Corrib natural gas

Corrib Gas Field Development

Environmental Impact Statement

Prepared in respect of the proposed Bellanaboy Bridge Gas Terminal and associated Srahmore Peat Deposition Site.

Volume 1:

Technical appendix 1

Proposed Bellanaboy Bridge Gas Terminal Bellanaboy Bridge Bellagelly South Co. Mayo

Geology, Hydrogeology Global Stability

TABLE OF CONTENTS

Technical Appendix: Vol.1 Geology, Hydrogeology and Global Stability

Arup Consulting Engineers

Shell E & P Ireland Ltd

Corrib Terminal: Bellanaboy Bridge

Geology, Hydrogeology and Global Stability Report

Arup Consulting Engineers

Shell E & P Ireland Ltd

Corrib Terminal: Bellanaboy Bridge

Geology, Hydrogeology and Global Stability Report

December 2003

Arup Consulting Engineers
15 Oliver Plunkett Street, Cork
Tel +353 021 4277670 Fax +353 021 4272345
www.arup.ie

Job number C1157.10

Job title	Corrib Terminal: Bellanaboy Bridge	Job number	C1157.10
Document title	Geology, Hydrogeology and Global Stability Report	File reference	
Document ref	RP004		

Revision	Date	Filename	RP004_Issue1_C1157-10_Geology Hydrogeology Global Stability.doc		
Issue 1	30/11/03	Description	Issued for Planning		
			Prepared by	Checked by	Approved by
		Name	John Redding, Chris Humpheson	Michael Daly	Eoghan Lynch
		Signature			
Issue 2	08/12/03	Filename	RP004_Issue2_C1157-10_Geology Hydrogeology Global Stability		
		Description			
			Prepared by	Checked by	Approved by
		Name	John Redding, Chris Humpheson	Michael Daly	Eoghan Lynch
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document ✓

©Arup F8.5
QA Rev 9.3, 17 November 2003

CONTENTS

APPENDICES

APPENDIX A
Figures

APPENDIX B
Geological Cross Sections

APPENDIX C
von Post Humification Index

APPENDIX D
Selected Photographs
(see Figure 22 for locations)

APPENDIX E
Derivation of Equation for Factor of Safety against Sliding

APPENDIX F
Calibration Calculations of Wedge Analysis Method

APPENDIX G
Stability Calculations for Existing Slopes

APPENDIX H
Stability Calculations for Slopes below Sheet Pile Walls

1. INTRODUCTION

The purpose of this report is four-fold:

a) To present a geological and hydrogeological model of the entire terminal site at Bellanaboy Bridge incorporating all relevant ground investigation data.

b) With the benefit of the model, consider in detail the ground conditions within the terminal footprint area.

c) From a review of historic peat slope instability, a morphological study of the area surrounding the terminal site, geotechnical analyses and supported by the above model, consider the global stability of the site.

d) Stemming from the above, examine the impact of the terminal construction on the geology, hydrogeology and global stability, and review appropriate mitigation measures.

Salient features of the site-wide geological model are summarised in a map (Figure 1a and 1b) and an idealised cross section (Figure 2); while salient features of the hydrogeological model are presented in the form of an annotated version of the geological cross section (Figure 11).

The model is intended to provide a distillation and synthesis of what has become a very large body of ground investigation data, incorporating these data into a rational and easily readable format. By means of the model it is possible to look at any specific location, area or alignment on the site with the benefit of an understanding drawn from the site as a whole. The model can thus be used to both interrogate individual items of ground investigation data and to guide extrapolation between data points.

The report describes the methodology used in compiling the model and then summarises its principle features. Although the geology and hydrogeology are described in different sections of the report, they are in fact part of a single integrated geological/hydrogeological model.

The section of the report covering Global Stability is essentially a stand-alone section, but it derives information from the model and has also helped to inform the model. For these reasons it has been included within the body of the present report.

At the time of writing this report (November 2003) further ground investigation is on-going at the terminal site. None of these ground investigation data points are included within this report, although some of the preliminary findings are referred to and the specific reason for undertaking this additional work is discussed where relevant.

2. METHODOLOGY USED

In compiling the model, datasets characterising particular features of the geology and hydrogeology are plotted graphically in order to derive a relationship between the feature and depth below ground level and/or elevation on the site. The relationship derived may be either a regression, or best-fit, mean line, or a line representing an envelope to the data set.

There is an implicit assumption in this approach (which also underpins the whole of statistics), which is that the mean of a sample population (in this case the ground investigation database) is an accurate descriptor of the population as a whole (i.e. the whole site).

A fundamental assertion of the modelling technique is that there is a linear or quasi-linear relationship between particular geological and hydrogeological features and the topography. The validity of this assertion is borne out by the graphical representations, which are included in support of the model.

The modelling approach described has certain limitations, however, which result from local variations in the geology and hydrogeology that are not captured by or do not conform to the average trend. These variations and their implications are discussed, where relevant, in the text.

3. GROUND PROFILE

An idealised ground profile, shown in cross-section in Figures 2 and 11, has been compiled from a digital ground model (DGM) of the site. The DGM is modelled in Inroads SelectCAD (a software package typically used for road and embankment design) and incorporates all of the ground level survey information for the site. The vertical axis on each of the profiles represents ground elevation, as in a conventional section, but the horizontal axis represents cumulative percentage of the total site area lying above a certain elevation. In effect, the profile represents a statistical mean ground profile for the site as a whole. Thus Figures 2 and 11 are not true cross sections, and do not indicate the actual slope of the site.

The ground profile shown in Figures 2 and 11 has been used as a datum for plotting the underlying geological layers, as well as groundwater levels and permeability data.

Figures 3 shows ground surface contours at 1m intervals plotted from the DGM.

4. GROUND INVESTIGATION DATABASE

The positions of all ground investigation data points available across the site are shown in Figure 3. Note that the data points used specifically in compiling the model, are distinguished by a label; the coding system being the same as that in the later graphical plots.

As indicated later in the report there are certain sets of data, such as cone penetration tests (CPTs), Mackintosh probes and in situ shear vane tests (unlabelled in Figure 3) that have not been used directly in compiling the model, this is due to uncertainty about geological interpretation of these data. However, with the benefit of the model, the CPTs have been used to provide additional information on the elevation and morphology of the sub-peat surface, which is shown in Figure 16. The in situ shear vane tests have been used in the global stability analyses, and their locations are shown separately in Figure 30. Thus the only data set to be completely excluded is the Mackintosh probes.

5. SOLID GEOLOGY

The solid (i.e. bedrock) geology is shown as a base layer to Figure 1b. It has been compiled using published geological map information, but incorporating lithological data from the various rotary-cored boreholes on the site.

The mapped solid geology shown in Figure 1b differs somewhat from the published geological map (Sheet 6, North Mayo: Reference 1). This is because in compiling the published map, the Geological Survey had very little in the way of rock outcrops to work with; much of the area being extensively cover by blanket bog. The published map (Sheet 6, North Mayo) was thus built up using available rock exposures (in coastal cliffs, in incised river valleys and in quarries) and extrapolating the geology into non-outcrop areas using ground features as a guide.

At the time of mapping Sheet 6 (Reference 1, 2 and 3), only one small bedrock exposure was available within a 1km radius of the site (a small quarry to the east of the site), with earlier documentary evidence of a former exposure in the stream-bed beneath Bellanaboy Bridge. The rotary core bedrock samples collected from the site thus represent a significant improvement on the available local bedrock geology information (C.B. Long, personal communication).

Apart from changes to the subcrop pattern, the main departure from the published map is that the thin formations lying between the Srahlaghy Quartzite and the Inver Schist are not recognised at the terminal site. This is probably due to pinching out on thrust faults, which are a feature of the contacts between these formations where seen at outcrop.

All of the formations present represent different sedimentary rocks that have been affected, to varying degrees, by regional metamorphism. Metamorphism has changed the lithology and fabric of the rock, requiring a different set of descriptors to characterise the individual rock types. Table 5.1 shows the rock descriptions used by the Geological Survey to characterise the various meta-sedimentary rock types in North Mayo (taken from Reference 4). The following gives a general geological description for each formation present on the site compiled by the Geological Survey (in quotation marks), together with a description compiled from rotary core samples.

The Benmore Formation comprises "A monotonous sequence of massive to banded psammitic quartzite and quartzite, with rare very thin heavy mineral bands and thin orthoquartzite beds. Cross-bedding is common". The formation is well exposed in the (now much enlarged) quarry just to the east of the site (see location in Figure 1b), where it can be seen to comprise a strong, thinly bedded, fine to medium grained quartzitic sandstone. In the quarry the bedding dips westwards at about 50^0 (see Plate 2., in Appendix D)

Table 5.1. Metasedimentary Rock Descriptions

ROCK TYPE	COMPOSITION
Orthoquartzite	More than 95% quartz
Quartzite	More than 80% quartz; mica and feldspar commonly present
Psammitic quartzite	60 to 80% quartz with the remainder largely feldspar and mica
Psammite	40 to 60% quartz with the remainder dominantly feldspar and mica
Semi-pellite	10 to 40% quartz with the remainder largely mica. Feldspar often up to 50%
Pellite	Less than 10% quartz with mica very prominent. Feldspar occurs
Marble	Composed of dolomite and/or calcite with minor amounts of quartz, feldspar and mica

5. SOLID GEOLOGY

The solid (i.e. bedrock) geology is shown as a base layer to Figure 1b. It has been compiled using published geological map information, but incorporating lithological data from the various rotary-cored boreholes on the site.

The mapped solid geology shown in Figure 1b differs somewhat from the published geological map (Sheet 6, North Mayo: Reference 1). This is because in compiling the published map, the Geological Survey had very little in the way of rock outcrops to work with; much of the area being extensively cover by blanket bog. The published map (Sheet 6, North Mayo) was thus built up using available rock exposures (in coastal cliffs, in incised river valleys and in quarries) and extrapolating the geology into non-outcrop areas using ground features as a guide.

At the time of mapping Sheet 6 (Reference 1, 2 and 3), only one small bedrock exposure was available within a 1km radius of the site (a small quarry to the east of the site), with earlier documentary evidence of a former exposure in the stream-bed beneath Bellanaboy Bridge. The rotary core bedrock samples collected from the site thus represent a significant improvement on the available local bedrock geology information (C.B. Long, personal communication).

Apart from changes to the subcrop pattern, the main departure from the published map is that the thin formations lying between the Srahlaghy Quartzite and the Inver Schist are not recognised at the terminal site. This is probably due to pinching out on thrust faults, which are a feature of the contacts between these formations where seen at outcrop.

All of the formations present represent different sedimentary rocks that have been affected, to varying degrees, by regional metamorphism. Metamorphism has changed the lithology and fabric of the rock, requiring a different set of descriptors to characterise the individual rock types. Table 5.1 shows the rock descriptions used by the Geological Survey to characterise the various meta-sedimentary rock types in North Mayo (taken from Reference 4). The following gives a general geological description for each formation present on the site compiled by the Geological Survey (in quotation marks), together with a description compiled from rotary core samples.

The Benmore Formation comprises "A monotonous sequence of massive to banded psammitic quartzite and quartzite, with rare very thin heavy mineral bands and thin orthoquartzite beds. Cross-bedding is common". The formation is well exposed in the (now much enlarged) quarry just to the east of the site (see location in Figure 1b), where it can be seen to comprise a strong, thinly bedded, fine to medium grained quartzitic sandstone. In the quarry the bedding dips westwards at about 50^0 (see Plate 2., in Appendix D)

Table 5.1. Metasedimentary Rock Descriptions

ROCK TYPE	COMPOSITION
Orthoquartzite	More than 95% quartz
Quartzite	More than 80% quartz; mica and feldspar commonly present
Psammitic quartzite	60 to 80% quartz with the remainder largely feldspar and mica
Psammite	40 to 60% quartz with the remainder dominantly feldspar and mica
Semi-pellite	10 to 40% quartz with the remainder largely mica. Feldspar often up to 50%
Pellite	Less than 10% quartz with mica very prominent. Feldspar occurs
Marble	Composed of dolomite and/or calcite with minor amounts of quartz, feldspar and mica

The Srahlaghy Formation comprises "Massive pale-coloured vitreous quartzites, lacking heavy mineral bands and with cross-bedding locally preserved". In corehole samples it is seen as a strong medium- to coarse-grained quartzite.

The Inver Schist Formation comprises "Dark, graphitic, semi-pellitic schists, with occasional discontinuous grey marbles, and bands of psammitic schist. Quartzite is absent". This formation underlies by far the greater proportion of the site and, based on corehole evidence, seems to contain roughly equal proportions of psammite, semi-pellite and pellite. Quartzite is only occasionally present. The varying amounts of quartz and mica give the rock a varying strength and susceptibility to weathering.

Bedrock weathering is discussed in more detail in Section 8.

6. SUPERFICIAL DEPOSITS

6.1 Peat

Peat is the uppermost of the superficial deposits and is present over the whole of the site, mantling the other superficial deposits and solid strata to a varying thickness. Any engineering development on the site will thus have to contend with a certain thickness of peat.

Peat thickness, taken from shell and auger boreholes, gouge core holes and trial pits, is plotted against ground surface elevation in Figure 4. The reason that other ground investigation data sources (CPTs and Mackintosh probes) have been excluded from this plot is that they do not always provide a wholly accurate and reliable measure of peat thickness, as they may not distinguish between peat and soft underlying material.

It is clear from Figure 4 that there is an inverse relationship between peat thickness and ground elevation, although this is not a simple linear relationship. Figure 4 shows the best-fit mean line drawn through the data points. Note that on the lower parts of the site, where the data points are less numerous, there appears to be a wider variation in thickness. The reasons for these local variations in peat thickness are discussed later in the report. The best-fit mean line shown in Figure 4 has been used to draw the base of the peat on the idealised cross-section in Figure 2.

The degree of decomposition (humification) of the peat is an important measure of its mechanical behaviour. To identify how the degree of decomposition of the peat varies with depth and position on the slope, values of von Post humification index (H) taken from the gouge core holes have been plotted against ground elevation in Figure 5. The full von Post humification scale (taken from Reference 5) is included in Appendix C. Two values of humification index were chosen for this purpose, namely H_4 and H_8. These values were chosen for the following reasons:

- Both are well represented within the data set as a whole.
- Both represent significant transitional boundaries within the peat profile.

H_4 represents the boundary between relatively un-decomposed peat and decomposed peat, while H_8 represents the boundary between peat with remnant fibres and non-fibrous, essentially gelatinous, peat. Thus, a three-layer peat profile is defined, which roughly equates to the three layers recognised by AGEC (Reference 6) from CPT data on the eastern part of the site.

In the case of the H_4 data set, the points plotted (in Figure 5) represent average values for each 2m interval of elevation. Because there are fewer values in the H_8 data set all of the data points have been plotted, hence the greater scatter. In both cases, there is a clear trend of increasing depth with increasing ground elevation and this is represented in each case by a mean best-fit line. The rate of increase is less, however, in the case of H_4.

The depth/ground elevation relationships represented by the mean best-fit lines in Figure 5 have been used to plot profiles of H_4 and H_8 on the idealised geological cross-section in Figure 2.

Several interesting features, stemming from the relationships defined in Figure 5, are evident in the peat profile shown in Figure 2.

- The thickness of less decomposed (H_1 – H_4) peat increases progressively upslope.
- Highly decomposed peat $>H_8$ thins to nothing upslope and is not present above a ground elevation of about 38mOD.

- Moderately decomposed ($H_4 - H_8$), but still fibrous, peat reaches a maximum thickness (of about 2m) on the middle part of the slope, but thins upslope and downslope.
- Because of the additional presence of highly decomposed ($>H_8$) peat on the lower part of the slope (whose downslope thickness is increasing at a greater rate than the less decomposed peat) the combined rate of downslope peat thickness increase is much greater on the lower part of the slope.

The variation in peat thickness in progressing upslope is presumed to be due to the invasive way in which peat grew: starting in low-lying wet hollows and gradually spreading to higher ground (see, for instance: Reference 7). The greater thickness on the lower slope thus represents a longer time period of overall accumulation and decay. However, the additional thickness of highly decomposed peat beneath the lower part of the slope is considered to be not simply due to age; rather it is thought to represent a slightly different type of peat. This is fen peat, which grew in wetter, more nutrient-rich, environments and was less fibrous in character.

6.2 Hillwash and Glacial Till

These two mineral soil deposits are treated together for the purposes of model description. In many of the boreholes on the site they are not clearly distinguished, although in reality they are of different origins and ages.

The data set used to derive layer thicknesses is shown in Figure 6. Note that layer thickness has been derived, principally, from shell and auger boreholes, with a few trial pits providing additional data. The CPTs, gouge core holes and Mackintosh probes have been excluded from this data plot because of uncertainty over interpretation of the two layers. On the basis of improved understanding derived from the model it should be possible to selectively incorporate these additional data into the model.

Unlike the other graphical data plots, layer thicknesses in Figure 6 are plotted relative to elevation of the sub-peat surface. A contour plot of the sub-peat surface compiled using all available data is shown in Figure 16. Because of their comparative thinness (particularly the hillwash layer), thickness variations of these mineral soils can be easily masked by variations in overlying peat thickness, when plotted against ground surface elevation; hence, the different vertical axis in Figure 6.

Notwithstanding the overall scatter of data points in Figure 6, there is a clear grouping into two distinct data sets, which have been represented by intersecting best-fit mean lines, labelled Hillwash Alone and Hillwash and Glacial Till.

6.2.1 Hillwash

The Hillwash layer can be see to extend across the whole site, increasing in thickness downslope at a rate defined by the best-fit mean line. This line has been used to plot the layer thickness on the idealised cross section in Figure 2.

The glacial till can be seen to be truncated by the hillwash layer and to be present only on the lower part of the site, below an average sub-peat elevation of about 30.5mOD. This corresponds to an upslope ground surface elevation limit of about 33.5mOD (shown in Figure 2), assuming an average thickness of 3m of peat on the mid-level part of the site taken from Figure 4.

The Hillwash layer, as the name implies, is thought to represent mainly local material that has been transported down slope by run-off and slope washing processes at a time when the site was devoid of vegetation. Because of its thinness and lack of previous recognition, very few (pre-2003) samples have been retrieved from this layer and so very few laboratory tests have been performed that would enable the material to be fully characterised[1]. On the middle and upper part of the slope, where the hillwash layer is less than 1m thick, it generally appears to be rather clayey in character, which probably reflects derivation from the underlying deeply weathered Inver Schist bedrock and head, with only limited transport and segregation downslope. In fact on this part of the slope the layer may represent a condensed residual soil (in the pedogenic sense), which has formed in situ. It would thus be equivalent to the 'A' horizon discussed in Section 8.2 (see also Plate 1., in Appendix D). Typically the material is described as a firm to stiff grey sandy gravelly clay, with boulders. The boulders, both angular and well-rounded, are of quartzite and sandstone.

Further downslope, where the hillwash is more than 1m thick, it appears to become more differentiated into discrete sand and silt layers. To this extent, it is more typical of a hillwash: being the product, rather than the residue, of downslope transport. Based on CPT signature the material is mainly a silty sand or sandy silt of variable density, but generally loose to medium dense. Two grading and plasticity tests (in IGSL boreholes P6 and W5) indicate this lower slope hillwash to be a non-plastic, silty, slightly gravely, sand.

The increase in thickness (to greater than 1m) and segregation into sand and silt layers seems to be particularly marked downslope from a present ground elevation of about 33mOD. This is interpreted as being due to the presence of a significant spring line (at this present ground elevation) at the time when this layer was being formed (see Hydrogeology Section). The spring line would have provided the additional water for transporting and segregating the hillwash material.

Deposition of the Hillwash layer is presumed to have been initiated towards the end of the last glacial period when the climate was not only significantly wetter and colder than present, but the area was largely devoid of vegetation. However, downslope washing of mineral soil appears to have continued until relatively recent times, as evidenced by the presence of sand/silt layers within the lower part of the peat profile, as seen in the CPTs on the lower part of the slope in the eastern area of the site.

Note that hillwash processes would have ceased once blanket bog had enveloped the whole hillside.

6.2.2 Glacial Till

The Glacial Till is thought to be a much older deposit, which probably dates from the penultimate glacial (Munsterian) period. A younger age is deemed to be unlikely since (Midlandian) glacial till *per se* was not deposited in the present area; Midlandian ice sheets not having extended into this part of NW Mayo (see Figure 6, and Reference 8).

The Glacial Till is a very stiff slightly cohesive mineral soil, which is variously described as a gravelly silty sand or gravelly silty clay. Five grading curves (from boreholes P7, P10, W7 and W9) indicate the material to be widely graded within the silt- to gravel-size range (which is typical of glacial tills), although with a preponderance of material in the sand-size range. The latter may indicate a water-laid origin for the till.

As noted in the previous section, the glacial till seems to thin to nothing upslope and is not present above a ground elevation of 30.5mOD. Locally, on the low-lying part of the site to the east of the terminal footprint, a much increased thickness of glacial till (greater than 3m) is present, evidently infilling a buried valley feature. This area is indicated in Figure 1a.

6.3 Bedrock Terrace and Overlying Head Deposits

The presence of a buried terrace feature has been identified, mainly from rotary-cored boreholes (Irish Drilling coreholes) on the terminal site. This identification is based on a

[1] Note this geotechnical information will be augmented by the ongoing investigation.

coincidence of drilled depths to the top of the underlying weathered bedrock surface, which is interpreted to correspond to the 50% core recovery value (see Figure 8). The terrace has been cut in bedrock (Inver Schist), with the back of the terrace forming a subdued buried cliff in rock. The terrace extends over an elevation range of 29.5-32.5mOD, and has a slight outward slope of 1 in 80.

The approximate extent of the terrace is shown in Figure 1a. This extent is based partly on a correspondence between the back and front of the terrace with the present 40mOD and 33.5mOD ground surface contours, respectively (as defined in Figure 8), and partly on specific borehole evidence.

Formation of the terrace is thought to post-date deposition of the previously described glacial till, since the latter does not appear to extend above the elevation of the front of the terrace. One of the many possible interpretations of the origin of the terrace is that the terrace was cut by a marine transgression at the end of the Munsterian glacial period. Isostatic rebound (following unloading by ice) is known to have lagged behind eustatic rise in sea level (due to ice melting), following the more recent Midlandian glaciation. As a result, late-Midlandian (Drumlin substage) raised marine terraces and glacio-marine deposits were formed, and extend up to 2km inland, along the North Mayo coast (Reference 9). Because of the more extensive ice cover during the Munsterian glaciation (see Figure 7) and the (presumed) much greater ice thickness, eustatic rise in sea level is expected to have penetrated further inland.

The material overlying the terrace is considered to have originated as a Head deposit, derived by downslope gravitational mass transport (solifluction) of surface rock debris from the hill above. Head is common in Ireland, but is mainly confined, as would be expected, to periglacial areas (i.e. areas lying outside the limits of glaciation; see, for instance: Reference 10). Plates 1 and 2, in Appendix D show examples of Head overlying Benmore Formation bedrock in the nearby quarry. Note particularly in Plate 2 the downslope curvature (cambering) of the bedding, which is symptomatic of down-slope mass movement of the overlying material under freeze-thaw conditions.

The Head material is under-represented in the terminal site ground investigation data set[2], however. This is because shell and auger boreholes and other soft-ground drilling methods tend to meet refusal at shallow depth in this layer, while rotary-cored boreholes experience significant loss of core recovery. However, the consistent description of this material in shell and auger boreholes on the terminal site as: "very dense, light green, slightly gravely SAND (Possible weathered Rock)" would fit the perceived origin and the wedge-like profile to this layer (up to 5m thick) as indicated in Figure 2. As seen in the trial pits of the on-going (November 2003) investigation, the material comprises a chaotic mixture of gravel- to cobble-size schist, sandstone and quartzite rock fragments in a micaceous earthy soil matrix, which would be the breakdown product of the Inver Schist. It is thus not surprising that the material has previously been characterised as weathered rock, as this is essentially what it is, although not in situ.

Note that if the terrace extends all the way around the hill to the north of the terminal site, as suspected, and the terrace is buried by Head material derived from up-slope, then the hill would have needed to have formerly extended to at least 60mOD to supply sufficient volume of material to completely bury the terrace. Deep weathering has affected the Head deposit, as well as the rock underlying the terrace (see following section), and so any original depositional fabric has been obliterated. Note, however, that Head rarely has much in the way of primary depositional character.

[2] Note this geological understanding is being augmented by the ongoing investigation.

Although a number of moisture condition value and CBR tests were performed on samples of this material from the earlier shell and auger boreholes on the terminal site, no grading tests were done[3].

[3] Note this geotechnical information will be augmented by the ongoing investigation.

7. BEDROCK WEATHERING AND ROCK QUALITY

Two of the consequences of the present area not having been covered by moving ice sheets during the last (Midlandian) glacial period are that:

- The area experienced a much longer period of weathering under peri-glacial and temperate climatic conditions.
- The products of weathering remained largely in situ, and were not removed by glacial scour.

Bare rock surfaces (not otherwise protected by a covering of low-permeability Munsterian glacial till), as well as surfaces covered by loose rock debris, thus experienced deep weathering (see Reference 8). This weathering appears to have affected the Inver Schist Formation much more profoundly than the other formations because of the proneness of the schist to both chemical and mechanical alteration. Leaching of calcium carbonate in particular, which is thought to be an important cementing agent, appears to have had a significant impact on rock strength.

Surface weathering has resulted in a loss of both strength and intactness of the rock and this has been incorporated into the model by virtue of its effect on total core recovery in the rotary-cored boreholes. Since the effect of rotary coring is to impose mechanical stresses on the rock and also subject the rock to pressurised water flow, any inherent weakness or friability will result in a reduction in core recovery.

In addition to the 50% recovery level noted earlier, two other values of core recovery have been utilised, namely 75% and 90%, which are plotted as a data set in Figure 8. Envelope lines have been added to this data plot to indicate the depth limits of each of these recovery values. The envelope lines have been plotted onto the idealised geological cross-section in Figure 2 to indicate how rock weathering might be expected to extend at depth beneath the terminal site.

There is an evident absence of significant bedrock weathering in the area, downslope of the terminal, underlain by glacial till. Conversely, there is a very significant increase in depth of weathering beneath the terrace. This probably relates to the fact that the terrace and the overlying head material formerly acted as a local reservoir for groundwater, which was the main agency for weathering.

Weathering also extends upslope of the terrace into the hill, but it is evident that the bedrock underlying the uppermost part of the hill (above a surface elevation of 45mOD) is largely un-weathered. This is probably due to the fact that the hill, which (as previously noted) was formerly much higher, progressively shed its weathered mantle onto the terrace. To this extent the hill crest can be seen as having developed as a subdued tor (i.e. a pinnacle of unweathered rock; see, for instance: Reference 10).

That the terrace extends around the hill at least on the eastern side is indicated by a similar plot of core recoveries against ground elevation compiled from the recently acquired (LSO) ground investigation data. This is shown in Figure 9. Although the data set is less complete in terms of extent across the terrace area there is a clear trend of deep bedrock weathering downslope of the 41.5mOD surface contour.

The effect of weathering on rock strength, as well as the intrinsic differences in strength between the different rock types making up the Inver Schist, can be seen in Figure 10. This shows a plot of measured unconfined compressive strength (UCS), derived from UCS tests and point load strength tests, against core recovery. Note that data for this plot were derived from measured core recoveries for individual core runs and any associated strength tests that were performed on the recovered core. Where more than one strength test was performed on core from a single core run, the test results were averaged.

The full data set represents 173 strength tests, on 136.5m of recovered core, in 225m of bedrock core run, in 20 boreholes, distributed roughly equally over the terminal footprint area. Ignoring for the moment the lost core, which as indicated below is likely to represent the very weakest material, the data points in Figure 10 are considered to be representative of the Inver Schist rock mass as a whole. The plot has been divided into areas, each of which corresponds to a different lithology making up the Inver Schist. This correspondence has been confirmed by comparing the individual test results with the rock descriptions given on the borehole logs. Since 100% on the x-axis of this plot represents the summation of all recovered core, a projection of the individual rock types areas onto the x-axis provides a measure of the proportion of each lithology within the rock mass as a whole. The Inver Schist can thus be seen to be made up of the following lithologies: Quartzite 15%: Psammite 25%: Semi-Pellite 30%; Pellite 30%, by volume (see Table 5.1 for rock type descriptions).

Between the different rock types there is a very wide range of strength, from over 100MPa to as little as 5MPa, with strength generally decreasing progressively through the sequence: Quartzite (strongest), Psammite, Semi-Pellite and Pellite (weakest). This is what would be expected given that the sequence reflects an increase in primary clay (now mica) content. Very weak rock material (less than 5MPa) appears to be under-represented in the data set, and this is thought to be due both to its absence in the intact un-weathered rock and the fact that weathered rock with a strength of less than 5MPa is easily lost during the coring process.

Figure 10 shows that weathering, resulting in a progressive loss of strength, affects all four rock types making up the Inver Schist and that this in turn impacts on core recovery. The core recovery values 50%, 75% and 90% can thus be seen to have particular significance in this regard. At a core recovery value of 50%, or less, all of the Semi-Pellite and Pellite have been weathered to a strength of less than 5MPa and are not recovered as solid core. Only the Quartzite maintains its strength; the strength of the Psammite is reduced to 20MPa or less. Between 50-75% core recovery Semi-Pellite is represented but its strength is generally less than 10MPa. The Psammite has an average strength of 20MPa. Between 75-90% core recovery all four rock types are represented although the Pellite is very weak and probably contributes most to lost core. The Semi-Pellite has an average strength of 10MPa and the Psammite an average strength of 20MPa. Above 90% core recovery the rock mass is effectively un-weathered, and while the Pellite still has a strength of less than 10MPa, the average Semi-Pellite strength is 15MPa and that of the Psammite is 40MPa.

Weathering and variations in rock strength are of particular relevance in relation to the following:

- Ease of excavation and stability of rock slopes;
- Potential for re-use as rockfill and aggregate;
- Implications for foundations;
- Effects on hydrogeology.

These issues are addressed in later sections of the report.

8. HYDROGEOLOGY

The purpose of this section is to show how the groundwater, contained within the various superficial deposits and bedrock, fits into the geological model and, likewise, how the bedrock and the various superficial deposits influence groundwater levels and groundwater flows at different locations and depths on the site.

For the purposes of the following description three groundwater units are recognised. These are referred to as:

a) The bedrock groundwater unit (which also includes the terrace deposits, glacial till and hillwash),
b) A unit referred to as the 'A' horizon groundwater unit, and
c) The peat groundwater unit.

A similar three-fold division of the groundwater has previously been proposed (Reference 11), although the nature of each of the present units is rather different from that previously envisaged.

Note that further pumping tests and in situ permeability tests are being carried out as part of the ongoing investigation work. These tests are intended to provide additional information for increased hydrogeological understanding of the site, as well as specific data for design of dewatering wells to be used during construction (see Section 11.7.2).

8.1 Bedrock Groundwater Unit

Figure 12 shows depths to groundwater recorded in piezometers variously installed in bedrock and in the overlying mineral soils. Notwithstanding the scatter of data points there is, above a surface elevation of about 31mOD, a clear trend of increasing depth to ground water in progressing upslope. The data points generally lie on or between two converging lines, as shown, and a best-fit average line is also indicated. Significantly, sub-peat groundwater can be seen to come very close to the surface between a ground elevation of 31-33.5mOD, and to remain at relatively shallow depth beneath the lower part of the slope.

To understand the significance of the water level data envelope defined by the converging lines in Figure 12 it is necessary to refer to the idealised hydrogeological cross-section (Figure 11). The converging lines have been plotted onto this section, together with the mean line (referred to in Figure 11 as the average bedrock piezometric level). The section also shows all of the in situ permeability measurements made in various boreholes, and the depth interval over which the measurements were made. The deeper measurements were obtained from packer tests carried out during drilling of the IDL cored boreholes on the terminal site; while the shallower group was derived from falling head tests in piezometers installed on completion of the drilling in both rotary core and shell and auger boreholes.

It can be seen that a uniformly low permeability (typically in the range 1 to 9 x 10^{-7} m/s) is indicated for the head deposits and the very weathered bedrock (50 – 75% core recovery zone). It is also evident that neither of these units can be separately distinguished purely on the basis of permeability. However, a higher permeability (in the range 1 to 5 x 10^{-6} m/s) is indicated for the less weathered (but still highly fractured, 75 – 90/100% core recovery) bedrock. The permeability of the bedrock can be seen as reducing again at deeper levels, and also downslope where it is overlain by glacial till. In these two latter situations the bedrock is largely un-weathered and un-fractured.

Reduction in permeability within the highly weathered rock and head deposits can be assumed to be associated with an increase in clay content, resulting from breakdown of more pellitic rock types. Collectively, these low permeability materials act as a thick (up to 15m) confining wedge to the more permeable underlying fractured bedrock. However, their permeability is not so low that they act as a complete aquiclude; bedrock groundwater is still able to migrate through these materials as evidenced by groundwater strikes during drilling and water levels in shallow piezometers that respond to the deeper bedrock water level. The presumption is that while weathering results in a low permeability, the porosity of the material may actually be increased (due to leaching of soluble mineral constituents, see Section 9).

Towards the crest of the hill, where (because of recharge) water levels reach their highest level, the rock is less weathered but still rather fractured. Only a relatively small vertical range of water levels is evident. Bedrock groundwater cannot flow laterally from the hill crest, however, because of the thick wedge of low permeability material (head and deeply weathered bedrock). Note that this is another reason for thinking that the hydrogeological profile represented by Figure 11 extends all the way around the hill. Flow thus takes place underneath the thick wedge, through the more fractured (10^{-6} m/s permeability) rock. Since this higher permeability rock zone rises again towards the surface on those parts of the site lying between about 32.5-33.5mOD, the latter is an area of potential outflow (upwelling) of bedrock groundwater. This preferential flow path for bedrock groundwater is indicated diagrammatically in Figure 11, by arrows.

This rather complex bedrock hydrogeology is further subtly complicated by the fact that the bedrock surface profile does not remain uniform across the site. As noted in Section 11.1, a shallow bedrock ridge extends NNW-SSE through the eastern part of the terminal footprint. Since this ridge runs essentially parallel to the line of section in Figure 11 its topographic expression is subsumed by the averaging effect of the section construction. The peat is also thinner across the ridge and so groundwater recharge to the bedrock is faster in this area.

The combined effect is that bedrock groundwater levels are higher (relative to the average) beneath this ridge, while elsewhere they are lower (relative to the average). That this is the case is shown in Figure 16, where an area circumscribing all of the data point locations, which in Figure 12, fall between the average line and the upper-bound line. Elsewhere on the site (i.e. outside of this area) measured bedrock groundwater levels fall between the average line and the lower-bound line in Figure 12.

In Section 6.2 it was noted that the zone of upwelling of bedrock groundwater probably equates to a former (pre-peat) spring line and that the hillwash layer changes character downslope from this point. Also it was noted that the glacial till thickens downslope. Based on limited permeability data (indicated on the cross-section in Figure 12) the glacial till would seem to have a rather low permeability (similar to that of the aforementioned thick wedge of head and deeply weathered bedrock). It too will act as a potential confining layer to the higher (10^{-6} m/s) permeability bedrock. The position of the upslope feather edge of the glacial till, together with the permeability of the hillwash, thus seem to play a key role in determining bedrock water levels beneath the lower part of the slope. If the shallow high permeability bedrock is completely confined by glacial till, or the hillwash has low permeability, bedrock groundwater levels are at shallow depth beneath the lower part of the slope. If, on the other hand, the shallow high permeability bedrock is not fully confined by glacial till and the hillwash layer has higher permeability, then leakage takes place and water pressures are relieved by downslope flow into and through the sandy hillwash layer. The lower of the two water level profiles is thus developed, or some intermediate profile determined by the actual degree of confinement and the permeability of the hillwash.

Note that these two scenarios essentially recapitulate the situation that would have pertained before the peat was deposited: with local springs arising at a particular elevation and issuing bedrock groundwater, separated by areas with no springs, but probably seepages extending higher up the slope due to the higher upslope bedrock groundwater levels.

It is of interest to note that the very shallow (sub-artesian) bedrock groundwater zone that occurs between 31-34.5mOD (as seen in Figure 12) is also manifested in the peat groundwater unit at this elevation, as discussed in Section 8.3.

How this complicated hydrogeology translates into actual bedrock groundwater levels beneath the terminal footprint area is shown in Figure 18, which has been constructed from available bedrock piezometers installed in boreholes in the terminal footprint area. The 32mOD contour marks the point of inflection on the average bedrock groundwater line in Figures 11 and 12. Downslope of the 32mOD contour, the bedrock groundwater surface essentially parallels the ground surface, upslope it rises but at a shallower angle than the ground slope. However, the fact that the bedrock groundwater contours are orientated at an acute angle to both the ground surface and the sub-peat surface contours (compare Figure 18 to Figures 3 and 16), indicates that the bedrock groundwater piezometric surface is declining westwards across the terminal footprint (i.e. away from the shallow bedrock ridge). Since the bedrock groundwater contours are essentially equipotential lines they enable the direction of groundwater flow to be determined, as indicated in Figure 16.

On the lowermost parts of the site (below 30mOD) only limited bedrock unit groundwater level data are available. Although these low-lying areas are of less direct consequence since the main development will take place further upslope, nevertheless it is important to consider the hydrogeology in these areas both from the point of view of global stability and for construction of the settlement ponds and the associated drainage pipe.

Compared to higher up the slope, the permeability profile is different. Now the bedrock and the glacial till are of uniformly low (10^{-7}m/s) permeability and the hillwash is of higher (10^{-6}m/s) permeability. What little water does migrate through the bedrock is not confined by the glacial till (because of the latter's equivalent permeability), but leaks directly into the higher permeability hillwash and pressures are dissipated downslope within this layer. An important factor in terms of the hydrogeological behaviour of the hillwash layer is that despite being covered by much lower (10^{-8}m/s) permeability peat, this covering is not fully water-tight over the whole site. Deep drains (such as drain D22) either expose the hillwash layer or come close to exposing it, allowing sub-peat groundwater to reach the surface. The hillwash thus sets a limit on bedrock groundwater level rise on the lowermost parts of the site, as is shown tentatively in Figure 12 and in the cross-section (Figure 11), where the mean bedrock groundwater level is indicated as being 1.5m below existing ground level.

If relief of bedrock groundwater pressures, via the hillwash layer to surface drainage, does not occur then sub-artesian or even artesian conditions may exist down slope: IGSL borehole BH W7 being an example. Such non-relief of bedrock groundwater pressures may occur for a variety of reasons: the hillwash may not be very permeable locally; surface drains may not be effective.

Alternatively, relief of bedrock groundwater pressures may be very effective; in which case lower than average bedrock groundwater levels may be experienced, as in IGSL BHP12 and MIN BH OB3.

Note that the site is somewhat unusual in having had a large number of surface drains installed, some of them quite deep and cutting into the underlying mineral soil, which influence the shallow (peat) hydrogeology. Elsewhere (i.e. off-site), where undrained virgin blanket bog occurs at lower levels (below 30mOD), bedrock groundwater levels may be much closer to, or even above, ground level.

8.2 'A' Horizon Groundwater Unit

In Figure 12 there is a group of water level data points, identified by an oval-shaped envelope, that do not relate to the previously described bedrock groundwater unit. These data points, which occur above a ground elevation of 37mOD, relate to water levels recorded at relatively shallow depth within weathered bedrock and head deposit. As a group, the water levels can be considered as representing a perched water table.

While the group seems to form a trend, as indicated by the long axis of the oval, the alignment is at an acute angle to the existing ground surface, as can be seen in the cross-section in Figure 11. A downslope extrapolation of this trend would intersect the existing ground surface at about 36mOD.

The various piezometers in which this perched groundwater has been identified have their response zones within the mineral soil strata immediately underlying the peat. The sub-peat surface is known from visible exposures in the nearby quarry (see Plate 1., in Appendix D) and in IGSL trial pit TP E1 to exhibit a leached 'A' horizon. Soil leaching and podsolization (see, for instance: Reference 12) is known to have occurred extensively in this part of Ireland, and was a precursor to peat formation. The base of the 'A' horizon is often marked by a thin iron pan layer, in which iron oxides and other minerals become concentrated to form a rather impermeable cemented layer. Leaching also often involves downward movement of clay minerals, so that the 'A' horizon becomes preferentially more permeable compared to the underlying substrate.

The above explanation would thus appear to offer a compelling argument for the perched groundwater being associated with pedogenic ('A' horizon) soil development, essentially within the residual hillwash layer. Clearly, in progressing down slope this perched water (which receives recharge from the hillcrest area and from water draining downwards through the peat) becomes progressively more confined by the overlying peat, particularly the highly humified (H_{8-10}) peat.

It is expected that the 'A' horizon will peter out down slope in the area where bedrock groundwater up-welling takes place: upward groundwater movement effectively supplanting downward leaching. The fact that the 'A' horizon does not connect downslope with the more permeable hillwash explains why groundwater levels within the 'A' horizon approach the surface downslope: the water effectively being trapped in this sloping wedge-like layer.

8.3 Peat Groundwater Unit

It is difficult to consider peat as a groundwater unit, in the same sense as a bedrock or mineral soil. This is because, volumetrically, peat is 95% water, whereas in a bedrock or mineral soil, water typically represents less than 40% of the total volume. However, in peat the majority of the water is rather firmly bound to the decomposing plant matter, fixed by humic acids and other water-absorbing complexes.

It might be expected, therefore, that peat permeability would somehow be related to degree of humification (and thereby depth below ground level). To evaluate this possibility, permeability measurements made by falling head tests in push-in piezometers have been compared to von Post humification values measured in the corresponding gouge core holes. The plot of permeability against humification is shown in Figure 13, with measurements made in pairs of piezometers being indicated by a connecting line. Note that some suspect measurements have been excluded from this plot: these being ones where the permeability was higher in the lower piezometer.

Despite a general trend of increasing permeability with decreasing degree of humification, it is evident from Figure 13 that no simple relationship exists. It would appear, in fact, as if two trends are present, with MIN GC 13 and MIN GC 22 indicating a steeper and more linear (log linear) rate of increase, than the other data points. For reasons explained below it is thought that in many cases the calculated peat permeabilities may be in error; the falling head test having been affected by vertical pore pressure gradients, and the calculations by false assumptions about water levels and degree of saturation of the peat. It is further thought that only MIN GC 13 and MIN GC 22 give an accurate measure of the variation of permeability with humification. These results have been used to derive a notional relationship (shown by a thick black line in Figure 13) between permeability and humification. From this it can be seen that the near-surface ($<H_4$) peat has a permeability greater than 2×10^{-7}m/s; the $H_4 - H_8$ peat

has a permeability in the range 2×10^{-7} to 6×10^{-9}m/s range; while $>H_8$ peat has a permeability of less than 6×10^{-9}m/s range (i.e. virtually impermeable). These permeabilities are broadly in line with those quoted in Reference 5, from a variety of source references on peat.

How these permeabilities relate to the humification profile for the peat developed for the geological model is shown on the cross-section in Figure 11. The variation in permeability as indicated by the cross-section has a number of important consequences:

- The thinnest and most permeable peat occurs towards the top of the site, in the area of the hillcrest. Recharge, as a result of surface precipitation, is thus higher (by orders of magnitude) in the hill crest area compared to the low-lying parts of the site.
- On the higher parts of the site the lower section of the peat profile is only slightly less permeable than the underlying mineral soils and very weathered bedrock. Downward percolation of water is thus likely to be a continuous process resulting in near full saturation of the ground above the bedrock water table, due to capillary rise. Note that the sub-peat ground is only likely to be unsaturated in the hillcrest area, where higher permeability (10^{-6} m/s) fractured bedrock is present.
- Downslope of a ground elevation of about 37.5mOD, which marks the upslope limit of $H_8 - H_{10}$ peat, all the underlying materials are effectively confined by the peat, due to the significantly lower permeability of the basal, highly humified, part of the peat. Consequently, if the hillwash is locally defective as a drainage layer, bedrock water levels may be elevated.

On-site permeability measurements are not available for the uppermost 0.5m of the peat profile, which is typically taken to be the approximate depth of the acrotelum - the living part of the peat profile. Permeabilities in excess of 10^{-5}m/s are, however, quoted in Reference 5, as being typical for the acrotelum of raised bog peat.

It is this higher permeability layer within the uppermost part of the peat profile that enables a separate, near-surface, perched water table to develop. A perched water table is only sustained, however, if precipitation exceeds run-off and evapo-transpiration. From measurements made on site this generally appears to be the case throughout much of the year (see also Reference 13).

Water level measurements made in shallow piezometers installed into the peat are shown collectively in Figure 14. In this figure, depth to peat groundwater is shown relative to ground elevation, as with previous plots. A number of interesting features are evident:

- The majority of measurements fall within 0.3m of the ground surface, indicating that the peat water table is very shallow. For this reason, it is not practical to represent it on the hydrogeological cross-section in Figure 11.
- There is a distinct clustering of points at or very near the ground surface between a ground elevation of 30mOD and 35.5mOD. At higher ground elevations the depth to water declines slowly, and more quickly at lower elevations.

The near-surface clustering of water level data points corresponds almost exactly in terms of ground elevation to the zone where the 'A' horizon groundwater levels and the upper half of the bedrock groundwater profile intersects the ground surface, as shown in Figure 12. Very shallow groundwater levels in the peat thus appear to reflect either subartesian (or possibly artesian) 'A' horizon water pressures or the zone of up-welling of bedrock groundwater, or both.

The decline in peat groundwater levels both upslope and downslope of this zone is the result of peat being under-drained in these areas. That is, peat groundwater can drain freely downwards into the underlying strata because sub-peat water pressures are less than hydrostatic and the substrate is more permeable. In the upslope area direction under-drainage is in response to declining water levels in both the 'A' horizon groundwater unit and in the bedrock groundwater unit. In the downslope direction under-drainage is in response to lower water levels in the hillwash layer.

Under-drainage of the peat, except in the 30-35.5mOD elevation range, is further confirmed by Figure 15, which shows a plot of vertical pore pressure gradient within the peat, versus ground elevation. Vertical pore pressure gradient has been calculated from measurements of water level made in pairs of piezometers installed to different depths into the peat. If the lower piezometer records a lower water level than the upper piezometer, this indicates a downward gradient of pressure and, therefore, a potential for downward water movement.

This is what is indicated in the majority of pairs of piezometers, with the downward gradient increasing both upslope and downslope from a ground elevation of about 33mOD. At the latter elevation the gradient is minimal, indicating a lack of downward flow of groundwater; except that is for a group of points (to be discussed in the following section) that are to the right of the enveloping lines. High vertical gradients of pore pressure are thought to explain the anomalous permeability measurements, as discussed earlier.

The reason that peat groundwater levels appear decline much more rapidly downslope from 30mOD than upslope from 35.5mOD is thought to be due to negative pressures developed in the hillwash as a result of this layer discharging at atmospheric pressure into deep drains further downslope. However, this is not reflected in the vertical pore pressure gradients in the peat (in Figure 15), as might be expected.

8.4 Sub-Surface Springs

Previous reference has been made to areas on the site where up-welling of bedrock groundwater seems to take place, these areas being where former surface springs existed.

Figure 11 indicates that within a sub-peat elevation range of 34.5mOD to 30mOD, bedrock groundwater unit water levels may be expected to emerge onto the sub-peat surface. Downslope of the lower of these two elevations, the model indicates springs are unlikely because of:

- An increasing thickness of confining glacial till.
- The bedrock has too low a permeability.
- The hillwash acts as an effective drainage layer.

Figure 15 indicates that the peat is a sensitive indicator of vertical groundwater flow, responding to confined water pressures in the underlying bedrock groundwater unit. At an elevation where bedrock groundwater levels are otherwise high (resulting in a low average pore pressure gradient in the peat), pore pressure gradient values, which are high would suggest that that bedrock water pressures are being dissipated e.g. by outflow from springs into the hillwash layer. Gouge core holes MIN GC 25 and MIN GC 18 (and to a lesser extent MIN GC 6) are cases in point.

Similarly, in Figure 12 at surface elevations where bedrock unit groundwater levels are otherwise at shallow depth, piezometers recording deeper water levels may indicate proximity to springs. Boreholes IGSL BH W5 and LAN BH 5 are cases in point.

When these two sets of locations are seen in plan, on a map showing the sub-peat surface (Figure 16), IGSL BH W5 and MIN GC 25 can be seen to be virtually coincident, and all three separate location appear to correspond to minor valleys developed on the sub-peat surface. In the case of MIN GC 18 the downslope CPTs confirm very well-developed sand layers within the hillwash.

At the other extreme, MIN GC 23, which records the lowest vertical pore pressure gradient (see Figure 15), corresponds approximately in location to IGSL BH P7, which shows a very high bedrock groundwater level. Figure 16 shows that this location corresponds to a shallow bedrock ridge. Note that this location is referred to again in Section 10.1 in terms of implications for site development.

9. HYDROCHEMISTRY

This section of the report explores the link between the chemistry of the groundwater and particular features of the geology and hydrogeology relevant to the model. All of the hydrochemical data relating to the site are summarised in Reference 14.

Groundwater hydrochemical data is presented as a series of graphical plots in Figure 17. The following determinands have been selected: iron, manganese, calcium, magnesium, chloride and total alkalinity. The metal ions can be considered as having been derived from the medium through which the groundwater passes and similarly with the alkalinity. Given the proximity of the site to the coast and the prevailing westerly wind direction, chloride is most likely to be an extraneous ion derived directly from seawater as an aerosol spray and precipitated onto the site as rainwater.

The data relate to two sampling events in May and November 2002. Not all the boreholes were sampled on both occasions, but where they were the results have been averaged for the purpose of plotting. The results are plotted against ground elevation at the point of sampling; no attempt has been made to incorporate depth below ground level at which the water sample was taken.

The data points have been grouped according to water samples derived from peat (in this case shallow water samples from within 0.5m of the ground surface), mineral soil and bedrock.

Note that further hydrochemical testing will be undertaken as part of the ongoing investigation work. These tests are intended to increase the understanding of the hydrochemistry of the groundwater.

9.1 Iron and Manganese

As might be expected (see Figures 17a and 17b), iron and manganese exhibit similar behaviour. Both ions are present at very low concentrations in the near-surface peat and in the mineral soil, but occur at relatively high concentrations in the bedrock (above current drinking water standards).

Within the bedrock there appears to be a trend of increasing concentration in progressing up slope, which would seem to extend all the way up the slope in the case of manganese, but is reversed at higher elevations in the case of iron. There are fewer data points on the middle part of the slope to confirm these diverging trends.

The data would seem to confirm that both iron and manganese are derived from the bedrock and are confined to the groundwater within the bedrock. The increase in concentration upslope would also seem to equate to a higher rate of leaching of iron and manganese towards the crest of the hill, where higher rates of recharge are presumed to occur as a result of the thinness and higher permeability of the peat (see Section 8.3). Note that the decrease in alkalinity (or, conversely, increase in acidity) on the upper half of the slope, as indicated by Figure 17f, would suggest that acidic groundwater percolating downwards through the peat is responsible for this leaching. It was noted earlier (Section 6.1) that bog peat appears to dominate the peat profile on the upper part of the slope, compared to fen peat on the lower part of the slope. Bog peat is known to produce more acidic groundwater (than fen peat, see Reference 5).

9.2 Calcium and Magnesium

As indicated by Figures 17c and 17d, calcium and magnesium also exhibit similar behaviour. Both ions are present at very low concentrations in the near-surface peat, but occur at somewhat higher concentrations in the mineral soil and bedrock. In the latter case there is a clear trend of increasing concentration at higher elevations on the site, but this is tempered by an increase in the range of concentrations present at higher elevations, as indicated by the diverging boundary lines.

In the case of calcium, higher concentrations are clearly associated with the mineral soil and lower concentrations with the bedrock. This in not quite so clear-cut in the case of magnesium.

As with iron and manganese, calcium and magnesium are thought to be derived by leaching from the bedrock and mineral soils, the increase in concentration upslope reflecting increased downward percolation of acidic groundwater from the peat. The trend of higher concentration in the mineral soil (particularly in the case of calcium) probably reflects a greater presence as carbonate minerals resulting from a tendency for calcium to move upwards in the soil profile under past atmospheric (pedogenic soil forming) conditions.

The slight increase in both calcium and magnesium noted in gouge core GC13 may reflect upwelling of groundwater at this elevation, although there are insufficient data points to confirm this.

9.3 Chloride

Chloride (see Figure 17e) exhibits a very different behaviour from the other determinands, which reflects its extraneous introduction into the groundwater environment as noted earlier. Apart from the one very high value (borehole BR4), which is difficult to explain, all the other data points are grouped very closely together.

The near-surface peat values are the lowest and do not exhibit any clear trend of variation with elevation on the site. This is what would be expected given that concentration of chloride in rainwater is likely to be uniform across the site. A common trend of decreasing concentration of chloride with increasing elevation is exhibited by the mineral soil and bedrock, although the rate of decrease upslope is very slight. This trend is thought to reflect the increasing degree of confinement of the mineral soils and bedrock in progressing downslope due to the increased thickness and degree of humification of the overlying peat. Increase in chloride content with degree of confinement is a common feature of confined aquifers and reflects decreasing mobility of the groundwater.

9.4 Alkalinity

As would be expected, alkalinity in the near-surface peat is uniformly very low (as indicated by Figure 17f). That of the mineral soil and bedrock, which together appear to exhibit a common trend, reaches a minimum at the highest elevation on the site, rises to a maximum concentration at an elevation of about 37mOD and then declines over the lower parts of the site.

On the lower parts of the site, rise in alkalinity with increasing elevation (with higher concentrations in the mineral soil than in the bedrock), mirrors the trend of concentration in calcium and magnesium. It probably reflects the increasing concentration of carbonate in the groundwater resulting from leaching of soluble carbonate minerals (mainly calcium carbonate) from the bedrock. At higher elevations on the site the downward percolation of acidic groundwater from the peat effectively neutralises the excess alkalinity, hence the trend of decreasing alkalinity at higher elevations.

10. GLOBAL STABILITY

This section of the report considers the geotechnical stability of the terminal site, not just in terms of the stability of the site itself, but in relation to the stability of its surroundings; this is often referred to as global stability. There are three primary objectives of a global stability study:

- To demonstrate that the chosen site is acceptable from a geotechnical stability standpoint.
- To consider the potential of the development to impact adversely on the geotechnical stability of its surroundings, and vice versa.
- To identify any residual instability issues, so that these can be mitigated by engineering design.

By geotechnical stability is meant the stability associated with the ground, the materials forming the ground, the ground slope and the groundwater. It also encompasses changes in slope geometry and loads resulting from the development.

In a more global context, many natural agencies and processes, and some historic anthropogenic (i.e. man-made) factors, can be the trigger or direct cause of geotechnical instability - such as seismic activity, fault rupture, flooding, underground mining, karstification, deep-seated slips, to name but a few. Engineering site development can also initiate instability, either directly or indirectly, in situations where a potential for instability exists. Instability, once initiated, may be confined to the site, it may extend from neighbouring areas onto the site, or it may extend off-site to affect surrounding areas and property.

Global stability, in the context of the Bellanaboy Terminal site, has to do primarily with slope stability and the potential for mass movement, specifically in relation to the peat and the mineral soils immediately underlying the peat. To a lesser extent it has to do with ground bearing stability and settlement of the peat under surface loading.

Potential for slope instability and mass movement has been considered in three ways:

1. From a review of documentary records of peat slope instability and mass movement phenomena in various parts of Ireland, and their probable causes.
2. From a project-specific morphological study, using aerial photographs, topographic and geological maps, geological/hydrogeological data derived from the site, and supported by a reconnaissance survey of the area.
3. By geotechnical analysis.

10.1 Historic Review of Peat Slope Instability and Mass Movement

An historic review of peat slope instability and mass movement was carried out by AGEC (Reference 6), in connection with an earlier terminal development scheme involving on-site retention of the peat in a repository. That review is reproduced here, with only slight modifications, since it is equally applicable to the present scheme.

The modifications that have been made involve reference to two recent (2003) slope failures at Pollatomish, Co. Mayo and Derrybrien, Co. Galway. Information on these slope failures has been extracted from public domain reports, OS maps, geological maps and aerial photographs available at the GSI.

10.1.1 Mass Movements of Irish Peat Bogs

The phenomenon of large-scale downslope movement of peat bogs is peculiar to Ireland and seems to rarely affect other countries with significant peat deposits (Reference 15). Over forty historical bog failures have been reported in the literature and these are summarised by Feehan and Donovan (Reference 16), see Table 10.1, which includes failures in both blanket bog and raised bog. The locations of these failures are shown in Figure 19.

Classification of mass movement defines two dominant types of failure in peat (Reference 17), namely:

- Bog flows, or bog bursts as they or more commonly referred to. This type of debris flow involves large quantities of water and peat debris, which flow down-slope usually following existing surface water channels. Large-scale bog bursts are usually associated with raised bogs where there is an upper fibrous layer over a lower body of weak amorphous peat.
- Bog slides. These, in contrast, appear to be much more localised in occurrence than bog bursts. Bog slides comprise a mass of intact bog that moves bodily downslope, usually over a comparatively short distance. Records indicate that slides usually affect blanket bogs.

Table 10.1 List of Selected Historical Bog Failures (after Reference 15)

Year and Date of Incident	Description of Incident	Figure 3 Reference
Before 1640	Clogher, County Tyrone	1
1697, June 7	Kapanihane bog, County Limerick, near Charleville. Meadow and pasture adjoining the bog moved over land of similar nature, and was followed by a mass of the bog.	2
1708	Poulevard or Castlegarde bog, County Limerick, moved along a valley, burying houses and twenty-one people. It was over 1.5km long, 4km wide and about 6m deep in parts.	3
1712, March	Clogher	4
1745, March 28	Bog of Addergoole, Dunmore, County Galway. Ten acres of bog moved down a stream course, covering 30 acres of pastures, and dammed water destroyed some 50 or 60 acres.	5
1786	Gorteenameale in Slieve Bloom.	33
1788, March 27	Bog near Dundrum, County Tipperary. A large bog of 1,500 acres burst, deluging a vast tract of fertile land with mud.	6
1788, May	Knocklayd, County Antrim.	39
1809, December 16	Bog of Rine, Camlin river, County Longford. "Twenty acres of bog burst asunder in numerous places". The debris dammed the drainage so as to submerge 170 acres.	7
1819, January	Owenmore Valley, Erris, County Mayo. Overflow of a mountain tarn caused bursting of a large bog which confined the waters of the lake. The bog carried boulders, bog timber, as well as stones, roofs and inhabitants of houses in a small hamlet which lay in its path.	8
1821, June 19 and 26	Kilmaleady bog near Clara, County Offaly, 500 acres in area, and 50 feet deep in places. Part of this bog moved 3 miles, covering an area of about 150 acres when it came to rest.	9
1821, September	Joyce Country, Galway.	10
1824, December	Ballywindelland, County Derry.	11
1832, January	Geevagh, County Sligo.	12
1840, January	Kanturk, County Cork.	14
1835, September	Randalstown, County Antrim.	13

Table 10.1 (cont'd) List of Selected Historical Bog Failures (after Reference 15)

Year and Date of Incident	Description of Incident	Figure 3 Reference
1867	Glen Castle Hill, Belmullet, County Mayo.	15
1870, December 14	Tulla bog, near Castlereagh, County Roscommon. The deposit of mud left on the low ground extended six or seven miles along the valley of the Suck, covering 165 acres.	16
1873, October 1	A bog, near Dunmore, County Galway, slowly moved down the valley of the Dunmore river, burying 3 farmhouses and covering 300 acres of farm land under 2m of peat.	17
1883, January 25	A bog between Moor and Baslick, Castlereagh, County Roscommon. The bog flow covered 4,000 acres of land; three houses had to be abandoned, several roads blocked.	19
1883, January 30	A bog near Newtownforbes, County Longford, started to move.	18
1890, January 27	Bog at Loughatorick North, County Galway (Slieve Aughty Mountains). An area of 100 acres was covered with a foot of peat, the upper part of the bog subsiding 10 or 12 feet.	20
1896, August 9	Dungiven bog, County Derry, 10 to 30 feet deep, burst and flowed downstream without doing damage, the gradient being steep – one in twelve in the bog itself.	21
1896, December 28	Knocknageeha bog above the Ownacree Valley, County Kerry; eight people killed.	22
1900	Ballaghline, near Lisdoonvarna, County Clare. Two people killed, much damage to land.	23
1906, June	County Offaly, near Ballycumber.	24
1909	Kilmore, County Galway; woman killed in her sleep when overwhelmed by liquid peat.	34
1931, February	Lake Carrowmore near Bangor, County Mayo; loss of animals and damage to land.	25
1934, October	Slieve Aughty Mountains, County Clare.	26
1937, spring	On the slopes of Mullaghcleevaun, Wicklow Mountains.	27
1938, July	Lough Bray, County Wicklow.	28
1945, January	Glen valley, County Donegal.	29
1954	Derrylea, County Kildare.	35
1963, November	Cushendum, County Antrim.	30
1963, November	Barnesmore, County Donegal.	31
1965, January	Slieve Rushen, County Cavan.	32
1973	Slieve Bloom, edge of plateau on Offaly side; many earlier flow scars in evidence.	36
1980	Seven sides in the Slieve-an-Orra hills, County Antrim, all at around the same time.	37
1984	Straduff, County Sligo; the fourth flow recorded here since 1831. This flow had a volume of 81,000m^3.	38
1988	Above Gorteenameale, Slieve Bloom, County Laois.	33

10.1.2 Controlling Mechanisms of Bog Failures

To highlight likely failure mechanisms involved in the failure of peat bogs a number of case histories were collated where details such as the failure type, geometry of the slope, scale of failure and weather conditions were available. These case histories are listed in Table 10.2.

Table 10.2 Case Histories of Peat Bog Failures

Location and Reference	Type	Regional Slope Geometry	Comment
Straduff, Sligo (Alexander et al., 1985)	Flow	3-5°	Other failures noted in area, clay rich drift may have precipitated failures.
Tullymascreen Townland, (Alexander et al., 1985)	Flow	2-3° dipping to 7°	Turf cutting in area Heavy rainfall noted Volume: 11,000m^2
Knockmageeha,Killarney, (Praeger, 1896)	Flow	2°	Large flow from 1-3m thick cutting. Unsupported trench excavation had taken place at toe and material appeared to ooze from beneath
Slieve an Orra, Co. Antrim (Tomlinson & Gardner,1982)	Slide(s)	Compound slope with some breaks. Slope angle 8-17°	Seven slides were reported in close proximity. Slides occurred between horizons of sandy and more clayey glacial till, following heavy rain.
Wicklow Mountains, (Mitchell,1938)	Slide	8-14°	Slide took place along interface of humified peat and bedrock.
Carrowmaculla, Fermanagh, (Tomlinson, 1981)	Flow	2-5°	Failure took place with heavy rainfall at a break in slope, a boundary drain had been excavated at the front face.
Slieve Rusheen Ballyconnell, Co. Cavan (Colhoun, 1965)	Flow	5-8°	Failure followed intense rainfall. Top layer of brown upper fibrous peat slid over lower black amorphous peat. * Labelled as a flow by author but description of the failure is reminiscent of sliding mode.
Meenacharry, Co. Donegal (Bishop & Mitchell, 1946)	Flow	5.5°	Failure caused by breach of firm dry peat located at break in slope and followed heavy rain and snow.
Slieve Aughty mountains, Co. Clare (Mitchell, 1934)	Flow	4°	Failure caused by breach of firm dry peat located at break in slope and followed heavy rain.

The following provides a summary of likely controlling mechanisms of mass movement of peat.

Extreme Rainfall Events

The dominant cause for all bog failures (flows and slides) appears to be unusually intense rainfall. Most failures are associated with extreme rainfall events, see Reference 17 and Reference 18 (and References 19 to 38). The likely failure mechanism is that following heavy rainfall infiltration of surface water into the ground results in a build-up of pore pressures and swelling of the peat bog. This results in an increase in loading, together with possible softening and/or reduction in shear strength within the peat and at the interface between the peat and the mineral soil beneath.

A sequence of dry periods followed by periods of heavy rainfall can also lead to failure. A number of records show that where failures have occurred following heavy winter rainfall, the proceeding summer had been notably dry. In these cases, drying out of the upper peat is likely to have resulted in the development of tension cracks, which could have facilitated ingress of water into the peat. With extreme desiccation the peat mass may also become unsaturated, to the extent that it behaves as a buoyant material when subject to inundation. In an unsaturated condition water entry into the peat mass is impeded by air in the pore spaces, so a condition of buoyancy may persist for some time.

In this respect, the recent landslides at Pollatomish are no exception. As the authors of the report on the landslides (Reference 39) note: "The primary cause of the more than 40 separate landslides in the Pollatomish area was exceptional rainfall, of such intensity as to overwhelm natural drainage systems in the peat and weathered rock, thereby mobilising sections of overburden through buoyancy and gravitational forces". In this instance, the rainfall intensity, which was extremely localised, was equivalent to the 1 in a 100-year event and followed an exceptionally dry summer.

Slope Morphology

A number of descriptions of bog failures, for example Reference 17 and Reference 32, note the presence of a convex break in slope at the source of the breach.

It appears that material gathers at the extremity of the upper slope and because of the favourable down-slope drainage conditions, a mound of well-drained, relatively strong peat material develops. This mound acts as a barrier providing containment for growth of peat upslope.

This mound can subsequently fail due to a build-up of lateral pressure on the upslope face. Alternatively, a failure mechanism, analogous to a piping failure underneath dams, has been noted where springs are present in locations immediately down-slope of the dried peat barrier. High pore pressure gradients within the peat can lead to hydraulic failure and undermining of the mound. Where the mound is breached, the peat bog upslope loses lateral support and moves downslope.

Slope Angle

Figure 20 shows a plot of available data on pre-failure slope angles. The failures are grouped in terms of bogs slides, natural bog bursts and man-influenced bog bursts. The latter are caused through human intervention, such as peat removal at the downslope margin and excavation for drainage.

From Figure 20, it is seen that the various failure types occurred within different ranges of slope angles. Sliding failures are associated with regional slope angles above 6^0, natural bog flow failures occur within a narrow range of regional slope angle between 3^0 and 5.5^0. Bog flow failures with man interference have occurred on slopes as shallow as 2^0.

The data suggests that a natural failure, that is without man interference, in peat bogs has little chance of occurring on regional slopes below about 3^0.

Drainage

Natural drainage and man-made drainage measures designed to reduce the water content in the peat have often been identified as a contributory cause of some failures. The drainage paths have allowed the migration of water to a failure site, thereby precipitating failure. In some instances, agricultural works led to the disturbance of an existing drainage network and eventually caused failure.

Man-made Interference

Man-made interference of peat bogs includes trackways constructed across peat land and peat cutting for turf for use as domestic fuel. These cause, respectively, loading of the peat and removal of support. Peat cutting for turf has been a contributory cause in several documented failures.

Re-current Failures

The presence of relic failures is often noted at the sites of failures, indicating that particular site conditions exist that encourage the development of these failures. The combination of geological and climatic conditions that prevail at these sites is, therefore, somewhat unique. This suggests that the probability of first-time failures is less likely at sites with no previous history of failure.

Age and Condition

Peat, being an organic material, is susceptible to decomposition and decay by processes, which are collectively known as humification. Humification results in the progressive breakdown of plant structures to produce, in the limit, an amorphous, gelatinous, peat whose shear strength is dependent on cohesion, thixotropy and water content. This process progresses at different rates depending on the nature of the plant matter, the rate of peat accumulation, the water level in the peat, its acidity, and a host of other factors. Fen peats are more susceptible to advanced humification, than bog peats, because of their less fibrous and woody plant species.

Nevertheless all peat deposits allowed to develop under suitable natural conditions will, given time, reach a stage where they can be considered potentially "ripe for instability". Time in this sense is measured in hundreds or thousands of years. Ripe for instability effectively means, in geotechnical terms, that the factor of safety against failure has fallen to less than 1. Whether instability is inevitable depends on the rate of consolidation (dewatering) of the peat, and the associated gain in strength, keeping pace with the rate of humification. It also depends on how the form of the peat deposit (its morphology and slope angle) changes with time.

While the concept of "ripeness" is both difficult to measure and quantify, it is evident that many spontaneous peat failures, particularly those of the bursting type, involve peat deposits that have reached an advanced stage of ripeness.

10.1.3 Historical Occurrence and Frequency of Slope Failures

A histogram detailing number of bog failures over 50-year periods since 1700AD is shown in Figure 21. Assuming that a lack of scientific interest and/or reporting resulted in the small number of reported events prior to 1800AD, it would appear that approximately eight such events occur every 50 years.

It is clearly far too early to judge the number that is likely to occur in the next 50-year period. It would also be wholly inappropriate to speculate that the two recent slips (at Pollatomish and Derrybrien), both of which would be considered as sizeable events on the basis of scale and damage to property and infrastructure, necessarily suggest a total higher than 8. This is because two events in the same year appear to be a common occurrence based on the historical record.

However, if the projections of climate change are correct (Reference 40) with the expectation of drier summers, wetter winters and more intense rainfall events, then the likelihood is that the frequency of bog failures will increase. Prudent engineering design of developments in peatland areas is, therefore, likely to be even more important in the future.

Although they are clearly an engineering phenomenon, the study of bog failures appears to be a research area confined to geographers and scientists. As such, the case histories tend not to include a great deal of information that would allow a detailed engineering analysis to be undertaken to examine the failure mechanisms and define the operational strength of materials. However, increased understanding of the form and mechanisms involved in bog failures in the last fifty years means that closer examination of the failures reported over that time-scale is a useful exercise.

Of the eight case histories, two (possibly three, see Table 10.2) can be described as bog slides. One case history (Reference 17) detailed the occurrence of seven approximately simultaneous slides within close geographical proximity to each other in the Antrim mountains. The latter appear very similar to the recent Pollatomish slides. Of the five occurrences of bog flows, two were clearly caused by human activity leaving three sites where examination showed no evidence of a human trigger to the flow. Of these three sites all displayed evidence of past failures in the form of (usually numerous) relic failure features.

10.1.4 Summary of Mass Movements of Irish Peat Bogs

A summary of the main points based on the review of mass movement of Irish peat is as follows:

1. Bog failures take the form of either bog flow (bursts) or bog slides. Records suggest that raised bogs may be more prone to bog bursts and that bog slides are possibly more common on blanket bogs.
2. Most, if not all, failures occur during or immediately following periods of heavy rainfall. Therefore, an understanding of local drainage patterns is essential in understanding the likely occurrence of a failure. Also an appreciation of the potential impact of climate change is important.
3. Sites that have experienced failure in the past are more likely to be affected by re-current failure. This suggests that the probability of first-time failures is less likely at sites with no previous history of failure.
4. Naturally occurring bog flows (not triggered by man-interference) appear to occur at regional slope angles of between 3^0 and 6^0.
5. Bog slides appear to occur at regional slope angles steeper than 6^0.
6. The data tends to suggest that natural failures in peat bogs are less likely to occur at regional slope angles below about 3^0.
7. A significant proportion of bog failures tend to be caused by human activity. Natural peat slopes at regional slope angles of about 2^0 have failed due to uncontrolled man interference. Important lessons can be learned from these failures and should be borne in mind when construction is being undertaken in the vicinity of these areas:
    - Any excavation, which may tend to undermine or otherwise compromise the downslope support of a peat slope, should be sufficiently retained so as to resist movement of the slope. Consideration should be given to the potential for hydraulic (piping) failure.
    - Loading of slopes e.g. by placing of spoil directly onto peat, should be avoided.
    - Careful attention should be given to the existing drainage and how a structure or development may affect this.

10.2 Morphological Study

10.2.1 Study Area and Study Methodology

A morphological study has been carried out of an area surrounding the site; the area having been chosen on the basis of a commonality of landscape features with the terminal site itself. The area, which covers approximately $20km^2$, is shown in Figure 22. The natural boundaries to this area are: Sruwaddacon Bay and the Glenamoy River, to the north and east; the rising ground of Slieve Fyagh, to the south and the rising ground of Bellanaboy ridge and the expanse of Carrowmore Lake, to the west. An examination of the 1:50,000 Discovery Series

OS map (see Figure 22) shows that the surrounding areas differ quite significantly from the study area.

It should be noted that the study area also represents the area within which consideration of 'acceptable stability' is appropriate.

The basic methodology of the study has been to look at the area from the point of view of the occurrence of those factors or features that may contribute to, or be a manifestation of, instability. These factors and features have been discussed in the previous section. An attempt has then made to define the aerial extent of each factor or feature within the study area as a whole. By adding all of the factors/features together in map form the intention is to categorise and grade the area in terms of potential risk.

10.2.2 Aerial Photograph Study

Several dates and scales of aerial photography, as indicated in the following table, were examined stereoscopically:

Source Photography	Image type	Contact Scale	Date of Photography
Corrib Project	Colour	1:10,000	12/09/03
Corrib Project	Colour	1:10,000	24/08/00
Geological Survey Ireland	B & W	1:30,000	1973

The object of this examination was to determine:

- Specific instability features (slips, slip scars, etc.)
- Landscape changes that might increase/decrease potential for instability
- Landscape features and factors that might provide a mechanism for instability or indicate an increased risk of instability.

To assist with identification of landscape changes, reference has also been made to old geological and Ordnance Survey 6inch to 1mile maps, dating back to the 1800s.

Morphologically, the area is one of low relief, with the ground being virtually everywhere below 50mOD, but generally above 10mOD. Higher ground is present to the south-east (towards Slieve Fyagh) and to the west (on Bellanaboy ridge); generally in these areas, slope angles exceed 6^0. A regional slope angle of 6^0 has been used (for reasons outlined earlier) to define the edge of the study area where it is flanked by higher ground. Lower ground is present adjacent to Sruwaddacon Bay/Glenamoy River and Carrowmore Lake.

The study area is characterised by low slope angles, typically between 3^0 and 1^0, but the ground is generally not flat. As can be seen from Figure 22 areas with slope angles of less than 1^0 are often wetland in character, with numerous small lakes. The area to the north-east of the Glenamoy River (Bellagelly North), which lies outside of the study area as defined, is a good example; but note that a similar wetland area also extended along the left bank of the Glanamoy River from Sruwaddacon Bay to Bellagelly South. At Bellagelly South isolated shallow lakes are still evident, but along the left bank of the Glenamoy River former lakes and bog holes are only barely discernible on aerial photographs, the latter area having been drained for forestry.

Formerly, the whole of the study area was nearly completely covered in blanket bog. The only natural areas where the bog is absent are the narrow floodplains of the Glenamoy, Muigingaun and Bellanaboy Rivers, where the peat either never grew or was subsequently eroded through to the underlying mineral soil. Peat working, resulting in removal of most if not all of the peat, has also taken place locally, generally in the vicinity of groups of dwellings or farms where the subsequent worked area has been reclaimed for agricultural use. Many of these worked/reclaimed areas also lie close to streams and rivers where the peat may originally have been of reduced thickness. Collectively, these areas with little or no peat, or reclaimed peat, are shown in Figure 22.

The outer edges of the latter areas are often, although not always, defined by steep slopes in peat. Such steep slopes can mark the cut edge of a working or the steep bank of a floodplain formed by stream erosion. Slopes are particularly steep along the edge of the Bellanaboy River floodplain north of Bellanaboy Bridge. Some slippage of the peat is evident in places where river meanders have undercut the peat slope. Other locations along the Glenamoy River and Sruwaddacon Bay where steep peat slopes are present are indicated in Figure 22. A notable raised bog area occurs near Bungurra, just east of Carrowmore Lake, with the lakeward-facing edge of the bog being defined by a steep slope.

Nowhere else within the study area have steep slopes in peat, or slip features or other manifestation of slope instability, been identified.

The aerial photographs have also been used to deduce patterns of surface drainage, both past and present, which are at a finer scale than shown on the base 1:50,000 OS map. These smaller drainage features, which generally take the form of winter-borne streams carrying water off the peat and discharging it into the larger streams and rivers, have been added to the base plan in Figure 22. Former drainage features have been added as dashed lines to indicate that they are no longer active. The role of these latter features has often been supplanted by later land drainage.

One of the primary objectives of this head-ward drainage study is to identify the locations and elevations at which water emanates from the peat. This is because, contrary to what might be expected considering the peat's low vertical permeability, surface water does not run-off readily from peat areas. Rather surface water tends to be absorbed into the peat, which swells to accommodate the additional moisture. This fact can be readily seen from the area to the north-east of the Glenamoy River, where the intensity of drainage (that is the total length of drainage per km^2) is not dissimilar to karst areas in Galway. Shallow surface drainage channels crossing peat areas are thus more than likely to be associated with groundwater emanating from the underlying mineral soil and bedrock, giving rise to upward seepage through the peat.

This stands to reason since peat invaded, creating a thin mantle to, a former landscape on which the drainage patterns were already firmly established. Peat, being the product of living plant communities, would have flourished in areas where mineral-rich springs and seepages occurred. Under these circumstances more fen-like, less fibrous, peat would have formed, giving rise to more humified peat.

It is evident from Figure 22 that within the study area the majority of the surface drainage lines start at an elevation between 20mOD and 30mOD and that wet areas often occur around or just upslope of the heads of the drainage lines. It was noted in the earlier sections of this report that because of the particular geology of the terminal site, bedrock groundwater tends to rise towards the surface at an elevation of 33.5mOD and below this elevation bedrock groundwater is within 1.5m of the surface. It was also noted in earlier sections of the report that the total peat thickness, and particularly the thickness of highly humified peat, increases downslope from 33.5mOD. These factors are not unconnected, and given the particular circumstances that gave rise to the geology/hydrogeology of the site, it would be surprising if a similar geology/hydrogeology were not widely present throughout the study area.

On this basis the ground below 30mOD, within the study area, might be considered more susceptible to instability for the following reasons, that do not apply higher upslope:

- Potentially greater thickness of peat and particularly highly humified peat

- Groundwater closer to the surface with higher risk of upward groundwater pressures
- Possibility of underground streams running through, or just below, the peat
- Steeper slopes likely, due to erosion adjacent to drainage channels

10.2.3 Reconnaissance Survey

The reconnaissance survey consisted of a combination of:

- Walking around the terminal site
- Driving around the study area using public roads and forestry tracks and viewing the study area and the site from various vantage points
- Looking at specific features

The purpose of the reconnaissance survey was to gain a general "feel" for the way that the site relates to the surrounding landscape, and to look at particular features identified from the aerial photographs. Special attention was paid to the area lying downslope from the terminal site, for two reasons:

1. This is the area most likely to be affected by any slope instability initiated by the development.
2. This is the area, which if off-site instability were to occur, would be most likely to impact on the development.

The area lying upslope from the terminal footprint is not considered to pose a risk to the development for three reasons:

1. The length of the slope (i.e. the distance to the crest of the hill) is less than 200m
2. The peat is generally less than 3m thick and gets thinner upslope.
3. Specific design measures are proposed to support the peat in the cutting that forms the upslope edge of the terminal footprint.

This issue is considered more fully in Sections 10.3 and 11.4.

Selected photographs showing views of the site, and downslope of the site, are shown in Plates 3 – 8, in Appendix D.

10.2.4 Summary of Morphological Study

The following is a summary of the main points stemming from the morphological study, which has considered a $20km^2$ area with common landscape characteristics centred on the terminal site. This summary also incorporates the findings of Sections 10.1 and 10.3.

1. Virtually the whole of the study area is underlain by blanket bog. The only exceptions are the floodplains of the various rivers and areas where the peat has been worked out; also one area of raised bog, which occurs at Bungurra adjacent to Carrowmore Lake.
2. Except for minor slippages of the peat along the edge of the Bellanaboy River floodplain, due to erosion by the river, there appear to be no manifestation of peat slope instability within the study area.
3. Potential for slope instability exists locally, however, along the upland margins of the study area where the ground slope exceeds 6^0. The areas considered at risk in this respect are along the southern margin, where high ground is associated with Sleive Fyagh, and along the western margin, where high ground is associated with Bellanaboy ridge. Any instability initiated in these upland areas could extend into the study area, but is unlikely to affect the terminal site. This is because the topography and natural drainage features

will constrain the run-out path, diverting any debris flow or slip material away from the terminal site.

4. Within the study area natural slopes are generally of the order of 1^0 to 3^0. On the basis of historical evidence, nature of the peat and geotechnical analysis (see Section 10.3), slopes generally within the area are judged to be stable provided that they are not disturbed or otherwise interfered with.

5. However, slopes steeper than 3^0 in peat occur adjacent to the rivers and areas of peat working. Minor instability might thus be expected in these areas, but is unlike to propagate any distance upslope because of the intrinsic stability of peat slopes within the area as a whole.

6. Notwithstanding the general comment (in 4. above) about slope stability, an area has been identified, which includes much of the study area, where the peat is generally thicker than 3.5m. The upslope limit of this area coincides approximately with the upslope limit of surface emergence of groundwater. The combination of thicker peat and upwelling of groundwater is considered to render this area potentially less stable than areas upslope, where the peat is thinner and not affected by upwelling groundwater.

7. Thickness of peat is important relative to stability. The thickness strongly influences the measures and costs necessary to ensure foundation stability and acceptable settlements.

8. By a process of elimination the terminal site can be seen as being located in an area (defined approximately by the 35mOD contour), which is intrinsically more stable than the remainder of the study area. Short of locating the terminal site at or closer to the crest of the hill, the chosen location is seen as being acceptable from the point of view of geotechnical stability.

9. Provided that normal engineering precautions are taken within the site development (as discussed in Section 11), stability of the site's surroundings will not be adversely affected.

10.3 Stability Analyses

Analyses have been carried out to assess the stability of the natural peat slopes within the site boundary, and to assess the impact of construction activities on overall stability of existing slopes. These analyses look predominantly at large scale global stability assuming translational sliding of the peat over the underlying mineral soil along a failure plane at the base of the peat.

The analyses presented in the following sections are based on lower bound estimates of the undrained shear strength (c_u) of the peat. There is limited data on drained effective stress strength parameters for peat from the Corrib site. A review of existing effective stress data is reported in Reference 6, and the test results are compared against published data for peat from other sites in Ireland. Reference 6 recommended effective stress design parameters of $c' = 3$ kPa and $\varphi' = 32°$ for peat. The c′ value recommended is equal to, or greater than, the undrained shear strength c_u values assumed for the analyses described below, and consequently an effective stress analysis would not give lower factors of safety than those determined from the analyses reported.

10.3.1 Relevant Codes

BS 6031:1981 Code of Practice for Earthworks (Reference 43) provides advice on design of both temporary and permanent slopes. It states that for a first time failure with a good standard of site investigation the design factor of safety should be between 1.3 and 1.4.

Eurocode 7: Geotechnical Design (Reference 44) is based on limit state design principles with partial factors applied to loads (actions) and resistances (soil strength). For ultimate limit state slope stability design, where soil resistance is derived from the undrained shear strength c_u, the latest version of EC7 recommends the use of a partial material factor γ_{cu} of 1.4 together with a weight density factor γ_γ of 1.0. As shown by the expressions given below the material factor γ_{cu} is equivalent to the overall factor of safety defined in BS 6031 for the sliding mechanisms proposed.

Based on the above a factor of safety of 1.4 has been adopted as the minimum acceptable value for stability analyses based on undrained shear strength values.

10.3.2 Stability Calculations

Typical cross sections across the site showing existing ground surface and base of peat levels are shown on Figures 23 to 28. The sections are drawn with an exaggerated vertical scale, that is the vertical scale is 10 times the horizontal scale. These sections show the depth of peat generally increasing from a minimum at the top of the slope to a maximum at the bottom. Variations in ground level and base of peat vary approximately linearly with distance down the slope, and for the purpose of the global stability analyses a tapered thickness of peat sliding on a planar surface has been assumed. The analysis is based on a simple sliding wedge method of analysis, as illustrated on Figure 29. Assuming that the peat has a constant undrained shear strength c_u the following expression has been derived for the factor of safety against sliding (see Appendix E for derivation of this expression): -

$$FOS = \frac{L_2\, c_u\, (\cos\theta + \tan\theta \sin\theta) + L_1\, c_u\, (\cos\beta - \sin\beta \tan\theta)}{W_1 (\sin\beta\cos\beta - \sin^2\beta \tan\theta) - W_2 \tan\theta + P_A (\cos^2\beta - \sin\beta\cos\beta\tan\theta)} \quad (1)$$

Where

β = slope angle of base of peat

c_u = undrained shear strength

W_1 = weight is sliding block of peat

W_2 = weight of passive wedge

L_1 = length of sliding surface beneath sliding block

L_2 = length of sliding surface beneath passive block

θ = angle of passive wedge base surface to horizontal

P_A = total horizontal force from active wedge

If the support provided by the passive wedge is excluded, the expression for the factor of safety against sliding is: -

$$FOS = \frac{L_1\, c_u \cos\beta}{W_1 \sin\beta\cos\beta + P_A \cos^2\beta} \quad (2)$$

For the case of constant peat thickness, with active and passive pressures both excluded, this expression reduces to that for an infinite slope where the factor of safety against sliding is given by: -

$$FOS = \frac{c_u}{\gamma\, z \sin\beta \cos\beta} \quad (3)$$

Where

γ = bulk unit weight

z = depth of peat (sliding layer)

To validate the methodology a series of calculations were carried out in which the factors of safety predicted by the expressions given above were compared against those derived from more rigorous solutions obtained using the *Oasys* slope stability program SLOPE. In the wedge analyses the horizontal force from the active wedge was calculated assuming a K_a value of 1.0 for peat (peat acts as a heavy fluid), and in the SLOPE analyses the peat forming the active wedge was assigned zero strength to give comparable active forces. In the SLOPE analyses factors of safety were calculated using Janbu's method for non circular slip surfaces (Reference 41). The initial calibration analyses assumed a passive wedge with a horizontal base together with the following parameters: -

Ground surface slope	α = 1.5°
Slope of base of slip surface	β = 2.0°
Base angle of passive wedge	θ = 0° (horizontal)
Thickness of peat at top of slope	h = 1.5m
Unit weight of peat	γ = 11kN/m³
Undrained shear strength	c_u = 3kPa

Calculations were carried out assuming a horizontal slope length of 100m and 500m. The factors of safety derived from these analyses are summarised in Table 10.4.

Table 10.4. Factors of Safety from calibration analyses

Method of analysis	Calculated factor of safety	
	100m long slope	500m long slope
SLOPE – no passive resistance	3.461	2.086
Wedge method – no passive resistance	3.464	2.089
SLOPE – with passive resistance	6.579	3.018
Wedge method – with passive resistance	6.599	3.022

For the case of solutions including passive wedge effects the overall factor of safety is a function of the inclination of the base (θ) of the passive wedge. Wedge and SLOPE analyses were carried out to determine the variation of factor of safety against θ and quantify the minimum factor of safety. For the wedge analyses the EXCEL solver function was used to vary θ to give the minimum factor of safety against sliding. Using SLOPE the factor of safety was calculated for specified slip surfaces for various values of θ . The calculations associated with these analyses are given in Appendix F, and the results are summarised in Table 10.5.

Table 10.5. Minimum Factors of Safety from calibration analyses

Method of analysis	Calculated factor of safety	
	100m long slope	500m long slope
SLOPE – no passive resistance	5.546	2.857
Wedge method – no passive resistance	5.562	2.868
Ratio of Wedge FOS to SLOPE FOS	1.003	1.004

The results given in Tables 10.4 and 10.5 show that for the assumed slip surface geometry the simple wedge analyses give factor of safety values almost identical to more conventional slope stability analyses, and validate the wedge method as an appropriate method of analysis.

As shown by the spreadsheet results presented in Appendix F the wedge analysis method also allows the effect of varying geometric and strength parameters on overall factor of safety to be easily determined using the solver function. For example, the minimum strength for limiting stability can be determined by optimising the undrained shear strength to give a factor of safety of 1.0. Similarly, using the specified undrained shear strength, the ground surface slope angle (α) that gives a factor of safety of 1.0 can be calculated provided the base of peat angle (β) is know or assumed. In the spreadsheet analysis the maximum slope angle is calculated assuming that the difference between α and β remains constant. In the examples shown in Appendix F it can be seen that for the specified geometry the minimum undrained shear strength needed for limiting equilibrium (FOS = 1.0) is 0.54kPa for a 100m long slope and 1.05kPa for a 500m long slope. For the analyses that exclude the passive resistance, however, the corresponding minimum undrained shear strength necessary for equilibrium are 0.87kN/m² and 1.44kN/m². This type of analysis illustrates that the effect of reducing or removing the stabilising passive resistance, as could result for example from the excavation of a ditch at the bottom of the slope, will reduce the overall factor of safety of the slope. If the slope is stable, but with a factor of safety close to 1, the reduction in sliding resistance could be sufficient to result in instability of the whole slope.

Based on the findings of the calibration analyses described above the wedge analysis method was used to investigate the stability of the peat slopes on the terminal site.

10.3.3 Stability Calculations

Stability calculations have been undertaken for the sections shown on Figure23. Section details are shown on Figures 24 to 28. These sections were selected as being representative of the range of ground conditions and slope geometry on the site. The procedure adopted was as follows: -

- Using topographic and existing site investigation data draw section showing ground level and base of peat levels.
- Approximate ground surface profile and base of peat surface by planar surfaces inclined at angles α and β respectively to the horizontal.
- Select the 'top of slope' location as the point where the actual surface profile becomes approximately asymptotic to the straight line approximation of the ground surface.
- Determine depth of peat at the 'top of slope' location.
- Using lower bound undrained shear strength values calculate FOS of existing slopes.
- Based on planned construction activities calculate FOS during construction.

10.3.4 Geotechnical design parameters

The geotechnical design parameters needed for the stability analyses are the undrained shear strength and the bulk unit weight of peat. Stability reduces as the weight of the sliding block increases, as the greater the weight the greater the disturbing force to be stabilised. It is therefore conservative to take the depth of the sliding block of peat to be as deep as possible and to adopt an upper bound value for the unit weight of peat.

The stability calculations assume sliding at the base of the peat, thereby maximising the sliding weight. Laboratory bulk unit weight measurements give values of 10kN/m³ or less. A value of 11kN/m³ was used for the stability analyses.

Undrained shear strength values have been determined from the results of in-situ field vane testing. The site has been subdivided into three areas, as shown on Figure 30, representing the following area of the site: -

Eastern Area	East of terminal area including main north-south access road, Temporary Construction Facilities area and previous repository area
Central Area	Terminal area including administration building and car park
Western Area	West of terminal area including settlement ponds.

Locations at which vane testing has been carried out are shown on Figure 30, and Figures 31 to 33 show measured values of undrained shear strength for each of these areas. Figures 31 to 33 show that the average undrained shear strength of the peat generally increases from east to west, but that there is little difference between the lower bound strength measurements across the three areas. For the stability calculations the peat was assumed to have a constant strength based on the lowest measured strength within the relevant area as follows: -

Eastern Area	$c_u = 2.5$kPa
Central Area	$c_u = 3$kPa
Western Area	$c_u = 2$kPa

10.3.5 Analysis Results

Existing Slopes

Calculations for the stability of the existing natural slopes are presented in Appendix G. The calculated global factors of safety for the sections shown on Figure 23 are summarised in Table 10.6.

Table 10.6 Factors of Safety of existing slopes

Section	Slope angle α (degs)	Undrained strength c_u (kPa)	Minimum FOS	Minimum c_u for stability	Maximum α for stability
1-1	1.5	2.5	2.3	1.1	3.43
2-2	1.56	3	2.6	1.2	4.06
3-3	1.45	3	3.3	1.0	4.6
4-4	1.35	2.5	2.6	1.0	3.5
5-5	1.26	2.5	4.4	0.5	5.6

The results presented in Table 10.6 show that the calculated factors of safety for the existing slopes have a minimum of 2.4. Considering that the analyses are based on the assumption that the lowest measured strength applies to the whole peat mass, and the sliding weight is based on conservative estimates of depth and unit weight, these calculated factors of safety are considered to be acceptable.

Based on the interpreted slope angles the minimum average undrained shear strength required for stability is typically 1kPa or less. The maximum ground surface slope angle for limiting equilibrium, for the assumed design strengths, is at least twice the existing slope angle varying between 3.5° and 4.7°. It is interesting that these slope angles are comparable to those reported on Figure 20 for historic bog failures. The factor of safety depends not only on the ground slope angle but also on the depth of peat and the slope angle of the failure surface. Unfortunately this data is not available for the historic failures.

Stability during construction

In considering the stability during construction it is important to distinguish between *global* stability and *local* stability. Global stability is the stability of the overall site, or a large portion of it. Local stability refers to the stability of a few metres of an excavated face, but if not contained and controlled local stability could lead to progressive failures resulting in more extensive global stability problems.

The worst condition that could occur during construction would be if all the peat was removed at the toe of the slope without any compensatory external support being provided. In stability analysis terms this is the condition that would apply if no passive resistance is provided to the sliding block.

The global factors of safety calculated for this condition are summarised in Table 10.7.

Table 10.7 Factors of Safety during construction (no passive resistance)

Section	Slope angle α (degs)	Undrained strength c_u (kPa)	Minimum FOS
1-1	1.5	2.5	2.0
2-2	1.56	3	2.1
3-3	1.45	3	2.5
4-4	1.35	2.5	2.1
5-5	1.26	2.5	3.6

For this extreme case the calculated lowest *global* factor of safety is 2.0, which is adequate. These results show that provided local stability is maintained overall global stability is acceptable.

For this worst case condition, however, *local* failure of the unsupported peat will occur for an excavated face greater than a certain height. The greatest height at which a vertical cut can stand is (Reference 42):

$$H_{max} = 4\, c_u / \gamma$$

For the undrained strengths given in Tables 10.6 and 10.7 H_{max} varies between 0.7m and 1.1m. This is consistent with observations of collapses of the sides of trial pits observed during site investigation works.

Excavation and local collapse of peat will not have a significant effect on stability downslope of the excavation. The consequence of excavation will be the removal of the active driving force from the top of the slope and this will tend to improve stability. Upslope of the excavation, however, the excavation results in the removal of the stabilising passive resistance, with the result that stability of a potential sliding block upslope of the excavation is reduced. For sliding block mechanisms that extend a relatively short distances from the excavation the dominant disturbing force is the active force acting on the back of the sliding block. Resistance to sliding is provided by the shear strength of the peat along the bottom surface of the sliding block, and for some distance back from the excavation the sliding resistance will be less than the active force and movement of the sliding block could occur. If uncontrolled a progressive collapse mechanism could develop, gradually extending upslope from the excavation.

To prevent such mechanisms developing all excavations in to peat will be supported by sheet pile retaining walls. The sheet pile retaining walls will be installed through the peat and embedded in to the underlying mineral soil. They will provide temporary support during excavation in the peat during site preparation works, and they will also be used to contain the peat beneath road and hard standing areas. The sheet piles will provide restraint to the peat they are supporting by mobilising passive resistance against the embedded toe section within the mineral soil. As an approximation the embedment depth required can be estimated by assuming that the passive resistance must be sufficient to balance the active force. Using this approach the embedment depth required if the peat is completely removed on one side of the sheet pile is approximately ⅔ H, where H is the depth of peat retained. For typical peat depths of 3 to 4.5m this give sheet pile embedment depths of 2 to 3m.

A number of sheet pile walls will be installed approximately parallel to the existing ground contours, and the effect of the sheet piles will be to subdivide the existing slopes in to two or more sections. As global stability of the peat depends on the weight and geometry of the sliding block, it is possible that the installation of sheet piles could result in a lower factor of safety against stability of the slope below the sheet pile.

The analysis method described above has been used to calculate factors of safety for the existing slopes below the sheet pile wall installed around the perimeter of the terminal platform area for Sections 1-1, 2-2 and 3-3 shown on Figure 23. Stability has also been examined for Section 4-4 assuming sheet piles are installed around the perimeter of the temporary construction facility (TCF). In this case stability has been calculated for the slopes above and below the TCF. The slopes for these two cases are shown on Figures 27a and 27b respectively.

These calculations are presented in Appendix H, and the results are summarised in Table 10.8.

Table 10.8 Factors of safety of slopes below sheet pile walls

	Slope conditions				Minimum FOS	
Section	Slope angle α (degs)	Peat thickness at top of slope (h)	Slope length (L)	Undrained strength c_u (kPa)	With passive	No passive
1-1 - below platform wall	1.5	3.6	470	2	1.7	1.4
2-2 - below platform wall	1.56	4.09	260	3	2.2	1.5
3-3 - below platform wall	1.45	3.16	350	3	2.7	2.0
4-4 - above TCF wall	1.83	3.5	300	2.5	2.9	2.7
4-4 - below TCF wall	1.3	1.7	500	2.5	3.1	2.4

The factors of safety reported in Table 10.8 are likely to be conservative since they assume full active pressure applied to the top of the slope by the sheet pile. Full hydrostatic water pressure is possible in the long term but this would still be less than the full total active force assumed. If the active force is excluded the factors of safety increase by between about 10 and 30%. The factor of safety for the 'no passive' condition represents a lower bound value as it assumes removal of all peat below at the toe of the slope with no external support from sheet piles. As discussed above the sheet piles themselves will provide additional resistance in cases where they are retaining up-hill slopes due to the passive resistance provided by the section embedded in the mineral soil. The spreadsheets in Appendices G and H calculate the sheet pile penetration necessary to provide the same resistance as the passive wedge down slope of the sheet pile. A penetration of 2 to 3m in to the mineral soil is adequate to compensate for the passive resistance provided by the in situ peat.

On Section 1-1, a second sheet pile wall will be installed at the settlement ponds. Geotechnical investigation of this area is currently in progress (November 2003) but at present there is limited data available on ground conditions around and down slope of the settlement ponds. A detailed assessment of the stability of this particular section of slope has not been undertaken. However, based on extrapolated data the factor of safety of a 200m long slope below the settlement ponds is calculated to be 1.4. This is a conservative estimate since the extrapolated data gives 4.9m depth of peat next to the settlement ponds where the latest site investigation data shows peat depths in the range of 3 to 3.5m. A lower depth of peat will give a higher factor of safety.

Analyses show that although the installation of a sheet pile within the existing slopes may reduce the factor of safety of the section of slope down hill of the sheet pile, the factor of safety based on lower strength estimates will be greater than 1.4, and therefore acceptable.

11. IMPLICATIONS FOR TERMINAL SITE DEVELOPMENT

This section of the report looks at the implication of the geology, hydrogeology and global stability for development of the terminal site. It is primarily concerned with geotechnical impacts, both on the development and of the development.

There is an initial discussion of the geology and hydrogeology of the terminal footprint, then the engineering aspects are consider in terms of: platform formation level, earthworks, cut slope stability, foundations, trenches in peat, site drainage (surface and groundwater) and, finally, re-use of materials.

Note that geotechnical slope stability issues stemming from the global stability study are fully addressed in Section 10.3. They are only considered in this section in as much as specific engineering measures are required to ensure stability.

In order to assess the ground conditions specifically within the terminal footprint area (rather than the site as a whole, to which the model relates) a series of geological cross sections has been drawn across the terminal footprint. The positions of these sections, together with the relevant ground investigation data on which the sections are based, are shown in Figure 18. Construction of the sections (which are incorporated into Appendix B) has been guided by the geological and hydrogeological model. The sections are drawn with an exaggerated vertical scale, that is the vertical scale is 10 times the horizontal scale.

11.1 Terminal Geology and Hydrogeology

The geological sequence underlying the terminal footprint is summarised in the following table:

Table 11.1 Terminal Footprint Geological Sequence

GEOLOGICAL LAYER NAME	THICKNESS (m)	DESCRIPTION
Peat	1.5 to 3.5	Soft to very soft brown PEAT
Hillwash (residual soil and weathered head)	0 to 1	Firm or stiff grey sandy gravely CLAY with boulders
Head	0 to 5	Very dense light green clayey silty gravely SAND
Bedrock	>30	Weak to moderately strong grey micaceous SCHIST (Inver Schist)

The different layers are indicated on the geological sections in Appendix B, to the extent that this is possible from the available ground investigation data points relating to each section. Note that the terminal footprint is above the level where glacial till is present. It is also located in an area where the hillwash is more like a residual soil, rather than a loose silty sandy (true hillwash) material.

It is evident from the sections that within the terminal footprint area the buried terrace is, at best, a very subdued feature, which could easily be missed without reference to the geological model. A secondary feature associated with the terrace, and highlighted by the geological model, is deep weathering of the bedrock. This deep weathering has been indicated on each of the sections by a line showing the 90% core recovery threshold. While weathering generally reaches a maximum depth beneath the terrace (consistent with the model, see Figure

11), the depth of weathering is not uniform, but increases progressively across the site in a westerly direction. While this is evident from the north-south sections when looked at in sequence, it is more clearly seen on the east-west sections.

The least depth of bedrock weathering appears to coincide with a NNW-SSE aligned ridge, which is evident from the surface topography but is slightly more obvious when seen on the sub-peat surface (see Figure 16). Across the ridge, the peat does not show the normal (as indicated by the model) downslope increase in thickness, but rather remains of uniform thickness downslope; hence the ridge being more evident on the sub-peat surface.

The ridge clearly extends from the crest of the hill north of the terminal footprint and links to the south of the R314 road with a corresponding ridge extending north-westwards from Slieve Fyagh. Together these ridge elements form a surface drainage divide between the Glenamore and Carrowmore catchments (see Figure 22 and Plate 6, in Appendix B).

The ridge is also thought to exert an important influence on the groundwater. It marks a groundwater drainage divide; and the same way that a downslope preferential flow path for groundwater exists from the hillcrest, through the moderately weathered (75-100% recovery) bedrock (as indicated in Figure 11), so fractured bedrock flow paths occur away from the ridge as indicated, diagrammatically, in Figure 16. This implies that bedrock groundwater levels are at a higher than average elevation beneath the ridge (represented by the upper line in Figure 12). A situation that would arise because of locally more rapid groundwater recharge (the peat being thinner across the ridge) and lateral continuity with the higher groundwater levels in the hillcrest area.

It was noted in Section 8.4, from the coincidence of high bedrock groundwater levels and low pore pressure gradients in the peat, that the area around borehole BH P7 corresponds with a non-spring area. Given the proximity of the ridge crest to this location (see Figure 16) a direct causal relationship between the ridge and the non-spring area would seem likely; springs being confined to the flanks of the ridge.

It is worth noting in this regard that despite its subdued topographic expression and narrow width, springs (giving rise to present-day streams) issue from both sides of this ridge to the south of the R314 road, suggesting that the ridge is an important source of water (see Figure 22).

How this translates into bedrock groundwater levels beneath the terminal footprint is shown by the bedrock groundwater contours in Figure 18 and the groundwater levels on the sections in Appendix B.

11.2 Platform Level

Platform level for the terminal footprint has been set at 33.4mOD Malin Head and is indicated on the sections in Appendix B. Were this level to be imposed onto the present ground surface, it would mean that only the south-west corner of the site would be in fill, the remainder of the site would be in cut. However, since the peat is deemed to be an unsuitable medium in which to found the main terminal structures, it is proposed to dig out the peat and replace it with structural fill in areas where the sub-peat surface occurs below the 33.4mOD level. The position of cut-fill line on the sub-peat surface will thus be as indicated approximately in Figure 18.

As can be seen from the sections, platform formation level in cut areas will be variously on hillwash, terrace deposits and bedrock. Cut formation level will be slightly below finished platform level and the latter will be made up, as necessary in areas not otherwise occupied by buildings, structures, roads or paving, by topsoil or a dressing of imported stone.

11.3 Earthworks

The initial phase of earthworks, in cut areas, will involve excavation in the various soil and rock materials to create the cut formation level. In fill areas (to the south of the cut-fill line indicated in Figure 18) peat will be dug out to expose the underlying mineral soil and the level will be made up using suitable structural fill (mainly excavated rock material) derived from the cut areas.

Excavation *per se* is expected to be straightforward in all the soil materials listed, because none is particularly hard or cemented. Rather the opposite is likely to be the case, with the intrinsic softness of the peat, and the potential for softening of the hillwash and terrace deposits, meaning that care will be required in both handling and trafficking of these materials. Control of the water contained in these materials is, therefore, expected to play a key role in determining the overall success of the earthworks (drainage and dewatering are discussed in Section 11.7).

Excavation in rock is not expected to present any particular problems. For the most part, rock that is encountered in cut areas will be deeply weathered and its reduced strength and increased fracture frequency will render it amenable to ripping and excavation using normal earth-moving plant. Only in the extreme north-east corner of the terminal footprint (as indicated in Figure 18) is relatively unweathered rock expected to be encountered. However, even in this area the fractures are generally closely spaced so that the rock is expected to be amenable to heavy ripping (perhaps with the assistance of a mechanical breaker).

Issues to do with material balance and sequencing of earthworks construction are covered in a separate report.

11.4 Cut-Slope Stability

Cut slopes, designed to achieve long-term stability, are shown in the following table:

Table 11.2 Cut-Slope Angles

MATERIAL	CUT-SLOPE ANGLE
Unweathered rock	1 in 1
Weathered rock and mineral soil	1 in 3
Peat	Retained

Although battered slopes in peat could be designed to achieve long term stability, for reasons of: increased stability, reduction of land-take and to minimise the peat silt load in surface drainage channels, it is proposed to have no cut slopes in peat. Instead, were peat is to be excavated, the edge of the excavation will be fully supported. This will be achieve:

1. In areas where existing ground level is above platform level – by a gabion gravity wall.
2. In areas where platform level is above ground level – by a sheet pile retaining wall.

Depending on the amount of seepage from cut faces in weathered rock and mineral soil so counterfort drainage may need to be introduced into these faces to prevent seepage erosion. Drainage and dewatering are discussed in Section 10.7.

Bedrock fractures are generally recorded as dipping at 45^0 or steeper, so cut slopes of 1 in 1 in rock should ensure stability against sliding failure on fracture planes.

11.5 Foundations

11.5.1 In areas where peat is to be removed

The majority of structures in cut areas will be founded on shallow footings.

SPT "N" values, shown against the shell and auger borehole sticks on the cross sections in Appendix B, indicate the relative density and stiffness of mineral soils. Generally, the hillwash can be seen as being a firm to stiff Clay (SPT "N" value of 10 to 30) and the terrace deposits a dense to very dense Sand (SPT "N" value of 30 to >50). Given that in cut areas site formation will extend across these soil layers onto weathered and then relatively unweathered rock, a range of foundation conditions and ground stiffness conditions are likely.

As a matter of course, in cut areas, shallow footings will be taken down through any hillwash material into the underlying dense sand layer. In some cases where settlement-sensitive structures straddle rock and mineral soil it may be necessary to pile through the mineral soil to minimise differential settlement.

All structures located in areas where the ground is made up by filling will be piled.

11.5.2 In areas where the peat will remain in situ

In areas where structures will be founded on or constructed in peat, the peat will generally be stabilised by in situ soil strengthening methods. This is to ensure that construction can proceed without risk of bearing failure and/or lateral loads being transferred into the adjacent peat, which might otherwise lead to slope stability problems.

This will apply to the administration building area, the temporary construction facility area, the area of the settlement ponds and the main access roads. In addition, some of the buildings and above ground structures in these areas will be supported on piles.

11.6 Trenches in Peat

The only significant trench in peat, to provide a permanent structure, will be that to the settlement ponds, to enable installation of the site drainage discharge pipe.

The trench will be dug in short sections and fully supported on both sides by sheet piles, which will be removed afterwards so as not to block groundwater drainage through the hillwash layer. The drainage pipe will be installed and backfilled with stone under and around the pipe and peat above the pipe, before moving on to the next section. A porous land drain will also be installed in the stone backfill and will discharge to the settlement ponds. This porous drain is intended to relieve any upward flow or pressure of groundwater from the underlying mineral soil/bedrock and hence prevent uplift of the site drainage discharge pipe when not carrying water.

11.7 Drainage and Dewatering

The hydrogeology of the site has been considered in some detail because it is anticipated that control of the surface and groundwater is likely to play a key role in the successful execution of the earthworks.

Because of the presence of a near-surface water table in the peat and the potentially saturated (or near-saturated) condition of the underlying mineral soils and bedrock, groundwater may be expected to flow into any excavation that extends more than a few metres below the ground surface, unless prior dewatering of these soils is carried out. Construction of the terminal will involve up to 10m of excavation below existing ground level.

Inflow of groundwater may not of itself present a significant problem, because the volumes are likely to relatively small (given the low permeability of the materials), however, if the water cannot immediately be removed it will tend to cause softening and deterioration of excavated materials and the cut formation. The mineral soils and highly weathered bedrock contain a significant quantity of fines, but are of low plasticity, which means that they may be susceptible to seepage erosion: whereby soil tends to flow with the water creating a slurry. Under these conditions the material will quickly become unusable, and normal drainage measures designed to remove the water will be rendered ineffective.

To avoid such a situation on a large construction site, consideration would probably be given to staged dewatering, using well-points, to control the groundwater; these being installed at different levels as the excavation proceeded downwards. However, staged dewatering will not be suitable for this site for the following reasons:

1. A large volume of peat (approximately 417,000m^3) is to be removed off-site in trucks. Since excess water in the peat (that is water not directly bound to the plant material) will largely govern its behaviour, prior removal of this excess water and prevention of any additional water getting into the peat will greatly assist the excavation and transport operation.
2. At the same time as the peat is being removed, exposed mineral soil and rock will also be being excavated. In total some 184,000m^3 of non-peat material will be excavated, with the majority being retained on site. Of this, some 143,000m^3 will be used as fill to raise the platform level in areas south of the cut-fill line, and 8,000m^3 will be used for other site works. Approximately 33,000m^3 of the least suitable mineral soil will be exported from the site. Avoiding deterioration of excavated soil materials (by water) will be a key factor in material balance.
3. Although earthworks construction is likely to take place during the summer, the site is located in an area where heavy and persistent rainfall can be expected at any time of the year.

   The following specific measures are, therefore proposed:

11.7.1 Pre-Drainage of the Peat

In advance of the removal of the peat from site, in order to improve the condition of the peat, it will be stripped and stock-piled to facilitate drying out.

Existing drains will also be upgraded to assist with the overall drainage of the site.

11.7.2 Dewatering Wells

In order to remove water from the underlying mineral soils and bedrock, as well as encourage additional under-drainage of the peat, it is proposed to install a series of dewatering wells prior to construction. In view of the relatively low permeabilities involved and the fact that the whole site is covered by a layer of water (peat), which will prevent air penetration, these will be vacuum assisted pumping wells designed to suck water out of the ground. Two groups of wells are proposed, as indicated in Figure 16. One, to capture the bedrock groundwater that emanates from the hillcrest and NNW-SSE aligned ridge, the other to intercept the zone of bedrock groundwater upwelling.

The wells will be drilled down into the zone of more highly permeable fractured bedrock, with plain cemented-in casing above this zone to the ground surface and open or screened within the zone. The wells will need to be developed, to stimulate fissure flow, and also sterilised to prevent pre-mature clogging by bacteria that cause precipitation of iron oxide.

The upper deeper group of wells will need to be pumped by means of submersible electric pumps. The lower group of wells may be pumped from the surface using self-priming suction pumps, because of the relatively shallow depth to groundwater and less than 10m drawdown level in the wells. The wells will be installed sufficiently in advance of the start of the earthworks to achieve maximum effect. Once stripping of the peat commences, air will begin to penetrate the ground resulting in by-passing of groundwater flow to the wells. The wells will thus be gradually phased out as the permanent groundwater drainage measures are phased in.

As part of the on-going phase of ground investigation pumping tests will be carried out in order to provide specific information for the design of the proposed dewatering wells and to determine the timing of their installation prior to construction.

11.7.3 Permanent Surface and Groundwater Drainage Measures

During the earthworks, surface water will be dealt with by means of falls and grips to lead the water to sump areas. At the earliest opportunity, however, it is planned to install permanent surface drains along the top and toe of cut slopes. The cut slope toe drains will eventually form part of a continuous perimeter drain around the footprint of the terminal site.

It is anticipated that cut slope toe drainage will provide sufficient in the way of drawdown of water level to prevent seepage from the cut face. However, there are two situations where this may not be the case:

1. In the north-east corner of the site, where the cut slope will be in rock. Existing bedrock groundwater levels are highest in this area and localised seepage may occur from individual fissures. This will not affect the stability of the rock slope and the rate of flow will be relatively minor.
2. Anywhere where the cut slope is in hillwash and/or head deposits. Localised seepage may occur due to locally higher permeability zones.

In the latter case, some form of slope face drainage may need to be introduced (such as counterfort drains) to prevent seepage erosion of the cut face.

At intervals along the cut slope toe drain sumps will be installed with the inlet pipe slightly higher than the outlet pipe. In this way, water will cascade into the sump causing aeration and precipitation of iron and manganese. The sumps can be periodically cleaned out. Specific measures to remove iron and manganese from the upslope bedrock groundwater are appropriate because of the higher content of these ions in this source of groundwater (see Section 9.1).

At the base of the platform fill a higher permeability layer will be provided in the form of rock material derived on site. This layer will connect downslope with a groundwater drain installed along the line of sheet piles that defines the southern edge of the fill platform. The purpose of the sub-fill drainage layer and the southern perimeter groundwater drain is to prevent groundwater rise within the fill.

A subsurface groundwater drain will also be installed in the trench carrying the discharge drainage pipe to the settlement ponds. The purpose of this drain is to prevent any rise in groundwater that might cause flotation of the pipe or instability of the slope.

The combined effect of the permanent groundwater drainage measures can thus been seen as being to:

- Prevent groundwater issuing at the surface or rising to such a level that it would affect buried structures.
- Set a cap on the potential for groundwater level rise that might affect stability of the site or the surrounding area.

11.8 Re-Use of Materials

It is not proposed to make use of any of the excavated peat on site. Excavate peat will be taken off-site to a deposition location, near Bangor Erris, owned by Bord na Mona. All of the excavated rock material and the bulk of the mineral soil excavated will be re-used, the quantities being indicated above.

All of the rock material, with a core recovery of 90% or better will be suitable as selected rockfill, although it is not likely to have sufficient durability or be of uniformly high strength to be suitable for surface stone dressing, or aggregate material. Weathered rock material (falling within the 50% to 90% core recovery zone) is likely to be suitable as common fill for raising the fill platform, although it is not intended to use this material as structural fill. Structures placed on the fill platform will be piled.

There is concern about the suitability of the mineral soil (mainly head deposits) for use as common fill. Although this material in situ is described as a dense to very dense sand, it appears to have a high fines content (indicated by its low permeability) and it is non-plastic. Re-compacted at natural moisture content this material appears to have a low CBR and it would require very little additional water to render it unsuitable as fill. It is primarily for this reason that it is proposed to carry out pre-earthworks dewatering. However, given its lack of plasticity and, primarily, granular composition, this material should be amenable to improvement, by allowing it to dry out and/or mixing it with a cement or lime binder.

The on-going investigation work is intended to provide information on the geotechnical behaviour and the potential for improvement of these soils.

REFERENCES

1. Long, C.B., et al. Geology of North Mayo, A Geological Description to Accompany the Bedrock Geology Map Series: Sheet 6, North Mayo, Geological Survey of Ireland 1992.

2. Max, M.D. The Geology of a Part of Northwest County Mayo, Ireland, PhD. Thesis University of Dublin, Trinity College, 1969.

3. Max, M.D. Stratigraphy of some Metasediments in part of Northwest County Mayo, Ireland, *Scientific Proceedings of the Royal Dublin Society*, Series A, Vol. 3, No. 29, 1970, p303-317.

4. Long C.B. Brief Lithological Descriptions of all Cambro-Ordovician, Dalradian, Pre-Dalradian and Igneous Rock Units of Sheet 6, North Mayo, Geological Survey of Ireland, 1992.

5. Hobbs, N.B. Mire Morphology and the Properties of some British and Foreign Peats, *Quarterly Journal of Engineering Geology*, Vol. 19, 1986, p. 7-80

6. Applied Ground Engineering Consultants Ltd. Geotechnical Interpretive and Design Report (2 Volumes) East Deposition Area, 9 September 2002.

7. Edwards. K. J. The Anthropogenic Factor in Vegetational History. In: The Quaternary History of Ireland, Edwards K.J. and Warren W.P. (Eds), Academic Press, 1985.

8. Synge, F.M. The Glaciation of West Mayo, *Irish Geography*, Vol. 5, 1968, p372-386.

9. McCabe, A.M., Haynes, J.R. and MacMillan, N.F. Late-Pleistocene Tidewater Glaciers and Glaciomarine Sequences from North County Mayo, Republic of Ireland, *Journal of Quaternary Science*, Vol 1, (1), 1986, p73-84.

10. Lewis, C.A. Periglacial Features. In: The Quaternary History of Ireland, Edwards K.J. and Warren W.P. (Eds), Academic Press, 1985.

11. Minerex Environmental Limited. Groundwater and Subsoil Investigations at the Bellanaboy Bridge Terminal Site (2 Parts), 31 April 2002.

12. Culleton E.B. and Gardiner M.J. Soil Formation. In: The Quaternary History of Ireland, Edwards K.J. and Warren W.P. (Eds), Academic Press, 1985.

13. Mills, G. Modelling the Water Budget of Ireland – Evapotranspiration and Soil Moisture, *Irish Geography*, Vol. 33(2), 2000, p99-110.

14. Minerex Environmental Limited. Report on Surface Water, Groundwater and Meteorological Monitoring at the Bellanaboy Bridge Terminal Site, 25 July 2002.

15. Hungr, O. and Evans, S.G. An Example of a Peat Flow near Prince Rupert, British Colombia, *Canadian Geotechnical Journal*, Vol. 22, 1985, p246-249.

16. Feehan, J. and O'Donovan, G. The Bogs of Ireland – An Introduction to the Natural, Cultural and Industrial Heritage of Irish Peatlands, University College Dublin, The Environmental Institute, 1996.

17. Tomlinson, R.W. and Gardiner, T. Seven Bog Slides in the Sleive-an-Orra Hills, County Antrim, *J.Earth Sci. R. Dubl. Soc.* Vol. 5, 1982, p1-9.

18. Alexander, R.W., Coxon, P. and Thorn, R.H. Bog Flows in South-East Sligo and South-West Leitrim. In: Sligo and West Leitrim, Field Guide No.8, Thorn, R.H. (Ed.) Irish Association for Quaternary Studies, 1986, p58-76.

19. Alexander, R.W., Coxon, P. and Thorn, R.H. A Bog Flow at Straduff Townland, County Sligo, *Proc. R. Ir. Acad.* B86, (4), 1986, p107-119.

20. Bishop, D.W. and Mitchell, G.F. On a Recent Bog-Flow in Meenacharvy Townland, Co. Donegal. *Sci. Proc. R.. Dubl. Soc.* Vol. 24, 1946, p151-156.

21. Burke, W. Effect of Drainage on the Hydrology of Blanket Bog, *Ir. J. agric. Res.* Vol. 14, 1975, p145-162.

22. Carling, P.A. Peat Slides in Teesdale and Weardale, Northern Pennines, July 1983: Description and Failure Mechanisms, *Earth Processes and Landforms,* Vol. 11, 1986, p193-206.

23. Cole, G.A.J. The Bog-Slide of Knocknageeha, in the County of Kerry, *Nature*, Vol.55, 1897. P254-256.

24. Colhoun, E.A. The Debris Flow at Glendalough, Co. Wicklow and the Bog-Flow at Slieve Rushen, Co. Cavan, January 1966, *Irish Naturalists Journal,* Vol.15, 1966, p199-206.

25. Colhoun, E.A., Common, R. and Cruickshank, M.M. Recent Bog Flows and Debris Slides in the North of Ireland, *Proc. R. Dubl. Soc.* A(2), 1965, p163-174.

26. Crisp, D.T., Rawes, M., and Welch, D. A Pennine Peat Slide, *Geogr. J.*, Vol.130, 1964, P519-524.

27. Delap, A.D. *et al.* Report on the Recent Bog Flow at Glencullin, Co. Mayo, *Sci. Proc. R. Dubl. Soc.* Vol.20, 1932, p181-192.

28. Delap, A.D., and Mitchell, G.F. On a Recent Bog-Flow in Powerescourt Mountain Townland, Co. Wicklow, *Sci. Proc. R. Dubl. Soc.* Vol.22, 1939, P195-198.

29. Hanrahan, E.T. A Road Failure on Peat, *Geotechnique*, Vol.14, no.3, 1964, p185-202.

30. Latimer, J. Some Notes on the Recent Bog Slips in the County of Kerry, *Trans. Institution of Civil Engineers of Ireland*, Vol.26, 1897, p94-97.

31. Mitchell, G.F. On a Recent Bog-Flow in County Clare, *Sci. Proc. R. Dubl. Soc.* Vol.21, 1935, p247-252.

32. Mitchell, G.F. On a Recent Bog-Flow in County Wicklow, *Sci. Proc. R. Dubl. Soc.* Vol.22, 1938, p49-54.

33. Praeger, R.L. Bog-Bursts, with Special Reference to the Recent Disaster in Co. Kerry, *The Irish Naturalist*, Vol.6, 1897, p141-162.

34. Praeger, R.L. A Bog-Burst Seven Years After, *The Irish Naturalist*, Vol.6, 1897, p201-203.

35. Praeger, R.L. The Ballycumber Bog-Slide, *The Irish Naturalist*, Vol.(_), 1906, p(_).

36. Sollas, W.J. *et al.* Report of the Committee Appointed by the Royal Dublin Society to Investigate the Recent Bog-Flow in Kerry, *Sci. Proc. R. Dubl. Soc.* Vol.8, 1897, p475-508.

37. Standen, R. Bog Bursts, *Irish Naturalist,* Vol.6, 1897, p224.

38. Tomlinson, R.W. A Preliminary Note on the Bog-Burst at Carrownaculla, Co. Fermanagh, November 1979, *Ir. Nat. J.* Vol.20, 1982, p313-316.

39. Patrick J.Tobin & Co. Ltd. Report on the Landslides at Dooncarton, Glenagad, Barnachuille and Pollatomais, County Mayo. Executive Summary, 2003, Document Ref. MFG/PG/MMcD 2033/1a.

40. EPA. Climate Change Scenarios & Impacts for Ireland (2000-LS-5.2.1-M1) Final Report, Environmental Protection Agency, 2003.

41. Janbu, N. Slope stability computations. In *Embankment Dam Engineering, Casagrande Memorial Volume,* Hirschfield, E., Poulos, S. eds. John Wiley, New York, 47-86, 1973

42. Terzaghi, K., Theoretical Soil Mechanics, John Wiley, New York, 1943 British Standards Institute (1981). BS 6031:1981 Code of Practice for Earthworks

43. Eurocode 7:Geotechnical Design – Part 1: General Rules. DD ENV 1997-1:1995. British Standards Institute.

Arup Consulting Engineers

APPENDIX A

Figures

Legend:

Yellow	Relatively unweathered Intact Rock at shallow depth.
Grey	Terrace elevation approx. 31mAOD (Malin Head)
Blue	Glacial Till increasing in thickness down slope.
Light blue	Additional thickness of Glacial Till.

Rev.	Date	By	Description	Chd By
P3	28.11.03	EG	Issued for Planning	JR
P2	17.10.03	EG	Issued for Information	MD
P1	2.10.03	EG	Issued for Information	MD

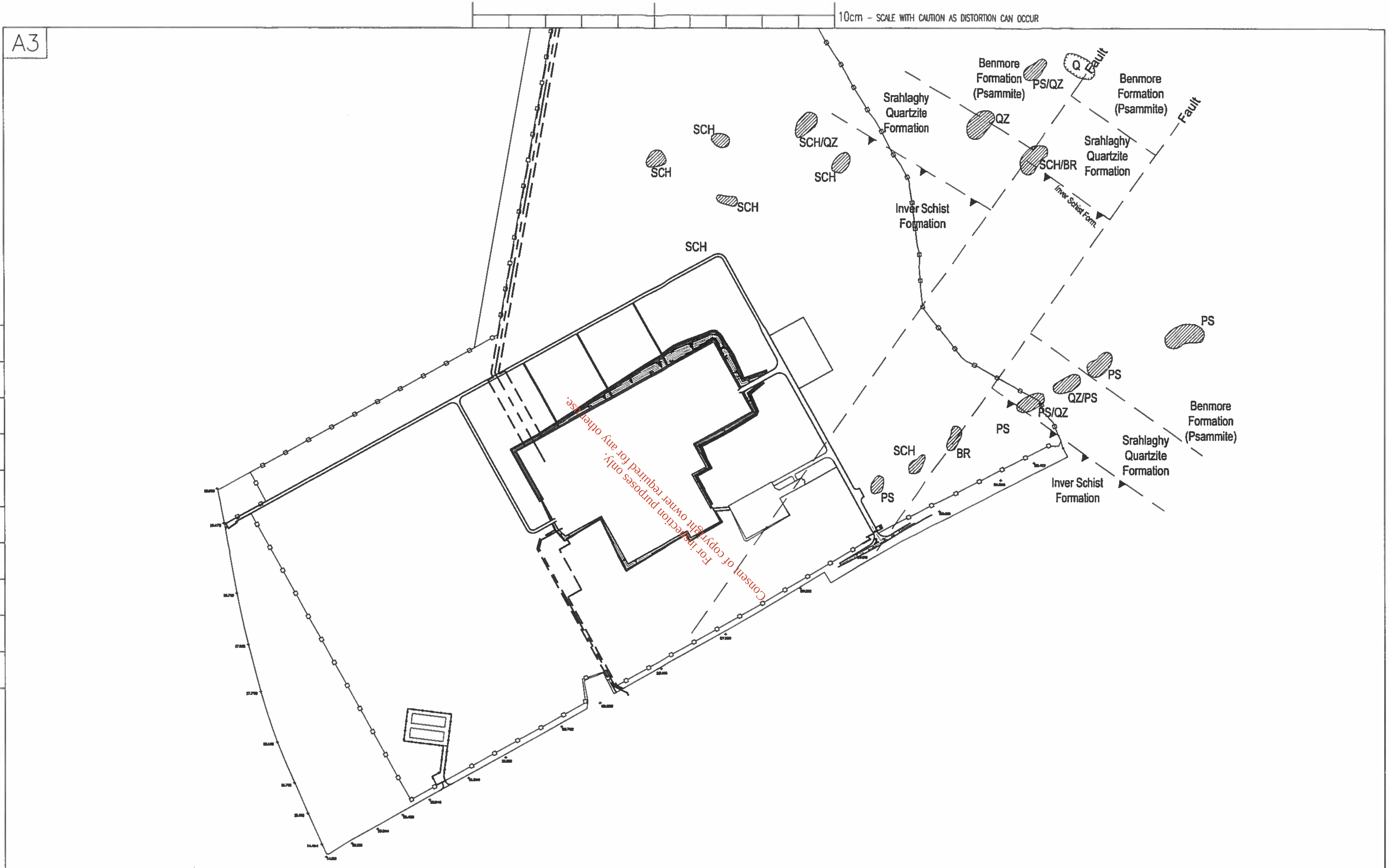
Job Title: CORRIB TERMINAL: BELLANABOY BRIDGE

Drawing Title: GEOLOGICAL MAP : MINERAL SOILS

Drawing Status: PLANNING

ARUP Consulting Engineers
15 Oliver Plunkett Street, Cork
Tel 021-4277670 Fax 021-4272345
EMail cork@arup.com
DUBLIN CORK LIMERICK

Scales N.T.S. | Originator E Guest
Checked J Redding | Approved E Lynch | Date 02.10.03
Job No. C1157.10 | Drawing No. Figure 1A | Rev. P3



Legend:

PS	Psammite	BR	Breccia
QZ	Quartzite	SCH	Schist

Rev.	Date	By	Description	Chd By
P3	28.11.03	EG	Issued for Planning	JR
P2	17.10.03	EG	Issued for Information	MD
P1	2.10.03	EG	Issued for Information	MD

Job Title: CORRIB TERMINAL: BELLANABOY BRIDGE

Drawing Title: GEOLOGICAL MAP : SOLID GEOLOGY

Drawing Status: PLANNING

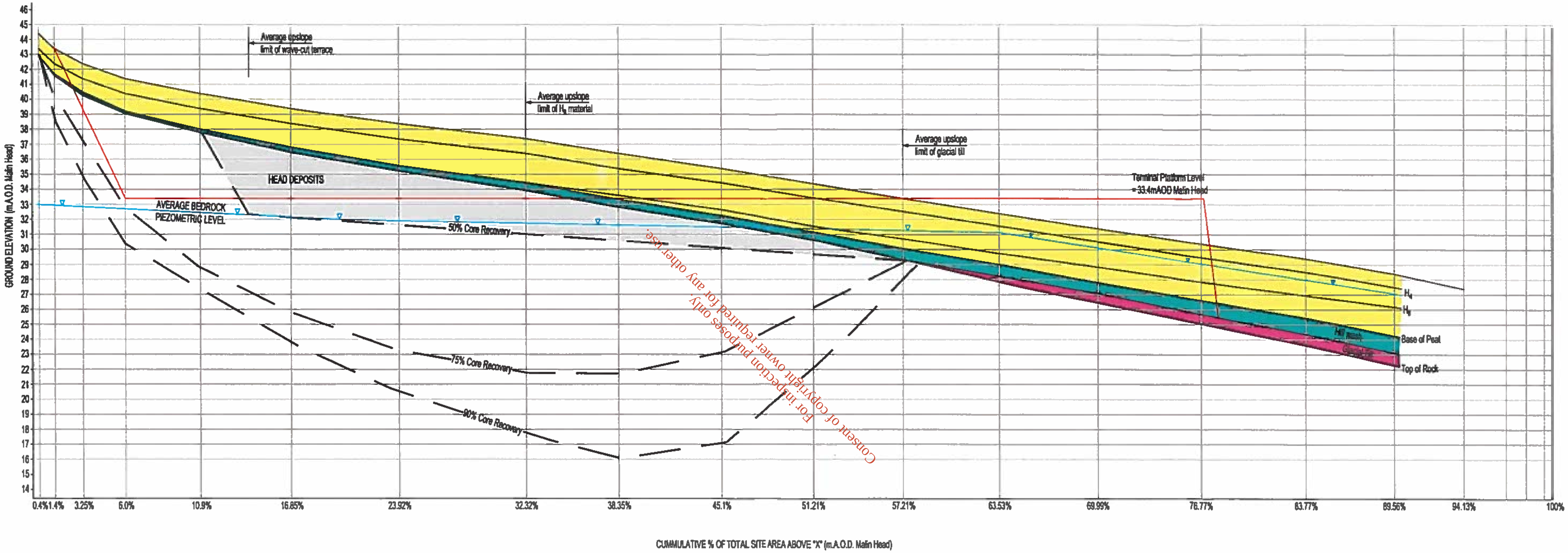
ARUP Consulting Engineers
15 Oliver Plunkett Street, Cork Tel 021-4277670 Fax 021-4272345 EMail cork@arup.com
DUBLIN CORK LIMERICK

©

Scales N.T.S. Originator E Guest
Checked J Redding Approved E Lynch Date 02.10.03
Job No. C1157.10 Drawing No. Figure 1B Rev. P3

A3

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR



Rev.	Date	By	Description	Chd By
P4	08.12.03	EG	Re-Issued for Planning	JR
P3	28.11.03	EG	Issued for Planning	MD
P2	08.9.03	EG	Re-Issued for Information	MD
P1	05.9.03	EG	Issued for Information	MD

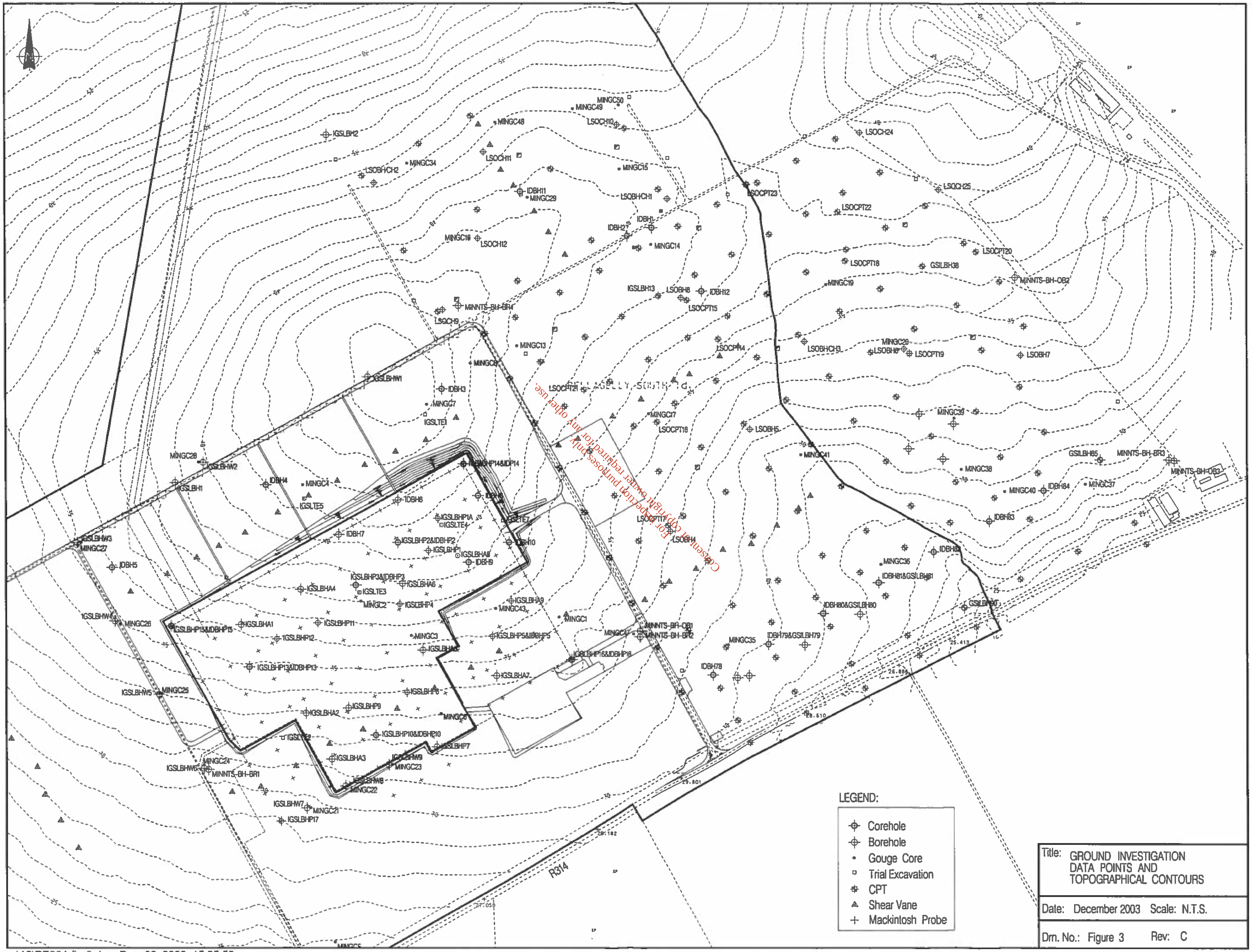
Job Title
CORRIB TERMINAL:
BELLANABOY BRIDGE

Drawing Title
SYNTHETIC GEOLOGICAL CROSS-SECTION

Drawing Status
PLANNING

ARUP Consulting Engineers
15 Oliver Plunkett Street, Cork
Tel 021-4277670 Fax 021-4272345
EMail cork@arup.com
DUBLIN CORK LIMERICK

Scales N.T.S. | Originator E Guest
Checked J Redding | Approved E Lynch | Date 05.09.03
Job No. C1157.10 | Drawing No. Figure 2 | Rev. P4



Title: GROUND INVESTIGATION DATA POINTS AND TOPOGRAPHICAL CONTOURS

Date: December 2003 Scale: N.T.S.

Drn. No.: Figure 3 Rev: C

Location ID	MAOD	Depth of Peat
MINGC7	44.23	1.25
IGSLBHW1	44.22	2.4
IGSLTE1	43.95	1.6
MINGC42	42.38	2.80
MINGC8	42.08	0.59
IGSLBHP14	41.73	2.2
MINGC4	41.53	2.35
MINGC16	41.38	1.80
IGSLTE5	41.26	2.8
IGSLBHP1A	40.96	2.6
MINGC31	40.93	2.16
IGSLBHP2	40.91	2.6
MINGC30	40.83	1.50
MINGC13	40.78	2.10
IGSLTE4	40.74	1.7
MINGC43	40.68	2.00
MINGC29	40.48	2.20
IGSLBHP1	40.37	2.6
IGSLBHW2	40.08	2.7
MINGC28	39.73	2.30
MINGC1	39.71	2.06
MINGC14	39.68	1.80
IGSLBHA8	39.59	2.8
MINGC15	39.38	1.60
IGSLBHA6	38.80	2.7
IGSLBH1	38.72	2.3
IGSLBHP3	38.58	2.6
IGSLTE7	38.56	2.8
IGSLTE3	38.54	2.9
MINGC32	38.53	2.80
MINGC33	38.53	3.40
MINGC44	38.48	2.00
MINGC2	38.08	2.20
IGSLBHP4	37.99	2.8
MINGC48	37.86	2.00
MINGC49	37.86	2.11
IGSLBHA4	37.73	2.8
MINGC50	37.28	3.00
IGSLTE6	37.24	2.7
IGSLBHP11	36.84	2.7
IGSLBHA9	36.77	2.9
MINGC3	36.48	3.20
IGSLBHA1	36.13	3.1
MINGC19	36.08	3.70
MINGC17	35.98	2.90
MINGC46	35.98	2.90
IGSLBHP5	35.95	2.8
IGSLBHP12	35.92	2.8
IGSLBHP15	35.67	3.6
IGSLBHA5	35.65	3.6
IGSLBHW3	35.02	2.8
IGSLBHW4	34.96	2.8
IGSLBHP13	34.91	3.0
MINGC26	34.78	2.65
IGSLBHA7	34.31	2.8
IGSLBHP16	34.14	3.0
MINGC20	33.83	4.20
IGSLBH2	33.72	2.2
IGSLBHP6	33.72	3.0
IGSLBHP9	33.51	2.8
MINGC6	33.08	2.63
MINGC25	32.98	2.35
MINGC47	32.88	3.60
IGSLBHW5	32.75	2.9
IGSLBHA2	32.74	2.9
MINGC18	32.58	2.90
IGSLBHP10	32.18	3.5
IGSLBHP7	32.03	2.8
IGSLTE2	31.82	3.0
IGSLBHW9	31.77	3.6
MINGC9	31.63	3.20
MINGC23	31.48	3.00
IGSLBHA3	31.38	3.3
MINGC39	31.38	3.70
IGSLBHW8	30.82	3.7
MINGC22	30.68	3.60
MINGC24	30.48	2.85
IGSLBHW6	30.47	2.8
MINGC21	29.73	3.80
IGSLBHW7	29.03	3.8
IGSLBHP17	28.99	3.7
MINGC36	27.88	5.10
MINGC10	27.48	2.35
MINGC5	25.88	4.75
MINGC12	24.03	3.65
MINGC11	22.83	4.70

Figure 4: Thickness of Peat v Ground Elevation

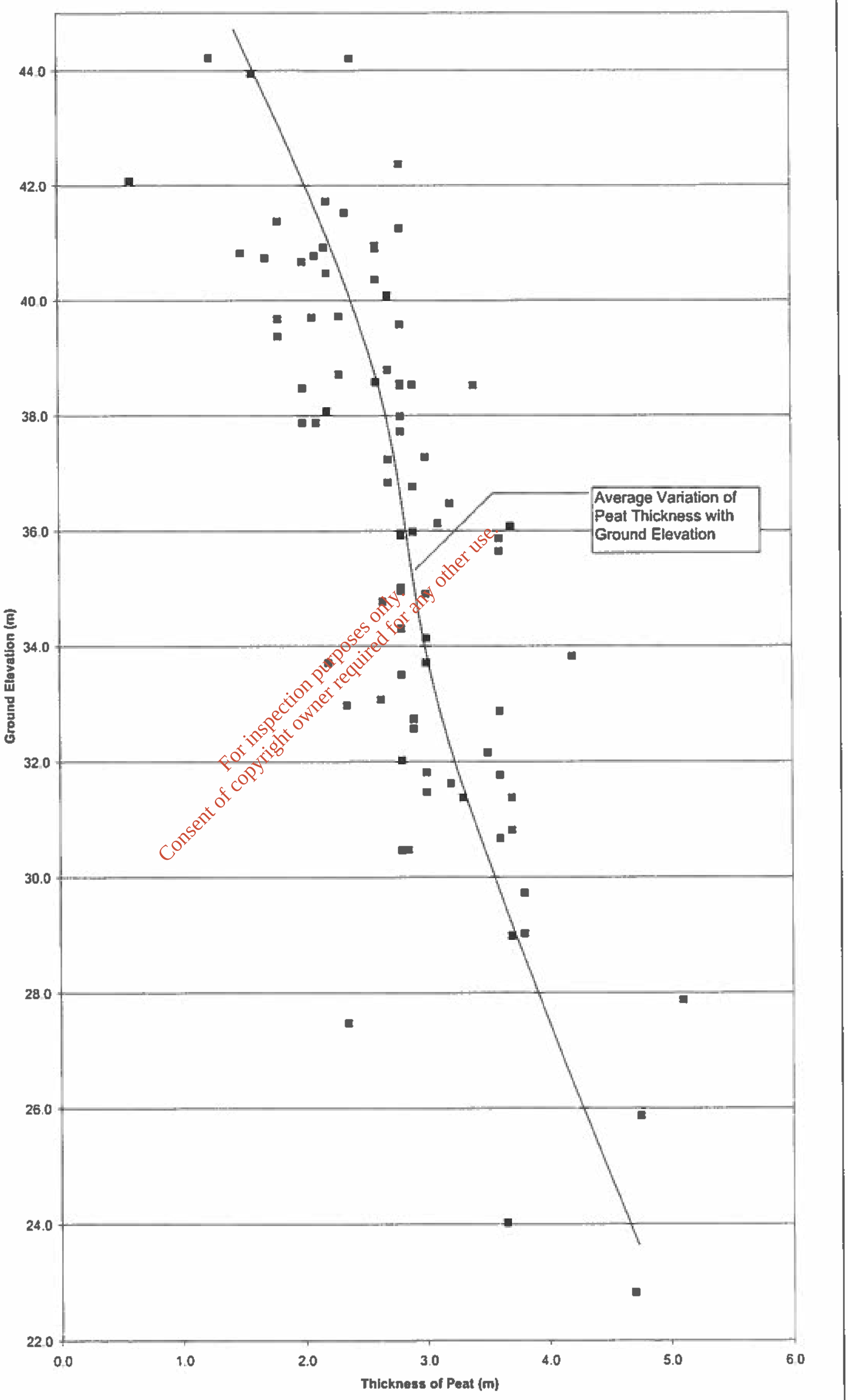


Figure 5: Level of Peat Humification versus Ground Elevation

based on Von Post Classification

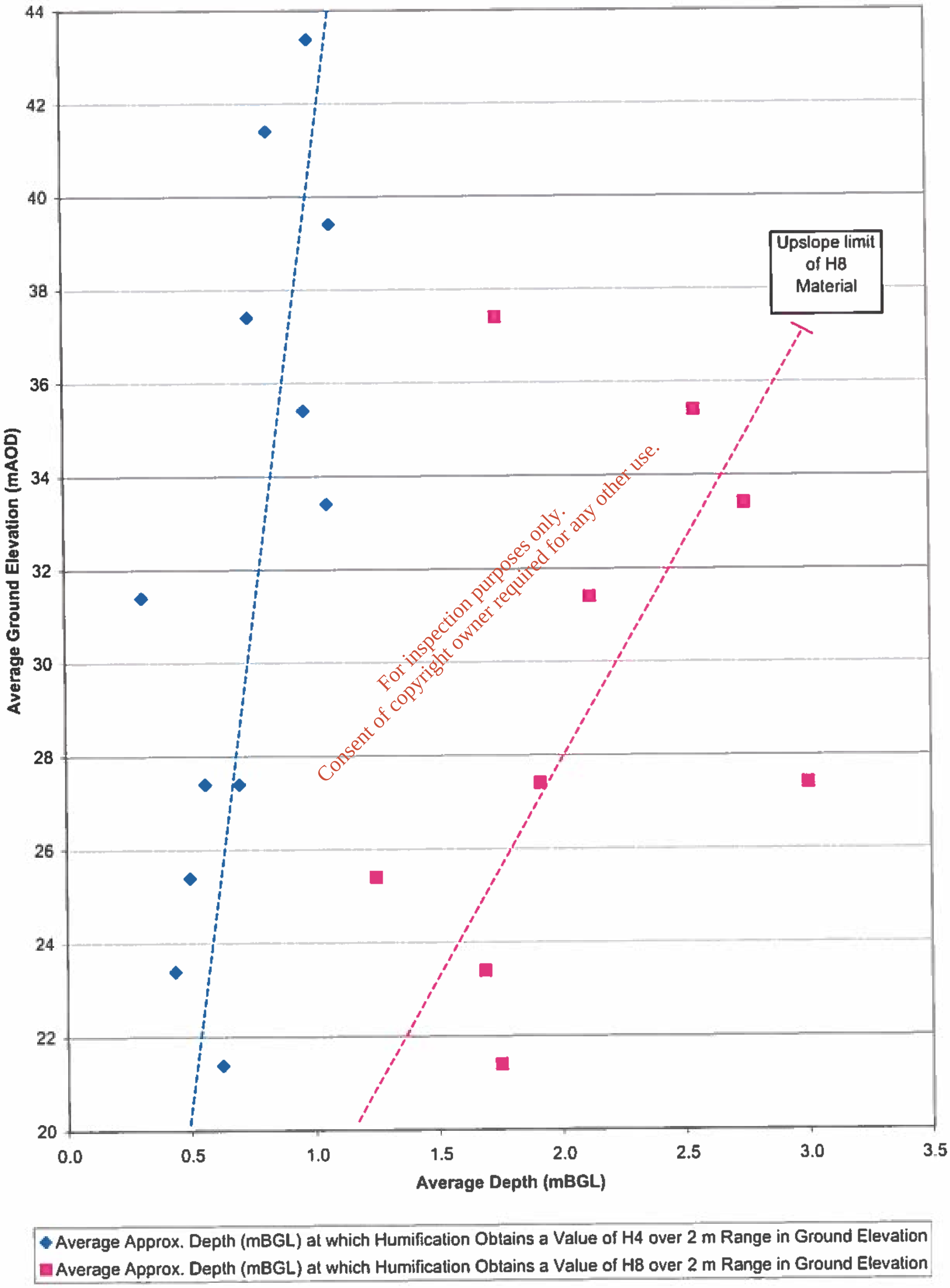
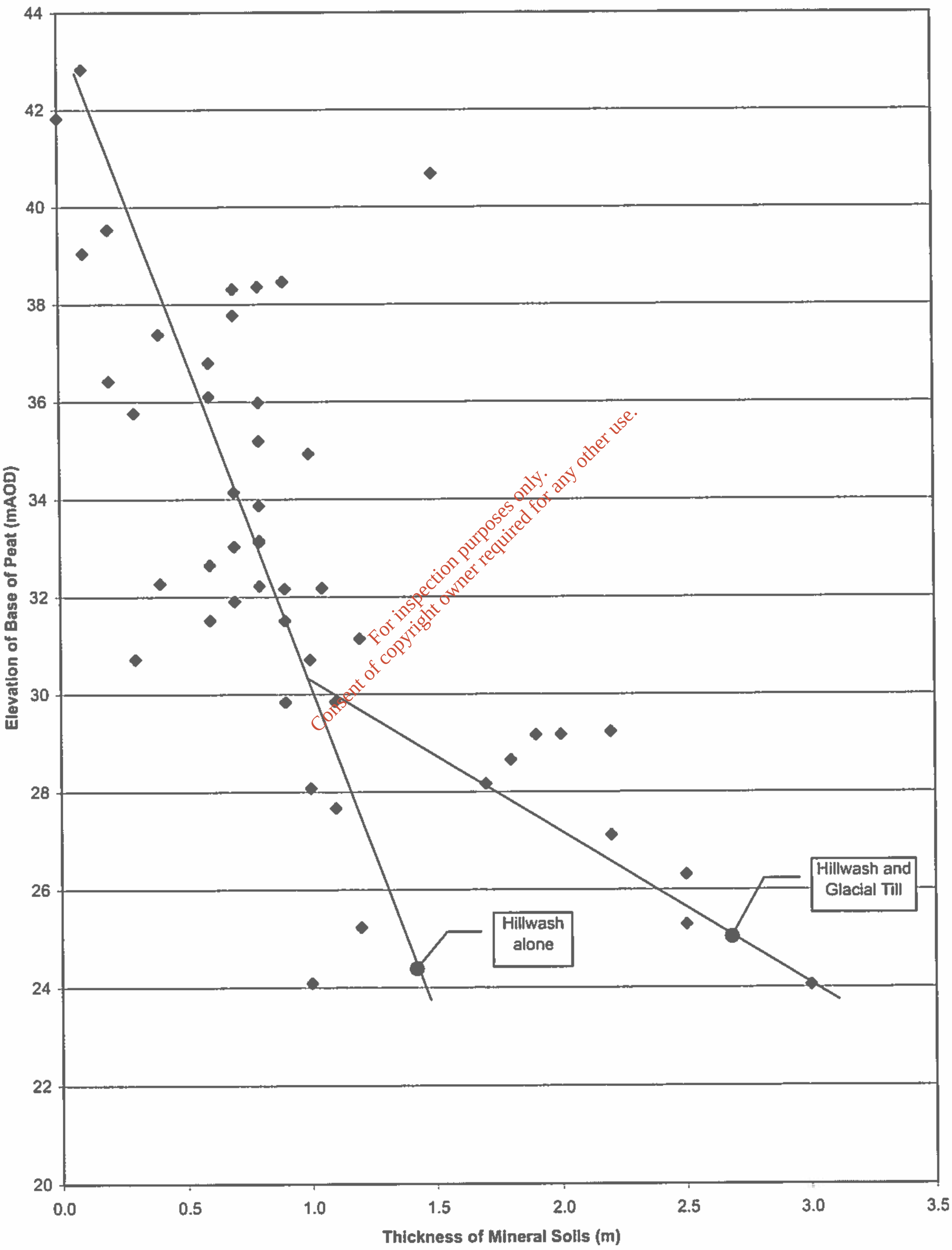


Figure 6: Thickness of Mineral Soil Deposits versus Elevation of Base of Peat



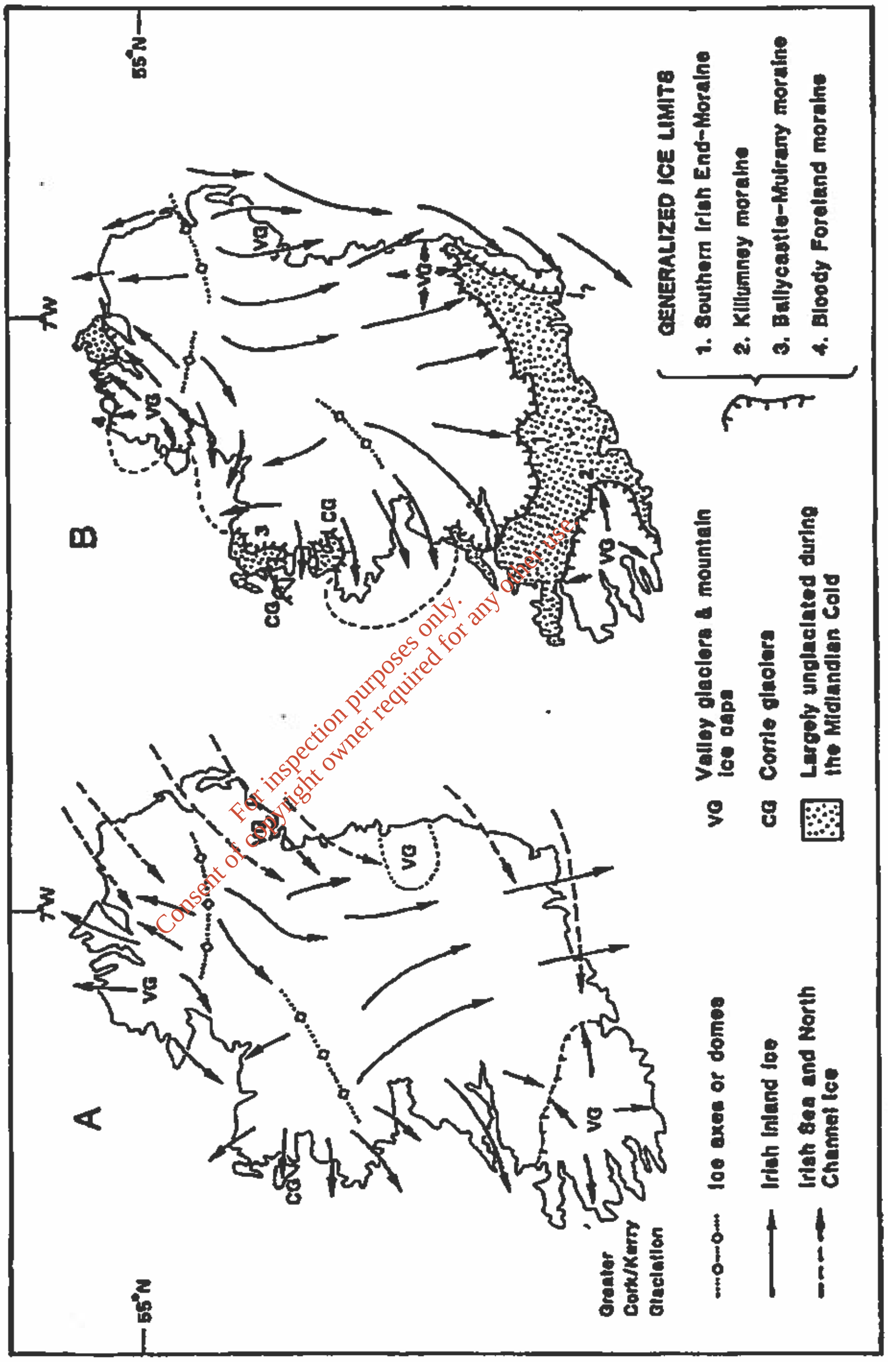


Fig. 2. General directions of ice-sheet movement in Ireland during the Munsterian (A) and late Midlandian (B) cold stages, based on the published works of Charlesworth, Creighton, Colhoun, Farrington, McCabe, Mitchell, Stephens, and Synge.

LIMITS OF GLACIATION IN IRELAND Figure 7

Figure 8: Core Recovery in Rotary Coreholes from Terminal Site versus Ground Elevation

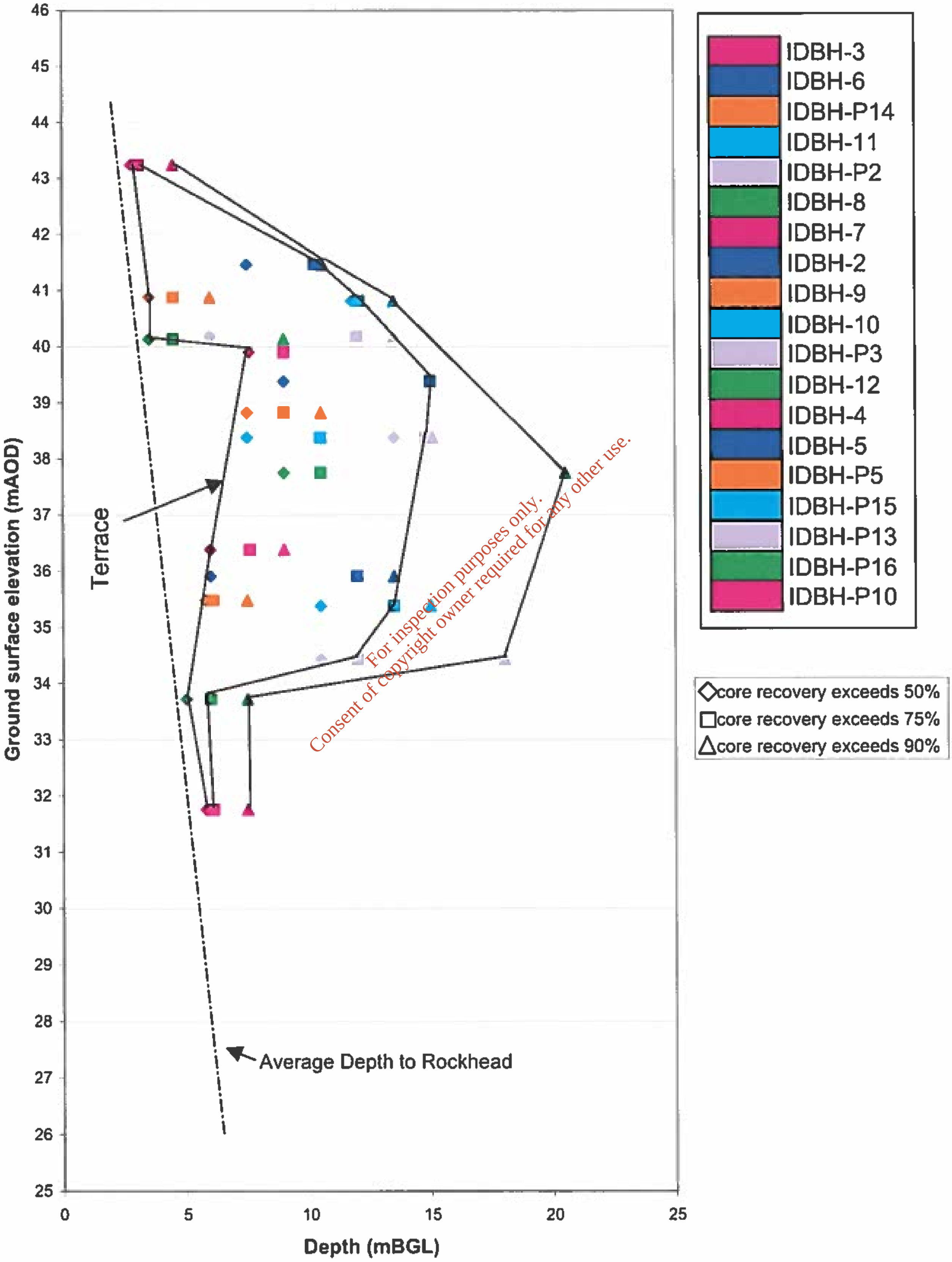
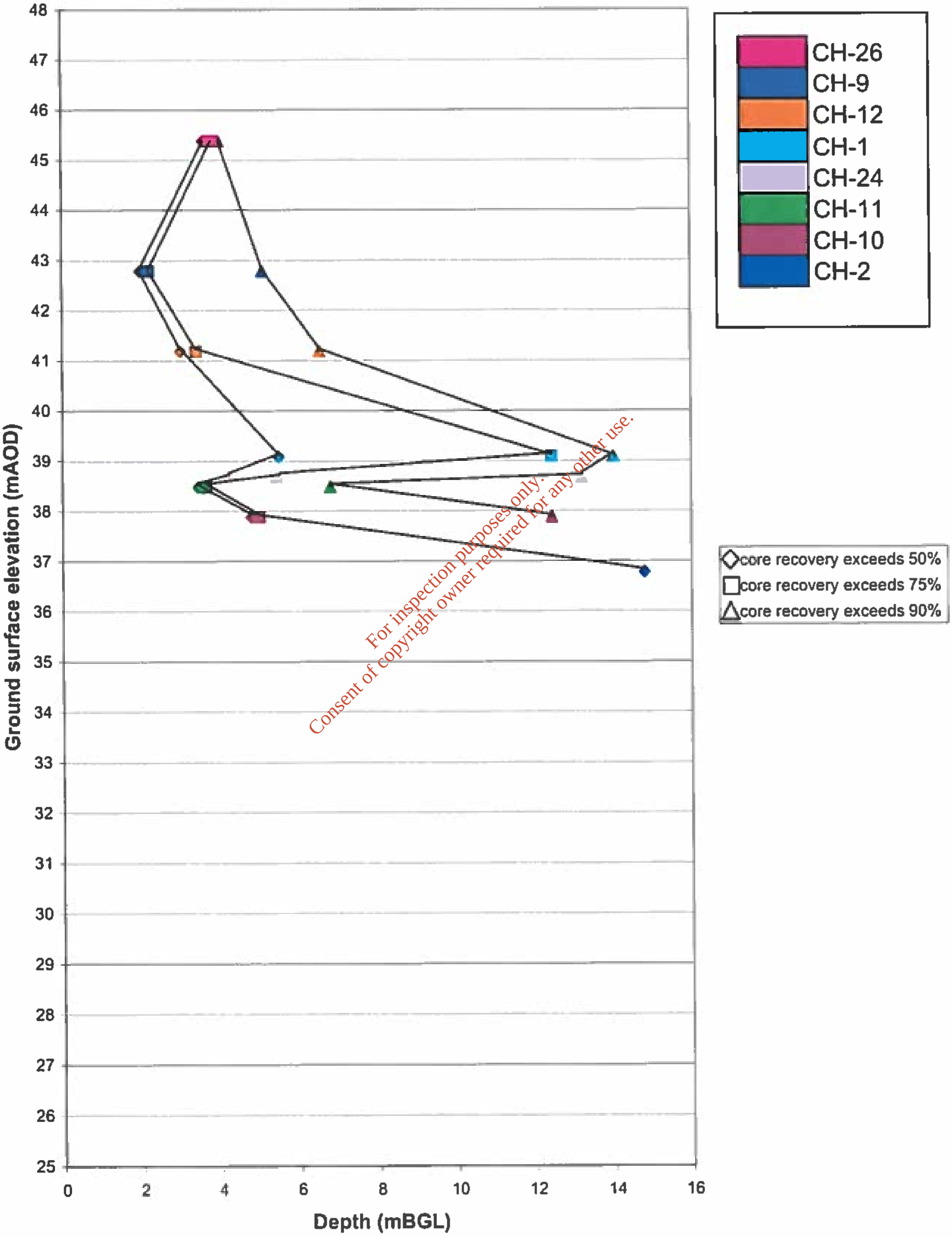


Figure 9: Core Recovery in Rotary Coreholes from Repository Location versus Ground Elevation



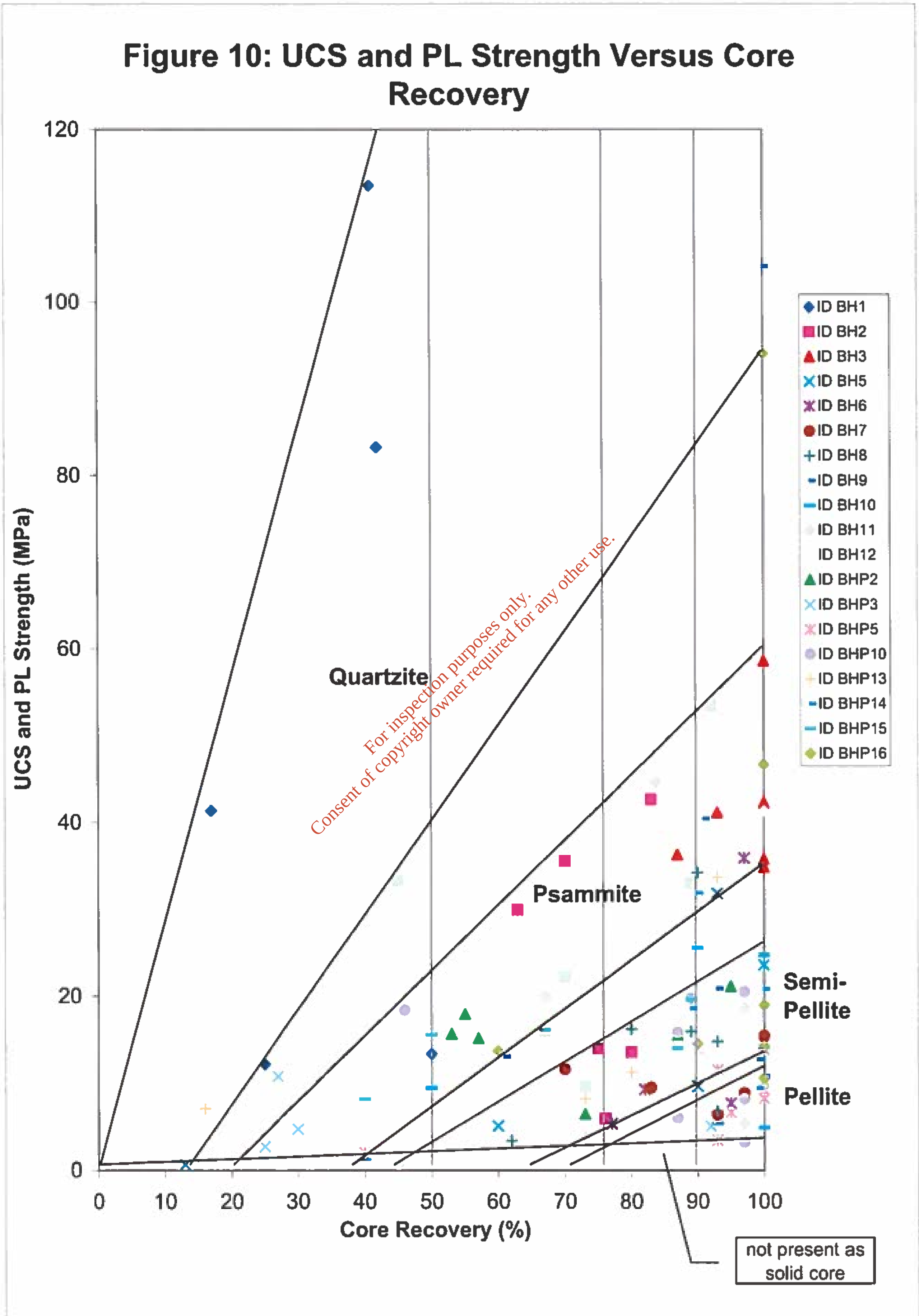
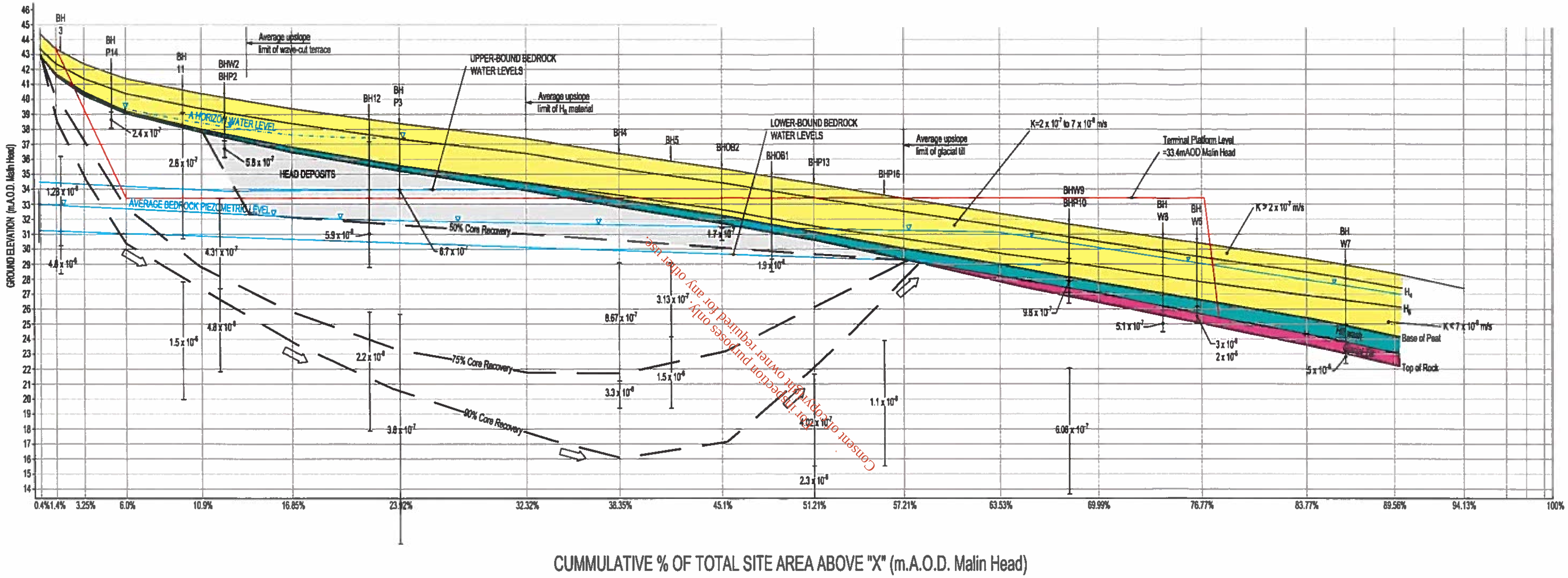


Figure 10: UCS and PL Strength Versus Core Recovery
UCS and PL Strength (MPa)
0
20
40
60
80
100
120
Core Recovery (%)
0
10
20
30
40
50
60
70
80
90
100
Quartzite
Psammite
Semi-Pellite
Pellite
not present as solid core
ID BH1
ID BH2
ID BH3
ID BH5
ID BH6
ID BH7
ID BH8
ID BH9
ID BH10
ID BH11
ID BH12
ID BHP2
ID BHP3
ID BHP5
ID BHP10
ID BHP13
ID BHP14
ID BHP15
ID BHP16

10cm - SCALE WITH CAUTION AS DISTORTION CAN OCCUR

A3



Legend:

⇨ Denotes Preferential Flow Path for Bedrock Ground Water

Rev.	Date	By	Description	Chd By
P4	08.12.03	EG	Re-Issued for Planning	JR
P3	28.11.03	EG	Issued for Planning	MD
P2	17.10.03	EG	Issued for Information	MD
P1	3.10.03	EG	Issued for Information	MD

Job Title: CORRIB TERMINAL: BELLANABOY BRIDGE

Drawing Title: SYNTHETIC GEOLOGICAL CROSS-SECTION WITH HYDROGEOLOGICAL INFORMATION

Drawing Status: PLANNING

ARUP Consulting Engineers
15 Oliver Plunkett Street, Cork Tel 021-4277670 Fax 021-4272345 EMail cork@arup.com
DUBLIN CORK LIMERICK

Scales N.T.S. Originator E Guest
Checked J Redding Approved E Lynch Date 02.10.03

Job No. C1157.10 Drawing No. Figure 11 Rev. P4

Figure 12: Bedrock and Mineral Soil Piezometric Levels Versus Ground Elevation

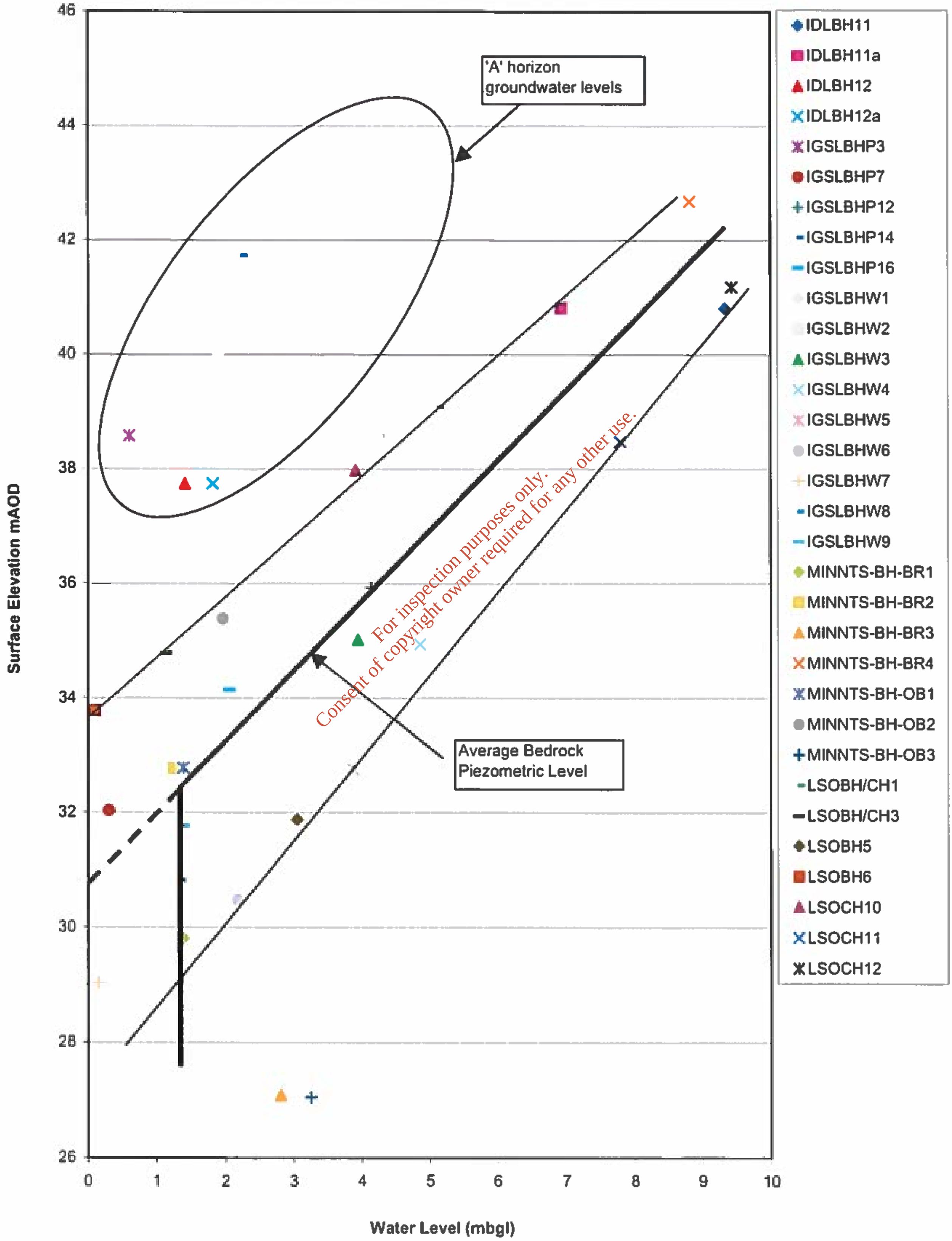


Figure 13: Peat Permeability versus Humification

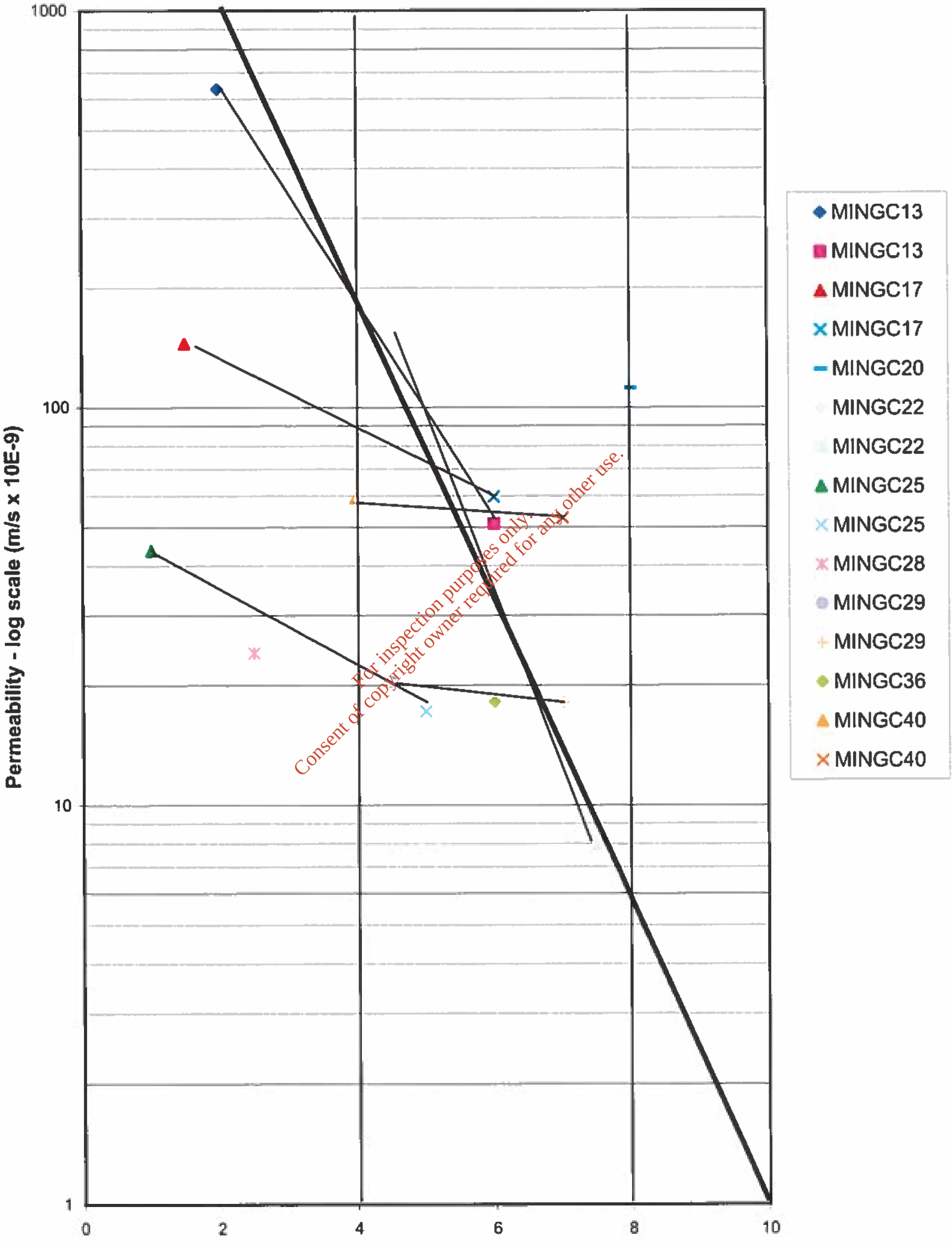


Figure 14: Phreatic Peat Water Levels

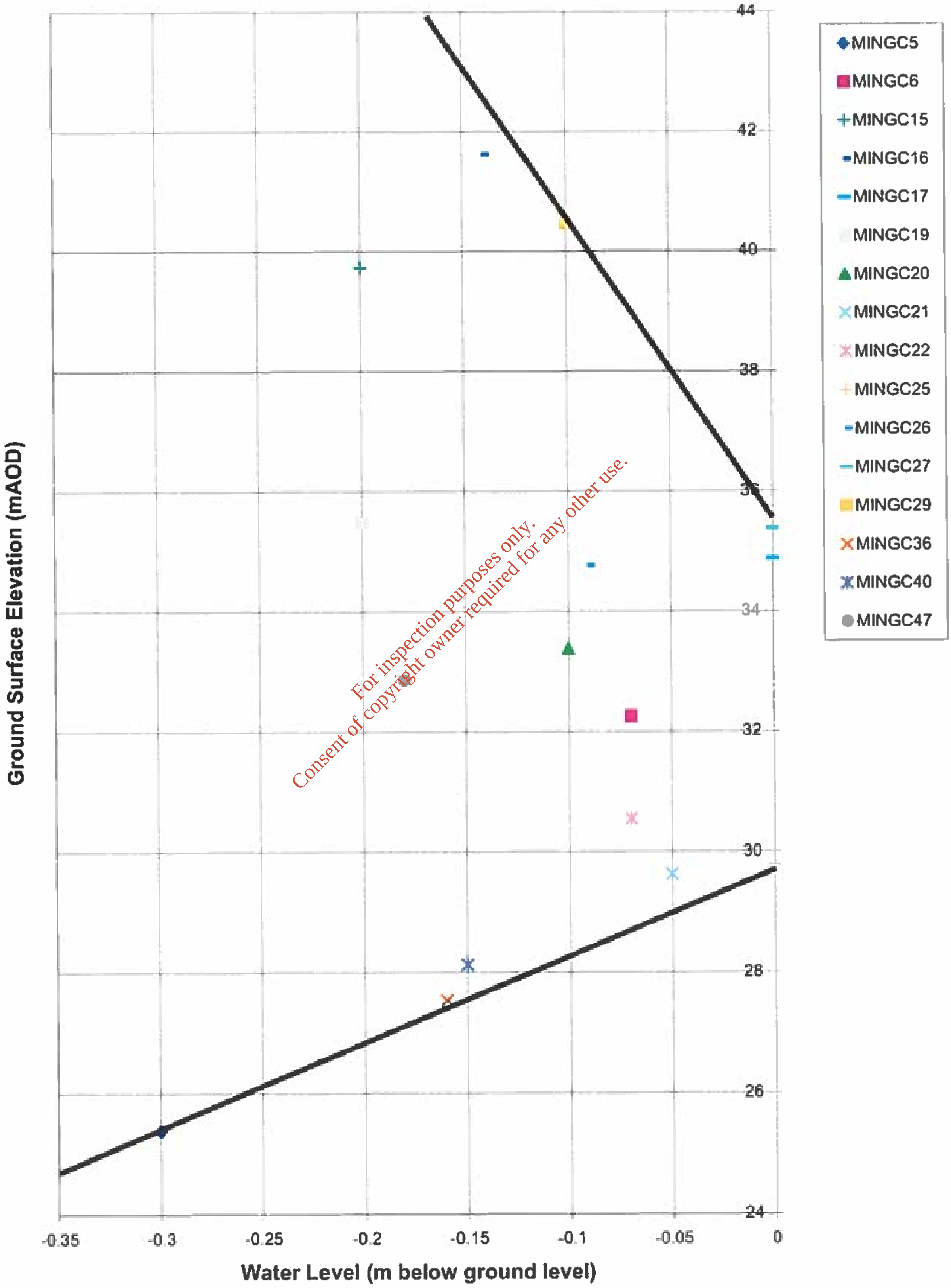
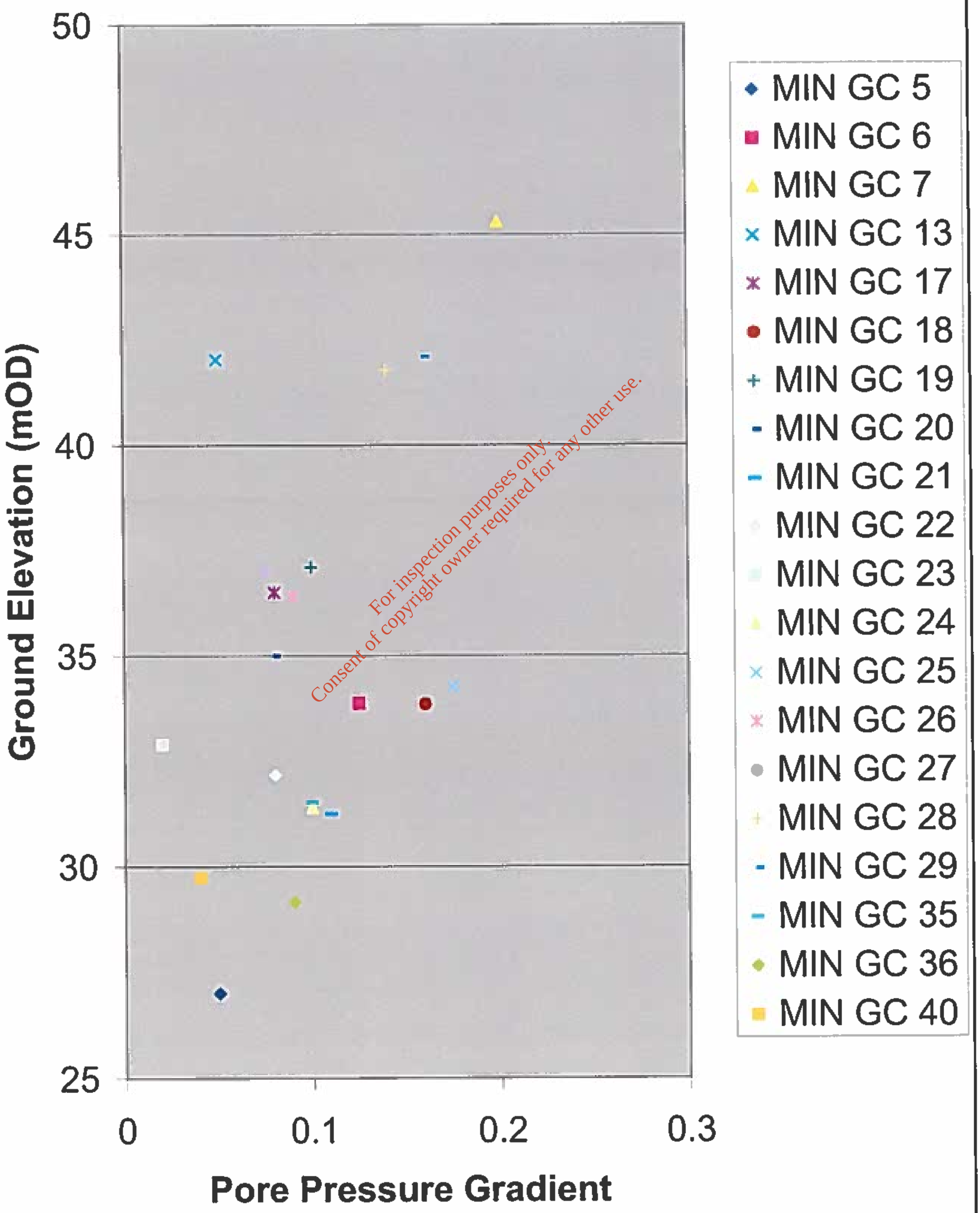
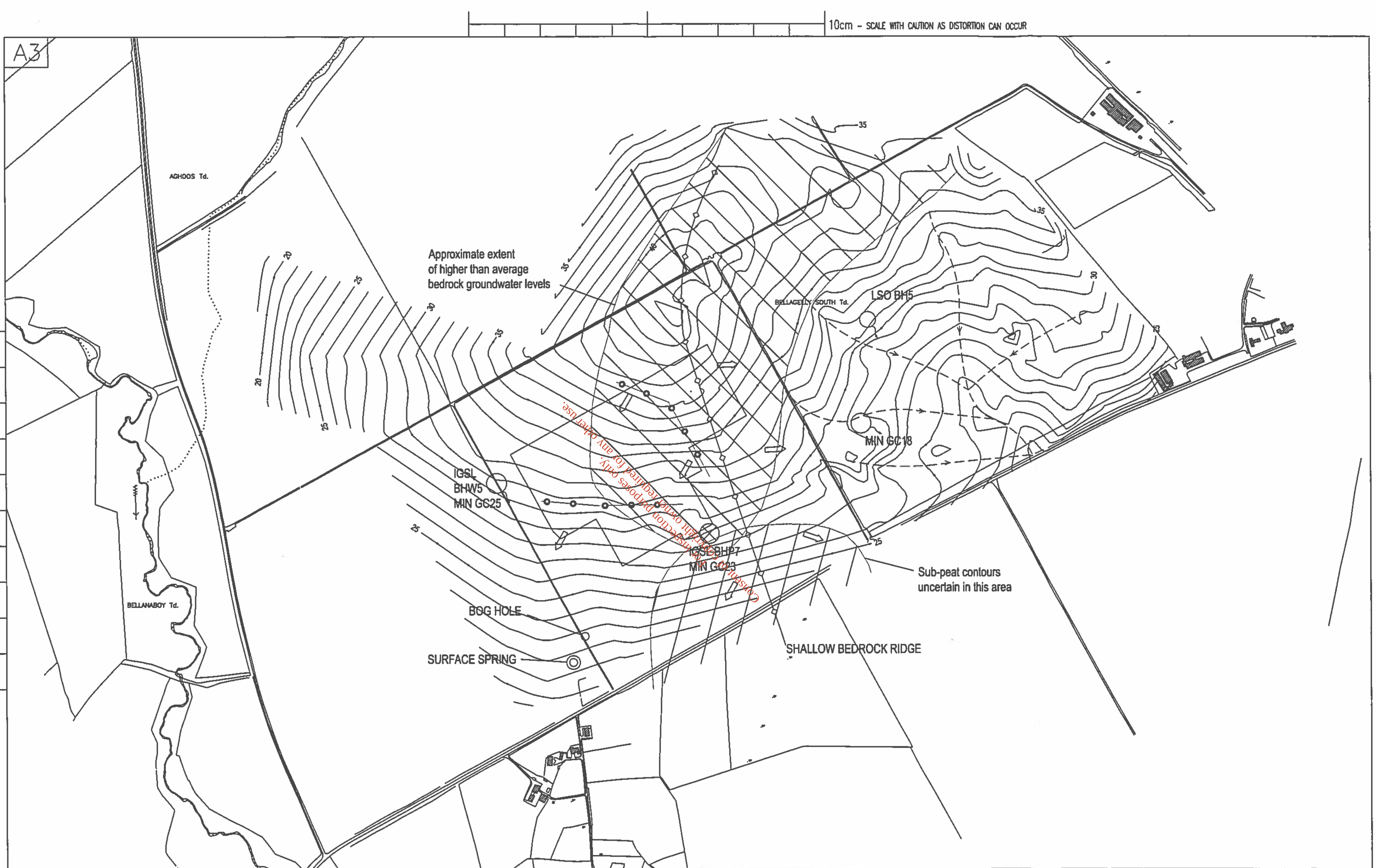


Figure 15: Vertical Pore Pressure Gradient versus Ground Elevation





Rev.	Date	By	Description	Chd By
P3	08.12.03	MD	Re-Issued for Planning	JR
P2	28.11.03	MD	Issued for Planning	MD
P1	17.10.03	EG	Issued for Information	MD

Legend:

- Possible Sub-peat Spring
- Non-Sub-peat Spring Area
- Buried Valley Feature
- Directions of Bedrock groundwater flow
- Approximate Locations of proposed Dewatering wells
- Contours of sub-peat surface

Job Title: CORRIB TERMINAL: BELLANABOY BRIDGE

Drawing Title: HYDROGEOLOGICAL FEATURES

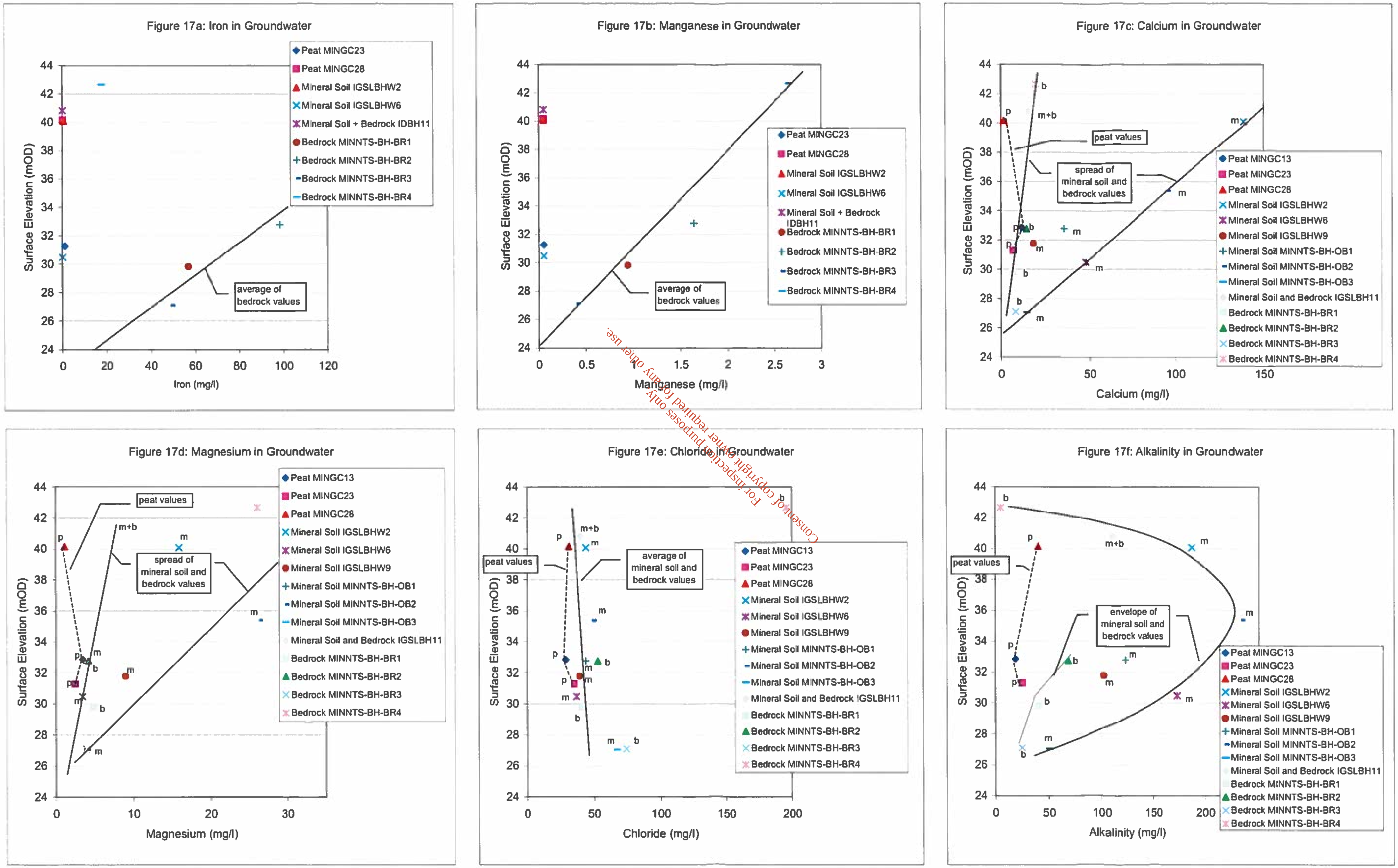
Drawing Status: PLANNING

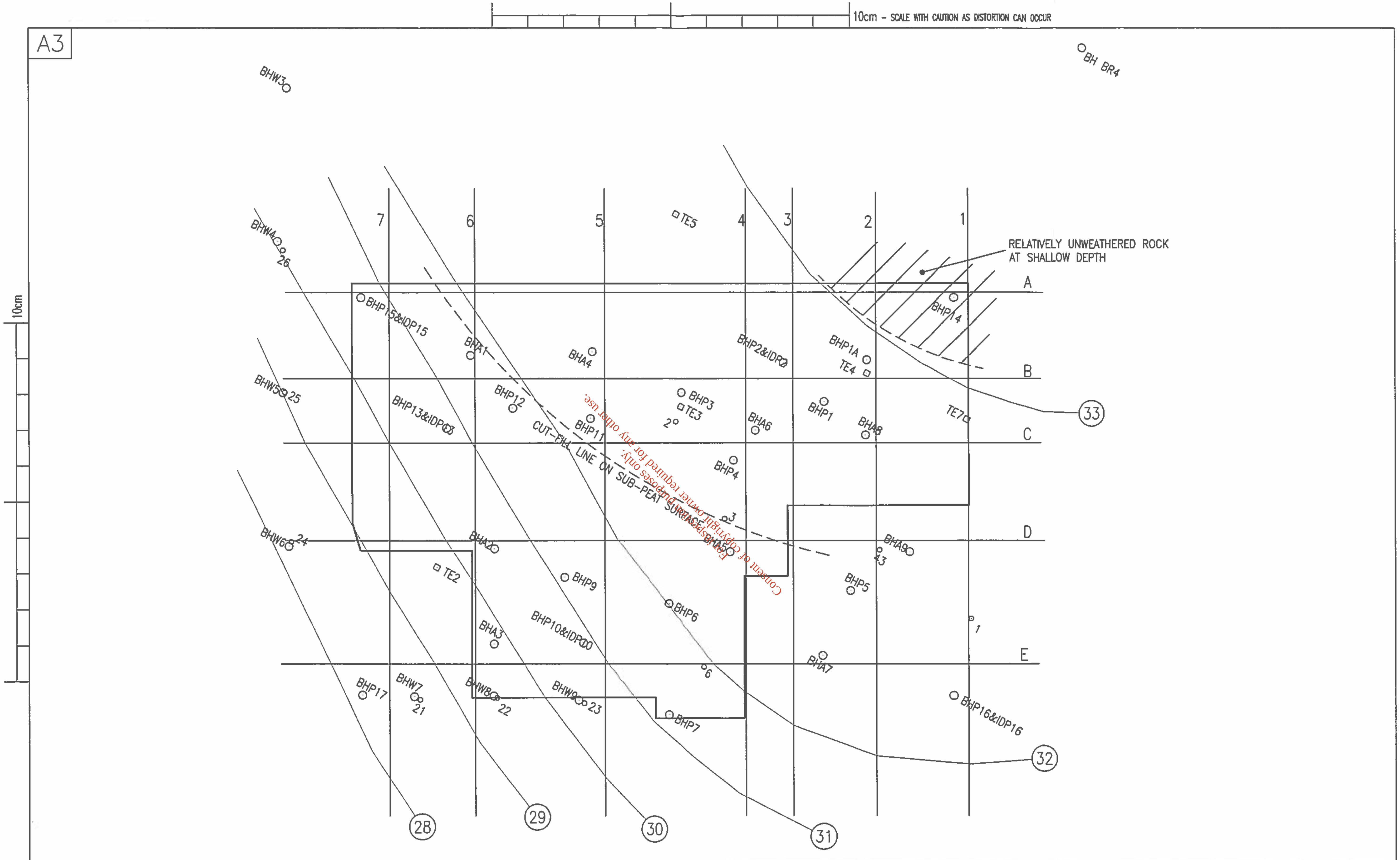
ARUP Consulting Engineers — 15 Oliver Plunkett Street, Cork. Tel 021-4277670 Fax 021-4272345 Email cork@arup.com — DUBLIN CORK LIMERICK ©

Scales: N.T.S. | Originator: E Guest | Checked: J Redding | Approved: E Lynch | Date: 02.10.03

Job No.: C1157.10 | Drawing No.: Figure 16 | Rev.: P3

Figure 17: Hydrochemistry Plots





Rev.	Date	By	Description	Chd By
P2	28.11.03	MD	Issued for Planning	MD
P1	17.10.03	EG	Issued for Information	MD

(32) Bedrock Groundwater Contours (mAOD)

Job Title: CORRIB TERMINAL: BELLANABOY BRIDGE

Drawing Title: LOCATIONS OF GEOLOGICAL SECTIONS, S.I. DATAPOINTS AND BEDROCK GROUNDWATER CONTOURS

Drawing Status: PLANNING

ARUP Consulting Engineers — 15 Oliver Plunkett Street, Cork. Tel 021-4277670 Fax 021-4272345 EMail cork@arup.com — DUBLIN CORK LIMERICK ©

Scales: N.T.S. | Originator: E.G. | Checked | Approved | Date: 17.10.03

Job No. C1157.10 | Drawing No. Figure 18 | Rev. P2

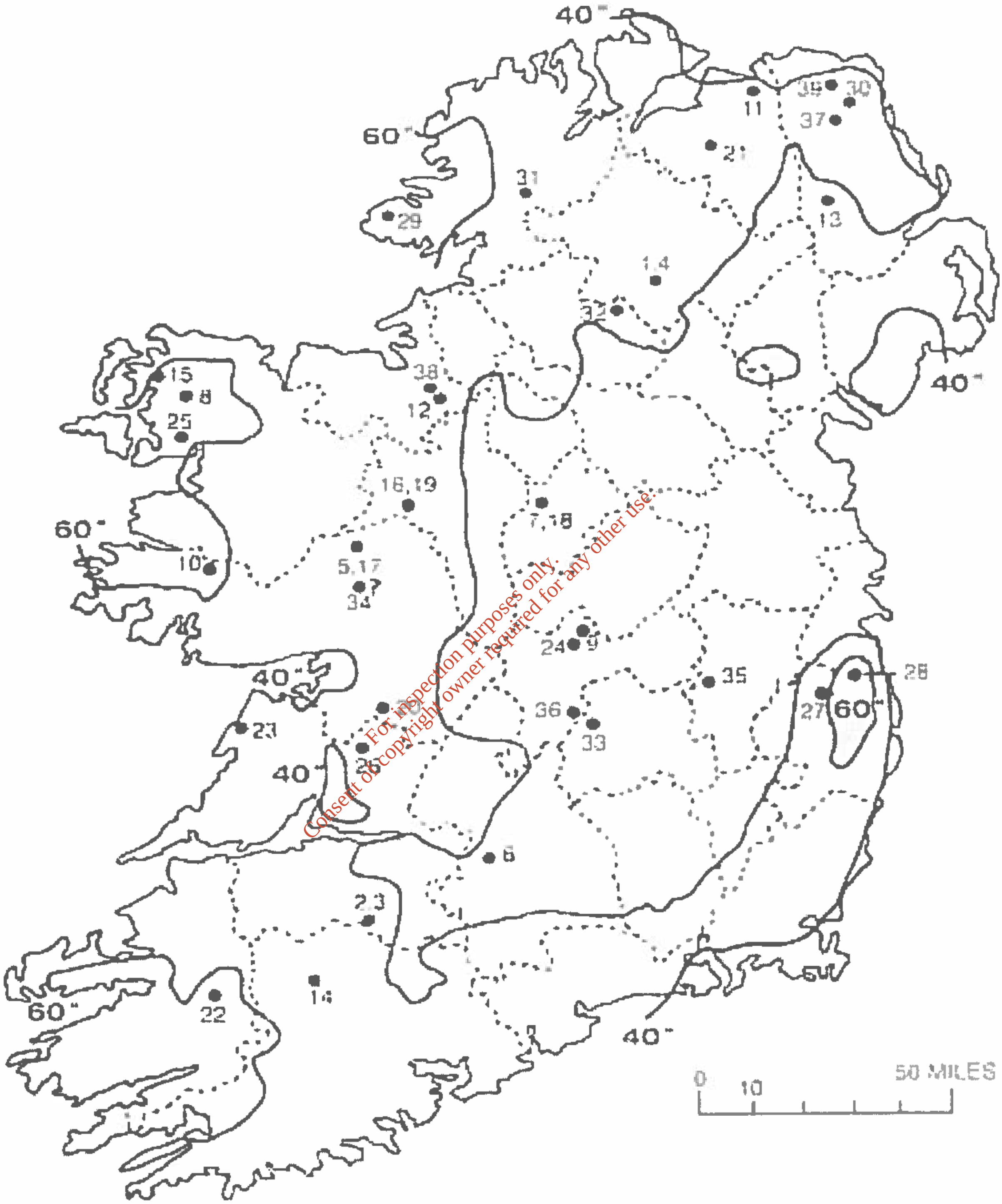


Figure 19 Location of Historical Bog Failures (Feehan & O'Donovan 1996)

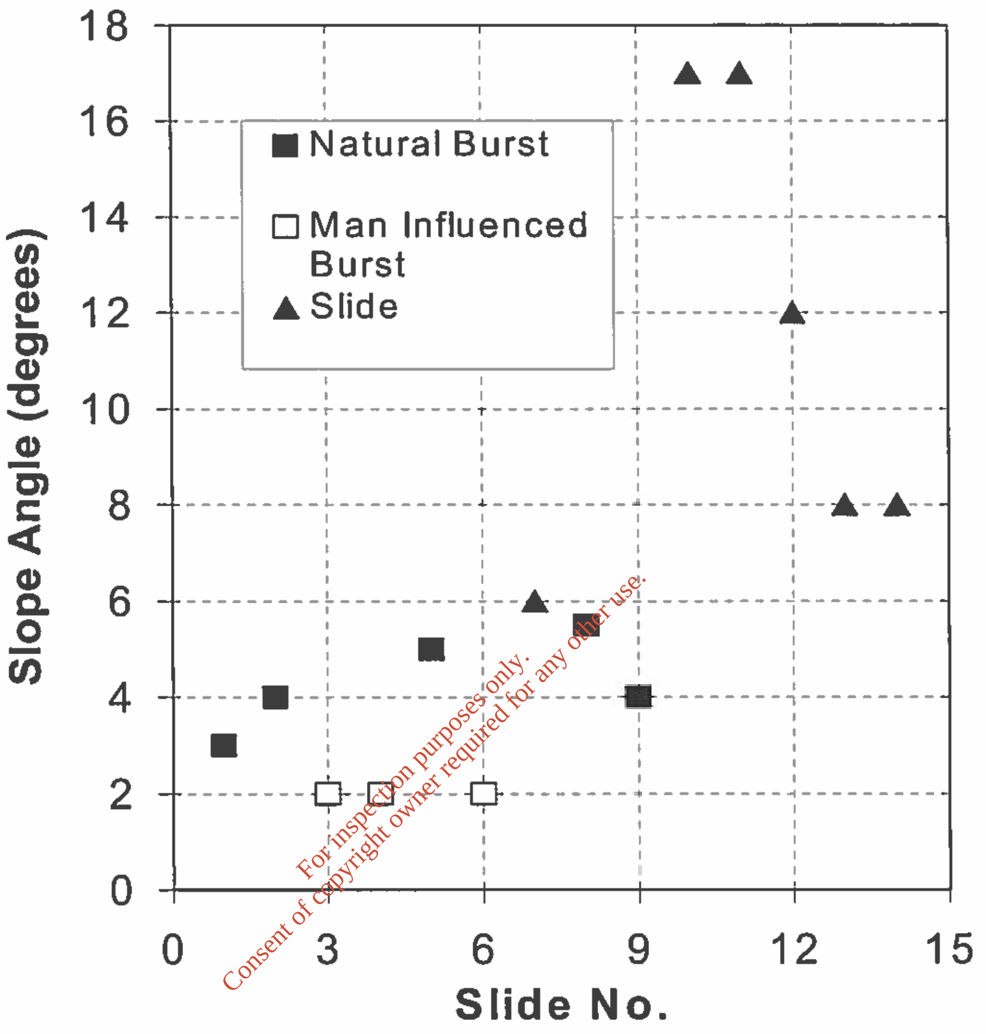


Figure 20 Slope Angles Recorded at Sites of Bog Failure

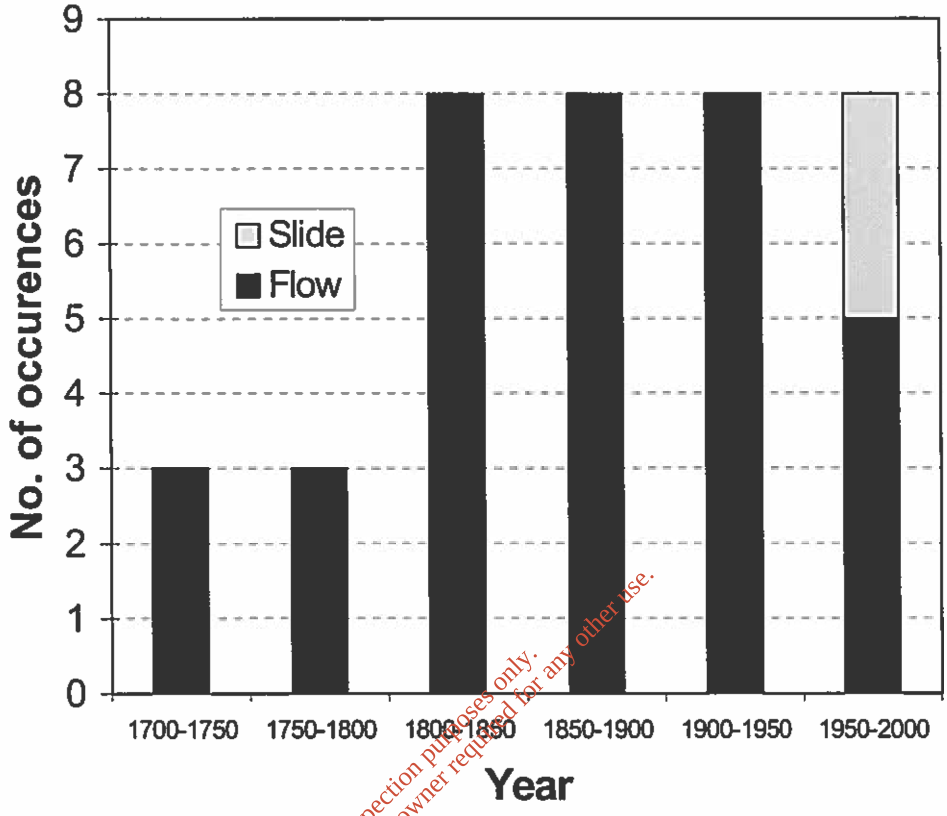
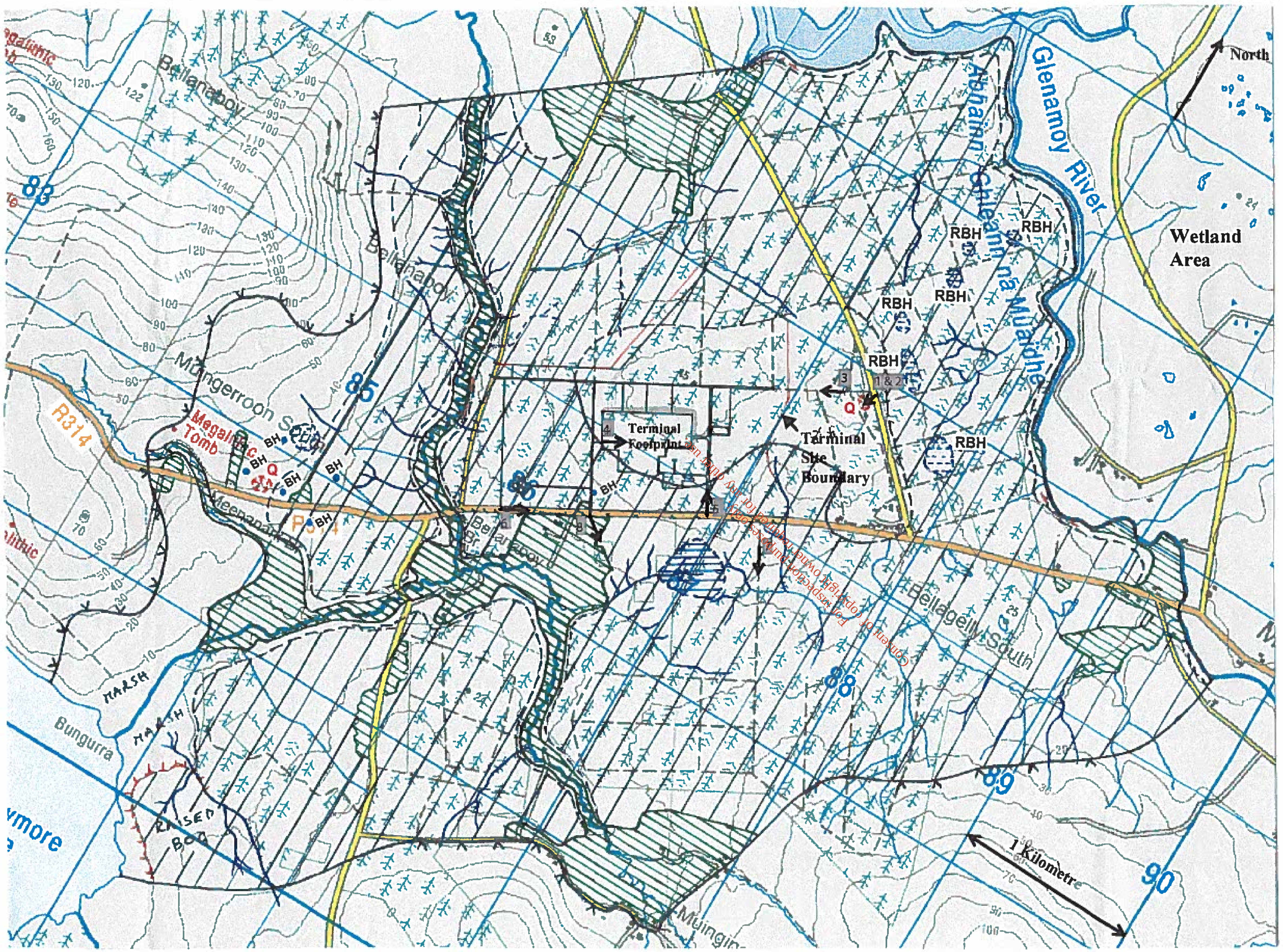


Figure 21 Recorded Occurrences of Bog Failures in Ireland



LEGEND:

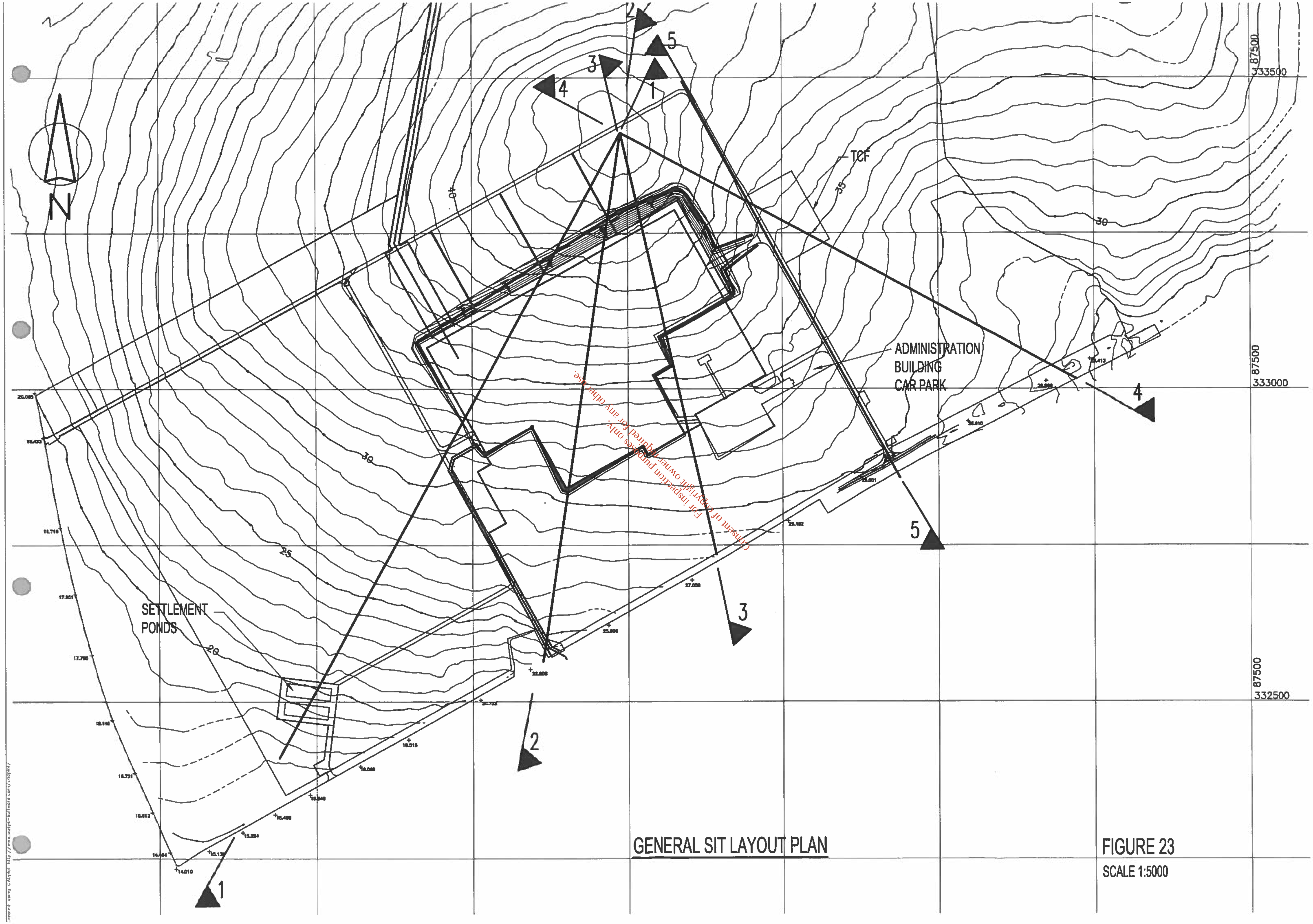
- Limits of Study Area
- Study Area Limits Defined by 6deg. Slope Angle
- Peat Absent or of Reduced Thickness (due to working)
- BH Bog Hole (R. Remnant)
- B Bog Hole Area (R. Remnant)
- Wet Ground Area
- Peat Suspected of being or known to be or more than 3.5m thick
- Potentially unstable steep slopes in peat
- Headward extension of stream drainage (added to OS mapping)
- 2 Location, direction of view and number of photographs in Appendix D
- Q Quarry

Enterprise Energy Ireland Ltd
Corrib Terminal

Morphological Study Area

Bellanaboy Bridge

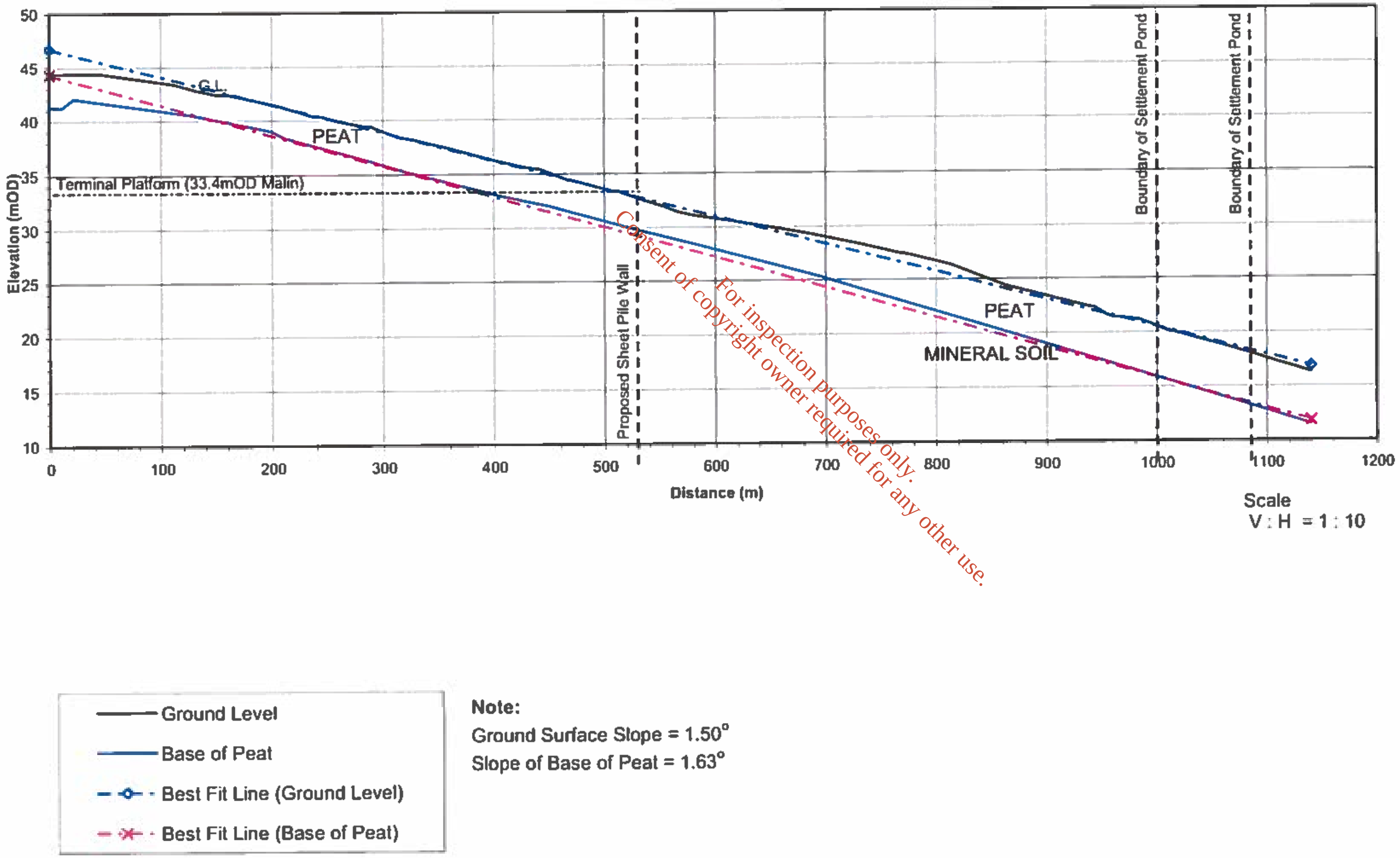
C1157.10 | ARUP | Nov 2003 | **RP004 Fig-22**



GENERAL SIT LAYOUT PLAN

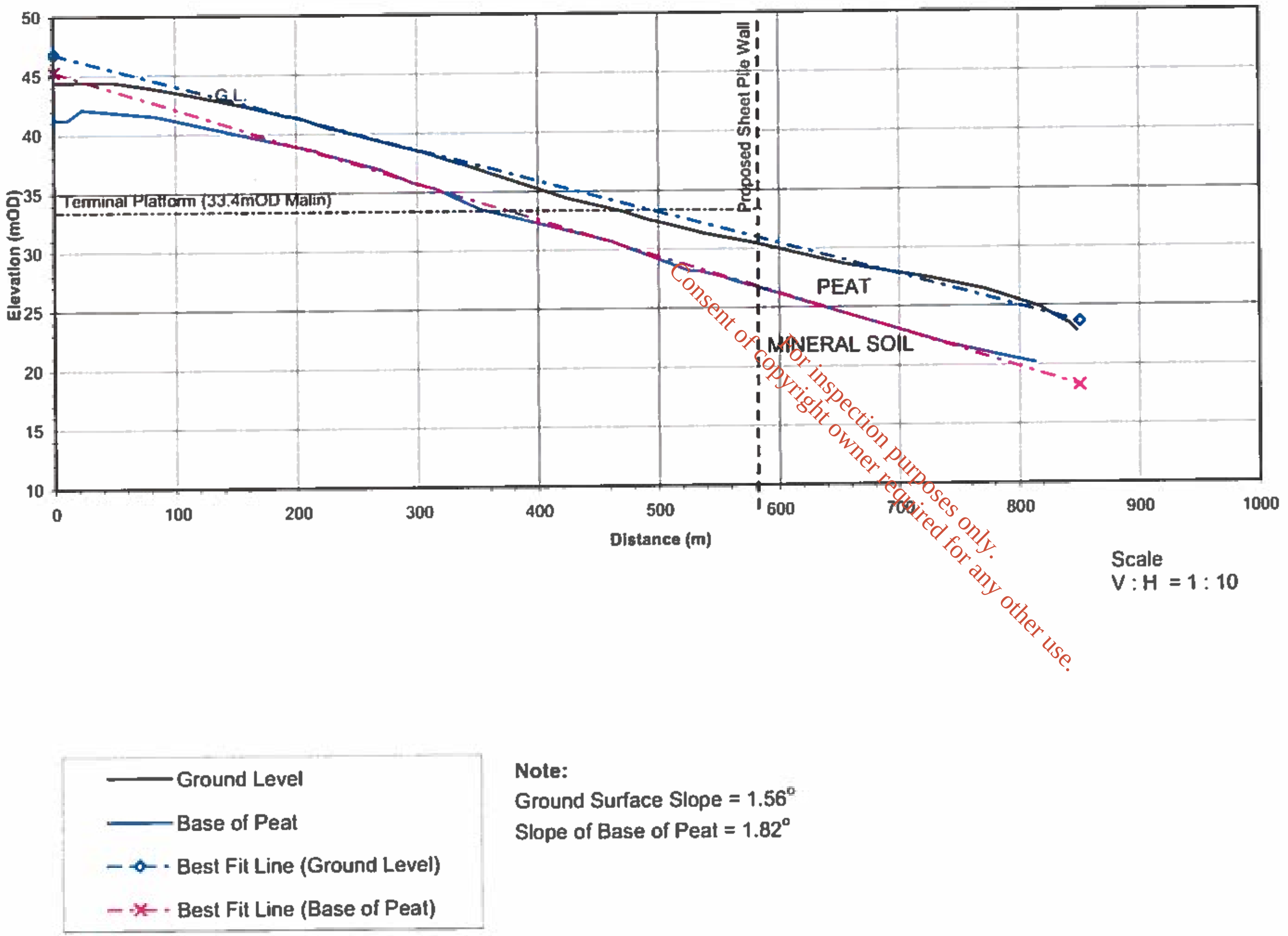
FIGURE 23

SCALE 1:5000



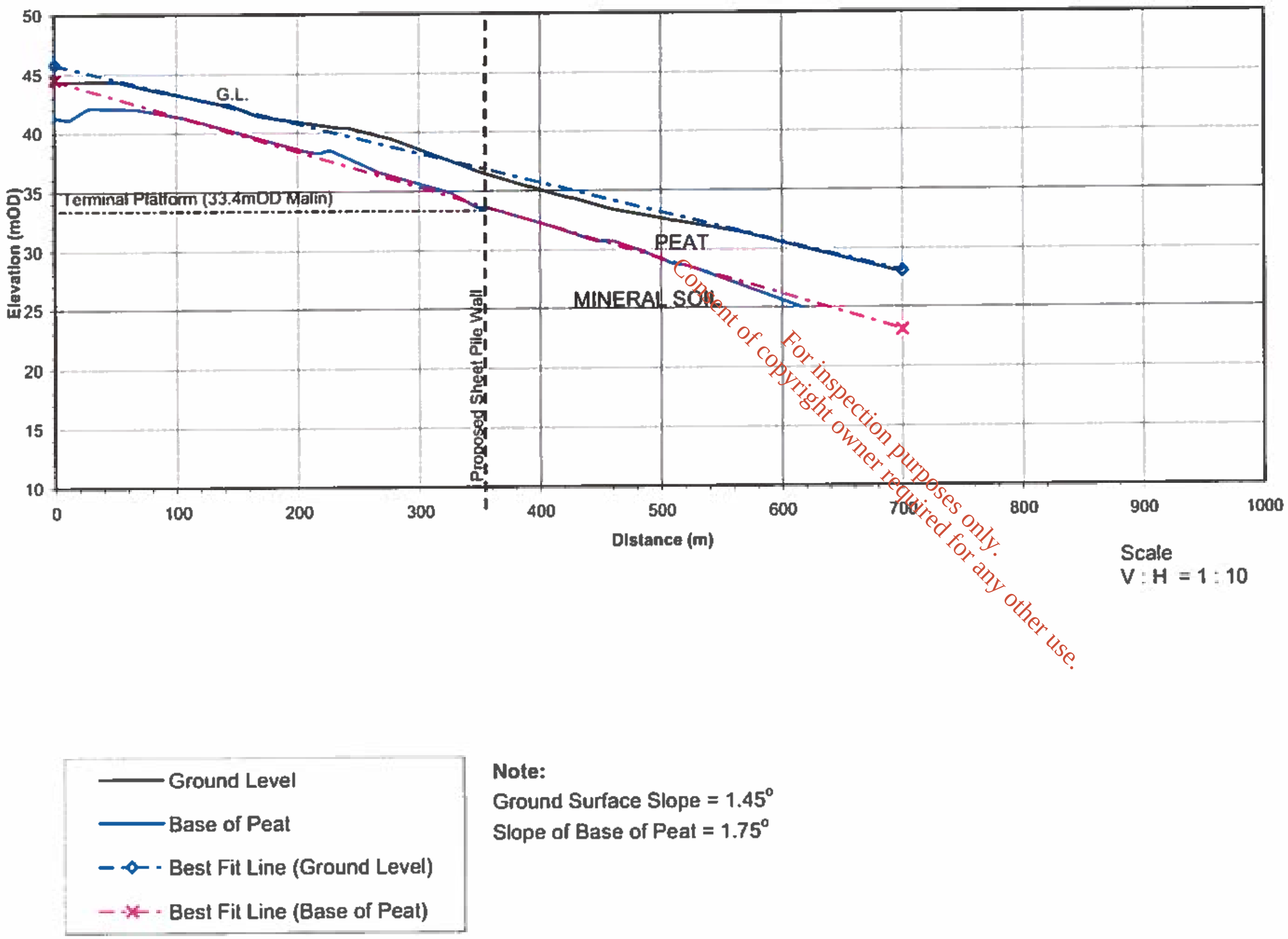
Note:
Ground Surface Slope = 1.50°
Slope of Base of Peat = 1.63°

Figure 24 **Typical Cross-section along Western Area and Settlement Ponds (Cross-section 1)**



Note:
Ground Surface Slope = 1.56°
Slope of Base of Peat = 1.82°

Figure 25 Typical Cross-section along Central Area (Cross-section 2)



Note:
Ground Surface Slope = 1.45°
Slope of Base of Peat = 1.75°

Figure 26 Typical Cross-section along Central Area (Cross-section 3)

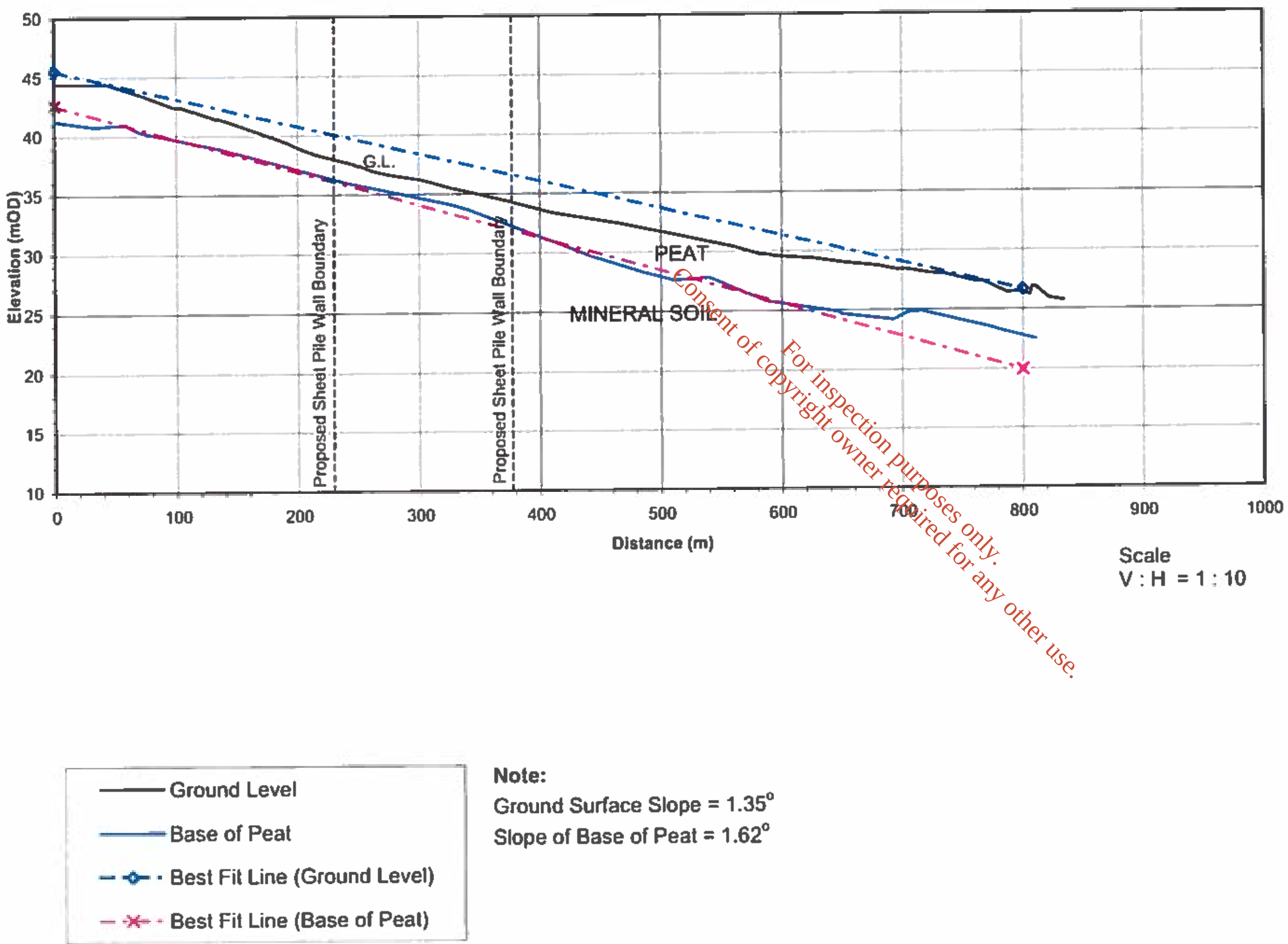
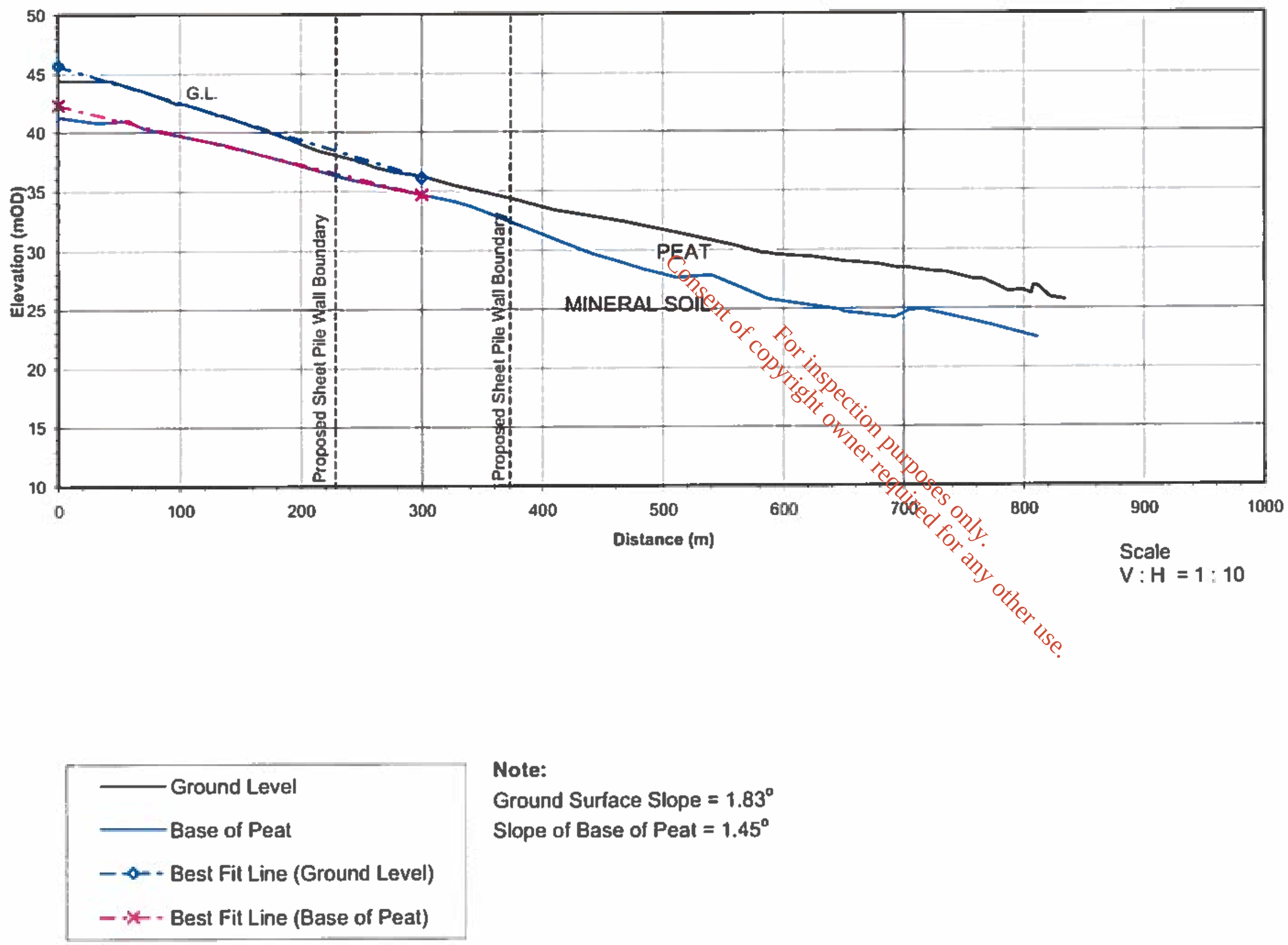


Figure 27 Typical Cross-section along Eastern Area and Temporary Construction Facility (Cross-section 4)



Note:
Ground Surface Slope = 1.83°
Slope of Base of Peat = 1.45°

Figure 27a **Typical Cross-section along Eastern Area and Temporary Construction Facility (Cross-section 4)**

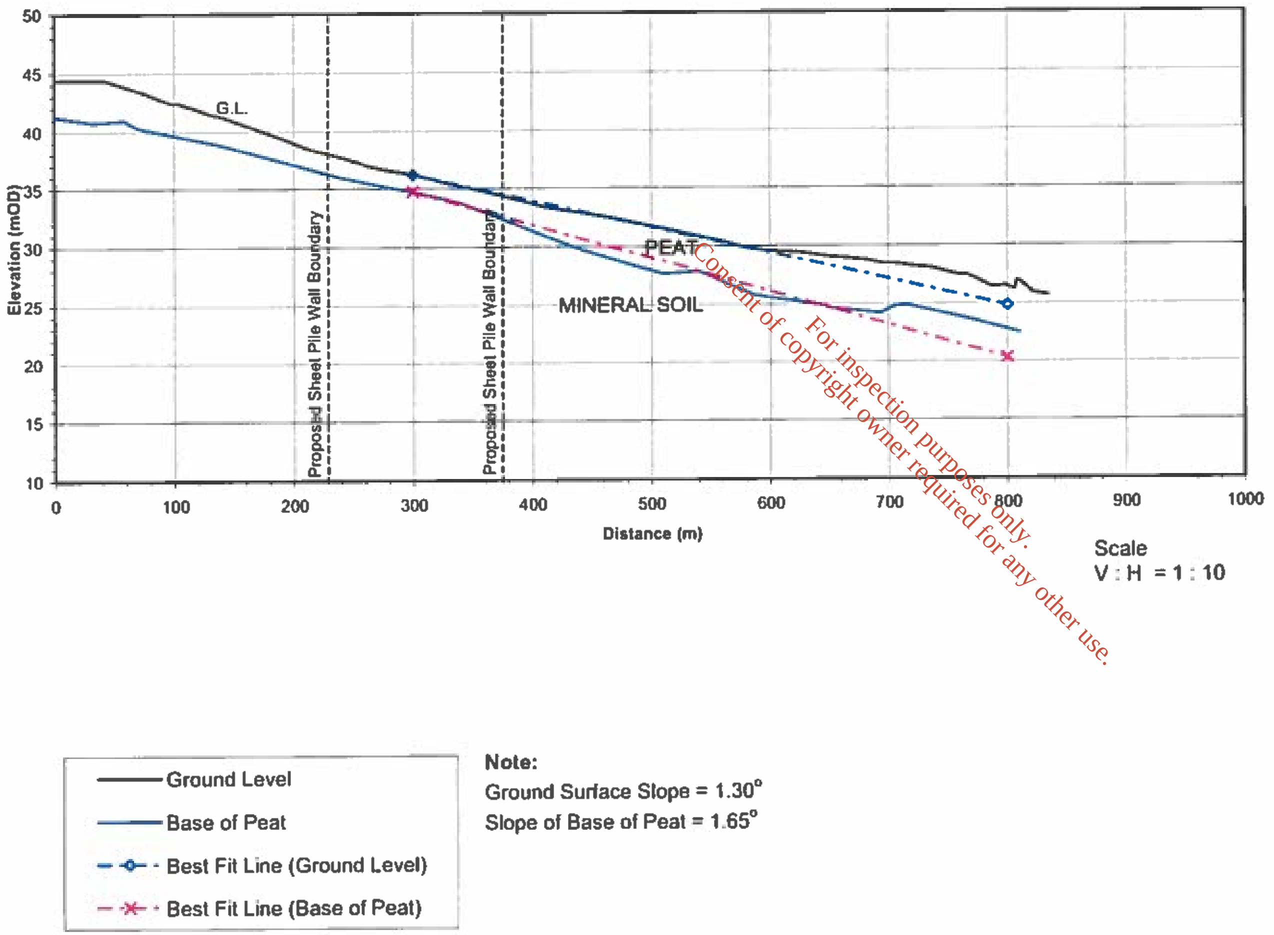


Figure 27b Typical Cross-section along Eastern Area and Temporary Construction Facility (Cross-section 4)

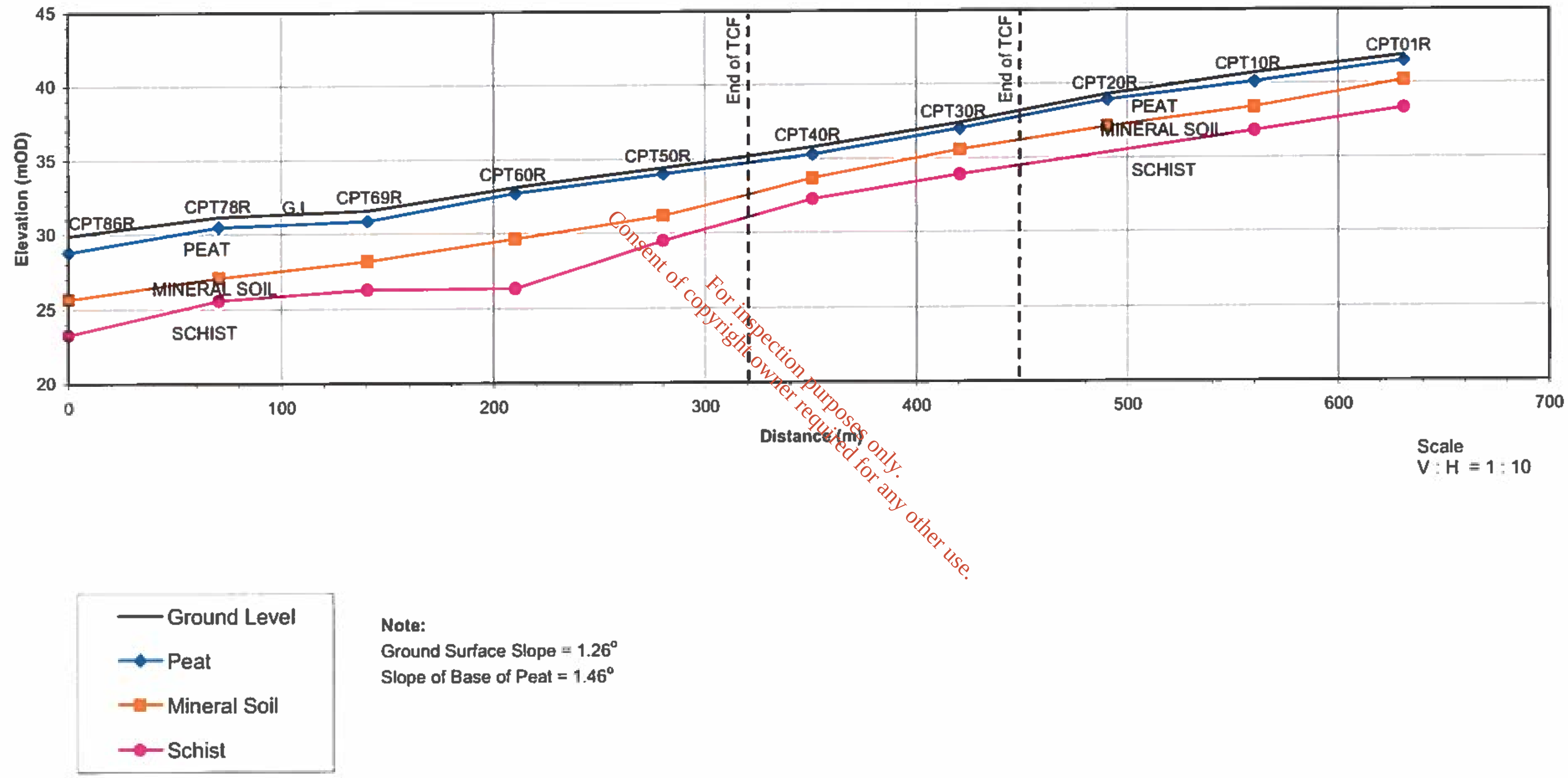


Figure 28 Typical Cross-section of Main Access Road (Cross-section 5)

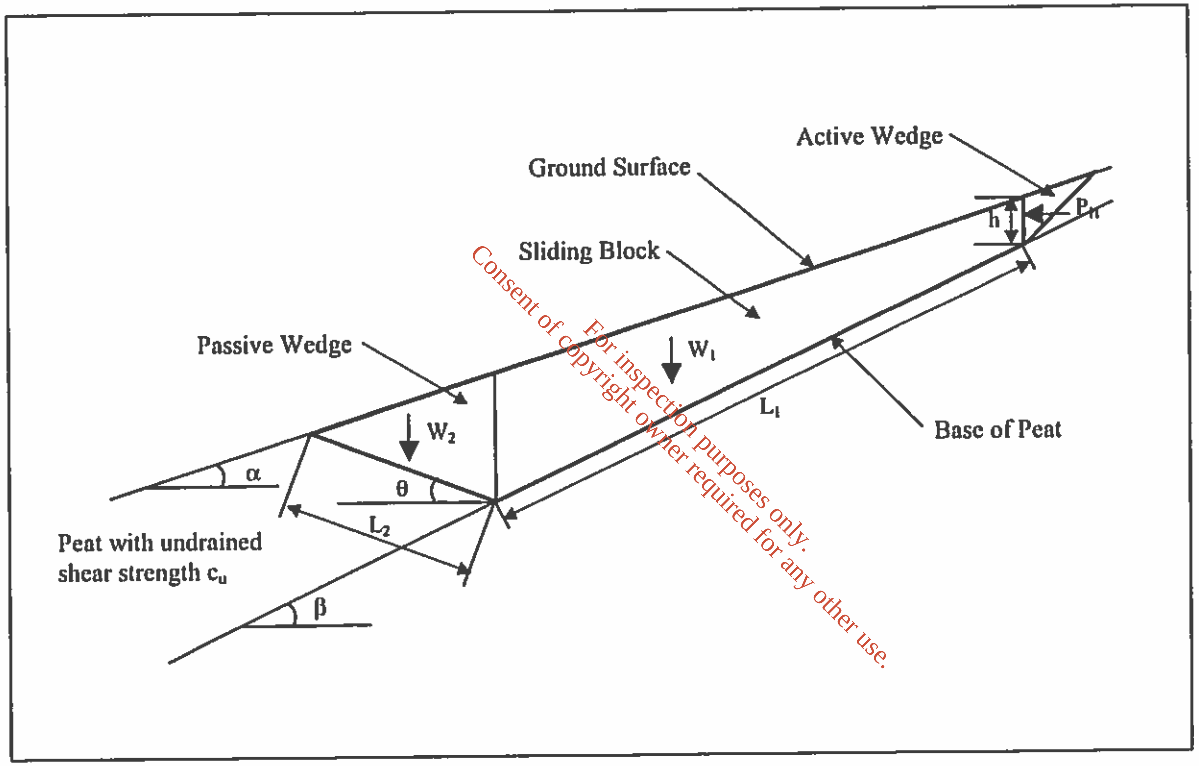
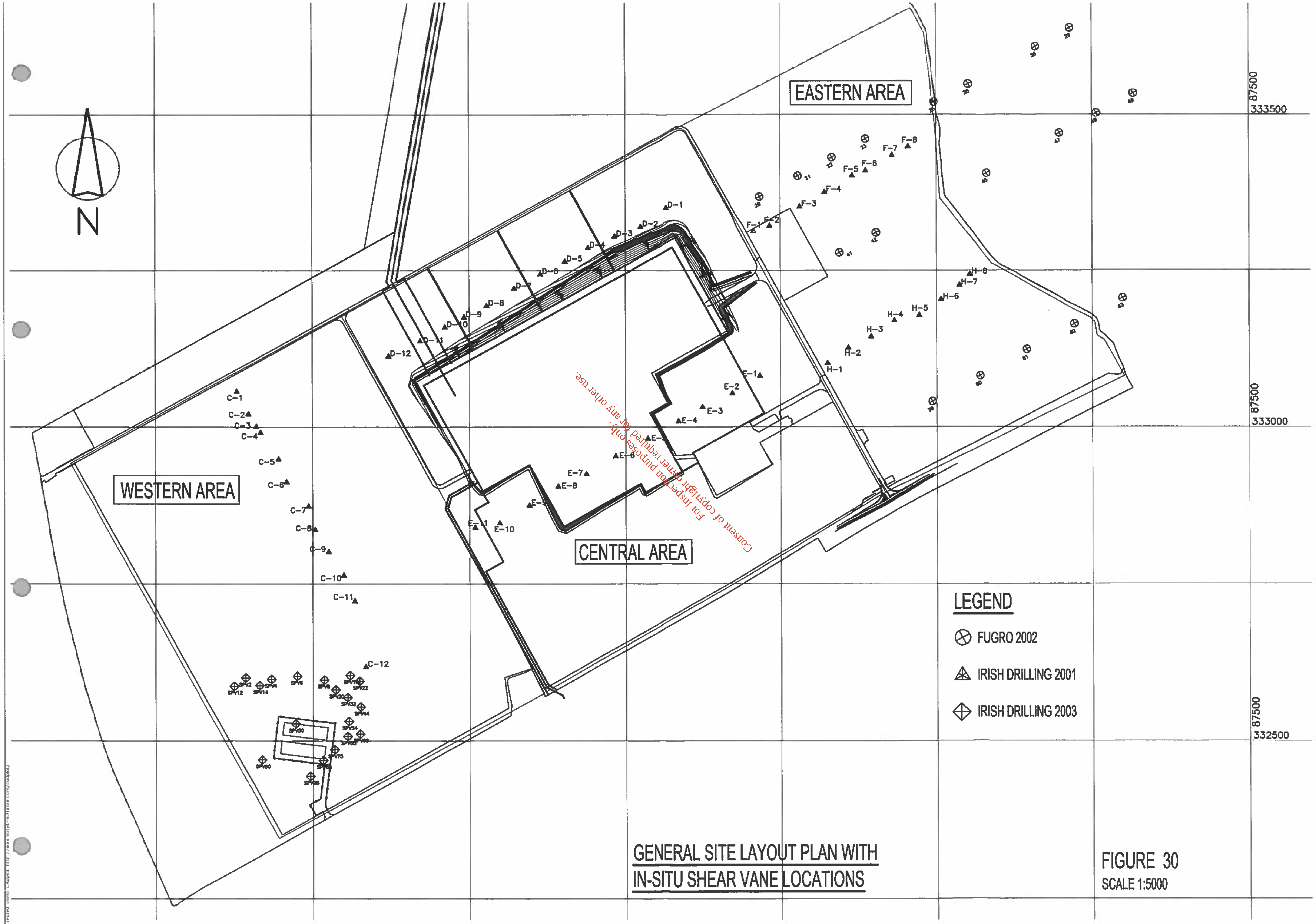


Figure 29 Sliding Wedge Mechanism



LEGEND

- ⊗ FUGRO 2002
- △ IRISH DRILLING 2001
- ◇ IRISH DRILLING 2003

GENERAL SITE LAYOUT PLAN WITH IN-SITU SHEAR VANE LOCATIONS

FIGURE 30
SCALE 1:5000

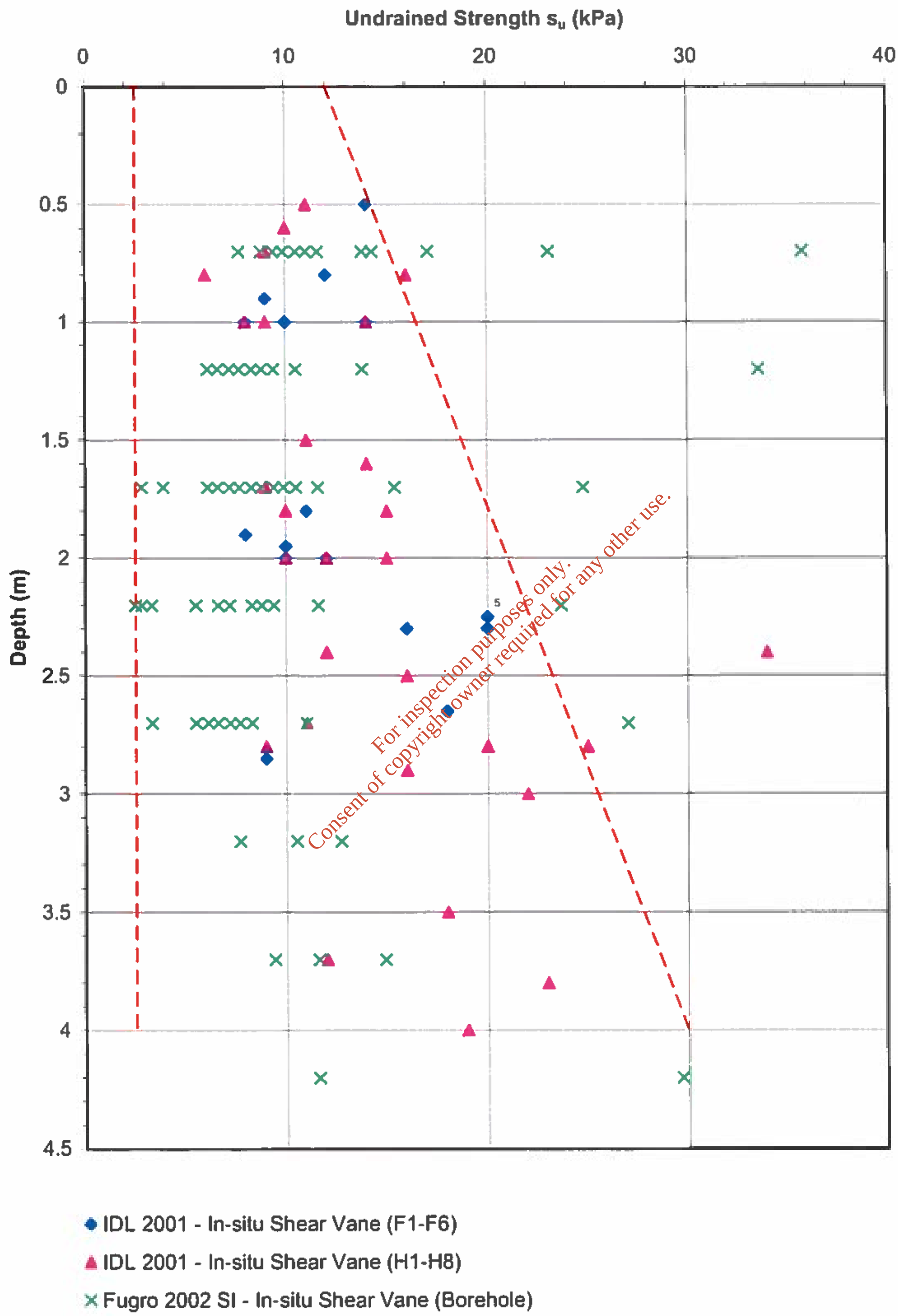


Figure 31 Summary of Undrained Shear Strength (Eastern Area)

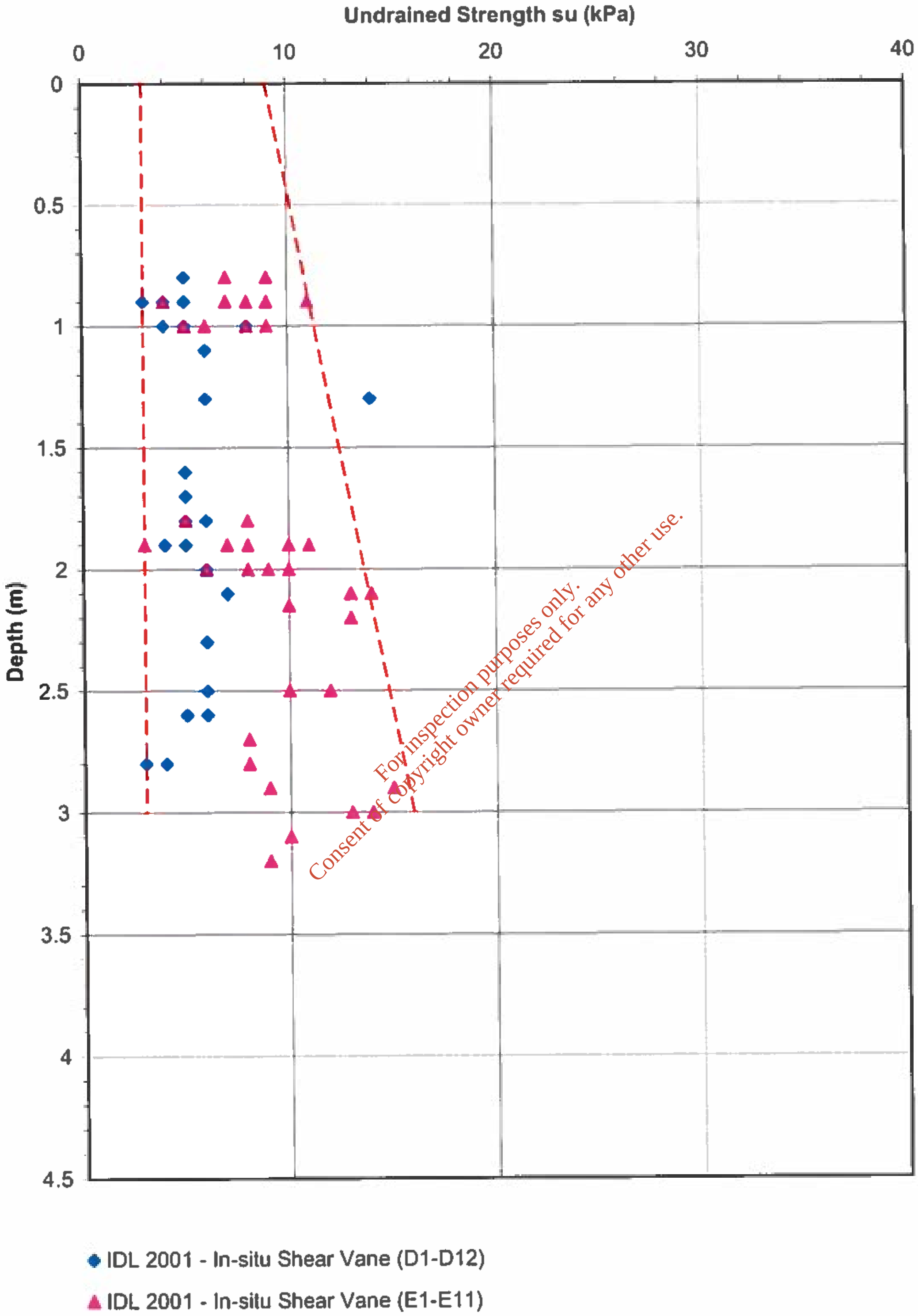


Figure 32 Summary of Undrained Shear Strength (Central Area)

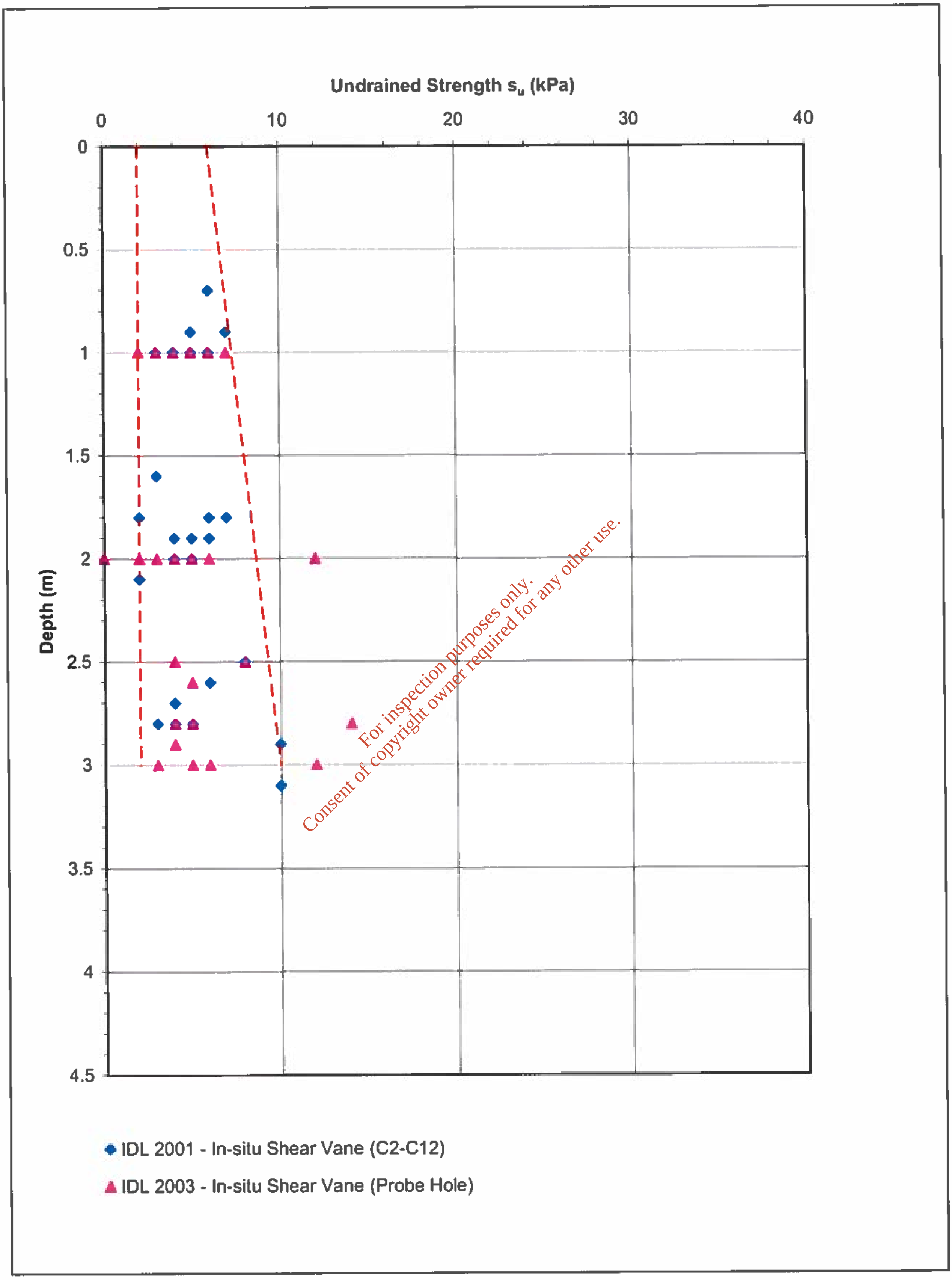
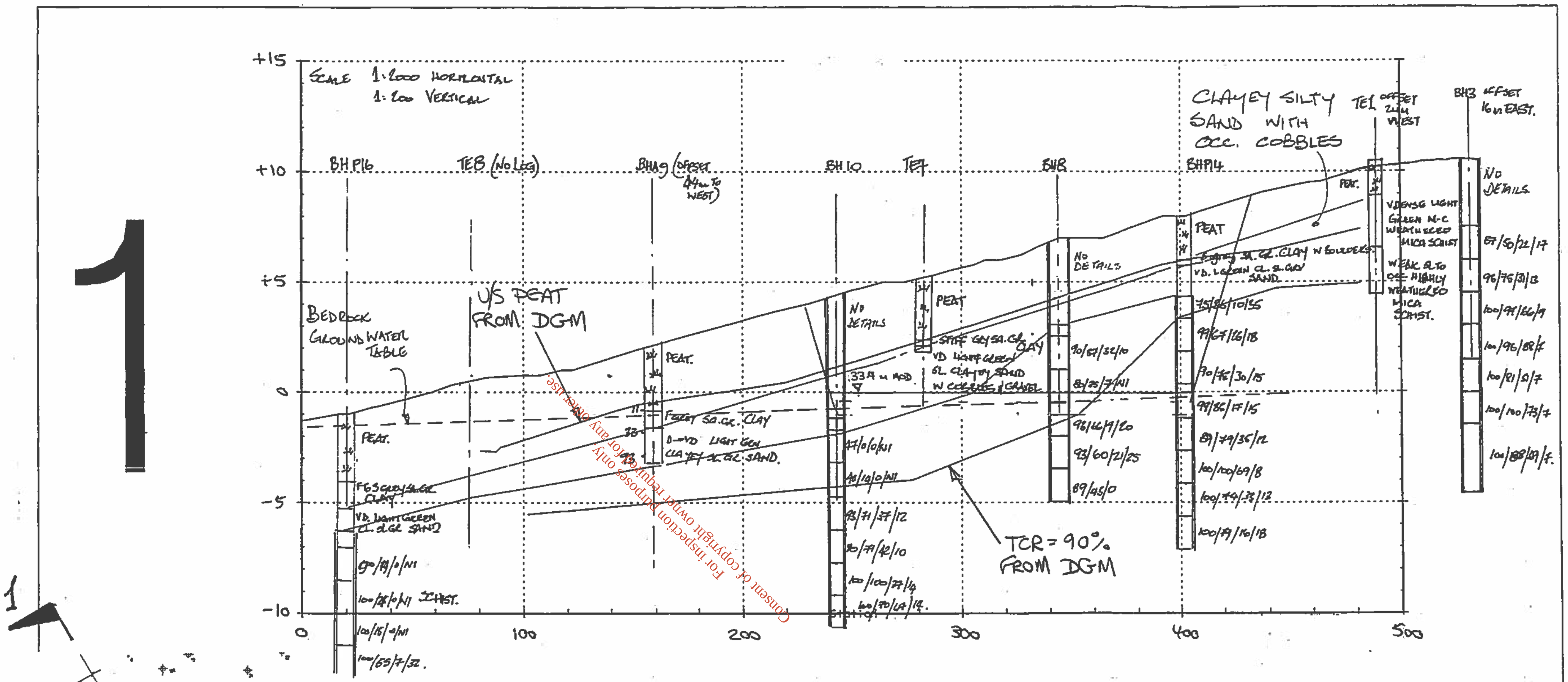
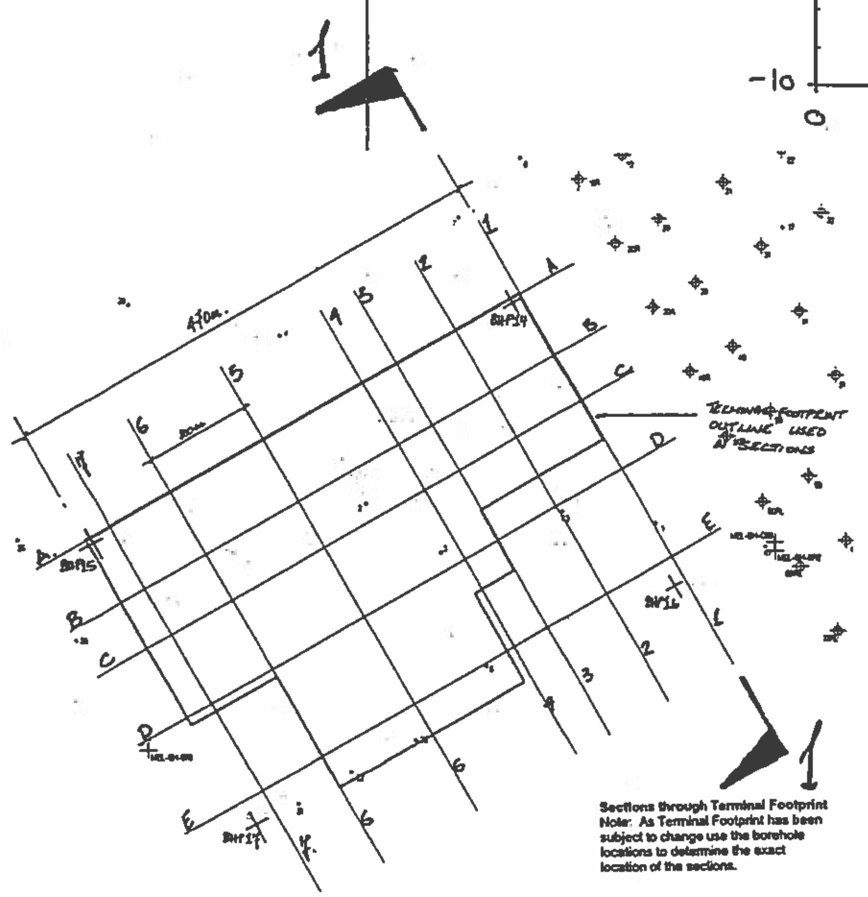


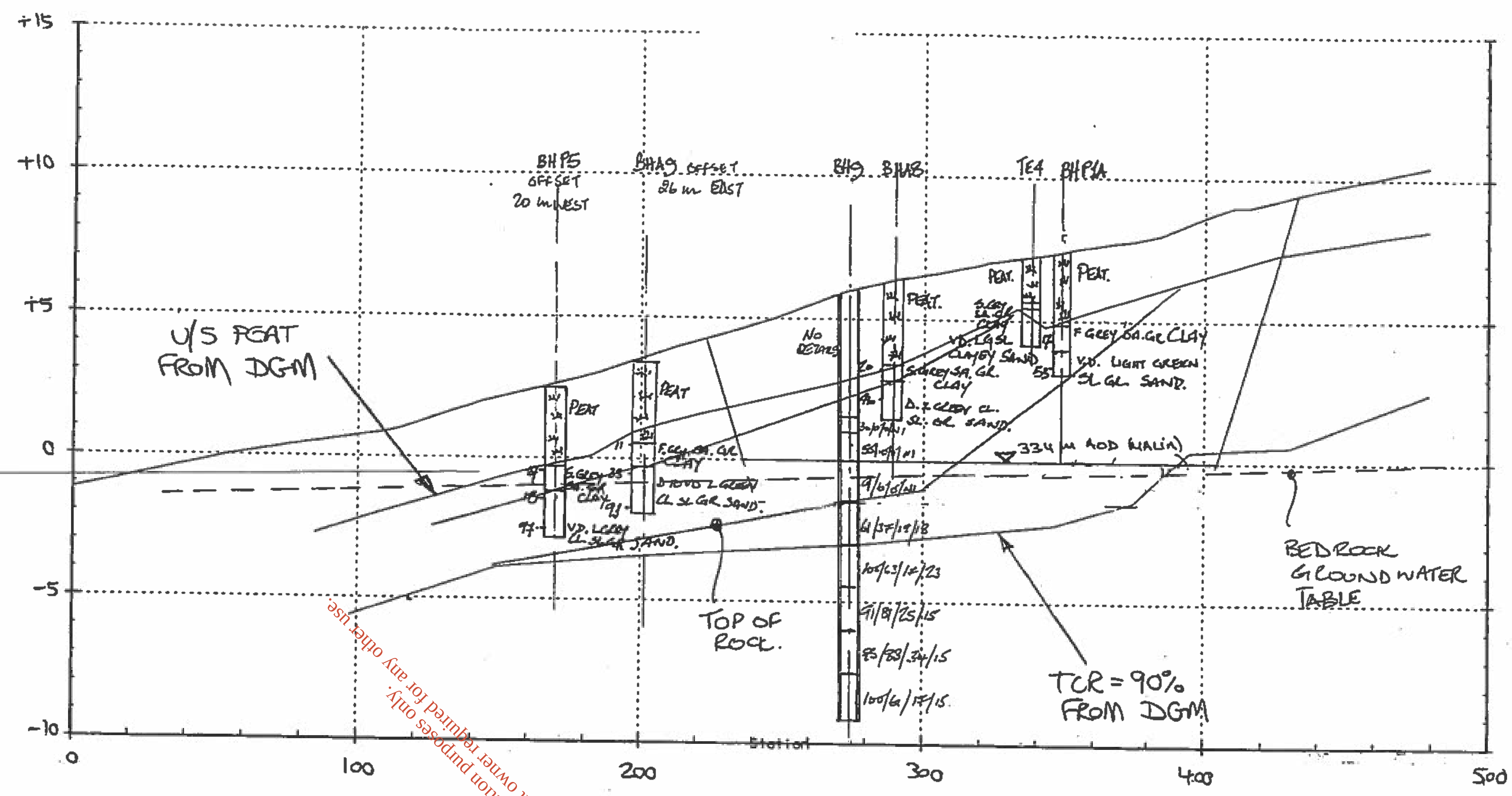
Figure 33 Summary of Undrained Shear Strength (Western Area)

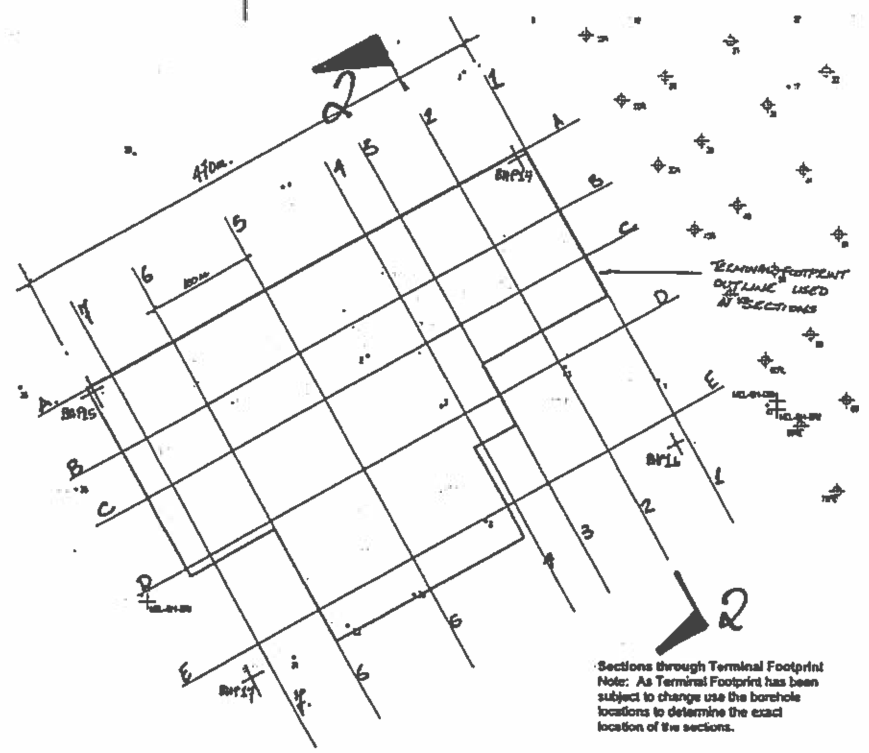




ARUP	15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345
Status	DESIGN
Job Title	CORRIB TERMINAL
Drawing Title	GEO SECTION 1 THRU TERMINAL
Scales	1:2000H, 1:200V
File Ref.	Mat. Cl.
Drn	J O'Brien
Date	Oct '03
Chd	
Approved	
Job No.	C1157.10
Drg. No.	Sk10.10.03-001
Rev.	C

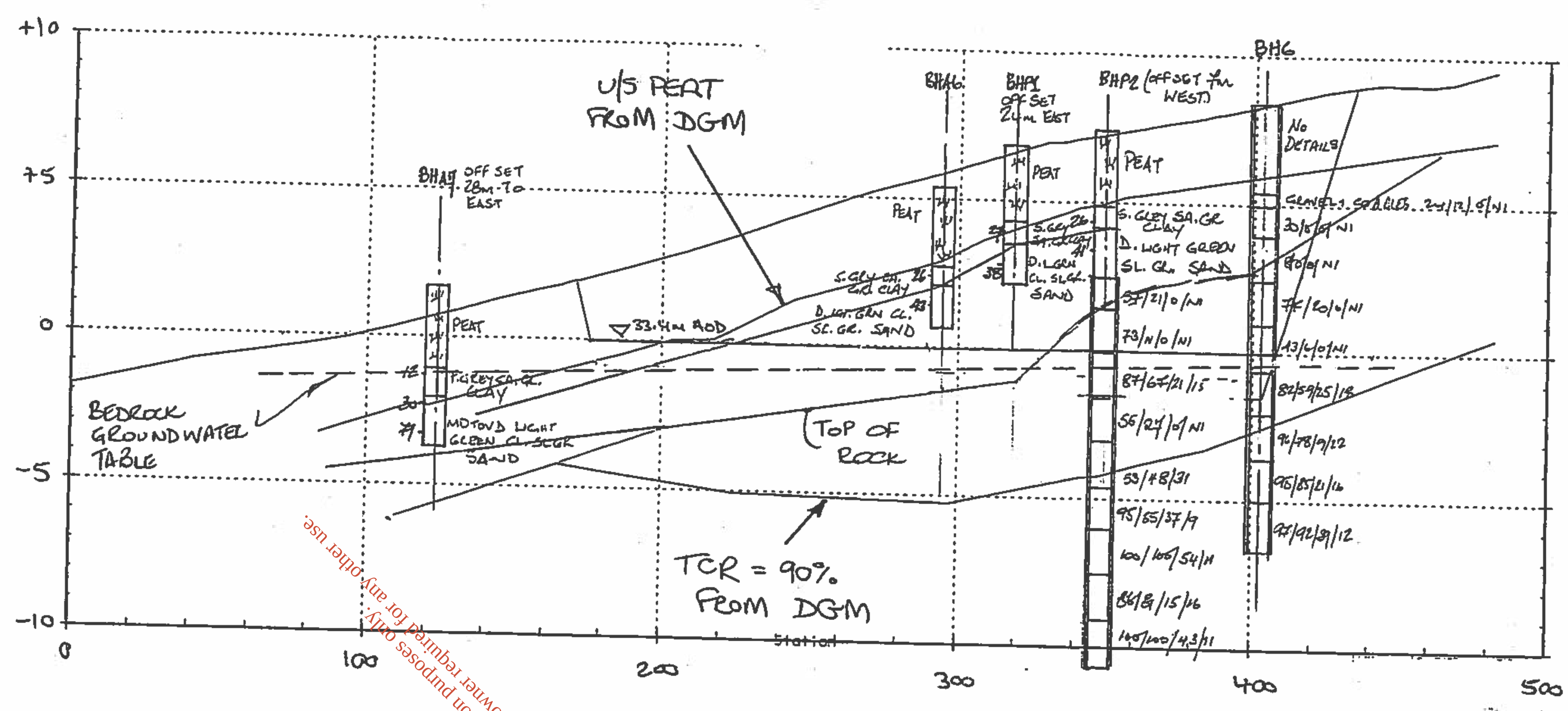
2

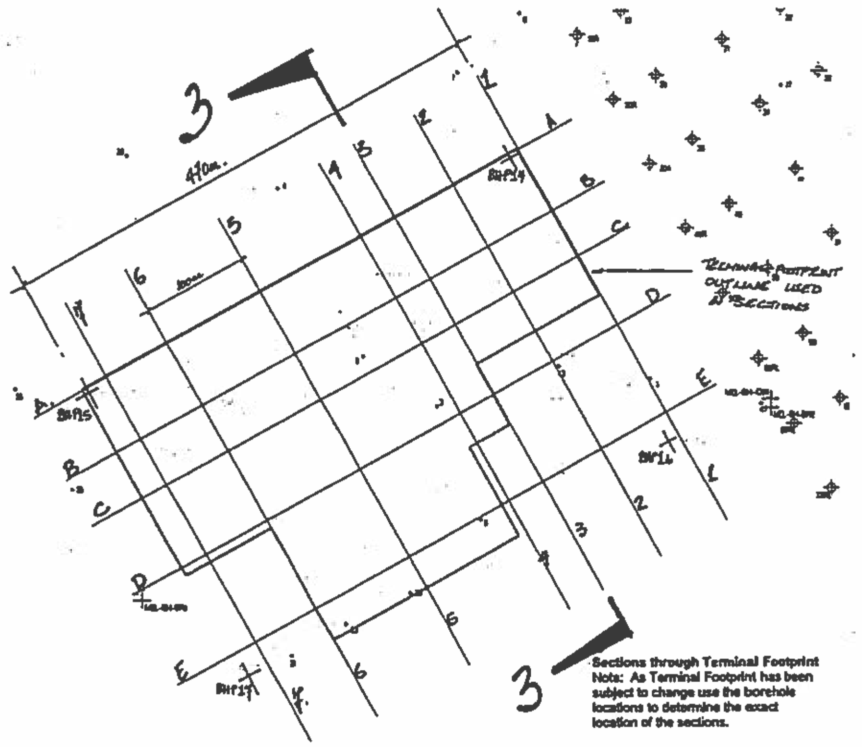




ARUP	15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345		
Status	DESIGN		
Job Title	CORRIB TERMINAL		
Drawing Title	GEO SECTION 2 THRU TERMINAL		
Scales	1:2000H, 1:200V	File Ref.	Mat. Cl.
Drn J O'Brien	Date Oct '03	Chd	Approved
Job No. C1157.10	Drg. No. Sk10.10.03-002		Rev. C

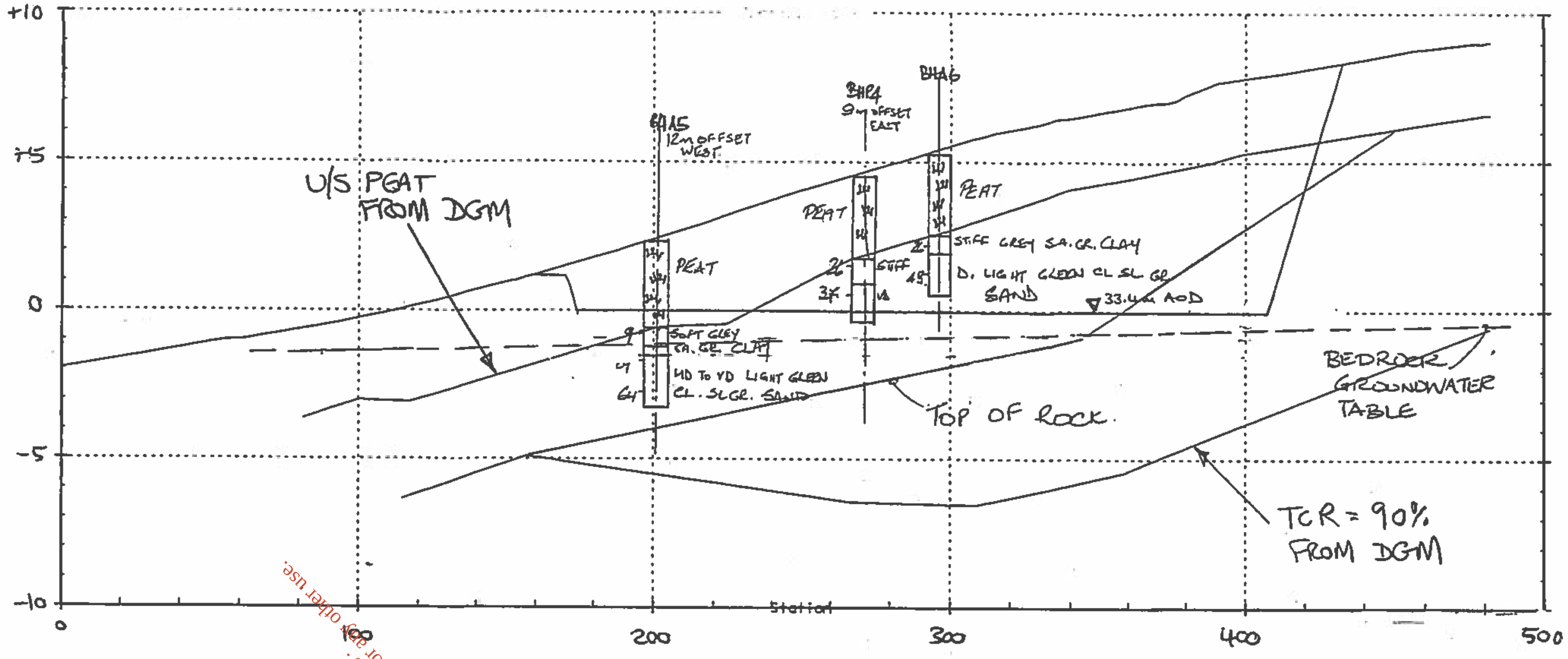
3

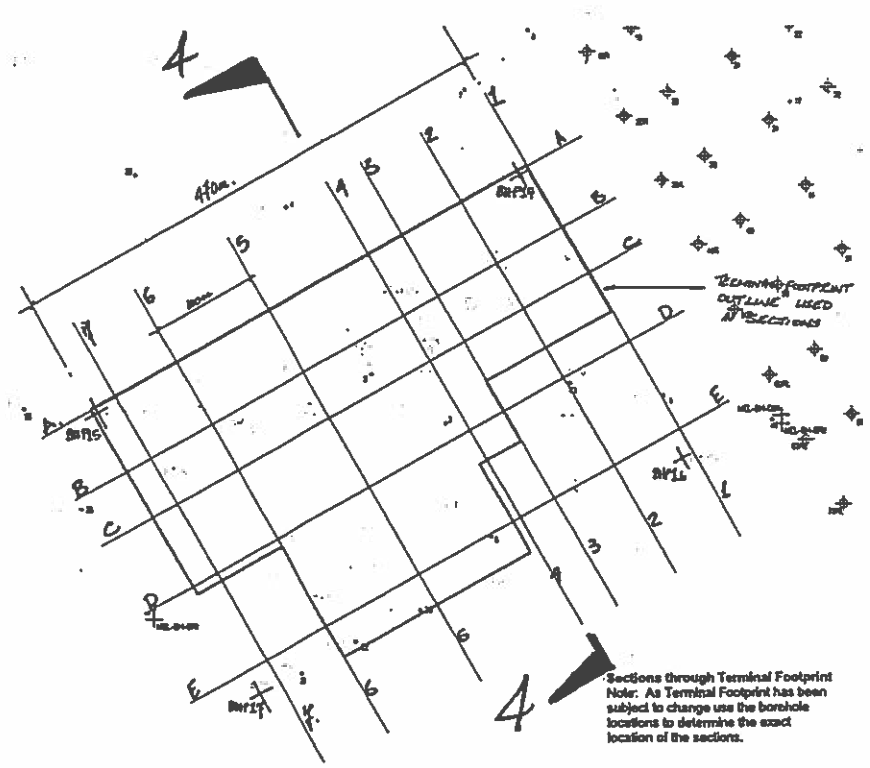




ARUP	15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345
Status	DESIGN
Job Title	CORRIB TERMINAL
Drawing Title	GEO SECTION 3 THRU TERMINAL
Scales 1:2000H, 1:200V	File Ref. Mat. Cl.
Drn J O'Brien · Date Oct '03	Chd · Approved
Job No. C1157.10	Drg. No. SK10.10.03-003 · Rev. C

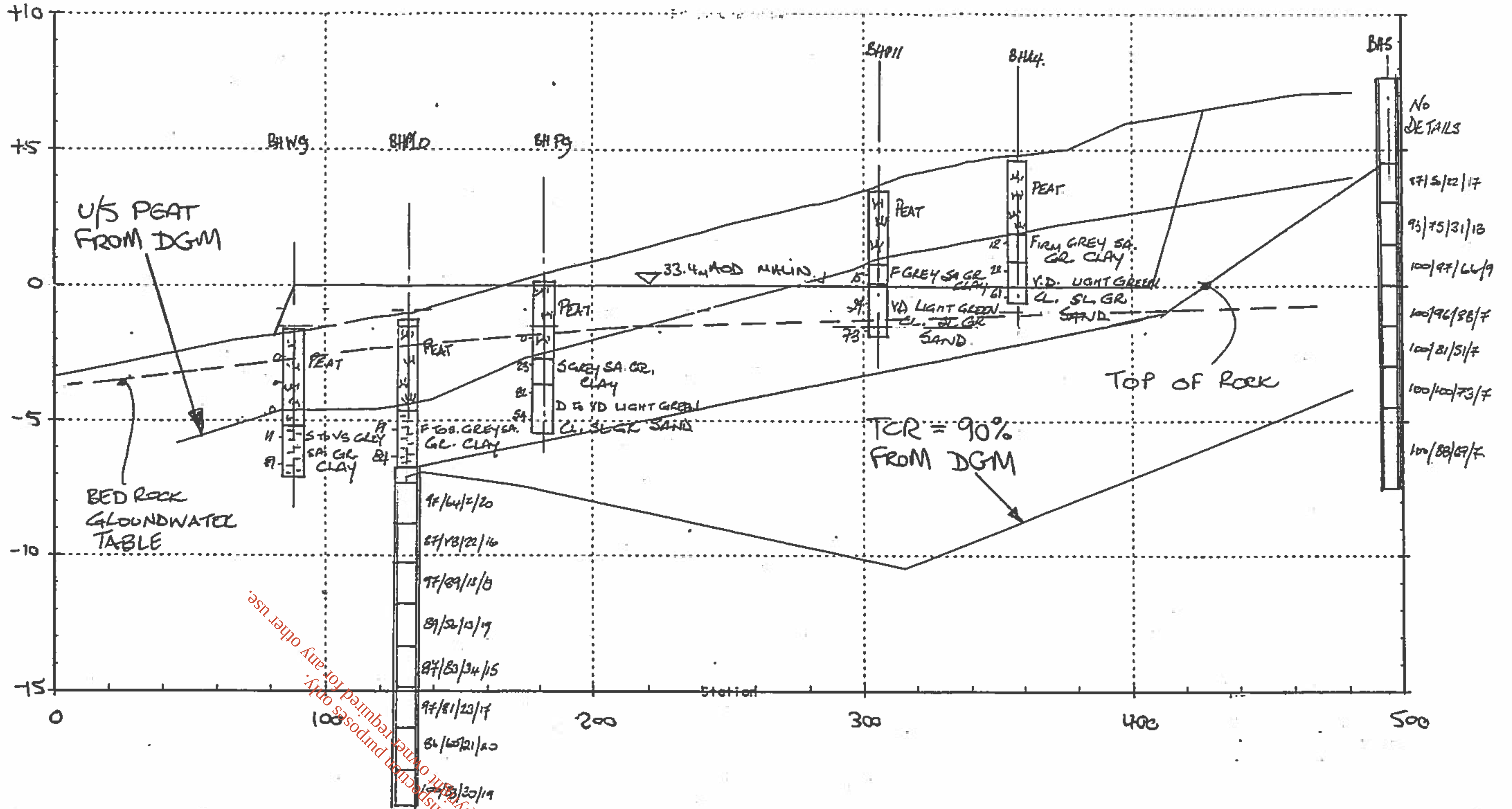
4

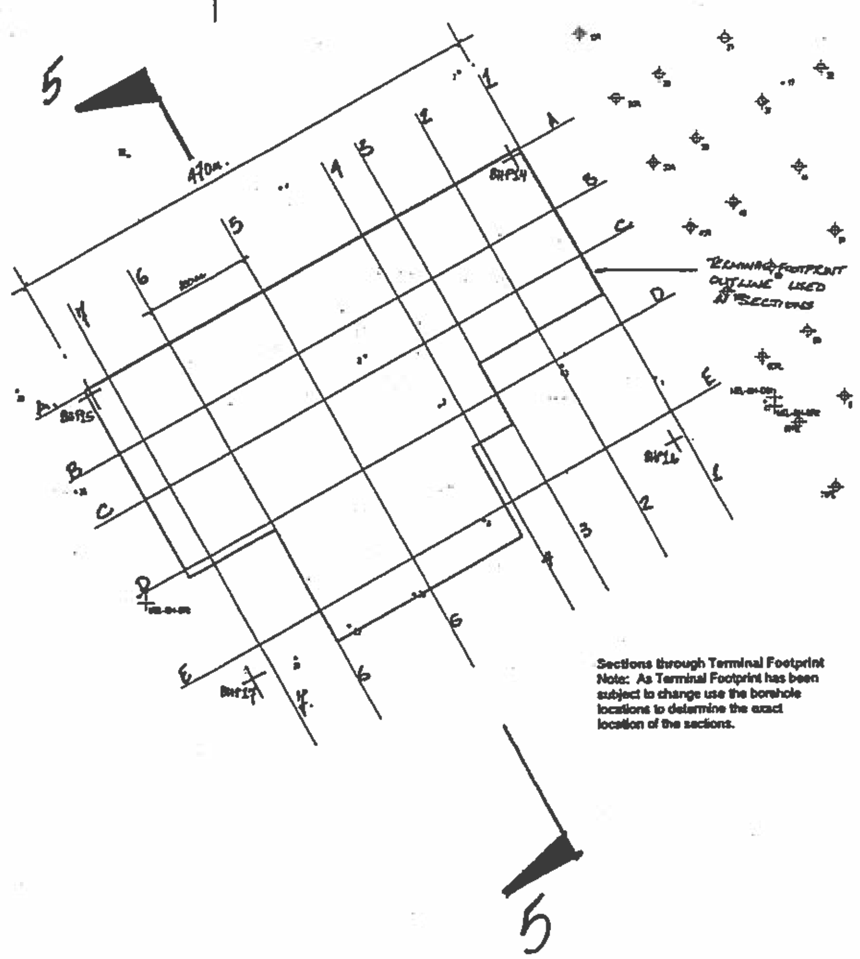




ARUP	15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345		
Status	DESIGN		
Job Title	CORRIB TERMINAL		
Drawing Title	GEO SECTION 4 THRU TERMINAL		
Scales	1:2000H, 1:200V	File Ref.	Mat. Cl.
Drn J O'Brien	Date Oct '03	Chd	Approved
Job No. C1157.10	Drg. No. SK70.10.03-004		Rev. C

5



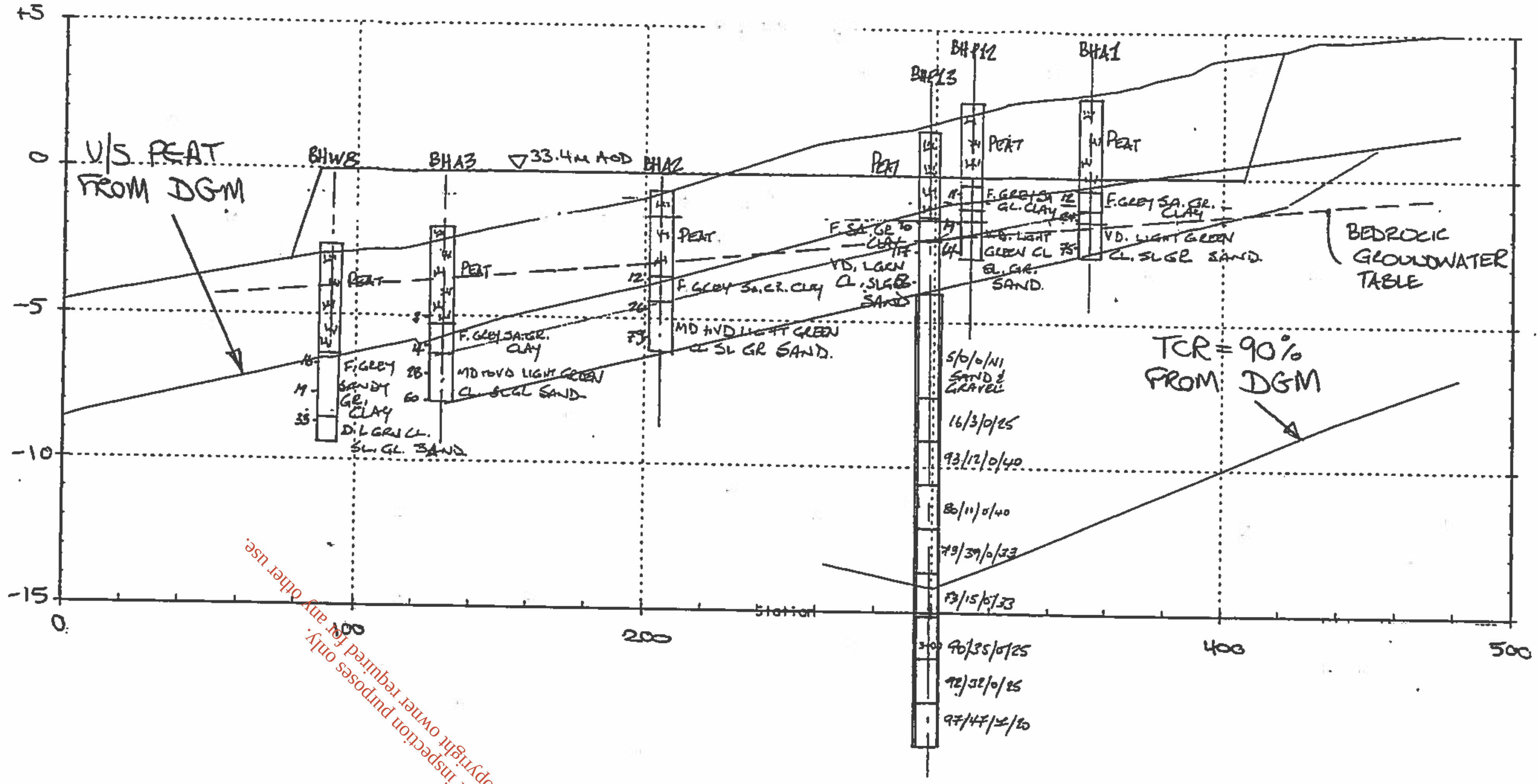


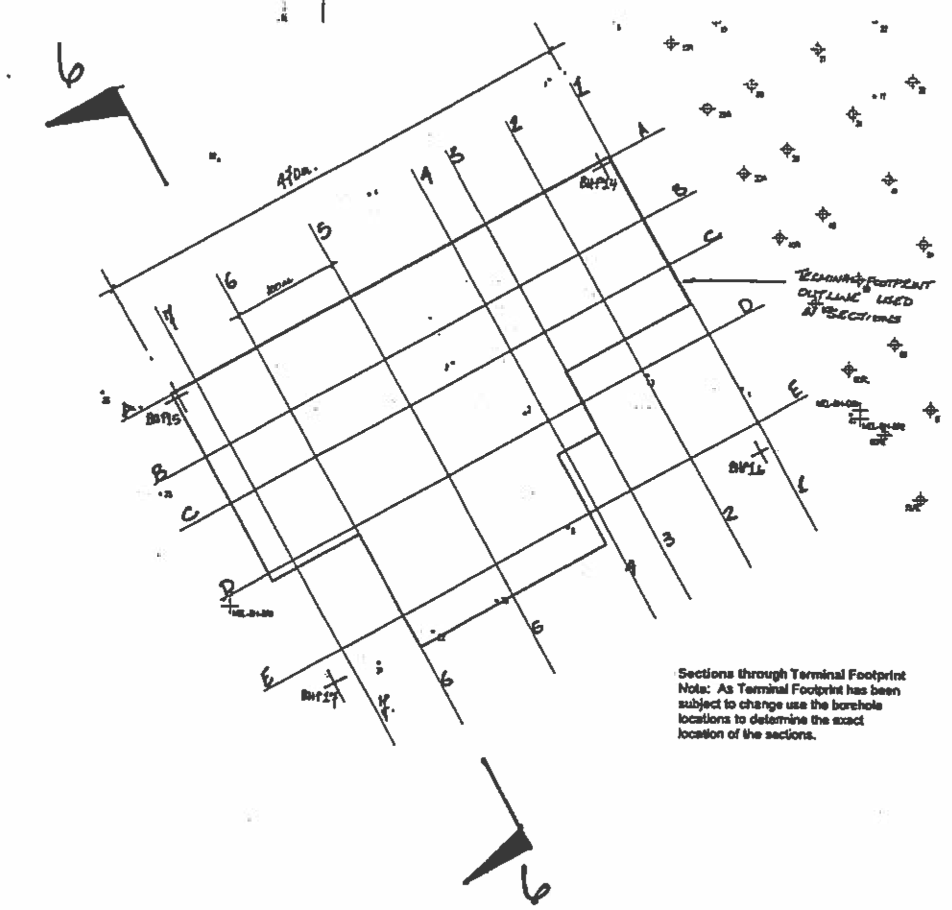
ARUP

15 Oliver Plunkett St. Cork
Tel: +353 (0)21 4277670
Fax: +353 (0)21 4272345

Status	DESIGN
Job Title	CORRIB TERMINAL
Drawing Title	GEO SECTION 5 THRU TERMINAL
Scales	1:2000H, 1:200V
File Ref.	Mat. Cl.
Drn	J O'Brien
Date	Oct '03
Job No.	C1157.10
Drg. No.	SK10.10.03-005
Rev.	C

6



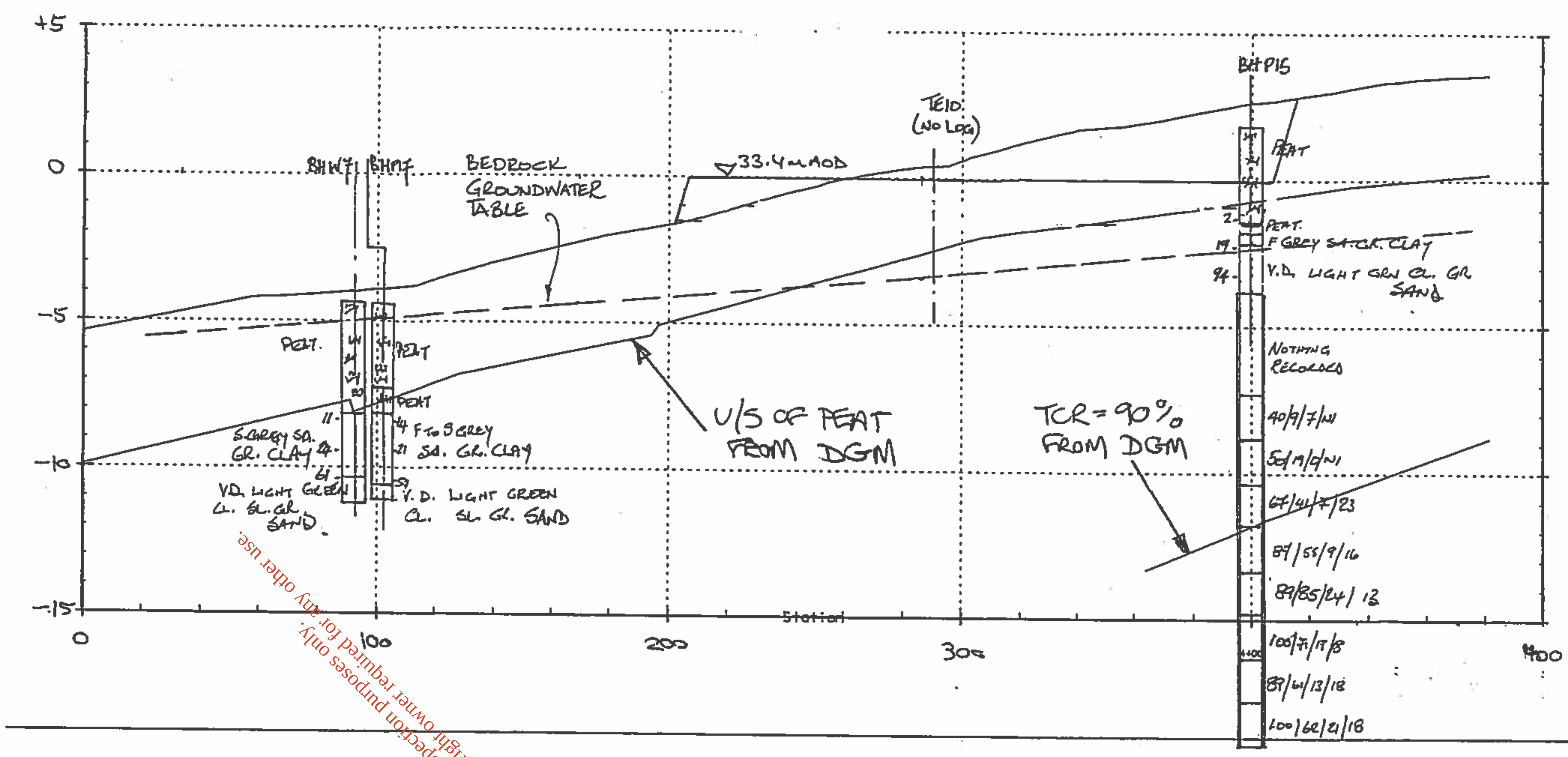


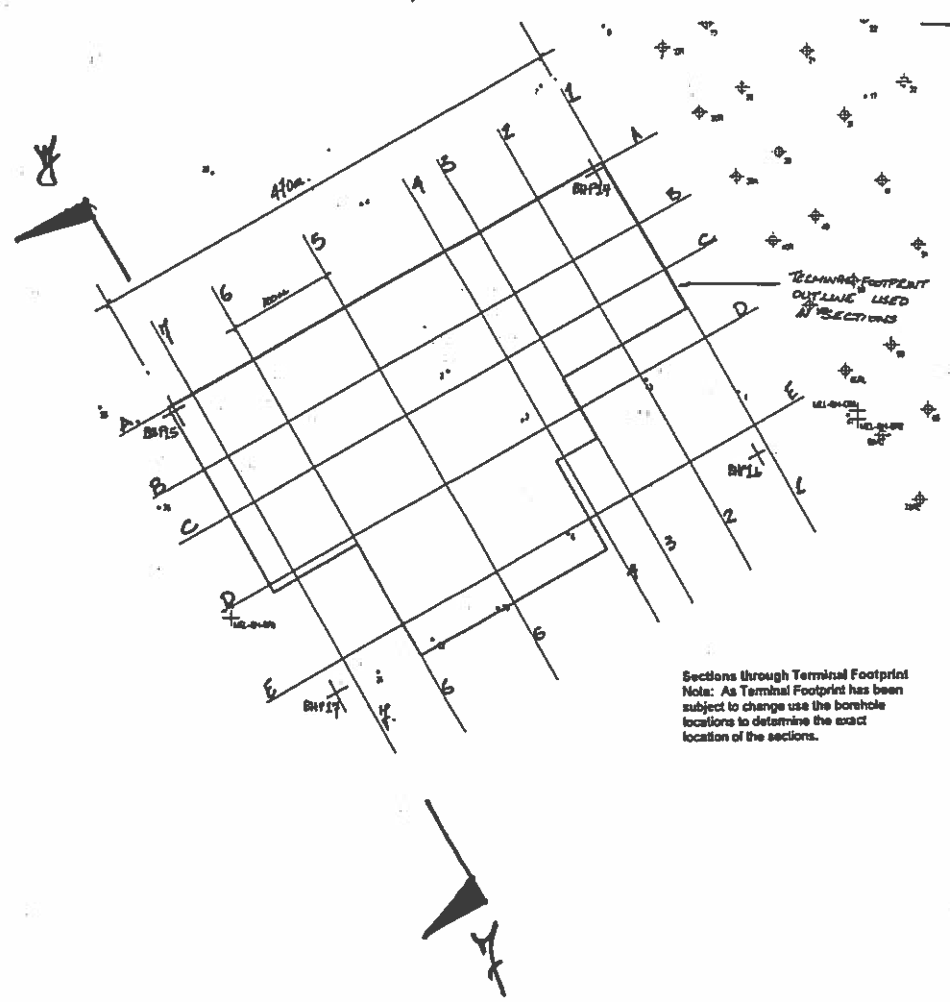
Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

ARUP
15 Oliver Plunkett St. Cork
Tel: +353 (0)21 4277670
Fax: +353 (0)21 4272345

Status	DESIGN		
Job Title	CORRIB TERMINAL		
Drawing Title	GEO SECTION 6 THRU TERMINAL		
Scales	1:2000H, 1:200V	File Ref.	Mat. Cl.
Drn J O'Brien	Date Oct '03	Chd	Approved
Job No. C1157.10		Drg. No. SK10.10.03-006	Rev. C

7



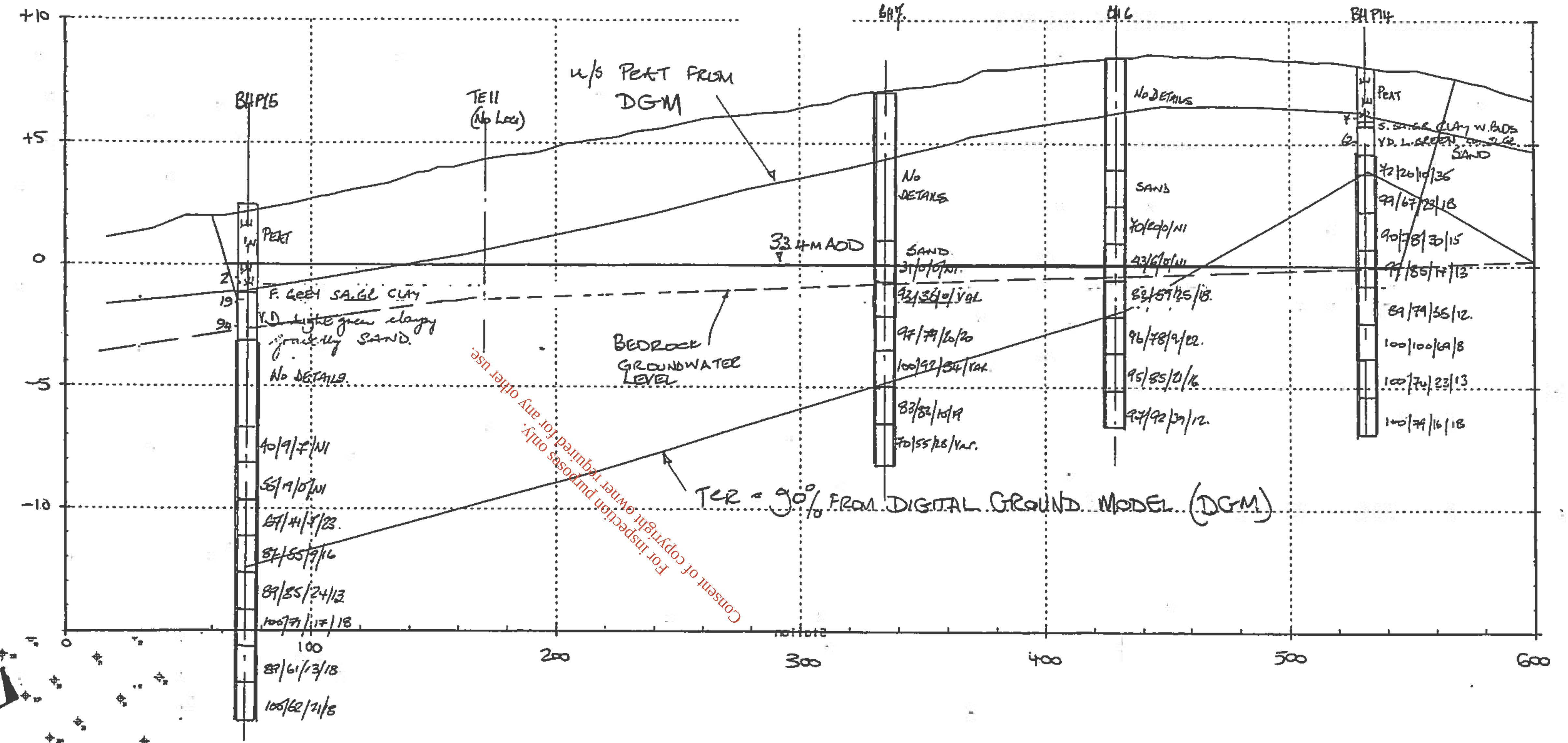


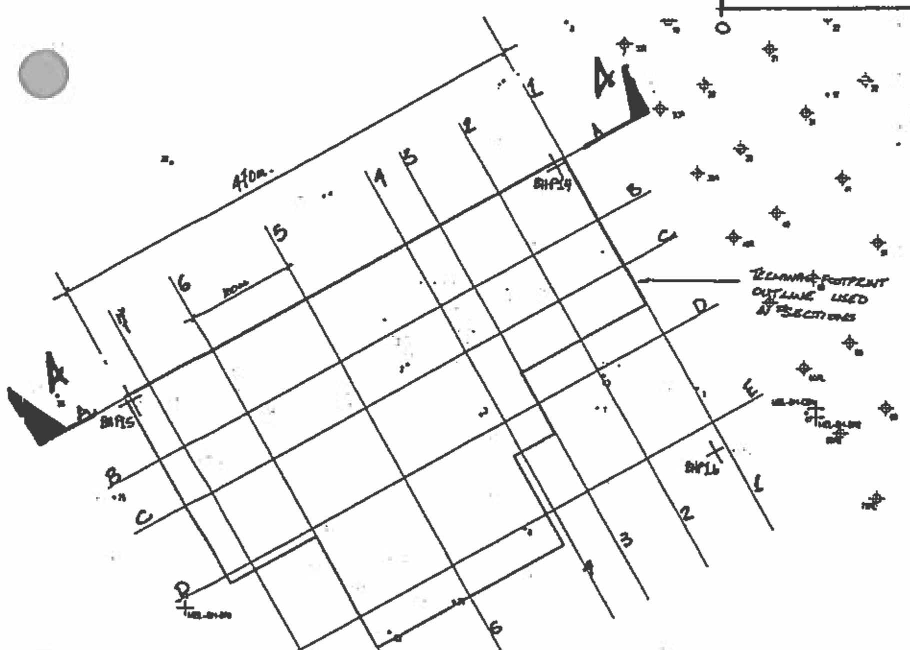
Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

ARUP
15 Oliver Plunkett St. Cork
Tel: +353 (0)21 4277670
Fax: +353 (0)21 4272345

Status	DESIGN
Job Title	CORRIB TERMINAL
Drawing Title	GEO SECTION 7 THRU TERMINAL
Scales	1:2000H, 1:200V
File Ref.	Mat. Cl.
Drn	J O'Brien
Date	Oct '03
Chd	
Approved	
Job No.	C1157.10
Drg. No.	SK10.10.03-007
Rev.	C

a



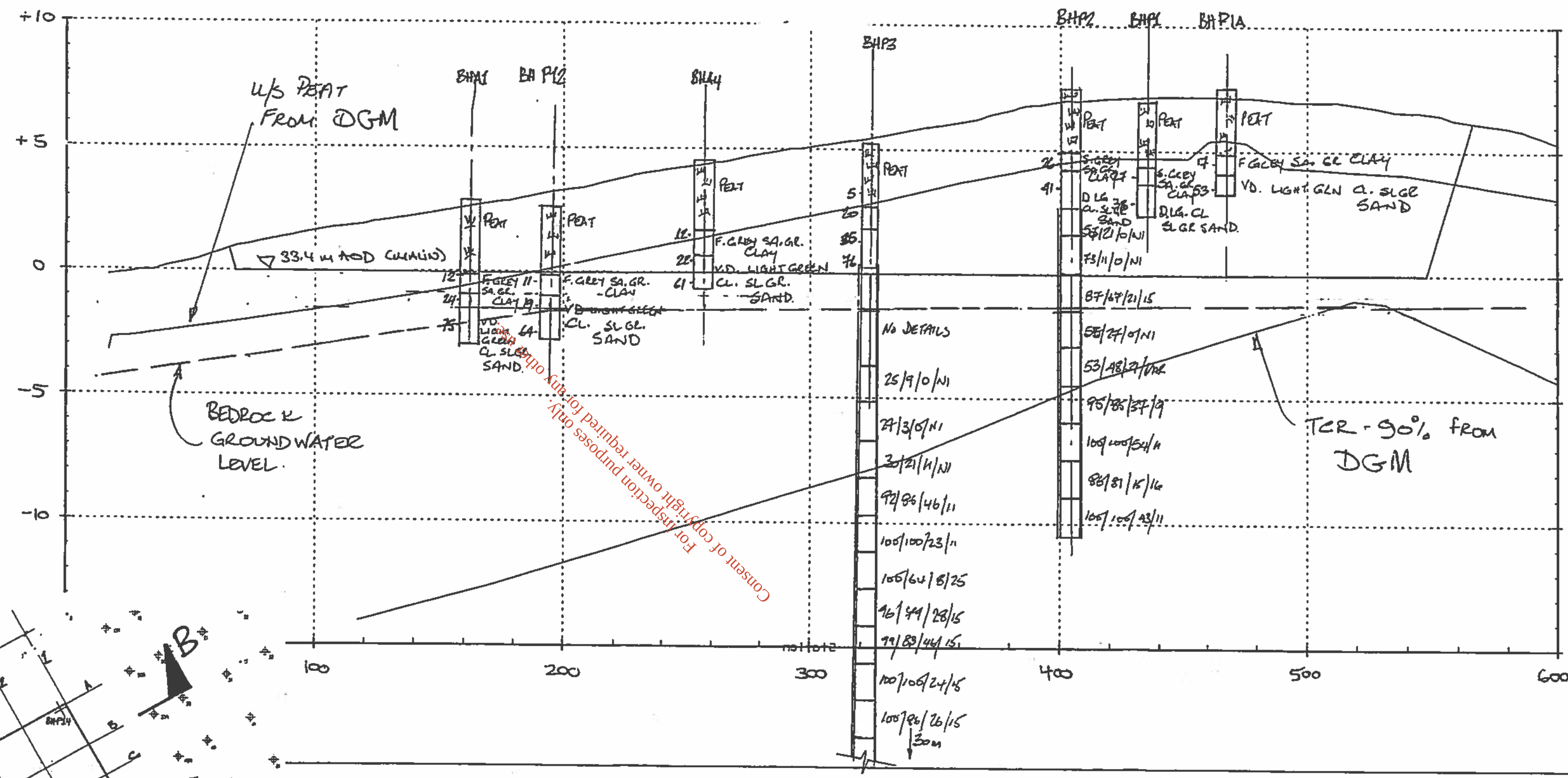


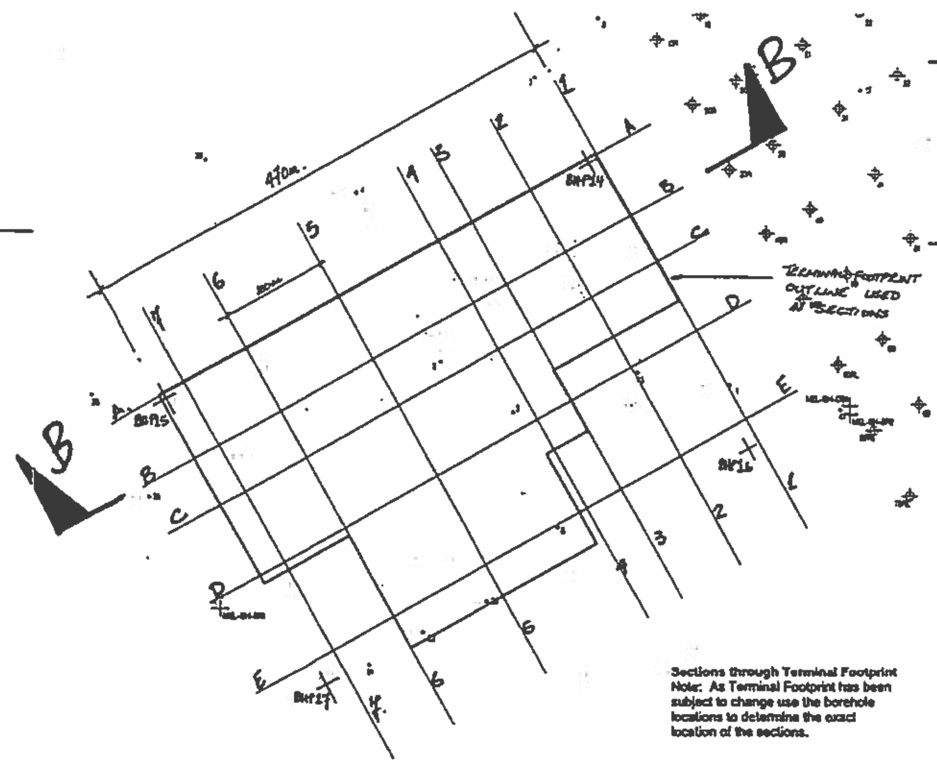
Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

ARUP
15 Oliver Plunkett St. Cork
Tel: +353 (0)21 4277670
Fax: +353 (0)21 4272345

Status	DESIGN
Job Title	CORRIB TERMINAL
Drawing Title	GEO SECTION A THRU TERMINAL
Scales	1:2000H, 1:200V
File Ref.	Mat. Cl.
Drn	J O'Brien
Date	Oct '03
Chd	
Approved	
Job No.	C1157.10
Drg. No.	Sk10.10.03-008
Rev.	C

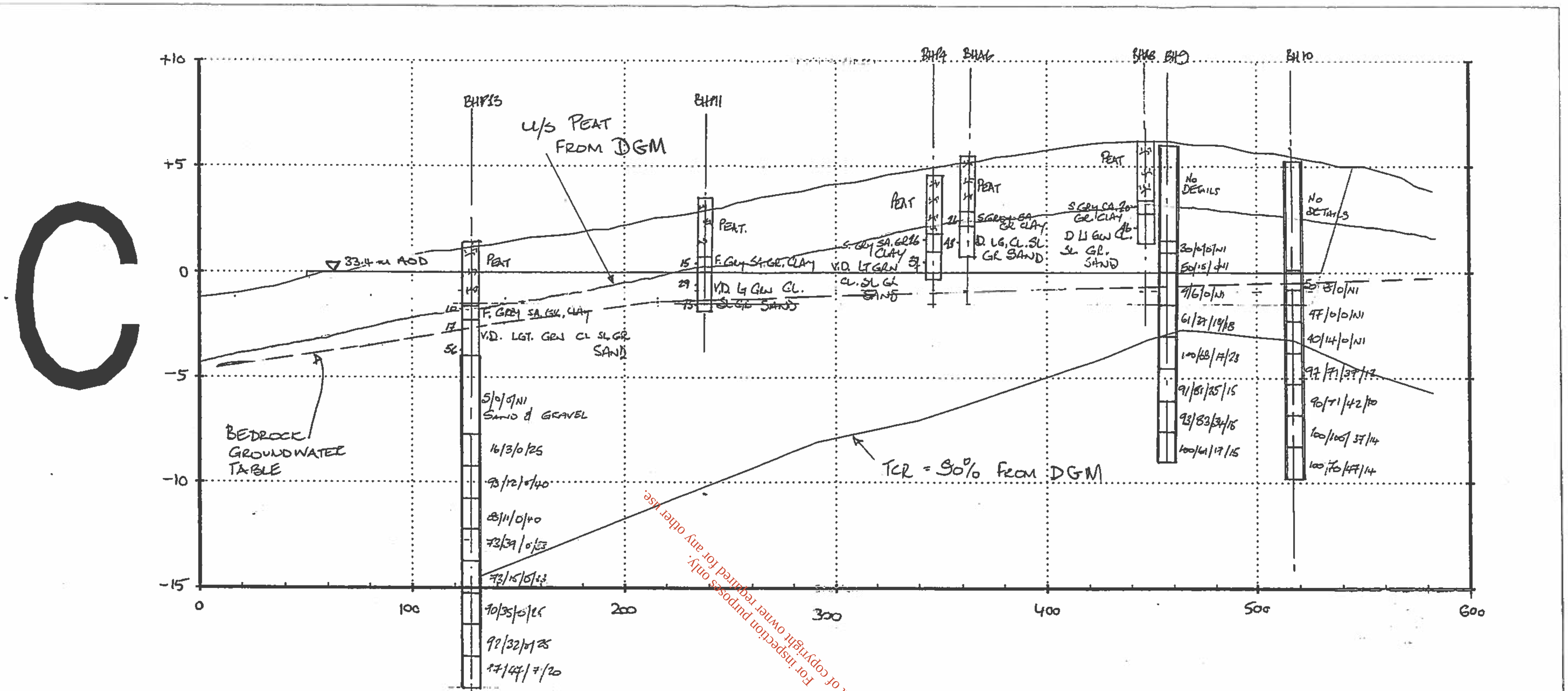
b

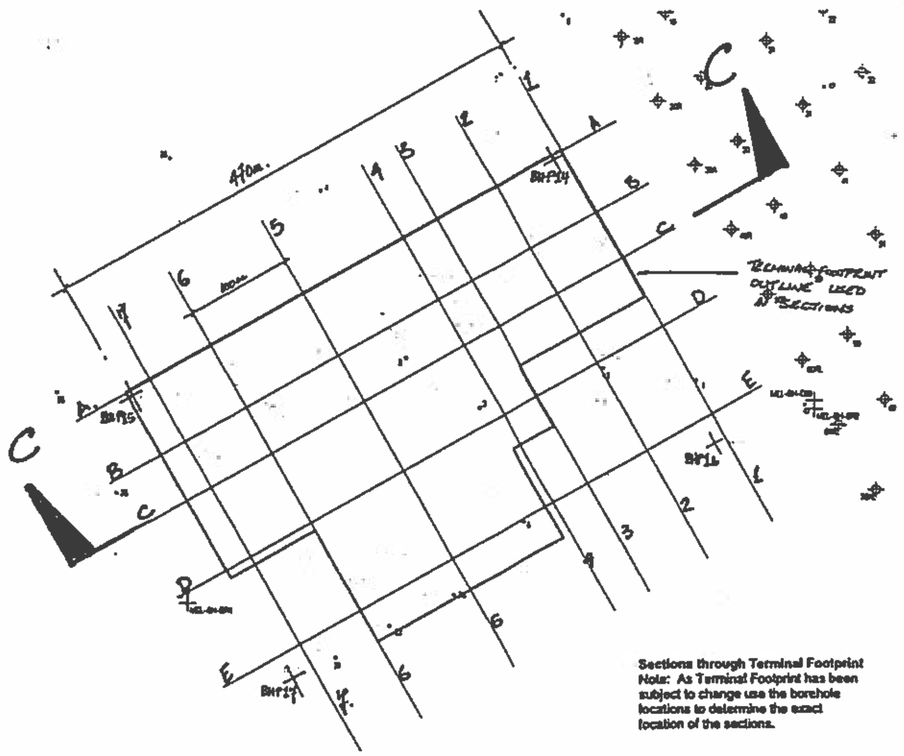




Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

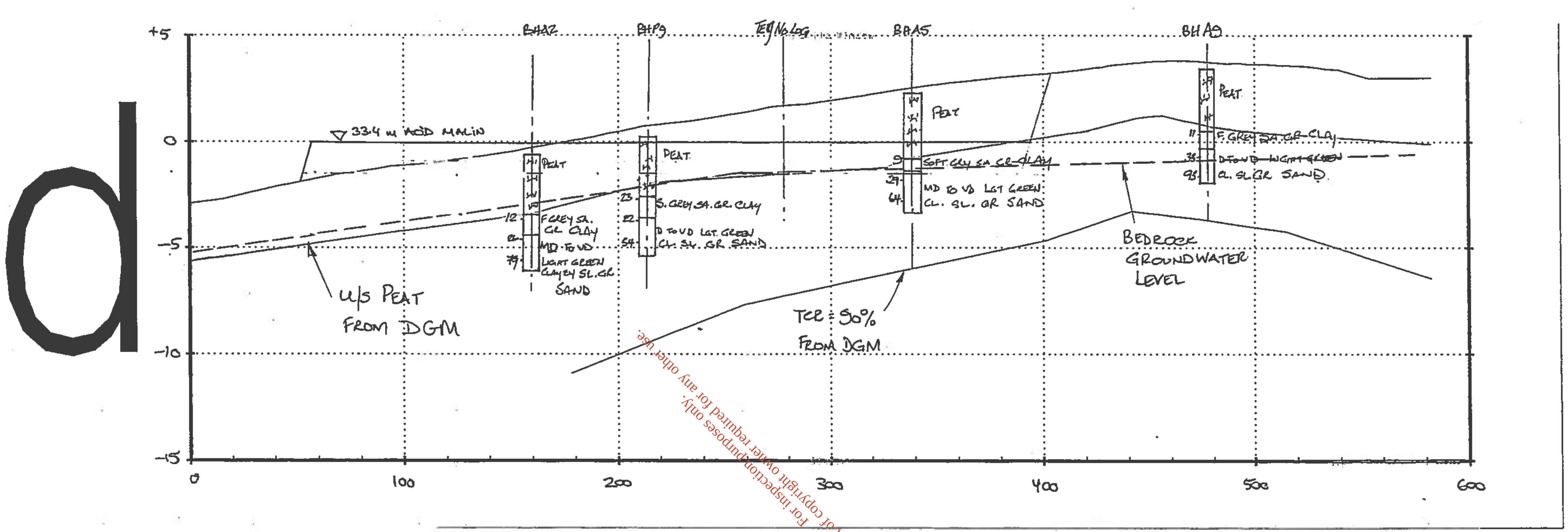
ARUP		15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345	
Status	DESIGN		
Job Title	CORRIB TERMINAL		
Drawing Title	GEO SECTION B THRU TERMINAL		
Scales 1:2000H, 1:200V		File Ref. Mat. Cl.	
Drn J O'Brien	Date Oct '03	Chd	Approved
Job No. C1157.10	Drg. No. Sk10.10.03-009		Rev. C

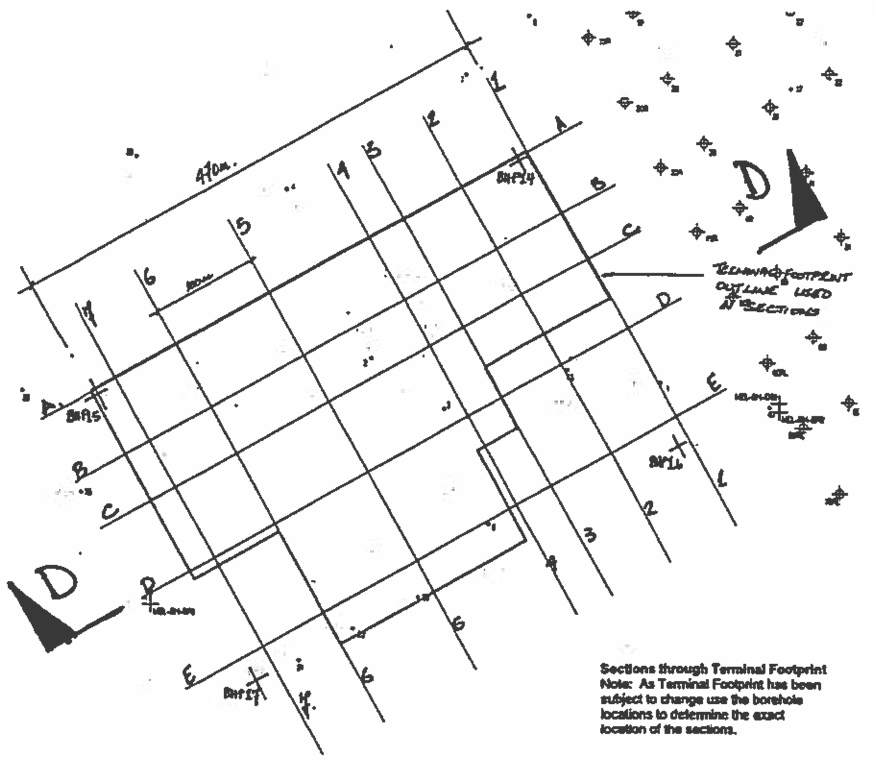




Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

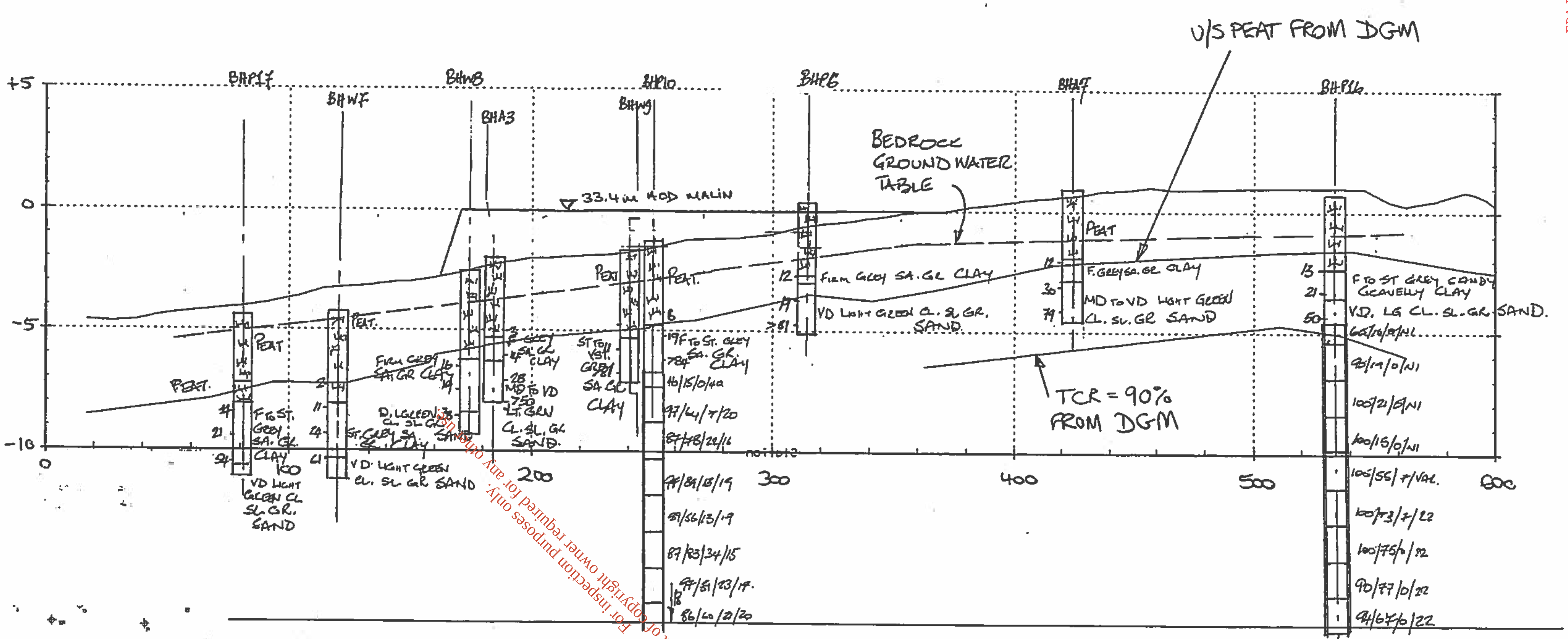
ARUP	15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345	
Status	DESIGN	
Job Title	CORRIB TERMINAL	
Drawing Title	GEO SECTION C THRU TERMINAL	
Scales 1:2000H, 1:200V	File Ref.	Mat. Cl.
Drn J O'Brien	Date Oct '03	Chd / Approved
Job No. C1157.10	Drg. No. Sk10.10.03-010	Rev. C

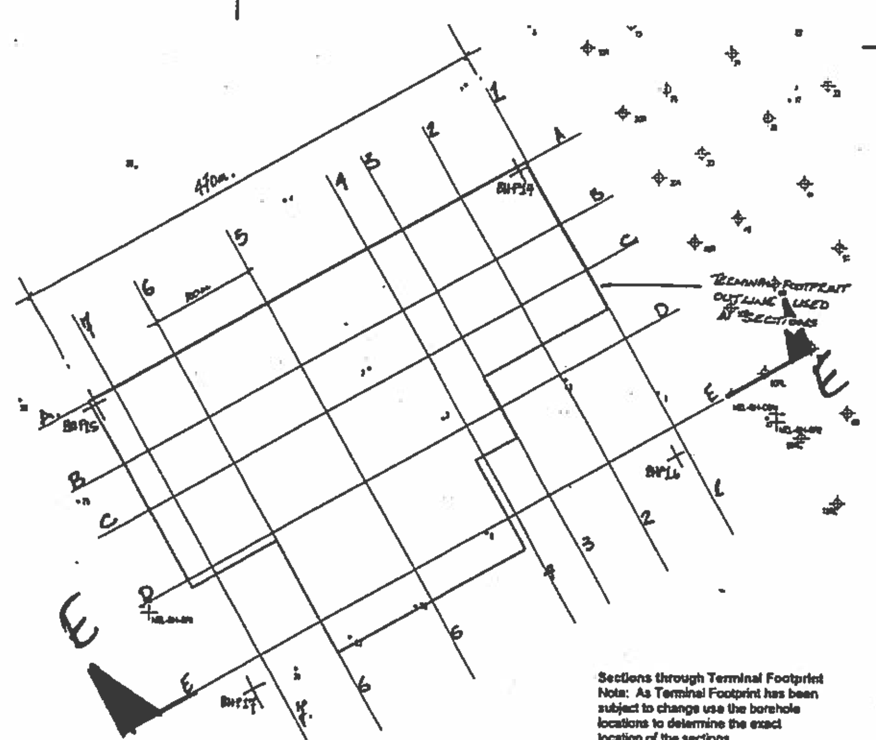




Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

ARUP	15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345		
Status	DESIGN		
Job Title	CORRIB TERMINAL		
Drawing Title	GEO SECTION D THRU TERMINAL		
Scales	1:2000H, 1:200V	File Ref	Mat. Cl.
Drn: J O'Brien	Date: Oct '03	Chd	Approved
Job No.: C1157.10	Drg. No.: SK10.10.03-011		Rev.: C





Sections through Terminal Footprint
Note: As Terminal Footprint has been subject to change use the borehole locations to determine the exact location of the sections.

ARUP			15 Oliver Plunkett St. Cork Tel: +353 (0)21 4277670 Fax: +353 (0)21 4272345		
Status	DESIGN				
Job Title	CORRIB TERMINAL				
Drawing Title	GEO SECTION E THRU TERMINAL				
Scales	1:2000H, 1:200V		File Ref.	Mat. Cl.	
Drn J O'Brien	Date Oct '03		Chd	Approved	
Job No. C1157.10			Drg. No. Sk10/10.03-012		Rev. C

Arup Consulting Engineers

APPENDIX C

von Post Humification Index

Degrees of humification

Degree of humification	Decomposition	Plant structure	Content of amorphous material	Material extruded on squeezing (passing between fingers)	Nature of residue
H_1	None	Easily identified	None	Clear, colourless water	
H_2	Insignificant	Easily identified	None	Yellowish water	
H_3	Very slight	Still identifiable	Slight	Brown, muddy water; no peat	Not pasty
H_4	Slight	Not easily identified	Some	Dark brown, muddy water; no peat	Somewhat pasty
H_5	Moderate	Recognisable, but vague	Considerable	Muddy water and some peat	Strongly pasty
H_6	Moderately strong	Indistinct (more distinct after squeezing)	Considerable	About one third of peat squeezed out; water dark brown	Fibres and roots more resistant to decomposition
H_7	Strong	Faintly recognizable	High	About one half of peat squeezed out; any water very dark brown	Fibres and roots more resistant to decomposition
H_8	Very strong	Very indistinct	High	About two thirds of peat squeezed out; also some pasty water	Fibres and roots more resistant to decomposition
H_9	Nearly complete	Almost unrecognisable		Nearly all the peat squeezed out as a fairly uniform paste	
H_{10}	Complete	Not discernible		All the peat passes between the fingers; no free water visible	

Arup Consulting Engineers

APPENDIX D

Selected Photographs (see Figure 22 for locations)

Plate 1. Quarry to east of terminal site, showing peat overlying head. Note light grey leached zone (A horizon) with thin iron pan layer (arrowed) developed at interface with underlying light brown head.

Plate 2. Quarry to east of terminal site, showing Benmore Formation bedrock. Note bedding and dip of this quartzite formation, and platy shape of the rock fragments. Note also how the bedding is turned over towards the top of the bedrock at the interface with the overlying head.

Plate 3. Looking south-west along the forestry track that runs along the crest of the terminal site ridge. Portacabins in the distance mark the north-east corner of the terminal footprint area. Note the high ground of Bellanaboy ridge in the background.

Plate 4. Terminal footprint area approximately mid-way down the slope looking east. Note ground slope (left to right) is barely perceptible.

Plate 5. Entrance to terminal site from R314 road looking upslope. Terminal footprint area is to the left.

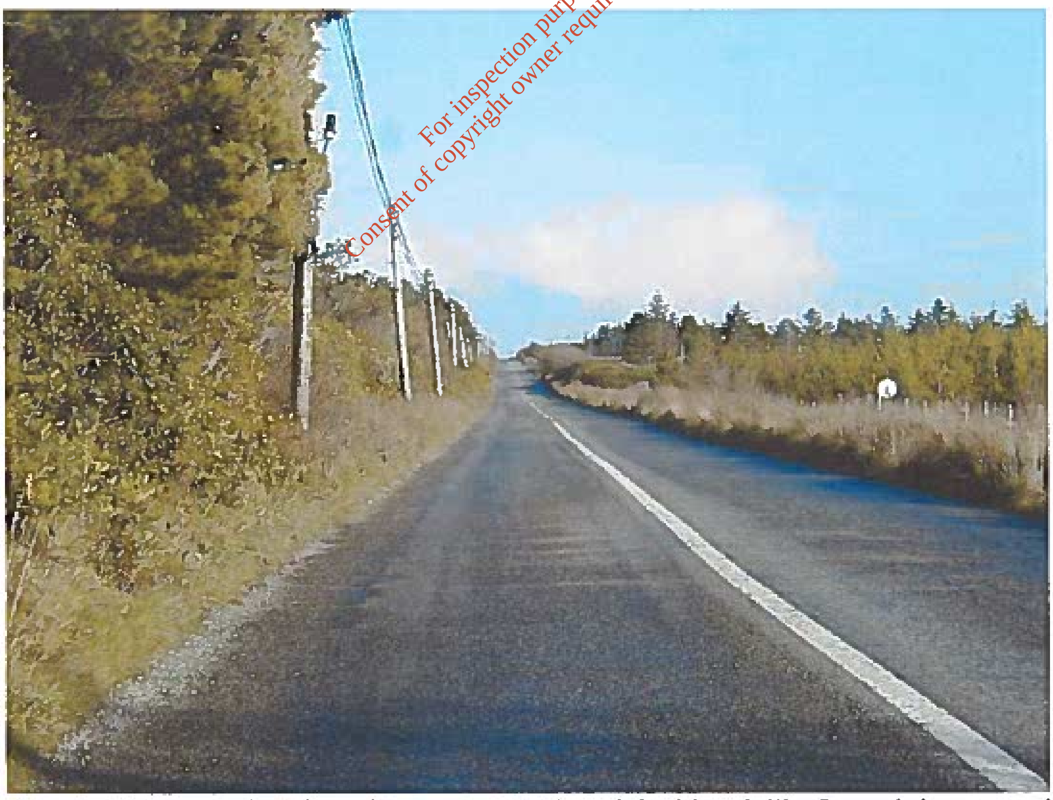


Plate 6. Below terminal footprint area on R314 road, looking ENE. Ground rises towards crest of shallow ridge, which lies just beyond the site entrance. This ridge marks the divide between the Glenamoy River and the Carrowmore Lake drainage catchments.

Plate 7. ESE of terminal footprint area and south of R314 road. Looking SSE along forestry track towards stream valley that is part of the headwaters of the Glenamoy River.

Plate 8. From SE corner of terminal footprint area on R314 road, looking south-east towards Slieve Fyagh. Note the steep bank marking the edge of cut peat, with virgin peat (brown) in the middle distance and a reclaimed area (green) in the foreground.

Arup Consulting Engineers

APPENDIX E

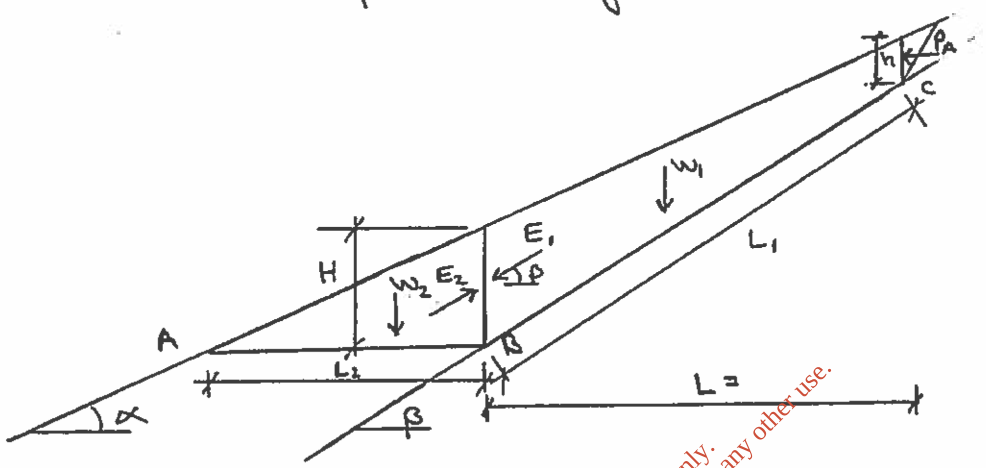
Derivation of Equation for Factor of Safety against Sliding

OAP20

ARUP Calculation sheet	Job No. 114662	Sheet No. E1	Rev.
	Member/Location		
Job Title: Corrib Gas Terminal	Drg. Ref.		
	Made by CH	Date Nov 2008	Chd. NP

Wedge Analysis for Sliding Stability.

1. Horizontal passive wedge.



W_1 = Weight of sliding block

W_2 = Weight of passive wedge.

E_1 = Force from sliding block acting on passive wedge.

E_2 = Force from passive wedge acting on sliding block (equal and opposite to E_1. Assumed to act // to sliding surface)

L_1 = Length of sliding block slip surface.

L_2 = length of passive wedge slip surface.

h = Peat thickness at top of slope.

c_u = average undrained shear strength of peat.

P_A = Active force

Sliding Block equilibrium.

Resolving forces // to slip surface. BC

$$E_2 = W_1 \sin\beta - L_1 c_u + P_A \cos\beta \qquad (1)$$

Resolving for for passive wedge // to slip surface AB

$$L_2 c_u = E_1 \cos\beta \qquad (2)$$

ARUP	Calculation sheet	Job No. 114662	Sheet No. E2	Rev.
Job Title: Corrib Gas Terminal.		Member/Location		
		Drg. Ref.		
		Made by CH	Date Nov 2003	Chd. NP

OAP20

$$E_1 = E_2$$

$\therefore$ substituting for E_2 from (1) into (2)

$$L_2 C_u = (W_1 \sin\beta - L_1 C_u + P_A \cos\beta)\cos\beta$$

$$C_u (L_2 + L_1 \cos\beta) = W_1 \sin\beta \cos\beta + P_A \cos^2\beta$$

If factor of safety = F, for stability

$$\frac{C_u}{F}(L_2 + L_1 \cos\beta) \geq W_1 \sin\beta \cos\beta$$

$$\therefore \quad F = \frac{C_u (L_2 + L_1 \cos\beta)}{W_1 \sin\beta \cos\beta + P_A \cos^2\beta} \qquad (3)$$

If there is no passive resistance $L_2 C_u \equiv 0$

$$\therefore F = \frac{C_u L_1 \cos\beta}{W_1 \sin\beta \cos\beta + P_A \cos^2\beta} \qquad (4)$$

$$L = L_1 \cos\beta$$

If $h = H$, $W_1 = hL\gamma$

$$\text{and } F = \frac{C_u L}{hL\gamma \sin\beta \cos\beta + P_A \cos^2\beta}$$

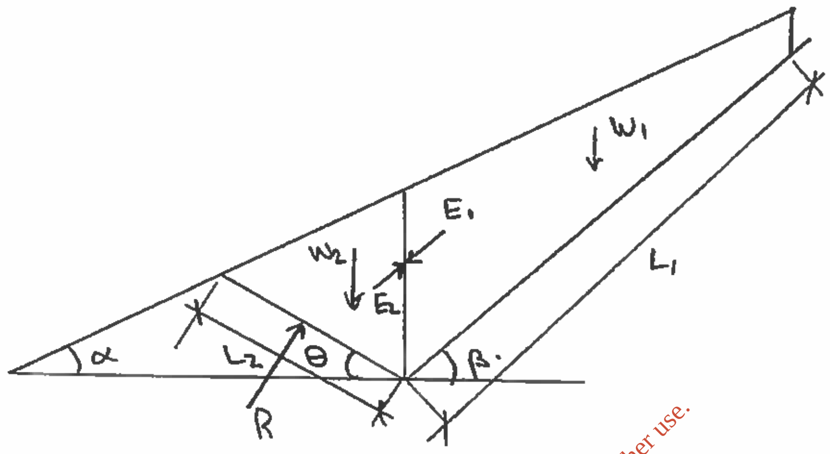
If $P_A = 0$

$$F = \frac{C_u}{\gamma h \sin\beta \cos\beta} = \text{Infinite slope solution} \qquad (5)$$

OAP20

ARUP Calculation sheet	Job No. 114602	Sheet No. E3	Rev.
Job Title: Corrib Gas Terminal	Member/Location		
	Drg. Ref.		
	Made by CH	Date Nov 2003	Chd. NP

2. Inclined Passive Wedge.



θ = inclination of base of passive wedge.

R = Resultant force on base of passive wedge.

For passive wedge

$$\uparrow \quad W_2 + E_1 \sin\beta + L_2 c_u \sin\theta = R\cos\theta \qquad (6)$$

$$\rightarrow \quad E_1 \cos\beta = L_2 c_u \cos\theta + R\sin\theta \qquad (7)$$

From (1) $E_1 = E_2 = W_1 \sin\beta - L_1 c_u + P_A \cos\beta$

From (6) $R = \frac{1}{\cos\theta}\left[W_2 + E_1\sin\beta + L_2 c_u \sin\theta\right]$

Substituting for R in (7)

$$E_1\cos\beta = L_2 c_u \cos\theta + \frac{\sin\theta}{\cos\theta}\left[W_2 + E_1\sin\beta + L_2 c_u \sin\theta\right]$$

$$= L_2 c_u\cos\theta + W_2\tan\theta + E_1\sin\beta\tan\theta + L_2 c_u \sin\theta\tan\theta$$

$$E_1(\cos\beta - \sin\beta\tan\theta) = L_2 c_u(\cos\theta + \sin\theta\tan\theta) + W_2\tan\theta$$

OAP20

ARUP Calculation sheet	Job No. 114602	Sheet No. E4	Rev.
	Member/Location		
Job Title: Corrib Gas Terminal	Drg. Ref.		
	Made by CH	Date Nov 2003	Chd. NP

$$E_1 (\cos\beta - \sin\beta \tan\theta) - W_2 \tan\theta = L_2 C_u (\cos\theta + \sin\theta \tan\theta)$$

Sub for E_1 from (1)

$$(W_1 \sin\beta - L_1 C_u + P_A \cos\beta)(\cos\beta - \sin\beta \tan\theta) - W_2 \tan\theta$$
$$= L_2 C_u (\cos\theta + \sin\theta \tan\theta)$$

$$(P_A \cos\beta + W_1 \sin\beta)\cos\beta - (W_1 \sin\beta + P_A \cos\beta)\sin\beta \tan\theta - W_2 \tan\theta$$
$$= L_2 C_u (\cos\theta + \sin\theta \tan\theta) + L_1 C_u (\cos\beta - \sin\beta \tan\theta)$$

$$W_1 (\sin\beta \cos\beta - \sin^2\beta \tan\theta) + P_A (\cos^2\beta - \cos\beta \sin\beta \tan\theta) - W_2 \tan\theta$$
$$= C_u [L_2 (\cos\theta + \sin\theta \tan\theta) + L_1 (\cos\beta - \sin\beta \tan\theta)]$$

$$\therefore F = \frac{L_2 C_u (\cos\theta + \sin\theta \tan\theta) + L_1 C_u (\cos\beta - \sin\beta \tan\theta)}{W_1 (\sin\beta \cos\beta - \sin^2\beta \tan\theta) - W_2 \tan\theta + P_A (\cos^2\beta - \cos\beta \sin\beta \tan\theta)} \quad \ldots (8)$$

If unit weight of peat = γ

$P_A = \frac{1}{2} \gamma h^2$ based on $k_A = 1$

Arup Consulting Engineers

APPENDIX F

Calibration Calculations of Wedge Analysis Method

Corrib Onshore Terminal
Stability of peal

Calibration runs for 100m long slope

		Minimum FOS								Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Slope angle of top of peat (ground surface)	α	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	8.45	7.42
Slope angle of base of peat	β	2	2	2	2	2	2	2	2	2	2	8.95	7.92
Slope length	L	100	100	100	100	100	100	100	100	100	100	100	100
Unit weight of peat	γ	11	11	11	11	11	11	11	11	11	11	11	11
Undrained shear strength of peat	c_u	3	3	3	3	3	3	3	3	0.54	0.87	3.00	3.00
Active pressure force (horizintal component)	P_A												
Peat thickness at bottom of slope	H	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
Slope of base of passive wedge	θ	26.63537	0	10	20	30	40	45	50	26.64	26.64	26.64	26.64
Length of slip surface	L_1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	101.2	101.0
Weight of sliding block	W_1	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0	2130.0
Surcharge load	W_S	0	0	0	0	0	0	0	0	0	0	0	0
FOS with no passive resistance		3.464	3.464	3.464	3.464	3.464	3.464	3.464	3.464	0.62	1.00	0.90	1.00
Max length of passive wedge	L^*	90.61	90.61	90.61	90.61	90.61	90.61	90.61	90.61	90.61		15.98	
Actual length of passive wedge	L_H	4.50	90.61	11.72	6.08	3.93	2.74	2.31	1.95	4.50		3.65	
Length of passive wedge slip surface	L_2	5.03	90.61	11.90	6.47	4.54	3.58	3.27	3.03	5.03		4.08	
Weight of passive wedge	W_2	58.67	1182.43	152.89	79.36	51.30	35.78	30.17	25.42	58.67		47.63	
Total weight		2188.65	3312.41	2282.87	2209.34	2181.28	2165.76	2160.15	2155.40	2188.65		2177.61	
Disturbing force component		55.71	86.65	59.16	56.66	55.28	54.08	53.45	52.75	55.71		288.57	
Resisting force		309.84	571.83	333.84	315.60	307.57	301.95	299.33	296.61	55.71		288.57	
FOS		5.562	6.599	5.643	5.570	5.564	5.583	5.600	5.623	1.00		1.00	
SLOPE FOS		5.532	6.579	5.626	5.550	5.532	5.546	5.552	5.569				
Wedge FOS/SLOPE FOS		1.005	1.00	1.00	1.00	1.01	1.01	1.01	1.01				
	P_A	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4

Calibration runs for 500m long slope

		Minimum FOS								Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Slope angle of top of peat (ground surface)	α	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	4.31	3.74
Slope angle of base of peat	β	2	2	2	2	2	2	2	2	2	2	4.81	4.24
Slope length	L	500	500	500	500	500	500	500	500	500	500	500	500
Unit weight of peat	γ	11	11	11	11	11	11	11	11	11	11	11	11
Undrained shear strength of peat	c_u	3	3	3	3	3	3	3	3	1.05	1.44	3.00	3.00
Active pressure force (horizintal component)	P_A	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Peat thickness at bottom of slope	H	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Slope of base of passive wedge	0	17.9258333	0	10	20	30	40	45	50	17.93	17.93	17.93	17.93
Length of slip surface	L_1	500.3	500.3	500.3	500.3	500.3	500.3	500.3	500.3	500.3	500.3	501.8	501.4
Weight of sliding block	W_1	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4	20249.4
Surcharge load	W_s	0	0	0	0	0	0	0	0	0	0	0	0
FOS with no passive resistance		2.089	2.089	2.089	2.089	2.089	2.089	2.089	2.089	0.728	1.000	0.883	1.000
Max length of passive wedge	L^*	223.92	223.92	223.92	223.92	223.92	223.92	223.92	223.92	223.92		77.75	
Actual length of passive wedge	L_H	16.77	223.92	28.95	15.03	9.72	6.78	5.71	4.81	16.77		14.70	
Length of passive wedge slip surface	L_2	17.62	223.92	29.40	15.99	11.22	8.85	8.08	7.49	17.62		15.45	
Weight of passive wedge	W_2	540.76	7221.03	933.71	484.65	313.30	218.53	184.26	155.25	540.76		474.02	
Total weight		20790.20	27470.47	21183.16	20734.09	20562.75	20467.97	20433.71	20404.70	20790.20		20723.46	
Disturbing force component		535.58	718.62	549.56	533.09	523.25	514.20	509.27	503.69	535.58		1505.49	
Resisting force		1535.93	2171.75	1578.96	1528.91	1503.41	1482.58	1471.86	1460.04	535.58		1505.49	
FOS		2.868	3.022	2.873	2.868	2.873	2.883	2.890	2.899	1.00		1.00	
SLOPE FOS		2.86	3.018	2.865	2.857	2.858	2.863	2.867	2.873				
Wedge FOS/SLOPE FOS		1.004	1.00	1.00	1.00	1.01	1.01	1.01	1.01				

ArupGeotechnics

Job No. 114662 Sheet 1/1 F3

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -.-

Corrib Onshore Terminal
Slope geometric data

Slope length	Passive wedge angle	SLOPE runs Run ID	FOS	Run ID	FOS	Wedge analysis FOS	SLOPE results on pages
100	No passive	Corrib AAA	3.561	Corrib AAB	3.461	3.464	F4 to F9
100	0	Corrib BBA	6.679	Corrib BBB	6.579	6.599	F10 to F15
100	10	Corrib BB1	5.776	Corrib BA1	5.626	5.643	F16 to F23
100	20	Corrib BB2	5.7	Corrib BA2	5.55	5.570	F24 to F29
100	30	Corrib BB3	5.689	Corrib BA3	5.532	5.564	F30 to F35
100	40	Corrib BB4	5.699	Corrib BA4	5.546	5.583	F36 to F43
100	45	Corrib BB5	5.71	Corrib BA5	5.552	5.600	F44 to F51
100	50	Corrib BB6	5.728	Corrib BA6	5.569	5.623	F52 to F59
500	No passive	Corrib CCA	2.098	Corrib CCB	2.086	2.089	F60 to F67
500	0	Corrib DDA	3.03	Corrib DDB	3.018	3.022	F68 to F73
500	10	Corrib DB1	2.881	Corrib DA1	2.865	2.873	F74 to F81
500	20	Corrib DB2	2.873	Corrib DA2	2.857	2.868	F82 to F89
500	30	Corrib DB3	2.874	Corrib DA3	2.858	2.873	F90 to F97
500	40	Corrib DB4	2.879	Corrib DA4	2.863	2.883	F98 to 105
500	45	Corrib DB5	2.883	Corrib DA5	2.867	2.890	F106 to F113
500	50	Corrib DB6	2.889	Corrib DA6	2.873	2.899	F114 to F121
		Runs in this column use cu =3 for peat in active wedge		Runs in this column use cu =0.1 for peat in active wedge			

All SLOPE files stored in 114662\calcs\oasys\slope

Made by: CH Chkd: CH.
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 100 m
Passive wedge angle θ = 90 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

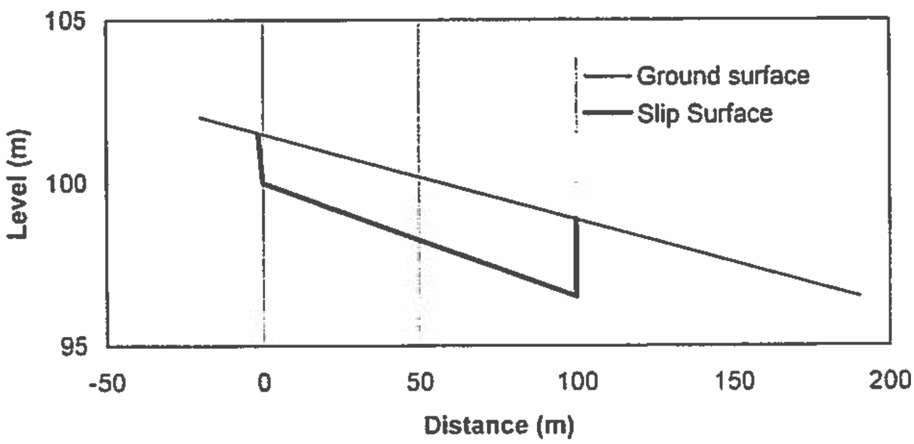
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				100	98.88141

L*	90.63973	
L2	1.45E-16	
θ	90	Set angle
x4	100	Intersection of slip surface with
y4	98.88141	ground surface

γ	45
x1	-1.5
y1	101.5



ArupGeotechnics

Job No. 114662 Sheet 1/1 F3

Made by: CH Chkd: CH.
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length	Passive wedge angle	SLOPE runs Run ID	SLOPE runs FOS	Wedge analysis FOS	SLOPE result on page
100	Infinite slope	Corrib A	4.047	4.041 ✓	F5
100	0	Corrib B	7.694	7.697 ✓	F8
100	10	Corrib E2	7.096	7.122 ✓	F13
100	20	Corrib E3	7.085	7.098 ✓	F17
100	30	Corrib E4	7.066	7.124 ✓	F22
100	40	Corrib E5	7.096	7.174 ✓	F27
100	45	Corrib E7	7.109	7.209 ✓	F30
100	50	Corrib E6	7.136	7.252 ✓	F33
500	Infinite slope	Corrib C	2.122	2.125 ✓	F36
500	0	Corrib D	3.072	3.075 ✓	F39
500	10	Corrib F	2.931	2.939 ✓	F43
500	20	Corrib F2	2.926	2.935 ✓	F48
500	30	Corrib F3	2.927	2.941 ✓	F52
500	40	Corrib F4	2.963	2.952 ✓	F55
500	45	Corrib F5	2.95	2.959 ✓	F60
500	50			2.968 ✓	

All SLOPE files stored in 114662\calcs\oasys\slope

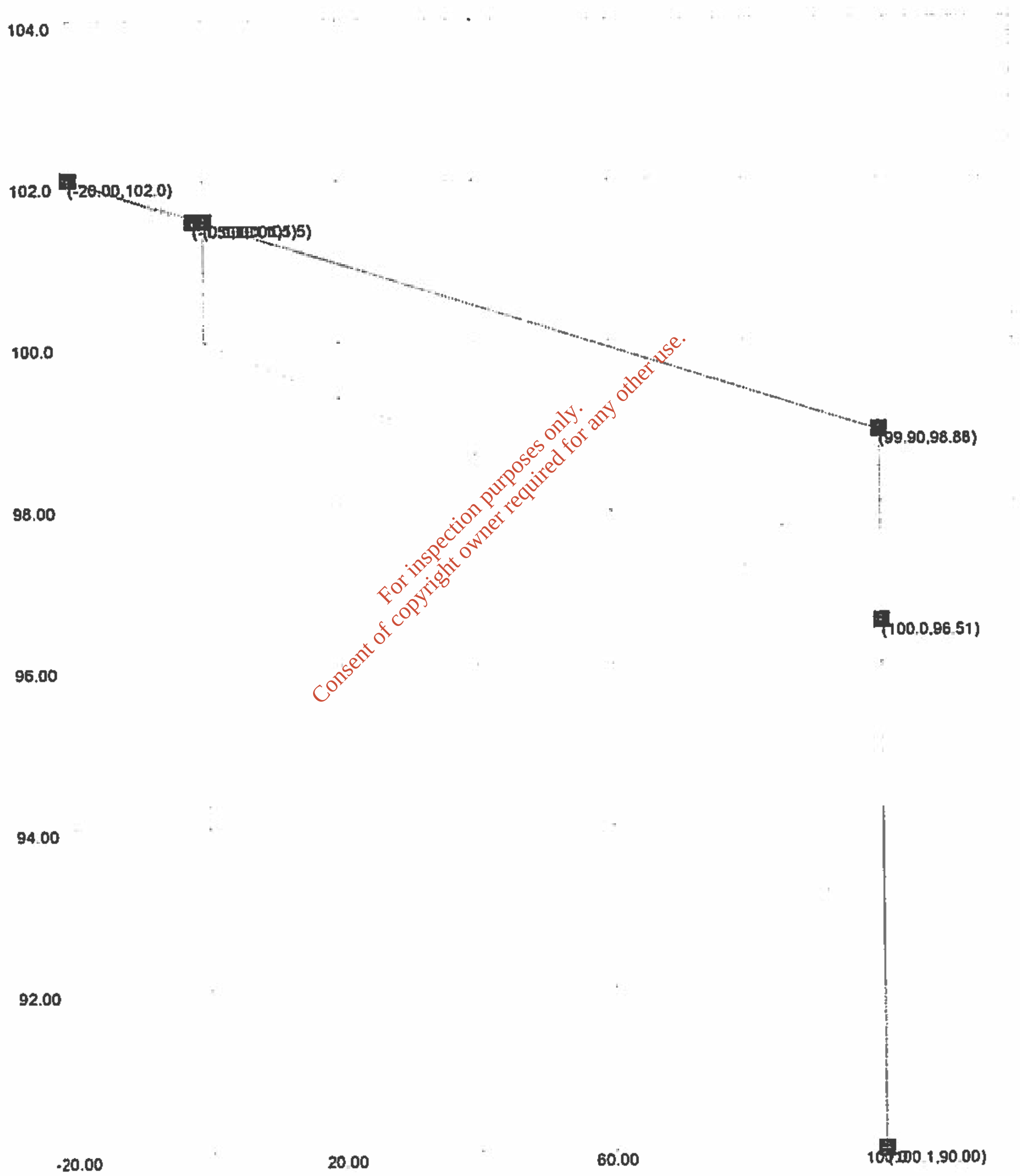
Oasys

Corrib
Peat stability - 100m slip length

Job No.	Sheet No.	Rev.
114662	FS	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib AAB.sld	CH



Scale x 1:992 y 1:82

Oasys	Job No. 114662	Sheet No. F6	Rev.
Corrib Peat stability - 100m slip length	Drg. Ref.		
	Made by CH	Date 05-Dec-2003	Data Corrib AAA.sld	Checked CH

```
General Parameters
Direction of slip:  DOWNHILL
Minimum slip weight (kN) : 10
Type of analysis : STATIC


Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method:  Janbu            (Horizontal interslice forces)
Maximum number of iterations:  100


Material properties
 No.      Description          Unit Weight                              Shear Strength
                                                                          Parameters
                          Above GWL Below GWL                          Phi or   c or cO'
                                                                       Phi0
                            [kN/m3]   [kN/m3]                           [°]      [kPa]
    1 peat 1                 11.00     11.00 Undrained                  0.0      3.000
    2 peat 2                 11.00     11.00 Undrained                  0.0      3.000

Coordinates of top of soil strata
Stratum  Material    X -->
                    -20.00    -1.500   -0.1000      0.0    0.1000     99.90     100.0
      1        1     102.0     101.5         .    101.5     101.5     98.00     96.51
      2        2     102.0         .     101.5    100.0     90.00         .     90.00
   GWL1        -     102.0         .     101.5    101.5     101.5     98.00     96.51
   Slip        -         .     101.5         .    100.0         .         .     96.51

Stratum  Material    X -->
                     100.1
      1        1     90.00
      2        2     90.00
   GWL1        -     90.00
   Slip        -         .


Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS
    Slip Centre        Radius     Slip     Comment/  Disturbing Restoring
                                  Weight      FoS      Moment     Moment
  x [m]      y [m]      [m]       [kN]                [kN m]     [kN m]
   134.8      1838.       0.0


WORST CASE : WATER CASE  1   OF   1
Centre at (134.8,1838.)                 Radius 0.0m
Iterations: 5                           Horiz acceleration [*g]: 0.0
Net vertical force [kN]: 0.0            Slip weight (kN) 2140.
Net horiz force [kN]: -6.602E-6         Disturbing moment [kN m]: 66.87
                                        Restoring moment [kN m]: [illegible]
                                        Factor of Safety: 3.561

Slip surface coordinates         Pore       Interslice forces
                               Pressure           (kN)
Point    x [m]       y [m]    u [kPa]       T           E          E(u)
    1    -1.500      101.5    0.3658       0.0         0.0          0.0
    2   -0.1000      100.1     14.00       0.0       6.077        5.600
    3       0.0      100.0     15.00       0.0       10.30        11.25
    4    0.1000      100.0     15.03       0.0       10.06        11.30
    5     2.096      99.93     15.21       0.0       9.552        11.56
    6     4.092      99.86     15.38       0.0       9.041        11.83
    7     6.088      99.79     15.55       0.0       8.542        12.09
    8     8.084      99.72     15.73       0.0       8.057        12.36
    9     10.08      99.65     15.90       0.0       7.585        12.64
   10     12.08      99.58     16.07       0.0       7.127        12.91
   11     14.07      99.51     16.24       0.0       6.681        13.19
   12     16.07      99.44     16.42       0.0       6.249        13.47
   13     18.06      99.37     16.59       0.0       5.830        13.76
   14     20.06      99.30     16.76       0.0       5.424        14.05
   15     22.06      99.23     16.93       0.0       5.032        14.34
   16     24.05      99.16     17.11       0.0       4.652        14.63
   17     26.05      99.09     17.28       0.0       4.286        14.93
   18     28.04      99.02     17.45       0.0       3.934        15.23
   19     30.04      98.95     17.62       0.0       3.594        15.53
   20     32.04      98.88     17.80       0.0       3.267        15.84
   21     34.03      98.81     17.97       0.0       2.954        16.14
   22     36.03      98.74     18.14       0.0       2.654        16.46
   23     38.02      98.67     18.31       0.0       2.368        16.77
   24     40.02      98.60     18.49       0.0       2.094        17.09
   25     42.02      98.53     18.66       0.0       1.834        17.41
   26     44.01      98.46     18.83       0.0       1.587        17.73
   27     46.01      98.39     19.00       0.0       1.353        18.06
   28     48.00      98.32     19.18       0.0       1.132        18.39
   29     50.00      98.26     19.35       0.0      0.9248        18.72
   30     52.00      98.19     19.52       0.0      0.7307        19.06
   31     53.99      98.12     19.70       0.0      0.5499        19.40
   32     55.99      98.05     19.87       0.0      0.3821        19.74
   33     57.98      97.98     20.04       0.0      0.2277        20.08
   34     59.98      97.91     20.21       0.0     0.08637        20.43
   35     61.98      97.84     20.39       0.0    -0.04158        20.78
   36     63.97      97.77     20.56       0.0     -0.1565        21.13
   37     65.97      97.70     20.73       0.0     -0.2580        21.49
   38     67.96      97.63     20.90       0.0     -0.3464        21.85
   39     69.96      97.56     21.08       0.0     -0.4214        22.21
   40     71.96      97.49     21.25       0.0     -0.4834        22.58
   41     73.95      97.42     21.42       0.0     -0.5320        22.94
   42     75.95      97.35     21.59       0.0     -0.5673        23.31
   43     77.94      97.28     21.77       0.0     -0.5897        23.69
   44     79.94      97.21     21.94       0.0     -0.5986        24.07
   45     81.94      97.14     22.11       0.0     -0.5944        24.45
   46     83.93      97.07     22.28       0.0     -0.5769        24.83
   47     85.93      97.00     22.46       0.0     -0.5463        25.22
   48     87.92      96.93     22.63       0.0     -0.5023        25.60
   49     89.92      96.86     22.80       0.0     -0.4452        26.00
   50     91.92      96.79     22.97       0.0     -0.3748        26.39
   51     93.91      96.72     23.15       0.0     -0.2913        26.79
   52     95.91      96.65     23.32       0.0     -0.1944        27.19
   53     97.90      96.58     23.49       0.0    -0.08441        27.59
   54     99.90      96.51     23.67       0.0  [illegible]  [illegible]
   55     100.0      96.51       0.0       0.0  [illegible]          0.0

Slice Strength Parameters   Pore      Slice   Forces on base (kN)
```

Oasys

Corrib
Peat stability - 100m slip length

Job No.	Sheet No.	Rev.
114662	F7	

Drg. Ref.			
Made by	**Date**	**Data**	**Checked**
CH	05-Dec-2003	Corrib AAA.sld	CH

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	3.000	0.0	7.183	10.78	13.94	5.940
2	3.000	0.0	14.50	1.595	2.137	0.4243
3	3.000	0.0	15.02	1.652	1.650	0.3002
4	3.000	0.0	15.12	33.20	33.16	5.992
5	3.000	0.0	15.29	33.58	33.54	5.992
6	3.000	0.0	15.47	33.96	33.92	5.992
7	3.000	0.0	15.64	34.34	34.30	5.992
8	3.000	0.0	15.81	34.72	34.68	5.992
9	3.000	0.0	15.98	35.09	35.06	5.992
10	3.000	0.0	16.16	35.47	35.44	5.992
11	3.000	0.0	16.33	35.85	35.82	5.992
12	3.000	0.0	16.50	36.23	36.20	5.992
13	3.000	0.0	16.67	36.61	36.57	5.992
14	3.000	0.0	16.85	36.99	36.95	5.992
15	3.000	0.0	17.02	37.37	37.33	5.992
16	3.000	0.0	17.19	37.75	37.71	5.992
17	3.000	0.0	17.37	38.13	38.09	5.992
18	3.000	0.0	17.54	38.51	38.47	5.992
19	3.000	0.0	17.71	38.88	38.85	5.992
20	3.000	0.0	17.88	39.26	39.23	5.992
21	3.000	0.0	18.06	39.64	39.61	5.992
22	3.000	0.0	18.23	40.02	39.99	5.992
23	3.000	0.0	18.40	40.40	40.37	5.992
24	3.000	0.0	18.57	40.78	40.75	5.992
25	3.000	0.0	18.75	41.16	41.12	5.992
26	3.000	0.0	18.92	41.54	41.50	5.992
27	3.000	0.0	19.09	41.92	41.88	5.992
28	3.000	0.0	19.26	42.30	42.26	5.992
29	3.000	0.0	19.44	42.67	42.64	5.992
30	3.000	0.0	19.61	43.05	43.02	5.992
31	3.000	0.0	19.78	43.43	43.40	5.992
32	3.000	0.0	19.95	43.81	43.78	5.992
33	3.000	0.0	20.13	44.19	44.16	5.992
34	3.000	0.0	20.30	44.57	44.54	5.992
35	3.000	0.0	20.47	44.95	44.92	5.992
36	3.000	0.0	20.64	45.33	45.30	5.992
37	3.000	0.0	20.82	45.71	45.68	5.992
38	3.000	0.0	20.99	46.08	46.05	5.992
39	3.000	0.0	21.16	46.46	46.43	5.992
40	3.000	0.0	21.33	46.84	46.81	5.992
41	3.000	0.0	21.51	47.22	47.19	5.992
42	3.000	0.0	21.68	47.60	47.57	5.992
43	3.000	0.0	21.85	47.98	47.95	5.992
44	3.000	0.0	22.03	48.36	48.33	5.992
45	3.000	0.0	22.20	48.74	48.71	5.992
46	3.000	0.0	22.37	49.12	49.09	5.992
47	3.000	0.0	22.54	49.50	49.47	5.992
48	3.000	0.0	22.72	49.87	49.85	5.992
49	3.000	0.0	22.89	50.25	50.23	5.992
50	3.000	0.0	23.06	50.63	50.60	5.992
51	3.000	0.0	23.23	51.01	50.98	5.992
52	3.000	0.0	23.41	51.39	51.36	5.992
53	3.000	0.0	23.58	51.77	51.74	5.992
54	3.000	0.0	11.83	1.302	1.299	0.3002

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

Oasys

Corrib
Peat stability - 100m slip length

Job No.	Sheet No.	Rev.
114662	F8	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib AAB.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	99.90	100.0
1	1	102.0	101.5	.	101.5	101.5	98.88	96.51
2	2	102.0	.	101.5	100.0	90.00	.	90.00
GWL1	-	102.0	.	101.5	101.5	101.5	98.88	96.51
Slip	-	.	101.5	.	100.0	.	.	96.51

Stratum	Material	X --> 100.1
1	1	90.00
2	2	90.00
GWL1	-	90.00
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 (m)
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
134.8	1638.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (134.8,1638.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -13.02E-6
Radius 0.0m
Horiz acceleration [*g]: 0.0
Slip weight [kN] 2140.
Disturbing moment [kN m]: 60.87
Restoring moment [kN m]: [illegible]0.7
Factor of safety: 3.461

Slip surface coordinates / Pore Pressure / Interslice forces [kN]

Point	x [m]	y [m]	u [kPa]	T	E	E(u)
1	-1.500	101.5	0.3650	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.96	9.609
3	0.0	100.0	15.00	0.0	12.54	11.25
4	0.1000	100.0	15.03	0.0	12.52	11.30
5	2.096	99.93	15.21	0.0	11.94	11.56
6	4.092	99.86	15.38	0.0	11.38	11.83
7	6.068	99.79	15.55	0.0	10.83	12.09
8	8.064	99.72	15.72	0.0	10.30	12.36
9	10.08	99.65	15.90	0.0	9.780	12.64
10	12.08	99.58	16.07	0.0	9.272	12.91
11	14.07	99.51	16.24	0.0	8.779	13.19
12	16.07	99.44	16.42	0.0	8.297	13.47
13	18.06	99.37	16.59	0.0	7.830	13.76
14	20.06	99.30	16.76	0.0	7.375	14.05
15	22.06	99.23	16.93	0.0	6.934	14.34
16	24.05	99.16	17.11	0.0	6.506	14.63
17	26.05	99.09	17.28	0.0	6.091	14.93
18	28.04	99.02	17.45	0.0	5.690	15.23
19	30.04	98.95	17.62	0.0	5.301	15.53
20	32.04	98.88	17.80	0.0	4.926	15.84
21	34.03	98.81	17.97	0.0	4.564	16.14
22	36.03	98.74	18.14	0.0	4.216	16.46
23	38.02	98.67	18.31	0.0	3.880	16.77
24	40.02	98.60	18.49	0.0	3.558	17.09
25	42.02	98.53	18.66	0.0	3.249	17.41
26	44.01	98.46	18.83	0.0	2.953	17.73
27	46.01	98.39	19.00	0.0	2.670	18.06
28	48.00	98.32	19.18	0.0	2.401	18.39
29	50.00	98.26	19.35	0.0	2.145	18.72
30	52.00	98.19	19.52	0.0	1.902	19.06
31	53.99	98.12	19.70	0.0	1.673	19.40
32	55.99	98.05	19.87	0.0	1.456	19.74
33	57.98	97.98	20.04	0.0	1.253	20.08
34	59.98	97.91	20.21	0.0	1.063	20.43
35	61.98	97.84	20.39	0.0	0.8864	20.78
36	63.97	97.77	20.56	0.0	0.7228	21.13
37	65.97	97.70	20.73	0.0	0.5726	21.49
38	67.96	97.63	20.90	0.0	0.4355	21.85
39	69.96	97.56	21.08	0.0	0.3117	22.21
40	71.96	97.49	21.25	0.0	0.2010	22.58
41	73.95	97.42	21.42	0.0	0.1037	22.94
42	75.95	97.35	21.59	0.0	0.01965	23.31
43	77.94	97.28	21.77	0.0	-0.05137	23.69
44	79.94	97.21	21.94	0.0	-0.1090	24.07
45	81.94	97.14	22.11	0.0	-0.1536	24.45
46	83.93	97.07	22.28	0.0	-0.1847	24.83
47	85.93	97.00	22.46	0.0	-0.2028	25.22
48	87.92	96.93	22.63	0.0	-0.2075	25.60
49	89.92	96.86	22.80	0.0	-0.1992	26.00
50	91.92	96.79	22.97	0.0	-0.1775	26.38
51	93.91	96.72	23.15	0.0	0.1427	26.78
52	95.91	96.65	23.32	0.0	-0.09444	27.18
53	97.90	96.58	23.49	0.0	-0.03326	27.58
54	99.90	96.51	23.67	0.0	[illegible]	[illegible]
55	100.0	96.51	0.0	0.0	-11.72E-6	0.0

Slice Strength Parameters Pore Slice Forces on base (kN)

Oasys

Corrib
Peat stability - 100m slip length

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	0.1000	0.0	7.103	10.78	15.55	0.1980
2	0.1000	0.0	14.50	1.595	2.252	0.01414
3	3.000	0.0	15.02	1.652	1.650	0.3002
4	3.000	0.0	15.12	33.20	33.16	5.992
5	3.000	0.0	15.29	33.58	33.54	5.992
6	3.000	0.0	15.47	33.96	33.92	5.992
7	3.000	0.0	15.64	34.34	34.30	5.992
8	3.000	0.0	15.81	34.72	34.68	5.992
9	3.000	0.0	15.98	35.09	35.06	5.992
10	3.000	0.0	16.16	35.47	35.44	5.992
11	3.000	0.0	16.33	35.85	35.81	5.992
12	3.000	0.0	16.50	36.23	36.19	5.992
13	3.000	0.0	16.67	36.61	36.57	5.992
14	3.000	0.0	16.85	36.99	36.95	5.992
15	3.000	0.0	17.02	37.37	37.33	5.992
16	3.000	0.0	17.19	37.75	37.71	5.992
17	3.000	0.0	17.37	38.13	38.09	5.992
18	3.000	0.0	17.54	38.51	38.47	5.992
19	3.000	0.0	17.71	38.88	38.85	5.992
20	3.000	0.0	17.88	39.26	39.23	5.992
21	3.000	0.0	18.06	39.64	39.61	5.992
22	3.000	0.0	18.23	40.02	39.99	5.992
23	3.000	0.0	18.40	40.40	40.36	5.992
24	3.000	0.0	18.57	40.78	40.74	5.992
25	3.000	0.0	18.75	41.16	41.12	5.992
26	3.000	0.0	18.92	41.54	41.50	5.992
27	3.000	0.0	19.09	41.92	41.88	5.992
28	3.000	0.0	19.26	42.30	42.26	5.992
29	3.000	0.0	19.44	42.67	42.64	5.992
30	3.000	0.0	19.61	43.05	43.02	5.992
31	3.000	0.0	19.78	43.43	43.40	5.992
32	3.000	0.0	19.95	43.81	43.78	5.992
33	3.000	0.0	20.13	44.19	44.16	5.992
34	3.000	0.0	20.30	44.57	44.54	5.992
35	3.000	0.0	20.47	44.95	44.91	5.992
36	3.000	0.0	20.64	45.33	45.29	5.992
37	3.000	0.0	20.82	45.71	45.67	5.992
38	3.000	0.0	20.99	46.08	46.05	5.992
39	3.000	0.0	21.16	46.46	46.43	5.992
40	3.000	0.0	21.33	46.84	46.81	5.992
41	3.000	0.0	21.51	47.22	47.19	5.992
42	3.000	0.0	21.68	47.60	47.57	5.992
43	3.000	0.0	21.85	47.98	47.95	5.992
44	3.000	0.0	22.03	48.36	48.33	5.992
45	3.000	0.0	22.20	48.74	48.71	5.992
46	3.000	0.0	22.37	49.12	49.09	5.992
47	3.000	0.0	22.54	49.50	49.47	5.992
48	3.000	0.0	22.72	49.87	49.84	5.992
49	3.000	0.0	22.89	50.25	50.22	5.992
50	3.000	0.0	23.06	50.63	50.60	5.992
51	3.000	0.0	23.23	51.01	50.98	5.992
52	3.000	0.0	23.41	51.39	51.36	5.992
53	3.000	0.0	23.58	51.77	51.74	5.992
54	3.000	0.0	11.83	1.302	1.299	0.3002

Slice no.	Surface Load [kPa] Vert	Surface Load [kPa] Horiz	Water Pressure on ground surface [kPa] Vert	Water Pressure on ground surface [kPa] Horiz
1	0.0	0.0	0.1029	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F10

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = **100 m**
Passive wedge angle θ = **0 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

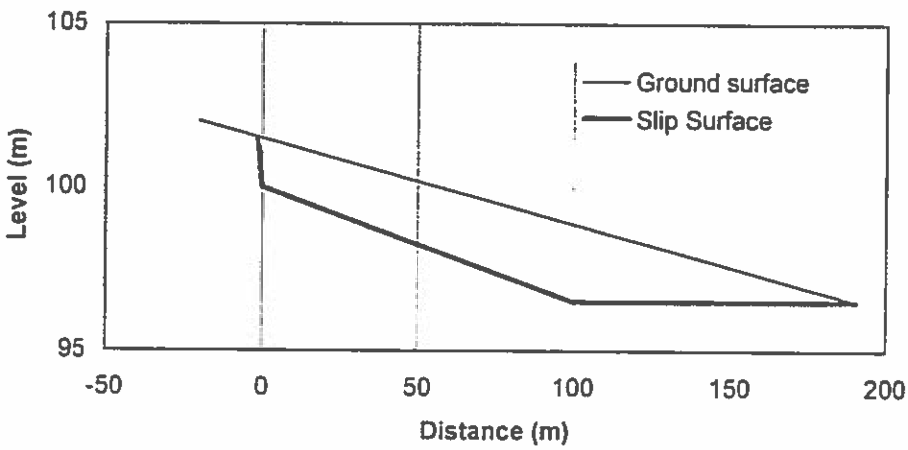
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				190.6397	96.50792

L*	90.63973	
L2	90.63973	
θ	0	Set angle
x4	190.6397	Intersection of slip surface with
y4	96.50792	ground surface

γ	45
x1	-1.5
y1	101.5



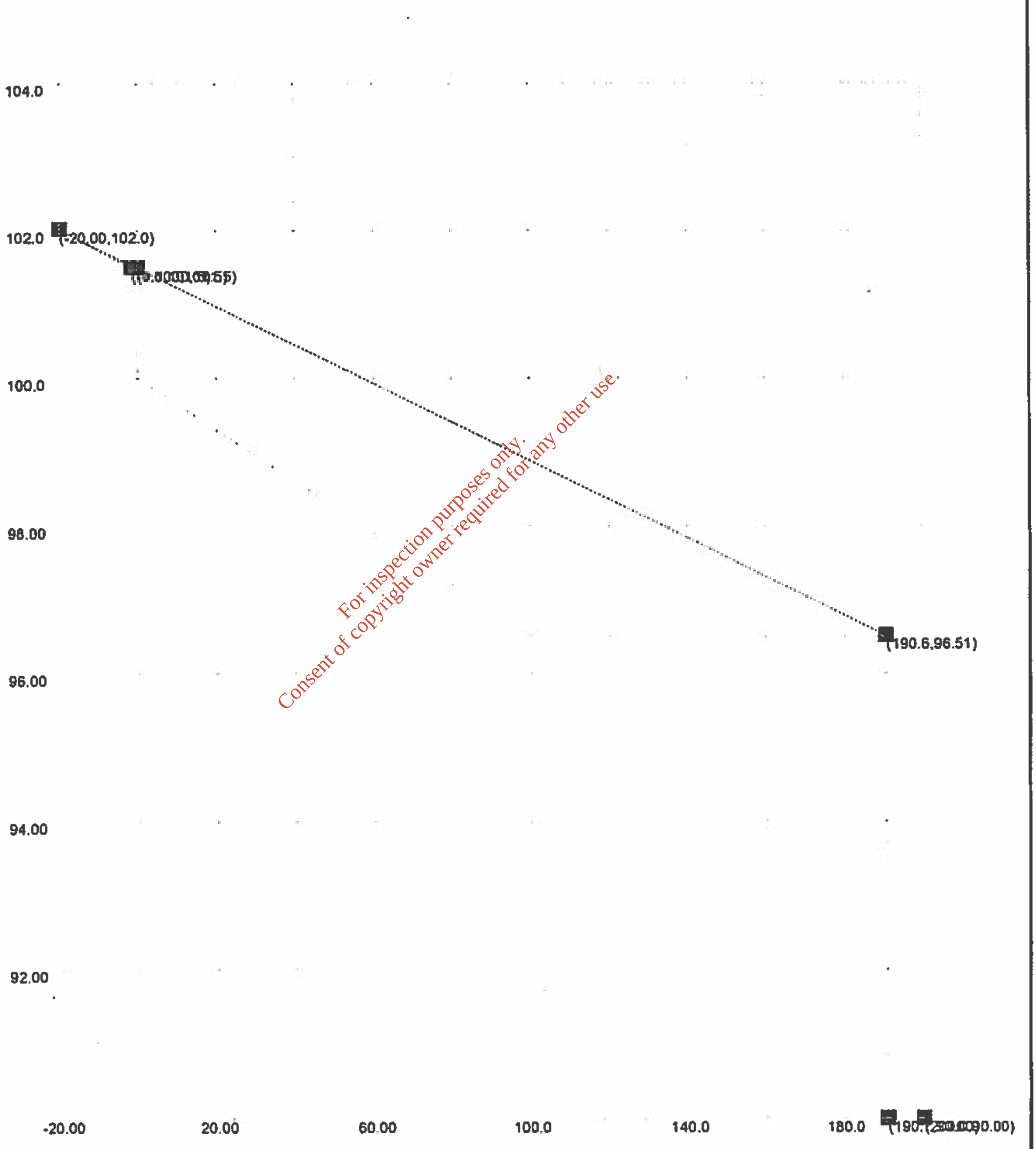
Oasys

Corrib
Peat stability - 100m slip length

Job No.	Sheet No.	Rev.
114662	F11	

Drg. Ref.

Made by	Date	Data	Checked
CH	24-Nov-2003	Corrib 8B.sld	CH



Scale x 1:1558 y 1:82

Oasys

Corrib
Peat stability - 100m slip length

Job No.	Sheet No.	Rev.
114662	F12	

Drg. Ref.

Made by	Date	Data	Checked
CH	24-Nov-2003	Corrib BBA.sld	CN

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	190.6
1	1	102.0	101.5	.	101.5	101.5	.	96.51
2	2	102.0	.	101.5	100.0	90.00	.	90.00
GWL1	-	102.0	.	101.5	101.5	101.5	.	96.51
Slip	-	.	101.5	.	100.0	.	96.51	96.50

Stratum	Material	X --> 190.7	200.0
1	1	90.00	90.00
2	2	90.00	90.00
GWL1	-	90.00	90.00
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
147.5	2139.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (147.5,2139.) Radius 0.0m
Iterations: 5 Horiz acceleration [-g]: 0.0
Net vertical force [kN]: 0.0 Slip weight [kN] 3328.
Net horiz force [kN]: -8.225E-6 Disturbing moment [kN m]: 87.04
Restoring moment [kN m]: 581.1
Factor of Safety: 6.679

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	9.776	9.600
3	0.0	100.0	15.00	0.0	11.26	11.25
4	0.1000	100.0	15.03	0.0	11.30	11.30
5	3.800	99.87	15.36	0.0	11.79	11.79
6	7.500	99.74	15.68	0.0	12.33	12.29
7	11.20	99.61	16.00	0.0	12.92	12.80
8	14.90	99.48	16.32	0.0	13.55	13.32
9	18.60	99.35	16.65	0.0	14.23	13.86
10	22.30	99.22	16.97	0.0	14.95	14.40
11	26.00	99.09	17.29	0.0	15.72	14.95
12	29.70	98.96	17.61	0.0	16.53	15.51
13	33.40	98.83	17.94	0.0	17.39	16.08
14	37.10	98.71	18.26	0.0	18.30	16.67
15	40.80	98.58	18.58	0.0	19.25	17.26
16	44.50	98.45	18.90	0.0	20.25	17.87
17	48.20	98.32	19.23	0.0	21.29	18.48
18	51.90	98.19	19.55	0.0	22.38	19.10
19	55.60	98.06	19.87	0.0	23.52	19.74
20	59.30	97.93	20.19	0.0	24.70	20.39
21	63.00	97.80	20.51	0.0	25.93	21.04
22	66.70	97.67	20.84	0.0	27.20	21.71
23	70.40	97.54	21.16	0.0	28.52	22.38
24	74.10	97.41	21.48	0.0	29.88	23.07
25	77.80	97.28	21.80	0.0	31.29	23.77
26	81.50	97.16	22.13	0.0	32.75	24.46
27	85.20	97.03	22.45	0.0	34.25	25.20
28	88.90	96.90	22.77	0.0	35.80	25.92
29	92.60	96.77	23.09	0.0	37.39	26.66
30	96.30	96.64	23.42	0.0	39.03	27.41
31	100.0	96.51	23.74	0.0	40.72	28.17
32	103.8	96.51	22.75	0.0	39.02	25.87
33	107.6	96.51	21.76	0.0	37.32	23.67
34	111.3	96.51	20.77	0.0	35.63	21.57
35	115.1	96.51	19.78	0.0	33.93	19.56
36	118.9	96.51	18.79	0.0	32.23	17.66
37	122.7	96.51	17.80	0.0	30.54	15.85
38	126.4	96.51	16.81	0.0	28.84	14.14
39	130.2	96.51	15.82	0.0	27.14	12.52
40	134.0	96.51	14.84	0.0	25.45	11.01
41	137.8	96.51	13.85	0.0	23.75	9.587
42	141.5	96.51	12.86	0.0	22.05	8.266
43	145.3	96.51	11.87	0.0	20.36	7.043
44	149.1	96.51	10.88	0.0	18.66	5.918
45	152.9	96.51	9.891	0.0	16.96	4.891
46	156.6	96.51	8.902	0.0	15.27	3.962
47	160.4	96.51	7.913	0.0	13.57	3.130
48	164.2	96.51	6.923	0.0	11.88	2.397
49	168.0	96.51	5.934	0.0	10.18	1.761
50	171.7	96.51	4.945	0.0	8.482	1.223
51	175.5	96.51	3.956	0.0	6.786	0.7828
52	179.3	96.51	2.967	0.0	5.089	0.4402
53	183.1	96.51	1.978	0.0	3.393	0.1957
54	186.8	96.51	0.9891	0.0	1.696	0.04891
55	190.6	96.51	0.0	0.0	-8.225E-6	0.0

Slice Strength Parameters Pore Slice Forces on base [kN]

Oasys

Corrib
Peat stability - 100m slip length

Job No.	Sheet No.	Rev.
114662	F13	

Drg. Ref.

Made by	Date	Data	Checked
CH	24-Nov-2003	Corrib BBA.sld	CH

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	3.000	0.0	7.183	10.78	14.72	5.940
2	3.000	0.0	14.50	1.595	2.192	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.20	61.85	61.83	11.11
5	3.000	0.0	15.52	63.16	63.14	11.11
6	3.000	0.0	15.84	64.47	64.45	11.11
7	3.000	0.0	16.16	65.78	65.77	11.11
8	3.000	0.0	16.49	67.10	67.08	11.11
9	3.000	0.0	16.81	68.41	68.39	11.11
10	3.000	0.0	17.13	69.72	69.70	11.11
11	3.000	0.0	17.45	71.03	71.02	11.11
12	3.000	0.0	17.77	72.34	72.33	11.11
13	3.000	0.0	18.10	73.65	73.64	11.11
14	3.000	0.0	18.42	74.97	74.95	11.11
15	3.000	0.0	18.74	76.28	76.27	11.11
16	3.000	0.0	19.06	77.59	77.58	11.11
17	3.000	0.0	19.39	78.90	78.89	11.11
18	3.000	0.0	19.71	80.21	80.20	11.11
19	3.000	0.0	20.03	81.53	81.52	11.11
20	3.000	0.0	20.35	82.84	82.83	11.11
21	3.000	0.0	20.68	84.15	84.14	11.11
22	3.000	0.0	21.00	85.46	85.45	11.11
23	3.000	0.0	21.32	86.77	86.77	11.11
24	3.000	0.0	21.64	88.08	88.08	11.11
25	3.000	0.0	21.96	89.40	89.39	11.11
26	3.000	0.0	22.29	90.71	90.71	11.11
27	3.000	0.0	22.61	92.02	92.02	11.11
28	3.000	0.0	22.93	93.33	93.33	11.11
29	3.000	0.0	23.25	94.64	94.64	11.11
30	3.000	0.0	23.58	95.96	95.96	11.11
31	3.000	0.0	23.24	96.56	96.56	11.33
32	3.000	0.0	22.25	92.45	92.45	11.33
33	3.000	0.0	21.26	88.34	88.34	11.33
34	3.000	0.0	20.28	84.23	84.23	11.33
35	3.000	0.0	19.29	80.12	80.12	11.33
36	3.000	0.0	18.30	76.01	76.01	11.33
37	3.000	0.0	17.31	71.91	71.91	11.33
38	3.000	0.0	16.32	67.80	67.80	11.33
39	3.000	0.0	15.33	63.69	63.69	11.33
40	3.000	0.0	14.34	59.58	59.58	11.33
41	3.000	0.0	13.35	55.47	55.47	11.33
42	3.000	0.0	12.36	51.36	51.36	11.33
43	3.000	0.0	11.37	47.25	47.25	11.33
44	3.000	0.0	10.39	43.14	43.14	11.33
45	3.000	0.0	9.396	39.03	39.03	11.33
46	3.000	0.0	8.407	34.93	34.93	11.33
47	3.000	0.0	7.418	30.82	30.82	11.33
48	3.000	0.0	6.429	26.71	26.71	11.33
49	3.000	0.0	5.440	22.60	22.60	11.33
50	3.000	0.0	4.451	18.49	18.49	11.33
51	3.000	0.0	3.462	14.38	14.38	11.33
52	3.000	0.0	2.473	10.27	10.27	11.33
53	3.000	0.0	1.484	6.163	6.163	11.33
54	3.000	0.0	0.4945	2.054	2.054	11.33

Slice no.	Surface Load [kPa] Vert	Surface Load [kPa] Horiz	Water Pressure on ground surface [kPa] Vert	Water Pressure on ground surface [kPa] Horiz
1	0.0	0.0	0.1025	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
	114662	F14	
	Drg. Ref.		

Corrib
Peat stability - 100m slip length

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BBB.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters: Phi or PhiO [°]	c or cO' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	190.6
1	1	102.0	101.5	.	101.5	101.5	.	96.51
2	2	102.0	.	101.5	100.0	90.00	.	90.00
GWL1	-	102.0	.	101.5	101.5	101.5	.	96.51
Slip	-	.	101.5	.	100.0	.	96.51	96.50

Stratum	Material	X --> 190.7	200.0
1	1	90.00	90.00
2	2	90.00	90.00
GWL1	-	90.00	90.00
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
147.5	2139.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (147.5,2139.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -11.44E-6

Radius 0.0m
Horiz acceleration [*g]: 0.0
Slip weight [kN] 3328.
Disturbing moment [kN m]: 87.84
Restoring moment [kN m]: 578.6
Factor of Safety: 6.579

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.99	9.600
3	0.0	100.0	15.00	0.0	12.19	11.25
4	0.1000	100.0	15.03	0.0	12.60	11.30
5	3.800	99.87	15.36	0.0	13.07	11.79
6	7.500	99.74	15.68	0.0	13.58	12.29
7	11.20	99.61	16.00	0.0	14.14	12.80
8	14.90	99.48	16.32	0.0	14.75	13.32
9	18.60	99.35	16.65	0.0	15.40	13.86
10	22.30	99.22	16.97	0.0	16.10	14.40
11	26.00	99.09	17.29	0.0	16.84	14.95
12	29.70	98.96	17.61	0.0	17.63	15.51
13	33.40	98.83	17.94	0.0	18.47	16.08
14	37.10	98.71	18.26	0.0	19.35	16.67
15	40.80	98.58	18.58	0.0	20.28	17.26
16	44.50	98.45	18.90	0.0	21.25	17.87
17	48.20	98.32	19.23	0.0	22.27	18.48
18	51.90	98.19	19.55	0.0	23.33	19.10
19	55.60	98.06	19.87	0.0	24.44	19.74
20	59.30	97.93	20.19	0.0	25.60	20.39
21	63.00	97.80	20.51	0.0	26.80	21.04
22	66.70	97.67	20.84	0.0	28.05	21.71
23	70.40	97.54	21.16	0.0	29.34	22.38
24	74.10	97.41	21.48	0.0	30.68	23.07
25	77.80	97.28	21.80	0.0	32.06	23.77
26	81.50	97.16	22.13	0.0	33.49	24.47
27	85.20	97.03	22.45	0.0	34.97	25.20
28	88.90	96.90	22.77	0.0	36.49	25.92
29	92.60	96.77	23.09	0.0	38.06	26.66
30	96.30	96.64	23.42	0.0	39.67	27.41
31	100.0	96.51	23.74	0.0	41.33	28.17
32	103.8	96.51	22.75	0.0	39.61	25.87
33	107.6	96.51	21.76	0.0	37.89	23.67
34	111.3	96.51	20.77	0.0	36.17	21.57
35	115.1	96.51	19.78	0.0	34.45	19.56
36	118.9	96.51	18.79	0.0	32.72	17.66
37	122.7	96.51	17.80	0.0	31.00	15.85
38	126.4	96.51	16.81	0.0	29.28	14.14
39	130.2	96.51	15.82	0.0	27.56	12.52
40	134.0	96.51	14.84	0.0	25.83	11.01
41	137.8	96.51	13.85	0.0	24.11	9.587
42	141.5	96.51	12.86	0.0	22.39	8.266
43	145.3	96.51	11.87	0.0	20.67	7.041
44	149.1	96.51	10.88	0.0	18.94	5.918
45	152.9	96.51	9.891	0.0	17.22	4.891
46	156.6	96.51	8.902	0.0	15.50	3.962
47	160.4	96.51	7.913	0.0	13.78	3.130
48	164.2	96.51	6.923	0.0	12.06	[illegible]
49	168.0	96.51	5.934	0.0	10.33	1.761
50	171.8	96.51	4.945	0.0	8.611	[illegible]
51	175.5	96.51	3.956	0.0	6.886	[illegible]
52	179.3	96.51	2.967	0.0	5.167	[illegible]
53	183.1	96.51	1.978	0.0	3.444	[illegible]
54	186.9	96.51	0.9891	0.0	1.722	[illegible]
55	190.6	96.51	0.0	0.0	-11.44E-6	[illegible]

Slice Strength Parameters Pore Slice Forces on base [kN]

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	0.1000	0.0	7.183	10.78	15.58	0.1980
2	0.1000	0.0	14.50	1.395	2.254	0.01414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.28	61.85	61.83	11.11
5	3.000	0.0	15.52	63.16	63.14	11.11
6	3.000	0.0	15.84	64.47	64.45	11.11
7	3.000	0.0	16.16	65.78	65.76	11.11
8	3.000	0.0	16.49	67.10	67.08	11.11
9	3.000	0.0	16.81	68.41	68.39	11.11
10	3.000	0.0	17.13	69.72	69.70	11.11
11	3.000	0.0	17.45	71.03	71.01	11.11
12	3.000	0.0	17.77	72.34	72.33	11.11
13	3.000	0.0	18.10	73.65	73.64	11.11
14	3.000	0.0	18.42	74.97	74.95	11.11
15	3.000	0.0	18.74	76.28	76.27	11.11
16	3.000	0.0	19.06	77.59	77.58	11.11
17	3.000	0.0	19.39	78.90	78.89	11.11
18	3.000	0.0	19.71	80.21	80.20	11.11
19	3.000	0.0	20.03	81.53	81.52	11.11
20	3.000	0.0	20.35	82.84	82.83	11.11
21	3.000	0.0	20.68	84.15	84.14	11.11
22	3.000	0.0	21.00	85.46	85.45	11.11
23	3.000	0.0	21.32	86.77	86.77	11.11
24	3.000	0.0	21.64	88.08	88.08	11.11
25	3.000	0.0	21.96	89.40	89.39	11.11
26	3.000	0.0	22.29	90.71	90.70	11.11
27	3.000	0.0	22.61	92.02	92.02	11.11
28	3.000	0.0	22.93	93.33	93.33	11.11
29	3.000	0.0	23.25	94.64	94.64	11.11
30	3.000	0.0	23.58	95.96	95.96	11.11
31	3.000	0.0	23.24	96.56	96.56	11.33
32	3.000	0.0	22.25	92.45	92.45	11.33
33	3.000	0.0	21.26	88.34	88.34	11.33
34	3.000	0.0	20.28	84.23	84.23	11.33
35	3.000	0.0	19.29	80.12	80.12	11.33
36	3.000	0.0	18.30	76.01	76.01	11.33
37	3.000	0.0	17.31	71.91	71.91	11.33
38	3.000	0.0	16.32	67.80	67.80	11.33
39	3.000	0.0	15.33	63.69	63.69	11.33
40	3.000	0.0	14.34	59.58	59.58	11.33
41	3.000	0.0	13.35	55.47	55.47	11.33
42	3.000	0.0	12.36	51.36	51.36	11.33
43	3.000	0.0	11.37	47.25	47.25	11.33
44	3.000	0.0	10.39	43.14	43.14	11.33
45	3.000	0.0	9.396	39.03	39.03	11.33
46	3.000	0.0	8.407	34.93	34.93	11.33
47	3.000	0.0	7.418	30.82	30.82	11.33
48	3.000	0.0	6.429	26.71	26.71	11.33
49	3.000	0.0	5.440	22.60	22.60	11.33
50	3.000	0.0	4.451	18.49	18.49	11.33
51	3.000	0.0	3.462	14.38	14.38	11.33
52	3.000	0.0	2.473	10.27	10.27	11.33
53	3.000	0.0	1.484	6.163	6.163	11.33
54	3.000	0.0	0.4945	2.054	2.054	11.33

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F1b

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 100 m
Passive wedge angle θ = 10 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

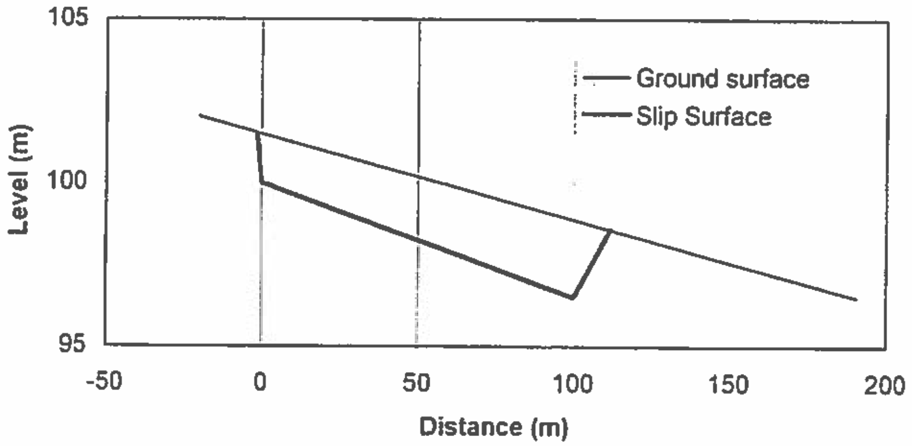
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

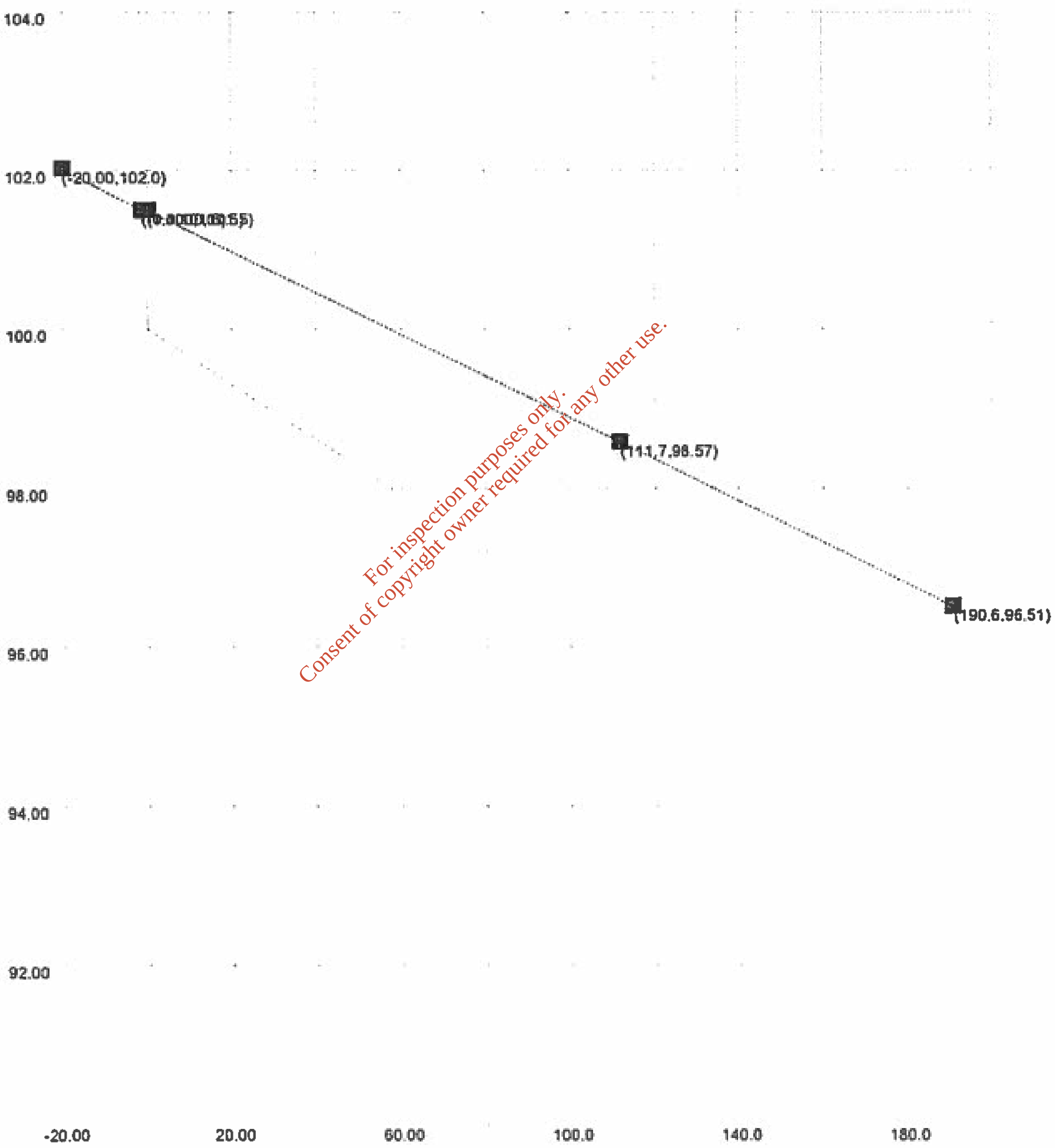
Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				111.7202	98.5745

L*	90.63973	
L2	11.72017	
θ	10	Set angle
x4	111.7202	Intersection of slip surface with
y4	98.5745	ground surface

γ	45
x1	-1.5
y1	101.5



Oasys	Job No.	Sheet No.	Rev.
Corrib **Peat stability - 100m slip length - 10deg wedge**	114662	F17	
	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib BB1.sld / Checked: CH



Scale x 1:1558 y 1:82

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 100m slip length - 10deg wedge	114662	F18	
	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib BB1.sld
	Checked: CH		

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters: Phi or Phi0 [°]	Shear Strength Parameters: c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	111.7
1	1	102.0	101.5	.	101.5	101.5	.	98.57
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5		101.5	101.5	.	98.57
Slip	-	.	101.5	.	100.0	.	96.51	98.57

Stratum	Material	X --> 190.6	190.7
1	1	96.51	
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
76.42	923.7	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (76.42,923.7)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 6.437E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2294.
Disturbing moment [kN m]: 59.84
Restoring moment [kN m]: 345.6
Factor of Safety: 5.776

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	9.326	9.800
3	0.0	100.0	15.00	0.0	10.82	11.25
4	0.1000	100.0	15.03	0.0	10.82	11.30
5	2.320	99.92	15.23	0.0	10.96	11.59
6	4.540	99.84	15.42	0.0	11.11	11.89
7	6.760	99.76	15.61	0.0	11.28	12.19
8	8.980	99.69	15.80	0.0	11.46	12.49

Oasys

Corrib
Peat stability - 100m slip length - 10deg wedge

Job No.	Sheet No.	Rev.
114662	F19	

Drg. Ref.			
Made by	**Date**	**Data**	**Checked**
CH	05-Dec-2003	Corrib BB1.sld	CH

9	11.20	99.61	16.00	0.0	11.66	12.79
10	13.42	99.53	16.19	0.0	11.88	13.10
11	15.64	99.45	16.38	0.0	12.11	13.41
12	17.86	99.38	16.57	0.0	12.36	13.73
13	20.08	99.30	16.76	0.0	12.63	14.05
14	22.30	99.22	16.96	0.0	12.91	14.37
15	24.52	99.14	17.15	0.0	13.21	14.70
16	26.74	99.07	17.34	0.0	13.52	15.03
17	28.96	98.99	17.53	0.0	13.85	15.37
18	31.18	98.91	17.72	0.0	14.20	15.71
19	33.40	98.83	17.92	0.0	14.57	16.05
20	35.62	98.76	18.11	0.0	14.95	16.39
21	37.84	98.68	18.30	0.0	15.34	16.74
22	40.06	98.60	18.49	0.0	15.76	17.10
23	42.28	98.52	18.68	0.0	16.19	17.45
24	44.50	98.45	18.88	0.0	16.63	17.81
25	46.72	98.37	19.07	0.0	17.09	18.18
26	48.94	98.29	19.26	0.0	17.57	18.55
27	51.16	98.21	19.45	0.0	18.07	18.92
28	53.38	98.14	19.64	0.0	18.58	19.29
29	55.60	98.06	19.84	0.0	19.11	19.67
30	57.82	97.98	20.03	0.0	19.65	20.06
31	60.04	97.90	20.22	0.0	20.21	20.44
32	62.26	97.83	20.41	0.0	20.79	20.83
33	64.48	97.75	20.60	0.0	21.38	21.23
34	66.70	97.67	20.80	0.0	21.99	21.62
35	68.92	97.59	20.99	0.0	22.62	22.02
36	71.14	97.52	21.18	0.0	23.26	22.43
37	73.36	97.44	21.37	0.0	23.92	22.84
38	75.58	97.36	21.56	0.0	24.58	23.25
39	77.80	97.28	21.76	0.0	25.29	23.67
40	80.02	97.21	21.95	0.0	25.99	24.09
41	82.24	97.13	22.14	0.0	26.72	24.51
42	84.46	97.05	22.33	0.0	27.46	24.94
43	86.68	96.97	22.52	0.0	28.22	25.37
44	88.90	96.90	22.72	0.0	28.99	25.80
45	91.12	96.82	22.91	0.0	29.78	26.24
46	93.34	96.74	23.10	0.0	30.58	26.68
47	95.56	96.66	23.29	0.0	31.41	27.13
48	97.78	96.59	23.48	0.0	32.25	27.58
49	100.0	96.51	23.68	0.0	33.10	28.03
50	102.0	96.85	19.73	0.0	23.86	19.46
51	103.9	97.20	15.78	0.0	16.11	12.46
52	105.9	97.54	11.84	0.0	9.844	7.007
53	107.8	97.88	7.892	0.0	5.073	3.114
54	109.8	98.23	3.946	0.0	1.791	0.7786
55	111.7	98.57	0.0	0.0	6.437E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.000	10.78	14.22	5.940
2	3.000	0.0	14.50	1.595	2.182	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	36.95	36.93	6.664
5	3.000	0.0	15.32	37.42	37.40	6.664
6	3.000	0.0	15.51	37.89	37.87	6.664
7	3.000	0.0	15.71	38.36	38.34	6.664
8	3.000	0.0	15.90	38.83	38.81	6.664
9	3.000	0.0	16.09	39.29	39.28	6.664
10	3.000	0.0	16.28	39.76	39.75	6.664
11	3.000	0.0	16.48	40.23	40.22	6.664
12	3.000	0.0	16.67	40.70	40.69	6.664
13	3.000	0.0	16.86	41.17	41.15	6.664
14	3.000	0.0	17.05	41.64	41.62	6.664
15	3.000	0.0	17.24	42.11	42.09	6.664
16	3.000	0.0	17.44	42.58	42.56	6.664
17	3.000	0.0	17.63	43.05	43.03	6.664
18	3.000	0.0	17.82	43.52	43.50	6.664
19	3.000	0.0	18.01	43.98	43.97	6.664
20	3.000	0.0	18.20	44.45	44.44	6.664
21	3.000	0.0	18.40	44.92	44.91	6.664
22	3.000	0.0	18.59	45.39	45.38	6.664
23	3.000	0.0	18.78	45.86	45.85	6.664
24	3.000	0.0	18.97	46.33	46.32	6.664

25	3.000	0.0	19.16	46.80	46.79	6.664
26	3.000	0.0	19.36	47.27	47.26	6.664
27	3.000	0.0	19.55	47.74	47.72	6.664
28	3.000	0.0	19.74	48.20	48.19	6.664
29	3.000	0.0	19.93	48.67	48.66	6.664
30	3.000	0.0	20.12	49.14	49.13	6.664
31	3.000	0.0	20.32	49.61	49.60	6.664
32	3.000	0.0	20.51	50.08	50.07	6.664
33	3.000	0.0	20.70	50.55	50.54	6.664
34	3.000	0.0	20.89	51.02	51.01	6.664
35	3.000	0.0	21.08	51.49	51.48	6.664
36	3.000	0.0	21.28	51.96	51.95	6.664
37	3.000	0.0	21.47	52.43	52.42	6.664
38	3.000	0.0	21.66	52.89	52.89	6.664
39	3.000	0.0	21.85	53.36	53.35	6.664
40	3.000	0.0	22.04	53.83	53.82	6.664
41	3.000	0.0	22.24	54.30	54.29	6.664
42	3.000	0.0	22.43	54.77	54.76	6.664
43	3.000	0.0	22.62	55.24	55.23	6.664
44	3.000	0.0	22.81	55.71	55.70	6.664
45	3.000	0.0	23.00	56.18	56.17	6.664
46	3.000	0.0	23.20	56.65	56.64	6.664
47	3.000	0.0	23.39	57.11	57.11	6.664
48	3.000	0.0	23.58	57.58	57.58	6.664
49	3.000	0.0	21.70	46.63	47.53	5.950
50	3.000	0.0	17.76	38.15	38.92	5.950
51	3.000	0.0	13.81	29.68	30.31	5.950
52	3.000	0.0	9.865	21.20	21.70	5.950
53	3.000	0.0	5.919	12.72	13.09	5.950
54	3.000	0.0	1.973	4.239	4.485	5.950

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
Corrib	114662	F21	
Peat stability - 100m slip length - 10deg wedge	Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA1.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.01000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	111.7
1	1	102.0	101.5	.	101.5	101.5	.	98.57
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.57
Slip	-	.	101.5		100.0	.	96.51	98.57

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
76.42	923.7	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (76.42,923.7)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 0.0
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2294.
Disturbing moment [kN m]: 59.84
Restoring moment [kN m]: 336.6
Factor of Safety: 5.626

Point	Slip surface coordinates x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.78	9.800
3	0.0	100.0	15.00	0.0	12.37	11.25
4	0.1000	100.0	15.03	0.0	12.37	11.30
5	2.320	99.92	15.23	0.0	12.48	11.59
6	4.540	99.84	15.42	0.0	12.60	11.89
7	6.760	99.76	15.61	0.0	12.74	12.19
8	8.980	99.69	15.80	0.0	12.89	12.49

9	11.20	99.61	16.00	0.0	13.06	12.79
10	13.42	99.53	16.19	0.0	13.24	13.10
11	15.64	99.45	16.38	0.0	13.45	13.41
12	17.86	99.38	16.57	0.0	13.67	13.73
13	20.08	99.30	16.76	0.0	13.90	14.05
14	22.30	99.22	16.96	0.0	14.15	14.37
15	24.52	99.14	17.15	0.0	14.42	14.70
16	26.74	99.07	17.34	0.0	14.71	15.03
17	28.96	98.99	17.53	0.0	15.01	15.37
18	31.18	98.91	17.72	0.0	15.32	15.71
19	33.40	98.83	17.92	0.0	15.66	16.05
20	35.62	98.76	18.11	0.0	16.01	16.39
21	37.84	98.68	18.30	0.0	16.37	16.74
22	40.06	98.60	18.49	0.0	16.75	17.10
23	42.28	98.52	18.68	0.0	17.15	17.45
24	44.50	98.45	18.88	0.0	17.57	17.81
25	46.72	98.37	19.07	0.0	18.00	18.18
26	48.94	98.29	19.26	0.0	18.45	18.55
27	51.16	98.21	19.45	0.0	18.91	18.92
28	53.38	98.14	19.64	0.0	19.39	19.29
29	55.60	98.06	19.84	0.0	19.89	19.67
30	57.82	97.98	20.03	0.0	20.40	20.06
31	60.04	97.90	20.22	0.0	20.93	20.44
32	62.26	97.83	20.41	0.0	21.48	20.83
33	64.48	97.75	20.60	0.0	22.04	21.23
34	66.70	97.67	20.80	0.0	22.62	21.62
35	68.92	97.59	20.99	0.0	23.22	22.02
36	71.14	97.52	21.18	0.0	23.83	22.43
37	73.36	97.44	21.37	0.0	24.46	22.84
38	75.58	97.36	21.56	0.0	25.10	23.25
39	77.80	97.28	21.76	0.0	25.76	23.67
40	80.02	97.21	21.95	0.0	26.44	24.09
41	82.24	97.13	22.14	0.0	27.13	24.51
42	84.46	97.05	22.33	0.0	27.84	24.94
43	86.68	96.97	22.52	0.0	28.57	25.37
44	88.90	96.90	22.72	0.0	29.31	25.80
45	91.12	96.82	22.91	0.0	30.07	26.24
46	93.34	96.74	23.10	0.0	30.84	26.68
47	95.56	96.66	23.29	0.0	31.64	27.13
48	97.78	96.59	23.48	0.0	32.44	27.58
49	100.0	96.51	23.68	0.0	33.27	28.03
50	102.0	96.85	19.73	0.0	24.00	19.46
51	103.9	97.20	15.78	0.0	16.22	12.46
52	105.9	97.54	11.84	0.0	9.928	7.007
53	107.8	97.88	7.892	0.0	5.128	3.114
54	109.8	98.23	3.946	0.0	1.819	0.7786
55	111.7	98.57	0.0	0.0	0.0	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.01000	0.0	7.000	10.78	15.24	0.01980
2	0.01000	0.0	14.50	1.595	2.255	0.001414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	36.95	36.93	6.664
5	3.000	0.0	15.32	37.42	37.40	6.664
6	3.000	0.0	15.51	37.89	37.87	6.664
7	3.000	0.0	15.71	38.36	38.34	6.664
8	3.000	0.0	15.90	38.83	38.81	6.664
9	3.000	0.0	16.09	39.29	39.28	6.664
10	3.000	0.0	16.28	39.76	39.75	6.664
11	3.000	0.0	16.48	40.23	40.22	6.664
12	3.000	0.0	16.67	40.70	40.68	6.664
13	3.000	0.0	16.86	41.17	41.15	6.664
14	3.000	0.0	17.05	41.64	41.62	6.664
15	3.000	0.0	17.24	42.11	42.09	6.664
16	3.000	0.0	17.44	42.58	42.56	6.664
17	3.000	0.0	17.63	43.05	43.03	6.664
18	3.000	0.0	17.82	43.52	43.50	6.664
19	3.000	0.0	18.01	43.98	43.97	6.664
20	3.000	0.0	18.20	44.45	44.44	6.664
21	3.000	0.0	18.40	44.92	44.91	6.664
22	3.000	0.0	18.59	45.39	45.38	6.664
23	3.000	0.0	18.78	45.86	45.85	6.664
24	3.000	0.0	18.97	46.33	46.32	6.664

25	3.000	0.0	19.16	46.80	46.78	6.664
26	3.000	0.0	19.36	47.27	47.25	6.664
27	3.000	0.0	19.55	47.74	47.72	6.664
28	3.000	0.0	19.74	48.20	48.19	6.664
29	3.000	0.0	19.93	48.67	48.66	6.664
30	3.000	0.0	20.12	49.14	49.13	6.664
31	3.000	0.0	20.32	49.61	49.60	6.664
32	3.000	0.0	20.51	50.08	50.07	6.664
33	3.000	0.0	20.70	50.55	50.54	6.664
34	3.000	0.0	20.89	51.02	51.01	6.664
35	3.000	0.0	21.08	51.49	51.48	6.664
36	3.000	0.0	21.28	51.96	51.95	6.664
37	3.000	0.0	21.47	52.43	52.42	6.664
38	3.000	0.0	21.66	52.89	52.88	6.664
39	3.000	0.0	21.85	53.36	53.35	6.664
40	3.000	0.0	22.04	53.83	53.82	6.664
41	3.000	0.0	22.24	54.30	54.29	6.664
42	3.000	0.0	22.43	54.77	54.76	6.664
43	3.000	0.0	22.62	55.24	55.23	6.664
44	3.000	0.0	22.81	55.71	55.70	6.664
45	3.000	0.0	23.00	56.18	56.17	6.664
46	3.000	0.0	23.20	56.65	56.64	6.664
47	3.000	0.0	23.39	57.11	57.11	6.664
48	3.000	0.0	23.58	57.58	57.58	6.664
49	3.000	0.0	21.70	46.63	47.53	5.950
50	3.000	0.0	17.76	38.15	38.93	5.950
51	3.000	0.0	13.81	29.68	30.32	5.950
52	3.000	0.0	9.865	21.20	21.71	5.950
53	3.000	0.0	5.919	12.72	13.10	5.950
54	3.000	0.0	1.973	4.239	4.490	5.950

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F21

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = **100 m**
Passive wedge angle θ = **20 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

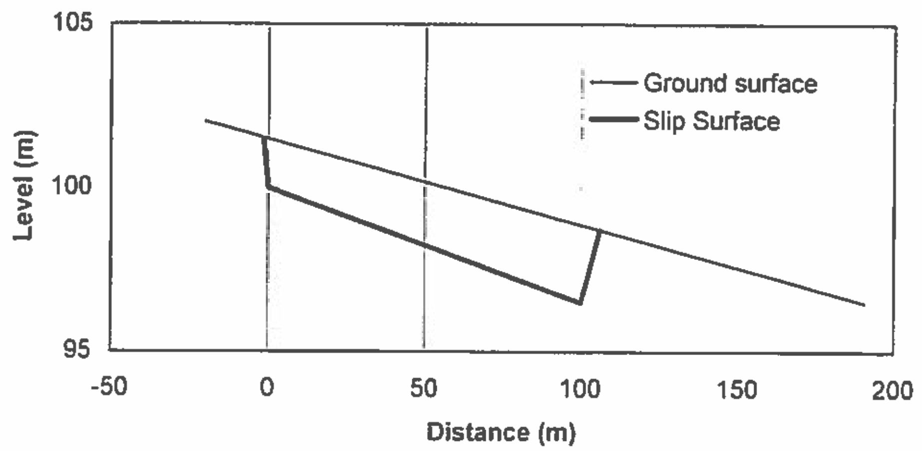
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				106.0834	98.72211

L*	90.63973	
L2	6.083423	
θ	20	Set angle
x4	106.0834	Intersection of slip surface with
y4	98.72211	ground surface

γ	45
x1	-1.5
y1	101.5



Oasys

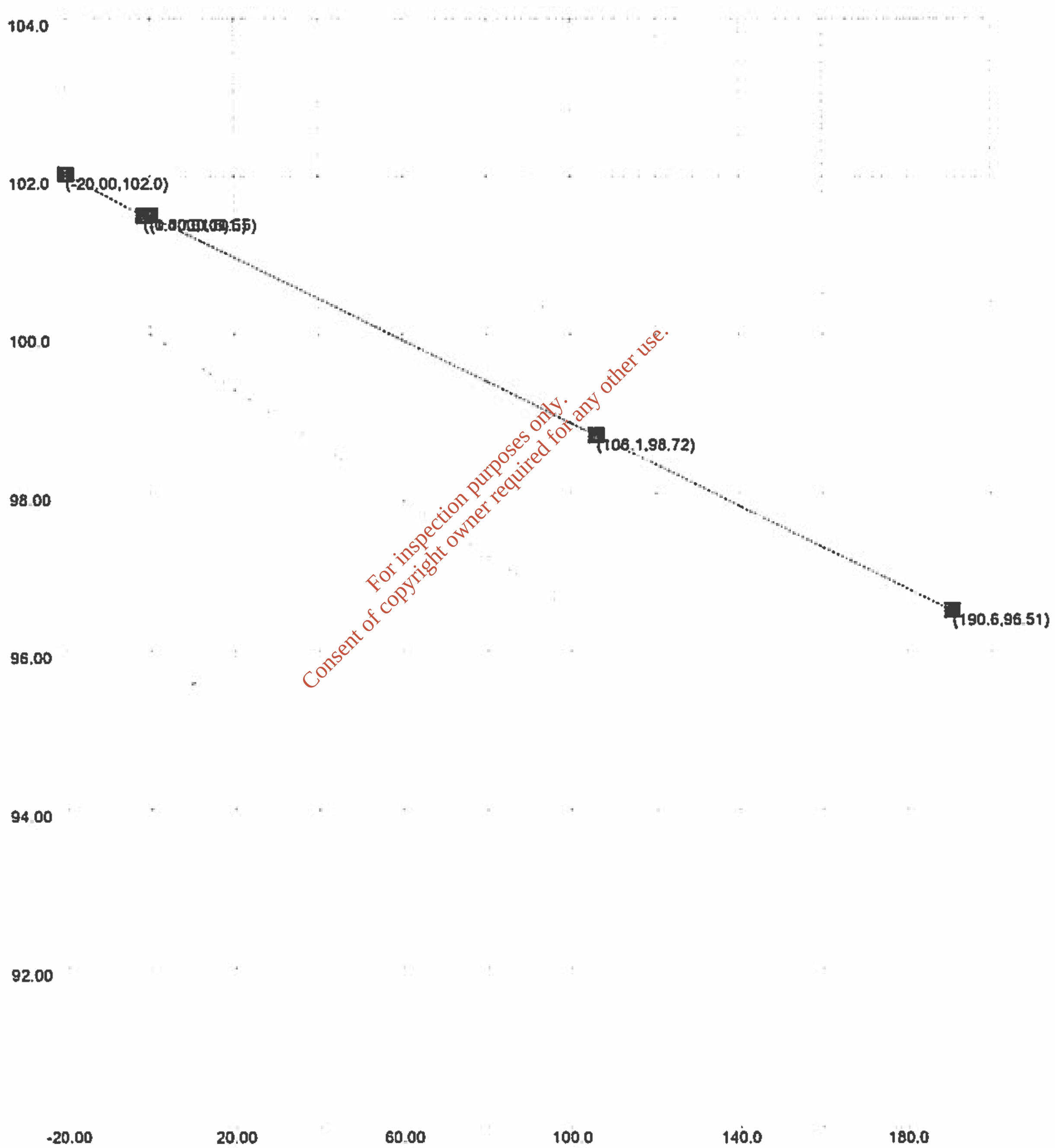
Corrib

Peat stability - 100m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F25	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BB2.sld	CU



Scale x 1:1558 y 1:82

Oasys

Corrib
Peat stability - 100m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F26	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BB2.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters: Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	106.1
1	1	102.0	101.5	.	101.5	101.5	.	98.72
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.72
Slip	-	.	101.5	.	100.0	.	96.51	98.72

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
71.70	851.1	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (71.70,851.1)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -10.25E-6

Radius 0.0m
Horiz acceleration (*g): 0.0
Slip weight [kN] 2221.
Disturbing moment [kN m]: 57.40
Restoring moment [kN m]: 3[illegible].0
Factor of Safety: 5.700

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.106	9.800
3	0.0	100.0	15.00	0.0	10.80	11.25
4	0.1000	100.0	15.03	0.0	10.80	11.30
5	2.226	99.92	15.22	0.0	10.92	11.58
6	4.351	99.85	15.40	0.0	11.04	11.86
7	6.477	99.77	15.59	0.0	11.19	12.15
8	8.602	99.70	15.77	0.0	11.35	12.44
9	10.73	99.63	15.96	0.0	11.52	12.73
10	12.85	99.55	16.14	0.0	11.71	13.03
11	14.98	99.48	16.32	0.0	11.92	13.32
12	17.10	99.40	16.51	0.0	12.14	13.63
13	19.23	99.33	16.69	0.0	12.37	13.93
14	21.36	99.25	16.88	0.0	12.62	14.24
15	23.48	99.18	17.06	0.0	12.88	14.56
16	25.61	99.11	17.25	0.0	13.16	14.87
17	27.73	99.03	17.43	0.0	13.46	15.19
18	29.86	98.96	17.61	0.0	13.77	15.51
19	31.98	98.88	17.80	0.0	14.09	15.84
20	34.11	98.81	17.98	0.0	14.43	16.17
21	36.23	98.74	18.17	0.0	14.79	16.50
22	38.36	98.66	18.35	0.0	15.16	16.84
23	40.49	98.59	18.54	0.0	15.54	17.18
24	42.61	98.51	18.72	0.0	15.94	17.52
25	44.74	98.44	18.90	0.0	16.36	17.87
26	46.86	98.36	19.09	0.0	16.79	18.22
27	48.99	98.29	19.27	0.0	17.23	18.57
28	51.11	98.22	19.46	0.0	17.69	18.93
29	53.24	98.14	19.64	0.0	18.17	19.29
30	55.36	98.07	19.83	0.0	18.66	19.65
31	57.49	97.99	20.01	0.0	19.16	20.02
32	59.61	97.92	20.19	0.0	19.68	20.39
33	61.74	97.85	20.38	0.0	20.22	20.76
34	63.87	97.77	20.56	0.0	20.77	21.14
35	65.99	97.70	20.75	0.0	21.33	21.52
36	68.12	97.62	20.93	0.0	21.91	21.91
37	70.24	97.55	21.12	0.0	22.51	22.29
38	72.37	97.47	21.30	0.0	23.12	22.68
39	74.49	97.40	21.48	0.0	23.75	23.08
40	76.62	97.33	21.67	0.0	24.39	23.48
41	78.74	97.25	21.85	0.0	25.04	23.88
42	80.87	97.18	22.04	0.0	25.71	24.28
43	83.00	97.10	22.22	0.0	26.40	24.69
44	85.12	97.03	22.41	0.0	27.10	25.10
45	87.25	96.96	22.59	0.0	27.81	25.51
46	89.37	96.88	22.77	0.0	28.54	25.93
47	91.50	96.81	22.96	0.0	29.28	26.35
48	93.62	96.73	23.14	0.0	30.05	26.78
49	95.75	96.66	23.33	0.0	30.83	27.21
50	97.87	96.58	23.51	0.0	31.62	27.64
51	100.0	96.51	23.69	0.0	32.42	28.07
52	101.5	97.06	17.77	0.0	18.42	15.79
53	103.0	97.62	11.85	0.0	8.012	7.018
54	104.6	98.17	5.924	0.0	2.706	1.755
55	106.1	98.72	0.0	0.0	-10.25E-6	0.0

Slice Strength Parameters Pore Slice Forces on base [kN]

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	3.000	0.0	7.000	10.78	14.20	5.940
2	3.000	0.0	14.50	1.595	2.101	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	35.37	35.35	6.380
5	3.000	0.0	15.31	35.80	35.78	6.380
6	3.000	0.0	15.50	36.23	36.21	6.380
7	3.000	0.0	15.68	36.66	36.64	6.380
8	3.000	0.0	15.86	37.09	37.07	6.380
9	3.000	0.0	16.05	37.52	37.51	6.380
10	3.000	0.0	16.23	37.95	37.94	6.380
11	3.000	0.0	16.42	38.38	38.37	6.380
12	3.000	0.0	16.60	38.81	38.80	6.380
13	3.000	0.0	16.79	39.25	39.23	6.380
14	3.000	0.0	16.97	39.68	39.66	6.380
15	3.000	0.0	17.15	40.11	40.09	6.380
16	3.000	0.0	17.34	40.54	40.52	6.380
17	3.000	0.0	17.52	40.97	40.95	6.380
18	3.000	0.0	17.71	41.40	41.39	6.380
19	3.000	0.0	17.89	41.83	41.82	6.380
20	3.000	0.0	18.00	42.26	42.25	6.380
21	3.000	0.0	18.26	42.69	42.68	6.380
22	3.000	0.0	18.44	43.12	43.11	6.380
23	3.000	0.0	18.63	43.55	43.54	6.380
24	3.000	0.0	18.81	43.98	43.97	6.380
25	3.000	0.0	19.00	44.41	44.40	6.380
26	3.000	0.0	19.18	44.85	44.83	6.380
27	3.000	0.0	19.36	45.28	45.27	6.380
28	3.000	0.0	19.55	45.71	45.70	6.380
29	3.000	0.0	19.73	46.14	46.13	6.380
30	3.000	0.0	19.92	46.57	46.56	6.380
31	3.000	0.0	20.10	47.00	46.99	6.380
32	3.000	0.0	20.29	47.43	47.42	6.380
33	3.000	0.0	20.47	47.86	47.85	6.380
34	3.000	0.0	20.65	48.29	48.28	6.380
35	3.000	0.0	20.84	48.72	48.71	6.380
36	3.000	0.0	21.02	49.15	49.14	6.380
37	3.000	0.0	21.21	49.58	49.58	6.380
38	3.000	0.0	21.39	50.02	50.01	6.380
39	3.000	0.0	21.58	50.45	50.44	6.380
40	3.000	0.0	21.76	50.88	50.87	6.380
41	3.000	0.0	21.94	51.31	51.30	6.380
42	3.000	0.0	22.13	51.74	51.73	6.380
43	3.000	0.0	22.31	52.17	52.16	6.380
44	3.000	0.0	22.50	52.60	52.59	6.380
45	3.000	0.0	22.68	53.03	53.02	6.380
46	3.000	0.0	22.87	53.46	53.46	6.380
47	3.000	0.0	23.05	53.89	53.89	6.380
48	3.000	0.0	23.23	54.32	54.32	6.380
49	3.000	0.0	23.42	54.75	54.75	6.380
50	3.000	0.0	23.60	55.19	55.18	6.380
51	3.000	0.0	20.73	34.67	37.19	4.052
52	3.000	0.0	14.81	24.76	26.66	4.052
53	3.000	0.0	8.486	14.06	16.12	4.052
54	3.000	0.0	2.962	4.952	5.579	4.052

Slice no.	Surface Load [kPa] Vert	Surface Load [kPa] Horiz	Water Pressure on ground surface [kPa] Vert	Water Pressure on ground surface [kPa] Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

Oasys

Corrib
Peat stability - 100m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F28	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA2.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	106.1
1	1	102.0	101.5	.	101.5	101.5	.	98.72
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.72
Slip	-	.	101.5	.	100.0	.	96.51	98.72

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
71.70	851.1	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (71.70,851.1)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -10.49E-6
Radius 0.0m
Horiz acceleration [*g]: 0.0
Slip weight [kN] 2221.
Disturbing moment [kN m]: 57.[illegible]
Restoring moment [kN m]: [illegible]
Factor of Safety: 5.550

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	Z(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	[illegible]	9.600
3	0.0	100.0	15.00	0.0	12.32	11.25
4	0.1000	100.0	15.01	0.0	12.32	11.30
5	2.226	99.92	15.22	0.0	12.41	11.58
6	4.351	99.85	15.40	0.0	12.51	11.86
7	6.477	99.77	15.59	0.0	12.62	12.15
8	8.602	99.70	15.77	0.0	12.75	12.44
9	10.73	99.63	15.96	0.0	12.89	12.73
10	12.85	99.55	16.14	0.0	13.05	13.03
11	14.98	99.48	16.32	0.0	13.23	13.32
12	17.10	99.40	16.51	0.0	13.42	13.63
13	19.23	99.33	16.69	0.0	13.62	13.93
14	21.36	99.25	16.88	0.0	13.84	14.24
15	23.48	99.18	17.06	0.0	14.07	14.56
16	25.61	99.11	17.25	0.0	14.32	14.87
17	27.73	99.03	17.43	0.0	14.59	15.19
18	29.86	98.96	17.61	0.0	14.87	15.51
19	31.98	98.88	17.80	0.0	15.16	15.84
20	34.11	98.81	17.98	0.0	15.47	16.17
21	36.23	98.74	18.17	0.0	15.80	16.50
22	38.36	98.66	18.35	0.0	16.14	16.84
23	40.49	98.59	18.54	0.0	16.49	17.18
24	42.61	98.51	18.72	0.0	16.86	17.52
25	44.74	98.44	18.90	0.0	17.24	17.87
26	46.86	98.36	19.09	0.0	17.64	18.22
27	48.99	98.29	19.27	0.0	18.06	18.57
28	51.11	98.22	19.46	0.0	18.49	18.93
29	53.24	98.14	19.64	0.0	18.93	19.29
30	55.36	98.07	19.83	0.0	19.39	19.65
31	57.49	97.99	20.01	0.0	19.87	20.02
32	59.61	97.92	20.19	0.0	20.36	20.39
33	61.74	97.85	20.38	0.0	20.86	20.76
34	63.87	97.77	20.56	0.0	21.38	21.14
35	65.99	97.70	20.75	0.0	21.92	21.52
36	68.12	97.62	20.93	0.0	22.47	21.91
37	70.24	97.55	21.12	0.0	23.03	22.29
38	72.37	97.47	21.30	0.0	23.61	22.68
39	74.49	97.40	21.48	0.0	24.21	23.08
40	76.62	97.33	21.67	0.0	24.82	23.48
41	78.74	97.25	21.85	0.0	25.44	23.88
42	80.87	97.18	22.04	0.0	26.08	24.28
43	83.00	97.10	22.22	0.0	26.74	24.69
44	85.12	97.03	22.41	0.0	27.41	25.10
45	87.25	96.96	22.59	0.0	28.09	25.51
46	89.37	96.88	22.77	0.0	28.79	25.93
47	91.50	96.81	22.96	0.0	29.51	26.35
48	93.62	96.73	23.14	0.0	30.24	26.78
49	95.75	96.66	23.33	0.0	30.99	27.21
50	97.87	96.58	23.51	0.0	31.75	27.64
51	100.0	96.51	23.69	0.0	32.52	28.07
52	101.5	97.06	17.77	0.0	18.66	15.79
53	103.0	97.62	11.49	0.0	9.061	[illegible]
54	104.6	98.17	5.424	0.0	2.730	1.755
55	106.1	98.72	0.0	0.0	-10.49E-6	0.0

Slice Strength Parameters Pore Slice Forces on base (kN)

Oasys

Corrib
Peat stability - 100m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F29	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA2.sld	CH

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	0.1000	0.0	7.000	10.78	15.21	0.1980
2	0.1000	0.0	14.50	1.595	2.253	0.01414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	35.37	35.35	6.380
5	3.000	0.0	15.31	35.80	35.78	6.380
6	3.000	0.0	15.50	36.23	36.21	6.380
7	3.000	0.0	15.68	36.66	36.64	6.380
8	3.000	0.0	15.86	37.09	37.07	6.380
9	3.000	0.0	16.05	37.52	37.50	6.380
10	3.000	0.0	16.23	37.95	37.94	6.380
11	3.000	0.0	16.42	38.38	38.37	6.380
12	3.000	0.0	16.60	38.81	38.80	6.380
13	3.000	0.0	16.79	39.25	39.23	6.380
14	3.000	0.0	16.97	39.68	39.66	6.380
15	3.000	0.0	17.15	40.11	40.09	6.380
16	3.000	0.0	17.34	40.54	40.52	6.380
17	3.000	0.0	17.52	40.97	40.95	6.380
18	3.000	0.0	17.71	41.40	41.38	6.380
19	3.000	0.0	17.89	41.83	41.82	6.380
20	3.000	0.0	18.08	42.26	42.25	6.380
21	3.000	0.0	18.26	42.69	42.68	6.380
22	3.000	0.0	18.44	43.12	43.11	6.380
23	3.000	0.0	18.63	43.55	43.54	6.380
24	3.000	0.0	18.81	43.98	43.97	6.380
25	3.000	0.0	19.00	44.41	44.40	6.380
26	3.000	0.0	19.18	44.85	44.83	6.380
27	3.000	0.0	19.36	45.28	45.26	6.380
28	3.000	0.0	19.55	45.71	45.70	6.380
29	3.000	0.0	19.73	46.14	46.13	6.380
30	3.000	0.0	19.92	46.57	46.56	6.380
31	3.000	0.0	20.10	47.00	46.99	6.380
32	3.000	0.0	20.29	47.43	47.42	6.380
33	3.000	0.0	20.47	47.86	47.85	6.380
34	3.000	0.0	20.65	48.29	48.28	6.380
35	3.000	0.0	20.84	48.72	48.71	6.380
36	3.000	0.0	21.02	49.15	49.14	6.380
37	3.000	0.0	21.21	49.58	49.57	6.380
38	3.000	0.0	21.39	50.02	50.01	6.380
39	3.000	0.0	21.58	50.45	50.44	6.380
40	3.000	0.0	21.76	50.88	50.87	6.380
41	3.000	0.0	21.94	51.31	51.30	6.380
42	3.000	0.0	22.13	51.74	51.73	6.380
43	3.000	0.0	22.31	52.17	52.16	6.380
44	3.000	0.0	22.50	52.60	52.59	6.380
45	3.000	0.0	22.68	53.03	53.02	6.380
46	3.000	0.0	22.87	53.46	53.45	6.380
47	3.000	0.0	23.05	53.89	53.89	6.380
48	3.000	0.0	23.23	54.32	54.32	6.380
49	3.000	0.0	23.42	54.75	54.75	6.380
50	3.000	0.0	23.60	55.19	55.18	6.380
51	3.000	0.0	20.73	34.67	37.20	4.652
52	3.000	0.0	14.81	24.76	26.66	4.652
53	3.000	0.0	8.866	14.86	16.13	4.652
54	3.000	0.0	2.962	4.952	5.567	4.652

Slice no.	Surface Load (kPa)		Water Pressure on ground surface (kPa)	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

Corrib Onshore Terminal
Slope geometric data

Slope length L = **100 m**
Passive wedge angle θ = **30 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

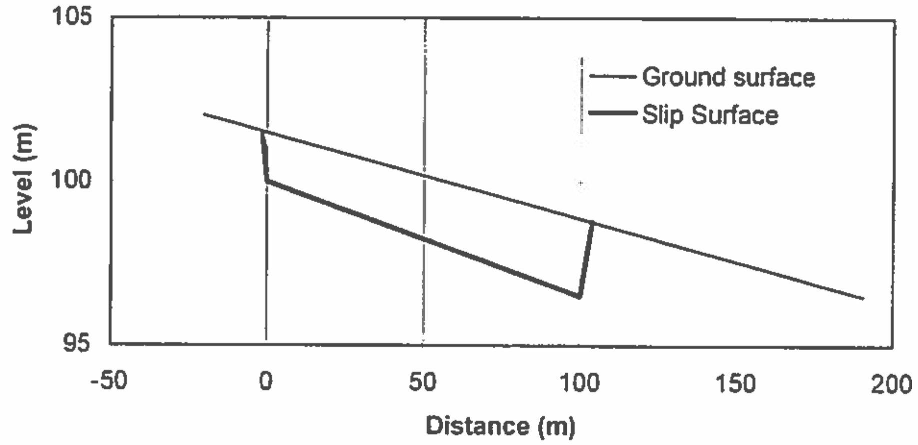
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				103.9326	98.77843

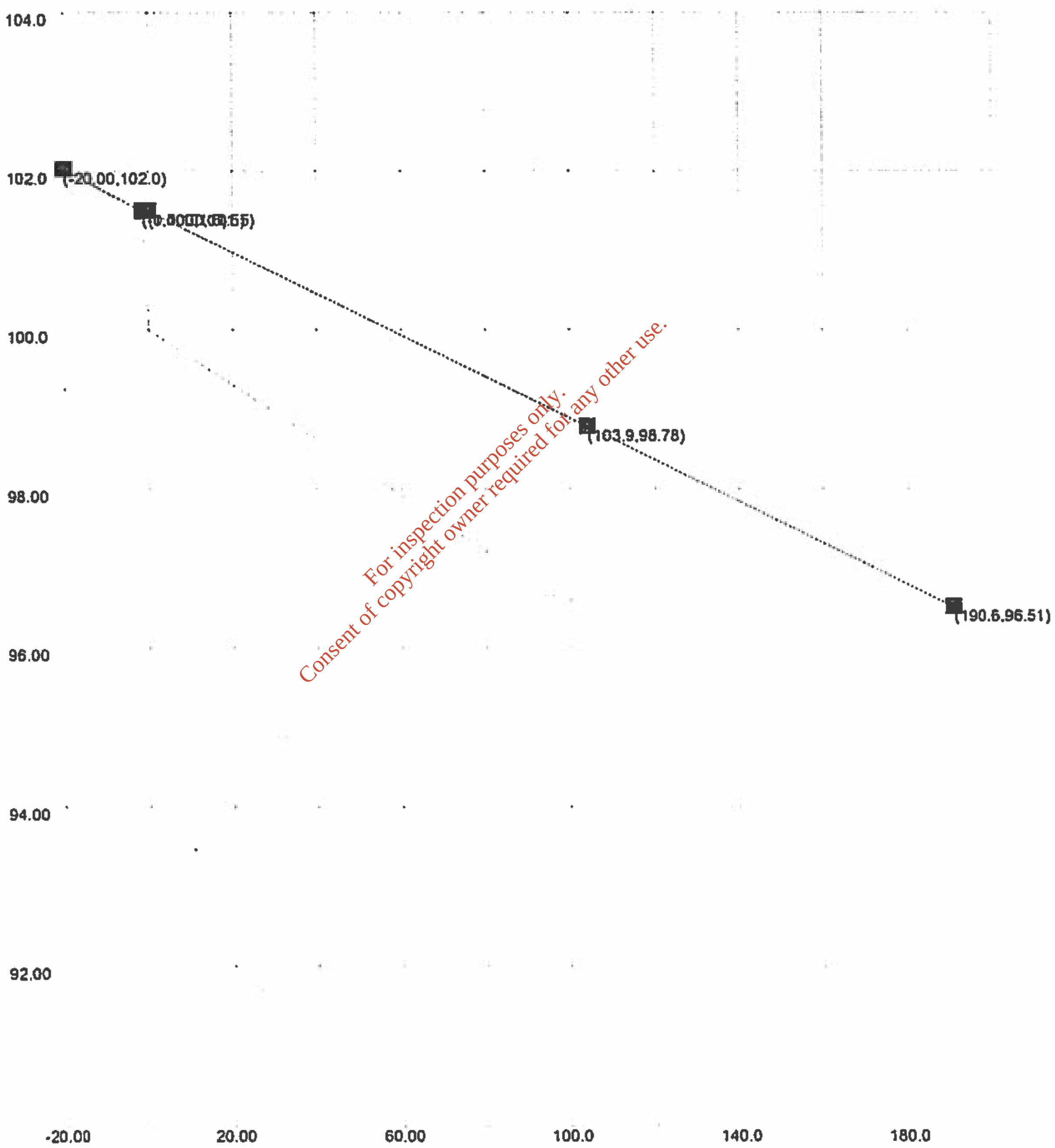
L*	90.63973	
L2	3.93263	
θ	30	Set angle
x4	103.9326	Intersection of slip surface with
y4	98.77843	ground surface

γ	45
x1	-1.5
y1	101.5



Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 100m slip length - 30deg wedge	114662	F31	
	Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BB3.sld	CH



Scale x 1:1558 y 1:82

Oasys

Corrib
Peat stability - 100m slip length - 30deg wedge

Job No.	Sheet No.	Rev.
114662	F32	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BB3.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	103.9
1	1	102.0	101.5	.	101.5	101.5	.	98.78
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.78
Slip	-	.	101.5	.	100.0	.	96.51	98.78

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
69.90	824.2	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (69.90,824.2) Radius 0.0m
Iterations: 5 Horiz acceleration [*g]: 0.0
Net vertical force [kN]: 0.0 Slip weight [kN] 2195.
Net horiz force [kN]: 3.815E-6 Disturbing moment [kN m]: [illegible]
Restoring moment [kN m]: 32?.1
Factor of Safety: 5.689

Slip surface coordinates / Pore Pressure / Interslice forces [kN]

Point	x [m]	y [m]	u [kPa]	T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	9.304	9.800
3	0.0	100.0	15.00	0.0	10.79	11.25
4	0.1000	100.0	15.03	0.0	10.80	11.30
5	2.181	99.92	15.22	0.0	10.91	11.58
6	4.262	99.85	15.40	0.0	11.03	11.85
7	6.344	99.78	15.58	0.0	11.17	12.13
8	8.425	99.71	15.76	0.0	11.32	12.42
9	10.51	99.63	15.94	0.0	11.49	12.71
10	12.59	99.56	16.12	0.0	11.67	13.00
11	14.67	99.49	16.30	0.0	11.87	13.29
12	16.75	99.42	16.48	0.0	12.08	13.59
13	18.83	99.34	16.67	0.0	12.31	13.89
14	20.91	99.27	16.85	0.0	12.55	14.19
15	22.99	99.20	17.03	0.0	12.80	14.50
16	25.08	99.12	17.21	0.0	13.07	14.81
17	27.16	99.05	17.39	0.0	13.35	15.12
18	29.24	98.98	17.57	0.0	13.65	15.44
19	31.32	98.91	17.75	0.0	13.96	15.76
20	33.40	98.83	17.93	0.0	14.29	16.08
21	35.48	98.76	18.11	0.0	14.63	16.41
22	37.56	98.69	18.30	0.0	14.99	16.74
23	39.64	98.62	18.48	0.0	15.36	17.07
24	41.72	98.54	18.66	0.0	15.74	17.41
25	43.81	98.47	18.84	0.0	16.14	17.75
26	45.89	98.40	19.02	0.0	16.56	18.09
27	47.97	98.33	19.20	0.0	16.98	18.43
28	50.05	98.25	19.38	0.0	17.43	18.78
29	52.13	98.18	19.56	0.0	17.88	19.14
30	54.21	98.11	19.74	0.0	18.35	19.49
31	56.29	98.04	19.93	0.0	18.84	19.85
32	58.38	97.96	20.11	0.0	19.34	20.21
33	60.46	97.89	20.29	0.0	19.86	20.58
34	62.54	97.82	20.47	0.0	20.39	20.95
35	64.62	97.74	20.65	0.0	20.93	21.32
36	66.70	97.67	20.83	0.0	21.49	21.70
37	68.78	97.60	21.01	0.0	22.06	22.08
38	70.86	97.53	21.19	0.0	22.65	22.46
39	72.94	97.45	21.37	0.0	23.25	22.84
40	75.03	97.38	21.56	0.0	23.87	23.23
41	77.11	97.31	21.74	0.0	24.50	23.62
42	79.19	97.24	21.92	0.0	25.14	24.02
43	81.27	97.16	22.10	0.0	25.80	24.42
44	83.35	97.09	22.28	0.0	26.48	24.82
45	85.43	97.02	22.46	0.0	27.16	25.23
46	87.51	96.95	22.64	0.0	27.87	25.63
47	89.59	96.87	22.82	0.0	28.58	26.05
48	91.68	96.80	23.00	0.0	29.32	26.46
49	93.76	96.73	23.19	0.0	30.06	26.88
50	95.84	96.66	23.37	0.0	30.82	[illegible]
51	97.92	96.58	23.55	0.0	31.60	[illegible]
52	100.0	96.51	23.73	0.0	32.39	[illegible]
53	101.3	97.27	15.82	0.0	[illegible]	12.51
54	[illegible]	[illegible]	7.910	0.0	[illegible]	[illegible]
55	[illegible]	[illegible]	0.0	0.0	[illegible]	[illegible]

Slice Strength Parameters Pore Slice Forces on base (kN)

Oasys

Job No.	Sheet No.	Rev.
114662	F33	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BB3.sld	CH

Corrib
Peat stability - 100m slip length - 30deg wedge

No.	c' (kPa)	Tan phi	Pressure (kPa)	Weight (kN)	Normal	Shear
1	3.000	0.0	7.000	10.70	14.20	5.940
2	3.000	0.0	14.50	1.595	2.101	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	34.63	34.61	6.240
5	3.000	0.0	15.31	35.04	35.03	6.240
6	3.000	0.0	15.49	35.46	35.44	6.240
7	3.000	0.0	15.67	35.87	35.86	6.240
8	3.000	0.0	15.85	36.29	36.27	6.240
9	3.000	0.0	16.03	36.70	36.69	6.240
10	3.000	0.0	16.21	37.12	37.10	6.240
11	3.000	0.0	16.39	37.53	37.52	6.240
12	3.000	0.0	16.57	37.95	37.93	6.240
13	3.000	0.0	16.76	38.36	38.35	6.240
14	3.000	0.0	16.94	38.77	38.76	6.240
15	3.000	0.0	17.12	39.19	39.17	6.240
16	3.000	0.0	17.30	39.60	39.59	6.240
17	3.000	0.0	17.48	40.02	40.00	6.240
18	3.000	0.0	17.66	40.43	40.42	6.240
19	3.000	0.0	17.84	40.85	40.83	6.240
20	3.000	0.0	18.02	41.26	41.25	6.240
21	3.000	0.0	18.20	41.68	41.66	6.240
22	3.000	0.0	18.39	42.09	42.08	6.240
23	3.000	0.0	18.57	42.51	42.49	6.240
24	3.000	0.0	18.75	42.92	42.91	6.240
25	3.000	0.0	18.93	43.34	43.32	6.240
26	3.000	0.0	19.11	43.75	43.74	6.240
27	3.000	0.0	19.29	44.17	44.15	6.240
28	3.000	0.0	19.47	44.58	44.57	6.240
29	3.000	0.0	19.65	45.00	44.98	6.240
30	3.000	0.0	19.84	45.41	45.40	6.240
31	3.000	0.0	20.02	45.82	45.81	6.240
32	3.000	0.0	20.20	46.24	46.23	6.240
33	3.000	0.0	20.38	46.65	46.64	6.240
34	3.000	0.0	20.56	47.07	47.06	6.240
35	3.000	0.0	20.74	47.48	47.47	6.240
36	3.000	0.0	20.92	47.90	47.89	6.240
37	3.000	0.0	21.10	48.31	48.30	6.240
38	3.000	0.0	21.28	48.73	48.72	6.240
39	3.000	0.0	21.47	49.14	49.13	6.240
40	3.000	0.0	21.65	49.56	49.55	6.240
41	3.000	0.0	21.83	49.97	49.96	6.240
42	3.000	0.0	22.01	50.39	50.38	6.240
43	3.000	0.0	22.19	50.80	50.79	6.240
44	3.000	0.0	22.37	51.22	51.21	6.240
45	3.000	0.0	22.55	51.63	51.62	6.240
46	3.000	0.0	22.73	52.04	52.04	6.240
47	3.000	0.0	22.91	52.46	52.45	6.240
48	3.000	0.0	23.10	52.87	52.87	6.240
49	3.000	0.0	23.28	53.29	53.28	6.240
50	3.000	0.0	23.46	53.70	53.70	6.240
51	3.000	0.0	23.64	54.12	54.11	6.240
52	3.000	0.0	19.77	28.50	33.37	4.538
53	3.000	0.0	11.66	17.10	20.21	4.538
54	3.000	0.0	3.555	5.699	7.042	4.538

Slice no.	Surface Load (kPa) Vert	Surface Load (kPa) Horiz	Water Pressure on ground surface (kPa) Vert	Water Pressure on ground surface (kPa) Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

Oasys

Corrib
Peat stability - 100m slip length - 30deg wedge

Job No.	Sheet No.	Rev.
114662	F34	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA3.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.01000

Coordinates of top of soil strata

Stratum	Material	x --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	103.9
1	1	102.0	101.5	.	101.5	101.5	.	98.78
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.78
Slip	-	.	101.5	.	100.0	.	96.51	98.78

Stratum	Material	x --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
69.90	124.2	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (69.90,124.2)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 1.907E-6
Radius 0.0m
Horiz acceleration [*g]: 0.0
Slip weight [kN] 2195.
Disturbing moment [kN m]: 57.94
Restoring moment [kN m]: 3[illegible].1
Factor of Safety: 5.532

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	Z(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.77	9.000
3	0.0	100.0	15.00	0.0	12.37	11.25
4	0.1000	100.0	15.03	0.0	12.37	11.30
5	2.181	99.92	15.22	0.0	12.45	11.58
6	4.262	99.85	15.40	0.0	12.54	11.85
7	6.344	99.78	15.58	0.0	12.65	12.13
8	8.425	99.71	15.76	0.0	12.77	12.42
9	10.51	99.63	15.94	0.0	12.91	12.71
10	12.59	99.56	16.12	0.0	13.06	13.00
11	14.67	99.49	16.30	0.0	13.23	13.29
12	16.75	99.42	16.48	0.0	13.41	13.59
13	18.83	99.34	16.67	0.0	13.60	13.89
14	20.91	99.27	16.85	0.0	13.81	14.19
15	22.99	99.20	17.03	0.0	14.03	14.50
16	25.08	99.12	17.21	0.0	14.27	14.81
17	27.16	99.05	17.39	0.0	14.52	15.12
18	29.24	98.98	17.57	0.0	14.79	15.44
19	31.32	98.91	17.75	0.0	15.07	15.76
20	33.40	98.83	17.93	0.0	15.37	16.08
21	35.48	98.76	18.11	0.0	15.68	16.41
22	37.56	98.69	18.30	0.0	16.00	16.74
23	39.64	98.62	18.48	0.0	16.34	17.07
24	41.72	98.54	18.66	0.0	16.69	17.41
25	43.81	98.47	18.84	0.0	17.06	17.75
26	45.89	98.40	19.02	0.0	17.44	18.09
27	47.97	98.33	19.20	0.0	17.84	18.43
28	50.05	98.25	19.38	0.0	18.25	18.78
29	52.13	98.18	19.56	0.0	18.68	19.14
30	54.21	98.11	19.74	0.0	19.12	19.49
31	56.29	98.04	19.93	0.0	19.57	19.85
32	58.38	97.96	20.11	0.0	20.04	20.21
33	60.46	97.89	20.29	0.0	20.53	20.58
34	62.54	97.82	20.47	0.0	21.02	20.95
35	64.62	97.74	20.65	0.0	21.54	21.32
36	66.70	97.67	20.83	0.0	22.06	21.70
37	68.78	97.60	21.01	0.0	22.61	22.08
38	70.86	97.53	21.19	0.0	23.16	22.46
39	72.94	97.45	21.37	0.0	23.73	22.84
40	75.03	97.38	21.56	0.0	24.32	23.23
41	77.11	97.31	21.74	0.0	24.92	23.62
42	79.19	97.24	21.92	0.0	25.53	24.02
43	81.27	97.16	22.10	0.0	26.16	24.42
44	83.35	97.09	22.28	0.0	26.80	24.82
45	85.43	97.02	22.46	0.0	27.46	25.23
46	87.51	96.95	22.64	0.0	28.13	25.63
47	89.59	96.87	22.82	0.0	28.82	26.05
48	91.68	96.80	23.00	0.0	29.52	26.46
49	93.76	96.73	23.19	0.0	30.24	[illegible]
50	95.84	96.66	23.37	0.0	30.97	[illegible]
51	97.92	96.59	23.55	0.0	31.71	[illegible]
52	100.0	96.51	23.73	0.0	32.47	[illegible]
53	101.5	97.27	15.92	0.0	15.04	[illegible]
54	[illegible]	98.02	7.420	0.0	4.214	[illegible]
55	[illegible]	[illegible]	0.0	0.0	[illegible]	[illegible]

Slice Strength Parameters Pore Slice Forces on base [kN]

Oasys

Job No.	Sheet No.	Rev.
114662	F35	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA3.sld	CH

Corrib
Peat stability - 100m slip length - 30deg wedge

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	0.01000	0.0	7.000	10.76	15.24	0.01980
2	0.01000	0.0	14.50	1.595	2.255	0.001414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	34.63	34.61	6.248
5	3.000	0.0	15.31	35.04	35.02	6.248
6	3.000	0.0	15.49	35.46	35.44	6.248
7	3.000	0.0	15.67	35.87	35.85	6.248
8	3.000	0.0	15.85	36.29	36.27	6.248
9	3.000	0.0	16.03	36.70	36.68	6.248
10	3.000	0.0	16.21	37.12	37.10	6.248
11	3.000	0.0	16.39	37.53	37.51	6.248
12	3.000	0.0	16.57	37.95	37.93	6.248
13	3.000	0.0	16.76	38.36	38.34	6.248
14	3.000	0.0	16.94	38.77	38.76	6.248
15	3.000	0.0	17.12	39.19	39.17	6.248
16	3.000	0.0	17.30	39.60	39.59	6.248
17	3.000	0.0	17.48	40.02	40.00	6.248
18	3.000	0.0	17.66	40.43	40.42	6.248
19	3.000	0.0	17.84	40.85	40.83	6.248
20	3.000	0.0	18.02	41.26	41.25	6.248
21	3.000	0.0	18.20	41.68	41.66	6.248
22	3.000	0.0	18.39	42.09	42.08	6.248
23	3.000	0.0	18.57	42.51	42.49	6.248
24	3.000	0.0	18.75	42.92	42.91	6.248
25	3.000	0.0	18.93	43.34	43.32	6.248
26	3.000	0.0	19.11	43.75	43.74	6.248
27	3.000	0.0	19.29	44.17	44.15	6.248
28	3.000	0.0	19.47	44.58	44.57	6.248
29	3.000	0.0	19.65	45.00	44.98	6.248
30	3.000	0.0	19.84	45.41	45.40	6.248
31	3.000	0.0	20.02	45.82	45.81	6.248
32	3.000	0.0	20.20	46.24	46.23	6.248
33	3.000	0.0	20.38	46.65	46.64	6.248
34	3.000	0.0	20.56	47.07	47.06	6.248
35	3.000	0.0	20.74	47.48	47.47	6.248
36	3.000	0.0	20.92	47.90	47.89	6.248
37	3.000	0.0	21.10	48.31	48.30	6.248
38	3.000	0.0	21.28	48.73	48.72	6.248
39	3.000	0.0	21.47	49.14	49.13	6.248
40	3.000	0.0	21.65	49.56	49.55	6.248
41	3.000	0.0	21.83	49.97	49.96	6.248
42	3.000	0.0	22.01	50.39	50.38	6.248
43	3.000	0.0	22.19	50.80	50.79	6.248
44	3.000	0.0	22.37	51.22	51.21	6.248
45	3.000	0.0	22.55	51.63	51.62	6.248
46	3.000	0.0	22.73	52.04	52.04	6.248
47	3.000	0.0	22.91	52.46	52.45	6.248
48	3.000	0.0	23.10	52.87	52.87	6.248
49	3.000	0.0	23.28	53.29	53.28	6.248
50	3.000	0.0	23.46	53.70	53.70	6.248
51	3.000	0.0	23.64	54.12	54.11	6.248
52	3.000	0.0	19.77	26.50	33.38	4.538
53	3.000	0.0	11.46	17.10	20.22	4.538
54	3.000	0.0	3.955	5.699	7.055	4.538

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F36

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = **100 m**
Passive wedge angle θ = **40 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

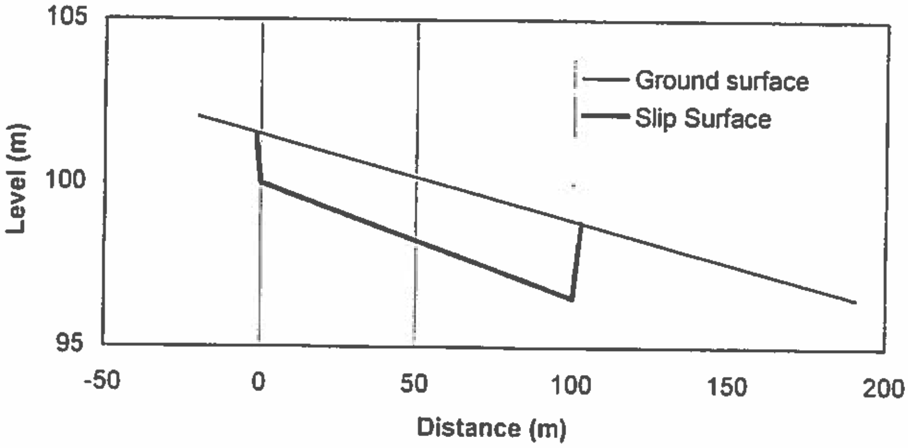
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				102.743	98.80958

L'	90.63973	
L2	2.743008	
θ	40	Set angle
x4	102.743	Intersection of slip surface with
y4	98.80958	ground surface

γ	45
x1	-1.5
y1	101.5

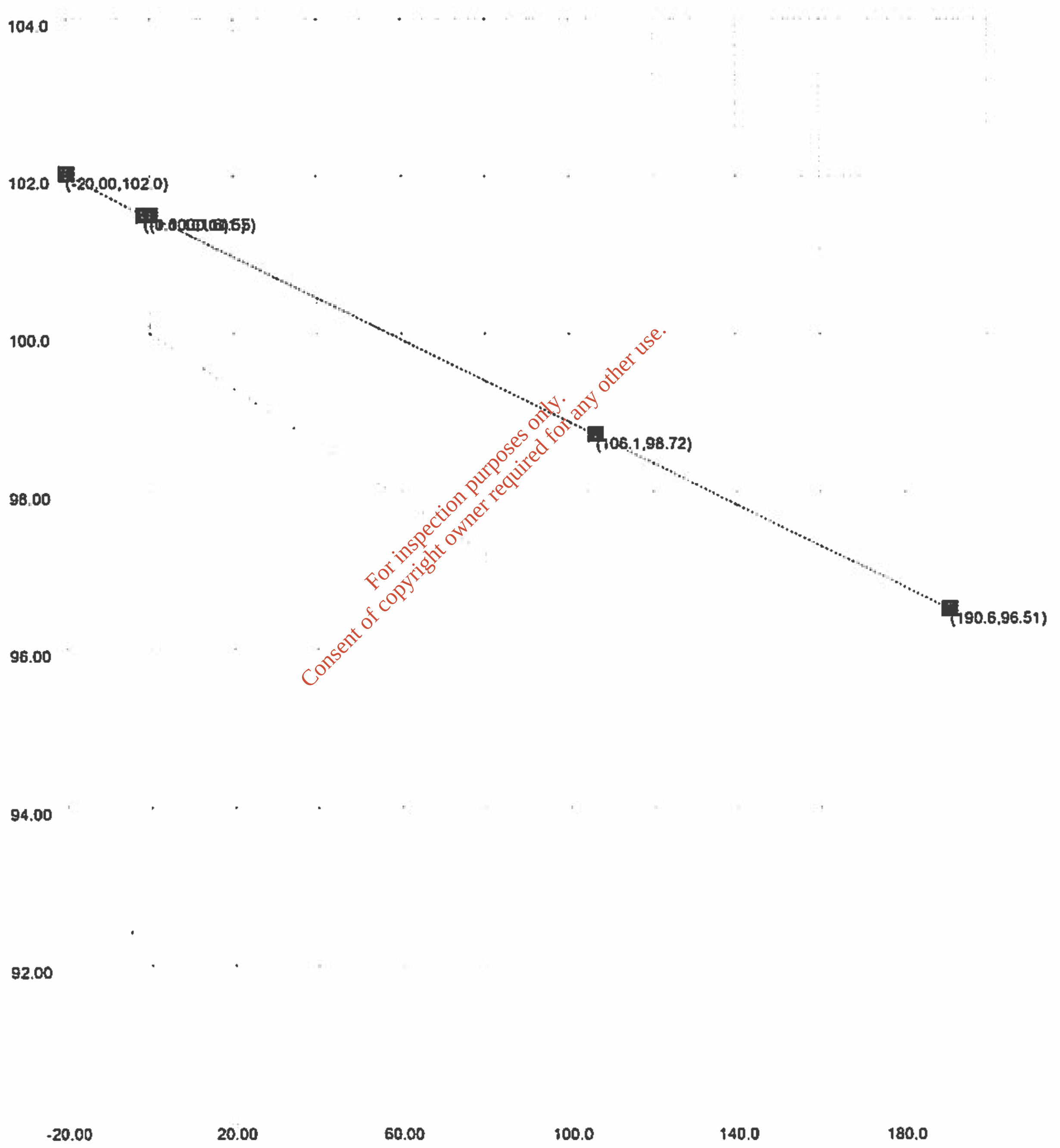


Oasys

Corrib
Peat stability - 100m slip length - 40deg wedge

Job No.	Sheet No.	Rev.
114662	F87	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA4.sld	CH



Scale x 1:1558 y 1:82

Oasys	Job No.	Sheet No.	Rev.
Corrib	114662	F38	
Peat stability - 100m slip length - 40deg wedge	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib BB4.sld
	Checked: CH		

General Parameters

Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options

Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters: Phi or Phi0 [°]	Shear Strength Parameters: c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	102.7
1	1	102.0	101.5	.	101.5	101.5	.	98.81
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	.
Slip	-	.	101.5	.	100.0	.	96.51	98.81

Stratum	Material	X --> 106.1	190.6	190.7
1	1	.	96.51	.
2	2	.	90.00	90.00
GWL1	-	98.72	96.51	96.51
Slip	-	.	.	.

Groundwater

Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
68.90	808.3	0.0				

WORST CASE : WATER CASE 1 OF 1

Centre at (68.90,808.3)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 12.69E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2179.
Disturbing moment [kN m]: 56.74
Restoring moment [kN m]: 323.4
Factor of Safety: 5.699

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	9.306	9.800
3	0.0	100.0	15.00	0.0	10.80	11.25
4	0.1000	100.0	15.03	0.0	10.80	11.30
5	2.181	99.92	15.22	0.0	10.91	11.58
6	4.262	99.85	15.40	0.0	11.04	11.85
7	6.344	99.78	15.58	0.0	11.18	12.13
8	8.425	99.71	15.76	0.0	11.33	12.41

9	10.51	99.63	15.94	0.0	11.50	12.70
10	12.59	99.56	16.12	0.0	11.69	12.99
11	14.67	99.49	16.30	0.0	11.89	13.28
12	16.75	99.42	16.48	0.0	12.10	13.58
13	18.83	99.34	16.66	0.0	12.33	13.88
14	20.91	99.27	16.84	0.0	12.57	14.18
15	22.99	99.20	17.02	0.0	12.82	14.48
16	25.08	99.12	17.20	0.0	13.09	14.79
17	27.16	99.05	17.38	0.0	13.38	15.10
18	29.24	98.98	17.56	0.0	13.68	15.42
19	31.32	98.91	17.74	0.0	13.99	15.74
20	33.40	98.83	17.92	0.0	14.32	16.06
21	35.48	98.76	18.10	0.0	14.66	16.38
22	37.56	98.69	18.28	0.0	15.02	16.71
23	39.64	98.62	18.46	0.0	15.39	17.04
24	41.72	98.54	18.64	0.0	15.78	17.38
25	43.81	98.47	18.82	0.0	16.18	17.72
26	45.89	98.40	19.00	0.0	16.59	18.06
27	47.97	98.33	19.18	0.0	17.02	18.40
28	50.05	98.25	19.36	0.0	17.47	18.75
29	52.13	98.18	19.55	0.0	17.93	19.10
30	54.21	98.11	19.73	0.0	18.40	19.46
31	56.29	98.04	19.91	0.0	18.89	19.81
32	58.38	97.96	20.09	0.0	19.39	20.17
33	60.46	97.89	20.27	0.0	19.91	20.54
34	62.54	97.82	20.45	0.0	20.44	20.90
35	64.62	97.74	20.63	0.0	20.98	21.28
36	66.70	97.67	20.81	0.0	21.54	21.65
37	68.78	97.60	20.99	0.0	22.12	22.03
38	70.86	97.53	21.17	0.0	22.70	22.41
39	72.94	97.45	21.35	0.0	23.31	22.79
40	75.03	97.38	21.53	0.0	23.92	23.18
41	77.11	97.31	21.71	0.0	24.56	23.57
42	79.19	97.24	21.89	0.0	25.20	23.96
43	81.27	97.16	22.07	0.0	25.86	24.36
44	83.35	97.09	22.25	0.0	26.54	24.76
45	85.43	97.02	22.43	0.0	27.23	25.16
46	87.51	96.95	22.61	0.0	27.93	25.57
47	89.59	96.87	22.79	0.0	28.65	25.98
48	91.68	96.80	22.97	0.0	29.38	26.39
49	93.76	96.73	23.15	0.0	30.13	26.80
50	95.84	96.66	23.33	0.0	30.89	27.22
51	97.92	96.58	23.51	0.0	31.67	27.65
52	100.0	96.51	23.69	0.0	32.46	28.07
53	101.4	97.66	11.85	0.0	8.746	7.018
54	102.7	98.81	0.0	0.0	0.002513	0.0
55	102.7	98.81	-0.02380	0.0	12.69E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Strength Parameters Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Forces on base [kN] Shear
1	3.000	0.0	7.000	10.78	14.20	5.940
2	3.000	0.0	14.50	1.595	2.181	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	34.63	34.61	6.248
5	3.000	0.0	15.31	35.04	35.02	6.248
6	3.000	0.0	15.49	35.46	35.44	6.248
7	3.000	0.0	15.67	35.87	35.85	6.248
8	3.000	0.0	15.85	36.28	36.27	6.248
9	3.000	0.0	16.03	36.70	36.68	6.248
10	3.000	0.0	16.21	37.11	37.10	6.248
11	3.000	0.0	16.39	37.53	37.51	6.248
12	3.000	0.0	16.57	37.94	37.93	6.248
13	3.000	0.0	16.75	38.35	38.34	6.248
14	3.000	0.0	16.93	38.77	38.75	6.248
15	3.000	0.0	17.11	39.18	39.17	6.248
16	3.000	0.0	17.29	39.60	39.58	6.248
17	3.000	0.0	17.47	40.01	40.00	6.248
18	3.000	0.0	17.65	40.43	40.41	6.248
19	3.000	0.0	17.83	40.84	40.83	6.248
20	3.000	0.0	18.01	41.25	41.24	6.248
21	3.000	0.0	18.19	41.67	41.66	6.248
22	3.000	0.0	18.37	42.08	42.07	6.248
23	3.000	0.0	18.55	42.50	42.48	6.248
24	3.000	0.0	18.73	42.91	42.90	6.248

25	3.000	0.0	18.91	43.32	43.31	6.248
26	3.000	0.0	19.09	43.74	43.73	6.248
27	3.000	0.0	19.27	44.15	44.14	6.248
28	3.000	0.0	19.46	44.57	44.56	6.248
29	3.000	0.0	19.64	44.98	44.97	6.248
30	3.000	0.0	19.82	45.40	45.38	6.248
31	3.000	0.0	20.00	45.81	45.80	6.248
32	3.000	0.0	20.18	46.22	46.21	6.248
33	3.000	0.0	20.36	46.64	46.63	6.248
34	3.000	0.0	20.54	47.05	47.04	6.248
35	3.000	0.0	20.72	47.47	47.46	6.248
36	3.000	0.0	20.90	47.88	47.87	6.248
37	3.000	0.0	21.08	48.29	48.29	6.248
38	3.000	0.0	21.26	48.71	48.70	6.248
39	3.000	0.0	21.44	49.12	49.11	6.248
40	3.000	0.0	21.62	49.54	49.53	6.248
41	3.000	0.0	21.80	49.95	49.94	6.248
42	3.000	0.0	21.98	50.37	50.36	6.248
43	3.000	0.0	22.16	50.78	50.77	6.248
44	3.000	0.0	22.34	51.19	51.19	6.248
45	3.000	0.0	22.52	51.61	51.60	6.248
46	3.000	0.0	22.70	52.02	52.02	6.248
47	3.000	0.0	22.88	52.44	52.43	6.248
48	3.000	0.0	23.06	52.85	52.84	6.248
49	3.000	0.0	23.24	53.26	53.26	6.248
50	3.000	0.0	23.42	53.68	53.67	6.248
51	3.000	0.0	23.60	54.09	54.09	6.248
52	3.000	0.0	17.77	26.79	35.77	5.361
53	3.000	0.0	5.924	8.954	12.49	5.361
54	3.000	0.0	0.0	35.96E-6	0.001638	0.01077

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 100m slip length - 40deg wedge	114662	F41	
	Drg. Ref.		
	Made by CH	Date 05-Dec-2003	Data Corrib BA4.sld	Checked CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	106.1
1	1	102.0	101.5	.	101.5	101.5	.	98.72
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.72
Slip	-	.	101.5		100.0	.	96.51	98.72

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
71.70	851.1	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (71.70,851.1)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -10.49E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2221.
Disturbing moment [kN m]: 57.90
Restoring moment [kN m]: 321.3
Factor of Safety: 5.550

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.73	9.800
3	0.0	100.0	15.00	0.0	12.32	11.25
4	0.1000	100.0	15.03	0.0	12.32	11.30
5	2.226	99.92	15.22	0.0	12.41	11.58
6	4.351	99.85	15.40	0.0	12.51	11.86
7	6.477	99.77	15.59	0.0	12.62	12.15
8	8.602	99.70	15.77	0.0	12.75	12.44

9	10.73	99.63	15.96	0.0	12.89	12.73
10	12.85	99.55	16.14	0.0	13.05	13.03
11	14.98	99.48	16.32	0.0	13.23	13.32
12	17.10	99.40	16.51	0.0	13.42	13.63
13	19.23	99.33	16.69	0.0	13.62	13.93
14	21.36	99.25	16.88	0.0	13.84	14.24
15	23.48	99.18	17.06	0.0	14.07	14.56
16	25.61	99.11	17.25	0.0	14.32	14.87
17	27.73	99.03	17.43	0.0	14.59	15.19
18	29.86	98.96	17.61	0.0	14.87	15.51
19	31.98	98.88	17.80	0.0	15.16	15.84
20	34.11	98.81	17.98	0.0	15.47	16.17
21	36.23	98.74	18.17	0.0	15.80	16.50
22	38.36	98.66	18.35	0.0	16.14	16.84
23	40.49	98.59	18.54	0.0	16.49	17.18
24	42.61	98.51	18.72	0.0	16.86	17.52
25	44.74	98.44	18.90	0.0	17.24	17.87
26	46.86	98.36	19.09	0.0	17.64	18.22
27	48.99	98.29	19.27	0.0	18.06	18.57
28	51.11	98.22	19.46	0.0	18.49	18.93
29	53.24	98.14	19.64	0.0	18.93	19.29
30	55.36	98.07	19.83	0.0	19.39	19.65
31	57.49	97.99	20.01	0.0	19.87	20.02
32	59.61	97.92	20.19	0.0	20.36	20.39
33	61.74	97.85	20.38	0.0	20.86	20.76
34	63.87	97.77	20.56	0.0	21.38	21.14
35	65.99	97.70	20.75	0.0	21.92	21.52
36	68.12	97.62	20.93	0.0	22.47	21.91
37	70.24	97.55	21.12	0.0	23.03	22.29
38	72.37	97.47	21.30	0.0	23.61	22.68
39	74.49	97.40	21.48	0.0	24.21	23.08
40	76.62	97.33	21.67	0.0	24.82	23.48
41	78.74	97.25	21.85	0.0	25.44	23.88
42	80.87	97.18	22.04	0.0	26.08	24.28
43	83.00	97.10	22.22	0.0	26.74	24.69
44	85.12	97.03	22.41	0.0	27.41	25.10
45	87.25	96.96	22.59	0.0	28.09	25.51
46	89.37	96.88	22.77	0.0	28.79	25.93
47	91.50	96.81	22.96	0.0	29.51	26.35
48	93.62	96.73	23.14	0.0	30.24	26.78
49	95.75	96.66	23.33	0.0	30.99	27.21
50	97.87	96.58	23.51	0.0	31.75	27.64
51	100.0	96.51	23.69	0.0	32.52	28.07
52	101.5	97.06	17.77	0.0	18.99	15.79
53	103.0	97.62	11.85	0.0	9.061	7.018
54	104.6	98.17	5.924	0.0	2.730	1.755
55	106.1	98.72	0.0	0.0	-10.49E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Strength Parameters Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Forces on base [kN] Shear
1	0.1000	0.0	7.000	10.78	15.21	0.1980
2	0.1000	0.0	14.50	1.595	2.253	0.01414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.13	35.37	35.35	6.380
5	3.000	0.0	15.31	35.80	35.78	6.380
6	3.000	0.0	15.50	36.23	36.21	6.380
7	3.000	0.0	15.68	36.66	36.64	6.380
8	3.000	0.0	15.86	37.09	37.07	6.380
9	3.000	0.0	16.05	37.52	37.50	6.380
10	3.000	0.0	16.23	37.95	37.94	6.380
11	3.000	0.0	16.42	38.38	38.37	6.380
12	3.000	0.0	16.60	38.81	38.80	6.380
13	3.000	0.0	16.79	39.25	39.23	6.380
14	3.000	0.0	16.97	39.68	39.66	6.380
15	3.000	0.0	17.15	40.11	40.09	6.380
16	3.000	0.0	17.34	40.54	40.52	6.380
17	3.000	0.0	17.52	40.97	40.95	6.380
18	3.000	0.0	17.71	41.40	41.38	6.380
19	3.000	0.0	17.89	41.83	41.82	6.380
20	3.000	0.0	18.08	42.26	42.25	6.380
21	3.000	0.0	18.26	42.69	42.68	6.380
22	3.000	0.0	18.44	43.12	43.11	6.380
23	3.000	0.0	18.63	43.55	43.54	6.380
24	3.000	0.0	18.81	43.98	43.97	6.380

25	3.000	0.0	19.00	44.41	44.40	6.380
26	3.000	0.0	19.18	44.85	44.83	6.380
27	3.000	0.0	19.36	45.28	45.26	6.380
28	3.000	0.0	19.55	45.71	45.70	6.380
29	3.000	0.0	19.73	46.14	46.13	6.380
30	3.000	0.0	19.92	46.57	46.56	6.380
31	3.000	0.0	20.10	47.00	46.99	6.380
32	3.000	0.0	20.29	47.43	47.42	6.380
33	3.000	0.0	20.47	47.86	47.85	6.380
34	3.000	0.0	20.65	48.29	48.28	6.380
35	3.000	0.0	20.84	48.72	48.71	6.380
36	3.000	0.0	21.02	49.15	49.14	6.380
37	3.000	0.0	21.21	49.58	49.57	6.380
38	3.000	0.0	21.39	50.02	50.01	6.380
39	3.000	0.0	21.58	50.45	50.44	6.380
40	3.000	0.0	21.76	50.88	50.87	6.380
41	3.000	0.0	21.94	51.31	51.30	6.380
42	3.000	0.0	22.13	51.74	51.73	6.380
43	3.000	0.0	22.31	52.17	52.16	6.380
44	3.000	0.0	22.50	52.60	52.59	6.380
45	3.000	0.0	22.68	53.03	53.02	6.380
46	3.000	0.0	22.87	53.46	53.45	6.380
47	3.000	0.0	23.05	53.89	53.89	6.380
48	3.000	0.0	23.23	54.32	54.32	6.380
49	3.000	0.0	23.42	54.75	54.75	6.380
50	3.000	0.0	23.60	55.19	55.18	6.380
51	3.000	0.0	20.73	34.67	37.20	4.852
52	3.000	0.0	14.81	24.76	26.66	4.852
53	3.000	0.0	8.886	14.86	16.13	4.852
54	3.000	0.0	2.962	4.952	5.587	4.852

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F44

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 100 m
Passive wedge angle θ = 45 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

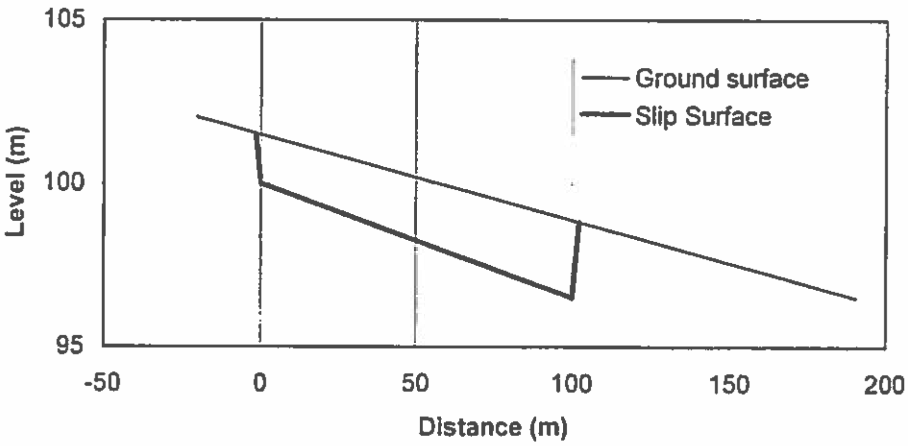
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				102.3129	98.82084

L*	90.63973	
L2	2.312919	
θ	45	Set angle
x4	102.3129	Intersection of slip surface with
y4	98.82084	ground surface

γ	45
x1	-1.5
y1	101.5



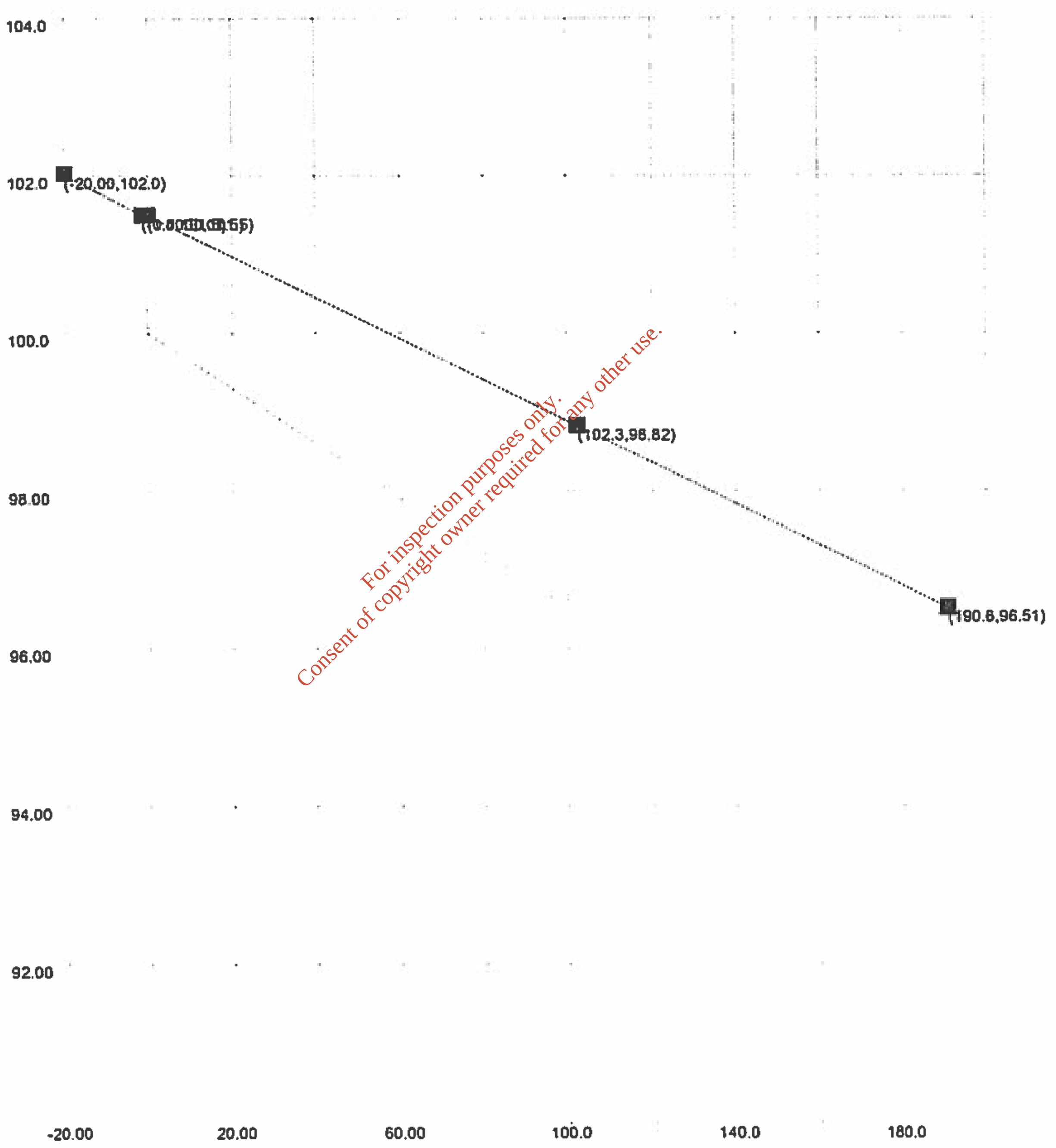
Oasys

Corrib
Peat stability - 100m slip length - 45deg wedge

Job No.	Sheet No.	Rev.
114662	FUS	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA5.sld	CH



Scale x 1:1558 y 1:82

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.01000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	102.3
1	1	102.0	101.5	.	101.5	101.5	.	98.82
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5		101.5	101.5	.	98.82
Slip	-	.	101.5		100.0	.	96.51	98.82

Stratum	Material	X --> 190.6	190.7
1	1	96.51	
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
68.62	805.7	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (68.62,805.7)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 13.35E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2173.
Disturbing moment [kN m]: 56.60
Restoring moment [kN m]: 314.3
Factor of Safety: 5.552

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.77	9.800
3	0.0	100.0	15.00	0.0	12.37	11.25
4	0.1000	100.0	15.03	0.0	12.37	11.30
5	2.139	99.93	15.21	0.0	12.45	11.57
6	4.178	99.85	15.39	0.0	12.55	11.84
7	6.216	99.78	15.57	0.0	12.66	12.11
8	8.255	99.71	15.74	0.0	12.78	12.39

9	10.29	99.64	15.92	0.0	12.92	12.67
10	12.33	99.57	16.10	0.0	13.06	12.95
11	14.37	99.50	16.27	0.0	13.23	13.24
12	16.41	99.43	16.45	0.0	13.41	13.53
13	18.45	99.36	16.63	0.0	13.60	13.82
14	20.49	99.28	16.80	0.0	13.80	14.12
15	22.53	99.21	16.98	0.0	14.02	14.42
16	24.57	99.14	17.16	0.0	14.26	14.72
17	26.60	99.07	17.34	0.0	14.50	15.03
18	28.64	99.00	17.51	0.0	14.76	15.33
19	30.68	98.93	17.69	0.0	15.04	15.65
20	32.72	98.86	17.87	0.0	15.33	15.96
21	34.76	98.79	18.04	0.0	15.63	16.28
22	36.80	98.72	18.22	0.0	15.94	16.60
23	38.84	98.64	18.40	0.0	16.27	16.92
24	40.88	98.57	18.57	0.0	16.62	17.25
25	42.91	98.50	18.75	0.0	16.98	17.58
26	44.95	98.43	18.93	0.0	17.35	17.91
27	46.99	98.36	19.10	0.0	17.73	18.25
28	49.03	98.29	19.28	0.0	18.13	18.59
29	51.07	98.22	19.46	0.0	18.55	18.93
30	53.11	98.15	19.64	0.0	18.97	19.28
31	55.15	98.08	19.81	0.0	19.41	19.63
32	57.19	98.00	19.99	0.0	19.87	19.98
33	59.22	97.93	20.17	0.0	20.34	20.33
34	61.26	97.86	20.34	0.0	20.82	20.69
35	63.30	97.79	20.52	0.0	21.31	21.05
36	65.34	97.72	20.70	0.0	21.82	21.42
37	67.38	97.65	20.87	0.0	22.35	21.79
38	69.42	97.58	21.05	0.0	22.89	22.16
39	71.46	97.51	21.23	0.0	23.44	22.53
40	73.50	97.43	21.41	0.0	24.00	22.91
41	75.53	97.36	21.58	0.0	24.58	23.29
42	77.57	97.29	21.76	0.0	25.18	23.67
43	79.61	97.22	21.94	0.0	25.78	24.06
44	81.65	97.15	22.11	0.0	26.40	24.45
45	83.69	97.08	22.29	0.0	27.04	24.84
46	85.73	97.01	22.47	0.0	27.69	25.24
47	87.77	96.94	22.64	0.0	28.35	25.64
48	89.81	96.87	22.82	0.0	29.03	26.04
49	91.84	96.79	23.00	0.0	29.72	26.44
50	93.88	96.72	23.17	0.0	30.42	26.85
51	95.92	96.65	23.35	0.0	31.14	27.27
52	97.96	96.58	23.53	0.0	31.87	27.68
53	100.0	96.51	23.71	0.0	32.61	28.10
54	101.2	97.67	11.85	0.0	8.778	7.024
55	102.3	98.82	0.0	0.0	13.35E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.01000	0.0	7.000	10.78	15.24	0.01980
2	0.01000	0.0	14.50	1.595	2.255	0.001414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.12	33.92	33.90	6.120
5	3.000	0.0	15.30	34.31	34.30	6.120
6	3.000	0.0	15.48	34.71	34.69	6.120
7	3.000	0.0	15.65	35.11	35.09	6.120
8	3.000	0.0	15.83	35.50	35.49	6.120
9	3.000	0.0	16.01	35.90	35.88	6.120
10	3.000	0.0	16.19	36.30	36.28	6.120
11	3.000	0.0	16.36	36.69	36.68	6.120
12	3.000	0.0	16.54	37.09	37.08	6.120
13	3.000	0.0	16.72	37.49	37.47	6.120
14	3.000	0.0	16.89	37.88	37.87	6.120
15	3.000	0.0	17.07	38.28	38.27	6.120
16	3.000	0.0	17.25	38.68	38.66	6.120
17	3.000	0.0	17.42	39.08	39.06	6.120
18	3.000	0.0	17.60	39.47	39.46	6.120
19	3.000	0.0	17.78	39.87	39.85	6.120
20	3.000	0.0	17.95	40.27	40.25	6.120
21	3.000	0.0	18.13	40.66	40.65	6.120
22	3.000	0.0	18.31	41.06	41.05	6.120
23	3.000	0.0	18.49	41.46	41.44	6.120
24	3.000	0.0	18.66	41.85	41.84	6.120

Oasys

Corrib

Peat stability - 100m slip length - 45deg wedge

Job No.	Sheet No.	Rev.
114662	F48	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BA5.sld	CH

25	3.000	0.0	18.84	42.25	42.24	6.120
26	3.000	0.0	19.02	42.65	42.63	6.120
27	3.000	0.0	19.19	43.04	43.03	6.120
28	3.000	0.0	19.37	43.44	43.43	6.120
29	3.000	0.0	19.55	43.84	43.83	6.120
30	3.000	0.0	19.72	44.23	44.22	6.120
31	3.000	0.0	19.90	44.63	44.62	6.120
32	3.000	0.0	20.08	45.03	45.02	6.120
33	3.000	0.0	20.26	45.42	45.41	6.120
34	3.000	0.0	20.43	45.82	45.81	6.120
35	3.000	0.0	20.61	46.22	46.21	6.120
36	3.000	0.0	20.79	46.62	46.61	6.120
37	3.000	0.0	20.96	47.01	47.00	6.120
38	3.000	0.0	21.14	47.41	47.40	6.120
39	3.000	0.0	21.32	47.81	47.80	6.120
40	3.000	0.0	21.49	48.20	48.19	6.120
41	3.000	0.0	21.67	48.60	48.59	6.120
42	3.000	0.0	21.85	49.00	48.99	6.120
43	3.000	0.0	22.02	49.39	49.39	6.120
44	3.000	0.0	22.20	49.79	49.78	6.120
45	3.000	0.0	22.38	50.19	50.18	6.120
46	3.000	0.0	22.56	50.58	50.58	6.120
47	3.000	0.0	22.73	50.98	50.97	6.120
48	3.000	0.0	22.91	51.38	51.37	6.120
49	3.000	0.0	23.09	51.77	51.77	6.120
50	3.000	0.0	23.26	52.17	52.16	6.120
51	3.000	0.0	23.44	52.57	52.56	6.120
52	3.000	0.0	23.62	52.97	52.96	6.120
53	3.000	0.0	17.78	22.59	32.83	4.900
54	3.000	0.0	5.926	7.529	11.53	4.900

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 100m slip length - 45deg wedge	114662	F 49	
	Drg. Ref.		
	Made by: CH Date: 05-Dec-2003	Data: Corrib BB5.sld	Checked: CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	102.3
1	1	102.0	101.5	.	101.5	101.5	.	98.82
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.82
Slip	-	.	101.5		100.0	.	96.51	98.82

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
68.62	805.7	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (68.62,805.7)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 14.31E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2173.
Disturbing moment [kN m]: 56.60
Restoring moment [kN m]: 323.2
Factor of Safety: 5.710

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	9.309	9.800
3	0.0	100.0	15.00	0.0	10.80	11.25
4	0.1000	100.0	15.03	0.0	10.80	11.30
5	2.139	99.93	15.21	0.0	10.92	11.57
6	4.178	99.85	15.39	0.0	11.04	11.84
7	6.216	99.78	15.57	0.0	11.16	12.11
8	8.255	99.71	15.74	0.0	11.33	12.39

9	10.29	99.64	15.92	0.0	11.50	12.67
10	12.33	99.57	16.10	0.0	11.68	12.95
11	14.37	99.50	16.27	0.0	11.87	13.24
12	16.41	99.43	16.45	0.0	12.08	13.53
13	18.45	99.36	16.63	0.0	12.30	13.82
14	20.49	99.28	16.80	0.0	12.54	14.12
15	22.53	99.21	16.98	0.0	12.79	14.42
16	24.57	99.14	17.16	0.0	13.05	14.72
17	26.60	99.07	17.34	0.0	13.33	15.03
18	28.64	99.00	17.51	0.0	13.62	15.33
19	30.68	98.93	17.69	0.0	13.93	15.65
20	32.72	98.86	17.87	0.0	14.25	15.96
21	34.76	98.79	18.04	0.0	14.58	16.28
22	36.80	98.72	18.22	0.0	14.93	16.60
23	38.84	98.64	18.40	0.0	15.29	16.92
24	40.88	98.57	18.57	0.0	15.66	17.25
25	42.91	98.50	18.75	0.0	16.05	17.58
26	44.95	98.43	18.93	0.0	16.45	17.91
27	46.99	98.36	19.10	0.0	16.87	18.25
28	49.03	98.29	19.28	0.0	17.30	18.59
29	51.07	98.22	19.46	0.0	17.74	18.93
30	53.11	98.15	19.64	0.0	18.20	19.28
31	55.15	98.08	19.81	0.0	18.67	19.63
32	57.19	98.00	19.99	0.0	19.16	19.98
33	59.22	97.93	20.17	0.0	19.65	20.33
34	61.26	97.86	20.34	0.0	20.17	20.69
35	63.30	97.79	20.52	0.0	20.69	21.05
36	65.34	97.72	20.70	0.0	21.24	21.42
37	67.38	97.65	20.87	0.0	21.79	21.79
38	69.42	97.58	21.05	0.0	22.36	22.16
39	71.46	97.51	21.23	0.0	22.94	22.53
40	73.50	97.43	21.41	0.0	23.54	22.91
41	75.53	97.36	21.58	0.0	24.15	23.29
42	77.57	97.29	21.76	0.0	24.77	23.67
43	79.61	97.22	21.94	0.0	25.41	24.06
44	81.65	97.15	22.11	0.0	26.06	24.45
45	83.69	97.08	22.29	0.0	26.72	24.84
46	85.73	97.01	22.47	0.0	27.40	25.24
47	87.77	96.94	22.64	0.0	28.10	25.64
48	89.81	96.87	22.82	0.0	28.80	26.04
49	91.84	96.79	23.00	0.0	29.52	26.44
50	93.88	96.72	23.17	0.0	30.26	26.85
51	95.92	96.65	23.35	0.0	31.01	27.27
52	97.96	96.58	23.53	0.0	31.77	27.68
53	100.0	96.51	23.71	0.0	32.55	28.10
54	101.2	97.67	11.85	0.0	8.743	7.024
55	102.3	98.82	0.0	0.0	14.31E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Strength Parameters Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Forces on base [kN] Shear
1	3.000	0.0	7.000	10.78	14.21	5.940
2	3.000	0.0	14.50	1.595	2.181	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.12	33.92	33.90	6.120
5	3.000	0.0	15.30	34.31	34.30	6.120
6	3.000	0.0	15.48	34.71	34.69	6.120
7	3.000	0.0	15.65	35.11	35.09	6.120
8	3.000	0.0	15.83	35.50	35.49	6.120
9	3.000	0.0	16.01	35.90	35.89	6.120
10	3.000	0.0	16.19	36.30	36.28	6.120
11	3.000	0.0	16.36	36.69	36.68	6.120
12	3.000	0.0	16.54	37.09	37.08	6.120
13	3.000	0.0	16.72	37.49	37.47	6.120
14	3.000	0.0	16.89	37.88	37.87	6.120
15	3.000	0.0	17.07	38.28	38.27	6.120
16	3.000	0.0	17.25	38.68	38.66	6.120
17	3.000	0.0	17.42	39.08	39.06	6.120
18	3.000	0.0	17.60	39.47	39.46	6.120
19	3.000	0.0	17.78	39.87	39.86	6.120
20	3.000	0.0	17.95	40.27	40.25	6.120
21	3.000	0.0	18.13	40.66	40.65	6.120
22	3.000	0.0	18.31	41.06	41.05	6.120
23	3.000	0.0	18.49	41.46	41.44	6.120
24	3.000	0.0	18.66	41.85	41.84	6.120

25	3.000	0.0	18.84	42.25	42.24	6.120
26	3.000	0.0	19.02	42.65	42.64	6.120
27	3.000	0.0	19.19	43.04	43.03	6.120
28	3.000	0.0	19.37	43.44	43.43	6.120
29	3.000	0.0	19.55	43.84	43.83	6.120
30	3.000	0.0	19.72	44.23	44.22	6.120
31	3.000	0.0	19.90	44.63	44.62	6.120
32	3.000	0.0	20.08	45.03	45.02	6.120
33	3.000	0.0	20.26	45.42	45.42	6.120
34	3.000	0.0	20.43	45.82	45.81	6.120
35	3.000	0.0	20.61	46.22	46.21	6.120
36	3.000	0.0	20.79	46.62	46.61	6.120
37	3.000	0.0	20.96	47.01	47.00	6.120
38	3.000	0.0	21.14	47.41	47.40	6.120
39	3.000	0.0	21.32	47.81	47.80	6.120
40	3.000	0.0	21.49	48.20	48.19	6.120
41	3.000	0.0	21.67	48.60	48.59	6.120
42	3.000	0.0	21.85	49.00	48.99	6.120
43	3.000	0.0	22.02	49.39	49.39	6.120
44	3.000	0.0	22.20	49.79	49.78	6.120
45	3.000	0.0	22.38	50.19	50.18	6.120
46	3.000	0.0	22.56	50.58	50.58	6.120
47	3.000	0.0	22.73	50.98	50.97	6.120
48	3.000	0.0	22.91	51.38	51.37	6.120
49	3.000	0.0	23.09	51.77	51.77	6.120
50	3.000	0.0	23.26	52.17	52.17	6.120
51	3.000	0.0	23.44	52.57	52.56	6.120
52	3.000	0.0	23.62	52.97	52.96	6.120
53	3.000	0.0	17.78	22.59	32.80	4.900
54	3.000	0.0	5.926	7.529	11.51	4.900

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 FS2

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 100 m
Passive wedge angle θ = 50 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

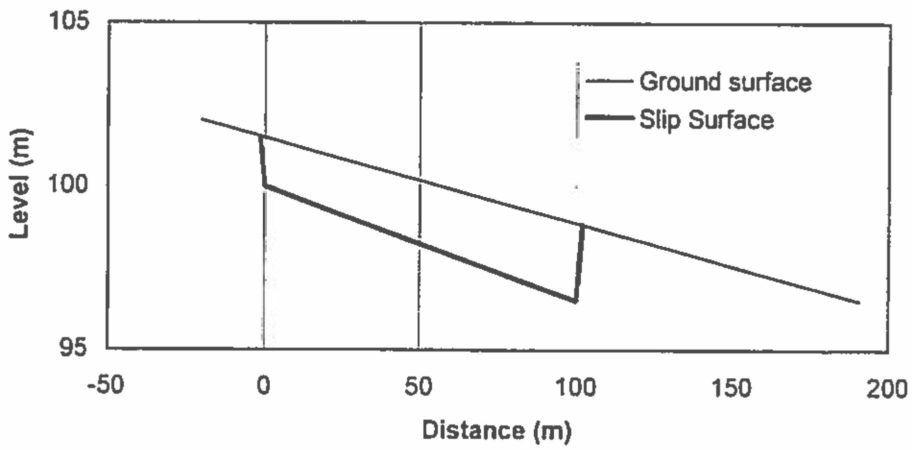
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	100	Set length
y3	96.50792	
x5	190.6397	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
190.6397	96.50792	500	82.53962	100	96.50792
				101.9488	98.83038

L*	90.63973	
L2	1.948771	
θ	50	Set angle
x4	101.9488	Intersection of slip surface with
y4	98.83038	ground surface

γ	45
x1	-1.5
y1	101.5



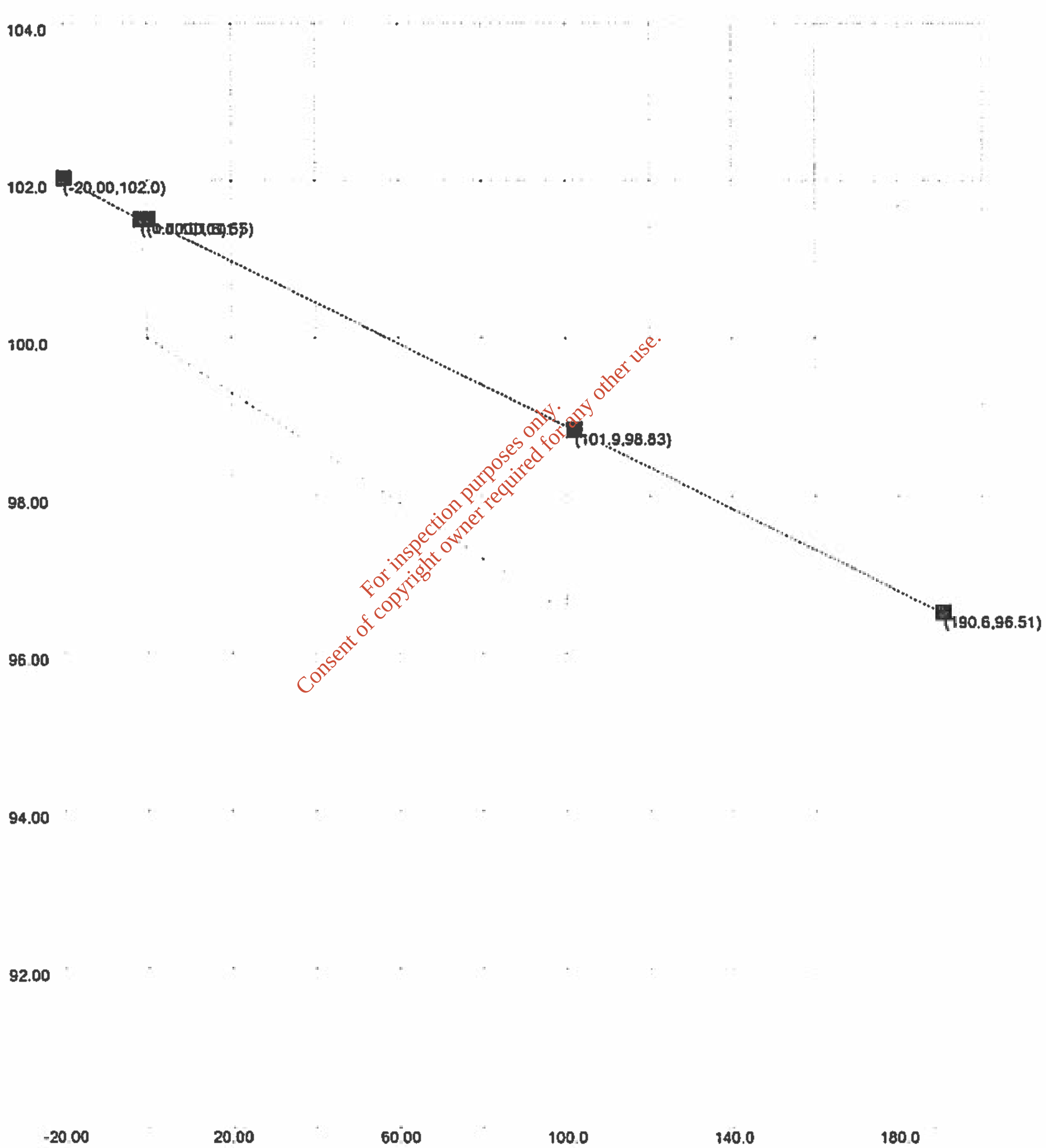
Oasys

Corrib
Peat stability - 100m slip length - 50deg wedge

Job No.	Sheet No.	Rev.
114662	F53	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib BB6.sld	CH



Scale x 1:1558 y 1:82

Oasys

Corrib
Peat stability - 100m slip length - 50deg wedge

Job No.	Sheet No.	Rev.
114662	FS4	

Drg. Ref.			
Made by CH	Date 05-Dec-2003	Data Corrib BB6.sld	Checked CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	101.9
1	1	102.0	101.5	.	101.5	101.5	.	98.83
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.83
Slip	-	.	101.5	.	100.0	.	96.51	98.83

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
68.31	800.8	0.0				

WORST CASE : WATER CASE 1 OF 1

Centre at (68.31,800.8)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 13.35E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2168.
Disturbing moment [kN m]: 56.48
Restoring moment [kN m]: 323.5
Factor of Safety: 5.728

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	9.314	9.800
3	0.0	100.0	15.00	0.0	10.80	11.25
4	0.1000	100.0	15.03	0.0	10.81	11.30
5	2.139	99.93	15.21	0.0	10.92	11.57
6	4.178	99.85	15.39	0.0	11.05	11.84
7	6.216	99.78	15.57	0.0	11.19	12.12
8	8.255	99.71	15.74	0.0	11.35	12.39

9	10.29	99.64	15.92	0.0	11.52	12.67
10	12.33	99.57	16.10	0.0	11.70	12.96
11	14.37	99.50	16.27	0.0	11.90	13.24
12	16.41	99.43	16.45	0.0	12.11	13.53
13	18.45	99.36	16.63	0.0	12.34	13.83
14	20.49	99.28	16.81	0.0	12.58	14.12
15	22.53	99.21	16.98	0.0	12.83	14.42
16	24.57	99.14	17.16	0.0	13.10	14.72
17	26.60	99.07	17.34	0.0	13.38	15.03
18	28.64	99.00	17.51	0.0	13.67	15.34
19	30.68	98.93	17.69	0.0	13.98	15.65
20	32.72	98.86	17.87	0.0	14.31	15.96
21	34.76	98.79	18.04	0.0	14.64	16.28
22	36.80	98.72	18.22	0.0	14.99	16.60
23	38.84	98.64	18.40	0.0	15.36	16.93
24	40.88	98.57	18.58	0.0	15.73	17.25
25	42.91	98.50	18.75	0.0	16.13	17.58
26	44.95	98.43	18.93	0.0	16.53	17.92
27	46.99	98.36	19.11	0.0	16.95	18.25
28	49.03	98.29	19.28	0.0	17.38	18.59
29	51.07	98.22	19.46	0.0	17.83	18.94
30	53.11	98.15	19.64	0.0	18.29	19.28
31	55.15	98.08	19.82	0.0	18.77	19.63
32	57.19	98.00	19.99	0.0	19.26	19.99
33	59.22	97.93	20.17	0.0	19.76	20.34
34	61.26	97.86	20.35	0.0	20.28	20.70
35	63.30	97.79	20.52	0.0	20.81	21.06
36	65.34	97.72	20.70	0.0	21.35	21.43
37	67.38	97.65	20.88	0.0	21.91	21.79
38	69.42	97.58	21.06	0.0	22.48	22.17
39	71.46	97.51	21.23	0.0	23.07	22.54
40	73.50	97.43	21.41	0.0	23.67	22.92
41	75.53	97.36	21.59	0.0	24.28	23.30
42	77.57	97.29	21.76	0.0	24.91	23.68
43	79.61	97.22	21.94	0.0	25.55	24.07
44	81.65	97.15	22.12	0.0	26.20	24.46
45	83.69	97.08	22.29	0.0	26.87	24.85
46	85.73	97.01	22.47	0.0	27.55	25.25
47	87.77	96.94	22.65	0.0	28.25	25.65
48	89.81	96.87	22.83	0.0	28.96	26.05
49	91.84	96.79	23.00	0.0	29.69	26.46
50	93.88	96.72	23.18	0.0	30.42	26.87
51	95.92	96.65	23.36	0.0	31.18	27.28
52	97.96	96.58	23.53	0.0	31.94	27.69
53	100.0	96.51	23.71	0.0	32.72	28.11
54	101.0	97.67	11.86	0.0	8.797	7.028
55	101.9	98.83	0.0	0.0	13.35E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.000	10.78	14.21	5.940
2	3.000	0.0	14.50	1.595	2.182	0.4243
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.12	33.92	33.90	6.120
5	3.000	0.0	15.30	34.31	34.30	6.120
6	3.000	0.0	15.48	34.71	34.69	6.120
7	3.000	0.0	15.65	35.11	35.09	6.120
8	3.000	0.0	15.83	35.50	35.49	6.120
9	3.000	0.0	16.01	35.90	35.89	6.120
10	3.000	0.0	16.19	36.30	36.28	6.120
11	3.000	0.0	16.36	36.70	36.68	6.120
12	3.000	0.0	16.54	37.09	37.08	6.120
13	3.000	0.0	16.72	37.49	37.48	6.120
14	3.000	0.0	16.89	37.89	37.87	6.120
15	3.000	0.0	17.07	38.28	38.27	6.120
16	3.000	0.0	17.25	38.68	38.67	6.120
17	3.000	0.0	17.43	39.08	39.07	6.120
18	3.000	0.0	17.60	39.48	39.46	6.120
19	3.000	0.0	17.78	39.87	39.86	6.120
20	3.000	0.0	17.96	40.27	40.26	6.120
21	3.000	0.0	18.13	40.67	40.65	6.120
22	3.000	0.0	18.31	41.06	41.05	6.120
23	3.000	0.0	18.49	41.46	41.45	6.120
24	3.000	0.0	18.66	41.86	41.85	6.120

Corrib

Peat stability - 100m slip length - 50deg wedge

25	3.000	0.0	18.84	42.26	42.24	6.120
26	3.000	0.0	19.02	42.65	42.64	6.120
27	3.000	0.0	19.20	43.05	43.04	6.120
28	3.000	0.0	19.37	43.45	43.44	6.120
29	3.000	0.0	19.55	43.84	43.83	6.120
30	3.000	0.0	19.73	44.24	44.23	6.120
31	3.000	0.0	19.90	44.64	44.63	6.120
32	3.000	0.0	20.08	45.04	45.03	6.120
33	3.000	0.0	20.26	45.43	45.42	6.120
34	3.000	0.0	20.44	45.83	45.82	6.120
35	3.000	0.0	20.61	46.23	46.22	6.120
36	3.000	0.0	20.79	46.62	46.62	6.120
37	3.000	0.0	20.97	47.02	47.01	6.120
38	3.000	0.0	21.14	47.42	47.41	6.120
39	3.000	0.0	21.32	47.82	47.81	6.120
40	3.000	0.0	21.50	48.21	48.20	6.120
41	3.000	0.0	21.67	48.61	48.60	6.120
42	3.000	0.0	21.85	49.01	49.00	6.120
43	3.000	0.0	22.03	49.40	49.40	6.120
44	3.000	0.0	22.21	49.80	49.79	6.120
45	3.000	0.0	22.38	50.20	50.19	6.120
46	3.000	0.0	22.56	50.59	50.59	6.120
47	3.000	0.0	22.74	50.99	50.99	6.120
48	3.000	0.0	22.91	51.39	51.38	6.120
49	3.000	0.0	23.09	51.79	51.78	6.120
50	3.000	0.0	23.27	52.18	52.18	6.120
51	3.000	0.0	23.45	52.58	52.58	6.120
52	3.000	0.0	23.62	52.98	52.97	6.120
53	3.000	0.0	17.78	19.07	30.59	4.546
54	3.000	0.0	5.928	6.358	10.83	4.546

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	Shear Strength Parameters c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.01000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	100.0	101.9
1	1	102.0	101.5	.	101.5	101.5	.	98.83
2	2	102.0	.	101.5	100.0	90.00	.	.
GWL1	-	102.0	101.5	.	101.5	101.5	.	98.83
Slip	-	.	101.5	.	100.0	.	96.51	98.83

Stratum	Material	X --> 190.6	190.7
1	1	96.51	.
2	2	90.00	90.00
GWL1	-	96.51	96.51
Slip	-	.	

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
68.31	800.8	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (68.31,800.8)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 18.12E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 2168.
Disturbing moment [kN m]: 56.48
Restoring moment [kN m]: 314.5
Factor of Safety: 5.569

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.0	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.77	9.800
3	0.0	100.0	15.00	0.0	12.37	11.25
4	0.1000	100.0	15.03	0.0	12.37	11.30
5	2.139	99.93	15.21	0.0	12.46	11.57
6	4.178	99.85	15.39	0.0	12.56	11.84
7	6.216	99.78	15.57	0.0	12.67	12.12
8	8.255	99.71	15.74	0.0	12.79	12.39

9	10.29	99.64	15.92	0.0	12.93	12.67
10	12.33	99.57	16.10	0.0	13.09	12.96
11	14.37	99.50	16.27	0.0	13.25	13.24
12	16.41	99.43	16.45	0.0	13.43	13.53
13	18.45	99.36	16.63	0.0	13.63	13.83
14	20.49	99.28	16.81	0.0	13.84	14.12
15	22.53	99.21	16.98	0.0	14.06	14.42
16	24.57	99.14	17.16	0.0	14.30	14.72
17	26.60	99.07	17.34	0.0	14.55	15.03
18	28.64	99.00	17.51	0.0	14.81	15.34
19	30.68	98.93	17.69	0.0	15.09	15.65
20	32.72	98.86	17.87	0.0	15.38	15.96
21	34.76	98.79	18.04	0.0	15.69	16.28
22	36.80	98.72	18.22	0.0	16.01	16.60
23	38.84	98.64	18.40	0.0	16.34	16.93
24	40.88	98.57	18.58	0.0	16.69	17.25
25	42.91	98.50	18.75	0.0	17.05	17.58
26	44.95	98.43	18.93	0.0	17.43	17.92
27	46.99	98.36	19.11	0.0	17.81	18.25
28	49.03	98.29	19.28	0.0	18.22	18.59
29	51.07	98.22	19.46	0.0	18.63	18.94
30	53.11	98.15	19.64	0.0	19.06	19.28
31	55.15	98.08	19.82	0.0	19.51	19.63
32	57.19	98.00	19.99	0.0	19.97	19.99
33	59.22	97.93	20.17	0.0	20.44	20.34
34	61.26	97.86	20.35	0.0	20.93	20.70
35	63.30	97.79	20.52	0.0	21.43	21.06
36	65.34	97.72	20.70	0.0	21.94	21.43
37	67.38	97.65	20.88	0.0	22.47	21.79
38	69.42	97.58	21.06	0.0	23.01	22.17
39	71.46	97.51	21.23	0.0	23.56	22.54
40	73.50	97.43	21.41	0.0	24.13	22.92
41	75.53	97.36	21.59	0.0	24.72	23.30
42	77.57	97.29	21.76	0.0	25.31	23.68
43	79.61	97.22	21.94	0.0	25.92	24.07
44	81.65	97.15	22.12	0.0	26.55	24.46
45	83.69	97.08	22.29	0.0	27.19	24.85
46	85.73	97.01	22.47	0.0	27.84	25.25
47	87.77	96.94	22.65	0.0	28.50	25.65
48	89.81	96.87	22.83	0.0	29.18	26.05
49	91.84	96.79	23.00	0.0	29.88	26.46
50	93.88	96.72	23.18	0.0	30.59	26.87
51	95.92	96.65	23.36	0.0	31.31	27.28
52	97.96	96.58	23.53	0.0	32.04	27.69
53	100.0	96.51	23.71	0.0	32.79	28.11
54	101.0	97.67	11.86	0.0	8.833	7.028
55	101.9	98.83	0.0	0.0	18.12E-6	0.0

Slice No.	Strength Parameters		Pore Pressure	Slice Weight	Forces on base [kN]	
	c' [kPa]	Tan phi	[kPa]	[kN]	Normal	Shear
1	0.01000	0.0	7.000	10.78	15.24	0.01980
2	0.01000	0.0	14.50	1.595	2.255	0.001414
3	3.000	0.0	15.02	1.652	1.651	0.3002
4	3.000	0.0	15.12	33.92	33.90	6.120
5	3.000	0.0	15.30	34.31	34.30	6.120
6	3.000	0.0	15.48	34.71	34.69	6.120
7	3.000	0.0	15.65	35.11	35.09	6.120
8	3.000	0.0	15.83	35.50	35.49	6.120
9	3.000	0.0	16.01	35.90	35.89	6.120
10	3.000	0.0	16.19	36.30	36.28	6.120
11	3.000	0.0	16.36	36.70	36.68	6.120
12	3.000	0.0	16.54	37.09	37.08	6.120
13	3.000	0.0	16.72	37.49	37.47	6.120
14	3.000	0.0	16.89	37.89	37.87	6.120
15	3.000	0.0	17.07	38.28	38.27	6.120
16	3.000	0.0	17.25	38.68	38.67	6.120
17	3.000	0.0	17.43	39.08	39.06	6.120
18	3.000	0.0	17.60	39.48	39.46	6.120
19	3.000	0.0	17.78	39.87	39.86	6.120
20	3.000	0.0	17.96	40.27	40.26	6.120
21	3.000	0.0	18.13	40.67	40.65	6.120
22	3.000	0.0	18.31	41.06	41.05	6.120
23	3.000	0.0	18.49	41.46	41.45	6.120
24	3.000	0.0	18.66	41.86	41.85	6.120

25	3.000	0.0	18.84	42.26	42.24	6.120
26	3.000	0.0	19.02	42.65	42.64	6.120
27	3.000	0.0	19.20	43.05	43.04	6.120
28	3.000	0.0	19.37	43.45	43.44	6.120
29	3.000	0.0	19.55	43.84	43.83	6.120
30	3.000	0.0	19.73	44.24	44.23	6.120
31	3.000	0.0	19.90	44.64	44.63	6.120
32	3.000	0.0	20.08	45.04	45.02	6.120
33	3.000	0.0	20.26	45.43	45.42	6.120
34	3.000	0.0	20.44	45.83	45.82	6.120
35	3.000	0.0	20.61	46.23	46.22	6.120
36	3.000	0.0	20.79	46.62	46.61	6.120
37	3.000	0.0	20.97	47.02	47.01	6.120
38	3.000	0.0	21.14	47.42	47.41	6.120
39	3.000	0.0	21.32	47.82	47.81	6.120
40	3.000	0.0	21.50	48.21	48.20	6.120
41	3.000	0.0	21.67	48.61	48.60	6.120
42	3.000	0.0	21.85	49.01	49.00	6.120
43	3.000	0.0	22.03	49.40	49.40	6.120
44	3.000	0.0	22.21	49.80	49.79	6.120
45	3.000	0.0	22.38	50.20	50.19	6.120
46	3.000	0.0	22.56	50.59	50.59	6.120
47	3.000	0.0	22.74	50.99	50.98	6.120
48	3.000	0.0	22.91	51.39	51.38	6.120
49	3.000	0.0	23.09	51.79	51.78	6.120
50	3.000	0.0	23.27	52.18	52.18	6.120
51	3.000	0.0	23.45	52.58	52.57	6.120
52	3.000	0.0	23.62	52.98	52.97	6.120
53	3.000	0.0	17.78	19.07	30.61	4.546
54	3.000	0.0	5.928	6.358	10.85	4.546

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Corrib Onshore Terminal
Slope geometric data

Slope length L = **500 m**
Passive wedge angle θ = **90 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

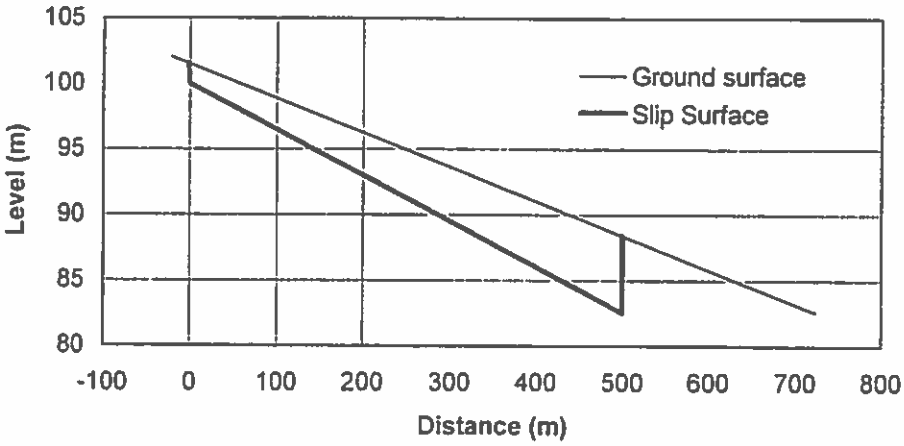
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				500	88.40704

L*	224.0679	
L2	3.59E-16	
θ	90	Set angle
x4	500	Intersection of slip surface with
y4	88.40704	ground surface

γ	45
x1	-1.5
y1	101.5



Oasys

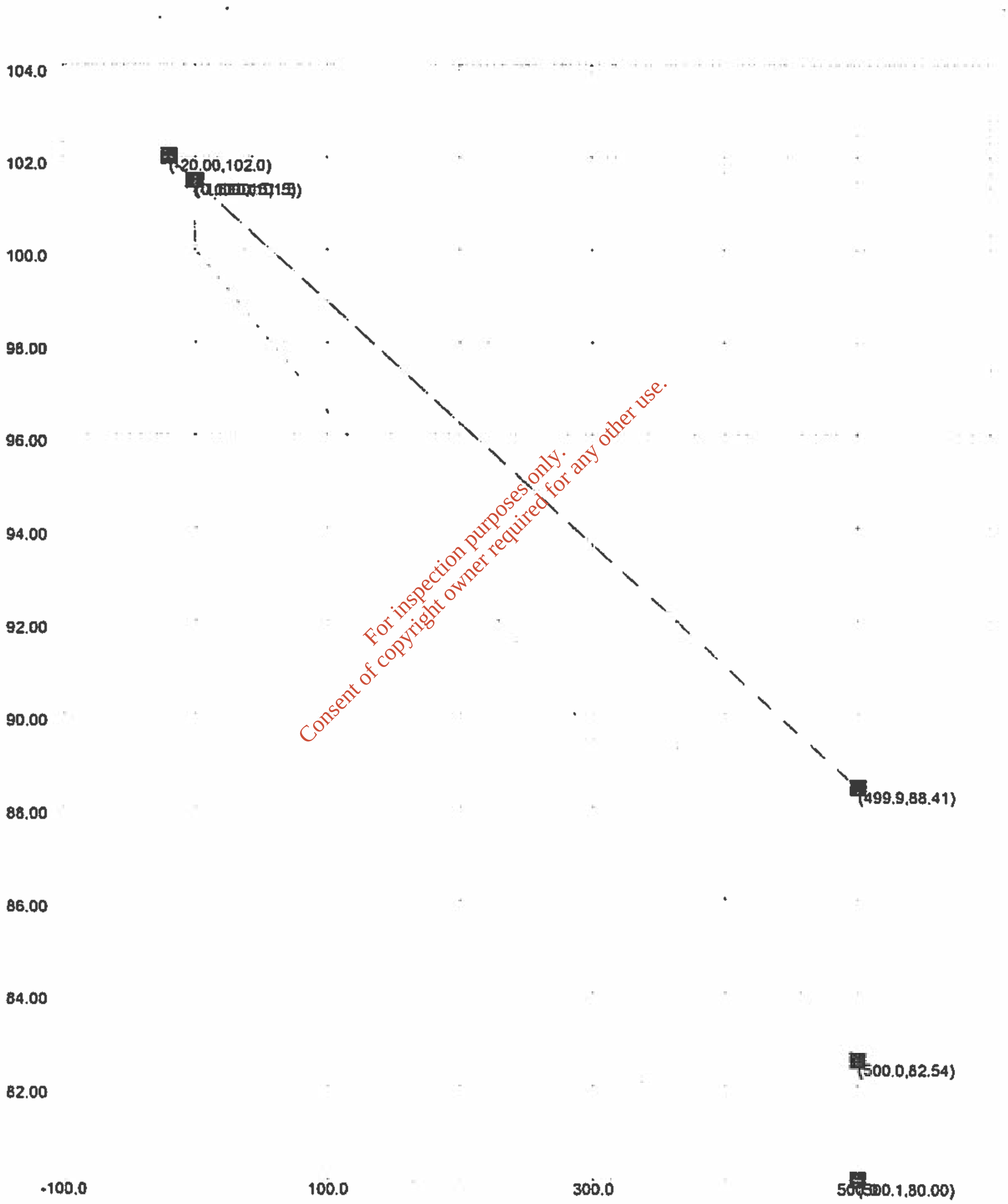
Corrib

Peat stability - 500m slip length - infinite slope

Job No.	Sheet No.	Rev.
114662	F61	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib CCA.sld	CH



Scale x 1:4958 y 1:141

Oasys	Job No.	Sheet No.	Rev.
Corrib	114662	F62	
Peat stability - 500m slip length - infinite slope	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib CCA.sld — Checked: CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	499.9	500.0
1	1	102.0	101.5	.	101.5	101.5	88.41	82.54
2	2	102.0	.	101.5	100.0	80.00	.	80.00
GWL1	-	102.0	.	101.5	101.5	101.5	88.41	82.54
Slip	-	.	101.5	.	100.0	.	.	82.54

Stratum	Material	X --> 500.1
1	1	80.00
2	2	80.00
GWL1	-	80.00
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
1833.	41980.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (1833.,41980.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -21.07E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20280.
Disturbing moment [kN m]: 720.3
Restoring moment [kN m]: 1511.
Factor of Safety: 2.098

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	7.032	9.800
3	0.0	100.0	15.00	0.0	8.340	11.25
4	0.1000	100.0	15.03	0.0	8.255	11.30
5	10.10	99.65	15.91	0.0	-0.1182	12.65
6	20.09	99.30	16.78	0.0	-8.156	14.08
7	30.09	98.95	17.65	0.0	-15.86	15.58
8	40.08	98.60	18.53	0.0	-23.23	17.16

9	50.08	98.25	19.40	0.0	-30.26	18.81
10	60.08	97.90	20.27	0.0	-36.96	20.54
11	70.07	97.55	21.14	0.0	-43.32	22.35
12	80.07	97.20	22.02	0.0	-49.35	24.23
13	90.06	96.85	22.89	0.0	-55.04	26.19
14	100.1	96.51	23.76	0.0	-60.40	28.23
15	110.1	96.16	24.63	0.0	-65.42	30.34
16	120.1	95.81	25.51	0.0	-70.11	32.53
17	130.0	95.46	26.38	0.0	-74.46	34.79
18	140.0	95.11	27.25	0.0	-78.48	37.13
19	150.0	94.76	28.12	0.0	-82.16	39.55
20	160.0	94.41	29.00	0.0	-85.51	42.04
21	170.0	94.06	29.87	0.0	-88.52	44.61
22	180.0	93.71	30.74	0.0	-91.20	47.25
23	190.0	93.36	31.61	0.0	-93.54	49.97
24	200.0	93.02	32.49	0.0	-95.55	52.77
25	210.0	92.67	33.36	0.0	-97.22	55.64
26	220.0	92.32	34.23	0.0	-98.56	58.59
27	230.0	91.97	35.10	0.0	-99.56	61.62
28	240.0	91.62	35.98	0.0	-100.2	64.72
29	250.0	91.27	36.85	0.0	-100.6	67.90
30	260.0	90.92	37.72	0.0	-100.6	71.15
31	270.0	90.57	38.60	0.0	-100.2	74.48
32	280.0	90.22	39.47	0.0	-99.55	77.89
33	290.0	89.87	40.34	0.0	-98.54	81.37
34	300.0	89.52	41.21	0.0	-97.19	84.93
35	310.0	89.18	42.09	0.0	-95.52	88.56
36	320.0	88.83	42.96	0.0	-93.50	92.27
37	330.0	88.48	43.83	0.0	-91.15	96.06
38	340.0	88.13	44.70	0.0	-88.47	99.92
39	350.0	87.78	45.58	0.0	-85.45	103.9
40	360.0	87.43	46.45	0.0	-82.10	107.9
41	370.0	87.08	47.32	0.0	-78.41	112.0
42	379.9	86.73	48.19	0.0	-74.39	116.1
43	389.9	86.38	49.07	0.0	-70.03	120.4
44	399.9	86.03	49.94	0.0	-65.33	124.7
45	409.9	85.69	50.81	0.0	-60.31	129.1
46	419.9	85.34	51.68	0.0	-54.94	133.6
47	429.9	84.99	52.56	0.0	-49.24	138.1
48	439.9	84.64	53.43	0.0	-43.21	142.7
49	449.9	84.29	54.30	0.0	-36.84	147.4
50	459.9	83.94	55.17	0.0	-30.14	152.2
51	469.9	83.59	56.05	0.0	-23.10	157.1
52	479.9	83.24	56.92	0.0	-15.72	162.0
53	489.9	82.89	57.79	0.0	-8.014	167.0
54	499.9	82.54	58.67	0.0	0.03044	172.1
55	500.0	82.54	0.0	0.0	-21.07E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.183	10.78	12.78	5.940
2	3.000	0.0	14.50	1.595	2.053	0.4243
3	3.000	0.0	15.02	1.652	1.648	0.3002
4	3.000	0.0	15.47	170.1	169.7	30.01
5	3.000	0.0	16.34	179.7	179.3	30.01
6	3.000	0.0	17.22	189.3	188.9	30.01
7	3.000	0.0	18.09	198.9	198.5	30.01
8	3.000	0.0	18.96	208.5	208.1	30.01
9	3.000	0.0	19.83	218.1	217.7	30.01
10	3.000	0.0	20.71	227.7	227.3	30.01
11	3.000	0.0	21.58	237.3	236.9	30.01
12	3.000	0.0	22.45	246.9	246.5	30.01
13	3.000	0.0	23.32	256.5	256.1	30.01
14	3.000	0.0	24.20	266.1	265.7	30.01
15	3.000	0.0	25.07	275.7	275.3	30.01
16	3.000	0.0	25.94	285.3	284.9	30.01
17	3.000	0.0	26.82	294.8	294.5	30.01
18	3.000	0.0	27.69	304.4	304.1	30.01
19	3.000	0.0	28.56	314.0	313.7	30.01
20	3.000	0.0	29.43	323.6	323.3	30.01
21	3.000	0.0	30.31	333.2	332.9	30.01
22	3.000	0.0	31.18	342.8	342.5	30.01
23	3.000	0.0	32.05	352.4	352.1	30.01
24	3.000	0.0	32.92	362.0	361.7	30.01

25	3.000	0.0	33.80	371.6	371.3	30.01
26	3.000	0.0	34.67	381.2	380.9	30.01
27	3.000	0.0	35.54	390.8	390.5	30.01
28	3.000	0.0	36.41	400.4	400.1	30.01
29	3.000	0.0	37.29	410.0	409.7	30.01
30	3.000	0.0	38.16	419.6	419.3	30.01
31	3.000	0.0	39.03	429.2	428.9	30.01
32	3.000	0.0	39.90	438.8	438.5	30.01
33	3.000	0.0	40.78	448.4	448.1	30.01
34	3.000	0.0	41.65	458.0	457.7	30.01
35	3.000	0.0	42.52	467.6	467.3	30.01
36	3.000	0.0	43.39	477.1	476.9	30.01
37	3.000	0.0	44.27	486.7	486.5	30.01
38	3.000	0.0	45.14	496.3	496.1	30.01
39	3.000	0.0	46.01	505.9	505.7	30.01
40	3.000	0.0	46.88	515.5	515.3	30.01
41	3.000	0.0	47.76	525.1	524.9	30.01
42	3.000	0.0	48.63	534.7	534.5	30.01
43	3.000	0.0	49.50	544.3	544.1	30.01
44	3.000	0.0	50.38	553.9	553.7	30.01
45	3.000	0.0	51.25	563.5	563.3	30.01
46	3.000	0.0	52.12	573.1	572.9	30.01
47	3.000	0.0	52.99	582.7	582.5	30.01
48	3.000	0.0	53.87	592.3	592.1	30.01
49	3.000	0.0	54.74	601.9	601.7	30.01
50	3.000	0.0	55.61	611.5	611.3	30.01
51	3.000	0.0	56.48	621.1	620.9	30.01
52	3.000	0.0	57.36	630.7	630.6	30.01
53	3.000	0.0	58.23	640.3	640.2	30.01
54	3.000	0.0	29.33	3.227	3.224	0.3002

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 500m slip length - infinite slope	114662	FoS	
	Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib CCB.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	499.9	500.0
1	1	102.0	101.5	.	101.5	101.5	88.41	82.54
2	2	102.0	.	101.5	100.0	80.00	.	80.00
GWL1	-	102.0	.	101.5	101.5	101.5	88.41	82.54
Slip	-	.	101.5		100.0	.	.	82.54

Stratum	Material	X --> 500.1
1	1	80.00
2	2	80.00
GWL1	-	80.00
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
1833.	41980.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (1833.,41980.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -39.84E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20280.
Disturbing moment [kN m]: 720.3
Restoring moment [kN m]: 1502.
Factor of Safety: 2.086

Point	Slip surface coordinates x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.90	9.800
3	0.0	100.0	15.00	0.0	12.49	11.25
4	0.1000	100.0	15.03	0.0	12.40	11.30
5	10.10	99.65	15.91	0.0	3.945	12.65
6	20.09	99.30	16.78	0.0	-4.176	14.08
7	30.09	98.95	17.65	0.0	-11.96	15.58
8	40.08	98.60	18.53	0.0	-19.41	17.16

Oasys

Corrib
Peat stability - 500m slip length - infinite slope

Job No.	Sheet No.	Rev.
114662	F66	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib CCB.sld	CH

9	50.08	98.25	19.40	0.0	-26.53	18.81
10	60.08	97.90	20.27	0.0	-33.31	20.54
11	70.07	97.55	21.14	0.0	-39.76	22.35
12	80.07	97.20	22.02	0.0	-45.87	24.23
13	90.06	96.85	22.89	0.0	-51.64	26.19
14	100.1	96.51	23.76	0.0	-57.08	28.23
15	110.1	96.16	24.63	0.0	-62.19	30.34
16	120.1	95.81	25.51	0.0	-66.96	32.53
17	130.0	95.46	26.38	0.0	-71.39	34.79
18	140.0	95.11	27.25	0.0	-75.50	37.13
19	150.0	94.76	28.12	0.0	-79.26	39.55
20	160.0	94.41	29.00	0.0	-82.69	42.04
21	170.0	94.06	29.87	0.0	-85.79	44.61
22	180.0	93.71	30.74	0.0	-88.55	47.25
23	190.0	93.36	31.61	0.0	-90.97	49.97
24	200.0	93.02	32.49	0.0	-93.06	52.77
25	210.0	92.67	33.36	0.0	-94.82	55.64
26	220.0	92.32	34.23	0.0	-96.24	58.59
27	230.0	91.97	35.10	0.0	-97.32	61.62
28	240.0	91.62	35.98	0.0	-98.07	64.72
29	250.0	91.27	36.85	0.0	-98.49	67.90
30	260.0	90.92	37.72	0.0	-98.57	71.15
31	270.0	90.57	38.60	0.0	-98.31	74.48
32	280.0	90.22	39.47	0.0	-97.72	77.89
33	290.0	89.87	40.34	0.0	-96.80	81.37
34	300.0	89.52	41.21	0.0	-95.54	84.93
35	310.0	89.18	42.09	0.0	-93.94	88.56
36	320.0	88.83	42.96	0.0	-92.01	92.27
37	330.0	88.48	43.83	0.0	-89.74	96.06
38	340.0	88.13	44.70	0.0	-87.14	99.92
39	350.0	87.78	45.58	0.0	-84.21	103.9
40	360.0	87.43	46.45	0.0	-80.94	107.9
41	370.0	87.08	47.32	0.0	-77.33	112.0
42	379.9	86.73	48.19	0.0	-73.39	116.1
43	389.9	86.38	49.07	0.0	-69.12	120.4
44	399.9	86.03	49.94	0.0	-64.50	124.7
45	409.9	85.69	50.81	0.0	-59.56	129.1
46	419.9	85.34	51.68	0.0	-54.28	133.6
47	429.9	84.99	52.56	0.0	-48.66	138.1
48	439.9	84.64	53.43	0.0	-42.71	142.7
49	449.9	84.29	54.30	0.0	-36.42	147.4
50	459.9	83.94	55.17	0.0	-29.80	152.2
51	469.9	83.59	56.05	0.0	-22.85	157.1
52	479.9	83.24	56.92	0.0	-15.56	162.0
53	489.9	82.89	57.79	0.0	-7.930	167.0
54	499.9	82.54	58.67	0.0	0.03125	172.1
55	500.0	82.54	0.0	0.0	-39.84E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.1000	0.0	7.183	10.78	15.51	0.1980
2	0.1000	0.0	14.50	1.595	2.249	0.01414
3	3.000	0.0	15.02	1.652	1.648	0.3002
4	3.000	0.0	15.47	170.1	169.7	30.01
5	3.000	0.0	16.34	179.7	179.3	30.01
6	3.000	0.0	17.22	189.3	188.9	30.01
7	3.000	0.0	18.09	198.9	198.5	30.01
8	3.000	0.0	18.96	208.5	208.1	30.01
9	3.000	0.0	19.83	218.1	217.7	30.01
10	3.000	0.0	20.71	227.7	227.3	30.01
11	3.000	0.0	21.58	237.3	236.9	30.01
12	3.000	0.0	22.45	246.9	246.5	30.01
13	3.000	0.0	23.32	256.5	256.1	30.01
14	3.000	0.0	24.20	266.1	265.7	30.01
15	3.000	0.0	25.07	275.7	275.3	30.01
16	3.000	0.0	25.94	285.3	284.9	30.01
17	3.000	0.0	26.82	294.8	294.5	30.01
18	3.000	0.0	27.69	304.4	304.1	30.01
19	3.000	0.0	28.56	314.0	313.7	30.01
20	3.000	0.0	29.43	323.6	323.3	30.01
21	3.000	0.0	30.31	333.2	332.9	30.01
22	3.000	0.0	31.18	342.8	342.5	30.01
23	3.000	0.0	32.05	352.4	352.1	30.01
24	3.000	0.0	32.92	362.0	361.7	30.01

25	3.000	0.0	33.80	371.6	371.3	30.01
26	3.000	0.0	34.67	381.2	380.9	30.01
27	3.000	0.0	35.54	390.8	390.5	30.01
28	3.000	0.0	36.41	400.4	400.1	30.01
29	3.000	0.0	37.29	410.0	409.7	30.01
30	3.000	0.0	38.16	419.6	419.3	30.01
31	3.000	0.0	39.03	429.2	428.9	30.01
32	3.000	0.0	39.90	438.8	438.5	30.01
33	3.000	0.0	40.78	448.4	448.1	30.01
34	3.000	0.0	41.65	458.0	457.7	30.01
35	3.000	0.0	42.52	467.6	467.3	30.01
36	3.000	0.0	43.39	477.1	476.9	30.01
37	3.000	0.0	44.27	486.7	486.5	30.01
38	3.000	0.0	45.14	496.3	496.1	30.01
39	3.000	0.0	46.01	505.9	505.7	30.01
40	3.000	0.0	46.88	515.5	515.3	30.01
41	3.000	0.0	47.76	525.1	524.9	30.01
42	3.000	0.0	48.63	534.7	534.5	30.01
43	3.000	0.0	49.50	544.3	544.1	30.01
44	3.000	0.0	50.38	553.9	553.7	30.01
45	3.000	0.0	51.25	563.5	563.3	30.01
46	3.000	0.0	52.12	573.1	572.9	30.01
47	3.000	0.0	52.99	582.7	582.5	30.01
48	3.000	0.0	53.87	592.3	592.1	30.01
49	3.000	0.0	54.74	601.9	601.7	30.01
50	3.000	0.0	55.61	611.5	611.3	30.01
51	3.000	0.0	56.48	621.1	620.9	30.01
52	3.000	0.0	57.36	630.7	630.5	30.01
53	3.000	0.0	58.23	640.3	640.1	30.01
54	3.000	0.0	29.33	3.227	3.224	0.3002

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1

F68

Made by: CH Chkd: CH

Date: 30/11/2003

Rev: -,-

Corrib Onshore Terminal

Slope geometric data

Slope length L = **500 m**

Passive wedge angle θ = **0 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

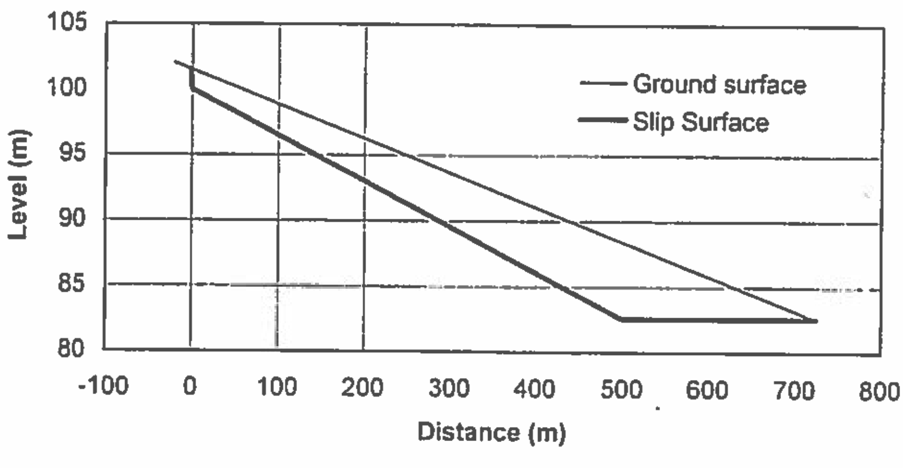
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				724.0679	82.53962

L*	224.0679	
L2	224.0679	
θ	0	Set angle
x4	724.0679	Intersection of slip surface with
y4	82.53962	ground surface

γ	45
x1	-1.5
y1	101.5



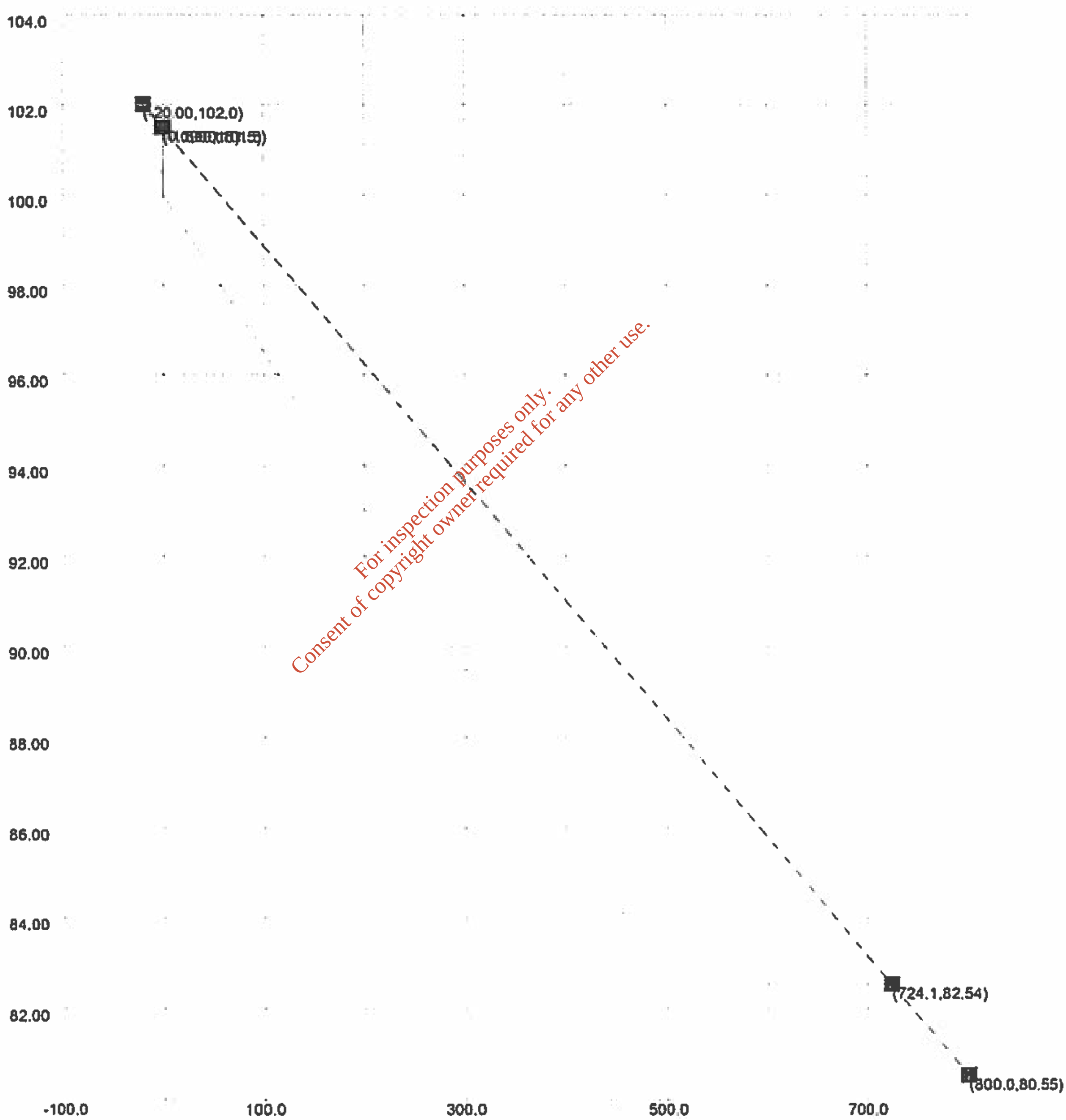
Oasys

Corrib
Peat stability - 500m slip length - 0deg wedge

Job No.	Sheet No.	Rev.
114662	F69	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DDA.sld	CH



Scale x 1:6374 y 1:141

Oasys

Corrib

Peat stability - 500m slip length - 0deg wedge

Job No.	Sheet No.	Rev.
114662	F7C	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DDA.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters: Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	724.1
1	1	102.0	101.5	.	101.5	101.5	.	82.54
2	2	102.0	.	101.5	100.0	80.00	.	82.54
GWL1	-	102.0	.	101.5	101.5	101.5	.	.
Slip	-	.	101.5	.	100.0	.	82.54	82.54

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
744.8	14770.	0.0				

WORST CASE : WATER CASE 1 OF 1

Centre at (744.8,14770.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -18.12E-6

Radius 0.0m
Horiz acceleration [-g]: 0.0
Slip weight [kN] 27910.
Disturbing moment [kN m]: 720.4
Restoring moment [kN m]: 218[illegible]
Factor of Safety: 3.030

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	[illegible]	9.609
3	0.0	100.0	15.00	0.0	9.661	11.25
4	0.1000	100.0	15.03	0.0	9.619	11.30
5	14.38	99.50	16.28	0.0	4.052	13.26
6	28.67	99.00	17.53	0.0	-0.8311	15.36
7	42.95	98.50	18.78	0.0	-5.010	17.63
8	57.23	98.00	20.02	0.0	-8.545	20.09
9	71.51	97.50	21.27	0.0	-11.38	22.62
10	85.80	97.00	22.52	0.0	-13.52	25.35
11	100.1	96.51	23.76	0.0	-14.98	28.24
12	114.4	96.01	25.01	0.0	-15.76	31.28
13	128.6	95.51	26.26	0.0	-15.86	34.47
14	142.9	95.01	27.51	0.0	-15.27	37.83
15	157.2	94.51	28.75	0.0	-13.99	41.34
16	171.5	94.01	30.00	0.0	-12.03	45.00
17	185.8	93.51	31.25	0.0	-9.391	48.82
18	200.1	93.01	32.49	0.0	-6.064	52.79
19	214.3	92.52	33.74	0.0	-2.053	56.92
20	228.6	92.02	34.99	0.0	2.642	61.21
21	242.9	91.52	36.23	0.0	8.021	65.65
22	257.2	91.02	37.48	0.0	14.08	70.24
23	271.5	90.52	38.73	0.0	20.83	75.00
24	285.8	90.02	39.98	0.0	28.26	79.90
25	300.0	89.52	41.22	0.0	36.38	84.97
26	314.3	89.02	42.47	0.0	45.18	90.19
27	328.6	88.53	43.72	0.0	54.67	95.56
28	342.9	88.03	44.96	0.0	64.83	101.1
29	357.2	87.53	46.21	0.0	75.69	106.8
30	371.5	87.03	47.46	0.0	87.22	112.6
31	385.7	86.53	48.71	0.0	99.44	118.6
32	400.0	86.03	49.95	0.0	112.3	124.8
33	414.3	85.53	51.20	0.0	125.9	131.1
34	428.6	85.03	52.45	0.0	140.2	137.5
35	442.9	84.54	53.69	0.0	155.2	144.1
36	457.2	84.04	54.94	0.0	170.8	150.9
37	471.4	83.54	56.19	0.0	187.3	157.9
38	485.7	83.04	57.43	0.0	204.1	164.9
39	500.0	82.54	58.68	0.0	221.8	172.2
40	514.0	82.54	55.01	0.0	208.0	151.3
41	528.0	82.54	51.35	0.0	194.1	131.8
42	542.0	82.54	47.68	0.0	180.2	113.7
43	556.0	82.54	44.01	0.0	166.4	96.85
44	570.0	82.54	40.34	0.0	152.5	81.36
45	584.0	82.54	36.68	0.0	138.7	67.26
46	598.0	82.54	33.01	0.0	124.8	54.48
47	612.0	82.54	29.34	0.0	110.9	43.04
48	626.0	82.54	25.67	0.0	97.06	32.96
49	640.0	82.54	22.01	0.0	83.19	24.21
50	654.0	82.54	18.34	0.0	69.33	16.81
51	668.1	82.54	14.67	0.0	55.46	10.76
52	682.1	82.54	11.00	0.0	41.60	6.053
53	696.2	82.54	7.335	0.0	27.73	2.690
54	710.1	82.54	3.668	0.0	13.87	0.6726
55	724.1	82.54	0.0	0.0	-18.12E-6	0.0

Slice Strength Parameters Pore Slice Forces on base (kN)

Job No.	Sheet No.	Rev.
114662	F71	

Drg. Ref.			
Made by	**Date**	**Data**	**Checked**
CH	05-Dec-2003	Corrib DDA.sld	CH

Oasys

Corrib

Peat stability - 500m slip length - 0deg wedge

No.	c' (kPa)	Tan phi	Pressure (kPa)	Weight (kN)	Normal	Shear
1	3.000	0.0	7.183	10.78	13.65	5.940
2	3.000	0.0	14.50	1.595	2.116	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.66	246.0	245.7	42.07
5	3.000	0.0	16.91	265.6	265.3	42.07
6	3.000	0.0	18.15	285.2	284.9	42.07
7	3.000	0.0	19.40	304.8	304.5	42.07
8	3.000	0.0	20.65	324.4	324.1	42.07
9	3.000	0.0	21.89	344.0	343.7	42.07
10	3.000	0.0	23.14	363.6	363.3	42.07
11	3.000	0.0	24.39	383.2	382.9	42.07
12	3.000	0.0	25.63	402.8	402.5	42.07
13	3.000	0.0	26.88	422.3	422.1	42.07
14	3.000	0.0	28.13	441.9	441.7	42.07
15	3.000	0.0	29.38	461.5	461.3	42.07
16	3.000	0.0	30.62	481.1	480.9	42.07
17	3.000	0.0	31.87	500.7	500.5	42.07
18	3.000	0.0	33.12	520.3	520.1	42.07
19	3.000	0.0	34.36	539.9	539.7	42.07
20	3.000	0.0	35.61	559.5	559.3	42.07
21	3.000	0.0	36.86	579.1	578.9	42.07
22	3.000	0.0	38.11	598.7	598.5	42.07
23	3.000	0.0	39.35	618.3	618.2	42.07
24	3.000	0.0	40.60	637.9	637.8	42.07
25	3.000	0.0	41.85	657.5	657.4	42.07
26	3.000	0.0	43.09	677.0	677.0	42.07
27	3.000	0.0	44.34	696.6	696.6	42.07
28	3.000	0.0	45.59	716.2	716.2	42.07
29	3.000	0.0	46.83	735.8	735.8	42.07
30	3.000	0.0	48.08	755.4	755.4	42.07
31	3.000	0.0	49.33	775.0	775.0	42.07
32	3.000	0.0	50.58	794.6	794.6	42.07
33	3.000	0.0	51.82	814.2	814.2	42.07
34	3.000	0.0	53.07	833.8	833.8	42.07
35	3.000	0.0	54.32	853.4	853.4	42.07
36	3.000	0.0	55.56	873.0	873.0	42.07
37	3.000	0.0	56.81	892.6	892.6	42.07
38	3.000	0.0	58.06	912.2	912.2	42.07
39	3.000	0.0	56.85	875.7	875.7	42.01
40	3.000	0.0	53.18	819.2	819.2	42.01
41	3.000	0.0	49.51	762.7	762.7	42.01
42	3.000	0.0	45.84	706.2	706.2	42.01
43	3.000	0.0	42.18	649.7	649.7	42.01
44	3.000	0.0	38.51	593.2	593.2	42.01
45	3.000	0.0	34.84	536.7	536.7	42.01
46	3.000	0.0	31.17	480.2	480.2	42.01
47	3.000	0.0	27.51	423.7	423.7	42.01
48	3.000	0.0	23.84	367.2	367.2	42.01
49	3.000	0.0	20.17	310.7	310.7	42.01
50	3.000	0.0	16.50	254.2	254.2	42.01
51	3.000	0.0	12.84	197.7	197.7	42.01
52	3.000	0.0	9.169	141.2	141.2	42.01
53	3.000	0.0	5.501	84.75	84.75	42.01
54	3.000	0.0	1.834	28.25	28.25	42.01

Slice no.	Surface Load (kPa)		Water Pressure on ground surface (kPa)	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1629	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
Corrib	114662	F72	
Peat stability - 500m slip length - 0deg wedge	Drg. Ref.		
	Made by CH	Date 05-Dec-2003	Data Corrib DDB.sld	Checked CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters: Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	x --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	724.1
1	1	102.0	101.5	.	101.5	101.5	.	82.54
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	82.54
Slip	-	.	101.5	.	100.0	.	82.54	82.54

Stratum	Material	x --> 800.0
1	1	80.55
2	2	60.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
744.8	14770.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (744.8,14770.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -1.507E-6

Radius 0.0m
Horiz acceleration [*g]: 0.0
Slip weight [kN] 27510.
Disturbing moment [kN m]: 720.4
Restoring moment [kN m]: 2176
Factor of Safety: 3.018

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3650	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.[illegible]	5.600
3	0.0	100.0	15.00	0.0	12.53	11.25
4	0.1000	100.0	15.03	0.0	12.49	11.30
5	14.38	99.50	16.28	0.0	6.866	13.26
6	28.67	99.00	17.53	0.0	1.928	15.36
7	42.95	98.50	18.78	0.0	-2.330	17.63
8	57.23	98.00	20.02	0.0	-5.901	20.05
9	71.51	97.50	21.27	0.0	-8.769	22.62
10	85.80	97.00	22.52	0.0	-10.99	25.35
11	100.1	96.51	23.76	0.0	-12.51	28.24
12	114.4	96.01	25.01	0.0	-13.35	31.28
13	128.6	95.51	26.26	0.0	-13.50	34.47
14	142.9	95.01	27.51	0.0	-12.96	37.83
15	157.2	94.51	28.75	0.0	-11.75	41.34
16	171.5	94.01	30.00	0.0	-9.843	45.00
17	185.8	93.51	31.25	0.0	-7.257	48.82
18	200.1	93.01	32.49	0.0	-3.987	52.79
19	214.3	92.52	33.74	0.0	-0.03258	56.92
20	228.6	92.02	34.99	0.0	4.006	61.21
21	242.9	91.52	36.23	0.0	9.929	65.65
22	257.2	91.02	37.48	0.0	15.94	70.24
23	271.5	90.52	38.73	0.0	22.63	75.00
24	285.8	90.02	39.98	0.0	30.00	79.90
25	300.0	89.52	41.22	0.0	38.06	84.97
26	314.3	89.02	42.47	0.0	46.80	90.19
27	328.6	88.53	43.72	0.0	56.21	95.56
28	342.9	88.03	44.96	0.0	66.34	101.1
29	357.2	87.53	46.21	0.0	77.14	106.8
30	371.5	87.03	47.46	0.0	88.62	112.6
31	385.7	86.53	48.71	0.0	100.8	118.6
32	400.0	86.03	49.95	0.0	113.6	124.8
33	414.3	85.53	51.20	0.0	127.2	131.1
34	428.6	85.03	52.45	0.0	141.4	137.5
35	442.9	84.54	53.69	0.0	156.3	144.1
36	457.2	84.04	54.94	0.0	171.9	150.9
37	471.4	83.54	56.19	0.0	188.1	157.9
38	485.7	83.04	57.43	0.0	205.1	164.9
39	500.0	82.54	58.68	0.0	222.7	172.2
40	514.0	82.54	55.01	0.0	208.8	151.3
41	528.0	82.54	51.35	0.0	194.9	131.8
42	542.0	82.54	47.68	0.0	181.0	113.7
43	556.0	82.54	44.01	0.0	167.0	96.85
44	570.0	82.54	40.34	0.0	153.1	81.38
45	584.0	82.54	36.68	0.0	139.2	67.26
46	598.0	82.54	33.01	0.0	125.3	54.48
47	612.0	82.54	29.34	0.0	111.4	43.04
48	626.0	82.54	25.67	0.0	97.44	32.96
49	640.0	82.54	22.01	0.0	83.52	24.21
50	654.0	82.54	18.34	0.0	69.60	16.81
51	668.1	82.54	14.67	0.0	55.68	10.76
52	682.1	82.54	11.00	0.0	41.76	6.053
53	696.1	82.54	7.335	0.0	27.84	2.690
54	710.1	82.54	3.668	0.0	13.92	0.6726
55	724.1	82.54	0.0	0.0	-1.507E-6	0.0

Slice Strength Parameters Pore Slice Forces on base [kN]

No.	c' [kPa]	Tan phi	Pressure [kPa]	Weight [kN]	Normal	Shear
1	0.1000	0.0	7.183	10.78	15.54	0.1980
2	0.1000	0.0	14.50	1.595	2.251	0.01414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.66	246.0	245.7	42.87
5	3.000	0.0	16.91	265.6	265.3	42.87
6	3.000	0.0	18.15	285.2	284.9	42.87
7	3.000	0.0	19.40	304.8	304.5	42.87
8	3.000	0.0	20.65	324.4	324.1	42.87
9	3.000	0.0	21.89	344.0	343.7	42.87
10	3.000	0.0	23.14	363.6	363.3	42.87
11	3.000	0.0	24.39	383.2	382.9	42.87
12	3.000	0.0	25.63	402.8	402.5	42.87
13	3.000	0.0	26.88	422.3	422.1	42.87
14	3.000	0.0	28.13	441.9	441.7	42.87
15	3.000	0.0	29.38	461.5	461.3	42.87
16	3.000	0.0	30.62	481.1	480.9	42.87
17	3.000	0.0	31.87	500.7	500.5	42.87
18	3.000	0.0	33.12	520.3	520.1	42.87
19	3.000	0.0	34.36	539.9	539.7	42.87
20	3.000	0.0	35.61	559.5	559.3	42.87
21	3.000	0.0	36.86	579.1	578.9	42.87
22	3.000	0.0	38.11	598.7	598.5	42.87
23	3.000	0.0	39.35	618.3	618.2	42.87
24	3.000	0.0	40.60	637.9	637.8	42.87
25	3.000	0.0	41.85	657.5	657.4	42.87
26	3.000	0.0	43.09	677.0	677.0	42.87
27	3.000	0.0	44.34	696.6	696.6	42.87
28	3.000	0.0	45.59	716.2	716.2	42.87
29	3.000	0.0	46.83	735.8	735.8	42.87
30	3.000	0.0	48.08	755.4	755.4	42.87
31	3.000	0.0	49.33	775.0	775.0	42.87
32	3.000	0.0	50.58	794.6	794.6	42.87
33	3.000	0.0	51.82	814.2	814.2	42.87
34	3.000	0.0	53.07	833.8	833.8	42.87
35	3.000	0.0	54.32	853.4	853.4	42.87
36	3.000	0.0	55.56	873.0	873.0	42.87
37	3.000	0.0	56.81	892.6	892.6	42.87
38	3.000	0.0	58.06	912.2	912.2	42.87
39	3.000	0.0	56.85	875.7	875.7	42.01
40	3.000	0.0	53.18	819.2	819.2	42.01
41	3.000	0.0	49.51	762.7	762.7	42.01
42	3.000	0.0	45.84	706.2	706.2	42.01
43	3.000	0.0	42.18	649.7	649.7	42.01
44	3.000	0.0	38.51	593.2	593.2	42.01
45	3.000	0.0	34.84	536.7	536.7	42.01
46	3.000	0.0	31.17	480.2	480.2	42.01
47	3.000	0.0	27.51	423.7	423.7	42.01
48	3.000	0.0	23.84	367.2	367.2	42.01
49	3.000	0.0	20.17	310.7	310.7	42.01
50	3.000	0.0	16.50	254.2	254.2	42.01
51	3.000	0.0	12.84	197.7	197.7	42.01
52	3.000	0.0	9.169	141.2	141.2	42.01
53	3.000	0.0	5.501	84.75	84.75	42.01
54	3.000	0.0	1.834	28.25	28.25	42.01

Slice no.	Surface Load (kPa)		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F74

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 500 m
Passive wedge angle θ = 10 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

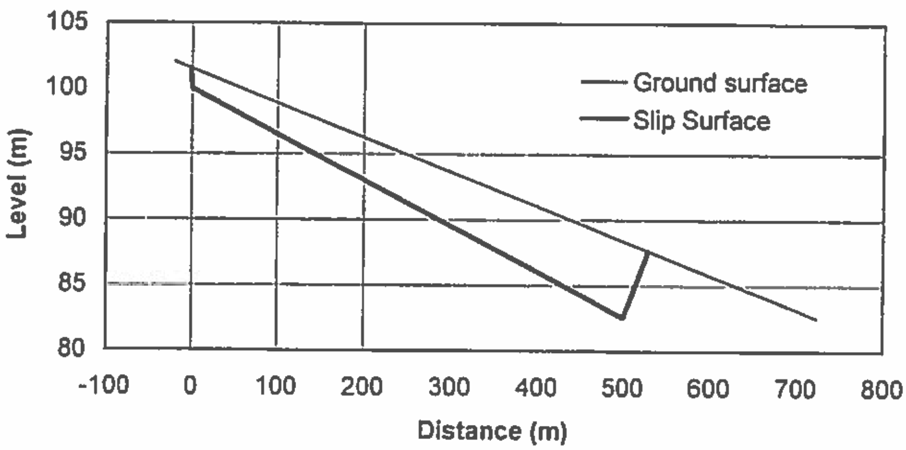
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

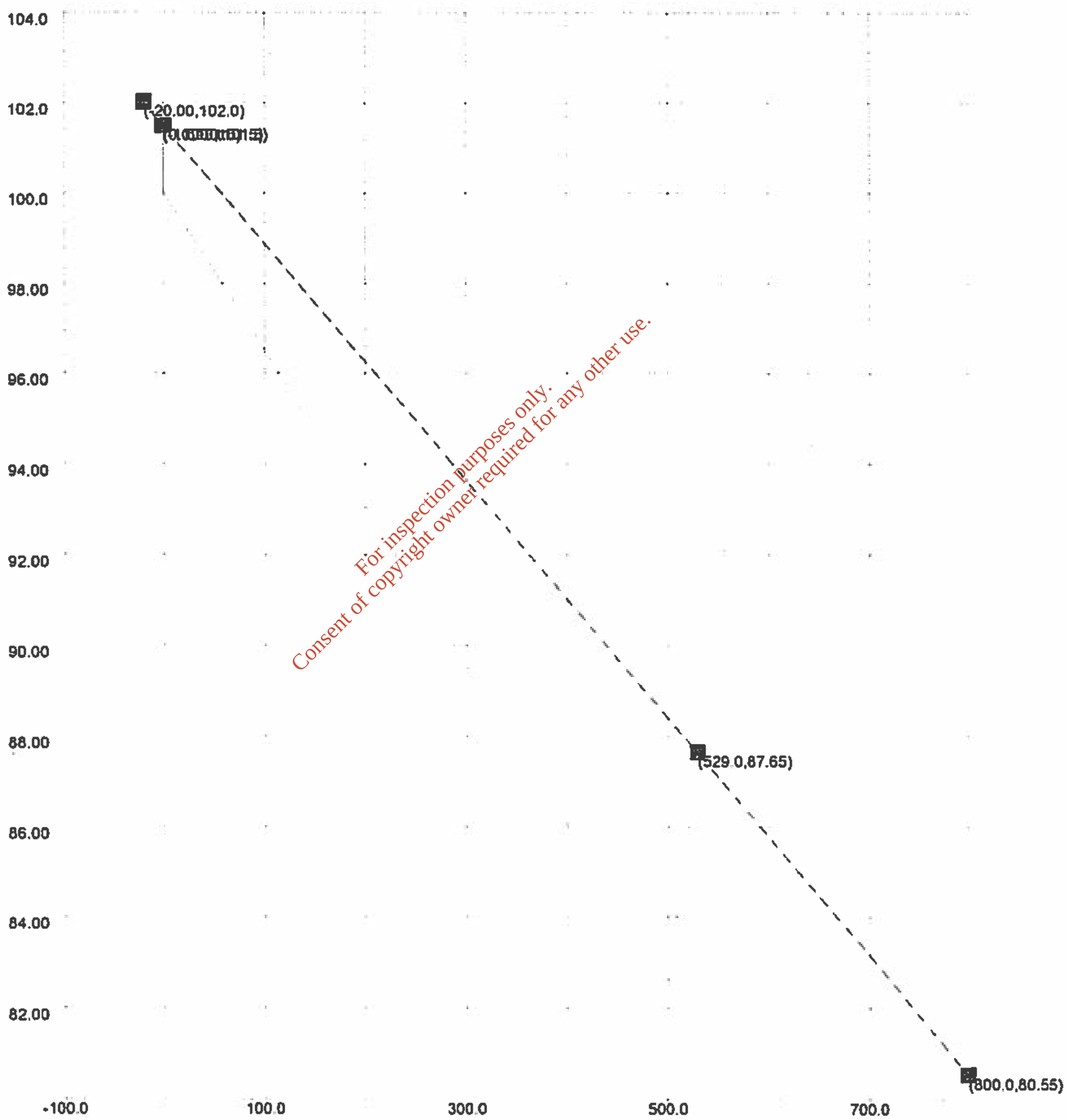
Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				528.9731	87.64835

L*	224.0679	
L2	28.97309	
θ	10	Set angle
x4	528.9731	Intersection of slip surface with
y4	87.64835	ground surface

γ	45
x1	-1.5
y1	101.5



Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 500m slip length - 10deg wedge	114662	F7S	
	Drg. Ref.		
	Made by CH	Date 05-Dec-2003	Data Corrib DB1.sld	Checked CH



Scale x 1:6374 y 1:141

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 500m slip length - 10deg wedge	114662	F76	
	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib DB1.sld — Checked: CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	529.0
1	1	102.0	101.5	.	101.5	101.5	.	87.65
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	87.65
Slip	-	.	101.5	.	100.0	.	82.54	87.65

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
513.8	9674.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (513.8,9674.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 175.5E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 21220.
Disturbing moment [kN m]: 555.6
Restoring moment [kN m]: 1600.
Factor of Safety: 2.881

Point	Slip surface coordinates x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.120	9.800
3	0.0	100.0	15.00	0.0	9.507	11.25
4	0.1000	100.0	15.03	0.0	9.460	11.30
5	10.51	99.63	15.94	0.0	4.798	12.71
6	20.93	99.27	16.85	0.0	0.4998	14.20
7	31.34	98.91	17.76	0.0	-3.435	15.78
8	41.76	98.54	18.67	0.0	-7.006	17.43

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 500m slip length - 10deg wedge	114662	F77	
	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib DB1.sld — Checked: CH

9	52.17	98.18	19.58	0.0	-10.21	19.17
10	62.59	97.81	20.49	0.0	-13.06	20.99
11	73.00	97.45	21.40	0.0	-15.54	22.90
12	83.42	97.09	22.31	0.0	-17.65	24.89
13	93.83	96.72	23.22	0.0	-19.40	26.96
14	104.2	96.36	24.13	0.0	-20.79	29.11
15	114.7	96.00	25.04	0.0	-21.81	31.35
16	125.1	95.63	25.95	0.0	-22.47	33.66
17	135.5	95.27	26.86	0.0	-22.77	36.07
18	145.9	94.91	27.77	0.0	-22.70	38.55
19	156.3	94.54	28.68	0.0	-22.27	41.12
20	166.7	94.18	29.59	0.0	-21.48	43.77
21	177.1	93.81	30.49	0.0	-20.32	46.50
22	187.6	93.45	31.40	0.0	-18.80	49.31
23	198.0	93.09	32.31	0.0	-16.91	52.21
24	208.4	92.72	33.22	0.0	-14.66	55.19
25	218.8	92.36	34.13	0.0	-12.05	58.25
26	229.2	92.00	35.04	0.0	-9.069	61.40
27	239.6	91.63	35.95	0.0	-5.728	64.63
28	250.1	91.27	36.86	0.0	-2.022	67.94
29	260.5	90.90	37.77	0.0	2.047	71.33
30	270.9	90.54	38.68	0.0	6.479	74.81
31	281.3	90.18	39.59	0.0	11.28	78.36
32	291.7	89.81	40.50	0.0	16.44	82.01
33	302.1	89.45	41.41	0.0	21.96	85.73
34	312.5	89.09	42.32	0.0	27.85	89.54
35	323.0	88.72	43.23	0.0	34.10	93.43
36	333.4	88.36	44.14	0.0	40.72	97.40
37	343.8	88.00	45.05	0.0	47.70	101.5
38	354.2	87.63	45.95	0.0	55.04	105.6
39	364.6	87.27	46.86	0.0	62.75	109.8
40	375.0	86.90	47.77	0.0	70.82	114.1
41	385.4	86.54	48.68	0.0	79.25	118.5
42	395.9	86.18	49.59	0.0	88.05	123.0
43	406.3	85.81	50.50	0.0	97.21	127.5
44	416.7	85.45	51.41	0.0	106.7	132.2
45	427.1	85.09	52.32	0.0	116.6	136.9
46	437.5	84.72	53.23	0.0	126.9	141.7
47	447.9	84.36	54.14	0.0	137.5	146.6
48	458.3	83.99	55.05	0.0	148.5	151.5
49	468.8	83.63	55.96	0.0	159.8	156.6
50	479.2	83.27	56.87	0.0	171.5	161.7
51	489.6	82.90	57.78	0.0	183.6	166.9
52	500.0	82.54	58.69	0.0	196.0	172.2
53	509.7	84.24	39.12	0.0	94.04	76.54
54	519.3	85.95	19.56	0.0	28.70	19.13
55	529.0	87.65	0.0	0.0	175.5E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.183	10.78	13.55	5.940
2	3.000	0.0	14.50	1.595	2.108	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.49	177.5	177.2	31.26
5	3.000	0.0	16.40	187.9	187.6	31.26
6	3.000	0.0	17.31	198.3	198.0	31.26
7	3.000	0.0	18.22	208.7	208.5	31.26
8	3.000	0.0	19.13	219.1	218.9	31.26
9	3.000	0.0	20.04	229.5	229.3	31.26
10	3.000	0.0	20.95	240.0	239.7	31.26
11	3.000	0.0	21.86	250.4	250.2	31.26
12	3.000	0.0	22.76	260.8	260.6	31.26
13	3.000	0.0	23.67	271.2	271.0	31.26
14	3.000	0.0	24.58	281.6	281.4	31.26
15	3.000	0.0	25.49	292.1	291.8	31.26
16	3.000	0.0	26.40	302.5	302.3	31.26
17	3.000	0.0	27.31	312.9	312.7	31.26
18	3.000	0.0	28.22	323.3	323.1	31.26
19	3.000	0.0	29.13	333.7	333.5	31.26
20	3.000	0.0	30.04	344.1	344.0	31.26
21	3.000	0.0	30.95	354.6	354.4	31.26
22	3.000	0.0	31.86	365.0	364.8	31.26
23	3.000	0.0	32.77	375.4	375.2	31.26
24	3.000	0.0	33.68	385.8	385.7	31.26

25	3.000	0.0	34.59	396.2	396.1	31.26
26	3.000	0.0	35.50	406.7	406.5	31.26
27	3.000	0.0	36.41	417.1	416.9	31.26
28	3.000	0.0	37.32	427.5	427.4	31.26
29	3.000	0.0	38.22	437.9	437.8	31.26
30	3.000	0.0	39.13	448.3	448.2	31.26
31	3.000	0.0	40.04	458.7	458.6	31.26
32	3.000	0.0	40.95	469.2	469.1	31.26
33	3.000	0.0	41.86	479.6	479.5	31.26
34	3.000	0.0	42.77	490.0	489.9	31.26
35	3.000	0.0	43.68	500.4	500.3	31.26
36	3.000	0.0	44.59	510.8	510.8	31.26
37	3.000	0.0	45.50	521.3	521.2	31.26
38	3.000	0.0	46.41	531.7	531.6	31.26
39	3.000	0.0	47.32	542.1	542.0	31.26
40	3.000	0.0	48.23	552.5	552.5	31.26
41	3.000	0.0	49.14	562.9	562.9	31.26
42	3.000	0.0	50.05	573.3	573.3	31.26
43	3.000	0.0	50.96	583.8	583.7	31.26
44	3.000	0.0	51.87	594.2	594.2	31.26
45	3.000	0.0	52.78	604.6	604.6	31.26
46	3.000	0.0	53.68	615.0	615.0	31.26
47	3.000	0.0	54.59	625.4	625.4	31.26
48	3.000	0.0	55.50	635.9	635.9	31.26
49	3.000	0.0	56.41	646.3	646.3	31.26
50	3.000	0.0	57.32	656.7	656.7	31.26
51	3.000	0.0	58.23	667.1	667.1	31.26
52	3.000	0.0	48.91	519.5	529.3	29.42
53	3.000	0.0	29.34	311.7	318.3	29.42
54	3.000	0.0	9.781	103.9	107.3	29.42

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	529.0
1	1	102.0	101.5	.	101.5	101.5	.	87.65
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	87.65
Slip	-	.	101.5		100.0	.	82.54	87.65

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
513.8	9674.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (513.8,9674.) Radius 0.0m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN]: 0.0 Slip weight [kN] 21220.
Net horiz force [kN]: 211.7E-6 Disturbing moment [kN m]: 555.6
Restoring moment [kN m]: 1592.
Factor of Safety: 2.865

Slip surface coordinates, Pore Pressure, Interslice forces [kN]

Point	x [m]	y [m]	u [kPa]	T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.94	9.800
3	0.0	100.0	15.00	0.0	12.53	11.25
4	0.1000	100.0	15.03	0.0	12.48	11.30
5	10.51	99.63	15.94	0.0	7.758	12.71
6	20.93	99.27	16.85	0.0	3.400	14.20
7	31.34	98.91	17.76	0.0	-0.5939	15.78
8	41.76	98.54	18.67	0.0	-4.224	17.43

9	52.17	98.18	19.58	0.0	-7.491	19.17
10	62.59	97.81	20.49	0.0	-10.39	20.99
11	73.00	97.45	21.40	0.0	-12.93	22.90
12	83.42	97.09	22.31	0.0	-15.11	24.89
13	93.83	96.72	23.22	0.0	-16.92	26.96
14	104.2	96.36	24.13	0.0	-18.37	29.11
15	114.7	96.00	25.04	0.0	-19.45	31.35
16	125.1	95.63	25.95	0.0	-20.17	33.66
17	135.5	95.27	26.86	0.0	-20.52	36.07
18	145.9	94.91	27.77	0.0	-20.52	38.55
19	156.3	94.54	28.68	0.0	-20.14	41.12
20	166.7	94.18	29.59	0.0	-19.41	43.77
21	177.1	93.81	30.49	0.0	-18.31	46.50
22	187.6	93.45	31.40	0.0	-16.85	49.31
23	198.0	93.09	32.31	0.0	-15.02	52.21
24	208.4	92.72	33.22	0.0	-12.83	55.19
25	218.8	92.36	34.13	0.0	-10.27	58.25
26	229.2	92.00	35.04	0.0	-7.356	61.40
27	239.6	91.63	35.95	0.0	-4.074	64.63
28	250.1	91.27	36.86	0.0	-0.4278	67.94
29	260.5	90.90	37.77	0.0	3.582	71.33
30	270.9	90.54	38.68	0.0	7.955	74.81
31	281.3	90.18	39.59	0.0	12.69	78.36
32	291.7	89.81	40.50	0.0	17.79	82.01
33	302.1	89.45	41.41	0.0	23.26	85.73
34	312.5	89.09	42.32	0.0	29.09	89.54
35	323.0	88.72	43.23	0.0	35.28	93.43
36	333.4	88.36	44.14	0.0	41.84	97.40
37	343.8	88.00	45.05	0.0	48.76	101.5
38	354.2	87.63	45.95	0.0	56.04	105.6
39	364.6	87.27	46.86	0.0	63.69	109.8
40	375.0	86.90	47.77	0.0	71.70	114.1
41	385.4	86.54	48.68	0.0	80.08	118.5
42	395.9	86.18	49.59	0.0	88.81	123.0
43	406.3	85.81	50.50	0.0	97.92	127.5
44	416.7	85.45	51.41	0.0	107.4	132.2
45	427.1	85.09	52.32	0.0	117.2	136.9
46	437.5	84.72	53.23	0.0	127.4	141.7
47	447.9	84.36	54.14	0.0	138.0	146.6
48	458.3	83.99	55.05	0.0	148.9	151.5
49	468.8	83.63	55.96	0.0	160.2	156.6
50	479.2	83.27	56.87	0.0	171.8	161.7
51	489.6	82.90	57.78	0.0	183.8	166.9
52	500.0	82.54	58.69	0.0	196.2	172.2
53	509.7	84.24	39.12	0.0	94.16	76.54
54	519.3	85.95	19.56	0.0	28.75	19.13
55	529.0	87.65	0.0	0.0	211.7E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.1000	0.0	7.183	10.78	15.54	0.1980
2	0.1000	0.0	14.50	1.595	2.251	0.01414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.49	177.5	177.2	31.26
5	3.000	0.0	16.40	187.9	187.6	31.26
6	3.000	0.0	17.31	198.3	198.0	31.26
7	3.000	0.0	18.22	208.7	208.5	31.26
8	3.000	0.0	19.13	219.1	218.9	31.26
9	3.000	0.0	20.04	229.5	229.3	31.26
10	3.000	0.0	20.95	240.0	239.7	31.26
11	3.000	0.0	21.86	250.4	250.1	31.26
12	3.000	0.0	22.76	260.8	260.6	31.26
13	3.000	0.0	23.67	271.2	271.0	31.26
14	3.000	0.0	24.58	281.6	281.4	31.26
15	3.000	0.0	25.49	292.1	291.8	31.26
16	3.000	0.0	26.40	302.5	302.3	31.26
17	3.000	0.0	27.31	312.9	312.7	31.26
18	3.000	0.0	28.22	323.3	323.1	31.26
19	3.000	0.0	29.13	333.7	333.5	31.26
20	3.000	0.0	30.04	344.1	344.0	31.26
21	3.000	0.0	30.95	354.6	354.4	31.26
22	3.000	0.0	31.86	365.0	364.8	31.26
23	3.000	0.0	32.77	375.4	375.2	31.26
24	3.000	0.0	33.68	385.8	385.7	31.26

25	3.000	0.0	34.59	396.2	396.1	31.26
26	3.000	0.0	35.50	406.7	406.5	31.26
27	3.000	0.0	36.41	417.1	416.9	31.26
28	3.000	0.0	37.32	427.5	427.4	31.26
29	3.000	0.0	38.22	437.9	437.8	31.26
30	3.000	0.0	39.13	448.3	448.2	31.26
31	3.000	0.0	40.04	458.7	458.6	31.26
32	3.000	0.0	40.95	469.2	469.1	31.26
33	3.000	0.0	41.86	479.6	479.5	31.26
34	3.000	0.0	42.77	490.0	489.9	31.26
35	3.000	0.0	43.68	500.4	500.3	31.26
36	3.000	0.0	44.59	510.8	510.8	31.26
37	3.000	0.0	45.50	521.3	521.2	31.26
38	3.000	0.0	46.41	531.7	531.6	31.26
39	3.000	0.0	47.32	542.1	542.0	31.26
40	3.000	0.0	48.23	552.5	552.5	31.26
41	3.000	0.0	49.14	562.9	562.9	31.26
42	3.000	0.0	50.05	573.3	573.3	31.26
43	3.000	0.0	50.96	583.8	583.7	31.26
44	3.000	0.0	51.87	594.2	594.2	31.26
45	3.000	0.0	52.78	604.6	604.6	31.26
46	3.000	0.0	53.68	615.0	615.0	31.26
47	3.000	0.0	54.59	625.4	625.4	31.26
48	3.000	0.0	55.50	635.9	635.9	31.26
49	3.000	0.0	56.41	646.3	646.3	31.26
50	3.000	0.0	57.32	656.7	656.7	31.26
51	3.000	0.0	58.23	667.1	667.1	31.26
52	3.000	0.0	48.91	519.5	529.3	29.42
53	3.000	0.0	29.34	311.7	318.3	29.42
54	3.000	0.0	9.781	103.9	107.3	29.42

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 FS2

Made by: CH Chkd:..CH
Date: 30/11/2003
Rev: -.-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 500 m
Passive wedge angle θ = 20 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

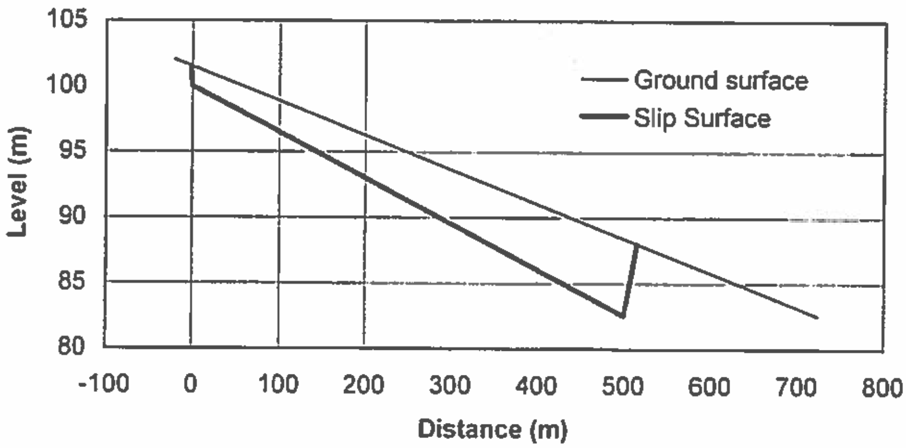
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				515.0387	88.01324

L*	224.0679	
L2	15.03866	
θ	20	Set angle
x4	515.0387	Intersection of slip surface with
y4	88.01324	ground surface

γ	45
x1	-1.5
y1	101.5



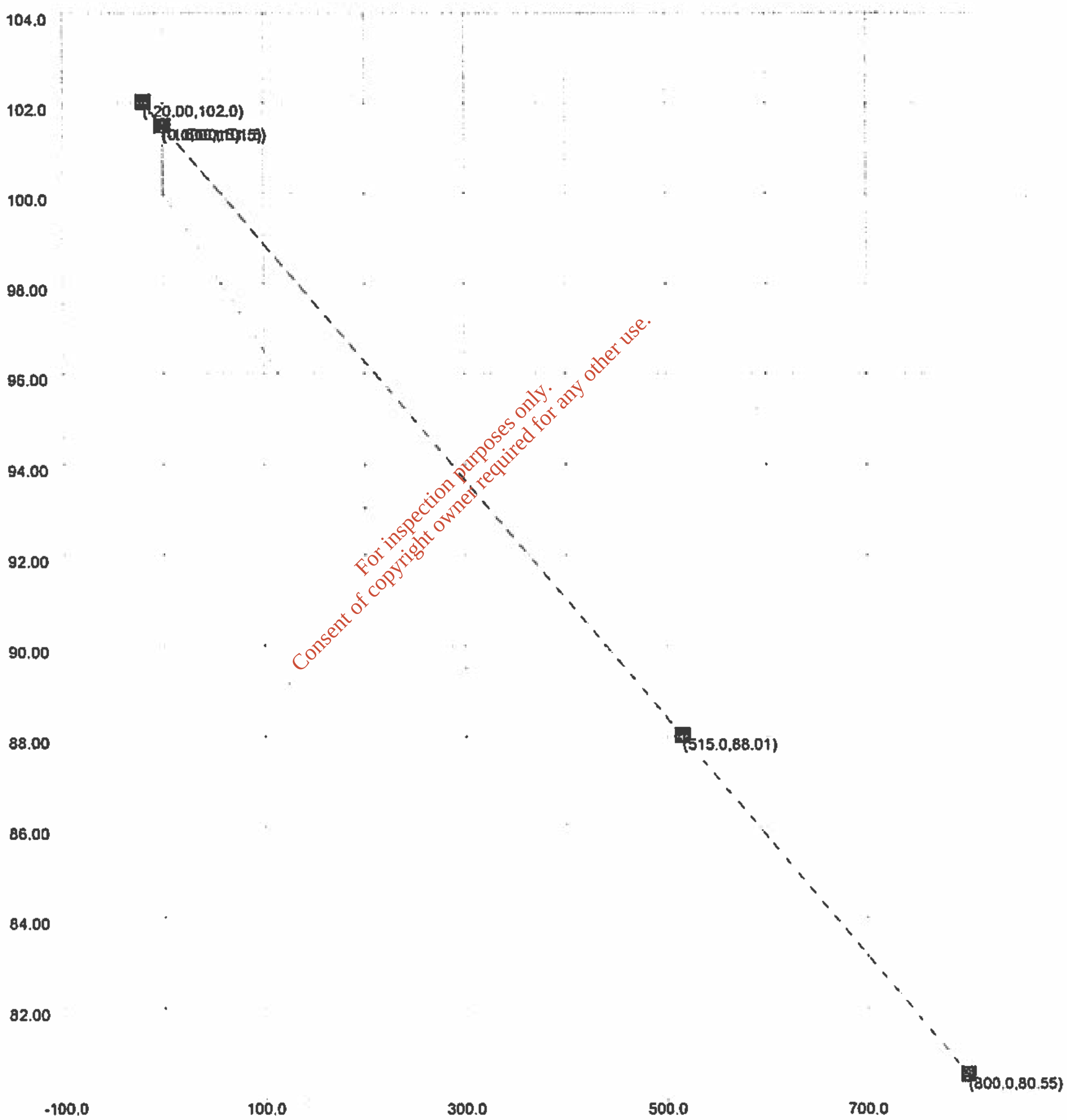
Oasys

Corrib

Peat stability - 500m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F83	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB2.sld	CH



Scale x 1:6374 y 1:141

Oasys

Corrib
Peat stability - 500m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F84	

Drg. Ref.			
Made by	**Date**	**Data**	**Checked**
CH	05-Dec-2003	Corrib DB2.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	515.0
1	1	102.0	101.5	.	101.5	101.5	.	88.01
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.01
Slip	-	.	101.5		100.0	.	82.54	88.01

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
497.2	9300.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (497.2,9300.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -95.37E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20760.
Disturbing moment [kN m]: 543.6
Restoring moment [kN m]: 1562.
Factor of Safety: 2.873

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.112	9.800
3	0.0	100.0	15.00	0.0	9.499	11.25
4	0.1000	100.0	15.03	0.0	9.452	11.30
5	10.30	99.64	15.92	0.0	4.853	12.68
6	20.50	99.28	16.81	0.0	0.6020	14.14
7	30.71	98.93	17.70	0.0	-3.300	15.67
8	40.91	98.57	18.59	0.0	-6.853	17.29

9	51.11	98.22	19.48	0.0	-10.06	18.98
10	61.31	97.86	20.37	0.0	-12.91	20.76
11	71.51	97.50	21.26	0.0	-15.42	22.61
12	81.72	97.15	22.15	0.0	-17.58	24.54
13	91.92	96.79	23.04	0.0	-19.39	26.55
14	102.1	96.43	23.93	0.0	-20.85	28.64
15	112.3	96.08	24.82	0.0	-21.96	30.81
16	122.5	95.72	25.71	0.0	-22.72	33.06
17	132.7	95.37	26.60	0.0	-23.14	35.39
18	142.9	95.01	27.49	0.0	-23.20	37.79
19	153.1	94.65	28.38	0.0	-22.92	40.28
20	163.3	94.30	29.27	0.0	-22.29	42.85
21	173.5	93.94	30.16	0.0	-21.31	45.49
22	183.7	93.58	31.05	0.0	-19.98	48.21
23	193.9	93.23	31.94	0.0	-18.30	51.02
24	204.1	92.87	32.83	0.0	-16.27	53.90
25	214.3	92.52	33.72	0.0	-13.90	56.86
26	224.5	92.16	34.61	0.0	-11.17	59.90
27	234.7	91.80	35.50	0.0	-8.101	63.02
28	244.9	91.45	36.39	0.0	-4.680	66.22
29	255.2	91.09	37.28	0.0	-0.9095	69.50
30	265.4	90.73	38.17	0.0	3.210	72.86
31	275.6	90.38	39.06	0.0	7.677	76.29
32	285.8	90.02	39.95	0.0	12.49	79.81
33	296.0	89.67	40.84	0.0	17.66	83.40
34	306.2	89.31	41.73	0.0	23.17	87.08
35	316.4	88.95	42.62	0.0	29.04	90.83
36	326.6	88.60	43.51	0.0	35.25	94.66
37	336.8	88.24	44.40	0.0	41.81	98.58
38	347.0	87.88	45.29	0.0	48.72	102.6
39	357.2	87.53	46.18	0.0	55.97	106.6
40	367.4	87.17	47.07	0.0	63.58	110.8
41	377.6	86.82	47.96	0.0	71.54	115.0
42	387.8	86.46	48.85	0.0	79.84	119.3
43	398.0	86.10	49.74	0.0	88.49	123.7
44	408.2	85.75	50.63	0.0	97.49	128.2
45	418.4	85.39	51.52	0.0	106.8	132.7
46	428.6	85.03	52.41	0.0	116.5	137.3
47	438.8	84.68	53.30	0.0	126.6	142.0
48	449.0	84.32	54.19	0.0	137.0	146.8
49	459.2	83.97	55.08	0.0	147.7	151.7
50	469.4	83.61	55.97	0.0	158.8	156.6
51	479.6	83.25	56.86	0.0	170.3	161.7
52	489.8	82.90	57.75	0.0	182.1	166.8
53	500.0	82.54	58.64	0.0	194.2	171.9
54	507.5	85.28	29.32	0.0	53.00	42.98
55	515.0	88.01	0.0	0.0	-95.37E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.183	10.78	13.54	5.940
2	3.000	0.0	14.50	1.595	2.108	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.48	173.7	173.5	30.62
5	3.000	0.0	16.37	183.7	183.4	30.62
6	3.000	0.0	17.26	193.7	193.4	30.62
7	3.000	0.0	18.15	203.7	203.4	30.62
8	3.000	0.0	19.04	213.7	213.4	30.62
9	3.000	0.0	19.93	223.7	223.4	30.62
10	3.000	0.0	20.82	233.6	233.4	30.62
11	3.000	0.0	21.71	243.6	243.4	30.62
12	3.000	0.0	22.60	253.6	253.4	30.62
13	3.000	0.0	23.49	263.6	263.4	30.62
14	3.000	0.0	24.38	273.6	273.4	30.62
15	3.000	0.0	25.27	283.6	283.4	30.62
16	3.000	0.0	26.16	293.6	293.4	30.62
17	3.000	0.0	27.05	303.5	303.4	30.62
18	3.000	0.0	27.94	313.5	313.4	30.62
19	3.000	0.0	28.83	323.5	323.3	30.62
20	3.000	0.0	29.72	333.5	333.3	30.62
21	3.000	0.0	30.61	343.5	343.3	30.62
22	3.000	0.0	31.50	353.5	353.3	30.62
23	3.000	0.0	32.39	363.5	363.3	30.62
24	3.000	0.0	33.28	373.5	373.3	30.62

Oasys

Corrib
Peat stability - 500m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F86	
Drg. Ref.		

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB2.sld	CM

25	3.000	0.0	34.17	383.4	383.3	30.62
26	3.000	0.0	35.06	393.4	393.3	30.62
27	3.000	0.0	35.95	403.4	403.3	30.62
28	3.000	0.0	36.84	413.4	413.3	30.62
29	3.000	0.0	37.73	423.4	423.3	30.62
30	3.000	0.0	38.62	433.4	433.3	30.62
31	3.000	0.0	39.51	443.4	443.3	30.62
32	3.000	0.0	40.40	453.3	453.3	30.62
33	3.000	0.0	41.29	463.3	463.2	30.62
34	3.000	0.0	42.18	473.3	473.2	30.62
35	3.000	0.0	43.07	483.3	483.2	30.62
36	3.000	0.0	43.96	493.3	493.2	30.62
37	3.000	0.0	44.85	503.3	503.2	30.62
38	3.000	0.0	45.74	513.3	513.2	30.62
39	3.000	0.0	46.63	523.3	523.2	30.62
40	3.000	0.0	47.52	533.2	533.2	30.62
41	3.000	0.0	48.41	543.2	543.2	30.62
42	3.000	0.0	49.30	553.2	553.2	30.62
43	3.000	0.0	50.19	563.2	563.2	30.62
44	3.000	0.0	51.08	573.2	573.2	30.62
45	3.000	0.0	51.97	583.2	583.2	30.62
46	3.000	0.0	52.86	593.2	593.1	30.62
47	3.000	0.0	53.75	603.1	603.1	30.62
48	3.000	0.0	54.64	613.1	613.1	30.62
49	3.000	0.0	55.53	623.1	623.1	30.62
50	3.000	0.0	56.42	633.1	633.1	30.62
51	3.000	0.0	57.31	643.1	643.1	30.62
52	3.000	0.0	58.20	653.1	653.1	30.62
53	3.000	0.0	43.98	363.8	390.2	24.01
54	3.000	0.0	14.66	121.3	132.1	24.01

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys

Corrib
Peat stability - 500m slip length - 20deg wedge

Job No.	Sheet No.	Rev.
114662	F87	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DA2.sld	CM

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.01000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	515.0
1	1	102.0	101.5	.	101.5	101.5	.	88.01
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.01
Slip	-	.	101.5		100.0	.	82.54	88.01

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
497.2	9300.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (497.2,9300.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -103.0E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20760.
Disturbing moment [kN m]: 543.6
Restoring moment [kN m]: 1553.
Factor of Safety: 2.857

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	11.03	9.800
3	0.0	100.0	15.00	0.0	12.62	11.25
4	0.1000	100.0	15.03	0.0	12.57	11.30
5	10.30	99.64	15.92	0.0	7.912	12.68
6	20.50	99.28	16.81	0.0	3.600	14.14
7	30.71	98.93	17.70	0.0	-0.3633	15.67
8	40.91	98.57	18.59	0.0	-3.978	17.29

9	51.11	98.22	19.48	0.0	-7.244	18.98
10	61.31	97.86	20.37	0.0	-10.16	20.76
11	71.51	97.50	21.26	0.0	-12.73	22.61
12	81.72	97.15	22.15	0.0	-14.95	24.54
13	91.92	96.79	23.04	0.0	-16.82	26.55
14	102.1	96.43	23.93	0.0	-18.34	28.64
15	112.3	96.08	24.82	0.0	-19.52	30.81
16	122.5	95.72	25.71	0.0	-20.34	33.06
17	132.7	95.37	26.60	0.0	-20.82	35.39
18	142.9	95.01	27.49	0.0	-20.94	37.79
19	153.1	94.65	28.38	0.0	-20.72	40.28
20	163.3	94.30	29.27	0.0	-20.15	42.85
21	173.5	93.94	30.16	0.0	-19.23	45.49
22	183.7	93.58	31.05	0.0	-17.97	48.21
23	193.9	93.23	31.94	0.0	-16.35	51.02
24	204.1	92.87	32.83	0.0	-14.38	53.90
25	214.3	92.52	33.72	0.0	-12.07	56.86
26	224.5	92.16	34.61	0.0	-9.408	59.90
27	234.7	91.80	35.50	0.0	-6.397	63.02
28	244.9	91.45	36.39	0.0	-3.037	66.22
29	255.2	91.09	37.28	0.0	0.6718	69.50
30	265.4	90.73	38.17	0.0	4.729	72.86
31	275.6	90.38	39.06	0.0	9.135	76.29
32	285.8	90.02	39.95	0.0	13.89	79.81
33	296.0	89.67	40.84	0.0	18.99	83.40
34	306.2	89.31	41.73	0.0	24.45	87.08
35	316.4	88.95	42.62	0.0	30.25	90.83
36	326.6	88.60	43.51	0.0	36.40	94.66
37	336.8	88.24	44.40	0.0	42.90	98.58
38	347.0	87.88	45.29	0.0	49.74	102.6
39	357.2	87.53	46.18	0.0	56.94	106.6
40	367.4	87.17	47.07	0.0	64.48	110.8
41	377.6	86.82	47.96	0.0	72.38	115.0
42	387.8	86.46	48.85	0.0	80.62	119.3
43	398.0	86.10	49.74	0.0	89.21	123.7
44	408.2	85.75	50.63	0.0	98.15	128.2
45	418.4	85.39	51.52	0.0	107.4	132.7
46	428.6	85.03	52.41	0.0	117.1	137.3
47	438.8	84.68	53.30	0.0	127.1	142.0
48	449.0	84.32	54.19	0.0	137.4	146.8
49	459.2	83.97	55.08	0.0	148.1	151.7
50	469.4	83.61	55.97	0.0	159.1	156.6
51	479.6	83.25	56.86	0.0	170.5	161.7
52	489.8	82.90	57.75	0.0	182.2	166.8
53	500.0	82.54	58.64	0.0	194.3	171.9
54	507.5	85.28	29.32	0.0	53.05	42.98
55	515.0	88.01	0.0	0.0	-103.0E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Strength Parameters Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Forces on base [kN] Shear
1	0.01000	0.0	7.183	10.78	15.60	0.01980
2	0.01000	0.0	14.50	1.595	2.255	0.001414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.48	173.7	173.5	30.62
5	3.000	0.0	16.37	183.7	183.4	30.62
6	3.000	0.0	17.26	193.7	193.4	30.62
7	3.000	0.0	18.15	203.7	203.4	30.62
8	3.000	0.0	19.04	213.7	213.4	30.62
9	3.000	0.0	19.93	223.7	223.4	30.62
10	3.000	0.0	20.82	233.6	233.4	30.62
11	3.000	0.0	21.71	243.6	243.4	30.62
12	3.000	0.0	22.60	253.6	253.4	30.62
13	3.000	0.0	23.49	263.6	263.4	30.62
14	3.000	0.0	24.38	273.6	273.4	30.62
15	3.000	0.0	25.27	283.6	283.4	30.62
16	3.000	0.0	26.16	293.6	293.4	30.62
17	3.000	0.0	27.05	303.5	303.4	30.62
18	3.000	0.0	27.94	313.5	313.3	30.62
19	3.000	0.0	28.83	323.5	323.3	30.62
20	3.000	0.0	29.72	333.5	333.3	30.62
21	3.000	0.0	30.61	343.5	343.3	30.62
22	3.000	0.0	31.50	353.5	353.3	30.62
23	3.000	0.0	32.39	363.5	363.3	30.62
24	3.000	0.0	33.28	373.5	373.3	30.62

25	3.000	0.0	34.17	383.4	383.3	30.62
26	3.000	0.0	35.06	393.4	393.3	30.62
27	3.000	0.0	35.95	403.4	403.3	30.62
28	3.000	0.0	36.84	413.4	413.3	30.62
29	3.000	0.0	37.73	423.4	423.3	30.62
30	3.000	0.0	38.62	433.4	433.3	30.62
31	3.000	0.0	39.51	443.4	443.3	30.62
32	3.000	0.0	40.40	453.3	453.2	30.62
33	3.000	0.0	41.29	463.3	463.2	30.62
34	3.000	0.0	42.18	473.3	473.2	30.62
35	3.000	0.0	43.07	483.3	483.2	30.62
36	3.000	0.0	43.96	493.3	493.2	30.62
37	3.000	0.0	44.85	503.3	503.2	30.62
38	3.000	0.0	45.74	513.3	513.2	30.62
39	3.000	0.0	46.63	523.3	523.2	30.62
40	3.000	0.0	47.52	533.2	533.2	30.62
41	3.000	0.0	48.41	543.2	543.2	30.62
42	3.000	0.0	49.30	553.2	553.2	30.62
43	3.000	0.0	50.19	563.2	563.2	30.62
44	3.000	0.0	51.08	573.2	573.2	30.62
45	3.000	0.0	51.97	583.2	583.2	30.62
46	3.000	0.0	52.86	593.2	593.1	30.62
47	3.000	0.0	53.75	603.1	603.1	30.62
48	3.000	0.0	54.64	613.1	613.1	30.62
49	3.000	0.0	55.53	623.1	623.1	30.62
50	3.000	0.0	56.42	633.1	633.1	30.62
51	3.000	0.0	57.31	643.1	643.1	30.62
52	3.000	0.0	58.20	653.1	653.1	30.62
53	3.000	0.0	43.98	363.8	390.2	24.01
54	3.000	0.0	14.66	121.3	132.1	24.01

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F4

Corrib Onshore Terminal
Slope geometric data

Made by: CH Chkd: CH
Date: 30/11/2003
Rev: -,-

Slope length L = **500 m**
Passive wedge angle θ = **30 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

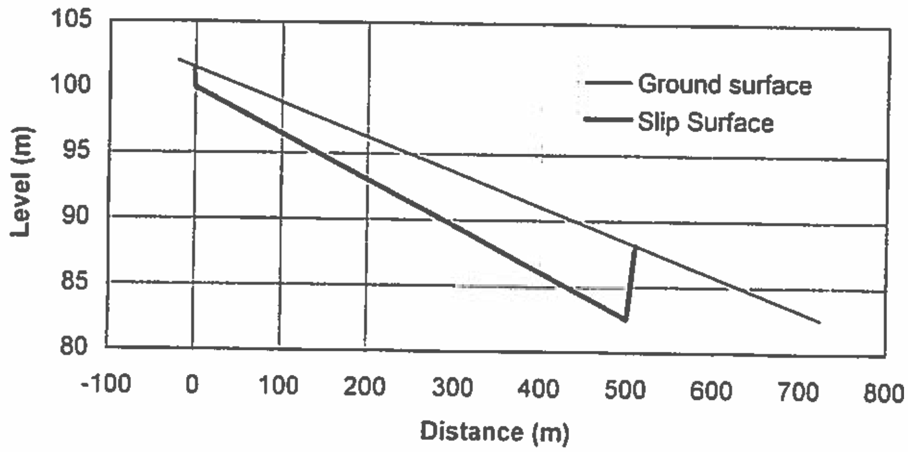
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				509.7217	88.15247

L*	224.0679	
L2	9.721743	
θ	30	Set angle
x4	509.7217	Intersection of slip surface with
y4	88.15247	ground surface

γ	45
x1	-1.5
y1	101.5



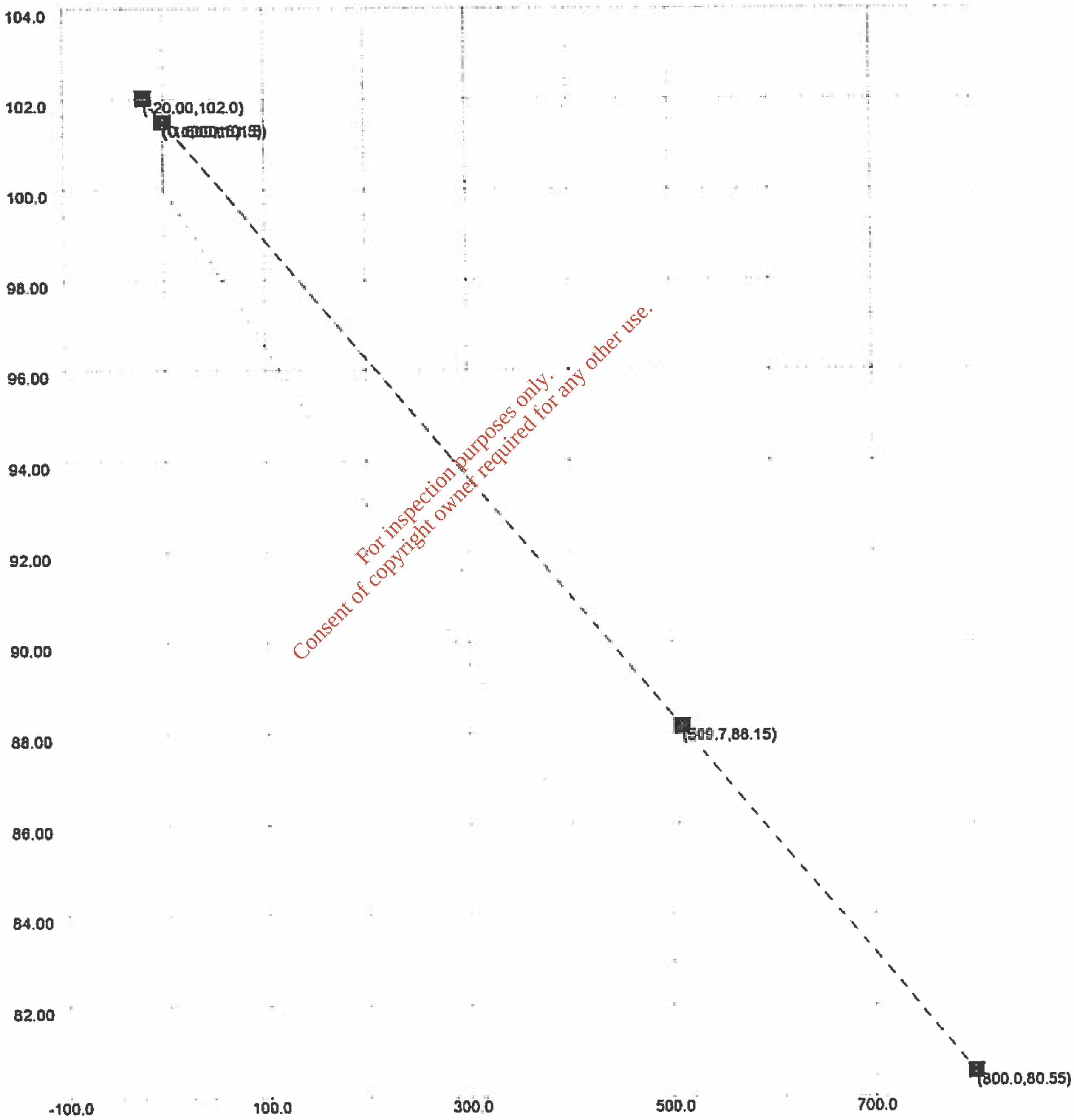
Oasys

Corrib
Peat stability - 500m slip length - 30deg wedge

Job No.	Sheet No.	Rev.
114662	F91	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DA3.sld	CH



Scale x 1:6374 y 1:141

Program SLOPE Version 17.9
Slope Stability Analysis

Printed 06-Dec-2003

Time 20:05

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	509.7
1	1	102.0	101.5	.	101.5	101.5	.	88.15
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.15
Slip	-	.	101.5	.	100.0	.	82.54	88.15

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
489.7	9118.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (489.7,9118.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -183.1E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20590.
Disturbing moment [kN m]: 539.2
Restoring moment [kN m]: 1541.
Factor of Safety: 2.858

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.94	9.800
3	0.0	100.0	15.00	0.0	12.53	11.25
4	0.1000	100.0	15.03	0.0	12.48	11.30
5	10.30	99.64	15.92	0.0	7.824	12.68
6	20.50	99.28	16.81	0.0	3.517	14.14
7	30.71	98.93	17.71	0.0	-0.4400	15.67
8	40.91	98.57	18.60	0.0	-4.049	17.29

9	51.11	98.22	19.49	0.0	-7.309	18.98
10	61.31	97.86	20.38	0.0	-10.22	20.76
11	71.51	97.50	21.27	0.0	-12.78	22.61
12	81.72	97.15	22.16	0.0	-15.00	24.54
13	91.92	96.79	23.05	0.0	-16.86	26.55
14	102.1	96.43	23.94	0.0	-18.38	28.64
15	112.3	96.08	24.83	0.0	-19.54	30.81
16	122.5	95.72	25.72	0.0	-20.36	33.06
17	132.7	95.37	26.61	0.0	-20.83	35.39
18	142.9	95.01	27.50	0.0	-20.95	37.80
19	153.1	94.65	28.39	0.0	-20.72	40.29
20	163.3	94.30	29.28	0.0	-20.15	42.85
21	173.5	93.94	30.17	0.0	-19.22	45.50
22	183.7	93.58	31.06	0.0	-17.95	48.22
23	193.9	93.23	31.95	0.0	-16.32	51.03
24	204.1	92.87	32.84	0.0	-14.35	53.91
25	214.3	92.52	33.73	0.0	-12.03	56.87
26	224.5	92.16	34.62	0.0	-9.362	59.91
27	234.7	91.80	35.51	0.0	-6.344	63.03
28	244.9	91.45	36.40	0.0	-2.977	66.23
29	255.2	91.09	37.29	0.0	0.7388	69.51
30	265.4	90.73	38.18	0.0	4.803	72.87
31	275.6	90.38	39.07	0.0	9.217	76.31
32	285.8	90.02	39.96	0.0	13.98	79.82
33	296.0	89.67	40.85	0.0	19.09	83.42
34	306.2	89.31	41.74	0.0	24.55	87.09
35	316.4	88.95	42.63	0.0	30.36	90.85
36	326.6	88.60	43.52	0.0	36.52	94.68
37	336.8	88.24	44.41	0.0	43.02	98.59
38	347.0	87.88	45.30	0.0	49.88	102.6
39	357.2	87.53	46.19	0.0	57.08	106.7
40	367.4	87.17	47.08	0.0	64.63	110.8
41	377.6	86.82	47.97	0.0	72.53	115.0
42	387.8	86.46	48.86	0.0	80.78	119.3
43	398.0	86.10	49.75	0.0	89.38	123.7
44	408.2	85.75	50.64	0.0	98.33	128.2
45	418.4	85.39	51.53	0.0	107.6	132.7
46	428.6	85.03	52.42	0.0	117.3	137.4
47	438.8	84.68	53.31	0.0	127.3	142.1
48	449.0	84.32	54.20	0.0	137.6	146.9
49	459.2	83.97	55.09	0.0	148.3	151.7
50	469.4	83.61	55.98	0.0	159.3	156.7
51	479.6	83.25	56.87	0.0	170.7	161.7
52	489.8	82.90	57.76	0.0	182.5	166.8
53	500.0	82.54	58.65	0.0	194.6	172.0
54	504.9	85.35	29.32	0.0	52.04	42.99
55	509.7	88.15	0.0	0.0	-183.1E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.1000	0.0	7.183	10.78	15.54	0.1980
2	0.1000	0.0	14.50	1.595	2.251	0.01414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.48	173.7	173.5	30.62
5	3.000	0.0	16.37	183.7	183.4	30.62
6	3.000	0.0	17.26	193.7	193.4	30.62
7	3.000	0.0	18.15	203.7	203.4	30.62
8	3.000	0.0	19.04	213.7	213.4	30.62
9	3.000	0.0	19.93	223.7	223.4	30.62
10	3.000	0.0	20.82	233.6	233.4	30.62
11	3.000	0.0	21.71	243.6	243.4	30.62
12	3.000	0.0	22.60	253.6	253.4	30.62
13	3.000	0.0	23.49	263.6	263.4	30.62
14	3.000	0.0	24.38	273.6	273.4	30.62
15	3.000	0.0	25.27	283.6	283.4	30.62
16	3.000	0.0	26.16	293.6	293.4	30.62
17	3.000	0.0	27.05	303.6	303.4	30.62
18	3.000	0.0	27.94	313.6	313.4	30.62
19	3.000	0.0	28.83	323.5	323.4	30.62
20	3.000	0.0	29.72	333.5	333.4	30.62
21	3.000	0.0	30.61	343.5	343.4	30.62
22	3.000	0.0	31.50	353.5	353.3	30.62
23	3.000	0.0	32.39	363.5	363.3	30.62
24	3.000	0.0	33.28	373.5	373.3	30.62

25	3.000	0.0	34.17	383.5	383.3	30.62
26	3.000	0.0	35.06	393.5	393.3	30.62
27	3.000	0.0	35.95	403.4	403.3	30.62
28	3.000	0.0	36.84	413.4	413.3	30.62
29	3.000	0.0	37.73	423.4	423.3	30.62
30	3.000	0.0	38.62	433.4	433.3	30.62
31	3.000	0.0	39.51	443.4	443.3	30.62
32	3.000	0.0	40.40	453.4	453.3	30.62
33	3.000	0.0	41.29	463.4	463.3	30.62
34	3.000	0.0	42.18	473.4	473.3	30.62
35	3.000	0.0	43.07	483.4	483.3	30.62
36	3.000	0.0	43.96	493.3	493.3	30.62
37	3.000	0.0	44.85	503.3	503.3	30.62
38	3.000	0.0	45.74	513.3	513.3	30.62
39	3.000	0.0	46.63	523.3	523.2	30.62
40	3.000	0.0	47.52	533.3	533.2	30.62
41	3.000	0.0	48.41	543.3	543.2	30.62
42	3.000	0.0	49.30	553.3	553.2	30.62
43	3.000	0.0	50.19	563.3	563.2	30.62
44	3.000	0.0	51.08	573.2	573.2	30.62
45	3.000	0.0	51.97	583.2	583.2	30.62
46	3.000	0.0	52.86	593.2	593.2	30.62
47	3.000	0.0	53.75	603.2	603.2	30.62
48	3.000	0.0	54.64	613.2	613.2	30.62
49	3.000	0.0	55.53	623.2	623.2	30.62
50	3.000	0.0	56.42	633.2	633.2	30.62
51	3.000	0.0	57.31	643.2	643.2	30.62
52	3.000	0.0	58.20	653.1	653.2	30.62
53	3.000	0.0	43.98	235.1	274.9	16.83
54	3.000	0.0	14.66	78.38	93.90	16.83

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
	114662	F95	

Oasys

Corrib
Peat stability - 500m slip length - 30deg wedge

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB3.sld	CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	x --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	509.7
1	1	102.0	101.5	.	101.5	101.5	.	88.15
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.15
Slip	-	.	101.5	.	100.0	.	82.54	88.15

Stratum	Material	x --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
489.7	9118.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (489.7,9118.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -183.1E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20590.
Disturbing moment [kN m]: 539.2
Restoring moment [kN m]: 1550.
Factor of Safety: 2.874

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.114	9.800
3	0.0	100.0	15.00	0.0	9.500	11.25
4	0.1000	100.0	15.03	0.0	9.453	11.30
5	10.30	99.64	15.92	0.0	4.858	12.68
6	20.50	99.28	16.81	0.0	0.6122	14.14
7	30.71	98.93	17.71	0.0	-3.285	15.67
8	40.91	98.57	18.60	0.0	-6.834	17.29

9	51.11	98.22	19.49	0.0	-10.03	18.98
10	61.31	97.86	20.38	0.0	-12.88	20.76
11	71.51	97.50	21.27	0.0	-15.39	22.61
12	81.72	97.15	22.16	0.0	-17.54	24.54
13	91.92	96.79	23.05	0.0	-19.34	26.55
14	102.1	96.43	23.94	0.0	-20.80	28.64
15	112.3	96.08	24.83	0.0	-21.91	30.81
16	122.5	95.72	25.72	0.0	-22.66	33.06
17	132.7	95.37	26.61	0.0	-23.07	35.39
18	142.9	95.01	27.50	0.0	-23.14	37.80
19	153.1	94.65	28.39	0.0	-22.85	40.29
20	163.3	94.30	29.28	0.0	-22.21	42.85
21	173.5	93.94	30.17	0.0	-21.22	45.50
22	183.7	93.58	31.06	0.0	-19.89	48.22
23	193.9	93.23	31.95	0.0	-18.21	51.03
24	204.1	92.87	32.84	0.0	-16.17	53.91
25	214.3	92.52	33.73	0.0	-13.79	56.87
26	224.5	92.16	34.62	0.0	-11.06	59.91
27	234.7	91.80	35.51	0.0	-7.985	63.03
28	244.9	91.45	36.40	0.0	-4.558	66.23
29	255.2	91.09	37.29	0.0	-0.7821	69.51
30	265.4	90.73	38.18	0.0	3.343	72.87
31	275.6	90.38	39.07	0.0	7.816	76.31
32	285.8	90.02	39.96	0.0	12.64	79.82
33	296.0	89.67	40.85	0.0	17.81	83.42
34	306.2	89.31	41.74	0.0	23.33	87.09
35	316.4	88.95	42.63	0.0	29.20	90.85
36	326.6	88.60	43.52	0.0	35.42	94.68
37	336.8	88.24	44.41	0.0	41.98	98.59
38	347.0	87.88	45.30	0.0	48.90	102.6
39	357.2	87.53	46.19	0.0	56.16	106.7
40	367.4	87.17	47.08	0.0	63.77	110.8
41	377.6	86.82	47.97	0.0	71.74	115.0
42	387.8	86.46	48.86	0.0	80.05	119.3
43	398.0	86.10	49.75	0.0	88.70	123.7
44	408.2	85.75	50.64	0.0	97.71	128.2
45	418.4	85.39	51.53	0.0	107.1	132.7
46	428.6	85.03	52.42	0.0	116.8	137.4
47	438.8	84.68	53.31	0.0	126.8	142.1
48	449.0	84.32	54.20	0.0	137.2	146.9
49	459.2	83.97	55.09	0.0	148.0	151.7
50	469.4	83.61	55.98	0.0	159.1	156.7
51	479.6	83.25	56.87	0.0	170.5	161.7
52	489.8	82.90	57.76	0.0	182.3	166.8
53	500.0	82.54	58.65	0.0	194.5	172.0
54	504.9	85.35	29.32	0.0	52.00	42.99
55	509.7	88.15	0.0	0.0	-183.1E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.183	10.78	13.54	5.940
2	3.000	0.0	14.50	1.595	2.108	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.48	173.7	173.5	30.62
5	3.000	0.0	16.37	183.7	183.4	30.62
6	3.000	0.0	17.26	193.7	193.4	30.62
7	3.000	0.0	18.15	203.7	203.4	30.62
8	3.000	0.0	19.04	213.7	213.4	30.62
9	3.000	0.0	19.93	223.7	223.4	30.62
10	3.000	0.0	20.82	233.6	233.4	30.62
11	3.000	0.0	21.71	243.6	243.4	30.62
12	3.000	0.0	22.60	253.6	253.4	30.62
13	3.000	0.0	23.49	263.6	263.4	30.62
14	3.000	0.0	24.38	273.6	273.4	30.62
15	3.000	0.0	25.27	283.6	283.4	30.62
16	3.000	0.0	26.16	293.6	293.4	30.62
17	3.000	0.0	27.05	303.6	303.4	30.62
18	3.000	0.0	27.94	313.6	313.4	30.62
19	3.000	0.0	28.83	323.5	323.4	30.62
20	3.000	0.0	29.72	333.5	333.4	30.62
21	3.000	0.0	30.61	343.5	343.4	30.62
22	3.000	0.0	31.50	353.5	353.3	30.62
23	3.000	0.0	32.39	363.5	363.3	30.62
24	3.000	0.0	33.28	373.5	373.3	30.62

25	3.000	0.0	34.17	383.5	383.3	30.62
26	3.000	0.0	35.06	393.5	393.3	30.62
27	3.000	0.0	35.95	403.4	403.3	30.62
28	3.000	0.0	36.84	413.4	413.3	30.62
29	3.000	0.0	37.73	423.4	423.3	30.62
30	3.000	0.0	38.62	433.4	433.3	30.62
31	3.000	0.0	39.51	443.4	443.3	30.62
32	3.000	0.0	40.40	453.4	453.3	30.62
33	3.000	0.0	41.29	463.4	463.3	30.62
34	3.000	0.0	42.18	473.4	473.3	30.62
35	3.000	0.0	43.07	483.4	483.3	30.62
36	3.000	0.0	43.96	493.3	493.3	30.62
37	3.000	0.0	44.85	503.3	503.3	30.62
38	3.000	0.0	45.74	513.3	513.3	30.62
39	3.000	0.0	46.63	523.3	523.3	30.62
40	3.000	0.0	47.52	533.3	533.2	30.62
41	3.000	0.0	48.41	543.3	543.2	30.62
42	3.000	0.0	49.30	553.3	553.2	30.62
43	3.000	0.0	50.19	563.3	563.2	30.62
44	3.000	0.0	51.08	573.2	573.2	30.62
45	3.000	0.0	51.97	583.2	583.2	30.62
46	3.000	0.0	52.86	593.2	593.2	30.62
47	3.000	0.0	53.75	603.2	603.2	30.62
48	3.000	0.0	54.64	613.2	613.2	30.62
49	3.000	0.0	55.53	623.2	623.2	30.62
50	3.000	0.0	56.42	633.2	633.2	30.62
51	3.000	0.0	57.31	643.2	643.2	30.62
52	3.000	0.0	58.20	653.1	653.2	30.62
53	3.000	0.0	43.98	235.1	274.9	16.83
54	3.000	0.0	14.66	78.38	93.88	16.83

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662   Sheet 1/1   F98

Made by: CH   Chkd: CU
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = 500 m
Passive wedge angle θ = 40 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

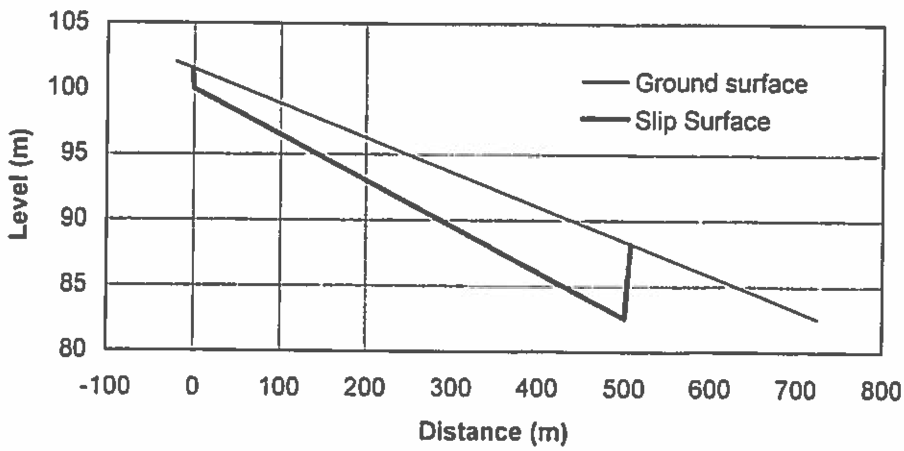
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				506.7809	88.22947

L*	224.0679	
L2	6.780911	
θ	40	Set angle
x4	506.7809	Intersection of slip surface with
y4	88.22947	ground surface

γ	45
x1	-1.5
y1	101.5



Oasys

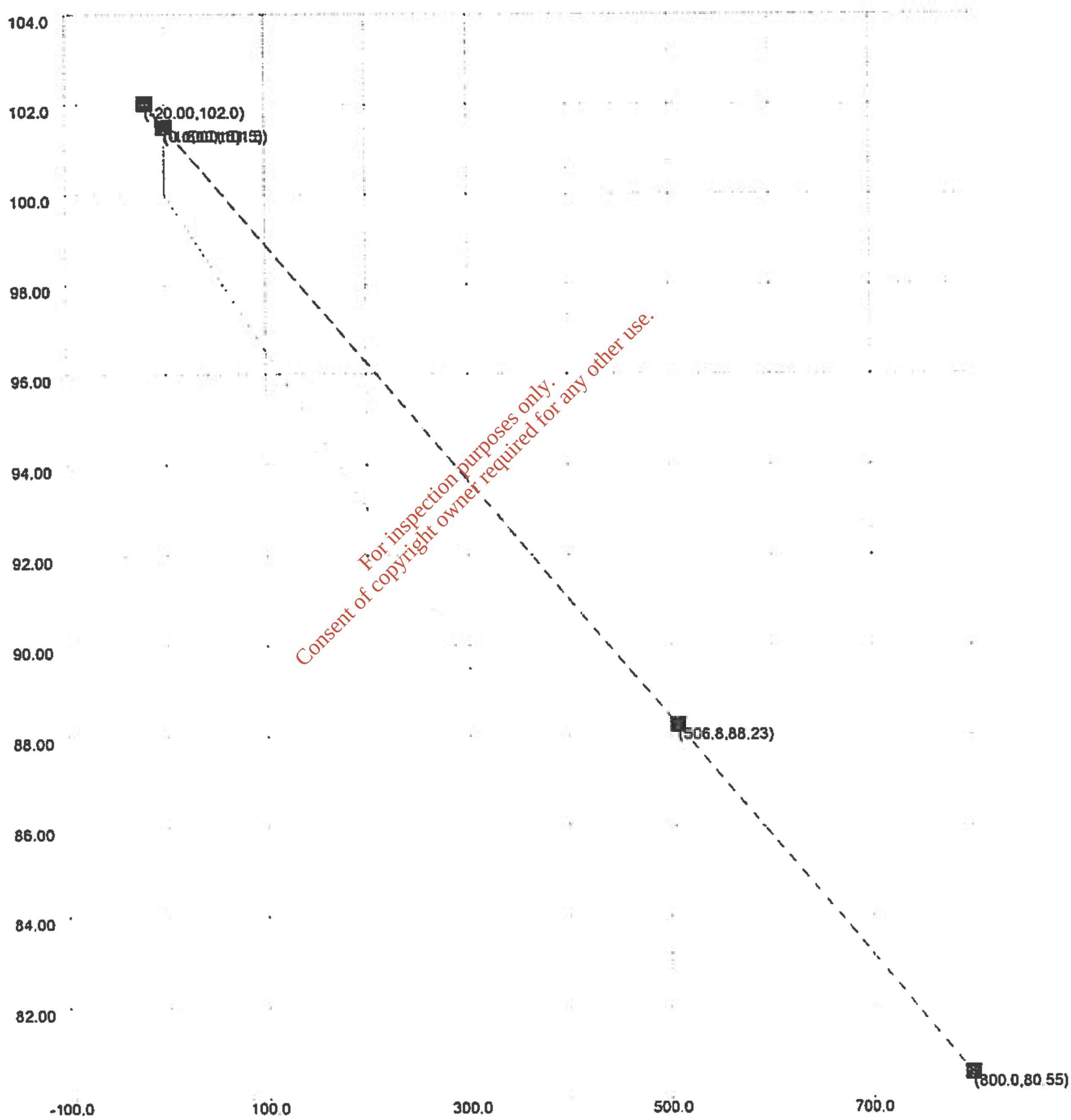
Corrib

Peat stability - 500m slip length - 40deg wedge

Job No.	Sheet No.	Rev.
114662	F99	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB4.sld	CH



Scale x 1:6374 y 1:141

Oasys	Job No.	Sheet No.	Rev.
Corrib **Peat stability - 500m slip length - 40deg wedge**	114662	F100	
	Drg. Ref.		
	Made by: CH	Date: 05-Dec-2003	Data: Corrib DB4.sld — Checked: CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	506.8
1	1	102.0	101.5	.	101.5	101.5	.	88.23
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.23
Slip	-	.	101.5		100.0	.	82.54	88.23

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
487.9	9107.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (487.9,9107.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -61.04E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20500.
Disturbing moment [kN m]: 536.8
Restoring moment [kN m]: 1545.
Factor of Safety: 2.879

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.119	9.800
3	0.0	100.0	15.00	0.0	9.505	11.25
4	0.1000	100.0	15.03	0.0	9.459	11.30
5	10.10	99.65	15.91	0.0	4.970	12.65
6	20.10	99.30	16.78	0.0	0.8174	14.08
7	30.09	98.95	17.65	0.0	-3.000	15.58
8	40.09	98.60	18.53	0.0	-6.483	17.16

9	50.09	98.25	19.40	0.0	-9.630	18.82
10	60.09	97.90	20.27	0.0	-12.44	20.55
11	70.09	97.55	21.14	0.0	-14.92	22.35
12	80.08	97.20	22.02	0.0	-17.06	24.24
13	90.08	96.85	22.89	0.0	-18.87	26.20
14	100.1	96.51	23.76	0.0	-20.34	28.23
15	110.1	96.16	24.64	0.0	-21.48	30.35
16	120.1	95.81	25.51	0.0	-22.28	32.53
17	130.1	95.46	26.38	0.0	-22.74	34.80
18	140.1	95.11	27.25	0.0	-22.87	37.14
19	150.1	94.76	28.13	0.0	-22.67	39.56
20	160.1	94.41	29.00	0.0	-22.13	42.05
21	170.1	94.06	29.87	0.0	-21.25	44.62
22	180.1	93.71	30.75	0.0	-20.04	47.26
23	190.1	93.36	31.62	0.0	-18.50	49.99
24	200.1	93.01	32.49	0.0	-16.62	52.78
25	210.1	92.66	33.36	0.0	-14.40	55.66
26	220.1	92.32	34.24	0.0	-11.85	58.61
27	230.1	91.97	35.11	0.0	-8.965	61.63
28	240.1	91.62	35.98	0.0	-5.744	64.74
29	250.1	91.27	36.86	0.0	-2.187	67.92
30	260.0	90.92	37.73	0.0	1.704	71.17
31	270.0	90.57	38.60	0.0	5.931	74.50
32	280.0	90.22	39.47	0.0	10.49	77.91
33	290.0	89.87	40.35	0.0	15.39	81.39
34	300.0	89.52	41.22	0.0	20.62	84.95
35	310.0	89.17	42.09	0.0	26.19	88.59
36	320.0	88.82	42.97	0.0	32.09	92.30
37	330.0	88.48	43.84	0.0	38.33	96.09
38	340.0	88.13	44.71	0.0	44.91	99.95
39	350.0	87.78	45.58	0.0	51.81	103.9
40	360.0	87.43	46.46	0.0	59.06	107.9
41	370.0	87.08	47.33	0.0	66.64	112.0
42	380.0	86.73	48.20	0.0	74.55	116.2
43	390.0	86.38	49.07	0.0	82.80	120.4
44	400.0	86.03	49.95	0.0	91.38	124.7
45	410.0	85.68	50.82	0.0	100.3	129.1
46	420.0	85.33	51.69	0.0	109.6	133.6
47	430.0	84.98	52.57	0.0	119.1	138.2
48	440.0	84.63	53.44	0.0	129.1	142.8
49	450.0	84.29	54.31	0.0	139.3	147.5
50	460.0	83.94	55.18	0.0	149.9	152.3
51	470.0	83.59	56.06	0.0	160.9	157.1
52	480.0	83.24	56.93	0.0	172.1	162.1
53	490.0	82.89	57.80	0.0	183.7	167.1
54	500.0	82.54	58.68	0.0	195.7	172.1
55	506.8	88.23	0.0	0.0	-61.04E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.183	10.78	13.54	5.940
2	3.000	0.0	14.50	1.595	2.108	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.47	170.2	169.9	30.01
5	3.000	0.0	16.34	179.7	179.5	30.01
6	3.000	0.0	17.22	189.3	189.1	30.01
7	3.000	0.0	18.09	198.9	198.7	30.01
8	3.000	0.0	18.96	208.5	208.3	30.01
9	3.000	0.0	19.84	218.1	217.9	30.01
10	3.000	0.0	20.71	227.7	227.5	30.01
11	3.000	0.0	21.58	237.3	237.1	30.01
12	3.000	0.0	22.45	246.9	246.7	30.01
13	3.000	0.0	23.33	256.5	256.3	30.01
14	3.000	0.0	24.20	266.1	265.9	30.01
15	3.000	0.0	25.07	275.7	275.5	30.01
16	3.000	0.0	25.95	285.3	285.1	30.01
17	3.000	0.0	26.82	294.9	294.8	30.01
18	3.000	0.0	27.69	304.5	304.4	30.01
19	3.000	0.0	28.56	314.1	314.0	30.01
20	3.000	0.0	29.44	323.7	323.6	30.01
21	3.000	0.0	30.31	333.3	333.2	30.01
22	3.000	0.0	31.18	342.9	342.8	30.01
23	3.000	0.0	32.05	352.5	352.4	30.01
24	3.000	0.0	32.93	362.1	362.0	30.01

25	3.000	0.0	33.80	371.7	371.6	30.01
26	3.000	0.0	34.67	381.3	381.2	30.01
27	3.000	0.0	35.55	390.9	390.8	30.01
28	3.000	0.0	36.42	400.5	400.4	30.01
29	3.000	0.0	37.29	410.1	410.0	30.01
30	3.000	0.0	38.16	419.7	419.6	30.01
31	3.000	0.0	39.04	429.3	429.2	30.01
32	3.000	0.0	39.91	438.9	438.8	30.01
33	3.000	0.0	40.78	448.5	448.4	30.01
34	3.000	0.0	41.66	458.1	458.0	30.01
35	3.000	0.0	42.53	467.7	467.6	30.01
36	3.000	0.0	43.40	477.3	477.2	30.01
37	3.000	0.0	44.27	486.9	486.9	30.01
38	3.000	0.0	45.15	496.5	496.5	30.01
39	3.000	0.0	46.02	506.1	506.1	30.01
40	3.000	0.0	46.89	515.7	515.7	30.01
41	3.000	0.0	47.77	525.3	525.3	30.01
42	3.000	0.0	48.64	534.9	534.9	30.01
43	3.000	0.0	49.51	544.5	544.5	30.01
44	3.000	0.0	50.38	554.1	554.1	30.01
45	3.000	0.0	51.26	563.7	563.7	30.01
46	3.000	0.0	52.13	573.3	573.3	30.01
47	3.000	0.0	53.00	582.9	582.9	30.01
48	3.000	0.0	53.88	592.5	592.5	30.01
49	3.000	0.0	54.75	602.1	602.1	30.01
50	3.000	0.0	55.62	611.7	611.7	30.01
51	3.000	0.0	56.49	621.3	621.3	30.01
52	3.000	0.0	57.37	630.9	630.9	30.01
53	3.000	0.0	58.24	640.5	640.5	30.01
54	3.000	0.0	29.34	218.8	293.9	26.55

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys

Corrib
Peat stability - 500m slip length - 40deg wedge

Job No.	Sheet No.	Rev.
114662	F103	

Drg. Ref.			
Made by CH	Date 05-Dec-2003	Data Corrib DA4.sld	Checked CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	506.8
1	1	102.0	101.5	.	101.5	101.5	.	88.23
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.23
Slip	-	.	101.5		100.0	.	82.54	88.23

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
487.9	9107.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (487.9,9107.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -45.78E-6
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20500.
Disturbing moment [kN m]: 536.8
Restoring moment [kN m]: 1537.
Factor of Safety: 2.863

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.94	9.800
3	0.0	100.0	15.00	0.0	12.53	11.25
4	0.1000	100.0	15.03	0.0	12.48	11.30
5	10.10	99.65	15.91	0.0	7.932	12.65
6	20.10	99.30	16.78	0.0	3.720	14.08
7	30.09	98.95	17.65	0.0	-0.1571	15.58
8	40.09	98.60	18.53	0.0	-3.699	17.16

Oasys

Corrib
Peat stability - 500m slip length - 40deg wedge

Job No.	Sheet No.	Rev.
114662	F104	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DA4.sld	CH

9	50.09	98.25	19.40	0.0	-6.905	18.82
10	60.09	97.90	20.27	0.0	-9.777	20.55
11	70.09	97.55	21.14	0.0	-12.31	22.35
12	80.08	97.20	22.02	0.0	-14.51	24.24
13	90.08	96.85	22.89	0.0	-16.38	26.20
14	100.1	96.51	23.76	0.0	-17.91	28.23
15	110.1	96.16	24.64	0.0	-19.11	30.35
16	120.1	95.81	25.51	0.0	-19.97	32.53
17	130.1	95.46	26.38	0.0	-20.49	34.80
18	140.1	95.11	27.25	0.0	-20.68	37.14
19	150.1	94.76	28.13	0.0	-20.53	39.56
20	160.1	94.41	29.00	0.0	-20.05	42.05
21	170.1	94.06	29.87	0.0	-19.24	44.62
22	180.1	93.71	30.75	0.0	-18.09	47.26
23	190.1	93.36	31.62	0.0	-16.60	49.99
24	200.1	93.01	32.49	0.0	-14.78	52.78
25	210.1	92.66	33.36	0.0	-12.62	55.66
26	220.1	92.32	34.24	0.0	-10.13	58.61
27	230.1	91.97	35.11	0.0	-7.303	61.63
28	240.1	91.62	35.98	0.0	-4.141	64.74
29	250.1	91.27	36.86	0.0	-0.6431	67.92
30	260.0	90.92	37.73	0.0	3.190	71.17
31	270.0	90.57	38.60	0.0	7.357	74.50
32	280.0	90.22	39.47	0.0	11.86	77.91
33	290.0	89.87	40.35	0.0	16.70	81.39
34	300.0	89.52	41.22	0.0	21.87	84.95
35	310.0	89.17	42.09	0.0	27.38	88.59
36	320.0	88.82	42.97	0.0	33.22	92.30
37	330.0	88.48	43.84	0.0	39.40	96.09
38	340.0	88.13	44.71	0.0	45.92	99.95
39	350.0	87.78	45.58	0.0	52.77	103.9
40	360.0	87.43	46.46	0.0	59.95	107.9
41	370.0	87.08	47.33	0.0	67.47	112.0
42	380.0	86.73	48.20	0.0	75.33	116.2
43	390.0	86.38	49.07	0.0	83.52	120.4
44	400.0	86.03	49.95	0.0	92.04	124.7
45	410.0	85.68	50.82	0.0	100.9	129.1
46	420.0	85.33	51.69	0.0	110.1	133.6
47	430.0	84.98	52.57	0.0	119.6	138.2
48	440.0	84.63	53.44	0.0	129.5	142.8
49	450.0	84.29	54.31	0.0	139.7	147.5
50	460.0	83.94	55.18	0.0	150.2	152.3
51	470.0	83.59	56.06	0.0	161.1	157.1
52	480.0	83.24	56.93	0.0	172.3	162.1
53	490.0	82.89	57.80	0.0	183.9	167.1
54	500.0	82.54	58.68	0.0	195.7	172.1
55	506.8	88.23	0.0	0.0	-45.78E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.1000	0.0	7.183	10.78	15.54	0.1980
2	0.1000	0.0	14.50	1.595	2.251	0.01414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.47	170.2	169.9	30.01
5	3.000	0.0	16.34	179.7	179.5	30.01
6	3.000	0.0	17.22	189.3	189.1	30.01
7	3.000	0.0	18.09	198.9	198.7	30.01
8	3.000	0.0	18.96	208.5	208.3	30.01
9	3.000	0.0	19.84	218.1	217.9	30.01
10	3.000	0.0	20.71	227.7	227.5	30.01
11	3.000	0.0	21.58	237.3	237.1	30.01
12	3.000	0.0	22.45	246.9	246.7	30.01
13	3.000	0.0	23.33	256.5	256.3	30.01
14	3.000	0.0	24.20	266.1	265.9	30.01
15	3.000	0.0	25.07	275.7	275.5	30.01
16	3.000	0.0	25.95	285.3	285.1	30.01
17	3.000	0.0	26.82	294.9	294.8	30.01
18	3.000	0.0	27.69	304.5	304.4	30.01
19	3.000	0.0	28.56	314.1	314.0	30.01
20	3.000	0.0	29.44	323.7	323.6	30.01
21	3.000	0.0	30.31	333.3	333.2	30.01
22	3.000	0.0	31.18	342.9	342.8	30.01
23	3.000	0.0	32.05	352.5	352.4	30.01
24	3.000	0.0	32.93	362.1	362.0	30.01

25	3.000	0.0	33.80	371.7	371.6	30.01
26	3.000	0.0	34.67	381.3	381.2	30.01
27	3.000	0.0	35.55	390.9	390.8	30.01
28	3.000	0.0	36.42	400.5	400.4	30.01
29	3.000	0.0	37.29	410.1	410.0	30.01
30	3.000	0.0	38.16	419.7	419.6	30.01
31	3.000	0.0	39.04	429.3	429.2	30.01
32	3.000	0.0	39.91	438.9	438.8	30.01
33	3.000	0.0	40.78	448.5	448.4	30.01
34	3.000	0.0	41.66	458.1	458.0	30.01
35	3.000	0.0	42.53	467.7	467.6	30.01
36	3.000	0.0	43.40	477.3	477.2	30.01
37	3.000	0.0	44.27	486.9	486.9	30.01
38	3.000	0.0	45.15	496.5	496.5	30.01
39	3.000	0.0	46.02	506.1	506.1	30.01
40	3.000	0.0	46.89	515.7	515.7	30.01
41	3.000	0.0	47.77	525.3	525.3	30.01
42	3.000	0.0	48.64	534.9	534.9	30.01
43	3.000	0.0	49.51	544.5	544.5	30.01
44	3.000	0.0	50.38	554.1	554.1	30.01
45	3.000	0.0	51.26	563.7	563.7	30.01
46	3.000	0.0	52.13	573.3	573.3	30.01
47	3.000	0.0	53.00	582.9	582.9	30.01
48	3.000	0.0	53.88	592.5	592.5	30.01
49	3.000	0.0	54.75	602.1	602.1	30.01
50	3.000	0.0	55.62	611.7	611.7	30.01
51	3.000	0.0	56.49	621.3	621.3	30.01
52	3.000	0.0	57.37	630.9	630.9	30.01
53	3.000	0.0	58.24	640.5	640.5	30.01
54	3.000	0.0	29.34	218.8	293.4	26.55

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F10b

Corrib Onshore Terminal
Slope geometric data

Made by: CH Chkd:...CH
Date: 30/11/2003
Rev: -,-

Slope length L = 500 m
Passive wedge angle θ = 45 degs

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

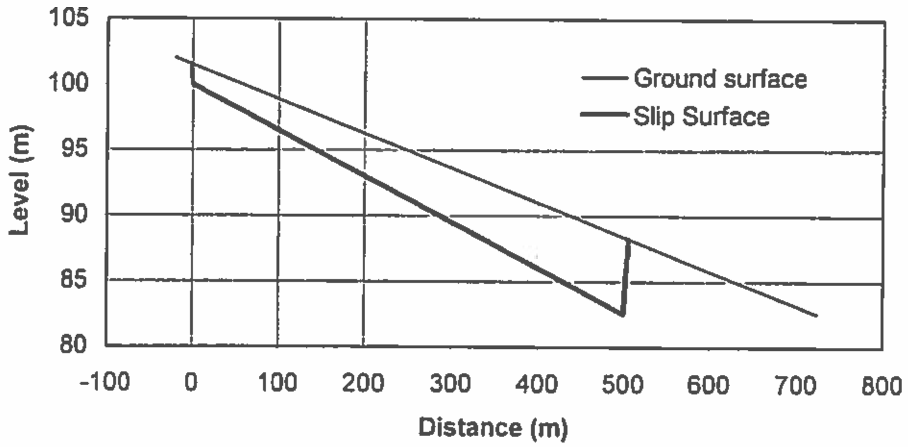
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				505.7177	88.25732

L*	224.0679	
L2	5.717701	
θ	45	Set angle
x4	505.7177	Intersection of slip surface with
y4	88.25732	ground surface

γ	45
x1	-1.5
y1	101.5



Job No.	Sheet No.	Rev.
114662	F107	

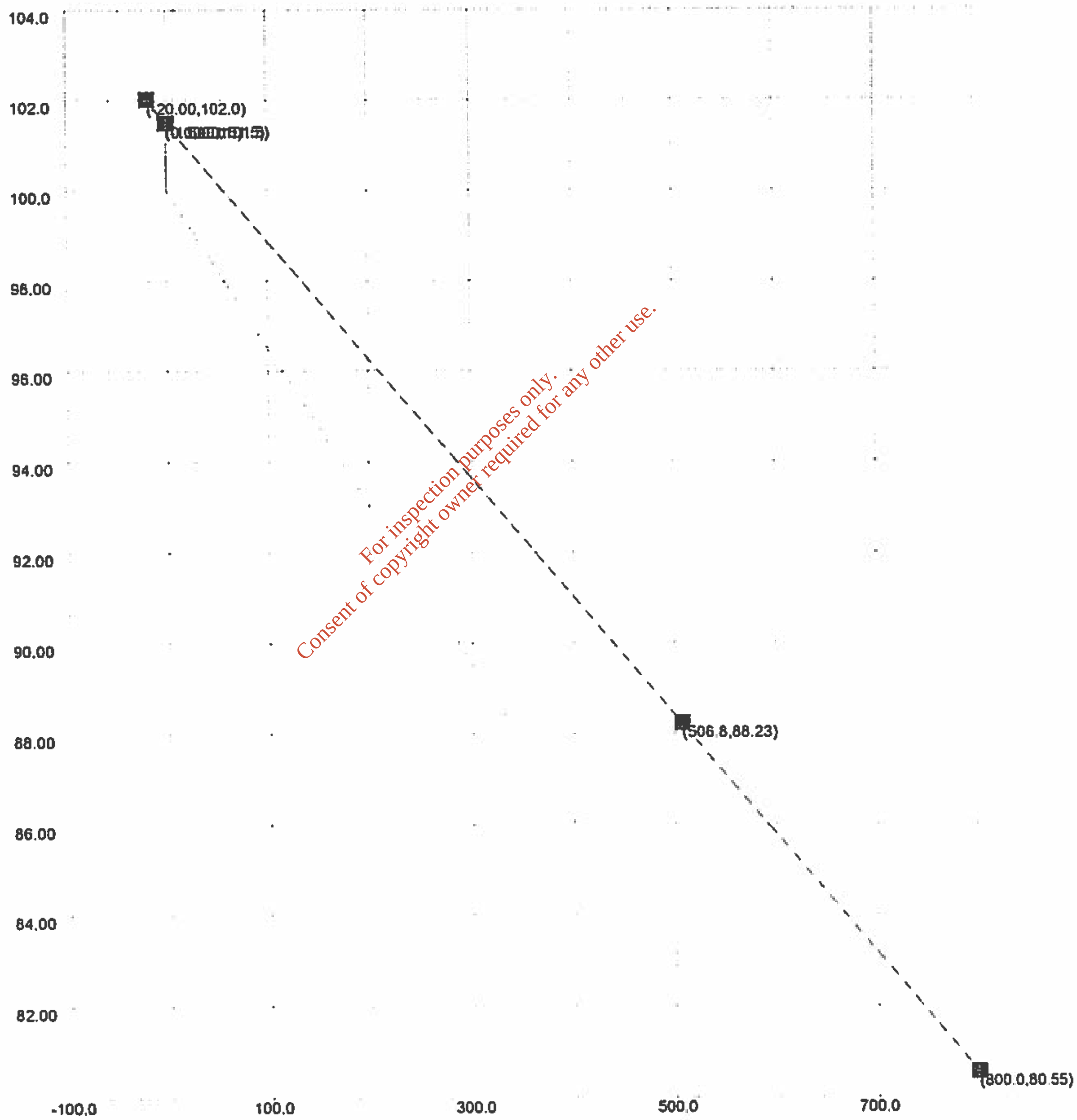
Oasys

Corrib

Peat stability - 500m slip length - 45deg wedge

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB5.sld	CH



Scale x 1:6374 y 1:141

Oasys	Job No.	Sheet No.	Rev.
Corrib Peat stability - 500m slip length - 45deg wedge	114662	F108	
	Drg. Ref.		
	Made by: CH Date: 05-Dec-2003	Data: Corrib DB5.sld	Checked: CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	505.7
1	1	102.0	101.5	.	101.5	101.5	.	88.26
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.26
Slip	-	.	101.5		100.0	.	82.54	88.26

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
486.4	9069.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (486.4,9069.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: -15.26E-6

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20470.
Disturbing moment [kN m]: 535.9
Restoring moment [kN m]: 1545.
Factor of Safety: 2.883

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.123	9.800
3	0.0	100.0	15.00	0.0	9.509	11.25
4	0.1000	100.0	15.03	0.0	9.463	11.30
5	10.10	99.65	15.91	0.0	4.988	12.65
6	20.10	99.30	16.78	0.0	0.8494	14.08
7	30.09	98.95	17.65	0.0	-2.954	15.58
8	40.09	98.60	18.53	0.0	-6.423	17.16

Oasys

Corrib
Peat stability - 500m slip length - 45deg wedge

Job No.	Sheet No.	Rev.
114662	F109	

Drg. Ref.

Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB5.sld	CH

9	50.09	98.25	19.40	0.0	-9.556	18.82
10	60.09	97.90	20.27	0.0	-12.35	20.55
11	70.09	97.55	21.15	0.0	-14.82	22.36
12	80.08	97.20	22.02	0.0	-16.94	24.25
13	90.08	96.85	22.89	0.0	-18.73	26.21
14	100.1	96.51	23.77	0.0	-20.19	28.24
15	110.1	96.16	24.64	0.0	-21.31	30.36
16	120.1	95.81	25.51	0.0	-22.10	32.55
17	130.1	95.46	26.39	0.0	-22.55	34.81
18	140.1	95.11	27.26	0.0	-22.66	37.16
19	150.1	94.76	28.13	0.0	-22.44	39.58
20	160.1	94.41	29.01	0.0	-21.88	42.07
21	170.1	94.06	29.88	0.0	-20.99	44.64
22	180.1	93.71	30.75	0.0	-19.77	47.29
23	190.1	93.36	31.63	0.0	-18.20	50.01
24	200.1	93.01	32.50	0.0	-16.31	52.81
25	210.1	92.66	33.37	0.0	-14.07	55.69
26	220.1	92.32	34.25	0.0	-11.50	58.64
27	230.1	91.97	35.12	0.0	-8.601	61.67
28	240.1	91.62	35.99	0.0	-5.362	64.78
29	250.1	91.27	36.87	0.0	-1.787	67.96
30	260.0	90.92	37.74	0.0	2.122	71.21
31	270.0	90.57	38.61	0.0	6.367	74.55
32	280.0	90.22	39.49	0.0	10.95	77.96
33	290.0	89.87	40.36	0.0	15.86	81.44
34	300.0	89.52	41.23	0.0	21.11	85.01
35	310.0	89.17	42.11	0.0	26.70	88.65
36	320.0	88.82	42.98	0.0	32.62	92.36
37	330.0	88.48	43.85	0.0	38.88	96.15
38	340.0	88.13	44.73	0.0	45.47	100.0
39	350.0	87.78	45.60	0.0	52.40	104.0
40	360.0	87.43	46.47	0.0	59.67	108.0
41	370.0	87.08	47.35	0.0	67.26	112.1
42	380.0	86.73	48.22	0.0	75.20	116.3
43	390.0	86.38	49.09	0.0	83.47	120.5
44	400.0	86.03	49.97	0.0	92.07	124.8
45	410.0	85.68	50.84	0.0	101.0	129.2
46	420.0	85.33	51.71	0.0	110.3	133.7
47	430.0	84.98	52.59	0.0	119.9	138.3
48	440.0	84.63	53.46	0.0	129.8	142.9
49	450.0	84.29	54.33	0.0	140.1	147.6
50	460.0	83.94	55.20	0.0	150.7	152.4
51	470.0	83.59	56.08	0.0	161.7	157.2
52	480.0	83.24	56.95	0.0	173.0	162.2
53	490.0	82.89	57.82	0.0	184.6	167.2
54	500.0	82.54	58.70	0.0	196.6	172.3
55	505.7	88.26	0.0	0.0	-15.26E-6	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	3.000	0.0	7.183	10.78	13.55	5.940
2	3.000	0.0	14.50	1.595	2.109	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.47	170.2	169.9	30.01
5	3.000	0.0	16.34	179.8	179.5	30.01
6	3.000	0.0	17.22	189.4	189.1	30.01
7	3.000	0.0	18.09	199.0	198.7	30.01
8	3.000	0.0	18.96	208.6	208.3	30.01
9	3.000	0.0	19.84	218.2	217.9	30.01
10	3.000	0.0	20.71	227.8	227.6	30.01
11	3.000	0.0	21.58	237.4	237.2	30.01
12	3.000	0.0	22.46	247.0	246.8	30.01
13	3.000	0.0	23.33	256.6	256.4	30.01
14	3.000	0.0	24.20	266.2	266.0	30.01
15	3.000	0.0	25.08	275.8	275.6	30.01
16	3.000	0.0	25.95	285.4	285.2	30.01
17	3.000	0.0	26.82	295.0	294.8	30.01
18	3.000	0.0	27.70	304.6	304.4	30.01
19	3.000	0.0	28.57	314.2	314.0	30.01
20	3.000	0.0	29.44	323.8	323.6	30.01
21	3.000	0.0	30.32	333.4	333.3	30.01
22	3.000	0.0	31.19	343.0	342.9	30.01
23	3.000	0.0	32.06	352.6	352.5	30.01
24	3.000	0.0	32.94	362.2	362.1	30.01

25	3.000	0.0	33.81	371.8	371.7	30.01
26	3.000	0.0	34.68	381.4	381.3	30.01
27	3.000	0.0	35.56	391.0	390.9	30.01
28	3.000	0.0	36.43	400.6	400.5	30.01
29	3.000	0.0	37.30	410.3	410.1	30.01
30	3.000	0.0	38.18	419.9	419.7	30.01
31	3.000	0.0	39.05	429.5	429.4	30.01
32	3.000	0.0	39.92	439.1	439.0	30.01
33	3.000	0.0	40.80	448.7	448.6	30.01
34	3.000	0.0	41.67	458.3	458.2	30.01
35	3.000	0.0	42.54	467.9	467.8	30.01
36	3.000	0.0	43.42	477.5	477.4	30.01
37	3.000	0.0	44.29	487.1	487.0	30.01
38	3.000	0.0	45.16	496.7	496.6	30.01
39	3.000	0.0	46.04	506.3	506.2	30.01
40	3.000	0.0	46.91	515.9	515.8	30.01
41	3.000	0.0	47.78	525.5	525.5	30.01
42	3.000	0.0	48.66	535.1	535.1	30.01
43	3.000	0.0	49.53	544.7	544.7	30.01
44	3.000	0.0	50.40	554.3	554.3	30.01
45	3.000	0.0	51.28	563.9	563.9	30.01
46	3.000	0.0	52.15	573.5	573.5	30.01
47	3.000	0.0	53.02	583.1	583.1	30.01
48	3.000	0.0	53.89	592.7	592.7	30.01
49	3.000	0.0	54.77	602.3	602.3	30.01
50	3.000	0.0	55.64	611.9	611.9	30.01
51	3.000	0.0	56.51	621.5	621.6	30.01
52	3.000	0.0	57.39	631.1	631.2	30.01
53	3.000	0.0	58.26	640.7	640.8	30.01
54	3.000	0.0	29.35	184.7	269.6	24.27

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Oasys	Job No.	Sheet No.	Rev.
	114662	F111	
	Drg. Ref.		
	Made by CH	Date 05-Dec-2003	Data Corrib DA5.sld	Checked CH

Corrib
Peat stability - 500m slip length - 45deg wedge

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	505.7
1	1	102.0	101.5	.	101.5	101.5	.	88.26
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.26
Slip	-	.	101.5		100.0	.	82.54	88.26

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
486.4	9069.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (486.4,9069.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 0.0

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20470.
Disturbing moment [kN m]: 535.9
Restoring moment [kN m]: 1536.
Factor of Safety: 2.867

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.94	9.800
3	0.0	100.0	15.00	0.0	12.53	11.25
4	0.1000	100.0	15.03	0.0	12.48	11.30
5	10.10	99.65	15.91	0.0	7.946	12.65
6	20.10	99.30	16.78	0.0	3.748	14.08
7	30.09	98.95	17.65	0.0	-0.1147	15.58
8	40.09	98.60	18.53	0.0	-3.642	17.16

9	50.09	98.25	19.40	0.0	-6.834	18.82
10	60.09	97.90	20.27	0.0	-9.691	20.55
11	70.09	97.55	21.15	0.0	-12.21	22.36
12	80.08	97.20	22.02	0.0	-14.40	24.25
13	90.08	96.85	22.89	0.0	-16.25	26.21
14	100.1	96.51	23.77	0.0	-17.76	28.24
15	110.1	96.16	24.64	0.0	-18.94	30.36
16	120.1	95.81	25.51	0.0	-19.79	32.55
17	130.1	95.46	26.39	0.0	-20.30	34.81
18	140.1	95.11	27.26	0.0	-20.47	37.16
19	150.1	94.76	28.13	0.0	-20.31	39.58
20	160.1	94.41	29.01	0.0	-19.81	42.07
21	170.1	94.06	29.88	0.0	-18.98	44.64
22	180.1	93.71	30.75	0.0	-17.81	47.29
23	190.1	93.36	31.63	0.0	-16.31	50.01
24	200.1	93.01	32.50	0.0	-14.47	52.81
25	210.1	92.66	33.37	0.0	-12.30	55.69
26	220.1	92.32	34.25	0.0	-9.786	58.64
27	230.1	91.97	35.12	0.0	-6.941	61.67
28	240.1	91.62	35.99	0.0	-3.761	64.78
29	250.1	91.27	36.87	0.0	-0.2455	67.96
30	260.0	90.92	37.74	0.0	3.605	71.21
31	270.0	90.57	38.61	0.0	7.791	74.55
32	280.0	90.22	39.49	0.0	12.31	77.96
33	290.0	89.87	40.36	0.0	17.17	81.44
34	300.0	89.52	41.23	0.0	22.36	85.01
35	310.0	89.17	42.11	0.0	27.89	88.65
36	320.0	88.82	42.98	0.0	33.75	92.36
37	330.0	88.48	43.85	0.0	39.95	96.15
38	340.0	88.13	44.73	0.0	46.48	100.0
39	350.0	87.78	45.60	0.0	53.35	104.0
40	360.0	87.43	46.47	0.0	60.56	108.0
41	370.0	87.08	47.35	0.0	68.10	112.1
42	380.0	86.73	48.22	0.0	75.97	116.3
43	390.0	86.38	49.09	0.0	84.18	120.5
44	400.0	86.03	49.97	0.0	92.73	124.8
45	410.0	85.68	50.84	0.0	101.6	129.2
46	420.0	85.33	51.71	0.0	110.8	133.7
47	430.0	84.98	52.59	0.0	120.4	138.3
48	440.0	84.63	53.46	0.0	130.3	142.9
49	450.0	84.29	54.33	0.0	140.5	147.6
50	460.0	83.94	55.20	0.0	151.0	152.4
51	470.0	83.59	56.08	0.0	161.9	157.2
52	480.0	83.24	56.95	0.0	173.2	162.2
53	490.0	82.89	57.82	0.0	184.7	167.2
54	500.0	82.54	58.70	0.0	196.6	172.3
55	505.7	88.26	0.0	0.0	0.0	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.1000	0.0	7.183	10.78	15.54	0.1980
2	0.1000	0.0	14.50	1.595	2.251	0.01414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.47	170.2	169.9	30.01
5	3.000	0.0	16.34	179.8	179.5	30.01
6	3.000	0.0	17.22	189.4	189.1	30.01
7	3.000	0.0	18.09	199.0	198.7	30.01
8	3.000	0.0	18.96	208.6	208.3	30.01
9	3.000	0.0	19.84	218.2	217.9	30.01
10	3.000	0.0	20.71	227.8	227.5	30.01
11	3.000	0.0	21.58	237.4	237.2	30.01
12	3.000	0.0	22.46	247.0	246.8	30.01
13	3.000	0.0	23.33	256.6	256.4	30.01
14	3.000	0.0	24.20	266.2	266.0	30.01
15	3.000	0.0	25.08	275.8	275.6	30.01
16	3.000	0.0	25.95	285.4	285.2	30.01
17	3.000	0.0	26.82	295.0	294.8	30.01
18	3.000	0.0	27.70	304.6	304.4	30.01
19	3.000	0.0	28.57	314.2	314.0	30.01
20	3.000	0.0	29.44	323.8	323.6	30.01
21	3.000	0.0	30.32	333.4	333.3	30.01
22	3.000	0.0	31.19	343.0	342.9	30.01
23	3.000	0.0	32.06	352.6	352.5	30.01
24	3.000	0.0	32.94	362.2	362.1	30.01

25	3.000	0.0	33.81	371.8	371.7	30.01
26	3.000	0.0	34.68	381.4	381.3	30.01
27	3.000	0.0	35.56	391.0	390.9	30.01
28	3.000	0.0	36.43	400.6	400.5	30.01
29	3.000	0.0	37.30	410.3	410.1	30.01
30	3.000	0.0	38.18	419.9	419.7	30.01
31	3.000	0.0	39.05	429.5	429.4	30.01
32	3.000	0.0	39.92	439.1	439.0	30.01
33	3.000	0.0	40.80	448.7	448.6	30.01
34	3.000	0.0	41.67	458.3	458.2	30.01
35	3.000	0.0	42.54	467.9	467.8	30.01
36	3.000	0.0	43.42	477.5	477.4	30.01
37	3.000	0.0	44.29	487.1	487.0	30.01
38	3.000	0.0	45.16	496.7	496.6	30.01
39	3.000	0.0	46.04	506.3	506.2	30.01
40	3.000	0.0	46.91	515.9	515.8	30.01
41	3.000	0.0	47.78	525.5	525.5	30.01
42	3.000	0.0	48.66	535.1	535.1	30.01
43	3.000	0.0	49.53	544.7	544.7	30.01
44	3.000	0.0	50.40	554.3	554.3	30.01
45	3.000	0.0	51.28	563.9	563.9	30.01
46	3.000	0.0	52.15	573.5	573.5	30.01
47	3.000	0.0	53.02	583.1	583.1	30.01
48	3.000	0.0	53.89	592.7	592.7	30.01
49	3.000	0.0	54.77	602.3	602.3	30.01
50	3.000	0.0	55.64	611.9	611.9	30.01
51	3.000	0.0	56.51	621.5	621.5	30.01
52	3.000	0.0	57.39	631.1	631.2	30.01
53	3.000	0.0	58.26	640.7	640.8	30.01
54	3.000	0.0	29.35	184.7	269.6	24.27

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

ArupGeotechnics

Job No. 114662 Sheet 1/1 F114

Made by: CH Chkd:..CH
Date: 30/11/2003
Rev: -,-

Corrib Onshore Terminal
Slope geometric data

Slope length L = **500 m**
Passive wedge angle θ = **50 degs**

Ground surface	
α	1.5
y0	101.5
x0	0
x	800
y	80.55126

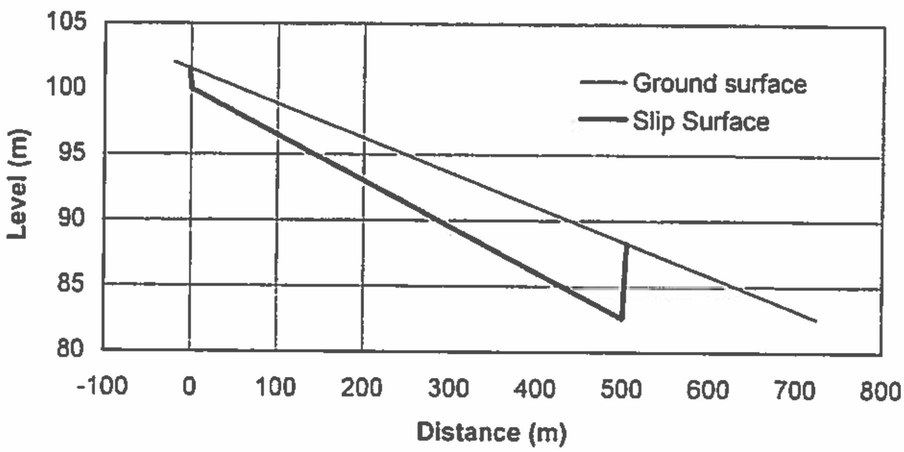
Peat surface	
β	2
y0	100
x0	0
x	500
y	82.53962

x1	0	
y1	101.5	
x2	0	
y2	100	
x3	500	Set length
y3	82.53962	
x5	724.0679	ground surface x at y=y3

Ground profile		Peat profile		Slip surface	
x	y	x	y	x	y
-20	102.0237	-20	100	-1.5	101.5
0	101.5	0	100	0	100
724.0679	82.53962	500	82.53962	500	82.53962
				504.8175	88.28089

L*	224.0679	
L2	4.8175	
θ	50	Set angle
x4	504.8175	Intersection of slip surface with
y4	88.28089	ground surface

γ	45
x1	-1.5
y1	101.5



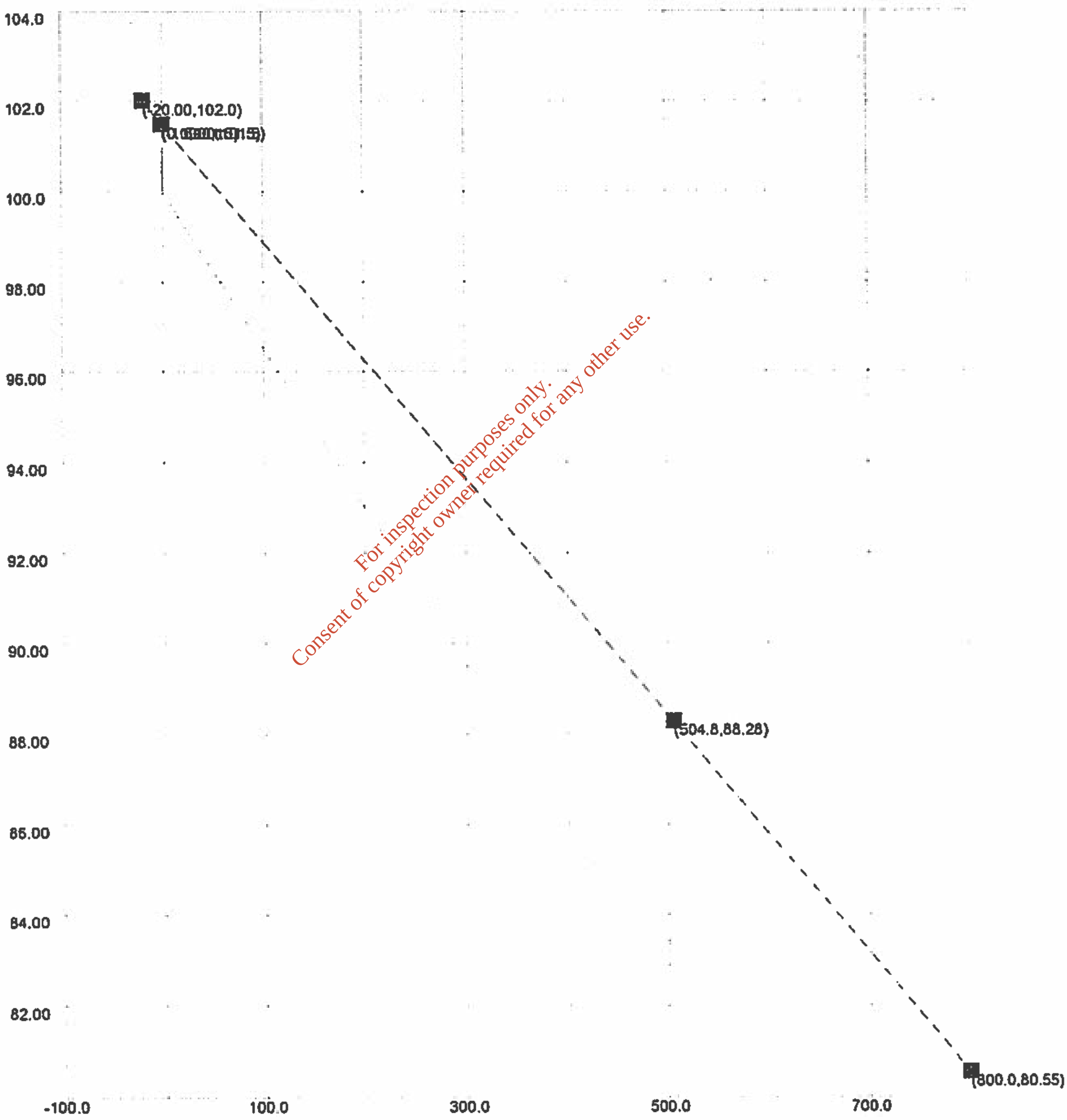
Oasys

Corrib

Peat stability - 500m slip length - 50deg wedge

Job No.	Sheet No.	Rev.
114662	F115	

Drg. Ref.			
Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DA6.sld	CH



Scale x 1:6374 y 1:141

Oasys	Job No.	Sheet No.	Rev.
Corrib	114662	F116	
Peat stability - 500m slip length - 50deg wedge	Drg. Ref.		
	Made by CH	Date 05-Dec-2003	Data Corrib DA6.sld	Checked CH

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	Shear Strength Parameters c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	0.1000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	504.8
1	1	102.0	101.5	.	101.5	101.5	.	88.28
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.28
Slip	-	.	101.5	.	100.0	.	82.54	88.28

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
485.3	9043.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (485.3,9043.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 0.0
Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20430.
Disturbing moment [kN m]: 535.1
Restoring moment [kN m]: 1537.
Factor of Safety: 2.873

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	10.94	9.800
3	0.0	100.0	15.00	0.0	12.53	11.25
4	0.1000	100.0	15.03	0.0	12.48	11.30
5	10.10	99.65	15.91	0.0	7.968	12.65
6	20.10	99.30	16.78	0.0	3.791	14.08
7	30.09	98.95	17.65	0.0	-0.05107	15.58
8	40.09	98.60	18.53	0.0	-3.558	17.16

9	50.09	98.25	19.40	0.0	-6.730	18.81
10	60.09	97.90	20.27	0.0	-9.566	20.54
11	70.09	97.55	21.14	0.0	-12.07	22.35
12	80.08	97.20	22.02	0.0	-14.23	24.23
13	90.08	96.85	22.89	0.0	-16.07	26.19
14	100.1	96.51	23.76	0.0	-17.56	28.23
15	110.1	96.16	24.63	0.0	-18.72	30.34
16	120.1	95.81	25.51	0.0	-19.55	32.53
17	130.1	95.46	26.38	0.0	-20.04	34.79
18	140.1	95.11	27.25	0.0	-20.20	37.13
19	150.1	94.76	28.12	0.0	-20.02	39.55
20	160.1	94.41	29.00	0.0	-19.50	42.04
21	170.1	94.06	29.87	0.0	-18.65	44.61
22	180.1	93.71	30.74	0.0	-17.47	47.25
23	190.1	93.36	31.61	0.0	-15.95	49.97
24	200.1	93.01	32.49	0.0	-14.09	52.77
25	210.1	92.66	33.36	0.0	-11.90	55.64
26	220.1	92.32	34.23	0.0	-9.379	58.59
27	230.1	91.97	35.10	0.0	-6.519	61.61
28	240.1	91.62	35.98	0.0	-3.324	64.71
29	250.1	91.27	36.85	0.0	0.2070	67.89
30	260.0	90.92	37.72	0.0	4.072	71.14
31	270.0	90.57	38.59	0.0	8.273	74.47
32	280.0	90.22	39.47	0.0	12.81	77.88
33	290.0	89.87	40.34	0.0	17.68	81.36
34	300.0	89.52	41.21	0.0	22.88	84.92
35	310.0	89.17	42.08	0.0	28.43	88.55
36	320.0	88.82	42.96	0.0	34.30	92.26
37	330.0	88.48	43.83	0.0	40.51	96.05
38	340.0	88.13	44.70	0.0	47.06	99.91
39	350.0	87.78	45.57	0.0	53.94	103.9
40	360.0	87.43	46.45	0.0	61.16	107.9
41	370.0	87.08	47.32	0.0	68.71	112.0
42	380.0	86.73	48.19	0.0	76.59	116.1
43	390.0	86.38	49.06	0.0	84.82	120.4
44	400.0	86.03	49.94	0.0	93.37	124.7
45	410.0	85.68	50.81	0.0	102.3	129.1
46	420.0	85.33	51.68	0.0	111.5	133.6
47	430.0	84.98	52.55	0.0	121.1	138.1
48	440.0	84.63	53.43	0.0	130.9	142.7
49	450.0	84.29	54.30	0.0	141.2	147.4
50	460.0	83.94	55.17	0.0	151.7	152.2
51	470.0	83.59	56.04	0.0	162.7	157.1
52	480.0	83.24	56.92	0.0	173.9	162.0
53	490.0	82.89	57.79	0.0	185.5	167.0
54	500.0	82.54	58.66	0.0	197.4	172.1
55	504.8	88.28	0.0	0.0	0.0	0.0

Slice No.	Strength Parameters c' [kPa]	Tan phi	Pore Pressure [kPa]	Slice Weight [kN]	Forces on base [kN] Normal	Shear
1	0.1000	0.0	7.183	10.78	15.54	0.1980
2	0.1000	0.0	14.50	1.595	2.251	0.01414
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.47	170.1	169.9	30.01
5	3.000	0.0	16.34	179.7	179.5	30.01
6	3.000	0.0	17.22	189.3	189.1	30.01
7	3.000	0.0	18.09	198.9	198.7	30.01
8	3.000	0.0	18.96	208.5	208.3	30.01
9	3.000	0.0	19.83	218.1	217.9	30.01
10	3.000	0.0	20.71	227.7	227.5	30.01
11	3.000	0.0	21.58	237.3	237.1	30.01
12	3.000	0.0	22.45	246.9	246.7	30.01
13	3.000	0.0	23.32	256.5	256.3	30.01
14	3.000	0.0	24.20	266.1	265.9	30.01
15	3.000	0.0	25.07	275.7	275.5	30.01
16	3.000	0.0	25.94	285.3	285.1	30.01
17	3.000	0.0	26.81	294.9	294.7	30.01
18	3.000	0.0	27.69	304.5	304.3	30.01
19	3.000	0.0	28.56	314.1	313.9	30.01
20	3.000	0.0	29.43	323.7	323.5	30.01
21	3.000	0.0	30.30	333.3	333.1	30.01
22	3.000	0.0	31.18	342.9	342.7	30.01
23	3.000	0.0	32.05	352.5	352.3	30.01
24	3.000	0.0	32.92	362.1	361.9	30.01

25	3.000	0.0	33.79	371.7	371.5	30.01
26	3.000	0.0	34.67	381.3	381.1	30.01
27	3.000	0.0	35.54	390.9	390.7	30.01
28	3.000	0.0	36.41	400.5	400.3	30.01
29	3.000	0.0	37.29	410.1	409.9	30.01
30	3.000	0.0	38.16	419.6	419.5	30.01
31	3.000	0.0	39.03	429.2	429.1	30.01
32	3.000	0.0	39.90	438.8	438.7	30.01
33	3.000	0.0	40.78	448.4	448.3	30.01
34	3.000	0.0	41.65	458.0	457.9	30.01
35	3.000	0.0	42.52	467.6	467.6	30.01
36	3.000	0.0	43.39	477.2	477.2	30.01
37	3.000	0.0	44.27	486.8	486.8	30.01
38	3.000	0.0	45.14	496.4	496.4	30.01
39	3.000	0.0	46.01	506.0	506.0	30.01
40	3.000	0.0	46.88	515.6	515.6	30.01
41	3.000	0.0	47.76	525.2	525.2	30.01
42	3.000	0.0	48.63	534.8	534.8	30.01
43	3.000	0.0	49.50	544.4	544.4	30.01
44	3.000	0.0	50.37	554.0	554.0	30.01
45	3.000	0.0	51.25	563.6	563.6	30.01
46	3.000	0.0	52.12	573.2	573.2	30.01
47	3.000	0.0	52.99	582.8	582.8	30.01
48	3.000	0.0	53.86	592.4	592.4	30.01
49	3.000	0.0	54.74	602.0	602.0	30.01
50	3.000	0.0	55.61	611.6	611.6	30.01
51	3.000	0.0	56.48	621.2	621.2	30.01
52	3.000	0.0	57.35	630.8	630.8	30.01
53	3.000	0.0	58.23	640.4	640.4	30.01
54	3.000	0.0	29.33	155.5	251.2	22.49

Slice no.	Surface Load [kPa] Vert	Horiz	Water Pressure on ground surface [kPa] Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

General Parameters
Direction of slip: DOWNHILL
Minimum slip weight [kN] : 10
Type of analysis : STATIC

Analysis Options
Factor of safety on : SHEAR STRENGTH
Minimum number of slices: 50
Method: Janbu (Horizontal interslice forces)
Maximum number of iterations: 100

Material properties

No.	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]		Shear Strength Parameters Phi or Phi0 [°]	c or c0' [kPa]
1	peat 1	11.00	11.00	Undrained	0.0	3.000
2	peat 2	11.00	11.00	Undrained	0.0	3.000

Coordinates of top of soil strata

Stratum	Material	X --> -20.00	-1.500	-0.1000	0.0	0.1000	500.0	504.8
1	1	102.0	101.5	.	101.5	101.5	.	88.28
2	2	102.0	.	101.5	100.0	80.00	.	.
GWL1	-	102.0	.	101.5	101.5	101.5	.	88.28
Slip	-	.	101.5		100.0	.	82.54	88.28

Stratum	Material	X --> 800.0
1	1	80.55
2	2	80.00
GWL1	-	80.55
Slip	-	.

Groundwater
Pore pressure distribution type: HYDROSTATIC
Maximum soil suction: 0.0 [m]
Unit weight of water: 10.00 kN/m³
Number of phreatic surfaces: 1

RESULTS OF ANALYSIS

Slip Centre x [m]	Slip Centre y [m]	Radius [m]	Slip Weight [kN]	Comment/ FoS	Disturbing Moment [kN m]	Restoring Moment [kN m]
485.3	9043.	0.0				

WORST CASE : WATER CASE 1 OF 1
Centre at (485.3,9043.)
Iterations: 5
Net vertical force [kN]: 0.0
Net horiz force [kN]: 0.0

Radius 0.0m
Horiz acceleration [%g]: 0.0
Slip weight [kN] 20430.
Disturbing moment [kN m]: 535.1
Restoring moment [kN m]: 1546.
Factor of Safety: 2.889

Slip surface coordinates

Point	x [m]	y [m]	Pore Pressure u [kPa]	Interslice forces [kN] T	E	E(u)
1	-1.500	101.5	0.3658	0.0	0.0	0.0
2	-0.1000	100.1	14.00	0.0	8.129	9.800
3	0.0	100.0	15.00	0.0	9.516	11.25
4	0.1000	100.0	15.03	0.0	9.470	11.30
5	10.10	99.65	15.91	0.0	5.016	12.65
6	20.10	99.30	16.78	0.0	0.8981	14.08
7	30.09	98.95	17.65	0.0	-2.885	15.58
8	40.09	98.60	18.53	0.0	-6.333	17.16

Oasys

Corrib
Peat stability - 500m slip length - 50deg wedge

Job No.	Sheet No.	Rev.
114662	F120	

Drg. Ref.			
Made by	Date	Data	Checked
CH	05-Dec-2003	Corrib DB6.sld	CH

9	50.09	98.25	19.40	0.0	-9.446	18.81
10	60.09	97.90	20.27	0.0	-12.22	20.54
11	70.09	97.55	21.14	0.0	-14.67	22.35
12	80.08	97.20	22.02	0.0	-16.77	24.23
13	90.08	96.85	22.89	0.0	-18.55	26.19
14	100.1	96.51	23.76	0.0	-19.98	28.23
15	110.1	96.16	24.63	0.0	-21.09	30.34
16	120.1	95.81	25.51	0.0	-21.85	32.53
17	130.1	95.46	26.38	0.0	-22.29	34.79
18	140.1	95.11	27.25	0.0	-22.38	37.13
19	150.1	94.76	28.12	0.0	-22.14	39.55
20	160.1	94.41	29.00	0.0	-21.57	42.04
21	170.1	94.06	29.87	0.0	-20.66	44.61
22	180.1	93.71	30.74	0.0	-19.42	47.25
23	190.1	93.36	31.61	0.0	-17.84	49.97
24	200.1	93.01	32.49	0.0	-15.93	52.77
25	210.1	92.66	33.36	0.0	-13.68	55.64
26	220.1	92.32	34.23	0.0	-11.09	58.59
27	230.1	91.97	35.10	0.0	-8.176	61.61
28	240.1	91.62	35.98	0.0	-4.922	64.71
29	250.1	91.27	36.85	0.0	-1.332	67.89
30	260.0	90.92	37.72	0.0	2.592	71.14
31	270.0	90.57	38.59	0.0	6.851	74.47
32	280.0	90.22	39.47	0.0	11.45	77.88
33	290.0	89.87	40.34	0.0	16.37	81.36
34	300.0	89.52	41.21	0.0	21.64	84.92
35	310.0	89.17	42.08	0.0	27.24	88.55
36	320.0	88.82	42.96	0.0	33.17	92.26
37	330.0	88.48	43.83	0.0	39.44	96.05
38	340.0	88.13	44.70	0.0	46.05	99.91
39	350.0	87.78	45.57	0.0	52.99	103.9
40	360.0	87.43	46.45	0.0	60.26	107.9
41	370.0	87.08	47.32	0.0	67.87	112.0
42	380.0	86.73	48.19	0.0	75.82	116.1
43	390.0	86.38	49.06	0.0	84.10	120.4
44	400.0	86.03	49.94	0.0	92.72	124.7
45	410.0	85.68	50.81	0.0	101.7	129.1
46	420.0	85.33	51.68	0.0	111.0	133.6
47	430.0	84.98	52.55	0.0	120.6	138.1
48	440.0	84.63	53.43	0.0	130.5	142.7
49	450.0	84.29	54.30	0.0	140.8	147.4
50	460.0	83.94	55.17	0.0	151.4	152.2
51	470.0	83.59	56.04	0.0	162.4	157.1
52	480.0	83.24	56.92	0.0	173.7	162.0
53	490.0	82.89	57.79	0.0	185.3	167.0
54	500.0	82.54	58.66	0.0	197.3	172.1
55	504.8	88.28	0.0	0.0	0.0	0.0

Slice No.	Strength Parameters		Pore Pressure	Slice Weight	Forces on base [kN]	
	c' [kPa]	Tan phi	[kPa]	[kN]	Normal	Shear
1	3.000	0.0	7.183	10.78	13.55	5.940
2	3.000	0.0	14.50	1.595	2.109	0.4243
3	3.000	0.0	15.02	1.652	1.649	0.3002
4	3.000	0.0	15.47	170.1	169.9	30.01
5	3.000	0.0	16.34	179.7	179.5	30.01
6	3.000	0.0	17.22	189.3	189.1	30.01
7	3.000	0.0	18.09	198.9	198.7	30.01
8	3.000	0.0	18.96	208.5	208.3	30.01
9	3.000	0.0	19.83	218.1	217.9	30.01
10	3.000	0.0	20.71	227.7	227.5	30.01
11	3.000	0.0	21.58	237.3	237.1	30.01
12	3.000	0.0	22.45	246.9	246.7	30.01
13	3.000	0.0	23.32	256.5	256.3	30.01
14	3.000	0.0	24.20	266.1	265.9	30.01
15	3.000	0.0	25.07	275.7	275.5	30.01
16	3.000	0.0	25.94	285.3	285.1	30.01
17	3.000	0.0	26.81	294.9	294.7	30.01
18	3.000	0.0	27.69	304.5	304.3	30.01
19	3.000	0.0	28.56	314.1	313.9	30.01
20	3.000	0.0	29.43	323.7	323.5	30.01
21	3.000	0.0	30.30	333.3	333.1	30.01
22	3.000	0.0	31.18	342.9	342.7	30.01
23	3.000	0.0	32.05	352.5	352.3	30.01
24	3.000	0.0	32.92	362.1	361.9	30.01

25	3.000	0.0	33.79	371.7	371.5	30.01
26	3.000	0.0	34.67	381.3	381.1	30.01
27	3.000	0.0	35.54	390.9	390.7	30.01
28	3.000	0.0	36.41	400.5	400.3	30.01
29	3.000	0.0	37.29	410.1	409.9	30.01
30	3.000	0.0	38.16	419.6	419.5	30.01
31	3.000	0.0	39.03	429.2	429.1	30.01
32	3.000	0.0	39.90	438.8	438.7	30.01
33	3.000	0.0	40.78	448.4	448.3	30.01
34	3.000	0.0	41.65	458.0	457.9	30.01
35	3.000	0.0	42.52	467.6	467.6	30.01
36	3.000	0.0	43.39	477.2	477.2	30.01
37	3.000	0.0	44.27	486.8	486.8	30.01
38	3.000	0.0	45.14	496.4	496.4	30.01
39	3.000	0.0	46.01	506.0	506.0	30.01
40	3.000	0.0	46.88	515.6	515.6	30.01
41	3.000	0.0	47.76	525.2	525.2	30.01
42	3.000	0.0	48.63	534.8	534.8	30.01
43	3.000	0.0	49.50	544.4	544.4	30.01
44	3.000	0.0	50.37	554.0	554.0	30.01
45	3.000	0.0	51.25	563.6	563.6	30.01
46	3.000	0.0	52.12	573.2	573.2	30.01
47	3.000	0.0	52.99	582.8	582.8	30.01
48	3.000	0.0	53.86	592.4	592.4	30.01
49	3.000	0.0	54.74	602.0	602.0	30.01
50	3.000	0.0	55.61	611.6	611.6	30.01
51	3.000	0.0	56.48	621.2	621.2	30.01
52	3.000	0.0	57.35	630.8	630.8	30.01
53	3.000	0.0	58.23	640.4	640.4	30.01
54	3.000	0.0	29.33	155.5	251.1	22.49

Slice no.	Surface Load [kPa]		Water Pressure on ground surface [kPa]	
	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.1829	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0

Arup Consulting Engineers

APPENDIX G

Stability Calculations for Existing Slopes

ArupGeotechnics Job No. 114662 Sheet 1/1 G1

Made by: CH Chkd: CH
Date: 14/11/2003
Rev: -.-

Corrib Onshore Terminal
Stability of peat

Section 1-1

		Optimise 0 for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	2.75	2.75	2.75	2.75	2.75
Slope angle of top of peat (ground surface)	α	1.5	1.5	1.5	3.43	3.23
Slope angle of base of peat	β	1.63	1.63	1.63	3.56	3.36
Slope length	L	950	950	950	950	950
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2.5	1.09	1.24	2.50	2.50
Active pressure force (horizintal component)	P_A	41.6	41.6	41.6	41.6	41.6
Peat thickness at bottom of slope	H	4.91	4.91	4.91	4.91	4.91
Slope of base of passive wedge	θ	27.8	27.8	27.8	27.8	27.8
Length of slip surface	L_1	950.4	950.4	950.4	951.8	951.6
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	39999.9	39999.9	39999.9	39999.9	39999.9
Weight of active wedge + surcharge	$W_1 + W_s$	39999.9	39999.9	39999.9	39999.9	39999.9
FOS with no passive resistance		2.015	0.882	1.000	0.943	1.000
Max length of passive wedge	L^*	187.33	187.33		81.78	
Actual length of passive wedge	L_H	8.85	8.85		8.34	
Length of passive wedge slip surface	L_2	10.01	10.01		9.43	
Weight of passive wedge	W_2	238.80	238.80		225.07	
Total weight		40238.71	40238.71		40224.98	
Disturbing force component		1035.09	1035.09		2320.50	
Resisting force		2364.33	1035.09		2320.50	
FOS		2.2842	1.00		1.00	
Horizontal restraining force from passive wedge		139.1	139.1		147.3	
Depth of sheet pile		3.20	3.20		3.29	

Note: s_u based on average of strength for central and western areas

Corrib Onshore Terminal
Stability of peat

Section 2-2

		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	2.5	2.5	2.5	2.5	2.5
Slope angle of top of peat (ground surface)	α	1.56	1.56	1.56	4.06	3.69
Slope angle of base of peat	β	1.82	1.82	1.82	4.32	3.95
Slope length	L	620	620	620	620	620
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	3	1.16	1.42	3.00	3.00
Active pressure force (horizintal component)	P_A	34.4	34.4	34.4	34.4	34.4
Peat thickness at bottom of slope	H	5.31	5.31	5.31	5.31	5.31
Slope of base of passive wedge	θ	25.1	25.1	25.1	25.1	25.1
Length of slip surface	L_1	620.3	620.3	620.3	621.8	621.5
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	26644.0	26644.0	26644.0	26644.0	26644.0
Weight of active wedge + surcharge	$W_1 + W_s$	26644.0	26644.0	26644.0	26644.0	26644.0
FOS with no passive resistance		2.114	0.815	1.000	0.917	1.000
Max length of passive wedge	L^*	195.11	195.11		74.93	
Actual length of passive wedge	L_H	10.73	10.73		9.86	
Length of passive wedge slip surface	L_2	11.85	11.85		10.89	
Weight of passive wedge	W_2	313.71	313.71		288.27	
Total weight		26957.71	26957.71		26932.27	
Disturbing force component		720.30	720.30		1827.01	
Resisting force		1867.91	720.30		1827.01	
FOS		2.5932	1.00		1.00	
Horizontal restraining force from passive wedge		162.9	162.9		173.6	
Depth of sheet pile		3.46	3.46		3.57	

ArupGeotechnics

Job No. 114662 Sheet 1/1 G3

Corrib Onshore Terminal
Stability of peat

Made by: CH Chkd: CH
Date: 14/11/2003
Rev: -,-

Section 3-3

		Optimise 0 for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	1.9	1.9	1.9	1.9	1.9
Slope angle of top of peat (ground surface)	α	1.45	1.45	1.45	4.60	4.22
Slope angle of base of peat	β	1.75	1.75	1.75	4.90	4.52
Slope length	L	590	590	590	590	590
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	3	0.95	1.19	3.00	3.00
Active pressure force (horizintal component)	P_A	19.9	19.9	19.9	19.9	19.9
Peat thickness at bottom of slope	H	4.99	4.99	4.99	4.99	4.99
Slope of base of passive wedge	θ	22.7	22.7	22.7	22.7	22.7
Length of slip surface	L_1	590.3	590.3	590.3	592.2	591.8
Surcharge load	W_s	0	0	0	0	0
Weight of sliding block	W_1	22355.7	22355.7	22355.7	22355.7	22355.7
Weight of active wedge + surcharge	$W_1 + W_s$	22355.7	22355.7	22355.7	22355.7	22355.7
FOS with no passive resistance		2.522	0.797	1.000	0.924	1.000
Max length of passive wedge	L^*	197.11	197.11		61.99	
Actual length of passive wedge	L_H	11.25	11.25		10.01	
Length of passive wedge slip surface	L_2	12.20	12.20		10.85	
Weight of passive wedge	W_2	308.85	308.85		274.66	
Total weight		22664.50	22664.50		22630.31	
Disturbing force component		564.17	564.17		1739.10	
Resisting force		1783.99	564.17		1739.10	
FOS		3.1622	1.00		1.00	
Horizontal restraining force from passive wedge		142.5	142.5		152.8	
Depth of sheet pile		3.24	3.24		3.35	

ArupGeotechnics

Job No. 114662 Sheet 1/1 G4

Made by: CH Chkd:..CH

Date: 14/11/2003

Rev: -,-

Corrib Onshore Terminal

Stability of peat

Section 4-4

		Optimise 0 for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	2	2	2	2	2
Slope angle of top of peat (ground surface)	α	1.35	1.35	1.35	3.50	3.16
Slope angle of base of peat	β	1.62	1.62	1.62	3.77	3.43
Slope length	L	750	750	750	750	750
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2.5	0.97	1.20	2.50	2.50
Active pressure force (horizintal component)	P_A	22.0	22.0	22.0	22.0	22.0
Peat thickness at bottom of slope	H	5.53	5.53	5.53	5.53	5.53
Slope of base of passive wedge	θ	22.4	22.4	22.4	22.4	22.4
Length of slip surface	L_1	750.3	750.3	750.3	751.6	751.3
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	31079.1	31079.1	31079.1	31079.1	31079.1
Weight of active wedge + surcharge	$W_1 + W_s$	31079.1	31079.1	31079.1	31079.1	31079.1
FOS with no passive resistance		2.084	0.806	1.000	0.913	1.000
Max length of passive wedge	L^*	234.84	234.84		90.61	
Actual length of passive wedge	L_H	12.73	12.73		11.72	
Length of passive wedge slip surface	L_2	13.76	13.76		12.67	
Weight of passive wedge	W_2	387.45	387.45		356.68	
Total weight		31466.51	31466.51		31435.74	
Disturbing force component		730.46	730.46		1855.94	
Resisting force		1887.60	730.46		1855.94	
FOS		2.5841	1.00		1.00	
Horizontal restraining force from passive wedge		174.7	174.7		183.3	
Depth of sheet pile		3.58	3.58		3.67	

ArupGeotechnics

Job No. 114662 Sheet 1/1 G.5

Corrib Onshore Terminal
Stability of peat

Made by: CH Chkd:...CH
Date: 14/11/2003
Rev: -.-

Section 5-5

		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	1.5	1.5	1.5	1.5	1.5
Slope angle of top of peat (ground surface)	α	1.26	1.26	1.26	5.57	5.29
Slope angle of base of peat	β	1.46	1.46	1.46	5.77	5.49
Slope length	L	500	500	500	500	500
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2.5	0.57	0.69	2.50	2.50
Active pressure force (horizintal component)	P_A	12.4	12.4	12.4	12.4	12.4
Peat thickness at bottom of slope	H	3.25	3.25	3.25	3.25	3.25
Slope of base of passive wedge	θ	25.4	25.4	25.4	25.4	25.4
Length of slip surface	L_1	500.2	500.2	500.2	502.5	502.3
Surcharge load	W_s	0	0	0	0	0
Weight of sliding block	W_1	13049.7	13049.7	13049.7	13049.7	13049.7
Weight of active wedge + surcharge	$W_1 + W_s$	13049.7	13049.7	13049.7	13049.7	13049.7
FOS with no passive resistance		3.627	0.826	1.000	0.954	1.000
Max length of passive wedge	L^*	147.55	147.55		33.29	
Actual length of passive wedge	L_H	6.54	6.54		5.68	
Length of passive wedge slip surface	L_2	7.24	7.24		6.28	
Weight of passive wedge	W_2	116.80	116.80		101.37	
Total weight		13166.47	13166.47		13151.05	
Disturbing force component		285.23	285.23		1205.87	
Resisting force		1253.00	285.23		1205.87	
FOS		4.3930	1.00		1.00	
Horizontal restraining force from passive wedge		60.2	60.2		67.0	
Depth of sheet pile		2.10	2.10		2.22	

ArupGeotechnics

Job No. 114662 Sheet 1/1 G6

Made by: CH Chkd: CY
Date: 14/11/2003
Rev: -,-

Corrib Onshore Terminal
Stability of peat

Section 4a-4a		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	3.5	3.5	3.5	3.5	3.5
Slope angle of top of peat (ground surface)	α	1.83	1.83	1.83	5.26	5.15
Slope angle of base of peat	β	1.45	1.45	1.45	4.88	4.77
Slope length	L	300	300	300	300	300
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2.5	0.87	0.92	2.50	2.50
Active pressure force (horizintal component)	P_A	67.4	67.4	67.4	67.4	67.4
Peat thickness at bottom of slope	H	1.51	1.51	1.51	1.51	1.51
Slope of base of passive wedge	θ	47.5	47.5	47.5	47.5	47.5
Length of slip surface	L_1	300.1	300.1	300.1	301.1	301.0
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	8267.0	8267.0	8267.0	8267.0	8267.0
Weight of active wedge + surcharge	$W_1 + W_s$	8267.0	8267.0	8267.0	8267.0	8267.0
FOS with no passive resistance		2.714	0.948	1.000	0.980	1.000
Max length of passive wedge	L^*	47.27	47.27		16.40	
Actual length of passive wedge	L_H	1.34	1.34		1.27	
Length of passive wedge slip surface	L_2	1.99	1.99		1.89	
Weight of passive wedge	W_2	11.15	11.15		10.59	
Total weight		8278.14	8278.14		8277.57	
Disturbing force component		256.62	256.62		684.69	
Resisting force		734.22	256.62		684.69	
FOS		2.8611	1.00		1.00	
Horizontal restraining force from passive wedge		14.3	14.3		18.0	
Depth of sheet pile		1.03	1.03		1.15	

ArupGeotechnics

Job No. 114662 Sheet 1/1 G7

Corrib Onshore Terminal
Stability of peat

Made by: CH Chkd:....CH
Date: 14/11/2003
Rev: -,-

Section 4b-4b

		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	1.7	1.7	1.7	1.7	1.7
Slope angle of top of peat (ground surface)	α	1.3	1.3	1.3	4.09	3.66
Slope angle of base of peat	β	1.65	1.65	1.65	4.44	4.01
Slope length	L	500	500	500	500	500
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2.5	0.80	1.05	2.50	2.50
Active pressure force (horizintal component)	P_A	15.9	15.9	15.9	15.9	15.9
Peat thickness at bottom of slope	H	4.75	4.75	4.75	4.75	4.75
Slope of base of passive wedge	θ	21.8	21.8	21.8	21.8	21.8
Length of slip surface	L_1	500.2	500.2	500.2	501.5	501.2
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	17749.5	17749.5	17749.5	17749.5	17749.5
Weight of active wedge + surcharge	$W_1 + W_s$	17749.5	17749.5	17749.5	17749.5	17749.5
FOS with no passive resistance		2.374	0.756	1.000	0.904	1.000
Max length of passive wedge	L^*	209.51	209.51		66.43	
Actual length of passive wedge	L_H	11.26	11.26		10.09	
Length of passive wedge slip surface	L_2	12.13	12.13		10.87	
Weight of passive wedge	W_2	294.49	294.49		263.93	
Total weight		18043.99	18043.99		18013.43	
Disturbing force component		403.05	403.05		1238.37	
Resisting force		1265.93	403.05		1238.37	
FOS		3.1409	1.00		1.00	
Horizontal restraining force from passive wedge		128.8	128.8		136.9	
Depth of sheet pile		3.08	3.08		3.17	

Arup Consulting Engineers

APPENDIX H

Stability Calculations for Slopes below Sheet Pile Walls

ArupGeotechnics

Job No. 114662 Sheet 1/1 H11

Made by: CH Chkd:...CH
Date: 14/11/2003
Rev: -,-

Corrib Onshore Terminal
Stability of peat

Section 1-1 - below platform wall

		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	3.59	3.59	3.59	3.59	3.59
Slope angle of top of peat (ground surface)	α	1.5	1.5	1.5	2.56	2.21
Slope angle of base of peat	β	1.63	1.63	1.63	2.69	2.34
Slope length	L	470	470	470	470	470
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2	1.17	1.44	2.00	2.00
Active pressure force (horizintal component)	P_A	70.9	70.9	70.9	70.9	70.9
Peat thickness at bottom of slope	H	4.66	4.66	4.66	4.66	4.66
Slope of base of passive wedge	θ	31.4	31.4	31.4	31.4	31.4
Length of slip surface	L_1	470.2	470.2	470.2	470.5	470.4
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	21316.9	21316.9	21316.9	21316.9	21316.9
Weight of active wedge + surcharge	$W_1 + W_s$	21316.9	21316.9	21316.9	21316.9	21316.9
FOS with no passive resistance		1.389	0.813	1.000	0.878	1.000
Max length of passive wedge	L^*	177.82	177.82		103.99	
Actual length of passive wedge	L_H	7.32	7.32		7.11	
Length of passive wedge slip surface	L_2	8.57	8.57		8.33	
Weight of passive wedge	W_2	187.45	187.45		182.13	
Total weight		21504.39	21504.39		21499.06	
Disturbing force component		550.85	550.85		929.68	
Resisting force		940.83	550.85		929.68	
FOS		1.7080	1.00		1.00	
Horizontal restraining force from passive wedge		126.6	126.6		131.5	
Depth of sheet pile		3.05	3.05		3.11	

ArupGeotechnics

Job No. 114662 Sheet 1/1 H2

Made by: CH Chkd:...CH

Date: 14/11/2003

Rev: -,-

Corrib Onshore Terminal
Stability of peat

Section 1-1 - below settlement ponds		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	4.79	4.79	4.79	4.79	4.79
Slope angle of top of peat (ground surface)	α	1.5	1.5	1.5	2.15	1.29
Slope angle of base of peat	β	1.63	1.63	1.63	2.28	1.42
Slope length	L	200	200	200	200	200
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	2	1.39	2.20	2.00	2.00
Active pressure force (horizintal component)	P_A	126.2	126.2	126.2	126.2	126.2
Peat thickness at bottom of slope	H	5.24	5.24	5.24	5.24	5.24
Slope of base of passive wedge	θ	32.9	32.9	32.9	32.9	32.9
Length of slip surface	L_1	200.1	200.1	200.1	200.2	200.1
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	11037.2	11037.2	11037.2	11037.2	11037.2
Weight of active wedge + surcharge	$W_1 + W_s$	11037.2	11037.2	11037.2	11037.2	11037.2
FOS with no passive resistance		0.910	0.634	1.000	0.708	1.000
Max length of passive wedge	L^*	200.25	200.25		139.44	
Actual length of passive wedge	L_H	7.80	7.80		7.67	
Length of passive wedge slip surface	L_2	9.29	9.29		9.13	
Weight of passive wedge	W_2	225.00	225.00		221.24	
Total weight		11262.16	11262.16		11258.40	
Disturbing force component		286.49	286.49		407.96	
Resisting force		411.22	286.49		407.96	
FOS		1.4354	1.00		1.00	
Horizontal restraining force from passive wedge		161.2	161.2		165.4	
Depth of sheet pile		3.44	3.44		3.49	

ArupGeotechnics

Job No. 114662 Sheet 1/1 H3

Made by: CH Chkd: CY
Date: 14/11/2003
Rev: -,-

Corrib Onshore Terminal
Stability of peat

Section 2-2 -m below platform wall

		Optimise θ for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	4.09	4.09	4.09	4.09	4.09
Slope angle of top of peat (ground surface)	α	1.56	1.56	1.56	3.44	2.70
Slope angle of base of peat	β	1.82	1.82	1.82	3.70	2.96
Slope length	L	260	260	260	260	260
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	3	1.36	1.99	3.00	3.00
Active pressure force (horizintal component)	P_A	92.0	92.0	92.0	92.0	92.0
Peat thickness at bottom of slope	H	5.27	5.27	5.27	5.27	5.27
Slope of base of passive wedge	θ	30.3	30.3	30.3	30.3	30.3
Length of slip surface	L_1	260.1	260.1	260.1	260.5	260.3
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	13384.6	13384.6	13384.6	13384.6	13384.6
Weight of active wedge + surcharge	$W_1 + W_s$	13384.6	13384.6	13384.6	13384.6	13384.6
FOS with no passive resistance		1.510	0.686	1.000	0.820	1.000
Max length of passive wedge	L^*	193.50	193.50		87.68	
Actual length of passive wedge	L_H	8.60	8.60		8.17	
Length of passive wedge slip surface	L_2	9.97	9.97		9.46	
Weight of passive wedge	W_2	249.37	249.37		236.67	
Total weight		13633.95	13633.95		13621.25	
Disturbing force component		361.22	361.22		778.87	
Resisting force		795.40	361.23		778.86	
FOS		2.2020	1.00		1.00	
Horizontal restraining force from passive wedge		162.6	162.6		173.5	
Depth of sheet pile		3.46	3.46		3.57	

ArupGeotechnics

Job No. 114662 Sheet 1/1 H4

Made by: CH Chkd: CH
Date: 14/11/2003
Rev: -,-

Corrib Onshore Terminal
Stability of peat

Section 3-3 - below platform wall		Optimise 0 for min FOS	Minimum strength for FOS=1		Maximum slope for FOS=1	
Thickness of peat at top of slope	h	3.16	3.16	3.16	3.16	3.16
Slope angle of top of peat (ground surface)	α	1.45	1.45	1.45	3.92	3.35
Slope angle of base of peat	β	1.75	1.75	1.75	4.22	3.65
Slope length	L	350	350	350	350	350
Unit weight of peat	γ	11	11	11	11	11
Undrained shear strength of peat	c_u	3	1.11	1.52	3.00	3.00
Active pressure force (horizintal component)	P_A	54.9	54.9	54.9	54.9	54.9
Peat thickness at bottom of slope	H	4.99	4.99	4.99	4.99	4.99
Slope of base of passive wedge	θ	28.0	28.0	28.0	28.0	28.0
Length of slip surface	L_1	350.2	350.2	350.2	351.0	350.7
Surcharge load	W_S	0	0	0	0	0
Weight of sliding block	W_1	15693.8	15693.8	15693.8	15693.8	15693.8
Weight of active wedge + surcharge	$W_1 + W_s$	15693.8	15693.8	15693.8	15693.8	15693.8
FOS with no passive resistance		1.968	0.730	1.000	0.873	1.000
Max length of passive wedge	L^*	197.24	197.24		72.90	
Actual length of passive wedge	L_H	8.97	8.97		8.32	
Length of passive wedge slip surface	L_2	10.15	10.15		9.42	
Weight of passive wedge	W_2	246.22	246.22		228.50	
Total weight		15940.00	15940.00		15922.28	
Disturbing force component		394.38	394.38		1037.11	
Resisting force		1063.41	394.38		1037.11	
FOS		2.6964	1.00		1.00	
Horizontal restraining force from passive wedge		144.5	144.5		155.8	
Depth of sheet pile		3.26	3.26		3.38	