Planning and Environmental Consultants

Environmental Impact Assessment Report

Derrybrien Wind Farm Development Decommissioning Project –

Prospective Development

Volume 2b: EIAR Appendix 8-2 (Part 1)

APPENDIX 8-2

GEOTECHNICAL STABILITY REPORT - WIND FARM SITE (PART I)

AGL CONSULTING
GEOTECHNICAL ENGINEERS

DERRYBRIEN WIND FARM
GEOTECHNICAL STABILITY REPORT & ASSESSMENT OF STABILITY IMPACTS OF ON-SITE ACTIVITIES

for

ESB Engineering & Major Projects
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Co. Dublin

5th December, 2024

Document Approval Form

DERRYBRIEN WIND FARM
GEOTECHNICAL STABILITY REPORT & ASSESSMENT OF STABILITY IMPACTS OF ON-SITE ACTIVITIES

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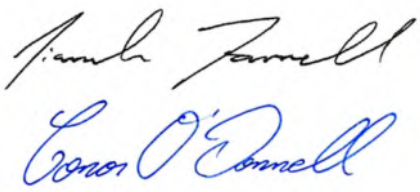
Made:	Conor O'Donnell / Niamh Farrell	
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DERRYBRIEN WIND FARM
GEOTECHNICAL STABILITY REPORT & ASSESSMENT OF STABILITY IMPACTS OF ON-SITE ACTIVITIES

Non-Technical Summary

This report presents an assessment of the impacts of site activities for the Derrybrien Wind Farm that have an effect on the stability of the receiving soils, geology and land (i.e. stability impacts). The assessment has been carried out in accordance with the 2022 *EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*.

An *impact* is defined here as an action from a site activity that results in a change to the receiving soils, geology and land. The *effect* of that impact is the change that occurs. *Stability impacts* increase or decrease the risk of instability on the site, depending on whether they are *negative* or *positive* impacts.

The Derrybrien wind farm is located at the peak of Cashlaundrumlahan Mountain in the Slieve Aughty Mountains near Gort, Co. Galway. The baseline conditions for soils and geology on the wind farm site in 1998, prior to construction, were characterised by a continuous cover of upland blanket bog comprised of very soft peat over clayey glacial till and Sandstone/Siltstone bedrock. Much of the site is characterised by flat or gently sloping ground with slope angles <3-5°. There are steeper slopes >5.0-7.5° on the south side of the wind farm, along the northern site boundary, and locally along the edges of the broad flat terraces on the north side of the site. The depth of peat on the site ranged from 1-6m, with the deeper peat (>3m) located on the flat or gently sloping terraces. The depth to rock typically ranged from 3.0 to 6.2m. Prior to construction of the wind farm most of the site and surrounding land downslope from the wind farm had been used by Coillte for commercial coniferous forestry. The open area at the east end of the site was used for peat harvesting and is sub-divided into turbary plots.

On the Derrybrien Wind Farm, activities that have negative impacts on the stability of the receiving soils, geology and land typically involve temporary or permanent loading on the surface of the blanket bog that covers the site. For example, where peat and glacial till excavated from the turbine foundations were placed or "sidecast" on the intact peat slopes adjacent to the excavations, the *stability impact* was the surcharge load that was applied to the surface of the peat due to the weight of the materials. The corresponding *effect* on the peat was the increase in stress that occurred under the applied loads, which could potentially have triggered a failure where the stresses exceeded the strength of the peat. Failures could range from a local bearing failure in very weak peat under a concentrated load, to a large peat slide on the slopes such as that which occurred at the site during construction on the 16th October, 2003.

Stability impacts of the wind farm site activities on the receiving soils, geology and land have been assessed at key stages of the project life cycle as:

- *Impacts that have occurred*, i.e. during construction (2003-2005) and during the operation and maintenance phase of the project up to the end of Q1 2022;
- *Impacts that are occurring*, i.e. impacts from construction or from the operation and maintenance phase of the wind farm that are still occurring during the ceased operation phase (2022-2024); and
- *Impacts that are likely to occur*, i.e. during or after decommissioning of the wind farm in 2025.

The *effects* of stability impacts on the peat have been qualitatively assessed as a function of:

- The characteristics of the site activity and the corresponding impact on the peat (e.g. the location, magnitude, extent, frequency and duration of surcharge loading on the peat);
- The quality of the impact (i.e. positive or negative impacts with respect to stability);
- The likelihood of a peat failure occurring as a result of the impact on the peat; and
- The possible extent and characteristics of a peat failure.

The characteristics of the site activities and the impacts on the peat are based on comprehensive records from construction and from the operation and maintenance phase of the wind farm up to Q1 2022, which are summarised in this report. Both positive and negative stability impacts have been assessed.

The probability of a peat failure occurring is a function of the characteristics of the site as well as the effects of stability impacts of site activities on the peat. Therefore, a Peat Stability Risk Assessment (PSRA) has been carried out for the wind farm site to interpret the likelihood of a peat slide in zones across the site based on factors that are relevant to peat stability such as topography, peat depth, peat strength, hydrology, and groundwater conditions.

The assessment has been carried out in accordance with the best practice guidelines in the report - "*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition, April 2017)*", by the Scottish Government Energy Consents Unit. The method of risk assessment is also consistent with the Institution of Civil Engineers' publication outlining UK best practice in "*Managing Geotechnical Risk*" (Clayton, 2001).

The likelihood of a peat failure occurring for each site activity has been assessed based on the results of the PSRA and on the characteristics of the stability impacts. For recurring activities, the likelihood of a peat slide has also been reassessed at key stages of the project to take account of improvements in site conditions that occur over time, such as the increase in the strength and stiffness of the peat under the floating roads, and the medium to long-term effects of the drainage improvements, which reduce the risk of a peat slide – a positive stability impact.

For this project, the possible extent of a peat slide and the characteristics of the soils, geology and land potentially impacted by a slide have been calibrated by the very large peat slide that occurred at the wind farm site in October 2003, which has reasonably been considered the worst case scenario. Consideration has also been given to the smaller more localised peat failures that occurred in a few areas on site during construction, which had a significantly lower impact on the peat.

Table NTS-1 gives a summary of the stability impacts that had significant effects on the stability of the peat for the different phases of the wind farm project. The *significance* of the effects reflects the likelihod of a peat failure occurring as a result of a stability impact as well as the baseline *sensitivity* of the receiving soils, geology and land potentially impacted by a peat failure.

All of the stability impacts that have significant effects on the receiving soils, geology and land relate to the blanket bog that covers the wind farm site and surrounding area. Prior to construction of the wind farm the bog had been degraded by drainage, forestry plantations and peat harvesting. Therefore, the baseline sensitivity of the soils, geology and land that could be impacted by the project has been assessed as MEDIUM based on a combination of the ecological value of the bog, the significance of carbon storage in the peat and the value of the land for forestry, agriculture and turbary rights. There are no recorded Geological Heritage Sites in the area.

In general, the stability impacts with the most significant effects occurred during the construction stage of the project when there would have been a higher level of activity on the wind farm site, particularly prior to the large peat slide that occurred at the site in October 2003. The impact of site activities reduces significantly over the project life cycle from the second phase of construction after the peat slide (2004-2005), through the operation and maintenance phases of the project (2005-2022), to decommissioning in 2025.

During the first phase of construction, prior to the peat slide on the 16th October 2003, the stability impacts with *significant effects* were related to the construction of the site access tracks as “floating roads” directly on the peat, the construction traffic loading on the floating roads, and the sidecasting of excavated materials on the intact peat slopes adjacent to the turbine foundation excavations.

Over 15km of new site access tracks were constructed as floating roads across the site and the majority of these were completed prior to the peat slide. The roads were constructed of 0.6-1.0m of crushed rock

granular fill reinforced with geogrids and a basal layer of small trees and branches directly on the surface of the peat. There was an additional live load surcharge on the peat from the construction traffic operating on the road at the time, which was comprised of the dump trucks, mechanical excavators, concrete trucks and 4-axle tipper trucks that were being used to construct the roads and turbine foundations. Prior to the slide, excavation to suitable formation on rock had been completed or partially completed at 43 No. turbines and the excavated peat, glacial till and occasionally weathered rock were sidecast on the intact peat slopes adjacent to the excavation.

No peat failures occurred under the floating roads. However, at the excavations for the turbine foundations there was a local bearing failure in the peat under the sidecast materials at Turbines T23, T29 and T66, and a small scale peat slide occurred at Turbine T17. At the time of the very large peat slide on the 16th October, 2003 excavation was underway at Turbine T68 and the excavated materials were being sidecast on the slope downslope from the turbine, where the slide is thought to have initiated. The loading from the sidecast materials has been attributed with triggering the slide, although there were a number of other contributory factors related to the topography, hydrology and peat strength in the area that made the location particularly susceptible to a peat failure, as discussed in this report.

In comparison, the stability impacts from other activities that were being carried out on the wind farm site at the time only had *slightly significant* effects on the stability of the peat. These included the live load surcharge from low ground bearing pressure construction and forestry equipment operating directly on the peat, the vibrations induced by rock blasting in the main borrow pit, and the local stability of temporary peat slopes around the perimeter of the turbine foundation excavations.

Poor drainage is a recognised risk factor for peat instability because it can lead to elevated groundwater pressures within the peat during periods of heavy or sustained rainfall that can contribute to peat failures. Therefore, the improved drainage on the wind farm site is a sustained positive stability impact and the effect on the stability of the peat is *moderately significant*.

For the second phase of construction after the peat slide there was a significant reduction in the effects of stability impacts due to some improvement in conditions on the wind farm site under sustained surcharge loads from the first phase of construction, but primarily as a result of additional risk mitigation measures that were implemented on the site after the peat slide, including:

- Supplemental geotechnical investigations and stability analyses;
- Controlled management and disposal of spoil from turbine excavations;
- Inspection, supervision and monitoring by geotechnical engineers; and
- Full-scale proof testing on all of the floating roads.

The stability impact for the remaining floating roads that had to be completed on the site, and the live load surcharge from the construction traffic on the roads still had a *significant effect* on the stability of the peat. However, geotechnical investigations and stability analyses confirmed that the stability of the roads was acceptable prior to resuming construction. Also, the effect of the live load surcharge from the construction traffic on the roads reduced to *moderately significant* after full-scale proof load tests had been carried out on the roads to verify their capacity under the design loads for the construction traffic and for the large mobile crane that was used to erect the turbines.

Excavated materials were removed from the slopes where the local peat failures occurred at Turbines T23, T29 and T66, and in other areas where there were concerns for the stability of the peat (T18 & T34). The materials were left in place on the slopes at all of the other turbines where the foundation excavations had been completed at the time of the slide. However, the highest risk of peat instability was at the time that the materials were placed on the slopes. Over time the peat compressed and increased in strength under the weight of the material so that the effect of the load on the stability of the peat reduced to *moderately significant* for the second phase of construction.

For the remaining excavations that needed to be completed for the turbines, crane hardstandings, substation site, borrow pits and anemometer mast foundations, all of the excavated peat was stored up to a maximum depth of 1.0m in designated repository sites on the peat in low risk areas of gently sloping

or flat ground within the wind farm site. Geotechnical investigations and stability analyses were carried out to confirm that the stability of the sites was acceptable so that the effect of the dead load surcharge of the peat on the stability of the intact peat slopes was only *slightly significant*. Excavated glacial till and weathered rock were stored in the borrow pits with a negligible effect on site stability.

Other stability impacts that had a *slightly significant* effect on the stability of the peat during the second phase of construction included the live load surcharge from low ground bearing pressure construction and forestry equipment operating directly on the peat, the vibrations induced by rock blasting in the main borrow pit, the local stability of temporary peat slopes around the perimeter of the remaining turbine foundation excavations, and miscellaneous localised live loads on the peat slopes from work related to tree felling, drainage and cable-trenching. The positive impact of drainage was sustained with further improvements during the second phase of construction, which had a *moderately significant* effect on the stability of the peat relative to the baseline conditions on the wind farm site prior to construction.

The site activities during the operation and maintenance phase of the wind farm between 2005 and the end of operation in Q1 2022 had a much lower impact on site stability. There were no negative stability impacts that had *significant* or *moderately significant* effects on the stability of the peat. Construction traffic loading on the floating roads was less frequent than during construction and the size of the mobile cranes that were used to service the turbines was kept to a minimum. Also, the performance and capacity of the road continued to improve due to the increase in the strength and stiffness of the underlying peat, which compressed under the weight of the roads. Therefore, the live load surcharge of the vehicles on the floating roads only had a *slightly significant* effect on peat stability.

4.5km of the floating roads were upgraded and re-surfaced in 2014 with an additional layer of crushed rock granular fill reinforced with geogrids. The thickness of the fill material was minimised to reduce the additional dead load on the roads, and all of the upgraded roads were proof tested to the design crane load on completion to verify their capacity and performance. Therefore, the effect of the additional dead load on the stability of the peat was *slightly significant.*

Other routine activities to carry out maintenance on the drainage network, installation of new fibre-optic cables, and felling of small trees that had re-grown on the site involved occasional live load surcharges on the intact peat slopes from low ground bearing pressure machines that had a *slightly significant* effect on the stability of the peat.

Between 2016 and 2018 trees were clear-felled for the project over an area of approximately 46ha in the mature conifer plantations on the west side of the wind farm, just outside the site boundary. The impact of the temporary localised surcharge loads from the forestry equipment operating on the peat, and from the temporary stockpiles of timber on the wind farm site also had a *slightly significant* effect on the stability of the peat. The effect of the surcharge loads from the short sections of forestry access tracks that were constructed at Turbines T3 and T19 to access the conifer plantations was also *slightly significant.*

Maintenance was carried out on the site drainage network to preserve the capacity and efficiency of the existing system to sustain the *moderately significant* effect of the positive impact on the stability of the peat relative to the baseline conditions on site prior to construction. Most of the significant maintenance works were completed prior to 2012. After that only minor works were required.

Decommissioning the wind farm in 2025 will involve de-energising the electricity cables and dismantling and removing all of the above ground elements of the wind farm including the turbines, substation, control building, anemometer masts and overhead power lines. Most of the heavy lifting work will be carried out on the granular hardstanding areas at the turbine and substation sites which are constructed of crushed rockfill on the glacial till below the peat and are designed to support the heavy loads. Therefore, there will be no significant or moderately significant effects on the stability of the peat during decommissioning.

The primary stability impact of the decommissioning work will be the live load surcharges on the floating roads from the construction vehicles, trucks, low-loader transporters and mobile cranes that will be used to dismantle the turbines and substation and transport the components off site for re-use, recycling or disposal in a suitably licensed facility. The loads will not exceed the design load for the floating roads, which has been verified by full-scale load tests. Therefore, the effect of the live load surcharge on the stability of the peat will be *slightly significant*. There will also be temporary localised surcharge loads on the peat along the overhead line from the LGBP wide-tracked excavators, ATV and forestry equipment that will be used to take down the cables and timber polesets. These will also have a *slightly significant* effect on the stability of the peat.

It may be necessary to temporarily widen the narrow turbary road between Turbines T31 and T45 and between T43 and T46 to provide safe access for the mobile crane to dismantle the turbines. Minor works may also be required to locally widen the existing floating road near junctions at Turbines T68, T14 and T1, and to extend the crane hardstanding at T4 to facilitate the long vehicles that will be used to transport the turbine components offsite. The floating roads will be widened with an additional layer of crushed rockfill, which will be reinforced with geogrids and supported on timber bog mats along the edge of the existing road. This will only involve a small increase in load on the peat along the edge of the road, which will only have a *slightly significant* effect on peat stability. The extension to the hardstanding will also be constructed as a short section of floating road, which will also only have a *slightly significant* effect on peat stability. The additional rockfill and temporary bog mats in these areas will be removed after decommissioning so that the effect will only be temporary.

Dismantling the 110kV OHL and timber polesets between PS-1 and PS-4 will involve some work on the peat. Existing Coillte forest roads will be used for access wherever possible and LGBP hydraulic excavators and ATV will be used for the work on the peat. Therefore, this will only have a *slightly significant* effect on peat stability along the OHL.

After decommissioning the site access tracks, turbine foundations, material deposition areas, peat repository sites and granular hardstanding areas at the turbines and substations will all be left in place along with all the electrical transmission and fibre-optic control cables that have been direct buried in the peat across the site and in ducts at road crossings (the Retained Development). The existing drainage network will also be left in place. It is not proposed to block any of the drains or re-wet the site.

There will be no activity related to the wind farm on the site after decommissioning. The reinstated site with the Retained Development will be returned to the landowner and Gort Wind Farms Ltd. (GWFL) will have no involvement in future land use or site activities. Therefore, the primary mitigation measure that will be used to mitigate post-decommissioning and residual impacts of the Retained Development on soils, geology and land in the project area is in the compilation and handover of the **Safety File** for the site to the landowner by GWFL.

The Safety File will provide the landowner with all relevant information necessary to make informed decisions on the maintenance and safe use of the Retained Development post-decommissioning. It will include comprehensive construction records from the decommissioning works as well as the design and as-built details for all the elements of the windfarm that will be left in place after decommissioning.

Provided that future uses of the Retained Development do not exceed the original design criteria, the sustained surcharge loads on the peat from the floating roads, peat repository sites and the material deposition areas will not have a significant effect on the stability of the peat after decommissioning.

The turbine foundations and granular hardstanding areas are constructed on the glacial till and rock below the peat so they will also not have a significant negative effect on site stability. They will provide some support to the peat upslope from the turbines, which is a **Slightly Significant *positive*** effect on peat stability. This would be a long-term permanent effect as the reinforced concrete turbine foundations and granular hardstand areas would not be expected to deteriorate and disintegrate over time. However, the site stability is not dependent on this support.

The improved drainage network on the wind farm site will continue to have a sustained positive effect on peat stability post decommissioning that is **Moderately Significant** relative to the baseline conditions on the site prior to construction. No maintenance works will be carried out on the drainage after decommissioning. Therefore, the efficiency and capacity of the drains could reduce over time if they become clogged due to vegetation growth. In the long-term this could result in gradual partial restoration of groundwater levels on the site which would reduce the positive effect on the stability of the peat to **Slightly Significant**.

Table NTS-1 – Summary of impacts of wind farm site activities on soils, geology and land that had significant effects with regard to site stability (i.e. Stability Impacts)

	*Stability Impacts with Significant Effects	*Stability Impacts with Moderately Significant Effects	*Stability Impacts with Slightly Significant Effects
Construction Stage – Phase 1 (2003) (prior to peat slide on 16th October, 2003) ***(Impacts which have occurred)***	• Dead load surcharge from floating roads constructed on the peat slopes with 0.6-1.0m of granular rockfill. • Live load surcharge from construction traffic on the floating roads. • Dead load surcharge from excavated peat, glacial till and occasionally weathered rock placed on the intact peat slopes in material sidecast areas adjacent to turbine foundation excavations.	• **[Positive Impact]** Reduction of groundwater levels and groundwater pressures in peat due to improved drainage. • **[Positive Impact]** Rockfill embankments constructed across slide area at T68 and T70, which act as a barrage with a positive effect on stability of disturbed peat within the slide area upslope from the roads. • No negative impacts	• Live load surcharge on peat slopes from low ground bearing pressure construction & forestry equipment. • Local stability of temporary peat slopes around the perimeter of turbine foundation & hardstanding excavations. • Dynamic inertial loading on peat from blast-induced vibrations due to rock blasting in Borrow Pit BP-3. • Miscellaneous localised live loads on peat slopes from work related to tree felling and drainage.
Construction Stage – Phase 2 (2004/2005) (after the peat slide) ***(Impacts which have occurred)***	• Dead load surcharge from the remaining floating roads constructed on the peat slopes with 0.6-1.0m of granular rockfill. • Live load surcharge on the new floating roads from the construction traffic used to construct the roads.	• **[Positive Impact]** Reduction of groundwater levels and groundwater pressures in peat due to improved drainage. • Dead load surcharge on the intact peat slopes from the excavated peat, glacial till and weathered rock in the material sidecast areas in the medium-term as the peat compressed and gained strength under the loads. • Live load surcharge from the construction traffic on the floating roads after the capacity and performance of the roads had been verified by full-scale proof load tests.	• Dead load surcharge from up to 1.0m of excavated peat placed on the peat slopes in designated repository areas. • Local stability of temporary peat slopes around the perimeter of turbine foundation & hardstanding excavations. • Live load surcharge on peat slopes from low ground bearing pressure construction & forestry equipment. • Dynamic inertial loading on peat from blast-induced vibrations due to rock blasting in Borrow Pit BP-3. • Miscellaneous localised live loads on peat slopes from work related to tree felling, drainage and cable-trenching.
Operation & Maintenance Phase 2005-2022 ***(Impacts which have occurred)***	• None	• **[Positive Impact]** Sustained long-term reduction of groundwater levels and groundwater pressures in peat due to maintenance of improved drainage network. • No negative impacts	• Increased dead load surcharge on the peat from crushed rock granular fill used to re-surface 4.5km of floating roads in 2014 (150mm capping + 20mm surfacing), and from the short sections of new forestry tracks constructed at T3 & T19 for clear felling west of wind farm between 2016 & 2018. • Live load surcharge on the floating roads from maintenance vehicles, trucks and mobile cranes used to carry out repairs to the access tracks, turbines and substation; • Occasional live loads on the peat slopes from low ground bearing pressure equipment used for the cable installations, drainage improvements, tree felling (west of the wind farm), and topping/felling small trees on the wind farm site. • Localised surcharge load from temporary timber stockpiles at T3, T19 & Coillte forestry track on west side of wind farm. • One-off localised live load surcharge (10kPa) on the peat from a large mobile crane that went off the road and overturned at Turbine T40 in 2007.

**all stability impacts are negative unless otherwise stated*

Table NTS-1 (Contd.) – Summary of impacts of wind farm site activities on soils, geology and land that had significant effects with regard to site stability (i.e. Stability Impacts)

	*Stability Impacts with Significant Effects	*Stability Impacts with Moderately Significant Effects	*Stability Impacts with Slightly Significant Effects
Ceased Operations Phase (2022-2024) ***(Impacts which are occurring)***	• None	• **[Positive Impact]** Sustained long-term reduction of groundwater levels and groundwater pressures in peat due to improved drainage network – relative to baseline condition in 1998, prior to construction. • No negative impacts	• **None** – i.e. effect of dead load surcharge from the floating roads, peat repository sites and material sidecast areas on the peat is **Not Significant** because the underlying peat has compressed and increased in shear strength under the sustained loads to reduce the risk of a peat slide to **Negligible**.
Decommissioning (2025) ***(Impacts which are likely to occur)***	• None	• None	• Live load surcharge on the floating roads from construction vehicles, trucks, low-loader transporters and mobile cranes used to dismantle turbines and substation and transport the components offsite for re-use, recycle or disposal in a suitably licensed facility. • The additional dead and live load surcharge where the existing floating roads will be temporarily widened at junctions near T1, T14 and T68, and along narrow sections of the tracks in the turbary area between T35 and T45, and between T43 and T46. • Live load surcharge on the peat from LGBP wide-track excavators and ATV that will be used to take down and remove OHL and timber polesets between PS-1a and PS-4.
Stability Impacts after Decommissioning (Residual Impacts) ***(Impacts which are likely to occur)***	• None	• **[Positive Impact]** Sustained long-term reduction of groundwater levels and groundwater pressures in peat due to improved drainage network – relative to baseline condition in 1998, prior to construction. Reduces to **Slightly Significant** over time if drains become clogged by vegetation, resulting in partial restoration of groundwater levels on site. • No negative impacts	• **[Positive Impact]** Permanent support provided to the peat slopes by the turbine foundations and crane hardstandings, which are constructed on rock and glacial till below the peat. **[Note – the stability of the peat slopes does not rely on this effect]** • No negative impacts

**all stability impacts are negative unless otherwise stated*

DERRYBRIEN WIND FARM
GEOTECHNICAL STABILITY REPORT & ASSESSMENT OF STABILITY IMPACTS OF ON-SITE ACTIVITIES

1.0 INTRODUCTION AND METHODOLOGY

1.1 Introduction

This report presents the assessment of the direct impact of on-site activities for the Derrybrien Wind Farm on the receiving soils, geology and land that have an effect on site stability, particularly with respect to the stability of the blanket bog that covers the wind farm site. The results of this assessment are incorporated into Chapter 8 (Soils, Geology and Land) of the Remedial Environmental Impact Assessment Report (rEIAR) for the elements of the wind farm that will be retained after decommissioning (the "Retained Development"). It will also be included in the appendices to Chapter 8 (Soils, Geology & Land) for the EIAR for decommissioning the wind farm (the "Proposed Development").

The methodology that was used for the assessment is based on the guidelines published in the 2022 report by the Environmental Protection Agency (EPA), titled "*2022 Draft EPA Guidelines on Information to be Contained in Environmental Impact Assessment Reports"* (EPA, 2022). Section 1.2 gives further details on the specific methodology that was used.

Section 2.0 of this report presents a characterisation of the baseline ground and groundwater conditions on the wind farm site in 1998, prior to construction. This is based on a review of all of the relevant ground investigation information as well as a comprehensive desk study of available information from published online sources.

Section 2.0 includes an assessment of the baseline sensitivity of the receiving soils, geology and land in the project area based on a combination of factors including the characteristics of the materials (i.e. peat, glacial till or rock), the ecological value of the impacted land, carbon storage potential (peat), geological heritage (glacial till/rock), and land use characteristics.

Stability impacts have been assessed at key stages over the full project life cycle, i.e.:

- ***Impacts that have occurred*** during construction (2003-2005), and during the operation and maintenance phase of the wind farm between 2005 and 2022 are assessed in Section 3.0 and Section 4.0, respectively;
- Section 5.0 presents an assessment of the existing conditions on the site and the ongoing ***impacts that are occurring*** during the ceased operation phase of the wind farm between 2022 and 2024; and
- ***Impacts that are likely to occur*** during and after decommissioning in 2025 are assessed in Section **Error! Reference source not found.** and Section 6.0, respectively.

Each key stage of the project that is assessed in this report includes:

- a comprehensive summary of the site activities related to the wind farm project;
- an assessment of the likely impacts of the activities on the receiving soils, geology and land, and the significance of the corresponding effects on site stability; and
- a summary of the measures that have been or will be implemented on the wind farm site to monitor or mitigate effects on the stability of the peat (i.e. to reduce the risk of peat instability).

For the impacts that have occurred, the details of the activities that were carried out on the wind farm site, and the characteristics of the corresponding stability impacts are based on site records from construction and from the operation and maintenance period of the wind farm between 2005 and 2022. These typically give details of the methodology that was adopted in carrying out works on site, the equipment that was used, the location of the works, and when the works were carried out. The construction records also include details of the monitoring and mitigation measures that were implemented on the site, particularly for the second phase of construction in 2004/2005, after the October 2003 peat slide.

The characteristics of site activities and the corresponding stability impacts that are likely to occur during decommissioning are based on the range of maintenance works that have been carried out on the wind farm site to date, and on the decommissioning plan for the wind farm. Details of these activities are based on the records of similar activities that have already been carried out on the site. The measures that will be implemented to monitor or mitigate the effect of stability impacts on the peat also take into account measures that have already been implemented as standard operation procedures for the likely range of activities on the site.

Section 5.0 presents a summary of the existing conditions on the wind farm site based on a review of monitoring data, site inspections and on-site testing. It also includes an assessment of stability impacts from the construction stage or operation and maintenance period of the wind farm up to Q1 2022 that are still occurring on the site.

No activities will be carried out on the wind farm site for the project after the wind farm is decommissioned. However, some elements of the wind farm will be left in place, including the site access tracks, hardstanding areas, turbine foundations, drainage and the electrical and fibre optic cables that are direct buried in the peat. Therefore, Section 7.0 presents an assessment of the stability impacts of the project on soils, geology and land based on impacts that are likely to occur after decommissioning.

Peat Stability Risk Assessments (PSRA):

This report also includes the results of Peat Stability Risk Assessments that have been carried out for the wind farm site at key stages of the project life cycle. The PSRA is a qualitative engineering risk assessment that is used to assess the risk of a peat slide in defined zones across the site based on the interpreted Likelihood (i.e. probability) of a peat slide in each zone, and the potential Impact of a slide in terms of the loss of habitat and infrastructure within the slide area and the potential downstream impacts of the mobilised peat on the receiving environment. It identifies where there are elevated risk factors with regard to peat instability to determine where mitigation measures are required for site activities to reduce the risk of peat instability to an acceptable level over the life cycle of the wind farm.

For this report the interpreted **likelihood** of a peat slide from the PSRA is an important parameter for the assessment of the significance of effects of stability impacts on the peat for the rEIAR.

Section 2.5 includes a baseline PSRA to characterise the risk of peat instability across the wind farm based on the site conditions in 1998, prior to construction.

In general, it will be shown in this report that the most significant effects of stability impacts on soils, geology and land occurred during the construction stage of the project, particularly up to and including the peat slide at the wind farm site in October 2003. The impact of site activities on the peat and the significance of the corresponding effects on peat stability reduce considerably over the project life cycle from the second phase of construction after the peat slide (2004-2005), through the operation and maintenance phase of the project (2005-2022), to decommissioning in 2025. This is due to changes in the likelihood of a peat slide as a result of:

- Implementation of effective design mitigation measures and alternative construction methods (e.g. alternative methods of spoil management);

- Additional geotechnical investigations, stability analyses, testing, monitoring and geotechnical supervision; and
- Changes to the wind farm site characteristics due to improved drainage and an increase in the strength of the peat under sustained loads on the intact peat slopes (i.e. under the floating roads, peat repositories and material sidecast areas).

Therefore, in this report the PSRA have been reviewed at key stages of the project to re-assess the likelihood of a peat slide for the second phase of construction in 2004/2005 (Section 3.4), and for decommissioning (Section 5.5). The significance of the effects of stability impacts are still assessed relative to the baseline sensitivity of the receiving environment in 1998, prior to construction.

The PSRA have been carried out in accordance with the best practice guidelines for peat landslide risk assessments presented in the report - "*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition, April 2017)*", by the Scottish Government Energy Consents Unit. The method of assessment is also consistent with the Institution of Civil Engineers' publication outlining UK best practice in "*Managing Geotechnical Risk*" (Clayton, 2001). Section 1.3 gives further details on the specific methodology that was used.

1.2 Methodology for Assessing the Significance of Effects of Stability Impacts in accordance with EPA Guidelines.

The baseline date for the site conditions used in the assessment of stability impacts is 1998, prior to the construction of the wind farm. All available information was used to establish the baseline conditions for the soils, geology and land on the wind farm site and in areas off-site that could be impacted by a peat slide. This included a comprehensive desk study of available information from published sources as well as a review of all the relevant ground investigation information.

The desk study included a review of historical aerial photographs, LiDAR topographical survey data, and relevant information on ground and groundwater conditions, bedrock geology and Geological Heritage Sites from the Geological Survey of Ireland (GSI) the Environmental Protection Agency (EPA) and the Ordnance Survey of Ireland (OSI).

Additional ground investigations were carried out during the construction stage of the wind farm in 2004/2005, after the peat slide, to supplement the original investigations for the wind farm prior to construction, which were completed in 2001. The majority of the information from the construction stage investigations would also be representative of the conditions on the wind farm site prior to construction, particularly outside the slide area and where the ground conditions were not impacted by the project. Therefore, all of the relevant information from these investigations was used to establish the baseline site conditions.

The baseline sensitivity of the receiving soils, geology and land impacted by the project has been assessed on a 7-point scale from **Negligible** to **High** based on a combination of a number of factors including the characteristics of the materials (i.e. peat, glacial till or rock), the ecological value of the impacted land, carbon storage potential (peat), geological heritage (glacial till/rock), and land use characteristics. In assessing the impact of a peat slide related to activities on the wind farm site for the project, consideration has also been given to the characteristics of the receiving soils, geology and land outside the site that could be directly impacted by a slide.

In this report:

- An **'Impact'** is defined as an action from a site activity that results in a change to the receiving soils, geology and land e.g. for construction of the turbine foundations the impact on the receiving soils, geology and land is the excavation of the peat and glacial till to construct the foundation on the underlying rock.

- The **'Effect'** is defined as the change or changes to the soils, geology and land resulting from that impact, e.g., the changes to the characteristics of the peat and glacial till that occur after they are excavated.

Stability impacts of the project on soils, geology and land have been assessed over the full project life cycle under three categories:

- Impacts that have occurred;
- Impacts that are occurring; and
- Impacts that are likely to occur.

The first category relates to impacts that occurred during the construction of the project between 2003 and 2005 as well as during the operation and maintenance period of the wind farm between 2005 and the end of 2020. The assessment of impacts over this period is based on a comprehensive record of activities that were carried out on the site and any related impacts that occurred, including the peat slide that occurred at the wind farm site during construction in October 2003.

The second category relates to impacts from the construction, operation and maintenance stages of the wind farm between 2005 and Q2 2022 that are still occurring at the end of 2024. These are typically ongoing long-term impacts such as groundwater lowering due to improved drainage, or permanent and sustained surcharge loads on the intact peat slopes from site access tracks or material deposition areas that were left in place at the end of construction.

The third category relates to impacts that are likely to occur on the wind farm site during decommissioning. It includes an assessment of the impact of activities that are likely to be carried out on the site over that period based on the nature and scope of the maintenance works that are anticipated or could be required, and based on the proposed decommissioning plan.

The methodology that was used for the assessment is based on the guidelines published in the 2022 report by the Environmental Protection Agency (EPA), titled "*2022 EPA Guidelines on Information to be Contained in Environmental Impact Assessment Reports"* (EPA, 2022).

This primary purpose of this report is to assess the direct impact of on-site activities for the wind farm on the receiving soils, geology and land that have an effect on site stability, particularly in relation to the blanket bog that covers the site. These impacts are referred to here as "stability impacts", i.e.:

- ***Direct Impacts*** of site activities are those that are assessed based on the direct physical impact on the receiving soils, geology and land use.
- ***Stability impacts*** are direct impacts where the effect on the receiving soils, geology and land increases or decreases the risk of instability on the site, typically in the peat, potentially triggering a large peat slide as a worst case scenario.

For example, where peat and glacial till were excavated for the turbine foundations and placed on the intact peat slopes adjacent to the excavations (i.e. sidecast), covering the peat habitat with the excavated material was a **direct impact** of the works on the receiving soils, geology and land.

However, sidecasting the excavated materials also applied a dead load surcharge on the surface of the intact peat slopes due to the self-weight of the materials. This is a **stability impact**, i.e. the primary effect of the impact is the increase in shear stress in the underlying peat, which increases the risk of a peat failure, potentially triggering a peat slide on sloping ground where the magnitude of loading is such that the downslope shear stresses exceed the shear strength of the peat.

The methodology for the assessment of stability impacts is illustrated on Figure 1-1. To identify site activities that have a higher risk of triggering a peat slide, the effects of stability impacts have been qualitatively assessed on a 7-point scale from **Negligible** to **High** as a function of:

- The characteristics of the site activity and stability impact (e.g. the magnitude, extent, frequency and duration of loading on the peat)
- The quality of the effect on the receiving soils, geology and land with respect to site stability [i.e. negative (increases risk of peat instability), or positive (reduces risk)];
- The probability of a peat failure occurring as a result of the effect; and
- The possible nature and extent of a peat failure.

Characteristics of Stability Impacts: In the majority of cases the stability impact of site activities involves a dead or live load surcharge on the intact peat slopes. The magnitude, extent and frequency of loading is a function of the characteristics of the site activities, which have been assessed based on the comprehensive site records from the construction stage of the project and from the initial operating phase of the wind farm to date. For impacts that are likely to occur over the remaining design life of the project, the characteristics of site activities and the corresponding stability impacts are based on the range of maintenance works that have been carried out on the site to date, and on the decommissioning plan for the wind farm. The probability of occurrence of the impacts is also considered.

Where appropriate, stability impacts of different site activities in the same part of the site have been assessed in-combination to determine the significance of the effect. For example, the effect of the live load surcharge from construction traffic on the floating roads has been assessed in combination with the dead load surcharge from the road itself, which was constructed directly on the peat. Also, in assessing the impact of material sidecasting on the intact peat slopes, consideration has also been given to the fact that the material was typically placed adjacent to the floating roads with the excavators operating on the roads, which would have led to a concentrated combined surcharge loading and activity on the peat slopes in those areas at the time.

In some cases it was not appropriate to assess impacts in combination. For example, while consideration has been given to the magnitude, frequency and duration of construction traffic loading on the floating roads for each activity, the live load surcharges from different site activities have not been combined because they do not lead to a cumulative loading on the road, i.e. the roads were not wide enough to accommodate two-way traffic. Furthermore, not all of the activities were carried out in the same part of the site or at the same time. For example, while excavations for some of the turbine foundations were active while the construction of the floating roads was being completed, they were typically being carried out in different parts of the site due to logistical constraints and traffic control. The heavy surcharge loading on the floating roads from the mobile cranes that were used to erect the turbines would also have occurred after the turbines and crane hardstandings had been completed. Site activities related to the 110 kV overhead line and Agannygal Substation were remote to the wind farm site.

Fundamentally, site activities that were carried out in different parts of the site or at different times did not have a combined stability impact on the peat. However, where activities that were carried out in the same area and at the same time did have a combined stability impact then this has been considered in the assessment.

Quality of Impact: The direct physical effect of surcharge loads on the peat slopes involves an increase in shear stresses in the peat, which increases the risk of a peat failure, potentially triggering a large peat slide as a worst case scenario. Therefore, surcharge loading has a **negative** impact on the peat with respect to site stability. Site activities that have a **positive impact** on the peat with respect to site stability are those which reduce the risk of peat failure e.g. drainage improvements that reduce groundwater pressures within and below the peat and increase the strength of the peat where the groundwater table is lowered; or activities such as tree felling that involve unloading the peat slopes.

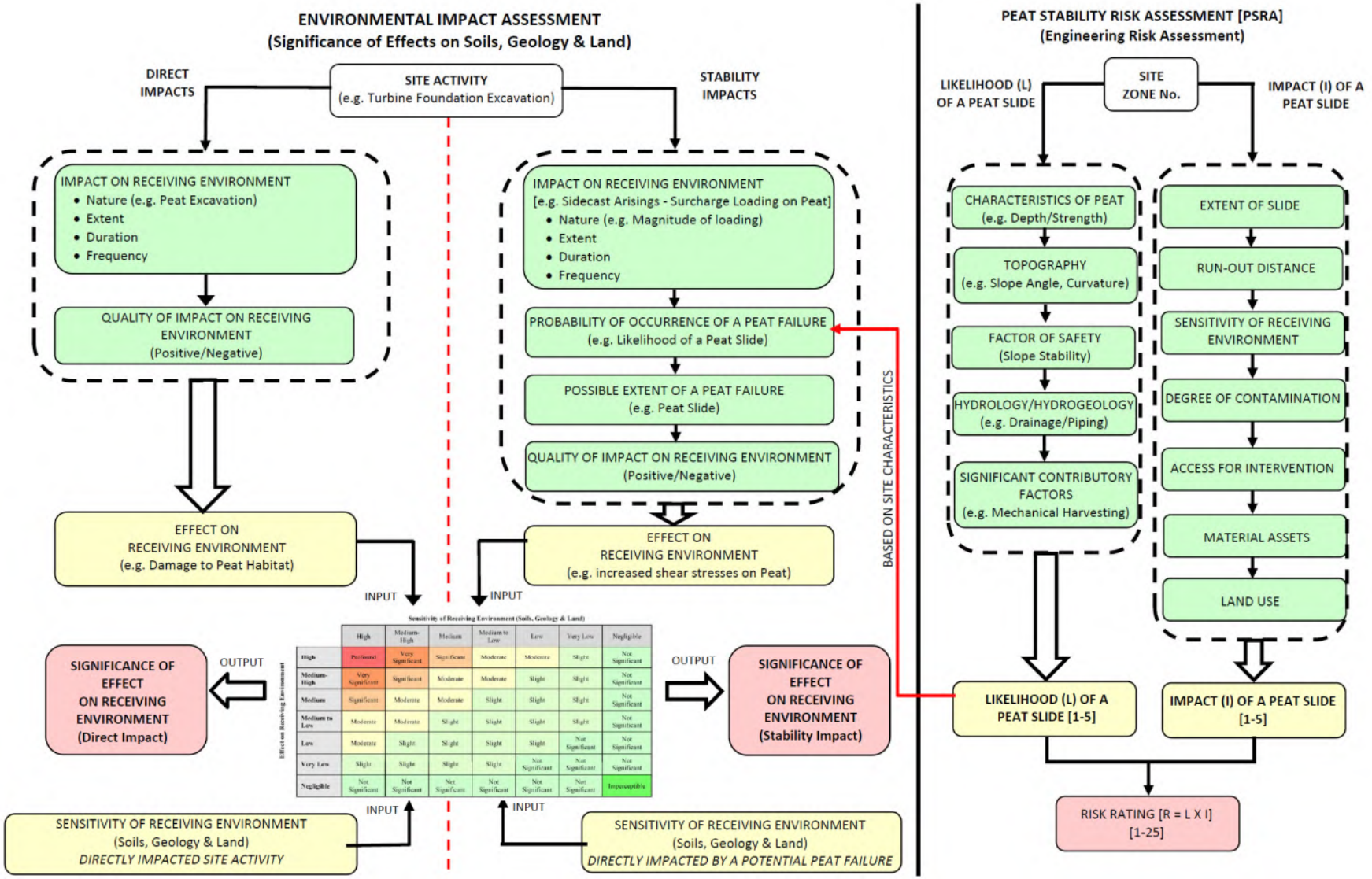


Figure 1-1 – Flow chart of methodology for assessment of stability impacts

Probability of Occurrence (Peat Failure): The probability of a peat failure occurring has been assessed for each site activity based on the characteristics of the stability impact (e.g. the magnitude, extent, duration and frequency of loading) as well as the physical characteristics of the site such as the topography, peat depth, peat strength and groundwater conditions. This is consistent with the EPA Guidelines (EPA, 2022) as well as the current best practice guidelines for peat landslide hazard and risk assessments (Scottish Government – Energy Consent Unit, 2017).

On this project a Peat Stability Risk Assessment has been carried out for the wind farm site in accordance with the current best-practice guidelines to assess the likelihood of a peat slide in zones across the site based on the site characteristics and other contributory factors that are known to lead to a higher risk of peat instability. As illustrated in Figure 1-1, the results have been used to assess the probability of occurrence of a peat failure for the assessment of stability impacts in this report.

The probability of occurrence of a peat failure is expressed as a range (e.g. Low to Possible) to characterise the range in conditions across the site. The probability is also assessed at each stage in the project life cycle to take account of any changes to the characteristics of the site activities - for example by alternative design or method of construction - or any changes in site conditions that could change the likelihood of a peat slide, such as the increase in strength that occurs in peat over time as it consolidates under sustained surcharge loads left in place on the slopes.

For this project, the possible **Extent** of a peat slide and the **Sensitivity of the receiving soils, geology and land** have been calibrated by the scale and characteristics of the very large peat slide that occurred on the site on the 16th October 2003, and by the land that that was directly impacted by the slide. The slide covered an area of approximately 25 ha and is the largest peat slide that has ever been recorded in Ireland. The characteristics of the land use, topography, ground and groundwater conditions within the slide area are also representative of the general conditions that could be impacted by the project in other areas around the site where there is a risk of a large peat slide. Therefore, it has reasonably been considered as the worst-case scenario in assessing stability impacts on this project.

To accurately characterise the possible extent of a slide for each site activity, consideration has also been given to the scale and characteristics of smaller, more localised peat failures that occurred on the site during construction – for example the localised shear failure or small scale peat slides that occurred around the perimeter of some of the open excavations in peat for the turbine foundations, which had a significantly lower impact on the receiving environment on the wind farm site.

The **Significance** of the effects of stability impacts was then determined using the matrix in Figure 1-2 as a function of the **Effect** that the impacts had on the peat with respect to site stability (which reflects the likelihood and possible extent of a peat failure), and the baseline **Sensitivity** of the receiving soils, geology and land potentially impacted by the peat failure, including land downslope and off-site from the wind farm in the case of a large peat slide.

This report identifies where peat failures actually occurred during construction as a result of site activities. Although the probability of a peat failure occurring has been assessed as Very Possible or Likely for some site activities that were carried out extensively across the site, only a small number of peat failures actually occurred, and all but one of these were localised or small scale failures within the site where the effect on the peat was Low and only Slightly Significant. This is because there are usually a number of other natural and anthropogenic factors that contribute to peat failures occurring in any area of the site in addition to the stability impact of the site activities.

To ensure that there is a consistent and representative methodology for assessing stability impacts of site activities on the receiving soils, geology and land, and the direct impact of peat failures that can occur as a result of those activities:

- The worst case scenario for the possible extent of a peat failure has been used to assess the significance of the effect of stability impacts on the receiving environment; and

- Where there is a high probability of a peat failure occurring as a result of a site activity (i.e. very possible to likely), the significance of the effect of the stability impact of that activity on the receiving environment is the same as the significance of the effect of the direct impact of the peat failure that could occur in the worst case scenario as a result of that activity.

In this way the methodology identifies stability impacts that have significant effects on peat stability whether or not a failure occurs so that appropriate mitigation and monitoring measures can be implemented to prevent a peat failure from occurring.

Effect on Receiving Environment	Sensitivity of Receiving Environment (Soils, Geology & Land)						
	High	Medium-High	Medium	Medium to Low	Low	Very Low	Negligible
High	Profound	Very Significant	Significant	Moderate	Moderate	Slight	Not Significant
Medium-High	Very Significant	Significant	Moderate	Moderate	Slight	Slight	Not Significant
Medium	Significant	Moderate	Moderate	Slight	Slight	Slight	Not Significant
Medium to Low	Moderate	Moderate	Slight	Slight	Slight	Slight	Not Significant
Low	Moderate	Slight	Slight	Slight	Slight	Not Significant	Not Significant
Very Low	Slight	Slight	Slight	Slight	Not Significant	Not Significant	Not Significant
Negligible	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Imperceptible

Figure 1-2 – Matrix used to determine the significance of effects of stability impacts on the receiving environment (soils, geology and land)

1.3 Peat Stability Risk Assessment Methodology

The Peat Stability Risk Assessment (PSRA) is an engineering risk assessment that has been carried out in accordance with the best practice guidelines for peat landslide risk assessments outlined in the report - "*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition, April 2017)*", by the Scottish Government Energy Consents Unit. The method of risk assessment is also consistent with the Institution of Civil Engineers' publication outlining UK best practice in "*Managing Geotechnical Risk*" (Clayton, 2001). The methodology is illustrated in the flow chart in Figure 1-1.

For this report, the site has been split up into representative zones corresponding to sections of the site around the turbines and access tracks on peat. A qualitative **Peat Stability Risk Assessment (PSRA)** has been carried out for each zone to assess the **Risk Rating (R)** for a peat slide based on the interpreted **Likelihood (L)** (i.e. probability) of occurrence and **Impact (I)** of failure, and to identify where specific design, construction & operational risk mitigation measures are required to reduce the risk to an acceptable level.

The **Likelihood (L)** of a peat slide in each zone has been interpreted by evaluating factors related to the peat and subsoil conditions, topography, site hydrology/hydrogeology and other significant contributory factors such as peat harvesting or slide history to determine where there are conditions that could lead to an elevated risk of a peat slide.

The potential **Impact (I)** of a peat slide in each zone has been interpreted by evaluating factors related to the potential volume of peat, degree of contamination, sensitivity of the receiving environment, access for intervention, and land use and existing infrastructure within the potential run-out distance.

A baseline **Risk Rating (R=L x I)** has then been calculated for each zone prior to the implementation of risk mitigation measures to characterise the risk of peat instability across the site to identify where specific design, construction & operational mitigation measures are required to mitigate the risk of peat instability to an acceptable level.

Zones of potential peat instability can be very localised, i.e. where there is a specific combination of factors on the site that can lead to an elevated risk of a peat slide under uncontrolled conditions, e.g. at the head of a watercourse. Therefore, the factors assessed are generally specific to the proposed location of the work element, i.e. along the alignment of the access track, or at the location of the turbines, crane hardstandings, borrow pits or peat repository sites. In this way representative combinations of peat depth, shear strength and slope angles are used in the assessment. However, consideration is also given to the general characteristics of the site in the vicinity of the works that are interpreted to be relevant to peat stability at the works location, i.e. proximity to and location relative to watercourses, evidence of peat instability under similar conditions in the general zone or elsewhere on site, and representative information from SI data in the area. Therefore, the assessment is also representative of the relative risk of peat instability for site activities related to the wind farm that are carried out on the peat between turbines and access tracks – for example drainage works or cable and duct installation on the peat slopes.

In this report the risk of peat instability in each zone has been re-evaluated at key stages of the project to take account factors that reduce the likelihood of a peat slide, including:

- Implementation of effective design mitigation measures and alternative construction methods (e.g. alternative methods of spoil management);
- Additional geotechnical investigations, stability analyses, testing, monitoring and geotechnical supervision; and
- Changes to the site characteristics due to improved drainage and an increase in the strength of the peat under sustained loads on the intact peat slopes (i.e. under the floating roads, peat repositories and material sidecast areas).

Residual mitigation measures are also recommended for monitoring and control during construction.

The following is a more detailed description of the methodology that was used for interpreting the Likelihood, Impact and Risk Rating in the PSRA.

1.3.1.1 Likelihood (L) of a Peat Slide

For each zone of the site the **Likelihood (L)** of a peat slide has been assessed based on an evaluation of the principal geotechnical, topographical, hydrological and hydrogeological characteristics on the site that are considered to impact the stability of peat on upland bogs. Peat stability risk factors are sub-divided into 5 categories:

1. Peat & Subsoil Conditions
2. Topography
3. Factor of Safety Calculations
4. Hydrology
5. Other Contributory Factors

For the **peat and subsoil conditions** the depth, undrained shear strength, water content and degree of decomposition (humification) of the peat are considered, along with the characteristics of the subsoil and the interface with the peat. Higher risks of peat instability are associated with relatively deep deposits of low strength peat, which typically corresponds to high water contents and a higher degree

of decomposition to less fibrous or clayey peat. The characteristics of the subsoil and the interface with the peat are also significant as previous peat slides in Ireland have been attributed to areas where there is a discontinuity at the interface (e.g. where the peat is directly on rock or nested boulders), where there is preferential flow of groundwater along permeable layers of granular soils or fractured rock at rockhead, or where there are weaker layers of sensitive low strength clayey soils at the base of the peat.

Topographical characteristics that are significant to peat stability include relatively steep slope angles (e.g. >5°), or the location of the site activities or infrastructure relative to a convex break in slope, or to a broad flat area directly upstream from a watercourse, where there is a higher risk of concentrated subsurface groundwater flow within or at the base of the peat that could contribute to a peat slide. Most of the peat slides that have occurred in Ireland have occurred above an elevation of 300mOD. Therefore, this is also considered in the assessment.

Topography is particularly significant where it is combined with other risk factors such as areas of deep low strength peat. Therefore, this is assessed by calculating **Factors of Safety (FoS)** against shear failure at the base of the peat as an index of peat stability on the slopes. This is done by infinite slope analysis, which assesses the resistance to shear failure on the inclined plane at the base of the peat under the downslope component of the gravitational loading due to the self-weight of the peat. The FoS is expressed as the ratio of the shear strength of the peat to the downslope shear force at the base of the peat. An FoS >1.0 indicates that failure should not occur. With appropriate design factors on the loading an FoS >1.4 would normally be acceptable for undrained conditions. To characterise the site the analyses are conservatively carried out assuming a low strength shear strength of 5kPa at the base of the peat. A worst case scenario is also assessed by assuming a residual shear strength of 2.5 kPa at the base of the peat, which would only apply where there is an existing failure surface of remoulded peat. The analyses are repeated under a surcharge load equivalent to the weight of 1.0 m of excavated peat on the slopes to characterise the sensitivity of the calculations.

Hydrology is very significant for assessing peat stability. Risk factors that are known to contribute to peat slides would include areas of poor drainage with ponded surface water, and areas where there is evidence of subsurface groundwater flow through open conduits called “pipes” within the peat, or along permeable layers of gravel or fractured rock at the base of the peat, which are typically identified in trial pits or exposures on site. The orientation of drains relative to the slope is also significant as drains that are cut across a peat slope in areas of deep peat have been known to contribute to peat instability by damaging the integrity of the vegetated crust of the peat and by restricting downslope surface runoff.

The PSRA also considers indirect **contributory factors** or site characteristics that can be used to identify sites or zones that could be particularly susceptible to peat slides, such as:

- Poor tree growth or wetlands vegetation and flushes associated with poor drainage;
- A history of previous slides on site or in the general area;
- Peat workings such as manual harvesting in turbary plots or mechanical harvesting with a saw-cutter or sausage cutter;
- Evidence of peat slides, subsurface drainage or general anomalies such as disturbed peat or drainage patterns from aerial photographs; and
- The stability of peat and groundwater ingress in trial pit excavations on the site.

Each of the five risk categories is rated on a scale of **0** to **20** depending on how significant the corresponding factors are with respect to peat stability, as follows:

- Negligible = 0
- Low = 5
- Medium = 10
- High = 15
- Very High = 20

The individual ratings for each category are then added to calculate a **Total Hazard Rating** on a scale of **0-100** for each zone on the site. This is not a probability of occurrence of a peat slide. It is an index that takes into account the interaction between different risk factors to assess the relative risk of peat instability between zones across the site and to identify zones where there are compounding risk factors that could make them particularly susceptible to peat slides.

For example, in zones where there are steep slopes there would be a high hazard rating for topography. However, if this was compensated by lower peat depths and higher strength peat, which would reduce the risk of peat instability, then the combination of the two would reduce the overall Total Hazard Rating. On the other hand, if the steep slopes were associated with deeper deposits of low strength peat and other negative contributory factors, then the compounding effect of these factors would lead to an elevated Total Hazard Rating and higher interpreted Likelihood of failure.

For the PRSA the interpreted Likelihood of a peat slide is correlated to the Total Hazard Rating on a scale of 1-5, as shown on Table 1-1.

Table 1-1 Total Hazard Rating and Likelihood (L) of a Peat Slide

Total Hazard Rating	Likelihood (L)		Probability of Occurrence (Event/km.yr)
0	**0**	Not Applicable (<0.5 m Peat)	<1/100,000
0-19	**1**	Negligible	1/100,000 to 1/10,000
20-39	**2**	Low	1/10,000 to 1/1,000
40-59	**3**	Possible	1/1,000 to 1/100
60-79	**4**	Very Possible	1/100 to 1/10
80-100	**5**	Likely	>1/10

Peat slides on upland bogs are still infrequent, even with the impact of wind farm development. Therefore, Table 1-1 lists possible ranges in probability of occurrence for each point on the Hazard Liklihood scale that are based on our experience with peat slides on wind farm sites in Ireland. The probability of occurrence is expressed in terms of events per km of access track per year.

The probability ranges in Table 1-1 are intended as indicative frequencies of failure for comparative purposes in a Qualitative Risk Assessment. They are not precise probabilities of occurrence calculated from a recorded database of case histories of peat slides that have occurred under similar conditions. Therefore, they should not be used for a Quantitative Risk Assessment.

It should also be noted that the failure frequencies listed in Table 1-1 do not reflect the **scale** of peat failures, which could range from small localised shear failures in areas of shallow peat on the site, to large scale peat slides or bog bursts in deeper peat in high risk zones. This is taken into account in the assessment of the **Impact** of a peat slide.

1.3.1.2 Impact of Occurrence:

The Impact of occurrence (**I**) is a qualitative assessment of the interpreted impact of a peat slide which has been assessed based on the following comprehensive list of primary impacts.

- Volume of peat in potential slide
- Possible run-out distance
- Sensitivity of the receiving environment & habitat
- Potential degree of contamination
- Access for intervention (onsite/offsite)
- Public / private infrastructure in potential peat flow path & within run-out distance (e.g. Roads, buildings, overhead power lines or telephone lines)
- Existing site infrastructure in potential peat flow path & within run-out distance (Access tracks, turbines, cable trenches, substations etc.)
- Land usage in potential peat flow path & within run-out distance

The volume of peat in a slide is assessed from the potential area that could be impacted by a slide and the depth of peat within that area. We have proposed the following bands based on past experience with peat slides in Ireland:

- Localised (<100 m^3)
- Very small (100-1,000m^3)
- Small (1,000-5,000 m^3)
- Medium (5,000 - 25,000 m^3)
- Large (25,000 - 100,000 m^3)
- Very Large (>100,000 m^3)

The potential run-out distances take into account the volume and nature of the peat as well as the topography and potential flow paths. For example, large scale peat slides or bog bursts in deep very soft amorphous (non-fibrous) peat with a high water content upslope from a watercourse channel has the highest potential to become fluidised and to flow considerable distances along the river channel downslope from the site. On the other hand, a localised peat slide in shallow dry fibrous peat would have low mobility with a short run-out distance downslope from the slide.

In assessing the sensitivity of the receiving environment specific consideration is given to protected habitats, National Heritage Areas or Special Areas of Conservation that could be disturbed by the slide, as well as the presence of protected freshwater fish or species in the watercourses downstream from the site.

The potential degree of contamination could range from diluted organic sediment from surface runoff, direct contamination by organic sediment, or direct inundation with a fluidised peat slurry, which would have the greatest impact to a river or water body downstream from the theoretical slide.

On some sites rapid deployment of resources can be an effective measure to mitigate the impact of a peat slide, for example by the construction of rockfill bunds as barrages to stop the flow of peat downslope. However, this depends on the site access to key intervention points and many wind farms are constructed in remote areas with limited infrastructure, which makes intervention restrictive.

The remaining factors take into account public and private infrastructure within the potential run-out distances that might be directly or indirectly impacted by a peat slide. Land use within this area is also taken into account as it will have a bearing on the value of the land and the potential disruption to agricultural activity.

The potential Impact of a peat slide on the Derrybrien site has been qualitatively assessed for each zone on a scale of 1-5 based on the factors listed above. Table 1-2 gives some guidance on the corresponding environmental, cost and time impacts for each Impact rating. These bands are considered as general guidelines. The cost and time impact would typically be interrelated for construction activities and the time impact may only be significant for activities on a critical path. Also, where the environmental impact could be high or very high the cost of mitigation or remedial measures would need to be considered. In general, where there is a sensitive receptor within the potential run-outdistance downstream from the works, such as a stream or river in a Special Area of Conservation, then the impact of a medium to large peat slide is likely to be high. The upper limit of 5 on the Impact identifies zones where there are compounding risk factors which suggest that a peat slide would have a severe impact on cost and time aspects of the project and also on the surrounding environment.

Table 1-2 Impact of Occurrence (I)

Hazard Impact (I)	Environmental Impact	Cost Impact	Time Impact
1	Low	<€1,000	<1 week on activity
2	Low to Medium	€1,000 - €10,000	1-4 weeks on activity, none on completion
3	Medium	€10,000 - €100,000	>4 weeks on activity, <1 week on completion.
4	Medium to High	€100,000 - €1,000,000	> 1 week on completion
5	High	>€1,000,000	> 10 weeks on completion

The peat slide that occurred during construction on the Derrybrien site involved approximately 450,000m^3 of peat, which would be classified as Very Large. The peat that was mobilized in the slide became fluidized and travelled a significant distance along the watercourses downstream from the site. Given the scale and nature of that slide, and the sensitivity of the receiving environment downslope from the site, the highest rating of 5 (High) has been given to the potential Impact of a peat slide for each zone on the site in the PSRA for this report.

It should be noted that the “Impact” of a peat slide in the PSRA is different to the Impact of site activities in the environmental impact assessment methodology described in Section 1.2. The PSRA is an engineering impact assessment. Therefore, the possible Impact of a peat slide includes a broader assessment on the sensitivity of the receiving environment that is not limited to the direct impact on soils, geology and land. It also includes commercial impacts that can have a significant impact on cost or time for an engineering project, which is consistent with the guidelines in the Institution of Civil Engineers' publication outlining UK best practice in "*Managing Geotechnical Risk*" (Clayton, 2001).

1.3.1.3 Risk Rating before and after Mitigation Measures

The **Risk Rating (R)** is a product of the Likelihood of occurrence (L) and the Impact of failure (I) **[i.e. R = L x I]** and is calculated on a scale of 1 to 25. Table 1-3 and Table 1-4 show the different bands of Risk Rating ranging from Low (Trivial), to Medium (Significant) or High (Intolerable) with some intermediate levels. Where the interpreted risk of peat instability is unacceptably high (R=16-25) then risk mitigation measures are required to reduce the risk to an acceptable level for all site activities.

Table 1-3 Risk Rating (R= L x I)

Likelihood (L)	**Impact (I)**				
	1	**2**	**3**	**4**	**5**
0	0	0	0	0	0
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	10
5	5	10	15	20	25

Table 1-4 Risk Rating Levels and Response

Risk Rating (R = L X I)		**Response**
0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

The baseline PSRA for the site in its original conditions in 1998, prior to construction is presented in Section 2.5. It represents a characterisation of the relative risk of peat instability across the site prior to any construction works being carried out on the site, and prior to the implementation of appropriate design and construction risk mitigation measures to reduce the likelihood or impact of a peat slide.

This report presents design, construction & operational measures that have been or will be implemented to mitigate against the risk of peat instability for all site activities at each stage of the risk assessment over the full life cycle of the wind farm. At key stages of the project the risk of peat instability has been re-assessed after the mitigation measures and changes in site conditions have been taken into account to re-evaluate the likelihood of a peat slide.

We have adopted the following general principles in our re-assessment:

- Effective design, construction & operational risk mitigation measures and improvements in site conditions can be used to reduce the Likelihood of a peat slide to a low or negligible level, even in high risk zones.
- The Likelihood of a peat slide can also be reduced by an improvement in site conditions due to improved drainage or an increase in the strength of the peat under sustained surcharge loads over time.

However,

- The potential Impact of a peat slide at a particular location cannot be reduced significantly unless positive measures are taken to effectively contain the peat or sediment along potential flow paths prior to construction.

For the Derrybrien Winfarm no further measures are currently scheduled to mitigate the Impact of a potential peat slide over the remaining operational life of the wind farm. Therefore, we have assumed that the Impact rating will be maintained at the highest level (I=5) throughout this assessment, even after the mitigation measures are taken into account.

2.0 SITE GEOTECHNICAL STATUS IN 1998, PRIOR TO CONSTRUCTION, AND BASELINE PEAT STABILITY RISK ASSESSMENT PRIOR TO MITIGATION

2.1 Introduction

This section of the report gives a characterisation of the baseline conditions for soils, geology and land on the site in 1998, prior to the construction of the wind farm.

All available information was used to establish the baseline conditions on the wind farm site, and in areas off-site that could be impacted by a peat slide. This included a comprehensive review of relevant information from the ground investigations that were carried out on the site, and a desk study review of historical aerial photographs, LiDAR topographical survey data, and relevant information on ground and groundwater conditions, bedrock, and geological heritage sites from online sources including the Geological Survey of Ireland (GSI), the Environmental Protection Agency (EPA) and the Ordnance Survey of Ireland (OSI).

Section 2.2 gives a summary of the ground investigations that were carried out on the wind farm site in 2001, prior to construction, and in 2004/2005 during the construction stage of the project. The majority of the information from the construction stage investigations would also be considered representative of the baseline conditions on the wind farm site, particularly outside the slide area and also where the ground conditions were not impacted by the project. Therefore, all of the relevant information from these investigations was used to establish the baseline site conditions.

Section 2.3.1 and Section 2.3.3 give a summary of the baseline conditions for the topography and land use on the site, as well as the geotechnical characterisation of the peat and glacial till, and the geological classification of the bedrock geology.

Section 2.3.4 gives a summary of the groundwater conditions on the site and an overview of the surface hydrology and hydrogeology in the peat, which are relevant to the assessment of the impacts on soils, particularly in relation to the peat and site stability.

The characteristics and sensitivity of any Geological Heritage Sites (GHS) within the wind farm site are assessed in Section 2.3.3.5 based on the information that is included in the GSI database, and based on additional information received through consultation with the GSI.

The baseline sensitivity of the receiving soils, geology and land impacted by the project has been assessed in Section 2.4 based on a number of factors including the characteristics of the materials that were impacted (i.e. peat, glacial till or rock), the ecological value of the habitat, carbon storage (peat), geological heritage (glacial till/rock), and land use characteristics. In assessing the impact of a peat slide related to activities on site for the project, consideration has also been given to the characteristics of the receiving soils and geology outside the wind farm site that could be directly impacted by a slide, downslope from the wind farm.

The results of the baseline peat stability risk assessment are presented in Section 2.5 to characterise the risk of a peat slide across the site based on baseline site characteristics related to topography, peat and subsoil conditions, hydrology, hydrogeology and other known contributory risk factors related to peat instability. The assessment identifies areas on the site where there were compounding risk factors with regard to peat stability that could lead to an elevated risk of a peat failure prior to the implementation of appropriate risk mitigation measures.

2.2 Geotechnical Investigations

2.2.1 Introduction

Extensive ground investigations have been carried out across the site to date at different phases of the project, primarily at detailed design and construction stage. Drawing No. 003 by AGEC Ltd. - *Ground Investigation Location Plan for Wind Farm & Failure Scar* - in Appendix A shows a consolidated layout plan of the majority of the investigation points, which illustrates the high level of site coverage that has been achieved. The investigations have largely been comprised of:

- An aerial LiDAR survey of the wind farm and surrounding area to obtain an accurate model of ground levels and topography across the site;
- Trial pits to determine the depth and characteristics of peat and subsoils, and the depth to bedrock at shallow depths up to 3.0-4.0 m;
- Extensive peat probing to establish a profile of the depth of peat across the site;
- In-site vane shear testing to establish the undrained shear strength of the peat;
- In-situ undisturbed piston sampling of the peat to obtain high-quality undisturbed samples for laboratory testing and inspection;
- Disturbed gouge-auger core samples of the peat and subsoil to inspect the characteristics of the peat at the interface with the underlying mineral soil; and
- Rotary coreholes to establish the depth to rock and the rock mass characteristics at a number of turbine locations.

AGL Consulting were geotechnical consultants to the Contractor, Bam Civil (formerly Ascon Ltd.) during the 2nd Phase of construction on the project in 2004/2005. Comprehensive details of the supplemental geotechnical investigations that were carried out by BAM and AGL during the post-slide construction stage of the project are presented in the AGL report titled "*Summary of supplemental investigations, stability analyses and peat stability risk mitigation measures adopted during the post-slide construction stage of the Derrybrien Wind Farm,*" Report No. 11-147-R01, dated 29th May, 2020, which is included in Appendix F.

AGL Report No. 11-147-R01 also includes the factual reports for the following geotechnical investigations:

- The pre-construction ground investigation that was carried out on the site by IGSL Ltd.:
- The rotary coreholes that were carried out at a number of the turbine sites by Irish Drilling Ltd. (IDL) in 2004; and
- The investigations that were carried out by ESBI Engineering & Facilities Management (ESBIE) in 2004 to assess the stability of the site for tree felling.

The following is an outline summary of the different phases of site investigations that were carried out. Further details of the investigations are also included in the remedial mitigation and monitoring measures for the wind farm project in Section 3.3.

2.2.2 Pre-Construction Site Investigation by IGSL Ltd. (2001/2002)

IGSL Ltd. carried out the pre-construction ground investigation on the site in December 2001. Access to the turbine locations was not possible for conventional ground investigation equipment to carry out trial pits, boreholes or rotary coreholes because of the poor ground conditions and extensive forestry coverage on the site. Therefore, the works was comprised of the following:

- 8 No. trial pits to depths of 2.5-3.3 m with a wide-track hydraulic excavator;

- 58 No. Dynamic Probes using a light hand-held Mackintosh Probe – primarily located at Turbines T1-T46, with 12 No. additional probes at selected locations over the rest of the site;
- 24 No. auger samples of the peat at depths of 1.5 m across the site;
- Laboratory testing of the disturbed samples of the peat, which included 12 No. water contents and 6 No. chemical tests (SO_3 & pH)

The results are presented in the factual report prepared by IGSL titled: "*Report on a Site Investigation at a Proposed Wind Farm, Derrybrien, Co. Galway. IGSL, Report No. 7637"*, dated January, 2002, which is included in the appendices to AGL Report No. 11-147-R01.

2.2.3 AGL/BAM Supplemental Site Investigations – Construction Stage (Post-Slide)

Extensive supplemental ground investigations were carried out on the site by AGL Consulting and the main civils contractor, Ascon Ltd. (now BAM Civil) during the second phase of construction in 2004/2005, after the peat slide, to accurately characterise the topography and the depth, strength and characteristics of the peat and underlying glacial till across the site so that the risk of peat instability could be adequately assessed and managed for the completion of the wind farm. AGL Report No. 11-147-R01 in Appendix F gives a comprehensive summary of the results of the investigations and in-situ testing. It also includes a summary of the stability analyses that were carried out and the peat stability risk mitigation measures that were adopted on the site.

The investigations were primarily concentrated along the site access tracks, at the turbines, and at proposed peat deposition areas on the intact peat slopes. The fieldwork consisted of:

- Peat depth probing and sampling with a hand-operated 20 mm diameter steel probe with the 1.0 m long 20mm diameter gouge-auger core sampler;
- Slope angle measurements on the surface of the peat by GPS, optical survey and hand-held Abney Level;
- In situ vane-shear tests to determine the undrained shear strength of the peat using a Geonor H-10 65/130mm penetration vane;
- Installation of 10 No. 19mm diameter push-in piezometers to record groundwater levels in the peat across the site;
- Collection of high-quality undisturbed samples of the peat with 75 & 100mm thin wall Geonor piston samplers and by block sampling in trial pits;
- Specialist laboratory testing of undisturbed samples to classify the strength and material characteristics of the peat; and
- Rotary coreholes by Irish Drilling Ltd. at 27 No. turbine bases to determine the depth to rock and rock mass characteristics, with Standard Penetration Tests (SPT) in the overburden to assess the in-situ undrained shear strength of the glacial till.

The hand-operated steel gouge auger probe was used to determine the depth of peat and to obtain 1.0m long 20 mm diameter core samples of the peat at selected locations and depth intervals. The probe was generally found to successfully penetrate the very soft peat down to the top of the underlying mineral soil. The core samples were used to inspect the characteristics of the peat, such as fibre content, degree of humification and shear strength, and also to inspect the transition from the peat into the mineral soil to confirm that no weak layers or discontinuities were present.

Slope angles at the top and base of the peat were determined by surveying the probe locations using a combination of GPS equipment, conventional optical survey leveling, and a hand held Abney Level. The Abney Level and optical survey level were used with survey rods to determine slope angles in areas where the GPS could not be used due to interference from the trees.

The in-situ vane shear tests were carried out using a Genor H-10 penetration vane with the 65mm diameter by 130 mm high rectangular vane. The H-10 vane has a sealed casing system that houses the vane down to the test depth so that there is no adhesion on the rods. Torque is applied at a standard rate using a device calibrated to the shear strength measured by the vane. The test procedure was assessed and reviewed on site to obtain reliable and consistent results.

The Geonor thin wall piston sampler and the piston tubes were used to obtain 75-100 mm diameter undisturbed samples of the peat from the vicinity of the slide for laboratory strength tests, and to examine the interface between the peat and the underlying mineral soil at selected locations along the access tracks and at peat repository locations to confirm that no weak layers or discontinuities were present. Large undisturbed block samples of the peat were also obtained from trial pits adjacent to the slide for specialist laboratory strength testing.

10 No. push-in piezometers were installed by AGL to record water levels in the peat. The piezometers were comprised of 19mm ID uPVC tubing with a 300 mm long perforated tip with a ceramic inner porous filter. They were installed by initially pre-forming a hole to about 1m and gently pushing the standpipe down to the base of the peat.

The laboratory testing was primarily carried out on undisturbed samples of the peat collected from the slide area. The purpose of the tests was to determine the material characteristics of the peat and to evaluate representative shear strength properties for the peat based on different test methods ranging from conventional triaxial compression tests and more sophisticated direct simple shear tests. This work was carried out in the soils laboratory of Trinity College Dublin for AGL.

All of these investigations were carried out by BAM and AGL Consulting under the continuous direction of Mr. Conor O'Donnell of AGL.

Between the 6th and 24th September, 2004, rotary coring was carried out by Irish Drilling Ltd. at 27 No. of the remaining turbines that were accessible at the time – mainly on the northern side of the wind farm (Turbines T6 – T8, T30, T33, T34, T36, T39, T47-T62, T64 & T70-T71). 2 No. additional coreholes were carried out at each of Turbines T51 and T64 to assess potential alternative locations for the turbines on shallower rock. Turbines T14, T15, T63, T65, T68 and T69 were inaccessible at the time of the investigations.

63 mm diameter (HQ) solid core samples of the bedrock were collected in the coreholes to determine the depth to competent rock and the strength, quality and degree of weathering of the rock for the design of the turbine foundations. The information was also required to assess the depth of excavation to suitable bearing on competent rock, and the temporary works requirements for the excavation in the peat and glacial till. Standard Penetration Tests (SPT) were also carried out in the glacial till to assess whether it would be suitable for supporting the turbine foundations at a shallower depth.

The logs of the rotary coreholes are included in the factual report by Irish Drilling Ltd. (IDL) titled "*Proposed Wind Farm at Derrybrien – Site Investigation Contract*" dated September, 2004, which is included in AGL Report No. 11-147-R01 in Appendix F.

2.2.4 Geotechnical Investigations by Applied Ground Engineering Consultants (AGEC)

AGEC carried out a ground investigation on the site after the peat slide in 2003. The investigation was comprised of:

- In-site vane shear tests with the hand held Geonor H-60, 25.4mm diameter vane to determine the undrained shear strength of the peat;
- In situ vane-shear tests with the Geonor H-10 55/110mm penetration vane mounted on a 3 tonne mini crawler rig, which were carried out by Fugro Ltd. for AGEC; and
- Detailed walkover survey inspections and geotechnical mapping of site characteristics and material sidecast areas at turbine locations.

The investigations that were carried out by AGEC are included in their report titled "*Final Report on Derrybrien Wind Farm Post-Landslide Site Appraisal*" dated 04/02/2004 (Report no. 378_099). Their investigations formed part of an initial preliminary investigation of peat stability across the site after the peat slide in October 2003. Therefore, they are located along the floating roads and near the turbine foundations that had been completed prior to the slide, where excavated material had been sidecast on the intact peat slopes.

2.2.5 Geotechnical Investigations by ESBI Engineering & Facilities Management (ESBIE)

Extensive supplemental geotechnical investigations were also carried out on the site by ESBIE between June 2004 and December 2004 to assess the stability of the site for the planned tree felling operations. The fieldwork provided comprehensive coverage of the site between the floating roads and turbines and was comprised of:

- Slope angle measurements with a hand-held Abney level at 15-25m intervals along 219 No. profiles at representative locations across the site.
- 3162 No. peat depth probes with a hand-operated 20 mm diameter steel probe to establish the variation in peat depth and the slope at the interface with the underlying mineral soil or rock along the survey profiles.
- Peat sampling at 222 No. locations with the 1.0 m long 20mm diameter steel gouge-auger core sampler to provide visual classification of the peat
- 1179 No. in-situ vane shear tests in the peat at representative locations with the Geotech AB 140mm x 280mm automated vane.
- Installation of piezometers in the peat at selected locations around the site in February 2004

The ground investigation results are presented in the report titled "Report on ESBIE Geotechnical Testing" (Volumes 1 and 2), Rev1, dated 25th January, 2005 (Report No. 78015-C11-R1 Rev 1), which is included in AGL Report No. 11-147-R01 in Appendix F of this report.

2.3 Baseline Conditions (1998) – Soils, Geology & Land Use

2.3.1 Topography and Land Use

Derrybrien Wind Farm is located on the upper slopes of the Cashlaundrumlahan Mountain in the Slieve Aughty Mountains in Co. Galway. The site is primarily characterised by upland blanket bog which has historically been used for commercial conifer forestry over the central and western parts of the site, and turf cutting in turbary plots on the east side. An aerial photograph of the site taken in 2000 is shown on Figure 2-1. The photograph identifies the main features that were on the site prior to construction of the wind farm, including:

- The boundary of the wind farm site;
- The extent of existing Coillte forestry access roads on the site prior to construction;
- The extent of the conifer plantations and firebreaks within the wind farm site;
- The turbary plots in the open blanket bog at the east end of the site;
- The existing access roads to the turbary plots which were constructed as floating roads;
- Patches of poor tree growth across the site – generally associated with deep peat and high water table;
- An area of bog pools and ponded surface water on flat ground at the centre of the site;
- Zones of darker vegetation associated with high water table and deeper peat on flat terraces across the site;
- Existing watercourses and drainage channels;
- A zone of young re-growth in an area that was possible damaged by fire;
- Potential subsurface drainage channels in the peat along lines of surface vegetation;

The pattern of tree furrows and the surface drainage network can be identified on the aerial photograph. In the area of peat harvesting on the east side of the site the network of surface drains is defined by the boundaries of the turbary plots. On the west side of the site there is a large area where the tree growth is smaller than the surrounding area – as indicated by the lighter shade of green, possibly indicating where there was a historic fire that damaged the trees in the area. The area has been re-planted and the strips of darker vegetation within this area are indicative of subsurface drainage paths or concentrated subsurface flow.

Figure 2-2 and Figure 2-3 show the general topography of the site following completion of construction (i.e. post 2005). However, with the exception of the borrow pits, the slide area at Turbines T68 and T70, and along the site access tracks, the ground surface elevations and slope angles across the site would generally also be relevant to the original conditions on the site in 1998, prior to construction.

The peak of Cashlaundrumlahan Mountain is at Elev. +365 mOD near Turbine T10 near the centre of the site. Within the site the ground level drops away gently to between approximately Elev. +325 mOD and +345 mOD along the perimeter of the wind farm site over a distance of approximately 700 m to the north and south, and 1.2km to the west. At the east end of the site the ground surface is lower and drops down to Elev. +290 mOD and +298 mOD at Turbines T46 and T44, respectively, which are approximately 2.6km from the peak.

There is a broad zone that runs across the full width of the site for a distance of approximately 250-300 m to the north and south of the peak of the mountain where the ground surface slopes gently away from the peak at slope angles <3°. This is within the central three rows of turbines on the site layout in Figure 2-2.

To the south of this zone the slope is convex in profile with slopes generally increasing up 4-5° degrees and locally 5.0-7.5° within the wind farm site, particularly between Turbines T21 and T41. Downslope from the site in this area the slopes increase more consistently up to 7.5° and locally up to 10.0°.

The northern upper slopes of the mountain within the wind farm site are characterised by a terraced profile with broad flat areas where the slope angles are <3°, separated by benches where the slopes are locally steeper at up to 5.0-7.5°, locally up to 10°. This reflects a stepped profile to the underlying bedrock, which has sub-horizontal bedding. There are areas of deeper peat and ponded surface water on the flat terraces, as identified on the aerial photograph in Figure 2-1. These are characterised by the change in colour to the darker natural vegetation on the blanket bog, or by pools of surface water, like the area near Turbine T61.

North of the wind farm site there is a convex break in slope to steeper more uniformly graded slopes up to 7.5-15.0°. Turbines T47 to T52 are located along the convex break in slope on this side of the site.

2.3.2 GSI National Landslide Susceptibility Map

Figure 2-4 shows the Landslide Susceptibility Map for the Project area from the Geological Survey of Ireland (GSI) superimposed on the OSI 1:50,000 Discovery Series map. This map provides information on areas which are pre-disposed to landslides using a classification system based on slope angle, soil type and a parameter referred to as the Topographic Flow Index (TFI), which is a measure of how overland flow of landslide debris is concentrated or dispersed by the terrain, also taking into account flow velocity.

The slope angle is derived from the 20m Digital Elevation Model (DEM) and values can range from 0 to 90 degrees. Soil types are generalised into 5 main groupings based on their grain size distribution (i.e. fine or coarse-grained), and/or particular characteristic, including Peat, which is particularly relevant for the Derrybrien Wind Farm. The TFI is also derived from the 20m DEM and is calculated using factors related to slope angle, flow direction and flow accumulation. The classification model is weighted by applying a known inventory of landslide events to particular combinations of factors that have a higher incidence of landslides. The results are banded into four categories of landslide susceptibility ranging in classification from Low to High. The resolution of the mapping is on a local to regional level based on the accuracy of the DEM (20m) and the scale of the base mapping (1:50,000).

The landslide susceptibility map for the Project area shows that much of the wind farm site would be classified as being of **Low** susceptibility to landslides. There is a broad area on the steeper slopes on the south side of the wind farm and across the turbary plots on the east side of the wind farm where the susceptibility is classified as **Moderately Low**. This includes the area where the peat slide occurred at Turbine T68 in October 2003, during construction of the wind farm. The location and extent of the peat slide are recorded on the GSI database.

The Landslide Susceptibility Map indicates that conditions on the wind farm site are suitable for the project with appropriate design and mitigation measures for working in peat, particularly in the areas of Moderately Low susceptibility. The areas of **Moderately High** and **High** susceptibility are generally limited to the steeper slopes to the north and south of the wind farm site, particularly to the north.

The GSI National Landslide Susceptibility Map was developed as part of a mapping project that was completed between 2007 and 2016. Therefore, it was not available for characterising the baseline conditions in the project area in 1998, prior to construction of the wind farm.

Figure 2-1: Aerial view of wind farm site dated 2000

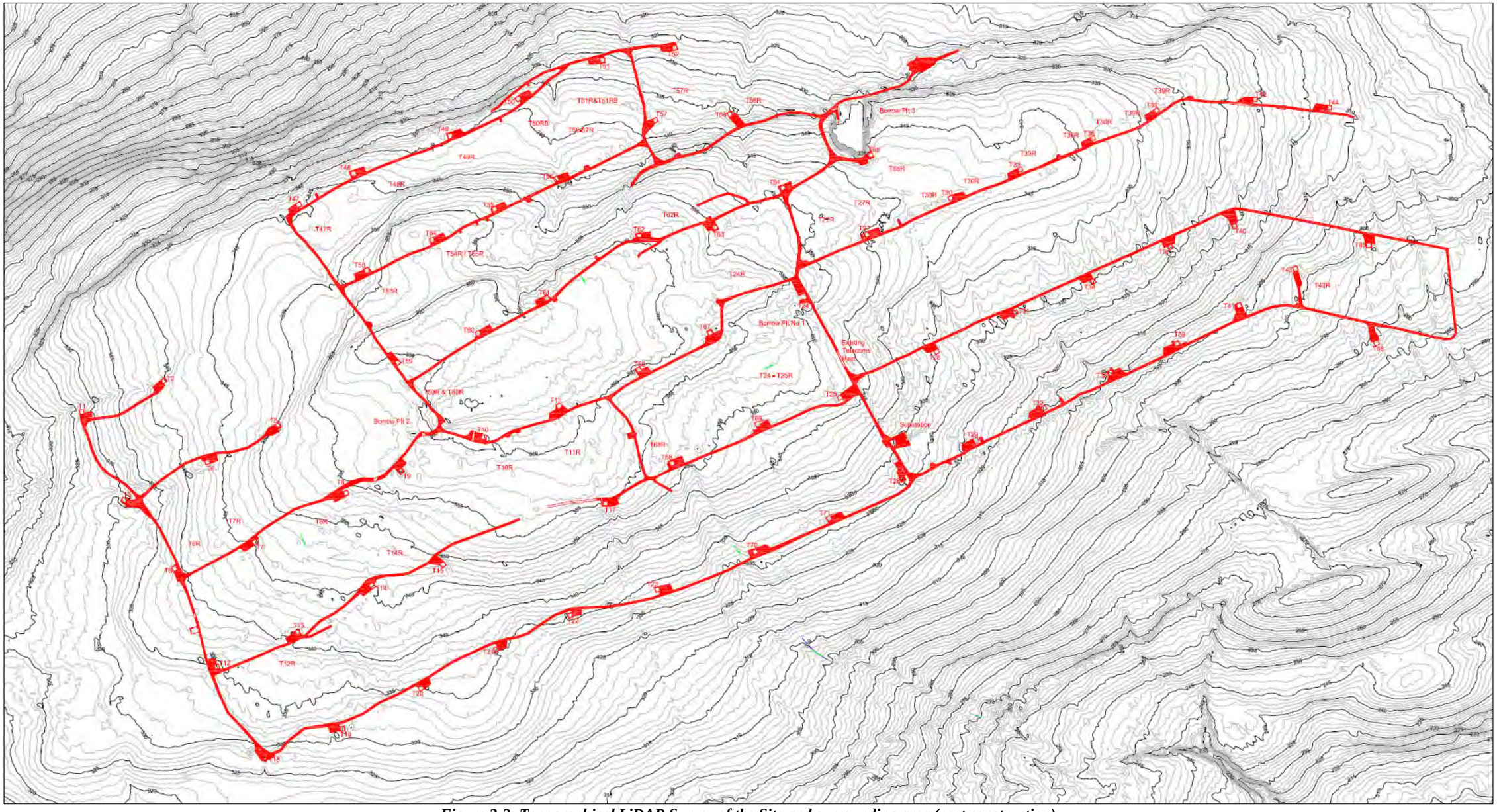


Figure 2-2: Topographical LiDAR Survey of the Site and surrounding area (post construction)

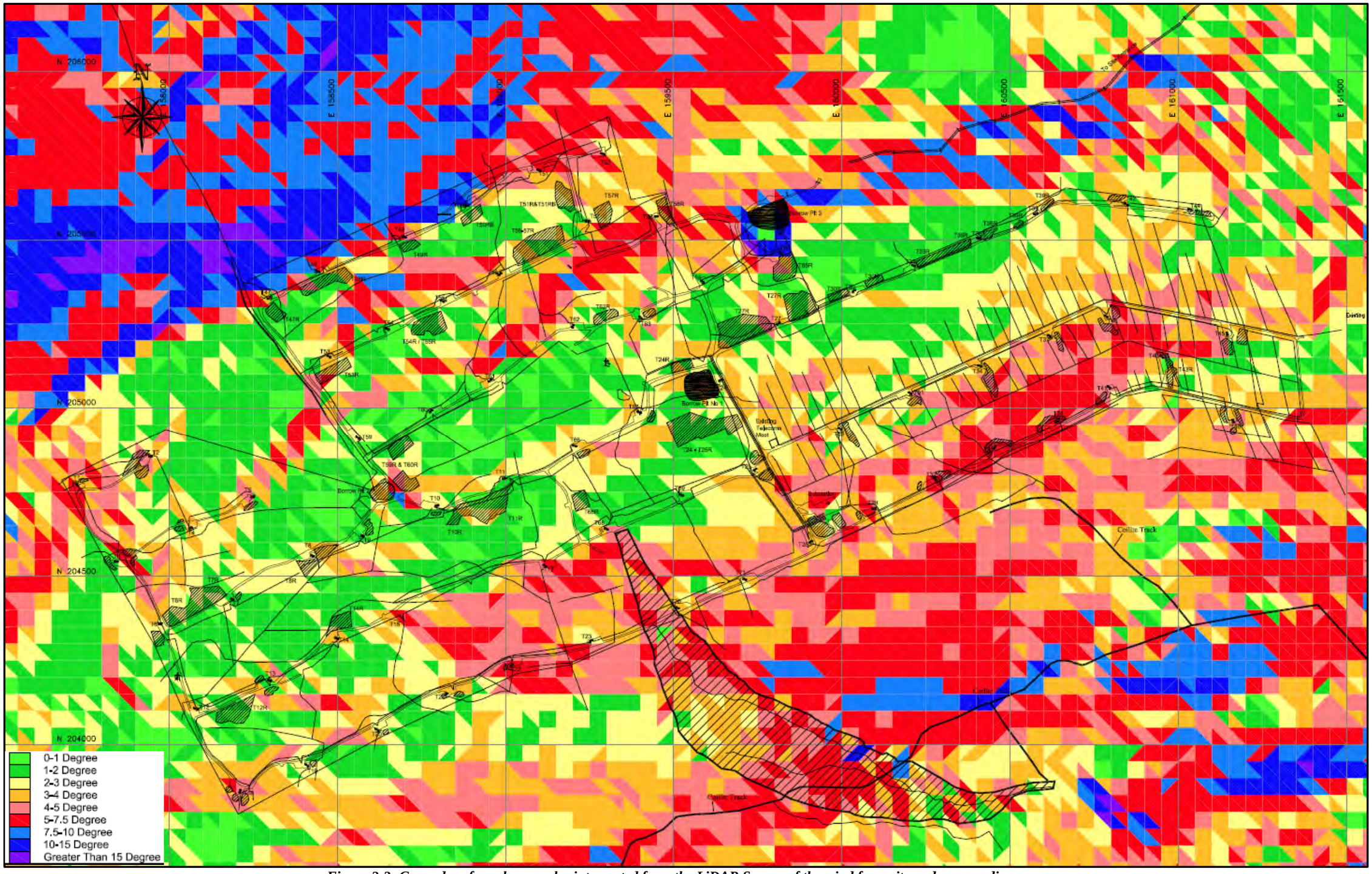


Figure 2-3: Ground surface slope angles interpreted from the LiDAR Survey of the wind farm site and surrounding area

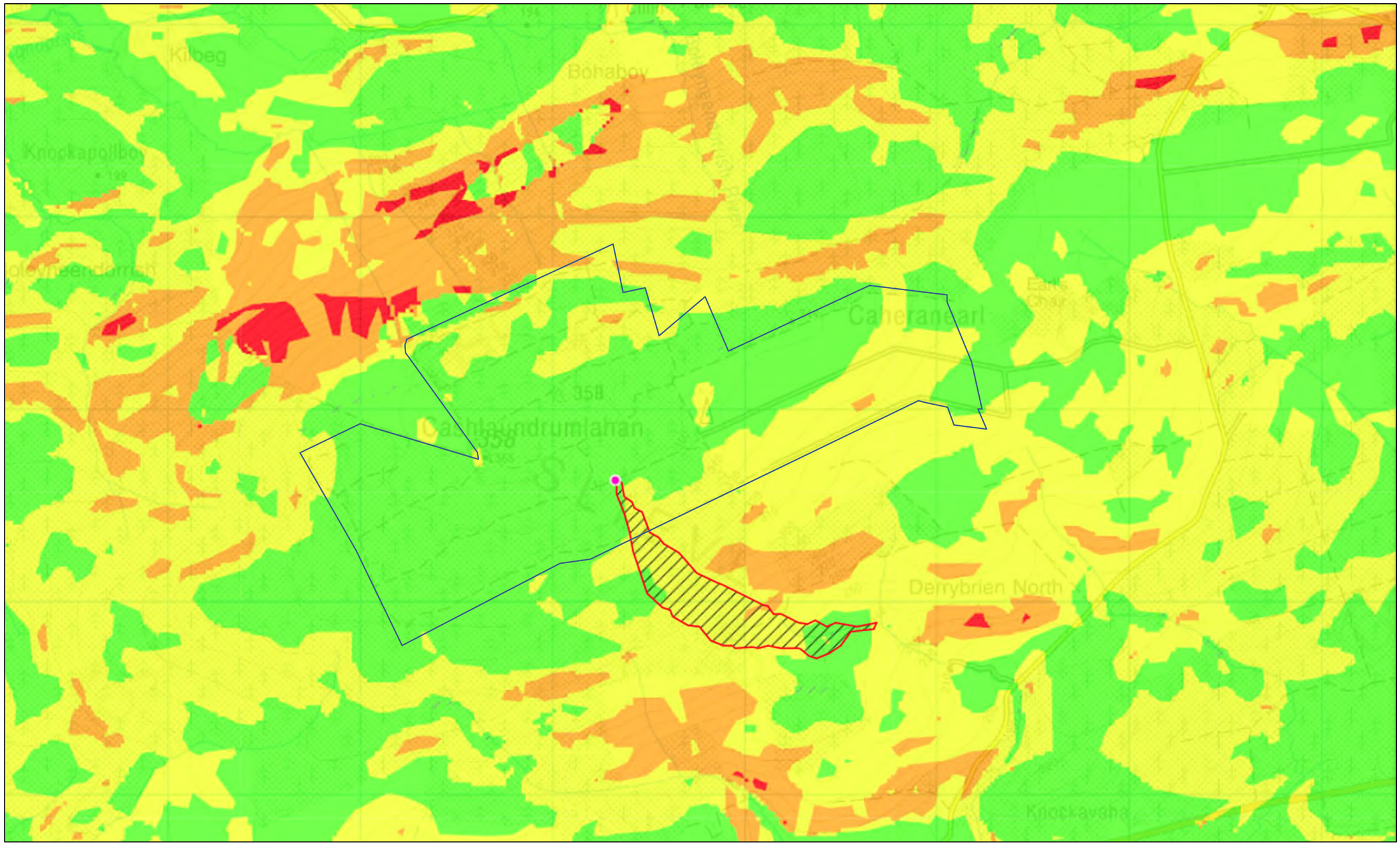


Figure 2-4 - GSI Landslide Susceptibility Map for Project Area (Geological Survey of Ireland – online mapping, 2020)

2.3.3 Geotechnical Characterisation of Baseline Site Conditions

2.3.3.1 Site Subsoil Map (GSI, 2018)

Figure 2-5 shows a map of the Quaternary Geology for the project area which was generated from the Geological Survey of Ireland online database. The layout of the wind farm turbines and access tracks is superimposed on the map in red.

The wind farm site is covered by upland blanket peat (BkPt). Exposures of glacial till derived from Devonian Sandstones (TDSs) are identified on the steep slopes on the north side of the site and on the lower slopes downslope from the wind farm.

There are many exposures of outcropping bedrock (Rck), particularly along the banks of streams and watercourses and on the steeper slopes downslope from the wind farm to the North and South.

2.3.3.2 Peat

The majority of the wind farm site is covered by blanket peat. Figure 2-6 shows the depth of peat across the site superimposed on the LiDAR survey. The depth of peat has been interpreted from the extensive number of peat probes that have been carried out on the site.

In general, the depth of peat is proportional to the slope angles. The areas of deep peat up to 3-6 m deep, and locally >6.0 m, correspond to the broad flat or gently sloping ground across the central and western sections of the site, and on the flat terraces on the north side. The slope angles in these areas are typically <2-3° (see Figure 2-3).

Peat depths <2m are generally confined to the areas of steeper slopes up to 5.0-7.5°, with shallow peat <1.0 m on slopes typically up to 7.5-10.0° along the benches at the edge of the terraces on the north side of the wind farm, and on the steep slopes along the perimeter of the wind farm between Turbines T47 and T50 to the north, and between Turbines T32 to T41 to the south. Peat depths of 2-3 m typically occur on the intermediate slopes of 3-5°.

In the trial pits carried out pre-construction by IGSL the peat is described as soft brown fibrous organic PEAT. In general, the degree of decomposition (humification) of the peat varies with depth – typically ranging from fibrous in the upper vegetated layer (the acrotelm) where there is still living plant matter (Von Post H4-H6), to slightly fibrous, amorphous or clayey with depth in the underlying catotelm peat, which is comprised of dead plant matter generally below the water table (Von Post H7-H10). There is a more significant variability in the characteristics of the peat in the areas of deeper peat >2-3 m.

Water contents recorded by IGSL in the peat ranged from 150-450%, which are very low for peat. Water contents recorded by AGL during the construction stages of the project were typically in the range of 800-1250%, which is more representative (Figure 2-7). The water content is expressed as the ratio between the mass of water to the mass of solids in the soil. Therefore, for water contents >1000%, over 90% of the peat mass is comprised of water, which is representative for blanket peat. Lower water contents of 20-75% were recorded in the clayey peat and organic clay layers at the base of the peat.

Mass loss on ignition tests carried out on samples of the peat indicated that the organic content is generally >95% (Figure 2-8). Lower values of 20-75% were recorded in the clayey peat and organic clay layers at the base of the peat. The bulk density of the peat samples tested by AGL ranged from 0.98 to 1.03 Mg/m^3 (Figure 2-9), increasing to 1.35-1.40 Mg/m^3 in the clayey peat and organic clay layers at the base.

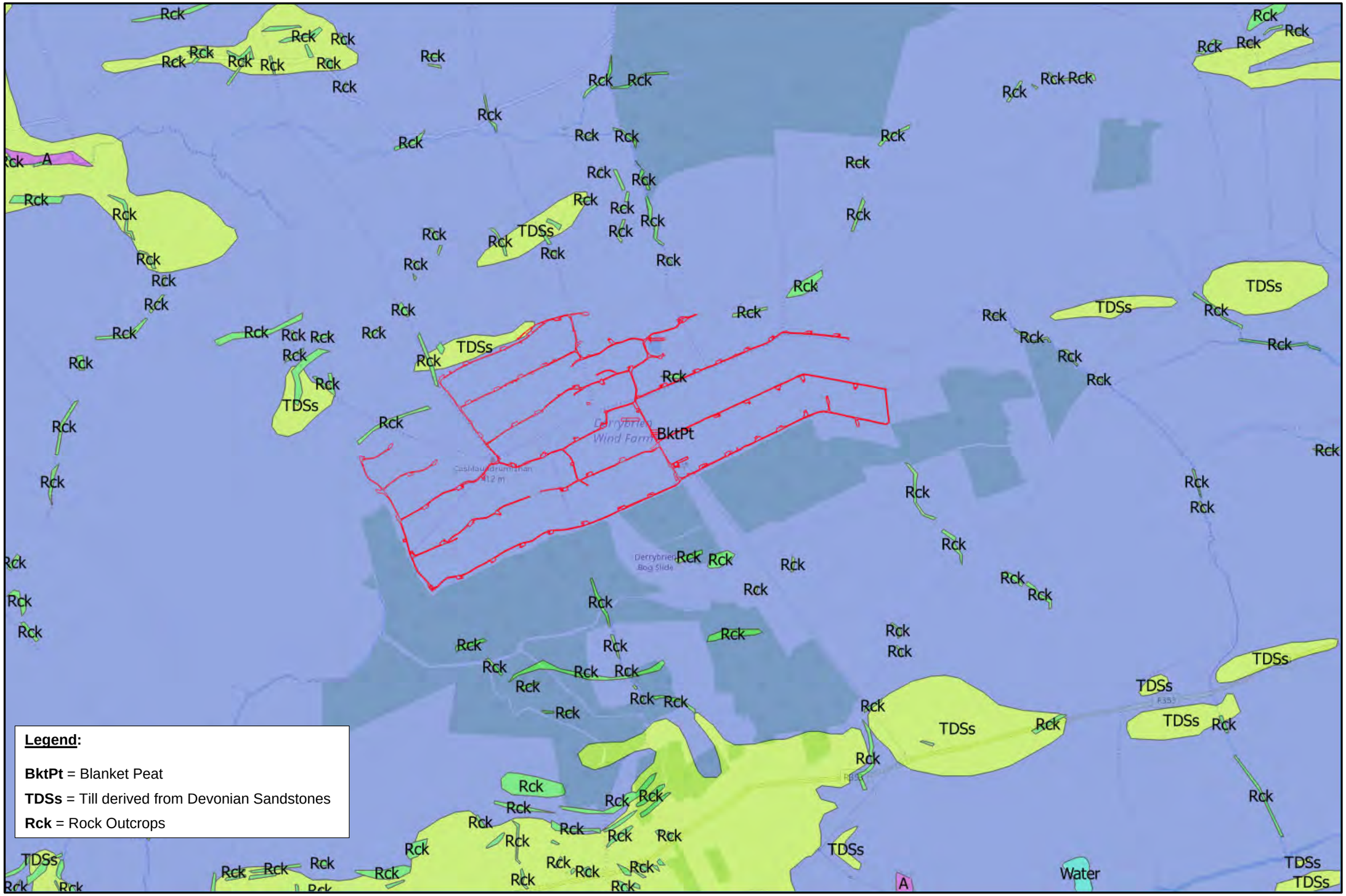


Figure 2-5: GSI Subsoil Map (Access roads & hardstanding areas shown in red), (GSI Online 2020)

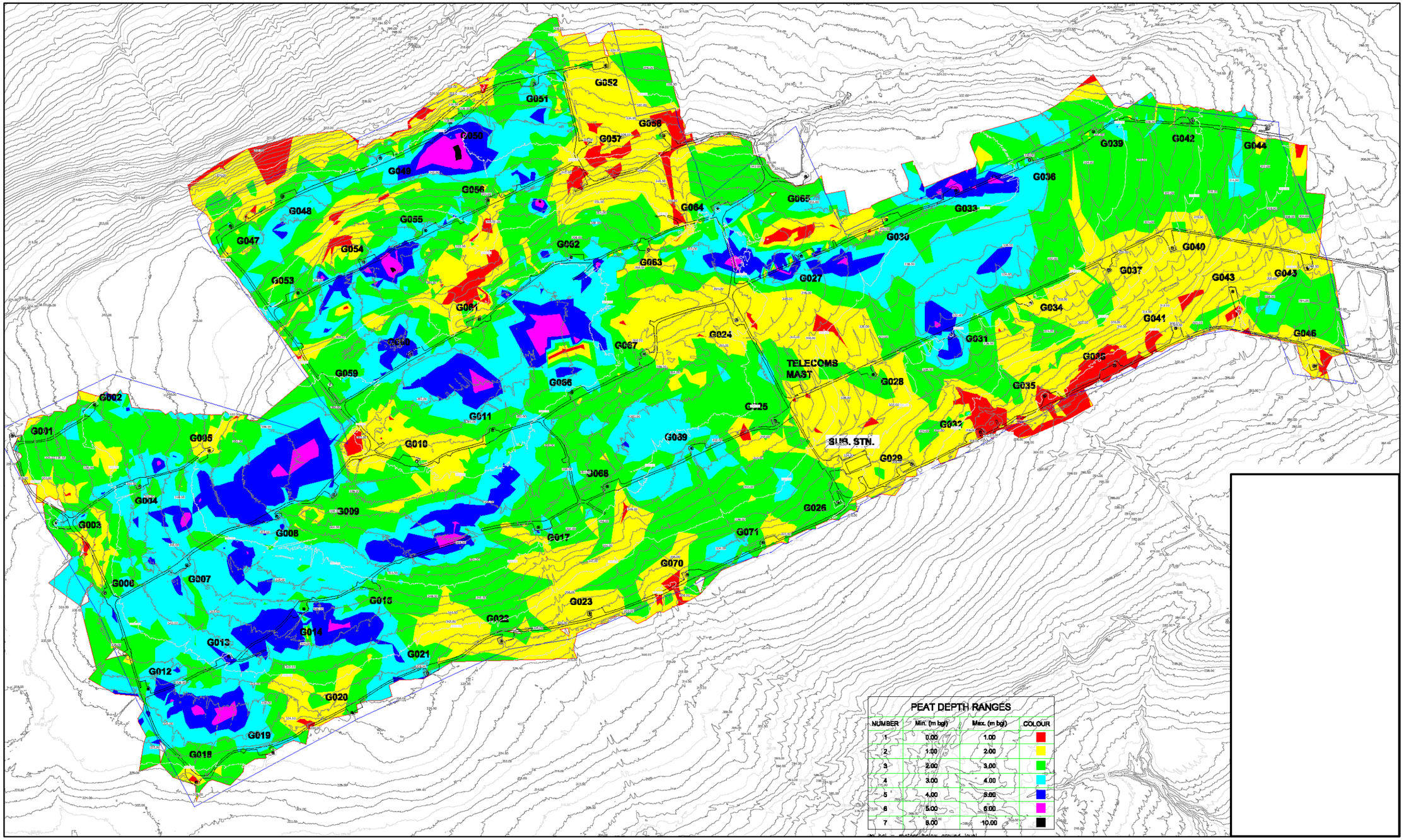


Figure 2-6: Depth of Peat across the site from the peat probes

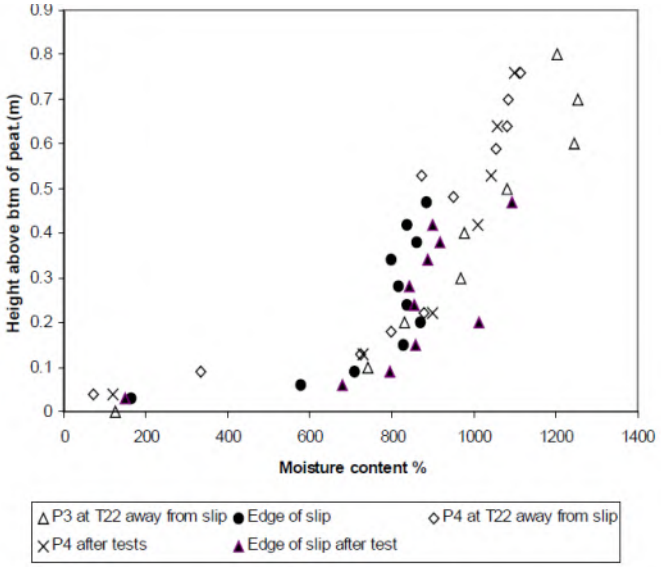


Figure 2-7: Water content of peat in slide area

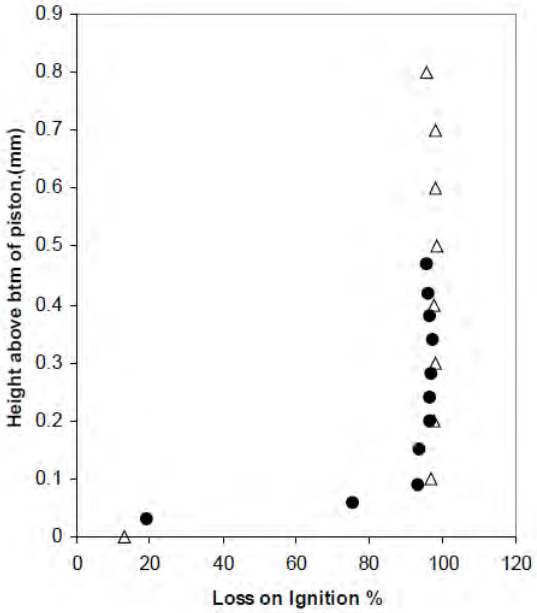


Figure 2-8: Organic content of peat by Mass Loss on Ignition

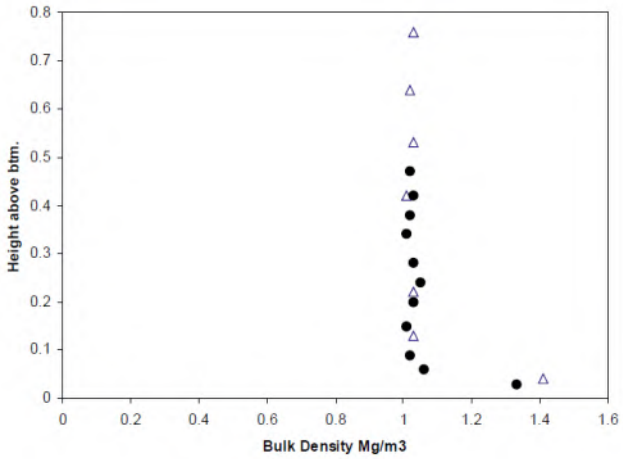


Figure 2-9: Bulk density of peat

Figure 2-10 shows typical profiles of unfactored undrained shear strength recorded in the peat by AGL/BAM with the Geonor H-10 in-situ penetration vane during construction. In accordance with BS5930:2015 – BS Code of Practice for Site Investigations, the peat would be classified as Extremely Low Strength with an undrained shear strength <10 kN/m^2. The results were generally in the range of 5-10 kN/m^2, with a few locally lower values of 3.5-4.0 kN/m^2. The unfactored shear strengths recorded with the Geonor H-10 vane were validated on site by proof load testing on a test section of floating road during construction, as described in AGL Report No. 11-147-R01 in Appendix F.

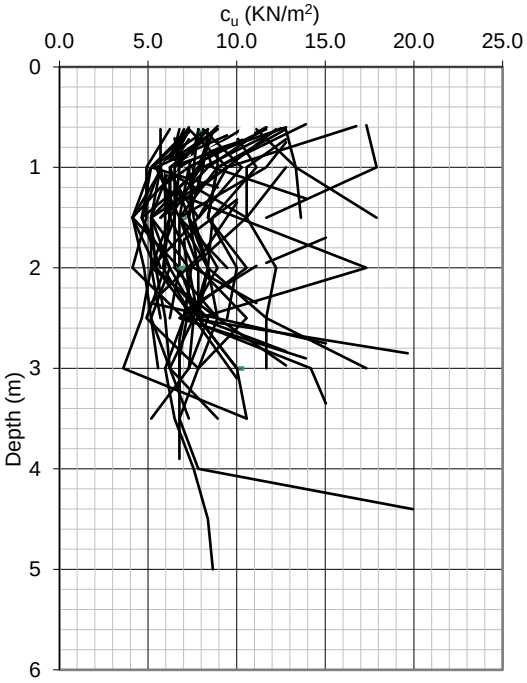


Figure 2-10: Profile of undrained shear strengths (c_u) with depth recorded in the peat with the Geonor H-10 penetration vane

Figure 2-11 shows the results of laboratory tests carried out on undisturbed samples of peat collected from the site by AGL. The tests were carried out at the soils laboratory of Trinity College Dublin and they included results of direct simple shear tests on samples collected adjacent to the slide. The results indicated that the undrained shear strength of the samples of peat tested in direct simple shear was generally greater than 4.5-6.0 kPa. However, some very low strengths on the order of 2.0-4.5 kPa were recorded on samples near the base of the peat in the vicinity of the slide (average = 3.5 kPa).

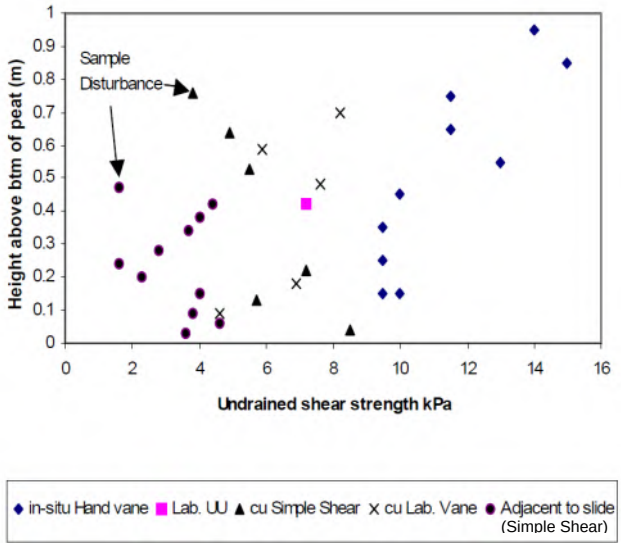


Figure 2-11: Undrained shear strengths recorded on undisturbed samples of peat

2.3.3.3 Mineral Subsoil & Glacial Till

Where the full depth of peat was penetrated in 4 No. of the trial pits carried out by IGSL Ltd. it is shown to be underlain by a 0.1-0.6 m thick layer of soft grey-white sandy SILT over glacial till described as Firm purple sandy gravelly CLAY. In areas of shallow rock, the peat may also be directly underlain by rock, although this was not generally the case.

Based on the rotary coreholes carried out by Irish Drilling Ltd. (IDL) at 27 No. of the turbines across the site (Turbines T6 – T8, T30, T33, T34, T36, T39, T47-T62, T64 & T70-T71), the glacial till layer ranges in thickness from 0.6m to 7.6 (typically between 0.6m and 3.5m) and is underlain by a weathered rock or rock. IDL generally describe the till as slightly sandy gravelly SILT, although samples recovered by conventional rotary coring may not be representative of the in-situ conditions.

Standard Penetration Tests (SPT) were carried out in the glacial till by IDL in some of the rotary coreholes. The SPT N-Values generally ranged from 10-33, which would correspond to an undrained shear strength (c_u) of 50 to 165kPa using the approximate empirical correlation $c_u \approx 5 \times N_{SPT}$. In accordance with BS 5930 the strength of the till would be classified as Medium (40-75 kPa) to High (75-150 kPa) or Very High Strength (150-300 kPa).

Some lower SPT N-Values of 6-9 were recorded in the glacial till at depths of 3.5-4.5 m in the coreholes at Turbines T31, T33 and T64. These would locally correspond to undrained shear strengths of 30-45 kPa, which would be classified as Low (20-40kPa) to Medium Strength in accordance with BS5930.

2.3.3.4 Rock

Figure 2-12 shows the bedrock geology on the site of the Derrybrien Wind Farm and in the surrounding area from the 1:100,000 Geological Map from the Geological Survey of Ireland (GSI).

The site lies in a zone of bedrock from the Ayle River Formation which is described as a Mudstones, Siltstones and Conglomerates. The lower part of the formation is characterised by red Siltstones, Mudstones with carbonate concretions, Sandstones and Conglomerates. Sandstones are generally large-scale trough and planar bedded. Conglomerates are large-scale cross-bedded.

Figure 2-5 and Figure 2-12 identify where rock outcrops have been mapped in the area, generally on the steeper slopes downslope from the perimeter of the wind farm site, particularly to the north of the site. The geological map also shows the dip angle and dip direction of the bedding in the rock. It is typically sub-horizontal (0-10^o) and dipping to the NE/NW on the north side of the mountain, and to the South and Southeast on the south side of the mountain.

On the steeper slopes to the north of the wind farm there is a zone of bedrock from the Derryfadda Formation, which is comprised of Greywackes, Siltstone and Mudstone. The Formation is dominated by grey-green, medium to thickly bedded (<3m), fine to coarse grained Greywacke, commonly containing conspicuous and diagnostic basal units of granule grade conglomerate.

Bedrock was cored by Irish Drilling Ltd. (IDL) at 27 No. turbines across the wind farm site (Turbines T6 – T8, T30, T33, T34, T36, T39, T47-T62, T64 & T70-T71). Bedrock at these turbines was generally comprised of slightly weathered, strong to very strong, thinly to medium bedded, locally thinly laminated, purple fine to medium-grained SANDSTONE.

At Turbines T8, T53 and T60 the rock within the depth of the corehole was locally comprised of moderately strong or strong, slightly weathered purple thinly laminated slightly sandy SILTSTONE. Siltstone layers were also encountered within the Sandstone elsewhere on the site.

Along the north side of the site, the rock encountered in the coreholes at Turbines T47 to T51 was generally comprised of slightly weathered, strong to very strong, thinly to thickly bedded and massive cream fine to coarse-grained Conglomerate.

The depth to the top of competent rock was variable but typically ranged from 3.0m to 6.2m. Shallower rock was encountered at a depth of 1.3-1.7 m at Turbines T47 and T49 at the north end of the site, and at a depth of 2.5 m at Turbine T58, near the site entrance.

Competent rock at Turbines T51 and T64 was initially at a depth of 8.0-10.3 m. However, additional coreholes carried out at the turbines indicated that the depth to rock was variable and rose to a depth of 5.5-5.6 m in places.

The Total Core Recovery (TCR) of the rock was generally 90-100%. The Rock Quality Designation (RQD) was variable and generally ranged from 0% to 57%, partially due to the thickness of the bedding in the rock. Higher RQD values of 78% and 100% were recorded in more competent Sandstone layers with thicker bedding. Bedding in the rock was generally sub-horizontal (0-10°) to gently dipping (10-20°).

There are sections of highly weathered rock noted at the transition from the overburden to rock. The weathered rock is described in the logs as a:

- Weak to moderately strong highly (locally completely) weathered green purple white medium grained thinly to medium bedded SANDSTONE with residual soil horizons

- Gravel and cobble sized fragments of strong highly weathered purple thinly laminated SILTSTONE.

- Weak to moderately weak, highly to completely weathered orange brown medium grained thinly to very thinly bedded SANDSTONE

The weathered rock was encountered predominantly in the north and northwest part of the wind farm, however, it was locally identified in T71 at the south end of the site and in T7 at the west end of the site. The weathered rock is noted above the bedrock at depths from 2.9m to 6.3mbgl, and it ranges in thickness from 0.8m to 3.4m. The Total Core Recovery (TCR) of the weathered rock ranged from 67% to 100% and the RQD was generally zero in the non-intact rock.

2.3.3.5 Geological Heritage Sites

There are no audited or unaudited geological heritage sites identified on the wind farm site on the Geological Survey of Ireland Spatial Resources interactive map viewer.

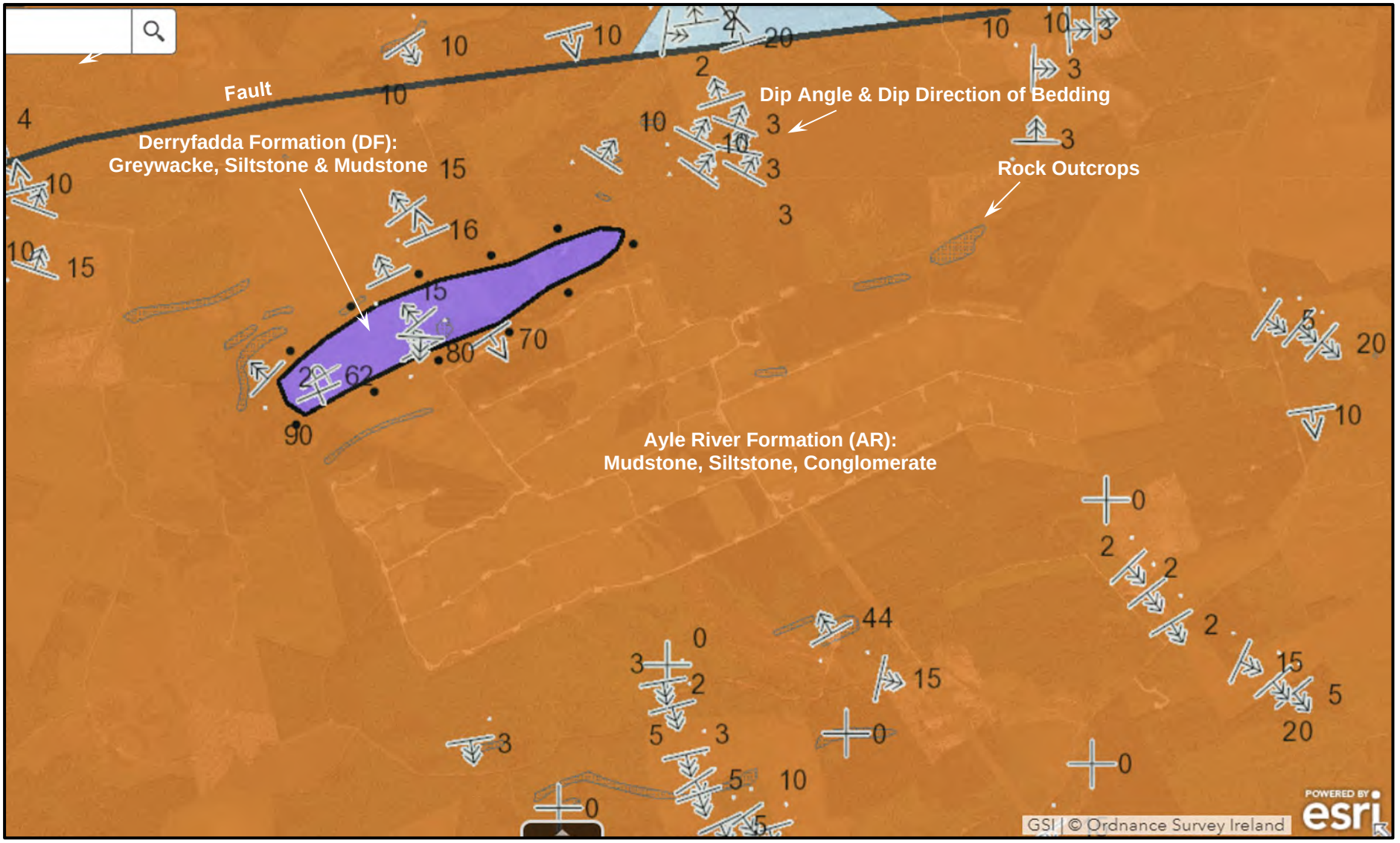


Figure 2-12: 1:100,000 GSI Bedrock Geology map (OSI online mapping, 2018)

2.3.4 Hydrology and Hydrogeology

2.3.4.1 Groundwater Conditions

The wind farm site is predominantly covered in blanket peat and there are areas of ponded water and small streams across the site. The aerial photograph in Figure 2-1 identifies areas of high groundwater level on the flat terraces or gently sloping ground across the site including:

- an area of ponded surface water with bog pools adjacent to Turbine T61 on the flat ground near the peak of the mountain; and
- areas of high groundwater level on the flat terraces associated with the change to the darker natural surface vegetation on the blanket bog.

In the pre-construction ground investigation carried out by IGSL Ltd. water strikes were recorded in the trial pits at depths of 1.0m to 1.5m and were described as seepage.

During construction, standpipes were installed by AGL at 6 No. locations along a north-south axis from the centre to the south of the wind farm in the vicinity of the peat slide to get a profile of the depth of groundwater down the slope. The readings that were taken from 17th November 2003 to 4th December 2003 indicated that the depth to groundwater ranged from 0.1m to 1.1mBGL.

In 2004, 12 No. electronic vibrating-wire piezometers were installed in clusters at 4 No. locations around the perimeter of the site to get continuous readings of water levels in the peat. The piezometers were installed adjacent to the following turbines:

- Turbine T2 (Pz-1 to Pz-3)
- Turbine T18 (Pz-4 to Pz-6)
- Turbine T34 (Pz-7 & Pz-9)
- Turbines T49/T50 (Pz-10 to Pz-12)

Drawing No. QS-00192-01-D451-016 by ESB International in Appendix A shows the location of the piezometers. They indicated that the depth to groundwater generally fluctuated between 0.3 and 1.1 mBGL at the end of construction in 2005.

Groundwater on the wind farm site would be expected to flow downslope through a network of natural open pipes within the peat as well as possibly through an open joint network in the underlying bedrock. Several springs have been identified on site, particularly within scarp faces on the northern slopes. The linear pattern of trees identified on the aerial photograph in Figure 2-1 is possibly indicative of concentrated subsurface drainage in the peat.

2.3.4.2 Hydrology - Surface Water, Drainage and Natural Watercourses

Figure 2-13 shows the network of natural watercourses and man-made drains that were on the wind farm site prior to construction. All of the existing drains and watercourses are narrow open drains, typically 1-2 m deep. Where the peat is shallow the drains and watercourses penetrate into the underlying glacial till. However, in deeper peat >1-2 m deep the drains are only excavated into the peat. At the east end of the site the drainage network reflects the outline of the turbary plots on that side of the site. Over the rest of the site the drains follow improved natural watercourses or forestry furrows.

Hydrology plays an important role in peat stability. Figure 2-13 illustrates how the site drainage feeds into the regional network of streams and rivers downslope from the site. It also shows that the peat slide that occurred at the site during construction in October 2003 is in the natural drainage channel for

the stream in sub-catchment SC7(b). Groundwater and surface runoff from that part of the site has formed streams of concentrated flow in shallow channels on the glacial till or rock below the disturbed peat within the slide area. These streams flow into Stream SC7(b) downslope from the site.

Figure 2-14 shows the regional hydrology in the area from the EPA online Water Maps (www.epa.ie). All of the streams and rivers on the south side of the wind farm flow south into the Owendalulleegh River, which flows west into Lough Cutra. It then turns north through Gort before joining the Kilchreest River near Coole Lough approximately 14.0 km northwest of the site.

The rivers on the north side of the wind farm flow north into the Ballynahowna River, which then flows west before turning north to join the Kilchreest River approximataely 10.5 km northwest of the site. The Kilchreest River flows ultimately flows into Southeast Galway Bay via an underground karstified aquifer from Coole Lough.

2.3.4.3 Hydrogeology - Bedrock Aquifer Classification & Vulnerability

Figure 2-15 shows the bedrock aquifer classification for the wind farm site from the Geological Survey of Ireland (GSI). Bedrock on the site has been classified as a Poor Aquifer (Pl), i.e. bedrock which is generally unproductive except for local zones. This is characteristic of a low permeability rock with concentrated zones of higher permeability along open fissures or seams of highly fractured, highly weathered rock, particularly along fault lines.

The GSI classify aquifer vulnerability in terms of the geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The criteria with which aquifers are classified is described in the publication “Groundwater Protection Schemes” (DELG/EPA/GSI, 1999) and reproduced here as Table 2-1. Figure 2-16 shows the GSI vulnerability rating for the bedrock aquifer in the area.

The GSI aquifer vulnerability area classification is based on desk study information on subsoil characteristics and depth to rock. Glacial tills are assigned a permeability category on the basis of a field assessment of texture, particle size distribution and mass characteristics of the exposure in combination with recharge observations such as vegetation and artificial drainage density. In-situ permeability test results are taken into account where available. The extent of the different zones using the criteria in Table 2-1 would generally be based on limited site-specific information. Therefore, the boundaries could be subject to change based on the results of the ground investigation on the site.

The aquifer vulnerability map of the area shown in Figure 2-16 indicates that the site is predominantly within an area of High (H) vulnerability with rock at a typical depth of 3-5m covered by low permeability peat and clayey subsoil. There are some areas of Extreme (E) vulnerability where rock is shallow or outcropping on the steep slopes and stream channels to the north of the wind farm, and along the existing forestry access road into the site from the northeast.

Areas of Moderate (M) and Low (L) vulnerability have been identified in the southeast corner of the site, where the turbary plots are located. The lower classification in this area would be indicative of deeper bedrock.

Table 2-1 – Aquifer vulnerability criteria (DELG/EPA/GSI, 1999)

Vulnerability Rating	**Hydrogeological Conditions**				
	Subsoil Permeability (Type) and Thickness			**Unsaturated Zone**	**Karst Features**
	High Permeability (sand/gravel)	Moderate Permeability (e.g. sandy subsoil)	Low Permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	-
High (H)	>3.0 m	3.0 - 10.0 m	3.0 – 5.0 m	>3.0 m	N/A
Moderate M)	N/A	> 10.0 m	5.0 – 10.0 m	N/A	N/A
Low (L)	N/A	N/A	>10.0 m	N/A	N/A

Notes:

(1) N/A = not applicable

(2) Precise permeability values cannot be given at present

(3) Release point of contaminants is assumed to be 1-2 m below ground surface

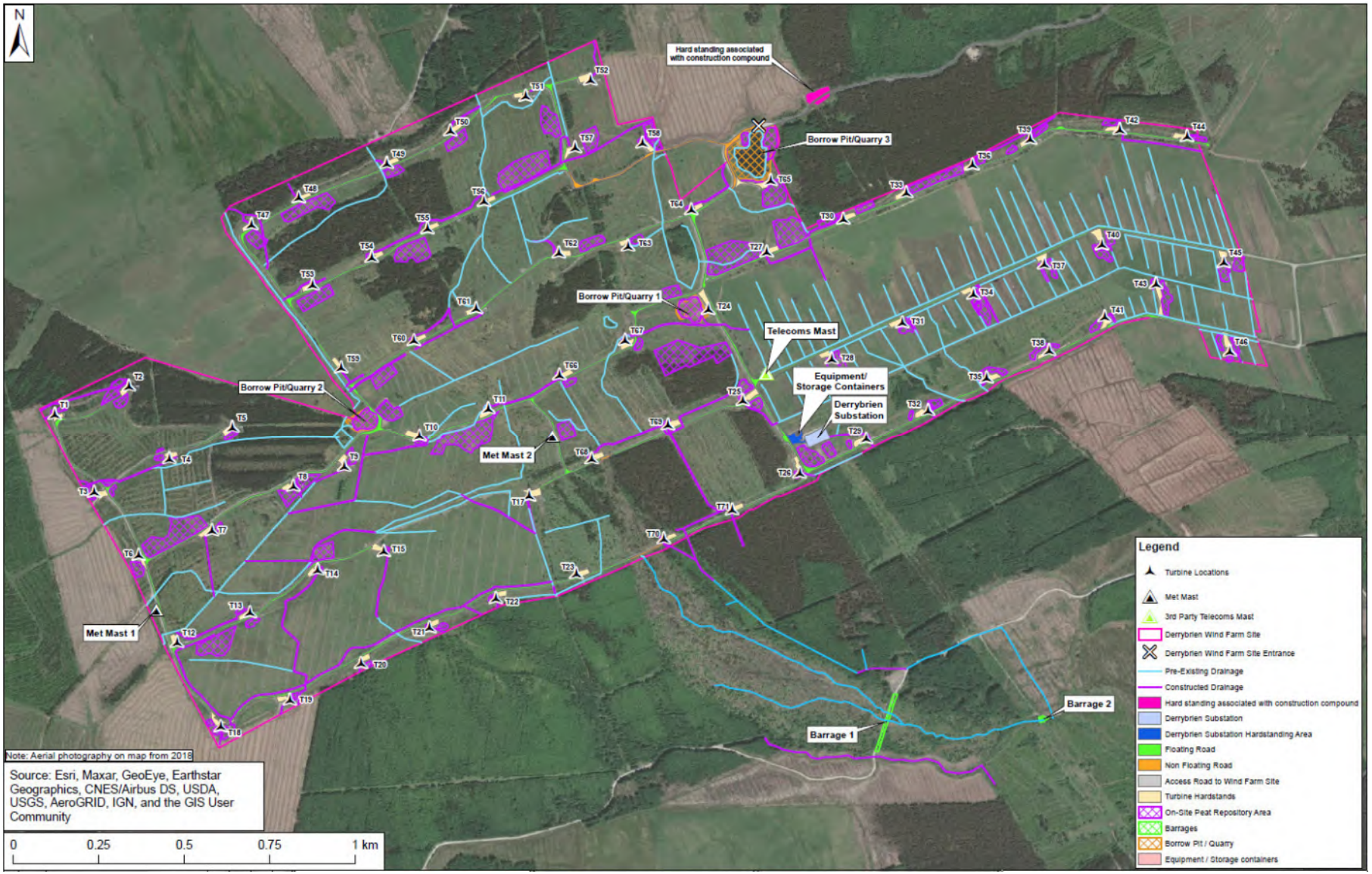


Figure 2-13: Surface hydrology and drainage network on site (ref: ESBI Drawing No.QS-000192-01-D451-001 in Appendix A)

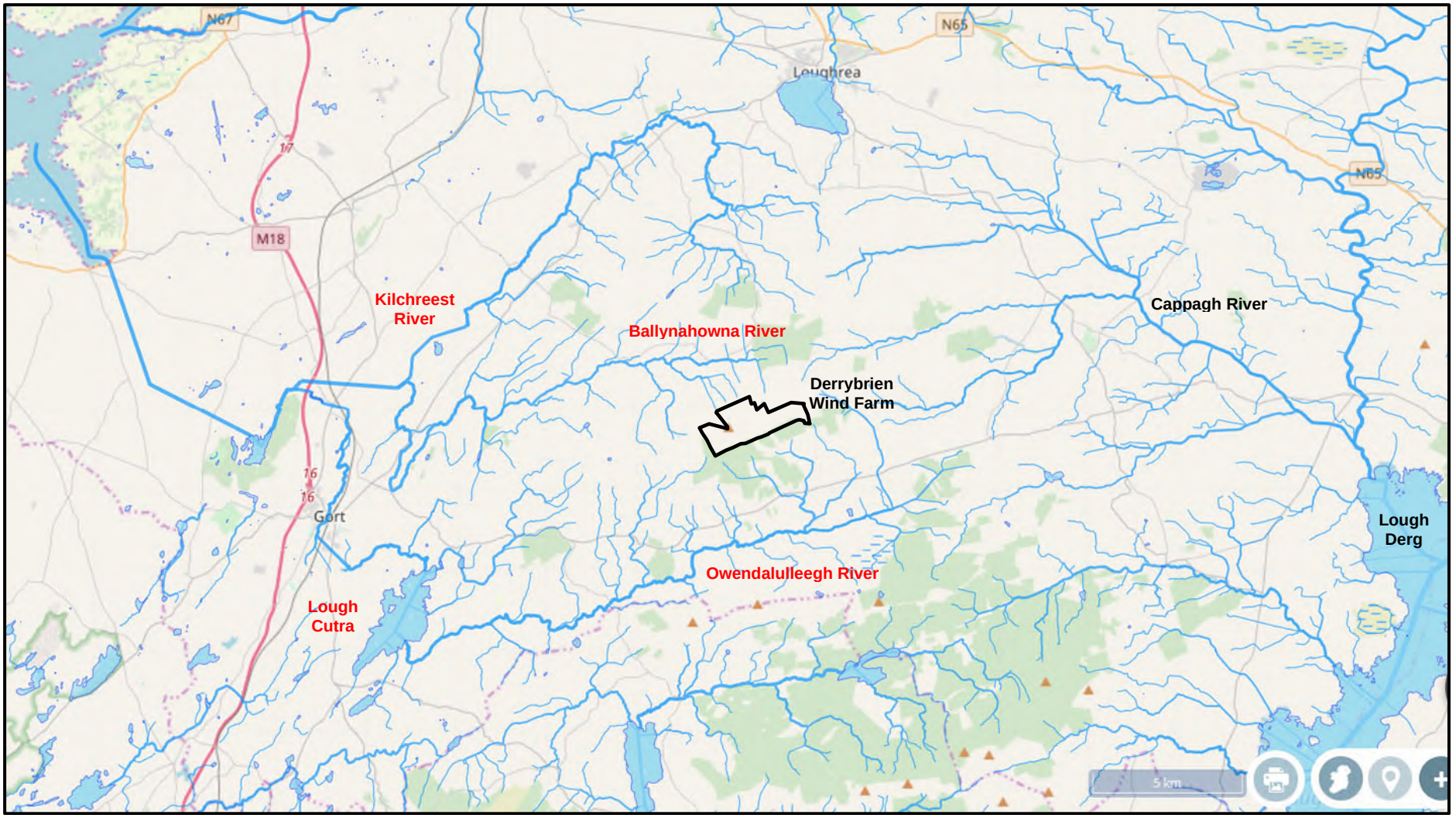


Figure 2-14: Regional hydrology (EPA Water Maps, www.epa.ie, 2020)

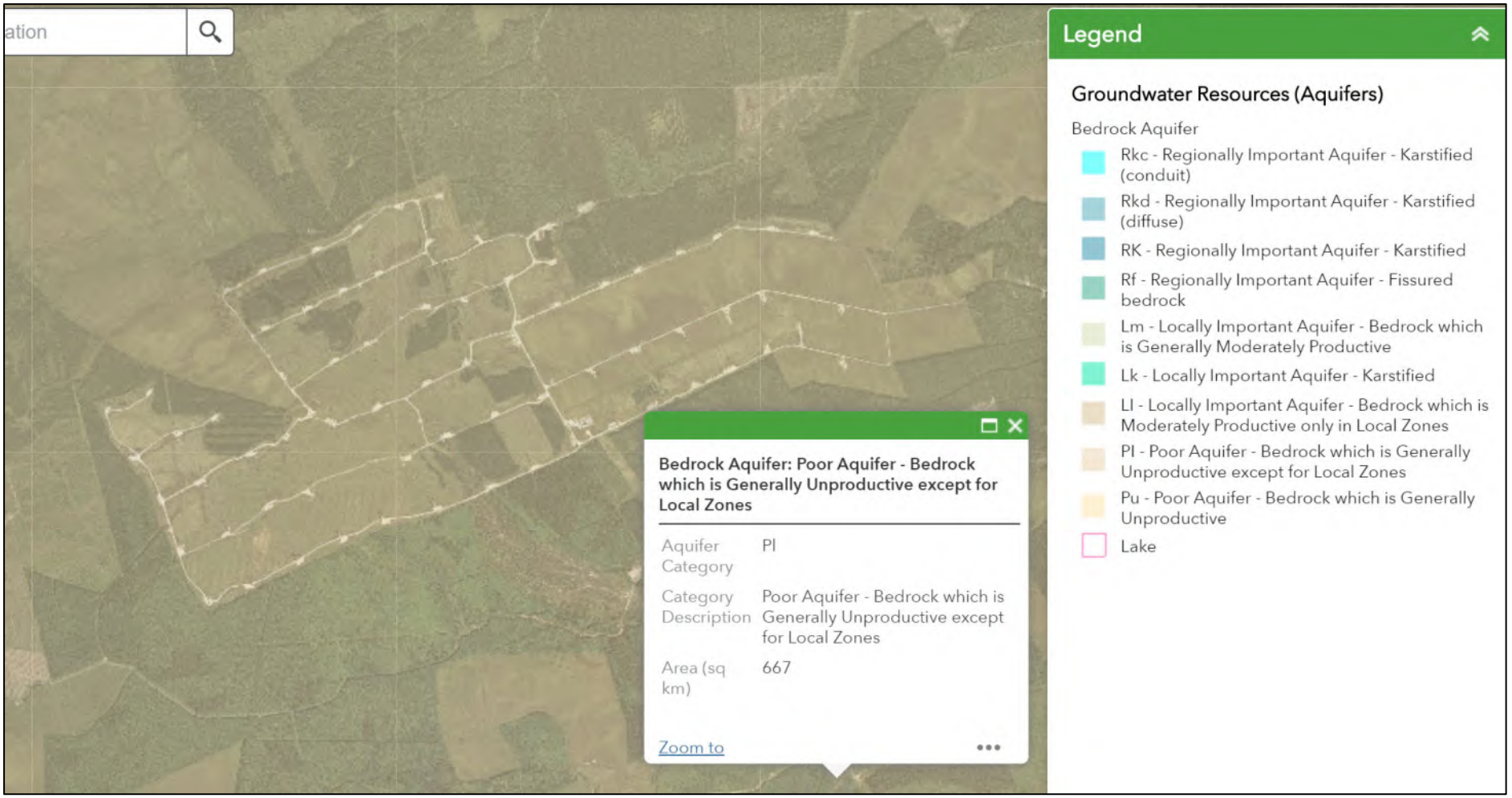


Figure 2-15 – Bedrock aquifer classification (GSI online mapping, www.gsi.ie, May 2020)

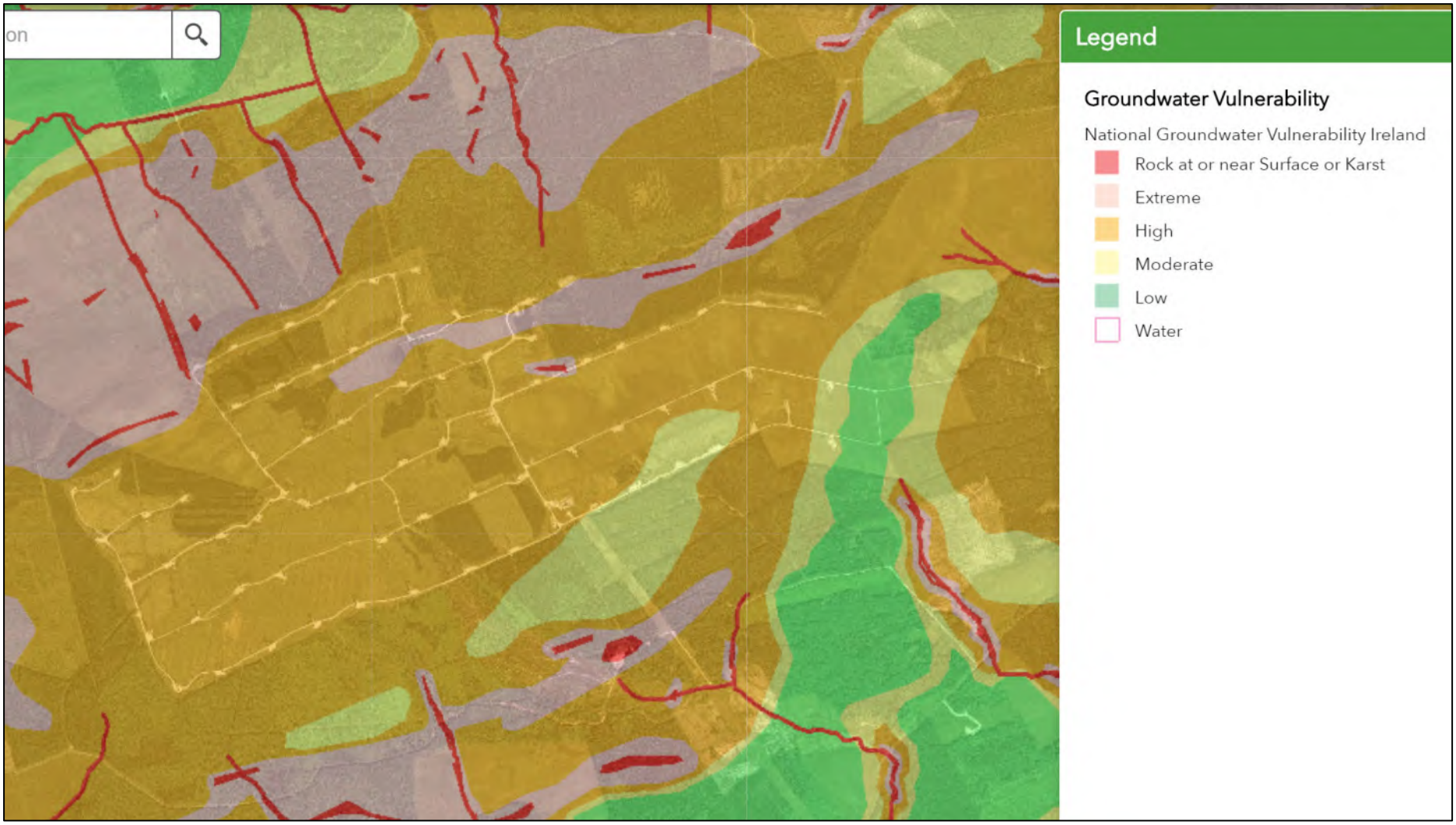


Figure 2-16– Bedrock aquifer vulnerability (GSI online mapping, www.gsi.ie, May 2020)

2.4 Baseline Sensitivity of Receiving Environment (Soils, Geology & Land) for the Wind Farm Site

The significance of the effects of impacts on soils, geology and land on the site has been assessed as a function of the sensitivity of the receiving environment using the matrix in Figure 1-2. The sensitivity of the receiving environment is classified on a 7-point scale from Negligible to High as a function of the characteristics of the soils, geology and land that are directly impacted by the project, or potentially impacted by a peat failure.

For this project, the majority of the significant effects on soils, geology and land relate to the upland blanket bog that covers most of the wind farm site and surrounding area. Therefore, the characteristics of the blanket bog in the area govern the classification of the sensitivity of the receiving environment for assessing the significance of effects on soils, geology and land on this project. For stability impacts, consideration has also been given to the sensitivity of the blanket bog outside the wind farm site that could be directly impacted by a peat slide at the site. The potential impact of the project on Geological Heritage Sites has also been taken into account.

For this project the sensitivity of the receiving soils, geology and land has been classified as **MEDIUM** based on a combination of factors, i.e.:

- Geological Heritage Sites that could be impacted by the project;
- The ecological importance of the blanket bog;
- The significance of the peat for carbon sequestration; and
- The use and value of the land impacted by the project;

There are no audited or unaudited Geological Heritage Sites identified on the wind farm site or in the project area on the Geological Survey of Ireland Spatial Resources interactive map viewer. Therefore, the bedrock is not a sensitive receptor on the project.

The habitat impacted by the project is predominately conifer plantation on upland blanket bog that had been degraded by drainage and by the planting of the trees, and is therefore of low ecological value.

The open bog in the eastern portion of the site that was used for turbary was degraded due to drainage and turf cutting and was also of low ecological value. However, the open areas are rare in the wider landscape and suitable for use by hen harrier. Therefore, when all habitats are taken into account, the overall ecological value of the blanket bog is of Local Importance (higher value). This would be equivalent to a **Medium** to **Low** sensitivity.

Blanket bog is a significant source of carbon sequestration in Ireland. Stored carbon in the peat can be negatively impacted by excavation, disturbance, and drainage. The rate of decomposition of peat significantly increases when exposed to an aerobic environment above the water table and this results in a release of stored carbon as carbon dioxide. Carbon can also be lost in solution due to erosion of disturbed peat.

To give context to the scale of the impact of the project on carbon storage in the peat:

- The extent of upland blanket bog on the wind farm site (approx. 340 ha) is <0.1% of the total area of upland blanket bog in Ireland (≈436,690 ha in 1979 Hammond (1981), Conaghan (2000));
- Less than 9% (≈ 30 ha) of the blanket bog on the site was directly impacted by the project (i.e. by the turbines, crane hardstandings, substation, borrow pits, material sidecast areas and peat repositories);
- A similar area of blanket bog (25ha) outside the wind farm site boundary was directly impacted by the peat slide that occurred at the site in October 2003;

- The mass of carbon stored in peat is on the order of **0.055 tonnes/m^3** (Holden & Connolly (2011) & Milne & Brown (1997))**.** This is equivalent to **0.2 tonnes CO_2 /m^3** if fully oxidised by decomposition.
- The total volume of peat excavated for the turbines, crane hardstandings, substation and borrow pits was approximately **185,000 m^3**. About a further **450,000 m^3** of peat was displaced in the peat slide at the site in October 2003. If it is assumed that 100% of the combined volume of excavated peat and displaced peat could be lost due to a combination of excavation/displacement, and long-term erosion and/or decomposition on exposure then this would be equivalent to releasing **127,000 tonnes of CO_2** into the atmosphere. However, this is very conservative as there is still approximately 200,000 m^3 of disturbed peat within the slide area. Also, the excavated peat was all stored in designated storage areas on site and vegetation has re-established on the surface of the peat, which will slow down the rate of decomposition. Therefore, the actual log-term carbon release from the excavated and displaced peat will be significantly lower, possibly on the order of **40-60% of the total (i.e. 50-75kt CO_2).**
- In terms of recent national statistics for greenhouse gas emissions in Ireland, **50-75 kt CO_2** is **≈ 0.10-0.15%** of Ireland's total estimated annual CO_2-equivalent GHG emissions in **2023 (55,000 kt-$CO_{2\text{-eq}}$)** and **≈ 0.65-0.95%** of the total emissions related to energy industries in that year **(7,865 kt-$CO_{2\text{-eq}}$)** in that year (www.epa.ie, 2024).

Therefore, the impact of the project on carbon storage is relatively low and would be compensated by the net carbon gain over the design life of the wind farm.

In terms of land use, the value of the land impacted by the project is largely determined by the forestry plantations and turbary plots on the wind farm site, which are of relatively low commercial value. The mature timber on the site was harvested during construction, but the trees could not be re-planted after the wind farm was completed. The wind farm also directly impacted approximately 30 ha of land on the site for the turbines, crane hardstandings, substation, borrow pits, material sidecast areas and peat repositories.

Based on the relatively low ecological value of the land, the sensitivity of the receiving environment could be characterised as Medium to Low. However, when combined with the additional environmental value of the land as a carbon store and the relatively low commercial value of the land for forestry/agriculture, this is sufficient to raise the combined level of sensitivity of the peat to "**MEDIUM**".

For the assessment of stability impacts the sensitivity of the receiving soils, geology and land that could be impacted by a peat slide has also been classified as **MEDIUM** based on the scale of the very large peat slide that occurred on the site in October 2003, and by the land that that was directly impacted by the slide, i.e.:

- The land that was disturbed by the peat slide covered an area of approximately 25 ha, which is comparable to the wind farm, and it was comprised of coniferous forests of low ecological and commercial value;
- Approximately 450,000m^3 of peat was displaced in the slide, but about 200,000m^3 of this is still present on the slope; and
- The agricultural land downslope from the main slide area that was impacted by peat from the slide was also of low ecological and commercial value;

Therefore, the impact on the blanket bog habitat, carbon storage and land use is of a similar scale and sensitivity to the wind farm project. The characteristics of the topography, ground and groundwater conditions in the area are also representative of the general conditions around the site that could be impacted by the project where there is a risk of a large peat slide. Therefore, for this project it has reasonably been considered as the worst-case scenario for assessing the impact of site activities on the

receiving soils, geology and land with respect to site stability. To accurately assess stability impacts on soils, geology and land, consideration has also been given to the scale and characteristics of the smaller, more localised peat failures that occurred on site during construction. For example, around the perimeter of the open excavations for the turbine foundations, the risk of peat instability was limited to localised shear failure or very small scale peat slides where the side slopes were not adequately supported, which had a significantly lower impact on the receiving soils, geology and land.

2.5 Baseline Peat Stability Risk Assessment for 1998 - Prior to Construction and Prior to Implementation of Appropriate Risk Mitigation Measures for Site Activities.

A baseline Peat Stability Risk Assessment (PSRA) has been carried out for the site to characterise the relative risk of peat instability in defined zones across the site in 1998, prior to construction of the wind farm. The purpose of the PSRA is to identify where there are elevated risk factors that determine where mitigation measures are required to ensure that the risk of peat instability can be reduced to an acceptable level for each site activity.

As described in Section 1.3, the PSRA is an engineering risk assessment that has been carried out in accordance with the best practice guidelines for peat landslide risk assessments outlined in the report - "*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition, April 2017)*", by the Scottish Government Energy Consents Unit. The method of risk assessment is also consistent with the Institution of Civil Engineers' publication outlining UK best practice in "*Managing Geotechnical Risk*" (Clayton, 2001).

For this assessment, the site has been split up into 71 No. representative zones corresponding to sections of the site around the turbines and access tracks on peat.

A qualitative risk assessment has been carried out for each zone to assess the **Risk Rating (R)** for a peat slide based on the interpreted **Likelihood (L)** (i.e. probability) of occurrence and **Impact (I)** of failure.

The **Likelihood (L)** of a peat slide in each zone has been interpreted by evaluating factors related to the peat and subsoil conditions, topography, site hydrology/hydrogeology and other significant contributory factors such as peat harvesting or slide history to determine where there are conditions that could lead to an elevated risk of a peat slide.

The potential **Impact (I)** of a peat slide in each zone has been interpreted by evaluating factors related to the potential volume of peat, degree of contamination, sensitivity of the receiving environment, access for intervention, and land use and existing infrastructure within the potential run-out distance.

A baseline **Risk Rating (R=L x I)** has then been calculated for each zone prior to the implementation of risk mitigation measures to characterise the risk of peat instability across the site to identify where specific design, construction & operational mitigation measures are required to mitigate the risk of peat instability to an acceptable level.

2.5.1 Likelihood (L)

The Likelihood (L) of a peat slide occurring has been interpreted for each zone across the site using the worksheets that are include in Appendix B. In addition to the information on site conditions summarised in Section 2.0 of this report and in AGL Report No. 11-147-R01 in Appendix F, the following information included in Appendix B has also been used to complete the worksheets:

- AGL Figure No. 2.1B – Site layout and LiDAR topographical survey
- AGL Drawing No. 11-147-03 – Aerial Photograph with LiDAR survey superimposed
- ESBI Drawing No. QS-000192-01-D451-025 – Peat Depth Banding
- AGL Drawing No. 11-147-05 – Slope Angle at Ground Surface
- ESBI Drawing No. QS-000192-01-D451-020 – Bottom Peat Slope Banding
- ESBI Drawing No. QS-000192-01-D451-028 – Infinite Slope Analysis [Peat Undrained Shear Strength, c_u=5kPa, Surcharge = 0kPa]

- ESBI Drawing No. QS-000192-01-D451-026 – Infinite Slope Analysis [Peat Undrained Shear Strength, c_u=2.5kPa, Surcharge = 0kPa]
- ESBI Drawing No. QS-000192-01-D451-029 – Infinite Slope Analysis [Peat Undrained Shear Strength, c_u=5kPa, Surcharge = 13kPa (= 1.0m Peat x 1.3)]
- ESBI Drawing No. QS-000192-01-D451-027 – Infinite Slope Analysis [Peat Undrained Shear Strength, c_u=2.5kPa, Surcharge = 13kPa (= 1.0m Peat x 1.3)]

Tables B1 to B5 in Appendix B give guidance on the assessment of the different factors included on the worksheets. The results are shown on Table 2-2 – Baseline Peat Stability Risk Assessment for site in original condition in 1998 prior to construction.

2.5.2 Impact (I)

Drawing No. QS-000192-01-D451-018 by ESBI in Appendix A shows a map of the environmental constraints that have been identified in the region of Derrybrien Wind Farm. A detailed environmental assessment of the site is outside the scope of this report. However this section gives a summary of factors that are relevant in assessing the potential impact of a peat slide on the site.

Based on the extent and characteristics of the peat slide that occurred at the wind farm site during construction in October 2003, where there is a risk of a large scale peat slide, then it could result in the shear failure of a large volume of peat, on the order of 450,000m^3, over a wide area on the side slopes of Cashlaundrumlahan Mountain. This would result in the loss of peat habitat within the slide area, which could extend outside the site boundary on the upper slopes of the mountain.

The nature of peat slides such as these is that they typically occur directly upslope from natural watercourses, particularly where poor drainage is a contributory factor. Therefore, a significant portion of the failed peat would become fluidised into a viscous mass of remoulded peat debris that would flow down into the river valleys directly inundating the rivers downslope. The material that remains within the failure scar on the upper slopes would typically be comprised of detached rafts of intact fibrous peat, remoulded peat debris and a thin cover of intact basal peat over the underlying mineral soil and rock.

The fluidised peat debris could have significant run-out distances along the river valleys, which could occur in pulses over a number of days if the peat becomes re-mobilised by subsequent periods of heavy rainfall. Where the volume of peat exceeds the capacity of the valley on flatter slopes it can spread out over the surrounding land to either side. Where rivers or streams cross public roads the peat can block culverts or bridges, sometimes overtopping the road and blocking public access. The downstream impact of the remoulded peat attenuates with distance from the site. The extent of organic sediment transported downstream will be a function of the volume and characteristics of the peat and the hydrological characteristics of the river and stream networks.

In contrast to this, where the risk is limited to a small localised peat slide in shallow fibrous peat then the impact of this could be contained on site with localised loss in peat habitat in the slide area and low run-out distances downslope from the slide without direct inundation of the downslope watercourses. In this case the risk of contamination of watercourses could be limited to sediment laden surface runoff, which can be mitigated or contained on site.

As stated in Section 0, the “Impact” of a peat slide in the PSRA is different to the Impact of site activities in the environmental impact assessment methodology. The PSRA is an engineering impact assessment. Therefore, the possible Impact of a peat slide includes a broader assessment on the sensitivity of the receiving environment that is not limited to the direct impact on soils, geology and land. It also includes commercial impacts that can have a significant impact on cost or time for an engineering project, which is consistent with the guidelines in the Institution of Civil Engineers' publication outlining UK best practice in "*Managing Geotechnical Risk*" (Clayton, 2001).

With this in mind, the following characteristics of the site and surrounding area are relevant in assessing the impact of a peat slide:

- The site is located within the Slieve Aughty Mountains Special Protection Area (SPA) which has Special Conservation Interest for Hen Harrier and Merlin.
- The Sonnagh Bog Special Area of Conservation (SAC) and proposed National Heritage Area (NHA) borders the banks of the Ballynahowna River approximately 1.5 km north of the site, which could be impacted along its southern margin by a large scale peat slide on the northern side of the site.
- The Slieve Aughty Bog NHA identified on the south side of the R353 near Derrybrien village could be impacted by peat from a large scale slide on the south side of the wind farm entering Derrybrien North River (Stream SC7(b)) which is along the western margin of the NHA.
- Although the Ballynahowna River and Owendalulleegh Rivers to the north and south of the wind farm, respectively, do not have protected status, approximately 10.5 km northwest of the site the Ballynahowna River flows into the Kilchreest River, which is designated a River in SAC Species; and approximately 11 km southwest of the site the Owendalulleegh River flows into Lough Cutra, which is a designated SAC.
- Although the area is generally sparsely populated, particularly to the north of the wind farm, Derrybrien village is located along the R353 Regional Road approximately 2 km downslope from the south side of the site. At this distance, the impact of a peat slide would be concentrated in the areas where the tributaries to the Owendalulleegh River cross the R353 and a slide would be unlikely to impact the dwellings, monuments or Architectural Heritage features in the village. Access to the village could be restricted if the road becomes blocked.
- The local road up to the site from Derrybrien, which is referred to as the "Black Road" could be impacted by a peat slide, particularly where it crosses the Derrybrien North River and the other unnamed tributary of the Owendalulleegh River
- As the wind farm has been completed, the existing site infrastructure could be directly impacted by a peat slide on the site, particularly the site access tracks that have been constructed as floating roads, and the 110 kV overhead line that connects the substation on the site to the national grid at the Agannygal Substation, approximately 7.7 km south of the site.
- Land use around the site is limited to commercial forestry on the sides of the mountain, with some agriculture on the lower slopes at the base of the mountain around Derrybrien Village. These activities could be directly impacted by a peat slide on the site, particularly the commercial forestry.

Also, a very large peat slide would have a significant commercial impact on the project. In addition to the costs of remedial works to mitigate the effect of the peat slide on the receiving environment, the commercial impact could include the loss of wind farm infrastructure, damage to local or regional public infrastructure (bridges, roads etc), and/or loss of commercial forestry and agricultural land. It could also lead to sustained periods of power outages where the wind farm is shut down or disconnected from the grid. During construction a large peat slide would also cause significant delays to the programme.

On the basis of these factors, the potential **Impact** of a large peat slide similar in scale and nature to the slide that occurred on the site during construction in 2003 has been classified as **High (I=5)** for all zones on the site.

2.5.3 Risk Rating

The results of the baseline PSRA are presented in Table 2-2 and in Figure 2-17. It should be noted that the Risk Ratings on these figures and tables represent the interpreted risk of a peat slide based on site conditions prior to the implementation of risk mitigation measures. It identifies areas of the site where

there is an elevated risk of peat instability so that appropriate design and construction mitigation measures can be identified to reduce the risk of a peat slide to an acceptable level for site activities.

The assessment identifies 38 No. zones across the site where the Risk Rating, R, prior to mitigation measures is characterised as **Medium to High (R=20)** or **High (R=25)**, which is unacceptable without appropriate mitigation measures. These zones are located in areas across the site where there are elevated risk factors in relation to peat stability, including, for example:

- Deposits of deep (3-6 m) and relatively deep (2-3m) weak peat ($c_u \approx$ 4-5 kPa) with low infinite slope Factor of Safety (<1.0-1.3);
- Areas of intermediate slope angles of 3-5° in close proximity to a convex break in slope to slope angles >5°;
- Zones that are in the broad valleys directly upslope from the rivers and streams downslope from the site boundary;
- Zones of deep peat with poor drainage and ponded surface water at the head of a watercourse, or along the edges of the terraces on the north side of the site; and
- Areas adjacent to the previous slide that have similar site characteristics.

The highest risk rating of R=25 occurs where there are compounding risk factors leading to an elevated risk of peat instability i.e.

- at **Turbines T17, T68** and **T21 to T70** in the vicinity of the slide in relatively deep peat on a convex breaking slope directly upslope from the rivers and streams on the south side of the site;
- at **Turbines T49 to T51** where there are deep deposits of peat in close proximity to a distinct convex break in slope to slopes >5-7.5° directly upslope from the rivers and streams on the side of the site; and
- at **Turbines T60 to T62** where there are deep deposits of very soft peat with a high water table and ponded surface water at the head of a watercourse and along the edge of a terraced slope.

In the remaining 33 No. zones across the site the Risk Rating, R, prior to mitigation measures would be characterised as **Medium (R=15)** or **Low to Medium (R=10)**, which would require early or regular attention with appropriate mitigation measures to reduce the risk of peat instability or to manage the risk on site. These were in areas where there were mitigating conditions that reduced the baseline risk of peat instability. For example:

- Areas of shallow (<1.0 m) or relatively shallow (1-2 m) peat;
- Areas of gently sloping ground (<3°) set well back from any convex break in slope to slopes >5°.
- Areas of relatively high infinite slope FoS >1.3-1.4;
- Zones where there is well-developed drainage and which are not directly upslope from the rivers and streams outside the site boundary.

Although there are areas of the Derrybrien site that have an elevated risk of peat instability, it is not an unusual or exceptional risk for wind farm developments on upland blanket bogs in Ireland. The design and construction risk mitigation measures that were adopted on the Derrybrien site after the peat slide in October 2003 are standard measures that are commensurate with the geotechnical risk of a peat slide on the site, and are now routinely adopted on similar sites across Ireland and the UK. Therefore, the baseline **Peat Stability Risk Assessment (PSRA)** has also been updated in Section 3.4 to reflect the reduced Likelihood or Probability of a peat slide for the site activities during the second phase of construction due to the risk mitigation measures that were successfully implemented without any further incidents of peat instability.

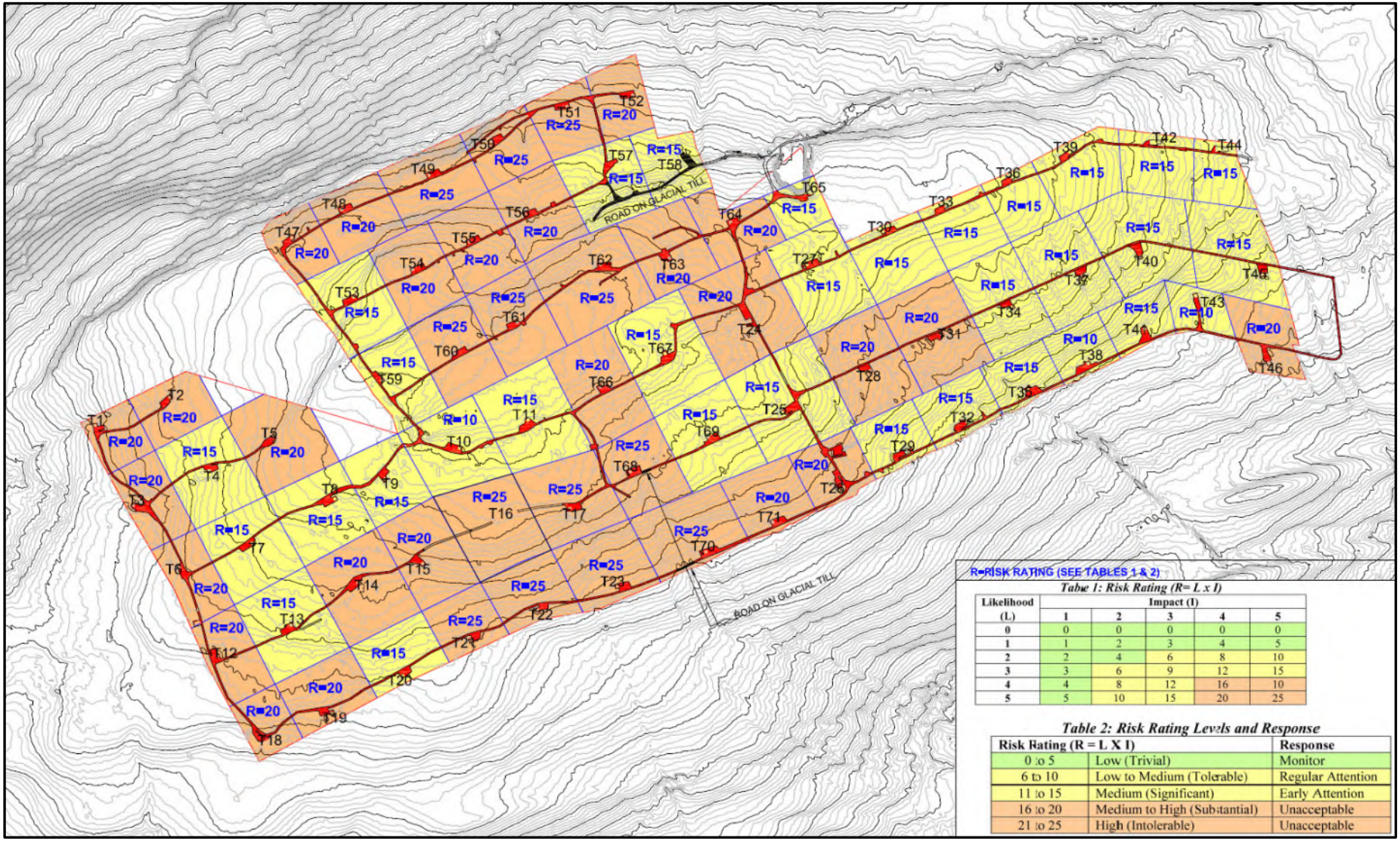


Figure 2-17 – Baseline Peat Stability Risk Assessment for site in original condition in 1998 prior to construction

Table 2-2 – Baseline Peat Stability Risk Assessment for site in original condition in 1998 prior to construction

							Baseline Risk Rating - 1998 (Original Condition Prior to Construction)				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T01	15	15	15	10	10	65	4	5	20	Medium to High	Unacceptable
T02	15	20	10	10	10	65	4	5	20	Medium to High	Unacceptable
T03	15	15	20	10	10	70	4	5	20	Medium to High	Unacceptable
T04	20	10	10	5	10	55	3	5	15	Medium	Early Attention
T05	15	10	10	10	15	60	4	5	20	Medium to High	Unacceptable
T06	20	15	10	5	10	60	4	5	20	Medium to High	Unacceptable
T07	20	5	10	5	10	50	3	5	15	Medium	Early Attention
T08	20	10	10	5	10	55	3	5	15	Medium	Early Attention
T09	20	5	10	5	10	50	3	5	15	Medium	Early Attention
T10	10	5	5	5	10	35	2	5	10	Low to Medium	Regular Attention
T11	20	5	10	5	10	50	3	5	15	Medium	Early Attention
T12	20	15	15	10	5	65	4	5	20	Medium to High	Unacceptable
T13	20	10	10	5	10	55	3	5	15	Medium	Early Attention
T14	20	10	15	10	10	65	4	5	20	Medium to High	Unacceptable
T15	20	10	15	10	15	70	4	5	20	Medium to High	Unacceptable
T16	20	20	15	10	20	85	5	5	25	High	Unacceptable
T17	20	20	15	10	20	85	5	5	25	High	Unacceptable
T18	15	15	15	15	5	65	4	5	20	Medium to High	Unacceptable
T19	20	15	5	10	15	65	4	5	20	Medium to High	Unacceptable
T20	20	10	5	10	10	55	3	5	15	Medium	Early Attention
T21	20	20	15	10	20	85	5	5	25	High	Unacceptable
T22	15	20	10	15	20	80	5	5	25	High	Unacceptable
T23	15	20	15	10	20	80	5	5	25	High	Unacceptable
T24	15	5	10	10	10	50	4	5	20	Medium to High	Unacceptable
T25	15	15	10	5	10	55	3	5	15	Medium	Early Attention

Table 2-2 (Contd.) – Baseline Peat Stability Risk Assessment for site in original condition in 1998 prior to construction

							Baseline Risk Rating - 1998 (Original Condition Prior to Construction)				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T26	15	15	15	5	10	60	4	5	20	Medium to High	Unacceptable
T27	20	5	10	10	10	55	3	5	15	Medium	Early Attention
T28	15	15	10	10	10	60	4	5	20	Medium to High	Unacceptable
T29	10	15	10	5	10	50	3	5	15	Medium	Early Attention
T30	15	5	5	5	10	40	3	5	15	Medium	Early Attention
T31	20	15	10	15	10	70	4	5	20	Medium to High	Unacceptable
T32	10	15	10	10	10	55	3	5	15	Medium	Early Attention
T33	20	5	5	5	5	40	3	5	15	Medium	Early Attention
T34	15	20	5	5	10	55	3	5	15	Medium	Early Attention
T35	10	15	10	10	10	55	3	5	15	Medium	Early Attention
T36	20	10	0	10	10	50	3	5	15	Medium	Early Attention
T37	10	15	5	5	10	45	3	5	15	Medium	Early Attention
T38	5	10	5	5	5	30	2	5	10	Low to Medium	Regular Attention
T39	15	10	10	5	5	45	3	5	15	Medium	Early Attention
T40	10	15	10	5	10	50	3	5	15	Medium	Early Attention
T41	10	10	10	10	10	50	3	5	15	Medium	Early Attention
T42	15	10	10	5	5	45	3	5	15	Medium	Early Attention
T43	10	10	0	5	10	35	2	5	10	Low to Medium	Regular Attention
T44	10	5	5	10	10	40	3	5	15	Medium	Early Attention
T45	10	10	10	5	10	45	3	5	15	Medium	Early Attention
T46	15	15	10	10	10	60	4	5	20	Medium to High	Unacceptable
T47	15	20	15	10	10	70	4	5	20	Medium to High	Unacceptable
T48	20	20	15	10	10	75	4	5	20	Medium to High	Unacceptable
T49	20	20	20	10	10	80	5	5	25	High	Unacceptable
T50	20	20	20	10	10	80	5	5	25	High	Unacceptable
T51	20	20	20	10	10	80	5	5	25	High	Unacceptable

Table 2-2 (Contd.) – Baseline Peat Stability Risk Assessment for site in original condition in 1998 prior to construction

							Baseline Risk Rating - 1998 (Original Condition Prior to Construction)				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T52	10	20	10	10	10	60	4	5	20	Medium to High	Unacceptable
T53	20	10	10	5	10	55	3	5	15	Medium	Early Attention
T54	20	10	20	5	10	65	4	5	20	Medium to High	Unacceptable
T55	20	15	15	5	10	65	4	5	20	Medium to High	Unacceptable
T56	20	10	15	10	10	65	4	5	20	Medium to High	Unacceptable
T57	10	15	10	5	10	50	3	5	15	Medium	Early Attention
T58	10	15	5	5	10	45	3	5	15	Medium	Early Attention
T59	15	5	10	10	5	45	3	5	15	Medium	Early Attention
T60	20	20	10	20	15	85	5	5	25	High	Unacceptable
T61	20	20	15	15	15	85	5	5	25	High	Unacceptable
T62	20	20	15	15	15	85	5	5	25	High	Unacceptable
T63	20	10	10	10	10	60	4	5	20	Medium to High	Unacceptable
T64	20	10	10	10	10	60	4	5	20	Medium to High	Unacceptable
T65	15	10	10	5	10	50	3	5	15	Medium	Early Attention
T66	20	15	10	5	10	60	4	5	20	Medium to High	Unacceptable
T67	15	15	10	5	10	55	3	5	15	Medium	Early Attention
T68	20	20	15	15	20	90	5	5	25	High	Unacceptable
T69	20	10	10	5	10	55	3	5	15	Medium	Early Attention
T70	15	20	15	10	20	80	5	5	25	High	Unacceptable
T71	15	15	15	5	10	60	4	5	20	Medium to High	Unacceptable

3.0 STABILITY IMPACTS – CONSTRUCTION STAGE (2003-2005)

3.1 Site Activities During Construction (2003-2005)

This section of the report presents a summary the primary activities on the site that were related to the construction of the wind farm in the period between June 2003 and September 2005. The activities have been grouped under the following headings:

- Tree felling
- Site compound
- Site access tracks
- Turbine foundations
- Crane hardstanding areas
- Spoil management
- Turbine assembly and erection
- Substation
- Borrow pits
- Drainage
- Cable trenching and ducting
- Anemometer Masts

3.1.1 Tree Felling

All tree felling activities were managed and the responsibility of Coillte. Tree felling commenced on the site in June 2003, in advance of the civil construction works in July 2003. Between June 2003 and the date of the peat slip on 16th October 2003, the felling activities on the site included the following works are shown on Figure 3-5:

- felling for a 15m wide corridor along the site access tracks,
- felling around the turbine bases,
- felling around the borrow pits and
- felling at the wind farm loop-in sub-station

Following completion of these felling works, the wind farm site was split into 19 No. areas for clear felling (see Figure 3-5). However, all works ceased on the 16th October 2003 following the peat slide that occurred on the site. No clear felling works had been carried out prior to this date. Clear felling commenced in the second half of 2004 and continued until mid-2005. The areas felled during this period are shown on Figure 3-6. The forestry present in 2018 is shown on Figure 3-7.

Modern harvesting and forwarding machinery were used to fell the trees. The harvesting machines comprise the Daewoo 360^0 tracked mechanical excavators with Silvatec 555 Harvesting Heads mounted onto their hydraulic arm (see Figure 3-1). The forwarders used for extraction of logs were Timberjack 1210 and Timberjack 810, see Figure 3-2 and Figure 3-3, respectively.

The trees were cut into 3m length logs, de-branched and placed on the ground beside the harvester. The logs were collected by a forwarding machine that followed behind the harvester and temporarily stockpiled beside a site access track – see Figure 3-8. Coillte would remove the stockpiled logs on a regular basis, by loading them onto an articulated trailer by HIAB and transporting them off-site for processing.

Areas 16 and 18 were felled by hand using a chain saw as the trees were too small for the harvesting machinery. Trees in these areas that were too large for felling using the chain saw were cut using a lighter harvester machine. These felled trees were formed into windrows within these areas and were left in-place.

Figure 3-1: Silvatec 555 MD60 Harvester Head mounted on a tracked excavator

Figure 3-2: Timberjack 1210 Forwarder

Figure 3-3: Timberjack 810 Forwarder

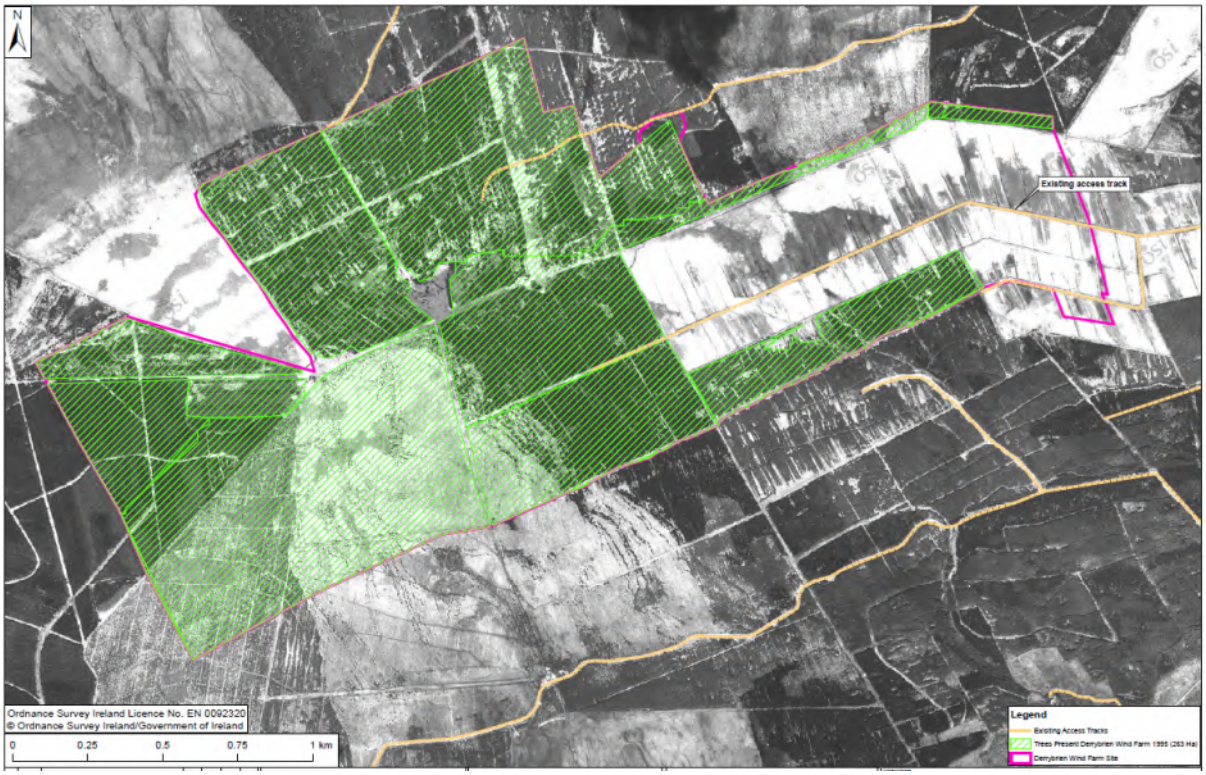


Figure 3-4: Forestry present in 1995

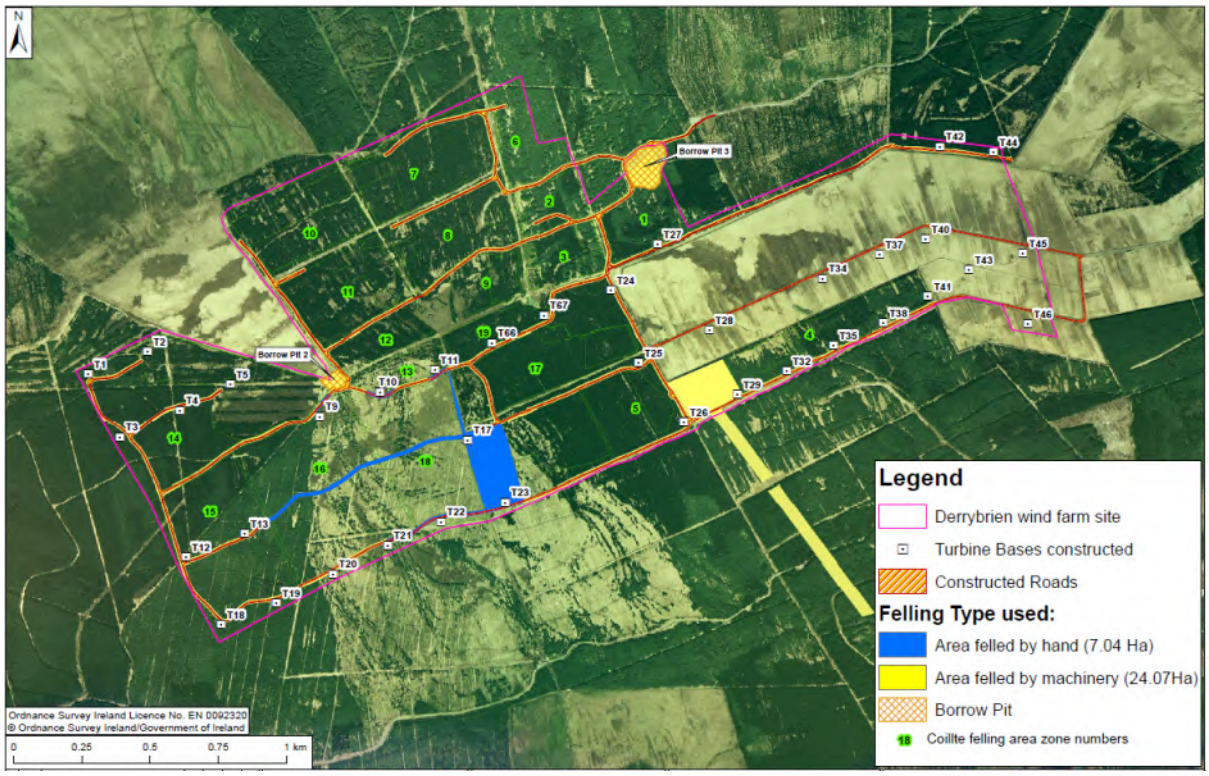


Figure 3-5: Forestry felled prior to October 2003 & type of felling carried out

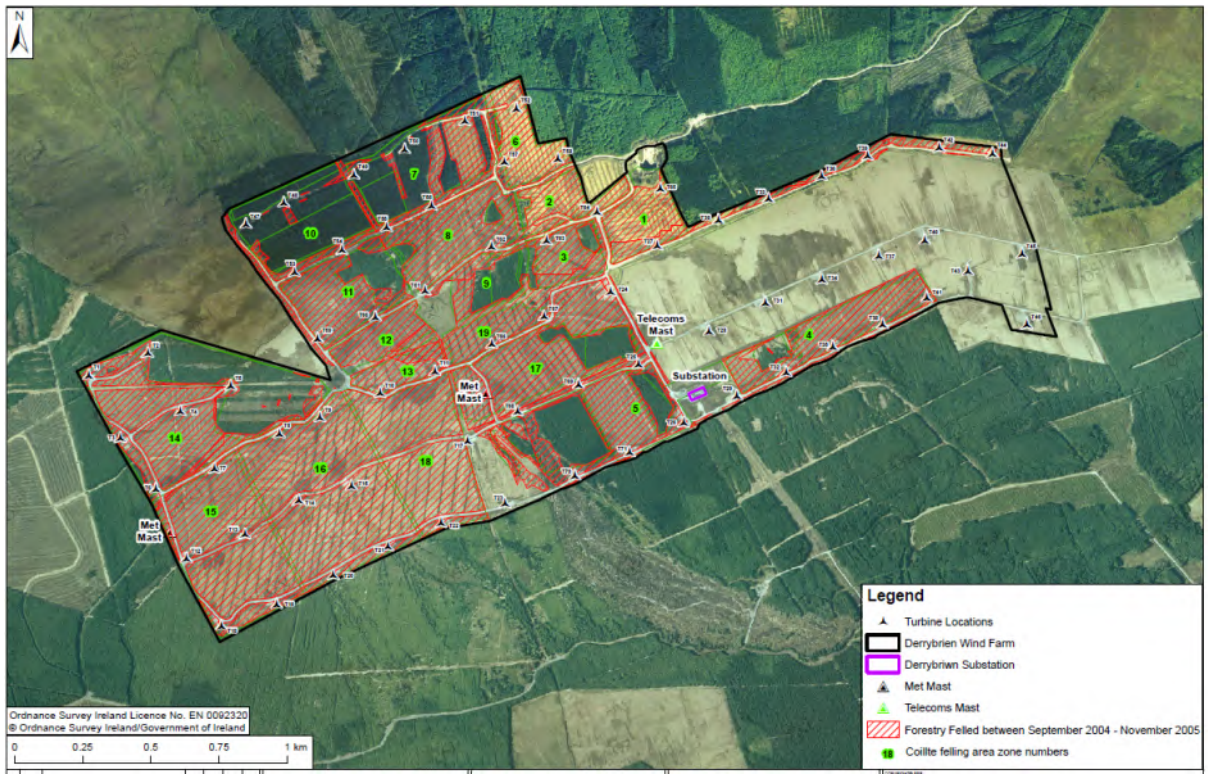


Figure 3-6: Forestry Felled Between September 2004 and February 2005

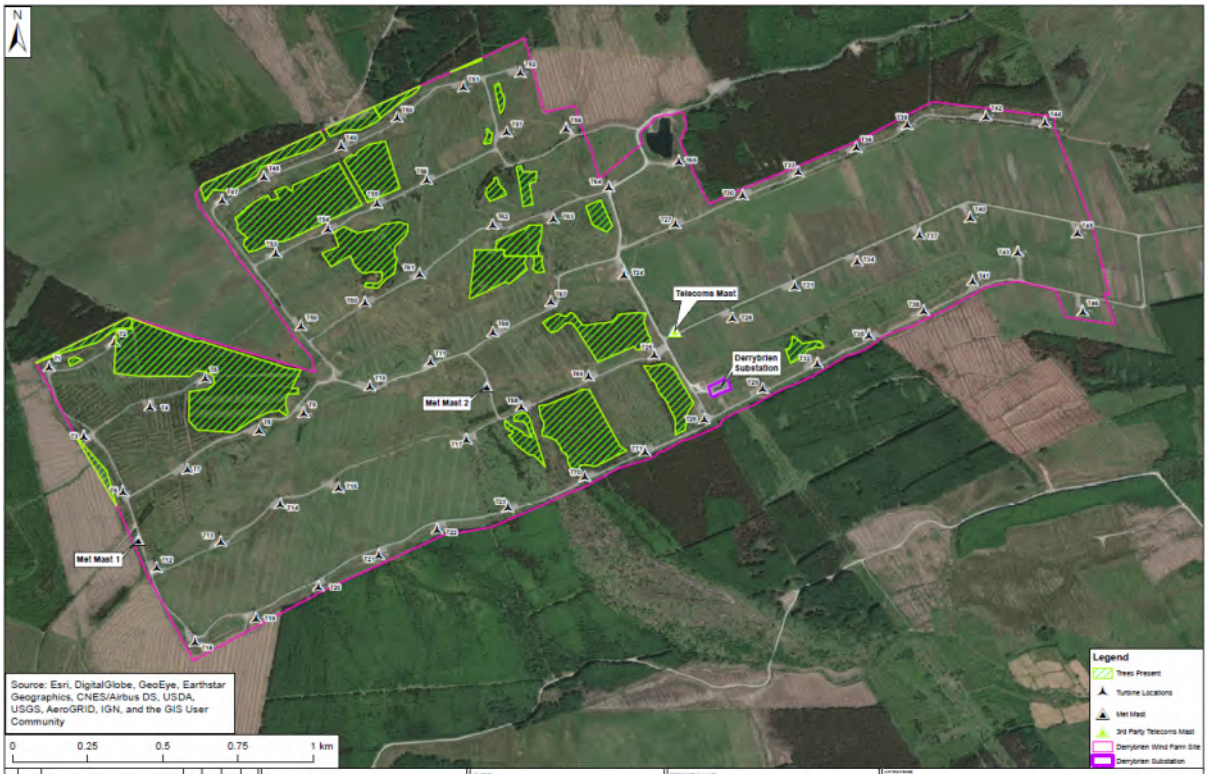


Figure 3-7: Forestry left in place at end of construction

Figure 3-8: Felled trees stockpiled adjacent to access road

3.1.2 Site compound

A site compound was constructed at the start of construction in 2003 to provide facilities during the construction works for the Contractor, Ascon Ltd., (now BAM Civil), their sub-contractors and the Client's Representative (Hibernian Wind Energy). The site compound was located along the existing forestry access road near the entrance to the site at the location shown on Figure 3-9 on an existing hardstanding area in an area of shallow peat. However, the existing hardstanding area was expanded to provide sufficient space for the temporary facilities required for the construction works.

The site compound comprised temporary steel portacabins to provide offices, meeting rooms, canteen, storage and welfare facilities. Parking and storage areas were provided on hardstanding areas around the portacabins. The compound covered an area of approximately 3,200 m^2 (80 m x 40 m) and straddled the access road into the site as shown on Figure 3-10.

The existing hardstanding area was originally constructed on peat, therefore, for the construction of the site compound, all peat below the existing rockfill and within the surrounding footprint of the proposed site compound was fully excavated. There are no records for where the excavated materials were disposed of. However, at that time excavated materials were typically placed or sidecast on the intact peat slopes adjacent to the excavations and spread out across the slope.

The ground rises to the west, therefore, the works required cutting into the slope to provide a level compound area. A layer of crushed rock granular fill was placed on the sub-formation as a capping material and surfaced with Clause 804 subbase material, which was imported from nearby quarries for a finished surface.

The portacabins and compound infrastructure were removed on completion of the wind farm. However, the compound granular hardstanding area has been left in place.

Figure 3-9: Aerial View (Bing 2020) of Site Compound

Figure 3-10: Aerial View (Bing 2020) of Site Compound (zoomed in)

3.1.3 Site access tracks

Figure 3-11 shows the as-built layout of the site access tracks. The total length of access tracks within the site boundary is 17.5 km. During the construction phase of the project:

- **0.9 km** of the tracks from the site compound up to Turbines T65 and T57 were constructed of granular rockfill on the glacial till below the peat;
- **14.6 km** of new tracks across the site were constructed as “floating roads” on the peat, and
- **2.0 km** of the tracks were constructed as upgraded roads along existing floating roads through the turbary plots on the east side of the site.

These sections of the roads are identified on Drawings No. QS-000192-01-D451-014 and P378015-C-0003 in Appendix A.

Most of the roads were constructed as "floating" roads directly over the vegetated surface of the peat. These were constructed with a basal layer of small trees, timber logs and brash and 500-800 mm of crushed rock fill reinforced with a single layer of Tensar SS30 geogrid. Figure 3-11 shows a typical design profile of a floating road on the site.

Over the course of the works a number of the roads were upgraded with an additional upper layer of Tensar SS20 geogrid and an additional 150-300 mm of crushed rock granular fill. The roads were surfaced with 100-150 mm of Clause 804 granular subbase material, which was imported to the site from nearby quarries.

Where necessary, the existing turbary roads on the east side of the site were upgraded with a capping layer of crushed rock granular fill reinforced with a layer of geogrid on the surface of the existing road. The width of these roads was not increased so they are narrower at 3-4 m wide.

At the time of the slide the majority of the roads had been fully or partially completed with the exception of the following sections of floating road which had not been started:

- Turbine T53 to T56
- Turbine T53 to T47
- Turbine T47 to T50
- Turbine T13 to T17
- Turbine T17/T68 to T11/T66

A 30m long section of the floating road at Turbine T68, and a 105m long section of the floating road to the west of Turbine T70 were destroyed in the peat slide on October 2003 and had to be reconstructed. These sections of the site access tracks were reconstructed as rockfill embankments up to about 2.5-3.0 m high on competent glacial till below the disturbed peat. The roads performed a dual function of reinstating the site access tracks that had been damaged in the slide, and acting as a barrage across the slide area to contain the disturbed peat upslope from the embankments.

As a further risk mitigation measure in this area, Turbine T16 was omitted from the scope of work on the project and the sections of floating road between Turbines T15 and T17 were closed and abandoned out of concerns for site stability. To maintain one-way traffic flow and minimise passing vehicles on the floating roads an alternative access loop was provided by connecting the road between Turbines T17 and T68 to the upper road between Turbines T11 and T66. This section of road was constructed as a floating road.

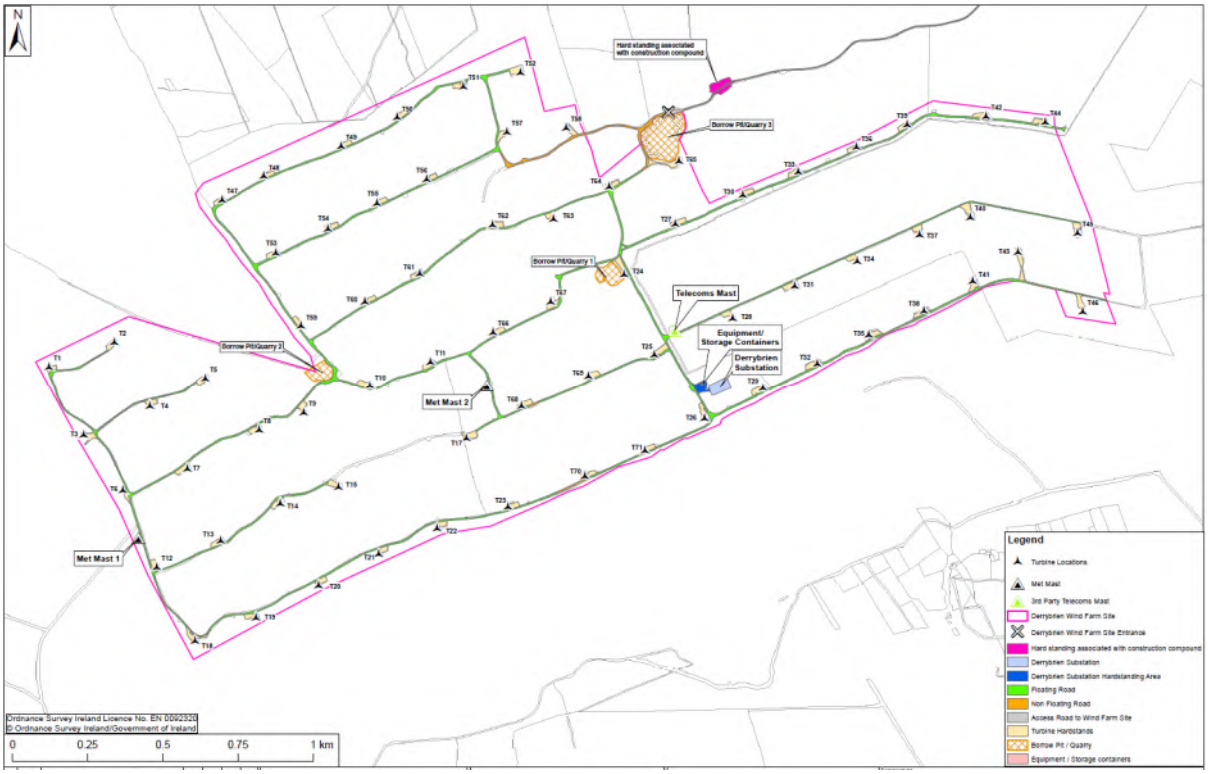


Figure 3-11: As-built layout of the site (Dwg No. QS-000192-01-D1-D451-014 – Appendix A)

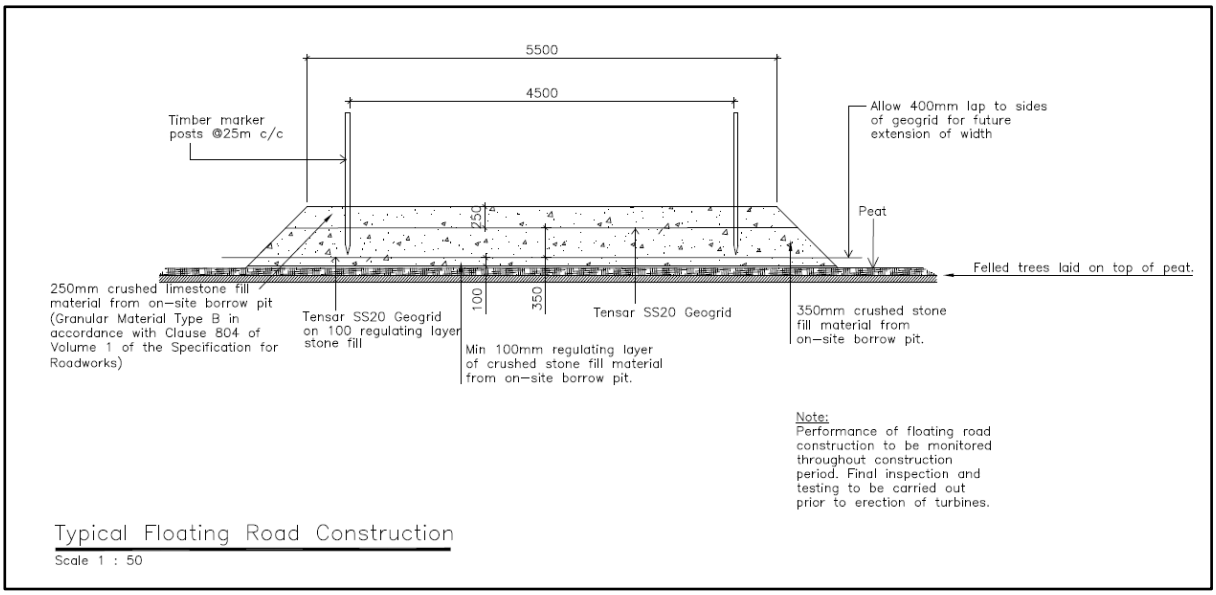


Figure 3-12: Typical Floating Road Construction Detail (Malone O'Regan dwg no 20206-13)

Figure 3-13: Typical section of floating road during construction

3.1.4 Turbine Foundations

The drawing shown on Figure 3-14 shows the design details of the reinforced concrete foundations for the turbine on the wind farm. There were 2 No. different foundation sizes used to support the turbines, namely, Foundation Type 1 which was 9.8m x 9.8m and Foundation Type 2 which was 11.0m x 11.0m. Both foundations were 1.0m deep. The majority of the foundations were Type 1, however, 6 No. of the 70 foundations were Type 2 (i.e. T11, T60-T62, T66, T67). Figure 3-14 shows the design details for Type 1. Similar details would also apply to the design for Type 2.

The excavation to foundation formation comprised an open excavation carried out using mechanical excavators with dump trucks to collect the excavated material. The excavation progressed to the top of rock which was typically between 2.4m and 6.0m depth, but up to a max of 10.3m at turbine T63. The excavation for the foundations typically extended a plan distance of approx. 1.0m beyond the foundation footprint to allow sufficient space for construction works.

Where the depth of excavation to rock was < 4.3m, the turbine foundations were supported directly on rock. However, as shown on Figure 3-14, where the depth of excavation to rock was > 4.3m, the foundations were supported on a “Rock Sandwich” consisting of alternating 200mm thick layers of crushed stone fill and grade C20 concrete blinding. The top of the foundations were covered with a minimum of 1.0m of crushed stone fill.

The depth to rock is given on drawings issued for construction by Malone O’Regan (drawing No. 20206-12) which is extracted on Table 3-1.

As shown on Figure 3-14, a 150mm diameter perforated PVC pipe was installed adjacent to the foundation to provide permanent drainage for the foundation as part of the uplift mitigation design. The drainage pipe was connected to an outfall.

Wherever possible the sides of the temporary excavations were battered back to stable slopes of about 1V:1H or flatter, as necessary. Side slopes in stiff glacial till and weathered rock were increased to 2V:1H or steeper to minimize the extent of the excavation.

In relatively deep (>2.5 - 3.0 m), weak highly amorphous peat in poorly drained areas with a high water table a rockfill berm was constructed down to mineral soil around the perimeter of the excavation to provide temporary support to the peat during construction.

At the time of the slide in October 2003 a total of 37 No. reinforced concrete bases had been constructed across the south, east and western side of the site (T1-T5, T9-T13, T17- T29, T32, T34, T35, T37, T38, T40-T46, T66 & T67). 29 No. of these had been fully backfilled with mineral soil up to ground level. The remaining turbine bases were exposed in open excavations. All of the turbines were in areas of peat. The crane hardstandings for the turbines had been partially constructed to provide a working area for the concrete trucks and steel fixers. However, additional peat excavations were required to complete the hardstandings and they had to be given the final surface treatment.

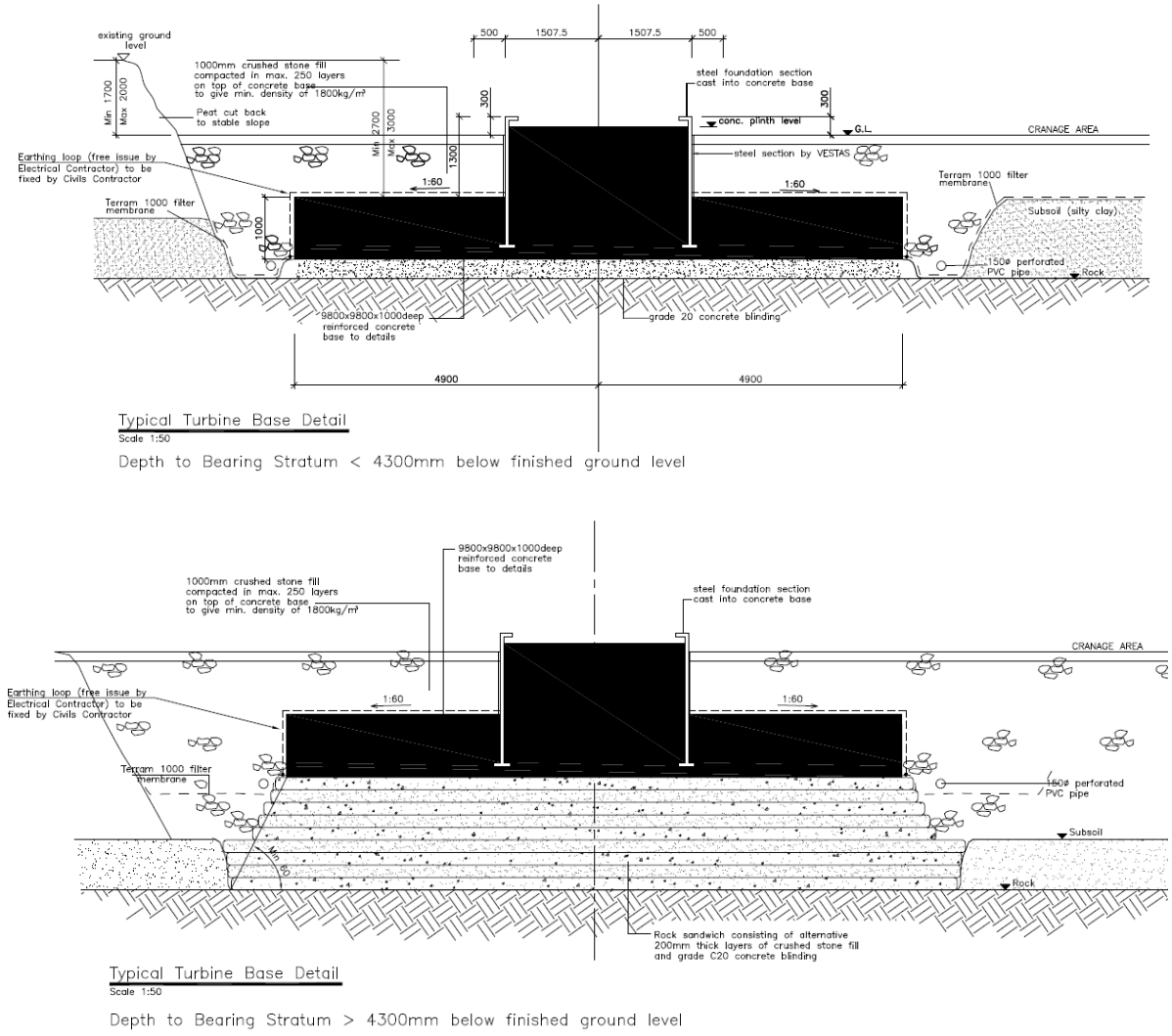


Figure 3-14: Typical Foundation Design Detail (dwg No. 20206-12)

Table 3-1: Table showing depth to rock given on drawings issued for construction by Malone O'Regan (dwg No. 20206-12)

Turbine No.	Depth of Excavation to suitable bearing strata	Depth of lean mix (mm)	Level of top of stone fill below existing G.L.	Foundation Type
T1	3800	100	1700	1
T2	3800	100	1700	1
T3	4400	800	1800	1
T4	5000	1300	1700	1
T5	3800	100	1700	1
T6	4600	900	1700	1
T7	5400	1700	1700	1
T8	5200	1350	1850	1
T9	5200	1350	1850	1
T10	3800	100	1700	1
T11	4000	200	1800	2
T12	3800	100	1700	1
T13	4500	700	1800	1
T14	5500	1800	1700	1
T15	4600	900	1700	1
T16	5200	1350	1850	1
T17	3800	100	1700	1
T18	3800	100	1700	1
T19	3800	100	1700	1
T20	3800	100	1700	1
T21	5400	1700	1600	1
T22	3800	100	1700	1
T23	3800	100	1700	1

Turbine No.	Depth of Excavation to suitable bearing strata	Depth of lean mix	Level of top of stone fill below existing G.L.	Foundation Type
T24	3800	100	1700	1
T25	3800	100	1700	1
T26	3800	100	1700	1
T27	5600	1800	1800	1
T28	3800	100	1700	1
T29	4000	200	1800	1
T30	4800	1350	1700	1
T31	5000	1350	1700	1
T32	5600	1800	1800	1
T33	5100	1350	1750	1
T34	3800	100	1700	1
T35	4600	900	1700	1
T36	3800	100	1700	1
T37	4400	900	1700	1
T38	4800	1350	1700	1
T39	4400	900	1700	1
T40	3800	100	1700	1
T41	3800	100	1700	1
T42	3800	100	1700	1
T43	3800	100	1700	1
T44	5000	1350	1700	1
T45	3800	100	1700	1
T46	3800	100	1700	1

Turbine No.	Depth of Excavation to suitable bearing strata	Depth of lean mix	Level of top of stone fill below existing G.L.	Foundation Type
T47	3800	100	1700	1
T48	4600	900	1700	1
T49	5200	1350	1850	1
T50	3000	100	1700	1
T51	3800	100	1700	1
T52	3800	100	1700	1
T53	5200	1350	1850	1
T54	5100	1350	1750	1
T55	5600	1800	1800	1
T56	4200	900	1700	1
T57	3800	100	1700	1
T58	3800	100	1200	1
T59	5000	1350	1700	1
T60	5300	1800	1700	2
T61	4700	900	1800	2
T62	5600	1800	1800	2
T63	5000	1350	1700	1
T64	5700	1800	1900	1
T65	5000	1350	1700	1
T66	4200	900	1700	2
T67	3800	100	1700	2
T68	5400	1800	1700	1
T69	5000	1350	1700	1
T70	5300	1800	1700	1
T71	5000	1350	1700	1

3.1.5 Crane Hardstanding Areas

The crane hardstanding areas were built adjacent to the turbines to provide sufficient space for the construction and maintenance works to be carried out safely on a competent platform. The design dimensions for the main hardstanding areas were 20m x 40m, as shown on the drawing issued by Malone O'Regan (No. 20206-14) and extracted on Figure 3-15.

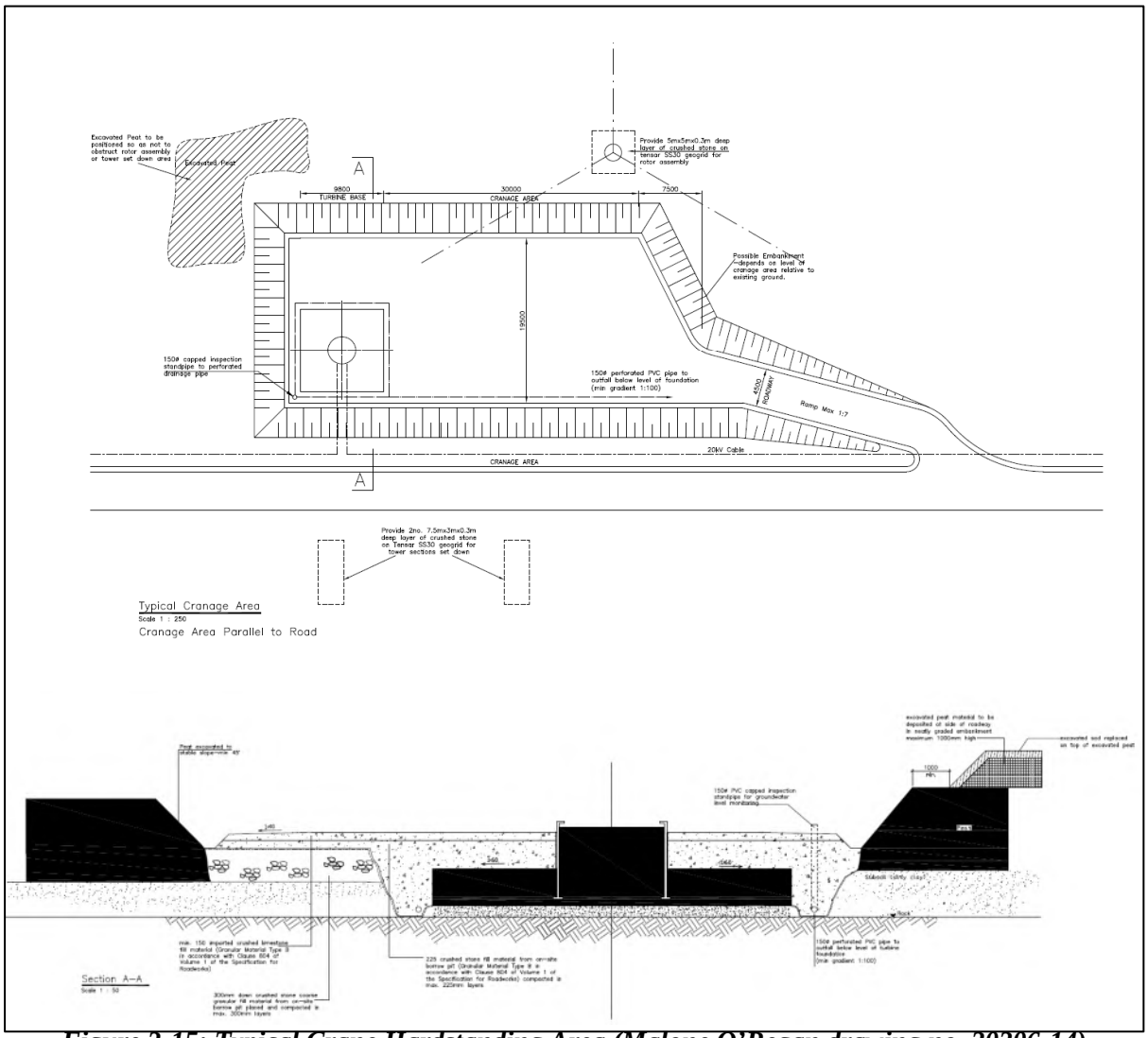


Figure 3-15: Typical Crane Hardstanding Area (Malone O'Regan drawing no. 20206-14)

The hardstandings were constructed of crushed rock granular fill from Borrow Pit No.3 supported on the Glacial Till below the Peat. On completion the hardstanding areas were surfaced with a 100-150 mm thick layer of Clause 804 subbase imported from nearby quarries. The granular fill was compacted using static and vibratory compactors in max layer thicknesses of 300mm for the crushed rockfill. The level of the surface of the hardstanding is at the level of fill above the turbine foundations. Therefore, the fill height varied depending on the foundation formation level and the depth of peat.

Drainage for the hardstanding area comprised the 150mm diameter perforated PVC pipe installed adjacent to the foundation and along the perimeter of the hardstanding and was connected to an outfall (see Figure 3-15). The surface of the hardstanding was also constructed to a fall of 1:40 to facilitate surface water movement to periphery drainage trenches surrounding the hardstanding area.

Access to the turbine comprised a 4.5m wide roadway constructed to a max gradient of 1:7. The hardstanding areas were typically built at or above existing ground level.

3.1.6 Spoil Management

Prior to the peat slide in October 2003 the Contractor had completed the excavation for the foundations of 39 No. turbines across the site, predominately in areas of shallow bedrock where the depth of excavation for the foundations was shallower (i.e. Turbines T1-T5, T9-T13, T17- T29, T32, T34, T35, T37, T38, T40-T46, T63, T66, T67 & T69). The extent of excavation at the time was limited to the turbine foundations and did not include the full crane hardstanding areas. Excavation was underway for the foundation at Turbines T62 and T68 at the time of the slide on the 16th October. The foundations for Turbines T6 and T31 had also been partially excavated in the peat.

The peat excavated from these turbine foundations was sidecast and spread out over a wide area across the surface of the peat slopes adjacent to the excavations generally to a depth of 0.5-1.5m, but locally up to 2.0-2.5m at T24, T27 and T40. Excavated glacial subsoil and weathered rock was also sidecast with the peat at some of the turbines. Table 3-2 summarises records of the depth, extent and material characteristics of the sidecast materials that were made by AGEC in their final report on the post-landslide site appraisal (Ref. AGEC Report No. 378_099 dated 4/2/2004).

Table 3-2 summarises the observations that were made by AGEC at the 39 No. areas where arisings were sidecast adjacent to the turbine bases that were fully excavated prior to the slide in October 2003. The majority of the sidecast areas [35 No. (90%)] were stable with only minor slumping or localised flow of the excavated material, in some cases blocking drains on the site.

At 3 No. turbine bases (Turbines T23, T29 and T66) there was a bearing capacity failure in the intact peat under the weight of the sidecast material. At each of these turbines the arisings from the foundation excavation were placed along the edge of the forest on the downslope side of the turbine and floating road. Turbines T23 and T29 are located along the southern boundary of the site. The bearing capacity failure at these turbines occurred in relatively shallow peat (1.0-1.5m deep) on gently sloping ground (2-4°). Turbine T66 is located near the centre of the site, 250 m upslope from Turbine T68 where the large peat slide occurred in October 2003. At T66 the excavated material was placed in peat up to 2.8 m deep on slopes of 3-5°.

At Turbine T17, there was a shear failure in the peat under the sidecast arisings which gave rise to a localised peat slide over an area of about 22m x 90m approximately 10 m east of the turbine on the south side of the floating road.

For the second phase of construction in 2004/2005 significant risk mitigation measures were implemented for the management and disposal of material excavated from the remaining turbine excavations and from the crane hardstanding areas for all of the turbines. The risk mitigation measures that were implemented for the controlled disposal of excavated peat and glacial till will be addressed in more detail in Section 3.3.3.6. However, in general terms:

- All of the peat and glacial till were segregated for separate disposal
- All of the glacial till was disposed of in the Borrow Pits.
- All of the peat was disposed of in designated peat repositories on the site.
- The peat repositories were located on flat or gently sloping ground (<3°) away from any areas of elevated risk with regard to peat instability.
- The depth of peat placed in the repository sites was limited to 1.0m and “floating” depth markers were used to confirm that this was not exceeded (i.e. markers that settled with the peat).
- Additional investigations and stability analyses were carried out at all of the repository sites to certify that they were suitable for the deposition.
- The certified extent of the repository sites was clearly marked out on site.
- Stability analyses and full scale proof load testing was carried out on all of the floating roads to certify them for designated access routes.

Table 3-2: Summary of Excavated Material Volumes & AGEC side Casting Observations Pre-Slide

Turbine no.	Foundation Size (m)	Peat Depth (m)	Thickness of Glacial Till (m)	Volume excavated peat (m^3) *	Volume excavated Glacial Till (m^3) *	AGEC Observations on Side casting
T1	9.8	1.90	1.9	633.5	419.3	Sidecast arisings to the west and east of excavation 20L x 30W x 0.5H.
T2	9.8	2.85	1.0	967.6	193.5	Sidecast arisings to the west and northeast of the excavation.
T3	9.8	2.80	1.6	1021.7	344.3	Sidecast arisings located to the southwest, west and north of the excavation.
T4	9.8	3.00	2.0	1179.5	445.1	Extensive sidecast arisings (approx. 40m x 25m x 1.3m) are located to the west of the excavation. Minor excavations are located to the north and south of the excavation and access road.
T5	9.8	1.75	2.1	582.2	458.1	Sidecast arisings located to the west and north of the excavation. The arisings are waterlogged.
T9	9.8	3.35	1.9	1357.8	406.5	Sidecast arisings (64m x 35m x 75m) are located across the access road to the north of the excavation
T10	9.8	2.25	1.6	754.6	332.1	Sidecast arisings (20m x 23m x 1.3m) and (31m x 10m x 1.3m) are located to the west and south of the excavation respectively.
T11	11.0	2.00	2.0	791.1	531.9	Sidecast arisings to the south of the access road (40L x 30W x 0.5H). Arisings to the north, east and west of excavation.
T12	9.8	3.50	0.3	1207.8	57.8	Sidecast arisings stockpiled to the south of access road. Arisings consist mainly of peat and extend some 45m by 20m. Arisings have flowed, blocking drainage ditch aligned 27$\acute{5}$ with water now re-directed into access track.
T13	9.8	4.50	0.0	1737.1	0.0	Sidecast arisings stockpiled to the east and south of acecess road. Arisings consist mainly of peat. Arisings south of road have flowed some 25m downslope.
T17	9.8	1.95	1.9	650.7	406.5	Peat slide adjacent to turbine - 140 m x 22 m. Arisings stockpiled to the south of the access road. Arisings are absent and assumed to have been involved in failure.
T18	9.8	0.40	3.4	131.5	849.8	Sidecast arisings to the south, southwest and northeast of the excavation. Arisings comprise peat and weathered bedrock. Arisings have flowed into the tree line into the forest. Lobe arisings dims are 70m by 120m wide, average height is 1.25m.
T19	9.8	2.50	1.3	842.4	272.8	Sidecast arisings to the south, southwest and northeast of the excavation. Arisings comprise peat, glacial till and weathered bedrock. Arisings have flowed into the tree line into the forest. Lobe arisings average height is 1.25m.
T20	9.8	2.20	1.6	737.2	344.3	Sidecast arisings to the north and west of the excavation. Arisings comprise peat and glacial till. Minor slumping of the arisings.
T21	9.8	3.00	2.4	1234.6	552.2	Sidecast arisings to the north and west of the excavation. Arisings comprise peat and glacial till. Minor slumping of arisings.
T22	9.8	1.90	1.9	633.5	419.3	Sidecast arisings to the east and west of the excavation. Arisings comprise of peat and glacial till. Minor slumping of arisings.
T23	9.8	1.33	2.5	441.2	570.7	Bearing Capacity Failure in peat under arisings. Arisings stockpiled to the south of the access road. Arisings consist of peat and till and extend some 20m by 40m. A drainage titch has been blocked by the arisings causing back-up of water to the east.
T24	9.8	1.50	2.3	497.4	524.8	Sidecast arisings up to 2.5m high to the north and west of the access road and base.

Turbine no.	Foundation Size (m)	Peat Depth (m)	Thickness of Glacial Till (m)	Volume excavated peat (m^3) *	Volume excavated Glacial Till (m^3) *	AGEC Observations on Side casting
T25	9.8	2.20	1.6	737.2	344.3	Sidecast arisings occur to the north and east of the site. Further arisings occur 15m to the south of the base west and south (across the access road) from the excavation. The arisings are 1m high.
T26	9.8	2.50	1.3	842.4	272.8	Sidecast arisings stockpiled to the east and west of the excavation and south of the access road, ground was saturated around arisings.
T27	9.8	3.40	2.2	1442.7	497.8	Sidecast arisings 2m high (20m x 40m in plan) were recorded at a distance of 30m to the east of the base, and 0.5m high, (20m x 27m in plan) at a distance of 15m to the west of the base.
T28	9.8	2.23	1.6	745.9	338.2	Sidecast arisings occur to the west, 1.5m high (85m x 15m in plan).
T29	9.8	1.25	2.8	423.9	651.4	Bearing Capacity Failure in peat under arisings. Arisings 27 long, 8m wide and 1m high. Arisings generaly glacial till placed near tree line south of access road.
T32	9.8	0.60	5.0	245.5	1422.5	Sidecast arisings to the east of the excavation and to the south of the access road.
T34	9.8	1.80	2.0	599.2	445.1	Sidecast arisings occur to the north west of the base and appear to have spread/slumped.
T35	9.8	0.70	3.9	254.6	1015.4	Sidecast arisings to the east and west of the excavation and to the south of the access road.
T37	9.8	1.65	2.8	590.6	651.4	Sidecast arisings occur to the East, 1.5m high (70m x 8m in plan) and to the south, 1m high (15m x 10m in plan)
T38	9.8	0.38	4.4	139.6	1202.2	Sidecast arisings to the east and west of the excavation and to the south of the access road.
T40	9.8	2.00	1.8	667.9	393.9	Sidecast arisings occur to the west, 1m high (35m x 8m in plan), to the south, 2m high (20m x 5m in plan) and to the east, 1m high (35m x 8m in plan).
T41	9.8	1.20	2.6	396.6	608.3	Sidecast arisings to the south of the access road. The arisings have blocked the drain and have flowed into the tree line.
T42	9.8	2.15	1.7	719.8	356.6	Sidecast arisings occur approx 20m to the east, west and south (across the access road) from the excavation. The arisings are 0.5 – 1m high, show signs of slumping.
T43	9.8	1.70	2.1	565.1	471.2	Sidecast arisings occur to the west, 0.5m high (30m x 20m in plan), to the north, 0.5m high (8m x 15m in plan) and to the east, 2m high (60m x 10m in plan).
T44	9.8	2.10	2.9	812.7	695.6	Sidecast arisings occur approx 20m to the east, west and south (across the access road) from the excavation. The arisings are <1m high.
T45	9.8	1.65	2.2	548.1	484.5	Sidecast arisings occur 10-15m to the west, 1m high (70m x 10m in plan), and to the east, 1m high (50m x 10m in plan).
T46	9.8	1.42	2.4	469.3	547.6	Sidecast arisings occur approx 20m south (20m x 15m in plan) and east (50m x 15m in plan) of the site. The arisings are up to 1.5m high.
T63	11.0	1.73	3.3	664.2	810.2	To the east of the excavation and north of the access road.
T66	11.0	2.55	1.7	1040.8	427.3	Bearing Capacity Failure in peat under arisings
T67	11.0	2.50	1.3	973.7	327.7	Sidecast arisings to the east and west of the excavation and to the south of the access road.
T69	11.0	3.10	1.9	1221.4	419.3	No records

** bulking factor of 1.35 applied to in-situ volume to calculate volume of excavated material.*

The total volume of excavated material generated from the 39 No. foundation excavations that had been completed prior to the peat slide was approximately:

- Peat: ≈ **29,500m^3** (≈ 21,855m^3 without bulking)
- Glacial Till (turbine foundations only): ≈ **19,500m^3** (≈ 14,455m^3 without bulking)

The total volume of excavated material generated from the remaining turbines and crane hardstandings during the second phase of construction, including a bulking factor of 1.35 due to disturbance on excavation was:

- Peat: ≈ **153,850m^3** (≈ 113,960m^3 without bulking)
- Glacial Till (turbine foundations only): ≈ **16,250m^3** (≈ 12,040m^3 without bulking)

The excavated peat and glacial till had to be transported across the site in standard dump trucks and 4-axle tipper trucks to the borrow pits and to the designated repository sites, many of which were remote from the point of excavation.

A combination of long-reach excavators operating from the floating road, and wide-tracked hydraulic excavators operating on the intact peat were used to place and spread the excavated peat out over the repository sites, as shown on Figure 3-16. Up to 1.0 m of excavated peat was placed over the extent of the repository sites, which ranged from an area of 25 x 50 m for the smaller sites, up to 50m x 175m or 75m x 125m for the larger combined sites. Not all of the certified capacity was used. The peat repositories were left in place at the end of construction. The locations of the repositories are shown on Figure 3-17. The total area covered by the repositories was approximately **11.47ha.**

The glacial till that was excavated from the turbine foundations was deposited in Borrow Pits Nos. 1 and 2. Some of the material was used to backfill above the turbine foundations.

Figure 3-16 – Spreading out peat in repository sites

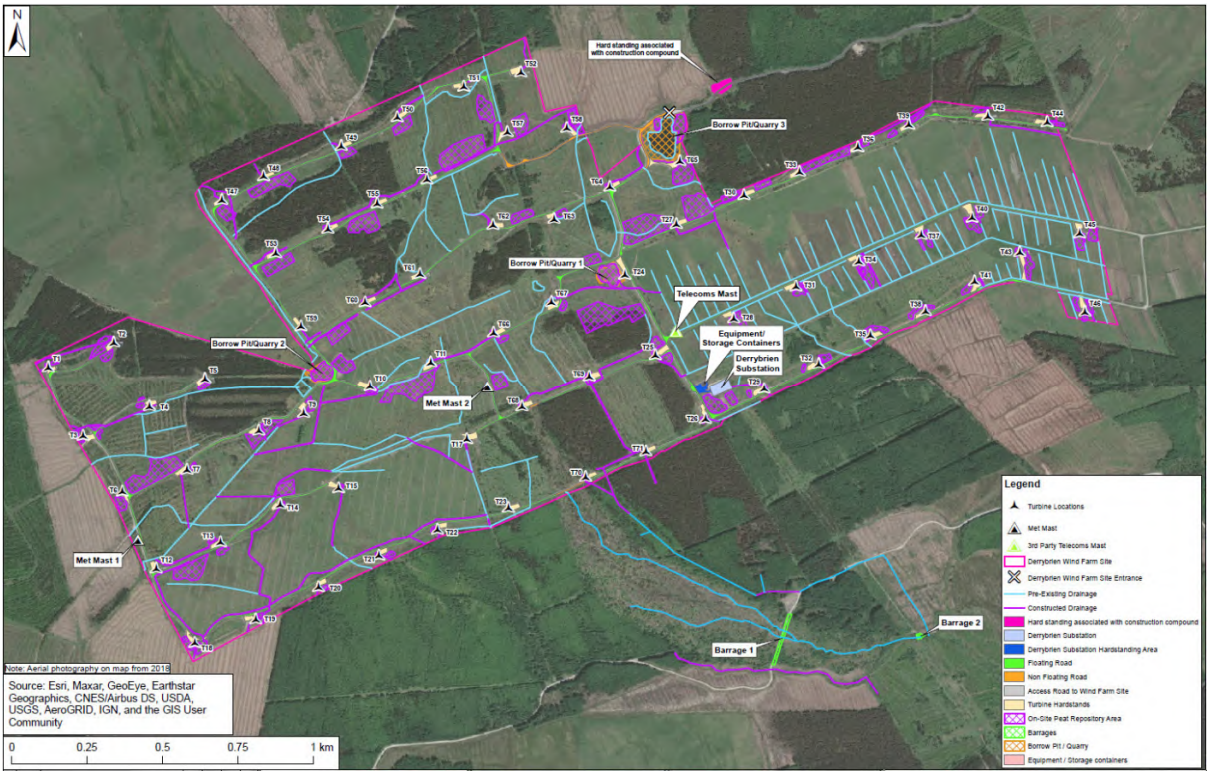


Figure 3-17: Location of Peat Repositories (from ESBI Drawing No. QS-000192-01-D1-D451-001 in Appendix A)

3.1.7 Turbine Assembly & Erection

A total of 70 No. Vestas V52/850 turbines were assembled and erected on site. Details of the turbine are shown on Figure 3-18.

Erection of the turbines involved transporting all of the turbine components to the turbine sites, including the steel tower sections, the hub, the rotor blades and the nacelle, which houses all of the mechanical and electrical generating components of the turbine. The components were transported to the turbines along the floating roads using standard trucks and low-loader articulated lorries. The large mobile cranes that were used to erect the turbines also travelled along the floating roads to the turbines.

The maximum design crane load for the floating roads was a 300 tonne Grove GMK 6300 all-terrain crane with a travelling weight of 72 tonnes on 6 axles (12 tonnes/axle), excluding counterweights and additional fittings such as outrigger pads. Figure 3-32 shows the dimensions of the crane from the manufacturer's specification.

The mobile cranes operated on the granular hardstanding areas for all of the heavy lifting works that were required to erect the turbines. The hardstanding areas were constructed of crushed rock granular fill supported on competent glacial till below the peat. Steel outrigger pads were used to spread out the bearing pressures from the crane supports and the hardstanding areas were designed to support the concentrated loads from the cranes without applying any load on the peat slopes.

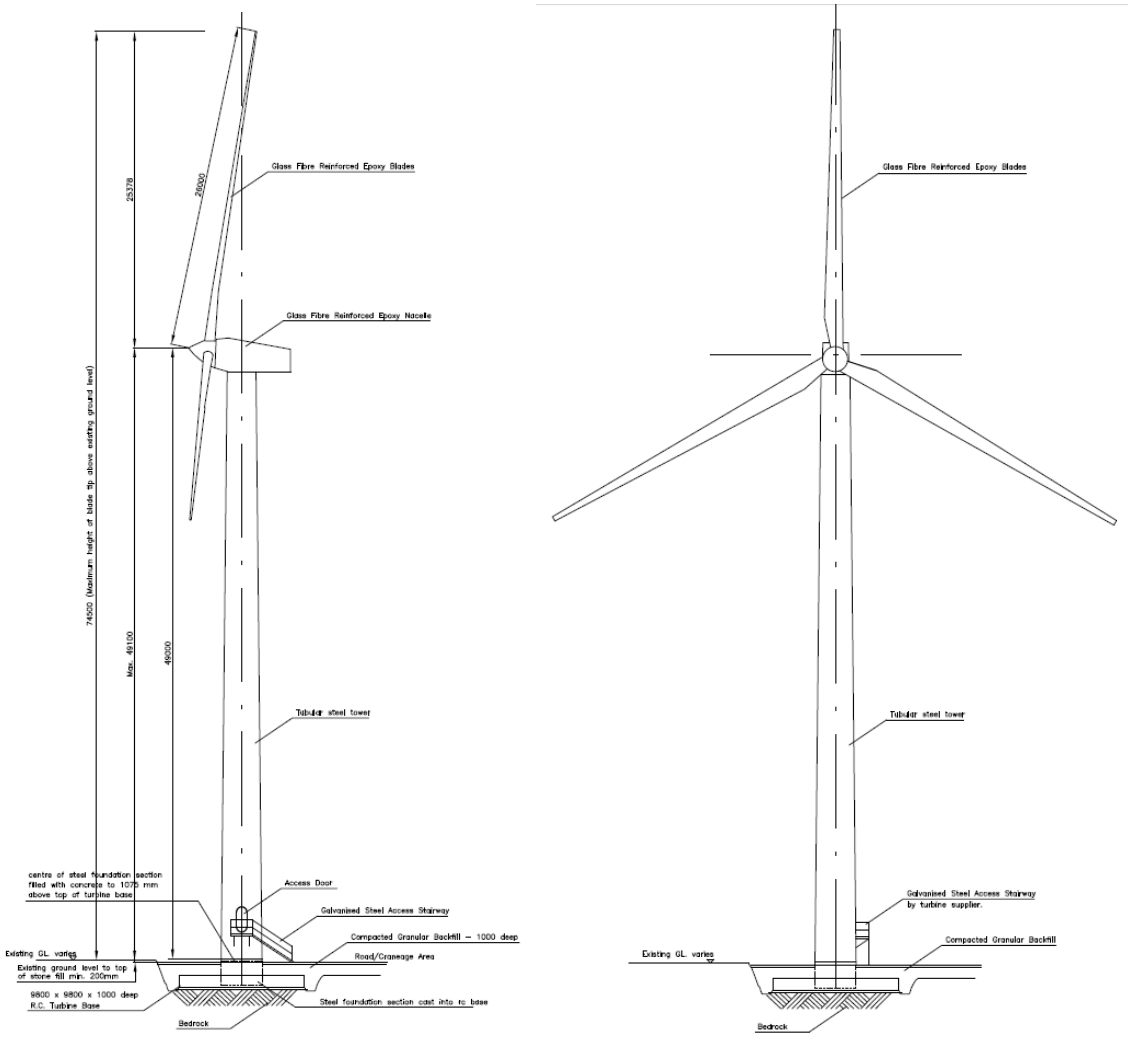


Figure 3-18: Details of Turbine V52-850

3.1.8 Substation

The substation modifies, controls and regulates the medium-voltage electricity generated from the turbines and converts it into the high-voltage electricity that is used to supply the grid using a system of transformers, capacitors and circuit control systems. The grid connection is via the overhead 110 kv high-voltage line that enters the site opposite the substation. The power generation and grid supply are controlled automatically by the electronic systems in the control building at the substation site. The systems can also be monitored or operated manually either in the control building or remotely offsite.

All of the peat that was excavated out from the site of the substation was transported to a designated repository area on site for disposal. The peat was transported to the repository sites using standard dumper trucks, and 4-axle tipper trucks were used to transport the granular rockfill to the site.

The level hardstanding for the substation was constructed by excavating into the gently sloping ground on the north side and by placing engineered fill material on the downslope side. The entire compound was then capped with crushed rock granular fill material from Borrow Pit No.3, with a hardcore surfacing imported from nearby quarries.

The main permanent structures that were constructed at the substation included the single storey control building, the 80-tonne step-up transformer and the lattice steel transmission tower for the 110 kV overhead line. The foundations for these were comprised of reinforced concrete pads or plinths

supported on the granular rockfill or the underlying firm or stiff glacial till. The foundations were designed for the applied loads. The remaining structures on the substation were light electrical transformer and transmission components, which were supported on reinforced concrete plinths within the granular rockfill.

For the construction of the control building and electrical transmission and transformer components on the site the construction traffic was generally comprised of standard concrete trucks, small mobile cranes, and trucks with HIAB loader cranes for transporting materials, equipment, cherry pickers and mobile elevated work platforms (MEWP) to the site. The largest load was from the 80-tonne step-up transformer, which was transported to the site on a specialised 28.5 m long multi-axle articulated truck and low-loader transporter which gave a combined total load of 131 tonnes spread out over 12 axles at a maximum load of 12 tonnes per axle. The equivalent live load surcharge over the length of the vehicle was also within the design load for the mobile crane that was used to erect the turbines. The transformer was transported to the site in a single supervised and scheduled trip along a defined access route.

3.1.9 Borrow Pits

3 No. borrow pits were opened up on site over the course of the works. The location of these is shown on Figure 3-19.

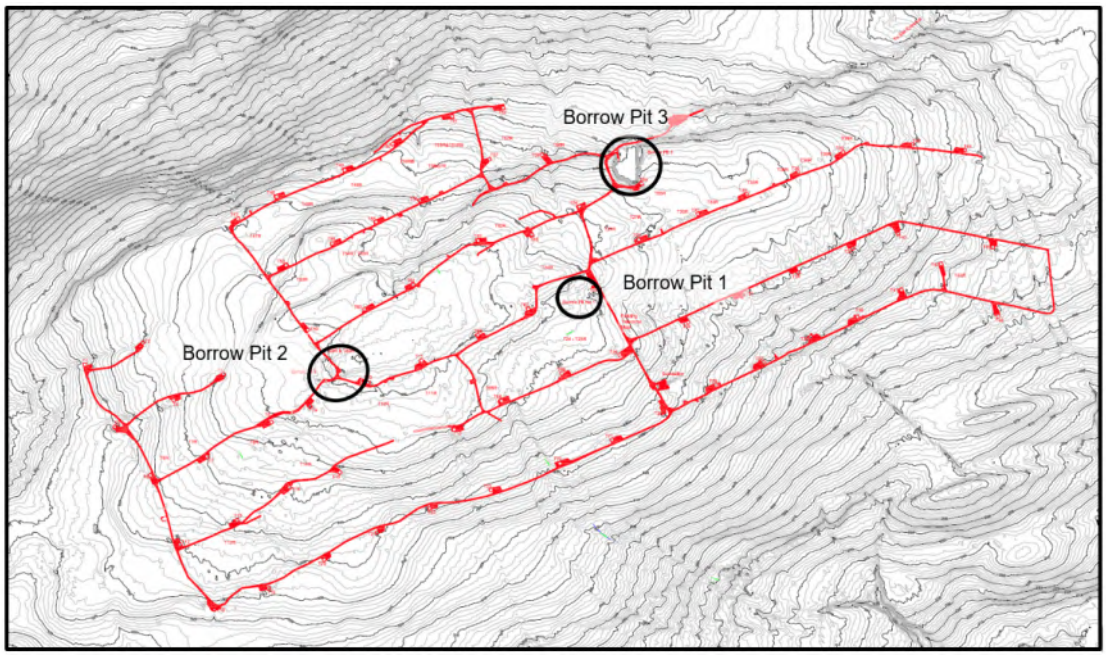


Figure 3-19: Location of borrow pits Nos. 1 to 3

3.1.9.1 Borrow Pit 1 (BP-1)

Borrow Pit 1 was developed during Phase I of construction in 2003 in an area of shallow peat around Turbine T24. Peat was stripped off the site and the underlying glacial till and weathered rock was excavated for re-use as backfill material over the turbine foundations. No rock blasting was carried out in the borrow pit and it was largely inactive during Phase II of the works in 2004/2005. Figure 3-21 shows an aerial photograph of the borrow pit from 2005. The area was reinstated prior to completion of the works on site.

3.1.9.2 Borrow Pit 2 (BP-2)

Borrow Pit 2 was opened up in an area of shallow and outcropping rock on the west side of the site between Turbines T9 and T10. Shallow peat was initially stripped from the site and mineral soil and rock were extracted during Phase I of the works in 2003 for use as backfill material for the turbines and for road construction. All of the rock was extracted by mechanical excavators and rock breakers. No blasting was carried out in the pit.

The area was largely inactive during Phase II of the works in 2004/2005. However, in 2005 the pit was used as a repository site for excess peat from the excavations for the turbine foundations and crane hardstandings. Bunds of mineral soil were constructed around the perimeter of the site so that the remoulded peat was fully contained within the pit with a negligible risk of a flow slide. The area was fenced off as a health and safety measure to prevent access to site. Figure 3-20 shows a view of the pit in December 2004. The aerial photograph in Figure 3-21 shows the extent of the bunded peat repositories on either side of the access track in 2005.

Figure 3-20: Borrow Pit 2 in 2004 prior to backfilling.

Figure 3-21: Aerial Photo of Borrow Pits 1 & 2 in 2005 (www.osi.ie)

3.1.9.3 Borrow Pit 3

Borrow Pit 3 near the site compound on the north side of Turbine T65 was the main pit used to extract rock on the site. The borrow pit was used to extract and crush rock to process it into granular fill for the construction of the access roads and crane hardstanding areas on the site. Rock blasting was carried out in the borrow pit during the initial phase of construction in 2003 as well as during Phase II of the works in 2004/2005. Figure 3-22 shows a view of the pit towards the end of construction in May 2005.

In an extreme condition seismic loading from blast-induced vibrations can generate downslope inertial forces that can cause slope failures if they are not kept within acceptable limits. It was considered that the risk was very low for the level of transient vibrations generally generated by controlled rock blasting in a quarry. Nevertheless:

- The blasting was carried out by a suitably qualified fully licensed professional;
- The pattern, sequence, timing and maximum instantaneous charge of the blasts were designed to minimise blast-induced vibrations on the slopes around the perimeter of the borrow pit;
- Vibration monitoring was carried out on the site throughout the blasting to assess the impact of the blasting on the peat slopes and to ensure that the peak particle velocity and peak particle acceleration of the vibrations were within acceptable limits;
- AGL Consulting carried out a comprehensive review of the blast monitoring records to establish threshold limits for the Peak Particle Velocity (PPV) and Peak Particle Acceleration (PPA) of the blast-induced vibrations, and to establish the radius of impact for the blasting;
- Glacial till excavated from the site was used to construct a berm along the face of the peat at the top of the rock slope around the perimeter of the borrow pit to act as a shear key to prevent a localised peat slide inundating the pit where the slopes were dipping towards the pit.

Figure 3-22: View of the borrow pit towards the end of construction in May 2005

3.1.10 Drainage

The existing drainage on the site was comprised of extensive drainage channels along the boundaries of the turbary plots on the east side of the site, and natural watercourses and open drainage channels across the rest of the site, as shown on Figure 3-23.

The additional drains that were installed during construction are also shown on Figure 3-23. These were typically comprised of shallow open drains (<1m) within the peat to increase the capacity of the existing drainage network and to intercept and drain surface runoff or ponded surface water from poorly drained areas of flat or gently sloping ground on the site. It also provided drainage to groundwater accumulating in the permeable pockets of crushed rock granular fill at the turbines, which was a design requirements for the foundations.

The drainage channels were constructed using low ground bearing pressure wide-tracked excavators operating on the peat or by hand. The drainage channels were cut into the peat and the peat was side cast adjacent to the drainage channel and spread out to a depth of <0.5m.

Where the drains passed under the floating road they were constructed using corrugated plastic uPVC drainage pipes that were placed in the drainage channel below the basal reinforcement of the road. In shallow peat the culverts were constructed with a granular pipe surround supported on the underlying glacial till.

Figure 3-23: Existing drainage on the site at end of Construction in 2005 (Drawing no. QS-000192-01-D451-001)

3.1.11 Cable Trenching and Ducting

All of the turbines are connected by buried medium voltage (MV) cables to the substation on the south side of the site. The cable route locations on the site are shown on Figure 3-24. Figure 3-25 shows typical profiles of the cable trenches.

The trenches were typically 1.1m deep. A copper earth cable was placed at the base of the trench and covered with 200mm of sand. The electrical cables and copper SCADA cable were placed at this level (0.9mBGL) to provide a minimum cover of 800mm below ground level. The width of the trench varied depending on the number of cable bundles within the trench. The minimum spacing between bundles of MV cables was 300mm, and the spacing between the MV cables and the SCADA cable was 400mm.

Installing the electrical cables and ducts on the site involved excavating trenches approximately 1.1m deep in the peat using LGBP wide-tracked hydraulic excavators operating on the intact peat slopes. The excavated material was temporarily sideccast adjacent to the trench and subsequently used to backfill around the cables. Where the cables passed under the floating roads they were installed in ducts that were pushed through the peat under the road. The cables were transported around the site on spools using teleporters and tractors with cable drum holders operating on the floating roads.

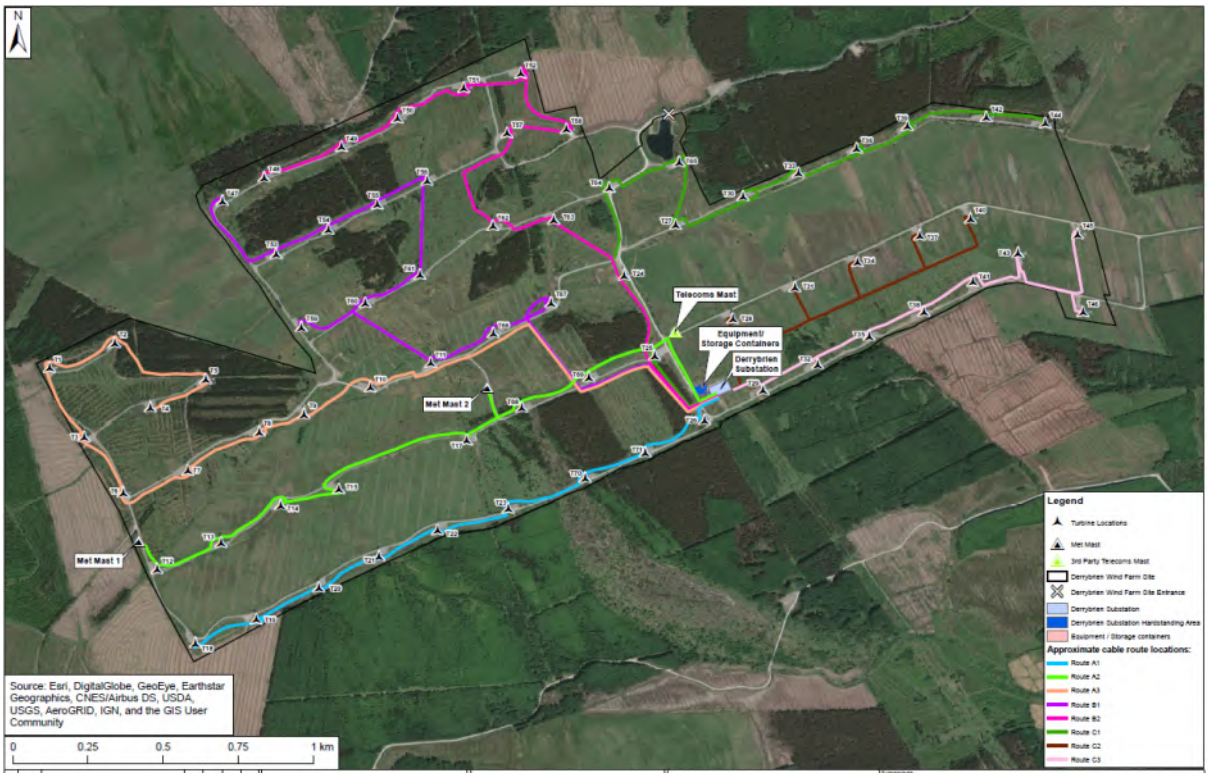


Figure 3-24: Cable Route Locations (Drawing no QS-000192-01-D451-017)

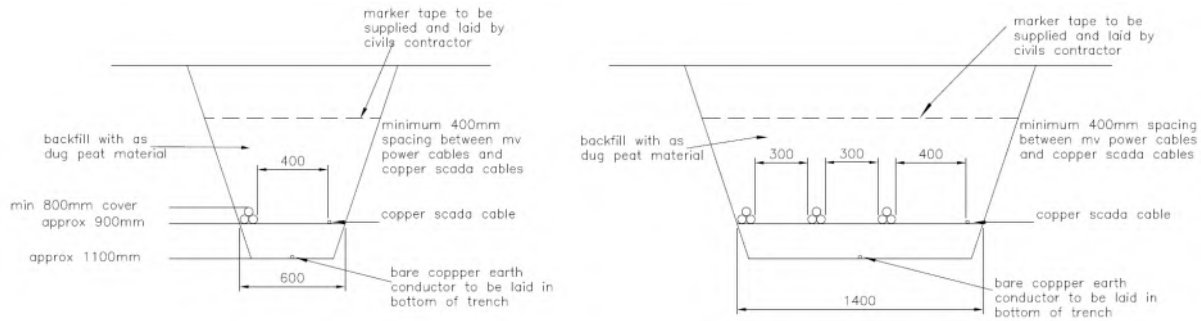


Figure 3-25: Typical Cable Trench Detail (Malone O'Regan dwg No. 20206-13)

3.1.12 Anemometer (Met Mast) Construction

There were 2 No. Anemometers (also referred to as Met Masts) constructed on the site at the locations shown on Drawing No. QS-000192-01-D451-017 in Appendix A (extracted on Figure 3-26).

The anemometers were comprised of 51.85m high light steel lattice structures (see Figure 3-27) supported on reinforced concrete foundations 5.7m x 5.7m in plan area and 0.5m deep. The foundations were founded on Firm Boulder Clay at a minimum depth of 1.8mBGL as shown on Figure 3-28. The foundation excavations were backfilled with Boulder Clay to provide a minimum cover of 1.3mBGL. The backfill was capped with crushed rock granular fill to provide a hardstanding area around the masts.

The excavations for the mast foundations in the peat were carried out using long-reach tracked excavators operating on the floating road adjacent to the excavation. The excavated peat was transported to a designated repository site for disposal.

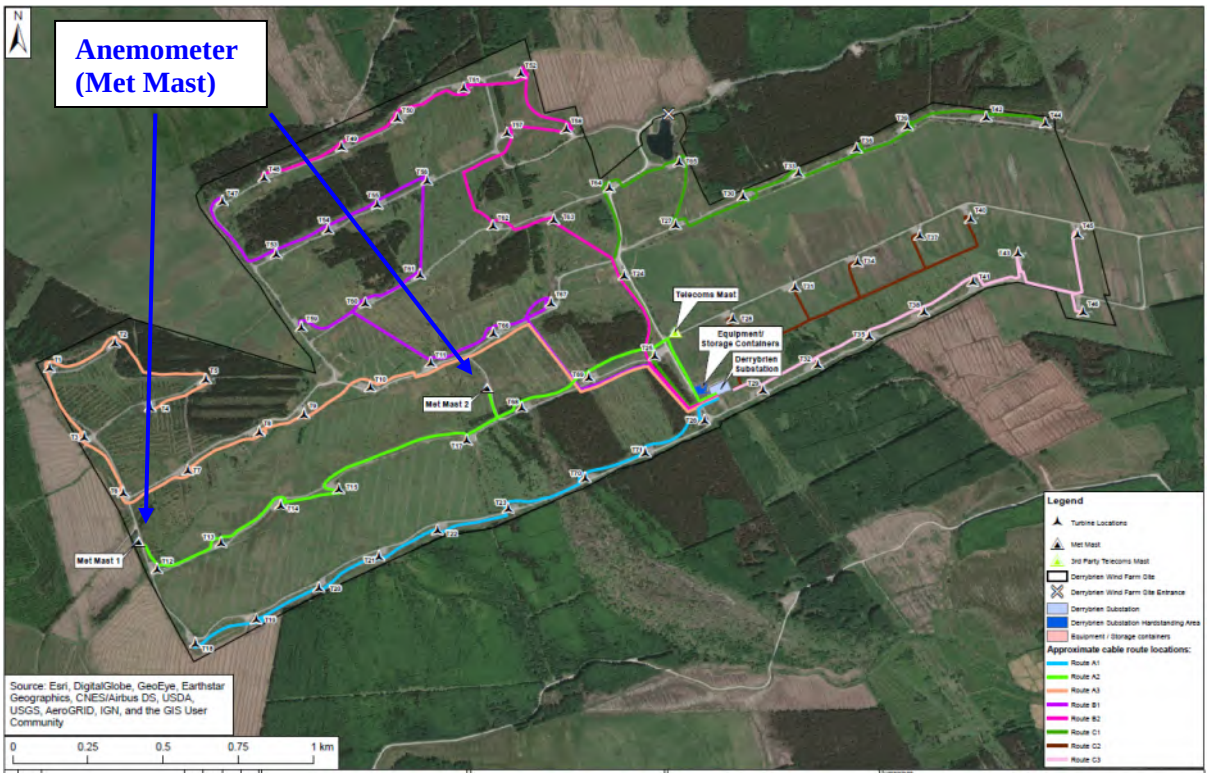


Figure 3-26: Location of 2 No. Anemometers (Met Masts) – (ESBI Drawing No. QS-000192-01-D451-017 in Appendix A)

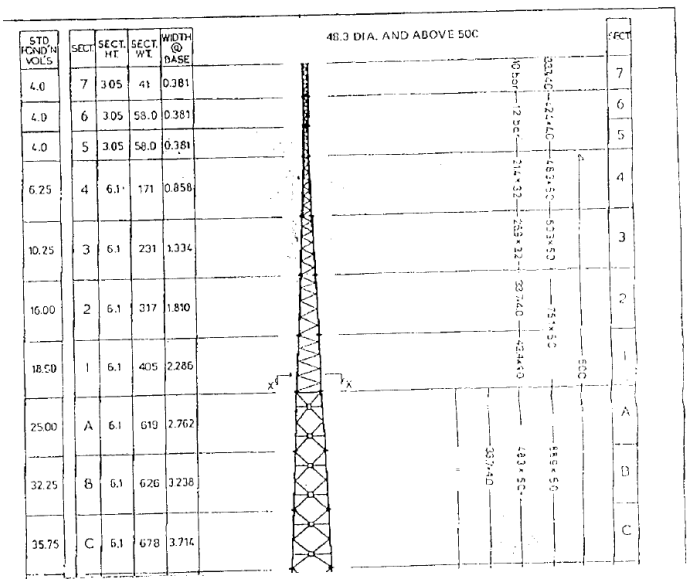


Figure 3-27: Anemometer (Met Mast) Details

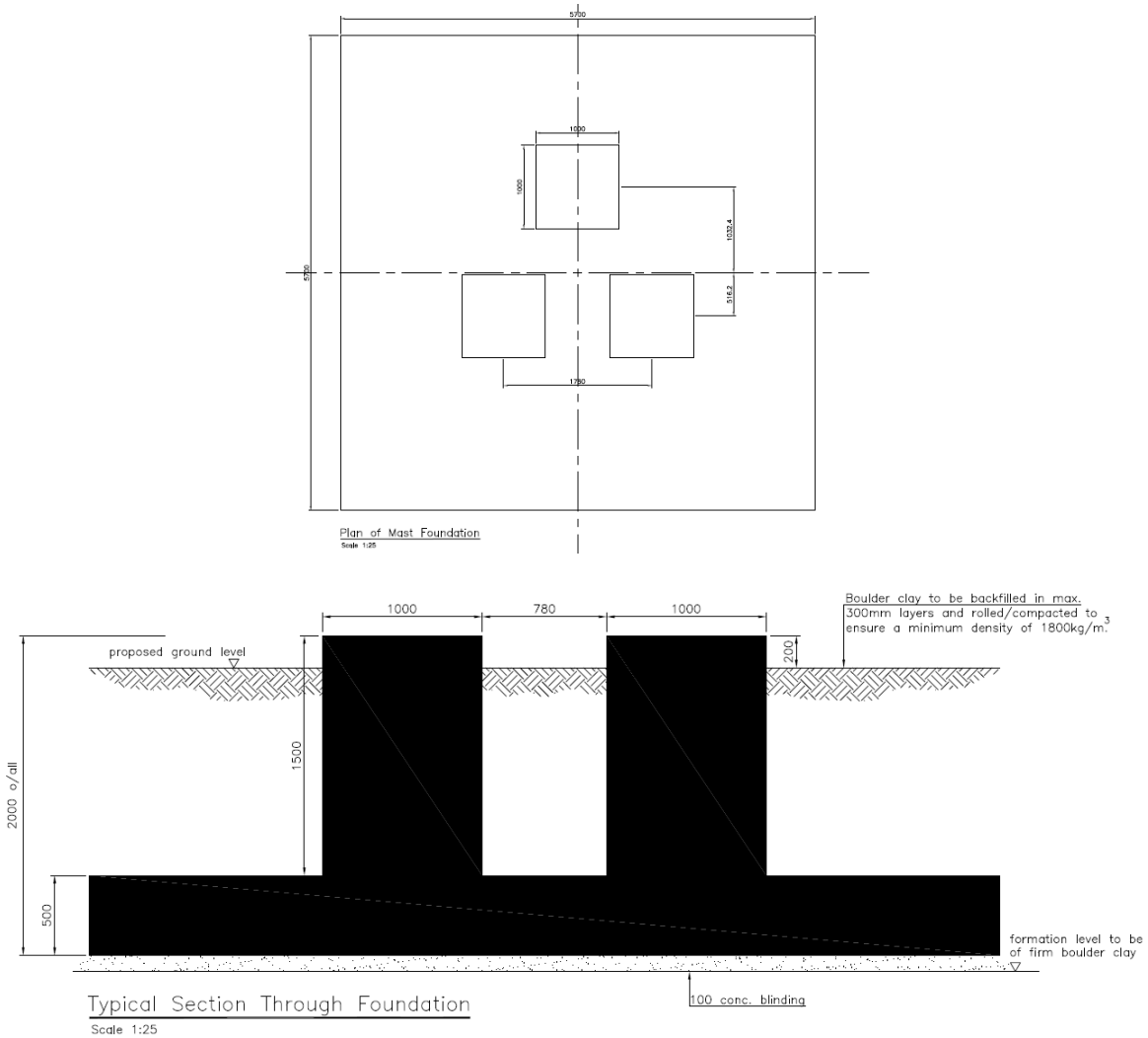


Figure 3-28: Anemometer foundation details (Malone O'Regan dwg No. 20206-41)

3.2 Assessment of Stability Impacts of Site Activities 2003-2005 (Construction Stage)

This section of the report presents the assessment of stability impacts for the construction stage of the wind farm between 2003 and 2005, i.e. the assessment of direct impacts of site activities on the receiving soils, geology and land that had an effect on site stability, particularly in relation to the peat. The results are summarised in Table 3-3.

For each activity, Table 3-3 states the characteristics of the **stability impact** – typically a dead or live load surcharge on the intact peat slopes - as well as the extent, duration and frequency of that impact. The characteristics of the impact are based on the records of site activities during construction, which typically detail the methodology that was adopted in carrying out the site activities, the equipment that was used on the site, the location of the works, and when the works were carried out.

As described in Section 1.2, the corresponding **effect** on the receiving soils, geology and land is a function of the characteristics of the site activity, the quality of the impact with respect to site stability, the probability of a peat failure occurring, and the possible nature and extent of a peat failure.

In terms of the **quality** of the stability impacts, **negative impacts** increase the risk of instability in the receiving soils, geology and land, and **positive impacts** reduce that risk. For example, activities that involve placing material on the intact peat slopes have a negative impact on the peat with respect to site stability because the corresponding surcharge loads increase shear stresses in the underlying peat which increases the risk of a peat failure, potentially leading to a peat slide in the worst case scenario.

The **probability** of a peat failure occurring has been assessed for each site activity based on the physical characteristics of the site (e.g. the topography, peat depth, strength and groundwater conditions), as well as the characteristics of the corresponding stability impact (e.g. the magnitude, extent, duration and frequency of loading). This is consistent with the EPA Guidelines (2022) as well current best practice guidelines for peat stability risk assessments (Scottish Government, Energy Consent Unit, 2017).

The **possible nature and extent of a peat failure** for each site activity has been calibrated by the peat failures that occurred during construction.

The **Significance** of the effects of the stability impacts has been assessed as a function of the **sensitivity** of the receiving soils, geology and land potentially impacted by a peat failure, using the matrix in Figure 1-2. For this project the sensitivity of the receiving soils, geology and land has been classified as **Medium** based on the characteristics of the peat failures that occurred during construction, as discussed in Section 2.4.

Table 3-3 also identifies where peat failures actually occurred as a result of a site activity during construction. Where peat failures did not occur, the **Significance** of the **effects** in Table 3-3 reflects the probability of a peat failure occurring due to the effect of the stability impacts on the peat (e.g. due to the increased shear stresses under applied surcharge loads), the potential scale and characteristics of a peat failure, and the sensitivity of the soils, geology and land potentially impacted by a peat failure.

Where failures did occur the significance of the effect of the stability impact of that site activity in Table 3-3 is consistent with the significance of the effect of the direct impact of the peat failures that occurred (i.e. the physical impact of the peat failures on the soils, geology and land that was displaced or disturbed within the failed areas).

Table 3-3 Assessment of Stability Impacts – Construction Stage (2002 to 2006)

Activity	Characteristics of Direct Impact of Site Activities with respect to Site Stability (Stability Impacts)				Assessment of Effect of Stability Impacts on Soils, Geology & Land						Did Peat Failure Occur? (Yes/No)
	Impact	Extent of Impact	Duration	Frequency	Quality of Impact	Possible Extent of a Peat Failure	Probability of Occurrence of a Peat Failure	Effect on Receiving Soils, Geology & Land	Sensitivity of Receiving Soils, Geology & Land	Significance of Effect	
Tree Felling	Loading from the tree felling equipment on the peat slopes	Across site, except turbary plots	Temporary	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Medium to Low	Medium	Slight	No
	Loading of the stockpiled logs on the peat slopes in localised areas along the floating roads.	Localised areas along floating roads	Temporary	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Medium to Low	Medium	Slight	No
	Unloading of the peat slopes with the removal of the felled trees	Across site, except turbary plots	Permanent	Sustained	Positive	Not Applicable - Reduced risk of a peat slide due to unloading of peat slopes where trees were felled	Positive Impact - Reduced Probability of a Peat Slide	Very Low (Positive)	Medium	Slight (Positive)	No
Site Compound	Loading on peat slopes due to disposal of excavated peat & possibly glacial till (Prior to Peat Slide)	On-Site	Permanent	Sustained	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Possible to Very Possible	High	Medium	Significant	No
	Loading from engineered fill materials to form a level platform and hardstanding area	At site compound	Temporary	Occasional	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Loading on hardstanding area from temporary structures	At site compound	Short-term	Occasional	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Construction traffic loading on hardstanding area	At site compound	Short-term	Frequently	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
Site Access: Floating Roads	Live loading on the peat from wide-track excavator placing small trees as basal reinforcement.	Along the floating roads	Temporary	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Medium to Low	Medium	Slight	No
	Dead load surcharge on the peat from 5.0 m wide strip of rockfill used to construct roads	Along the floating roads	Permanent	Sustained	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Possible to Very Possible	High	Medium	Significant	No
	Live load surcharge from construction traffic on floating roads - prior to peat slide in October 2003	Along the floating roads	Short-term	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Possible to Very Possible	High	Medium	Significant	No
	Live load surcharge from construction traffic on completed floating roads - 2nd Phase of Construction - After Testing	Along the floating roads	Short-term	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No
Site Access: Access Tracks on Glacial Subsoil	Additional dead load from layer of rockfill used to upgrade existing access tracks	Along existing access tracks on glacial subsoil	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Construction traffic loading on upgraded access tracks	Along upgraded access tracks on glacial subsoil	Temporary	Frequently	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No

Table 3-3 (Contd.) Assessment of Stability Impacts – Construction Stage (2002 to 2006)

Activity	Characteristics of Direct Impact of Site Activities with respect to Site Stability (Stability Impacts)				Assessment of Effect of Stability Impacts on Soils, Geology & Land						Did Peat Failure Occur? (Yes/No)
	Impact	Extent of Impact	Duration	Frequency	Quality of Impact	Possible Extent of a Peat Failure	Probability of Occurrence of a Peat Failure	Effect on Receiving Soils, Geology & Land	Sensitivity of Receiving Soils, Geology & Land	Significance of Effect	
Site Access: Access tracks across slide area at Turbines T68 and T70	Rockfill loading on the glacial subsoil	Along reconstructed access tracks at T68 and T70	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**	**No**
	Construction traffic loading on upgraded access tracks	Along reconstructed access tracks at T68 and T70	Temporary	Frequently	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**	**No**
	Containment of disturbed peat upslope from the access tracks	Slide area directly upslope from reconstructed access tracks at T68 and T70	Permanent	Sustained	Positive	Not Applicable - Disturbed peat in slide area upslope from access track contained by rockfill berms	Positive Impact - Reduced Probability of a Peat Slide	**Medium (Positive)**	**Medium**	**Moderate (Positive)**	**No**
Construction of Turbine Foundations	Temporary stability of peat slopes around perimeter of excavation due to excavation of peat and mineral soil to rockhead	At turbine foundations	Temporary	Once at each turbine	Negative	Localised (<10m^2) to Very Small (10m^2-100m^2) Peat Slide [Upslope from excavation]	Possible to Very Possible	**Medium to Low**	**Medium**	**Slight**	**Yes** [**T52** - V.Small Shear Failure Upslope from Excavation, **T66** - Tension Cracks over V. Small Area Upslope]
	Excavation backfilling and construction of RC Foundation – loading from structural fill, steel and concrete	At turbine foundations	Temporary	Once at each turbine	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**	**No**
	Construction traffic loading on floating roads	At turbine foundations and along floating roads	Short-term	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Low to Possible	**Medium**	**Medium**	**Moderate**	**No**
Crane Hardstanding Areas	Temporary stability of peat due to excavation to suitable formation on glacial subsoil	At each turbine	Temporary	Once at each turbine	Negative	Localised (<10m^2) to Very Small (10m^2-100m^2) Peat Slide [Upslope from excavation]	Very Low to Low	**Low**	**Medium**	**Slight**	**No**
	Excavation backfilling and construction of crane hardstanding – loading from crushed rock granular fill on glacial subsoil	At turbine foundations	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**	**No**
	Construction traffic loading on crane hardstanding	At turbine foundations	Temporary	Frequently	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**	**No**
	Construction traffic loading on floating roads.	At each turbine and along floating roads	Short-term	Frequently	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	**Medium**	**Medium**	**Moderate**	**No**
Spoil Management: Prior to Peat Slide on 16th October, 2003	Shear Failure due to sidecasting of excavated peat and glacial till	At 37 No. turbines completed prior to slide	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Possible to Likely	**High**	**Medium**	**Significant**	**Yes** [**T68** - Very Large (25Ha); **T17** - Small (1,800m^2); **T23,T29 & T66**-Local Bearing Failure]
	Disposal of surplus excavated glacial subsoil in borrow pits	At Borrow Pits #1 & #2	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**	**No**

Table 3-3 (Contd.) Assessment of Stability Impacts – Construction Stage (2002 to 2006)

Activity	Characteristics of Direct Impact of Site Activities with respect to Site Stability (Stability Impacts)				Assessment of Effect of Stability Impacts on Soils, Geology & Land						Did Peat Failure Occur? (Yes/No)
	Impact	Extent of Impact	Duration	Frequency	Quality of Impact	Possible Extent of a Peat Failure	Probability of Occurrence of a Peat Failure	Effect on Receiving Soils, Geology & Land	Sensitivity of Receiving Soils, Geology & Land	Significance of Effect	
Spoil Management: Post Peat Slide	Medium Term Impact of sidecasting of excavated peat and possibly glacial subsoil	At 37 No. turbines completed prior to slide - [arisings partially/fully removed at 5 No. turbines (T18, T23, T29, T34, T66)]	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No
	Dead load surcharge from up to 1.0m of excavated peat in designated peat repository areas on flat peat slopes	At designated peat repository areas	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Medium to Low	Medium	Slight	No
	Disposal of surplus excavated glacial subsoil in borrow pits	At Borrow Pits #1 & #2	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Construction traffic loading on floating roads to transport spoil	Along floating roads	Temporary	Frequently	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No
Turbine Erection	Construction traffic loading on floating roads to access turbines	Along floating roads	Temporary	Frequently	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No
	Mobile crane loading on crane hardstanding areas	At each turbine	Brief	Frequently	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
Substation	Loading on peat slopes due to disposal of excavated peat	In designated peat repository areas	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Medium to Low	Medium	Slight	No
	Earthworks to construct hardstanding for substation hardstanding – Loading from Engineered Fill Materials.	At substation	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Loading on hardstanding compound from permanent structures	At substation compound	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Construction traffic loading on floating roads	Along floating roads	Temporary	Frequently	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No
Borrow Pits	Disposal/Sidecasting of excavated peat and Glacial Till from Borrow Pits No.1 and 2 in 2003	In vicinity of borrow pits – no detailed records	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Possible to Likely	High	Medium	Significant	No
	Medium Term Impact of sidecasting of excavated peat and possibly glacial subsoil (2nd Phase of Construction - 2004/2005)	In vicinity of borrow pits – no detailed records	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No

Table 3-3 (Contd.) Assessment of Stability Impacts – Construction Stage (2002 to 2006)

Activity	Characteristics of Direct Impact of Site Activities with respect to Site Stability (Stability Impacts)				Assessment of Effect of Stability Impacts on Soils, Geology & Land						Did Peat Failure Occur? (Yes/No)
	Impact	Extent of Impact	Duration	Frequency	Quality of Impact	Possible Extent of a Peat Failure	Probability of Occurrence of a Peat Failure	Effect on Receiving Soils, Geology & Land	Sensitivity of Receiving Soils, Geology & Land	Significance of Effect	
Borrow Pits (Contd.)	Controlled disposal of excavated peat from Borrow Pits No.3 - 2nd Phase of Construction (2004/2005)	In designated peat repository areas	Permanent	Sustained	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Medium to Low	Medium	Slight	No
	Backfilling borrow pits with Glacial Subsoil (Borrow Pit No.2)	Borrow Pit No.2	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Backfilling borrow pits with Peat below ground level or contained by rockfill bunds (BP No.2 and small sections of BP No.3)	In BP No.2 and BP No.3 (small sections)	Permanent	Sustained	Negative	Localised flow slide of remoulded peat due to failure of containment bunds	Very Low	Very Low	Medium	Slight	No
	Blast-induced vibrations (BP No.3 Only)	Within 200-500 m of BP No.3	Momentary	Occasional	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Very Low	Medium	Slight	No
Drainage	Loading on peat slopes from wide-track excavators and locally sidecast peat.	Along open drains	Temporary	Occasional	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight	No
	Improvement of groundwater conditions	In areas of improved drainage	Permanent	Sustained	Positive	Not Applicable - Reduced risk of a peat slide due to improved groundwater conditions	Positive Impact - Reduced Probability of a Peat Slide	Medium (Positive)	Medium	Moderate (Positive)	No
Cable Trenching and Ducting	Loading on peat slopes from wide-track excavators and cable transporting equipment	Across site, generally along site access tracks	Temporary	Frequently	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight	No
	Installation of cable ducts under floating roads	At cable crossing points	Brief	Once at each crossing point	Slight Negative	Localised (<10m^2) at duct crossings under road	Very Low	Very Low	Medium	Slight	No
Erection of 110kv Twin Poleset	Live load surcahrge on intact peat from construction activities to excavate the foundations and erect the poleset	At the 110kv twin poleset on the windfarm site (adjacent to substation)	Temporary	Once	Slight Negative	Localised (<10m^2) to Very Small (10m^2-100m^2) Peat Slide	Very Low	Very Low	Medium	Slight	No
Construction of Anemometer Towers	Controlled excavation of peat for hardstand & RC foundation	At 2 No. anemometer locations	Temporary	Once at each location	Negative	Localised (<10m^2) to Very Small (10m^2-100m^2) Peat Slide [Upslope from excavation]	Very Low to Low	Low	Medium	Slight	No
	Permanent loading on glacial subsoil from hardstand and anemometer structure	At 2 No. anemometer locations	Permanent	Sustained	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Construction traffic loading on floating roads - spoil management, tranpsorting backfill materials & components	Along floating roads to anemometer locations	Brief	Occasional	Negative	Small (100m2-2500m2) to Very Large (>10Ha) Peat Slide	Low to Possible	Medium	Medium	Moderate	No

3.2.1 Tree Felling

The stability impacts of the tree felling on the receiving soils, geology and land were:

- The live load surcharge from the tree felling equipment on the peat slopes
- The dead load surcharge of the stockpiled logs on the peat slopes in localised areas along the floating roads.
- Unloading of the peat slopes with the removal of the felled trees

The majority of the large trees on the site were felled, stripped of the branches and cut into 3.0 m long logs using 10 to 13-tonne LGBP (low ground-bearing pressure) wide-tracked hydraulic excavators fitted with specialised tree harvesting attachments on the arm of the machines. The logs were then gathered and stockpiled using 8-12 tonne LGBP rubber-tyred forwarders. The machinery was operated directly on the peat in the forested areas across the site, which applied a live load surcharge on the peat slopes. The loading was **Frequent** during active periods of tree felling, but the **Duration** of loading was **Temporary**. The machinery that was used was standard forestry equipment that has been widely used by Coillte for felling trees on upland blanket bogs in Ireland. In areas where the peat was soft, the harvesters also placed small trees and cut branches on the surface of the peat along the lines of the tracks to provide a reinforced mat to spread out the concentrated track loads from the machines. In areas where the trees were too small for the harvesters the trees were felled by hand or with light tracked excavators and left in windrows on the slopes. The probability of a peat failure under the live load surcharge of the forestry equipment was **Very Low to Low**. Therefore, the effect of the loading on the peat with respect to site stability was **Medium to Low,** and the **Significance** of the effect was **Slight**.

The forwarders collected the 3.0m long timber logs from the slopes and stacked them on the peat adjacent to the floating roads in approximately 20 m long stockpiles up to about 2.5-3.0 m high close to where felling was active on the site. The stockpiles were regularly removed by Coillte using articulated trucks fitted with a HIAB lifting arm, and were then taken offsite for processing. The surcharge loading from the stockpiles was **Frequent** during active periods of tree felling, but the **Duration** of loading was **Temporary**. The coniferous trees on the site have a relatively low density of about 5kN/m^3, which means that the 2.5-3.0m high stockpiles applied a surcharge of about 12.5-15.0kN/m^2 over an area of 3.0m by about 20.0 m on the peat slopes. This was equivalent load to the load from about 1.25-1.50m of peat over the same area. The probability of a peat failure under the dead load surcharge of the stockpiled logs was **Very Low to Low**. Therefore, the effect of the loading on the stability of the peat was **Medium to Low,** and the **Significance** of the effect was **Slight**.

None of the areas where the trees were felled were re-planted. Therefore, the tree felling has also had a long-term **Positive** impact with respect to site stability. Where the large trees were felled and removed from site this has resulted in a **Permanent** and **Sustained** unloading of the peat slopes. However, the level of unloading was low (<1kN/m^2). Therefore, the effect of the loading on the stability of the peat was **Very Low,** and the **Significance** of the effect was **Slight**.

3.2.2 Site Compound

The stability impacts on soils, geology and land related to the construction of the site compound were:

- Loading on the intact peat slopes due to disposal of peat excavated from the site
- Loading from engineered fill materials to form a level platform and hardstanding area.
- Loading on the hardstanding area from the temporary structures
- Construction traffic loading on the hardstanding area.

The available construction records do not identify where all of the peat excavated from site compound was placed prior to the peat slide in October 2003. Typically, at that time the excavated peat was spread out or “sidecast” on the intact peat slopes adjacent to the excavation resulting in a **Permanent** and **Sustained** loading on the peat. Based on the peat failures that occurred elsewhere on the site where

excavated material was sidecast on the peat slopes, the probability of a peat failure under the sidecast material was **Possible to Very Possible**. Therefore, the effect of the surcharge load on the stability of the peat was **High** and **Significant**. However, there were no incidents of peat instability recorded during the construction of the compound. When peat was excavated to expand the compound after the peat slide in October 2003 it was stored in designated peat repositories on the site, which is assessed under spoil management in Section 3.2.6.

The compound was located on a terrace of gently sloping ground near the site entrance on the north side of the site. To construct the compound a turning bay on the existing Coillte forestry road in this area was expanded by excavating into the slope on the south side of the road, and by placing fill material downslope to the north. The entire compound was then capped with crushed rock granular fill material which was imported from nearby quarries. All of the peat on the site was excavated out from underneath the compound so that the fill materials were supported on the underlying glacial subsoil and bedrock exposed at formation level. Therefore, the effect of the dead load surcharge from the fill on the stability of the underlying glacial till or rock was **Negligible** and **Not Significant**.

The temporary structures that were placed on the compound were limited to standard single storey steel portacabin type structures which were supported on the granular rockfill. The compound was also used for parking staff cars and site vehicles, and for storage of materials and equipment. There were no large or abnormal loads on the compound and all of the structures were removed at the end of construction. Therefore, the **Duration** of the loading was **Short-Term.** The effect of the surcharge loads on the stability of the underlying glacial till or rock was **Negligible** and **Not Significant**.

Similarly, the granular capping and surfacing layers at the compound were designed to support the standard axle and wheel loading from the construction traffic on the site. Therefore, the effect of the surcharge loads on the stability of the underlying glacial till or rock was **Negligible** and **Not Significant**.

3.2.3 Site Access Tracks

3.2.3.1 Floating Roads

The majority of the site access tracks (14.6 km) were constructed as floating roads on the peat. The roads were typically 4.5-5.0m wide at the top, about 6.0-7.0m wide at the base, and were comprised of 0.6-1.0 m of crushed rock granular fill with 1-2 layers of geogrid reinforcement and a basal reinforcing layer of small trees and branches placed directly on the vegetated surface of the peat. A further 2.0km of an existing narrow floating road (approx. 3.0-3.5m wide) through the turbary plots on the east side of the site was upgraded with a surface capping layer of crushed rock granular fill.

The stability impacts of the floating roads on soils, geology and land during construction were:

- The live load surcharge on the peat from the tracked excavator placing small trees as basal reinforcement;
- The dead load surcharge on the peat from the 6.0-7.0 m wide strip of crushed rockfill used to construct the roads; and
- The live load surcharge from the construction traffic on the completed floating roads.

Tracked excavators were initially used to place a layer of small timber logs, branches and brash on the surface of the peat along the line of the roads within a corridor where the trees were felled at the start of construction. The timber was placed using the same harvesting and forwarding equipment that was used to fell the trees. Therefore, the effect of the live load surcharge on the stability of the peat was **Medium to Low,** and the **Significance** of the effect was **Slight**. The loading was **Frequent** when the trees were being felled, but the **Duration** of loading was **Temporary.** The trees along the corridor of the access tracks were felled prior to the peat slide between July and October 2003. The effect of the

dead load surcharge from the thin layer of trees and branches (typ. <1kN/m^2) was **Negligible** and **Not Significant**.

The 0.6-1.0m thick layer of granular rockfill that was used to construct the roads was equivalent to a dead load surcharge of 12.5-20.0kPa on the surface of the peat over an approximately 6.0-7.0 m wide strip along the line of the roads. On the sloping ground the effect of the dead load surcharge was to increase shear stresses in the underlying peat, potentially leading to a peat failure where the stresses exceeded the strength of the peat. The probability of a peat failure occurring under the surcharge loads was **Possible** to **Very Possible,** with the higher probability associated with the sections of the site where there was a higher risk a peat slide based on the baseline site characteristics, as shown on Figure 2-17. Therefore, the effect of the dead load surcharge from the floating roads on the stability of the peat was **High** and **Significant**.

The roads were left in place at the end of construction. Therefore, the surcharge loads are **Permanent** and **Sustained.** However, the highest risk for peat instability was in the short-term undrained condition during construction. Over time, the peat consolidated and increased in shear strength under the weight of the road, which reduced the probability of a peat slide.

The design live load surcharge on the floating roads was for the Grove GMK 6300 crane, which had a lifting capacity of 300 tonnes and was the largest crane that was used for the erection of the turbines. The maximum axle load of the crane was 12 tonnes and it had a travelling weight of 72 tonnes spread out over a contact area of 11.1m x 3.0m on the floating roads. The geogrids and basal reinforcement in the rockfill spread the load out over the full width of the roads so that the applied surcharge on the surface of the peat was reduced to <11.5kN/m^2 over a localised area of about 12.5m x 5.0m. The construction traffic loading was **Frequent** over the construction period, although the more frequent traffic loading was from the smaller dump trucks and concrete wagons, which had a similar live load surcharge, but over a shorter length of the road (<7.5m). The **Duration** of the loading was **Short-Term** over the construction period.

During the initial phase of construction prior to the peat slide in October, 2003, the probability of a peat failure occurring under the live load surcharge of the construction traffic used to build the floating roads was **Possible** to **Very Possible** so that the effect that the surcharge loads on the stability of the peat was **High** and **Significant**.

During the second phase of construction in 2004/2005 full-scale proof load tests were carried out on all of the floating roads prior to the erection of the turbines to certify them for the design crane loads. The strength of the peat would also have increased as it compressed under the sustained dead load surcharge from the road. Therefore, at that stage, due to the testing and improved site conditions, the probability of a peat slide under the live load surcharge load from the construction traffic reduced to **Low** to **Possible** so that the effect of the load on the stability of the peat was **Medium** and the **Significance** of the effect was **Moderate**.

3.2.3.2 Access Tracks on Glacial Subsoil

There is a 0.8km section of access track from the site entrance to Turbines T65 and T57 which is along an existing forestry access track that was constructed of granular rockfill on the glacial subsoil below the peat. The track was upgraded by re-surfacing with a layer of granular rockfill during construction of the wind farm. Therefore, the related stability impacts on soils, geology and land were:

- The additional dead load from the layer of rockfill used to upgrade existing access tracks; and
- The live load surcharge from construction traffic on the upgraded access tracks

The road is supported on the glacial till below the peat and it had been in-place for a number of years prior to construction of the wind farm. The dead load surcharge from the capping layer of rockfill that was used to upgrade the road was very low and the road was designed to support the concentrated axle

loads and the full live load surcharge from the construction traffic without applying any load to the peat. Therefore, the effect of the additional dead and live loads on the stability of the glacial till below the roads was **Negligible** and **Not Significant**.

3.2.3.3 Access tracks across slide area at Turbines T68 and T70

After the peat slide on the 16th October, 2003, a 30m long section of the floating road at Turbine T68, and a 105m long section of the floating road to the west of Turbine T70 had to be reconstructed. The new sections of road were reconstructed across the slide area as rockfill embankments up to about 2.5-3.0 m high on competent glacial subsoil below the disturbed peat. The roads performed a dual function of reinstating the site access tracks that had been damaged in the slide, and acting as a barrage to contain the disturbed peat upslope from the rockfill embankments. Therefore, the related stability impacts on soils, geology and land were:

- The dead load from the rockfill embankments on the glacial subsoil;
- The live load surcharge from the construction traffic loading on the upgraded access tracks; and
- Containment of the disturbed peat upslope from the embankments.

The rockfill embankments were constructed on competent firm and stiff glacial till below the disturbed peat and they were designed to support the concentrated axle loads and live load surcharge from the construction traffic without applying any load to the peat. Therefore, the effect of the additional dead and live loads on the stability of the glacial till below the roads was **Negligible** and **Not Significant**.

The embankments also had a **Positive** impact on the peat with respect to site stability as they act as a barrage to contain the disturbed peat within the slide area upslope from the roads. The effect of the embankments on the stability of the upslope peat is **Medium** and the **Significance** of the effect is **Moderate**. The embankments were left in place after construction. Therefore, the positive impact is **Permanent** and **Sustained**.

3.2.4 Construction of the Turbine Foundations

The construction of the turbine foundations involved

- excavating the peat and mineral soil to rockhead within the footprint of the pad foundation with temporary side slopes;
- backfilling up to the underside of the reinforced concrete pad foundation with layers of lean mix concrete and granular rockfill;
- assembling the steel reinforcement and casting the concrete pad foundation in-situ with the base can of the turbine tower; and
- backfilling around the completed foundation up to the level of the crane hardstanding with excavated glacial till with a capping layer of crushed rockfill.

The stability impacts on the receiving soils, geology and land related to the construction of the turbine foundations:

- Excavation of the temporary peat slopes around the perimeter of the excavation;
- The dead load surcharge from the structural fill, reinforcing steel and concrete on bedrock;
- The live load surcharge on the floating roads accessed by the construction traffic - excavators, concrete trucks, tipper trucks.

Excavation of the turbine foundations generated approximately **62,250 m^3** of peat and **35,750m^3** of glacial subsoil, assuming a bulking factor of 1.35 on excavation (i.e. ≈ 46,125m^3 (peat) & 26,500m^3

(till) in-situ undisturbed prior to excavation). Management of the spoil from the foundation excavations is addressed separately in Section 3.2.6.

The stability of the temporary peat slopes around the perimeter of the excavations for the turbine foundations was largely a local stability issue with a potential for collapse of the side slopes in deep very soft peat. Where the conditions were suitable the peat and mineral soil were trimmed back to stable temporary side slopes of about 1V:1H. In areas of deep very soft peat the contractor initially constructed rockfill berms down to the glacial subsoil to support the peat around the perimeter of the excavation. The probability of a local peat failure on the side slopes was **Possible** to **Very Possible**, with the higher risk in areas of deep, very soft peat. However, as the scale of a potential failure was limited to a localised collapse of the side slopes (<10m^2) or a very small scale peat slide (<100m^2) on the upslope side of the excavation, the effect of the excavation on the stability of the peat was **Medium to Low** and the **Significance** of the effect was **Slight**. The excavations were backfilled up to or above original ground level on completion so the **Duration** of the impact was **Temporary** and it occurred only **Once** at each turbine.

The structural fill and reinforced concrete pad foundations were constructed on competent bedrock with sufficient bearing capacity to support the design loads. Therefore, the effect of the additional dead and live loads on the stability of the bedrock below the foundations was **Negligible** and **Not Significant**.

The excavations for the turbine foundations were initially carried out using tracked hydraulic excavators operating on the floating roads to remove some of the peat, and then on the glacial till inside the excavation to remove the remaining peat and to excavate the glacial till to bedrock. The excavated peat and mineral soil were loaded onto tipper trucks for disposal in designated deposition areas on site. The floating roads were also used by the tipper trucks and concrete wagons that were used to bring the structural fill and concrete to each turbine foundation. The construction traffic loading on the floating roads was **Frequent** over the construction period. The **Duration** of the loading was **Short-Term** over the construction period.

The construction traffic loading on the floating roads was lower than the design load from the mobile cranes that were used to erect the turbines. During the second phase of construction in 2004/2005, after the peat slide, full-scale proof load tests were also carried out on all of the floating roads prior to the excavation of the remaining turbine foundations. Therefore, the probability of a peat slide under the live load surcharge load from the construction traffic was **Low** to **Possible,** with the higher risk associated with the areas on the site where there was a higher risk of peat instability (see Figure 2-17)**.** Therefore, the effect of the surcharge load on the stability of the peat was **Medium** and the **Significance** of the effect was **Moderate**.

3.2.5 Crane Hardstanding Areas

Construction of the crane hardstanding areas involved excavating the peat and soft clay down to competent bearing on the underlying glacial till over a 20 m x 37.5 m area adjacent to the turbine foundations and then backfilling the excavation with layers of crushed rock granular fill from the borrow pit on site. A finer imported rockfill was used for capping the finished surface of the hardstanding.

The stability impacts on soils, geology and land during construction of the hardstanding areas were:

- Excavation in peat to suitable formation on the glacial subsoil;
- The dead load surcharge from the crushed rock granular fill on the glacial subsoil;
- The live load surcharge from the construction traffic on the crane hardstanding areas - excavators, tipper trucks etc.
- The live load surcharge from the construction traffic on the floating roads - excavators, compaction equipment, trucks etc.

Excavation of the crane hardstandings generated approximately **121,000 m^3** of peat, assuming a bulking factor of 1.35 on excavation (i.e. ≈ 90,000m^3 in-situ undisturbed prior to excavation). Management of the spoil from the foundation excavations is addressed separately in Section 3.2.6.

The stability of the temporary peat slopes around the perimeter of the excavations for the crane hardstanding areas was largely a local stability issue with a potential for collapse of the side slopes in deep very soft peat. Where the conditions were suitable the peat was trimmed back to a stable temporary side slope and backfilled immediately with rockfill, particularly along the upslope side of the excavation. In areas of deep very soft peat the contractor initially stabilised the perimeter of the excavation with rockfill berms constructed down to the glacial subsoil. The probability of a local peat failure on the side slopes was **Very Low** to **Low**, with the higher risk in areas of deep, very soft peat. The scale of a potential failure was also limited to a localised collapse of the side slopes (<10m^2) or a very small scale peat slide (<100m^2) on the upslope side of the excavation. Therefore, the effect of the excavation on the stability of the peat was **Low** and the **Significance** of the effect was **Slight**. The excavations were backfilled up to or above original ground level on completion so the **Duration** of the impact was **Temporary** and it occurred only **Once** at each turbine.

The crane hardstandings were constructed on competent glacial subsoils with sufficient bearing capacity to support the weight of the rockfill and the live load surcharge from the equipment and machinery used to construct the hardstandings. Therefore, the effect of the additional dead and live loads on the stability of the underlying glacial till was **Negligible** and **Not Significant**.

The excavations for the crane hardstandings were carried out using tracked hydraulic excavators operating on the floating roads and on the rockfill within the excavation. The excavated peat was loaded onto tipper trucks for disposal in designated deposition areas on site along the site access tracks. The floating roads were also used by the tipper trucks that were used to bring the granular rockfill from the borrow pit or offsite quarry to the hardstanding areas.

The construction traffic loading on the floating roads was lower than the design load from the mobile cranes that were used to erect the turbines. During the second phase of construction in 2004/2005, after the peat slide, full-scale proof load tests were also carried out on all of the floating roads prior to the excavation of the crane hardstandings. The impact of the construction traffic loading was **Frequent** over the construction period. Therefore, the probability of a peat slide under the live load surcharge load from the construction traffic was **Low** to **Possible,** with the higher risk associated with the areas on the site where there was a higher risk of peat instability (see Figure 2-17)**.** Therefore, the effect of the surcharge load on the stability of the peat was **Medium** and the **Significance** of the effect was **Moderate**. The **Duration** of the impact of the live load on the site access tracks was **Short-Term** over the construction period.

3.2.6 Spoil Management

3.2.6.1 Material Sidecasting Areas - Prior to Peat Slide on 16th October, 2003

Prior to the peat slide in October 2003 the Contractor had completed the excavation for the foundations of 39 No. turbines across the site, predominately in areas of shallow bedrock where the depth of excavation for the foundations was shallower (i.e. Turbines T1-T5, T9-T13, T17- T29, T32, T34, T35, T37, T38, T40-T46, T63, T66, T67 & T69). The extent of excavation at the time was limited to the turbine foundations and did not include the full crane hardstanding areas. Excavation was underway for the foundation at Turbines T62 and T68 at the time of the slide on the 16th October. The foundations for Turbines T6 and T31 had also been partially excavated in the peat.

The peat, glacial till and occasionally weathered rock excavated from these turbine foundations was spread out or "sidecast" over a wide area across the surface of the intact peat adjacent to the excavations,

generally to a depth of 0.5-1.5m, but locally up to 2.0-2.5m at T24, T27 and T40. With respect to site stability, the **impact** of the sidecasting was the dead load surcharge applied on the peat slopes.

Applied Ground Engineering Consultants (AGEC) inspected each of the sidecast areas in a walkover inspection of the site after the slide. Records of the depth, extent, material characteristics and stability of the sidecast materials are presented in their report – "*Final Report on Derrybrien Wind Farm Post-Landslide Site Appraisal*," AGEC Report No. 378_099, dated 4/2/2004 (AGEC, 2004).

Some slumping or localised flow of the saturated excavated material on the peat slopes was noted by AGEC. However, in terms of site stability, the primary impact of the material sidecasting was the dead load surcharge that was applied to the intact peat on the slopes.

There are no detailed records of the volume of peat and glacial subsoil sidecast at each turbine. However, in their post-landslide site appraisal report AGEC made some visual observations on the characteristics of the material – i.e. whether it is predominately peat, glacial till or some combination of both, which is summarised in Table 3-2. Based on the relative thickness of peat and glacial till down to rock at each of the turbines, the average ratio of peat to glacial till is 1:1 (i.e. 50%/50%), excluding a few outliers in deep peat over shallow rock (T2, T12 & T13) where the arisings were predominately comprised of peat. Assuming a unit weight of 10kN/m^3 for the peat and 20 kN/m^3 for the glacial till, an average unit weight of 15.0kN/m^3 would give in indicative surcharge weight for the sidecast material.

The depth of sidecast material generally ranged from 0.5 to 1.5m, which was equivalent to a surcharge load of 7.5-22.5kN/m^2. At turbines T24, T27 and T40 the surcharge was locally up to 30.0-37.5kN/m^2 where the sidecast material was up to 2.0-2.5m deep.

Where the extent of the sidecast material on the slopes was recorded by AGEC (seeTable 3-2) it covered an area ranging from 215 m^2 at Turbine T29 to 2,240 m^2 at T9. However, it was generally between 600m^2 and 1,340m^2, with an average of about 1,000m^2, which would cover an area of about 25 x 40m. The sidecast areas for the 39 No. turbine foundation excavations that were completed would cover a total area of about **3.8ha**, excluding at T17 where the small scale peat slide occurred.

With respect to site stability, the primary **effect** of the surcharge load applied by the sidecast material was the increased shear stress in the underlying intact peat, which increased the risk of a peat slide on the slopes. The surcharge also applied a concentrated bearing pressure on the peat which increased the risk of localised bearing failure.

Table 3-2 summarises the observations that were made by AGEC of the 39 No. areas were arisings were sidecast adjacent to the turbine bases that were fully excavated prior to the slide in October 2003. The majority of the sidecast areas [35 No. (≈ 90%)] were stable with only minor slumping or localised flow of the excavated material, in some cases blocking drains on the site. In these areas the sidecast material was left in place so that the impact on the peat was **Permanent** and **Sustained**.

Of the 4 No. (≈ 10%) remaining sidecast areas inspected by AGEC where the turbine excavation had been completed a local bearing failure was recorded under the sidecast material at 3 No. Turbines T23, T29 & T66, and a small scale peat slide (<2,500m^2) occurred at Turbine T17.

Excavation was underway for the foundation at Turbine T68 at the time of the slide and the excavated material was being sidecast on the slopes downslope from the turbine and floating road, where the slide is thought to have initiated.

Local bearing failure that occurred in the peat at T23, T29 and T66:

At Turbines T23, T29 and T66 there was a localised bearing capacity failure in the intact peat under the weight of the sidecast material. At each of these turbines the arisings from the foundation excavation were placed on the intact peat slopes along the edge of the forest on the downslope side of the turbine and floating road.

The bearing capacity failures were characterised by a rotational shear failure in the intact peat under the arisings, which caused slumping of the excavated material and heave with tension cracks in the intact peat downslope, giving the slope an irregular stepped profile, as shown in Figure 3-29. Some trees within the zone of ground movement were tilted over.

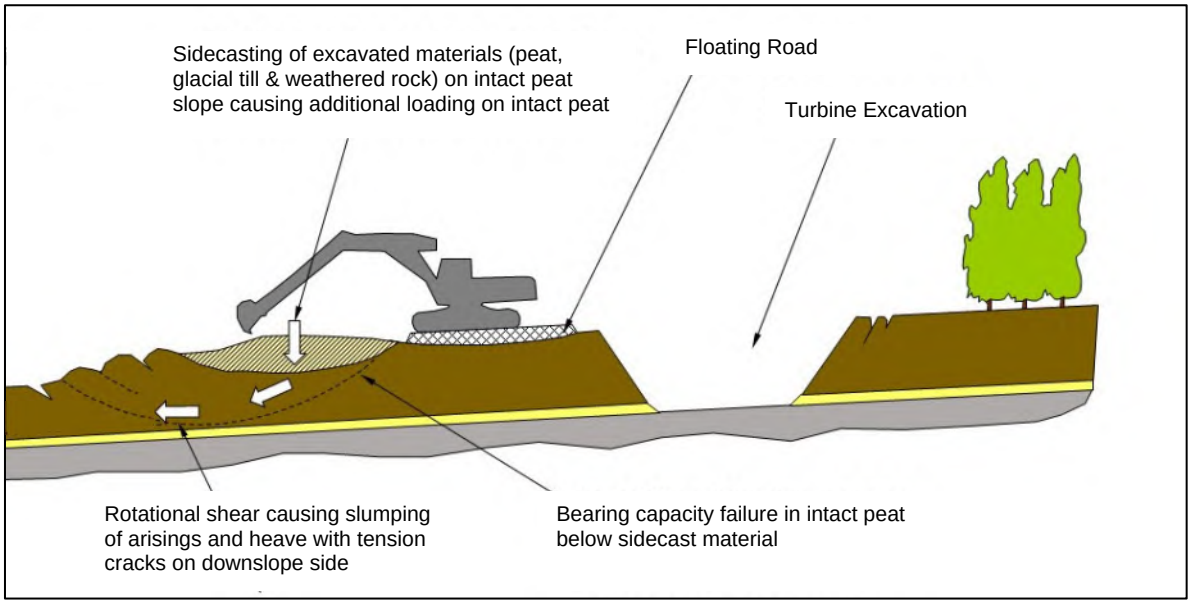


Figure 3-29 - Bearing capacity failure below sidecast materials

Turbines T23 and T29 are located along the southern boundary of the site. The bearing capacity failure at these turbines occurred in relatively shallow peat (1.0-1.5m deep) on gently sloping ground (2-4°).

Turbine T66 is located near the centre of the site, 250 m upslope from Turbine T68 where the large peat slide occurred in October 2003. At T66 the excavated material was placed on intact peat up to 2.8 m deep on intermediate slopes of 3-5°.

At each turbine the failure within the peat was localised and limited to an area that extended a few metres downslope from the sidecast material. The peat outside the zone of the bearing failure remained undisturbed and intact. Therefore, the effect that this had on the peat was **Low**, which is of **Slight Significance**.

In these areas some or all of the sidecast material was removed after the failures occurred to stabilise the slope so that the impact of the loading was **Temporary**.

Small scale peat slide that occurred at Turbine T17:

At Turbine T17, there was a shear failure in the peat under the sidecast material which gave rise to a small peat slide over an area of about 22m x 90m (1,980 m^2) approximately 10 m east of the turbine on the south side of the floating road. The slide occurred as a planar shear failure near the base of the peat in peat up to 1.5-2.0m deep on slopes of 2-4°.

The disturbed remoulded peat from the failed area flowed out in a lobe over the intact peat downslope from the failure for a run-out distance of about 45 m, where it came to rest on flatter slopes with shallower peat about 1.0 m deep.

There was no evidence of failure in the in-situ peat below the lobe of remoulded peat in the run-out zone. The slide was small (<2,500m^2) and the peat slopes downslope from the failed area remained undisturbed and intact. Therefore, the effect that this had on the peat was **Low**, which is of **Slight Significance**.

Very large scale peat slide that occurred at Turbine T68 on 16th October 2003:

On the 16th October 2003 over 450,000m^3 of blanket bog was disturbed in the peat slide over an area of approximately 25 Hectares on the forested slopes at Turbine T68 on the south side of the wind farm. Approximately 250,000m^3 of the disturbed peat moved downslope from the slide area, broke up and entered the natural drainage channel for the as a viscous flow of fluidised remoulded peat debris. Some of this material was deposited in lobes on flatter ground to either side of the channel upslope from the Black Road Bridge. A proportion of the debris moved further downslope along the stream channel below the bridge ultimately reaching the Owendalulleagh River, approximately 5.25 km downstream from the site.

The movement of the debris along the stream channel occurred in pulses in the days and weeks following the slide in response to subsequent rainfall events, which remobilised the peat debris in the upper reaches of the stream when surface runoff entered the channel. Immediately following the peat slide a number of rockfill barrages were constructed across the stream channel and slide area in an effort to contain the downstream movement of the debris.

The material that remained within the failure scar on the upper slopes and wind farm site was typically comprised of detached rafts of intact peat, remoulded peat debris and a thin cover of intact basal peat over the underlying mineral soil and rock. Sections of the site access tracks on the south side of the wind farm were also damaged in the slide and had to be re-constructed. Over time, surface runoff and groundwater has become concentrated along natural drainage channels within the slide area, increasing the level of drainage to the blanket bog on the surrounding slopes.

At the time of the slide, peat up to 3.5m deep was being excavated from the site of Turbine T68 and placed on the intact peat slopes on the downslope side of the floating road, opposite the turbine, using 2 No. 20 tonne Hitachi EX200 long-reach excavators. Some of the excavated material was also placed on the slopes to either side of the turbine. The excavators were operating on the floating road and on a small section of granular hardstanding on the glacial till between the turbine and the hardstanding. The excavation had not progressed into the glacial till so only peat was sidecast on the slopes.

Applied Ground Engineering Consultants, Ltd. (AGEC) carried out an inspection and supplemental investigations on the site at the time of the slide to provide an opinion on the likely cause of the failure. In their report "*Derrybrien Wind Farm – Final Report on Landslide of October 2003*" (AGEC, 2004), they concluded that the construction activity, and particularly the placing of arisings onto the intact peat slopes, most likely triggered the slide.

The failure mechanism that AGEC proposed is shown schematically in Figure 3-30. The additional surcharge load from the arisings on the intact peat slopes could have initially caused a localised shear failure in the underlying intact peat. This would have reduced its shear resistance and resulted in a redistribution or transfer of lateral load to the adjacent peat downslope. Additional transfer of lateral loading as more material was placed on the slopes could have led to a progressive shear failure and reduction in shear resistance along the base of the peat further downslope. Ultimately, this could have led to the large planar or translational peat slide that occurred on the inclined slopes.

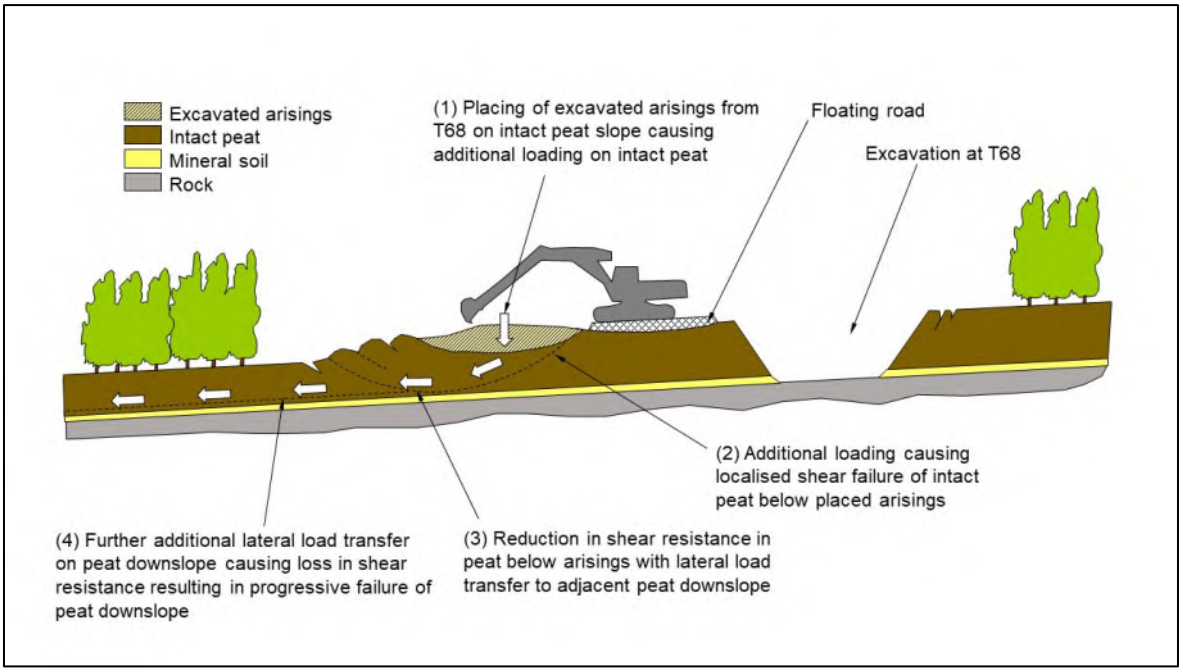


Figure 3-30 - Schematic of likely failure mechanism of 16th October peat slide

Although the peat slide occurred while the excavated peat was being sidecast on the intact peat slopes downslope from Turbine T68, site observations at the time of the slide indicated that the failed mass of peat initially moved as a rigid body in a large planar slide over a wide area on the slopes of the mountain. The magnitude of loading from the sidecast material over a very small area at the top of the slide was actually quite low relative to the scale and characteristics of the slide. Furthermore, excavated arisings from the turbine foundations had already been sidecast on the intact peat slopes in a number of other locations on the site without causing a failure in the peat. Therefore, on its own it does not fully explain why the slide occurred at T68.

At the time of the peat slide at the Derrybrien Wind Farm the construction industry's general knowledge of failures on peat slopes was very limited. As a result of the Derrybrien slide there have been numerous investigations, research projects and publications into peat slope failures in Ireland and the UK which have greatly increased our knowledge of the behaviour of peat and of peat failures on upland blanket bogs. Subsequent investigations into peat slope failures have also shown similar types of triggering events and failure mechanisms to the slide that occurred at Derrybrien - specifically large peat slides caused by the placement of relatively small loads at the head of an intact peat slope (Dykes & Warburton (2007), Kane et al (2020)).

Based on their investigations into the peat slide at Derrybrien in 2003, AGEC identified additional contributory factors that would have made the slope predisposed to the failure in that area. Their findings are consistent with the results of subsequent investigations and testing carried out on the site after the slide, as well as our current understanding of peat slope failures on upland blanket bogs. It is now recognised that the following compounding factors and site conditions contributed significantly to the peat slide occurring in that area at that time:

- There was a convex break in slope to locally steeper slopes >4-5° on the downslope side of the floating road at the top of the slide, where the excavated material was being sidecast on the peat slopes (see Figure 2-3);
- The slide occurred within a shallow buried valley that was filled with locally deeper peat, which would not have been evident from the ground surface;

- Laboratory testing of undisturbed samples from the base of the peat adjacent to the slide indicated that the failure occurred within a layer of uncharacteristically weak highly decomposed and possibly disturbed peat that was not encountered elsewhere on the site and may have been indicative of a previous historic peat slide in the area;
- The shallow buried valley where the slide occurred is directly upslope from the valley for the stream in sub-catchment SC7(b) (Derrybrien River North). Therefore it is likely that there was concentrated subsurface flow of groundwater within and below the peat in the valley at Turbine T68 which has since formed a stream within the disturbed peat in the slide area;
- Aerial photographs of the site from before the slide also showed evidence of concentrated subsurface drainage in the peat within the slide area in the form of lines of dark green vegetation on the slopes (see Figure 2-1).
- The historical aerial photographs of the site (Figure 2-1) also show that there was a large irregular area of smaller tree growth in the conifer plantations on the west side of the wind farm where the trees may have been destroyed by fire at some point in the past. The peat slide occurred at the eastern edge of this area.
- Prior to construction of the wind farm, the integrity of the upper fibrous layer of intact peat in the slide area would also have been damaged by the drains and furrows that were cut into the slope for the conifer forest plantations.
- At the time of the slide drainage works were also being carried out on the peat slope within the slide area approximately 300m downslope from the turbine;

All of these compounding factors would indicate that the peat on the slope in this area could have been at or close to the point of failure when the construction works were being carried out.

This is consistent with the current best practice guidelines for assessing the risk of peat instability for wind farm developments on upland blanket bogs (Scottish Government – Energy Consent Unit, 2017), which are based on assessing a range of similar contributory risk factors related to site characteristics to identify areas where there is an elevated risk of peat instability, as described in Section 1.3.

The peat slide displaced peat and forestry on the slopes over an area of about 25 ha that extended 1.68 km downslope from Turbine T68, which is very large (>10ha). The majority of this (≈90%) was in the Coillte coniferous forests outside the wind farm site. From here fluidised remoulded peat from the slide entered the valley of the stream SC7(b) (Derrybrien River North) and impacted farmland down to the Black Road Bridge approximately 1.0 km downslope from the slide area where rockfill barrages were constructed to contain much of the material. This was the primary run-out zone for the slide. Some of the remoulded peat was transported further downstream along the river channel.

The total volume of peat from the slide has been estimated at about 450,000m^3, of which approximately 200,000m^3 has remained on the slopes within the slide area. The effect of the slide has been assessed as **High** due to the extent of the slide and the volume of peat that was disturbed and displaced from the slopes in the slide area.

The baseline sensitivity of the receiving soils, geology and land directly impacted by the slide has been assessed as **Medium** based on a combination of the low overall ecological value of the degraded blanket bog, the relatively low value of the land for forestry and agriculture, and the potential carbon loss in the disturbed peat in the context of the overall wind farm project and national annual carbon emissions. Therefore, the effect of the peat slide on soils, geology and land was **Significant**.

General effect of material sidecasting on the peat with respect to site stability prior to the peat slide on the 13th October, 2003:

The significance of the general effect of the surcharge loading from the sidecast materials on the intact peat slopes, including in the areas where no peat failures occurred, has been calibrated as a function of the number, extent and characteristics of the peat failures that occurred on the site, and the sensitivity of the soils, geology and land impacted by the failures, particularly the large scale peat slide that occurred at T68 in October, 2003.

The probability of a peat slide or local bearing failure occurring under the dead load surcharge on the slopes has been assessed generally as **Possible** to **Very Possible.** The higher probability would have been associated with areas on the site where:

- there was a higher risk of a peat failure based on the baseline site characteristics (see Figure 2-17);
- a greater depth and volume of excavated material was placed on the slopes; and
- the sidecast material included a significant proportion of glacial till or weathered rock which are almost twice the weight of peat.

Based on the number of peat failures that occurred and the possible extent and characteristics of a large peat slide being triggered by the surcharge loading in the worst case scenario, the effect of the surcharge loading on the stability of the peat has been generally assessed as **High**. Where peat failures did not occur this reflects the probability of a peat failure occurring due to the effect of the stability impact on the peat (e.g. due to the increased shear stresses under applied surcharge loads).

The baseline sensitivity of the receiving soils, geology and land that could potentially be impacted by a large scale peat slide at the wind farm site has been assessed as **Medium**. Therefore, the effect of the surcharge loading on the receiving soils, geology and land with respect to site stability was **Significant**.

3.2.6.2 Material Sidecasting Areas - After the Peat Slide on 16th October, 2003

No further general sidecasting of excavated material was permitted on the site when construction on the wind farm resumed in 2004. Where the arisings from the turbine excavations had already been sidecast on the peat slopes prior to the 2003 peat slide:

- Each area was inspected by AGEC to assess the stability of the peat slopes and sidecast material, and to recommend where remedial works needed to be carried out;
- Drainage improvements were carried out to clear drains that were blocked by the sidecast arisings, and to drain areas of ponded groundwater or surface runoff; and
- Sidecast arisings were removed from areas where peat instability was observed (e.g. Turbines T23, T29 and T66), or where there were concerns for the stability of the peat (T18 & T34).

These remedial works significantly reduced the risk of peat instability in the sidecast areas. Furthermore, the highest risk of peat instability was in the short-term undrained condition at the time that the material was placed on the slopes. Over time, the peat consolidated and compressed under the weight of the arisings, increasing the shear strength in the process so that, by the time that construction resumed on the site in 2004 there was a lower risk of peat instability. Therefore, for the second phase of construction in 2004/2005 the probability of a peat failure reduced to **Low** to **Possible** so that the effect of the dead load surcharge on the stability of the peat slopes was **Medium** and **Moderately Significant**. Where the sidecast material was left in place on the slopes, the impact on the peat was **Permanent** and **Sustained**.

3.2.6.3 Spoil Management for Construction Stage Post Peat Slide (2004/2005)

For the second phase of construction in 2004/2005 significant risk mitigation measures were implemented for the management and disposal of material excavated from the remaining turbine excavations and from the crane hardstanding areas for all of the turbines.

The stability impacts of spoil deposition on the receiving soils, geology and land after the peat slide on 16th October, 2003 were:

- The live load and dead load surcharges from placing up to 1.0m of excavated peat on the intact peat slopes in the designated repository areas;
- Loading from excavated glacial till placed in the borrow pits.
- Construction traffic live loading on the floating roads to transport spoil to the designated disposal areas.

The risk mitigation measures that were implemented for the controlled disposal of excavated peat and glacial till will be addressed in more detail in Section 3.3.3.6. However, in general terms:

- All of the peat and glacial till were segregated for separate disposal;
- All of the glacial till was disposed of in the borrow pits;
- All of the peat was disposed of in designated peat repositories on the site;
- The peat repositories were located on flat or gently sloping ground (<3°) away from any areas of elevated risk with regard to peat instability;
- The depth of peat placed in the repository sites was limited to 1.0m and "floating" depth markers were used to confirm that this was not exceeded (i.e. markers that settled with the peat);
- Additional investigations and stability analyses were carried out at all of the repository sites to certify that they were suitable for the deposition;
- The certified extent of the repository sites was clearly marked out on site; and
- Stability analyses and full scale proof load testing was carried out on all of the floating roads to certify them for designated access routes.

The total volume of excavated material generated from the excavations for all of the turbines and crane hardstandings areas, including a bulking factor of 1.35 due to disturbance on excavation was:

- Peat: ≈ **183,350m^3** (= 136,125m^3 without bulking)
- Glacial Till (turbine foundations only): ≈ **35,750m^3** (= 26,500m^3 without bulking)

A combination of long-reach excavators operating from the floating road, and wide-tracked hydraulic excavators operating on the intact peat were used to place and spread the excavated peat out over the repository sites, which applied a live load surcharge to the underlying peat slopes. The dead load from up to 1.0 m of excavated peat was 10kN/m^2 and this was applied over the extent of the repository sites, which ranged from an area of 25 x 50 m for the smaller sites, up to 50m x 175m or 75m x 125m for the larger combined sites. Not all of the certified capacity was used. A typical photograph of a peat repository during construction is shown in Figure 3-16.

With the mitigation measures that were implemented for this phase of construction, the probability of a peat failure occurring in the peat repository areas was **Very Low** to **Low** so that the effect of the dead load surcharge on the stability of the peat slopes was **Medium to Low** and only **Slightly Significant**. The peat repositories were left in place after construction. Therefore, the impact on the peat was **Permanent** and **Sustained**.

The glacial till that was excavated for the turbine foundations was deposited in Borrow Pits Nos. 1 and 2. The till was spread out over the surface of the exposed intact glacial till and rock in the borrow pits with no loading on the peat. Therefore, the effect of the surcharge loading on the underlying glacial till and rock with respect to site stability was **Negligible** and **Not Significant**.

The excavated peat and glacial till had to be transported across the site in standard dump trucks and 4-axle tipper trucks to the borrow pits and to the designated repository sites, many of which were remote from the point of excavation. This increased the level of construction traffic on the floating roads. During the second phase of construction in 2004/2005, after the peat slide, stability analyses and full-scale proof load tests were carried out on all of the floating roads to certify them for the design live load surcharge. Therefore, the probability of a peat slide under the live load surcharge load from the construction traffic was **Low** to **Possible,** with the higher risk associated with the areas on the site where there was a higher risk of peat instability (see Figure 2-17)**.** Therefore, the effect of the surcharge load on the stability of the peat was **Medium** and the **Significance** of the effect was **Moderate**.

The construction traffic loading was **Frequent** but the **Duration** of the loading was **Temporary** over the remaining construction period.

3.2.7 Turbine Erection

The stability impacts on soils, geology and land during erection of the turbines were:

- Construction traffic loading on the floating roads to access the turbines – mobile cranes, low loader transporters, service vehicles etc.
- Crane loading on the hardstanding areas to lift the components into place for assembly.

Erection of the turbines involved transporting all of the turbine components to the turbine sites, including the steel tower sections, the hub, the rotor blades and the nacelle, which houses all of the mechanical and electrical generating components of the turbine. The components were transported to the turbines along the floating roads using standard trucks and low-loader articulated lorries. The large mobile cranes that were used to erect the turbines also travelled along the floating roads to the turbine sites. This was the design live load surcharge for the floating roads, which was verified by full-scale proof testing prior to erecting the turbines. Therefore, the probability of a peat slide under the live load surcharge load from the construction traffic was **Low** to **Possible**, the effect of the surcharge load on the stability of the peat was **Medium** and **Moderately Significant**.

The construction traffic loading related to the erection of the turbines was **Frequent** during the erection of the turbines, but the **Duration** of the loading was **Temporary**.

The mobile cranes operated on the granular hardstanding areas for all of the heavy lifting works that were required to erect the turbines. The hardstanding areas were constructed of crushed rock granular fill supported on competent glacial till below the peat. Steel outrigger pads were used to spread out the bearing pressures from the crane supports and the hardstanding areas were designed to support the concentrated loads from the cranes without applying any load on the peat slopes. Therefore, the effect that these loads had on the stability of the glacial till and rock was **Negligible** and **Not Significant**.

3.2.8 Substation Construction

The stability impacts on soils, geology and land during construction of the substation were:

- Disposal of the peat excavated from the site: the dead load surcharge of up to 1.0 m of peat placed on intact peat slopes in designated peat repository sites;
- Earthworks to construct hardstanding for substation – the dead load from engineered fill materials on the underlying glacial till;

- Dead load on hardstanding compound from permanent structures - control building, transformer, RC plinths, transmission towers.
- Construction traffic loading on hardstanding area – mobile cranes, MEWP, service vehicles, concrete trucks etc.
- Construction traffic loading on floating roads – small mobile cranes, concrete trucks, low-loader transporters, transformer, tipper trucks etc.

All of the peat that was excavated out from the site of the substation was transported to a designated repository area on site for disposal. As described in Section 3.2.6.3, all of the peat repository sites were located on flat or gently sloping ground in low risk areas that were analysed and certified for storage of up to 1.0 m of peat. Therefore, the probability of a peat failure occurring in these areas was **Very Low** to **Low** so that the effect of the live load surcharge on the stability of the peat slopes was **Medium to Low** and only **Slightly Significant**. The peat repositories were left in place after construction. Therefore, the impact on the peat was **Permanent** and **Sustained**.

The level hardstanding for the substation was constructed by excavating into the gently sloping ground on the north side and by placing engineered fill material on the downslope side. The entire compound was then capped with crushed rock granular fill material from Borrow Pit No.3, with a hardcore surfacing imported from nearby quarries. All of the fill materials were supported on the glacial subsoil exposed at formation level. The effect of the dead load from the fill materials on the stability of the underlying glacial till was **Negligible** and **Not Significant**.

The main permanent structures that were constructed at the substation included the single storey control building, the 80-tonne step-up transformer and the lattice steel transmission tower for the 110 kV overhead line. The foundations for these were comprised of reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The foundations were designed for the applied loads. The remaining structures on the substation were light electrical transformer and transmission components, which were supported on reinforced concrete plinths within the granular rockfill or on the underlying firm or stiff glacial till. The effect that the dead load from these foundations had on the stability of the site compound and underlying glacial till was **Negligible** and **Not Significant**.

The impact of the vehicles travelling along the floating roads was more significant for site stability. All of the peat that was excavated from the site was transported to nearby designated peat repository sites using standard dumper trucks. Standard 4-axle tipper trucks were used to transport the granular rockfill from Borrow Pit No.3 (BP-3) to form the hardstanding area at the substation.

For the construction of the control building and electrical transmission and transformer components on the site the construction traffic was generally comprised of standard concrete trucks, small mobile cranes, and trucks with HIAB loader cranes for transporting materials, equipment, cherry pickers and mobile elevated work platforms (MEWP) to the site. The largest load was from the 80-tonne step-up transformer, which was transported to the site on a specialised 28.5 m long multi-axle articulated truck and low-loader transporter which gave a combined total load of 131 tonnes spread out over 12 axles at a maximum load of 12 tonnes per axle. The equivalent live load surcharge over the length of the vehicle was also within the design load for the mobile crane that was used to erect the turbines.

The general construction traffic loading was **Frequent** during the construction of the substation, but the **Duration** of the loading was **Temporary**. The transformer was transported to the site in a single supervised and scheduled trip along a defined access route. As stated previously (Section 3.2.3.1), stability analyses and full-scale proof load tests were carried out on all of the floating roads in 2004/2005 to certify them for the live load surcharge from the construction traffic, which was prior to construction of the substation. Furthermore, in advance of transporting the step-up transformer to the site an additional full-scale proof load test was carried out on a sacrificial section of floating road along the access route to the substation to validate the method of stability analysis for the roads, as described in

Section 3.3.3.4. Therefore, the probability of a peat slide under the live load surcharge load from the construction traffic was **Low** to **Possible**, and the effect of the surcharge load on the stability of the peat was **Medium** and **Moderately Significant**.

3.2.9 Borrow Pits

Of the 3 No. borrow pits:

- Peat was excavated from the footprint of all three borrow pits and disposed of on-site;
- Borrow pits No.1 (BP-1) and No.2 (BP-2) were small borrow pits that were used to extract glacial till and shallow rock for use in backfilling around the turbine foundations prior to the peat slide in October 2003. The materials were extracted by mechanical excavators without blasting.
- BP-1 was backfilled with surplus glacial till from the turbine excavations and reinstated on completion of the works.
- BP-2 was backfilled with a combination of surplus glacial till and peat. The peat was fully contained within the depth of the borrow pit and by bunds of glacial till and weathered rock around the perimeter.
- Borrow Pit No.3 (BP-3) was the largest borrow pit and was the main source of granular rockfill for the project. The rock was extracted by periodic controlled blasting and then crushed to the required grading on site.
- Near the end of construction a small area to the left and right of the entrance to BP-3 was backfilled with excavated peat which was fully contained within rockfill bunds. The rest of the borrow pit was left open at the end of construction and has since recharged naturally with groundwater.

The stability impacts on soils, geology and land related to the development and backfilling of the borrow pits were:

- On-site disposal of the peat and surplus glacial subsoils excavated from the borrow pits;
- Unloading due to excavation of peat, glacial subsoil and rock;
- Reloading by backfilling borrow pits with glacial till or peat; and
- Blast-induced vibrations (Borrow Pit No.3 only).

In terms of site stability the most significant impact was from disposal of the peat and surplus glacial till excavated from the borrow pits. All of the borrow pits were located in areas of shallow peat with shallow/outcropping rock. The available construction records do not identify where the peat excavated from the borrow pits was placed prior to the peat slide in October 2003. Typically, at that time excavated peat was sidecast and spread out on the slopes near the excavation resulting in a **Permanent** and **Sustained** loading on the peat slopes. Some of the glacial subsoil may also have been sidecast with the peat, although much of this was contained within the borrow pits.

As discussed in Section 3.2.6.1, prior to the peat slide in October 2003, the probability of a peat slide or local bearing failure occurring under the dead load surcharge of the sidecast materials on the intact peat slopes was **Possible** to **Very Possible.** The higher probability would have been associated with areas on the site where:

- there was a higher risk of a peat failure based on the baseline site characteristics (see Figure 2-17);
- a greater depth and volume of excavated material was placed on the slopes; and
- the sidecast material included a significant proportion of glacial till or weathered rock which are almost twice the weight of peat.

The corresponding effect of the surcharge loading from the sidecast materials on the stability of the peat was **High** and **Significant**. However, there were no incidents of peat instability recorded on the site during the excavation of the borrow pits.

As described in Section 3.2.6.2, the highest risk of peat instability was in the short-term undrained condition at the time that the material was placed on the slopes. Over time, the peat consolidated and compressed under the weight of the materials, increasing its shear strength in the process so that, by the time that construction resumed on the site in 2004 there was a lower risk of peat instability. Therefore, for the second phase of construction in 2004/2005 the probability of a peat failure in the material sidecast areas reduced to **Low** to **Possible** so that the effect of the dead load surcharge on the stability of the peat slopes was **Medium** and **Moderately Significant**.

Much of BP-3 was developed during the second phase of construction in 2004/2005. All of the additional peat that was excavated from the borrow pit as it was expanded was placed in designated peat repositories on the wind farm site. The impact of this is assessed under spoil management in Section 3.2.6.3. The effect of the dead load surcharge on the stability of the intact peat on the slopes in the repository areas was **Medium to Low** and **Slightly Significant**.

Some of the glacial till excavated from BP-3 was used to construct a berm supporting the peat around the perimeter of the borrow pit to prevent any local instability during blasting. The remaining surplus glacial till was deposited in BP-1 and BP-2 where it was supported on rock or glacial till with a **Negligible** effect on site stability.

Excavation of the peat, glacial subsoil and rock had the effect of unloading the site slopes, particularly in BP-3 which was not backfilled on completion of construction so that the unloading was **Permanent** and **Sustained**. This had a **Slight Positive** impact with respect to site stability. However, as the pits were taken down into the rock the effect of the unloading on the stability of the rock was **Negligible** and **Not Significant.**

Similarly, backfilling the borrow pits with peat and surplus glacial till from excavations on the site only had a **Slight Negative** impact with respect to site stability as the peat was fully contained by rockfill bunds, and all of the peat, glacial till and rockfill bunds that were placed inside the borrow pits was supported on the underlying competent glacial till or bedrock without loading the peat. Therefore, the effect of the dead load surcharges on site stability was **Negligible** and **Not Significant.**

Where excavated peat was contained by rockfill bunds within BP-3 there was a residual risk of a localised flow slide due to failure of the bunds during construction. The risk was **Very Low** and the failure would have been fully contained within the borrow pit. Therefore, the effect on the stability of the peat was **Very Lo**w and only of **Slight Significance**. The highest risk was during construction. No failures were recorded.

For the second phase of construction in 2004/2005 controlled rock blasting was required to extract the rock from BP-3. Blast-induced vibrations generate horizontal inertial forces that can cause peat failures on inclined slopes in an extreme condition if the vibrations are not kept within acceptable limits. The blasting in BP-3 was carried out by a licensed professional, and the pattern, sequence, timing and maximum instantaneous charge of the blasts were designed to minimise the impact of the blasting on the intact peat around the perimeter of the borrow pit. Vibration monitoring was carried out on the site to assess the impact of the blasting on the peat slopes and to ensure that the peak particle velocity and peak particle acceleration of the vibrations were within acceptable limits. Therefore, the effect of the periodic transient vibrations on the stability of the peat was **Very Low** and the **Significance** of the effect was **Slight.** Site monitoring confirmed that the peat slide that occurred at the site in October 2003 was outside the range of the blast-induced vibrations from BP-3.

3.2.10 Drainage

Constructing open drains on the site involved excavating trenches typically up to 1.0-1.5m deep in the peat using wide-tracked hydraulic excavators operating on the intact peat slopes. The excavated material was normally sideccast and spread out on the peat adjacent to the trench. Where the drains passed under the floating road they were constructed using corrugated plastic uPVC drainage pipes. In shallow peat the culverts were constructed with a granular pipe surround supported on the underlying glacial till.

In the short-term the impact of the drainage works on soils, geology and land with respect to site stability was the live load surcharge on the peat from the machinery that as used to construct the drains. Sidecasting of the peat only resulted in minor localised redistribution of loading on the peat slopes along the line of the drains. Therefore, the probability of a peat failure resulting from the loading was **Very Lo**w to **Low**, the effect of the loading on the stability of the peat during construction was **Low** and the **Significance** of the effect was **Slight.** These works were carried out **Occasionally** on the site and the **Duration** of the impact was **Temporary**.

Improved drainage also had a **Positive impact** on the peat with respect to site stability. Poor drainage is a recognised contributory risk factor for peat instability. During periods of heavy or sustained rainfall it can lead to elevated hydrostatic uplift pressures below the peat, or hydraulic surcharge pressures in the existing drainage network of pipes and seepage channels within the peat, which have a finite capacity. These elevated groundwater pressures within and below the peat can contribute to peat slides. The impact of the improved drainage was to relieve ponded groundwater and increase surface runoff in areas where the drains were installed, and to lower the groundwater levels in the peat in the medium to long-term. The effect of this was to reduce the groundwater pressures in the peat during or after periods of sustained or heavy rainfall, thereby reducing the risk of a peat slide on the site.

In the medium to long-term, improved drainage would also have increased the shear strength of the peat where the groundwater table was lowered, which has also had a positive impact on the peat with respect to site stability. Wherever the groundwater table was lowered, buoyancy (uplift) forces in the peat were reduced. This would have caused the peat to consolidate (compress) under its own self-weight, which has increased its shear strength, similar to the effect of a surcharge load. The peat above the lowered water table would also have increased in strength as it dried out.

The effect of the positive impact of the drainage improvements on the stability of the peat is **Medium** and **Moderately Significant**. The drains were left in place at the end of construction. Therefore, the impact of the drainage improvements is **Permanent** and **Sustained**.

3.2.11 Cable Trenching and Ducting

Installing the electrical cables and ducts on the site involved excavating trenches approximately 1.1m deep in the peat using wide-tracked hydraulic excavators operating on the intact peat slopes. The excavated material was temporarily sideccast adjacent to the trench and subsequently used to backfill around the cables. Where the cables passed under the floating roads they were installed in ducts that were pushed through the peat under the road. The cables were transported around the site on spools using teleporters and tractors with cable drum holders operating on the floating roads.

The primary stability impact of the cable trenching and ducting on soils, geology and land was the live load surcharge on the peat from the machinery that was used to construct the trenches. Temporary sidecasting of the peat only resulted in minor localised redistribution of loading on the peat slopes along the line of the cables. Therefore, the probability of a peat slide under the live load surcharge was **Very Low** to **Low**, and the effect of the surcharge load on the stability of the peat was **Low** and **Slightly Significant**.

The loading on the peat was **Frequent** while the cable trenching was in progress in 2005 but the **Duration** of the impact was **Temporary** as the works were completed in a few months.

Installation of the cable ducts under the road was localised at a limited number of road crossings. There was minimal disturbance to the peat under the roads and no significant load increase from the PVC ducts. Therefore, the effect of the works on the stability of the peat was **Very Low** and only **Slightly Significant**.

3.2.12 110 kV Twin Poleset - Onsite

The twin poleset for the 110 kV overhead line that is within the site boundary is located near the site boundary near the substation on the south side of the site. The timber poles were transported to the site by truck along the floating roads. The foundation for each pole was comprised of a hole excavated through the peat to a depth of at least 1.0 m into the underlying glacial till. The poles were winched into an upright position in the holes, and the foundations were then backfilled with unreinforced concrete that was mixed on site.

The stability impact of the construction of the poleset on soils, geology and land was the temporary live loading on the peat slopes. The foundations for the timber poles were excavated using a hydraulic wide-tracked excavator operating on the intact peat slopes. The small volume of excavated peat and glacial till was temporarily sidecast adjacent to the excavation and subsequently used to backfill the excavation around the poles. The poles and cables were erected and tensioned using light winching equipment and the poles are supported in the glacial till without any load on the peat. Therefore, the effect of the live loads on the stability of the peat was **Very Low** and the **Significance** of the effect was **Slight.** The works were only carried out **Once** at the location of the poleset and the **Duration** of the impact on the peat was **Temporary** as the works only took few days.

3.2.13 Anemometer Masts (Met Masts)

The 2 No. anemometers on the site – 1 No. in the centre of the site at Turbine T68, and 1 No. at on the west side of the site near T12 – were constructed in 2005. The stability impacts that the construction of the masts and their surrounding hardstanding areas had on soils, geology and land were:

- Excavation of the peat and construction of the granular hardstanding at each mast.
- Construction traffic loading on the floating roads – concrete trucks, mobile crane
- Permanent loading on glacial subsoil from the hardstand rockfill, reinforced concrete foundation and lattice steel structure.

The hardstanding area at each mast was formed by excavating the peat down to competent bearing on the underlying glacial till and backfilling the excavation with crushed rock granular fill, similar to the crane hardstanding areas adjacent to the turbines (see Section 3.2.5). The temporary slopes around the sides of the excavation were battered back to stable temporary slopes to prevent localised shear failure around the edges, and the excavation was backfilled as soon as possible with granular rockfill from Borrow Pit No.3 up to original ground level.

The stability of the temporary peat slopes around the perimeter of the excavations was largely a local stability issue with a potential for collapse of the side slopes in deep very soft peat. The probability of a local peat failure on the side slopes was **Very Low** to **Low**, with the higher risk in areas of deep, very soft peat. The scale of a potential failure was limited to a localised collapse of the side slopes (<10m^2). Therefore, the effect of the excavation on the stability of the peat was **Low** and the **Significance** of the effect was **Slight**. The excavations were backfilled up to or above original ground level on completion so the **Duration** of the impact was **Temporary** and it occurred only **Once** at each mast.

The excavated peat was disposed of in designated peat repository sites under controlled conditions, as described in Section 3.2.6.3. Therefore, the effect of the live load surcharge from the excavated peat on the stability of the intact peat slopes in the repository areas was **Medium to Low** and **Slightly Significant**. The peat repositories were left in place after construction so the impact on the peat was **Permanent** and **Sustained**.

The peat was excavated using tracked excavators operating initially on the floating road and then on the rockfill within the excavation. The excavated peat was loaded into standard dump trucks and transported to nearby designated peat repository sites along the floating roads. The floating roads were also used by standard 4-axle tipper trucks to transport the granular rockfill from Borrow Pit No.3 and by concrete trucks for the construction of the RC pad foundation. The anemometers were delivered to the mast locations on standard trucks and assembled and erected on site with small mobile cranes. The live load surcharge from all these vehicles was within the design capacity for the floating roads, which had been verified by full-scale proof testing in advance of the construction of the met masts. Therefore, the probability of a peat failure under the live load surcharge load from the construction traffic was **Low to Possible**, and the effect of the surcharge load on the stability of the peat was **Medium** and **Moderately Significant**.

The impact of the construction traffic on the peat was **Frequent** but **Temporary** – lasting only a few weeks for the construction of the masts, foundation pads and hardstanding areas.

The anemometers were comprised of light 49m high lattice steel structures. The reinforced concrete pad foundations were designed to support the dead load of the structure on the granular rockfill of the hardstanding area, and the hardstand was constructed on competent glacial till below the peat. Therefore, the effect of the loading on the stability of the glacial till was **Negligible** and **Not Significant.**

3.3 Monitoring and Mitigation of Stability Impacts during Construction (2003-2005)

3.3.1 Introduction

This section of the report presents a summary of the geotechnical monitoring and mitigation measures that were implemented on site for the construction stage of the project between 2003 and 2005.

Section 3.3.2 presents the risk mitigation measures that were implemented on the site for the initial construction stage of the project prior to 16th October, 2003.

As a result of the slide additional investigations and analyses were carried out to assess site stability and additional risk mitigation measures were implemented for the completion of the works. These are outlined in Section 3.3.3. It also includes a summary of the instrumentation that was installed to monitor stability of the peat on the site for the second phase of construction.

Section 3.4 presents an updated peat stability risk assessment for construction on the site taking into account the additional risk mitigation measures, investigations and analyses

In accordance with the 2022 *EPA Guidelines on Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022) this section of the report only addresses those activities where the impact was deemed to be negative and of significance (i.e. excluding those impacts in Section 3.2 that are Imperceptible or Not Significant).

3.3.2 Monitoring and Mitigation of Stability Impacts of Site Activities Prior to the Peat Slide on the 16th October, 2003

The impacts of site activities that had a **Significant** effect on the peat with respect to site stability were:

- The dead load surcharge on the intact peat slopes from the construction of the floating roads with 0.6-1.0m of crushed rock granular fill;
- The live load surcharge on the floating roads from the vehicles and machinery that were used to construct the floating roads; and
- The dead load surcharge on the intact peat slopes where peat, glacial till and occasionally weathered rock excavated from the turbine foundations was sidecast on the peat adjacent to the excavation.

None of the negative impacts of the site activities had a **Moderately Significant** effect on the peat with respect to site stability. The improved drainage was a positive impact that had a **Moderately Significant** effect on the stability of the peat.

The impacts of site activities that had a **Slightly Significant** effect on the peat with respect to site stability were:

- The live load surcharge on peat slopes from low ground bearing pressure construction and forestry equipment operating on the peat slopes;
- The local stability of the temporary peat slopes around the perimeter of the excavations for the turbine foundations and crane hardstandings;
- Dynamic inertial loading on the peat from blast-induced vibrations from rock excavation in Borrow Pit No.3; and
- Miscellaneous localised loading on the peat slopes from work related to tree felling and drainage.

The following is a summary of the peat stability risk mitigation measures were implemented on the project prior to the peat slide in October 2013:

Construction Management and Supervision:

The civil works were carried out by an experienced earthworks and civil contractor – Ascon Ltd. (now BAM Civil). The works were carried out under the supervision of ESBI engineers with experience of construction for wind farms on upland blanket bogs in Ireland.

Site Access Tracks:

A basal layer of brash and small trees and 1-2 layers of geogrid reinforcement were incorporated into the design of the floating roads to minimise the thickness of granular rockfill used to construct the roads, and to spread the dead load of the road evenly over the surface of the intact peat.

On the north side of the site the access track between Turbines T50 and T47 was originally aligned along the north side of the turbines – in close proximity to the edge of the steep slopes on that side of the site. At an early stage in construction the track was re-aligned to the south side of the turbines to move it further back from the edge of the steep slopes.

Spoil Management:

Peat and glacial till excavated from the turbine foundations sidecast on the intact peat slopes adjacent to the excavations was spread out over the surface of the peat, generally to a depth of 0.5-1.5 m, to minimise the dead load surcharge and distribute it over a wide area.

The live load surcharge from construction plant operating on the peat slopes was minimised through a combination of long reach excavators operating on the access tracks, and LGBP (low ground-bearing pressure) wide-tracked excavators operating on the peat.

Stability of Peat Excavations at Turbine Foundations:

Wherever possible the temporary peat slopes at the turbine foundations were battered back to a stable temporary slope angle of 1V:1H or flatter. Where the sides of the excavations were unstable in deep weak peat, rockfill was backfilled up against the slopes as temporary support.

Drainage:

Some improvements were carried out to the existing drainage network on the site to clear out blocked drains, to relieve groundwater levels in areas of deep peat, and to prevent ponding of surface runoff in areas where the access roads and turbines were constructed. Culverts were also installed under the new site access tracks to preserve the existing hydrology.

Borrow Pits:

Borrow pits were opened up on the site to extract rock and process it into the granular rockfill that was used to construct the site access tracks and crane hardstandings. Blasting was only carried out in Borrow Pit No.3, near the site entrance. The blasting was carried out by an experienced licensed professional and charge delays were used to minimise blast-induced vibrations.

Tree Felling:

Tree felling works were carried out by experienced specialist subcontractors under the management of Coillte. The trees were felled and gathered using specialised forestry equipment comprised of a wide-tracked hydraulic excavator fitted with a harvesting attachment and 8-12 tonne rubber-tyred forwarders that have been widely used in commercial conifer forests on upland blanket bogs in Ireland.

In areas of soft peat the contractors placed timber brash and trimmed branches along the access routes of the harvesters and forwarders through the forest to spread out the concentrated live load surcharge under the tracks or tyres of the machines.

3.3.3 Monitoring and Mitigation of Stability Impacts of Site Activities After the Peat Slide on the 16th October, 2003

The impacts of site activities that had a **Significant** effect on the peat with respect to site stability during the second phase of construction were:

- The dead load surcharge on the intact peat slopes from the construction of the remaining floating roads with 0.6-1.0m of crushed rock granular fill; and
- The live load surcharge on the floating roads from the vehicles and machinery that were used to construct the remaining floating roads;

The impacts of site activities and their primary effects that had a **Moderately Significant** effect on the stability of the peat were:

- The dead load surcharge on the peat from the material sidecast areas in the medium-term as the peat gained strength under the load; and
- The live load surcharge from the construction traffic on the floating roads during the second phase of construction in 2004/2005, which was within the proven capacity of the roads.

The impact of the improved drainage was positive with respect to site stability and it had a **Moderately Significant** effect on peat stability.

The impacts of site activities that had a **Slightly Significant** effect on the stability of the peat were:

- The dead load surcharge from up to 1.0 m of excavated peat placed on the intact peat slopes in designated peat repository areas in 2004/2005;
- The local stability of the temporary peat slopes around the perimeter of the excavations for the turbine foundations and crane hardstandings;
- The live load surcharge on peat slopes from low ground bearing pressure construction and forestry equipment operating on the peat slopes;
- Dynamic inertial loading on the peat from blast-induced vibrations from rock excavation in Borrow Pit No.3; and
- Miscellaneous localised loading on the peat slopes from work related to tree felling, drainage, and cable trenching.

Comprehensive details of the supplemental geotechnical investigations and stability analyses that were carried out by AGL Consulting and the main civil contractor Ascon Ltd. (now BAM Civil) the second phase of construction in 2004/2005, after the peat slide, are presented in the AGL report titled "*Summary of supplemental investigations, stability analyses and peat stability risk mitigation measures adopted during the post-slide construction stage of the Derrybrien Wind Farm*," Report No. 11-147-R01, dated 29th May, 2020, which is included in Appendix F. The following is a summary of the measures were implemented on the site to monitor or mitigate significant effects of the stability impacts on soils, geology and land.

3.3.3.1 Instrumentation and Monitoring

Clusters of instrumentation were installed at selected locations on the site to monitor groundwater levels and ground movements in the peat. The instrumentation was comprised of a total of 12 No. push in piezometers (Pz-01 to Pz-12) and 15 No. tilt sensors (Tilt-01 to Tilt-15), which were installed in clusters at 4 No. locations on the site – in the vicinity of Turbines T2, T18, T34 and T49/50. The locations of the instruments are shown on ESBI Drawing No.QS-00192-01-D451-016 in Appendix A.

The piezometers were electronic vibrating-wire push-in piezometers that were installed with the tip of the piezometer at the base of the peat to provide a continuous record of daily and seasonal groundwater level fluctuations.

The tilt sensors were electronic tiltmeters that were installed over the full depth of the peat to provide a continuous record of any downslope movement or creep in the peat at the sensor locations.

The electronic sensors were connected to a central logger unit in each area. The logger units were fitted with GSM cards to allow remote access to the data, which was downloaded regularly to a central server. The tiltmeters were also set up with an automated alarm system to alert wind farm technical representatives of incidents of peat movement on the site that exceeded pre-defined limits.

3.3.3.2 Geotechnical Supervision & Certification

The level of geotechnical supervision for the civil works contract was significantly increased for the second phase of construction on the site in 2004/2005, i.e.:

AGL Consulting were appointed by the main contractor Ascon Ltd. (now BAM Civil) to provide geotechnical analysis, supervision and design services for the project from October 2003 until the end of the civil works contract in 2005. Our scope of services included:

- Geotechnical investigations at the peat slide, including detailed walkover surveys and specialised sampling and testing of the peat;
- Specification, supervision and reporting of supplemental geotechnical investigations on the site;
- Stability analyses for all of the floating roads;
- Identification and assessment of suitable peat repository sites;
- Preparation of geotechnical reports with the results of the supplemental ground investigations and stability analyses;
- Inspection of full-scale serviceability and proof load testing on all of the floating roads;
- Assessment and monitoring of blast-induced vibrations on peat stability;
- Periodic site inspections by a geotechnical director and attendance at progress meetings; and
- Full-time on call technical support from the office to address geotechnical queries.

As part of the geotechnical review process and Permit to Work scheme, a geotechnical certification system was implemented for the civil works on the site during the second phase of construction. AGL reviewed and certified the Contractor's method statements for site activities to ensure that specified design and construction peat stability risk mitigation measures were incorporated into the works, including for example:

- The depth of peat and the depth to formation for the turbine foundations and crane hardstandings;
- Drainage requirements;
- The method of excavation and temporary support requirements for excavation side slopes;
- The plant requirements for the handling and transporting of peat;
- The location of the approved repository site for the disposal of peat;
- Traffic management plan with the proposed haul routes; and
- Risk assessment and health and safety considerations.

Method statements were prepared for floating road construction, turbine foundation and crane hardstanding excavations, spoil disposal, peat repository sites and full-scale proof load tests on the floating roads. Copies of the certificates that were issued over the course of the works are included in AGL Report No. 11-147-R01 in Appendix F.

Engineers from **ESB International** had a full-time presence on site to supervise the civil works and coordinate with the mechanical/electrical sub-contractors. Their scope of work included:

- Reviewing design submittals from the Contractor to ensure that the works were carried out in accordance with the Contract Specification;
- Managing a Permit to Work scheme for the contractors and subcontractors on the site;
- Carrying out supplemental ground investigations involving peat depth probing and in-situ vane shear testing to assess the potential impact of tree felling operations on the peat;
- Monitoring groundwater levels and ground movements recorded by the instrumentation on the site; and
- Carrying out site inspections and attending project meetings.

Applied Ground Engineering Consultants (AGEC) provided geotechnical services to ESBI between October 2003 and the end of the civil works contract in 2005 including:

- An appraisal of site stability after the peat slide including, including detailed walkover surveys, supplemental ground investigations (peat probing and in-situ vane shear testing), and slope stability analyses;
- Review of technical submittals from the Contractor, including results of additional investigations, site stability analyses, in-situ testing, and certified method statements;
- Periodic site inspections and attendance at project meetings.

3.3.3.3 Supplemental Geotechnical Investigations

As discussed in Section 2.2, comprehensive supplemental geotechnical investigations were carried out on the wind farm site after the peat slide in October 2003 to characterise the ground and groundwater conditions across the site. In general the scope of work included:

- A desk study review of aerial photography – including 3D stereoscopic imaging to assess the site topography;
- Aerial LiDAR surveys, satellite GPS surveys and in-situ slope angle measurements with a hand-held Abney Level to characterise the site topography;
- Detailed walkover surveys and inspections by suitably qualified and experienced geotechnical engineers;
- Extensive peat probing, in-situ vane shear testing, undisturbed sampling and specialised laboratory testing to characterise the depth, strength and material characteristics of the peat across the site;
- Installation of piezometers to monitor groundwater levels in the peat; and
- Rotary coring at turbine foundations to determine the strength of the cohesive glacial till overburden below the peat and the depth to competent rock.

The primary objectives of these investigations were to manage peat stability for the completion of the project and to assess the ground conditions at turbine foundations. Specifically, they were used to

- Carry out a forensic investigation of the peat slide;
- Assess the design and stability of the existing floating roads that had been completed prior to the slide, as well as the remaining sections of roads that needed to be constructed;
- Identify suitable peat repository areas on the site and analyse the stability of each area under 1.0 m of deposited peat;
- Assess the stability of the site for tree felling operation.

- Determine the depth of peat that needed to be excavated at each of the remaining turbines and crane hardstanding areas to assess the required capacity for disposal in the repository sites;
- Identify the overburden conditions and depth to competent rock at the remaining turbine foundations to determine the depth of excavation to rock for the pad foundations, the volume of peat and glacial till that need to be disposed of on-site, and the requirements for safe temporary side slopes around the perimeter of the excavation; and

The results of the investigations that were carried out by AGL Consulting and the main Contractor, Ascon Ltd. (Bam Civil) are presented in AGL Report No. 11-147-R01 in Appendix F. These investigations were required for the assessment of the wind farm infrastructure. The following reports are also included in AGL Report No. 11-147-R01:

- The factual report for the rotary coreholes that were carried out at Turbines T6 – T8, T30, T33, T34, T36, T39, T47-T62, T64 & T70-T71 by Irish Drilling Ltd. titled "Proposed Wind Farm at Derrybrien – Site Investigation Contract" dated September, 2004.
- The results of the geotechnical investigations that were carried out by ESB International – Engineering and Facilities Management (ESBIE) between June 2004 and December 2004 to assess peat stability for the planned tree felling operations, which are presented in their report titled "Report on ESBIE Geotechnical Testing", Rev.1, Volumes 1 and 2, dated 25th January, 2005 (Report No. 78015-C11-R1 Rev. 1).

The investigations that were carried out by AGEC are included in their report titled "Final Report on Derrybrien Wind Farm Post-Landslide Site Appraisal" dated 04/02/2004 (Report no. 378_099)". Their investigations formed part of an initial preliminary investigation of peat stability across the site after the peat slide in October 2003. Therefore, they are located along the floating roads and near the turbine foundations that had been completed prior to the slide, where excavated material had been sidecast on the intact peat slopes.

3.3.3.4 Site Access tracks – Floating Roads

The mitigation measures for the floating roads on the peat consisted of:

- Supplemental investigations;
- Stability analyses;
- Full-scale serviceability and proof load tests on the working roads;
- Remedial works to improve the performance of sections of the floating roads;
- A trial load test on a test section of floating road; and
- Modifications to the design and layout of the site access tracks in the vicinity of the slide.
- Site Controls

Records of the investigations, stability analyses and proof load tests on the floating roads are included in AGL Report No. 11-147-R01 in Appendix F.

Supplemental Investigations:

The supplemental investigations that were carried out for the roads were comprised of:

- Peat depth measurements at 25 m centres along the road with a steel gouge auger probe. At each location the peat depth was probed on the downslope side of the road and 25-50 m further downslope.
- Slope angle measurements at the probes with the hand-held Abney Level or by GPS survey.
- In-situ vane shear test profiles in the peat at 50-100 m centres along the road using the Geonor H-10 65x130 mm shear vane.

- Inspection of piston samples or gouge auger core samples taken from the bottom 1.0 m of peat and into the underlying mineral soil to confirm that there was no weak layer or discontinuity.

Stability Analyses:

Prior to resuming construction on the site the stability of the floating roads was analyzed using the limit equilibrium slope stability computer program Slope/W. 2-D plane strain analyses were carried out at representative sections along the floating roads to calculate the margin of safety against shear failure in the peat in the short-term undrained condition, which was the governing criterion.

The stability analyses were carried out in cells corresponding to the turbine locations. For each cell, a representative design profile was determined from the gouge auger probes and topographical survey data. The profile of characteristic undrained shear strength, c_{uk}, with depth was determined from the in-situ vane shear tests.

The road was conservatively modelled as a 5.0 m wide x 1.0 m thick layer of rockfill reinforced with geogrids. A live load surcharge of 17.1kN/m^2 was applied over a 3.0 m wide strip at the centre of the road to represent the design crane load.

The analyses were carried out using Design Approach 3 (DA-3) of IS-EN1997-1 – Eurocode 7 for Geotechnical Design, Part 1 – General Rules. Partial factors of 1.4 and 1.3 were applied to the characteristic undrained shear strength and live load surcharge, respectively. Under these conditions a calculated margin of safety >1.0 was acceptable. Figure 3-31 shows an example of the analyses results.

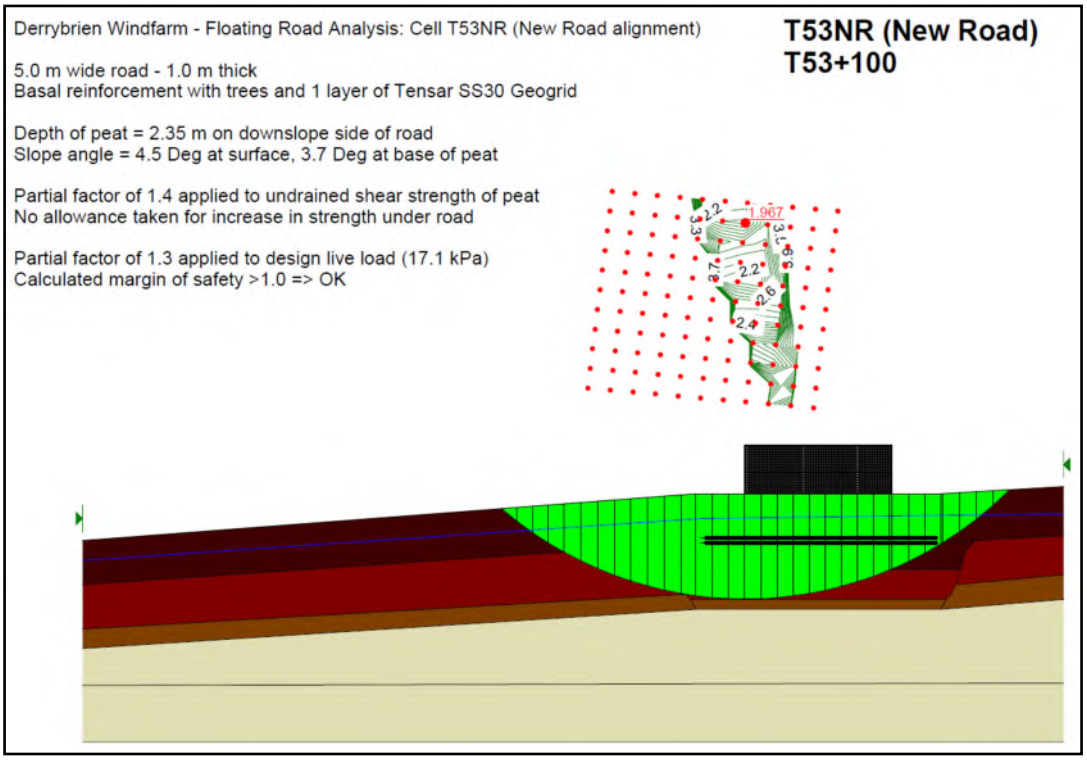


Figure 3-31 - Typical Results of Slope/W Analyses on sections of the floating roads

Full Scale Serviceability and Proof Load Tests – Construction Traffic Loading (Civil Works):

Full scale serviceability and proof load tests were carried out on all of the existing floating roads to verify their design capacity and to assess the performance of the roads under the maximum construction traffic load for the civil works i.e. the design live load surcharge from the fully loaded dump trucks, 4-axle tipper trucks, and concrete wagons that were used to complete the turbine foundations, crane

hardstandings and remaining floating roads on the site. The purpose of the tests was to reopen the roads so that construction could resume on site.
The maximum total load for these vehicles was 36 tonnes, with a maximum axle load of 12 tonnes. The tests were carried out as incremental load tests, initially using a 4-axle truck half-loaded with gravel weighing 26.8 to 28.2 tonnes, and then subsequently with a fully loaded truck weighing 35.9 to 37.4 tonnes. The weight of the trucks was recorded at a weighbridge. The tests were inspected by geotechnical engineers from AGL Consulting.

The test procedure at each load increment was as follows:

- The condition and deflection of the road was observed visually as the truck traveled continuously over the roads at a speed of approximately 5-10 mph.
- The performance of the roads was qualitatively classified as Good, Fair or Poor based on the condition of the road and the observed deflection under the weight of the truck using the serviceability criteria in Table 3-4, which was developed for this project.
- Representative areas where low margins of safety were calculated in the Slope/W analyses and where the road performance was classified as Fair or Poor were selected to record the deflection of the road under the truck.
- In those areas the deflection of the road was recorded at the rear axle of the truck under static load at approximately 25 m intervals along the road. The deflection was measured with an optical level and survey staff.

All of the floating roads were successfully loaded to a minimum of 36 tonnes without any evidence of excessive deflection, yielding or shear failure in the peat, and they were certified for use by a Geotechnical Director at AGL Consulting.

Table 3-4 - Serviceability criteria for road tests under 36.5 tonne load

Road Performance Classification	Serviceability Criteria (36.5 tonne load)
GOOD	• Road deflections generally <10 mm • Road deflects relatively rigidly under truck load with only slightly greater deformation locally under the wheel load at localized soft spots. • Road surface is even with minor rutting and no loose rockfill
FAIR	• Road deflections between 10 and 30 mm • Road deflects noticeably under wheel loads • Road surface is relatively even with some rutting along the line of the wheels. The rockfill is generally dense. • Local transverse rutting occurs at soft spots where the rockfill has loosened over weak peat, or where there are gaps in the basal reinforcement trees.
POOR	• Road deflections are greater than 30 mm (up to about 60 mm) • Road deforms very noticeably under wheel loads in wave-like motion. • Deformations are uneven causing the truck to tilt slightly on local soft spots. • Road surface is in poor condition with both longitudinal and transverse rutting creating an uneven road surface. • Rockfill is loosened over worst areas.

The majority of the roads were classified as 'Good' or 'Fair', with only local soft spots at watercourses or where there were gaps in the trees along the base of the road. Limited sections of the roads were classified as "Poor" - generally corresponding to areas of deep very soft peat where low (but still acceptable) margins of safety were calculated in the stability analyses (e.g. T62 to T61 – calculated margin of safety = 1.01 to 1.10) and where there was only a single layer of geogrid reinforcement. However, none of these sections showed any signs of failure and there was no visible deformation in the peat at the side of the roads to indicate any problems with slope stability or bearing capacity. The deformations were generally locally concentrated under the wheel loads and the total load was adequately supported by the road.

Remedial Works to Floating Roads:

Remedial works were carried out to sections of floating road where the performance was classified as "Poor" based on the serviceability criteria in Table 3-4. The remedial work involved placing a second layer of Tensar SS20 geogrid along the surface of the road and capping it with an additional 150mm of well-graded crushed rock granular fill. The maximum total thickness of rockfill was limited to 1.0m to limit the weight of the road on the peat, so in some areas it was necessary to excavate excess material off the road before the second layer of geogrid was added.

The remedial works were designed to improve the performance of the roads under the concentrated construction traffic loads. All of the upgraded roads were re-tested and certified on completion of the works to demonstrate that they had sufficient capacity to support the applied loads. It was found that the extra layer of geogrid and capping material significantly increased the stiffness of the road so that it effectively spread out the concentrated axle loads from the trucks over the full width of the road so that the upgraded roads were generally re-classified as "Good" based on the criteria in Table 3-4.

Full Scale Serviceability and Proof Load Tests – Mobile Crane Design Load for Turbine Erection:

The maximum design crane load for the floating roads was a 300 tonne Grove GMK 6300 all-terrain crane with a travelling weight of 72 tonnes on 6 axles (12 tonnes/axle), excluding counterweights and additional fittings such as outrigger pads. Figure 3-32 shows the dimensions of the crane from the manufacturer's specification. The contact area of the wheelbase on the load was approximately 12.0 m x 3.0 m, assuming a tyre contact length of 0.5m.

Prior to mobilising the crane on the site a full scale proof load test was carried out on all of the floating roads to confirm that they had adequate capacity to support the travelling weight of the crane. The roads were tested to a minimum load of 72 tonnes over a plan area of approximately 15.0 m x 2.75 m using two fully-loaded 4-axle trucks, each weighing a minimum of 36 tonnes, travelling back to back at low speed (<10 mph) around the site. The tests were inspected by a Geotechnical Engineer from AGL Consulting and the roads were certified for the crane loads by a Geotechnical Director.

Trial Load Test:

The low-loader articulated truck transporting the 80 tonne step-up transformer to the substation was the largest single load applied to the floating roads. The combined weight of the transformer and tuck was 130 tonnes, which was spread out over 12 axles at a maximum load of 12 tonnes per axle.

In advance of bringing the transformer to the site a trial load test was carried out on a 20 m long test section of floating road in an area of very weak peat ($c_{uk} \approx 5$kPa) along the route to the substation to validate the method of stability analyses and to confirm that the Geonor H-10 vane gave representative values for the characteristic undrained shear strength of the peat. The location of the test is shown on Figure 3-33. Details of the test are include in AGL Report No. 11-147-R01 in Appendix F. Figure 3-34 is a photograph of the transformer on the low-loader transporter at the site.

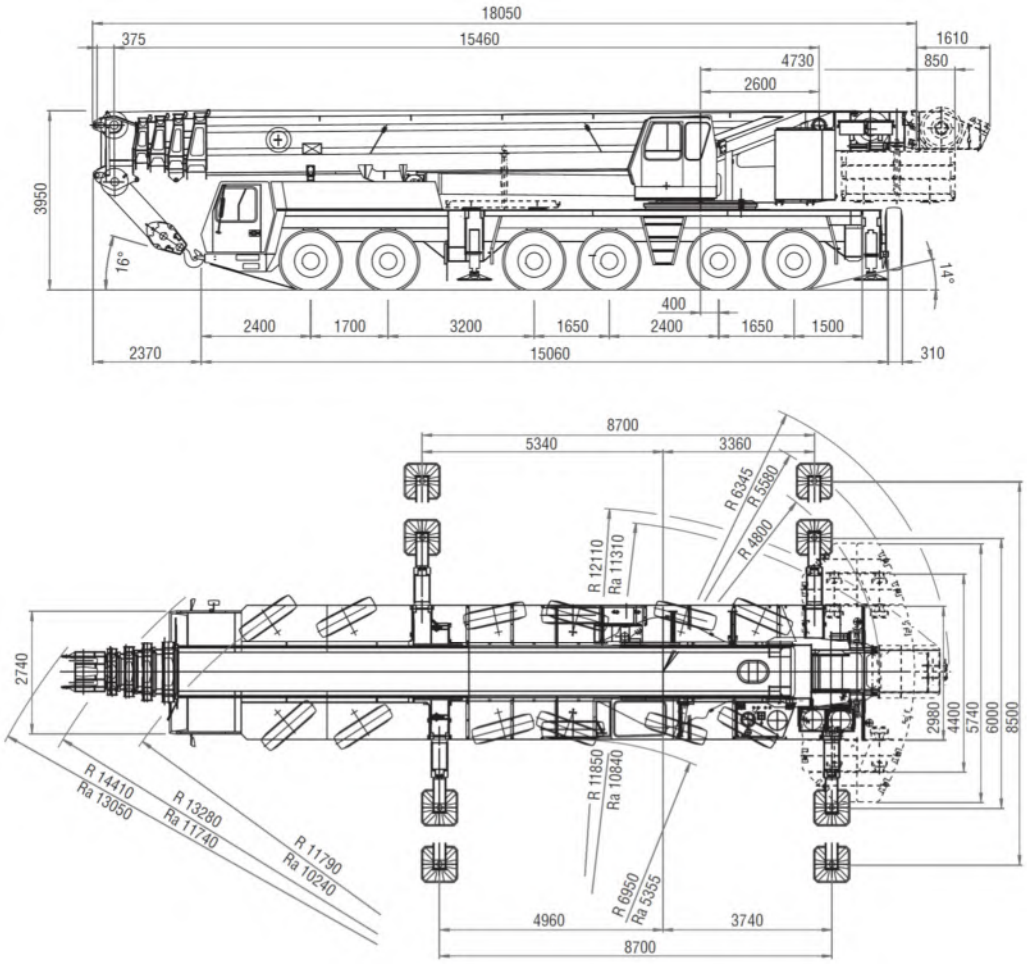


Figure 3-32 - Dimensions of the Grove GMK6300 all-terrain mobile crane

The test section of the road was constructed as a 5.0 m wide road with 500 mm of crushed rockfill reinforced with a single layer of Tensar SS30 geogrid and a basal layer of small trees and branches. The depth of peat in the area was determined by peat probing with the steel gouge auger probe and the Geonor H-10 65x130mm shear vane was used to measure the characteristic undrained shear strength with depth. Stability analyses were carried out using Slope/W to determine the ultimate load capacity of the road using the unfactored peat strengths measured with the Geonor H-10 vane.

For the test the road was incrementally loaded by placing rockfill on the surface in 250 mm lifts up to a maximum height of 2.0 m. Settlement of the road surface under the fill was measured after each load increment. Bamboo rods in the peat adjacent to the road were also observed to detect signs of extrusion or bearing capacity failure. Figure 3-35 is a photo of the road at the end of the test.

The maximum test load exceeded the ultimate capacity of the road predicted using Slope/W with the unfactored undrained shear strengths measured from the Geonor H-10 65 x 130 mm vane. The load-displacement characteristics of the road were essentially linear up to the maximum test load indicating that there was no evidence of bearing capacity failure in the peat. Therefore, the test successfully validated the method of analysis and strength measurements in the peat and the transformer was transported to the substation without incident.

<u>Modifications to the Site Access Tracks in the Slide Area</u>:

A 30m long section of the floating road at Turbine T68, and a 105m long section of the floating road to the west of Turbine T70 were destroyed in the peat slide on October 2003 and had to be reconstructed. These sections of the site access tracks were reconstructed as rockfill embankments up to about 2.5-3.0 m high on competent glacial till below the disturbed peat. The roads performed a dual function of reinstating the site access tracks that had been damaged in the slide, and acting as a barrage across the slide area to contain the disturbed peat upslope from the embankments.

As a further risk mitigation measure in this area, Turbine T16 was omitted from the scope of work on the project and the sections of floating road between Turbines T15 and T17 were closed and abandoned out of concerns for site stability.

The locations of these areas are identified on Figure 3-33.

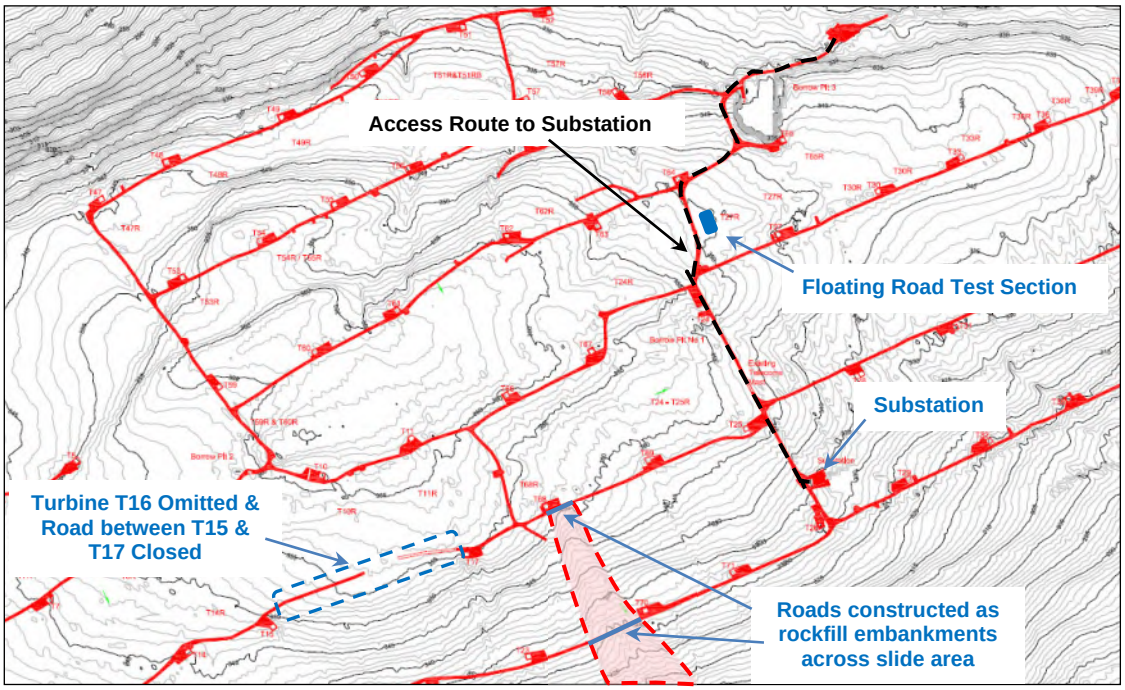


Figure 3-33- Location of floating road test section

Figure 3-34 – 80 tonne Transformer in transit on a low loader – total load 130 tonnes

Figure 3-35- Photograph of the floating road test section after the test

Site Controls:

The following site controls were implemented for the use of the floating roads during the second phase of construction, i.e.:

- All of the roads had to certified for use by AGL Consulting for the Permit to Work protocols based on the results of the additional investigations, stability analyses and full-scale serviceability and proof load tests;
- All of the construction vehicles were driven slowly and steadily across the floating roads within the specified site speed limit of 10 mph;
- The size and weight of the construction vehicles using the floating roads was not permitted to exceed the design surcharge load from the mobile crane that was used to erect the turbines, or from the low-loader transporter that was used to bring the step-up transformer to the substation;
- The cranes were stripped of any unnecessary ballast when travelling across the floating roads to the turbine sites;
- The mobile cranes and large low-loader transporters were transported across the site under the direct supervision of site personnel using the shortest and most direct route possible;
- The cranes were not stopped on the floating roads. All intermediate stopping points were on crane hardstandings adjacent to turbines; and
- Where necessary, steel plates were placed along on the edges of the floating roads to facilitate access around tight bends where there was a risk of excessive deflection and overturning on a soft verge.

3.3.3.5 Turbine Foundations and Crane Hardstandings

The monitoring and mitigation measures for the construction of the turbine foundations and crane hardstanding areas consisted of:

- Supplemental investigations; and
- Support for temporary side slopes of peat excavations;

Supplemental Investigations:

At the time of the slide a total of 37 No. reinforced concrete bases had been constructed across the south, east and western side of the site – mainly in the areas of shallow bedrock (T1-T5, T9-T13, T17-T29, T32, T34, T35, T37, T38, T40-T46, T66 & T67). None of the adjacent crane hardstandings had been completed. The following supplemental investigations were carried out at each the 33 No. remaining turbines in advance of excavation:

- Peat depth probes with the steel gouge auger probe at the four corners and centre of the turbine bases and adjacent crane hardstanding areas; and
- A minimum of 1 No. in-situ vane shear test profile with the Geonor H-10 65x 130 mm vane. Tests were carried out at 0.5 m intervals over the full depth of peat.

The purpose of the investigations was to determine the volume of peat that needed to be excavated to assess the capacity that was required in the repository sites for controlled storage of the peat on site. The strength of the peat determined the requirements for temporary support to the side slopes around the perimeter of the excavations.

Rotary coreholes were also carried out at 27 No. of the turbines that were accessible at the time of the investigation (Turbines T6 – T8, T30, T33, T34, T36, T39, T47-T62, T64 & T70-T71) to determine the depth to competent rock for the reinforced concrete pad foundations, and the depth of glacial till that needed to be disposed of on-site. SPT tests in the glacial till determined the requirements for safe temporary slope angles. Additional coreholes were carried out at Turbines T51 and T64 to assess the potential to move the turbines onto shallower rock in each area to reduce the depth of excavation.

Temporary Side Slopes:

The side slopes around the perimeter of the excavation for the turbine foundation needed to be stable for the duration of the works required to constructed the reinforced concrete pad foundation. Wherever possible the sides of the temporary excavations were battered back to stable slopes of about 1V:1H or flatter, as necessary, as shown in Figure 3-36. Side slopes in stiff glacial till and weathered rock were increased to 2V:1H or steeper to minimize the extent of the excavation.

In relatively deep (>2.5 - 3.0 m), weak highly amorphous peat in poorly drained areas with a high water table a rockfill berm was initially constructed down to mineral soil around the perimeter of the excavation to provide temporary support to the peat during construction. This was done using the controlled displacement of peat where large boulders and coarse rockfill were pushed down into the weak peat below the stable depth of excavation to refusal on the underlying mineral soil. The berm was constructed in a trench around the full perimeter of the turbine base prior to excavation of the peat and mineral soil within the area as shown in Figure 3-37. The slopes around the perimeter of the crane hardstanding were only left open for a short period as the excavations were backfilled immediately after excavation.

Figure 3-36 - Temporary side slopes in peat battered back to stable temporary slope

Figure 3-37 - Rockfill berm used to support the sides of a turbine excavation in weak peat

3.3.3.6 Spoil Management and Peat Repository Sites

As a result of the peat slide in October 2003 no further general sidecasting of excavated material was permitted on the site for the second phase of construction in 2004/2005. Where the arisings from the turbine excavations had already been sidecast on the peat slopes prior to the slide:

- Each area was inspected by AGEC to assess the stability of the peat slopes and sidecast material, and to recommend where remedial works needed to be carried out;
- Drainage improvements were carried out to clear drains that were blocked by the sidecast arisings, and to drain areas of ponded groundwater or surface runoff; and
- Sidecast arisings were removed from areas where peat instability was observed (e.g. Turbines T23, T29 and T66), or where there was a concern over the impact that the material would have had on the stability of the peat slopes (e.g. T18 and T34).

Furthermore:

- All peat and glacial till excavated from the site had to be segregated and disposed of separately in designated deposition areas;
- No glacial till was permitted to be deposited or stored on peat. All of the surplus glacial till was disposed of in Borrow Pits BP-1 and BP-2;
- Where peat was stored in the borrow pits it had to be fully contained by perimeter bunds of rockfill or glacial till below original ground level; and
- Suitable peat repository sites had to be identified in gently sloping areas of the site to store the majority of the excavated peat on the intact peat slopes.

The monitoring and mitigation measures that were implemented for the identification, assessment and control of the peat repository sites during the second phase of construction in 2004/2005 by AGL Consulting consisted of:

- Desk study and detailed walkover surveys;
- Supplemental investigations;
- Stability analyses; and
- Site control measures.

Records of the investigations and stability analyses are included in AGL Report No. 11-147-R01 in Appendix F.

Desk Studies & Walkover Surveys:

A comprehensive desk study was carried out to identify potentially suitable repository sites as close as possible to the turbine excavations. Topographical maps, recent aerial photographs (1995, 2000) and 3D stereoscopic imaging of black and white aerial photographs of the site from 1973 and 1975 were used to locate areas of gently sloping ground (≤3°) outside the influence of the main hydrological features on the site, and set back more than 25 m from any defined or steep convex break in slope.

The natural topography and drainage courses were clearly identifiable on the old aerial photographs because they were taken before trees were planted over much of the site. The slopes on the south side of the site that had similar topographical characteristics to the slide area were excluded from consideration.

Detailed walkover surveys were carried out on site by geotechnical engineers from AGL Consulting to inspect each proposed repository site to determine which were suitable for further consideration.

Supplemental Investigations:

A comprehensive site investigation was carried out for each repository site to determine the depth, strength and material characteristics of the peat, and to measure the slope angles at the ground surface. The investigations consisted of:

- Peat depth probes on a 25 m grid over the full area of the repository site - aligned parallel and perpendicular to the plane of the slope wherever possible;
- Additional peat depth probes along two orthogonal planes 50 and 100 m downslope from the repository site;
- Topographical surveying between probes with a hand-held Abney Level to determine the slope angle at the surface and base of the peat within the repository and along the profiles 50 and 100 m downslope from the site;
- In-situ vane shear tests using the Geonor H-10 Vane (65mm/130 mm) at locations selected by AGL Consulting based on the results of the probes. In general, 1 No. test was carried out for each 50 m x 25 m area, usually with a minimum of 2 No. tests per repository site. At each test location the undrained shear strength of the peat was recorded at 0.5 m intervals over the full depth of the peat with the last test 0.25m above the interface with the underlying soil; and
- Inspection of gouge auger probe core samples from the base of the peat to ensure that there was no weak layer or discontinuity present.

Stability Analyses:

2D plane strain slope stability analyses were carried out at each repository site using Slope/W to ensure that there was an acceptable margin of safety against planar sliding along the base of the peat under a surcharge load equivalent to the weight of 1.0 m of excavated peat in the short-term undrained condition, which governed the stability of the slopes.

Two cases were analysed for each repository site:

- Case 1: the characteristic undrained shear strength (c_{uk}) of the peat was taken as the minimum undrained shear strength recorded with the Geonor H-10 65x130mm vane, which was conservatively assumed to apply over the full depth of the peat (i.e. neglecting the higher strength of the surface vegetated layer – the acrotelm).
- Case 2: The analyses was repeated with a 0.5 m thick layer of very weak peat at the base of the peat with a design (i.e factored) undrained shear strength (c_{ud}) of 2 kPa. This was the lowest strength that was recorded for the weak layer of peat identified in the vicinity of the slide and is equivalent to the shear strength of a remoulded peat.

For each site a representative design profile was determined from the gouge auger probe and topographical survey data. The design section represented the most conservative combination in terms of peat depth and slope angle. The resultant slope angles were calculated from the slope angles measured on orthogonal planes in each cell of the repository sites.

The analyses were carried out using Design Approach 3 (DA-3) of IS-EN1997-1 – Eurocode 7 for Geotechnical Design, Part 1 – General Rules. A partial factor of 1.4 was applied to the characteristic undrained shear strength (c_{uk}) of the peat to calculate the design values (c_{ud}), except in the case of the very weak layer, which was assumed to have a residual design strength of 2.0kPa. For both analyses a partial factor of 1.3 was applied to the surcharge load of 10 kN/m^2, which is equivalent to 1.0 m of peat.

Site Control Measures:

Control measures were implemented on site to ensure that the deposition of the peat at the repository sites complied with the design assumptions, i.e.:

- Geotechnical Approval Certificates were signed by a Director of AGL Consulting for each repository site to confirm that it was suitable based on the supplemental investigations and stability analyses;
- The boundaries of the approved repository sites were clearly marked out on site with survey tape between probe locations;
- The depth of excavated peat that was placed in the site was strictly limited to 1.0 m and no temporary stockpiling was permitted on the peat slopes;
- "Floating" depth markers were set up within the repository sites to control the depth of peat placed on the site. Floating markers were comprised of wooden stakes that were pushed into the peat but not down onto the underlying glacial till so that they could settle with the ground surface as it compressed under the weight of the additional peat that was placed on the slopes.
- The live load surcharge on the peat slopes was minimised through a combination of long reach excavators operating on the access tracks, and LGBP (low ground-bearing pressure) wide-tracked excavators operating on the peat.

Geotechnical engineers from AGL Consulting carried out periodic inspections of the works to ensure that they complied with the method statements and specified risk mitigation measures. Figure 3-38 shows an aerial view of peat repository T68R upslope from Turbine T68 which illustrates how the excavated peat was spread out evenly in a thin layer 1.0 m deep over the surface of the peat. Figure 3-16 shows the plant operating on the site when the peat was being placed in a peat repository.

Figure 3-38 - Peat repository site T68R north of Turbine T68

3.3.3.7 Tree Felling

The following monitoring and risk mitigation measures were implemented for the felling of the trees that were remaining on the site after the slide:

- Extensive geotechnical investigations comprised of peat depth probes, in-situ vane shear tests, slope angle measurements, piezometers and undisturbed gouge auger core sampling were carried out across the site by ESBI to assess the stability of the peat on the site for the tree felling operations;
- The trees were left in place in areas that were considered unsuitable for the mechanical harvesting and forwarding equipment. The extent of forestry on the site at the end of construction is shown on Figure 3-7;
- Where clear felling was permitted the works were carried out by experienced specialist subcontractors under the management of Coillte;
- The trees were felled and gathered using specialised equipment comprised of a wide-tracked hydraulic excavator fitted with a harvesting attachment, and 8-12 tonne rubber-tyred forwarders that have been widely used in commercial conifer forests on upland blanket bogs in Ireland;
- In areas of soft peat the contractors placed timber brash and trimmed branches along the access routes of the harvesters and forwarders through the forest to spread out the concentrated live load surcharge under the tracks or tyres of the machines; and
- Where the trees were too small for the harversting machinery on the slopes on the west side of the site the trees were felled by hand (Areas 16 and 18 on Figure 3-5). Some of the larger trees in these area were felled with a light machine harvester, formed into windrows and left in place on the slopes.

3.3.3.8 Rock Blasting in Borrow Pit No.3

Borrow Pit No.3 (BP-3) was the main borrow pit that was active during the second phase of construction in 2004/2005. It was used to extract, crush and process rock into the granular fill that was used for the construction of the floating roads and the hardstanding areas for the crane pads, substation and anemometer masts. The rock was extracted by blasting.

In an extreme condition seismic loading from blast-induced vibrations can generate downslope inertial forces that can cause slope failures if they are not kept within acceptable limits. It was considered that the risk was very low to low for the level of transient vibrations generally generated by controlled rock blasting in a quarry. Nevertheless, the following monitoring and mitigation measures were implemented to confirm that the large peat slide that occurred in October 2003 was outside the range of the blast-induced vibrations from the borrow pit, and that the peak particle velocity and acceleration of vibrations were within acceptable limits:

- The blasting was carried out by a suitably qualified fully licensed professional;
- The pattern, sequence, timing and maximum instantaneous charge of the blasts were designed to minimise blast-induced vibrations on the slopes around the perimeter of the borrow pit;
- Vibration monitoring was carried out on the site throughout the blasting;
- AGL Consulting carried out a comprehensive review of the blast monitoring records to establish threshold limits for the Peak Particle Velocity (PPV) and Peak Particle Acceleration (PPA) of the blast-induced vibrations, and to establish the radius of impact for the blasting;
- Glacial till excavated from the site was used to construct a berm to support the peat at the top of the rock face around the perimeter of the borrow pit to prevent a localised peat slide inundating the pit where the surrounding slopes were sloping down towards the pit.

No peat failures were caused by the blasting. The radius of influence of the blast-induced vibrations was approximately 1,000m, which did not extend as far as the slide area. Therefore, it was confirmed that blasting carried out on the site prior to the October 2003 did not contribute to the peat slide.

3.3.3.9 Drainage

Drains were excavated on site over the course of the works to improve site drainage, particularly in areas of high water table and ponded surface runoff. Drainage was also required at the turbines to keep the groundwater below the design water level for the turbine foundations. Figure 3-23 shows the as-built layout of the drains that were constructed on the site. The network of pre-existing drains and natural watercourses are also identified on the drawing.

Poor drainage is a recognised contributory risk factor for peat slides. Therefore, the improved drainage network has had a **sustained positive impact with respect to site stability** and, as such, would in itself be a significant risk mitigation measure for site stability. The following risk mitigation measures were also implemented for the drainage works:

- Wherever possible, minor drainage works were carried out by hand to avoid machine or equipment loading on the peat;
- Where mechanical excavators were required the works were carried out using wide-tracked LGBP 10-13 tonne excavators suitable for working directly on the peat;
- The peat excavated from the trenches was sidecast on the adjacent intact peat slopes and spread out to depths typically <0.5 m;
- Where large culverts were constructed at road crossings over the main watercourses on the site all of the peat was excavated out from under the culverts and granular surround to avoid surcharge loading on the peat.

The peat slide in October 2003 occurred within a buried valley at the head of a watercourse. After the slide natural watercourses developed within the slide scar along shallow drainage channels on the glacial till and rock below the peat. Prior to the slide there would have been more dispersed surface and subsurface groundwater flow in this area and the peat would have impeded subsurface drainage. Therefore, the natural watercourses that have developed within the slide have improved drainage and reduced the risk of further peat instability in the area.

3.3.3.10 Cable Trenching & Ducting

The following risk mitigation measures were implemented for the cable trenching and ducting:

- The alignment of the cable trenches were designed to follow the shortest, most direct route across the site to the control building with the minimum number of road crossings;
- Most of the cable trenches were aligned alongside the site access tracks so that the cable spools could be transported along the floating roads, minimising construction traffic on the intact peat slopes;
- The cable trenches in the peat were excavated using wide-tracked LGBP 10-13 tonne excavators suitable for working directly on the peat;
- To minimise the impact of the road crossings on the floating roads the new ducts were pushed horizontally through the peat under the roads to avoid having to open up a trench across the road, which would cut through the geogrid reinforcement.
- The works were carried out by specialist sub-contractors who were experienced with similar work for wind farms on upland blanket bogs in Ireland.

3.4 Peat Stability Risk Assessment – with Monitoring and Mitigation Measures for 2nd Phase of Construction (2004-2005)

The baseline Peat Stability Risk Assessment for the site in its original conditions prior to construction in 1998 is presented in Section 2.5. Table 3-5 gives a summary of the interpreted risk of a peat slide for each zone across the site after implementation of the monitoring and mitigation measures in Section 3.3 of this report for the second phase of construction in 2004/2005, after the peat slide. The results are also shown on a plan of the site in Figure 3-39.

We have adopted the following general principles in our assessment of the Likelihood and Impact of a peat slide after the implementation of the site monitoring and risk mitigation measures:

- Effective design, construction & operational risk mitigation measures and improvements in site conditions can be used to reduce the Likelihood of a peat slide to a low or negligible level, even in high risk zones.
- The Likelihood of a peat slide can also be reduced by an improvement in site conditions due to improved drainage or an increase in the strength of the peat under sustained surcharge loads over time.
- The potential Impact of a peat slide at a particular location cannot be reduced significantly unless positive measures are taken to effectively contain the peat or sediment along potential flow paths prior to construction.

With the appropriate monitoring and mitigation measures detailed in this report, it was possible to reduce the **Likelihood** of Occurrence, **L**, of a peat slide to **1 (Negligible) or 2 (Low)** in all 70 zones across the site. The higher Likelihood of 2 (Low) was interpreted for zones where the access tracks are constructed as floating roads and where the likelihood of a peat slide prior to the implementation of the mitigation measures was interpreted as High (L=4) or Very High (L=5). This is to reflect a slightly higher residual risk in these areas. Cell T16 has been excluded because the turbine and floating road were omitted from the scope of works as a mitigation measure, as discussed in Section 3.3.3.4.

Due to the sensitivity of the receiving environment and the potential scale of a peat slide, we have conservatively assumed that the Impact of a peat slide remains the same even after the mitigation measures have been implemented. Therefore, with appropriate implementation of the monitoring and risk mitigation measures the Risk Rating for all 70 zones across the site reduces to **Low (R = 5) or Low to Medium (R=10) as a function of the interpreted Likelihood of a slide**.

Where the Risk Rating is Low it would be classified as **Trivial** which is acceptable with **Monitoring** during construction. Where the Risk Rating is Low to Medium, it would still be classified as **Tolerable** and can be addressed with **Regular Attention** during construction.

This is consistent with the actual experience on the site. With the implementation of the appropriate monitoring and risk mitigation measures there were no peat slides on the site during the second phase of construction on the wind farm after the peat slide, between 2004 and the end of construction in 2005.

Furthermore, although the baseline PSRA identifies that there are areas of the Derrybrien site that have an elevated risk of peat instability prior to implementing appropriate mitigation measures, it is not an unusual or exceptional risk for wind farm developments on upland blanket bogs in Ireland. The design, construction mitigation measures that have been adopted on the Derrybrien site are standard measures that are commensurate with the geotechnical risk of a peat slide on the site, and are routinely adopted on similar sites on upland blanket bogs across Ireland and the UK.

This PSRA would also reflect the reduced Likelihood of a peat slide for the activities that were carried out on the site during the operation and maintenance phase of the wind farm between 2005 and 2022.

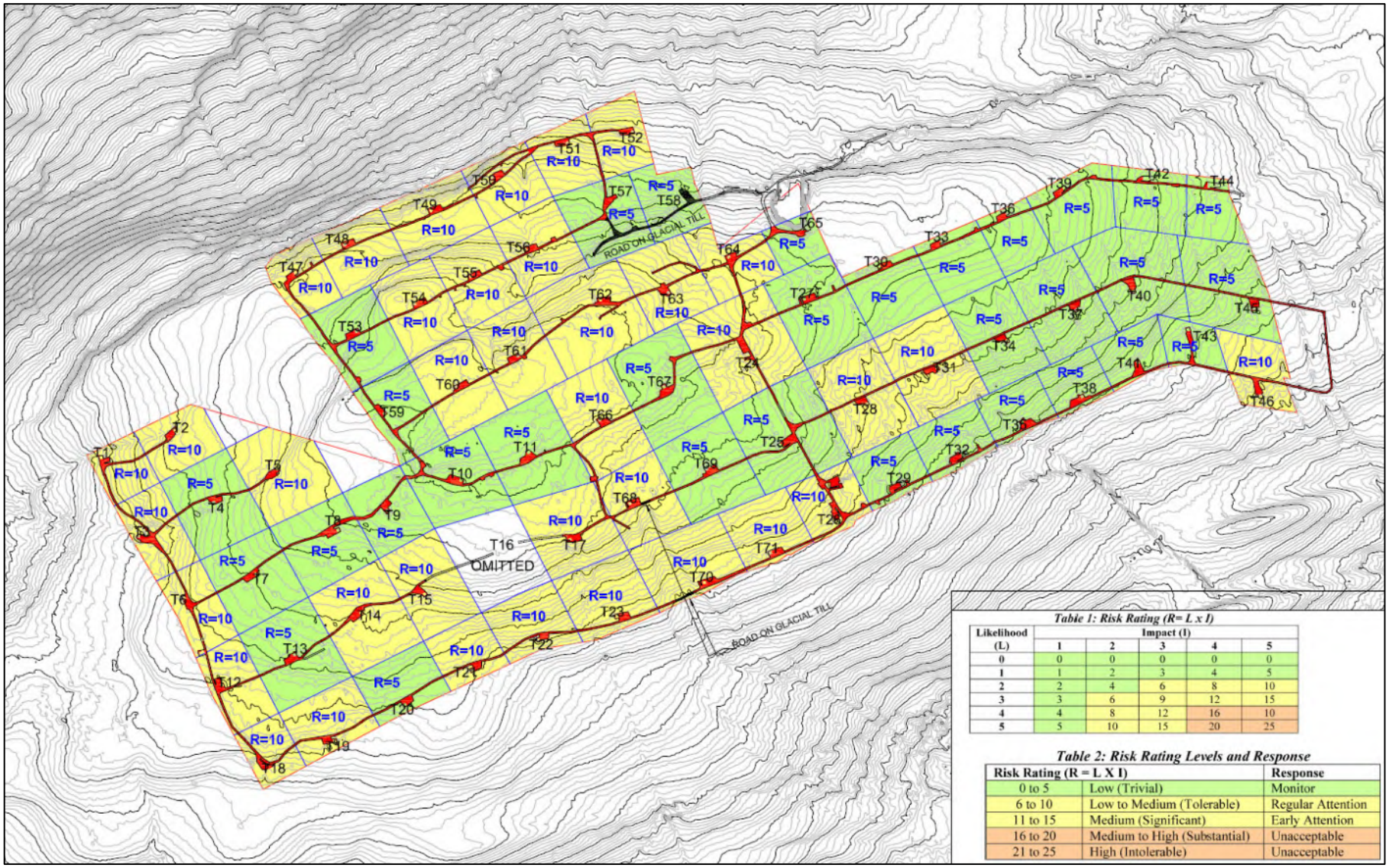


Table 1: Risk Rating (R= L x I)

Likelihood (L)	Impact (I)				
	1	2	3	4	5
0	0	0	0	0	0
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	10
5	5	10	15	20	25

Table 2: Risk Rating Levels and Response

Risk Rating (R = L X I)		Response
0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

Figure 3-39: PSRA for 2nd phase of construction (2004/2005) and for O&M period from 2005 to 2024 - after implementation of mitigation measures

Table 3-5: Peat Stability Risk Rating before and after implementation of monitoring and mitigation measures (2004-2005)

							Risk Rating Prior to Mitigation Measures - 2003					Risk Rating After Mitigation Measures for Site Activities 2004-2005				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T01	15	15	15	10	10	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T02	15	20	10	10	10	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T03	15	15	20	10	10	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T04	20	10	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T05	15	10	10	10	15	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T06	20	15	10	5	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T07	20	5	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T08	20	10	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T09	20	5	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T10	10	5	5	5	10	35	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T11	20	5	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T12	20	15	15	10	5	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T13	20	10	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T14	20	10	15	10	10	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T15	20	10	15	10	15	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T16	Turbine Ommitted at Construction Stage															
T17	20	20	15	10	20	85	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T18	15	15	15	15	5	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T19	20	15	5	10	15	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T20	20	10	5	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T21	20	20	15	10	20	85	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T22	15	20	10	15	20	80	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T23	15	20	15	10	20	80	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T24	15	5	10	10	10	50	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T25	15	15	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T26	15	15	15	5	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T27	20	5	10	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T28	15	15	10	10	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T29	10	15	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T30	15	5	5	5	10	40	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T31	20	15	10	15	10	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T32	10	15	10	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T33	20	5	5	5	5	40	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T34	15	20	5	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T35	10	15	10	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T36	20	10	0	10	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T37	10	15	5	5	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T38	5	10	5	5	5	30	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T39	15	10	10	5	5	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor

Table 3-5 (Contd.) – Peat Stability Risk Rating before and after implementation of monitoring and mitigation measures

							Risk Rating Prior to Mitigation Measures - 2003					Risk Rating After Mitigation Measures for Site Activities 2004-2005				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T40	10	15	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T41	10	10	10	10	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T42	15	10	10	5	5	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T43	10	10	0	5	10	35	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T44	10	5	5	10	10	40	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T45	10	10	10	5	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T46	15	15	10	10	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T47	15	20	15	10	10	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T48	20	20	15	10	10	75	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T49	20	20	20	10	10	80	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T50	20	20	20	10	10	80	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T51	20	20	20	10	10	80	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T52	10	20	10	10	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T53	20	10	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T54	20	10	20	5	10	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T55	20	15	15	5	10	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T56	20	10	15	10	10	65	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T57	10	15	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T58	10	15	5	5	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T59	15	5	10	10	5	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T60	20	20	10	20	15	85	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T61	20	20	15	15	15	85	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T62	20	20	15	15	15	85	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T63	20	10	10	10	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T64	20	10	10	10	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T65	15	10	10	5	10	50	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T66	20	15	10	5	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T67	15	15	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T68	20	20	15	15	20	90	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T69	20	10	10	5	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T70	15	20	15	10	20	80	5	5	25	High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T71	15	15	15	5	10	60	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention

4.0 STABILITY IMPACTS – OPERATION AND MAINTENANCE PHASE 2005-2022

4.1 Site Activities from September 2005-2022

This section of the report gives a comprehensive list of the primary activities on the site that were related to the operation and maintenance of the wind farm in the period between 2005 and 2022. The activities have been grouped under the following headings

- Power generation and transmission
- Maintenance/repair of the turbines
- Maintenance/repair of the substation and control building
- Maintenance/repair of the access tracks
- Cables and Ducting
- Drainage
- Miscellaneous Activities

4.1.1 Power Generation & Transmission

The wind farm has been operated continuously since it went live in October 2005. Each of the 70 No. Vestas V52/850 turbines on the site generate electricity intermittently as a function of wind speed and electricity demand on the grid. The turbines have a low wind-speed cut-in (4 m/s or 10 km/hr) when the rotors automatically begin to rotate to generate electricity. The turbines reach their maximum generating capacity (850 kW) at a rated steady wind speed of 14 m/s (55 km/hr). At higher wind speeds there is a risk of damage to the turbines. Therefore, at wind speeds greater than 25 m/s (80 km/hr) the turbines automatically cut-out, stop rotating and "feather" or point into the wind to reduce the surface area exposed to the wind to prevent unnecessary strain on the turbine tower, nacelle and rotor. Individual turbines are also taken off-line when they are undergoing maintenance or repair, or where there is insufficient electricity demand in the grid.

All of the turbines are connected by buried low voltage (LV) cables to the substation on the south side of the site between Turbines T26 and T29. The substation modifies, controls and regulates the medium-voltage electricity generated from the turbines and converts it into the high-voltage electricity that is used to supply the grid using a system of transformers, capacitors and circuit control systems. The grid connection is via the overhead 110 kv high-voltage line that enters the site opposite the substation. The power generation and grid supply are controlled automatically by the electronic systems in the control building at the substation site. The systems can also be monitored or operated manually either in the control building or remotely offsite.

4.1.2 Maintenance/Repair of Turbines

Routine maintenance works and repair works are carried out regularly on the turbine mechanical and electrical systems. The O&M sub-contractor, Vestas, has a permanent maintenance crew of 4-6 No. technicians stationed full-time on the site for this work.

The regular maintenance and repair works typically involve:

- Cleaning/maintenance of the clutch, gear box and mechanical systems in the turbine nacelle.
- Repairs to the electrical generation systems, transformers and circuit control systems.
- Cleaning/repairs to the turbine blades and rotor systems.
- Sealing the earth wire hole through the flange of the base can to prevent groundwater ingress.
- Sealing the internal joint between concrete base and steel tower (e.g. T9, T10, T35)

All of the maintenance work is carried out on-site at the turbine. The technicians travel to and from the turbines along the site access tracks in standard commercial vehicles. Elevated man access to the nacelle and rotor systems is via a winch system or a mobile elevated work platform (MEWP) such as a cherrypicker operating from the adjacent crane hardstanding area.

Occasionally more substantial works were required to replace broken or malfunctioning mechanical or electrical components in the nacelle and rotor hub such as the gearbox, bearings, electricity generation systems or turbine blades.

Table 4-1 gives a summary of the major components that were repaired or replaced on the turbines between 2005 and 2018 based on the site maintenance records. The majority of the major repairs were related to the gearbox and generator systems, which needed to replaced 84 times at 55 No. turbines. At 15 No. of the turbines the gearbox or generator had to be replaced on more than one occasion.

A further 14 No. major repairs or replacements have been recorded at 12 No. turbines related to:

- Gearbox failures where the gearbox was not replaced
- The shrink disc
- Generator bearings
- Cracked chassis
- Twisted cables
- Gearbox couplings
- The generator cooling fan
- Blade repairs

All of these repairs involved elevated man access to the nacelle and rotor system by MEWP, and a mobile crane with a telescopic boom that had a rated lifting capacity sufficient for the hub height and the weight of the components that needed to be replaced.

In total there have been approximately 86 crane operations on the site over this period. The majority of these (approx. 80%) were carried out using a 100 tonne crane (e.g. the Liebherr LTM 1100-5.2). The remainder were carried out using a 130 tonne crane (e.g. the Liebherr LTM 1130-5.1), with the exception of the works carried out at Turbine T17 in July 2018, when the larger 200 tonne Liebherr LTM 1200-5.1 mobile crane was used to replace the gearbox. All of the cranes were 5-axle cranes with a maximum standard axle load of 10-12 tonnes when travelling.

The MEWP and mobile crane access the turbines via the site access tracks. However, all elevated and heavy lifting work is carried out from the crane hardstanding areas adjacent to the turbines.

Table 4-1 - List of Major Repairs to Turbines (2005-2018)

Turbine No.	Gearbox Failure	Generator Failure	Other Major Component Repair/Replacement
T1	**3**	1	Shrink Disc
T2	**2**	1	
T3			Generator Bearings
T4	**3**		
T5			
T6		**2**	
T7		**2**	
T8		1	
T9		**2**	
T10		**2**	

Table 4-1 (contd.) – List of Major Repairs to Turbines (2005-2018)

Turbine No.	Gearbox Failure	Generator Failure	Other Major Component Repair/Replacement
T11		1	
T12		**2**	Cracked Chassis
T13	1		
T14			
T15	1		
T17	1		
T18		1	
T19		**2**	
T20		1	
T21	1	1	
T22		1	Shrink Disc
T23	**3**	1	
T24		1	
T25	1	1	
T26		1	
T27			
T28		1	
T29		1	
T30	**2**		
T31	1		
T32		1	
T33			
T34			Gearbox Failure (Not Replaced), Cables Twisted
T35	1	1	
T36			Shrink Disc
T37	1		
T38		1	
T39	1		
T40		1	
T41			
T42		**2**	
T43	1		
T44	**2**		
T45	1	1	
T46			Blade Repair
T47		1	
T48	1		
T49		1	
T50		1	
T51		1	
T52			
T53	**2**	1	
T54		1	

Table 4-1 (contd.) – List of Major Repairs to Turbines (2005-2018)

Turbine No.	Gearbox Failure	Generator Failure	Other Major Component Repair/Replacement
T55			
T56			Blade Repair
T57	1		
T58		**2**	Gearbox Failure (Not Replaced); Gearbox Coupling
T59		1	
T60	1	1	
T61	1		
T62	1		
T63	1	1	
T64		1	
T65		1	Generator Bearings
T66		1	
T67		1	
T68			Generator Bearings
T69			Generator Cooling Fan
T70			
T71	1	1	
Total No. Replaced:	**35**	**49**	**14 No. Other Major Repairs/Replacements**
Total Lost Hours (Days)	21,010 (875)	23,458 (977)	8,342 (Recorded for 8 No. repairs) (348)
Average Lost Hours (Days)	600 (25)	478 (20)	1043 (43)

4.1.3 Maintenance/Repair of Substation & Control Building

Routine cleaning, maintenance and repair works were carried out annually on the electrical components of the substation and control building, including the transformers, capacitors, and circuit control systems. These works were carried out directly on the granular hardstanding area of the substation by specialist high-voltage sub-contractors H&MV Engineering.

No heavy components in the substation, such as the step-up transformer (80 tonnes), have had to be replaced or removed for off-site repair. Therefore, there has been no requirement for high capacity mobile cranes to carry out the maintenance and repair works at the substation. Electrical technicians accessed the substation using standard commercial vans and trucks along the site access tracks. Where elevated man access was required to clean or repair small electrical components such as the bushings or busbars, this was done using a MEWP such as a cherrypicker operating at heights of up to 5-6 m.

4.1.4 Maintenance/Repair/Upgrading of Site Access Tracks

4.1.4.1 Performance and condition of site access tracks 2005-2014

The total length of access tracks within the site boundary is 17.5 km. During the construction phase of the project prior to September 2005:

- **0.9 km** of the tracks from the site compound up to Turbines T65 and T57 were constructed of granular rockfill on the glacial till below the peat;
- **14.6 km** of new tracks across the site were constructed as floating roads on the peat, and

- **2.0 km** of the tracks were constructed as upgraded roads along existing floating roads through the turbary plots on the east side of the site.

These sections of the roads are shown on Drawings No. QS-000192-01-D451-014 and P378015-C-0003 in Appendix A. The sections of road that cross the slide area were also constructed as rockfill berms on the glacial till below the peat.

The new floating roads that were constructed on the site are typically about 4.5-5.0 m wide at the top and are comprised of 600-1000 mm of crushed rock granular fill reinforced with 1-2 layers of geogrids, as necessary, over a regulating layer of granular fill on a basal layer of logs, branches and brash from trees that were felled on the site.

Where necessary, the existing turbary roads on the east side of the site were upgraded with a capping layer of crushed rock granular fill reinforced with a layer of geogrid on the surface of the existing road. The width of these roads was not increased so they are narrower at 3-4 m wide.

After September 2005 the condition of the some sections of the new floating roads deteriorated as they settled into the peat and the basal layer of trees started to rot and break in some areas, reducing the capacity of the basal reinforcement. In the worst affected areas, often corresponding to the areas of deeper peat and high water table on the site, the surface of the road was uneven where ruts had formed along the line of the wheel loads, and sections of the road deflected noticeably and unevenly under the concentrated 10-12 tonne axle loads from cranes and loaded dump trucks periodically accessing the site to carry out maintenance and repair works on the wind farm. Potholes and transverse ruts or soft spots had formed in areas where larger tree trunks had broken under the road or where the rockfill from the road had fallen down through gaps between the basal layer of logs.

On 22nd September 2011, at the request of ESBI, AGL inspected the condition of the floating roads to assess the requirement for remedial improvement works. Full scale serviceability load tests were subsequently carried out by ESBI on the roads on 2nd December 2011 under the supervision of AGL to assess the condition and performance of the roads under the original design loads. The test involved observing the performance of the road under the weight of 2 No. fully-loaded 4 axle trucks weighing 36.5 tonnes each and driving closely together at speeds of 5-10 kph along the roads. This was intended to simulate the design crane load of the 300 tonne Grove GMK 6300 all-terrain mobile crane, which has a travelling weight of 72 tonnes over the same length of the road (15.0 m).

The performance of the road was qualitatively assessed as “Good”, “Fair” or “Poor” based on the condition of the road and the observed deflections under the applied loads using the criteria in Table 3-4. Drawing No. P378015-C-0003 in Appendix A by ESBI identifies the areas where the performance of the road was identified as “Good”, and where it performed poorly and remedial works were recommended to improve the performance of the road. It also includes GPS coordinates for the areas where the remedial improvement works were recommended.

4.1.4.2 2014 Road Improvement Works

Remedial improvement works were carried out on the floating roads in April and May 2014 by John Sisk & Sons Ltd. Drawing No. P378015-C-0003 in Appendix A by ESBI shows the agreed extent of the remedial works to the roads.

The general road improvement works that were carried out were comprised of the following:

- All of the potholes were filled up to existing road level with Class 6F2 crushed rock granular capping material to regulate the surface of the road;
- A single 4.75 m wide layer of geogrid reinforcement [Naue 30/30 Q6 Polyester (PET) Secugrid] was placed along the regulated surface of the road;
- The road was covered with an average 150 mm thick layer of Class 6F2 crushed rock capping material;

- The Class 6F2 capping material was spread with a 13 tonne tracked excavator and statically compacted with 4 No. passes of an 11 tonne roller (Hamm 3411: 1145 kg/m width of roll);
- The surface of the road was blinded with a 20mm thick layer of Class 6H (0-6 mm) granular fill and statically rolled with another 4 No. passes of the 11 tonne roller.

The Class 6F2 and Class 6H granular fill materials were imported crushed Limestone aggregates that are defined in Series 600 of the TII specification for Roadworks (TII Publication No. CC-SPW-00600). The materials were delivered to site in standard 4-axle trucks with a maximum weight of 36 tonnes. The material was stockpiled on the crane hardstandings and brought to the work areas along the site access tracks using a smaller 9 tonne dumper or half-loaded 4-axle dump trucks.

Between Turbines T13 and T15 on the west side of the site a 150 mm thick capping layer of crushed rock had already been placed on the road to upgrade it prior to the remedial works contract. However, it was considered that that the grading of the rockfill was unsuitable because it was too coarse. Therefore, during the road improvement works in 2014 the coarse capping layer was removed to upgrade the road with the geogrid and well-graded Class 6F2 capping layer, as outlined above. The unsuitable rockfill was removed using an 18-tonne rubber-tyred excavator and transported to a suitable disposal area using a 9 tonne dumper.

In the areas where there were localised pronounced deflections of the road under the wheel or axle loads of the trucks due to broken/rotten timber or a ruptured geogrid at the base of the road the following additional remedial works were carried out:

- The existing road was excavated for a minimum distance of 2.5 m to either side of the problem area to expose the basal reinforcement and underlying trees to investigate the problem;
- Intact geogrids were protected from damage and preserved for re-use where possible. The excavated rockfill was also retained for re-use where it was not contaminated with peat;
- Where necessary, timber was used to replace any broken logs, fill any gaps in the timbers and regulate the level at the base of the road in lieu of rockfill;
- A new layer of geogrid reinforcement was placed along the exposed base of the road. The geogrid was comprised of two 4.0 m wide strips of Naue 40/40 Q6 Polyester (PET) Secugrid which were overlapped along the centerline of the road;
- A minimum 450 mm thick layer of Class 6F2 capping material was constructed in 2 No. 225 mm thick lifts which were spread and statically compacted with the 13 tonne tracked excavator;
- A second layer of geogrid reinforcement was placed over the surface of the road. This was comprised of a single 4.75 m wide layer of Naue 30/30 Q6 Polyester (PET) Secugrid; and
- The surface of the road was capped with a further 150 mm thick layer of Class 6F2 capping material and a 20mm blinding layer of Class 6H (0-6 mm) granular fill. These layers were spread with the 13 tonne tracked excavator and compacted by static rolling with 4 No. passes of the 11-tonne roller (Hamm 3411).

Minor works to repair large potholes were also carried out at selected locations along sections of the road that performed well in the serviceability load tests. The potholes were filled with Class 6F2 granular capping material using the 18 tonne rubber-tyred excavator. The imported fill material was stockpiled on the crane hardstandings and brought to the locations of the localised repairs using the 9 tonne dumper.

The contract for the 2014 road improvement included remedial works to improve and widen the existing floating road over culverts at the following locations where the existing road was too narrow and where the side slope down into the drainage channel was too steep, which posed a health and safety risk to vehicles using the road:

- Turbines T10, T24, T35, T50, T66

The following work was carried out in these areas:

- The edge of the road was widened to accommodate an 0.5 m wide safety barrier and to flatten the side slopes to 1V:1.5H using 0.5 m of Class 6F2 capping over Class 6B drainage stone;
- At the culvert adjacent to Turbine T35 the road was also widened to provide a minimum 4.5 m road width over the culvert;
- All peat was excavated out from under the widened sections of the roads at the culverts so that the Class 6B & 6F2 rockfill was supported on the underlying glacial till;
- The existing culvert pipe was extended with a corrugated uPVC drainage pipe so that it protruded 0.5 m out from the new rockfill slope; and
- Where the existing culvert was under a floating road the culvert was extended using an oversized pipe to accommodate differential settlement between the two sections of pipe.

No remedial works were carried out to the section of the turbary road between Turbines T25 and T45 during the 2014 improvement works.

4.1.4.3 Other Minor Road Works (Excluding 2014 Improvement Works)

The following is a summary of other minor works that were carried out on the site access tracks between 2005 and 2022, other than for the 2014 road improvement works:

- In September 2011 the turbary road between Turbines T25 and T34, which is a floating road, was resurfaced with a 150 mm thick layer of Class 6F2 crushed rock capping material.
- In August 2011 the floating road between Turbines T13 and T15 was capped with a 150 mm thick layer of coarse rockfill, which was removed during the 2014 improvement works.
- In September 2011 the geogrid reinforcement at the base of the floating road near Turbine T24 ruptured due to excessive differential settlement where there was a transition from shallow to deeper peat. The road and underlying peat were excavated out from the area and the road was reconstructed on the underlying glacial till across the interface using imported crushed rock granular fill.

The ESBI annual inspection reports include details of other minor road works that were carried out on the site access tracks, including:

- Locally re-surfacing the tracks with a capping layer of crushed rock granular fill where the underlying timbers or geogrids are exposed (e.g. T51/52 Junction. 20 m west of Turbine T3)
- Filling potholes with the imported crushed rock granular fill.
- Re-grading the road surface to level it out where rutting had formed in loosely compacted rockfill (e.g. T8-T9, T25, T36, East/North of T17, East/West of T35)

4.1.5 Cables and Ducting

ESBI Drawing No. QS-000192-01-D451-017 in Appendix A shows the approximate as-built layout of the underground HV electrical cables that were installed during construction of the wind farm prior to September 2005. Between 2005 and 2022 the only work that was carried out on these cables was to ensure that they had adequate cover, typically at some of the drainage crossings adjacent to the turbines where exposed cables were identified by ESBI in the Geotechnical Inspection Reports.

In September 2017, as part of an upgrade to the turbine control systems, approximately 7.6 km of new 12 core single-mode fibre-optic cable was installed on the site to improve the response of communication signals between the turbine controllers and the central control system. The cables were installed in 50 mm buried ducts from the central control system at the substation to the met mast and the first turbine on each of the 8 No. radials, i.e.:

- T26 on Radial A
- T25 on Radial B
- T10 on Radial C
- T67 on Radial D
- T63 on Radial E
- T24 on Radial F
- T28 on Radial G
- T29 on Radial H

Figure 4-1 shows the layout of the 50 mm ducts that were installed for the new fibre-optic cables. The total length of ducting was approximately 2.55 km. A mole plough was used to bury the ducts directly in the peat at a depth of 0.5-0.6 m with a warning tape overhead without having to open up a trench. At the 5 No. road crossings the 50 mm ducting was fed through a 75 mm diameter galvanized pipe that was pushed horizontally through the peat under the floating roads to avoid having to open up a trench in the roads. Manholes were installed at 7 No. junctions across the site (i.e. at the Met Mast, the substation, Turbines T67 and T24, and 3 No. at the cluster of junctions around Turbine T25). The manholes were pre-cast concrete box structures that were supported on the glacial till below the peat. All of these works were carried out by Powercomm Engineering for ESBI.

Figure 4-1: Layout of new fibre-optic cable ducts.

4.1.6 Drainage

ESBI Drawing No. QS-000192-01-D451-001 shows the layout of the drains that were constructed for the wind farm along with the network of drains that originally existed on the site prior to construction.

ESBI personnel carried out periodic inspections of the site between 2005 and 2019 to assess maintenance requirements for short and long-term stability. Table 4-2 gives a list of the reports that were prepared and the date of the inspections.

Table 4-2 – List of ESBI Geotechnical Inspection Reports for Derrybrien Wind Farm

ESBI Report No.	Date of Issue	Date of Inspection
P78015-R476-002	8th December, 2006	November 2006
P78015-R476-003	14th April, 2008	November 2007/January 2008
P78024-R476-001	28th April, 2009	February 2009
P378015-F105-016-R001	30th January, 2013	December 2012
P378015-F105-016-R002	22nd July, 2013	May 2013
P378015-F105-016-R003	25th May, 2015	December 2014/January 2015
P378015-F105-016-R005	6th October, 2017	April/May 2017
P378015-F105-016-R006	20th November, 2018	July & September 2018
P378015-F105-016-R007	16th December, 2019	November/December 2019

The majority of the recommendations in the reports relate to site drainage. These were incorporated into the maintenance programme for the site, therefore, they form a comprehensive record of the works that were carried out. The following is an outline summary of the nature and scope of the works.

The drainage requirements were presented in two categories based on the priority of the work:

- Drainage around turbines
- General site drainage

Drainage around the turbines was prioritized for immediate action due to the potential impact that it could have had on the stability of the turbines. The reinforced concrete pad foundations of the turbines are designed to resist overturning under lateral wind loads using the self-weight of the foundation at the design water level below ground. Where the actual water level is above the design level due to poor drainage, the additional buoyancy on the pad foundation could result in insufficient resistance to overturning if it occurs during periods of high wind speeds. This has not occurred on the site. Nevertheless, the ESBI Geotechnical Inspection Reports noted areas of poor drainage and ponded water at some of the turbines, which needed to be addressed as a priority.

A build up in groundwater and ponded surface water due to poor drainage is a recognized contributory factor for peat instability. Therefore, the ESBI inspection reports included recommendations for general maintenance and improvement of the drainage network on the site to ensure that there was adequate drainage of groundwater and surface runoff. The drainage requirements were assessed during the wetter winter months. However, these works were scheduled for the drier summer months when there would have been a lower risk of peat instability. For minor issues, recommendations were made for ongoing monitoring of the conditions on site.

The general issues that were identified in the ESBI inspection reports included the following:

- Turbines where there was no drain or insufficient drainage around the pad foundation;
- Areas of ponded surface water;
- Drains that had insufficient capacity leading to overtopping and erosion of the adjacent access track;
- Drains with insufficient fall;
- Drains blocked due to vegetation growth;

- Drains blocked due to sidewall collapse or closure in peat;
- Erosion/scoring of drains due to excessive flow velocity;
- Culverts at road and cable crossings blocked due to settlement of drainage pipe; and
- Collapsed drainage pipes.

The remedial actions that were recommended where these issues were identified included:

- Constructing new drains around the turbine foundations;
- Improving the connection between the drains around the turbines to the site drainage network;
- Increasing the capacity of drains by deepening and/or widening them;
- Deepening and re-grading drains with insufficient fall;
- Clearing overgrown vegetation out of blocked drains;
- Re-excavating drains that were blocked due to sidewall collapse or closure;
- Providing additional support to unstable sidewalls;
- Placing cobble and boulder-sized rockfill in the drains to prevent scour and to reduce flow velocity;
- Re-aligning the drains at junctions where the flow velocity was leading to excessive erosion and scour;
- Clearing out the inlet and outlet of culvert pipes that had become blocked due to settlement; or
- Excavating and re-laying the culvert pipes under the roads or cables with rockfill surround supported on the underlying glacial till to prevent further settlement.

Minor drainage works were carried out by hand. More substantial works were carried out by mechanical excavation with a wide-tracked 10 or 13-tonne low ground bearing pressure excavator suitable for working directly on the peat.

The majority of the drainage improvement works were carried out within 6 years of completion of the wind farm (i.e. up to the end of 2011). A major maintenance programme was completed on the site in 2011. After that the ESBI inspection reports only included recommendations for minor remedial works to maintain the efficiency and capacity of the existing drainage network, which indicates that maintenance on the site drainage is at a residual level.

4.1.7 Miscellaneous Works

4.1.7.1 Peat Repository Sites

The peat repository sites shown on Drawing No. QS-000192-01-D451-009 in Appendix A, which were used to store excavated peat from the construction of the wind farm, were also inspected by ESBI during the periodic inspections between 2005 and 2022. In general, it was noted that the repository sites were stable and that vegetation had established on the surface of the excavated peat. No remedial works were required for site stability. However, minor drainage works were recommended to clear ponded water on the upslope side of the repository at T47 in 2008, and behind T7, T8, T14, T15, T18, T27-T30 and T36-T39 in 2009.

4.1.7.2 Borrow Pits BP-1 to BP-3

Borrow Pits BP-1 to BP-3 were inspected by ESBI during the periodic site inspections between 2005 and 2022. In general, no remedial works were recommended for site stability. However, at BP-3, which was the main source of rockfill during construction, it was noted that, since 2005, the borrow pit had filled with water to within 1.0-1.5 m of the level of the site access road at the entrance to the borrow pit so that there was a risk of overtopping if it were allowed to rise further. The water level has stabilized

at this level. However, as a precautionary measure a drain was excavated along the edge of the road to divert any rising water from the borrow pit to the off-site drainage network.

In 2015 the storm damage to the timber security fence between Turbine T65 and BP3 was repaired.

4.1.7.3 Instrumentation

In 2009 work was carried out to replace the rotting timber frames supporting the logger units for the 4 No. clusters of instrumentation around the site [i.e. the electronic piezometers and inclinometers @T49/T50, @T2, @T34T38, and @T18]. All of the electronic piezometers and inclinometers were re-calibrated by ITM Monitoring in December 2012. All of this work was carried out manually.

4.1.7.4 Forestry – Tree Felling and Tree Topping

Between 2016 and 2018 trees were clear-felled for the Project over an area of approximately 46ha in the mature conifer plantations on the west side of the wind farm, just outside the site boundary, as shown in Figure 4-2. The trees were felled by experienced contractors working for Coillte using the same standard forestry equipment that was used for tree felling on the blanket bog during the construction of the wind farm, i.e. 10-13 tonne wide tracked low ground-bearing pressure excavators fitted with harvesting attachments to cut and trim the trees, and 8-12 tonne rubber-tyred forwarders to gather and stockpile the cut timber logs.

Short-sections of floating road ≈25-35m long were constructed at Turbines T3 and T19 to access the area for felling. The roads were comprised of 300mm of crushed rock on a layer of timber brash constructed directly on the surface of the peat. A short section of the existing Coillte track at the met mast between Turbines T6 and T12 was also re-surfaced with an approx. 150mm thick capping layer of crushed rockfill. Felled timber logs 3m long were temporarily stockpiled at stacking points adjacent to Turbines T3 and T19, and off the existing Coillte track near the met mast and Turbine T6, as show on Figure 4-2.

The stockpiled logs were periodically collected by Coillte using articulated trucks fitted with a HIAB crane and then transported off site. Approximately half of the timber was transported off site along the access tracks on the wind farm site. The remainder were removed via the existing Coillte tracks to the south.

The conifer plantation at the northwest corner of the wind farm, which is oultined in green in Figure 4-2, will not be felled. The areas that were clear felled will be re-planted.

No trees have been re-planted on the wind farm site since 2005. However, some small trees have begun to re-establish naturally on the site where the trees were felled during construction. Therefore, tree-topping and tree-felling will be carried out periodically on the site to clear brash and small trees from the areas where the trees had previously been felled. This work will be carried out by hand or with a Hitachi 100 10-tonne wide-tracked excavator with a saw head attachment. This is a specialist low ground-bearing pressure forestry machine suitable for operating directly on the peat. The felled trees will be cut down and left in place on the site.

Tree-topping and tree felling will be carried out over a number of years with an annual plan of the areas that need to be addressed. In 2018 tree topping was carried out for a distance of 10 metres either side of the site access track in the following locations:

- The top turbary road from Turbine T27 to T44
- Turbine T26 to T70
- Turbine T3 to T5
- Turbine T1 to T2

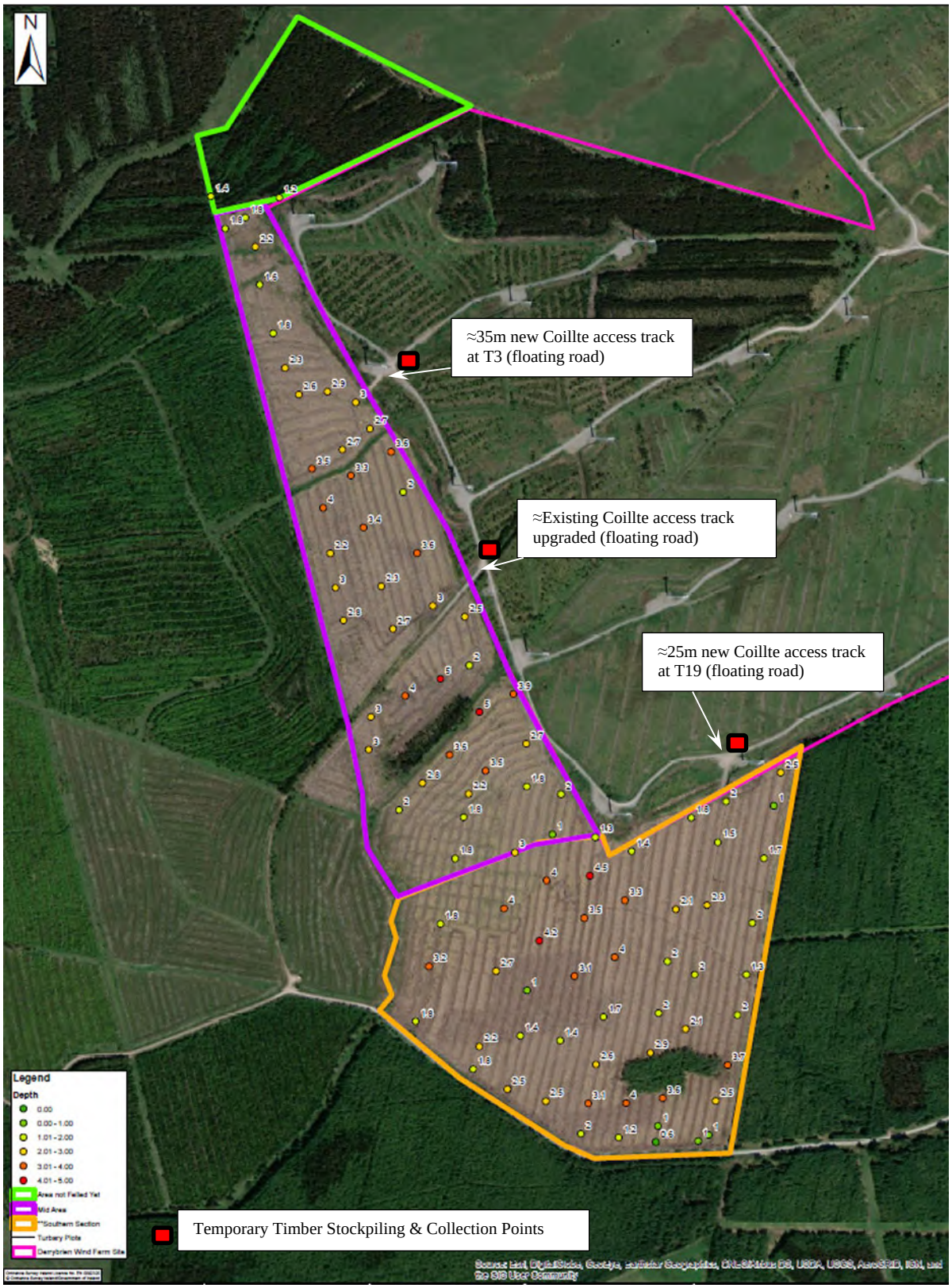


Figure 4-2 - Location and extent of tree felling on the west side of the wind farm site in 2018 (including peat depth probes)

4.1.7.5 Remedial works to right a crane that went off the narrow turbary road at Turbine T40

In July 2007 a 250 tonne Liebherr 1250-5.1 mobile crane went off the turbary road while travelling to Turbine T40 to carry out some essential maintenance. The road in this area is a narrow floating road that is 3.0-3.5 m wide. The wheelbase of the crane is 3.0 m.

The cranes are top heavy in their travelling configuration. While travelling east along the road to T40 the outer edge of the floating road deflected down under the wheels on the right side of the crane causing it to overturn into the peat on the downslope side of the road. There were no casualties and the weight of the crane on the peat did not cause a failure in the peat in the area.

Remedial works were carried out on the site to right the crane so that it could be removed for repairs. This involved excavating out a section of the floating road adjacent to the crane and constructing a section of hardstanding supported on the glacial till below the peat. The crane was then winched up onto the solid road using a system of steel plates, winching cables, and low-ground bearing pressure excavators anchored into the glacial till below the peat on the upslope side of the side of the road as a reaction to the winching forces. The crane was successfully righted and removed from the site without further incident. Crane traffic has since been restricted on this road.

4.2 Assessment of Stability Impacts During Operation & Maintenance Phase of Wind Farm Between 2005 and 2022

This section of the report presents the assessment of stability impacts for the operation and maintenance phase of the wind farm between 2005 and 2022, i.e. the assessment of direct impacts of site activities on the receiving soils, geology and land that had an effect on site stability, particularly in relation to the peat. The results are summarised in Table 4-3.

For each activity, Table 4-3 states the characteristics of the **stability impact** – typically a dead or live load surcharge on the intact peat slopes - as well as the extent, duration and frequency of that impact. The characteristics of the impact are based on the records of site activities from 2005 to 2020, which typically detail the methodology that was adopted in carrying out the site activities, the equipment that was used on the site, the location of the works, and when the works were carried out.

As described in Section 1.2, the corresponding **effect** on the receiving soils, geology and land has been assessed as a function of the characteristics of the site activity, the quality of the impact with respect to site stability, the probability of a peat failure occurring, and the possible nature and extent of a peat failure.

The **Significance** of the effects of the stability impacts has been assessed as a function of the **sensitivity** of the receiving soils, geology and land potentially impacted by a peat failure, using the matrix in Figure 1-2. For this project the sensitivity of the receiving soils, geology and land has been classified as **Medium** based on the characteristics of the peat failures that occurred during construction, as discussed in Section 2.4.

No peat failures occurred during the operation and maintenance phase of the wind farm between 2005 and 2020. Therefore, the **Significance** of **effects** in Table 4-3 reflects the probability of a peat failure occurring due to the effect of the stability impacts on the peat (e.g. due to the increased shear stresses under applied surcharge loads), the potential scale and characteristics of a peat failure, and the sensitivity of the soils, geology and land potentially impacted by a peat failure.

4.2.1 Power Generation & Transmission

The primary stability impact of power generation is the dead and live load surcharge that is applied on the slope under the turbine pad foundations from the wind loads on the turbine. All of the turbines are supported on shallow spread footings on rock below the peat and glacial till. The foundations are designed to have adequate bearing capacity to support the applied loads. Therefore, the effect that the loads have on site stability is **Negligible** and **Not Significant**.

Transmission of electrical current through the buried cables and substation has had an **imperceptible** impact on soils, geology and land with regard to site stability.

4.2.2 Maintenance & Repair of Turbines

The stability impacts on soils, geology and land related to the maintenance and repair of the turbines were the concentrated loads from cranes operating on the adjacent hardstanding areas during the repair works, and the live load surcharge on the floating roads when the cranes were travelling to the turbines.

All of the heavy repair works were carried out from the crane hardstanding areas adjacent to the turbine. The hardstanding areas are constructed of crushed rock granular fill supported on the glacial till below the peat. They were used for the erection of the turbines during construction and they are designed to support the concentrated loads from the cranes and service vehicles without applying any load on the peat slopes. Therefore, the effect that these loads had on site stability was **Negligible** and **Not Significant**.

Table 4-3 Assessment of Stability Impacts – Operation & Maintenance Phase 2005-2020

Activity	Characteristics of Direct Impact of Site Activities with respect to Site Stability (Stability Impacts)				Assessment of Effect of Stability Impacts on Soils, Geology & Land						Did Peat Failure Occur? (Yes/No)
	Impact	Extent of Impact	Duration	Frequency	Quality of Impact	Possible Extent of a Peat Failure	Probability of Occurrence of a Peat Failure	Effect on Receiving Soils, Geology & Land	Sensitivity of Receiving Soils, Geology & Land	Significance of Effect	
Power Generation	Turbine Foundation Loading on Glacial Till	At turbine locations	Continuous		Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant (Imperceptible)	No
Power Transmission	Eletricity Transmission & Conversion	At Turbines and substation; along buried MV cables on-site & along 110 kV line off-site	Continuous		Neutral	Not Applicable	Negligible	Negligible	Medium	Not Significant (Imperceptible)	No
Maintenance/ Repair of Turbines	Crane Loading on Hardstanding Areas	Hardstanding areas adjacent to turbines	Temporary	Occasional	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Crane Loading on Floating Roads	Along Floating Roads travelled by Crane	Brief	Occasional	Negative	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight	No
Maintenance/ Repair of Substation & Control Building	MEWP Loading on Hardstanding Areas	Hardstanding area at Substation site	Temporary	Occasional	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
	Service Vehicle Loading on Floating Roads	Along Floating Roads to Substation Site	Brief	Occasional	Slight Negative	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low	Very Low	Medium	Slight	No
Maintenance/ Repair of Access Tracks	Increased Capping Load on Floating Roads - Roads Upgrade 2014	Extent of 2014 Floating Road Upgrade Works - ESBI Drawing No.P378015-C-003	Long-Term	Sustained	Negative (Short-term)	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight (Short Term)	No
					Slight Negative (Medium-Term)	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low	Very Low	Medium	Slight (Medium Term)	No
	Increased Capping Load on Floating Roads - Localised Repairs	Localised Sections of Floating Roads (See Section 3.1.4.3)	Long-Term	Sustained	Negative (Short-term)	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight (Short Term)	No
					Slight Negative (Medium-Term)	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low	Very Low	Medium	Slight (Medium Term)	No
Cables & Ducting	Equipment loading on peat during 2017 Fibre-Optic Cable Installation	Along route of new fibre-optic cable ducts (see Figure 3.1)	Temporary	Once	Slight Negative	Small ($100m^2$-$2500m^2$) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight	No

Table 4-3 (Contd.) - Assessment of Stability Impacts – Operation & Maintenance Phase 2005-2020

Activity	Characteristics of Direct Impact of Site Activities with respect to Site Stability (Stability Impacts)				Assessment of Effect of Stability Impacts on Soils, Geology & Land						Did Peat Failure Occur? (Yes/No)
	Impact	Extent of Impact	Duration	Frequency	Quality of Impact	Possible Extent of a Peat Failure	Probability of Occurrence of a Peat Failure	Effect on Receiving Soils, Geology & Land	Sensitivity of Receiving Soils, Geology & Land	Significance of Effect	
Drainage Improvements	Low ground-bearing machine loading on Peat during Improvement Works	Along site drains at specified locations (see ESBI Geotechnical Inspection Reports)	Temporary	Occasional	Slight Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight	No
	Improvement of Groundwater Conditions	Sitewide - particularly upstream of drainage improvements	Long-Term	Sustained	Positive	In areas where drainage works were carried out	Positive Impact - Reduced Probability of a Peat Slide	Medium (Positive)	Medium	Moderate (Positive)	No
	Installation of drain to prevent overtopping of water in Borrow Pit No.3	Along adjacent site access road	Temporary	Once	Slight Positive	Not Applicable - Drain not required	Negligible	Negligible	Medium	Not Significant	No
Instrumentation	Manual repair work to instrumentation and fencing on peat.	At the 4 No. instrumentation logger units	Brief	Once	Slight Negative	Not Applicable	Negligible	Negligible	Medium	Not Significant	No
Forestry (Offsite) Clear Felling	Localised live load surcharge on peat from timber harvesters and forwarders	46ha conifer forest plantation offsite, along the west side of wind farm site	Temporary	Occasional (2016 to 2018)	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Low	Medium to Low	Medium	Slight	No
Forestry (Offsite) New Access Tracks (Floating) & Re-Surfacing of Existing Coillte Track	Small additional dead load surcharge on the peat	Short sections (25-35m) of new floating road at T3 and T19 & re-surfacing approx. 50m of existing Coillte track near T6	Permanent	Once	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Low	Medium to Low	Medium	Slight	No
Forestry (Offsite) Timber Stockpiling on WF site	Localised surcharge on peat from timber stockpile	Adjacent to Floating Road near Turbines T3, T6 & T19	Temporary	Occasionally (2016-2018)	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Low	Medium to Low	Medium	Slight	No
Forestry (Onsite) Tree Topping	Low ground bearing pressure equipment loading on peat	10 m either side of access track in areas specified for 2018 (see Section 3.17.4)	Temporary	Once	Slight Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Very Low to Low	Low	Medium	Slight	No
Mobile Crane Going off the Turbary Road While Travelling	Localised surcharge on Peat from overturned crane.	Along turbary road near Turbine T40	Temporary	Once	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Low	Medium to Low	Medium	Slight	No
	Reaction loads on rockfill road from winching during crane righting	Along turbary road near Turbine T40	Brief	Once	Slight Negative	Small (100m^2-2500m^2) to Very Large (>10Ha) Peat Slide	Negligible	Negligible	Medium	Not Significant	No

The impact of the cranes travelling along the floating roads to access the turbines is more significant for site stability because the roads are constructed directly on the peat so the cranes apply a locally concentrated live load surcharge on the peat slopes when they travel across the site. Based on the site records, there were approximately 86 No. crane operations on the site between 2005 and 2018, which is an average of approximately 1 No. every 50 days. The cranes were driven directly to the turbines without stopping on the access tracks. Therefore, the **Frequency** of the loading was **Occasional** and the **Duration** of loading was **Brief**. Proof load tests were carried out on all of the floating roads at the end of construction in 2005, and again after the roads were upgraded in 2014. The roads were tested to a load comparable to the design crane load. The design load on the floating roads was not exceeded by the mobile cranes that were used on the site between 2005 and 2022 and the smallest crane required was mobilised for each job. Therefore, the probability of a peat failure occurring under the surcharge loads was **Very Low** to **Low**, the effect of the loading on the stability of the peat was **Low** and the **Significance** of the effect was **Slight**.

4.2.3 Maintenance & Repair of Substation & Control Building

The stability impacts on soils, geology and land related to the maintenance and repair works at the substation and control building were the concentrated live loads on the hardstanding areas around the substation during the works, and the live load surcharge on the floating roads when the vehicles were travelling along the floating roads to access the site.

All of the repair works were carried out from the hardstanding area at the substation. The hardstanding area is constructed of crushed rock granular fill supported on the glacial till below the peat. It was used for the construction of the substation and it is designed to support the concentrated loads from the Mobile Elevated Work Platforms (MEWP) and service vehicles without applying any load on the peat slopes. Therefore, the effect that these loads had on site stability was **Negligible** and **Not Significant**.

The vehicles travelling along the floating roads to access the substation apply a locally concentrated live load surcharge on the peat slopes when they travel across the site. The **Frequency** of the loading was **Occasional** and the **Duration** of loading was **Brief**. The vehicles travelled along the shortest route directly to the substation. No large mobile cranes were required and the load that the maintenance vehicles applied on the floating roads was significantly lower than the design crane loads for which the roads were tested. Therefore, the probability of a peat failure occurring under the surcharge loads was **Very Low**, the effect of the loading on the stability of the peat was **Low** and the **Significance** of the effect was **Slight**.

4.2.4 Maintenance & Repair of Access Tracks

The primary stability impact on soils, geology and land related to the maintenance and repair works that were carried out on the access tracks was during the contract to upgrade the tracks in 2014. During that contract, approximately 4.6km of the floating roads were capped with an additional 150 mm of crushed rock granular fill reinforced with a layer of geogrid to improve the performance of the roads. The top of the coarse angular fill was then “blinded” (i.e. covered) with a nominal 20mm thick layer of finer gravel as surfacing. The floating roads are supported directly on the peat. Therefore, the combined effect of the additional fill was to increase the dead load (i.e. the self-weight) of the roads on the peat slopes. The extent of the works are shown on ESBI Drawing No. P378015-C-003 in Appendix A. The additional loading is **Long-term** and **Sustained**. There would also have been some locally higher loads acting briefly on the roads where the granular fill was unloaded and spread out across the surface of the roads during construction, although measures were taken to mitigate the impact of this.

The additional thickness of granular fill was kept to a minimum to minimise the additional dead load surcharge on the peat (≈3.2 kN/m^2). Analyses were also carried out to demonstrate that the additional load had only a minor effect on the stability of the road, which was within its design capacity. It was

also proportional to the increase in undrained shear strength that would have already occurred in the underlying peat as it consolidated (compressed) under the weight of the original road.

Therefore, at the time that the works were carried out, the probability of a peat slide due to the increase in shear stresses applied by the additional layer of capping material and surfacing was **Very Low to Low** with the higher risk associated with the sections of the site where there was a higher likelihood of a peat slide based on the site characteristics (see Figure 3-39). The effect of the increased dead load on the stability of the peat was **Low** and the **Significance** of the effect was **Slight**.

The highest risk of shear failure under the additional load was in the **short-term** (undrained) condition when the load was applied during the construction phase of the 2014 contract. Over time, the peat would have consolidated and increased in shear strength further under the weight of the additional fill, reducing the risk of shear failure in the peat. Furthermore, the capacity of upgraded the floating roads to support the design crane surcharge load was verified by full-scale proof load testing at the end of the 2014 upgrade works. Therefore, in the **medium to long-term** the probability of a peat slide occurring due to the increased weight of the upgraded roads on the peat was **Very Low**. The effect of the increased dead load on the stability of the peat was also **Very Low** and only **Slightly Significant**.

Section 3.1.4.3 gives details of other minor localised upgrade works that were carried out on the floating roads between 2005 and 2022. In general, the stability impact of these works would have been similar to the main 2014 upgrade works as they involved a small increase in dead load on the peat slopes where an additional layer of rockfill was placed on the floating roads. However, the impact would have been more localised and confined to the areas where the repairs were carried out. In the **short-term** the effect of the additional load on the stability of the peat was **Low** but this would have reduced to **Very Low** in the **medium to long-term** as the peat compressed and gained strength under the increased load. The **Significance** of the effect was **Slight**.

4.2.5 Cables & Ducting

The primary stability impacts on soils, geology and land related to the cable and ducting works between 2005 and 2022 was the live load surcharge on the peat by the equipment that was used to install the new ducting and fibre-optic cables across the site in 2017, as summarised in Section 3.1.5. The cables were fed through ducts that were installed by a low ground-bearing pressure mole plough suitable for working on peat without the need for open trench excavation. The impact was only **slightly negative** and was limited to the areas where the ducts were installed, as shown on Figure 4-1. All of the manholes were constructed on the glacial till below the peat. The machine loading on the peat was **temporary** and the works were carried out in a single contract over a period of 2-3 months. The probability of a peat failure occurring under the live load surcharge was **Very Low**, the effect of the loading on the stability of the peat was **Low** and only **Slightly Significant**.

4.2.6 Drainage Improvements

The drainage improvement works across the site were either carried out manually or by localised excavations in existing shallow drainage trenches using low ground-bearing pressure (LGBP) tracked excavators suitable for operating directly on the peat. The extent of the works are summarised in the Geotechnical Inspection Reports by ESBIE and in the site maintenance records. Section 4.1.6 gives a summary of the general nature of the works. In the short-term, when the works were carried out on the site, the primary stability impact on soils, geology and land would have been the occasional temporary loading on the peat slopes by the LGBP mechanical excavators. The increased load on the peat would have been low and limited to the localised areas where the drainage improvements were carried out. Therefore, the probability of a peat failure occurring under the live load surcharge was **Very Low**, and the effect of the loading on the stability of the peat was **Low** and only **Slightly Significant**.

Poor drainage is a recognised contributory risk factor for peat slides as it can lead to elevated hydrostatic uplift pressures below the peat, or hydraulic surcharge pressures in the existing drainage network of pipes and seepage channels within the peat, both of which can contribute to peat slides. The improved drainage has reduced this risk on the wind farm site, therefore it has had a **Permanent** and **Sustained positive impact** on the peat with respect to site stability. In the medium to long-term, improved drainage would also have increased the shear strength of the peat where the groundwater table was lowered (i.e. the peat would have compressed and dried out where the groundwater table was lowered, increasing its shear strength in the process).

The drainage improvements that were carried out on site during the operation and maintenance period between 2006 and 2022 were primarily required to improve the performance and efficiency of the existing drainage network without significantly increasing the capacity of the system. However, relative to the baseline condition in 1998 the effect of the drainage improvements on the stability of the peat was **Medium**, and **Moderately Significant**.

The drain that was installed along the site access road at Borrow Pit No. BP-3 (see Section 4.1.7.2) was a preventative measure to prevent overtopping of the rising water level in the borrow pit. However, the water level stabilized 1.0-1.5 m below the level of the road. Therefore, the impact of the drain and the effect that it had on site stability was **Negligible** and **Not Significant**.

4.2.7 Miscellaneous Activities

4.2.7.1 Instrumentation

The effect of the maintenance works on the timber frames supporting the instrumentation logger units was limited to man access across the peat to carry out the works manually. No machinery was used. Therefore, the effect that this work had on site stability was **Negligible** and **Not Significant**.

4.2.7.2 Forestry – Tree Felling & Tree Topping

Between 2016 and 2018 trees were clear-felled for the Project over an area of approximately 46ha in the mature conifer plantations on the west side of the wind farm, just outside the site boundary, as shown in Figure 4-2.

The trees were felled by experienced contractors working for Coillte using the same standard forestry equipment that was used for tree felling on the blanket bog during the construction of the wind farm, i.e. 10-13 tonne wide tracked low ground-bearing pressure excavators fitted with harvesting attachments to cut and trim the trees, and 8-12 tonne rubber-tyred forwarders to gather and stockpile the cut timber logs (see Section 3.1.1).

Figure 4-3 shows the topography, peat depth and hydrology in the area where the trees were felled. There are some zones within the felled area where there is a locally higher risk of peat instability, particularly at the convex break in slope along the downslope edge of the gently sloping terraces of locally deeper peat (4-5m) upslope from the watercourses on this side of the wind farm site. However, the live load surcharge from the type of forestry equipment that was used was localised and spread out over the surface of the peat to prevent concentrated loading so that the risk of a peat slide was generally **Low**. Therefore, the effect of the live load surcharge on the stability of the peat was **Medium to Low**, and the significance of the effect was **Slight**.

No incidents of peat instability occurred when the trees were felled.

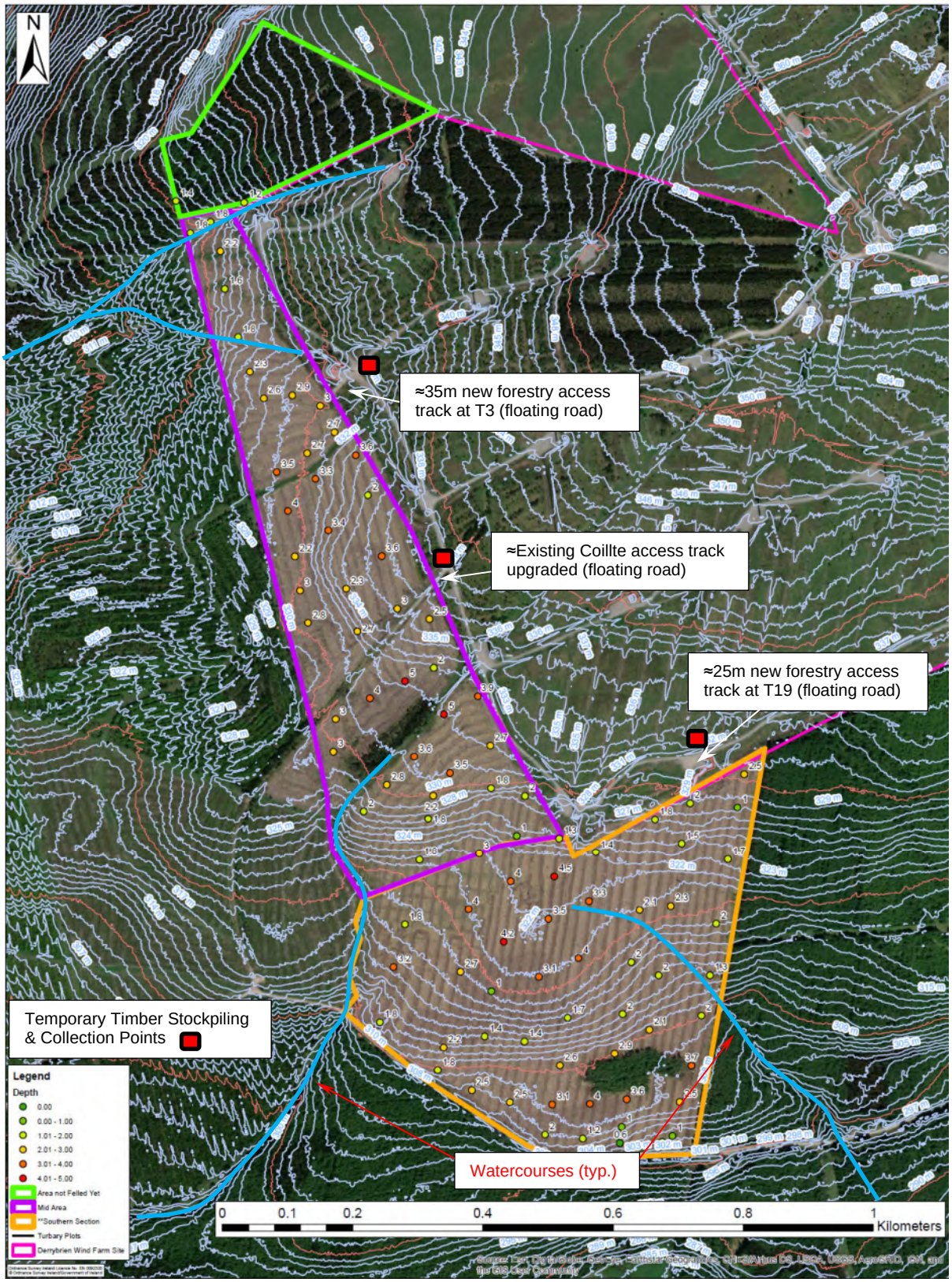


Figure 4-3- Location and extent of tree felling on the west side of the wind farm site in 2018 showing LiDAR survey contours, natural watercourses and peat depth probes.

Short-sections of floating road ≈25-35m long were constructed at Turbines T3 and T19 to provide access for forestry harvesters and forwarders across the wind farm cable trenches to the area off-site to the west for clear-felling of the conifer plantations. The roads were comprised of 300mm of crushed rock on a layer of timber brash constructed directly on the surface of the peat. The tracks were only constructed over a short length to avoid damage to the electrical cables on the wind farm site. The thickness of rockfill was kept to a minimum so that the applied dead load surcharge on the peat was only approximately 6kPa, which is less than the dead weight of a layer of peat 1.0m thick.

A short (50m) section of an existing Coillte access track near the met mast at T6 was also re-surfaced with a 150mm thick layer of granular rockfill, which would apply a small additional load of 3kPa on the underlying peat.

The probability of a peat slide occurring due to the increase in shear stresses in the peat under the small additional surcharge load from the new sections of floating roads and from the additional surfacing layer on the existing Coillte track was **Low**. Therefore, the effect of the increased dead load on the stability of the peat was **Medium to Low** and the Significance of the effect was **Slight**.

Approximately half of the timber was transported off site along the access tracks on the wind farm site. The remainder were removed via the existing Coillte tracks to the south. The trees that were transported across the wind farm site were temporarily stockpiled at stacking points adjacent to Turbines T3 and T19, and along the Coillte track near the met mast at Turbine T6, as shown on Figure 4-3. Figure 4-4 shows an image of the stockpile near T6 in May, 2017, as noted in the ESBI site inspection report from 2017 (Document No. P378015-F105-016-R-0005, dated 6th October, 2017).

Figure 4-4 - Felled timber from an adjacent plantation stockpiled on the peat within the wind farm site near Turbine T6 in May 2017 (ESBI Site Inspection Report - 2017)

The 3m long timber logs were typically stockpiled to a height of 2.5-3.0m on the intact peat slopes over a length of about 20m along the road. This is equivalent to a live load surcharge of 12.5-15.0kN/m^2 over the footprint of the stockpile. The stockpiles were removed from the site periodically by Coillte, so the localised loading was **short-term**. The effect of the surcharge load on the stability of the peat was **Medium to Low** and the significance of the effect was **Slight**.

No clear felling was carried out on the wind farm site between 2005 and Q2 2022 and none of the areas that were clear-felled during construction of the wind farm have been re-planted.

Some tree topping was carried out on the site in 2018 to cut down small trees and brash that have re-established naturally on the slopes in the areas that were previously felled prior to October 2005. The works were limited to selected areas within a distance of 10 m to either side of the access track, as summarised in Section 3.1.7.4, i.e.:

- The top turbary road from Turbine T27 to T44
- Turbine T26 to T70
- Turbine T3 to T5
- Turbine T1 to T2

The work was carried out using a low ground-bearing pressure 10-tonne wide-tracked excavator with a saw head attachment suitable for operating directly on the peat. All of the cut trees and vegetation was left in place on the site. Therefore, the risk of a peat slide under the localised live load surcharge on the peat was **Very Low to Low**, the effect of the load on the stability of the peat was **Low**, and the Significance of the impact was **Slight**.

4.2.7.3 Remedial works to right a mobile crane that went off the narrow turbary road:

The mobile crane that went off the road and overturned near Turbine T40 was a one-off event that occurred due to the narrow width of the floating road relative to the width of the wheelbase of the crane. The wheels on one side of the crane deflected excessively on the soft edge of the road causing the top-heavy crane to turn over onto the peat on the downslope side.

The stability impact that this has had on the peat was the temporary localised surcharge load that was applied to the peat slope until the crane could be righted a few weeks later. The weight of the crane was 60 tonnes, which was spread out over an area of approximately 15 m x 4 m, which is equivalent to a surcharge of about 10kN/m^2. This is similar to the weight of 1.0 m of excavated peat over the same area, although the load from the overturning crane would have had a dynamic component. The probability of a peat slide occurring under the crane load in this part of the site was **Low** (see Figure 3-39). Therefore, the effect of the load on the stability of the peat was **Medium to Low** and the Significance of the effect was **Slight**.

The crane was righted a few weeks later using a combination of a winching system and steel plates under the wheels to rotate the crane back up onto the road. To achieve this the section of the floating road adjacent to the crane was excavated out to form a hardstanding area of crushed rock granular fill supported on the glacial till below the peat. The reaction frame for the winching system was also supported on the glacial till so that the reaction loads were not applied to the peat slopes. As a result, the effect that the winching loads had on the stability of the peat was **Negligible** and not **Significant**.

4.3 Monitoring and Mitigation of Stability Impacts of Site Activities During Operation & Maintenance Phase of the Wind Farm Between 2005 & 2022

4.3.1 Introduction

The drainage improvements had a permanent and sustained positive impact on the peat with respect to site stability and the effect on the stability of the peat was **Moderately Significant** relative to the baseline conditions on site in 1998, prior to construction.

The negative impacts of site activities that had a **Slightly Significant** effect on the peat with respect to site stability were:

- The additional dead load surcharge on the 4.5km of floating roads that were upgraded in 2014 with an additional 150mm of crushed rock capping material and a nominal 20mm thick surfacing layer of fine gravel;
- The live load surcharge on the floating roads from the general maintenance and repair vehicles, and from the large mobile cranes that were occasionally required to carry out repairs to the turbines;
- The occasional live load surcharge on the intact peat slopes from low ground bearing pressure equipment that was required for tree topping, to install the new cable ducts and to carry out improvements to the drainage network; and
- The one-off temporary live load surcharge of $10kN/m^2$ on the peat slope at Turbine T40, where the 250 tonne mobile crane went off the road and overturned when travelling along the road.

No peat instability was observed or recorded on the site during the operation and maintenance period of the wind farm between 2005 and 2022. The following is a summary of the monitoring and mitigation measures that were implemented on the project to mitigate the effect of significant stability impacts on soils, geology and land.

4.3.2 Instrumentation and Monitoring

Between 2005 and the end of 2012 groundwater levels and peat movement were monitored continuously at the clusters of instrumentation that were installed in the vicinity of Turbines T2, T18, T34 and T49/50 during construction. The instrumentation was comprised of a total of 12 No. push in piezometers (Pz-01 to Pz-12) and 15 No. tilt sensors (Tilt-01 to Tilt-15). The piezometers were electronic vibrating-wire push-in piezometers that were installed with the tip of the piezometer at the base of the peat to provide a continuous record of daily and seasonal groundwater level fluctuations. The tilt sensors were electronic tiltmeters that were installed over the full depth of the peat to provide a continuous record of any downslope movement or creep in the peat at the sensor locations. The locations of the instruments are shown on ESBI Drawing No.QS-00192-01-D451-016 in Appendix A.

The electronic sensors were connected to a central logger unit in each area. The logger units were fitted with GSM cards to allow remote access to the data, which was downloaded regularly to a central server. The tiltmeters were also set up with an automated alarm system to alert wind farm technical representatives of incidents of peat movement on the site that exceeded pre-defined limits.

The instruments were decommissioned in 2014 as some of them showed signs of malfunction. It was considered that they had been in place for a sufficient period of time to ensure that they were exposed to a range of environmental conditions on the site, and they did not indicate any evidence of peat instability.

In May 2005, 7 No. monitoring points were established on the peat within the slide area for long-term monitoring of movement and settlement of the disturbed peat. The ITM coordinates and level of the monitoring points were recorded periodically by GPS surveys between 2005 and 2022.

4.3.3 Geotechnical Supervision and Inspection

Gort Wind Farms Ltd. (GWL) appointed a site manager who was responsible for coordinating and managing the operation of the wind farm and the maintenance of the turbines and site infrastructure. His responsibilities included regular site inspections and managing health and safety for the operation and maintenance of the wind farm, including co-ordinating and supervising access to the turbines for the large mobile cranes.

ESBI Engineers carried out regular periodic geotechnical inspections of the site between 2005 and 2022 to assess maintenance requirements for the operation of the wind farm and to manage the risk of peat instability on the site. The majority of the recommendations in the reports relate to maintenance works on the site access roads and site drainage which were incorporated into the maintenance programme for the project. A list of all of the inspection reports is presented in Table 4-2.

AGL Consulting were appointed by ESB International to provide geotechnical support services periodically over the operation and maintenance phase of the project between 2011 and 2022, including:

- Site inspections and walkover surveys by Senior Geotechnical Engineers and Geotechnical Directors (2011, 2014 & 2018);
- Inspection and certification of full-scale proof load tests on the floating roads under the design mobile crane load in 2011, 2014 and 2018;
- Geotechnical analysis and design services for the upgrade of the floating roads in 2014, including a site-wide Peat Stability Risk Assessment (PSRA); and
- Site supervision and office-based technical support services during construction stage of the 2014 civil contract to upgrade the floating roads, including a review and certification of the Contractor's Method Statements.

ESBI also administered the contract for the 2014 upgrade of the floating roads and provided geotechnical inspection services for the works on site.

4.3.4 Maintenance/repair of site access tracks

The following design, construction mitigation measures were implemented for the main roads upgrade contract in 2014, which accounts for the majority of the works that were carried out on the floating roads between 2005 and 2022.

- In 2011 all of the site access tracks were inspected by a geotechnical engineer from AGL Consulting and full-scale proof load tests were carried out on the floating roads to assess the nature and extent of the upgrade works that would be required, and to verify the capacity and stability of the floating roads under the design crane load prior to designing the upgrade works.
- For continuity of geotechnical risk management, the geotechnical engineer for AGL Consulting who carried out the 2011 inspections and the design for the 2014 upgrade works was the same person who evaluated the design and stability of the roads for the Contractor after the peat slide during the construction stage of the project in 2003/2004 – Mr. Conor O'Donnell.
- To minimise the additional load on the peat where the floating roads were upgraded:
    - The roads were reinforced with an additional layer of stiff polyester geogrid to reduce the thickness of granular capping material required;
    - The thickness of the capping material was limited to 150mm of Class 6F2 crushed rock granular fill, as defined in the Transport Infrastructure Ireland (TII) Specification for Roadworks (Publication No. CC-SPW-00600); and

  - The coarse granular capping material was surfaced with a nominal 20mm thick blinding layer of fine gravel in lieu of a thicker layer of granular subbase material (Clause 804) that would normally be used.

- The additional dead load on the floating roads was designed to be within the factor applied to the live load surcharge in the stability analyses [i.e. <30% of characteristic (unfactored) live load surcharge].
- Stability analyses were carried out to demonstrate that the additional load had only a minor impact on the factor of safety against bearing capacity or shear failure in the peat under the roads, and that the difference (<5-10%) was proportional to the increase in undrained shear strength that would have already occurred in the underlying peat as it consolidated (compressed) under the weight of the roads since they were constructed in 2003-2005;
- The construction stage traffic and live load surcharges were also restricted so that the combination of the temporary live load surcharge and the increased dead load on the road did not exceed the design live load surcharge for the 300 tonne Grove GMK6300 All-Terrain mobile crane on the floating roads.
- A Peat Stability Risk Assessment (PSRA) was carried out in advance of construction in accordance with industry best practice guidelines using the methodology described in Section 1.3 to characterise the risk of peat instability across the site during the 2014 road upgrade works.
- Construction stage risk mitigation measures were incorporated into the Geotechnical Risk Register for the works on site, including:
  - Designated access routes for construction plant and machinery;
  - Limits on the maximum size of plant that could be used on the roads, particularly in areas where there was a higher risk of peat instability;
  - A requirement to stockpile granular fill materials in the crane hardstanding areas to avoid concentrated loading on the floating roads;
  - Restrictions on the way in which the fill was tipped and spread on the roads to minimise dynamic impact loads and to avoid concentrated static loads from temporary piles of rockfill that exceeded the design surcharge load of the road;
  - Restrictions on work during or after periods of heavy or sustained rainfall;
  - Compaction by static rolling only;
- During construction full-time supervision of the works was carried out jointly by geotechnical engineers from AGL Consulting and ESB International to ensure that the works complied with the specification and that the specified risk mitigation measures were implemented on site.
- A certification procedure was implemented for the review and approval of the Contractor's method statements to certify that reasonable skill and care was taken in ensuring that appropriate measures were implemented to mitigate against the risk of peat instability during construction. The Geotechnical Approval Certificates were issued by AGL Consulting and signed by a Director of the company.
- On completion of the works, full scale proof load tests were successfully carried out on the upgraded roads, to verify the capacity of the roads under the design crane load using a mobile crane loaded with additional ballast.

As a general note, the upgrade works that were carried out on the floating roads in 2014 had a site-wide benefit to site stability and health and safety because the works reduced the risk of bearing failure or rupture of the roads under the weight of the cranes. It also reduced the risk of the cranes overturning due to excessive non-uniform deflection of the roads.

4.3.5 Maintenance/repair of turbines

The following design, construction & operational risk mitigation measures were implemented for the maintenance and repair of the turbines on the site:

- All heavy lifting operations involving cranes were carried out from the hardstanding areas adjacent to the turbines so that the loads were adequately supported on the glacial till and rock.
- Steel bearing plates were used to reduce the bearing pressure under the crane outrigger pads to prevent any localised bearing failure on the hardstanding areas.
- The capacity of the floating roads to support the design crane load was verified by full-scale proof loading at the end of the construction period in 2005, after the roads were upgraded in 2014, and again in 2018 when the narrow turbary road was also re-tested.
- The comprehensive upgrade programme that was carried out on the floating roads in 2014 improved the condition and performance of the sections of roads that had deteriorated significantly since they were constructed in 2005.
- The number of crane mobilisations to site during the operation and maintenance period between 2005 and 2022 was minimised by combining maintenance work on turbines, wherever possible;
- The smallest size and of mobile crane with sufficient capacity for the required maintenance lifting loads was mobilised to the site. For example, based on an audit of crane movements between 2005 and 2018, which would be representative of the typical operations on the site:
    - Approximately 80% of the 86 No. crane operations on the site were carried out using a 100 tonne crane (e.g. the Liebherr LTM 1100-5.2 which is 2.75m wide and has a total travelling weight of 60 tonnes on 5 axles, with a maximum axle load of 12 tonnes/axle);
    - All but one of the remaining operations were carried out using a 130 tonne crane (e.g. the Liebherr LTM 1130-5.1 which is also 2.75 m wide and has a total travelling weight of 60 tonnes on 5 axles, with a maximum axle load of 12 tonnes/axle); and
    - 1 No. operation at Turbine T17 in July 2018 required the larger 200 tonne Liebherr LTM 1200-5.1 mobile crane, which is 3.0 m wide and has a total travelling weight of 60 tonnes on 5 axles, with a maximum axle load of 12 tonnes/axle).

    In comparison, the design crane load for the floating roads is the 300 tonne Grove GMK6300 All-Terrain crane, which is 3.0 m wide and has a total travelling weight of 72 tonnes on 6 axles with a maximum axle load of 12 tonnes/axle;
- All of the cranes were stripped of any unnecessary additional ballast when travelling across the floating roads to the turbine sites.
- All of the cranes were transported across the site under the direct supervision of the site maintenance manager for Gort Wind Farms Ltd. (GWL).
- The cranes were driven directly to the required turbine using the shortest route across the floating roads, avoiding unnecessary turns at tight junctions where there was a risk of going off the road, or sections of floating roads that were in poor condition prior to the 2014 roads upgrade programme.
- The mobile cranes were driven slowly and steadily across the floating roads within the specified site speed limit of 5 km/hr. All intermediate stopping points were on crane hardstandings adjacent to turbines, not on the roads.
- Where necessary, steel plates were placed along on the edges of the floating roads to facilitate access around tight bends where there was a risk of excessive deflection on a soft verge.
- Strict restrictions were placed on access for cranes along the narrow 3.0-3.5 m wide turbary road between Turbines T25 and T45.

4.3.6 Maintenance/repair of substation and control building

Maintenance and repair works on the substation and control building did not require large mobile cranes for heavy lifting. All of the work was carried out using normal service vehicles and trucks bringing equipment and Mobile Elevated Work Platforms (MEWP) to the site. Therefore, the impact of the works was more limited than from the repair work on the turbines. Nevertheless, the following design, construction & operational risk mitigation measures were implemented on the site:

- All maintenance operations were carried out from the hardstanding area around the substation and control building so that the loads from the vehicles and MEWP were adequately supported on the glacial till and rock below the peat.
- All of the vehicles and equipment were driven directly to the substation site across the minimum length of floating road.
- The dead weight and axle loads of the vehicles and equipment was kept to a minimum and the loads were within the design crane load that was verified by the proof load tests that were carried out on the floating roads along the access route to the substation in 2005, 2011, 2014 and 2018.
- Trucks that were used to bring materials or large equipment such as the MEWP to the substation were escorted along the roads by the ESB site maintenance manager.
- The vehicles were driven slowly and steadily across the floating roads within the specified site speed limit of 5 km/hr.

4.3.7 Drainage Improvements

The primary negative impact of the drainage improvements was the occasional localised temporary loading on the peat slopes by mechanical excavators used to clear out, deepen or realign existing drains. The following measures were implemented to mitigate the effect of the loading on the stability of the peat:

- Wherever possible, minor maintenance works and drain clearing was carried out by hand to avoid machine or equipment loading on the peat.
- Where mechanical excavators were required the works were carried out using wide-tracked low ground bearing pressure 10-13 tonne excavators suitable for working directly on the peat.
- Where significant excavations were required the excavated peat and mineral soil was removed to a secure material disposal area to avoid side-casting the material on the peat adjacent to the drain.
- Where culverts were widened at road crossings all of the peat was excavated out from under the rockfill used to widen the road to avoid surcharge loading on the peat.
- The inspections used to assess the requirements for maintenance and improvement works to the drainage network were carried out over the wetter months in winter or early spring when groundwater levels on the site were higher and drainage issues would have been more apparent.
- The drainage improvement works were prioritised so that:
    - Only priority work to improve the drainage at the turbine foundations was carried out urgently in the winter or early spring; and
    - All other general maintenance and drainage improvement works on the site were carried out during the drier summer months when there would be a lower risk of peat instability on the site.

Poor drainage is a recognised contributory risk factor for peat slides. Therefore, as such, the drainage improvement would in itself be a significant risk mitigation measure for site stability during the operation and maintenance of the wind farm.

4.3.8 Cable Ducting

The main work that was carried out on the cables and ducting on the site of the wind farm between 2005 and 2022 was the installation of the new ducting and fibre-optic cables for the upgrade of the turbine control systems in September 2017. The following measures were implemented for the works to mitigate the effects of stability impacts:

- The length of new cable ducts that had to be installed on the site was minimised by optimising the layout of the ducts to combine clusters of fibre-optic cables on different circuits into the same duct. In this way it was possible to reduce the total length of new ducts to 2.55 km to house 7.6 km of fibre-optic cables.
- The alignment of each of the ducts follows the shortest, most direct route across the site to the control building and the number of road crossings was minimised.
- The ducts were installed using a mole-plough capable of installing the ducts directly into the peat without the need for open-trench excavation and backfilling.
- The mole-plough was a low ground-bearing tracked machine suitable for working directly on the peat.
- To minimise the impact of the road crossings on the floating roads the new ducts were pushed horizontally through the peat under the roads to avoid having to open up a trench across the road, which would cut through the geogrid reinforcement.
- The manholes were constructed on the glacial till below the peat to avoid any loading on the peat.
- The works were carried out by personnel that were experienced with similar work for wind farms on upland peat bogs in Ireland.

4.3.9 Forestry – Tree Felling and Tree Topping

No commercial forestry planting or felling was permitted on the wind farm site during the operation and maintenance period between October 2005 and October 2022.

Between 2016 and 2018 trees were clear-felled for the Project over an area of approximately 46ha in the mature conifer plantations on the west side of the wind farm, just outside the site boundary, as shown in Figure 4-2. The following monitoring and risk mitigation measures were implemented for the felling of the trees:

- The works were carried out by experienced specialist subcontractors under the management of Coillte;
- The trees were felled and gathered using specialised equipment comprised of a wide-tracked hydraulic excavator fitted with a harvesting attachment, and 8-12 tonne rubber-tyred forwarders that have been widely used in commercial conifer forests on upland blanket bogs in Ireland;

In September/October 2018, tree topping was carried out for a distance of 10 m either side of the access track in selected areas around the site. The following measures were implemented for the works to mitigate the effects of stability impacts:

- The tree-topping works were limited to clearing small trees (typically conifers <4-5 m high) and shrubs that had re-grown naturally within areas that had been cleared during the construction of the wind farm.
- The tree topping was carried out using a light 10 tonne wide-tracked excavator with a saw head attachment, which is a specialist low-ground bearing pressure forestry machine suitable for working directly on the peat.

- All of the trimmed vegetation was cut and left in place on the peat slopes with no additional handling, which minimised machine movements and loading on the peat.
- The works were carried out at the end of the drier summer months when the risk of peat instability on the site is lower.
- The tree topping works were scheduled on a priority basis as part of a multi-year annual maintenance plan under the supervision of the site maintenance manager for GWL. No unscheduled or works were carried out.

4.3.10 Forestry – Timber Stockpiling

In the 2017 Geotechnical Inspection Report by ESBI it was noted that stockpiles of timber that had been felled outside the boundary of the wind farm site had been stockpiled on the peat near Turbine T6. Therefore, the following measures were implemented to mitigate the effect of the live load surcharge on the peat:

- The timber stockpile was removed shortly after it had been reported.
- No further timber stockpiling was permitted on the site.

5.0 REVIEW OF EXISTING SITE CONDITIONS AND ASSESSMENT OF STABILITY IMPACTS WHICH ARE OCCURRING RELATIVE TO BASELINE CONDITIONS

5.1 Introduction

This section of the report presents a review of existing conditions on the wind farm site with respect to peat stability, groundwater levels, and the stability and condition of the floating roads, peat repository areas and borrow pits.

The review is based on:

- A summary of groundwater levels and peat movement from instrumentation that was monitored on the site post-construction;
- The results of full-scale proof load tests that were carried out in July 2018 on all of the floating roads on the site to assess the performance of the roads and to verify their capacity to support the design crane load in their existing condition;
- Inspections carried out by AGL in July 2018 of the site infrastructure adjacent to the slide, and other areas of localised peat instability that had been identified during construction; and
- Inspections carried out by AGL in October 2018 and January 2024 on all of the peat repositories and borrow pits on the site.

This section of the report also includes an assessment of the significance of effects of stability impacts from the construction stage of the wind farm that are still occurring during the ceased operations phase of the windfarm (2022-2024).

Based on the results of the monitoring, road tests and inspections on site we have also updated the Peat Stablity Risk Assessment (PSRA) for the wind farm site to reflect the reduced likelihood of a peat slide due to improved conditions on the site with regard to peat stability since the end of construction in 2005. This would be representative of the conditions that would apply for the range of activities that are likely to occur on the site for the remaining operational life of the wind farm and during decommissioning.

This does not represent a change in the baseline conditions for assessing stability impacts on soils, geology and land for the wind farm. Improvement in the ground and groundwater conditions on the site can reduce the probability of a peat failure occurring, which reduces the effects of stability impacts on the stability of the peat. However, the significance of the effects is still assessed relative to the baseline sensitivity of the receiving soils, geology and land.

5.2 Findings from Instrumentation Monitoring for the period from 2005 to 2022

5.2.1 Monitoring points within the slide area

Figure 5-1 shows the location of 7 No. survey monitoring points (Mon 1 to Mon 7) that were established on the peat within the slide area for long-term monitoring of peat movement. Monitoring Points 1-3 are upslope of Barrage No.1, which was constructed across the slide in 2003 downslope from the wind farm site as part of the efforts to contain the peat. The barrage was constructed of rockfill supported on the underlying glacial till. Monitoring Points 4-7 are downslope of the barrage. Figure 5-1 shows movements recorded at the monitoring points between May 2005 and August 2017.

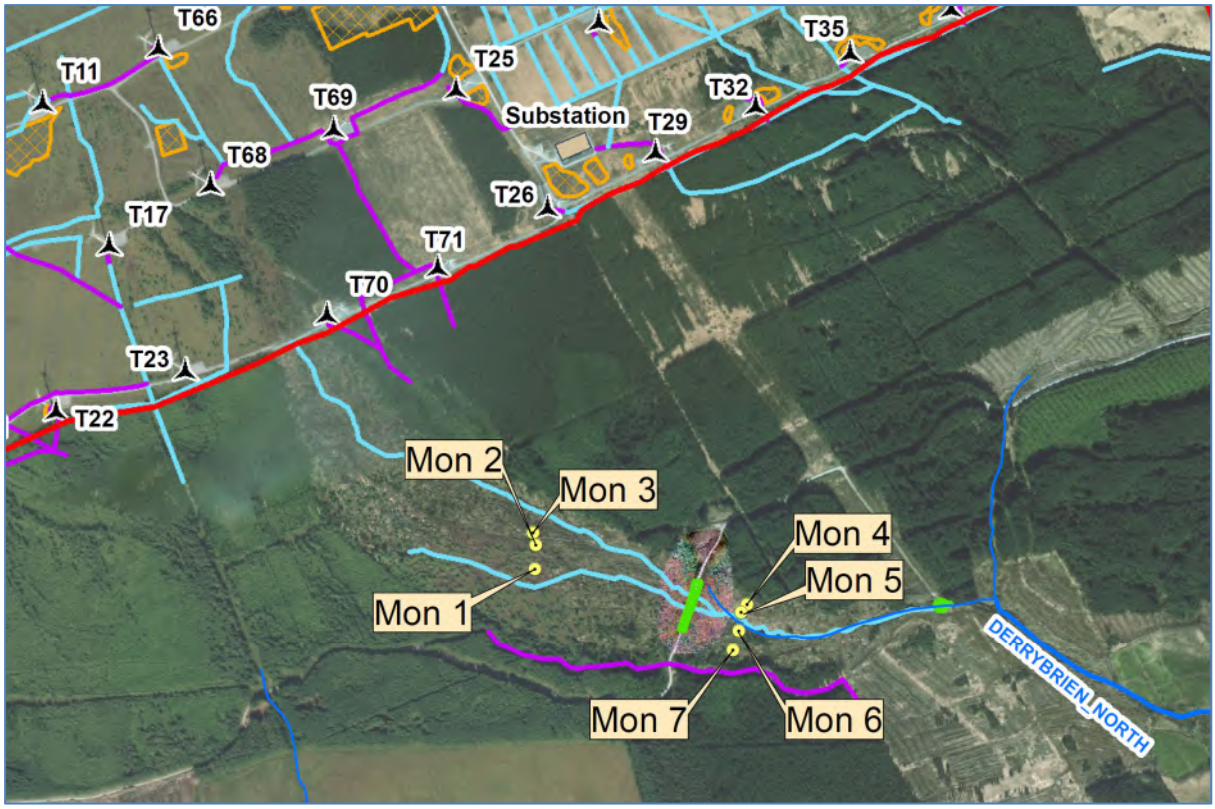


Figure 5-1: Location of survey monitoring points within the slide area (ESBI Drawing No. QS-000192-01-D1-D451-009)

The East/West and North/South movements are based on the GPS surveyed ITM coordinates in Easting and Northings, which would have less accuracy than a total station to a fixed reference point.

Between 2005 and 2017 the change in Easting and Northing of the survey points was <20-30mm, which is not a significant movement for the peat and is probably within the accuracy of the method of measurement, particularly when it is considered that a positive movement to the North is actually uphill, which is not possible. A slightly higher movement of 70-85 mm to the South was recorded at Monitoring Point No. 7. However, at this location downslope is to the East (see Figure 5-1). Therefore, this would be cross-slope movement, or possibly slightly upslope if the sides of the valley rise on this side. Therefore, it does not indicate that there was any significant creep or downslope movement of the peat within the slide area.

All of the monitoring points consistently showed settlement ranging from 25 mm to 150 mm, typically <100 mm, over the 12 year monitoring period. This is not surprising because the disturbed remoulded peat within the slide area would have dried out over time due to drainage within the slide, which would have caused it to consolidate or settle in-situ. This is supported by the fact that no significant downslope movement was recorded.

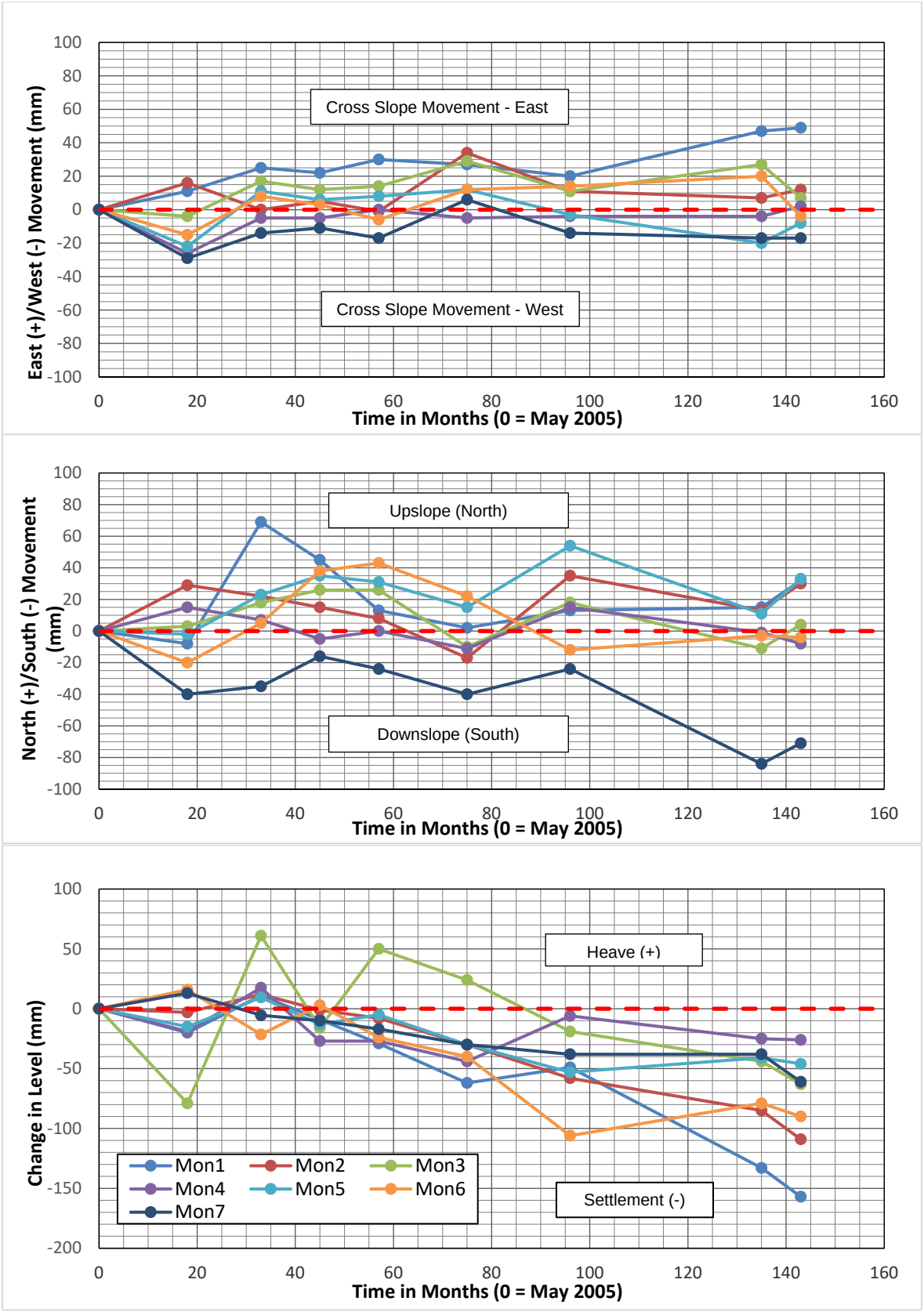


Figure 5-2 - Movements recorded at monitoring points in the slide area

5.2.2 Tiltmeters and Electronic Piezometers

Between 2005 and the end of 2012 peat movement and groundwater levels were monitored continuously with the instrumentation that was installed in the vicinity of Turbines T2, T18, T34 and T49/50 in 2004. The instrumentation was comprised of a total of 12 No. push in piezometers (Pz-01 to Pz-12) and 15 No. tilt sensors (Tilt-01 to Tilt-15) which were installed in clusters as follows:

- Turbine T2 (Logger Site 1): Pz-1 to PZ-3 Tilt-01 to Tilt-03
- Turbine T18 (Logger Site 2): Pz-4 to Pz-6 Tilt-04 to Tilt-08
- Turbine T34 (Logger Site 3): Pz-7 & Pz-9 Tilt-09 to Tilt-11
- Turbine T49/T50 (Logger Site 4): Pz-10 to Pz-12 Tilt-12 to Tilt-15

The instrument locations are shown on ESBI Drawing No.QS-00192-01-D451-016 in Appendix A.

Tiltmeters (Peat Movement):

The tilt sensors were electronic tiltmeters that were installed over the full depth of the peat to provide a continuous record of any downslope movement or creep in the peat at the sensor locations. A review was carried out of the instrumentation in January 2014, approximately 10 years after the slide had occurred on the site. With regard to the tilt-sensors it was concluded that:

- No movement has been recorded at the tilt-sensors that can be attributed to potential adverse peat movement;
- Where the tilt sensors appeared to have been operating satisfactorily (e.g. Turbine T2 and T18) they recorded little or no natural creep movement of the peat (<5-20mm), and minor movements are likely as a result of heavy rainfall or work in the area;
- A number of the tilt sensors had localised spikes and gaps in the readings over the years, which are likely as a result of the instruments malfunctioning (e.g. Tilt sensors at T34 and T49/50), and as such these instruments cannot be used to provide any meaningful measure of potential ground movement.

In summary, the tilt-sensors did not show any evidence of adverse peat movement. The creep and minor movements that were recorded were not unexpected and would be considered natural in an upland peat area. Where larger movements were recorded, these were generally related to spikes in data that were more indicative of the instruments malfunctioning. The instruments were decommissioned in 2014.

Piezometers (Groundwater Levels):

The piezometers were electronic vibrating-wire push-in piezometers that were installed with the tip of the piezometer at the base of the peat to provide a continuous record of daily and seasonal groundwater level fluctuations. Figure 5-3 shows the readings from the piezometers at T2, T18 and T34 up to November 2011. The readings from the piezometers at T49/T50 are not plotted because they malfunctioned after installation.

The short-term regular fluctuation in the data reflects seasonal fluctuations in groundwater level as well as changes in atmospheric pressure, which directly affect the water level readings as they are based on pressure. Nevertheless, the results indicate that, on average, between December 2005 and November 2011 the groundwater level in the peat gradually dropped by about 0.40m at Turbine T18 in the SW corner of the wind farm site, and by about 0.75m at T2 and T34 in the NW corner of the site and in the turbary plots at the east end of the site, respectively.

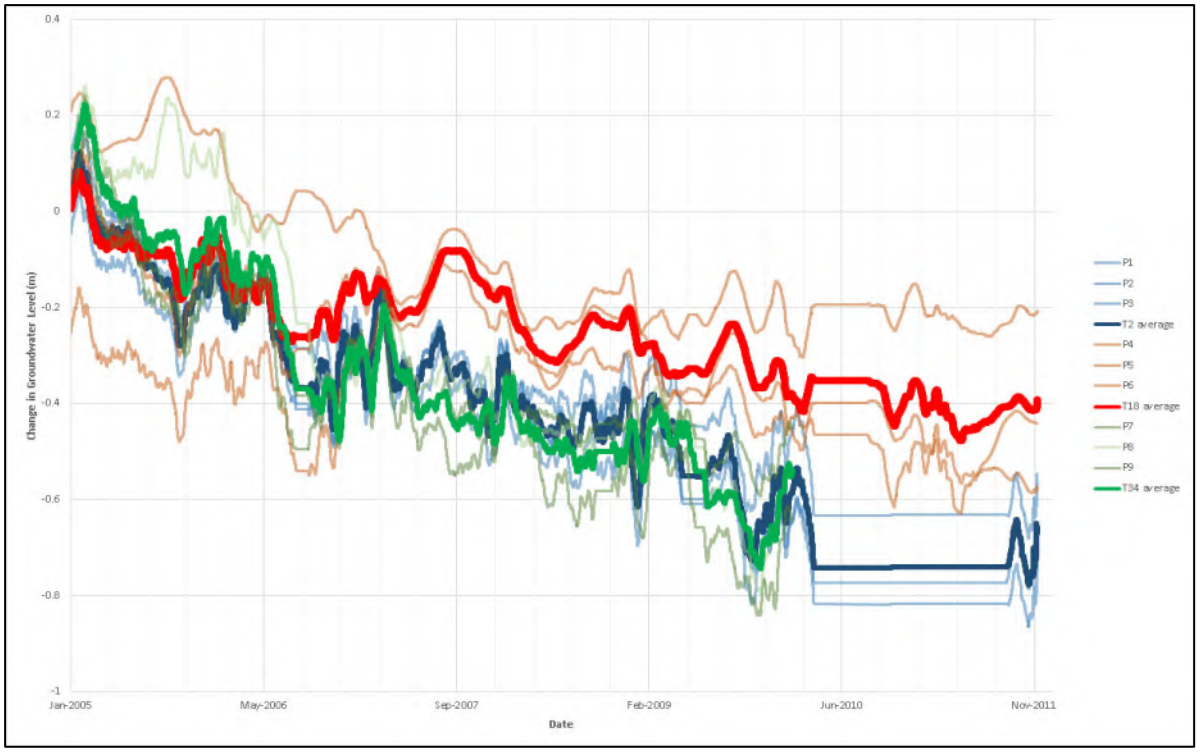


Figure 5-3 – Groundwater level readings from electronic piezometers at Turbines T2, T18 & T34

This level of groundwater lowering would not have occurred uniformly across the wind farm site. The permeability of the peat is low, therefore, the extent of drawdown from the shallow open drains would be limited to within a few meters of the drains rather than generally across the site. However, the new drains that were installed during construction would have increased the rate of surface runoff from the wind farm site, which would have reduced the rate of infiltration into the peat. Over time this has resulted in a gradual lowering of the groundwater levels on the site. The impact would be greatest on the steeper slopes at the downslope perimeter of the site, where the piezometers were located. Less drawdown would be expected at the upper levels of the wind farm and on the terraces of flat or gently sloping ground across the wind farm site where surface water accumulates.

During the operation and maintenance phase of the wind farm between 2005 and 2022, maintenance works were carried out to improve the performance and efficiency of the drainage network. However, the capacity of the system was not significantly increased and most of the works were completed by 2012. The groundwater levels in the piezometers had not stabilised fully by the end of 2011, but they did show a reduced rate of drawdown towards the end of the monitoring period.

It will take many years for the groundwater in the peat to stabilise at new equilibrium levels across the site. However, most of the major drainage works were completed during construction and during the maintenance period prior to 2012. Therefore, the majority of the groundwater lowering would have occurred by the end of 2022 and any further changes over the remaining design life of the wind farm should be minor. The piezometers were decommissioned in 2014.

5.3 Summary of Proof Testing carried out on roads in 2018

On the 17th July, 2018, a full-scale proof load test was carried out on all of the floating roads on the site under the supervision of Mr. Conor O'Donnell from AGL Consulting. The purpose of the test was to assess the performance of the upgraded roads in their existing condition and to verify the capacity of the roads to support the design maximum crane load. The results of the tests are presented in AGL Report No. 11-147-R05 in Appendix C.

The floating roads for Derrybrien Wind Farm were designed to support a 300 tonne Grove GMK6300 All-Terrain crane which has a travelling load of 72 tonnes over 6 axles (12 tonnes per axle). This is the maximum crane size that was previously used at Derrybrien to erect the turbines during construction.

The proof load test involved observing the performance of the floating roads under the weight of either a 95-tonne Liebherr LTM 1095-5.1 mobile crane or a fully-loaded Volvo A25D articulated dumper truck travelling steadily along the road at a speed of approximately 5 kph.

The majority of the roads were tested using the 95 tonne Liebherr LTM 1095-5.1 mobile crane with additional ballast to give a total load of 60 tonnes on 5 axles at a maximum load of 12 tonnes per axle. The axles are 2.75 m wide and the total wheel contact area is approximately 7.75 x 2.75m. This equates to a characteristic UDL of 27.6 kN/m^2, or 76 kN/m length of road.

The narrower turbary road along the east side of the site (T25 to T45) and the floating road between T27 and T44 were tested using a Volvo A25D articulated dump truck with a full payload capacity of granular rockfill to give a combined load of approximately 45.6 tonnes on 3 axles with axle loads of 14.1-15.7 tonnes over a wheel contact area of 6.45 x 2.86 m. This equates to a characteristic (unfactored) UDL of 24.2 kN/m^2, or 69 kN per metre length of road when travelling.

The loads applied to the floating road by the Grove GMK6300 All-Terrain crane are summarised on Table 5-1 along with the comparable loads from the 95 tonne Liebherr LTM 1095-5.1 mobile crane and the Volvo A25D articulated dump truck. The Liebherr LTM 1095-5.1 mobile crane and the Volvo A25D dump truck have a lower total mass than the Grove GMK 6300. However:

- The Leibherr LTM 1095-5.1 was loaded with extra ballast to give it the same axle load as the larger Grove GMK6300 crane (12 tonnes/axle);
- The Volvo A25D had a full payload of granular rockfill so that the axle loads were higher than the Grove GMK6300 crane (14.1-15.7 tonnes/axle);
- The load applied by the Volvo A25D and the Liebherr LTM 1095-5.1 per metre length of road were approximately 10-20% greater than the comparable load from the Grove GMK6300 with the larger wheel base.

The performance of the road is assessed based on the deflection of the road under the axle loads, and the bearing capacity of the road is a function of the load per meter length of road, which is distributed across the surface of the peat by the layers of geogrid reinforcement in the road (the "snowshoe effect"). Therefore, the loads from the Liebherr LTM 1095-5.1 and the Volvo A25D were sufficient to verify the performance and capacity of the floating roads across the site.

Table 5-1 - Truck/Crane Type used in Proof Load Test including pressure on floating road

	Grove GMK 6300	**Leibherr LTM 1095-5.1[Note 2]**	**Volvo A25D with 24 tonne payload**
Total Mass	72 tonnes	60 tonnes	45.6 tonnes
Axle Load	12 tonnes	12 tonnes	14.1/15.7 tonnes (Front/Rear)
Contact Wheel Base [Note 1]	11.1m x 3.0m	7.75m x 2.75m	6.45m x 2.86m
UDL on Floating Road	21.2 kN/m^2	27.6 kN/m^2	24.2 kN/m^2
Load/m Length of Road	63.6 kN/m	76 kN/m	69.3 kN/m

Notes:
1. Assumes 0.5m tyre contact length for Liebherr & Grove Cranes & 0.6m for Volvo A25 (23.5R25 tyres)
2. Carrying additional ballast

All of the floating roads were successfully proof tested for the design crane load without any indication of bearing failure or shear failure in the peat under the roads.

Similar to the tests that were carried out on the roads in 2011 and 2014, it was intended to classify the performance of the roads as “Good", "Fair" or "Poor" based on the criteria in Table 3-4, which was developed by AGL for testing the roads during construction. However, when the roads were tested in 2018 the majority of the roads performed exceptionally well, so that we have now classified the performance of the roads as “Very Good” under a new category that has been added to the criteria in Table 5-2.

Table 5-2 - Floating road performance criteria for full-scale serviceability load tests.

Road Performance Classification	Performance Criteria
Very Good	➢ Road deflects rigidly under crane/truck load with only slight deflections noticeable in some localised areas under the crane load. ➢ Road surface is even with no obvious rutting and no loose rockfill.
Good	➢ Road deflections generally <10 mm ➢ Road deflects relatively rigidly under truck load with only slightly greater deformation locally under the wheel load at localized soft spots. ➢ Road surface is even with minor rutting and no loose rockfill.
Fair	➢ Road deflections between 10 and 30 mm ➢ Road deflects noticeably under wheel loads ➢ Road surface is relatively even with some rutting along the line of the wheels. The rockfill is generally dense. ➢ Local transverse rutting occurs at soft spots where the rockfill has loosened over weak peat, or where there are gaps in the basal reinforcement trees.
Poor	➢ Road deflections are greater than 30 mm (up to about 60 mm) ➢ Road deforms very noticeably under wheel loads in wave-like motion. ➢ Deformations are uneven causing the truck to tilt slightly on local soft spots. ➢ Road surface is in poor condition with both longitudinal and transverse rutting creating an uneven road surface. ➢ Rockfill is loosened over worst areas.

The roads generally deflected rigidly under the axle loads from the mobile crane or Volvo dump truck, with only localised areas where slight deflections were observed. In the few areas where there was a more continuous stretch of road where slight deflections were noted under the applied axle loads, such as along the Turbary road between Turbines T34 and T43, the performance of the floating road has still been classified as “Good”.

It is considered that the noticeable improvement in the performance of the floating roads is largely due to the increase in strength and stiffness that has occurred in the underlying peat due to consolidation of the peat under the weight of the roads since they were constructed in 2005, and again under the weight of the additional capping layer that was placed on the sections of road that were upgraded in 2014. The additional layer of geogrid reinforcement placed in the upgraded roads would also have significantly improved the performance of the roads – stiffening them up and more effectively spreading the load out across the surface of the peat. This effect would also become more pronounced over time as the roads continued to settle into the peat so that the geogrids effectively become “post-tensioned”.

5.4 Existing Site Conditions - Summary of AGL Site Inspections

This section of the report gives a summary of AGL inspections of the peat repositories, the borrow pits, the site infrastructure adjacent to the slide, and the areas adjacent to turbines where local peat instability was noted during construction in 2004/2005.

5.4.1 Stability of site infrastructure adjacent to the Slide Area

On 17th July, 2018, Mr. Conor O'Donnell inspected the peat adjacent to the site access tracks in the slide area at Turbine T68 and T70 to determine whether there was a risk that further movement in the peat could impact the site access tracks. Photographs of the area are included in Appendices D & E.

After the slide in 2003, the sections of floating road that had originally been constructed as floating roads across the slide area at Turbines T68 and T70 were replaced with rockfill embankments supported on the glacial till below the peat. The embankments were constructed across the full width of the slide are so that, during construction, they acted as barrages to contain any disturbed or remoulded peat upslope from the roads. They were also not impacted by any further movement of the disturbed peat on the downslope side so that the roads were stable throughout construction. The floating roads to either side of the slide area were left in place. There have been no reported incidents of peat instability in the area since the slide occurred in 2003.

There is no evidence of further movement of the peat within and around the slide area in the vicinity of the site access tracks at Turbines T68 and T70. This is based on the survey records of movement at the monitoring points downslope from Turbines T70, as summarised in Section 5.2.1, and the following observations that were made by AGL on the characteristics of the peat within the slide area at Turbines T68 and T70:

- Groundwater flow has become concentrated into channels of surface runoff on the mineral soil or rock below the peat within the slide scar. This has significantly improved the drainage in the area, which has a positive impact on peat stability;
- Vegetation has re-established on the disturbed peat within the slide area, which improves the overall stability of the peat;
- Small trees on rafts of peat that had been deposited in the scar area showed continued growth with trunks rotated to vertical, indicating that the underlying rafts of peat have been stable for some time.
- Similarly, the peat along the edges of the slide adjacent to the floating road to either side of the rockfill embankment across the slide area at Turbines T68 and T70 does not show any signs of recent movement. There are no new tension cracks and the trees that tilted over on disturbed peat when the slide occurred have continued to grow with their trunks rotated to the vertical indicating that they have also been stable for some time.

The sections of floating roads to either side of the slide area at Turbines T68 and T70 were also successfully proof tested to 110-120% of the design crane load during the road tests in July 2018 without any indications of shear failure or bearing failure at the edges of the slide. Therefore, it is considered that the long-term impact of the slide on the site infrastructure is **negligible**.

5.4.2 Existing Condition and Stability of Peat Repositories

Over the course of the works in 2004 and 2005, AGL identified locations on flat or gently sloping slopes on the blanket bog (<3°) on the site which were suitable for the storage of up to 1.0 m of excavated peat from the site of the turbines, crane hardstanding areas, borrow pits, substation site and anemometer masts. A total of 32 No. peat repository sites were identified across the site, as listed in Table 5-3. They are numbered according to the closest turbine. Figure 3-17 shows the location of the repositories along with additional areas where peat was sidecast adjacent to the turbines prior to the peat slide.

AGL Report No. 11-147-R01 in Appendix F gives details of the supplemental investigations and stability analyses that were carried out by AGL and Ascon Ltd. (now BAM Civil) on each repository site listed in Table 5-3 to ensure that there was an acceptable margin of safety against peat failure under the surcharge loading from up to 1.0 m of excavated peat. Strict controls were implemented on site to control the depth of peat and the way in which it was handled and spread out evenly over the ground to ensure that there were no concentrated loads. All of the peat that was excavated on the site by BAM after the slide was successfully deposited and stored in the peat repositories that were certified by AGL without any further incidents of peat instability.

Table 5-3 - List of peat repositories that were analysed and certified by AGL during construction

T6R	T24-25R	T47R	T56-57R
T7R	T27R	T48R	T57R
T8R	T30R	T49R	T58R
T10R	T33R	T50R	T59R
T11R	T36R	T51R	T60R
T12R	T39R	T53R	T62R
T14R	T43R	T54R	T65R
T24R	T46R	T55R	T68R

On 22nd October, 2018, Ms. Niamh Farrell of AGL Consulting, inspected each of these repositories to confirm that there was still no evidence of peat instability 13 years after construction was completed on the site. No peat has been placed in the repositories since that time. Drainage improvements were carried out at some of the repositories between 2005 and 2011 to prevent surface water ponding, as detailed in the site maintenance records. Photographs of the repositories from th 20218 inspection are included in Appendix D. The repositories were inspected again in January 2024 by Mr. Conor O'Donnell of AGL Consulting. Photographs from that inspection are included in Appendix E.

The highest risk of a peat slide from the surcharge applied in the peat repository was at the time that the peat was placed in the repository during construction (i.e. the short-term undrained condition). Over time the underlying peat would have consolidated and increased in shear strength, reducing the likelihood of a peat failure.

This was confirmed by the site inspections in 2018 and 2024. There was no evidence of movement or peat instability in the peat repositories. The excavated peat has settled into the slope and vegetation has re-established on the surface of the repository sites, in some cases making them difficult to distinguish from the surrounding ground. The surface of the excavated peat has dried out making it safe to walk on.

5.4.3 Borrow Pits

Three borrow pits were opened up on site over the course of the works. The location of these is identified in Figure 5-4. Figure 5-5, Figure 5-6 and Figure 5-7 show aerial photos of the pits from 2015. The borrow pits were inspected by Ms. Niamh Farrell of AGL Consulting on the 22nd October, 2018, and by Mr. Conor O'Donnell on the 17th January 2024. Representative photographs from the inspections are included in Appendices D & E.

Borrow Pit BP-1 was developed during Phase 1 of construction, prior to the slide in 2003, in an area of shallow peat adjacent to Turbine T24. Peat was stripped off the site and the underlying glacial till and weathered rock was excavated for re-use as backfill material over the turbine foundations. No rock blasting was carried out in the borrow pit and it was largely inactive during Phase II of the works in 2004/2005, after the slide. The area was reinstated prior to completion of the works on site.

Photos D90 to D91 in Appendix D and Photo E45 in Appendix E show the current condition of the borrow pit. The area has been reinstated and blanket bog vegetation and some small trees have become established on the ground. There are no issues with regard to peat stability in the area.

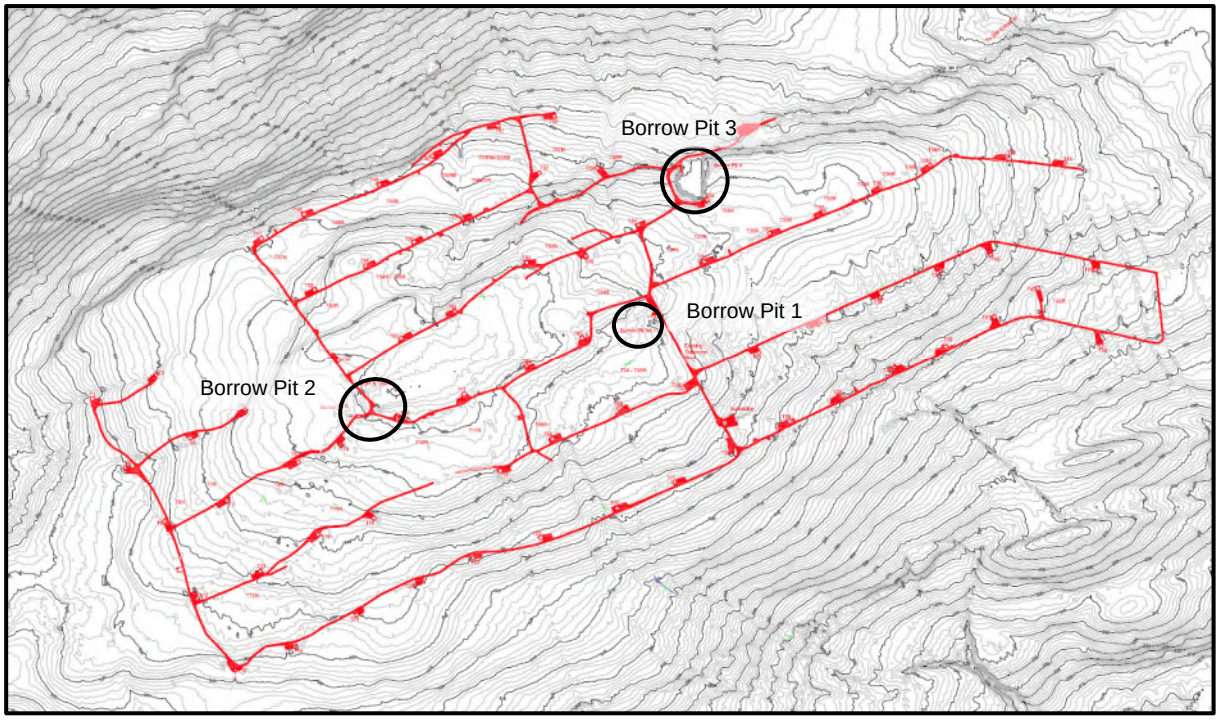


Figure 5-4 - Location of borrow pits on the site

Figure 5-5 - Borrow Pit BP-1 (Google Earth 16th April 2020)

Figure 5-6 - Borrow Pit BP-2 (Google Earth 16th April 2020)

Figure 5-7 - Borrow Pit BP-3 (Google Earth 16th April 2020)

Borrow Pit BP-2 was developed during Phase 1 of construction, prior to the slide in 2003, in an area of shallow and outcropping rock on the west side of the site between Turbines T9 and T10. Shallow peat was initially stripped from the site and mineral soil and rock were extracted for use as backfill material for the turbines and for road construction. All of the rock was extracted by mechanical excavators and rock breakers. No blasting was carried out in the pit.

The area was largely inactive during Phase 2 of the works in 2004/2005. However, in 2005 the pit was used as a repository site for excess peat from the excavations for the turbine foundations and crane hardstandings. Bunds of mineral soil were constructed around the perimeter of the borrow pit so that the remoulded peat was fully contained within the pit with a negligible risk of a flow slide. The area was fenced off as a health and safety measure to prevent access to site.

Photos D92 to D95 in Appendix D and Photos E25 to E27 in Appendix E show the current condition of the borrow pit. The surface of the peat has now dried out and blanket bog vegetation has become established on the peat so that is possible to walk on the surface. Some water is ponding on the surface on the east side. However, the peat is fully contained within rockfill bunds there are no issues with regard to peat stability in the area.

Borrow Pit BP-3 near the site compound on the north side of Turbine T65 was the main pit used to extract rock on the site for the construction of the site access tracks and hardstanding areas. An existing small borrow pit in this area prior to construction of the wind farm was extended and deepened to extract and process rock for the construction of the access roads and crane hardstanding areas on the site. Rock blasting was carried out in the borrow pit during the initial phase of construction in 2003 as well as during Phase 2 of the works in 2004/2005. No peat failures occurred on the site as a result of the blast induced vibrations (see Section 3.3.3.8). As a risk mitigation measure glacial till excavated from the borrow pit was used to construct a berm to support the peat at the top of the rock face around the perimeter of the borrow pit to prevent a localised peat slide inundating the pit.

Sections of the borrow pit were also used as bunded peat repository sites as shown in Figure 5-7 The peat stored on the east side of the borrow pit was most likely excavated from the site of the borrow pit as it was expanded. The peat on the west side was excess peat from the excavations for the turbines and crane hardstandings on the site. In both areas the peat is fully contained within rockfill and mineral soil bunds so that there is a negligible risk of a flow slide. The areas have also been fenced off to restrict access as a health and safety consideration and soft ground warning signs have been erected around the perimeter.

Photos D96 and D97 in Appendix D and Photos E1 to E3 in Appendix E show the current condition of the borrow pit. The natural groundwater level was reinstated inside the borrow pit on completion of construction so that the pit is flooded. The water level has not risen above the level of the access road. There is no indication of peat instability in the bunded peat repositories at the sides of the borrow pit. Therefore, there is a negligible risk of peat instability in the area.

5.4.4 Other areas where local peat instability was noted during construction

As discussed in Section 3.2.6.1, Applied Ground Engineering Consultants Ltd. (AGEC) carried out a geotechnical appraisal of the site after the peat slide of October 2003. Their final report (AGEC, 2004) includes a summary of the areas where arisings from the turbine foundation excavations had been sidecast on the peat adjacent to the excavations prior to the slide. It also included a summary of areas where there was evidence of local bearing capacity problems and shear failure in the peat.

The majority of the sidecast areas [35 No. (90%)] were stable with only minor slumping or localised flow of the excavated material, in some cases blocking drains on the site.

At 3 No. turbine bases (Turbines T23, T29 and T66) there was a bearing capacity failure in the intact peat under the weight of the sidecast material. At each of these turbines the arisings from the foundation excavation were placed along the edge of the forest on the downslope side of the turbine and floating road. Turbines T23 and T29 are located along the southern boundary of the site. The bearing capacity failure at these turbines occurred in relatively shallow peat (1.0-1.5m deep) on gently sloping ground (2-4°). Turbine T66 is located near the centre of the site, 250 m upslope from Turbine T68 where the large peat slide occurred in October 2003. At T66 the excavated material was placed in peat up to 2.8 m deep on slopes of 3-5°.

At Turbine T17, there was a shear failure in the peat under the sidecast arisings which gave rise to a localised peat slide over an area of about 22m x 90m approximately 10 m east of the turbine on the south side of the floating road. The peat debris flowed downslope over a distance of about 45m.

Tension cracks were also observed in the peat at Turbine T66 on the upslope side of the turbine and crane hardstanding on completion of the works.

The impact of these peat failures on soils, geology and land has been assessed in Section 3.2.6.1. All of the failures were small scale or localised failures that were contained within the degraded blanket bog and coniferous forests on the wind farm site. Therefore, in each area the effect on the peat was **Low** and only **Slightly Significant** relative to the baseline conditions on the site in 1998, prior to construction.

Each of these areas was inspected by Mr. Conor O'Donnell of AGL Consulting in 2004 and again on 17th July, 2018 for this report. Representative photographs of each area from the 2018 inspection are included in Appendix D. In all areas there was no evidence of further peat instability or a deterioration in the stability of the peat under the arisings since construction was completed 13 years ago. Some of all of the arisings had been removed during construction to unload the peat slopes.

The localised peat slide that occurred adjacent to Turbine T17 was contained on site and the peat has run out on the slopes downslope from the slide area. There is no evidence of further peat movement in the area. It has become re-vegetated and has been stable in its current condition since the slide occurred in 2003. Therefore, at this stage the probability of further instability in the area over the remaining operational life of the wind farm should be **negligible**.

Where there were areas of localised bearing capacity failure under arisings adjacent to Turbines T23, T29 and T66 the risk of a peat slide under the weight of the spoil would have been greatest during the construction stage of the work in 2003, when the arising were first placed on the peat. Over time the peat would have gained strength as it consolidated under the weight of the additional fill. There is no evidence of any recent movement or peat instability in these areas, such as new tension cracks or recent movement in the peat or trees. Therefore, at this stage the probability of further peat instability as a result of the arisings over the remaining operation life of the wind farm should be **negligible**.

The tension cracks that were observed on the upslope side of Turbine T66 were likely caused as a result of local shear failure in the peat around the excavation for the turbine and crane hardstanding in the area during construction. The cracks have become vegetated over and do not show any signs of recent movement. Also, the turbine and crane hardstanding are constructed on the glacial till and rock downslope from the area where the tension cracks were observed. Therefore, they will act as a shear key to prevent any further movement in the peat so that at this stage the probability of further peat instability in the area over the remaining operation life of the wind farm should be **negligible**.

In each area the vegetation on the peat has regenerated. However, the original damage to the peat is still evident and degradation of the disturbed peat exposed in the failed areas would still be ongoing due to decomposition, particularly at Turbine T17. Therefore, the significance of the effect of the original failures on the peat is still **Slightly Significant** relative to the baseline conditions on the site.

5.5 Stability Impacts which are Occurring

The significant effects of stability impacts from the construction, operation and maintenance stages of the wind farm from 2003 to 2022 that are still occurring at the end of Q2 2024 are related to:

- Surcharge loading on the peat from the floating roads, material sidecast areas and peat repository sites that were left in place at the end of construction; and
- Groundwater lowering due to drainage improvements

5.5.1 Surcharge loading on the peat

During construction, dead load surcharges were applied to the intact peat slopes from:

- the construction of the floating roads;
- the sidecasting of peat and glacial till excavated from the turbine foundations that were completed prior to the peat slide; and
- the controlled disposal of up to 1.0 m of peat excavated from the site of the remaining turbines, crane hardstanding areas, substation and anemometers in designated peat repository areas after the peat slide.

The initial loading on the intact peat slopes from the floating roads and material sidecast areas was assessed as having a **Significant** effect on the peat with regard to site stability for the construction stage of the project (Section 3.2.6.1).

No peat failures occurred during the construction of the floating roads. However, the large peat slide on the 16th October 2003 occurred as material excavated from the foundation for Turbine T68 was being sidecast on the slopes downslope from the turbine. There was also a small scale peat slide where material was sidecast on the slopes adjacent to Turbine T17, and local bearing failure was noted in the peat under the excavated material that was sidecast at Turbines T23, T29 and T66.

During the second phase of construction in 2004/2005, after the peat slide, strict controls were implemented in the selection and usage of the peat repository areas for disposing of peat excavated from the site. Therefore, the peat repository areas were assessed as having a **Slightly Significant** effect on peat stability and no peat failures occurred as a result of the loading (Section 3.2.6.3).

With the exception of the sidecast areas at T18, T34, T23, T29 and T66, where some of the material was removed due to concerns with the local bearing failure in the peat, all of the remaining dead load surcharges from the floating roads, material sidecast areas and peat repository sites were left in place at the end of construction as a permanent and sustained load on the intact peat slopes. The dead load surcharge on the floating roads was increased slightly where they were upgraded with an additional 150mm thick layer of capping material in 2014.

The effect of these dead load surcharges on the peat would therefore still be occurring at the end of Q2 2020. However, the highest risk for peat instability under the surcharge loads was in the short-term undrained condition at the time that the material was placed on the slopes during construction. Over time, the undrained shear strength of the underlying peat increased as it consolidated and compressed under the applied loads, which has significantly reduced the probability of a peat slide occurring. The increase in shear strength that occurs in cohesive soils such as peat when they are consolidated under an increased load is an established engineering principle and it was verified by in-situ testing in the peat under the floating roads on the site. Full scale proof load testing was also carried out on all of the floating roads to verify their capacity and performance under the design crane loads.

By the end of 2024 primary consolidation of the peat would be complete under the existing dead load surcharge of the floating roads, material sidecast areas and peat repositories that were stable and intact at the end of construction, including the additional load on the floating roads from the 2014 upgrade programme. Therefore, with the corresponding increase in undrained shear strength in the underlying peat, the probability of a peat slide occurring under the surcharge loads has reduced to **Negligible,** so that by now the effect of the surcharge on the peat with regard to site stability is **Not Significant**.

This does not represent a change in the baseline condition of the receiving environment. In the assessment there is no change to the possible extent of a peat slide or the baseline sensitivity of the receiving soils, geology and land that could be impacted by a slide, which has been assessed as **Medium** based on the site conditions in 1998, prior to construction.

5.5.2 Drainage improvements in the peat

As discussed in Section 3.2.10, poor drainage is a recognised contributory risk factor for peat instability as it can lead to elevated hydrostatic uplift pressures below the peat, or hydraulic surcharge pressures in the existing drainage network of pipes and seepage channels within the peat during periods of heavy or sustained rainfall. The improved drainage that was implemented on site during construction has had a positive impact on the peat with respect to site stability by relieving ponded groundwater and increasing surface runoff in areas where the drains were installed, and by lowering the groundwater levels in the peat in the medium to long-term. The effect of this was to reduce the groundwater pressures in the peat, particularly during or after periods of sustained or heavy rainfall, thereby reducing the risk of a peat slide on the site.

In the medium to long-term, improved drainage would also have increased the shear strength of the peat where the groundwater table was lowered, which has also had a positive impact on the peat with respect to site stability. Wherever the groundwater table was lowered buoyancy (uplift) forces in the peat were reduced. This would have caused the peat to consolidate (compress) under its own self-weight, which has increased its shear strength, similar to the effect of a surcharge load. The peat above the lowered water table would also have increased in strength as it dried out.

The drains were left in place at the end of construction. Therefore, the impact of the drainage improvements is **Permanent** and **Sustained**. As discussed in Section 5.2.2, the majority of the groundwater lowering would have occurred by the end of 2024 and any further changes would be expected to be minor. However, relative to the baseline conditions on the site in 1998, prior to construction, the corresponding effect of the drainage improvements on the stability of the peat is **Medium** and **Moderately Significant**. None of the drains have been blocked or infilled since construction and the efficiency and capacity of the existing drainage network has been maintained on site. Therefore, the effect would still be occurring on the site at the end of 2024.

5.5.3 Turbine Foundations & Crane Hardstandings

The reinforced concrete turbine foundations are supported on rock below the peat and glacial till so that they do not apply any load on the peat. Similarly, the hardstanding areas adjacent to the turbines are constructed of crushed rock granular fill supported on the glacial till or rock below the peat. Therefore, the foundations and hardstanding areas will act as a shear key preventing shear failure in the peat directly upslope from them, which is a positive impact with respect to site stability. The effect of the support they provide is **Slightly Significant**.

5.6 Updated Peat Stability Risk Assessment (PSRA) to take into account improvements in site conditions up to 2024.

The results of the Peat Stability Risk Assessment (PSRA) in Section 3.4 have been reviewed here to re-assess the likelihood of a peat slide on the site in 2024 to account for improvements in site conditions since the end of construction in 2005, and also to take account of the measures that have been taken to mitigate stability impacts of activities that are likely to be carried out on the site for the remaining operational life of the wind farm and during decommissioning.

The results of the updated PSRA are presented in Table 5-4 and Figure 5-8. With the improved conditions on the site in 2024 and with appropriate measures to mitigate stability impacts of site activities, it should be possible to reduce the **Likelihood** of Occurrence, **L**, of a peat slide to **1 (Negligible)** in all 70 zones across the site. This is based on:

- The drainage improvements and infrastructure upgrade works carried out on the site between 2005 and 2024;
- The improved performance of the floating roads during the full-scale proof testing for the design crane load in 2018;
- The inspections of the peat repository sites, borrow pits and site infrastructure adjacent to the slide area carried out by AGL in 2018 and 2024;
- The anticipated scope of site activities expected to occur over the remaining design life of the wind farm, including decommissioning; and
- The mitigation measures that have been adopted for similar activities on the wind farm to date, which have been incorporated into the standard operating procedures on the site.

Due to the sensitivity of the receiving environment and the potential scale and characteristics of a peat slide, we have conservatively assumed that the **Impact** of a peat slide would remain the same (**I=5**) even after the mitigation measures have been implemented. Therefore, with appropriate implementation of the monitoring and risk mitigation measures the Risk Rating for all 70 zones across the site reduces to **Low (R = 5).** This would be classified as **Trivial** which is acceptable with **Monitoring** during the remaining operational life of the wind farm and during decommissioning.

As stated in Section 5.5, this does not represent a change in the baseline condition of the receiving environment. In assessing stability impacts of site activities on soils, geology and land during the remaining operational life of the wind farm and during decommissioning, the improved conditions and mitigation measure reduce the *effect* of stability impacts because of the reduced probability of a peat slide occurring at this stage of the project. However, in assessing the *significance* of the effects the possible extent of a peat slide and the baseline sensitivity of the receiving soils, geology and land that could be impacted by a slide are still based on the site conditions in 1998, prior to construction.

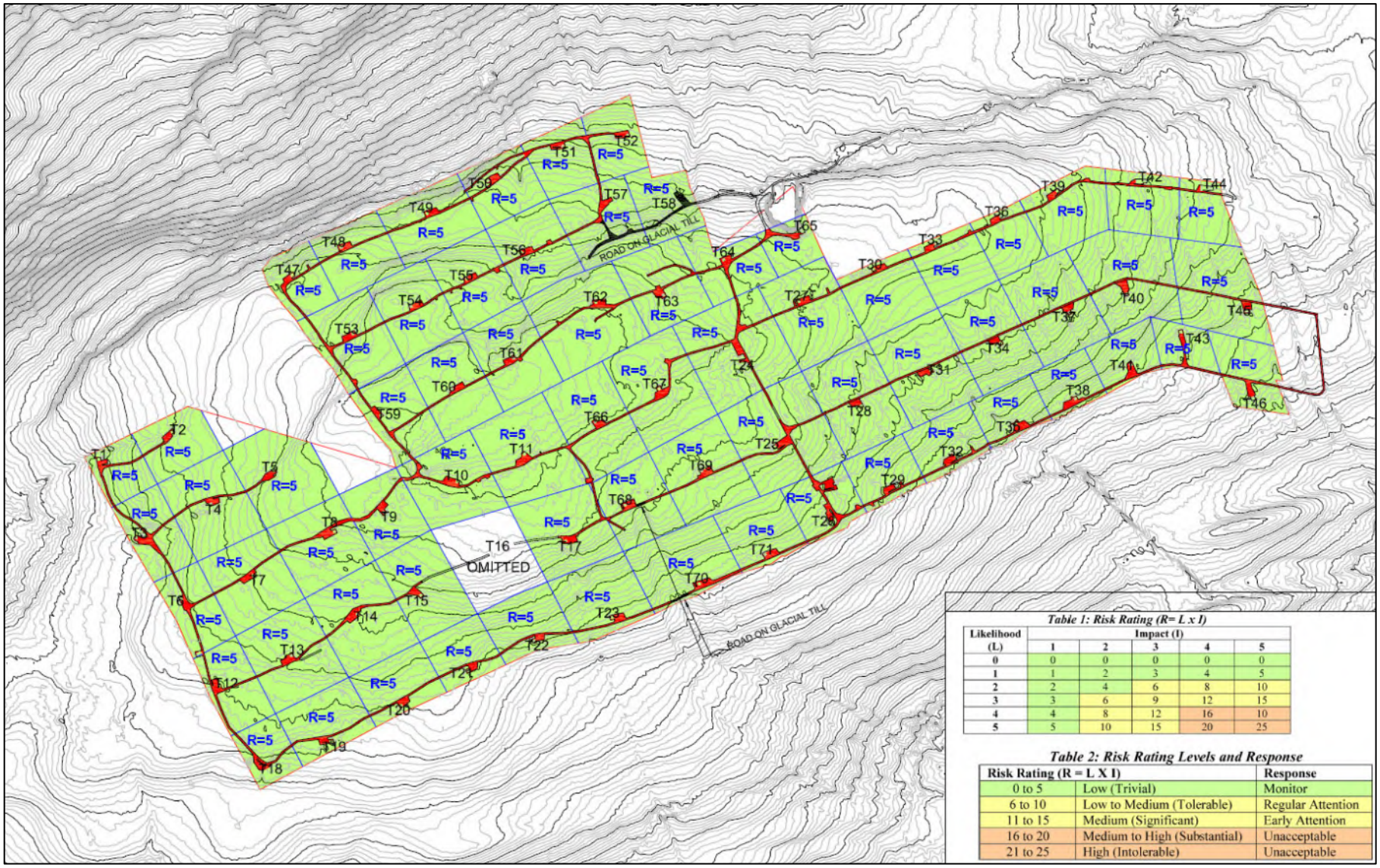


Figure 5-8: Updated PSRA for Site Activities during Decommissioning with Appropriate Mitigation Measures

Table 5-4: Updated Peat Stability Risk Rating for Site Activities during Decommissioning with Appropriate Mitigation Measures

							Risk Rating After Mitigation Measures for Site Activities 2005 to 2020					Updated Baseline Risk Rating for Site Activities 2020 to Decommissioning				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T01	15	15	15	10	10	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T02	15	20	10	10	10	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T03	15	15	20	10	10	70	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T04	20	10	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T05	15	10	10	10	15	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T06	20	15	10	5	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T07	20	5	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T08	20	10	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T09	20	5	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T10	10	5	5	5	10	35	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T11	20	5	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T12	20	15	15	10	5	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T13	20	10	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T14	20	10	15	10	10	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T15	20	10	15	10	15	70	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T16	Turbine Ommitted at Construction Stage															
T17	20	20	15	10	20	85	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T18	15	15	15	15	5	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T19	20	15	5	10	15	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T20	20	10	5	10	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T21	20	20	15	10	20	85	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T22	15	20	10	15	20	80	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T23	15	20	15	10	20	80	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T24	15	5	10	10	10	50	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T25	15	15	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T26	15	15	15	5	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T27	20	5	10	10	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T28	15	15	10	10	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T29	10	15	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T30	15	5	5	5	10	40	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T31	20	15	10	15	10	70	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T32	10	15	10	10	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T33	20	5	5	5	5	40	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T34	15	20	5	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T35	10	15	10	10	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor

Table 5-4 (Contd.) – Updated Peat Stability Risk Rating for Site Activities during Decommissioning with Appropriate Mitigation Measures

							Risk Rating After Mitigation Measures for Site Activities 2005 to 2020					Updated Baseline Risk Rating for Site Activities 2020 to Decommissioning				
Turbine No.	Peat/Subsoil	Topography	Hydrology	FoS	Contributary Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response	Hazard Likelihood (L)	Impact (I)	Risk Rating (R = L x I)	Risk Classification	Response
T36	20	10	0	10	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T37	10	15	5	5	10	45	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T38	5	10	5	5	5	30	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T39	15	10	10	5	5	45	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T40	10	15	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T41	10	10	10	10	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T42	15	10	10	5	5	45	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T43	10	10	0	5	10	35	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T44	10	5	5	10	10	40	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T45	10	10	10	5	10	45	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T46	15	15	10	10	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T47	15	20	15	10	10	70	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T48	20	20	15	10	10	75	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T49	20	20	20	10	10	80	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T50	20	20	20	10	10	80	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T51	20	20	20	10	10	80	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T52	10	20	10	10	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T53	20	10	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T54	20	10	20	5	10	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T55	20	15	15	5	10	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T56	20	10	15	10	10	65	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T57	10	15	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T58	10	15	5	5	10	45	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T59	15	5	10	10	5	45	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T60	20	20	10	20	15	85	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T61	20	20	15	15	15	85	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T62	20	20	15	15	15	85	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T63	20	10	10	10	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T64	20	10	10	10	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T65	15	10	10	5	10	50	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T66	20	15	10	5	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T67	15	15	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T68	20	20	15	15	20	90	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T69	20	10	10	5	10	55	1	5	5	Low	Monitor	1	5	5	Low	Monitor
T70	15	20	15	10	20	80	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor
T71	15	15	15	5	10	60	2	5	10	Low to Medium	Regular Attention	1	5	5	Low	Monitor

6.0 STABILITY IMPACTS – DECOMMISSIONING STAGE

6.1 Site Activities – Decommissioning of Wind Farm

Commercial operations at Derrybrien Wind Farm ceased in February 2022 after An Bord Pleanala refused substitute consent for the wind farm. The turbines were turned off and the blades were feathered to the wind to reduce the wind loads on the turbines and foundations. All the wind farm infrastructure was temporarily left in place and only essential maintenance has been carried out on the turbines since then. No other wind farm related activities have been carried out on the site since commercial operations ceased.

It is now proposed to fully decommission the wind farm in 2025. In terms of both site stability and environmental protection it is considered that minimal decommissioning works is the best approach for the Derrybrien wind farm site. Therefore, the decommissioning plan will entail the following:

- De-energising the site by initially disconnecting the high voltage (HV) lines at the substation, followed by low voltage (LV) disconnection at each of the turbines as well as the 110kV OHL for the grid connection;
- Temporary widening of the narrow sections of the site access tracks in the turbary area and at selected junctions to provide safe access for mobile cranes to the turbines;
- Controlled dismantling of the turbine blades, nacelle and masts. The decommissioned components will be removed from the site for re-cycling, disposal or re-use elsewhere;
- Removal of the sub-station and associated buildings-including removal of all the electrical transmission components, capacitors, transformer, concrete plinths, control building and foundations;
- Controlled dismantling and removal of the steel lattice tower and timber twin polesets for the 110kV Overhead Line (OHL); and
- Dismantling of the steel lattice towers for the anemometers.

The following elements of the wind farm will be left in place in their final configuration after decommissioning:

- The reinforced concrete bases for the turbines and anemometer masts.
- All of the site access tracks including the floating roads on the peat;
- The crane hardstanding areas adjacent to the turbines;
- The hardstanding area for the substation and control building;
- All of the de-energised and disconnected LV electrical cables and fibre-optic cables that are direct-buried in the peat between the turbines and in ducts below the roads;
- The construction phase peat repository sites and material sidecast areas;
- The construction phase borrow pits, and
- The site drainage network.

The turbine blades, nacelles and masts will be dismantled down to the bolted connection to the reinforced concrete pedestal at the top of the pad foundation using large mobile cranes operating on the adjacent crane hardstanding areas. The hardstanding areas are constructed of crushed rockfill down to the glacial till or rock below the peat. Where necessary, steel plates will be used to reduce the bearing pressure under the crane outrigger pads to prevent localised bearing failure under high concentrated loads. The reinforced concrete pad foundations and pedestals will be left in place below ground level.

The steel lattice towers for the anemometers and the substation control buildings, transformer, electrical transmission components and reinforced concrete plinths will also be dismantled and demolished from the surrounding granular hardstanding areas so that there will be no loading on the peat.

The mobile cranes that will be used to dismantle the turbines and substation will be required to travel on the floating roads across the site. It is anticipated that a larger 250 or 300 tonne mobile crane will be required for dismantling the turbines and substation transformer. The design crane for the site is the Grove GMK6300 mobile crane, which was the type of crane that was used to erect the turbines during construction. The crane has a 300-tonne lifting capacity and a travelling weight of 72 tonnes spread out over 6 axles at a maximum load of 12 tonnes per axle, as shown on Figure 3-32.

In July 2018 full-scale proof load tests were successfully carried out on all the floating roads on the site to verify the capacity and performance of the roads for the design crane load, as described in Section 5.3. A copy of the test report (AGL Report No. 11-147-R05) is included in Appendix C.

The majority of the roads were tested using a 95 tonne Liebherr LTM 1095-5.1 mobile crane loaded with additional ballast to give an equivalent axle load of 12 tonnes per axle on 5-axles. The total crane load per unit length of road also exceeded the design load for the Grove GMK6300 all-terrain crane, as shown on Table 5-1.

The narrower turbary roads along the east side of the site (T25 to T45) and the floating road between T27 and T44 were tested using a Volvo A25D articulated dump truck with a full payload capacity of granular rockfill to give a combined load that also exceeded the design load for the Grove GMK6300 all-terrain crane, as shown on Table 5-1.

The floating roads performed very well during the tests and the test loads exceeded the concentration of loading from the 300 tonne Grove GMK6300 crane. Therefore, the capacity and performance of the floating roads has been verified for the maximum crane size that will be used for decommissioning.

The floating roads will also be used by specialist low-loader transporter vehicles to remove oversized or heavy components from the turbines and substation. The heaviest component that was brought to site during construction was the substation transformer, which, along with the transporter, had a combined weight of 130 tonnes spread out over 12 axles at a maximum load of 12 tonnes per axle, as shown in Figure 6-1.

The highest load concentration was under the trailer carrying the transformer, which had a combined load of 96 tonnes over a wheel contact area of 18.5 x 3.0m = 55.0m^2. This equates to a characteristic UDL of 17.1 kN/m^2, or 51.4 kN/m length of road, which is less than the concentration of the design load from the 300 tonne Grove GMK6300 crane and within the capacity proven by the full-scale proof tests carried out on the roads in July 2018.

The transformer will be taken off site using a similar low-loader transporter to the one that was used to bring it to the substation during construction. It will also follow the same direct route between the substation and the site entrance (Figure 3-33), which has proven capacity to support the loads. Special precautions will be taken to ensure that the 28.5 m long vehicle can safely navigate along the roads without going off the road.

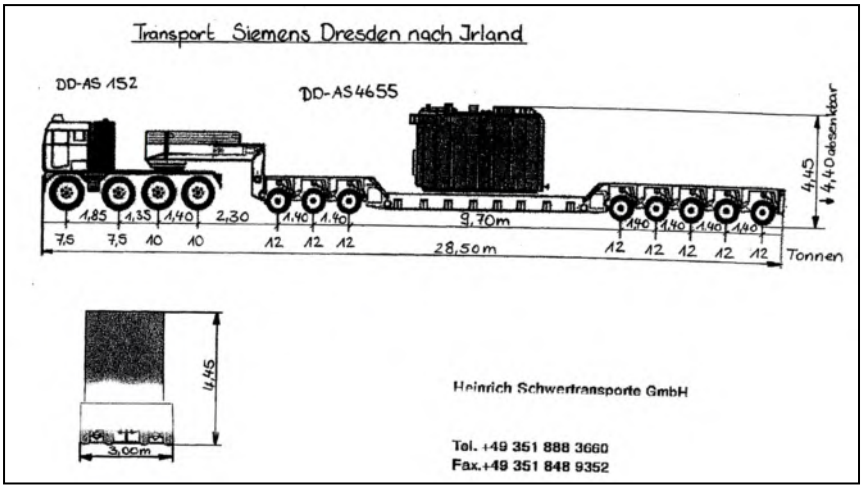


Figure 6-1 – Load of Transformer and Low-Loader Transporter

Where necessary, narrow sections of the turbary road between Turbines T35 and T45 and between T43 and T46 will be temporarily widened by about 1.0-1.5m to provide safe access to the turbines for the Grove GMK6300 mobile crane during decommissioning. A typical detail for the temporary road widening is shown in Figure 6-2. It will involve capping and widening the existing floating road to a minimum width of 4.5m with a 150-300mm thick layer of Class 6F2 crushed rock granular fill reinforced with two layers of geogrid and surfaced with a 100mm thick layer of Clause 804 granular subbase material. Timber bog mats will initially be laid on the surface of the peat along the widened side of the roads to spread out the loads from the mobile cranes and granular capping/subbase layers. Geogrid reinforcement will be laid continuously across the full width of the road and will be designed with a wraparound detail at the edge of the road to reduce deflections under the concentrated wheel loads. Where necessary the peat under the widened section of the road will be trimmed down to ensure that the finished surface of the road has a uniform profile across the full width. The intact peat turves will be retained for reinstatement on completion of the decommissioning works.

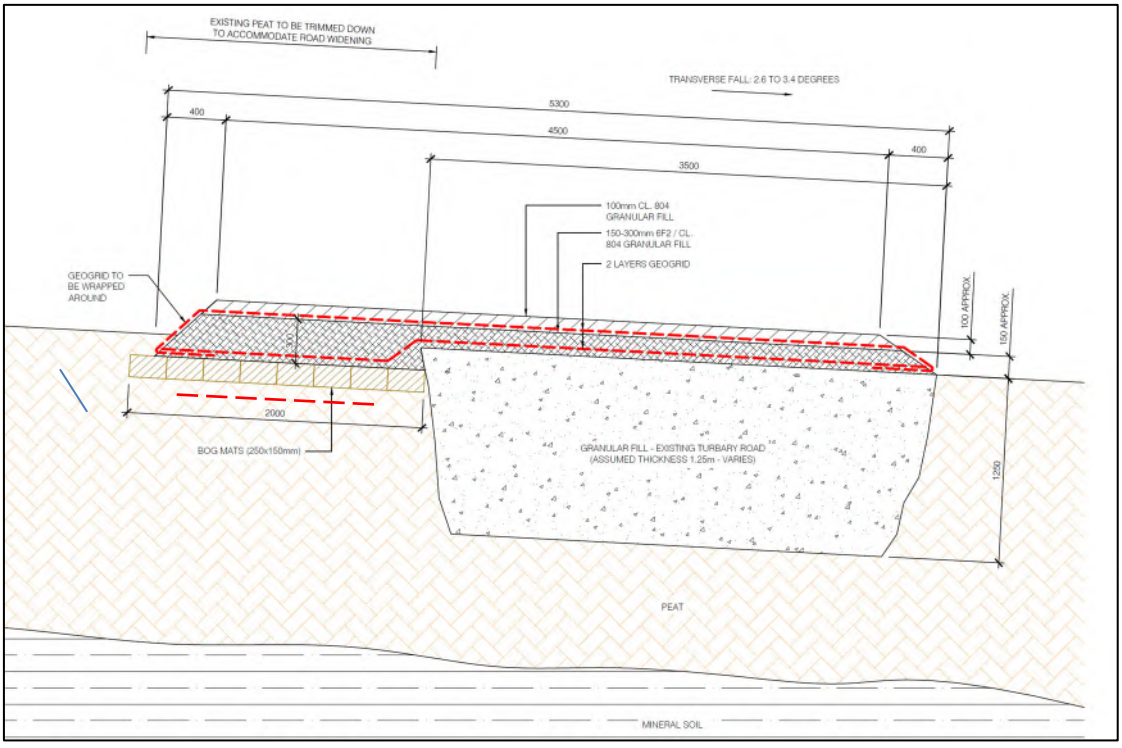


Figure 6-2 – Typical temporary road widening detail.

Wherever possible the road will be widened on the upslope side. This will reduce the likelihood of peat instability compared to widening on the downslope side because the peat under the existing road has compressed under the weight of the fill giving it a higher strength and a greater resistance to shear failure than the virgin peat downslope from the road.

Some minor works will also be required on the existing roads at 4 No. locations to provide the necessary width and turning space for the vehicles that will be required to transport the turbine components off the site, as shown in Figure 6-3 to Figure 6-6 i.e.:

- Widening up to 2.5m at the bend of the T-junction to the west of Turbine T68 (Figure 6-3);
- Widening the approach road and hardstanding area at Turbine T14 by 1.5-2.0m (Figure 6-4);
- Providing an 8.9m long x 4.6m wide spur to increase the length of the hardstanding at T4 for reversing vehicles (Figure 6-5); and
- Widening the access road on the approach to Turbine T1 by 0.5m (Figure 6-6).

With the exception of the spur extension to the hardstanding at T4, the junction and road widening works would use a similar detail to that shown for the temporary road widening on Figure 6-2.

The spur extension to the hardstanding at Turbine T4 will be constructed as a floating road comprised of 600mm of crushed rock granular fill reinforced with two layers of geogrids.

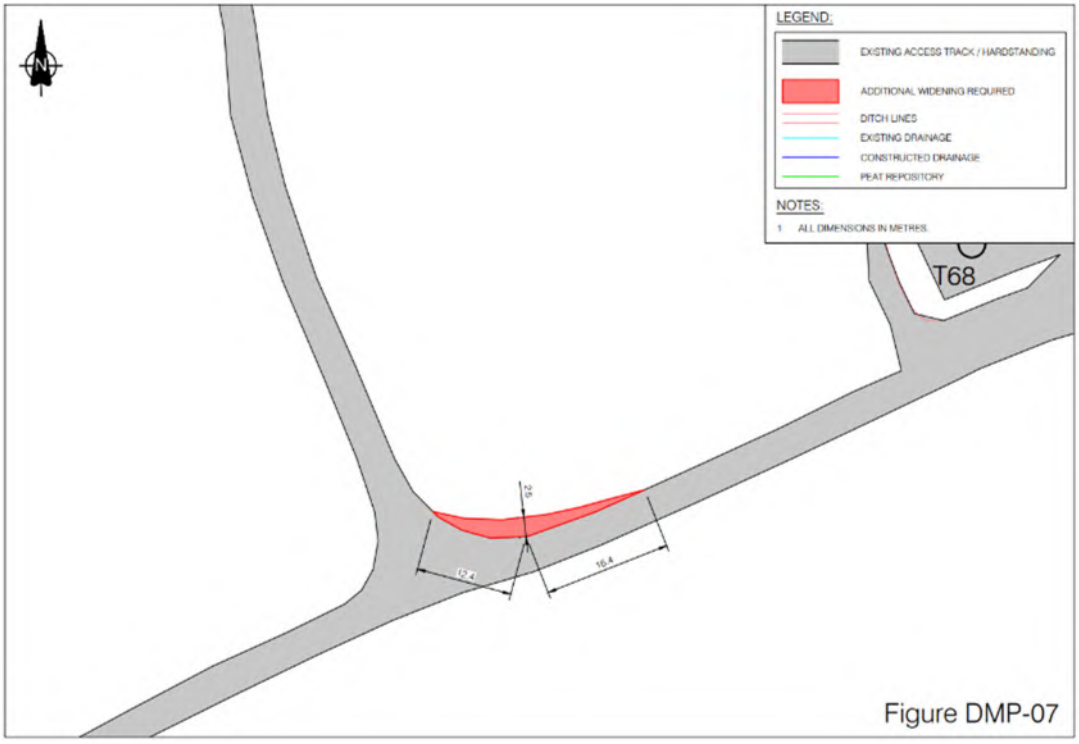


Figure 6-3 Proposed minor road widening works at Turbine T68 for decommissioning.

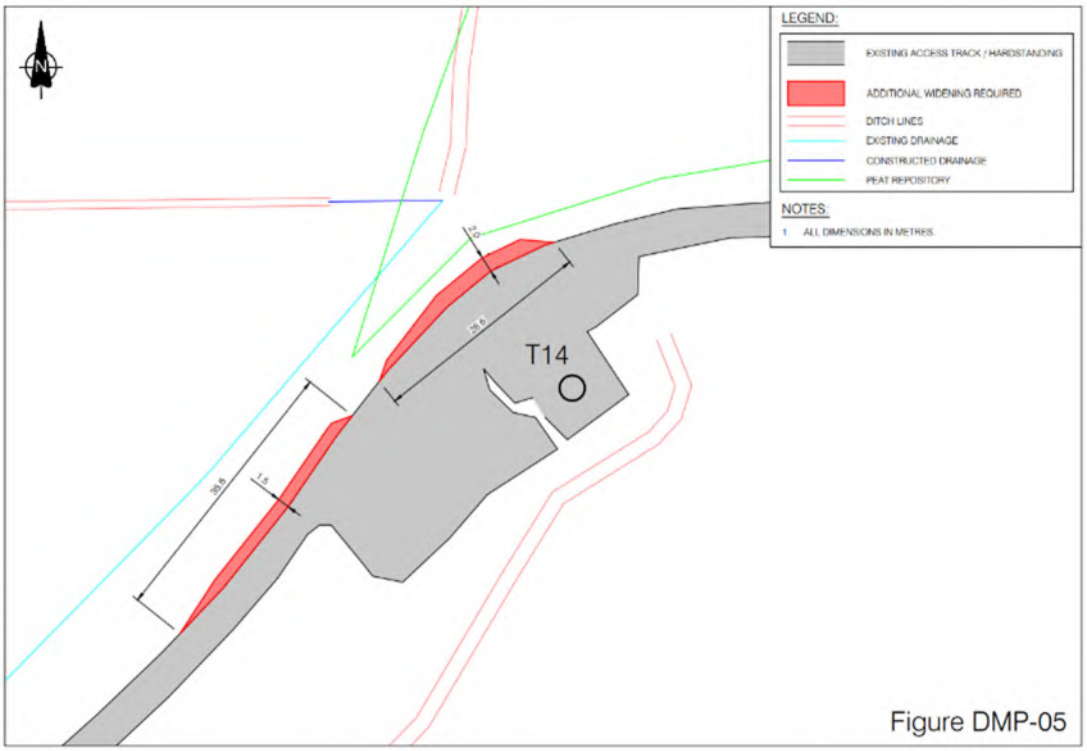


Figure 6-4 Proposed minor road widening works at Turbine T14 for decommissioning.

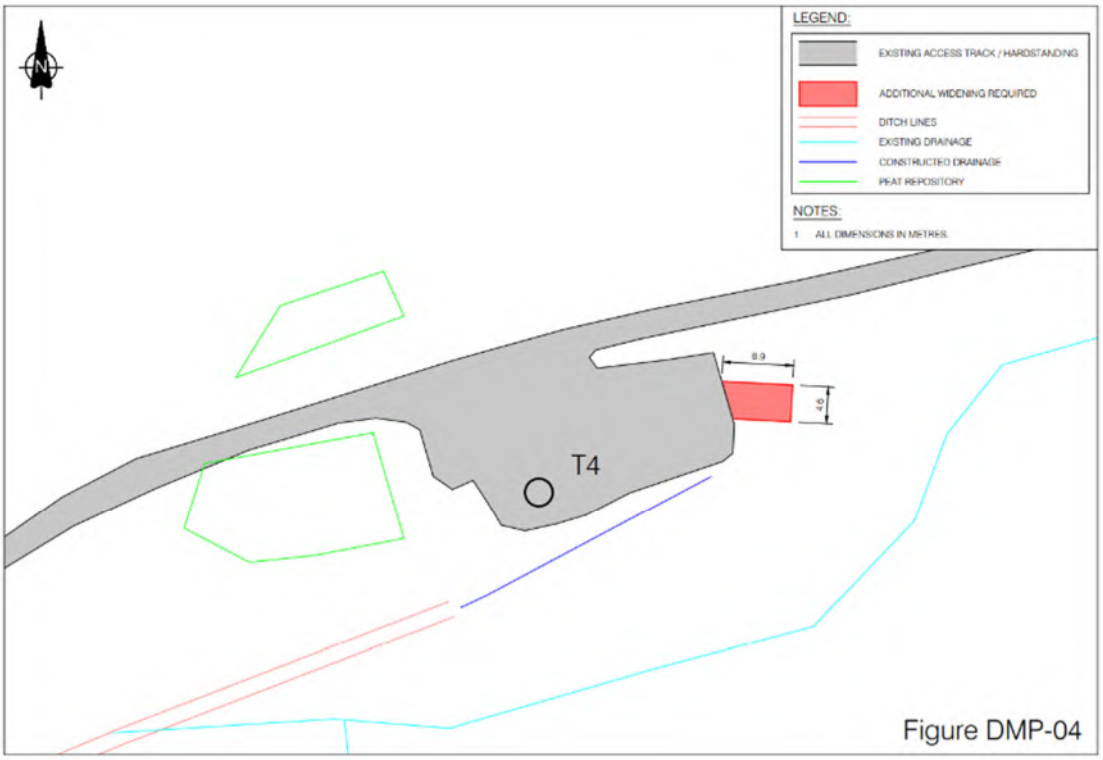


Figure 6-5 Proposed minor road widening works at Turbine T4 for decommissioning.

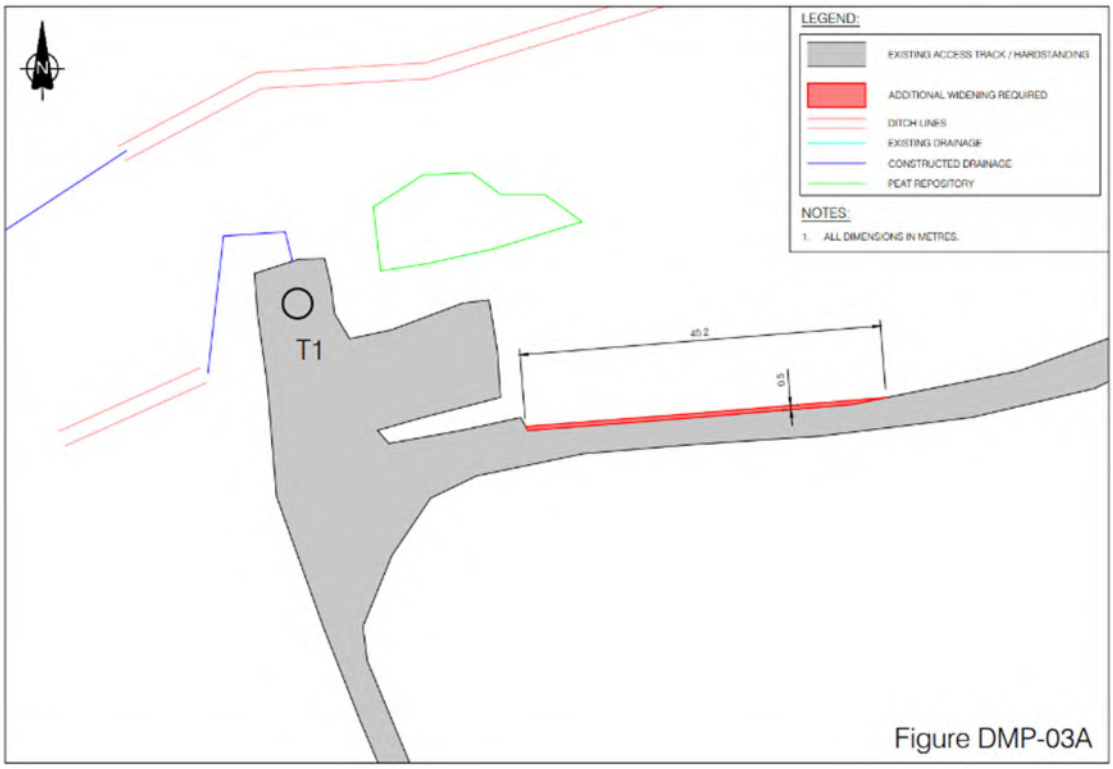


Figure 6-6 Proposed minor road widening works at Turbine T1 for decommissioning.

Demolition of the control building and reinforced concrete plinths for the generator and electrical transmission components will be carried out on the hardstand areas with mechanical demolition equipment and hydraulic breakers for the reinforced concrete foundations. No blasting will be carried out on site during decommissioning. All the electrical transmission equipment, capacitors and transformers will be dismantled and taken off site for re-cycling, disposal or re-use elsewhere. The granular hardstand area will be left in place.

All the de-energised LV electrical cables, earth wires, and SCADA & fibre-optic control cables between the turbines and the substation are direct buried in the peat in shallow trenches at a depth of 0.9-1.1m below ground level. The trenches were backfilled over the cables with the excavated peat. uPVC cable ducts were only used at road crossings and at the turbine and substation connections.

All the de-energised electrical cables and control cables will be disconnected at the turbine foundations and substation control building and the ducts will be cut below ground level and backfilled with cement grout. The remaining length of cables direct buried in the ground across the site will be left in place to avoid disturbing the peat.

The steel lattice towers for the anemometers and for the 110kV Overhead Line (OHL) at the substation will be dismantled using mobile cranes operating on the adjacent hardstanding areas. The dismantled components will then be transported off site for recycling. The reinforced concrete pad foundations and the adjacent hardstanding areas will be left in place.

The timber twin polesets for the 110kV OHL that will be decommissioned with the wind farm (PS-1a to PS-4) will be cut down at ground level, cut into sections and transported off site for disposal. The de-energised cable will first be lowered from the supports, cut into sections and winched up onto reels from the Coillte forestry roads or wind farm access roads to be transported off site.

This work will be carried out along the line of the OHL using standard forestry equipment suitable for working on peat, including low ground-bearing pressure wide-tracked excavators fitted with chainsaw cutters to fell and cut-up the polesets, and ATV to transport the timber and de-energised electrical cables

to a collection point on the windfarm or Coillte access roads for disposal offsite. The embedded foundations for the polesets will be left in place.

It is not proposed to carry out final remedial or reinstatement works on any of the other elements of the wind farm that will be left in place after decommissioning, including the site access tracks, turbine foundations, hardstanding areas, peat repository sites and underground electrical transmission and fibre-optic cables that are direct buried in the peat.

It is also not proposed to carry out any improvement works on the site drainage. However, if any blockages are encountered at the culverts under the floating roads or along sections of open drains, minor civil works will be carried out to remove the blockages during decommissioning, as necessary.

6.2 Assessment of Stability Impacts During Decommissioning

This section of the report presents the assessment of stability impacts for decommissioning the wind farm, i.e. the assessment of direct impacts of site activities on the receiving soils, geology and land that are likely to have an effect on site stability, particularly in relation to the peat. The results are summarised in Table 6-1.

For each activity, Table 6-1 states the characteristics of the **stability impact** – typically a dead or live load surcharge on the intact peat slopes - as well as the extent, duration and frequency of that impact. The characteristics of the impact are based on the site records for comparable activities during the construction stage of the project, which typically detail the methodology that was adopted in carrying out the works and the equipment that was used on the site.

As described in Section 1.2, the corresponding **effect** on the receiving soils, geology and land has been assessed as a function of the characteristics of the site activity, the quality of the impact with respect to site stability, the probability of a peat failure occurring, and the possible nature and extent of a peat failure.

The **Significance** of the effects of the stability impacts has been assessed as a function of the **sensitivity** of the receiving soils, geology and land potentially impacted by a peat failure, using the matrix in Figure 1-2. For this project the sensitivity of the receiving soils, geology and land has been classified as **Medium** based on the characteristics of the peat failures that occurred during construction, as discussed in Section 2.4.

Therefore, the **Significance** of **effects** in Table 6-1 reflects the probability of a peat failure occurring due to the effect of the stability impacts on the peat (e.g. due to the increased shear stresses under applied surcharge loads), the potential scale and characteristics of a peat failure, and the sensitivity of the soils, geology and land potentially impacted by a peat failure.

Table 6-1: Significance of Geotechnical Impact of Site Activities during Decommissioning

Activity	Characteristics of Site Activities					Impact Assessment - Site Stability (Peat Slide)					
	Nature of Primary Impact	Probability of Occurrence	Extent	Duration	Frequency	Quality of Geotechnical Impact	Possible Extent of Impact (Peat Slide)	Probability of Occurrence (Impact)	Geotechnical Impact of Primary Effect on Site Stability	Sensitivity of Receiving Soils, Geology & Land	Significance of Geotechnical Impact
Dismantling of Turbine Blades, Nacelle & Mast	Crane Loading on Hardstanding Areas	Likely	Hardstanding areas adjacent to turbines	Temporary	Regularly	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**
	Blade loading on peat in temporary set down areas	Likely	On peat on upslope side of crane hardstanding areas at each turbine	Temporary	Occasional (3 No. blades at each turbine)	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**
	Crane Loading on Floating Roads	Likely	Along floating roads between turbines and site entrance	Temporary	Regularly	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha)	Very Low	**Very Low**	**Medium**	**Slight**
	Low-Loader Transporter Loading with Turbine Components on Floating Roads	Likely	Along floating roads between turbines and site entrance	Temporary	Frequently	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha)	Very Low	**Very Low**	**Medium**	**Slight**
Dismantling of Substation & Demolition of Control Building	Mobile Crane, MEWP and Vehicle Loading on Hardstanding Areas	Likely	Hardstanding area at Substation site	Temporary	Frequently	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**
	Service Vehicle Loading on Floating Roads	Likely	Along Floating Roads to/from Substation Site	Temporary	Regularly	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**
	Mobile Crane or Low-Loader Transporter Loading with Transformer on Floating Roads	Likely	Along Floating Roads from Substation Site	Brief	Occasional	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha)	Very Low	**Very Low**	**Medium**	**Slight**
Localised Temp. Widening of Floating Roads & Hardstandings	Load from additional rockfill and crane wheel load on widened side of existing floating road	Possible	Localised Areas at T1, T4, T14 & T68, and possibly access track in turbary areas between Turbines T35 and T45, & T43-T46	Temporary	Occasional (Crane Load) Sustained (Add. Rockfill)	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha)	Very Low to Low	**Low**	**Medium**	**Slight**
Dismantling the Anemometers	Mobile Crane and Vehicle Loading on Hardstanding Areas	Likely	Hardstanding area at Anemometers	Temporary	Occasional	Slight Negative	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**
	Mobile Crane or Transporter Loading with Anemometer Components on Floating Roads	Likely	Along Floating Roads from Anemometer Sites	Brief	Occasional	Negative	Small (100m^2-2500m^2) to Large (5Ha)	Very Low	**Very Low**	**Medium**	**Slight**
Dismantling OHL Timber Twin Polesets	Loading on Peat from Wide-Tracked Excavators and All-Terrain Vehicles (ATV)	Likely	Across pat slops from forestry access roads to OHL polsets PS-1a to PS-4	Brief	Occasional	Negative	Small (100m^2-2500m^2) to Very Large (>10Ha)	Very Low	**Very Low**	**Medium**	**Slight**
Cables & Ducting	De-energising and disconnecting HV and LV cables	Likely	At Substation (HV) and at Turbines (LV)	Temporary	Occasional	Neutral	Not Applicable	Negligible	**Negligible**	**Medium**	**Not Significant**

6.2.1 Dismantling of Turbine Blades, Nacelle and Masts

The main stability impacts on soils, geology and land during decommissioning of the turbines will be

- the concentrated crane loads on the hardstanding areas during the dismantling of the turbines;
- the temporary surcharge load on the peat in the blade set-down areas;
- the live load surcharge on the floating roads when the cranes are travelling to the turbines along the roads; and
- the live load surcharge on the floating roads from specialist low-loader transporter vehicles transporting heavy or oversized components of the turbines off site.

All of the heavy dismantling works will be carried out from the crane hardstanding areas adjacent to the turbine. The hardstanding areas are constructed of crushed rock granular fill supported on the glacial till below the peat. They were used for the erection of the turbines during construction and they are designed to support the concentrated loads from the cranes and service vehicles without applying any load on the peat slopes. Therefore, the effect that these loads will have on site stability is **Negligible** and **Not Significant**.

When the turbines are being dismantled the 3 No. blades from each turbine will be temporarily set down on the surface of the peat in a designated area 26.0 x 12.0m in plan area on the upslope side of the crane hardstanding area. The blades, which are 26m long and weigh approximately 1,900 kg each, will be laid out across the peat so that the load is distributed along the length of the blade. In this way they will only impart a surcharge load of <1.0-2.0kPa on the surface of the peat along the length of each blade, which is very low (i.e. equivalent to the load from a 100-200mm thick strip of peat). The crane hardstanding downslope from the setdown area will also act as a shear key to prevent shear failure in the peat. Therefore, the effect that these loads will have on site stability is **Negligible** and **Not Significant**.

The large mobile cranes that will be used to dismantle the turbines will travel along the floating roads to access the turbines. Therefore, they will apply a locally concentrated live load surcharge on the peat slopes when they travel across the site. The decommissioning works are expected to take approximately 12-18 months. During that time it is expected that the mobile cranes will be operating continuously on site when the turbines are being dismantled. They will be primarily set up at the hardstanding areas adjacent to the turbines, but will travel regularly along the floating roads between turbines. There may also be more than one mobile crane on the site at any one time. Therefore, the loading will be **Regular** but the **Duration** of loading will be **Temporary**.

Proof load tests were carried out on all of the floating roads on the site in July 2018 using a mobile crane and articulated dumper truck to verify the capacity, performance and stability of the roads under the design crane load. The live load surcharge from the mobile crane used for dismantling the turbines will not exceed the design crane load. Furthermore, the roads showed a visible improvement in performance in 2018 compared to when they were tested in 2005 and 2014 due to the increase in the strength and stiffness that occurred in the underlying peat as it compressed under the weight of the road, and also due to the upgrade works that were carried out on sections of the road in 2014 (see Section 4.1.4.2). Therefore, the probability of a peat failure occurring under the surcharge loads will be **Very Low**, the effect of the loading on the stability of the peat will be **Low** and only **Slightly Significant.**

Specialist trucks and low-loader transporters will be **Frequently** required to remove the heavy and oversized components of the turbines from the site. The mass and length of the main turbine components are as follows for the Vestas V52/850 turbine:

- Nacelle: 22 tonnes
- Rotor: 10 tonnes
- Rotor Blades (26 m) 1.9 tonnes
- Mast (Hub Height 55 m): 55 tonnes

The mast can be split into sections so that the mass of each load will be less than 30 tonnes, and the axle load on the transporters will be limited to a maximum of 12 tonnes/axle so that they can travel on the national road network in Ireland. Therefore, the load from the transporters on the floating roads will not exceed the design load of the mobile crane so that the effect of the live load surcharge on the stability of the peat will also be **Low** and only **Slightly Significant.**

6.2.2 Dismantling of Substation & Demolition of Control Building

The main stability impacts on soils, geology and land during the dismantling of the substation and demolition of the control building will be:

- the concentrated loads on the hardstanding areas around the substation during the works; and
- the live load surcharge on the floating roads from the vehicles and low-loader transporters transporting equipment, demolition waste and electrical components to and from the site.

All the dismantling and demolition works for the substation, control building and electrical transmission and transformer components will be carried out in-situ on the existing hardstanding area at the substation site. The hardstanding is constructed of crushed rock granular fill supported on the glacial till below the peat. It was used for the construction of the substation and it is designed to support the concentrated loads from the Mobile Elevated Work Platforms (MEWP), mobile cranes and service vehicles without applying any load on the peat slopes. Demolition of the control building and reinforced concrete plinths for the electrical transmission and transformer components will also be done in-situ from the hardstanding area using mechanical excavators and hydraulic breakers without blasting. Therefore, the effect that the concentrated loads on the hardstanding area will have on site stability is **Negligible** and **Not Significant**.

The vehicles travelling along the floating roads to the substation apply a locally concentrated live load surcharge on the peat slopes when they travel across the site. Generally, the traffic will be limited to the commercial vehicles and trucks that will be used to transport personnel, waste materials and equipment to and from the substation and control building. All the small decommissioned electrical components and demolition waste will be taken off-site for re-cycling or to a licensed waste disposal area on standard dump trucks which have a maximum load of 37.5 tonnes on 4 axles at up to 10 tonnes per axle. For the duration of the decommissioning contract the **Frequency** of this traffic loading will be **Regular** and the **Duration** of loading will be **Temporary**. However, the load that these vehicles apply on the floating roads is significantly lower than the design crane loads for which the roads were tested. Therefore, based on the improved performance of the roads when they were tested in 2018, the effect of the loading on the stability of the peat will be **Negligible** and **Not Significant**.

The transformer was the largest single load for all of the components that were transported to the site during construction. Section 3.3.3.4 gives details of the low-loader that was used to transport the transformer to the substation during construction and the route that it took across the floating roads. The combined weight of the transformer and low-loader transporter was 130 tonnes, which was spread out over 12 axles at a maximum load of 12 tonnes per axle. The equivalent live load surcharge over the 28.5m length of the vehicle was within the design load for the floating road. The mobile crane that will be required to lift the transformer onto the low-loader will also be smaller than the crane that will be used to dismantle the turbines. Similar vehicles will be used to take the transformer off site and they will follow the same route to and from the substation. Therefore, the probability of a peat failure occurring under the surcharge loads will be **Very Low**, the effect of the loading on the stability of the peat will also be **Very Low** and the Significance of the effect will be **Slight.**

6.2.3 Localised Works to Temporarily Widen the Existing Floating Roads

Where necessary, the narrow sections of turbary road between Turbines T35 and T45 and between T43 and T46 will be temporarily widened by about 1.0-1.5m to provide safe access to the turbines for the Grove GMK6300 mobile crane for decommissioning. Minor works will also be required to locally

widen the existing floating road at Turbines T68, T14 and T1, and to extend the crane hardstanding at T4 to facilitate reversing long vehicles that will be used to transport the turbine components offsite.

A typical detail for the temporary road widening is shown in Figure 6-2. The minor civil works will involve widening the existing floating road with a 300mm thick layer of Class 6F2 crushed rock granular capping material supported on a layer of timber bog mats placed on the peat. The capping layer will be reinforced with geogrids and surfaced with a 100mm thick layer of Cl.804 crushed rock granular subbase material. The impact of this will be to apply a small dead load surcharge of approximately 8.5kN/m^2 on the peat upslope from the road. This is equivalent to the dead load from less than 1.0m of peat over the same area, which is low.

The capping/subbase layers and the geogrid reinforcement will be extended across the full width of the road, with a minimum thickness of 150 mm for the section of capping over the existing road to minimise the additional load. The geogrids will have a wraparound detail at the edges to provider a stiffer response to the wheel loads and to provide enhanced anchorage to the existing road. Where necessary the peat under the widened section of the road will be trimmed down to ensure that the finished surface of the road has a uniform profile across the full width.

The existing 3.0-3.5m wide road was fully proof load tested for the design live load surcharge in 2018 and the peat has consolidated and gained strength under the road since it was constructed. Wherever possible the road will be widened on the upslope side as the higher strength peat under the existing road will provide greater resistance to shear failure than the virgin peat downslope from the road, which will reduce the likelihood of peat instability.

The widened road will spread the same traffic load out over a wider area (approx. 5m). Therefore, the effect that the load from the widened road will have on the stability of the peat will be **Low**, and the Significance of the effect will be **Slight.**

With the exception of the temporary spur extension to the hardstanding at T4, the junction and road widening works would use a similar detail to that shown for the temporary road widening on Figure 6-2.

The short temporary spur extension to the hardstanding at Turbine T4 will be constructed as a floating road comprised of 600mm of crushed rock granular fill reinforced with two layers of geogrids. This will result in a localised dead load surcharge of approximately 12 kN/m^2 on the peat, which is equivalent to about 1.2m of peat, which is low. The section of road will also be connected to the hardstanding by the embedded geogrid reinforcements. Therefore, the effect that this will have on the stability of the peat will also be **Low**, and the Significance of the effect will be **Slight**.

The additional surcharge loading from the widened roads and extended hardstanding will be **Sustained** during decommissioning. However, the additional granular fill, geogrids and bog mats used to widen the roads will be removed on completion of the works and any areas where peat was trimmed along the edges will be re-instated using the intact peat turves. Therefore, the effect will be **Temporary**.

6.2.4 Dismantling the Anemometers

The stability impacts on soils, geology and land during the dismantling of the anemometers will be:

- the concentrated loads from the mobile crane operating on the hardstanding areas around the anemometers during the works; and
- the live load surcharge on the floating roads from the mobile crane used to dismantle the lattice steel towers, and from the support vehicles used to transport the materials off the site for recycling.

All the dismantling and demolition works will be carried out in-situ on the hardstanding areas at the anemometers which are constructed of crushed rock granular fill supported on the glacial till below the peat. They were used for the construction of the anemometers so they are designed to support the concentrated loads from the mobile cranes and service vehicles without applying any load on the peat slopes. Therefore, the effect that the concentrated loads on the hardstanding area will have on site stability is **Negligible** and **Not Significant**.

The live load surcharge from the mobile crane and support vehicles that will be used to dismantle the anemometers will not exceed the maximum design capacity of the floating roads, which has been verified by full scale proof load tests. Therefore, the probability of a peat failure occurring under the surcharge loads will be **Very Low**, and the effect of the loading on the stability of the peat will be **Very Low** and only **Slightly Significant**.

6.2.5 Dismantling Timber Twin Polesets PS-1a to PS-4 and the 110kV OHL

The main stability impacts on soils, geology and land during the dismantling of the anemometers will be the live load surcharge on the peat from the equipment that will be used to lower, cut and remove the electrical transmission cable, and to cut down the timber polesets and transport them offsite.

The timber twin polesets for the 110kV OHL that will be decommissioned with the wind farm (PS-1a to PS-4) will be cut down at ground level, cut into sections and transported off site for disposal. The de-energised cable will first be lowered from the supports, cut into sections and winched up onto reels from the Coillte forestry roads or wind farm access roads to be transported off site.

Work along the OHL will be carried out using standard forestry equipment suitable for working on peat, including low ground-bearing pressure wide-tracked excavators fitted with chainsaw cutters to fell and cut-up the polesets, and ATV to transport the timber and de-energised electrical cables to a collection point on the windfarm or Coillte access roads for disposal offsite. The embedded foundations for the polesets will be left in place.

The work will be carried out in an area of established coniferous forestry therefore, the probability of a peat failure occurring under the surcharge loads will be **Very Low**, the effect of the loading on the stability of the peat will be **Very Low** and only **Slightly Significant**.

6.2.6 Cables & Ducting

De-energising the buried LV electrical cables connecting the turbines to the substation will have an imperceptible impact on the peat. Therefore, the effect that it will have on site stability will be **Negligible** and **Not Significant**.

All the de-energised LV electrical cables, earth wires, and SCADA & fibre-optic control cables between the turbines and the substation are direct buried in the peat in shallow trenches at a depth of 0.9-1.1m below ground level. The trenches were backfilled over the cables with the excavated peat. uPVC cable ducts were only used at road crossings and at the turbine and substation connections.

All the de-energised electrical cables and control cables will be disconnected at the turbine foundations and substation control building and the ducts will be cut below ground level and backfilled with cement grout. All this work will be carried out from the hardstanding areas at the turbines and substation with no loading or excavations on the peat. Therefore, the effect that it will have on site stability will be **Negligible** and **Not Significant**. The remaining length of cables direct buried in the ground across the site will be left in place to avoid disturbing the peat.

6.3 Geotechnical Monitoring and Mitigation of Site Activities during Decommissioning

The site activities that are likely be carried out on the site during decommissioning of the windfarm that could have an impact on soils, geology and land with significant effects include the following:

- Dismantling the turbines, substation and anemometers and transporting the components off-site for re-use, recycling or disposal;
- Localised widening or extension of the existing floating roads at selected junctions and along sections of the narrow turbary road between Turbines T35 and T45 and between T43 and T46 (where required);
- Demolition and disposal of the OHL and twin polesets for the 110 kV line.

This is based on the proposed decommissioning plan for the project, which will involve removing all the above ground elements of the turbines, substation and transmission structures. The turbine foundations and the granular hardstanding areas for the cranes, substation, site compound and anemometer masts will be left in place along with all the site access tracks, peat repository sites, borrow pits, material deposition areas, the improved drainage network and the buried network of fibre-optic, LV and SCADA cables in the peat.

The negative impacts of these site activities will be limited to:

- The live load surcharge of the large mobile cranes or the low-loader transporters carrying heavy turbine components or transformers on the floating roads; and
- The additional dead and live load surcharge on the peat along the widened sections of the existing floating roads or extended hardstanding areas;
- The live load surcharge on the peat from the wide-tracked excavators and timber forwarders used to take down the transmission line and timber twin pole-sets for the 110kV OHL.

The likelihood of a peat failure occurring as a result of these impacts is considered to be **Very Low to Low**. Therefore, the effect that the impacts will have on the stability of the peat will only be **Slightly Significant**.

AGL Report No. 11-147-R01 in Appendix F outlines the measures that were taken to mitigate stability impacts of site activities during the construction stage of the project, and during the operation and maintenance phase of the windfarm up to the end of 2022. These measures have been incorporated into the standard operating procedures for routine maintenance and repair works on the windfarm site and will continue to be applied for site activities that have a comparable impact during decommissioning (e.g. for dismantling/demolition vs assembly/construction of turbines and substation, and for construction traffic loading on floating roads and on the intact peat slopes). Therefore, **none of the site activities during decommissioning will have a stability impact that will have a Significant or Moderately Significant effect on the receiving soils, geology and land.**

In addition to the standard operation procedures that have already being routinely implemented on the site, the following additional mitigation measures will be implemented during decommissioning to mitigate the **Slightly Significant effects** of the stability impacts on soils, geology and land:

- The carriageway requirements for the large mobile crane that will be used to dismantle the turbines along the narrow section of turbary road between Turbines T35 and T45 and between T43 and T46 will be reviewed in advance of the works and the road will be widened, where necessary, to provide safe access to the turbines;
- Where it is necessary to widen or extend the existing floating roads then:
    - Detailed design of the road improvements will be carried out by a suitably qualified geotechnical engineer;
    - Additional site investigations will be carried out, where necessary, to characterise the depth and strength of the peat and the composition of the existing floating road;

  - Stability analyses will be carried out in advance of the works on site in accordance to confirm that the stability of the widened road is acceptable in accordance with IS EN 1997-1: Eurocode 7 for Geotechnical Design, Part 1 – General Rules; and
  - The works on site will be supervised by a suitably qualified geotechnical engineer on behalf of Gort Windfarms Ltd.
- The size, weight and axle load of the large mobile crane that is used to dismantle the turbines shall not exceed the design load for the floating roads (i.e. the 300 tonne Grove GMK6300 all-terrain mobile crane with a travelling weight of 72 tonnes on 6 axles – max 12 tonnes/axle);
- The size, weight and axle load of the low-loader transporter used to transport the transformer off the site shall not exceed the combined design load of the vehicle that was used to bring the transformer to the substation site during construction (i.e. a total combined load of 130 tonnes over 28.5m x 3.0m area with 12 axles and a maximum axle load of 12 tonnes);
- The decommissioning works will be supervised by a suitably qualified engineer from ESB Engineering and Major Projects (ESB – E&MP);
- A permit to work scheme will be implemented on the site for the works; and
- The Contractors method statements will be reviewed and certified by a suitably qualified geotechnical engineer.

7.0 STABILITY IMPACTS AFTER DECOMMISSIONING (RESIDUAL IMPACTS)

This section of the report assesses the post-decommissioning (residual) effects of stability impacts related to elements of the wind farm project that will be left in place after decommissioning.

During decommissioning all the above ground elements of the wind farm will be dismantled or demolished and taken off site, including:

- The turbine rotors, blades, nacelles and masts;
- The substation electrical transmission and transformer components, concrete plinths, control building and concrete foundations;
- The electrical transmission cable, steel lattice tower and timber twin polesets for the 110kv Overhead Line (OHL); and
- The steel lattice towers for the anemometers.

Additional rockfill placed to temporarily widen sections of the site access tracks in the turbary area and at narrow junctions will also be removed offsite and any vegetated peat turves that were excavated to widen narrow section of the turbary road will be reinstated along the edge of the road.

The following elements of the wind farm will be left in place on the site after decommissioning:

- The site access tracks, including 16.7 km of floating roads constructed on the peat with 0.6-1.0 m of granular rockfill reinforced with 1-2 layers of geogrids and a basal layer of timber, branches or small trees;
- The hardstanding areas adjacent to the turbines and at the substation, which are constructed of crushed rock granular fill supported on the glacial till or rock below the peat;
- The foundations for the turbines and anemometer lattice towers, which were constructed as reinforced concrete pad foundations supported directly on rock or on a layered profile of structural fill comprised of lean mix concrete and crushed rock granular fill down to rock;
- The existing network of open drains and culverts across the site;
- The peat repository sites with re-generated surface vegetation; and
- The closed borrow pits including the main borrow pit near the site entrance.

7.1 Site Access Tracks

The floating roads have been in place for 20 years. The highest risk of shear or bearing failure was when the roads were originally constructed in 2003-2005, particularly under the design live load surcharge from the mobile crane that was used to erect the turbines. Since then, the peat under the roads has increased in strength as it compressed under the weight of the rockfill, which has reduced the probability of shear failure occurring. No failures have occurred under the floating roads during construction or during the operation and maintenance period of the wind farm. They also performed very well under the design crane load in the full-scale proof load tests that were carried out on the roads in 2018. After decommissioning no further heavy construction traffic loading will be required on the floating roads for the wind farm. Therefore, the probability of a failure occurring in the peat due to the residual impact of the roads is **negligible** so that the effect of the surcharge load on the stability of the peat will be **negligible** and **Not Significant**.

The floating roads adjacent to the slide area at Turbines T68 and T70 were inspected by AGL Consulting in July 2018. There was no evidence of further instability in the peat at the edges of the slide area. Therefore, the residual impact of the slide on the peat in the area and the corresponding effect on the stability of the floating roads should be **negligible** and **Not Significant**.

The site access tracks across the slide area at T68 and T70 are constructed as rockfill berms supported on the glacial till below the peat. Therefore, the residual impact of the berms and the effect on the stability of the underlying glacial till or rock will be **negligible** and **Not Significant**.

The berms will also have a **positive** impact on the stability of the displaced peat within the slide area as they will help to contain the peat upslope from the berms. The peat has stabilised since the slide and vegetation has started to regenerate in the area. Therefore, the effect of the residual impact of the berms on the stability of the peat will be **Low**, which is **Slightly Significant**.

7.2 Turbine Foundations & Crane Hardstandings

The hardstanding areas adjacent to the turbines and at the substation site are constructed of crushed rock granular rockfill supported on the glacial till or rock below the peat. Therefore, they do not apply any load on the peat and the effect of the residual impact on the stability of the underlying glacial till or rock will be **negligible** and **Not Significant**.

Similarly, the reinforced concrete turbine foundations are supported on rock or lean mix fill down to rock below the peat and glacial till so that they do not apply any load on the peat. Also, after the turbines are removed there will be no loading on the foundations. Therefore, the effect of the residual impact on the stability of the underlying glacial till or rock will be **negligible** and **Not Significant**.

The turbine foundations and crane hardstanding areas will also act as a shear key preventing shear failure in the peat directly upslope from them, which is a ***positive*** residual impact with respect to site stability. The effect of the support they provide will be **Slightly Significant**.

The reinforced concrete bases would have been designed for the chemical exposure classification relevant to the ground conditions on the site. Therefore, the concrete would not be expected to deteriorate significantly in strength or disintegrate over time. Nevertheless, the long-term stability of the peat slopes after decommissioning is not dependent on the positive shear-key effect that the bases have on the stability of the peat upslope from the turbines.

7.3 Drainage

The existing network of open drains and culverts across the site will be left in place at the end of decommissioning. As discussed in Section 3.2.10, poor drainage is a recognised contributory risk factor for peat instability. Therefore, relative to the original baseline condition prior to construction, the improved drainage network that was constructed on the site for the wind farm has had a **permanent** and **sustained positive** impact on groundwater levels in the peat that will continue after decommissioning. The improved drainage would also have increased the shear strength of the peat where the groundwater table was lowered. Therefore, the positive effect of the drainage improvements on the stability of the peat has been assessed as **Medium** and **Moderately Significant** relative to the baseline conditions on the site in 1998, prior to construction. This will continue as a residual impact after decommissioning.

The site maintenance records prior to 2022 indicated that maintenance on the drainage network was at a residual level after 2011– with only minor works required to maintain the efficiency and capacity of the existing system. The records also indicate that the drainage network has sufficient capacity to handle exceptionally high and sustained levels of rainfall without any occurrences of peat instability– for example during the high levels of rainfall recorded during the extreme rainfall events that occurred in December 2015, including Storm Frank, when the average monthly rainfall was over 250-300% of the Long Term Average (LTA) rainfall for the area in December.

No maintenance will be carried out on the drains after decommissioning. Therefore, in the long-term the efficiency of the drains is likely to gradually reduce as they become clogged by vegetation, which will result in a partial gradual restoration of groundwater levels on the site. In the long-term, the positive

residual impact of the drainage and its effect on the stability of the peat relative to the original baseline conditions on the site in 1998 will likely reduce to **Medium to Low** or **Low**, which will be **Slightly Significant**. However, any reduction in the efficiency of the drainage network after decommissioning is expected to be minor and to occur gradually over time so that it will not become a ***negative*** effect on the stability of the peat.

7.4 Peat Repositories

The peat repositories were used to store up to 1.0 m of peat from the excavations for the turbine foundations, crane hardstandings, substation site, borrow pits and anemometer masts during the second phase of construction in 2004/2005. All of the repository sites were located on the intact peat slopes in areas of gently sloping ground on the site. Section 3.2.6.3 describes the investigations and stability analyses that were carried out to assess each repository site and the control measures that were implemented when the peat was placed on the slopes.

With the mitigation measures that were implemented during construction, the probability of a peat failure occurring in the peat repository areas was **Very Low** to **Low** so that the effect of the live load surcharge on the stability of the peat slopes was **Medium to Low** and only **Slightly Significant**. The peat repositories will be left in place after decommissioning. Therefore, the impact on the peat is **Permanent** and **Sustained** and will continue as a residual impact after decommissioning. However, the highest risk of a peat slide under the surcharge loads was at the time that the peat was placed in the repository during construction (i.e. the short-term undrained condition). Over time the underlying peat has consolidated and increased in shear strength, reducing the likelihood of a failure.

This was confirmed by the site inspections carried out by AGL in 2018 and 2024 (Section 5.4.2). There was no evidence of movement or peat instability in the repositories. The excavated peat had settled into the slope and dried out. Vegetation had also re-established on the surface, in some cases making them difficult to distinguish from the surrounding ground. With the increase in undrained shear strength in the underlying peat, the probability of a peat slide occurring due to the residual impact of the repository sites after decommissioning will be negligible. Therefore, the effect of leaving the repositories in place on the stability of the peat will be **negligible** and **Not Significant**.

7.5 Borrow Pits

The borrow pits have been closed since construction was completed in 2005 and have remained undisturbed and stable since then. The main borrow pit (No.3) near the site entrance, where most of the rock was excavated, has been allowed to flood with groundwater and the level of groundwater in the pit has stabilized at a long-term natural level 1.0-1.5 m below the level of site access road at the entrance to the borrow pit. There are bunded cells of excavated peat contained by rockfill berms within the borrow pit, which were observed to be stable during the site inspections in 2018 and 2024. It is not anticipated that there will be any deterioration or change in the condition of the borrow pits after decommissioning. The short and long-term residual impact that they will have on soils, geology and land in the area with respect to site stability will be **imperceptible**.

7.6 Mitigation of Stability Impacts after Decommissioning

After decommissioning there will be no more activity or works related to the wind farm on the site. The reinstated site with the retained development will be returned to the landowner and Gort Wind Farms Ltd. will not have any involvement in future land use or site activities. Therefore, the primary mitigation measure that will be used to mitigate the post-decommissioning residual impact of the retained development is in the compilation and handover of the **Safety File** for the site to the landowner by Gort Wind Farms Ltd.

Among other information, the Safety File will include:

- Construction records from the decommissioning works to confirm compliance with the design and specifications for the works.
- Design and as-built construction details for all the elements of the windfarm that have been left in place after decommissioning (the Retained Development), including:
    - The reinforced concrete bases for the turbines and anemometer masts.
    - All of the site access tracks including the floating roads on the peat;
    - The crane hardstanding areas adjacent to the turbines;
    - The hardstanding area for the substation and control building;
    - All of the de-energised and disconnected LV electrical cables and fibre-optic cables that are direct-buried in the peat between the turbines and in ducts below the roads;
    - The construction phase peat repository sites and material sidecast areas;
    - The construction phase borrow pits, and
    - The site drainage network.
- Records of significant maintenance works that have been carried out on the retained elements of the project, including the 2014 upgrade of the floating roads and the 2017 fibre-optic upgrade of the turbine control systems.
- Reports on all the full-scale serviceability and proof load tests that have been carried out on the floating roads across the site, which includes the design criteria for the maximum axle loads and live load surcharges from the mobile cranes that govern the capacity of the roads.
- Records of all the site investigation works and in-situ tests that were carried out for the project during construction and over the operational and maintenance phase of the project.
- Results of stability analyses that have been carried out for the floating roads and peat repository sites.
- Geotechnical stability report for the wind farm site including the Peat Stability Risk Assessment (PSRA) for the site and design/construction mitigation measures that have been implemented to mitigate the risk of peat instability for the wind farm activities.
- Peat Stability Risk Assessment for the turbary area on the east side of the site, including mitigation measures that have been recommended to manage the risk of peat instability due to mechanical peat harvesting in that part of the site.

The Safety File will provide the landowner with all relevant information necessary to make informed decisions on the maintenance and safe use of the Retained Development post-decommissioning.

8.0 REFERENCES

1. Applied Ground Engineering Consultants Ltd. (AGEC) (2004) – "*Derrybrien Wind Farm – Final Report on Landslide of October 2003 & Final Report on Derrybrien Wind Farm Post-Landslide Site Appraisal*," AGEC Report No. 378_099, dated 4/2/2004.
2. Conaghan, J., et al (2000) – *Distribution, Ecology and Conservation of Blanket Bog in Ireland*, commissioned by the National Parks and Wildlife Service, Dúchas and The Heritage Serice, Dublin, Ireland.
3. Clayton, C.R.I, (2001) *Managing Geotechnical Risk: Improving Productivity in UK Building and Construction*, Published by the Department of the Environment, Transport and the Regions, and the Institution of Civil Engineers (Great Britain)
4. Dykes, A.P and Warburton, J. (2007) *Mass movements in peat; a formal classification scheme.* Geomorphology, 86, pp 73-93.
5. Environmental Protection Agency (EPA), (2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*.
6. Environmental Protection Agency (EPA), (2024) Data on latest Greenhouse Gas (GHG) and CO_2 emissions in Ireland downloaded from EPA website (www.epa.ie) in November, 2024.Groundwater Protection Schemes, 1999 – Department of the Environment and Local Government, Environmental Protection Agency, and Geological Survey of Ireland.
7. Hammond, R.F. (1981) - *The Peatlands of Ireland.* Soil Survey Bulletin 35 (2nd Ed.), An Foras Talúntas, Dublin.
8. Holden, N.M., Connolly, J. (2011) *"Estimating the carbon stock of a blanket peat region using a peat depth inference model"*, Catena, doi:10, 1016/j.catena.2011.02.002.
9. Kane, G., Grennan, R., and Jennings, P (2020), *Investigation into the likely cause of peat failure at Ballincollig Hill Wind Farm, Ireland.* Proceedings of the XVII ECSMGE-2020 Geotechnical Engineering, Foundation of the Future.
10. Milne, R., Brown, T.A., (1997), *"Carbon in the Vegetation and Soils of Great Britain"*, Journal of Environmental Management, **49**, 413-433.
11. Scottish Government, Energy Consent Unit (2017) - *"Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects* (2nd Edition, April 2017).

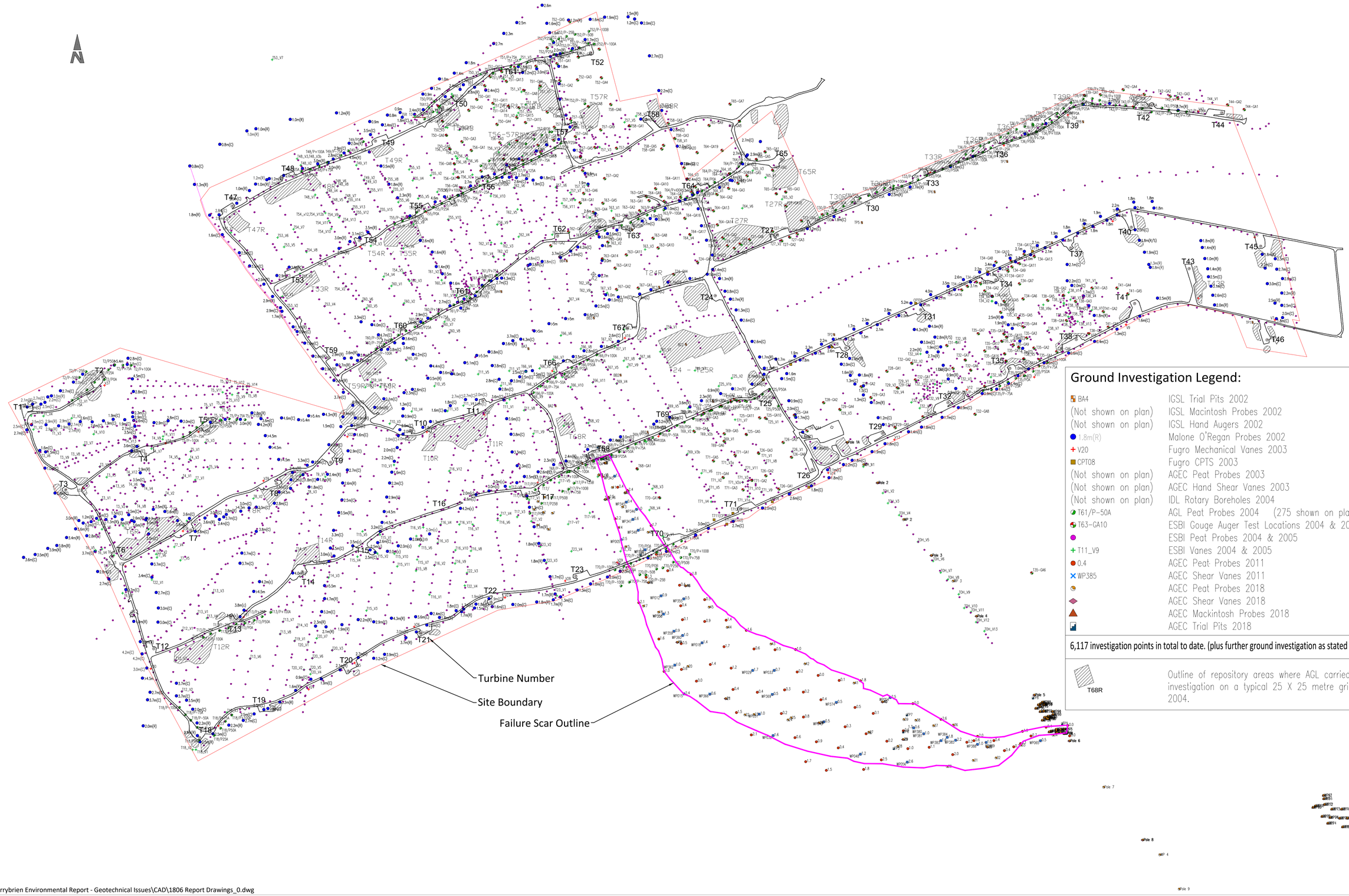
APPENDIX A

AS-BUILT RECORDS (DRAWINGS)

FOR INFORMATION

0m 500m

Scale Bar



Ground Investigation Legend:

BA4	IGSL Trial Pits 2002	(20 No.)
(Not shown on plan)	IGSL Macintosh Probes 2002	(58 No.)
(Not shown on plan)	IGSL Hand Augers 2002	(24 No.)
1.8m(R)	Malone O'Regan Probes 2002	(629 No.)
V20	Fugro Mechanical Vanes 2003	(42 No.)
CPT08	Fugro CPTS 2003	(12 No.)
(Not shown on plan)	AGEC Peat Probes 2003	(621 No.)
(Not shown on plan)	AGEC Hand Shear Vanes 2003	(45 No.)
(Not shown on plan)	IDL Rotary Boreholes 2004	(31 No.)
T61/P-50A	AGL Peat Probes 2004 (275 shown on plan)	(529 No.)
T63-GA10	ESBI Gouge Auger Test Locations 2004 & 2005	(214 No.)
	ESBI Peat Probes 2004 & 2005	(3048 No.)
T11_V9	ESBI Vanes 2004 & 2005	(384 No.)
0.4	AGEC Peat Probes 2011	(113 No.)
WP385	AGEC Shear Vanes 2011	(38 No.)
	AGEC Peat Probes 2018	(185 No.)
	AGEC Shear Vanes 2018	(33 No.)
	AGEC Mackintosh Probes 2018	(80 No.)
	AGEC Trial Pits 2018	(11 No.)

6,117 investigation points in total to date. (plus further ground investigation as stated below)

T68R — Outline of repository areas where AGL carried out ground investigation on a typical 25 X 25 metre grid system in 2004.

S:\2018\1806 Derrybrien Environmental Report - Geotechnical Issues\CAD\1806 Report Drawings_0.dwg

Further notes:

Notes:

Scale: 1:5,000 @ A1 | Checked: G.K.
Date: 25 July 2018 | Revision: 0
Drawn: P.O.R. | Based on:

Client: ESB International

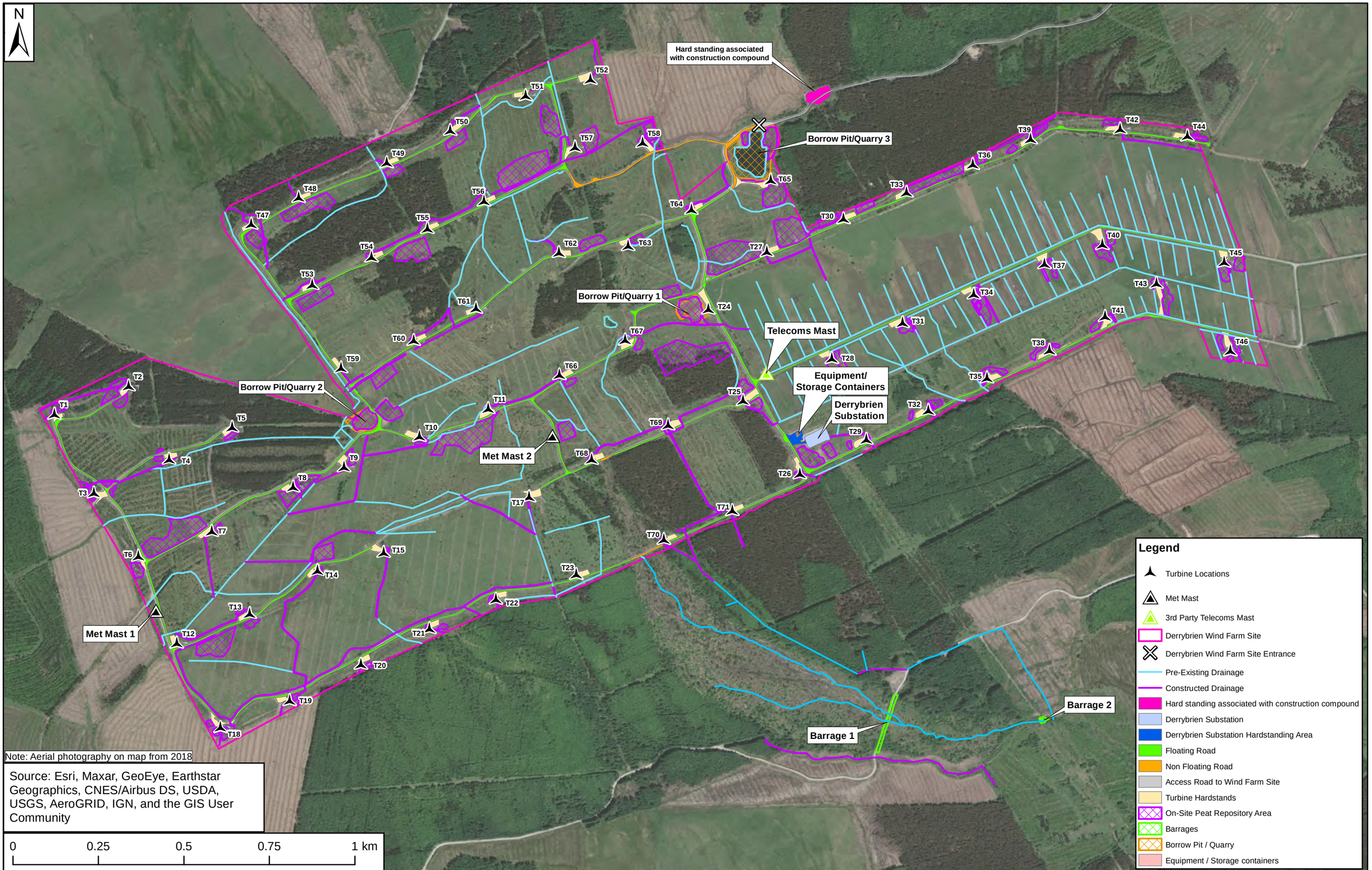
Job: Derrybrien Wind Farm Site

Drg. No. - 003

Title: Ground Investigation Location Plan for Wind Farm & Failure Scar

AGEC Ltd
The Grainstore
Singletons Lane
Bagenalstown
Carlow
Ireland
Tel: +353 59 972 3800
Fax: +353 59 972 3793
agec geotechnical engineering consultants
www.agec.ie
info@agec.ie

Applied Ground Engineering Consultants Limited



Note: Aerial photography on map from 2018

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 0.25 0.5 0.75 1 km

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	29/06/20	Issued for substitute consent	E.O'S	E.O'S	H.G	R.O'D

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

Energy for generations

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

Tel: 353 1 703 8000 Web: www.esb.ie

Engineering and Major Projects is a division of ESB.

CLIENT: **Gort Windfarms Ltd**

PROJECT: **Derrybrien Wind Farm Project**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Derrybrien Wind Farm - Pre-Existing & Constructed Drainage**

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DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	H.Griffin	M.Brides	03/08/2020

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:10,000

DRAWING NUMBER: **QS-000192-01-D451-001**

N

Hard standing associated with construction compound

Borrow Pit/Quarry 3

Borrow Pit/Quarry 1

Borrow Pit/Quarry 2

Telecoms Mast

Equipment/ Storage Containers

Derrybrien Substation

Met Mast 1

Met Mast 2

Barrage 1

Barrage 2

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T48 T49 T50 T51 T52 T53 T54 T55 T56 T57 T58 T59 T60 T61 T62 T63 T64 T65 T66 T67 T68 T69 T70 T71

Mon1 Mon2 Mon3 Mon4 Mon5 Mon6 Mon7

Legend

- Location monitoring points along slip (Mon 1)
- Turbine Locations
- Met Mast
- 3rd Party Telecoms Mast
- Derrybrien Wind Farm Site
- Derrybrien Wind Farm Site Entrance
- Pre-Existing Drainage
- Constructed Drainage
- Hard standing associated with construction compound
- Derrybrien Substation
- Derrybrien Substation Hardstanding Area
- Floating Road
- Non Floating Road
- Access Road to Wind Farm Site
- Turbine Hardstands
- Barrages
- Borrow Pit / Quarry
- Equipment / Storage containers

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 0.25 0.5 0.75 1 km

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	29/06/20	Issued for substitute consent	E.O'S	E.O'S	M.B	P.K

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PROJECT: Derrybrien Wind Farm Project

CONTRACT

PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Derrybrien Wind Farm - Location monitoring points

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DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	M.Brides	P.Kavanagh	01/07/2020

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:10,000

DRAWING NUMBER: QS-000192-01-D451-009

N

Hard standing associated with construction compound

Borrow Pit/Quarry 3

Borrow Pit/Quarry 1

Borrow Pit/Quarry 2

Telecoms Mast

Equipment/ Storage Containers

Derrybrien Substation

Met Mast 2

Met Mast 1

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T48 T49 T50 T51 T52 T53 T54 T55 T56 T57 T58 T59 T60 T61 T62 T63 T64 T65 T66 T67 T68 T69 T70 T71

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0 0.25 0.5 0.75 1 km

Legend

- Turbine Locations
- Met Mast
- 3rd Party Telecoms Mast
- Derrybrien Wind Farm Site
- Derrybrien Wind Farm Site Entrance
- Hard standing associated with construction compound
- Derrybrien Substation
- Derrybrien Substation Hardstanding Area
- Floating Road
- Non Floating Road
- Access Road to Wind Farm Site
- Turbine Hardstands
- Borrow Pit / Quarry
- Equipment / Storage containers

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	05/05/20	Issued for substitute consent	E.O'S	E.O'S	P.K	M.B

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PROJECT: Derrybrien Wind Farm Project

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DRAWING TITLE: Derrybrien Wind Farm- Site Layout

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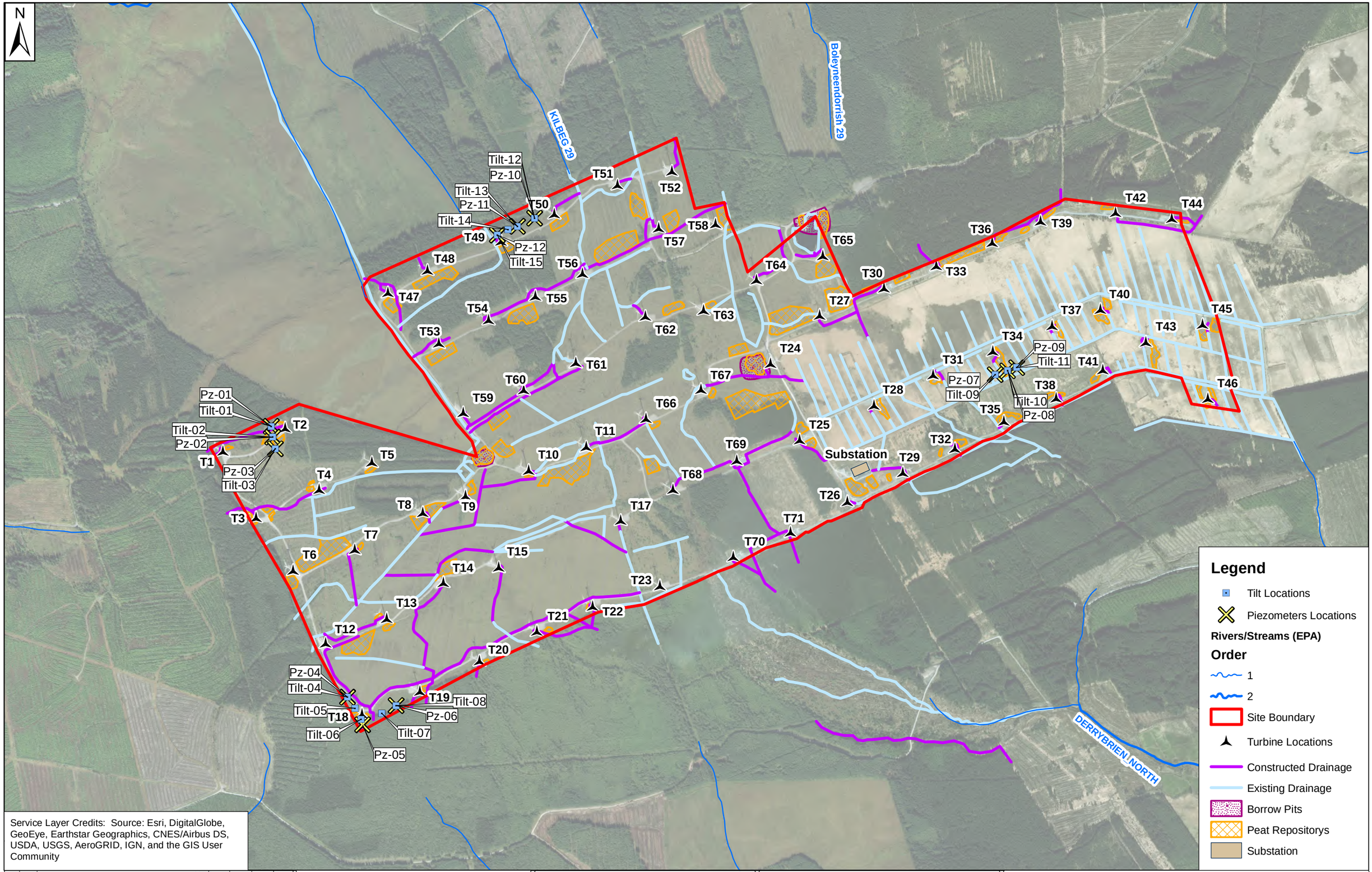

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PRODUCTION UNIT: Civil & Environmental Engineering

PROJECT: Derrybrien Wind Farm Environmental Report

DRAWING TITLE: Derrybrien Wind Farm - Approximate Location of Piezometres & tiltmeters points on Site

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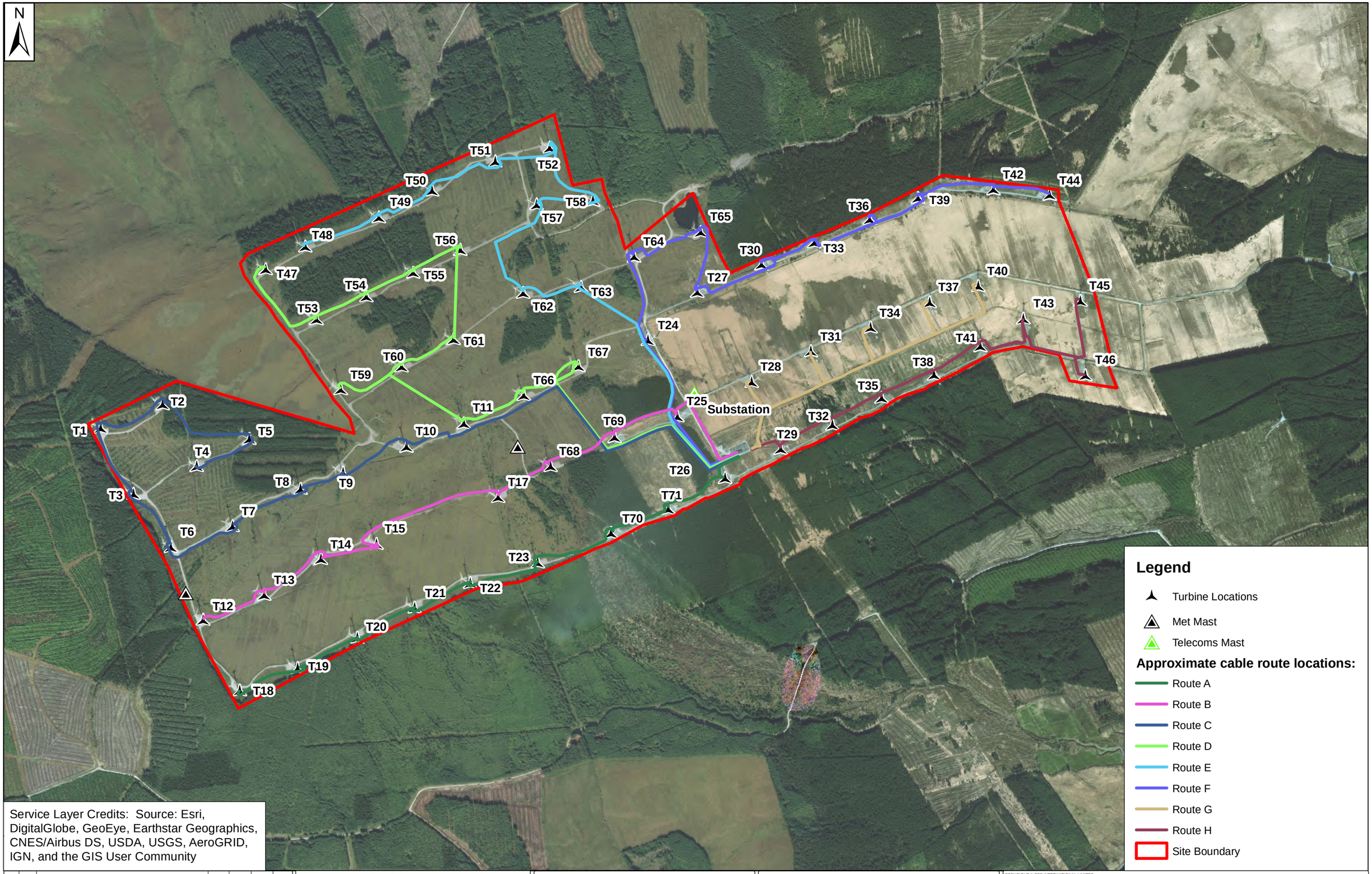

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REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

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PROJECT: Derrybrien Wind Farm Environmental Report

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PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Derrybrien Wind Farm - Approximate cable route locations

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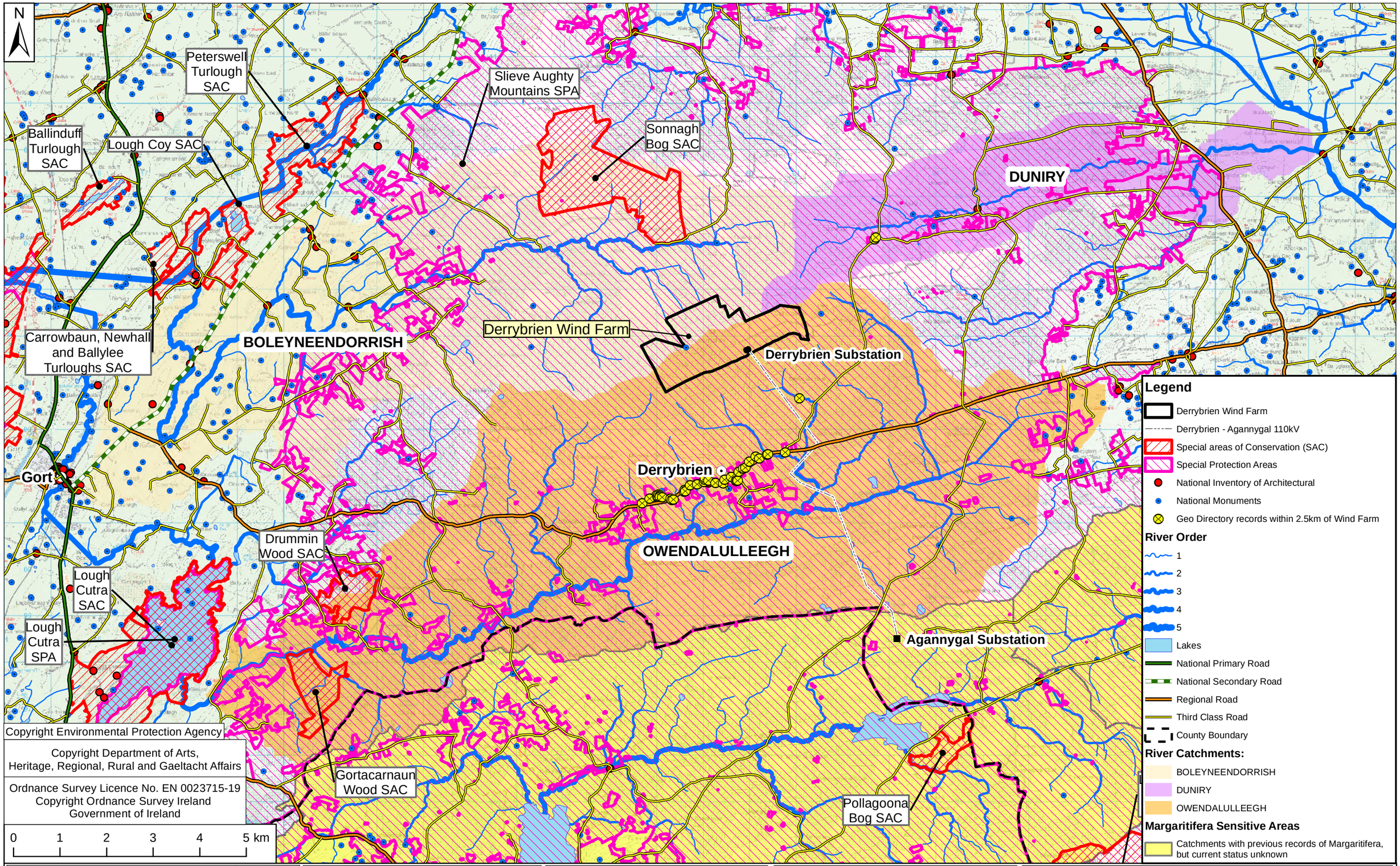
DRAWING NUMBER: QS-000192-01-D451-017



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PROJECT: **Derrybrien Wind Farm Environmental Report**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Derrybrien Wind Farm Constraints**

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T. O'Rourke	T.O'Rourke	R.O'Donovan	J.Fitzpatrick	30/10/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
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DRAWING NUMBER: **QS-000192-01-D451-018**

COMMENTS

(i) LEVEL ROUGH STONE ADJACENT HARDSTAND

(ii) LOW SPOT IN ROAD REQUIRES FILLING TO REMOVE PONDING WATER

(iii) COURSE STONE TO BE SCRAPPED OF MATTED MATERIAL. **CL.6H MATERIAL OR SIMILAR APPROVED** TO BE PLACED AND TRACKED IN POSITION. ROADS EDGE TO BE CLEARLY DEFINED WITH OVERSPILL FROM PREVIOUS WORKS REMOVED/COVERED.

(iv) COURSE STONE TO BE REMOVED AND REINSTATED WITH GEOGRID AND CL.6F2 MATERIAL. DRAIN TO BE FORMED IN H/S TO REMOVE WATER

(v) LOW SPOT IN ROAD REQUIRES FILLING TO REMOVE PONDING WATER

(vi) CAPPING REQ'D ONLY (NO GEOGRID NEEDED)

(vii) CORNER TO BE REGRADED FOR SWEPT PATH OF CRANE

(viii) COURSE MATERIAL TO BE REMOVED AND REPLACED WITH SPECIFIED CL.6F2 AND GEOGRID

(ix) STRIP FINE MATERIAL AND STORE FOR USE AS BLINDING MATERIAL. REINSTATE AREA WITH GEOGRID AND CL.6F2

(x) RESURFACING WORKS REQUIRED. EXACT AREA TO BE FINALISED ONSITE WITH SUPERVISING ENGINEER.

(xi) REGRADING / RESURFACING WORKS REQUIRED ONLY. NO GEOGRID REQUIRED IN THIS LOCATION.

(xii) BOG MACHINE REQUIRED IN THIS AREA TO PROVIDE DRAINAGE FROM ACCESS TRACK INTO SURROUNDING PEAT AREA.

(xiii) GEOGRID AND CAPPING REQUIRED IN TRANSITION IN ROAD. TO BE IDENTIFIED ONSITE PRIOR TO WORKS.

(xiv) REGRADING / SURFACING WORKS REQUIRED AT MET MAST. EXTENT OF WORK TO BE IDENTIFIED BY SUPERVISING ENGINEER.

(xv) AREA WHERE REMEDIAL WORKS HAVE NOT PREVIOUSLY BEEN CARRIED OUT TO BE IDENTIFIED AND A LAYER OF GEOGRID AND CAPPING LAYER TO BE APPLIED. TO BE AGREED WITH SUPERVISIG ENGINEER.

(xvi) WORK EXTENDS FROM SIGN POST AT JUNCTION TO END OF T17 HARDSTAND

(xvii) COURSE STONE TO HAVE **CL.6H MATERIAL OR SIMILAR APPROVED** PLACED AND TRACKED IN POSITION.

(xviii) REGRADING WORK REQUIRED AT ROADS EDGE / DRAIN. ARE TO BE IDENTIFIED ONSITE BY SUPERVISING ENGINEER.

(xix) LOCALISED RESURFACING WORKS TO BE IDENTIFIED BY SUPERVISING ENGINEER.

(xx) AREAS WHERE WORKS HAVE PREVIOUSLY BEEN CARRIED OUT TO BE IDENTIFIED ON SITE BY SUPERVISING ENGINEER. NO REMEDIAL WORKS REQUIRED IN THESE AREAS.

(xxi) SOFT SPOT IDENTIFIED DURING OBSERVATIONAL LOAD TEST. AREA TO BE AGREED WITH SUPERVISING ENGINEER AND GEOGRID AND CAPPING TO BE APPLIED.

(xxii) AREA TO HAVE DETAIL A APPLIED. EXACT AREA TO BE IDENTIFIED AND AGREED ONSITE WITH THE SUPERVISING ENGINEER. AREA LOCATED BETWEEN WATERCOURSES.

(xxiii) AREA REQUIRES RESURFACING WORKS. EXACT AREA TO BE IDENTIFIED AND AGREED ONSITE WITH THE SUPERVISING ENGINEER.

(xxiv) AREA REQUIRES REGRADING WORKS. EXACT AREA TO BE IDENTIFIED AND AGREED ONSITE WITH THE SUPERVISING ENGINEER.

(xxv) AREA REQUIRES RESURFACING WORKS. EXACT AREA TO BE IDENTIFIED AND AGREED ONSITE WITH THE SUPERVISING ENGINEER.

(xxvi) COURSE STONE TO BE REGRADED AND A LAYER OF BLINDING APPLIED AND TRACKED IN POSITION. EXACT AREA TO BE IDENTIFIED AND AGREED ONSITE WITH THE SUPERVISING

(xxvii) EXACT METHOD OF REMEDIAL WORKS TO BE DETERMINED ON S SUPERVISING ENGINEER.

NOTES

(1) AREA WHERE ACCESS TRACK TRANSITIONS WITH HARDSTAND TO BE STRENGTHENED WITH GEOGRID AND CAPPING LAYER. AREAS TO BE IDENTIFIED ON SITE BY SUPERVISING ENGINEER. INITIAL AREAS IDENTIFIED INCLUDE T8, T9, T13, T17, T29, T30,T51,T52.

(2) IN ADDITION TO AREAS WHICH REQUIRE REMEDIAL WORKS, POTHOLES TO BE FILLED SITE WIDE. EXTENT OF POTHOLE FILLING TO BE IDENTIFIED AND AGREED ONSITE WITH THE SUPERVISING ENGINEER.

ROAD PERFORMANCE

- GOOD
- MISCELLANEOUS WORKS
- REMEDIAL WORK DETAIL A
- REMEDIAL WORK DETAIL B

FLOATING ROAD PERFORMANCE CRITERIA FOR FULL-SCALE SERVICEABILITY LOAD TESTS

ROAD PERFORMANCE CLASSIFICATION	PERFORMANCE CRITERIA (2 x 36.5 TONNE LOAD)
Good	***➢ Road deflections generally <10 mm*** ***➢ Road deflects relatively rigidly under truck load with only slightly greater deformation locally under the wheel load at localized soft spots.*** ***➢ Road surface is even with minor rutting and no loose rockfill.***
Poor	***➢ Road deflections are greater than 30 mm (up to about 60 mm)*** ***➢ Road deforms very noticeably under wheel loads in wave-like motion.*** ***➢ Deformations are uneven causing the truck to tilt slightly on local soft spots.*** ***➢ Road surface is in poor condition with both longitudinal and transverse rutting creating an uneven road surface.*** ***➢ Rockfill is loosened over worst areas.***

REV.	DATE	REVISION DESCRIPTION	DRN	VER	APP
1	10.4.14	ADDITIONAL AREAS OF REQUIRED WORKS ADDED	SB	DA	SS
0	26.3.14	ISSUED FOR CONSTRUCTION	SB	DA	SS

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

TENDER ☐ CLIENT APPROVAL ☐ CONSTRUCTION ☒ AS-BUILT ☐ REVISED ☐

Client: GORT WIND FARMS LTD.

Project: DERRYBRIEN WIND FARM

Contract: SITE TRACKS REMEDIAL WORKS

Drawing Title: REMEDIAL WORKS PLAN

Production Unit: CIVIL, BUILDING & ENVIRONMENTAL

ESB International
ESBI Energy Innovation

ESBI Engineering Solutions, Stephen Court,18–21 St. Stephen's Green, Dublin 2, Ireland. **Tel:** +353 (0)1 703 8000 **Fax:** +353 (0)1 703 7186
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DRAWN	VERIFIED	APPROVED	APPD DATE
S. Bolton	D.Ahern	S.Shanley	26.03.2014

CLIENT REF	No. of Shts	SIZE	REV	SCALE
	1	A1	1	1:5000

DRAWING NUMBER: P378015-C-0003

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APPENDIX B

PEAT STABILITY RISK ASSESSMENT (PRSA)

APPENDIX B

PEAT STABILITY RISK ASSESSMENT (PRSA)

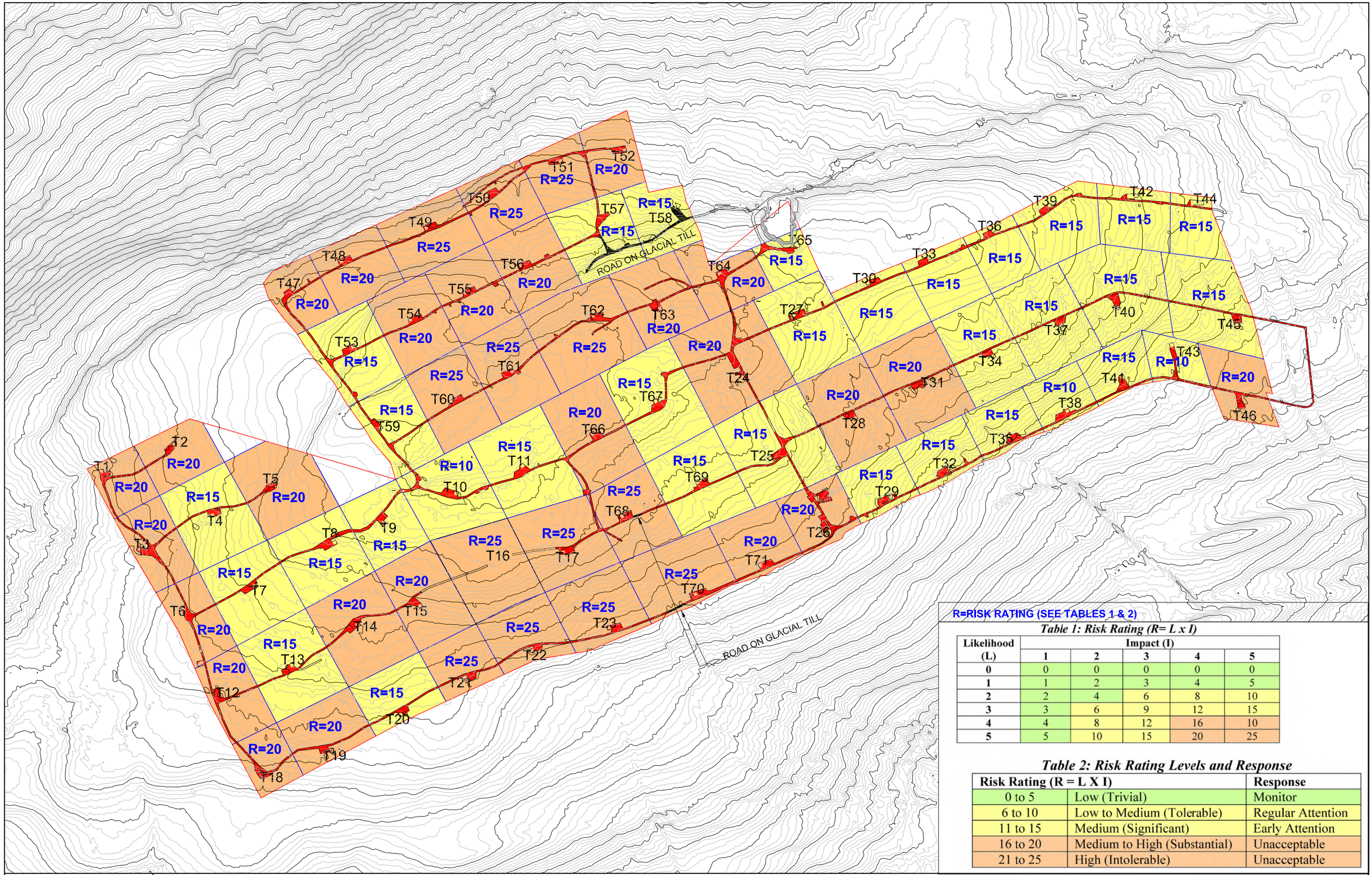
TABLE B1: PEAT/SUBSOIL CONDITIONS	Rating			
	Negligible	**Low**	**Medium**	**High**
Peat				
Peat Depth	**<0.5 m**	**0.5 - 1.0**	**1.0 - 2.0**	**>2.0**
Water Content	**0-500%**	**500-1000%**	**1000-1500%**	**>1500%**
Min Peak Undrained Shear Strength	**>20 kPa**	**10-20 kPa**	**5-10 kPa**	**<=5 kPa**
Peat Classification at c_u min	**Very Fibrous**	**Fibrous**	**Pseudo-Fibrous/Slightly Fibrous**	**Amorphous/ Clayey**
Stability of peat in trial pits	**Stable**	**Slight spalling**	**Collapse @ >3 m Depth**	**Collapse/squeezing <3 m Depth**
Very Soft Clay Layer Below Peat [applies to uniform clay of high plasticity, & excludes well-graded gravelly Cohesive Glacial Till or decomposed rock]				
Very soft clay layer at base of peat	**No**			**Yes**
Sensitivity Coefficient ($c_{u\ peak}/c_{u\ residual}$)	**1.0**	**1.0-1.5**	**1.5 - 2.0**	**>2**
Peak Undrained Shear Strength	**>20 kPa**	**10-20 kPa**	**5-10 kPa**	**<=5 kPa**
Residual Undrained Shear Strength	**>20 kPa**	**10-20 kPa**	**5-10 kPa**	**<=5 kPa**
Transition - Peat to Mineral Soil				
Sharp discontinuity (possible or potential shear plane) identified in peat or at base of peat in trial pits, probes or piston samples	**No**			**Yes**
Underlying Mineral Soil/Rock				
Granular soil/Fractured rock at base of peat	**No**			**Yes**
Nested Flat Boulders	**No**			**Yes**
Rock below Peat - Interface Characteristics	**Rough/ Weathered**	**Rough/Fractured**	**Smooth Undulating**	**Smooth Planar**

TABLE B2: TOPOGRAPHY	Rating			
	Negligible	Low	Medium	High
Slope Angle	**Flat**	**Shallow**	**Intermediate**	**High**
Slope Angle - Ground Surface	**<1º**	**1-3º**	**3º-5º**	**>5º**
Slope Angle - Base of Peat	**<1º**	**1-3º**	**3º-5º**	**>5º**
In broad valley upslope from defined watercourses	**No**	**Yes, slopes <3º**	**Yes, slopes 3-5º**	**Yes, slopes > 5º**
Distance from topographical low-point upslope from defined watercourses	**>250 m**	**100-250 m**	**50-100 m**	**<50 m**
General slope characteristics downslope from road/turbine	**Concave**	**Planar to Concave**	**Planar to Convex**	**Convex**
Distance from break in convex slope	**>100 m**	**50-100 m**	**10-50 m**	**<10 m**

TABLE B3: FACTOR OF SAFETY CALCULATIONS	Rating			
	Negligible	Low	Medium	High
FOS Infinite Slope - No Surcharge (Existing Condition)				
c_u = 5kPa (or minimum)	**>3**	**2.0 - 3.0**	**1.5 - 2.0**	**<1.5**
c_u = 2.5kPa (Worst Case)	**>2**	**1.5 - 2.0**	**1.0 - 1.5**	**<1.0**
FOS Infinite Slope - Surcharge of 1.0m Peat with Partial Factor = 1.3				
c_u = 5kPa (or minimum)	**>3**	**2.0 - 3.0**	**1.5 - 2.0**	**<1.5**
c_u = 2.5kPa (Worst Case)	**>2**	**1.5 - 2.0**	**1.0 - 1.5**	**<1.0**
FOS - Floating Road				
Planar Sliding (c_u = 5kPa)	**>2**	**1.4 - 2.0**	**1.0 - 1.4**	**<1.0**
Bearing Capacity	**>2**	**1.4 - 2.0**	**1.0 - 1.4**	**<1.0**
Extrusion	**>2**	**1.4 - 2.0**	**1.0 - 1.4**	**<1.0**

TABLE B4: HYDROLOGY/HYDROGEOLOGY	Rating			
	Negligible	Low	Medium	High
Surface water	**Dry**	**Localised/ Flowing in Drains**	**Ponded in drains**	**Springs/Surface Water**
Existing drainage ditches	**None/ Downslope**	**Varied (Gen. Downslope)**	**Varied (Gen. Across Slope)**	**Across slope**
Groundwater observations in peat in trial pits.	**Dry**	**Slight Seepage**	**Moderate Seepage**	**Strong Flow**
Piping observed in trial pits	**No**	**Slight Flow/Small Dia. (<25 mm)**	**Moderate Flow/Medium Dia. (25-50 mm)**	**Strong Flow/Large Dia. (>50 mm)**
Seepage at Base of Peat	**No**			**Yes**
Evidence of piping from walkover survey	**No**	**Possibly**	**Probably**	**Yes**

TABLE B5: OTHER CONTRIBUTORY FACTORS	Rating			
	Negligible	Low	Medium	High
Slide History				
Evidence of historic slides		**General Area**	**On Site**	**<1 km**
Tension Cracks in Peat				**Yes**
Aerial Photography				
Evidence of historic slides in area		**Possibly**	**Probably**	**Yes**
Evidence of subterranean drainage/piping		**Possibly**	**Probably**	**Yes**
Other notable contributory features		**Possibly**	**Probably**	**Yes**
Vegetation				
Tree Growth (Coniferous Forestry)	**Good**		**Fair**	**Poor**
Vegetation (no trees)	**Grass/Crops**	**Improved Grass/Dry Heather**	**Wet grassland/juncus**	**Wetlands Sphagnum/ sedge**
Land Use				
Peat Workings	**None/Cutaway to <0.5 m Peat**	**Forestry**	**Turbury Plots**	**Sausage Cutter**



R=RISK RATING (SEE TABLES 1 & 2)

Table 1: Risk Rating (R= L x I)

Likelihood (L)	Impact (I)				
	1	2	3	4	5
0	0	0	0	0	0
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	10
5	5	10	15	20	25

Table 2: Risk Rating Levels and Response

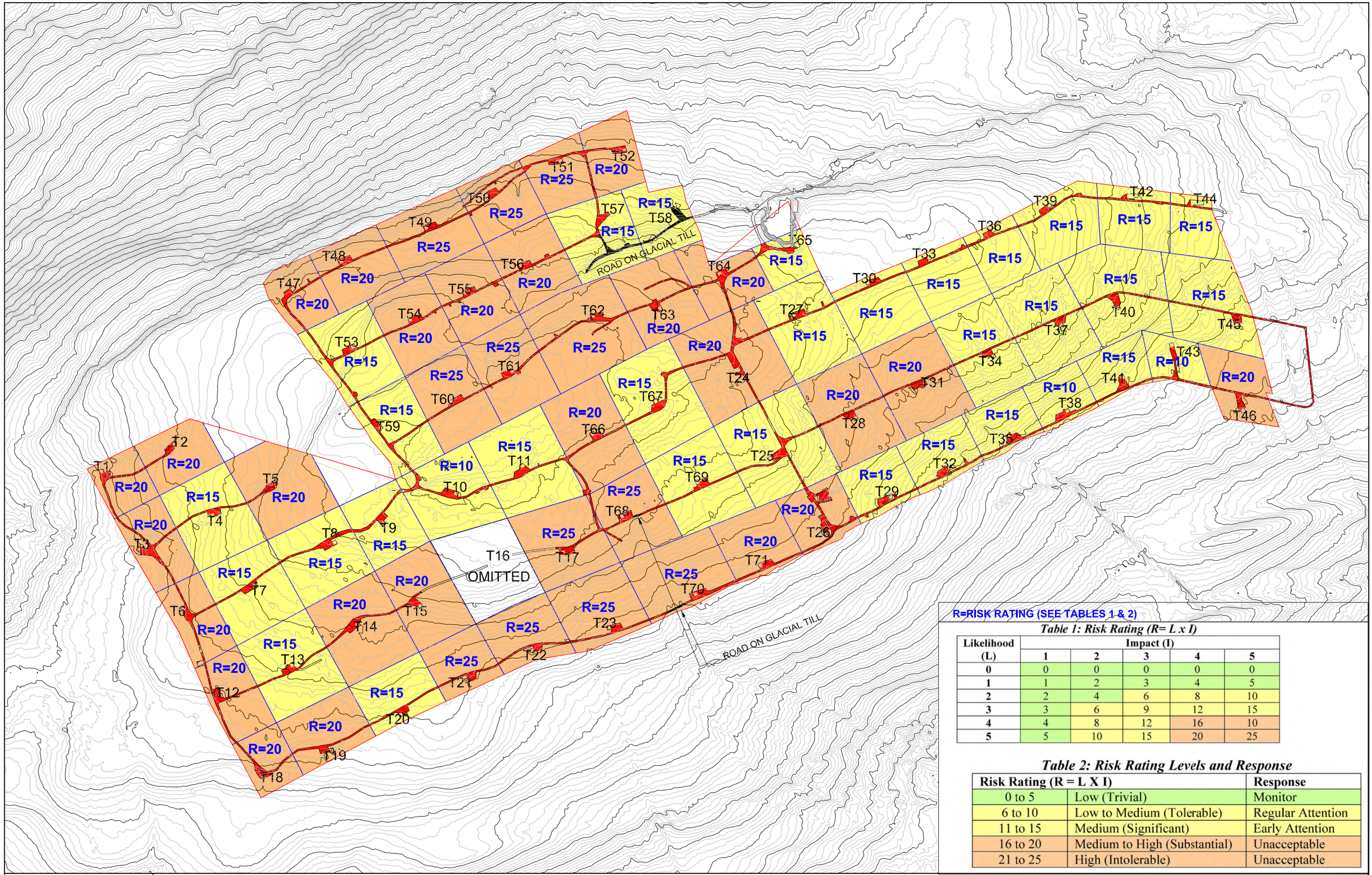
Risk Rating (R = L X I)		Response
0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

AGL CONSULTING
GEOTECHNICAL ENGINEERS

Project: Derrybrien Wind Farm

Title: Baseline PSRA of site in original condition in 1998 prior to construction

Scales	Date	Page no.	Drawing No.:
1:10,000	30/10/2019	1 of 1	Figure B–1
Version: Final	Drawn: NMF	Checked: COD	



R=RISK RATING (SEE TABLES 1 & 2)

Table 1: Risk Rating (R= L x I)

Likelihood (L)	Impact (I)				
	1	2	3	4	5
0	0	0	0	0	0
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	10
5	5	10	15	20	25

Table 2: Risk Rating Levels and Response

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0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

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Project: Derrybrien Wind Farm

Title: PSRA for End of Construction in 2005 - Prior to Mitigation Measures

Scales	Date	Page no.	Drawing No.:
1:10,000	30/10/2019	1 of 1	Figure B–2
Version: Final	Drawn: NMF	Checked: COD	

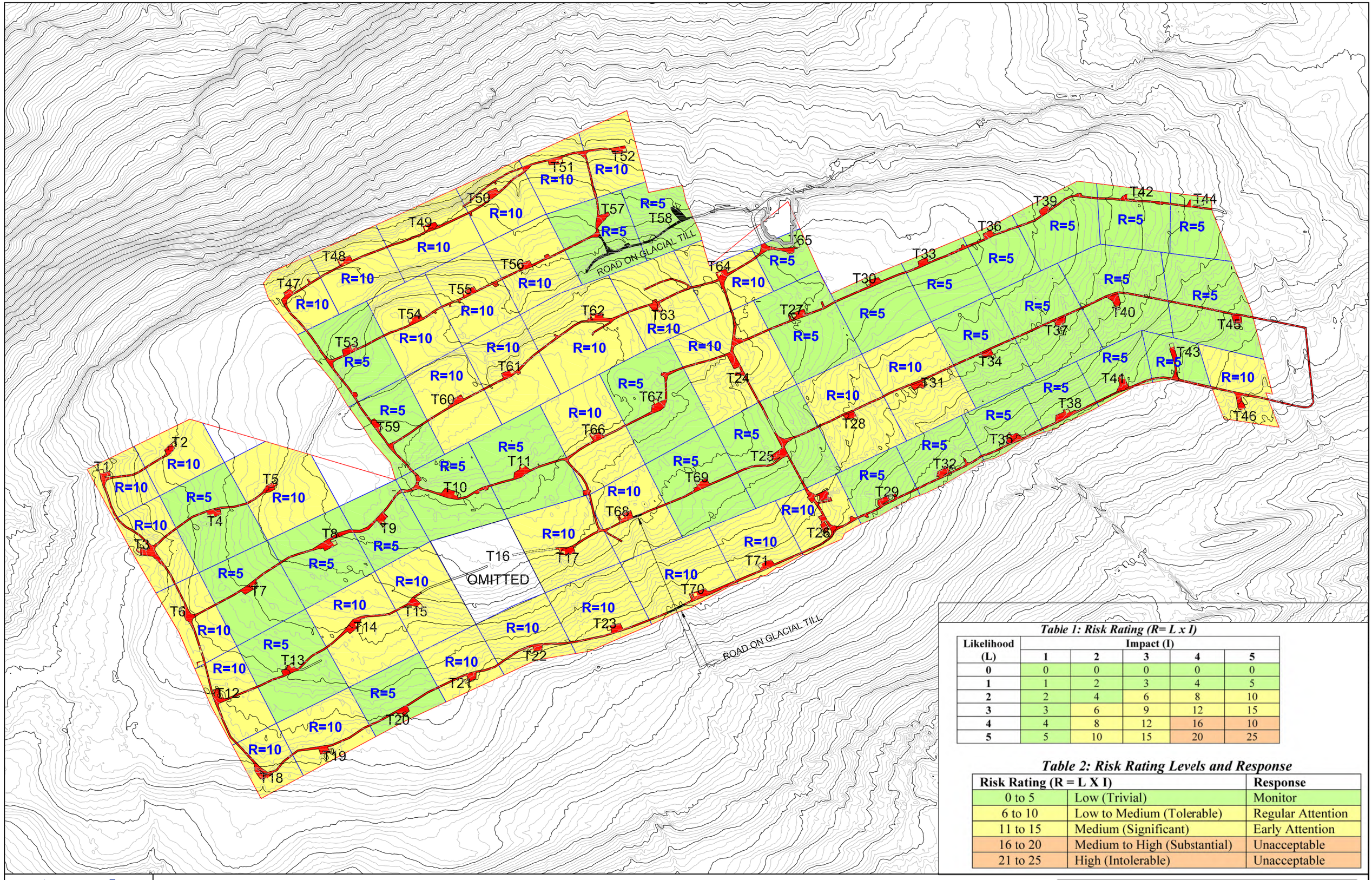

Table 1: Risk Rating (R= L x I)

Likelihood (L)	Impact (I)				
	1	**2**	**3**	**4**	**5**
0	0	0	0	0	0
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	10
5	5	10	15	20	25

Table 2: Risk Rating Levels and Response

Risk Rating (R = L X I)		Response
0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

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Project: Derrybrien Wind Farm

Title: Updated PSRA for Site Activities 2005-2018 - after Mitigation Measures

Scales	Date	Page no.	Drawing No.:
1:10,000	30/10/2019	1 of 1	Figure B–3
Version: Final	Drawn: NMF	Checked: COD	

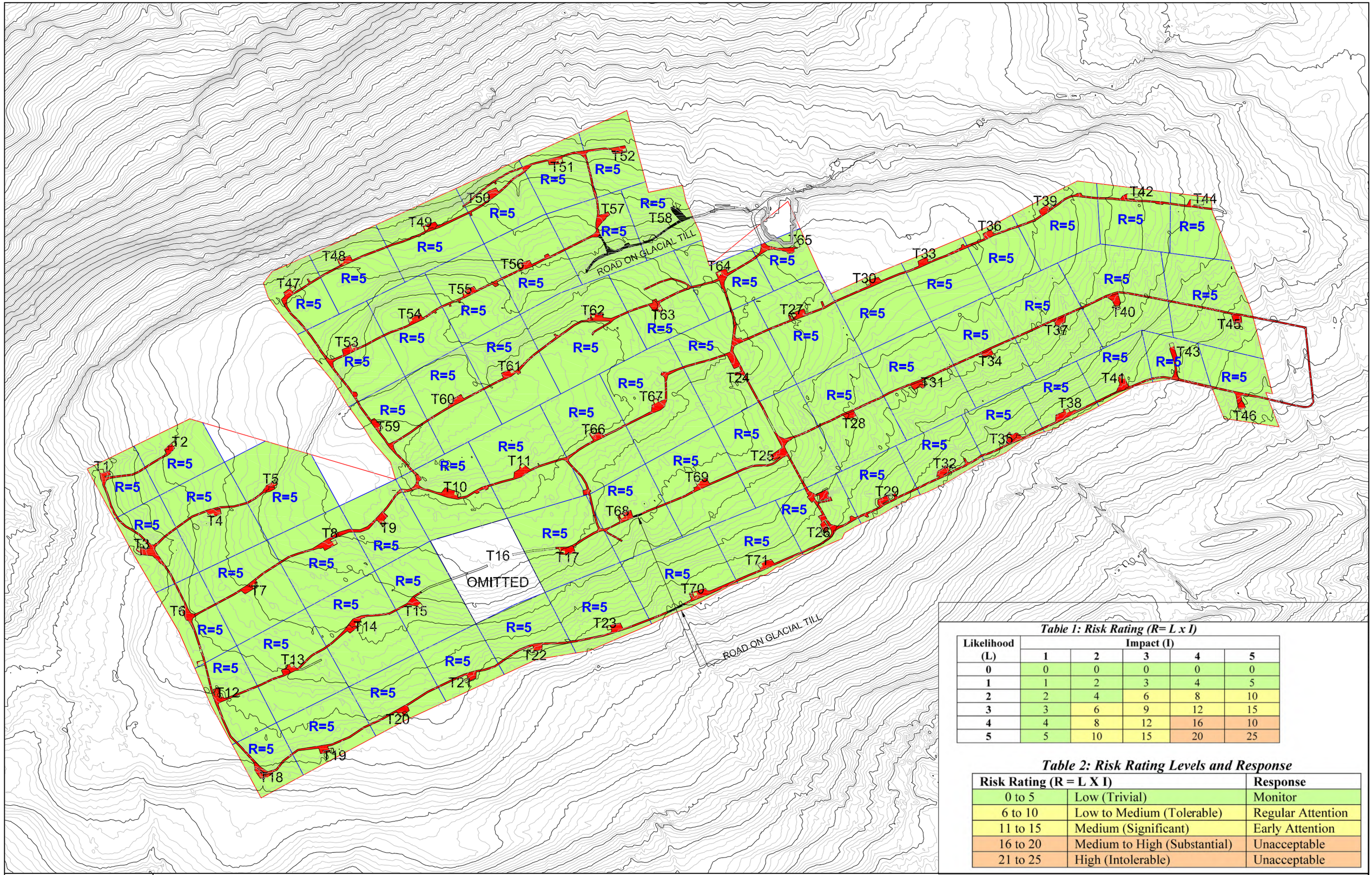

Table 1: Risk Rating (R= L x I)

Likelihood (L)	Impact (I)				
	1	2	3	4	5
0	0	0	0	0	0
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	10
5	5	10	15	20	25

Table 2: Risk Rating Levels and Response

Risk Rating (R = L X I)		Response
0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

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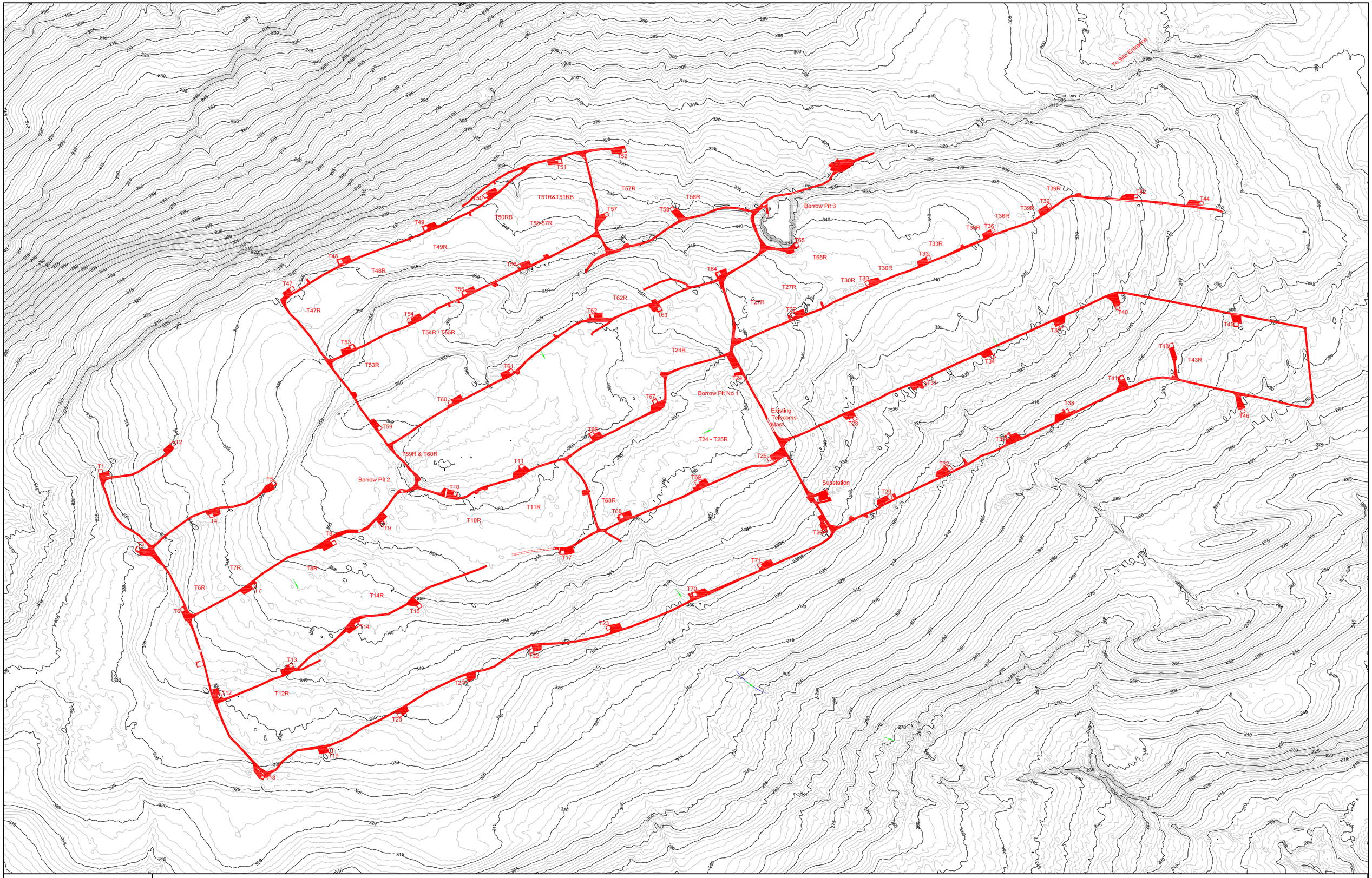
Project: Derrybrien Wind Farm

Title: Updated Baseline PSRA for Site Activities 2018-End of Operation - after Mitigation Measures

Scales	Date	Page no.	Drawing No.:
1:10,000	30/10/2019	1 of 1	Figure B-4
Version: Final	Drawn: NMF	Checked: COD	



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Project: Derrybrien Wind Farm			
Title: LIDAR TOPOGRAPHICAL SURVEY			
Scales: 1:10,000	Date: 13/08/2018	Page no.: 1 of 1	Drawing No.: Figure 2.1B
Version: Final	Drawn: NMF	Checked: COD	

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ESBI Energy Innovation

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Legend:

Project: Derrybrien Wind Farm			
Title: Aerial Photo			
Scales: 1:10,000	Date: 24/11/2011	Page no.: 1 of 1	Drawing No.: 11-147-03
Version: Draft	Drawn: PS	Checked: CDD	

LEGEND:

AS BUILT LAYOUT

SITE BOUNDARY

N

G001 G002 G003 G004 G005 G006 G007 G008 G009 G010 G011 G012 G013 G014 G015 G017 G018 G019 G020 G021 G022 G023 G024 G025 G026 G027 G028 G029 G030 G031 G032 G033 G034 G035 G036 G037 G039 G040 G041 G042 G043 G044 G045 G046 G047 G048 G049 G050 G051 G052 G053 G054 G055 G056 G057 G058 G059 G060 G061 G062 G063 G064 G065 G066 G067 G068 G069 G070 G071

TELECOMS MAST

SUB. STN.

PEAT DEPTH RANGES

NUMBER	Min. (m bgl)	Max. (m bgl)	COLOUR
1	0.00	1.00	
2	1.00	2.00	
3	2.00	3.00	
4	3.00	4.00	
5	4.00	5.00	
6	5.00	6.00	
7	6.00	10.00	

m bgl = meters below ground level

Metres

REV.	DATE	REVISION DESCRIPTION	DRN	PRO	VER	APP
0	31.07.19	FOR INFORMATION ONLY	SB	LMcM	MB	RC

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

TENDER ☐ CLIENT APPROVAL ☐ CONSTRUCTION ☐ AS-BUILT ☐ REVISED ☐

Client: ESB

Project: DERRYBRIEN WIND FARM
Co. GALWAY

Contract:

Drawing Title: SITE LAYOUT
PEAT DEPTH BANDING

Production Unit: CIVIL AND ENVIRONMENTAL ENGINEERING

Energy for generations

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Web: www.esb.ie
Registered Office: as above Registered in Ireland:No. 471139

DRAWN	PRODUCED	VERIFIED	APPROVED	APPD DATE
S. Bolton	LMcM	M.Brides	R.Canavan	06.02.2019

CLIENT REF	No. of Shts	SIZE	REV	SCALE
	1	A1	0	1:5000 @ A1

DRAWING NUMBER: QS-000192-01-D451-025

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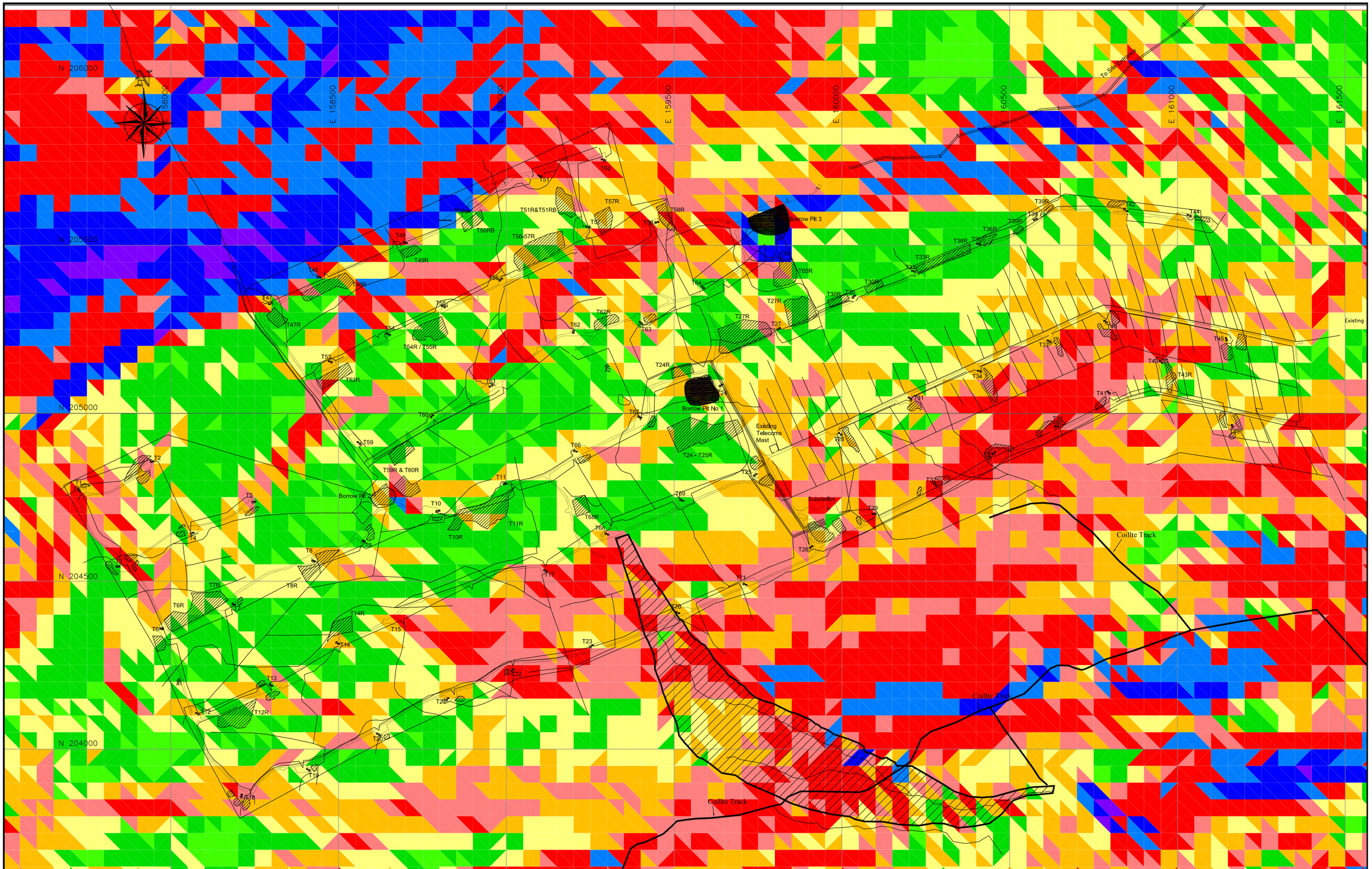

International
ESBI Energy Innovation

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Legend:

- 0-1 Degree
- 1-2 Degree
- 2-3 Degree
- 3-4 Degree
- 4-5 Degree
- 5-7.5 Degree
- 7.5-10 Degree
- 10-15 Degree
- Greater Than 15 Degree

Project: Derrybrien Wind Farm

Title: Slope Angle at Ground Surface

Scales	Date	Page no.	Drawing No.:
1:10,000	24/11/2011	1 of 1	11-147-05
Version: Draft	Drawn: PS	Checked: COD	

LEGEND:

AS BUILT LAYOUT

SITE BOUNDARY

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G001 G002 G003 G004 G005 G006 G007 G008 G009 G010 G011 G012 G013 G014 G015 G016 G017 G018 G019 G020 G021 G022 G023 G024 G025 G026 G027 G028 G029 G030 G031 G032 G033 G034 G035 G036 G037 G038 G039 G040 G041 G042 G043 G044 G045 G046 G047 G048 G049 G050 G051 G052 G053 G054 G055 G056 G057 G058 G059 G060 G061 G062 G063 G064 G065 G066 G067 G068 G069 G070 G071

TELECOMS MAST

SUB. STN.

Base of Peat Slope			
Number	Minimum Slope	Maximum Slope	Color
1	0°	1°	
2	1°	2°	
3	2°	3°	
4	3°	4°	
5	4°	5°	
6	5°	7.5°	
7	7.5°	10°	
8	10°	15°	
9	15°	>15°	

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

TENDER ☐ CLIENT APPROVAL ☐ CONSTRUCTION ☐ AS-BUILT ☐ REVISED ☐

Client: ESB

Project: DERRYBRIEN WIND FARM
Co. GALWAY

Contract:

Drawing Title: SITE LAYOUT
BOTTOM PEAT SLOPE BANDING

Production Unit: CIVIL AND ENVIRONMENTAL ENGINEERING

Energy for generations

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Web: www.esb.ie
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0 100 200 Metres

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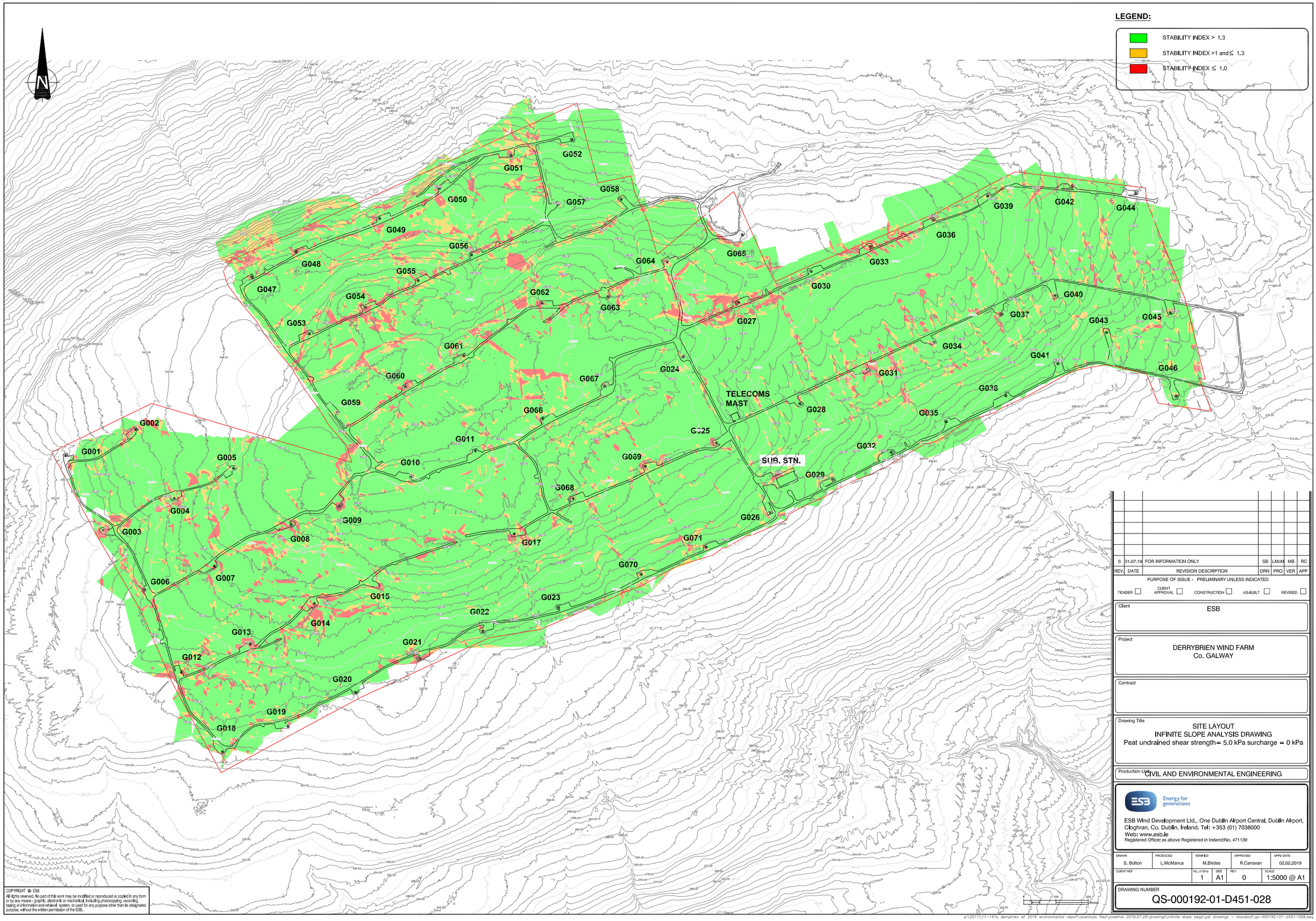

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

TENDER ☐ CLIENT APPROVAL ☐ CONSTRUCTION ☐ AS-BUILT ☐ REVISED ☐

Client: ESB

Project: DERRYBRIEN WIND FARM
Co. GALWAY

Contract:

Drawing Title: SITE LAYOUT
INFINITE SLOPE ANALYSIS DRAWING
Peat undrained shear strength= 5.0 kPa surcharge = 0 kPa

Production Unit: CIVIL AND ENVIRONMENTAL ENGINEERING

Energy for generations
ESB Wind Development Ltd., One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, Ireland. Tel: +353 (01) 7038000
Web: www.esb.ie
Registered Office: as above Registered in Ireland:No. 471139

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S. Bolton	L.McManus	M.Brides	R.Canavan	02.02.2019

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DRAWING NUMBER: QS-000192-01-D451-028

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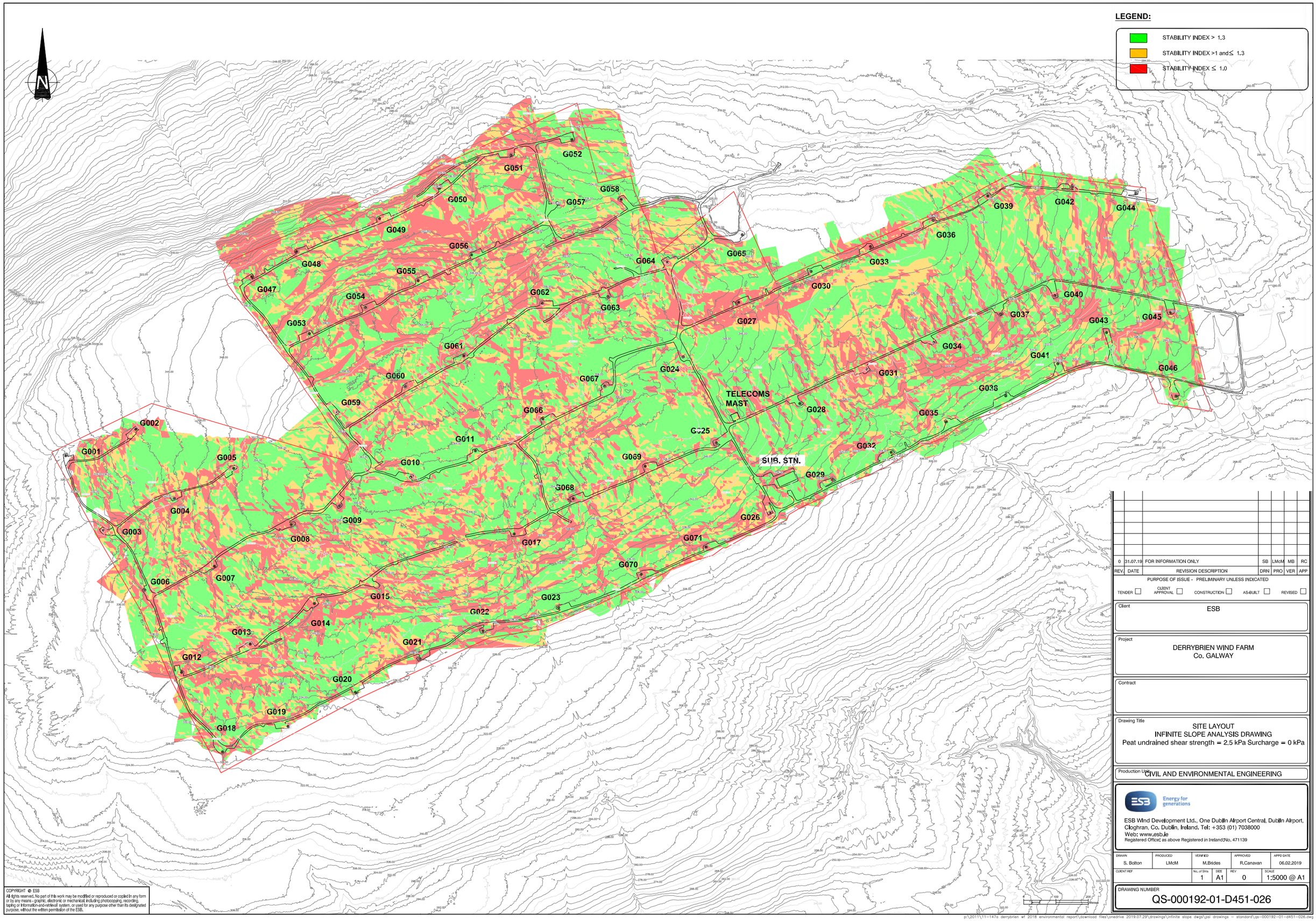

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

TENDER ☐ CLIENT APPROVAL ☐ CONSTRUCTION ☐ AS-BUILT ☐ REVISED ☐

Client: ESB

Project: DERRYBRIEN WIND FARM
Co. GALWAY

Contract:

Drawing Title: SITE LAYOUT
INFINITE SLOPE ANALYSIS DRAWING
Peat undrained shear strength = 2.5 kPa Surcharge = 0 kPa

Production Unit: CIVIL AND ENVIRONMENTAL ENGINEERING

Energy for generations
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Web: www.esb.ie
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DRAWN	PRODUCED	VERIFIED	APPROVED	APPD DATE
S. Bolton	LMcM	M.Brides	R.Canavan	06.02.2019

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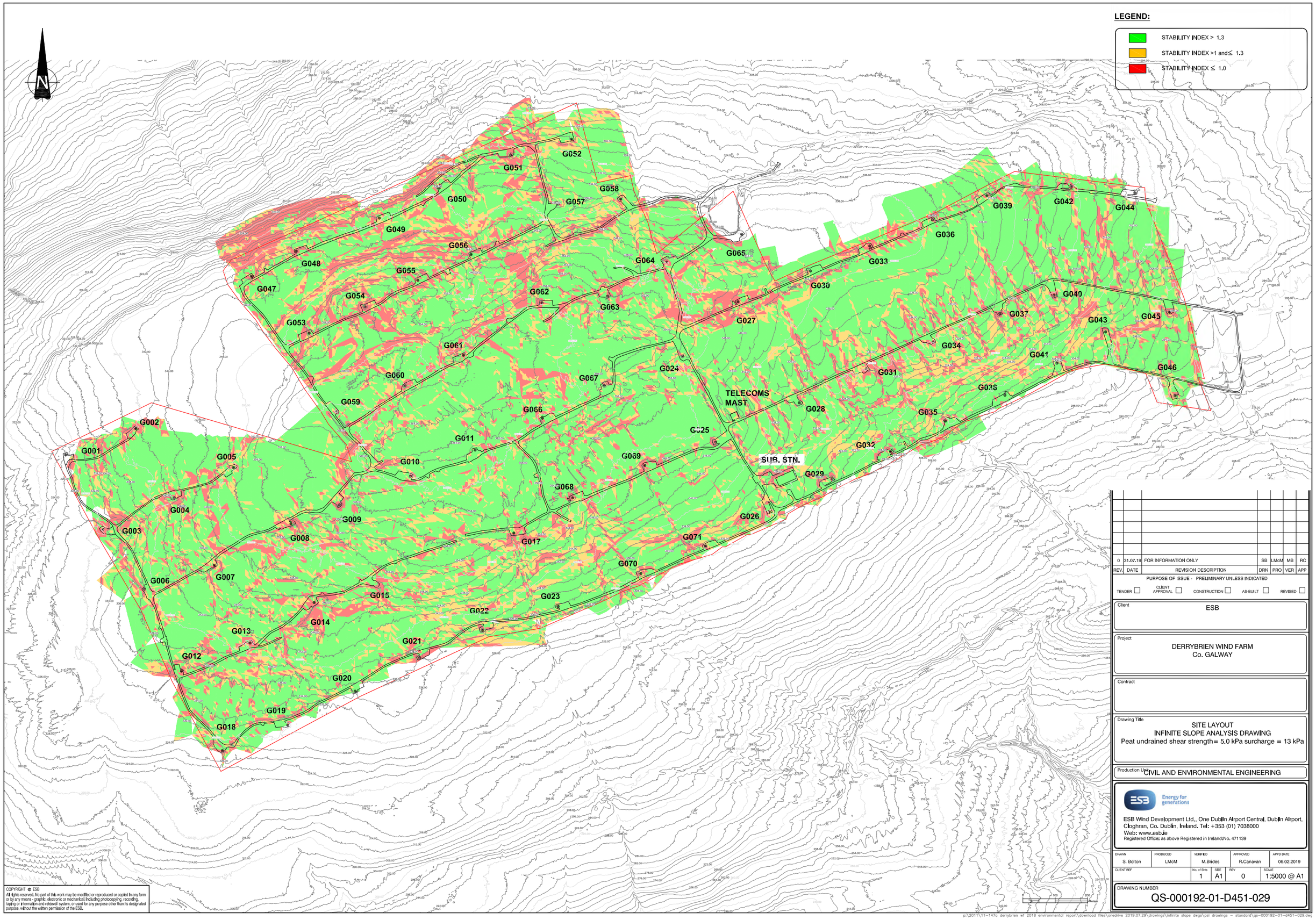

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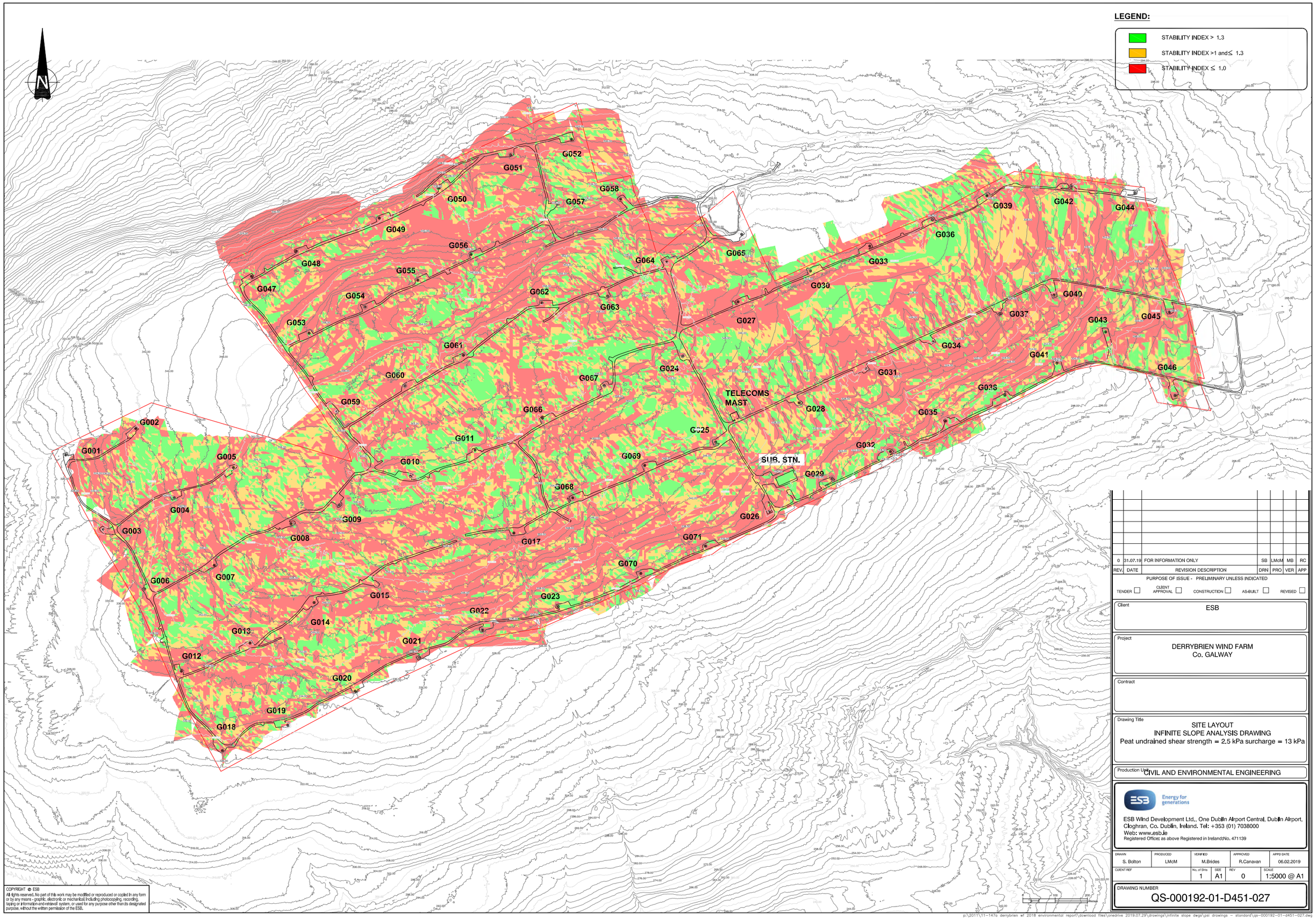

REV.	DATE	REVISION DESCRIPTION	DRN	PRO	VER	APP
0	31.07.19	FOR INFORMATION ONLY	SB	LMcM	MB	RC

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

TENDER ☐ CLIENT APPROVAL ☐ CONSTRUCTION ☐ AS-BUILT ☐ REVISED ☐

Client: ESB

Project: DERRYBRIEN WIND FARM
Co. GALWAY

Contract:

Drawing Title:
SITE LAYOUT
INFINITE SLOPE ANALYSIS DRAWING
Peat undrained shear strength = 2.5 kPa surcharge = 13 kPa

Production Unit: CIVIL AND ENVIRONMENTAL ENGINEERING

Energy for generations

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Web: www.esb.ie
Registered Office: as above Registered in Ireland:No. 471139

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CLIENT REF	No. of Shts	SIZE	REV	SCALE
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AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T1**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-3m, locally 3-4m east of H/S • **C_u (Geonor H-10) in Peat: <**5kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 4-7.5°; locally 3-4° • **General slope characteristics:** On sloping ground at end of terrace, ground slopes down to west, slight convex break east of H/S, • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 327-335mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 • ***cu = 2.5kPa**: Generally ≤ 1.0 to ≤ 1.3; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 east of H/S, variable south, ≤ 1.0 to > 1.3; • ***c_u = 2.5kPa:** Generally ≤1.0 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible small amount of surface water on flat ground to the southeast • **Drainage:** Water course to the north; Forestry Furrows to the east • **Seepage in trial pits:** Possible seepage in flat ground area to the southeast • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north & west; cut forest to southeast • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T2**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-4m; pocket of 4-5m east of H/S • **C_u (Geonor H-10) in Peat:** 5.7-13.3kPa (average = 8.9kPa) • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-4°; 4-5° at H/S; south of H/S ≤ 3° • **General slope characteristics:** On sloping ground at end of terrace, ground slopes down to west, slight convex break west of H/S, ground relatively flat (≤ 3°) to south and east • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 335-341mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally >1.3; locally ≤ 1.0 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤ 1.0; Locally > 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water on flat ground to the south • **Drainage:** Water course to the north; Forestry Furrows to the south and north • **Seepage in trial pits:** Possible seepage in flat ground area to the south • **Evidence of piping/subsurface flow:** Possible piping upslope of watercourse	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** Possible piping upslope of watercourse • **Vegetation:** Forestry north and south of H/S; Cut forest to the south and north of road • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T3**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-4m at H/S and to east; 0-2m to north and south • **C_u (Geonor H-10) in Peat:** <5-10kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** East of H/S ≤ 3°; north & south of H/S 5-7.5°, locally 4-5 °; • **General slope characteristics:** On sloping ground at end of terrace, ground slopes down to the east; Distinct convex break along road north and south of H/S; ground relatively flatter (< 3°) west of H/S • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 328-337mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1.0 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1.0; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤ 1.0 with localised areas > 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1.0 **Undrained shear strength at base of Peat*	VH	20
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water on flat ground to the west • **Drainage:** Drain to east, crossing road to east and north of H/S; Forestry Furrows north and south of the road and strip to the west. • **Seepage in trial pits:** Possible seepage in deep peat (3-4m) to the east • **Evidence of piping/subsurface flow:** No	2-3	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No. • **Vegetation:** Forestry to the west; cut forest to the east • **Peat Harvesting:** No.	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T4**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m; pocket of deep peat (4-6m) to the south and north • **C_u (Geonor H-10) in Peat:** <5kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-4° • **General slope characteristics:** On sloping ground at end of terrace, ground slopes down to the west, slight convex break east and west of H/S, • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 340-347mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally between ≤ 1.3 and ≤1.0 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Variable, ≤ 1.0 to > 1.3; • ***c_u = 2.5kPa:** Generally ≤1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in relatively flat area (≤ 3°) with deep peat (4-6m) to north and south • **Drainage:** Drain along southern side of road; Forestry Furrows to north and south • **Seepage in trial pits:** Possible seepage in relatively flat area (≤ 3°) with deep peat (4-6m) to north and south • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No. • **Vegetation:** Cut forest to north and south • **Peat Harvesting:** No.	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T5**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-3m at H/S; 2-4m west of H/S; Deep peat (4-6m) to the south • **C_u (Geonor H-10) in Peat:** 8.1-14.2kPa (average = 12.1kPa) • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Slight spalling to local collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-4°; locally 4-5 ° at H/S; 1-2° south of H/S • **General slope characteristics:** On sloping ground between terraces, slight convex break at H/S, distinct convex break east of H/S; relatively flat ground (1-2°) to northeast and southeast on terrace • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 346-350mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Variable ≤ 1.0 to > 1.3; generally > 1.3 at H/S • ***c_u = 2.5kPa:** Generally ≤1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and relatively flat ground area to the southeast • **Drainage:** Drain along south of road and H/S. Forestry furrows to the west • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and relatively flat ground area to the south • **Evidence of piping/subsurface flow:** No.	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No. • **Vegetation:** Forestry to the north, south and east; cut forest to the northwest (strip) and south west of H/S • **Peat Harvesting:** No.	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**	**Total Hazard Rating**	60
	Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T6**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m; 0-2m to north • **C_u (Geonor H-10) in Peat:** <5kPa to 10kPa* • **Water Content:** 500-1500%* • **Max degree of humification: Stability of peat in trial pits:** H5-H10* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; 3-5° north of H/S • **General slope characteristics:** Ground generally gently sloping down to west; Distinct convex break north of H/S; steeper slopes (4-5°) on shallower peat to the north • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 335-342mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; typically > 1.3 north of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Variable, ≤ 1.0 to > 1.3; Generally > 1.3 north of H/S • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in relatively flat ground (≤ 3°) and deep peat (3-5m) to east and south. • **Drainage:** Drain crossing road north and south of H/S; Forestry furrows to the north, south and west of area. • **Seepage in trial pits:** Possible seepage in relatively flat ground and deep peat (3-5m) to east and south. • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Cut forest to east and strip to west of H/S; Forestry further west • **Peat Harvesting:** No.	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T7**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 3-4m; locally 2-3m to East; pockets of 4-5m to north and south • **C_u (Geonor H-10) in Peat:** cu = <5kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** ≤ 3° • **General slope characteristics:** Ground gently sloping down west, generally planar; • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 342-350mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally >1.3; locally ≤ 1 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Variable, ≤ 1.0 to > 1.3; • ***c_u = 2.5kPa:** Generally ≤ 1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-5m) and relatively flat ground (≤ 3°) to the north and south • **Drainage:** Drain to north and south; Forestry furrows to the north and south. • **Seepage in trial pits:** Possible seepage in deep peat (3-5m) and relatively flat ground to the north and south • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to north and south • **Peat Harvesting:** No.	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T8**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m; locally 4-5m in H/S area • **C_u (Geonor H-10) in Peat:** cu = <5kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3 °; locally 3-4 ° at H/S • **General slope characteristics:** Located on sloping ground between terraces, ground gently sloping down to the west/southwest, generally planar along road, slight convex break southeast of H/S • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 350-356mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1.0 at H/S • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 east and west of H/S; ≤ 1.0 to ≤ 1.3 at H/S • ***c_u = 2.5kPa:** Generally ≤ 1.0; locally > 1.3 west of H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and flat ground area to the north • **Drainage:** Ditches to south; Forestry furrows to the north and south • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and flat ground area to the north • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Ditches to south; Forestry furrows to the north and south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T9**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m; 4-6m to the north and 2-3m to the south • **C_u (Geonor H-10) in Peat:** cu = <5kPa* • **Water Content:** 1000-1500% * • **Max degree of humification:** H8-H10***** • **Stability of peat in trial pits:** Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-4° • **General slope characteristics:** Located at edge of terrace, flat ground to north (≤ 3°); slight convex break west and south of H/S • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 355-360mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1.0 at H/S; locally >1 and ≤ 1.3 east of H/S ***cu = 2.5kPa:** >1 and ≤ 1.3 west of H/S; ≤ 1 east of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** > 1.3 west of H/S; > 1 to > 1.3 east and at H/S • ***c_u = 2.5kPa:** Generally ≤ 1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and flat ground area to the north • **Drainage:** Drainage ditches to the south and north of road; forestry furrows to the south and north • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and flat ground area to the north • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Cut forestry to the south & north; some forestry to the north • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T10**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0-2, locally 2-3m at H/S • **C_u (Geonor H-10) in Peat:** cu = 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally ≤ 3°; locally 5-7.5° at crest of hill to northwest of H/S • **General slope characteristics:** Located on sloping ground between terraces, highest point on site on flat ground (< 3°) north of T10 (364mOD), ground slopes down to south and west from this point, ground generally planar, distinct concave hill along road northwest of H/S, adjacent to borrow pit 2 • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 360-364mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; • ***cu = 2.5kPa:** Generally > 1.3; locally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally ≤ 1, particularly to northwest • ***c_u = 2.5kPa:** Generally > 1.3, locally ≤ 1, particularly to northwest **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** No – shallow peat and/or steeply sloping ground • **Drainage:** Drainage ditches and forestry furrows to the north and south. • **Seepage in trial pits:** No – shallow peat and/or steeply sloping ground • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** <1km • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to north and south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	35
		Hazard Likelihood (L)	2

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T11**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m at west, increasing to 3-4m to east • **C_u (Geonor H-10) in Peat:** cu = 5-10kPa, locally 12-16kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Stable - Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-4° • **General slope characteristics:** Located at edge of terrace, highest point on site on flat ground (< 3°) north of T11 (364mOD), ground slopes down to south and east from this point, ground generally planar • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 360-363mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; • ***cu = 2.5kPa:** >1.3 at and west of H/S; ≤ 1 to ≤ 1.3 east of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally ≤ 1 to ≤ 1.3 east of H/S • ***c_u = 2.5kPa:** Generally > 1.3 west of H/S, Generally ≤ 1 east of H/S; **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches to the north; drainage ditch crossing road east of H/S. Forestry furrows north and south • **Seepage in trial pits:** No. • **Evidence of piping/subsurface flow:** Yes – linear vegetation growth to the north and south	L	5
Significant Contributory Factors	• **Slide History:** <1km • **Tension Cracks:** No • **Piping:** Yes – linear vegetation growth to the north and south • **Vegetation:** Cut Forest to north and south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T12**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-4m; pocket 3-5m east of H/S, • **C_u (Geonor H-10) in Peat:** cu < 5kPa to 10kPa* • **Water Content:** wn = 1000% to 1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Slight spalling to local collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°, locally 3-4°. • **General slope characteristics:** Generally planar; distinct convex break along road south of H/S near T18, slight convex break east of H/S near T13, ground slopes down to southwest • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 333-339mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1 • ***cu = 2.5kPa:** Generally ≤ 1 to ≤ 1.3; locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; Locally ≤ 1.0 to ≤ 1.3; • ***c_u = 2.5kPa:** Generally ≤ 1; locally >1 to ≤ 1.3 to north **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water to east in deep peat & flat ground • **Drainage:** Drainage ditches along roadside to the east and south. 2 No. ditches cross the road to the north; Forestry furrows to the east • **Seepage in trial pits:** Possible seepage to east in deep peat & flat ground • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Cut forest to the east; Forest to west • **Peat Harvesting:** No	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T13**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-5m; locally 2-3m to west • **C_u (Geonor H-10) in Peat:** cu = 5-10kPa, locally 11-16kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits**: Collapse • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally > 3°, locally 3-5° • **General slope characteristics:** Ground generally planar, slight convex break at and to southeast of H/S, ground slopes down to southwest • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 337-344mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1 east of and at H/S • ***cu = 2.5kPa:** ≤ 1 to > 1.3 west of H/S; generally > 1.3 east of H/S; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally ≤ 1 • ***c_u = 2.5kPa:** Generally ≤ 1; locally > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water deep peat and relatively flat ground to west • **Drainage:** Drainage ditches and forestry furrows to north and south • **Seepage in trial pits:** Possible seepage deep peat and relatively flat ground to west • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest north and south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	**3**

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T14**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 4-5m west, 2-4m east • **C_u (Geonor H-10) in Peat:** cu = <5kPa***** • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°, locally 3-4° at H/S; • **General slope characteristics:** Slight convex break east of H/S, relatively flat (≤ 3°) to north and south, ground slopes down to southwest • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 334m-348mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 west of H/S; ≤ 1 to > 1.3 east of and at H/S • ***cu = 2.5kPa:** Generally ≤ 1; Locally > 1.3, particularly west of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** generally > 1.3 west of H/S, Generally ≤ 1 east and at H/S, locally > 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally >1 to ≤ 1.3 west of H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat and in flat ground areas • **Drainage:** Drainage ditches and Forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat and in flat ground areas • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest Area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T15**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m, increasing to 4-6m to the east and southwest • **C_u (Geonor H-10) in Peat:** cu = <5kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; Locally 4-7.5° • **General slope characteristics:** At the base of a terrace, ground flat (< 3°) on terrace east and north of H/S, ground slopes steeply (4-7.5°) west of H/S, distinct convex break at H/S and along southside of road; ground slopes to south/southeast; • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 347-356mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1 • ***cu = 2.5kPa:** Variable, ≤ 1 to > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1.0 • ***c_u = 2.5kPa:** Generally < 1.0; locally >1 to > 1.3. **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat and flat area to the northeast • **Drainage:** Drainage ditches and forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat and flat area to the northeast • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest area • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T17**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-3m; locally 3-4m at H/S; 3-6m pocket to west • **C_u (Geonor H-10) in Peat:** Generally 4-7kPa • **Water Content:** 1000-1500kPa* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight Spalling; collapse in deeper peat (> 4m)* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3° along road, 4-7.5° south of H/S. • **General slope characteristics:** Located at edge of terrace and adjacent to slide, distinct convex break along south side of road, ground slopes steeply (4-7.5°); ground slopes down to south/southwest • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 354-356mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; Locally ≤ 1, >1 to ≤1.3 at H/S • ***cu = 2.5kPa:** Generally > 1.3; locally ≤ 1, particularly at H/S; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1; Locally ≤ 1 at H/S • ***c_u = 2.5kPa:** Generally ≤ 1; locally >1 to > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat & flat ground area to the west • **Drainage:** Drainage ditches and forestry furrows to the north and south • **Seepage in trial pits:** Possible seepage in deep peat & flat ground area to the west • **Evidence of piping/subsurface flow:** Yes – linear vegetation growth to the south	H	15
Significant Contributory Factors	• **Slide History:** <1km – recent slide to the east • **Tension Cracks:** Yes, slight tears in peat adjacent to slide • **Piping:** Yes – linear vegetation growth to the southeast • **Vegetation:** cut forest area, however, some linear vegetation growth to the southeast • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	85
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T18**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-3m; locally 3-4m to north and east • **C_u (Geonor H-10) in Peat:** Generally 5-10kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 3-4 °; locally 4-7.5° at H/S; • **General slope characteristics:** located on sloping ground between small terraces, road to southwest and H/S located along distinct convex break, ground slopes down to the southwest • **In broad flat or buried valley directly upslope from a watercourse?:** No • **Altitude:** 326-331mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1.0 to ≤ 1.3; • ***c_u = 2.5kPa:** Generally ≤ 1, >1 to ≤1.3 east of H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and flat ground area (≤ 3°) to the northeast • **Drainage:** Drainage ditches along road, forestry furrows in area. • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and flat ground area (≤ 3°) to the northeast • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Forestry to south and west, cut forest to northeast • **Peat Harvesting:** No	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	85
		Hazard Likelihood (L)	4

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T19**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-4m • **C_u (Geonor H-10) in Peat:** Generally 4.5-8kPa, up to 10-16kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Slight spalling-local collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3 °; locally 3-5° • **General slope characteristics:** Generally planar along road, distinct convex break west of H/S; ground slopes to the southwest. • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 331-334mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1.0 to ≤ 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and flat ground area (≤ 3°) to the north • **Drainage:** Drainage ditches along road and crossing road east of H/S, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and flat ground area (≤ 3°) to the north • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Forestry to south, cut forest to the north • **Peat Harvesting:** No.	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T20**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m to west of H/S, 2-3m at H/S; 3-4m east of H/S • **C_u (Geonor H-10) in Peat:** < 5kPa to 10kPa* • **Water Content:** 500-1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Slight spalling • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** ≤ 3° at H/S and east of H/S; 4-5° west of H/S; • **General slope characteristics:** Slight convex break along road west of H/S ground sloping down to southwest, ground flat (≤ 3°) east of H/S, ground sloping steeply (4-5°) beyond southern site boundary • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 332-336mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; locally > 1.3, particularly to west **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally > 1.0 to ≤ 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1; locally >1 to ≤1.3 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in flat ground (≤ 3°) and deeper peat (3-4m) to east • **Drainage:** Drainage ditch along road and crossing road to east, forestry furrows north and south • **Seepage in trial pits:** Possible surface water in flat ground (≤ 3°) and deeper peat (3-4m) to east • **Evidence of piping/subsurface flow:** Yes – linear green vegetation growth to the south on aerial views	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Yes – linear green vegetation growth to the south on aerial views • **Vegetation:** Forestry to the south; cut forest to the north • **Peat Harvesting:** No.	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T21**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 3-4m west and at H/S; 1-2m east of H/S • **C_u (Geonor H-10) in Peat:** < 5kPa to 10kPa* • **Water Content:** 500-1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Slight spalling • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** ≤ 3° west of H/S; 3-5° east of H/S • **General slope characteristics:** Ground relatively flat (< 3°) west of H/S, ground slopes steeply (3-7.5°) east of H/S, slight convex break in slope across road sloping down to the south; ground sloping steeply (4-5°) beyond southern site boundary off site to the south. • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 334-337mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; locally > 1.3, particularly at H/S and to east **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1.0 to ≤ 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in flat ground (≤ 3°) and deeper peat (3-4m) to north • **Drainage:** Drainage ditches along north of road and crossing road east and west of H/S; forestry furrows east and west of H/S • **Seepage in trial pits:** Possible seepage in flat ground (≤ 3°) and deeper peat (3-4m) to north • **Evidence of piping/subsurface flow:** Yes – linear green vegetation growth to the south on aerial views	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Yes – linear green vegetation growth to the south on aerial views • **Vegetation:** Forestry to south; Cut forest to north • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	85
		Hazard Likelihood (L)	5

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T22**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-3m; • **C_u (Geonor H-10) in Peat:** < 5kPa to 10kPa* • **Water Content:** 500% to 1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** 4-7.5° • **General slope characteristics:** Generally planar, ground slopes down to the south/southeast • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 334-338mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally ≤ 1; Locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally >1 to ≤1.3 & > 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drains along road across slope upslope and downslope. Forestry drains diagonally across slope downslope. Downslope drain near T23. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Yes – linear green vegetation growth to the south on aerial views	H	15
Significant Contributory Factors	• **Slide History:** < 1km • **Tension Cracks:** No • **Piping:** Yes – linear green vegetation growth to the south on aerial views • **Vegetation:** Forestry to south; Cut forest to north • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	80
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T23**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-2m; locally 2-3m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** 3-7.5°, sloping down to the southeast, slopes steeply in slide area (4-7.5°) • **General slope characteristics:** Generally planar, ground slopes down to south/southeast, slightly concave along road in area of slide • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 332-335mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 • ***cu = 2.5kPa:** Generally >1.3; locally >1 to ≤ 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally >1 to ≤1.3 west of H/S • ***c_u = 2.5kPa:** Generally ≤ 1to ≤1.3, Locally > 1.3 at H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches and forestry furrow to north and south, stream in area of peat slide • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Yes – linear green vegetation growth to the north on aerial views	M	10
Significant Contributory Factors	• **Slide History:** < 1km – adjacent to slide • **Tension Cracks:** No • **Piping:** Yes – linear green vegetation growth to the north on aerial views • **Vegetation:** Forestry to south; Cut forest to north • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**	**Total Hazard Rating**	80
	Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T24**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-2m; pocket of deep peat (3-6m) north of H/S • **C_u (Geonor H-10) in Peat:** 5-13kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally ≤ 3°, locally 3-4° • **General slope characteristics:** Located adjacent to Borrow Pit 1, ground slopes down to east/southeast, slight convex break and H/S and west of H/S • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 348-358mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, ≤ 1 north and northeast of H/S • ***cu = 2.5kPa:** Generally > 1.3 west and south of H/S locally ≤ 1.0 to ≤ 1.3; Generally ≤ 1 north and east of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 south and west of H/S, locally ≤ 1 to ≤1.3; Generally ≤ 1 north and east of H/S, locally > 1.0 to ≤ 1.3; • ***c_u = 2.5kPa:** Generally ≤ 1 north, south and east of H/S; Generally > 1.3 west of H/S, locally ≤ 1.0 to ≤ 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat pocket and relatively flat ground north of H/S • **Drainage:** Ditch crosses road south and north of H/S; Forestry furrows in area. • **Seepage in trial pits:** Possible seepage in deep peat pocket and relatively flat ground north of H/S • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** < 1km • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally in cut forest area; local tree growth to southwest • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T25**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-3m • **C_u (Geonor H-10) in Peat:** 5-15kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable - Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** 2-4°; locally 4-7.5° • **General slope characteristics:** Located at edge of terrace, ground slopes down to east/southeast, slight convex break along eastern and southern side road roads, • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 340-348mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤ 1 ≤1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally > 1.3 north and at H/S; Elsewhere generally ≤ 1 to ≤1.3; **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches on all sides of road, forestry furrows in area • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** < 1km • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally in cut forest area; local tree growth to north and south, turbary plots to the east • **Peat Harvesting:** Yes, to the east in the turbary plots	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T26**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-3m • **C_u (Geonor H-10) in Peat:** < 5kPa to 10kPa* • **Water Content**: 500% to 1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Stable - Slight spalling • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 3-5° • **General slope characteristics:** Generally planar, ground slopes down to southeast, • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 328-334mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 • ***cu = 2.5kPa:** Generally ≤ 1 to ≤1.3, locally > 1.3, particularly east and north of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1 to > 1.3, locally ≤ 1 • ***c_u = 2.5kPa:** Generally ≤ 1, locally >1 to ≤1.3 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch along eastern road, forestry furrows to east and west • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** < 1km • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Forest to the south; cut forest to the east and west, local tree grown to the west • **Peat Harvesting:** Yes, to the east in the turbary plots	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T27**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 3-5m; locally 5-6m, shallow pocket (<2m) to north • **C_u (Geonor H-10) in Peat:** Generally 5-8kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits: Local** Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-5° • **General slope characteristics:** Generally planar, ground slopes down to east • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 343-348mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Variable, between ≤ 1 and > 1.3 • ***cu = 2.5kPa:** Generally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤ 1; locally > 1.3 • ***c_u = 2.5kPa:** ≤ 1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat and flat ground area (≤ 3°) • **Drainage:** Drainage ditches adjacent to road and in turbary plot area. • **Seepage in trial pits:** Possible seepage in deep peat and flat ground area (≤ 3°) • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the south	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** Possible subsurface flow in darker vegetation to the south • **Vegetation:** Cut forest to north and turbary plot to south • **Peat Harvesting:** Yes, to the east in the turbary plots	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T28**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-3m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable - Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally ≤ 3°; locally 4-7.5° particularly to the south • **General slope characteristics:** Generally planar; slight convex break to south, south of the road the ground slopes down to southeast north of the road the ground slopes down to the south • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 333-341mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, • ***cu = 2.5kPa:** Variable ≤ 1, >1 to ≤1.3, > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally >1 to ≤1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches through north and south in turbary plots. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Yes, some green vegetation to the south on aerial views	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Yes, some green vegetation to the south on aerial views • **Vegetation:** turbary plots to the north and south • **Peat Harvesting:** Yes, turbary plots to the north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T29**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m • **C_u (Geonor H-10) in Peat**: 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** 3-4°; locally 4-7.5 ° to the west • **General slope characteristics:** Generally planar, ground slopes down to the southeast; • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 320-328mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 west of H/S; Generally > 1.3 east of H/S, **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch crossing road at H/S. Forestry Furrows to south • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Turbary plots to north, forest to south (offsite) • **Peat Harvesting:** Yes, turbary plots to the north	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T30**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-3m; pockets of deep peat (3-5m) south and east of H/S • **C_u (Geonor H-10) in Peat:** Generally 4-8kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Stable to local collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** ≤ 3° • **General slope characteristics:** ground generally planar, road and H/S located on terrace, ground slopes down to north and south either side of road • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 342-343Mod	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 to ≤ 1.3, particularly south and north of road **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤ 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 west of H/S; >1 to ≤1.3 at H/S; > 1.3 east of H/S **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in flat ground and deep peat pockets to south and east of H/S • **Drainage:** Drainage ditch along road to north and connected to drainage in turbary plot area to south. • **Seepage in trial pits:** Possible seepage in flat ground and deep peat pockets to south and east of H/S • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the south	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** • **Piping:** Possible subsurface flow in darker vegetation to the south. • **Vegetation:** Forest to north; turbary plots to the south • **Peat Harvesting:** Yes, turbary plots to the south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	40
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T31**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-4m; locally 3-5m at H/S; • **C_u (Geonor H-10) in Peat:** Generally 6-10kPa, locally 11-15kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling - Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; 4-7.5° southeast of H/S • **General slope characteristics:** Planar along road, distinct convex break along south side of road, ground slopes down to southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 331-332mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 • ***cu = 2.5kPa:** Generally ≤ 1, locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Variable ≤ 1 to > 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat and flat ground area at H/S • **Drainage:** Drainage ditches in turbary plot area to north and south. • **Seepage in trial pits:** Possible seepage in deep peat and flat ground area at H/S • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the south and in greener vegetated area to the southeast	H	15
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the south and in greener vegetated area to the southeast • **Vegetation:** Turbary plot to north and south • **Peat Harvesting:** Yes, turbary plots to the north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T32**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000kPa* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** 4-7.5° at and east of H/S; 3-4° west of H/S • **General slope characteristics:** Generally planar, ground slopes down to the southeast; • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 312-320mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 east of H/S; ≤ 1 to > 1.3 at and west of H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches along southern side of road and crossing road to east. Forestry furrows to south • **Seepage in trial pits:** No. • **Evidence of piping/subsurface flow:** Possible subsurface flow to north – green vegetation in turbary plot area seen from aerial views	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow to north – green vegetation in turbary plot area seen from aerial views • **Vegetation:** turbary plots to north; Forest to south, however, locally disrupted • **Peat Harvesting:** Yes, turbary plots to the north	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**	**Total Hazard Rating**	55
	Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T33**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-6m at; locally 2-3m to west • **C_u (Geonor H-10) in Peat:** Generally 4-8kPa • **Water Content:** 1000-1500kPa* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits: Local** Collapse – Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles**: ≤ 3° • **General slope characteristics:** Ground generally planar, road and H/S located on terrace, ground slopes down to north and south either side of road and down to the east along road • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 340-342mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally >1.3, locally ≤ 1 • ***cu = 2.5kPa:** ≤ 1 east and at H/S, generally > 1.3 west of H/S, locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤ 1, locally > 1.3, particularly to west of H/S • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3 west of H/S s **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat and flat ground area to east • **Drainage:** Drainage ditch along northern side of road & in turbary plot area to south • **Seepage in trial pits:** Possible seepage in deep peat and flat ground area to east • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the south	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the south • **Vegetation:** Forest to north; turbary plots to south • **Peat Harvesting:** Yes, turbary plot area to south	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	40
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T34**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-3m, 3-5m to the north • **C_u (Geonor H-10) in Peat:** Generally 5-10kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-4° along road, ≤ 3° north of H/S, 4-7.5° south of H/S • **General slope characteristics:** Planar along road, distinct convex break along south side of road, ground slopes down to southeast • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 330-332mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally >1.3, locally ≤ 1 to ≤1.3 • ***cu = 2.5kPa:** Variable ≤ 1 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1.0 to ≤ 1.3; • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-5m) and flat ground area to the north • **Drainage:** Drainage ditches in turbary plot areas to north and south • **Seepage in trial pits:** Possible seepage in deep peat (3-5m) and flat ground area to the north • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the north	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the north • **Vegetation:** turbary plots to north and south • **Peat Harvesting:** Yes, turbary plot area to north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T35**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 1000-1500kPa* • **Max degree of humification**: H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** 5-7.5° • **General slope characteristics:** Generally planar, ground slopes down to the southeast; • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 307-312mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1, particularly south of road **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1.0 to ≤ 1.3; • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3 east of H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch along southern side of road and crossing road at H/S, • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Possible piping/subsurface flow along drainage ditch west of H/S	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible piping/subsurface flow along drainage ditch west of H/S • **Vegetation:** Forest to south; turbary plots to north • **Peat Harvesting:** Yes, turbary plot area to north	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T36**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-4m, 4-6m west of H/S; • **C_u (Geonor H-10) in Peat:** <5-10kPa* • **Water Content:** 500-1500kPa* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Stable to local collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** ≤3° • **General slope characteristics:** Generally planar, slight convex break along road east of H/S, ground slopes down to east • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 336-341mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 at and east of H/S; generally ≤ 1 west of H/S • ***cu = 2.5kPa:** Variable ≤ 1.0 to > 1.3; generally ≤ 1.0 to west **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 at and east of H/S, locally ≤ 1.0 to ≤ 1.3; Generally ≤ 1.0 west of H/S • ***c_u = 2.5kPa:** Generally ≤ 1; locally > 1.3 at and east of H/S **Undrained shear strength at base of Peat*	N	0
Hydrology/ Hydrogeology	• **Surface Water: Possible:** Possible surface water in deep peat and flat ground area to west • **Drainage:** Drainage ditch along southern side of road & in turbary plot area to south. • **Seepage in trial pits:** Possible seepage in deep peat and flat ground area to west • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the south	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the south • **Vegetation:** Forest to north; turbary plots to south • **Peat Harvesting:** Yes, turbary plot area to south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T37**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 3-4°; 4-7.5° south of H/S • **General slope characteristics:** Planar along road, distinct convex break along south side of road, ground slopes down to southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 324-331mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤ 1 • ***cu = 2.5kPa:** Generally > 1.3; locally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally ≤ 1 to ≤ 1.3 • ***c_u = 2.5kPa:** Generally ≤ 1; locally > 1.3 at and east of H/S **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches turbary plot areas north and south • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the north	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the north • **Vegetation:** turbary plots to north and south • **Peat Harvesting:** Yes, turbary plot area to north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T38**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-1m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	L	5
Topography	• **Slope angles:** 4-7.5° • **General slope characteristics:** Generally planar, ground slopes down to the southeast; • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 305-307mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally > 1.3, **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 • ***c_u = 2.5kPa:** Generally > 1.3; locally ≤ 1 at H/S **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch downslope of road. Forestry furrows to south • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Possible subsurface flow - green vegetation growth north of H/S seen from aerial views.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow - green vegetation growth north of H/S seen from aerial views. • **Vegetation:** Forest to south; turbary plots to north • **Peat Harvesting:** Yes, turbary plot to north.	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	30
		Hazard Likelihood (L)	2

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T39**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-3m; locally 3-4m east of H/S • **C_u (Geonor H-10) in Peat:** <5-10kPa* • **Water Content:** 500-1500%* • **Max degree of humification:** H5 - H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?**: No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 1-3°; locally 3-4° • **General slope characteristics:** Generally planar, slight convex east of H/S, ground slopes down to east • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 327-337mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally >1 to ≤1.3 • ***cu = 2.5kPa:** Variable, ≤ 1 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 to ≤1.3, locally > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch along south of road and drainage ditches in turbary plot to south. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forest to north; turbary plots to south • **Peat Harvesting:** No.	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T40**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 3-5° • **General slope characteristics:** Planar along road to west, distinct convex break along south side of road and along road east of H/S, ground slopes down to southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 310-325mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally >1 to ≤1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 ***c_u = 2.5kPa:** Generally ≤ 1 to east; Generally > 1.3 to west, locally ≤ 1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No. • **Drainage:** Drainage ditches in turbary plot area to north and south • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** turbary plots to north and south • **Peat Harvesting:** Yes, turbary plot area to north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T41**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** 4-7.5° West of H/S; ≤ 3° east of H/S. • **General slope characteristics:** Generally planar, ground slopes down to the southeast; slope is slightly flatter east of H/S • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 302-306mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally > 1.3; locally ≤ 1, particularly to east **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 to west; Generally ≤ 1 to ≤1.3 to east • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3 west and at H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage**: Drainage ditch along south side of road, drainage ditch in turbary plot area to northeast, forestry furrows to southwest. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Possible subsurface flow - green vegetation growth northwest of H/S seen from aerial views.	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow - green vegetation growth northwest of H/S seen from aerial views. • **Vegetation:** turbary plots to north and southeast, forest to southwest • **Peat Harvesting:** Yes, turbary plot area to north and southeast	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T42**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-3m • **C_u (Geonor H-10) in Peat:** Generally 4-8kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10***** • **Stability of peat in trial pits**: Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally ≤3°, locally 3-4° • **General slope characteristics:** Generally planar, slight convex break at H/S, ground slopes down to east • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 317-326mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤ 1 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 • ***c_u = 2.5kPa:** Generally ≤ 1 to ≤1.3, locally >1.3 west of H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch running along south side of road, drainage ditches in turbary plot are to south, • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the south	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the south • **Vegetation:** turbary plots to south, forest to north • **Peat Harvesting:** Yes, turbary plot area to south	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T43**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-2m, locally 2-3m • **C_u (Geonor H-10) in Peat**: 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-4° at H/S; 4-7.5° north of H/S • **General slope characteristics:** Generally planar along road; Distinct convex break north of H/S; ground slopes down to southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 295-303mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally >1 to ≤1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1.3. **Undrained shear strength at base of Peat*	N	0
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches to north in turbary plot area. Drainage ditch to east along south side of road • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** turbary plots to north and south • **Peat Harvesting:** Yes, turbary plot area to north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	35
		Hazard Likelihood (L)	2

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T44**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-3m; • **C_u (Geonor H-10) in Peat:** <5kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H8-H10 • **Stability of peat in trial pits:** Slight spalling • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-4° • **General slope characteristics:** Generally planar, slight convex break to the south of H/S, ground slopes down to southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 310-318mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Variable ≤ 1, >1 to ≤1.3 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally >1 to > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in flat ground (3°) & deep peat (2-3m) along road • **Drainage:** drainage ditch along road on south side and at west side of H/S; drainage ditches in turbary plot area to south • **Seepage in trial pits:** Possible seepage in flat ground (3°) & deep peat (2-3m) along road • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Forestry to north; turbary plots to south • **Peat Harvesting:** Yes, turbary plots to south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T45**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** 3-5° at and west of H/S; 2-4° east of H/S • **General slope characteristics:** distinct convex break at H/S, ground slopes down to southeast; relatively flat ground (≤3°) to the southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 298-305mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally >1 to ≤1.3 at H/S • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1 to ≤1.3; locally > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches to north and south in turbary plots area. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker vegetation to the north and south	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker vegetation to the north and south • **Vegetation:** turbary plot area to north and south • **Peat Harvesting:** Yes, turbary plot area to north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T46**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m, 2-3m to the north • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000kPa* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-4°, locally 4-5° • **General slope characteristics:** Distinct convex break at H/S, ground slopes down to the southeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 288-295mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3, **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally >1 to ≤1.3, • ***c_u = 2.5kPa:** Generally ≤ 1 to ≤1.3; locally > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches in turbary plots to north and south. Probably well drained. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No.	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** turbary plot area to north and south • **Peat Harvesting:** Yes, turbary plot area to north and south	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T47**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-3m, locally 1-2m; 3-4m to the south • **C_u (Geonor H-10) in Peat:** Generally 5.5-7kPa, locally 9-11kPa • **Water Content:** 1000-1500kPa* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** South of H/S ≤ 3°, east of H/S 4-7.5° • **General slope characteristics:** At end of terrace, distinct convex break beyond northern site boundary adjacent to road, ground slopes down to the north/northwest at approx. 7.5-15°, increasing to > 15° further north. Ground to south and west is relatively flat (≤ 3°) • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 345-352mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Variable, ≤ 1 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally >1.3. **Undrained shear strength at base of Peat*	M	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in relatively flat ground (<3°) to the south • **Drainage:** Drainage ditch along road on western side, drainage ditch on southern side and 1 No. drainage crossing road east of H/S; forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in relatively flat ground (<3°) to the south • **Evidence of piping/subsurface flow:** No	L	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest along strip 20m north and 50m south of road, forestry beyond; cut forest to west, • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T48**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m west of H/S gradually increasing to 3-4m east of H/S • **C_u (Geonor H-10) in Peat:** 4-8.5kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10 ***** • **Stability of peat in trial pits:** Slight spalling - Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally 4-7.5°, locally ≤ 3° southwest of H/S • **General slope characteristics:** At edge of terrace, distinct convex break beyond northern site boundary adjacent to road, ground slopes down to the north/northwest at approx. 7.5-15°, increasing to > 15° further north. Distinct convex break south of H/S, ground slopes down to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 341-346mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤ to ≤1.3 • ***cu = 2.5kPa:** Generally ≤ 1 to ≤1.3; locally > 1 west of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3, particularly at H/S • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1 to > 1.3 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in relatively flat ground (<3°) to the southwest • **Drainage:** Drainage ditch to south of road and north of H/S; forestry furrows to the north and south • **Seepage in trial pits:** Possible seepage in relatively flat ground (<3°) to the southwest • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest along strip 20m north and 50m south of road, forestry beyond • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	75
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T49**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-4m, pocket of deep peat (4-10m) southeast of H/S; peat reduces to 0-2m beyond the northern site boundary • **C_u (Geonor H-10) in Peat:** Generally 5-13kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Slight spalling to Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Varies generally 3-7.5° West of and at H/S; 2-4 ° east of H/S • **General slope characteristics:** Located at edge of terrace, distinct convex break beyond northern site boundary adjacent to road, ground slopes down to the northwest at approx. 7.5-15°, Distinct convex break south of H/S, ground slopes down to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 340-341mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***cu = 2.5kPa:** Generally ≤ 1; locally >1 to > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1 to > 1.3 **Undrained shear strength at base of Peat*	VH	20
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in pocket of deep peat (4-10m) & flat ground (<3°) southeast of H/S • **Drainage:** Ditch crossing road at H/S and extending to the west of the site; forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in pocket of deep peat (4-10m) & flat ground (<3°) southeast of H/S • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest along strip 20m north and 50m south of road, forestry beyond • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	80
		Hazard Likelihood (L)	5

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T50**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Pocket of deep peat (4-10m) at and west of H/S; peat reduces to 0-2m east of H/S and beyond the northern site boundary • **C_u (Geonor H-10) in Peat:** 6-14kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Slight spalling - Collapse***** • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** 7.5-10° at and west of H/S; 3-5° east of H/S • **General slope characteristics:** At edge of terrace, distinct convex break beyond northern site boundary adjacent to road, ground slopes down to the northwest at approx. 7.5-15°, ground relatively flat to south (< 3°) • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 334-341mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3 • ***cu = 2.5kPa:** Generally ≤ 1 west of H/S, generally > 1.3 at and east of H/S but locally ≤ 1 to ≤1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤ 1 to ≤1.3, particularly to west • ***c_u = 2.5kPa:** Generally ≤ 1, locally > 1 to > 1.3 at and east of H/S **Undrained shear strength at base of Peat*	VH	20
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in pocket of deep peat (4-10m) & flat ground (<3°) southeast of H/S • **Drainage:** Drainage ditch running along north of road and crossing road east of H/S; forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in pocket of deep peat (4-10m) & flat ground (<3°) southeast of H/S • **Evidence of piping/subsurface flow:** No.	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest along strip 20m north of road, forestry beyond; cut forest to south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	80
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T51**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-4m • **C_u (Geonor H-10) in Peat:** Generally 6-13kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Slight spalling to Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally 4-7.5° • **General slope characteristics:** On sloping ground north of terrace, slight convex break beyond northern site boundary adjacent to road, ground slopes down to the northeast at approx. 4-7.5° • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 328-333mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3 west of H/S; Generally >1 to ≤1.3 east of H/S • ***cu = 2.5kPa:** Generally ≤ 1, locally >1 to ≤1.3 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 to west, locally ≤ 1 to ≤1.3; generally ≤1.0 to east and south, locally > 1 to > 1.3; • ***c_u = 2.5kPa:** Generally ≤1 **Undrained shear strength at base of Peat*	VH	20
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat pocket (4-5m) and relatively flat ground to southwest of H/S • **Drainage:** Drainage ditch crossing road east and west of H/S, and drainage ditch running along southern side of road • **Seepage in trial pits:** Possible seepage in deep peat pocket (4-5m) and relatively flat ground to southwest of H/S • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest along strip 20m north of road, forestry beyond; cut forest to south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	80
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T52**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m • **C_u (Geonor H-10) in Peat:** 4-13kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till		
Topography	• **Slope angles:** 4-7.5° • **General slope characteristics:** Generally planar, ground slopes down to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 326-328mOD		
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** > 1.3 • ***cu = 2.5kPa:** > 1.3 at H/S, generally ≤1 elsewhere with local > 1.3 spots **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** > 1.3 at H/S, >1 to ≤1.3 west of H/S, • ***c_u = 2.5kPa:** Generally ≤1; locally > 1.3 at H/S and to southwest **Undrained shear strength at base of Peat*		
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch along eastern side of road, and crossing road to west. Drainage ditch east of H/S • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No		
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest along strip 80m north of road, forestry beyond; Cut forest to south and west; forest to east • **Peat Harvesting:** No		
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experiencea**		**Total Hazard Rating**	
		Hazard Likelihood (L)	

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T53**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-4m; locally 4-6m east of H/S • **C_u (Geonor H-10) in Peat:** 6-10kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Slight spalling – Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally 1-4°, locally 4-5° • **General slope characteristics:** At edge of terrace, slight convex break south of and at H/S, ground slopes down to northwest • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 347-357mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 • ***cu = 2.5kPa:** Generally ≤1 at H/S; > 1.3 east and west of H/S but locally ≤1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1 • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 to west **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-5m) and flat ground (≤ 3°) to north and east of H/S • **Drainage:** Drainage ditch along western and northern side of road. Drainage ditch crosses road north of junction; forestry furrows to north and south • **Seepage in Trial Pits:** Possible seepage in deep peat (3-5m) and flat ground (≤ 3°) to north and east of H/S • **Evidence of Piping/Subsurface Flow:** Possible subsurface flow in darker shaded ground beyond western side boundary.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No. • **Vegetation:** Cut forest along strip 40m north of road, forestry beyond; cut forest to south and west • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T54**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-5m; deep peat pocket of 5-6m at and east of H/S • **C_u (Geonor H-10) in Peat:** Generally 4-8kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Local Collapse – Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** 1-3° generally ; locally 3-4 west of H/S • **General slope characteristics:** located at edge terrace, distinct convex break north of road, ground slopes down to north/northeast; slight convex break south of road sloping down to north/northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 355-358mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally ≤1, locally > 1.3 • ***cu = 2.5kPa:** Generally ≤1 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤1, locally > 1.3 • ***c_u = 2.5kPa:** ≤1, **Undrained shear strength at base of Peat*	VH	20
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) & flat ground (≤ 3°) south of road • **Drainage:** Drainage ditch running along northside of road, forestry furrows to north and south. • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) & flat ground (≤ 3°) south of road • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest along strip approx. 30m north and south of road, forestry beyond; • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T55**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-5m; locally 4-6m west of H/S • **C_u (Geonor H-10) in Peat:** 4-9kPa • **Water Content:** 1000-1500kPa* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤3° at and west of H/S; 3-5° east of H/S; • **General slope characteristics:** At edge of terrace, distinct convex break to north, ground slopes down steeply (4-7.5°) to northeast; distinct convex break to south, ground slopes down steeply (4-7.5°) to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 350-358mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 • ***cu = 2.5kPa:** Generally ≤1, locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤1, locally > 1.3, particularly at H/S • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and flat ground (≤ 3°) to west of H/S • **Drainage:** Drainage ditch along north side of road, forestry furrows to north and south. • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and flat ground (≤ 3°) to west of H/S • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest along approx. 25m strip north and south of road, cut forest beyond • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T56**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-4m; locally 1-2m at H/S • **C_u (Geonor H-10) in Peat:** Generally 7-12kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** 3-5° at and west of H/S; 1-4° east of H/S • **General slope characteristics:** On sloping ground between terraces, ground slopes down to the northeast, ground flattens (≤3°) on terrace in deep peat area (4-10m) to north • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 343-350mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 • ***cu = 2.5kPa:** Generally ≤1, locally > 1.3, particularly at H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Variable ≤1 & > 1.3 • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat pocket (4-10m) and relatively flat ground (≤3°) to north • **Drainage:** Drainage ditch along northern side of road, drainage ditch crossing road at H/S • **Seepage in trial pits:** Possible seepage in deep peat pocket (4-10m) and relatively flat ground (≤3°) to north • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to north and south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T57**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m • **C_u (Geonor H-10) in Peat:** Generally 4-11kPa • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** 1-4° generally, locally 4-5° north of H/S, 5-7.5° south of H/S • **General slope characteristics:** Located at edge of terrace, distinct convex break in slope south of H/S, ground slopes down to the northeast • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 336-344mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Generally > 1.3, locally ≤1 & >1 to ≤1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** > 1.3 at H/S; Generally ≤1 to ≤1.3 north, south and west of H/S, locally > 1.3 • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat pocket (3-5m) and flat ground (≤3°) to the northwest • **Drainage:** Drainage ditches running along road to north and west and crosses road south of H/S; Forestry furrows to east and west. • **Seepage in trial pits:** Possible seepage in deep peat pocket (3-5m) and flat ground (≤3°) to the northeast • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to east and west; local tree growth to west and north of H/S • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T58**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m, 2-3m • **C_u (Geonor H-10) in Peat:** 5-10kPa* • **Water Content:** 500-1000%* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Stable* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till		
Topography	• **Slope angles:** Generally 4-7.5° • **General slope characteristics:** Located on steeply sloping ground (4-7.5°), ground slopes down to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 335-345mOD		
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Generally > 1.3 at H/S; Generally ≤1 east and west of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤1, locally > 1.3 at H/S • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*		
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch running along northside of road, and along eastern side of H/S, forestry furrows to north and south • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No		
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to south and west, 40m-50m strip of cut forest to east and north of H/S, forestry beyond • **Peat Harvesting:** No		
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	
		Hazard Likelihood (L)	

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T59**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-3m; locally 1-2m north of H/S, 3-4m to east and west • **C_u (Geonor H-10) in Peat:** Generally 4-7kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 1-3°; locally 3-5° north of H/S • **General slope characteristics:** On terrace, distinct convex break along road north of H/S, ground slopes down to northwest, distinct concave hill along road south of H/S, adjacent to borrow pit 2, ground slopes down to northwest • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 358-361mOD	L	5
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Generally ≤ 1.0 to ≤ 1.3; locally > 1.3, particularly north and south of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally >1.3, locally ≤1, • ***c_u = 2.5kPa:** Generally ≤1; locally > 1.3 to north, south and at H/S. **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat pocket (3-5m) and flat ground (≤3°) to east and west • **Drainage:** Drainage ditches along roads. Forestry furrows to east and west • **Seepage in trial pits:** Possible seepage in deep peat pocket (3-5m) and flat ground (≤3°) to east and west • **Evidence of piping/subsurface flow:** Possible subsurface flow in darker shaded ground beyond western side boundary.	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** Possible subsurface flow in darker shaded ground beyond western side boundary. • **Vegetation:** Cut forest to east and west; • **Peat Harvesting:** No	L	5
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	45
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T60**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m; locally 4-5m at and west of H/S • **C_u (Geonor H-10) in Peat:** Generally 5-10kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Local Collapse – Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** ≤ 3° • **General slope characteristics:** Located on terrace, planar along road, ground slopes down gently to northwest and northeast, slight convex break to the north, • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 360-361mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤1 • ***cu = 2.5kPa:** Generally ≤1 at and west of H/S; east of H/S is variable - ≤1, >1 to ≤1.3 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** ≤1 to > 1.3 west and at of H/S; Generally > 1.3 east of H/S, locally ≤1 • ***c_u = 2.5kPa:** Generally ≤1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-5m) and flat ground (≤ 3°) area to the north and south • **Drainage:** Drainage ditches along north and south side of road. Drainage ditch across deep peat around to south, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat (3-5m) and flat ground (≤ 3°) area to the north and south • **Evidence of piping/subsurface flow:** No	VH	20
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally cut forest to north and south, small area of forest to the northeast • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-**	**Total Hazard Rating**	85
	Hazard Likelihood (L)	5

site experience		

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T61**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-3m; 3-4m to east with locally pocket of 4-6m • **C_u (Geonor H-10) in Peat:** Generally 6-9kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Stable - Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤3°, locally 3-7.5° • **General slope characteristics:** At edge of terrace, planar along road, ground flat (≤3°) to south, distinct convex break to north adjacent to road, ground slopes down to northeast, • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 360-363mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; locally ≤1 • ***cu = 2.5kPa:** Variable ≤1, >1 to ≤1.3, > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally ≤1 • ***c_u = 2.5kPa:** Generally ≤1; locally > 1.3 east of H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Yes, several small lakes to south • **Drainage:** Drainage ditches along north and south side of road west of H/S; Drainage ditch east of H/S and crossing shallow peat area (≤2m) to north, forestry furrows to north and south • **Seepage in trial pits:** Yes, several small lakes to south. Probable seepage in deep peat (4-6m) and flat ground (≤3°) to southeast and southwest • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** Tears in peat in lake to the south • **Piping:** No • **Vegetation:** Generally cut forest area, small area of forest to the northwest • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	85
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T62**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 3-4m; locally pocket of 4-6m east of H/S • **C_u (Geonor H-10) in Peat:** Generally 4-8kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°, locally 3-5° • **General slope characteristics:** Located at edge of terrace, ground relatively flat (≤ 3°) to south, distinct convex break to north, ground slopes down steeply (4-7.5°) to the northeast. • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 357-362mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 • ***cu = 2.5kPa:** Generally ≤1 east of H/S; Variable west of H/S, ≤1, >1 to ≤1.3 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3; locally ≤1, particularly east of H/S • ***c_u = 2.5kPa:** Generally ≤1; locally > 1.3 west of H/S **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-6m) and flat ground (≤ 3°) to southwest, several small lakes also identified south of T61 • **Drainage:** 2 No. drainage ditches crossing north of the road, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat (3-6m) and flat ground (≤ 3°) to southwest, several small lakes also identified south of T61 • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally cut forest, small forest approx. 50m south of H/S • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	85
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T63**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-3m, locally 3-4m • **C_u (Geonor H-10) in Peat:** 7-9kPa • **Water Content:** 500-1000kPa* • **Max degree of humification:** H5-H7* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤3°; locally 3-5° • **General slope characteristics:** At edge of terrace, slight convex break at H/S, ground slopes down to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 350-358mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Generally ≤1; locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally ≤1 to ≤1.3, locally > 1.3 • ***c_u = 2.5kPa:** Generally ≤1 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-4m) and flat ground (≤3°) to west. • **Drainage:** Drainage ditch along southeastern side of road, drainage ditch crossing road east of H/S, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat (3-4m) and flat ground (≤3°) to west. • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally cut forest area, small forest area to southwest and northwest • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T64**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 3-4m, locally 4-6m • **C_u (Geonor H-10) in Peat:** Generally 5-9kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤3°; 3-5° northeast of H/S • **General slope characteristics:** Located at edge of terrace, generally planar along road; slight convex break northeast of H/S, ground slopes down to northeast • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 345-350mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3, particularly to south • ***cu = 2.5kPa:** Generally ≤1 south of H/S; ≤1, Variable east and west of H/S, ≤1 to >1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 east and west of H/S, locally ≤1; Generally ≤1 to ≤1.3 south of H/S, locally > 1.3 • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-6m) and flat ground (≤3°) to south • **Drainage:** Drainage ditch along northern side of road and crossing road to east, Drainage ditch along southern side of road, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat (4-6m) and flat ground (≤3°) to south • **Evidence of piping/subsurface flow:** No.	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally cut forest area, small forest area southwest of H/S • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T65**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2-3m, locally 3-4m • **C_u (Geonor H-10) in Peat:** <5kPa* • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 3-5°, locally 5-7.5°. • **General slope characteristics:** Located adjacent to south side of borrow pit that is filled with water. Located at edge of terrace, ground generally flat (≤ 3°) to southeast; ground slopes down to the northeast, slight convex break northwest of H/S • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 340-345mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3; Locally ≤1 at H/S • ***cu = 2.5kPa:** Variable ≤1, >1 to ≤1.3, > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1, particularly at H/S • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 west of H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-4m) and flat ground (≤3°) • **Drainage:** Drainage ditches generally adjacent to road,forestry furrows to east and west • **Seepage in trial pits:** Possible seepage in deep peat (3-4m) and flat ground (≤3°) • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to the south and west, forestry to east and north • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	50
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T66**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-3m; locally 3-4m east of H/S • **C_u (Geonor H-10) in Peat:** Generally 5-10kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10***** • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; Locally 3-4° • **General slope characteristics:** Located on gently sloping ground between terraces, ground slopes down to the southeast, highest point on site (364mOD) on plateau located to northwest. • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 359-360mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, • ***cu = 2.5kPa:** Variable, ≤ 1.0 to > 1.3; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤1, **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (4-5m) and flat ground (≤ 3°) to the north • **Drainage:** Drainage ditch along north side of road, west of H/S, drainage ditch at H/S to the south connecting to H/S for T68, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat (4-5m) and flat ground (≤ 3°) to the north • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** <1km - To north (upslope) of recent slide • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Cut forest to north and south • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T67**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 1-2m to north; 2-3m to west • **C_u (Geonor H-10) in Peat:** < 5-10kPa • **Water Content:** 500-1500% • **Max degree of humification:** H5-H10 • **Stability of peat in trial pits:** Stable - Slight spalling • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally ≤3°; Locally 3-4° • **General slope characteristics:** Generally planar west of H/S, slight convex break north of H/S before L-bend in road, ground slopes down to the southeast • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 357-359mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, • ***cu = 2.5kPa:** Generally > 1.3, locally ≤1, >1 to ≤1.3, particularly west of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤1 to west; Generally > 1.3 to north, locally ≤ 1.0 to ≤ 1.3; **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Yes, small lake located north of H/S, possible surface water in deep peat pocket (4-6m) and flat ground (≤3°) to northwest • **Drainage:** Drainage ditches crossing roads north and west of H/S, forestry furrows to north and south • **Seepage in trial pits:** Possible seepage in deep peat pocket (4-6m) and flat ground (≤3°) to northwest • **Evidence of piping/subsurface flow:** No	L	5
Significant Contributory Factors	• **Slide History:** < 1km • **Tension Cracks:** No • **Piping:** No • **Vegetation:** Generally cut forest area, small area of forest to the south and north. • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T68**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-3m; 3-4m east of H/S • **C_u (Geonor H-10) in Peat:** 5-9kPa • **Water Content**: 1000-1500%* • **Max degree of humification**: H8-H10* • **Stability of peat in trial pits:** Slight spalling - local collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; 4-7.5° at H/S and southwest of H/S • **General slope characteristics:** located at top of slide and at edge of terrace, distinct convex break south side of road, ground slopes down steeply (4-7.5°) to south • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 349-354mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Variable ≤1, >1 to ≤1.3 & > 1.3, generally > 1.0 to ≤ 1.3 east of H/S; **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤1, locally >1 to > 1.3 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in flat ground (≤ 3°) and deep peat (4-6m) to northeast and northwest. • **Drainage:** Drainage ditch north of H/S crossing deep peat area (4-5m) and along northern side of road • **Seepage in trial pits:** Possible seepage in flat ground (≤ 3°) and deep peat (4-6m) to northeast and northwest. • **Evidence of piping/subsurface flow:** Yes, linear green vegetation growth to southwest of H/S. Possible subsurface flow in darker shaded area within slide area and to north	H	15
Significant Contributory Factors	• **Slide History:** <1km - At head of slide • **Tension Cracks:** Yes, slight tears in peat adjacent to slide • **Piping:** No • **Vegetation:** Generally cut forest area, Forest to southeast, local tree grown to southwest adjacent to slide area. • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	90
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T69**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 2-4m; locally 0-2m • **C_u (Geonor H-10) in Peat:** Generally 5-11kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H8-H10* • **Stability of peat in trial pits:** Slight spalling - Local Collapse* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	VH	20
Topography	• **Slope angles:** Generally ≤ 3°; locally 3-4° east of H/S. • **General slope characteristics:** Located east of slide, generally planar along road, slight convex break in slope south of H/S, ground slopes down to south • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 347-349mOD	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally **>** 1.3, locally ≤1 to ≤1.3 • ***cu = 2.5kPa:** Generally ≤1, >1 to ≤1.3, locally > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤1, locally > 1.3 at H/S **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible surface water in deep peat (3-4m) and flat ground (≤ 3°) area to north • **Drainage:** Drainage ditches along north side of road, drainage ditches cross peat area to north and south. Forestry furrows to north and south. • **Seepage in trial pits:** Possible seepage in deep peat (3-4m) and flat ground (≤ 3°) area to north • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** < 1km – located adjacent to slide • **Tension Cracks:** No • **Piping:** No • **Vegetation:** cut forest areas to northwest and southeast, forest area to northeast and southwest • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

AGL CONSULTING Geotechnical Engineers	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T70**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** 0-2m west of H/S; 2-3m at and east of H/S, locally 3-4m • **C_u (Geonor H-10) in Peat:** Generally 5-8kPa • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Stable - Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 3-7.5°; locally 5-7.5° west of H/S • **General slope characteristics:** Within zone of slide, generally planar along road outside slide area, slightly concave within slide area, ground slopes down steeply (4-7.5°) beyond southern site boundary to south/southeast. • **In broad flat or buried valley directly upslope from a watercourse?:** Y • **Altitude:** 329-333mOD	VH	20
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, • ***cu = 2.5kPa:** Generally > 1.3 west of H/S; Generally > 1.0 to ≤ 1.3 east of H/S **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3, locally ≤1 to ≤1.3 • ***c_u = 2.5kPa:** Generally ≤1, locally > 1 to > 1.3 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditches within slide area, along road east of H/S, and 2 No. ditches crossing peat area north of road. forestry furrows to north and south • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** Yes, linear green vegetation growth to northwest of H/S. Possible subsurface flow in darker shaded area within slide area	M	10
Significant Contributory Factors	• **Slide History:** < 1km - adjacent to slide • **Tension Cracks:** Yes, slight tears in peat adjacent to slide • **Piping:** No • **Vegetation:** Generally within forestry area, cut forest to northwest. Vegetation not fully re-established within slide area, however, some tree growth evident. • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	80
		Hazard Likelihood (L)	5

AGL CONSULTING GEOTECHNICAL ENGINEERS	**Derrybrien Wind Farm** **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T71**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1-3m; locally 3-4m • **C_u (Geonor H-10) in Peat**: <5-10kPa* • **Water Content:** 500-1500%* • **Max degree of humification:** H5-H10* • **Stability of peat in trial pits:** Stable - Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 3-5°; locally 1-2° • **General slope characteristics:** Planar along road, ground slopes down steeply (4-7.5°) to south • **In broad flat or buried valley directly upslope from a watercourse?:** N • **Altitude:** 331-333mOD	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5kPa:** Generally > 1.3, locally ≤1 to ≤ 1.3 • ***cu = 2.5kPa:** Variable, ≤1, > 1.0 to ≤ 1.3 & > 1.3 **13kPa surcharge (1m of Peat w/partial factor of 1.3)** • ***c_u = 5kPa:** Generally > 1.3 at and west of H/S, locally ≤1 to ≤1.3, Generally > 1.0 to ≤ 1.3; • ***c_u = 2.5kPa:** Generally ≤1 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** No • **Drainage:** Drainage ditch along northern side of road, crossing road at 2 No. locations west of H/S, drainage ditch crossing peat area to north, forestry furrows to north and south. • **Seepage in trial pits:** No • **Evidence of piping/subsurface flow:** No.	L	5
Significant Contributory Factors	• **Slide History:** < 1km • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Generally within forestry area, cut forest to northeast, • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on-site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

APPENDIX C

AGL REPORT NO. 11-147-R05:
PROOF LOAD TESTING OF FLOATING ROADS IN 2018

DERRYBRIEN WINDFARM ACCESS ROADS
ROAD TEST ON FLOATING ROADS

for

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30th October, 2018

Document Approval Form

DERRYBRIEN WINDFARM ACCESS ROADS
ROAD TEST ON UPGRADED FLOATING ROADS

Revision	Description	Date	Notes
0	Issue	30/10/2018	

Document No:	**11-147-R05**	
Made:	Niamh Farrell	
Checked:	Conor O'Donnell	

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2.0 FLOATING ROAD CONSTRUCTION HISTORY **1**
3.0 PROOF LOAD TEST DETAILS **2**
4.0 PROOF LOAD TEST RESULTS **6**
5.0 CONCLUSIONS AND RECOMMENDATIONS **7**

APPENDICES

Appendix A: Results of Proof Load Test

DERRYBRIEN WINDFARM ACCESS ROADS
ROAD TEST ON ACCESS/FLOATING ROADS

1.0 INTRODUCTION

AGL Consulting was requested by ESBI to undertake an assessment of the condition of the 17.5km of floating roads on the Derrybrien Windfarm, Co. Galway. A proof load test was carried out on the 17th of June, 2018 to confirm the existing capacity and to characterise the performance of the floating roads. This report sets out the details and the results of the proof load test carried out on the site.

2.0 FLOATING ROAD CONSTRUCTION HISTORY

The original access roads at Derrybrien Windfarm were constructed between August 2003 and May 2005 during the construction of the windfarm. The majority of the access tracks on the site were constructed as floating roads. These were comprised of 500-800 mm of crushed rock granular fill reinforced with 1-2 layers of Tensar SS30 geogrid over a layer of trees or brash as basal reinforcement on the surface of the peat.

Due to degradation of the floating roads since their construction in 2005, upgrade works were carried out on the roads. These upgrade works involved one of the following options:

1. The placement of a single 4.75m wide layer of Naue Polyester (PET) Secugrid 30/30 Q6 over the existing road surface and capped with a maximum 150mm thick layer of Class 6F2 crushed rock granular fill as defined in Series 600 of the NRA specification for Road works.
2. The placement of a maximum 150mm thick layer of Class 6F2 crushed rock granular fill as defined in Series 600 of the NRA specification for Road works.

All upgraded sections of road were overlain by Class 6H blinding and statically rolled using a 13 tonne roller to create a smooth running surface.

The remedial and widening works for the narrow turbary road between turbine T28 and T45 were not under this scope of upgrade works.

The upgrade works were carried out by SISK Contractors between April, 2014 and May, 2014.

No further upgrade works were carried out on the floating roads on the site since 2014.

3.0 PROOF LOAD TEST DETAILS

On the 17th July, 2018, a full-scale proof load test was carried out on all of the floating roads on the site under the supervision of Mr. Conor O'Donnell from AGL Consulting. The purpose of the test was to assess the performance of the upgraded roads in their existing condition and to verify the capacity of the roads to support the design maximum crane load.

The floating roads for Derrybrien Windfarm were designed to support a 300 tonne Grove GMK6300 All-Terrain crane which has a travelling load of 72 tonnes over 6 axles (12 tonnes per axle). This is the maximum crane size that was previously used at Derrybrien to erect the turbines during construction. The configuration of the crane is shown on Figure 3-1.

The proof load test involved observing the performance of the floating roads under the weight of either a 60-tonne Liebherr LTM 1095-5.1 mobile crane or a fully-loaded 45.6 tonne Volvo A25D articulated dumper truck travelling steadily along the road at a speed of approximately 5 kph.

The majority of the roads were tested using a Liebherr LTM 1095-5.1 mobile crane with additional ballast to give a total load of 60 tonnes on 5 axles at a maximum load of 12 tonnes per axle. The axles are 2.75 m wide and the total wheel contact area is approximately 7.75 x 2.75m. This equates to a characteristic UDL of 27.6 kN/m^2, or 76 kN/m length of road. The configuration of the crane is shown on Figure 3-2.

The narrower turbary road along the east side of the site (T25 to T45) and the floating road between T27 and T44 were tested using a Volvo A25D articulated dump truck with a full payload capacity of granular rockfill to give a combined load of approximately 45.6 tonnes on 3 axles with axle loads of 14.1-15.7 tonnes over a wheel contact area of 6.45 x 2.86 m. This equates to a characteristic (unfactored) UDL of 24.2 kN/m^2, or 69 kN per metre length of road when travelling. The configuration of the crane is shown on Figure 3-3.

The loads applied to the floating road by the Grove GMK6300 All-Terrain crane are summarised on Table 3-1 along with the comparable loads from the 60 tonne Liebherr LTM 1095-5.1 mobile crane and the 45.6 tonne Volvo A25D articulated dump truck. The Liebherr LTM 1095-5.1 mobile crane and the Volvo A25D dump truck have a lower total mass than the Grove GMK 6300. However:

- The Leibherr LTM 1095-5.1 was loaded with extra ballast to give it the same axle load as the larger Grove GMK6300 crane (12 tonnes/axle);
- The Volvo A25D had a full payload of granular rockfill so that the axle loads were higher than the Grove GMK6300 crane (14.1-15.7 tonnes/axle);
- The load applied by the Volvo A25D and the Liebherr LTM 1095-5.1 per metre length of road were approximately 10-20% greater than the comparable load from the Grove GMK6300 with the larger wheel base.

The performance of the road is assessed based on the deflection of the road under the axle loads, and the bearing capacity of the road is a function of the load per meter length of road, which is distributed across the surface of the peat by the layers of geogrid reinforcement in the road (the "snowshoe effect"). Therefore, the loads from the Liebherr LTM 1095-5.1 and the Volvo A25D were sufficient to verify the performance and capacity of the floating roads across the site.

Table 3-1: Truck/Crane Type used in Proof Load Test including pressure on floating road

	Grove GMK 6300	**Leibherr LTM 1095-5.1**[Note 2]	**Volvo A25D with 24 tonne payload**
Total Mass	72 tonnes	60 tonnes	45.6 tonnes
Axle Load	12 tonnes	12 tonnes	14.1/15.7 tonnes (Front/Rear)
Contact Wheel Base [Note 1]	11.1m x 3.0m	7.75m x 2.75m	6.45m x 2.86m
UDL on Floating Road	21.2 kN/m^2	27.6 kN/m^2	24.2 kN/m^2
Load/m Length of Road	63.6 kN/m	76 kN/m	69.3 kN/m

Notes:
1. Assumes 0.5m tyre contact length for Liebherr & Groave Cranes & 0.6m for Volvo A25 (23.5R25 tyres)
2. Carrying additional ballast

Similar to the tests that were carried out on the roads in 2011 and 2014, it was intended to classify the performance of the roads as “Good", "Fair" or "Poor" based on the criteria in Table 3-2, which was developed by AGL for testing the roads during construction. However, when the roads were tested in 2018, the majority of the roads performed exceptionally well, so that we have now classified the performance of the roads as “Very Good” under a new category that has been added to the criteria in Table 3-2.

Table 3-2: Floating road performance criteria for full-scale serviceability load tests.

Road Performance Classification	**Performance Criteria**
Very Good	➢ Road deflects rigidly under crane/truck load with only slight deflections noticeable in some localised areas under the crane load. ➢ Road surface is even with no obvious rutting and no loose rockfill.
Good	➢ Road deflections generally <10 mm ➢ Road deflects relatively rigidly under truck load with only slightly greater deformation locally under the wheel load at localized soft spots. ➢ Road surface is even with minor rutting and no loose rockfill.
Fair	➢ Road deflections between 10 and 30 mm ➢ Road deflects noticeably under wheel loads ➢ Road surface is relatively even with some rutting along the line of the wheels. The rockfill is generally dense. ➢ Local transverse rutting occurs at soft spots where the rockfill has loosened over weak peat, or where there are gaps in the basal reinforcement trees.
Poor	➢ Road deflections are greater than 30 mm (up to about 60 mm) ➢ Road deforms very noticeably under wheel loads in wave-like motion. ➢ Deformations are uneven causing the truck to tilt slightly on local soft spots. ➢ Road surface is in poor condition with both longitudinal and transverse rutting creating an uneven road surface. ➢ Rockfill is loosened over worst areas.

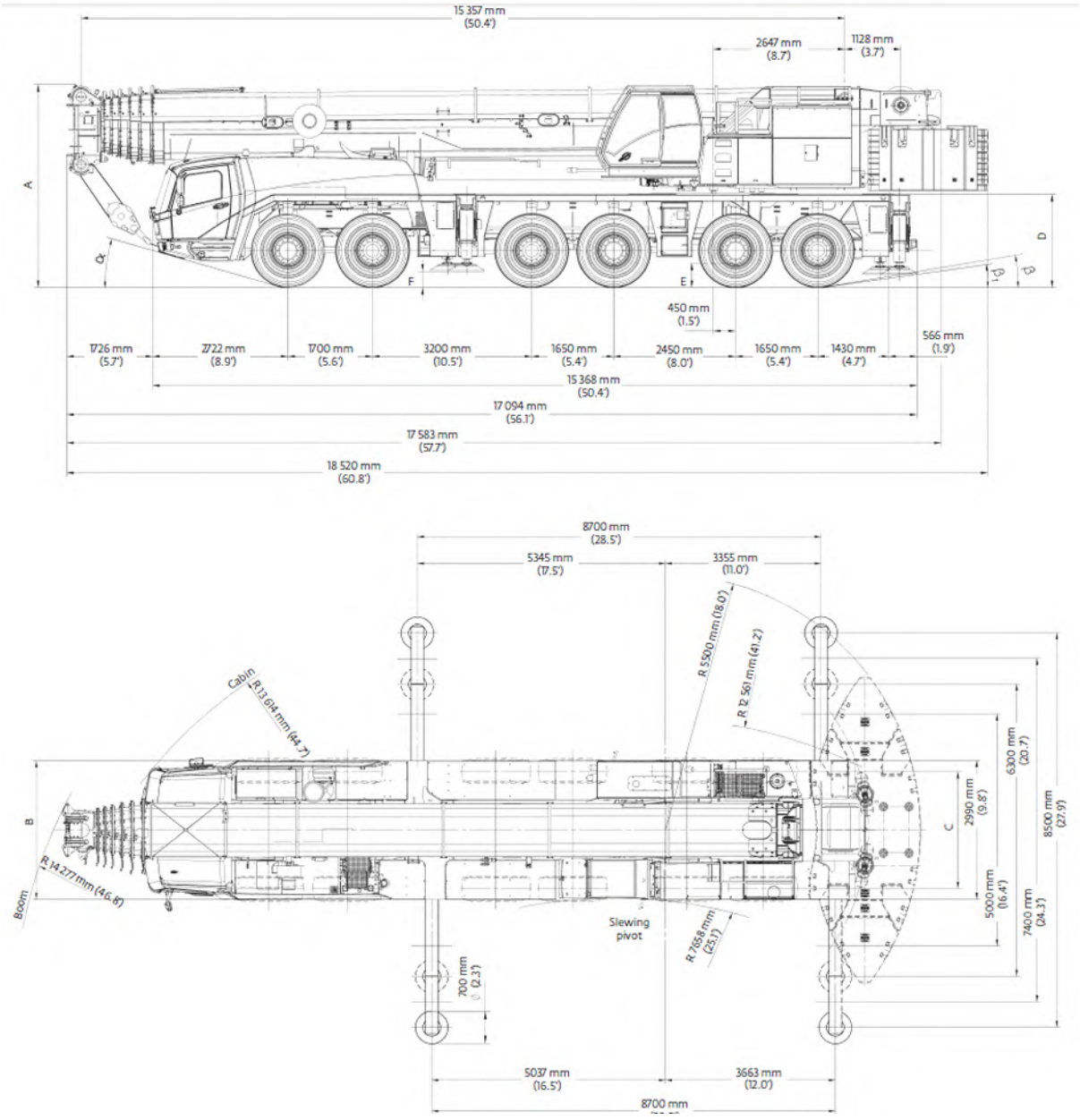


Figure 3-1: Configuration of 300 tonne Grove GMK6300 mobile crane (Design Crane for Floating Roads)

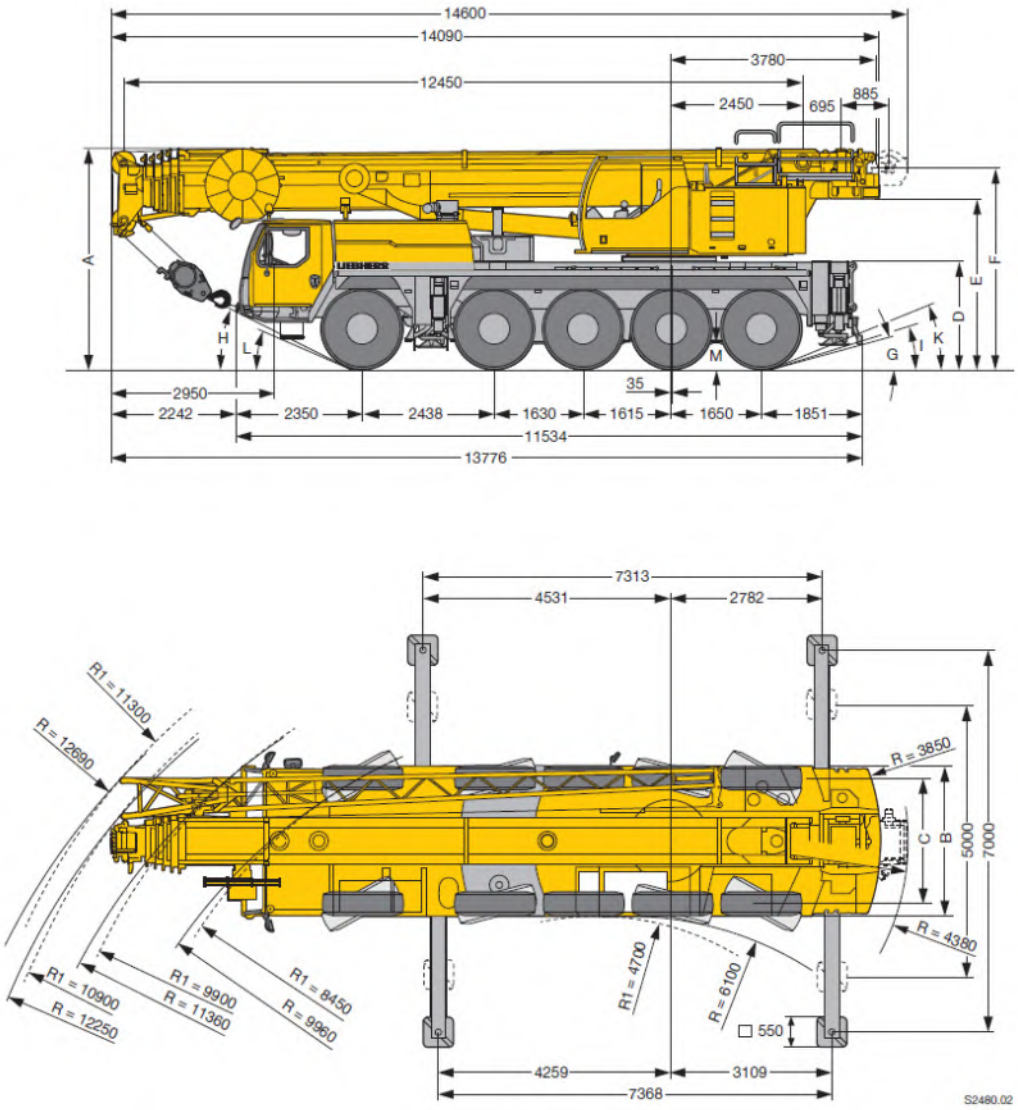


Figure 3-2: Configuration of Leibherr LTM 1095-9.1 mobile crane

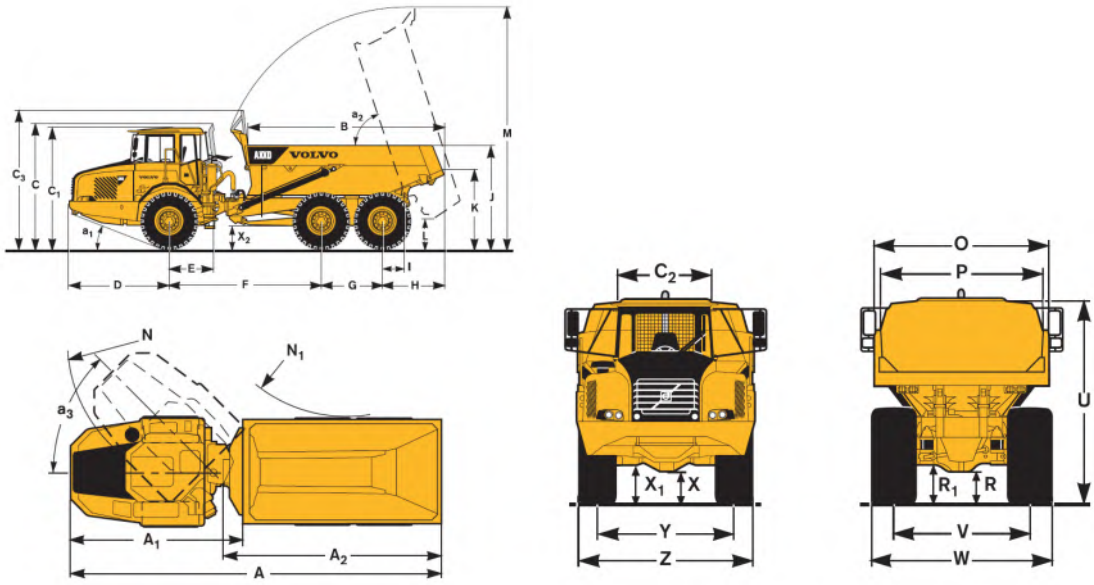


Figure 3-3: Configuration of Volvo A25D articulated dump truck

4.0 PROOF LOAD TEST RESULTS

The proof load test was carried out by visually observing the performance of the floating roads under the weight of the Liebherr LTM 1095-9.1 mobile crane or the Volvo A25D articulated dump truck travelling over the floating roads at a speed of approximately 15kph.

The majority of the roads were tested using a 60 tonne Liebherr LTM 1095-5.1 mobile crane, however, the narrower turbary road along the east side of the site (T25 to T45) and the floating road between T27 and T44 were tested using a 45.6 tonne Volvo A25D articulated dump truck.

The results of the test are presented graphically on drawing No. 11-147-R05-01 in Appendix A and the following is a summary of the findings observed during the test:

- All of the floating roads were successfully proof tested for the design crane load without any indication of bearing failure or shear failure in the peat under the roads.
- The roads generally deflected rigidly under the axle loads from the crane or Volvo dump truck, with only localised areas where slight deflections were observed. Therefore, the majority of the upgraded sections of the floating roads are classified as "Very Good" using the classification system presented on Table 3-2.
- In the few areas where there was a more continuous stretch of road where slight deflections were noted under the applied axle loads, such as along the Turbary road between Turbines T34 and T45, the performance of the floating road has still been classified as "Good".
- There were 15 No. local "Good" spots on the road (<10m) within the "Very Good" sections. These are classified as section of the road which either showed a slight increase in deflection (<10mm) under the wheel load of the crane, had a slightly uneven surface due to localised potholes on the road or had a rough surface which reduce the driving quality. These areas are identified on Drawing 11-147-R05-01. The locations were recorded by hand-held GPS during the road test. The performance of these sections of road would be acceptable in their present condition.
- The results indicate that the performance of the floating roads has improved since the upgrade works that were carried out in 2014. It is considered that the noticeable improvement in the performance of the floating roads is largely due to the increase in strength and stiffness that has occurred in the underlying peat due to consolidation of the peat under the weight of the roads since they were constructed in 2005, and again under the weight of the additional capping layer that was placed on the sections of road that were upgraded in 2014. The additional layer of geogrid reinforcement placed in the upgraded roads would also have significantly improved the performance of the roads – stiffening them up and more effectively spreading the load out across the surface of the peat. This effect would also become more pronounced over time as the roads continued to settle into the peat so that the geogrids effectively become "post-tensioned".

5.0 CONCLUSIONS AND RECOMMENDATIONS

A proof load test was carried out by AGL on the floating roads at Derrybrien Windfarm on the 17th June, 2018 to confirm the existing capacity and to characterise the performance of the floating roads.

The proof load test involved observing the performance of the floating roads under the weight of either a 60 tonne 5 axle crane or a 45.6 tonne Volvo A25D articulated dumper truck travelling along the road at a speed of approximately 15kph. The majority of the roads were tested using a Liebherr LTM 1095-5.1 mobile crane, however, the narrower turbary road along the east side of the site (T25 to T45) and the floating road between T27 and T44 were tested using the Volvo A25D articulated dump truck.

The performance of the road was qualitatively assessed as “Very Good”, "Good", "Fair" or "Poor" based on criteria developed by AGL during the original construction of the floating road. However, the “Very Good” category has been added for the proof load tests carried out in 2018 to take into account the noticeable improvement in the performance of the floating roads in comparison with the 2014 test.

All of the floating roads were successfully proof tested for the design crane load without any indication of bearing failure or shear failure in the peat under the roads.

The observations made during the road test indicate that the majority of the access roads perform to a “Very Good” standard. The road was observed to deflect rigidly under the crane load and the road surface was even with no rutting/loose rockfill noted.

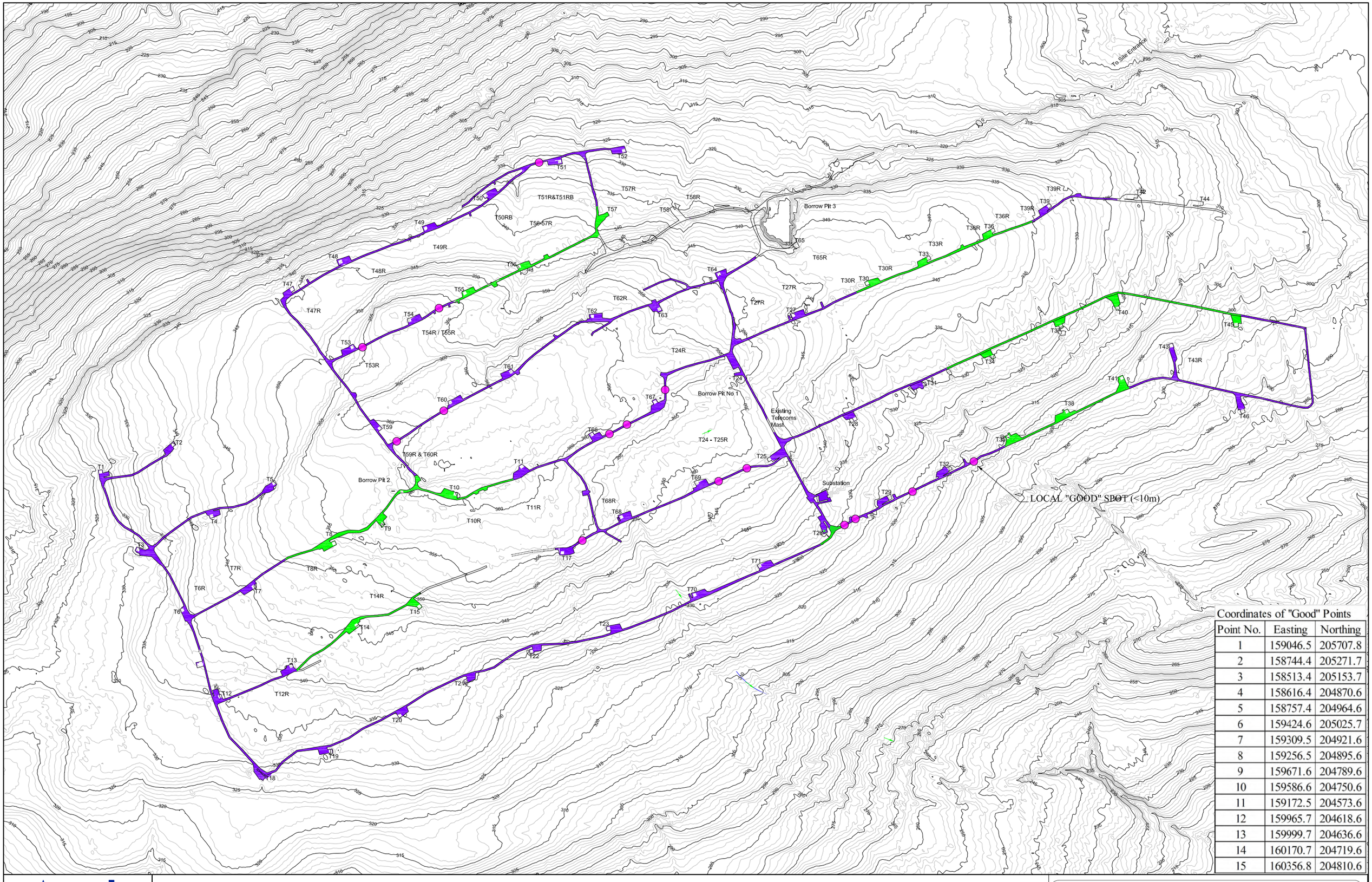
In the few areas where there was a more continuous stretch of road where slight deflections were noted under the applied axle loads, such as along the Turbary road between Turbines T34 and T45, the performance of the floating road has still been classified as “Good”.

There were 15 No. local “Good” spots on the road (<10m) within the “Very Good” sections. These are classified as section of the road which either showed a slight increase in deflection (<10mm) under the wheel load of the crane, had a slightly uneven surface due to localised potholes on the road or had a rough surface which reduce the driving quality.

The results indicate that the performance of the floating roads has improved since the upgrade works that were carried out in 2014. It is considered that the noticeable improvement in the performance of the floating roads is largely due to the increase in strength and stiffness that has occurred in the underlying peat due to consolidation of the peat under the weight of the roads since they were constructed in 2005, and again under the weight of the additional capping layer that was placed on the sections of road that were upgraded in 2014. The additional layer of geogrid reinforcement placed in the upgraded roads would also have significantly improved the performance of the roads – stiffening them up and more effectively spreading the load out across the surface of the peat. This effect would also become more pronounced over time as the roads continued to settle into the peat so that the geogrids effectively become “post-tensioned”.

APPENDIX A

RESULTS OF PROOF LOAD TEST



Coordinates of "Good" Points

Point No.	Easting	Northing
1	159046.5	205707.8
2	158744.4	205271.7
3	158513.4	205153.7
4	158616.4	204870.6
5	158757.4	204964.6
6	159424.6	205025.7
7	159309.5	204921.6
8	159256.5	204895.6
9	159671.6	204789.6
10	159586.6	204750.6
11	159172.5	204573.6
12	159965.7	204618.6
13	159999.7	204636.6
14	160170.7	204719.6
15	160356.8	204810.6

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ROAD PERFORMANCE
- VERY GOOD
- GOOD
- FAIR
- POOR
- LOCAL "GOOD" SPOT (<10m)

CAUSES OF LOCAL GOOD SPOTS (<10m)
1. Localised small deflections under 12 tonne axle load
2. Slightly uneven surface due to local potholes on the road

Project: Derrybrien Wind Farm

Title: ROAD TEST ON FLOATING ROADS (17/06/2018)

Scales	Date	Page no.	Drawing No.:
1:10,000	16/10/2018	1 of 1	11-147-R05-01
Version: Final	Drawn: NMF	Checked: COD	

APPENDIX D

PHOTOS FROM AGL SITE INSPECTION IN 2018

APPENDIX C

PHOTOS FROM AGL SITE INSPECTIONS IN 2018

AGL REPOSITORIES

Photo No. C-1: T6R Peat Repository facing east

Photo No. C-2: T6R Peat Repository facing north

Photo No. C-3: T6R Peat Repository facing west

Photo No. C-4: T7R Peat Repository facing south

Photo No. C-5: T8R+T8R Ext Peat Repository facing west

Photo No. C-6: T8R+T8R Ext Peat Repository facing east

Photo No. C-7: T10R Peat Repository facing east

Photo No. C-8: T11R Peat Repository facing west

Photo No. C-9: T12R Peat Repository facing west

Photo No. C-10: T12R Peat Repository facing east

Photo No. C-11: T14R Peat Repository facing north

Photo No. C-12: T24R Peat Repository

Photo No. C-13: T24-T25 Peat Repository facing west

Photo No. C-14: T27R Peat Repository facing east

Photo No. C-15: T27R Peat Repository facing north

Photo No. C-16: T27R Peat Repository facing west

Photo No. C-17: T30R Peat Repository West facing east

Photo No. C-18: T30R Peat Repository East facing west

Photo No. C-19: T33R Peat Repository facing east

Photo No. C-20: T33R Peat Repository facing west

Photo No. C-21: T36R Peat Repository facing east

Photo No. C-22: T39R Peat Repository West facing north

Photo No. C-23: T39R Peat Repository East facing north

Photo No. C-24: T43R Peat Repository adjacent to hardstanding facing east

Photo No. C-25: T43R Peat Repository south end of repository facing northeast

Photo No. C-26: T46R Peat Repository West facing south

Photo No. C-27: T46R Peat Repository East facing south

Photo No. C-28: T47R Peat Repository

Photo No. C-29: T48R+T48R(B) Peat Repository facing east

Photo No. C-30: T48R+T48R(B) Peat Repository facing west

Photo No. C-31: T49R Peat Repository

Photo No. C-32: T50R Peat Repository

Photo No. C-33: T51R+T51R(B) Peat Repository

Photo No. C-34: T53R Peat Repository

Photo No. C-35: T54-T55R Peat Repository

Photo No. C-36: T56-T57R Peat Repository middle of repository facing west

Photo No. C-37: T56-T57R Peat Repository middle of repository facing east

Photo No. C-38: T57R Peat Repository facing east

Photo No. C-39: T58R Peat Repository facing east

Photo No. C-40: T58R Peat Repository facing northeast

Photo No. C-41: T59R-T60R Peat Repository facing east

Photo No. C-42: T59R-T60R Peat Repository facing south

Photo No. C-43: T62R Peat Repository facing northeast

Photo No. C-44: T65R Peat Repository facing south

Photo No. C-45: T68R Peat Repository facing east

ADDITIONAL SIDECAST AREAS

Photo No. C-46: T1R Peat Repository facing north

Photo No. C-47: T2R Peat Repository South facing south

Photo No. C-48: T2R Peat Repository North facing north

Photo No. C-49: T3R Peat Repository West facing north

Photo No. C-50: T3R Peat Repository Northeast facing north

Photo No. C-51: T3R Peat Repository Southeast facing south

Photo No. C-52: T4R Peat Repository North facing north

Photo No. C-53: T4R Peat Repository South facing south

Photo No. C-54: T5R Peat Repository facing southeast

Photo No. C-55: T6R Peat Repository facing south

Photo No. C-56: T9R Peat Repository facing east

Photo No. C-57: T13R Peat Repository North facing north

Photo No. C-58: T13R Peat Repository South facing south

Photo No. C-59: T18R Peat Repository East facing southeast

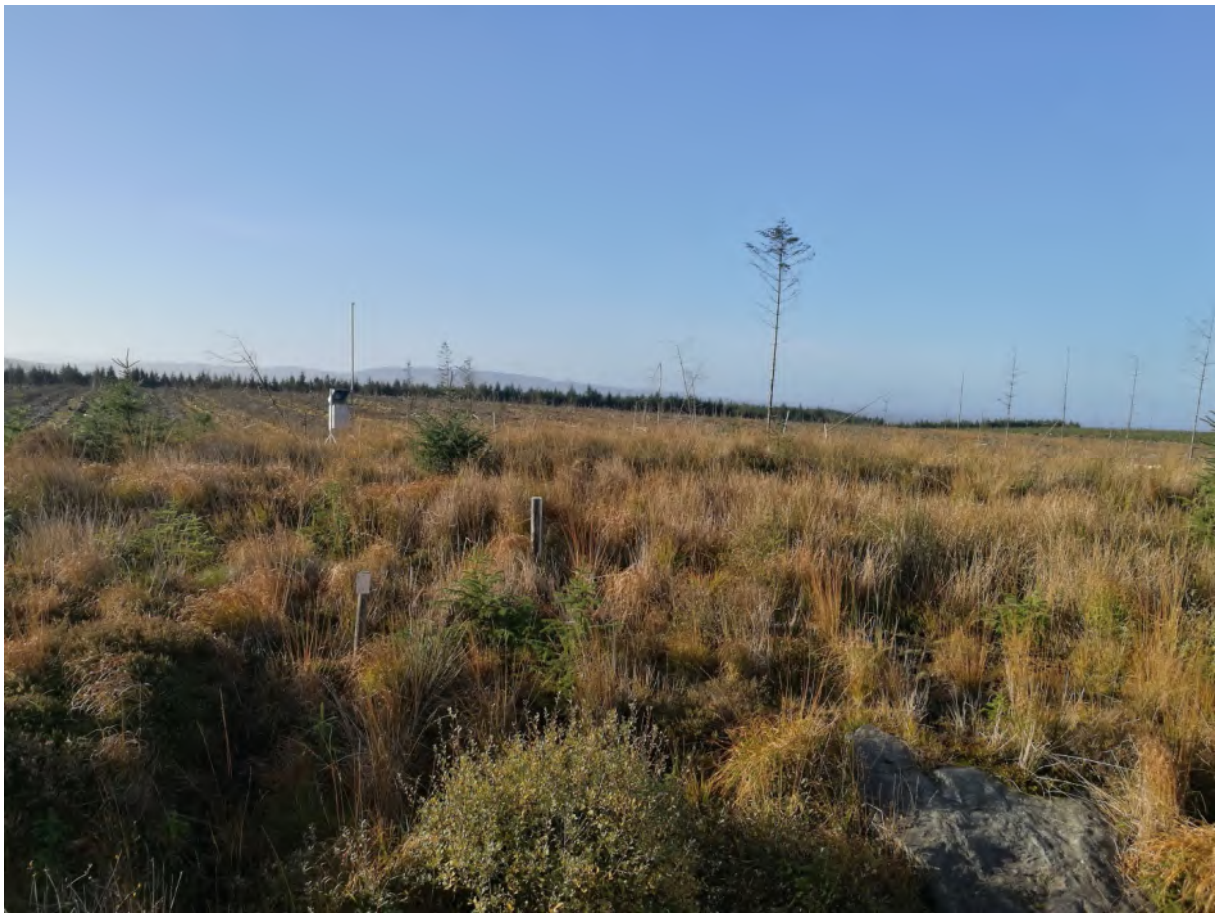

Photo No. C-60: T18R Peat Repository West facing northwest

Photo No. C-61: T19R Peat Repository facing east

Photo No. C-62: T20R Peat Repository facing southeast

Photo No. C-63: T21R Peat Repository facing southeast

Photo No. C-64: T22R Peat Repository facing west

Photo No. C-65: T25R Peat Repository North facing west

Photo No. C-66: T25R Peat Repository South facing west

Photo No. C-67: T26-T29R Peat Repository West facing east

Photo No. C-68: T26-T29R Peat Repository Centre facing north

Photo No. C-69: T27R Peat Repository East facing east

Photo No. C-70: T28R Peat Repository facing southeast

Photo No. C-71: T29R Peat Repository facing north

Photo No. C-72: T31R Peat Repository facing south

Photo No. C-73: T32R Peat Repository West racing west

Photo No. C-74: T32R Peat Repository East facing east

Photo No. C-75: T34R Peat Repository facing south

Photo No. C-76: T35R Peat Repository facing east

Photo No. C-77: T37R Peat Repository facing south

Photo No. C-78: T38R Peat Repository facing west

Photo No. C-79: T38R Peat Repository facing east

Photo No. C-80: T40R Peat Repository East facing east

Photo No. C-81: T40R Peat Repository South facing south

Photo No. C-82: T41R Peat Repository facing west

Photo No. C-83: T42R Peat Repository facing north

Photo No. C-84: T44R Peat Repository facing east

Photo No. C-85: T45R Peat Repository East facing southeast

Photo No. C-86: T45R Peat Repository South facing south

Photo No. C-87: T63R Peat Repository facing east

Photo No. C-88: T66R Peat Repository facing south

Photo No. C-89: T67R Peat Repository facing southeast

BORROW PITS

Photo No. C-90: Borrow Pit 1

Photo No. C-91: Borrow Pit 2 West

Photo No. C-92: Borrow Pit 2 West

Photo No. C-93: Borrow Pit 2 East

Photo No. C-94: Borrow Pit 2 East

Photo No. C-95: Borrow Pit 3 from top of borrow pit facing east

Photo No. C-96: Borrow Pit 3 from base of borrow pit facing south

Photo No. C-97: Borrow Pit 3 from base of borrow pit facing south

APPENDIX E

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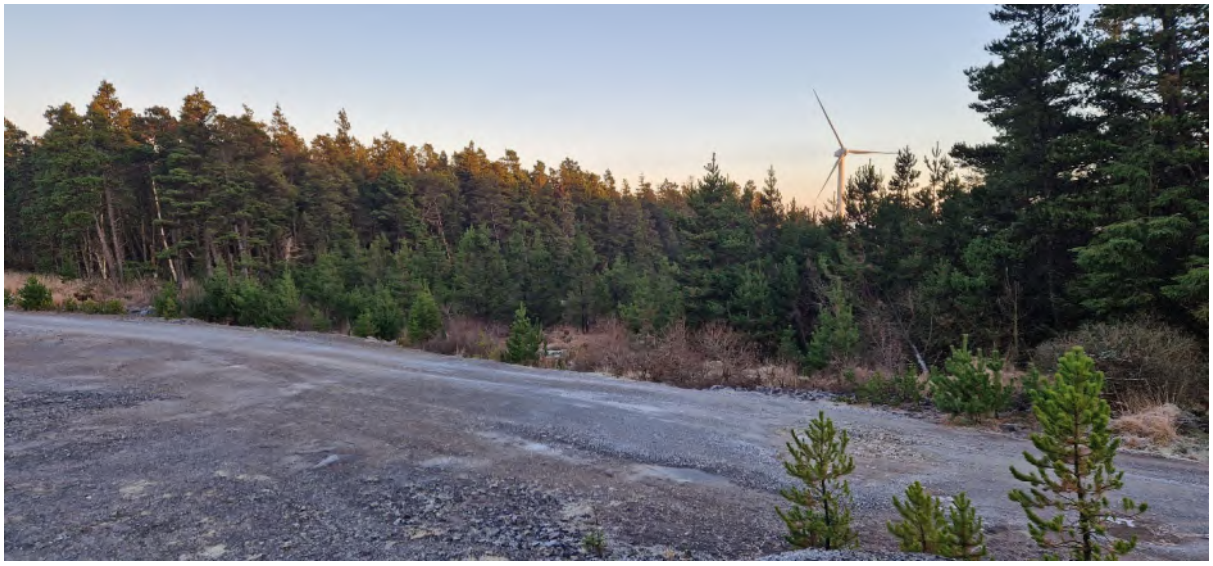

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APPENDIX F

AGL REPORT NO. 11-147-R01:

CONSTRUCTION STAGE GEOTECHNICAL INVESTIGATIONS, STABILITY ANALYSES AND PEAT STABILITY RISK MITIGATION MEASURES (POST-SLIDE)

DERRYBRRIEN WINDFARM

SUMMARY OF GEOTECHNICAL INVESTIGATIONS, STABILITY ANALYSES AND PEAT STABILITY RISK MITIGATION MEASURES ADOPTED DURING POST-SLIDE CONSTRUCTION STAGE

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Document Approval Form

DERRYBRIEN WINDFARM

SUMMARY OF GEOTECHNICAL INVESTIGATIONS, STABILITY ANALYSES AND PEAT STABILITY RISK MITIGATION MEASURES ADOPTED DURING POST-SLIDE CONSTRUCTION STAGE

Issue	Revision	Date	Notes
01	Rev.0	29/5/2020	Final Report
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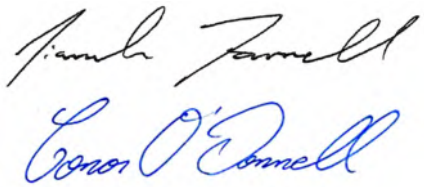
Made:	Conor O'Donnell/Niamh Farrell	
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DERRYBRIEN WINDFARM

SUMMARY OF GEOTECHNICAL INVESTIGATIONS, STABILITY ANALYSES AND PEAT STABILITY RISK MITIGATION MEASURES ADOPTED DURING POST-SLIDE CONSTRUCTION STAGE

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V. AGL Memo No. 03-104-DM18 – Full Scale Testing on the Floating Roads

VI. AGL Report No. 03-104-R06 – Report on the Load Test Carried out on a Test Section of Floating Road

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DERRYBRIEN WINDFARM

SUMMARY OF GEOTECHNICAL INVESTIGATIONS, STABILITY ANALYSES AND PEAT STABILITY RISK MITIGATION MEASURES ADOPTED DURING POST-SLIDE CONSTRUCTION STAGE

1.0 INTRODUCTION

This report provides a record of the geotechnical investigations that were carried out on the site of the Derrybrien Windfarm during the post-slide construction stage of the project by AGL Consulting, by the main civils contractor, Ascon Ltd. (now BAM Civil), and by ESBIE. The report also provides a summary of the stability analyses that were carried out and the peat stability risk mitigation measures that were implemented on site. The factual report of the pre-construction ground investigation that was carried out on the site in 2001 by IGSL Ltd. is included to provide a complete record of the geotechnical investigations that have been carried out on the site.

AGL Consulting were appointed by Ascon to provide geotechnical analysis, design, supervision, and inspection services for the project from October 2003 until the end of the civil works in 2005. Our scope of services included:

- Geotechnical investigations at the peat slide area, including detailed walkover surveys and specialised sampling and testing of the peat;
- Specification, supervision and reporting of supplemental geotechnical investigations on the site;
- Stability analyses for all of the floating roads;
- Identification and assessment of suitable peat repository sites;
- Preparation of geotechnical reports with the results of the supplemental ground investigations and stability analyses;
- Inspection of full-scale serviceability and proof load testing on all of the floating roads;
- Assessment and monitoring of blast-induced vibrations on peat stability;
- Periodic site inspections by a geotechnical engineer (Director) and attendance at progress meetings; and
- Review and certification of the Contractor's Method Statements; and
- Full-time on call technical support from the office to address geotechnical queries.

Extensive supplemental ground investigations were carried out on the site by AGL Consulting and the main civils contractor, Ascon Ltd. (now BAM Civil) during the second phase of construction in 2004/2005, after the peat slide, to accurately characterise the topography and the depth, strength and characteristics of the peat and underlying glacial till across the site so that the risk of peat instability could be adequately assessed and managed for the completion of the windfarm.

The fieldwork consisted of:

- Peat depth probing and sampling with a hand-operated 20 mm diameter steel probe with the 1.0 m long 20mm diameter gouge-auger core sampler;

- Slope angle measurements on the surface of the peat by GPS, optical survey and hand-held Abney Level;
- In situ vane-shear tests to determine the undrained shear strength of the peat using a Geonor H-10 65/130mm penetration vane;
- Rotary coreholes by Irish Drilling Ltd. at 27 No. turbine bases to determine the depth to rock and rock mass characteristics, with Standard Penetration Tests (SPT) in the overburden to assess the in-situ undrained shear strength of the glacial till;
- Installation of 10 No. 19mm diameter push-in piezometers to record groundwater levels in the peat across the site;
- Collection of high-quality undisturbed samples of the peat with 75 & 100mm thin wall Geonor piston samplers and by block sampling in trial pits; and
- Specialist laboratory testing of undisturbed samples to classify the strength and material characteristics of the peat.

These investigations were required for the geotechnical assessment of the stability of the windfarm infrastructure and spoil deposition areas. Therefore, they were primarily located at the turbines and crane hardstanding areas, at the peat repository sites, and within a 25-50 m wide corridor along the floating roads.

This report presents a summary of the geotechnical investigations and stability analyses that were carried out. Copies of the relevant factual reports, site investigation information, stability analyses, geotechnical reports, design memoranda and geotechnical certificates are included in the appendices.

The following factual reports of geotechnical investigations are also included in the appendices:

- The results of the pre-construction site investigation in 2001, which are presented in the factual report prepared by IGSL Ltd. titled: "*Report on a Site Investigation at a Proposed Wind Farm, Derrybrien, Co. Galway. IGSL, Report No. 7637"*, dated January 2002.
- The factual report for the rotary coreholes that were carried out at Turbines T6 – T8, T30, T33, T34, T36, T39, T47-T62, T64 & T70-T71 by Irish Drilling Ltd. titled "Proposed Windfarm at Derrybrien – Site Investigation Contract" dated September, 2004.
- The results of the geotechnical investigations that were carried out by ESBI Engineering and Facilities Management (ESBIE) between June 2004 and December 2004 to assess peat stability for the planned tree felling operations, which are presented in their report titled "Report on ESBIE Geotechnical Testing Rev1, dated 25th January, 2005 (report No. 78015-C11-R1 Rev. 1).

Malone O'Regan Mc Gillicuddy were civil, structural designers for Ascon. It is understood that they carried out some additional geotechnical investigations on the site to assess the ground conditions for the design of the turbine foundations. They did not produce a factual report for the investigations. However, Table No.1 shows the details for the depth to suitable formation on rock for the turbine foundations, which was included on their Drawing No. 20206-12 – Turbine Foundation, General Arrangement and Details, Rev. 03, which was issued for construction on the 27th August, 2003.

Table 1-1 – Depth to suitable formation on rock at turbine foundations (MOR Drawing No.20206-12)

Turbine No.	Depth of Excavation to suitable bearing strata	Depth of lean mix (mm)	Level of top of stone fill below existing G.L.	Foundation Type
T1	3800	100	1700	1
T2	3800	100	1700	1
T3	4400	600	1800	1
T4	5000	1300	1700	1
T5	3800	100	1700	1
T6	4600	900	1700	1
T7	5400	1700	1700	1
T8	5200	1350	1850	1
T9	5200	1350	1850	1
T10	3800	100	1700	1
T11	4000	200	1800	2
T12	3800	100	1700	1
T13	4500	700	1800	1
T14	5500	1800	1700	1
T15	4600	900	1700	1
T16	5200	1350	1850	1
T17	3800	100	1700	1
T18	3800	100	1700	1
T19	3800	100	1700	1
T20	3800	100	1700	1
T21	5400	1700	1600	1
T22	3800	100	1700	1
T23	3800	100	1700	1

Turbine No.	Depth of Excavation to suitable bearing strata	Depth of lean mix	Level of top of stone fill below existing G.L.	Foundation Type
T24	3800	100	1700	1
T25	3800	100	1700	1
T26	3800	100	1700	1
T27	5600	1800	1800	1
T28	3800	100	1700	1
T29	4000	200	1800	1
T30	4800	1350	1700	1
T31	5000	1350	1700	1
T32	5600	1800	1800	1
T33	5100	1350	1750	1
T34	3800	100	1700	1
T35	4600	900	1700	1
T36	3800	100	1700	1
T37	4400	900	1700	1
T38	4800	1350	1700	1
T39	4400	900	1700	1
T40	3800	100	1700	1
T41	3800	100	1700	1
T42	3800	100	1700	1
T43	3800	100	1700	1
T44	5000	1350	1700	1
T45	3800	100	1700	1
T46	3800	100	1700	1

Turbine No.	Depth of Excavation to suitable bearing strata	Depth of lean mix	Level of top of stone fill below existing G.L.	Foundation Type
T47	3800	100	1700	1
T48	4600	900	1700	1
T49	5200	1350	1850	1
T50	3000	100	1700	1
T51	3800	100	1700	1
T52	3800	100	1700	1
T53	5200	1350	1850	1
T54	5100	1350	1750	1
T55	5600	1800	1800	1
T56	4200	900	1700	1
T57	3800	100	1700	1
T58	3800	100	1200	1
T59	5000	1350	1700	1
T60	5300	1800	1700	2
T61	4700	900	1800	2
T62	5600	1800	1800	2
T63	5000	1350	1700	1
T64	5700	1800	1900	1
T65	5000	1350	1700	1
T66	4200	900	1700	2
T67	3800	100	1700	2
T68	5400	1800	1700	1
T69	5000	1350	1700	1
T70	5300	1800	1700	1
T71	5000	1350	1700	1

Wind Turbine Foundation Details

2.0 GEOTECHNICAL INFORMATION PROVIDED IN APPENDICES

2.1 Appendix I: IGSL Factual Report for Pre-Construction SI (2001)

IGSL Ltd. carried out the pre-construction ground investigation on the site on behalf of Michael Punch & Partners, Ltd. Access to the turbine locations was not possible for conventional ground investigation equipment to carry out trial pits, boreholes or rotary coreholes because of the poor ground conditions and extensive forestry coverage on the site. Therefore, the works was comprised of the following:

- 8 No. trial pits to depths of 2.5-3.3 m in areas that were accessible to a wide-track hydraulic excavator;
- 58 No. Dynamic Probes using a light hand-held Mackintosh Probe – primarily located at Turbines T1-T46, with 12 No. additional probes at selected locations over the rest of the site;
- 24 No. auger samples of the peat at depths of 1.5 m across the site;
- Laboratory testing of the disturbed samples of the peat, which included 12 No. water contents and 6 No. chemical tests (SO_3 & pH)

The investigation works were carried out on site in December 2001. The results are presented in the factual report prepared by IGSL titled: "*Report on a Site Investigation at a Proposed Wind Farm, Derrybrien, Co. Galway. IGSL, Report No. 7637"*, dated January 2002. A copy of the report is included in **Appendix I**.

2.2 Appendix II: Factual Report on Rotary Coreholes at Turbine Locations by Irish Drilling Ltd., (2004)

Between the 6th and 24th September, 2004, 31 No. rotary coreholes were carried out at 27 No. of the remaining turbines that were accessible at that time – mainly on the northern side of the windfarm (Turbines T6 – T8, T30, T31, T33, T36, T39, T47-T62, T64 & T70-T71). 2 No. additional coreholes were carried out at each of Turbines T51 and T64 to assess potential alternative locations for the turbines on shallower rock.

The coreholes were required to obtain 63 mm diameter (HQ) solid core samples of the bedrock to determine the depth to competent rock and the strength, quality and degree of weathering of the rock for the design of the turbine pad foundations, which are supported on the rock.

Standard Penetration Tests (SPT) were also carried out in the glacial till above rockhead to assess whether it would be suitable for supporting the turbine foundations at a shallower depth, and to assess the temporary works requirements for the slopes around the perimeter of the open excavation.

The works were carried out by Irish Drilling Ltd. for the main civil contractor, Ascon Ltd. The logs of the coreholes are included in the factual report by Irish Drilling Ltd. titled "*Proposed Windfarm at Derrybrien – Site Investigation Contract*" dated September, 2004, which is included in **Appendix II**.

2.3 Appendix III: AGL Report No. 03-104-R01 (Rev.1) on Stability of Floating Roads, Turbine Excavations & Peat Disposal Areas

Report No. 03-104-R01 (Rev.1) - *"Report on the Stability of the Floating Roads, Turbine Excavations and Peat Disposal Areas on the site of the Derrybrien Windfarm, Co. Galway,"* by AGL Consulting, dated November 1st, 2004 is in **Appendix III**.

The report includes the following:

- The factual results of supplemental investigations carried out by AGL Consulting and Ascon Ltd. for floating roads, peat repositories and turbine excavations on the windfarm site between August 17th and November 1st, 2004. The investigations were comprised of:
    - Peat depth probes
    - Slope angle measurements, and
    - In-situ vane shear test results with the Geonor H-10 vane.
- The assessment methodology and results of stability analyses for the floating roads and peat repository sites;
- Results of full scale serviceability and proof load tests on sections of the floating roads for construction traffic primarily on the north side of the site.

2.4 Appendix IV: AGL Report No. 03-104-R02 – Report on the Stability of the Floating Roads

Report No. 03-104-R02 - "*Report on the Stability of the Floating Roads on the site of the Derrybrien Windfarm, Co. Galway,*" by AGL Consulting, dated 16th December, 2004 is included in **Appendix IV**.

The report is an addendum to Report No. 03-104-R01, specifically in relation to the assessment of the floating roads, and includes the following:

- The factual results of supplemental investigations carried out by AGL Consulting and Ascon Ltd. for the floating roads on the windfarm site between August 17th and December 16th, which were comprised of:
    - Peat depth probes
    - Slope angle measurements, and
    - In-situ vane shear test results with the Geonor H-10 vane.
- The results of additional stability analyses for the floating roads;
- Results of full scale serviceability and proof load tests on additional sections of the floating roads on the site for construction traffic loading.

2.5 Appendix V: AGL Memo No. 03-104-DM18 – Full Scale Testing on the Floating Roads

Memo No. 03-104-DM18, by AGL Consulting, dated 22nd April, 2005, Re: "*Full scale tests on floating roads*" is included in **Appendix V.**

The memo presents the results of the full scale serviceability and proof load tests for the design mobile crane load for all of the floating roads that had been completed by the time that the test was carried out on 20th April, 2005.

Areas that performed poorly in the serviceability tests are identified and a method statement is included for the remedial works that were carried out in these areas to improve the performance of the roads.

2.6 Appendix VI: AGL Report No. 03-104-R06 – Report on the Load Test Carried out on a Test Section of Floating Road

Report No. 03-104-R06 - "*Report on the Load Test Carried out on a Test Section of Floating Road on the Derrybrien Windfarm, Loughrea, Co. Galway,*" by AGL Consulting, dated 23rd May, 2005 is included in **Appendix VI**.

This report presents the results of a full-scale incremental load test that was carried out on a test section of floating road in an area of deep very soft peat along the access route to the Derrybrien substation. The purpose of the test was to verify the capacity of the floating roads for the design load from the low-loader transporter bringing the transformer to the site, which had a combined weight of 130 tonnes in transit.

2.7 Appendix VII: AGL Memo No. 03-104-DM24 – Transformer Load on the Floating Roads

Memo No. 03-104-DM24, by AGL Consulting, dated 23rd May, 2005, Re: "*Transformer load on the floating roads*" is included in **Appendix VII.** It presents the assessment of the capacity of the existing floating roads along the route to the Derrybrien substation to support the low-loader transporter bringing the transformer to the site. The memo includes recommendations for supervising and monitoring the transporter along the designated route.

2.8 Appendix VIII: Peat Repository Sites – Geotechnical Investigations & Stability Analyses

Appendix VIII presents the results of the supplemental geotechnical investigations and stability analyses that were carried out for the peat repository sites that were assessed for storing up to 1.0 m of excavated peat on the windfarm site.

The investigations were comprised of peat depth probes, slope angle measurements and in-situ vane shear tests with the Geonor H-10 vane. The results of the peat depth and slope angle measurements are presented graphically on an approximate 25m grid over the extent of the approved area of each repository site. The records also include plots of the undrained shear strength with depth from the in-situ vane shear tests in the peat, as well as the results of

computer slope stability analyses to determine the factor of safety for a peat slide in the repository site, with and without a weak layer at the base of the peat.

These records illustrate the extent of investigations and stability analyses that were carried out on the site. Not all of the approved repository sites were actually used during construction. Also, some of the repository sites that were used were not filled to capacity over the approved area.

2.9 Appendix IX: AGL Memo No. 03-104-DM22 – Review of Blast Monitoring Records for Borrow Pit No.3

Memo No. 03-104-DM22 - "*Review of blast monitoring records*", by AGL Consulting dated 10th May, 2005 is included in **Appendix IX**. It presents an assessment of the vibration monitoring that was carried for the rock blasts in Borrow Pit No.3 to assess the impact of the blasts on the surrounding peat, and the effect that the blast-induced vibrations had on the stability of the peat.

The radius of influence of the blast-induced vibrations is presented in the memo along with recommendations for the maximum resultant Peak Particle Acceleration (PPA) and Peak Particle Velocity (PPV) for future blasts in the borrow pit to ensure that the blast-induced vibrations are within acceptable limits.

[Note: the memo refers to the borrow pit where the blasting was carried out as Borrow Pit No.2. However, it should actually refer to Borrow Pit No.3, which was located near the site entrance and was the main source of rockfill on the project].

2.10 Appendix X: AGL Geotechnical Approval Certificates

As part of the permit to work scheme implemented on the site, AGL Consulting reviewed all of the method statements prepared by the civil contractor, Ascon Ltd., and signed Geotechnical Approval Certificates (GAC) to certify that:

- Reasonable professional skill and care had been taken by AGL with a view to assessing:
    - The methods proposed for excavating the peat and mineral soil
    - The stability of the floating roads along the haul routes which had been tested and approved for the proposed construction traffic loads.
    - The stability of the peat repository sites that had been identified for the specific element of the works covered by the certificate.
- The geotechnical aspects of the contractor's method statements had been reviewed by AGL Consulting and that work could proceed in accordance with the terms of the method statements, subject to any conditions noted on the certificate.

Standalone GAC were also issued for general elements of the work that were not related to specific method statements such as the full-scale proof tests on the floating roads, and the large peat repositories that were being used as general disposal areas for excavated peat on the site.

A copy of all of the signed GAC that were issued during Phase II of construction on the site between December 2004 and May 2005 are included in **Appendix X**.

2.11 Appendix XI: AGL Report No. 03-104-R03 – Report on Movement of the Floating Road west of Turbine T17

Report No. 03-104-R03 - "*Report on the Movement of the Floating Road west of T17 on the Derrybrien Windfarm, Co. Galway*," by AGL Consulting, dated April 8th, 2005 is included in **Appendix XI**.

During construction of the floating road between Turbines T15 and T17 there was some localised downslope movement and possible subsidence of the road along a 30 m section to the west of Turbine T17. A tension crack opened along the upslope side of the road and a drain parallel to the road 5 m downslope from the road had closed over.

AGL carried out additional investigations in the peat at the location where the movement was observed to investigate the characteristics and strength of the peat on the slopes. The investigations were comprised of:

- A visual inspection of the road and surrounding bog upslope and downslope from the road:
- Slope angle measurements with the hand-held Abney level;
- Peat depth measurements and core sampling with the steel gouge auger probe:
- In-situ vane shear tests with the Geonor H-10 65/130mm penetration vane; and
- Undisturbed piston sampling of the peat for laboratory testing and visual inspection of the characteristics of the peat and peat/mineral soil interface.

We also carried out analyses to assess the stability of the road and peat in the area. The results of the site investigations and stability analyses are presented in AGL Report No. 03-104-R03 dated April 8th, 2005 - "Report on the Movement of the Floating Road west of T17 on the Derrybrien Windfarm, Co. Galway", which is included in **Appendix XI**.

2.12 Appendix XII & Appendix XIII: AGL Reports No.03-104-R04 & R05: Assessment of Proposed Works at Turbines T68 & T70

Turbines T68 was under construction at the time of the slide and is located at the head of the slide. The base was partially excavated but work was suspended in the area after the slide occurred. Turbine T70 is located along the eastern edge of the slide downslope from T68. Work had not started on this turbine at the time of the slide.

Given the sensitive location of these two turbines specific investigations and analyses were carried out by AGL to ensure that there was a negligible risk of a further peat slide in the area to allow works to resum on the construction of the turbines and crane hardstandings. The investigations carried out in each area typically consisted of:

- Additional site investigations consisting of peat depth probes, topographical surveying to determine slope angles, in-situ vane shear tests with the Geonor H-10 Vane to measure the peat strength, and inspection of piston samples and gouge auger core samples to confirm that there was no weak layer, shear zone or discontinuity at the base of the peat.

- Stability analyses of the floating roads with Slope/W to ensure that there was an adequate margin of safety against a peat failure.
- Full scale serviceability and proof load tests on the floating roads in the area at a load of 36 tonnes and 72 tonnes.
- Identification and certification of suitable peat repository sites for the remoulded peat from the turbine and hardstanding excavations.

The results of the investigations and analyses are presented in the following reports from AGL, which are included in **Appendix XII** and **Appendix XIII**, respectively:

- Report No. 03-104-R04 - "*Report on the Assessment of the Proposed Works at Turbine Base T68 on the Derrybrien Windfarm, Co. Galway*," by AGL Consulting, dated April 21st, 2005; and
- Report No. 03-104-R05 - "*Report on the Assessment of the Proposed Works at Turbine Base T70 on the Derrybrien Windfarm, Co. Galway."* by AGL Consulting, dated May 4th, 2005.

2.13 Appendix XIV: Factual Report of Geotechnical Investigations by ESB International – Engineering and Facilities Management (ESBIE)

Extensive supplemental geotechnical investigations were also carried out on the site by ESB International - Engineering and Facilities Management (ESBIE) between June 2004 and December 2004 to assess the stability of the site for the planned tree felling operations. The fieldwork provided comprehensive coverage of the site between the floating roads and turbines vand was comprised of:

- Slope angle measurements with a hand-held Abney level at 15-25m intervals along 219 No. profiles at representative locations across the site.
- 3162 No. peat depth probes with a hand-operated 20 mm diameter steel probe to establish the variation in peat depth and the slope at the interface with the underlying mineral soil or rock along the survey profiles.
- Peat sampling at 222 No. locations with the 1.0 m long 20mm diameter steel gouge-auger core sampler to provide visual classification of the peat
- 1179 No. in-situ vane shear tests in the peat at representative locations with the Geotech AB 140mm x 280mm automated vane.
- Installation of piezometers in the peat at selected locations around the site in February 2004

The results of the geotechnical investigations that were carried out by ESBIE are presented in their report titled *"Report on ESBIE Geotechnical Testing*", Volumes 1 and 2, dated 25th January 2005 (Report No. 78015-C11-R1 Rev. 1), which are included in **Appendix XIV**.

APPENDIX I

IGSL FACTUAL REPORT FOR PRE-CONSTRUCTION SI (2001)

REPORT ON A SITE INVESTIGATION
At
A PROPOSED WIND FARM
DERRYBRIEN CO.GALWAY

MICHAEL PUNCH AND PARTNERS
CONSULTING ENGINEERS

REPORT NO. 7637 **JANUARY 2002**

Introduction

A major Windfarm development is to be undertaken on a site at Derrybrien, County Galway. An investigation of sub soil conditions has been ordered by the project consulting engineers, Michael Punch and Partners.

The investigation encompassed three distinct development areas, designated A, B and C. The programme of the investigation at these locations included,

- The excavation of trial pits using a Hitachi excavator equipped with wide bog tracks. All pits were logged and sampled by an IGSL geotechnical engineer.
- Dynamic probing using a light Macintosh probe at each turbine location to establish the thickness of soft soils and the depth to a competent sub stratum.
- Recovery of representative soil samples at number of locations using hand auger methods.
- Laboratory analysis of recovered material.

This report includes all factual data pertaining to the project and comments on the findings relative to foundation design for the new turbines.

Fieldwork

The site location and location of the trial pits, hand augers and light dynamic probes are indicated on the sketch plans enclosed in Appendix IV to this report. The site is mountainous and very isolated; bog land with intense tree planting over much of the area. The surface was waterlogged and very difficult to traverse. Typical photographs are enclosed.

Access to turbine locations for conventional ground investigation plant i.e. borehole drilling rigs was not possible, consequently hand portable probing and sampling tools were utilised along with excavation plant equipped with bog tracks. The excavation plant, even with the large bog tracks was unable to access the entire site and trial pit excavation was terminated after 3 days on site.

A GPS setting out system was used to locate exploratory positions, heavy tree cover in places precluded the use of the GPS and setting out was carried out by direct measurement from known locations.

Trial Pits.

Trial pits were excavated using a Hitachi excavator with large bog tracks . All pits were logged by an I.G.S.L. geotechnical engineer and samples of sub - soils were taken for laboratory examination.

On completion of the excavation, pits were backfilled and reinstated. Where groundwater was encountered pits were left open for a period of time and the rate of ingress and final water levels were recorded.

Full details of all stratification, sampling and water conditions as well as notes on pit stability are given on the detailed trial pit records enclosed in Appendix I to this report.

Light Dynamic Probes.

A light dynamic probe, operating in accordance with BS 1377 and Eurocode Part 3 was used to assess in situ soil strength with depth. A conical probe is driven by drop hammer. Blow counts are recorded for each 200mm increment of penetration and results are presented both numerically and graphically. Probing is terminated following blow counts in excess of 25 to avoid damage to t he probe apparatus. A total of 58 probes were driven. Probe graphs are enclosed in Appendix 1.

The probe graphs present a very consistent pattern of very soft to soft material (Peat) overlying a very thin dense or stiff material, with refusal immediately below this stiff layer.

Refusal may indicate the rock horizon, however it was not possible to proof drill the rock using the techniques available for this investigation.

The records indicate that the peat was penetrated by self weight or by one blow achieving a penetration of 1.00 metres (one probe rod). The thickness of peat varies from 1.00 to 4.50 (but more generally from 1.50 to 3.00 metres).

Below the soft peat, blow counts increase rapidly, indicating dense or stiff material (gravel or clay). Penetration of this lower layer ranged from about 0.20 to 1.20 metres before probing was terminated.

Sampling

A 75mm hand auger with extension rods was used at a total of 24 locations to bore and recover samples of the soft soils. The material was sent to the IGSL laboratory for identification and analysis. Details of probe locations and depths are noted in Appendix II.

III. TESTING

During the course of the investigation samples of the sub soils were taken from the boreholes and trial pits and returned to IGSL's soils laboratory in Newbridge, Co. Kildare.

Laboratory Testing

All of the test data is included in Appendix III to this report. Geotechnical lab. tests carried out included

- Chemical Analyses (pH and SO3)
- Moisture Contents

Each sample received in the laboratory was examined and described. Moisture content values were established to give an indication of the relative strength of the peat over the various locations.

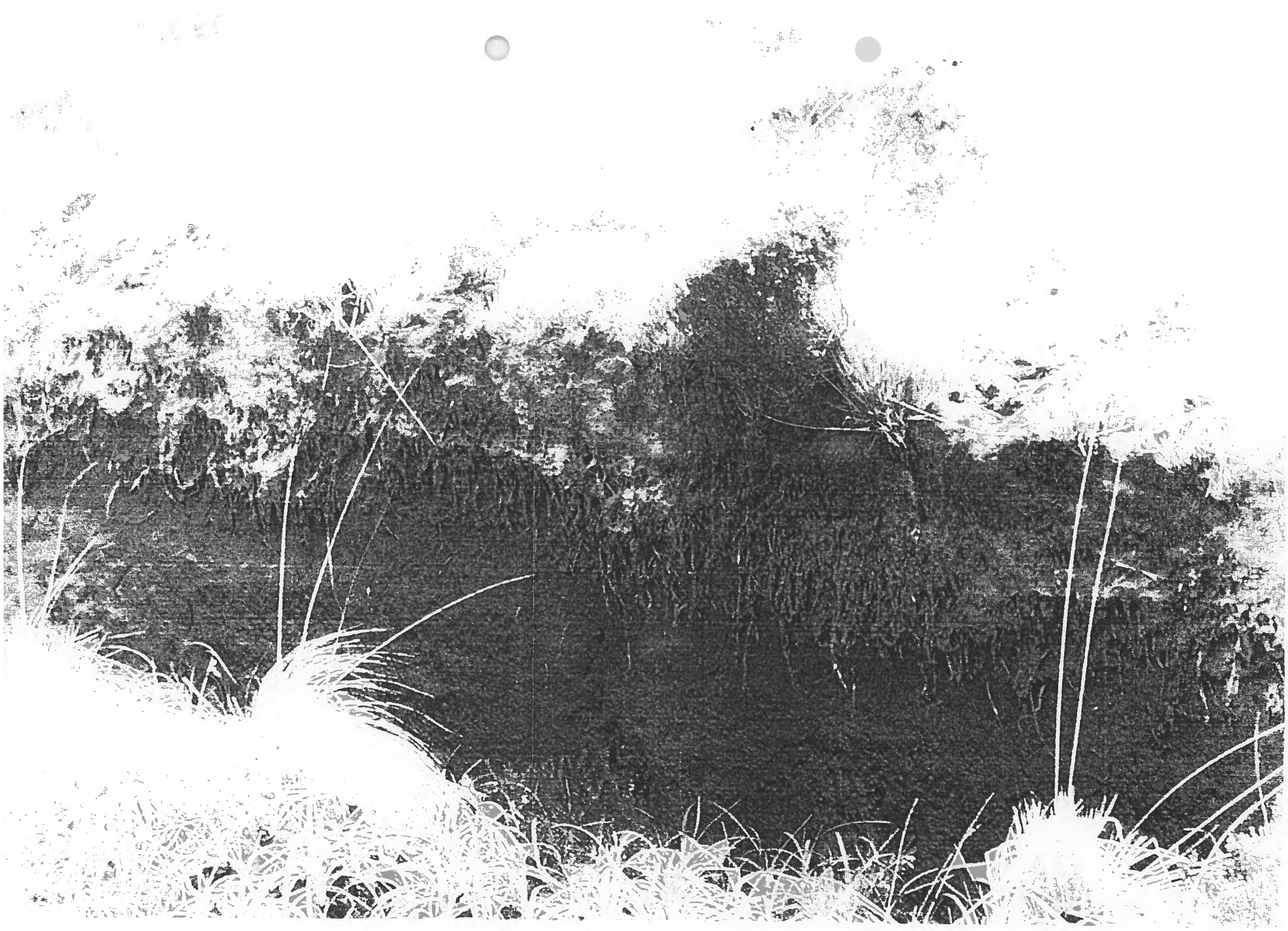
Sulphate content and pH was determined for a number of samples and results are presented in Appendix III. No special precautions are necessary to protect sub surface concrete.

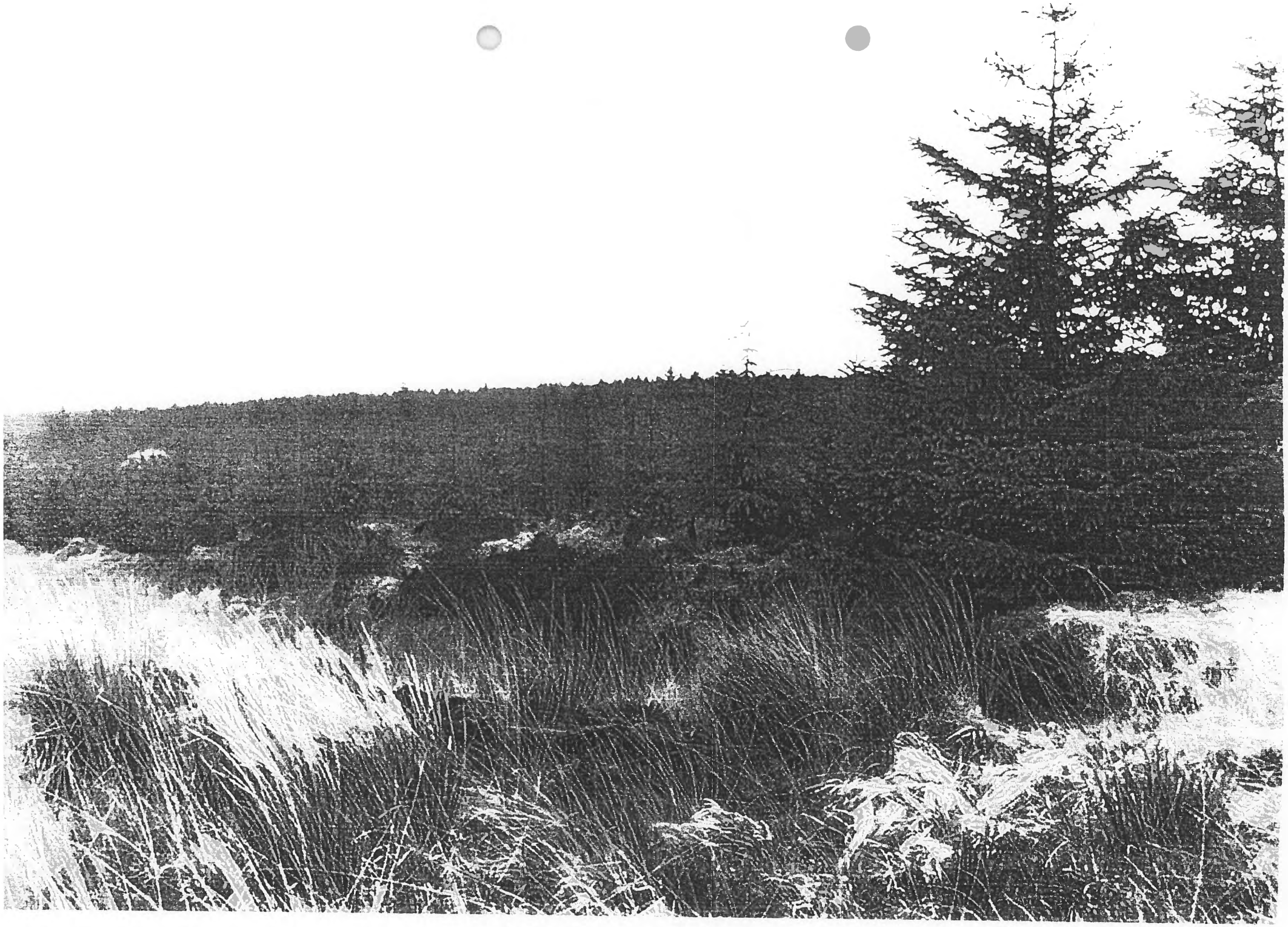
IV Discussion.

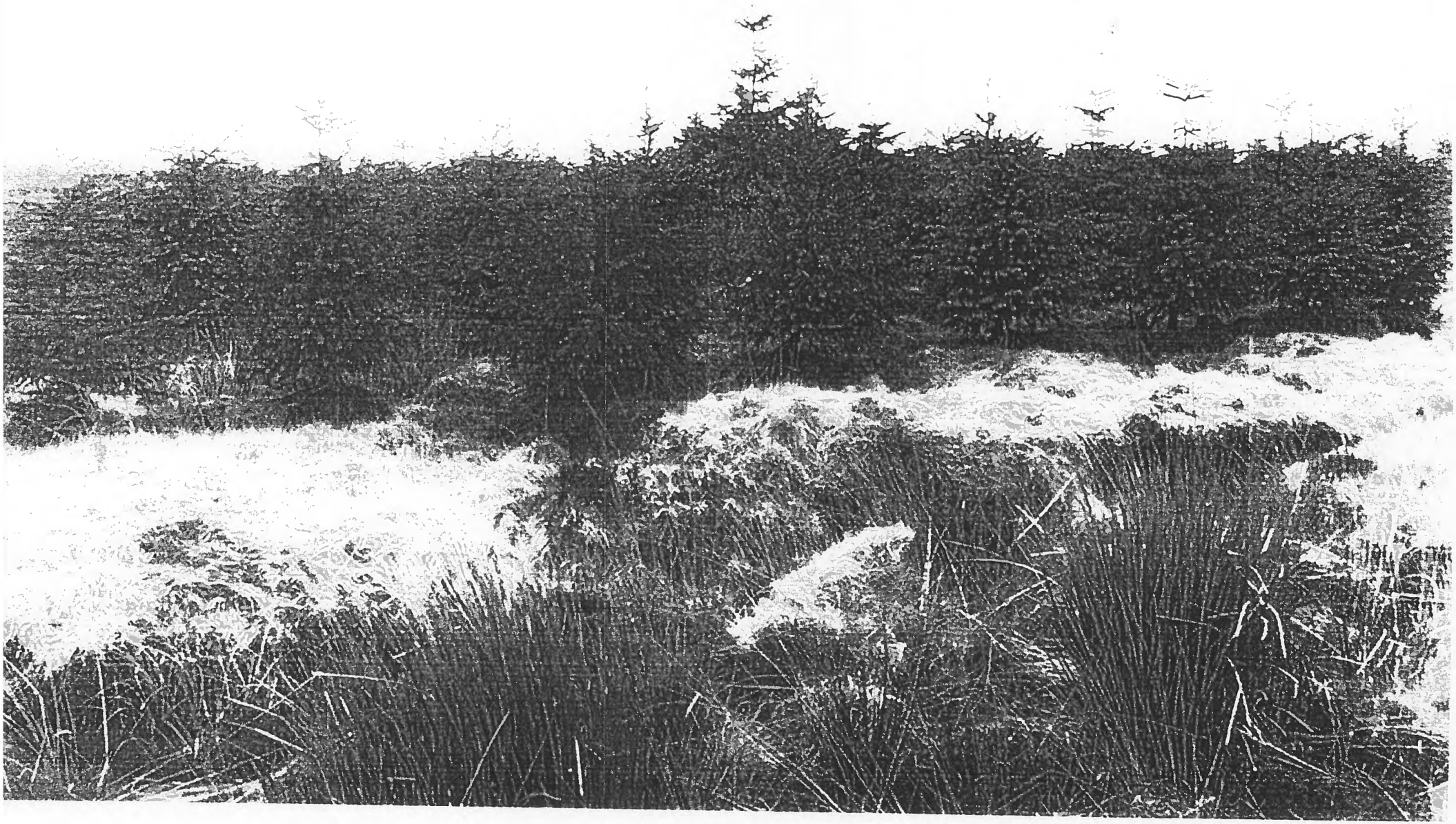
The investigation has indicated consistent sub soil conditions over the three areas of investigation. Very soft to soft fibrous silty PEAT extends from surface to depths varying from 1.00 to 4.50 metres, with an average thickness of 2.75 metres. The peat overlies firm, occasionally stiff, glacial till deposits or dense granular soils, with refusals possibly indicating the rock horizon. Rock was not drilled.

The peat must be regarded as unsuitable as a founding medium, from both a strength and compressibility viewpoint, with turbine loadings transferred to the obviously competent material underlying the peat, or to bedrock.

IGSL
January 2002







APPENDIX I
TRIAL PIT RECORDS

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.
CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C30	
	Sheet : 1 of 1	
CLIENT: Powergen Ireland	Excavation Method: Hitachi	
ENGINEER Micheal Punch & Partners	Date Started:	
LOCATION: Derrybrien Co.Galway	Date Completed:	
	Ground Level (mOD):	

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT		1.30					
	Soft grey white sandy SILT		1.50					
-2	Firm purple andy gravelly CLAY				B2589	D	2.00	
-3			3.30					
-4	End of Pit							
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.500m

Remarks: Trial pit remained stable

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.

CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C32
	Sheet : 1 of 1
CLIENT: Powergen Ireland	Excavation Method: Hitachi
ENGINEER Micheal Punch & Partners	Date Started:
LOCATION: Derrybrien Co.Galway	Date Completed:
	Ground Level (mOD):

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT		1.40					
	Soft grey white sandy SILT		1.60					
-2	Firm purple sandy gravelly CLAY		2.50		B2578	D	1.80	
-3	Presumed bedrock							
-4								
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.500m

Remarks: Trial pit remained stable

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.
CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C35	
	Sheet : 1 of 1	
CLIENT: Powergen Ireland	Excavation Method: Hitachi	
ENGINEER Micheal Punch & Partners	Date Started:	
LOCATION: Derrybrien Co.Galway	Date Completed:	
	Ground Level (mOD):	

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT				B2580	D	1.00	
			2.00					
-2	Soft grey white sandy SILT				B2579	D	2.20	
			2.50					
-3	Presumed bedrock							
-4								
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.500m

Remarks: Trial pit remained stable

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.
CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C36	
	Sheet : 1 of 1	
CLIENT: Powergen Ireland	Excavation Method: Hitachi	
ENGINEER Micheal Punch & Partners	Date Started:	
LOCATION: Derrybrien Co.Galway	Date Completed:	
	Ground Level (mOD):	

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT		1.80					
-2	Soft grey white sandy SILT		2.45		B2884	D	2.20	
-3	Firm purple andy gravelly CLAY		3.30		B2885	D	3.00	
-4	End of Pit							
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.500m

Remarks: Trial pit remained stable

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.
CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C41	
	Sheet : 1 of 1	
CLIENT: Powergen Ireland	Excavation Method: Hitachi	
ENGINEER Micheal Punch & Partners	Date Started:	
LOCATION: Derrybrien Co.Galway	Date Completed:	
	Ground Level (mOD):	

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT							
-2								
-3			3.00					
	End of Pit							
-4								
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.00m

Remarks: Trial pit very unstable
Continous collapsing in pit walls

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.
CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C42	
	Sheet : 1 of 1	
CLIENT: Powergen Ireland	Excavation Method: Hitachi	
ENGINEER Micheal Punch & Partners	Date Started:	
LOCATION: Derrybrien Co.Galway	Date Completed:	
	Ground Level (mOD):	

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT							
-2					C2592	D	2.00	
			2.50					
-3	End of Pit							
-4								
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.00m

Remarks: Trial pit very unstable
Continous collapsing in pit walls

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.
CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C43	
	Sheet : 1 of 1	
CLIENT: Powergen Ireland	Excavation Method: Hitachi	
ENGINEER Micheal Punch & Partners	Date Started:	
LOCATION: Derrybrien Co.Galway	Date Completed:	
	Ground Level (mOD):	

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT							
-2			2.50					
-3	End of Pit							
-4								
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.00m

Remarks: Trial pit very unstable
Continous collapsing in pit walls

Report No. 7637	TRIAL PIT RECORD	I.G.S.L.

CONTRACT: Proposed Windfarm at Derrybrien	Trial Pit No.: C44
	Sheet : 1 of 1
CLIENT: Powergen Ireland	Excavation Method: Hitachi
ENGINEER Micheal Punch & Partners	Date Started:
LOCATION: Derrybrien Co.Galway	Date Completed:
	Ground Level (mOD):

	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	samples			Field Tests
					Ref. No.	Type	Depth (m)	
-1	Soft brown fibrous organic PEAT				B2591	D	1.60	
-2			2.50					
-3	End of Pit							
-4								
-5								
-6								

Groundwater Conditions: Seepage encountered at 1.500m

Remarks: Trial pit very unstable

APPENDIX II
MACINTOSH PROBE / HAND AUGER RESULTS

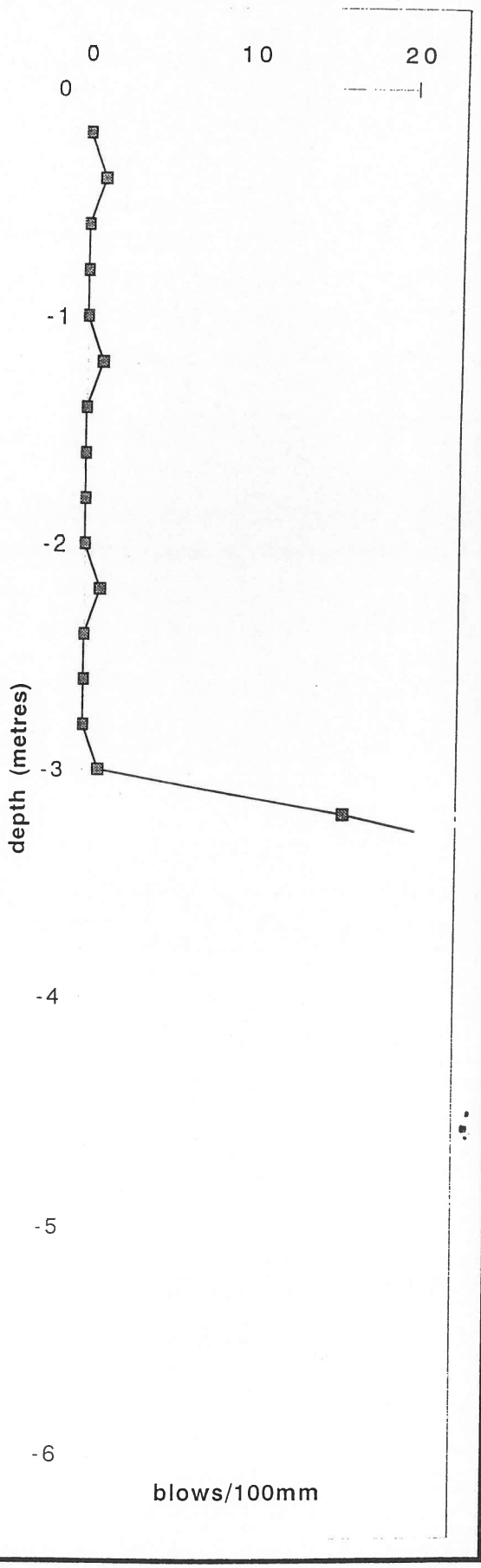
PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	101
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	13.12.01

GROUND LEVEL

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
16		-3.2
28	REF at 3.40	-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

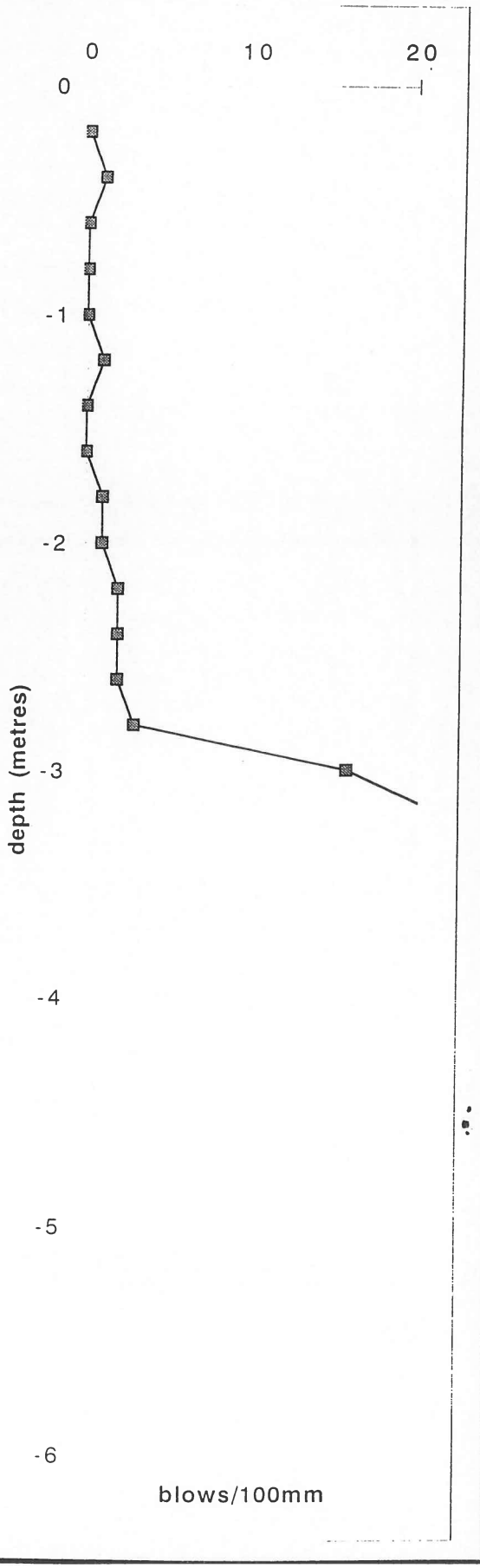


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	102
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
1		-2.0
2		-2.2
2		-2.4
2		-2.6
3		-2.8
16		-3.0
22		-3.2
25	REF AT 3.40	-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

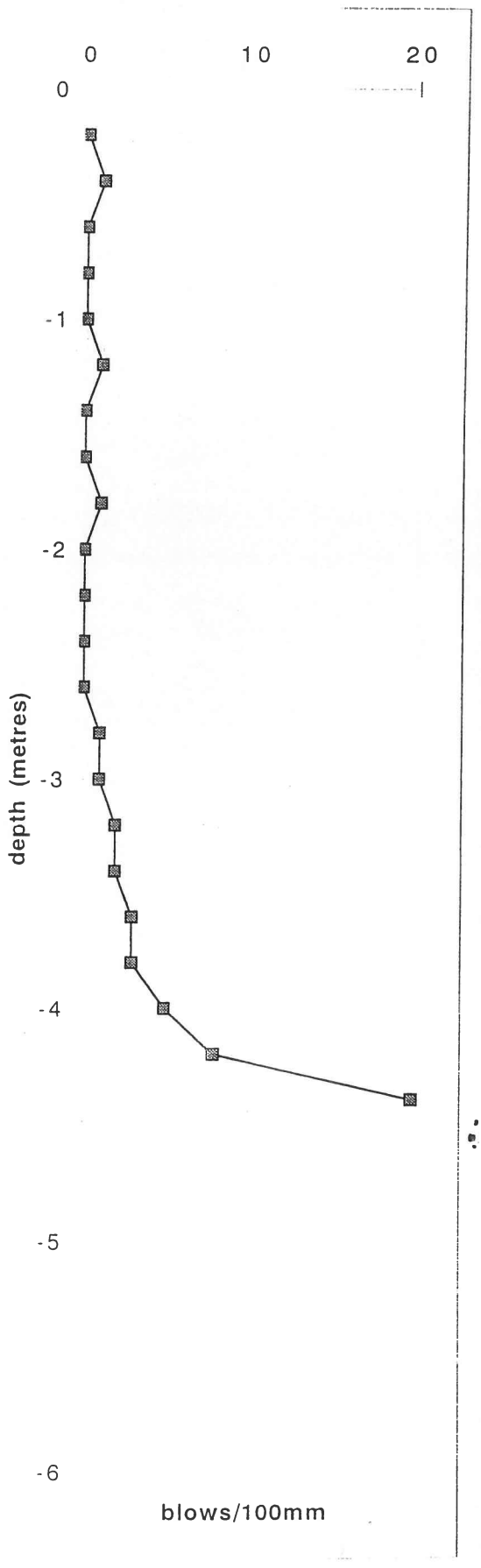


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	103
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
0		-2.2
0		-2.4
0		-2.6
1		-2.8
1		-3.0
2		-3.2
2		-3.4
3		-3.6
3		-3.8
5		-4.0
8		-4.2
20	REF AT 4.40	-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

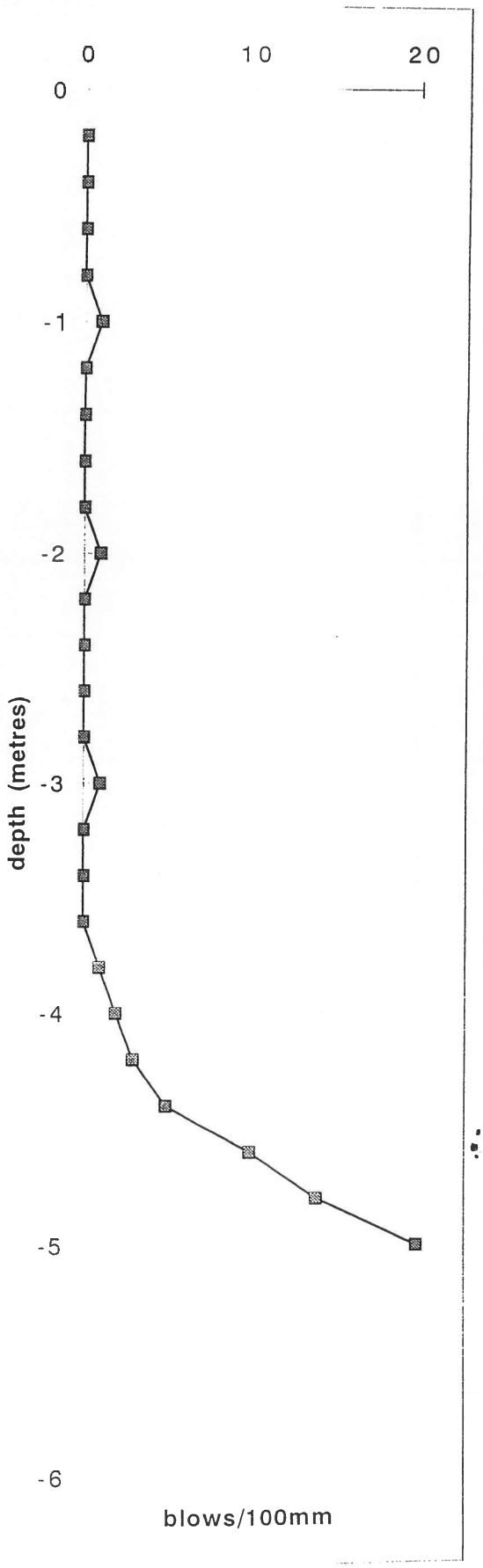


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 104
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0		-0.8
1		-1.0
0	1 Blow/metre	-1.2
0	GL to 4.00	-1.4
0		-1.6
0		-1.8
1		-2.0
0		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
0		-3.2
0		-3.4
0		-3.6
1		-3.8
2		-4.0
3		-4.2
5		-4.4
10		-4.6
14		-4.8
20	REF AT 5.00	-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

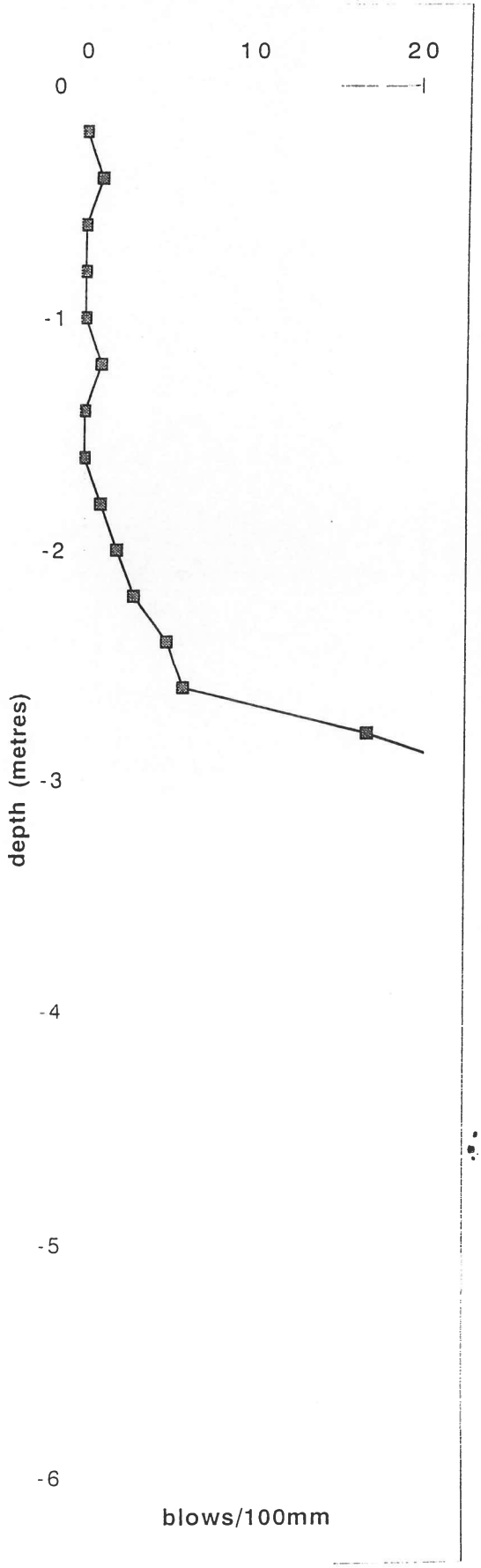


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	105
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 1.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
2		-2.0
3		-2.2
5		-2.4
6		-2.6
17		-2.8
25	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

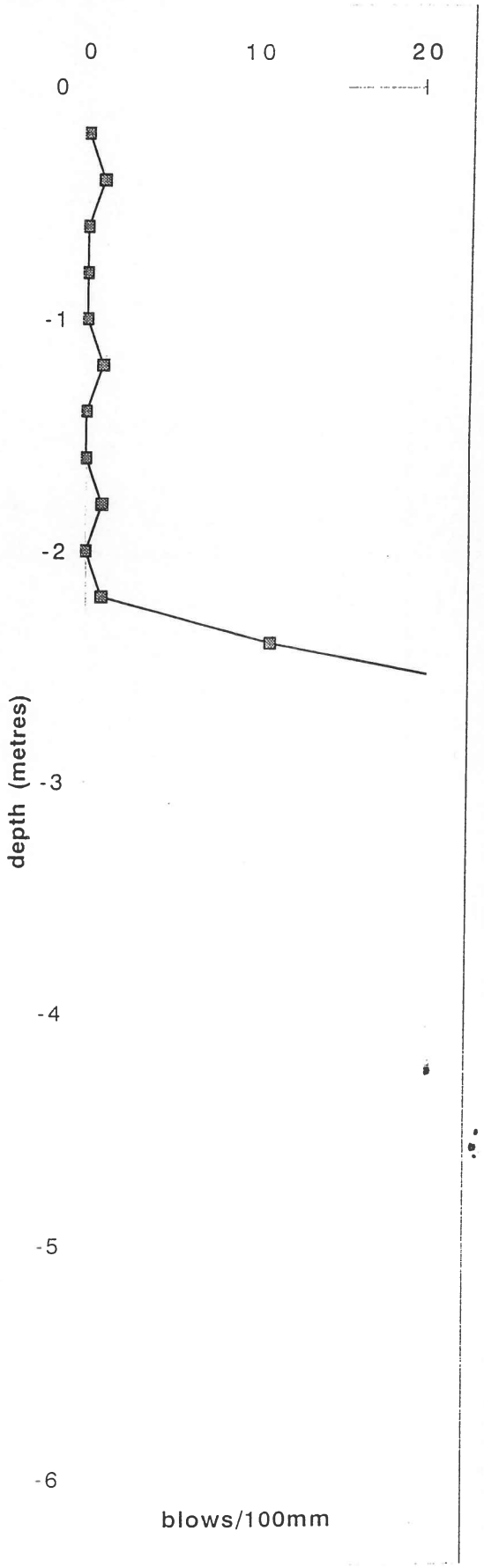


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	106
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
1		-2.2
11		-2.4
25	REF AT 2.60	-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

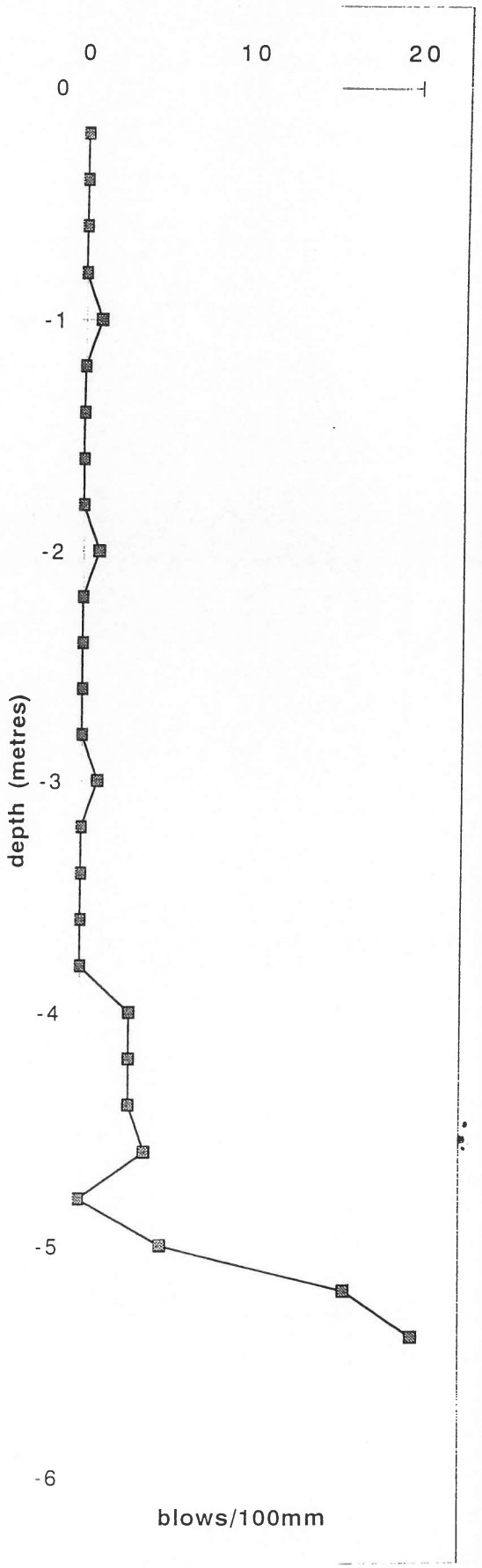


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 107
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0		-0.8
1		-1.0
0	1 Blow/metre	-1.2
0	GL to 5.00	-1.4
0		-1.6
0		-1.8
1		-2.0
0		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
0		-3.2
0		-3.4
0		-3.6
0		-3.8
3		-4.0
3		-4.2
3		-4.4
4		-4.6
X 0 X		-4.8
5		-5.0
16		-5.2
20	REF AT 5.40	-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

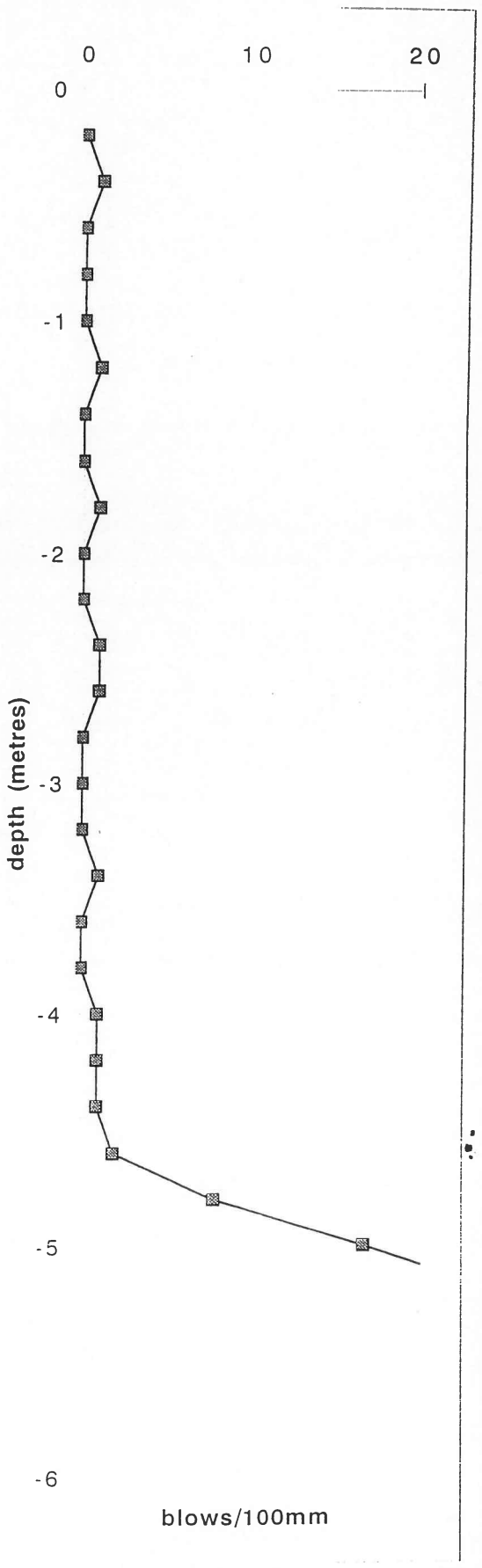


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	108
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
0		-2.2
1		-2.4
1		-2.6
0		-2.8
0		-3.0
0		-3.2
1		-3.4
0		-3.6
0		-3.8
1		-4.0
1		-4.2
1		-4.4
2		-4.6
8		-4.8
17		-5.0
25	REF AT 5.20	-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

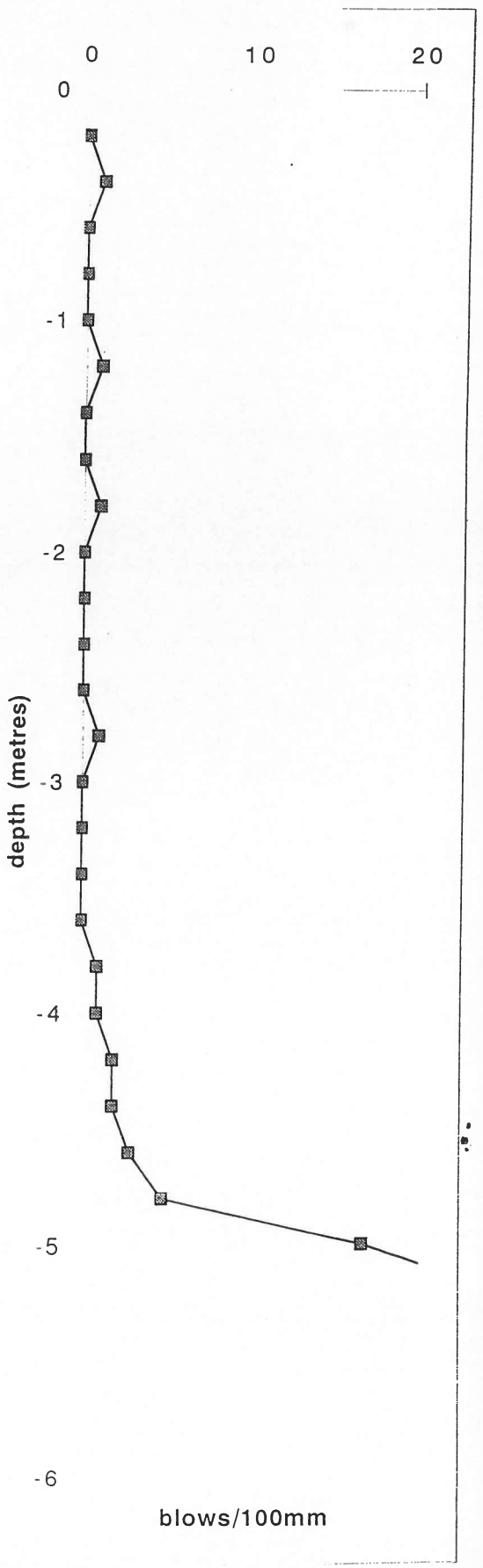


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	109
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
0		-2.2
0		-2.4
0		-2.6
1		-2.8
0		-3.0
0		-3.2
0		-3.4
0		-3.6
1		-3.8
1		-4.0
2		-4.2
2		-4.4
3		-4.6
5		-4.8
17		-5.0
25	REF AT 5.20	-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

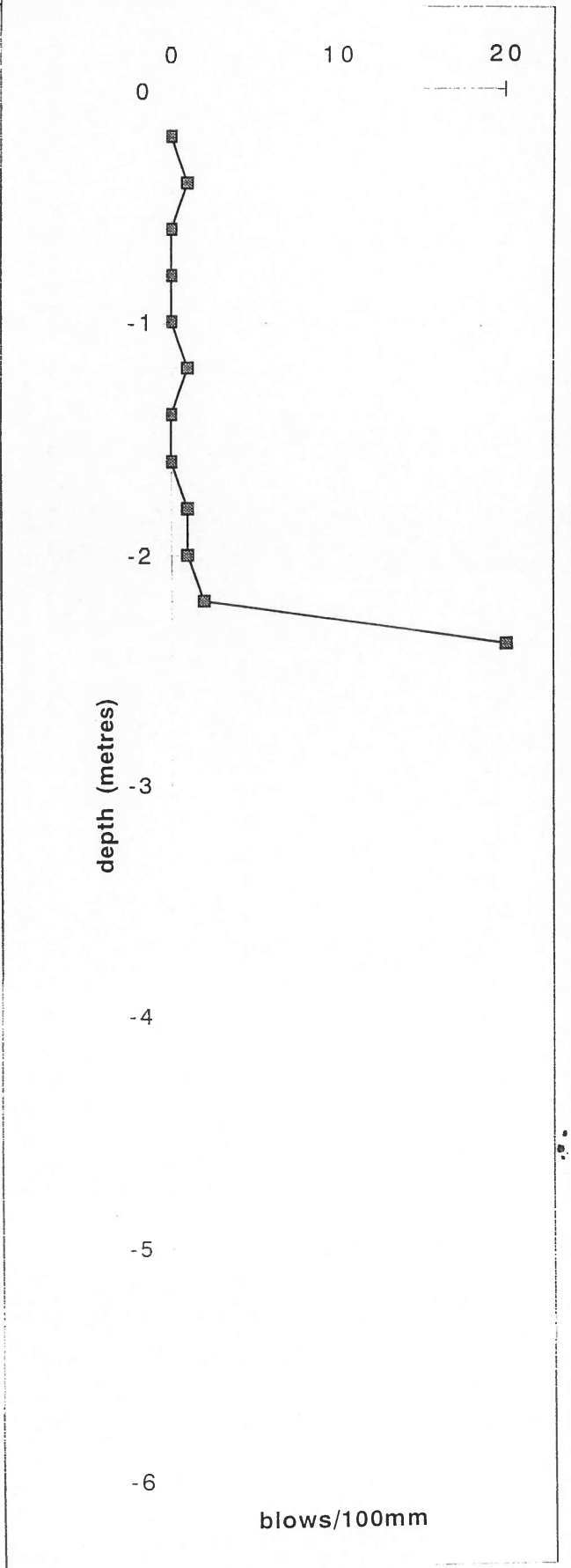


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	110
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
1		-2.0
2		-2.2
20		-2.4
25	REF AT 2.60	-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

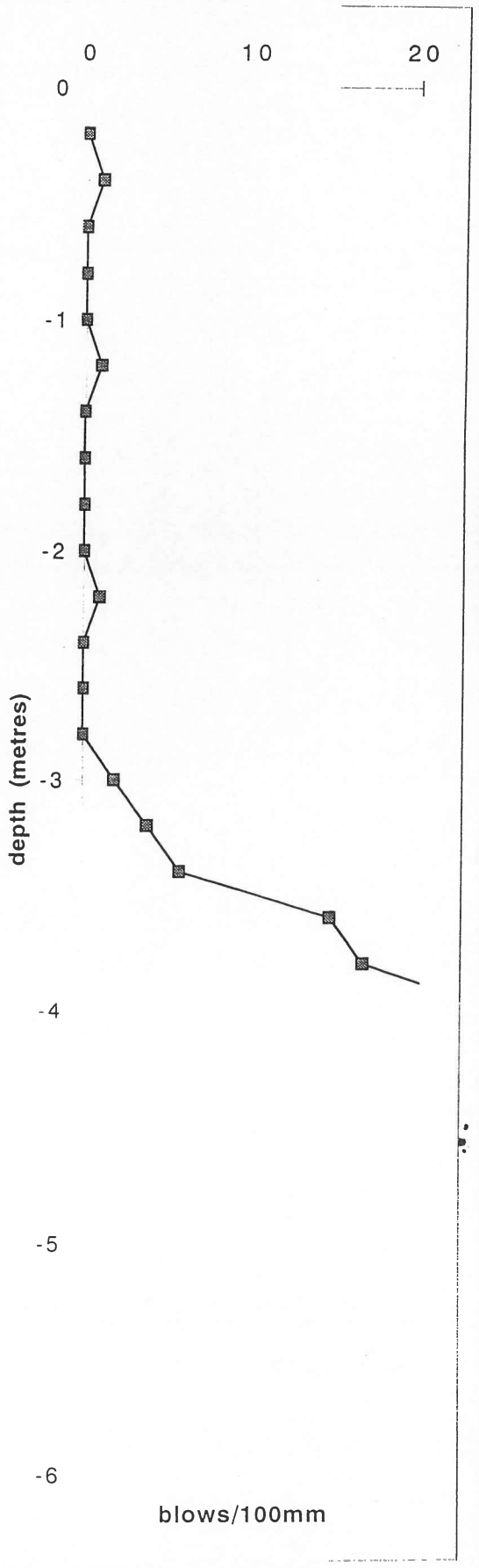


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	111
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
2		-3.0
4		-3.2
6		-3.4
15		-3.6
17		-3.8
25	REF AT 4.00	-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

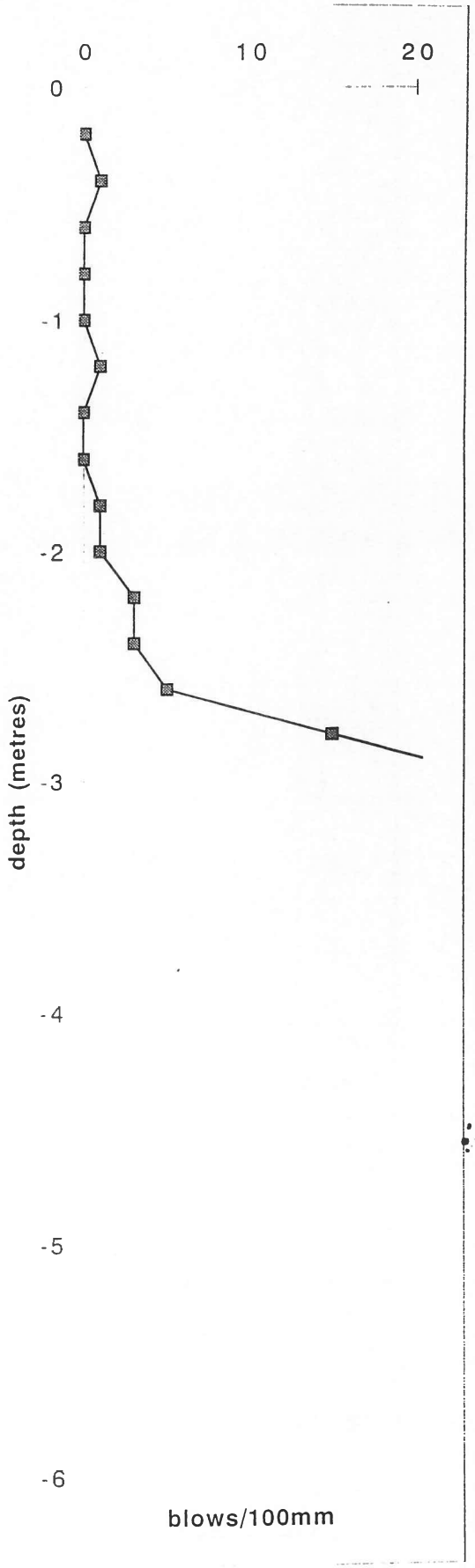


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	112
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
1		-2.0
3		-2.2
3		-2.4
5		-2.6
15		-2.8
25	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

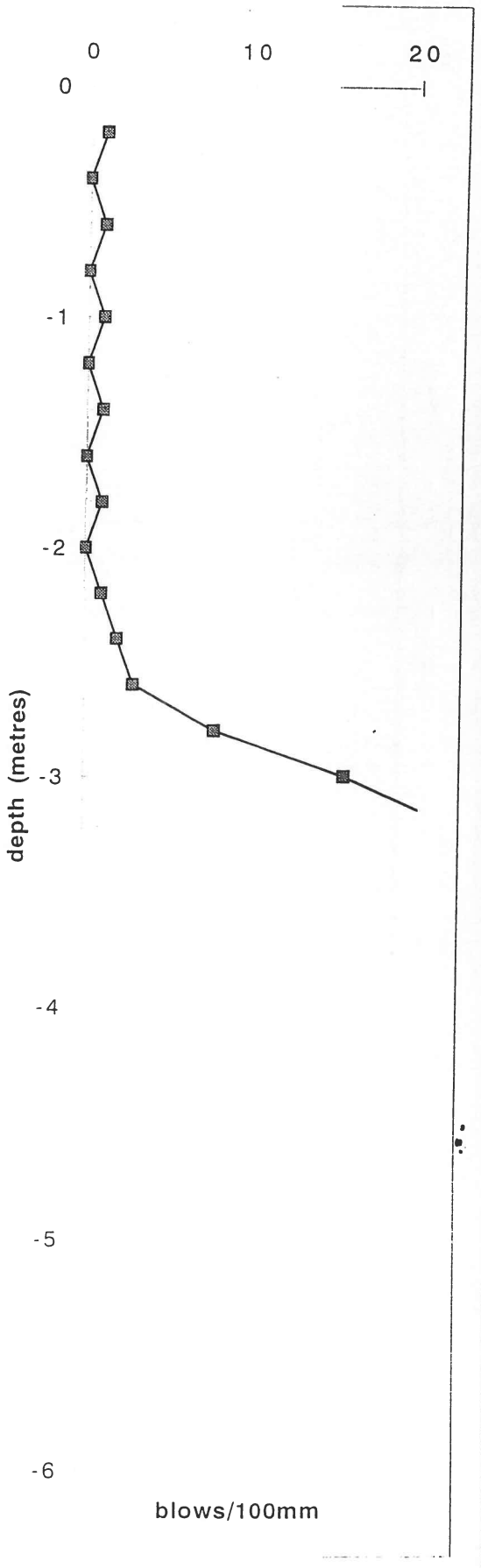


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE NO	MACINTOSH
No.	7637	LOCATION	113
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
1		-0.2
0		-0.4
1		-0.6
0		-0.8
1		-1.0
0		-1.2
1		-1.4
0		-1.6
1		-1.8
0		-2.0
1		-2.2
2		-2.4
3		-2.6
8		-2.8
16		-3.0
22		-3.2
28	REF AT 3.40	-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

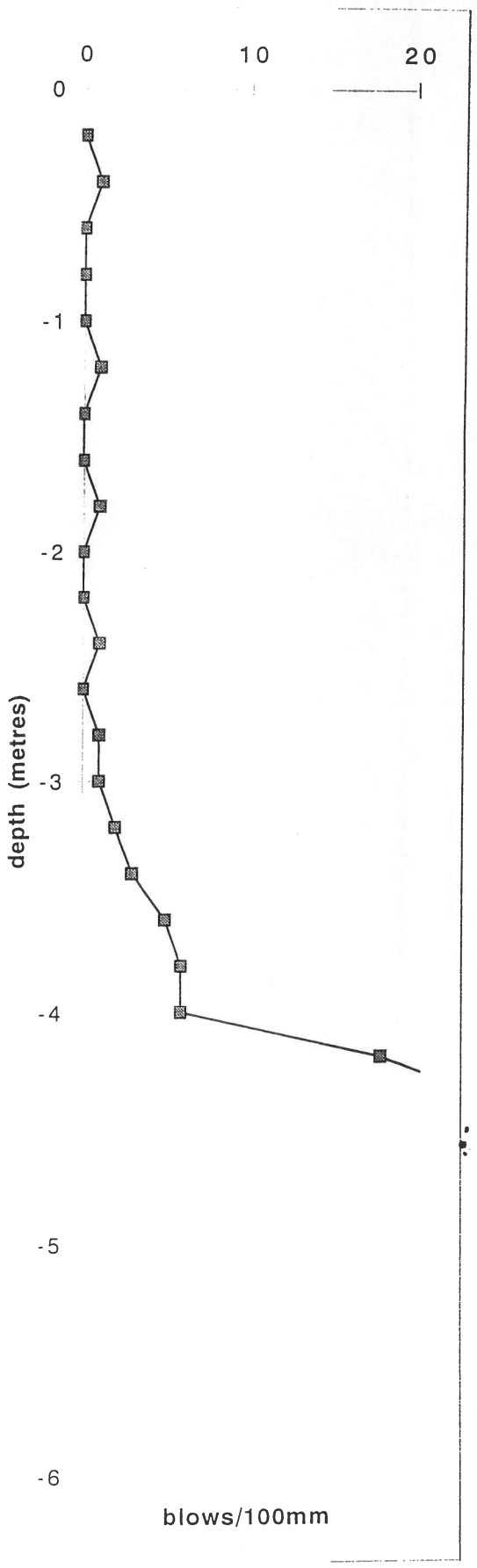


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	114
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
0		-2.2
1		-2.4
0		-2.6
1		-2.8
1		-3.0
2		-3.2
3		-3.4
5		-3.6
6		-3.8
6		-4.0
18		-4.2
25	REF AT 4.40	-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

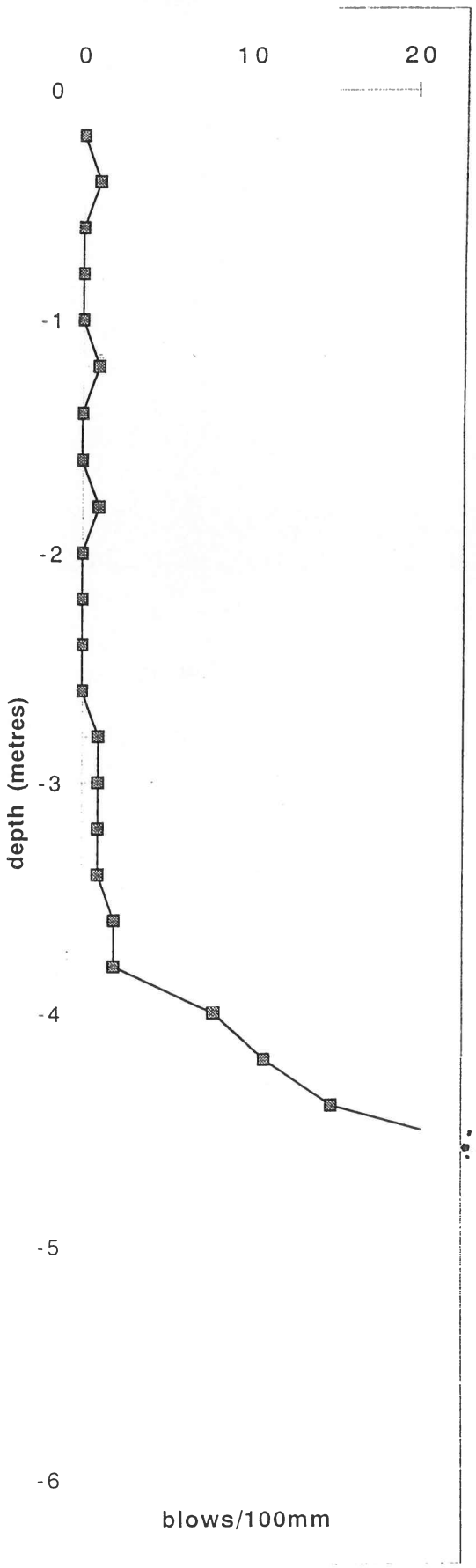


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	115
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
0		-2.2
0		-2.4
0		-2.6
1		-2.8
1		-3.0
1		-3.2
1		-3.4
2		-3.6
2		-3.8
8		-4.0
11		-4.2
15		-4.4
25	REF AT 4.60	-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

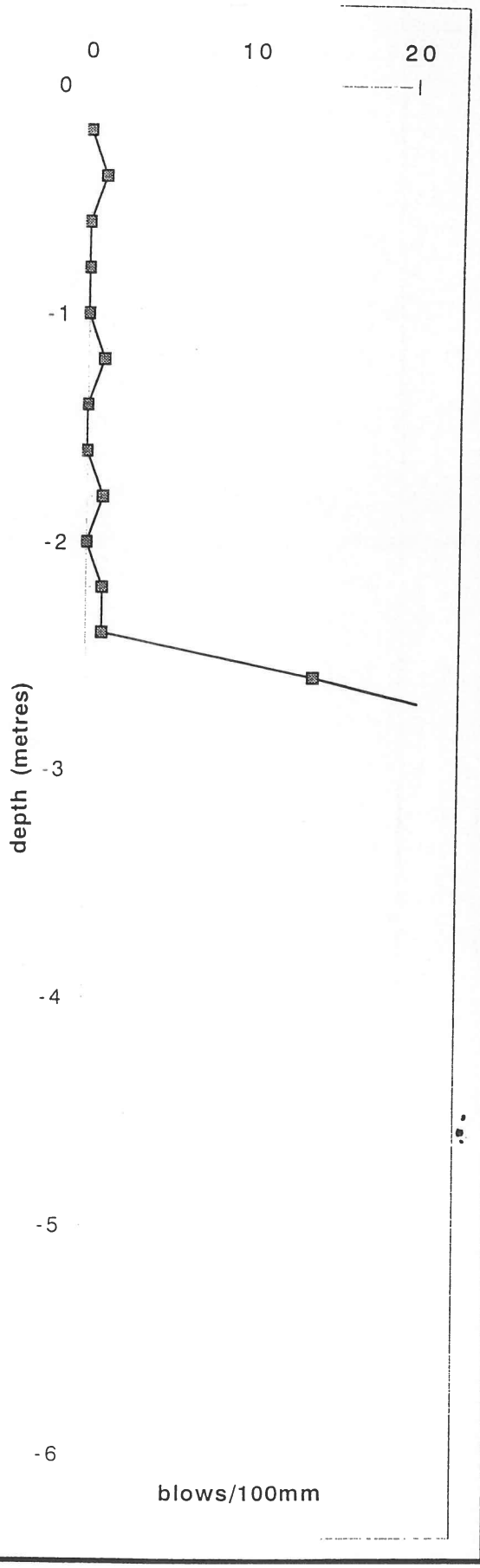


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	116
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
1		-2.2
1		-2.4
14		-2.6
25	REF AT 2.70	-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

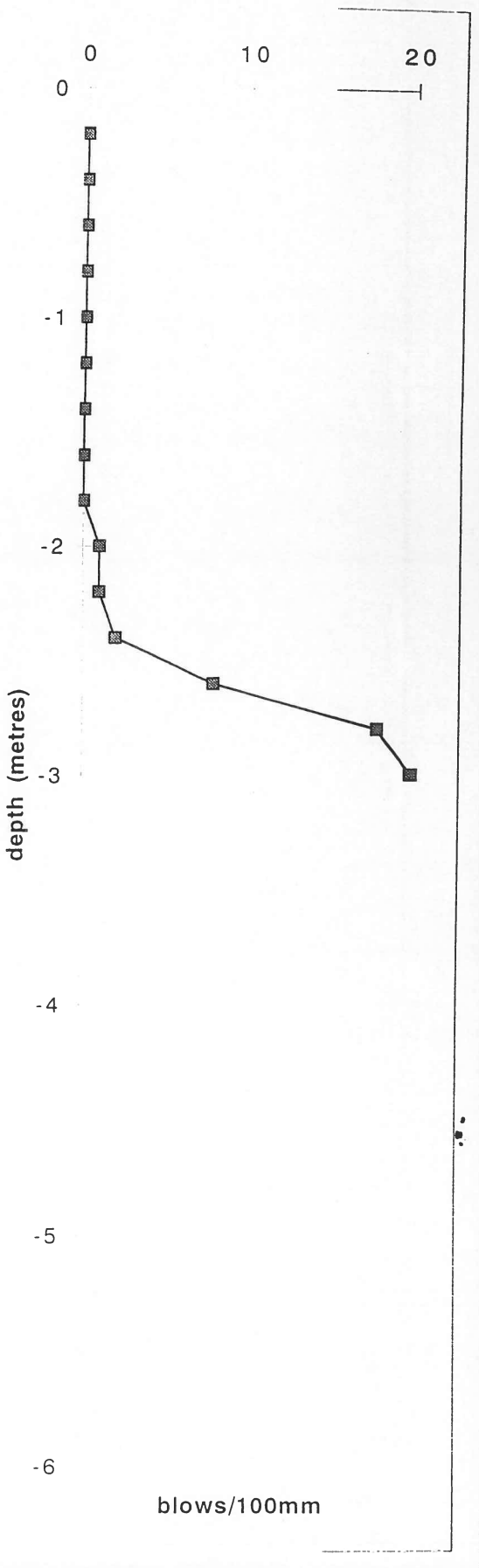


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 117
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0	SELF WEIGHT	-0.8
0	GL TO 3.00	-1.0
0		-1.2
0		-1.4
0		-1.6
0		-1.8
1		-2.0
1		-2.2
2		-2.4
8		-2.6
18		-2.8
20	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

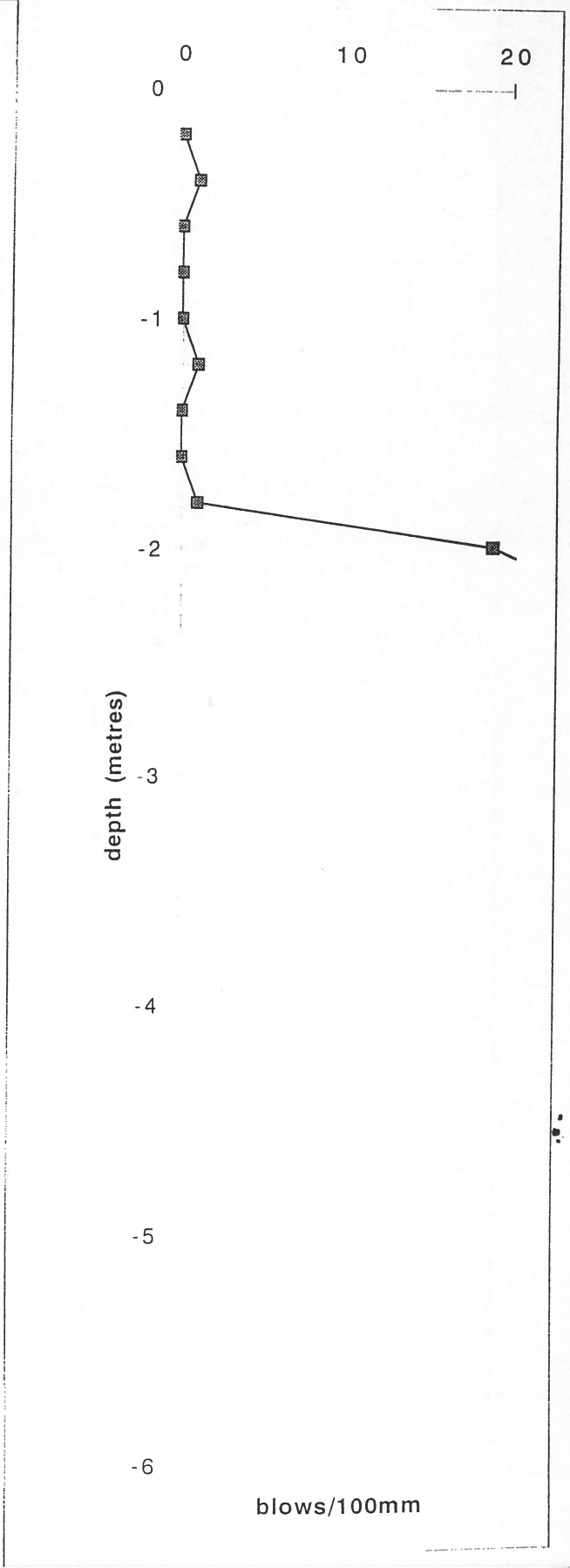


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	118
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
19		-2.0
25	REF AT 2.20	-2.2
		-2.4
		-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

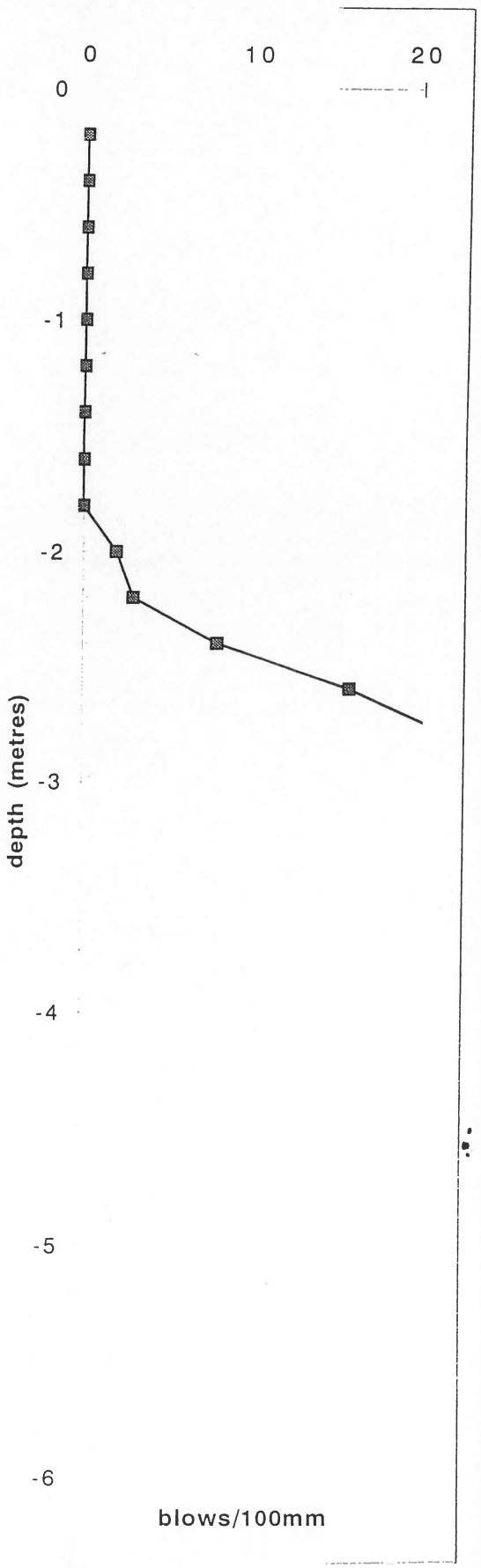


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 119
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0	SELF WEIGHT	-0.8
0	GL TO 2.60	-1.0
0		-1.2
0		-1.4
0		-1.6
0		-1.8
2		-2.0
3		-2.2
8		-2.4
16		-2.6
22	REF AT 2.80	-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0



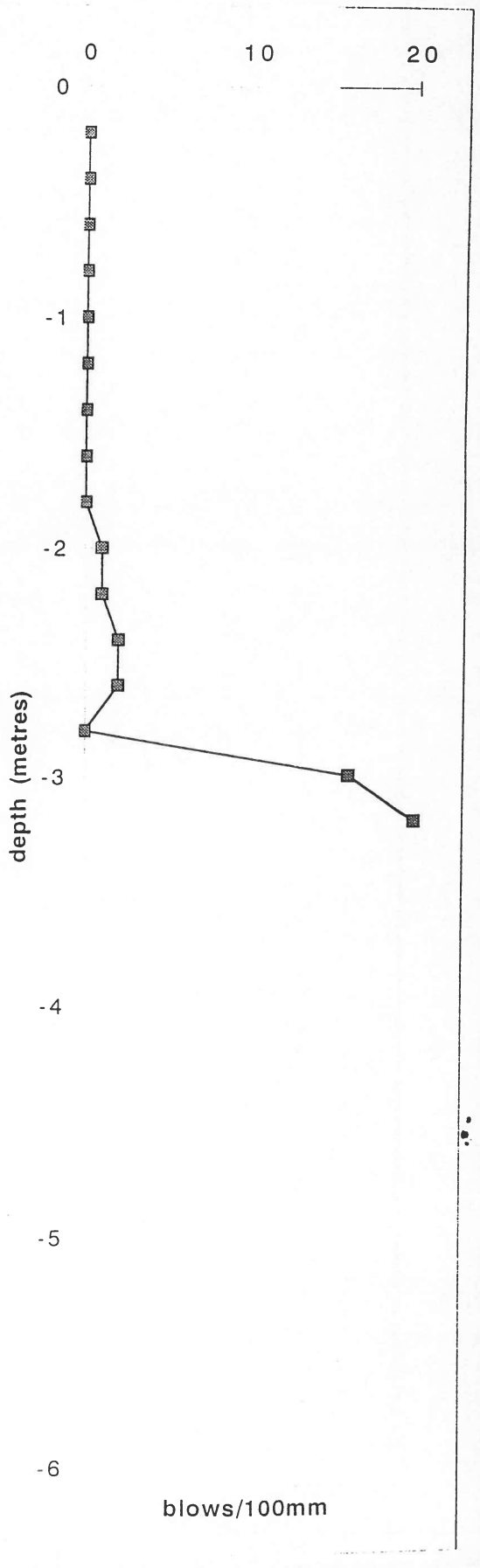
PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 120
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.2001

GROUND LEVEL

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0	SELF WEIGHT	-0.8
0	GL TO 2.80	-1.0
0		-1.2
0		-1.4
0		-1.6
0		-1.8
1		-2.0
1		-2.2
2		-2.4
2		-2.6
0		-2.8
16		-3.0
20	REF AT 3.20	-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

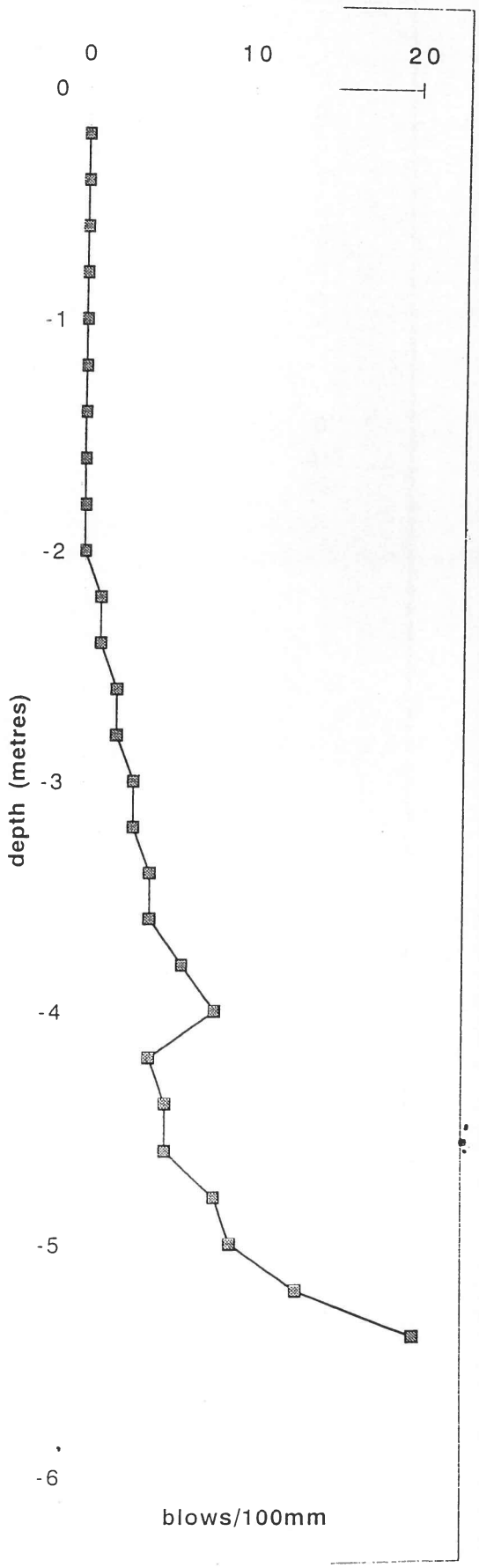


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	121
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0	SELF WEIGHT	-0.8
0	GL TO 2.00	-1.0
0		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
1		-2.4
2		-2.6
2		-2.8
3		-3.0
3		-3.2
4		-3.4
4		-3.6
6		-3.8
8		-4.0
4		-4.2
5		-4.4
5		-4.6
8		-4.8
9		-5.0
13		-5.2
20	REF AT 5.40	-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

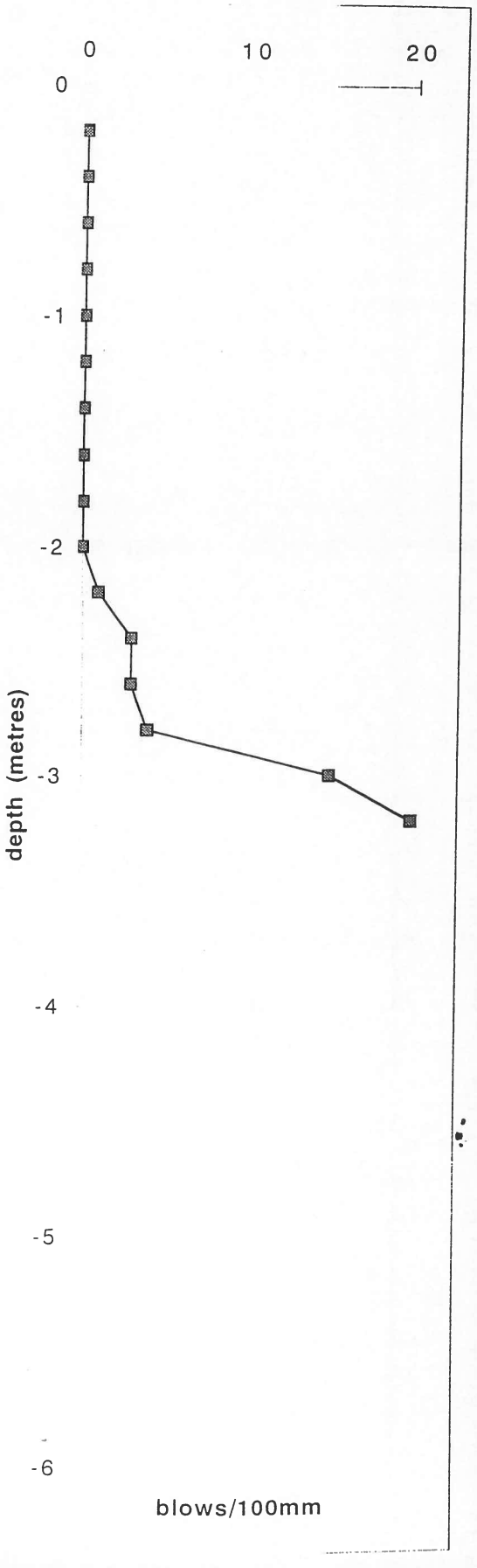


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 122
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0	SELF WEIGHT	-0.8
0	GL TO 2.00	-1.0
0		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
3		-2.4
3		-2.6
4		-2.8
15		-3.0
20	REF AT 3.20	-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0



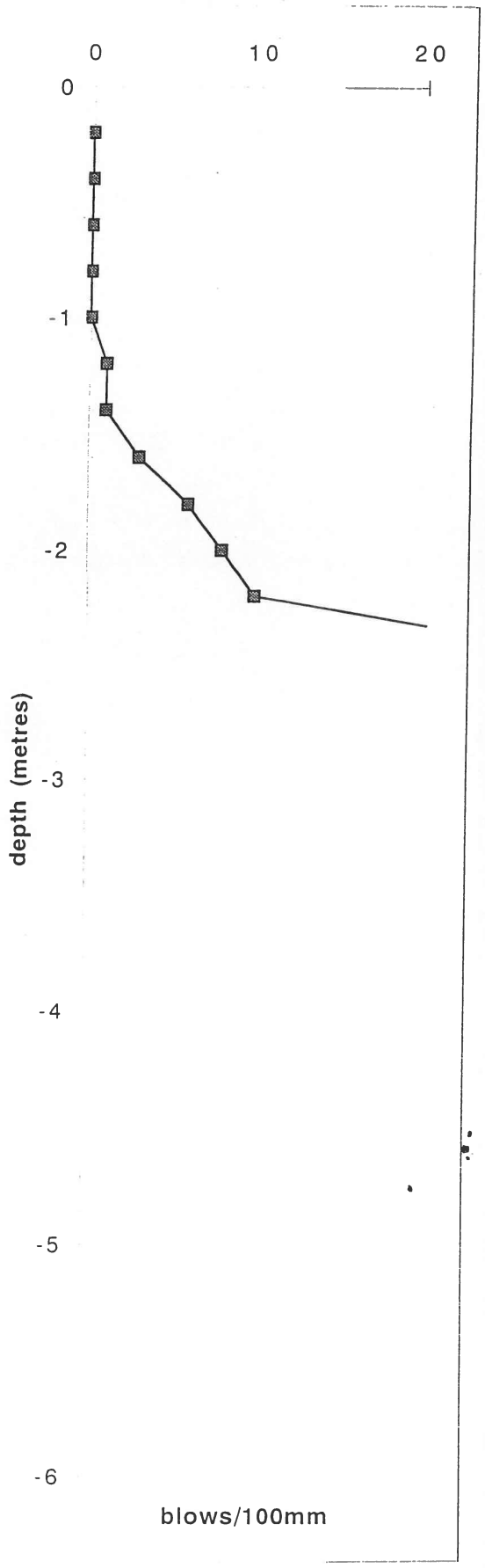
PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 123
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	11.12.2001

GROUND LEVEL

BLOWS	REMARKS	Depth metres)
0		-0.2
0		-0.4
0		-0.6
0	SELF WEIGHT	-0.8
0	GL TO 1.20	-1.0
1		-1.2
1		-1.4
3		-1.6
6		-1.8
8		-2.0
10		-2.2
26	REF AT 2.40	-2.4
		-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0



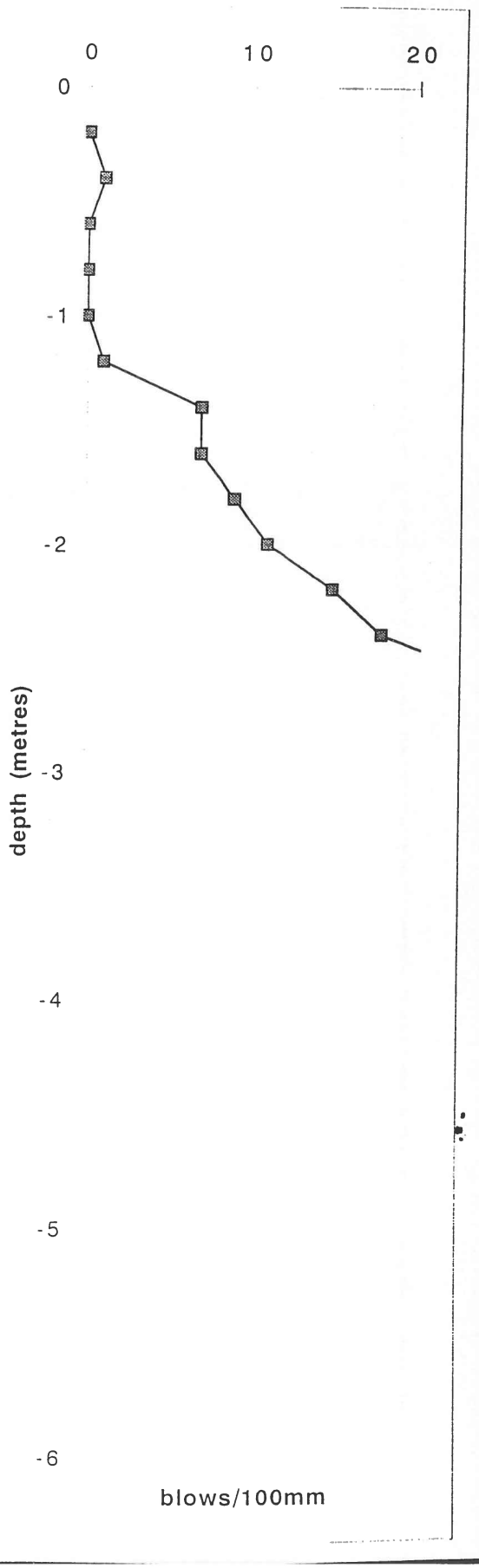
PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	124
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01

GROUND LEVEL

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 1.00	-1.0
1		-1.2
7		-1.4
7		-1.6
9		-1.8
11		-2.0
15		-2.2
18		-2.4
25	REF AT 2.60	-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

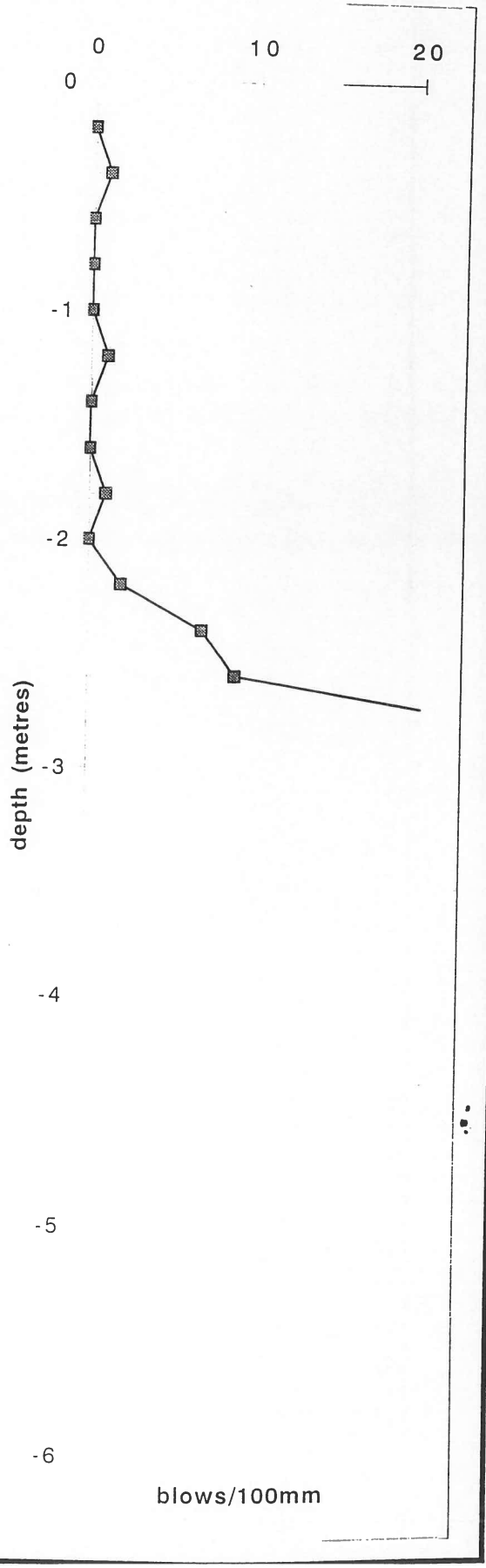


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	125
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
0		-2.0
2		-2.2
7		-2.4
9		-2.6
25	REF AT 2.80	-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

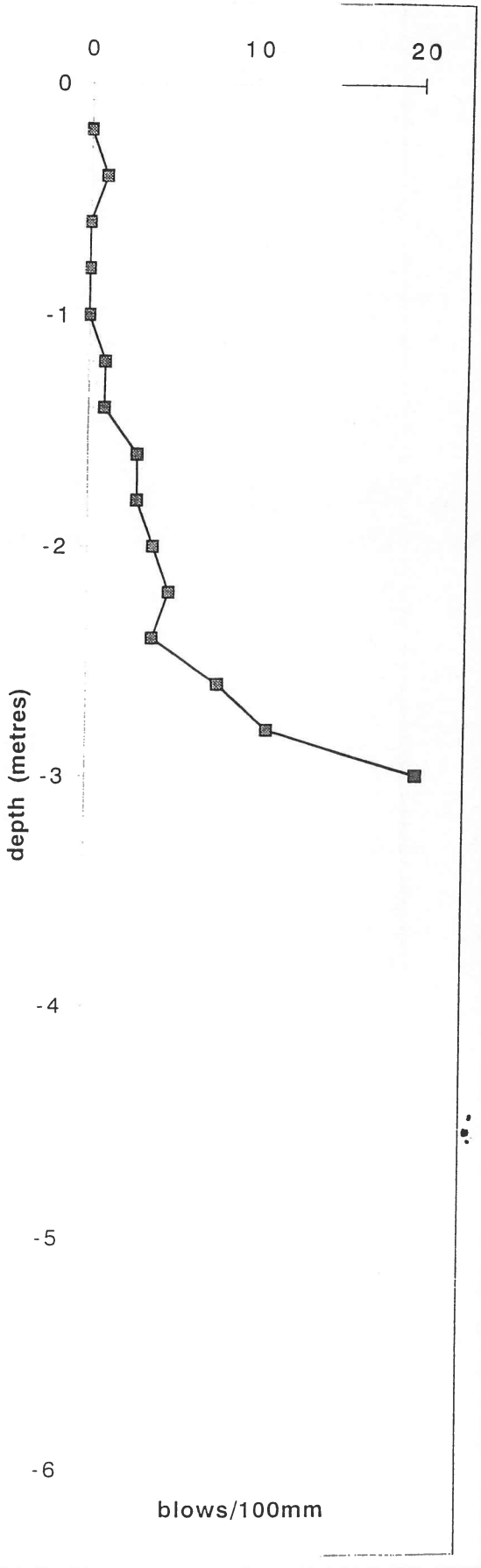


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 126
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0		-0.8
0		-1.0
1		-1.2
1		-1.4
3		-1.6
3		-1.8
4		-2.0
5		-2.2
4		-2.4
8		-2.6
11		-2.8
20	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

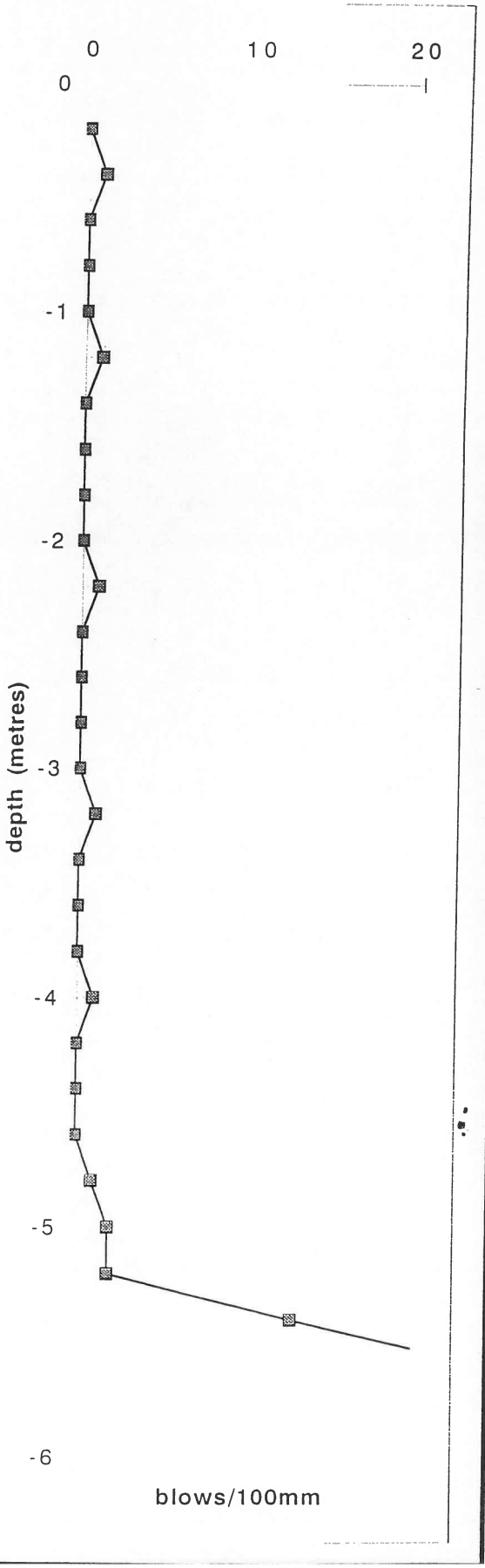


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	127
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 5.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
0		-3.0
1		-3.2
0		-3.4
0		-3.6
0		-3.8
1		-4.0
0		-4.2
0		-4.4
0		-4.6
1		-4.8
2		-5.0
2		-5.2
13		-5.4
25	REF AT 5.60	-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

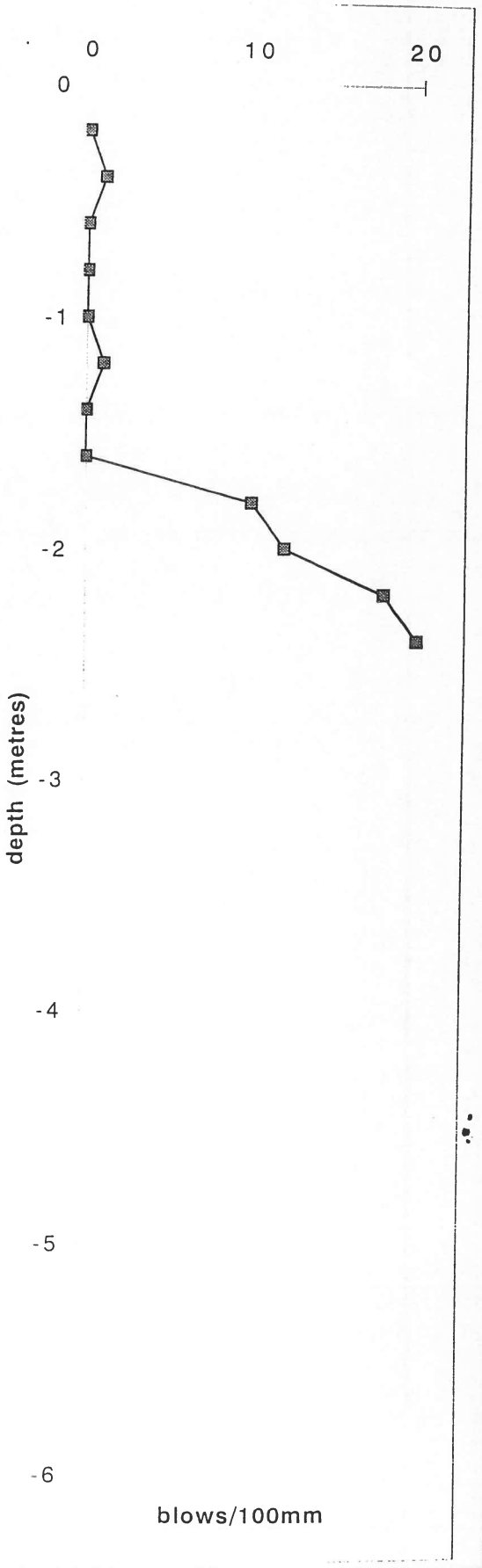


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	128
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
10		-1.8
12		-2.0
18		-2.2
20		-2.4
25	REF AT 2.60	-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

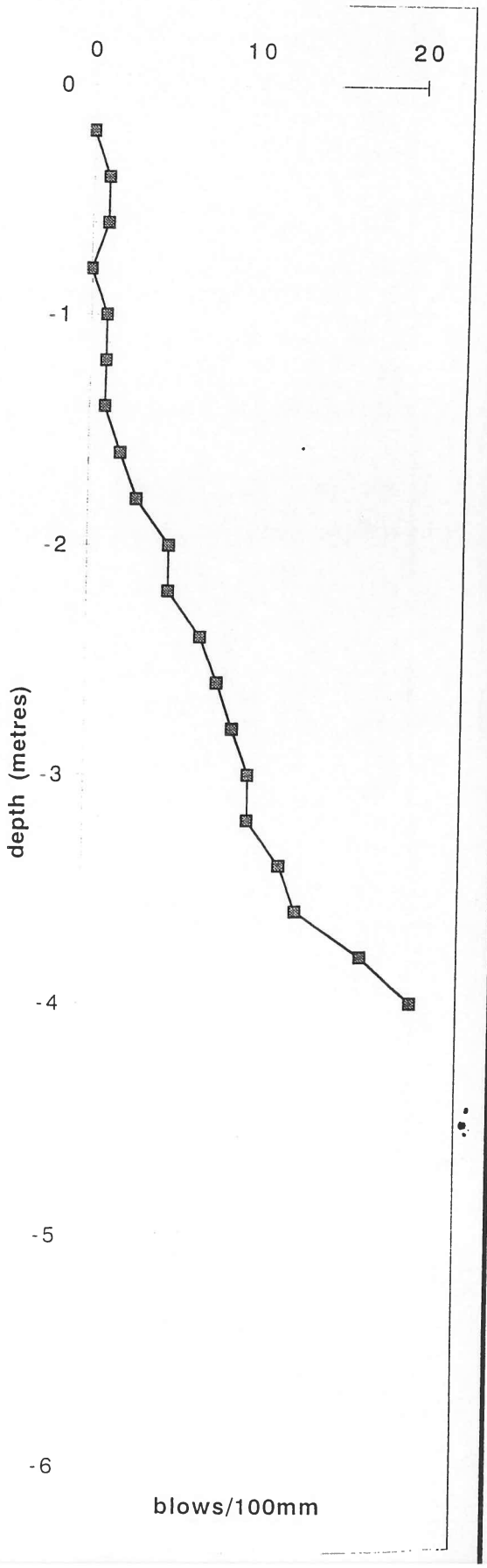


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 129
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
1		-0.6
0		-0.8
1		-1.0
1		-1.2
1		-1.4
2		-1.6
3		-1.8
5		-2.0
5		-2.2
7		-2.4
8		-2.6
9		-2.8
10		-3.0
10		-3.2
12		-3.4
13		-3.6
17		-3.8
20	REF AT 4.00	-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

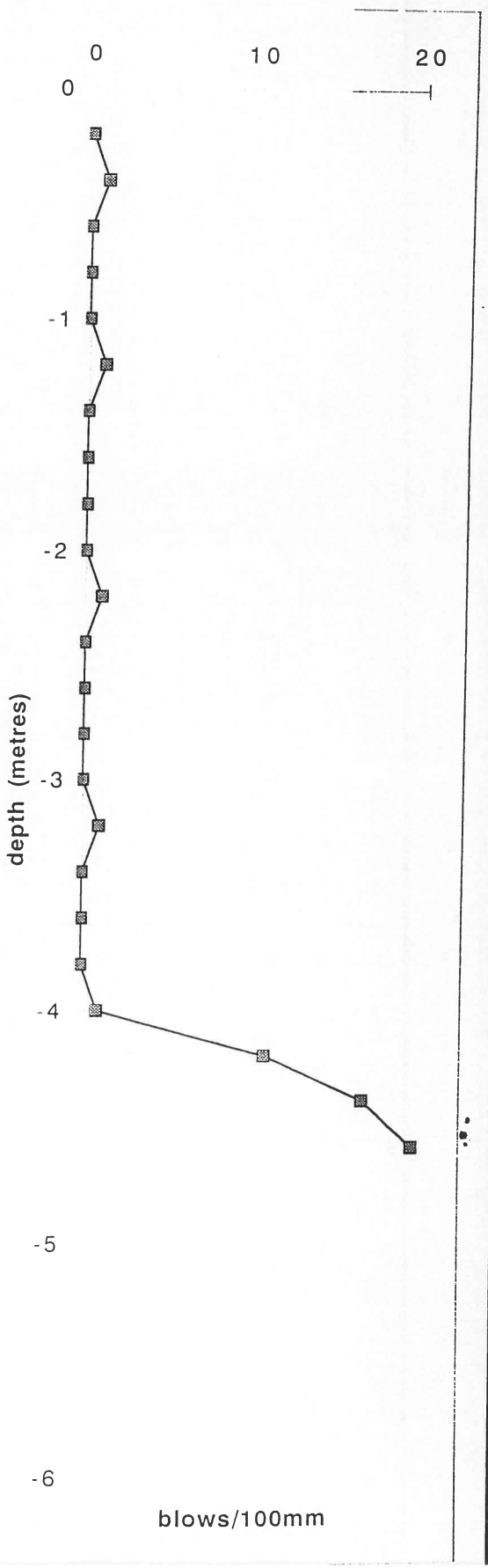


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	130
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
0		-3.0
1		-3.2
0		-3.4
0		-3.6
0		-3.8
1		-4.0
11		-4.2
17		-4.4
20		-4.6
25	REF AT 4.80	-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

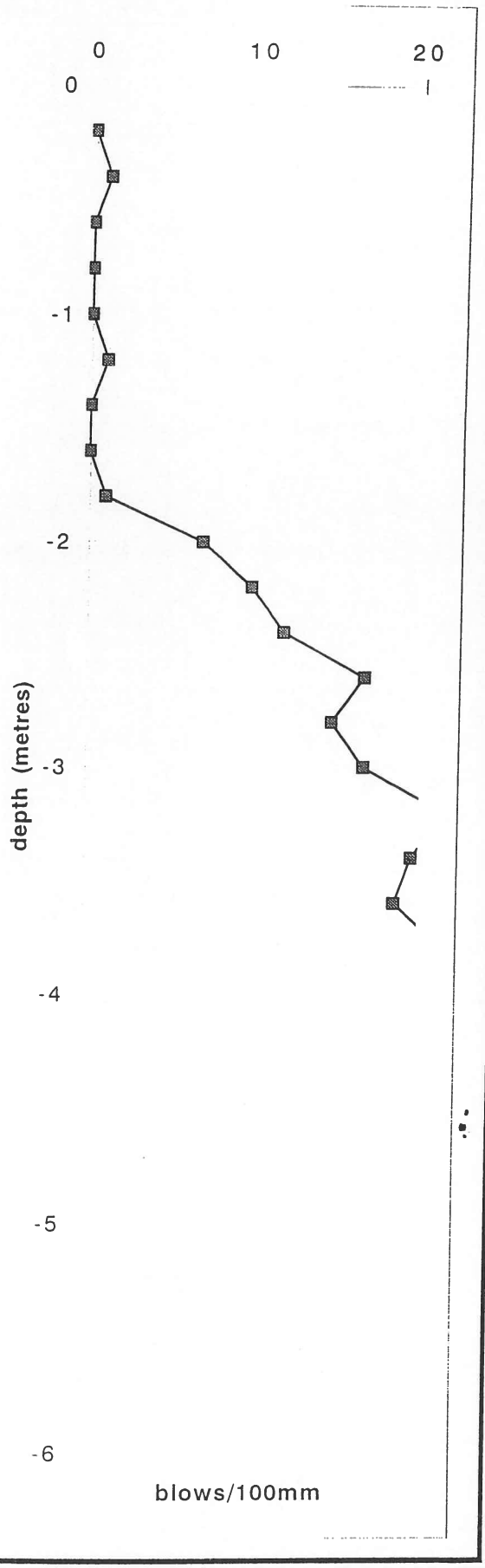


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	131
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
7		-2.0
10		-2.2
12		-2.4
17		-2.6
15		-2.8
17		-3.0
22		-3.2
20		-3.4
19		-3.6
22		-3.8
25		-4.0
30	REF AT 4.20	-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

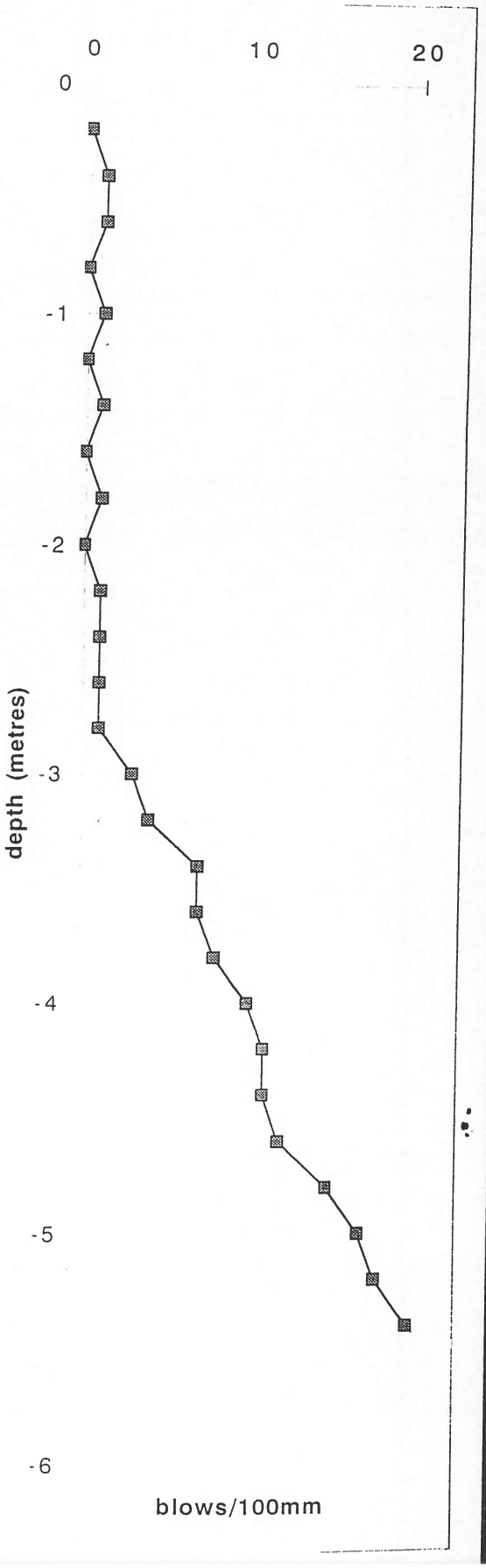


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 132
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
1		-0.6
0		-0.8
1		-1.0
0		-1.2
1		-1.4
0		-1.6
1		-1.8
0		-2.0
1		-2.2
1		-2.4
1		-2.6
1		-2.8
3		-3.0
4		-3.2
7		-3.4
7		-3.6
8		-3.8
10		-4.0
11		-4.2
11		-4.4
12		-4.6
15		-4.8
17		-5.0
18		-5.2
20		-5.4
23	REF AT 5.60	-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

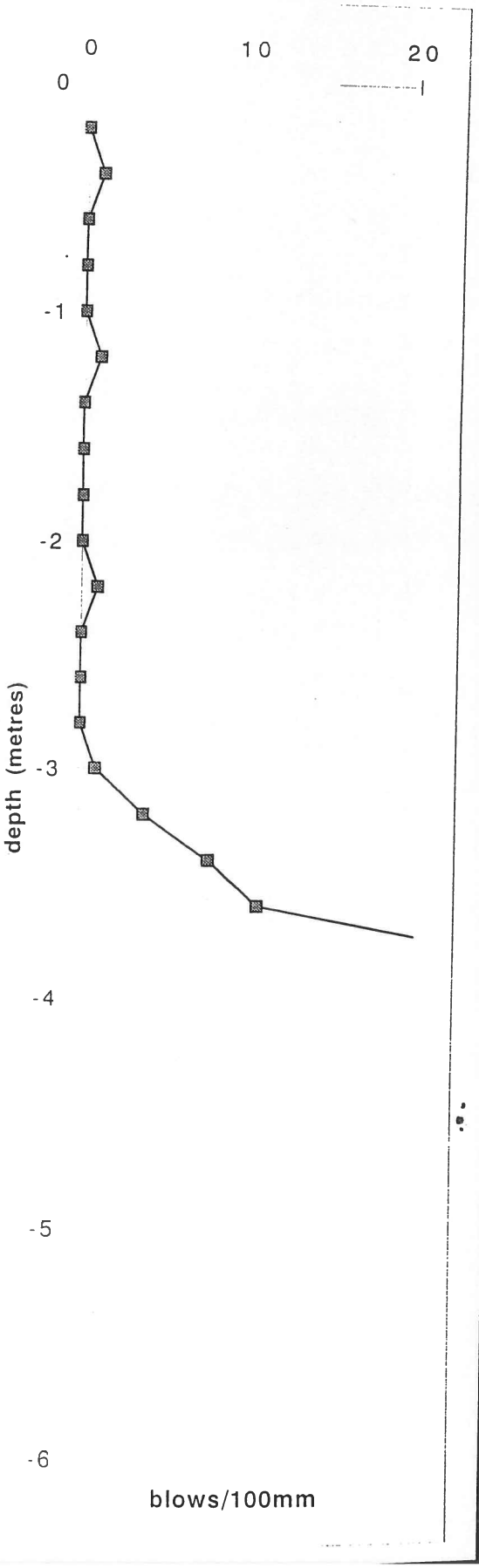


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	133
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
4		-3.2
8		-3.4
11		-3.6
25	REF AT 3.80	-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

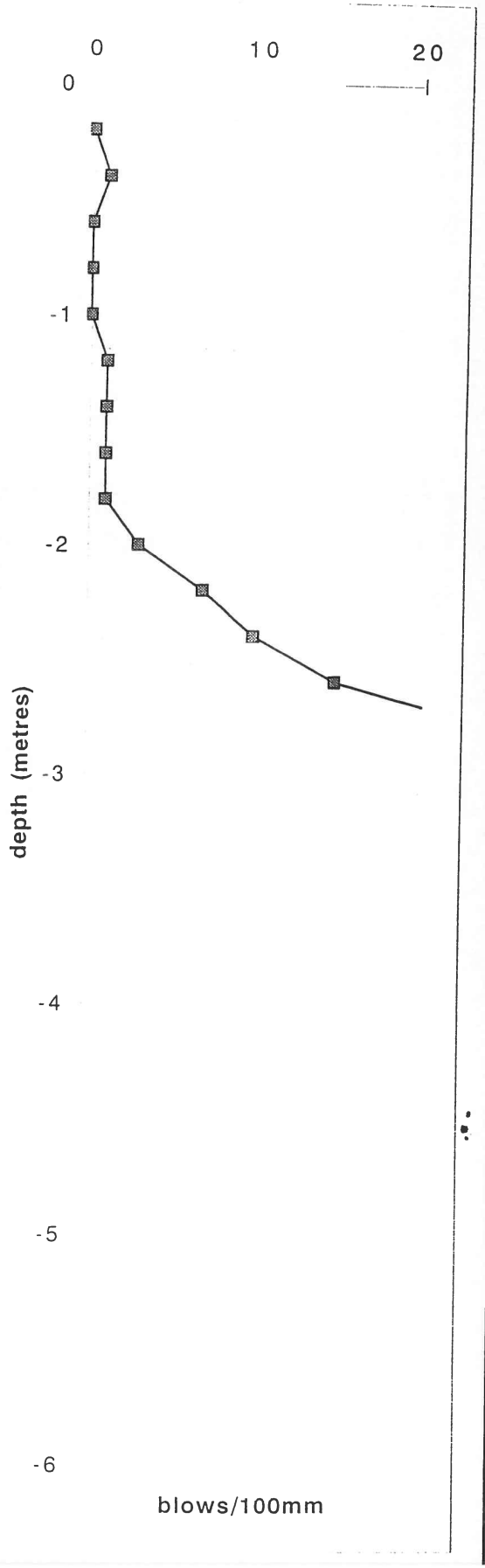


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	134
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 1.00	-1.0
1		-1.2
1		-1.4
1		-1.6
1		-1.8
3		-2.0
7		-2.2
10		-2.4
15		-2.6
25	REF AT 2.80	-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0



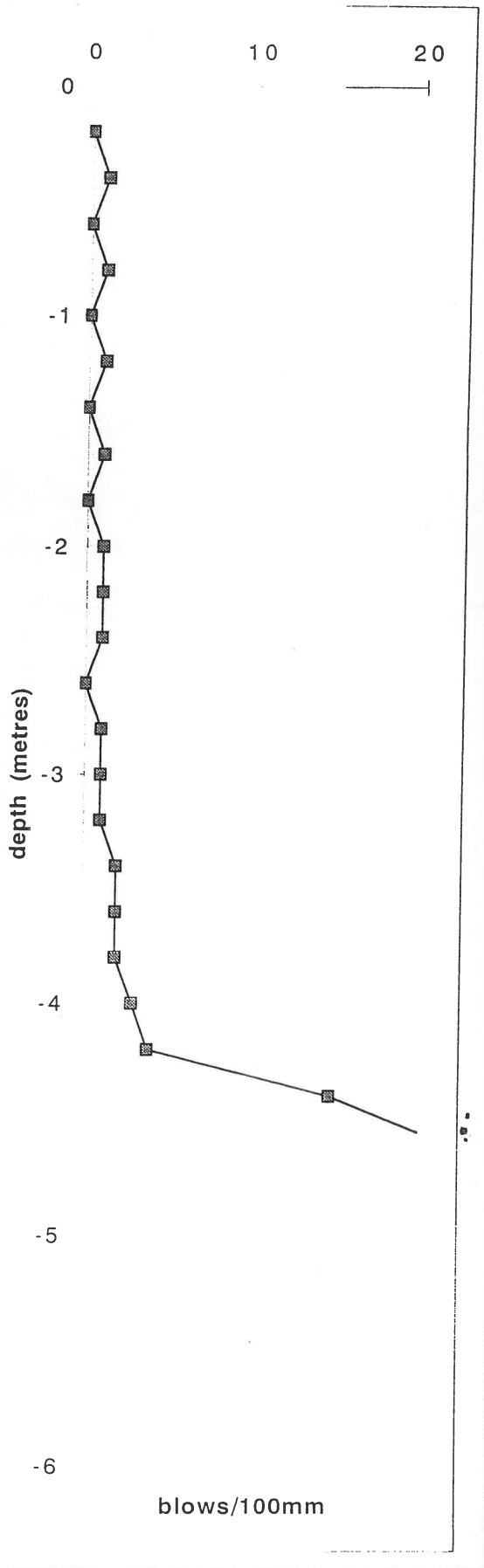
PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 135
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	11.12.2001

GROUND LEVEL

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
1		-0.8
0		-1.0
1		-1.2
0		-1.4
1		-1.6
0		-1.8
1		-2.0
1		-2.2
1		-2.4
0		-2.6
1		-2.8
1		-3.0
1		-3.2
2		-3.4
2		-3.6
2		-3.8
3		-4.0
4		-4.2
15		-4.4
22	REF AT 4.60	-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

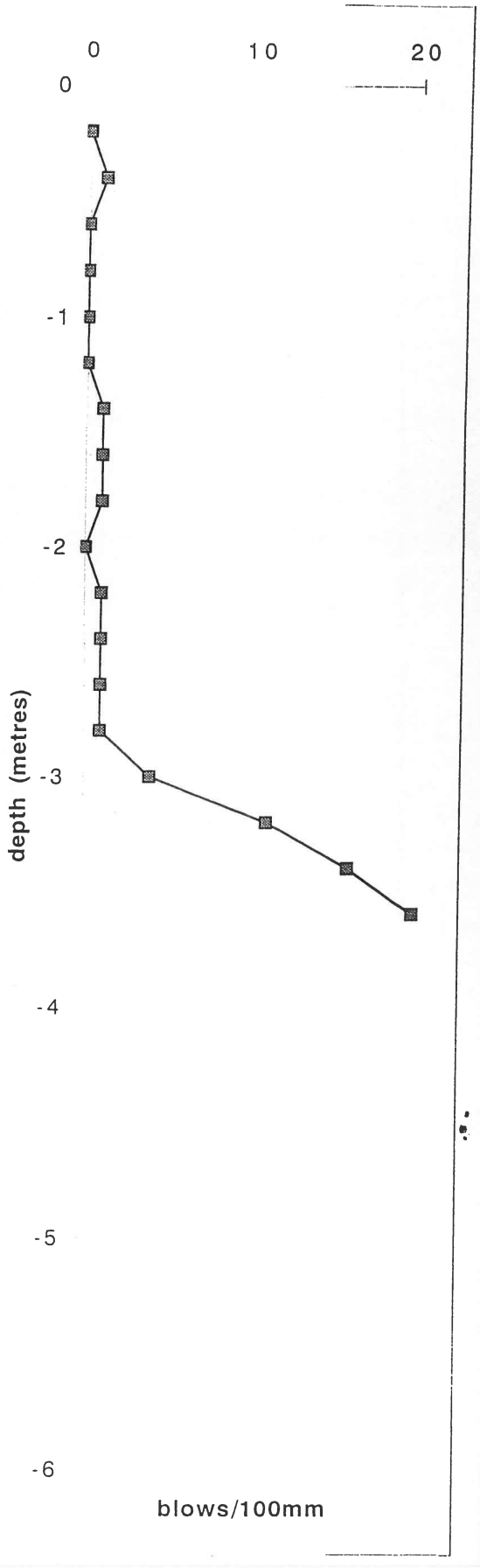


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 136
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0		-0.8
0		-1.0
0		-1.2
1		-1.4
1		-1.6
1		-1.8
0		-2.0
1		-2.2
1		-2.4
1		-2.6
1		-2.8
4		-3.0
11		-3.2
16		-3.4
20	REF AT 3.60	-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

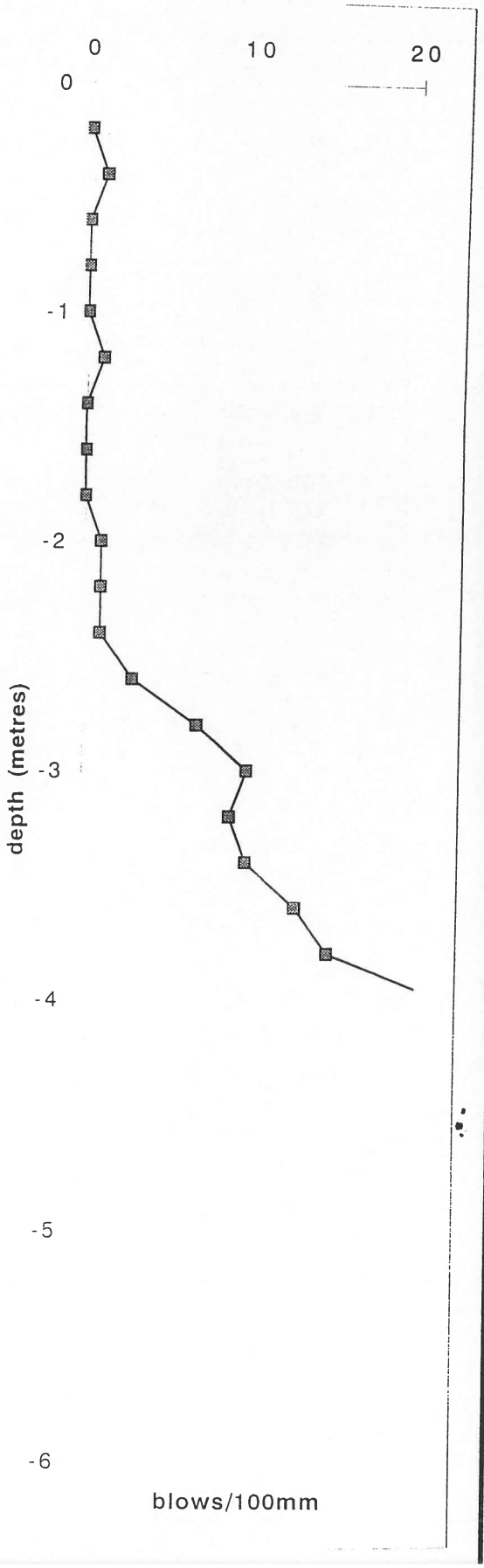


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	137
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
1		-2.0
1		-2.2
1		-2.4
3		-2.6
7		-2.8
10		-3.0
9		-3.2
10		-3.4
13		-3.6
15		-3.8
22		-4.0
23		-4.2
25	REF AT 4.40	-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

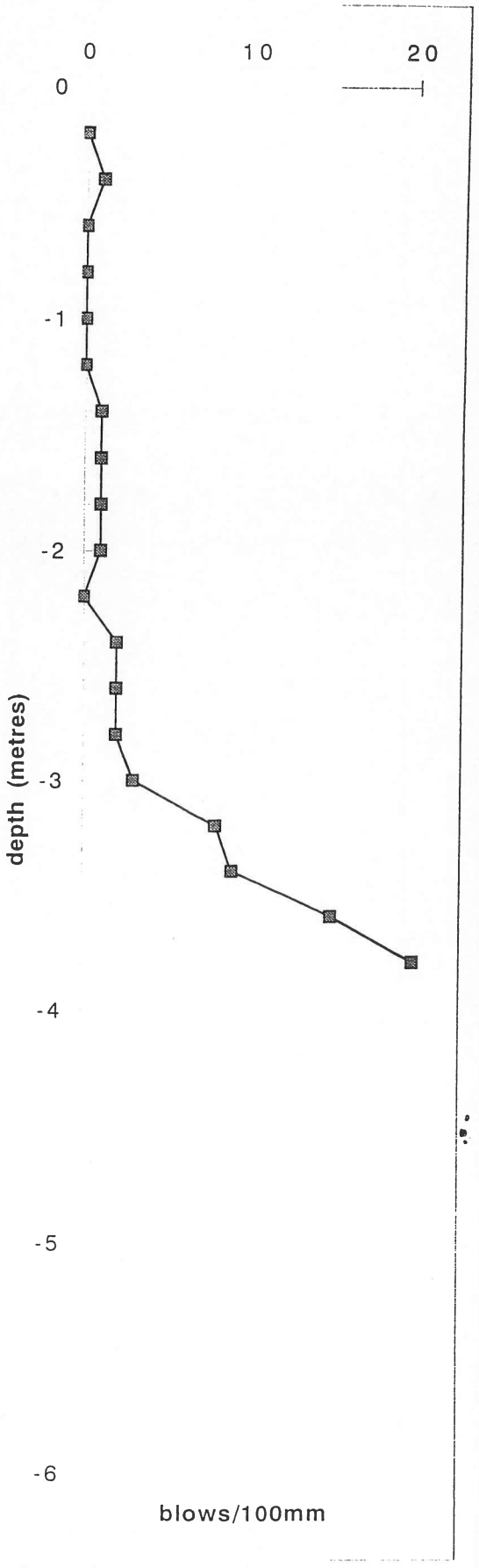


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	PR 138
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0		-0.8
0		-1.0
0		-1.2
1		-1.4
1		-1.6
1		-1.8
1		-2.0
0		-2.2
2		-2.4
2		-2.6
2		-2.8
3		-3.0
8		-3.2
9		-3.4
15		-3.6
20	REF AT 3.80	-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

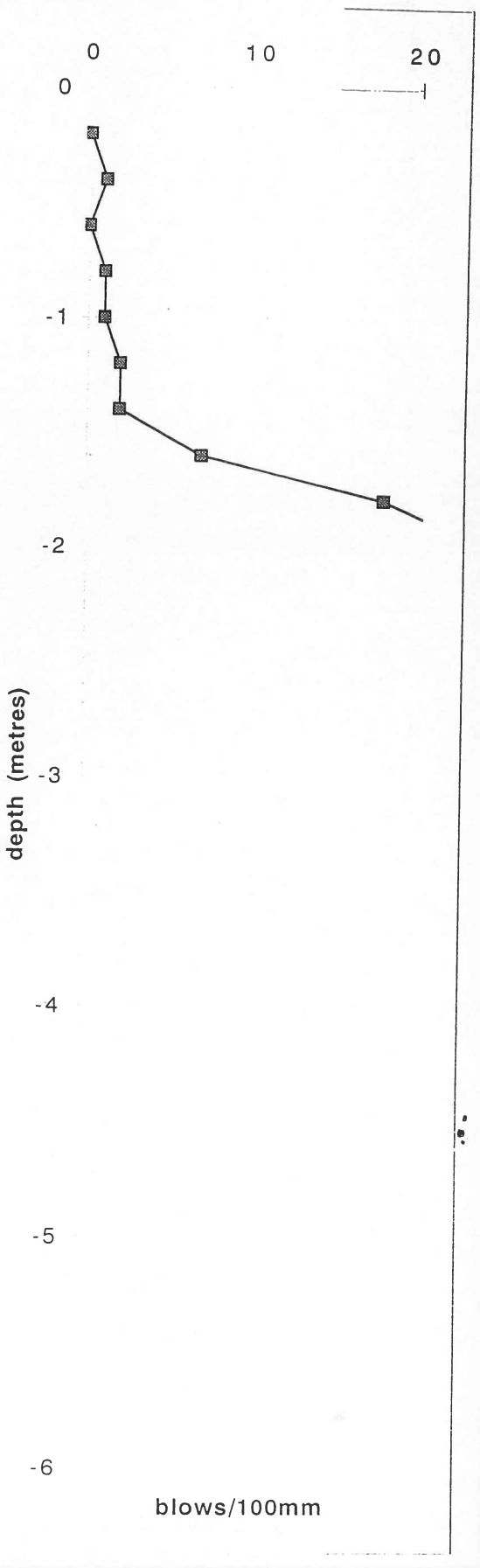


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 139
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
1		-0.8
1		-1.0
2		-1.2
2		-1.4
7		-1.6
18		-1.8
24	REF AT 2.00	-2.0
		-2.2
		-2.4
		-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

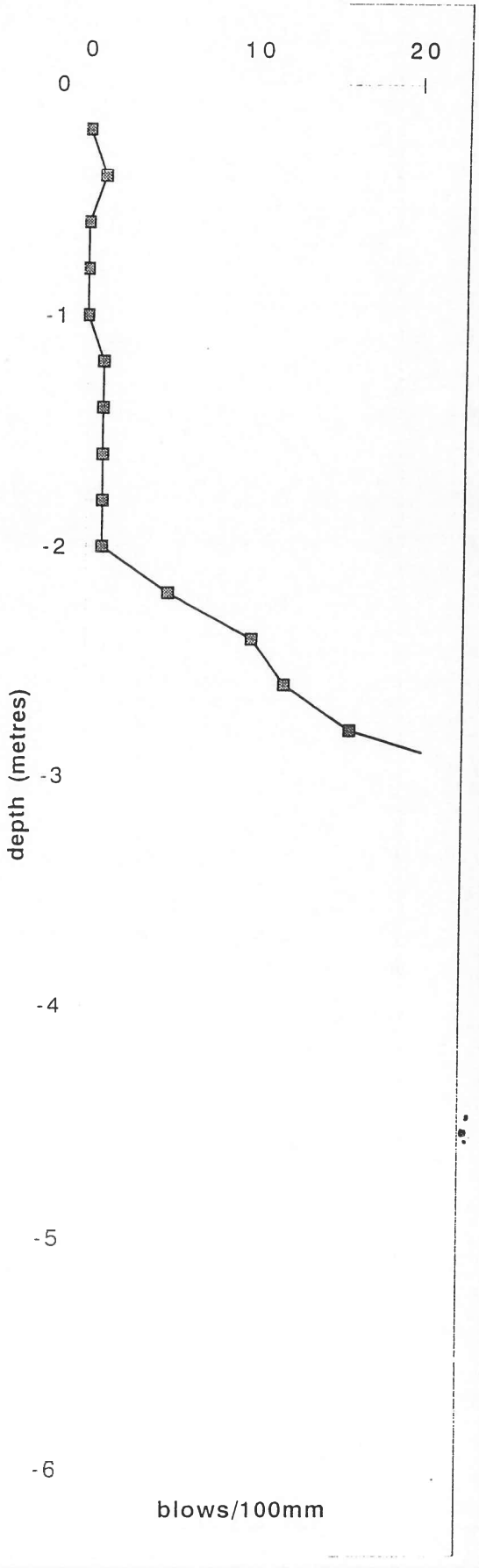


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	140
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 1.00	-1.0
1		-1.2
1		-1.4
1		-1.6
1		-1.8
1		-2.0
5		-2.2
10		-2.4
12		-2.6
16		-2.8
25	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

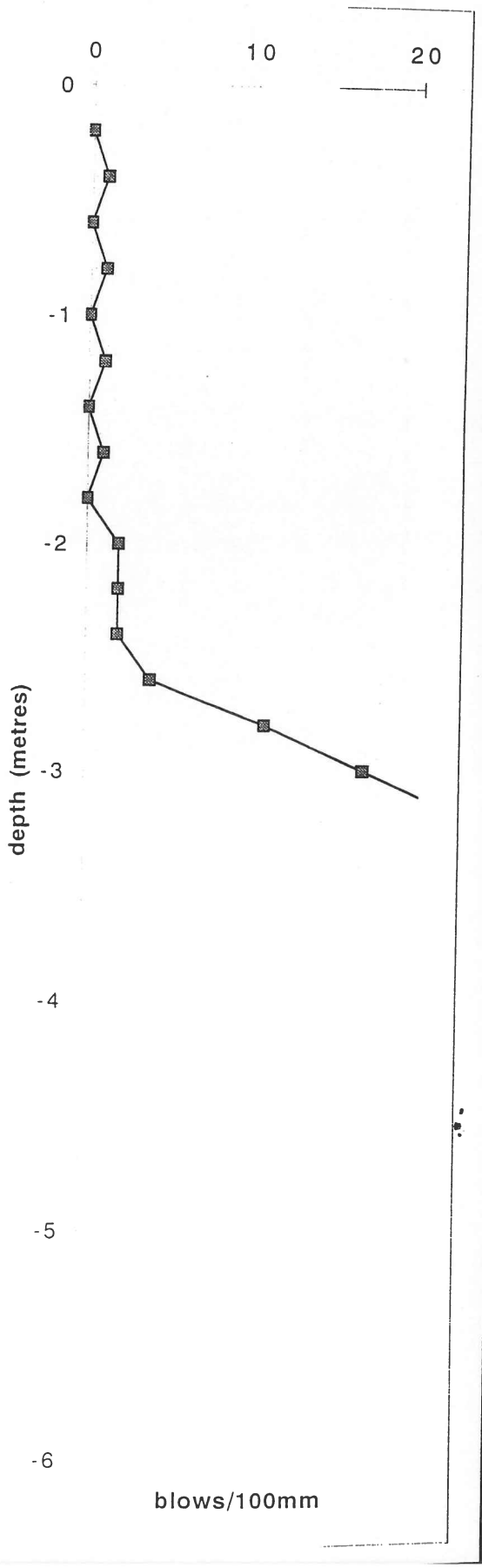


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 141
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
1		-0.8
0		-1.0
1		-1.2
0		-1.4
1		-1.6
0		-1.8
2		-2.0
2		-2.2
2		-2.4
4		-2.6
11		-2.8
17		-3.0
23	REF AT 3.20	-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

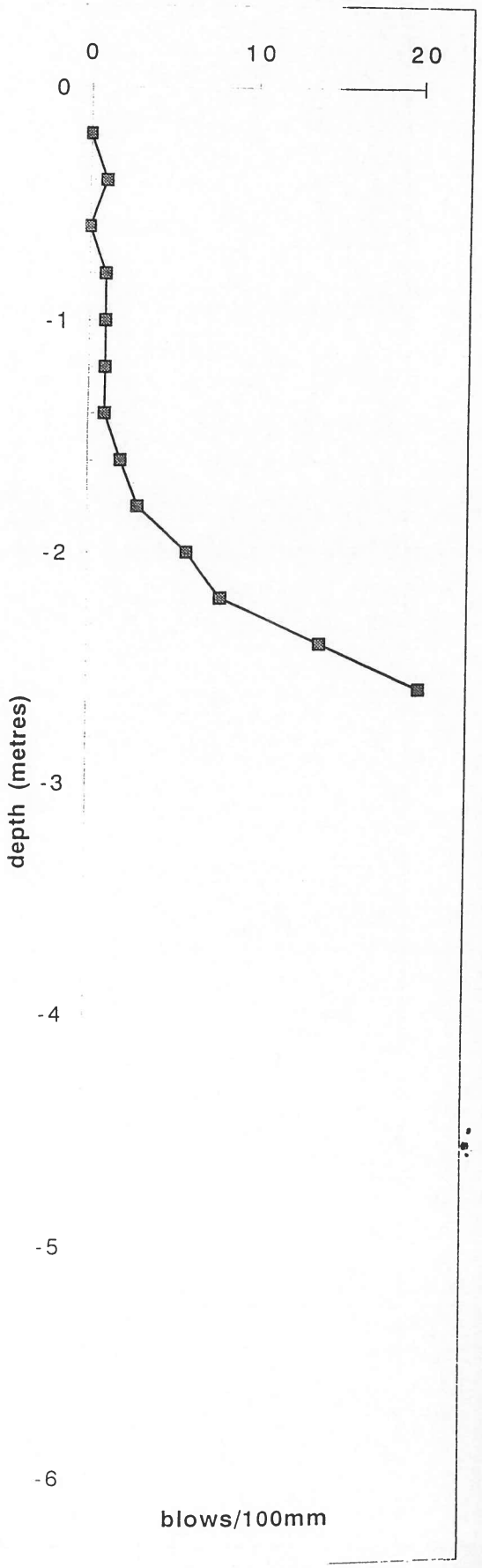


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 142
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
1		-0.8
1		-1.0
1		-1.2
1		-1.4
2		-1.6
3		-1.8
6		-2.0
8		-2.2
14		-2.4
20		-2.6
25	REF AT 2.80	-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

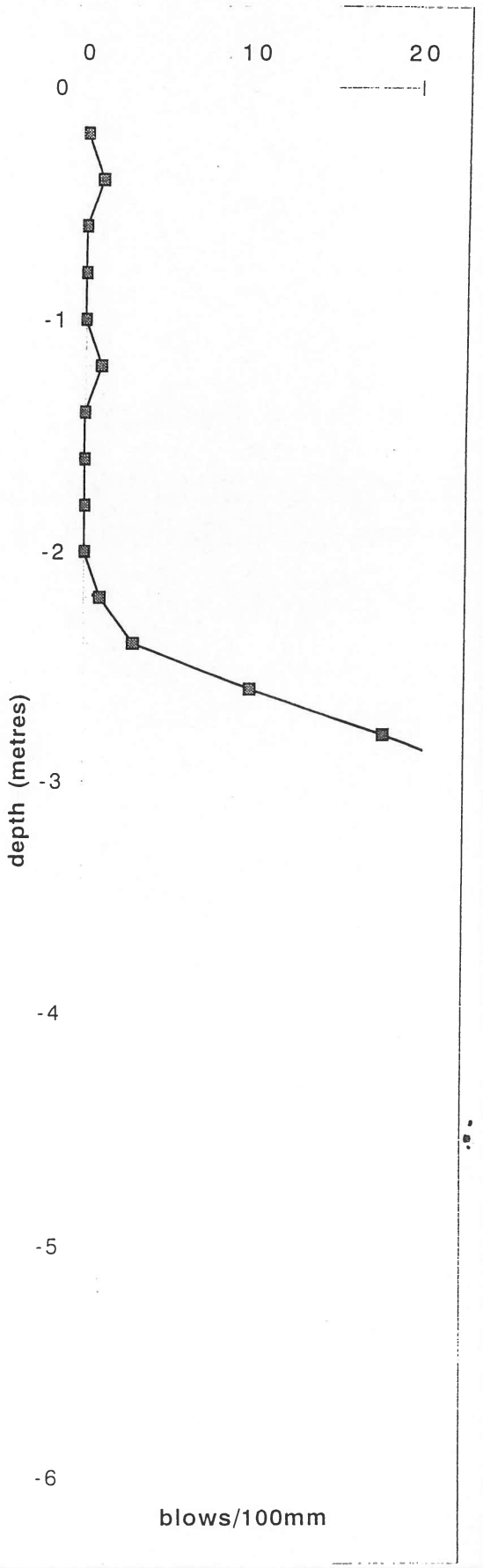


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	143
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
3		-2.4
10		-2.6
18		-2.8
25	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

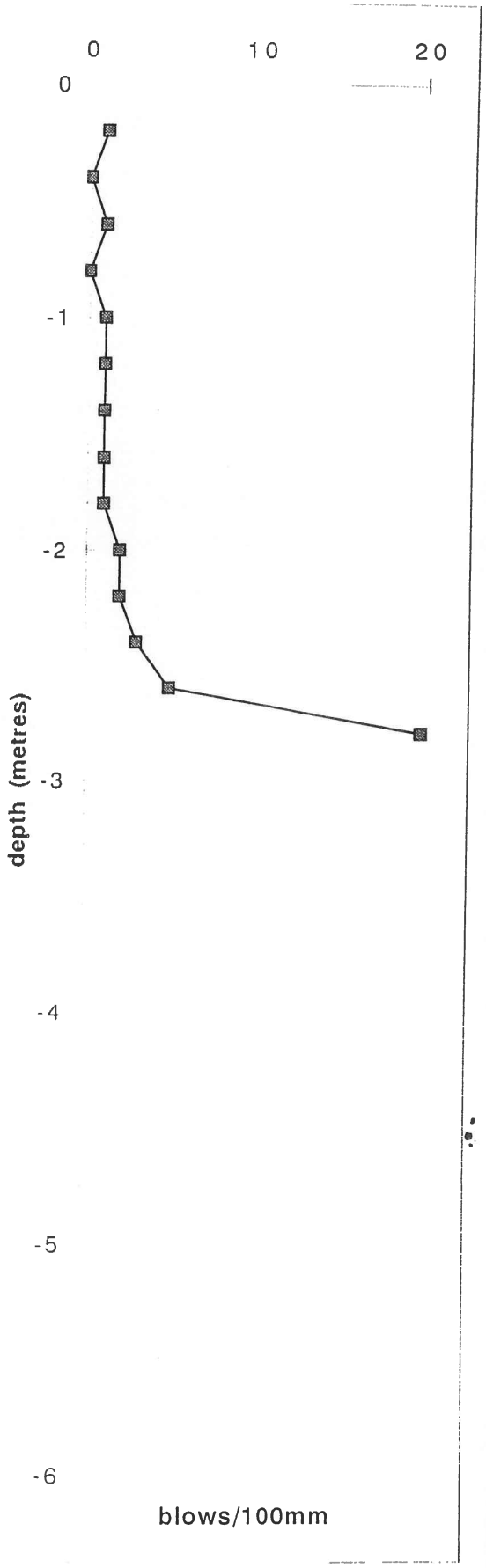


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 144
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
1		-0.2
0		-0.4
1		-0.6
0		-0.8
1		-1.0
1		-1.2
1		-1.4
1		-1.6
1		-1.8
2		-2.0
2		-2.2
3		-2.4
5		-2.6
20	REF AT 2.80	-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

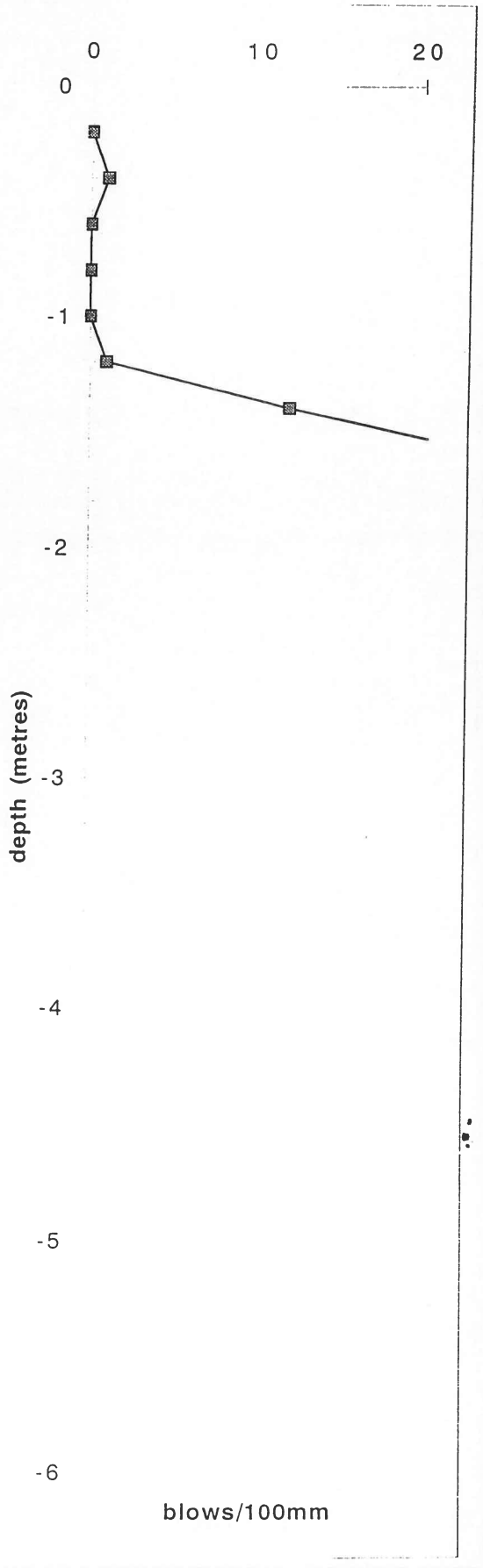


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	145
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	12.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 1.00	-1.0
1		-1.2
12		-1.4
25	REF AT 1.60	-1.6
		-1.8
		-2.0
		-2.2
		-2.4
		-2.6
		-2.8
		-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

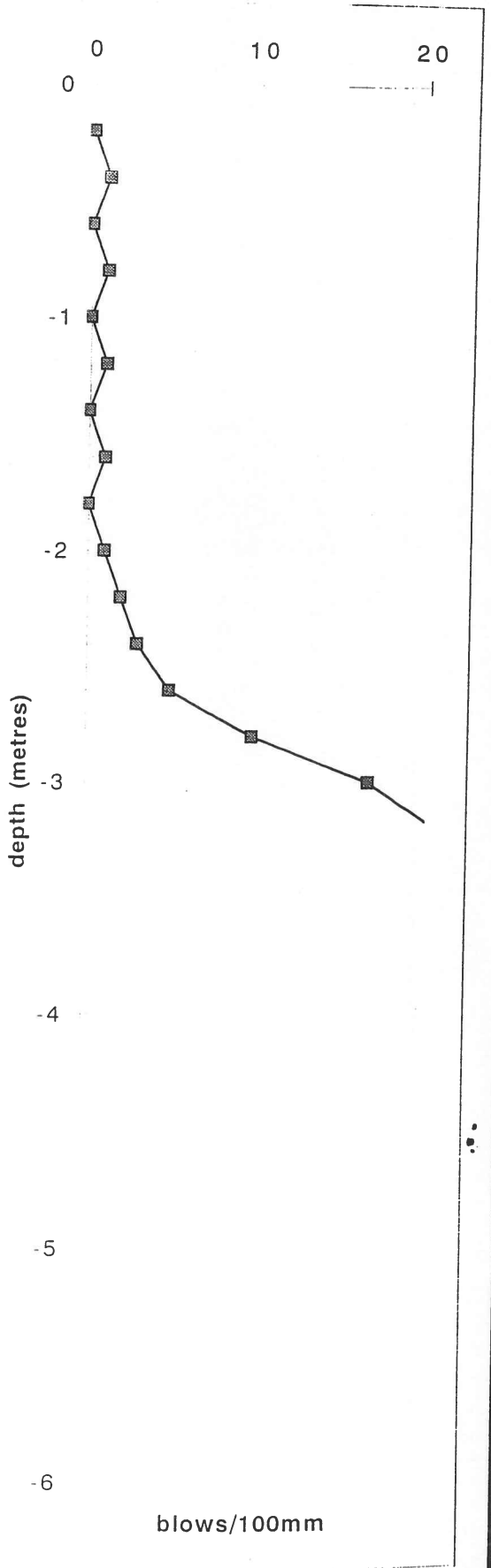


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	PR 146
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	11.12.2001
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
1		-0.8
0		-1.0
1		-1.2
0		-1.4
1		-1.6
0		-1.8
1		-2.0
2		-2.2
3		-2.4
5		-2.6
10		-2.8
17		-3.0
21	REF AT 3.20	-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

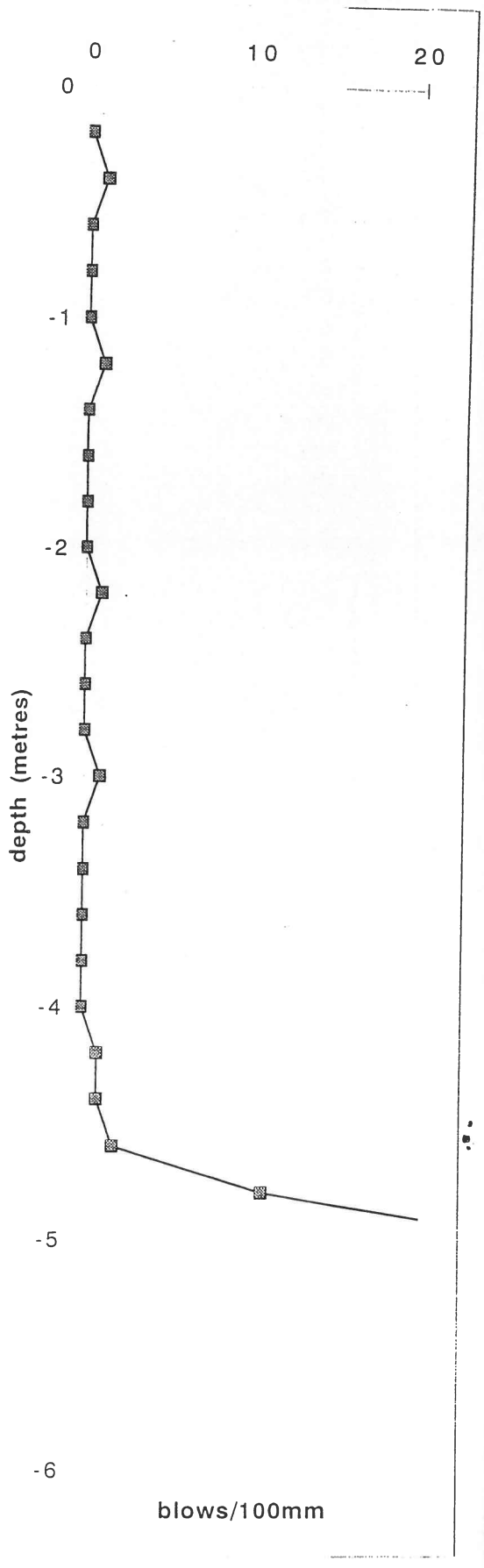


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BA 1
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
0		-3.2
0		-3.4
0		-3.6
0		-3.8
0		-4.0
1		-4.2
1		-4.4
2		-4.6
11		-4.8
27	REF AT 5.00	-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

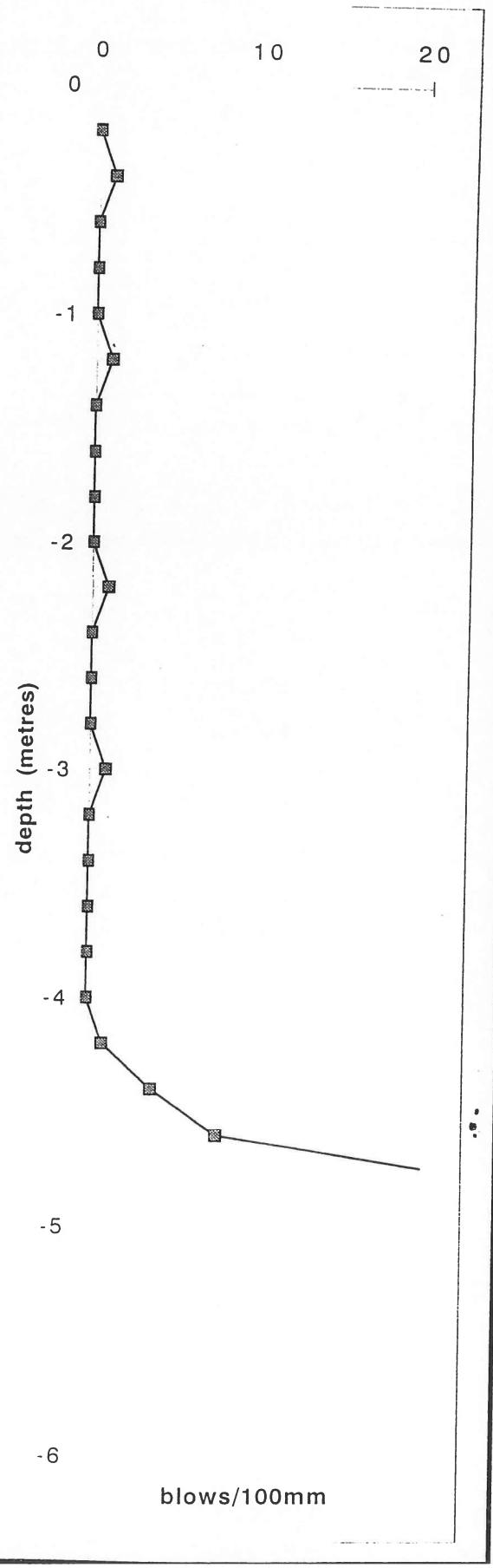


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BA 2
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
0		-3.2
0		-3.4
0		-3.6
0		-3.8
0		-4.0
1		-4.2
4		-4.4
8		-4.6
25	REF AT 4.80	-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

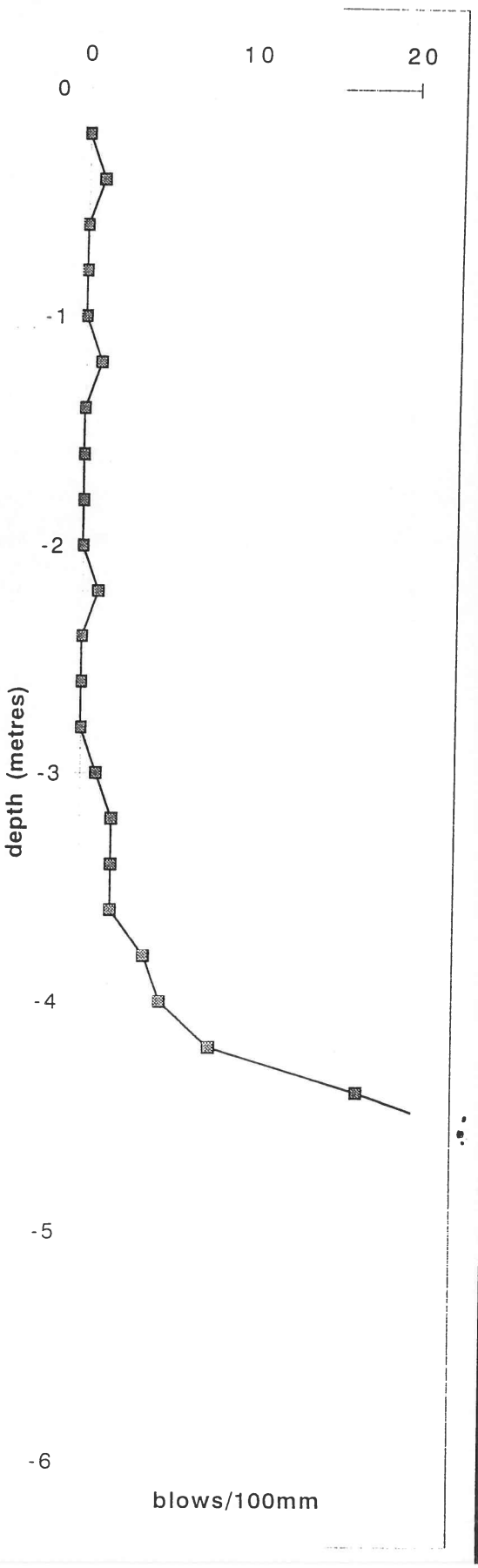


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	BA 3
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
2		-3.2
2		-3.4
2		-3.6
4		-3.8
5		-4.0
8		-4.2
17		-4.4
25	REF AT 4.60	-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

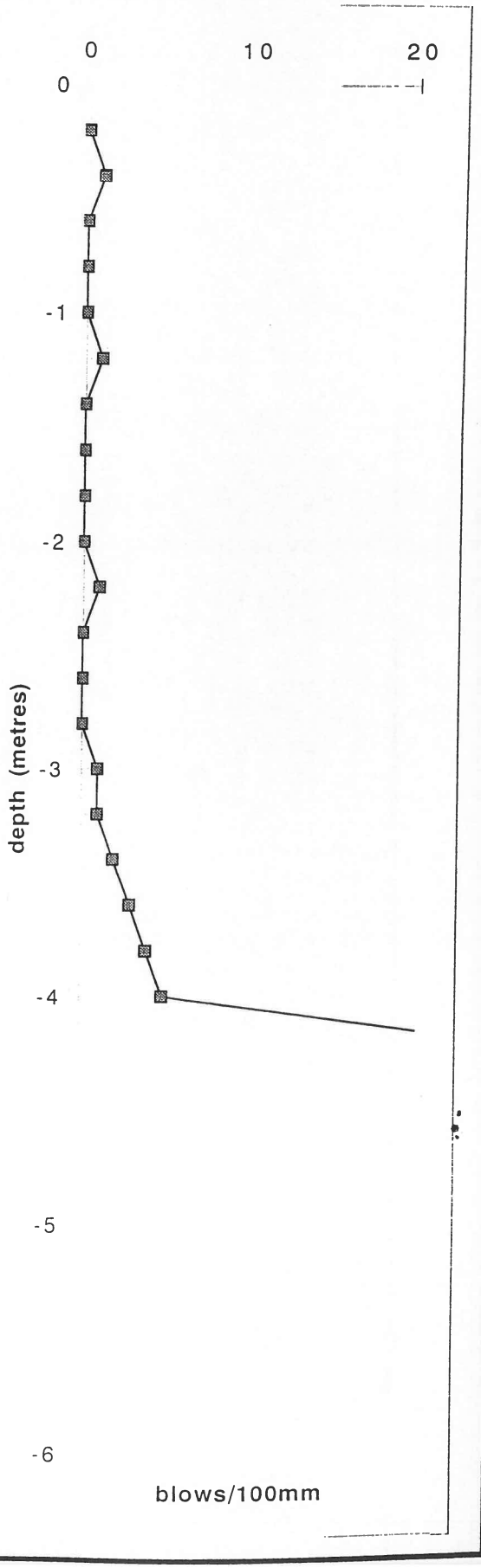


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	BA 4
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
1		-3.2
2		-3.4
3		-3.6
4		-3.8
5		-4.0
25	REF AT 4.10	-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

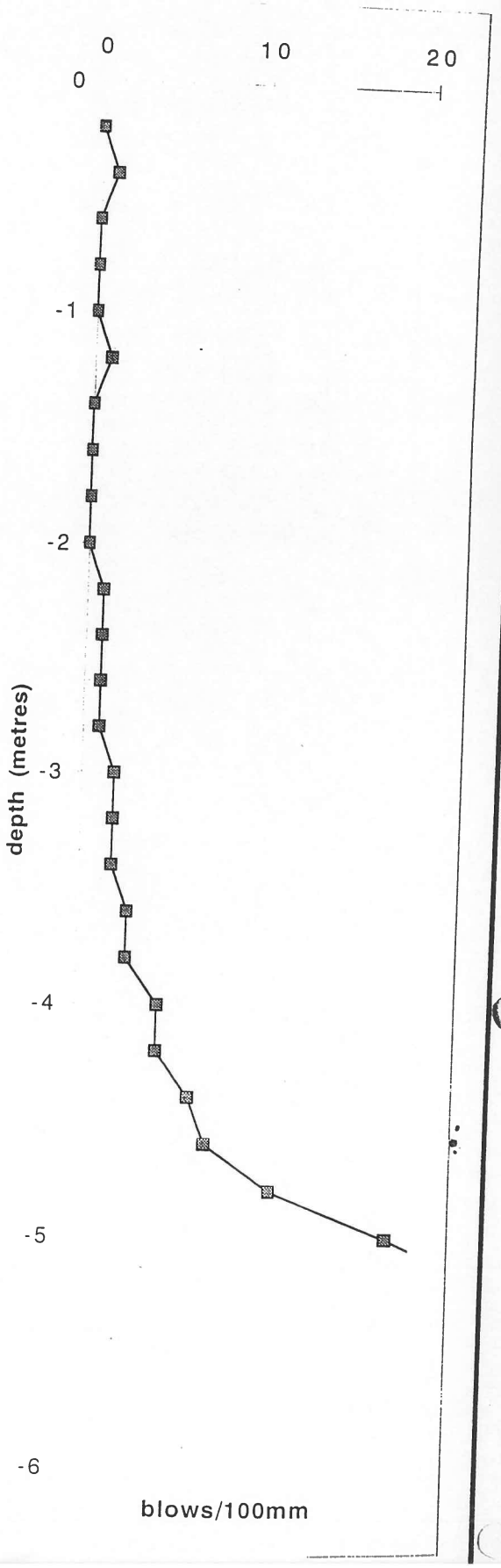


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BB 1
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
1		-2.4
1		-2.6
1		-2.8
2		-3.0
2		-3.2
2		-3.4
3		-3.6
3		-3.8
5		-4.0
5		-4.2
7		-4.4
8		-4.6
12		-4.8
19		-5.0
25	REF AT 5.20	-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

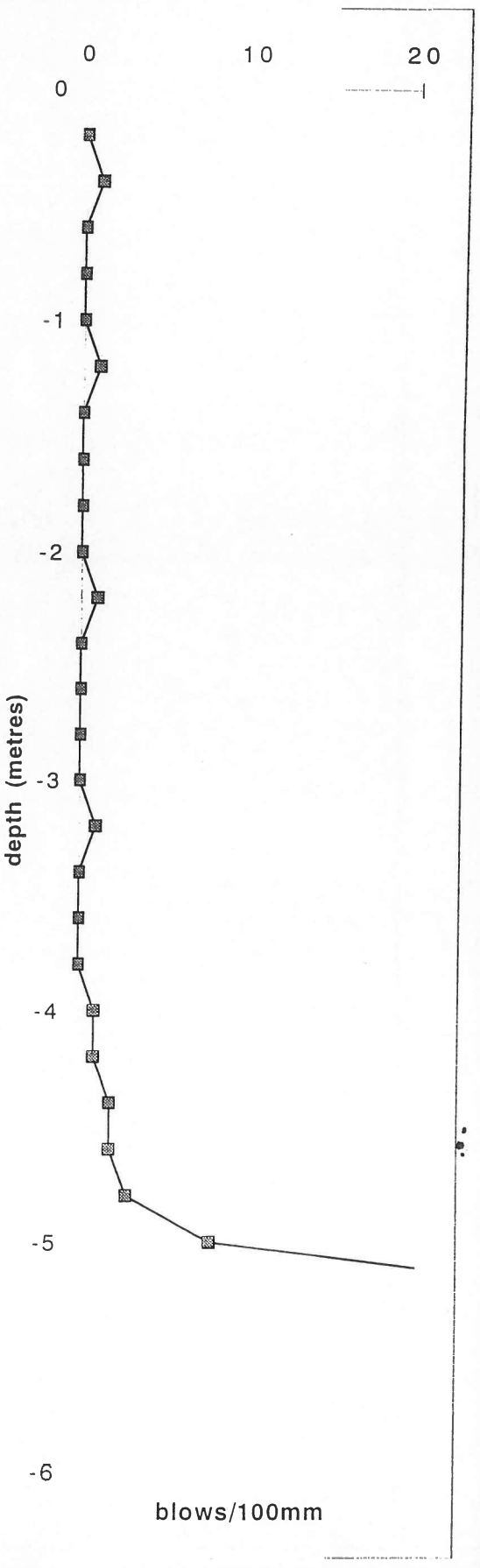


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	BB 2
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
0		-3.0
1		-3.2
0		-3.4
0		-3.6
0		-3.8
1		-4.0
1		-4.2
2		-4.4
2		-4.6
3		-4.8
8		-5.0
30	REF AT 5.20	-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

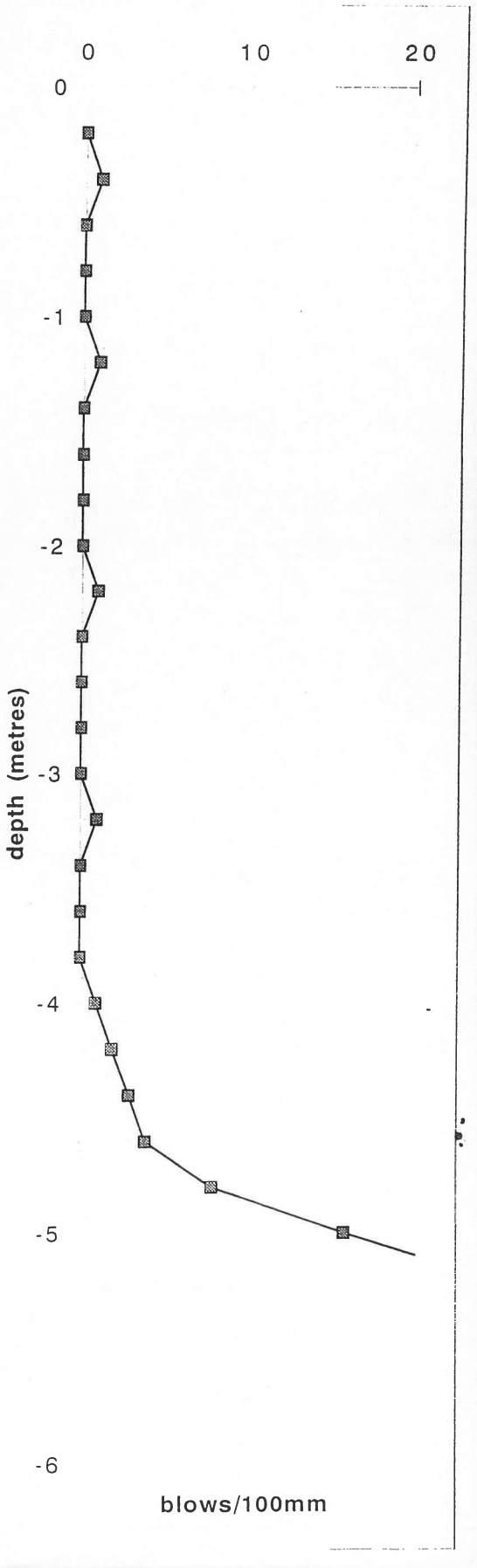


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	BB 3
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 4.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
0		-3.0
1		-3.2
0		-3.4
0		-3.6
0		-3.8
1		-4.0
2		-4.2
3		-4.4
4		-4.6
8		-4.8
16		-5.0
25	REF AT 5.20	-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

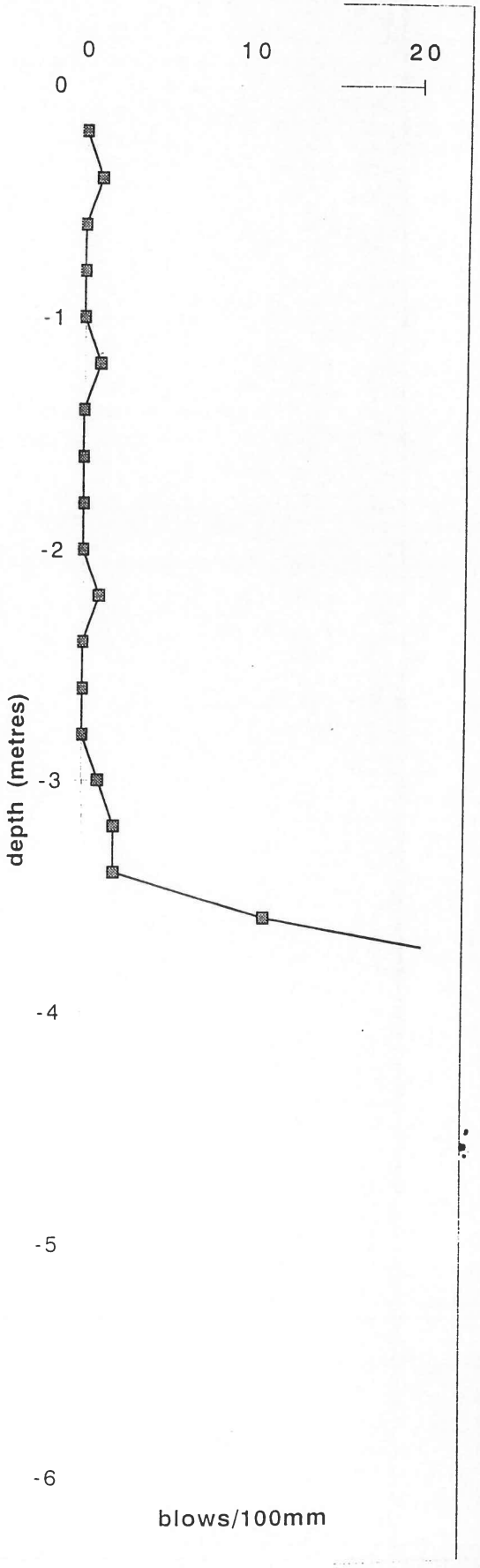


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BB 4
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
0		-2.0
1		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
2		-3.2
2		-3.4
11		-3.6
25	REF AT 3.80	-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0



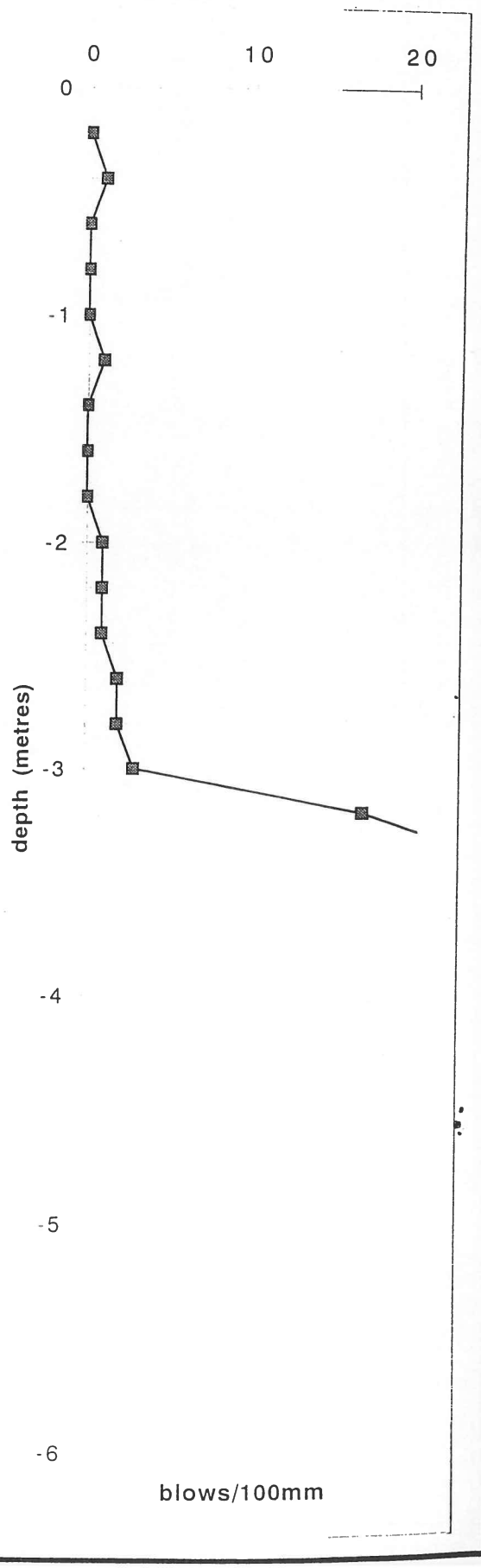
PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BC 1
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01

GROUND LEVEL

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
1		-2.0
1		-2.2
1		-2.4
2		-2.6
2		-2.8
3		-3.0
17		-3.2
25	REF AT 3.40	-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

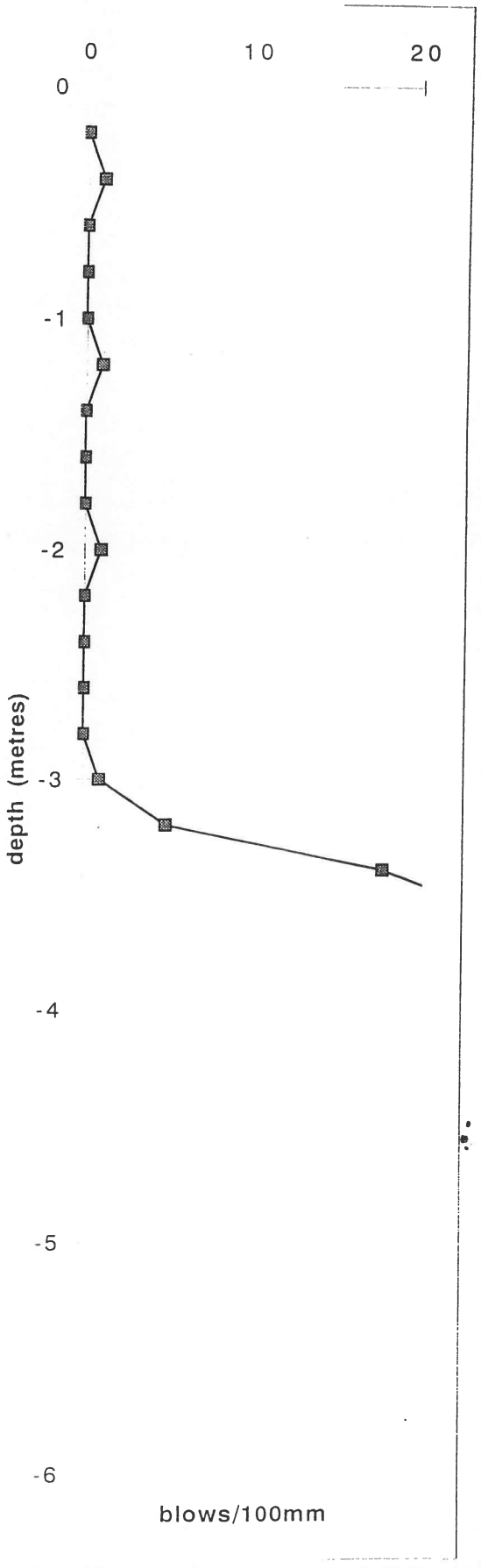


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BC 2
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 3.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
1		-2.0
0		-2.2
0		-2.4
0		-2.6
0		-2.8
1		-3.0
5		-3.2
18		-3.4
25	REF AT 3.60	-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

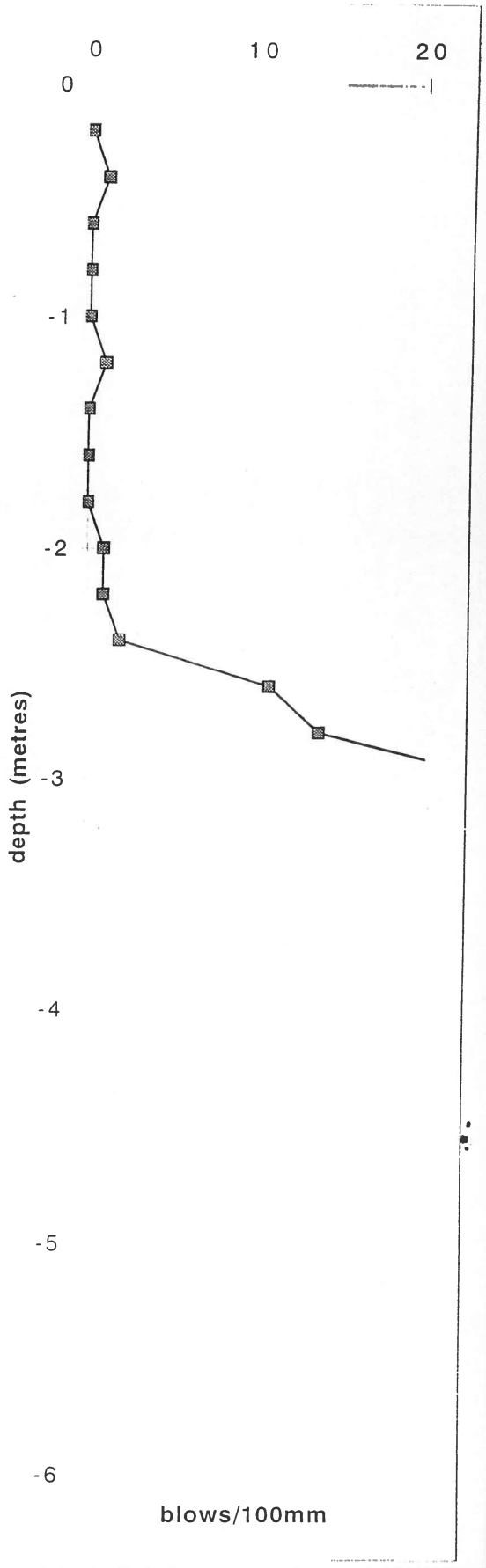


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	**PROBE TYPE**	MACINTOSH
No.	7637	**LOCATION**	BC 3
CLIENT	POWERGEN/MICHAEL PUNCH	**DATE**	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	1 blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
0		-1.8
1		-2.0
1		-2.2
2		-2.4
11		-2.6
14		-2.8
25	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0

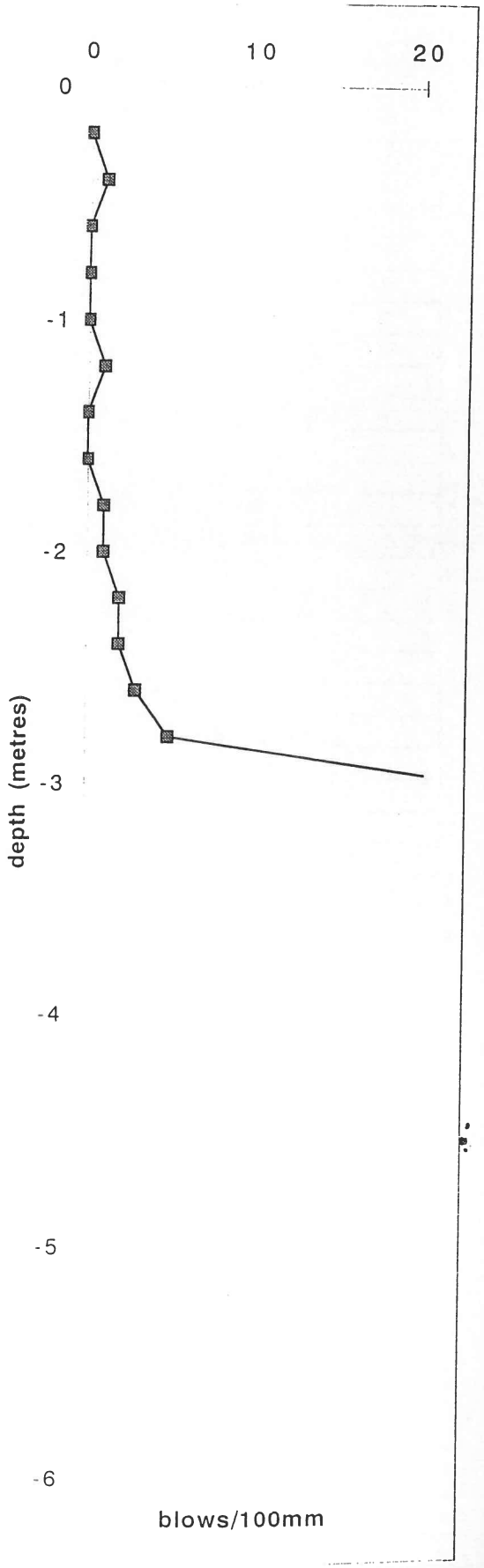


PROBE LOG

I.G.S.L

CONTRACT	DERRYBRIEN WIND FARM	PROBE TYPE	MACINTOSH
No.	7637	LOCATION	BC 4
CLIENT	POWERGEN/MICHAEL PUNCH	DATE	13.12.01
		GROUND LEVEL	

BLOWS	REMARKS	Depth metres)
0		-0.2
1		-0.4
0		-0.6
0	I blow/metre	-0.8
0	GL to 2.00	-1.0
1		-1.2
0		-1.4
0		-1.6
1		-1.8
1		-2.0
2		-2.2
2		-2.4
3		-2.6
5		-2.8
23	REF AT 3.00	-3.0
		-3.2
		-3.4
		-3.6
		-3.8
		-4.0
		-4.2
		-4.4
		-4.6
		-4.8
		-5.0
		-5.2
		-5.4
		-5.6
		-5.8
		-6.0
		-6.2
		-6.4
		-6.6
		-6.8
		-7.0
		-7.2
		-7.4
		-7.6
		-7.8
		-8.0
		-8.2
		-8.4
		-8.6
		-8.8
		-9.0
		-9.2
		-9.4
		-9.6
		-9.8
		-10.0



DERRYBRIEN WINDFARM
SAMPLE DESCRIPTIONS AND NUMBERING

Auger no	Depth		Sample No	Description
101	1.5		C1267	Soft brown fibrous PEAT
103	1.5		C1268	Soft brown fibrous PEAT
106	1.5		C1269	Soft brown fibrous PEAT
110	1.5		C1270	Soft brown fibrous PEAT
114	1.5		C1271	Soft brown fibrous PEAT
118	1.5		C1272	Soft brown fibrous PEAT
120	1.5		C1273	Soft brown fibrous PEAT
124	1.5		C1274	Soft brown fibrous PEAT
129	1.5		C1275	Soft brown fibrous PEAT
132	1.5		C1276	Soft brown fibrous PEAT
135	1.5		C1277	Soft brown fibrous PEAT
138	1.5		C1278	Soft brown fibrous PEAT
142	1.5		C1279	Soft brown fibrous PEAT
147	1.5		C1280	Soft brown fibrous PEAT
150	1.5		C1281	Soft brown fibrous PEAT
154	1.5		C1282	Soft brown fibrous PEAT
158	1.5		C1283	Soft brown fibrous PEAT
164	1.5		C1284	Soft brown fibrous PEAT
166	1.5		C1285	Soft brown fibrous PEAT
169	1.5		C1286	Soft brown fibrous PEAT
173	1.5		C1287	Soft brown fibrous PEAT
145	1.5		C1288	Soft brown fibrous PEAT
170	1.5		C1289	Soft brown fibrous PEAT

APPENDIX III
LABORATORY TEST RESULTS

REPORT NO.		MOISTURE CONTENT			IGSL
CONTRACT:	DERRYBRIEN WIND FARM				
BH/TP NO.	DEPTH (M)	SAMPLE NO.	SAMPLE TYPE	MC %	DESCRIPTION
3		C1268	WS	199	Dark brown black fibrous PEAT
10		C1270	WS	155	Dark brown black fibrous PEAT
20		C1272	WS	234	Dark brown black fibrous PEAT
29		C1274	WS	437	Dark brown black fibrous PEAT
35		C1276	WS	194	Dark brown black fibrous PEAT
42		C1278	WS	259	Dark brown black fibrous PEAT
50		C1280	WS	202	Dark brown black fibrous PEAT
58		C1282	WS	299	Dark brown black fibrous PEAT
66		C1284	WS	202	Dark brown black fibrous PEAT
73		C1286	WS	446	Dark brown black fibrous PEAT
16		C1288	WS	353	Dark brown black fibrous PEAT
70		C2190	WS	390	Dark brown black fibrous PEAT

Report: **CHEMICAL ANALYSIS TEST RESULTS** **I.G.S.L**

CONTRACT : Derrybrien Wind Farm
CLIENT : Michael Punch & Partners

BOREHOLE NO.	SAMPLE NO.	DEPTH (M)	SAMPLE TYPE	TEST CODE	SULPHUR TRIOXIDE		Class	PH Value
					SO3 in water	SO3 IN SOIL		
3	C1268		D	S	\	0.12	Class 1	7.50
20	C1272		D	S	\	0.21	Class 2	8.00
35	C1276		D	S	\	n/d	Class 1	8.00
50	C1280		D	S	\	0.15	Class 1	7.50
66	C1284		D	S	\	0.15	Class 1	8.00
73	C1286		D	S	\	0.08	Class 1	8.50

NOTE: SO3 IN WATER IS PARTS PER 100,000
TEST CODES: S = SOIL W = WATER

Derrybrien Wind Farm

Co-ordinates for Site Investigation Probe locations

Turbine & Probe Locations

Point No.	Easting(x)	Northing(y)	Point No.	Easting(x)	Northing(y)
101	157722	204772	136	160453	205448
102	157935	204876	137	160569	205206
103	157848	204540	138	160705	204974
104	158051	204644	139	160636	205532
105	158253	204738	140	160762	205291
106	157984	204308	141	160897	205068
107	158177	204421	142	160868	205520
108	158389	204515	143	160955	205260
109	158582	204600	144	161070	205480
110	158794	204694	145	161148	205220
111	158996	204798	146	161129	205008
112	158081	204086	147	158214	205315
113	158293	204190	148	158426	205400
114	158505	204284	149	158638	205484
115	158698	204368	150	158840	205607
116	158901	204472	151	159033	205682
117	159103	204566	152	159246	205776
118	158217	203835	153	158378	205073
119	158409	203938	154	158542	205168
120	158622	204052	155	158754	205262
121	158824	204146	156	158966	205366
122	159027	204240	157	159159	205450
123	159239	204334	158	159371	205544
124	159652	205080	159	158668	204936
125	159778	204848	160	158871	205030
126	159894	204626	161	159073	205134
127	159864	205194	162	159276	205218
128	159990	204942	163	159488	205313
129	160107	204720	164	159690	205407
130	160067	205269	165	159902	205501
131	160193	205027	166	159199	204892
132	160300	204805	167	159402	204987
133	160260	205363	168	159315	204660
134	160386	205131	169	159518	204755
135	160502	204899	170	159432	204419
			171	159644	204523

N.B.

The Co-ordinates for the probe locations in the heavily wooded areas are approximately only as the area was too heavily wooded for the use of the GPS.

Derrybrien Wind Farm

Co-ordinates for additional Site Investigation Locations

Trial Pits		
Location I D	Easting	Northing
C30	161.118	205.036
C32	159.966	204.974
C35	160.569	205.228
C36	160.756	205.317
C41	160.043	205.284
C42	160.244	205.369
C43	160.445	205.453
C44	160.655	205.563

Additional Probes		
Location I D	Easting	Northing
BA1	159.269	204.618
BA2	159.195	204.777
BA3	159.120	204.935
BA4	159.045	205.093
BB1	159.450	204.704
BB2	159.375	204.862
BB3	159.301	205.020
BB4	159.226	205.178
BC1	159.631	204.789
BC2	159.556	204.947
BC3	159.482	205.105
BC4	159.407	205.264

N.B.

The Co-ordinates for the probe locations in the heavily wooded areas are approximately only as the area was too heavily wooded for the use of the GPS.

Phase 1

Location	Turbine No./Point	No. Blows	Depth (m)
123	23	10	2.2
Between T68 & T17	BA1	11	4.8
Half way between T66 & T68	BA2	25	4.8
Half way between T66 & T61	BA3	17	4.4
T61	BA4	25	4.2
Half way between T68 & T69	BB1	12	4.8
Half way between T68 & T67	BB2	30	5.2
Half way between T67 & T62	BB3	16	5
T62	BB4	11	3.6
Half way between T69 & T25	BC1	17	3.2
Half way between T69 & T67	BC2	18	3.4
Half way between T67 & T63	BC3	11	2.6
T63	BC4	23	3

Total Depth	51.2

Average depth	3.94

Phase 2

Location I.D.	Turbine No.	No. Blows	Depth (m)
129	29	10	3
128	28	10	1.8
132	32	10	4
131	31	10	2.2
135	35	15	4.4
134	34	10	2.4
138	38	15	3.6
137	37	10	3.4
141	41	11	2.8
140	40	10	2.4
146	46	10	2.8
143	43	10	2.6
145	45	12	1.4
126	26	11	2.8
125	25	25	2.8
124	24	11	2
127	27	13	5.4
130	30	11	4.2
133	33	11	3.6
136	36	11	3.2
139	39	18	1.8
142	42	14	2.4
144	44	20	2.8

Total Depth	67.8
Average depth	3.08

Phase 3

Location I.D.	Turbine No.	No. Blows	Depth (m)
122	22	15	3
121	21	13	5.2
120	20	16	3
119	19	16	2.6
118	18	19	2
117	17	18	2.8
116	16	14	2.6
115	15	11	4.2
114	14	18	4.2
113	13	16	3
112	12	15	2.8
106	6	11	2.4
107	7	16	5.2
108	8	17	5
109	9	17	5
110	10	20	2.4
111	11	15	3.6
103	3	20	4.4
101	1	16	3.2
102	2	16	3
104	4	10	4.6
105	5	17	2.8

Total Depth	77

Average depth	3.67

APPENDIX II

FACTUAL REPORT ON ROTARY COREHOLES AT TURBINE LOCATIONS BY IRISH DRILLING LTD., (2004)

IRISH DRILLING LIMITED

CONTRACT DRILLING
SITE INVESTIGATION

LOUGHREA, CO. GALWAY, IRELAND

Phone: (091) 841 274
Fax: (091) 847 687

email: irdrill@iol.ie
V.A.T. No. IE 6399801R

new email address: info@irishdrilling.ie

6th October 2004

AGL Consultants
Suite 2
The Avenue
Beacon Court
Sandyford
Dublin 18

F.A.O. Mr. Conor O'Donnell

Re **Proposed Windfarm at Derrybrien - Site Investigation Contract**

Dear Conor

Please find enclosed one copy of the Site Investigation Report relating to the above contract.

Should you require any further information, please do not hesitate to contact us.

Yours faithfully

Ronan Killeen
Irish Drilling Limited

ronan@irishdrilling.ie

Encl.

Directors: HERB M. STANLEY, B.Sc., B.A., (Canadian) EMILY STANLEY, DECLAN JOYCE, B.E., M. Eng. Sc., C.Eng., M.I.E.I., RONAN KILLEEN, B.E., C.Eng., M.I.E.I., (Secretary)
Operations Manger: MICHAEL MAHON Registered Office: 200 UPPER SALTHILL, GALWAY Registered No. 379801

IRISH DRILLING LIMITED

CONTRACT DRILLING
SITE INVESTIGATION

LOUGHREA, CO. GALWAY, IRELAND

Phone: (091) 841 274
Fax: (091) 847 687

email: irdrill@iol.ie
V.A.T. No. IE 6399801R

new email address: info@irishdrilling.ie

6th October 2004

AGL Consultants
Suite 2
The Avenue
Beacon Court
Sandyford
Dublin 18

F.A.O. Mr. Conor O'Donnell

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Dear Conor

Please find enclosed one copy of the Site Investigation Report relating to the above contract.

Should you require any further information, please do not hesitate to contact us.

Yours faithfully

Ronan Killeen
Irish Drilling Limited

ronan@irishdrilling.ie

Encl.

IRISH DRILLING LIMITED

CONTRACT DRILLING
SITE INVESTIGATION

LOUGHREA, CO. GALWAY, IRELAND

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PROPOSED WINDFARM AT DERRYBRIEN

SITE INVESTIGATION FACTUAL REPORT

Ascon Ltd.,
Civil Engineering & Building Contractors,
Site Office,
Derrybrien,
Co. Galway.

September 2004

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FOREWORD

The borehole records have been compiled from an examination of the samples by a Geotechnical Engineer and from the Drillers' descriptions.

The report presents an opinion on the configuration of the strata within the site based on the borehole results. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes.

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1.0	Introduction
2.0	The Site & Geology
3.0	Fieldwork
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1.0 Introduction.

Irish Drilling Ltd. (IDL) was instructed by Ascon Construction Ltd. to carry out a site investigation on the site of a proposed Windfarm at Derrybrien.

This investigation was carried out to assess the ground conditions and provide data to assist in the design of foundations.

The fieldwork commenced on September 6th 2004 and was completed on September 24th 2004.

2.0 Site & Geology

The site is located at Derrybrien, County Galway.

Site plans showing the positions of the boreholes have been prepared by Ascon Construction Ltd and this report should be read in conjunction with the site plans.

Geological Survey maps of the area indicate that the site is underlain by Sandstone Rock Formations.

3.0 Fieldwork.

The fieldwork consisted of the following:

Thirty-one rotary core boreholes were completed using a BBS 37 GoTract Drilling Rig that specialises in working over very soft ground conditions and where the terrain is difficult to traverse.

The rotary core boreholes were carried out to establish rockhead and to establish the nature and integrity of the underlying rock.

HQ size (63mm diameter) coring was carried out, with samples placed in wooden boxes and returned to the laboratory where there were logged and photographed by a Geotechnical Engineer and presented for storage and possible laboratory testing.

In–Situ testing consisting of Standard Penetration Tests were carried out at regular intervals in a number of rotary core boreholes.

The borehole locations were set out and surveyed by Ascon Construction Ltd. and the fieldwork was carried out in accordance with BS5930 Code of Practice for Site Investigation.

The records of all fieldwork including borehole logs are included in the Factual Report.

APPENDIX 1

BOREHOLE RECORDS
(ROTARY CORE)

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 6

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.7m

DRILLING STARTED: 20.9.04
DRILLING COMPLETED: 20.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 7.50m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									3.70	
	3.70	66	25	-					4.30	Overburden.
4	4.60				27	Very close,planar,stepped,dipping 3 deg's, some purple sandy silt smear. 7.0-7.3m: joint: vertical,planar,smooth,purple silt smear,open.				Strong slightly weathered purple fine to medium grained thinly bedded SANDSTONE.
5		100	99	-	37					5.20: creamish grey.
6	6.00	100	99	9	23					
7					14				7.50	
	7.50						END			Borehole terminated.
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 7

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.7m

DRILLING STARTED: 21.9.04
DRILLING COMPLETED: 21.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 7.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
3	3.00	67	17	-					3.00	Overburden - recovered as slightly sandy gravelly SILT with cobbles.
4					>15	Very close,bedding parallel,moderately open to open.			4.00	Weak to moderately strong,highly (locally completely) weathered green medium grained thinly bedded SANDSTONE with residual soil horizons.
	4.50								4.80	
5		87	70	-		Very close to close,bedding parallel,subplanar to undulose, tight to moderately open,clay filled,discoloured.				Moderately strong (strong from 6.0m),moderately weathered multicoloured fine grained subhorizontal thinly bedded SANDSTONE.
6	6.00				NI					5.80-6.30: very thin green siltstone horizon.
		100	100	57	15					
7	7.00						END		7.00	Borehole terminated.
8										
9										
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 8

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.3

DRILLING STARTED: 22.9.04
DRILLING COMPLETED: 22.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 8.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									3.00	
3	3.00	33	-	-						Overburden - recovered as peat overlying sandy gravelly silt with cobbles.
4	4.40	40	17	-					5.10	
5	5.30	100	-	-	NI	Extremely to very close,bedding parallel,planar to slightly undulose, smooth,tight,smeared.Predominantly non-intact.				Moderately strong,fresh to slightly weathered purple medium grained thinly laminated horizontally bedded sandy locally finely conglomeratic SILTSTONE.
6	6.60	100	31	-					7.00	
7	7.00	100	95	78	>15 6	Close to medium (locally very close),bedding parallel,planar, slightly rough,tight,smeared.			8.00	Very strong,fresh to slightly weathered cream white fine grained subhorizontal medium locally thinly bedded SANDSTONE.
8	8.00						END			Borehole terminated.
9										
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 30

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.4m

DRILLING STARTED: 6.9.04
DRILLING COMPLETED: 6.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 9.00m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.40	
	2.40	100	-	-						Overburden - recovered as firm purple slightly sandy gravelly SILT. 2.55-2.85: CPT at 2.40m: N=14.
3	3.10	100	-	-						
	3.40	100	-	-						3.40: very stiff. 3.55-3.85: CPT at 3.55m: N=33.
4										
5	5.00	100	-	-						5.00: stiff. 5.15-5.45: CPT at 5.00m: N=29.
	5.60								5.60	
6		100	80	30	2	Close,planar,dipping 4 deg's,smooth, some pink silt smea and mica. 5.66-5.86m: joint: vertical,undulating,tight.				Strong fresh purple fine to medium grained thinly laminated micaceous SANDSTONE.
	6.60				12	7.2-7.25m: joint: subvertical,irregular,stepped,rough,wide.				
7		100	97	39	26	7.35-7.5m: joint: vertical,curviplanar,smooth,wide.				
8	8.10	100	98	17	13					
	9.00								9.00	
9							END			Borehole terminated.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 31

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	**LOCATION: Derrybrien, Co. Galway**	**DRILLING STARTED: 23.9.04**
CORE BARREL: HQ	**GROUND SURFACE**	**DRILLING COMPLETED: 23.9.04**
BIT DESIGN: HQ	**ELEVATION m O.D.: msl**	**DRILLING BY: TH**
CORE DIAMETER mm: HQ	**INCLINATION: Vertical**	**AZIMUTH: ---**
FLUSH: water	**CASING DEPTH (m): 4.5m**	**FINAL DEPTH: 9.00m**

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
4.30	4.30	29	-	-					4.30	Overburden - recovered as purple slightly sandy gravelly SILT with cobbles. 4.50: soft. 4.65-4.95: CPT at 4.65m: N=6.
	5.10	100	-	-						
6.00	6.00	93	93	49	9	Close (locally very close),bedding parallel,subplanar to undulose, rough,tight (frequently moderately open,clay smeared),occasionally open and clay filled.			6.00	Strong to very strong,slightly to moderately weathered cream white fine grained medium locally thinly bedded slightly conglomeratic SANDSTONE with occasional small mudflakes.
	7.50	100	100	87	7					
9.00	9.00						END		9.00	Borehole terminated.

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 33

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 7.9.04
DRILLING COMPLETED: 7.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 8.60m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
3	3.00	57	-	-					3.00	Overburden - recovered as black fibrous PEAT with wood fragments.
4	4.40	25	-	-						4.55: CPT at 4.55m: N=9.
5	5.20	50	50	-					5.40	
6	5.60	100	90	-	14	Very close,planar,stepped,dipping 10 deg's,rough, some cream silt smear. 6.0-6.4m: joint: subvertical,undulating,rough,a little cream sandy silt smear,open. 7.5-7.6m: planar,stepped,pink silt smear,dipping 60 deg's.				Strong slightly weathered cream fine to medium grained thinly bedded micaceous SANDSTONE. 5.40: CPT at 5.40m: N=refusal.
					36					
7	7.10				18				7.60	
8	8.60	100	-	-	NI	Non-intact.			8.60	Strong highly weathered purple micaceous SILTSTONE gravel and cobbles.
9							END			Borehole terminated.
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 36

Sheet 1 of 1

Co-ordinates:

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 7.9.04
DRILLING COMPLETED: 7.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 7.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									3.00	
3	3.00	12	10	-					3.60	Overburden - recovered as black fibrous PEAT with wood fragments. 3.15: CPT at 3.15m: N=1.
	3.80	100	94	30	5	Close,undulating,rough,dipping 20 deg's, open,iron stain (very close from 4.5-5.2m). 3.6-3.75m: joint: planar,dipping 82 deg's,pink sandy silt infill.				Very strong moderately weathered cream brown fine to coarse grained micaceous quartz SANDSTONE. 3.60-5.50: massive.
4	4.60	100	87	11	19	5.2-5.46m: planar,rough,pink sandy silt smear,dipping 82 deg's,open.				4.70: slightly weathered,cream.
5					22					5.50-6.25: thinly bedded.
6	5.90	100	60	10	23	Close,irregular,smooth,dipping 20 deg's. 6.45-7.00m: joint: subvertical,planar,stepped,smooth,open.			6.25	Strong slightly weathered white mottled grey thinly bedded weakly calcareous CLAYSTONE with detrital quartz and mudstone clasts.
7	7.00						END		7.00	Borehole terminated.
8										
9										
10										

Remarks: CPT at 3.00m: 1 blow for 1.60m.

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 39

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	LOCATION: Derrybrien, Co. Galway	DRILLING STARTED: 7.9.04
CORE BARREL: HQ	GROUND SURFACE	DRILLING COMPLETED: 7.9.04
BIT DESIGN: HQ	ELEVATION m O.D.: msl	DRILLING BY: TH
CORE DIAMETER mm: HQ	INCLINATION: Vertical	AZIMUTH: ---
FLUSH: water	CASING DEPTH (m): 3.0m	FINAL DEPTH: 7.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
3	3.00	63	25	-					3.00	Overburden - recovered as black fibrous PEAT with wood fragments.
					NI	Very close (close from 5.3-7.0m),irregular,stepped,rough,dipping 20 deg's.,cream silt smear.			3.50	Very strong slightly weathered cream fine to coatrse grained thinly bedded SANDSTONE. 3.50-3.60: weak,completely weathered. 3.60-3.80: moderately weathered.
4	3.80	100	93	6	20	3.8-4.2m: joint: vertical,curviplanar,stepped,rough,pink silt smear,open.				
					21	6.6-6.8m: joint: planar,stepped,rough,pink silt smear,5mm wide,dipping 82 deg's.				
5	5.30					6.7-7.0m: joint: planar,rough,pink silt smear,10mm wide,dipping 82 deg's.,quartz crystals.				5.10-5.30: coarse grained subrounded relict gravel clasts.
6		100	96	21	18	6.9-7.0m: joint: planar,rough,pink silt smear,wide,dipping 82 deg's.,quartz crystals.				6.30-6.60: coarse grained subrounded relict gravel clasts.
	6.80				8					
7	7.00	100	45	-	NI				7.00	
							END			Borehole terminated.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 47

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 1.3m

DRILLING STARTED: 13.9.04
DRILLING COMPLETED: 13.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 4.30m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1									1.30	
	1.30	100	77	-	15	Close (medium from 2.7-3.1m),irregular,rough,dipping 12 deg's.				Very strong slightly weathered cream thickly bedded CONGLOMERATE.
2	1.60	100	84	38					2.40	
					NI	Extremely close,undulating,stepped,rough,cream silt smear,dipping 30 deg's.			2.70	Moderately strong moderately weathered thinly laminated green SILTSTONE.
3	2.70	100	90	41	6	Close (medium from 2.7-3.1m),irregular,rough,dipping 12 deg's. 3.5-3.8m: joint: vertical,undulating,stepped,rough,pink silt smear,wide.				Very strong slightly weathered cream thickly bedded CONGLOMERATE.
4	4.00	100	80	-	7	4.1-4.3m: joint: irregular,rough,pink silt smear,open,dipping 82 deg's.			4.30	
	4.30						END			Borehole terminated.
5										
6										
7										
8										
9										
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 48

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	LOCATION: Derrybrien, Co. Galway	DRILLING STARTED: 13.9.04
CORE BARREL: HQ	GROUND SURFACE	DRILLING COMPLETED: 13.9.04
BIT DESIGN: HQ	ELEVATION m O.D.: msl	DRILLING BY: TH
CORE DIAMETER mm: HQ	INCLINATION: Vertical	AZIMUTH: ---
FLUSH: water	CASING DEPTH (m): 3.2m	FINAL DEPTH: 6.50m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1										
2										
3									3.20	Overburden - recovered as black fibrous PEAT/ORGANIC SILT.
	3.20	50	-	-					3.40	3.20: CPT at 3.20m: 3,3,4,30 for 0mm.
4	3.40	100	56	-	NI 13 NI 32	Close (medium from 5.40n),irregular,stepped,dipping 10 deg's,rough. 3.6-3.95m: joint: vertical,planar,stepped,open. 4.3-5.2m: joint: vertical,planar,stepped,open. 5.2-5.3m: joint: undulating,stepped,open. 6.2-6.4m: joint: irregular,stepped,dipping 72 deg's,open,cream silt smear.				Strong slightly weathered cream thinly bedded CONGLOMERATE. 3.40-5.80: fine to medium grained.
5	5.00	100	97	50	10					5.80-6.50: coarse grained.
6					3				6.50	
	6.50						END			Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 49

Sheet 1 of 1

Co-ordinates:

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 1.5m

DRILLING STARTED: 10.9.04
DRILLING COMPLETED: 10.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 5.80m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1										
	1.50								1.50	
		100	-	-					1.70	Overburden - recovered as black fibrous PEAT with wood fragments.
	1.70					Close,irregular,stepped,dipping 20 deg's,rough, some cream silt smear.				Very strong slightly weathered greenish cream fine to coarse grained massive CONGLOMERATE. 1.70-2.50: moderately weathered.
2		100	19	-	NI	1.7-2.5m: joint: subvertical,undulating,stepped, rough,grey sandy silt smear,open.				
						2.9-2.95m: greenish white gravelly silt (possible residual rock).				
	2.70									
3		100	80	24		4.0-4.25m: joint: undulating,stepped, rough,black silt smear,open,dipping 80 deg's.				
						4.7-4.9m: joint: undulating, tight,dipping 82 deg's.				
4						5.7-5.8m: joint: undulating,stepped, rough,iron stain,wide,dipping 60 deg's.				
	4.30									
5		100	99	24						
	5.80								5.80	
6							END			Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 50

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 1.5m

DRILLING STARTED: 10.9.04
DRILLING COMPLETED: 10.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 6.20m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1										
	1.50								1.50	
2		66	-	-						Overburden - recovered as subrounded to rounded quartz gravel and cobbles and some mudstone gravel. 1.65-1.95: CPT at 1.65m: N=16.
3	3.10								3.10	
		100	93	32	11	Close,irregular,stepped,dipping 20-30 deg's,rough, some dark cream sandy clay smear.				Strong slightly weathered cream coarse grained sandy massive CONGLOMERATE.
4					12					
	4.60									
5		100	89	21	13					
6	6.20								6.20	
							END			Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 51

Sheet 1 of 2

Co-ordinates:

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 10.9.04
DRILLING COMPLETED: 10.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 11.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
3	3.00	15	-	-					3.00	Overburden - recovered as purple slightly sandy gravelly SILT with sandstone cobbles.
4	4.30	40	-	-						
5										
6	5.80	100	-	-						
7	7.30									
8		100	33	-	7	Close,irregular,rough,dipping 12 deg's.,pink silt smear.			8.00	Strong slightly weathered purple thinly bedded slightly sandy SILTSTONE.
									8.60	
9	8.80	100	91	41	15	Close (medium from 9.5m),undulating,dipping 20 deg's,rough, some pink silt smear.				Very strong slightly weathered greenish purple fine to coarse grained quartz micaceous SANDSTONE. 8.60-9.50: thinly bedded. 9.50-10.10: thickly laminated.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 51

Sheet 2 of 2

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 10.9.04
DRILLING COMPLETED: 10.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 11.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
10									10.10	
	10.30					Medium spaced,undulating,stepped,rough, dipping 20 deg's.				Very strong slightly weathered green speckled grey fine to coarse grained medium bedded quartzitic CONGLOMERATE.
		100	99	91	4	10.4-10.7m: joint: undulating,tight,dipping 78 deg's,iron stain.				
11	11.00						END		11.00	Borehole terminated.
12										
13										
14										
15										
16										
17										
18										
19										
20										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 51A

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.5m

DRILLING STARTED: 24.9.04
DRILLING COMPLETED: 24.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 9.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.50	
	2.50	50	-	-						Overburden - recovered as 50mm peat on 200mm grey gravelly silt overlying purple sandy gravelly silt with cobbles and boulders.
3	3.00	48	-	-						
4	4.50	80	-	-						
6	6.00	100	-	-						
	7.50	97	-	-						
9	9.00						END		9.00	Borehole terminated.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 51B

Sheet 1 of 1

Co-ordinates:

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.4m

DRILLING STARTED: 24.9.04
DRILLING COMPLETED: 24.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 9.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
3.40	3.40	25	-	-					3.40	Overburden - recovered as 100mm peat on 140mm grey gravelly silt overlying purple sandy gravelly silt with cobbles and boulders.
4.50		75	-	-					5.60	
6.00	6.00	98	81	47	12 NI 9	Close (occasionally medium),bedding parallel, undulose, moderately open,occasionally non-intact. Also subvertical,planar,rough to stepped,moderately open and clay filled.				Moderately strong(locally moderately weak), highly-locally moderately weathered, green purple white fine grained subhorizontal thin to medium bedded SANDSTONE (becoming a vesicular sandstone conglomerate below 7.80m).
7.50	7.50	100	59	47	NI 5				9.00	
9	9.00						END			Borehole terminated.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 52

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	LOCATION: Derrybrien, Co. Galway	DRILLING STARTED: 10.9.04
CORE BARREL: HQ	GROUND SURFACE	DRILLING COMPLETED: 10.9.04
BIT DESIGN: HQ	ELEVATION m O.D.: msl	DRILLING BY: TH
CORE DIAMETER mm: HQ	INCLINATION: Vertical	AZIMUTH: ---
FLUSH: water	CASING DEPTH (m): 1.6m	FINAL DEPTH: 8.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1									1.60	
	1.60									Overburden - recovered as firm purple slightly sandy gravelly SILT.
2		30	-	-						1.75: CPT at 1.75m: N=10
	2.60									2.60: stiff, gravelly.
3		83	-	-						2.75: CPT at 2.75m: N=19
	3.20									
		22	-	-						
4	4.10								4.10	
		88	36	-	NI	Non-intact.			4.60	Recovered as strong highly weathered purple thinly laminated SILTSTONE gravel and cobbles. 4.10: CPT at 4.10m: N=refusal.
					12	Very close,planar,stepped,dipping 10 deg's,rough, some mica.				Strong slightly weathered purple fine to medium grained thinly laminated micaceous SANDSTONE.
5	5.00					4.7-4.9m: joint: vertical,undulating,stepped,rough,open.				
		100	91	33	33	5.5-5.65m: joint: vertical,undulating,stepped,rough,open.			6.05	
6						Medium,planar,stepped,rough,dipping 20 deg's.,some mica,iron stain.				Very strong fresh cream mottled purple fine to coarse grained thinly bedded SANDSTONE.
	6.50				5					
7									7.20	
		100	59	37	NI	Very close,irregular,horizontal,stepped,smooth.				Moderately strong slightly weathered purple SILTSTONE. 7.20-7.30: slightly sandy.
					4				8.00	
8	8.00						END			Borehole terminated.
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 53

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 14.9.04
DRILLING COMPLETED: 14.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 6.00m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
3	3.00								3.00	
		100	55	-	11	Close,planar,smooth,dipping 10 deg's.				Moderately strong slightly weathered purple slightly sandy feldspathic SILTSTONE.
					NI	Non-intact.				
4					5					
	4.50									4.50-5.20: highly weathered.
5		100	23	-	NI					
6	6.00						END		6.00	Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 54

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 14.9.04
DRILLING COMPLETED: 14.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 6.50m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									3.00	
3	3.00									Overburden - recovered as black fibrous PEAT with wood fragments.
									3.50	
		88	46	16	11	Close,planar,stepped,dipping 20 deg's,rough. 3.6-3.8m: joint: subvertical,planar,stepped,open. 3.9-4.0m: joint: smooth,planar,stepped,open,dipping 60 deg's.				Strong slightly weathered brown fine grained massive SANDSTONE.
4									4.60	
	4.60	100	73	37	14	Close,irregular,rough,dipping 30 deg's.				Strong slightly weathered cream medium grained massive CONGLOMERATE.
5									5.60	
	5.60	100	63	55	NI 7	Close,undulating,rough,dipping 12 deg's,some mica.				Strong slightly weathered purple thinly bedded slightly sandy feldspathic SILTSTONE. 5.60-5.90: highly weathered,gravel fragments.
6									6.50	
	6.50						END			
7										
8										Borehole terminated.
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 55

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	LOCATION: Derrybrien, Co. Galway	DRILLING STARTED: 15.9.04
CORE BARREL: HQ	GROUND SURFACE	DRILLING COMPLETED: 15.9.04
BIT DESIGN: HQ	ELEVATION m O.D.: msl	DRILLING BY: TH
CORE DIAMETER mm: HQ	INCLINATION: Vertical	AZIMUTH: ---
FLUSH: water	CASING DEPTH (m): 3.0m	FINAL DEPTH: 9.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1										
2										
3	3.00								3.00	
		20	-	-						Overburden - recovered as firm purple slightly sandy gravelly SILT.
4	4.00									
		22	-	-						4.15-4.45: CPT at 4.00m: N=14.
	4.90	100	-	-						
5	5.00								5.10	
		94	33	28	NI	Non-intact.			6.00	Moderately weak highly weathered purple slightly sandy SILTSTONE gravel. 5.15-5.45: CPT at 5.00m: N=56.
6					6	Close (medium from 7.9m),irregular,dipping 12 deg's,rough.				Very strong slightly weathered cream thickly bedded fine to coarse CONGLOMERATE.
	6.60									
7		100	88	74	8					7.20-7.50: purple.
	7.90									
8		100	96	95	1					
									9.00	
9	9.00						END			Borehole terminated.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 56

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 15.9.04
DRILLING COMPLETED: 15.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 7.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									3.00	
3	3.00									Overburden - recovered as firm purple slightly sandy gravelly SILT. 3.15-3.45: CPT at 3.00m: N=10.
									3.70	
4		56	22	-	20	Very close,undulating,dipping 28 deg's,rough, sandy smear. 5.0-5.3m: joint: subvertical,undulating,stepped,rough,open.				Strong moderately weathered cream fine to medium grained thinly bedded SANDSTONE.
	4.60					5.3-5.9m: joint: subvertical,undulating,stepped,rough,open,sandy.				4.60-4.70: purple. 4.70-6.40: weak,highly weathered,brown.
5		100	16	-	NI					
6	6.10									
		100	95	12	5				6.70	6.40-6.70: strong,slightly weathered,purple,thinly bedded,cream sandstone with feldspars.
					4	Close,undulating,stepped,rough,dipping 38 deg's.			7.00	Strong slightly weathered purple fine to medium grained feldspathic SANDSTONE.
7	7.00						END			Borehole terminated.
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 57

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 9.9.04
DRILLING COMPLETED: 9.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 6.00m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									1.50	
	1.50	100	-	-	NI					Overburden - recovered as stiff purple slightly sandy gravelly SILT (possible residual rock). 1.65-1.95: CPT at 1.50m: N=17.
	2.60								2.60	
		100	77	-	6	Close,planar,stepped,dipping 10 deg's,rough. 3.25-3.35m: joint: subvertical,planar,stepped,a little pink silt smear,iron stain,open.				Very strong slightly weathered greenish grey speckled black thinly bedded quartzitic SANDSTONE.
	3.00									
		100	86	9	16	3.6-4.05m: joint: subvertical,undulating,tight. 4.45-4.5m: joint: undulating,rough,dipping 68 deg's.				
					11				4.50	
	4.50				NI	Close,planar,stepped,rough,dipping 10 deg's,some mica.				Moderately strong slightly weathered cream purple thinly laminated fine to medium SANDSTONE.
					8				5.00	
		100	63	16	NI	Non-intact.				Moderately strong highly weathered purple SILTSTONE grave.
									5.40	
					7	Close,planar,stepped,dipping 10 deg's,rough. 5.8-5.85m: joint:subvertical,undulating,stepped,rough,open.				Moderately strong slightly weathered cream purple thinly laminated fine to medium SANDSTONE.
	6.00						END		6.00	Borehole terminated.

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 58

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	**LOCATION: Derrybrien, Co. Galway**	**DRILLING STARTED: 8.9.04**
CORE BARREL: HQ	**GROUND SURFACE**	**DRILLING COMPLETED: 8.9.04**
BIT DESIGN: HQ	**ELEVATION m O.D.: msl**	**DRILLING BY: TH**
CORE DIAMETER mm: HQ	**INCLINATION: Vertical**	**AZIMUTH: ---**
FLUSH: water	**CASING DEPTH (m): 3.0m**	**FINAL DEPTH: 6.00m**

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1										
2									2.40	
	2.40	100	37	-	21	Very close,undulating,stepped,dipping 10 deg's,rough, some cream silt smear.				Very strong slightly weathered cream speckled brown fine to medium grained thinly bedded SANDSTONE.
3	2.80				32	3.6-3.8m: joint: subvertical,planar,stepped,smooth,a little cream silt smear,open. 4.25-4.3m: joint: planar,stepped,rough,brown silt smear,dipping 50 deg's.,open.				
		100	76	-					3.80	
4					NI	4.4-4.6m: joint: undulating,stepped,smooth,pink slightly sandy silt smear,open.			4.10	Strong highly weathered green siltstone GRAVEL with some grey sandy silt.
	4.40				17	5.4-5.5m: joint: undulating,stepped,rough,pink silt smear,dipping 76 deg's.,open. 5.2-5.3m: joint: undulating,stepped,rough,cream grey slightly sandy clay smear,wide,horizontal.				Very strong slightly weathered cream speckled brown fine to medium grained thinly bedded SANDSTONE.
5		100	82	9	22	5.63-6.00m: joint: undulating,stepped,smooth,black silt smear,open,dipping 88 deg's.			6.00	
6	6.00						END			Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 59

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.7m

DRILLING STARTED: 20.9.04
DRILLING COMPLETED: 20.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 9.50m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.70	
	2.70	54	-	-						Overburden - recovered as purple slightly sandy gravelly SILT.
	3.20	35	-	-						
	4.60	65	-	-						4.75-5.05: CPT at 4.75m: N=17.
	6.20	100	84	38	16	Medium,undulating,stepped,smooth,dipping 20 deg's,some sandy silt and mica.			6.20	Very strong slightly weathered cream fine to medium grained thickly bedded SANDSTONE. 6.70-6.75: very weak,highly weathered,greenish cream.
					8					
	7.90	100	91	80	2					
	9.50						END		9.50	Borehole terminated.

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 60

Sheet 1 of 2

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	LOCATION: Derrybrien, Co. Galway	DRILLING STARTED: 17.9.04
CORE BARREL: HQ	GROUND SURFACE	DRILLING COMPLETED: 17.9.04
BIT DESIGN: HQ	ELEVATION m O.D.: msl	DRILLING BY: TH
CORE DIAMETER mm: HQ	INCLINATION: Vertical	AZIMUTH: ---
FLUSH: water	CASING DEPTH (m): 3.6m	FINAL DEPTH: 10.30m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									3.60	
	3.60	32	-	-						Overburden - recovered as purple slightly sandy gravelly SILT. 3.75: CPT at 3.75m: N=12.
	5.30	33	-	-						5.45: CPT at 5.45m: N=12.
	5.60	30	-	-					6.30	
	6.60	83	-	-	NI	Non-intact.				Moderately weak,highly weathered purple SILTSTONE gravel.
	7.80	100	13	-						
	9.30	100	35	-		Close,undulating,dipping 3 deg's,smooth, some grey silt smear.				9.10: moderately strong,moderately weathered.
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 60

Sheet 2 of 2

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	**LOCATION: Derrybrien, Co. Galway**	**DRILLING STARTED: 17.9.04**
CORE BARREL: HQ	**GROUND SURFACE**	**DRILLING COMPLETED: 17.9.04**
BIT DESIGN: HQ	**ELEVATION m O.D.: msl**	**DRILLING BY: TH**
CORE DIAMETER mm: HQ	**INCLINATION: Vertical**	**AZIMUTH: ---**
FLUSH: water	**CASING DEPTH (m): 3.6m**	**FINAL DEPTH: 10.30m**

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
10										
									10.30	Moderately weak,highly weathered purple SILTSTONE gravel. *(continued)*
	10.30						END			Borehole terminated.
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 61

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.8m

DRILLING STARTED: 17.9.04
DRILLING COMPLETED: 17.9.04
DRILLING BY: TH
AZIMUTH: —
FINAL DEPTH: 6.00m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.80	
	2.80				NI				2.90	Overburden - recovered as purple slightly sandy gravelly SILT.
3		100	60	-	32	Extremely close (close from 5.0m),planar,stepped,dipping 8 deg's,rough.				Strong slightly weathered cream fine to medium grained thickly laminated SANDSTONE.
	3.40				22	4.1-4.4m: joint: vertical,planar,stepped,tight to 4.2m then open.				
4		100	96	-	45					4.30-5.00: weak,moderately weathered,green brown.
5	5.00	100	97	38	11					
									6.00	
6	6.00						END			Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 62

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	**LOCATION: Derrybrien, Co. Galway**	**DRILLING STARTED: 16.9.04**
CORE BARREL: HQ	**GROUND SURFACE**	**DRILLING COMPLETED: 16.9.04**
BIT DESIGN: HQ	**ELEVATION m O.D.: msl**	**DRILLING BY: TH**
CORE DIAMETER mm: HQ	**INCLINATION: Vertical**	**AZIMUTH: ---**
FLUSH: water	**CASING DEPTH (m): 3.4m**	**FINAL DEPTH: 9.00m**

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
1										
2										
3									3.40	
	3.40	42	-	-					4.80	Overburden - recovered as greenish grey slightly sandy gravelly SILT.
4										
5	4.80	81	53	-	23	Close,planar,dipping 10 deg's,rough, some green grey silt smear. 5.2-5.5m: joint: subvertical,planar,rough,a little cream silt smear,open.				Very strong slightly weathered greenish speckled brown cream fine to medium grained massive SANDSTONE.
	5.80	58	30	7	NI	6.6-6.8m: joint: 2 no. parallel at 64 deg's,curviplanar,stepped,brown silt smear,rough,open. 7.2-7.35 and 7.25-7.3m: joint: undulating,stepped,smooth,open dipping 74 deg's,black iron smear.				5.80-6.40: very weak residual sandstone (recovered as sand and gravel sandstone clasts).
6										
7					7	7.7-8.0m: joint: vertical,curviplanar,stepped,black iron smear,open. 8.2-8.35m: joint: planar,stepped,open dipping 74 deg's,cream silt smear.				
	7.30	100	70	36	10	8.7-9.0m: joint: subvertical,planar,stepped,pink silt smear,open.				
8	7.90	100	79	46	6				9.00	
9	9.00						END			Borehole terminated.
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 64

Sheet 1 of 2

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 3.0m

DRILLING STARTED: 16.9.04
DRILLING COMPLETED: 16.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 13.50m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.70	
	2.70									Overburden - recovered as purple slightly sandy gravelly SILT with cobbles.
3		36	-	-						3.15-3.45: CPT at 3.15m: N=8. 3.50: becoming firm.
4	4.50									4.50: becoming stiff. 4.65-4.95: CPT at 4.65m: N=22.
5		73	-	-						
6	6.00									6.00: becoming very stiff. 6.15-6.45: CPT at 6.15m: N=38.
7		46	-	-						
	7.50									7.65-7.95: CPT at 7.65m: N=42.
8		34	-	-						
	8.80									
9		8	-	-						
	9.60									
10										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 64

Sheet 2 of 2

Co-ordinates:

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core

CORE BARREL: HQ

BIT DESIGN: HQ

CORE DIAMETER mm: HQ

FLUSH: water

LOCATION: Derrybrien, Co. Galway

GROUND SURFACE

ELEVATION m O.D.: msl

INCLINATION: Vertical

CASING DEPTH (m): 3.0m

DRILLING STARTED: 16.9.04

DRILLING COMPLETED: 16.9.04

DRILLING BY: TH

AZIMUTH: ---

FINAL DEPTH: 13.50m

Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0		100	43	15					10.30	
	10.50				28	Close,planar,stepped,dipping 10 deg's,smooth, some mica and purple silt smear. 10.9-11.1m: joint: vertical,curviplanar,stepped,smooth,a little pink silt smear,open.				Strong slightly weathered purple fine grained thinly laminated micaceous SANDSTONE.
1		100	83	40					11.60	
					5	Close,planar,stepped,rough. 11.8-12.0m: joint: planar,stepped,dipping 70 deg's,pink silt and iron stain.			12.00	Very strong slightly weathered cream massive coarse SANDSTONE.
2	12.00									
		100	85	29	23	Medium,planar,stepped,dipping 20 deg's,smooth, some mica and grey silt smear. 12.1-12.6m: joint: vertical,undulating,stepped,rough,a little green grey silt smear and iron stain,open				Very strong slightly weathered greenish grey fine to medium grained thinly laminated micaceous SANDSTONE.
3					3	12.6-12.7m: joint: undulating,stepped,rough,dipping 60 deg's,grey silt smear,open.				13.10: grey.
	13.50								13.50	
							END			Borehole terminated.
4										
5										
6										
7										
8										
19										
20										

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 64A

Sheet 1 of 2

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.5m

DRILLING STARTED: 23.9.04
DRILLING COMPLETED: 23.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 10.50m

Co-ordinates:

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.50	
	2.50									Overburden - recovered as purple slightly sandy gravelly SILT.
		17	-	-						
	4.60									
		47	-	-						
	6.00									
		25	-	-						
	7.20									
		100	-	-						
	8.80									
		93	71	71	3	Medium spaced,planar to undulose,bedding parallel,slightly rough,tight.			9.30	Very strong slightly weathered brownish white medium bedded SANDSTONE with occasional green siltstone flakes.

Remarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 64A

Sheet 2 of 2

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core	**LOCATION: Derrybrien, Co. Galway**	**DRILLING STARTED: 23.9.04**
CORE BARREL: HQ	**GROUND SURFACE**	**DRILLING COMPLETED: 23.9.04**
BIT DESIGN: HQ	**ELEVATION m O.D.: msl**	**DRILLING BY: TH**
CORE DIAMETER mm: HQ	**INCLINATION: Vertical**	**AZIMUTH: ---**
FLUSH: water	**CASING DEPTH (m): 2.5m**	**FINAL DEPTH: 10.50m**

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
10										
									10.50	Very strong slightly weathered brownish white medium bedded SANDSTONE with occasional green siltstone flakes. *(continued)*
	10.50						END			Borehole terminated.
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 64B

Sheet 1 of 1

CLIENT: Ascon

ENGINEER:

Co-ordinates:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.0m

DRILLING STARTED: 24.9.04
DRILLING COMPLETED: 24.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 8.50m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
									2.30	
	2.30	46	-	-						Overburden - recovered as 100mm of silty sand over purple slightly sandy gravelly SILT with cobbles.
3	3.00	55	-	-						
4	4.00	43	3	-						5.20: creamish grey.
									5.50	
	5.60	100	94	81	8	Medium to closely spaced,planar,bedding parallel,slightly rough,tight generally clean(stained at 6.6m).				Very strong fresh to slightly weathered pale green medium bedded subhorizontal fine grained SANDSTONE with occasional thin siltstone intervals.
7	7.00	100	100	100	6					
									8.50	
	8.50						END			Borehole terminated.
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

ROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 70

Sheet 1 of 1

Co-ordinates:

IENT: Ascon

ENGINEER:

ACHINE TYPE: rotary core
ORE BARREL: HQ
T DESIGN: HQ
ORE DIAMETER mm: HQ
USH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.6m

DRILLING STARTED: 22.9.04
DRILLING COMPLETED: 22.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 8.00m

Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0.00								0.80	Openhole drilling - no recovery. Driller's description: PEAT.
0.80	19	-	-						Overburden - recovered as purple slightly sandy gravelly SILT with cobbles.
2.60	38	-	-						
3.90	92	-	-						
5.00	100	77	73	5	Medium to closely spaced,subplanar,bedding parallel,locally undulose rough,tight frequently discoloured.			5.35	Very strong fresh to slightly weathered greenish grey brown purple thin and medium bedded subhorizontal SANDSTONE (becoming conglomeratic below 7.70m).
6.50	100	100	95					8.00	
8.00						END			Borehole terminated.

emarks:

Scale: 1:50

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PROJECT: Proposed Windfarm at Derrybrien

BOREHOLE: T 71

Sheet 1 of 1

Co-ordinates:

CLIENT: Ascon

ENGINEER:

MACHINE TYPE: rotary core
CORE BARREL: HQ
BIT DESIGN: HQ
CORE DIAMETER mm: HQ
FLUSH: water

LOCATION: Derrybrien, Co. Galway
GROUND SURFACE
ELEVATION m O.D.: msl
INCLINATION: Vertical
CASING DEPTH (m): 2.5m

DRILLING STARTED: 22.9.04
DRILLING COMPLETED: 22.9.04
DRILLING BY: TH
AZIMUTH: ---
FINAL DEPTH: 6.00m

Borehole Depth (m)	Core Run Depth (m)	Total Core Recovery %	Solid Core Recovery %	Rock Quality Designation %	Fracture Spacing Index	DISCONTINUITIES	LEGEND	Elevation m O.D.	Depth (m)	GEOLOGICAL DESCRIPTION
0	0.00									Openhole drilling - no recovery. Driller's description: PEAT.
	2.50								2.90	
3		79	69	-		Close to very closely spaced, bedding parallel, planar,slightly rough,generally tight,frequently discoloured.				Weak to moderately weak, highly to completely weathered orange brown medium grained thinly to very thinly bedded (15-25 deg's) SANDSTONE.
4	4.20								4.20	
		100	53	19	>15	Very close,bedding parallel,tight. Fracture: planar,subvertical.			4.70	Strong slightly to moderately weathered cream white fine grained thinly to medium bedded SANDSTONE.
5	5.20	100	15	-	NI	Non-intact.				Angular coarse gravel size fragments of green and purple fine grained pebble CONGLOMERATE.
6	6.00						END		6.00	Borehole terminated.
7										
8										
9										
10										

Remarks:

Scale: 1:50

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ROTARY COREHOLE DERRYBRIENRC.GPJ IRISHDRL.GDT 06/10/04

APPENDIX III

AGL REPORT NO. 03-104-R01 (REV.1) ON STABILITY OF FLOATING ROADS, TURBINE EXCAVATIONS & PEAT DISPOSAL AREAS

Report on the Stability of the Floating Roads, Turbine Excavations and Peat Disposal Areas on the site of the Derrybrien Windfarm, Co. Galway

Report No. 03-104-R01 (Rev 1)

for

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November 1st, 2004

Report on the Stability of the Floating Roads, Turbine Excavations and Peat Disposal Areas on the site of the Derrybrien Windfarm, Co. Galway

1.0 INTRODUCTION

This report gives details of the assessment of the stability of the floating roads, turbine excavations and peat disposal areas that has been carried out to date for the Derrybrien Windfarm in Co. Galway. The conclusions presented in this report are based on the results of the geotechnical investigation carried out on the site by Ascon Ltd. and AGL Consulting since August 17th, 2004, and a back-analysis of the bog-slide that occurred on the site in October 2003.

Ascon Ltd. have identified a programme of work for November/December 2004 which includes the construction of the remaining floating roads and 6 No. turbine bases in the northern part of the site, trafficking of the roads in that area with construction plant, and disposal of material from the excavations for the turbine bases.

Details of the ground investigations that have been carried out on the site to date are presented herein. The procedures for assessing the stability of the floating roads and repository sites are outlined, and the results of the analyses and field tests for the northern part of the site are presented.

It is demonstrated that the existing floating roads in the northern part of the site have an adequate margin of safety against failure using the undrained shear strengths determined using the Geonor H-10 with the 65 mm/130 mm vane. Results are also presented for field tests to evaluate the performance of the floating roads under the proposed maximum loads anticipated during construction of the remaining turbine bases on the northern part of the site.

The proposed alignment of the new floating roads to be constructed between bases T47 and T51, and between T53 and T55 has also been assessed. Between T47 and T51 it is proposed to realign the road away from the crest of the steeply sloping ridge along the original alignment. The new road will be constructed across relatively flat ground approximately 25 m to the south of the ridge. Between T53 and T55 it is proposed to realign the road across relatively flat ground to the north of the existing alignment, where the peat is shallower and where there is a backfall to the ground downslope from the road. In this report we demonstrate that the new road alignments will have an adequate margin of safety against failure and can therefore proceed to construction. The roads will be proof tested for construction traffic loads prior to use.

A desk study of the site has been carried out using 3-D stereoscopic imaging of aerial photographs to identify areas that would be suitable for peat repository sites. The procedure for assessing the repository sites is outlined in this report and the results of the assessment are presented for the repository sites that will be used for the first six bases

that Ascon propose to construct in the northern part of the site. It is demonstrated in this report that the geometry of the slope and the strength of the peat in these areas is suitable for the storage of up to 1.0 m depth of peat from the turbine excavations. Piston sampling was carried out at selected locations in the site to ensure that there is no weak layer/discontinuity near the base of the peat that could lead to a slide under the weight of the peat arisings. The repository sites will only be used for peat storage. The mineral soils will be disposed of at controlled locations.

Finally, a summary is presented of the remaining geotechnical investigation that will be carried out to assess the stability of the floating roads on the southern part of the site. A summary of the geotechnical investigation that has already been completed in this area is included in this report.

Suitable repository sites for the peat excavated from the remaining turbine bases that need to be constructed will be identified on a case by case basis in accordance with the procedures outlined in this report. Based on the desk study, areas of the site that exhibit similar characteristics to the area where the slide occurred last year will be excluded from consideration.

A complete record of the ground investigations carried out on the site, along with the remaining stability analyses and road test results will be presented in a supplemental report when the work has been completed.

2.0 SUMMARY OF SUPLEMENTAL GROUND INVESTIGATION

2.1 Introduction

In this section a summary is provided of the supplemental ground investigation that has been carried out on the site to date by AGL Consulting and Ascon. The methods of investigation adopted on the site include gouge auger probing, in-situ vane shear tests, topographical surveys, piston sampling and rotary coring.

A hand-operated steel gouge auger probe was used to determine the depth of peat at selected locations. This type of probe has generally been found to successfully penetrate the very soft peat down to the top of the underlying mineral soil.

The in-situ vane shear tests were carried out using a Genor H-10 penetration vane with the 65mm diameter by 130 mm high rectangular vane. The test procedure has been assessed and reviewed on site to obtain reliable and consistent results.

Slope angles at the top and base of the peat have been determined by surveying the probe locations using a combination of GPS equipment, conventional optical survey leveling, and a hand held Abney Level. The Abney Level and optical survey level were used to determine slope angles in areas where the GPS could not be used due to interference from the trees. All three methods have been found to give acceptable results.

Rotary coring was carried out by Irish Drilling Ltd. at selected turbine bases to determine the depth to rock and the depth of mineral soil under the peat. Standard penetration tests (SPT) were carried out in the mineral soil at selected locations.

Piston samples were collected using a Geonor piston sampling device with 50 mm diameter thin walled tube samplers. The device was hand-operated in peat to depths of up to 5.0 m.

2.2 Supplemental investigation for floating roads

The work that was carried out for the analysis floating roads generally consists of

- Gouge auger probes on 25 m intervals on the downslope side of the road and at a 50 m offset. In some cases intermediate probes were also carried out at a 25 m offset to facilitate slope measurements where the slopes were covered in trees, or where there was a break in the slope between 0 and 50 m downslope.

- Topographical surveying at probe locations to determine the slope angle at the surface and base of the peat on the downslope side of the road. Wherever possible the probes have been surveyed with the GPS system to record the

location relative to the national grid and the ground surface elevation relative to Ordnance Datum.

- In situ vane shear tests at 50 to 100 m intervals along the floating roads, and at selected locations under the road. At each location vane shear tests were carried out at 0.5 m depth intervals over the full depth of peat.

- An incremental road test using an 8-wheel truck with a laden weight of up to 36.5 tonnes. The road deflection was measured at selected locations by optical survey.

Tables Nos. 2.1a) and 2.1b) list the work that was carried out in the different parts of the site for the analysis of the stability of the roads. Similar to previous investigations carried out on the site, the data has been split up on a cell by cell basis for each turbine. The probe and vane shear test results for each cell are included in Appendix A.

Table No. 2.1a) Summary of data collected in the northern part of the site for the floating road analyses.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T47	X	3	X
T48	X	3	X
T49	X	3	X
T50	X	3	X
T51	X	3	X
T52	X	4	X
T53	X	2	X
T54	X	3	X
T55	X	8	X
T56	X	4	X
T57	X	4	X
T58	X		X
T59	X	2	X
T60	X	2	X
T61	X	2	X
T62	X	4	X
T63	X	2	X
T64	X	2	X
T65	X		X

Table No. 2.1b) Summary of data collected over the rest of the site for the floating road analyses.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T1			
T2	X		X
T3			
T4			
T5	X		X
T6			
T7			
T8			
T9			
T10			
T11			
T12			
T13	X		X
T14			
T15			
T16			
T17	X	3	X
T18	X	2	X
T19	X		X
T20			
T21			
T22			
T23			
T24			
T25	X	2	X
T26			
T27			
T28			
T29			
T30	X	4	X
T31			
T32			
T33	X	4	X
T34			
T35	X		X
T36	X		X
T37			
T38			
T39	X		X
T40			
T41			

Table No. 2.1b) contd.: Summary of data collected over the rest of the site for the floating road analyses.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T42	X		X
T43			
T44			
T45			
T46			
T66	X	4	X
T67			
T68	X	3	X
T69	X	6	X
T70	X		X
T71			

Note: It was not possible to locate all of the probes and vane shear test locations by GPS. Therefore, a numbering system was used which gives the approximate location of the probe or vane shear test. Following is a guide to the system that was used:

VST55+50: Vane shear test in Cell T55, 50 m to the east of the turbine base (i.e. +50). The test was carried out on the downslope side of the road, typically about 3 m from the edge of the road.

P55A-50: Gouge auger probe in Cell T55 approximately 3 m downslope from the floating road (**A**), 50 m to the west of the base (i.e. -50).

P55B+50: Gouge auger probe in Cell T55 approximately 50 m downslope from the floating road (**B**), 50 m to the east of the base (i.e. +50).

VST55B: Vane shear test at the turbine base in Cell T55.

P55B-NW: Gouge auger probe at the northwest corner of the turbine base.

2.3 Supplemental investigation for turbine bases

The work that was carried out for the analysis of the turbine bases generally consists of

- Gouge auger probes at the four corners and at the centre of the base.
- 1 No. rotary corehole at each base to determine the depth to rockhead and the quality and strength of the rock.

- SPT tests at selected intervals in the overburden to assess the strength/density of the mineral soil under the peat.

- 1 No. in situ vane shear test at selected base locations. At each location vane shear tests were carried out at 0.5 m depth intervals over the full depth of peat.

Table No. 2.2 lists the work that was carried out at each of the bases that remain to be constructed. The probe and vane shear test results for each turbine are included in Appendix A. The data from the rotary coreholes are included in the report from Irish Drilling Ltd. titled "Proposed Windfarm at Derrybrien – Site Investigation Factual Report", dated September 2004.

Table No. 2.2 Summary of data collected at turbine locations.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T1			
T2	X		X
T3			
T4			
T5	X		X
T6			
T7			
T8			
T9			
T10			
T11			
T12			
T13	X		X
T14			
T15			
T16			
T17	X	3	X
T18	X	2	X
T19	X		X
T20			
T21			
T22			
T23			
T24			
T25	X	2	X
T26			
T27			
T28			
T29			

Table No. 2.2 contd. - Summary of data collected at turbine locations.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T31			
T32			
T33	X	4	X
T34			
T35	X		X
T36	X		X
T37			
T38			
T39	X		X
T40			
T41			
T42	X		X
T43			
T44			
T45			
T46			
T66	X	4	X
T67			
T68	X	3	X
T69	X	6	X
T70	X		X
T71			

2.4 Supplemental investigation for peat repository sites

The supplemental ground investigation carried out at each peat repository location consisted of the following:

- Gouge auger probes on a 25 m grid (max 30 m) over the full area of the repository site to determine the depth of peat. The grid of probes was aligned with the dip of the slope wherever possible.

- Gouge auger probes along two orthogonal planes 50 and 100 m downslope of the repository site.

- Topographical surveying between probes to determine the slope angle at the surface and base of the peat on the repository site and 50 and 100 m downslope from the site. Wherever possible the probes have been surveyed with the GPS system to record the location relative to the national grid and

the ground surface elevation relative to Ordnance Datum. Otherwise the Abney Level or optical survey level were used to determine the slope angles.

- Vane shear tests at a minimum of 2 No. locations using the Geonor H-10 Vane (65mm/130 mm), at locations selected by AGL Consulting based on the results of the probes. In general, 1 No. test will be carried out for each 50 m x 25 m area. The final test was carried out with the tip of the vane 0.25 m above the base the peat. The depth of the peat was first determined by probing 0.5 m across the slope from the vane test.

- Piston samples were collected from the base of the peat and extruded on site to ensure that there was no weak layer or discontinuity near the base of the peat from a previous slide or fire.

A summary of the ground investigation at each repository site analyzed to date is presented in Appendix B.

3.0 STABILITY OF THE FLOATING ROADS

3.1 Introduction

In this section we describe the procedure adopted for assessing the stability of the floating roads. The procedure is described in detail for the road between bases T55, T56 and T57. A summary is then presented of the soil properties, slope geometry and analysis results for all of the existing and proposed roads in the northern part of the site. The results of the field test on the existing roads in that area are also included.

The interpretation of the undrained shear strength of the peat from the in-situ vanes and the selection of a representative value for the floating road stability analyses are also discussed in this section of the report. It is demonstrated that the unadjusted undrained shear strength profiles measured using the Geonor H-10 apparatus with the 65mm/130mm vane give a representative index of the undrained shear strength of the peat for the stability calculations.

3.2 Procedure for assessing the floating roads

The stability of the floating roads was analyzed using the limiting equilibrium slope stability program Slope/W. A 2-D plane strain analysis was carried out at representative sections along the floating roads to calculate the margin of safety for the critical slip circle under the road in the undrained condition.

The stability analyses were carried out in cells corresponding to the turbine locations. For each cell analyzed, a representative design profile was determined from the gouge auger probe and topographical survey data in Appendix A. The design section represented the most conservative combination in terms of peat depth and slope angle. In some cases, where the profile changed significantly within a cell more than one design profile was analyzed.

The size of the road was conservatively taken as 5.0 m wide and 1.0 m thick. The basal reinforcement consists of a layer of trees and a single layer of Tensar SS30 geogrid within the crushed rock. We have assumed that critical slip circles would have to develop over the full width of the road for failure to occur.

A live load surcharge of 17.1 kPa has been applied to simulate the proposed load of the crane on the roads. This is equivalent to 15 m long x 2.75 m wide crane with a fully laden weight of 72 tonnes on six axles when traveling.

A representative characteristic undrained shear strength profile was determined for each cell from the unadjusted Geonor H-10 vane shear test data in Appendix A. The profile with the lowest recorded undrained shear strengths was typically used.

In accordance with Eurocode EC(7), a partial factor of 1.4 was applied to the characteristic undrained shear strengths, c_{uk} , to obtain the design values, c_{ud}. A partial factor of 1.3 was also applied to the live load surcharge. By this method of analysis a calculated margin of safety >1.0 in the slope stability analyses is acceptable. This is more conservative than the British Standard (BS) approach where no partial factor is applied to the live load.

Vane shear tests under the existing roads on the site have confirmed that there is a significant increase in strength of the peat under the weight of the road. This has been conservatively neglected in our analyses provided that an acceptable margin of safety could be achieved using the undrained shear strength profiles from the vane shear tests carried out beside the roads. However, the increase in strength is important for the stability of the roads, and in some cases it was necessary to allow for it to acheive the desired margin of safety, as described in Section 3.4, and noted on Table No. 3.2

3.3 Review of the characteristic undrained shear strength of the peat

3.3.1 Undrained shear strengths recorded on site with the Geonor H-10 65mm x 130 mm vane

The characteristic undrained shear strength (c_{uk}) values recorded along the floating roads on the site with the Geonor H-10 65mm x 130mm vane are included in Appendix A. The undrained shear strength of the peat generally ranged from 4kPa to 10kPa, with some higher values recorded in the crust at the top of the peat, at the base of the peat, or where the peat was shallow and/or well drained (e.g. T56, T57 at the Base).

At selected locations a hole was excavated through the road to determine the undrained shear strength of the peat under the road (e.g. T55, T18). The vane tests carried out under the road at T55 indicate that there is a noticeable increase in the undrained shear strength of the peat under the roads due to the consolidation of the peat from the weight of the fill.

At T55 the tests under the road were carried out near the base (VST55+0), where the lowest undrained shear strengths were recorded. Undrained shear strengths at a depth of 0.6 m increased from 7.2 kPa beside to road to 10 and 11kPa under 360 mm and 450 mm of stone, respectively. At depths of 1-3 m, the undrained shear strength increased from between 4.0 and 5.5 kPa at the side of the road, to between 6.8 and 7.3 kPa under the road.

This increase in strength is significant as it increases the stability of the road with time. The road at T55 has only been lightly trafficked and has not been finished off with the geogrid and capping layer of crushed rock. Therefore, the peat could be expected to gain more strength with time when the road is finished and used by construction traffic.

3.3.2 Discussion on the interpretation of undrained shear strength determined by in-situ vanes in peat.

Previous tests have shown that the peat on this site has high moisture contents (in excess of 800% and sometimes over 1000%) and nearly 100% loss on ignition (apart from the bottom 0.1m). The peat is generally fibrous with organic matter at various stages of decomposition. It would be expected to contain gas, particularly in the upper regions, and could drain relatively rapidly under load.

The interpretation of the in-situ vane is based on the assumption that the torque measured is related to the strength of the soil per unit of surface area sheared, and that this strength is independent of stress level. For the stability analyses on the roads it is also assumed that the undrained shear strength determined by the vane (c_{uvane}) is representative of the shear strength mobilized along a circular slip surface at failure.

These assumptions are invalidated when interpreting the in-situ vane in peat since the peat is fibrous, it can drain rapidly and it contains gas (which means that the shear strength is not independent of stress level). The in-situ vanes must therefore be taken as an index test of the strength of the peat.

Experience and publications have shown that c_{uvane} is dependent of the size of the vane in peat. In comparison, in clay, where the assumptions are valid, c_{uvane} does not depend on the size of the vane.

2 No. comparative tests were carried out on the Derrybrien site between the Geonor H-10 with the 65 mm x 135 mm vane, and the larger 135mm by 270mm vane used by ESBI. The results are compared on Figure No. 3.1. These tests would seem to indicate that the interpreted c_{uvane} below a depth of 1.0 m and above the base of the peat are higher for the Geonor H-10 penetration vane than the larger 135mm by 270mm vane used by ESBI. The ratio of strengths between the Geonor H-10 and ESBI Vanes generally ranges from 1.5 to 1.85, but one value up to 2.7 was calculated at a depth of 3.0 m in the forest in cell T56.

Similarly, the undrained shear strengths recorded by AGEC (Applied Ground Engineering Consultants) using the Geonor H-10 with the smaller 55mm x 110mm vane are greater than the values recorded with the 65mm x 130mm vane. The bulk of the data from their vane tests was in the range 6 to 15kPa (see Figure No. 4 of AGEC report – Final Report on Derrybrien Windfarm Post-Landslide Site Appraisal), compared to 4 to 10 kPa using the larger 65mm x 130mm vane.

A similar finding is reported in the Muskeg Engineering Handbook (1969), in the Japanese Peat Engineering handbook (1991) and elsewhere. However the reason for the difference has not been identified in these publications.

It is known that the c_{uvane} in peats decreases with rate of shearing (which is different to clays), that it involves shearing and distortion of fibres in the peat, that the shear surface is about 10mm outside the vane itself, and that the peat is compressed on one side of the vane and separates from the vane on the other side. However it is difficult to account for the difference between the c_{uvane} determined for the different sizes from these considerations. Reliance must therefore be made on practical experience and, if possible, on-site calibration of the results.

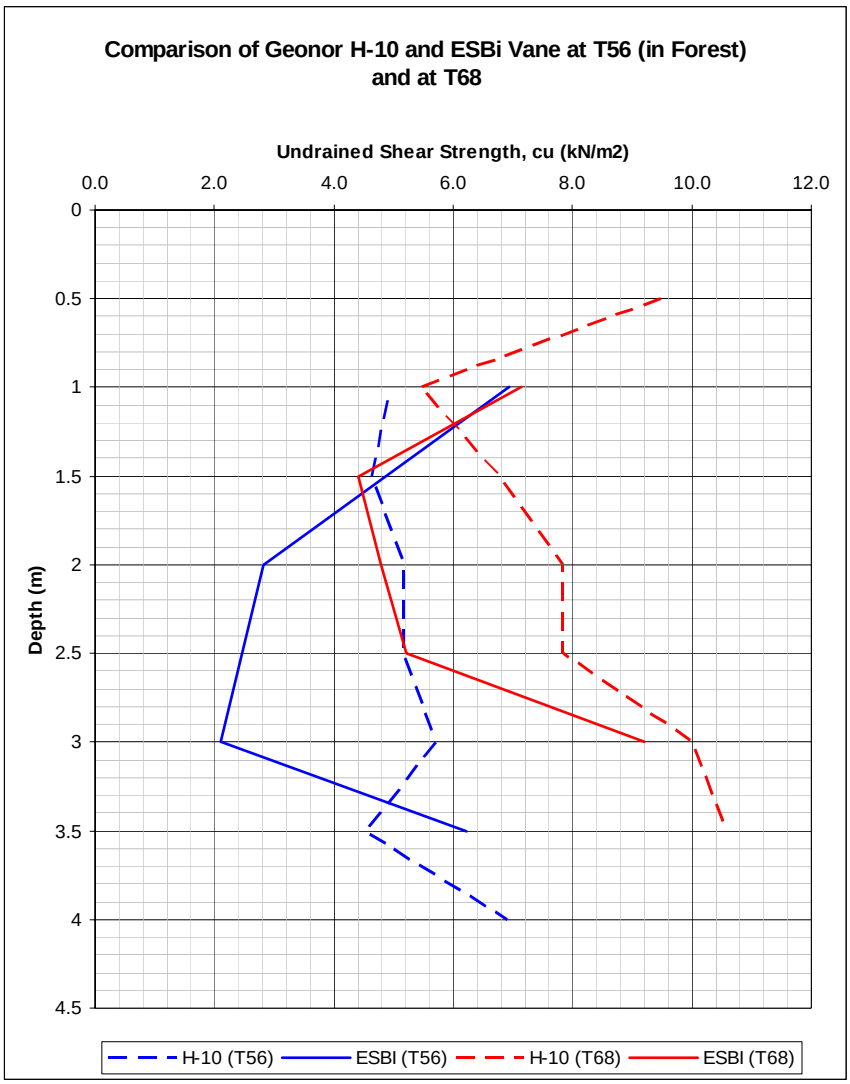


Figure No. 3.1 Comparison between H-10 vane and ESBI vane.

3.3.3 Laboratory tests on peat from the Derrybrien site

The results of a variety of laboratory undrained shear strength tests on samples of the peat recovered from adjacent to and away from the slide that occurred in Derrybrien in October ’03 are shown on Figure No. 3.2. These tests included small laboratory vanes,

small ELE Hand vanes, laboratory unconsolidated undrained triaxial testing and laboratory simple shear tests. These results show that c_u of the peat away from the slide was in excess of 4kPa, with the in-situ hand vane indicating higher values of the order of 9 to 15kPa. Exceptionally low shear strengths were recorded in simple shear tests on samples taken adjacent to the slide in material which is considered to represent a pre-existing failure plane where a major discontinuity formed in the peat.

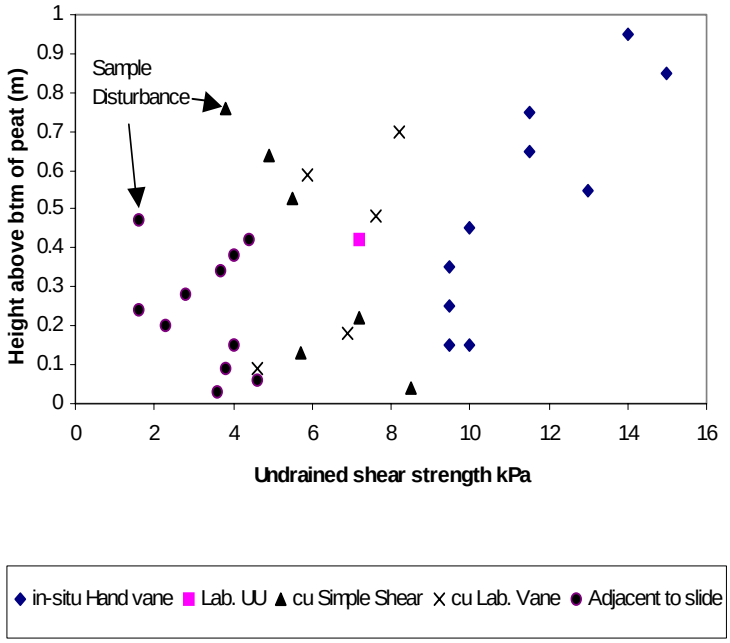


Figure No. 3.2 Undrained shear strengths recorded on undisturbed samples of the peat

3.3.4 Bearing capacity from in-situ vane tests

Available publications on back analyses of embankment failures indicate that the appropriate shear strength in normal bearing capacity/slip circle calculations in peat is between 0.5 and 1.0 c_{uvane}, however this statement has not been related to the size of the vane used in the test, which is known to significantly affect the results.

The design of floating roads is mainly based on experience of other sites and of bog roads in general as the c_{uvane} may not represent the relevant strength of the peat. The strength of the peat may be influenced by consolidation under the weight of the roads, and by the presence of gas.

The previous experience on the site has shown that the floating roads have been successfully traveled by fully loaded concrete trucks (estimated to be about 40 tonnes) and by a 50 tonne mobile crane. Preliminary tests on the floating road between T55 and T57, where the margin of safety calculated with the slope stability analysis is in the range of 1.08 to 1.18 (allowing for an increase in strength of the peat under the roads and

computed using unadjusted vane shear strengths) confirmed that the floating roads can adequately support the design load without any signs of bearing capacity failure.

This would indicate that the unadjsuted shear strengths determined using the Geonor H-10 with the 65mm x 130mm vane give a reasonable index of the characteristic undrained shear strength of the peat for the design of the floating roads.

3.4 Example analysis for the floating road in cells T55, T56 and T57

The stability of the road in Cells T55, T56 and T57 was analysed using the slope stability program Slope/W. A summary of the material properties, peat depths and slope geometries used in the analyses is presented in Table No.3.1.

The characteristic undrained shear strength profiles for T55, T56 and T57 are plotted against the recorded VST data in Figures Nos. 3.3, 3.4 and 3.5, respectively. The profiles for T55 and T57 are plotted against a typical range in the VST data in Figure No. 3.6. The lowest recorded shear strength profile in each section was used in the analysis.

In the analyses, higher strengths were given to the peat under the roads to simulate the increase in strength of the peat due to consolidation under the weight of the fill. At T55, this is based on the actual test data. The increase in strength is on the order of 35 to 50%.

In T57, the peat strength has been conservatively increased by 20% within a depth of about 3.2 m. No increase in strength has been included below that depth.

The results of the analyses are included in Appendix C. The calculated margins of safety were as follows:

T55: **1.076**
T56: **1.569**
T57: **1.175**

In accordance with EC(7), partial factors were applied to the characteristic undrained shear strength of the peat (1.4) and the surcharge load (1.3). Therefore, a calculated margin of safety of >1.0 represents an acceptable condition.

Table No. 3.1 – Assumed properties for slope stability analyses of floating road in Cells T55, T56 and T57.

Cell T55					
Design Depth of Peat = 3.6 m (Actual range: 2.85 m to 3.85 m)					
Slope Angle = 3.7° on the ground surface and 1.4° at the base of the peat.					
Road Thickness = 1.0 m stone (assumed - measured <0.5 m)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road (from test results)**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.5	4.65	1.0 - 1.7	9.5	6.8
1.0 - 2.0	4.5	3.2	1.7 - 2.5	6.8	4.85
2.0 - 3.0	5.0	3.6	2.5 - 3.2	6.8	4.85
3.0 - 3.75	6.0	4.3	3.2 - 3.75	6.8	4.85

Cell T56					
Design Depth of Peat = 3.4 m (Actual range: 1.3 m to 3.43 m)					
Slope Angle = 4.0° on the ground surface and 4.2° at the base of the peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			***Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	9.5	6.8	1.0 - 1.7	11.5	8.2
1.0 - 2.0	7.5	5.35	1.7 - 2.5	9	6.4
2.0 - 3.0	10.0	7.15	2.5 - 3.25	10	7.15
3.0 - 3.75	10.0	7.15			

* Assume 20% increase in undrained shear strength under road in top 2.5 m - no test results

Cell T57					
Design Depth of Peat = 3.6 m (Actual range: 1.5 to 3.8 m)					
Slope Angle = 1.7° on the ground surface and 1.9° at the base of the peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	8.0	5.7	1.0 - 1.7	9.5	6.8
1.0 - 2.0	5.25	3.75	1.7 - 2.5	6.3	4.5
2.0 - 3.0	4.25	3.0	2.5 - 3.2	5.1	3.65
3.0 - 3.75	7.0	5.0	3.2 - 3.75	7.0	5.0

* Assume 20% increase in undrained shear strength under road in top 3.2m - no test results

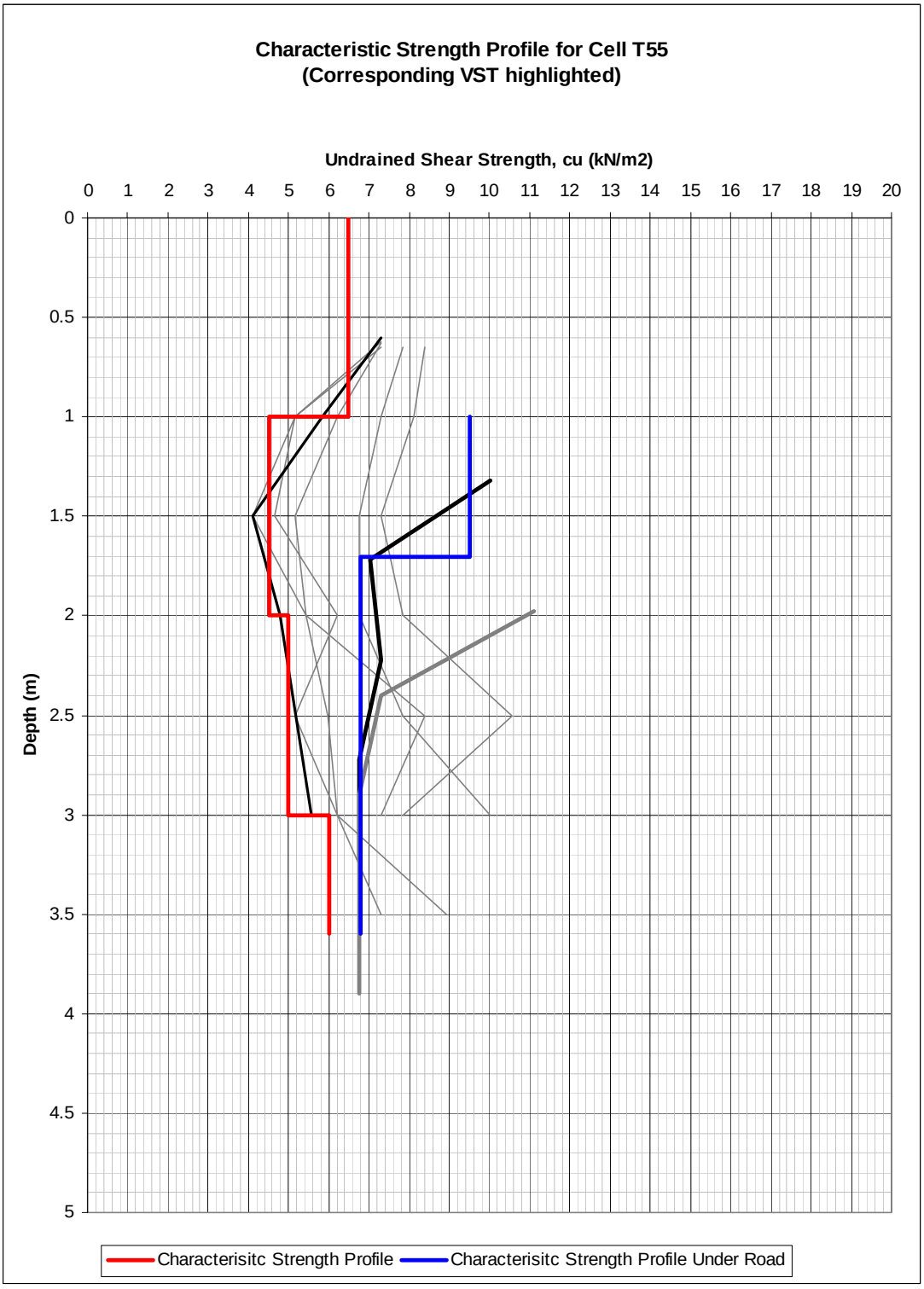


Figure No. 3.3 Characteristic undrained shear strength profile for T55

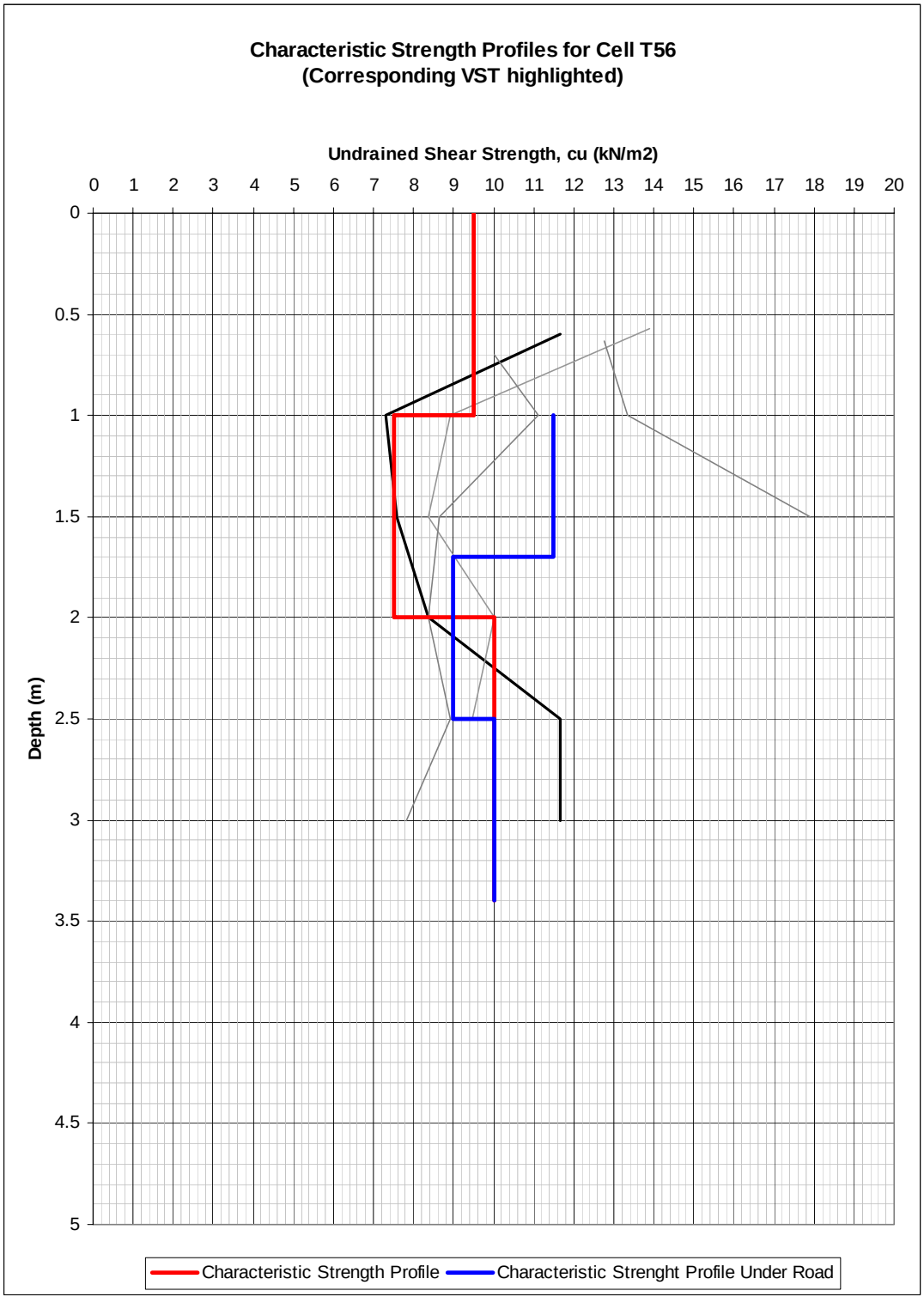


Figure No. 3.4 Characteristic undrained shear strength profile for T56

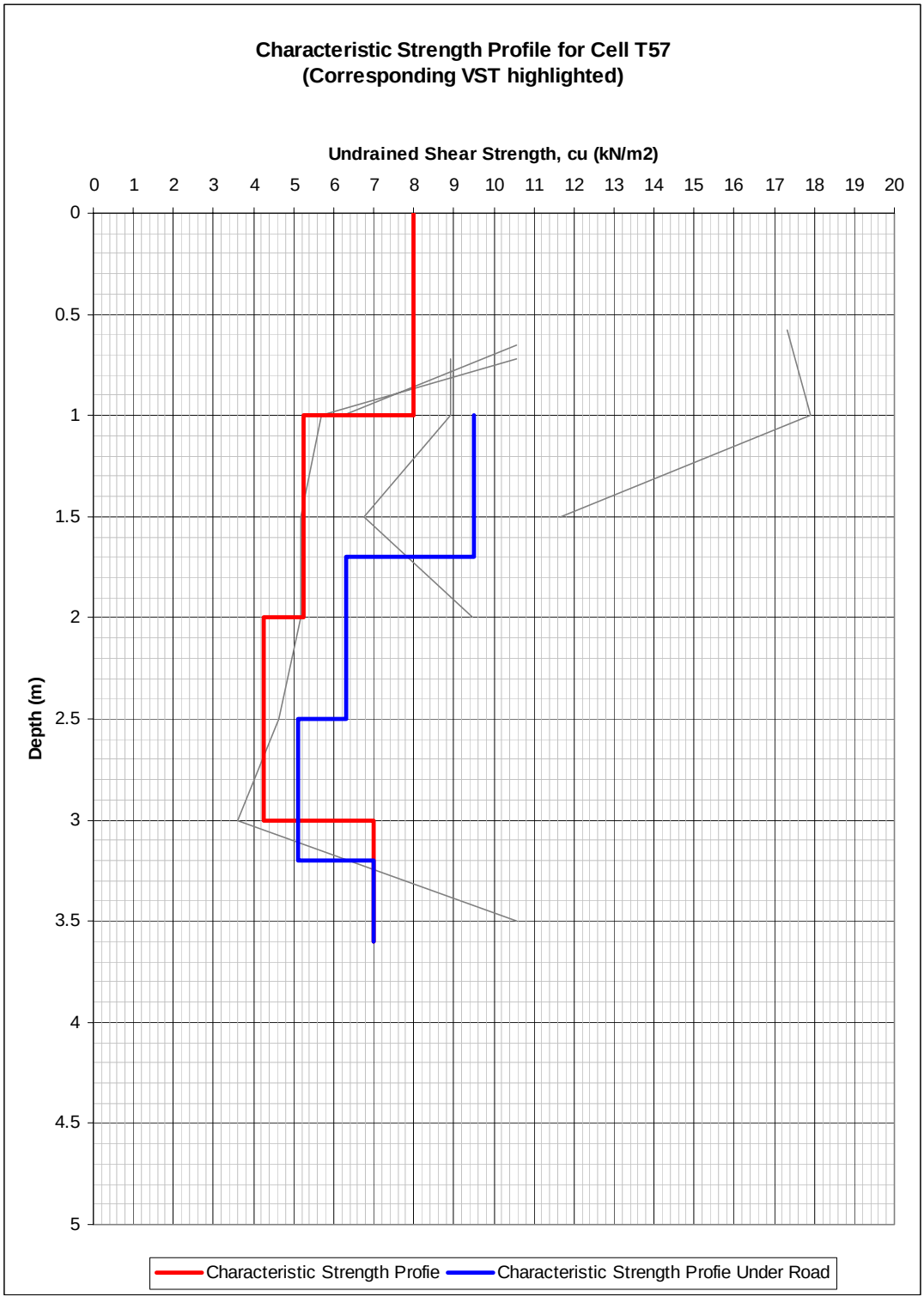


Figure No. 3.5 Characteristic undrained shear strength profile for T57

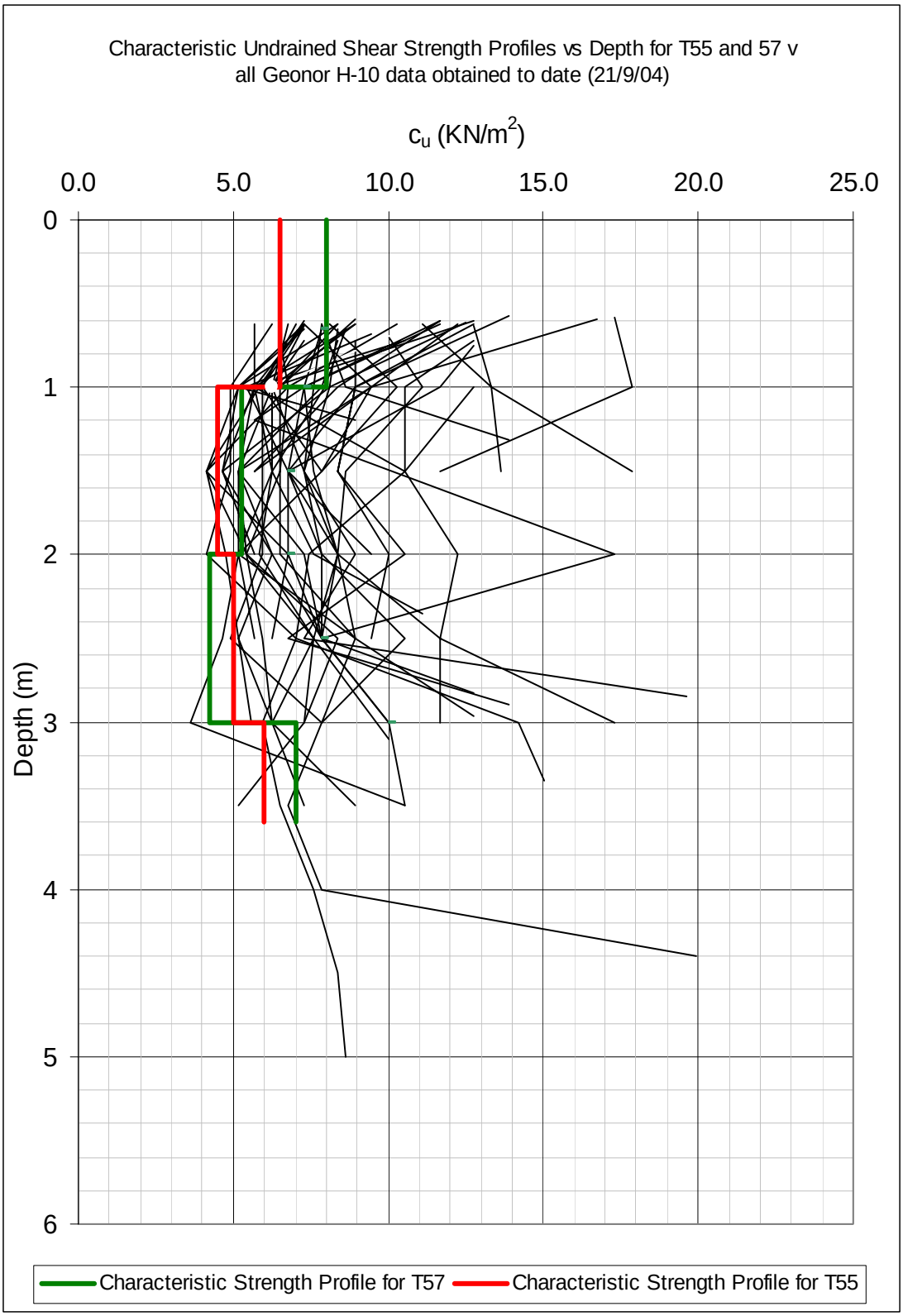


Figure No. 3.6 Characteristic undrained shear strength profile for T57

3.5 Results of Slope/W analyses of the floating roads

Ascon propose to resume work in the northern part of the site. Therefore, for this report we have completed the stability analysis for all of the cells in that area where the existing roads are constructed as floating roads, or where new floating roads will be constructed on the peat.

The results of the Slope/W analyses are included in Appendix C and summarized in Table No.3.2 below. A summary of the slope geometry, peat depths, and peat strengths used for the analyses is also included with the results in Appendix C. The properties were assessed from the field investigation data in Appendix A.

A calculated margin of safety > 1.0 was achieved for the design section in each cell using the partial factor of 1.4 on c_{uk}, and 1.3 on the live load, which is an acceptable condition. In most cases this was achieved without making an allowance for the increase in strength of the peat under the roads.

Table No. 3.2 Summary of the results of the Slope/W analyses of the floating roads in the northern part of the site.

Cell No.	Allowance made for increase in peat strength under road (Y/N)	Calculated Margin of Safety (>1.0 is OK)	Comments:
T47NR	N	1.40	New road alignment
T48NR	N	1.32	New road alignment
T49NR	N	1.24	New road alignment
T50NR	N	1.74	New road alignment (T50-70m)
T50NR	N	3.20	New road alignment (T50+75m)
T51NR	N	3.18	New road alignment @ T51-100m
T51	N	1.74	Existing road @T51+75m
T52	N	2.36	Existing road
T53NR	N	1.48	New road alignment
T54NR	N	1.08	New road alignment
T55	Y	1.08	Existing road. Increase in strength under road based on vane shear tests at T55+0m
T56	N	1.57	Existing road
T57	Y	1.18	Existing road. Assumed 20% increase in undrained shear strength to 3.2 mBGL.
T59	N	1.04	Existing road
T60	N	1.55	Existing road
T61	N	1.10	Existing road
T62	N	1.06	Existing road (T62-125m)
T62	N	1.01	Existing road (T62-75m)
T63	N	1.46	Existing road
T64	N	1.27	Existing road

3.6 Road tests

On 14th and 15th October, 2004 an incremental road test was carried out on the existing floating roads in the northern part of the site, and on the road down to the sub-station. The procedure for the road tests was as follows:

1. Initially the roads were traveled with an 8-wheel truck half-loaded with gravel with a weight of 27.4 tonnes recorded by weighbridge.

2. Deflection of the road was observed visually as the truck traveled continuously over the roads at a speed of approximately 10 mph.

3. The performance of the roads was classified as good, fair or poor based on the condition of the road and the observed deflection under the weight of the truck.

4. Representative areas where low margins of safety were calculated in the Slope/W analysis and where the road performance was classified as fair or poor were selected to record the deflection of the road under the truck.

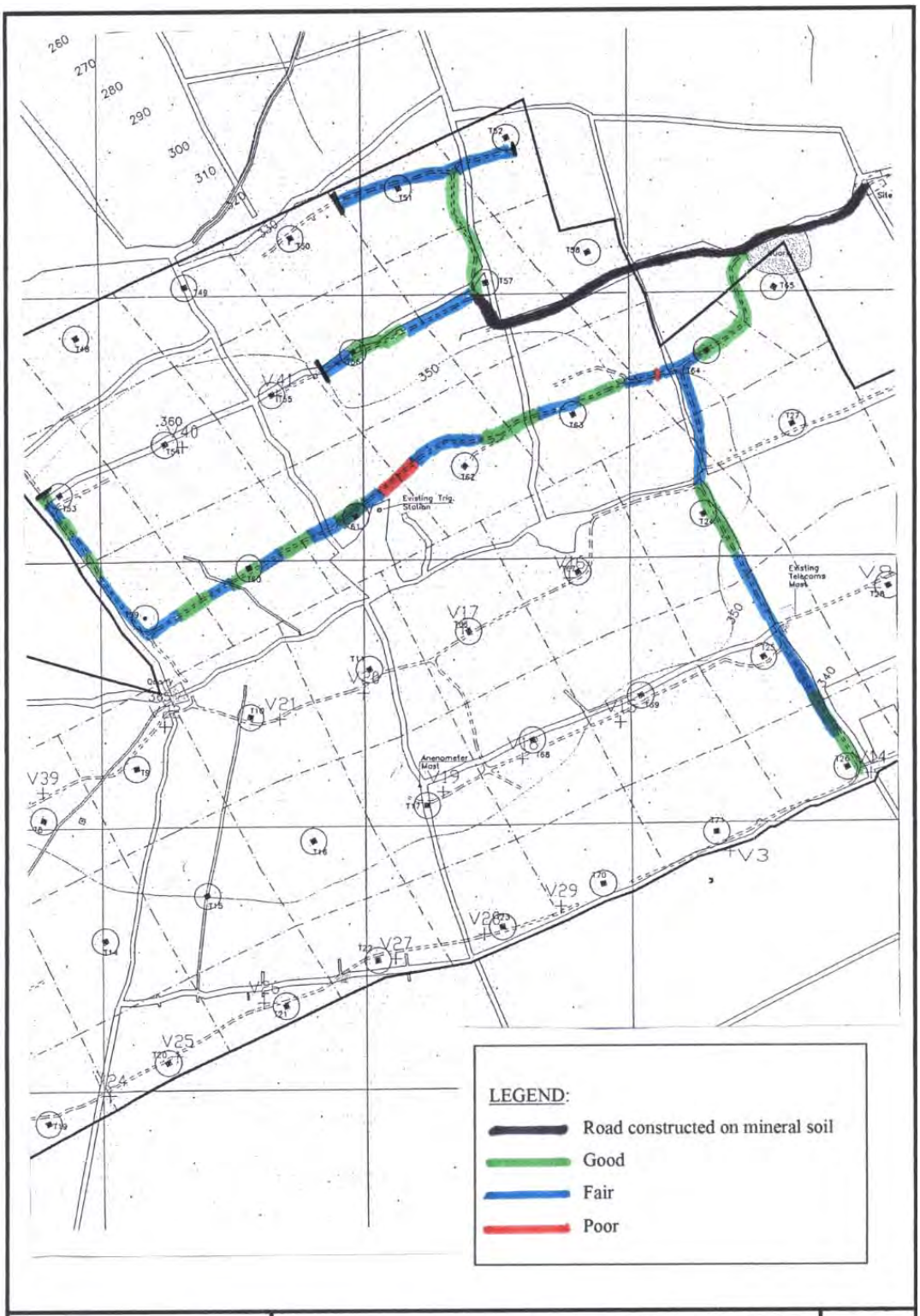
5. Deflection of the road was recorded at 25 m intervals along the road beside the wheel of the front rear axle. Deflection was recorded using an optical level to measure the rebound that occurred after unloading.

6. The truck was filled to capacity (recorded weight = 36.5 tonnes) and the performance of the road was classified visually as the truck traveled continuously over the roads at about 10 mph.

7. The deflection under the fully loaded truck was recorded under the fully loaded truck in representative areas where the performance of the road was classified as fair or poor and low margins of safety were calculated.

Deflection of the existing floating roads was monitored in the six areas listed below. The calculated margin of safety against bearing failure for the floating roads in each area is shown in brackets. The areas are identified on Figure No. 3.7. The recorded deflection of the roads is included in Appendix D.

1. East to west between T62 and T61 (1.01 to 1.10)
2. West to east between T63 and T64 (1.27 to 1.46)
3. West to east between T56 and T57 (1.18 to 1.57)
4. East to west between T51 and T50 (1.74 to 2.36)
5. South to north between T59 and T53
6. South to north between T25 and T26



AGL Consulting ***Geotechnical Engineers*** Suite 2, The Avenue, Beacon Court, Sandyford, D18 T: (01) 295 6532 F: (01) 295 6533	**Project:** **Job No.:**	Derrybrien Windfarm 03-104	**Made By:** **Date:**	CO'D 1/11/04	**Scale:** 1:10,000
	Performance of the Floating Roads during The Road Test in Northern Part of Site				**Figure No.3.7**

All of the roads that were tested were classified on Figure No. 3.7 in accordance with the general criteria in Table No. 3.3.

Table No.3.3 Performance criteria for road tests under 36.5 tonne load.

Road Performance Classification	Performance Criteria (36.5 tonne load)
Good	➢ Road deflections generally <10 mm ➢ Road deflects relatively rigidly under truck load with only slightly greater deformation locally under the wheel load at localized soft spots. ➢ Road surface is even with minor rutting and no loose rockfill.
Fair	➢ Road deflections between 10 and 30 mm ➢ Road deflects noticeably under wheel loads ➢ Road surface is relatively even with some rutting along the line of the wheels. The rockfill is generally dense. ➢ Local transverse rutting occurs at soft spots where the rockfill has loosened over weak peat, or where there are gaps in the basal reinforcement trees.
Poor	➢ Road deflections are greater than 30 mm (up to about 60 mm) ➢ Road deforms very noticeably under wheel loads in wave-like motion. ➢ Deformations are uneven causing the truck to tilt slightly on local soft spots. ➢ Road surface is in poor condition with both longitudinal and transverse rutting creating an uneven road surface. ➢ Rockfill is loosened over worst areas.

The majority of the roads were classified as ‘good’ to ‘fair’ with only local soft spots, possibly where there are gaps in the trees along the base of the road.

The areas where the performance of the road was poor generally corresponded to areas where low margins of safety were calculated in the stability analyses (e.g. T62 to T61 – calculated margin of safety = 1.01 to 1.10). However, none of the roads showed any signs of yielding or excessive deflection at the sides of the road, even when the road performance was classified as poor. There was no visible deformation in the peat at the side of the roads. The deformations were generally locally concentrated under the wheel loads and the total load was adequately supported by the road.

In areas where the road performed poorly, the performance of the road could be improved by excavating the existing stone, replacing the tree base layer, adding a second layer of geogrid and re-surfacing the road.

3.7 Conclusion

It has been demonstrated that the existing and proposed floating roads in the northern part of the site have an acceptable margin of safety against bearing failure using the slope stability program Slope/W and by incremental load tests on the site.

The Slope/W analyses were carried out using unfactored peat strengths determined using the Geonor H-10 with the 65mm x 130mm vane. The lowest recorded strengths in each cell were used for the analyses and a partial factor of 1.4 was applied to the undrained shear strengths in accordance with EC(7). In general the increase in strength under the weight of the road was conservatively neglected in the analyses.

A partial factor of 1.3 was applied to the live load surcharge and the most conservative conditions were used for the design section in each cell in terms of peat depth and slope angle.

A road thickness of 1.0 m was assumed, whereas, in most areas the thickness of the road would be less.

Preliminary load tests confirmed that the unfactored peat strengths determined by the Geonor H-10 give an acceptable index of the undrained shear strength of the peat.

Once it was confirmed that all of the existing roads in the northern part of the site had an acceptable margin of safety with the Slope/W analyses, the roads were tested by incrementally loading with an 8-wheel truck with a fully laden weight of 36.5 tonnes, which is equivalent to a distributed pressure of 20.75 kPa over a loaded area of 7.5 x 2.3 m. This is greater than the load of the crane that will be used to erect the turbines (17.1 kPa) and it is equivalent to the proposed maximum construction traffic load.

The road tests have confirmed that the roads on the northern part of the site have adequate capacity to support the loads from the traffic that will be used for the construction of the turbine bases. Similarly, the road down to the substation was also tested and confirmed to be suitable for the proposed construction traffic.

It has also been determined that the proposed new alignment of the roads between T47 and T50, and between T53 and T55 will have an acceptable margin of safety against bearing failure and can proceed to construction. The analysis was carried out without taking into account the increase in strength of the peat under the weight of the road. Nevertheless, the roads will be left for a period of 2-4 weeks before they are tested and approved for construction traffic.

All of the floating roads on the site will be tested at a later date to the full crane load (72 tonnes) before they are handed over for turbine construction. Where the roads perform poorly under the construction traffic the existing road will be excavated and reconstructed with a new tree base and possibly two layers of geogrid reinforcement.

4.0 STABILITY OF PEAT REPOSITORY SITES

4.1 Introduction

In this section we describe the procedure used to assess the stability of the repository sites that will be used to store up to 1.0 m depth of peat from the excavations for the turbine bases. The sites will not be used to store mineral soil.

6 No. sites have been identified in the northern part of the site for the first phase when construction activity resumes on the site. The results of the field investigations and stability analyses carried out for each of these sites is presented in this report.

4.2 General requirements for repository sites

Repository sites will be required to dispose of the peat excavated from 33 of the 34 No. turbines bases that have yet to be constructed. Mineral soil excavated from the turbine locations will be used to backfill excavations or it will be taken to a quarry or borrow pit for disposal.

It is proposed to limit the depth of peat placed on each repository site to 1.0 m, which will result in an additional surcharge of approximately 10 kN/m^2.

Where the depth of peat to be excavated at a turbine base is less than 2.5 m, the required area of the repository site will be less than 50 m x 25 m. For depths of peat up to 4.5 m, the repository sites will about 50 x 50 m.

Additional repository sites will be required for the peat to be excavated from the sub-station, the proposed quarry extension, and any borrow pits that will need to be opened up. The required area for these repository sites will be assessed on a case by case basis.

4.3 General criteria used for initial selection of suitable repository sites

In order to identify potentially suitable peat repository sites, the following general criteria was adopted:

1. The slope angle at the top and base of the peat must be less than 3 degrees.
2. The depth of peat should be limited to 4.0 m and areas where the peat is shallow would be preferable.
3. The sites should be as close as possible to the turbine excavations.
4. The maximum downslope length of the repository sites will be limited to 50 m. However they can be constructed in a strip up to 50 m wide across the slopes and adjacent to the floating roads, provided that the ground conditions are suitable.

5. They should not be located in areas identified as unsuitable based on the desk study of aerial photographs, or where the stability analyses indicate that the site is unsuitable.
6. They should be at least 25 m back from a break in slope or drainage channel.
7. Double handling of the peat (i.e. where the peat is first deposited at an intermediate point by the excavator at the turbine base before being moved to the repository site by another excavator) will only be permitted adjacent to the repository sites where the there is no significant change in the slope between the intermediate point and the repository site.

Figure No. 4.1 shows the location of 6 No. repository sites that have been selected for the first phase of work when construction activity resumes on the site. The sites are named after the cells in which they are located:

1. T50R
2. T51R
3. T56R
4. T56/57R
5. T57R
6. T58R

Each site has been assessed on a case by case basis to ensure that the slope angles meet the above criteria and to ensure that the peat has sufficient strength to support the proposed surcharge load.

The general criteria proposed for the selection of suitable repository sites may be revised at a later date depending on the requirements of the Contractor and the results of our stability analyses.

Local deviations from the above criteria will only be accepted if it can be demonstrated that the site will have adequate stability for all of the design conditions.

4.4 Desk Study

A desk study was carried out using 3D stereoscopic imaging of aerial photographs of the site from 1973 and 1975. The natural topography and drainage courses are clearly identifiable on these photographs as they were taken before trees were planted over much of the site.

The photographs were reviewed to identify sections of the site that may be suitable for peat repository sites based on the topography and visible hydrological conditions.

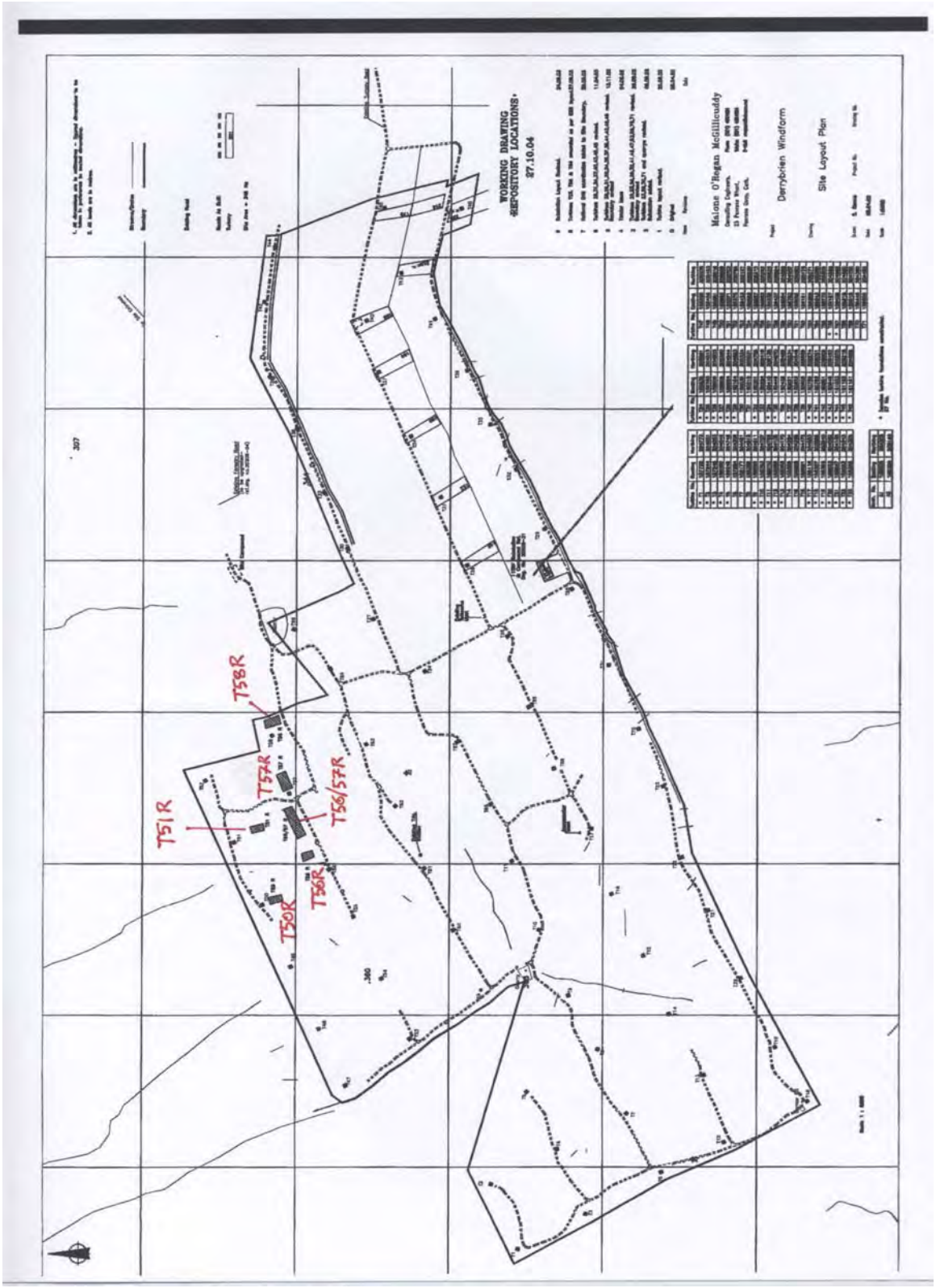


Figure No. 4.1 – Location of proposed peat repository sites.

Using the aerial photographs, the natural drainage courses were plotted on a plan of the site, and areas where slopes were steep or where there were similar topographical and hydrological conditions as the area where the October 16th, 2003 slide occurred were excluded from consideration.

The general areas that are considered unsuitable for repository sites are illustrated on Figure No. 4.2. The sites will also be kept at least 25 m from the natural drainage courses on the site. The drainage courses will be used to improve the drainage on the site.

4.5 Field Investigation

On site a field survey was carried out at each repository location consisting of the following:

- Gouge auger probes on a 25 m grid (max 30 m) over the full area of the repository site to determine the depth of peat. The grid of probes was aligned with the dip of the slope wherever possible.

- Gouge auger probes along two orthogonal planes 50 and 100 m downslope of the repository site.

- Topographical surveying between probes to determine the slope angle at the surface and base of the peat on the repository site and 50 and 100 m downslope from the site. Wherever possible the probes have been surveyed with the GPS system to record the location relative to the national grid and the ground surface elevation relative to Ordnance Datum. Otherwise the Abney Level or optical survey level were used to determine the slope angles.

- Vane shear tests at a minimum of 2 No. locations using the Geonor H-10 Vane (65mm/130 mm), at locations selected by AGL Consulting based on the results of the probes. In general, 1 No. test will be carried out for each 50 m x 25 m area. The final test was carried out with the tip of the vane 0.25 m above the base the peat. The depth of the peat was first determined by probing 0.5 m across the slope from the vane test.

- Piston samples were collected from the base of the peat and extruded on site to ensure that there was no weak layer or discontinuity near the base of the peat.

The results of the field investigations are summarized in Appendix D. The probe and survey data has been presented in graphical form to illustrate the variation in the depth of the peat and the slope angle at the surface and base of the peat.

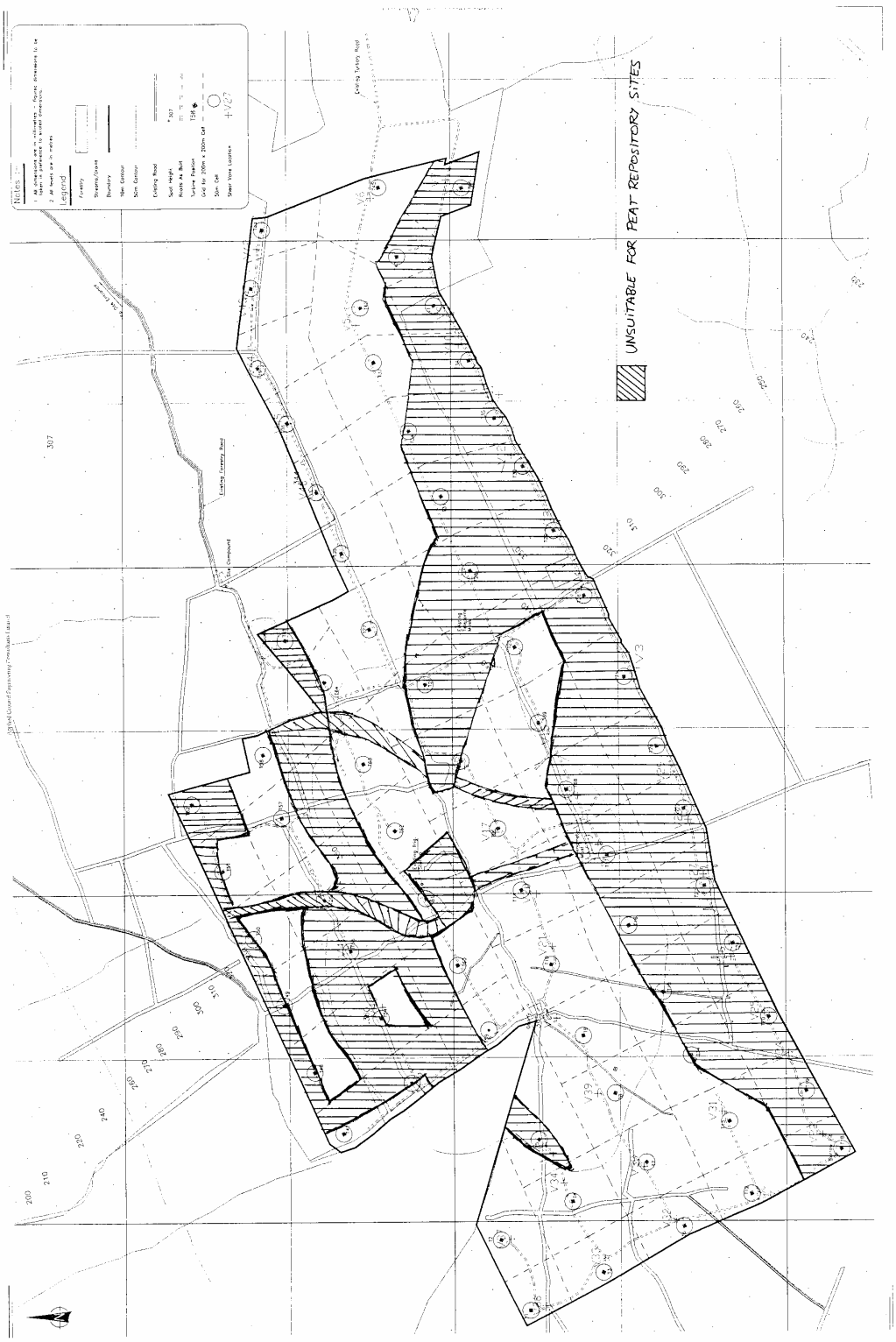


Figure No. 4.2 – Areas excluded from consideration for peat repository sites based on aerial photos.

4.6 Stability analyses

A stability analysis was carried out for each repository site to ensure that the peat has sufficient strength to support the proposed loads.

2 No. 2D plane strain analyses were carried out at each repository site using Slope/W to calculate the margin of safety against block sliding along the base of the peat in the undrained condition.

For the first analysis (Case 1), the characteristic undrained shear strength (c_{uk}) of the peat was taken as the minimum undrained shear strength determined with the Geonor H-10 using the 65mm/130mm vane. This strength was conservatively assumed to apply over the full depth of the peat.

For the second analysis (Case 2), a 0.5 m thick layer of very weak peat was introduced at the base of the peat with a design undrained shear strength (c_{ud}) of 2 kPa. This is the lowest strength that was recorded for the weak layer of peat identified in the vicinity of the slide that occurred on the mountain in October 2003.

For each site a representative design profile was determined from the gouge auger probe and topographical survey data in Appendix D. The design section represented the most conservative combination in terms of peat depth and slope angle. The resultant slope angles were calculated from the slope angles measured on orthogonal planes in each section of the repository sites.

In accordance with Eurocode EC(7), a partial factor of 1.4 was applied to the characteristic undrained shear strength (c_{uk}) of the peat to calculate the design values (c_{ud}), except in the case of the very weak layer, which was assumed to have a design value of 2.0kPa. For both analyses a partial factor of 1.3 was applied to the surcharge load of 10 kN/m^2, which is equivalent to 1.0 m of peat.

Generally, the undrained shear strengths recorded on the site with the Geonor H-10 have been greater than 4.0 kN/m^2. Although our analyses consider the presence of a very weak layer near the base of the peat, this is a very conservative condition to demonstrate the suitability of the repository site in the event that a weak layer is not identified in the piston sampling. However, if a discontinuity or a very weak layer of peat is identified with the vanes and piston sampling then the proposed repository site will be relocated.

4.7 Results of stability analyses

The results of the stability analyses from Slope/W are presented in Appendix E. The calculated margins of safety are summarized in Table No. 4.1. In accordance with EC(7), with a partial factor of 1.4 on the undrained shear strength and 1.3 on the surcharge load, a calculated margin of safety greater than 1.0 is an acceptable condition.

It can be seen from Table No. 4.1 that all of the proposed repository sites have an acceptable margin of safety against failure even if there is a 0.5 m thick layer of very weak peat with an undrained shear strength of 2kPa near the base of the peat.

Table No. 4.1 Summary of Stability Analyses for Peat Repository Sites.

Repository Site No.	Calculated Margin of Safety for Design Condition (Case 1)	Calculated Margin of Safety with very weak layer at base of peat (Case 2)	Minimum characteristic peat strength from Geonor H-10 field vane, c_{uk} (kN/m^2)	Design peat strength, c_{ud} (kN/m^2)
T50R	1.73	1.73	*2.0	*2.0
T51R	2.37	1.55	4.6	3.3
T56R	1.80	1.01	6.0	4.4
T56/57R	1.49	1.21	3.6	2.6
T57R	1.54	1.06	4.6	3.3
T58R	1.62	1.55	4.1	2.9

***** No vane shear test results as depth of peat <0.5 m at repository site. Min. value assumed.

4.8 Conclusion

Each of the sites T50R, T51R, T56R, T56/57R, T57R and T58R have been approved for use as peat repository sites. They all have an acceptable margin of safety against failure for up to 1.0 m of peat, and no very weak layer or discontinuity was present near the base of the peat in the piston samples taken from the site.

During construction, stakes will be driven into the ground at each repository location to identify the 1.0 m limit on the depth of peat on the site. The deposition of peat will also be observed by AGL Consulting in selected areas to ensure that there are no signs of failure in the peat.

5.0 CONCLUSION

5.1 Ascon Construction Programme

Ascon proposes to resume construction in the northern part of the site with the roads from T50 to T47, and from T55 to T53. Work will then commence on the following 6 No. bases, in chronological order: T63, T58, T57, T52, T50, T49 and T47 at a rate of about 2 No. bases per week.

Some drainage works will be carried out elsewhere on the site in the vicinity of bases T30 to T39, T14 to T16 and T6 to T8, in advance of base construction.

5.2 Further study

At this stage most of the ground investigation has been completed on the site. However, the analyses have been concentrated in the northern part of the site, where Ascon proposes to resume work. Some additional investigation needs to be carried out to complete the analyses of the floating roads, repository sites and turbine bases over the remainder of the site. The results of these tests and the related stability analyses will be submitted in a supplemental report when they have been completed to form a record of the investigations and analyses that are carried.

5.2.1 Existing and New Floating roads

The stability of the floating roads will continue to be analyzed on a cell by cell basis in the critical areas prior to carrying out the road tests over the rest of the site.

The analysis for existing roads will be concentrated in the areas where AGEC have identified a factor of safety < 1.4 for load condition 3 (20 kPa surcharge) (17 cells), where there was insufficient information to carry out their analysis, or areas where there may be a concern about the stability of the roads based on the depth of peat and slope angles.

At this stage it is proposed to complete the analysis of the peat strengths and topographical surveys in the areas identified by AGEC with a factor of safety < 1.4. A total of 4 No. vane shear tests will be carried out with the Geonor H-10 vane in each cell. Peat probing and topographical survey will be carried out on 25 m intervals on the downslope side of the road and 50 m downslope of the road.

In those areas where AGEC had insufficient information to carry out their analysis the peat probing and topographical surveys will be carried out at 25 m intervals along the edge of the road and 50 m downslope. Vane shear tests will then be carried out at 2 No. selected locations to record the peat strengths in critical areas.

Most of this information has already been collected. The data will now be analyzed and the stability analyses will be carried out to assess the stability of the floating roads.

In each of the cells that require checking an analysis will be carried out at the critical section to verify the stability of the road under the proposed roads. As more analyses are completed it may be possible to identify criteria for which it is known that the design of the road is adequate based on the results of other analyses.

If necessary, vane shear tests will be carried out under the floating road at selected locations to investigate the increase in strength of the peat from the weight of the fill.

The road tests will be carried out in a similar manner to the tests that were carried out on the northern part of the site to approve the roads for the traffic that will be used to construct the turbine bases.

All of the floating roads on the site will be tested at a later date to the full crane load (72 tonnes) before they are handed over for turbine construction. Where the roads perform poorly under the construction traffic a second layer of geogrid reinforcement will be placed on the road and they will be resurfaced with crushed rock fill.

Piston sampling will be carried out at selected locations to determine if there is a weak layer or discontinuity at the base of the peat.

5.2.2 Peat repository sites

Peat repository sites will be assessed on a case by case basis in accordance with the procedures outlined in this report as the need arises on the site.

5.2.3 Turbine excavations

1 No. vane shear tests will be required at each base location unless a test has already been carried out along the edge of the road at the base location.

The method of excavation will be assessed for each of the remaining turbine bases and potential alternative foundation types will be considered.

For AGL Consulting:

Conor O'Donnell **Eric Farrell**

Date: 1/11/04

Appendix A

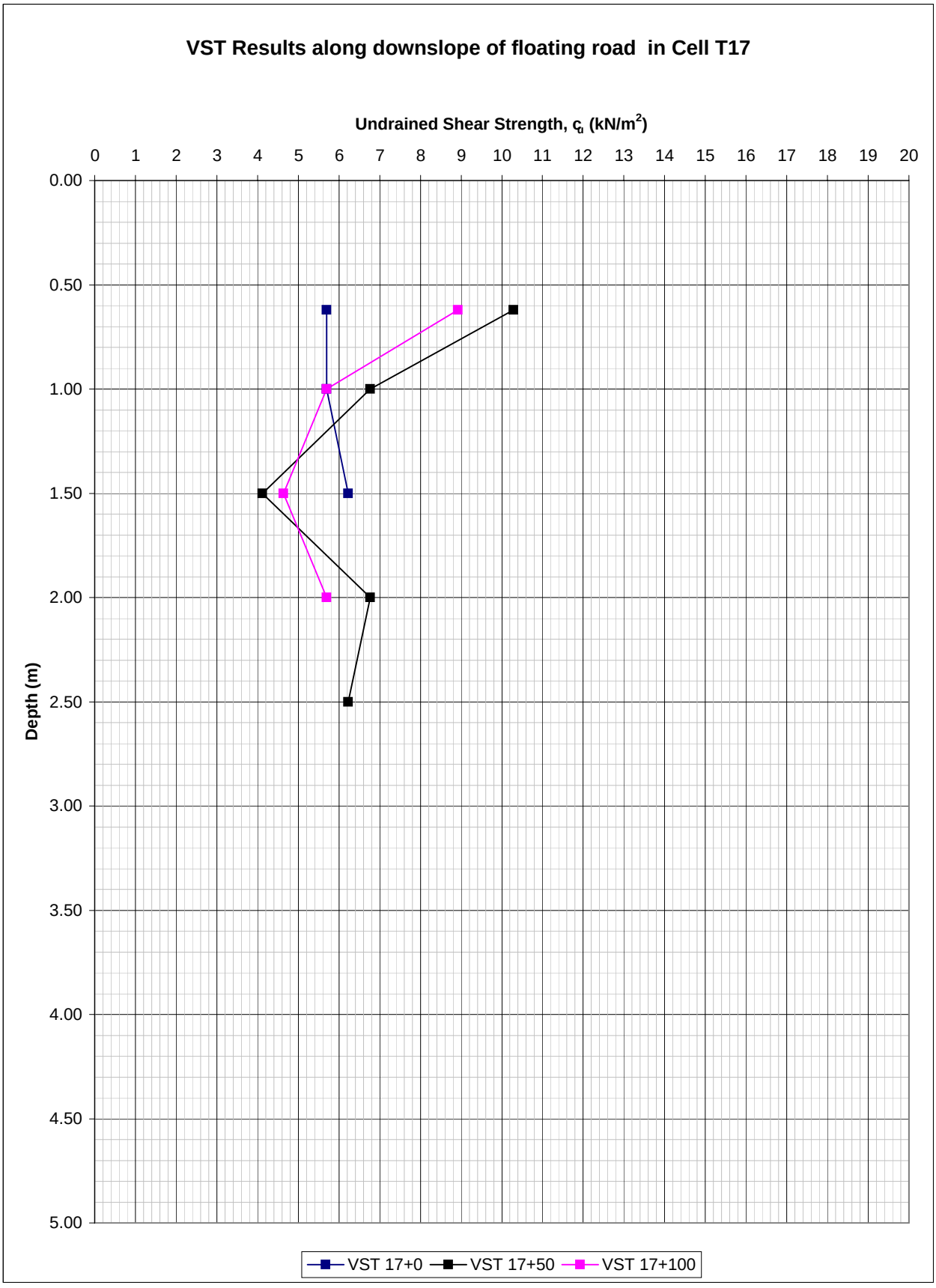
Results of Gouge Auger Probes and Geonor H-10 (65mm/135mm) Penetration Vane Tests

AGL Consulting ***Geotechnical Engineers***			**Record of Gouge Auger Probes**					
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 2**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T2/P-100A					**3.30**		**2.3**	**1.3**
T2/P-100B					**2.44**			
T2/P-75A		157856.6	204791.8	343.82	**2.84**	340.98	**1.5**	**1.0**
T2/P-75B				342.59	**2.44**	340.15		
T2/P-50A		157897.5	204820.7	344.66	**2.84**	341.82	**2.2**	**1.0**
T2/P-50B		157876.8	204855.0	343.13	**2.00**	341.13		
T2/P-25A		157918.7	204841.6	345.48	**3.30**	342.18	**2.1**	**0.1**
T2/P-25B		157895.5	204871.0	344.13	**2.00**	342.13		
T2/P0A		157946.0	204849.0	346.68	**2.84**	343.84	**1.5**	**0.5**
T2/P0B				345.45	**2.00**	343.45		
T2/P25A		157957.0	204876.3	347.65				
T2/P25B								
T2/P50A		157974.4	204889.9	348.47				
T2/P50B								
T2/P+75A		157997.2	204888.9	349.41				
T2/P+75B								
T2/P+100A		158019.9	204888.3	349.82				
T2/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T2B-NE								
T2B-NW								
T2B-SE								
T2B-SW								
T2B-C								
T2B+50								
T2B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 5**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T5/P-100A		158164.2	204690.8	353.37	**3.10**	350.27	**1.5**	**0.8**
T5/P-100B				352.14	**2.54**	349.60		
T5/P-75A		158183.3	204702.5	354.31	**3.10**	351.21	**1.5**	**1.0**
T5/P-75B				353.08	**2.70**	350.38		
T5/P-50A		158201.1	204716.8	355.53	**2.60**	352.93	**1.5**	**1.4**
T5/P-50B				354.30	**2.50**	351.80		
T5/P-25A		158217.3	204730.2	355.47	**1.20**	354.27	**2.3**	**3.4**
T5/P-25B				353.58	**2.10**	351.48		
T5/P0A					**1.50**		**3.5**	**3.9**
T5/P0B					**1.84**			
T5/P25A		158269.5	204736.4	358.02	**1.40**	356.62	**2.3**	**2.4**
T5/P25B				356.13	**1.50**	354.63		
T5/P50A		158291.7	204740.3	358.90	**2.10**	356.80	**2.5**	**2.2**
T5/P50B				356.85	**1.84**	355.01		
T5/P+75A		158312.1	204738.2	359.46	**2.20**	357.26	**1.5**	**1.3**
T5/P+75B				358.23	**2.00**	356.23		
T5/P+100A		158335.6	204738.0	359.98	**2.50**	357.48	**1.5**	**1.4**
T5/P+100B				358.75	**2.40**	356.35		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T5B-NE								
T5B-NW								
T5B-SE								
T5B-SW								
T5B-C								
T5B+50								
T5B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 13**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T13/P-100A		158219.5	204136.2	323.46	**2.53**	320.93	**1.2**	**2.8**
T13/P-100B				322.50	**3.90**	318.60		
T13/P-75A		158239.4	204146.3	323.98	**2.07**	321.91	**1.5**	**3.0**
T13/P-75B				322.75	**3.33**	319.42		
T13/P-50A		158265.0	204154.7	325.23	**2.43**	322.80	**5.0**	**6.0**
T13/P-50B				321.12	**3.24**	317.88		
T13/P-25A		158289.3	204161.7	326.22	**2.90**	323.32	**4.2**	**4.3**
T13/P-25B				322.80	**3.00**	319.80		
T13/P0A		158310.5	204172.8	327.22	**3.29**	323.93	**3.3**	**3.7**
T13/P0B				324.48	**3.59**	320.89		
T13/P25A		158334.1	204175.0	327.60	**3.30**	324.30	**3.0**	**3.4**
T13/P25B				325.14	**3.59**	321.55		
T13/P50A		158360.5	204183.3	328.13	**3.76**	324.37	**1.3**	**0.7**
T13/P50B				327.04	**3.20**	323.84		
T13/P+75A		158382.7	204193.2	328.67	**3.84**	324.83	**2.5**	**1.7**
T13/P+75B				326.62	**3.16**	323.46		
T13/P+100A		158406.4	204205.2	329.19	**3.54**	325.65	**2.0**	**0.5**
T13/P+100B				327.55	**2.30**	325.25		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T13B-NE								
T13B-NW								
T13B-SE								
T13B-SW								
T13B-C								
T13B+50								
T13B+100								

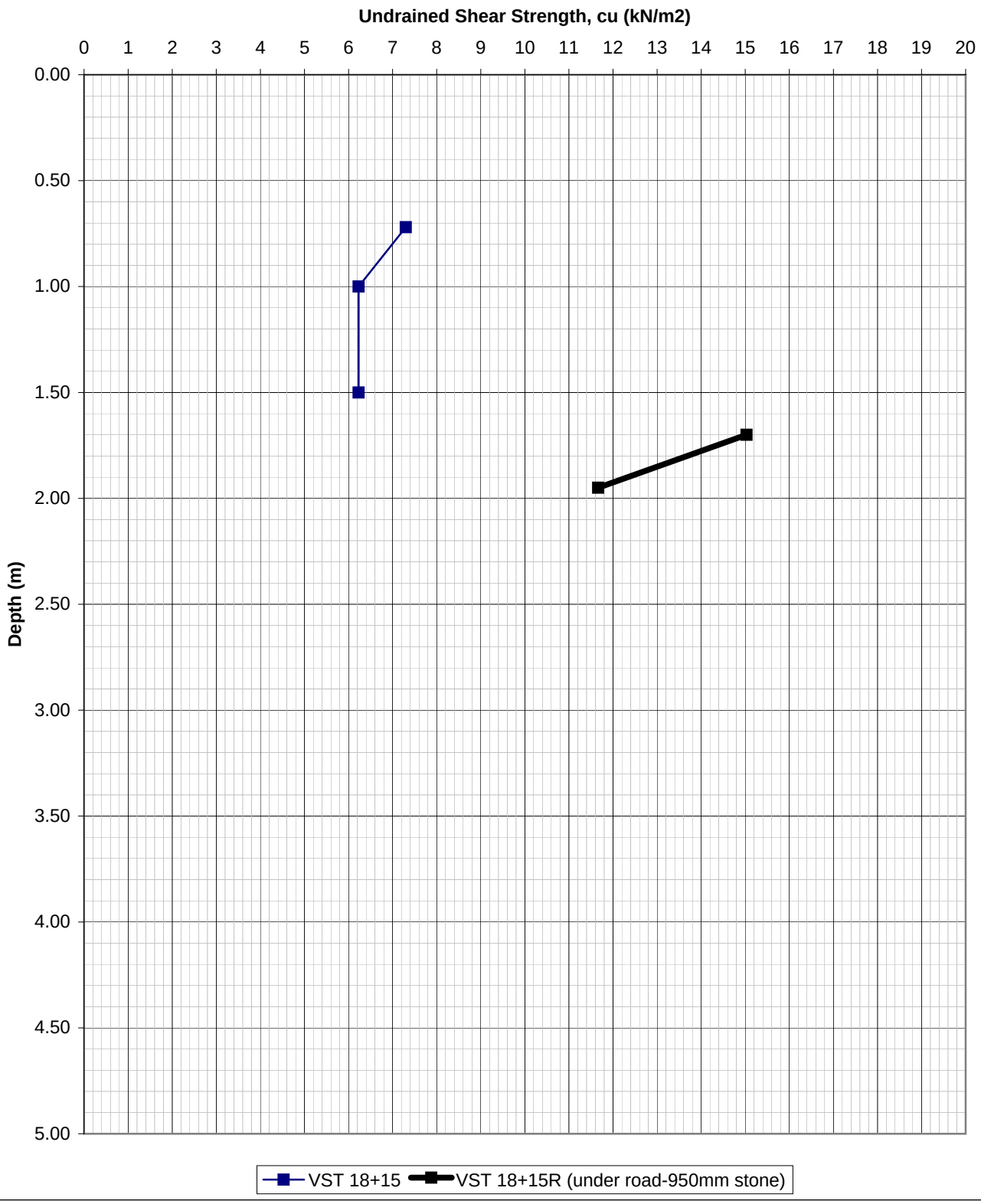
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 17**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T17/P-100A								
T17/P-100B								
T17/P-75A								
T17/P-75B								
T17/P-50A								
T17/P-50B								
T17/P-25A								
T17/P-25B								
T17/P0A		159115.8	204520.2	353.92	**1.90**	352.02	**5.7**	**5.9**
T17/P0B		159123.6	204479.2	349.72	**2.00**	347.72		
T17/P25A		159138.3	204544.7	354.30	**1.80**	352.50	**3.8**	**3.3**
T17/P25B		159155.9	204506.6	351.48	**1.40**	350.08		
T17/P50A		159161.2	204557.2	354.96	**2.50**	352.46	**3.8**	**3.8**
T17/P50B		159183.6	204522.9	352.22	**2.50**	349.72		
T17/P+75A		159181.3	204570.8	354.72	**2.16**	352.56	**3.5**	**3.5**
T17/P+75B		159213.7	204540.2	351.97	**2.14**	349.83		
T17/P+100A		159203.6	204580.9	354.27	**2.10**	352.17	**3.7**	**3.9**
T17/P+100B		159230.6	204546.0	351.40	**2.24**	349.16		
T17/P+125A		159226.0	204592.9	353.89	**2.04**	351.85	**3.2**	**3.0**
T17/P+125B		159245.9	204562.5	351.86	**1.90**	349.96		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T17B-NE								
T17B-NW								
T17B-SE								
T17B-SW								
T17B-C								
T17B+50								
T17B+100								


VST Results along downslope of floating road in Cell T17
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 17+0
VST 17+50
VST 17+100

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 17**
Test No.		VST 17+0	Date:			Peat Depth (m) 1.75	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	11.0	11.00	5.7				
1.00	11.0	7.00	5.7				
1.50	12.0	6.00	6.2				
Test No.		VST 17+50	Date:			Peat Depth (m) 2.51	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	19.5	5.00	10.3				
1.00	13.0	4.00	6.8				
1.50	8.0	3.00	4.1				
2.00	13.0	4.50	6.8				
2.50	12.0	4.00	6.2				
Test No.		VST 17+100	Date:			Peat Depth (m) 2.51	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	17.0	6.50	8.9				
1.00	11.0	4.50	5.7				
1.50	9.0	5.00	4.6				
2.00	11.0	3.50	5.7				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 18**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T18/P-100A		158153.7	203942.1	319.16	**2.50**	316.66	**4.2**	**3.8**
T18/P-100B				315.74	**2.20**	313.54		
T18/P-75A		158169.9	203921.9	318.39				
T18/P-75B								
T18/P-50A		158184.9	203906.8	316.99	**2.20**	314.79	**4.2**	**4.0**
T18/P-50B				313.56	**2.10**	311.46		
T18/P-25A		158202.8	203886.9	315.58				
T18/P-25B								
T18/P0A		158207.7	203850.9	313.71	**2.30**	311.41	**5.7**	**4.9**
T18/P0B				309.05	**1.70**	307.35		
T18/P25A		158249.8	203864.6	314.14				
T18/P25B								
T18/P50A		158267.7	203884.6	315.51	**1.90**	313.61	**1.2**	**1.5**
T18/P50B				314.55	**2.20**	312.35		
T18/P+75A		158281	203903.5	316.90				
T18/P+75B								
T18/P+100A		158298.5	203921.1	317.71	**2.40**	315.31	**3.3**	**3.0**
T18/P+100B				314.97	**2.15**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T18 B-NE								
T18B-NW								
T18B-SE								
T18B-SW								
T18 C								
T18B+50								
T18+100								

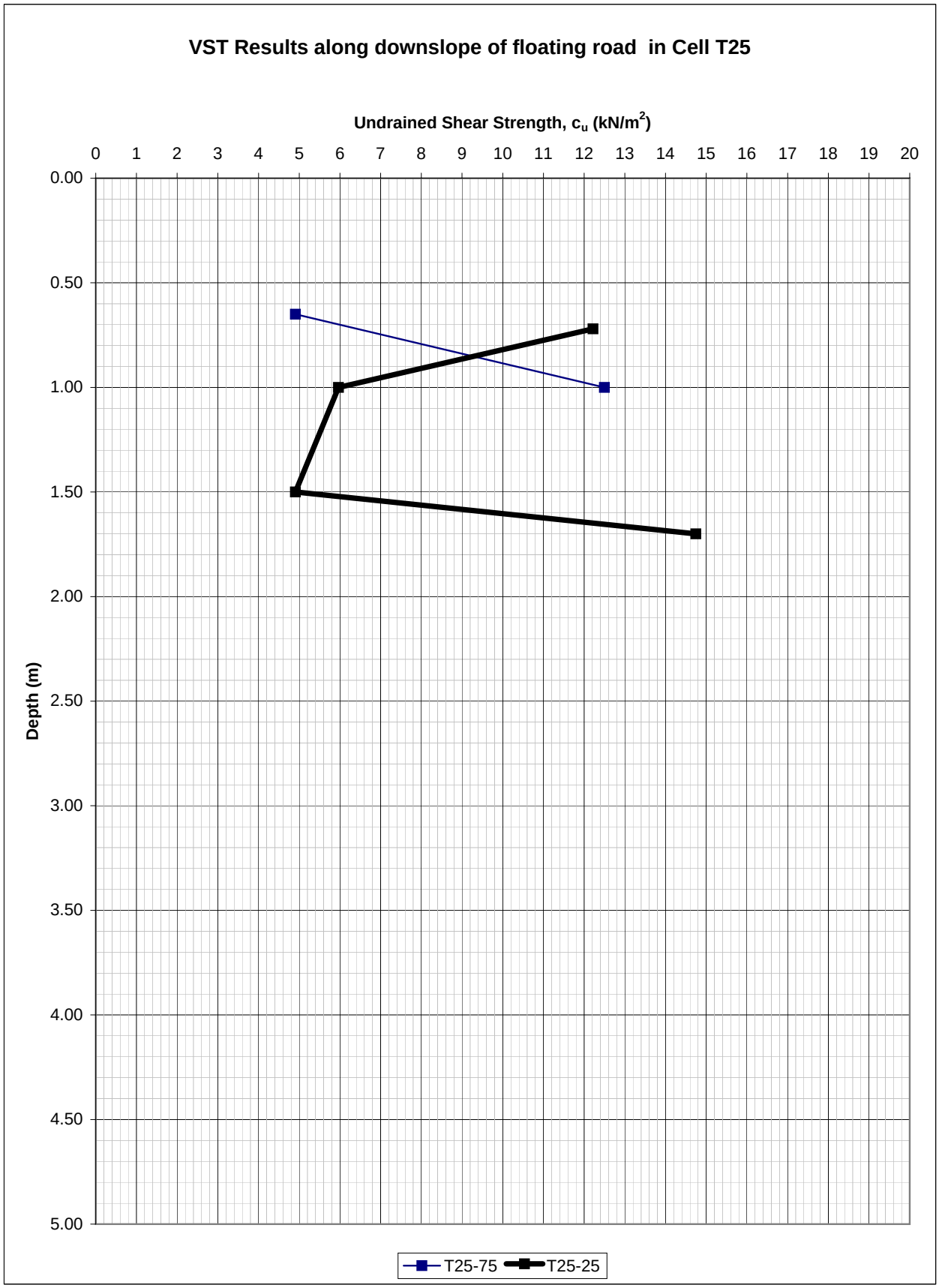
VST Results along downslope of floating road and under road in Cell T18



AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 18**
Job No. 03-104							
Test No.		VST 18+15	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	14.0	6.00	7.3				
1.00	12.0	6.00	6.2				
1.50	12.0	5.50	6.2				
Test No.		VST 18+15R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
1.70	28.0	8.00	15.0				
1.95	22.0	5.00	11.7				
Test carried out under road. Road finished, previously quite heavily trafficked.							
Construction of bases in surrounding locations complete.							
Road width 4.5 meters. Depth below road surface. Depth of road 0.95m							
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

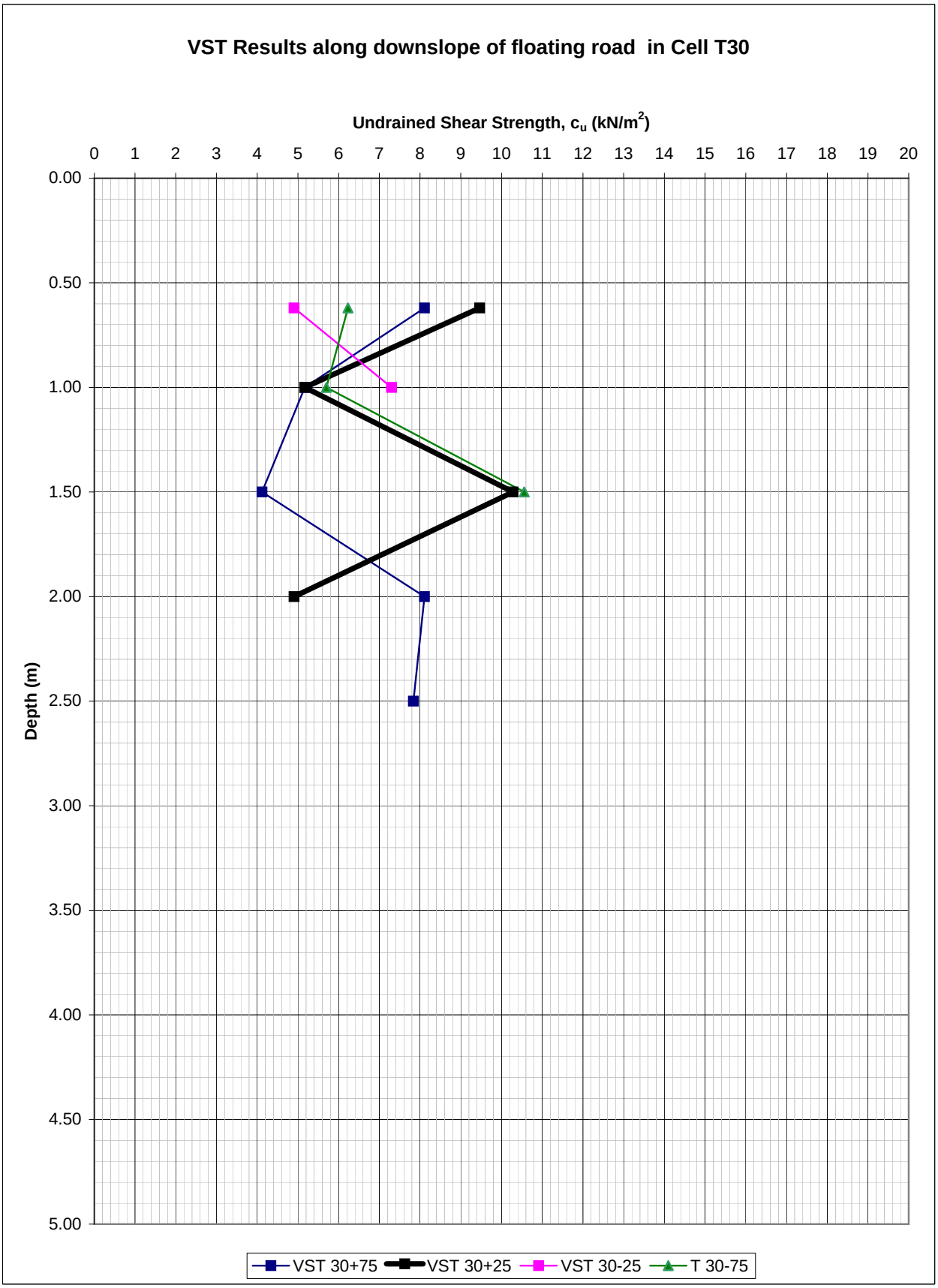
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 19**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T19/P-100A		159232.2	204594.3	355.99	2.40	353.59	**4.0**	**3.6**
T19/P-100B				352.70	2.10	350.60		
T19/P-75A		159257.1	204603.7	355.37	2.84	352.53	**3.5**	**3.5**
T19/P-75B				352.49	2.84	349.65		
T19/P-50A		159277.7	204612.9	354.82	2.90	351.92	**4.0**	**3.3**
T19/P-50B				351.53	2.32	349.21		
T19/P-25A		159299.5	204623.4	354.11	2.47	351.64	**1.7**	**0.9**
T19/P-25B				352.74	1.84	350.90		
T19/P0A		159322.7	204629.6	352.45	0.27	352.18	**3.5**	**5.4**
T19/P0B				349.57	1.84	347.73		
T19/P25A		159348.4	204641	353.37	3.27	350.10	**2.3**	**1.0**
T19/P25B				351.45	2.17	349.28		
T19/P50A		159371.2	204649	353.11	2.84	350.27	**1.7**	**1.2**
T19/P50B				351.74	2.42	349.32		
T19/P+75A		159393.6	204659.3	352.61	2.40	350.21	**1.2**	**2.7**
T19/P+75B				352.10	3.08	349.02		
T19/P+100A		159415.9	204670.8	351.96	2.24	349.72	**1.7**	**1.4**
T19/P+100B				350.59	2.00	348.59		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T19B-NE								
T19B-NW								
T19B-SE								
T19B-SW								
T19B-C								
T19B+50								
T19B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 25**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T25/P-125A		159625.6	204763.9	347.31	**2.33**	344.98	**3.0**	**3.1**
T25/P-125B				344.85	**2.39**	342.46		
T25/P-100A		159648.3	204774.0	347.25	**0.84**	346.41	**3.3**	**4.1**
T25/P-100B				344.51	**1.46**	343.05		
T25/P-75A		159671.8	204785.8	347.45	**1.00**	346.45	**5.3**	**5.7**
T25/P-75B				343.07	**1.34**	341.73		
T25/P-50A		159695.4	204791.5	347.53	**2.08**	345.45	**3.3**	**3.0**
T25/P-50B				344.79	**1.84**	342.95		
T25/P-25A		159718.7	204790.8	347.08	**2.14**	344.94	**5.3**	**4.6**
T25/P-25B				342.70	**1.56**	341.14		
T25/P0A		159744.8	204796.8	346.62	**2.14**	344.48	**3.3**	**3.0**
T25/P0B				343.88	**1.90**	341.98		
T25/P25A		159767.0	204808.6	346.67	**1.84**	344.83	**5.3**	**6.0**
T25/P25B				342.29	**2.40**	339.89		
T25/P50A		159787.1	204822.2	346.04	**1.90**	344.14	**3.5**	**3.4**
T25/P50B		159811.3	204776.0	342.84	**1.84**	341.00		
T25/P+75A								
T25/P+75B								
T25/P+100A								
T25/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T25B-NE								
T25B-NW								
T25B-SE								
T25B-SW								
T25B-C								
T25B+50								
T25B+100								


VST Results along downslope of floating road in Cell T25
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
T25-75
T25-25

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 25**
Test No.		T25-75	Date: 27th Sept 04			Peat Depth (m) 1.05	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	9.5	3.50	4.9				
1.00	23.5	3.50	12.5				
Test No.		T25-25	Date: 27th Sept 04			Peat Depth (m) 1.75	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	23	8.00	12.2				
1.00	11.5	4.00	6.0				
1.50	9.5	5.00	4.9				
1.70	27.5	4.00	14.7				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

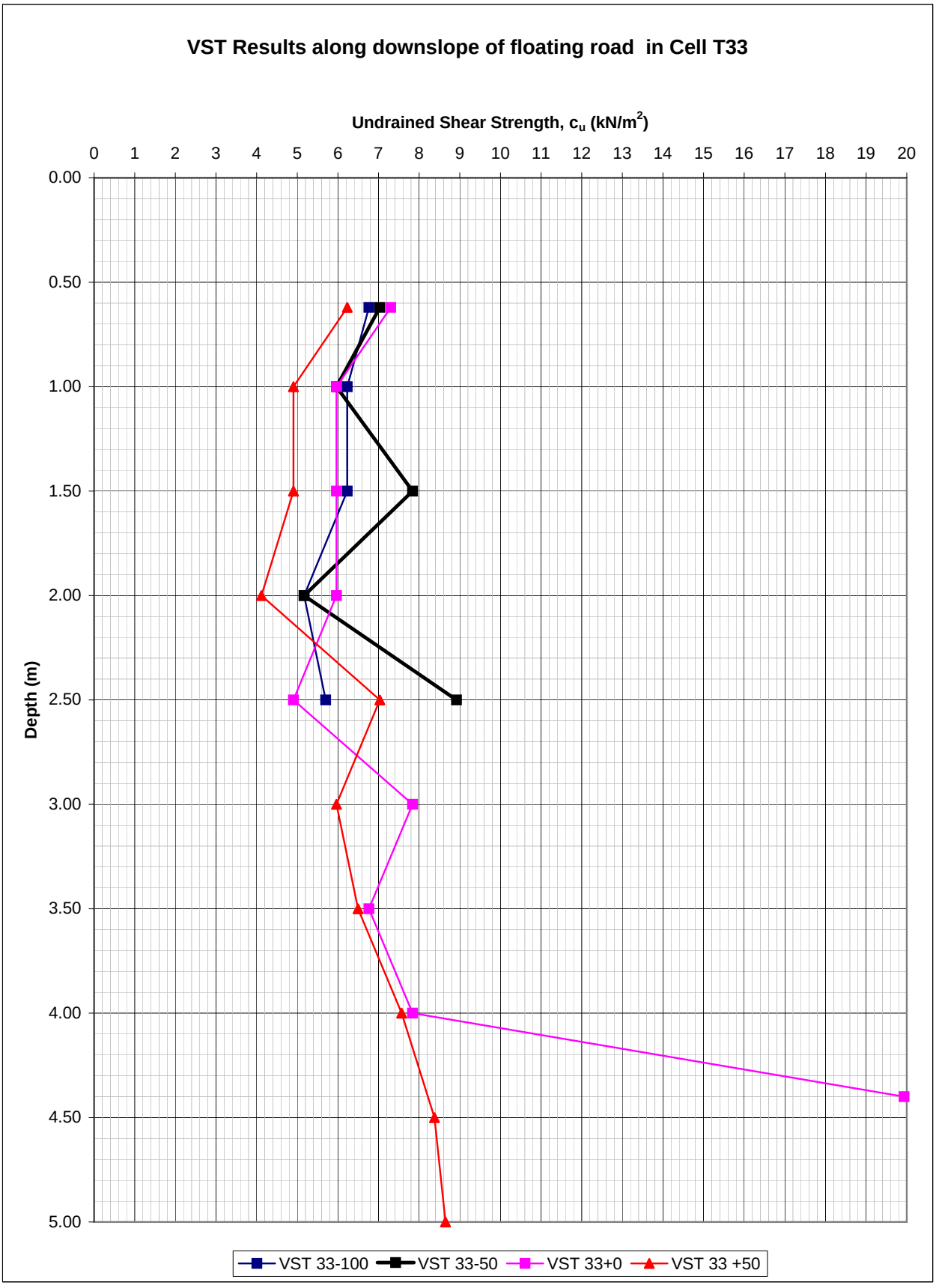
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 30**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Pea	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T30/P-100A		159946.2	205307.8	337.39	**1.80**	335.59	**0.9**	**1.0**
T30/P-100B				337.69	**1.30**	336.39		
T30/P-75A		159969.8	205318.0	337.10	**1.60**	335.50	**2.1**	**0.9**
T30/P-75B				337.86	**1.60**	336.26		
T30/P-50A		159991.8	205329.2	337.40	**1.70**	335.70	**2.5**	**0.7**
T30/P-50B				338.12	**1.80**	336.32		
T30/P-25A		160014.8	205339.9	337.67	**1.80**	335.87	**2.2**	**0.3**
T30/P-25B				338.21	**2.10**	336.11		
T30/P0A		160036.4	205350.6	337.87	**1.90**	335.97	**1.4**	**0.5**
T30/P0B				338.20	**2.60**	335.60		
T30/P25A		160061	205358.2	337.70	**2.30**	335.40	**1.3**	**0.3**
T30/P25B				338.16	**3.00**	335.16		
T30/P50A		160083.2	205368.0	337.59	**2.30**	335.29	**0.5**	**0.6**
T30/P50B				337.76	**3.00**	334.76		
T30/P+75A		160105.1	205379.0	337.53	**2.60**	334.93	**0.4**	**0.6**
T30/P+75B				337.43	**3.00**	334.43		
T30/P+100A		160129.6	205384.8	337.24	**2.80**	334.44	**0.5**	**0.3**
T30/P+100B				337.37	**3.20**	334.17		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T30B-NE								
T30B-NW								
T30B-SE								
T30B-SW								
T30B-C		160039.0	205334.0					
T30B+50								
T30B+100								


VST Results along downslope of floating road in Cell T30
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 30+75
VST 30+25
VST 30-25
T 30-75

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 30**
Job No. 03-104							
Test No.		VST 30+75	Date:	24th Sept 04		Peat Depth (m)	2.65
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.5	6.50	8.1				
1.00	10.0	5.00	5.2				
1.50	8.0	5.50	4.1				
2.00	15.5	5.50	8.1				
2.50	15.0	3.00	7.8				
Test No.		VST 30+25	Date:	24th Sept 04		Peat Depth (m)	2.03
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	18.0	5.00	9.5				
1.00	10.0	4.00	5.2				
1.50	19.5	6.00	10.3				
2.00	9.5	3.00	4.9				
Test No.		VST 30-25	Date:	24th sept 04		Peat Depth (m)	1.32
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	9.5	4.50	4.9				
1.00	14.0	4.00	7.3				
Test No.		VST 30-75	Date:	24th sept 04		Peat Depth (m)	1.63m
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	12.0	7.00	6.2				
1.00	11.0	4.00	5.7				
1.50	20.0	4.50	10.6				

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 33**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T33/P-100A		160128.9	205377.7	341.61	**2.80**	338.81	**0.5**	**1.4**
T33/P-100B					**3.50**			
T 33/P-75A		160152.7	205384.5	341.58	**3.40**	338.18	**0.5**	**0.7**
T33/P-75B					**3.60**			
T33/P-50A		160175.8	205392.3	341.43	**3.40**	338.03	**0.5**	**1.0**
T33/P-50B					**3.80**			
T33/P-25A		160197.5	205402.2	341.35	**3.80**	337.55	**0.5**	**0.9**
T33/P-25B					**4.10**			
T33/P0A		160221.7	205414.1	341.07	**4.00**	337.07	**0.5**	**1.5**
T33/P0B					**4.80**			
T33/P25A		160242.4	205422.2	341.03	**4.80**	336.23	**0.5**	**-0.2**
T33/P25B					**4.20**			
T33/P50A		160265.4	205430.7	340.92	**4.80**	336.12	**0.5**	**0.9**
T33/P50B					**5.10**			
T33/P+75A		160287.2	205440.9	340.85	**5.20**		**0.5**	
T33/P+75B								
T33/P+100A		160309.5	205451.2	340.41	**5.40**		**0.5**	
T33/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T33B-NE								
T33B-NW								
T33B-SE								
T33B-SW								
T33B-C		160224.0	205410.0					
T33B+50								
T33B+100								

Turbine/ Cell No.


VST Results along downslope of floating road in Cell T33
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 33-100
VST 33-50
VST 33+0
VST 33 +50

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 33**
Test No.		VST 33-100	Date:			Peat Depth (m) 2.6	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	13.0	6.50	6.8				
1.00	12.0	5.50	6.2				
1.50	12.0	4.50	6.2				
2.00	10.0	4.00	5.2				
2.50	11.0	5.50	5.7				
Test No.		VST 33-50	Date:			Peat Depth (m) 2.55	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	13.5	5.50	7.0				
1.00	11.5	5.50	6.0				
1.50	15.0	4.00	7.8				
2.00	10.0	3.50	5.2				
2.50	17.0	3.00	8.9				
Test No.		VST 33+0	Date:			Peat Depth (m) 4.45	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14.0	4.50	7.3				
1.00	11.5	4.00	6.0				
1.50	11.5	4.00	6.0				
2.00	11.5	3.50	6.0				
2.50	9.5	4.50	4.9				
3.00	15.0	5.00	7.8				
3.50	13.0	4.00	6.8				
4.00	15.0	5.00	7.8				
4.40	36.5	5.50	19.9				
Test No.		VST 33+50	Date:			Peat Depth (m) 5.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	12.0	5.50	6.2				
1.00	9.5	5.00	4.9				
1.50	9.5	4.50	4.9				
2.00	8.0	5.50	4.1				
2.50	13.5	4.50	7.0				
3.00	11.5	5.00	6.0				
3.50	12.5	4.50	6.5				
4.00	14.5	4.00	7.6				
4.50	16.0	4.00	8.4				
5.00	16.5	5.00	8.6				

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 35**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T35/P-100A		160377.9	204818.7	310.99	**0.40**	310.59	**4.5**	**4.5**
T35/P-100B				307.30	**0.44**	306.86		
T35/P-75A		160401.9	204820.7	309.68	**1.10**	308.58	**5.5**	**5.2**
T35/P-75B				305.16	**0.84**	304.32		
T35/P-50A		160423.8	204831.2	309.42	**1.85**	307.57	**12.0**	**10.6**
T35/P-50B				299.43	**0.65**	298.78		
T35/P-25A		160445.8	204842.5	307.49	**0.65**	306.84	**4.5**	**4.5**
T35/P-25B				303.79	**0.65**	303.14		
T35/P0A		160468.4	204852.6	307.33	**0.40**	306.93	**6.7**	**7.0**
T35/P0B				301.84	**0.70**	301.14		
T35/P25A		160492.4	204860.6	307.12	**0.10**	307.02	**6.3**	**7.3**
T35/P25B				301.91	**0.90**	301.01		
T35/P50A		160516.7	204872.0	306.19	**0.84**	305.35	**6.5**	**5.8**
T35/P50B				300.83	**0.30**	300.53		
T35/P+75A		160533.1	204886.5	305.81	**0.54**	305.27	**2.5**	**2.2**
T35/P+75B				303.76	**0.26**	303.50		
T35/P+100A		160555.5	204896.1	305.80	**0.84**	304.96	**2.7**	**3.1**
T35/P+100B				303.61	**1.20**	302.41		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T35B-NE								
T35B-NW								
T35B-SE								
T35B-SW								
T35B-C								
T35B+50								
T35B+100								

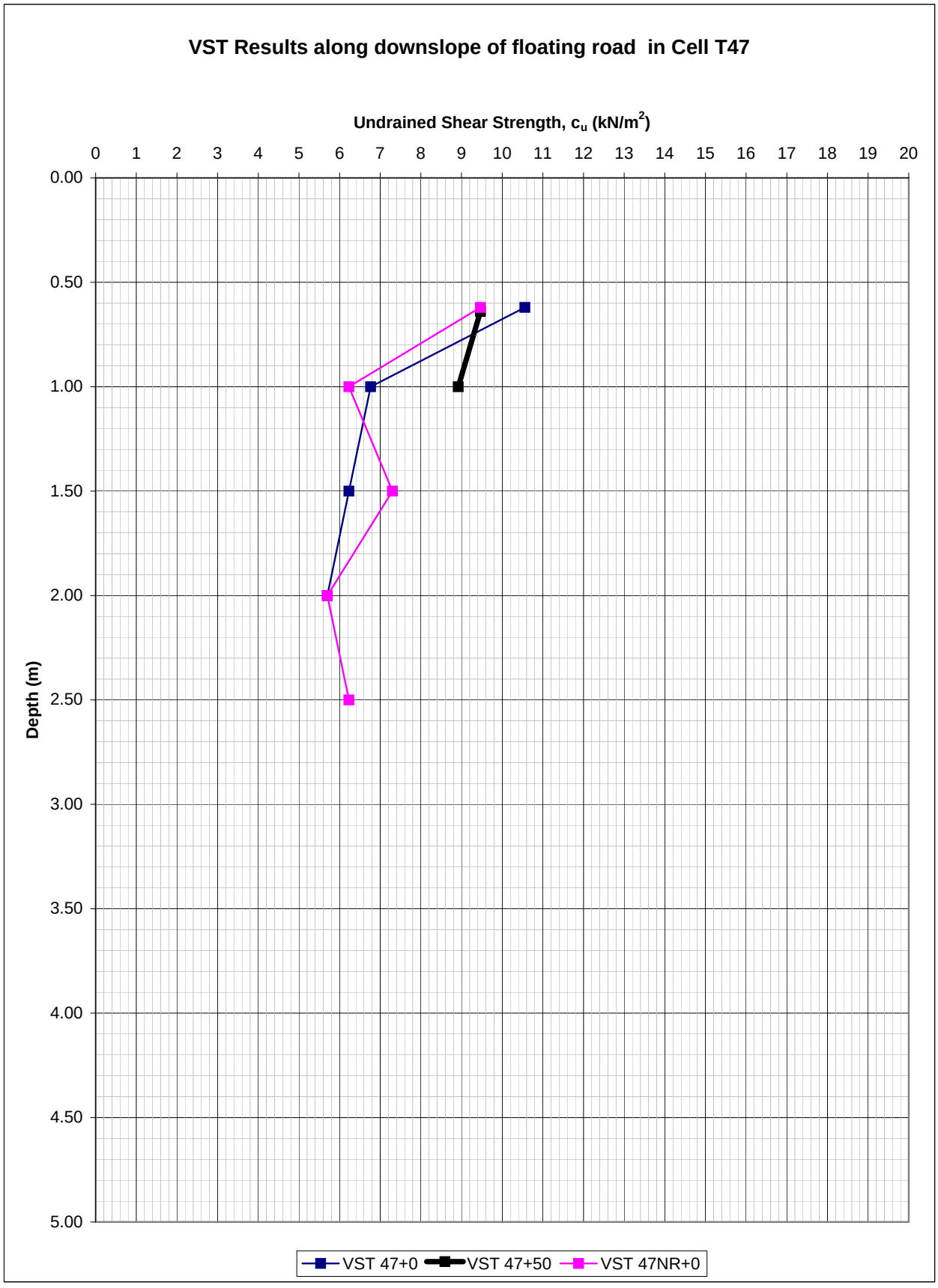
AGL Consulting ***Geotechnical Engineers***			**Record of Gouge Auger Probes**					
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 36**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T36/P-100A		160333.6	205459.1	340.48	4.38	336.10	**0.1**	**-0.7**
T36/P-100B		160329.2	205472.4	340.43	3.78	336.65		
T36/P-75A		160355.1	205468.4	340.10	3.88	336.22	**0.7**	**-0.3**
T36/P-75B		160348.7	205482.0	339.86	3.40	336.46		
T36/P-50A		160376.7	205478.5	339.61	3.38	336.23	**0.2**	**-0.7**
T36/P-50B		160369.6	205495.7	339.41	2.58	336.83		
T36/P-25A		160398.6	205490.4	339.11	2.90	336.21	**0.3**	**0.1**
T36/P-25B		160393.9	205505.2	338.81	2.70	336.11		
T36/P0A		160433.6	205502.9	338.26	3.18	335.08	**0.6**	**0.1**
T36/P0B		160426.0	205520.0	337.72	2.70	335.02		
T36/P25A		160456.5	205510.8	337.38	2.90	334.48	**0.6**	**0.1**
T36/P25B		160447.0	205530.5	337.32	2.90	334.42		
T36/P50A		160480.2	205518.0	336.75	2.88	333.87	**0.3**	**0.1**
T36/P50B		160470.0	205541.4	336.75	3.00	333.75		
T36/P+75A		160503.1	205526.4	335.96	2.78	333.18	**0.2**	**0.1**
T36/P+75B		160492.8	205549.5	335.97	2.90	333.07		
T36/P+100A		160525.8	205534.5	335.40	2.00	333.40	**0.5**	**0.0**
T36/P+100B		160514.4	205556.3	335.39	2.00	333.39		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T36B-NE								
T36B-NW								
T36B-SE								
T36B-SW								
T36B-C		160435.0	205499.0					
T36B+50								
T36B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 39**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T39/P-125A		160524.7	205535.0	339.0			**0.8**	**0.0**
T39/P-125B		160516.0	205552.7	339.3				
T39/P-100A		160546.7	205546.7	338.4	**2.50**	335.88	**0.7**	**2.5**
T39/P-100B		160541.6	205556.0	338.5	**3.10**	335.41		
T39/P-75A					**2.00**			
T39/P-75B					**2.50**			
T39/P-50A		160567.2	205561.8	337.1	**1.90**	335.18	**0.5**	**-0.5**
T39/P-50B		160562.0	205570.1	337.2	**1.90**	335.27		
T39/P-25A		160587.1	205574.7	336.2	**2.38**	333.85	**0.3**	**-1.3**
T39/P-25B		160581.7	205584.7	336.3	**2.18**	334.11		
T39/P0A		160605.4	205590.3	335.5	**2.88**	332.62	**0.6**	**-2.2**
T39/P0B		160600.2	205599.3	335.4	**2.38**	333.01		
T39/P25A		160628.6	205603.4	334.5	**3.28**	331.19	**0.4**	**-2.8**
T39/P25B		160621.0	205615.3	334.6	**2.70**	331.88		
T39/P50A		160652.6	205611.6	333.5	**2.40**	331.09	**1.2**	**-0.1**
T39/P50B		160654.8	205625.3	333.2	**2.08**	331.11		
T39/P+75A		160679.4	205613.0	332.3	**1.88**	330.47	**0.6**	**2.9**
T39/P+75B		160680.0	205626.4	332.2	**2.40**	329.80		
T39/P+100A		160701.6	205610.9	331.0	**1.88**	329.14	**1.2**	**1.9**
T39/P+100B		160700.2	205621.8	331.2	**2.48**	328.77		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T39B-NE								
T39B-NW								
T39B-SE								
T39B-SW								
T39B-C								
T39B+50								
T39B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 42**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T42/P-150A					**3.20**			
T42/P-150B					**3.40**			
T42/P-125A					**2.80**		**1.5**	**1.9**
T42/P-125B					**3.10**			
T42/P-100A		160744.4	205607.9	325.14	**1.90**	323.24	**0.0**	**0.0**
T42/P-100B				325.14	**1.90**	323.24		
T42/P-75A		160770.9	205607.1	324.34				
T42/P-75B								
T42/P-50A		160795.0	205602.7	323.22	**1.84**	321.38	**1.5**	**1.5**
T42/P-50B				321.99	**1.84**	320.15		
T42/P-25A		160817.9	205599.3	322.23	**2.10**	320.13	**1.5**	**1.0**
T42/P-25B				321.00	**1.70**	319.30		
T42/P0A		160843.5	205589.2	320.41	**2.30**	318.11	**0.5**	**0.4**
T42/P0B				320.00	**2.20**	317.80		
T42/P25A		160872.8	205600.6	318.65	**2.30**	316.35	**1.5**	**1.3**
T42/P25B				317.42	**2.10**	315.32		
T42/P50A		160891.8	205594.7	318.29	**2.20**	316.09	**2.5**	**2.9**
T42/P50B				316.24	**2.50**	313.74		
T42/P+75A		160916.5	205592.4	317.25	**2.50**	314.75	**2.5**	**2.9**
T42/P+75B				315.20	**2.84**	312.36		
T42/P+100A		160940.4	205590.0	316.49	**2.40**	314.09	**1.5**	**2.1**
T42/P+100B				315.26	**2.90**	312.36		
T42/P+125A					**3.14**		**1.7**	**2.5**
T42/P+125B					**3.80**			
T42/P+150A					**2.70**		**1.7**	**2.5**
T42/P+150B					**3.40**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T42B-NE								
T42B-NW								
T42B-SE								
T42B-SW								
T42B-C								
T42B+50								
T42B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 47**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T47/P-100A								
T47/P-100B								
T47/P-75A								
T47/P-75B								
T47/P-50A								
T47/P-50B								
T47/P-25A								
T47/P-25B								
T47/P0A					**2.80**			
T47/P0B					**1.60**		**2.5**	**1.0**
T47/P25A					**2.15**			
T47/P25B					**1.60**		**2.5**	**1.8**
T47/P50A					**1.20**			
T47/P50B					**2.40**		**6.3**	**7.8**
T47/P+75A					**0.90**			
T47/P+75B					**1.50**		**11.0**	**11.7**
T47/P+100A					**2.40**			
T47/P+100B					**1.20**		**12.0**	**10.6**
T47/P+125A					**0.80**			
T47/P+125B					**1.50**		**6.0**	**6.8**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T47NE					**2.1**			
T47NW					**1.8**			
T47SE					**1.8**			
T47SW					**2.0**			
T47C					**1.7**			
T47+50					**1.6**			
T47+100								

Intermediate Point (AB) Coordinates E (m)	N (m)	Elev. (mOD)	Assume Total = 47 m Distance A to AB (m)	Distance AB to B (m)	Slope Angle (Ground Surface) (Deg.) A to AB	AB to B (Abney Level)	AB (Over 47 m)	δ Elev AB to B (m)	X (m)
						2.5		2.05	0.85
						2.5		2.05	1.50
						6.3		5.21	6.41
						11.0		9.14	9.74
						12.0		9.99	8.79
						6.0		4.94	5.64

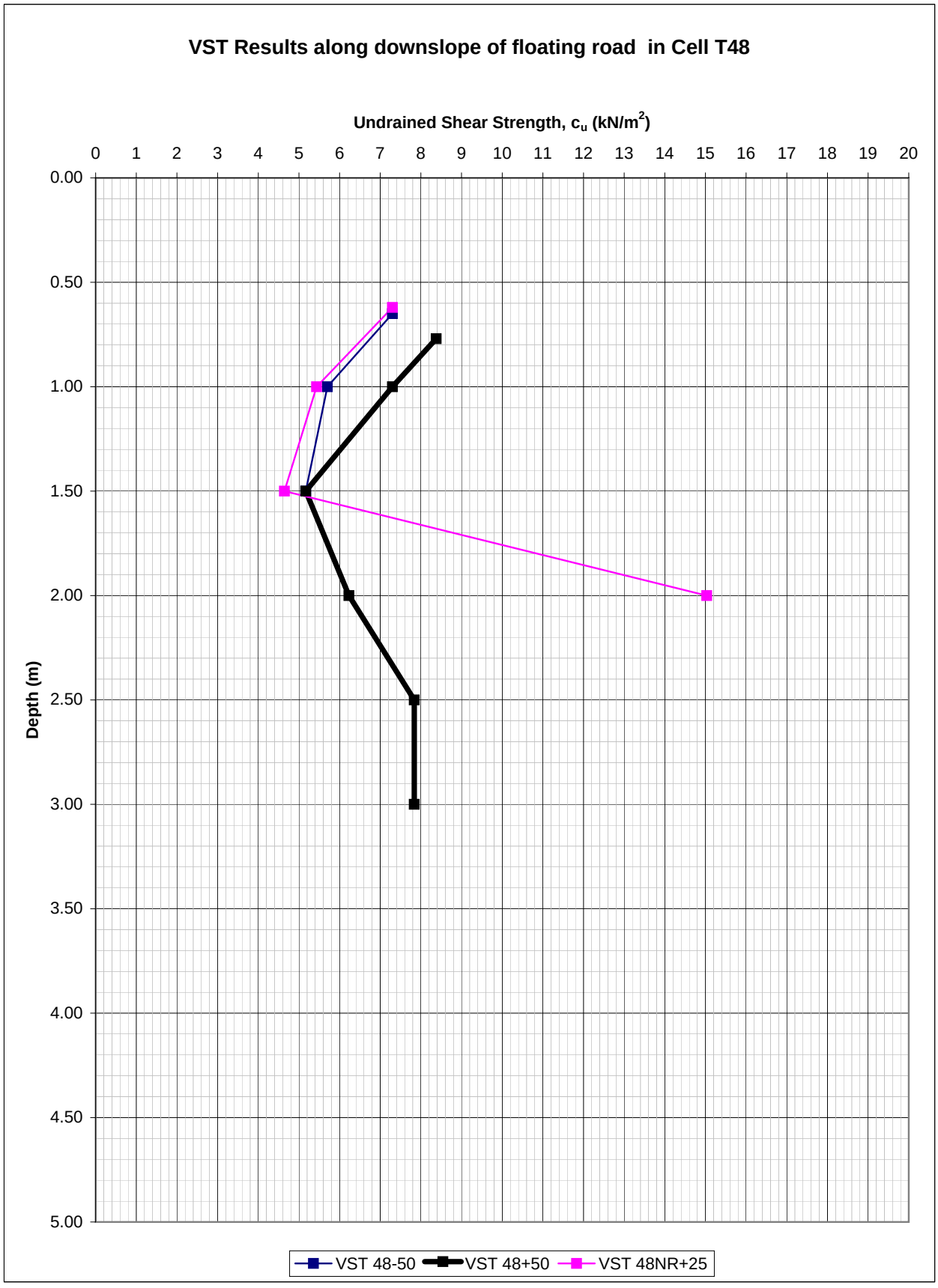

VST Results along downslope of floating road in Cell T47
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 47+0
VST 47+50
VST 47NR+0

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 47**
Job No. 03-104							
Test No.		VST 47+0	Date:			Peat Depth (m) 2.01	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	20.0	8.50	10.6				
1.00	13.0	5.50	6.8				
1.50	12.0	9.00	6.2				
2.00	11.0	5.50	5.7				
Test No.		VST 47+50	Date:			Peat Depth (m) 1.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.64	18.0	4.50	9.5				
1.00	17.0	5.50	8.9				
Test No.		VST 47NR+0	Date:			Peat Depth (m) 2.65	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	18.0	4.50	9.5				
1.00	12.0	5.50	6.2				
1.50	14.0	6.00	7.3				
2.00	11.0	5.00	5.7				
2.50	12.0	4.50	6.2				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 47NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T47/P-100A								
T47/P-100B								
T47/P-75A								
T47/P-75B								
T47/P-50A								
T47/P-50B								
T47/P-25A								
T47/P-25B								
T47/P0A					**3.10**		**0.8**	**0.0**
T47/P0B					**2.80**			
T47/P25A					**2.50**			
T47/P25B					**2.15**			
T47/P50A					**1.24**		**0.3**	**0.2**
T47/P50B					**1.20**			
T47/P+75A								
T47/P+75B								
T47/P+100A					**1.70**		**0.0**	**2.0**
T47/P+100B					**2.40**			
T47/P+125A								
T47/P+125B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 20m downslope from road								
Probes On Turbine Base								
T47B-NE								
T47B-NW								
T47B-SE								
T47B-SW								
T47B-C								
T47B+50								
T47B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 48**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T48/P-100A					**1.30**			
T48/P-100B					**2.00**		**10.0**	**10.8**
T48/P-75A					**2.20**			
T48/P-75B					**1.80**		**9.0**	**8.5**
T48/P-50A					**1.70**			
T48/P-50B					**1.80**		**7.0**	**7.1**
T48/P-25A					**1.90**			
T48/P-25B					**1.10**		**3.2**	**2.2**
T48/P0A					**3.00**			
T48/P0B					**0.00**		**6.2**	**2.5**
T48/P25A		158491.1	205426.0	348.34	**3.50**	344.84		
T48/P25B				344.64	**1.90**	342.74	**4.5**	**2.6**
T48/P50A		158515.1	205430.6	348.20	**3.10**	345.10		
T48/P50B				346.29	**2.80**	343.49	**2.3**	**2.0**
T48/P+75A		158540.4	205439.1	347.62	**3.20**	344.42		
T48/P+75B				344.34	**2.15**	342.19	**4.0**	**2.7**
T48/P+100A		158562.4	205450.0	346.81	**3.20**	343.61		
T48/P+100B				344.34	**1.45**	342.89	**3.0**	**0.9**
T48/P+125A					**2.90**			
T48/P+125B					**2.10**		**4.7**	**3.7**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T48NE					**2.6**			
T48NW					**2.7**			
T48SE					**2.9**			
T48SW					**2.9**			
T48C					**2.85**			
T48+50					**0.0**			
T48+100					**0.8**			

Intermediate Point (AB) Coordinates E (m)	N (m)	Elev. (mOD)	Assume Total = 47 m Distance A to AB (m)	Distance AB to B (m)	Slope Angle (Ground Surface) (Deg.) A to AB	AB to B (Abney Level)	AB (Over 47 m)	δ Elev AB to B (m)	X (m)
						10.0		8.29	8.99
						9.0		7.44	7.04
						7.0		5.77	5.87
						3.2		2.60	1.80
						6.2		5.08	2.08
						4.5		3.70	2.10
						2.3		1.91	1.61
						4.0		3.29	2.24
						3.0		2.46	0.71
						4.7		3.83	3.03

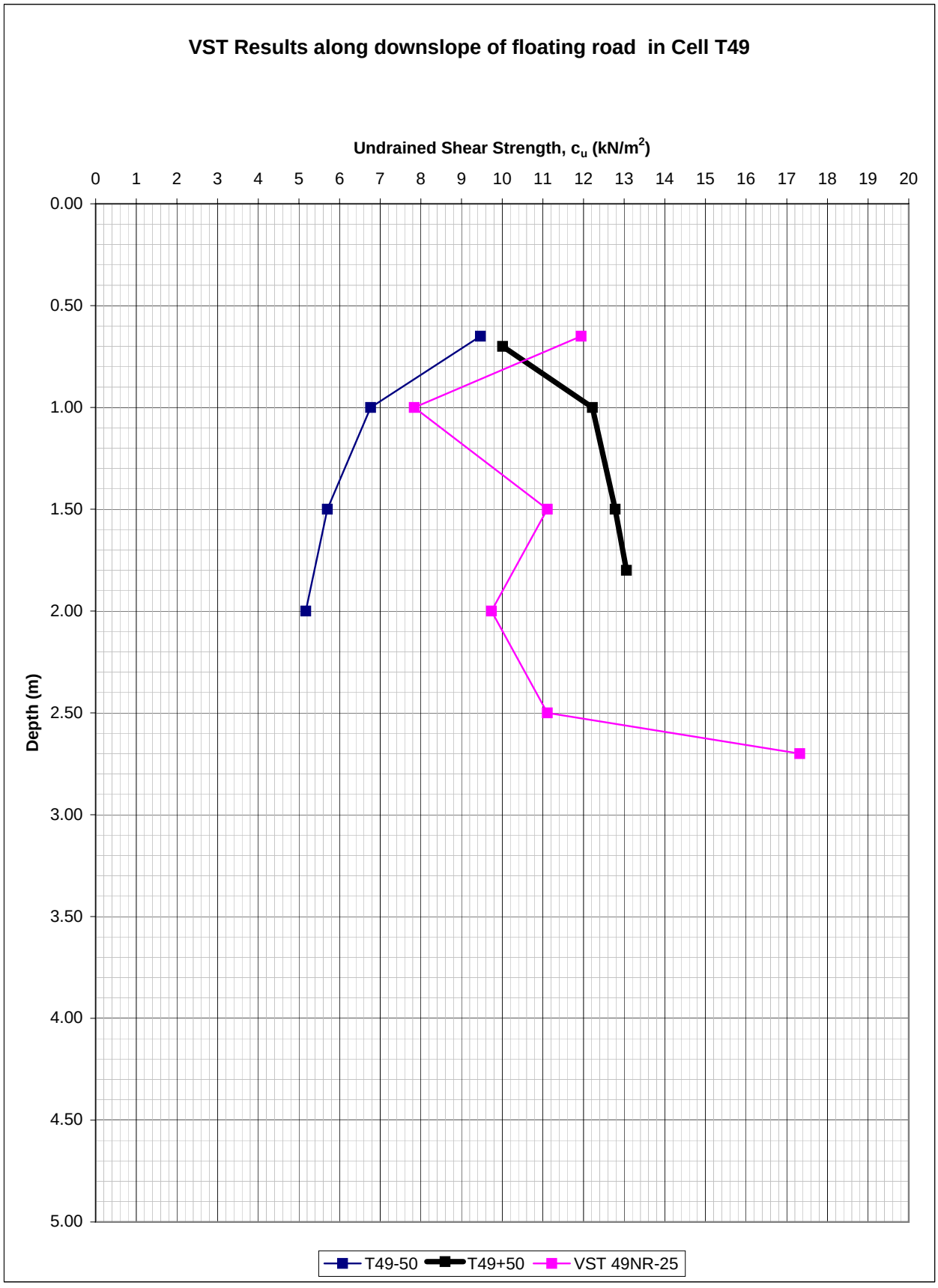

VST Results along downslope of floating road in Cell T48
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 48-50
VST 48+50
VST 48NR+25

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 48**
Test No.		VST 48-50	Date:			Peat Depth (m) 1.64	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	14.0	5.00	7.3				
1.00	11.0	2.50	5.7				
1.50	10.0	3.00	5.2				
Test No.		VST 48+50	Date:			Peat Depth (m) 3.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.77	16.0	4.00	8.4				
1.00	14.0	4.00	7.3				
1.50	10.0	4.00	5.2				
2.00	12.0	4.50	6.2				
2.50	15.0	4.50	7.8				
3.00	15.0	4.00	7.8				
Test No.		VST 48NR+25	Date:			Peat Depth (m) 2.05	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14.0	4.00	7.3				
1.00	10.5	3.50	5.4				
1.50	9.0	2.00	4.6				
2.00	28.0	4.00	15.0				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 48NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T48/P-100A								
T48/P-100B								
T48/P-75A					**1.80**		**1.7**	**1.1**
T48/P-75B					**2.20**			
T48/P-50A								
T48/P-50B								
T48/P-25A					**2.80**		**1.0**	**-2.6**
T48/P-25B					**1.90**			
T48/P0A					**3.00**		**1.7**	**1.7**
T48/P0B					**3.00**			
T48/P25A					**3.34**		**1.0**	**1.5**
T48/P25B					**3.50**			
T48/P50A								
T48/P50B								
T48/P+75A					**3.04**		**1.0**	**1.5**
T48/P+75B					**3.20**			
T48/P+100A								
T48/P+100B								
T48/P+125A								
T48/P+125B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 20m downslope from road								
Probes On Turbine Base								
T48B-NE								
T48B-NW								
T48B-SE								
T48B-SW								
T48B-C								
T48B+50								
T48B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 49**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T49/P-100A					**2.90**			
T49/P-100B					**2.10**		**4.7**	**3.7**
T49/P-75A		158600.7	205469.5	345.22	**1.85**	343.37		
T49/P-75B				341.38	**2.00**	339.38	**4.7**	**4.8**
T49/P-50A		158621.2	205482.2	344.83	**2.40**	342.43		
T49/P-50B				337.81	**1.50**	336.31	**8.5**	**7.4**
T49/P-25A					**2.20**			
T49/P-25B					**0.80**		**7.5**	**5.8**
T49/P0A		158662.5	205507.4	344.70	**1.95**	342.75		
T49/P0B				332.83	**1.40**	331.43	**14.2**	**13.5**
T49/P25A					**2.90**			
T49/P25B					**1.40**		**11.5**	**9.7**
T49/P50A					**1.50**			
T49/P50B					**0.80**		**7.5**	**6.7**
T49/P+75A					**0.95**			
T49/P+75B					**0.70**		**8.5**	**8.2**
T49/P+100A					**1.80**			
T49/P+100B					**0.65**		**4.7**	**3.3**
T49/P+125A					**1.15**			
T49/P+125B					**0.40**		**4.7**	**3.8**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T49NE					**2.70**			
T49NW					**2.70**			
T49SE					**3.00**			
T49SW					**3.10**			
T49C					**1.95**			
T49+50					**1.40**			
T49+100					**0.90**			

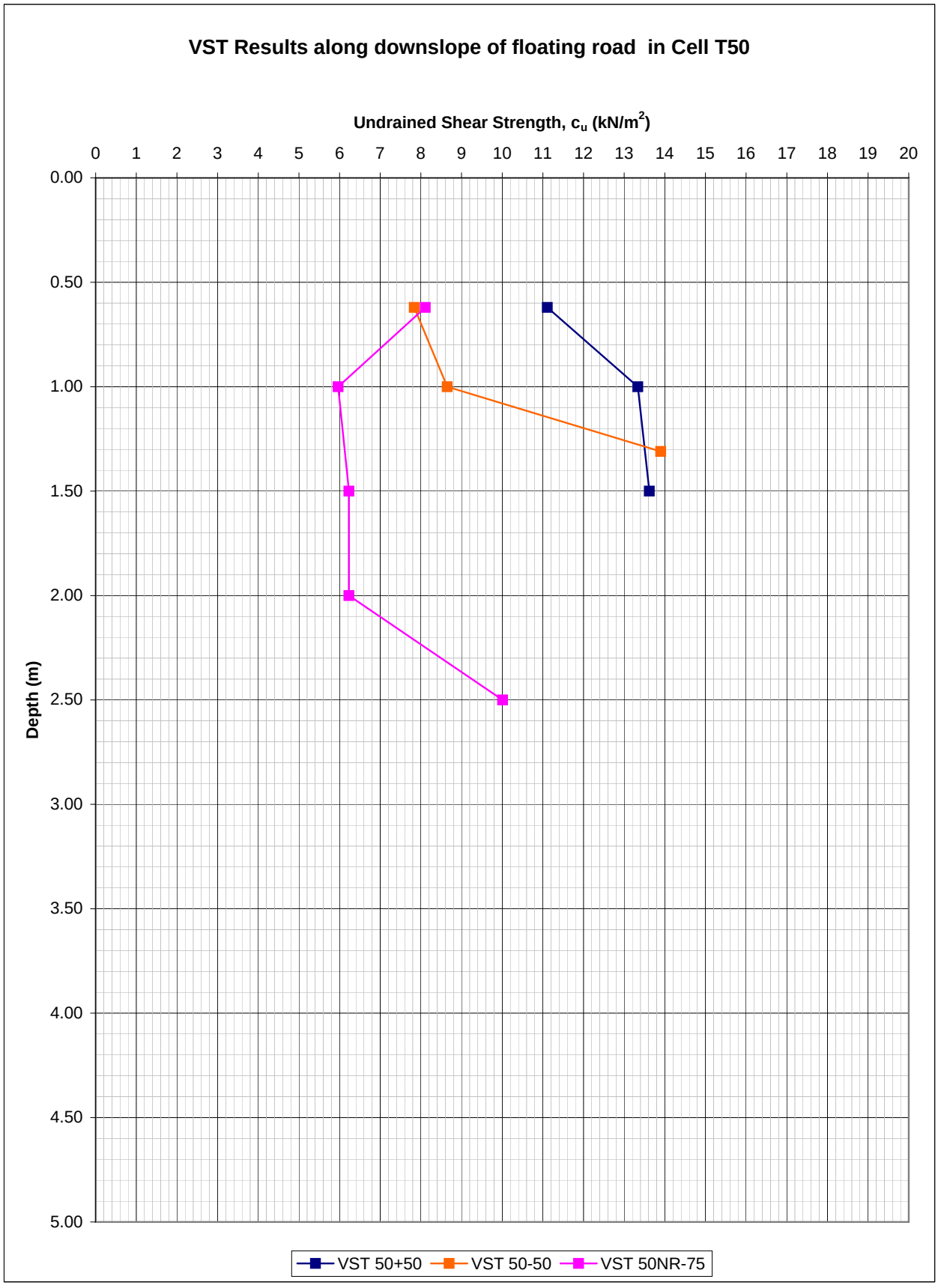
Intermediate Point (AB) Coordinates E (m)	N (m)	Elev. (mOD)	Assume Total = 47 m Distance A to AB (m)	Distance AB to B (m)	Slope Angle (Ground Surface) (Deg.) A to AB (Abney Level)	AB to B (Abney Level)	AB (Over 47 m)	δ Elev AB to B (m)	X (m)
						4.7		3.83	3.03
						4.7		3.83	3.98
						8.5		7.02	6.12
						7.5		6.19	4.79
						14.2		11.87	11.32
						11.5		9.56	8.06
						7.5		6.19	5.49
						8.5		7.02	6.77
						4.7		3.83	2.68
						4.7		3.83	3.08


VST Results along downslope of floating road in Cell T49
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
T49-50
T49+50
VST 49NR-25

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 49**
Test No.		T49-50	Date:			Peat Depth (m) 2.2	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	18.0	5.50	9.5				
1.00	13.0	4.50	6.8				
1.50	11.0	4.50	5.7				
2.00	10.0	4.50	5.2				
Test No.		T49+50	Date:			Peat Depth (m) 1.85	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.70	19.0	5.00	10.0				
1.00	23.0	9.50	12.2				
1.50	24.0	5.50	12.8				
1.80	24.5	5.50	13.1				
Test No.		VST 49NR-25	Date:			Peat Depth (m) 2.92	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	22.5	4.50	11.9				
1.00	15.0	5.50	7.8				
1.50	21.0	5.00	11.1				
2.00	18.5	2.50	9.7				
2.50	21.0	3.50	11.1				
2.70	32.0	4.00	17.3				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

AGL Consulting ***Geotechnical Engineers***			**Record of Gouge Auger Probes**					
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 49NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T49/P-100A					**2.44**		**1.0**	**2.3**
T49/P-100B					**2.90**			
T49/P-75A								
T49/P-75B								
T49/P-50A					**2.20**		**0.7**	**1.2**
T49/P-50B					**2.40**			
T49/P-25A					**3.30**		**1.0**	**-2.2**
T49/P-25B					**2.20**			
T49/P0A								
T49/P0B								
T49/P25A					**2.80**		**1.7**	**2.0**
T49/P25B					**2.90**			
T49/P50A					**2.20**		**2.3**	**0.3**
T49/P50B					**1.50**			
T49/P+75A								
T49/P+75B								
T49/P+100A					**2.20**		**2.5**	**1.4**
T49/P+100B					**1.80**			
T49/P+125A								
T49/P+125B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 20m downslope from road								
Probes On Turbine Base								
T49B-NE								
T49B-NW								
T49B-SE								
T49B-SW								
T49B-C								
T49B+50								
T49B+100								

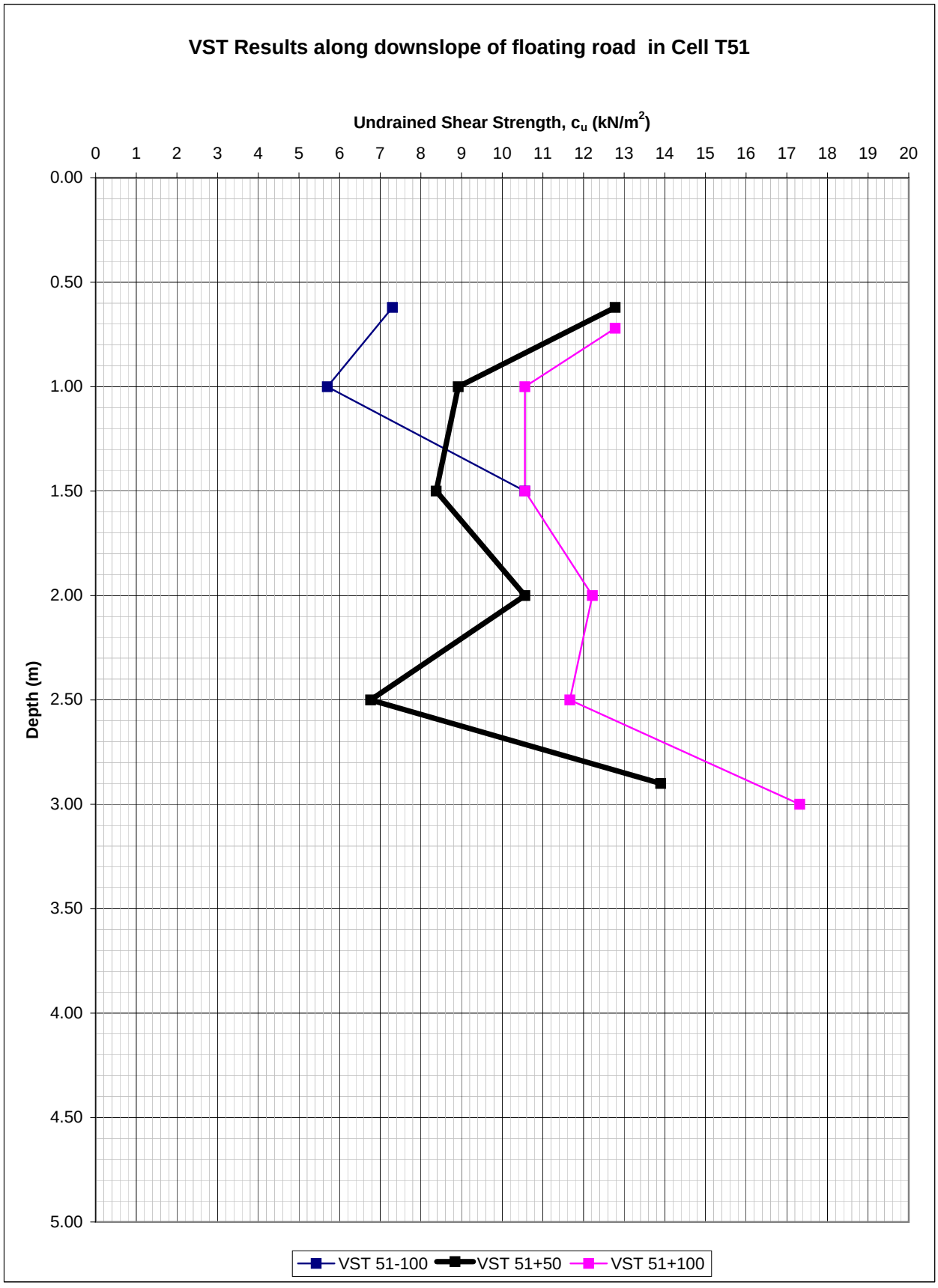
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 50**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T50/P-100A								
T50/P-100B								
T50/P-70A					**1.88**		**20.8**	**19.8**
T50/P-70B					**0.88**			
T50/P-50A					**1.24**		**11.5**	**11.1**
T50/P-50B					**0.88**			
T50/P-25A					**1.64**		**18.8**	**17.6**
T50/P-25B					**0.54**			
T50/P0A		158858.3	205619.0	342.25	**1.88**	340.37	**18.8**	**19.0**
T50/P0B				326.22	**2.00**	324.22		
T50/P25A					**1.36**		**10.3**	**10.3**
T50/P25B					**1.34**			
T50/P50A					**1.88**		**11.5**	**10.9**
T50/P50B					**1.38**			
T50/P+75A					**1.74**		**12.5**	**12.8**
T50/P+75B					**2.00**			
T50/P+100A								
T50/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T50B-NE					**2.06**			
T50B-NW					**1.9**			
T50B-SE					**2.64**			
T50B-SW					**2.66**			
T50B-C								
T50B+50					**0.35**			
T50B+100					**0.54**			


VST Results along downslope of floating road in Cell T50
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 50+50
VST 50-50
VST 50NR-75

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 50**
Job No. 03-104							
Test No.		VST 50+50	Date:			Peat Depth (m) 1.62	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	21.00		11.1				
1.00	25.00		13.3				
1.50	25.50		13.6				
Test No.		VST 50NR-75	Date:			Peat Depth (m) 2.70	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.50	6.50	8.1				
1.00	11.50	3.00	6.0				
1.50	12.00	3.50	6.2				
2.00	12.00	3.50	6.2				
2.50	19.00	4.50	10.0				
Test No.		VST 50-50	Date:			Peat Depth (m) 1.33	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.0	4.00	7.8				
1.00	16.5	4.50	8.6				
1.31	26.0	3.50	13.9				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

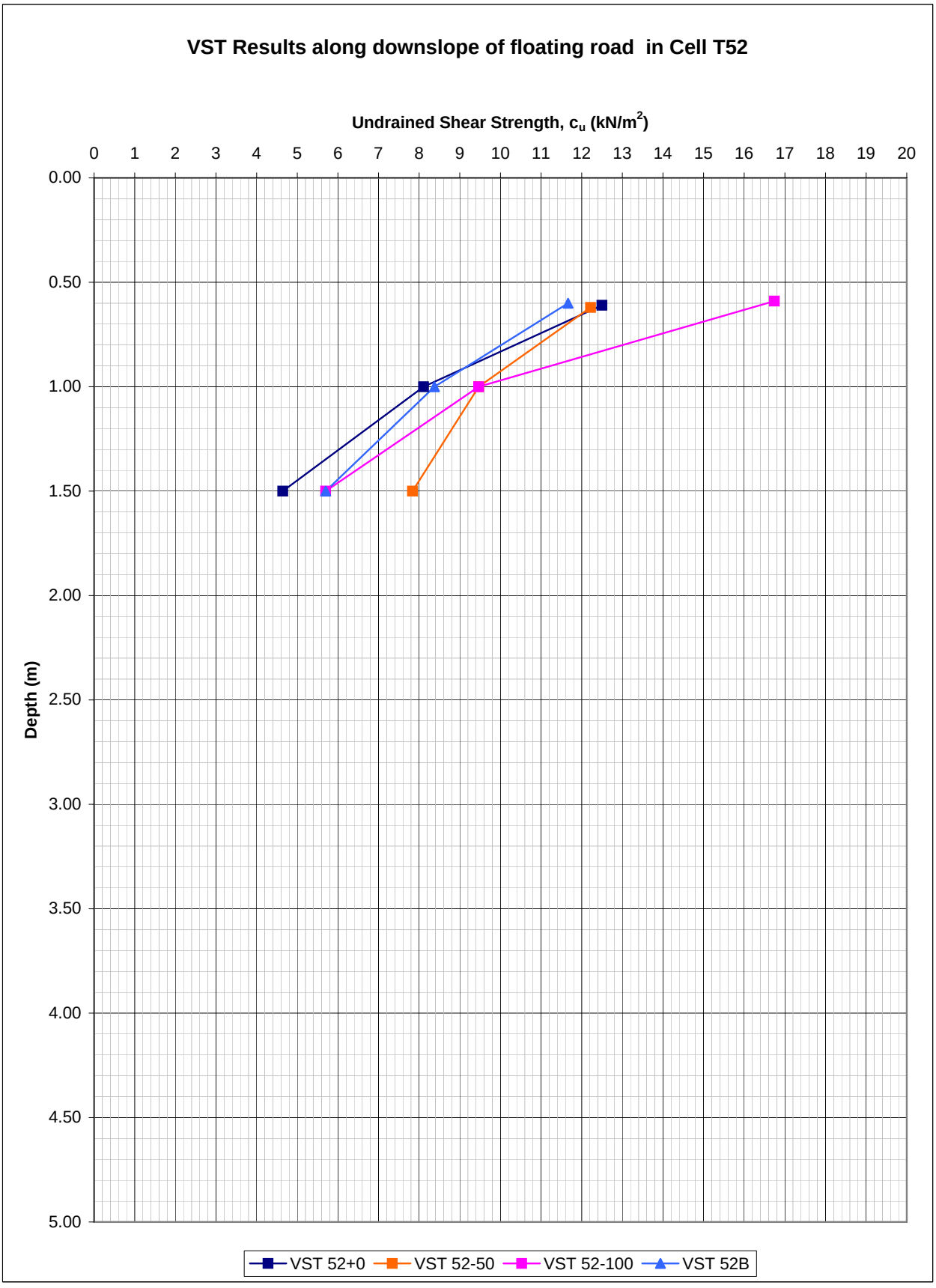
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 50NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T50/P-100A								
T50/P-100B								
T50/P-70A					**2.50**		**1.0**	
T50/P-70B								
T50/P-50A		158832.1	205569.9	345.8	**2.84**		**1.0**	
T50/P-50B								
T50/P-25A		158855.4	205589.9	345.0				
T50/P-25B								
T50/P0A					**1.90**		**4.5**	
T50/P0B								
T50/P25A								
T50/P25B								
T50/P50A		158909.8	205632.8	342.0	**2.00**		**4.0**	
T50/P50B								
T50/P+85A					**2.10**		**4.0**	
T50/P+85B								
T50/P+100A								
T50/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T50B-NE								
T50B-NW								
T50B-SE								
T50B-SW								
T50B-C								
T50B+50								
T50B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm					Made By:		**Cell No: 51**	
Job No. 03-104					Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T51/P-100A					**1.66**			
T51/P-100B					**1.44**		**9.5**	**9.2**
T51/P-75A					**1.56**			
T51/P-75B					**1.56**		**9.5**	**9.5**
T51/P-50A					**1.42**			
T51/P-50B					**1.12**		**4.6**	**4.2**
T51/P-25A					**2.21**			
T51/P-25B					**1.34**		**5.2**	**4.1**
T51/P0A		159021.4	205697.4	337.51	**2.64**	334.87		
T51/P0B				333.26	**2.10**	331.16	**5.2**	**4.5**
T51/P25A		159044.4	205708.2	336.99	**2.84**	334.15		
T51/P25B				333.29	**2.40**	330.89	**4.5**	**4.0**
T51/P50A		159069.9	205714.3	336.69	**2.84**	333.85		
T51/P50B				332.99	**2.84**	330.15	**4.5**	**4.5**
T51/P+75A		159093.2	205719.2	336.57	**3.08**	333.49		
T51/P+75B				332.32	**2.70**	329.62	**5.2**	**4.7**
T51/P+100A		159115.9	205726.4	335.86	**2.84**	333.02		
T51/P+100B				331.33	**1.46**	329.87	**5.5**	**3.8**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T51B-NE					**2.12**			
T51B-NW					**2.16**			
T51B-SE					**2.34**			
T51B-SW					**2.30**			
T51B-C					**2.42**			
T51B+50					**2.10**			
T51B+100					**2.61**			


VST Results along downslope of floating road in Cell T51
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 51-100
VST 51+50
VST 51+100

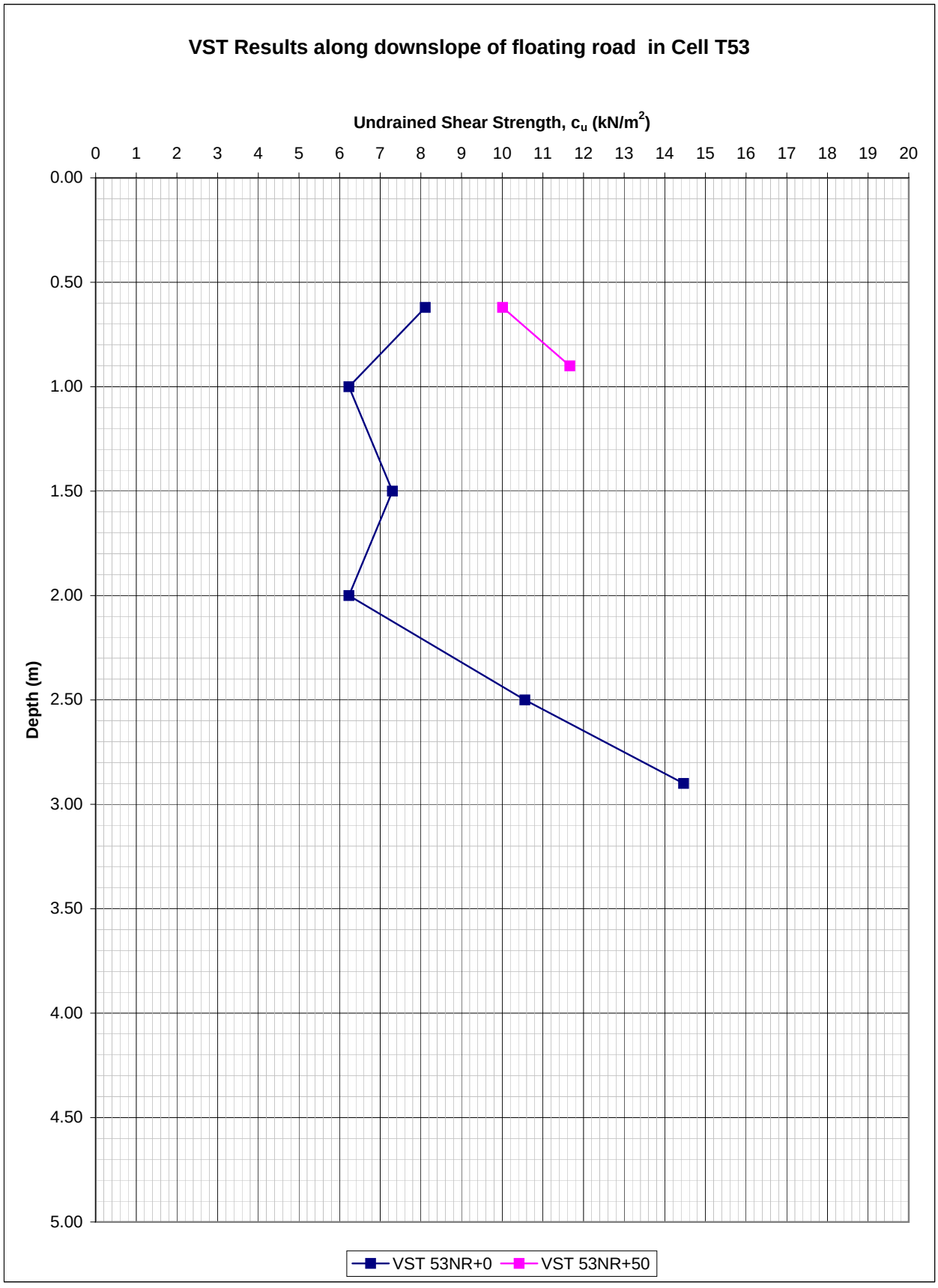
AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 51**
Job No. 03-104							
Test No.		VST 51-100				Peat Depth (m) 1.1	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14.0	6.00	7.3				
1.00	11.0	6.50	5.7				
1.50	20.0	5.00	10.6				
Test No.		VST 51+50	Date:			Peat Depth (m) 2.96	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	24.0		12.8				
1.00	17.0		8.9				
1.50	16.0		8.4				
2.00	20.0		10.6				
2.50	13.0		6.8				
2.90	26.0		13.9				
Test No.		VST 51+100	Date:			Peat Depth (m) 3.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	24.0	6.00	12.8				
1.00	20.0	5.50	10.6				
1.50	20.0	5.00	10.6				
2.00	23.0	6.00	12.2				
2.50	22.0	4.50	11.7				
3.00	32.0	4.00	17.3				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 52**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T52/P-100A		159300.4	205777.6	320.66	**1.88**	318.78	**4.2**	**4.6**
T52/P-100B		159286.9	205812.6	317.89	**2.14**	315.75		
T52/P-75A		159284.4	205779.3	320.69	**2.06**	318.63	**4.6**	**4.3**
T52/P-75B		159275.6	205812.2	317.98	**1.88**	316.10		
T52/P-50A		159260.0	205767.3	321.45	**2.28**	319.17	**4.3**	**3.5**
T52/P-50B		159248.5	205804.2	318.54	**1.76**	316.78		
T52/P-25A		159237.5	205759.5	322.51	**1.90**	320.61	**5.6**	**5.6**
T52/P-25B		159224.9	205798.5	318.51	**1.90**	316.61		
T52/P0A		159213.6	205752.5	322.90	**2.00**	320.90	**5.0**	**4.5**
T52/P0B		159203.1	205791.6	319.37	**1.64**	317.73		
T52/P25A		159190.9	205748.7	322.93	**2.00**	320.93	**5.7**	**5.4**
T52/P25B		159186.9	205785.5	319.22	**1.78**	317.44		
T 52/P50A								
T52/P50B								
T52/P+75A								
T52/P+75B								
T52/P+100A								
T52/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T52B-NE					**1.80**			
T52B-NW					**1.60**			
T52B-SE					**1.70**			
T52B-SW					**1.60**			
T52B-C		159275.0	205795.0		**1.84**			
T52B+50		159266.8	205845.9	315.00	**1.80**			
T52B+100					**2.16**			


VST Results along downslope of floating road in Cell T52
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 52+0
VST 52-50
VST 52-100
VST 52B

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 52**
Job No. 03-104							
Test No.		VST 52+0	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.61	23.5	7.50	12.5				
1.00	15.5	6.00	8.1				
1.50	9.0	5.00	4.6				
Test No.		VST 52-50	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.62	23.0	6.00	12.2				
1.00	18.0	6.00	9.5				
1.50	15.0	4.00	7.8				
Test No.		VST 52-100	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.59	31.0	6.00	16.7				
1.00	18.0	5.00	9.5				
1.50	11.0	5.00	5.7				
Test No.		VST 52B	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.60	22.0	7.00	11.7				
1.00	16.0	5.50	8.4				
1.50	11.0	4.50	5.7				

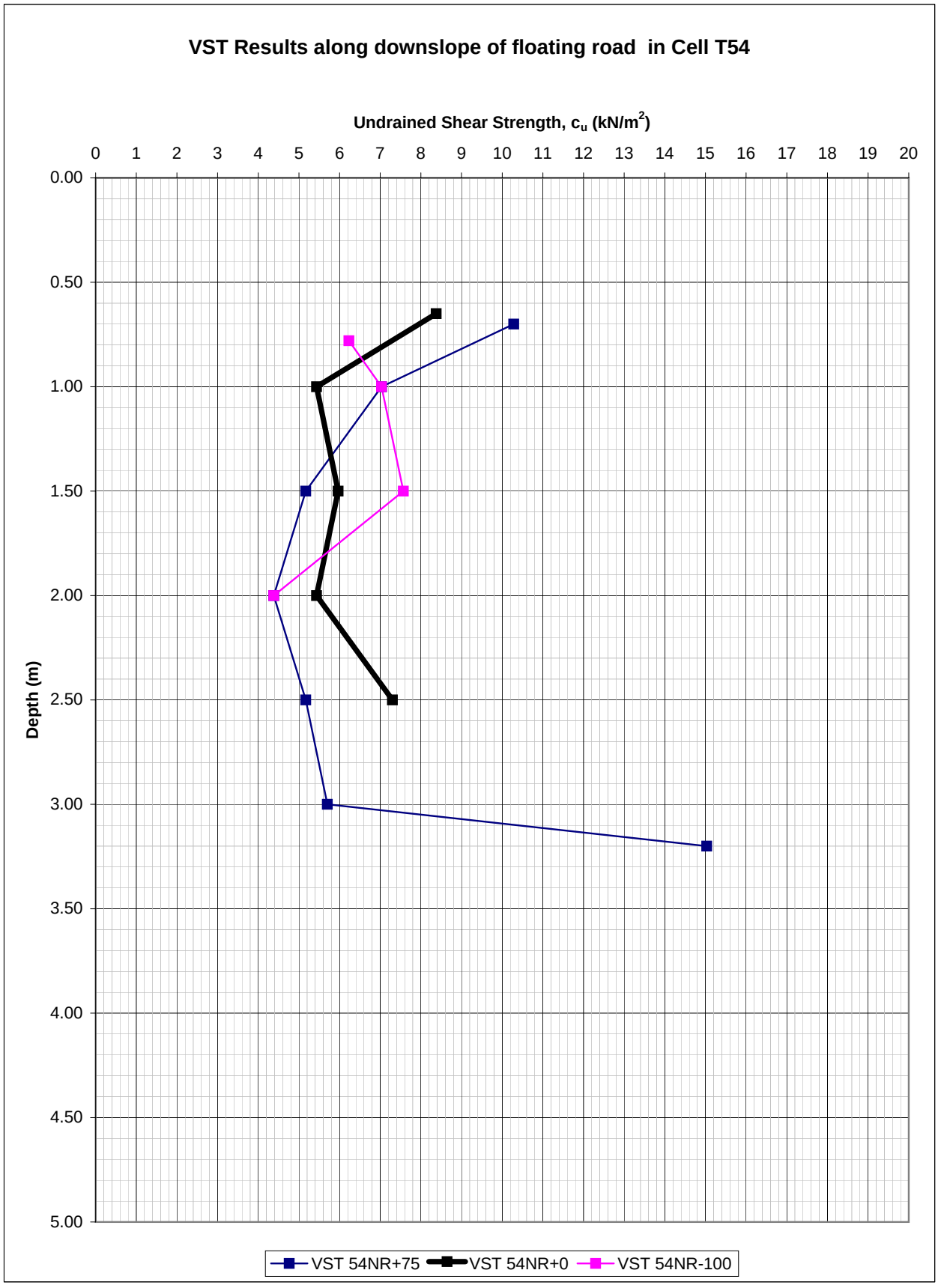
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 53**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T53/P-100A								
T53/P-100B								
T53/P-75A								
T53/P-75B								
T53/P-50A								
T53/P-50B								
T53/P-20A					**3.24**		**1.5**	**-0.2**
T53/P-20B					**1.88**			
T53/P0A					**3.00**		**1.5**	**1.0**
T53/P0B					**2.56**			
T 53/P25A					**2.60**		**0.0**	**0.5**
T53/P25B					**3.00**			
T53/P50A					**1.32**		**0.5**	**2.6**
T53/P50B					**3.08**			
T53/P+75A					**1.48**		**0.5**	**2.2**
T53/P+75B					**2.88**			
T53/P+100A					**3.20**		**1.5**	**0.0**
T53/P+100B					**2.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T53B-NE					**2.80**			
T53B-NW					**3.08**			
T53B-SE					**2.88**			
T53B-SW					**3.18**			
T53B-C					**2.88**			
T53B+50					**2.17**			
T53B+100					**2.42**			


VST Results along downslope of floating road in Cell T53
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 53NR+0
VST 53NR+50

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 53**
Test No.		VST 53NR+0	Date:			Peat Depth (m) 2.95	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.5	6.00	8.1				
1.00	12.0	5.50	6.2				
1.50	14.0	5.00	7.3				
2.00	12.0	4.00	6.2				
2.50	20.0	5.50	10.6				
2.90	27.0	5.00	14.5				
Test No.		VST 53NR+50	Date:			Peat Depth (m) 1.05	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	19.0	6.00	10.0				
0.90	22.0	5.00	11.7				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 53NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T53/P-100A								
T53/P-100B								
T53/P-75A								
T53/P-75B								
T53/P-50A								
T53/P-50B								
T53/P-25A					**3.35**		**0.5**	**-2.9**
T53/P-25B					**1.88**			
T53/P0A					**2.90**		**0.5**	**-0.3**
T53/P0B					**2.56**			
T53/P25A					**2.30**		**0.0**	**1.6**
T53/P25B					**3.00**			
T53/P50A					**0.80**		**1.0**	**6.2**
T53/P50B					**3.08**			
T53/P+75A					**3.70**		**1.0**	**-0.9**
T53/P+75B					**2.88**			
T53/P+100A					**2.35**		**4.5**	**3.7**
T53/P+100B					**2.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T53B-NE								
T53B-NW								
T53B-SE								
T53B-SW								
T53B-C								
T53B+50								
T53B+100								

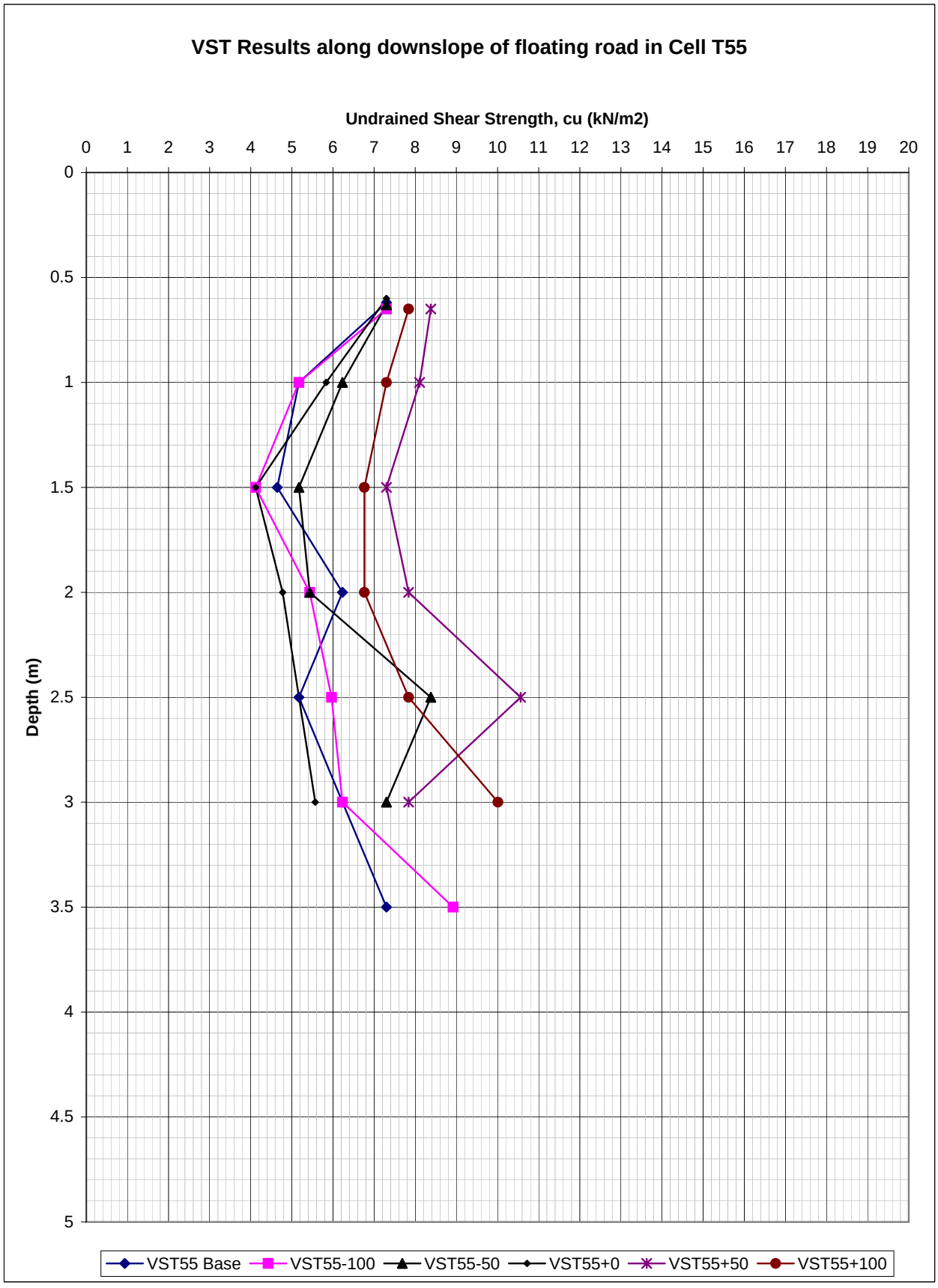
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 54**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T54/P-125A					**3.60**			
T54/P-125B					**1.50**			
T54/P-100A					**3.90**		**0.0**	**-3.5**
T54/P-100B					**1.00**			
T54/P-75A					**4.00**		**1.5**	**-2.2**
T54/P-75B					**1.00**			
T54/P-50A					**3.10**		**1.5**	**-1.1**
T54/P-50B					**1.00**			
T54/P-25A					**3.50**		**0.5**	**-1.3**
T54/P-25B					**2.00**			
T54/P0A					**3.70**		**1.5**	**-1.5**
T54/P0B					**1.20**			
T54/P25A					**4.00**		**0.5**	**-0.8**
T54/P25B					**2.90**			
T54/P50A					**4.00**		**0.5**	**-1.9**
T54/P50B					**2.00**			
T54/P+75A					**4.50**		**0.5**	**-2.4**
T54/P+75B					**2.10**			
T54/P+100A					**3.60**		**0.5**	**-0.7**
T54/P+100B					**2.60**			
T54/P+125A					**4.00**			
T54/P+125B					**2.60**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T54B-NE								
T54B-NW								
T54B-SE								
T54B-SW								
T54B-C								
T54B+50								
T54B+100								

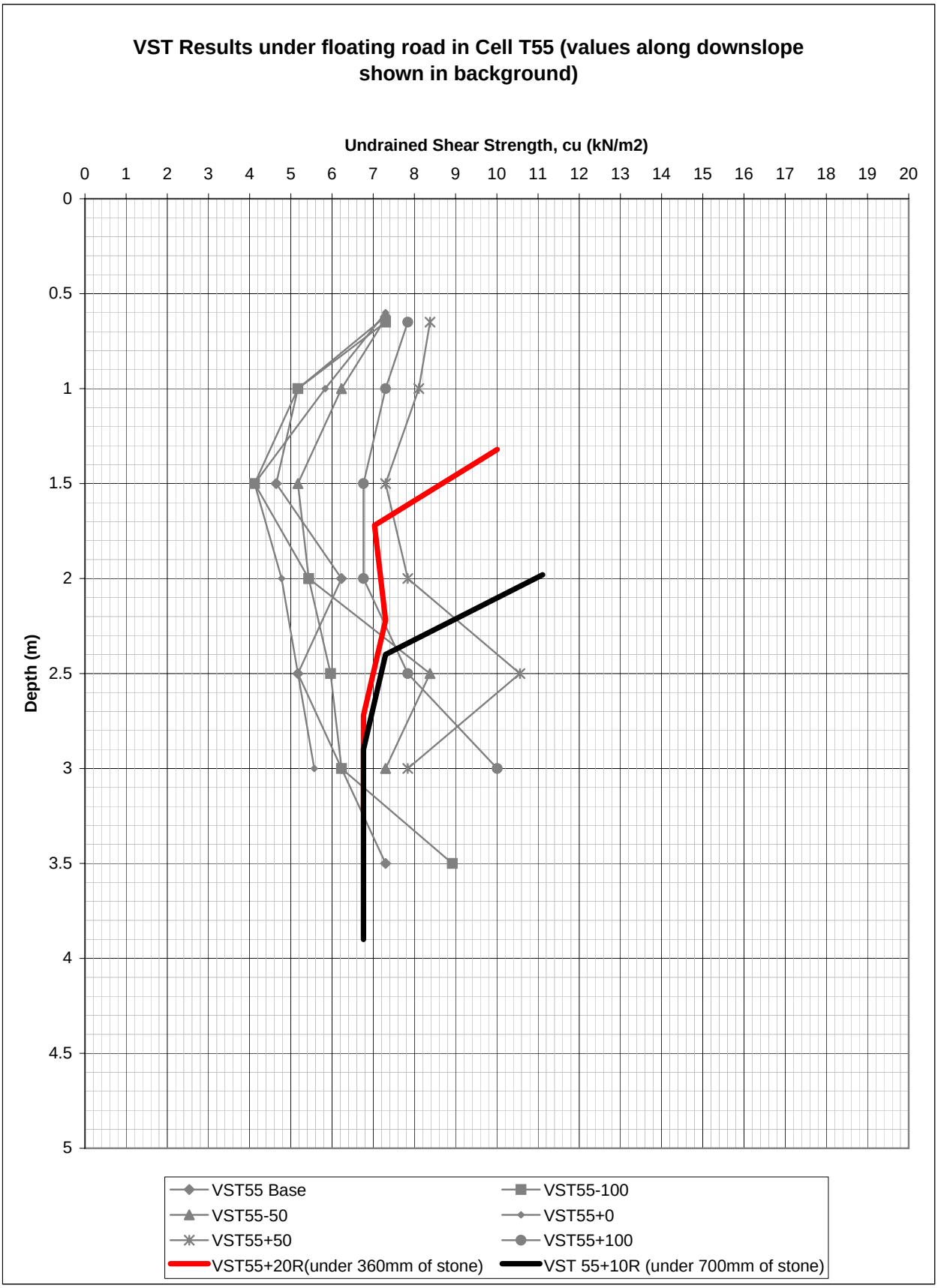

VST Results along downslope of floating road in Cell T54
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 54NR+75
VST 54NR+0
VST 54NR-100

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 54**
Test No.		VST 54NR+75	Date:			Peat Depth (m) 3.3	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	19.5	4.50	10.3				
1.00	13.5	4.50	7.0				
1.50	10.0	3.50	5.2				
2.00	8.5	4.50	4.4				
2.50	10.0	3.50	5.2				
3.00	11.0	4.50	5.7				
3.20	28.0	4.50	15.0				
Test No.		VST 54NR+0	Date:			Peat Depth (m) 2.6	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	16.0	6.50	8.4				
1.00	10.5	4.00	5.4				
1.50	11.5	5.50	6.0				
2.00	10.5	5.50	5.4				
2.50	14.0	5.50	7.3				
Test No.		VST 54NR-100	Date:			Peat Depth (m) 2.15	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.78	12.0	5.50	6.2				
1.00	13.5	3.50	7.0				
1.50	14.5	4.00	7.6				
2.00	8.5	3.00	4.4				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 54NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T54/P-125A					**2.60**			
T54/P-125B					**1.50**			
T54/P-100A					**2.50**		**0.5**	**-2.9**
T54/P-100B					**1.00**			
T54/P-75A					**1.90**		**0.5**	**-1.6**
T54/P-75B					**1.00**			
T54/P-50A					**2.60**		**0.5**	**-3.2**
T54/P-50B					**1.00**			
T54/P-25A					**2.60**		**0.5**	**-0.9**
T54/P-25B					**2.00**			
T54/P0A					**2.70**		**1.5**	**-1.9**
T54/P0B					**1.20**			
T54/P25A					**2.80**		**0.5**	**0.7**
T54/P25B					**2.90**			
T54/P50A					**3.00**		**1.5**	**-0.8**
T54/P50B					**2.00**			
T54/P+75A					**3.30**		**1.5**	**-1.2**
T54/P+75B					**2.10**			
T54/P+100A					**3.30**		**0.0**	**-1.6**
T54/P+100B					**2.60**			
T54/P+125A					**3.70**			
T54/P+125B					**2.60**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T54B-NE								
T54B-NW								
T54B-SE								
T54B-SW								
T54B-C								
T54B+50								
T54B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm					Made By:		**Cell No: 55**	
Job No. 03-104					Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T55/P-100A		158749.2	205280.1	357.79	**3.84**	353.95	**2.3**	**0.0**
T55/P-100B				356.32	**2.36**	353.96		
T55/P-75A		158770.7	205288.2	357.40	**3.39**	354.01	**3.5**	**2.6**
T55/P-75B				355.11	**3.26**	351.85		
T55/P-50A		158789.8	205296.8	356.93	**2.84**	354.09	**3.3**	**2.3**
T55/P-50B				354.51	**2.33**	352.18		
T55/P-25A		158810.4	205311.7	355.58	**2.96**	352.62	**3.3**	**2.6**
T55/P-25B				352.97	**2.46**	350.51		
T55/P0A		158833.0	205314.8	355.14	**3.56**	351.58	**3.7**	**1.4**
T55/P0B				352.57	**2.12**	350.45		
T55/P25A		158856.2	205326.4	354.24	**3.28**	350.96	**2.3**	**0.8**
T55 /P25B				352.42	**2.10**	350.32		
T55/P50A		158879.5	205336.5	353.14	**3.12**	350.02	**4.0**	**1.5**
T55/P50B				350.60	**1.84**	348.76		
T55/P+75A		158902.0	205348.9	352.06	**3.00**	349.06	**3.0**	**2.1**
T55/P+75B				349.87	**2.50**	347.37		
T55/P+100A		158923.7	205358.8	351.07	**3.14**	347.93	**4.0**	**3.2**
T55/P+100B				347.90	**2.64**	345.26		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T55B-NE					**3.14**			
T55B- NW					**3.00**			
T55B-SE					**2.41**			
T55B-SW					**2.39**			
T55B-C		158827	205312		**2.47**			
T55B+50		Trees	Trees		**3.14**			
T55B+100		Trees	Trees		**2.94**			


VST Results along downslope of floating road in Cell T55
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
VST55 Base
VST55-100
VST55-50
VST55+0
VST55+50
VST55+100

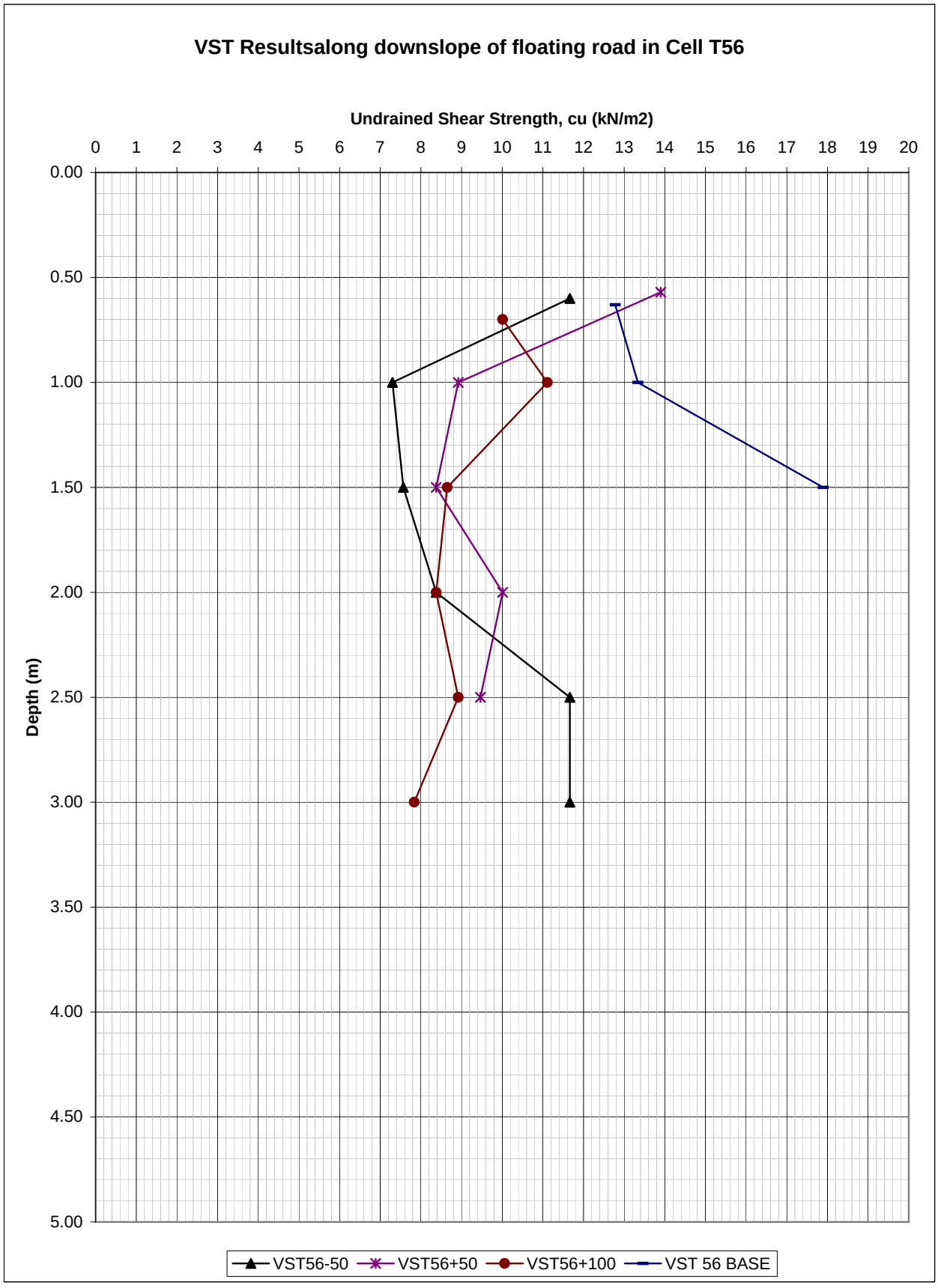

VST Results under floating road in Cell T55 (values along downslope shown in background)
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
VST55 Base
VST55-100
VST55-50
VST55+0
VST55+50
VST55+100
VST55+20R(under 360mm of stone)
VST 55+10R (under 700mm of stone)

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 55**
Job No. 03-104							
Test No.		VST 55-BASE	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14	6.00	7.3				
1	10	8.00	5.2				
1.5	9	8.00	4.6				
2	12	8.00	6.2				
2.5	10	7.00	5.2				
3	12	6.00	6.2				
3.5	14	6.00	7.3				
Test No.		VST 55+20R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
1.32	19.00	11.00	10.0				(270 mm
1.72	13.50	7.00	7.0				stone, 360
2.22	14.00	6.00	7.3				mm total
2.72	13.00	6.00	6.8				
3.22	13.00	6.00	6.8				
Total Road Thickness =			0.36 m				
Test No.		VST 55+10R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
1.98	21.00	11.00	11.1				
2.40	14.00	7.00	7.3				
2.90	13.00	6.00	6.8				
3.40	13.00	6.00	6.8				
3.90	13.00	6.00	6.8				
Total Road Thickness =			0.7 m				
(450 mm stone, 700 mm total w/trees)							
Test No.		VST 55-100	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	14.00	9.00	7.3				
1.00	10.00	6.00	5.2				
1.50	8.00	6.00	4.1				
2.00	10.50	7.00	5.4				
2.50	11.50	9.00	6.0				
3.00	12.00	7.00	6.2				
3.50	17.00	7.00	8.9				

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 55**
Test No.		VST 55-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.63	14.00	11.00	7.3				
1.00	12.00	5.00	6.2				
1.50	10.00	6.00	5.2				
2.00	10.50	5.00	5.4				
2.50	16.00	7.00	8.4				
3.00	14.00	5.00	7.3				
Test No.		VST 55+0	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.60	14.00	11.00	7.3				
1.00	11.25	7.00	5.8				
1.50	8.00	6.00	4.1				
2.00	9.25	6.00	4.8				
3.00	10.75	6.00	5.6				
Test No.		VST 55+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	16.00	10.0	8.4				
1.00	15.50	7.00	8.1				
1.50	14.00	8.00	7.3				
2.00	15.00	7.00	7.8				
2.50	20.00	9.00	10.6				
3.00	15.00	7.50	7.8				
Test No.		VST 55+100	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	15.00	8.00	7.8				
1.00	14.00	6.00	7.3				
1.50	13.00	6.00	6.8				
2.00	13.00	6.00	6.8				
2.50	15.00	7.00	7.8				
3.00	19.00	4.00	10.0				

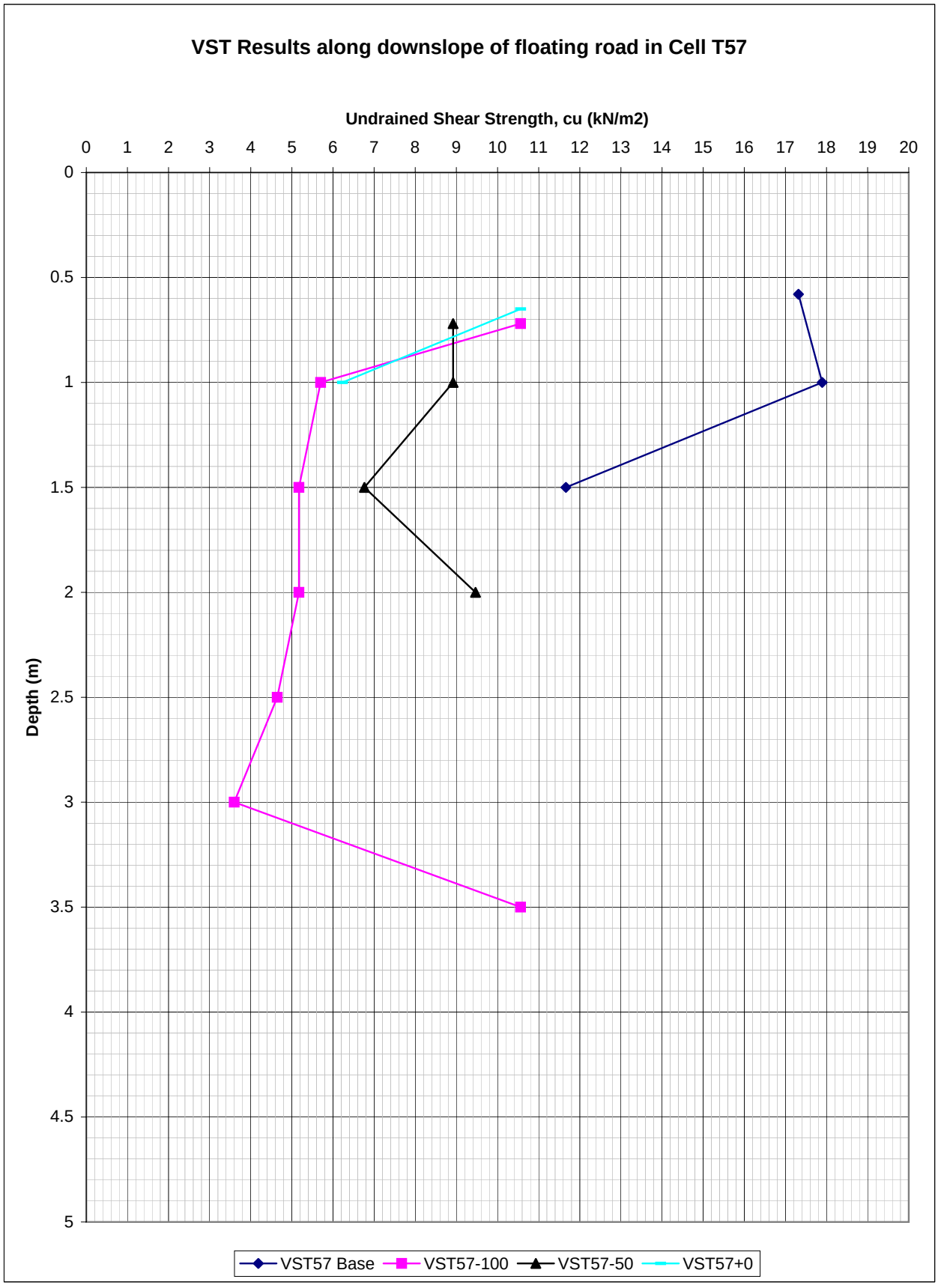
Points to Note: Road has been constructed from +100 meters to 0 meters. From 0 to -100 meters the trees for the floating roads have been put in place but no surface has yet been constructed. The land is sloping from west (higher) to east (lower) i.e from -100 to +100 and to the north.

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 56**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T56/P-75A		158923.7	205358.8	351.07	**3.40**	347.67	**4.0**	**4.2**
T56/P-75B				347.90	**3.65**	344.25		
T56/P-50A		158937.5	205365.4	350.53	**3.00**	347.53	**3.8**	**3.2**
T56/P-50B				347.40	**2.52**	344.88		
T56/P-25A		158960.4	205374.6	349.20	**2.88**	346.32	**4.0**	**2.6**
T56/P-25B				346.18	**2.00**	344.18		
T56/P0A		158984.3	205385.7	347.24	**1.95**	345.29	**4.0**	**2.8**
T56/P0B				344.42	**1.46**	342.96		
T56/P25A		159005.7	205397.7	345.44	**1.30**	344.14	**2.9**	**3.9**
T56/P25B		158987.9	205440.5	343.06	**2.14**	340.92		
T56/P50A		159030.6	205408.3	346.25	**2.18**	344.07	**2.6**	**4.3**
T56/P50B		159010.9	205454.4	344.13	**3.58**	340.55		
T56 /P+75A		159052.5	205419.2	345.69	**2.88**	342.81	**2.8**	**3.8**
T56/P+75B				343.55	**3.88**	339.67		
T56/P+100A		159075.4	205429.8	345.55	**3.43**	342.12	**2.8**	**3.5**
T56/P+100B				343.54	**4.29**	339.25		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T56B-NE					**1.64**			
T56B-NW					**2.26**			
T56B-SE					**1.48**			
T56B-SW					**1.04**			
T56B-C					**1.95**			
T56B+50					**1.46**			
T56B+100					**3.44**			


VST Resultsalong downslope of floating road in Cell T56
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST56-50
VST56+50
VST56+100
VST 56 BASE

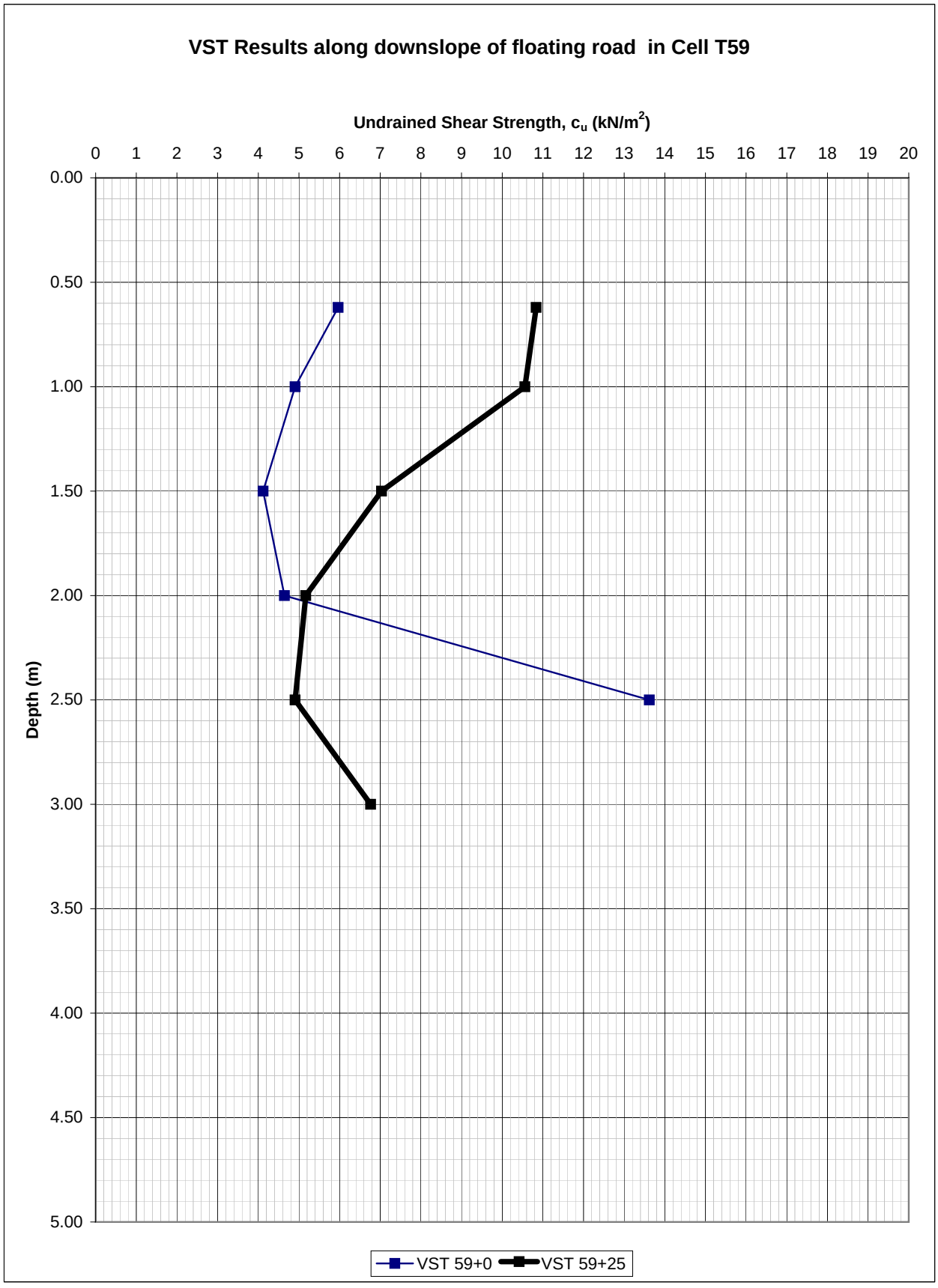
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No.56**
Test No.		VST 56-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.60	22.00	8.00	11.7				
1.00	14.00	6.00	7.3				
1.50	14.50	6.00	7.6				
2.00	16.00	6.00	8.4				
2.50	22.00	6.00	11.7				
3.00	22.00	5.00	11.7				
Test No.		VST 56+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.57	26.00	8.00	13.9				
1.00	17.00	6.00	8.9				
1.50	16.00	6.00	8.4				
2.00	19.00	6.00	10.0				
2.50	18.00	6.00	9.5				
Test No.		VST 56+100	Date:			Peat Depth (m) 3.32	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.70	19.00	9.00	10.0				
1.00	21.00	6.00	11.1				
1.50	16.50	6.00	8.6				
2.00	16.00	6.00	8.4				
2.50	17.00	7.00	8.9				
3.00	15.00	6.00	7.8				
Test No.		VST 56 BASE	Date:			Peat Depth 1.84m	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.63	24	13	12.8				
1	25	6	13.3				
1.5	33	6	17.9				
Points to Note: Valley feature present between 0 and +50 meters.							
Land sloping from both sides of turbine into valley feature and to the north							
. Drains present adjacent to road on downslope side joining northward flowing drain in valley.							
Difficulty encountered at turbine base and +50 in advancing vane into ground and retrieving vane.							

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 57**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T57/P-125A		159083.0	205434.0	345.46	**3.40**	342.1	**1.7**	**1.9**
T57/P-125B				344.18	**3.65**	340.5		
T57/P-100A		159104.6	205444.8	345.25	**3.80**	341.4	**1.2**	**-0.1**
T57/P-100B				344.36	**2.80**	341.6		
T57/P-75A		159127.5	205456.0	345.05	**3.15**	341.9	**1.9**	**1.3**
T57/P-75B		159112.1	205501.4	343.53	**2.70**	340.8		
T57/P-50A		159148.7	205465.7	344.36	**2.20**	342.2	**1.7**	**2.1**
T57/P-50B		159135.4	205514.0	342.98	**2.50**	340.5		
T57/P-25A		159170.4	205477.9	343.86	**1.50**	342.4	**1.8**	**2.7**
T57/P-25B		159156.3	205525.3	342.36	**2.20**	340.2		
T57/P0A		159192.5	205490.6	343.20	**1.70**	341.5	**1.7**	**1.8**
T57/P0B		159177.6	205534.2	341.83	**1.80**	340.0		
T57/P25A		159208.4	205502.5	342.28	**1.50**	340.8	**0.7**	**1.1**
T57/P25B		159184.2	205534.3	341.68	**1.80**	339.9		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T57B-NE								
T57B-NW								
T57B-SE								
T57B-SW								
T57B-C								
T57B+50								
T57B+100								


VST Results along downslope of floating road in Cell T57
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
VST57 Base
VST57-100
VST57-50
VST57+0

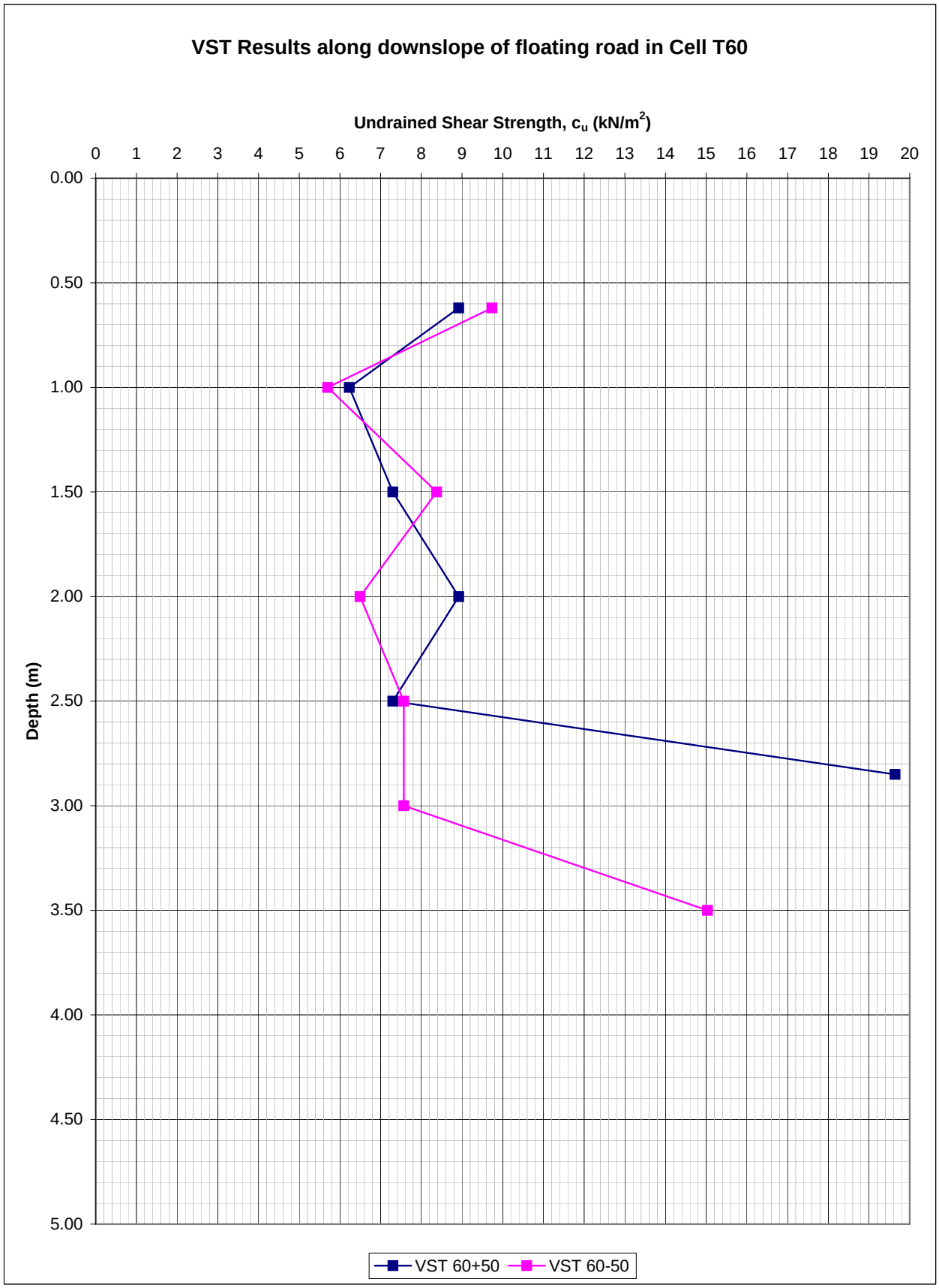
AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 57**
Job No. 03-104							
Test No.		VST 57-100	Date:			Peat Depth (m) 3.8	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	20.00	9.00	10.6				
1.00	11.00	8.00	5.7				
1.50	10.00	8.00	5.2				
2.00	10.00	7.00	5.2				
2.50	9.00	6.00	4.6				
3.00	7.00	6.00	3.6				
3.50	20.00	6.00	10.6				
Test No.		VST 57-50	Date:			Peat Depth (m) 2.96	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	17.00	9.00	8.9				
1.00	17.00	6.00	8.9				
1.50	13.00	6.00	6.8				
2.00	18.00	6.00	9.5				
Test No.		VST 57-0	Date:			Peat Depth (m) 1.42	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	20.00	7.50	10.6				
1.00	12.00	6.00	6.2				
Test No.		VST 57-Base 5	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.58	32	10	17.3				
1	33	7	17.9				
1.5	22	6	11.7				

AGL Consulting ***Geotechnical Engineers***		**Record of Gouge Auger Probes**						
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 59**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T59/P-100A								
T59/P-100B								
T59/P-75A								
T59/P-75B								
T59/P-50A								
T59/P-50B								
T59/P-25A								
T59/P-25B								
T59/P0A		158602.6	204868.2	360.38	**2.70**	357.68	**0.7**	**0.1**
T59/P0B				359.83	**2.20**	357.63		
T59/P25A		158623.9	204881.6	360.41	**2.85**	357.56	**0.5**	**0.7**
T59/P25B				360.00	**3.05**	356.95		
T59/P50A		158645.1	204893.7	360.71	**3.00**	357.71	**0.8**	**1.0**
T59/P50B				360.03	**3.10**	356.93		
T59/P+75A		158665.8	204909.6	361.21	**3.50**	357.71	**0.8**	**0.1**
T59/P+75B				360.53	**2.90**	357.63		
T59/P+100A		158684.5	204924.7	361.59	**3.60**	357.99	**0.5**	**0.0**
T59/P+100B				361.18	**3.20**	357.98		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T59B-NE								
T59B-NW								
T59B-SE		158588.1	204896.1	360.48				
T59B-SW		158581.5	204888.5	360.18				
T59B-C		158581.3	204896.3	360.27				
T59B+50								
T59B+100								


VST Results along downslope of floating road in Cell T59
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 59+0
VST 59+25

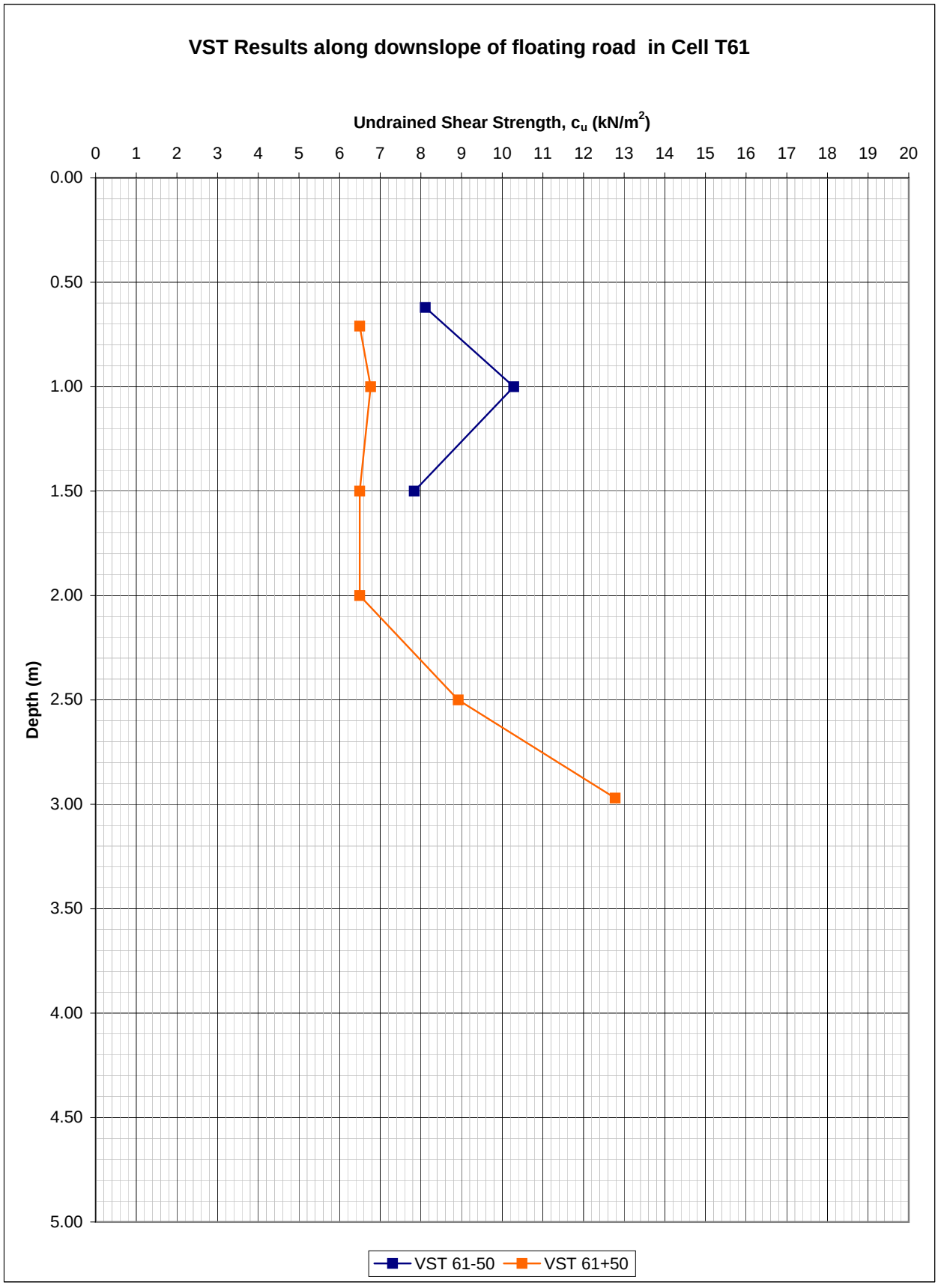
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 59**
Job No. 03-104							
Test No. VST 59+0			Date: 07.10.04			Peat Depth (m) 2.65	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	11.5	5.50	6.0				
1.00	9.5	6.50	4.9				
1.50	8.0	6.00	4.1				
2.00	9.0	4.00	4.6				
2.50	25.5	7.50	13.6				
Test No. VST 59+25			Date: 07.10.04			Peat Depth (m) 3.50	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	20.5	8.50	10.8				
1.00	20.0	7.50	10.6				
1.50	13.5	6.50	7.0				
2.00	10.0	4.50	5.2				
2.50	9.5	5.00	4.9				
3.00	13.0	4.50	6.8				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 60**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T60/P-100A		158697.6	204933.5	362.03	**3.80**	358.23	**0.5**	**-0.1**
T60/P-100B				361.62	**3.30**	358.32		
T60/P-75A		158719.9	204947.1	362.53	**3.85**	358.68	**0.5**	**0.6**
T60/P-75B				362.12	**3.90**	358.22		
T60/P-50A		158740.3	204960.2	362.68	**3.10**	359.58	**0.5**	**1.6**
T60/P-50B				362.27	**4.00**	358.27		
T60/P-25A		158759.3	204972.1	362.86	**3.80**	359.06	**0.5**	**1.6**
T60/-25B				362.45	**4.70**	357.75		
T60/P0A		158780.5	204983.7	363.18	**3.75**	359.43	**0.5**	
T60/P0B				362.77				
T60/P25A		158805.2	204994.8	362.90	**3.20**	359.70	**0.5**	**1.0**
T60/P25B				362.49	**3.65**	358.84		
T 60/P50A		158827.8	205006.1	362.67	**2.80**	359.87	**0.5**	**-0.5**
T60/P50B				362.26	**2.00**	360.26		
T60/P+75A		158848.7	205017.8	362.13	**2.30**	359.83	**0.5**	**1.4**
T60/P+75B				361.72	**3.00**	358.72		
T60/P+100A		158869.9	205031.6	361.87	**2.50**	359.37	**2.2**	**2.0**
T60/P+100B				360.10	**2.40**	357.70		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T60B-NE								
T60B-NW								
T 60B-SE								
T60B-SW								
T60B-C								
T60B+50								
T60B+100								


VST Results along downslope of floating road in Cell T60
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 60+50
VST 60-50

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 60**
Test No.		VST 60+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	17.0		8.9				
1.00	12.0		6.2				
1.50	14.0		7.3				
2.00	17.0		8.9				
2.50	14.0		7.3				
2.85	36.0		19.6				
Test No.		VST 60-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	18.5		9.7				
1.00	11.0		5.7				
1.50	16.0		8.4				
2.00	12.5		6.5				
2.50	14.5		7.6				
3.00	14.5		7.6				
3.50	28.0		15.0				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

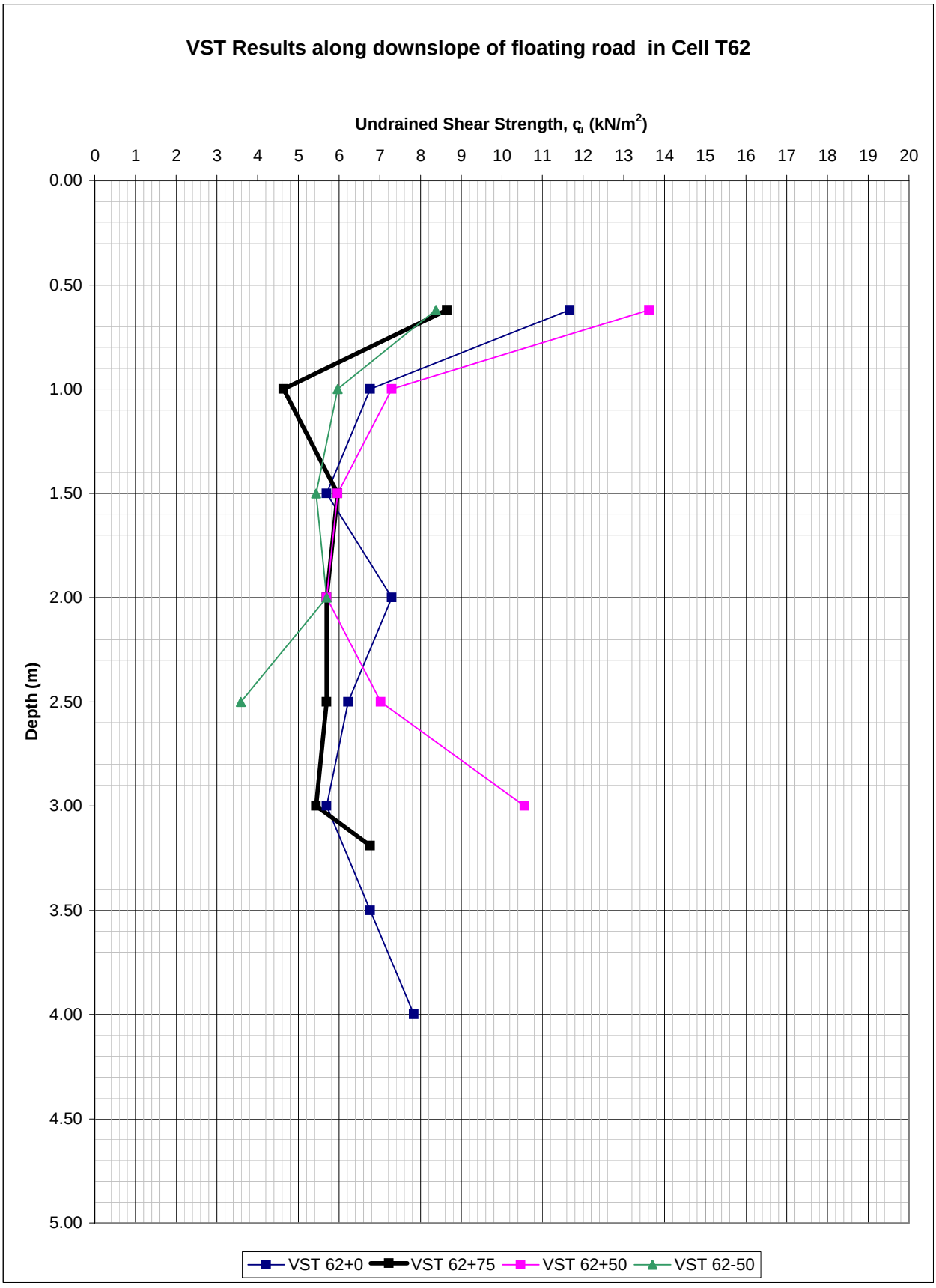
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 61**	
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T61/P-100A		158890.9	205043.8	361.30	**3.24**	358.06	**2.2**	**0.1**
T61/P-100B				359.52	**1.52**	358.00		
T61/P-75A		158912.7	205055.9	362.09	**1.10**	360.99	**6.0**	**6.3**
T61/P-75B				357.15	**1.34**	355.81		
T61/P-50A		158935.6	205064.7	363.30	**1.88**	361.42	**9.7**	**8.5**
T61/P-50B				355.29	**0.88**	354.41		
T61/P-25A		158957.2	205075.3	364.42	**2.18**	362.24	**5.0**	**2.9**
T61/P-25B				360.31	**0.46**	359.85		
T61/P0A		158975.8	205091.5	364.66	**2.34**	362.32	**7.8**	**5.5**
T61/P0B				358.20	**0.44**	357.76		
T61/P25A		158993.2	205107.4	364.04	**2.04**	362.00	**6.2**	**4.5**
T61/P25B				358.96	**0.63**	358.33		
T61/P50A		159011.1	205123.4	364.04	**3.03**	361.01	**1.8**	**-1.6**
T61/P50B				362.53	**0.23**	362.30		
T61/P+75A		159031.1	205138.1	364.07	**3.41**	360.66	**3.0**	**0.3**
T61/P+75B				361.61	**1.20**	360.41		
T61/P+100A		159031.1	205138.1	364.11	**3.34**	360.77	**4.5**	**2.7**
T61/P+100B				360.41	**1.88**	358.53		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T61B-NE								
T61B-NW								
T61B-SE					**3.00**			
T61B-SW					**2.48**			
T61B-C					**2.88**			
T61B+50					**2.12**			
T61B+100					**0.24**			


VST Results along downslope of floating road in Cell T61
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 61-50
VST 61+50

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 61**
Job No. 03-104							
Test No.		VST 61-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.5	4.50	8.1				
1.00	19.5	4.50	10.3				
1.50	15.0	4.50	7.8				
Test No.		VST 61+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.71	12.5	4.50	6.5				
1.00	13.0	4.50	6.8				
1.50	12.5	5.00	6.5				
2.00	12.5	4.50	6.5				
2.50	17.0	5.50	8.9				
2.97	24.0	4.50	12.8				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 61**	
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T61/P-100A								
T61/P-100B								
T61/P-75A		158912.7	205055.9	362.09	**1.10**	360.99	**5.5**	**7.3**
T61/P-75B				359.68	**1.90**	357.78		
T61/P-50A		158935.6	205064.7	363.30	**1.88**	361.42	**3.5**	**3.3**
T61/P-50B				362.07	**1.80**	360.27		
T61/P-25A		158957.2	205075.3	364.42	**2.18**	362.24	**0.3**	**-1.0**
T61/P-25B				364.34	**1.85**	362.49		
T61/P0A		158975.8	205091.5	364.66	**2.34**	362.32	**2.2**	**2.1**
T61/P0B				363.70	**2.30**	361.40		
T61/P25A		158993.2	205107.4	364.04	**2.04**	362.00	**5.2**	**4.2**
T61/P25B				362.22	**1.70**	360.52		
T61/P50A		159011.1	205123.4	364.04	**3.03**	361.01	**1.3**	**-0.5**
T61/P50B				363.58	**2.40**	361.18		
T61/P+75A		159031.1	205138.1	364.07	**3.41**	360.66	**2.5**	**0.7**
T61/P+75B				362.76	**2.45**	360.31		
T61/P+100A		159031.1	205138.1	364.11	**3.34**	360.77	**3.3**	**-0.1**
T61/P+100B				363.25	**2.45**	360.80		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T61B-NE								
T61B-NW								
T61B-SE					**3.00**			
T61B-SW					**2.48**			
T61B-C					**2.88**			
T61B+50					**2.12**			
T61B+100					**0.24**			

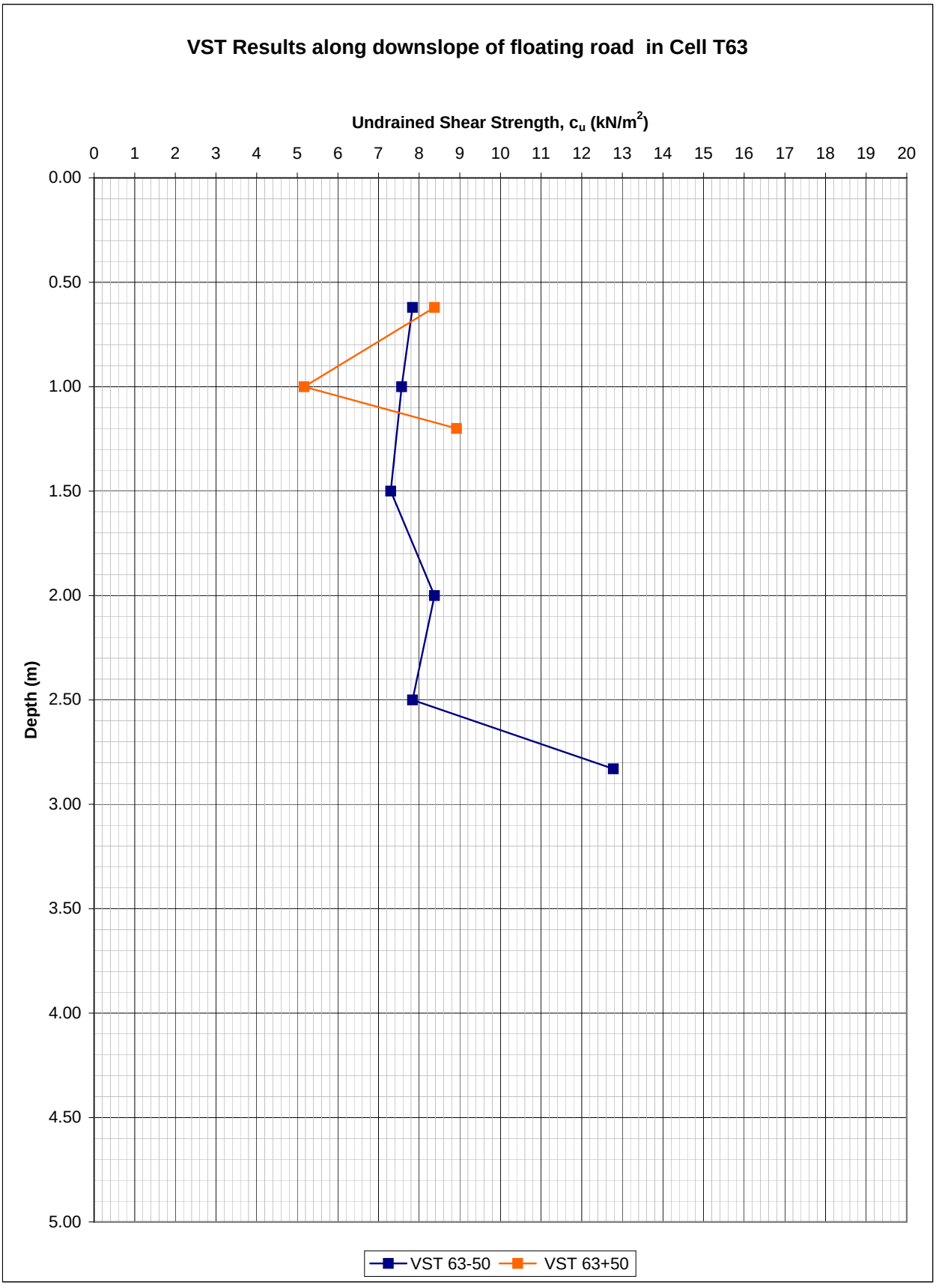
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 62**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T62/P-125A					**3.50**		**6.8**	**4.8**
T62/P-125B					**1.80**			
T62/P-100A					**2.30**		**5.0**	**6.0**
T62/P-100B					**3.10**			
T62/P-75A					**2.80**		**5.5**	**4.5**
T62/P-75B					**2.00**			
T62/P-50A					**2.80**		**5.0**	**4.3**
T62/P-50B					**2.20**			
T62/P-25A					**2.95**		**4.2**	**3.6**
T62/P-25B					**2.50**			
T62/P0A					**2.80**		**2.5**	**2.4**
T62/P0B					**2.75**			
T62/P25A					**2.85**		**2.0**	**1.3**
T62/P25B					**2.30**			
T62/P50A					**2.90**		**1.2**	**0.7**
T62/P50B					**2.55**			
T62/P+75A					**3.25**		**1.5**	**1.6**
T62/P+75B					**3.30**			
T62/P+100A					**3.65**		**2.2**	**1.3**
T62/P+100B					**2.90**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T62B-NE								
T62B-NW								
T62B-SE								
T62B-SW								
T62B-C								
T62B+50								
T62B+100								


VST Results along downslope of floating road in Cell T62
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 62+0
VST 62+75
VST 62+50
VST 62-50

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 62**
Job No. 03-104							
Test No.		VST 62+0	Date:			Peat Depth (m) 4.02	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	22.0	6.50	11.7				
1.00	13.0	5.00	6.8				
1.50	11.0	5.50	5.7				
2.00	14.0	5.00	7.3				
2.50	12.0	6.00	6.2				
3.00	11.0	5.50	5.7				
3.50	13.0	6.50	6.8				
4.00	15.0	6.00	7.8				
Test No.		VST 62+50	Date:			Peat Depth (m) 3.1	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	25.5	5.50	13.6				
1.0	14.0	5.00	7.3				
1.5	11.5	3.00	6.0				
2.0	11.0	3.00	5.7				
2.5	13.5	4.50	7.0				
3.0	20.0	5.00	10.6				
Test No.		VST 62+75	Date:			Peat Depth (m) 3.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	16.5	4.00	8.6				
1.00	9.0	3.00	4.6				
1.50	11.5	4.00	6.0				
2.00	11.0	3.00	5.7				
2.50	11.0	4.50	5.7				
3.00	10.5	3.00	5.4				
3.19	13.0	3.00	6.8				
Test No.		VST 62-50	Date:			Peat Depth (m) 2.5	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	16.0	6.00	8.4				
1.00	11.5	5.50	6.0				
1.50	10.5	4.00	5.4				
2.00	11.0	3.50	5.7				
2.50	7.0	3.50	3.6				

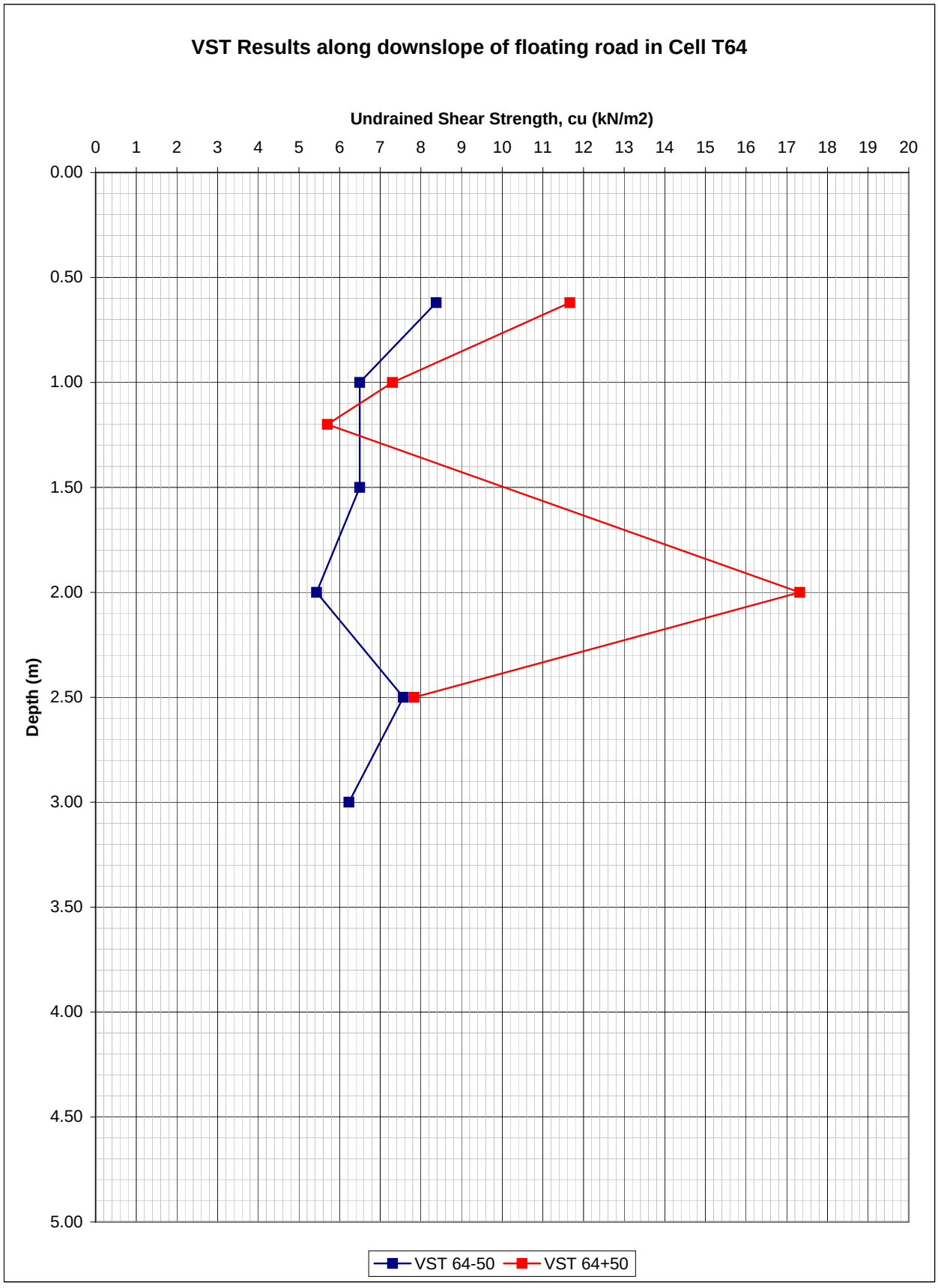
AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 62**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T62/P-125A					**3.50**		**2.8**	**-1.1**
T62/P-125B					**2.15**			
T62/P-100A					**2.30**		**3.8**	**1.9**
T62/P-100B					**1.80**			
T62/P-75A					**2.80**		**3.5**	**0.8**
T62/P-75B					**2.10**			
T62/P-50A					**2.80**		**2.3**	**1.6**
T62/P-50B					**2.50**			
T62/P-25A					**2.95**		**3.2**	**2.9**
T62/P-25B					**2.85**			
T62/P0A					**2.80**		**2.5**	**1.6**
T62/P0B					**2.50**			
T62/P25A					**2.85**		**2.0**	**1.3**
T62/P25B					**2.30**			
T62/P50A					**2.90**		**1.2**	**0.7**
T62/P50B					**2.55**			
T62/P+75A					**3.25**		**1.5**	**1.6**
T62/P+75B					**3.30**			
T62/P+100A					**3.65**		**2.2**	**1.3**
T62/P+100B					**2.90**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T62B-NE								
T62B-NW								
T62B-SE								
T62B-SW								
T62B-C								
T62B+50								
T62B+100								

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 63**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surf	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T63/P-100A		159494.3	205318.9	346.25	**3.10**	343.15	**3.3**	**3.1**
T63/P-100B				343.51	**2.90**	340.61		
T63/P-75A		159468.7	205315.3	346.71	**3.20**	343.51	**2.5**	**2.1**
T63/P-75B				344.65	**2.90**	341.75		
T63/P-50A		159448.1	205304.4	347.54	**3.20**	344.34	**1.7**	**1.5**
T63/P-50B				346.17	**3.10**	343.07		
T63/P-25A		159422.9	205293.3	348.89	**3.20**	345.69	**3.5**	**4.0**
T63/P-25B				346.02	**3.60**	342.42		
T63/P0A		159401.6	205283.6	351.33	**2.10**	349.23	**2.5**	**1.6**
T63/P0B				349.28	**1.40**	347.88		
T63/P25A		159377.1	205275.9	352.17	**1.70**	350.47	**2.5**	**2.5**
T63/P25B				350.11	**1.70**	348.41		
T63/P50A		195353.6	205269.4	353.09	**1.70**	351.39	**2.5**	**2.4**
T63/P50B				351.04	**1.64**	349.40		
T63/P+75A		159330.6	205262	354.20	**1.30**	352.90	**1.7**	**1.3**
T63/P+75B				352.83	**1.00**	351.83		
T63/P+100A		159307.7	205252.5	354.77	**0.90**	353.87	**1.5**	**1.5**
T63/P+100B				353.54	**0.90**	352.64		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T63B-NE								
T63B-NW								
T63B-SE								
T63B-SW								
T63B-C		159395.0	205271.0					
T63B+50		159384.7	205317.3	349.64	**1.60**			
T63B+100		159392.9	205382.1	347.69	**2.40**			


VST Results along downslope of floating road in Cell T63
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 63-50
VST 63+50

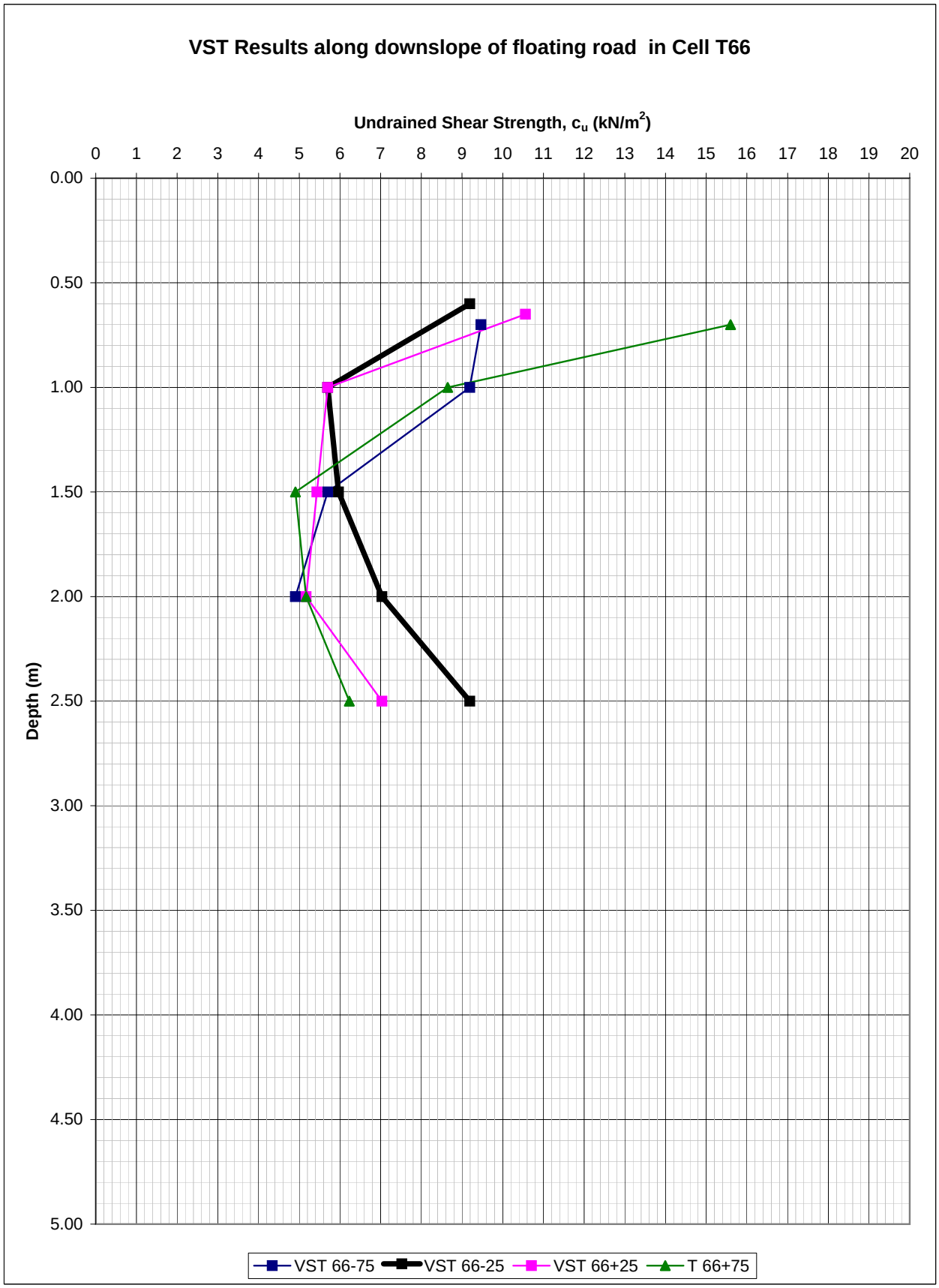
AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 63**
Test No.		VST 63-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.0	4.50	7.8				
1.00	14.5	5.50	7.6				
1.50	14.0	5.50	7.3				
2.00	16.0	5.00	8.4				
2.50	15.0	4.50	7.8				
2.83	24.0	5.00	12.8				
Test No.		VST 63+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	16.0	6.00	8.4				
1.00	10.0	4.00	5.2				
1.20	17.0	5.00	8.9				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 64**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surfa	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T64/P-100A		159709	205450.1	340.33	**2.50**	337.83	**1.5**	**1.4**
T64/P-100B				339.10	**2.40**	336.70		
T64/P-75A		159701	205438.2	341.01	**2.30**	338.71	**1.5**	**1.1**
T64/P-75B				339.78	**2.00**	337.78		
T64/P-50A		159677.8	205419	342.51	**2.50**	340.01	**1.8**	**1.0**
T64/P-50B				341.00	**1.80**	339.20		
T64/P-25A		159660.3	205408	343.25	**2.60**	340.65	**0.5**	**-0.6**
T64/P-25B				342.84	**1.70**	341.14		
T64/P0A		159634.3	205395.2	344.16	**2.80**	341.36	**0.5**	**-0.8**
T64/P0B				343.75	**1.70**	342.05		
T64/P25A		159620.6	205383.3	344.80	**2.90**	341.90	**1.5**	**0.5**
T64/P25B				343.57	**2.10**	341.47		
T64/P50A		159599.5	205371.2	345.60	**3.00**	342.60	**0.5**	**-0.7**
T64/P50B				345.19	**2.00**	343.19		
T64/P+75A		159577.1	205360.2	346.09	**3.10**	342.99	**1.5**	**0.8**
T64/P+75B				344.86	**2.50**	342.36		
T64/P+100A		159556.8	205352.1	346.40	**3.20**	343.20	**1.5**	**0.6**
T64/P+100B				345.17	**2.50**	342.67		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T64B-NE					**2.40**			
T64B-NW					**2.50**			
T64B-SE					**2.80**			
T64B-SW					**2.70**			
T64B-C		159643.0	205389.0					
T64B+50		159623.0	205453.0	336.60	**2.00**			
T64B+100		159494.3	205318.9	346.24	**2.10**			


VST Results along downslope of floating road in Cell T64
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 64-50
VST 64+50

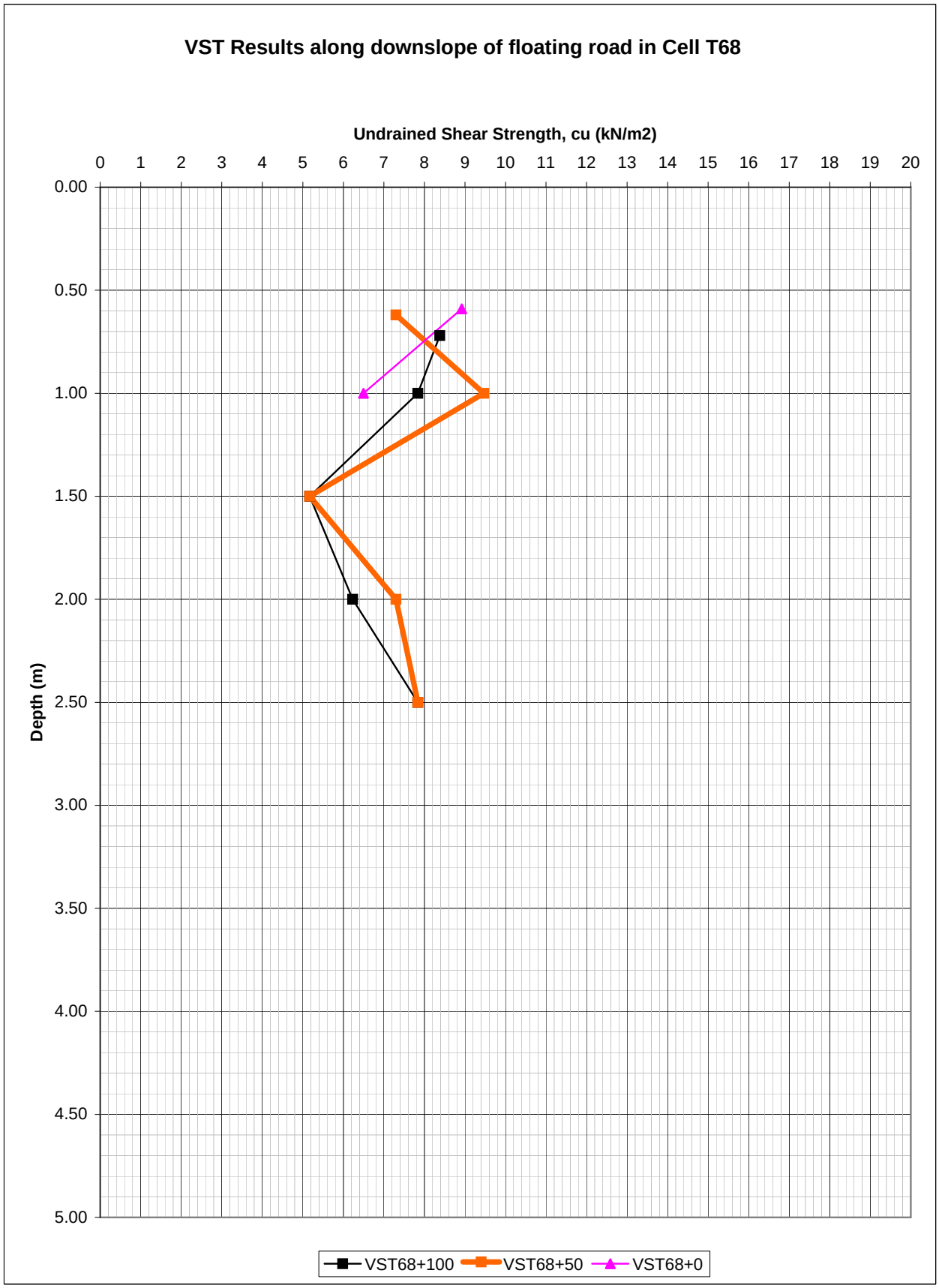
AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 64**
Job No. 03-104							
Test No.		VST 64-50	Date:			Peat Depth (m) 3.02	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	16.0	7.00	8.4				
1.00	12.5	4.50	6.5				
1.50	12.5	4.50	6.5				
2.00	10.5	4.00	5.4				
2.50	14.5	5.00	7.6				
3.00	12.0	4.50	6.2				
Test No.		VST 64+50	Date:			Peat Depth (m) 2.76	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	22.0	9.00	11.7				
1.00	14.0	8.50	7.3				
1.20	11.0	7.50	5.7				
2.00	32.0	16.50	17.3				
2.50	15.0	4.50	7.8				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***			**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104				Made By: Date:		**Cell No: 66**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T66/P-100A		159133.6	204813.1	358.59	**3.20**	355.39	**1.0**	**0.5**
T66/P-100B				357.77	**2.80**	354.97		
T66/P-75A		159153.4	204830.8	358.42	**2.50**	355.92	**1.7**	**1.8**
T66/P-75B				357.06	**2.60**	354.46		
T66/P-50A		159171.7	204843.9	358.22	**2.35**	355.87	**2.5**	**2.3**
T66/P-50B				356.17	**2.15**	354.02		
T66/P-25A		159194.0	204854.7	358.39	**2.85**	355.54	**3.3**	**3.0**
T66/P-25B				355.66	**2.55**	353.11		
T66/P0A		159218.6	204864.9	357.89	**0.90**	356.99	**3.0**	**5.4**
T66/P0B				355.43	**2.85**	352.58		
T66/P25A		159239.3	204881.9	358.57	**2.00**	356.57	**3.0**	**4.1**
T66/P25B				356.11	**2.90**	353.21		
T66/P50A		159260.8	204892.3	358.23	**2.85**	355.38	**3.2**	**3.2**
T66/P50B				355.63	**2.85**	352.78		
T66/P+75A		159282.5	204903.2	358.52	**2.80**	355.72	**3.0**	**2.8**
T66/P+75B				356.06	**2.65**	353.41		
T66/P+100A		159308.6	204917.4	358.49	**2.80**	355.69	**3.0**	**2.5**
T66/P+100B				356.03	**2.35**	353.68		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T66B-NE								
T66B-NW								
T66B-SE								
T66B-SW								
T66B-C								


VST Results along downslope of floating road in Cell T66
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 66-75
VST 66-25
VST 66+25
T 66+75

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 66**
Job No. 03-104							
Test No.		VST 66-75	Date: 24th sept			Peat Depth (m) 2.17	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	18.0	6.50	9.5				
1.00	17.5	5.50	9.2				
1.50	11.0	3.00	5.7				
2.00	9.5	2.00	4.9				
Test No.		VST 66-25	Date: 24th sept			Peat Depth (m) 2.6	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	17.5	9.00	9.2				
1.00	11.0	2.00	5.7				
1.50	11.5	3.00	6.0				
2.00	13.5	3.50	7.0				
2.50	17.5	4.50	9.2				
Test No.		VST 66+25	Date: 27th sept			Peat Depth (m) 2.7	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	20.0	6.00	10.6				
1.00	11.0	4.00	5.7				
1.50	10.5	3.50	5.4				
2.00	10.0	4.50	5.2				
2.50	13.5	3.50	7.0				
Test No.		VST 66+75	Date: 27th sept			Peat Depth (m) 2.55	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	29.0	6.50	15.6				
1.00	16.5	6.50	8.6				
1.50	9.5	4.00	4.9				
2.00	10.0	3.00	5.2				
2.50	12.0	3.50	6.2				

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 68**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T68/P-100A		159232.2	204594.3	355.99	2.04	353.95	**4.0**	**2.8**
T68/P-100B				352.70	1.09	351.61		
T68/P-75A		159257.1	204603.7	355.37	2.00	353.37	**3.5**	**3.7**
T68/P-75B				352.49	2.20	350.29		
T68/P-50A		159277.7	204612.9	354.82	2.10	352.72	**4.0**	**3.6**
T66/P-50B				351.53	1.80	349.73		
T68/P-25A		159299.5	204623.4	354.11	2.17	351.94	**1.7**	**1.3**
T68/P-25B				352.74	1.90	350.84		
T68/P0A		159322.7	204629.6	352.45	1.37	351.08	**3.5**	**2.8**
T68/P0B				349.57	0.80	348.77		
T68/P25A		159348.4	204641	353.37	2.60	350.77	**2.3**	**2.6**
T68/P25B				351.46	2.80	348.66		
T68/P50A		159371.2	204649	353.11	3.24	349.87	**1.7**	**1.7**
T68/P50B				351.74	3.24	348.50		
T68/P+75A		159393.6	204659.3	352.61	3.30	349.31	**1.2**	**1.5**
T68/P+75B				351.65	3.58	348.07		
T68/P+100A		159415.9	204670.8	351.96	3.14	348.82	**1.7**	**1.8**
T68/P+100B				350.59	3.28	347.31		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T68B-NE								
T68B-NW								
T68B-SE								
T68B-SW								
T68B-C								
T68B+50								
T68B+100								

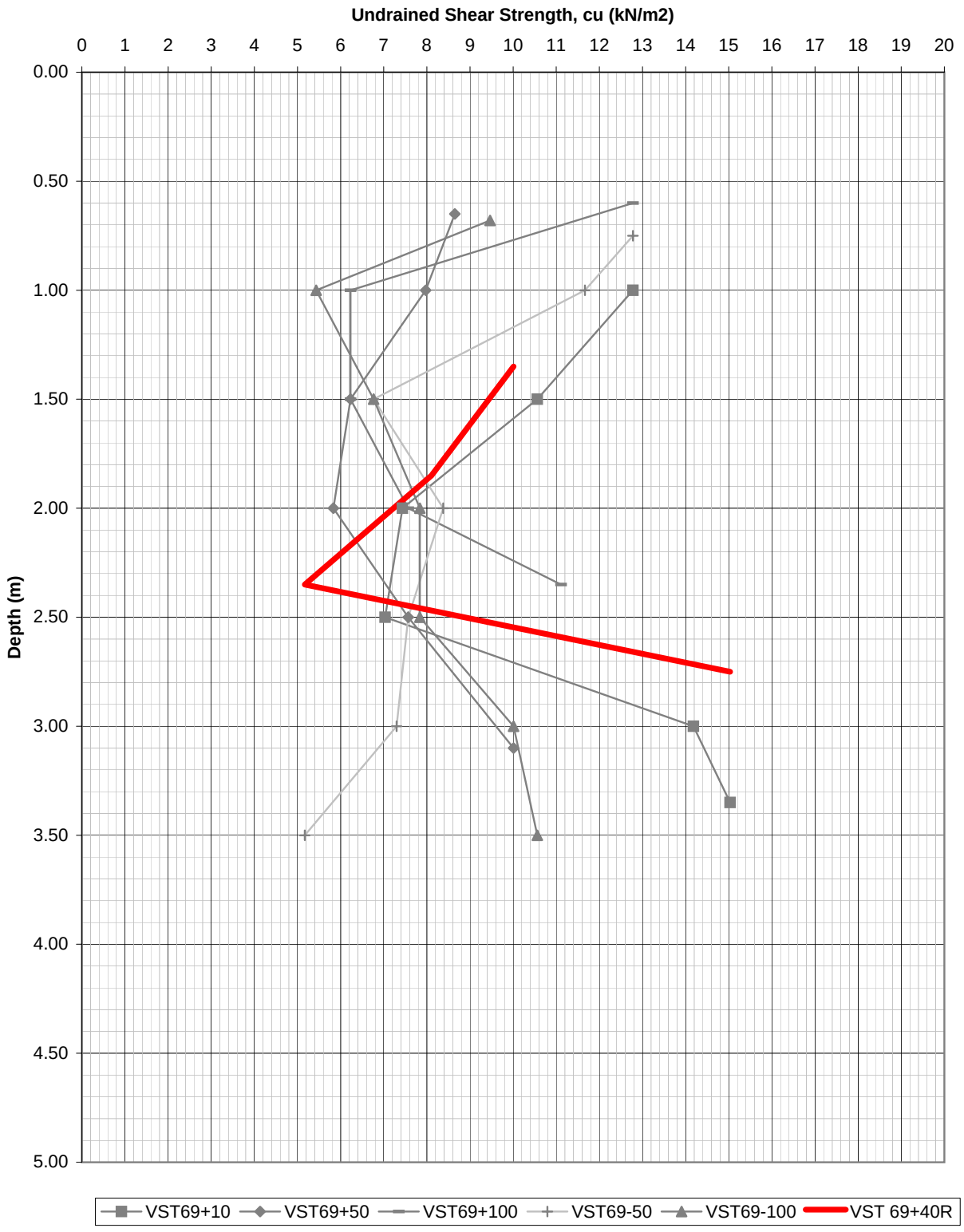

VST Results along downslope of floating road in Cell T68
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST68+100
VST68+50
VST68+0

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 68**
Test No.		VST 68+100	Date:	02-Sep		Peat Depth (m)	2.89
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.72	16.0	6.00	8.4				
1.00	15.0	8.00	7.8				
1.50	10.0	5.00	5.2				
2.00	12.0	6.00	6.2				
2.50	15.0	6.00	7.8				
Test No.		VST 68+50	Date:	02-Sep		Peat Depth (m)	2.96
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	14.0	5.00	7.3				
1.00	18.0	5.00	9.5				
1.50	10.0	4.00	5.2				
2.00	14.0	5.00	7.3				
2.50	15.0	4.00	7.8				
Test No.		VST 68+0	Date:	02-Sep		Peat Depth (m)	1.32
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.59	17.0	6.00	8.9				
1.00	12.5	4.00	6.5				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 69**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T69/P-100A		159440.8	204680.3	351.38	**3.30**	348.08	**1.2**	**1.0**
T69/P-100B				350.42	**3.20**	347.22		
T69/P-75A		159463.1	204688.4	350.75	**3.00**	347.75	**1.2**	**1.3**
T69/P-75B				349.79	**3.15**	346.64		
T69/P-50A		159484.4	204699.7	350.37	**3.47**	346.90	**1.2**	**0.8**
T69/P-50B				349.41	**3.20**	346.21		
T69/P-25A		159508.5	204707.7	349.48	**3.10**	346.38	**1.2**	**0.8**
T69/P-25B				348.52	**2.84**	345.68		
T69/P0A		159530.6	204722.0	349.40	**3.56**	345.84	**1.7**	**0.8**
T69/P0B				348.03	**2.84**	345.19		
T69/P25A		159551.5	204731.0	349.73	**3.12**	346.61	**1.7**	**2.2**
T69/P25B				348.36	**3.54**	344.82		
T69/P50A		159576.1	204741.9	349.87	**3.25**	346.62	**2.3**	**2.3**
T69/P50B				347.95	**3.25**	344.70		
T69/P+75A		159598.1	204750.5	349.79	**3.38**	346.41	**2.3**	**2.3**
T69/P+75B				347.88	**3.35**	344.53		
T69/P+100A		159620.6	204762.4	349.70	**2.44**	347.26	**1.7**	**1.4**
T69/P+100B				348.34	**2.20**	346.14		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T69B-NE								
T69B-NW								
T69B-SE								
T69B-SW								
T69B-C								
T69B+50								
T69B+100								

VST Results along downslope of floating road in Cell T69
Undrained Shear Strength, cu (kN/m2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST69+10
VST69+50
VST69+100
VST69-50
VST69-100

VST Results under floating road in Cell T69 (results along downslope side shown in background)



AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 69**
Job No. 03-104							
Test No.		VST 69+10	Date:	02-Sep		Peat Depth (m)	3.40
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
1.00	24.00	8.50	12.8				
1.50	20.00	7.50	10.6				
2.00	14.25	6.50	7.4				
2.50	13.50	6.00	7.0				
3.00	26.50	7.00	14.2				
3.35	28.00	8.00	15.0				dropped to 20
							@ failure
Test No.		VST 69+50	Date:	02-Sep		Peat Depth (m)	3.20
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.65	16.50	6.50	8.6				
1.00	15.25	8.50	8.0				
1.50	12.00	6.00	6.2				
2.00	11.25	4.00	5.8				
2.50	14.50	8.00	7.6				
3.10	19.00	4.00	10.0				
Test No.		VST 69+100	Date:	02-Sep		Peat Depth (m)	2.4
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.60	24.0	8.0	12.8				
1.00	12.0	6.5	6.2				
1.50	12.0	5.0	6.2				
2.00	14.5	5.5	7.6				
2.35	21.0	3.0	11.1				
Test No.		VST 69+40R	Date:	02-Sep		Peat Depth (m)	Under Road:2.0m
**Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
1.35	19.0	6.00	10.0				
1.85	15.5	5.50	8.1				
2.35	10.0	5.50	5.2				
2.75	28.0	6.00	15.0				
850mm road thickness. Stone down to top peat;Very few trees at base of road @ test location							
**Depth below road surface. Depth to base of peat is 2.85 m							

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 69**
Test No.		VST 69-50	Date:	02-Sep		Peat Depth (m)	3.68
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.75	24.0	5.00	12.8				
1.00	22.0	6.50	11.7				
1.50	13.0	7.00	6.8				
2.00	16.0	6.00	8.4				
2.50	14.5	6.00	7.6				
3.00	14.0	5.00	7.3				
3.50	10.0	5.00	5.2				
Test No.		VST 69-100	Date:	02-Sep		Peat Depth (m)	3.66
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.68	18.0	6.00	9.5				
1.00	10.5	4.00	5.4				
1.50	13.0	5.00	6.8				
2.00	15.0	3.00	7.8				
2.50	15.0	5.50	7.8				
3.00	19.0	4.00	10.0				
3.50	20.0	5.00	10.6				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting ***Geotechnical Engineers***				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 70**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T70/P-100A		159359.2	204322.5	332.33	**2.13**	330.20	**3.9**	**3.2**
T70/P-100B		159376.1	204278.1	329.11	**1.57**	327.54		
T70/P-75A		159383.1	204331.8	332.47	**2.16**	330.31	**4.0**	**3.7**
T70/P-75B		159398.9	204288.6	329.24	**1.90**	327.34		
T70/P-50A		159403.0	204340.8	330.94	**1.44**	329.50	**3.6**	**3.1**
T70/P-50B		159427.9	204309.1	328.39	**1.09**	327.30		
T70/P-25A		159427.1	204351.0	329.55	**0.84**	328.71	**2.3**	**2.7**
T70/P-25B		159444.3	204308.7	327.72	**1.20**	326.52		
T70/P0A		159452.4	204360.5	329.02	**1.32**	327.70	**3.4**	**3.1**
T70/P0B		159474.2	204324.9	326.55	**1.10**	325.45		
T70/P25A		159474.2	204371.3	328.51	**0.40**	328.11	**3.4**	**3.3**
T70/P25B		159491.8	204328.2	325.74	**0.32**	325.42		
T70/P50A		159499.9	204381.5	330.37	**1.64**	328.73	**3.8**	**3.2**
T70/P50B		159520.6	204343.8	327.55	**1.22**	326.33		
T70/P+75A		159520.3	204393.6	331.93	**2.62**	329.31	**3.3**	**2.7**
T70/P+75B		159541.6	204356.6	329.49	**2.21**	327.28		
T70/P+100A		159543.2	204402.4	332.00	**2.52**	329.48	**3.4**	**4.2**
T70/P+100B		159566.0	204365.6	329.42	**3.10**	326.32		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T70B-NE								
T70B-NW								
T70B-SE								
T70B-SW								
T70B-C								
T70B+50								
T70B+100								

Appendix B

Summary of the Field Investigations at Proposed Peat Repository Sites

AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**		**Rep. No: T7R**

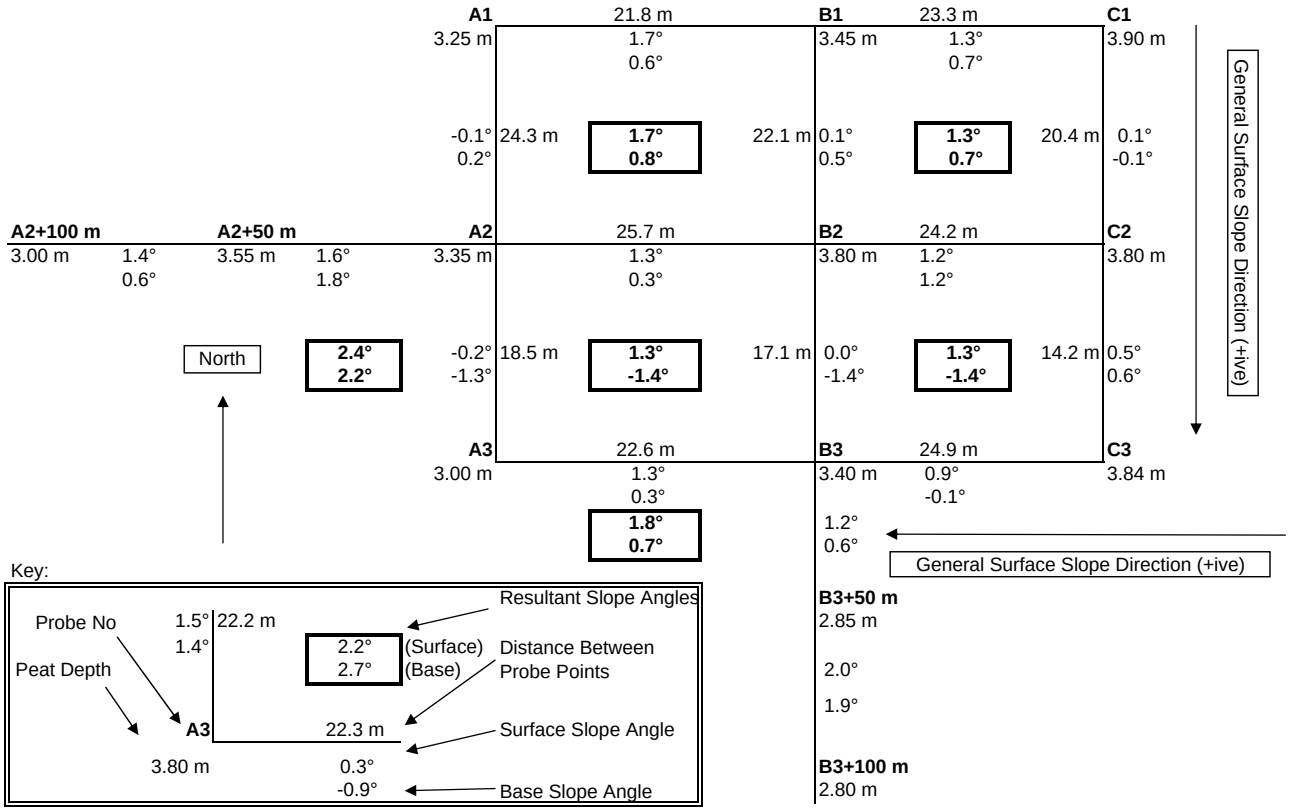
Max Slope at Ground Surface:	1.7°
Downslope:	0.1°
Orthogonal Direction:	1.7°
Resultant:	1.7°

Max Slope at Base of Peat:	-1.4°
Downslope:	1.4°
Orthogonal Direction:	-0.3°
Resultant:	-1.4°

Comments:

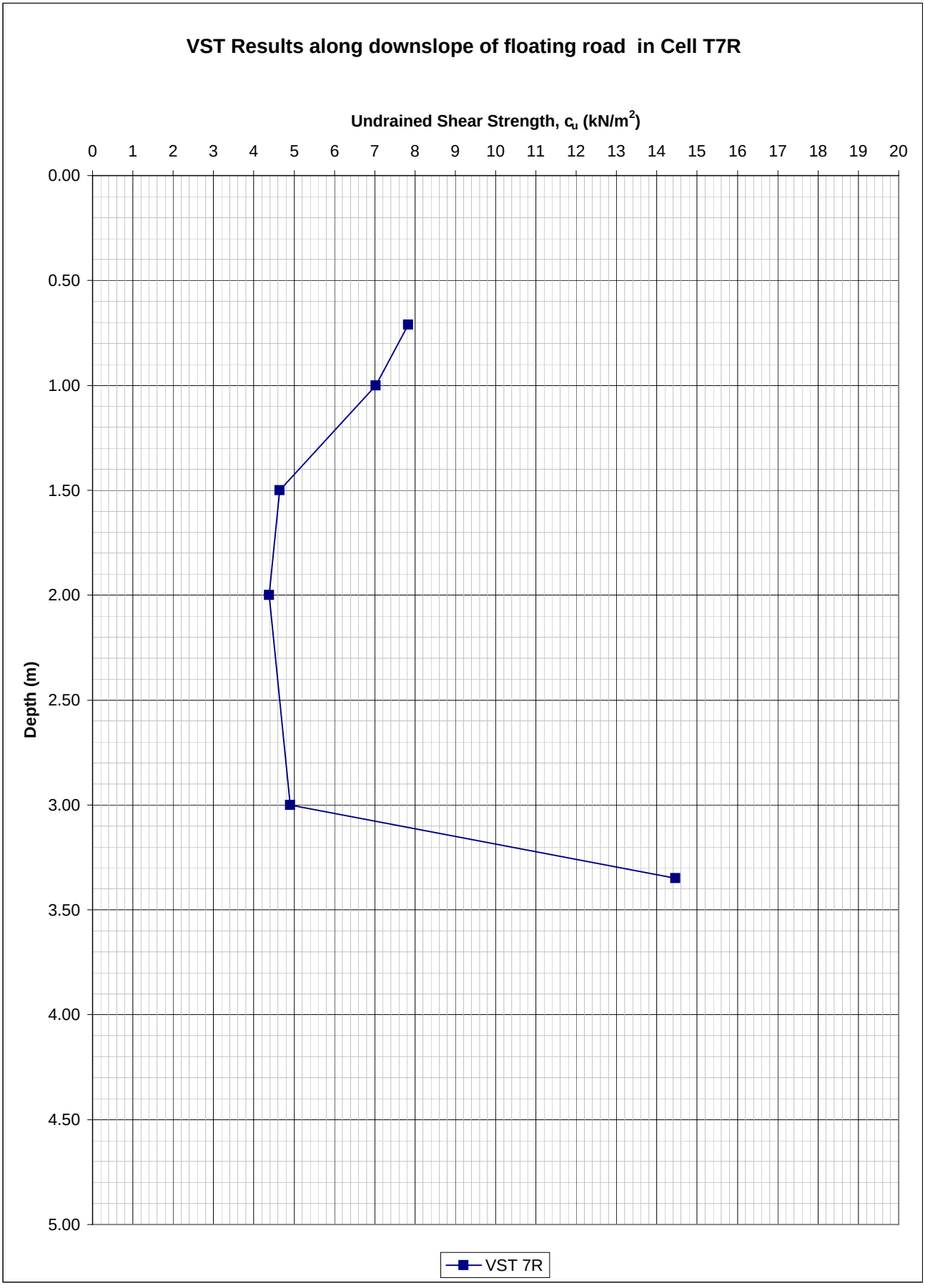
Peat Depth :	3.0 m - 3.9 m
Min Undrained Shear Strength:	4.4 kPa at Depth = 2.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Preser	Yes	No



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T7R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 7R

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 7R**
Job No. 03-104							
Test No.		VST 7R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.71	15.0	5.5	7.8				
1.00	13.5	6.0	7.0				
1.50	9.0	5.0	4.6				
2.00	8.5	3.5	4.4				
3.00	9.5	3.0	4.9				
3.35	27.0	5.5	14.5				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

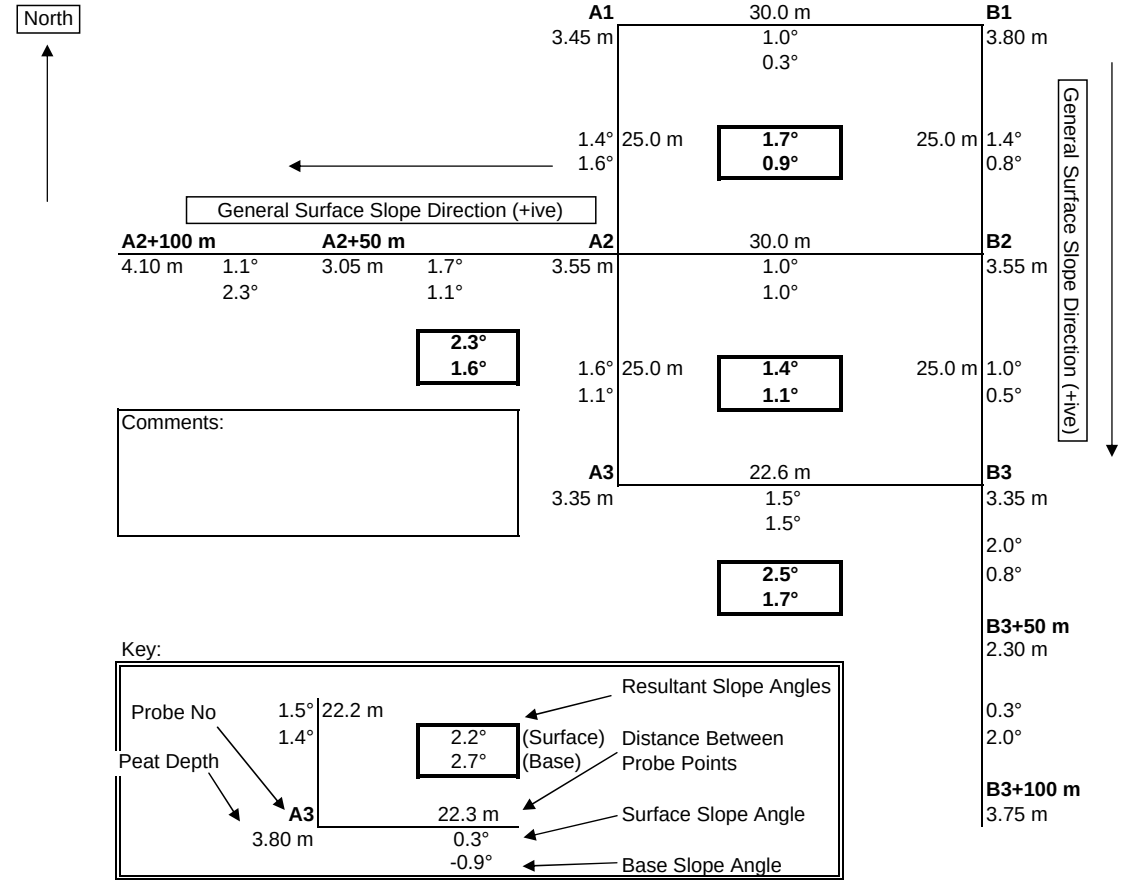
AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T8R**

Max Slope at Ground Surface:	1.7°
Downslope:	1.4°
Orthogonal Direction:	1.0°
Resultant:	1.7°

Max Slope at Base of Peat:	1.1°
Downslope:	0.5°
Orthogonal Direction:	1.0°
Resultant:	1.1°

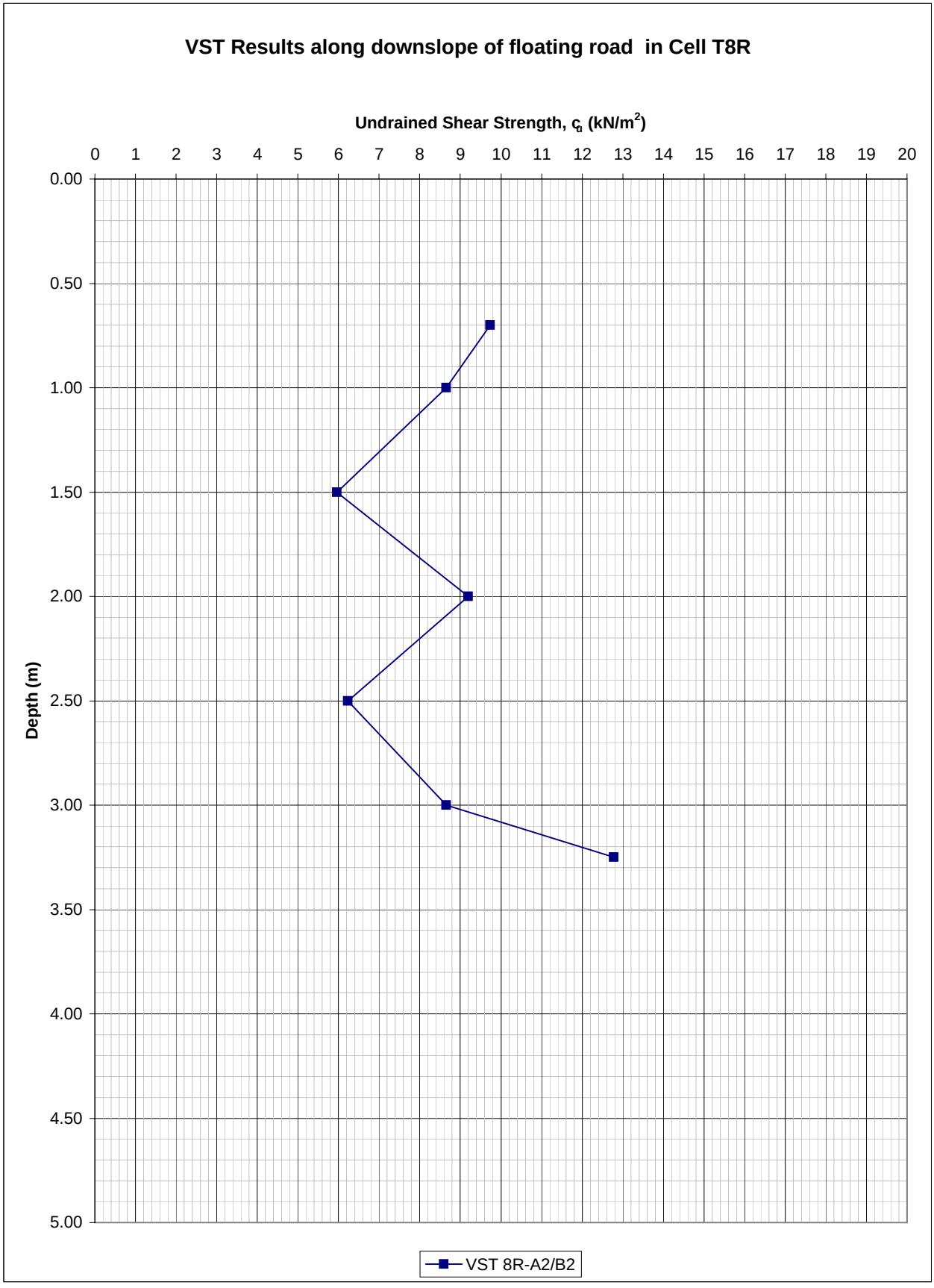
Peat Depth :	3.35 m - 3.80 m
Min Undrained Shear Strength:	6.0 kPa at Depth = 1.5 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Present:	Yes	No



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T8R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 8R-A2/B2

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 8R**
Job No. 03-104							
Test No.		VST 8R-A2/B2	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	18.5	5.00	9.7				
1.00	16.5	6.50	8.6				
1.50	11.5	3.50	6.0				
2.00	17.5	5.50	9.2				
2.50	12.0	4.00	6.2				
3.00	16.5	5.00	8.6				
3.25	24.0	5.50	12.8				

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

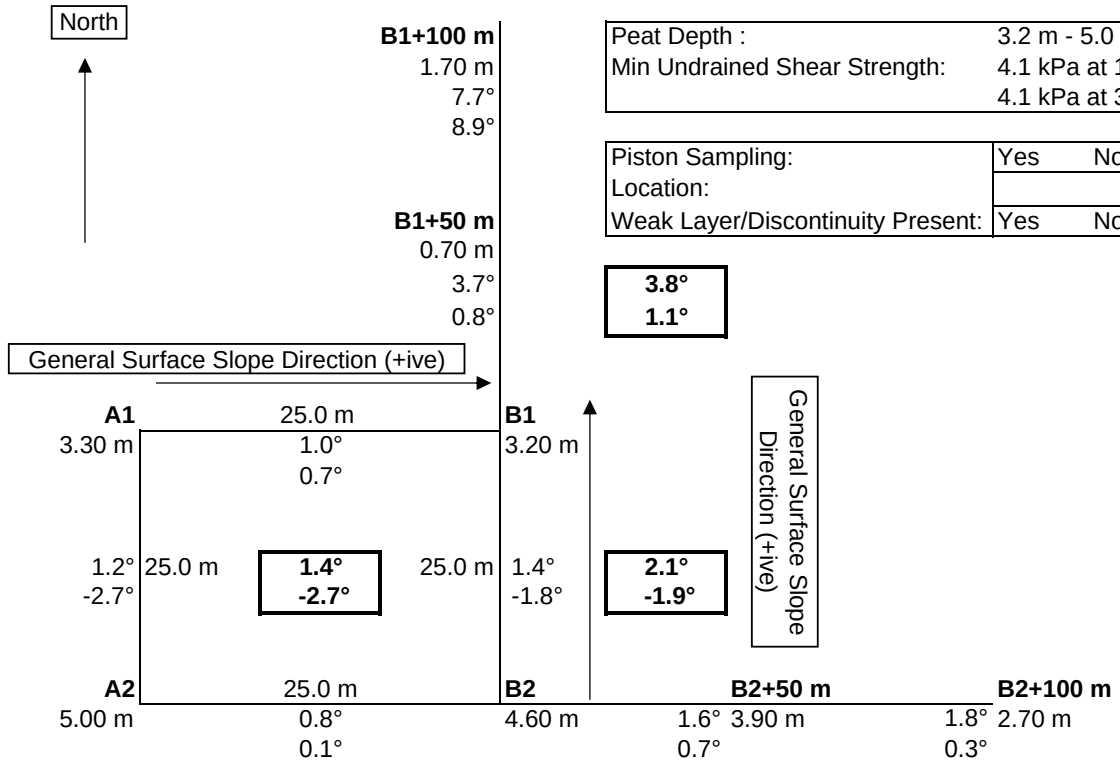
Turbine/ Cell No.

Derrybrien Wind Farm Additional Gound Investigation
Peat Repository Location Assessment

AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T50R**

Max Slope at Ground Surface:	1.4°
Downslope:	1.2°
Orthogonal Direction:	0.8°
Resultant:	1.4°

Max Slope at Base of Peat:	-2.7°
Downslope:	-2.7°
Orthogonal Direction:	0.1°
Resultant:	-2.7°

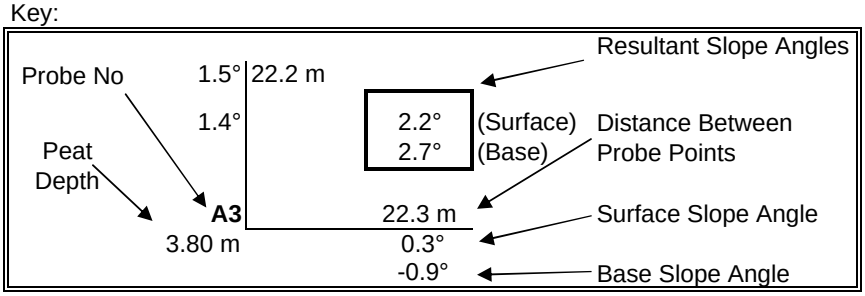


Peat Depth :	3.2 m - 5.0 m
Min Undrained Shear Strength:	4.1 kPa at 1.5 m
	4.1 kPa at 3.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Present:	Yes	No

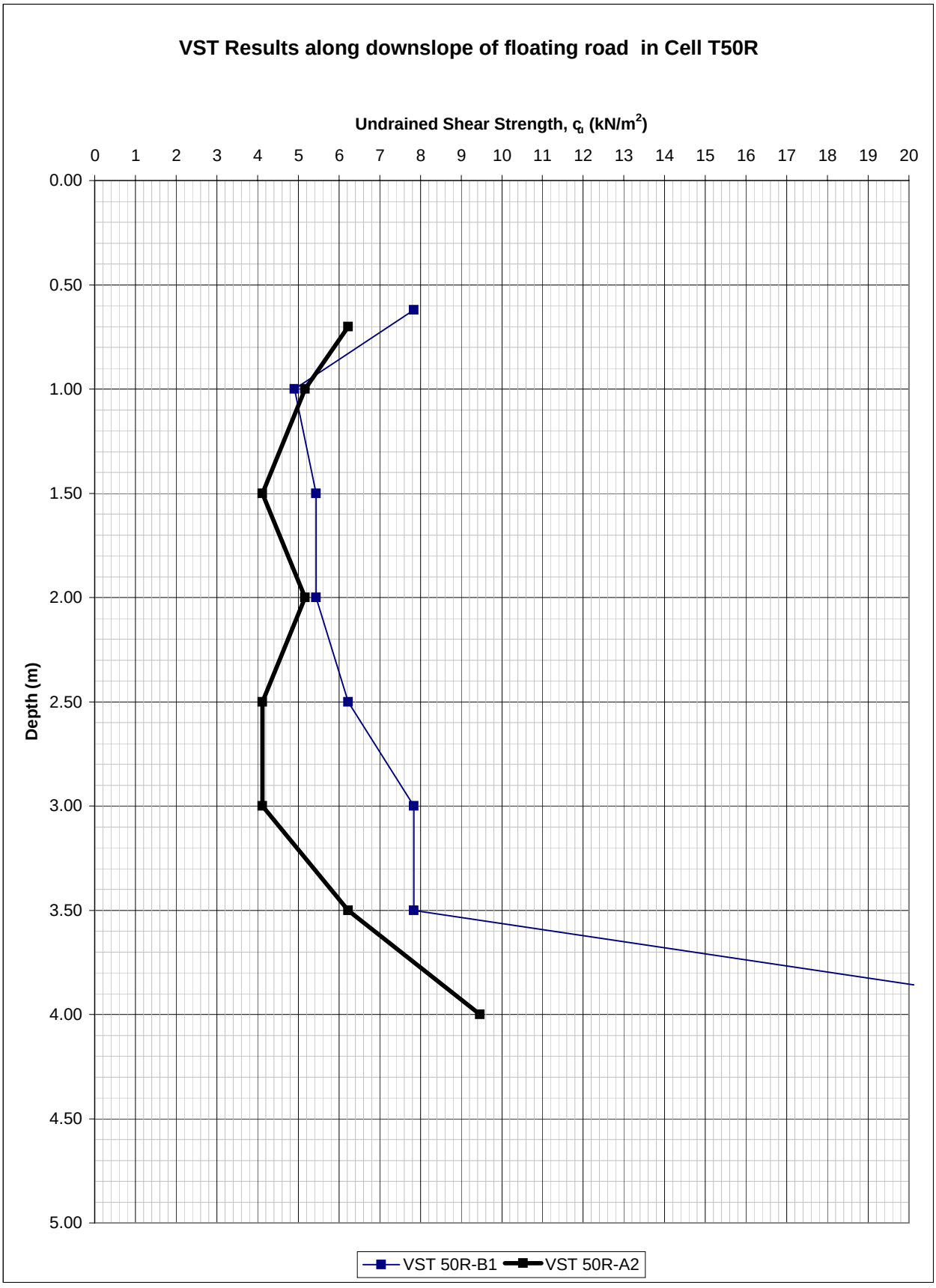
Comments:

Key:



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T50R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 50R-B1
VST 50R-A2

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 50R**
Test No.		VST 50R-B1	Date:			Peat Depth (m) 4.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.0	8.00	7.8				
1.00	9.5	5.50	4.9				
1.50	10.5	5.50	5.4				
2.00	10.5	4.00	5.4				
2.50	12.0	4.50	6.2				
3.00	15.0	7.00	7.8				
3.50	15.0	3.50	7.8				
4.00	45.0	9.00	25.0				
Test No.		VST 50R-A2	Date:			Peat Depth (m) 4.73	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	12.0	4.50	6.2				
1.00	10.0	3.00	5.2				
1.50	8.0	3.50	4.1				
2.00	10.0	3.00	5.2				
2.50	8.0	4.00	4.1				
3.00	8.0	3.50	4.1				
3.50	12.0	3.00	6.2				
4.00	18.0	4.50	9.5				
4.50	29.0	4.50	15.6				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Derrybrien Wind Farm Additional Gound Investigation
Peat Repository Location Assessment

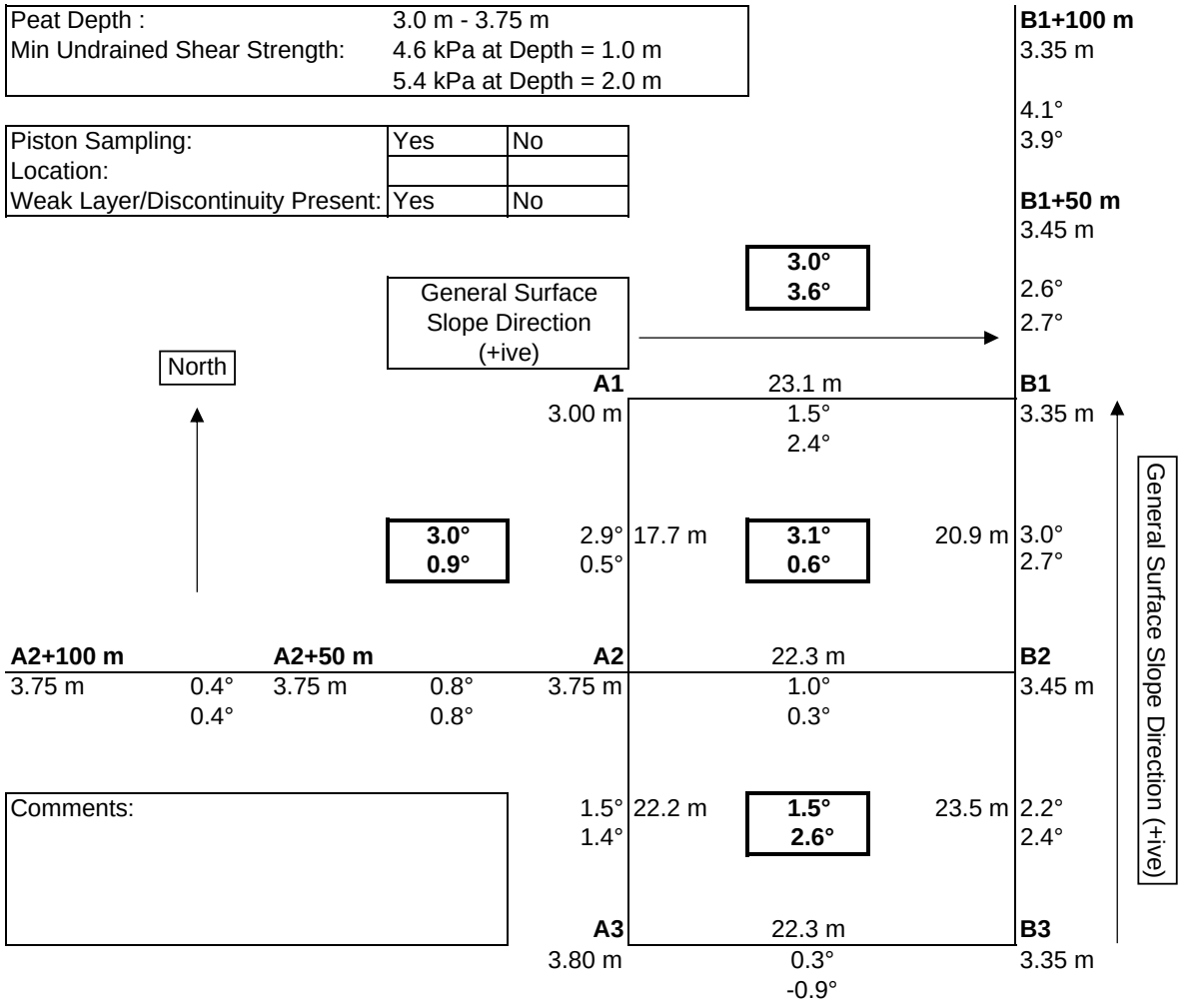
AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T51R**

Max Slope at Ground Surface:	3.1°
Downslope:	2.9°
Orthogonal Direction:	1.0°
Resultant:	3.1°

Max Slope at Base of Peat:	2.6°
Downslope:	2.4°
Orthogonal Direction:	-0.9°
Resultant:	2.6°

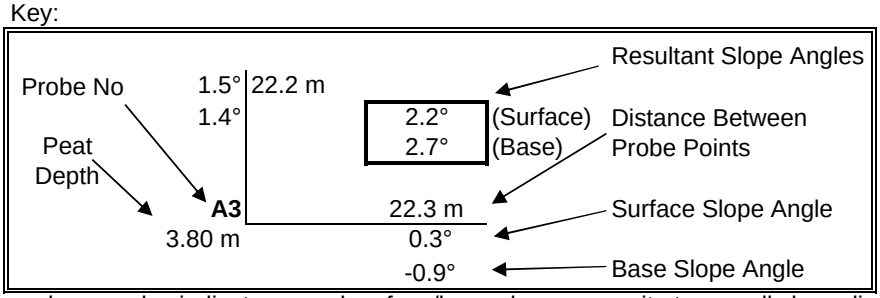
Peat Depth :	3.0 m - 3.75 m
Min Undrained Shear Strength:	4.6 kPa at Depth = 1.0 m
	5.4 kPa at Depth = 2.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Present:	Yes	No



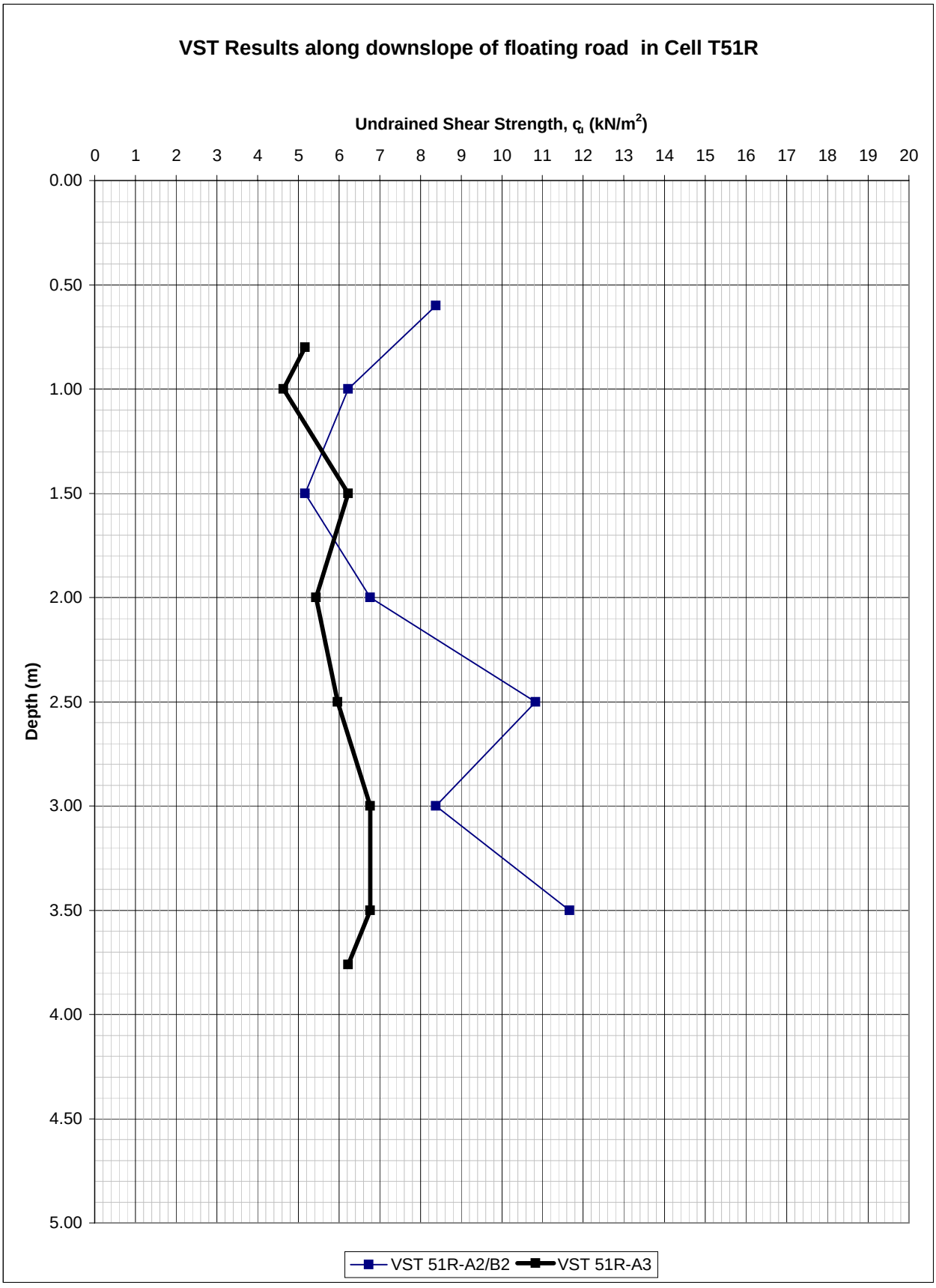
Comments:

Key:



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T51R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 51R-A2/B2
VST 51R-A3

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 51R**
Job No. 03-104							
Test No.		VST 51R-A2/B2	Date:			Peat Depth (m) 3.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	16.0	8.00	8.4				
1.00	12.0	6.00	6.2				
1.50	10.0	6.00	5.2				
2.00	13.0	5.50	6.8				
2.50	20.5	4.50	10.8				
3.00	16.0	2.50	8.4				
3.50	22.0	4.00	11.7				
Test No.		VST 51R-A3	Date:			Peat Depth (m) 3.76	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.80	10.0	4.00	5.2				
1.00	9.0	5.00	4.6				
1.50	12.0	4.00	6.2				
2.00	10.5	4.50	5.4				
2.50	11.5	4.00	6.0				
3.00	13.0	5.00	6.8				
3.50	13.0	4.00	6.8				
3.76	12.0	4.00	6.2				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Derrybrien Wind Farm Additional Gound Investigation
Peat Repository Location Assessment

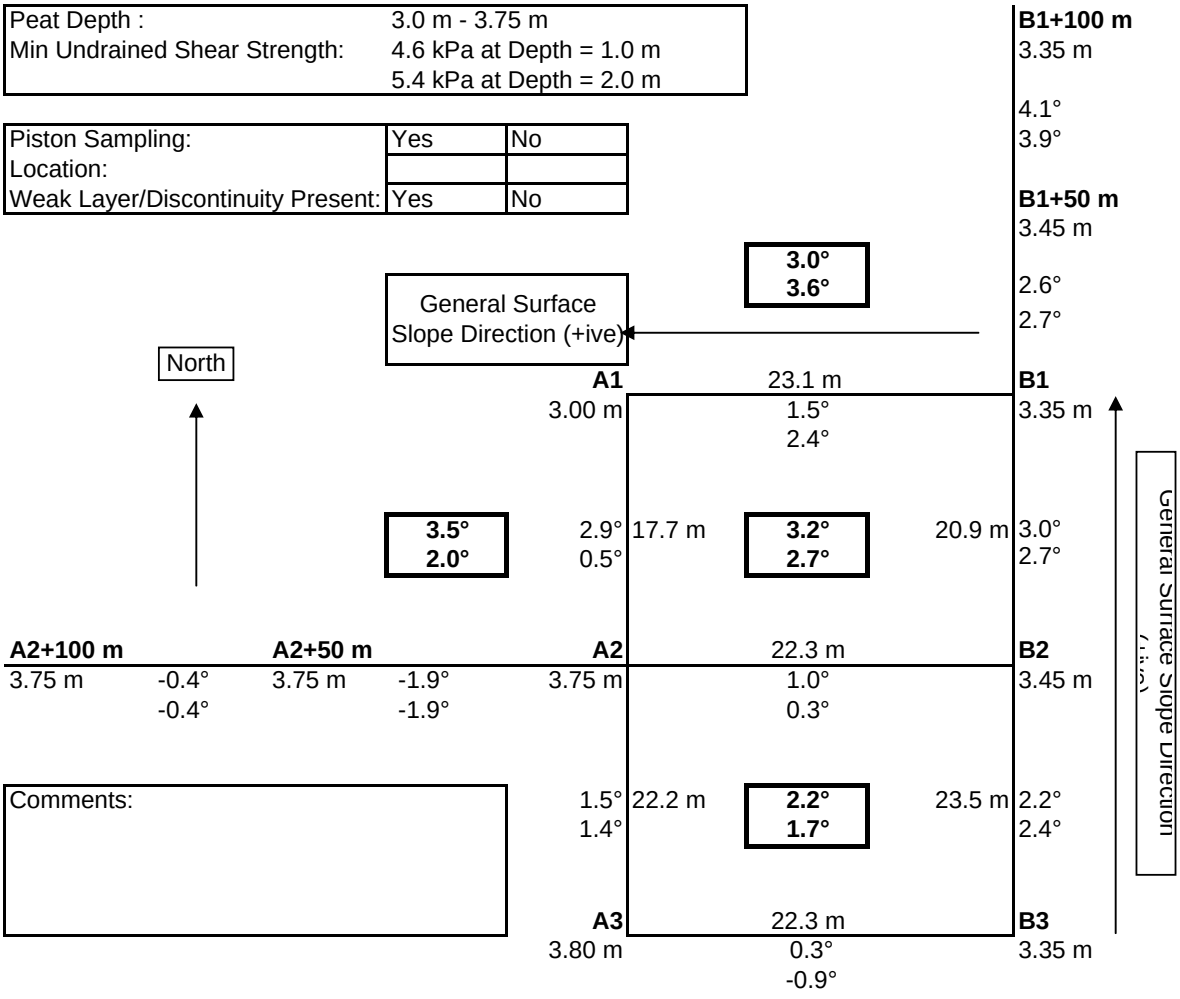
AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T51**

Max Slope at Ground Surface:	3.2°
Downslope:	3.0°
Orthogonal Direction:	1.0°
Resultant:	3.2°

Max Slope at Base of Peat:	2.7°
Downslope:	2.7°
Orthogonal Direction:	0.3°
Resultant:	2.7°

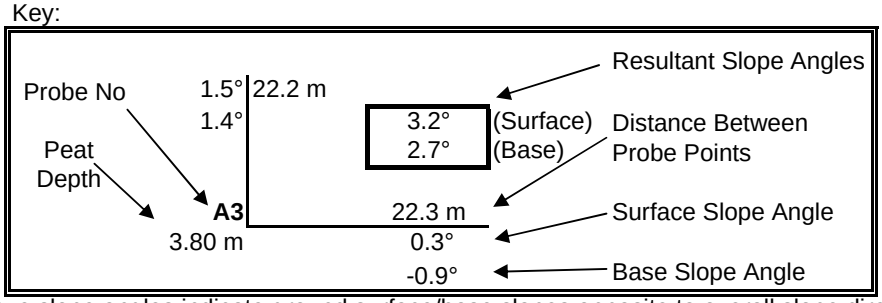
Peat Depth :	3.0 m - 3.75 m
Min Undrained Shear Strength:	4.6 kPa at Depth = 1.0 m 5.4 kPa at Depth = 2.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Present:	Yes	No



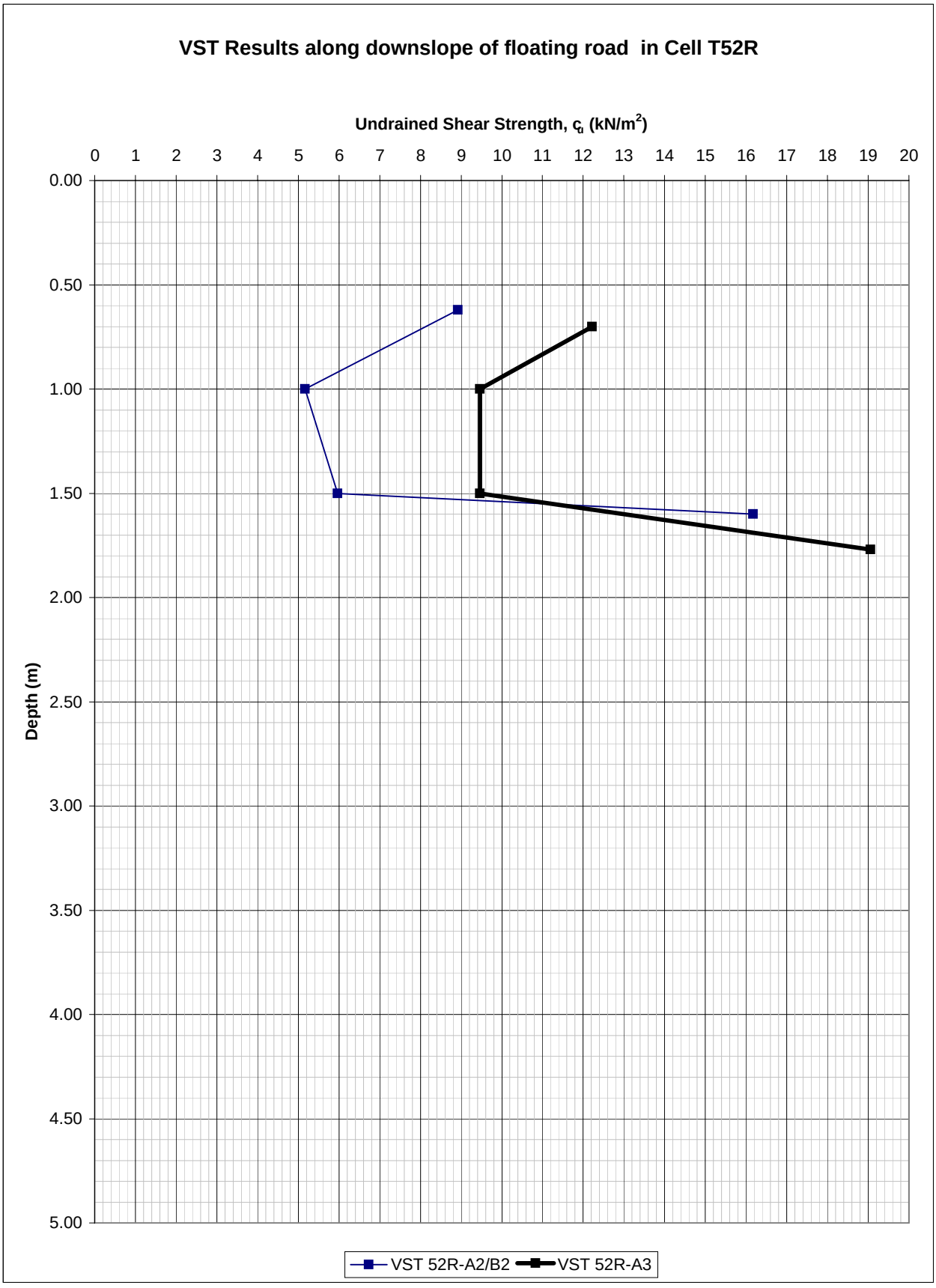
Comments:

Key:



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T52R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 52R-A2/B2
VST 52R-A3

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 52R**
Test No.		VST 52R-A2/B2	Date:			Peat Depth (m) 1.6	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	17.0	7.50	8.9				
1.00	10.0	4.00	5.2				
1.50	11.5	2.50	6.0				
1.60	30.0	6.00	16.2				
Test No.		VST 52R-A3	Date:			Peat Depth (m) 1.77	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.70	23.0	5.00	12.2				
1.00	18.0	5.00	9.5				
1.50	18.0	7.50	9.5				
1.77	35.0	6.00	19.1				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T56/57R**

Max Slope at Ground Surface:	2.8°
Downslope:	2.5°
Orthogonal Direction:	1.3°
Resultant:	2.8°

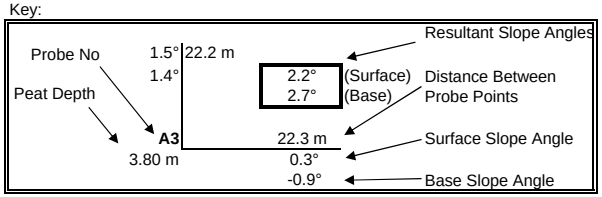
Max Slope at Base of Peat:	3.7°
Downslope:	3.5°
Orthogonal Direction:	1.3°
Resultant:	3.7°

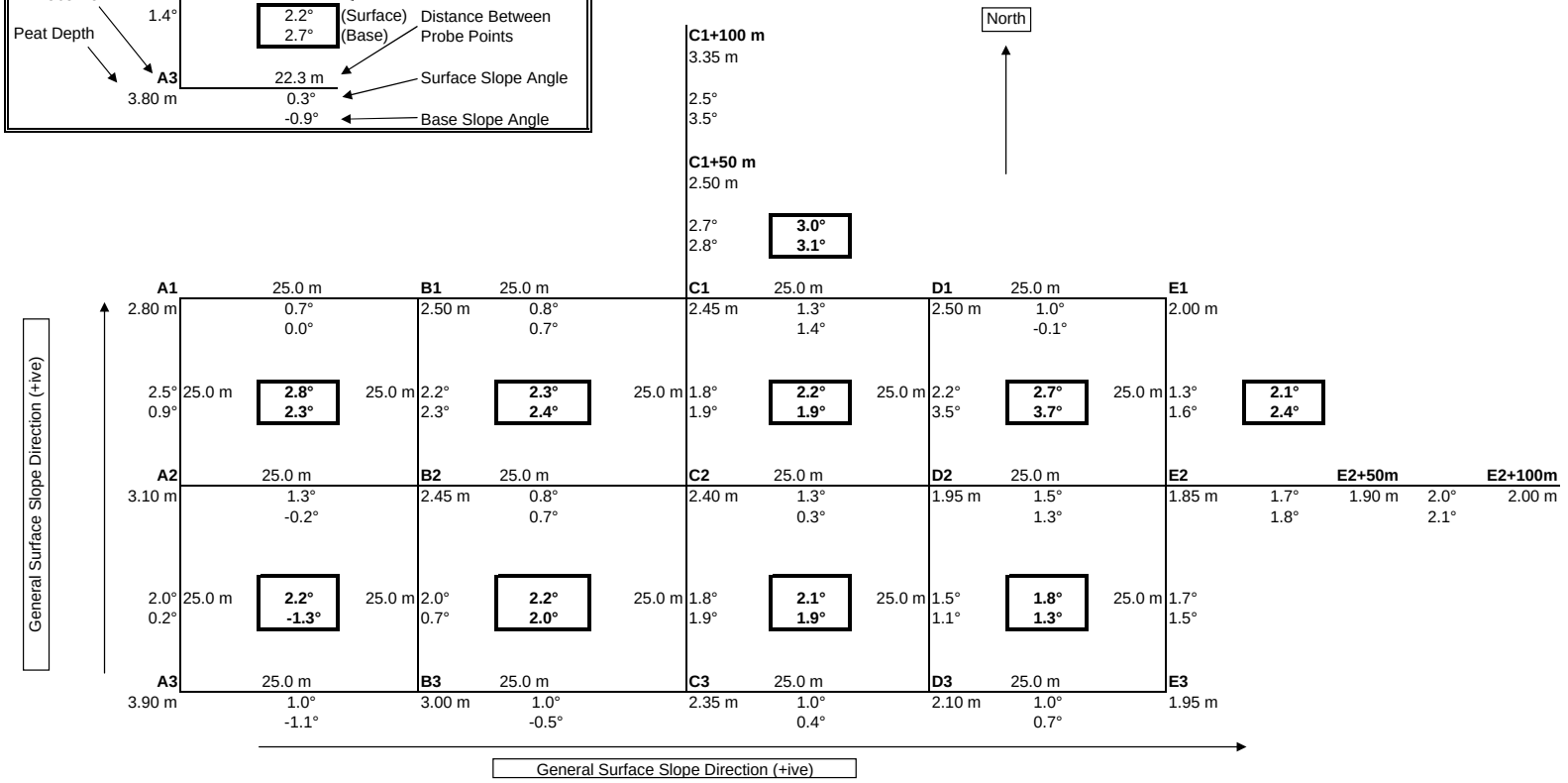
Comments:

Peat Depth :	3.0 m - 3.9 m
Min Undrained Shear Strength:	3.6 kPa at Depth = 3.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Preser	Yes	No

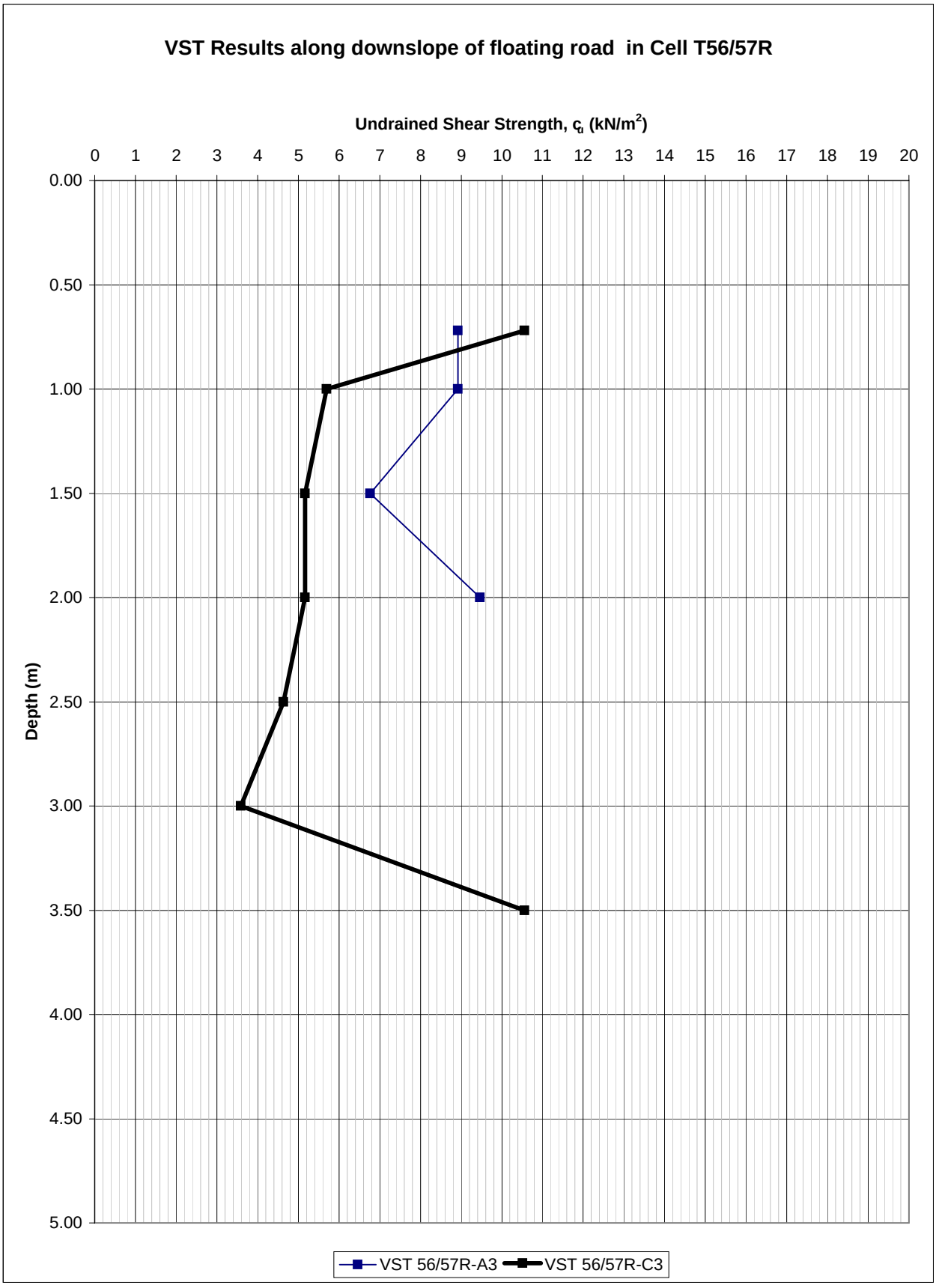
Key:





Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T56/57R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 56/57R-A3
VST 56/57R-C3

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. T56/57R**
Job No. 03-104							
Test No.		VST 56/57R-A3	Date:			Peat Depth (m) 2.96	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	17.00	9.00	8.9				
1.00	17.00	6.00	8.9				
1.50	13.00	6.00	6.8				
2.00	18.00	6.00	9.5				
Test No.		VST 56/57R-C3	Date:			Peat Depth (m) 3.8	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	20.00	9.00	10.6				
1.00	11.00	8.00	5.7				
1.50	10.00	8.00	5.2				
2.00	10.00	7.00	5.2				
2.50	9.00	6.00	4.6				
3.00	7.00	6.00	3.6				
3.50	20.00	6.00	10.6				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Derrybrien Wind Farm Additional Gound Investigation
Peat Repository Location Assessment

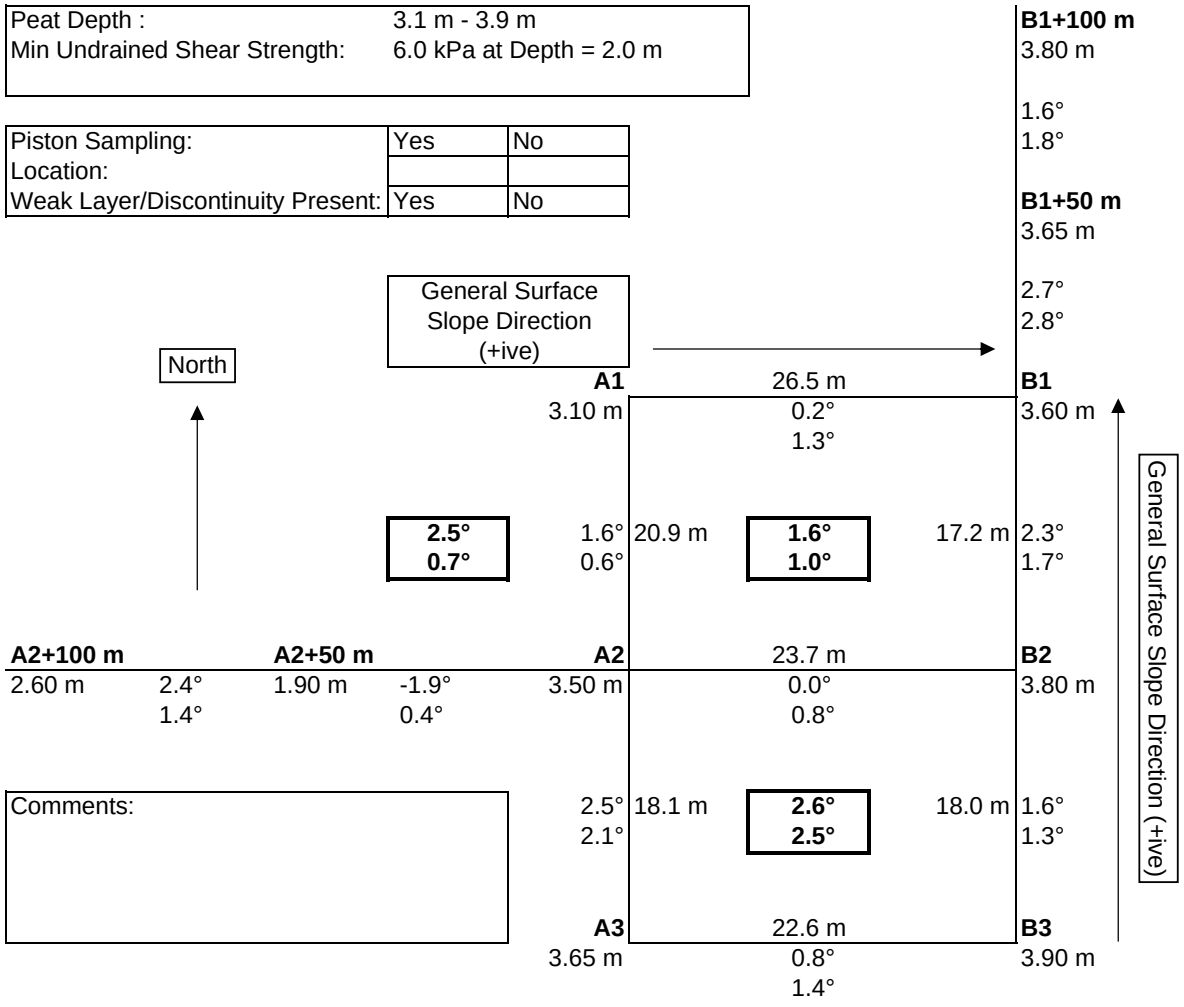
AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T56R**

Max Slope at Ground Surface:	2.6°
Downslope:	2.5°
Orthogonal Direction:	0.8°
Resultant:	2.7°

Max Slope at Base of Peat:	2.5°
Downslope:	2.1°
Orthogonal Direction:	1.4°
Resultant:	2.5°

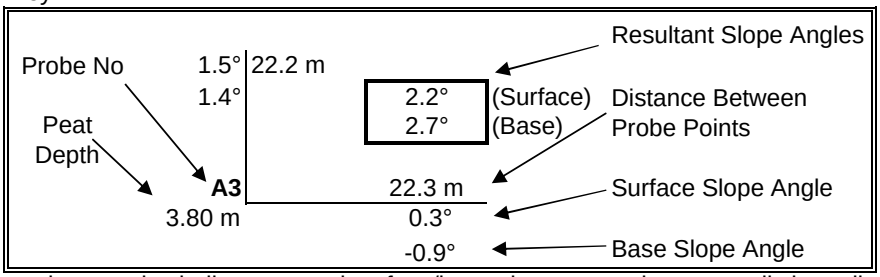
Peat Depth :	3.1 m - 3.9 m
Min Undrained Shear Strength:	6.0 kPa at Depth = 2.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Present:	Yes	No



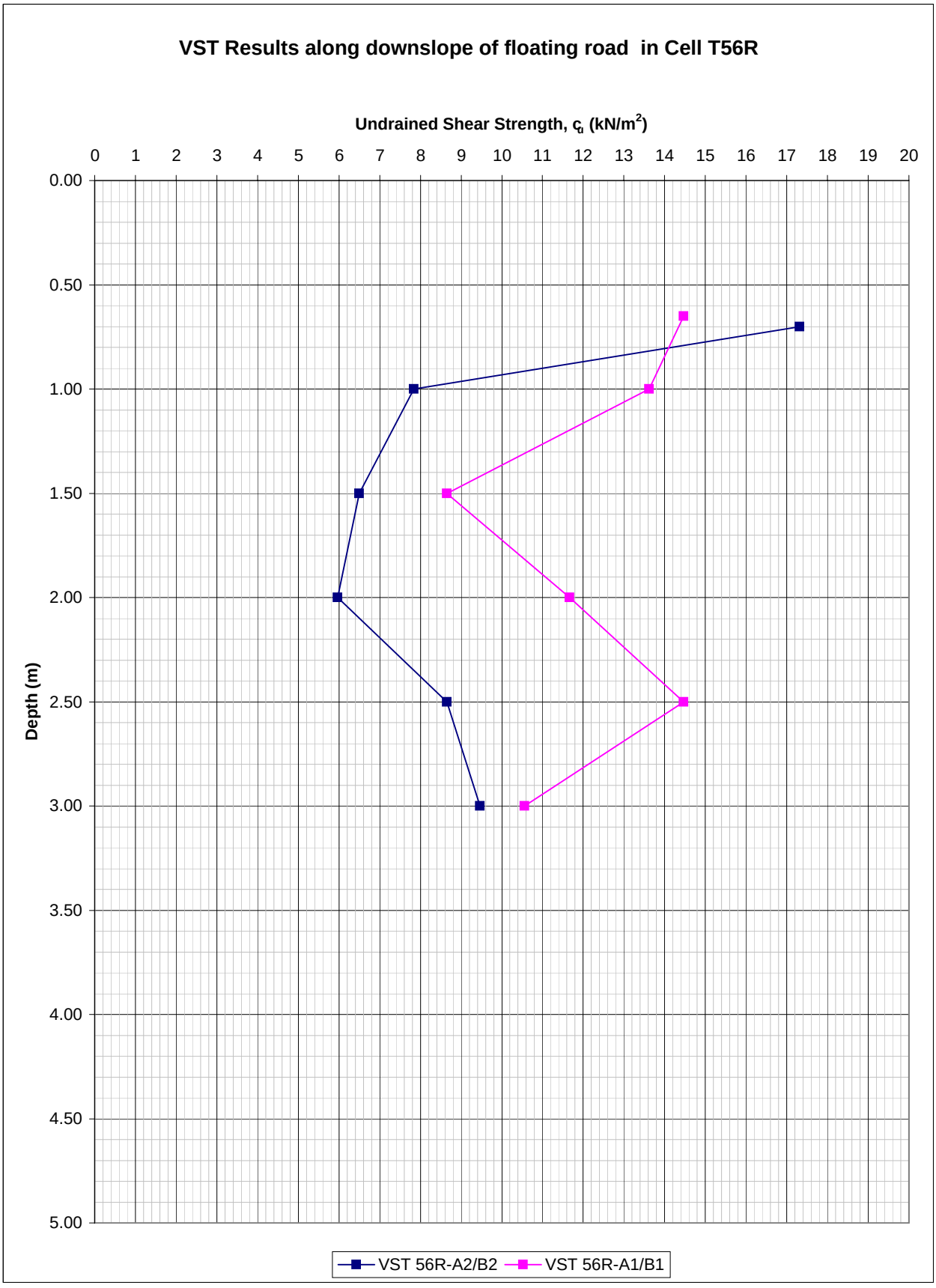
Comments:

Key:



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T56R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 56R-A2/B2
VST 56R-A1/B1

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 56R**
Job No. 03-104							
Test No.		VST 56R-A2/B2	Date:			Peat Depth (m) 3.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	32.0	7.00	17.3				
1.00	15.0	6.00	7.8				
1.50	12.5	5.50	6.5				
2.00	11.5	2.50	6.0				
2.50	16.5	5.00	8.6				
3.00	18.0	6.00	9.5				
Test No.		VST 56R-A1/B1	Date:			Peat Depth (m) 3.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	27.0	5.50	14.5				
1.00	25.5	6.00	13.6				
1.50	16.5	3.00	8.6				
2.00	22.0	4.00	11.7				
2.50	27.0	6.00	14.5				
3.00	20.0	2.50	10.6				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Derrybrien Wind Farm Additional Gound Investigation
Peat Repository Location Assessment

AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T57R**

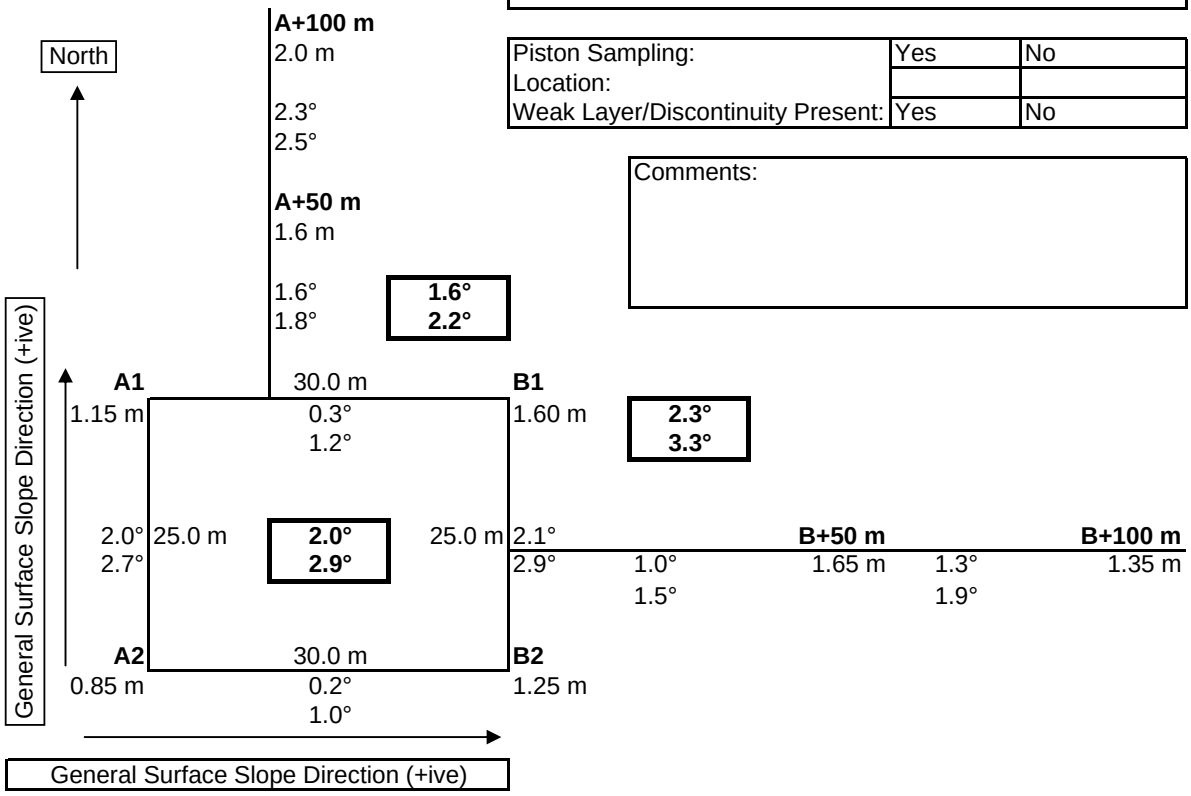
Max Slope at Ground Surface:	2.0°
Downslope:	2.0°
Orthogonal Direction:	0.2°
Resultant:	2.0°

Max Slope at Base of Peat:	2.9°
Downslope:	2.7°
Orthogonal Direction:	1.0°
Resultant:	2.9°

Peat Depth :	0.85 m - 1.6 m
Min Undrained Shear Strength:	4.0 kPa at Depth = 1.0 m

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity Present:	Yes	No

Comments:



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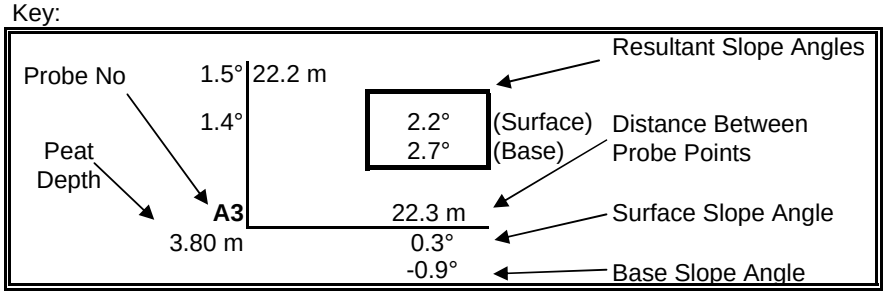
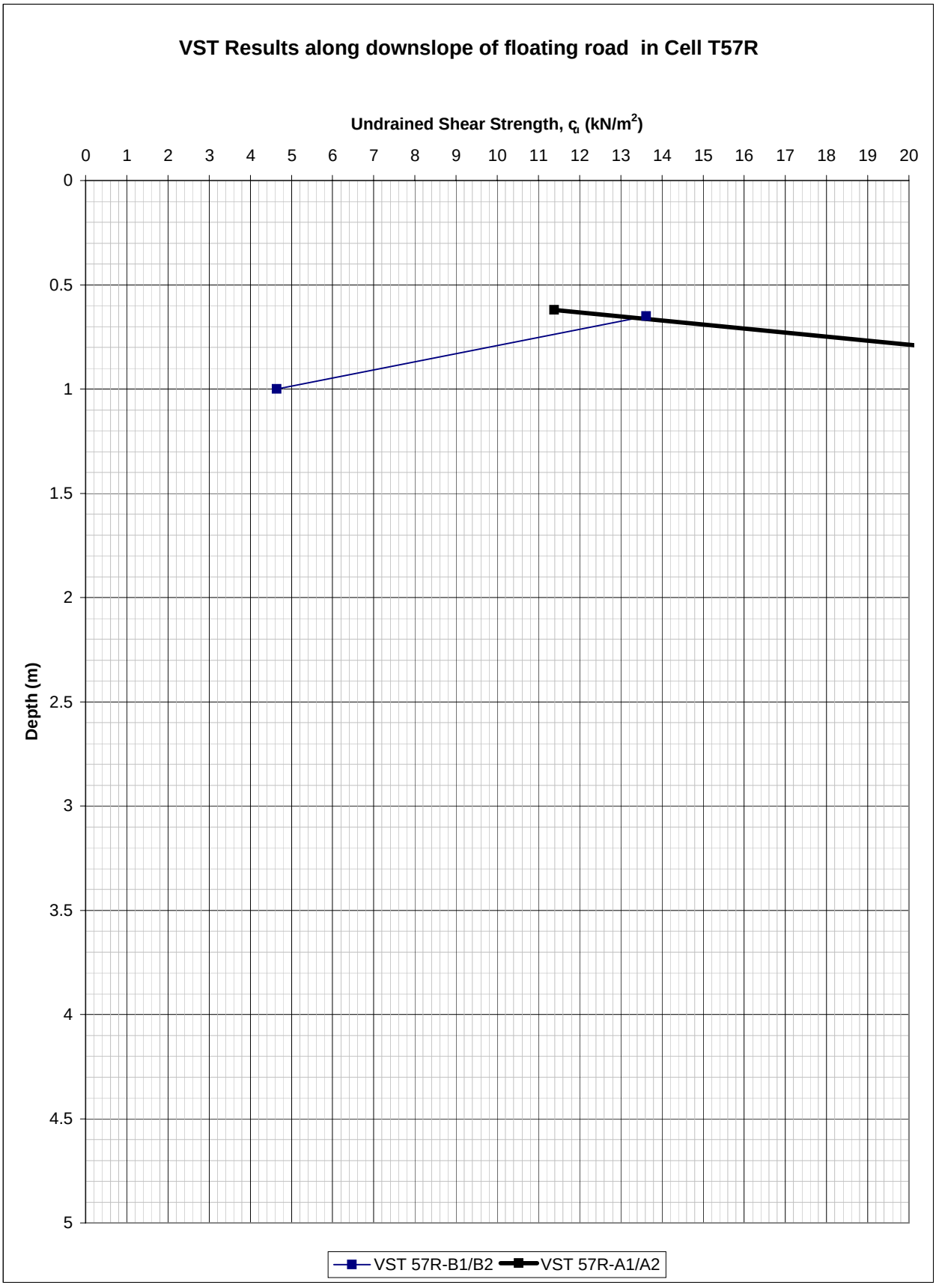


Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

Repository Site Approved:		Yes	No	Signed:	
Date:					


VST Results along downslope of floating road in Cell T57R
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
VST 57R-B1/B2
VST 57R-A1/A2

AGL Consulting ***Geotechnical Engineers***			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 57R**
Test No.		VST 57R-B1/B2	Date:			Peat Depth (m) 1.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	25.5	6.50	13.6				
1.00	9.0	6.00	4.6				
Test No.		VST 57R-A1/A2	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	21.5	7.00	11.4				
0.92	48.0	8.50	26.8				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

AGL Consulting *Geotechnical Engineers*	**Record of Peat Repository Locations**	**Rep. No: T58R**

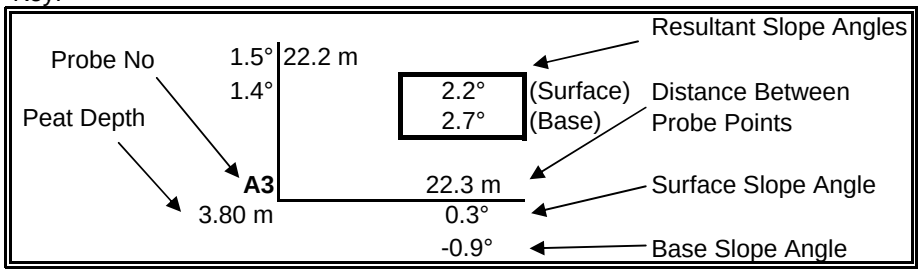
Max Slope at Ground Surface:	2.8°
Downslope:	2.0°
Orthogonal Direction:	2.0°
Resultant:	2.8°

Max Slope at Base of Peat:	2.7°
Downslope:	2.7°
Orthogonal Direction:	0.3°
Resultant:	2.7°

Comments:
No vanes peat too shallow.

Piston Sampling:	Yes	No
Location:		
Weak Layer/Discontinuity	Yes	No

Key:



Note: Negitave slope angles indicate ground surface/base slopes opposite to overall slope direction.

North

General Surface Slope Direction (+ive)

	B1+100 m										
	2.50 m										
	1.0°										
	3.1°										
	B1+50 m										
	0.70 m										
			2.4°								
	2.0°		**2.4°**								
	1.7°										
A1		17.5 m			**B1**	17.5 m			**C1**		
0.30 m		0.8°			0.40 m	1.4°			0.50 m		
		1.1°				1.7°					
2.0°	24.0 m	**2.8°**	1.1°		21.0 m	**1.6°**	18.0 m		1.2°	**1.6°**	
1.8°		**2.7°**	1.1°			**1.6°**			1.6°	**°**	
A2		20.0 m			**B2**	20.0 m			**C2**	**C2+50 m**	**C2+100 m**
0.40 m		2.0°			0.40 m	1.2°			0.40 m	1.0° 2.65 m	1.0° 2.70 m
		2.0°				1.2°				°	0.9°

Peat Depth :	0.3 m - 0.5 m
Min Undrained Shear Strength:	~ See Comments

General Surface Slope Direction (+ive)

Repository Site Approved:		Yes	No	Signed:	
Date:					

Appendix C

Results of Slope/W Analyses for the Floating Roads

Cell T47NR (T47NR+0)					
Design Depth of Peat = 3.1 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 1.5° on the ground surface and 1.0° backfall at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	8.7	6.2	1.0 - 1.7	8.7	6.2
1.0 - 2.0	6.2	4.4	1.7 - 2.5	6.2	4.4
2.0 - 3.1	5.7	4.1	2.5 - 3.1	5.7	4.1

Cell T48NR (T48NR+25)					
Design Depth of Peat = 3.34 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 1.0° on the ground surface and 1.3° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.5	4.6	1.0 - 1.7	6.5	4.6
1.0 - 2.0	5.7	4.1	1.7 - 2.5	5.7	4.1
2.0 - 3.3	7.3	5.2	2.5 - 3.3	7.3	5.2

Cell T49NR (T49NR-25)					
Design Depth of Peat = 3.3 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 1.0° on the ground surface and 0.8° backfall at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	8.2	5.8	1.0 - 1.7	8.2	5.8
1.0 - 2.0	5.9	4.2	1.7 - 2.5	5.9	4.2
2.0 - 3.0	5.2	3.7	2.5 - 3.3	5.2	3.7
3.0 - 3.3	5.2	3.7			

Cell T50NR (T50-70)					
Design Depth of Peat = 2.50 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 1° on the ground surface and 0.2° backfall at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	8.2	5.9	1.0 - 1.5	8.2	5.9
1.0 - 2.0	11.3	8.1	1.5 - 2.2	11.3	8.1
2.0 - 2.5	11.3	8.1	2.2 - 2.5	11.3	8.1

Cell T50 (T50+75)					
Design Depth of Peat = 1.75 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 12.5° on the ground surface and 12.8° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	12.2	8.7	1.0 - 1.3	12.2	8.7
1.0 - 1.75	20.1	14.6	1.3 - 1.75	20.1	14.6

Cell T51 (T51-100)					
Design Depth of Peat = 1.66 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 9.5° on the ground surface and 9.2° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.5	4.6	1.0 - 1.3	6.5	4.6
1.0 - 1.66	8.15	5.8	1.3 - 1.66	8.15	5.8

Cell T51 (T51+75)					
Design Depth of Peat = 3.1 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 5.2° on the ground surface and 4.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	10.9	7.8	1.0 - 1.7	10.9	7.8
1.0 - 2.0	9.3	6.6	1.7 - 2.5	9.3	6.6
2.0 - 3.1	10.4	7.5	2.5 - 3.1	10.4	7.5

Cell T52 (T52-25/+25)					
Design Depth of Peat = 2.0 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 5.7° on the ground surface and 5.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	10.3	7.4	1.0 - 1.4	10.3	7.4
1.0 - 2.0	5.8	4.1	1.4 - 2.0	5.8	4.1

Cell T53 (T53+0)					
Design Depth of Peat = 2.5 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 1.5° on the ground surface and 1.0° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	7.2	5.1	1.0 - 1.6	7.2	5.1
1.0 - 2.0	6.6	4.7	1.6 - 2.3	6.6	4.7
2.0 - 2.5	10.4	7.5	2.3 - 2.5	10.4	7.5

Cell T54 (T54+75)					
Design Depth of Peat = 3.3 m (Actual range: 1.0 m - 3.3 m)					
Slope Angle = 1.5° on the ground surface and 0.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	8.7	6.2	1.0 - 1.6	8.7	6.2
1.0 - 2.0	5.5	3.9	1.6 - 2.3	5.5	3.9
2.0 - 3.0	5.1	3.6	2.3 - 3.0	5.1	3.6
3.0 - 3.3	5.7	4.1	3.0 - 3.3	5.7	4.1

Cell T55					
Design Depth of Peat = 3.75 m (Actual range: 2.85 m to 3.85 m)					
Slope Angle = 3.7° on the ground surface and 1.4° at the base of peat.					
Road Thickness = 1.0 m stone (assumed - measured <0.5 m)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.5	4.65	1.0 - 1.7	9.5	6.8
1.0 - 2.0	4.5	3.2	1.7 - 2.5	6.8	4.85
2.0 - 3.0	5.0	3.6	2.5 - 3.2	6.8	4.85
3.0 - 3.75	6.0	4.3	3.2 - 3.75	6.8	4.85

Cell T56					
Design Depth of Peat = 3.25 m (Actual range: 1.3 m - 3.43 m)					
Slope Angle = 4.0° on the ground surface and 4.2° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			***Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	9.5	6.8	1.0 - 1.7	11.5	8.2
1.0 - 2.0	7.5	5.35	1.7 - 2.5	9	6.4
2.0 - 3.0	10.0	7.15	2.5 - 3.25	10	7.15
3.0 - 3.75	10.0	7.15			

* Assume 20% increase in undrained shear strength under road in top 2.5 m - no test results

Cell T57					
Design Depth of Peat = 3.75 m (Actual range: 1.3 m - 3.43 m)					
Slope Angle = 1.7° on the ground surface and 1.9° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	8.0	5.7	1.0 - 1.7	9.5	6.8
1.0 - 2.0	5.25	3.75	1.7 - 2.5	6.3	4.5
2.0 - 3.0	4.25	3.0	2.5 - 3.2	5.1	3.65
3.0 - 3.75	7.0	5.0	3.2 - 3.75	7.0	5.0

Cell T59 (T59+100)					
Design Depth of Peat = 3.6 m (Actual range: 2.2 m - 3.6 m)					
Slope Angle = 0.5° on the ground surface and 0.0° at the base of peat.					
Road Thickness = 1.0 m stone (assumed - measured <0.5 m)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	5.5	3.9	1.0 - 1.7	5.5	3.9
1.0 - 2.0	4.5	3.2	1.7 - 2.4	4.5	3.2
2.0 - 3.0	5.4	3.9	2.4 - 3.1	5.4	3.9
3.0 - 3.6	6.8	4.9	3.1 - 3.6	6.8	4.9

Cell T60 (T60-25)					
Design Depth of Peat = 3.8 m (Actual range: 2.4 m - 3.0 m)					
Slope Angle = 0.5° on the ground surface and 1.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	7.7	5.5	1.0 - 1.7	7.7	5.5
1.0 - 2.0	6.9	4.9	1.7 - 2.4	6.9	4.9
2.0 - 3.0	7.2	5.1	2.4 - 3.1	7.2	5.1
3.0 - 3.8	11.3	8.1	3.1 - 3.8	11.3	8.1

Cell T61 (T61-50)					
Design Depth of Peat = 1.88 m (Actual range: 0.23 m - 3.34 m)					
Slope Angle = 0.5° on the ground surface and 1.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.7	4.8	1.0 - 1.4	6.7	4.8
1.0 - 1.88	6.6	4.7	1.4 - 1.9	6.6	4.7

Cell T62 (T62-125)					
Design Depth of Peat = 3.5 m (Actual range: 1.8 m - 3.65 m)					
Slope Angle = 3.0° on the ground surface and 4.8° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.6	4.7	1.0 - 1.7	6.6	4.7
1.0 - 2.0	5.4	3.9	1.7 - 2.4	5.4	3.9
2.0 - 3.0	5.6	4.0	2.4 - 3.1	5.6	4.0
3.0 - 3.5	6.1	4.4	3.1 - 3.5	6.1	4.4

Cell T62 (T62-75)					
Design Depth of Peat = 2.8 m (Actual range: 1.8 m - 3.65 m)					
Slope Angle = 5.5° on the ground surface and 4.5° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	7.2	5.1	1.0 - 1.7	7.2	5.1
1.0 - 2.0	5.7	4.0	1.7 - 2.4	5.7	4.0
2.0 - 2.8	4.7	3.3	2.4 - 2.8	4.7	3.3

Cell T63 (T63-25)					
Design Depth of Peat = 3.25 m (Actual range: 0.9 m - 3.6 m)					
Slope Angle = 3.5° on the ground surface and 4.0° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	6.8	4.9	1.0 - 1.7	6.8	4.9
1.0 - 2.0	7.0	5.0	1.7 - 2.4	7.0	5.0
2.0 - 3.0	9.7	6.9	2.4 - 3.2	9.7	6.9
3.0 - 3.25	9.7	6.9	3.2 - 3.3	9.7	6.9

Cell T64 (64+100)					
Design Depth of Peat = 3.2 m (Actual range: 1.7 m - 3.2 m)					
Slope Angle = 1.5° on the ground surface and 0.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			**Under Road**		
Depth (m)	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**	**Depth (m)**	**c_{uk} (kN/m^2)**	**c_{ud} (kN/m^2)**
0.0 - 1.0	7.5	5.4	1.0 - 1.7	7.5	5.4
1.0 - 2.0	6.1	4.4	1.7 - 2.4	6.1	4.4
2.0 - 3.0	6.4	4.6	2.4 - 3.1	6.4	4.6
3.0 - 3.2	6.2	4.4	3.1 - 3.2	6.2	4.4

Derrybrien Windfarm - Floating Road Analysis: Cell T47NR (New Road alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

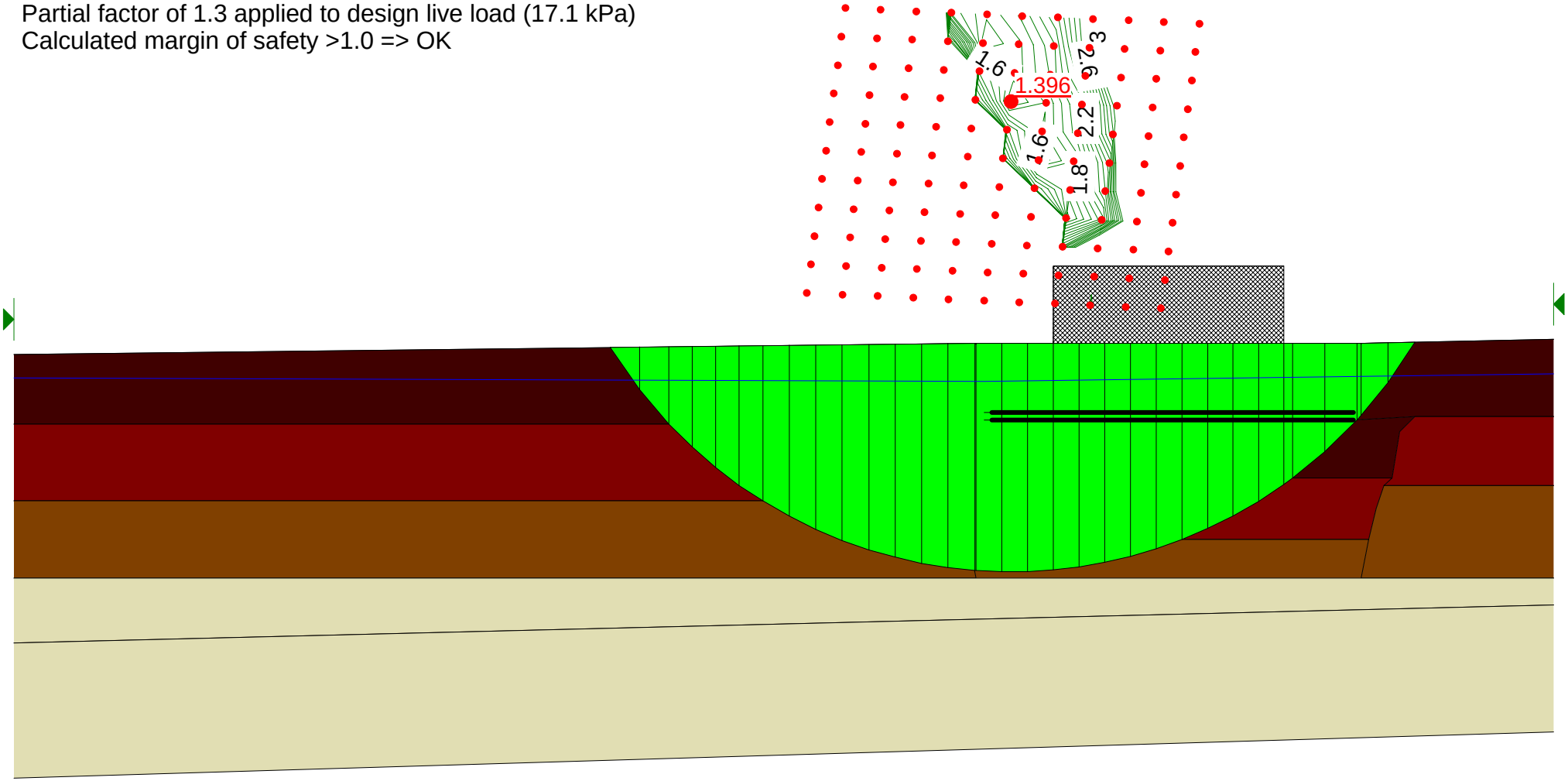
Depth of peat = 3.1m on downslope side of road
Slope angle = 0.8 Deg at surface, 0.0 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to design live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T47NR (New Road)

T47+0



Derrybrien Windfarm - Floating Road Analysis: Cell T48NR (New Road alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

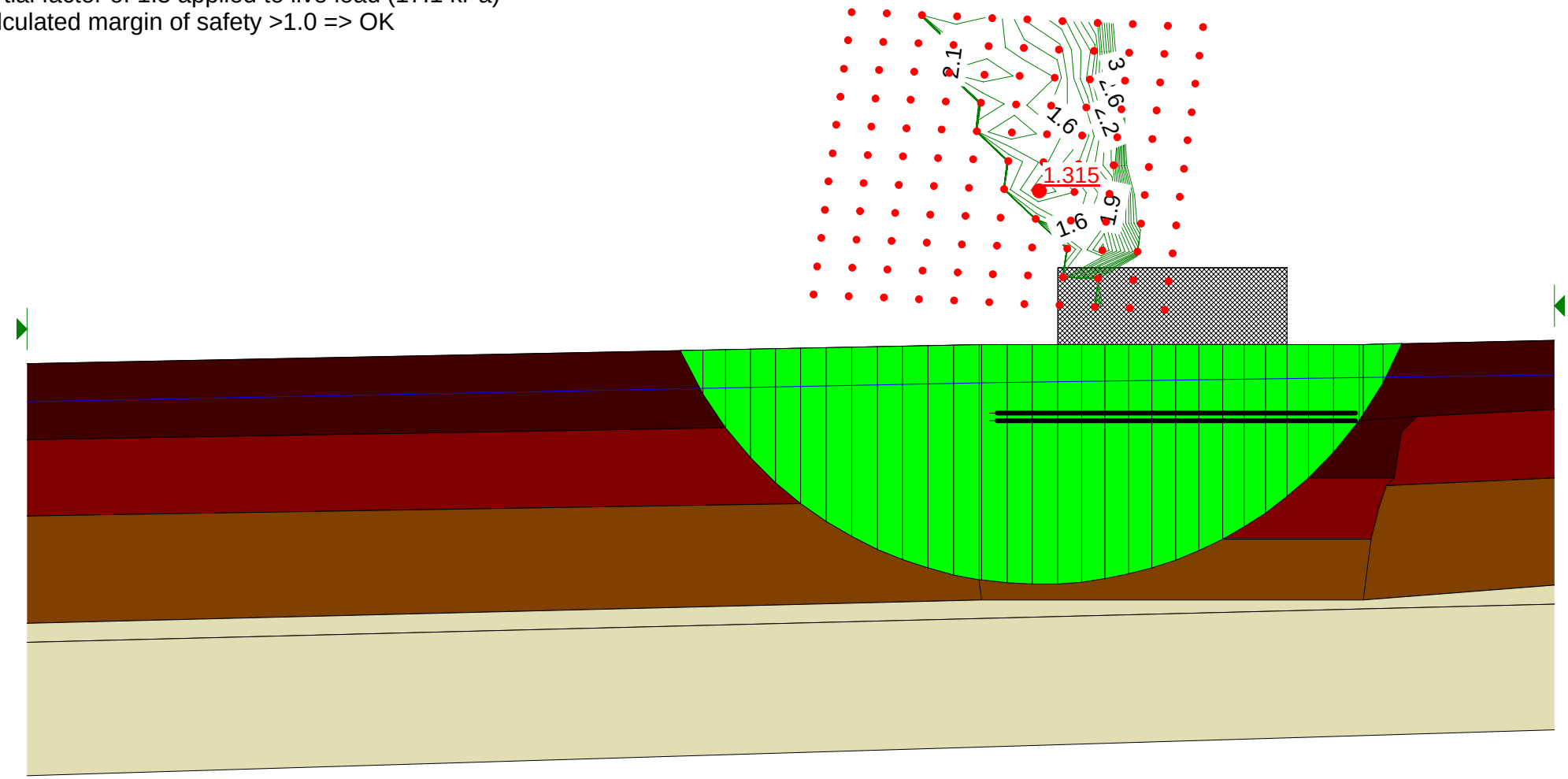
Depth of peat = 3.34 on downslope side of road
Slope angle = 1 Deg at surface, 1.5 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T48NR (New Road)

T48+25



Derrybrien Windfarm - Floating Road Analysis: Cell T49NR (New Road alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

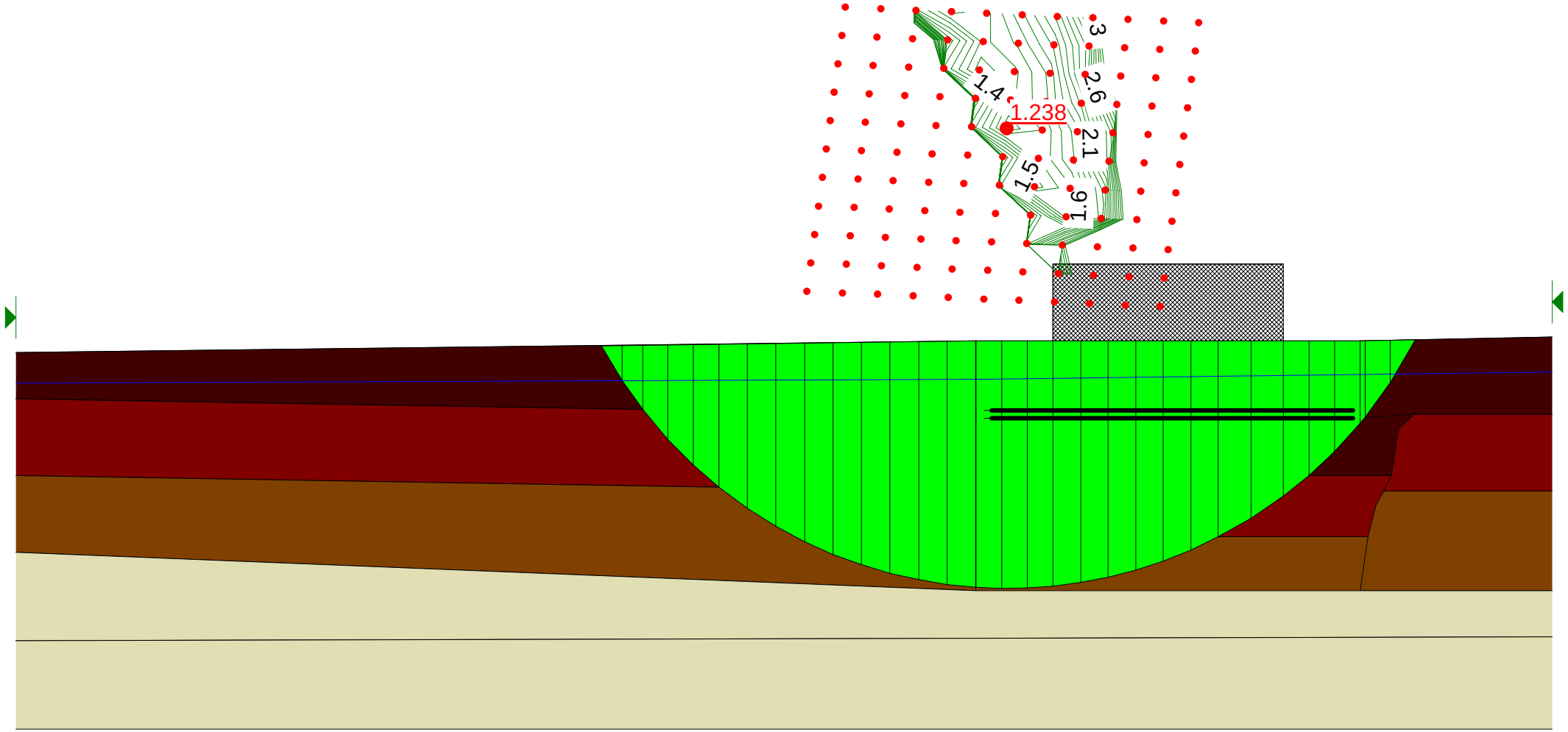
Depth of peat = 3.3 m on downslope side of road
Slope angle = 1 Deg at surface, 2.2 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T49NR (New Road)

T49-25



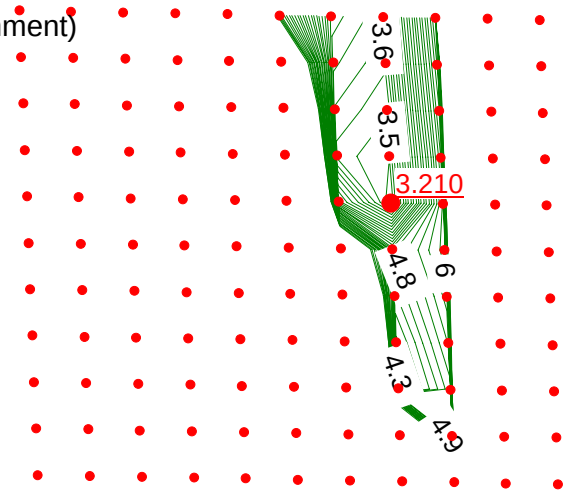
Derrybrien Windfarm - Floating Road Analysis: Cell T50NR (New Road Alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 laer of Tensar SS30 Geogrid

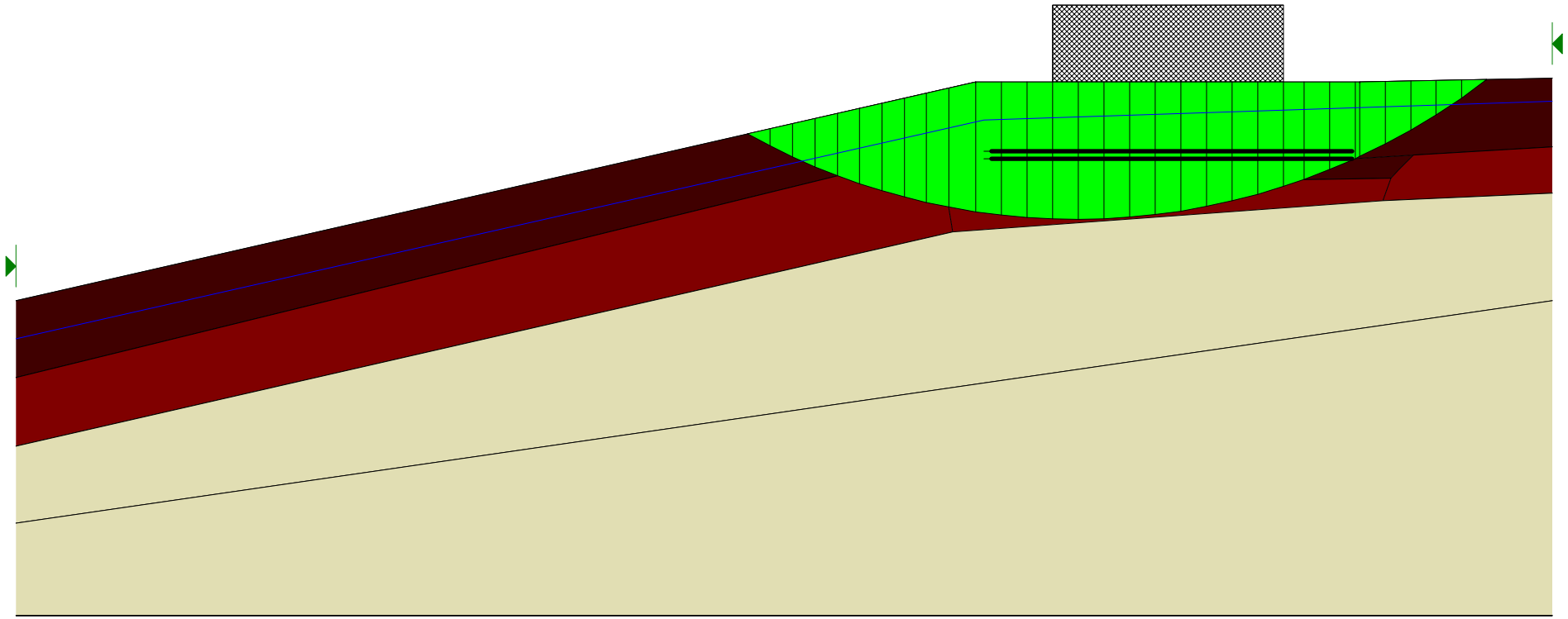
Depth of peat = 1.75 m on downslope side of road
Slope angle 12.5 Deg at surface, 12.8 Deg at base of peat

Partial factor of safety of 1.4 applied to undrained shear strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



T50+75



Derrybrien Windfarm - Floating Road Analysis: Cell T50NR (New Road Alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

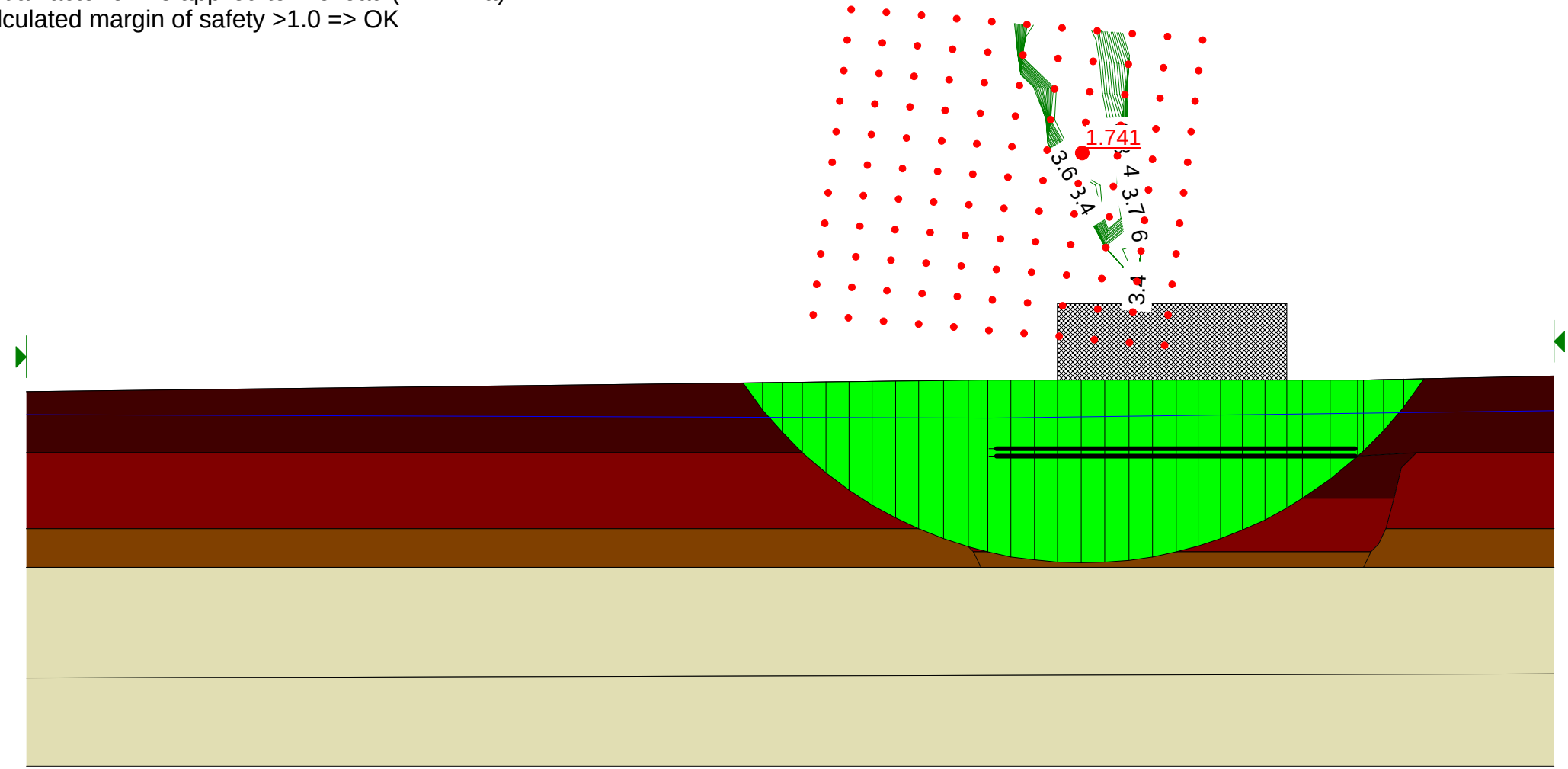
Depth of peat = 2.5 m on downslope side of road
Slope angle = 1 Deg at surface, 0.2 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T50NR (New Road)

T50-70



Derryrien Windfarm - Floating Road Analysis: Cell T51

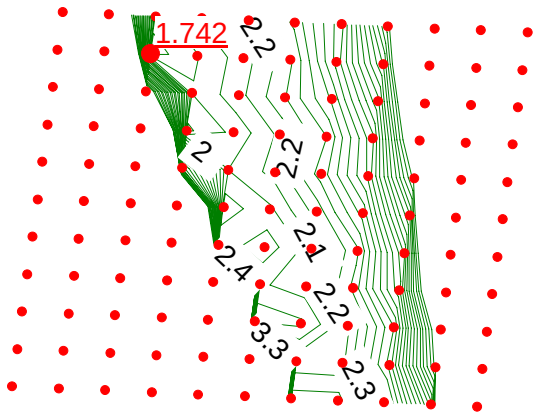
5.0 m wide road 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

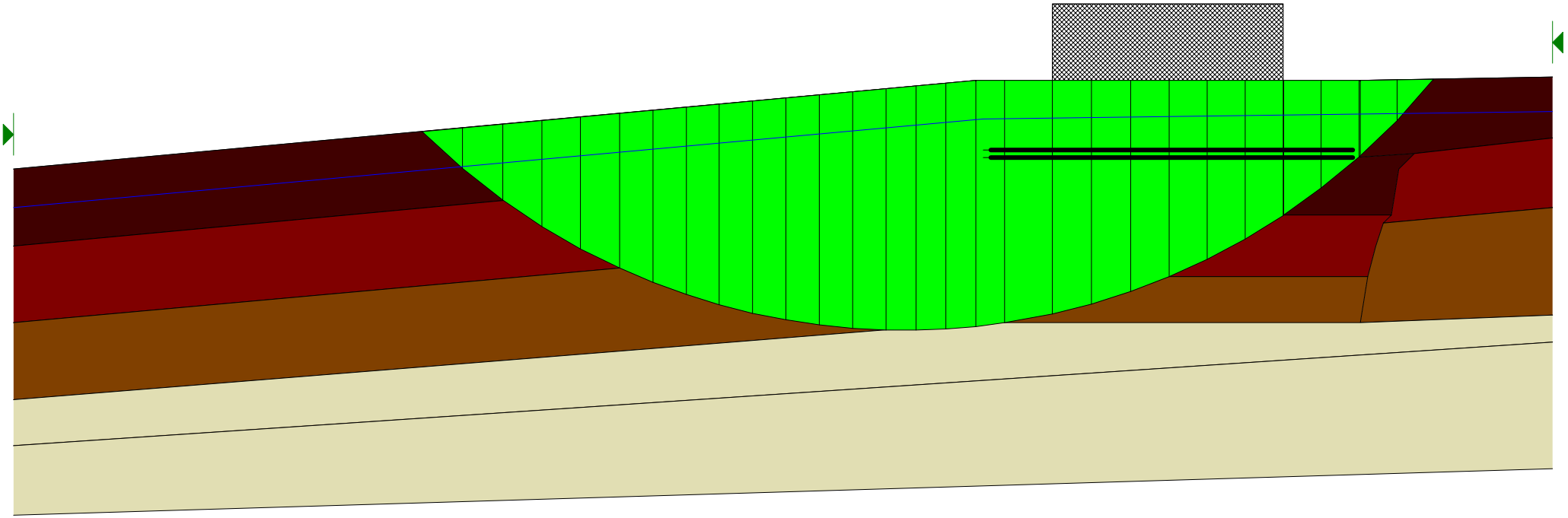
T51+75

Depth of peat = 3.08 meters on downslope side of road
Slope angle = 5.2 Deg at surface, 4.7 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





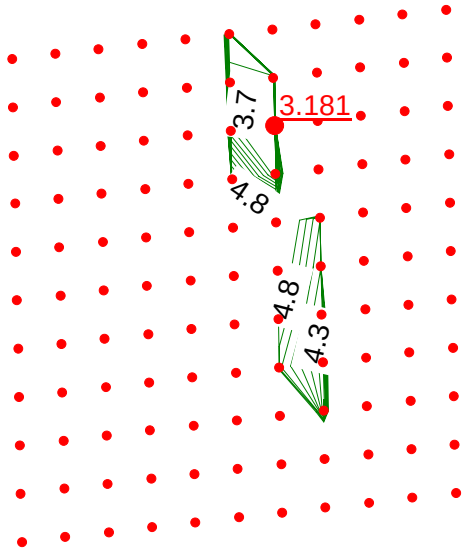
Derrybrien Windfarm - Floating Road Analysis: Cell T51

5.0 m wide road - 1.0 m thick
Basal reinforement with trees and 1 layer of Tensar SS30 Geogrid

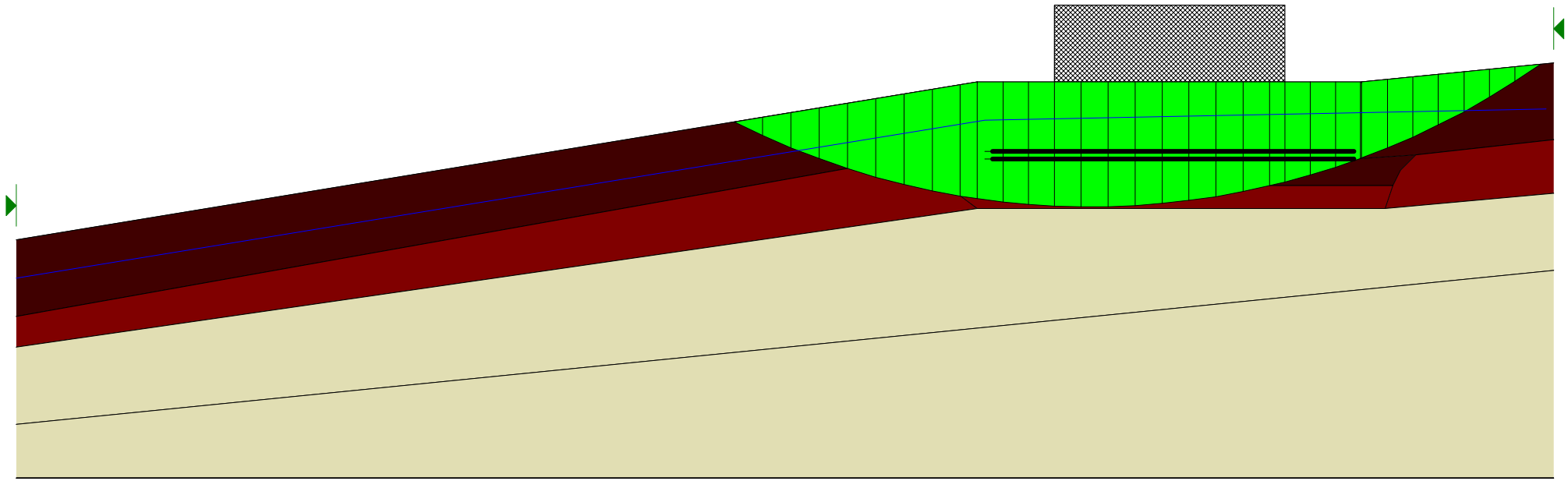
Depth of peat = 1.66 m on downslope side of road
Slope angle = 9.5 Deg at surface, 9.2 Deg at base of peat

Partial factor of safety of 1.4 applied to undrained shear strength under road
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 => OK



T51-100



Derrybrien Windfarm - Floating Road analysis: Cell T52

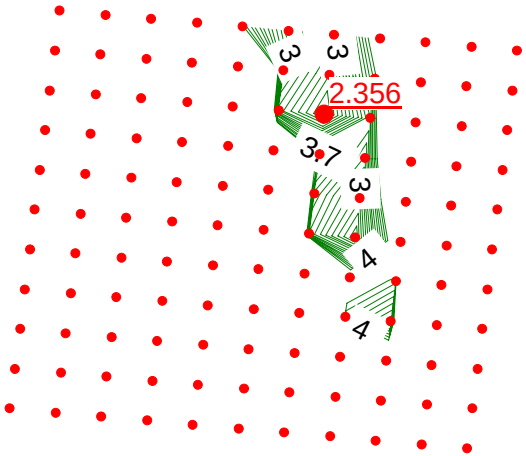
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

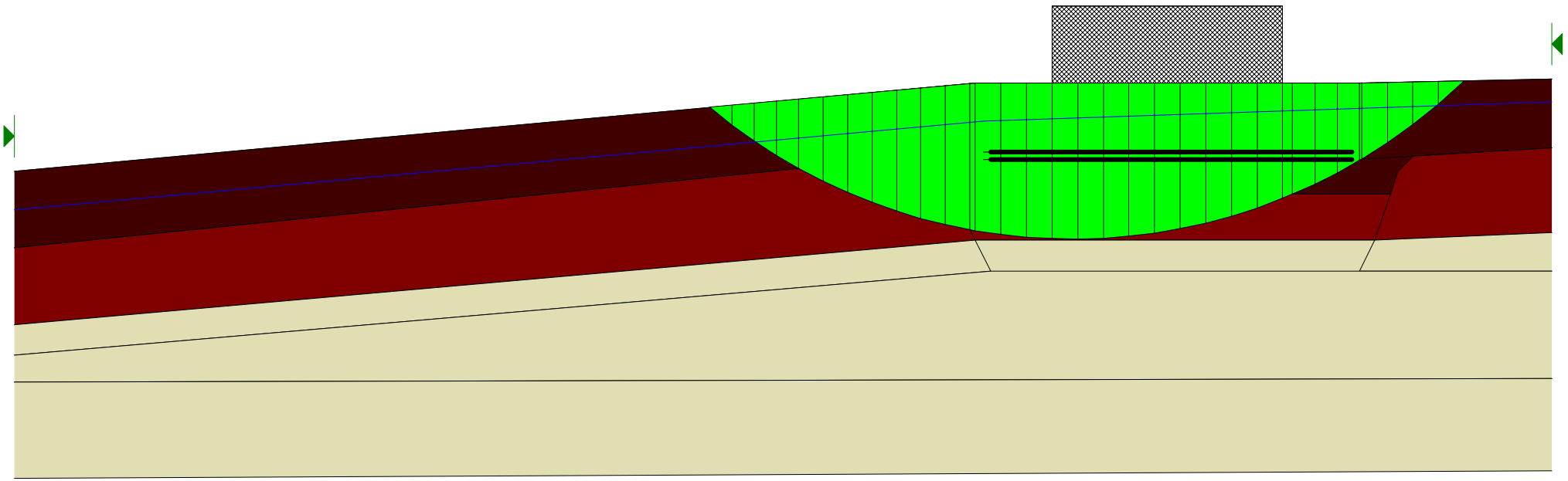
T52-25/+25

Depth of peat = 2.0 m on downslope side of road
Slope angle = 5.7 Deg at surface, 5.7 Deg at base of peat

Partial factor of 1.4 applied toundrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 = OK





Derrybrien Windfarm - Floating Road Analysis: Cell T53NR (New Road alignment)

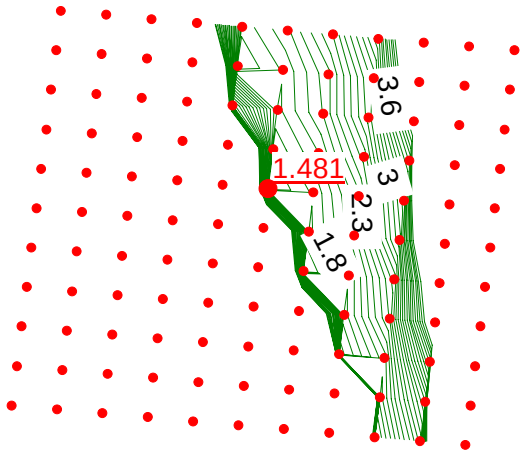
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

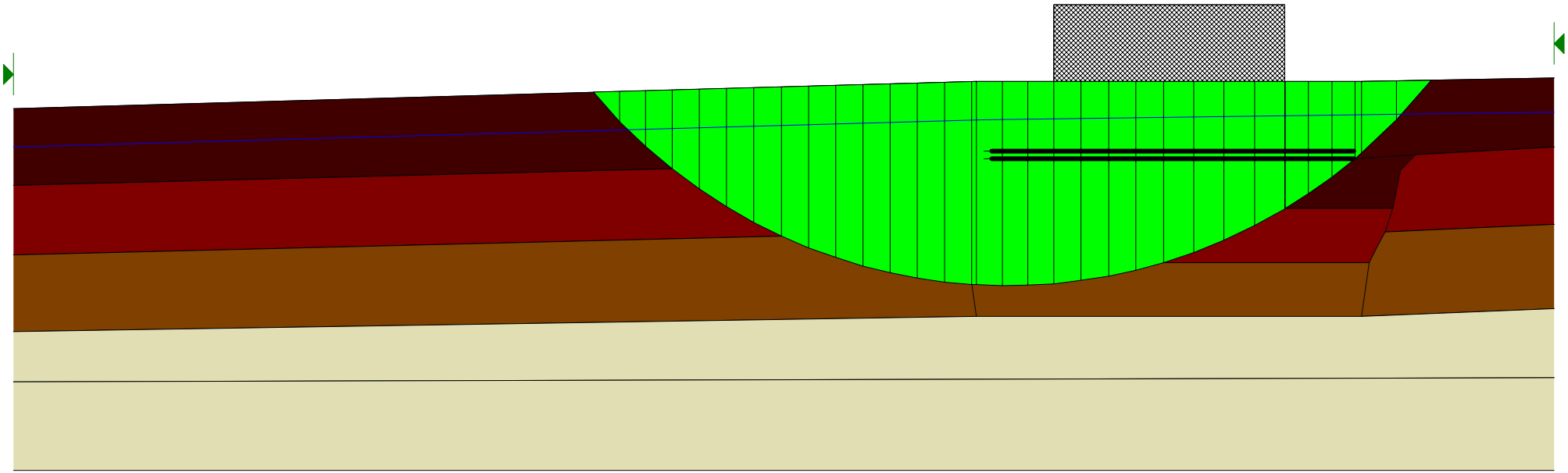
Depth of peat = 3.0 m on downslope side of road
Slope angle = 1.5 Deg at surface, 1.0 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to design live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T53NR (New Road)
T53+0





Derrybrien Windfarm - Floating Road Analysis: Cell T53NR (New Road alignment)

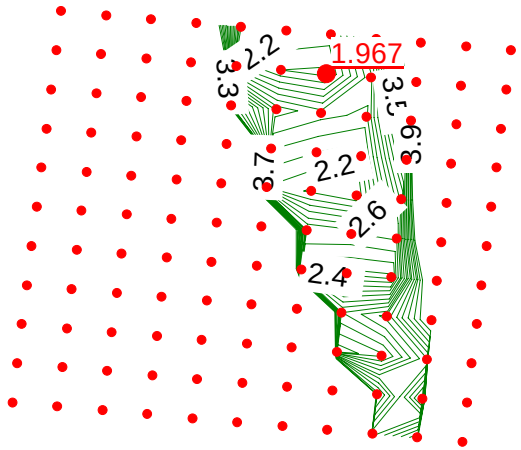
T53NR (New Road)
T53+100

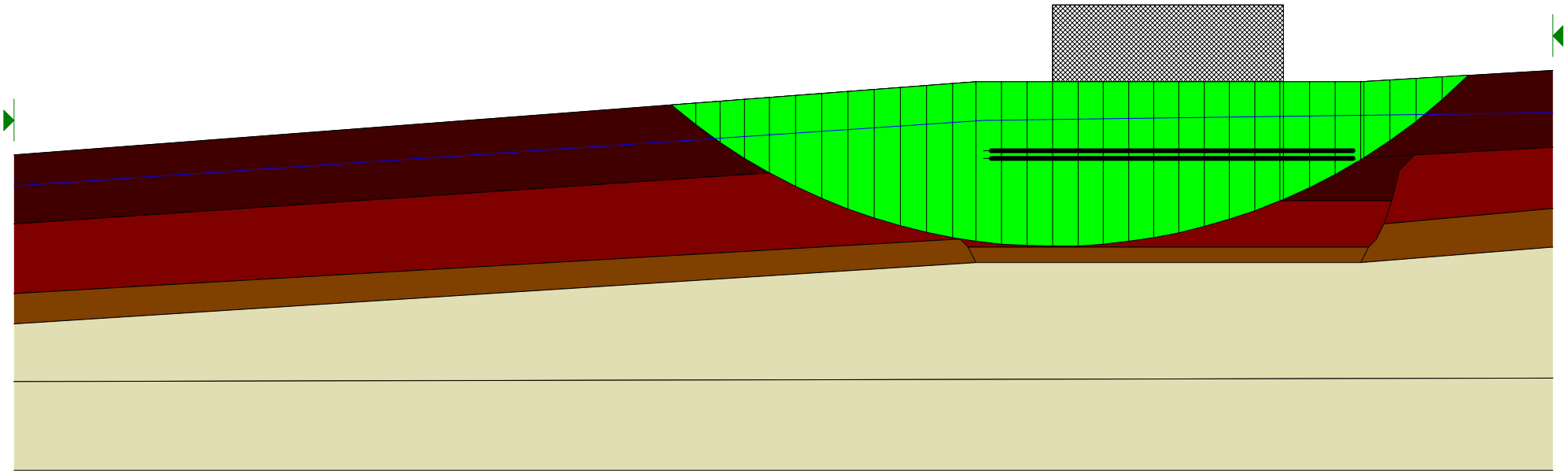
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.35 m on downslope side of road
Slope angle = 4.5 Deg at surface, 3.7 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to design live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





Derrybrien Windfarm - Floating Road Analysis: Cell T54NR (New Road alignment)

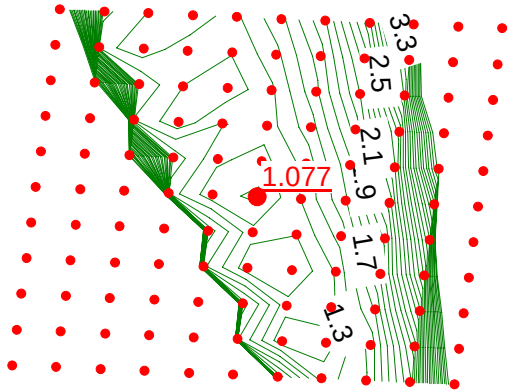
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

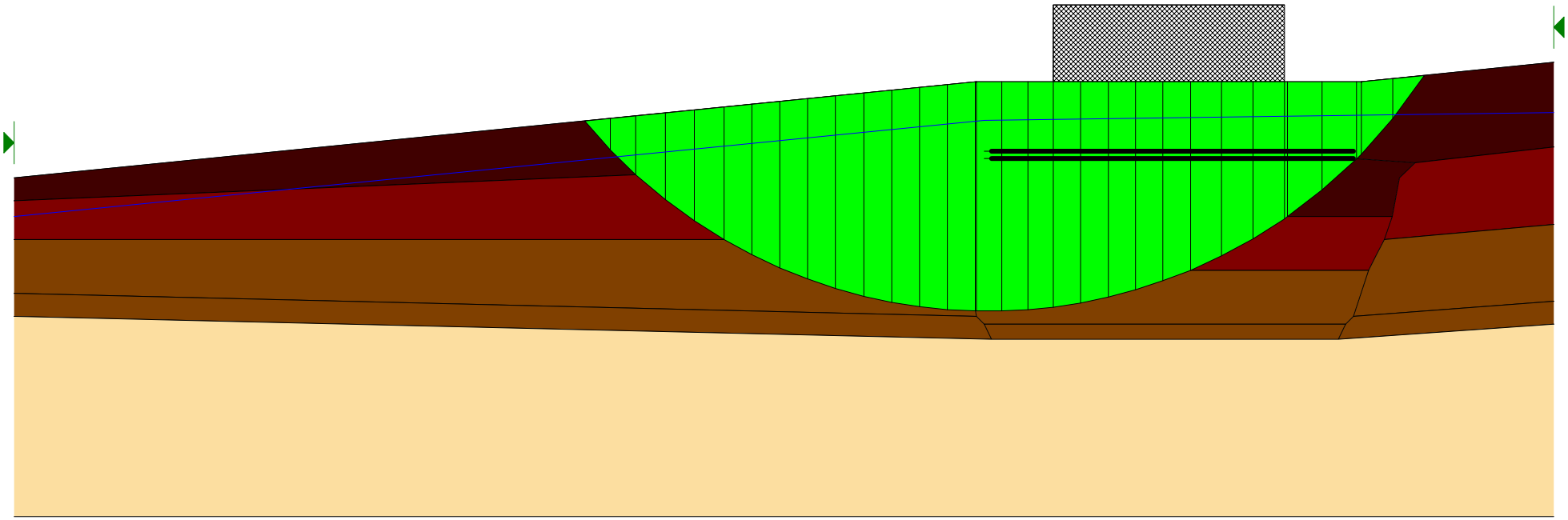
Depth of peat = 3.3 m on downslope side of road
Slope angle = 1.5 Deg at surface, 0.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to design live load (17.1 kPa)
Calculated margin of safety>1.0 => OK

T54NR (New Road)
T54+75





Derrybrien Windfarm - Floating Road Analysis: Cell T55

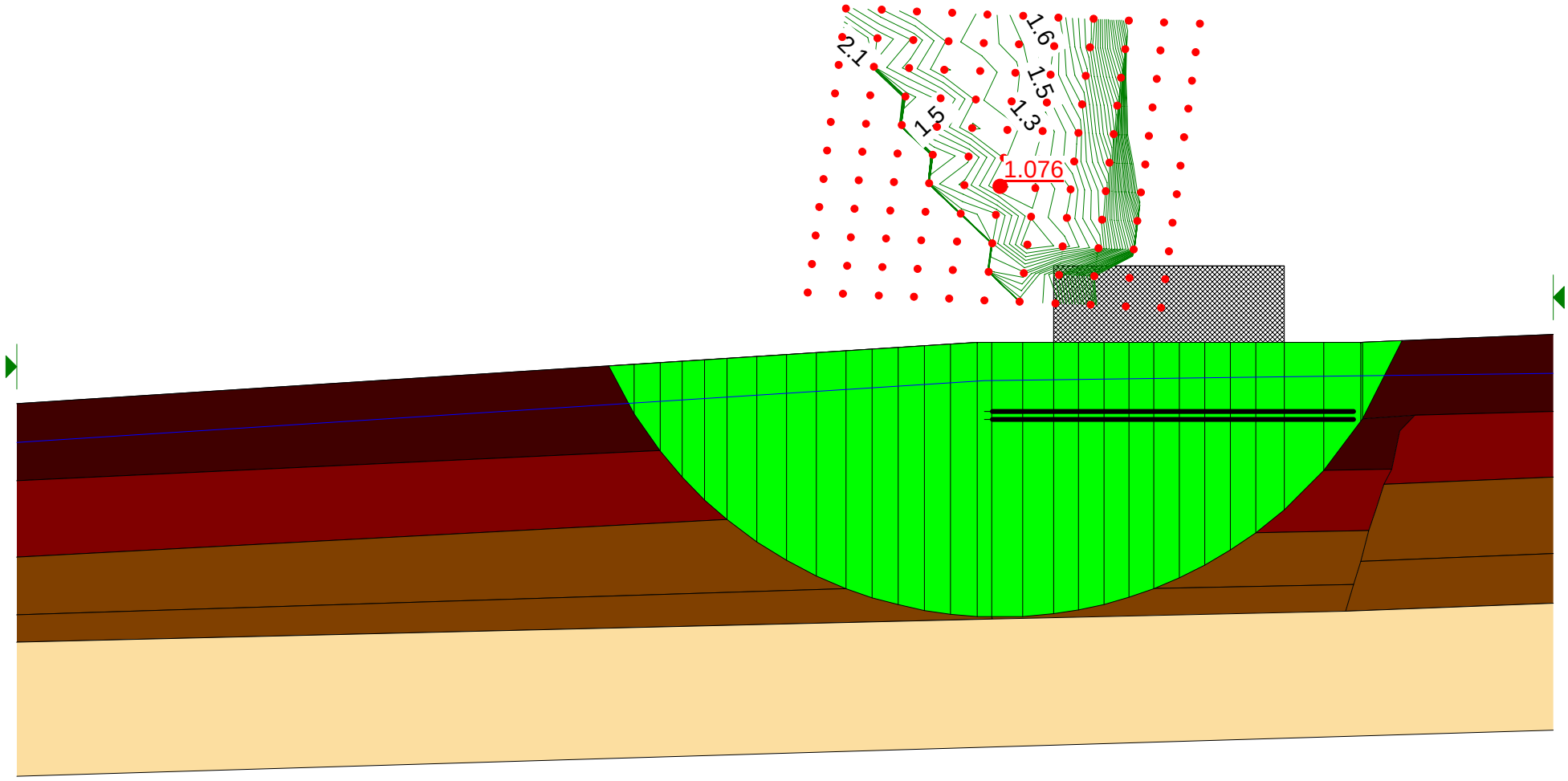
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.75 m on downslope side of road
Slope angle = 3.7 Deg at surface, 1.4 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat

T55

Partial factor of 1.3 applied to live load (17.1kPa)
Calculated margin of safety >1.0 => OK



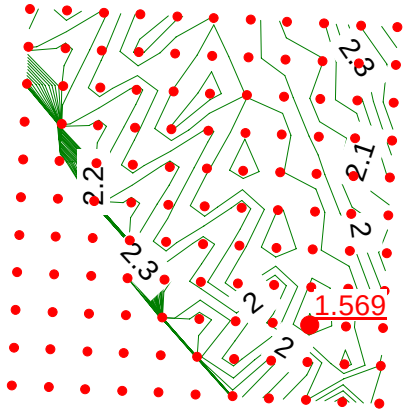
Derrybrien Windfarm - Floating Road Analysis: Cell T56

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

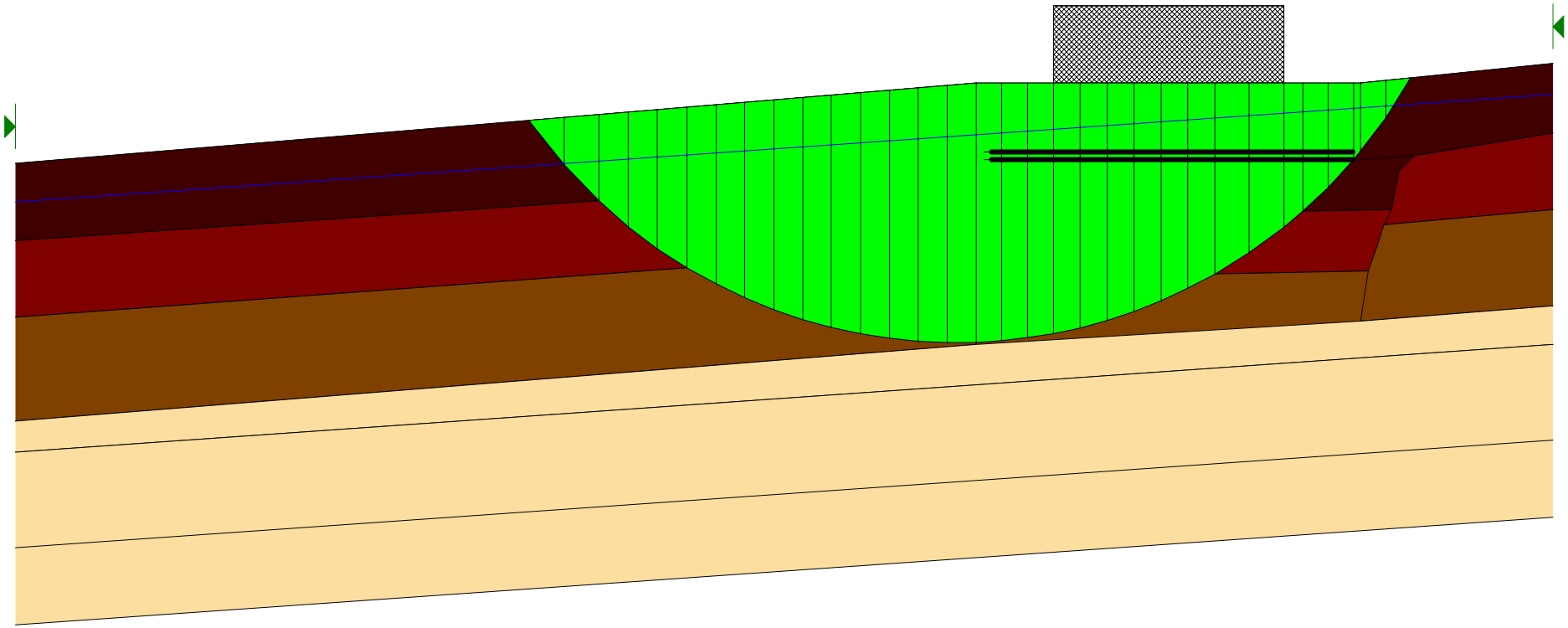
Depth of peat = 3.25 m on downslope side of road
Slope angle = 4.0 Deg at suface, 4.2 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 =>OK



T56



Derrybrien Windfarm - Floating Road Analysis: Cell T57

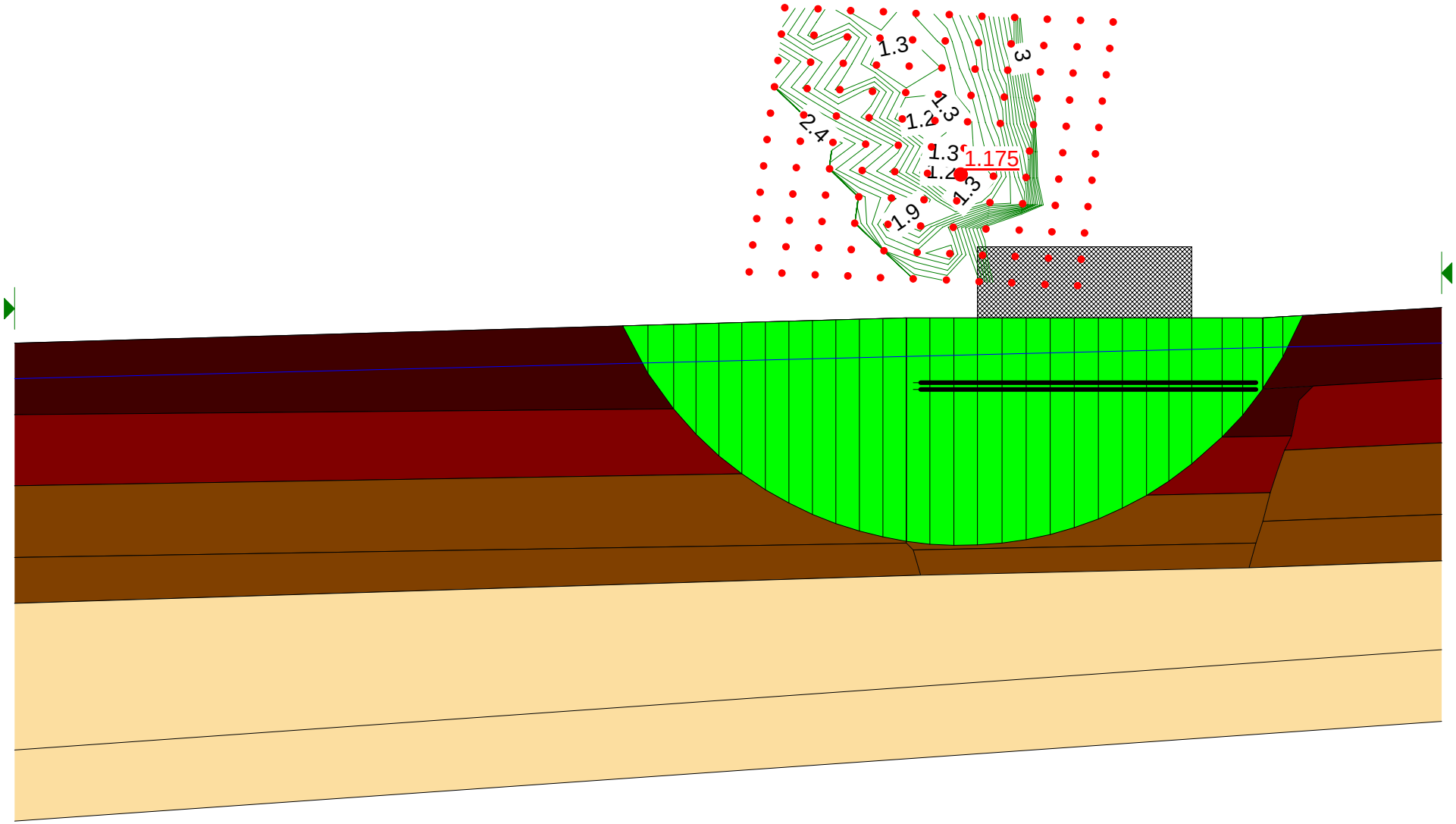
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

T57

Depth of peat = 3.75 m on downslope side of road
Slope angle = 1.7 Deg at surface, 1.9 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T59

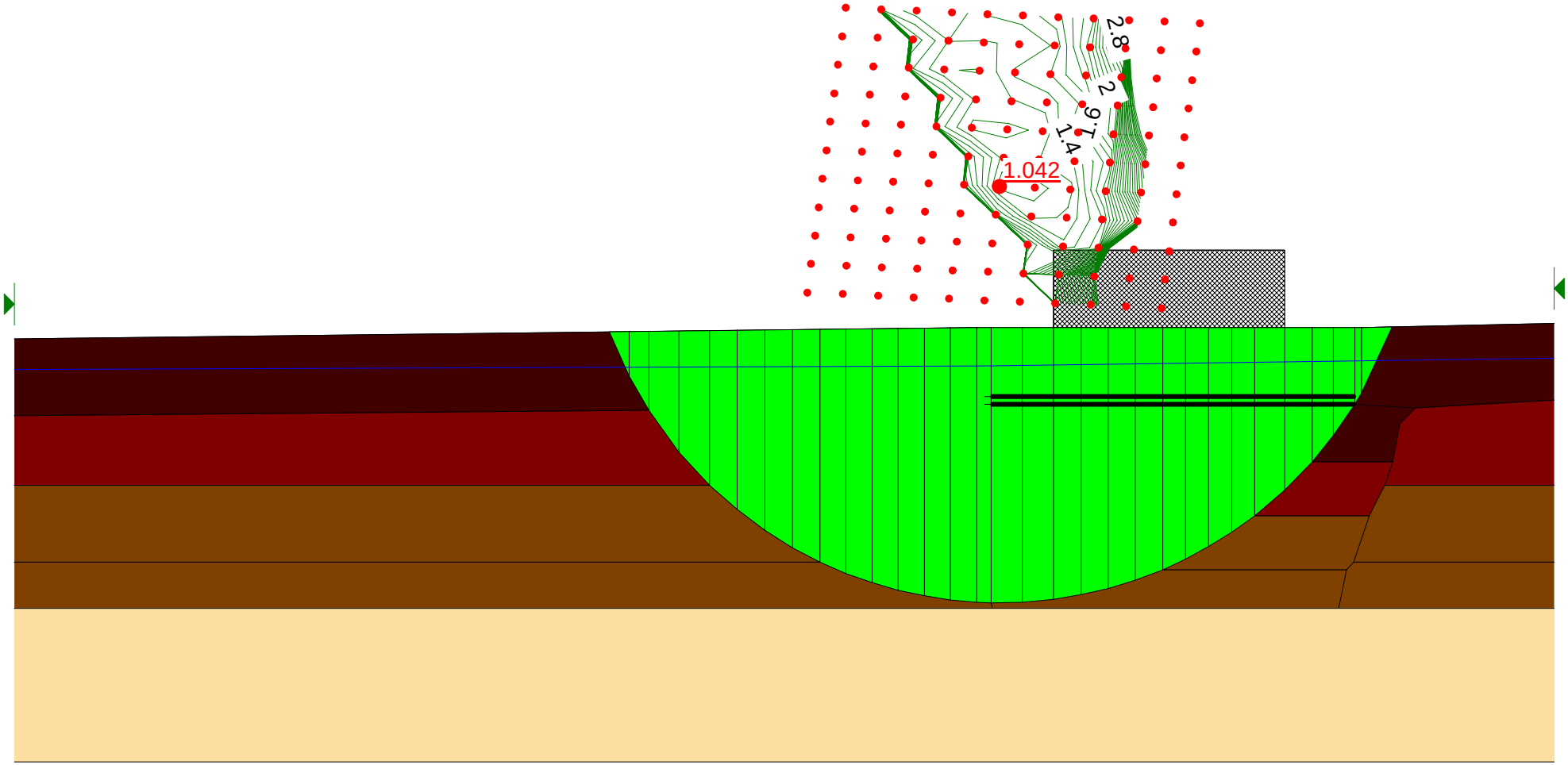
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.6 m on downslope side of road
Slope angle = 0.5 Deg at surface, 0 Deg at base of peat

T59+100

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T60

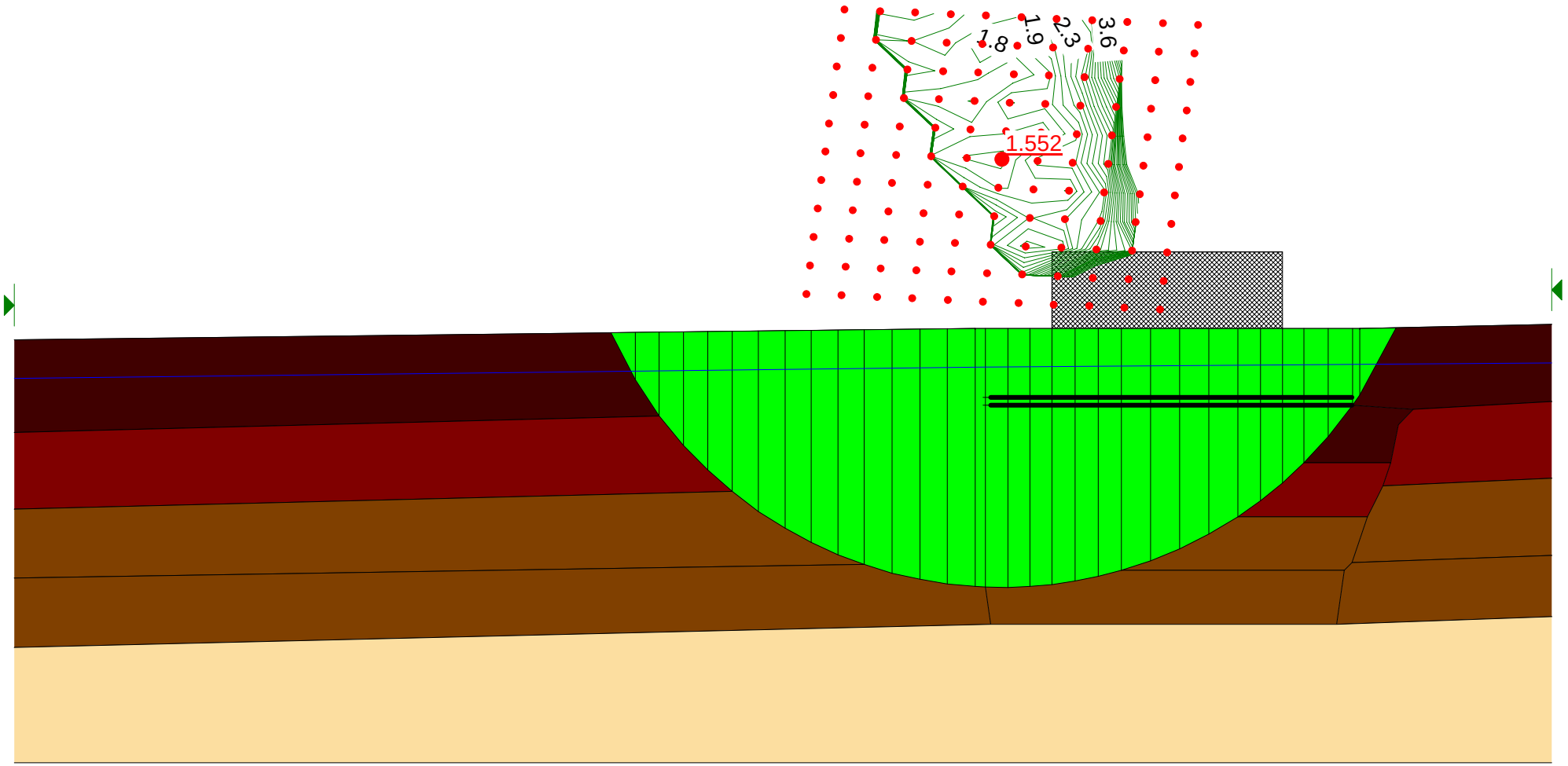
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.8 m on downslope side of road
Slope angle = 0.5 Deg at surface, 1.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T60-25



Derrybrien Windfarm - Floating Road Analysis: Cell T61

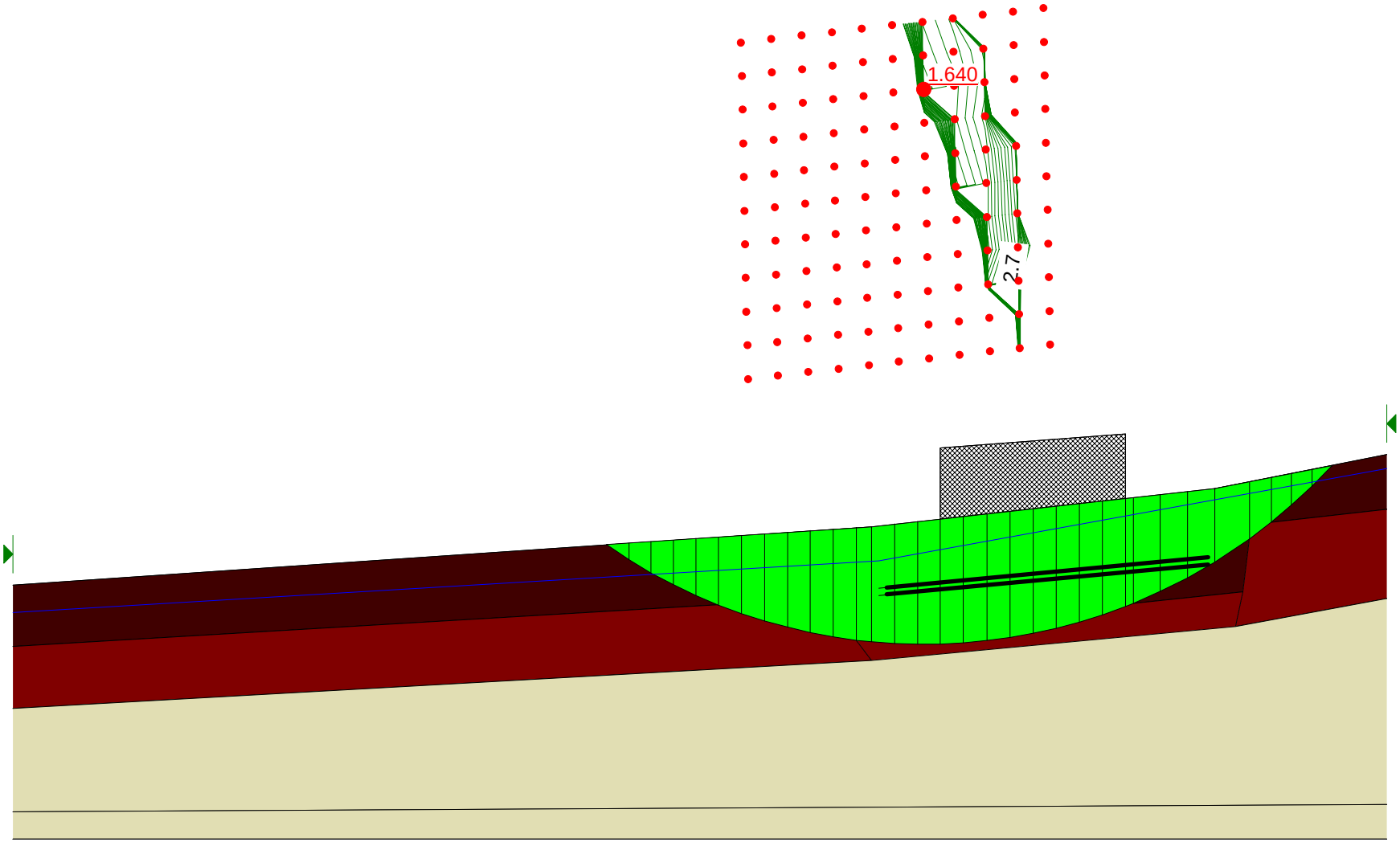
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 1.9 m on downslope side of road
Slope angle = 3.5 Deg at surface, 3.1 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 => OK

T61-50



Derrybrien Windfarm - Floating Road Analysis: Cell T62

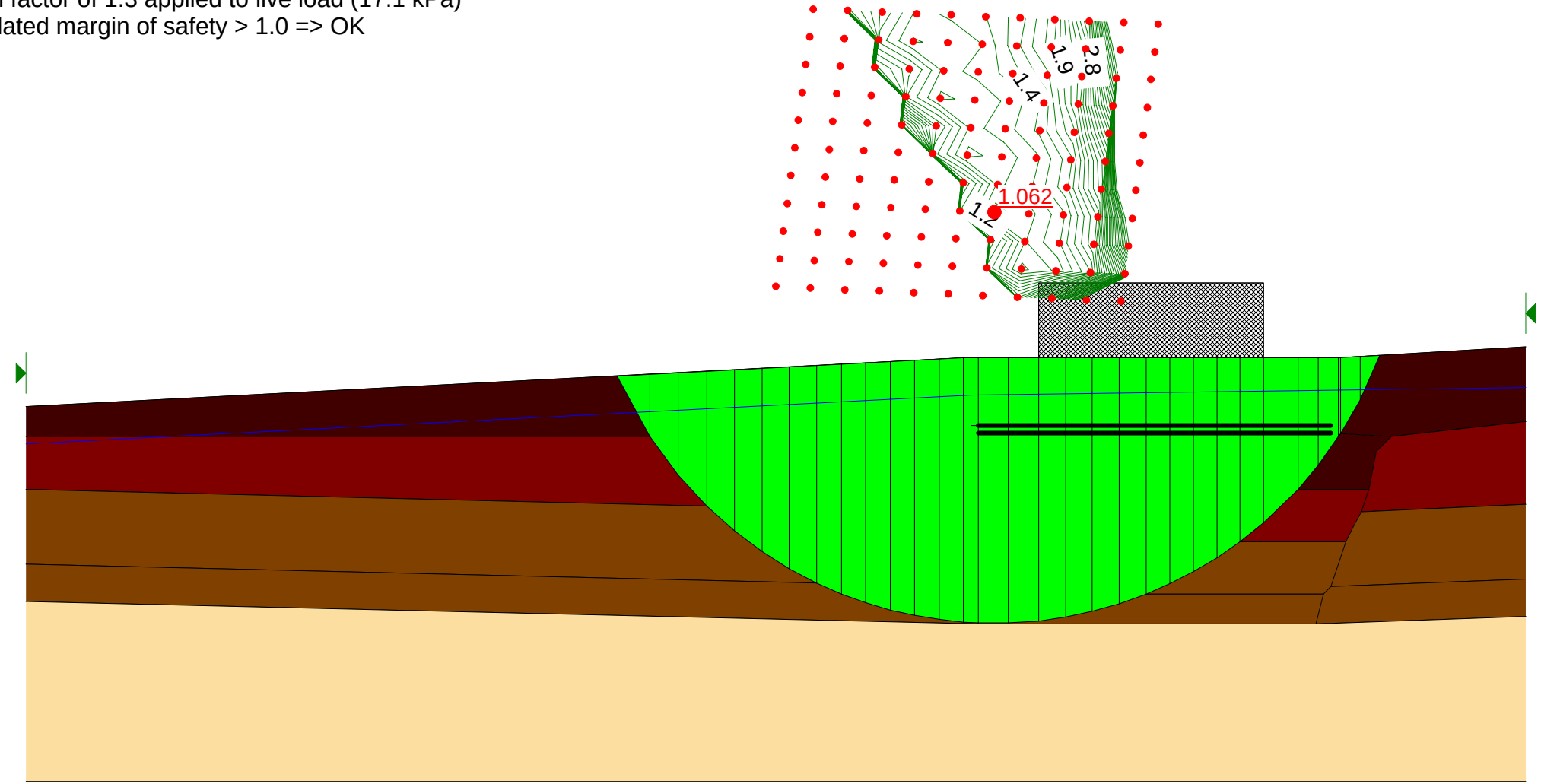
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

T62-125

Depth of peat = 3.5 m on downslope side of road
Slope angle = 3.0 Deg at surface, -1.3 Deg at base of peat (backslope)

Partial factor of 1.4 applied to undrained shear strength of peat
No allowane taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 => OK



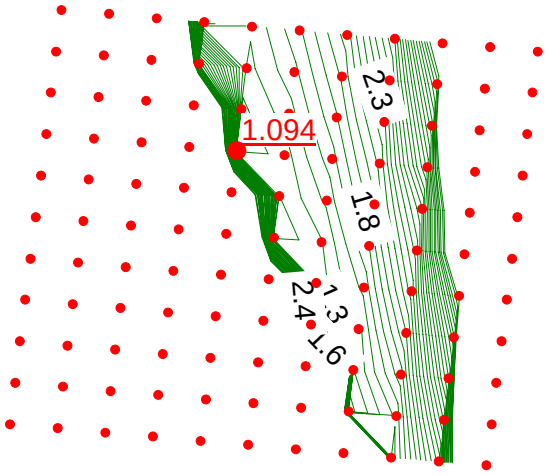
Derrybrien windfarm - Floating Road Analysis: Cell T62

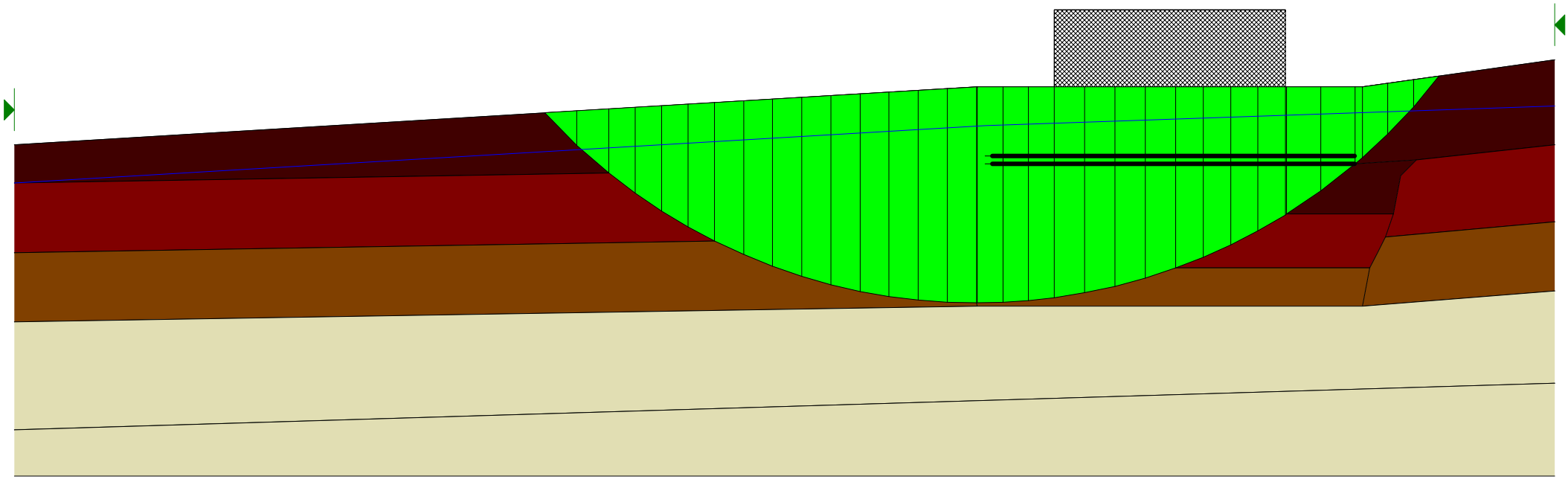
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.8 m on downslope side of road
Slope angle 3.5 Deg at surface, 0.8 deg at base of peat

Partial factor of 1.3 applied to design live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T62-75





Derrybrien Windfarm - Floating Road Analysis: Cell T63

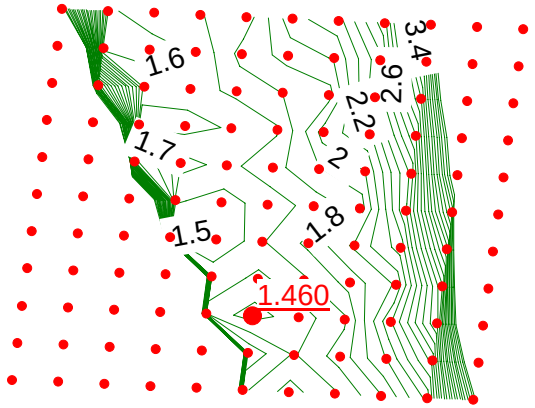
T63-25

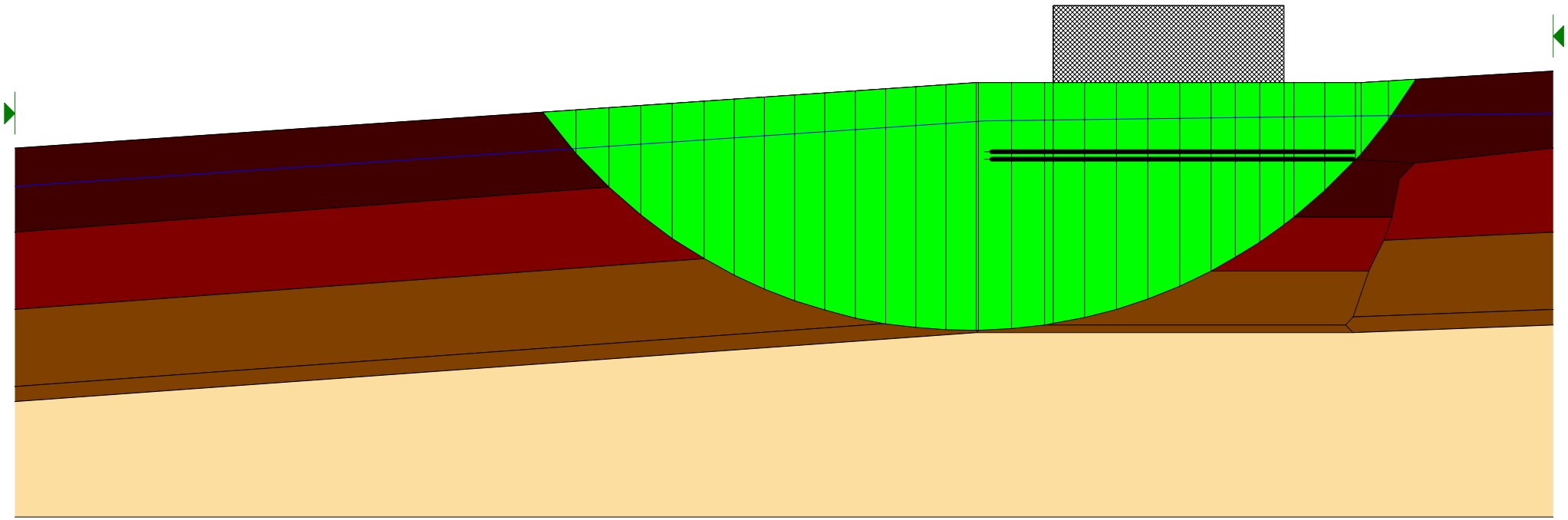
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.2 m on downslope side of road
Slope angle = 3.5 Deg at surface, 4.0 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





Derrybrien windfarm - Floating Road Analysis: Cell T64

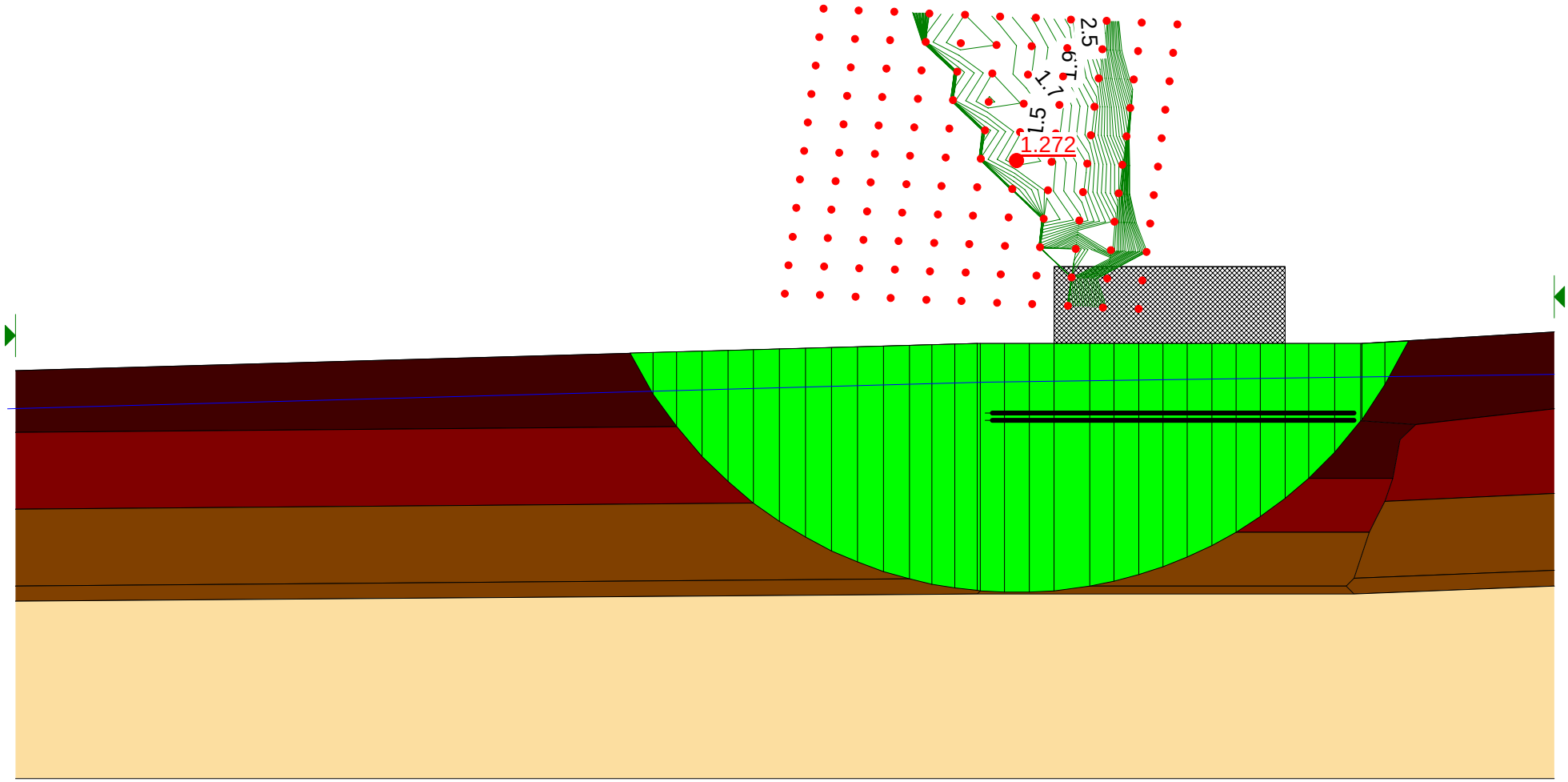
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.2 m on downslope side of road
Slope angle = 1.5 Deg at surface, 0.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

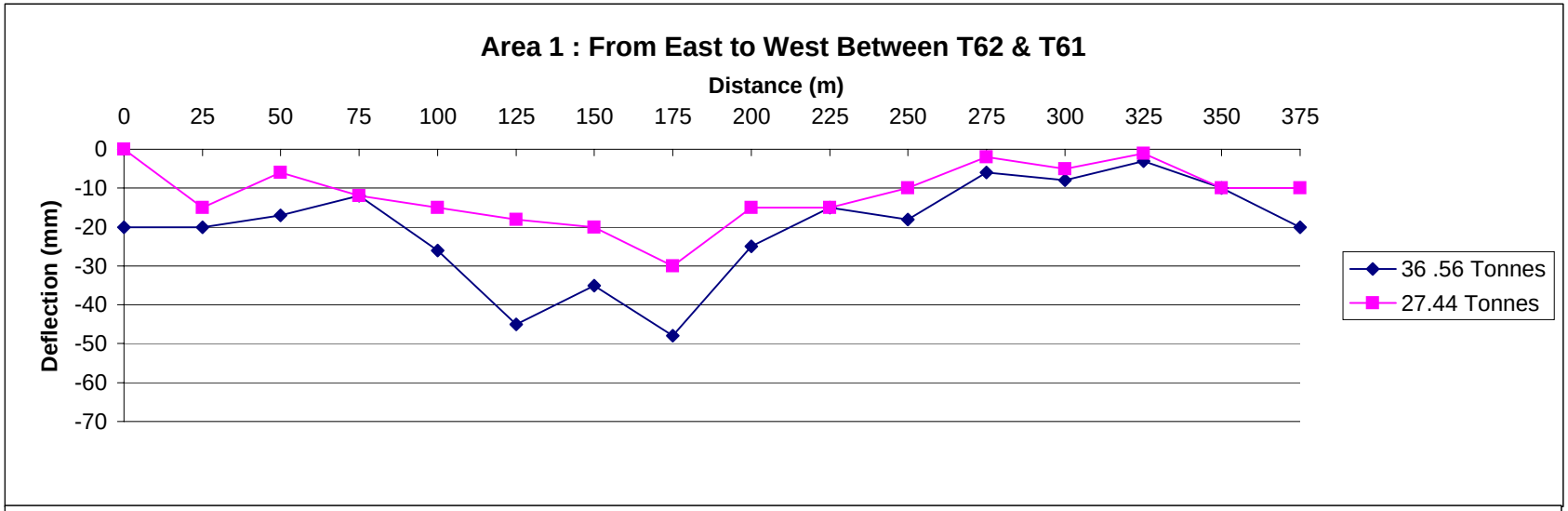
Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

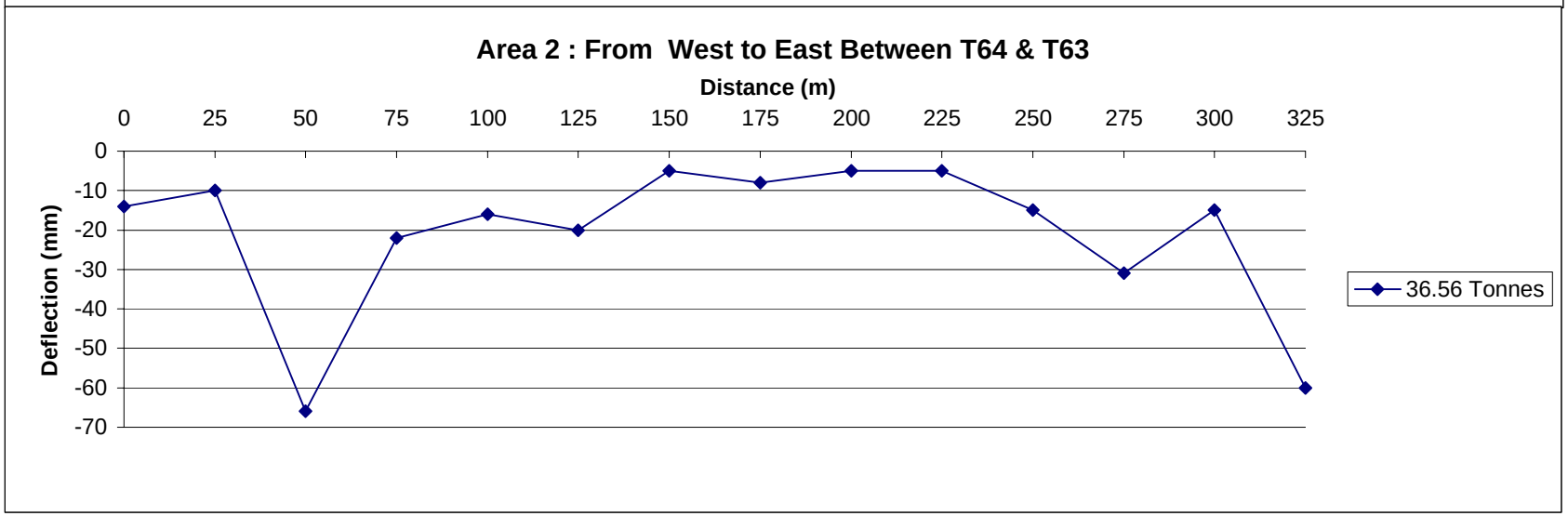
T64+100



Appendix D

Road Deflection Measurements from Field Load Tests on Floating Roads


Area 1 : From East to West Between T62 & T61
Distance (m)
0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375
Deflection (mm)
0 -10 -20 -30 -40 -50 -60 -70
36 .56 Tonnes
27.44 Tonnes


Area 2 : From West to East Between T64 & T63
Distance (m)
0 25 50 75 100 125 150 175 200 225 250 275 300 325
Deflection (mm)
0 -10 -20 -30 -40 -50 -60 -70
36.56 Tonnes

Area 3 : From West - East Between T56 & T57
Distance (m)
0
25
50
75
100
125
150
175
200
225
250
275
300
325
Deflection (mm)
0
-10
-20
-30
-40
-50
-60
-70
36.56 Tonnes
Area 4 : From South - North Between T59 & T53
Distance (m)
0
25
50
75
100
125
Deflection (mm)
0
-10
-20
-30
-40
-50
-60
-70
36.56 Tonnes
27.44 Tonnes

Area 5 : From East - West Between T51 & T50
Distance (m)
0
25
50
75
100
125
Deflection (mm)
0
-10
-20
-30
-40
-50
-60
-70
36.56 Tonnes
Area 6 : Road From South to North Between T25 & T26
Distance (m)
0
25
50
75
100
125
150
175
Deflection (mm)
0
-10
-20
-30
-40
-50
-60
-70
36.56 Tonnes

Appendix E

Results of Slope Stability Analyses for Proposed Peat Repository Sites

T50R (2 kPa)

Peat Repository Site : T50R
Sliding Stability Analysis with 0.5 m thick layer of very weak peat (cu = 2kPa) at Base)

Size of Repository Site = 25 x 25 m
Length of loaded area parallel to resultant slope direction = 35.4 m

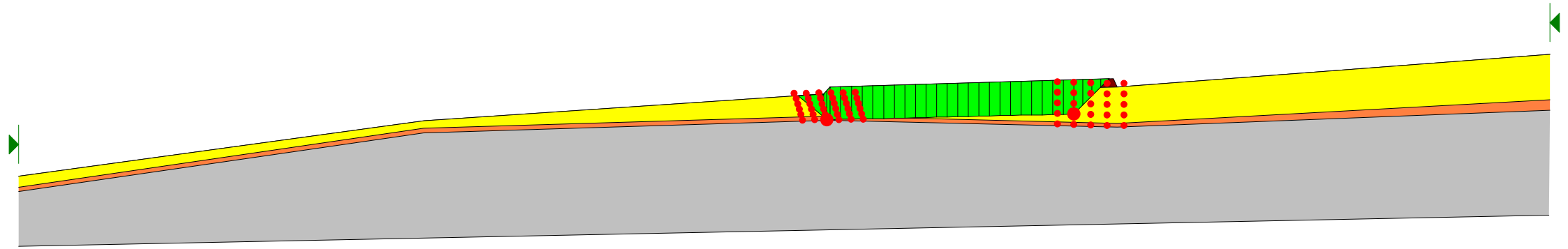
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	2.4 - 5.0 m	1.4 Deg	2.7 Deg
0 - 50 m Downslope	0.70 - 2.4 m	3.8 Deg	1.1 Deg
50 - 100 m Downslope	0.70 - 1.7 m	7.7 Deg	8.9 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

1.552

Design undrained shear strength of peat = 2.9 kPa
(Characteristic Strength = 4.1 kPa)

Calculated margin of safety > 1.0 => OK



Peat Repository Site : T50R
Sliding Stability Analysis

T50R

Size of Repository Site = 25 x 25 m
Length of loaded area parallel to resultant slope direction = 35.4 m

	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	2.4 - 5.0 m	1.4 Deg	-1.5 Deg (Backslope)
0 - 50 m Downslope	0.70 - 2.4 m	3.8 Deg	1.1 Deg
50 - 100 m Downslope	0.70 - 1.7 m	7.7 Deg	8.9 Deg

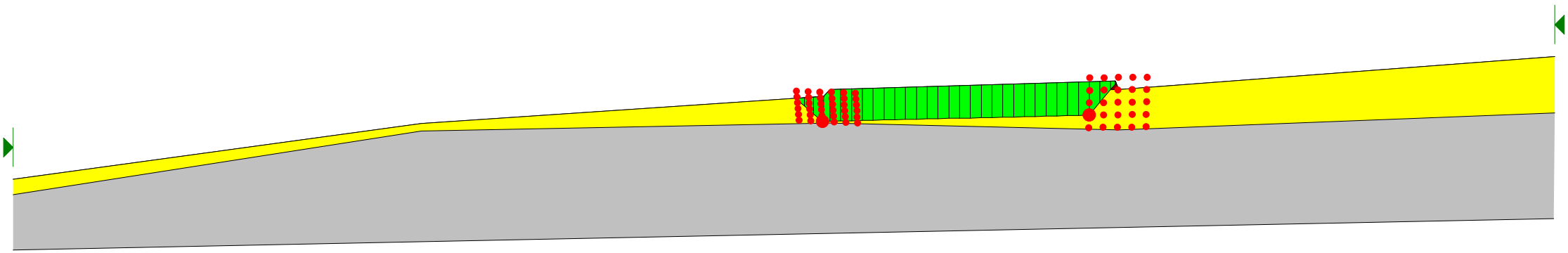
Backslope conservatively reduced to -1.5 Deg to model depth of peat recorded in probes.

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

1.616

Design undrained shear strength of peat = 2.9 kPa
(Characteristic Strength = 4.1 kPa)

Calculated margin of safety > 1.0 => OK



T51R (2 kPa)

Peat Repository Site : T51R
Sliding Stability Analysis with 0.5 m thick layer of very weak peat (cu = 2kPa) at Base

Size of Repository Site = 40 x 23 m
Length of loaded area parallel to resultant slope direction = 46.0 m

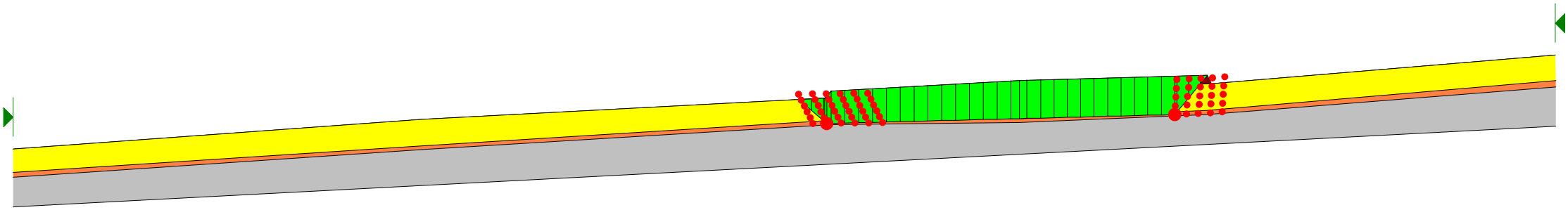
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	3.8 - 4.2 m	3.1 - 1.5 Deg	0.6 - 2.6 Deg
0 - 50 m Downslope	3.2 - 3.7 m	3.0 Deg	3.6 Deg
50 - 100 m Downslope	3.5 - 3.7 m	4.1 Deg	3.9 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 3.3 kPa
(Characteristic Strength = 4.6 kPa)

1.063

Calculated margin of safety > 1.0 => OK



Peat Repository Site : T51R
Sliding Stability Analysis

T51R

Size of Repository Site = 40 x 23 m
Length of loaded area parallel to resultant slope direction = 46.0 m

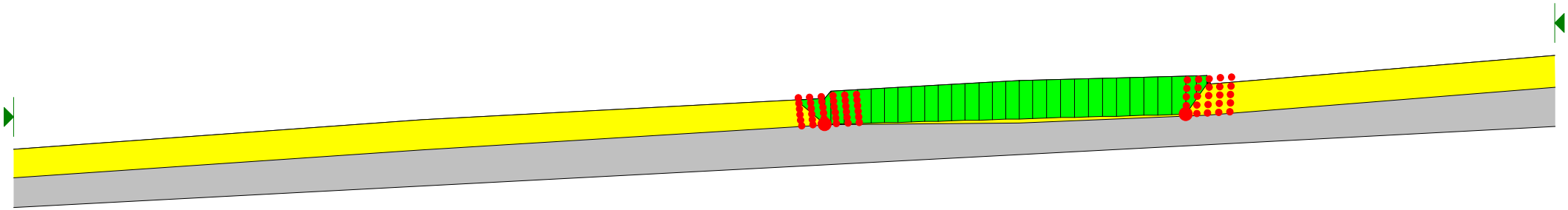
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	3.8 - 4.2 m	3.1 - 1.5 Deg	0.6 - 2.6 Deg
0 - 50 m Downslope	3.2 - 3.7 m	3.0 Deg	3.6 Deg
50 - 100 m Downslope	3.5 - 3.7 m	4.1 Deg	3.9 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 3.3 kPa
(Characteristic Strength = 4.6 kPa)

1.542

Calculated margin of safety > 1.0 => OK



T56/57R (2 kPa)

Peat Repository Site : T56/57R
Sliding Stability Analysis with 0.5 m thick layer of very weak peat (cu = 2kPa) at base

Size of Repository Site = 50 x 100 m
Length of loaded area parallel to resultant slope direction = 62.5 m

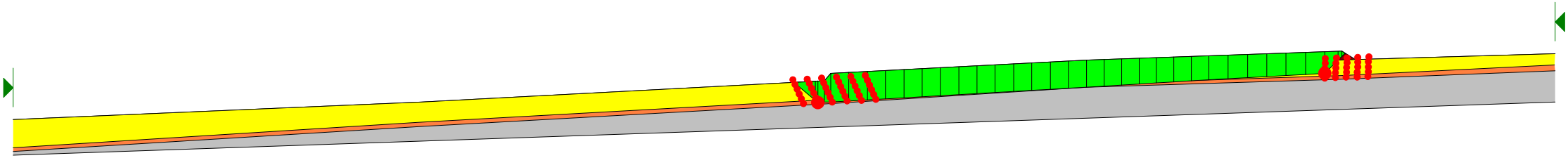
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	2.3 - 2.8 m	2.1 - 2.7 Deg	1.9 - 3.7 Deg
0 - 50 m Downslope	2.8 - 2.9 m	3.0 Deg	3.1 Deg
50 - 100 m Downslope	2.9 - 3.8 m	2.5 Deg	3.5 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

1.209

Design undrained shear strength of peat = 2.6 kPa
(Characteristic Strength = 3.6 kPa)

Calculated margin of safety > 1.0 => OK



Peat Repository Site : T56/57R
Sliding Stability Analysis

T56/57R

Size of Repository Site = 50 x 100 m
Length of loaded area parallel to resultant slope direction = 62.5 m

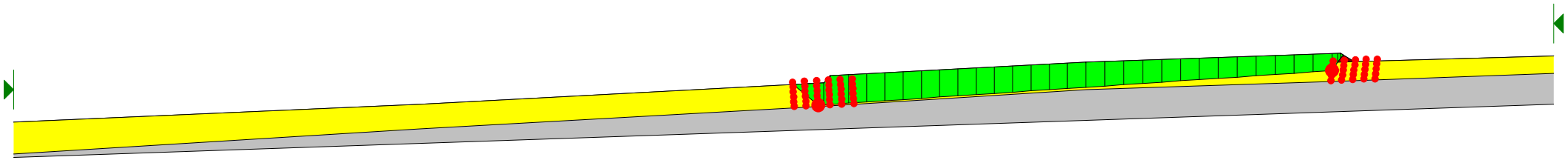
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	2.3 - 2.8 m	2.1 - 2.7 Deg	1.9 - 3.7 Deg
0 - 50 m Downslope	2.8 - 2.9 m	3.0 Deg	3.1 Deg
50 - 100 m Downslope	2.9 - 3.8 m	2.5 Deg	3.5 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 2.6 kPa
(Characteristic Strength = 3.6 kPa)

1.490

Calculated margin of safety > 1.0 => OK



Peat Repository Site : T56R
Sliding Stability Analysis with 0.5 m thick layer of very weak peat (cu = 2 kPa) at Base

T56R (2 kPa)

Size of Repository Site = 39 x 26.5 m
Length of loaded area parallel to resultant slope direction = 35.2 m

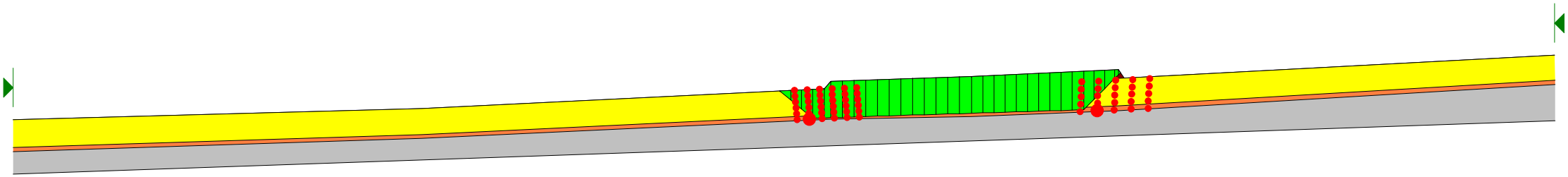
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	3.7 - 3.9 m	1.6 - 2.6 Deg	1.0 - 2.5 Deg
0 - 50 m Downslope	3.7 m	2.7 Deg	2.8 Deg
50 - 100 m Downslope	3.7 - 3.9 m	1.6 Deg	1.8 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 4.3 kPa
(Characteristic Strength = 6.0 kPa)

1.013

Calculated margin of safety > 1.0 => OK



Peat Repository Site : T56R
Sliding Stability Analysis

T56R

Size of Repository Site = 39 x 26.5 m
Length of loaded area parallel to resultant slope direction = 35.2 m

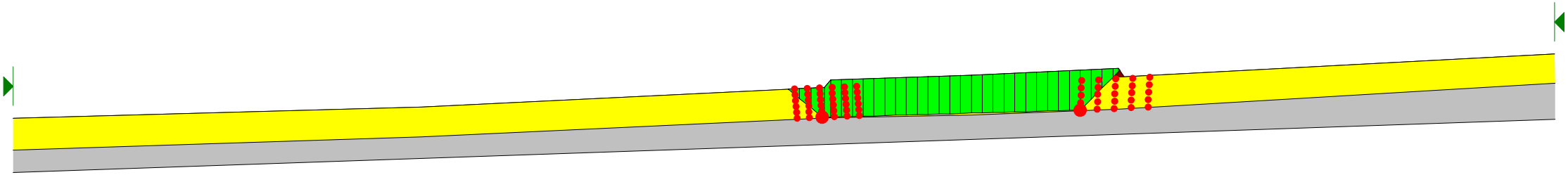
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	3.7 - 3.9 m	1.6 - 2.6 Deg	1.0 - 2.5 Deg
0 - 50 m Downslope	3.7 m	2.7 Deg	2.8 Deg
50 - 100 m Downslope	3.7 - 3.9 m	1.6 Deg	1.8 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 4.3 kPa
(Characteristic Strength = 6.0 kPa)

1.801

Calculated margin of safety > 1.0 => OK



T57R (2 kPa)

Peat Repository Site : T57R
Sliding Stability Analysis with 0.5 m thick layer of very weak peat (cu = 2kPa) at Base

Size of Repository Site = 25 x 30 m
Length of loaded area parallel to resultant slope direction = 25 m

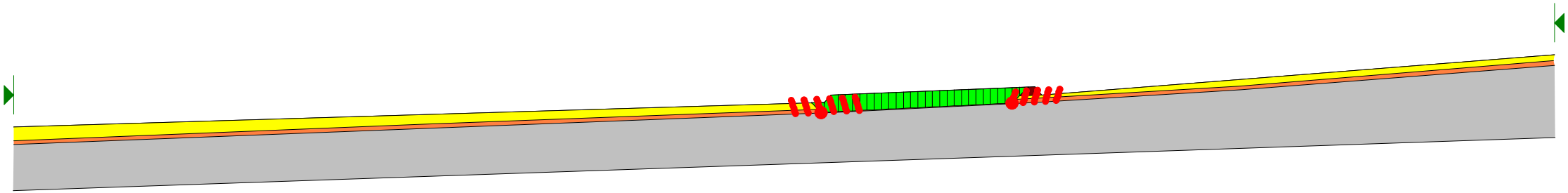
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	0.85 - 1.2 m	2.0 Deg	2.9 Deg
0 - 50 m Downslope	1.20 - 1.6 m	1.6 Deg	2.2 Deg
50 - 100 m Downslope	1.60 - 2.1 m	1.6 Deg	2.2 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 3.3 kPa
(Characteristic Strength = 4.6 kPa)

1.553

Calculated margin of safety > 1.0 => OK



T57R

Peat Repository Site : T57R
Sliding Stability Analysis

Size of Repository Site = 25 x 30 m
Length of loaded area parallel to resultant slope direction = 25 m

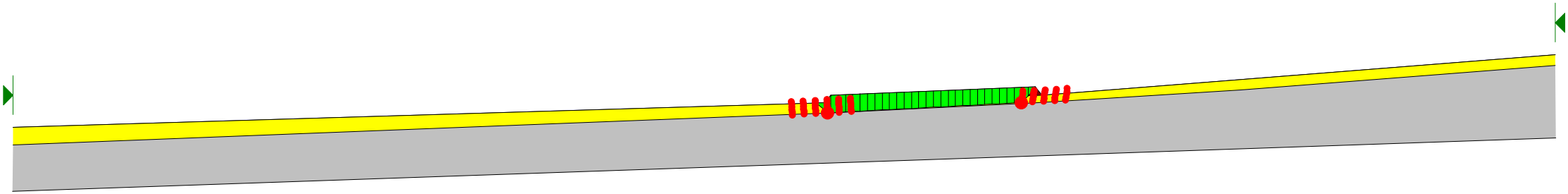
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	0.85 - 1.2 m	2.0 Deg	2.9 Deg
0 - 50 m Downslope	1.20 - 1.6 m	1.6 Deg	2.2 Deg
50 - 100 m Downslope	1.60 - 2.1 m	1.6 Deg	2.2 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 3.3 kPa
(Characteristic Strength = 4.6 kPa)

2.371

Calculated margin of safety > 1.0 => OK



T58R (2 kPa)

Peat Repository Site : T58R
Sliding Stability Analysis with 0.5 m thick layer of very weak peat (cu = 2kPa) at Base)

Size of Repository Site = 24 x 35 m
Length of loaded area parallel to resultant slope direction = 31.2 m

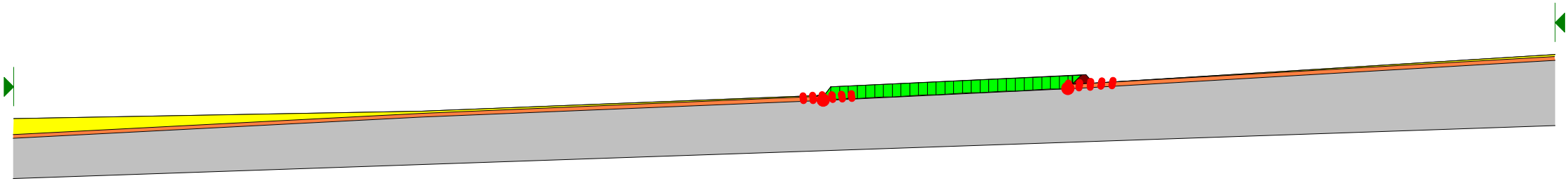
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	0.4 m	2.8 Deg	2.7 Deg
0 - 50 m Downslope	0.40 - 0.7 m	2.1 Deg	2.1 Deg
50 - 100 m Downslope	0.70 - 2.4 m	1.0 Deg	3.1 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 2.0 kPa

1.731

Calculated margin of safety > 1.0 => OK



T58R

Peat Repository Site : T58R
Sliding Stability Analysis

Size of Repository Site = 24 x 35 m
Length of loaded area parallel to resultant slope direction = 31.2 m

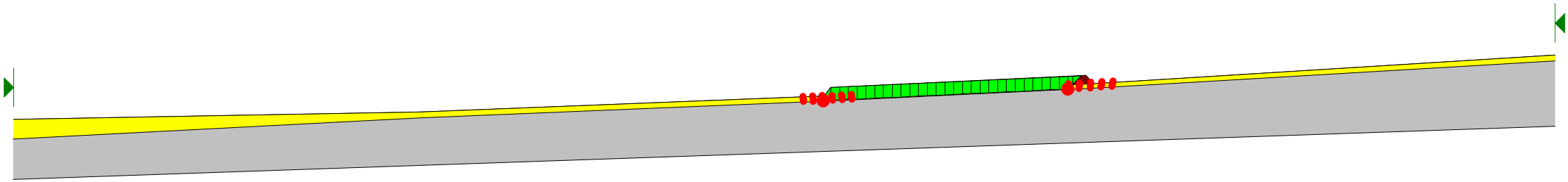
	Peat Depth	Surface Slope Angle	Base Slope Angle
Repository Site	0.4 m	2.8 Deg	2.7 Deg
0 - 50 m Downslope	0.40 - 0.7 m	2.1 Deg	2.1 Deg
50 - 100 m Downslope	0.70 - 2.4 m	1.0 Deg	3.1 Deg

Partial factor of 1.4 applied to undrained shear strength and 1.3 applied to surcharge load (1.0m peat)

Design undrained shear strength of peat = 2.0 kPa

1.731

Calculated margin of safety > 1.0 => OK



APPENDIX IV

AGL REPORT NO. 03-104-R02 – REPORT ON THE STABILITY OF THE FLOATING ROADS

Report on the Stability of the Floating Roads on the site of the Derrybrien Windfarm, Co. Galway

Report No. 03-104-R02

for

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December 16th, 2004

Report on the Stability of the Floating Roads on the site of the Derrybrien Windfarm, Co. Galway

1.0 INTRODUCTION

This report gives a factual summary of the work that has been carried out to date on the assessment of the existing floating roads on the site of the Derrybrien Windfarm. It is an addendum to AGL Report No. 03-104-R01 (Rev 1) dated November 1st, 2004, which provides a more detailed account of the ground investigation carried out on the site and the procedure used for assessing and testing the floating roads.

The results of all the gouge auger probes, slope angle measurements and vane shear tests carried out along the roads are presented in this report along with the results of the road tests on all of the existing roads on the site.

2.0 GROUND INVESTIGATION

The ground investigation that was carried out for the analysis floating roads generally consists of

- Gouge auger probes on 25 m intervals on the downslope side of the road and at a 50 m offset. In some cases intermediate probes were also carried out at a 25 m offset to facilitate slope measurements where the slopes were covered in trees, or where there was a break in the slope between 0 and 50 m downslope.

- Topographical surveying at probe locations to determine the slope angle at the surface and base of the peat on the downslope side of the road. Wherever possible the probes have been surveyed with the GPS system to record the location relative to the national grid and the ground surface elevation relative to Ordnance Datum.

- In situ vane shear tests at 50 to 100 m intervals along the floating roads, and at selected locations under the road. At each location vane shear tests were carried out at 0.5 m depth intervals over the full depth of peat.

- Piston sampling and/or gouge auger sampling at selected areas to inspect the peat and confirm that there is no weak layer or discontinuity near the base of the peat.

Tables No.1 lists the work that was carried out in the different parts of the site for the analysis of the stability of the floating roads. Similar to previous investigations on the site, the data has been split up on a cell by cell basis for each turbine. The probe, slope angle and vane shear test results for each cell are included in Appendix A.

Table No.1 – Summary of ground investigation that was carried out for the analysis of the existing floating roads.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T1			
T2	X	2	X
T3			
T4			
T5	X	2	X
T6			
T7			
T8			
T9			
T10			
T11	X	3	X
T12			
T13	X	4	X
T14			
T15	X		
T16	X		
T17	X	4	X
T18	X	4	X
T19	X	4	X
T20			
T21			
T22			
T23			
T24	X	2	X
T25	X	2	X
T26			
T27	X	2	X
T28			
T29			
T30	X	4	X
T31	X	4	X
T32			
T33	X	4	X
T34	X	5	X
T35	X	1	X
T36	X		X
T37			
T38			
T39	X		X
T40			
T41			
T42	X	4	X
T43			
T44			
T45			
T46			
T47	X	3	X
T48	X	3	X

Table No.1 Contd. – Summary of ground investigation that was carried out for the analysis of the existing floating roads.

Cell No.	Gauge Auger Probes	Vane Shear Testing (Geonor H-10 65/130mm)	Slope Angle Measurement
T50	X	3	X
T51	X	3	X
T52	X	4	X
T53	X	2	X
T54	X	3	X
T55	X	8	X
T56	X	4	X
T57	X	4	X
T58	X		X
T59	X	2	X
T60	X	2	X
T61	X	2	X
T62	X	4	X
T63	X	2	X
T64	X	2	X
T65	X		X
T66	X	4	X
T67			
T68	X	4	X
T69	X	6	X
T70	X	2	X
T71			

Note: It was not possible to locate all of the probes and vane shear test locations by GPS. Therefore, a numbering system was used which gives the approximate location of the probe or vane shear test. Following is a guide to the system that was used:

VST55+50: Vane shear test in Cell T55, 50 m to the east of the turbine base (i.e. +50). The test was carried out on the downslope side of the road, typically about 3 m from the edge of the road.

P55A-50: Gouge auger probe in Cell T55 approximately 3 m downslope from the floating road (**A**), 50 m to the west of the base (i.e. -50).

P55B+50: Gouge auger probe in Cell T55 approximately 50 m downslope from the floating road (**B**), 50 m to the east of the base (i.e. +50).

VST55B: Vane shear test at the turbine base in Cell T55.

P55B-NW: Gouge auger probe at the northwest corner of the turbine base.

3.0 STABILITY ANALYSES

The stability of the floating roads was analyzed using the limiting equilibrium slope stability program Slope/W. A 2-D plane strain analysis was carried out at representative sections along the floating roads to calculate the margin of safety for the critical slip circle under the road in the undrained condition.

The stability analyses were carried out in cells corresponding to the turbine locations. For each cell analyzed, a representative design profile was determined from the gouge auger probe and topographical survey data in Appendix A. The design section represented the most conservative combination in terms of peat depth and slope angle. In some cases, where the profile changed significantly within a cell more than one design profile was analyzed.

The size of the road was conservatively taken as 5.0 m wide and 1.0 m thick. The basal reinforcement consists of a layer of trees and a single layer of Tensar SS20 geogrid within the crushed rock. We have assumed that critical slip circles would have to develop over the full width of the road for failure to occur.

The existing turbary road between T25 and T45 was widened from 4.0 m to 5.0 m. However, as the basal reinforcement would not be continuous over the full width of the road, the road has been analyzed as 4.0 m wide. The width of the road will be restricted for construction traffic.

A live load surcharge of 17.1 kPa has been applied to simulate the proposed load of the crane on the roads. This is equivalent to 15 m long x 2.75 m wide crane with a fully laden weight of 72 tonnes on six axles when traveling.

A representative characteristic undrained shear strength profile was determined for each cell from the unadjusted Geonor H-10 vane shear test data in Appendix A. The profile with the lowest recorded undrained shear strengths was typically used.

In accordance with Eurocode EC(7), a partial factor of 1.4 was applied to the characteristic undrained shear strengths, c_{uk} , to obtain the design values, c_{ud}. A partial factor of 1.3 was also applied to the live load surcharge. By this method of analysis a calculated margin of safety >1.0 in the slope stability analyses is acceptable. This is more conservative than the British Standard (BS) approach where no partial factor is applied to the live load.

The results of the Slope/W analyses are included in Appendix B and summarized in Table No. 2 below. A summary of the slope geometry, peat depths, and peat strengths used for the analyses is also included with the results in Appendix B. The properties were assessed from the field investigation data in Appendix A.

A calculated margin of safety > 1.0 was achieved for the design section in each cell using the partial factor of 1.4 on c_{uk}, and 1.3 on the live load, which is an acceptable condition.

In most cases this was achieved without making an allowance for the increase in strength of the peat under the roads.

Table No. 2 – Calculated margin of safety from Slope/W analyses

Cell No.	Allowance made for increase in peat strength under road (Y/N)	Calculated Margin of Safety (>1.0 is OK)	Comments:
T2	N	1.12	Existing road (T2-100m)
T5	N	1.42	Existing road
T11	N	1.09	Existing road (T11+100m)
T13	N	1.02	Existing road (T13-25m)
T17	N	1.04	Existing road
T18	N	1.08	Existing road
T19	N	1.11	Existing road (T19-50m)
T24	N	2.36	Existing road
T25	N	1.02	Existing road (T25-25m)
T27	N	1.10	Existing road (T27+75m)
T30	N	1.12	Existing road
T31	N	1.23	Existing road
T33	N	1.01	Existing road (T33+50m)
T34	N	1.02	Existing road
T35	N	1.90	Existing road (T35+50m)
T42	N	1.06	Existing road
T50	N	3.21	Existing road (T50+75m)
T51	N	1.74	Existing road (T51+75m)
T52	N	2.36	Existing road
T55	Y	1.08	Existing road. Increase in strength under road based on vane shear tests at T55+0m
T56	N	1.57	Existing road
T57	Y	1.18	Existing road. Assumed 20% increase in undrained shear strength to 3.2 mBGL.
T59	N	1.04	Existing road
T60	N	1.55	Existing road
T61	N	1.64	Existing road (T61-50m)
T62	N	1.06	Existing road (T62-125m)
T62	N	1.09	Existing road (T62-75m)
T63	N	1.46	Existing road (T63-25m)
T64	N	1.27	Existing road (T64+100m)
T66	N	1.05	Existing road
T68	N	1.44	Existing road (T68-50m)
T69	N	1.08	Existing road (T69+75m)
T70	N	1.43	Existing road (T70+75m)

4.0 ROAD TESTS

Incremental road test was carried out on the existing floating roads. The procedure for the road tests was as follows:

1. Initially the roads were traveled with an 8-wheel truck half-loaded with gravel with a weight of 26.75 to 28.15 tonnes recorded by weighbridge.

2. Deflection of the road was observed visually as the truck traveled continuously over the roads at a speed of approximately 10 mph.

3. The performance of the roads was classified as good, fair or poor based on the condition of the road and the observed deflection under the weight of the truck.

4. Representative areas where low margins of safety were calculated in the Slope/W analysis and where the road performance was classified as fair or poor were selected to record the deflection of the road under the truck.

5. Deflection of the road was recorded at approximately 25 m intervals along the road beside the wheel of the front rear axle. Deflection was recorded using an optical level to measure the rebound that occurred after unloading.

6. The truck was filled to capacity (recorded weight = 35.92 to 37.37 tonnes) and the performance of the road was classified visually as the truck traveled continuously over the roads at about 10 mph.

7. The deflection under the fully loaded truck was recorded in representative areas where the performance of the road was classified as fair or poor and low margins of safety were calculated.

The road tests were carried out in three phases:

Phase 1: On 14th and 15th October, 2004: Northern section of the site.

- T50 to T52
- T52 to T57
- T55 to T57
- T53 to T59
- T59 to T65
- T64 to T26

Phase 2: 23rd to 25th of November, 2004: Western and southern sections of the site.

- T1 to T2
- T1 to T8
- T3 to T5

- T6 to T24
- T12 to T13
- T18 to T26

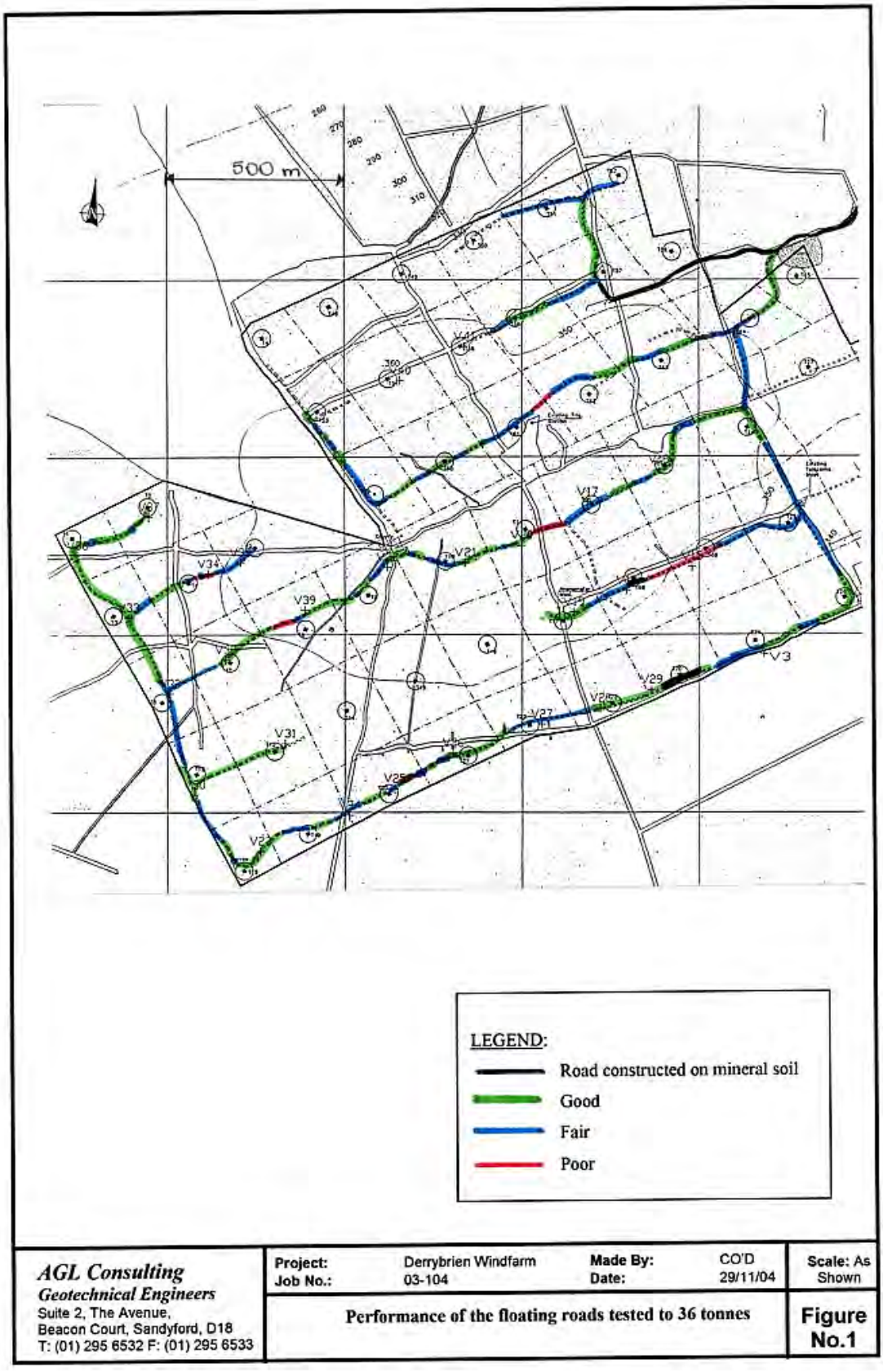
Phase 3: 13th to 15th December, 2004: Eastern and central section of the site.

- T17 to T25
- T24 to T44
- T25 to T45
- T26 to T41

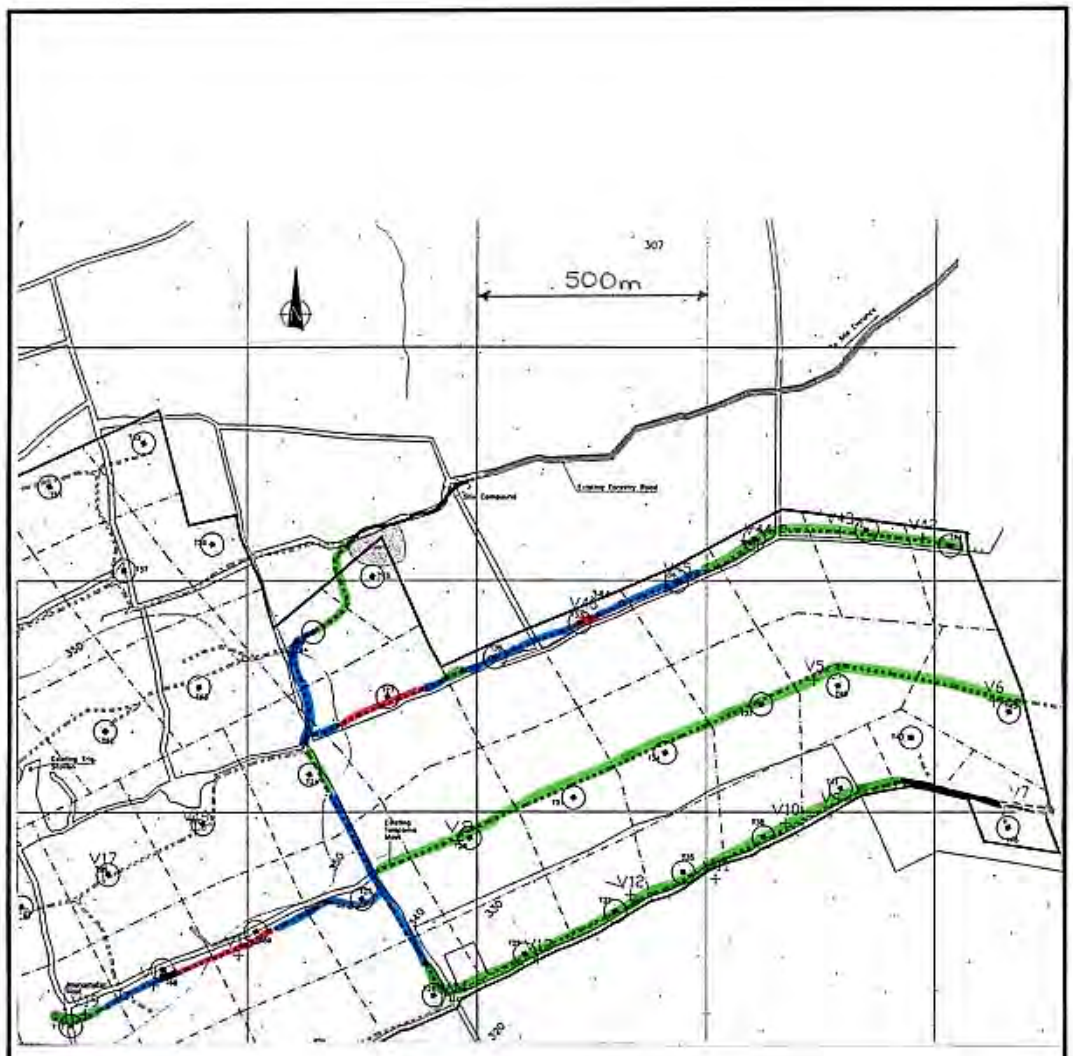
The criteria used to assess the performance of the roads are presented in Table No.3. A summary of the road classifications are presented in Figures Nos. 1 and 2.

Table No. 3 Performance criteria for road tests under maximum test load (36-37 tonnes)

Road Performance Classification	Performance Criteria (36-37 tonne load)
Good	➢ Road deflections generally <10 mm ➢ Road deflects relatively rigidly under truck load with only slightly greater deformation locally under the wheel load at localized soft spots. ➢ Road surface is even with minor rutting and no loose rockfill.
Fair	➢ Road deflections between 10 and 30 mm ➢ Road deflects noticeably under wheel loads ➢ Road surface is relatively even with some rutting along the line of the wheels. The rockfill is generally dense. ➢ Local transverse rutting occurs at soft spots where the rockfill has loosened over weak peat, or where there are gaps in the basal reinforcement trees.
Poor	➢ Road deflections are greater than 30 mm (up to about 60 mm) ➢ Road deforms very noticeably under wheel loads in wave-like motion. ➢ Deformations are uneven causing the truck to tilt slightly on local soft spots. ➢ Road surface is in poor condition with both longitudinal and transverse rutting creating an uneven road surface. ➢ Rockfill is loosened over worst areas.



AGL Consulting *Geotechnical Engineers* Suite 2, The Avenue, Beacon Court, Sandyford, D18 T: (01) 295 6532 F: (01) 295 6533	**Project:** Derrybrien Windfarm **Job No.:** 03-104	**Made By:** CO'D **Date:** 29/11/04	**Scale:** As Shown	
	Performance of the floating roads tested to 36 tonnes			**Figure No.1**



AGL Consulting ***Geotechnical Engineers*** Suite 2, The Avenue, Beacon Court, Sandyford, D18 T: (01) 295 6532 F: (01) 295 6533	Project:	Derrybrien Windfarm	Made By:	DEC	Scale: As Shown
	Job No.:	03-104	Date:	16/12/04	
	Performance of the floating roads tested to 36 tonnes				**Figure No.2**

Deflection of the floating roads was monitored at representative sections where the road performance was "fair" or "poor". The recorded deflection of these sections roads is included in Appendix C for Phase 1, 2 and 3 of the road tests.

The majority of the roads were classified as 'good' to 'fair' with only local soft spots, possibly where there are gaps in the trees along the base of the road.

Some sections of the road were classified as "poor", as indicated on Figures Nos. 1 and 2. However, none of the roads showed any signs of yielding or excessive deflection at the sides of the road, even when the road performance was classified as poor. There was no visible deformation in the peat at the side of the roads. The deformations were generally locally concentrated under the wheel loads and the total load was adequately supported by the road.

5.0 CONCLUSION

It has been demonstrated by full scale load tests that the existing floating roads on the site have adequate bearing capacity to support construction traffic loads up to 36 tonnes with an equivalent uniformly distributed load of 20 kN/m^2.

The load tests were carried out using an 8-wheel truck fully loaded with gravel. For comparison, the weight of a fully loaded concrete truck is 33 tonnes.

The performance of the majority of the roads was classified as "good" or "fair". These roads will be adequate for the proposed construction traffic loads. Remedial work should be carried out at local soft spots where it causes noticeable rutting in the road and deterioration of the road surface during construction.

Some short sections of the road were classified as "poor" based on the measured deflections and observed behaviour of the road under the maximum construction traffic load. Remedial work will be carried out in these areas to improve the performance of the road. The remedial work should be carried out in accordance with the AGL method statement dated in Appendix D.

Remedial work has now been completed on the road between T11 and T66, which was classified as "poor". The thickness of the road ranged from 500 to 900 mm and the geogrid was intact. The existing road was improved by adding a second layer of Tensar SS20 geogrid and 300 mm of crushed stone. The maximum thickness of stone was limited to 1.0 m, so in some areas it was necessary to excavate excess material off the road before the second layer of geogrid was added.

This section of the road was tested on December 14th, 2004 under a load of 37.4 tonnes and was re-classified as "good".

Some additional investigation will be carried out to assess the remedial work that will be required for the section of floating road between T69 and T68. This section of road should not be used for construction traffic until this work has been carried out.

A full-scale load test will be carried out on a test section of floating road to the east of the existing road between T64 and T24 to confirm that the Geonor H-10 vane gives a representative index of the undrained shear strength of the peat, compared to the lower strengths determined by the larger vane used by ESBI. The ultimate capacity of the road will be calculated using both sets of results. The road will then be loaded incrementally with layers of gravel until the maximum predicted load or failure occurs.

All of the floating roads on the site will be tested at a later date to the full crane load (72 tonnes) before they are handed over for turbine construction. The stability of the roads will also have to be assessed along the transport route of the transformer, which will have a combined load of 132 tonnes in transit.

For AGL Consulting:

Conor O'Donnell **Eric Farrell**

Date: 16/12/04

Appendix A

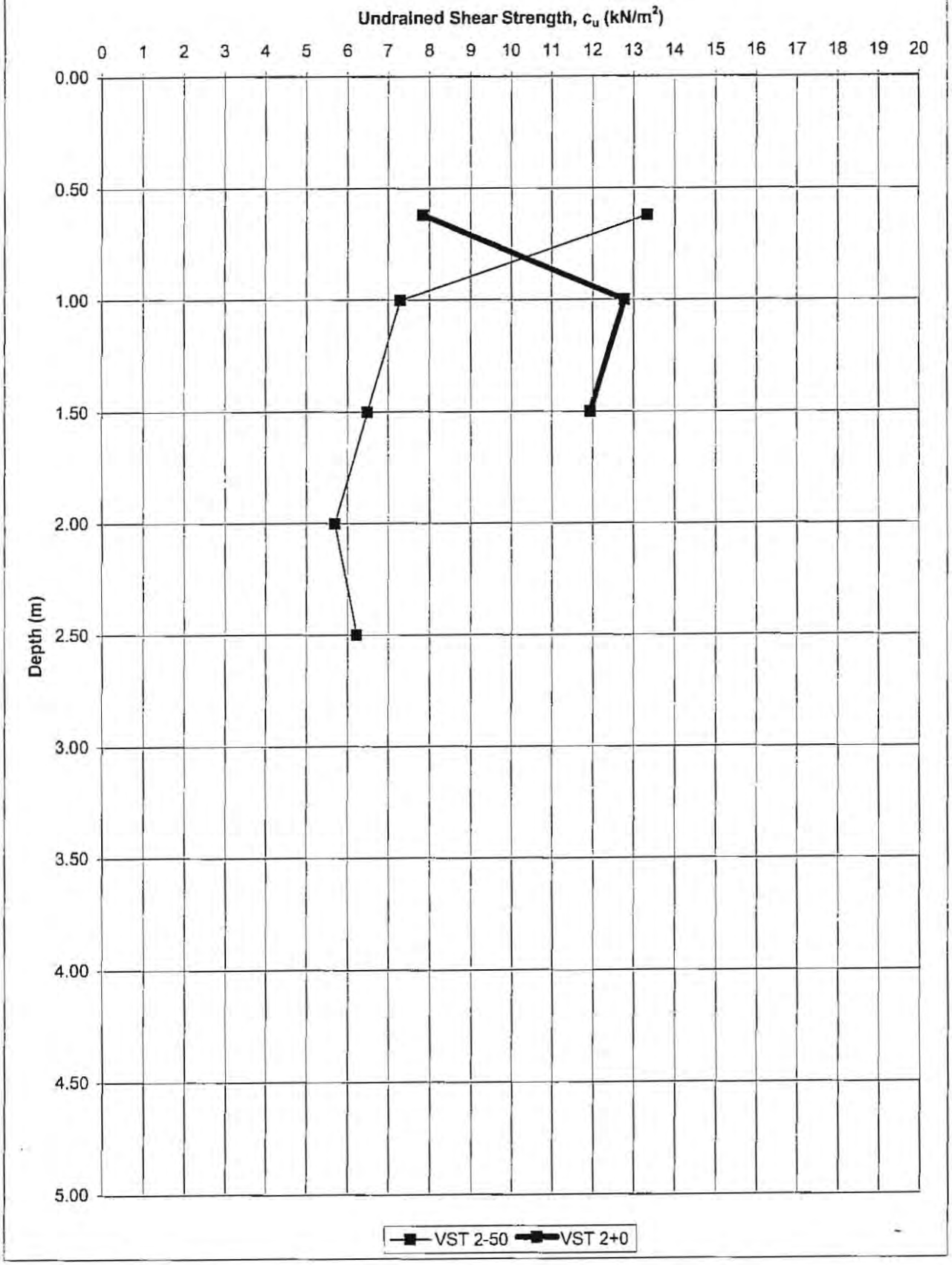
Results of Gouge Auger Probes and Geonor H-10 (65mm/135mm) Penetration Vane Tests

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 2**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T2/P-100A					**3.30**		**2.3**	**1.3**
T2/P-100B					**2.44**			
T2/P-75A		157856.6	204791.8	343.82	**2.84**	340.98	**1.5**	**1.0**
T2/P-75B				342.59	**2.44**	340.15		
T2/P-50A		157897.5	204820.7	344.66	**2.84**	341.82	**2.2**	**1.0**
T2/P-50B		157876.8	204855.0	343.13	**2.00**	341.13		
T2/P-25A		157918.7	204841.6	345.48	**3.30**	342.18	**2.1**	**0.1**
T2/P-25B		157895.5	204871.0	344.13	**2.00**	342.13		
T2/P0A		157946.0	204849.0	346.68	**2.84**	343.84	**1.5**	**0.5**
T2/P0B				345.45	**2.00**	343.45		
T2/P25A		157957.0	204876.3	347.65				
T2/P25B								
T2/P50A		157974.4	204889.9	348.47				
T2/P50B								
T2/P+75A		157997.2	204888.9	349.41				
T2/P+75B								
T2/P+100A		158019.9	204888.3	349.82				
T2/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T2B-NE								
T2B-NW								
T2B-SE								
T2B-SW								
T2B-C								
T2B+50								
T2B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 2**
Test No.		VST 2-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	25.0	6.00	13.3				
1.00	14.0	4.50	7.3				
1.50	12.5	3.50	6.5				
2.00	11.0	2.00	5.7				
2.50	12.0	3.00	6.2				
Test No.		VST 2+0	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	15.0	3.50	7.8				
1.00	24.0	4.00	12.8				
1.50	22.5	6.00	11.9				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

Turbine/ Cell No.

VST Results along downslope of floating road in Cell T2

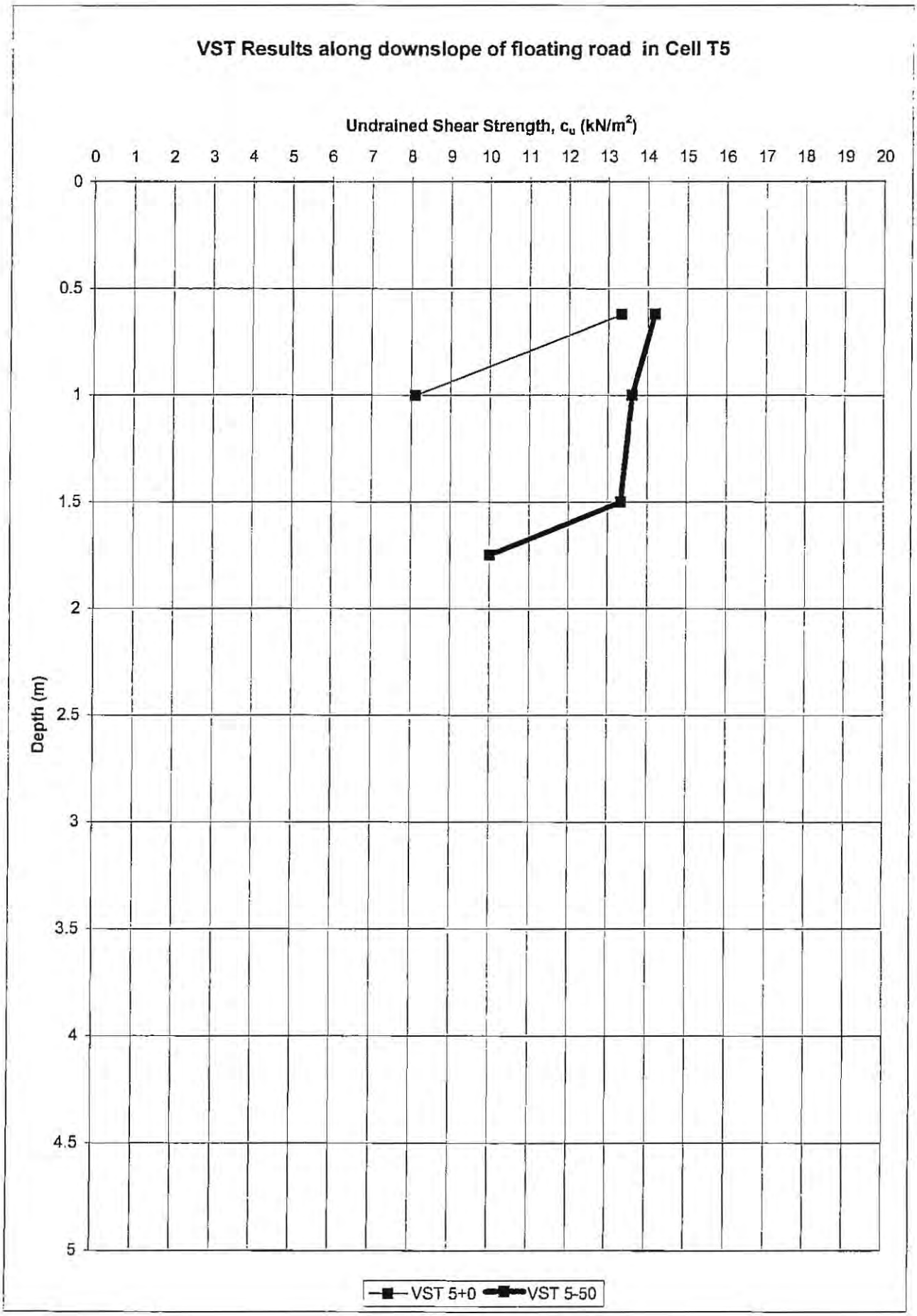


AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 5**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T5/P-100A		158164.2	204690.8	353.37	**3.10**	350.27	**1.5**	**0.8**
T5/P-100B				352.14	**2.54**	349.60		
T5/P-75A		158183.3	204702.5	354.31	**3.10**	351.21	**1.5**	**1.0**
T5/P-75B				353.08	**2.70**	350.38		
T5/P-50A		158201.1	204716.8	355.53	**2.60**	352.93	**1.5**	**1.4**
T5/P-50B				354.30	**2.50**	351.80		
T5/P-25A		158217.3	204730.2	355.47	**1.20**	354.27	**2.3**	**3.4**
T5/P-25B				353.58	**2.10**	351.48		
T5/P0A					**1.50**		**3.5**	**3.9**
T5/P0B					**1.84**			
T5/P25A		158269.5	204736.4	358.02	**1.40**	356.62	**2.3**	**2.4**
T5/P25B				356.13	**1.50**	354.63		
T5/P50A		158291.7	204740.3	358.90	**2.10**	356.80	**2.5**	**2.2**
T5/P50B				356.85	**1.84**	355.01		
T5/P+75A		158312.1	204738.2	359.46	**2.20**	357.26	**1.5**	**1.3**
T5/P+75B				358.23	**2.00**	356.23		
T5/P+100A		158335.6	204738.0	359.98	**2.50**	357.48	**1.5**	**1.4**
T5/P+100B				358.75	**2.40**	356.35		
East								

Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively
ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road

Probes On Turbine Base								
T5B-NE								
T5B-NW								
T5B-SE								
T5B-SW T5B-C								
T5B+50								
T5B+100								

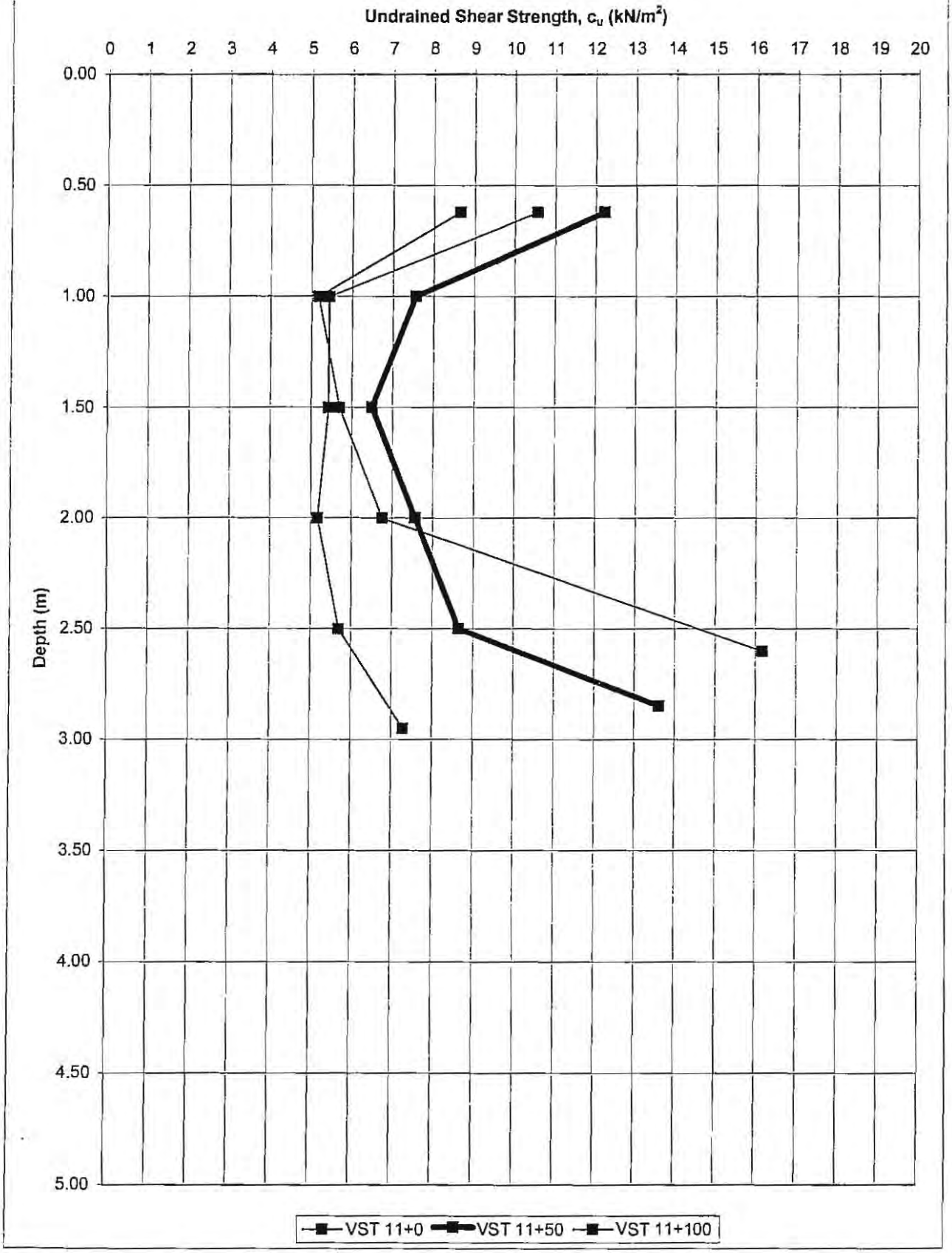
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 5**
Job No. 03-104							
Test No.		VST 5+0	Date:			Peat Depth (m) 1.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	25.0	8.50	13.3				
1.00	15.5	5.50	8.1				
Test No.		VST 5-50	Date:			Peat Depth (m) 1.75	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	26.5	5.50	14.2				
1.00	25.5	3.50	13.6				
1.50	25.0	3.00	13.3				
1.75	19.0	3.00	10.0				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	


VST Results along downslope of floating road in Cell T5
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
VST 5+0
VST 5-50

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 11**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T11/P-100A								
T11/P-100B								
T11/P-75A								
T11/P-75B								
T11/P-50A								
T11/P-50B								
T11/P-25A								
T11/P-25B								
T11/P0A					**2.70**		**0.0**	**2.3**
T11/P0B					**2.85**			
T11/P25A					**2.85**		**2.0**	**2.0**
T11/P25B					**2.85**			
T11/P50A					**3.00**		**2.0**	**0.2**
T11/P50B					**2.20**			
T11/P+75A					**3.25**		**2.0**	**2.2**
T11/P+75B					**3.35**			
T11/P+100A					**3.45**		**2.0**	**2.5**
East					**3.65**			
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T11B-NE								
T11B-NW								
T11B-SE								
T11B-SW								
T11B-C								
T11B+50								
T11B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 11**
Test No.		VST 11+0	Date:			Peat Depth (m) 2.85	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	16.5	5.00	8.6				
1.00	10.0	3.50	5.2				
1.50	11.0	3.00	5.7				
2.00	13.0	3.50	6.8				
2.60	30.0	4.50	16.2				
Test No.		VST 11+50	Date:			Peat Depth (m) 3.1	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	23.0	5.00	12.2				
1.00	14.5	4.00	7.6				
1.50	12.5	3.50	6.5				
2.00	14.5	4.50	7.6				
2.50	16.5	3.50	8.6				
2.85	25.5	4.00	13.6				
Test No.		VST 11+100	Date:			Peat Depth (m) 3.2	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	20.0	6.50	10.6				
1.00	10.5	5.00	5.4				
1.50	10.5	5.00	5.4				
2.00	10.0	3.50	5.2				
2.50	11.0	3.50	5.7				
2.95	14.0	4.00	7.3				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

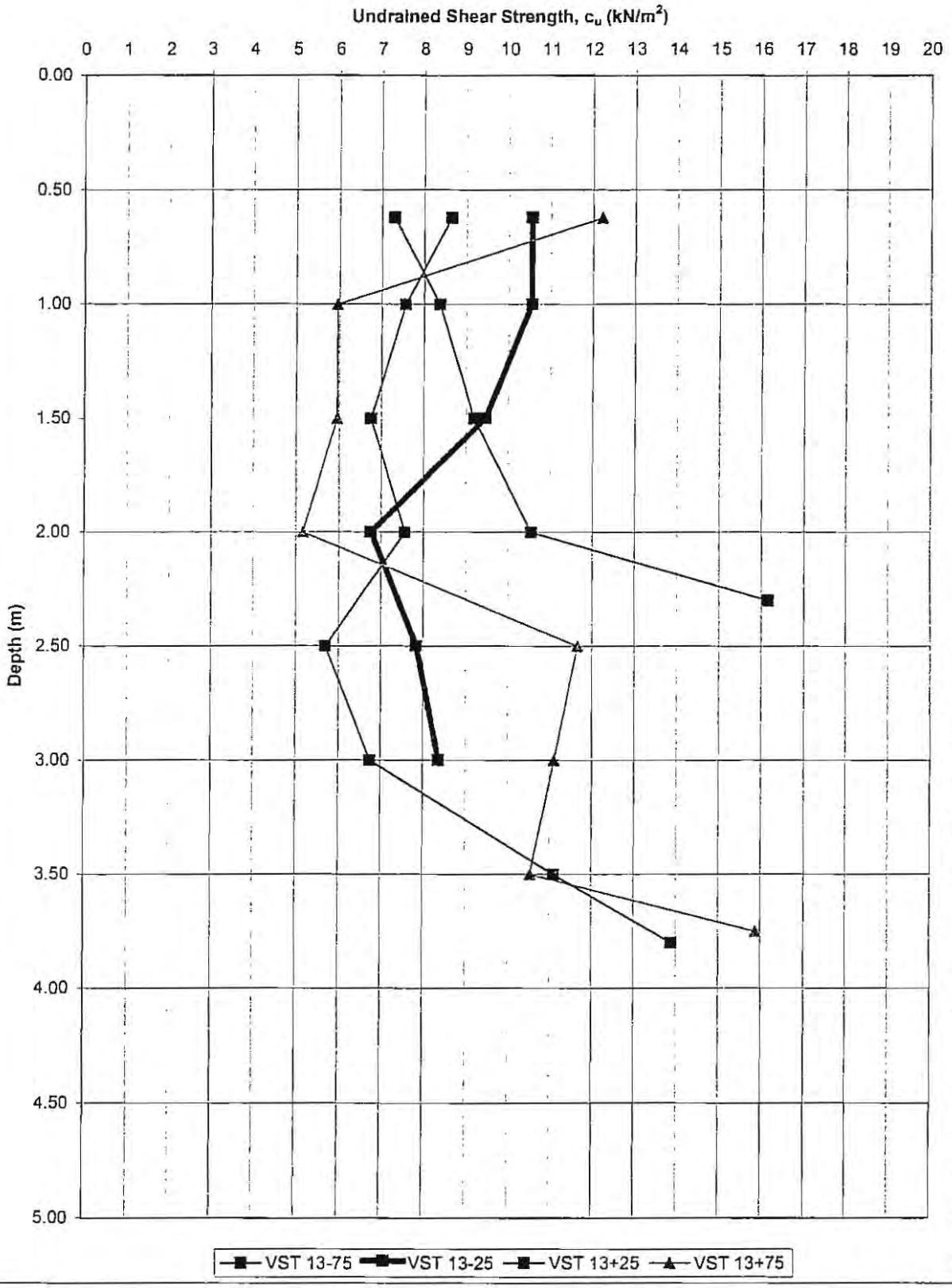
VST Results along downslope of floating road in Cell T11



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 13**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T13/P-100A		158219.5	204136.2	323.46	**2.53**	320.93	**1.2**	**2.8**
T13/P-100B				322.50	**3.90**	318.60		
T13/P-75A		158239.4	204146.3	323.98	**2.07**	321.91	**1.5**	**3.0**
T13/P-75B				322.75	**3.33**	319.42		
T13/P-50A		158265.0	204154.7	325.23	**2.43**	322.80	**5.0**	**6.0**
T13/P-50B				321.12	**3.24**	317.88		
T13/P-25A		158289.3	204161.7	326.22	**2.90**	323.32	**4.2**	**4.3**
T13/P-25B				322.80	**3.00**	319.80		
T13/P0A		158310.5	204172.8	327.22	**3.29**	323.93	**3.3**	**3.7**
T13/P0B				324.48	**3.59**	320.89		
T13/P25A		158334.1	204175.0	327.60	**3.30**	324.30	**3.0**	**3.4**
T13/P25B				325.14	**3.59**	321.55		
T13/P50A		158360.5	204183.3	328.13	**3.76**	324.37	**1.3**	**0.7**
T13/P50B				327.04	**3.20**	323.84		
T13/P+75A		158382.7	204193.2	328.67	**3.84**	324.83	**2.5**	**1.7**
T13/P+75B				326.62	**3.16**	323.46		
T13/P+100A		158406.4	204205.2	329.19	**3.54**	325.65	**2.0**	**0.5**
T13/P+100B				327.55	**2.30**	325.25		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T13B-NE								
T13B-NW								
T13B-SE								
T13B-SW								
T13B-C								
T13B+50								
T13B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 13**
Test No.		VST 13-75	Date:			Peat Depth (m) 2.35	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	14.0	5.50	7.3				
1.00	16.0	6.00	8.4				
1.50	17.5	5.50	9.2				
2.00	20.0	4.50	10.6				
2.30	30.0	5.50	16.2				
Test No.		VST 13-25	Date:			Peat Depth (m) 3.05	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	20.0	7.00	10.6				
1.00	20.0	5.00	10.6				
1.50	18.0	6.00	9.5				
2.00	13.0	3.50	6.8				
2.50	15.0	4.00	7.8				
3.00	16.0	3.50	8.4				
Test No.		VST 13+25	Date:			Peat Depth (m) 3.85	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	16.5	7.50	8.6				
1.00	14.5	5.50	7.6				
1.50	13.0	4.50	6.8				
2.00	14.5	4.50	7.6				
2.50	11.0	4.00	5.7				
3.00	13.0	4.00	6.8				
3.50	21.0	6.00	11.1				
3.80	26.0	4.00	13.9				
Test No.		VST 13+75	Date:			Peat Depth (m) 3.8	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	23.0	5.00	12.2				
1.00	11.5	3.50	6.0				
1.50	11.5	4.00	6.0				
2.00	10.0	4.00	5.2				
2.50	22.0	5.50	11.7				
3.00	21.0	5.00	11.1				
3.50	20.0	4.50	10.6				
3.75	29.5	4.00	15.9				

VST Results along downslope of floating road in Cell T13



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 15**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T15/P-100A					**2.80**		**2.3**	**3.0**
T15/P-100B					**3.10**			
T15/P-75A					**3.00**		**3.2**	**0.0**
T15/P-75B					**3.00**			
T15/P-50A					**2.80**		**4.0**	**4.2**
T15/P-50B					**2.90**			
T15/P-25A					**2.85**		**4.0**	**3.9**
T15/P-25B					**2.80**			
T15/P0A					**2.60**		**3.5**	**3.3**
T15/P0B					**2.50**			
T15/P25A					**2.50**		**4.8**	**5.0**
T15/P25B					**2.60**			
T15/P50A					**3.00**		**2.5**	**1.1**
T15/P50B					**2.40**			
T15/P+75A					**3.50**		**2.5**	**2.5**
T15/P+75B					**3.50**			
T15/P+100A					**3.20**		**2.5**	**1.8**
T15/P+100B					**2.90**			
East								

Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively
ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road

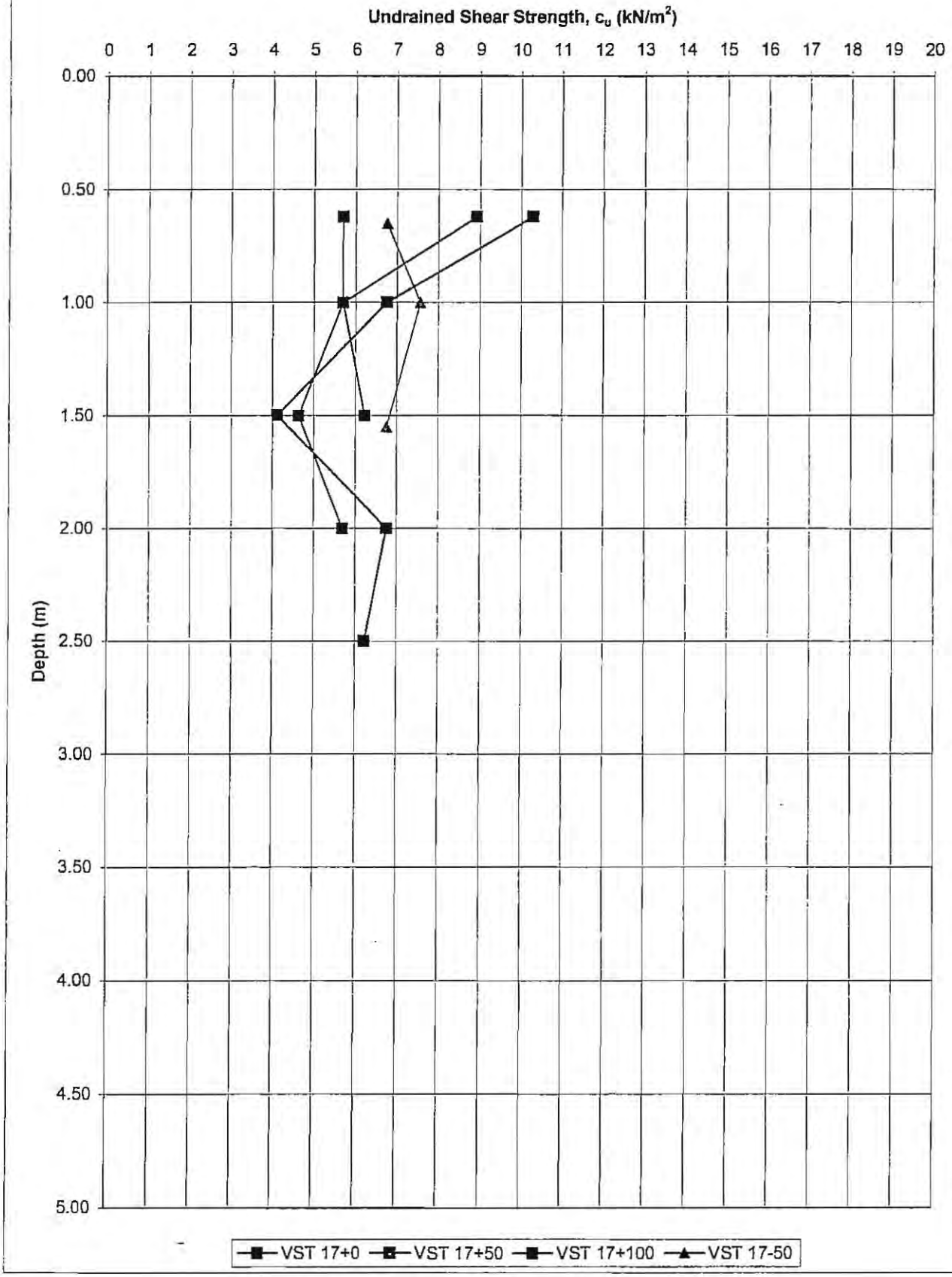
Probes On Turbine Base								
T15B-NE								
T15B-NW								
T15B-SE								
T15B-SW								
T15B-C								
T15B+50								
T15B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 16**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T16/P-100A					**3.90**		**0.5**	**-0.2**
T16/P-100B					**3.60**			
T16/P-75A					**4.10**		**2.0**	**-2.1**
T16/P-75B					**3.20**			
T16/P-50A					**4.50**		**1.0**	**-0.4**
T16/P-50B					**3.90**			
T16/P-25A					**5.00**		**1.3**	**-1.3**
T16/P-25B					**3.85**			
T16/P0A					**4.50**		**1.0**	**-2.4**
T16/P0B					**3.00**			
T16/P25A					**4.00**		**0.5**	**-2.2**
T16/P25B					**2.80**			
T16/P50A					**3.10**		**1.0**	**0.5**
T16/P50B					**2.90**			
T16/P+75A					**2.90**		**1.3**	**-0.1**
T16/P+75B					**2.30**			
T16/P+100A					**2.10**		**1.8**	**1.6**
T16/P+100B					**2.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T16B-NE								
T16B-NW								
T16B-SE								
T16B-SW								
T16B-C								
T16B+50								
T16B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Job No.	Derrybrien Wind Farm 03-104				Made By: Date:		**Cell No: 17**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T17/P-100A								
T17/P-100B								
T17/P-75A								
T17/P-75B								
T17/P-50A								
T17/P-50B								
T17/P-25A								
T17/P-25B								
T17/P0A		159115.8	204520.2	353.92	**1.90**	352.02	**5.7**	**5.9**
T17/P0B		159123.6	204479.2	349.72	**2.00**	347.72		
T17/P25A		159138.3	204544.7	354.30	**1.80**	352.50	**3.8**	**3.3**
T17/P25B		159155.9	204506.6	351.48	**1.40**	350.08		
T17/P50A		159161.2	204557.2	354.96	**2.50**	352.46	**3.8**	**3.8**
T17/P50B		159183.6	204522.9	352.22	**2.50**	349.72		
T17/P+75A		159181.3	204570.8	354.72	**2.16**	352.56	**3.5**	**3.5**
T17/P+75B		159213.7	204540.2	351.97	**2.14**	349.83		
T17/P+100A		159203.6	204580.9	354.27	**2.10**	352.17	**3.7**	**3.9**
T17/P+100B		159230.6	204546.0	351.40	**2.24**	349.16		
T17/P+125A		159226.0	204592.9	353.89	**2.04**	351.85	**3.2**	**3.0**
T17/P+125B		159245.9	204562.5	351.86	**1.90**	349.96		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T17B-NE								
T17B-NW								
T17B-SE								
T17B-SW								
T17B-C								
T17B+50								
T17B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 17**
Job No. 03-104							
Test No.		VST 17+0	Date:			Peat Depth (m) 1.75	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	11.0	11.00	5.7				
1.00	11.0	7.00	5.7				
1.50	12.0	6.00	6.2				
Test No.		VST 17+50	Date:			Peat Depth (m) 2.51	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	19.5	5.00	10.3				
1.00	13.0	4.00	6.8				
1.50	8.0	3.00	4.1				
2.00	13.0	4.50	6.8				
2.50	12.0	4.00	6.2				
Test No.		VST 17+100	Date:			Peat Depth (m) 2.51	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	17.0	6.50	8.9				
1.00	11.0	4.50	5.7				
1.50	9.0	5.00	4.6				
2.00	11.0	3.50	5.7				
Test No.		VST 17-50	Date:			Peat Depth (m) 1.8	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	13.0	3.50	6.8				
1.00	14.5	4.00	7.6				
1.55	13.0	3.50	6.8				

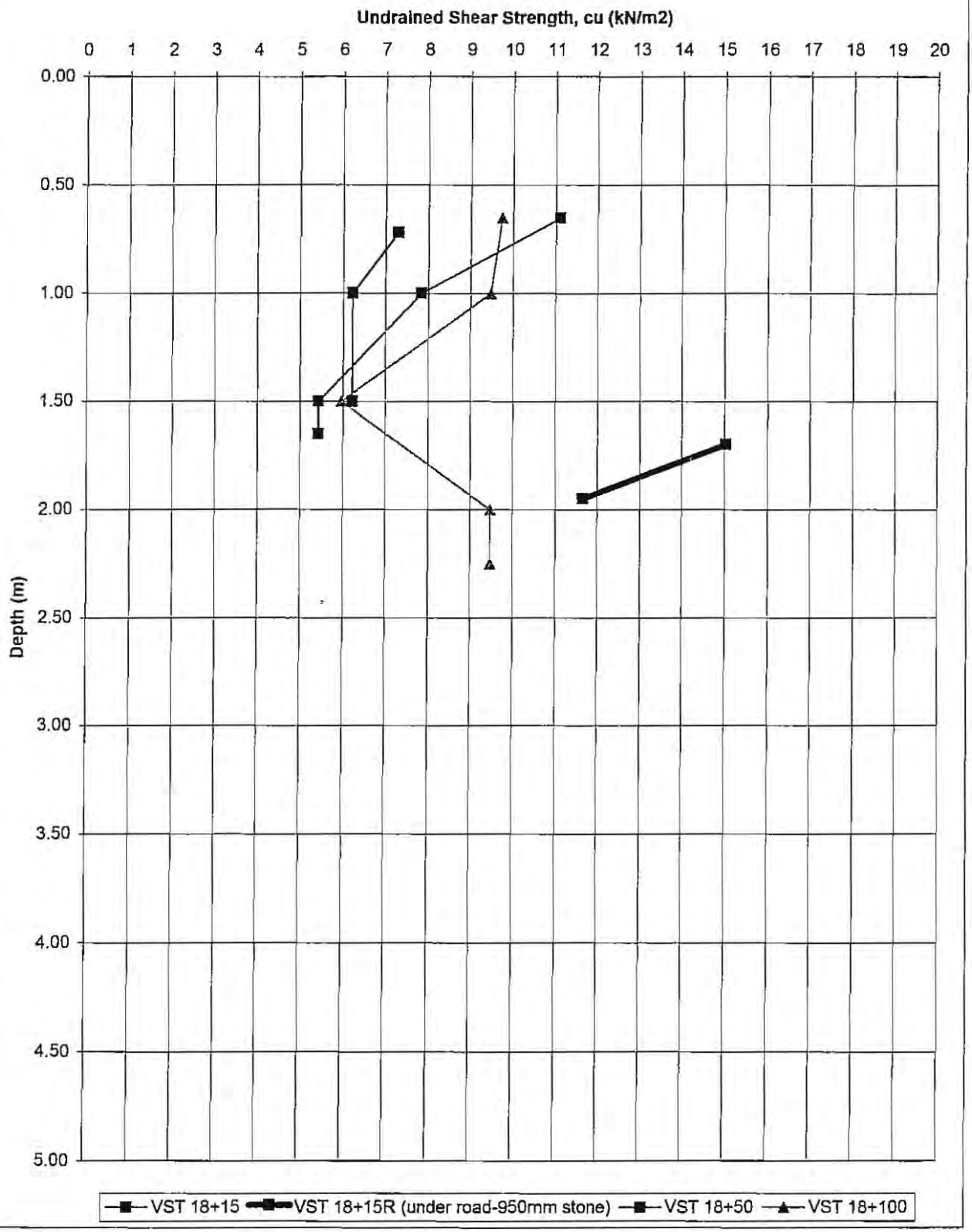
VST Results along downslope of floating road in Cell T17



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 18**	
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T18/P-100A		158153.7	203942.1	319.16	**2.50**	316.66	**4.2**	**3.8**
T18/P-100B				315.74	**2.20**	313.54		
T18/P-75A		158169.9	203921.9	318.39	**1.70**	316.69	**8.0**	**8.9**
T18/P-75B					**2.10**			
T18/P-50A		158184.9	203906.8	316.99	**2.20**	314.79	**4.2**	**4.0**
T18/P-50B				313.56	**2.10**	311.46		
T18/P-25A		158202.8	203886.9	315.58	**0.00**	315.58	**0.0**	**0.0**
T18/P-25B					**0.00**			
T18/P0A		158207.7	203850.9	313.71	**2.30**	311.41	**5.7**	**4.9**
T18/P0B				309.05	**1.70**	307.35		
T18/P25A		158249.8	203864.6	314.14	**2.10**	312.04	**2.0**	**1.3**
T18/P25B					**1.80**			
T18/P50A		158267.7	203884.6	315.51	**1.90**	313.61	**1.2**	**1.5**
T18/P50B				314.55	**2.20**	312.35		
T18/P+75A		158281	203903.5	316.90	**1.95**	314.95	**5.0**	**5.0**
T18/P+75B					**1.95**			
T18/P+100A		158298.5	203921.1	317.71	**2.40**	315.31	**3.3**	**3.0**
T18/P+100B				314.97	**2.15**	312.82		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T18 B-NE								
T18B-NW								
T18B-SE								
T18B-SW								
T18B-C								
T18B+50								
T18+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project:	Derrybrien Wind Farm		Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 18**
Job No.	03-104						
Test No.		VST 18+15	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	14.0	6.00	7.3				
1.00	12.0	6.00	6.2				
1.50	12.0	5.50	6.2				
Test No.		VST 18+15R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
1.70	28.0	8.00	15.0				
1.95	22.0	5.00	11.7				
Test carried out under road. Road finished, previously quite heavily trafficked.							
Construction of bases in surrounding locations complete.							
Road width 4.5 meters. Depth below road surface. Depth of road 0.95m							
Test No.		VST 18+50	Date:			Peat Depth (m)	1.90
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	21.0	6.00	11.1				
1.00	15.0	5.00	7.8				
1.50	10.5	4.00	5.4				
1.65	10.5	3.00	5.4				
Test No.		VST 18+100	Date:			Peat Depth (m)	2.5
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	18.5	7.50	9.7				
1.00	18.0	5.00	9.5				
1.50	11.5	3.50	6.0				
2.00	18.0	5.00	9.5				
2.25	18.0	4.50	9.5				

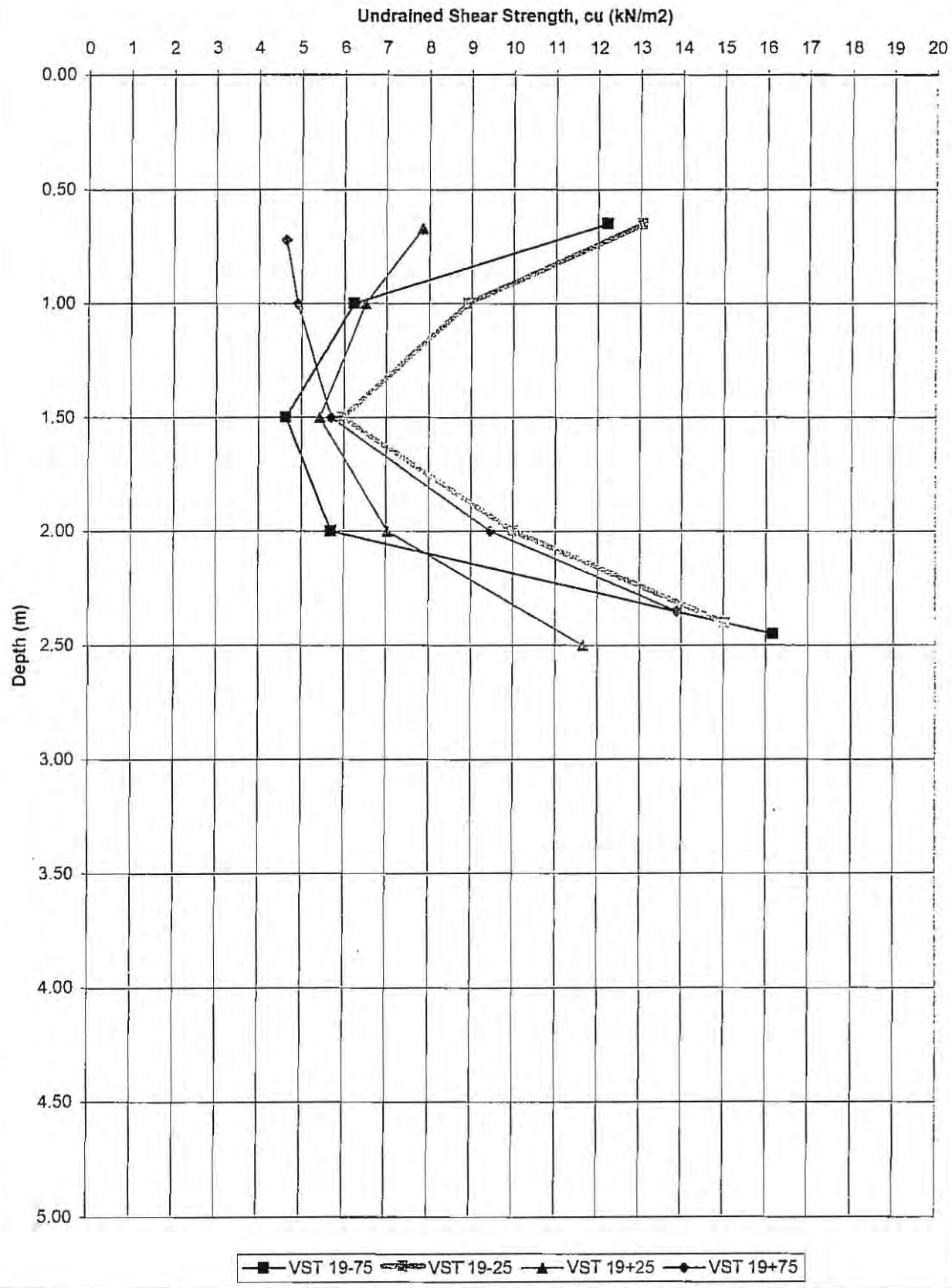
VST Results along downslope of floating road and under road in Cell T18



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 19**	
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T19/P-100A		159232.2	204594.3	355.99	2.40	353.59	**4.0**	**3.6**
T19/P-100B				352.70	2.10	350.60		
T19/P-75A		159257.1	204603.7	355.37	2.84	352.53	**3.5**	**3.5**
T19/P-75B				352.49	2.84	349.65		
T19/P-50A		159277.7	204612.9	354.82	2.90	351.92	**4.0**	**3.3**
T19/P-50B				351.53	2.32	349.21		
T19/P-25A		159299.5	204623.4	354.11	2.47	351.64	**1.7**	**0.9**
T19/P-25B				352.74	1.84	350.90		
T19/P0A		159322.7	204629.6	352.45	0.27	352.18	**3.5**	**5.4**
T19/P0B				349.57	1.84	347.73		
T19/P25A		159348.4	204641	353.37	3.27	350.10	**2.3**	**1.0**
T19/P25B				351.45	2.17	349.28		
T19/P50A		159371.2	204649	353.11	2.84	350.27	**1.7**	**1.2**
T19/P50B				351.74	2.42	349.32		
T19/P+75A		159393.6	204659.3	352.61	2.40	350.21	**1.2**	**2.7**
T19/P+75B				352.10	3.08	349.02		
T19/P+100A		159415.9	204670.8	351.96	2.24	349.72	**1.7**	**1.4**
T19/P+100B				350.59	2.00	348.59		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T19B-NE								
T19B-NW								
T19B-SE								
T19B-SW								
T19B-C								
T19B+50								
T19B+100								

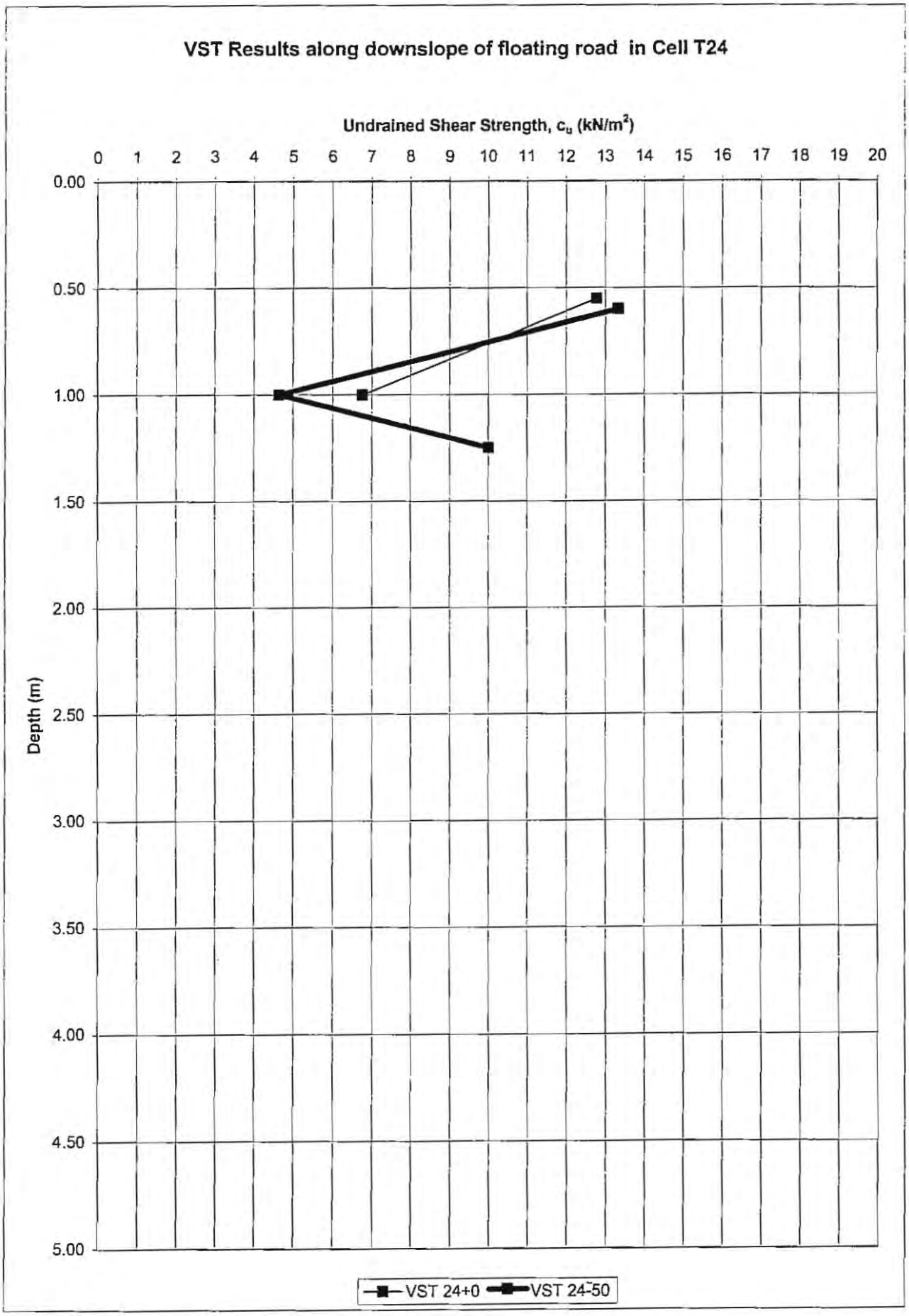
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. T19**
Job No. 03-104							
Test No.		VST 19-75	Date:			Peat Depth (m) 2.5	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	23.0	7.00	12.2				
1.00	12.0	6.00	6.2				
1.50	9.0	3.50	4.6				
2.00	11.0	4.00	5.7				
2.45	30.0	6.00	16.2				
Test No.		VST 19-25	Date:			Peat Depth (m) 2.4	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	24.5	11.00	13.1				
1.00	17.0	6.00	8.9				
1.50	11.5	4.50	6.0				
2.00	19.0	4.00	10.0				
2.40	28.0	5.50	15.0				
Test No.		VST 19+25	Date:			Peat Depth (m) 2.55	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.67	15.0	5.00	7.8				
1.00	12.5	4.00	6.5				
1.50	10.5	5.00	5.4				
2.00	13.5	5.50	7.0				
2.50	22.0	8.00	11.7				
Test No.		VST 19+75	Date:			Peat Depth (m) 2.4	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	9.0	4.00	4.6				
1.00	9.5	5.00	4.9				
1.50	11.0	4.50	5.7				
2.00	18.0	7.00	9.5				
2.35	26.0	4.00	13.9				

VST Results along downslope of floating road in Cell T19



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 24**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T24/P-100A					**1.65**		**1.5**	**2.0**
T24/P-100B					**1.85**			
T24/P-75A					**1.60**		**1.5**	**1.5**
T24/P-75B					**1.60**			
T24/P-50A					**1.60**		**1.5**	**2.2**
T24/P-50B					**1.90**			
T24/P-25A					**1.50**		**2.0**	**3.1**
T24/P-25B					**2.00**			
T24/P0A					**1.45**		**3.0**	**3.0**
T24/P0B					**1.45**			
T24/P25A					**1.10**		**2.5**	**3.1**
T24/P25B					**1.35**			
T24/P50A								
T24/P50B								
T24/P+75A								
T24/P+75B								
T24/P+100A								
T24/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T24B-NE								
T24B-NW								
T24B-SE								
T24B-SW								
T24B-C								
T24B+50								
T24B+100								

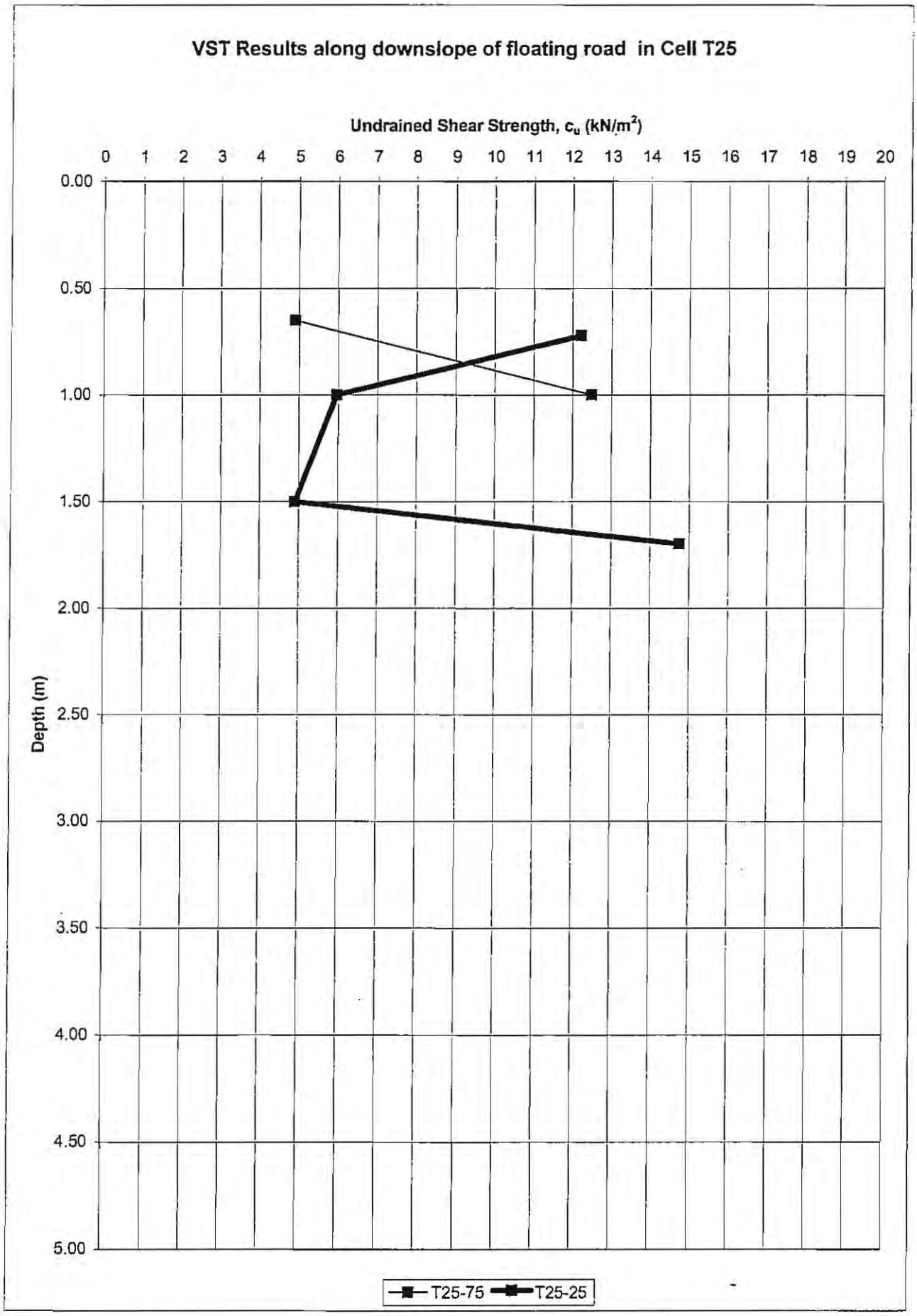
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 24**
Job No. 03-104							
Test No.		VST 24+0	Date:			Peat Depth (m) 1.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.55	24.0	7.00	12.8				
1.00	13.0	3.50	6.8				
Test No.		VST 24-50	Date:			Peat Depth (m) 1.5	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	25.0	6.0	13.3				
1.00	9.0	6.0	4.6				
1.25	19.0	4.5	10.0				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	


VST Results along downslope of floating road in Cell T24
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 24+0
VST 24-50

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 25**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T25/P-125A		159625.6	204763.9	347.31	**2.33**	344.98	**3.0**	**3.1**
T25/P-125B				344.85	**2.39**	342.46		
T25/P-100A		159648.3	204774.0	347.25	**0.84**	346.41	**3.3**	**4.1**
T25/P-100B				344.51	**1.46**	343.05		
T25/P-75A		159671.8	204785.8	347.45	**1.00**	346.45	**5.3**	**5.7**
T25/P-75B				343.07	**1.34**	341.73		
T25/P-50A		159695.4	204791.5	347.53	**2.08**	345.45	**3.3**	**3.0**
T25/P-50B				344.79	**1.84**	342.95		
T25/P-25A		159718.7	204790.8	347.08	**2.14**	344.94	**5.3**	**4.6**
T25/P-25B				342.70	**1.56**	341.14		
T25/P0A		159744.8	204796.8	346.62	**2.14**	344.48	**3.3**	**3.0**
T25/P0B				343.88	**1.90**	341.98		
T25/P25A		159767.0	204808.6	346.67	**1.84**	344.83	**5.3**	**6.0**
T25/P25B				342.29	**2.40**	339.89		
T25/P50A		159787.1	204822.2	346.04	**1.90**	344.14	**3.5**	**3.4**
T25/P50B		159811.3	204776.0	342.84	**1.84**	341.00		
T25/P+75A								
T25/P+75B								
T25/P+100A								
T25/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T25B-NE								
T25B-NW								
T25B-SE								
T25B-SW								
T25B-C								
T25B+50								
T25B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 25**
Job No. 03-104							
Test No.		T25-75	Date: 27th Sept 04			Peat Depth (m) 1.05	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	9.5	3.50	4.9				
1.00	23.5	3.50	12.5				
Test No.		T25-25	Date: 27th Sept 04			Peat Depth (m) 1.75	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.72	23	8.00	12.2				
1.00	11.5	4.00	6.0				
1.50	9.5	5.00	4.9				
1.70	27.5	4.00	14.7				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

Turbine/ Cell No.


VST Results along downslope of floating road in Cell T25
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
Depth (m)
T25-75
T25-25

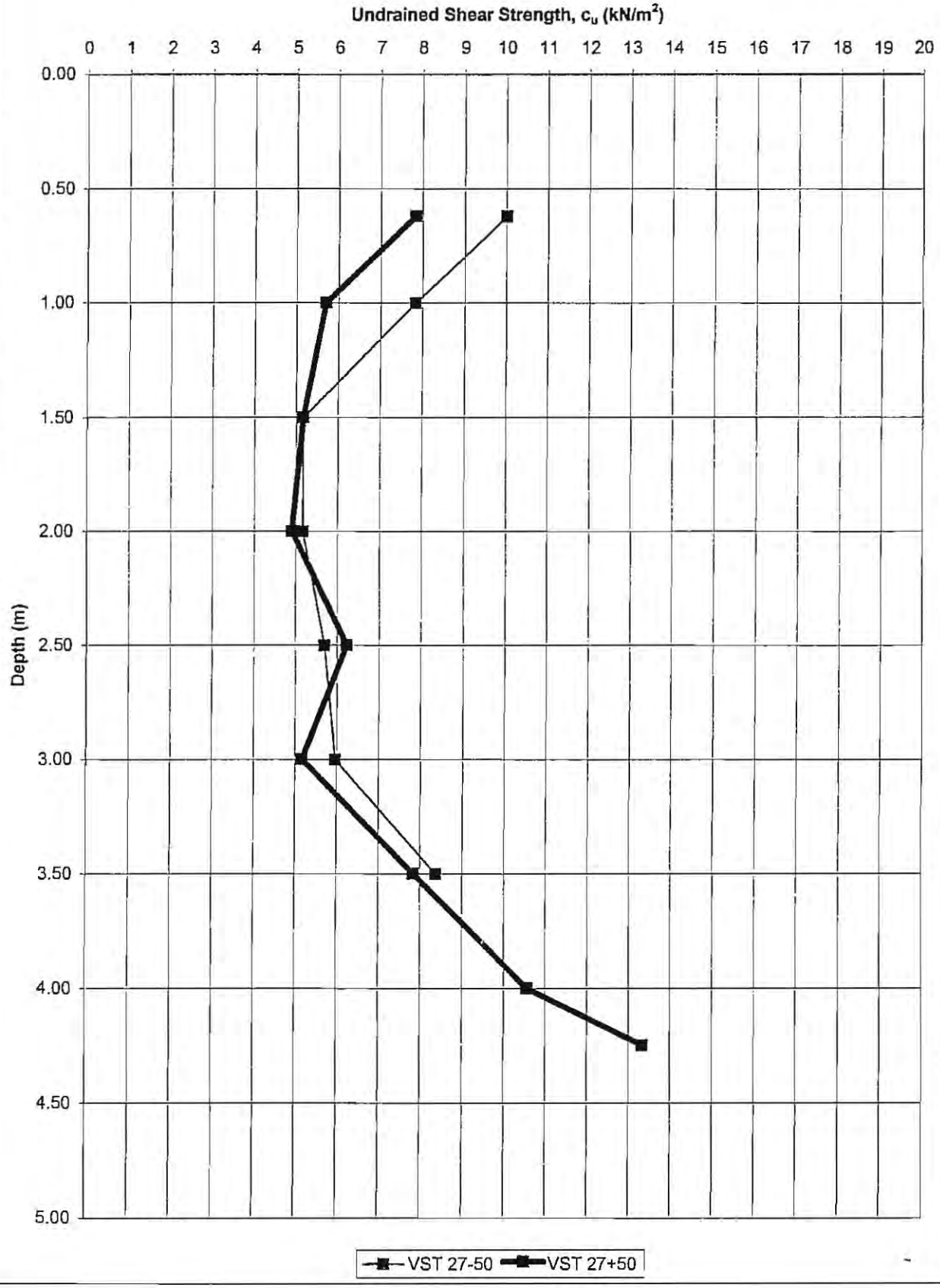
AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 27**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T27/P-100A					**3.60**		**0.5**	**-3.2**
T27/P-100B					**2.00**			
T27/P-75A					**3.95**		**0.0**	**-4.5**
T27/P-75B					**2.00**			
T27/P-50A					**4.50**		**0.0**	**-1.6**
T27/P-50B					**3.80**			
T27/P-25A					**4.50**		**0.5**	**1.2**
T27/P-25B					**4.80**			
T27/P0A					**3.80**		**0.5**	**1.2**
T27/P0B					**4.10**			
T27/P25A					**4.20**		**1.2**	**2.1**
T27/P25B					**4.60**			
T27/P50A					**3.90**		**1.5**	**3.6**
T27/P50B					**4.80**			
T27/P+75A					**3.50**		**1.0**	**4.4**
T27/P+75B					**5.00**			
T27/P+100A					**2.80**		**2.0**	**3.6**
T27/P+100B					**3.50**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T27B-NE								
T27B-NW								
T27B-SE								
T27B-SW								
T27B-C								
T27B+50								
T27B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 27**
Test No.		VST 27-50	Date:			Peat Depth (m) 3.80	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	19.0	4.50	10.0				
1.00	15.0	4.00	7.8				
1.50	10.0	3.50	5.2				
2.00	10.0	4.00	5.2				
2.50	11.0	4.00	5.7				
3.00	11.5	3.00	6.0				
3.50	16.0	3.00	8.4				
Test No.		VST 27+50	Date:			Peat Depth (m) 4.50	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.0	3.00	7.8				
1.00	11.0	4.00	5.7				
1.50	10.0	3.00	5.2				
2.00	9.5	3.00	4.9				
2.50	12.0	4.00	6.2				
3.00	10.0	3.50	5.2				
3.50	15.0	3.00	7.8				
4.00	20.0	5.00	10.6				
4.25	25.0	4.00	13.3				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Turbine/ Cell No.

Page of

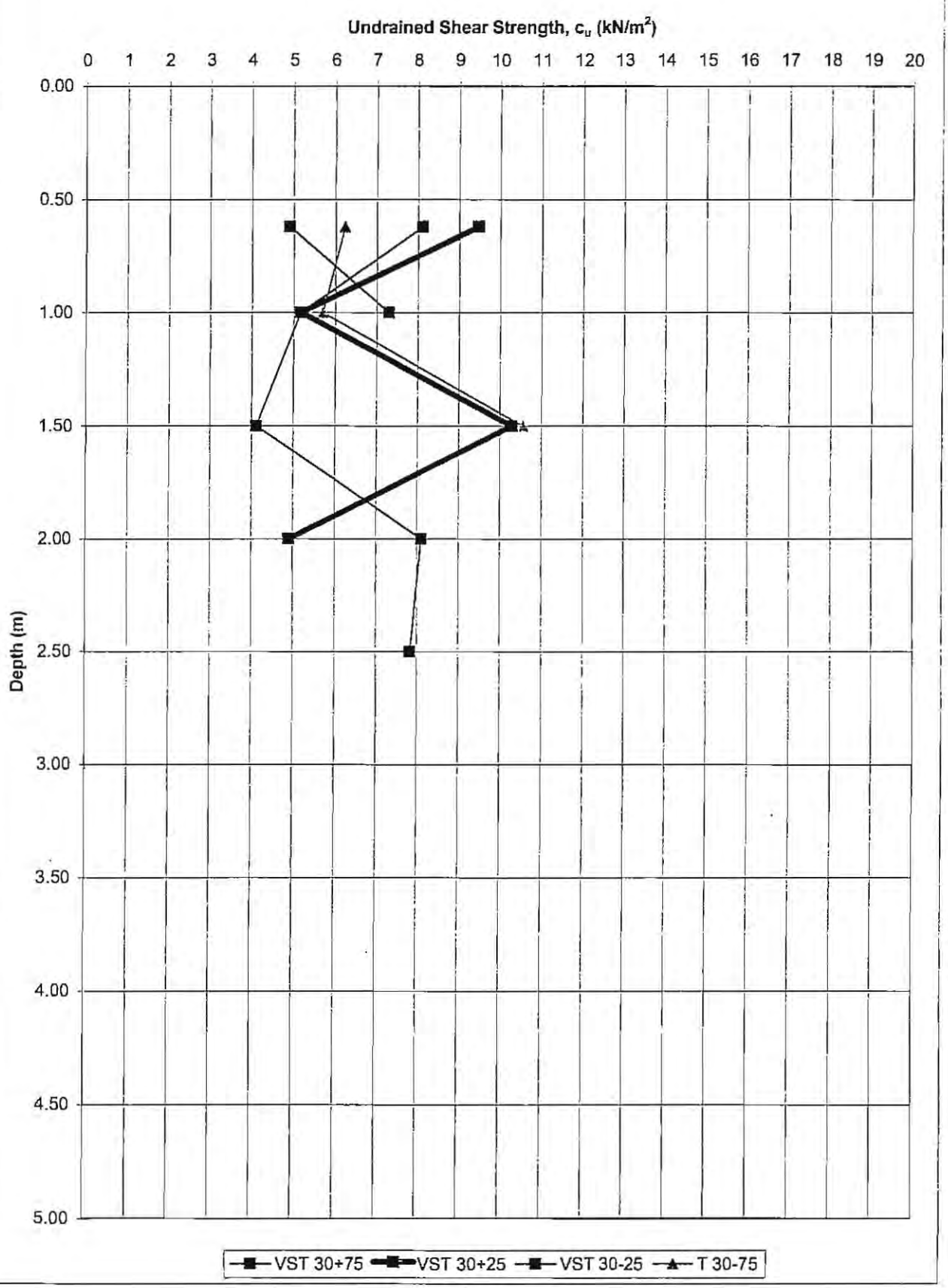
VST Results along downslope of floating road in Cell T27



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 30**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Pea	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T30/P-100A		159946.2	205307.8	337.39	**1.80**	335.59	**0.9**	**1.0**
T30/P-100B				337.69	**1.30**	336.39		
T30/P-75A		159969.8	205318.0	337.10	**1.60**	335.50	**2.1**	**0.9**
T30/P-75B				337.86	**1.60**	336.26		
T30/P-50A		159991.8	205329.2	337.40	**1.70**	335.70	**2.5**	**0.7**
T30/P-50B				338.12	**1.80**	336.32		
T30/P-25A		160014.8	205339.9	337.67	**1.80**	335.87	**2.2**	**0.3**
T30/P-25B				338.21	**2.10**	336.11		
T30/P0A		160036.4	205350.6	337.87	**1.90**	335.97	**1.4**	**0.5**
T30/P0B				338.20	**2.60**	335.60		
T30/P25A		160061	205358.2	337.70	**2.30**	335.40	**1.3**	**0.3**
T30/P25B				338.16	**3.00**	335.16		
T30/P50A		160083.2	205368.0	337.59	**2.30**	335.29	**0.5**	**0.6**
T30/P50B				337.76	**3.00**	334.76		
T30/P+75A		160105.1	205379.0	337.53	**2.60**	334.93	**0.4**	**0.6**
T30/P+75B				337.43	**3.00**	334.43		
T30/P+100A		160129.6	205384.8	337.24	**2.80**	334.44	**0.5**	**0.3**
T30/P+100B				337.37	**3.20**	334.17		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T30B-NE								
T30B-NW								
T30B-SE								
T30B-SW								
T30B-C		160039.0	205334.0					
T30B+50								
T30B+100								

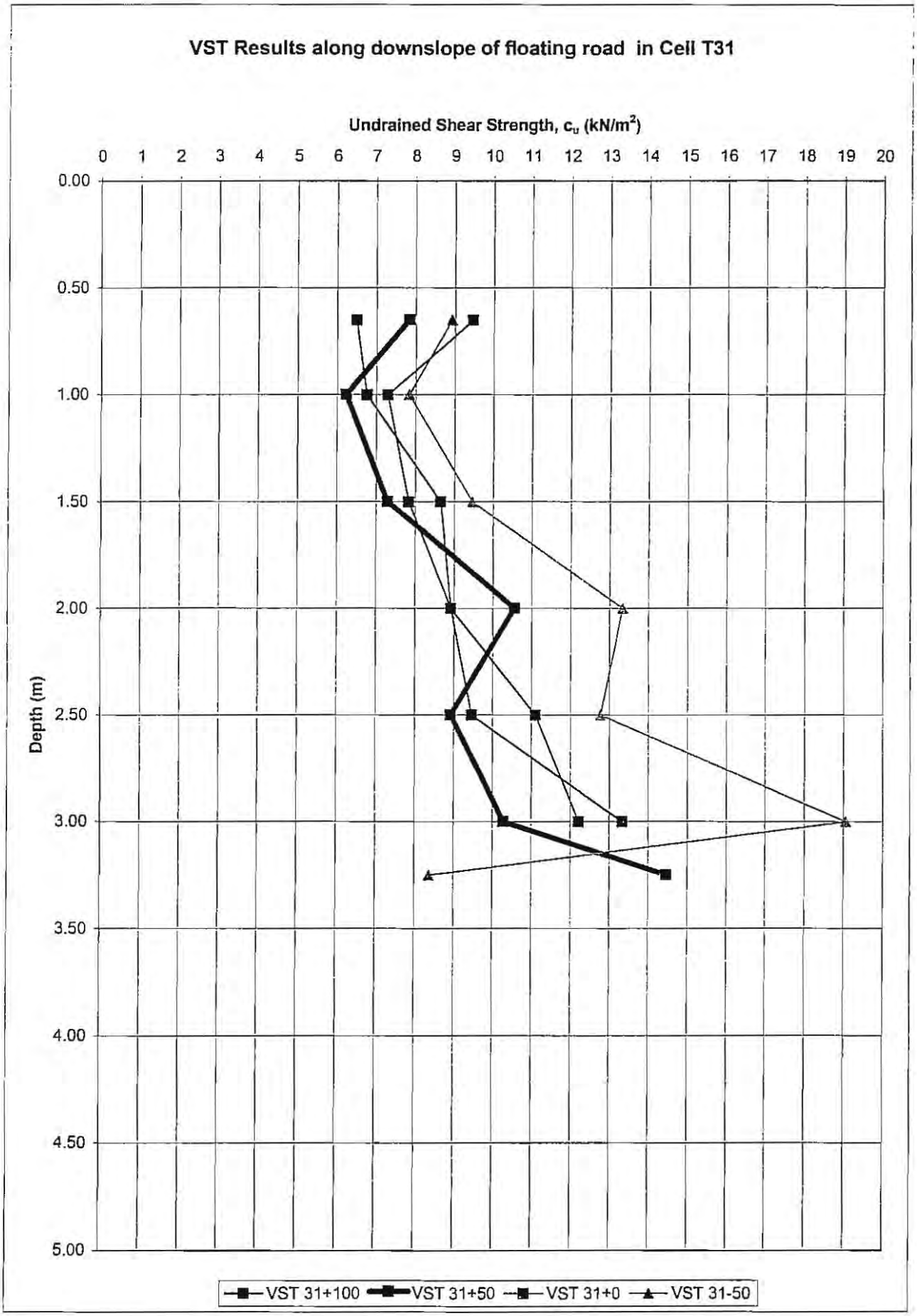
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 30**
Job No. 03-104							
Test No.		VST 30+75	Date: 24th Sept 04			Peat Depth (m)	2.65
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.5	6.50	8.1				
1.00	10.0	5.00	5.2				
1.50	8.0	5.50	4.1				
2.00	15.5	5.50	8.1				
2.50	15.0	3.00	7.8				
Test No.		VST 30+25	Date: 24th Sept 04			Peat Depth (m)	2.03
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	18.0	5.00	9.5				
1.00	10.0	4.00	5.2				
1.50	19.5	6.00	10.3				
2.00	9.5	3.00	4.9				
Test No.		VST 30-25	Date: 24th sept 04			Peat Depth (m)	1.32
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	9.5	4.50	4.9				
1.00	14.0	4.00	7.3				
Test No.		VST 30-75	Date: 24th sept 04			Peat Depth (m)	1.63m
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	12.0	7.00	6.2				
1.00	11.0	4.00	5.7				
1.50	20.0	4.50	10.6				

VST Results along downslope of floating road in Cell T30



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 31**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T31/P-100A					**2.20**		**1.0**	**2.4**
T31/P-100B					**2.80**			
T31/P-75A					**3.20**		**2.0**	**2.3**
T31/P-75B					**3.35**			
T31/P-50A					**3.50**		**1.2**	**2.8**
T31/P-50B					**4.20**			
T31/P-25A					**4.00**		**2.3**	**2.3**
T31/P-25B					**4.00**			
T31/P0A					**4.70**		**2.3**	**1.4**
T31/P0B					**4.30**			
T31/P25A					**3.80**		**3.0**	**1.6**
T31/P25B					**3.20**			
T31/P50A					**3.30**		**2.5**	**0.7**
T31/P50B					**2.50**			
T31/P+75A					**2.35**		**2.0**	**3.0**
T31/P+75B					**2.80**			
T31/P+100A					**3.30**		**2.0**	**1.1**
T31/P+100B					**2.90**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T31B-NE								
T31B-NW								
T31B-SE								
T31B-SW								
T31B-C								
T31B+50								
T31B+100								

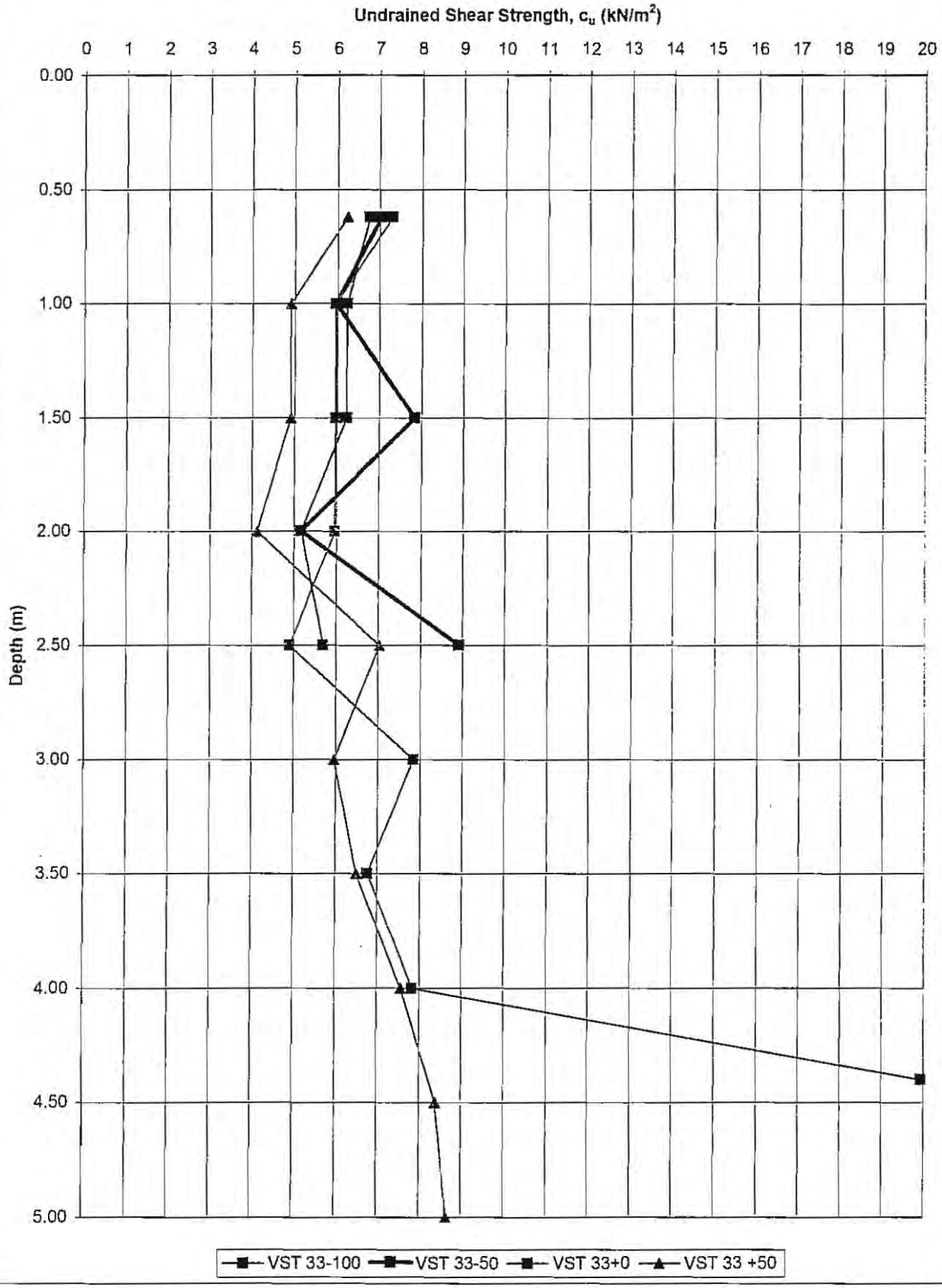
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 31**
Job No. 03-104							
Test No.		VST 31+100	Date:			Peat Depth (m) 3.3	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	12.5	3.00	6.5				
1.00	13.0	3.00	6.8				
1.50	16.5	4.00	8.6				
2.00	17.0	4.00	8.9				
2.50	18.0	4.50	9.5				
3.00	25.0	4.00	13.3				
Test No.		VST 31+50	Date:			Peat Depth (m) 3.5	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	15.0	3.50	7.8				
1.00	12.0	3.50	6.2				
1.50	14.0	3.00	7.3				
2.00	20.0	3.50	10.6				
2.50	17.0	4.00	8.9				
3.00	19.5	4.00	10.3				
3.25	27.0	5.00	14.5				
Test No.		VST 31+0	Date:			Peat Depth (m) 3.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	18.0	4.50	9.5				
1.00	14.0	4.00	7.3				
1.50	15.0	5.00	7.8				
2.00	17.0	4.50	8.9				
2.50	21.0	3.50	11.1				
3.00	23.0	5.00	12.2				
Test No.		VST 31-50	Date:			Peat Depth (m) 3.5	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	17.0	4.00	8.9				
1.00	15.0	3.50	7.8				
1.50	18.0	3.50	9.5				
2.00	25.0	4.00	13.3				
2.50	24.0	5.00	12.8				
3.00	35.0	4.50	19.1				
3.25	16.0	4.00	8.4				


VST Results along downslope of floating road in Cell T31
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
VST 31+100
VST 31+50
VST 31+0
VST 31-50

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 33**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T33/P-100A		160128.9	205377.7	341.61	**2.80**	338.81	**0.5**	**1.4**
T33/P-100B					**3.50**			
T 33/P-75A		160152.7	205384.5	341.58	**3.40**	338.18	**0.5**	**0.7**
T33/P-75B					**3.60**			
T33/P-50A		160175.8	205392.3	341.43	**3.40**	338.03	**0.5**	**1.0**
T33/P-50B					**3.80**			
T33/P-25A		160197.5	205402.2	341.35	**3.80**	337.55	**0.5**	**0.9**
T33/P-25B					**4.10**			
T33/P0A		160221.7	205414.1	341.07	**4.00**	337.07	**0.5**	**1.5**
T33/P0B					**4.80**			
T33/P25A		160242.4	205422.2	341.03	**4.80**	336.23	**0.5**	**-0.2**
T33/P25B					**4.20**			
T33/P50A		160265.4	205430.7	340.92	**4.80**	336.12	**0.5**	**0.9**
T33/P50B					**5.10**			
T33/P+75A		160287.2	205440.9	340.85	**4.90**		**0.5**	**-0.5**
T33/P+75B					**4.10**			
T33/P+100A		160309.5	205451.2	340.41	**5.40**		**0.5**	**-1.2**
T33/P+100B					**4.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T33B-NE								
T33B-NW								
T33B-SE								
T33B-SW								
T33B-C		160224.0	205410.0					
T33B+50								
T33B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 33**
Job No. 03-104							
Test No.		VST 33-100	Date:			Peat Depth (m) 2.6	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	13.0	6.50	6.8				
1.00	12.0	5.50	6.2				
1.50	12.0	4.50	6.2				
2.00	10.0	4.00	5.2				
2.50	11.0	5.50	5.7				
Test No.		VST 33-50	Date:			Peat Depth (m) 2.55	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	13.5	5.50	7.0				
1.00	11.5	5.50	6.0				
1.50	15.0	4.00	7.8				
2.00	10.0	3.50	5.2				
2.50	17.0	3.00	8.9				
Test No.		VST 33+0	Date:			Peat Depth (m) 4.45	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	14.0	4.50	7.3				
1.00	11.5	4.00	6.0				
1.50	11.5	4.00	6.0				
2.00	11.5	3.50	6.0				
2.50	9.5	4.50	4.9				
3.00	15.0	5.00	7.8				
3.50	13.0	4.00	6.8				
4.00	15.0	5.00	7.8				
4.40	36.5	5.50	19.9				
Test No.		VST 33+50	Date:			Peat Depth (m) 5.2	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	12.0	5.50	6.2				
1.00	9.5	5.00	4.9				
1.50	9.5	4.50	4.9				
2.00	8.0	5.50	4.1				
2.50	13.5	4.50	7.0				
3.00	11.5	5.00	6.0				
3.50	12.5	4.50	6.5				
4.00	14.5	4.00	7.6				
4.50	16.0	4.00	8.4				
5.00	16.5	5.00	8.6				

VST Results along downslope of floating road in Cell T33



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 34**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T34/P-100A					**2.90**		**1.3**	**-1.1**
T34/P-100B					**0.90**			
T34/P-75A					**2.70**		**1.0**	**-0.6**
T34/P-75B					**2.20**			
T34/P-50A					**2.30**		**2.3**	**1.7**
T34/P-50B					**1.80**			
T34/P-25A					**1.80**		**1.5**	**2.0**
T34/P-25B					**2.20**			
T34/P0A					**1.80**		**2.0**	**2.4**
T34/P0B					**2.10**			
T34/P25A					**1.90**		**4.0**	**3.8**
T34/P25B					**1.70**			
T34/P50A					**1.90**		**3.0**	**2.8**
T34/P50B					**1.70**			
T34/P+75A					**2.50**		**3.8**	**2.8**
T34/P+75B					**1.70**			
T34/P+100A					**2.40**		**3.7**	**3.0**
T34/P+100B					**1.80**			
T34/P+125A					**1.70**		**4.0**	**4.4**
T34/P+125B					**2.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T34B-NE								
T34B-NW								
T34B-SE								
T34B-SW								
T34B-C								
T34B+50								
T34B+100								

Turbine/ Cell No.

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 34**
Test No.		VST 34-100	Date:			Peat Depth (m) 3.07	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.74	14.0	4.00	7.3				
1.00	14.0	4.50	7.3				
1.50	12.0	4.00	6.2				
2.00	10.0	4.00	5.2				
2.50	15.0	5.00	7.8				
3.00	19.0	4.00	10.0				
Test No.		VST 34-50	Date:			Peat Depth (m) 2.3	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	24.0	6.00	12.8				
1.00	19.0	5.50	10.0				
1.50	16.0	4.50	8.4				
2.00	17.0	4.50	8.9				
Test No.		VST 34+0	Date:			Peat Depth (m) 1.7	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	16.0	6.00	8.4				
1.00	19.0	8.50	10.0				
1.50	19.5	7.00	10.3				
Test No.		VST 34+50	Date:			Peat Depth (m) 1.9	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.68	21.0	5.50	11.1				
1.00	9.5	5.00	4.9				
1.50	11.0	5.00	5.7				
1.85	11.5	3.00	6.0				

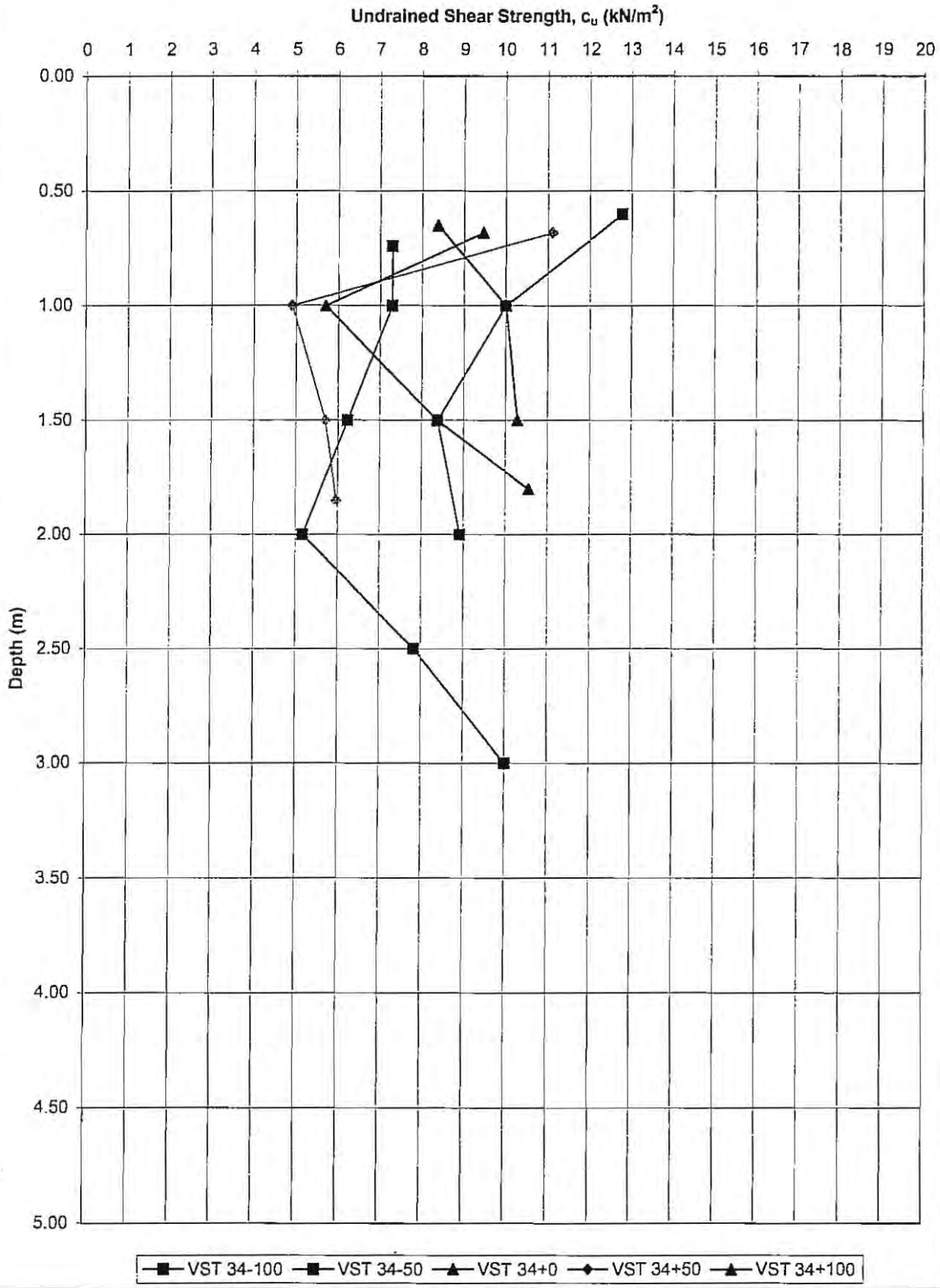
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 34**
Test No.		VST 34+100	Date:			Peat Depth (m) 1.84	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.68	18.0	4.50	9.5				
1.00	11.0	5.00	5.7				
1.50	16.0	4.00	8.4				
1.80	20.0	3.00	10.6				

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

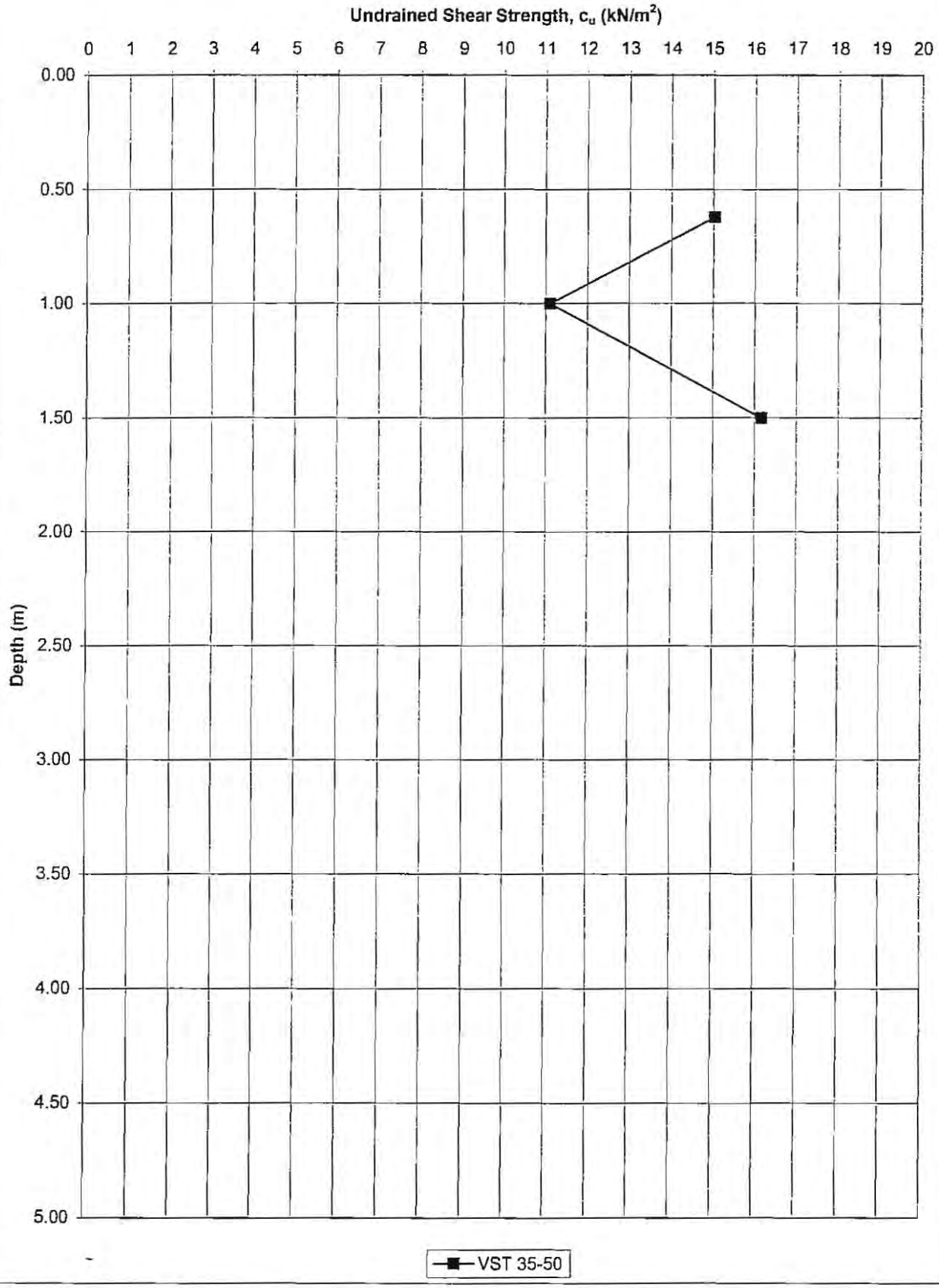
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

VST Results along downslope of floating road in Cell T 34



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 35**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T35/P-100A		160377.9	204818.7	311.0	**0.40**	310.6	**4.5**	**4.5**
T35/P-100B				307.3	**0.44**	306.9		
T35/P-75A		160401.9	204820.7	309.7	**1.10**	308.6	**5.5**	**5.2**
T35/P-75B				305.2	**0.84**	304.3		
T35/P-50A		160423.8	204831.2	309.4	**1.85**	307.6	**12.0**	**10.6**
T35/P-50B				299.4	**0.65**	298.8		
T35/P-25A		160445.8	204842.5	307.5	**0.65**	306.8	**4.5**	**4.5**
T35/P-25B				303.8	**0.65**	303.1		
T35/P0A		160468.4	204852.6	307.3	**0.40**	306.9	**6.7**	**7.0**
T35/P0B				301.8	**0.70**	301.1		
T35/P25A		160492.4	204860.6	307.1	**0.10**	307.0	**6.3**	**7.3**
T35/P25B				301.9	**0.90**	301.0		
T35/P50A		160516.7	204872.0	306.2	**0.84**	305.3	**6.5**	**5.8**
T35/P50B				300.8	**0.30**	300.5		
T35/P+75A		160533.1	204886.5	305.8	**0.54**	305.3	**2.5**	**2.2**
T35/P+75B				303.8	**0.26**	303.5		
T35/P+100A		160555.5	204896.1	305.8	**0.84**	305.0	**2.7**	**3.1**
T35/P+100B				303.6	**1.20**	302.4		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T35B-NE								
T35B-NW								
T35B-SE								
T35B-SW								
T35B-C								
T35B+50								
T35B+100								

VST Results along downslope of floating road in Cell T35



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 36**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T36/P-100A		160333.6	205459.1	340.48	4.38	336.10	**0.1**	**-0.7**
T36/P-100B		160329.2	205472.4	340.43	3.78	336.65		
T36/P-75A		160355.1	205468.4	340.10	3.88	336.22	**0.7**	**-0.3**
T36/P-75B		160348.7	205482.0	339.86	3.40	336.46		
T36/P-50A		160376.7	205478.5	339.61	3.38	336.23	**0.2**	**-0.7**
T36/P-50B		160369.6	205495.7	339.41	2.58	336.83		
T36/P-25A		160398.6	205490.4	339.11	2.90	336.21	**0.3**	**0.1**
T36/P-25B		160393.9	205505.2	338.81	2.70	336.11		
T36/P0A		160433.6	205502.9	338.26	3.18	335.08	**0.6**	**0.1**
T36/P0B		160426.0	205520.0	337.72	2.70	335.02		
T36/P25A		160456.5	205510.8	337.38	2.90	334.48	**0.6**	**0.1**
T36/P25B		160447.0	205530.5	337.32	2.90	334.42		
T36/P50A		160480.2	205518.0	336.75	2.88	333.87	**0.3**	**0.1**
T36/P50B		160470.0	205541.4	336.75	3.00	333.75		
T36/P+75A		160503.1	205526.4	335.96	2.78	333.18	**0.2**	**0.1**
T36/P+75B		160492.8	205549.5	335.97	2.90	333.07		
T36/P+100A		160525.8	205534.5	335.40	2.00	333.40	**0.5**	**0.0**
T36/P+100B		160514.4	205556.3	335.39	2.00	333.39		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T36B-NE								
T36B-NW								
T36B-SE								
T36B-SW								
T36B-C		160435.0	205499.0					
T36B+50								
T36B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 39**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T39/P-125A		160524.7	205535.0	339.0			**0.8**	**0.0**
T39/P-125B		160516.0	205552.7	339.3				
T39/P-100A		160546.7	205546.7	338.4	**2.50**	335.88	**0.7**	**2.5**
T39/P-100B		160541.6	205556.0	338.5	**3.10**	335.41		
T39/P-75A					**2.00**			
T39/P-75B					**2.50**			
T39/P-50A		160567.2	205561.8	337.1	**1.90**	335.18	**0.5**	**-0.5**
T39/P-50B		160562.0	205570.1	337.2	**1.90**	335.27		
T39/P-25A		160587.1	205574.7	336.2	**2.38**	333.85	**0.3**	**-1.3**
T39/P-25B		160581.7	205584.7	336.3	**2.18**	334.11		
T39/P0A		160605.4	205590.3	335.5	**2.88**	332.62	**0.6**	**-2.2**
T39/P0B		160600.2	205599.3	335.4	**2.38**	333.01		
T39/P25A		160628.6	205603.4	334.5	**3.28**	331.19	**0.4**	**-2.8**
T39/P25B		160621.0	205615.3	334.6	**2.70**	331.88		
T39/P50A		160652.6	205611.6	333.5	**2.40**	331.09	**1.2**	**-0.1**
T39/P50B		160654.8	205625.3	333.2	**2.08**	331.11		
T39/P+75A		160679.4	205613.0	332.3	**1.88**	330.47	**0.6**	**2.9**
T39/P+75B		160680.0	205626.4	332.2	**2.40**	329.80		
T39/P+100A		160701.6	205610.9	331.0	**1.88**	329.14	**1.2**	**1.9**
T39/P+100B		160700.2	205621.8	331.2	**2.48**	328.77		
East								

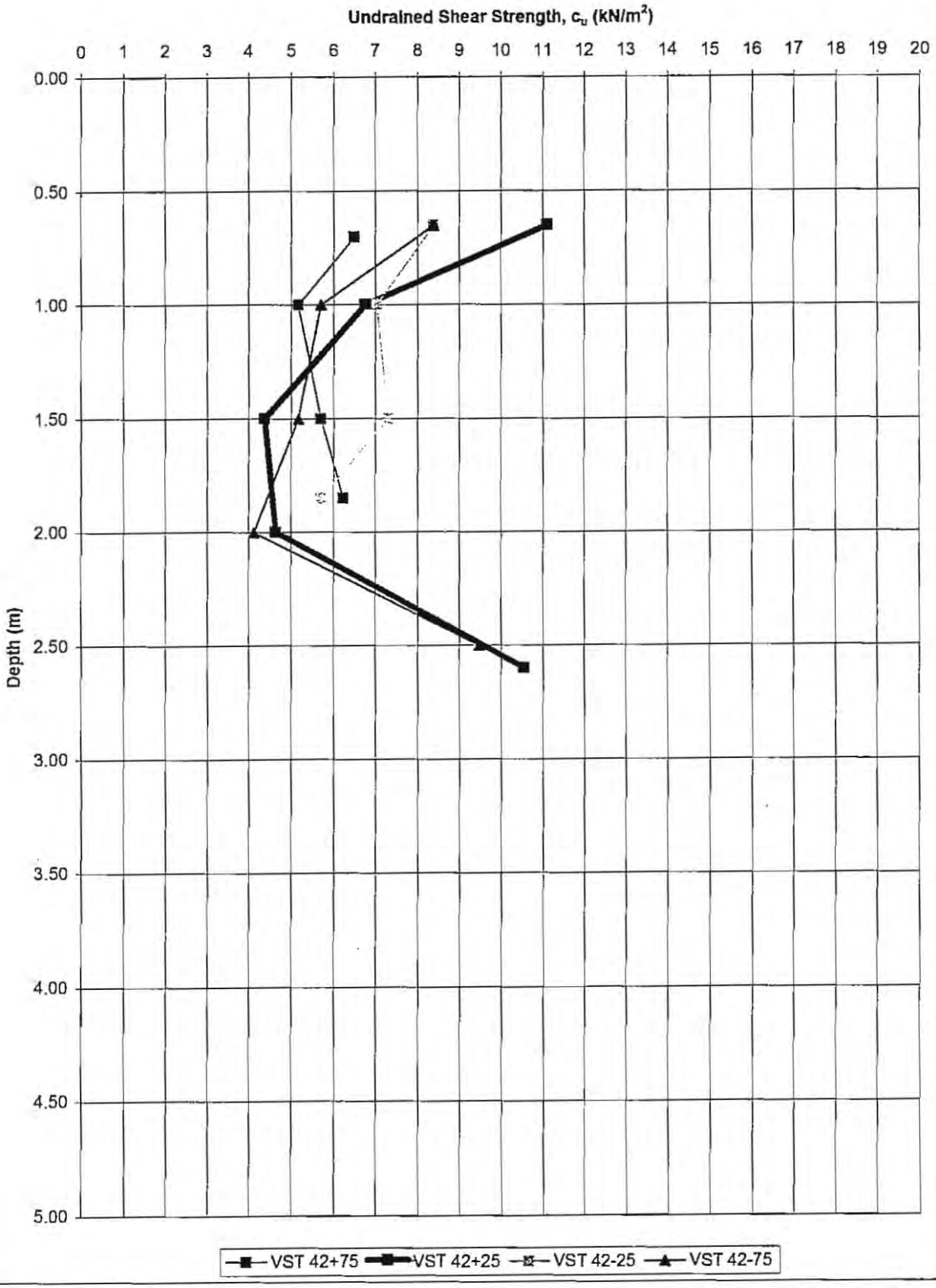
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively
ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road

Probes On Turbine Base								
T39B-NE								
T39B-NW								
T39B-SE								
T39B-SW								
T39B-C								
T39B+50								
T39B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 42**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T42/P-150A					**3.20**		**0.0**	**0.2**
T42/P-150B					**3.40**			
T42/P-125A					**2.80**		**1.5**	**1.9**
T42/P-125B					**3.10**			
T42/P-100A		160744.4	205607.9	325.14	**1.90**	323.24	**0.0**	**0.0**
T42/P-100B				325.14	**1.90**	323.24		
T42/P-75A		160770.9	205607.1	324.34	**3.00**		**0.8**	**0.1**
T42/P-75B					**2.40**			
T42/P-50A		160795.0	205602.7	323.22	**1.84**	321.38	**1.5**	**1.5**
T42/P-50B				321.99	**1.84**	320.15		
T42/P-25A		160817.9	205599.3	322.23	**2.10**	320.13	**1.5**	**1.0**
T42/P-25B				321.00	**1.70**	319.30		
T42/P0A		160843.5	205589.2	320.41	**2.30**	318.11	**0.5**	**0.4**
T42/P0B				320.00	**2.20**	317.80		
T42/P25A		160872.8	205600.6	318.65	**2.30**	316.35	**1.5**	**1.3**
T42/P25B				317.42	**2.10**	315.32		
T42/P50A		160891.8	205594.7	318.29	**2.20**	316.09	**2.5**	**2.9**
T42/P50B				316.24	**2.50**	313.74		
T42/P+75A		160916.5	205592.4	317.25	**2.50**	314.75	**2.5**	**2.9**
T42/P+75B				315.20	**2.84**	312.36		
T42/P+100A		160940.4	205590.0	316.49	**2.40**	314.09	**1.5**	**2.1**
T42/P+100B				315.26	**2.90**	312.36		
T42/P+125A					**3.14**		**1.7**	**2.5**
T42/P+125B					**3.80**			
T42/P+150A					**2.70**		**1.7**	**2.5**
T42/P+150B					**3.40**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T42B-NE								
T42B-NW								
T42B-SE								
T42B-SW								
T42B-C								
T42B+50								
T42B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 42**
Job No. 03-104							
Test No.		VST 42+75	Date:			Peat Depth (m) 2.1	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	12.5	3.50	6.5				
1.00	10.0	3.00	5.2				
1.50	11.0	3.00	5.7				
1.85	12.0	3.00	6.2				
Test No.		VST 42+25	Date:			Peat Depth (m) 2.8	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	21.0	4.50	11.1				
1.00	13.0	4.00	6.8				
1.50	8.5	3.00	4.4				
2.00	9.0	3.50	4.6				
2.60	20.0	4.00	10.6				
Test No.		VST 42-25	Date:			Peat Depth (m) 2.1	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	16.0	3.50	8.4				
1.00	13.5	4.00	7.0				
1.50	14.0	3.50	7.3				
1.85	11.0	4.00	5.7				
Test No.		VST 42-75	Date:			Peat Depth (m) 2.75	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	16.0	4.00	8.4				
1.00	11.0	3.00	5.7				
1.50	10.0	3.00	5.2				
2.00	8.0	3.00	4.1				
2.50	18.0	4.00	9.5				

VST Results along downslope of floating road in Cell T42

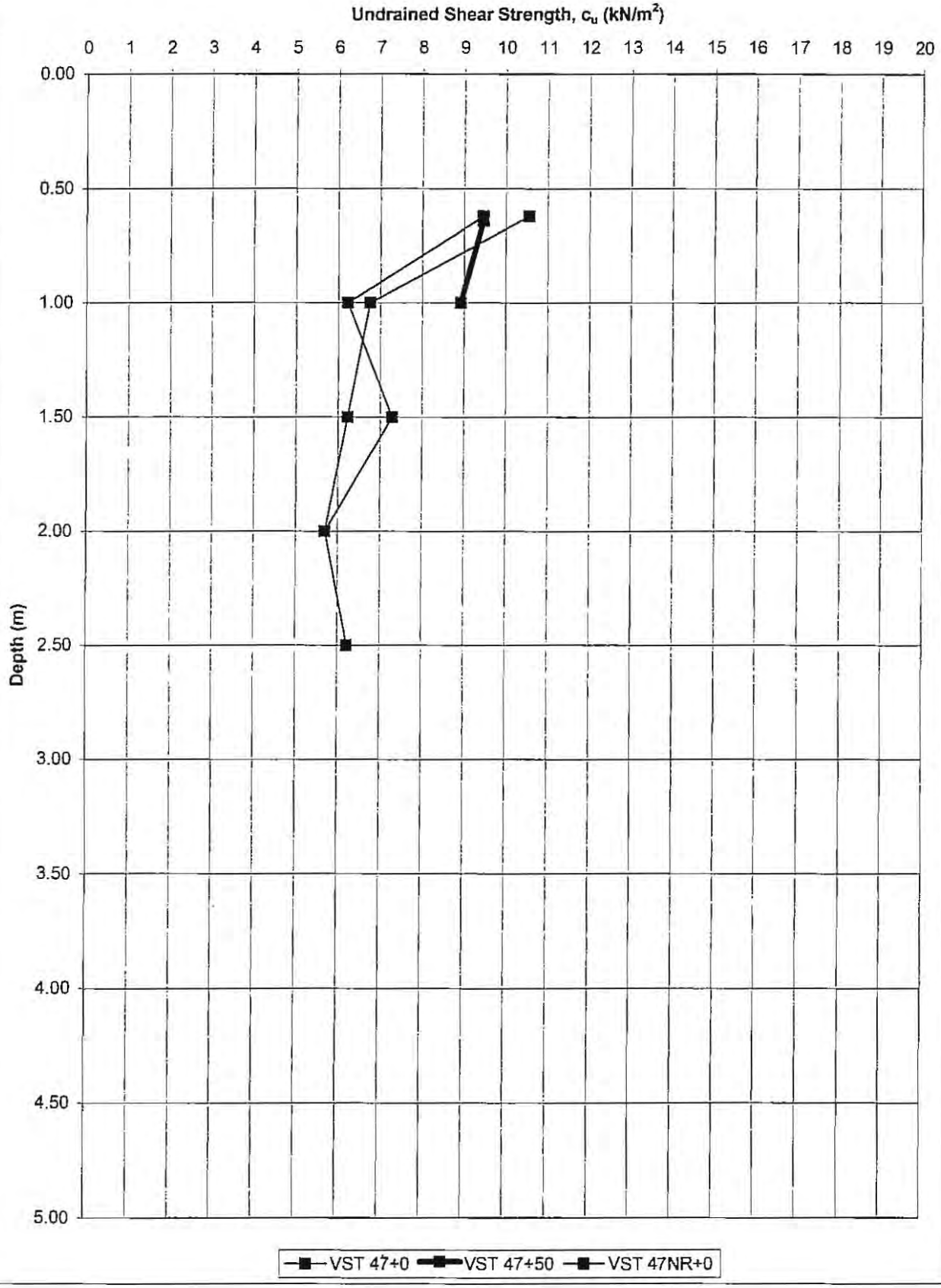


AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 47**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T47/P-100A								
T47/P-100B								
T47/P-75A								
T47/P-75B								
T47/P-50A								
T47/P-50B								
T47/P-25A								
T47/P-25B								
T47/P0A					**2.80**			
T47/P0B					**1.60**		**2.5**	**1.0**
T47/P25A					**2.15**			
T47/P25B					**1.60**		**2.5**	**1.8**
T47/P50A					**1.20**			
T47/P50B					**2.40**		**6.3**	**7.8**
T47/P+75A					**0.90**			
T47/P+75B					**1.50**		**11.0**	**11.7**
T47/P+100A					**2.40**			
T47/P+100B					**1.20**		**12.0**	**10.6**
T47/P+125A					**0.80**			
T47/P+125B					**1.50**		**6.0**	**6.8**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T47B-NE					**2.10**			
T47B-NW					**1.80**			
T47B-SE					**1.80**			
T47B-SW					**2.00**			
T47B-C					**1.70**			
T47+50					**1.60**			
T47+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 47NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T47/P-100A								
T47/P-100B								
T47/P-75A								
T47/P-75B								
T47/P-50A								
T47/P-50B								
T47/P-25A								
T47/P-25B								
T47/P0A					**3.10**		**0.8**	**0.0**
T47/P0B					**2.80**			
T47/P25A					**2.50**			
T47/P25B					**2.15**			
T47/P50A					**1.24**		**0.3**	**0.2**
T47/P50B					**1.20**			
T47/P+75A								
T47/P+75B								
T47/P+100A					**1.70**		**0.0**	**2.0**
T47/P+100B					**2.40**			
T47/P+125A								
T47/P+125B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 20m downslope from road								
Probes On Turbine Base								
T47B-NE								
T47B-NW								
T47B-SE								
T47B-SW								
T47B-C								
T47B+50								
T47B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 47**
Test No.		VST 47+0	Date:			Peat Depth (m) 2.01	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	20.0	8.50	10.6				
1.00	13.0	5.50	6.8				
1.50	12.0	9.00	6.2				
2.00	11.0	5.50	5.7				
Test No.		VST 47+50	Date:			Peat Depth (m) 1.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.64	18.0	4.50	9.5				
1.00	17.0	5.50	8.9				
Test No.		VST 47NR+0	Date:			Peat Depth (m) 2.65	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	18.0	4.50	9.5				
1.00	12.0	5.50	6.2				
1.50	14.0	6.00	7.3				
2.00	11.0	5.00	5.7				
2.50	12.0	4.50	6.2				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

VST Results along downslope of floating road in Cell T47



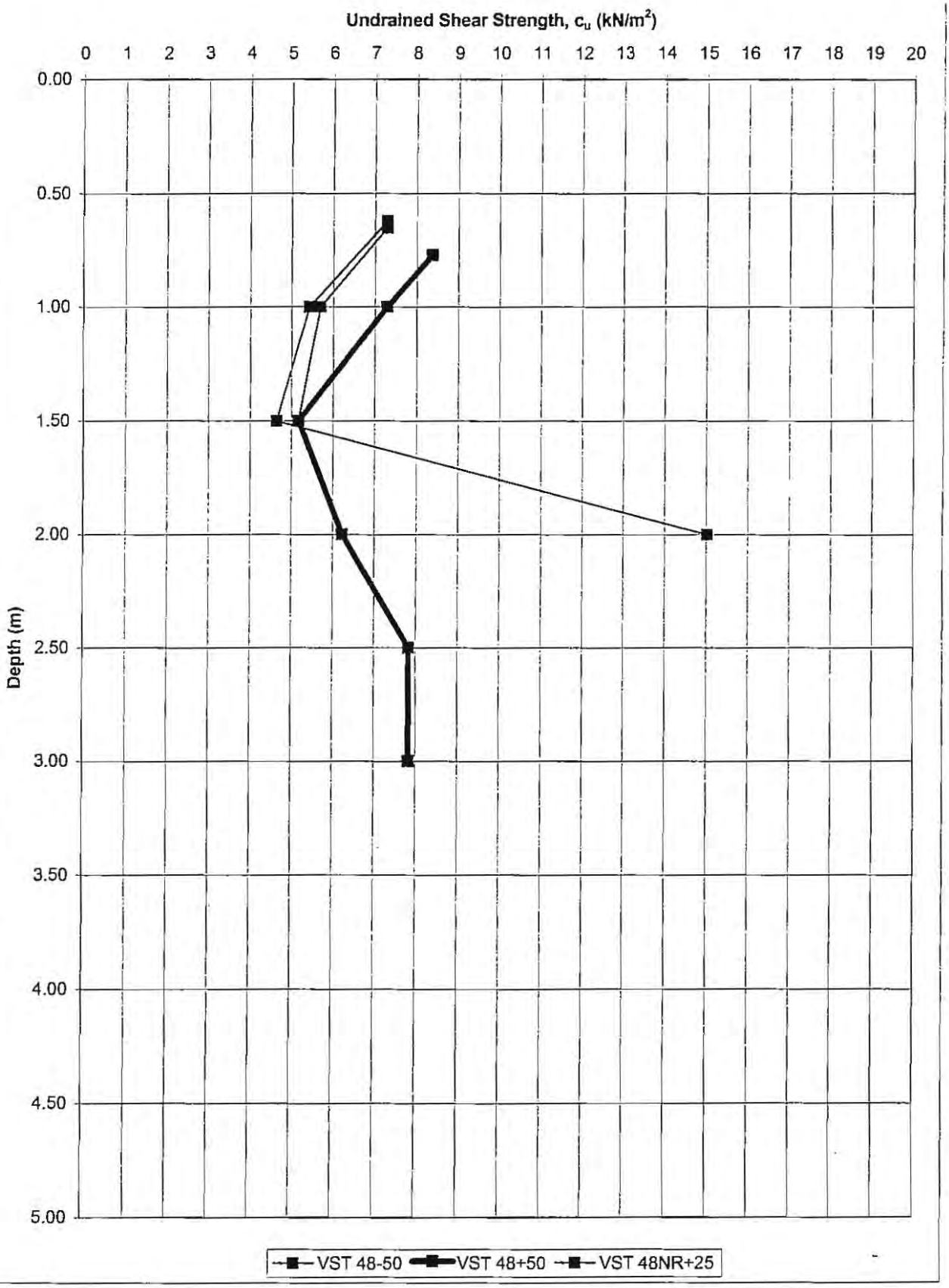
AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 48**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T48/P-100A					**1.30**			
T48/P-100B					**2.00**		**10.0**	**10.8**
T48/P-75A					**2.20**			
T48/P-75B					**1.80**		**9.0**	**8.5**
T48/P-50A					**1.70**			
T48/P-50B					**1.80**		**7.0**	**7.1**
T48/P-25A					**1.90**			
T48/P-25B					**1.10**		**3.2**	**2.2**
T48/P0A					**3.00**			
T48/P0B					**0.00**		**6.2**	**2.5**
T48/P25A		158491.1	205426.0	348.34	**3.50**	344.84		
T48/P25B				344.64	**1.90**	342.74	**4.5**	**2.6**
T48/P50A		158515.1	205430.6	348.20	**3.10**	345.10		
T48/P50B				346.29	**2.80**	343.49	**2.3**	**2.0**
T48/P+75A		158540.4	205439.1	347.62	**3.20**	344.42		
T48/P+75B				344.34	**2.15**	342.19	**4.0**	**2.7**
T48/P+100A		158562.4	205450.0	346.81	**3.20**	343.61		
T48/P+100B				344.34	**1.45**	342.89	**3.0**	**0.9**
T48/P+125A					**2.90**			
T48/P+125B					**2.10**		**4.7**	**3.7**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T48B-NE					**2.60**			
T48B-NW					**2.70**			
T48B-SE					**2.90**			
T48B-SW					**2.90**			
T48B-C					**2.85**			
T48B+50					**0.00**			
T48B+100					**0.80**			

Turbine/ Cell No.

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 48NR**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T48/P-100A								
T48/P-100B								
T48/P-75A					**1.80**		**1.7**	**2.8**
T48/P-75B					**2.20**			
T48/P-50A								
T48/P-50B								
T48/P-25A					**2.80**		**1.0**	**-1.6**
T48/P-25B					**1.90**			
T48/P0A					**3.00**		**1.7**	**1.7**
T48/P0B					**3.00**			
T48/P25A					**3.34**		**1.0**	**1.5**
T48/P25B					**3.50**			
T48/P50A								
T48/P50B								
T48/P+75A					**3.04**		**1.0**	**1.5**
T48/P+75B					**3.20**			
T48/P+100A								
T48/P+100B								
T48/P+125A								
T48/P+125B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 20m downslope from road								
Probes On Turbine Base								
T48B-NE								
T48B-NW								
T48B-SE								
T48B-SW								
T48B-C								
T48B+50								
T48B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 48**
Test No.		VST 48-50	Date:			Peat Depth (m) 1.64	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	14.0	5.00	7.3				
1.00	11.0	2.50	5.7				
1.50	10.0	3.00	5.2				
Test No.		VST 48+50	Date:			Peat Depth (m) 3.25	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.77	16.0	4.00	8.4				
1.00	14.0	4.00	7.3				
1.50	10.0	4.00	5.2				
2.00	12.0	4.50	6.2				
2.50	15.0	4.50	7.8				
3.00	15.0	4.00	7.8				
Test No.		VST 48NR+25	Date:			Peat Depth (m) 2.05	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	14.0	4.00	7.3				
1.00	10.5	3.50	5.4				
1.50	9.0	2.00	4.6				
2.00	28.0	4.00	15.0				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

VST Results along downslope of floating road in Cell T48

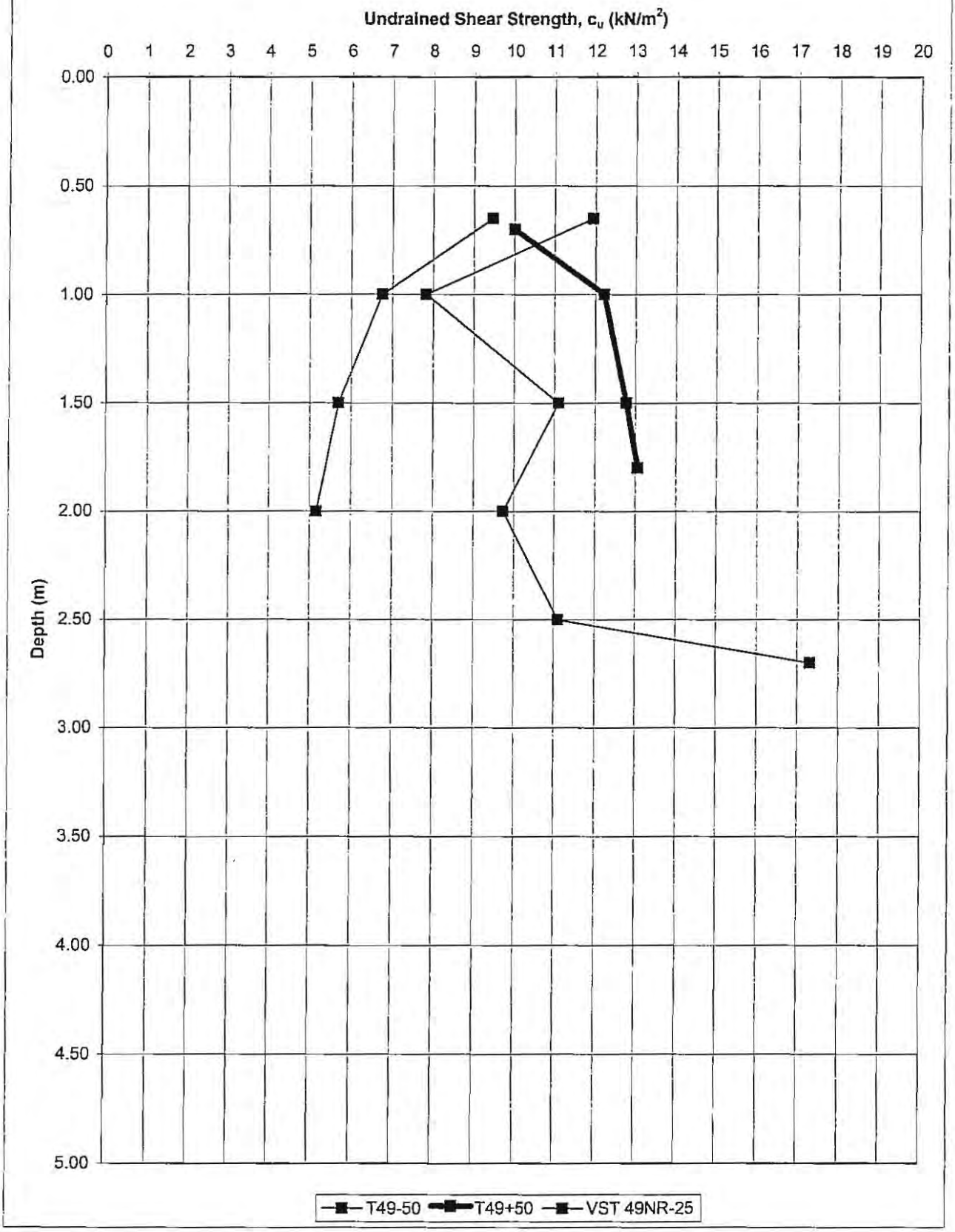


AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 49**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T49/P-100A					**2.90**			
T49/P-100B					**2.10**		**4.7**	**3.7**
T49/P-75A		158600.7	205469.5	345.22	**1.85**	343.37		
T49/P-75B				341.38	**2.00**	339.38	**4.7**	**4.8**
T49/P-50A		158621.2	205482.2	344.83	**2.40**	342.43		
T49/P-50B				337.81	**1.50**	336.31	**8.5**	**7.4**
T49/P-25A					**2.20**			
T49/P-25B					**0.80**		**7.5**	**5.8**
T49/P0A		158662.5	205507.4	344.70	**1.95**	342.75		
T49/P0B				332.83	**1.40**	331.43	**14.2**	**13.5**
T49/P25A					**2.90**			
T49/P25B					**1.40**		**11.5**	**9.7**
T49/P50A					**1.50**			
T49/P50B					**0.80**		**7.5**	**6.7**
T49/P+75A					**0.95**			
T49/P+75B					**0.70**		**8.5**	**8.2**
T49/P+100A					**1.80**			
T49/P+100B					**0.65**		**4.7**	**3.3**
T49/P+125A					**1.15**			
T49/P+125B					**0.40**		**4.7**	**3.8**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T49B-NE					**2.70**			
T49B-NW					**2.70**			
T49B-SE					**3.00**			
T49B-SW					**3.10**			
T49B-C					**1.95**			
T49B+50					**1.40**			
T49B+100					**0.90**			

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 49NR**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T49/P-100A					**2.44**		**1.0**	**2.3**
T49/P-100B					**2.90**			
T49/P-75A								
T49/P-75B								
T49/P-50A					**2.20**		**0.7**	**1.2**
T49/P-50B					**2.40**			
T49/P-25A					**3.30**		**1.0**	**-2.2**
T49/P-25B					**2.20**			
T49/P0A								
T49/P0B								
T49/P25A					**2.80**		**1.7**	**2.0**
T49/P25B					**2.90**			
T49/P50A					**2.20**		**2.3**	**0.3**
T49/P50B					**1.50**			
T49/P+75A								
T49/P+75B								
T49/P+100A					**2.20**		**2.5**	**1.4**
T49/P+100B					**1.80**			
T49/P+125A								
T49/P+125B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 20m downslope from road								
Probes On Turbine Base								
T49B-NE								
T49B-NW								
T49B-SE								
T49B-SW								
T49B-C								
T49B+50								
T49B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 49**
Job No. 03-104							
Test No.		T49-50	Date:			Peat Depth (m) 2.2	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	18.0	5.50	9.5				
1.00	13.0	4.50	6.8				
1.50	11.0	4.50	5.7				
2.00	10.0	4.50	5.2				
Test No.		T49+50	Date:			Peat Depth (m) 1.85	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	19.0	5.00	10.0				
1.00	23.0	9.50	12.2				
1.50	24.0	5.50	12.8				
1.80	24.5	5.50	13.1				
Test No.		VST 49NR-25	Date:			Peat Depth (m) 2.92	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	22.5	4.50	11.9				
1.00	15.0	5.50	7.8				
1.50	21.0	5.00	11.1				
2.00	18.5	2.50	9.7				
2.50	21.0	3.50	11.1				
2.70	32.0	4.00	17.3				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

VST Results along downslope of floating road in Cell T49

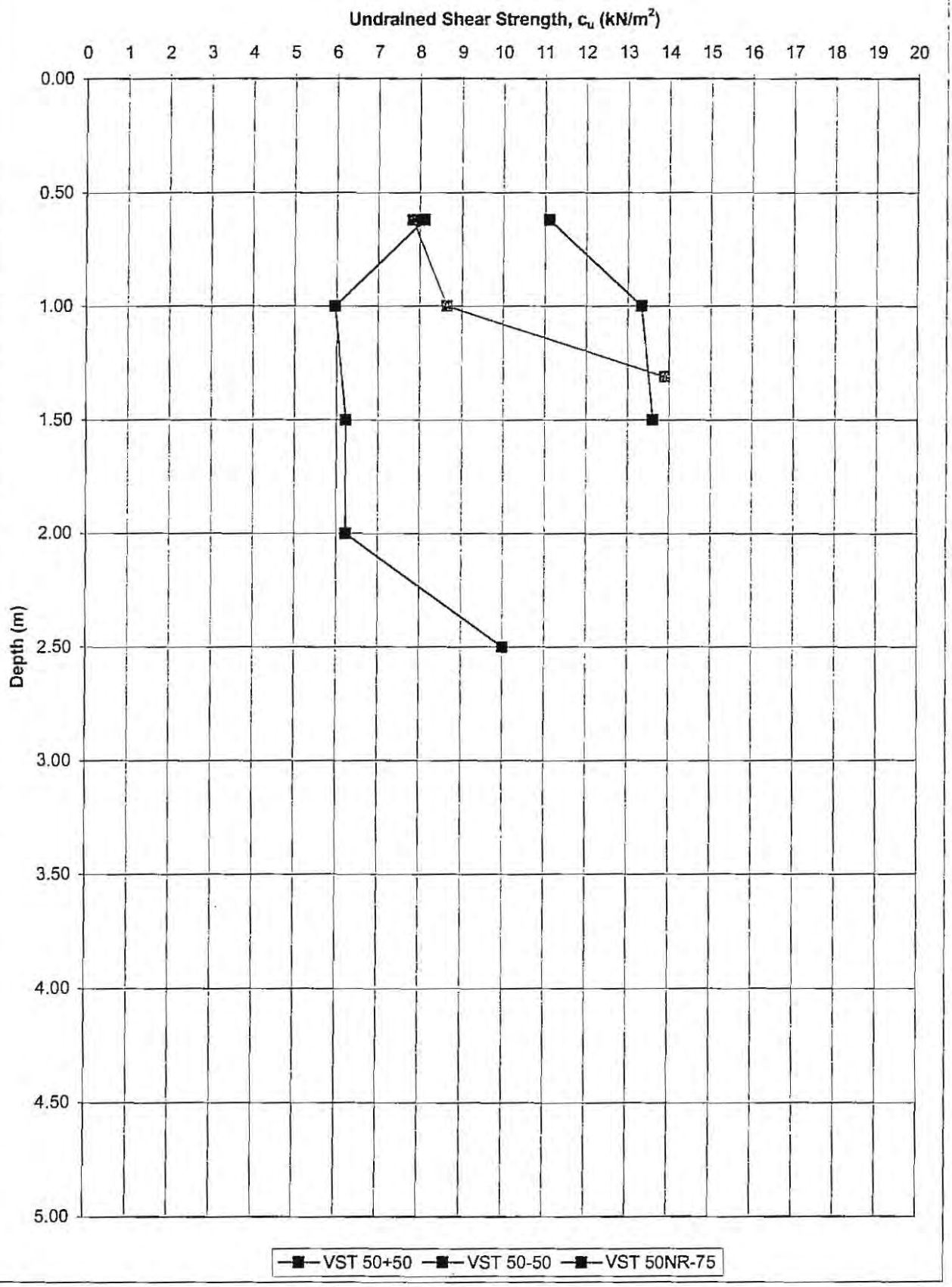


AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 50**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T50/P-100A								
T50/P-100B								
T50/P-70A					**1.88**		**20.8**	**19.8**
T50/P-70B					**0.88**			
T50/P-50A					**1.24**		**11.5**	**11.1**
T50/P-50B					**0.88**			
T50/P-25A					**1.64**		**18.8**	**17.6**
T50/P-25B					**0.54**			
T50/P0A		158858.3	205619.0	342.25	**1.88**	340.37	**18.8**	**19.0**
T50/P0B				326.22	**2.00**	324.22		
T50/P25A					**1.36**		**10.3**	**10.3**
T50/P25B					**1.34**			
T50/P50A					**1.88**		**11.5**	**10.9**
T50/P50B					**1.38**			
T50/P+75A					**1.74**		**12.5**	**12.8**
T50/P+75B					**2.00**			
T50/P+100A								
T50/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T50B-NE					**2.06**			
T50B-NW					**1.9**			
T50B-SE					**2.64**			
T50B-SW					**2.66**			
T50B-C								
T50B+50					**0.35**			
T50B+100					**0.54**			

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 50NR**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T50/P-100A								
T50/P-100B								
T50/P-70A					**2.50**		**1.0**	
T50/P-70B								
T50/P-50A		158832.1	205569.9	345.8	**2.84**		**1.0**	
T50/P-50B								
T50/P-25A		158855.4	205589.9	345.0				
T50/P-25B								
T50/P0A					**1.90**		**4.5**	
T50/P0B								
T50/P25A								
T50/P25B								
T50/P50A		158909.8	205632.8	342.0	**2.00**		**4.0**	
T50/P50B								
T50/P+85A					**2.10**		**4.0**	
T50/P+85B								
T50/P+100A								
T50/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T50B-NE								
T50B-NW								
T50B-SE								
T50B-SW								
T50B-C								
T50B+50								
T50B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 50**
Job No. 03-104							
Test No.		VST 50+50	Date:			Peat Depth (m) 1.62	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments
0.62	21.00		11.1				
1.00	25.00		13.3				
1.50	25.50		13.6				
Test No.		VST 50NR-75	Date:			Peat Depth (m) 2.70	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments
0.62	15.50	6.50	8.1				
1.00	11.50	3.00	6.0				
1.50	12.00	3.50	6.2				
2.00	12.00	3.50	6.2				
2.50	19.00	4.50	10.0				
Test No.		VST 50-50	Date:			Peat Depth (m) 1.33	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments
0.62	15.0	4.00	7.8				
1.00	16.5	4.50	8.6				
1.31	26.0	3.50	13.9				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments

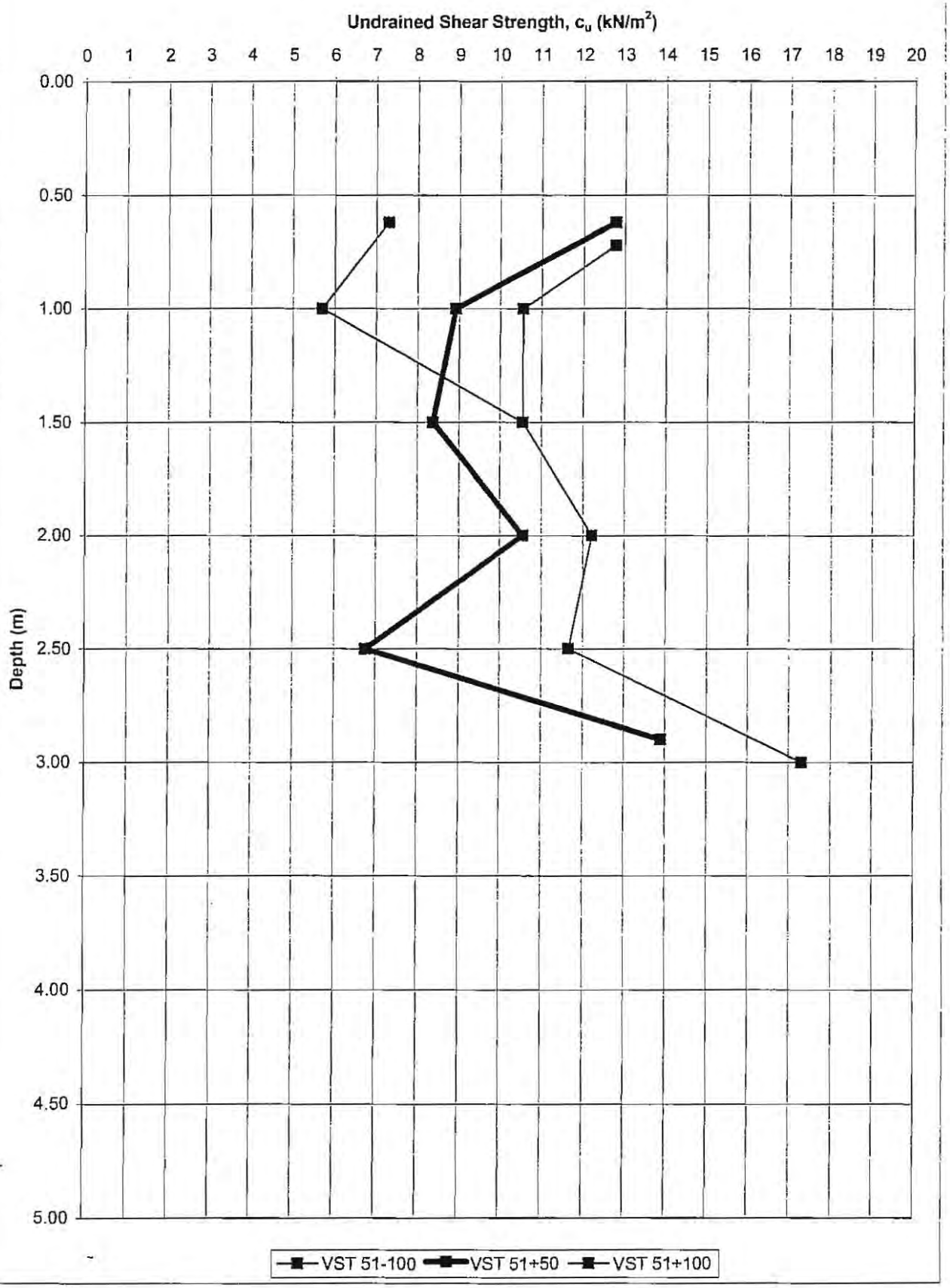
VST Results along downslope of floating road in Cell T50



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm					Made By:		**Cell No: 51**	
Job No. 03-104					Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T51/P-100A					**1.66**			
T51/P-100B					**1.44**		**9.5**	**9.2**
T51/P-75A					**1.56**			
T51/P-75B					**1.56**		**9.5**	**9.5**
T51/P-50A					**1.42**			
T51/P-50B					**1.12**		**4.6**	**4.2**
T51/P-25A					**2.21**			
T51/P-25B					**1.34**		**5.2**	**4.1**
T51/P0A		159021.4	205697.4	337.51	**2.64**	334.87		
T51/P0B				333.26	**2.10**	331.16	**5.2**	**4.5**
T51/P25A		159044.4	205708.2	336.99	**2.84**	334.15		
T51/P25B				333.29	**2.40**	330.89	**4.5**	**4.0**
T51/P50A		159069.9	205714.3	336.69	**2.84**	333.85		
T51/P50B				332.99	**2.84**	330.15	**4.5**	**4.5**
T51/P+75A		159093.2	205719.2	336.57	**3.08**	333.49		
T51/P+75B				332.32	**2.70**	329.62	**5.2**	**4.7**
T51/P+100A		159115.9	205726.4	335.86	**2.84**	333.02		
T51/P+100B				331.33	**1.46**	329.87	**5.5**	**3.8**
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T51B-NE					**2.12**			
T51B-NW					**2.16**			
T51B-SE					**2.34**			
T51B-SW					**2.30**			
T51B-C					**2.42**			
T51B+50					**2.10**			
T51B+100					**2.61**			

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 51**
Job No. 03-104							
Test No.		VST 51-100				Peat Depth (m) 1.1	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14.0	6.00	7.3				
1.00	11.0	6.50	5.7				
1.50	20.0	5.00	10.6				
Test No.		VST 51+50	Date:			Peat Depth (m) 2.96	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	24.0		12.8				
1.00	17.0		8.9				
1.50	16.0		8.4				
2.00	20.0		10.6				
2.50	13.0		6.8				
2.90	26.0		13.9				
Test No.		VST 51+100	Date:			Peat Depth (m) 3.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	24.0	6.00	12.8				
1.00	20.0	5.50	10.6				
1.50	20.0	5.00	10.6				
2.00	23.0	6.00	12.2				
2.50	22.0	4.50	11.7				
3.00	32.0	4.00	17.3				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

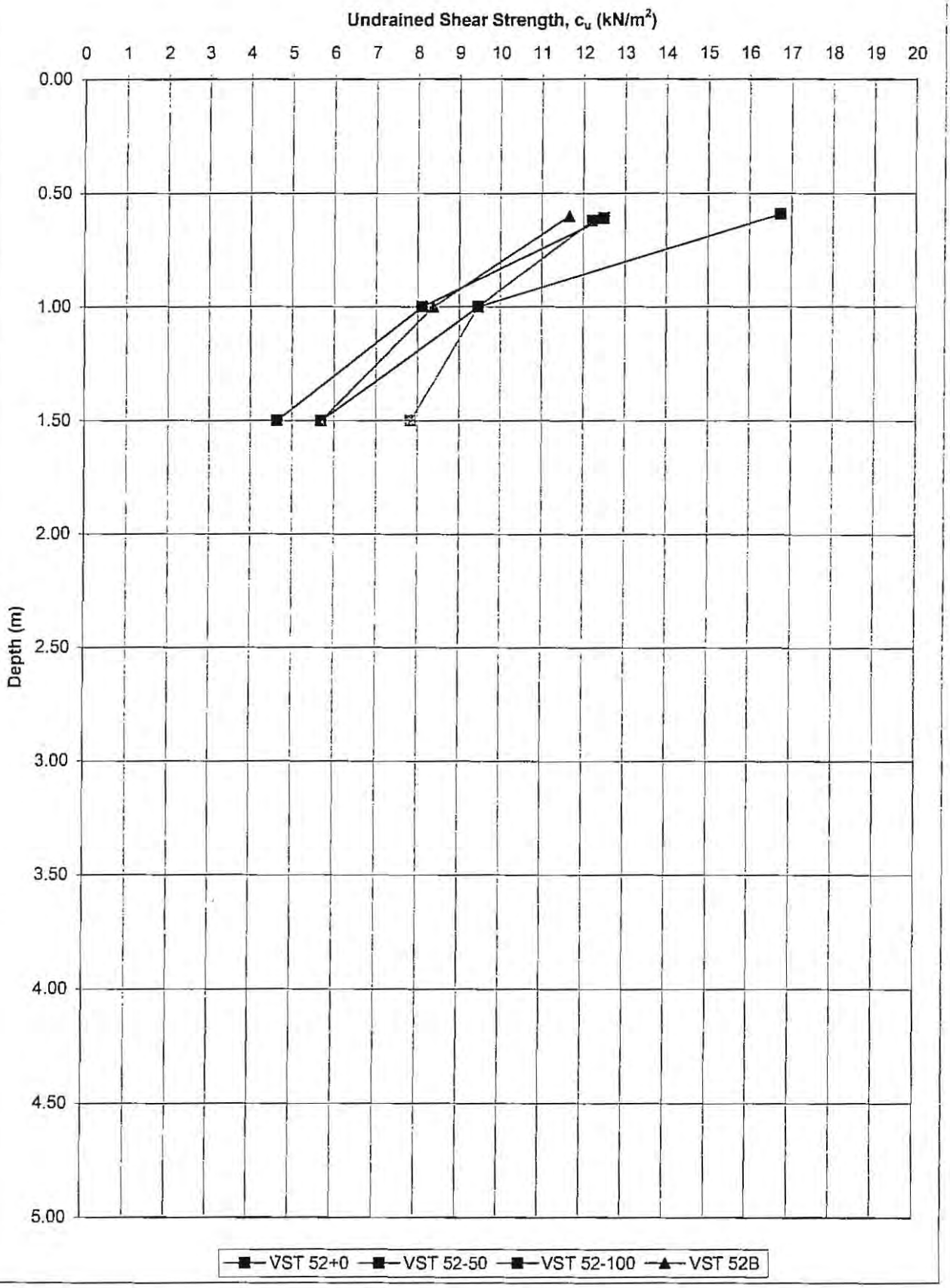
VST Results along downslope of floating road in Cell T51



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 52**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T52/P-100A		159300.4	205777.6	320.66	**1.88**	318.78	**4.2**	**4.6**
T52/P-100B		159286.9	205812.6	317.89	**2.14**	315.75		
T52/P-75A		159284.4	205779.3	320.69	**2.06**	318.63	**4.6**	**4.3**
T52/P-75B		159275.6	205812.2	317.98	**1.88**	316.10		
T52/P-50A		159260.0	205767.3	321.45	**2.28**	319.17	**4.3**	**3.5**
T52/P-50B		159248.5	205804.2	318.54	**1.76**	316.78		
T52/P-25A		159237.5	205759.5	322.51	**1.90**	320.61	**5.6**	**5.6**
T52/P-25B		159224.9	205798.5	318.51	**1.90**	316.61		
T52/P0A		159213.6	205752.5	322.90	**2.00**	320.90	**5.0**	**4.5**
T52/P0B		159203.1	205791.6	319.37	**1.64**	317.73		
T52/P25A		159190.9	205748.7	322.93	**2.00**	320.93	**5.7**	**5.4**
T52/P25B		159186.9	205785.5	319.22	**1.78**	317.44		
T 52/P50A								
T52/P50B								
T52/P+75A								
T52/P+75B								
T52/P+100A								
T52/P+100B								
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T52B-NE					**1.80**			
T52B-NW					**1.60**			
T52B-SE					**1.70**			
T52B-SW					**1.60**			
T52B-C		159275.0	205795.0		**1.84**			
T52B+50		159266.8	205845.9	315.00	**1.80**			
T52B+100					**2.16**			

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 52**
Job No. 03-104							
Test No.		VST 52+0	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.61	23.5	7.50	12.5				
1.00	15.5	6.00	8.1				
1.50	9.0	5.00	4.6				
Test No.		VST 52-50	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.62	23.0	6.00	12.2				
1.00	18.0	6.00	9.5				
1.50	15.0	4.00	7.8				
Test No.		VST 52-100	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.59	31.0	6.00	16.7				
1.00	18.0	5.00	9.5				
1.50	11.0	5.00	5.7				
Test No.		VST 52B	Date:	02-Sep		Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.60	22.0	7.00	11.7				
1.00	16.0	5.50	8.4				
1.50	11.0	4.50	5.7				

VST Results along downslope of floating road in Cell T52



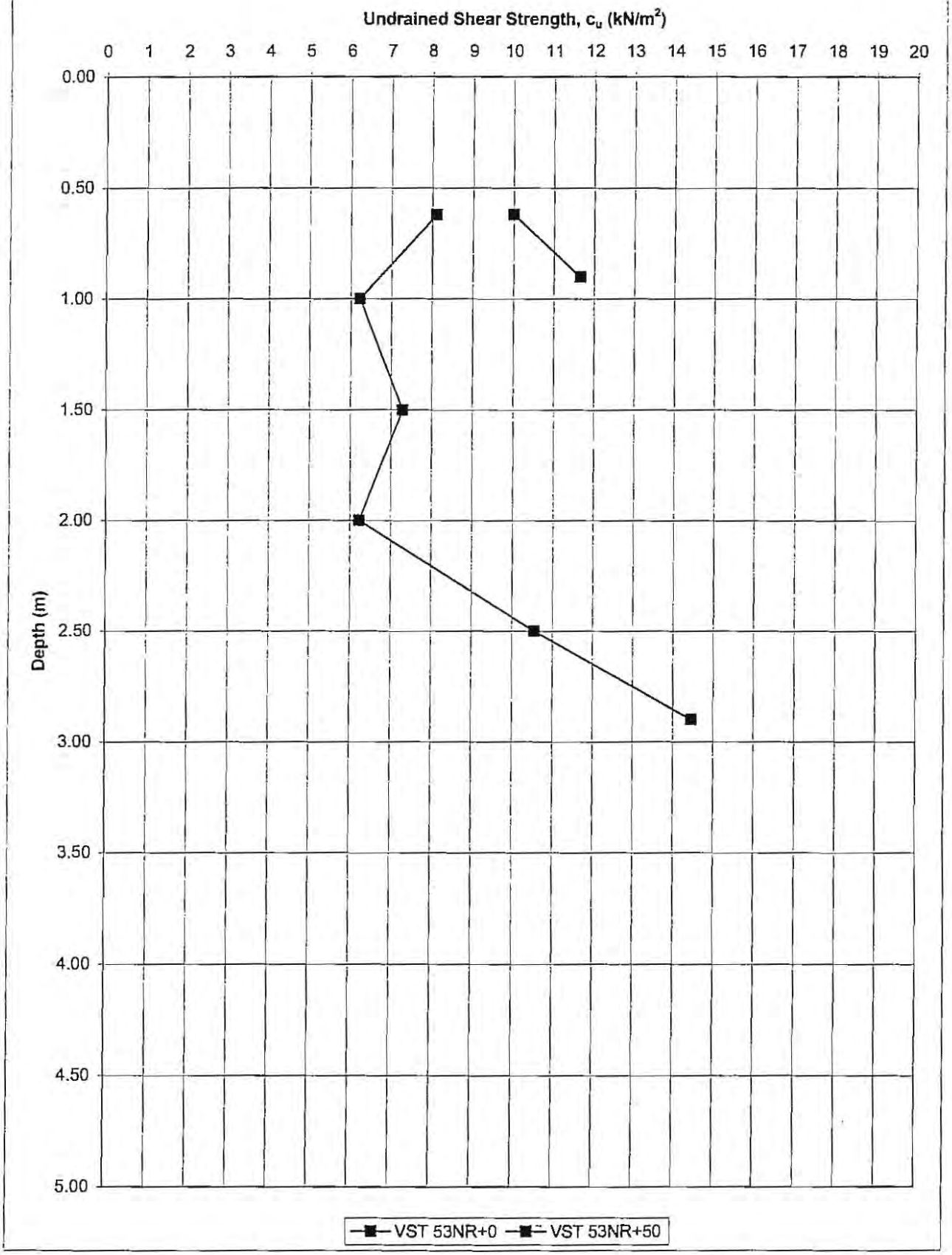
AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm					Made By:		**Cell No: 53**	
Job No. 03-104					Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Pea	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T53/P-100A								
T53/P-100B								
T53/P-75A								
T53/P-75B								
T53/P-50A								
T53/P-50B								
T53/P-20A					**3.24**		**1.5**	**-0.2**
T53/P-20B					**1.88**			
T53/P0A					**3.00**		**1.5**	**1.0**
T53/P0B					**2.56**			
T 53/P25A					**2.60**		**0.0**	**0.5**
T53/P25B					**3.00**			
T53/P50A					**1.32**		**0.5**	**2.6**
T53/P50B					**3.08**			
T53/P+75A					**1.48**		**0.5**	**2.2**
T53/P+75B					**2.88**			
T53/P+100A					**3.20**		**1.5**	**0.0**
T53/P+100B					**2.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T53B-NE					**2.80**			
T53B-NW					**3.08**			
T53B-SE					**2.88**			
T53B-SW					**3.18**			
T53B-C					**2.88**			
T53B+50					**2.17**			
T53B+100					**2.42**			

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 53NR**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T53/P-100A								
T53/P-100B								
T53/P-75A								
T53/P-75B								
T53/P-50A								
T53/P-50B								
T53/P-25A					**3.35**		**0.5**	**-2.9**
T53/P-25B					**1.88**			
T53/P0A					**2.90**		**0.5**	**-0.3**
T53/P0B					**2.56**			
T53/P25A					**2.30**		**0.0**	**1.6**
T53/P25B					**3.00**			
T53/P50A					**0.80**		**1.0**	**6.2**
T53/P50B					**3.08**			
T53/P+75A					**3.70**		**1.0**	**-0.9**
T53/P+75B					**2.88**			
T53/P+100A					**2.35**		**4.5**	**3.7**
T53/P+100B					**2.00**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T53B-NE								
T53B-NW								
T53B-SE								
T53B-SW								
T53B-C								
T53B+50								
T53B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 53**
Job No. 03-104							
Test No.		VST 53NR+0	Date:			Peat Depth (m) 2.95	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments
0.62	15.5	6.00	8.1				
1.00	12.0	5.50	6.2				
1.50	14.0	5.00	7.3				
2.00	12.0	4.00	6.2				
2.50	20.0	5.50	10.6				
2.90	27.0	5.00	14.5				
Test No.		VST 53NR+50	Date:			Peat Depth (m) 1.05	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments
0.62	19.0	6.00	10.0				
0.90	22.0	5.00	11.7				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	Co-ordinates N (m)	Elevation (mOD)	Comments

Turbine/ Cell No.

VST Results along downslope of floating road in Cell T53



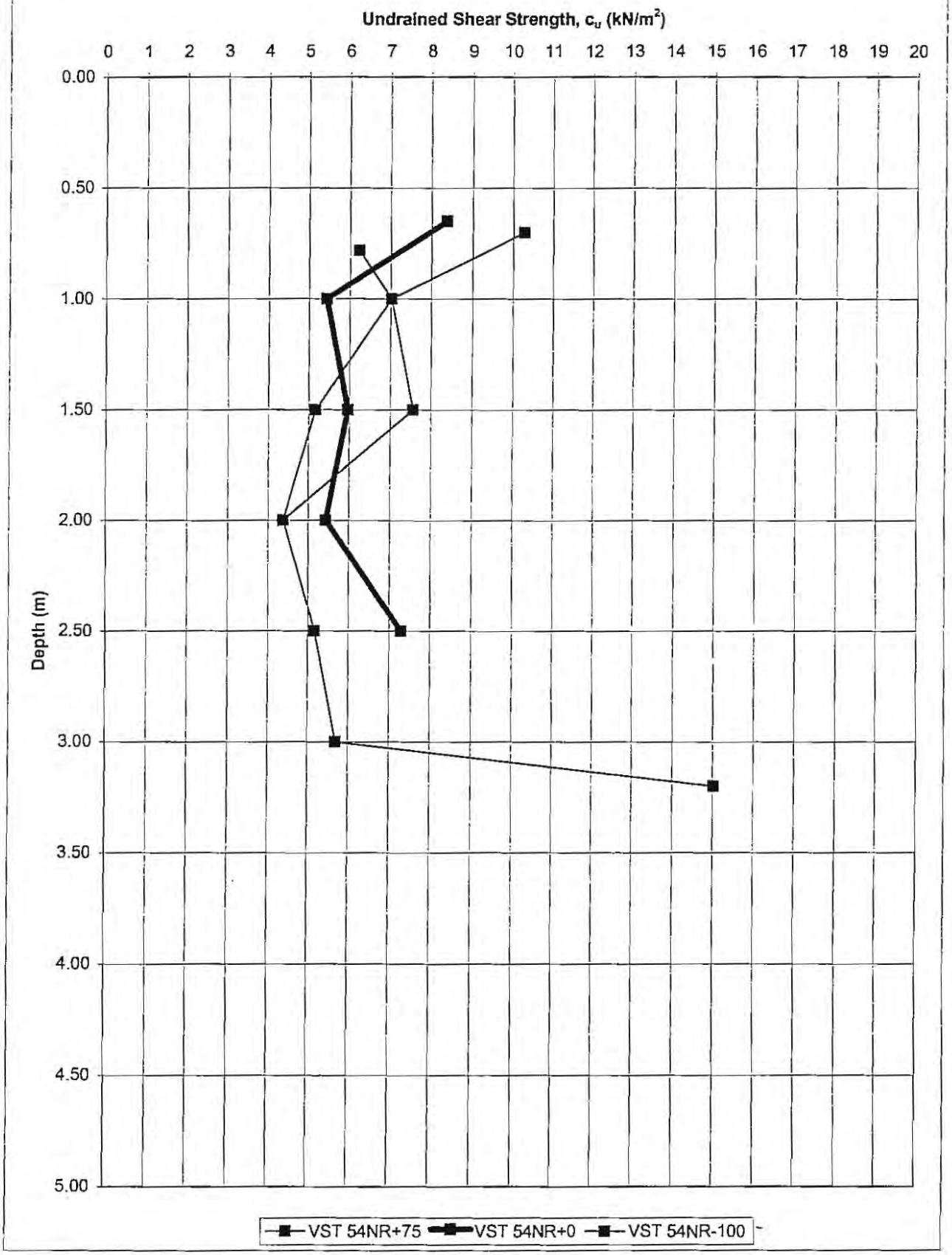
AGL Consulting *Geotechnical Engineers*			**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104				Made By: Date:		Cell No: 54	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T54/P-125A					3.60			
T54/P-125B					1.50			
T54/P-100A					3.90			
T54/P-100B					1.00		0.0	-3.5
T54/P-75A					4.00			
T54/P-75B					1.00		1.5	-2.2
T54/P-50A					3.10			
T54/P-50B					1.00		1.5	-1.1
T54/P-25A					3.50			
T54/P-25B					2.00		0.5	-1.3
T54/P0A					3.70			
T54/P0B					1.20		1.5	-1.5
T54/P25A					4.00			
T54/P25B					2.90		0.5	-0.8
T54/P50A					4.00			
T54/P50B					2.00		0.5	-1.9
T54/P+75A					4.50			
T54/P+75B					2.10		0.5	-2.4
T54/P+100A					3.60			
T54/P+100B					2.60		0.5	-0.7
T54/P+125A					4.00			
T54/P+125B					2.60			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T54B-NE								
T54B-NW								
T54B-SE								
T54B-SW								
T54B-C								
T54B+50								
T54B+100								

AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 54NR**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T54/P-125A					**2.60**			
T54/P-125B					**1.50**			
T54/P-100A					**2.50**		**0.5**	**-2.9**
T54/P-100B					**1.00**			
T54/P-75A					**1.90**		**0.5**	**-1.6**
T54/P-75B					**1.00**			
T54/P-50A					**2.60**		**0.5**	**-3.2**
T54/P-50B					**1.00**			
T54/P-25A					**2.60**		**0.5**	**-0.9**
T54/P-25B					**2.00**			
T54/P0A					**2.70**		**1.5**	**-1.9**
T54/P0B					**1.20**			
T54/P25A					**2.80**		**0.5**	**0.7**
T54/P25B					**2.90**			
T54/P50A					**3.00**		**1.5**	**-0.8**
T54/P50B					**2.00**			
T54/P+75A					**3.30**		**1.5**	**-1.2**
T54/P+75B					**2.10**			
T54/P+100A					**3.30**		**0.0**	**-1.6**
T54/P+100B					**2.60**			
T54/P+125A					**3.70**			
T54/P+125B					**2.60**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T54B-NE								
T54B-NW								
T54B-SE								
T54B-SW								
T54B-C								
T54B+50								
T54B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 54**
Job No. 03-104							
Test No.		VST 54NR+75	Date:			Peat Depth (m) 3.3	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.70	19.5	4.50	10.3				
1.00	13.5	4.50	7.0				
1.50	10.0	3.50	5.2				
2.00	8.5	4.50	4.4				
2.50	10.0	3.50	5.2				
3.00	11.0	4.50	5.7				
3.20	28.0	4.50	15.0				
Test No.		VST 54NR+0	Date:			Peat Depth (m) 2.6	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.65	16.0	6.50	8.4				
1.00	10.5	4.00	5.4				
1.50	11.5	5.50	6.0				
2.00	10.5	5.50	5.4				
2.50	14.0	5.50	7.3				
Test No.		VST 54NR-10(	Date:			Peat Depth (m) 2.15	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.78	12.0	5.50	6.2				
1.00	13.5	3.50	7.0				
1.50	14.5	4.00	7.6				
2.00	8.5	3.00	4.4				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

Turbine/ Cell No.

VST Results along downslope of floating road in Cell T54



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm					Made By:		**Cell No: 55**	
Job No. 03-104					Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T55/P-100A		158749.2	205280.1	357.79	**3.84**	353.95	**2.3**	**0.0**
T55/P-100B				356.32	**2.36**	353.96		
T55/P-75A		158770.7	205288.2	357.40	**3.39**	354.01	**3.5**	**2.6**
T55/P-75B				355.11	**3.26**	351.85		
T55/P-50A		158789.8	205296.8	356.93	**2.84**	354.09	**3.3**	**2.3**
T55/P-50B				354.51	**2.33**	352.18		
T55/P-25A		158810.4	205311.7	355.58	**2.96**	352.62	**3.3**	**2.6**
T55/P-25B				352.97	**2.46**	350.51		
T55/P0A		158833.0	205314.8	355.14	**3.56**	351.58	**3.7**	**1.4**
T55/P0B				352.57	**2.12**	350.45		
T55/P25A		158856.2	205326.4	354.24	**3.28**	350.96	**2.3**	**0.8**
T55 /P25B				352.42	**2.10**	350.32		
T55/P50A		158879.5	205336.5	353.14	**3.12**	350.02	**4.0**	**1.5**
T55/P50B				350.60	**1.84**	348.76		
T55/P+75A		158902.0	205348.9	352.06	**3.00**	349.06	**3.0**	**2.1**
T55/P+75B				349.87	**2.50**	347.37		
T55/P+100A		158923.7	205358.8	351.07	**3.14**	347.93	**4.0**	**3.2**
T55/P+100B				347.90	**2.64**	345.26		
East								

Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively
ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road

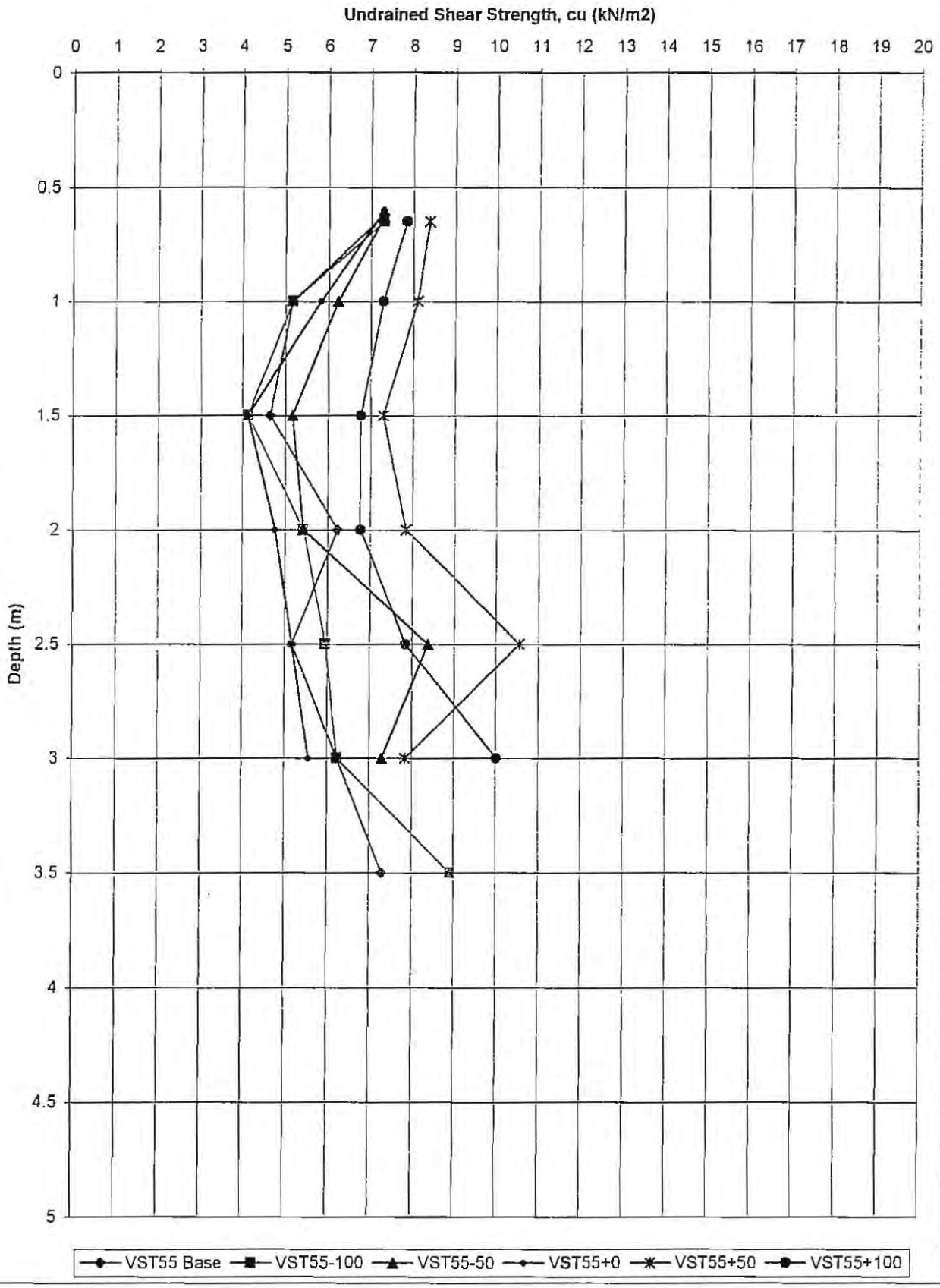
Probes On Turbine Base								
T55B-NE					**3.14**			
T55B- NW					**3.00**			
T55B-SE					**2.41**			
T55B-SW					**2.39**			
T55B-C		158827	205312		**2.47**			
T55B+50		Trees	Trees		**3.14**			
T55B+100		Trees	Trees		**2.94**			

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 55**
Job No. 03-104							
Test No.		VST 55-BASE	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14	6.00	7.3				
1	10	8.00	5.2				
1.5	9	8.00	4.6				
2	12	8.00	6.2				
2.5	10	7.00	5.2				
3	12	6.00	6.2				
3.5	14	6.00	7.3				
Test No.		VST 55+20R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
1.32	19.00	11.00	10.0				(270 mm
1.72	13.50	7.00	7.0				stone, 360
2.22	14.00	6.00	7.3				mm total
2.72	13.00	6.00	6.8				
3.22	13.00	6.00	6.8				
Total Road Thickness =			0.36 m				
Test No.		VST 55+10R	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
1.98	21.00	11.00	11.1				
2.40	14.00	7.00	7.3				
2.90	13.00	6.00	6.8				
3.40	13.00	6.00	6.8				
3.90	13.00	6.00	6.8				
Total Road Thickness =			0.7 m				
(450 mm stone, 700 mm total w/trees)							
Test No.		VST 55-100	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	14.00	9.00	7.3				
1.00	10.00	6.00	5.2				
1.50	8.00	6.00	4.1				
2.00	10.50	7.00	5.4				
2.50	11.50	9.00	6.0				
3.00	12.00	7.00	6.2				
3.50	17.00	7.00	8.9				

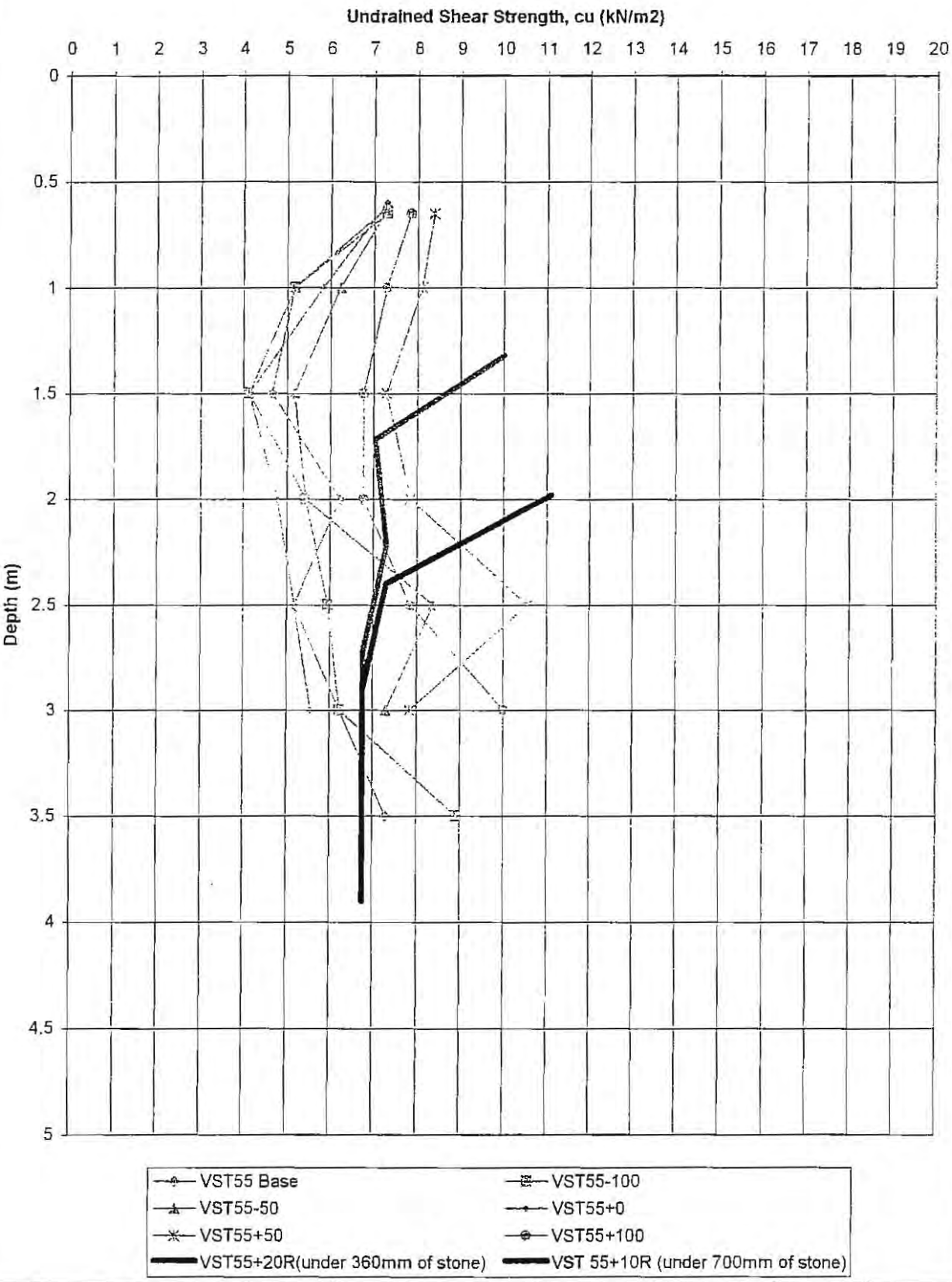
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 55**
Job No. 03-104							
Test No.		VST 55-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.63	14.00	11.00	7.3				
1.00	12.00	5.00	6.2				
1.50	10.00	6.00	5.2				
2.00	10.50	5.00	5.4				
2.50	16.00	7.00	8.4				
3.00	14.00	5.00	7.3				
Test No.		VST 55+0	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	14.00	11.00	7.3				
1.00	11.25	7.00	5.8				
1.50	8.00	6.00	4.1				
2.00	9.25	6.00	4.8				
3.00	10.75	6.00	5.6				
Test No.		VST 55+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	16.00	10.0	8.4				
1.00	15.50	7.00	8.1				
1.50	14.00	8.00	7.3				
2.00	15.00	7.00	7.8				
2.50	20.00	9.00	10.6				
3.00	15.00	7.50	7.8				
Test No.		VST 55+100	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	15.00	8.00	7.8				
1.00	14.00	6.00	7.3				
1.50	13.00	6.00	6.8				
2.00	13.00	6.00	6.8				
2.50	15.00	7.00	7.8				
3.00	19.00	4.00	10.0				

Points to Note: Road has been constructed from +100 meters to 0 meters. From 0 to -100 meters the trees for the floating roads have been put in place but no surface has yet been constructed. The land is sloping from west (higher) to east (lower) i.e from -100 to +100 and to the north.

VST Results along downslope of floating road in Cell T55



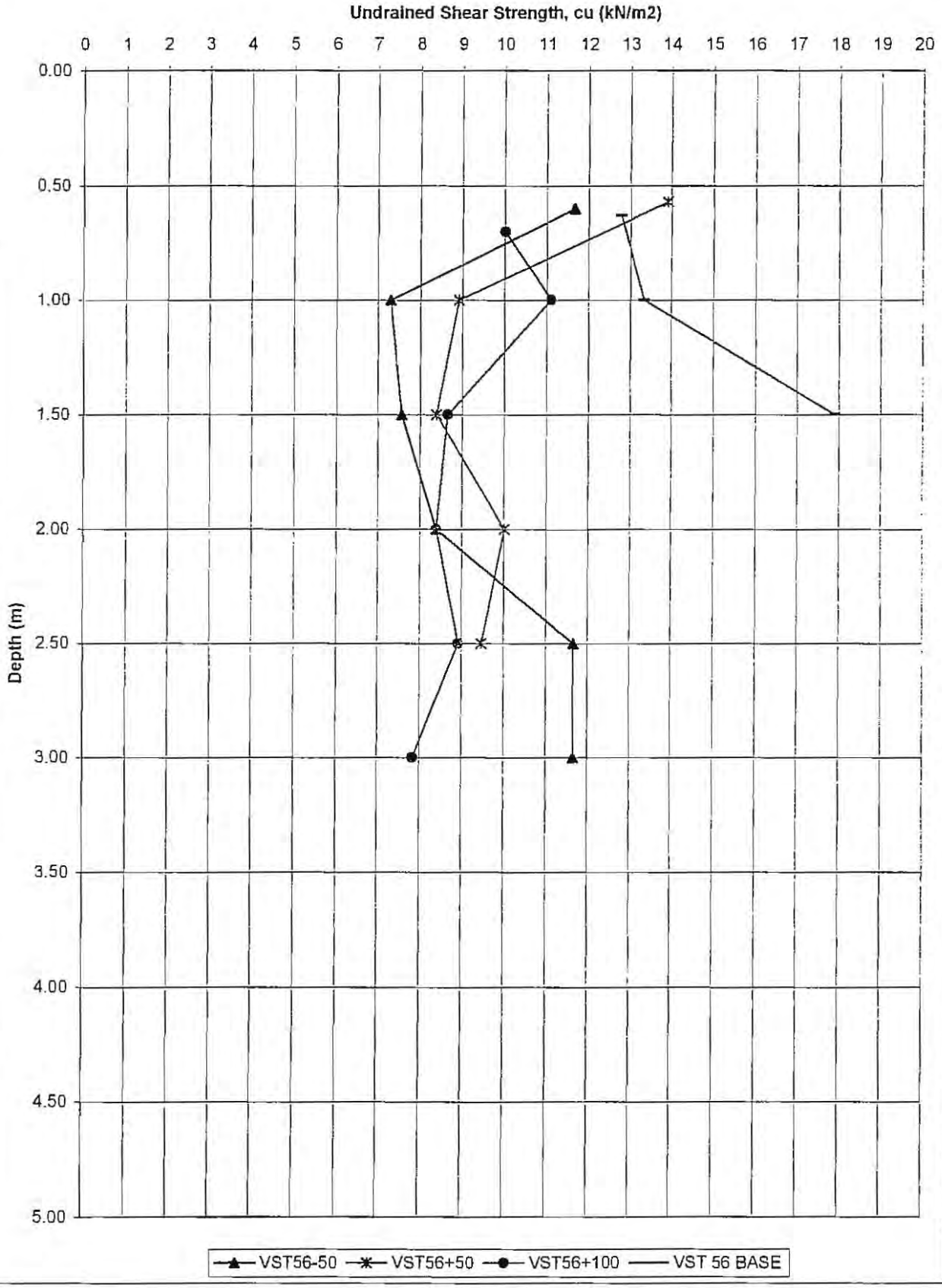
VST Results under floating road in Cell T55 (values along downslope shown in background)



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 56**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T56/P-75A		158923.7	205358.8	351.07	**3.40**	347.67	**4.0**	**4.2**
T56/P-75B				347.90	**3.65**	344.25		
T56/P-50A		158937.5	205365.4	350.53	**3.00**	347.53	**3.8**	**3.2**
T56/P-50B				347.40	**2.52**	344.88		
T56/P-25A		158960.4	205374.6	349.20	**2.88**	346.32	**4.0**	**2.6**
T56/P-25B				346.18	**2.00**	344.18		
T56/P0A		158984.3	205385.7	347.24	**1.95**	345.29	**4.0**	**2.8**
T56/P0B				344.42	**1.46**	342.96		
T56/P25A		159005.7	205397.7	345.44	**1.30**	344.14	**2.9**	**3.9**
T56/P25B		158987.9	205440.5	343.06	**2.14**	340.92		
T56/P50A		159030.6	205408.3	346.25	**2.18**	344.07	**2.6**	**4.3**
T56/P50B		159010.9	205454.4	344.13	**3.58**	340.55		
T56 /P+75A		159052.5	205419.2	345.69	**2.88**	342.81	**2.8**	**3.8**
T56/P+75B				343.55	**3.88**	339.67		
T56/P+100A		159075.4	205429.8	345.55	**3.43**	342.12	**2.8**	**3.5**
T56/P+100B				343.54	**4.29**	339.25		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T56B-NE					**1.64**			
T56B-NW					**2.26**			
T56B-SE					**1.48**			
T56B-SW					**1.04**			
T56B-C					**1.95**			
T56B+50					**1.46**			
T56B+100					**3.44**			

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No.56**
Job No. 03-104							
Test No.		VST 56-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	22.00	8.00	11.7				
1.00	14.00	6.00	7.3				
1.50	14.50	6.00	7.6				
2.00	16.00	6.00	8.4				
2.50	22.00	6.00	11.7				
3.00	22.00	5.00	11.7				
Test No.		VST 56+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.57	26.00	8.00	13.9				
1.00	17.00	6.00	8.9				
1.50	16.00	6.00	8.4				
2.00	19.00	6.00	10.0				
2.50	18.00	6.00	9.5				
Test No.		VST 56+100	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	19.00	9.00	10.0				
1.00	21.00	6.00	11.1				
1.50	16.50	6.00	8.6				
2.00	16.00	6.00	8.4				
2.50	17.00	7.00	8.9				
3.00	15.00	6.00	7.8				
Test No.		VST 56 BASE	Date:			Peat Depth 1.84m	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.63	24	13	12.8				
1	25	6	13.3				
1.5	33	6	17.9				
Points to Note: Valley feature present between 0 and +50 meters.							
Land sloping from both sides of turbine into valley feature and to the north							
. Drains present adjacent to road on downslope side joining northward flowing drain in valley.							
Difficulty encountered at turbine base and +50 in advancing vane into ground and retrieving vane.							

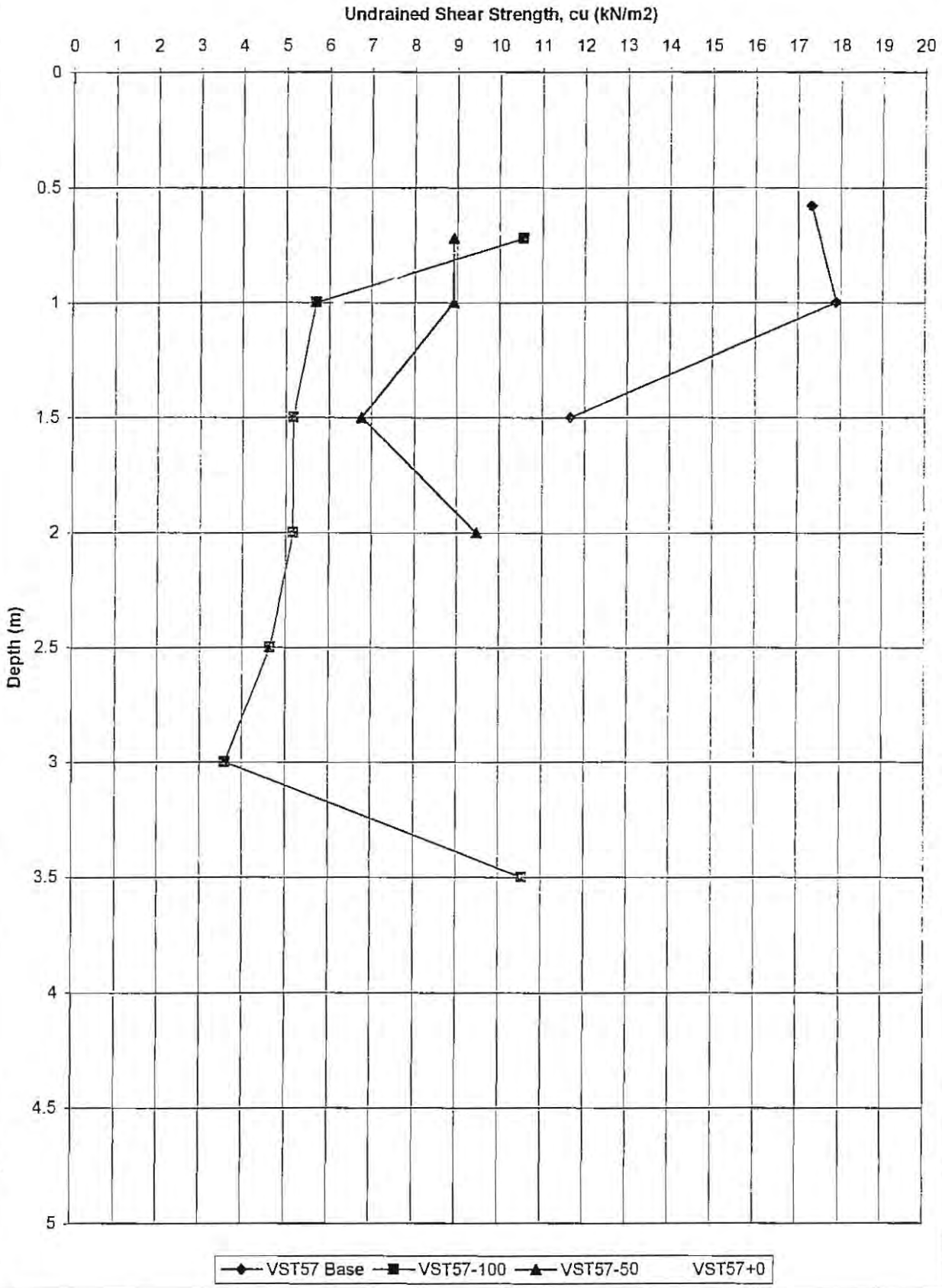
VST Resultsalong downslope of floating road in Cell T56



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 57**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T57/P-125A		159083.0	205434.0	345.46	**3.40**	342.1	**1.7**	**1.9**
T57/P-125B				344.18	**3.65**	340.5		
T57/P-100A		159104.6	205444.8	345.25	**3.80**	341.4	**1.2**	**-0.1**
T57/P-100B				344.36	**2.80**	341.6		
T57/P-75A		159127.5	205456.0	345.05	**3.15**	341.9	**1.9**	**1.3**
T57/P-75B		159112.1	205501.4	343.53	**2.70**	340.8		
T57/P-50A		159148.7	205465.7	344.36	**2.20**	342.2	**1.7**	**2.1**
T57/P-50B		159135.4	205514.0	342.98	**2.50**	340.5		
T57/P-25A		159170.4	205477.9	343.86	**1.50**	342.4	**1.8**	**2.7**
T57/P-25B		159156.3	205525.3	342.36	**2.20**	340.2		
T57/P0A		159192.5	205490.6	343.20	**1.70**	341.5	**1.7**	**1.8**
T57/P0B		159177.6	205534.2	341.83	**1.80**	340.0		
T57/P25A		159208.4	205502.5	342.28	**1.50**	340.8	**0.7**	1.1
T57/P25B		159184.2	205534.3	341.68	**1.80**	339.9		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T57B-NE								
T57B-NW								
T57B-SE								
T57B-SW								
T57B-C								
T57B+50								
T57B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 57**
Job No. 03-104							
Test No.		VST 57-100	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	20.00	9.00	10.6				
1.00	11.00	8.00	5.7				
1.50	10.00	8.00	5.2				
2.00	10.00	7.00	5.2				
2.50	9.00	6.00	4.6				
3.00	7.00	6.00	3.6				
3.50	20.00	6.00	10.6				
Test No.		VST 57-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	17.00	9.00	8.9				
1.00	17.00	6.00	8.9				
1.50	13.00	6.00	6.8				
2.00	18.00	6.00	9.5				
Test No.		VST 57-0	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	20.00	7.50	10.6				
1.00	12.00	6.00	6.2				
Test No.		VST 57-Base	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.58	32	10	17.3				
1	33	7	17.9				
1.5	22	6	11.7				

VST Results along downslope of floating road in Cell T57



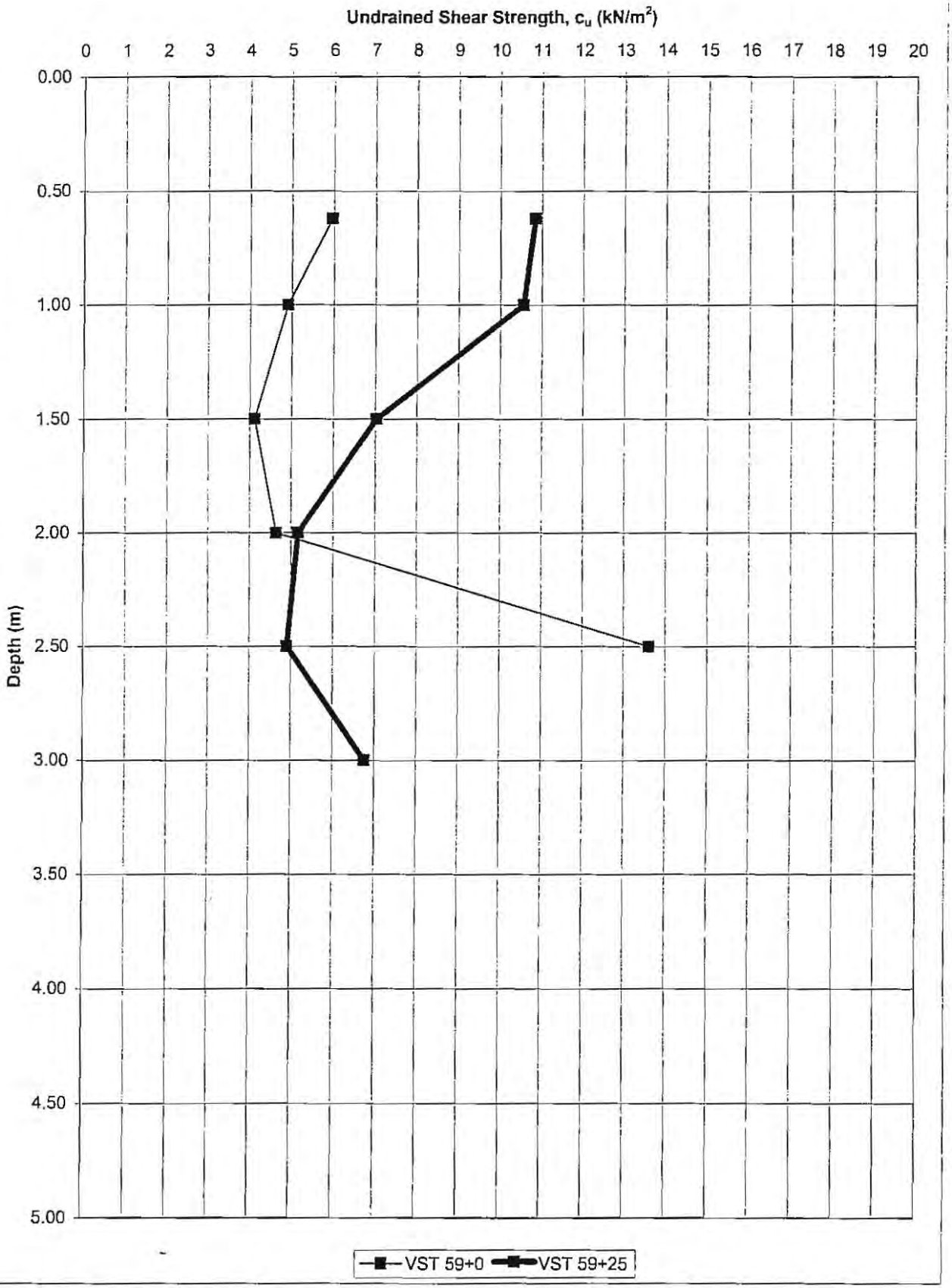
AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		Cell No: 59	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T59/P-100A								
T59/P-100B								
T59/P-75A								
T59/P-75B								
T59/P-50A								
T59/P-50B								
T59/P-25A								
T59/P-25B								
T59/P0A		158602.6	204868.2	360.38	**2.70**	357.68	**0.7**	**0.1**
T59/P0B				359.83	**2.20**	357.63		
T59/P25A		158623.9	204881.6	360.41	**2.85**	357.56	**0.5**	**0.7**
T59/P25B				360.00	**3.05**	356.95		
T59/P50A		158645.1	204893.7	360.71	**3.00**	357.71	**0.8**	**1.0**
T59/P50B				360.03	**3.10**	356.93		
T59/P+75A		158665.8	204909.6	361.21	**3.50**	357.71	**0.8**	**0.1**
T59/P+75B				360.53	**2.90**	357.63		
T59/P+100A		158684.5	204924.7	361.59	**3.60**	357.99	**0.5**	**0.0**
T59/P+100B				361.18	**3.20**	357.98		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T59B-NE								
T59B-NW								
T59B-SE		158588.1	204896.1	360.48				
T59B-SW		158581.5	204888.5	360.18				
T59B-C		158581.3	204896.3	360.27				
T59B+50								
T59B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project:	Derrybrien Wind Farm		Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 59**
Job No.	03-104						
Test No.	VST 59+0		Date: 07.10.04			Peat Depth (m) 2.65	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	11.5	5.50	6.0				
1.00	9.5	6.50	4.9				
1.50	8.0	6.00	4.1				
2.00	9.0	4.00	4.6				
2.50	25.5	7.50	13.6				
Test No.	VST 59+25		Date: 07.10.04			Peat Depth (m) 3.50	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	20.5	8.50	10.8				
1.00	20.0	7.50	10.6				
1.50	13.5	6.50	7.0				
2.00	10.0	4.50	5.2				
2.50	9.5	5.00	4.9				
3.00	13.0	4.50	6.8				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

Turbine/ Cell No.

Page of

VST Results along downslope of floating road in Cell T59



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 60**	
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T60/P-100A		158697.6	204933.5	362.03	**3.80**	358.23	**0.5**	**-0.1**
T60/P-100B				361.62	**3.30**	358.32		
T60/P-75A		158719.9	204947.1	362.53	**3.85**	358.68	**0.5**	**0.6**
T60/P-75B				362.12	**3.90**	358.22		
T60/P-50A		158740.3	204960.2	362.68	**3.10**	359.58	**0.5**	**1.6**
T60/P-50B				362.27	**4.00**	358.27		
T60/P-25A		158759.3	204972.1	362.86	**3.80**	359.06	**0.5**	**1.6**
T60/-25B				362.45	**4.70**	357.75		
T60/P0A		158780.5	204983.7	363.18	**3.75**	359.43	**0.5**	
T60/P0B				362.77				
T60/P25A		158805.2	204994.8	362.90	**3.20**	359.70	**0.5**	**1.0**
T60/P25B				362.49	**3.65**	358.84		
T 60/P50A		158827.8	205006.1	362.67	**2.80**	359.87	**0.5**	**-0.5**
T60/P50B				362.26	**2.00**	360.26		
T60/P+75A		158848.7	205017.8	362.13	**2.30**	359.83	**0.5**	**1.4**
T60/P+75B				361.72	**3.00**	358.72		
T60/P+100A		158869.9	205031.6	361.87	**2.50**	359.37	**2.2**	**2.0**
T60/P+100B				360.10	**2.40**	357.70		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T60B-NE								
T60B-NW								
T 60B-SE								
T60B-SW								
T60B-C								
T60B+50								
T60B+100								

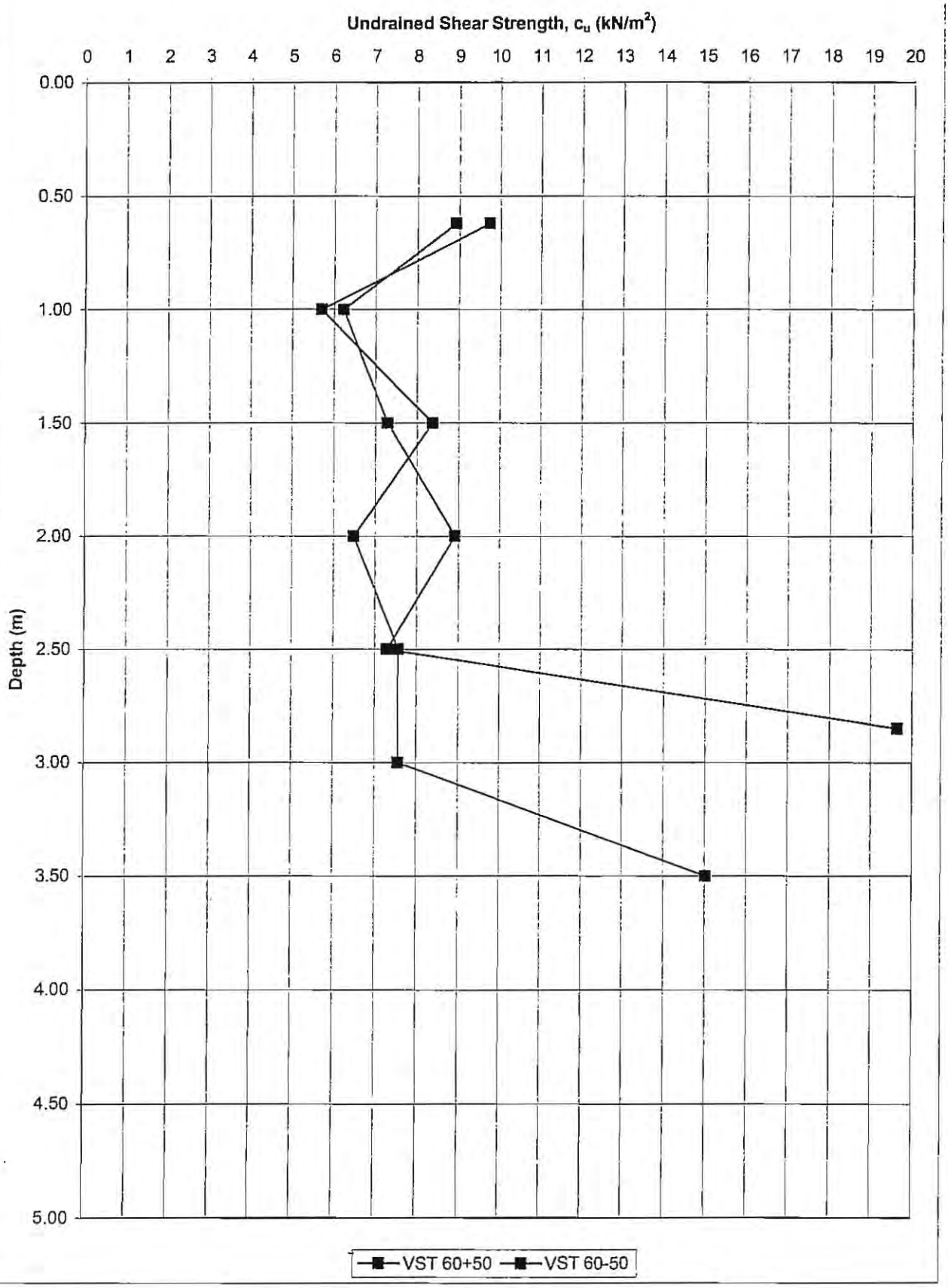
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 60**
Test No.		VST 60+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	17.0		8.9				
1.00	12.0		6.2				
1.50	14.0		7.3				
2.00	17.0		8.9				
2.50	14.0		7.3				
2.85	36.0		19.6				

Test No.		VST 60-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	18.5		9.7				
1.00	11.0		5.7				
1.50	16.0		8.4				
2.00	12.5		6.5				
2.50	14.5		7.6				
3.00	14.5		7.6				
3.50	28.0		15.0				

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

VST Results along downslope of floating road in Cell T60



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 61**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Su	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T61/P-100A								
T61/P-100B								
T61/P-75A		158912.7	205055.9	362.09	**1.10**	360.99	**5.5**	**7.3**
T61/P-75B				359.68	**1.90**	357.78		
T61/P-50A		158935.6	205064.7	363.30	**1.88**	361.42	**3.5**	**3.3**
T61/P-50B				362.07	**1.80**	360.27		
T61/P-25A		158957.2	205075.3	364.42	**2.18**	362.24	**0.3**	**-1.0**
T61/P-25B				364.34	**1.85**	362.49		
T61/P0A		158975.8	205091.5	364.66	**2.34**	362.32	**2.2**	**2.1**
T61/P0B				363.70	**2.30**	361.40		
T61/P25A		158993.2	205107.4	364.04	**2.04**	362.00	**5.2**	**4.2**
T61/P25B				362.22	**1.70**	360.52		
T61/P50A		159011.1	205123.4	364.04	**3.03**	361.01	**1.3**	**-0.5**
T61/P50B				363.58	**2.40**	361.18		
T61/P+75A		159031.1	205138.1	364.07	**3.41**	360.66	**2.5**	**0.7**
T61/P+75B				362.76	**2.45**	360.31		
T61/P+100A		159031.1	205138.1	364.11	**3.34**	360.77	**3.3**	**-0.1**
T61/P+100B				363.25	**2.45**	360.80		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 25m downslope from road								
Probes On Turbine Base								
T61B-NE								
T61B-NW								
T61B-SE					**3.00**			
T61B-SW					**2.48**			
T61B-C					**2.88**			
T61B+50					**2.12**			
T61B+100					**0.24**			

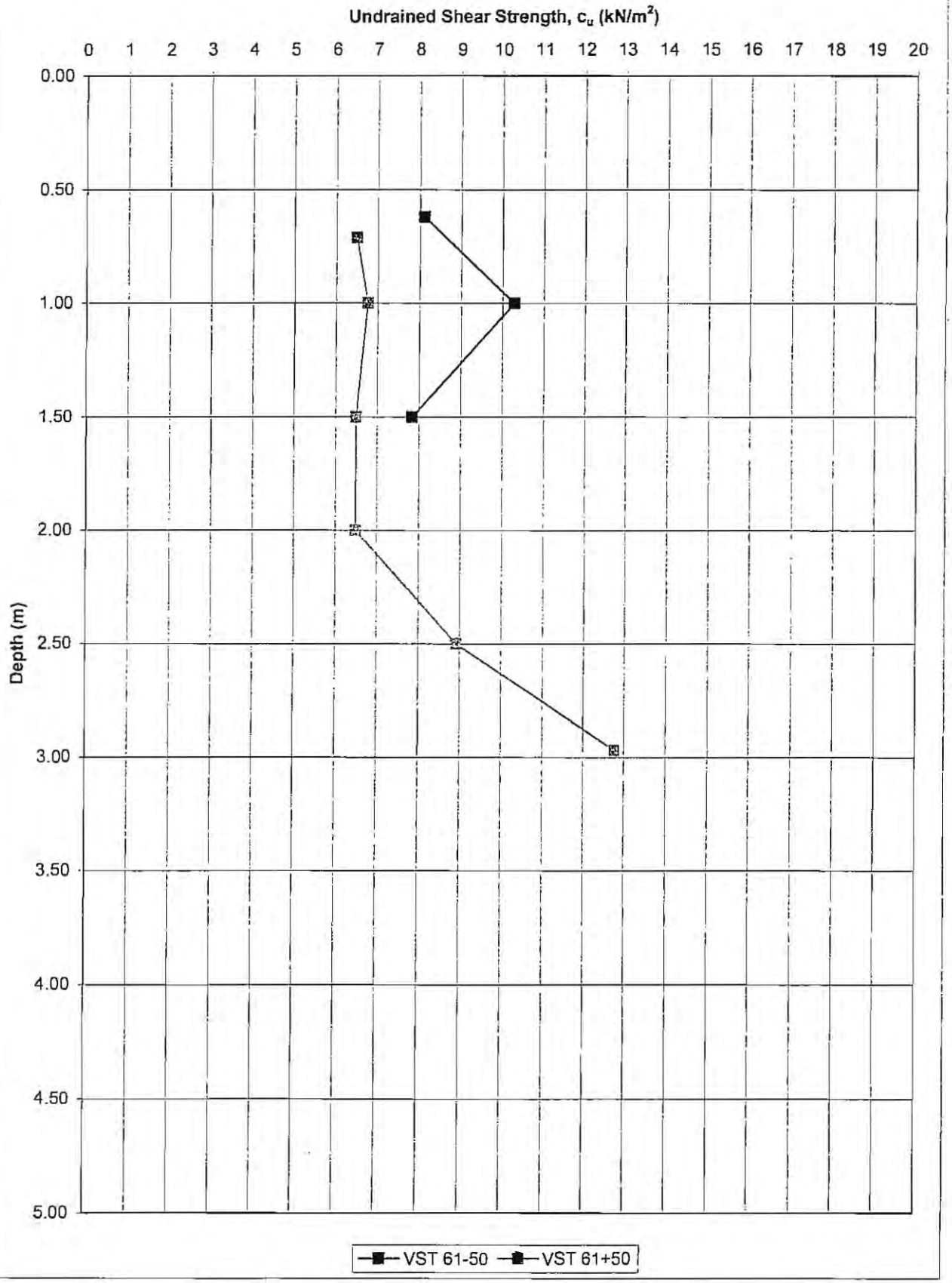
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm Job No. 03-104			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 61**
Test No.		VST 61-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	15.5	4.50	8.1				
1.00	19.5	4.50	10.3				
1.50	15.0	4.50	7.8				

Test No.		VST 61+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.71	12.5	4.50	6.5				
1.00	13.0	4.50	6.8				
1.50	12.5	5.00	6.5				
2.00	12.5	4.50	6.5				
2.50	17.0	5.50	8.9				
2.97	24.0	4.50	12.8				

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments

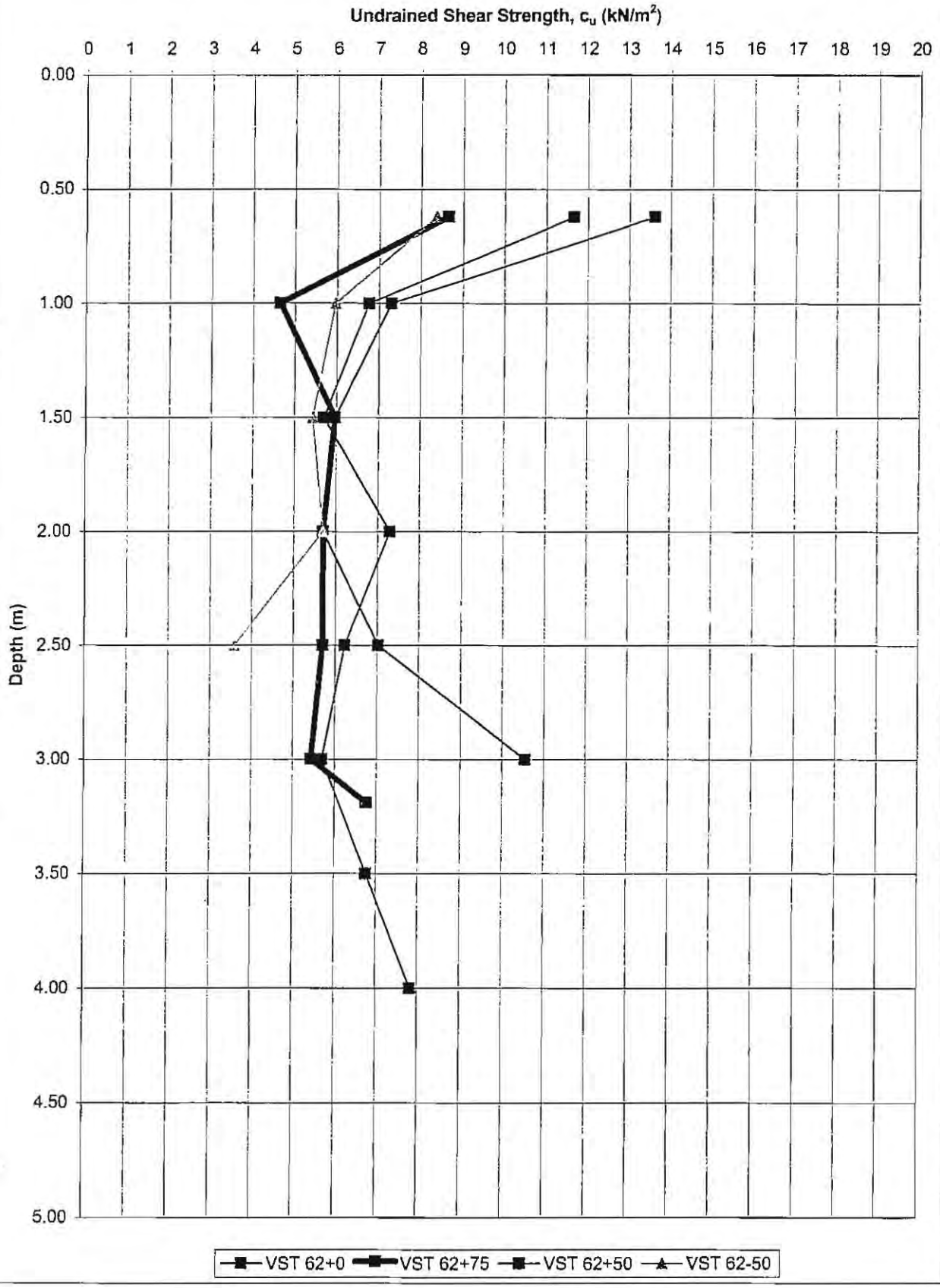
VST Results along downslope of floating road in Cell T61



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 62**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T62/P-125A					**3.50**		**2.8**	**-1.1**
T62/P-125B					**2.15**			
T62/P-100A					**2.30**		**3.8**	**1.9**
T62/P-100B					**1.80**			
T62/P-75A					**2.80**		**3.5**	**0.8**
T62/P-75B					**2.10**			
T62/P-50A					**2.80**		**2.3**	**1.6**
T62/P-50B					**2.50**			
T62/P-25A					**2.95**		**3.2**	**2.9**
T62/P-25B					**2.85**			
T62/P0A					**2.80**		**2.5**	**1.6**
T62/P0B					**2.50**			
T62/P25A					**2.85**		**2.0**	**1.3**
T62/P25B					**2.30**			
T62/P50A					**2.90**		**1.2**	**0.7**
T62/P50B					**2.55**			
T62/P+75A					**3.25**		**1.5**	**1.6**
T62/P+75B					**3.30**			
T62/P+100A					**3.65**		**2.2**	**1.3**
T62/P+100B					**2.90**			
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T62B-NE								
T62B-NW								
T62B-SE								
T62B-SW								
T62B-C								
T62B+50								
T62B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 62**
Job No. 03-104							
Test No.		VST 62+0	Date:			Peat Depth (m) 4.02	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	22.0	6.50	11.7				
1.00	13.0	5.00	6.8				
1.50	11.0	5.50	5.7				
2.00	14.0	5.00	7.3				
2.50	12.0	6.00	6.2				
3.00	11.0	5.50	5.7				
3.50	13.0	6.50	6.8				
4.00	15.0	6.00	7.8				
Test No.		VST 62+50	Date:			Peat Depth (m) 3.1	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	25.5	5.50	13.6				
1.0	14.0	5.00	7.3				
1.5	11.5	3.00	6.0				
2.0	11.0	3.00	5.7				
2.5	13.5	4.50	7.0				
3.0	20.0	5.00	10.6				
Test No.		VST 62+75	Date:			Peat Depth (m) 3.2	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	16.5	4.00	8.6				
1.00	9.0	3.00	4.6				
1.50	11.5	4.00	6.0				
2.00	11.0	3.00	5.7				
2.50	11.0	4.50	5.7				
3.00	10.5	3.00	5.4				
3.19	13.0	3.00	6.8				
Test No.		VST 62-50	Date:			Peat Depth (m) 2.5	
Depth (m)	Dial Gauge Reading	Time to Failure (mins)	c_u (KN/m^2)	Co-ordinates E (m)	N (m)	Elevation (mOD)	Comments
0.62	16.0	6.00	8.4				
1.00	11.5	5.50	6.0				
1.50	10.5	4.00	5.4				
2.00	11.0	3.50	5.7				
2.50	7.0	3.50	3.6				

VST Results along downslope of floating road in Cell T62



AGL Consulting
Geotechnical Engineers

Record of Gouge Auger Probes

Project: Derrybrien Wind Farm
Job No. 03-104
Made By:
Date:
Cell No: 63

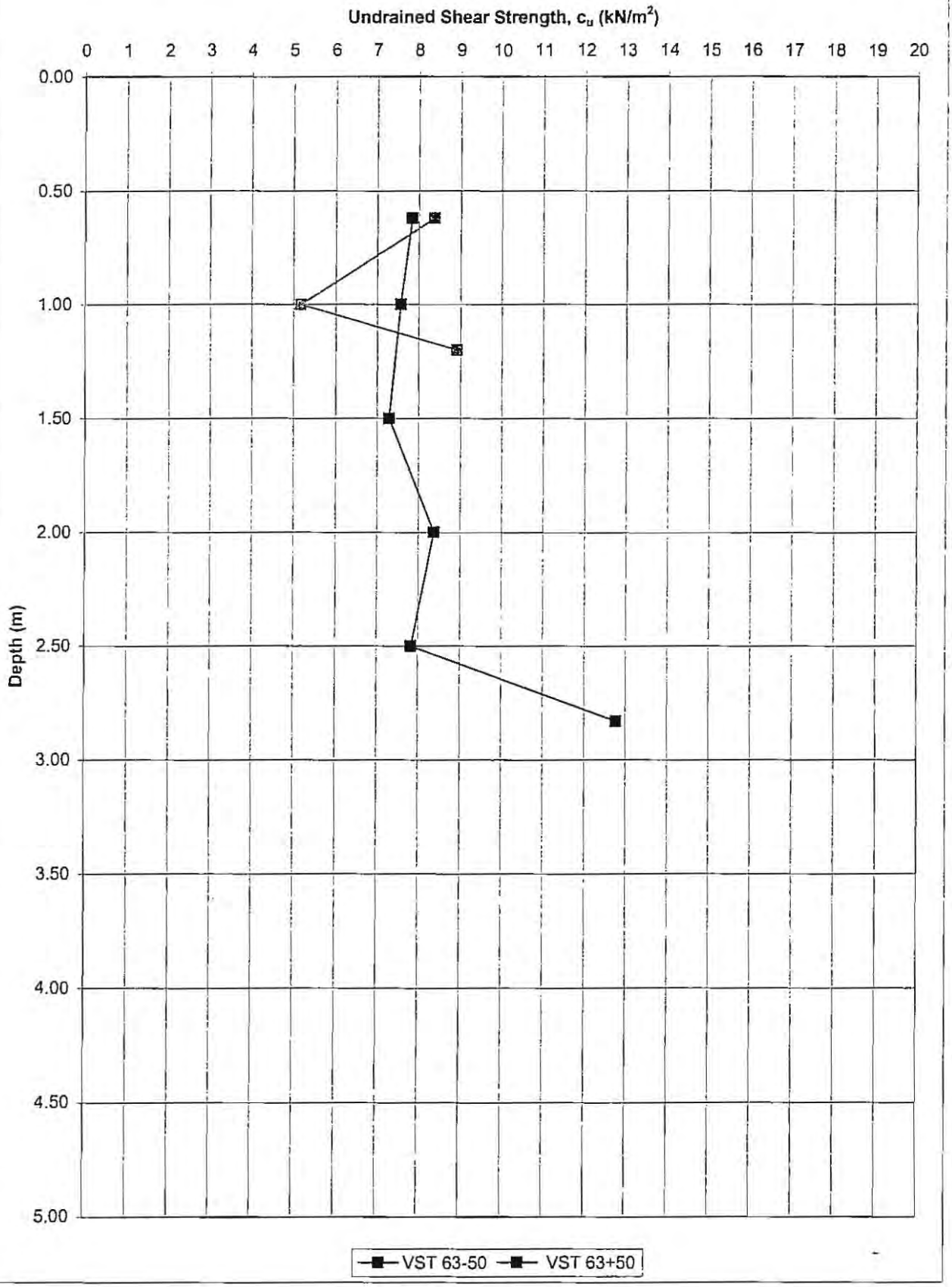
Probe No.	Date	Coordinates		Ground Sur	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T63/P-100A		159494.3	205318.9	346.25	**3.10**	343.15	**3.3**	**3.1**
T63/P-100B				343.51	**2.90**	340.61		
T63/P-75A		159468.7	205315.3	346.71	**3.20**	343.51	**2.5**	**2.1**
T63/P-75B				344.65	**2.90**	341.75		
T63/P-50A		159448.1	205304.4	347.54	**3.20**	344.34	**1.7**	**1.5**
T63/P-50B				346.17	**3.10**	343.07		
T63/P-25A		159422.9	205293.3	348.89	**3.20**	345.69	**3.5**	**4.0**
T63/P-25B				346.02	**3.60**	342.42		
T63/P0A		159401.6	205283.6	351.33	**2.10**	349.23	**2.5**	**1.6**
T63/P0B				349.28	**1.40**	347.88		
T63/P25A		159377.1	205275.9	352.17	**1.70**	350.47	**2.5**	**2.5**
T63/P25B				350.11	**1.70**	348.41		
T63/P50A		195353.6	205269.4	353.09	**1.70**	351.39	**2.5**	**2.4**
T63/P50B				351.04	**1.64**	349.40		
T63/P+75A		159330.6	205262	354.20	**1.30**	352.90	**1.7**	**1.3**
T63/P+75B				352.83	**1.00**	351.83		
T63/P+100A		159307.7	205252.5	354.77	**0.90**	353.87	**1.5**	**1.5**
T63/P+100B				353.54	**0.90**	352.64		
East								

Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively
ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road

Probes On Turbine Base								
T63B-NE								
T63B-NW								
T63B-SE								
T63B-SW								
T63B-C		159395.0	205271.0					
T63B+50		159384.7	205317.3	349.64	**1.60**			
T63B+100		159392.9	205382.1	347.69	**2.40**			

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 63**
Job No. 03-104							
Test No.		VST 63-50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	15.0	4.50	7.8				
1.00	14.5	5.50	7.6				
1.50	14.0	5.50	7.3				
2.00	16.0	5.00	8.4				
2.50	15.0	4.50	7.8				
2.83	24.0	5.00	12.8				
Test No.		VST 63+50	Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	16.0	6.00	8.4				
1.00	10.0	4.00	5.2				
1.20	17.0	5.00	8.9				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

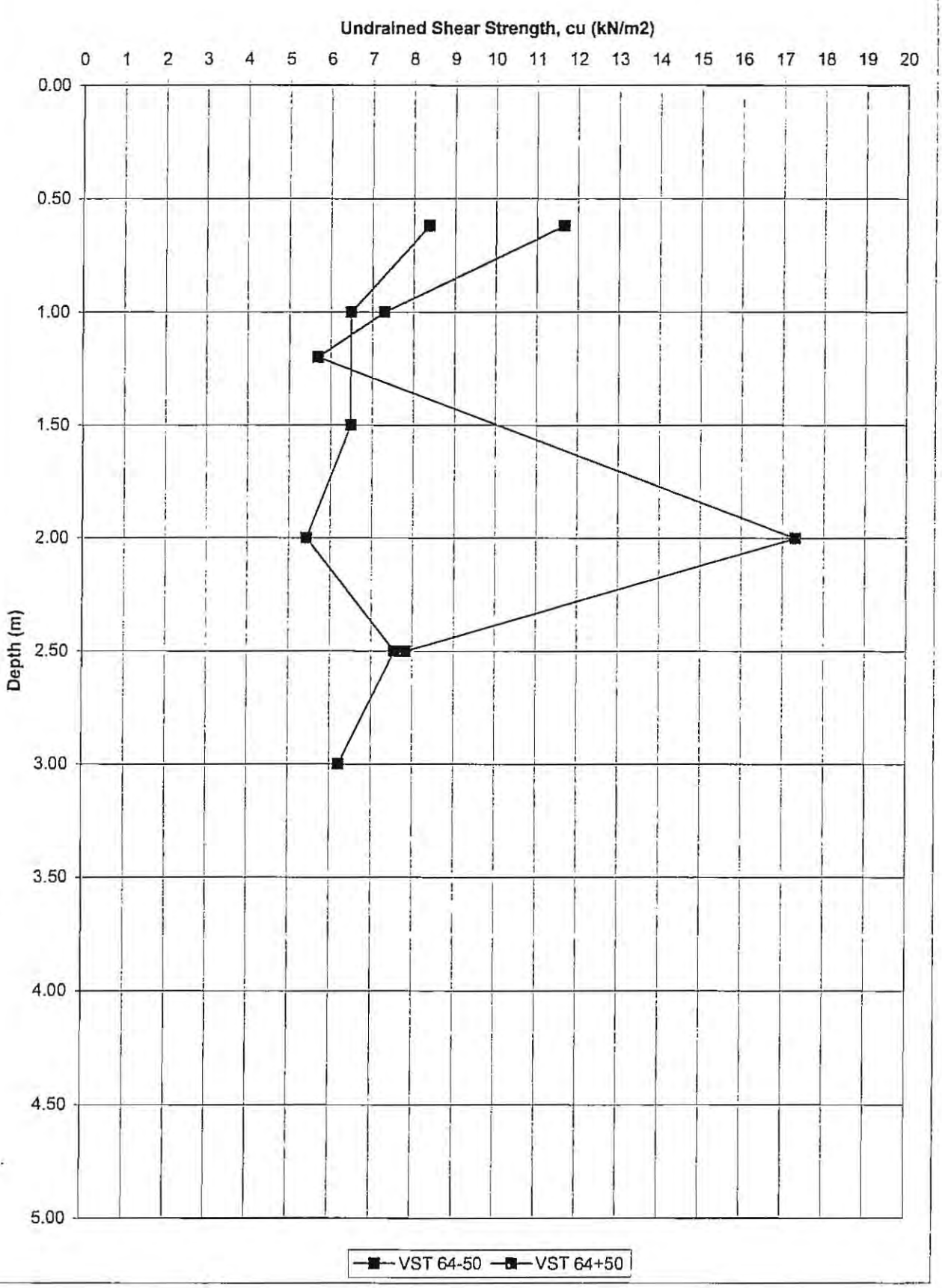
VST Results along downslope of floating road in Cell T63



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 64**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surf	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T64/P-100A		159709	205450.1	340.33	**2.50**	337.83	**1.5**	**1.4**
T64/P-100B				339.10	**2.40**	336.70		
T64/P-75A		159701	205438.2	341.01	**2.30**	338.71	**1.5**	**1.1**
T64/P-75B				339.78	**2.00**	337.78		
T64/P-50A		159677.8	205419	342.51	**2.50**	340.01	**1.8**	**1.0**
T64/P-50B				341.00	**1.80**	339.20		
T64/P-25A		159660.3	205408	343.25	**2.60**	340.65	**0.5**	**-0.6**
T64/P-25B				342.84	**1.70**	341.14		
T64/P0A		159634.3	205395.2	344.16	**2.80**	341.36	**0.5**	**-0.8**
T64/P0B				343.75	**1.70**	342.05		
T64/P25A		159620.6	205383.3	344.80	**2.90**	341.90	**1.5**	**0.5**
T64/P25B				343.57	**2.10**	341.47		
T64/P50A		159599.5	205371.2	345.60	**3.00**	342.60	**0.5**	**-0.7**
T64/P50B				345.19	**2.00**	343.19		
T64/P+75A		159577.1	205360.2	346.09	**3.10**	342.99	**1.5**	**0.8**
T64/P+75B				344.86	**2.50**	342.36		
T64/P+100A		159556.8	205352.1	346.40	**3.20**	343.20	**1.5**	**0.6**
T64/P+100B				345.17	**2.50**	342.67		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T64B-NE					**2.40**			
T64B-NW					**2.50**			
T64B-SE					**2.80**			
T64B-SW					**2.70**			
T64B-C		159643.0	205389.0					
T64B+50		159623.0	205453.0	336.60	**2.00**			
T64B+100		159494.3	205318.9	346.24	**2.10**			

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 (65_{mm}/130_{mm})				**Cell No. 64**
Job No. 03-104							
Test No.		VST 64-50	Date:			Peat Depth (m) 3.02	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	16.0	7.00	8.4				
1.00	12.5	4.50	6.5				
1.50	12.5	4.50	6.5				
2.00	10.5	4.00	5.4				
2.50	14.5	5.00	7.6				
3.00	12.0	4.50	6.2				
Test No.		VST 64+50	Date:			Peat Depth (m) 2.76	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	22.0	9.00	11.7				
1.00	14.0	8.50	7.3				
1.20	11.0	7.50	5.7				
2.00	32.0	16.50	17.3				
2.50	15.0	4.50	7.8				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

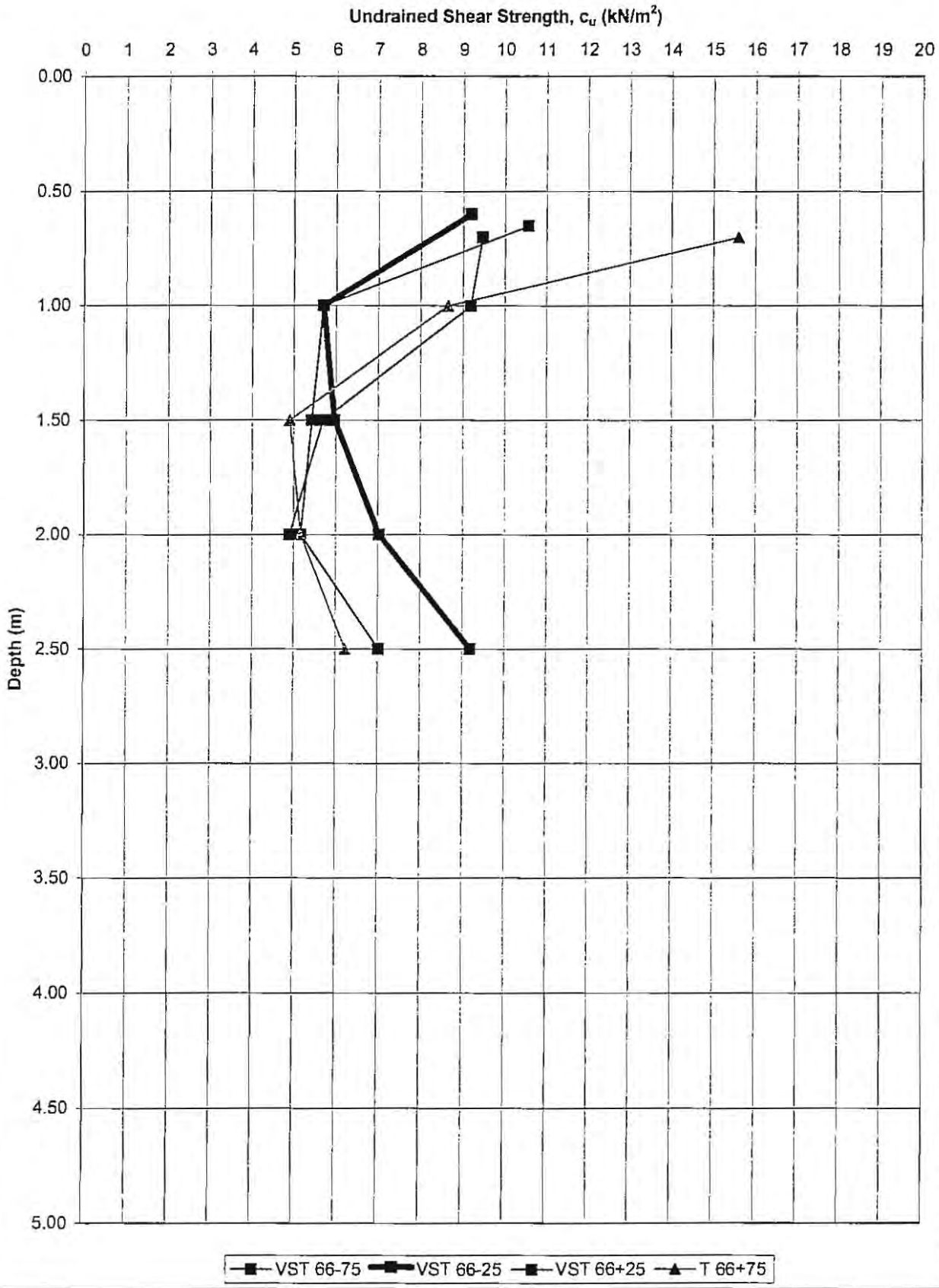
VST Results along downslope of floating road in Cell T64



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 66**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T66/P-100A		159133.6	204813.1	358.59	**3.20**	355.39	**1.0**	**0.5**
T66/P-100B				357.77	**2.80**	354.97		
T66/P-75A		159153.4	204830.8	358.42	**2.50**	355.92	**1.7**	**1.8**
T66/P-75B				357.06	**2.60**	354.46		
T66/P-50A		159171.7	204843.9	358.22	**2.35**	355.87	**2.5**	**2.3**
T66/P-50B				356.17	**2.15**	354.02		
T66/P-25A		159194.0	204854.7	358.39	**2.85**	355.54	**3.3**	**3.0**
T66/P-25B				355.66	**2.55**	353.11		
T66/P0A		159218.6	204864.9	357.89	**0.90**	356.99	**3.0**	**5.4**
T66/P0B				355.43	**2.85**	352.58		
T66/P25A		159239.3	204881.9	358.57	**2.00**	356.57	**3.0**	**4.1**
T66/P25B				356.11	**2.90**	353.21		
T66/P50A		159260.8	204892.3	358.23	**2.85**	355.38	**3.2**	**3.2**
T66/P50B				355.63	**2.85**	352.78		
T66/P+75A		159282.5	204903.2	358.52	**2.80**	355.72	**3.0**	**2.8**
T66/P+75B				356.06	**2.65**	353.41		
T66/P+100A		159308.6	204917.4	358.49	**2.80**	355.69	**3.0**	**2.5**
T66/P+100B				356.03	**2.35**	353.68		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T66B-NE								
T66B-NW								
T66B-SE								
T66B-SW								
T66B-C								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 66**
Job No. 03-104							
Test No.		VST 66-75	Date: 24th sept			Peat Depth (m) 2.17	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	18.0	6.50	9.5				
1.00	17.5	5.50	9.2				
1.50	11.0	3.00	5.7				
2.00	9.5	2.00	4.9				
Test No.		VST 66-25	Date: 24th sept			Peat Depth (m) 2.6	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.60	17.5	9.00	9.2				
1.00	11.0	2.00	5.7				
1.50	11.5	3.00	6.0				
2.00	13.5	3.50	7.0				
2.50	17.5	4.50	9.2				
Test No.		VST 66+25	Date: 27th sept			Peat Depth (m) 2.7	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	20.0	6.00	10.6				
1.00	11.0	4.00	5.7				
1.50	10.5	3.50	5.4				
2.00	10.0	4.50	5.2				
2.50	13.5	3.50	7.0				
Test No.		VST 66+75	Date: 27th sept			Peat Depth (m) 2.55	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.70	29.0	6.50	15.6				
1.00	16.5	6.50	8.6				
1.50	9.5	4.00	4.9				
2.00	10.0	3.00	5.2				
2.50	12.0	3.50	6.2				

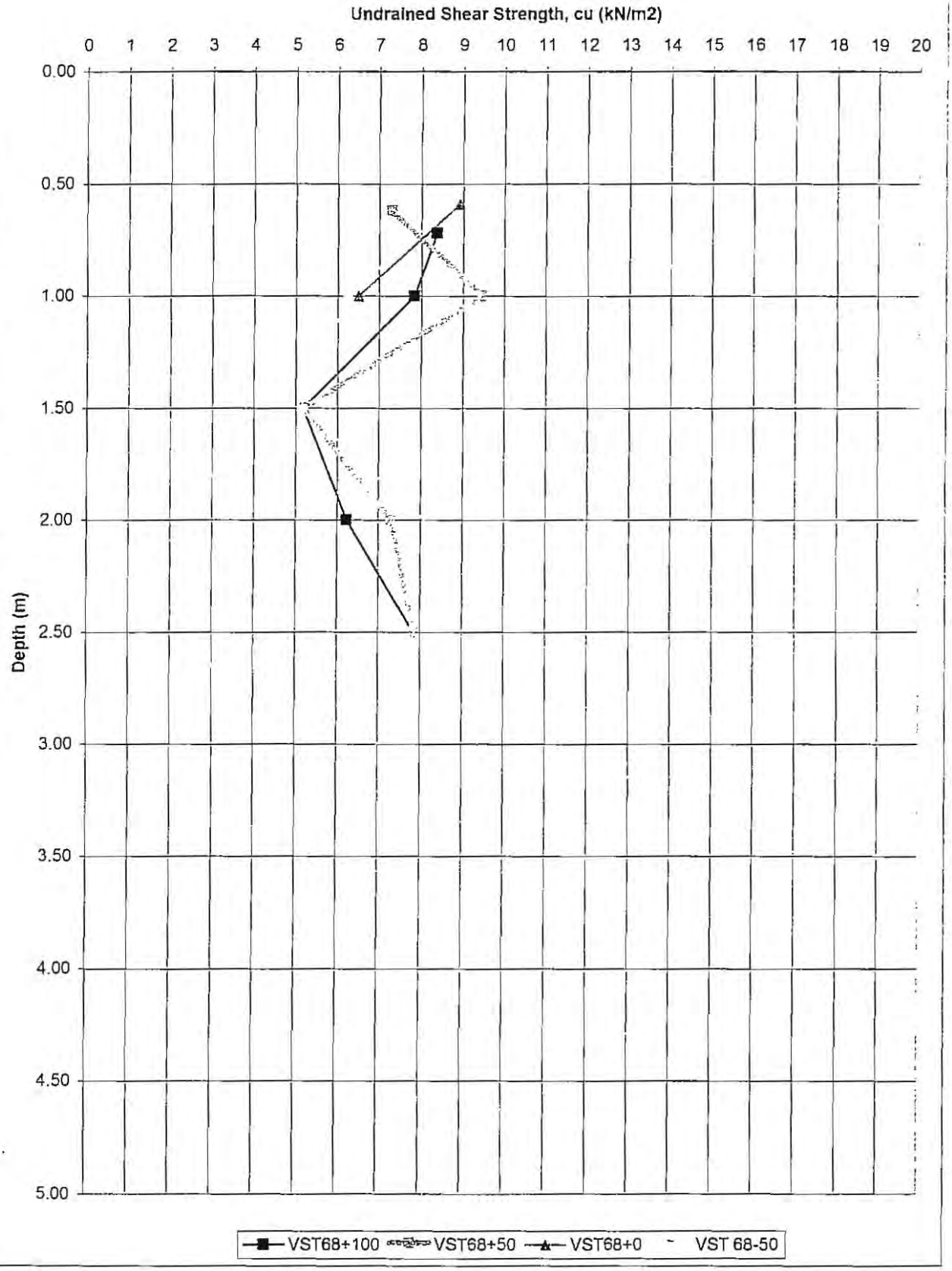
VST Results along downslope of floating road in Cell T66



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 68**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T68/P-100A		159232.2	204594.3	355.99	2.04	353.95	**4.0**	**2.8**
T68/P-100B				352.70	1.09	351.61		
T68/P-75A		159257.1	204603.7	355.37	2.00	353.37	**3.5**	**3.7**
T68/P-75B				352.49	2.20	350.29		
T68/P-50A		159277.7	204612.9	354.82	2.10	352.72	**4.0**	**3.6**
T66/P-50B				351.53	1.80	349.73		
T68/P-25A		159299.5	204623.4	354.11	2.17	351.94	**1.7**	**1.3**
T68/P-25B				352.74	1.90	350.84		
T68/P0A		159322.7	204629.6	352.45	1.37	351.08	**3.5**	**2.8**
T68/P0B				349.57	0.80	348.77		
T68/P25A		159348.4	204641	353.37	2.60	350.77	**2.3**	**2.6**
T68/P25B				351.46	2.80	348.66		
T68/P50A		159371.2	204649	353.11	3.24	349.87	**1.7**	**1.7**
T68/P50B				351.74	3.24	348.50		
T68/P+75A		159393.6	204659.3	352.61	3.30	349.31	**1.2**	**1.5**
T68/P+75B				351.65	3.58	348.07		
T68/P+100A		159415.9	204670.8	351.96	3.14	348.82	**1.7**	**1.8**
T68/P+100B				350.59	3.28	347.31		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T68B-NE								
T68B-NW								
T68B-SE								
T68B-SW								
T68B-C								
T68B+50								
T68B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 68**
Job No. 03-104							
Test No.		VST 68+100	Date:	02-Sep		Peat Depth (m) 2.89	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.72	16.0	6.00	8.4				
1.00	15.0	8.00	7.8				
1.50	10.0	5.00	5.2				
2.00	12.0	6.00	6.2				
2.50	15.0	6.00	7.8				
Test No.		VST 68+50	Date:	02-Sep		Peat Depth (m) 2.96	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.62	14.0	5.00	7.3				
1.00	18.0	5.00	9.5				
1.50	10.0	4.00	5.2				
2.00	14.0	5.00	7.3				
2.50	15.0	4.00	7.8				
Test No.		VST 68+0	Date:	02-Sep		Peat Depth (m) 1.32	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.59	17.0	6.00	8.9				
1.00	12.5	4.00	6.5				
Test No.		VST 68-50	Date:			Peat Depth (m) 2.30	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	16.0	5.00	8.4				
1.00	12.0	4.00	6.2				
1.50	10.0	4.00	5.2				
2.05	16.0	5.00	8.4				

VST Results along downslope of floating road in Cell T68

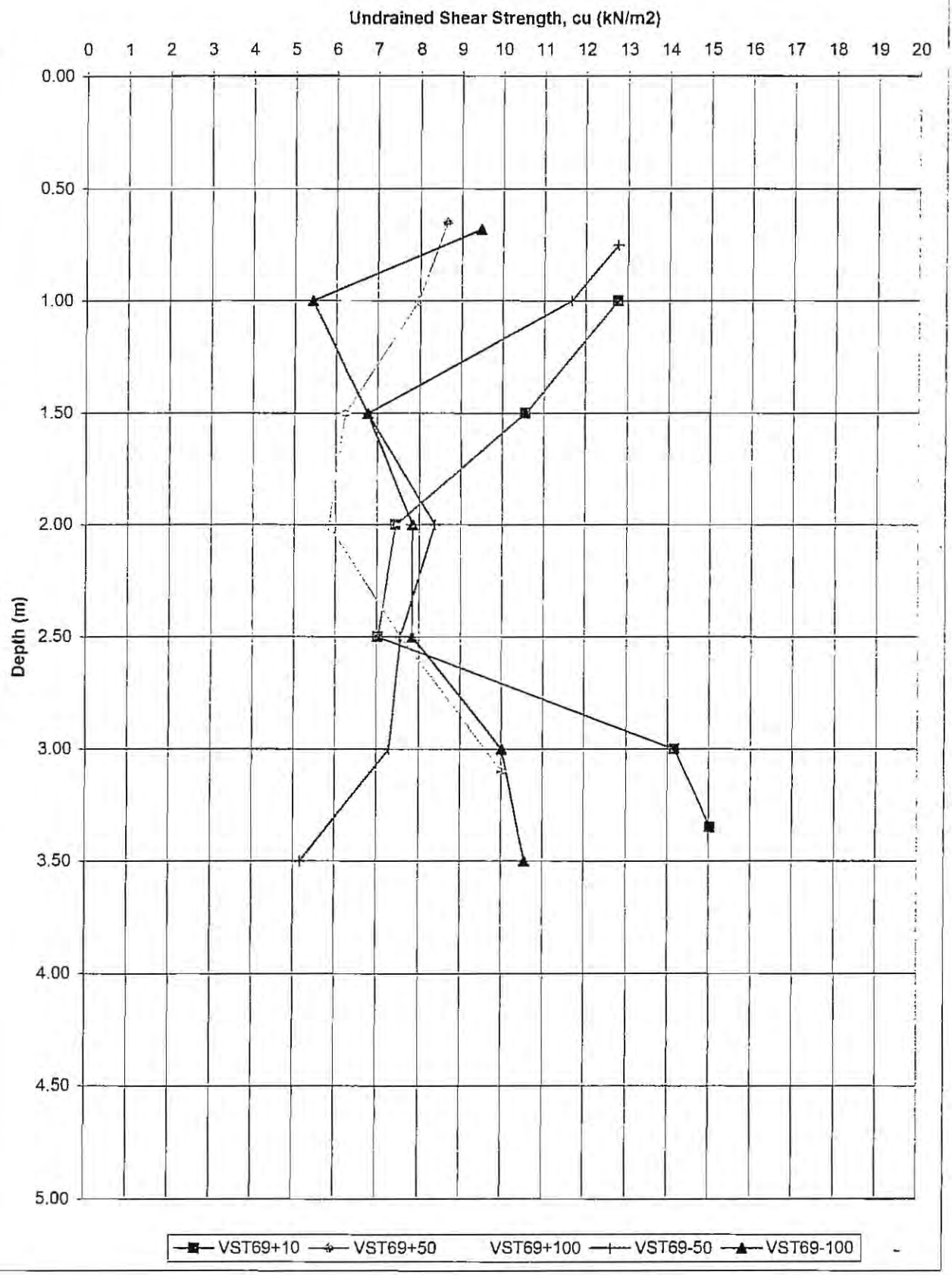


AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project: Derrybrien Wind Farm Job No. 03-104					Made By: Date:		**Cell No: 69**	
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T69/P-100A		159440.8	204680.3	351.38	**3.30**	348.08	**1.2**	**1.0**
T69/P-100B				350.42	**3.20**	347.22		
T69/P-75A		159463.1	204688.4	350.75	**3.00**	347.75	**1.2**	**1.3**
T69/P-75B				349.79	**3.15**	346.64		
T69/P-50A		159484.4	204699.7	350.37	**3.47**	346.90	**1.2**	**0.8**
T69/P-50B				349.41	**3.20**	346.21		
T69/P-25A		159508.5	204707.7	349.48	**3.10**	346.38	**1.2**	**0.8**
T69/P-25B				348.52	**2.84**	345.68		
T69/P0A		159530.6	204722.0	349.40	**3.56**	345.84	**1.7**	**0.8**
T69/P0B				348.03	**2.84**	345.19		
T69/P25A		159551.5	204731.0	349.73	**3.12**	346.61	**1.7**	**2.2**
T69/P25B				348.36	**3.54**	344.82		
T69/P50A		159576.1	204741.9	349.87	**3.25**	346.62	**2.3**	**2.3**
T69/P50B				347.95	**3.25**	344.70		
T69/P+75A		159598.1	204750.5	349.79	**3.38**	346.41	**2.3**	**2.3**
T69/P+75B				347.88	**3.35**	344.53		
T69/P+100A		159620.6	204762.4	349.70	**2.44**	347.26	**1.7**	**1.4**
T69/P+100B				348.34	**2.20**	346.14		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T69B-NE								
T69B-NW								
T69B-SE								
T69B-SW								
T69B-C								
T69B+50								
T69B+100								

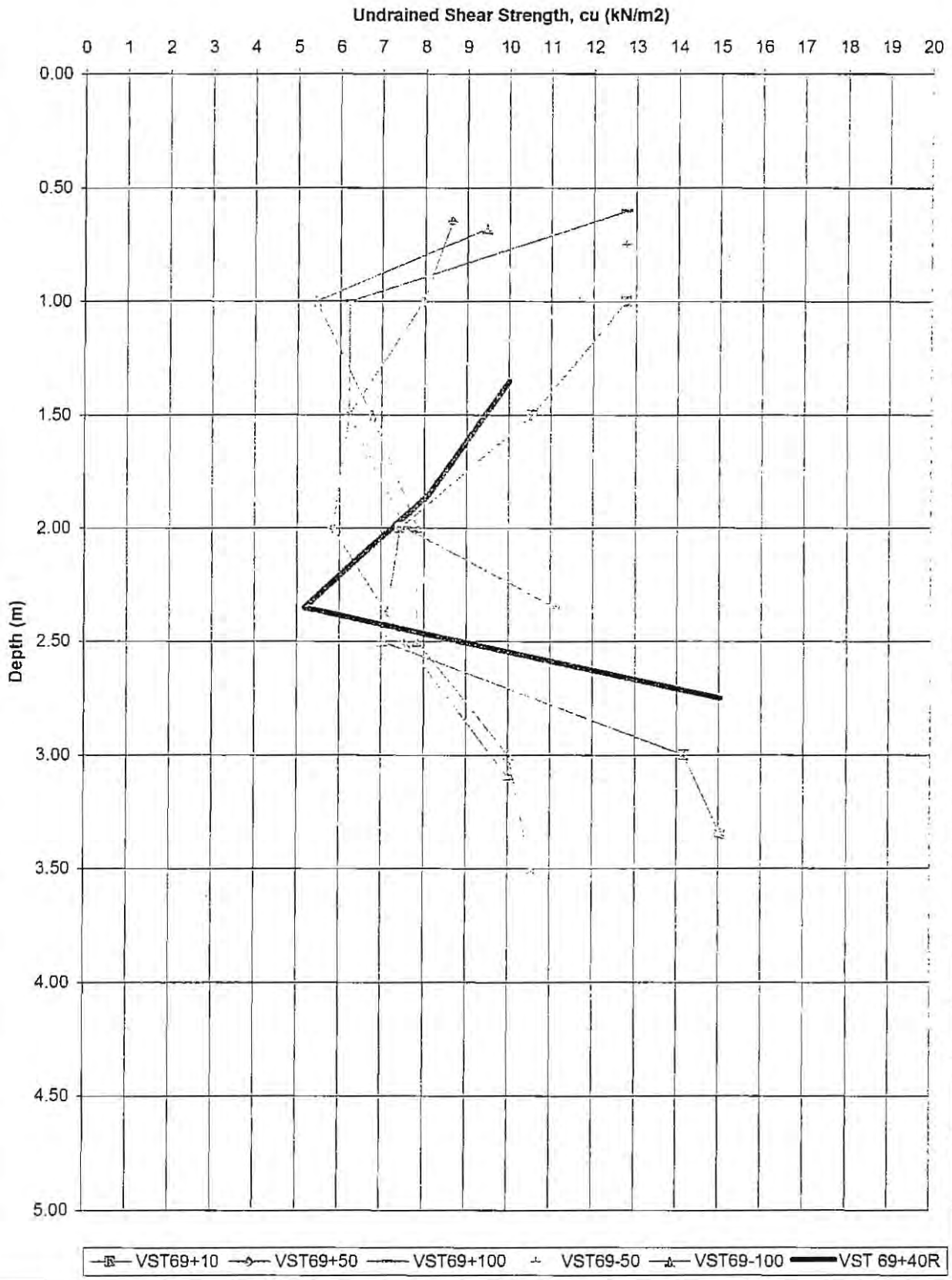
AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 69**
Job No. 03-104							
Test No.		VST 69+10	Date:	02-Sep		Peat Depth (m)	3.40
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
1.00	24.00	8.50	12.8				
1.50	20.00	7.50	10.6				
2.00	14.25	6.50	7.4				
2.50	13.50	6.00	7.0				
3.00	26.50	7.00	14.2				
3.35	28.00	8.00	15.0				dropped to 20 @ failure
Test No.		VST 69+50	Date:	02-Sep		Peat Depth (m)	3.20
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.65	16.50	6.50	8.6				
1.00	15.25	8.50	8.0				
1.50	12.00	6.00	6.2				
2.00	11.25	4.00	5.8				
2.50	14.50	8.00	7.6				
3.10	19.00	4.00	10.0				
Test No.		VST 69+100	Date:	02-Sep		Peat Depth (m)	2.4
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.60	24.0	8.0	12.8				
1.00	12.0	6.5	6.2				
1.50	12.0	5.0	6.2				
2.00	14.5	5.5	7.6				
2.35	21.0	3.0	11.1				
Test No.		VST 69+40R	Date:	02-Sep		Peat Depth (m)	Under Road:2.0m
**Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
1.35	19.0	6.00	10.0				
1.85	15.5	5.50	8.1				
2.35	10.0	5.50	5.2				
2.75	28.0	6.00	15.0				
850mm road thickness. Stone down to top peat;Very few trees at base of road @ test location							
**Depth below road surface. Depth to base of peat is 2.85 m							

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 69**
Job No. 03-104							
Test No.		VST 69-50	Date:	02-Sep		Peat Depth (m)	3.68
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.75	24.0	5.00	12.8				
1.00	22.0	6.50	11.7				
1.50	13.0	7.00	6.8				
2.00	16.0	6.00	8.4				
2.50	14.5	6.00	7.6				
3.00	14.0	5.00	7.3				
3.50	10.0	5.00	5.2				
Test No.		VST 69-100	Date:	02-Sep		Peat Depth (m)	3.66
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)		
0.68	18.0	6.00	9.5				
1.00	10.5	4.00	5.4				
1.50	13.0	5.00	6.8				
2.00	15.0	3.00	7.8				
2.50	15.0	5.50	7.8				
3.00	19.0	4.00	10.0				
3.50	20.0	5.00	10.6				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	

VST Results along downslope of floating road in Cell T69

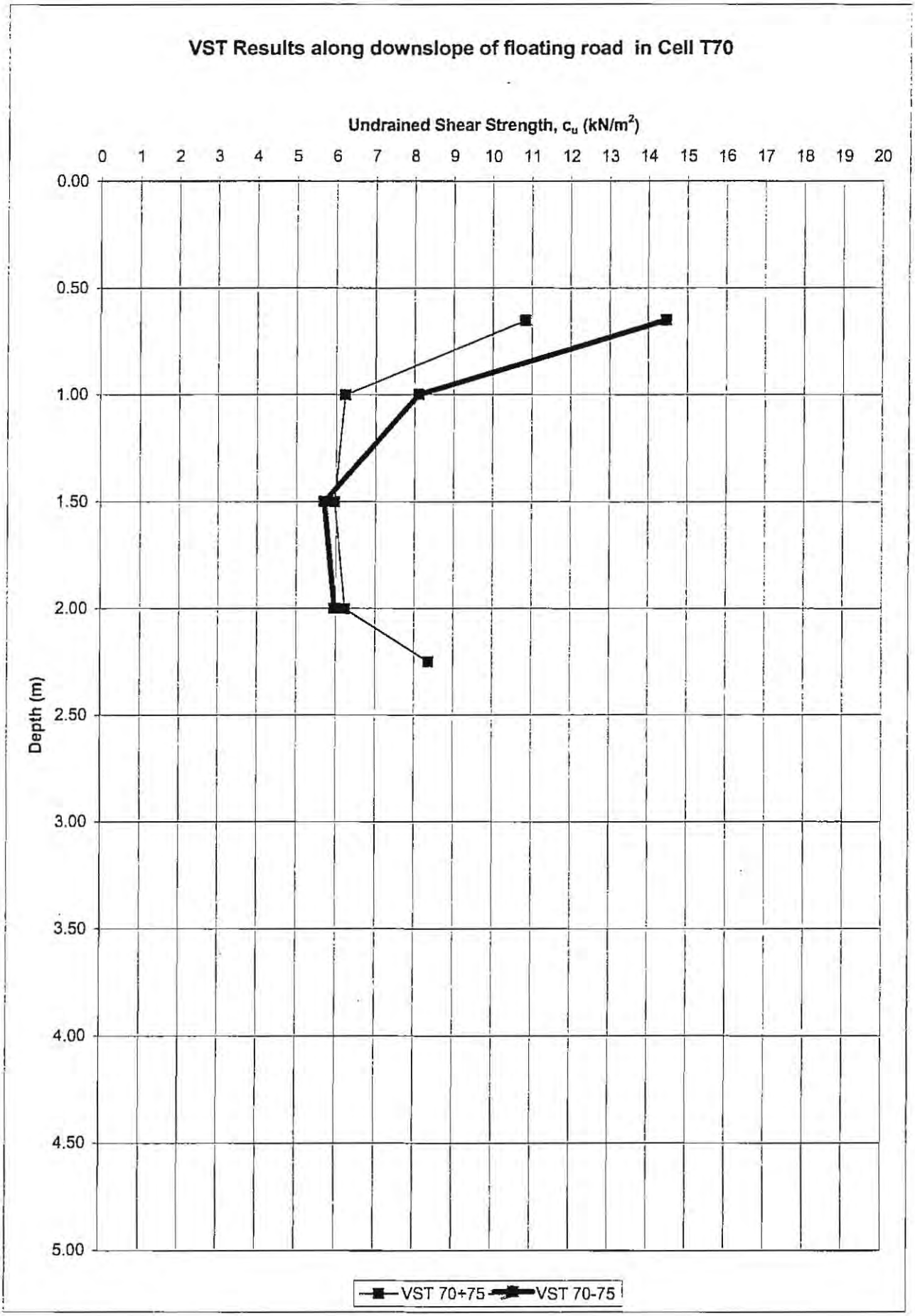


VST Results under floating road in Cell T69 (results along downslope side shown in background)



AGL Consulting *Geotechnical Engineers*				**Record of Gouge Auger Probes**				
Project:	Derrybrien Wind Farm				Made By:		**Cell No: 70**	
Job No.	03-104				Date:			
Probe No.	Date	Coordinates		Ground Surface	Depth	Elev at	Slope Angle (Deg)	
		E (m)	N (m)	Elev	(m)	Base of Peat	Top	Base
				(mOD)		(mOD)	of Peat	of Peat
West								
T70/P-100A		159359.2	204322.5	332.33	**2.13**	330.20	**3.9**	**3.2**
T70/P-100B		159376.1	204278.1	329.11	**1.57**	327.54		
T70/P-75A		159383.1	204331.8	332.47	**2.16**	330.31	**4.0**	**3.7**
T70/P-75B		159398.9	204288.6	329.24	**1.90**	327.34		
T70/P-50A		159403.0	204340.8	330.94	**1.44**	329.50	**3.6**	**3.1**
T70/P-50B		159427.9	204309.1	328.39	**1.09**	327.30		
T70/P-25A		159427.1	204351.0	329.55	**0.84**	328.71	**2.3**	**2.7**
T70/P-25B		159444.3	204308.7	327.72	**1.20**	326.52		
T70/P0A		159452.4	204360.5	329.02	**1.32**	327.70	**3.4**	**3.1**
T70/P0B		159474.2	204324.9	326.55	**1.10**	325.45		
T70/P25A		159474.2	204371.3	328.51	**0.40**	328.11	**3.4**	**3.3**
T70/P25B		159491.8	204328.2	325.74	**0.32**	325.42		
T70/P50A		159499.9	204381.5	330.37	**1.64**	328.73	**3.8**	**3.2**
T70/P50B		159520.6	204343.8	327.55	**1.22**	326.33		
T70/P+75A		159520.3	204393.6	331.93	**2.62**	329.31	**3.3**	**2.7**
T70/P+75B		159541.6	204356.6	329.49	**2.21**	327.28		
T70/P+100A		159543.2	204402.4	332.00	**2.52**	329.48	**3.4**	**4.2**
T70/P+100B		159566.0	204365.6	329.42	**3.10**	326.32		
East								
Note: i. Minus and plus signs indicate offset along road to west and east of turbine base respectively ii. 'A' series probes on downslope side of road.'B' series probes are approx 50m downslope from road								
Probes On Turbine Base								
T70B-NE								
T70B-NW								
T70B-SE								
T70B-SW								
T70B-C								
T70B+50								
T70B+100								

AGL Consulting *Geotechnical Engineers*			**Record Of Vane Shear Tests**				
Project: Derrybrien Wind Farm			Vane Type: Geonor H-10 ($65_{mm}/130_{mm}$)				**Cell No. 70**
Job No. 03-104							
Test No.		VST 70+75	Date:			Peat Depth (m) 2.50	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	20.5	6.50	10.8				
1.00	12.0	4.00	6.2				
1.50	11.5	4.50	6.0				
2.00	12.0	3.00	6.2				
2.25	16.0	5.50	8.4				
Test No.		VST 70-75	Date:			Peat Depth (m) 2.25	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
0.65	27.0	6.50	14.5				
1.00	15.5	6.00	8.1				
1.50	11.0	4.50	5.7				
2.00	11.5	4.00	6.0				
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	
Test No.			Date:			Peat Depth (m)	
Depth (m)	Dial Gauge	Time to	c_u	Co-ordinates		Elevation	Comments
	Reading	Failure (mins)	(KN/m^2)	E (m)	N (m)	(mOD)	


VST Results along downslope of floating road in Cell T70
Undrained Shear Strength, c_u (kN/m^2)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
Depth (m)
VST 70+75
VST 70-75

Appendix B

Results of Slope/W Analyses for the Floating Roads

Cell T2 (T2-100)					
Design Depth of Peat = 3.3 m (Actual range: 2.8 m - 3.3 m)					
Slope Angle = 2.3° on the ground surface and 1.3° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.6	5.4	1.0 - 1.7	7.6	5.4
1.0 - 2.0	6.5	4.6	1.7 - 2.4	6.5	4.6
2.0 - 3.0	6.0	4.3	2.4 - 3.1	6.0	4.3
3.0 - 3.3	6.0	4.3	3.1 - 3.3	6.0	4.3

Cell T5					
Design Depth of Peat = 3.1 m (Actual range: 1.2 m - 3.10 m)					
Slope Angle = 3.5° on the ground surface and 3.9° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	10.7	7.6	1.0 - 1.7	10.7	7.6
1.0 - 2.0	8.1	5.8	1.7 - 2.4	8.1	5.8
2.0 - 3.1	8.1	5.8	2.4 - 3.1	8.1	5.8

Cell T11 (T11+100)					
Design Depth of Peat = 3.5 m (Actual range: 1.7 m - 3.45 m)					
Slope Angle = 2.0° on the ground surface and 2.5° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.9	4.9	1.0 - 1.7	6.9	4.9
1.0 - 2.0	5.3	3.8	1.7 - 2.4	5.3	3.8
2.0 - 3.0	6.1	4.4	2.4 - 3.1	6.1	4.4
3.0 - 3.5	7.3	5.2	3.1 - 3.5	7.3	5.2

Cell T13 (T13-25)					
Design Depth of Peat = 2.9 m (Actual range: 2.07 m - 3.84 m)					
Slope Angle = 4.2° on the ground surface and 4.3° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.7	4.8	1.0 - 1.6	6.7	4.8
1.0 - 2.0	5.7	4.1	1.6 - 2.3	5.7	4.1
2.0 - 2.9	5.9	4.2	2.3 - 2.9	5.9	4.2

Cell T17					
Design Depth of Peat = 2.5 m (Actual range: 1.8 m - 2.5 m)					
Slope Angle = 5.7° on the ground surface and 5.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	5.7	4.1	1.0 - 1.5	5.7	4.1
1.0 - 2.0	5.2	3.7	1.5 - 2.0	5.2	3.7
2.0 - 2.5	6.0	4.3	2.0 - 2.5	6.0	4.3

Cell T18					
Design Depth of Peat = 2.5 m (Actual range: 0.0 m - 2.5 m)					
Slope Angle = 8.0° on the ground surface and 8.9° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.8	4.9	1.0 - 1.6	6.8	4.9
1.0 - 2.0	5.7	4.1	1.6 - 2.2	5.7	4.1
2.0 - 2.5	9.5	6.8	2.2 - 2.5	9.5	6.8

Cell T19 (T19-50)					
Design Depth of Peat = 2.9 m (Actual range: 0.27 m - 3.27 m)					
Slope Angle = 4.0° on the ground surface and 3.3° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	9.2	6.6	1.0 - 1.6	9.2	6.6
1.0 - 2.0	5.5	3.9	1.6 - 2.3	5.5	3.9
2.0 - 2.9	11.0	7.9	2.3 - 2.9	11.0	7.9

Cell T24					
Design Depth of Peat = 1.7 m (Actual range: 1.1 m - 1.65 m)					
Slope Angle = 3.0° on the ground surface and 3.1° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	8.7	6.2	1.0 - 1.3	8.7	6.2
1.0 - 1.7	7.3	5.2	1.3 - 1.4	7.3	5.2

Cell T25 (T25-25)					
Design Depth of Peat = 2.1 m (Actual range: 0.84 m - 2.33 m)					
Slope Angle = 5.3° on the ground surface and 4.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	5.5	3.9	1.0 - 1.4	5.5	3.9
1.0 - 2.0	5.3	3.8	1.4 - 1.9	5.3	3.8
2.0 - 2.1	4.9	3.5	1.9 - 2.1	4.9	3.5

Cell T27 (T27+75)					
Design Depth of Peat = 3.5 m (Actual range: 2.8 m - 4.5 m)					
Slope Angle = 1.0° on the ground surface and 4.4° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.8	4.9	1.0 - 1.7	6.8	4.9
1.0 - 2.0	5.3	3.8	1.7 - 2.4	5.3	3.8
2.0 - 3.0	5.3	3.8	2.4 - 3.1	5.3	3.8
3.0 - 3.5	6.5	4.6	3.1 - 3.5	6.5	4.6

Cell T30					
Design Depth of Peat = 2.8 m (Actual range: 1.6 m - 2.8 m)					
Slope Angle = 2.5° on the ground surface and 0.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	5.1	3.6	1.0 - 1.6	5.1	3.6
1.0 - 2.0	4.7	3.4	1.6 - 2.3	4.7	3.4
2.0 - 2.8	6.4	4.6	2.3 - 2.8	6.4	4.6

Cell T31					
Design Depth of Peat = 4.7 m (Actual range: 2.2 m - 4.7 m)					
Slope Angle = 2.0° on the ground surface and 3.0° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.4	4.6	1.0 - 1.7	6.4	4.6
1.0 - 2.0	7.5	5.4	1.7 - 2.4	7.5	5.4
2.0 - 3.0	9.4	6.7	2.4 - 3.1	9.4	6.7
3.0 - 4.0	9.4	6.7	3.1 - 4.0	9.4	6.7
4.0 - 4.7	9.4	6.7	4.0 - 4.7	9.4	6.7

Cell T33 (T33+50)					
Design Depth of Peat = 4.8 m (Actual range: 2.8 m - 5.4 m)					
Slope Angle = 0.5° on the ground surface and 0.9° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	5.6	4.0	1.0 - 1.7	5.6	4.0
1.0 - 2.0	4.6	3.3	1.7 - 2.4	4.6	3.3
2.0 - 3.0	5.7	4.1	2.4 - 3.2	5.7	4.1
3.0 - 4.0	6.7	4.8	3.2 - 4.1	6.7	4.8
4.0 - 4.8	8.2	5.9	4.1 - 4.8	8.2	5.9

Cell T34					
Design Depth of Peat = 2.7 m (Actual range: 1.7 m - 2.9 m)					
Slope Angle = 4.0° on the ground surface and 4.4° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.3	5.2	1.0 - 1.7	7.3	5.2
1.0 - 2.0	6.2	4.4	1.7 - 2.4	6.2	4.4
2.0 - 2.7	7.7	5.5	2.4 - 2.7	7.7	5.5

Cell T35 (T35-50)					
Design Depth of Peat = 1.85 m (Actual range: 0.1 m - 1.85 m)					
Slope Angle = 12.0° on the ground surface and 10.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	13.1	9.4	1.0 - 1.4	13.1	9.4
1.0 - 1.85	13.7	9.8	1.4 - 1.85	13.7	9.8

Cell T42					
Design Depth of Peat = 3.2 m (Actual range: 1.9 m - 3.2 m)					
Slope Angle = 2.5° on the ground surface and 2.9° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	5.9	4.2	1.0 - 1.7	5.9	4.2
1.0 - 2.0	4.6	3.3	1.7 - 2.4	4.6	3.3
2.0 - 3.0	6.8	4.9	2.4 - 3.1	6.8	4.9
3.0 - 3.4	6.8	4.9	3.1 - 3.4	6.8	4.9

Cell T50 (T50+75)					
Design Depth of Peat = 1.75 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 12.5° on the ground surface and 12.8° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	12.2	8.7	1.0 - 1.3	12.2	8.7
1.0 - 1.75	20.1	14.6	1.3 - 1.75	20.1	14.6

Cell T51 (T51-100)					
Design Depth of Peat = 1.66 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 9.5° on the ground surface and 9.2° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.5	4.6	1.0 - 1.3	6.5	4.6
1.0 - 1.66	8.15	5.8	1.3 - 1.66	8.15	5.8

Cell T51 (T51+75)					
Design Depth of Peat = 3.1 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 5.2° on the ground surface and 4.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	10.9	7.8	1.0 - 1.7	10.9	7.8
1.0 - 2.0	9.3	6.6	1.7 - 2.5	9.3	6.6
2.0 - 3.1	10.4	7.5	2.5 - 3.1	10.4	7.5

Cell T52 (T52-25/+25)					
Design Depth of Peat = 2.0 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 5.7° on the ground surface and 5.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	10.3	7.4	1.0 - 1.4	10.3	7.4
1.0 - 2.0	5.8	4.1	1.4 - 2.0	5.8	4.1

Cell T53 (T53+100)					
Design Depth of Peat = 2.3 m (Actual range: 1.7 m - 3.1 m)					
Slope Angle = 4.5° on the ground surface and 3.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.2	5.1	1.0 - 1.5	7.2	5.1
1.0 - 2.0	6.6	4.7	1.5 - 2.0	6.6	4.7
2.0 - 2.3	10.4	7.5	2.0 - 2.3	10.4	7.5

Cell T54 (T54+75)					
Design Depth of Peat = 3.3 m (Actual range: 1.0 m - 3.3 m)					
Slope Angle = 1.5° on the ground surface and 1.2° backfall at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	8.7	6.2	1.0 - 1.6	8.7	6.2
1.0 - 2.0	5.5	3.9	1.6 - 2.3	5.5	3.9
2.0 - 3.0	5.1	3.6	2.3 - 3.0	5.1	3.6
3.0 - 3.3	5.7	4.1	3.0 - 3.3	5.7	4.1

Cell T55					
Design Depth of Peat = 3.75 m (Actual range: 2.85 m to 3.85 m)					
Slope Angle = 3.7° on the ground surface and 1.4° at the base of peat.					
Road Thickness = 1.0 m stone (assumed - measured <0.5 m)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.5	4.65	1.0 - 1.7	9.5	6.8
1.0 - 2.0	4.5	3.2	1.7 - 2.5	6.8	4.85
2.0 - 3.0	5.0	3.6	2.5 - 3.2	6.8	4.85
3.0 - 3.75	6.0	4.3	3.2 - 3.75	6.8	4.85

Cell T56					
Design Depth of Peat = 3.25 m (Actual range: 1.3 m - 3.43 m)					
Slope Angle = 4.0° on the ground surface and 4.2° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			*Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	9.5	6.8	1.0 - 1.7	11.5	8.2
1.0 - 2.0	7.5	5.35	1.7 - 2.5	9	6.4
2.0 - 3.0	10.0	7.15	2.5 - 3.25	10	7.15
3.0 - 3.75	10.0	7.15			

* Assume 20% increase in undrained shear strength under road in top 2.5 m - no test results

Cell T57					
Design Depth of Peat = 3.75 m (Actual range: 1.3 m - 3.43 m)					
Slope Angle = 1.7° on the ground surface and 1.9° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	8.0	5.7	1.0 - 1.7	9.5	6.8
1.0 - 2.0	5.25	3.75	1.7 - 2.5	6.3	4.5
2.0 - 3.0	4.25	3.0	2.5 - 3.2	5.1	3.65
3.0 - 3.75	7.0	5.0	3.2 - 3.75	7.0	5.0

Cell T59 (T59+100)					
Design Depth of Peat = 3.6 m (Actual range: 2.2 m - 3.6 m)					
Slope Angle = 0.5° on the ground surface and 0.0° at the base of peat.					
Road Thickness = 1.0 m stone (assumed - measured <0.5 m)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	5.5	3.9	1.0 - 1.7	5.5	3.9
1.0 - 2.0	4.5	3.2	1.7 - 2.4	4.5	3.2
2.0 - 3.0	5.4	3.9	2.4 - 3.1	5.4	3.9
3.0 - 3.6	6.8	4.9	3.1 - 3.6	6.8	4.9

Cell T60 (T60-25)					
Design Depth of Peat = 3.8 m (Actual range: 2.4 m - 3.0 m)					
Slope Angle = 0.5° on the ground surface and 1.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.7	5.5	1.0 - 1.7	7.7	5.5
1.0 - 2.0	6.9	4.9	1.7 - 2.4	6.9	4.9
2.0 - 3.0	7.2	5.1	2.4 - 3.1	7.2	5.1
3.0 - 3.8	11.3	8.1	3.1 - 3.8	11.3	8.1

Cell T61 (T61-50)					
Design Depth of Peat = 1.88 m (Actual range: 0.23 m - 3.34 m)					
Slope Angle = 3.5° on the ground surface and 3.1° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.7	4.8	1.0 - 1.4	6.7	4.8
1.0 - 1.88	6.6	4.7	1.4 - 1.9	6.6	4.7

Cell T62 (T62-125)					
Design Depth of Peat = 3.5 m (Actual range: 1.8 m - 3.65 m)					
Slope Angle = 3.0° on the ground surface and -1.3° (backslope) at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.6	4.7	1.0 - 1.7	6.6	4.7
1.0 - 2.0	5.4	3.9	1.7 - 2.4	5.4	3.9
2.0 - 3.0	5.6	4.0	2.4 - 3.1	5.6	4.0
3.0 - 3.5	6.1	4.4	3.1 - 3.5	6.1	4.4

Cell T62 (T62-75)					
Design Depth of Peat = 2.8 m (Actual range: 1.8 m - 3.65 m)					
Slope Angle = 3.5° on the ground surface and 0.8° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.2	5.1	1.0 - 1.7	7.2	5.1
1.0 - 2.0	5.7	4.0	1.7 - 2.4	5.7	4.0
2.0 - 2.8	4.7	3.3	2.4 - 2.8	4.7	3.3

Cell T63 (T63-25)					
Design Depth of Peat = 3.25 m (Actual range: 0.9 m - 3.6 m)					
Slope Angle = 3.5° on the ground surface and 4.0° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.8	4.9	1.0 - 1.7	6.8	4.9
1.0 - 2.0	7.0	5.0	1.7 - 2.4	7.0	5.0
2.0 - 3.0	9.7	6.9	2.4 - 3.2	9.7	6.9
3.0 - 3.25	9.7	6.9	3.2 - 3.3	9.7	6.9

Cell T64 (64+100)					
Design Depth of Peat = 3.2 m (Actual range: 1.7 m - 3.2 m)					
Slope Angle = 1.5° on the ground surface and 0.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.5	5.4	1.0 - 1.7	7.5	5.4
1.0 - 2.0	6.1	4.4	1.7 - 2.4	6.1	4.4
2.0 - 3.0	6.4	4.6	2.4 - 3.1	6.4	4.6
3.0 - 3.2	6.2	4.4	3.1 - 3.2	6.2	4.4

Cell T66					
Design Depth of Peat = 3.2 m (Actual range: 0.9 m - 3.2 m)					
Slope Angle = 3.2° on the ground surface and 5.4° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	8.2	5.9	1.0 - 1.7	8.2	5.9
1.0 - 2.0	5.4	3.9	1.7 - 2.4	5.4	3.9
2.0 - 3.0	6.1	4.4	2.4 - 3.1	6.1	4.4
3.0 - 3.2	6.1	4.4	3.1 - 3.2	6.1	4.4

Cell T68 (T68-50)					
Design Depth of Peat = 2.1 m (Actual range: 1.37 m - 3.3 m)					
Slope Angle = 4.0° on the ground surface and 3.6° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	6.9	4.9	1.0 - 1.5	6.9	4.9
1.0 - 2.1	6.0	4.3	1.5 - 2.1	6.0	4.3

Cell T69 (T69+75)					
Design Depth of Peat = 3.4 m (Actual range: 3.0 m - 3.56 m)					
Slope Angle = 2.3° on the ground surface and 2.3° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	7.0	5.0	1.0 - 1.7	7.0	5.0
1.0 - 2.0	5.8	4.1	1.7 - 2.4	5.8	4.1
2.0 - 3.0	6.7	4.8	2.4 - 3.0	6.7	4.8
3.0 - 3.4	5.9	4.2	3.0 - 3.2	5.9	4.2

Cell T70 (T70+75)					
Design Depth of Peat = 2.62 m (Actual range: 0.4 m - 2.6 m)					
Slope Angle = 3.3° on the ground surface and 2.7° at the base of peat.					
Road Thickness = 1.0 m stone (assumed)					
Undrained Shear Strength Profile from Geonor H-10 Vane					
Side of Road			Under Road		
Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)	Depth (m)	c_{uk} (kN/m^2)	c_{ud} (kN/m^2)
0.0 - 1.0	8.5	6.1	1.0 - 1.6	8.5	6.1
1.0 - 2.0	6.0	4.3	1.6 - 2.3	6.0	4.3
2.0 - 2.6	7.2	5.1	2.3 - 2.6	7.2	5.1

Derrybrien Windfarm - Floating Road Analysis: Cell T2

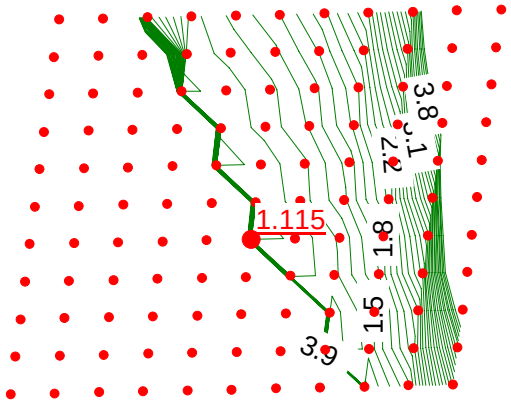
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

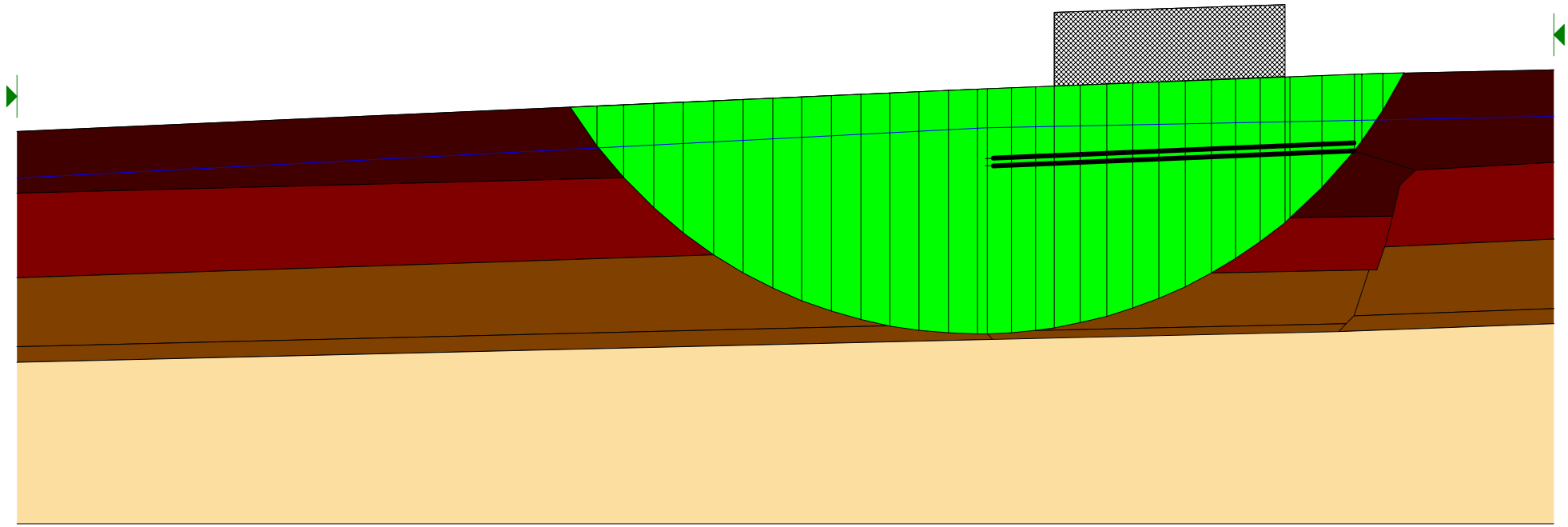
T2-100

Depth of peat = 3.3 m on downslope side of road
Slope angle = 2.3 Deg at surface, 1.3 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





Derrybrien Windfarm - Floating Road Analysis: Cell T5

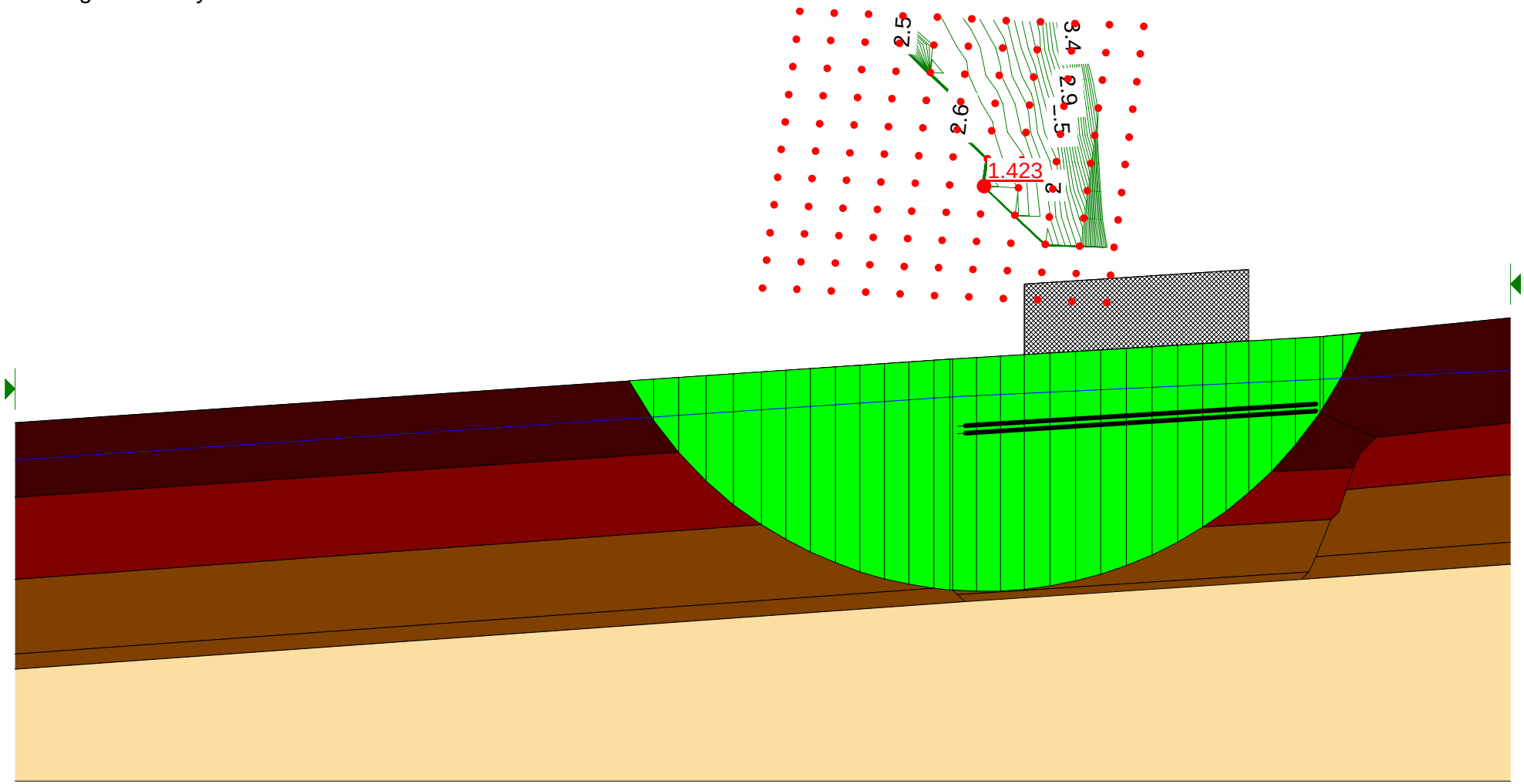
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

T5

Depth of peat = 3.1 m on downslope side of road
Slope angle = 3.5 Deg at surface, 3.9 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T11

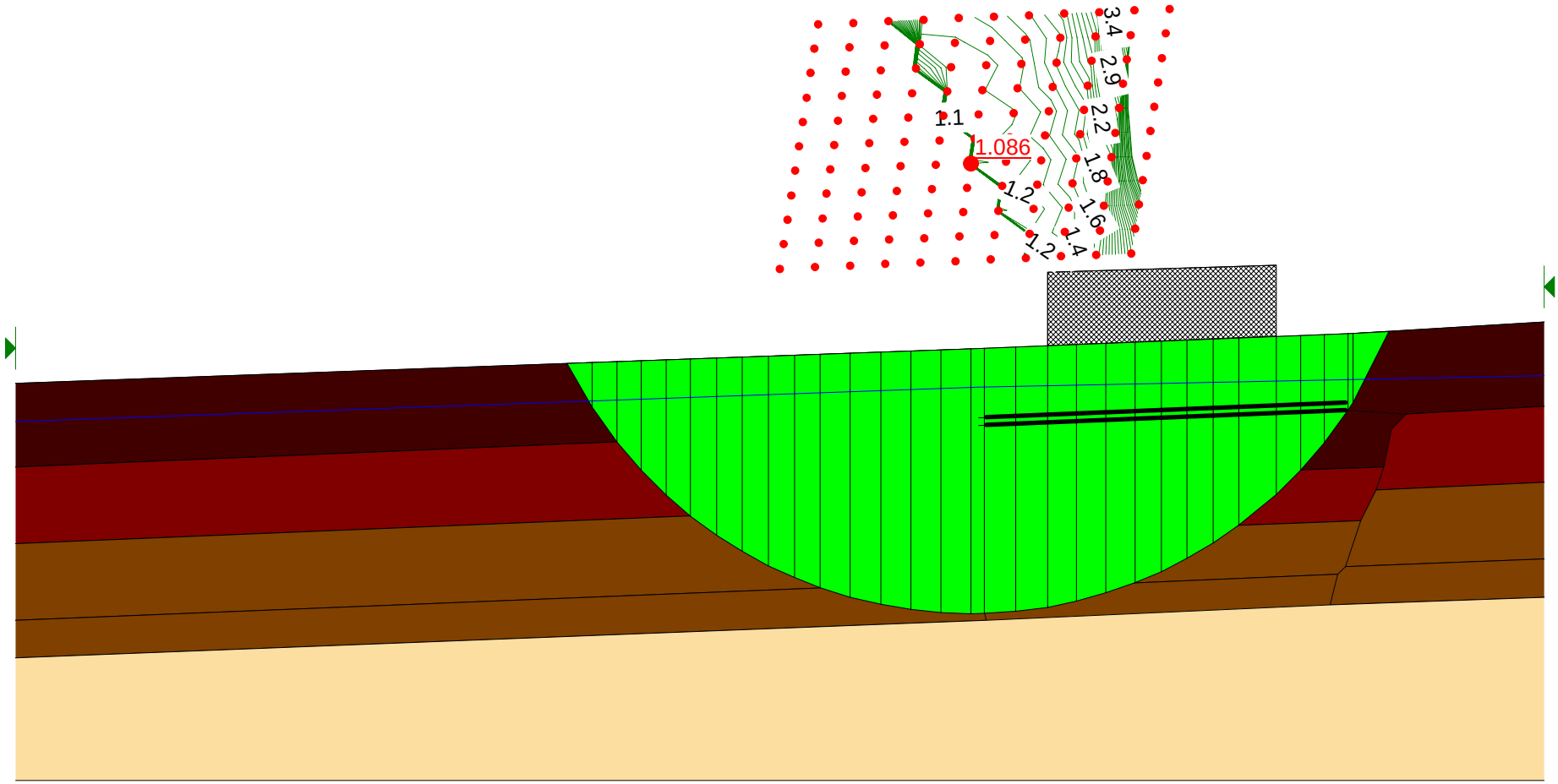
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.5 m on downslope side of road
Slope angle = 2.0 Deg at surface, 2.5 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T11+100



Derrybrien Windfarm - Floating Road Analysis: Cell T13

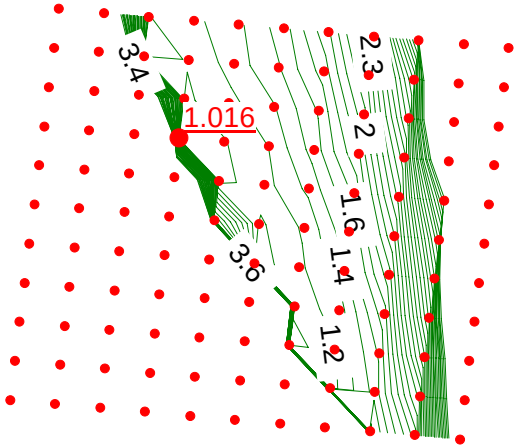
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

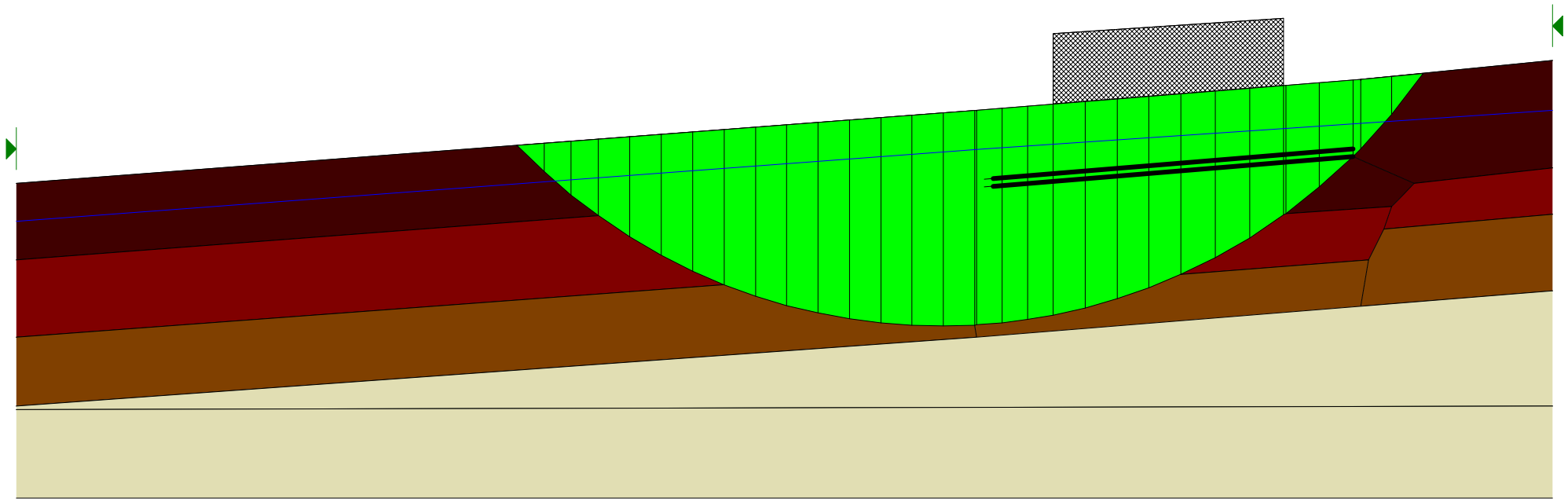
T13-25

Depth of peat = 2.9 m on downslope side of road
Slope angle = 4.2 Deg at surface, 4.3 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





Derrybrien Windfarm - Floating Road Analysis: Cell T17

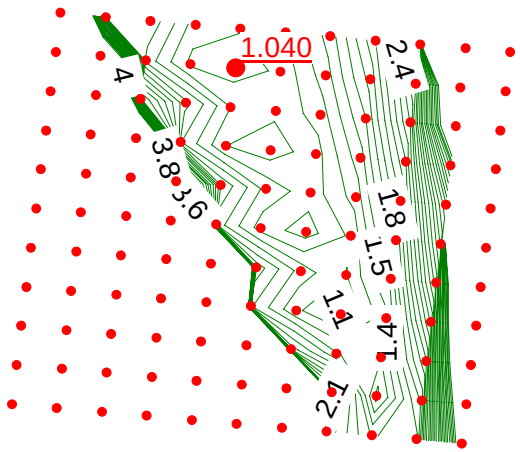
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

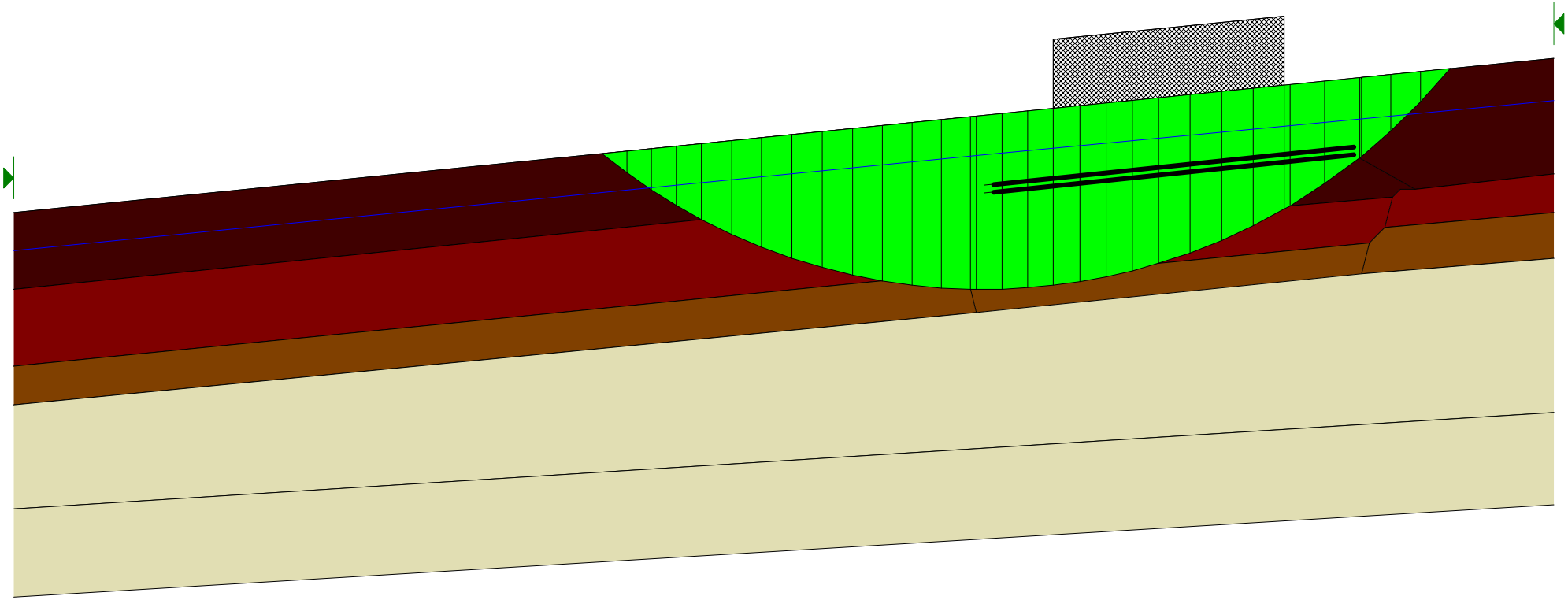
T17

Depth of peat = 2.5 m on downslope side of road
Slope angle = 5.7 Deg at surface, 5.7 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 =>OK





Derrybrien Windfarm - Floating Road Analysis: Cell T18

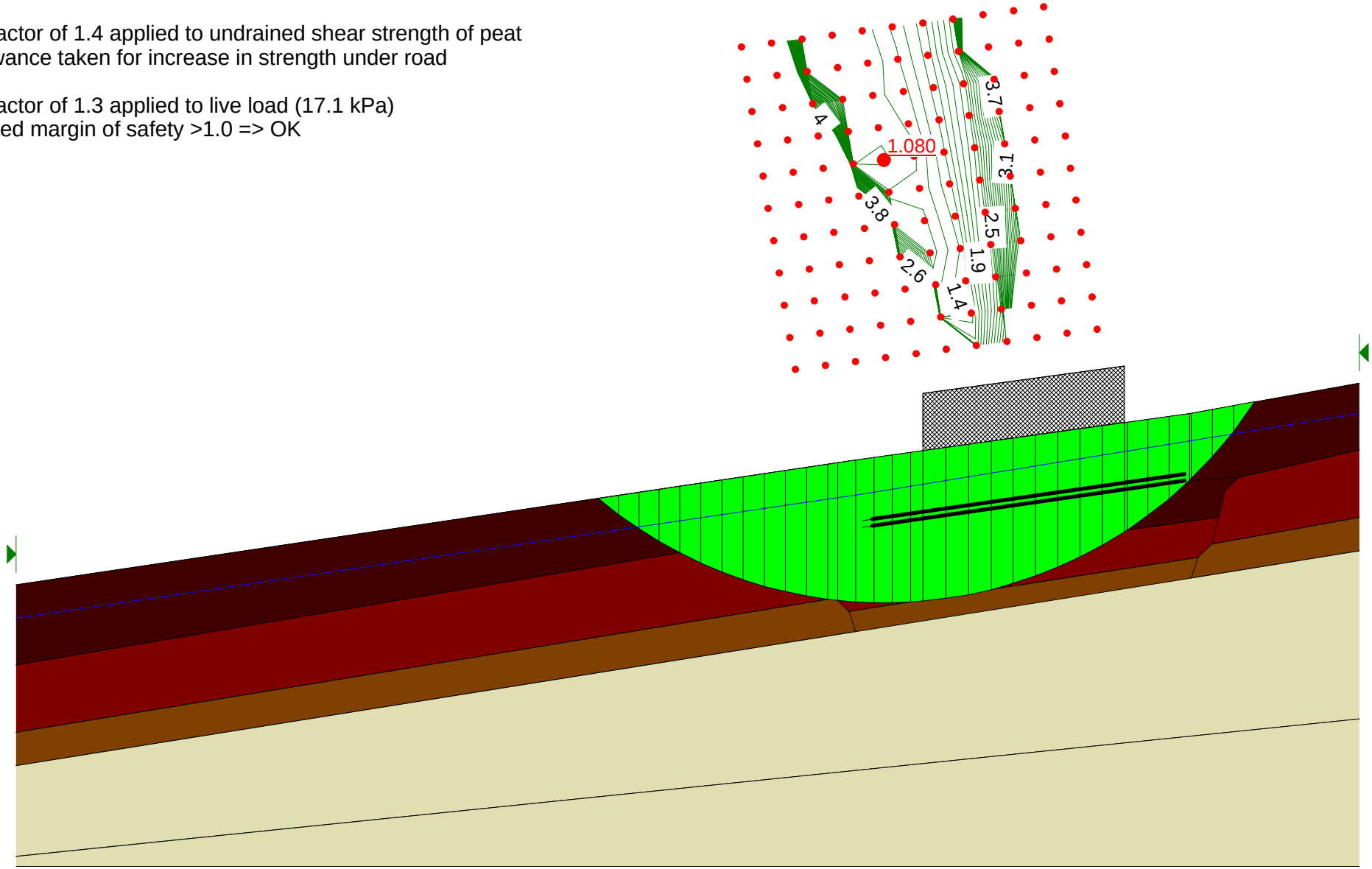
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.5 m on downslope side of road
Slope angle = 8.0 Deg at surface, 8.9 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T18



Derrybrien Windfarm - Floating Road Analysis: Cell T19

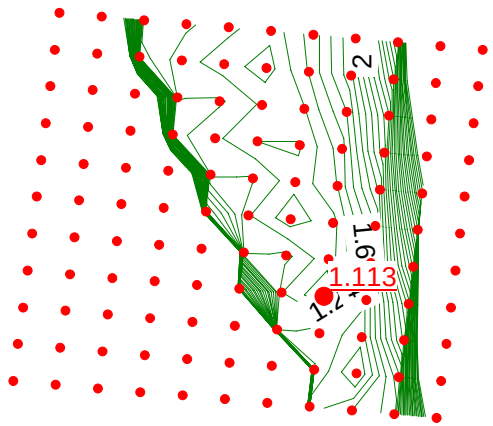
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

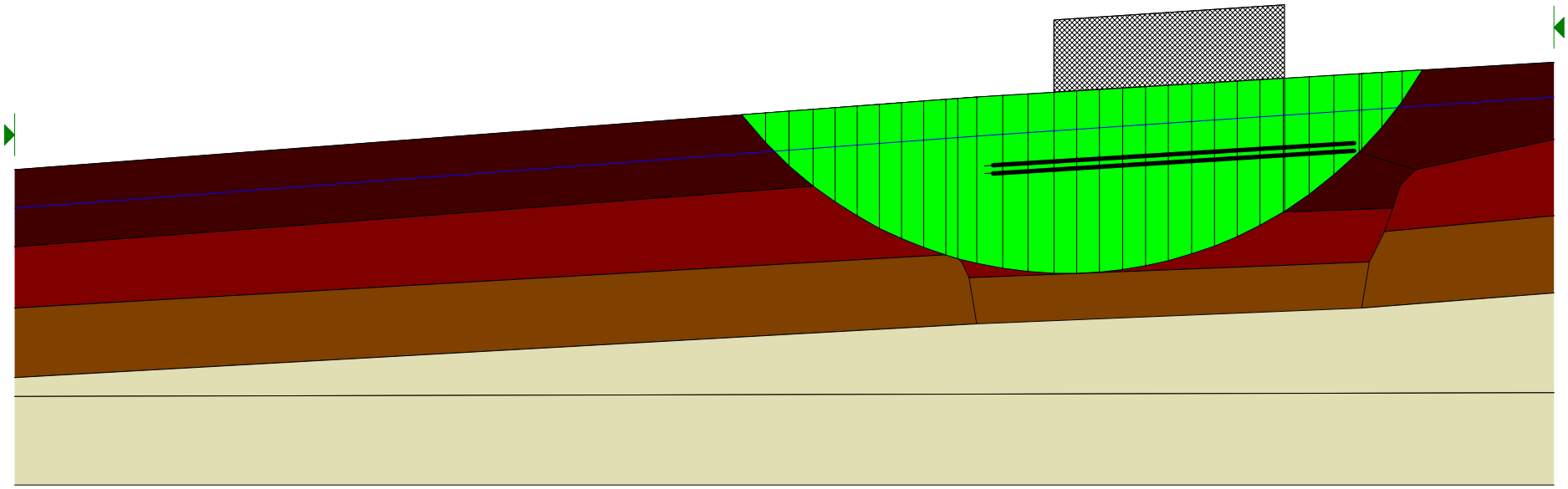
T19-50

Depth of peat = 2.9 m on downslope side of road
Slope angle = 4.0 Deg at surface, 3.3 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





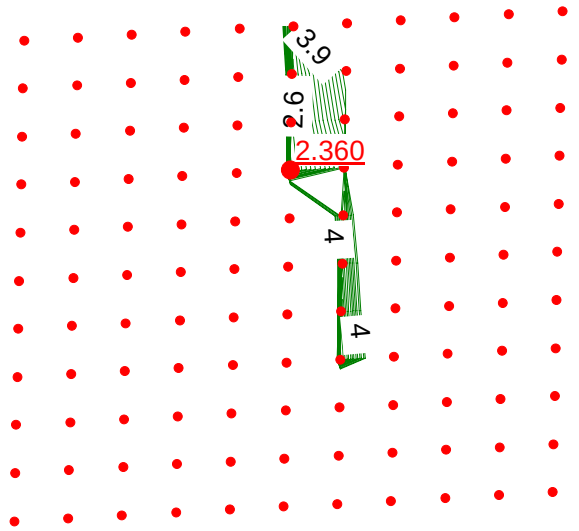
Derrybrien Windfarm - Floating Road Analysis: Cell T24

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

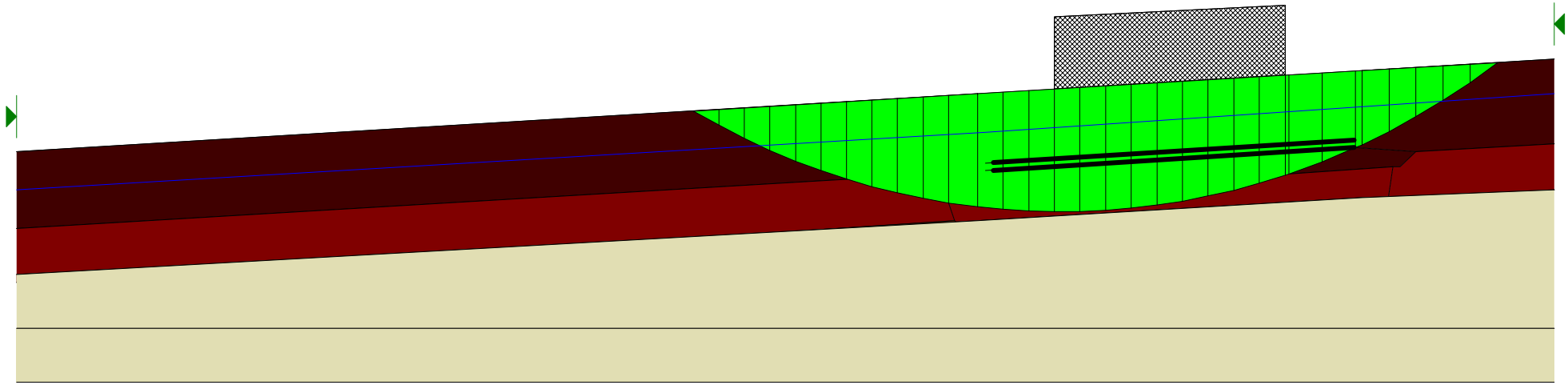
Depth of peat = 1.65 m on downslope side of road
Slope angle = 3.0 Deg at surface, 3.1 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



T24



Derrybrien Windfarm - Floating Road Analysis: Cell T25

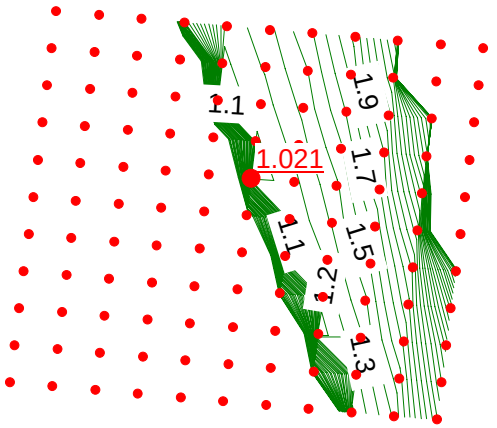
T25-25

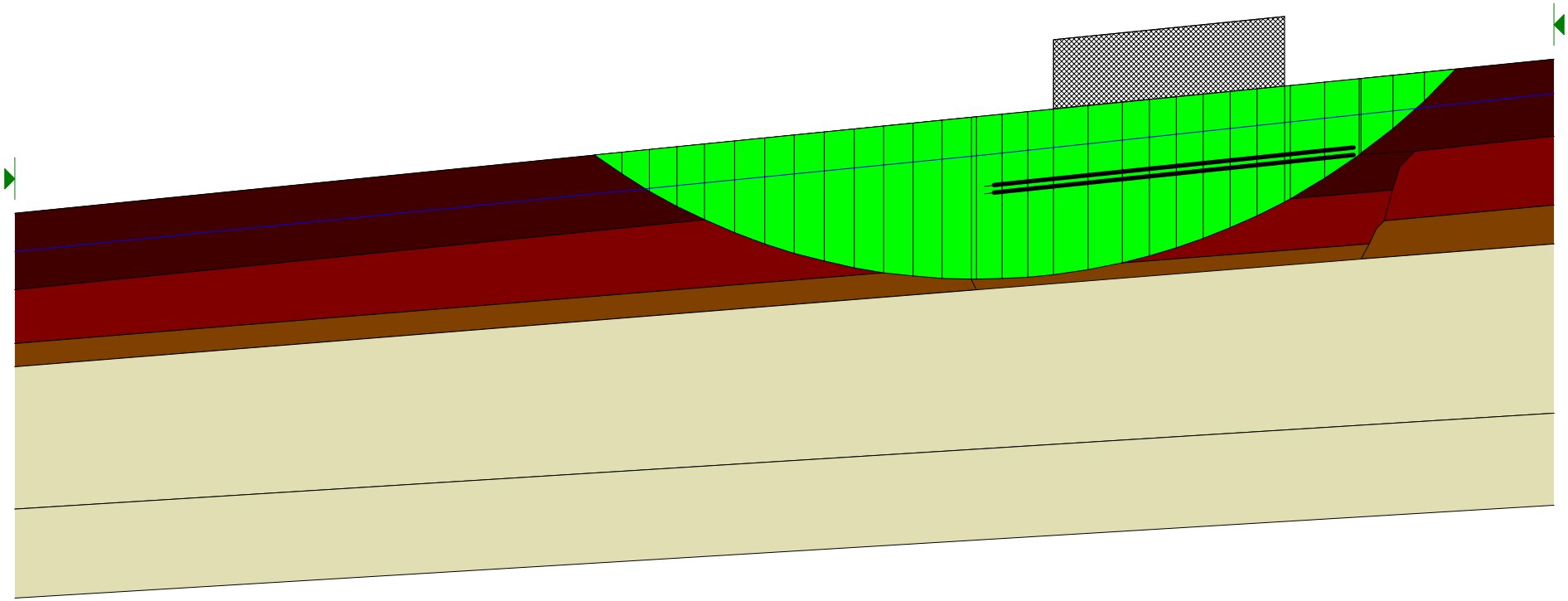
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.1 m on downslope side of road
Slope angle = 5.3 Deg at surface, 4.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





Derrybrien Windfarm - Floating Road Analysis: Cell T27

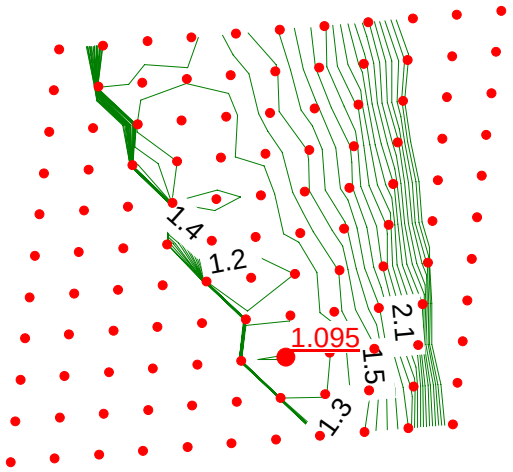
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

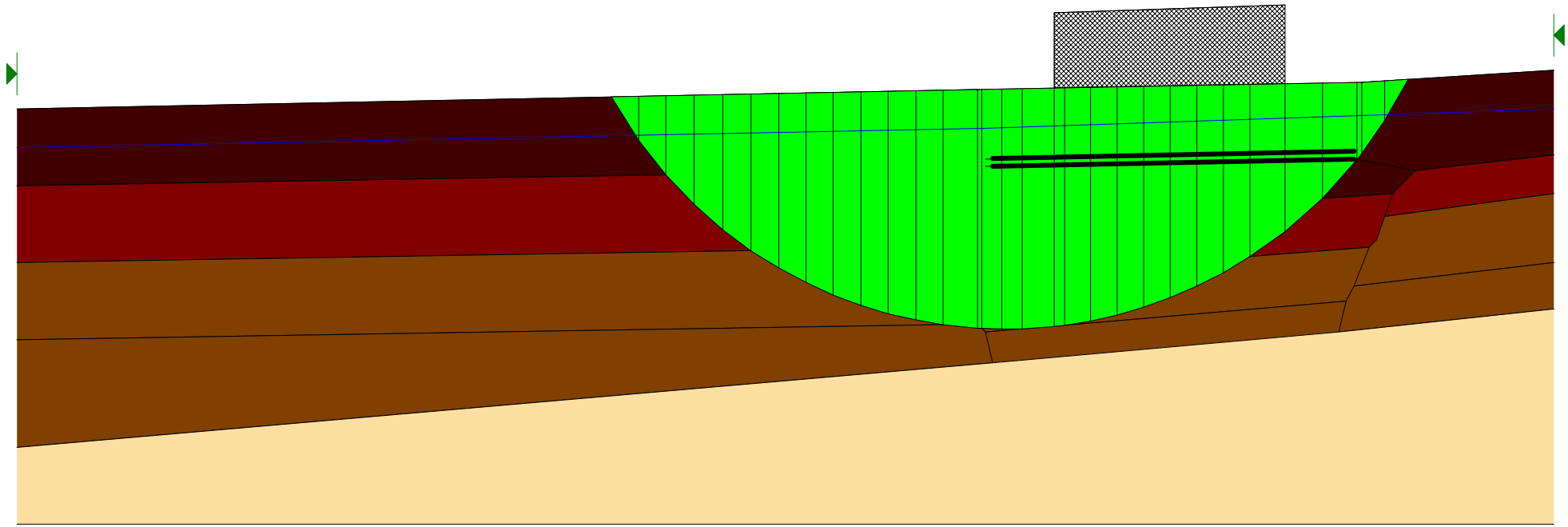
Depth of peat = 3.5 m on downslope side of road
Slope angle = 1.0 Deg at surface, 5.0 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T27+75





Derrybrien Windfarm - Floating Road Analysis: Cell T30

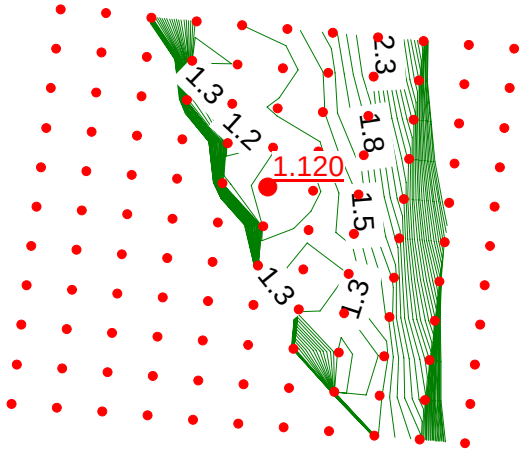
T30

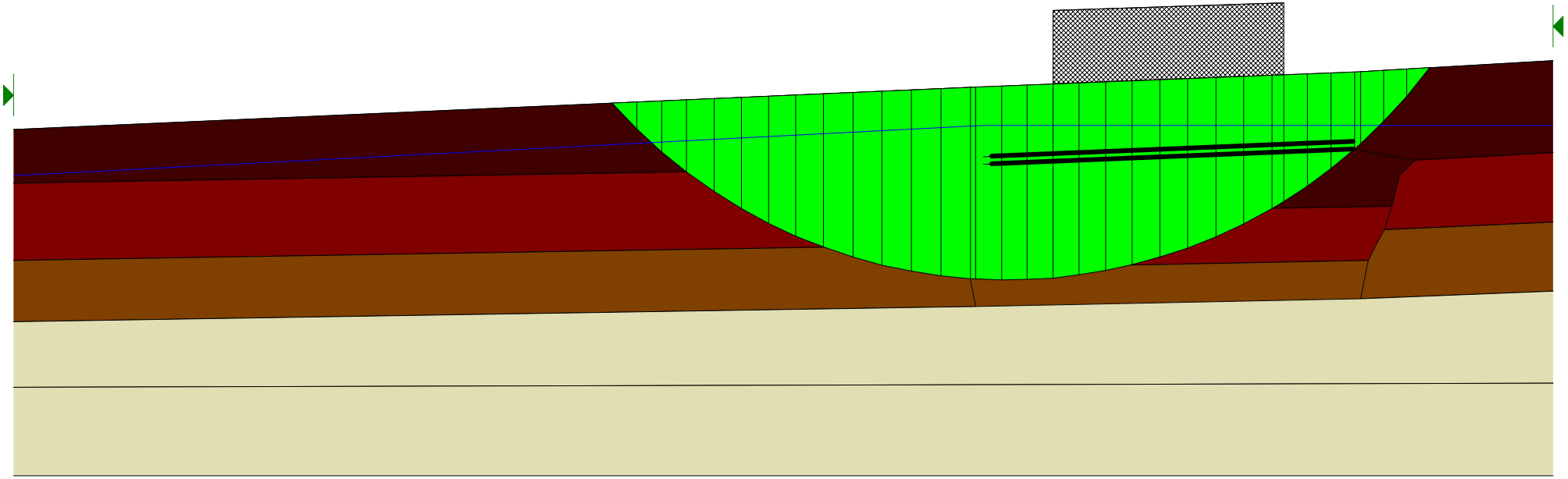
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.8 m on downslope side of road
Slope angle = 2.5 Deg at surface, 0.7 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





T31

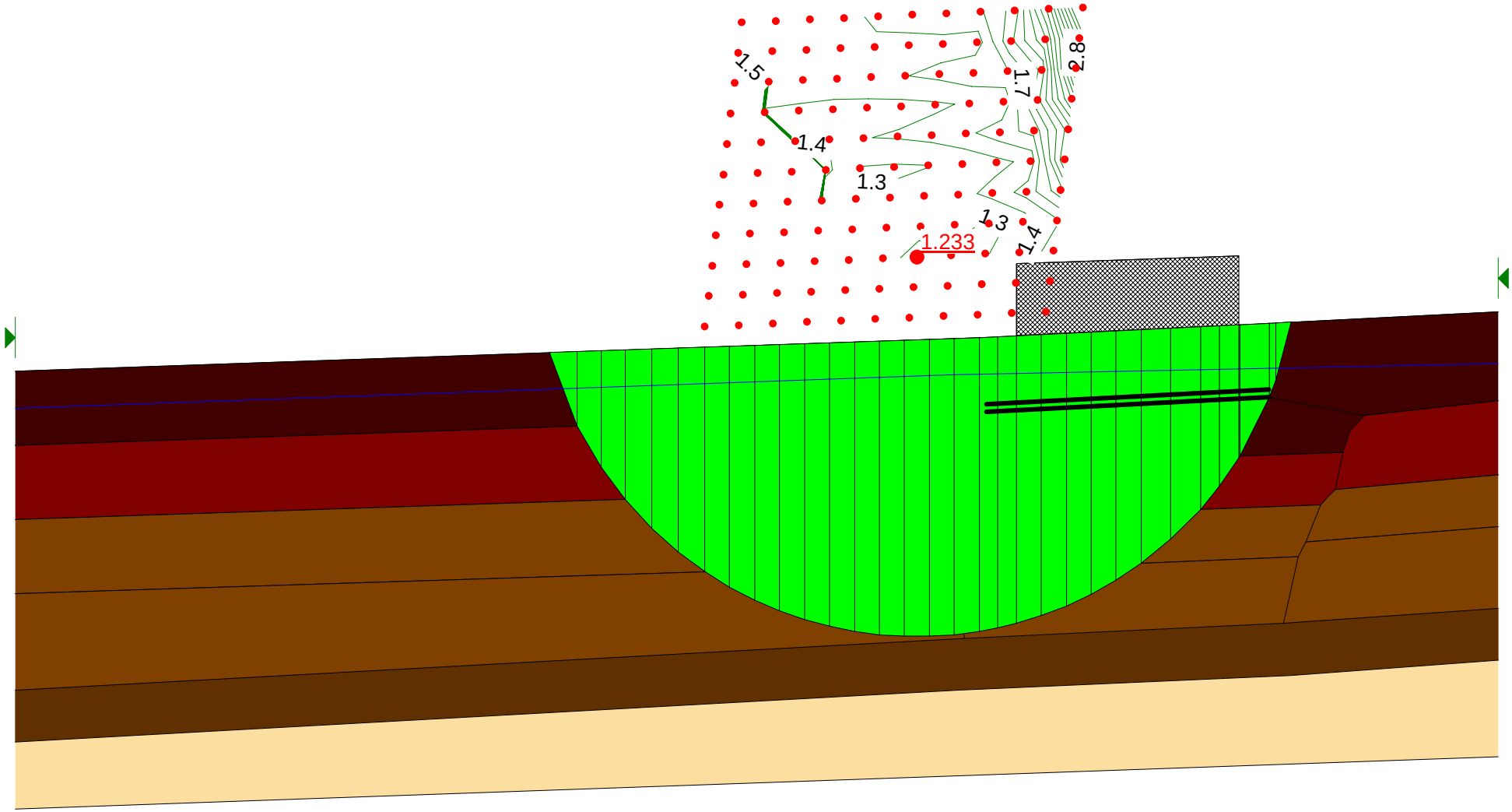
Derrybrien Windfarm - Floating Road Analysis: Cell T31

4.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 4.7 m on downslope side of road
Slope angle = 2.0 Deg at surface, 3.0 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T33

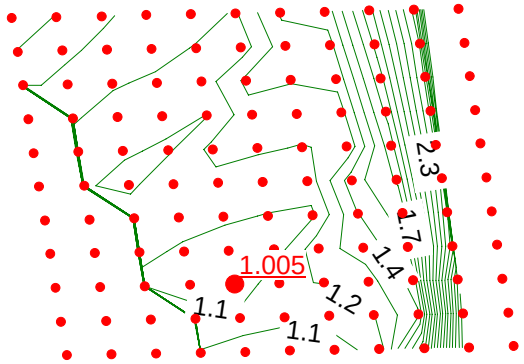
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

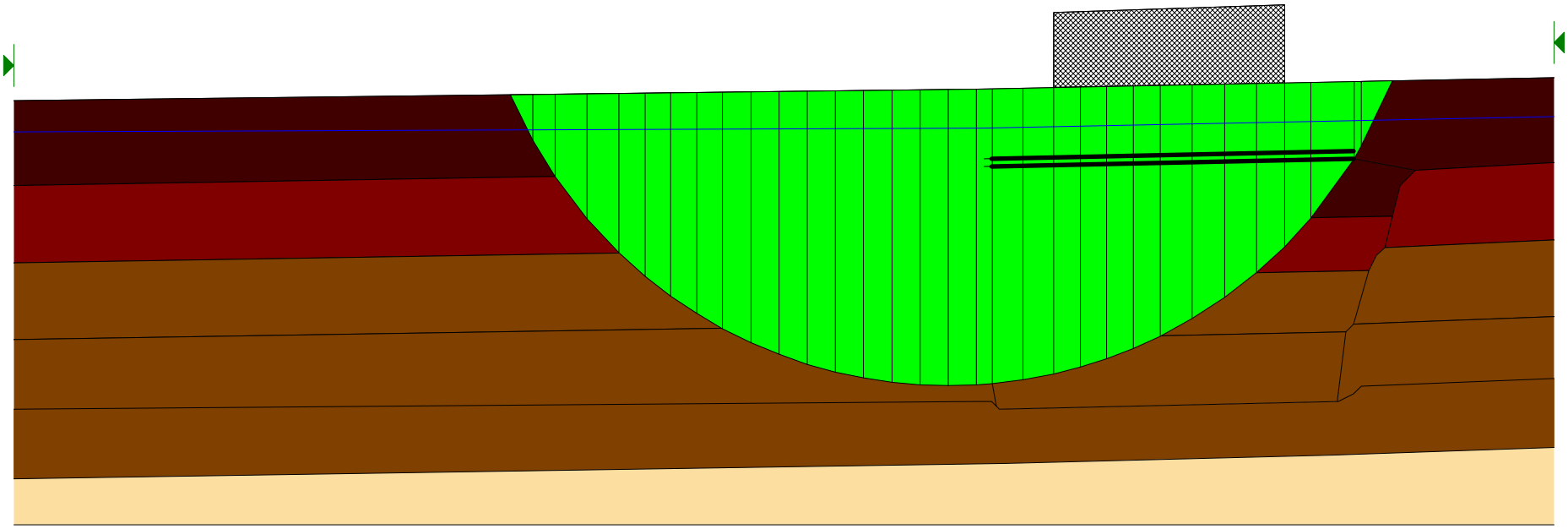
T33+50

Depth of peat = 4.8 m on downslope side of road
Slope angle = 0.5 Deg at surface, 0.9 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





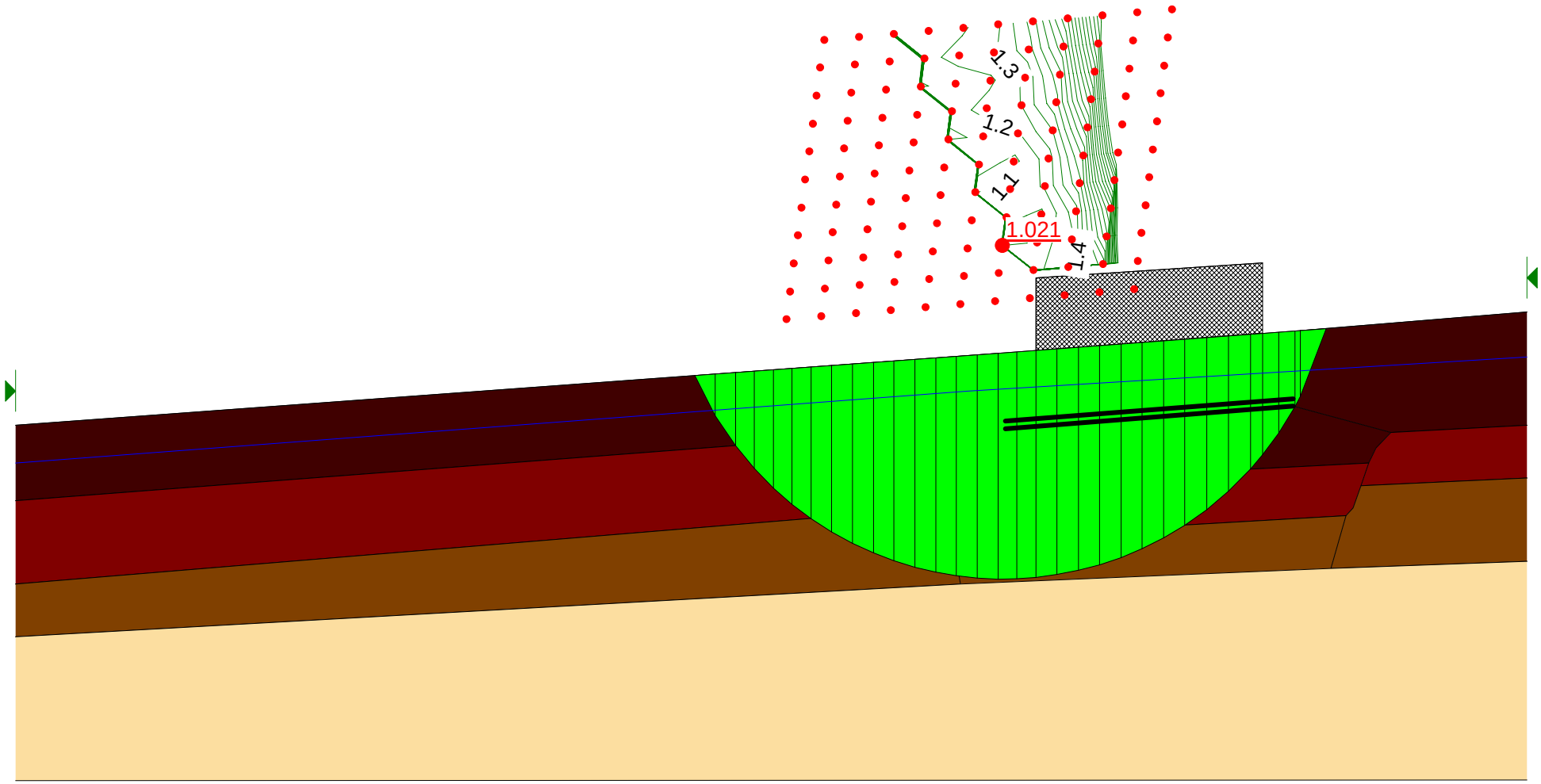
T34

Derrybrien Windfarm - Floating Road Analysis: Cell T34
4.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.7 m on downslope side of road
Slope angle = 4.0 Deg at surface, 4.4 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



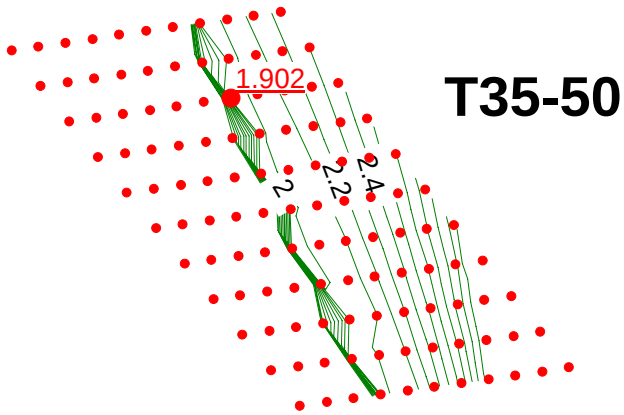
Derrybrien Windfarm - Floating Road Analysis: Cell T35

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

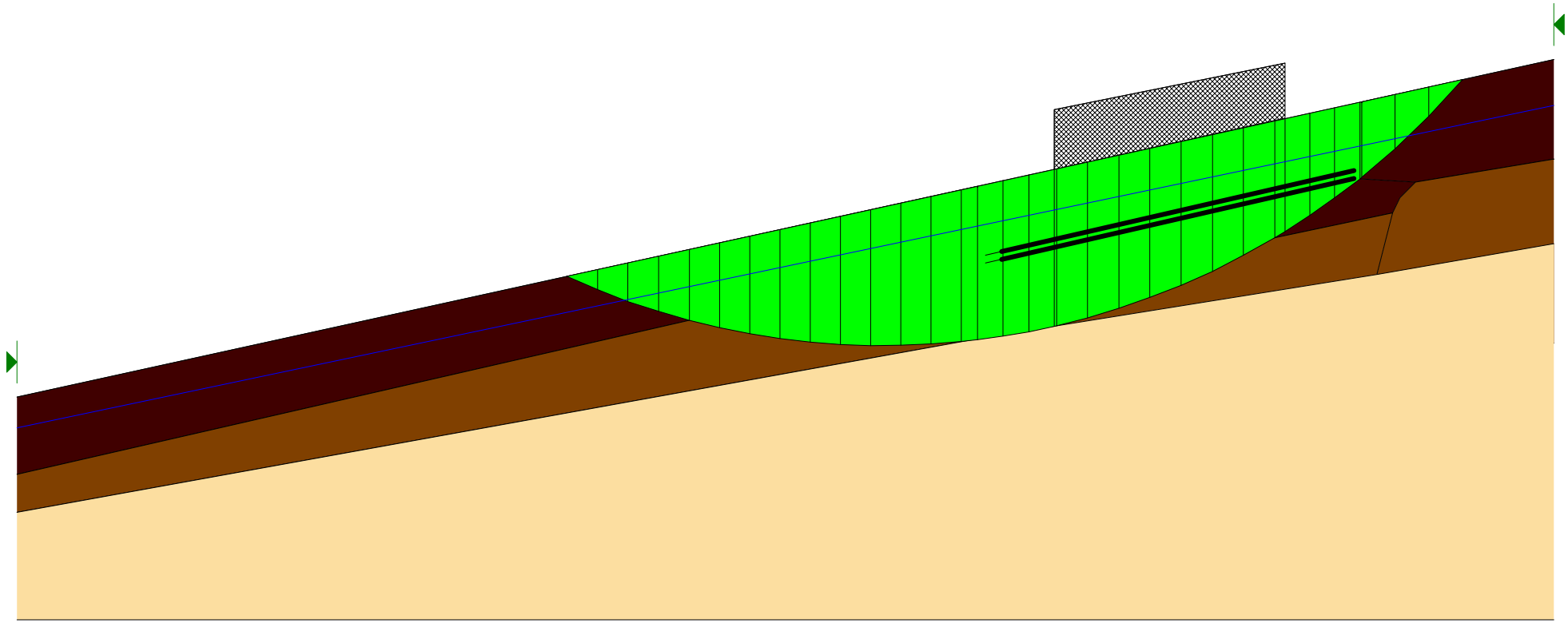
Depth of peat = 1.9 m on downslope side of road
Slope angle = 12.0 Deg at surface, 10.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



T35-50



Derrybrien Windfarm - Floating Road Analysis: Cell T42

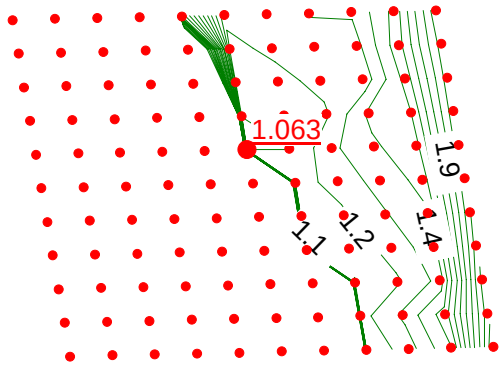
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

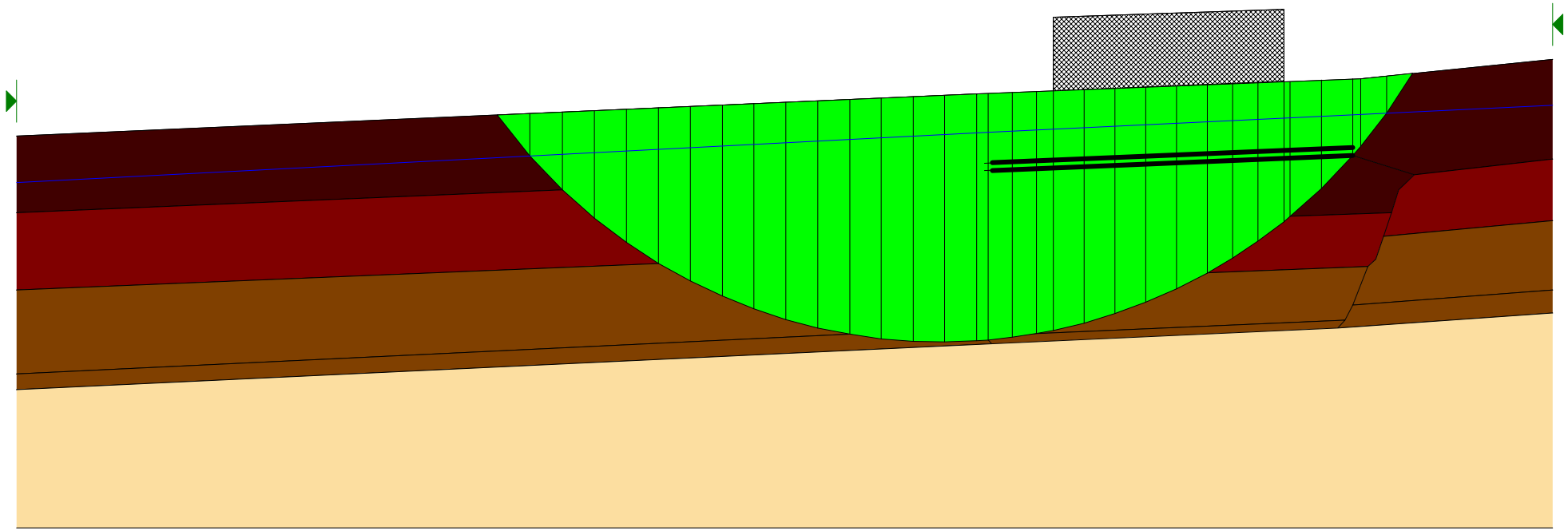
T42

Depth of peat = 3.2 m on downslope side of road
Slope angle = 2.5 Deg at surface, 2.9 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





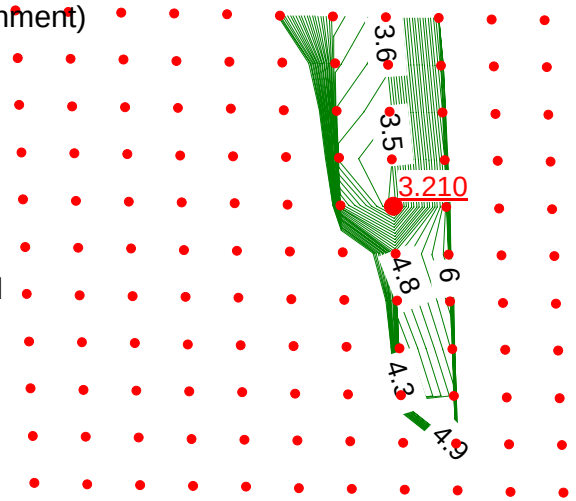
Derrybrien Windfarm - Floating Road Analysis: Cell T50NR (New Road Alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 laer of Tensar SS30 Geogrid

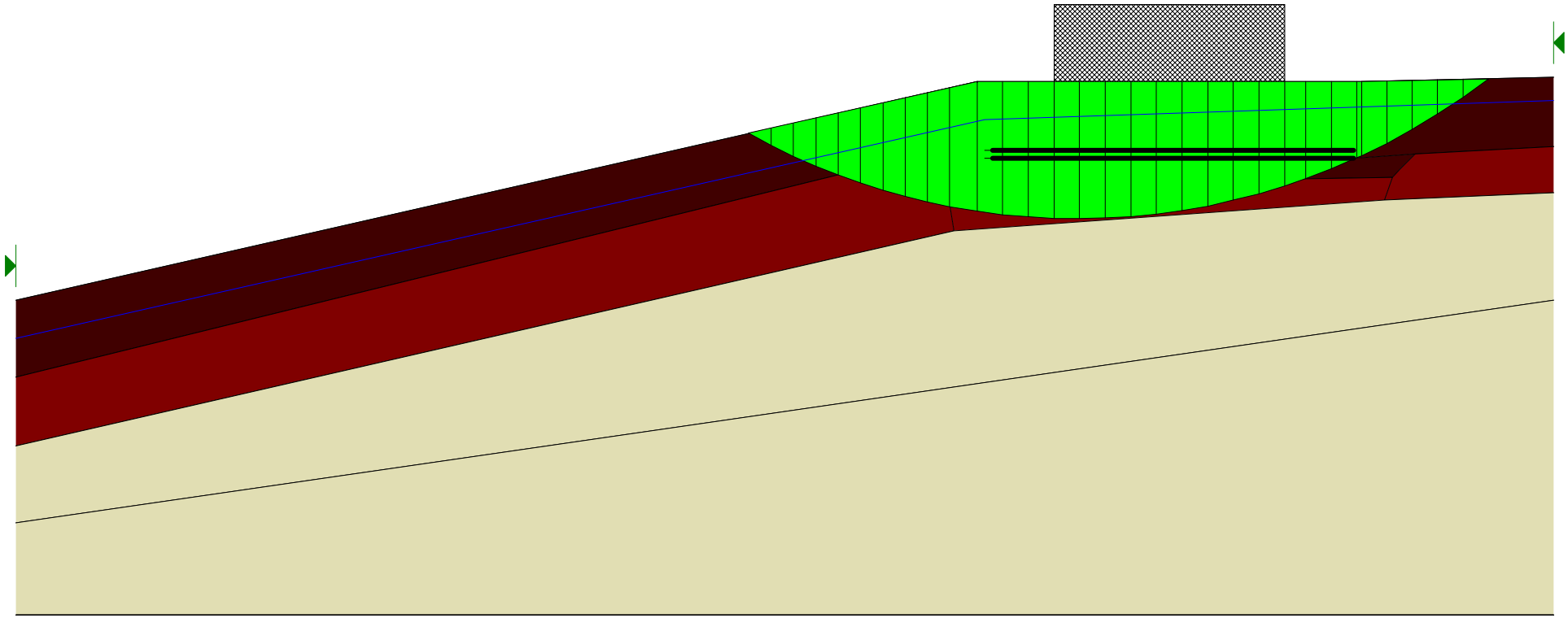
Depth of peat = 1.75 m on downslope side of road
Slope angle 12.5 Deg at surface, 12.8 Deg at base of peat

Partial factor of safety of 1.4 applied to undrained shear strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



T50+75



Derrybrien Windfarm - Floating Road Analysis: Cell T50NR (New Road Alignment)

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

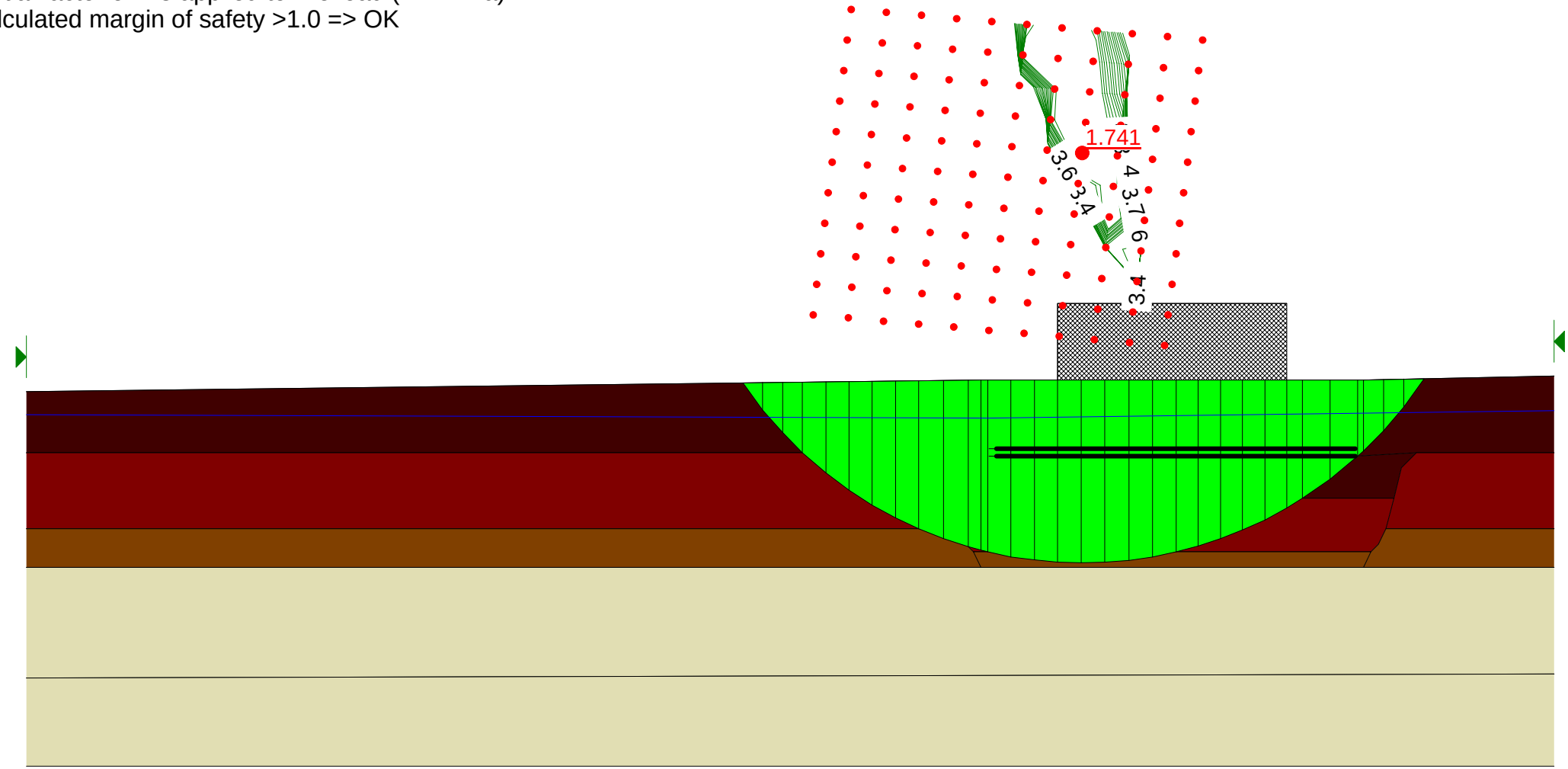
Depth of peat = 2.5 m on downslope side of road
Slope angle = 1 Deg at surface, 0.2 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T50NR (New Road)

T50-70



Derryrien Windfarm - Floating Road Analysis: Cell T51

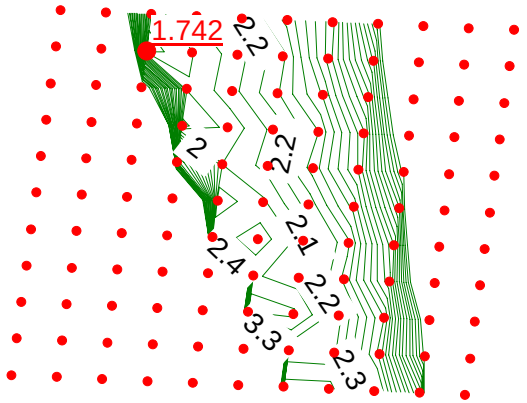
5.0 m wide road 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

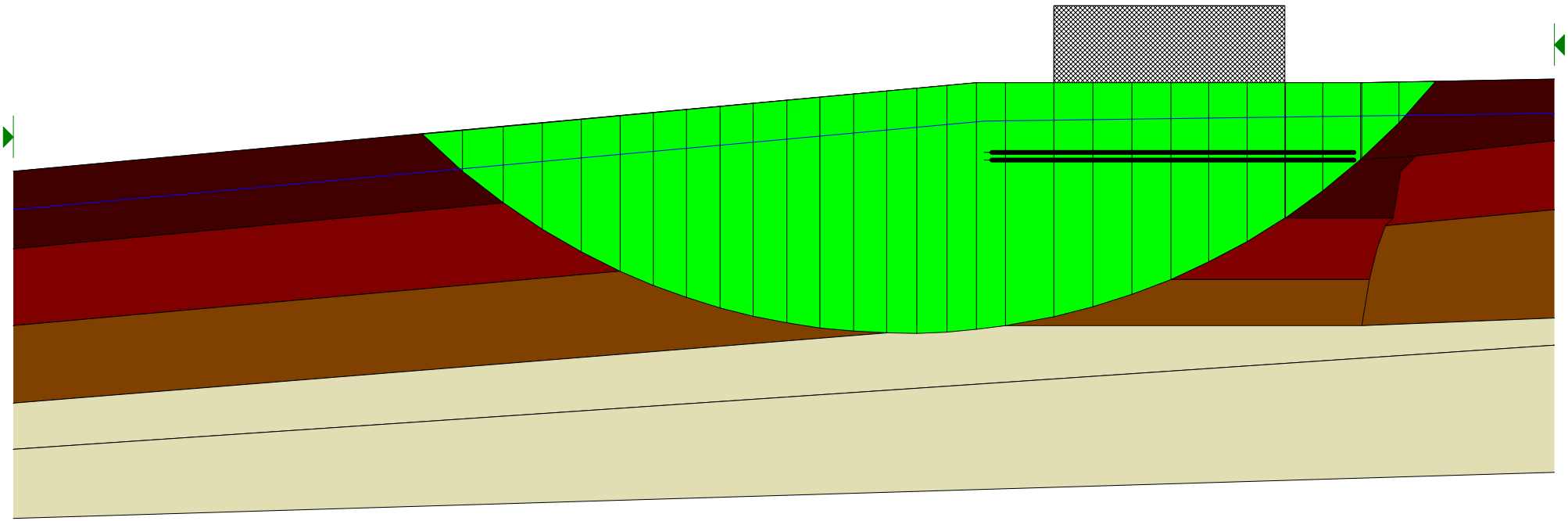
T51+75

Depth of peat = 3.08 meters on downslope side of road
Slope angle = 5.2 Deg at surface, 4.7 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





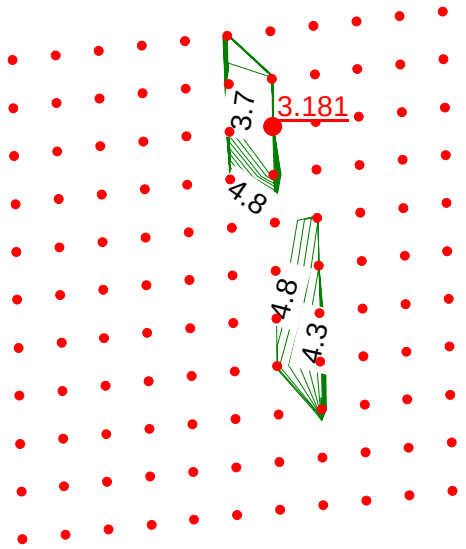
Derrybrien Windfarm - Floating Road Analysis: Cell T51

5.0 m wide road - 1.0 m thick
Basal reinforement with trees and 1 layer of Tensar SS30 Geogrid

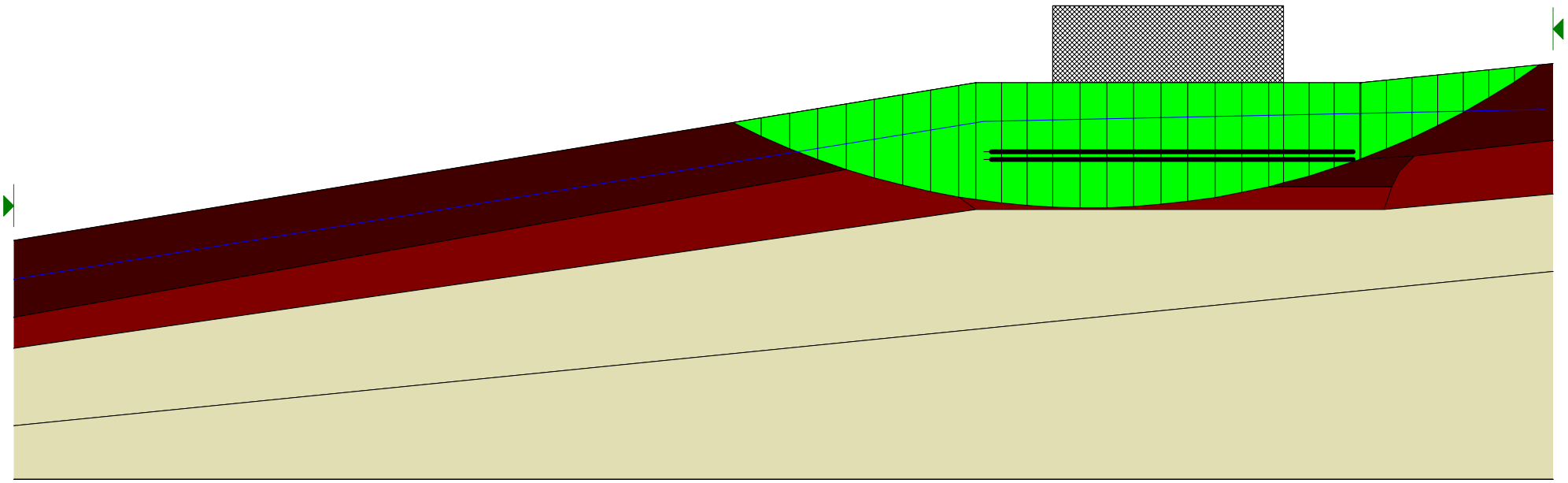
Depth of peat = 1.66 m on downslope side of road
Slope angle = 9.5 Deg at surface, 9.2 Deg at base of peat

Partial factor of safety of 1.4 applied to undrained shear strength under road
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 => OK



T51-100



Derrybrien Windfarm - Floating Road analysis: Cell T52

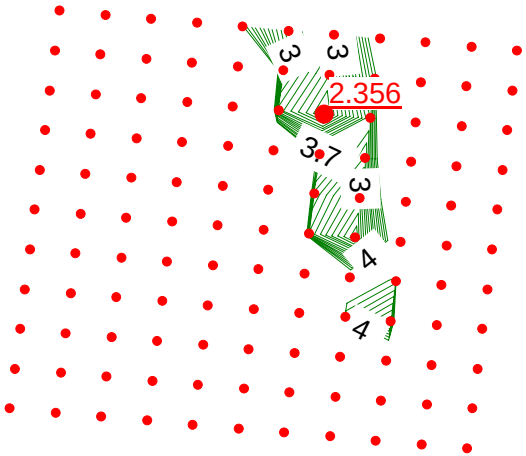
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

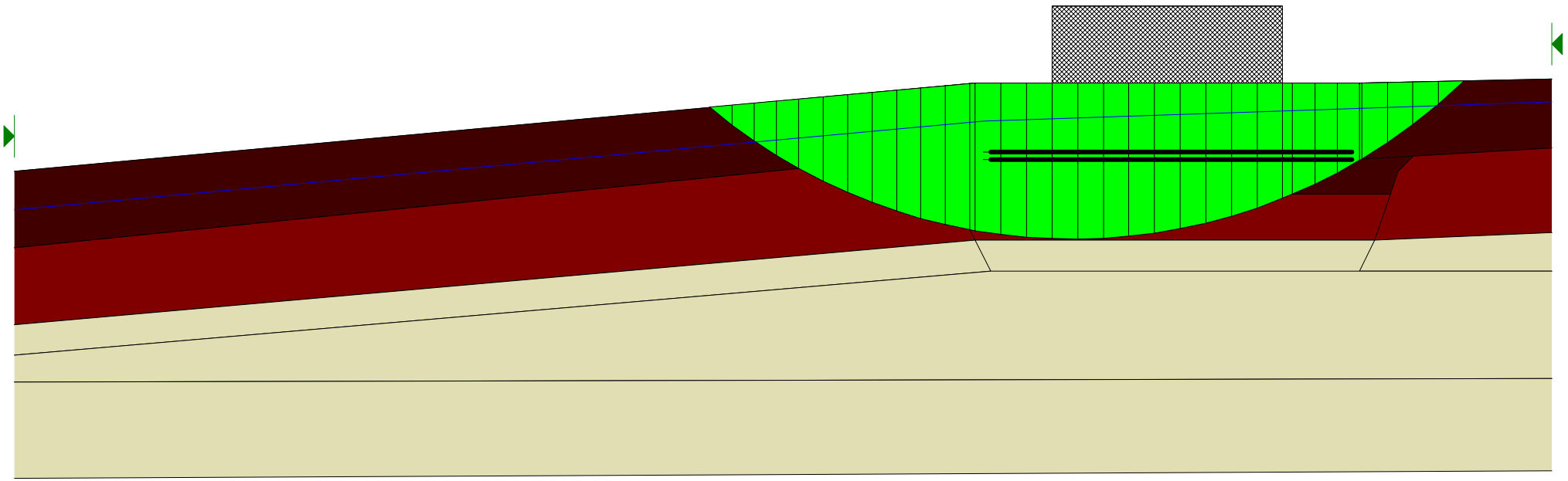
T52-25/+25

Depth of peat = 2.0 m on downslope side of road
Slope angle = 5.7 Deg at surface, 5.7 Deg at base of peat

Partial factor of 1.4 applied toundrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 = OK





Derrybrien Windfarm - Floating Road Analysis: Cell T55

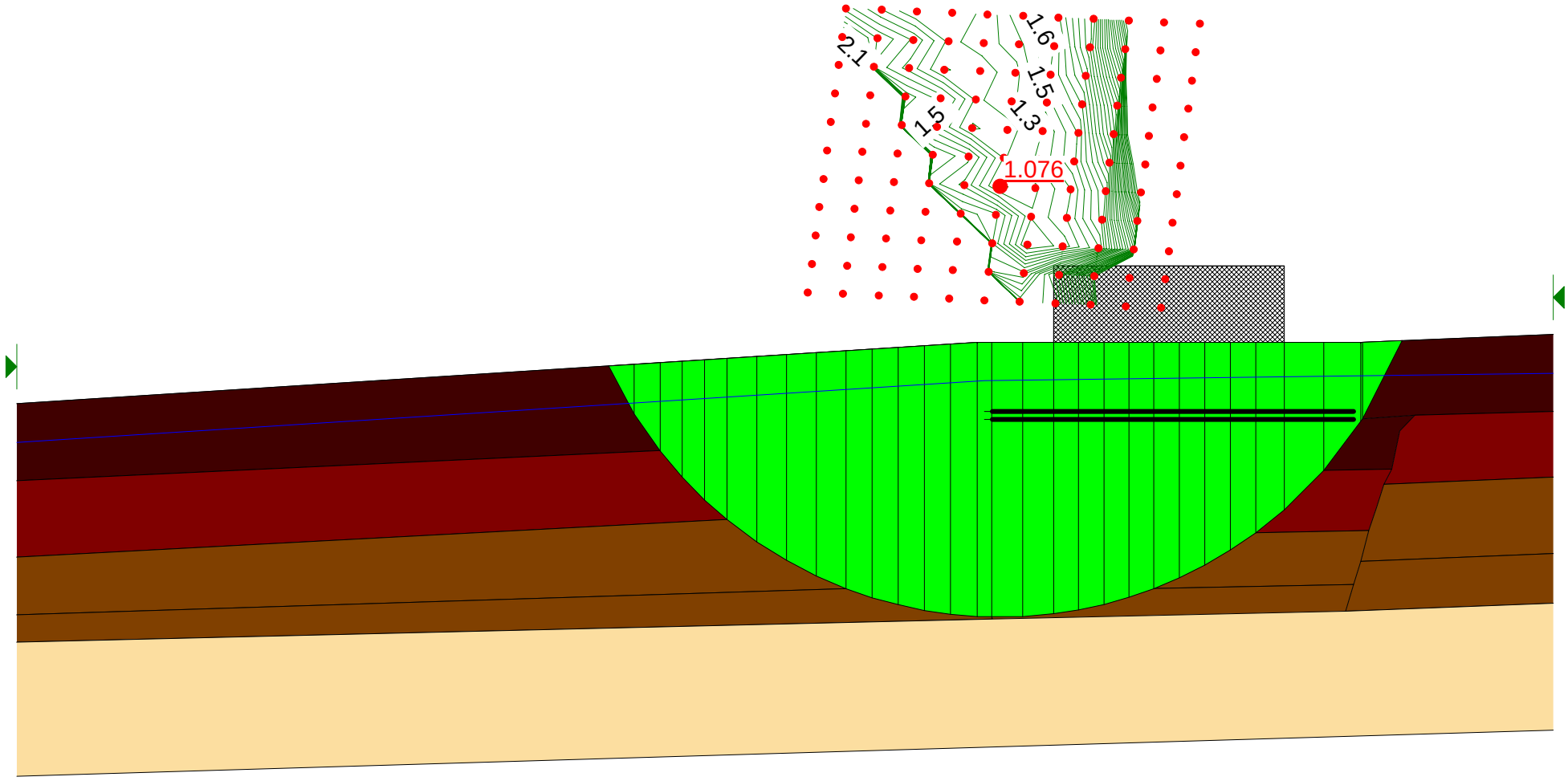
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.75 m on downslope side of road
Slope angle = 3.7 Deg at surface, 1.4 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat

T55

Partial factor of 1.3 applied to live load (17.1kPa)
Calculated margin of safety >1.0 => OK



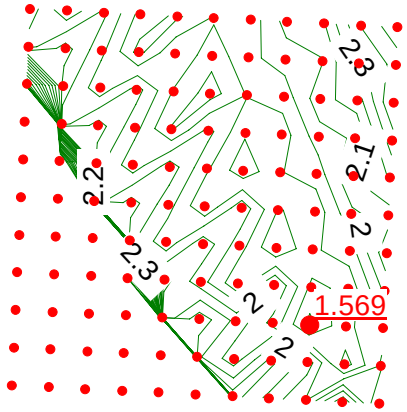
Derrybrien Windfarm - Floating Road Analysis: Cell T56

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

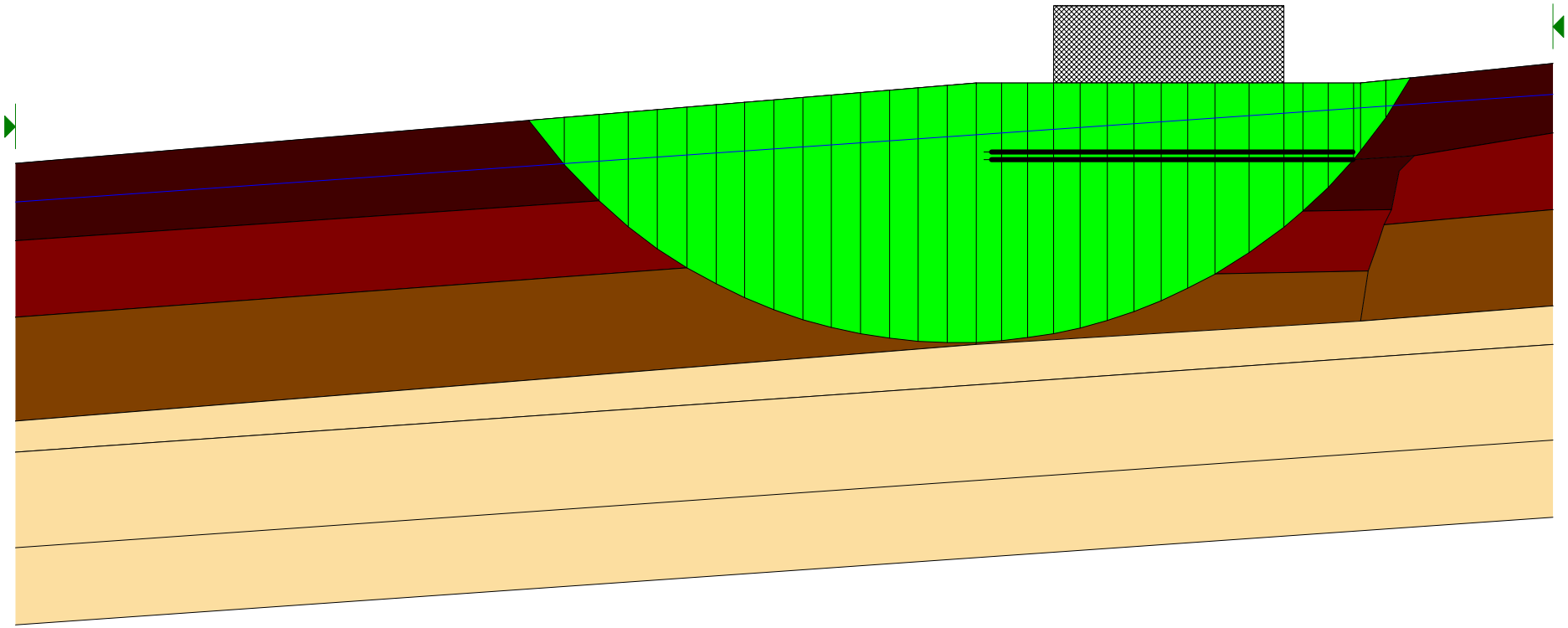
Depth of peat = 3.25 m on downslope side of road
Slope angle = 4.0 Deg at suface, 4.2 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 =>OK



T56



Derrybrien Windfarm - Floating Road Analysis: Cell T57

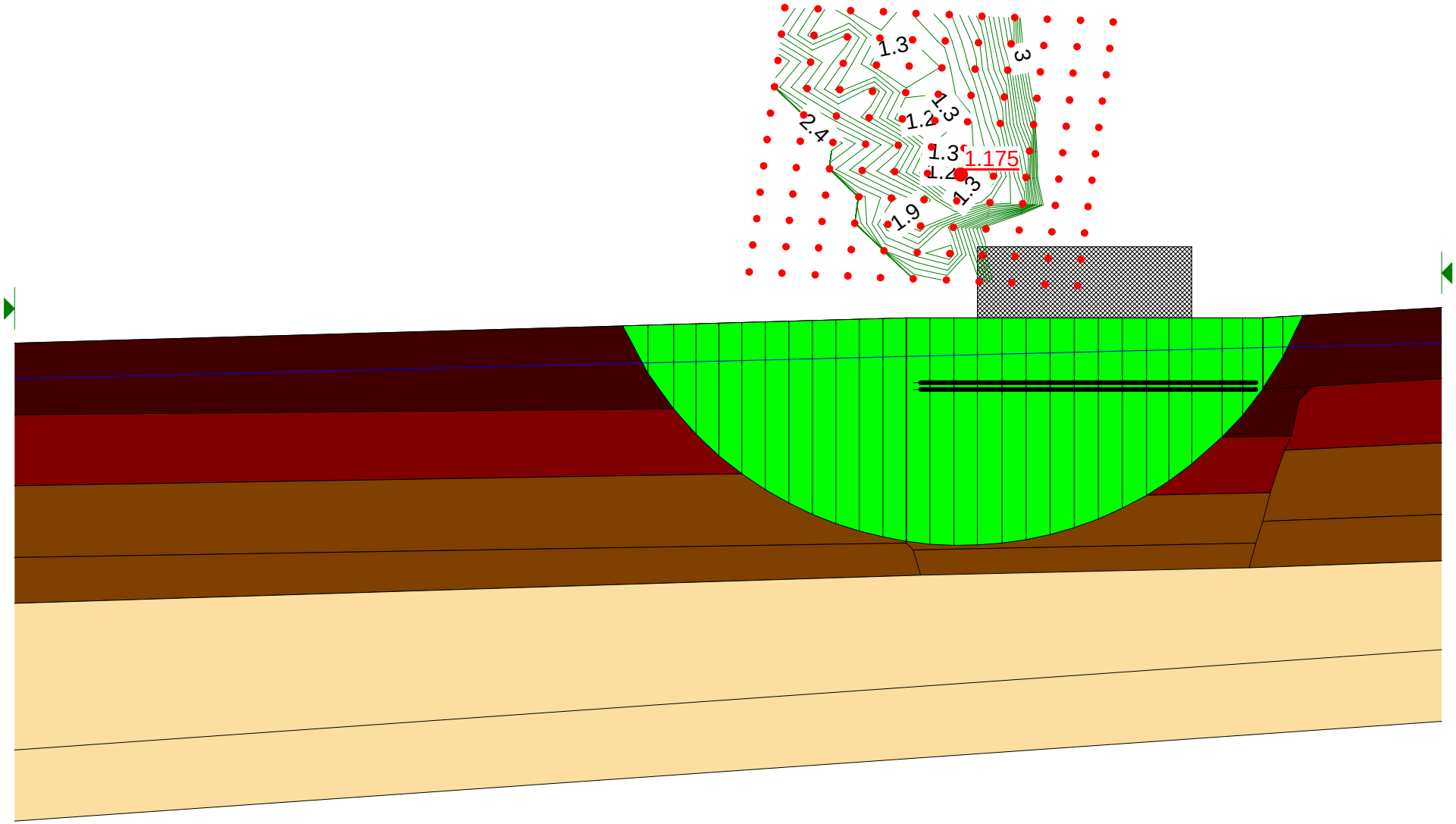
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

T57

Depth of peat = 3.75 m on downslope side of road
Slope angle = 1.7 Deg at surface, 1.9 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T59

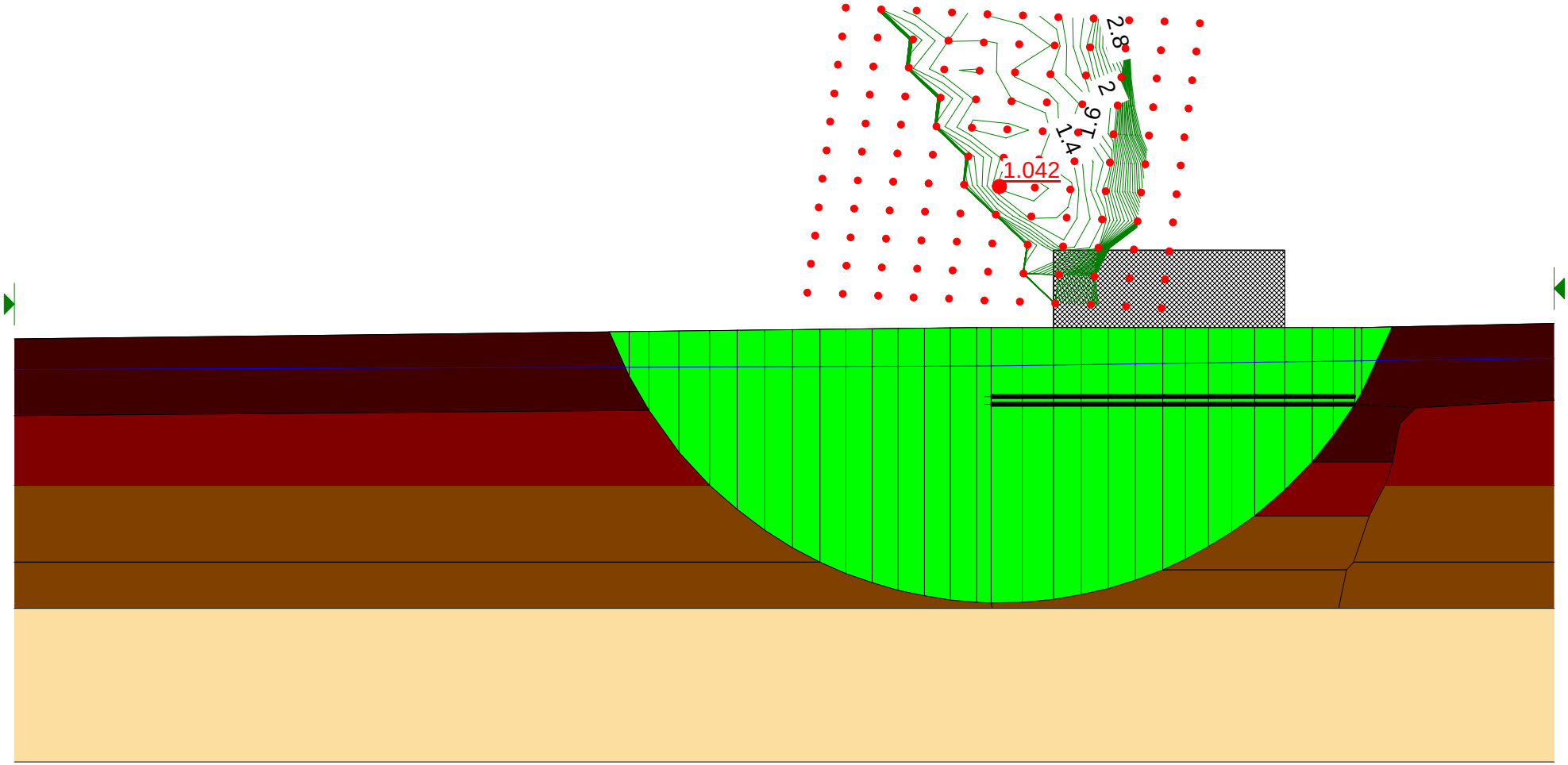
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.6 m on downslope side of road
Slope angle = 0.5 Deg at surface, 0 Deg at base of peat

T59+100

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T60

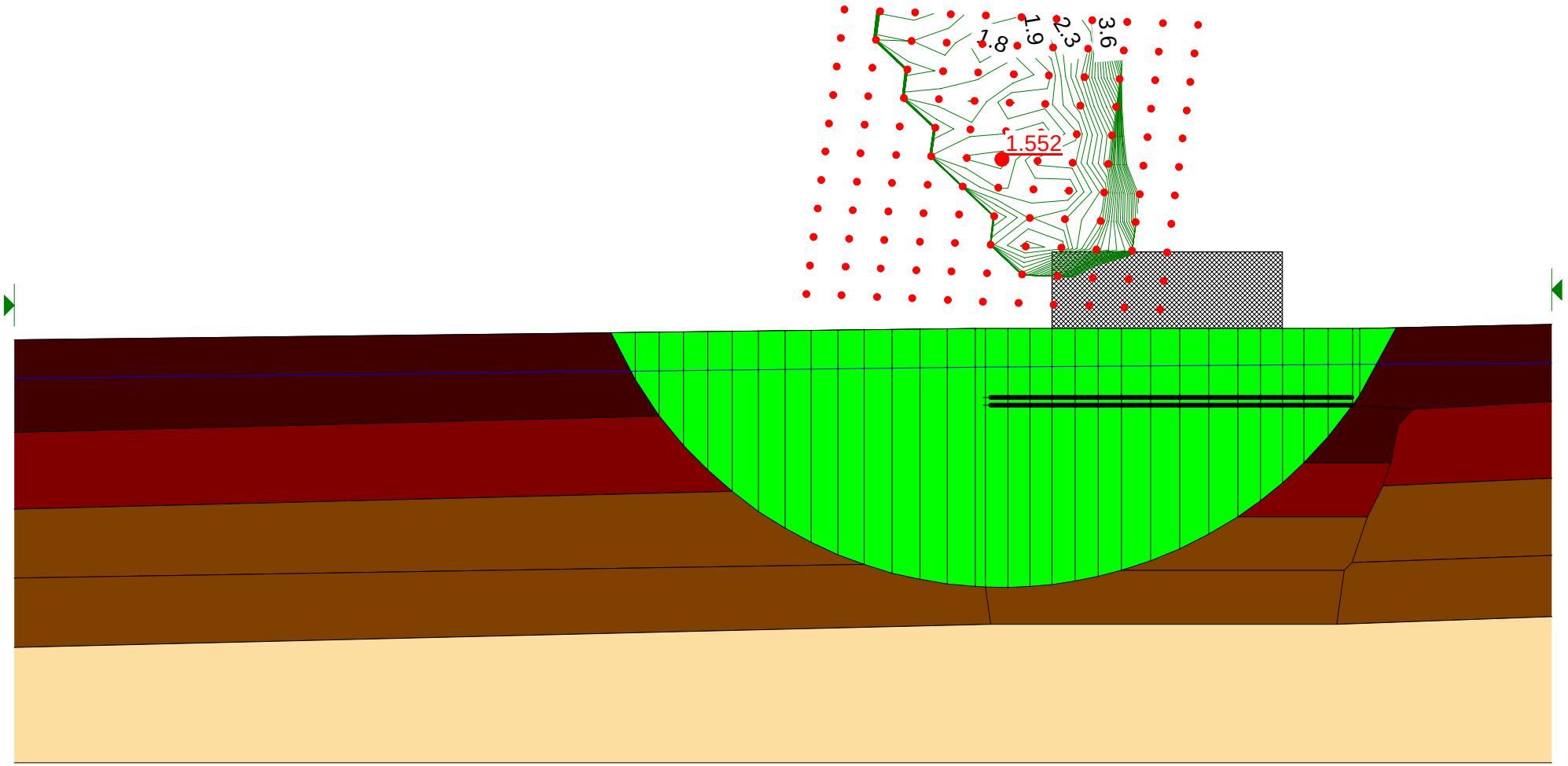
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.8 m on downslope side of road
Slope angle = 0.5 Deg at surface, 1.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T60-25



Derrybrien Windfarm - Floating Road Analysis: Cell T61

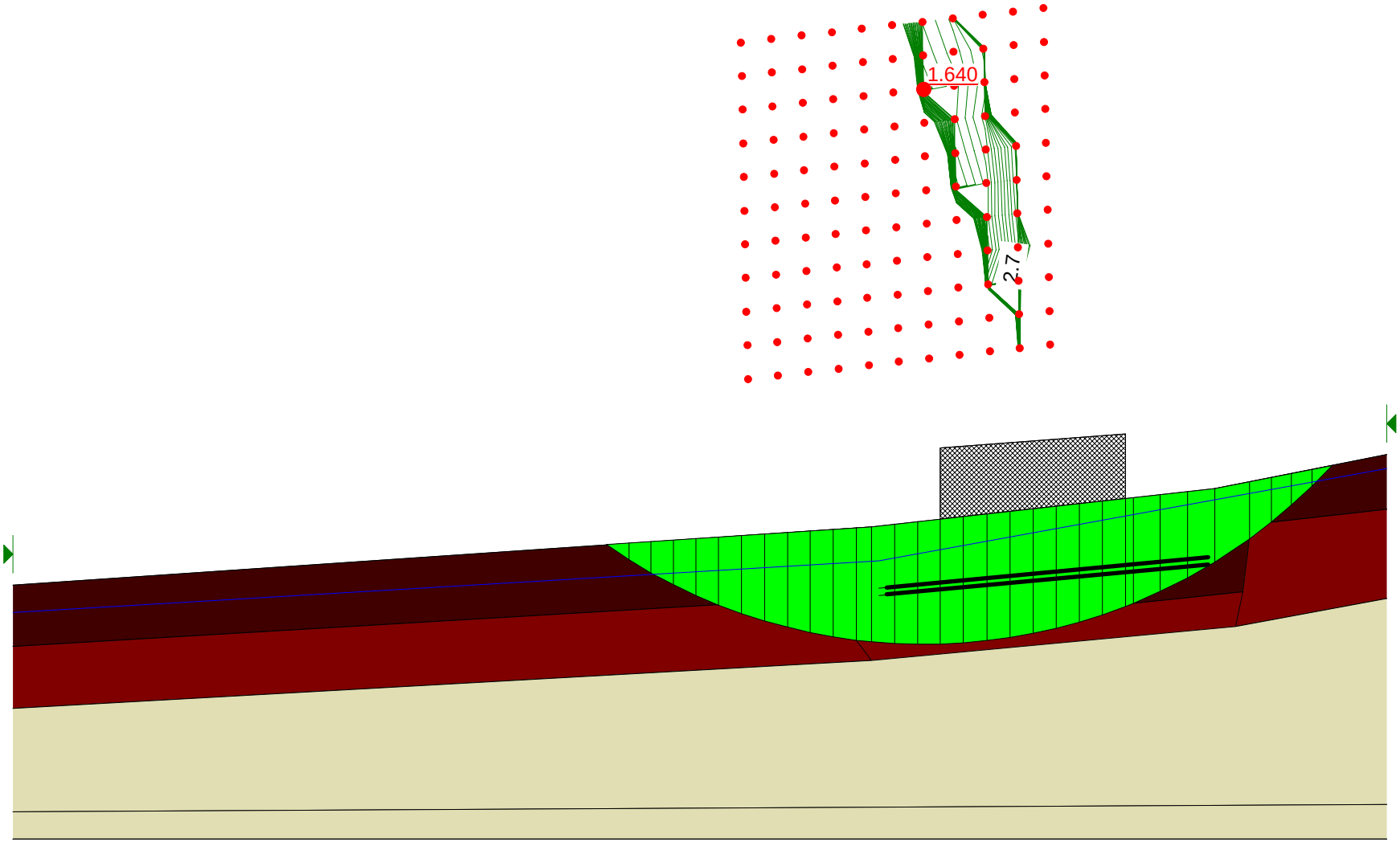
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 1.9 m on downslope side of road
Slope angle = 3.5 Deg at surface, 3.1 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 => OK

T61-50



Derrybrien Windfarm - Floating Road Analysis: Cell T62

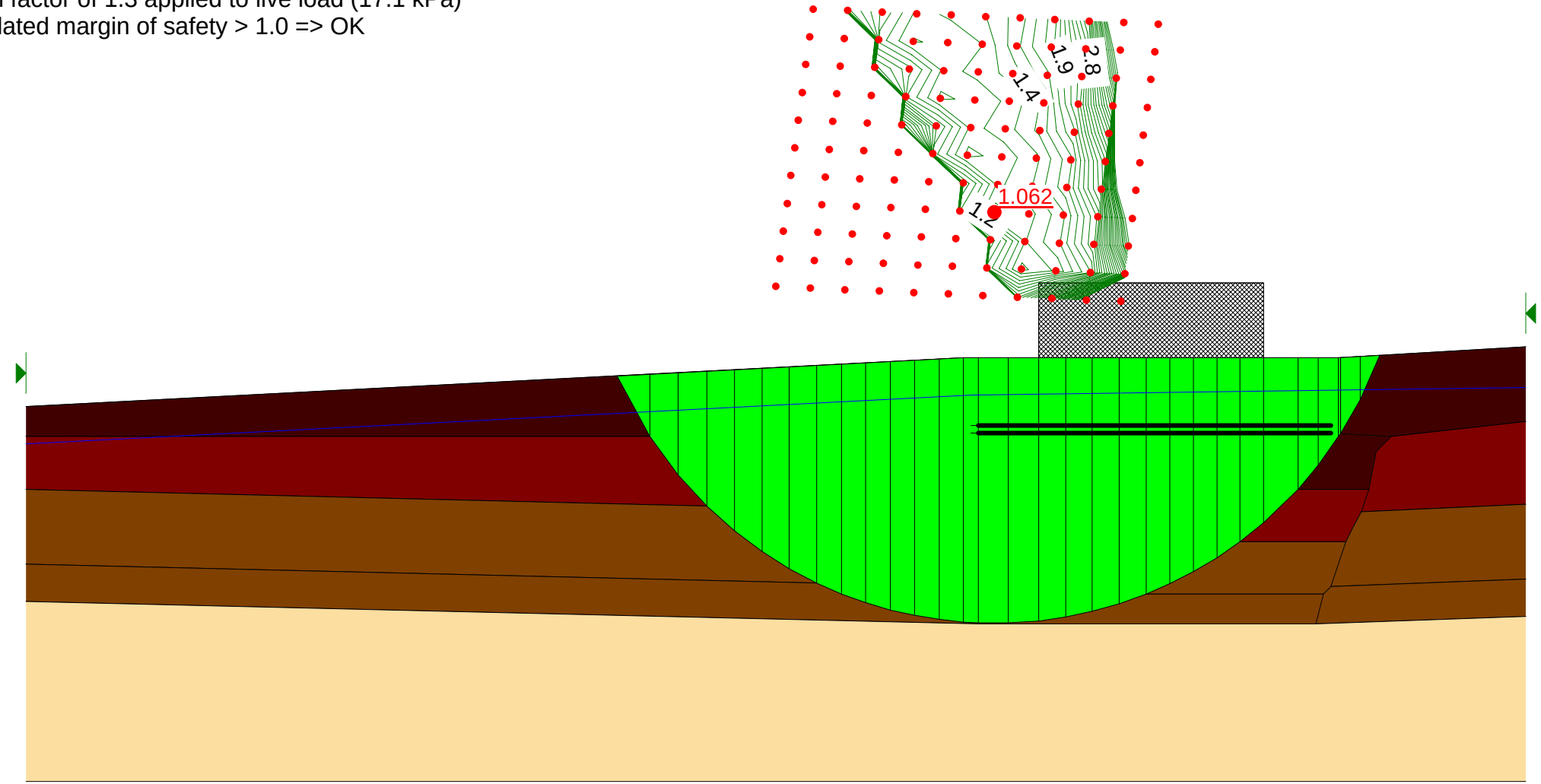
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

T62-125

Depth of peat = 3.5 m on downslope side of road
Slope angle = 3.0 Deg at surface, -1.3 Deg at base of peat (backslope)

Partial factor of 1.4 applied to undrained shear strength of peat
No allowane taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety > 1.0 => OK



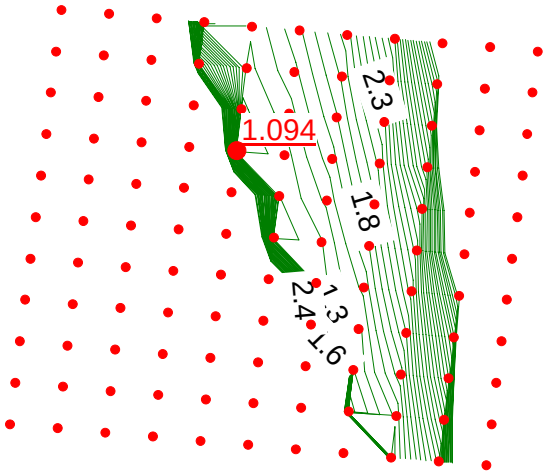
Derrybrien windfarm - Floating Road Analysis: Cell T62

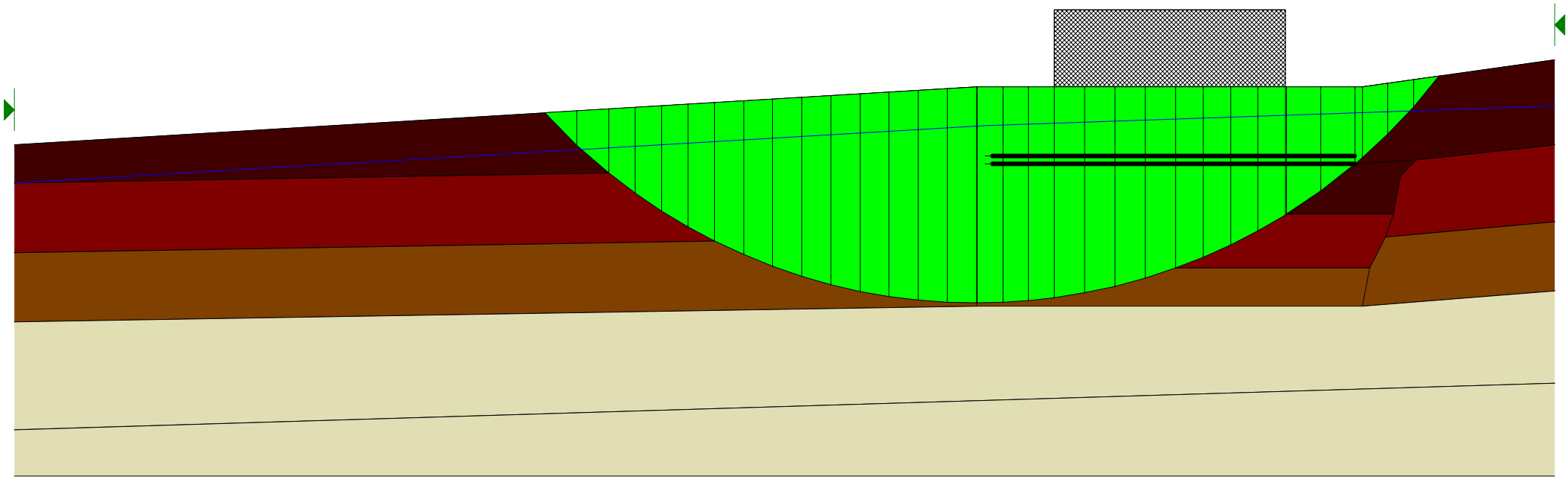
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 2.8 m on downslope side of road
Slope angle 3.5 Deg at surface, 0.8 deg at base of peat

Partial factor of 1.3 applied to design live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T62-75





Derrybrien Windfarm - Floating Road Analysis: Cell T63

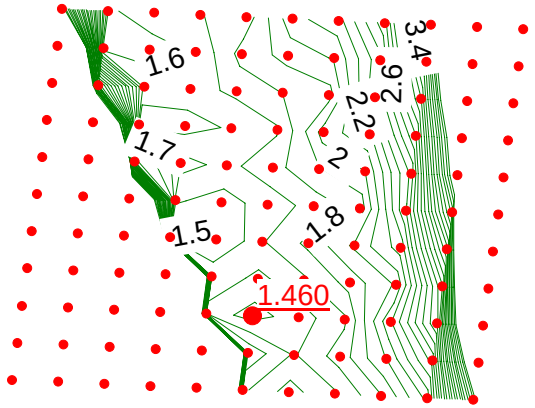
T63-25

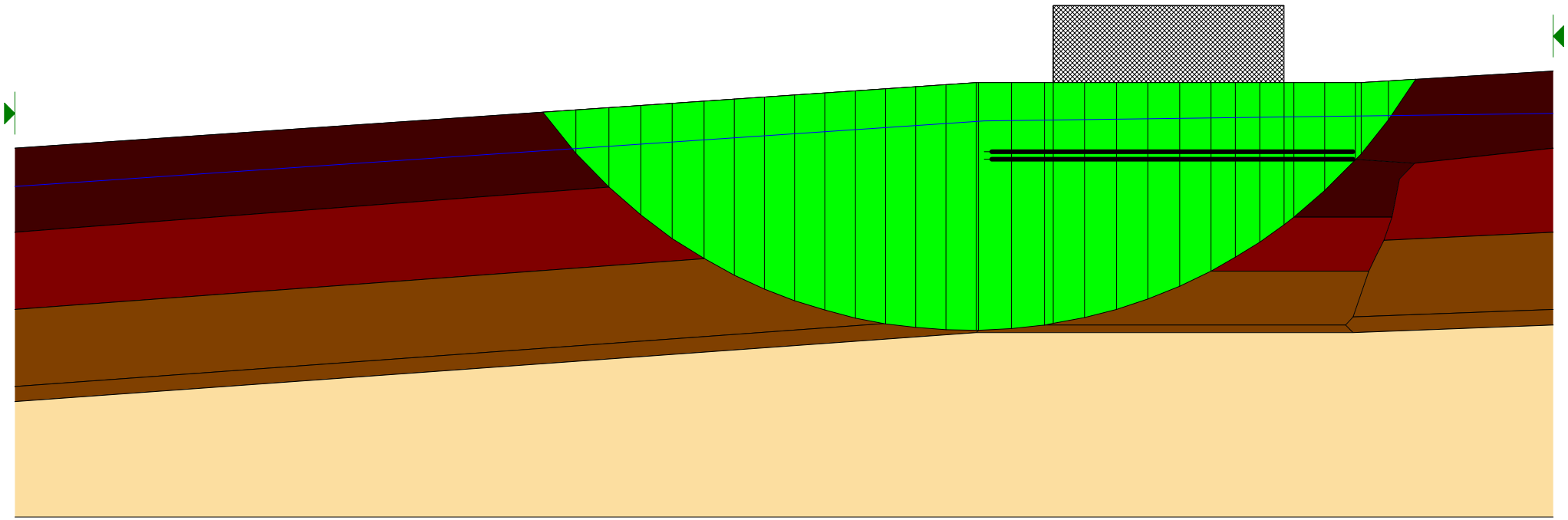
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.2 m on downslope side of road
Slope angle = 3.5 Deg at surface, 4.0 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK





Derrybrien windfarm - Floating Road Analysis: Cell T64

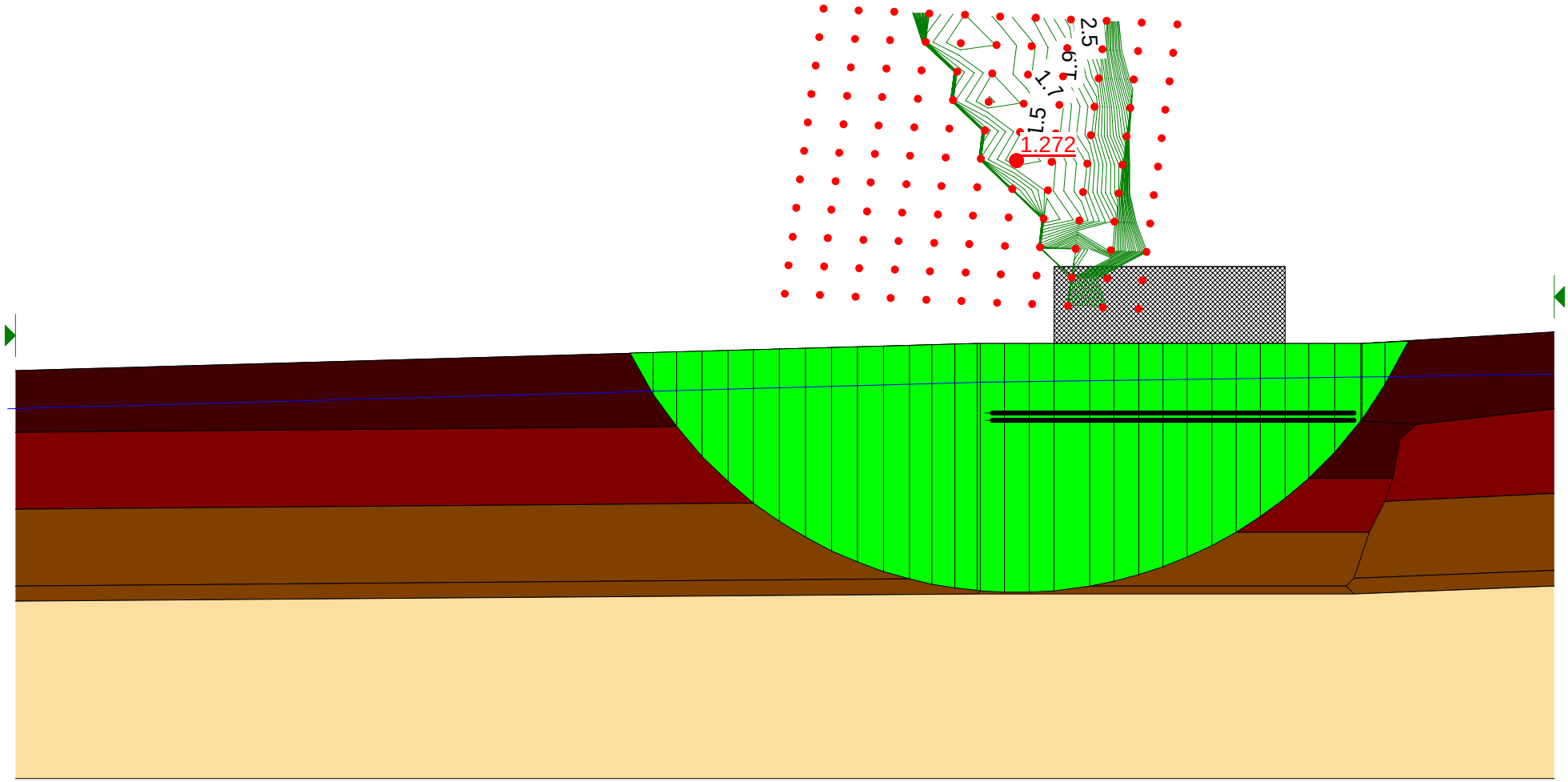
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.2 m on downslope side of road
Slope angle = 1.5 Deg at surface, 0.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T64+100



Derrybrien Windfarm - Floating Road Analysis: Cell T66

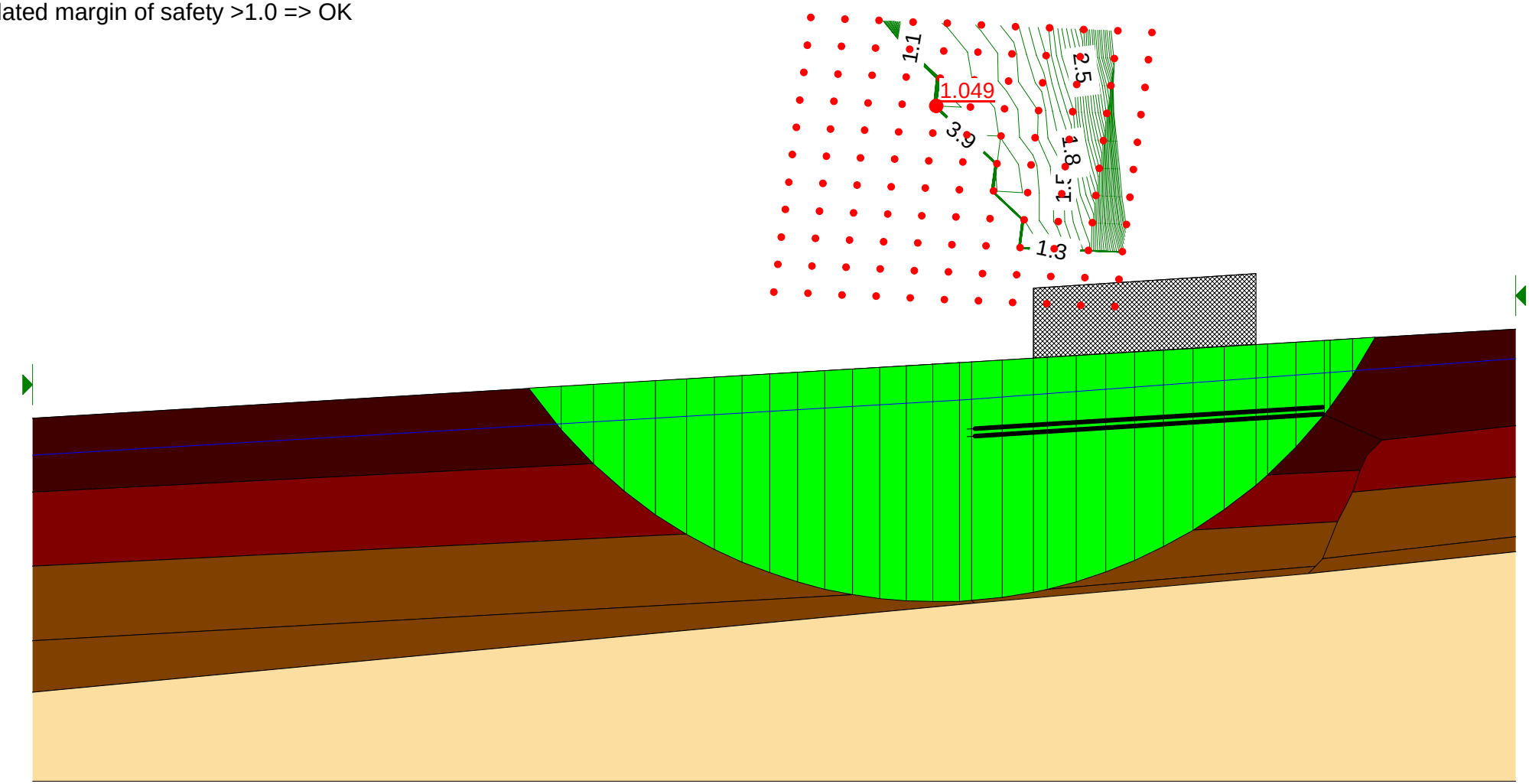
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.2 m on downslope side of road
Slope angle = 3.2 Deg at surface, 5.4 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T66



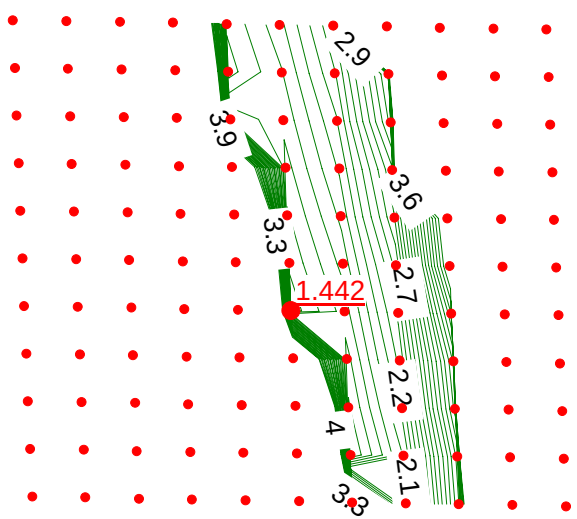
Derrybrien Windfarm - Floating Road Analysis: Cell T68

5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

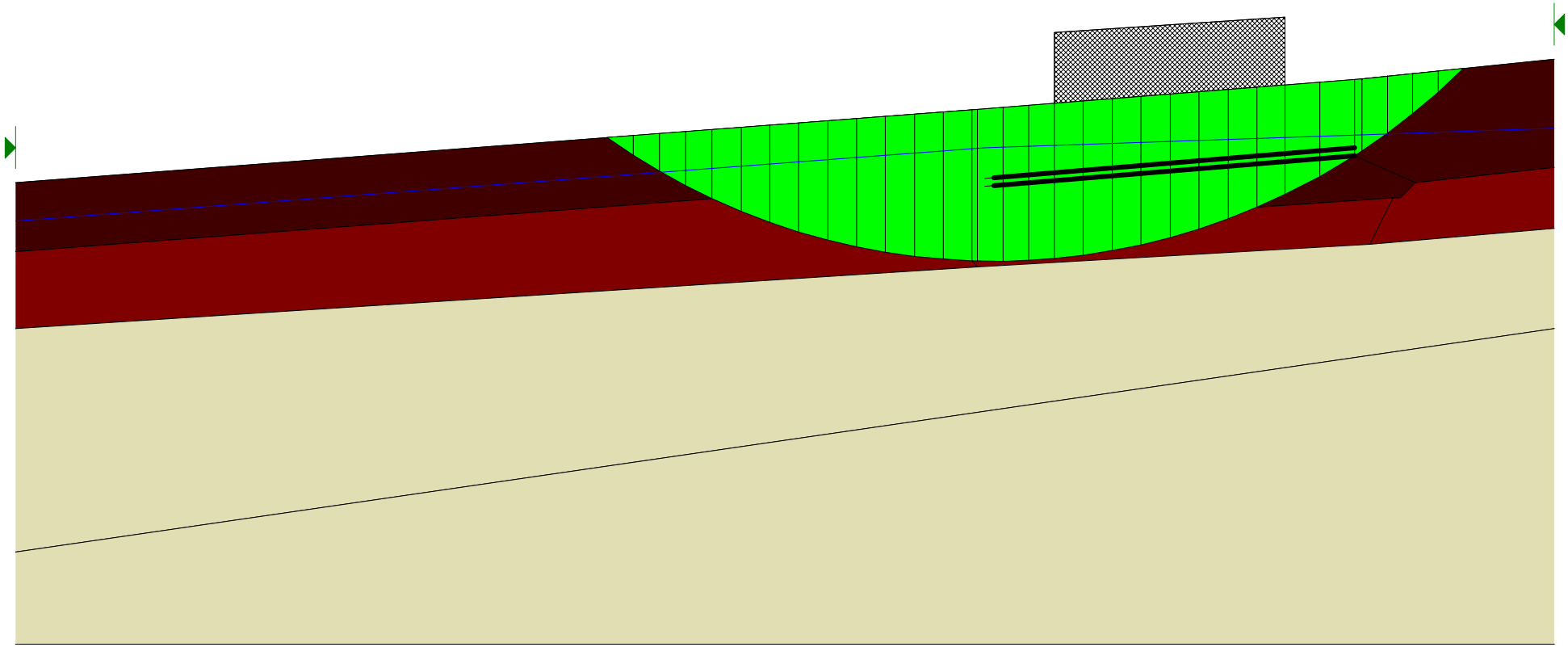
Depth of peat = 2.1 m on downslope side of road
Slope angle = 4.0 Deg at surface, 3.6 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



T68-50



Derrybrien Windfarm - Floating Road Analysis: Cell T69

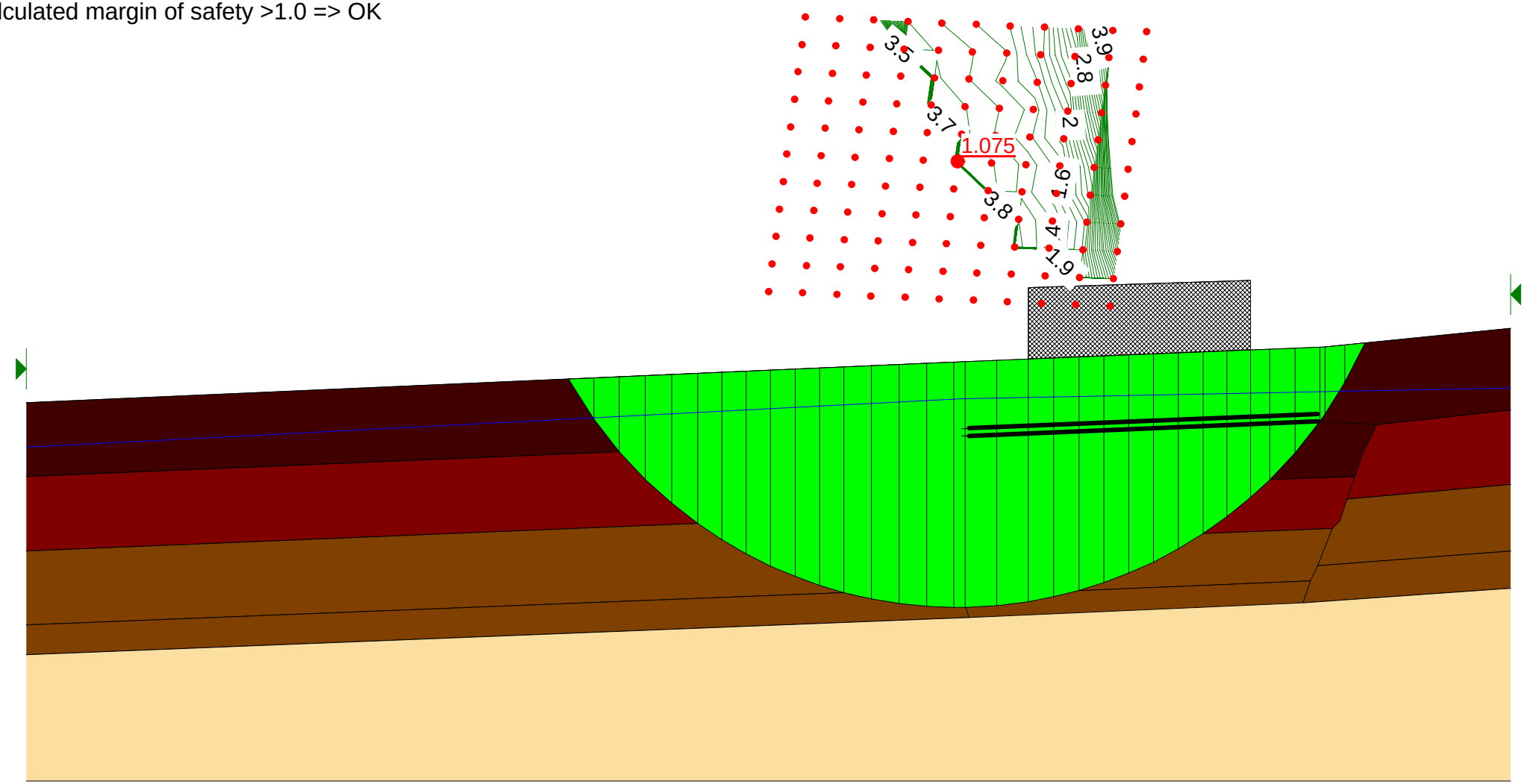
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

Depth of peat = 3.4 m on downslope side of road
Slope angle = 2.3 Deg at surface, 2.3 Deg at base of peat

T69+75

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK



Derrybrien Windfarm - Floating Road Analysis: Cell T70

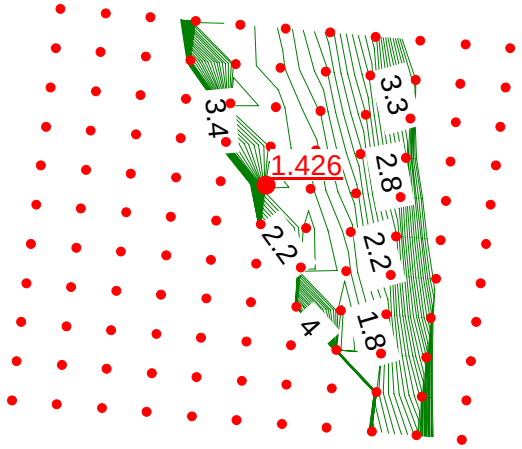
5.0 m wide road - 1.0 m thick
Basal reinforcement with trees and 1 layer of Tensar SS30 Geogrid

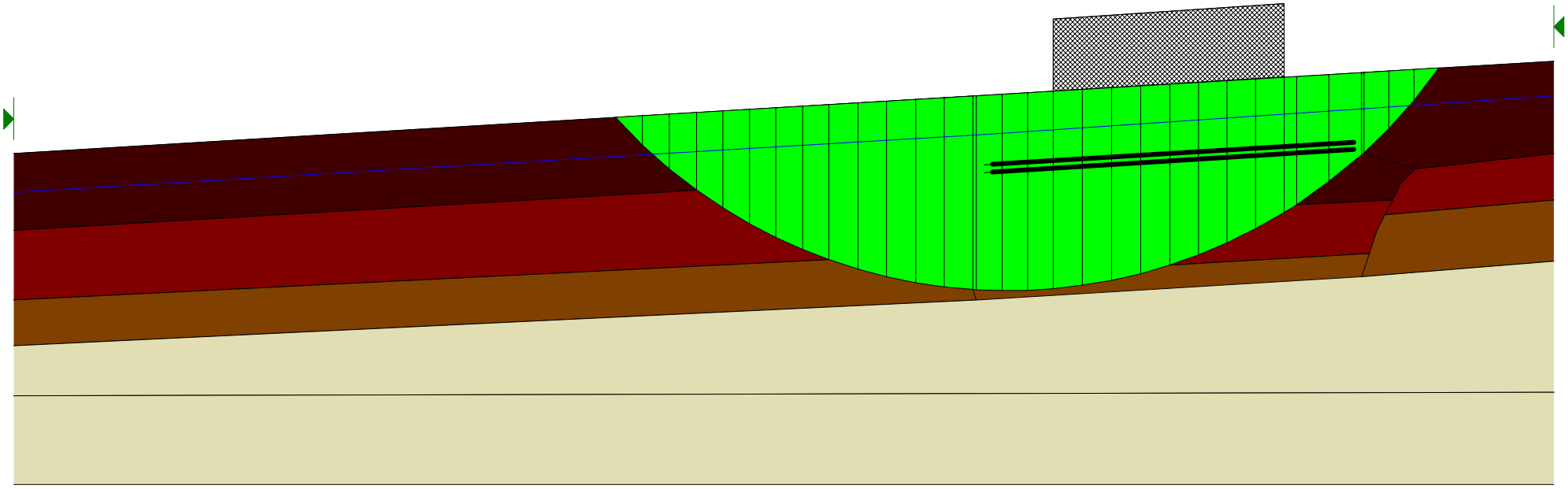
Depth of peat = 2.6 m on downslope side of road
Slope angle = 3.3 Deg at surface, 2.7 Deg at base of peat

Partial factor of 1.4 applied to undrained shear strength of peat
No allowance taken for increase in strength under road

Partial factor of 1.3 applied to live load (17.1 kPa)
Calculated margin of safety >1.0 => OK

T70+75

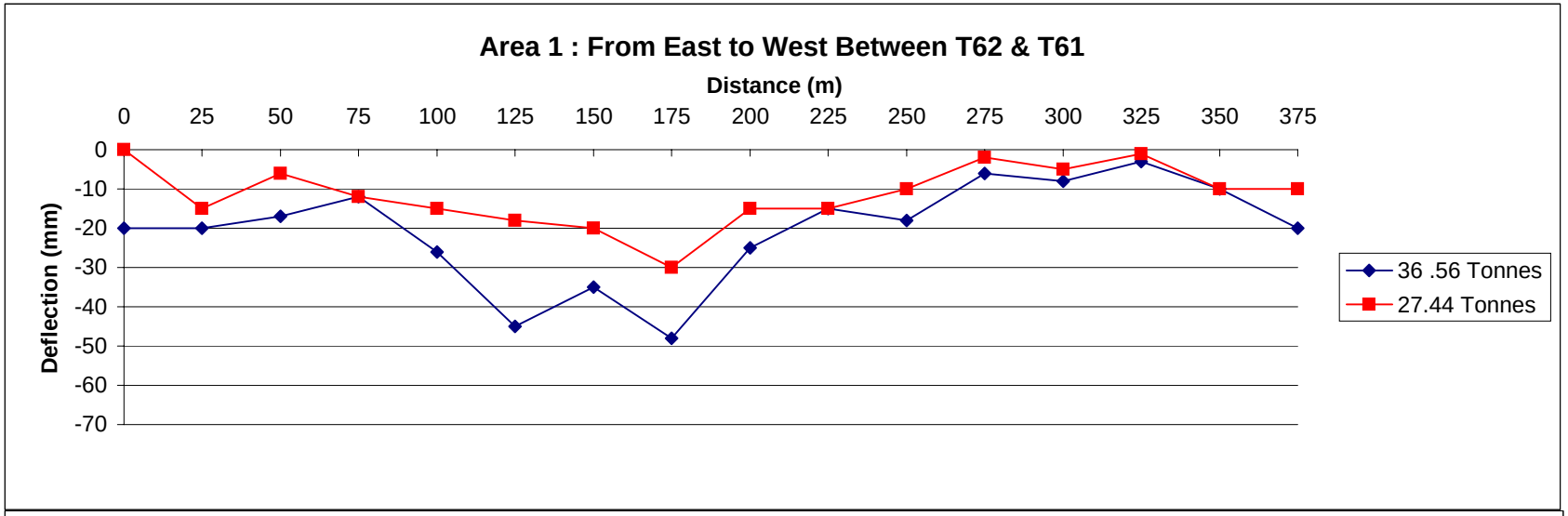


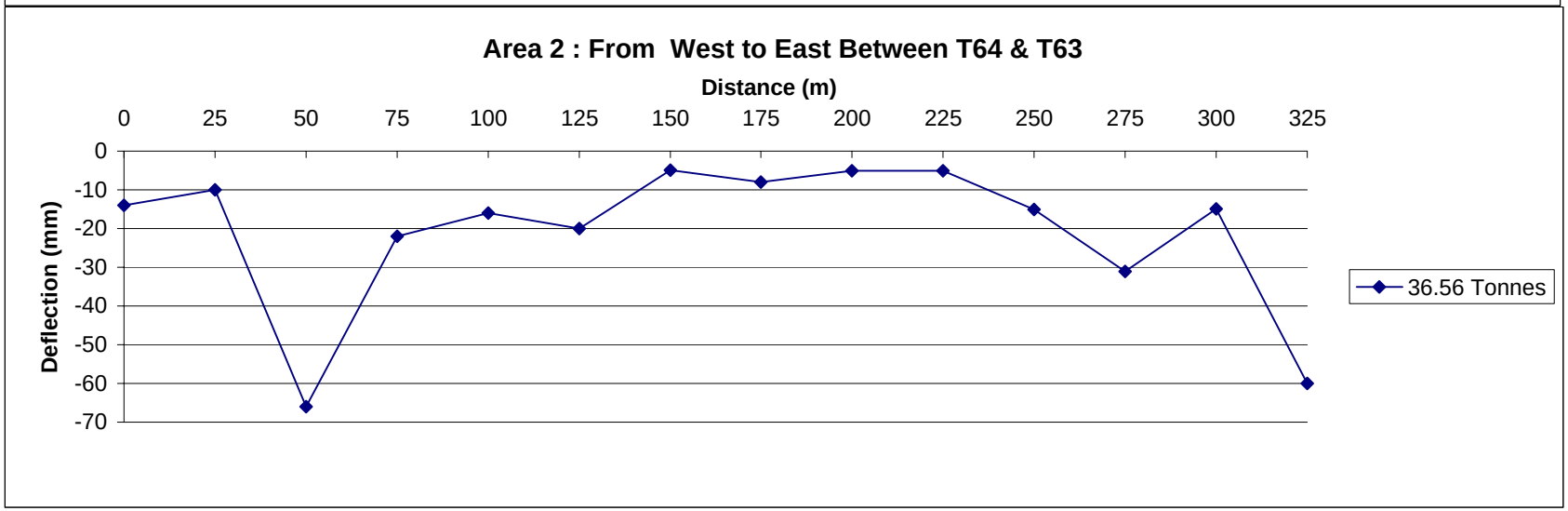


Appendix C

Road Deflection Measurements from Field Load Tests on Floating Roads

Derrybrien Windfarm - Road Test Results
Phase 1 North Section of Site

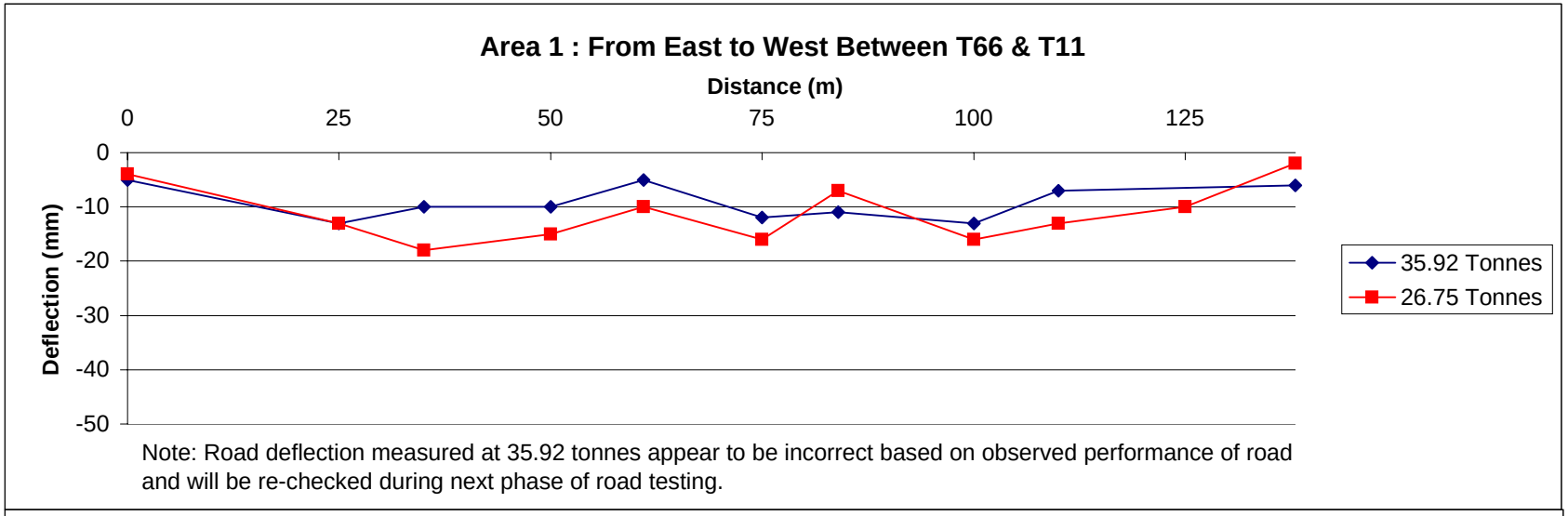




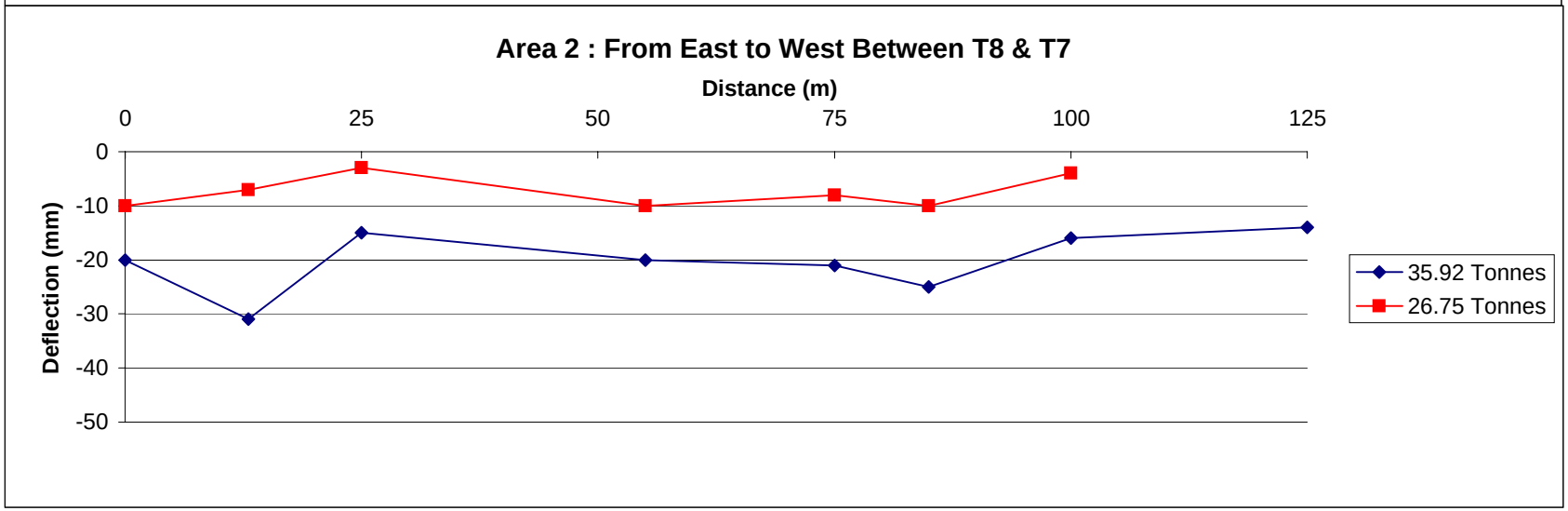
Derrybrien Windfarm - Road Test Results
Phase 1 North Section of Site

Derrybrien Windfarm - Road Test Results
Phase 1 North Section of Site

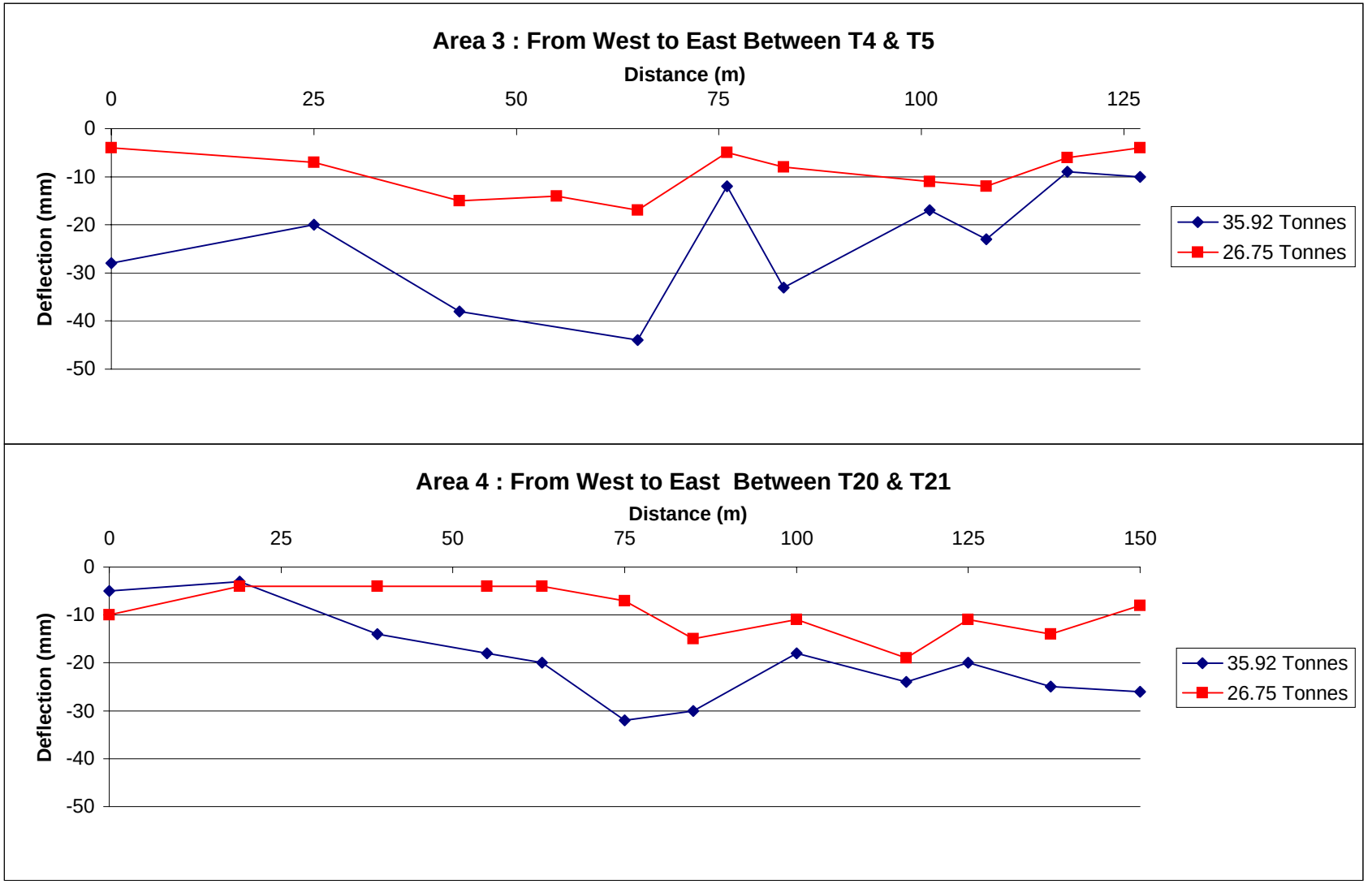
Derrybrien Windfarm - Road Test Results
Phase 2 South and Western Section of Site



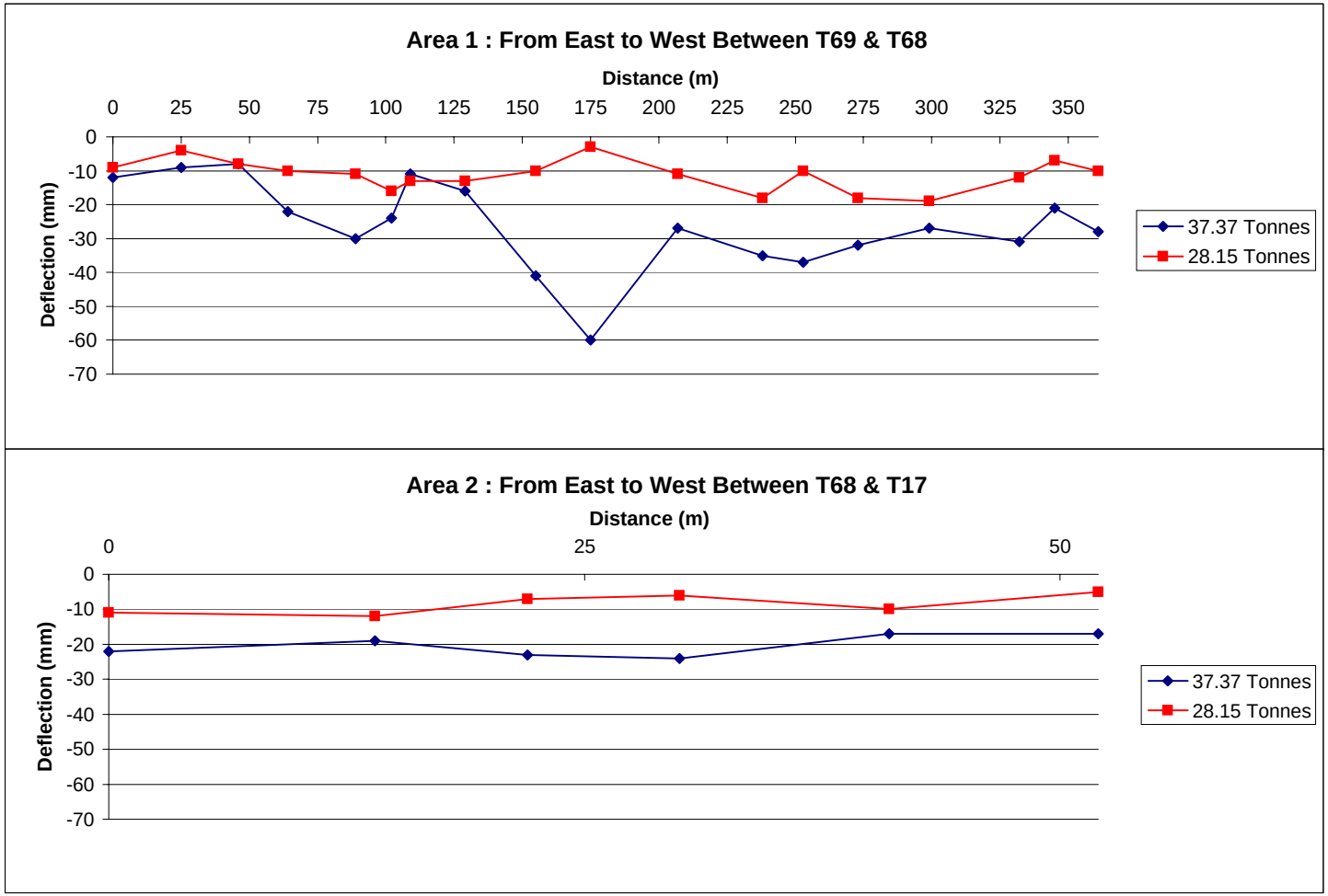
Note: Road deflection measured at 35.92 tonnes appear to be incorrect based on observed performance of road and will be re-checked during next phase of road testing.

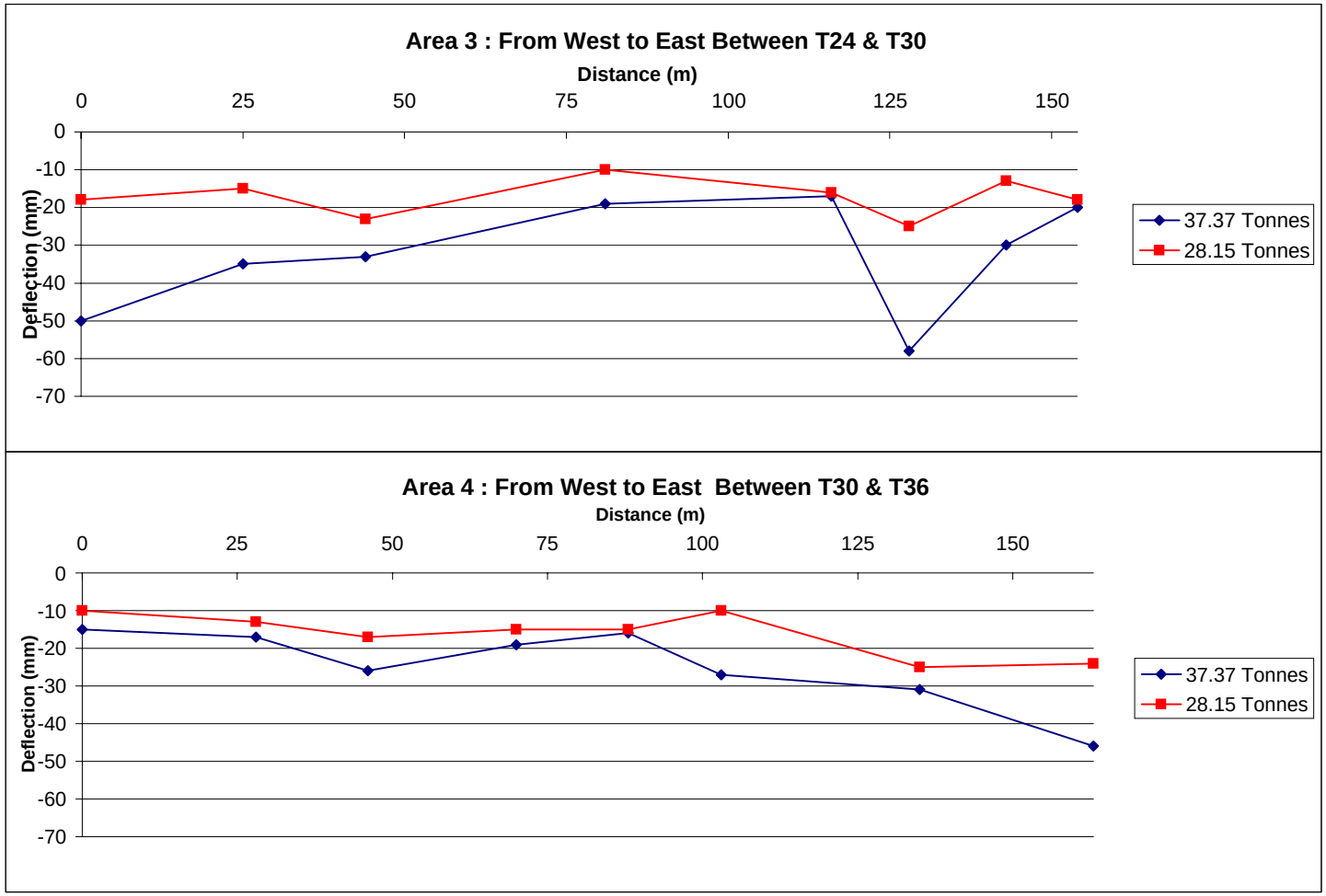


Derrybrien Windfarm - Road Test Results
Phase 2 South and Western Section of Site



Derrybrien Windfarm - Road Test Results
Phase 3 Eastern Section of Site




Area 3 : From West to East Between T24 & T30
Distance (m)
0
25
50
75
100
125
150
0
-10
-20
-30
-40
-50
-60
-70
Deflection (mm)
37.37 Tonnes
28.15 Tonnes
Area 4 : From West to East Between T30 & T36
Distance (m)
0
25
50
75
100
125
150
0
-10
-20
-30
-40
-50
-60
-70
Deflection (mm)
37.37 Tonnes
28.15 Tonnes

Appendix D

AGL Method Statement for Remedial Works on Sections of Floating Roads Classified as “Poor”

Draft for Discussion

Method Statement
for
Assessment & Supplemental Work
to be carried out
on the
Floating Roads of the Derrybrien Windfarm.

AGL Consulting.

1. Purpose

The purpose of this method statement is to detail the supplemental ground investigation that will be required to asses the geotechnical risks associated with the floating roads and to prescribe the corrective actions to be carried out by Ascon to alleviate those risks on the Derrybrien Windfarm site. The principal aim of this investigation is to identify the current condition of the road structure in areas where the road has performed "poorly" during road testing and to outline what measures will be required to mitigate the risk and approve the road to carry construction traffic.

2. Scope of Work

Work shall be carried in the areas where a high degree of deformation was noted during road testing. These areas are as detailed in AGL's report on the supplemental ground Investigation carried out to date at the Derrybrien Windfarm site.

3. Ground Investigation and Reinforcement

3.1 Inspection of Tensar Geogrid

In areas where large deflections were recorded and at locations determined by AGL personnel, exploratory trial pits shall be dug into the existing road surface exposing the underlying layer of Tensar Geogrid. The condition of the geogrid layer shall be assessed by AGL personnel and the total depth of overlying road material to the wood base layer shall be recorded. The excavation shall be carried out by Ascon personnel. Should any damage to the geogrid occur during excavation, all effected areas shall be replaced to the satisfaction of AGL personnel.

3.2 Mitigating Measures

Should the condition of the insitu geogrid be deemed acceptable by AGL personnel, the surrounding area of road shall be stripped back of its stone surface layer and a second

layer of geogrid shall be laid. 300 mm of stone shall be placed upon the new geogrid layer and the road finished to a level working surface. An overall road thickness of **no grater than 1 meter** shall be achieved at any point in the road.

If however the condition of the geogrid layer be deemed unacceptable by AGL personnel, the surrounding area of road shall be excavated to facilitate the removal of the existing geogrid and a new lower layer of geogrid in addition to the upper layer be constructed.

4 Additional Road Test

Once resurfaced the reinforced floating road shall be left untrafficed for a period of **no less than 1 week**. Once a suitable period of time as judged by AGL personnel has elapsed, the reinforced road structure shall be retested under construction traffic loads and it performance assessed as before. The assessment of the reinforced road shall be carried out by AGL personnel.

4.1 Road Deflection

Areas in which a substantial improvement in road performance is recorded shall be deemed acceptable to carry construction traffic. Those areas in which a substantial improvement in performance is not recorded shall require further work and retesting in order to be deemed acceptable. The level of improvement in performance shall be judged by AGL personnel.

5 Further Work

In areas where no substantial improvement in road performance has been recorded the road and its wood base shall be excavated. Under the supervision of AGL personnel, a new wood base shall be laid and two layers of new geogrid placed as set out in section 3.1. of this document. After a suitable period of time has elapsed the new road section shall be re-tested to asses the new level of performance achieved. Should further mitigating measures be required, an assessment will then be made by AGL personnel into the feasibility of the floating road in question to safely traffic construction loads without incurring undue risk of local failure.