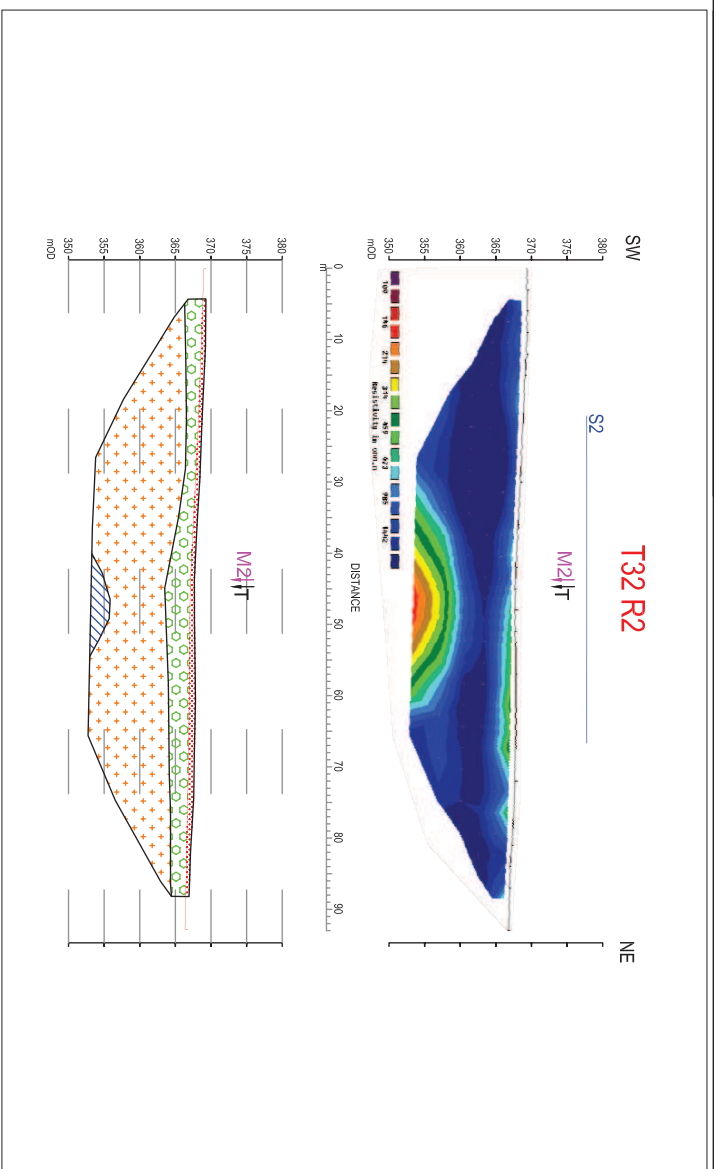
INDEX MAP:



LEGEND:

- SOIL RESISTIVITY/LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- Sandy GRAVELLY CLAY
- CLAYE GRAVEL/GRAVEL
- Slightly Weathered/Fresh SANDSTONE
- Slightly Weathered/Fresh SILTSTONE
- Slightly Weathered/Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- RC32A Borehole

FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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 www.apexgeoservices.ie

PROJECT: BARNASTOOKA WIND FARM

DRAWING No: AGL4827\_T32\_01\_TURBINE 32  
 DATE: 21 MAY 2015  
 CLIENT: ISSUESB1

SCALE: AS INDICATED @ A3

VERSION	DATE	CREATED BY	CHANGED BY
1	21.05.15	SOR	TL
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T32</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	505904
Northing	571196
Elevation (mOD)	367.5

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	314	-	578	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.4	1.7	1442	244	898	2000	0.46	119.52	0.35	7.04	Clayey GRAVEL	MEDIUM DENSE to DENSE	Diggable
1.7	2.4	1442	228	1311	2000	0.48	103.67	0.31	5.72	Clayey GRAVEL	DENSE	Diggable
2.4	3.2	1442	293	1629	2000	0.48	171.38	0.51	13.10	Clayey GRAVEL	DENSE to VERY DENSE	Diggable
3.2	4.2	1442	464	2014	2000	0.47	431.01	1.27	59.25	Clayey GRAVEL	VERY DENSE	Diggable
4.2	5.4	1442	589	2401	2700	0.47	935.87	2.75	212.02	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.4	6.8	1442	923	2800	2700	0.44	2299.58	6.62	904.29	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
6.8	9.8	985	1021	3750	2700	0.46	2813.22	8.21	1291.58	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast

S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

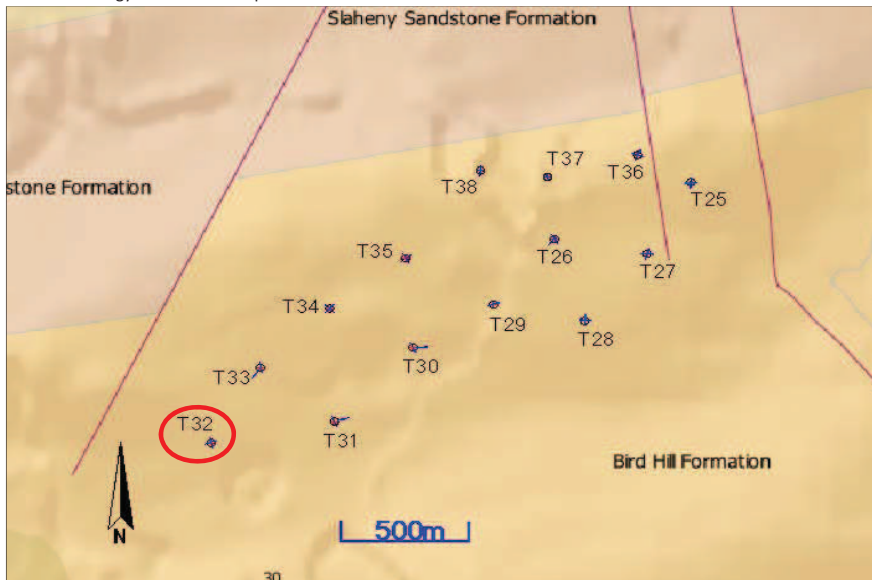
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T32**

Discussion
The base centre is characterised by medium dense-very dense clayey gravel from 0.4-4.2m bgl followed by slightly weathered-fresh sandstone.

Recommendations



FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

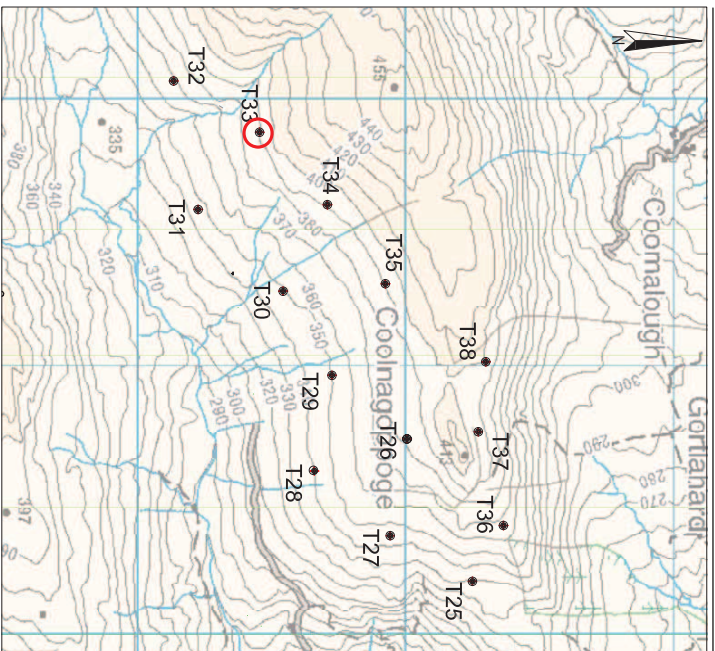
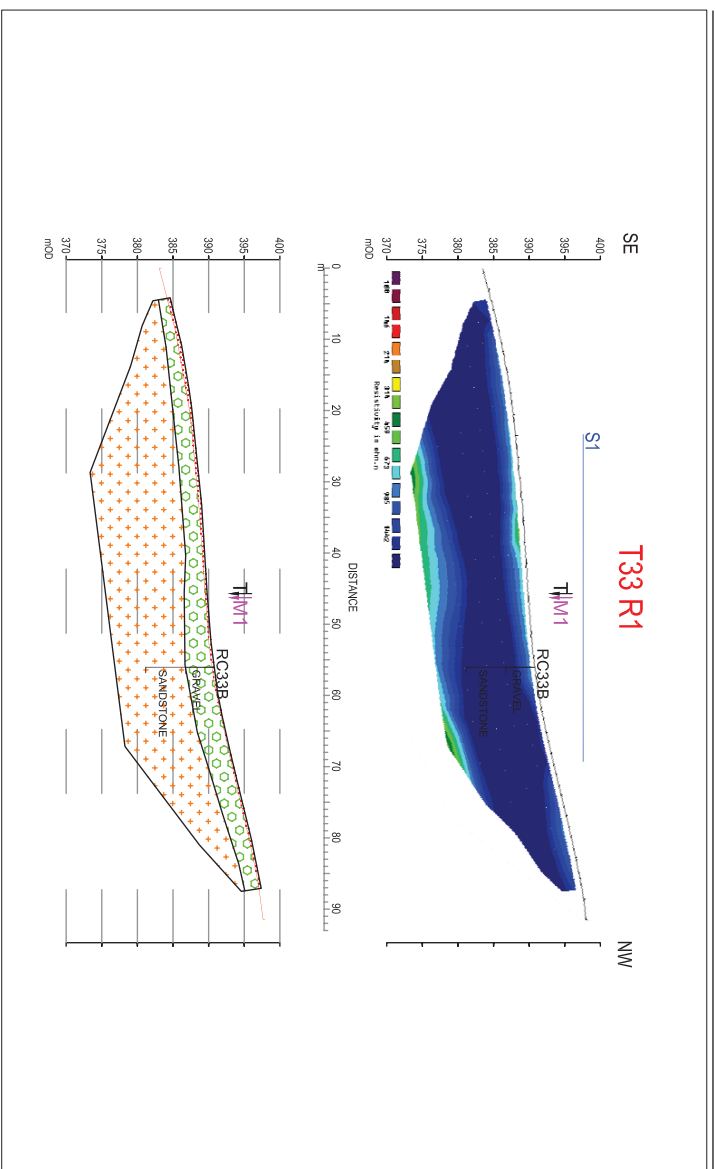
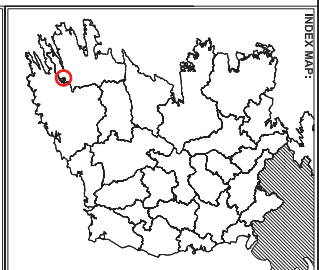


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 33



INDEX MAP:

- LEGEND:
- SOIL RESISTIVITY LOCATION
  - ERT PROFILE
  - SEISMIC REFRACTION PROFILE
  - + 1D MASW PROFILE
  - + 10 MASW PROFILE
  - PEAT
  - Sandy Gravelly CLAY
  - Clayey GRAVEL/GRAVEL
  - Slightly Weathered-Fresh SANDSTONE
  - Slightly Weathered-Fresh SILTSTONE
  - Slightly Weathered-Fresh SHALE
  - Peat Profile Depth
  - Possible Fault
  - Turbine Centre
  - + 1D MASW profile
  - + RC33BA Borehole

FIGURE 2: TURBINE MAP: Scale 1:2000@A3

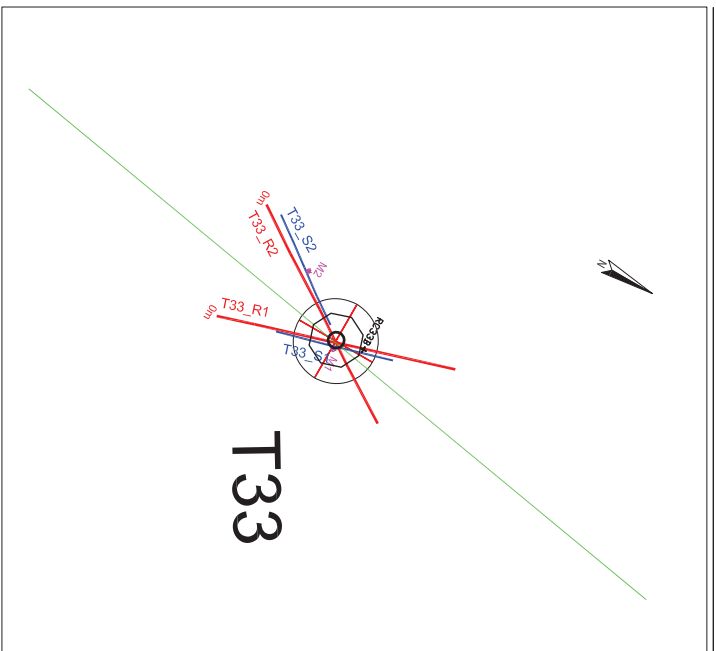
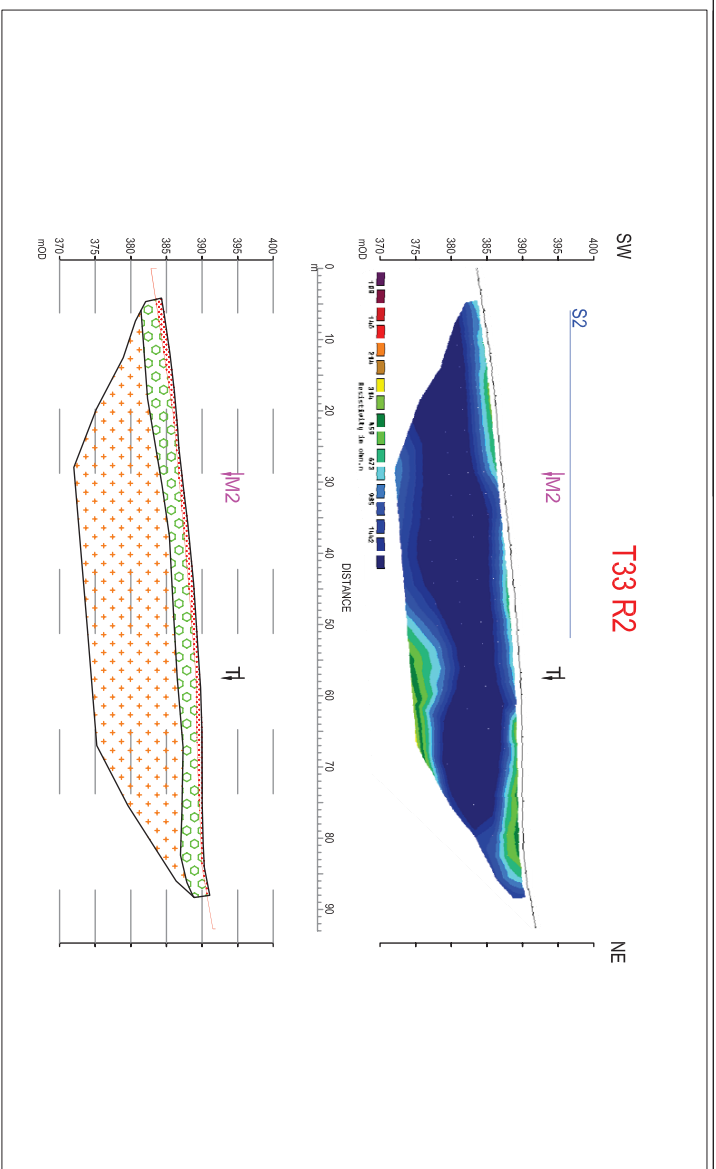


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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 E info@apexgeoservices.co.uk  
 www.apexgeoservices.co.uk

PROJECT:  
 BARNASTOOKA WIND FARM

DRAWING No.:  
 AGL14827\_T33\_01\_TURBINE 33

DATE:  
 21 MAY 2015

CLIENT:  
 ISSUESB1

SCALE:  
 AS INDICATED @ A3

VERSION	DATE	ISSUES	CHANGED
1	21.05.15	SOR	TL
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T33</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	506096
Northing	571517
Elevation (mOD)	389.8

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.3	314	-	425	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.3	1.4	673	<b>187</b>	689	2000	0.46	70.31	0.21	2.93	Clayey GRAVEL	MEDIUM DENSE	Diggable
1.4	2.3	985	<b>323</b>	1186	2000	0.46	208.56	0.61	17.65	Clayey GRAVEL	DENSE	Diggable
2.3	3.2	1442	<b>506</b>	1859	2000	0.46	512.20	1.50	77.72	Clayey GRAVEL	VERY DENSE	Diggable
3.2	4.1	1442	<b>672</b>	2467	2700	0.46	1217.73	3.56	324.41	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.1	5.1	1442	<b>836</b>	3070	2700	0.46	1885.96	5.51	667.67	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
5.1	6.0	1442	<b>847</b>	3112	2700	0.46	1936.97	5.66	697.73	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
6.0	7.9	1442	<b>882</b>	3241	2700	0.46	2101.19	6.14	798.00	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
7.9	9.8	1442	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

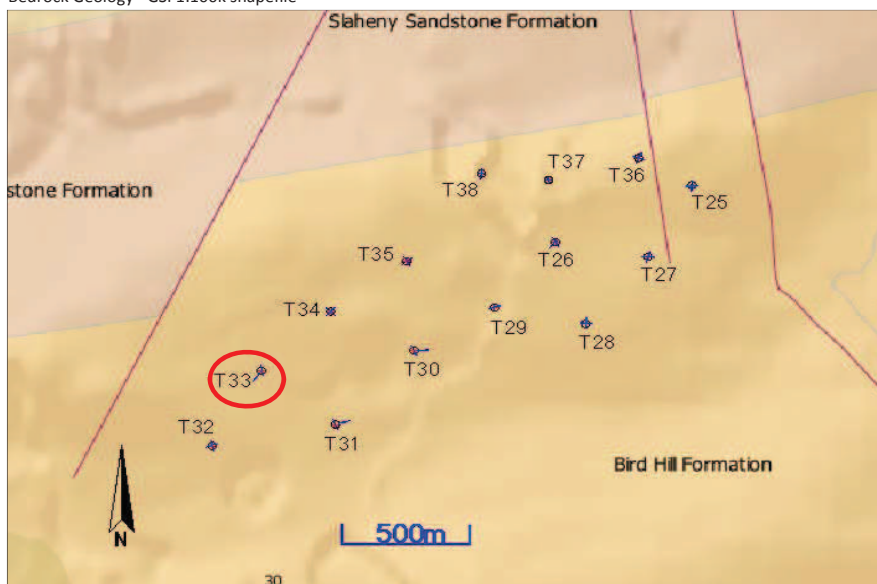
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T33**

Discussion	The base centre is characterised by medium dense-very dense clayey gravel from 0.3-3.2m bgl followed by slightly weathered-fresh sandstone.

Recommendations	

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

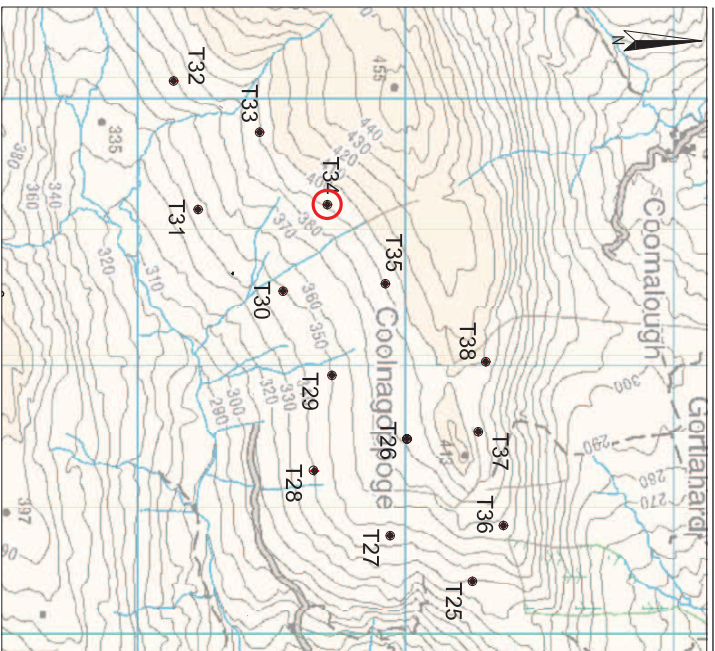


FIGURE 2: TURBINE MAP: Scale 1:1250@A3

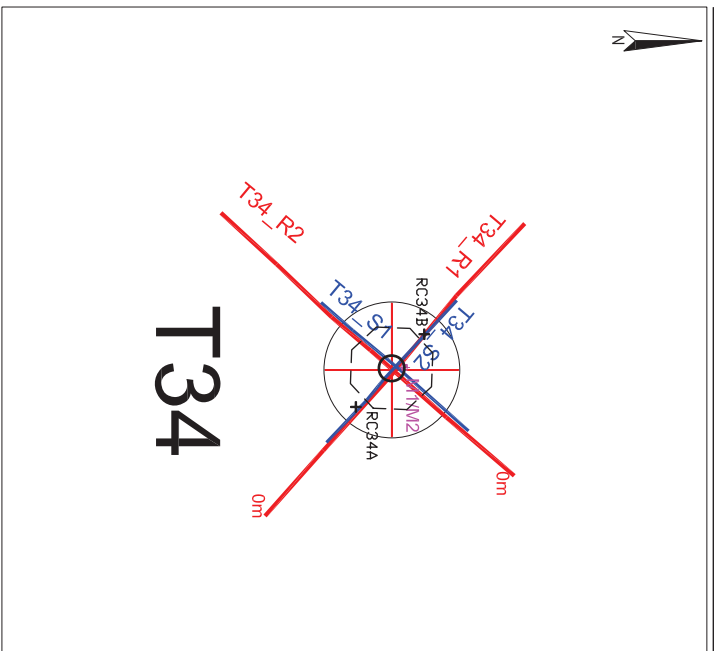
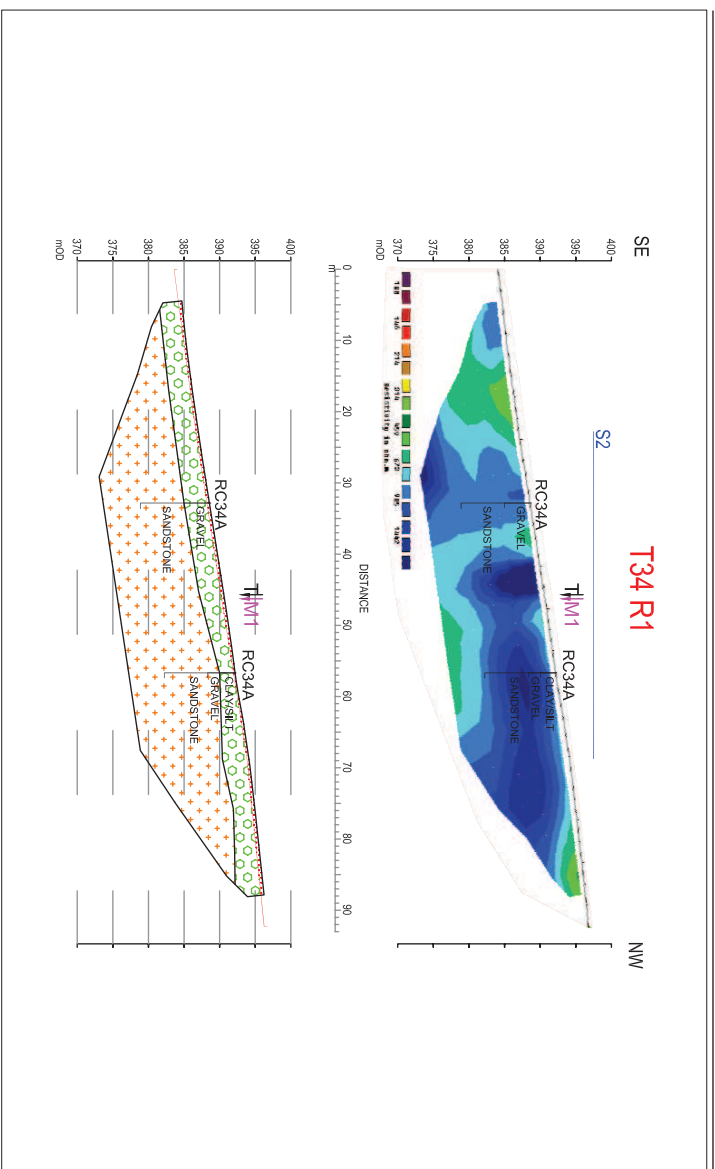
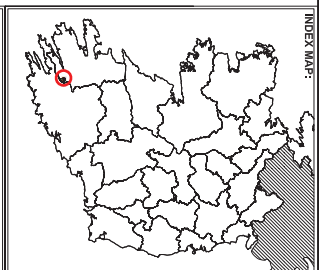
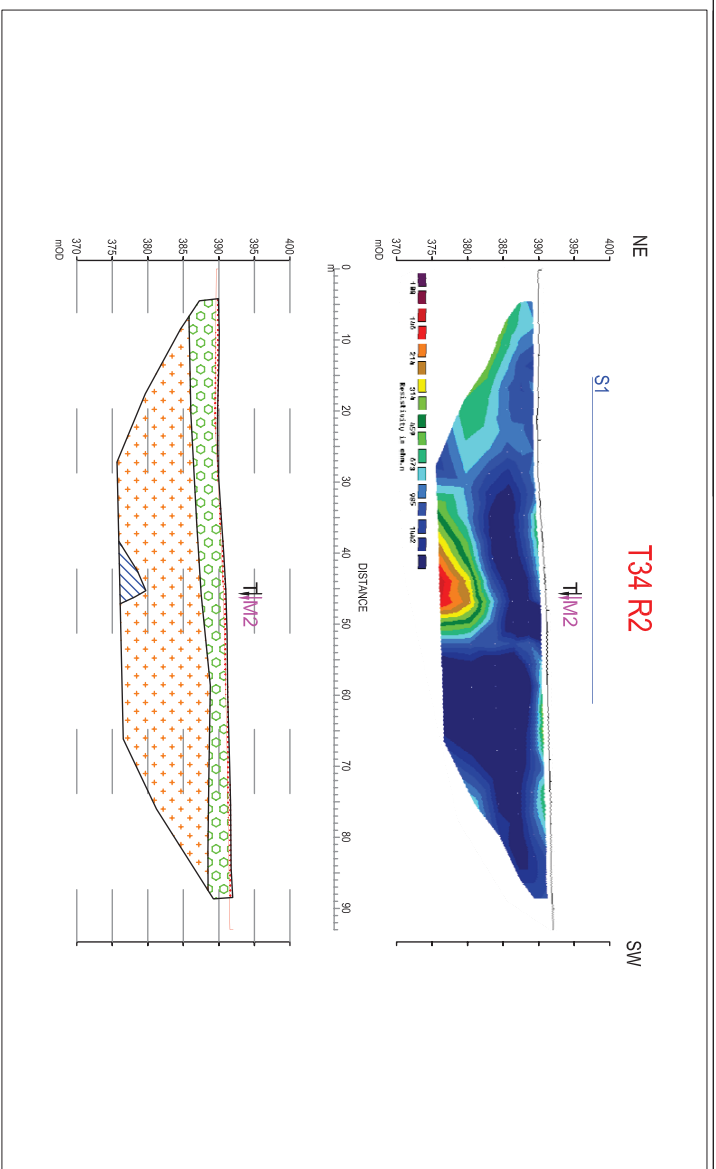


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 34

FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- Sandy Gently CLAY
- Clayey GRAVEL/GRAVEL
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- RC38A Borehole



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 www.apexgeoservices.co.uk

PROJECT: BARNASTOOKA WIND FARM

DRAWING NO:	AGL4827_T34_01 TURBINE 34		
DATE:	21 MAY 2015		
CHECKED:	ISSUES/BI		
SCALE:	AS INDICATED @ A3		
VARIABLE	DATE	SCALE	STATUS
1	21.05.15	SOR	
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T34</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	506367
Northing	571771
Elevation (mOD)	390.6

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	314	-	481	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.4	1.4	1442	196	721	2000	0.46	76.93	0.22	3.40	Clayey GRAVEL	MEDIUM DENSE	Diggable
1.4	2.0	1442	236	988	2000	0.47	111.16	0.33	6.32	Clayey GRAVEL	MEDIUM DENSE	Diggable
2.0	2.6	1442	333	1192	2000	0.46	222.11	0.65	19.53	Clayey GRAVEL	DENSE	Diggable
2.6	3.5	1442	599	1764	2000	0.43	717.96	2.06	131.84	Clayey GRAVEL	VERY DENSE	Diggable
3.5	4.5	1442	704	2393	2700	0.45	1340.01	3.89	376.71	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.5	5.6	1442	983	2972	2700	0.44	2609.27	7.51	1113.29	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
5.6	9.9	985	1061	3897	2700	0.46	3038.41	8.87	1466.57	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

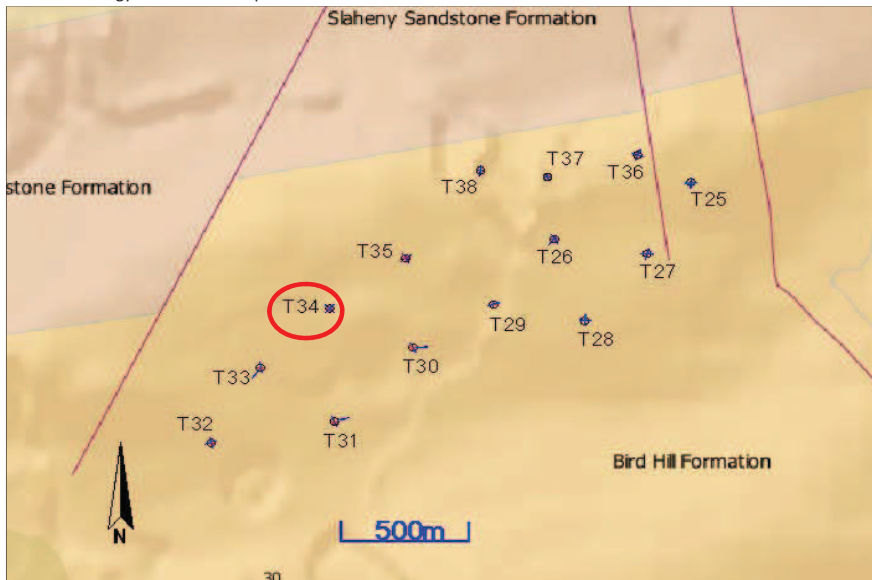
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T34**

Discussion
The base centre is characterised by medium dense-very dense clayey gravel from 0.4-3.5m bgl followed by slightly weathered-fresh sandstone.

Recommendations

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

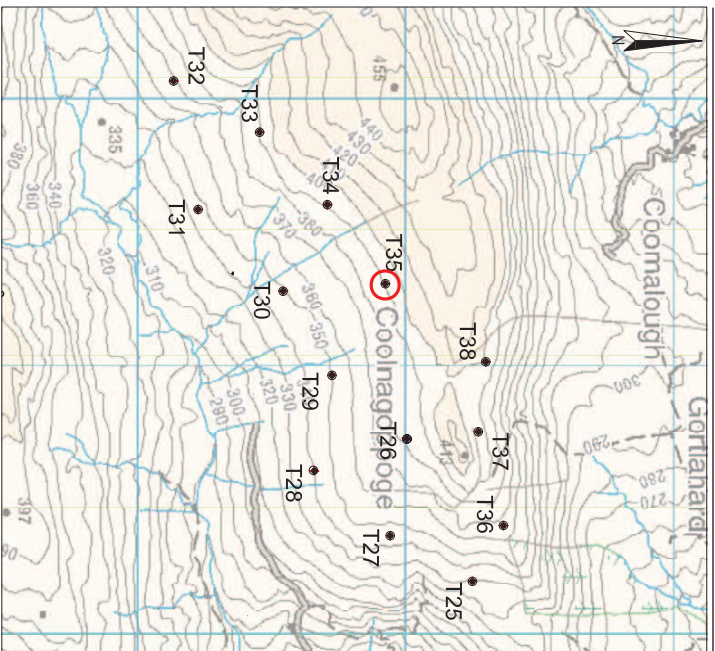
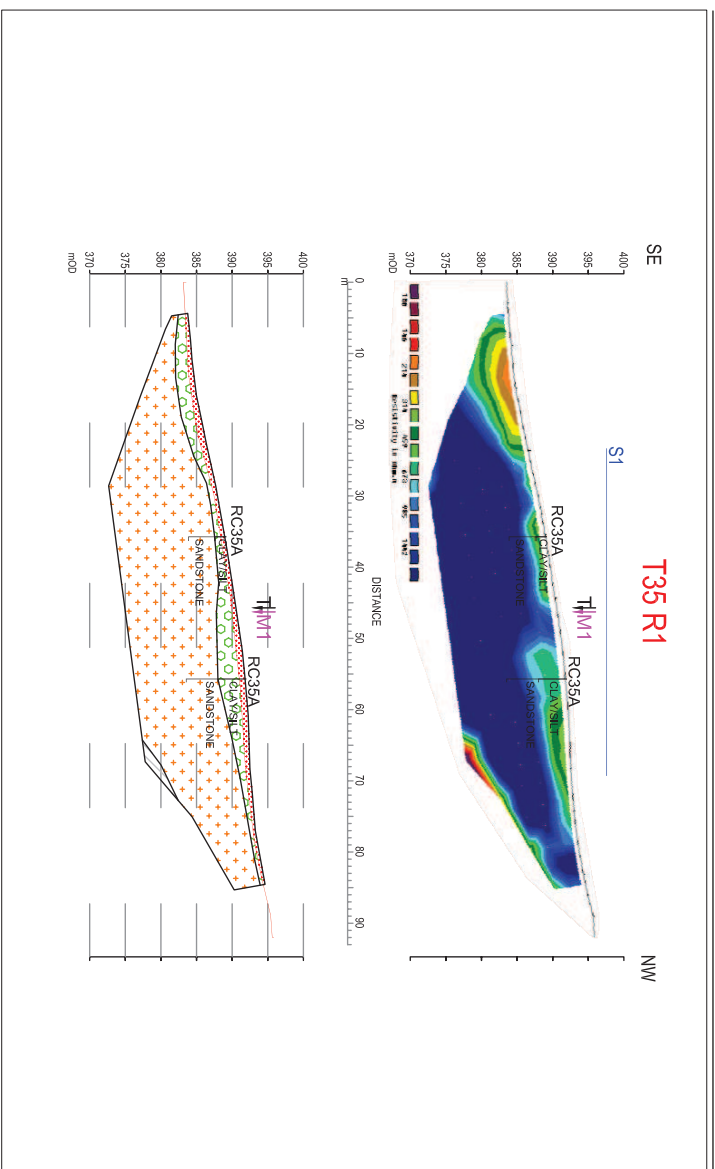
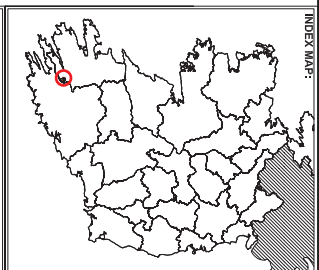


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 35



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- Sandy GRAVELLY CLAY
- Gravelly GRAVEL
- Slightly Weathered FRESH SANDSTONE
- Slightly Weathered FRESH SILTSTONE
- Slightly Weathered FRESH SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- RC35A Borehole

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

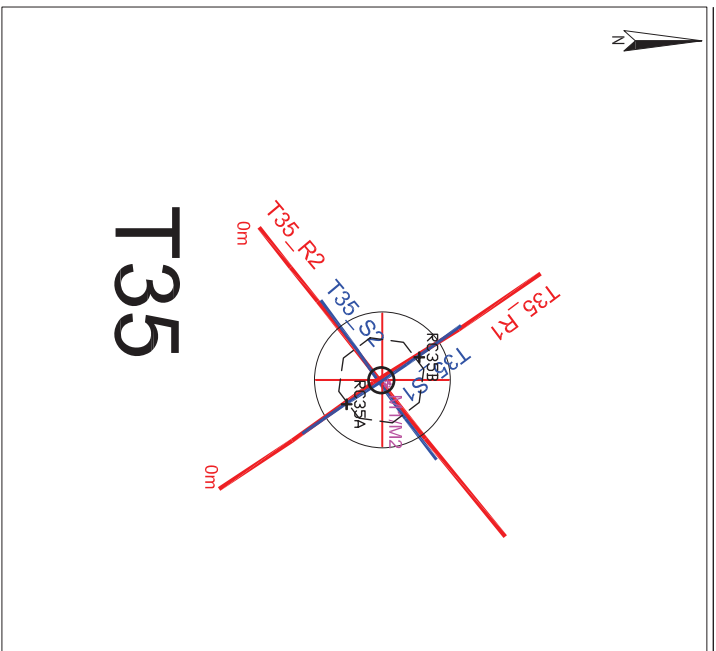
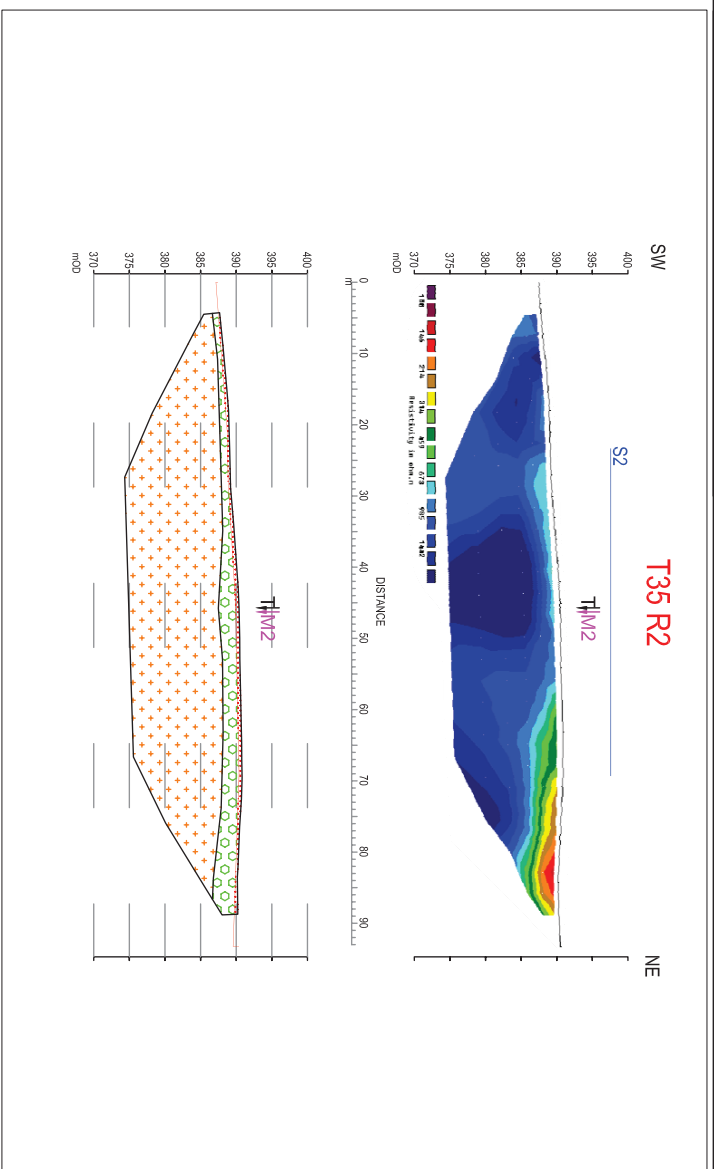


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



**apex** geoservices

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 www.apexgeoservices.co.uk

PROJECT: BARNASTOOKA WIND FARM

DRAWING NO: AGL4827\_T35\_01 TURBINE 35  
 DATE: 21 MAY 2015

CHECKED: ISSUES BY

SCALE: AS INDICATED @ A3

VERSION	DATE	CHANGED BY	REASON
1	21.05.15	SOR	TL
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T35</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	506663
Northing	571988
Elevation (mOD)	390.5

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.5	314	-	624	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.5	1.6	673	319	1173	2000	0.46	204.06	0.60	17.02	Clayey GRAVEL	DENSE	Diggable
1.6	2.2	985	253	1766	2000	0.49	128.00	0.38	8.15	Clayey GRAVEL	DENSE-VERY DENSE	Diggable
2.2	2.7	1442	422	2273	2000	0.48	356.68	1.06	43.85	Clayey GRAVEL	VERY DENSE	Diggable
2.7	3.9	1442	560	2632	2700	0.48	846.52	2.50	181.34	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.9	5.0	1442	711	3433	2700	0.48	1363.69	4.03	398.85	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
5.0	6.2	1442	1099	4037	2700	0.46	3260.38	9.52	1647.51	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
6.2	9.7	1442	1144	4203	2700	0.46	3533.52	10.32	1881.39	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

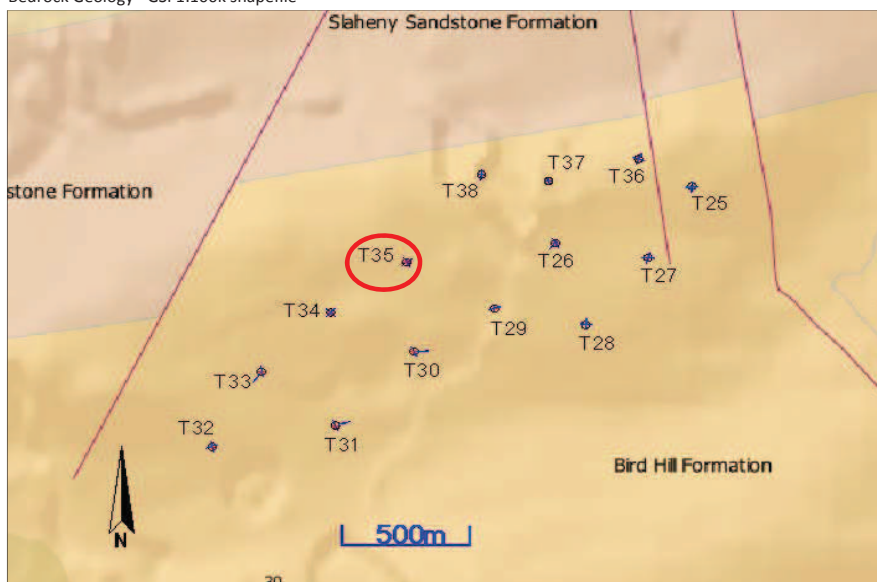
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T35**

Discussion
The base centre is characterised by dense-very dense clayey gravel from 0.5-2.7m bgl followed by slightly weathered-fresh sandstone.

Recommendations

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

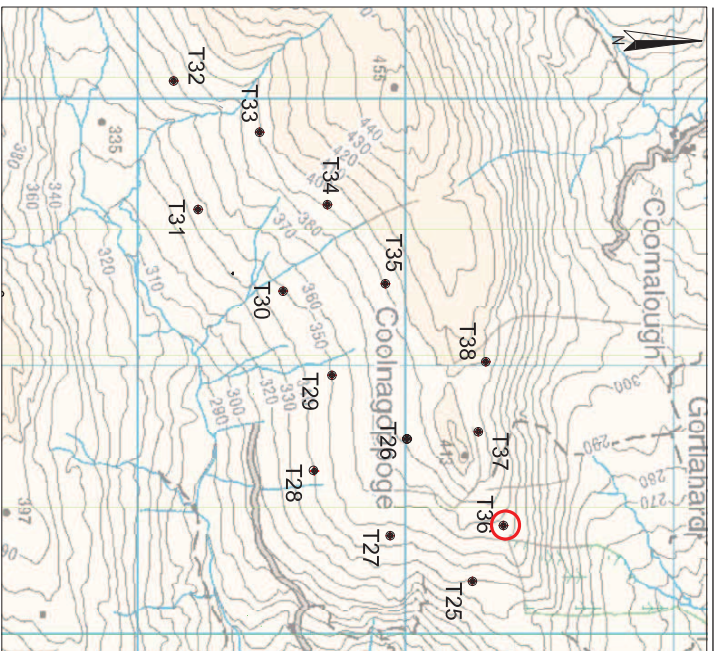
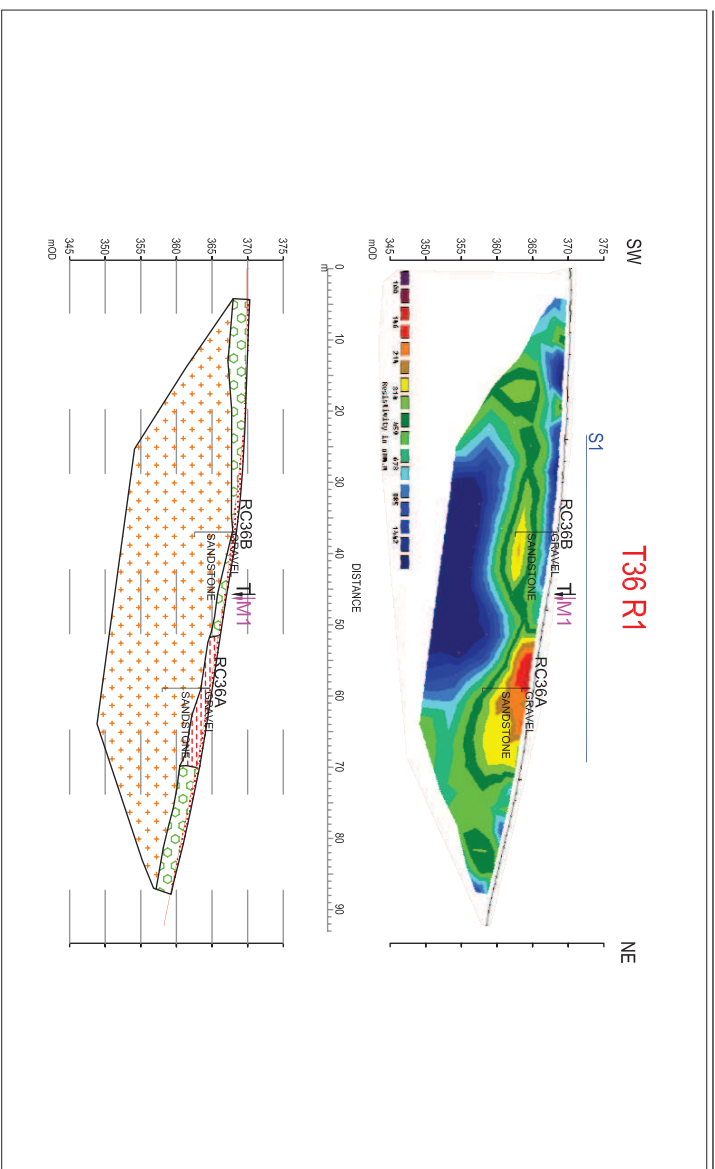
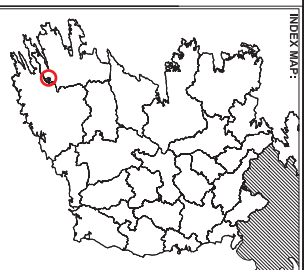


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 36



INDEX MAP:

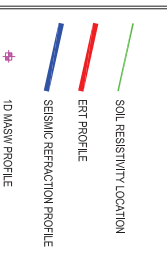


FIGURE 2: TURBINE MAP: Scale 1:2000@A3

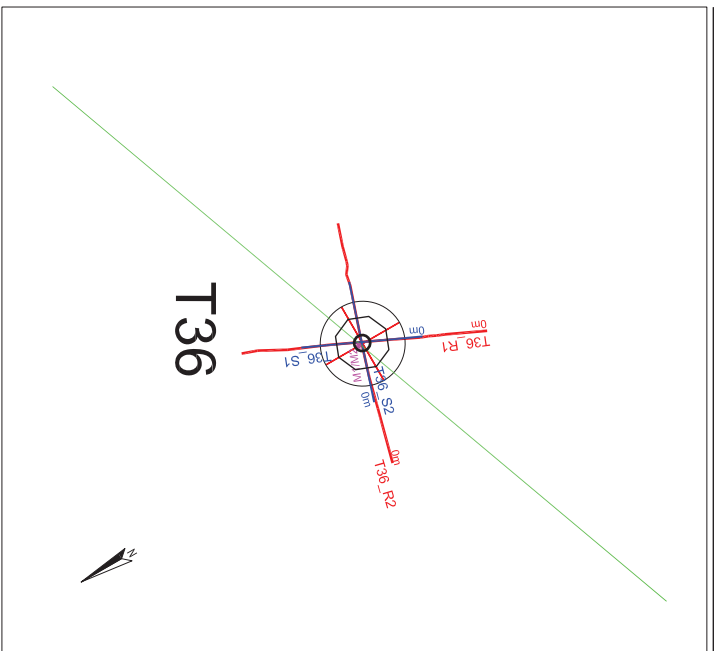
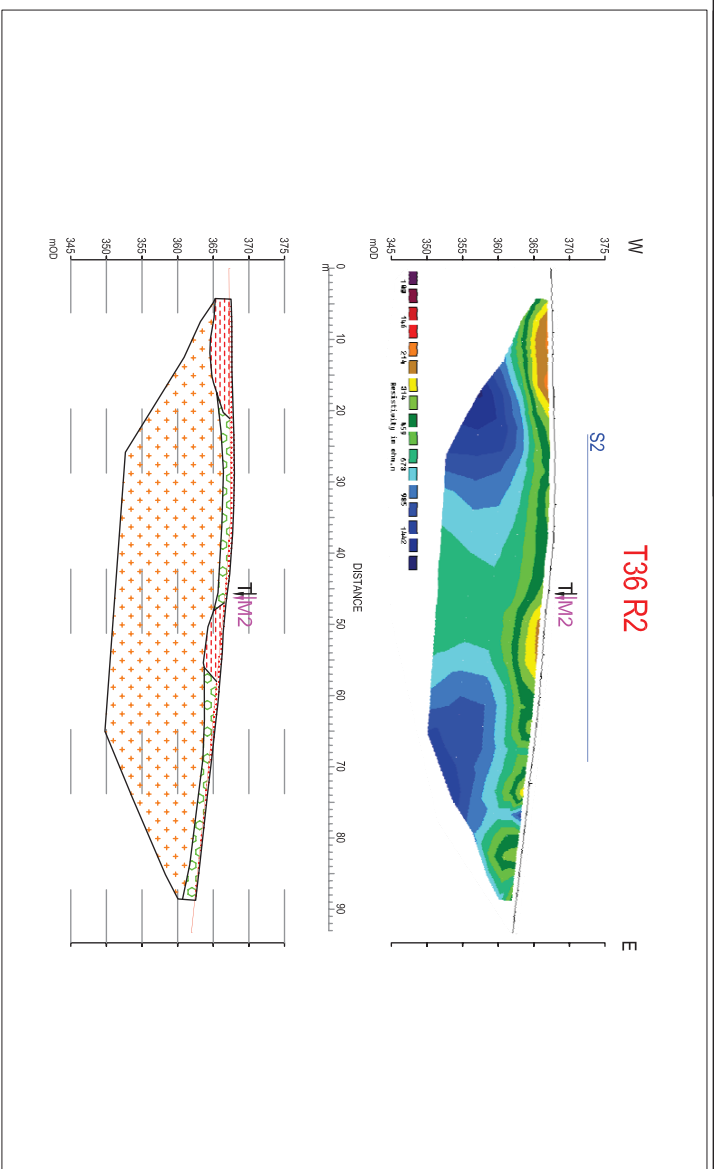


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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www.apexgeoservices.co.uk

PROJECT: BARNASTOOKA WIND FARM

DRAWING No.: AGL14827\_T36\_01\_TURBINE\_36  
DATE: 21 MAY 2015

CHECKED: ISSUES: 1  
SCALE: AS INDICATED @ A3

VERSION:	DATE:	CHANGED BY:	REASON:
1	21.05.15	SOR	
2	10.07.15	SOR	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T36</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507568
Northing	572430
Elevation (mOD)	367.1

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.3	314	-	807	2000	-	-	-	-	PEAT	VERY SOFT	Diggable
0.3	1.3	459	<b>487</b>	1789	2000	0.46	474.33	1.39	68.47	Clayey GRAVEL	VERY DENSE	Diggable
1.3	2.2	673	<b>740</b>	2719	2700	0.46	1478.93	4.32	447.04	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
2.2	3.1	673	<b>915</b>	3361	2700	0.46	2259.18	6.60	899.41	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
3.1	4.0	985	<b>1142</b>	4194	2700	0.46	3519.24	10.28	1868.86	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
4.0	4.9	985	<b>1143</b>	4200	2700	0.46	3528.59	10.30	1877.06	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
4.9	5.8	985	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.8	7.7	985	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.7	9.6	1442	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

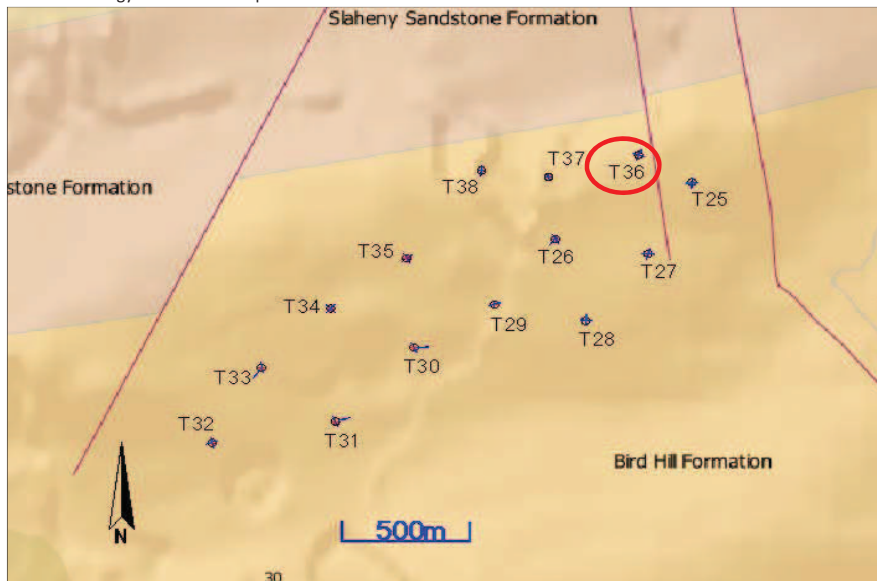
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T36**

Discussion	
The base centre is characterised by very dense clayey gravel from 0.3-1.3m bgl followed by slightly weathered-fresh sandstone.	

Recommendations	



FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

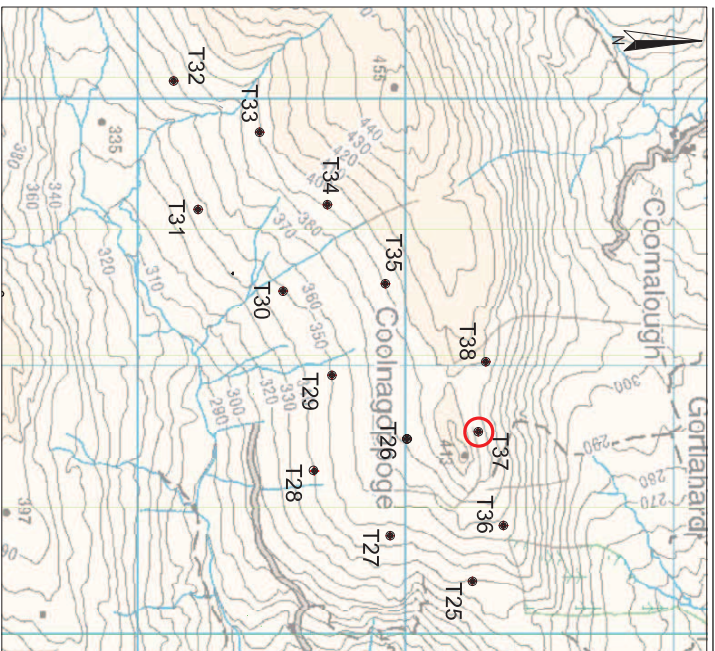
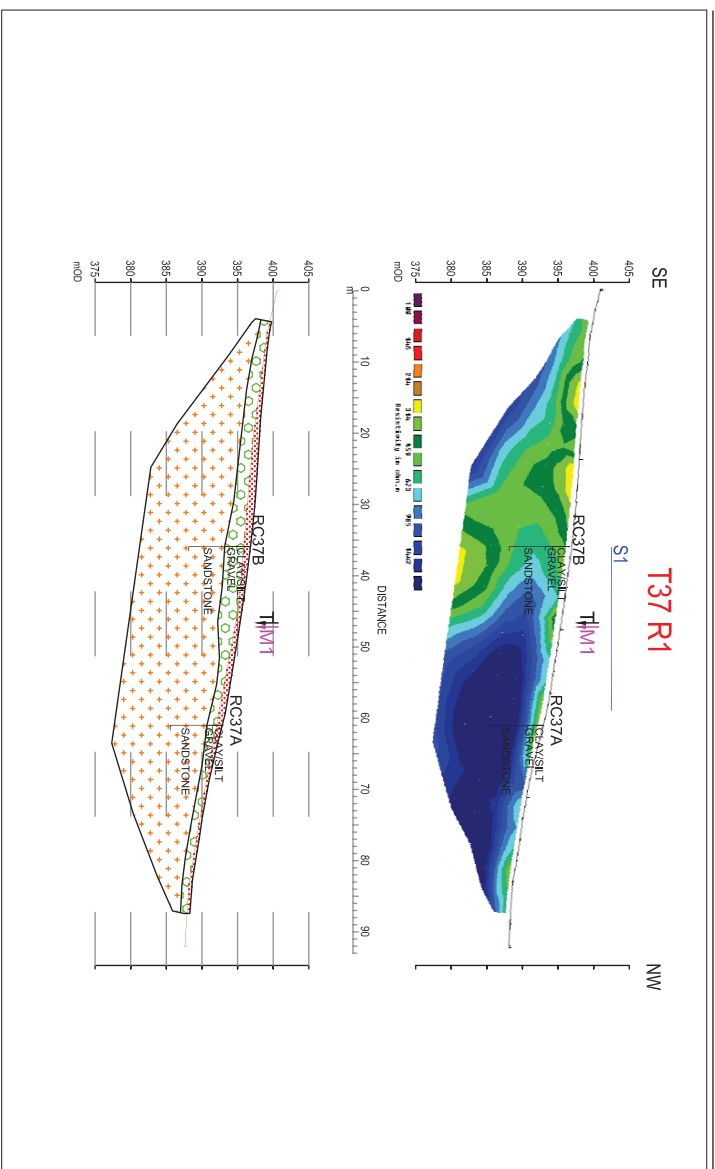
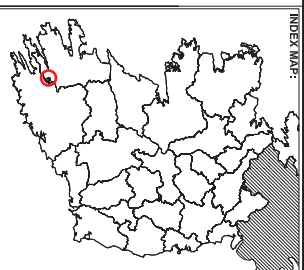


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 37



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 10 MASW PROFILE
- PEAT
- Slightly Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Slightly Weathered/Fresh SANDSTONE
- Slightly Weathered/Fresh SILTSTONE
- Slightly Weathered/Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 10 MASW Profile
- +RC38A Borehole

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

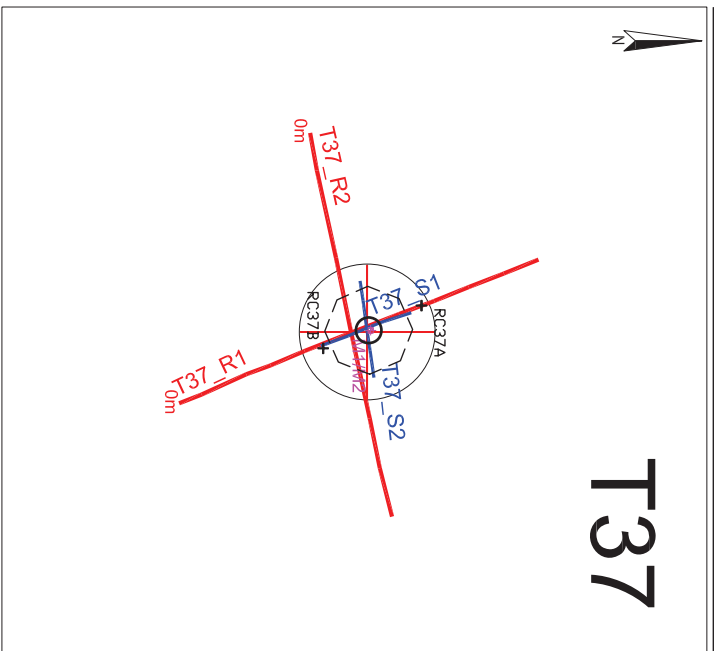
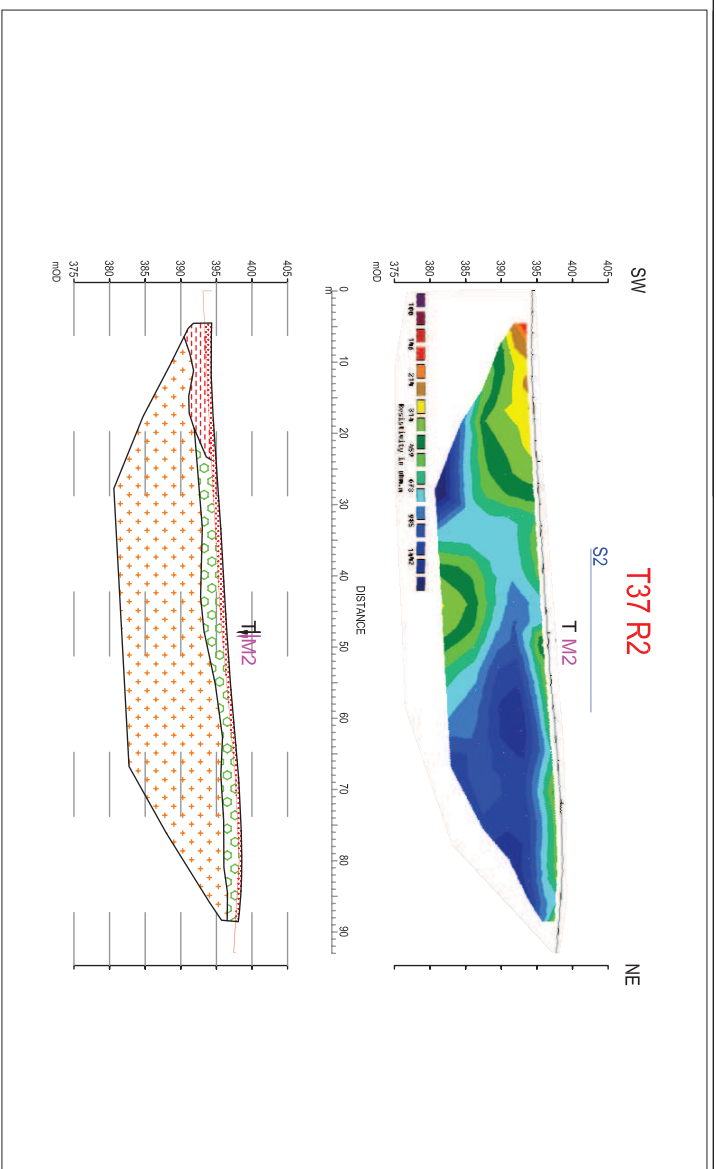


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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PROJECT: BARNASTOOKA WIND FARM

DRAWING NO: AGL4482\_T37\_01 TURBINE 37

DATE: 21 MAY 2015

CHECKED: ISSUES BY

SCALE: AS INDICATED @ A3

NO	DATE	DESCRIPTION
1	21.05.15	SOR
2	10.07.15	SOR

Site	Barnastooka Wind Farm
Turbine Base	<b>T37</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507217
Northing	572336
Elevation (mOD)	395.3

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.6	314	-	605	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.6	1.4	459	<b>254</b>	933	2000	0.46	128.90	0.38	7.98	Clayey GRAVEL	MEDIUM DENSE to DENSE	Diggable
1.4	2.3	673	<b>331</b>	1216	2000	0.46	219.23	0.64	19.16	Clayey GRAVEL	DENSE-VERY DENSE	Diggable
2.3	3.2	985	<b>497</b>	1825	2000	0.46	493.48	1.44	73.08	Clayey GRAVEL	VERY DENSE	Diggable
3.2	4.2	985	<b>802</b>	2946	2700	0.46	1736.38	5.07	582.57	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
4.2	5.1	985	<b>1134</b>	4167	2700	0.46	3473.83	10.14	1829.24	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.1	6.0	985	<b>1141</b>	4191	2700	0.46	3513.74	10.26	1864.04	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
6.0	7.9	1212	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.9	9.9	1212	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

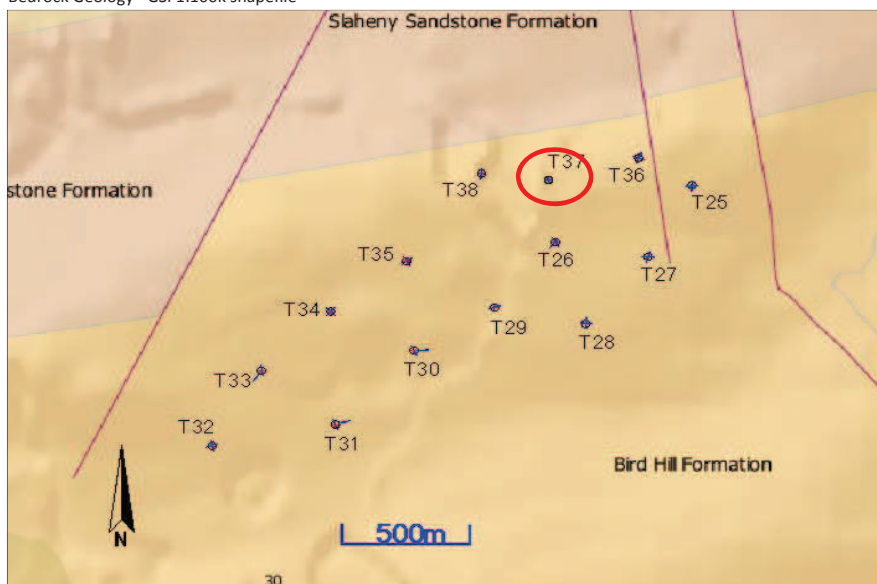
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T37**

Discussion	The base centre is characterised by medium dense-very dense clayey gravel from 0.6-3.2m bgl followed by slightly weathered-fresh sandstone.

Recommendations	

FIGURE 1: BARNASTOOKA WIND FARM LOCATION: Scale 1:20000@A3

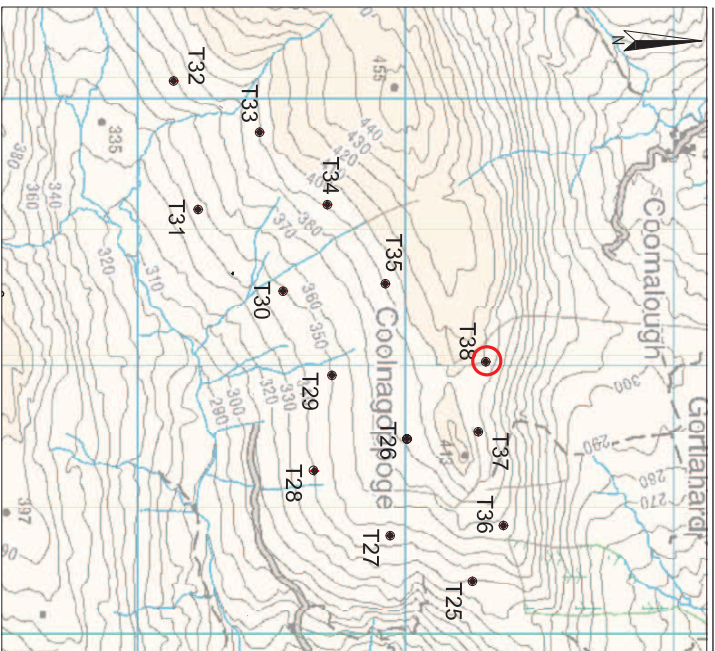
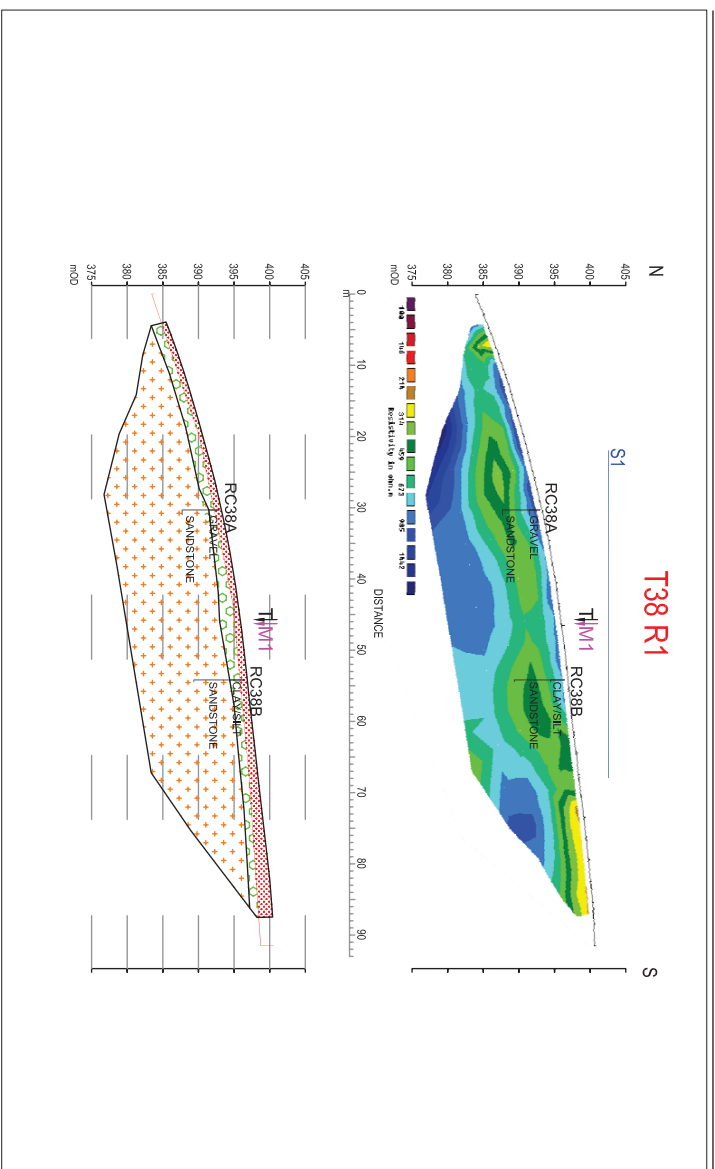
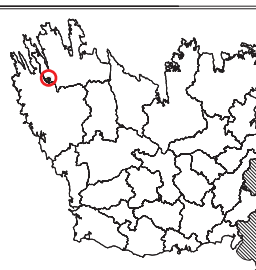


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



BARNASTOOKA TURBINE 38

INDEX MAP:



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Grey GRAVEL/GRAVEL
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- RC38A Borehole

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

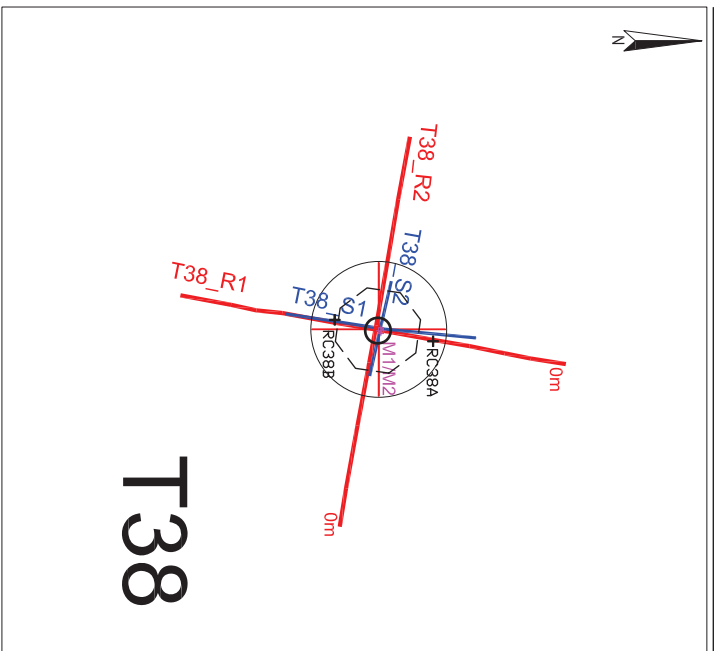
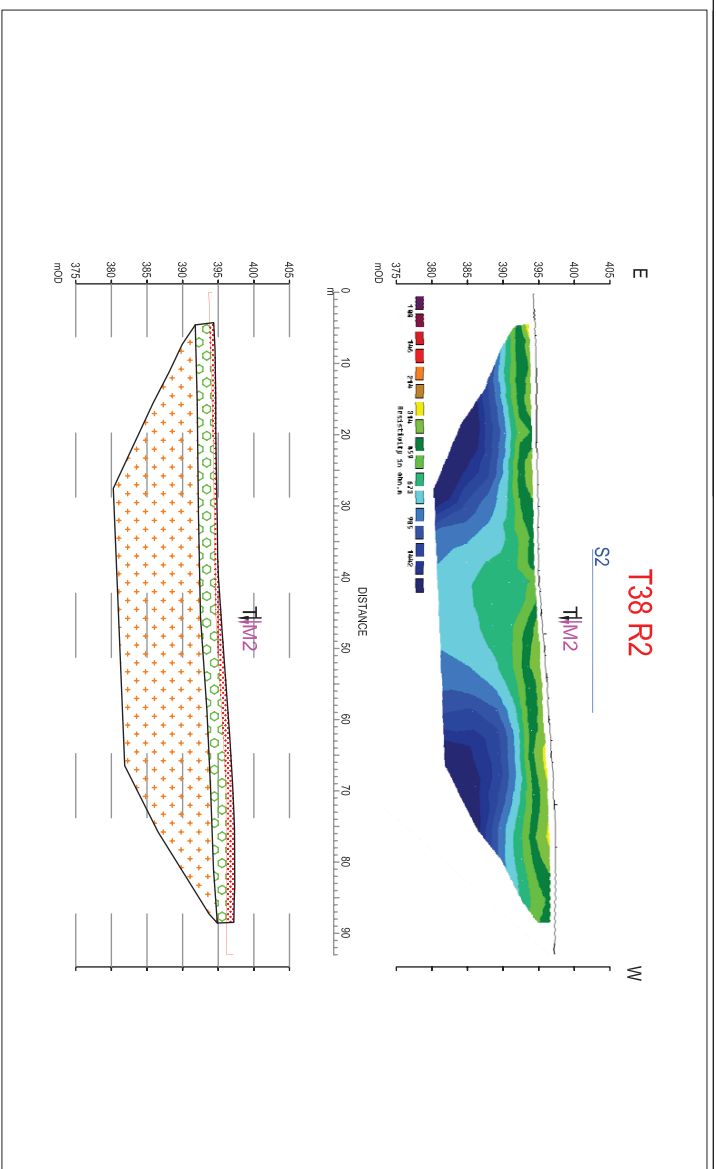


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



6 Knockmolin Business Park, Regus House, Herald Way  
Geary  
Rohiniford  
Regus Business Park  
T +353 (0)202-1842  
F +353 (0)202-1843  
E info@apexgeoservices.co.uk  
www.apexgeoservices.co.uk

**BARNASTOOKA WIND FARM**

DRAWING NO: AGL44327\_T38\_01\_TURBINE\_38  
DATE: 21 MAY 2015  
CLIENT: ISSUESB1

SCALE:	AS INDICATED @ A3
VERSION:	1
DATE:	21.05.15
BY:	SOR
DATE:	10.07.15
BY:	TL

Site	Barnastooka Wind Farm
Turbine Base	<b>T38</b>

Methodology	
Seismic Refraction	24 ch. @ 1&2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	506955
Northing	572364
Elevation (mOD)	396.0

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.7	314	-	585	1200	-	-	-	-	PEAT	VERY SOFT	Diggable
0.7	1.3	985	<b>234</b>	859	2000	0.46	109.25	0.32	6.07	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
1.3	2.1	985	<b>370</b>	1361	2000	0.46	274.41	0.80	27.75	Clayey GRAVEL/GRAVEL	DENSE-VERY DENSE	Diggable
2.1	2.9	673	<b>474</b>	1740	2000	0.46	448.49	1.31	62.42	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.9	3.8	459	<b>716</b>	2629	2700	0.46	1382.63	4.04	400.04	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.8	4.6	673	<b>819</b>	3009	2700	0.46	1811.02	5.29	624.47	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.6	5.5	985	<b>1046</b>	3842	2700	0.46	2953.15	8.62	1399.29	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.5	7.2	985	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.2	9.0	985	<b>1143</b>	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

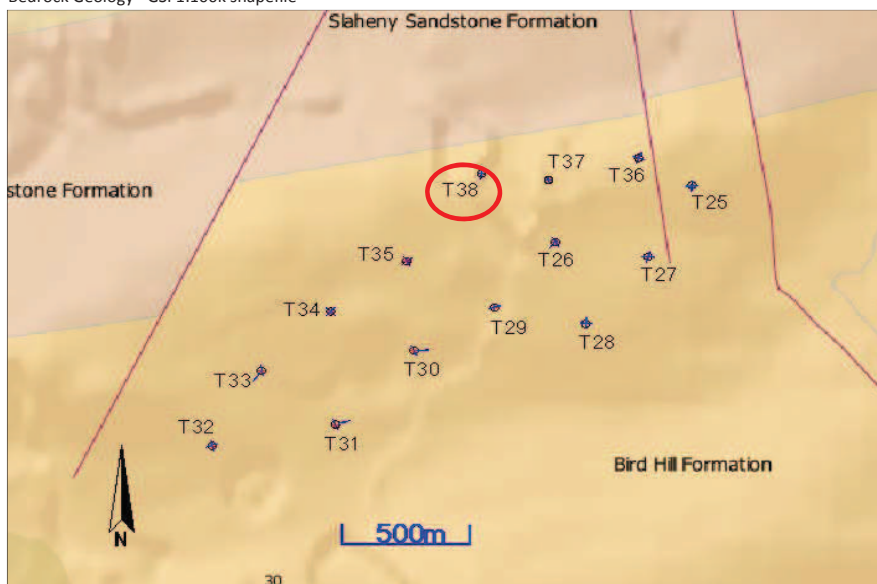
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Barnastooka Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T38**

Discussion
The base centre is characterised by medium dense-very dense clayey gravel from 0.7-2.9m bgl followed by slightly weathered-fresh sandstone.

Recommendations

## 6. APPENDIX B: SEISMIC PLATES

The following figures show the seismic refraction data acquired at each of the fourteen proposed turbine bases:

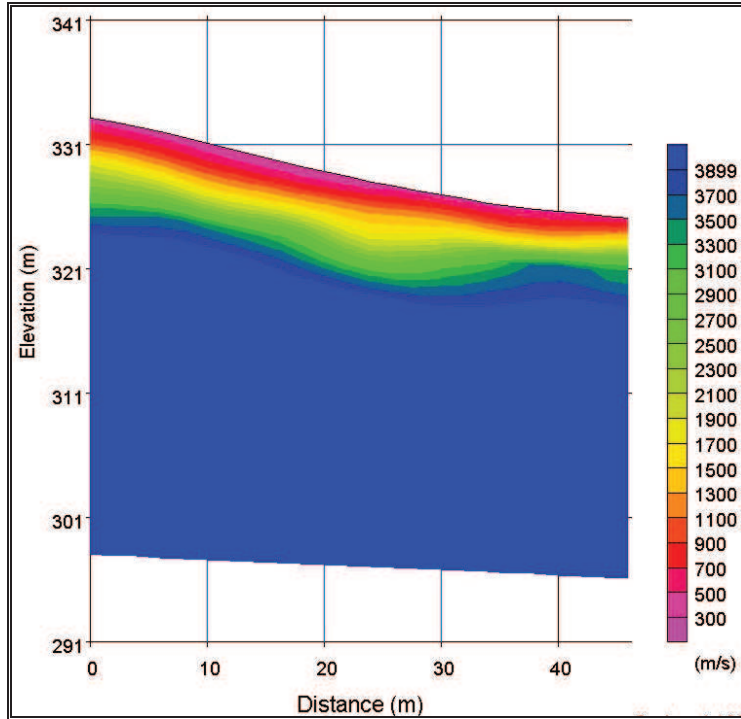


Fig.6.1. Tomographic Inversion of Profile S1 at Turbine Base T25.

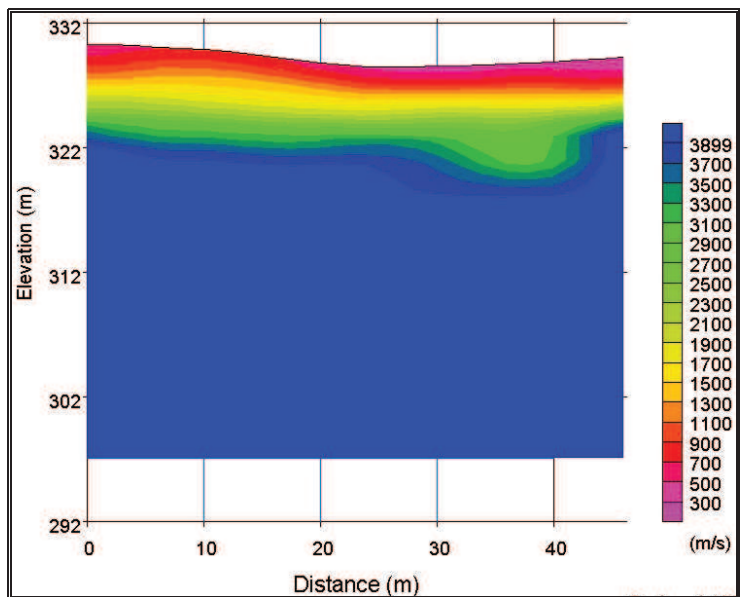


Fig.6.2. Tomographic Inversion of Profile S2 at Turbine Base T25.

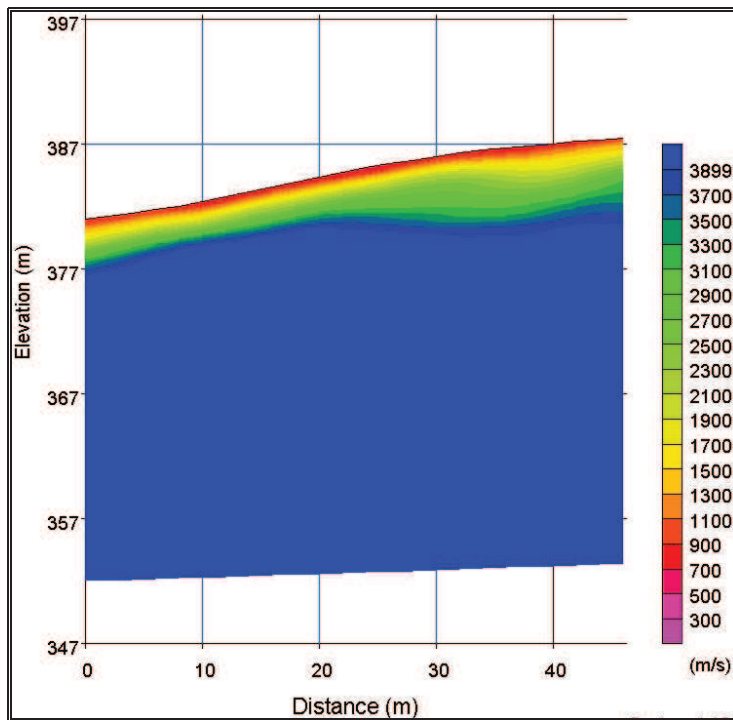


Fig.6.3. Tomographic Inversion of Profile S1 at Turbine Base T26.

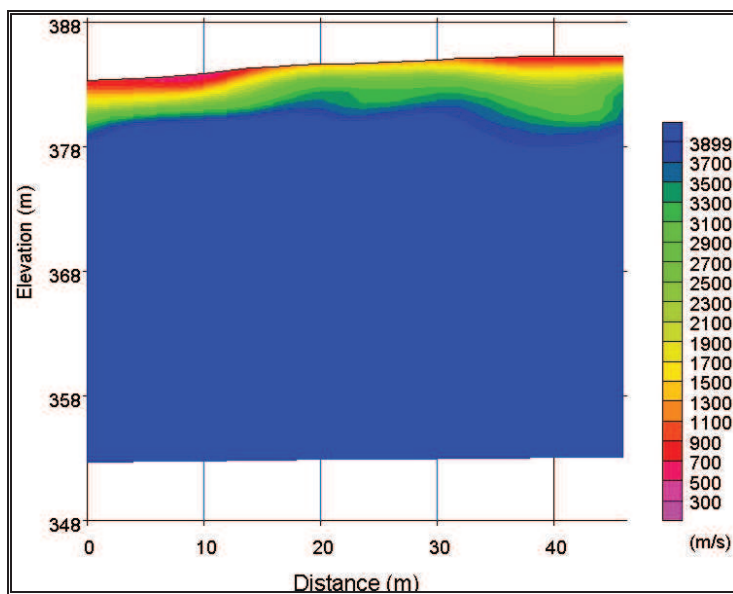


Fig.6.4. Tomographic Inversion of Profile S2 at Turbine Base T26.

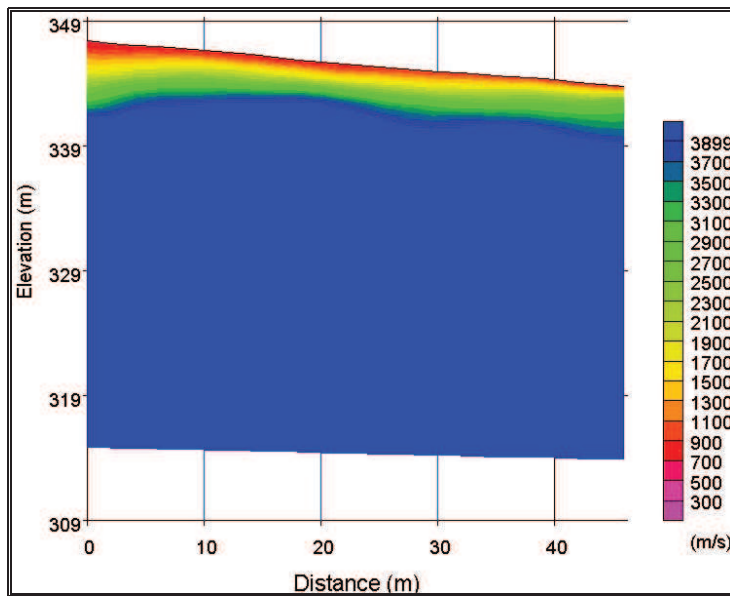


Fig.6.5. Tomographic Inversion of Profile S1 at Turbine Base T27.

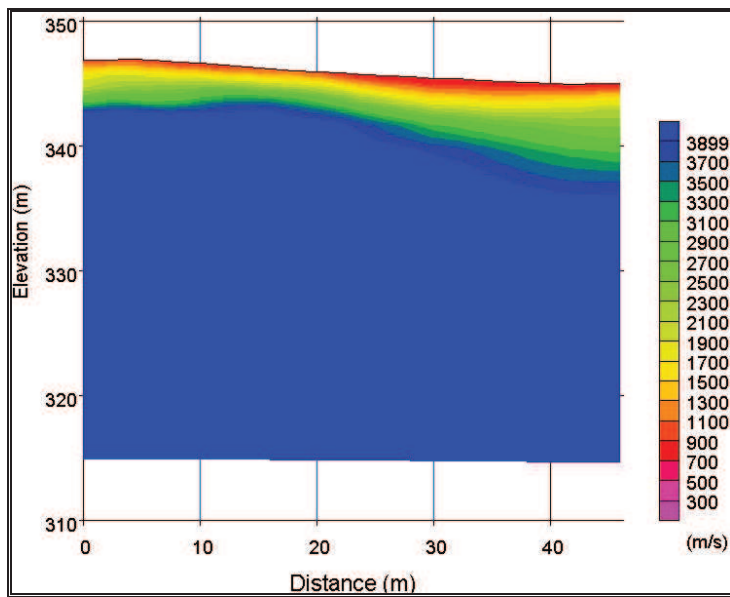


Fig.6.6. Tomographic Inversion of Profile S2 at Turbine Base T27.

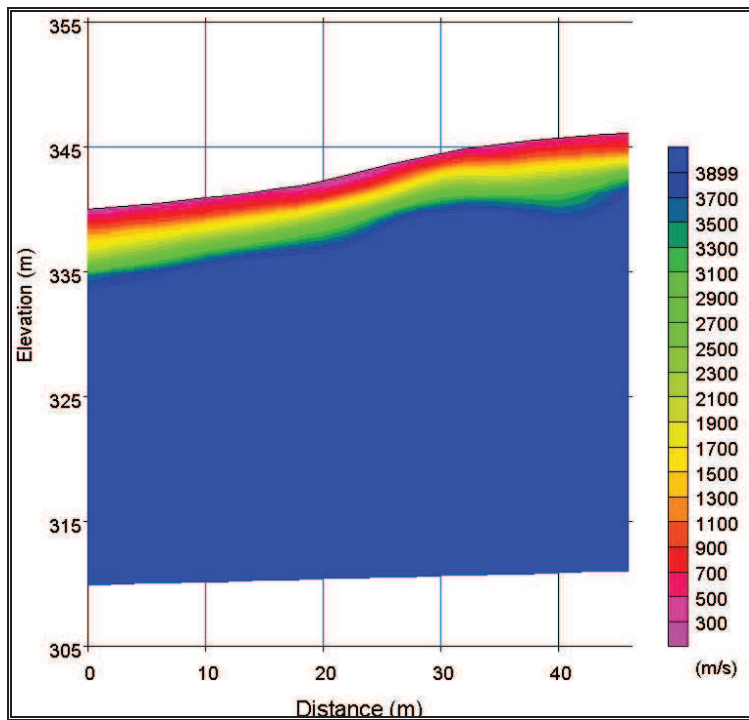


Fig.6.7. Tomographic Inversion of Profile S1 at Turbine Base T28.

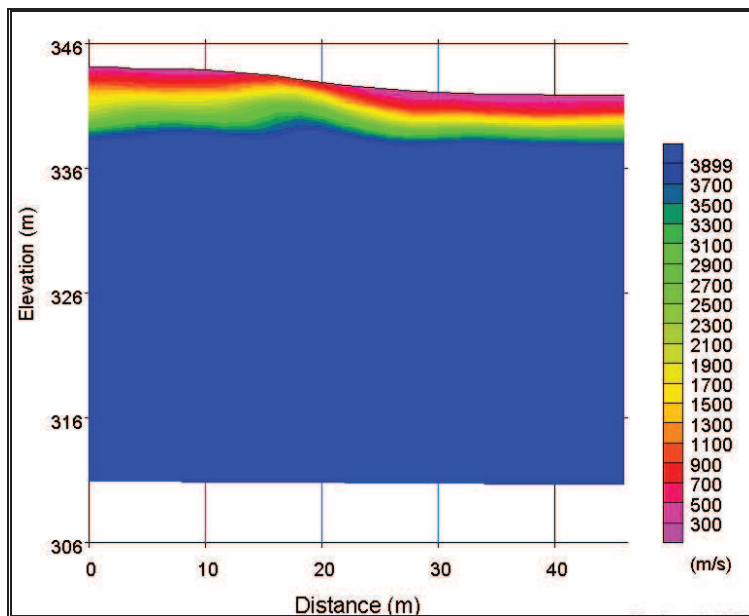


Fig.6.8. Tomographic Inversion of Profile S2 at Turbine Base T28.



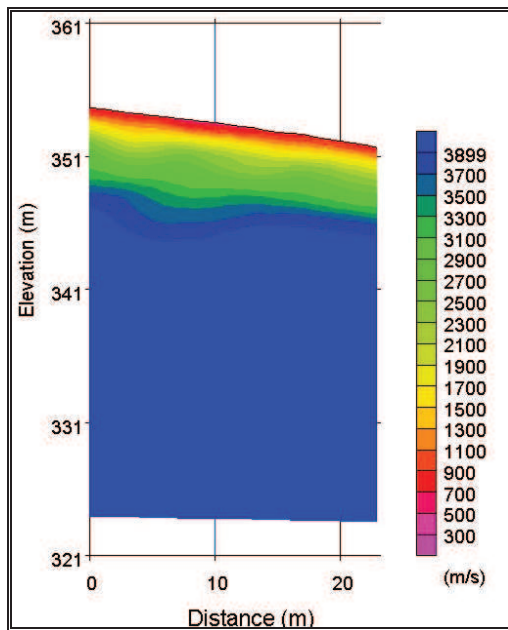


Fig.6.9. Tomographic Inversion of Profile S1 at Turbine Base T29.

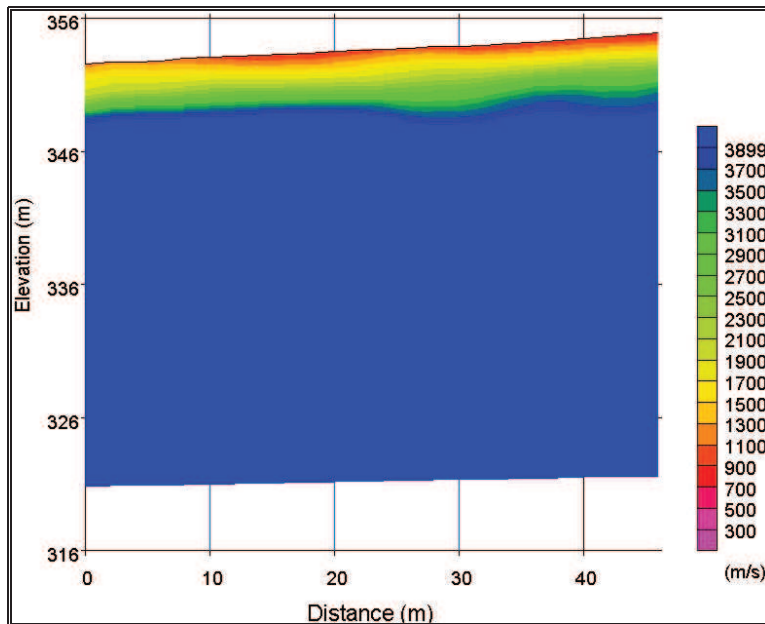


Fig.6.10. Tomographic Inversion of Profile S2 at Turbine Base T29.

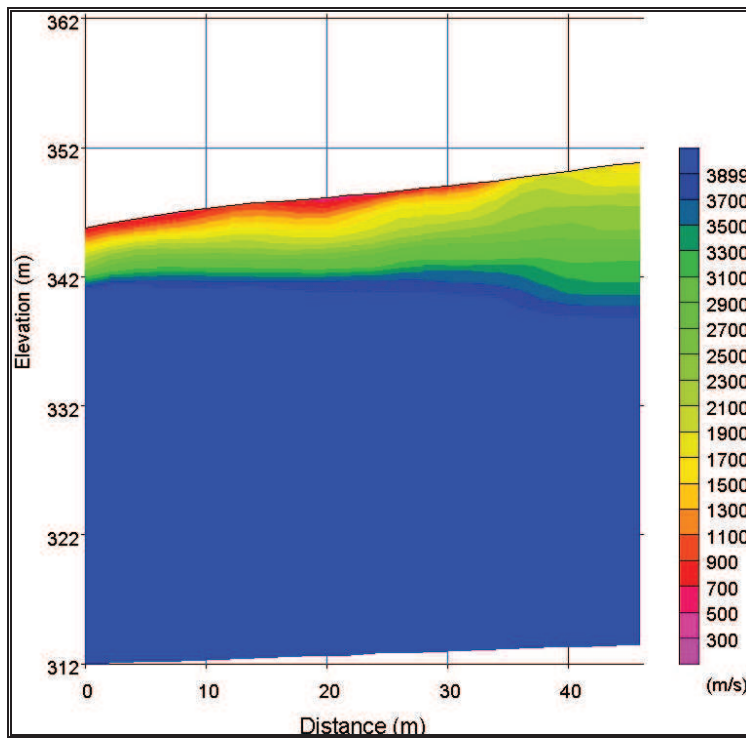


Fig.6.11. Tomographic Inversion of Profile S1 at Turbine Base T30.

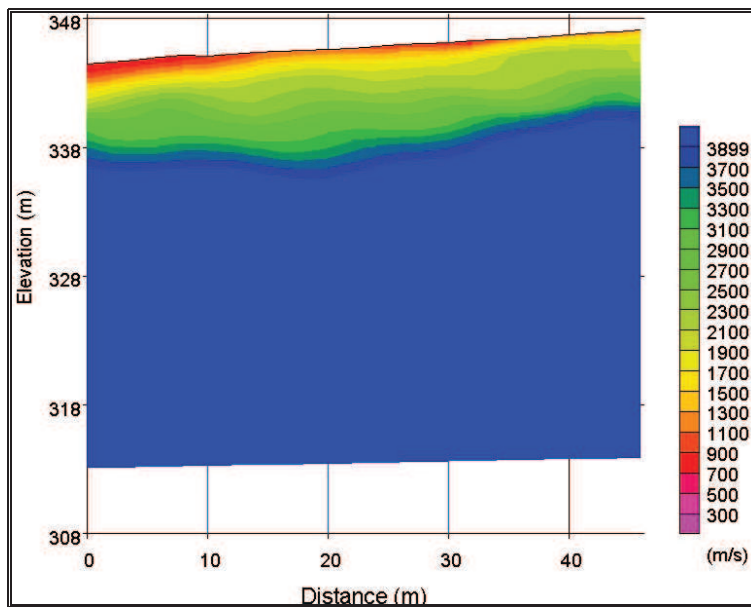


Fig.6.12. Tomographic Inversion of Profile S2 at Turbine Base T30.

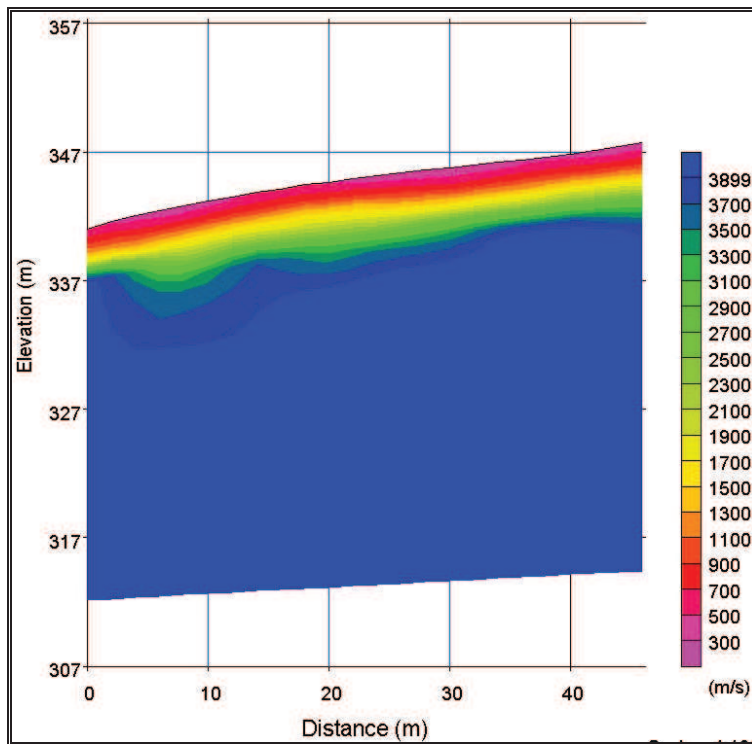


Fig.6.13. Tomographic Inversion of Profile S1 at Turbine Base T31.

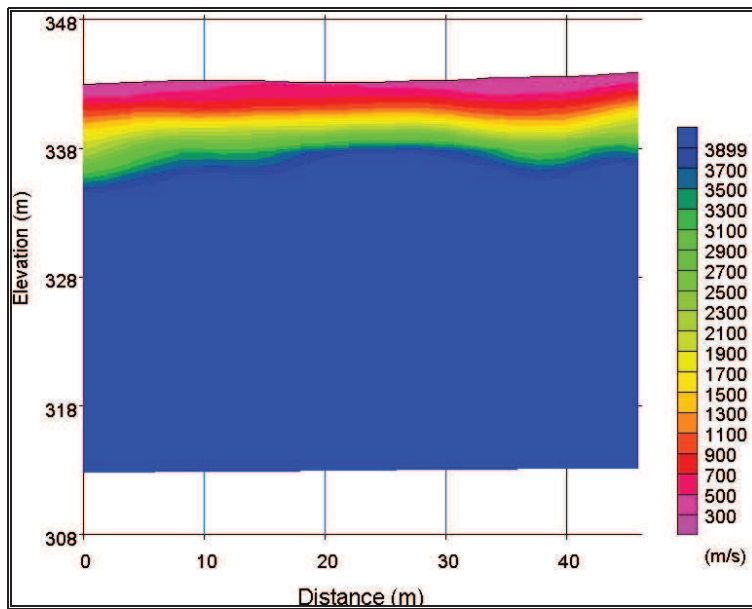


Fig.6.14. Tomographic Inversion of Profile S2 at Turbine Base T31.

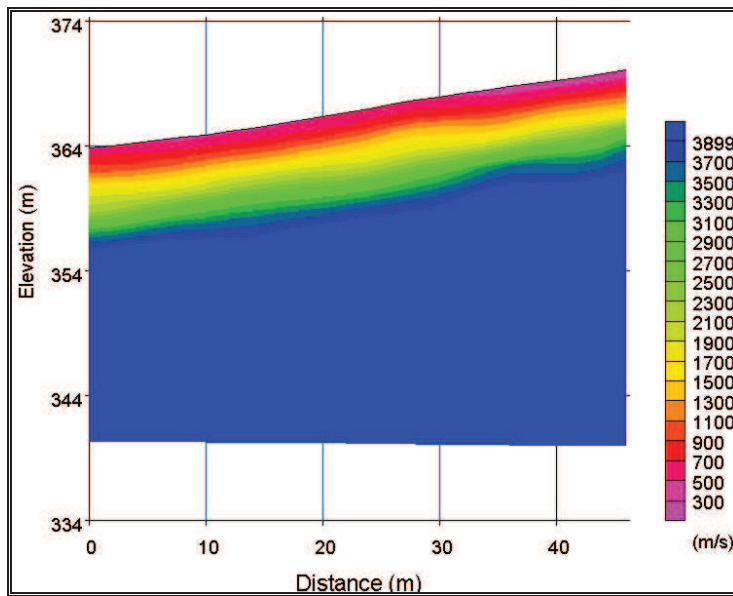


Fig.6.15. Tomographic Inversion of Profile S1 at Turbine Base T32.

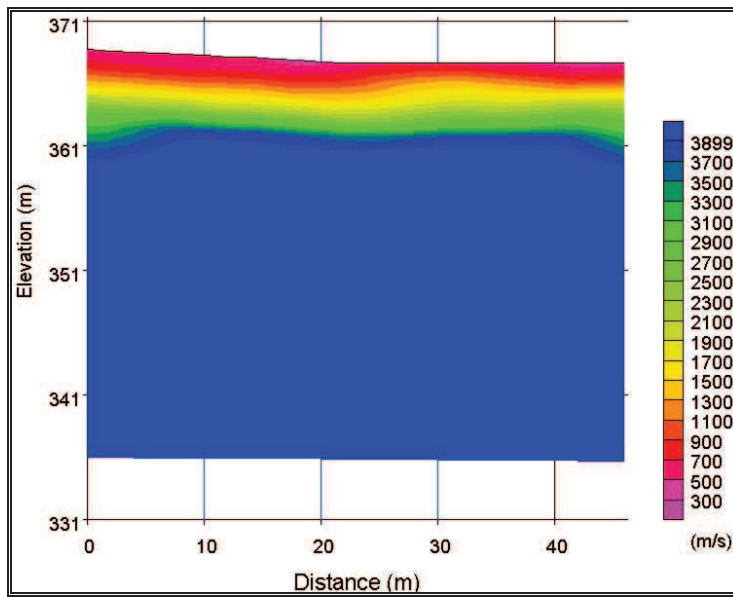


Fig.6.16. Tomographic Inversion of Profile S2 at Turbine Base T32.

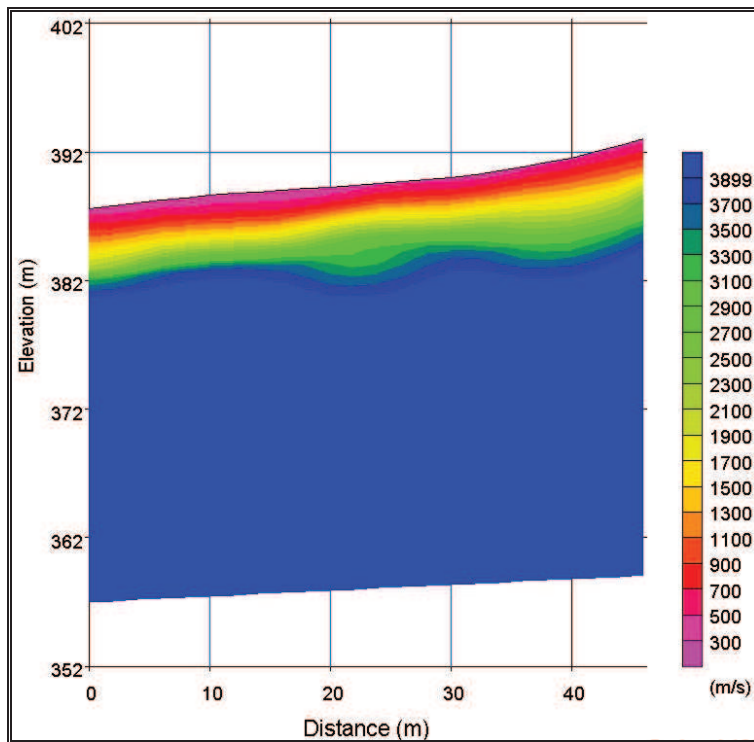


Fig.6.17. Tomographic Inversion of Profile S1 at Turbine Base T33.

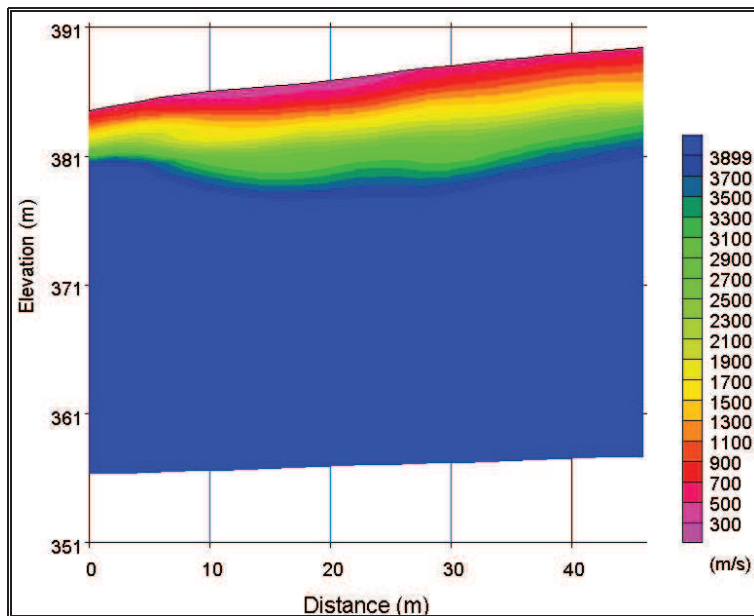


Fig.6.18. Tomographic Inversion of Profile S2 at Turbine Base T33.

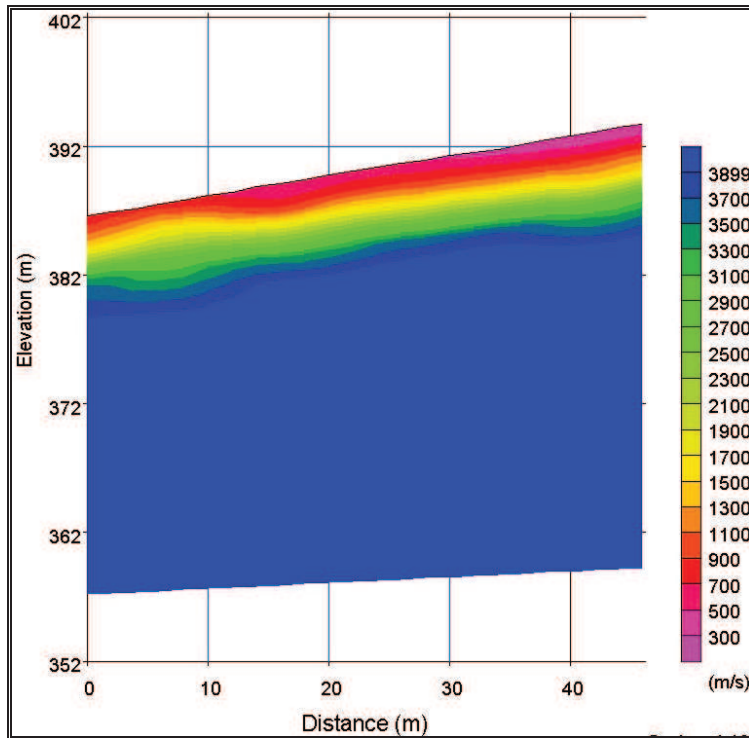


Fig.6.19. Tomographic Inversion of Profile S1 at Turbine Base T34.

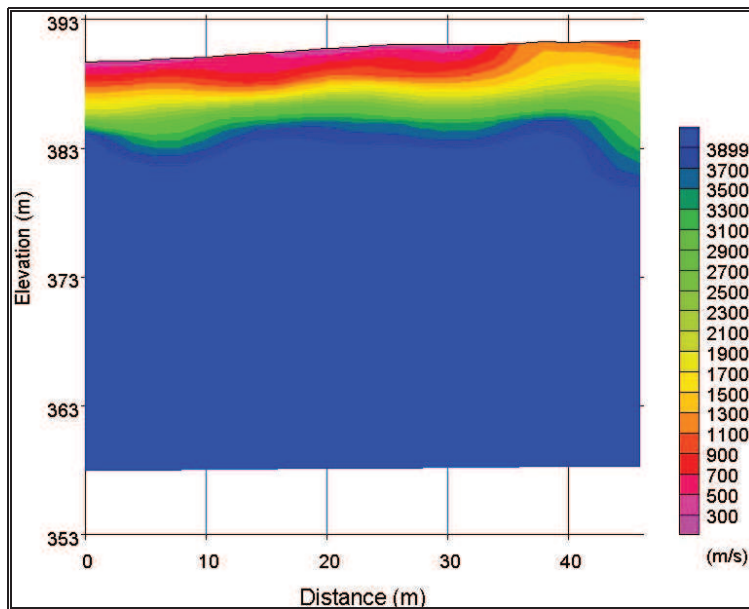


Fig.6.20. Tomographic Inversion of Profile S2 at Turbine Base T34.

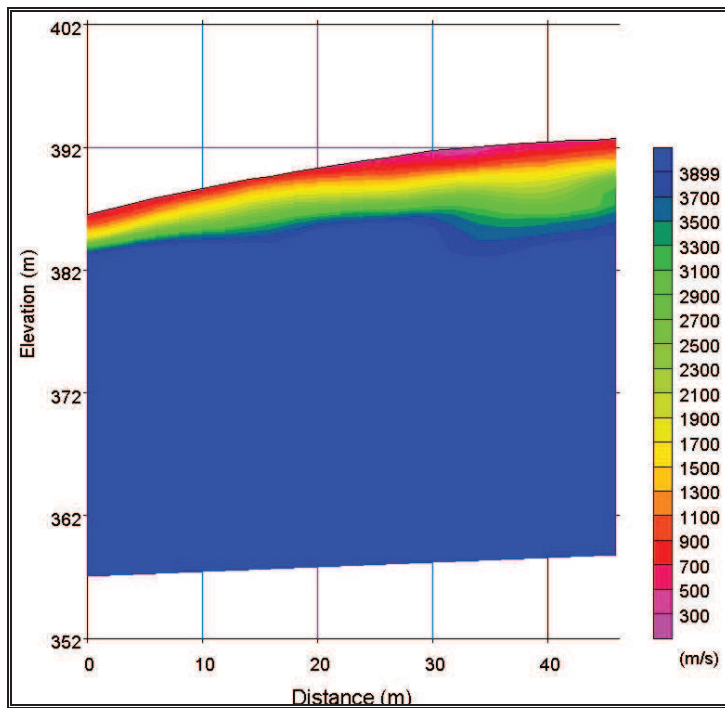


Fig.6.21. Tomographic Inversion of Profile S1 at Turbine Base T35.

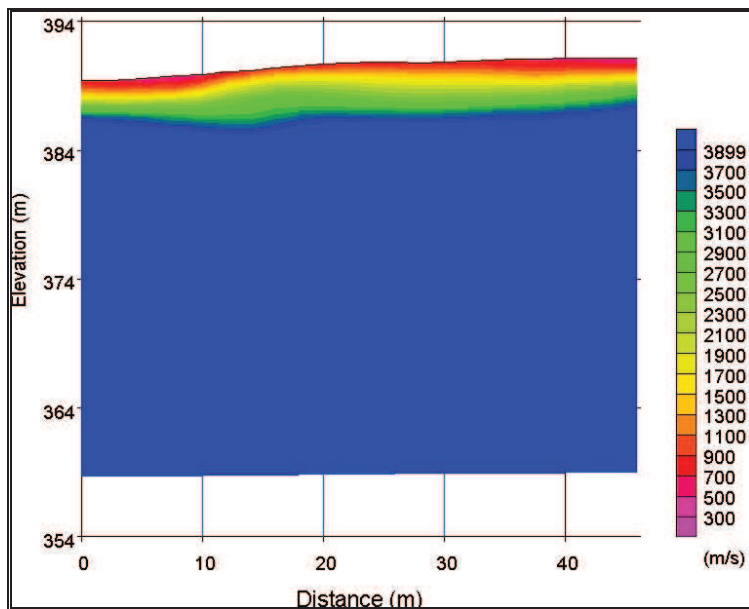


Fig.6.22. Tomographic Inversion of Profile S2 at Turbine Base T35.

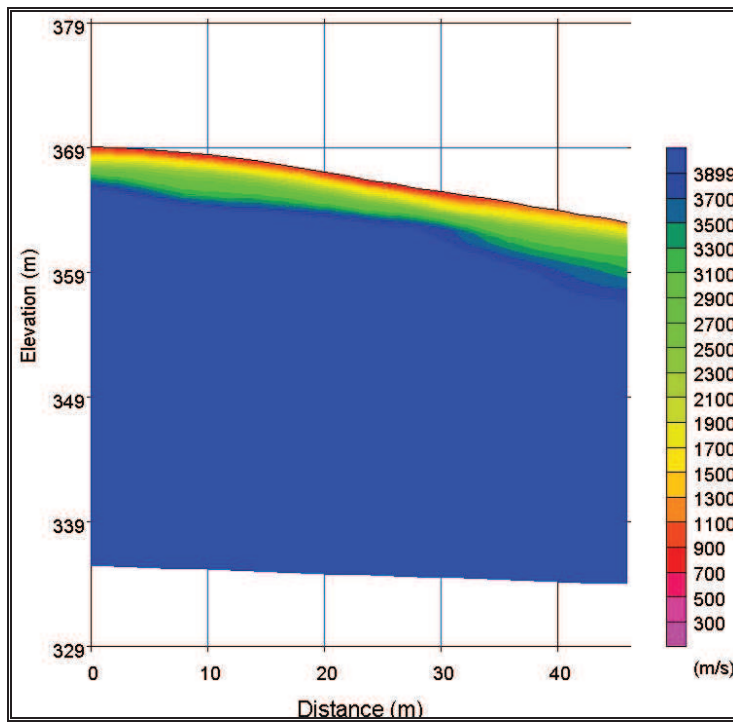


Fig.6.23. Tomographic Inversion of Profile S1 at Turbine Base T36.

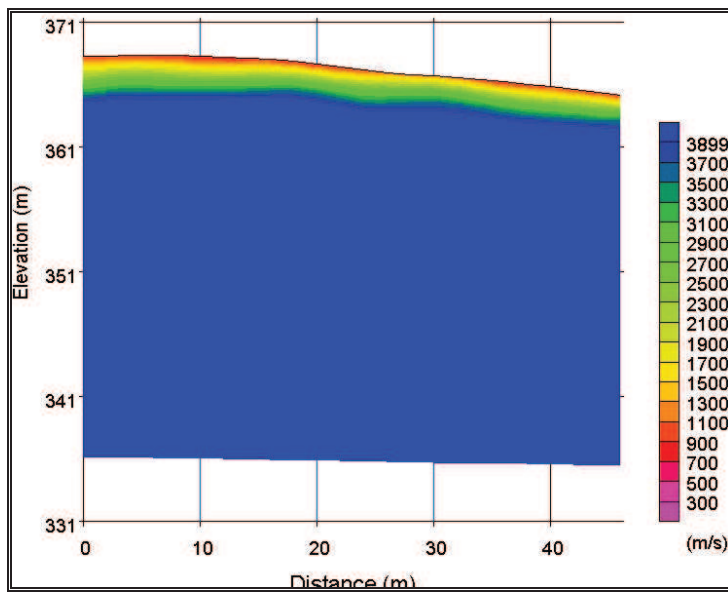


Fig.6.24. Tomographic Inversion of Profile S2 at Turbine Base T36.



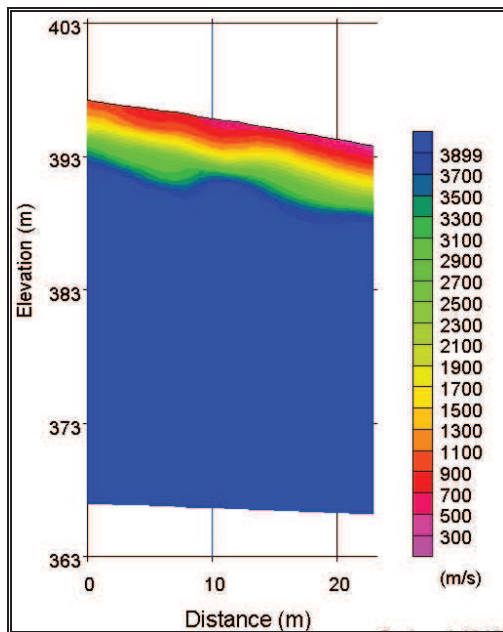


Fig.6.25. Tomographic Inversion of Profile S1 at Turbine Base T37.

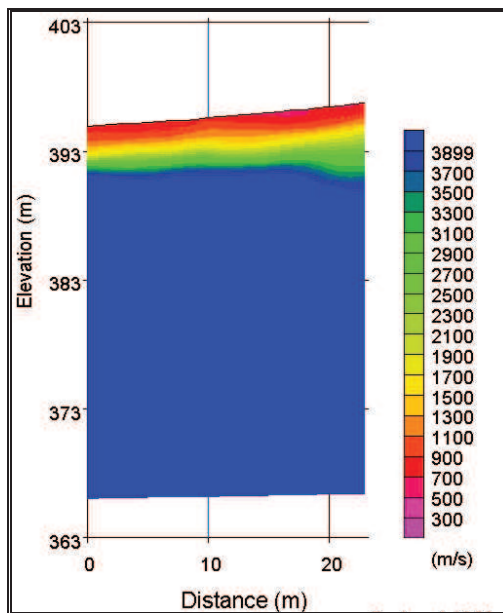


Fig.6.26. Tomographic Inversion of Profile S2 at Turbine Base T37.

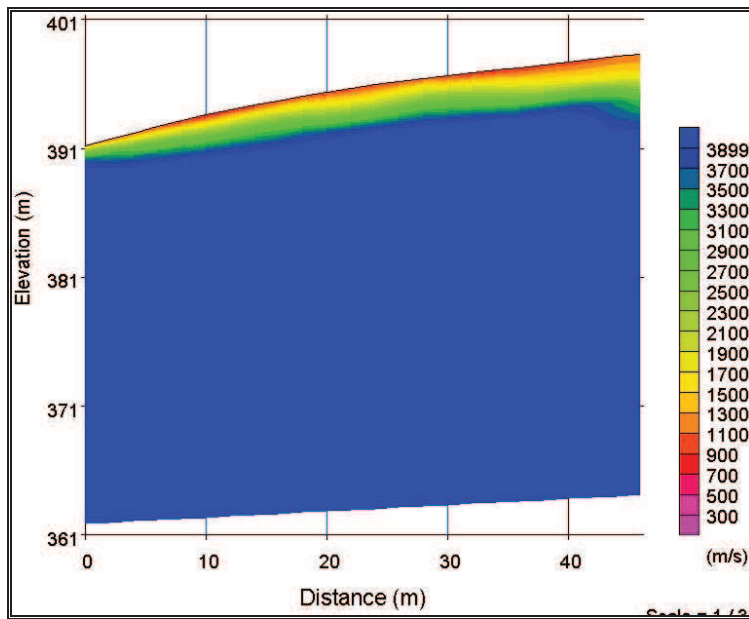


Fig.6.27. Tomographic Inversion of Profile S1 at Turbine Base T38.

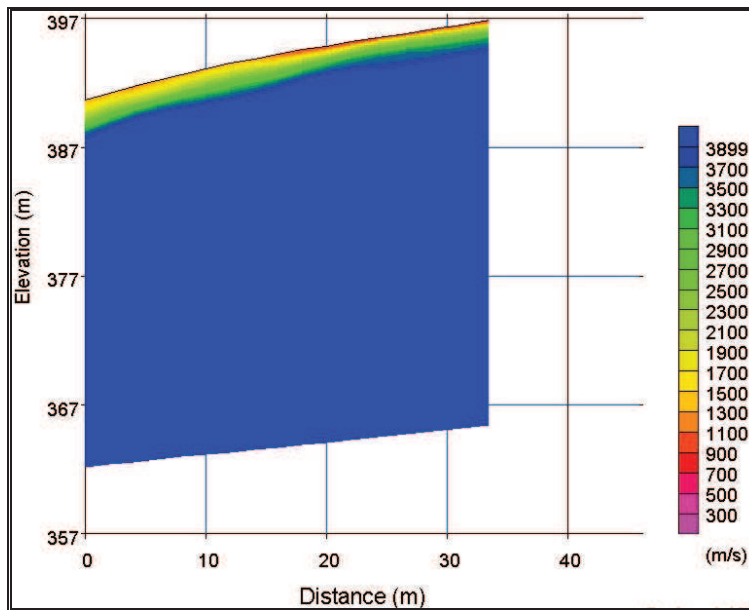


Fig.6.28. Tomographic Inversion of Profile S2 at Turbine Base T38.

## 7. APPENDIX C: DETAILED METHODOLOGY

A combination of a number of geophysical techniques was used to provide the high quality interpretation and reduce any ambiguities, which may otherwise exist. The data was acquired from 23<sup>rd</sup> March to 1<sup>st</sup> April 2015.

### 7.1 Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

#### 7.1.1 Principles

This surveying technique makes use of the Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. The 2D-resistivity profiling method involves the use of 32 electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.



#### 7.1.2 Data Collection

Profiles were recorded using a Tigre resistivity meter, imaging software, one 32 takeout multicore cable and up to 32 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after survey. A 3m electrode spacing was used throughout, with each profile 93m in length which has a depth of penetration of 15m. Two orthogonal profiles were acquired at each of the turbine bases.

#### 7.1.3 Data Processing

The field readings were stored in computer files and inverted using the RES2DINV package (Campus Geophysical Instruments, 1997) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-Depth model of the resistivities.

The inverted 2D-Resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Distance is indicated along the

horizontal axis of the profiles. Profiles have been contoured using the same contour intervals and colour codes.

## 7.2 Seismic refraction profiling

### 7.2.1 Principles

This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity ( $V_p$ ) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher  $V_p$  velocities while soft, loose or fractured materials have lower  $V_p$  velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

### 7.2.2 Data Collection

A Geode high resolution 24 channel digital seismograph, 24 10HZ vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable (1-2m spacing). Equipment was carried was operated by a two-person crew. Two orthogonal profiles were acquired at each of the turbine bases.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile.( eg. 69m profile ~23m depth, 33m profile ~ 11m depth)

Shots from seven different positions were taken (2 x off-end, 2 x end, 3 x middle) to ensure optimum coverage of all refractors. All profiles were surveyed to Irish National Grid using a ProXR dGPS system.



### 7.2.3 Data Processing

The recorded data was interpreted using the ray-tracing and tomographic inversion methods, to acquire depths to layer boundaries and the P-wave velocities of these layers, using the SeisImager/2D programme from Geometrics.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The programme includes three methods for data analysis, time-term inversion, the reciprocal method and tomography.

The time-term method uses a least squares approach to calculate delay times to determine a discrete layer solution for the data.

In the reciprocal method delay times are calculated manually to also determine a discrete layer solution for the data.

The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method.

## 7.3 Multichannel Analysis of Surface Waves (MASW)

MASW profiling was carried out to provide information on overburden material stiffness or density and on the bedrock quality.

### 7.3.1 Principles

The Multi-channel Analysis of Surface Waves (MASW) (Park et al., 1998, 1999) utilizes Surface waves (Rayleigh waves) to determine the elastic properties of the shallow subsurface (<15m). Surface waves carry up to two-thirds of the seismic energy but are usually considered as noise in conventional body wave reflection and refraction seismic surveys.

The penetration depth of surface waves changes with wavelength, i.e. longer wavelengths penetrate deeper. When the elastic properties of near surface materials vary with depth, surface waves then become dispersive, i.e. propagation velocity changes with frequency. The propagation (or phase) velocity is determined by the average elastic property of the medium within the penetration depth. Therefore the dispersive nature of surface waves may be used to investigate changes in elastic properties of the shallow subsurface.

The MASW method employs the multi-channel recording and processing techniques (Sheriff and Geldart, 1982) that have similarities to those used in a seismic reflection survey and which allow better waveform analysis and noise elimination. To produce a shear wave velocity ( $V_s$ ) profile and a stiffness profile of the subsurface using Surface waves the following basic procedure is followed:

- (i) A point source (eg. a sledgehammer) is used to generate vertical ground motions,
- (ii) The ground motions are measured using low frequency geophones, which are disposed along a straight line directed toward the source,

(iii) the ground motions are recorded using either a conventional seismograph, oscilloscope or spectrum analyzer,

(iv) a dispersion curve is produced from a spectral analysis of the data showing the variation of Surface wave velocity with wavelength,

(v) the dispersion curve is inverted using a modeling and least squares minimization process to produce a subsurface profile of the variation of Surface wave and shear wave velocity with depth.

### 7.3.2 Data Collection

The recording equipment consisted of a Geode 24 channel digital seismograph, 24 no. 10HZ vertical geophones, hammer energy source with mounted trigger and a 24 take-out cable. Two orthogonal profiles were acquired at each of the turbine bases, with a 1m geophone spacing.



### 7.3.3 Data Processing

MASW processing was carried out using the SURFSEIS processing package developed by Kansas Geological Survey (KGS, 2000). SURFSEIS is designed to generate a shear wave ( $V_s$ ) velocity profile.

SURFSEIS data processing involves three steps:

- (i) Preparation of the acquired multichannel record. This involves converting data file into the processing format.
- (ii) Production of a dispersion curve from a spectral analysis of the data showing the variation of Rayleigh wave phase velocity with wavelength. Confidence in the dispersion curve can be estimated through a measure of signal to noise ratio ( $S/N$ ), which is obtained from a coherency analysis. Noise includes both body waves and higher mode surface waves. To obtain an accurate dispersion curve the spectral content and phase velocity characteristics are examined through an overtone analysis of the data.

(iii) Inversion of the dispersion curve is then carried out to produce a subsurface profile of the variation of shear wave velocity with depth.

### 7.3.4 Relocation

All data were referenced using a ProXR dGPS system with sub 1m accuracy. All positions within this report are given in ITM coordinates.

## 7.4 Soil Resistivity

### 7.4.1 Principles

The method used is the four point method as described in IEEE Std 81-1983 (Guide for measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System); with a modification in the “a” spacings as detailed below as specified by the client ESBi.

This method utilizes the equally spaced Wenner Array to determine the apparent resistivity of the ground material using four electrodes placed in a line in the ground and a current is passed through the two outer electrodes. The potential difference (V) is measured across the two inner electrodes. The measured potential is divided by the current value (I) to obtain the resistance (R) using the following formula:  $V/I=R$ .

The resistivity is determined from the measured resistance at each electrode spacing using the following standard formula for the Wenner array:

Resistivity (ohm-m)  $\rho = R * 2 * \pi * \text{inter-electrode spacing}$ .

Single measurements were taken with the four electrodes having inter-electrode separations (‘a’ spacing) of 0.3, 0.5, 0.7, 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40, 50, 60, 80 and 100m.

(IEEE Std 81-1983 states that use of an electrode spacing of  $a$  m gives approximately the average resistivity of the soil to  $a$  m, although general geophysical experience indicates that the effective depth of penetration for the Wenner array is approximately  $a/2$  m).

### 7.4.2 Data Collection

One set of Soil Resistivity Measurements were recorded at turbines T33 and T36 as shown on Drawings AGL14327\_T33\_01 & AGL14327\_T36\_01.

### 7.4.3 Data Processing

The field readings were converted to apparent resistivities using the formula  $\text{Resistivity} = R * 2 * \pi * a$  where :

R = measured resistance (ohms)

a = inter-electrode spacing

The results are summarised in Appendix D.

#### **7.4.4 Relocation**

All data were referenced using a Pro-XR GPS system with c.1m accuracy.



## **Appendix 4**

### **Laboratory Test Records (Soils)**

IGSL Ltd  
 Materials Laboratory  
 Unit J5, M7 Business Park  
 Newhall, Naas  
 Co. Kildare  
 045 846176

# Test Report

## Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3



Report No. **R65028**      Contract No. 18312      Contract Name: Barnastooka Windfarm  
 Customer ESB Wind Development Ltd  
 Samples Received: 30/06/15      Date Tested: 30/06/15

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP016	AA21680	1.6	A15/2049	B	12	26	NP	NP	43	WS	4.4		Purple/Brown slightly sandy, gravelly, SILT
TP023	AA21665	1.5	A15/2050	B	11	36	NP	NP	29	WS	4.4		Purple/Brown silty, very sandy, GRAVEL
TP029	AA16699	1.8	A15/2051	B	8.9	21	NP	NP	56	WS	4.4		Dark brown/purple slightly sandy, slightly gravelly, SILT
TP029A	AA25439	3.0	A15/2062	B	9	21	NP	NP	39	WS	4.4		Purple/brown slightly sandy, gravelly, SILT with some cobbles
TP040	AA25449	1.9	A15/2060	B	9.5	23	NP	NP	33	WS	4.4		Purple/brown slightly sandy, gravelly, SILT
TP051	AA21693	1.6	A15/2053	B	11	26	NP	NP	57	WS	4.4		Dark brown silty, very sandy, GRAVEL
TP079	AA16690	2.0	A15/2054	B	19	34	NP	NP	44	WS	4.4		Purple/brown very sandy gravelly SILT
TP080	AA16687	2.8	A15/2055	B	9.9	29	NP	NP	43	WS	4.4		Purple/Brown slightly sandy, gravelly, SILT
TP087	AA16667	2.0	A15/2056	B	8.8	26	NP	NP	45	WS	4.4		Purple/brown silty, very sandy, GRAVEL with some cobbles
TP097	AA27944	2.8	A15/2057	B	9.3		NP	NP					Mottled purple/brown slightly sandy, gravelly, SILT
TPS2	AA16656	2.0	A15/2056	B	15	25	NP	NP	59	WS	4.4		Mottled pink/brown slightly sandy, slightly gravelly, SILT
TPR001	AA25425	2.0	A15/2063	B	13	32	NP	NP	68	WS	4.4		Purple/brown sandy, slightly gravelly, SILT

Notes: Preparation: WS - Wet sieved      Sample Type: B - bulk disturbed  
 AR - As received      U - Undisturbed  
 NP - Non plastic  
 Liquid Limit 4.3 Cone Penetrometer definitive method  
 Clause: 4.4 Cone Penetrometer one point method  
 Remarks: Opinions and interpretations are outside the scope of accreditation.  
 The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by	Date	Page
		H.Byrne	08/07/15	1 of 1

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

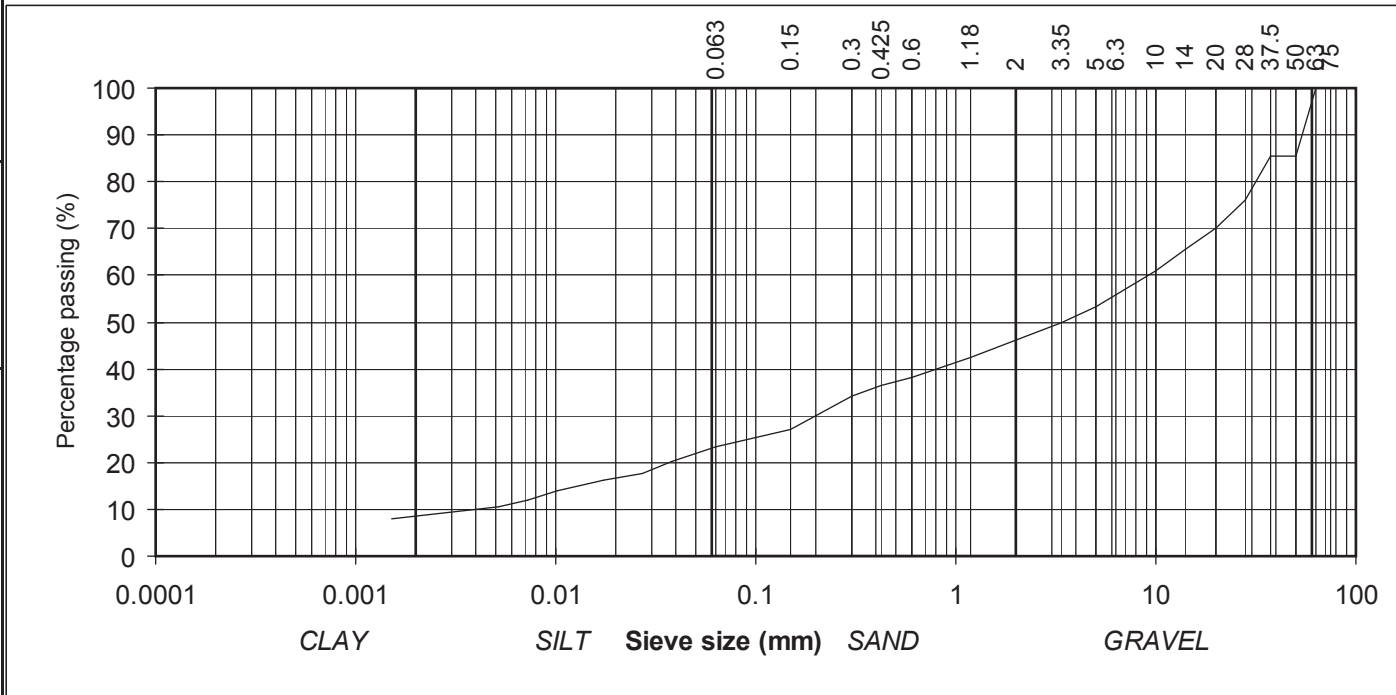
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	86	
37.5	86	
28	76	
20	70	GRAVEL
14	66	
10	61	
6.3	56	
5	53	
3.35	50	
2	46	
1.18	42	SAND
0.6	38	
0.425	36	
0.3	34	
0.15	27	SILT/CLAY
0.063	23	
0.038	20	
0.027	18	
0.017	16	
0.010	14	
0.007	12	
0.005	10	
0.002	8	

Contract No: 18312      Report No. R65944  
 Contract: Barnastooka Wind Farm  
 TP: TP016  
 Sample No. AA21680      Lab. Sample No. A15/2049  
 Sample Type: B  
 Depth (m) 1.60m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/Brown slightly sandy, gravelly, SILT

Remarks      Sample size did not meet the requirements of BS1377



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

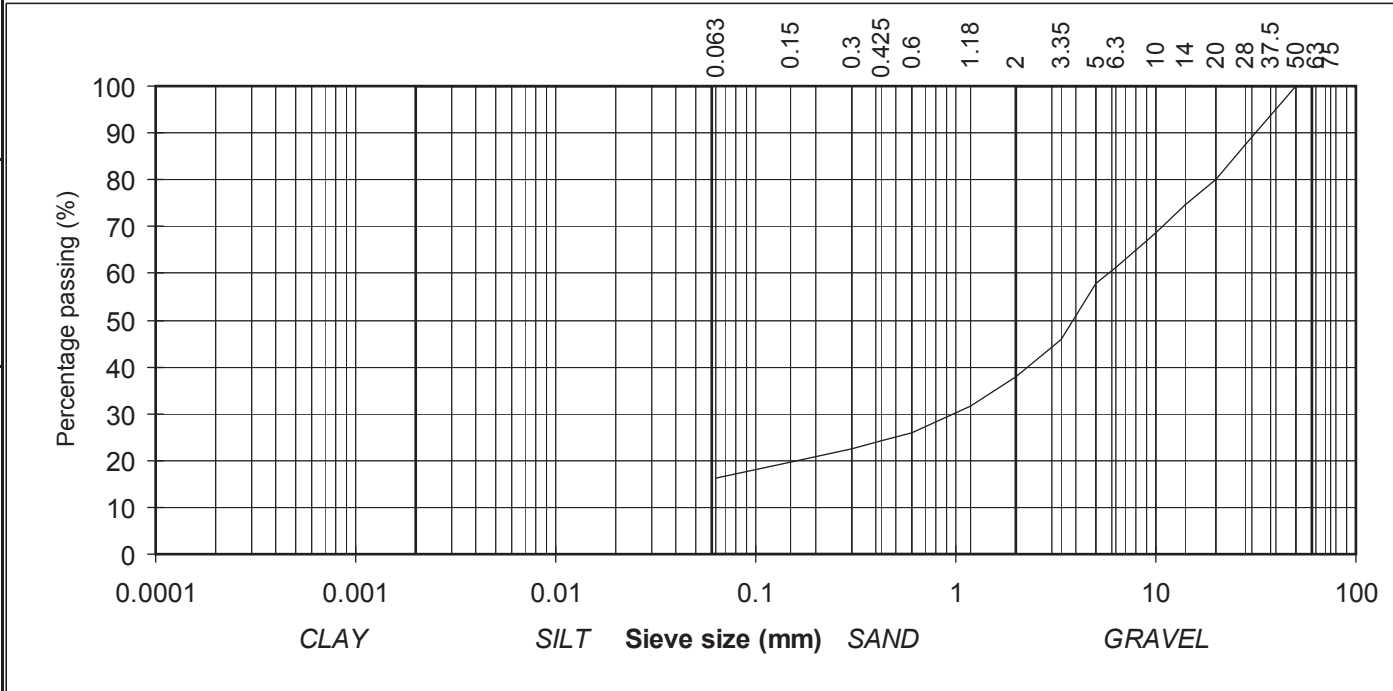
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	94	GRAVEL
28	87	
20	80	
14	75	
10	69	
6.3	61	
5	58	
3.35	46	
2	38	
1.18	32	
0.6	26	SAND
0.425	24	
0.3	23	
0.15	20	SILT/CLAY
0.063	16	

Contract No: 18312      Report No. R65945  
 Contract: Barnastooka Wind Farm  
 TP: TP023  
 Sample No. AA21665      Lab. Sample No. A15/2050  
 Sample Type: B  
 Depth (m) 1.50m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/Brown silty, very sandy, GRAVEL

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

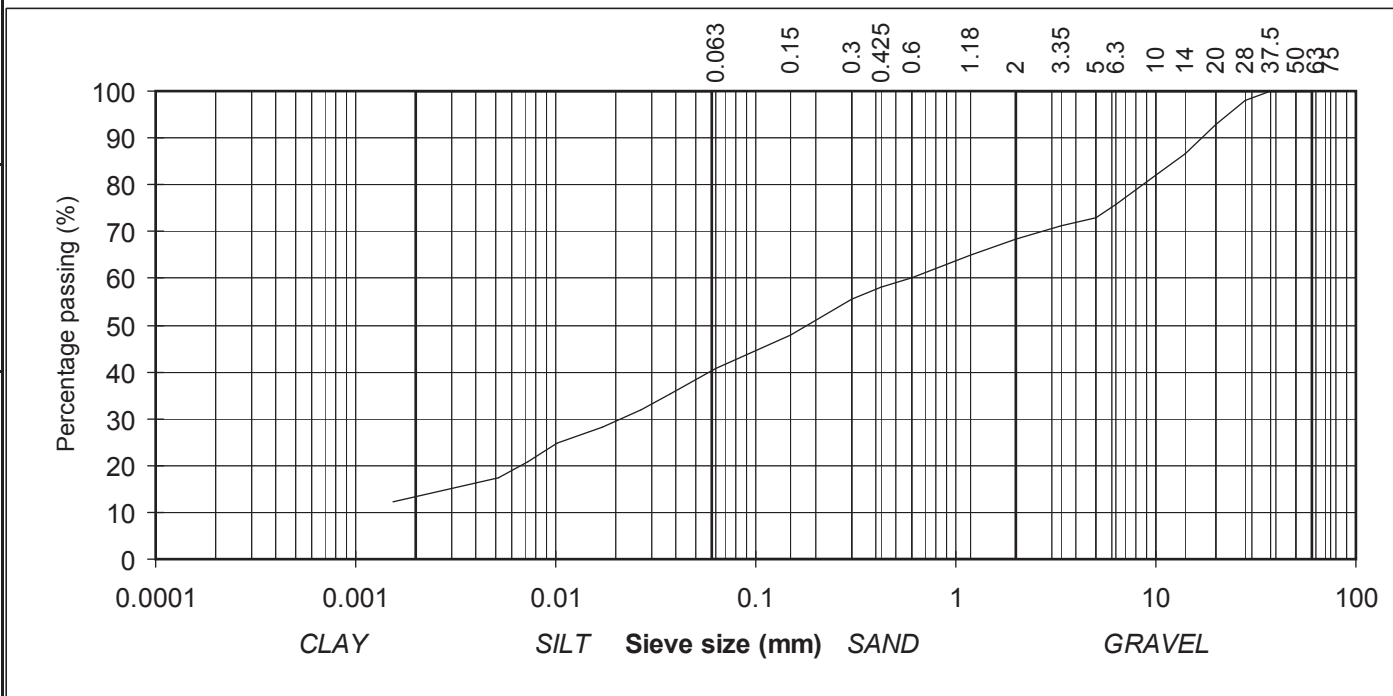
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	GRAVEL
28	98	
20	93	
14	87	
10	82	
6.3	76	
5	73	
3.35	71	SAND
2	69	
1.18	65	
0.6	60	
0.425	58	SILT/CLAY
0.3	56	
0.15	48	
0.063	41	
0.037	35	
0.027	32	
0.017	28	
0.010	25	
0.007	21	
0.005	17	
0.002	12	

Contract No: 18312      Report No. R65946  
 Contract: Barnastooka Wind Farm  
 TP: TP029  
 Sample No. AA16699      Lab. Sample No. A15/2051  
 Sample Type: B  
 Depth (m) 1.80m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Dark brown/purple slightly sandy, slightly gravelly, SILT

Remarks



**IGSL Ltd Materials Laboratory**

Approved by:	Date:	Page no:
H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

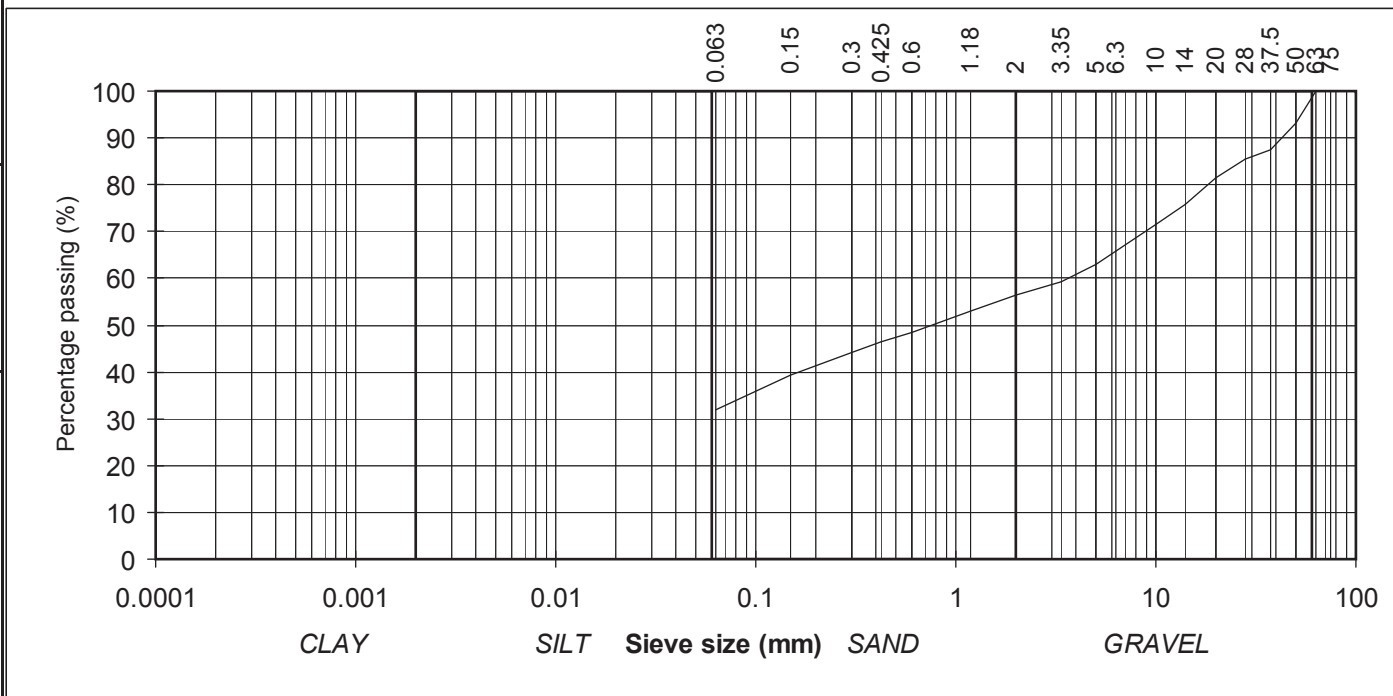
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	93	GRAVEL
37.5	88	
28	85	
20	81	
14	76	
10	72	
6.3	66	
5	63	
3.35	59	SAND
2	56	
1.18	53	
0.6	48	
0.425	46	SILT/CLAY
0.3	44	
0.15	39	
0.063	32	

Contract No: 18312      Report No. R65955  
 Contract: Barnastooka Wind Farm  
 TP: TP R001  
 Sample No. AA25439      Lab. Sample No. A15/2062  
 Sample Type: B  
 Depth (m) 2.00m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Mottled pink/brown slightly sandy, gravelly, SILT

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

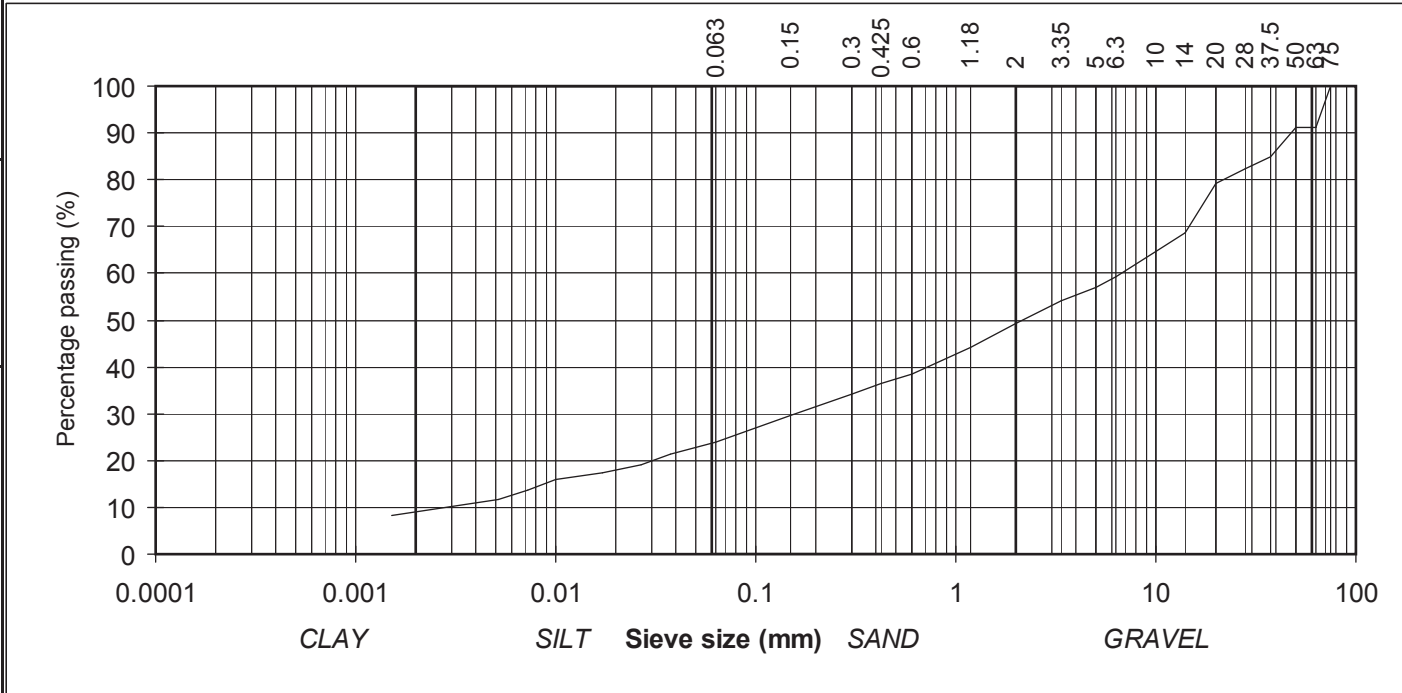
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	91	
50	91	
37.5	85	
28	82	
20	79	GRAVEL
14	69	
10	65	
6.3	59	
5	57	
3.35	54	
2	49	
1.18	44	
0.6	39	
0.425	37	
0.3	34	
0.15	30	
0.063	24	
0.037	21	
0.027	19	SILT/CLAY
0.017	17	
0.010	16	
0.007	14	
0.005	12	
0.002	8	

Contract No: 18312      Report No. R65947  
 Contract: Barnastooka Wind Farm  
 TP: TP040  
 Sample No. AA25449      Lab. Sample No. A15/2052  
 Sample Type: B  
 Depth (m) 1.90m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/brown slightly sandy, gravelly, SILT with some cobbles

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

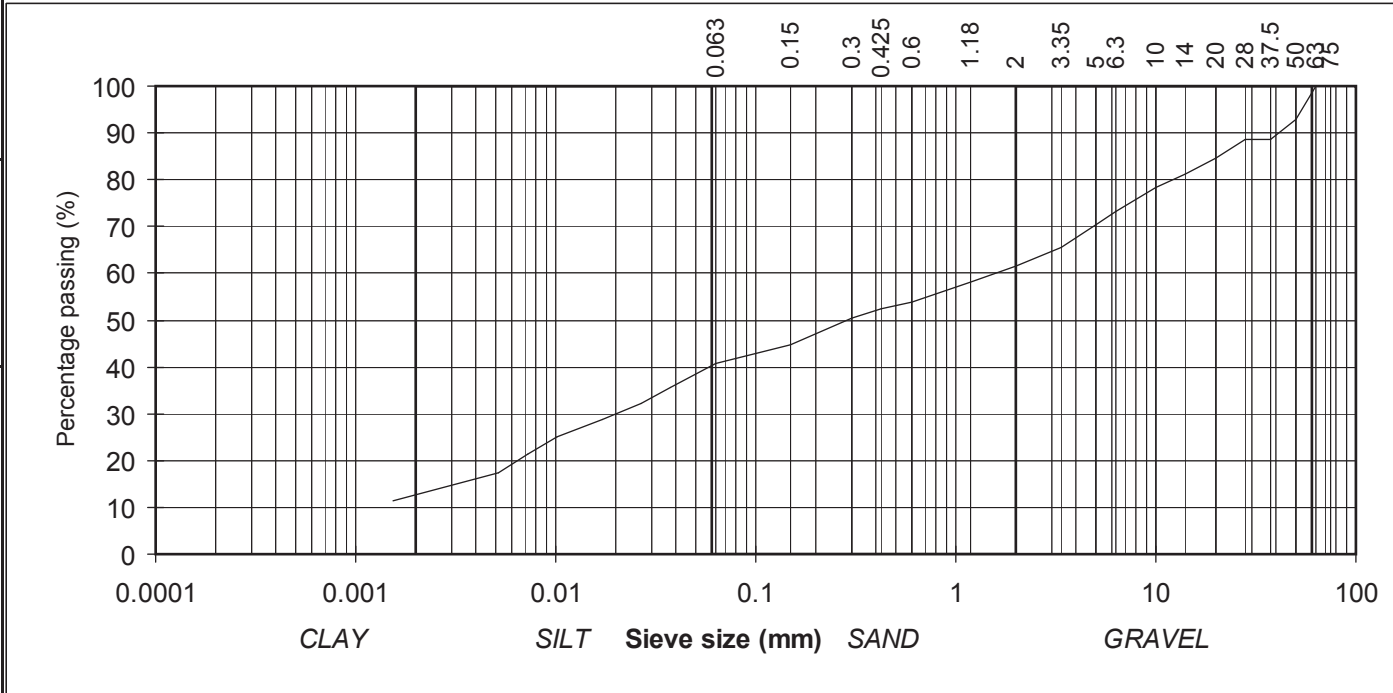
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	93	
37.5	89	GRAVEL
28	89	
20	85	
14	81	
10	78	
6.3	73	
5	70	
3.35	66	SAND
2	61	
1.18	58	
0.6	54	
0.425	52	
0.3	50	SILT/CLAY
0.15	45	
0.063	41	
0.037	36	
0.027	32	
0.017	29	
0.010	25	
0.007	21	
0.005	17	
0.002	11	

Contract No: 18312      Report No. R65948  
 Contract: Barnastooka Wind Farm  
 TP: TP051  
 Sample No. AA21693      Lab. Sample No. A15/2053  
 Sample Type: B  
 Depth (m) 1.60m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/brown slightly sandy, gravelly, SILT

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)



# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

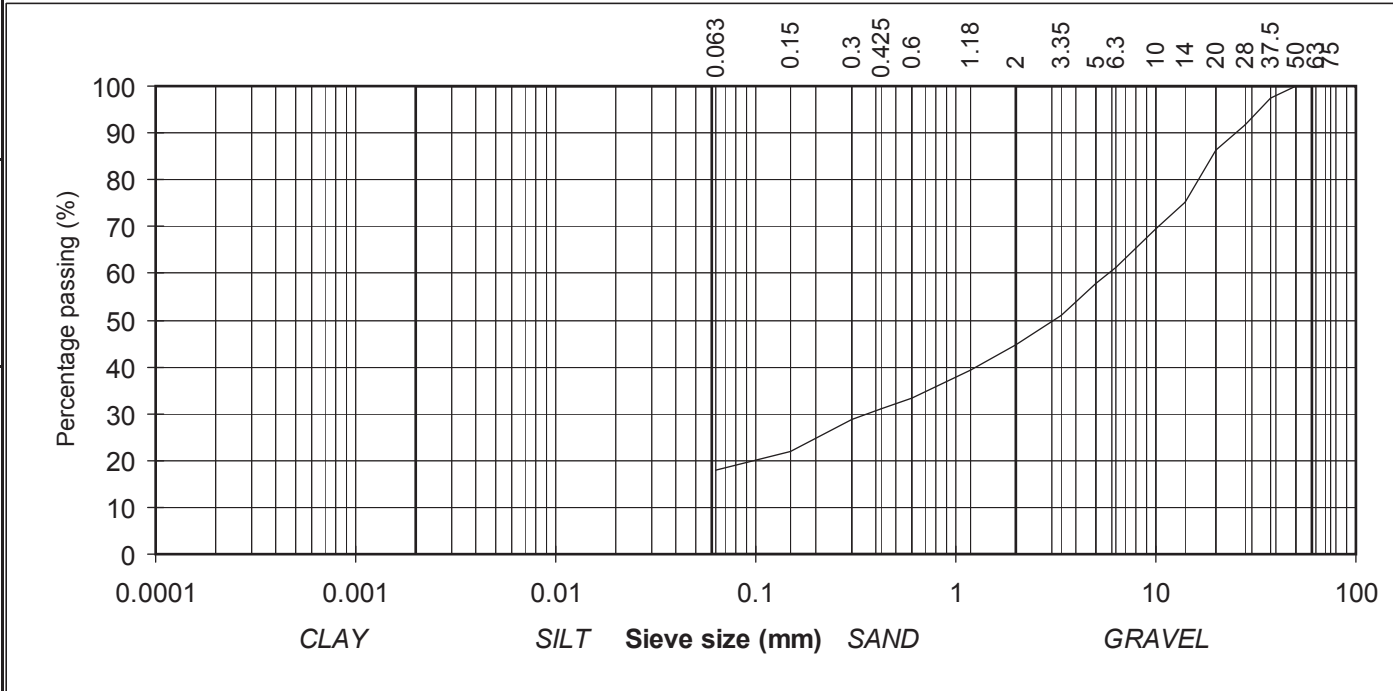
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	98	
28	92	
20	86	GRAVEL
14	75	
10	70	
6.3	61	
5	58	
3.35	51	
2	45	
1.18	39	
0.6	33	
0.425	31	
0.3	29	
0.15	22	
0.063	18	SILT/CLAY

Contract No: 18312      Report No. R65949  
 Contract: Barnastooka Wind Farm  
 TP: TP079  
 Sample No. AA16690      Lab. Sample No. A15/2054  
 Sample Type: B  
 Depth (m) 2.00m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Dark brown silty, very sandy, GRAVEL

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

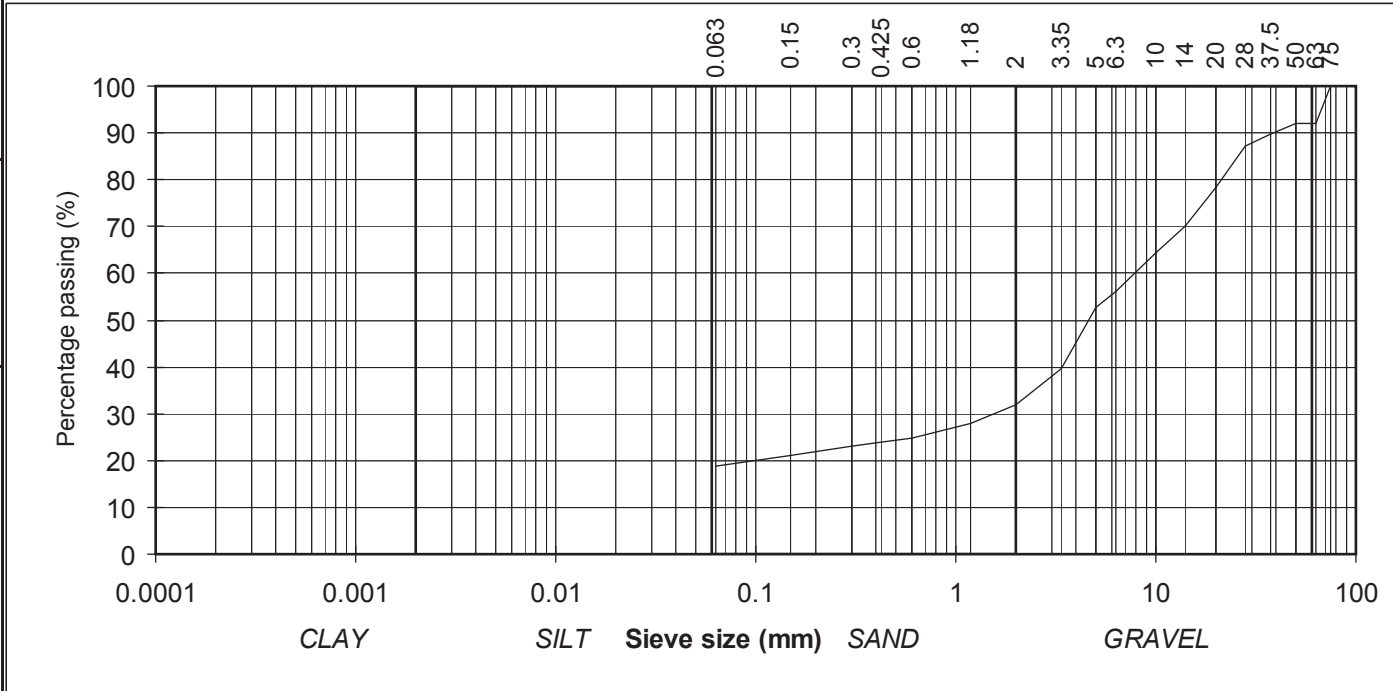
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	92	
50	92	
37.5	90	
28	87	
20	78	GRAVEL
14	70	
10	64	
6.3	56	
5	53	
3.35	40	
2	32	
1.18	28	
0.6	25	
0.425	24	
0.3	23	SAND
0.15	21	
0.063	19	
		SILT/CLAY

Contract No: 18312      Report No. R65950  
 Contract: Barnastooka Wind Farm  
 TP: TP080  
 Sample No. AA16687      Lab. Sample No. A15/2055  
 Sample Type: B  
 Depth (m) 2.80m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/brown silty, sandy, GRAVEL with some cobbles

Remarks



**IGSL Ltd Materials Laboratory**

Approved by:	Date:	Page no:
H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

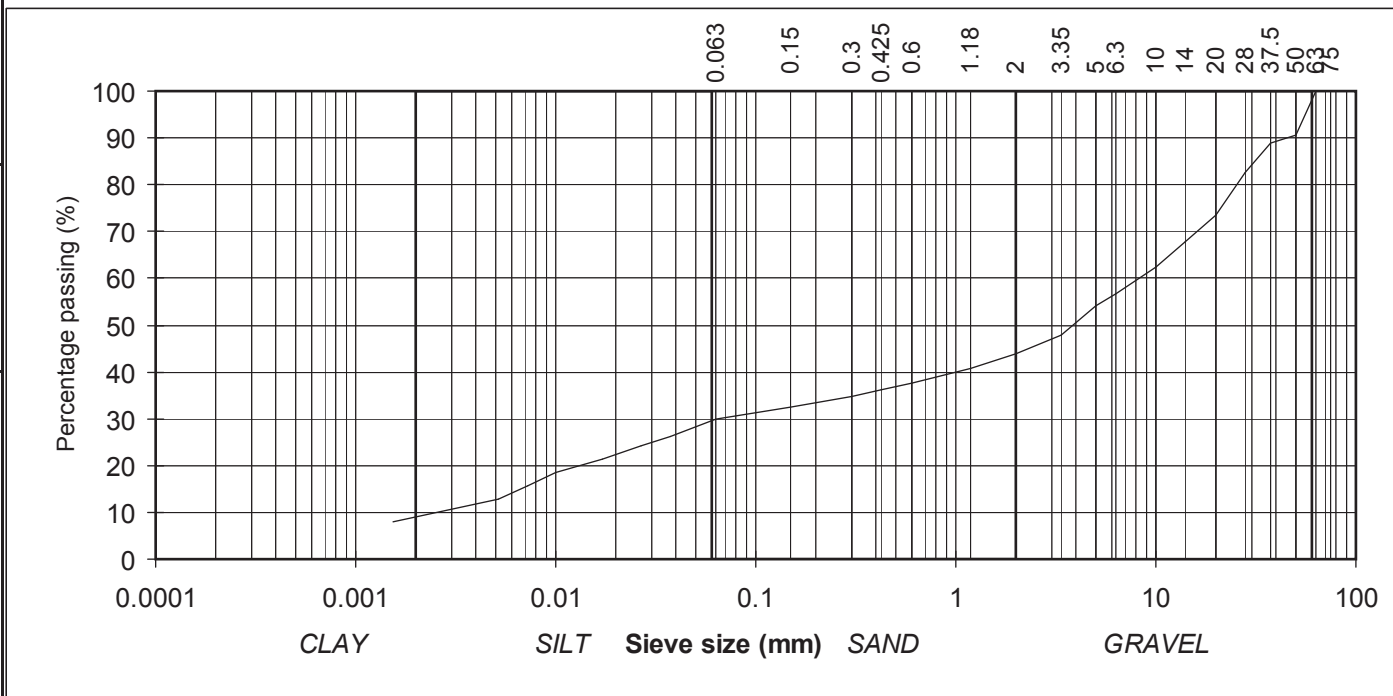
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	90	
37.5	89	GRAVEL
28	83	
20	73	
14	68	
10	63	
6.3	57	
5	54	
3.35	48	SAND
2	44	
1.18	41	
0.6	38	
0.425	36	SILT/CLAY
0.3	35	
0.15	32	
0.063	30	
0.037	26	
0.027	24	
0.017	21	
0.010	19	
0.007	16	
0.005	13	
0.002	8	

Contract No: 18312      Report No. R65938  
 Contract: Barnastooka Wind Farm  
 TP: TP087  
 Sample No. AA16667      Lab. Sample No. A15/2056  
 Sample Type: B  
 Depth (m) 2.00m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/Brown slightly sandy, gravelly, SILT

Remarks



**IGSL Ltd Materials Laboratory**

Approved by:	Date:	Page no:
H Byrne	07/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

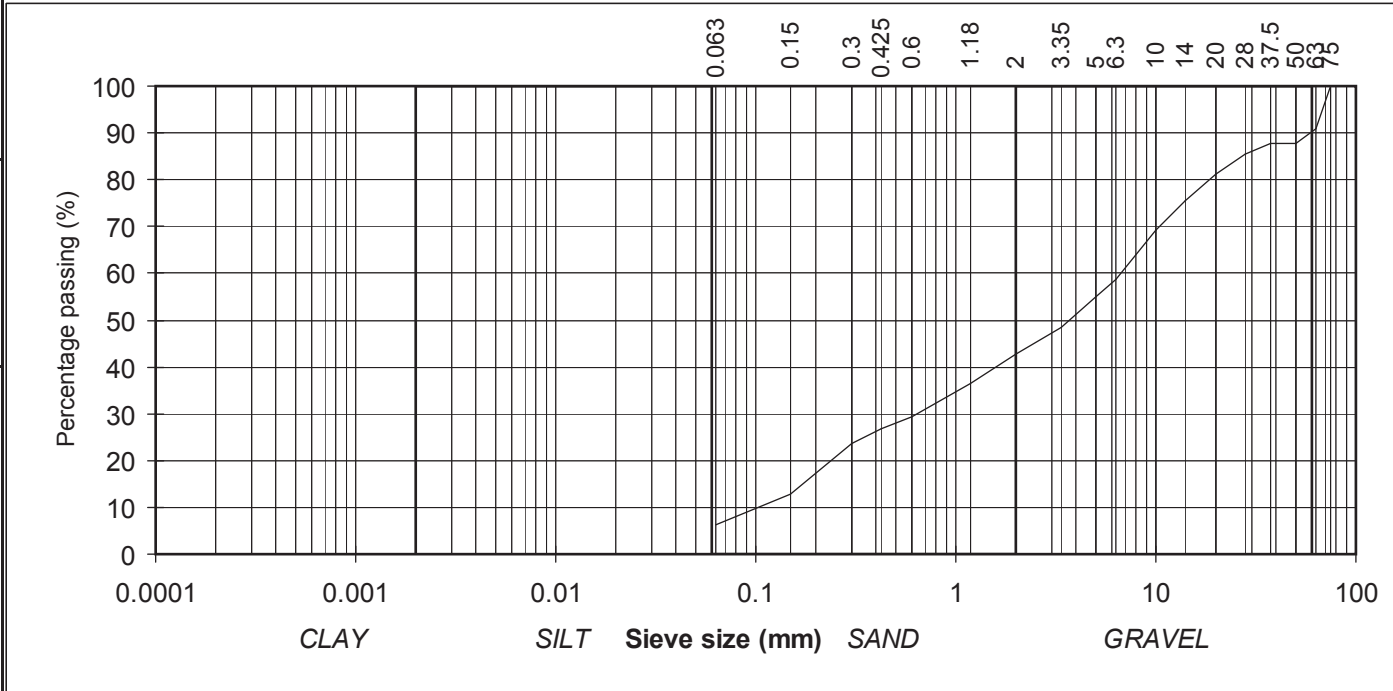
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	91	
50	88	
37.5	88	GRAVEL
28	86	
20	81	
14	76	
10	69	
6.3	59	
5	55	
3.35	49	
2	43	
1.18	37	
0.6	29	SAND
0.425	27	
0.3	24	
0.15	13	SILT/CLAY
0.063	6	

Contract No: 18312      Report No. R65951  
 Contract: Barnastooka Wind Farm  
 TP: TP097  
 Sample No. AA27944      Lab. Sample No. A15/2057  
 Sample Type: B  
 Depth (m) 2.80m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/brown silty, very sandy, GRAVEL with some cobbles

Remarks



**IGSL Ltd Materials Laboratory**

Approved by:	Date:	Page no:
H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

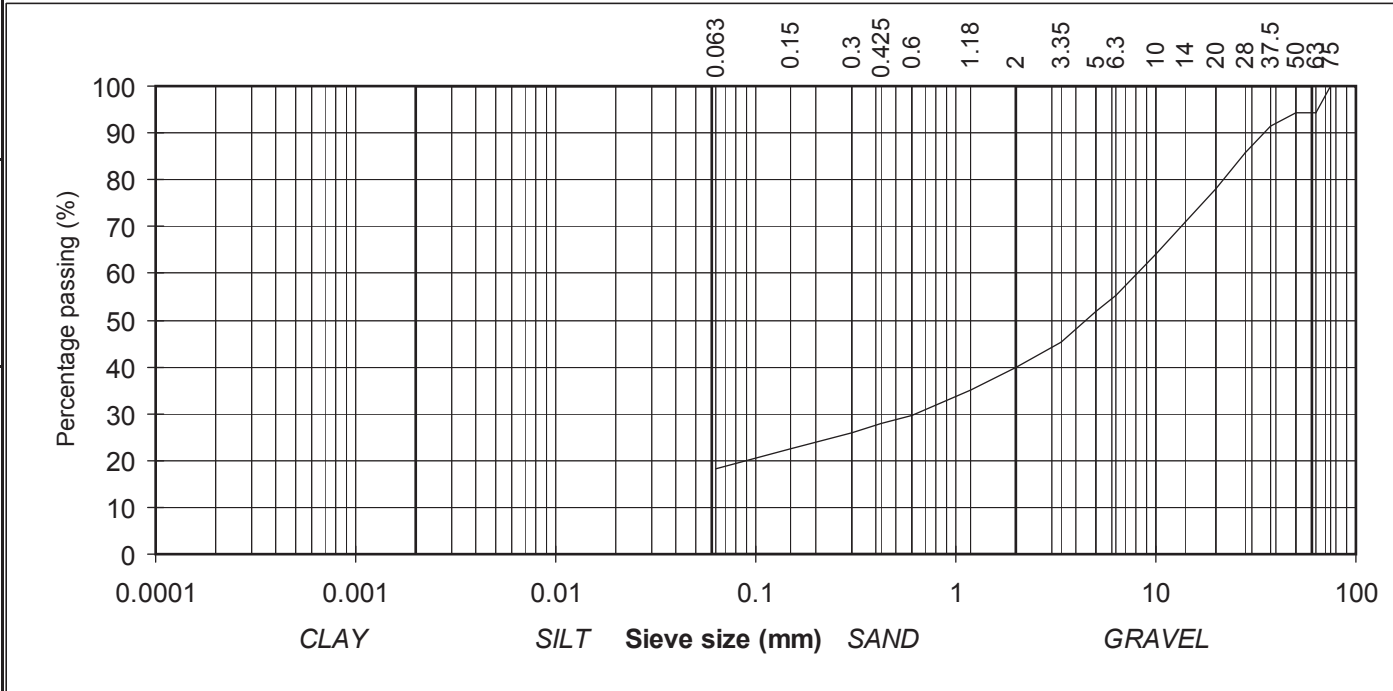
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	94	
50	94	
37.5	92	GRAVEL
28	86	
20	78	
14	71	
10	64	
6.3	55	
5	52	
3.35	45	SAND
2	40	
1.18	35	
0.6	30	
0.425	28	SILT/CLAY
0.3	26	
0.15	23	
0.063	18	

Contract No: 18312      Report No. R65952  
 Contract: Barnastooka Wind Farm  
 TP: TP105  
 Sample No. AA17712      Lab. Sample No. A15/2058  
 Sample Type: B  
 Depth (m) 2.50m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/brown silty, very sandy, GRAVEL with some cobbles

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

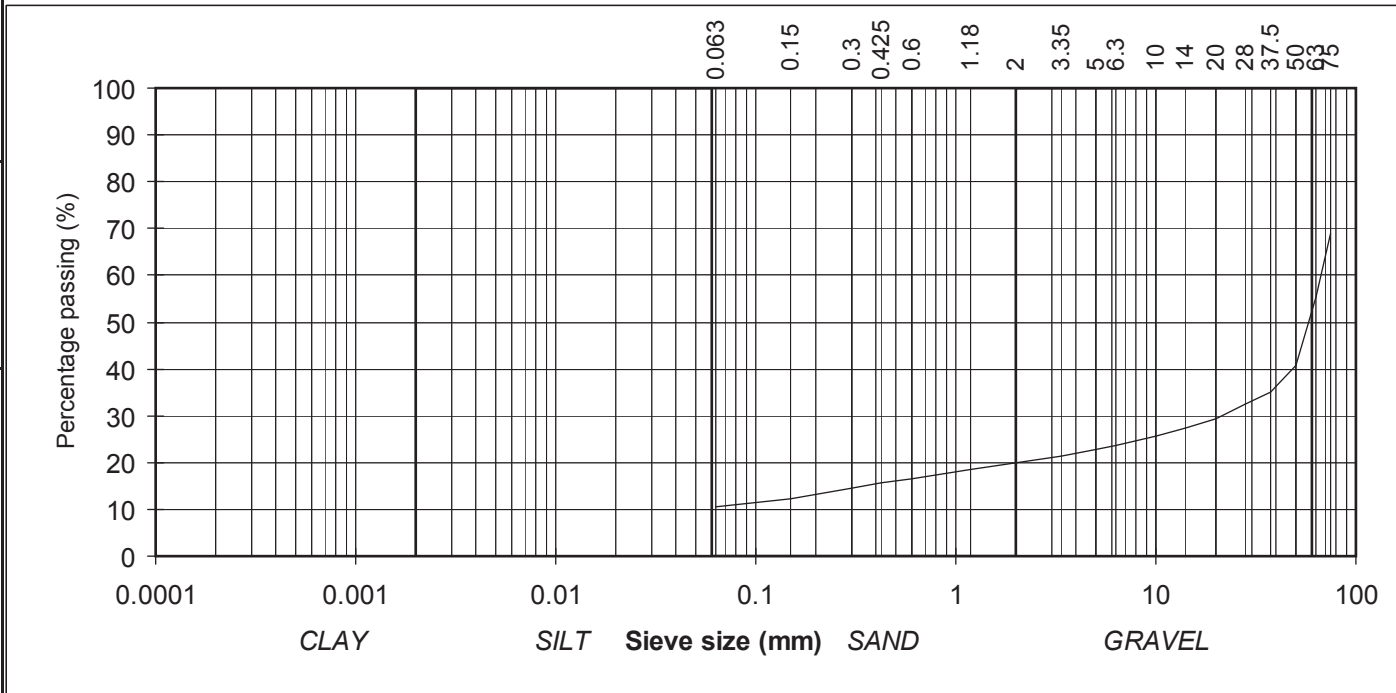
(note: Sedimentation stage not accredited)



particle size	% passing	
75	69	COBBLES
63	55	
50	41	
37.5	35	
28	32	GRAVEL
20	29	
14	27	
10	26	
6.3	24	
5	23	
3.35	21	
2	20	SAND
1.18	18	
0.6	16	
0.425	16	
0.3	15	SILT/CLAY
0.15	12	
0.063	10	

Contract No: 18312      Report No. R65953  
 Contract: Barnastooka Wind Farm  
 TP: TP109  
 Sample No. AA17720      Lab. Sample No. A15/2059  
 Sample Type: B  
 Depth (m) 2.50m      Customer: ESBI  
 Date Received 18/5/15      Date Testing started 30/06/2015  
 Description: Purple/brown clayey/silty, sandy, GRAVEL with many cobbles

Remarks: Sample size did not meet the requirements of the BS1377



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

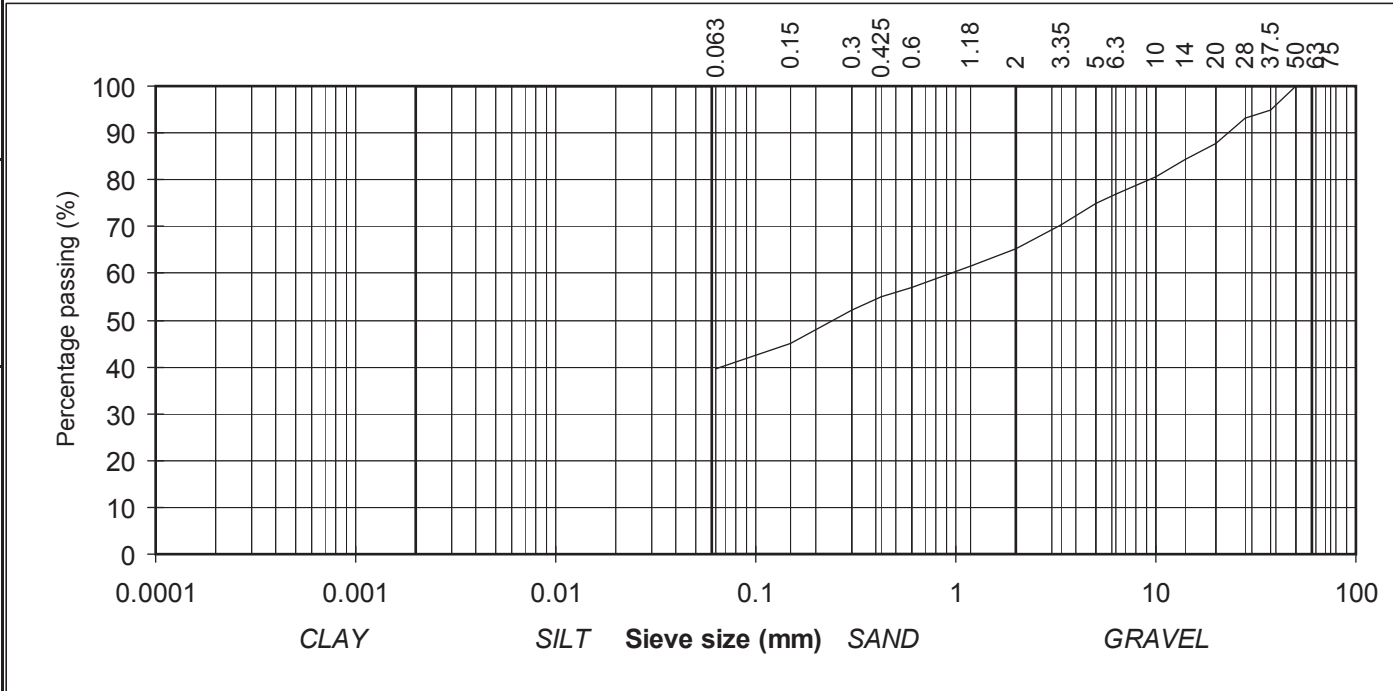
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	95	
28	93	
20	88	GRAVEL
14	84	
10	81	
6.3	77	
5	75	
3.35	70	
2	65	
1.18	62	SAND
0.6	57	
0.425	55	
0.3	52	
0.15	45	SILT/CLAY
0.063	40	

Contract No: 18312      Report No. R65956  
 Contract: Barnastooka Wind Farm  
 TP: TP R001  
 Sample No. AA25425      Lab. Sample No. A15/2063  
 Sample Type: B  
 Depth (m) 2.00m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Mottled pink/brown slightly sandy, slightly gravelly, SILT

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

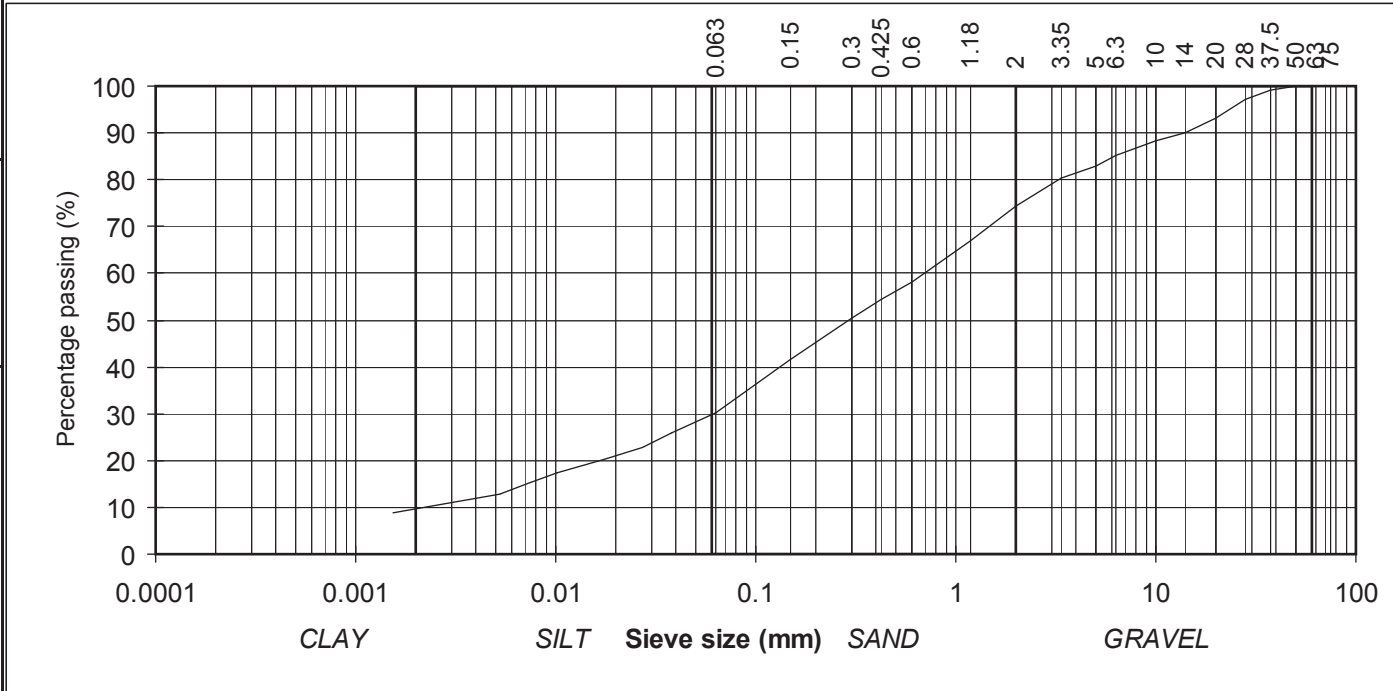
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	99	GRAVEL
28	97	
20	93	
14	90	
10	88	
6.3	85	
5	83	
3.35	80	
2	74	
1.18	67	
0.6	58	SAND
0.425	54	
0.3	50	
0.15	41	SILT/CLAY
0.063	30	
0.038	26	
0.027	23	
0.017	20	
0.010	17	
0.007	15	
0.005	13	
0.002	9	

Contract No: 18312      Report No. R65954  
 Contract: Barnastooka Wind Farm  
 TP: TP R004  
 Sample No. AA25429      Lab. Sample No. A15/2060  
 Sample Type: B  
 Depth (m) 2.00m      Customer: ESBI  
 Date Received 30/06/2015      Date Testing started 30/06/2015  
 Description: Purple/brown sandy, slightly gravelly, SILT

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	08/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)



# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

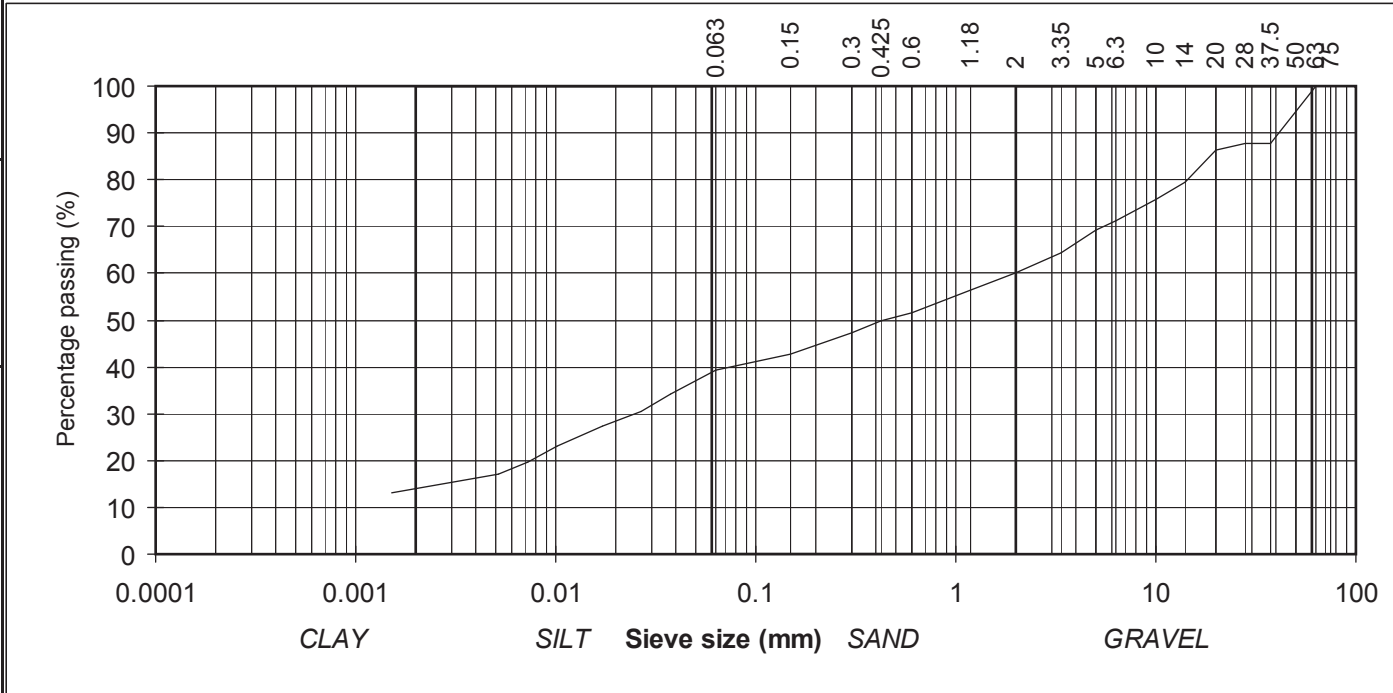
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	94	GRAVEL
37.5	88	
28	88	
20	86	
14	80	
10	76	
6.3	71	
5	69	
3.35	65	
2	60	
1.18	56	
0.6	52	
0.425	50	
0.3	47	SILT/CLAY
0.15	43	
0.063	39	
0.037	34	
0.027	31	
0.017	27	
0.010	23	
0.007	20	
0.005	17	
0.002	13	

Contract No: 18312 Report No. R65937  
 Contract: Barnastooka Wind Farm  
 TP: TP S2  
 Sample No. AA16656 Lab. Sample No. A15/2061  
 Sample Type: B  
 Depth (m) 2.00m Customer: ESBI  
 Date Received 30/06/2015 Date Testing started 30/06/2015  
 Description: Mottled pink/brown slightly sandy, gravelly, SILT

Remarks



<b>IGSL Ltd Materials Laboratory</b>	Approved by:	Date:	Page no:
	H Byrne	07/07/15	1 of 1

Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)



# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

IGSL  
Unit F  
M7 Business Park  
Naas  
Co Kildare  
Ireland

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



**Attention :** Darren Keogh  
**Date :** 13th July, 2015  
**Your reference :** 18312  
**Our reference :** Test Report 15/9565 Batch 1  
**Location :** Barnastdoka Windfarm  
**Date samples received :** 3rd July, 2015  
**Status :** Final report  
**Issue :** 1

Seven samples were received for analysis on 3rd July, 2015 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

## Compiled By:

**Phil Sommerton BSc**  
**Project Manager**

Client Name: IGSL  
 Reference: 18312  
 Location: Barnastdoka Windfarm  
 Contact: Darren Keogh  
 JE Job No.: 15/9565

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1	2	3	4	5	6	7							
Sample ID	TP T012	TP T025A	TP T027A	TP T028A	TP T029A	TP T035A	TP T005							
Depth	1.00	1.00	1.30	1.80	1.80	0.50	0.90							
COC No / misc														
Containers	J	J	J	J	J	J	J							
Sample Date	02/07/2015	02/07/2015	02/07/2015	02/07/2015	02/07/2015	02/07/2015	02/07/2015							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1	1							
Date of Receipt	03/07/2015	03/07/2015	03/07/2015	03/07/2015	03/07/2015	03/07/2015	03/07/2015							
												LOD/LOR	Units	Method No.
Sulphate as SO <sub>4</sub> (2:1 Ext) #	0.0102	0.0194	0.0084	0.0143	0.0087	0.0127	0.0046					<0.0015	g/l	TM38/PM20
pH #	5.44	7.06	5.71	7.43	6.18	6.45	6.35					<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

**Client Name:** IGSL  
**Reference:** 18312  
**Location:** Barnastdoka Windfarm  
**Contact:** Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/9565						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.  
Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/9565

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 15/9565

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

## **Appendix 5**

### **Laboratory Test Records (Rock)**



IGSL Ltd  
Materials Laboratory  
Unit J5, M7 Business Park  
Newhall, Naas  
Co. Kildare  
045 846176

## Test Report

### Ten per cent Fines Value

Tested in accordance with BS812:Part 111:1990



**Report No.** R65992

Customer: ESB Wind Development Ltd

Contract No. 18312

Contract Name: Barnastooka Windfarm

Sample No. A15/2884

Customer Ref. RCR1 @ 5.8- 6.6m

Material Type: Aggregate

Date Received: 30/06/15

Date Tested: 30/06/15

Location: RCR1 @ 5.8- 6.6m

Sample Certificate: Not provided

Description: 14-10mm aggregate

Condition of aggregate tested: Soaked

Ten per cent Fines Value (kN): **160**

The result relates to the specimens tested.  
Any remaining material will be retained for one month.  
Sampling and opinions and interpretations are outside the scope of accreditation.

#### Approved signatories

H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by

H Byrne

Date

08/07/15

Page

1 of 1

IGSL Ltd  
 Materials Laboratory  
 Unit J5, M7 Business Park  
 Newhall, Naas  
 Co. Kildare  
 045 846176

**Test Report**

**Ten per cent Fines Value**

Tested in accordance with BS812:Part 111:1990



**Report No.**                    **R65993**

Customer:                        ESB Wind Development Ltd

Contract No.                    18312

Contract Name:                Barnastooka Windfarm

Sample No.                      A15/2885

Customer Ref.                 TPB001 @ 1.6m

Material Type:                 Aggregate

Date Received:                30/06/15

Date Tested:                    30/06/15

Location:                        TPB001 @ 1.6m

Sample Certificate:            Not provided

Description:                    14-10mm aggregate

Condition of aggregate  
 tested:                            Soaked

Ten per cent Fines  
 Value (kN):                      **180**

The result relates to the specimens tested.  
 Any remaining material will be retained for one month.  
 Sampling and opinions and interpretations are outside the scope of accreditation.

Approved signatories  
  
 H Byrne (Quality Manager)

<b>IGSL Materials Laboratory</b>	Approved by	Date	Page
	H Byrne	08/07/15	1 of 1

IGSL Ltd  
 Materials Laboratory  
 Unit J5, M7 Business Park  
 Newhall, Naas  
 Co. Kildare  
 045 846176

**Test Report**

**Slake Durability**

Tested in accordance with ISRM Part 2 (1981)



**Report No.** R65994  
 Contract No. 18312  
 Contract Name: Barnastooka Windfarm  
 Client: ESB Wind Development Ltd

Sample No. A15/2884  
 Client Ref RCR1 5.8-6.1  
 Location RCR1 5.8-6.1  
 Sample Certificate Approved / Provided  
 Date Received 30/06/2015  
 Date Tested 30/06/2015

Slake Durability  
 Cycle 1 98.3  
 Cycle 2 97.4

Description of the rock  
 Pre Test: Grey Sandstone  
 Post Test: Grey Sandstone

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens tested.  
 Any remaining material will be retained for one month.  
 Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve report  
 J Barrett (Dep Quality Manager)  
 H Byrne (Quality Manager)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	08/07/15	1 of 1

IGSL Ltd  
 Materials Laboratory  
 Unit J5, M7 Business Park  
 Newhall, Naas  
 Co. Kildare  
 045 846176

**Test Report**

**Slake Durability**

Tested in accordance with ISRM Part 2 (1981)



**Report No.** R65995  
 Contract No. 18312  
 Contract Name: Barnastooka Windfarm  
 Client: ESB Wind Development Ltd

Sample No. A15/2885  
 Client Ref TPB001 @ 1.6m  
 Location TPB001 @ 1.6m  
 Sample Certificate Approved / Provided  
 Date Received 30/06/2015  
 Date Tested 30/06/2015

Slake Durability  
 Cycle 1 99.2  
 Cycle 2 98.3

Description of the rock  
 Pre Test: Grey Sandstone  
 Post Test: Grey Sandstone


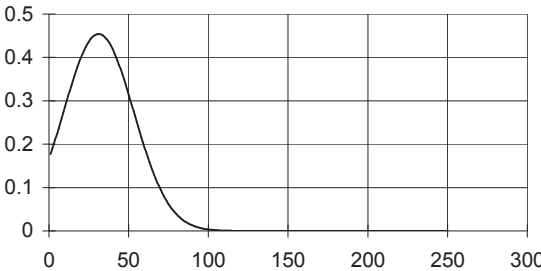
The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens tested.  
 Any remaining material will be retained for one month.  
 Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve report

J Barrett (Dep Quality Manager)  
 H Byrne (Quality Manager)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	08/07/15	1 of 1

POINT LOAD STRENGTH INDEX TEST DATA										
Contract: Barnastooka Windfarm				Sample Type: Core Contract no. 18312						
Date of test: 1/7/15										
RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orientation	
RCR1	6.0	78	4.0	1.222	0.66	0.80	16	PL	90°	
RCR2	9.0	78	6.0	1.222	0.99	1.20	24	PL	90°	
	8.5	78	16.0	1.222	2.63	3.21	64	PL	90°	
RC26B	11.5	78	12.0	1.222	1.97	2.41	48	PL	90°	
	5.0	78	8.0	1.222	1.31	1.61	32	PL	90°	
RC28A	6.5	78	14.0	1.222	2.30	2.81	56	PL	90°	
RC28B	6.0	78	12.0	1.222	1.97	2.41	48	PL	90°	
RC28B	5.0	78	8.0	1.222	1.31	1.61	32	PL	90°	
RC29A	No UCS Possible - Carried out 6x no. Point Load Tests Instead								PL	90°
RC29B	5.6	78	6.0	1.222	0.99	1.20	24	PL	90°	
	5.7	78	2.0	1.222	0.33	0.40	8	PL	90°	
	5.8	78	2.0	1.222	0.33	0.40	8	PL	90°	
	6.9	78	4.0	1.222	0.66	0.80	16	PL	90°	
	7.1	78	6.0	1.222	0.99	1.20	24	PL	90°	
	7.3	78	2.0	1.222	0.33	0.40	8	PL	90°	
	4.0	78	1.0	1.222	0.16	0.20	4	PL	90°	
	6.0	78	2.0	1.222	0.33	0.40	8	PL	90°	
	RC30A	7.5	78	17.0	1.222	2.79	3.41	68	PL	90°
	RC30B	9.0	78	9.0	1.222	1.48	1.81	36	PL	90°
RC31A	7.0	78	5.0	1.222	0.82	1.00	20	PL	90°	
RC31B	4.2	78	10.0	1.222	1.64	2.01	40	PL	90°	
RC33A	5.0	78	18.0	1.222	2.96	3.61	72	PL	90°	
RC33B	6.0	78	4.0	1.222	0.66	0.80	16	PL	90°	
RC34A	4.0	78	6.0	1.222	0.99	1.20	24	PL	90°	
RC34B	7.0	78	2.0	1.222	0.33	0.40	8	PL	90°	
RC35A	5.0	78	18.0	1.222	2.96	3.61	72	PL	90°	
Statistical Summary Data			Is(50)	UCS*	*UCS Normal Distribution Curve			Abbreviations		
Number of Samples Tested			25	25				i	irregular	
Minimum			0.20	4				a	axial	
Average			1.56	31				b	block	
Maximum			3.61	72				d	diametral	
Standard Dev.			1.10	22				approx. orientation to planes of weakness/bedding		
Upper 95% Confidence Limit			3.71	74.23				U	unknown	
Lower 95% Confidence Limit			-0.60	-11.90	P	perpendicular				
<u>Comments:</u>					//	parallel				
*UCS taken as k x Point Load Is(50):			k=	20						

# Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC26A  
 Depth (m): 4.8m

Sample Description

Colour:	Purple
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SILTSTONE

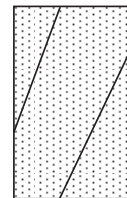
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	184	
Diameter (∅)	78.1	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	102	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{102000}{4788.19385} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{21.29} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.66} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:

# Uniaxial Compression Test Report Sheet

*I.G.S.L.*

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC28A  
 Depth (m): 3.5m

Sample Description

Colour:	Green
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SANDSTONE

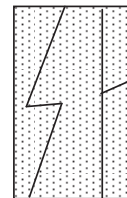
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	198	
Diameter (∅)	78.1	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	127	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{127000}{4788.19385} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{26.51} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.67} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:

# Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC30A  
 Depth (m): 5.5m

Sample Description

Colour:	Purple
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SANDSTONE/SILTSTONE

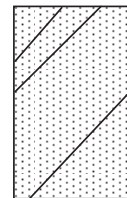
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	204	mm
Diameter (∅)	78	

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	157	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{157000}{4775.94} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{32.86} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.67} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:



# Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC31B  
 Depth (m): 6.6m

Sample Description

Colour:	Purple
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SANDSTONE

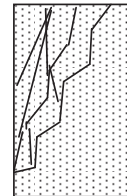
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	197	
Diameter (∅)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	84	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{84000}{4775.94} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{17.58} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.66} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:

# Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC33A  
 Depth (m): 5.8m

Sample Description

Colour:	Purple
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SANDSTONE

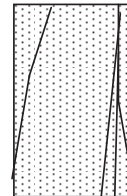
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	162	
Diameter (∅)	78.1	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	84	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{84000}{4788.19385} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{17.53} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.64} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:

# Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC34A  
 Depth (m): 5.3m

Sample Description

Colour:	Green
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SANDSTONE

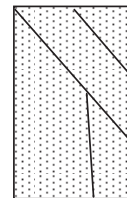
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	184	
Diameter (∅)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	129	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{129000}{4775.94} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{27.00} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.65} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:

# Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Barnastooka Windfarm  
 Job Number: 18312  
 Hole No: RC35A  
 Depth (m): 5.1m

Sample Description

Colour:	Green/blue
Grain size:	Fine grained
Weathering Grade:	Fresh
Rock Type:	SANDSTONE

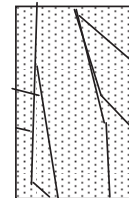
Weathering Grade Criteria

- |                            |  |
|----------------------------|--|
| I. Fresh:                  | Unchanged from original state                                      |
| II. Slightly weathered:    | Slight discolouration, slight weakening                            |
| III. Moderately weathered: | Considerable weakening, penetrative discolouration                 |
| IV. Highly weathered:      | Considerable weakening, penetrative discolouration, breaks in hand |

Sample Measurements

Length	214	
Diameter (∅)	78.1	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	411	kN

Strength Calculations

$$\begin{aligned}
 \text{Uniaxial Compressive Strength} &= \frac{411000}{4788.19385} \\
 &= \frac{1000 \times P}{\pi \times (\varnothing/2)^2} \\
 &= \boxed{85.79} \text{ (Mpa)} \\
 \text{Bulk Density} &= \boxed{2.67} \text{ (Mg/m}^3\text{)}
 \end{aligned}$$

Notes:

## **Appendix 6**

### **Site Plan / Drawings**

**ROTARY CORE DRILLHOLES****As Built Coordinates**

	E	N	Elev.
RC25A	507791	572314	326.778
RC25B	507765.8	572315	331.501
RC26A	507248	572058	382.48
RC26B	507239	572077.9	385.68
RC27A	507614	572000.9	344.85
RC27B	507596	572007	346.316
RC28A	507364	571710	340.727
RC28B	507364	571733	345.122
RC29A	507005.9	571777	351.499
RC29B	507006	571799	354.408
RC30A	506696	571597	346.755
RC30B	506686	571615	348.698
RC31A	506387.1	571277	343.868
RC31B	506380.9	571277	345.89
RC32A	505908.1	571182.9	365.534
RC32B	505902	571208	369.336
RC33A	506100	571507	388.88
RC33B	506094	571528	390.844
RC34A	506375.9	571763.1	389.075
RC34B	506358.9	571779	392.331
RC35A	506668.9	571980.1	389.176
RC35B	506658.1	571997.3	391.998
RC36A	507574	572441	364.69
RC36B	507563.9	572421	368.469
RC37A	507211	572349	392.999
RC37B	507221	572326	396.635
RC38A	506958	572376.9	392.549
RC38B	506952.9	572354	396.454
RCR1	507101	572121	392.41
RCR2	506827	571634	341.783
RCR3	506625	571415	339.123
RCR4	506292	571452.8	374.258
RCSUB1	509526.7	569823.7	340.876
RCSUB2	509468.2	569860	339.13

**TRIAL PIT****As Built Coordinates**

	E	N	Elev.
TP001	508624.7	572488.2	193.292
TP002	508579.6	572427.8	187.548
TP003	508524	572344	189.098
TP004	508480	572256.1	195.355
TP005	508420	572173	196.413
TP006	508364.5	572094.9	200.512
TP007	508295.9	572028.1	204.022
TP008	508198.9	571984.7	209.26
TP009	508117.6	571902.5	217.205
TP010	508144.8	571809.7	223.17
TP011	508095.4	571725.4	232.179
TP012	508027.1	571641.7	238.312
TP013	507965.7	571555.7	245.694
TP014	507907.9	571490	265.251
TP015	507807	571463	282.72
TP016	507704	571442.9	284.581
TP017	507594	571433	292.274
TP018	507486.1	571438	297.087
TP019	507385	571470	303.959
TP020	507279.8	571485	309.214
TP021	507181.7	571504.3	310.19
TP022	507082	571496	313.538
TP023	506979	571484	314.321
TP024	506883.1	571458	319.085
TP025	506782	571442	322.315
TP026	506684	571397	329.592
TP027	506591	571361	337.296
TP028	506507	571319	339.597
TP029	506326.1	571240.2	341.458
TP030	506234	571191	341.322
TP031	506139	571152.8	342.705
TP032	506036	571150	352.206
TP033	505925	571335	382.261
TP034	505967	571335	377.509
TP035	506010.7	571421.1	375.701
TP036	506121.2	571570.4	399.929
TP037	506194	571629	400.414
TP038	506262	571696	398.541
TP039	506413	571816.9	389.208
TP040	506490	571856	385.196
TP041	506552	571902	385.991
TP042	506828	571534	333.597
TP043	506892	571600	335.818
TP044	506941	571676	341.608
TP045	506996	571730.1	345.637
TP046	507134.8	571765.1	347.01
TP047	507223	571753.1	349.291
TP048	507426	571751	345.815
TP049	507520	571799	346.694
TP050	507559	571886	350.974
TP051	507585	571960	348.233
TP052	507636	572131	344.921
TP053	507730	572175	331.419
TP054	507642	572241	353.48
TP055	507550	572201	363.1
TP056	507456.9	572156	367.994
TP057	507360	572125	378.108
TP058	507604	572315.9	363.015
TP059	507505.9	572419	372.829
TP060	507420	572389	386.098
TP061	507331.1	572368.9	393.225
TP062	507167	572308	394.696
TP063	507073	572338.1	392.291

**TRIAL PIT****As Built Coordinates**

	E	N	Elev.
TP072	509750.1	570867	333.92
TP079	509738	570767	335.18
TP080	509711.9	570669.9	337.143
TP081	509666.5	570583.5	335.891
TP082	509634.1	570489.9	336.346
TP083	509639.7	570389.1	337.947
TP084	509658	570291	336.654
TP085	509730	570222	339.184
TP086	509743	570124	333.267
TP087	509750.6	570013.4	340.01
TP091	509692.8	569925.9	343.314
TP092	509648.3	569838.9	342.616
TP093	509563.4	569861.5	342.665
TPT025A	507775	572271	330.024
TPT026A	507619	572046	343.29
TPT027A	507322	571727	344.885
TPT028A	507245	572343	397.114
TPT029A	507269.9	572084	385.22
TPT030A	506414	571297	343.944
TPT031A	505903.2	571208	369.188
TPT032A	507038.3	571796.8	354.47
TPT033A	506075.2	571494.5	390.337
TPT034A	506342.9	571744	391.559
TPT035A	506635	571796.8	389.351
TPT036A	507581	572404	366.827
TPT037A	506990	572359	393.623
TPT038A	507766	572315	331.506
TPR001	507024	572154	395.995
TPR002	507158	572114	390.713
TPR003	506827	571699	345.984
TPR004	506775	571610	342.69
TPR005	506672	571420	331.691
TPR006	506571.1	571409.9	343.074
TPR007	506358	571449.2	369.071
TPR008	506238.1	571449.6	379.07
TPS001			
TPS002	509528.9	569906	335.095
TPS003			





## APPENDIX B

### Grousemount Wind Farm Site Investigation Report

**IGSL Ltd**

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**Grousemount Wind Farm  
Site Investigation**

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**Geotechnical Site Investigation  
Report  
(Factual)**

**Project No. 18387**

**July 2015**



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**DOCUMENT ISSUE REGISTER**

<b>Distribution</b>	<b>Copies</b>	<b>Rev.</b>	<b>Date of Issue</b>	<b>Prepared By:</b>	<b>Approved By:</b>
ESB International	Draft – by email (PDF)	A	16-07- 2015	Ciaran Killaly Chartered Geotechnical Engineer BE CEng MIEI	John Lawler BSc MSc P.Geo. EurGeol FGS

## TABLE OF CONTENTS

Foreword

**1. Introduction**

**2. Contract Outline & Objectives**

**3. Fieldwork**

**3.1 General**

**3.2 Trial Pitting**

**3.3 Geophysical Surveying**

**3.4 Surveying of Exploratory Locations**

References

### **Figures**

Figure 1            - Site Location Plan

### **Appendices**

Appendix 1        - Trial Pit Records

Appendix 2        - APEX Geophysical Report

Appendix 3        - Site Plan / Drawings

## **FOREWORD**

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

### **Standards**

The ground investigation works for this project (**Grousemount Wind Farm**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930:1999 +A2:2010 and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

### **Reporting**

This report has been prepared for ESB International and the information should not be used without prior written permission of either party. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

### **Boring Procedures**

Unless otherwise stated, 'shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variations is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

**Rotary Drilling Procedures**

Rotary drilling methods are used to recover very heavily over-consolidated glacial till and bedrock samples in line with Section 3.5 of IS EN 1997-2:2007 and IS EN ISO 22475-1. Open hole drilling methods (odex or symmetrix) are utilized to advance the drillholes through granular dominant superficial deposits, with coring in hard ('cemented') fine grained or cohesive glacial deposits and bedrock. In this particular project, the key objective of the rotary coring operations was to advance and sample the high strength glacial till and underlying granite bedrock.

**In-Situ Testing**

Standard penetration tests are conducted by IGSL strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio ( $E_r$ ) is defined as the ratio of the actual energy  $E_{meas}$  (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy ( $E_{theor}$ ) as calculated from the drive weight assembly. The measured number of blows ( $N$ ) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

**Groundwater**

The depth of entry of any influx of groundwater is recorded during the course of boring or drilling operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

**Soil Sampling**

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Where appropriate Class 1 thin wall undisturbed tube samples (UT100) are obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

**Table A – Details of Sample Quality Requirements**

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

#### **Engineering Logging**

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

#### **Retention of Samples**

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is company policy to discard soil samples one month after submission of our final report.



## 1. INTRODUCTION

At the instruction of ESB International, IGSL has undertaken a programme of geotechnical site investigation works for a proposed Wind Farm Development in the townlands of Ballagh, Grousemount and Knockanruddig, approximately 9km east of the village of Kilgarvan, on the Cork/Kerry border (Figure 1). It is understood that the scheme will involve the construction of twenty four turbines and associated infrastructure. The proposed development is to include the development of an extensive network of access tracks together with a substation and rock borrow pits.

**Figure 1 – Site Location Plan**



Taken from Google Maps, 2015

The investigations comprised rotary coreholes, trial pitting and a geophysical survey. Reporting of the rotary core drilling will not be included in this preliminary version of the factual report. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (1999+A2:2010) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing. The 'as-built' co-ordinates and ground levels are shown on the exploratory hole logs with a full list of the coordinates provided in Appendix 3. Exploratory hole drawings are to be included in future versions of this report.

This draft report presents the factual geotechnical data acquired from the 2015 investigation featuring the trial pits and the draft geophysical report.

**2. CONTRACT OUTLINE & OBJECTIVES**

This contract is currently underway, being carried out in one phase. It comprises rotary core drillholes and machine excavated trial pits.

The primary objectives of the works are as follows:

- Determine the composition, consistency and strength / stiffness of the superficial soils
- Establish the rockhead elevation, weathering profile, discontinuity characteristics and strength of the bedrock
- Recover samples for geotechnical laboratory testing in accordance with the requirements of the Employer's Representative

This factual report presents the trial pit and geophysical records. The results of laboratory testing will follow in a future version of this report.

### 3. FIELDWORK

#### 3.1 General

The geotechnical investigations reported in this draft report were carried out in April and May 2015 and comprised the following:

- Trial Pits (186 No.)
  - TP (156 No.)
  - TP-T (24 No.)
  - TP-B (6 No.)
- Associated sampling & in-situ testing
- Geophysical Survey
- Setting out & surveying

#### 3.2 Trial Pitting

The trial pits were undertaken using a 13 tonne tracked hydraulic excavator. The pits were logged and sampled by an IGSL geotechnical engineer. Representative disturbed bulk samples were taken as the pits were excavated, these were placed in heavy-duty polyethylene bags and tubs and returned to the site laboratory for examination and laboratory testing.

The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of the Employer's Representative. The trial pit logs are presented in Appendix 1 and include engineering descriptions of the soils encountered, samples recovered, groundwater strikes and stability of the pit sidewalls.

#### 3.3 Geophysical Surveying

APEX Geoservices carried out the geophysical survey at the site. The key aim of the survey was to map rockhead and to identify any anomalous ground conditions. A combination of techniques was utilised. It included 2D Electrical Resistivity Tomography [ERT], Seismic Refraction Profiling and Multichannel Analysis of Surface Waves [MASW]. The preliminary findings of the geophysical survey are incorporated in Appendix 2.

#### 3.4 Surveying of Exploratory Locations

Following completion of the exploratory boreholes and trial pits, surveying was carried out using Realtime Kinetic GPS techniques. Co-ordinates (x, y) were measured to national grid and ground level (z) established relative to OD Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs. The 'as-constructed' locations are listed in Appendix 3. The exploratory hole plan is to be included in a future version of this report.

### **References**

1. BS 5930 (1999) Code of Practice for Site Investigation, British Standards Institution (BSI).
2. Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

## **Appendix 1**

### **Trial Pit Records**



# TRIAL PIT RECORD

**REPORT NUMBER**

## 18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP064</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI ESBI		<b>CO-ORDINATES</b> 509,224.03 E 571,489.99 N	
<b>GROUND LEVEL (m)</b> 318.44		<b>DATE STARTED</b> 16/04/2015	
		<b>DATE COMPLETED</b> 16/04/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
			0.70	317.74		AA32070	B	0.50-0.50	40	
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.70m					AA32070	D	0.50-0.50	46	
1.0									40	
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP065**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,261.67 E  
571,415.66 N

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 327.62

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark Brown fibrous PEAT (H4-H7)									
0.40	Stiff very gravelly SILT with frequent cobbles and boulders. Cobbles and boulders are angular.		0.40	327.22		AA32068 AA32068	B D	0.30-0.30 0.30-0.30	40 52	
0.90	Angular gravelly COBBLES and BOULDERS (Possible weathered rock)		0.90	326.72		AA32069 AA32069	B D	0.80-0.80 0.80-0.80		
1.20	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.20m		1.20	326.42						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP066**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,335.01 E  
571,196.01 N

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 337.35

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
	Dark grey peaty silty GRAVEL with frequent cobbles		0.20	337.15		AA32064	B	0.10-0.10	40	
						AA32064	D	0.10-0.10	46	
						AA32065	B	0.30-0.30	42	
						AA32065	D	0.30-0.30		
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.40m		0.40	336.95						
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP067

**SHEET** Sheet 1 of 1

**LOGGED BY** JL

**CO-ORDINATES** 509,459.02 E  
571,056.04 N

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 319.32

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft peaty CLAY with frequent organics		0.20	319.12		AA32059 AA32059T	B D	0.20-0.20 0.20-0.20	40 -[R]	
	Soft dark brown pseudofibrous PEAT (H6-H7)		0.50	318.82						
	Grey brown silty GRAVEL with occasional cobbles and boulders (up to 500mm)		0.60	318.72		AA32060 AA32060T	B D	0.55-5.55 0.55-0.55	46 -[R] 50 -[R]	
1.0					↓ (Slow)					
						AA32061 AA32061T	B D	1.55-1.55 1.55-1.55		
2.0										
	End of Trial Pit at 2.30m		2.30	317.02						
3.0										
4.0										

**Groundwater Conditions**

**Stability**

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP068</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,575.76 E 570,995.73 N		<b>DATE STARTED</b> 15/04/2015
<b>GROUND LEVEL (m)</b> 328.69		<b>DATE COMPLETED</b> 15/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Light brown very gravelly SILT with occasional cobbles		0.20	328.49					32	
1.0						AA32057	D	1.00-1.00	28	
1.50	Grey very silty GRAVEL with cobbles and large boulders. Cobbles and boulders are angular.		1.50	327.19					30	
2.0						AA32058	D	2.00-2.00		
2.30	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.30m		2.30	326.39						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP069**

**LOGGED BY** F.C

**CO-ORDINATES** 509,623.08 E  
570,943.10 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 325.64

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft fibrous PEAT with roots (H4-H7)									
0.35	Soft mottled brown slightly gravelly SILT		0.35	325.29		AA32054 AA32054	B D	0.50-0.50 0.50-0.50	30 28 30	
0.80	Dense very silty GRAVEL with frequent cobbles and boulders. Cobbles and boulders are angular.		0.80	324.84						
1.50						AA32055 AA32055	B D	1.50-1.50 1.50-1.50		
3.00						AA32056 AA32056	B D	3.00-3.00 3.00-3.00		
3.50	Obstruction - Possible weathered ROCK End of Trial Pit at 3.50m		3.50	322.14						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP070</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 15/04/2015	
<b>CO-ORDINATES</b> 509,713.13 E 570,894.95 N		<b>DATE COMPLETED</b> 15/04/2015	
<b>GROUND LEVEL (m)</b> 327.20		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black PEAT (H4-H7)									
0.40	Purple very gravelly SILT		0.40	326.80				22		
0.50	Grey silty GRAVEL with occasional cobbles and boulders		0.50	326.70		AA32051	B	0.50-0.50	30	
						AA32051	D	0.50-0.50	24	
1.0										
2.0						AA32052	B	1.50-1.50		
						AA32052	D	1.50-1.50		
3.0	End of Trial Pit at 3.00m		3.00	324.20		AA32053	B	3.00-3.00		
						AA32053	D	3.00-3.00		
4.0										

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP071**

**LOGGED BY** F.C

**CO-ORDINATES** 509,671.02 E  
570,802.96 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 13/04/2015

**DATE COMPLETED** 13/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 325.75

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
			Sample Ref	Type	Depth		
0.0							
0.30	325.45		AA27906 AA27906T	B D	0.30-0.30 0.30-0.30	24 10[R]	
0.90	324.85		AA27907 AA27907T	B D	0.90-0.90 0.90-0.90		
2.10	323.65		AA27908 AA27908T	B D	1.90-1.90 1.90-1.90		
2.10							

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP073</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 509,766.02 E 570,773.97 N		<b>DATE STARTED</b> 17/04/2015	
<b>GROUND LEVEL (m)</b> 342.10		<b>DATE COMPLETED</b> 17/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
	Soft brown peaty gravelly SILT		0.20	341.90		AA32073	B	0.20-0.20	44	
	Soft dark brown fibrous PEAT (H4-H7)		0.40	341.70		AA32073	D	0.20-0.20	46	
									40	
1.0						AA32074	B	1.00-1.00		
						AA32074	D	1.00-1.00		
	Medium dense grey very silty GRAVEL with frequent cobbles and occasional boulders. Cobbles and boulders are angular.		1.40	340.70						
2.0						AA32075	B	2.00-2.00		
						AA32075	D	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	339.10						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP074**

**LOGGED BY** F.C

**CO-ORDINATES** 509,823.02 E  
570,692.03 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 17/04/2015

**DATE COMPLETED** 17/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 357.38

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
0.30	Dark brown sandy gravelly SILT with occasional cobbles		0.30	357.08					44	
0.50	Grey silty GRAVEL with frequent cobbles and occasional boulders		0.50	356.88		AA32076	D	0.40-0.40	48	
1.0									50	
1.20	Angular gravelly COBBLES and BOULDERS (Possible weathered rock)		1.20	356.18		AA32077	D	1.00-1.00		
2.0										
2.40	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.40m		2.40	354.98		AA32078	D	2.00-2.00		
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP075</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,885.91 E 570,614.00 N		<b>DATE STARTED</b> 13/04/2015
<b>GROUND LEVEL (m)</b> 377.36		<b>DATE COMPLETED</b> 13/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H5-H6)									
0.30	Angular shaley GRAVEL		0.30	377.06		AA27911	B	0.30-0.30	26 80[R]	
0.40	Soft brown gravelly SILT with rootlets. Gravel is subangular.		0.40	376.96		AA27911T	D	0.30-0.30		
0.60	Soft to firm blue/grey sandy gravelly SILT. Sand is coarse. Gravel is subangular to subrounded.		0.60	376.76		AA27912	B	0.50-0.50		
						AA27912T	D	0.50-0.50		
1.10	Angular COBBLES and BOULDERS (Possible weathered rockhead)		1.10	376.26						
1.50	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.50m		1.50	375.86		AA27913	B	1.40-1.40		
						AA27913T	D	1.40-1.40		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP076

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,928.97 E  
570,523.98 N

**DATE STARTED** 14/04/2015

**DATE COMPLETED** 14/05/2014

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 390.08

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown gravelly SILT with rootlets. Gravel is subangular.		0.40	389.68		AA27920	B	0.40-0.40	26 1[R]	
	Firm to stiff blue/grey sandy gravelly SILT. Sand is coarse. Gravel is subangular to subrounded.		0.60	389.48		AA27920T	D	0.40-0.40		
1.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.10m		1.10	388.98		AA27921	B	1.00-1.00		
						AA27921T	D	1.00-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP077</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,975.04 E 570,434.98 N		<b>DATE STARTED</b> 14/03/2015
<b>GROUND LEVEL (m)</b> 401.73		<b>DATE COMPLETED</b> 14/03/2015
<b>CLIENT</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown sandy gravelly SILT with pockets of reddish clay and rootlets. Sand is coarse. Gravel is angular to subangular.		0.40	401.33		AA27922	B	0.40-0.40	36 8[R]	
						AA27922T	D	0.40-0.40		
0.70	Firm to stiff blue/grey sandy gravelly SILT with occasional cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are angular to subangular.		0.70	401.03		AA27923	B	0.60-0.60		
						AA27923T	D	0.60-0.60		
1.40	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.40m		1.40	400.33		AA27924	B	1.20-1.20		
						AA27924T	D	1.20-1.20		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP078**

**LOGGED BY** F.C

**CO-ORDINATES** 510,017.94 E  
570,345.01 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 14/02/2015

**DATE COMPLETED** 14/01/2016

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 402.77

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft reddish/light brown sandy gravelly SILT with occasional cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are angular.	x x x x x o o o o o x x x x x	0.40	402.37		AA27925 AA27925T	B D	0.40-0.40 0.40-0.40	38 12[R]	
1.10	Firm to stiff blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are angular to subangular.	x x x x x o o o o o x x x x x o o o o o x x x x x	1.10	401.67		AA27926 AA27926T	B D	1.00-1.00 1.00-1.00		
2.00	Obstruction (Possible boulders/bedrock) End of Trial Pit at 2.00m	x x x x x o o o o o x x x x x o o o o o x x x x x o o o o o x x x x x	2.00	400.77		AA27927 AA27927T	B D	1.90-1.90 1.90-1.90		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP088</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,762.01 E 569,945.01 N		<b>DATE STARTED</b> 14/09/2014
<b>GROUND LEVEL (m)</b> 348.01		<b>DATE COMPLETED</b> 14/03/2020
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
0.60	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.60m		0.60	347.41		AA27935 AA27935T	B D	0.50-0.50 0.50-0.50	32 10[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP089**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,858.95 E  
569,929.03 N

**DATE STARTED** 14/10/2014

**DATE COMPLETED** 14/05/2019

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 353.61

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.50m		0.50	353.11		AA27934 AA27934T	B D	0.50-0.50 0.50-0.50	28 6[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP090

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,952.33 E  
569,908.52 N

**DATE STARTED** 14/11/2014

**DATE COMPLETED** 14/07/2018

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 361.17

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ (Rapid)					
0.40	Soft to firm blue/grey sandy gravelly SILT with occasional cobbles and boulders. Sand is coarse. Gravel is angular to subangular. Cobbles and boulders are angular.	x x x x x o o o o o x x x x x	0.40	360.77		AA27932 AA27932T	B D	0.40-0.40 0.40-0.40	20 4[R]	
1.80	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.80m	x x x x x o o o o o x x x x x	1.80	359.37		AA27933 AA27933T	B D	1.40-1.40 1.40-1.40		

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP094**

**LOGGED BY** F.C

**CO-ORDINATES** 509,537.96 E  
569,776.08 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 14/08/2014

**DATE COMPLETED** 14/01/2021

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 350.01

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black brown fibrous PEAT (H4-H7)				↓ (Rapid)				26 8[R]	
1.0						AA27936 AA27936T	B D	1.00-1.00 1.00-1.00	12 2[R]	
2.0	Soft brown/grey sandy very gravelly SILT. Sand is coarse. Gravel is angular to subangular.		1.80	348.21		AA27937 AA27937T	B D	2.00-2.00 2.00-2.00	6 0[R]	
2.30	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.30m		2.30	347.71						

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
Pit was unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP095**

**LOGGED BY** F.C

**CO-ORDINATES** 509,446.01 E  
569,714.04 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 14/07/2014

**DATE COMPLETED** 14/11/2021

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 366.97

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown/grey sandy very gravelly SILT with occasional cobbles and boulders	x x x x x o o o o o x x x x x	0.20	366.77					28	
1.0		x x x x x o o o o o x x x x x								
	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.20m	x x x x x o o o o o x x x x x	1.20	365.77		AA27938 AA27938T	B D	1.00-1.00 1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP096**

**LOGGED BY** F.C

**CO-ORDINATES**


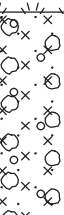

**SHEET** Sheet 1 of 1

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**DATE STARTED** 15/04/2015  
**DATE COMPLETED** 15/04/2015

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0	Soft blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular to subrounded.		0.80		 (Rapid)	AA27940 AA27940T	B D	0.50-0.50 0.50-0.50	16 6[R]	
2.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.70m		1.70			AA27941 AA27941T	B D	1.50-1.50 1.50-1.50		

**Groundwater Conditions**  
Rapid water ingress from 0.80m

**Stability**  
Pit was unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP097**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,260.92 E  
569,639.03 N

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 387.68

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft brown sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular to subrounded.		0.30	387.38		AA27942 AA27942T	B D	0.50-0.50 0.50-0.50	40 16[R]	
0.80	Firm to stiff blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular to subrounded.		0.80	386.88						
1.80						AA27943 AA27943T	B D	1.80-1.80 1.80-1.80		
2.80						AA27944 AA27944T	B D	2.80-2.80 2.80-2.80		
3.00	End of Trial Pit at 3.00m		3.00	384.68						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP098</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,158.04 E 569,646.98 N		<b>DATE STARTED</b> 15/04/2015
<b>GROUND LEVEL (m)</b> 391.58		<b>DATE COMPLETED</b> 15/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Angular GRAVEL and COBBLES		0.30	391.28					24	
						AA27946	B	0.50-0.50		
						AA27946T	D	0.50-0.50		
						AA27945	B	0.60-0.60		
						AA27945T	D	0.60-0.60		
1.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.80m		0.80	390.78						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP099

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,057.04 E  
569,794.96 N

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 387.31

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
		▽▽								
		▽▽								
		▽▽								
		▽▽								
		▽▽								
0.80	Soft light brown/red sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subangular.	X	0.80	386.51		AA27948 AA27948T	B D	0.50-0.50 0.50-0.50	18 6[R]	
1.0		X								
		X								
		X								
		X								
1.30	Angular GRAVEL and COBBLES	○	1.30	386.01		AA27949 AA27949T	B D	1.00-1.00 1.00-1.00		
1.70	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.70m	○	1.70	385.61						
2.0		○								
3.0		○								
4.0		○								

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP100**

**LOGGED BY** F.C

**CO-ORDINATES** 508,972.05 E  
569,864.97 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 393.38

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft light brown/red sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded.		0.50	392.88		AA27950 AA27950T	B D	0.50-0.50 0.50-0.50	36 12[R]	
1.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.20m		1.20	392.18		AA17701 AA17701T	B D	1.00-1.00 1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP101**

**LOGGED BY** F.C

**CO-ORDINATES** 509,065.87 E  
569,686.03 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 396.85

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽				AA17704 AA17704T	B D	1.00-1.00 1.00-1.00	20 6[R]	
1.50	Soft blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are angular.	x x	1.50	395.35					12 2[R]	
2.0	Angular GRAVEL and COBBLES	○ ○	2.00	394.85		AA17705 AA17705T	B D	1.90-1.90 1.90-1.90	10 0[R]	
2.40	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.40m	○ ○	2.40	394.45						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP102</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 16/04/2015	
<b>CO-ORDINATES</b> 508,983.05 E 569,749.96 N		<b>DATE COMPLETED</b> 16/04/2015	
<b>GROUND LEVEL (m)</b> 396.96		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.50m		0.50	396.46		AA17706 AA17706T	B D	0.50-0.50 0.50-0.50	40 12[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP103</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 508,885.90 E 569,778.96 N		<b>DATE STARTED</b> 16/04/2015	
<b>GROUND LEVEL (m)</b> 397.01		<b>DATE COMPLETED</b> 16/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽								
	Soft light brown/red sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded.	XO	1.30	395.71		AA17707 AA17707T	B D	1.00-1.00 1.00-1.00	20 4[R]	
	Medium dense silty sandy GRAVEL. Sand is coarse. Gravel is angular. (Possible weathered rock)	XO	1.80	395.21		AA17708 AA17708T	B D	1.50-1.50 1.50-1.50	10 0[R]	
2.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.20m	XO	2.20	394.81						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP104**

**LOGGED BY** F.C

**CO-ORDINATES** 508,793.04 E  
569,755.01 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 391.80

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Soft light brown/red sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subangular.		0.50	391.30		AA17709 AA17709T	B D	0.50-0.50 0.50-0.50	12 2[R]	
1.00	Medium dense silty sandy GRAVEL. Sand is coarse. Gravel is angular. (Possible weathered rock)		1.00	390.80		AA17710 AA17710T	B D	0.90-0.90 0.90-0.90		
1.40	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.40m		1.40	390.40						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP105**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,726.01 E  
569,686.07 N

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 387.24

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
1.30	Soft to firm blue/grey sandy very gravelly SILT with cobbles. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are angular.		1.30	385.94		AA17711 AA17711T	B D	1.00-1.00 1.00-1.00	28 10[R]	14 4[R]
2.0										
2.50										
3.0	End of Trial Pit at 3.00m		3.00	384.24		AA17712 AA17712T	B D	2.50-2.50 2.50-2.50		
4.0										

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP106**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,954.77 E  
569,686.05 N



**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 401.19

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
1.0	Medium dense silty angular GRAVEL		0.90	400.29		AA17714 AA17714T	B D	0.60-0.60 0.60-0.60	32 10[R]	12 2[R]
1.30	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.30m		1.30	399.89						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP107**

**LOGGED BY** F.C

**CO-ORDINATES** 508,913.19 E  
569,615.11 N

**SHEET** Sheet 1 of 1






















**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 401.81

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	       								
1.0	Firm to stiff blue/grey sandy gravelly SILT with occasional cobbles. Sand is fine. Gravel is angular to subangular. Cobbles are angular.	            	1.20	400.61		AA17715 AA17715T	B D	1.00-1.00 1.00-1.00	20 0.6[R] 12 0[R]	
2.0								AA17716 AA17716T	B D	2.50-2.50 2.50-2.50
2.70	End of Trial Pit at 2.70m		2.70	399.11						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP108**

**LOGGED BY** F.C

**CO-ORDINATES** 508,882.56 E  
569,524.88 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 402.97

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
1.40	Soft to firm blue/grey sandy gravelly SILT with occasional cobbles. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are angular.		1.40	401.57		AA17717 AA17717T	B D	1.00-1.00 1.00-1.00	22 8[R]	10 2[R]
2.0										
2.50						AA17718 AA17718T	B D	2.50-2.50 2.50-2.50	8 0[R]	
3.0	End of Trial Pit at 3.00m		3.00	399.97						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP109**

**LOGGED BY** F.C

**CO-ORDINATES** 508,947.88 E  
569,442.86 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 412.01

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0						AA17719 AA17719T	B D	1.00-1.00 1.00-1.00	28 10[R]	16 4[R]
2.0	Medium dense very silty angular GRAVEL		1.90	410.11					10 1[R]	8 0[R]
3.0	End of Trial Pit at 3.00m		3.00	409.01		AA17720 AA17720T	B D	2.50-2.50 2.50-2.50		

**Groundwater Conditions**  
Water seepage noted at 1.90m

**Stability**  
Pit sides collapsing from 1.90m

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP110</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 17/04/2015	
<b>CO-ORDINATES</b> 509,034.94 E 569,395.10 N		<b>DATE COMPLETED</b> 17/04/2015	
<b>GROUND LEVEL (m)</b> 426.62		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ \ \ \ \								
0.40	Medium dense silty peaty angular GRAVEL (Possible weathered rock)	\ \ \ \ \	0.40	426.22		AA17721 AA17721T	B D	0.40-0.40 0.40-0.40	16 4[R]	
1.50	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.50m	\ \ \ \ \	1.50	425.12						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP111**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,112.80 E  
569,347.10 N

**DATE STARTED** 17/04/2015

**DATE COMPLETED** 17/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 439.98

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular.		0.20	439.78		AA17722 AA17722T	B D	0.20-0.20 0.20-0.20		
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.60m		0.60	439.38		AA17723 AA17723T	B D	0.50-0.50 0.50-0.50	36 14[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP112</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 17/04/2015	
<b>CO-ORDINATES</b> 508,963.24 E 569,317.66 N		<b>DATE COMPLETED</b> 17/04/2015	
<b>GROUND LEVEL (m)</b> 421.72		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft blue/grey sandy gravelly SILT with occasional cobbles. Sand is fine to coarse. Gravel is subangular. Cobbles are angular to subangular.		0.50-0.50 0.50-0.50	421.02		AA17726 AA17726T	B D	0.50-0.50 0.50-0.50	24 8[R]	
1.60	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.60m		1.20-1.20 1.20-1.20	420.12		AA17727 AA17727T	B D	1.20-1.20 1.20-1.20		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP113**

**LOGGED BY** F.C

**CO-ORDINATES** 508,991.13 E  
569,223.03 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 17/04/2015

**DATE COMPLETED** 17/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 424.49

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft brown sandy gravelly SILT with cobbles and boulders. Sand is coarse. Gravel is angular to subangular. Cobbles and boulders are angular to subangular.		0.20	424.29		AA17728 AA17728T	B D	0.20-0.20 0.20-0.20	34 14[R]	
1.30	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.30m		1.30	423.19		AA17729 AA17729T	B D	1.20-1.20 1.20-1.20		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP114**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,058.03 E  
569,150.91 N

























**DATE STARTED** 20/04/2015

**DATE COMPLETED** 20/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 427.96

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)	     								
1.0	Soft to firm blue/grey sandy gravelly SILT. Sand is fine. Gravel is subangular.	     	1.10	426.86		AA17730 AA17730	B D	1.00-1.00 1.00-1.00	20 6[R]	12 2[R]
2.0		     				AA17731 AA17731	B D	2.00-2.00 2.00-2.00		
2.40	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.40m	     	2.40	425.56						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**  
Moved 20m on instruction of archaeologist

IGSL TP LOG - 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP115**

**LOGGED BY** F.C

**CO-ORDINATES** 509,117.99 E  
569,067.14 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 20/04/2015

**DATE COMPLETED** 20/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 430.07

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
0.30	Soft brown sandy gravelly SILT with cobbles, boulders and rootlets. Sand is coarse. Gravel is subangular to subrounded. Cobbles and boulders are subangular to subrounded.		0.30	429.77		AA17732 AA17732	B D	0.30-0.30 0.30-0.30	28 10[R]	
1.60	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular. Cobbles are subangular.		1.60	428.47		AA17733 AA17733	B D	1.50-1.50 1.50-1.50		
2.60						AA17734 AA17734	B D	2.60-2.60 2.60-2.60		
3.0	End of Trial Pit at 3.00m		3.00	427.07						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Pit unstable 0.30-1.60m

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP116**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,174.08 E  
568,975.85 N

**DATE STARTED** 20/04/2015

**DATE COMPLETED** 20/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 434.47

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with occasional boulders and rootlets. Sand is coarse. Gravel is subangular to subrounded. Boulders are subangular.		0.30	434.17		AA17735 AA17735	B D	0.30-0.30 0.30-0.30	8 0[R]	
1.0	Firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular. Cobbles are subangular.		1.00	433.47		AA17736 AA17736	B D	0.90-0.90 0.90-0.90		
2.0										
	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.40m		2.40	432.07		AA17737 AA17737	B D	2.20-2.20 2.20-2.20		
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Slight collapse of side walls

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP117**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,229.53 E  
568,883.45 N

**DATE STARTED** 20/04/2015

**DATE COMPLETED** 20/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 446.36

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft to firm brown sandy gravelly SILT with occasional boulders and rootlets. Sand is coarse. Gravel is angular to subangular. Boulders are subangular.		0.70	445.66		AA17738 AA17738	B D	0.50-0.50 0.50-0.50	30 6[R]	
1.20	Soft to firm blue/grey sandy SILT with cobbles. Sand is fine. Gravel is subangular. Cobbles are subangular.		1.20	445.16		AA17739 AA17739	B D	1.00-1.00 1.00-1.00		
2.10	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.10m		2.10	444.26		AA17740 AA17740	B D	2.00-2.00 2.00-2.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP118</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 21/04/2015	
<b>CO-ORDINATES</b> 509,255.62 E 568,815.69 N		<b>DATE COMPLETED</b> 21/04/2015	
<b>GROUND LEVEL (m)</b> 452.81		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with occasional large boulders. Boulders are subangular.									
0.80	Soft to firm blue/grey very sandy gravelly SILT with cobbles and boulders - possibly silty sand from 2.00m. Sand is fine. Gravel is subangular to subrounded. Cobbles and boulders are subangular.		0.50-0.50 0.50-0.50	452.01		AA17741 AA17741	B D	20 8[R]		
1.50			1.50-1.50 1.50-1.50			AA17742 AA17742	B D			
2.50	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.50m		2.50-2.50 2.50-2.50	450.31		AA17743 AA17743	B D			

**Groundwater Conditions**  
Water ingress noted

**Stability**  
Slight collapse of side walls

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP119**

**LOGGED BY** F.C

**CO-ORDINATES** 509,261.67 E  
568,741.01 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 21/04/2015

**DATE COMPLETED** 21/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 459.19

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with occasional boulders. Boulders are subangular.									
0.80	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.		0.50-0.50 0.50-0.50	458.39		AA17744 AA17744	B D	32 12[R]		
2.30			2.30-2.30 2.30-2.30			AA17745 AA17745	B D			
3.00	End of Trial Pit at 3.00m		3.00	456.19						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP120**

**LOGGED BY** F.C

**CO-ORDINATES** 509,193.58 E  
568,677.44 N

**SHEET** Sheet 1 of 1







**DATE STARTED** 21/04/2015

**DATE COMPLETED** 21/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 457.16

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
1.0										
1.30	Soft to firm blue/grey very sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.		1.30	455.86	 (Rapid)	AA17746 AA17746	B D	1.00-1.00 1.00-1.00	26 14[R] 10 0[R]	
2.0										
2.80	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.80m		2.80	454.36		AA17747 AA17747	B D	2.50-2.50 2.50-2.50		
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress at 1.30m

**Stability**  
Pit unstable due to water ingress

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

## 18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP121</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 21/04/2015	
<b>CO-ORDINATES</b> 509,126.06 E 568,593.96 N		<b>DATE COMPLETED</b> 21/04/2015	
<b>GROUND LEVEL (m)</b> 458.92		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular. Cobbles are subangular.		0.20	458.72					24	
1.0						AA17748 AA17748	B D	1.20-1.20 1.20-1.20		
1.70	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.70m		1.70	457.22						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP122</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 509,385.03 E 568,995.00 N		<b>DATE STARTED</b> 21/04/2015
<b>GROUND LEVEL (m)</b> 471.48		<b>DATE COMPLETED</b> 21/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ Water Strike (Seepage)					
0.20	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.20	471.28					10	0[R]
0.80	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.		0.80	470.68		AA22709 AA22709	B D	0.80-0.80 0.80-0.80		
2.30						AA22710 AA22710	B D	2.30-2.30 2.30-2.30		
3.00	End of Trial Pit at 3.00m		3.00	468.48						

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Slight collapse of side walls

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP123**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,438.03 E  
569,079.94 N

**DATE STARTED** 21/04/2015

**DATE COMPLETED** 21/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 478.08

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽▽								
0.50	Angular GRAVEL, COBBLES and BOULDERS (Possible weathered rock)	○●○	0.50	477.58		AA22708 AA22708	B D	0.50-0.50 0.50-0.50	32 8[R]	
1.00	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.00m		1.00	477.08						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP124**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,474.51 E  
569,162.69 N

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 487.50

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Angular GRAVEL, COBBLES and BOULDERS (Possible weathered rock)		0.20	487.30		AA22709	B	0.20-0.20	26	
			0.50	487.00		AA22709	D	0.20-0.20	10[R]	
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.20m									
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP125**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,526.99 E  
569,236.98 N

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 487.57

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Angular GRAVEL, COBBLES and BOULDERS with traces of blue/grey silt (Possible weathered rock)		0.30	487.27		AA22710 AA22710	B D	0.30-0.30 0.30-0.30	24 8[R]	
1.00	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.00m		1.00	486.57						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP126**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,566.06 E  
569,312.94 N


**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 489.38

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Loose silty sandy GRAVEL with cobbles, boulders and occasional rootlets		0.15	489.23		AA22711	B	0.50-0.50		
						AA22711	D	0.50-0.50		
1.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.80m		0.80	488.58						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP127**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,839.17 E  
569,448.01 N

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 404.61

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	[Symbol]								
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.	[Symbol]	0.40	404.21		AA22714	B	0.40-0.40	10 0[R]	
		[Symbol]	0.70	403.91		AA22714	D	0.40-0.40		
		[Symbol]				AA22715	B	0.60-0.60		
		[Symbol]				AA22715	D	0.60-0.60		
1.0	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.	[Symbol]				AA22716	B	1.00-1.00		
		[Symbol]				AA22716	D	1.00-1.00		
2.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.60m		1.60	403.01						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP128**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,816.17 E  
569,338.95 N

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 404.07

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black fibrous PEAT (H4-H7)	\ \ / \ /								
0.20	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.20m	\ \ / \ /	0.20	403.87		AA22717 AA22717	B D	0.20-0.20 0.20-0.20	10 0[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP129</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 22/04/2015	
<b>CO-ORDINATES</b> 508,750.61 E 569,159.77 N		<b>DATE COMPLETED</b> 22/04/2015	
<b>GROUND LEVEL (m)</b> 392.11		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT									
0.50	Soft to firm brown sandy gravelly SILT. Sand is coarse. Gravel is angular to subangular.	x x x x x	0.50	391.61		AA22720 AA22720	B D	0.50-0.50 0.50-0.50	28 10[R]	
0.90	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is angular to subangular to subrounded. Cobbles are subangular.	x x x x x	0.90	391.21		AA22721 AA22721	B D	0.80-0.80 0.80-0.80		
2.00		x x x x x				AA22722 AA22722	B D	2.00-2.00 2.00-2.00		
2.30	Obstruction - Very large boulders End of Trial Pit at 2.30m	x x x x x	2.30	389.81						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP130</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 22/04/2015	
<b>CO-ORDINATES</b> 508,751.68 E 569,058.44 N		<b>DATE COMPLETED</b> 22/04/2015	
<b>GROUND LEVEL (m)</b> 384.91		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)				↓ (Rapid)				100[R]	
1.0	Soft to firm grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.		0.90	384.01		AA22723 AA22723	B D	0.90-0.90 0.90-0.90		
2.0						AA22724 AA22724	B D	2.60-2.60 2.60-2.60		
3.0	End of Trial Pit at 3.00m		3.00	381.91						
4.0										

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
Pit unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP131**

**LOGGED BY** F.C

**CO-ORDINATES** 508,687.26 E  
568,932.93 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 364.07

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft light brown slightly sandy slightly gravelly clayey SILT. Sand is coarse. Gravel is subangular.		0.60	363.47		AA22725 AA22725	B D	0.50-0.50 0.50-0.50	30 10[R]	
1.0	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.		1.10	362.97		AA22726 AA22726	B D	1.00-1.00 1.00-1.00		
2.0										
						AA22727 AA22727	B D	2.50-2.50 2.50-2.50		
3.0	End of Trial Pit at 3.00m		3.00	361.07						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP132**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,718.06 E  
568,865.95 N

**DATE STARTED** 23/04/2015

**DATE COMPLETED** 23/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 360.44

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.20	360.24					20	6[R]
1.0						AA22728 AA22728	B D	1.00-1.00 1.00-1.00		
1.30	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is angular to subangular. Cobbles are subangular.		1.30	359.14						
2.0						AA22729 AA22729	B D	2.00-2.00 2.00-2.00		
2.20	Obstruction - Large angular boulders End of Trial Pit at 2.20m		2.20	358.24						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Slight collapse of pit sides

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP133</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 23/04/2015	
<b>CO-ORDINATES</b> 508,635.94 E 568,809.81 N		<b>DATE COMPLETED</b> 23/04/2015	
<b>GROUND LEVEL (m)</b> 341.28		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft blue/grey very sandy gravelly SILT with cobbles and occasional boulders. Sand is fine. Gravel is angular to subangular. Cobbles are subangular. Boulders are angular.		0.30	340.98		AA22730 AA22730	B D	0.30-0.30 0.30-0.30	40 22[R]	
1.0										
2.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.00m		2.00	339.28	 (See page)	AA22731 AA22731	B D	1.70-1.70 1.70-1.70		
3.0										
4.0										

**Groundwater Conditions**  
Water lying on top of rock

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP134</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 508,549.87 E 568,762.00 N		<b>DATE STARTED</b> 23/04/2015	
<b>GROUND LEVEL (m)</b> 333.79		<b>DATE COMPLETED</b> 23/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ (Rapid)					
0.50	Large angular BOULDERS	○○○	0.50	333.29		AA22732	B	0.50-0.50	34	
0.50						AA22732	D	0.50-0.50	12[R]	
1.00	Soft blue/grey very sandy gravelly SILT with occasional cobbles to possible silty sand. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.	x⊙x	1.00	332.79						
2.00						AA22733	B	1.80-1.80		
2.00						AA22733	D	1.80-1.80		
2.30	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.30m		2.30	331.49						

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
Pit sides unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP135**

**LOGGED BY** F.C

**CO-ORDINATES** 508,450.04 E  
568,740.96 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 23/04/2015

**DATE COMPLETED** 23/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 324.54

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with boulders. Boulders are subangular.		0.20	324.34		AA22734	B	0.20-0.20	24	
	Soft blue/grey very sandy gravelly SILT with cobbles to possible silty sand. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.					AA22734	D	0.20-0.20		
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.80m			0.80	323.74		AA22735	B	0.70-0.70	
						AA22735	D	0.70-0.70		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP136</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 508,359.03 E 568,700.98 N		<b>DATE STARTED</b> 23/04/2015
<b>GROUND LEVEL (m)</b> 317.07		<b>DATE COMPLETED</b> 23/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft brown very sandy gravelly SILT with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded.		0.30	316.77		AA22736 AA22736	B D	0.30-0.30 0.30-0.30	40 18[R]	
0.80	Soft blue/grey very sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular to subrounded.		0.80	316.27		AA22737 AA22737	B D	0.70-0.70 0.70-0.70		
2.0						AA22738 AA22738	B D	1.90-1.90 1.90-1.90		
2.30	Obstruction - Large angular boulders End of Trial Pit at 2.30m		2.30	314.77						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP137</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 508,270.97 E 568,649.01 N		<b>DATE STARTED</b> 23/04/2015
<b>GROUND LEVEL (m)</b> 322.08		<b>DATE COMPLETED</b> 23/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.30	321.78		AA32204 AA32204	B D	0.30-0.30 0.30-0.30	60 20[R]	
1.60	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to rounded. Cobbles are subangular to subrounded.		1.60	320.48		AA32205 AA32205	B D	1.30-1.30 1.30-1.30		
2.60						AA32206 AA32206	B D	2.60-2.60 2.60-2.60		
3.00	End of Trial Pit at 3.00m		3.00	319.08						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP138**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,182.07 E  
568,601.01 N

**DATE STARTED** 27/04/2015

**DATE COMPLETED** 27/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 335.78

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft light and dark brown sandy gravelly SILT with cobbles and rootlets throughout. Sand is fine. Gravel is subangular to subrounded. Cobbles are subrounded.		0.20	335.58		AA32207	B	0.50-0.50	44	14[R]
1.00	Loose grey gravelly silty SAND. Gravel is subrounded. Sand is fine.		1.00	334.78						
1.80			1.80			AA32207	B	1.80-1.80		
2.50	Obstruction - Possible large boulders End of Trial Pit at 2.50m		2.50	333.28						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP139**

**LOGGED BY** F.C

**CO-ORDINATES** 508,091.13 E  
568,564.14 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 27/04/2015

**DATE COMPLETED** 27/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 342.94

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	// //								
0.30	Soft brown sandy gravelly SILT with cobbles and rootlets throughout. Sand is coarse. Gravel and cobbles are subangular.	x x x x o o o o x x x x	0.30	342.64		AA32209	B	0.30-0.30	26	8[R]
1.10	Soft to firm blue/grey very sandy gravelly SILT with a high cobble content	x x x x o o o o x x x x	1.10	341.84		AA32210	B	1.00-1.00		
2.30		x x x x o o o o x x x x				AA32211	B	2.30-2.30		
2.70	Obstruction - Large boulders End of Trial Pit at 2.70m	x x x x o o o o x x x x	2.70	340.24						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP140</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 507,991.04 E 568,570.02 N		<b>DATE STARTED</b> 27/04/2015	
<b>GROUND LEVEL (m)</b> 338.38		<b>DATE COMPLETED</b> 27/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft/soft black fibrous PEAT (H4-H7)									
1.0										
1.30	Soft to firm blue/grey very sandy gravelly SILT with cobbles throughout. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.		1.30	337.08	 (Rapid)	AA32212	B	1.00-1.00	24 8[R]	
2.0						AA32213	B	2.00-2.00	20 4[R]	
2.50	Obstruction - Possible rock End of Trial Pit at 2.50m		2.50	335.88						
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress at 1.30m

**Stability**  
Pit sides were unstable

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP141</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 27/04/2015	
<b>CO-ORDINATES</b> 507,898.12 E 568,603.55 N		<b>DATE COMPLETED</b> 27/04/2015	
<b>GROUND LEVEL (m)</b> 325.91		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black fibrous PEAT (H4-H7)	▽▽							40[R]	
1.0		▽▽							80[R]	
1.30	Soft light/dark brown sandy gravelly SILT with cobbles throughout. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.	▽▽ ⊗	1.30	324.61		AA32214	B	1.00-1.00		
2.0		▽▽ ⊗								
2.40	Loose silty/clayey very sandy GRAVEL with cobbles throughout. Sand is coarse. Gravel and cobbles are subangular to subrounded.	▽▽ ⊗	2.40	323.51		AA32215	B	2.00-2.00		
3.0		▽▽ ⊗								
3.20	End of Trial Pit at 3.20m	▽▽ ⊗	3.20	322.71		AA32216	B	3.00-3.00		
4.0		▽▽ ⊗								

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP142**

**LOGGED BY** F.C

**CO-ORDINATES** 507,797.82 E  
568,600.90 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 27/04/2015

**DATE COMPLETED** 27/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 338.28

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	338.18						
	Soft to firm dark brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.		0.50	337.78		AA32217	B	0.50-0.50		
	Soft light/dark brown sandy gravelly silty CLAY with cobbles throughout. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.		1.00			AA32218	B	1.00-1.00		
	Loose gravelly SAND with occasional cobbles and boulders. Sand is fine to coarse. Gravel, cobbles and boulders are subrounded.		1.40	336.88						
	Obstruction - Possible rock End of Trial Pit at 2.70m		2.70	335.58		AA32219	B	2.50-2.50		
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP143**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,700.90 E  
568,585.98 N

**DATE STARTED** 28/04/2015

**DATE COMPLETED** 28/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 347.58

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown very sandy gravelly SILT with cobbles and boulders throughout. Sand is coarse. Gravel is subangular to subrounded. Cobbles and boulders are angular to subrounded.		0.20	347.38		AA32220	B	0.20-0.20	30	10[R]
1.0	Obstruction - Possible rock End of Trial Pit at 1.10m		1.10	346.48		AA32221	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP144**

**LOGGED BY** F.C

**CO-ORDINATES** 507,597.96 E  
568,607.04 N

**SHEET** Sheet 1 of 1



**DATE STARTED** 28/05/2015

**DATE COMPLETED** 28/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 365.70

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft to firm grey sandy gravelly SILT with cobbles throughout. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.		0.40	365.30		AA32222	B	0.40-0.40	24	8[R]
1.80			1.80			AA32223	B	1.80-1.80		
2.40	Obstruction - Possible weathered rock End of Trial Pit at 2.40m		2.40	363.30						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP145**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,487.96 E  
568,608.05 N

**DATE STARTED** 28/04/2015

**DATE COMPLETED** 28/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 378.78

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Large angular to subangular BOULDERS		0.30	378.48		AA32224	B	0.30-0.30	22	8[R]
1.0	Soft to firm blue/grey sandy gravelly SILT with cobbles throughout. Sand is fine to coarse. Gravel and cobbles are subangular.		0.90	377.88						
	Soft to firm brown sandy gravelly SILT with cobbles throughout. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.		1.40	377.38		AA32225	B	1.30-1.30		
2.0	Obstruction - Possible rock End of Trial Pit at 1.90m		1.90	376.88		AA32226	B	1.80-1.80		
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP146**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,311.97 E  
568,764.96 N

**DATE STARTED** 28/02/2015

**DATE COMPLETED** 28/02/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 418.99

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Large subangular BOULDERS	○○○○	0.40	418.59		AA32229	B	0.40-0.40	32	10[R]
1.20	Soft grey/black sandy gravelly SILT with cobbles throughout. Sand is fine to coarse. Gravel and cobbles are subangular.	x x x x	1.20	417.79						
1.80		x x x x	1.80	417.19		AA32230	B	1.80-1.80		
2.10	Obstruction - Possible weathered rock End of Trial Pit at 2.10m	x x x x	2.10	416.89						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP147**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,205.97 E  
568,787.09 N

**DATE STARTED** 28/01/2015

**DATE COMPLETED** 28/01/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 434.65

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Large subangular BOULDERS		0.20	434.45		AA32231	B	0.20-0.20	34	12[R]
1.0	Soft grey sandy gravelly SILT with cobbles throughout		1.00	433.65						
2.0						AA32232	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	431.65						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP148</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,259.05 E 568,895.74 N		<b>DATE STARTED</b> 29/04/2015
<b>GROUND LEVEL (m)</b> 439.81		<b>DATE COMPLETED</b> 29/04/2015
<b>CLIENT ENGINEER</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft to firm blue/grey sandy gravelly SILT with cobbles throughout. Sand is fine. Gravel and cobbles are subangular.		0.20	439.61	(Rapid)	AA32236	B	0.20-0.20	46	14[R]
1.0										
1.90	Stiff grey brown sandy gravelly SILT with cobbles throughout. Sand is fine. Gravel and cobbles are subangular.		1.90	437.91		AA32237	B	1.40-1.40		
2.0										
2.80										
3.00	End of Trial Pit at 3.00m		3.00	436.81		AA32238	B	2.80-2.80		
3.0										
4.0										

**Groundwater Conditions**  
Water ingress from G.L

**Stability**  
Pit unstable from G.L

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP149**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,368.10 E  
568,892.88 N

**DATE STARTED** 29/04/2015

**DATE COMPLETED** 29/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 425.26

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.20	425.06		AA32239	B	0.20-0.20	20 8[R]	
	Soft to firm brown/grey sandy gravelly SILT with cobbles throughout. Sand is fine. Gravel and cobbles are subangular to subrounded.		0.60	424.66		AA32240	B	0.50-0.50		
1.0	Obstruction - Possible weathered rock End of Trial Pit at 1.20m		1.20	424.06		AA32241	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15






# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP150</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 29/04/2015	
<b>CO-ORDINATES</b> 507,388.23 E 568,968.07 N		<b>DATE COMPLETED</b> 29/04/2015	
<b>GROUND LEVEL (m)</b> 432.38		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0	Loose brown very sandy silty GRAVEL with cobbles throughout. Sand is coarse. Gravel and cobbles are subangular to subrounded.		1.30	431.08		AA32242	B	1.00-1.00	14 2[R]	
2.0						AA32243	B	2.50-2.50		
3.0	End of Trial Pit at 1.30m		3.00	429.38						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Pit unstable from 1.30m

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP151</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 507,106.91 E 568,815.01 N		<b>DATE STARTED</b> 28/04/2015	
<b>GROUND LEVEL (m)</b> 450.44		<b>DATE COMPLETED</b> 28/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽								
1.20	Loose brown silty sandy GRAVEL with cobbles throughout. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.	○●	1.20	449.24		AA32233	B	1.00-1.00	228[R]	184[R]
2.0		○●								
2.60	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel and cobbles are subangular.	○●x	2.60	447.84						
3.0		○●x								
3.10	End of Trial Pit at 3.10m	○●x	3.10	447.34		AA32235	B	2.80-2.80		
4.0		○●x								

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Slight collapse at 1.50m

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

## 18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP152</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,024.55 E 568,828.80 N		<b>DATE STARTED</b> 29/04/2015
<b>GROUND LEVEL (m)</b> 462.16		<b>DATE COMPLETED</b> 29/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft brown very sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subrounded. Cobbles are subangular.		0.30	461.86		AA32246	B	0.30-0.30	14	2[R]
1.20						AA32247	B	1.20-1.20		
1.40	Obstruction - Possible weathered rock End of Trial Pit at 1.40m		1.40	460.76						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP153**

**LOGGED BY** F.C

**CO-ORDINATES** 506,997.72 E  
568,897.16 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 29/04/2015

**DATE COMPLETED** 29/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 466.81

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	[Symbol]								
0.20	Soft brown very sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subrounded. Cobbles are subangular.	[Symbol]	0.20	466.61		AA32248	B	0.20-0.20	14	2[R]
1.0	Obstruction - Possible weathered rock End of Trial Pit at 1.10m	[Symbol]	1.10	465.71		AA32249	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP154</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,955.51 E 568,976.07 N		<b>DATE STARTED</b> 29/04/2015
<b>GROUND LEVEL (m)</b> 472.40		<b>DATE COMPLETED</b> 29/04/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular.		0.40	472.00	 ↓ (Rapid)	AA32250	B	0.40-0.40	32 10[R]	
1.00	Soft brown/grey sandy gravelly SILT. Sand is coarse. Gravel is subangular to subrounded.		1.00	471.40		AA34701	B	0.80-0.80		
2.00	Soft brown/grey sandy gravelly SILT with cobbles and boulders. Sand is coarse. Gravel is angular. Cobbles and boulders are subangular.		2.00	470.40		AA34702	B	2.20-2.20		
2.50	Obstruction - Possible weathered rock End of Trial Pit at 2.50m		2.50	469.90						
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from 1.50m

**Stability**  
Side walls collapsing due to water ingress.

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP155**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,185.06 E  
569,035.50 N

**DATE STARTED** 29/04/2015

**DATE COMPLETED** 29/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 464.46

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT									
1.50	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.		1.50	462.96		AA34705	B	1.50-1.50	24 10[R]	
3.10	End of Trial Pit at 3.10m		3.10	461.36		AA34706	B	3.00-3.00		

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Pit sides unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP156</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 507,253.01 E 569,151.00 N	
<b>GROUND LEVEL (m)</b> 465.52		<b>DATE STARTED</b> 29/04/2015	
		<b>DATE COMPLETED</b> 29/04/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽								
1.20	Angular COBBLES and BOULDERS (Possible weathered rock)	○	1.20	464.32		AA34707	B	1.00-1.00	28 8[R]	
1.60	Obstruction - Possible rock End of Trial Pit at 1.60m	○	1.60	463.92					14 2[R]	
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP157**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,174.79 E  
569,122.45 N






















**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 473.80

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT (H4-H7)	       								
1.0	Soft to firm blue/grey sandy gravelly SILT with cobbles throughout. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.	            	1.20	472.60		AA34709	B	1.20-1.20	16 6[R]	8 2[R]
2.0								AA34710	B	2.50-2.50
3.0	End of Trial Pit at 3.00m		3.00	470.80						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP158</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 30/04/2015	
<b>CO-ORDINATES</b> 507,084.24 E 569,199.95 N		<b>DATE COMPLETED</b> 30/04/2015	
<b>GROUND LEVEL (m)</b> 490.33		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT (H4-H7)									
1.0	Soft brown sandy gravelly SILT with rootlets and cobbles. Sand is coarse. Gravel and cobbles are angular to subangular.		1.00	489.33		AA34711	B	1.00-1.00	24 6[R]	
	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular. Cobbles are angular to subangular.		1.60	488.73		AA34712	B	1.50-1.50		
2.0						AA34713	B	2.50-2.50		
3.0	End of Trial Pit at 3.10m		3.10	487.23						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

REPORT NUMBER

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP159

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,997.48 E  
569,211.86 N

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 500.43

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.40	500.03		AA34714	B	0.40-0.40	12	0[R]
1.0	Soft to firm brown sandy gravelly SILT with cobbles. Sand is fine. Gravel and cobbles are angular to subangular.		1.10	499.33		AA34715	B	1.00-1.00		
2.0										
						AA34715	B	2.40-2.40		
3.0	End of Trial Pit at 3.10m		3.10	497.33						
4.0										

**Groundwater Conditions**

Water seepage from G.L

**Stability**

Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP160**

**LOGGED BY** F.C

**CO-ORDINATES** 506,904.45 E  
569,274.06 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 512.34

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.60	511.74		AA34717	B	0.50-0.50		
1.0	Loose brown silty sandy GRAVEL. Sand is coarse. Gravel is angular. (Possible weathered rock)		1.40	510.94		AA34718	B	1.30-1.30		
2.0	Obstruction - Possible rock End of Trial Pit at 2.00m		2.00	510.34					10 0[R]	
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP161**

**LOGGED BY** F.C

**CO-ORDINATES** 506,817.46 E  
569,308.84 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 524.48

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽▽								
	Angular COBBLES and BOULDERS (Possible weathered rock)	●●●	0.30	524.18		AA34720	B	0.30-0.30	14	
	Obstruction - Possible rock End of Trial Pit at 0.60m		0.60	523.88					2[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP162</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,752.69 E 569,387.78 N		<b>DATE STARTED</b> 30/04/2015
<b>GROUND LEVEL (m)</b> 535.75		<b>DATE COMPLETED</b> 30/04/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Loose silty sandy GRAVEL with cobbles and boulders (Possible weathered rock)		0.30	535.45		AA34721	B	0.30-0.30	30	12[R]
1.80			1.80			AA34722	B	1.80-1.80		
2.30	Obstruction - Possible rock End of Trial Pit at 2.30m		2.30	533.45						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP163

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,715.95 E  
569,463.23 N

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 543.54

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
	Soft brown sandy very gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel and cobbles are angular.		0.40	543.14		AA34723	B	0.40-0.40	30	8[R]
1.0	Obstruction - Possible rock End of Trial Pit at 1.10m		1.10	542.44	↓ (Seepage)	AA34724	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Water lying on top of rock

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP164</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 30/04/2015	
<b>CO-ORDINATES</b> 506,695.47 E 569,550.30 N		<b>DATE COMPLETED</b> 30/04/2015	
<b>GROUND LEVEL (m)</b> 547.99		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0	Soft to firm brown/grey sandy gravelly SILT with cobbles and boulders. Sand is coarse. Gravel, cobbles and boulders are angular to subangular.		1.20	546.79		AA34725	B	1.20-1.20	18 6[R]	14 2[R]
2.0						AA34726	B	2.60-2.60		
3.0	End of Trial Pit at 3.00m		3.00	544.99						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP165</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>CO-ORDINATES</b> 506,660.52 E 569,647.15 N	
<b>GROUND LEVEL (m)</b> 544.95		<b>DATE STARTED</b> 30/04/2015	
		<b>DATE COMPLETED</b> 30/04/2015	
		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	544.85						
	Loose silty sandy angular GRAVEL (Possible weathered rock)									
1.0	Obstruction - Possible weathered rock End of Trial Pit at 1.10m		1.10	543.85		AA34727	B	1.00-1.00		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP166**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,645.12 E  
569,739.25 N

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 532.32

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽▽▽								
	Soft light brown sandy gravelly SILT with rootlets. Sand is fine. Gravel is angular.	x o x x	0.40	531.92		AA34728	B	0.40-0.40	14 2[R]	
	Loose silty angular GRAVEL (Possible weathered rock)	x o x x	0.80	531.52		AA34729	B	0.80-0.80		
1.0	Obstruction - Possible weathered rock End of Trial Pit at 1.20m	x o x x	1.20	531.12						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP167**

**LOGGED BY** F.C

**CO-ORDINATES** 506,710.49 E  
569,789.02 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 518.61

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)	\ / \ / \ /								
	Soft brown sandy gravelly SILT with rootlets. Sand is fine. Gravel is angular.	x o x o x o	0.30	518.31		AA34730	B	0.30-0.30	22 8[R]	
	Obstruction - Possible rock End of Trial Pit at 0.60m	x o x o x o	0.60	518.01		AA34731	B	0.50-0.50		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP168**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,732.06 E  
569,896.99 N

**DATE STARTED** 30/04/2015

**DATE COMPLETED** 30/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 503.89

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Angular COBBLES and BOULDERS (Presumed weathered rock)		0.20	503.69		AA34732	B	0.20-0.20	18	
	Obstruction - Possible rock End of Trial Pit at 0.50m		0.50	503.39					2[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Water lying on top of rock

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP169</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 01/05/2015	
<b>CO-ORDINATES</b> 506,747.75 E 569,985.73 N		<b>DATE COMPLETED</b> 01/05/2015	
<b>GROUND LEVEL (m)</b> 491.73		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽							20 8[R]	
1.5		▽▽							14 2[R]	
1.90		▽▽	1.90	489.83		AA34733	B	1.50-1.50	10 0[R]	
2.0	Loose silty sandy GRAVEL with cobbles. Sand is coarse. Gravel and cobbles are angular.	○●							10 0[R]	
2.50		○●				AA34734	B	2.50-2.50		
2.80	Obstruction - Possible weathered rock End of Trial Pit at 2.80m	○●	2.80	488.93						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP170**

**LOGGED BY** F.C

**CO-ORDINATES** 506,852.11 E  
570,103.52 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 01/05/2015

**DATE COMPLETED** 01/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 493.67

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	493.57						
	Angular COBBLES and BOULDERS (Possible weathered rock)									
	Obstruction - Possible weathered rock End of Trial Pit at 0.40m		0.40	493.27		AA34737	B	0.30-0.30		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP171</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 05/05/2015	
<b>CO-ORDINATES</b> 506,942.83 E 570,243.05 N		<b>DATE COMPLETED</b> 05/05/2015	
<b>GROUND LEVEL (m)</b> 473.20		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT (H4-H7)									
0.90	Obstruction - Possible rock End of Trial Pit at 0.90m		0.90	472.30		AA34740	B	0.90-0.90	140[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP172</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,026.41 E 570,292.72 N		<b>DATE STARTED</b> 05/05/2015
<b>GROUND LEVEL (m)</b> 461.73		<b>DATE COMPLETED</b> 05/05/2015
<b>CLIENT</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)				 (Rapid)					
0.60	Obstruction - Possible rock End of Trial Pit at 0.60m		0.60	461.13		AA34741	B	0.50-0.50	48	12[R]
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP173</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,130.93 E 570,323.38 N		<b>DATE STARTED</b> 05/05/2015
<b>GROUND LEVEL (m)</b> 443.08		<b>DATE COMPLETED</b> 05/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ Water Strike (Rapid)					
0.40	Angular COBBLES and BOULDERS (Possible weathered rock)		0.40	442.68		AA34742	B	0.40-0.40	24	10[R]
1.00	Obstruction - Possible rock End of Trial Pit at 1.00m		1.00	442.08						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP174**

**LOGGED BY** F.C

**CO-ORDINATES** 507,211.27 E  
570,373.66 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 05/05/2015

**DATE COMPLETED** 05/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 425.22

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown sandy gravelly SILT with rootlets throughout. Sand is coarse. Gravel is angular to subangular.		0.40	424.82		AA34743	B	0.40-0.40	28	10[R]
1.10						AA34744	B	1.10-1.10		
1.30	Obstruction - Possible rock End of Trial Pit at 1.30m		1.30	423.92						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP175**

**LOGGED BY** F.C

**CO-ORDINATES** 507,294.25 E  
570,425.18 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 05/05/2015

**DATE COMPLETED** 05/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 404.81

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
1.0						AA34745	B	1.00-1.00	24 8[R]	
1.60	Obstruction - Possible rock End of Trial Pit at 1.60m		1.60	403.21					16 8[R]	
2.0									10 2[R]	
3.0										
4.0										

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP176</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,390.93 E 570,451.61 N		<b>DATE STARTED</b> 05/05/2015
<b>GROUND LEVEL (m)</b> 395.46		<b>DATE COMPLETED</b> 05/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Rapid)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽								
1.40	Angular COBBLES and BOULDERS (Possible weathered rock)	○	1.40	394.06		AA34746	B	1.00-1.00	184[R]	100[R]
2.00	Obstruction - Possible rock End of Trial Pit at 2.00m	○	2.00	393.46						
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP177</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 11/05/2015	
<b>CO-ORDINATES</b> 507,488.69 E 570,475.05 N		<b>DATE COMPLETED</b> 11/05/2015	
<b>GROUND LEVEL (m)</b> 394.66		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
1.0						AA12662	B	1.00-1.00	24 10[R]	
2.0	Soft brown sandy gravelly SILT with pockets of reddish brown clay and blue/grey silt		1.90	392.76					20 8[R]	
3.0	End of Trial Pit at 3.00m		3.00	391.66		AA12663	B	2.50-2.50	10 0[R]	

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP178

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,588.31 E  
570,495.39 N


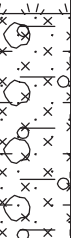

**DATE STARTED** 11/05/2015

**DATE COMPLETED** 11/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 392.40

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
1.0	Soft brown sandy gravelly SILT with cobbles and pockets of reddish brown clay. Sand is fine to coarse. Gravel and cobbles are angular to subangular.		1.10	391.30		AA12660	B	1.00-1.00	20 10[R]	14 6[R]
2.0	End of Trial Pit at 2.10m		2.10	390.30		AA12661	B	2.00-2.00		
3.0										
4.0										

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP179</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 11/05/2015	
<b>CO-ORDINATES</b> 507,664.71 E 570,552.99 N		<b>DATE COMPLETED</b> 11/05/2015	
<b>GROUND LEVEL (m)</b> 388.67		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
0.80	Soft to firm brown sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular.	x x x x	0.80	387.87		AA12658	B	0.80-0.80	22 8[R]	
1.00	Loose brown silty sandy GRAVEL with cobbles. Sand is coarse. Gravel and cobbles are subrounded.	○ ○ ○ ○	1.00	387.67						
1.70		○ ○ ○ ○	1.70	386.77		AA12659	B	1.70-1.70		
2.10	Soft blue/grey sandy gravelly SILT. Sand is fine. Gravel is angular.	x x x x	2.10	386.57						
	Obstruction - Possible rock End of Trial Pit at 2.10m	x x x x								

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP180**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,736.07 E  
570,594.37 N

**DATE STARTED** 11/05/2015

**DATE COMPLETED** 11/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 385.45

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.40	385.05		AA12656	B	0.40-0.40	26	10[R]
0.90	Obstruction - Possible rock End of Trial Pit at 0.90m		0.90	384.55		AA12657	B	0.90-0.90		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP181**

**LOGGED BY** F.C

**CO-ORDINATES** 507,834.40 E  
570,626.65 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 11/05/2015

**DATE COMPLETED** 11/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 377.90

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular.		0.40	377.50		AA12654	B	0.40-0.40	20 8[R]	
	Obstruction - Possible rock End of Trial Pit at 0.90m		0.90	377.00		AA12655	B	0.80-0.80		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP182</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,914.08 E 570,680.61 N		<b>DATE STARTED</b> 11/05/2015
<b>GROUND LEVEL (m)</b> 371.29		<b>DATE COMPLETED</b> 11/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
0.60	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.		0.60	370.69		AA10199	B	0.50-0.50	18 6[R]	
1.00	Obstruction - Possible rock End of Trial Pit at 1.00m		1.00	370.29		AA10200	B	0.90-0.90		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP183**

**LOGGED BY** F.C

**CO-ORDINATES** 508,027.00 E  
570,697.88 N

**SHEET** Sheet 1 of 1

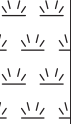


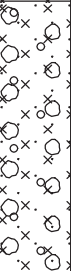
**DATE STARTED** 11/05/2015

**DATE COMPLETED** 11/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 363.88

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				 (Seepage)					
0.60	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular.		0.60	363.28		AA10197	B	0.50-0.50	40	14[R]
0.90	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel and cobbles are subangular.		0.90	362.98						
1.70						AA10198	B	1.70-1.70		
2.10	Obstruction - Possible rock End of Trial Pit at 2.10m		2.10	361.78						

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Side walls unstable due to water ingress

**General Remarks**  
\* Relocated 20m downhill

IGSL TP LOG - 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

## 18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP184</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 508,080.03 E 570,651.66 N		<b>DATE STARTED</b> 11/05/2015
<b>GROUND LEVEL (m)</b> 355.47		<b>DATE COMPLETED</b> 11/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
			Sample Ref	Type	Depth		
0.0		↓ (Seepage)					
0.40	355.07		AA10195	B	0.40-0.40	20 8[R]	
2.00	353.27		AA10196	B	2.00-2.00		
Obstruction - Possible rock End of Trial Pit at 2.20m							

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP185**

**LOGGED BY** F.C

**CO-ORDINATES** 508,044.89 E  
570,558.35 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 11/05/2015

**DATE COMPLETED** 11/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 348.87

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
0.50	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel and cobbles are subangular.		0.50	348.37		AA10193	B	0.50-0.50	80[R]	
2.50						AA10194	B	2.50-2.50		
3.20	End of Trial Pit at 3.20m		3.20	345.67						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP186</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 07/05/2015	
<b>CO-ORDINATES</b> 507,906.48 E 570,413.76 N		<b>DATE COMPLETED</b> 07/05/2015	
<b>GROUND LEVEL (m)</b> 348.32		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.60	Soft reddish brown sandy gravelly CLAY. Sand is fine. Gravel is subangular.		0.60	347.72		AA10189	B	0.50-0.50	20	
0.80	Soft to firm grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.		0.80	347.52					8[R]	
2.0	Obstruction - Possible rock End of Trial Pit at 2.20m		2.20	346.12		AA10190	B	2.00-2.00		

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP187**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,801.18 E  
570,384.41 N

**DATE STARTED** 07/05/2015

**DATE COMPLETED** 07/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 358.26

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft reddish brown sandy gravelly CLAY. Sand is fine. Gravel is subangular.		0.40	357.86		AA10186	B	0.40-0.40	30 10[R]	
0.90	Loose silty sandy GRAVEL. Sand is coarse. Gravel is angular. (Possible weathered rock)		0.90	357.36		AA10187	B	0.80-0.80		
2.00						AA10188	B	2.00-2.00		
2.50	Obstruction - Possible rock End of Trial Pit at 2.50m		2.50	355.76						

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP188</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 07/05/2015	
<b>CO-ORDINATES</b> 507,720.84 E 570,334.95 N		<b>DATE COMPLETED</b> 07/05/2015	
<b>GROUND LEVEL (m)</b> 361.55		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown gravelly sandy SILT with pockets of blue silt and red clay and rootlets. Sand is coarse. Gravel is subangular.		0.20	361.35					38 16[R]	
	Loose silty angular GRAVEL (Possibly weathered rock)		0.60	360.95		AA10184	B	0.50-0.50		
2.0						AA10185	B	2.00-2.00		
2.40	Obstruction - Possible rock End of Trial Pit at 2.40m		2.40	359.15						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP189</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,601.65 E 570,633.60 N		<b>DATE STARTED</b> 12/05/2015
<b>GROUND LEVEL (m)</b> 397.45		<b>DATE COMPLETED</b> 12/05/2015
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
	Medium dense silty angular GRAVEL		1.30	396.15		AA12664	B	1.00-1.00	20 8[R]	
	Obstruction - Possible rock End of Trial Pit at 1.50m		1.50	395.95						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP190**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,421.82 E  
570,642.97 N

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 393.77

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ /								
	Firm brown sandy gravelly SILT	x o x o x o	0.30	393.47		AA12671	B	0.30-0.30	24 10[R]	
		x o x o x o	0.60	392.97		AA12672	B	0.60-0.60		
1.0	Obstruction - Possible rock End of Trial Pit at 0.80m									

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP191</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,317.67 E 570,654.66 N		<b>DATE STARTED</b> 12/05/2015
<b>GROUND LEVEL (m)</b> 385.49		<b>DATE COMPLETED</b> 12/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.60	Soft blue/grey sandy gravelly SILT with cobbles throughout. Sand is fine to coarse. Gravel and cobbles are subangular to subrounded.		0.50-0.50	384.89		AA12673	B		24	10[R]
1.50			1.50-1.50			AA12674	B			
2.10	Obstruction - Possible rock End of Trial Pit at 2.10m			383.39						

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP192**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,225.38 E  
570,695.73 N

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 376.92

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Obstruction - Possible rock End of Trial Pit at 0.30m		0.30	376.62		AA12675	B	0.30-0.30	38 22[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP193**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,038.62 E  
570,663.89 N

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 396.54

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Obstruction - Possible rock End of Trial Pit at 0.50m		0.50	396.04		AA12677	B	0.50-0.50	12 2[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP194**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,938.53 E  
570,667.42 N

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 399.52

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ (Rapid)					
0.70	Soft to firm brown sandy gravelly SILT. Sand is coarse. Gravel is subangular.		0.70	398.82		AA12678	B	0.50-0.50	10	0[R]
1.00	Obstruction - Possible rock End of Trial Pit at 1.00m		1.00	398.52		AA12679	B	1.00-1.00		

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP195**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ / \ /								
0.50	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular.	x o x x x x	0.50			AA12680	B	0.50-0.50	28 12[R]	
0.80	Soft brown sandy very gravelly SILT with cobbles and boulders. Sand is fine to coarse. Gravel, cobbles and boulders are angular to subangular.	x o x x x x	0.80							
1.0		x o x x x x				AA12681	B	1.50-1.50		
1.80	Obstruction - Possible rock End of Trial Pit at 1.80m	x o x x x x	1.80							
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP196**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,669.43 E  
570,668.74 N

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 393.87

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft to firm brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are angular.		0.30	393.57		AA12667	B	0.30-0.30	14 4[R]	
	Obstruction - Possible rock End of Trial Pit at 0.70m		0.70	393.17		AA12668	B	0.60-0.60		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP197</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 12/05/2015	
<b>CO-ORDINATES</b> 507,580.49 E 570,705.76 N		<b>DATE COMPLETED</b> 12/05/2015	
<b>GROUND LEVEL (m)</b> 394.71		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.80	Soft to firm brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are angular.		0.80	393.91		AA12669	B	0.50-0.50	10	2[R]
1.60	Obstruction - Possible rock End of Trial Pit at 1.60m		1.60	393.11		AA12670	B	1.50-1.50		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP198</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,481.12 E 570,729.30 N		<b>DATE STARTED</b> 13/05/2015
<b>GROUND LEVEL (m)</b> 382.57		<b>DATE COMPLETED</b> 13/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
1.20	Soft brown/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.		1.20	381.37		AA12684	B	1.00-1.00	14 4[R]	
1.60						AA12685	B	1.60-1.60	14 2[R]	
1.90	Obstruction - Possible rock End of Trial Pit at 1.90m		1.90	380.67						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP199**

**LOGGED BY** F.C

**CO-ORDINATES** 507,382.71 E  
570,725.76 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 379.09

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ / \ /								
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.	x o x o x o	0.30	378.79		AA12686	B	0.30-0.30	14 4[R]	
	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subrounded.	x o x o x o	0.80	378.29		AA12687	B	0.60-0.60		
1.0										
	Obstruction - Possible rock End of Trial Pit at 1.70m	x o x o x o	1.70	377.39		AA12688	B	1.60-1.60		
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

## 18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP200**
**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,277.77 E  
570,722.57 N

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 372.37

**EXCAVATION METHOD** 13 Tonne Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.30	372.07		AA12689	B	0.30-0.30	18	6[R]
1.0						AA12690	B	1.00-1.00		
	Obstruction - Possible rock End of Trial Pit at 1.30m		1.30	371.07						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP201</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 507,175.59 E 570,733.90 N		<b>DATE STARTED</b> 13/05/2015
<b>GROUND LEVEL (m)</b> 371.07		<b>DATE COMPLETED</b> 13/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0					 (Rapid)	AA12691	B	1.00-1.00	14 2[R]	10 0[R]
1.40	Obstruction - Possible rock End of Trial Pit at 1.40m		1.40	369.67						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from 1.10m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

**18312**

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP202**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,077.22 E  
570,732.17 N

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 376.27

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7) Obstruction - Possible rock End of Trial Pit at 0.10m		0.10	376.17		AA12692	B	0.10-0.10		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP203**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,979.61 E  
570,753.92 N

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 377.43

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Obstruction - Possible rock End of Trial Pit at 0.30m		0.30	377.13		AA12693	B	0.30-0.30	20 10[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP204**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,875.06 E  
570,763.37 N

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 379.19

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ / \ /								
0.40	Soft brown sandy gravelly SILT with cobbles and pockets of reddish brown clay. Sand is coarse. Gravel and cobbles are subangular to subrounded.	\ / \ / \ / x x x x x x o o o o o o	0.40	378.79		AA12694	B	0.40-0.40	22	8[R]
1.60	Obstruction - Possible rock End of Trial Pit at 1.60m	\ / \ / \ / x x x x x x o o o o o o x x x x x x	1.60	377.59		AA12695	B	1.40-1.40		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP205**

**LOGGED BY** F.C

**CO-ORDINATES** 506,769.76 E  
570,766.56 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 362.58

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black fibrous PEAT with occasional angular boulders									
1.0	Obstruction - Possible rock End of Trial Pit at 0.90m		0.90	361.68	 (Rapid)	AA12696	B	0.50-0.50	80[R]	
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from 0.90m

**Stability**  
No instability Observed

**General Remarks**  
\* Relocated 10m due to steepness of slope

IGSL TP LOG - 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP206**

**LOGGED BY** F.C

**CO-ORDINATES** 506,672.19 E  
570,763.63 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 13/05/2015

**DATE COMPLETED** 13/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 355.12

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	355.02						
1.0	Soft brown very sandy very gravelly SILT with cobbles, boulders and rootlets. Sand is coarse. Gravel, cobbles and boulders are angular to subangular.					AA12697	B	1.00-1.00		
2.0	Obstruction - Possible boulders End of Trial Pit at 1.80m		1.80	353.32						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Major collapse at 1.80m

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP207</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,579.32 E 570,765.34 N		<b>DATE STARTED</b> 13/05/2015
<b>GROUND LEVEL (m)</b> 350.70		<b>DATE COMPLETED</b> 13/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Soft brown/light brown sandy gravelly SILT with cobbles. Sand is coarse. Gravel and cobbles are subangular.		0.50	350.20		AA12698	B	0.50-0.50	30 14[R]	
1.50						AA12699	B	1.50-1.50		
2.00	Soft grey sandy gravelly SILT with cobbles and boulders. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles and boulders are subangular.		2.00	348.70						
2.50						AA12700	B	2.50-2.50		
3.00	End of Trial Pit at 3.00m		3.00	347.70						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP208</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,465.34 E 570,758.26 N		<b>DATE STARTED</b> 13/05/2015
<b>GROUND LEVEL (m)</b> 339.98		<b>DATE COMPLETED</b> 13/05/2015
<b>CLIENT</b> ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	339.88						
	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.									
	Obstruction - Possible rock End of Trial Pit at 0.60m		0.60	339.38		AA20460	B	0.50-0.50		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP209</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,368.57 E 570,763.68 N		<b>DATE STARTED</b> 13/05/2015
<b>GROUND LEVEL (m)</b> 337.84		<b>DATE COMPLETED</b> 13/05/2015
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				 (Rapid)					
0.30	Soft brown sandy gravelly SILT with cobbles. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.			337.54					20	
1.00						AA20461	B	1.00-1.00		
1.50	Obstruction - Possible rock End of Trial Pit at 1.50m			336.34						

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15










# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP210</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 14/05/2015	
<b>CO-ORDINATES</b> 506,274.61 E 570,775.40 N		<b>DATE COMPLETED</b> 14/05/2015	
<b>GROUND LEVEL (m)</b> 333.46		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				 (Seepage)					
1.0									16 4[R]	
1.20	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are subangular.		1.20	332.26		AA20462	B	1.00-1.00	10 0[R]	
2.0										
2.50						AA20463	B	2.50-2.50		
3.0	End of Trial Pit at 3.00m		3.00	330.46						
4.0										

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Side walls collapsing from 1.20m

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP211</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,168.23 E 570,762.29 N		<b>DATE STARTED</b> 14/05/2015
<b>GROUND LEVEL (m)</b> 334.39		<b>DATE COMPLETED</b> 14/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
1.40	Soft to firm blue/grey sandy gravelly SILT with cobbles and pockets of silt. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.		1.40	332.99		AA20464	B	1.00-1.00	20 8[R]	14 4[R]
2.0										
2.00						AA20465	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	331.39						
4.0										

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP212</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,068.21 E 570,760.71 N		<b>DATE STARTED</b> 14/05/2015
<b>GROUND LEVEL (m)</b> 336.46		<b>DATE COMPLETED</b> 14/05/2015
<b>CLIENT</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator
<b>ENGINEER</b> ESBI		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft brown sandy gravelly SILT with occasional large boulders and rootlets	x x x x x o o o o o x x x x x	0.30	336.16		AA20466	B	0.30-0.30	10 0[R]	
1.40	Obstruction - Possible rock End of Trial Pit at 1.40m	x x x x x o o o o o x x x x x	1.40	335.06		AA20467	B	1.30-1.30		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP213**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 505,981.51 E  
570,770.83 N

**DATE STARTED** 14/05/2015

**DATE COMPLETED** 14/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 339.50

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7) Soft blue/grey sandy gravelly SILT with cobbles and rootlets		0.10	339.40						
1.0						AA20468	B	1.00-1.00		
1.40	Obstruction - Possible rock End of Trial Pit at 1.40m		1.40	338.10						
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP214**

**LOGGED BY** F.C

**CO-ORDINATES** 505,890.03 E  
570,820.30 N

**SHEET** Sheet 1 of 1







**DATE STARTED** 14/05/2015

**DATE COMPLETED** 14/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 342.15

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
1.40	Soft grey/blue sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular.		1.40	340.75	 (Rapid)	AA20469	B	1.00-1.00	34 12[R]	14 6[R]
2.0						AA20470	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	339.15						
4.0										

**Groundwater Conditions**  
Rapid water ingress from 1.40m

**Stability**  
Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP215**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 505,856.52 E  
570,903.56 N

**DATE STARTED** 14/05/2015

**DATE COMPLETED** 14/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 345.60

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	// //								
0.30	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular.	x o x	0.30	345.30		AA20471	B	0.30-0.30	30 10[R]	
0.70	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are subangular.	x o x	0.70	344.90		AA20472	B	0.60-0.60		
1.60		x o x				AA20473	B	1.60-1.60		
2.30	Obstruction - Possible rock End of Trial Pit at 2.30m	x o x	2.30	343.30						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP216</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 14/05/2015	
<b>CO-ORDINATES</b> 505,857.66 E 570,991.74 N		<b>DATE COMPLETED</b> 14/05/2015	
<b>GROUND LEVEL (m)</b> 348.53		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)			
						Sample Ref	Type	Depth					
0.0	Very soft black fibrous PEAT (H4-H7)				↓ Water Strike (Rapid)								
1.0										14 4[R]			
2.0											12 0[R]		
2.40			Loose silty sandy GRAVEL with cobbles. Gravel and cobbles are angular.			2.40	346.13		AA20474	B	1.50-1.50	8 0[R]	
3.0			End of Trial Pit at 3.00m			3.00	345.53		AA20475	B	2.70-2.70	4 0[R]	
4.0													

**Groundwater Conditions**  
Rapid water ingress from G.L

**Stability**  
Pit collapsing due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP217**

**LOGGED BY** F.C

**CO-ORDINATES** 505,937.72 E  
571,042.68 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 14/05/2015

**DATE COMPLETED** 14/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 348.01

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽								
1.50	Medium dense silty sandy GRAVEL with cobbles and boulders. Sand is coarse. Gravel, cobbles and boulders are angular.	▽▽	1.50	346.51	↓ (Rapid)	AA20476	B	1.00-1.00	14 2[R]	10 0[R]
1.80	Obstruction - possible rock End of Trial Pit at 1.80m	▽▽	1.80	346.21					8 0[R]	
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Rapid water ingress from 1.50m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP218</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 14/05/2015	
<b>CO-ORDINATES</b> 506,025.24 E 571,096.90 N		<b>DATE COMPLETED</b> 14/05/2015	
<b>GROUND LEVEL (m)</b> 346.37		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft blue/grey sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are subangular.	x x x x x o o o o o x x x x x	0.40	345.97		AA20477	B	0.40-0.40	28	0[R]
1.30	Obstruction - Possible rock End of Trial Pit at 1.30m	x x x x x o o o o o x x x x x	1.30	345.07		AA20478	B	1.20-1.20		

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Pit sides collapsing

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP219**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 22/05/2015

**DATE COMPLETED** 22/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
0.30	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.30			AA19341	B	0.30-0.30	30	12[R]
0.60	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel and cobbles are subangular to subrounded.		0.60							
1.0						AA19342	B	1.30-1.30		
2.0	Obstruction - Possible rock End of Trial Pit at 2.00m		2.00							
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP220

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 22/05/2015

**DATE COMPLETED** 22/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.90	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subrounded.		0.90			AA19343	B	0.80-0.80	26 12[R]	
1.20	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel and cobbles are subangular to subrounded.		1.20							
2.00						AA19344	B	2.00-2.00		
3.00	End of Trial Pit at 3.00m		3.00							

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP221

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 22/05/2015

**DATE COMPLETED** 22/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0										
1.40	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel and cobbles are subangular to subrounded.		1.40			AA19345	B	1.00-1.00	24 10[R]	
2.0										
2.20	Obstruction - Possible rock End of Trial Pit at 2.20m		2.20			AA19346	B	2.00-2.00	16 4[R]	
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP222**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**














**DATE STARTED** 22/05/2015

**DATE COMPLETED** 22/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	   								
1.0	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.	   	0.90		 (Seepage)	AA19367	B	0.80-0.80	24 8[R]	
2.0	Soft grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subrounded.	   	1.50			AA19368	B	1.80-1.80		
3.0	End of Trial Pit at 3.00m		3.00							

**Groundwater Conditions**  
water seepage at 0.90m

**Stability**  
Pit sides collapsing due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP223

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 22/05/2015

**DATE COMPLETED** 22/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/grey sandy gravelly SILT with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded.									
1.0	Soft brown/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subrounded.		1.00			AA19349	B	1.20-1.20		
2.0	Obstruction End of Trial Pit at 2.20m		2.20							
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP224**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ / \ /								
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.	x o x o x o	0.30			AA19350	B	0.30-0.30	28 10[R]	
1.0	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.	x o x o x o	0.90			AA24303	B	1.00-1.00		
2.0	Obstruction - Possible rock End of Trial Pit at 1.70m	x o x o x o	1.70							

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP225**

**LOGGED BY** F.C

**CO-ORDINATES**

**SHEET** Sheet 1 of 1

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with pockets of silt (H4-H7)	[Symbol]								
	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.	[Symbol]	0.20			AA24304	B	0.20-0.20		
1.0	Soft blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subrounded. Cobbles are subangular.	[Symbol]	0.90							
2.0		[Symbol]				AA24305	B	1.90-1.90		
3.0	Obstruction - Possible rock End of Trial Pit at 2.80m	[Symbol]	2.80							
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP226**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Medium dense silty sandy GRAVEL with cobbles and boulders and rootlets. Gravel, cobbles and boulders are angular.	(b) (c) (r)	0.20			AA24306	B	0.40-0.40	30	
	Obstruction - Large angular boulders End of Trial Pit at 0.70m	(b)	0.70							
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP227

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10							
1.0	Soft light grey sandy gravelly SILT with rootlets and cobbles. Sand is fine to coarse. Gravel is subrounded to rounded. Cobbles are subangular.		1.20			AA24307	B	1.00-1.00		
2.0	Soft light grey gravelly silty SAND with cobbles and boulders. Sand is fine to coarse. Gravel is subrounded to rounded. Cobbles and boulders are subangular.		2.30							
3.0	Obstruction - Possible boulders End of Trial Pit at 2.30m									
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP228

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.20	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.20						24	
0.60	Soft to firm grey/blue sandy gravelly SILT with cobbles. Sand is coarse. Gravel and cobbles are subrounded.		0.60							
1.0										
2.0						AA24308	B	1.50-1.50		
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TP229</b>
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 25/05/2015
<b>CO-ORDINATES</b>		<b>DATE COMPLETED</b> 25/05/2015
<b>GROUND LEVEL (m)</b>		<b>EXCAVATION METHOD</b> 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.15							
1.0	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		1.20			AA24309	B	1.00-1.00		
2.0	Soft blue/grey sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subrounded. Cobbles are subangular.		1.60							
2.0	Obstruction - Possible rock End of Trial Pit at 1.60m									

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP230**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Stiff black CLAY		0.20							
	Obstruction - possible rock End of Trial Pit at 0.40m		0.40			AA24310	B	0.30-0.30		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TP231  
**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015  
**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
					Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)								
0.20	Soft brown sandy gravelly SILT with rootlets. Gravel is subrounded.								
1.0					AA24311	B	1.00-1.00		
1.20	Loose grey silty gravelly SAND with occasional cobbles. Sand is fine. Gravel is rounded to subrounded. Cobbles are subrounded.								
2.0									
2.50					AA24312	B	2.50-2.50		
3.0	End of Trial Pit at 3.00m								
4.0									

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TP232**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 25/05/2015

**DATE COMPLETED** 25/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subrounded.		0.70			AA24313	B	0.50-0.50	20	8[R]
1.20	Soft blue/grey SILT		1.20							
2.60						AA24314	B	2.60-2.60		
3.00	End of Trial Pit at 3.00m		3.00							

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
Pit was unstable at 1.20m

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT001

**LOGGED BY** F.C

**CO-ORDINATES** 509,174.96 E  
571,570.92 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 314.13

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)									
	Light brown gravelly SILT with cobbles		0.30	313.83					50 54 56	
	Dark brown very gravelly SILT with frequent cobbles and occasional angular boulders (up to 500mm)		0.70	313.43		AA32071 AA32071	B D	0.50-0.50 0.50-0.50		
1.0										
2.0						AA32072 AA32072	B D	1.50-1.50 1.50-1.50		
3.0	End of Trial Pit at 3.00m		3.00	311.13						
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT002

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,277.14 E  
571,309.48 N

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 339.23

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark black fibrous PEAT (H4-H7)									
	Reddish grey very gravelly SILT with frequent cobbles and some boulders. Cobbles and boulders are angular.		0.30	338.93		AA32066 AA32066	B D	0.20-0.20 0.20-0.20	40 42 50	
	Obstruction - Possible boulder/bedrock End of Trial Pit at 0.60m		0.60	338.63		AA32067 AA32067	B D	0.50-0.50 0.50-0.50		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT003

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,369.02 E  
571,100.02 N

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 324.96

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft dark brown fibrous PEAT (H4-H7)	\ / \ / \ /								
		\ / \ / \ /	0.50	324.46		AA32062	B	0.30-0.30	30	
		\ / \ / \ /	0.60	324.36		AA32062	D	0.30-0.30	20	
	Soft dark grey silty PEAT (H4-H7)	\ / \ / \ /							30	
	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.60m					AA32063	B	0.60-0.60		
						AA32063	D	0.60-0.60		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT004

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES**

**DATE STARTED** 13/04/2015

**DATE COMPLETED** 13/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)**

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)	▽▽▽								
	Soft brown gravelly SILT with rootlets. Gravel is subangular.	x o x	0.30			AA27909	B	0.30-0.30	30 10[R]	
	BOULDERS (Possible bedrock)	x + x	0.50			AA27909T	D	0.30-0.30		
		o				AA27910	B	0.50-0.50		
		○	0.70			AA27910T	D	0.50-0.50		
1.0	Obstruction - Possible bedrock End of Trial Pit at 0.70m									

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT005

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,833.93 E  
570,491.96 N





**DATE STARTED** 13/04/2015

**DATE COMPLETED** 13/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 384.79

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown/black fibrous PEAT (H4-H7)									
0.60	Soft brown slightly gravelly SILT with rootlets. Gravel is subangular.		0.60	384.19		AA27917 AA27917T	B D	0.50-0.50 0.50-0.50	26 12[R]	
1.00	Angular GRAVEL (Possible weathered rock)		1.00	383.79		AA27918 AA27918T	B D	0.90-0.90 0.90-0.90	26 4[R]	
1.50	Obstruction - Possible boulder/bedrock End of Trial Pit at 1.50m		1.50	383.29		AA27919 AA27919T	B D	1.40-1.40 1.40-1.40		

**Groundwater Conditions**  
Rapid water ingress at 1.00m

**Stability**  
Trial Pit unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TPT006</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 14/01/2015	
<b>CO-ORDINATES</b> 510,139.87 E 570,255.88 N		<b>DATE COMPLETED</b> 14/11/2016	
<b>GROUND LEVEL (m)</b> 405.11		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown sandy gravelly SILT with occasional cobbles and rootlets. Sand is coarse. Gravel is angular to subangular. Cobbles are angular.		0.40	404.71		AA27928 AA27928T	B D	0.30-0.30 0.30-0.30	26 6[R]	
0.70	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.70m		0.70	404.41		AA27929 AA27929T	B D	0.60-0.60 0.60-0.60		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT007

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 510,054.65 E  
569,917.87 N

**DATE STARTED** 14/12/2014

**DATE COMPLETED** 14/09/2017

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 368.33

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)	    								
1.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.00m		1.00	367.33		AA27930 AA27930T	B D	0.50-0.50 0.50-0.50	22 4[R]	
2.0										
3.0										
4.0										

**Groundwater Conditions**  
Water lying at 1.00m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

REPORT NUMBER

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT008

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,884.46 E  
569,921.56 N

**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 395.84

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.30	Soft light brown/red sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded.		0.30	395.54		AA17702 AA17702T	B D	0.50-0.50 0.50-0.50	20 6[R]	
1.00	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.00m		1.00	394.84		AA17703 AA17703T	B D	0.90-1.00 0.90-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPT009**

**LOGGED BY** F.C

**CO-ORDINATES** 508,634.72 E  
569,564.61 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 16/04/2015

**DATE COMPLETED** 16/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 380.94

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)	
						Sample Ref	Type	Depth			
0.0	Soft black fibrous PEAT (H4-H7)	▽▽									
		▽▽									
		▽▽									
		▽▽									
		▽▽									
		▽▽									
		▽▽									
1.0			▽▽				AA17713	B	1.00-1.00	22	
			▽▽				AA17713T	D	1.00-1.00	8	
		Obstruction - Possible boulders/bedrock End of Trial Pit at 1.40m	▽▽	1.40	379.54					8	
2.0											
3.0											
4.0											

**Groundwater Conditions**  
Rapid water ingress at 1.40m

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPT010**

**LOGGED BY** F.C

**CO-ORDINATES** 509,093.51 E  
569,730.69 N

**SHEET** Sheet 1 of 1















































































**DATE STARTED** 15/04/2015

**DATE COMPLETED** 15/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 389.91

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)	
						Sample Ref	Type	Depth			
0.0	Soft black/brown fibrous PEAT (H4-H7)	                                              								26 10[R]	
1.0	Grey silty sandy GRAVEL and COBBLES	                              	1.00	388.91		AA27947 AA27947T	B D	1.00-1.00 1.00-1.00	18 2[R]		
2.0	Obstruction - Possible boulders/bedrock End of Trial Pit at 1.80m		1.80	388.11							
3.0											
4.0											

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT011

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,800.94 E  
569,250.93 N

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 403.58

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)									
0.80	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is angular to subrounded. Cobbles are subangular.		0.80	402.78		AA22718 AA22718	B D	0.80-0.80 0.80-0.80	24 14[R]	
2.40	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.40m		2.40	401.18		AA22719 AA22719	B D	2.20-2.20 2.20-2.20		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TPT012</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 17/04/2015	
<b>CO-ORDINATES</b> 509,206.76 E 569,326.24 N		<b>DATE COMPLETED</b> 17/04/2015	
<b>GROUND LEVEL (m)</b> 453.92		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	// //								
0.20	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.20m	// //	0.20	453.72		AA17724 AA17724T	B D	0.20-0.20 0.20-0.20	30 12[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPT013**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,636.96 E  
569,384.93 N

**DATE STARTED** 22/04/2015

**DATE COMPLETED** 22/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 492.98

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Very soft black fibrous PEAT (H4-H7)	// //								
0.20	Obstruction - Possible boulders/bedrock End of Trial Pit at 0.20m	// //	0.20	492.78		AA22712 AA22712	B D	0.20-0.20 0.20-0.20		
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPT014**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 509,315.96 E  
568,912.99 N

















**DATE STARTED** 21/04/2015

**DATE COMPLETED** 21/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 459.14

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	   								
0.80	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is angular to subangular.	   	0.80	458.34		AA22703 AA22706	B D	0.50-0.50 0.50-0.50	30 12[R]	
1.40	Soft blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular to subrounded. Cobbles are subangular.	   	1.40	457.74		AA22704 AA22707	B D	1.00-1.00 1.00-1.00		
2.20	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.20m	   	2.20	456.94		AA22705 AA22708	B D	2.00-2.00 2.00-2.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TPT015</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CO-ORDINATES</b> 509,071.92 E 568,548.05 N		<b>DATE STARTED</b> 21/04/2015	
<b>GROUND LEVEL (m)</b> 452.80		<b>DATE COMPLETED</b> 21/04/2015	
<b>CLIENT ENGINEER</b> ESBI		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT with large boulders. Boulders are subangular.									
1.0			1.20	451.60		AA17749 AA17749	B D	1.00-1.00 1.00-1.00	22 8[R]	14 2[R]
2.0	Soft brown very sandy gravelly SILT with cobbles. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subangular to subrounded.									
2.70	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.70m		2.70	450.10		AA17750 AA17750	B D	2.50-2.50 2.50-2.50		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPT016**

**LOGGED BY** F.C

**CO-ORDINATES** 507,397.05 E  
568,681.06 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 28/03/2015

**DATE COMPLETED** 28/03/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 397.61

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Soft to firm brown/grey sandy gravelly SILT with cobbles and boulders and occasional pockets of blue/grey silt. Sand is fine to coarse. Gravel, cobbles and boulders are subangular.		0.50	397.11		AA32227	B	0.50-0.50	46	14[R]
1.0										
2.0						AA32228	B	1.90-1.90		
2.20	Obstruction - Possible rock End of Trial Pit at 2.20m		2.20	395.41						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT017

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,110.25 E  
568,974.05 N

**DATE STARTED** 29/04/2015

**DATE COMPLETED** 29/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 459.90

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)				↓ (Seepage)					
0.30	Soft brown sandy gravelly SILT with rootlets and pockets of light brown clay. Sand is coarse. Gravel is subangular to subrounded.		0.30	459.60		AA34703	B	0.30-0.30	42	14[R]
1.00	Soft grey/brown sandy gravelly SILT with cobbles and boulders. Sand is fine to coarse. Gravel, cobbles and boulders are angular to subangular.		1.00	458.90						
2.00						AA34704	B	2.00-2.00		
2.60	Obstruction - Possible rock End of Trial Pit at 2.60m		2.60	457.30						

**Groundwater Conditions**

Water ingress from G.L

**Stability**

Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT018

**LOGGED BY** F.C

**CO-ORDINATES** 507,513.20 E  
569,026.91 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 29/04/2015

**DATE COMPLETED** 29/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 414.24

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown very sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is angular to subrounded. Cobbles are subangular.		0.40	413.84		AA32244	B	0.40-0.40	18 6[R]	
1.10						AA32245	B	1.10-1.10		
1.40	Obstruction End of Trial Pit at 1.40m		1.40	412.84						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPT019**

**LOGGED BY** F.C

**CO-ORDINATES** 507,320.71 E  
569,285.30 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 29/04/2015

**DATE COMPLETED** 29/04/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 464.06

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.60	Angular COBBLES and BOULDERS (Possible weathered rock)		0.60	463.46		AA34708	B	0.30-0.30	18	4[R]
1.20	Obstruction - possible rock End of Trial Pit at 1.20m		1.20	462.86						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT020

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,620.74 E  
570,306.97 N

**DATE STARTED** 07/05/2015

**DATE COMPLETED** 07/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 370.44

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.50	Soft brown sandy gravelly SILT with pockets of blue silt and red clay. Sand is coarse. Gravel is subangular to subrounded.		0.50	369.94		AA10182	B	0.50-0.50	20	8[R]
2.0						AA10183	B	2.00-2.00		
2.70	Soft blue/grey sandy gravelly SILT. Sand is fine. Gravel is subangular.		2.70	367.74						
3.20	End of Trial Pit at 3.20m		3.20	367.24						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT021

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,972.35 E  
570,471.17 N

**DATE STARTED** 07/05/2015

**DATE COMPLETED** 07/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 349.28

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.40	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular.		0.40	348.88		AA10191	B	0.40-0.40	30	12[R]
1.10	Obstruction - Possible rock End of Trial Pit at 1.10m		1.10	348.18		AA10192	B	1.00-1.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT022

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,524.53 E  
570,619.42 N










































































































































**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 398.22

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)	
						Sample Ref	Type	Depth			
0.0	Soft black fibrous PEAT (H4-H7)	                                              								24 10[R]	
1.0									18 8[R]		
2.0									10 0[R]		
2.20	Soft to firm brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular.	                                	2.20	396.02		AA12665	B	1.50-1.50	10 0[R]		
2.60	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is angular to subangular. Cobbles are subangular.	                             	2.60	395.62							
3.0	End of Trial Pit at 3.10m	                          	3.10	395.12		AA12666	B	3.00-3.00			

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** TPT023

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 507,134.46 E  
570,664.16 N

**DATE STARTED** 12/05/2015

**DATE COMPLETED** 12/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 384.43

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
	Soft brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel is subangular to subrounded. Cobbles are subrounded.	X X X X X O O O O O	0.20	384.23					24	
	Obstruction End of Trial Pit at 0.60m	X X X X X O O O O O	0.60	383.83		AA12676	B	0.50-0.50	10[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15





# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> TPT024
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1
<b>CO-ORDINATES</b> 506,734.06 E 570,566.16 N		<b>DATE STARTED</b> 12/05/2015
<b>GROUND LEVEL (m)</b> 401.08		<b>DATE COMPLETED</b> 12/05/2015
<b>CLIENT ENGINEER</b> ESBI ESBI	<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Seepage)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	▽▽								
1.0		▽▽				AA12682	B	1.00-1.00	20 8[R]	
2.0	Medium dense silty angular GRAVEL (Possible weathered rock)	⊗	1.70	399.38		AA12683	B	2.00-2.00	14 2[R]	
2.20	Obstruction - Possible rock End of Trial Pit at 1.70m	⊗	2.20	398.88						

**Groundwater Conditions**  
Water seepage from G.L

**Stability**  
Side walls unstable due to water ingress

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TPB001</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 13/04/2015	
<b>CO-ORDINATES</b> 509,866.98 E 570,495.01 N		<b>DATE COMPLETED</b> 13/04/2015	
<b>GROUND LEVEL (m)</b> 387.42		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black/brown fibrous PEAT (H4-H7)	▽▽				AA27914 AA27914T	B D	0.50-0.50 0.50-0.50	20 4[R]	
	Soft light reddish/brown CLAY	▬▬	0.80	386.62						
1.0	Firm blue/grey sandy gravelly SILT. Sand is coarse. Gravel is subangular to subrounded.	xoxo	1.10	386.32		AA27915 AA27915T	B D	1.00-1.00 1.00-1.00		
	Angular COBBLES and BOULDERS (Possible weathered rock)	○○	1.60	385.82		AA27916 AA27916T	B D	1.60-1.60 1.60-1.60		
2.0	Obstruction - Possible boulder/bedrock End of Trial Pit at 2.00m	—	2.00	385.42						
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPB004**  
**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 508,349.85 E  
568,636.49 N

**DATE STARTED** 23/04/2015  
**DATE COMPLETED** 23/04/2015

**CLIENT ENGINEER** ESBI  
 ESBI

**GROUND LEVEL (m)** 334.38

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
0.70	Soft brown sandy gravelly SILT with rootlets. Sand is coarse. Gravel is subangular to subrounded.		0.70	333.68		AA32201 AA32201	B D	0.50-0.50 0.50-0.50	28 10[R]	
1.20	Soft blue/grey very sandy gravelly SILT with cobbles. Sand is fine to coarse. Gravel is subangular to subrounded. Cobbles are subangular.		1.20	333.18		AA32202 AA32202	B D	1.00-1.00 1.00-1.00		
2.30	Obstruction - Possible boulders/bedrock End of Trial Pit at 2.30m		2.30	332.08		AA32203 AA32203	B D	2.00-2.00 2.00-2.00		

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

<b>CONTRACT</b> Grousemount Wind Farm		<b>TRIAL PIT NO.</b> <b>TPB005</b>	
<b>LOGGED BY</b> F.C		<b>SHEET</b> Sheet 1 of 1	
<b>CLIENT ENGINEER</b> ESBI		<b>DATE STARTED</b> 01/05/2015	
<b>CO-ORDINATES</b> 506,762.77 E 570,062.50 N		<b>DATE COMPLETED</b> 01/05/2015	
<b>GROUND LEVEL (m)</b> 494.70		<b>EXCAVATION METHOD</b> 13 Tonne Excavator	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)		0.10	494.60						
	Loose silty sandy GRAVEL with cobbles. Sand is coarse. Gravel and cobbles are angular. ( Possible weathered rock)					AA34735	B	0.40-0.40		
	Obstruction - Possible rock End of Trial Pit at 0.70m		0.70	494.00						
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPB006**  
**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,826.25 E  
570,043.22 N

**DATE STARTED** 01/04/2015  
**DATE COMPLETED** 01/05/2015

**CLIENT ENGINEER** ESBI  
 ESBI

**GROUND LEVEL (m)** 492.40

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)	\ / \ / \ /								
	Loose silty angular GRAVEL ( Possible weathered rock)	⊗ ⊗ ⊗ ⊗	0.30	492.10		AA34736	B	0.30-0.30	20	
	Obstruction - Possible rock End of Trial Pit at 0.50m	⊗ ⊗ ⊗ ⊗	0.50	491.90					8[R]	
1.0										
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

IGSL TP LOG 18387.GPJ IGSL\_GDT 16/7/15



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPB007**

**SHEET** Sheet 1 of 1

**LOGGED BY** F.C

**CO-ORDINATES** 506,857.19 E  
570,182.65 N

**DATE STARTED** 01/05/2015

**DATE COMPLETED** 01/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 483.50

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown fibrous PEAT (H4-H7)									
1.0	Soft brown sandy gravelly SILT with cobbles and rootlets. Sand is coarse. Gravel and cobbles are angular to subangular.		1.00	482.50		AA34739	B	0.50-0.50	80[R]	
2.0	Soft to firm blue/grey sandy gravelly SILT with cobbles. Sand is fine. Gravel is subangular. Cobbles are angular to subangular.		1.60	481.90						
3.0	End of Trial Pit at 0.60m		3.10	480.40						

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability Observed

**General Remarks**



# TRIAL PIT RECORD

**REPORT NUMBER**

18312

**CONTRACT** Grousemount Wind Farm

**TRIAL PIT NO.** **TPB008**

**LOGGED BY** F.C

**CO-ORDINATES** 506,911.13 E  
570,146.29 N

**SHEET** Sheet 1 of 1

**DATE STARTED** 01/05/2015

**DATE COMPLETED** 01/05/2015

**CLIENT ENGINEER** ESBI  
ESBI

**GROUND LEVEL (m)** 495.05

**EXCAVATION METHOD** 13 Tonne Excavator

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft black fibrous PEAT (H4-H7)									
1.0	Obstruction - Possible rock End of Trial Pit at 0.60m		0.60	494.45		AA34738	B	0.60-0.60	30 14[R]	
2.0										
3.0										
4.0										

**Groundwater Conditions**  
No Groundwater Observed

**Stability**  
No instability observed

**General Remarks**

**Appendix 2**

**APEX Geophysical Report**



**AGL15080\_01**

**REPORT ON THE  
GEOPHYSICAL SURVEY  
AT  
GROUSEMOUNT WIND FARM  
FOR  
IGSL/ESBI**



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**8TH JUNE 2015**

## ***PRIVATE AND CONFIDENTIAL***

*THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOSERVICES LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.*

<b>PROJECT NUMBER</b>	AGL15080		
<b>AUTHOR</b>	<b>CHECKED</b>	<b>REPORT STATUS</b>	<b>DATE</b>
EURGEOL SHANE O'ROURKE P.GEO., M.SC (GEOPHYSICS)		V.01	8 <sup>TH</sup> JUNE 2015

## CONTENTS

<b>1.</b>	<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>2.</b>	<b>INTRODUCTION .....</b>	<b>4</b>
2.1	Survey Objectives.....	4
2.2	Site Background .....	4
2.2.1	Geology .....	5
2.2.2	Soils .....	6
2.2.3	Aquifers.....	7
2.2.4	Vulnerability.....	8
2.3	Survey Rationale .....	10
<b>3.</b>	<b>RESULTS .....</b>	<b>11</b>
3.1	ERT .....	11
3.2	Seismic Refraction Profiling.....	11
3.3	MASW .....	12
3.4	Soil Resistivity Testing .....	13
<b>4.</b>	<b>REFERENCES .....</b>	<b>16</b>
<b>5.</b>	<b>APPENDIX A: DRAWINGS &amp; TURBINE SUMMARIES .....</b>	<b>17</b>
<b>6.</b>	<b>APPENDIX B: SEISMIC PLATES.....</b>	<b>22</b>
<b>7.</b>	<b>APPENDIX C: DETAILED METHODOLOGY.....</b>	<b>46</b>
7.1	Electrical Resistivity Tomography (ERT) .....	46
7.1.1	Principles.....	46
7.1.2	Data Collection.....	46
7.1.3	Data Processing.....	46
7.2	Seismic refraction profiling .....	47
7.2.1	Principles.....	47
7.2.2	Data Collection.....	47
7.2.3	Data Processing.....	48
7.3	Multichannel Analysis of Surface Waves (MASW) .....	48
7.3.1	Principles.....	48
7.3.2	Data Collection.....	49
7.3.3	Data Processing.....	49
7.3.4	Relocation .....	50
7.4	Soil Resistivity.....	50
7.4.1	Principles.....	50
7.4.2	Data Collection.....	50
7.4.3	Data Processing.....	50
7.4.4	Relocation .....	51

## 1. EXECUTIVE SUMMARY

APEX Geoservices Limited was requested by IGSL & ESBi to carry out a geophysical investigation as part of the ground investigation prior to the development of the Grousemount Wind Farm, 18km east of Kenmare.

Grousemount Wind Farm involves the design and construction of twenty-four wind turbines (T01-T24) and associated infrastructure on the site.

The geophysical investigation consisted of Electrical Resistivity Tomography, Seismic Refraction, and MASW at the turbine bases to provide geotechnical parameters on the sub-peat soils and bedrock.

Peat probing has been carried out upon each of the ERT Profiles and this shows a thin covering of peat which has been plotted on each of the sections.

The centre of Turbine T01 has been interpreted as medium dense-very dense clayey gravel/gravel from 0.2-3.7m followed by slightly weathered-fresh sandstone.

The centre of Turbine T02 has been interpreted as loose-very dense clayey gravel/gravel from 0.7-2.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T03 has been interpreted as medium dense-very dense clayey gravel/gravel from 0.5-3.3m followed by slightly weathered-fresh sandstone.

The centre of Turbine T04 has been interpreted as loose dense clayey gravel/gravel from 0.4-2.2m followed by highly-moderately weathered sandstone to 4.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T05 has been interpreted as very dense clayey gravel/gravel from 1.3-5.3m followed by highly-moderately weathered sandstone to 8.0m followed by slightly weathered-fresh sandstone.

The centre of Turbine T06 has been interpreted as very loose-very dense clayey gravel/gravel from 0.5-3.1m followed by slightly weathered-fresh sandstone.

The centre of Turbine T07 has been interpreted as very dense clayey gravel/gravel from 0.9-3.1m followed by slightly weathered-fresh sandstone.

The centre of Turbine T08 has been interpreted as very loose-very dense clayey gravel/gravel from 0.9-4.4m followed by slightly weathered-fresh sandstone.

The centre of Turbine T09 has been interpreted as very loose-very dense clayey gravel/gravel from 0.5-3.5m followed by highly-moderately weathered sandstone to 6.4m followed by slightly weathered-fresh sandstone.

The centre of Turbine T10 has been interpreted as very loose-very dense clayey gravel/gravel from 0.7-4.3m followed by slightly weathered-fresh sandstone.

The centre of Turbine T11 has been interpreted as loose-very dense clayey gravel/gravel from 0.6-4.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T12 has been interpreted as very dense clayey gravel/gravel from 0.7-1.3m followed by slightly weathered-fresh sandstone.

The centre of Turbine T13 has been interpreted as very dense clayey gravel/gravel from 0.4-2.1m followed by slightly weathered-fresh sandstone.

The centre of Turbine T14 has been interpreted as loose-very dense clayey gravel/gravel from 0.7-4.0m followed by highly-moderately weathered sandstone to 5.7m followed by slightly weathered-fresh sandstone.

The centre of Turbine T15 has been interpreted as loose-very dense clayey gravel/gravel from 0.2-6.4m followed by highly-moderately weathered sandstone to 11.0m followed by slightly weathered-fresh sandstone.

The centre of Turbine T16 has been interpreted as loose-very dense clayey gravel/gravel from 0.3-5.5m followed by slightly weathered-fresh sandstone.

The centre of Turbine T17 has been interpreted as very loose-very dense clayey gravel/gravel from 0.2-5.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T18 has been interpreted as very loose-very dense clayey gravel/gravel from 0.2-4.8m followed by slightly weathered-fresh sandstone.

The centre of Turbine T19 has been interpreted as very dense clayey gravel/gravel from 0.3-2.3m followed by slightly weathered-fresh sandstone.

The centre of Turbine T20 has been interpreted as medium dense-very dense clayey gravel/gravel from 0.3-6.4m followed by slightly weathered-fresh sandstone.

The centre of Turbine T21 has been interpreted as dense-very dense clayey gravel/gravel from 0.1-2.2m followed by slightly weathered-fresh sandstone.

The centre of Turbine T22 has been interpreted as very dense clayey gravel/gravel from 2.0-4.0m followed by slightly weathered-fresh sandstone.

The centre of Turbine T23 has been interpreted as very dense clayey gravel/gravel from 0.8-2.1m followed by slightly weathered-fresh sandstone.

The centre of Turbine T24 has been interpreted as very dense clayey gravel/gravel from 0.8-2.2m followed by slightly weathered-fresh sandstone.

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Sharp lithological contacts and/or faults may result in zones of lower quality bedrock (increased weathering/fracturing) being present that could increase the risk to excavation.

Changes in bedrock lithology with depth may represent a perpendicular change in bedrock properties. These lithological boundaries would pose a possible risk to the excavation of the turbine foundation due to lateral variations in the bedrock quality.

The findings of the geophysical investigation should be reviewed following the completion of the intrusive investigations.

One set of soil resistivity measurements have been carried out at T2, T14, T17 & T22, with two sets at the substation location.

## 2. INTRODUCTION

APEX Geoservices Limited was requested by IGSL & ESBi to carry out a geophysical investigation as part of the ground investigation prior to the development of the Grousemount Wind Farm, 18km east of Kenmare.

Grousemount Wind Farm involves the design and construction of twenty-four wind turbines and associated infrastructure on the site. The turbine bases to be investigated were T01-T24.

The geophysical investigation consisted of Electrical Resistivity Tomography, Seismic Refraction and MASW at the turbine bases to provide geotechnical parameters on the sub-peat soils and bedrock. Soil Resistivity measurements were carried out at bases T2, T14, T17 & T22, with two sets of measurements at the substation location.

This report details the findings from the turbine bases investigation utilising ERT, seismic refraction and MASW.

### 2.1 Survey Objectives

The objective of the investigation was:

- Provide information on the type and thickness of the overburden
- Estimate the overburden stiffness
- Assess the depth to and quality of the bedrock
- Identify the type of bedrock
- Measure the soil resistivity values at five locations

### 2.2 Site Background

The site is set in steeply undulating boggy mountainous area with topography ranging from c. 320-460 mOD. The surrounding land is used both for agriculture and for forestry. The Roughty River flows through the centre of the survey area from south to north. The turbine bases are approximately 400m apart.

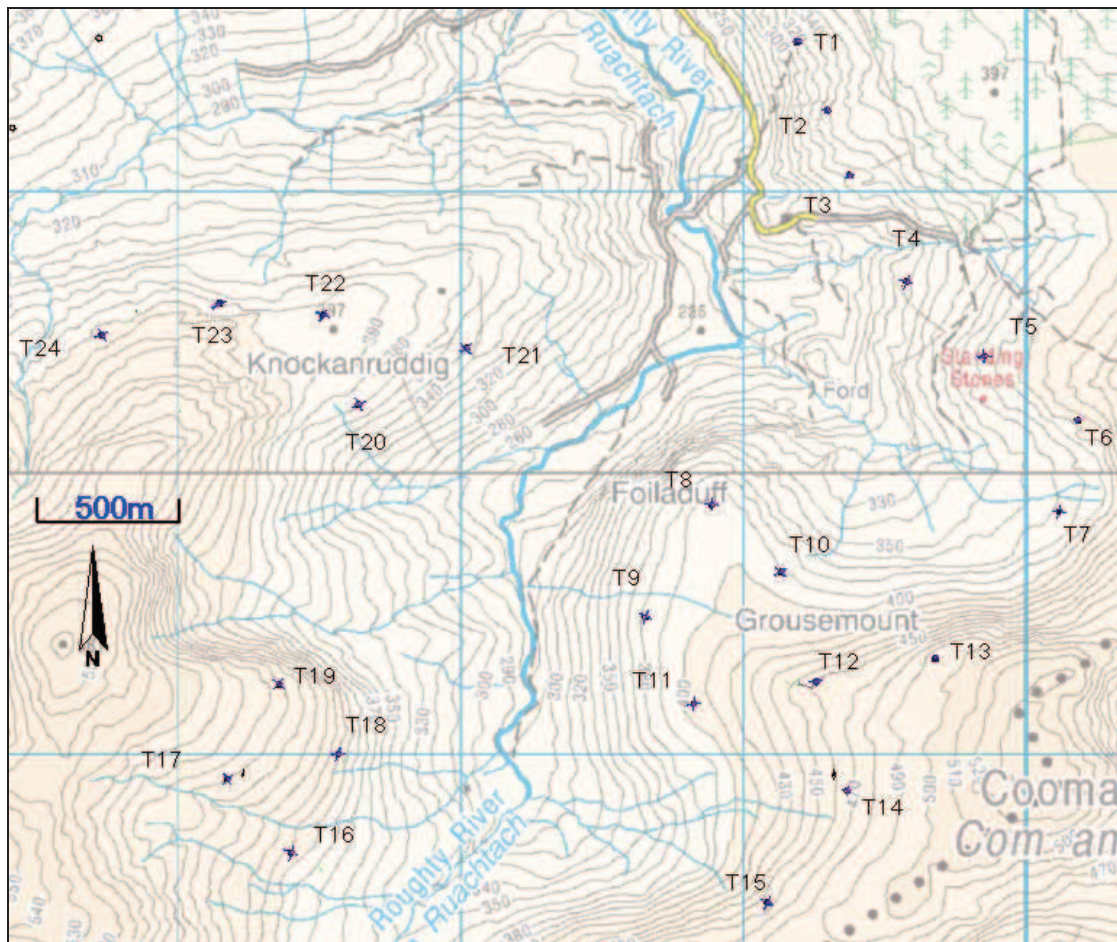


Fig 2.1: Location map.

## 2.2.1 Geology

Bedrock geology for the site comprises the Bird Hill Formation (Fig.2.2) which is made up of purple siltstone and fine sandstone and strikes approximately east-west, and dips steeply to the north and south. It is offset by several sinistral faults that trend north-south.



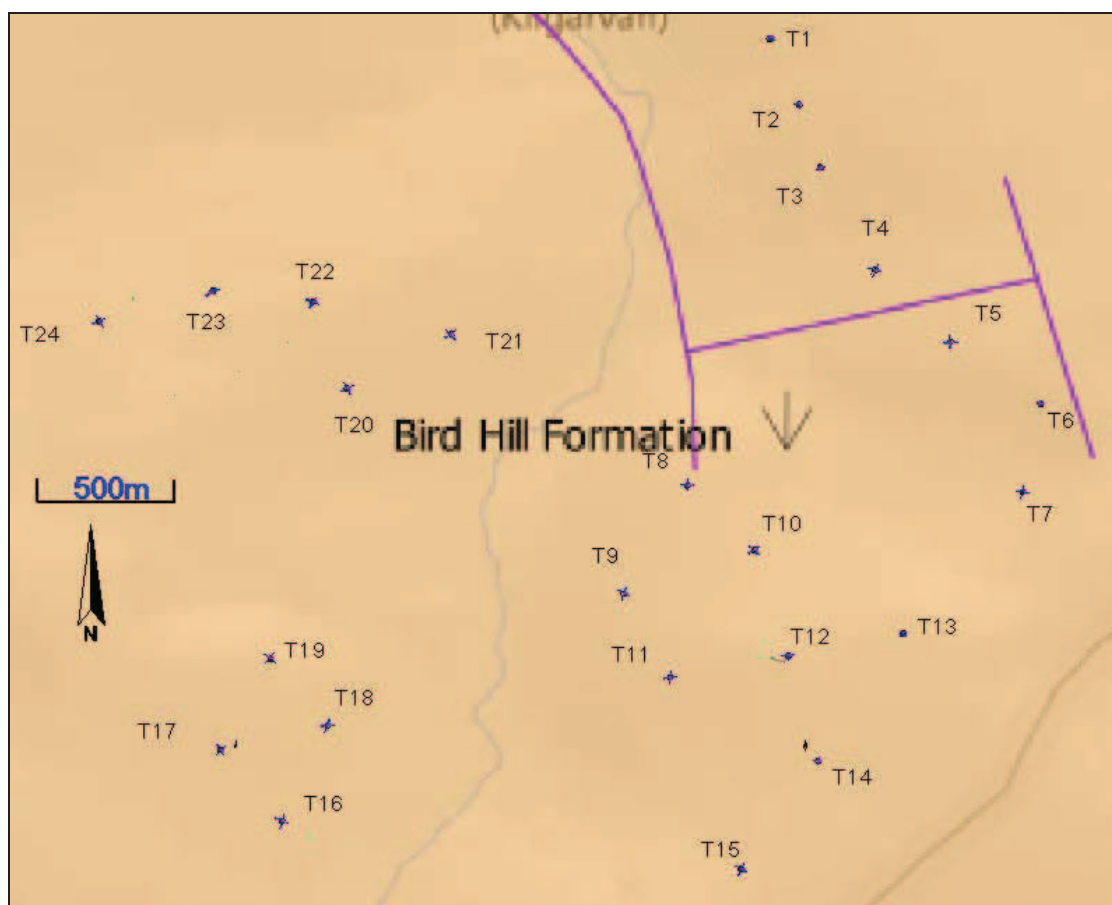


Fig 2.2: The GSI bedrock map showing the geology as the Bird Hill Formation.

### 2.2.2 Soils

The soil for the predominant part of the site is a layer of blanket peat on rock, with some Devonian sandstone till to the east of the site (Fig.2.3).



Fig. 2.3: The Teagasc soil map with blanket peat (brown), rock at surface (grey), and Devonian sandstone till (magenta).

### 2.2.3 Aquifers

The site of the Grousemount Wind Farm is described as a “Poor Aquifer – Bedrock which is Generally Unproductive except in Local Zones” (Fig.2.4).

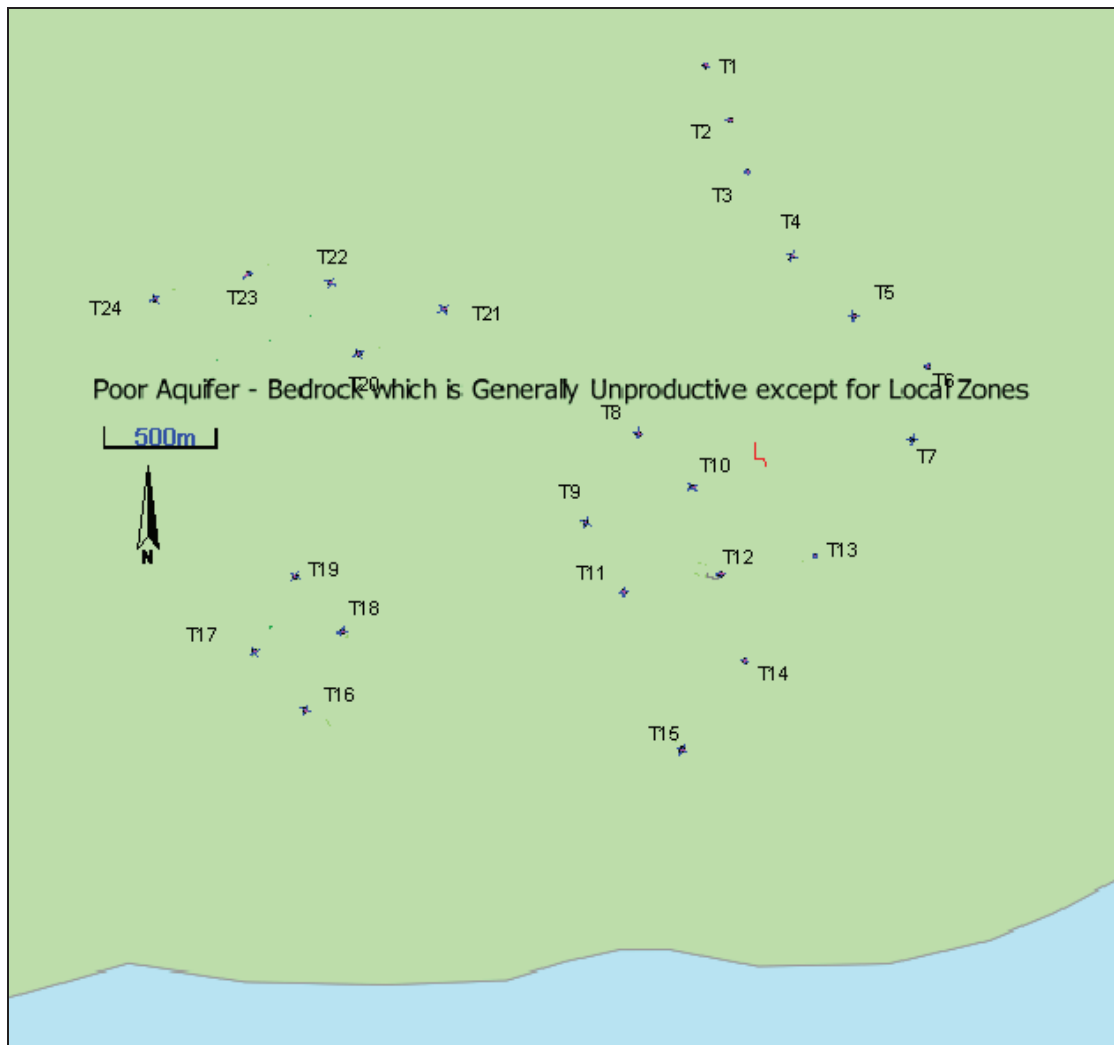


Fig. 2.4: Aquifers map for the site. Green = Poor Aquifer – Bedrock which is Generally Unproductive except in Local Zones. Cyan = Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones.

## 2.2.4 Vulnerability

The vulnerability for the site is either high or extreme, and also contains sections where there is rock near to the surface (Fig.2.5).



Fig. 2.5: Vulnerability map for the site. Green = High. Pink = Extreme. Grey = Rock at or near the surface.

### 2.3 Survey Rationale

The following techniques have been employed to achieve the objectives of the survey:

**Electrical Resistivity Tomography (ERT)** soundings will outline variations in overburden/bedrock type and depth to the top of the bedrock along profiles which were 62/93m in length. ERT profiles will also map any sharp lateral changes in bedrock topography, and changes in bedrock lithology.

**Seismic Refraction Profiling** will confirm the depth to the top of the bedrock based upon an increase in seismic velocity for the more competent rock, compared to less competent overburden. When combined with the resistivity method, it is possible to interpret variations in seismic velocity as variations in overburden / bedrock type.

The **MASW** method is used to estimate shear-wave (S-wave) velocities in the ground material to indicate possible soft zones. Overburden material with an S-wave velocity of <175 m/s is generally classified as soft. The depth of investigation for this method will depend on the source type and geophone spacing.

The **Soil Resistivity Measurements**, using the Wenner Array, as described in IEEE Std 81-1983 (Guide for measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System) is a standard method used for measuring vertical variations in subsurface resistivity. These measurements are used in the design of earthing systems. For ESBI, the "A" spacings are used are 0.3, 0.5, 0.7, 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40, 50, 60, 80 and 100m.

### 3. RESULTS

The findings from the investigation have been presented in ACAD Drawing No's AGL15080\_T01\_01 to AGL15080\_T24\_01 and corresponding A4 report tables.

#### 3.1 ERT

Two orthogonal Electrical Resistivity Tomography (ERT) profiles were acquired at each turbine base. Each of the profiles were 62/93m in length, with a 2-3m electrode spacing, which image to a depth of 12-15m.

The resistivity values are in the range 100 - 2400 Ohm.m and the results and interpretation are shown in the Drawings AGL15080\_T01\_01 to AGL15080\_T24\_01.

The resistivity data has been generally interpreted on the following basis:

Resistivity	Interpretation
100-314	Sandy Gravelly CLAY
314-985	GRAVEL
459-1700	SANDSTONE
214-673	SILTSTONE
100-214	SHALE

#### 3.2 Seismic Refraction Profiling

Two P-wave seismic refraction profiles were recorded at each of the turbine bases. These were each 23/46m in length with a 1-2m geophone spacing.

The locations are indicated on Drawings AGL15080\_T01\_01 to AGL15080\_T24\_01.

The tomographically processed seismic data indicates p-wave velocities in the range 250–4500 m/s for the twenty-four turbine bases over a depth range of 0-25m (Appendix B).

### 3.3 MASW

Two 1D MASW profiles were acquired with a 1m geophone spacing, and centered at each proposed turbine location.

Data was recorded to 1 second and 1D end shots for each profile were selected for office based data analysis.

The data describes the estimated stiffness of the overburden layers and velocity of the top of the top of rock.

The data shows S-wave velocities in the range 150-1200 m/s over a depth range of 1.5m – 11m bgl.

The results and interpretation are shown in detail in Appendix A (Turbine Summaries). For T02-T03, T06-T07, T10, T12-T14, T16, T19 and T22-T24 an insufficient surface wave was generated to allow MASS processing, which is sometimes the case in areas of very shallow bedrock. For these profiles the shear wave velocities were calculated from the seismic refraction results (all of excellent quality) using a Poissons Ratio of 0.46.

The following table summarises shear wave velocity, soil cohesion and bedrock type.

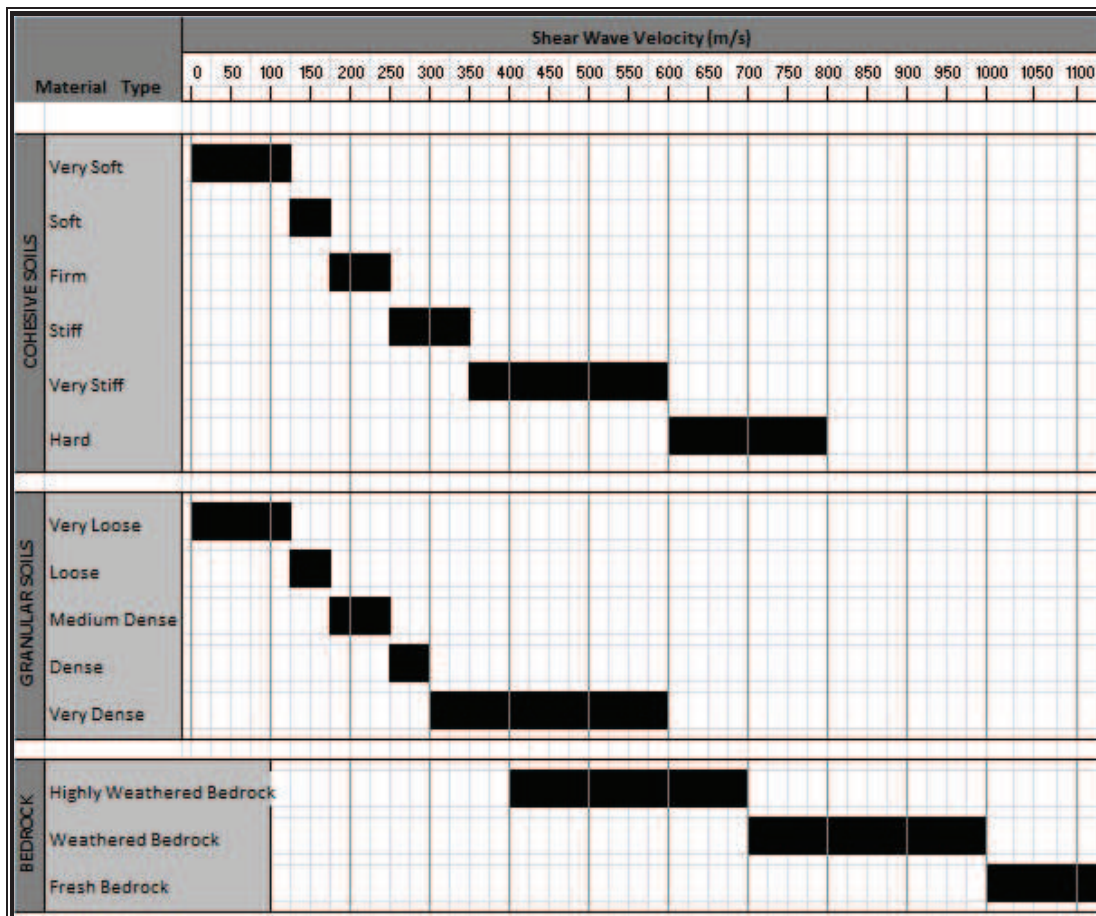


Fig.3.1. Shear-wave velocity and corresponding soil cohesion.

### 3.4 Soil Resistivity Testing

Soil resistivity measurements were taken at T02, T14, T17, T22 and R1 & R2 at the substation as follows:

T02 "A" Spacing	Resistance (ohms)	Resistivity (Ohm-m)
0.3	105.6	198.95
0.5	100.5	315.57
0.7	95.75	420.92
1	101.5	637.42
2	93.03	1168.46
3	68.75	1295.25
4	52.6	1321.31
5	45.26	1421.16
7	39.6	1740.82
10	33.89	2128.29
15	25.34	2387.03
20	19.31	2425.34
30	14.38	2709.19
40	12.57	3157.58
50	12.06	3786.84
60	10.56	3979.01
80	9.142	4592.94
100		

T14 "A" Spacing	Resistance (ohms)	Resistivity (Ohm-m)
0.3	106.4	200.46
0.5	75.42	236.82
0.7	61.03	268.29
1	53.22	334.22
2	26.95	338.49
3	26.65	502.09
4	26.65	669.45
5	24.54	770.56
7	25.64	1127.13
10	21.32	1338.90
15	13.93	1312.21
20	10.66	1338.90
30	6.623	1247.77
40	5.431	1364.27
50	4.646	1458.84
60	4.063	1530.94
80	3.721	1869.43
100	3.51	2204.28



T17 "A" Spacing	Resistance (ohms)	Resistivity (Ohm- m)
0.3	46.75	88.08
0.5	41.35	129.84
0.7	27.29	119.97
1	34.42	216.16
2	31.99	401.79
3	30.35	571.79
4	30.25	759.88
5	34.02	1068.23
7	28.72	1262.53
10	25.15	1579.42
15	22.22	2093.12
20	15.38	1931.73
30	10.85	2044.14
40	7.211	1811.40
50	4.858	1525.41
60	3.33	1254.74
80	2.841	1427.32
100	2.77	1739.56

T22 "A" Spacing	Resistance (ohms)	Resistivity (Ohm- m)
0.3	10.25	19.31
0.5	67.93	213.30
0.7	44.25	194.52
1	38.62	242.53
2	23.83	299.30
3	18.09	340.82
4	16.2	406.94
5	16.09	505.23
7	15.85	696.77
10	15.09	947.65
15	14.28	1345.18
20	10.5	1318.80
30	8.7	1639.08
40	8.5	2135.20
50	6.03	1893.42
60	6.01	2264.57
80	5.04	2532.10
100		

SUB-R1 "A" Spacing	Resistance (ohms)	Resistivity (Ohm- m)
0.3	89.51	168.64
0.5	87.5	274.75
0.7	73.32	322.31
1	56.32	353.69
2	49.08	616.44
3	40.53	763.59
4	33.29	836.24
5	28.36	890.50
7	23.43	1029.98
10	18.7	1174.36
15	13.27	1250.03
20	12.16	1527.30
30	9.595	1807.70
40	8.68	2180.42
50	7.543	2368.50
60	6.366	2398.71
80	4.707	2364.80
100	3.61	2267.08

SUB-R2 "A" Spacing	Resistance (ohms)	Resistivity (Ohm- m)
0.3	117.6	221.56
0.5	102.5	321.85
0.7	90.72	398.81
1	67.18	421.89
2	54.51	684.65
3	42.54	801.45
4	35.5	891.76
5	31.68	994.75
7	27.76	1220.33
10	21.12	1326.34
15	15.38	1448.80
20	10.76	1351.46
30	10.04	1891.54
40	9.011	2263.56
50	7.503	2355.94
60	6.044	2277.38
80	4.626	2324.10
100	3.59	2254.52

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## 5. APPENDIX A: DRAWINGS & TURBINE SUMMARIES

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

### T01

AGL14327_T01_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T01_02	Geophysical Investigation Summary T01	A4 Spreadsheet
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### T02

AGL14327_T002_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T02_02	Geophysical Investigation Summary T02	A4 Spreadsheet
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### T03

AGL14327_T03_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T03_02	Geophysical Investigation Summary T03	A4 Spreadsheet
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### T04

AGL14327_T04_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T04_02	Geophysical Investigation Summary T04	A4 Spreadsheet
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### T05

AGL14327_T05_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T05_02	Geophysical Investigation Summary T05	A4 Spreadsheet
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**T06**

AGL14327_T06_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T06_02	Geophysical Investigation Summary T06	A4 Spreadsheet
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**T07**

AGL14327_T07_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T07_02	Geophysical Investigation Summary T07	A4 Spreadsheet
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**T08**

AGL14327_T08_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T08_02	Geophysical Investigation Summary T08	A4 Spreadsheet
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**T09**

AGL14327_T09_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T09_02	Geophysical Investigation Summary T09	A4 Spreadsheet
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**T10**

AGL14327_T10_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T10_02	Geophysical Investigation Summary T10	A4 Spreadsheet
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**T11**

AGL14327_T11_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T11_02	Geophysical Investigation Summary T11	A4 Spreadsheet
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**T12**

AGL14327_T12_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T12_02	Geophysical Investigation Summary T12	A4 Spreadsheet
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**T13**

AGL14327_T13_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T13_02	Geophysical Investigation Summary T13	A4 Spreadsheet
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**T14**

AGL14327_T14_01	Fig.1 Grousemount Wind Farm Location	1:20000 @ A3
	Fig.2 Turbine Map	1: 2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T14_02	Geophysical Investigation Summary T14	A4 Spreadsheet
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**T15**

AGL14327_T15_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T15_02	Geophysical Investigation Summary T15	A4 Spreadsheet
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**T16**

AGL14327_T16_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T16_02	Geophysical Investigation Summary T16	A4 Spreadsheet
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**T17**

AGL14327_T17_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1: 2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T17_02	Geophysical Investigation Summary T17	A4 Spreadsheet
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**T18**

AGL14327_T18_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T18_02	Geophysical Investigation Summary T18	A4 Spreadsheet
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**T19**

AGL14327_T19_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T19_02	Geophysical Investigation Summary T19	A4 Spreadsheet
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**T20**

AGL14327_T20_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T20_02	Geophysical Investigation Summary T20	A4 Spreadsheet
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**T21**

AGL14327_T21_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T21_02	Geophysical Investigation Summary T21	A4 Spreadsheet
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**T22**

AGL14327_T22_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1: 2000 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T22_02	Geophysical Investigation Summary T22	A4 Spreadsheet
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**T23**

AGL14327_T23_01	Fig.1 Grousemount Wind Farm Location	1:40000 @ A3
	Fig.2 Turbine Map	1:1250 @ A3
	Fig.3 ERT Profile R1	1:750 @ A3
	Fig.3 ERT Profile R2	1:750 @ A3

AGL14327_T23_02	Geophysical Investigation Summary T23	A4 Spreadsheet
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**T24**

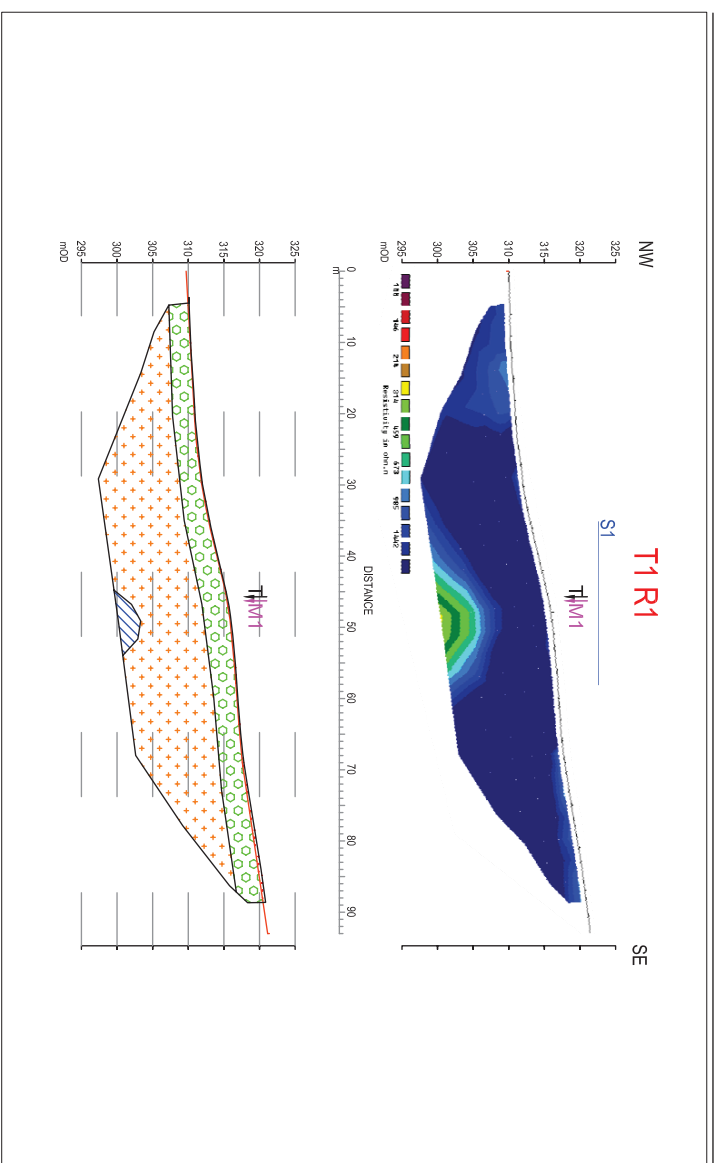
AGL14327_T24_01	Fig.1 Grousemount Wind Farm Location Fig.2 Turbine Map Fig.3 ERT Profile R1 Fig.3 ERT Profile R2	1:40000 @ A3 1:1250 @ A3 1:750 @ A3 1:750 @ A3
AGL14327_T24_02	Geophysical Investigation Summary T24	A4 Spreadsheet
AGL14327_SUB_01	Fig.1 Grousemount Wind Farm Location Fig.2 Substation Map Fig.3 ERT Profile R1 Fig.3 ERT Profile R2	1:40000 @ A3 1:2500 @ A3 1:750 @ A3 1:750 @ A3



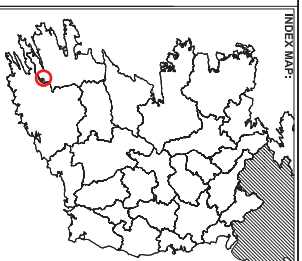
FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 01



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE

- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Highly-Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

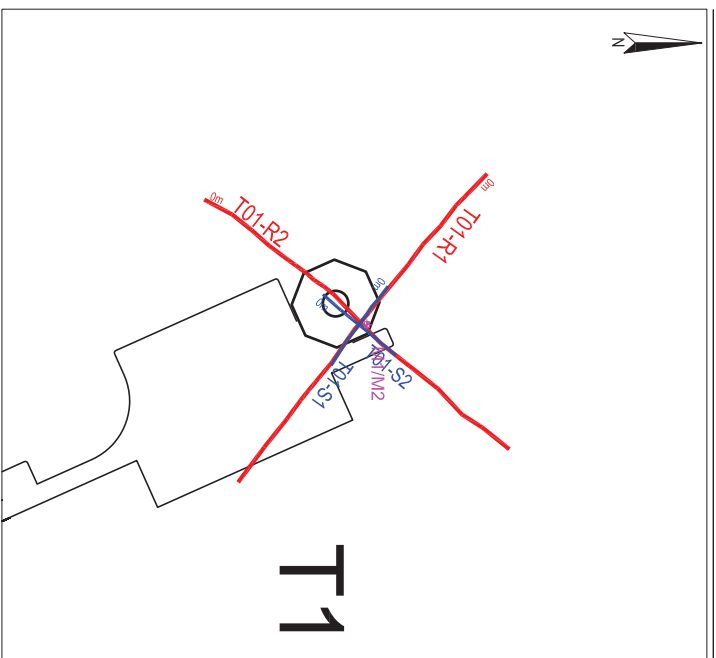
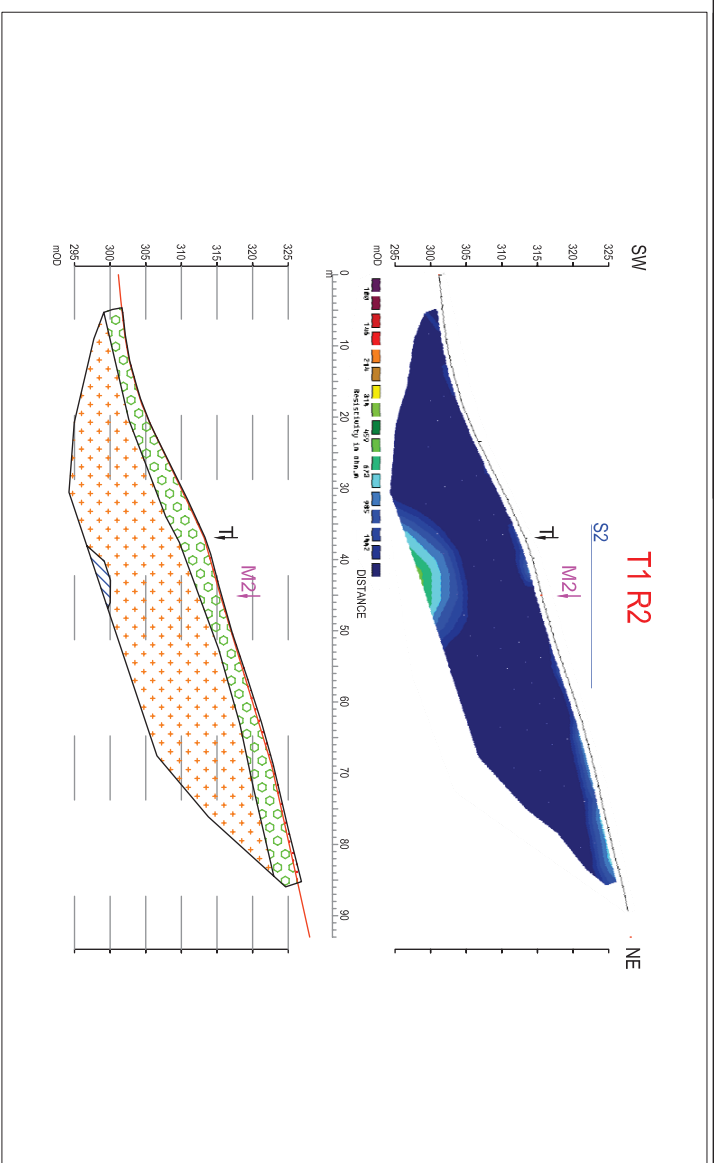


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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PROJECT:		GROUSEMOUNT WIND FARM	
DRAWING No.:		AGL15060_T01_01 TURBINE 1	
DATE:		08 JUNE 2015	
CLIENT:		ICSL/ESB	
SCALE:		AS INDICATED @ A3	
ISSUED:	DATE:	CREATED BY:	CHECKED BY:
1	08.06.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T01</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509159
Northing	571592
Elevation (mOD)	314.5

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.2	314	-	355	1200	-	-	-	-	PEAT		Diggable
0.2	1.7	1442	227	835	2000	0.46	103.39	0.30	5.54	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
1.7	2.6	1442	370	1470	2000	0.47	273.90	0.80	27.86	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.6	3.7	985	581	1993	2000	0.45	676.03	1.97	121.95	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.7	5.1	985	763	2540	2700	0.45	1573.92	4.57	490.00	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.1	6.8	673	867	3139	2700	0.46	2028.53	5.92	751.91	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
6.8	9.0	459	976	3638	2700	0.46	2570.41	7.51	1114.43	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
9.0	11.7	459	1184	3969	2700	0.45	3787.93	10.99	2088.96	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

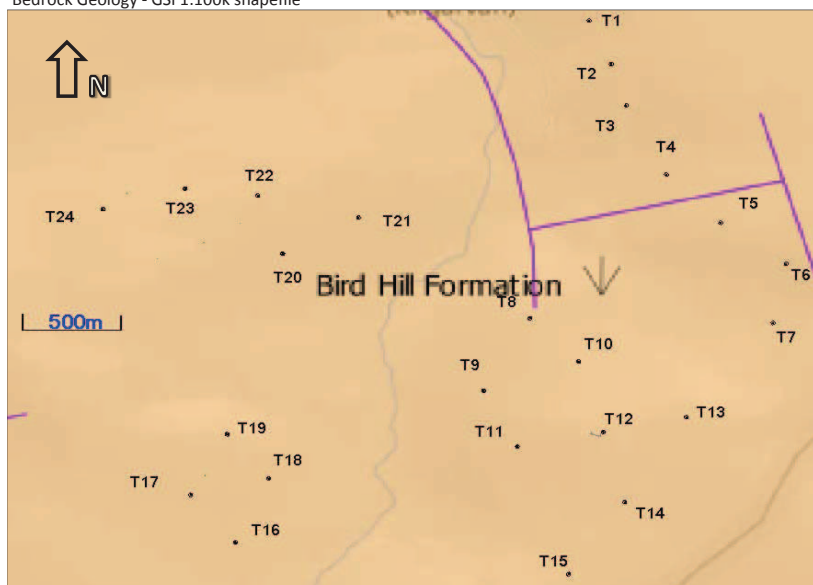
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T01**

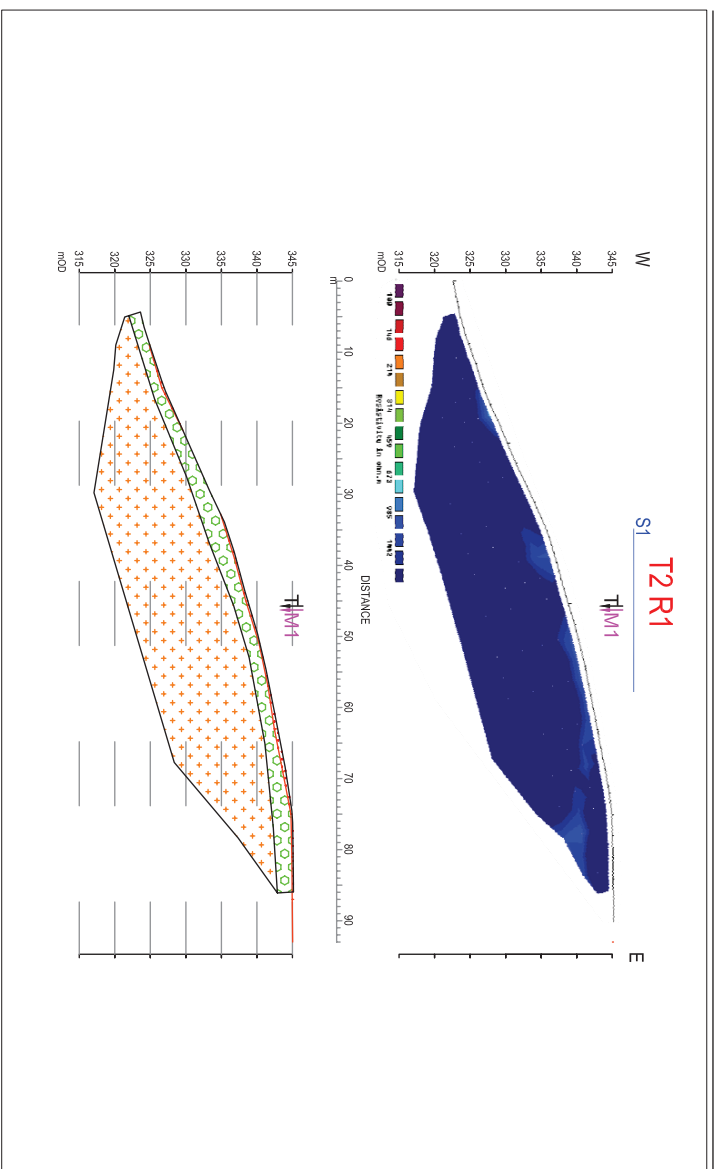
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 02

FIGURE 2: TURBINE MAP: Scale 1:2000@A3

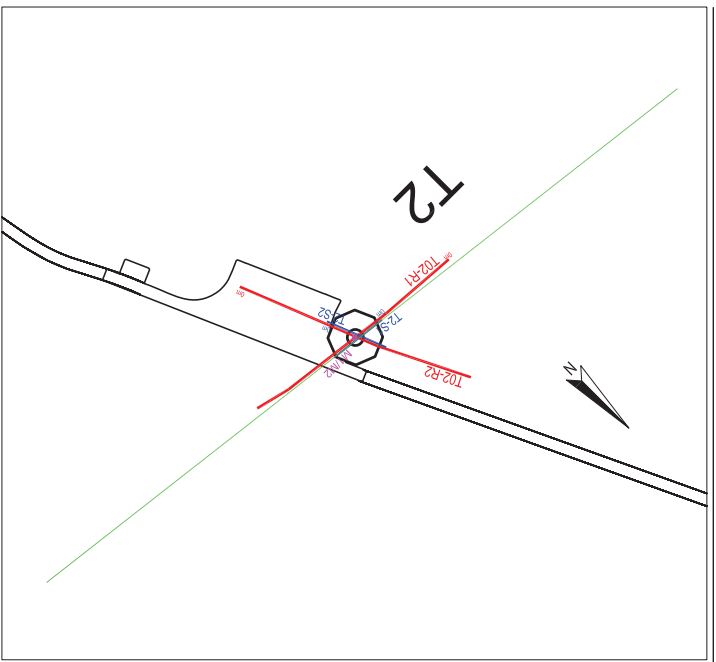
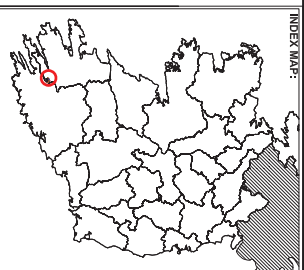
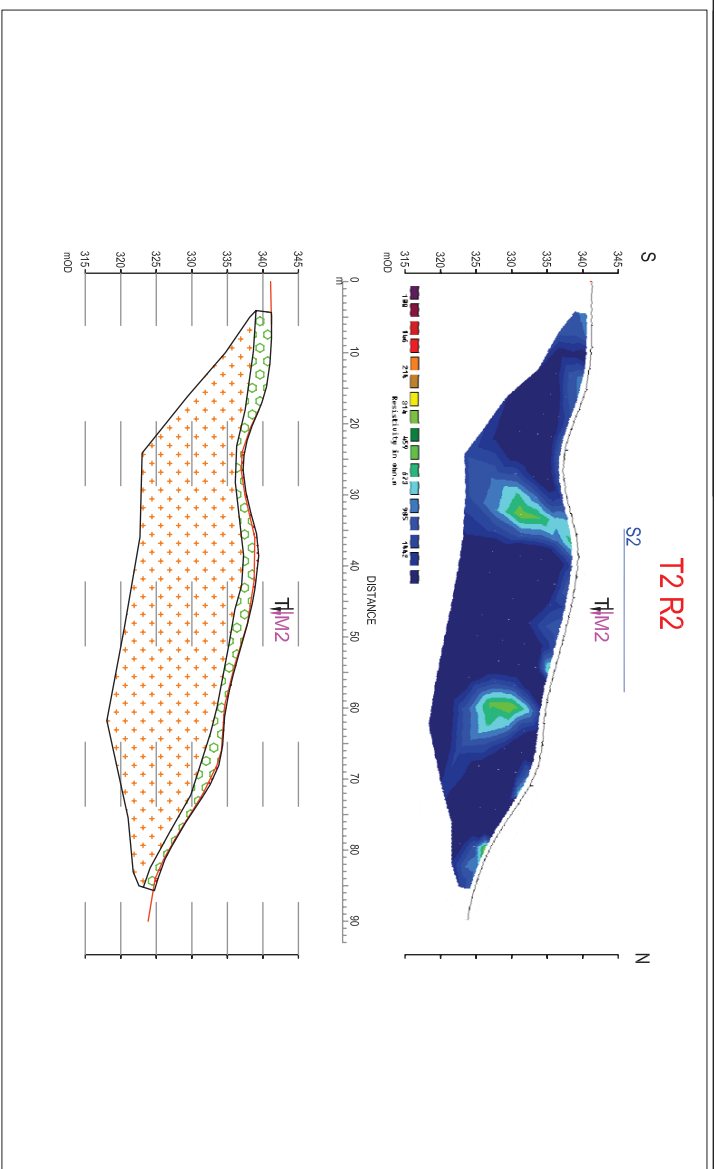


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



INDEX MAP:

**LEGEND:**

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- SANDY GENEVEY CLAY
- CLAYEY GRAVEL/GRAVEL
- Highly-Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- T1 Turbine Centre
- M1 1D MASW Profile

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**PROJECT:** GROUSEMOUNT WIND FARM

**DRAWING No.:** AGL15980\_T01\_02 TURBINE 2

**DATE:** 08 JUNE 2015

**CLIENT:** ISSUES81

**SCALE:** AS INDICATED @ A3

VERSION	DATE	CREATED BY	CHANGED BY
1	08.06.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T02</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509159
Northing	571592
Elevation (mOD)	338.5

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.7	314	-	315	1200	-	-	-	-	PEAT		Diggable
0.7	1.3	1442	155	569	2000	0.46	48.02	0.14	1.56	Clayey GRAVEL/GRAVEL	LOOSE	Diggable
1.3	2.2	1442	391	1435	2000	0.46	305.05	0.89	33.05	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.2	3.1	1442	655	2405	2700	0.46	1156.75	3.38	298.05	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.1	3.9	1442	820	3011	2700	0.46	1813.88	5.30	626.10	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
3.9	4.8	1700	858	3153	2700	0.46	1988.60	5.81	728.70	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.8	7.5	1700	891	3272	2700	0.46	2141.79	6.25	823.61	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
7.5	9.3	1700	952	3496	2700	0.46	2444.57	7.14	1024.41	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

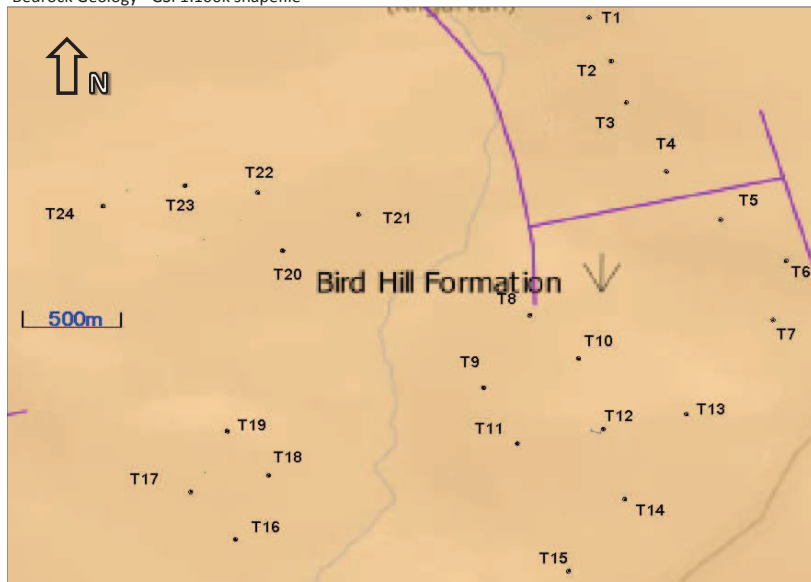
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T02**

Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:4,0000@A3



FIGURE 2: TURBINE MAP: Scale 1:1,250@A3

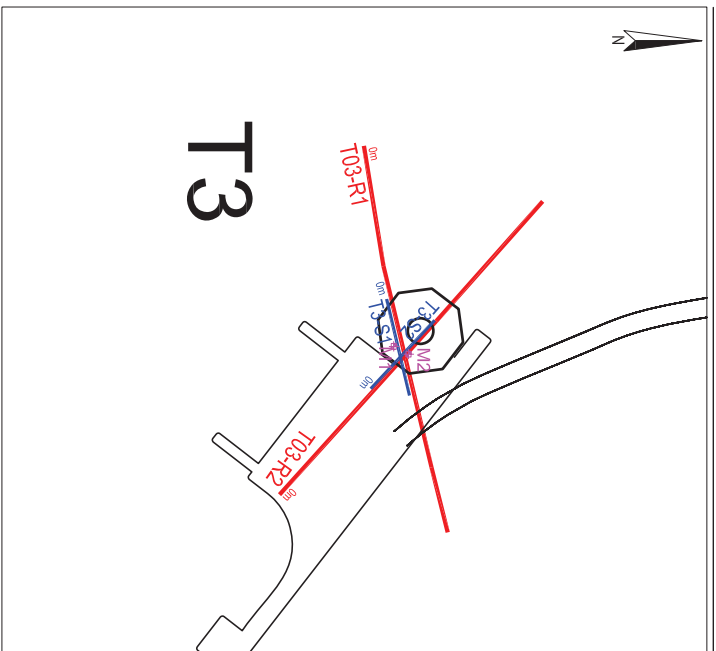
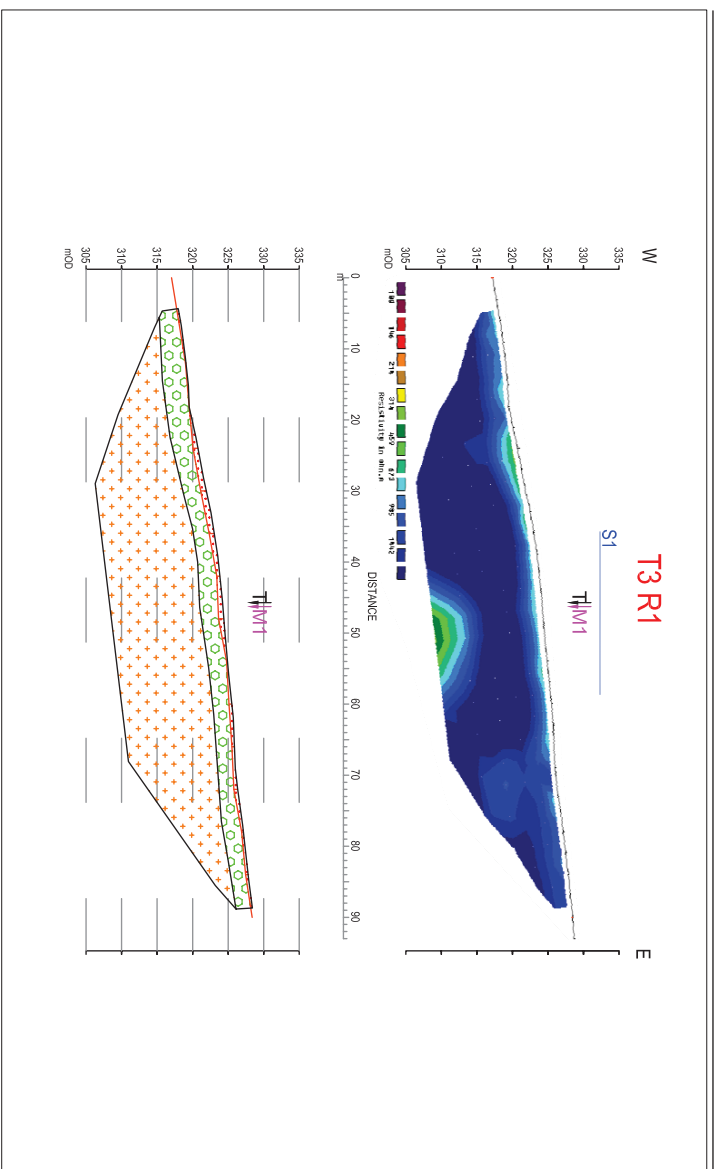
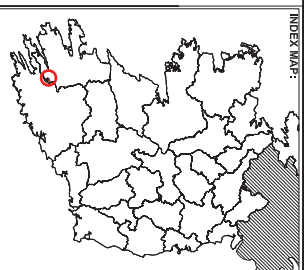
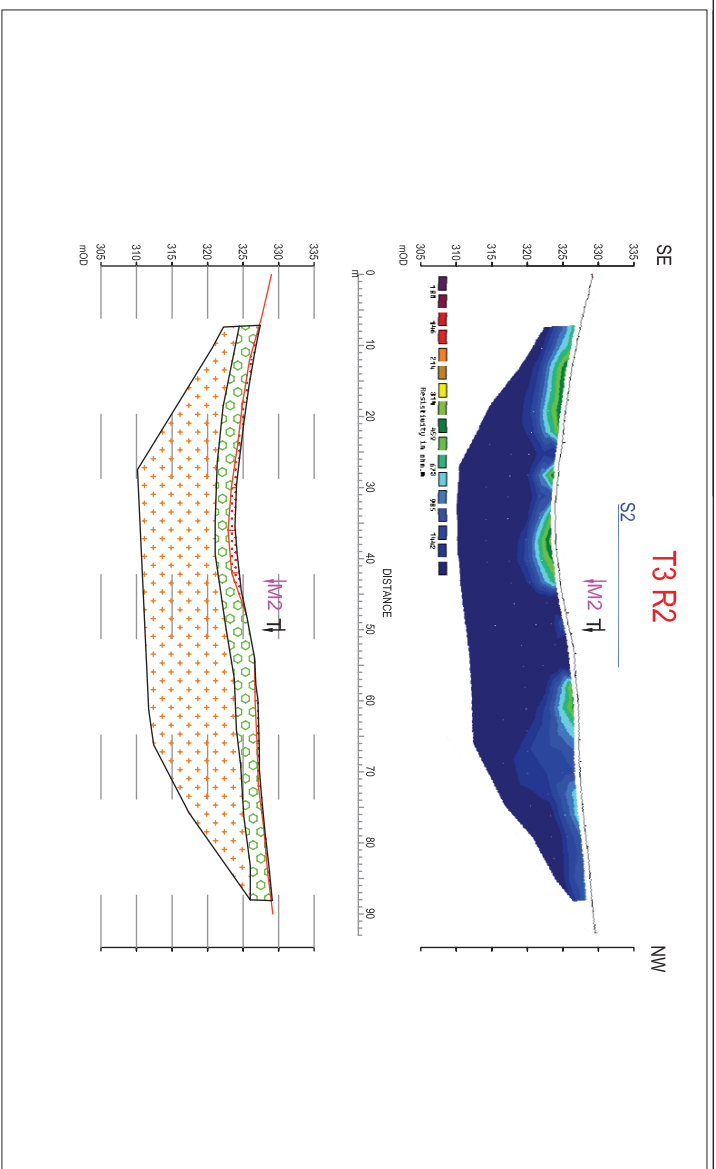


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 03

FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASS PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Highly/Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASSIV PROFILE



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 www.apexgeoservices.co.uk

PROJECT:	GROUSEMOUNT WIND FARM
DRAWING No.:	AG15980_T03_01 TURBINE 3
DATE:	08 JUNE 2015
CHECKED:	ISSUES/BI
SCALE:	AS INDICATED @A3
VERSION:	1
DATE:	08.08.2015
SOR:	

Site	Grousemount Wind Farm
Turbine Base	<b>T03</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509346
Northing	571122
Elevation (mOD)	325.4

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.5	314	-	371	1200	-	-	-	-	PEAT		Diggable
0.5	1.4	1442	194	713	2000	0.46	75.33	0.22	3.29	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
1.4	2.4	1442	401	1473	2000	0.46	321.70	0.94	36.08	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.4	3.3	1442	568	2086	2000	0.46	644.79	1.88	113.63	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.3	4.2	1442	602	2212	2700	0.46	978.64	2.86	226.19	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.2	5.2	985	646	2372	2700	0.46	1125.82	3.29	285.01	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.2	8.0	673	829	3045	2700	0.46	1854.38	5.41	649.34	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
8.0	10.0	673	979	3595	2700	0.46	2585.25	7.55	1123.49	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

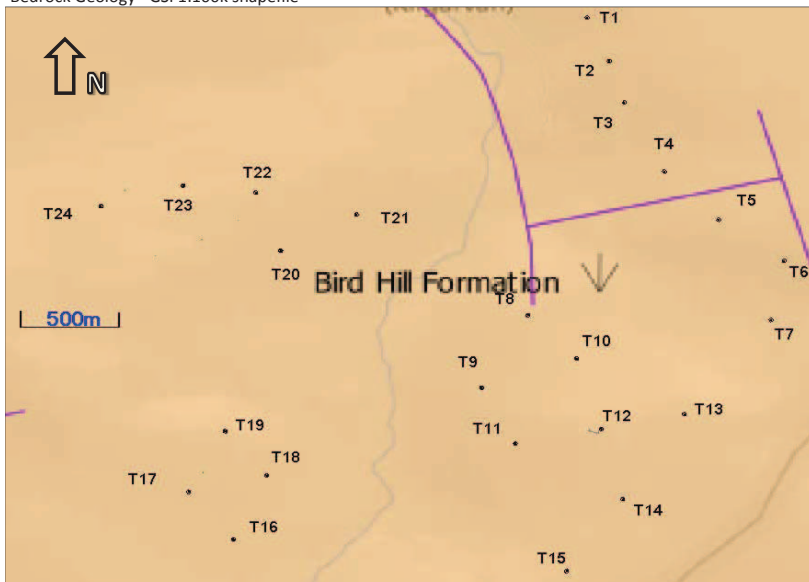
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T03**

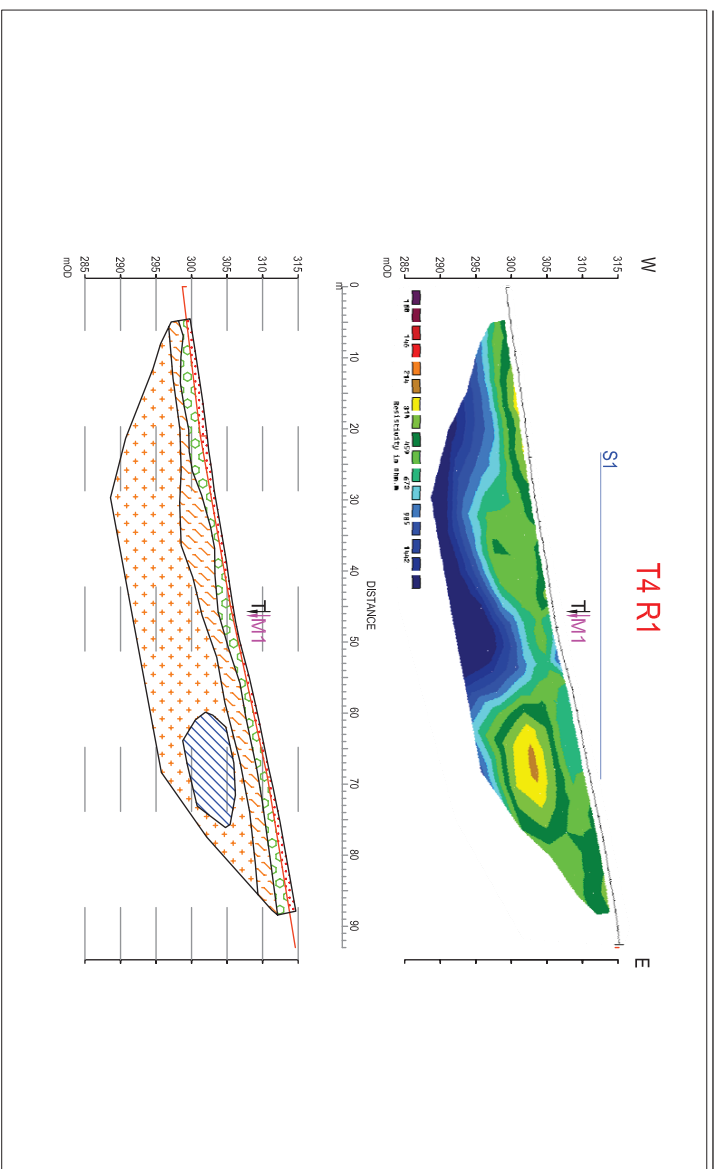
Discussion	

Recommendations	

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 04

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

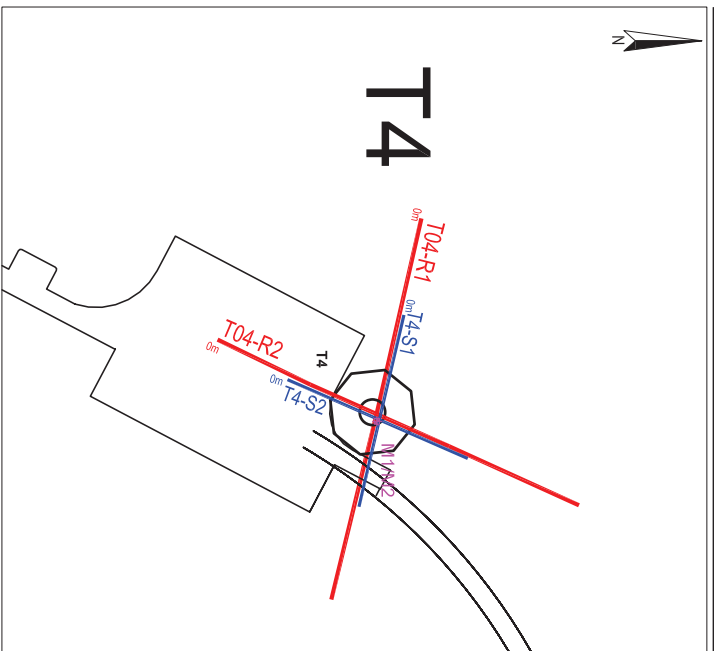
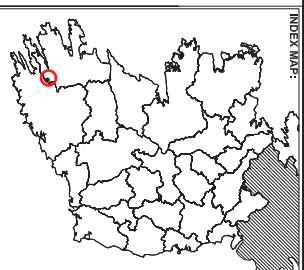
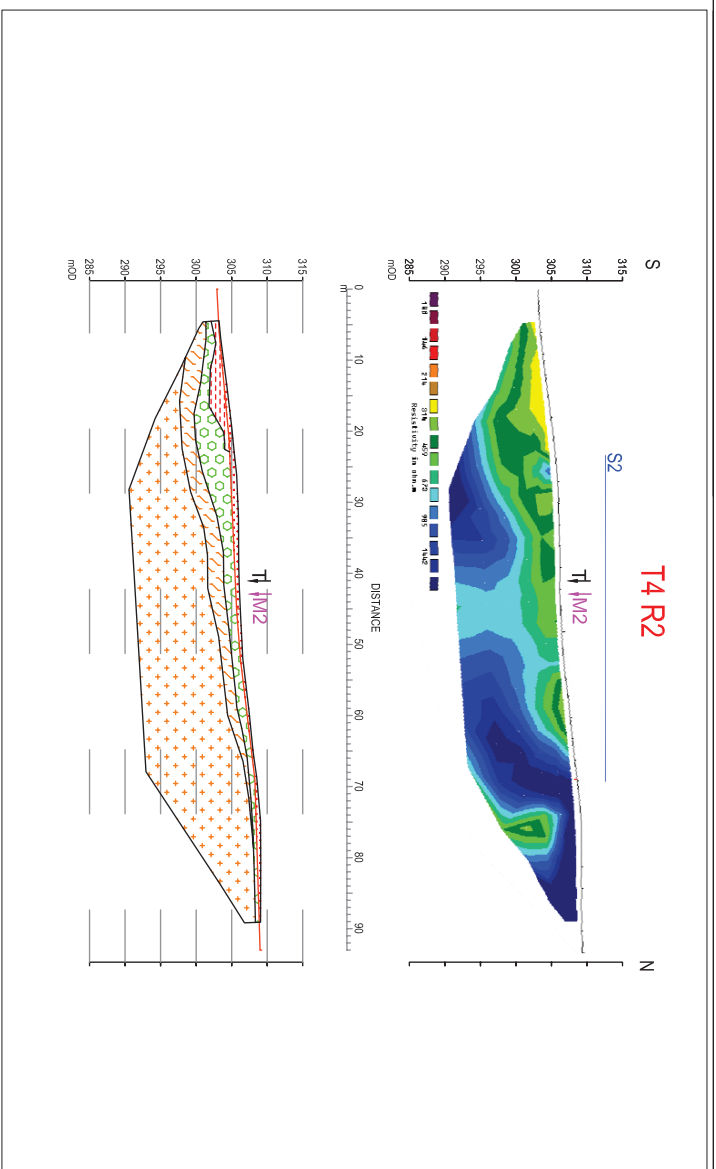


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- SANDY GRAVELLY CLAY
- CLAYEY GRAVEL
- HIGHLY/INTERMEDIATELY WEATHERED SANDSTONE
- SLIGHTLY WEATHERED/FRESH SANDSTONE
- SLIGHTLY WEATHERED/FRESH SILTSTONE
- SLIGHTLY WEATHERED/FRESH SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile



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PROJECT: GROUSEMOUNT WIND FARM

DRAWING No:	AGL15980_T04_01 TURBINE 4
DATE:	08 JUNE 2015
CLIENT:	ISSUES81
SCALE:	AS INDICATED @ A3
VERSION:	1
DATE:	08.06.2015
BY:	SOR
CHECKED:	
DATE:	

Site	Grousemount Wind Farm
Turbine Base	<b>T04</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509549
Northing	570741
Elevation (mOD)	306.4

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	314	-	306	1200	-	-	-	-	PEAT		Diggable
0.4	0.9	459	142	523	2000	0.46	40.47	0.12	1.18	Clayey GRAVEL/GRAVEL	LOOSE	Diggable
0.9	1.5	673	271	969	2000	0.46	146.96	0.43	9.88	Clayey GRAVEL/GRAVEL	DENSE	Diggable
1.5	2.2	673	264	1413	2000	0.48	139.70	0.41	9.34	Clayey GRAVEL/GRAVEL	DENSE	Diggable
2.2	4.5	985	364	2315	2500	0.49	331.29	0.99	39.05	Highly-Moderately Weathered SANDSTONE	POOR	Break / Blast
4.5	6.0	1442	454	2676	2700	0.49	555.74	1.65	91.46	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
6.0	8.8	1442	569	2863	2700	0.48	875.45	2.59	192.35	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
8.8	11.0	1442	885	2992	2700	0.45	2115.21	6.14	799.57	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

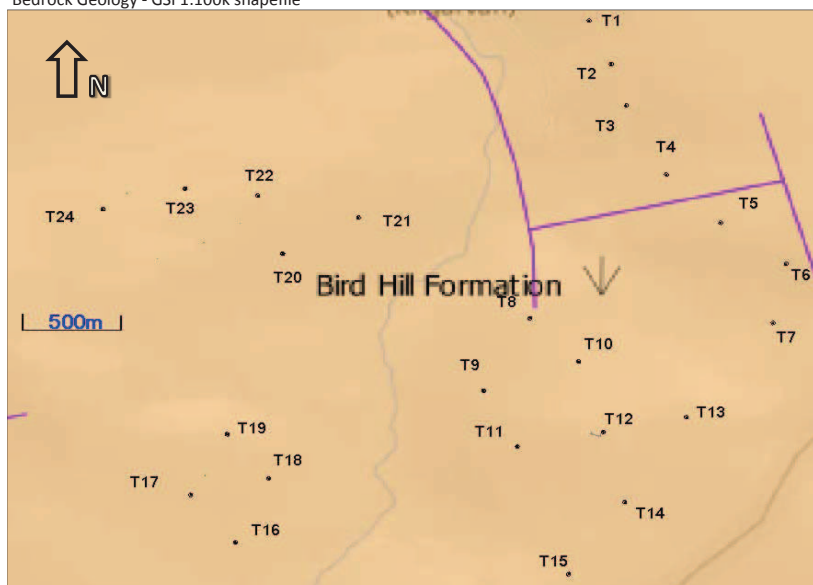
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T04**

Discussion

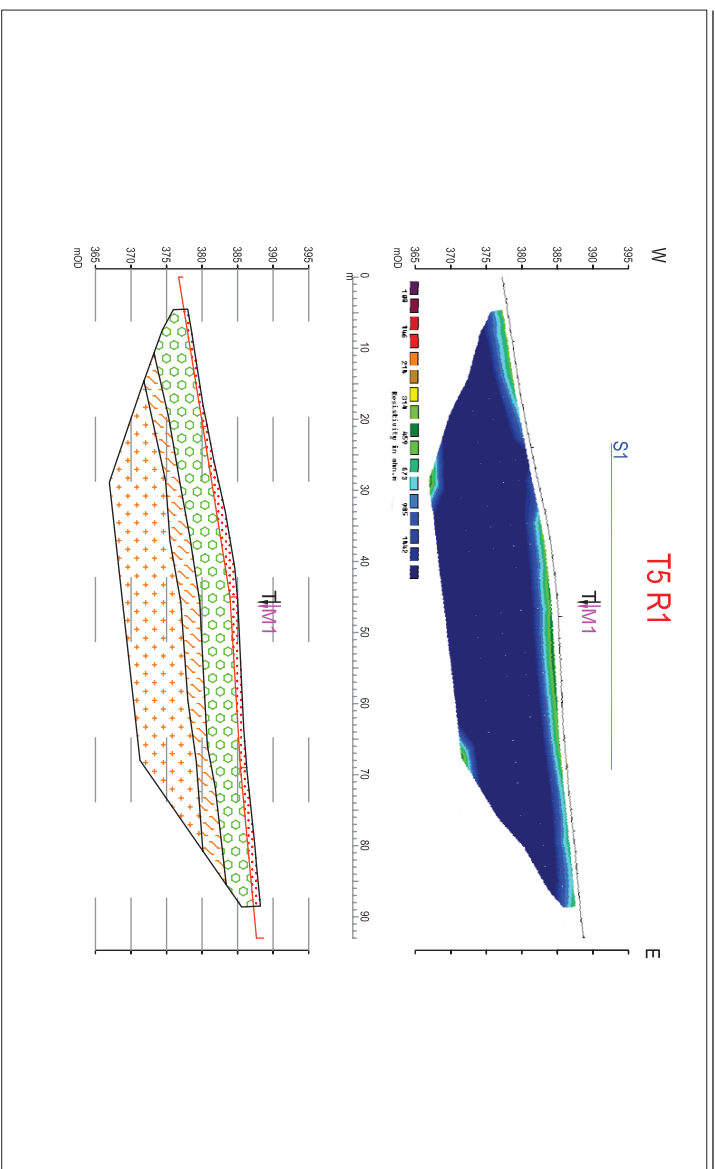
Recommendations



FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3

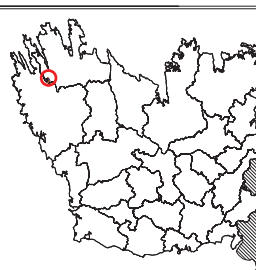


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 05

INDEX MAP:



LEGEND:

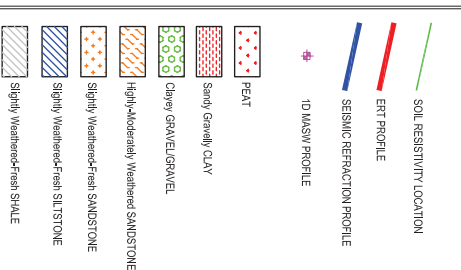


FIGURE 2: TURBINE MAP: Scale 1:1250@A3

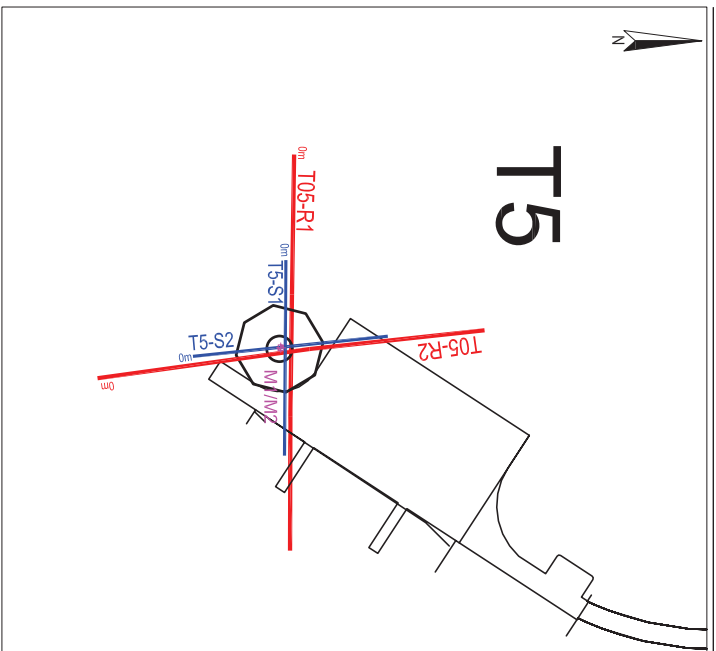
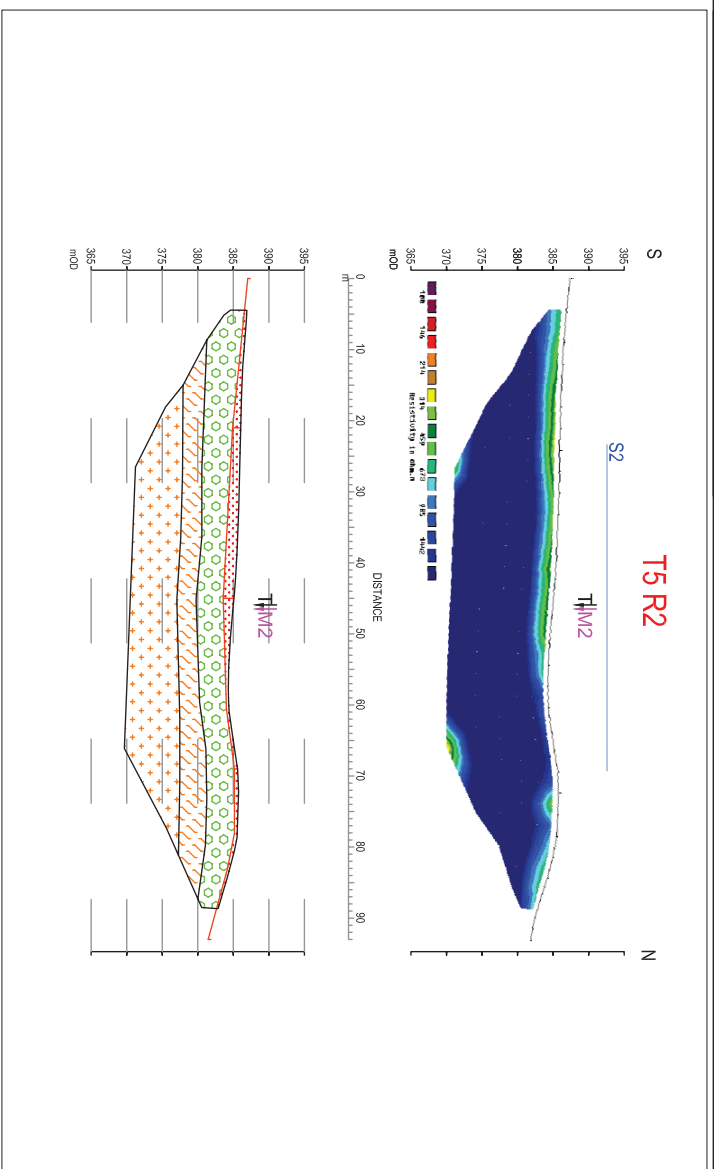


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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**GROUSEMOUNT WIND FARM**

DRAWING NO: AGL15080\_T05\_01 TURBINE 5  
DATE: 08 JUNE 2015  
CLIENT: ISSUES81  
SCALE: AS INDICATED @ A3  
ISSUES: 1  
DATE: 08.08.2015  
SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T05</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509824
Northing	570475
Elevation (mOD)	385.1

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	1.3	530	-	533	1200	-	-	-	-	PEAT		Diggable
1.3	2.0	673	388	604	2000	0.15	300.85	0.69	21.74	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.0	3.0	985	398	692	2000	0.25	316.65	0.79	27.31	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.0	3.9	1442	418	816	2000	0.32	349.26	0.92	35.08	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.9	5.3	1700	399	1014	2000	0.41	317.99	0.90	33.36	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
5.3	8.0	1700	426	1184	2500	0.43	454.59	1.30	61.35	Highly-Moderately Weathered SANDSTONE	VERY POOR	Rippable
8.0	11.0	1700	681	1520	2500	0.37	1158.44	3.18	270.45	Highly-Moderately Weathered SANDSTONE	VERY POOR	Rippable
11.0	13.2	1700	568	2085	2700	0.46	869.74	2.54	186.18	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
13.2	15.3	1700	652	2395	2700	0.46	1147.85	3.35	294.27	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

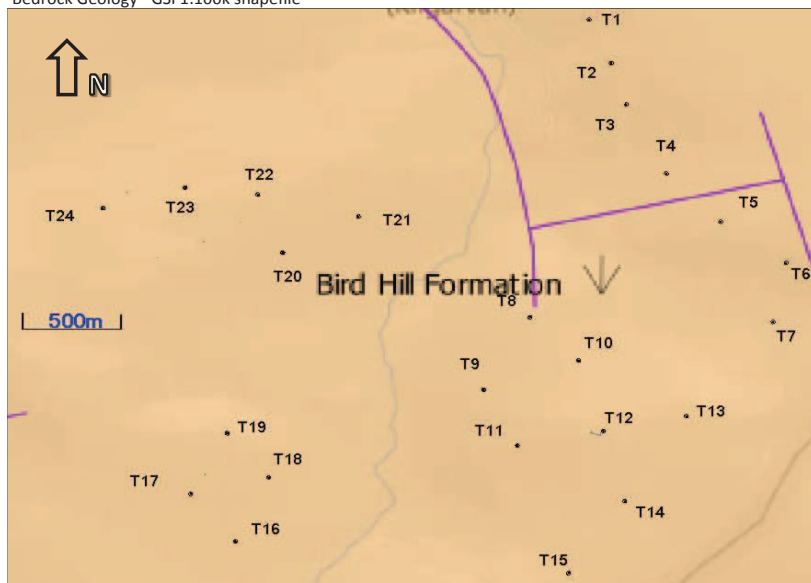
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T05**

Discussion	

Recommendations	

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3

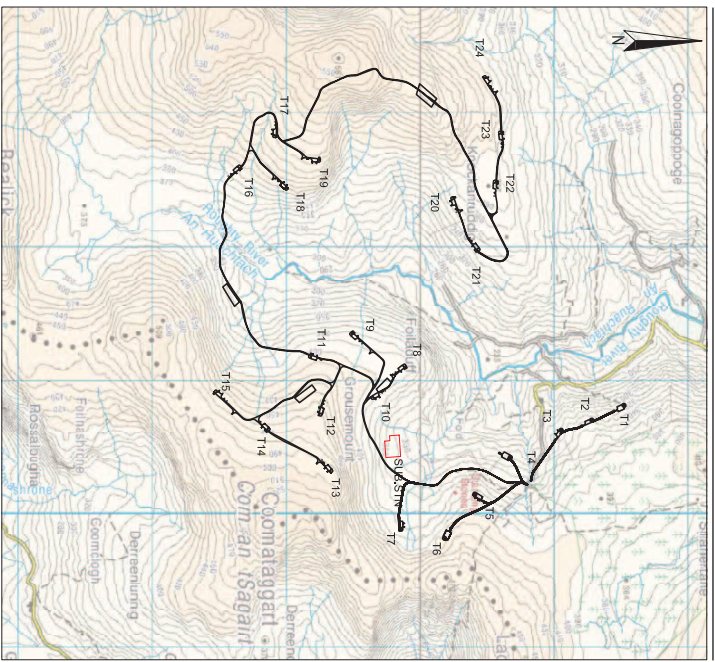
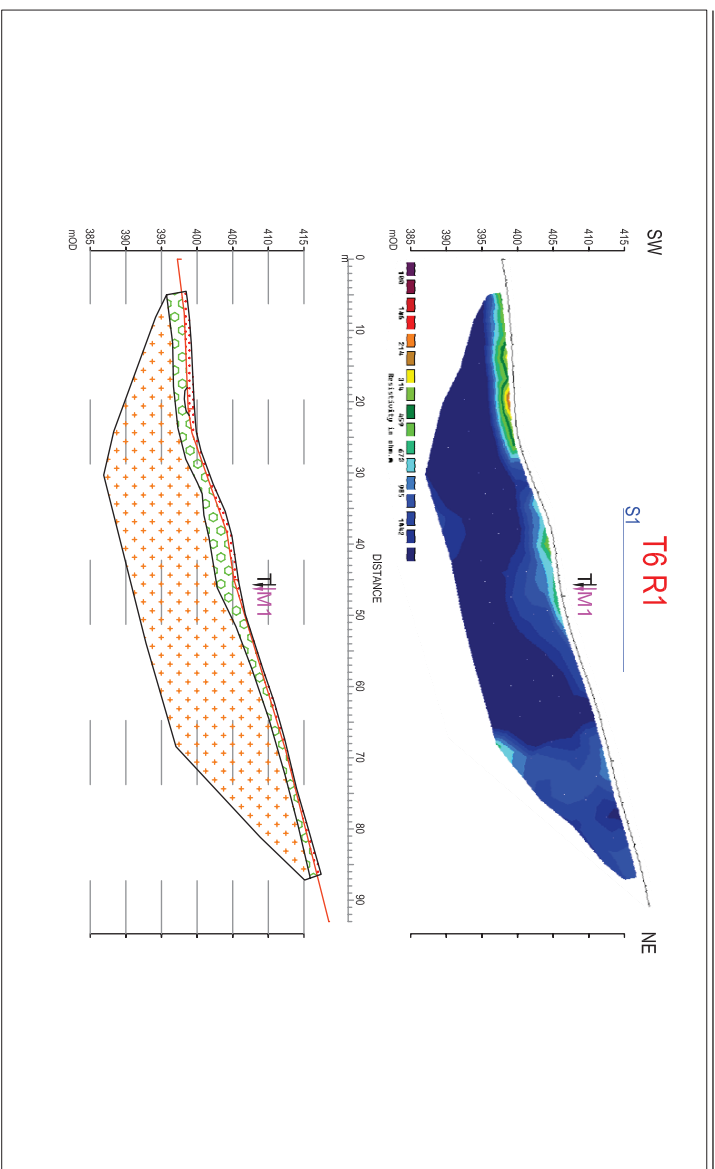
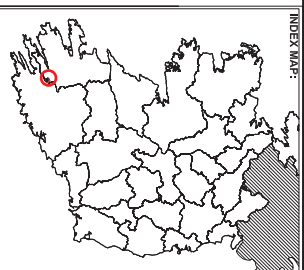


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 06



INDEX MAP:

LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

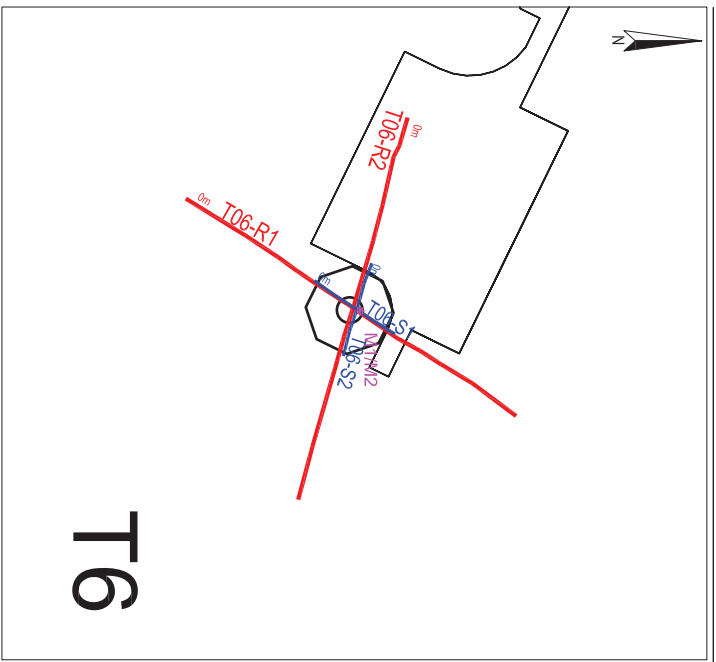
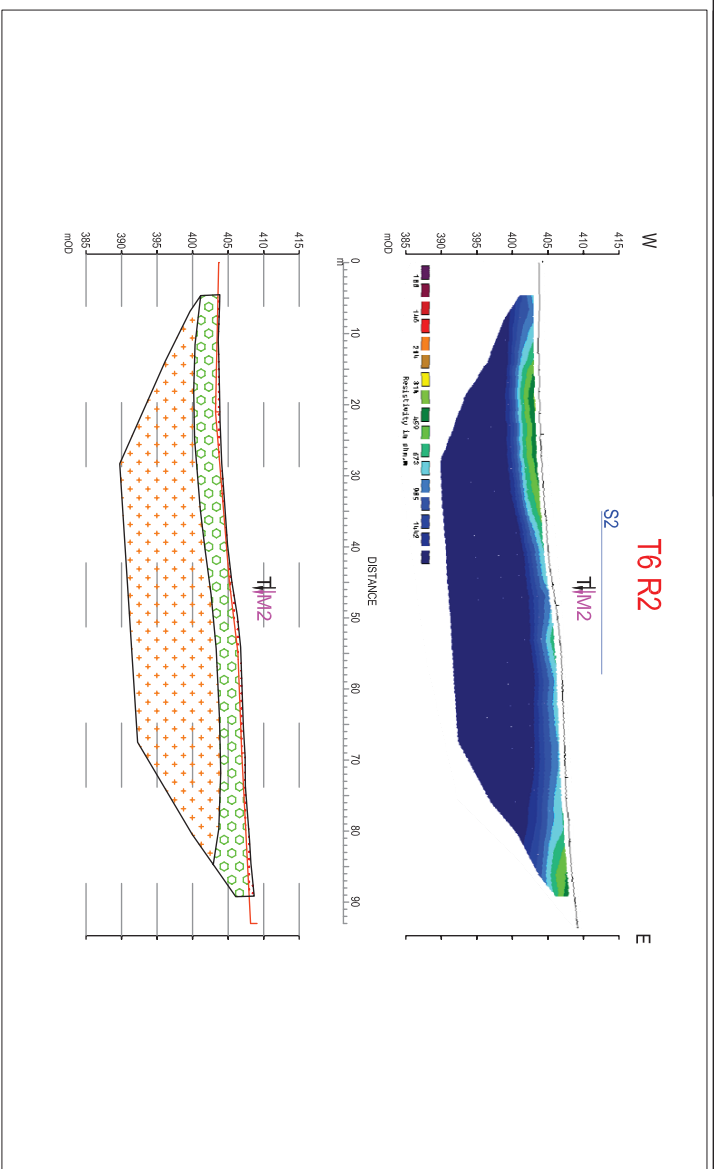


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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Rushmore  
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www.apexgeoservices.co.uk

PROJECT: GROUSEMOUNT WIND FARM

DRAWING NO: AGL15080\_T06\_01 TURBINE 6

DATE: 08 JUNE 2015

CLIENT: ISSUES81

SCALE: AS INDICATED @ A3

NO.	DATE	DESCRIPTION
1	08.06.2015	SOR

- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile
- Slightly Weathered-Fresh SHALE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- High-Moderately Weathered SANDSTONE
- Clayey GRAVEL/SAND
- Slightly Gravelly CLAY
- PEAT

T6

Site	Grousemount Wind Farm
Turbine Base	<b>T06</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	510155
Northing	570248
Elevation (mOD)	406.0

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.5	530	-	300	1200	-	-	-	-	PEAT		Diggable
0.5	1.3	673	122	448	2000	0.46	29.70	0.09	0.71	Clayey GRAVEL/GRAVEL	VERY LOOSE to LOOSE	Diggable
1.3	2.2	985	318	1169	2000	0.46	202.47	0.59	16.81	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.2	3.1	1442	542	1993	2000	0.46	588.56	1.72	97.74	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.1	4.0	1700	789	2899	2700	0.46	1681.11	4.91	552.29	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
4.0	4.9	1700	918	3371	2700	0.46	2273.24	6.64	908.66	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.9	7.6	1700	1040	3821	2700	0.46	2920.49	8.53	1373.85	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.6	11.4	1700	1134	4168	2700	0.46	3474.97	10.15	1830.23	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

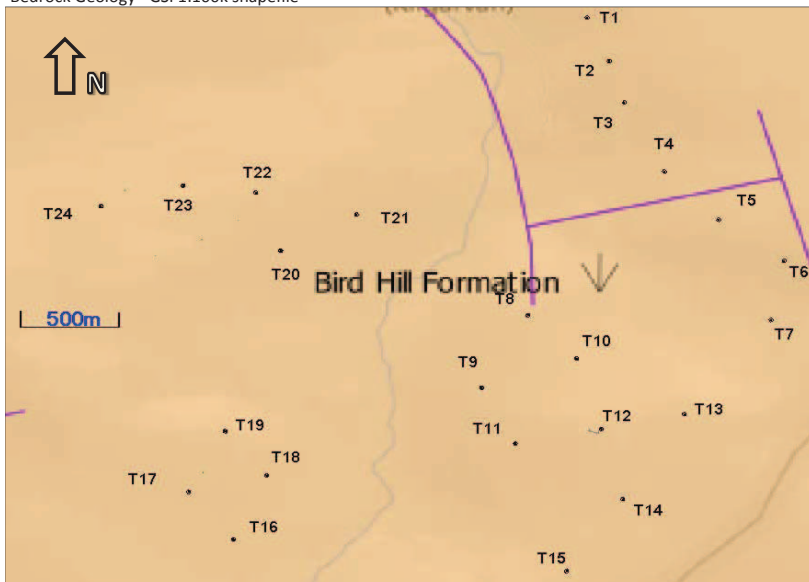
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T06**

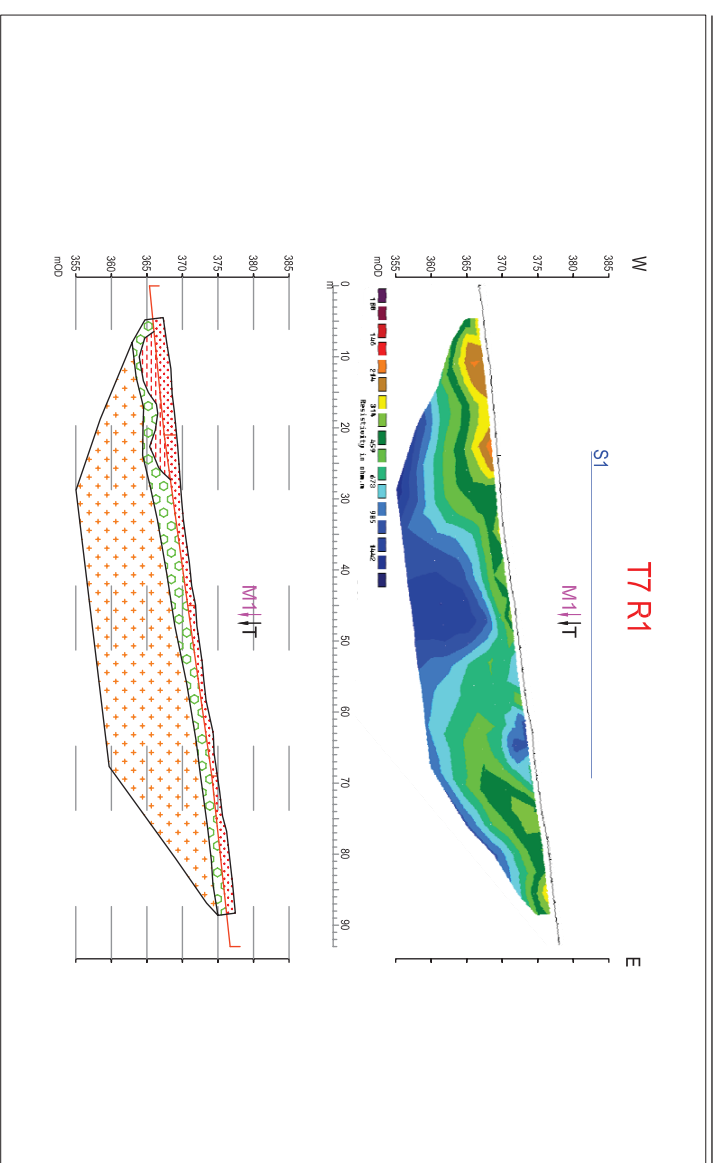
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 07

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

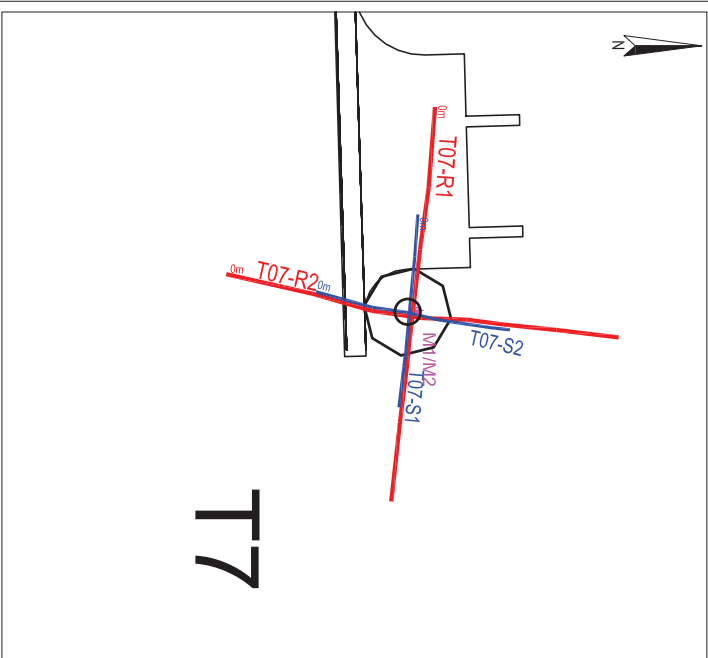
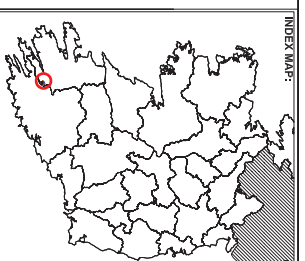
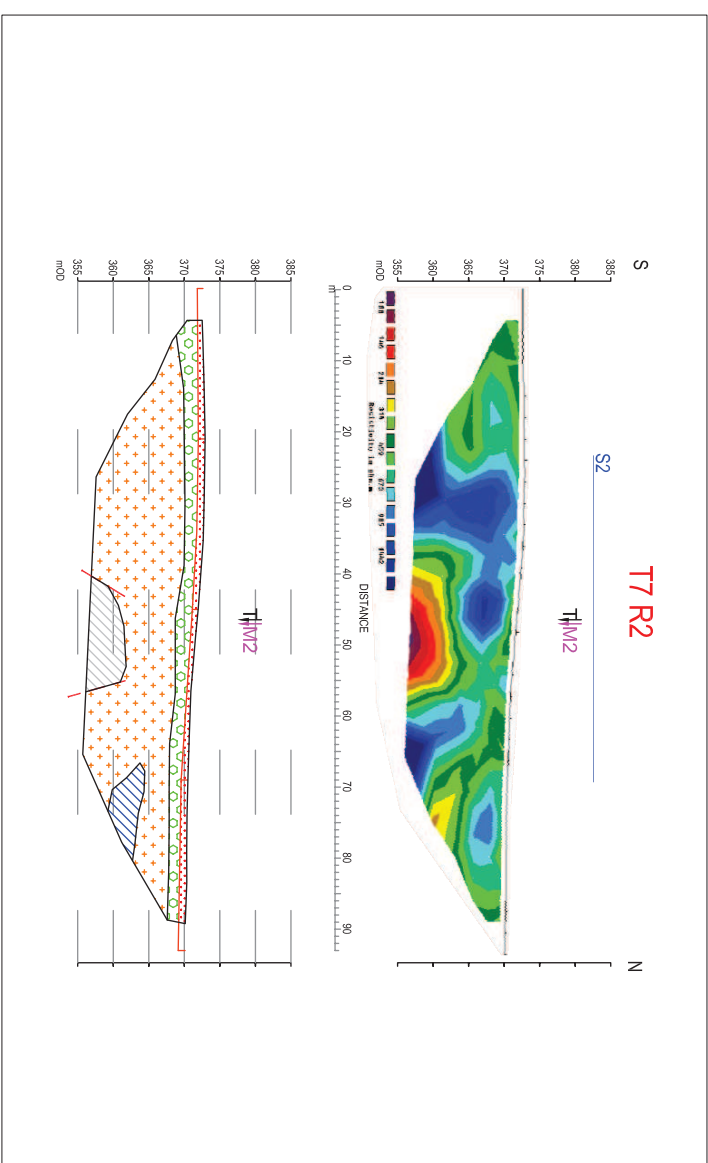


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE

- PEAT
- Slightly Genually CLAY
- Clayey GRAVEL/SAND
- High/Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE

- Peat Probe Depth
- Possible Fault

- Turbine Centre
- 1D MASW Profile



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PROJECT: GROUSEMOUNT WIND FARM

DRAWING No.: AGL15080\_T07\_01 TURBINE 7

DATE: 08 JUNE 2015

CLIENT: ISSUES81

SCALE: AS INDICATED @ A3

NO.	DATE	ISSUED BY	REVISION
1	08.06.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T07</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	510088
Northing	569922
Elevation (mOD)	371.9

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.9	459	-	747	1200	-	-	-	-	PEAT		Diggable
0.9	2.2	673	397	1457	2000	0.46	314.71	0.92	34.79	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.2	3.1	985	524	1924	2000	0.46	548.70	1.60	87.06	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.1	4.0	1442	692	2543	2700	0.46	1294.01	3.78	358.62	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.0	4.9	1442	872	3204	2700	0.46	2053.03	5.99	768.05	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.9	5.8	1442	982	3607	2700	0.46	2603.25	7.60	1136.42	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
5.8	7.6	985	1088	3998	2700	0.46	3198.22	9.34	1596.01	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.6	11.4	673	1137	4178	2700	0.46	3491.34	10.19	1844.48	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

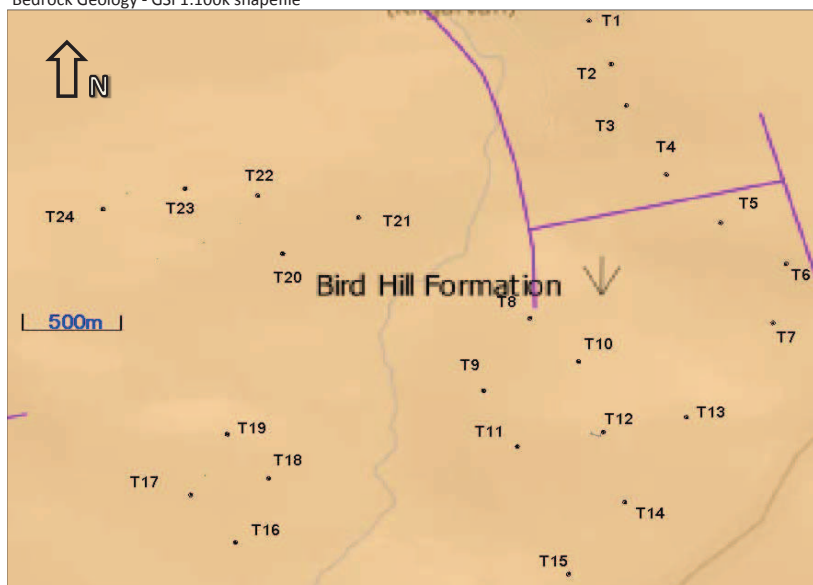
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T07**

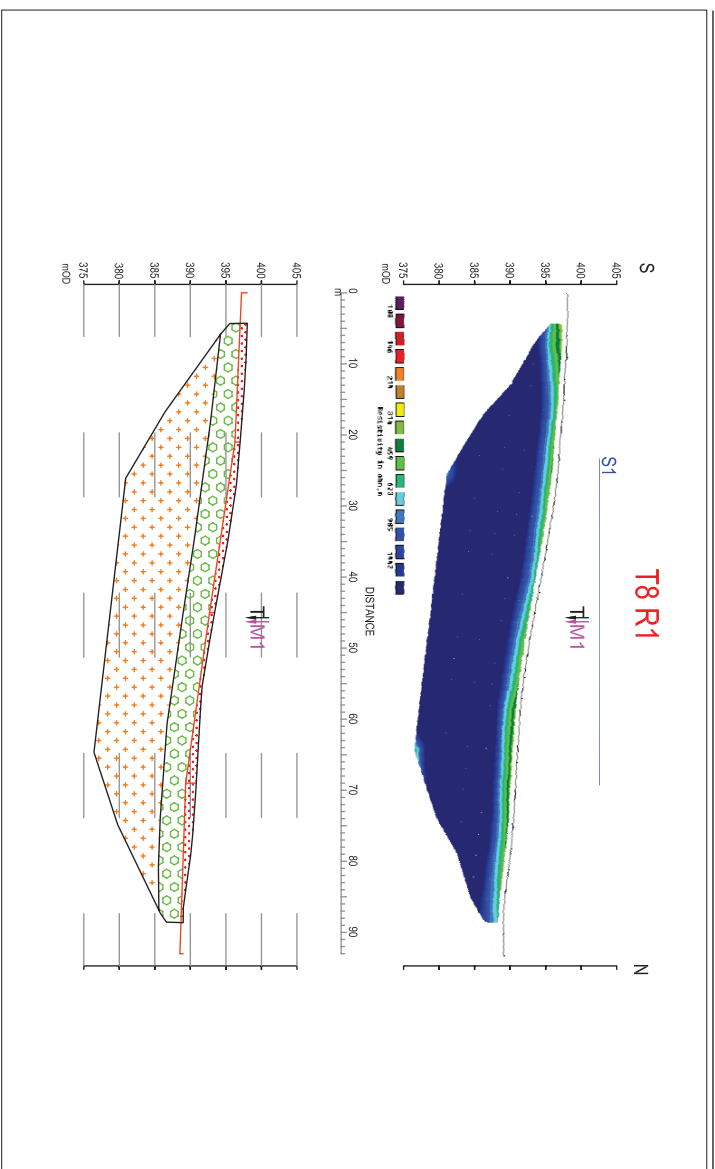
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 08

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

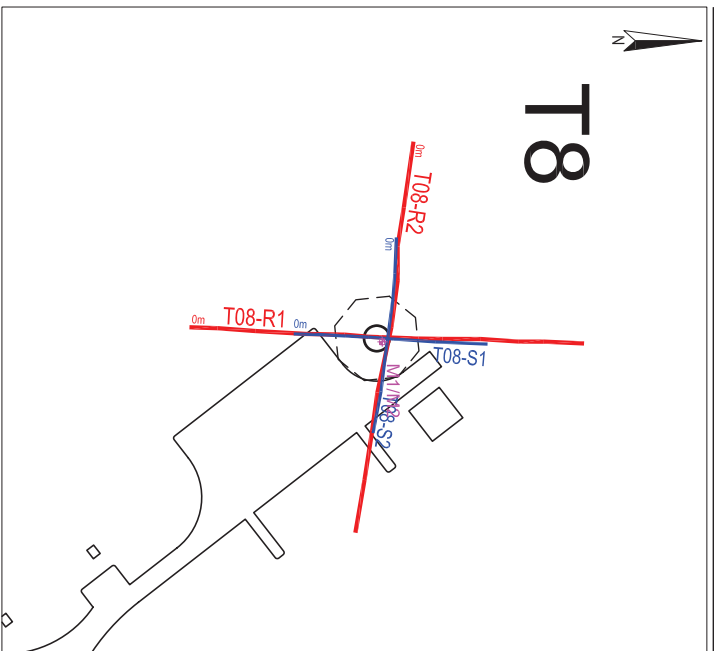
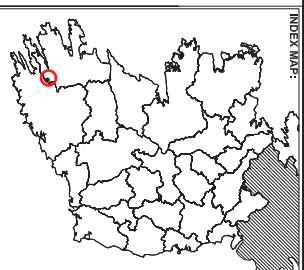
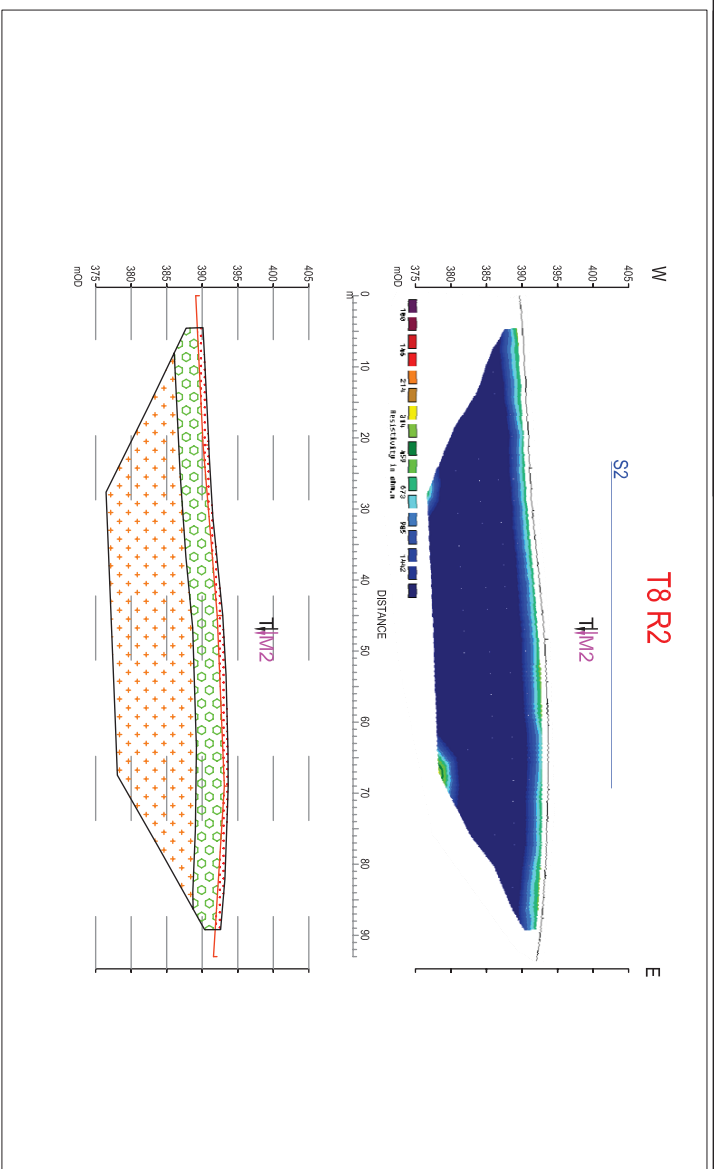


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 1D MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- High-/Moderately weathered SANDSTONE
- Slightly weathered-fresh SANDSTONE
- Slightly weathered-fresh SILTSTONE
- Slightly weathered-fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile



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DRAWING No.:		AGL15080_T08_01 TURBINE 8
DATE:		08 JUNE 2015
CLIENT:		ISSUES/81
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	08.08.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T08</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	508860
Northing	569948
Elevation (mOD)	393.2

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.9	314	-	320	1200	-	-	-	-	PEAT		Diggable
0.9	1.7	459	<i>111</i>	408	2000	0.46	24.68	0.07	0.52	Clayey GRAVEL/GRAVEL	VERY LOOSE	Diggable
1.7	2.4	673	<i>259</i>	648	2000	0.40	134.56	0.38	8.03	Clayey GRAVEL/GRAVEL	DENSE	Diggable
2.4	3.3	985	<i>465</i>	784	2000	0.23	431.84	1.06	44.12	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.3	4.4	1442	<i>579</i>	1055	2000	0.28	669.70	1.72	97.94	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.4	5.8	1442	<i>687</i>	1864	2000	0.42	945.06	2.69	204.26	Slightly Weathered -Fresh SANDSTONE	VERY POOR	Break / Blast
5.8	7.6	1442	<i>829</i>	2787	2700	0.45	1854.02	5.38	642.92	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.8	7.6	1442	<i>847</i>	3111	2700	0.46	1936.22	5.65	697.29	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
7.6	9.5	1442	<i>948</i>	3481	2700	0.46	2424.03	7.08	1010.24	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

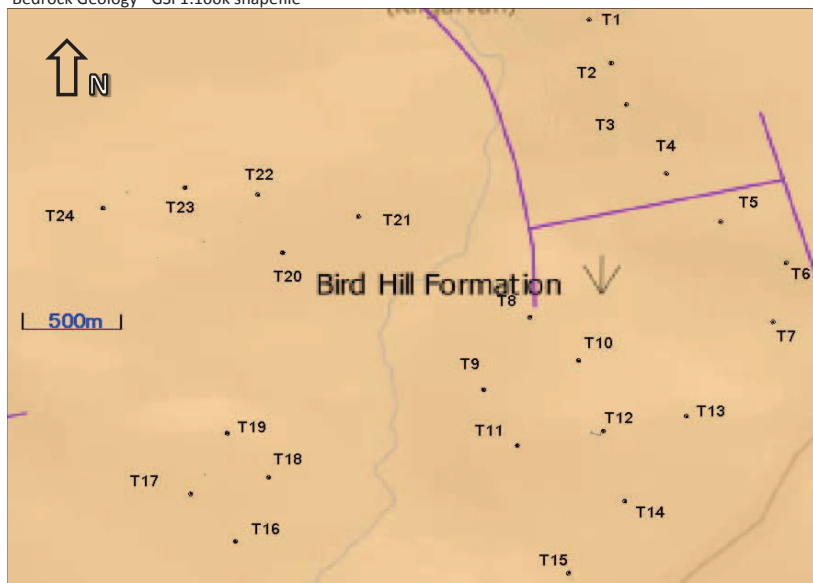
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T08**

Discussion	

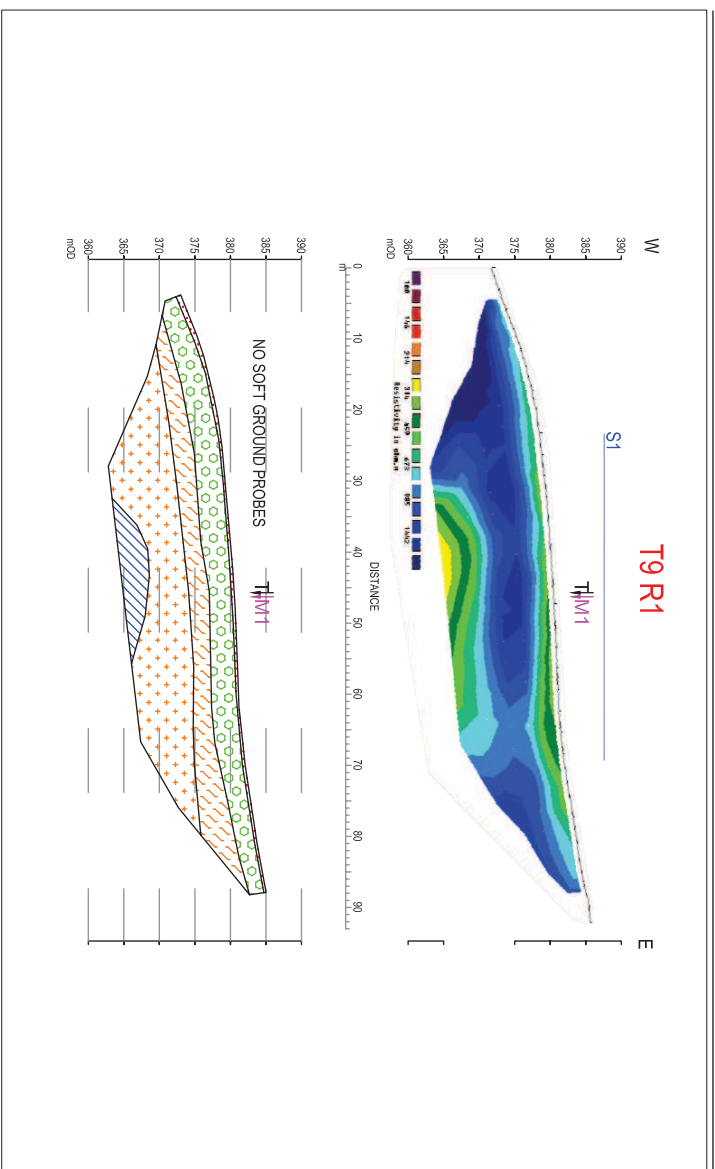
Recommendations	



FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 09

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

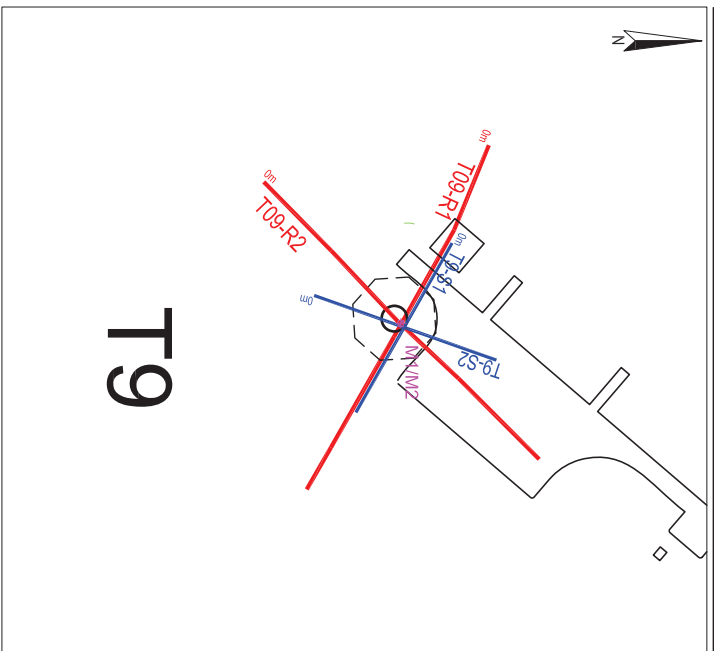
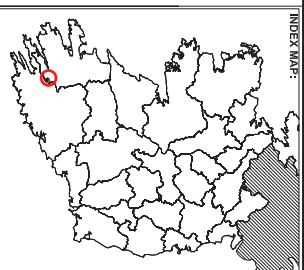
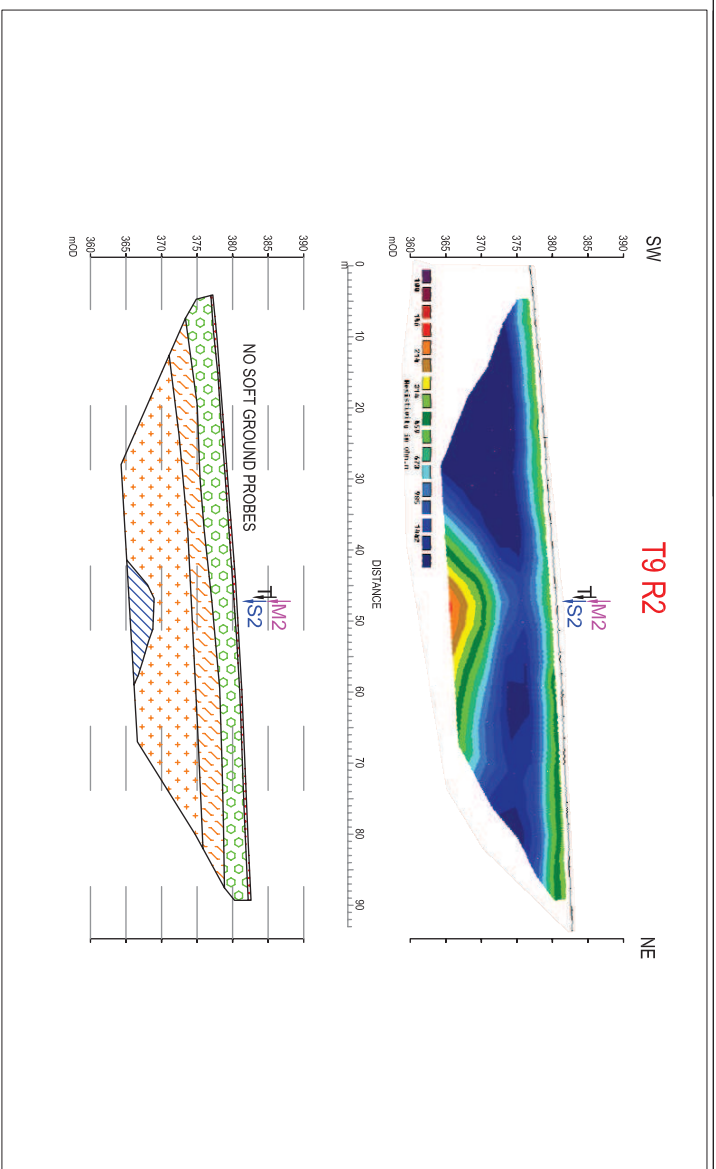


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



INDEX MAP:

- LEGEND:
- SOIL RESISTIVITY LOCATION
  - ERT PROFILE
  - SEISMIC REFRACTION PROFILE
  - + 1D MASW PROFILE
  - PEAT PEAT
  - SANDY GRAVELLY CLAY SANDY GRAVELLY CLAY
  - CLEAVY GRAVEL/GRAVEL CLEAVY GRAVEL/GRAVEL
  - HIGHLY/MODERATELY WEATHERED SANDSTONE HIGHLY/MODERATELY WEATHERED SANDSTONE
  - SLIGHTLY WEATHERED/FRESH SANDSTONE SLIGHTLY WEATHERED/FRESH SANDSTONE
  - SLIGHTLY WEATHERED/FRESH SLTSTONE SLIGHTLY WEATHERED/FRESH SLTSTONE
  - SLIGHTLY WEATHERED/FRESH SHALE SLIGHTLY WEATHERED/FRESH SHALE
  - Peat Probe Depth
  - Possible Fault
  - + Turbine Centre
  - + 1D MASW Profile



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 www.apexgeoservices.co.uk

PROJECT: GROUSEMOUNT WIND FARM

DRAWING No:	AG15980_T09_01 TURBINE 9
DATE:	08 JUNE 2015
CLIENT:	ISSUES/1
SCALE:	AS INDICATED @ A3
VERSION:	1
DATE:	08.06.2015
BY:	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T09</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	508625
Northing	569548
Elevation (mOD)	380.1

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.5	459	-	375	1200	-	-	-	-	PEAT		Diggable
0.5	1.2	673	135	495	2000	0.46	36.35	0.11	0.99	Clayey GRAVEL/GRAVEL	VERY LOOSE to LOOSE	Diggable
1.2	1.8	673	285	681	2000	0.39	162.44	0.45	10.82	Clayey GRAVEL/GRAVEL	DENSE	Diggable
1.8	2.6	985	326	709	2000	0.37	212.69	0.58	16.33	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.6	3.5	1442	383	1043	2000	0.42	294.12	0.84	29.79	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.5	6.4	1442	454	1688	2500	0.46	515.68	1.51	78.68	Highly-Moderately Weathered SANDSTONE	VERY POOR	Rippable
6.4	8.4	985	597	2306	2700	0.46	962.89	2.82	221.23	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
8.4	11.7	985	864	3173	2700	0.46	2013.95	5.88	744.07	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

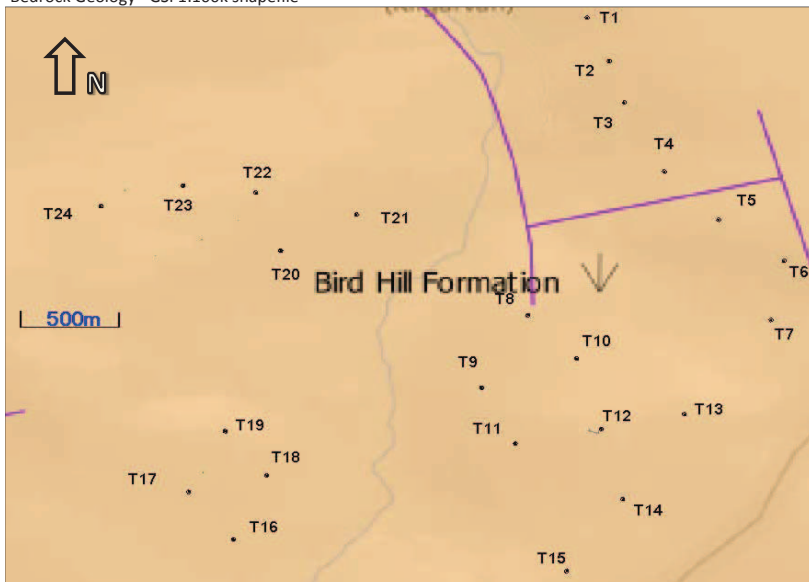
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T09**

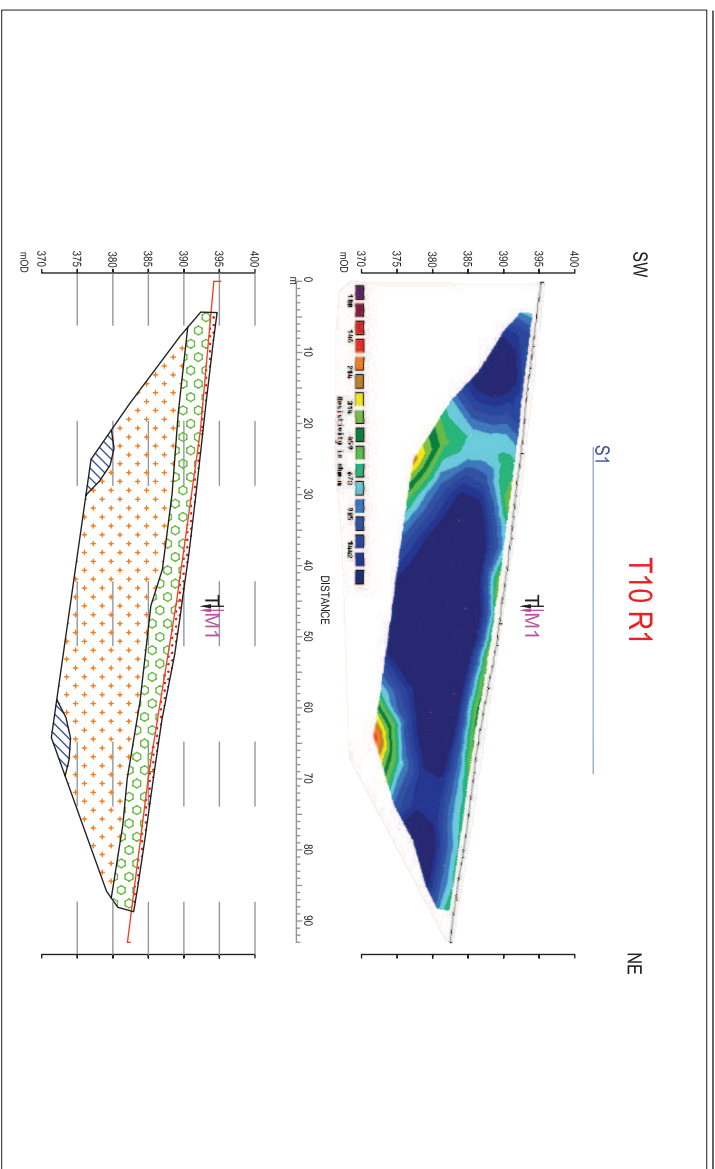
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 10

FIGURE 4: ERT PROFILE R2: Scale 1:750@A3

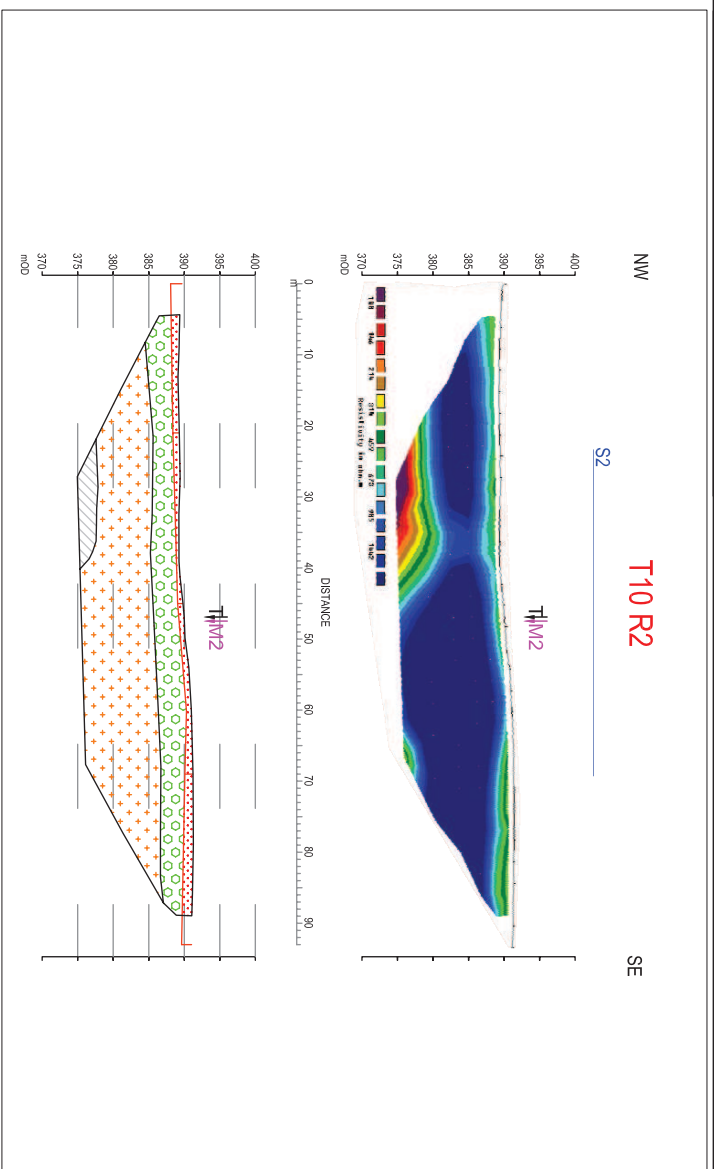
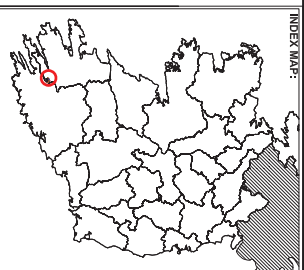
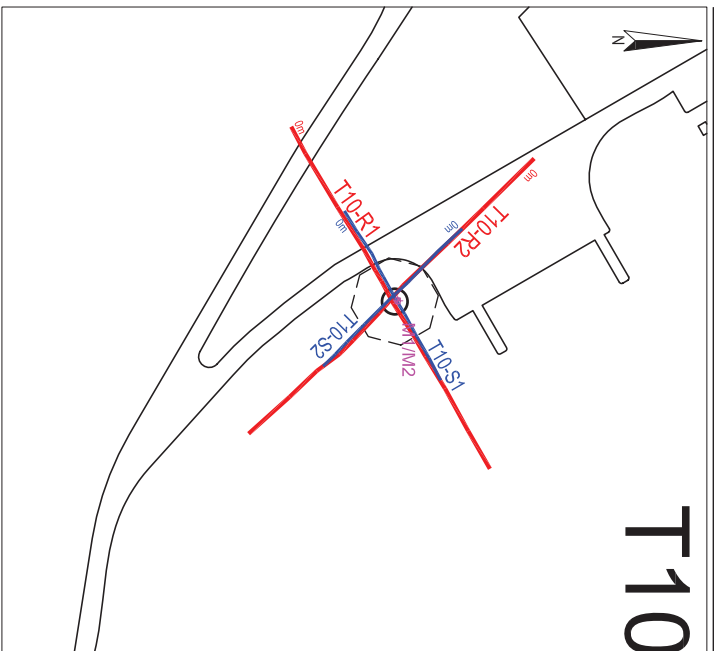


FIGURE 2: TURBINE MAP: Scale 1:1250@A3



INDEX MAP:

- LEGEND:
- SOIL RESISTIVITY LOCATION
  - ERT PROFILE
  - SEISMIC REFRACTION PROFILE
  - + 1D MASIV PROFILE
  - PEAT PEAT
  - SANDY GENERALLY CLAY SANDY GENERALLY CLAY
  - CLAYEY GRAVEL/GRAVEL CLAYEY GRAVEL/GRAVEL
  - HIGHLY-HETEROGENEOUS WEATHERED SANDSTONE HIGHLY-HETEROGENEOUS WEATHERED SANDSTONE
  - SLIGHTLY WEATHERED-FRESH SANDSTONE SLIGHTLY WEATHERED-FRESH SANDSTONE
  - SLIGHTLY WEATHERED-FRESH SILTSTONE SLIGHTLY WEATHERED-FRESH SILTSTONE
  - SLIGHTLY WEATHERED-FRESH SHALE SLIGHTLY WEATHERED-FRESH SHALE
  - Peat Probe Depth
  - Possible Fault
  - + Turbine Centre
  - + 1D MASIV Profile



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 www.apexgeoservices.co.uk

PROJECT: GROUSEMOUNT WIND FARM

DRAWING NO:	AG15980_T10_01 TURBINE 10
DATE:	08 JUNE 2015
CHECKED:	ISSUESB1
SCALE:	AS INDICATED @ A3
VERSION:	1
DATE:	08.06.2015
BY:	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T10</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509105
Northing	569709
Elevation (mOD)	389.6

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.7	673	-	407	1200	-	-	-	-	PEAT		Diggable
0.7	1.4	985	133	489	2000	0.46	35.49	0.10	0.95	Clayey GRAVEL/GRAVEL	VERY LOOSE to LOOSE	Diggable
1.4	2.4	1442	250	918	2000	0.46	125.02	0.37	7.58	Clayey GRAVEL/GRAVEL	MEDIUM DENSE to DENSE	Diggable
2.4	3.3	1442	343	1259	2000	0.46	234.80	0.69	21.46	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.3	4.3	1442	425	1563	2000	0.46	361.87	1.06	43.81	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.3	5.5	1700	619	2273	2700	0.46	1033.49	3.02	247.48	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.5	6.7	1700	737	2708	2700	0.46	1467.37	4.28	441.29	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
6.7	9.3	1700	1046	3844	2700	0.46	2956.31	8.63	1401.76	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

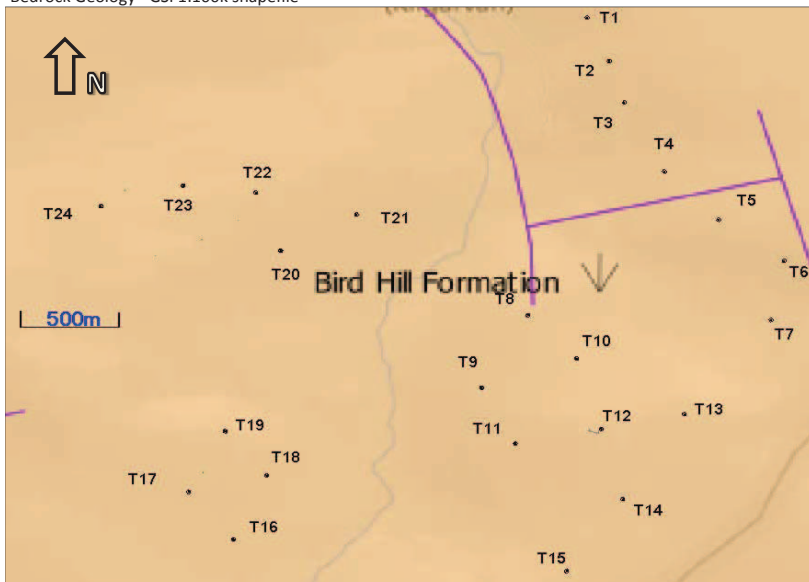
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T10**

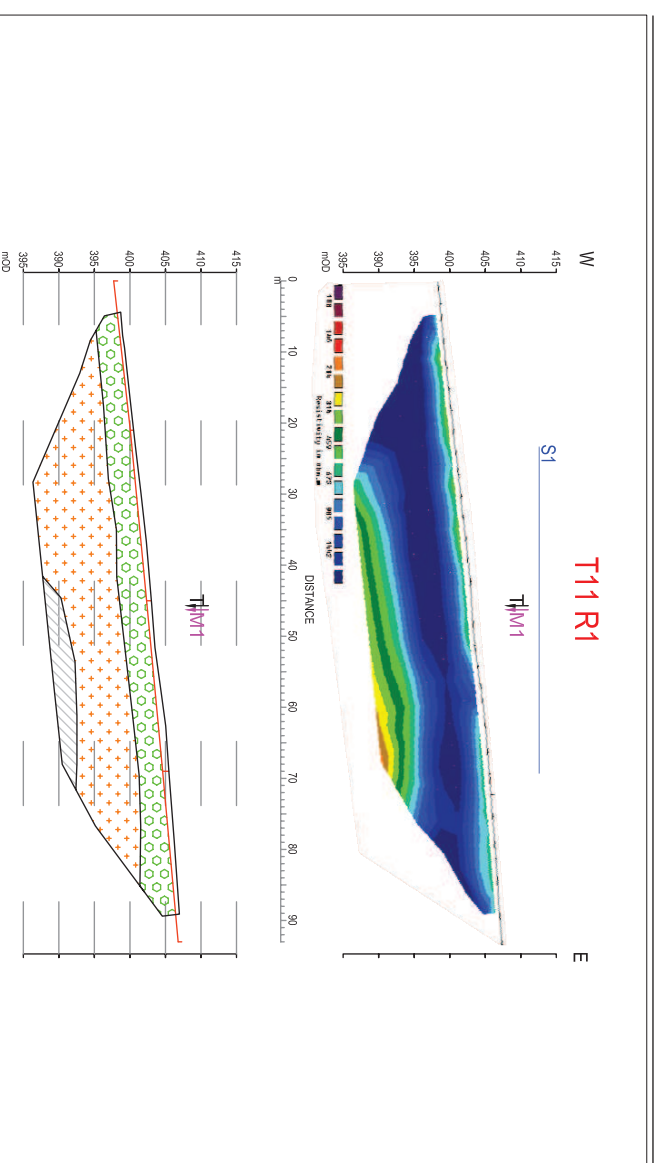
Discussion

Recommendations

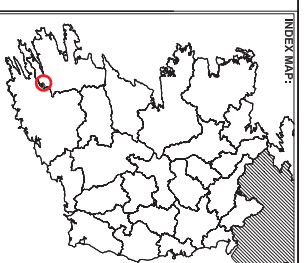
FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 11



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 1D MASW PROFILE
- PEAT PEAT
- SANDY GRAVELLY CLAY SANDY GRAVELLY CLAY
- CLAYEY GRAVEL/SANDWEL CLAYEY GRAVEL/SANDWEL
- HIGH/MODERATELY WEATHERED SANDSTONE HIGH/MODERATELY WEATHERED SANDSTONE
- SLIGHTLY WEATHERED/FRESH SANDSTONE SLIGHTLY WEATHERED/FRESH SANDSTONE
- SLIGHTLY WEATHERED/FRESH SILTSTONE SLIGHTLY WEATHERED/FRESH SILTSTONE
- SLIGHTLY WEATHERED/FRESH SHALE SLIGHTLY WEATHERED/FRESH SHALE
- Peat Probe Depth
- Possible Fault
- + Turbine Centre
- + 1D MASW Profile

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

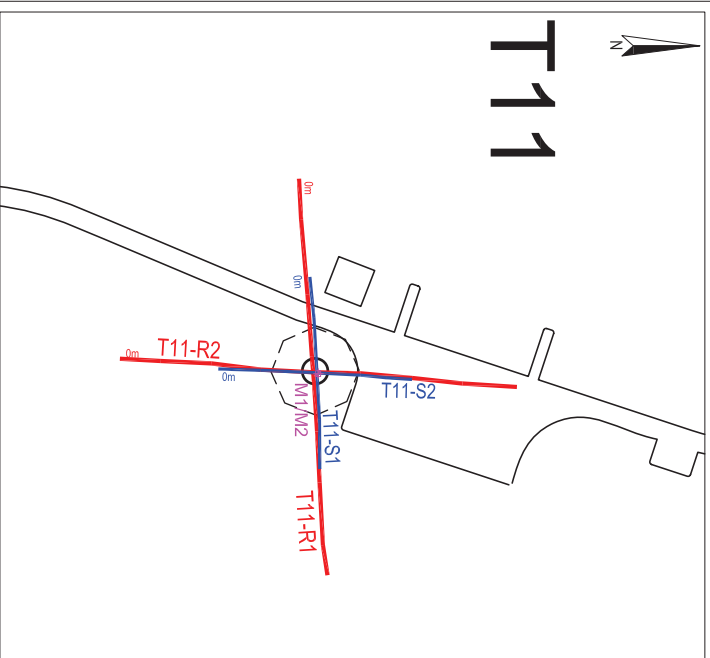
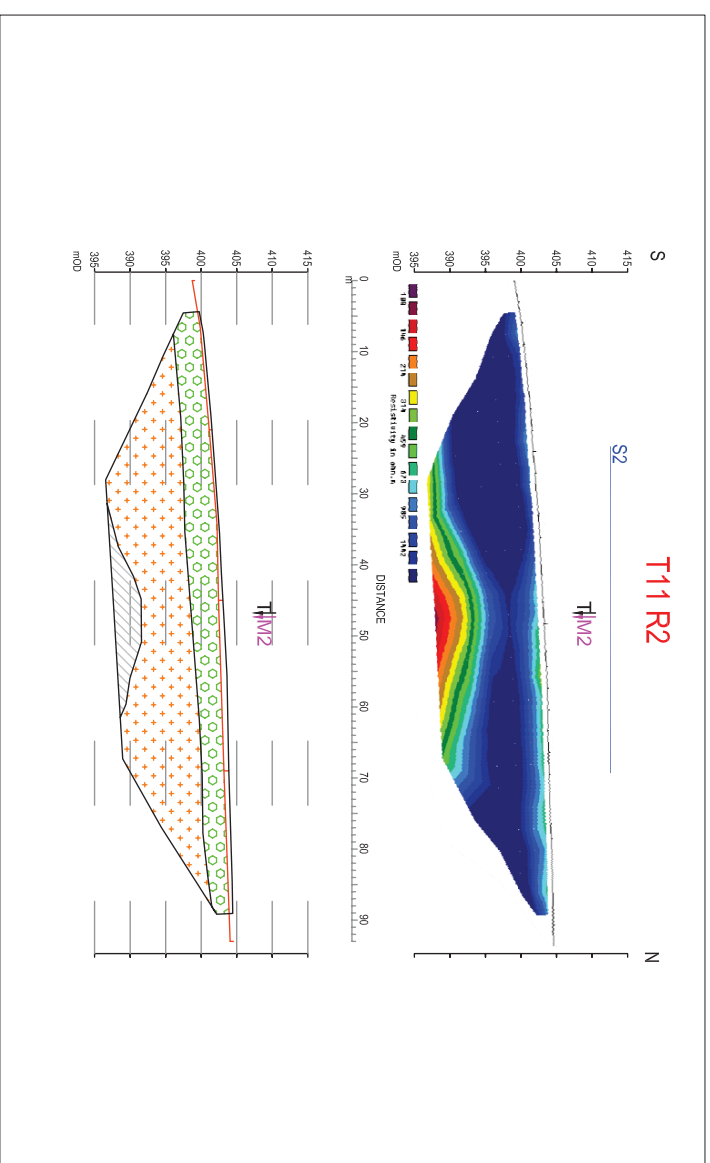


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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PROJECT:		GROUSEMOUNT WIND FARM
DRAWING NO.:		AG15980_T11_01 TURBINE 11
DATE:		08 JUNE 2015
CLIENT:		ISSUES/1
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	08.08.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T11</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m elect. spacing
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	508796
Northing	569240
Elevation (mOD)	403.0

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.6	459	-	493	1200	-	-	-	-	PEAT		Diggable
0.6	1.7	763	166	610	2000	0.46	55.18	0.16	1.97	Clayey GRAVEL/GRAVEL	LOOSE to MEDIUM DENSE	Diggable
1.7	2.5	985	266	785	2000	0.44	141.58	0.41	9.05	Clayey GRAVEL/GRAVEL	DENSE	Diggable
2.5	3.4	1442	451	1124	2000	0.40	406.05	1.14	49.68	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.4	4.5	1442	639	1871	2000	0.43	817.18	2.34	163.06	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.5	6.0	1442	706	2451	2700	0.45	1345.46	3.91	380.20	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
6.0	7.5	985	836	3355	2700	0.47	1889.23	5.54	674.79	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
7.5	9.5	985	1045	3839	2700	0.46	2948.67	8.61	1395.79	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

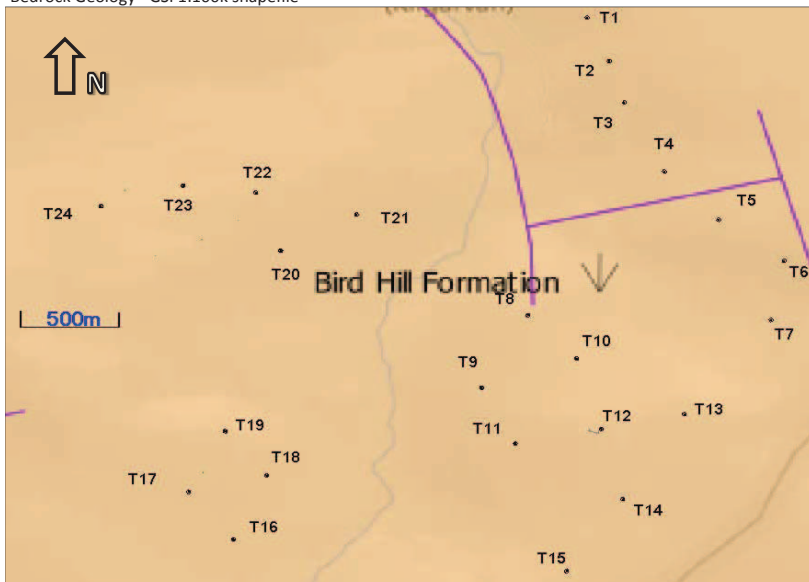
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T11**

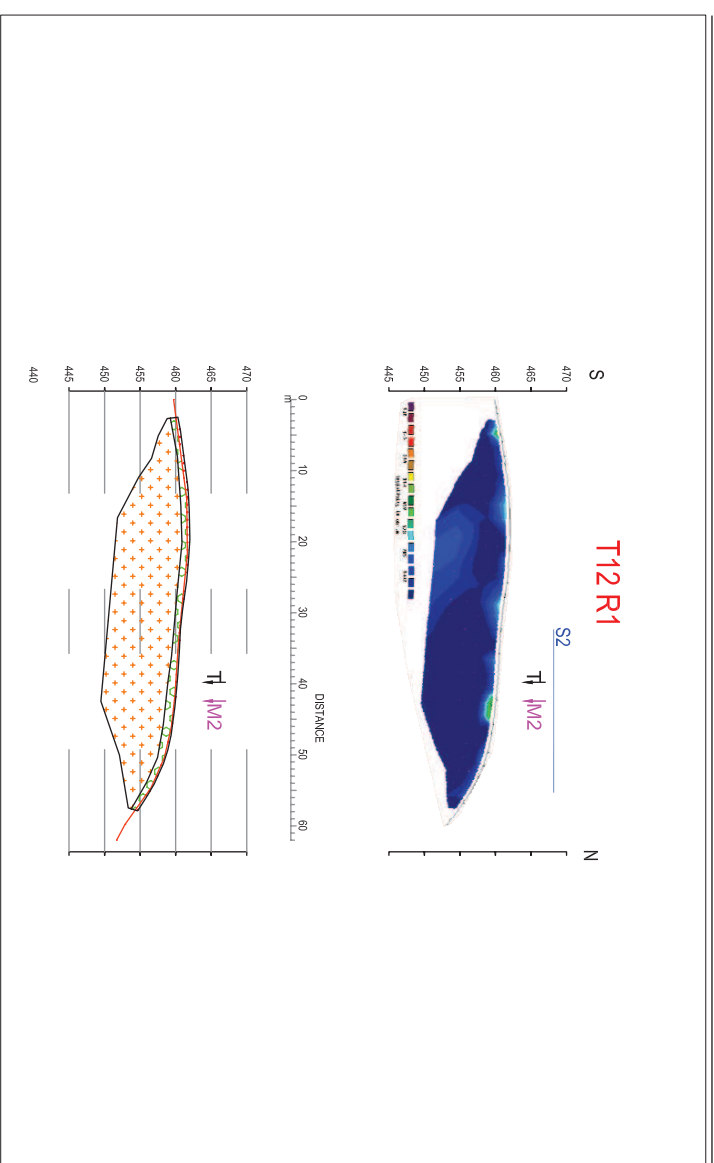
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 12

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

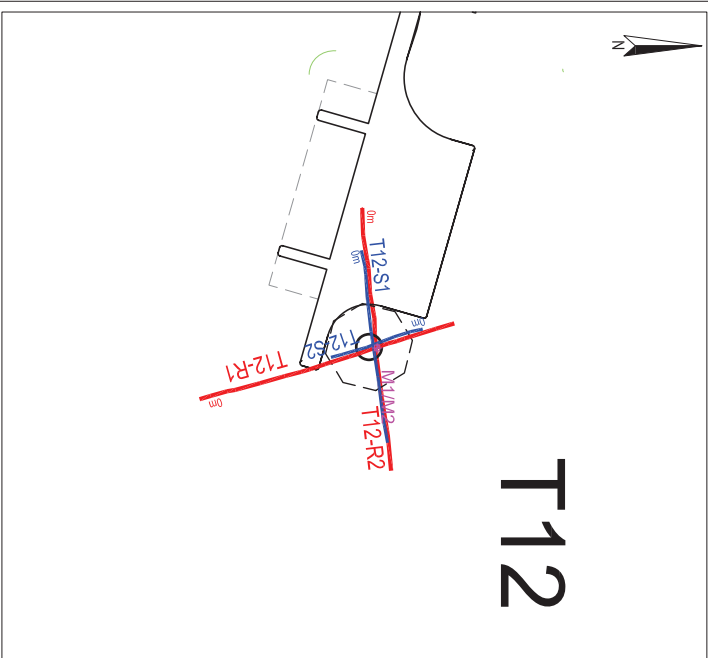
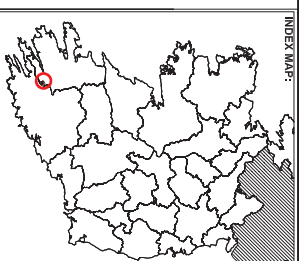
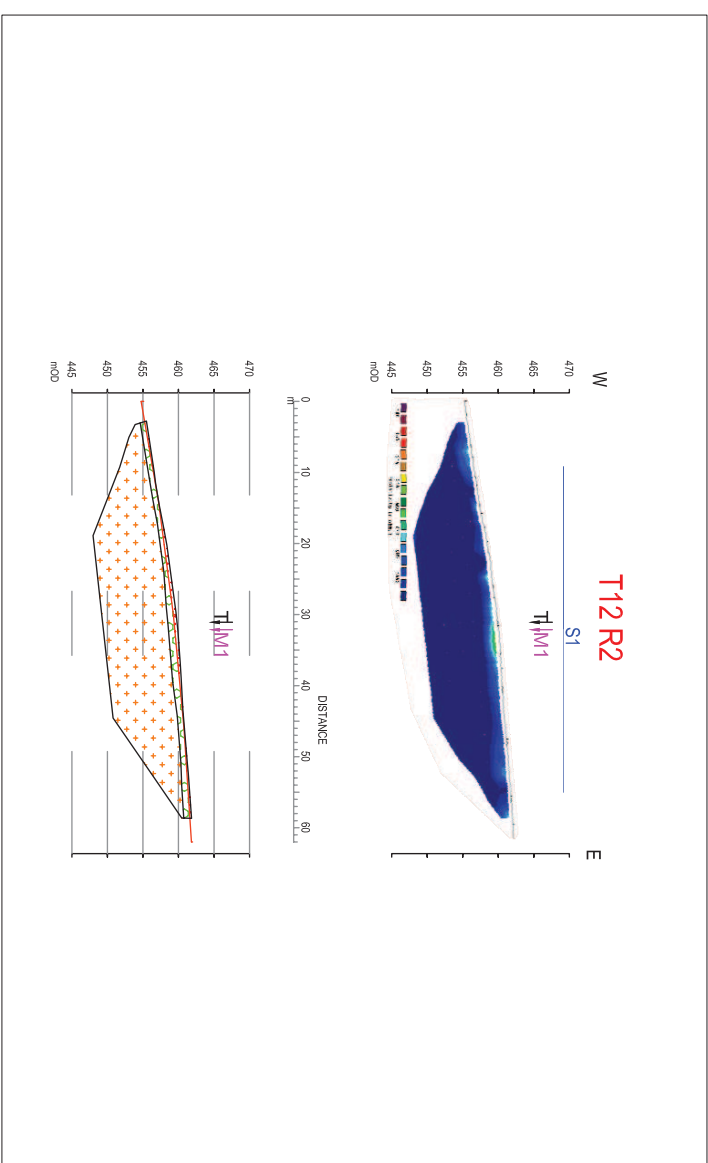


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



INDEX MAP:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 1D MASW PROFILE

- PEAT
- Sandy Gravely CLAY
- Clayey GRAVEL/GRAVEL
- High/Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile



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PROJECT:		GROUSEMOUNT WIND FARM
DRAWING NO.:		AGL15980_T12_01 TURBINE 12
DATE:		08 JUNE 2015
CLIENT:		ISSUES/1
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	08.08.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T12</b>

Methodology	
Seismic Refraction	24 ch. @ 1&2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 2m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509230
Northing	569320
Elevation (mOD)	460.1

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.7	985	-	576	1200	-	-	-	-	PEAT		Diggable
0.7	1.3	1442	314	1153	2000	0.46	197.07	0.58	16.07	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
1.3	2.2	1442	609	2238	2700	0.46	1002.12	2.93	235.21	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
2.2	3.1	1442	818	3004	2700	0.46	1805.29	5.27	621.21	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
3.1	4.0	1700	979	3598	2700	0.46	2590.13	7.56	1126.98	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
4.0	5.8	1700	1262	4635	2700	0.46	4298.56	12.55	2599.68	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.8	7.7	1700	1325	4866	2700	0.46	4737.41	13.83	3051.96	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.7	9.6	1700	1353	4972	2700	0.46	4946.15	14.44	3277.01	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

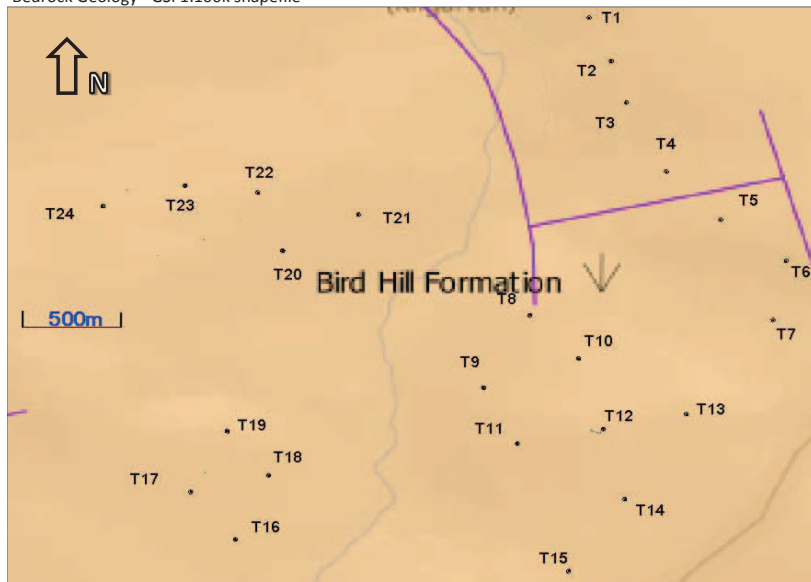
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T12**

Discussion

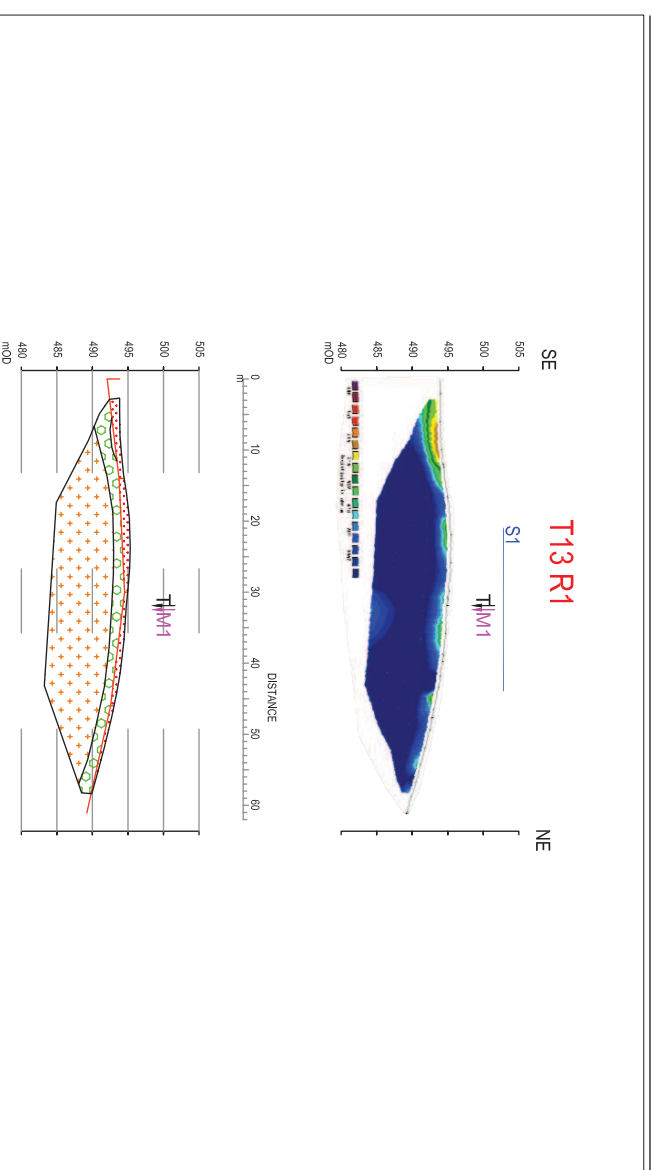
Recommendations



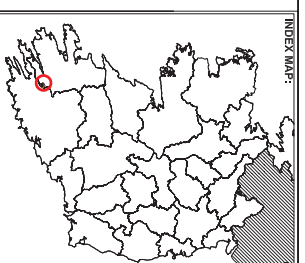
FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 13



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

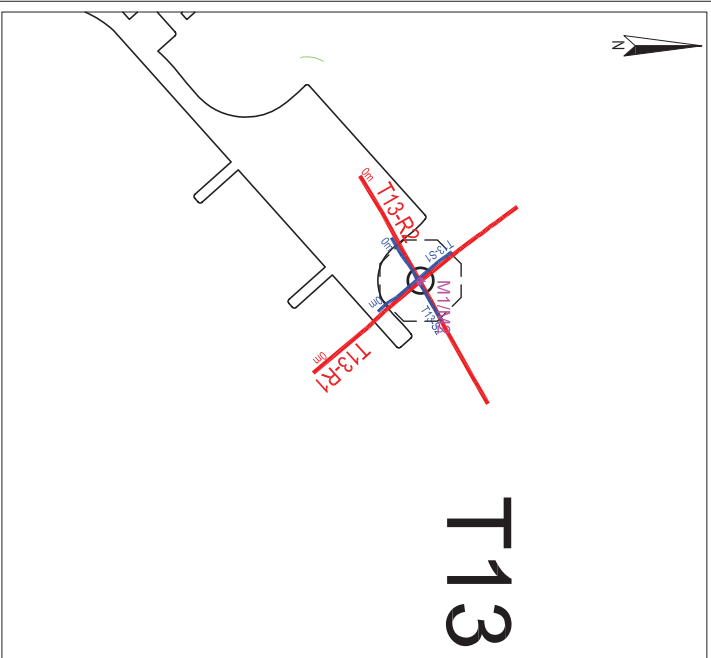
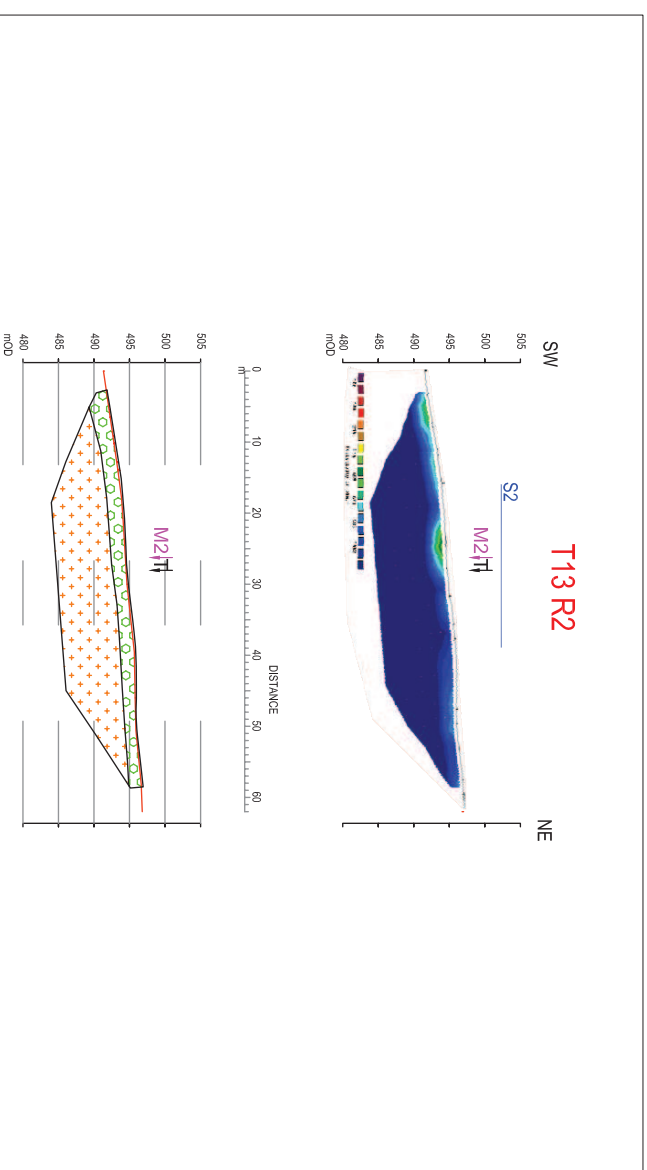


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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[www.apexgeoservices.co.uk](http://www.apexgeoservices.co.uk)

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**PROJECT:** GROUSEMOUNT WIND FARM

**DRAWING NO.:** AGL15090\_T13\_01 TURBINE 13

**DATE:** 08 JUNE 2015

**CLIENT:** ISSUES81

**SCALE:** AS INDICATED @ A3

VERSION	DATE	CREATED BY	CHANGED BY
1	08.06.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T13</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 2m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509651
Northing	569402
Elevation (mOD)	494.7

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.4	695	-	424	1200	-	-	-	-	PEAT		Diggable
0.4	2.1	985	544	1997	2000	0.46	591.04	1.73	98.42	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.1	3.1	1442	848	3117	2700	0.46	1943.63	5.68	701.69	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
3.1	4.3	1442	862	3167	2700	0.46	2007.00	5.86	739.84	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.3	5.7	1700	953	3500	2700	0.46	2450.56	7.16	1028.55	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
5.7	7.5	1700	1034	3798	2700	0.46	2884.97	8.42	1346.39	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.5	9.7	1700	1096	4026	2700	0.46	3242.94	9.47	1633.00	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

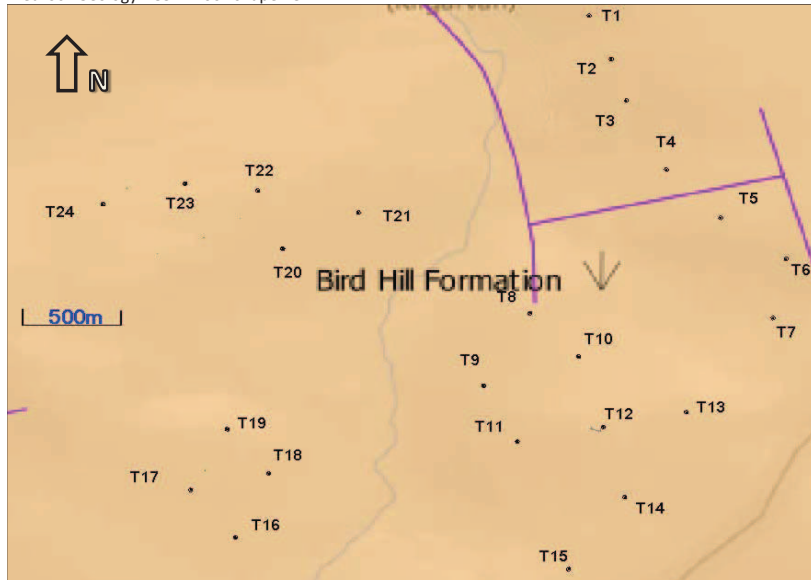
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T13**

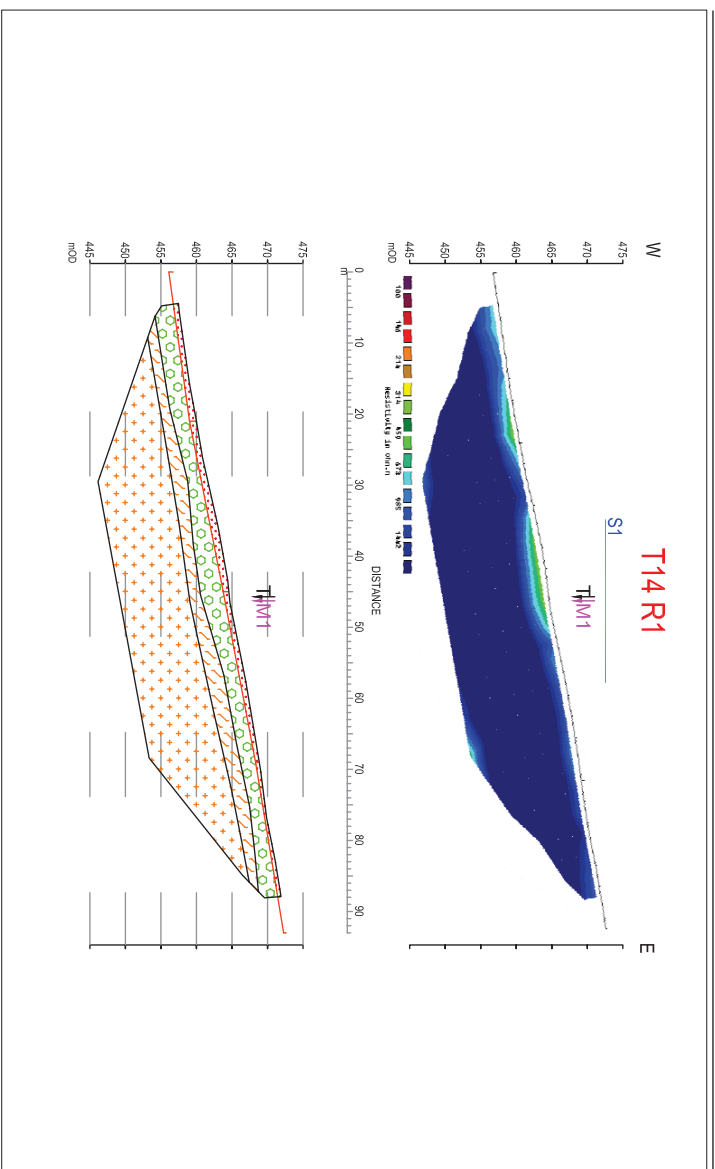
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 14

FIGURE 2: TURBINE MAP: Scale 1:2000@A3

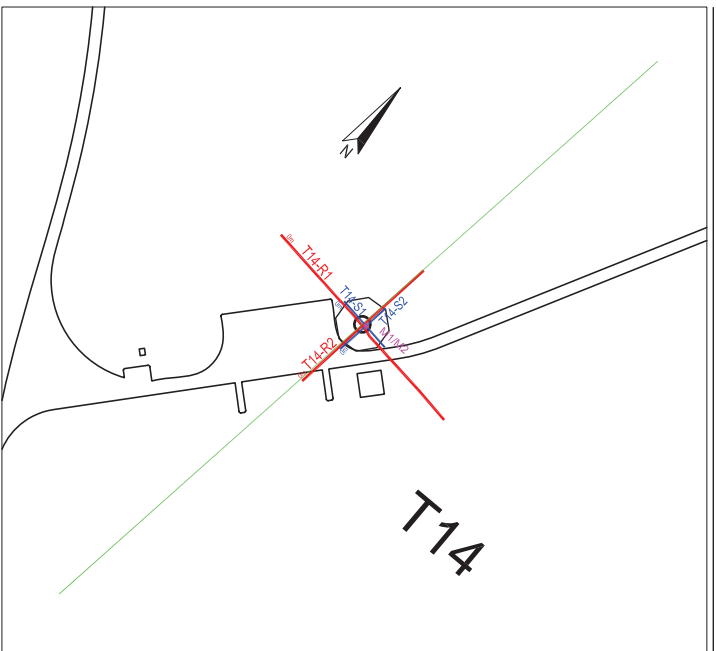
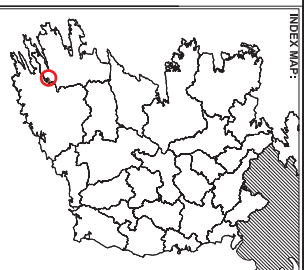
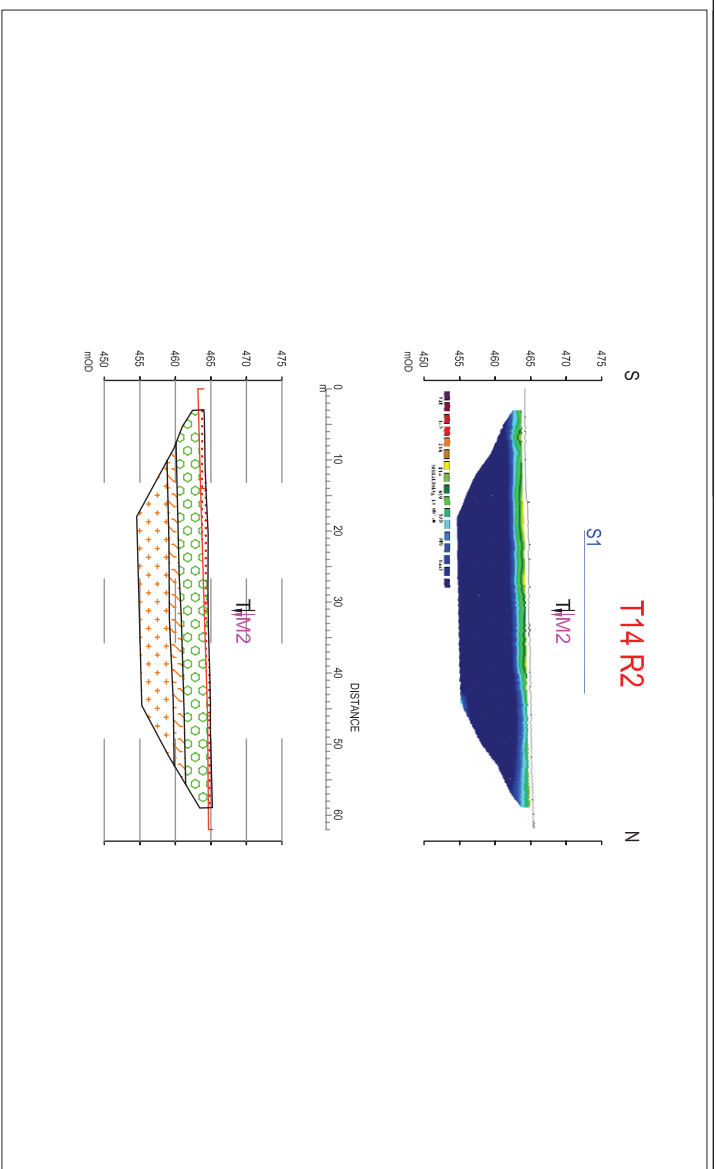
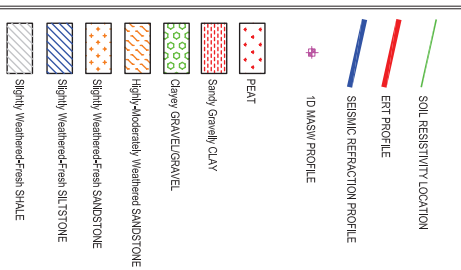


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



INDEX MAP:



**apex** geoservices

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 E info@apexgeoservices.co.uk E info@apexgeoservices.co.uk  
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PROJECT: GROUSEMOUNT WIND FARM

DRAWING NO: AGL15090\_T14\_01 TURBINE 14

DATE: 08 JUNE 2015

CHECKED: ISSUES/EBI

SCALE: AS INDICATED @ A3

VERSION	DATE	CREATED BY	CHANGED BY
1	08.06.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T14</b>

Methodology	
Seismic Refraction	24 ch. @ 1m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 2m & 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509339
Northing	568932
Elevation (mOD)	464.9

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.7	673	-	456	1200	-	-	-	-	PEAT		Diggable
0.7	1.3	985	180	661	2000	0.46	64.75	0.19	2.56	Clayey GRAVEL/GRAVEL	LOOSE to MEDIUM DENSE	Diggable
1.3	2.2	1442	233	857	2000	0.46	108.72	0.32	6.02	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
2.2	3.1	1700	275	1010	2000	0.46	151.09	0.44	10.37	Clayey GRAVEL/GRAVEL	DENSE	Diggable
3.1	4.0	1700	308	1133	2000	0.46	190.14	0.56	15.15	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.0	5.7	1700	366	1343	2500	0.46	333.99	0.98	38.38	Highly-Moderately Weathered SANDSTONE	VERY POOR	Rippable
5.7	7.6	1700	579	2126	2700	0.46	904.12	2.64	198.48	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
7.6	9.4	1700	854	3139	2700	0.46	1970.84	5.75	717.98	Slightly Weathered -Fresh SHALE	FAIR	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

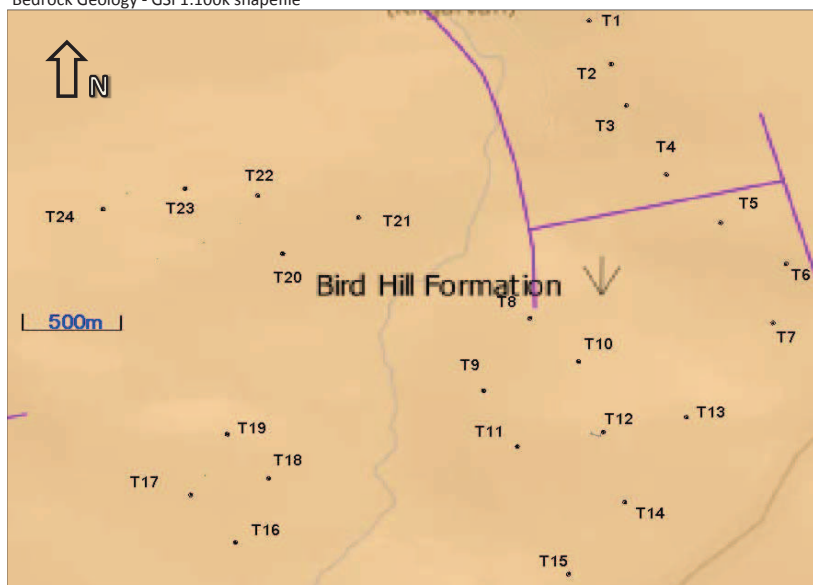
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T14**

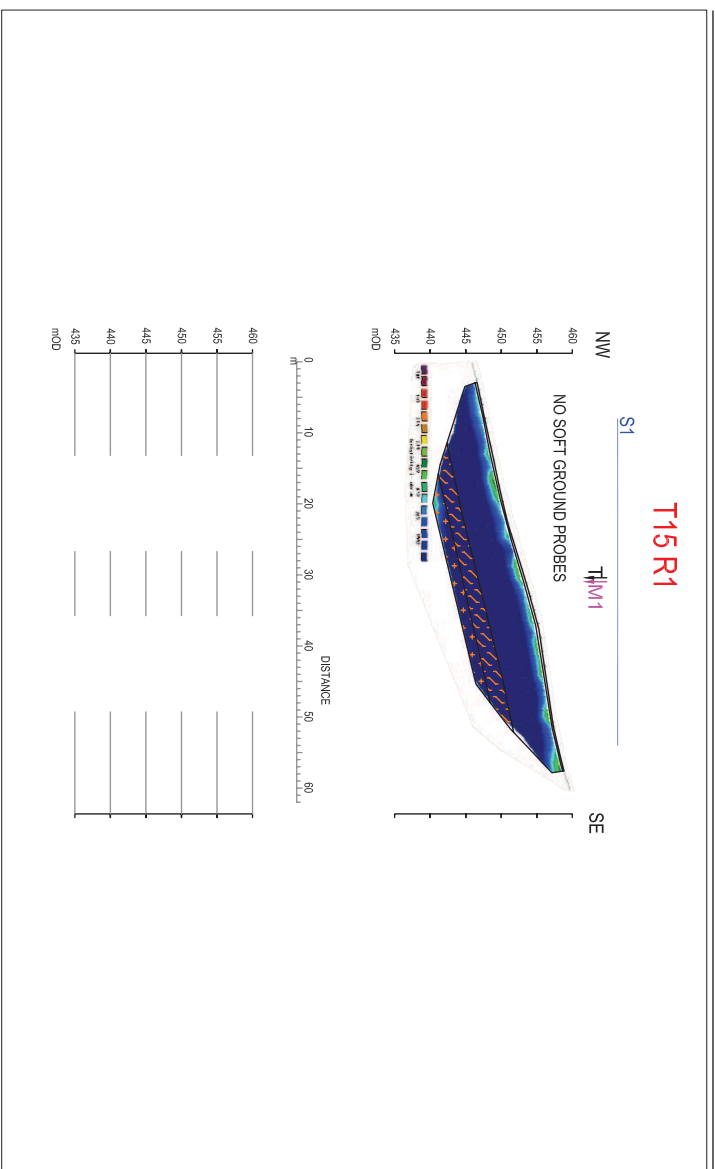
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 15

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

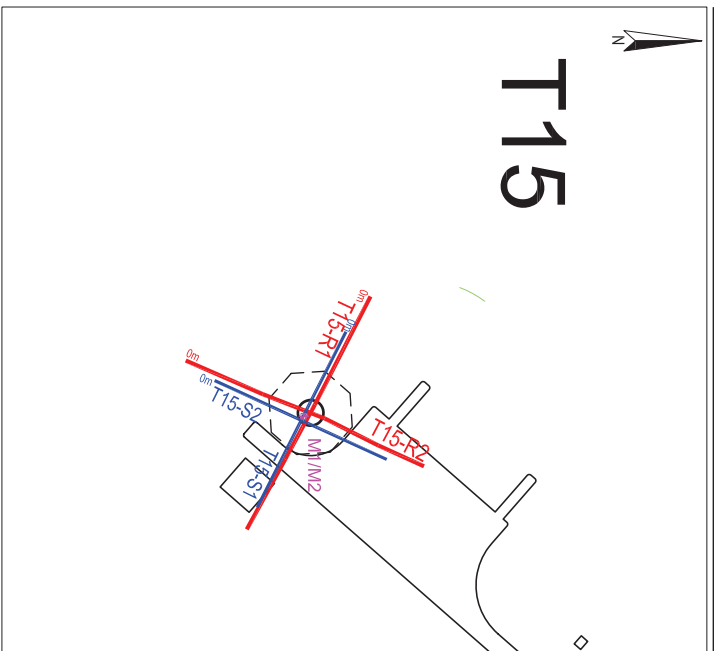
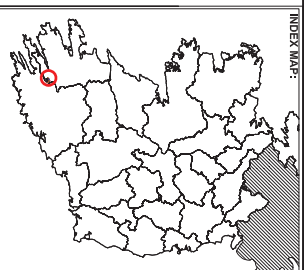
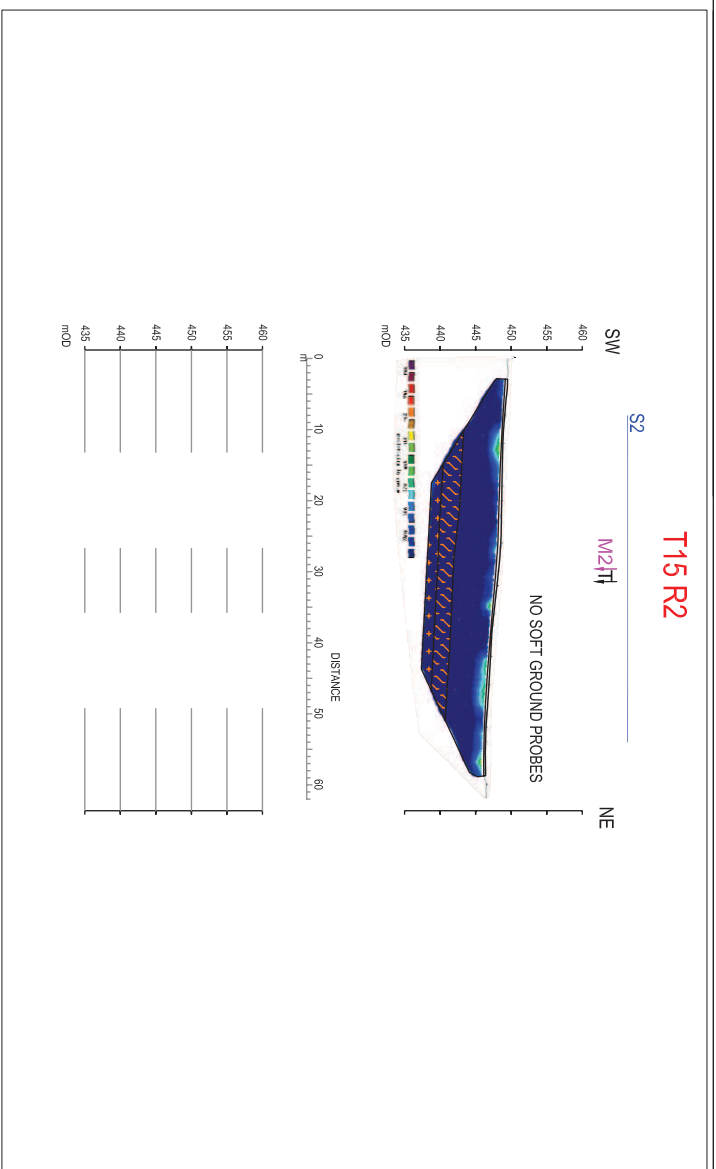


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- # 1D MASW PROFILE
- PEAT PEAT
- Sandy Gravelly CLAY Sandy Gravelly CLAY
- CLAY GRAVEL/GRAVEL Clay GRAVEL/GRAVEL
- High-Moderately Weathered SANDSTONE High-Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE Slightly Weathered-Fresh SHALE
- Pail Probe depth
- Possible Fault
- T Turbine Centre
- M1 1D MASW Profile



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PROJECT:		GROUSEMOUNT WIND FARM
DRAWING NO.:		AGL15080_T15_01 TURBINE 15
DATE:		08 JUNE 2015
CLIENT:		ISSUESB1
SCALE:		AS INDICATED @ A3
VERSION:	DATE	CREATED BY
1	08.08.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T15</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 2m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	509055
Northing	568536
Elevation (mOD)	452.8

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.2	673	-	228	1200	-	-	-	-	PEAT		Diggable
0.3	1.3	985	<i>74</i>	272	2000	0.46	10.94	0.03	0.14	Clayey GRAVEL/GRAVEL	VERY LOOSE	Diggable
1.3	2.4	1442	<i>132</i>	485	2000	0.46	34.79	0.10	0.92	Clayey GRAVEL/GRAVEL	VERY LOOSE to LOOSE	Diggable
2.4	3.5	1442	<i>326</i>	591	2000	0.28	212.06	0.54	14.63	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.5	4.8	1700	<i>344</i>	732	2000	0.36	236.54	0.64	19.28	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.8	6.4	1700	<i>406</i>	958	2000	0.39	329.79	0.92	34.68	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
6.4	8.6	1700	<i>535</i>	1292	2500	0.40	714.95	2.00	125.22	Highly-Moderately Weathered SANDSTONE	VERY POOR	Rippable
8.6	11.0	1700	<i>675</i>	1724	2500	0.41	1139.47	3.21	274.31	Highly-Moderately Weathered SANDSTONE	VERY POOR	Rippable
11.0	13.3	1700	<i>587</i>	2155	2700	0.46	929.18	2.71	207.63	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

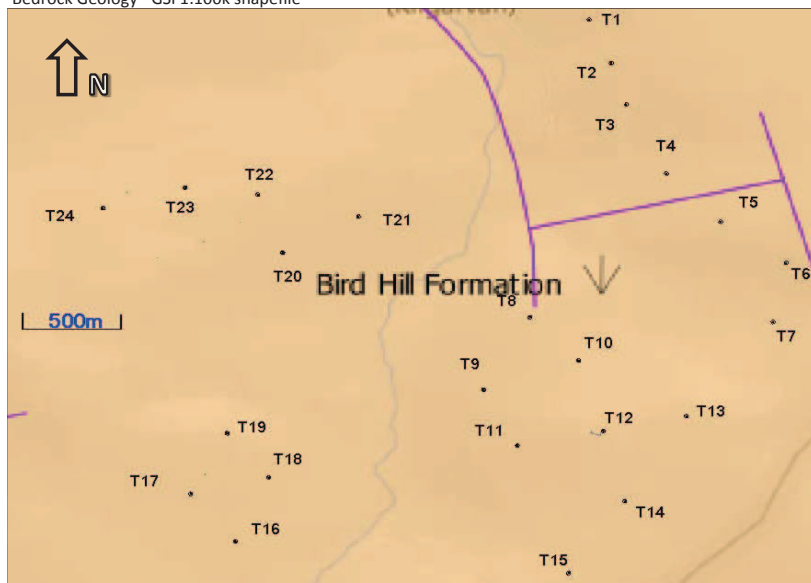
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T15**

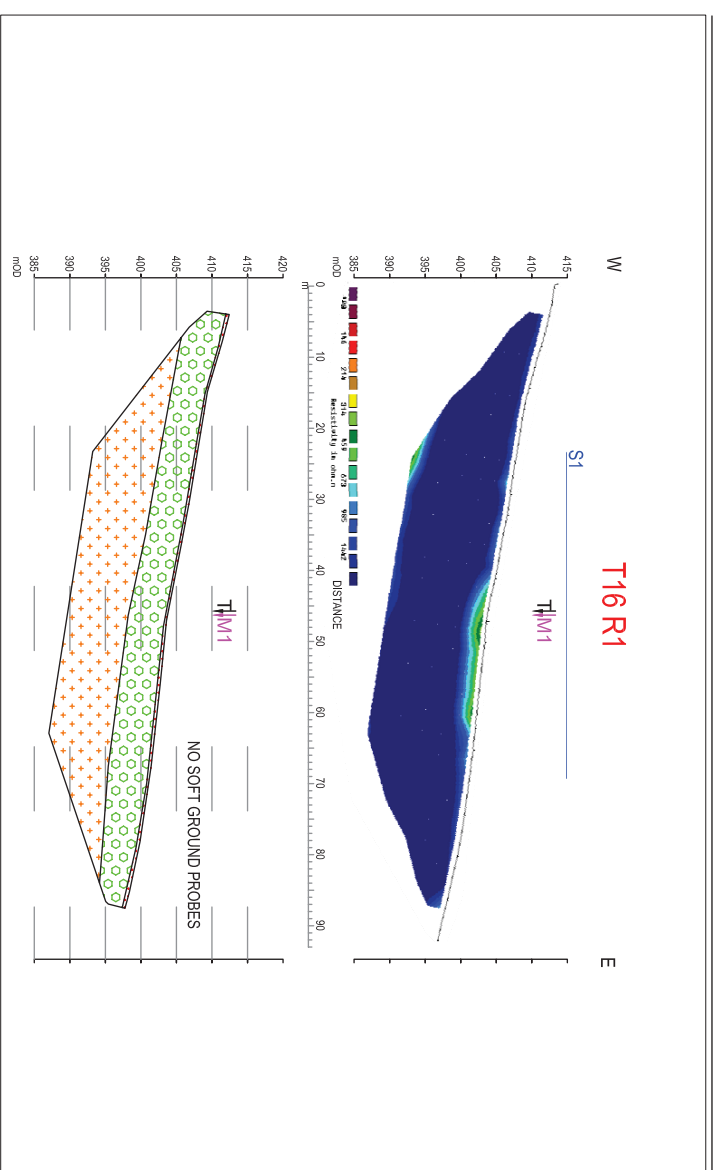
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 16

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

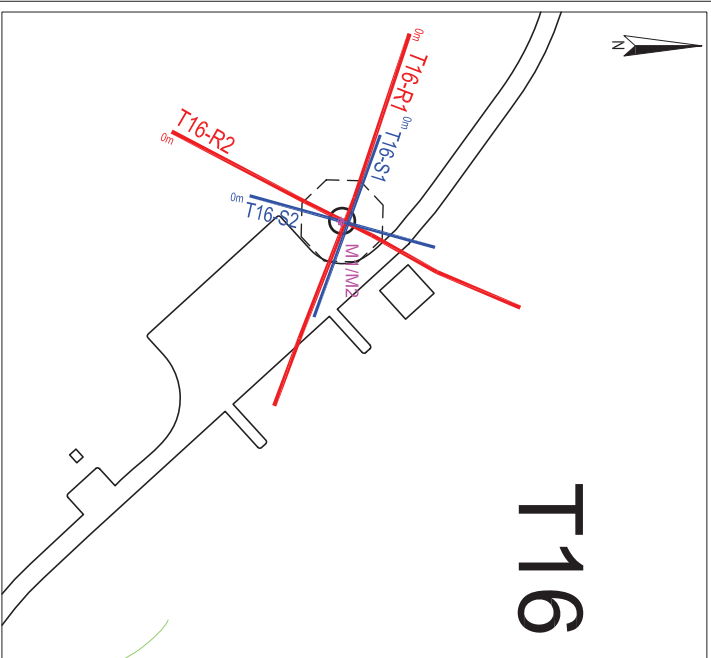
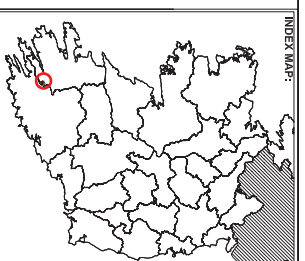
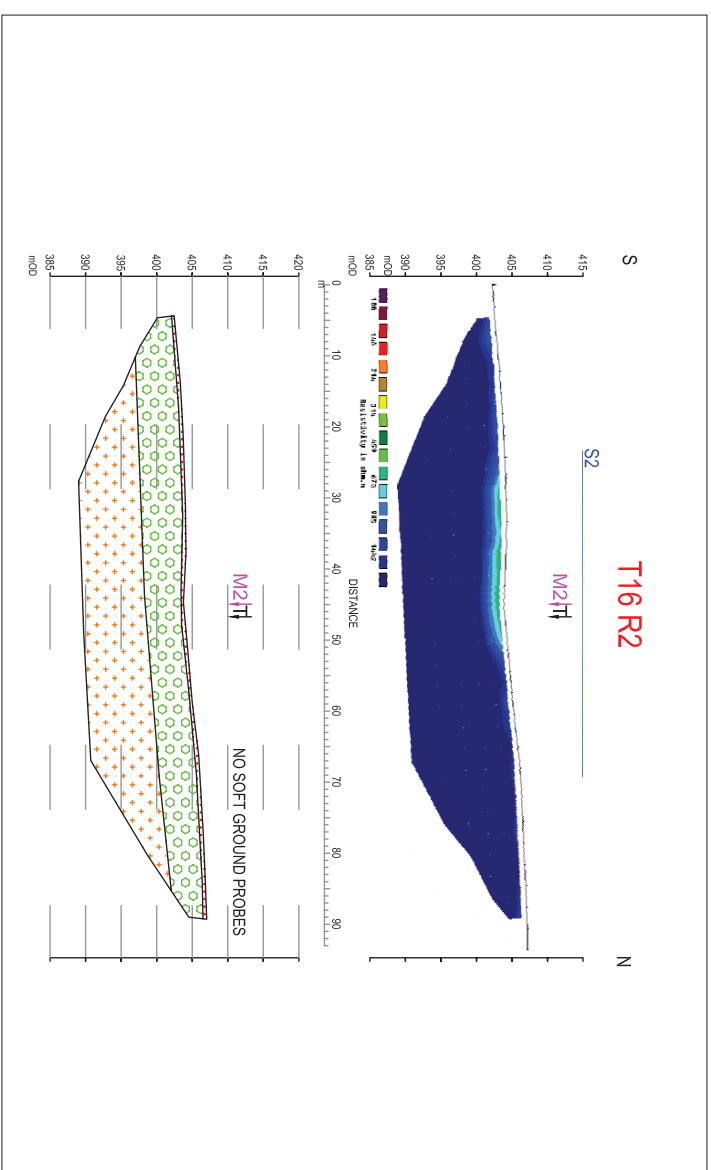


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 1D MASW PROFILE
- PEAT PEAT
- SANDY GNEISS CLAY SANDY GNEISS CLAY
- CLAYEY GRAVEL/GRAVEL CLAYEY GRAVEL/GRAVEL
- HIGHLY/MODERATELY WEATHERED SANDSTONE HIGHLY/MODERATELY WEATHERED SANDSTONE
- SLIGHTLY WEATHERED/FRESH SANDSTONE SLIGHTLY WEATHERED/FRESH SANDSTONE
- SLIGHTLY WEATHERED/FRESH SILTSTONE SLIGHTLY WEATHERED/FRESH SILTSTONE
- SLIGHTLY WEATHERED/FRESH SHALE SLIGHTLY WEATHERED/FRESH SHALE
- Peat Probe Depth
- Possible Fault
- + Turbine Centre
- + 1D MASW Profile



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PROJECT: GROUSEMOUNT WIND FARM

DRAWING NO:	AGL15980_T16_01 TURBINE 16
DATE:	08 JUNE 2015
CLIENT:	ISSUES/BI
SCALE:	AS INDICATED @ A3
VERSION:	1
DATE:	08.06.2015
BY:	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T16</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507371
Northing	568711
Elevation (mOD)	403.7

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.3	673	-	365	1200	-	-	-	-	PEAT		Diggable
0.3	1.3	985	147	539	2000	0.46	43.04	0.13	1.31	Clayey GRAVEL/GRAVEL	LOOSE	Diggable
1.3	2.1	1442	204	750	2000	0.46	83.30	0.24	3.88	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
2.1	2.9	1442	265	972	2000	0.46	140.04	0.41	9.15	Clayey GRAVEL/GRAVEL	DENSE	Diggable
2.9	3.8	1700	314	1153	2000	0.46	196.89	0.57	16.05	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.8	4.7	1700	374	1373	2000	0.46	279.17	0.82	28.55	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.7	5.5	1700	458	1681	2000	0.46	418.79	1.22	55.75	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.7	7.2	1700	627	2303	2700	0.46	1061.11	3.10	258.49	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.5	9.1	1700	907	3332	2700	0.46	2220.61	6.48	874.21	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

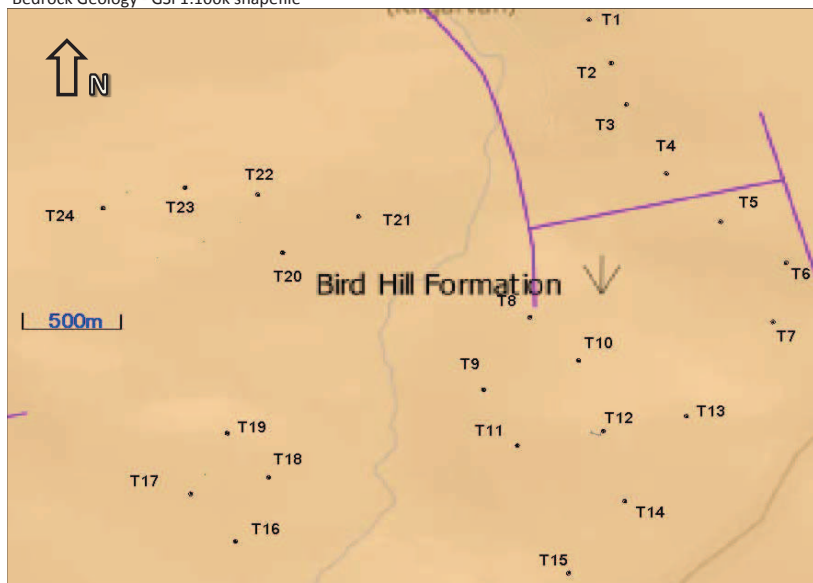
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T16**

Discussion	

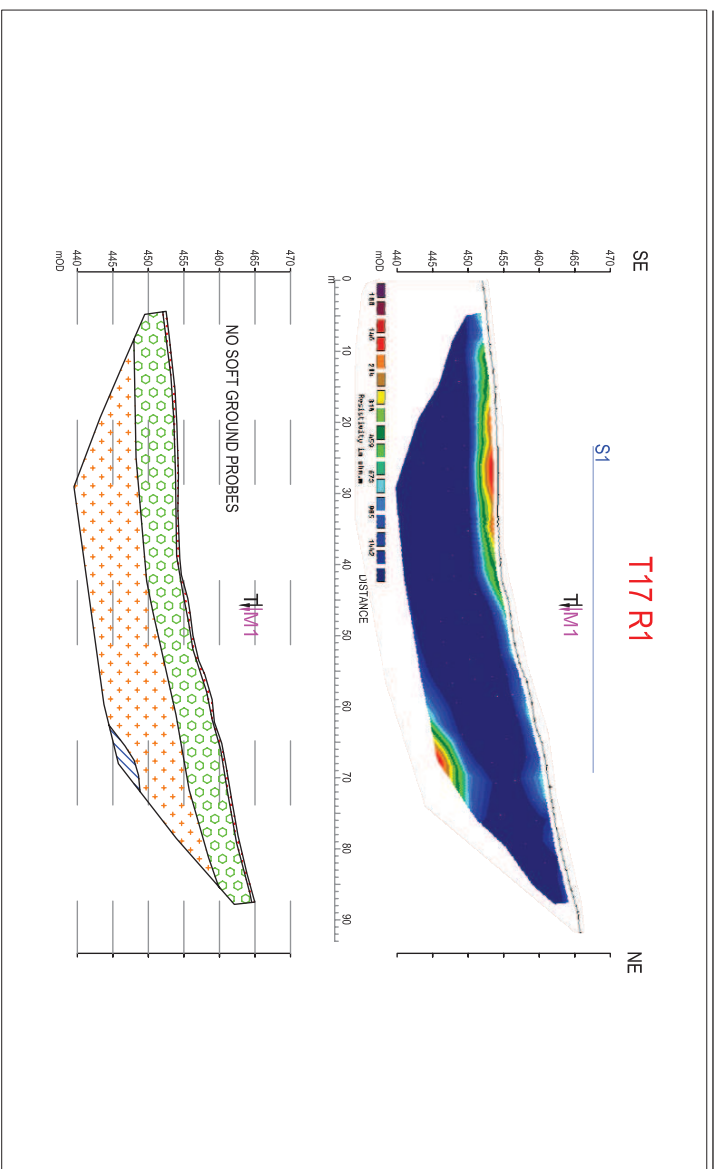
Recommendations	



FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 17

FIGURE 2: TURBINE MAP: Scale 1:2000@A3

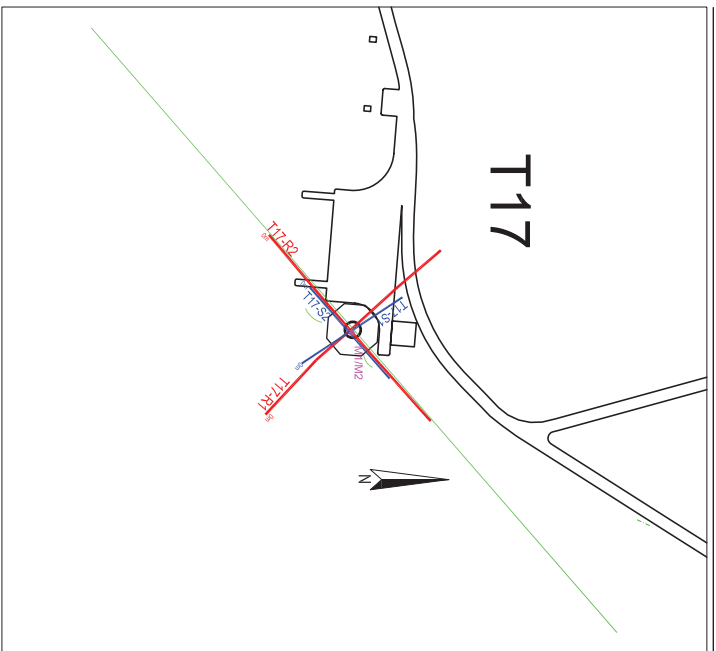
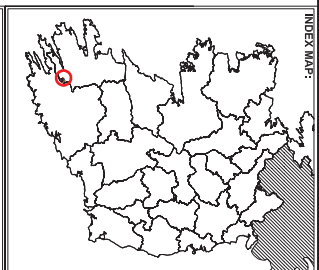
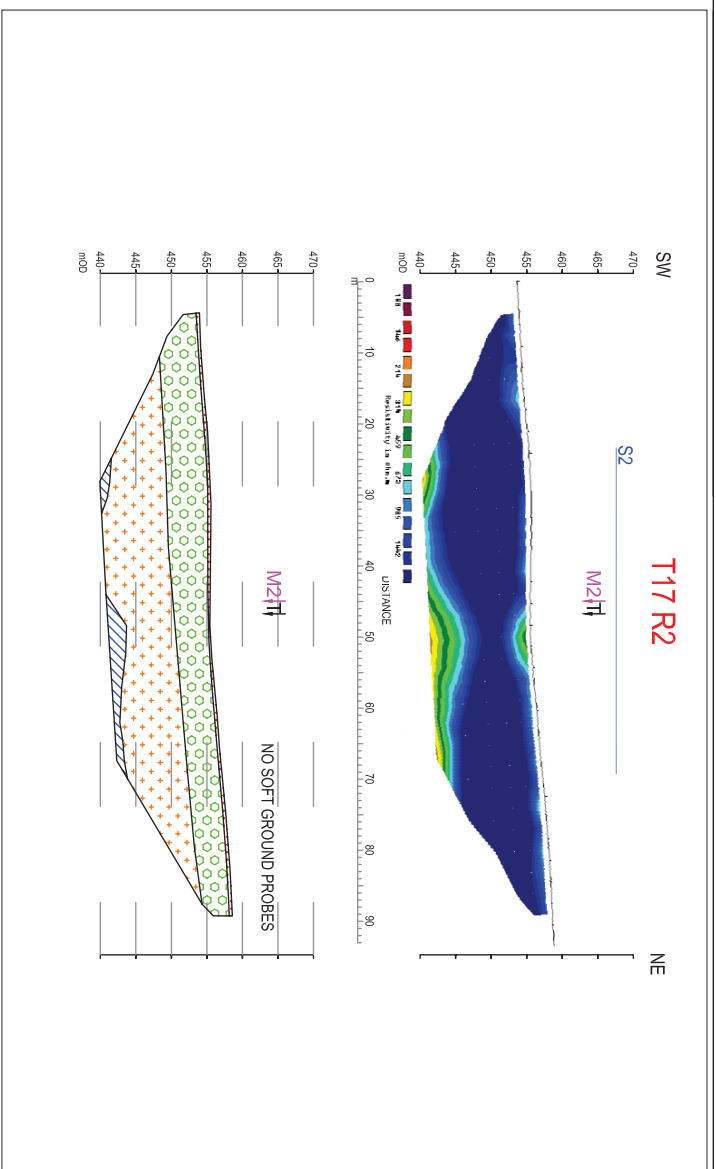


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Highly-Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Fault Profile Depth
- Possible Fault
- Turbine Centre
- 1D MASW Profile



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 www.apexgeoservices.co.uk

PROJECT: GROUSEMOUNT WIND FARM

DRAWING NO:	AGL15980_T17_01 TURBINE 17		
DATE:	08 JUNE 2015		
CHECKED:	ISSUES/BI		
SCALE:	AS INDICATED @ A3		
VERSION:	DATE	CREATED BY	CHANGED BY
1	08.08.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T17</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507145
Northing	568973
Elevation (mOD)	455.2

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.2	673	-	317	1200	-	-	-	-	PEAT		Diggable
0.2	2.0	985	99	363	2000	0.46	19.52	0.06	0.35	Clayey GRAVEL/GRAVEL	VERY LOOSE	Diggable
2.0	2.9	1442	217	674	2000	0.44	94.26	0.27	4.66	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
2.9	3.9	1442	218	985	2000	0.47	95.42	0.28	4.93	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
3.9	5.2	1700	332	1330	2000	0.47	220.64	0.65	19.51	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
5.2	6.9	1700	485	1855	2700	0.46	635.58	1.86	111.38	Slightly Weathered -Fresh SANDSTONE	VERY POOR	Break / Blast
6.9	8.9	1700	604	2568	2700	0.47	983.84	2.89	230.95	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
8.9	11.1	1700	916	3230	2700	0.46	2265.79	6.60	899.95	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

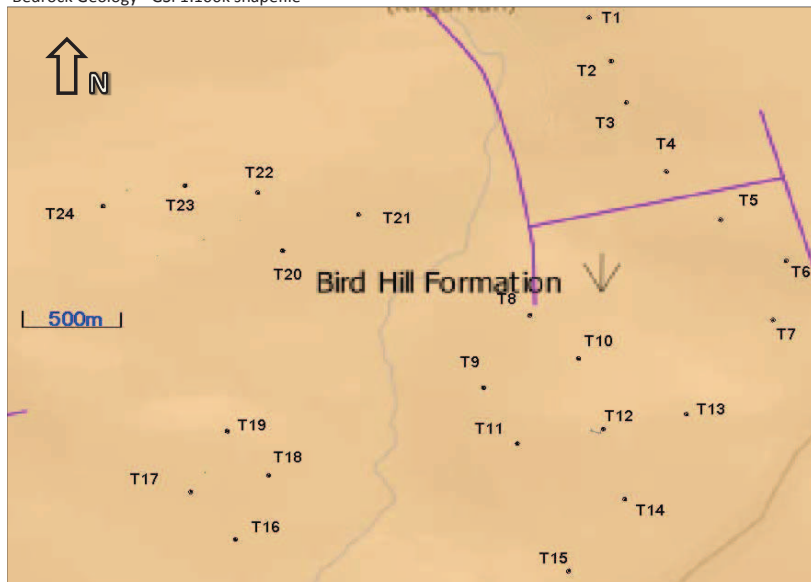
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T17**

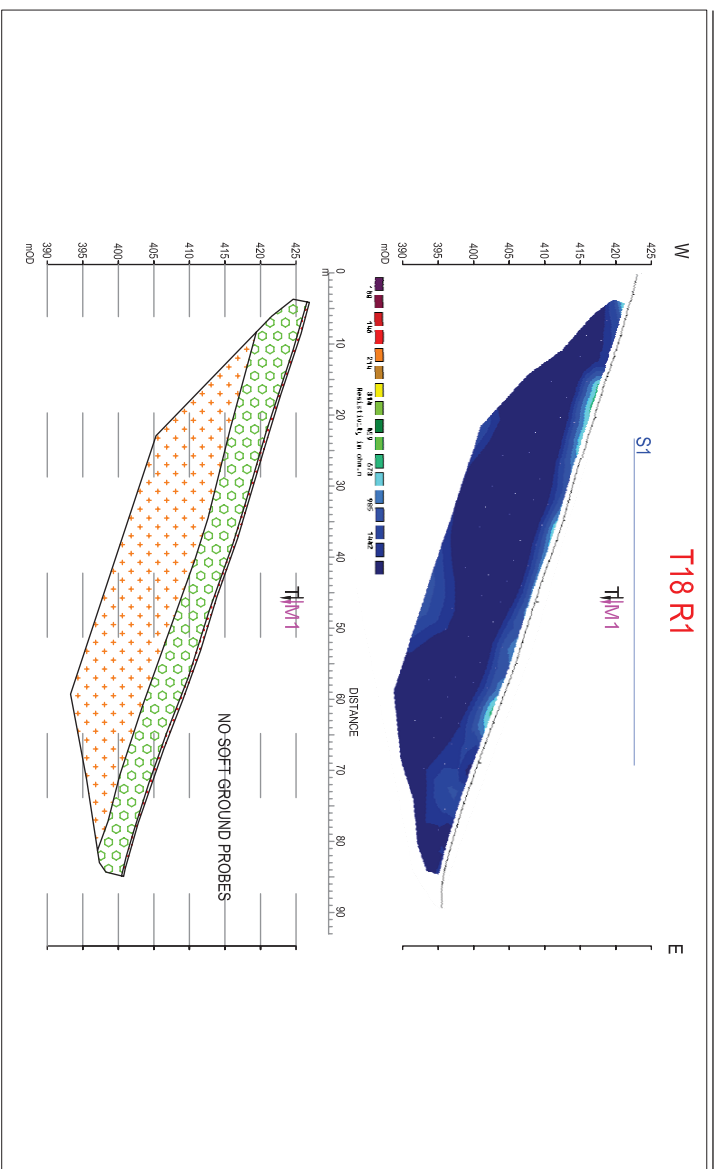
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 18

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

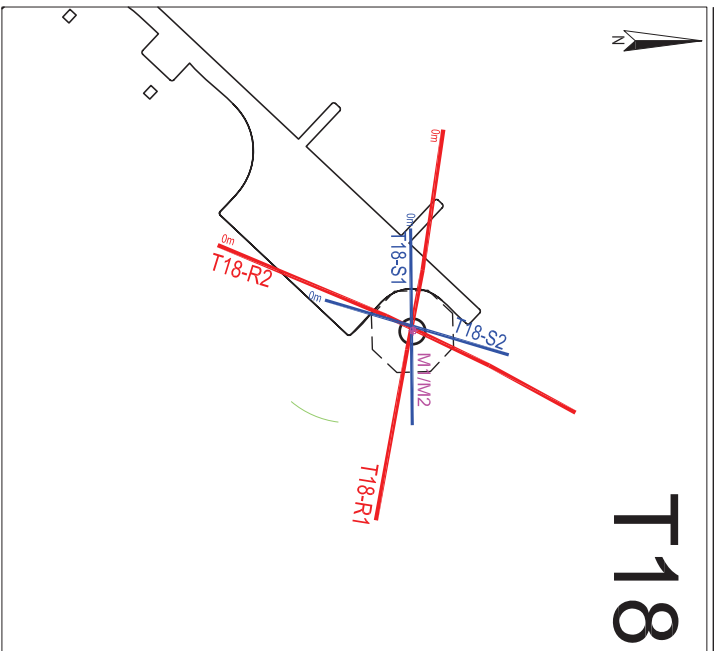
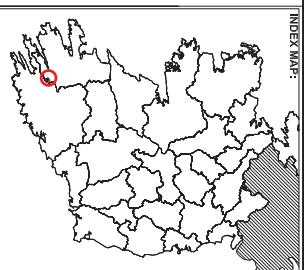
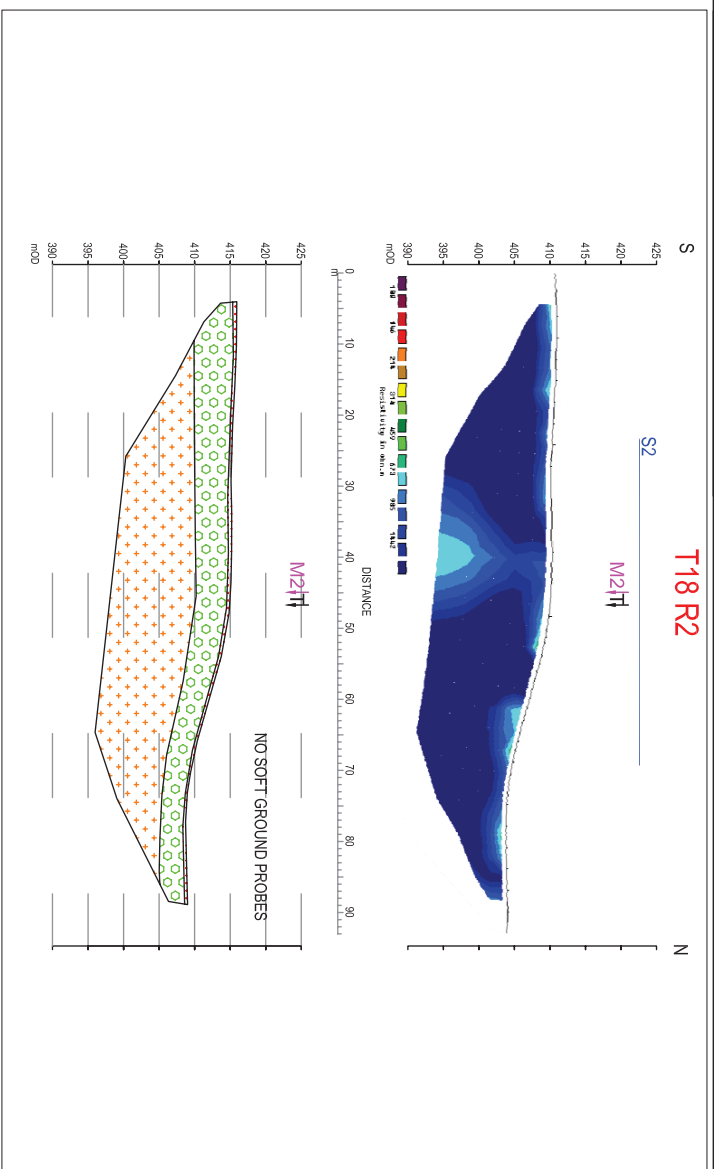


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC RETRACTION PROFILE
- + 1D MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Highly/Medium/Lowly Weathered SANDSTONE
- Slightly Weathered/Fresh SANDSTONE
- Slightly Weathered/Fresh SILTSTONE
- Slightly Weathered/Fresh SHALE
- Peat Probe Depth
- Possible Fault
- + Turbine Centre
- + 1D MASW Profile



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 www.apexgeoservices.co.uk

PROJECT:		GROUSEMOUNT WIND FARM
DRAWING No.:		AGL15980_T18_01 TURBINE 18
DATE:		08 JUNE 2015
CLIENT:		ISSUES/1
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	08.06.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T18</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507539
Northing	569063
Elevation (mOD)	408.8

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.2	673	-	211	1200	-	-	-	-	PEAT		Diggable
0.2	1.6	985	90	331	2000	0.46	16.26	0.05	0.26	Clayey GRAVEL/GRAVEL	VERY LOOSE	Diggable
1.6	2.6	1442	246	953	2000	0.46	120.93	0.35	7.21	Clayey GRAVEL/GRAVEL	MEDIUM DENSE to DENSE	Diggable
2.6	3.6	1442	267	1550	2000	0.48	142.72	0.42	9.70	Clayey GRAVEL/GRAVEL	DENSE	Diggable
3.6	4.8	1700	362	2072	2000	0.48	261.87	0.78	26.40	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.8	6.3	1700	477	2883	2700	0.49	614.81	1.83	108.14	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
6.3	8.2	1700	599	3443	2700	0.48	969.54	2.88	228.90	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
8.2	10.1	1700	946	3500	2700	0.46	2416.54	7.06	1005.77	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

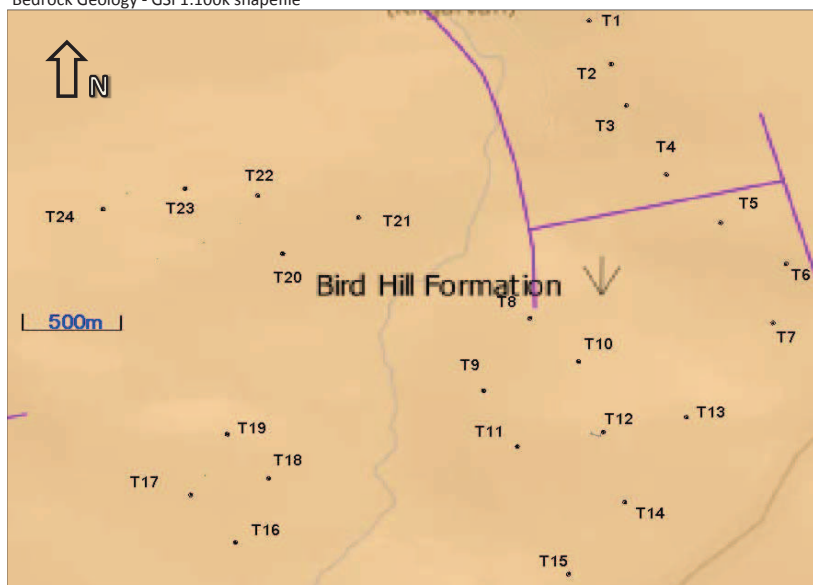
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T18**

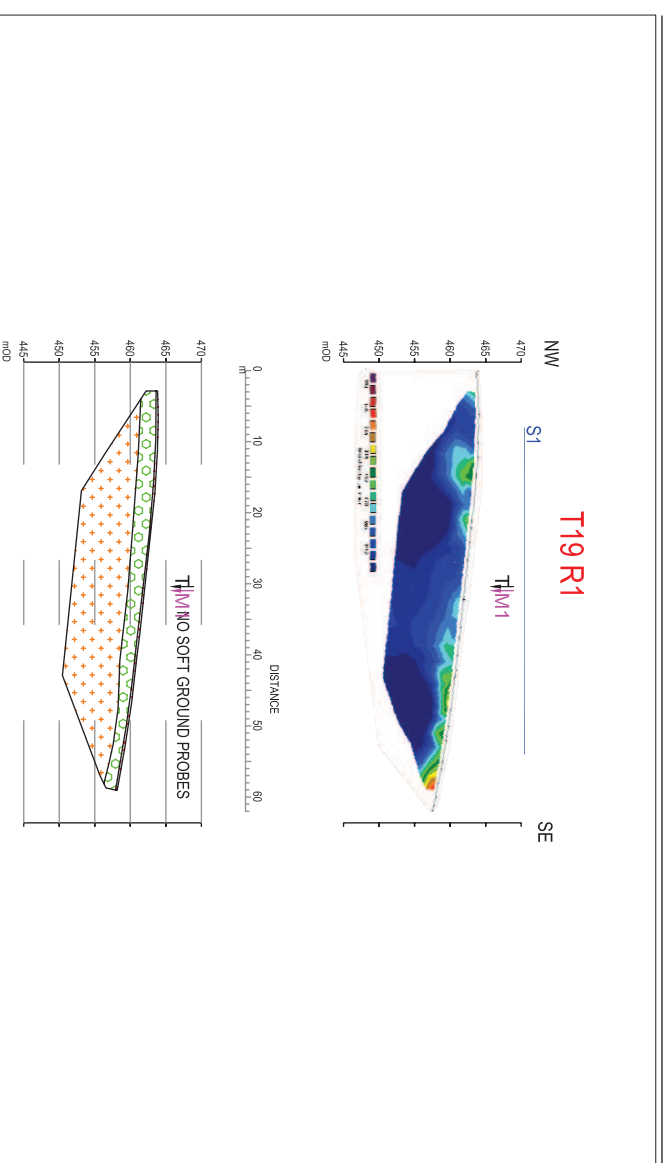
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 19

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

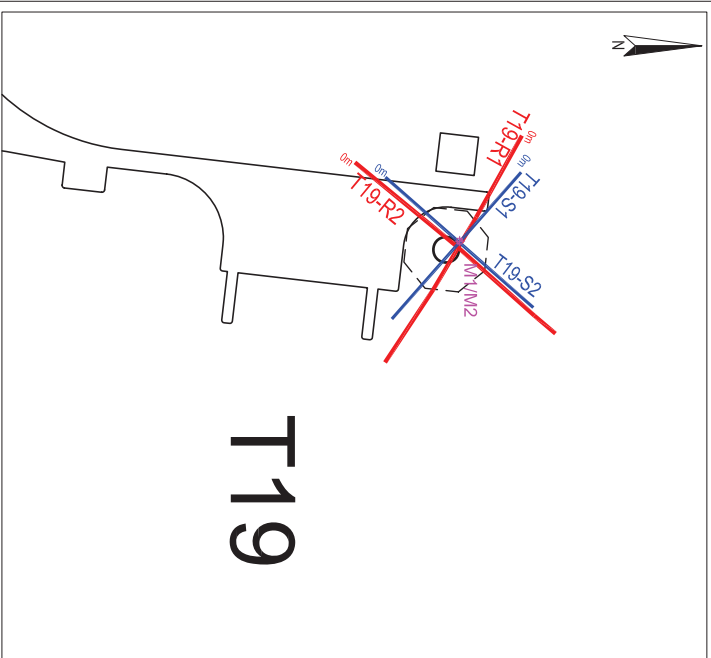
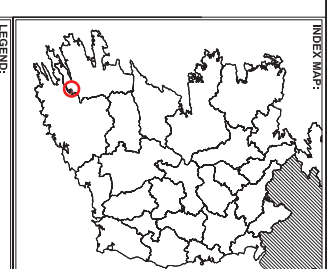
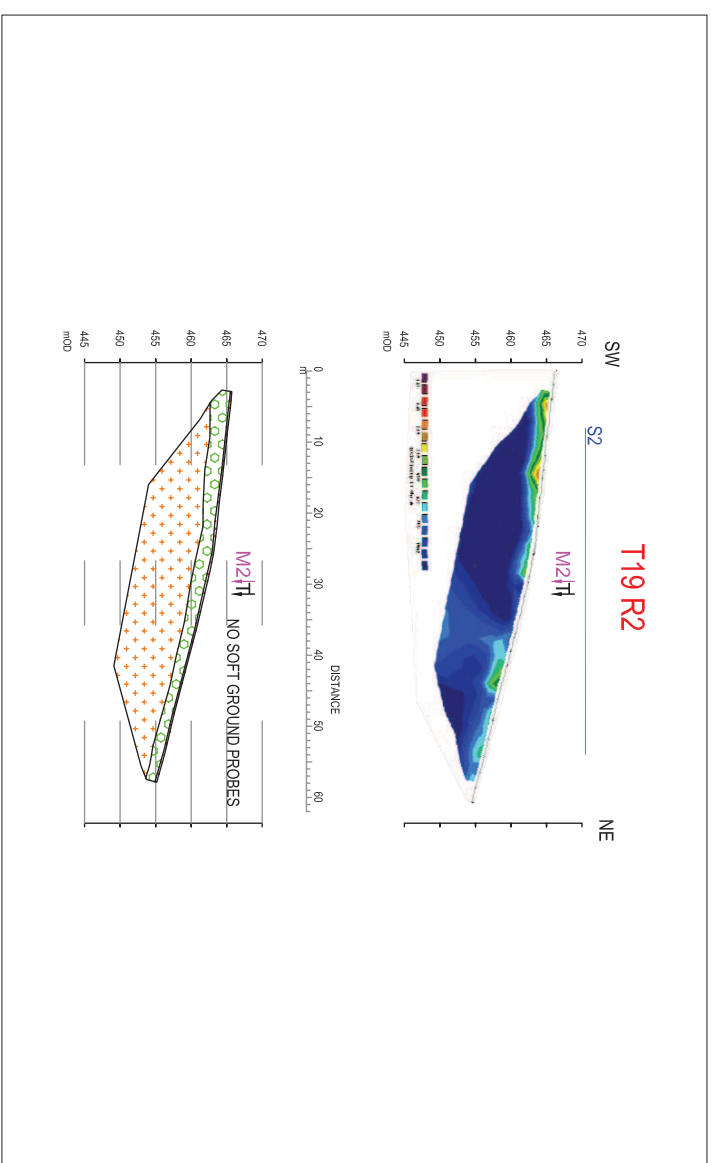


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASIV PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAUEL
- Highly/Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MASIV Profile



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PROJECT:		GROUSEMOUNT WIND FARM
DRAWING NO.:		AG15980_T19_01 TURBINE 19
DATE:		08 JUNE 2015
CLIENT:		ISSUES/1
SCALE:		AS INDICATED @ A3
VERSION:	DATE	CREATED BY
1	08.08.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T19</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 2m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507329
Northing	569308
Elevation (mOD)	461.5

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.3	673	-	578	1200	-	-	-	-	PEAT		Diggable
0.3	1.4	985	361	1327	2000	0.46	260.79	0.76	25.52	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
1.4	2.3	1442	522	1916	2000	0.46	543.93	1.59	85.82	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.3	3.2	1442	755	2772	2700	0.46	1537.21	4.49	476.48	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.2	4.1	1700	849	3117	2700	0.46	1944.15	5.68	702.00	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.1	5.0	1700	882	3241	2700	0.46	2101.45	6.14	798.16	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
5.0	7.8	1700	1058	3889	2700	0.46	3024.86	8.83	1455.79	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.8	9.6	1700	1143	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

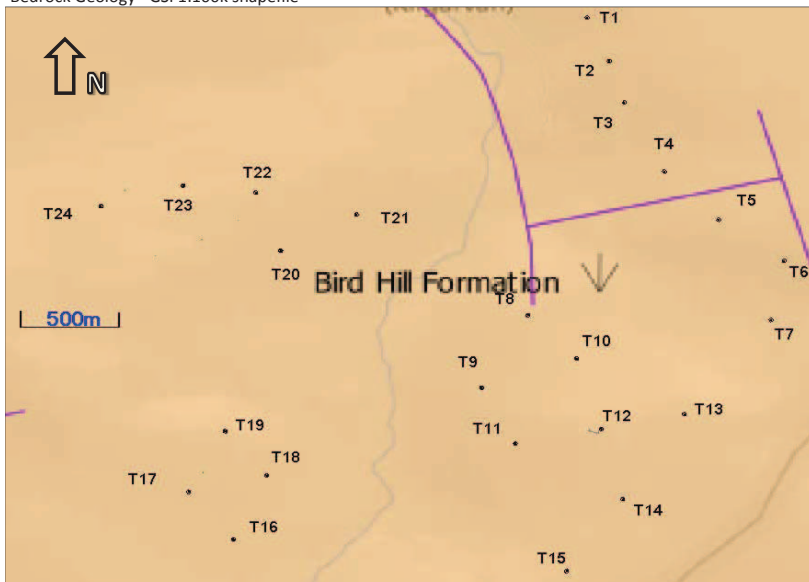
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T19**

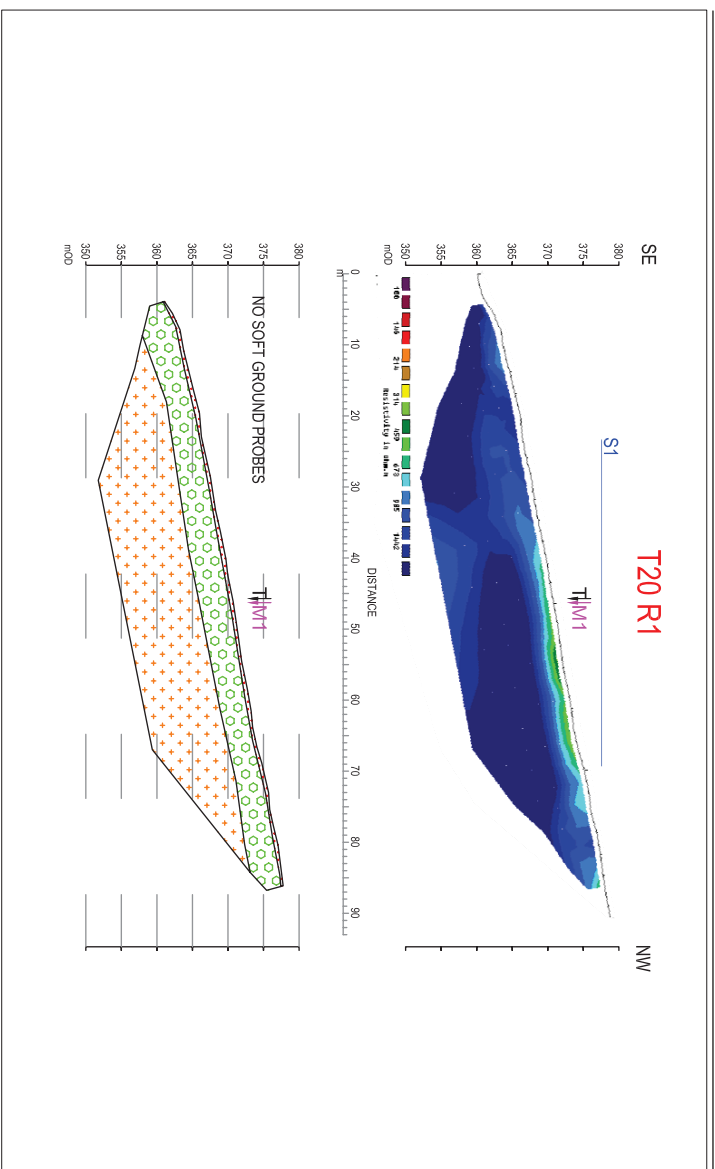
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 20

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

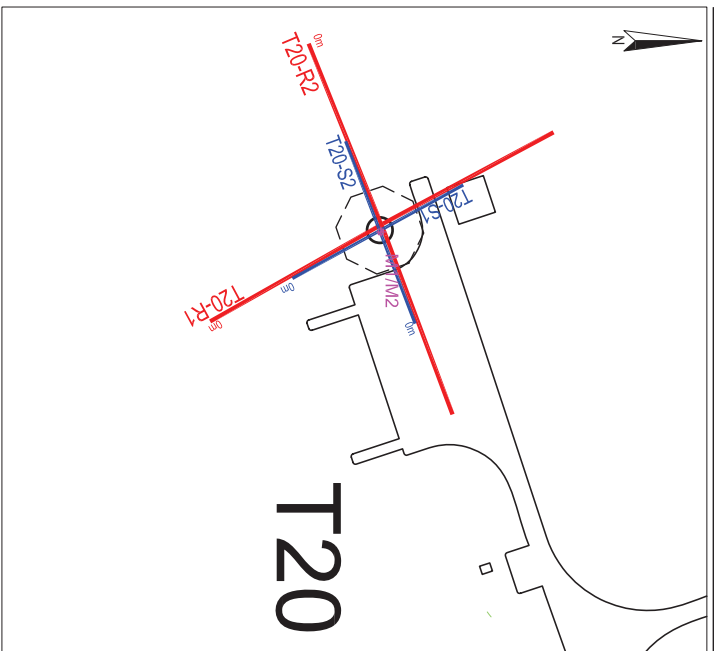
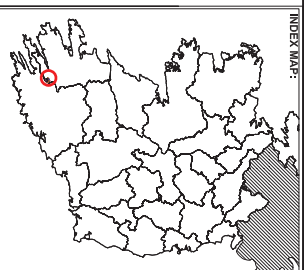
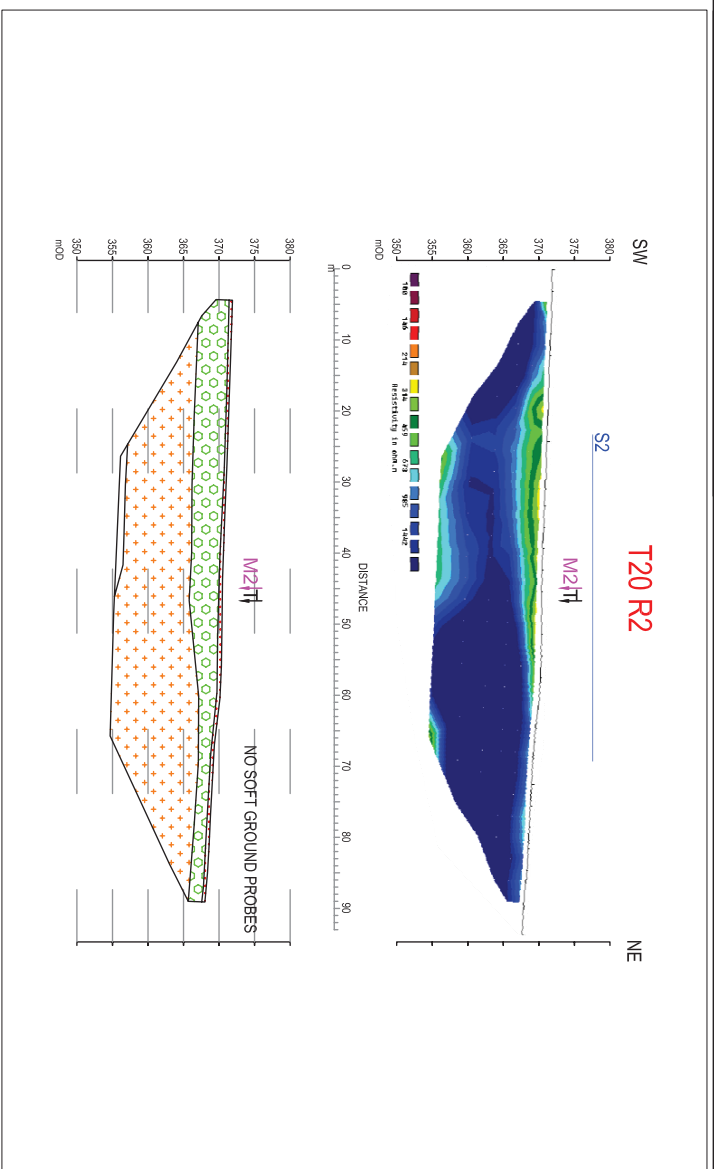


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MWSW PROFILE

- FEINT
- Silty Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Highly/Modestly Weathered SANDSTONE
- Slightly Weathered/Fresh SANDSTONE
- Slightly Weathered/Fresh SILTSTONE
- Slightly Weathered/Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 1D MWSW Profile



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PROJECT:		GROUSEMOUNT WIND FARM
DRAWING No.:		AG15980_T20_01 TURBINE 20
DATE:		08 JUNE 2015
CLIENT:		ISSUES/81
SCALE:		AS INDICATED @ A3
VERSION:	DATE:	CREATED:
1	08.08.2015	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T20</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507610
Northing	570305
Elevation (mOD)	369.8

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.3	673	-	419	1200	-	-	-	-	PEAT		Diggable
0.3	1.3	985	196	531	2000	0.42	76.89	0.22	3.25	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
1.3	2.5	1442	234	673	2000	0.43	109.83	0.31	5.93	Clayey GRAVEL/GRAVEL	MEDIUM DENSE	Diggable
2.5	3.5	1442	319	765	2000	0.39	203.76	0.57	15.74	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.5	4.8	1700	435	871	2000	0.33	378.14	1.01	40.58	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.8	6.4	1700	533	1218	2000	0.38	567.18	1.57	83.99	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
6.4	8.5	1700	628	1836	2700	0.43	1065.66	3.06	252.64	Slightly Weathered -Fresh SANDSTONE	VERY POOR	Break / Blast
8.5	11.0	1700	<i>703</i>	2582	2700	0.46	1334.19	3.90	377.18	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

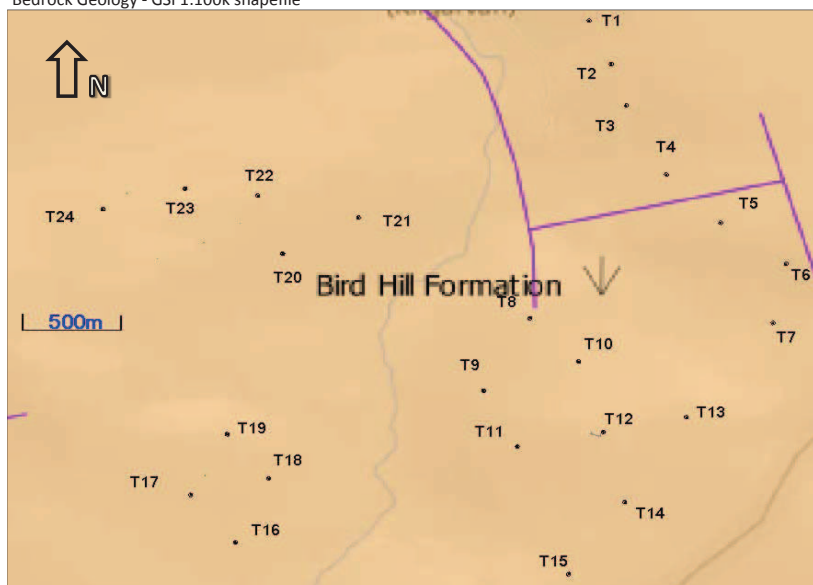
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T20**

Discussion

Recommendations



FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3

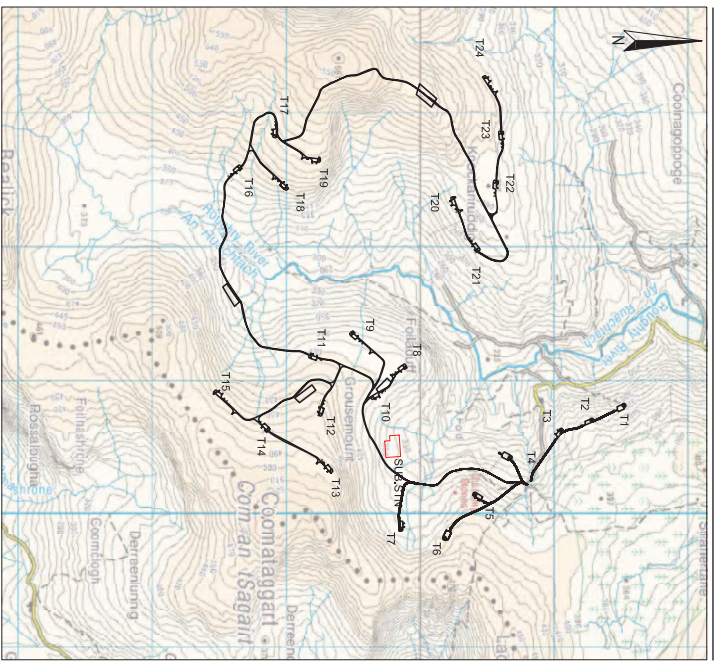
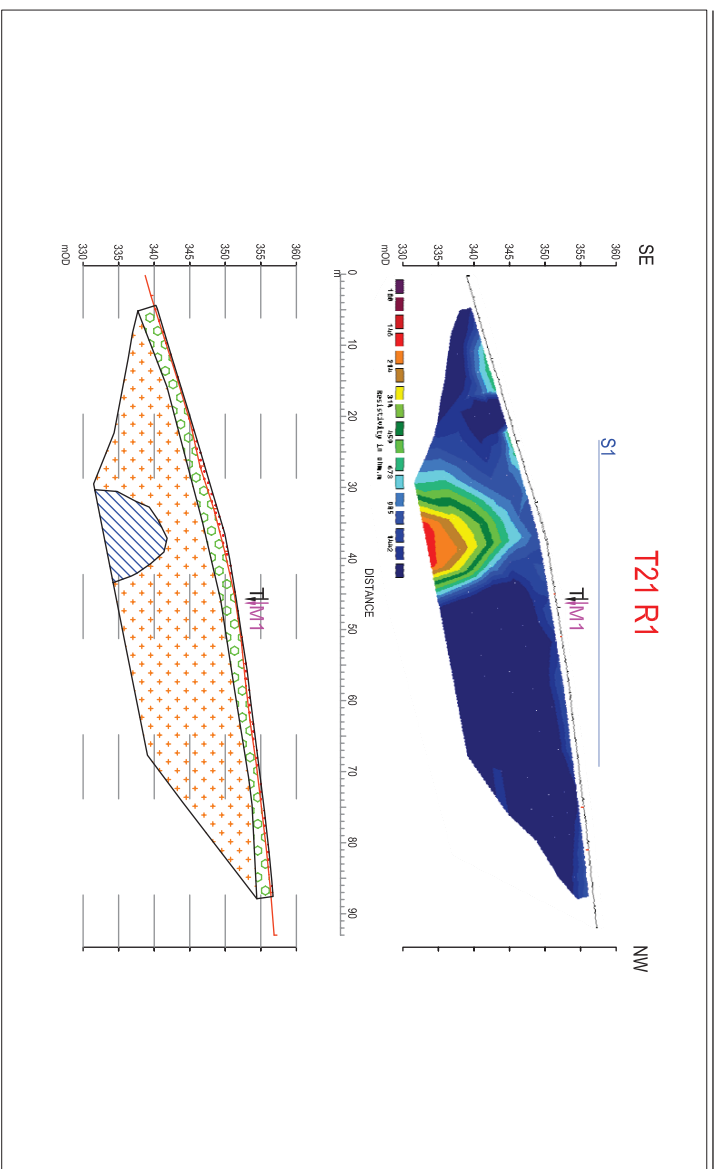


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 21

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

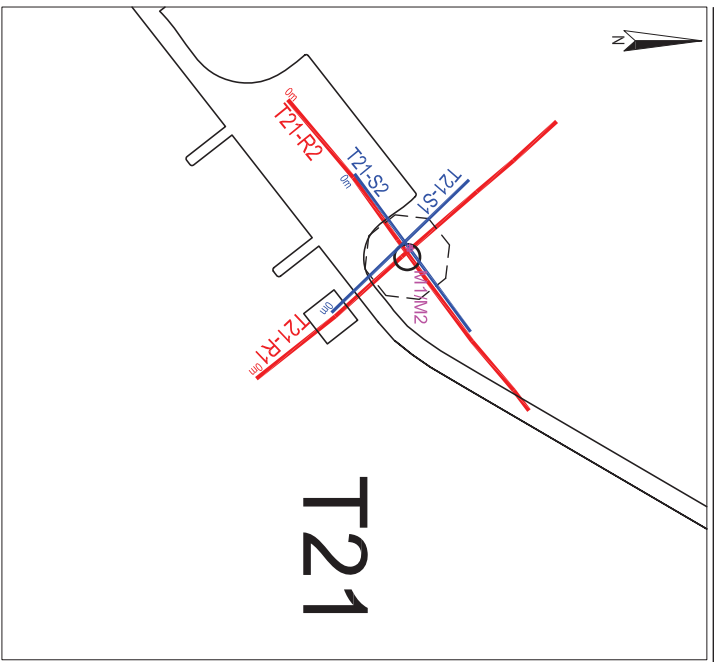
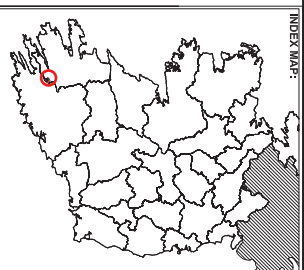
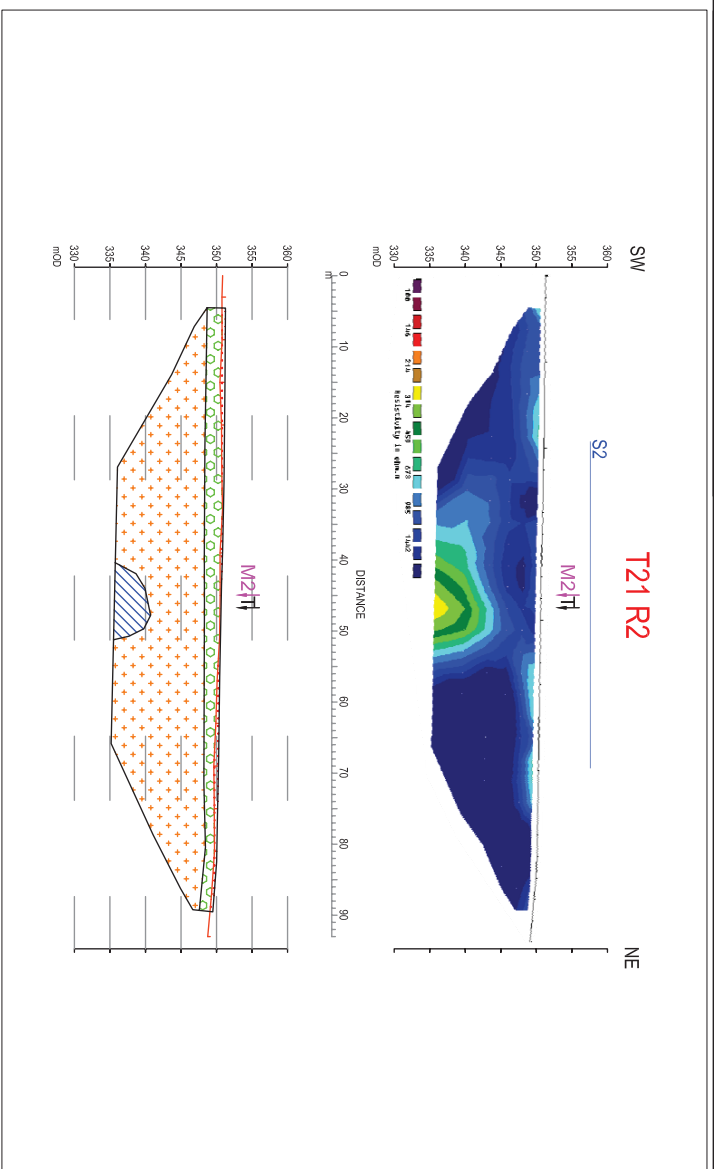


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- + 10 MASW PROFILE
- PEAT
- Sandy Gravelly CLAY
- Clayey GRAVEL/GRAVEL
- Highly-Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SLTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- + Turbine Centre
- + 10 MASW Profile



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PROJECT: GROUSEMOUNT WIND FARM

DRAWING No:	AG15980_T21_01 TURBINE 21
DATE:	08 JUNE 2015
CLIENT:	ISSUESB1
SCALE:	AS INDICATED @ A3
VERSION:	1
DATE:	08.08.2015
BY:	SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T21</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507993
Northing	570504
Elevation (mOD)	350.6

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.1	314	-	523	1200	-	-	-	-	PEAT		Diggable
0.1	0.9	673	257	946	2000	0.46	132.51	0.39	8.35	Clayey GRAVEL/GRAVEL	DENSE	Diggable
0.9	1.5	985	270	1327	2000	0.48	145.97	0.43	10.00	Clayey GRAVEL/GRAVEL	DENSE	Diggable
1.5	2.2	1442	337	1933	2000	0.48	226.90	0.67	20.84	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.2	3.2	1442	464	2502	2700	0.48	580.28	1.72	97.90	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.2	4.4	1442	544	3165	2700	0.48	799.66	2.37	166.64	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.4	7.8	985	723	3675	2700	0.48	1411.92	4.18	423.46	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
7.8	10.0	985	916	3799	2700	0.47	2266.69	6.66	913.69	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

*S wave values in italics have been calculated from the P wave results, assuming a Poissons Ratio of 0.46*

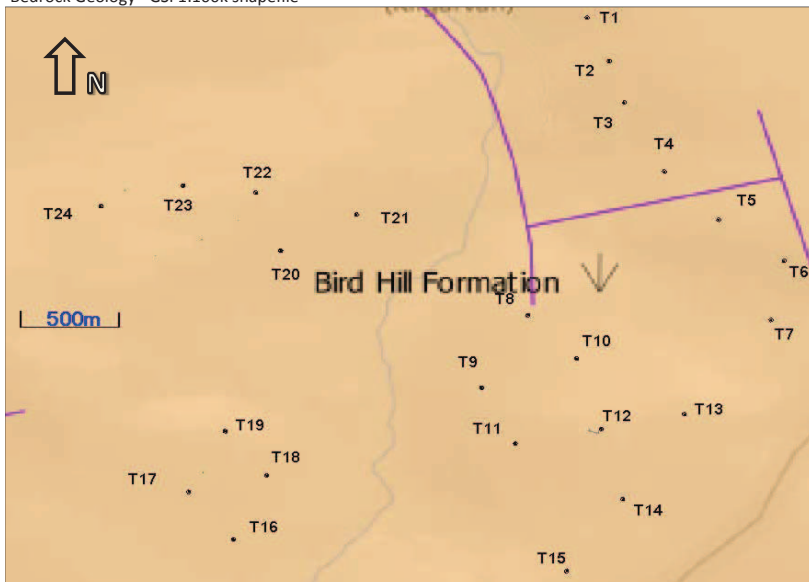
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T21**

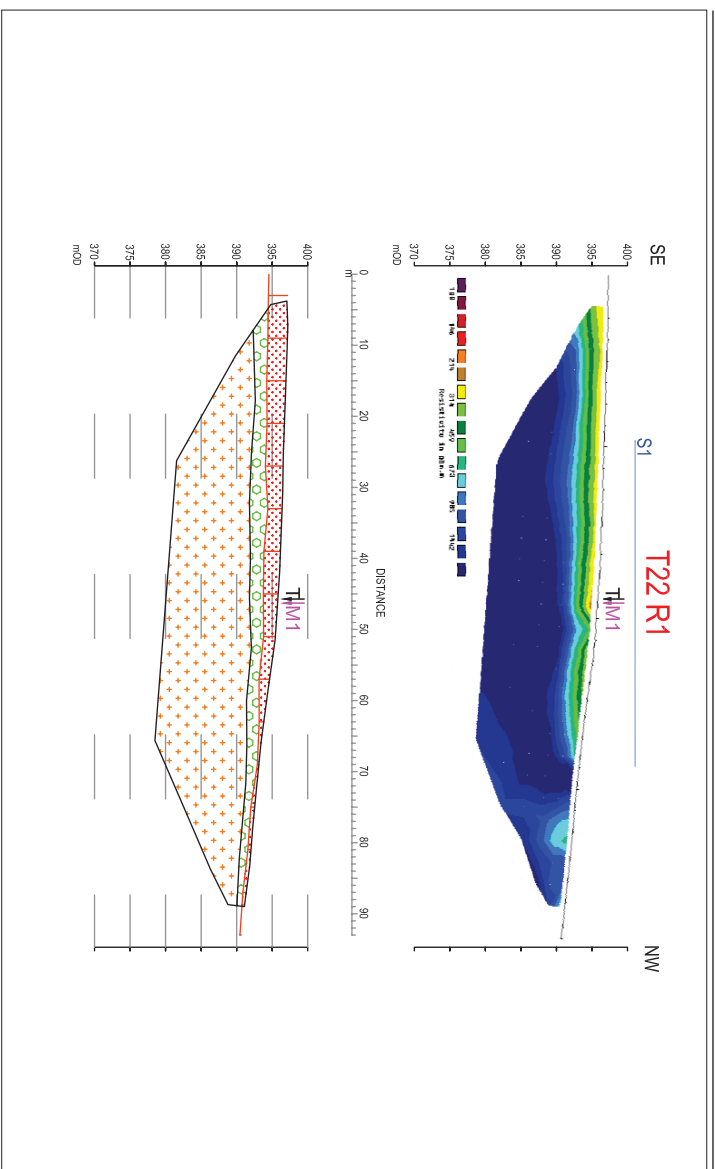
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 22

INDEX MAP:

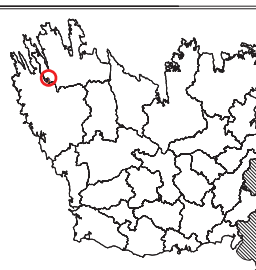


FIGURE 2: TURBINE MAP: Scale 1:2000@A3

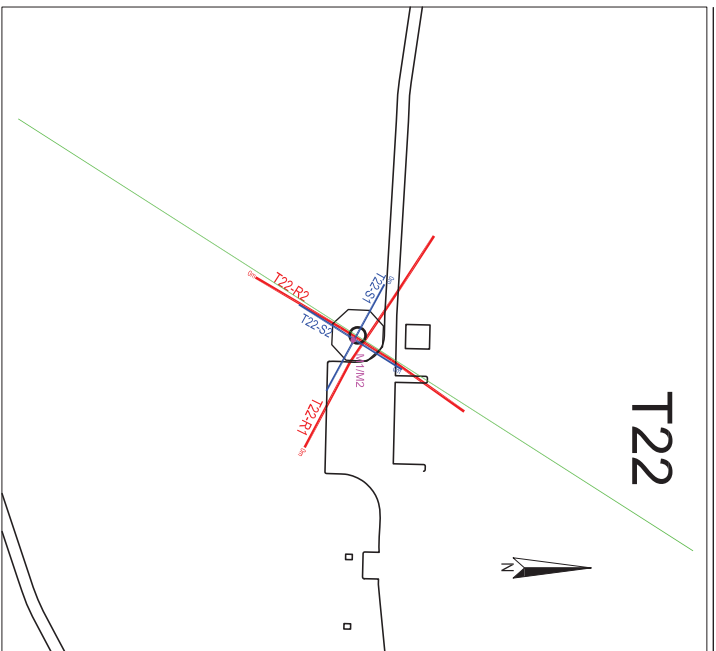
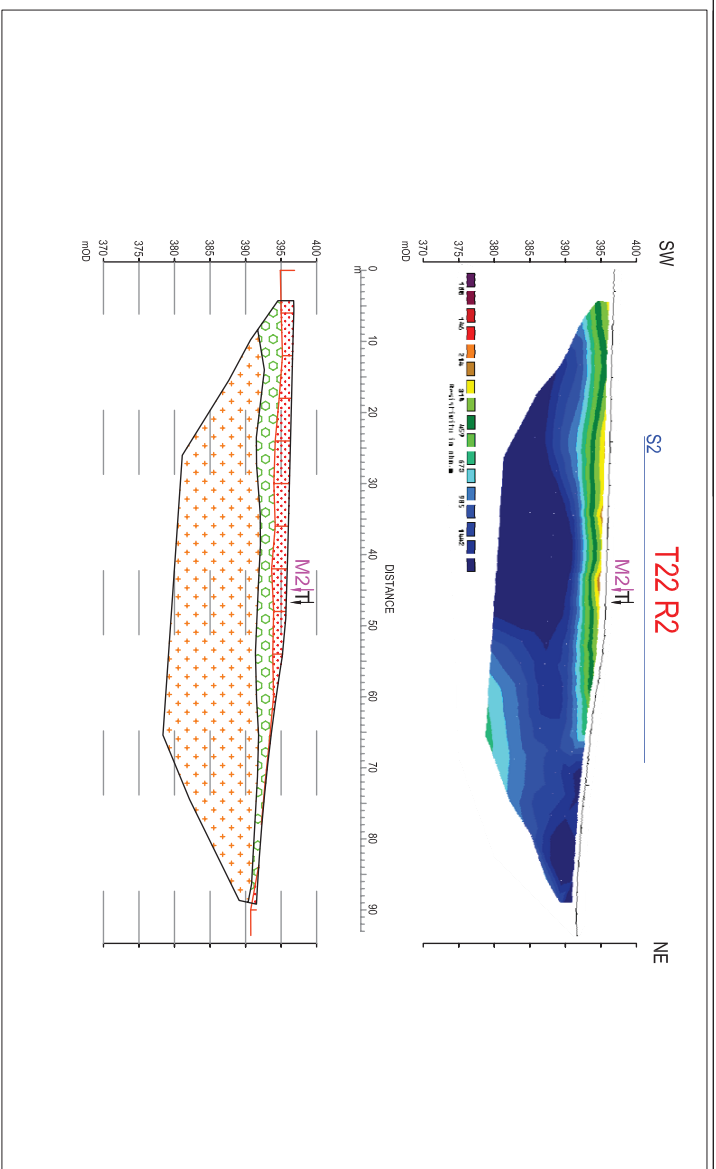


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



**apex** geoservices

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PROJECT: GROUSEMOUNT WIND FARM

DRAWING No: AGL15080\_T22\_01 TURBINE 22  
DATE: 08 JUNE 2015  
CLIENT: ISSUES81

SCALE: AS INDICATED @ A3

VERSION	DATE	CREATED BY	CHANGED BY
1	08.08.2015	SOR	

Site	Grousemount Wind Farm
Turbine Base	<b>T22</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507484
Northing	570624
Elevation (mOD)	396.0

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	2.0	314	-	590	1200	-	-	-	-	PEAT		Diggable
2.0	3.1	459	390	1432	2000	0.46	303.89	0.89	32.84	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
3.1	4.0	673	422	1551	2000	0.46	356.42	1.04	42.72	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
4.0	4.8	985	549	2016	2700	0.46	812.74	2.37	166.48	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
4.8	5.7	1442	636	2335	2700	0.46	1090.62	3.18	270.46	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
5.7	7.5	1442	981	3602	2700	0.46	2595.77	7.58	1131.03	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
7.5	9.4	1442	1141	4193	2700	0.46	3516.41	10.27	1866.38	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

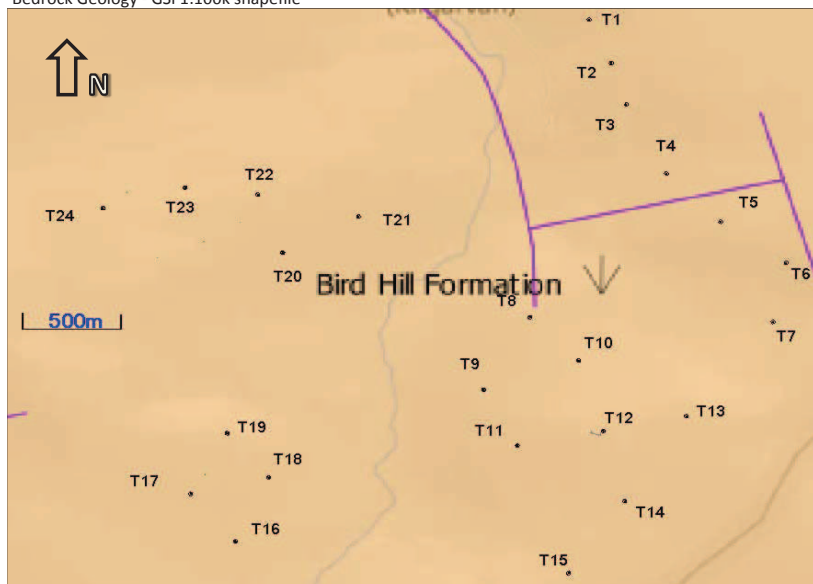
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T22**

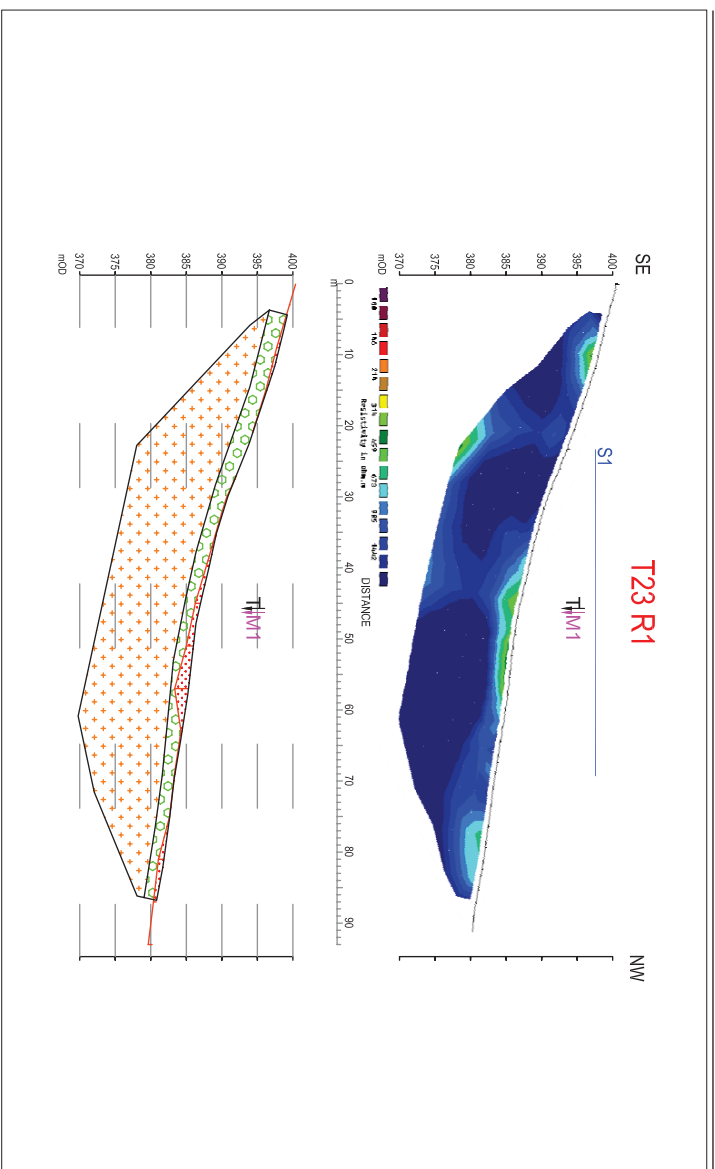
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3



FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 23

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

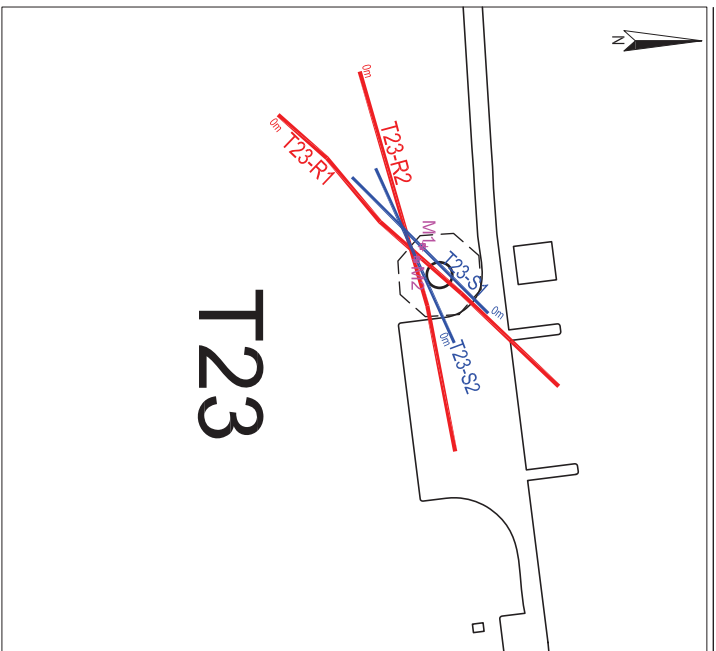
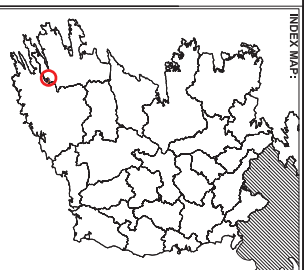
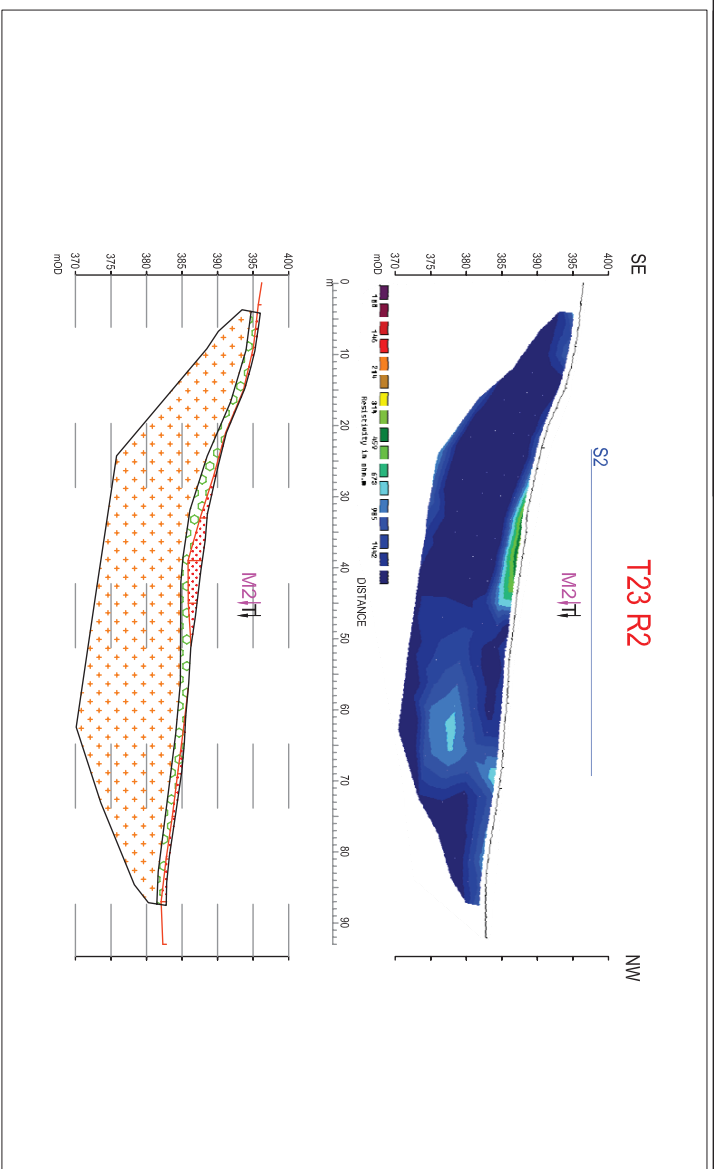
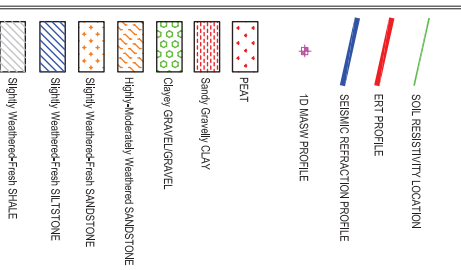


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



INDEX MAP



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**GROUSEMOUNT WIND FARM**

DRAWING No: AGL15980\_T23\_01\_TURBINE 23  
DATE: 08 JUNE 2015  
CLIENT: ISSUES81  
SCALE: AS INDICATED @ A3  
ISSUES: 1  
DATE: 08.06.2015  
SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T23</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507110
Northing	570648
Elevation (mOD)	386.0

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.8	459	-	1184	1200	-	-	-	-	PEAT		Diggable
0.8	1.3	673	526	1933	2000	0.46	553.49	1.62	88.32	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
1.3	2.1	985	560	2056	2000	0.46	626.70	1.83	108.42	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.1	3.0	1442	643	2364	2700	0.46	1117.79	3.26	281.66	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.0	3.9	1442	781	2870	2700	0.46	1647.99	4.81	534.45	Slightly Weathered -Fresh SANDSTONE	FAIR	Break / Blast
3.9	4.7	1442	852	3131	2700	0.46	1960.77	5.73	711.93	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.7	7.4	1442	965	3547	2700	0.46	2516.83	7.35	1074.84	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
7.4	9.2	1442	1143	4200	2700	0.46	3529.74	10.31	1878.07	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

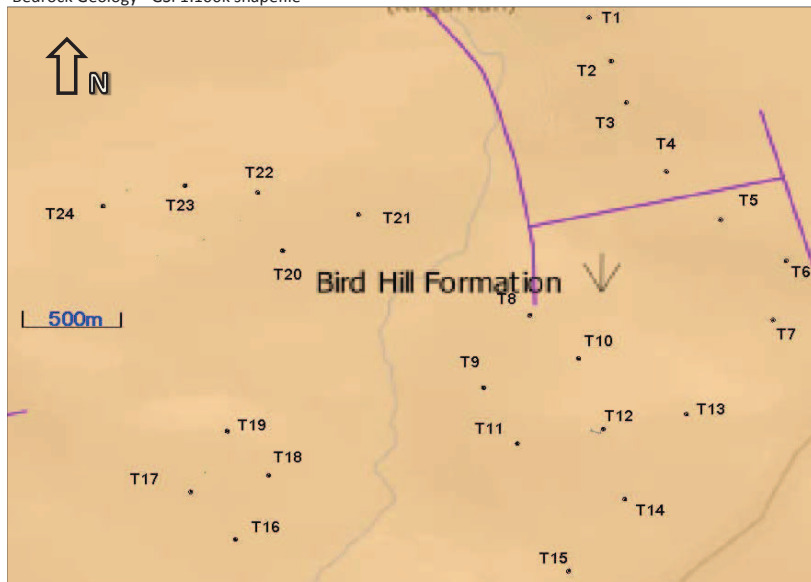
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T23**

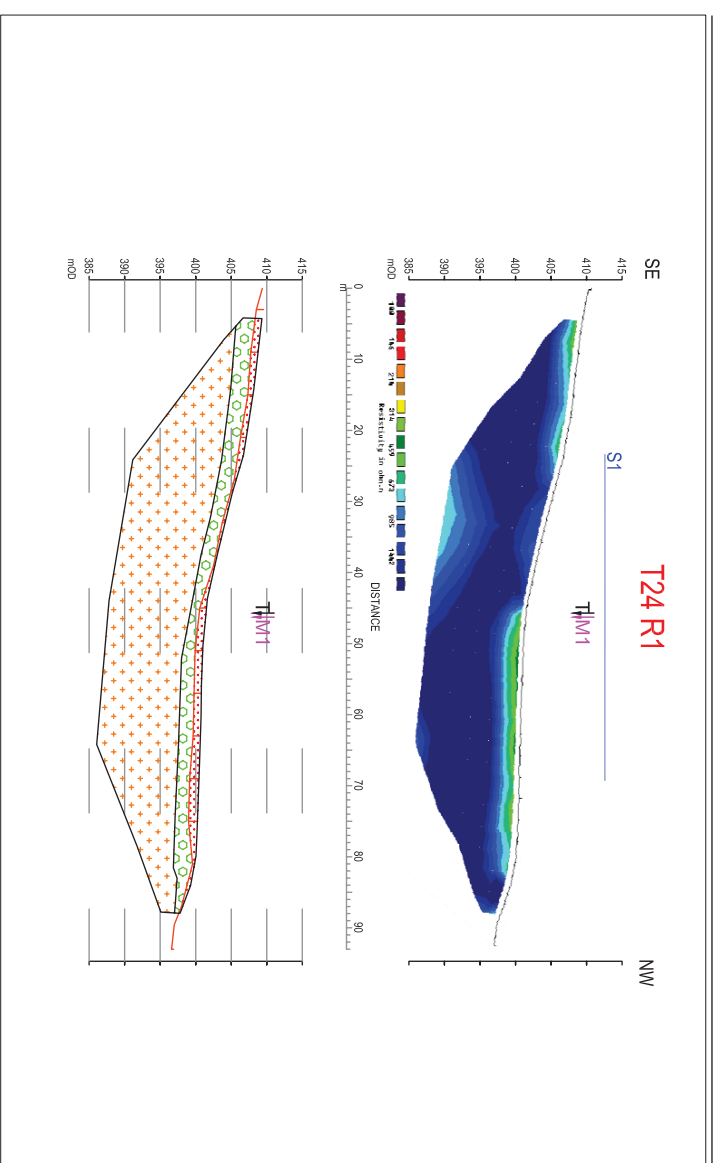
Discussion

Recommendations

FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3

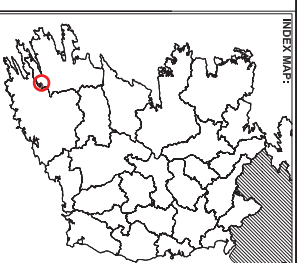


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT TURBINE 24

INDEX MAP:



LEGEND:

- SOIL RESISTIVITY LOCATION
- ERT PROFILE
- SEISMIC REFRACTION PROFILE
- 1D MASW PROFILE
- 10 MASW PROFILE
- PEAT
- Sandy Gently CLAY
- Clayey GRAVEL/GRAVEL
- Highly-Moderately Weathered SANDSTONE
- Slightly Weathered-Fresh SANDSTONE
- Slightly Weathered-Fresh SILTSTONE
- Slightly Weathered-Fresh SHALE
- Peat Probe Depth
- Possible Fault
- Turbine Centre
- 10 MASW Profile

FIGURE 2: TURBINE MAP: Scale 1:1250@A3

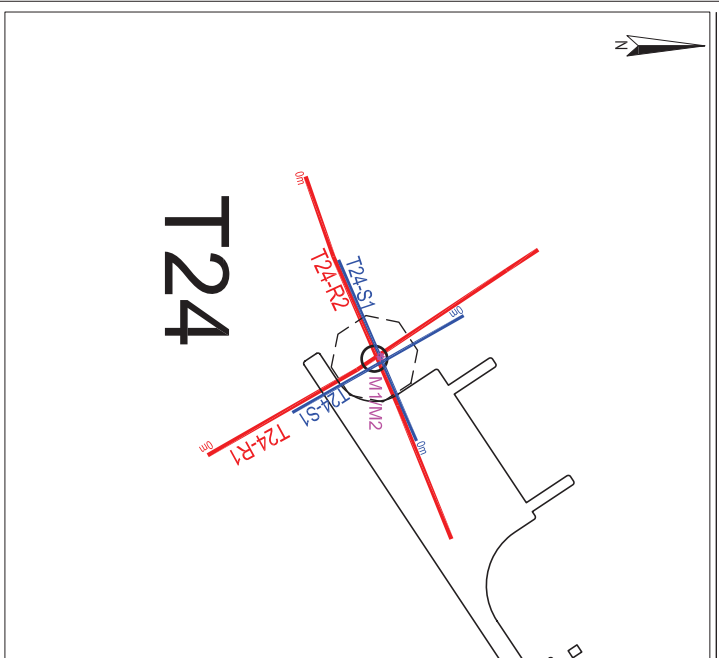
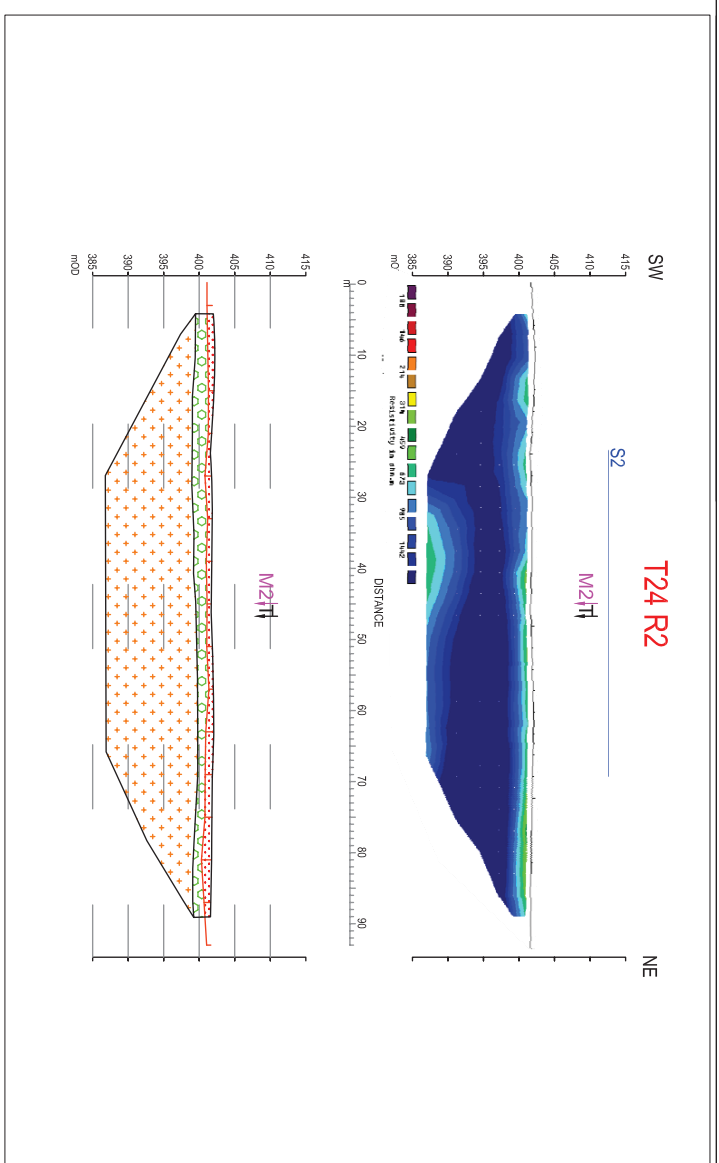


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



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**DRAWING No.:** AG15980\_T24\_01 TURBINE 24  
**DATE:** 08 JUNE 2015  
**CLIENT:** ISSUES81  
**SCALE:** AS INDICATED @ A3  
**ISSUES:**  
1 08.08.2015 SOR

Site	Grousemount Wind Farm
Turbine Base	<b>T24</b>

Methodology	
Seismic Refraction	24 ch. @ 2m geophones
MASW	24 ch. @ 1m geophones
ERT	32 el. @ 3m electrodes
GPS	dGPS (< 1m accuracy)

Location (ITM)	
Easting	507110
Northing	570648
Elevation (mOD)	386.0

Depth (m)	Depth (m)	Resistivity	Avg. Velocity (m/s)		Assumed Density	Poissons Ratio	Shear Mod	Youngs Mod	Youngs Mod	Interpretation	Estimated Stiffness / Rock Quality **	Estimated Excavatability
			from	to								
0.0	0.8	673	-	602	1200	-	-	-	-	PEAT		Diggable
0.8	2.2	985	333	1223	2000	0.46	221.70	0.65	19.52	Clayey GRAVEL/GRAVEL	VERY DENSE	Diggable
2.2	3.1	1442	615	2260	2700	0.46	1021.53	2.98	242.77	Slightly Weathered -Fresh SANDSTONE	POOR	Break / Blast
3.1	4.0	1442	908	3337	2700	0.46	2227.16	6.50	878.47	Slightly Weathered -Fresh SANDSTONE	FAIR	Heavy Break / Blast
4.0	4.9	1442	992	3644	2700	0.46	2656.32	7.76	1174.89	Slightly Weathered -Fresh SANDSTONE	GOOD	Heavy Break / Blast
4.9	5.7	1442	1100	4041	2700	0.46	3266.58	9.54	1652.69	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
5.7	7.6	1442	1132	4160	2700	0.46	3462.37	10.11	1819.29	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast
7.6	9.5	1442	1143	4200	2700	0.46	3528.90	10.30	1877.33	Slightly Weathered -Fresh SANDSTONE	EXCELLENT	Heavy Break / Blast

Due to the insufficient development of surface waves, the above S wave values have been calculated from the P wave results, assuming a Poissons Ratio of 0.46

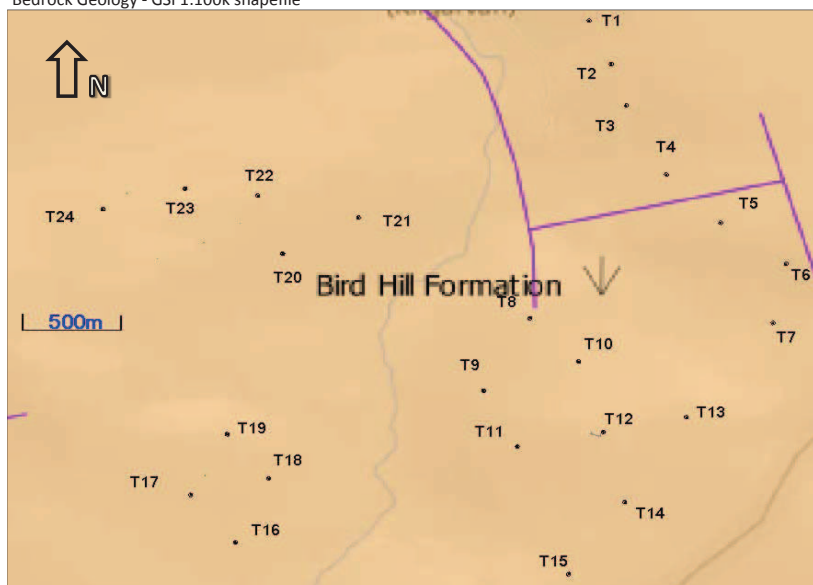
\* converted to static equivalent using empirical correlation from van Heerden, 1987.

\*\* correlation from Imai et al, 1976

\*\*\* from Deere et al, 1967

Depth information taken at centre of base (closest accessible point)

Bedrock Geology - GSI 1:100k shapefile



According to the GSI 1:100k Bedrock Geology map the Grousemount Wind Farm site is underlain by the Bird Hill Formation. This is described as purple siltstone and fine sandstone.

**T24**

Discussion

Recommendations



FIGURE 1: GROUSEMOUNT WIND FARM LOCATION: Scale 1:40000@A3

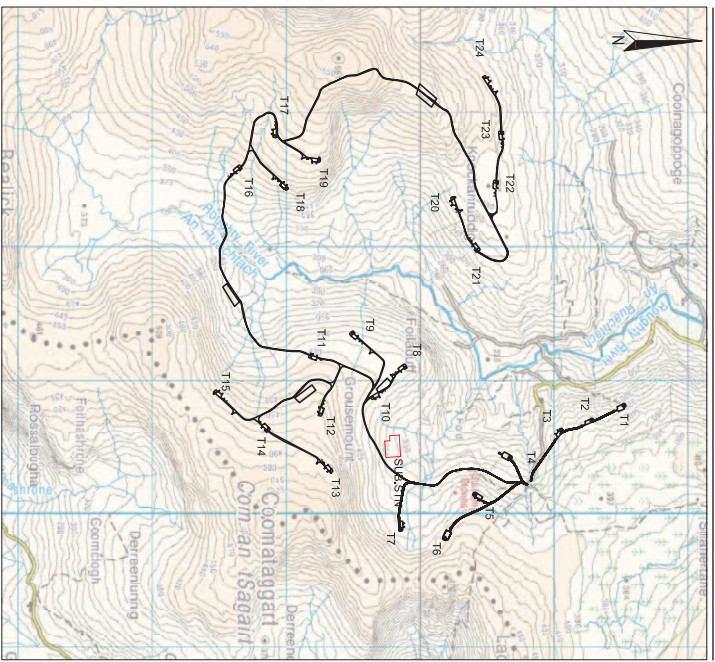
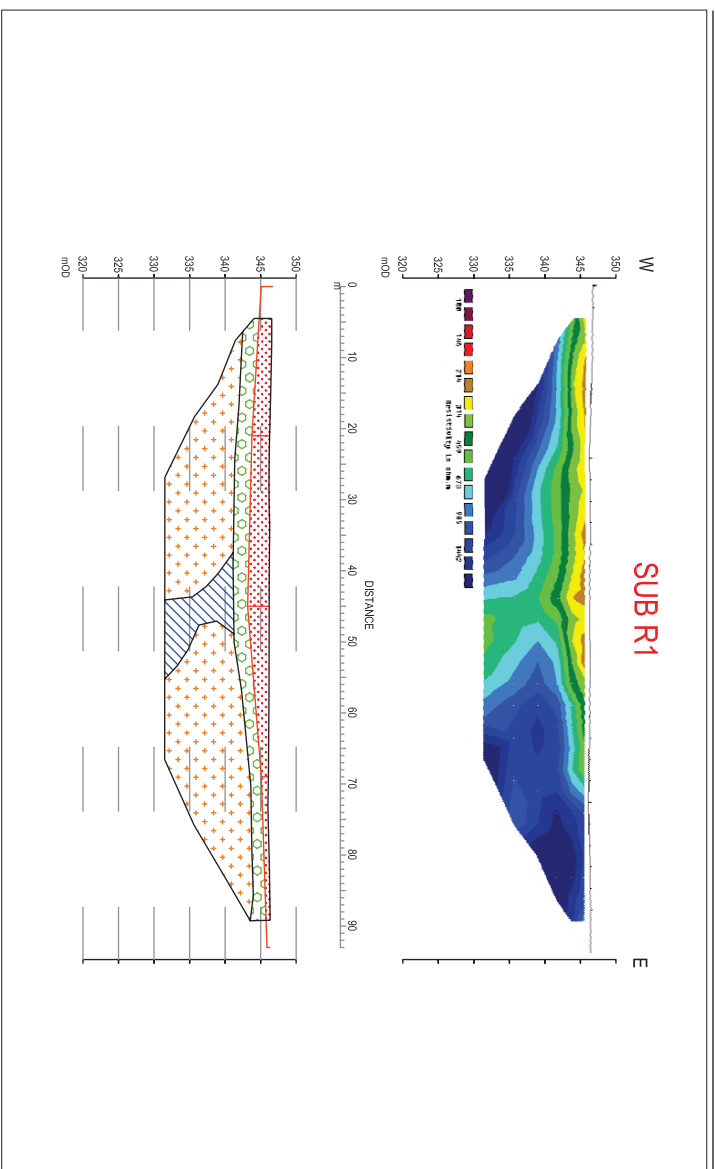


FIGURE 3: ERT PROFILE R1: Scale 1:750@A3



GROUSEMOUNT SUBSTATION

FIGURE 2: SUBSTATION MAP: Scale 1:25000@A3

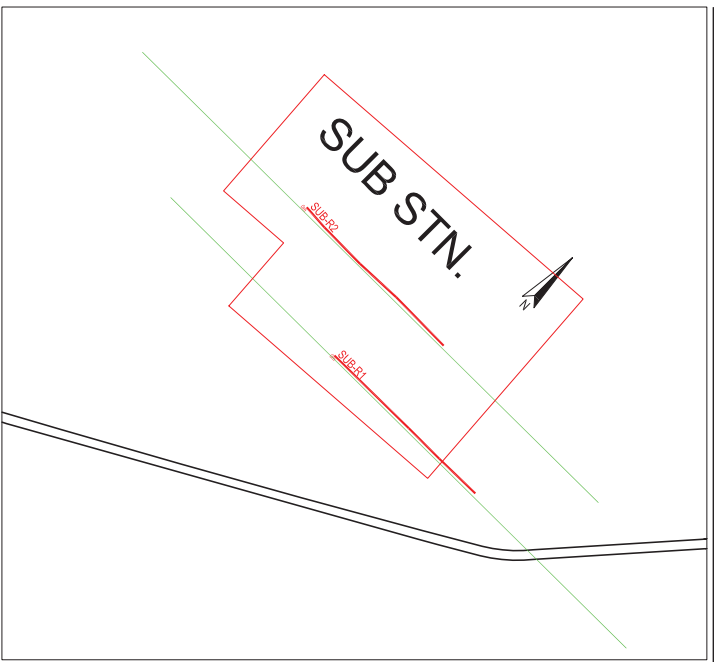
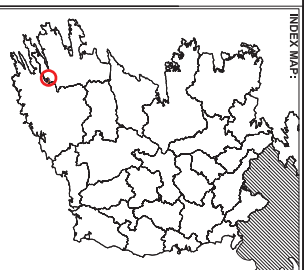
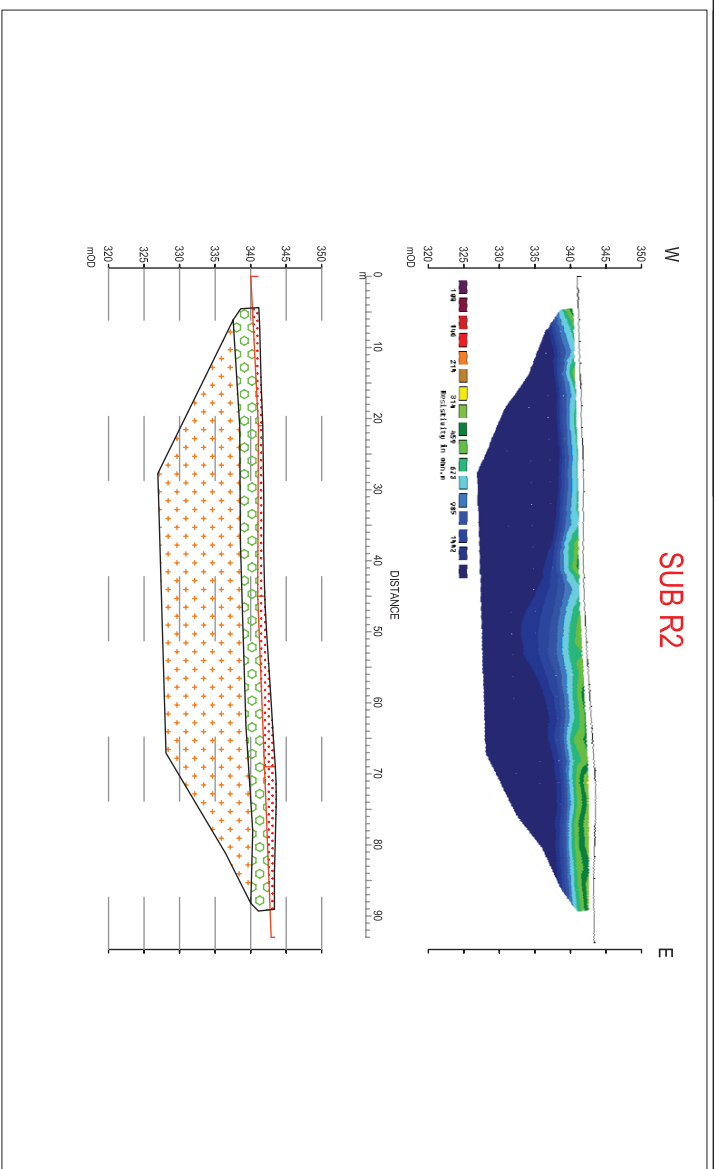


FIGURE 4: ERT PROFILE R2: Scale 1:750@A3



INDEX MAP:

- LEGEND:
- SOIL RESISTIVITY LOCATION
  - ERT PROFILE
  - SEISMIC REFRACTION PROFILE
  - + 1D MASW PROFILE
  - PEAT
  - Sandy Gravelly CLAY
  - Gravelly GRAVEL/GRAVEL
  - Highly/Moderately Weathered SANDSTONE
  - Slightly Weathered-Fresh SANDSTONE
  - Slightly Weathered-Fresh SILTSTONE
  - Slightly Weathered-Fresh SHALE
  - Peat Probe Depth
  - Possible Fault
  - T1 Turbine Centre
  - IM1 1D MASW Profile



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PROJECT: GROUSEMOUNT WIND FARM

DRAWING No: AGL15980 SUB R1

DATE: 08 JUNE 2015

CHECKED: ISSUESB1

SCALE: AS INDICATED @ A3

NO.	DATE	DESCRIPTION
1	08.06.2015	SOR

## 6. APPENDIX B: SEISMIC PLATES

The following figures show the seismic refraction data acquired at each of the fourteen proposed turbine bases:

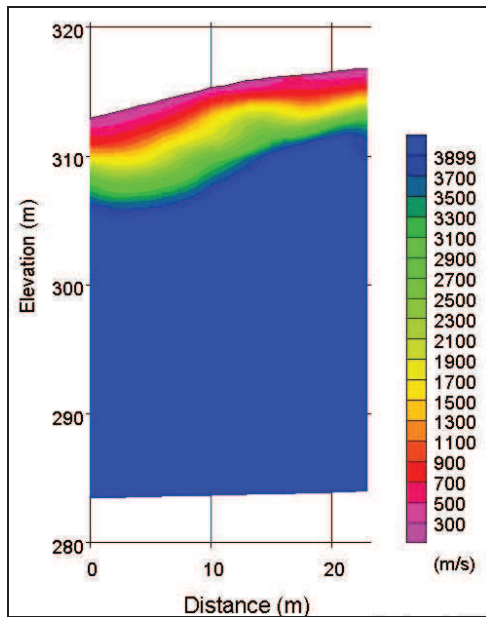


Fig.6.1. Tomographic Inversion of Profile S1 at Turbine Base T01.

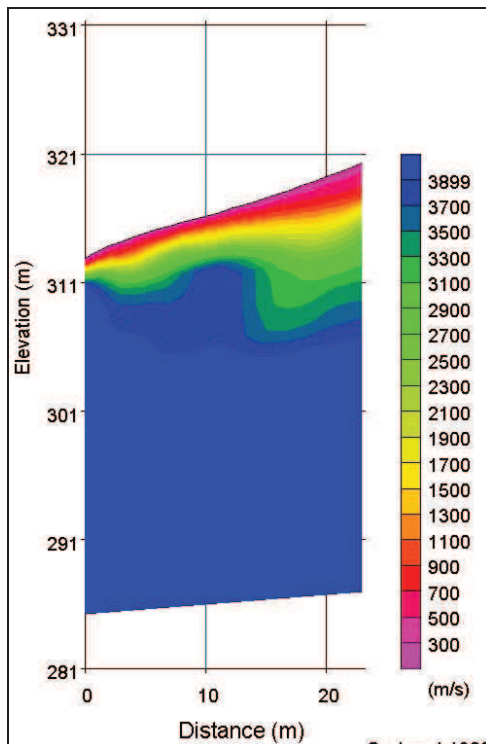


Fig.6.2. Tomographic Inversion of Profile S2 at Turbine Base T01.

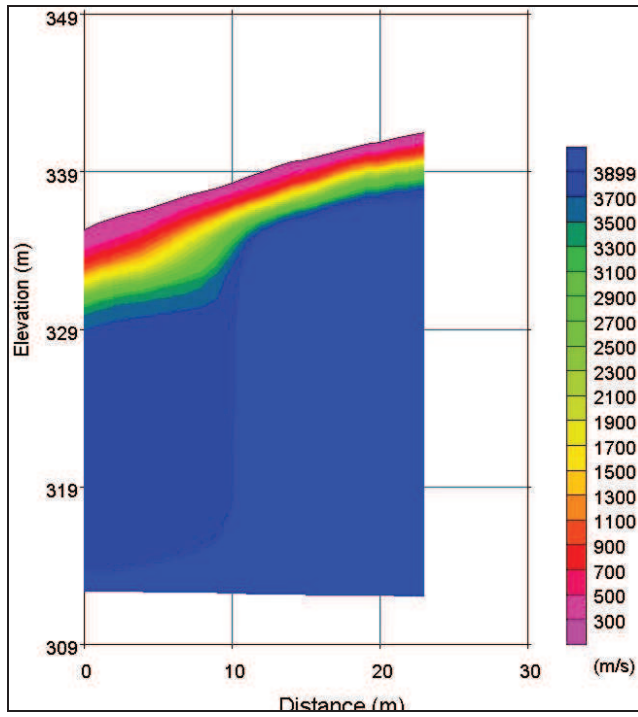


Fig.6.3. Tomographic Inversion of Profile S1 at Turbine Base T02.

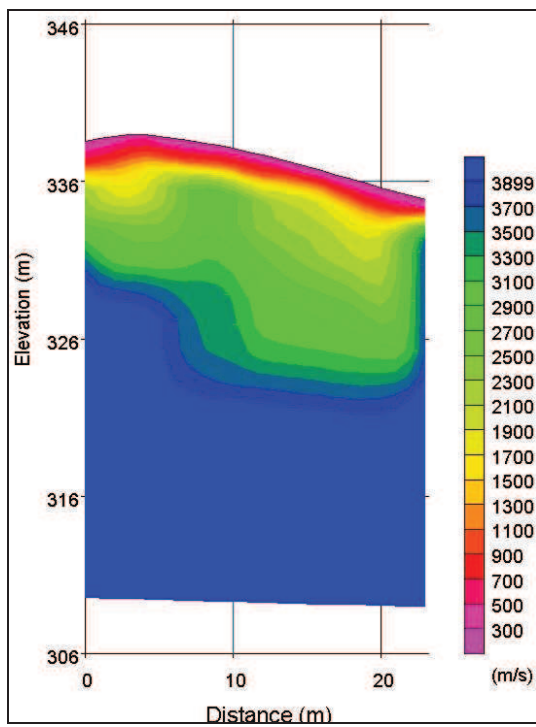


Fig.6.4. Tomographic Inversion of Profile S2 at Turbine Base T02.

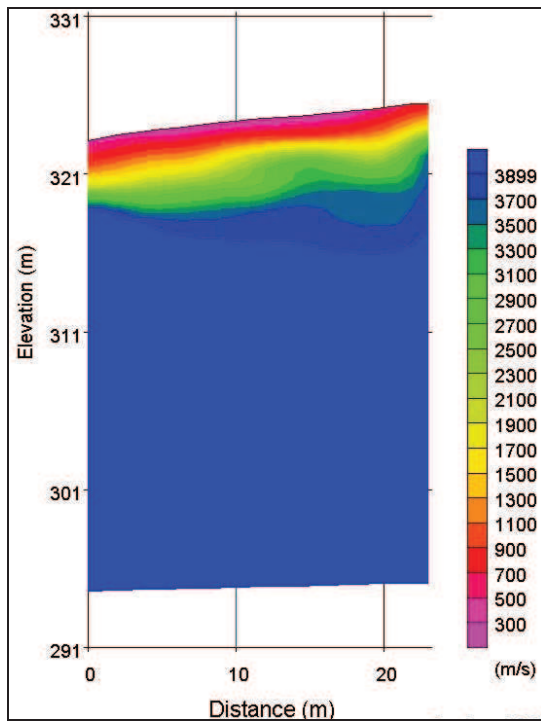


Fig.6.5. Tomographic Inversion of Profile S1 at Turbine Base T03.

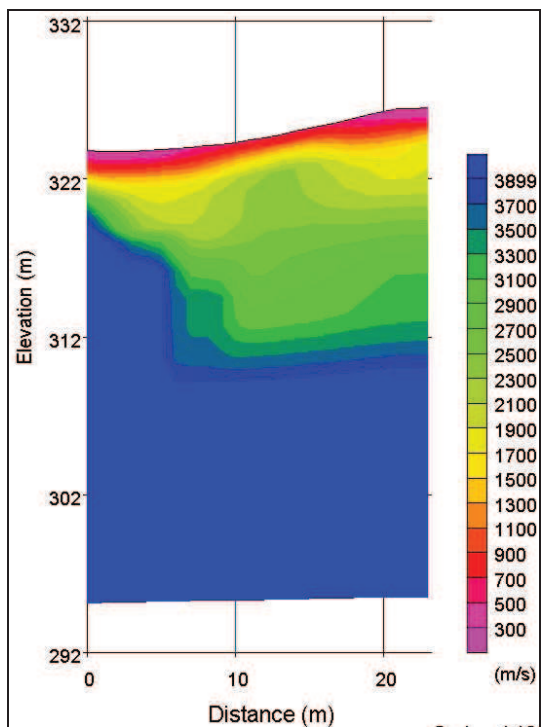


Fig.6.6. Tomographic Inversion of Profile S2 at Turbine Base T03.

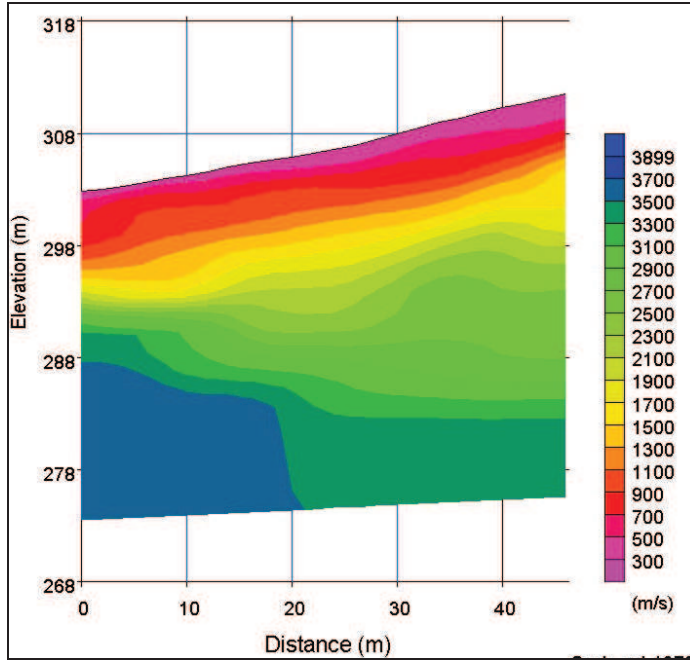


Fig.6.7. Tomographic Inversion of Profile S1 at Turbine Base T04.

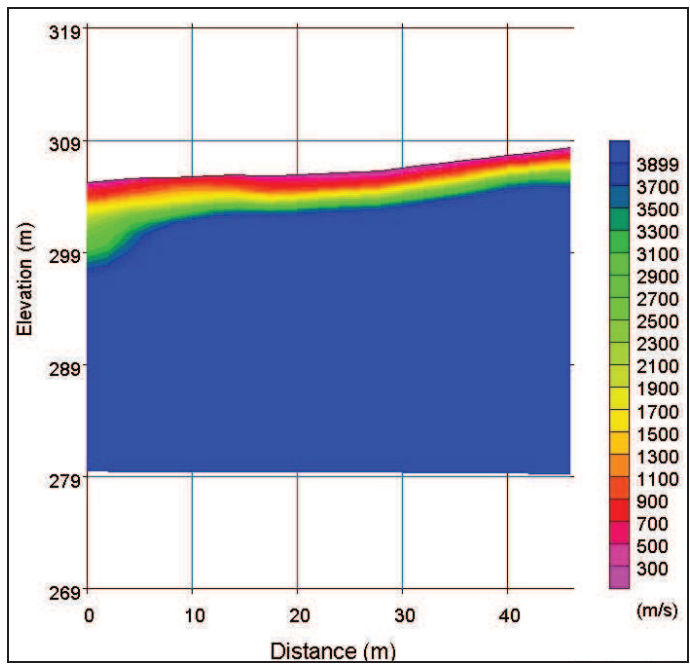


Fig.6.8. Tomographic Inversion of Profile S2 at Turbine Base T04.

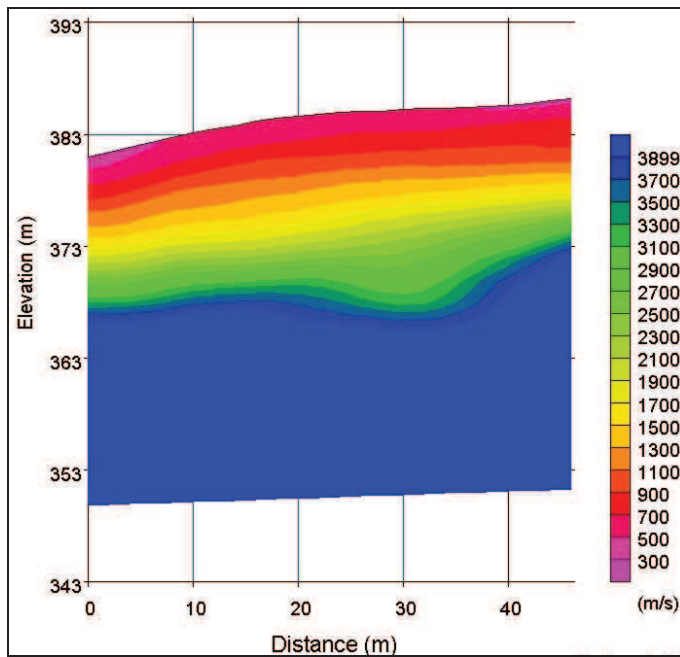


Fig.6.9. Tomographic Inversion of Profile S1 at Turbine Base T05.

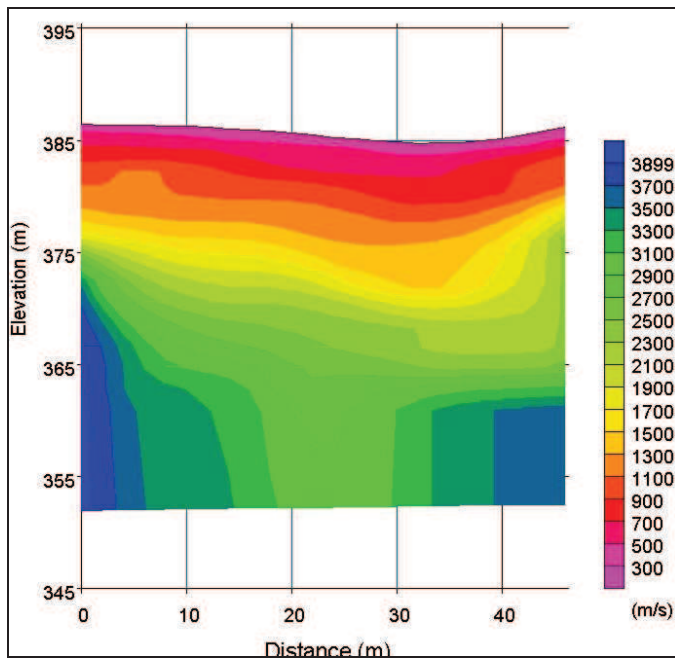


Fig.6.10. Tomographic Inversion of Profile S2 at Turbine Base T05.

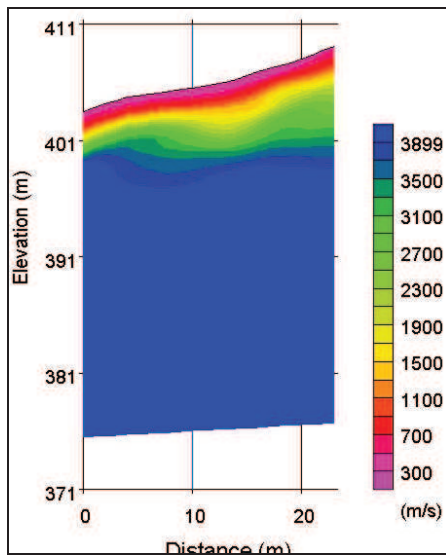


Fig.6.11. Tomographic Inversion of Profile S1 at Turbine Base T06.

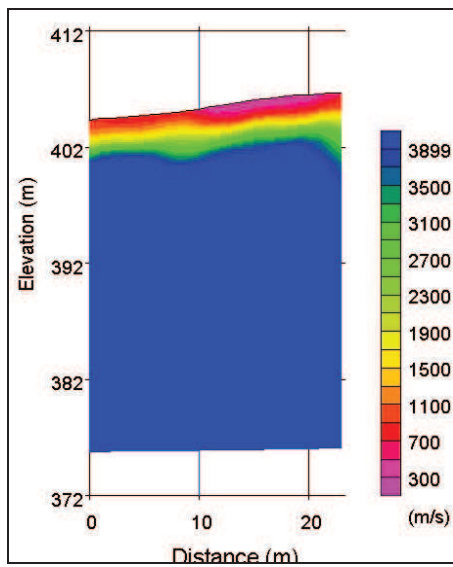


Fig.6.12. Tomographic Inversion of Profile S2 at Turbine Base T06.

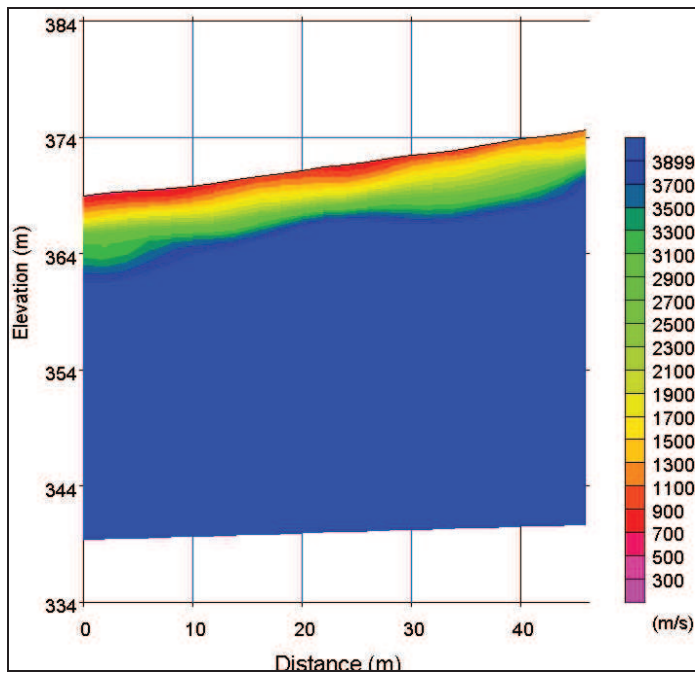


Fig.6.13. Tomographic Inversion of Profile S1 at Turbine Base T07.

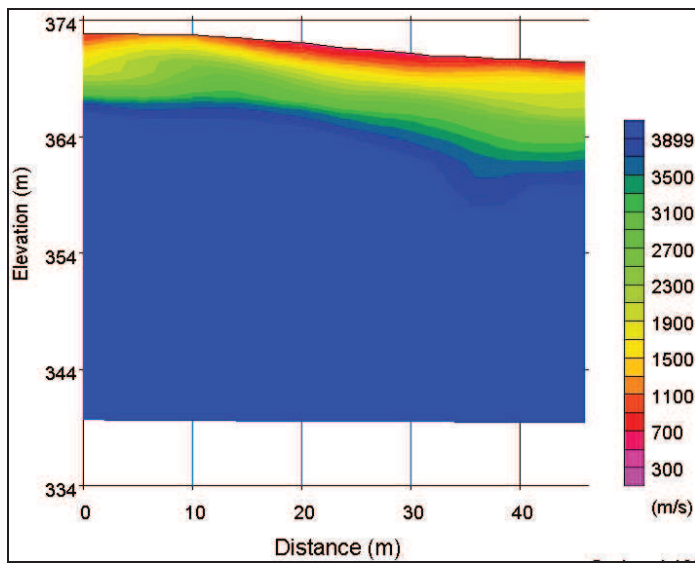


Fig.6.14. Tomographic Inversion of Profile S2 at Turbine Base T07.



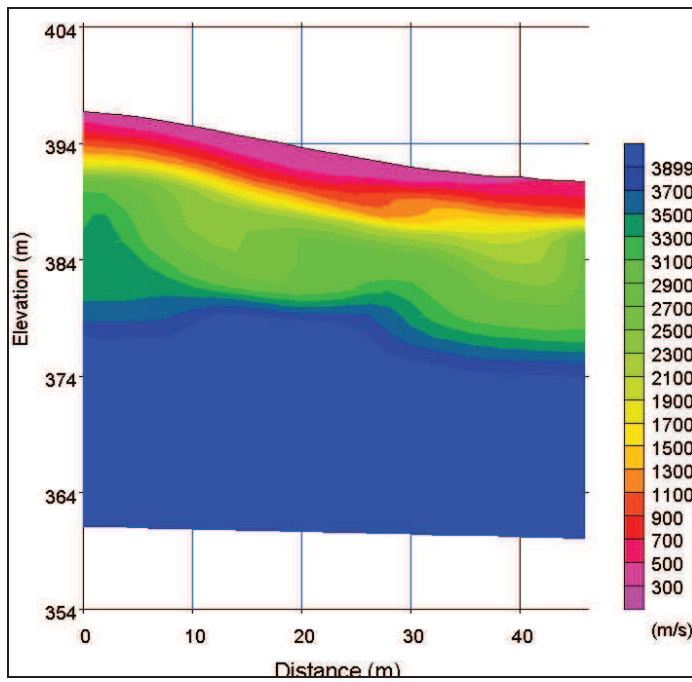


Fig.6.15. Tomographic Inversion of Profile S1 at Turbine Base T08.

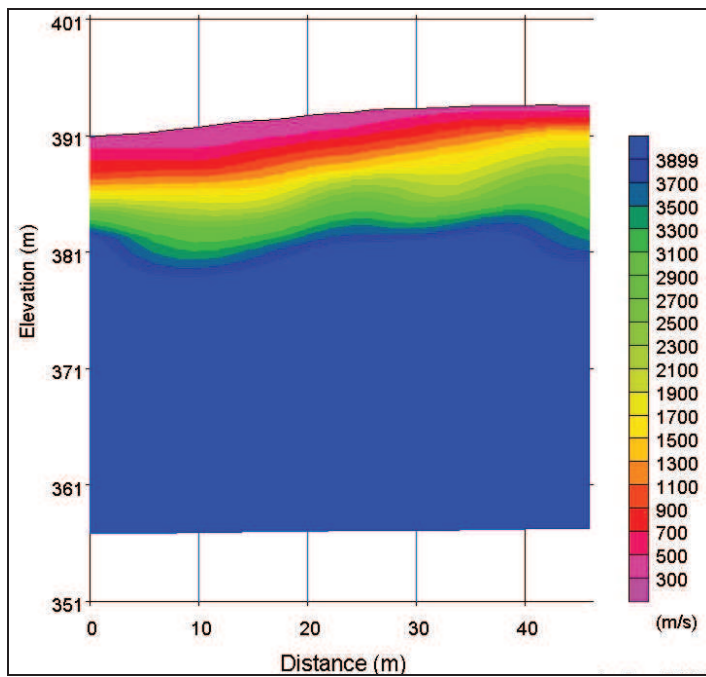


Fig.6.16. Tomographic Inversion of Profile S2 at Turbine Base T08.

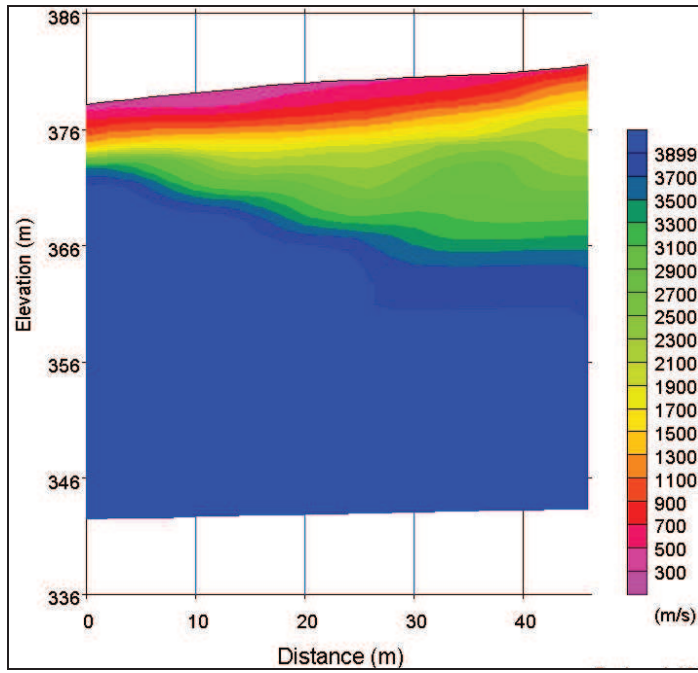


Fig.6.17. Tomographic Inversion of Profile S1 at Turbine Base T09.

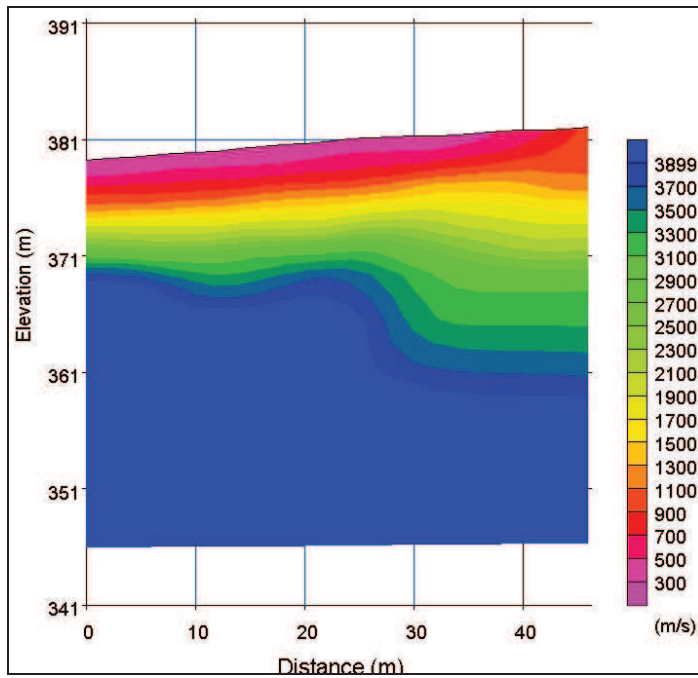


Fig.6.18. Tomographic Inversion of Profile S2 at Turbine Base T09.

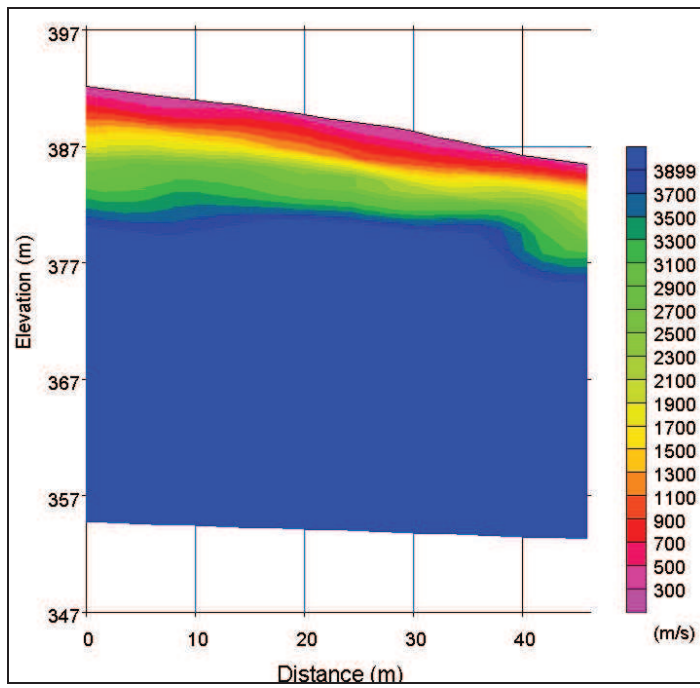


Fig.6.19. Tomographic Inversion of Profile S1 at Turbine Base T10.

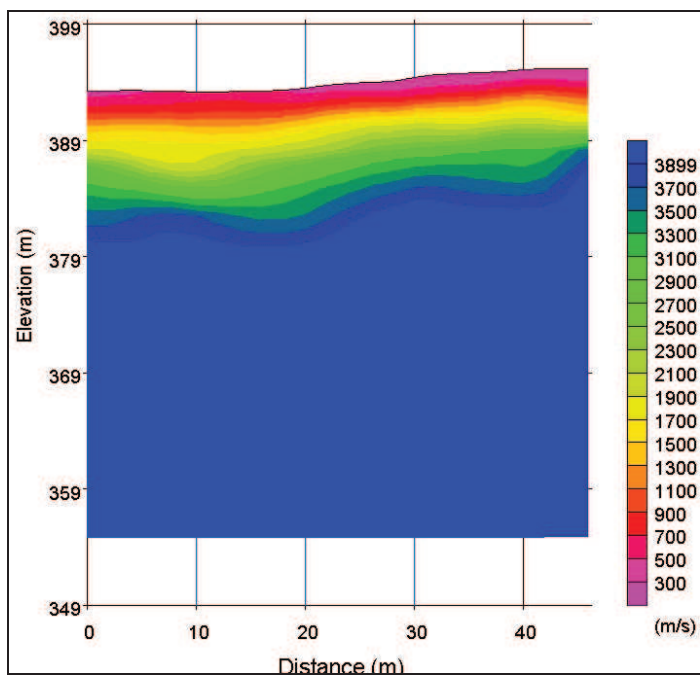


Fig.6.20. Tomographic Inversion of Profile S2 at Turbine Base T10.

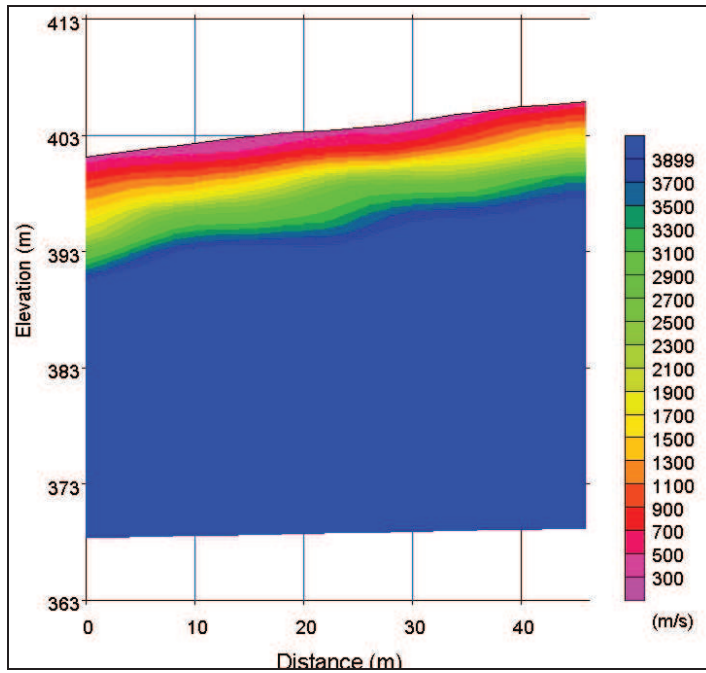


Fig.6.21. Tomographic Inversion of Profile S1 at Turbine Base T11.

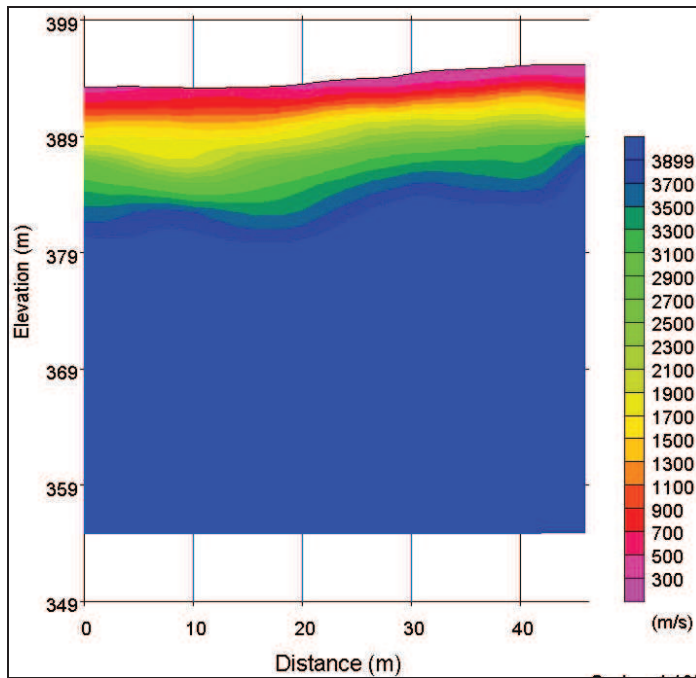


Fig.6.22. Tomographic Inversion of Profile S2 at Turbine Base T11.

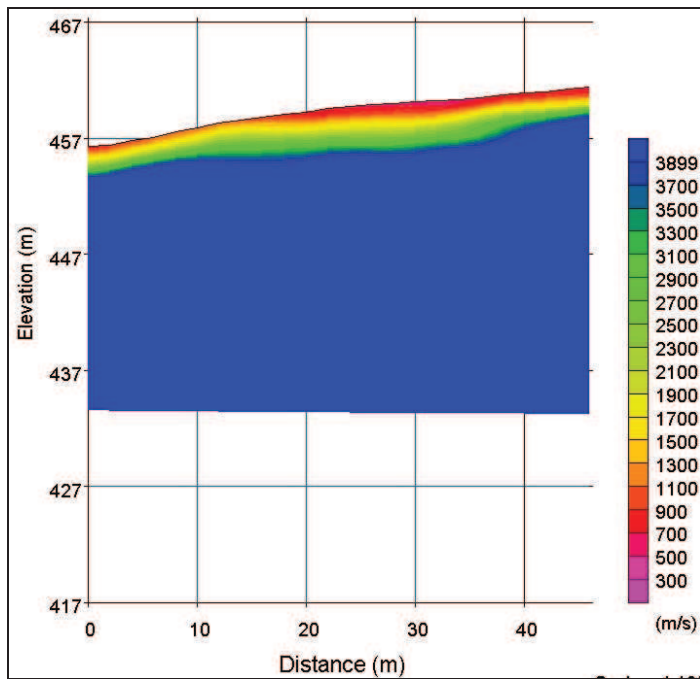


Fig.6.23. Tomographic Inversion of Profile S1 at Turbine Base T12.

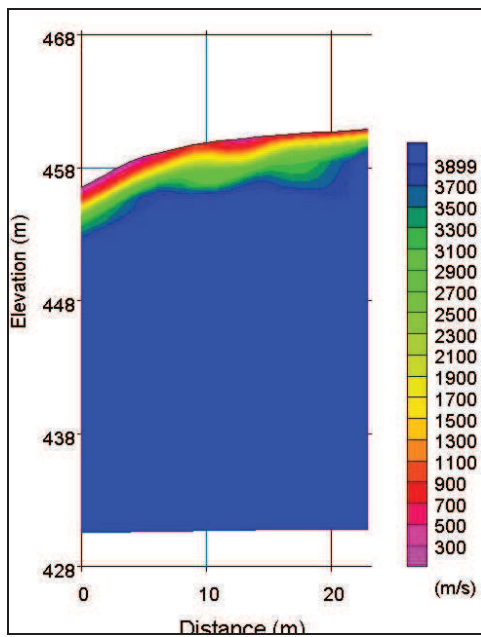


Fig.6.24. Tomographic Inversion of Profile S2 at Turbine Base T12.

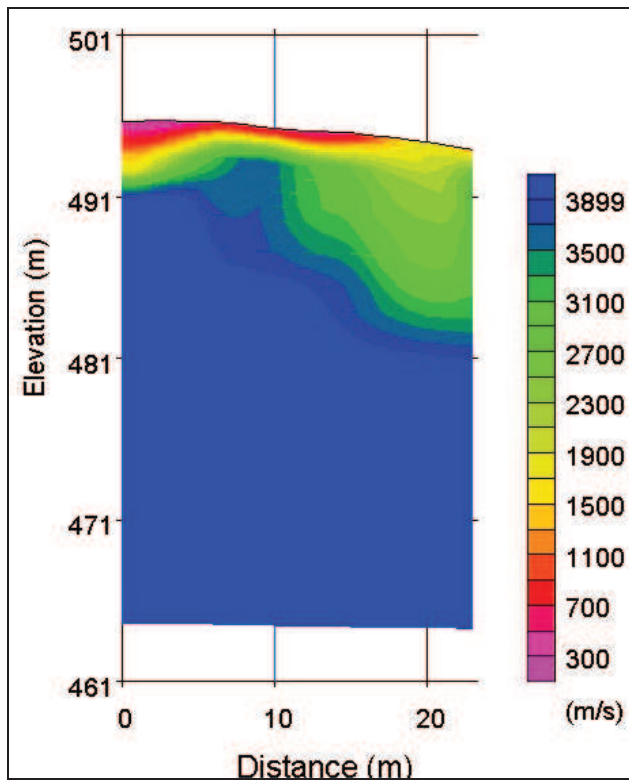


Fig.6.25. Tomographic Inversion of Profile S1 at Turbine Base T13.

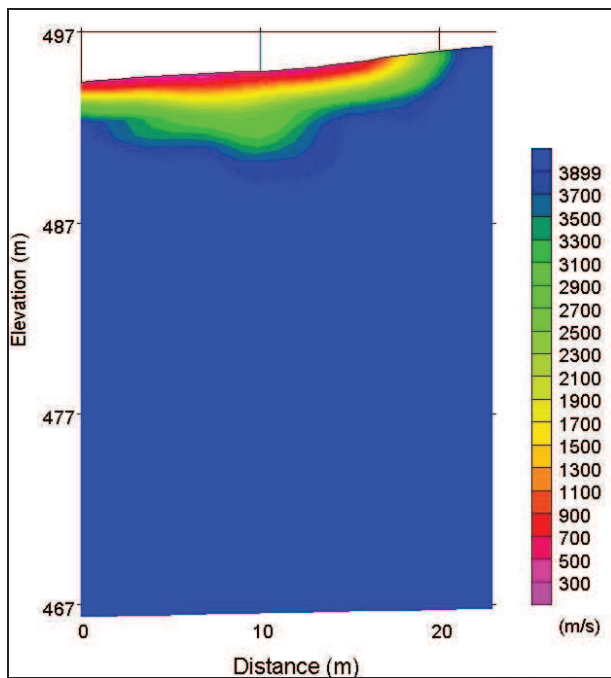


Fig.6.26. Tomographic Inversion of Profile S2 at Turbine Base T13.

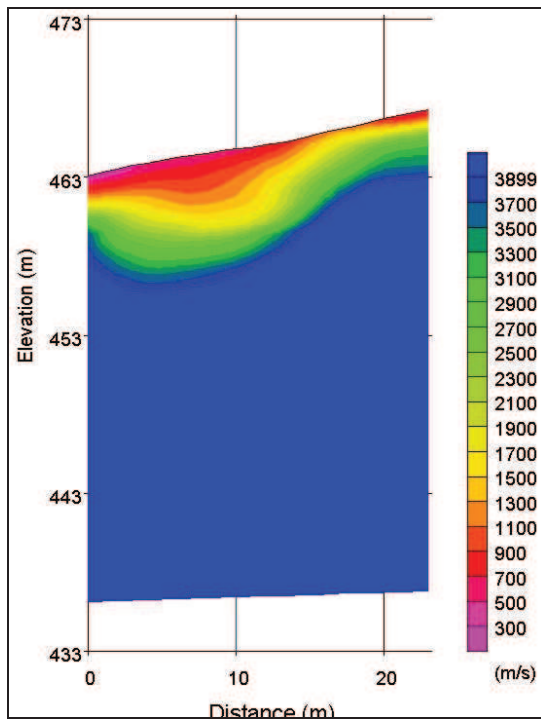


Fig.6.27. Tomographic Inversion of Profile S1 at Turbine Base T14.

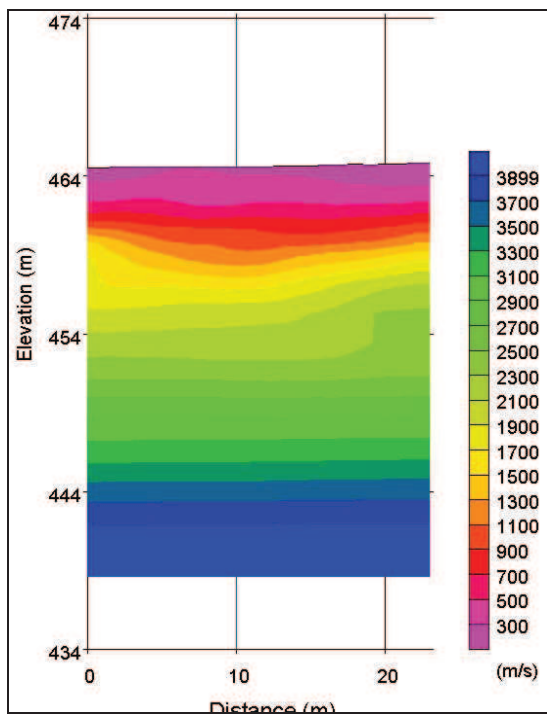


Fig.6.28. Tomographic Inversion of Profile S2 at Turbine Base T14.

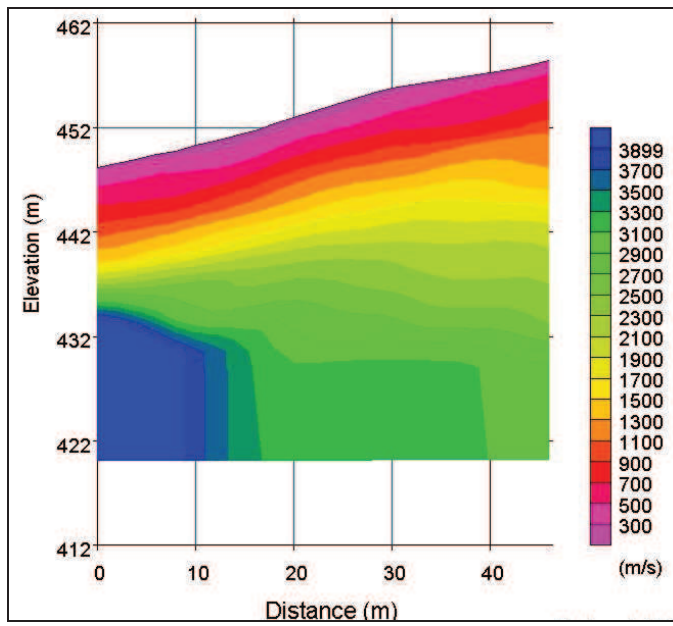


Fig.6.29. Tomographic Inversion of Profile S1 at Turbine Base T15.

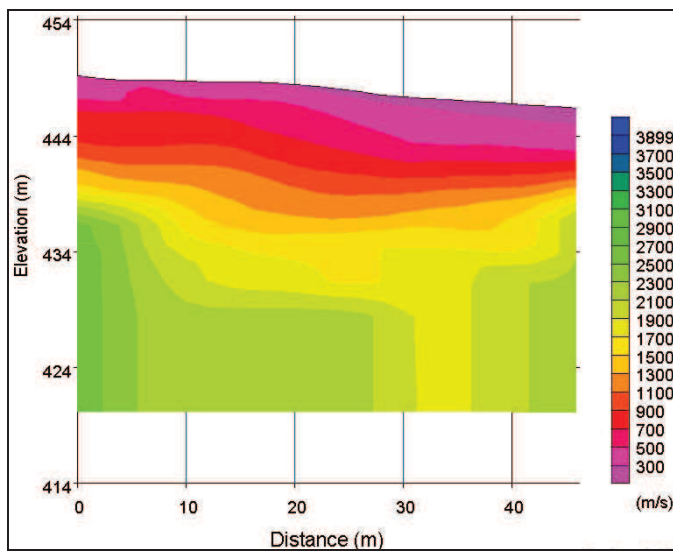


Fig.6.30. Tomographic Inversion of Profile S2 at Turbine Base T15.



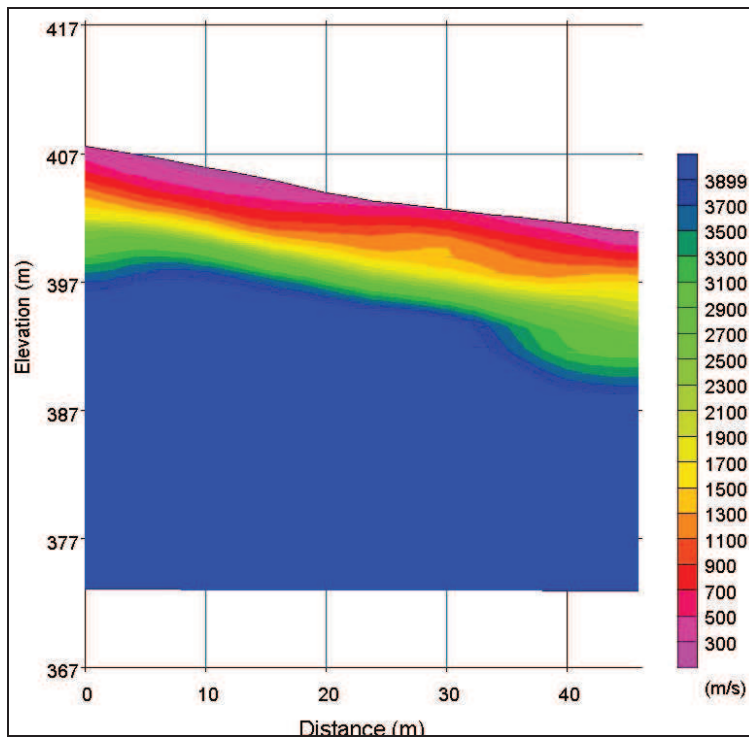


Fig.6.31. Tomographic Inversion of Profile S1 at Turbine Base T16.

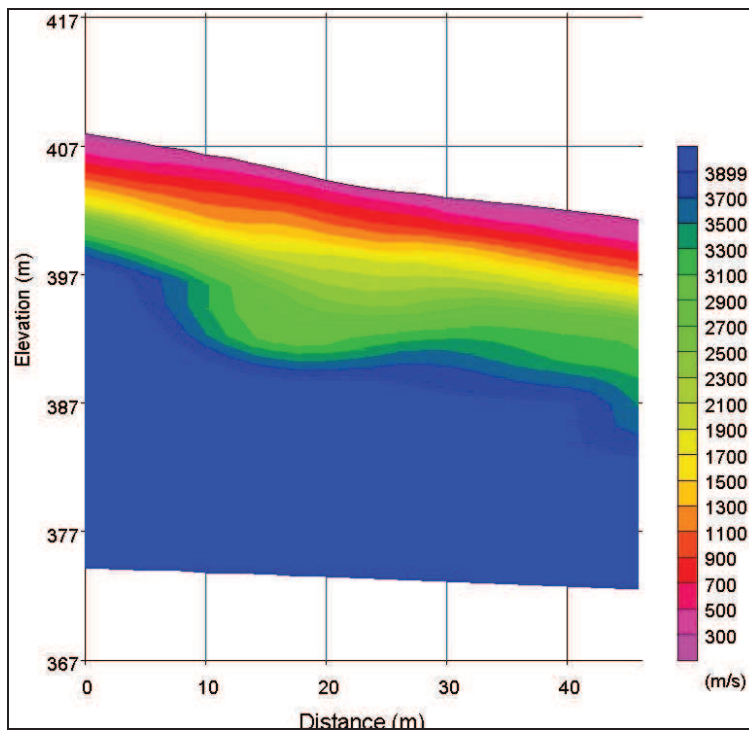


Fig.6.32. Tomographic Inversion of Profile S2 at Turbine Base T16.

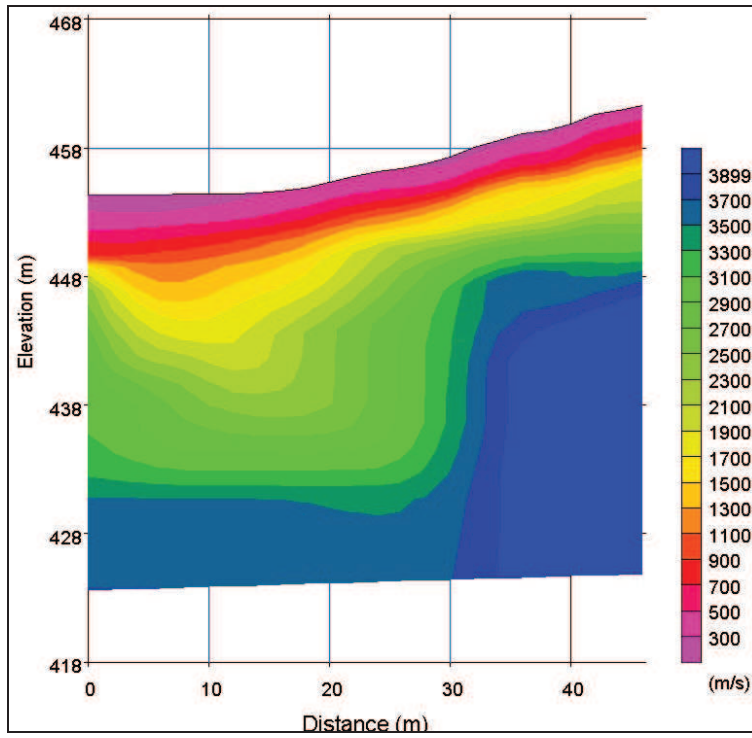


Fig.6.33. Tomographic Inversion of Profile S1 at Turbine Base T17.

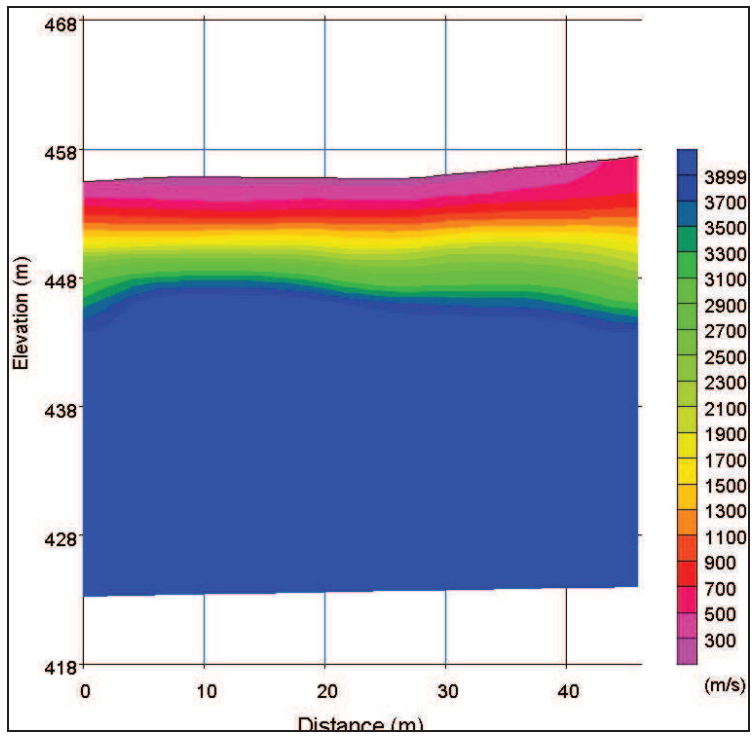


Fig.6.34. Tomographic Inversion of Profile S2 at Turbine Base T17.

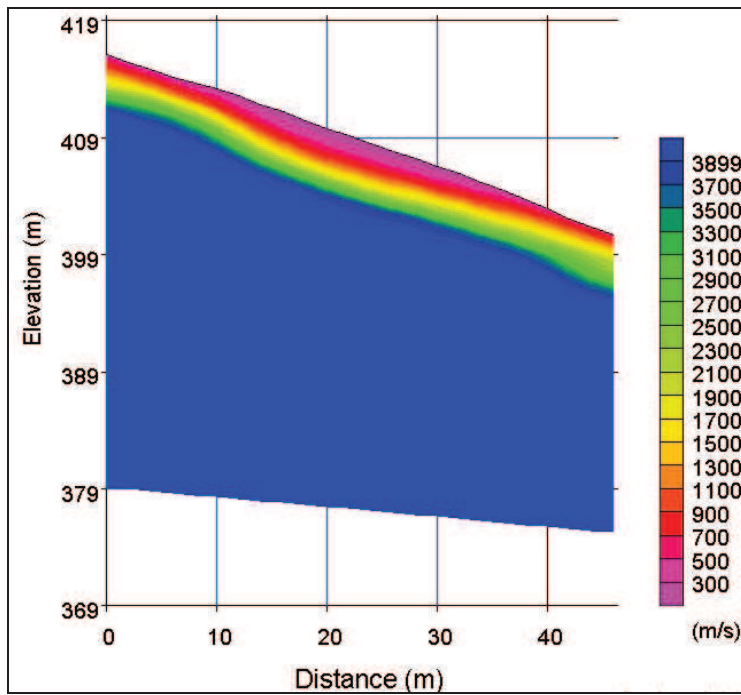


Fig.6.35. Tomographic Inversion of Profile S1 at Turbine Base T18.

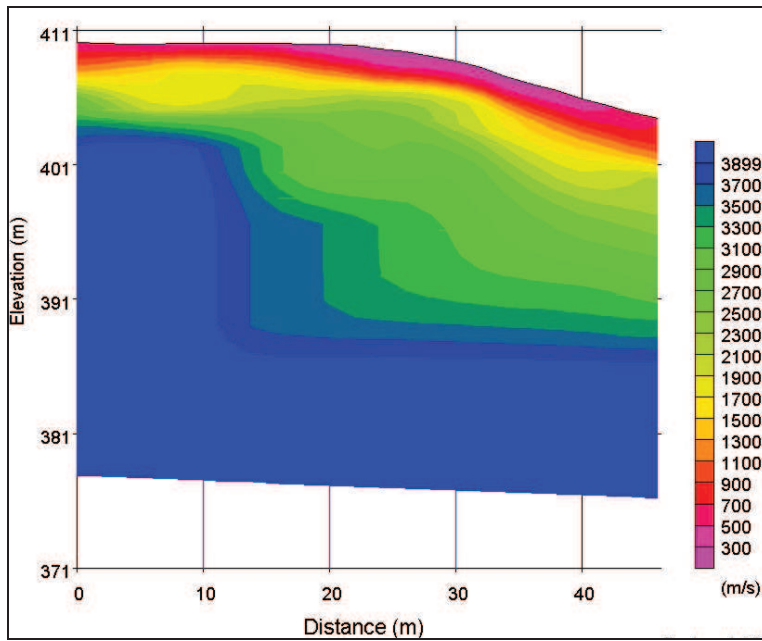


Fig.6.36. Tomographic Inversion of Profile S2 at Turbine Base T18.

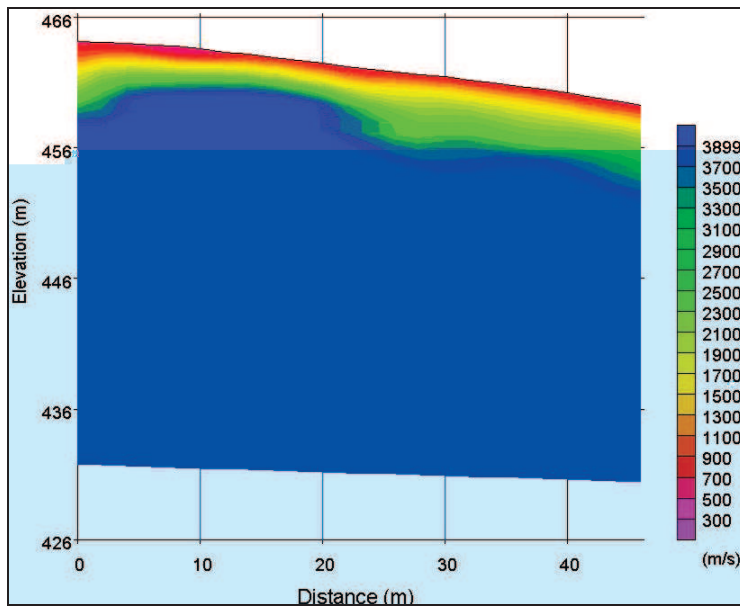


Fig.6.37. Tomographic Inversion of Profile S1 at Turbine Base T19.

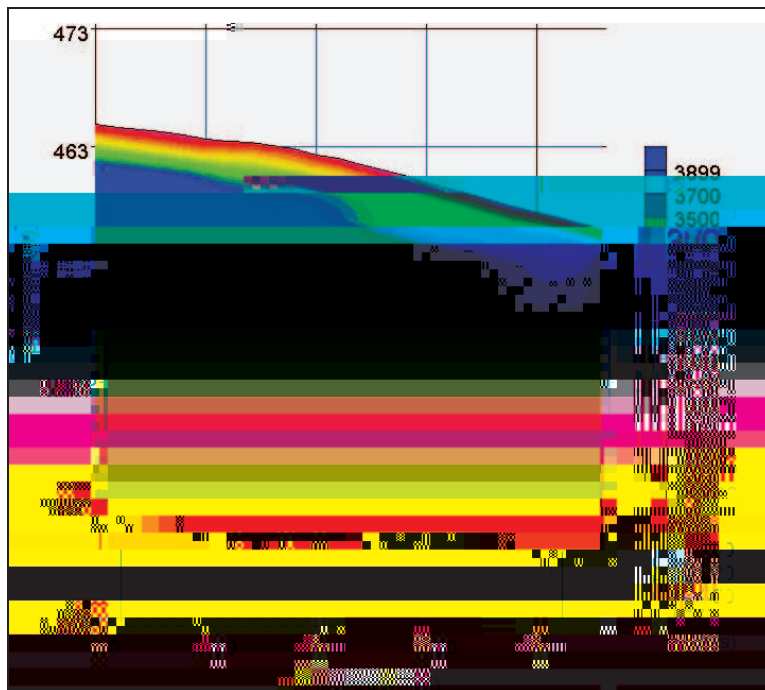


Fig.6.38. Tomographic Inversion of Profile S2 at Turbine Base T19.

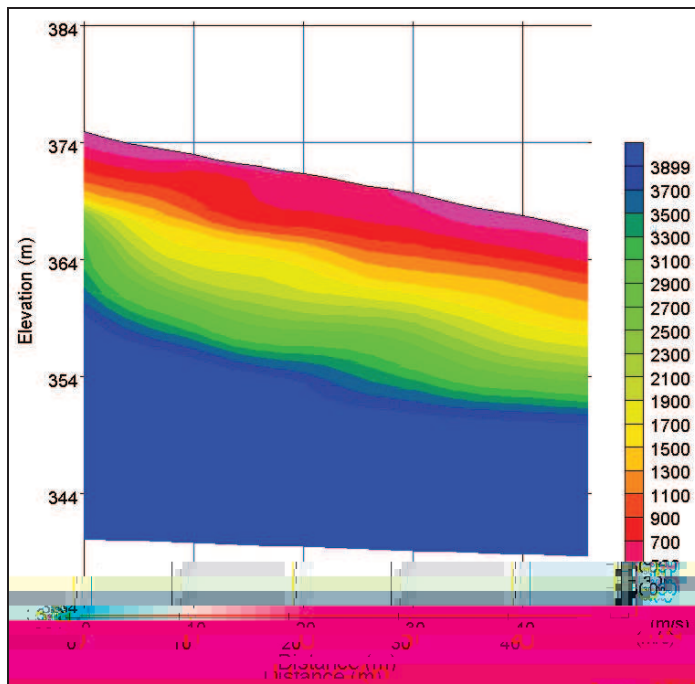


Fig.6.39. Tomographic Inversion of Profile S1 at Turbine Base T20.

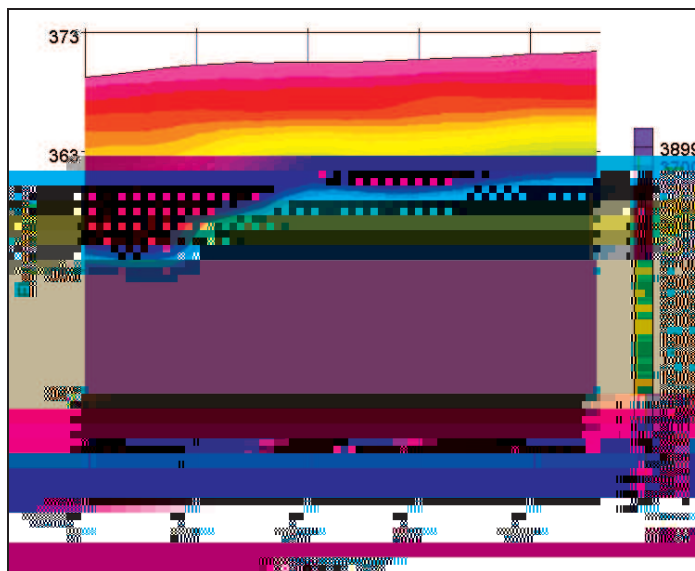


Fig.6.40. Tomographic Inversion of Profile S2 at Turbine Base T20.

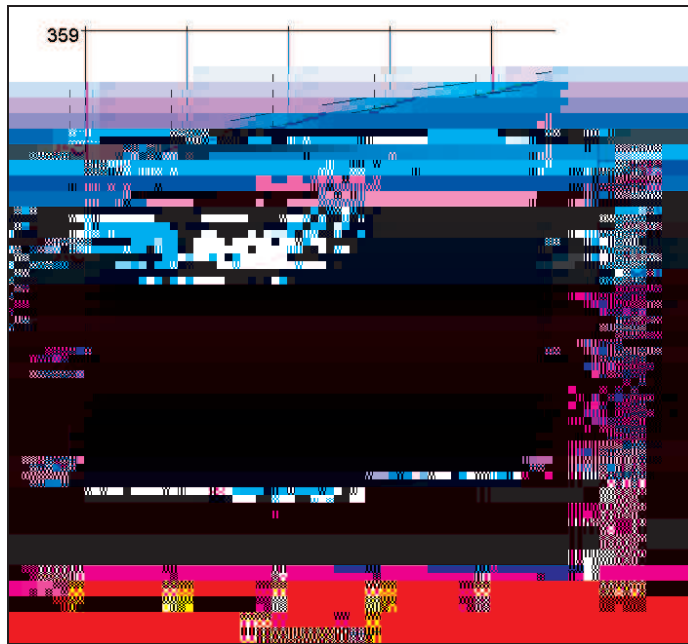


Fig.6.41. Tomographic Inversion of Profile S1 at Turbine Base T21.

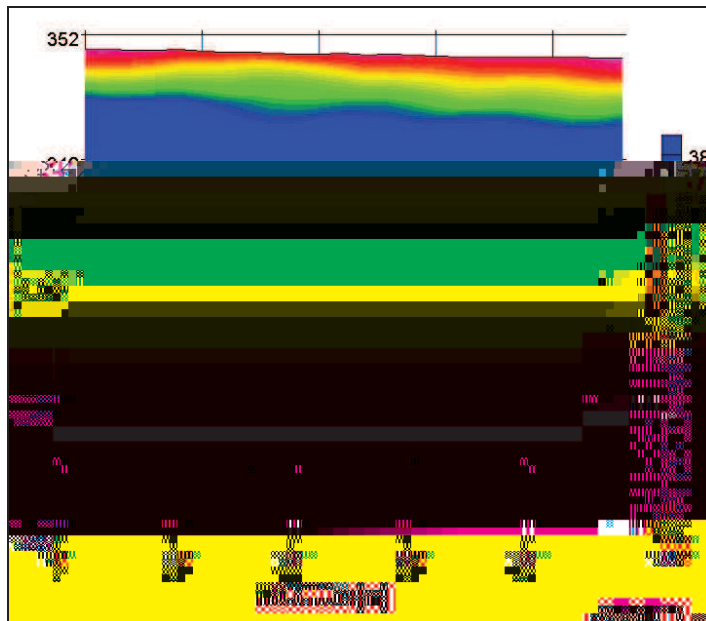


Fig.6.42. Tomographic Inversion of Profile S2 at Turbine Base T21.

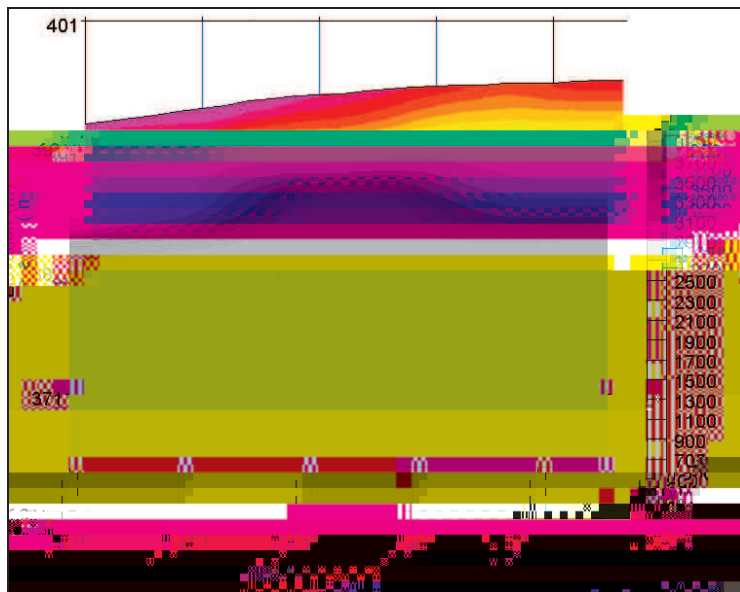


Fig.6.43. Tomographic Inversion of Profile S1 at Turbine Base T22.

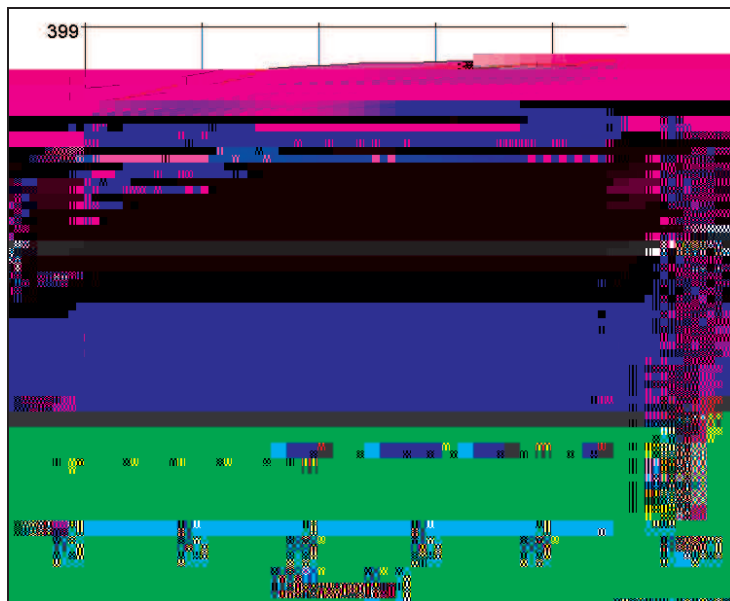


Fig.6.44. Tomographic Inversion of Profile S2 at Turbine Base T22.

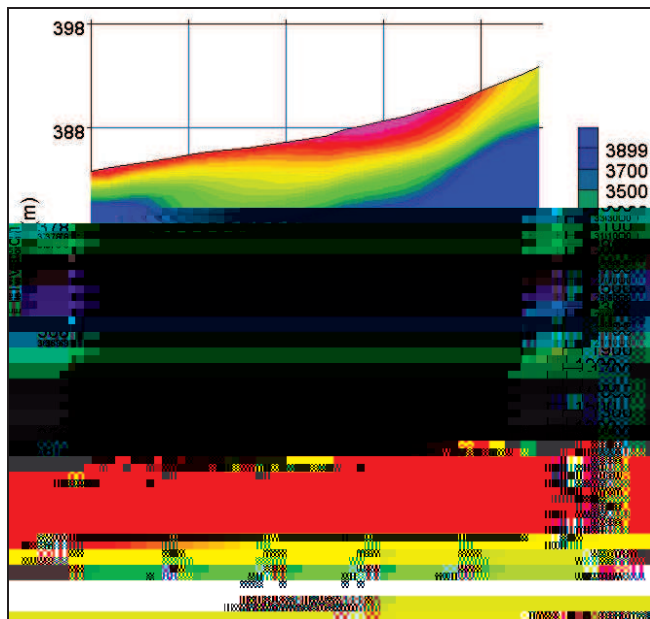


Fig.6.45. Tomographic Inversion of Profile S1 at Turbine Base T23.

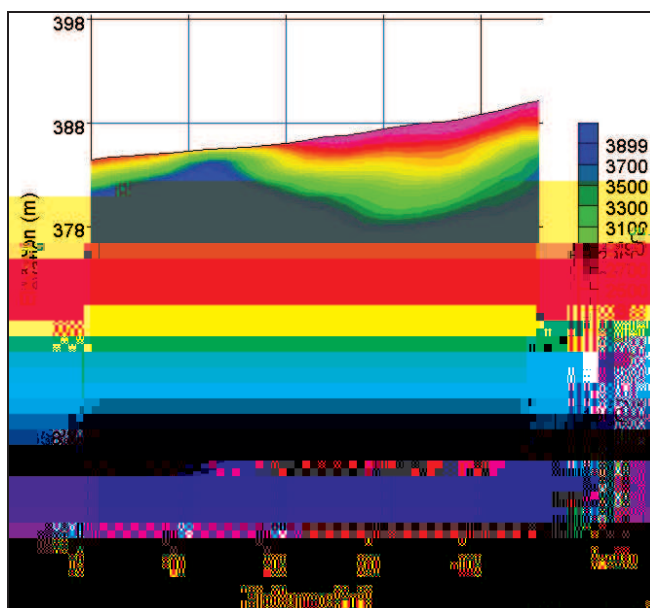


Fig.6.46. Tomographic Inversion of Profile S2 at Turbine Base T23.



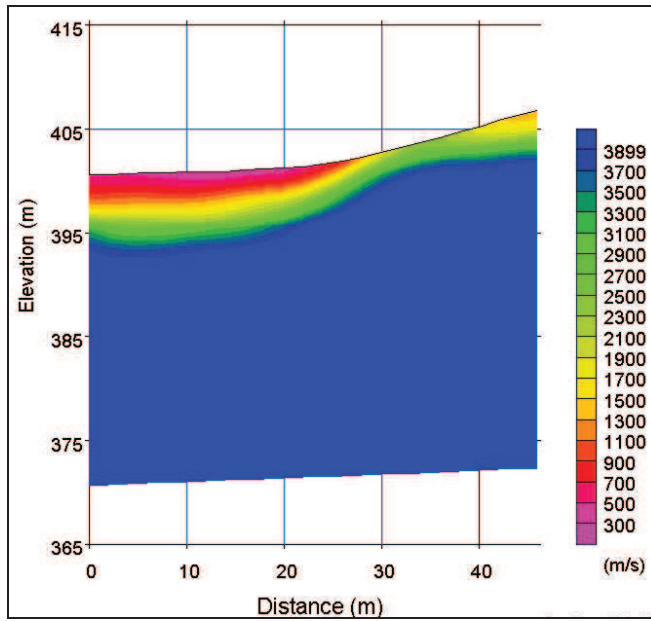


Fig.6.47. Tomographic Inversion of Profile S1 at Turbine Base T24.

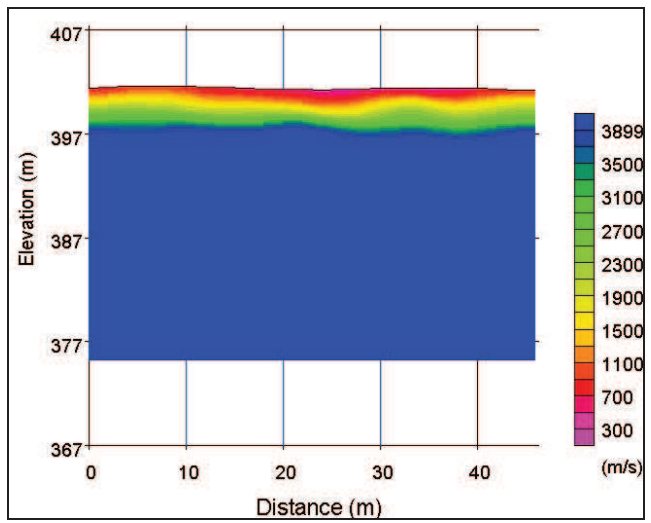


Fig.6.48. Tomographic Inversion of Profile S2 at Turbine Base T24.

## 7. APPENDIX C: DETAILED METHODOLOGY

A combination of a number of geophysical techniques was used to provide the high quality interpretation and reduce any ambiguities, which may otherwise exist. The data was acquired from 16<sup>th</sup> April to 21<sup>st</sup> May 2015.

### 7.1 Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

#### 7.1.1 Principles

This surveying technique makes use of the Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. The 2D-resistivity profiling method involves the use of 32 electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.



#### 7.1.2 Data Collection

Profiles were recorded using a Tigre resistivity meter, imaging software, one 32 takeout multicore cable and up to 32 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after survey. A 2-3m electrode spacing was used throughout, with each profile 62-93m in length which has a depth of penetration of 12-15m. Two orthogonal profiles were acquired at each of the turbine bases.

#### 7.1.3 Data Processing

The field readings were stored in computer files and inverted using the RES2DINV package (Campus Geophysical Instruments, 1997) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-Depth model of the resistivities.

The inverted 2D-Resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Distance is indicated along the

horizontal axis of the profiles. Profiles have been contoured using the same contour intervals and colour codes.

## 7.2 Seismic refraction profiling

### 7.2.1 Principles

This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity ( $V_p$ ) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher  $V_p$  velocities while soft, loose or fractured materials have lower  $V_p$  velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

### 7.2.2 Data Collection

A Geode high resolution 24 channel digital seismograph, 24 10HZ vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable (1-2m spacing). Equipment was carried was operated by a two-person crew. Two orthogonal profiles were acquired at each of the turbine bases.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile.( eg. 46m profile ~16m depth, 23m profile ~ 11m depth)

Shots from seven different positions were taken (2 x off-end, 2 x end, 3 x middle) to ensure optimum coverage of all refractors. All profiles were surveyed to Irish National Grid using a ProXR dGPS system.



### 7.2.3 Data Processing

The recorded data was interpreted using the ray-tracing and tomographic inversion methods, to acquire depths to layer boundaries and the P-wave velocities of these layers, using the SeisImager/2D programme from Geometrics.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The programme includes three methods for data analysis, time-term inversion, the reciprocal method and tomography.

The time-term method uses a least squares approach to calculate delay times to determine a discrete layer solution for the data.

In the reciprocal method delay times are calculated manually to also determine a discrete layer solution for the data.

The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method.

## 7.3 Multichannel Analysis of Surface Waves (MASW)

MASW profiling was carried out to provide information on overburden material stiffness or density and on the bedrock quality.

### 7.3.1 Principles

The Multi-channel Analysis of Surface Waves (MASW) (Park et al., 1998, 1999) utilizes Surface waves (Rayleigh waves) to determine the elastic properties of the shallow subsurface (<15m). Surface waves carry up to two-thirds of the seismic energy but are usually considered as noise in conventional body wave reflection and refraction seismic surveys.

The penetration depth of surface waves changes with wavelength, i.e. longer wavelengths penetrate deeper. When the elastic properties of near surface materials vary with depth, surface waves then become dispersive, i.e. propagation velocity changes with frequency. The propagation (or phase) velocity is determined by the average elastic property of the medium within the penetration depth. Therefore the dispersive nature of surface waves may be used to investigate changes in elastic properties of the shallow subsurface.

The MASW method employs the multi-channel recording and processing techniques (Sheriff and Geldart, 1982) that have similarities to those used in a seismic reflection survey and which allow better waveform analysis and noise elimination. To produce a shear wave velocity ( $V_s$ ) profile and a stiffness profile of the subsurface using Surface waves the following basic procedure is followed:

- (i) A point source (eg. a sledgehammer) is used to generate vertical ground motions,
- (ii) The ground motions are measured using low frequency geophones, which are disposed along a straight line directed toward the source,

(iii) the ground motions are recorded using either a conventional seismograph, oscilloscope or spectrum analyzer,

(iv) a dispersion curve is produced from a spectral analysis of the data showing the variation of Surface wave velocity with wavelength,

(v) the dispersion curve is inverted using a modeling and least squares minimization process to produce a subsurface profile of the variation of Surface wave and shear wave velocity with depth.

### 7.3.2 Data Collection

The recording equipment consisted of a Geode 24 channel digital seismograph, 24 no. 10HZ vertical geophones, hammer energy source with mounted trigger and a 24 take-out cable. Two orthogonal profiles were acquired at each of the turbine bases, with a 1m geophone spacing.



### 7.3.3 Data Processing

MASW processing was carried out using the SURFSEIS processing package developed by Kansas Geological Survey (KGS, 2000). SURFSEIS is designed to generate a shear wave ( $V_s$ ) velocity profile.

SURFSEIS data processing involves three steps:

- (i) Preparation of the acquired multichannel record. This involves converting data file into the processing format.
- (ii) Production of a dispersion curve from a spectral analysis of the data showing the variation of Raleigh wave phase velocity with wavelength. Confidence in the dispersion curve can be estimated through a measure of signal to noise ratio ( $S/N$ ), which is obtained from a coherency analysis. Noise includes both body waves and higher mode surface waves. To obtain an accurate dispersion curve the spectral content and phase velocity characteristics are examined through an overtone analysis of the data.

(iii) Inversion of the dispersion curve is then carried out to produce a subsurface profile of the variation of shear wave velocity with depth.

### 7.3.4 Relocation

All data were referenced using a ProXR dGPS system with sub 1m accuracy. All positions within this report are given in ITM coordinates.

## 7.4 Soil Resistivity

### 7.4.1 Principles

The method used is the four point method as described in IEEE Std 81-1983 (Guide for measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System); with a modification in the “a” spacings as detailed below as specified by the client ESBi.

This method utilizes the equally spaced Wenner Array to determine the apparent resistivity of the ground material using four electrodes placed in a line in the ground and a current is passed through the two outer electrodes. The potential difference (V) is measured across the two inner electrodes. The measured potential is divided by the current value (I) to obtain the resistance (R) using the following formula:  $V/I=R$ .

The resistivity is determined from the measured resistance at each electrode spacing using the following standard formula for the Wenner array:

Resistivity (ohm-m)  $\rho = R * 2 * \pi * \text{inter-electrode spacing}$ .

Single measurements were taken with the four electrodes having inter-electrode separations (‘a’ spacing) of 0.3, 0.5, 0.7, 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40, 50, 60, 80 and 100m.

(IEEE Std 81-1983 states that use of an electrode spacing of  $a$  m gives approximately the average resistivity of the soil to  $a$  m, although general geophysical experience indicates that the effective depth of penetration for the Wenner array is approximately  $a/2$  m).

### 7.4.2 Data Collection

One set of Soil Resistivity Measurements were recorded at turbines T2, T14, T17 & T22, with two sets at the substation location.

### 7.4.3 Data Processing

The field readings were converted to apparent resistivities using the formula  $\text{Resistivity} = R * 2 * \pi * a$  where :

R = measured resistance (ohms)

a = inter-electrode spacing

#### **7.4.4 Relocation**

All data were referenced using a Pro-XR GPS system with c.1m accuracy.

## **Appendix 3**

### **Site Plan / Drawings**



**TRIAL PIT****As Built Coordinates**

	E	N	Elev.
TP064	509224	571490	318.441
TP065	509261.7	571415.7	327.62
TP066	509335	571196	337.35
TP067	509459	571056	319.319
TP068	509575.8	570995.7	328.692
TP069	509623.1	570943.1	325.644
TP070	509713.1	570894.9	327.201
TP071	509671	570803	325.751
TP073	509766	570774	342.099
TP074	509823	570692	357.382
TP075	509885.9	570614	377.361
TP076	509929	570524	390.083
TP077	509975	570435	401.729
TP078	510017.9	570345	402.77
TP088	509762	569945	348.009
TP089	509858.9	569929	353.611
TP090	509952.3	569908.5	361.167
TP094	509538	569776.1	350.007
TP095	509446	569714	366.967
TP096			
TP097	509260.9	569639	387.68
TP098	509158	569647	391.584
TP099	509057	569795	387.31
TP100	508972	569865	393.376
TP101	509065.9	569686	396.847
TP102	508983.1	569750	396.955
TP103	508885.9	569779	397.006
TP104	508793	569755	391.804
TP105	508726	569686.1	387.241
TP106	508954.8	569686	401.188
TP107	508913.2	569615.1	401.812
TP108	508882.6	569524.9	402.972
TP109	508947.9	569442.9	412.014
TP110	509034.9	569395.1	426.618
TP111	509112.8	569347.1	439.982
TP112	508963.2	569317.7	421.721
TP113	508991.1	569223	424.485
TP114	509058	569150.9	427.957
TP115	509118	569067.1	430.07
TP116	509174.1	568975.8	434.473
TP117	509229.5	568883.4	446.359
TP118	509255.6	568815.7	452.81
TP119	509261.7	568741	459.188
TP120	509193.6	568677.4	457.16
TP121	509126.1	568594	458.915
TP122	509385	568995	471.48
TP123	509438	569079.9	478.083
TP124	509474.5	569162.7	487.501
TP125	509527	569237	487.574
TP126	509566.1	569312.9	489.38
TP127	508839.2	569448	404.608

**TRIAL PIT****As Built Coordinates**

TP128	508816.2	569339	404.066
TP129	508750.6	569159.8	392.109
TP130	508751.7	569058.4	384.909
TP131	508687.3	568932.9	364.065
TP132	508718.1	568865.9	360.44
TP133	508635.9	568809.8	341.279
TP134	508549.9	568762	333.792
TP135	508450	568741	324.539
TP136	508359	568701	317.068
TP137	508271	568649	322.08
TP138	508182.1	568601	335.782
TP139	508091.1	568564.1	342.941
TP140	507991	568570	338.379
TP141	507898.1	568603.6	325.913
TP142	507797.8	568600.9	338.276
TP143	507700.9	568586	347.583
TP144	507598	568607	365.695
TP145	507488	568608.1	378.776
TP146	507312	568765	418.993
TP147	507206	568787.1	434.645
TP148	507259	568895.7	439.812
TP149	507368.1	568892.9	425.262
TP150	507388.2	568968.1	432.384
TP151	507106.9	568815	450.44
TP152	507024.6	568828.8	462.161
TP153	506997.7	568897.2	466.809
TP154	506955.5	568976.1	472.4
TP155	507185.1	569035.5	464.461
TP156	507253	569151	465.517
TP157	507174.8	569122.4	473.798
TP158	507084.2	569200	490.331
TP159	506997.5	569211.9	500.434
TP160	506904.4	569274.1	512.344
TP161	506817.5	569308.8	524.475
TP162	506752.7	569387.8	535.749
TP163	506715.9	569463.2	543.535
TP164	506695.5	569550.3	547.985
TP165	506660.5	569647.1	544.949
TP166	506645.1	569739.2	532.316
TP167	506710.5	569789	518.608
TP168	506732.1	569897	503.888
TP169	506747.7	569985.7	491.734
TP170	506852.1	570103.5	493.667
TP171	506942.8	570243	473.2
TP172	507026.4	570292.7	461.727
TP173	507130.9	570323.4	443.075
TP174	507211.3	570373.7	425.216
TP175	507294.2	570425.2	404.809
TP176	507390.9	570451.6	395.457
TP177	507488.7	570475	394.659
TP178	507588.3	570495.4	392.396
TP179	507664.7	570553	388.672
TP180	507736.1	570594.4	385.454
TP181	507834.4	570626.7	377.903
TP182	507914.1	570680.6	371.287
TP183	508027	570697.9	363.884
TP184	508080	570651.7	355.466
TP185	508044.9	570558.3	348.874

**TRIAL PIT****As Built Coordinates**

TP186	507906.5	570413.8	348.315
TP187	507801.2	570384.4	358.255
TP188	507720.8	570335	361.552
TP189	507601.6	570633.6	397.45
TP190	507421.8	570643	393.77
TP191	507317.7	570654.7	385.489
TP192	507225.4	570695.7	376.924
TP193	507038.6	570663.9	396.537
TP194	506938.5	570667.4	399.517
TP195			
TP196	507669.4	570668.7	393.872
TP197	507580.5	570705.8	394.705
TP198	507481.1	570729.3	382.571
TP199	507382.7	570725.8	379.087
TP200	507277.8	570722.6	372.371
TP201	507175.6	570733.9	371.07
TP202	507077.2	570732.2	376.271
TP203	506979.6	570753.9	377.43
TP204	506875.1	570763.4	379.185
TP205	506769.8	570766.6	362.581
TP206	506672.2	570763.6	355.116
TP207	506579.3	570765.3	350.703
TP208	506465.3	570758.3	339.98
TP209	506368.6	570763.7	337.84
TP210	506274.6	570775.4	333.464
TP211	506168.2	570762.3	334.387
TP212	506068.2	570760.7	336.463
TP213	505981.5	570770.8	339.499
TP214	505890	570820.3	342.152
TP215	505856.5	570903.6	345.597
TP216	505857.7	570991.7	348.527
TP217	505937.7	571042.7	348.013
TP218	506025.2	571096.9	346.371
TP219			
TP220			
TP221			
TP222			
TP223			
TP224			
TP225			
TP226			
TP227			
TP228			
TP229			
TP230			
TP231			
TP232			

**TRIAL PIT****As Built Coordinates**

TPB001	509867	570495	387.423
TPB004	508349.8	568636.5	334.379
TPB005	506762.8	570062.5	494.695
TPB006	506826.3	570043.2	492.4
TPB007	506857.2	570182.7	483.498
TPB008	506911.1	570146.3	495.052
TPT001	509175	571570.9	314.129
TPT002	509277.1	571309.5	339.233
TPT003	509369	571100	324.96
TPT004			
TPT005	509833.9	570492	384.785
TPT006	510139.9	570255.9	405.105
TPT007	510054.6	569917.9	368.328
TPT008	508884.5	569921.6	395.835
TPT009	508634.7	569564.6	380.938
TPT010	509093.5	569730.7	389.909
TPT011	508800.9	569250.9	403.578
TPT012	509206.8	569326.2	453.921
TPT013	509637	569384.9	492.984
TPT014	509316	568913	459.138
TPT015	509071.9	568548.1	452.797
TPT016	507397.1	568681.1	397.608
TPT017	507110.3	568974.1	459.903
TPT018	507513.2	569026.9	414.238
TPT019	507320.7	569285.3	464.063
TPT020	507620.7	570307	370.437
TPT021	507972.4	570471.2	349.275
TPT022	507524.5	570619.4	398.216
TPT023	507134.5	570664.2	384.427
TPT024	506734.1	570566.2	401.084



## APPENDIX D

### Correspondence from Byrne Looby

19<sup>th</sup> August 2015

Ref: B1323/2\_GEO\_L01\_01

## BY E-MAIL

Ms. Susan Stack,  
ESB International.

Re: **Grousemount Wind Farm – High Level Review**

Dear Susan,

ESB International (ESBI) have requested that ByrneLooby carry out a high level review of their Peat Stability Risk Assessment (PSRA) for the proposed Grousemount Wind Farm in County Kerry.

ESBI have requested a high level review of their PSRA, with ByrneLooby to review a selection of the proposed roads and turbines in areas deemed most onerous in terms of peat stability. ESBI have not assessed any of the areas where peat was found to be less than 0.5m deep during the trial pit investigations. The following defines the scope of the review which is presented in this letter:

- The basis of the Peat Stability Risk Assessment.
- Adequacy of the mitigation measures in relation to peat storage
- Comment on the conclusions and recommendations
- Comment on the factual information in the PSRA worksheets

### Statement of Expertise:

ByrneLooby have over 15 years' experience of design and risk mitigation in upland peat environments on Wind Farms and other developments in Ireland and abroad. The site walkover survey for Grousemount Wind Farm was carried out by an engineer from ByrneLooby with more than 5 years similar experience of peat stability assessments for wind farms in Ireland. The project director for the works has over 20 years' experience of similar projects in both design and expert witness roles.

### Initial Comment:

Following the high level review, ByrneLooby can confirm that ESBI's overarching approach to the preliminary stage PSRA has used industry best practice in line with the recommendations of the Scottish Executive document titled 'Peat Landslide Hazard and Risk Assessment: Best Practice Guide for Proposed Electricity Generation Developments' (2006). This included targeted site investigations which considered all the proposed infrastructure, site drainage considerations and minimisation of risk.

The preliminary work which has been carried will allow development of a geotechnical risk register and detailed design of the proposed wind farm while minimising risk of peat instability in line with industry best practice. This approach should be continued into the detailed design stage.

## Information Provided:

In terms of ground investigations, the majority of the planned trial pits and a number of peat probes have been carried out and made available to ByrneLooby for the purposes of the review. Rotary coring is currently being carried out, with results not yet available for review.

Byrne Looby have been provided with the following information by ESBI for the purposes of carrying out the PSRA review:

- ESBI drawings as follows;
  - Barnastooka Wind Farm Site Location Map – W78035-F105-010-D-0002\_0
  - Barnastooka Wind Farm Site Investigation Locations – W78035-F105-010-D-0003\_1
  - Grousemount Wind Farm Site Location Map – W78035-F105-010-D-0004\_0
  - Grousemount Wind Farm Site Investigation Locations – W78035-F105-010-D-0005\_1
  - Grousemount Wind Farm Main Works Contract Site Layout Drawings Sheets 1 to 7 – QR320171-MWC-P-1003 (July 2015)
- IGSL Trial Pit records for Grousemount Wind Farm – Report No. 18312 (April 2015)
- ESBI Draft Peat Stability Risk Assessment Report – W78035-F105-018-R-0001 (August 2015)

The initial work undertaken to carry out this review involved a walkover survey and review of the available site investigation information to allow the PSRA's carried out by ESBI to be reviewed.

Following this, the draft PSRA report has been reviewed with a view to assessing the risk methodology adopted and to confirm that acceptably low risk proposals for storage of peat are proposed.

ByrneLooby have reviewed 25 of the PSRA's carried out by ESBI in detail (6 No. turbine locations and 19 No. access tracks). The selection was based on the most onerous locations in terms of the initial risk ratings that were assigned by ESBI. Most of the locations reviewed were given a 'significant' risk rating prior to mitigation measures.

## Walkover Survey:

A site walkover survey was completed by two engineers from ByrneLooby on 22<sup>nd</sup> to 24<sup>th</sup> June 2015. During the survey all of the proposed turbine locations and access road routes were



walked and assessed, excluding those where ESBI had indicated peat depths were less than 0.5m and thus had not carried out PSRA's.

At the time of the walkover, only trial pits located in accessible areas had been completed on site and no further intrusive works had been undertaken on site. Therefore, Byrne Looby used GPS co-ordinates of the completed and proposed site investigations as well as the ESBI site layout maps to estimate the location of the roads and turbines.

The assessments completed by ByrneLooby included peat probing in selective areas and general visual assessments along roads and at turbines. This included noting topographical features such as slope characteristics, gradients and existing drainage ditches etc. Other parameters relevant to the PSRA's were also noted where evident.

It should be noted that the Everwind Wind Farm site was not assessed as part of the walkover survey. This is a small additional site not connected to the main Grousemount Wind Farm. For the purposes of the high level review at this preliminary stage, it was not required to review the entire site.

#### Existing Conditions:

No development has been undertaken on the proposed wind farm sites to date. The existing conditions on site are typically undisturbed upland peat and rock outcrops. The peat was typically underlain by a grey glacial till material which could be variously described as sandy gravelly Silt/Clay or very clayey/silty Sand and Gravel with occasional cobbles.

The peat was shallow and appeared to be relatively dry (moisture content <1000%) on most of the slopes, with deeper upland blanket bog on some of the flatter topographies. Terraces of peat which appeared to be held in place by the rock cleavage were also common on some slopes.

The bedrock on the site appeared to be Sandstone and Siltstone, based on inspection of outcrops.

Vegetation on the site was consistent throughout the proposed development areas of the site. Typically well-established grassland which was stocked with sheep was prevalent across the mountains in question. In some wetter areas, rushes and moss/spagnum were more evident; however there was no significant change with grass dominant in all areas. Sparse heather was also found locally at higher elevations.

Drainage on the site consisted of man-made drainage ditches typically running downslope and small streams flowing towards the two main watercourses, both of which combined into the Roughty River before leaving the site.

Summary:

Conceptually, the basis of the proposed mitigation measures is deemed to be adequate and in line with industry best practice. However, some of the finer points of implementing these mitigation measures will need to be teased out during detailed design to ensure that the proposed solutions can be practically implemented at Grousemount during the construction phase.

For the purposes of the planning stage high level review, ByrneLooby are satisfied that the PSRA carried out by ESBI is generally adequate.

It should be noted that this is a high level review with spot checking of the factual information in some of the PSRA's only. We are not verifying the accuracy of all factual data.

If you have any questions on the information outlined above do not hesitate to contact me.

Yours sincerely,

for  
Byrne Looby Partners



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Paul Stephenson BEng. CEng. MIEI.  
Senior Project Engineer