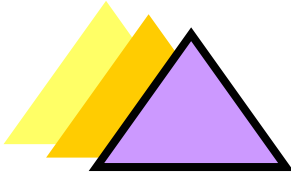


APPENDIX 2.4.2
Geophysical Survey Report of Drehid Site by
APEX Geoservices Ltd.

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APEX Geoservices Ltd.
Geophysical & Geological Consultants

FINAL REPORT ON THE GEOPHYSICAL SURVEY
FOR THE
PROPOSED LANDFILL SITE, DREHID, CO. KILDARE
FOR
TES CONSULTING ENGINEERS.

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1. INTRODUCTION

APEX Geoservices Ltd. was requested by TES Consulting Engineers to carry out a geophysical survey for a proposed landfill at Drehid, Co. Kildare. A draft geophysical report was made in November 2002 with recommendations for borehole locations. Six boreholes and twenty one trial pits were carried out by TES Consulting Engineers in December 2002. Data from a previous investigation carried out in the area by Fehily Timoney & Company in January 2002 comprising a geophysical report and direct investigation data was also provided. This final report combines the results of both reports and the findings of the direct investigation.

Survey Objectives

The objectives of the survey were:

- ❖ To indicate type and thickness of overburden, lateral variation of overburden, geotechnical properties, bedrock profile, bedrock lithology, presence of fault or fracture zones, possible karstified or dolomitized zones
- ❖ To assist in the selection of the most suitable area for further investigation.

Survey Methodology

The following program of geophysical surveying was carried out:

- ❖ VLF – Resistivity to determine overburden resistivity to investigate variations in overburden type and thickness, outline bedrock lithology, indicate possible fault or fracture zones and locate possible occurrences of karstified or dolomitised limestone.
- ❖ Supplementary 2D-Resistivity Profiling to estimate overburden type and thickness, bedrock resistivity and investigate possible high permeability zones.

Site Background & Geological Setting

The site lies approximately 2km west of Timahoe, Co. Kildare and comprises approximately 1650 hectares of cutaway bog. The survey was carried out across a combined area of approximately 350 hectares of the cutaway bog.

The geological map for the area (Geology of Kildare-Wicklow, Sheet 16, 1:100,000) indicates that the site lies on the north-western limb of a Waulsortian Limestone anticline with a transition to Allenwood Formation thick-bedded limestone occurring east of the survey area. Boston Hill nodular and muddy limestone and shale is shown along the axis of the anticline to the southwest.

Report Outline

- ❖ The survey results are discussed in Section 2.
- ❖ The locations of the geophysical readings are shown on Map 2.
- ❖ The processed VLFR data are shown on Maps 3 to 6
- ❖ The results of the geophysical survey are summarised on Map 7.
- ❖ An account of the geophysical methods, equipment used and data processing is contained in Appendix I.
- ❖ Appendix II contains the January 2002 Interpreted 2D Resistivity Profiles.
- ❖ Appendix III contains the November 2002 Interpreted 2D Resistivity Profiles.
- ❖ Appendix IV contains the January 2002 Seismic Profiles.
- ❖ Appendix V contains the January 2002 Peat Thickness Contour Plot.

2. RESULTS

January 2002 & November 2002 VLF-Resistivity

The combined 2001 and 2002 VLF-R data have been processed to produce four plots; recorded apparent resistivity; recorded phase angle; calculated overburden thickness; and calculated bedrock resistivity (Maps 3 to 6).

The recorded apparent resistivity (Map 3) indicates that the northwest of the surveyed area is dominated by high apparent resistivity values (400-1400 ohm-m) and low phase angles (8-31 degrees) interpreted as thin overburden (<10m) over Waulsortian Limestone.

To the east and southeast of the survey area apparent resistivity values from 200-400 ohm-m, and low phase angles (9-27 degrees) have been interpreted as indicating thick overburden (10-15m) over Waulsortian Limestone.

To the southwest of the survey area apparent resistivity values from 250-600 ohm-m, and phase angles from 16-24 degrees have been interpreted as indicating 5-10m overburden over Boston Hill Formation limestone and shale.

Through the centre of the survey area a SSW trending zone of low apparent resistivity values (<200 ohm-m) and high phase angles (26-52 degrees) have been interpreted as indicating a channel in the bedrock with overburden thicknesses ranging to in excess of 50 m (which is the maximum range of the VLFR method in the channel fill material).

Table 1: VLF-Resistivity Values

Apparent Resistivity (ohm-m)	Interpretation
200-600	10-25m Overburden over Waulsortian (west of channel)
600-1400	>10m Overburden over Waulsortian (west of channel)
70-200	15->50m Overburden (channel)
200-400	10-15m Overburden over Waulsortian Limestone (east)
400-800	5-10m Overburden over Waulsortian (east of channel)
200-600	5-10m Overburden over Boston Hill Limestone & Shale

The overburden thicknesses have been calculated from the VLF-R data in conjunction with the 2D Resistivity data. The results can be seen on Map 5. Thicknesses show good agreement with the 2D Resistivity data and borehole data. Some localised zones of increased overburden thickness/possible karstification have also been identified (Summary Map 7).

The calculated bedrock resistivities (Map 6) were found to be generally higher than those recorded on the 2D resistivity profiles. This is due to the greater depth of penetration of the VLFR compared to the 2D Resistivity profiles and indicates that Waulsortian in this area is thick and persists at depth. The zone interpreted as being underlain by Boston Hill Fm. Limestone and shale has generally lower interpreted bedrock resistivity values (generally <2000 ohm-m) than the zones interpreted as underlain by Waulsortian Limestone (typically >2000 ohm-m).

January 2002 & November 2002 2D-Resistivity

Fifteen 2D-resistivity profiles were recorded in January 2002 and nine in November 2002 at locations based on the results of the VLFR survey. Their locations are indicated on Map 2. The spatial distribution of the November 2002 profiles was decided upon in consultation with the client.

The November 2002 2D Resistivity profiles have been interpreted on the following basis (Sections 1-9):

Table 2: 2D-Resistivity Values

Resistivity (ohm-m)	Interpretation
50-100	Peat/Clay/Silt
50-126	Tertiary Clay (Channel Fill Material)
100-250	Gravelly Clay
250-1600	Waulsortian Limestone

Note: The 2D-Resistivity values vary from the VLF-Resistivity values as the 2D-Resistivity values are modelled resistivities while the VLF-Resistivity values are apparent resistivity values and the depth range of the VLF-R is greater than the 2D-Resistivity and takes into account the effects of deeper layers than the 2D-Resistivity

The resistivity values of 50 - 100 ohm-m for the Peat/Clay/Silt layer and 100-250 ohm-m for the gravelly clay are typical values for these materials. The resistivity values of 50 - 126 ohm-m for the Tertiary Clay would be typical of gravelly silt/clay material. Waulsortian Limestone would typically have a higher range of resistivity values than those interpreted from November 2002 2D Resistivity Profile 1 (250-1600 ohm-m). This may be due to the effect of dolomitisation especially in the upper 5-10 m of interpreted bedrock. The significance of this dolomitisation in terms of increased bedrock permeability should be investigated.

The threshold of values of the January 2002 2D Resistivity profiles varied slightly, however, values were within 50 ohm-m.

All 2D Resistivity profiles were interpreted as indicating a thin layer of peat/silt/clay underlain by gravelly clay over Limestone. On January 2002 Profiles 1, 2 and 5 and November 2002 Profiles 1 and 4 the gravelly clay has been interpreted as being underlain by low resistivity Tertiary Clay. January 2002 Profiles 1, 2, 5, 8, 11 and 15 and November 2002 Profiles 1, 2, 4 and 9 indicate the boundaries of the SSW trending bedrock channel. The western end of January 2002 Profile 1 and the eastern end of January 2002 Profile 5 at depths >30m bgl indicate the presence of a possible ridge of bedrock at depth through the centre of the channel.

Small bedrock depressions were indicated on some profiles (eg. January 2002 Profiles 7 and 13 and November 2002 Profiles 7 and 8) but the 2D Resistivity data indicate that these do not persist at depth.

January 2002 Seismic Refraction

Ten seismic spreads were recorded in January 2002 along the 2D-resistivity profiles. Up to 4 velocity layers were indicated by the seismic data. The spreads were interpreted on the following as follows:

Table 3: Seismic Refraction Values

Seismic Velocity (m/s)	Interpretation
268-550	Soft-firm Peat/Clay/Silt
1176-2105	Firm-stiff Gravelly Clay (with occasional gravel)
3196-3839	Waulsortian Limestone
2223-2720	Very stiff Tertiary Clay

The velocities of the Peat/Clay/Silt and Gravelly Clay layers are typical values for these materials. The velocities of the bedrock are at the lower end of the range typically recorded for thickly bedded massive Waulsortian Reef Limestone. This indicates a higher level of discontinuities in the rock probably associated with the dolomitisation of the limestone referred to previously. This may have the effect of increasing permeability in the upper levels of the limestone bedrock. No significant changes in bedrock topography of the type associated with karstification and collapse of the limestone bedrock were apparent on the seismic records.

The velocity data for the Tertiary clay is within the range that would be expected for a very stiff to hard, over-consolidated clay. The seismic data for this material is limited and only of fair quality in places due to its depth and the poor velocity contrast with the overlying stiff gravelly clay.

The seismic depths and velocities have been drawn on the January 2002 2D Resistivity profiles and are contained in Appendix IV.

January 2002 Peat Probing

Peat probing was carried out in January 2002 at 205 locations across the survey area to assist in the interpretation of the VLFR data. Peat thicknesses in the cut-away area range from 0.4 to 2.3 m. Samples from the base of each probe indicated that the peat is underlain by grey-brown clay/silt at 145 locations and is underlain by clay and gravel at 12 locations. The probes refused at 48 locations without recovering a sample from the base of the peat possibly due to wood or other obstruction. These locations occur randomly through out the survey area.

The contoured plot of peat thickness is contained in Appendix V.

Integrated Interpretation

The interpretation of the geophysical data has allowed the subdivision of the site into the following zones (Summary Map 7):

Table 4: Zones of overburden thicknesses

Zone	Description2
A	0-5m Overburden over Waulsortian Limestone
B	5-10m Overburden over Waulsortian Limestone
C	10-15m Overburden over Waulsortian Limestone
D	10-25m Overburden over Waulsortian Limestone
E	15-25m Overburden over Waulsortian Limestone
F	25-50m Overburden in SSW trending Channel
G	>50m Overburden in SSW trending Channel
H	10-15m Overburden over Boston Hill Formation
I	5-10m Overburden over Boston Hill Formation

It is likely that the permeability of the Peat/Clay/Silt layer and the Tertiary Clay will be low, with the Gravelly Clay having low to medium permeability. Permeability of the bedrock is likely to be increased where dolomitisation has occurred.

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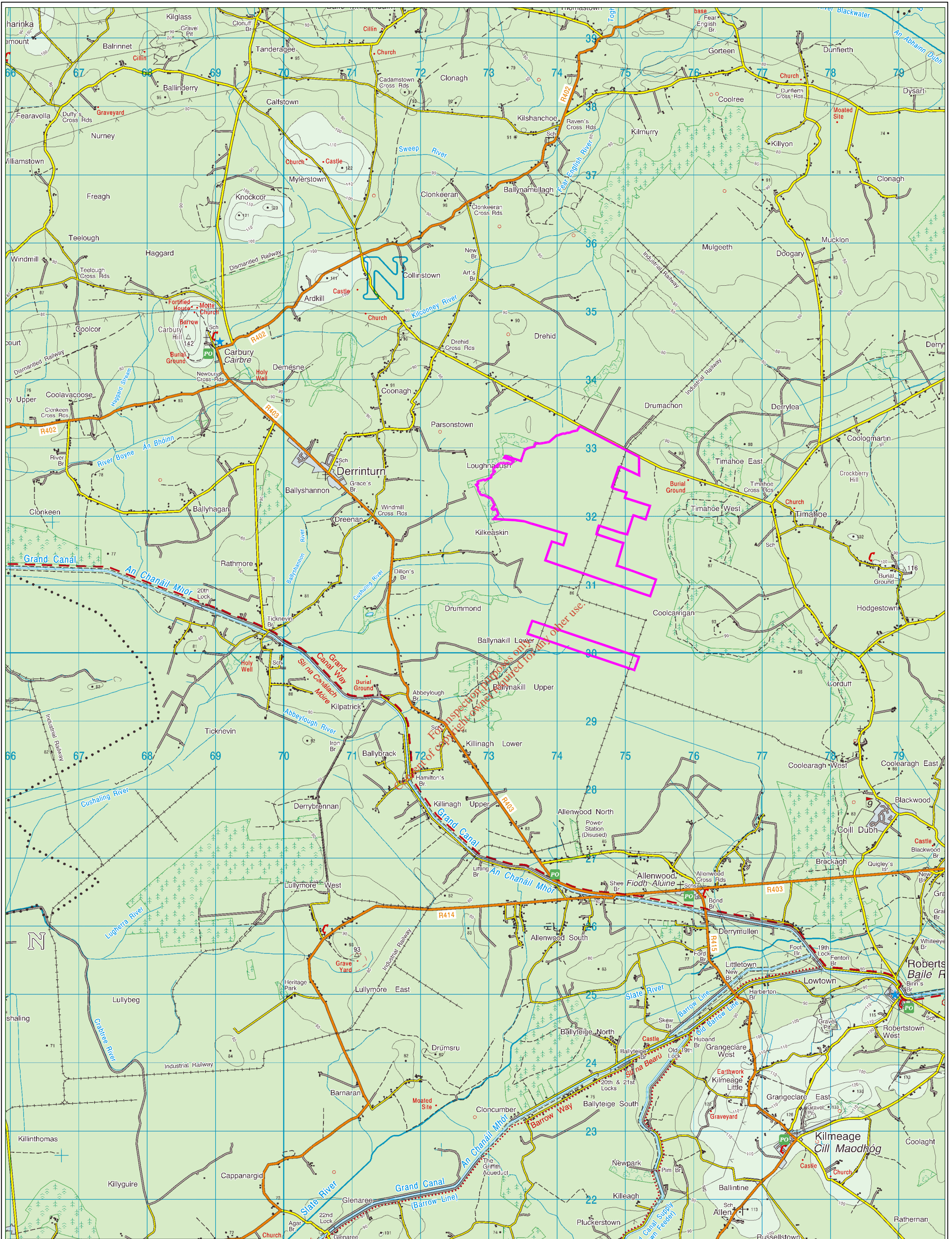
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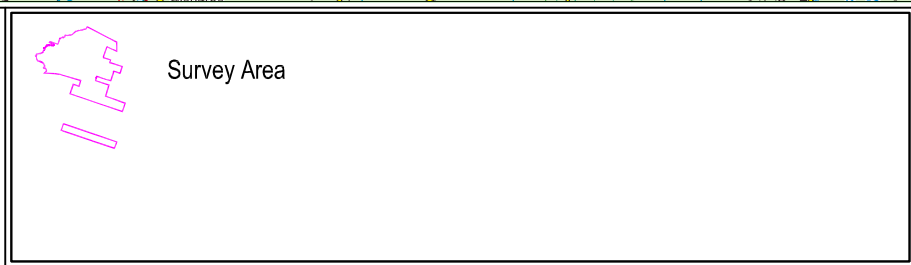
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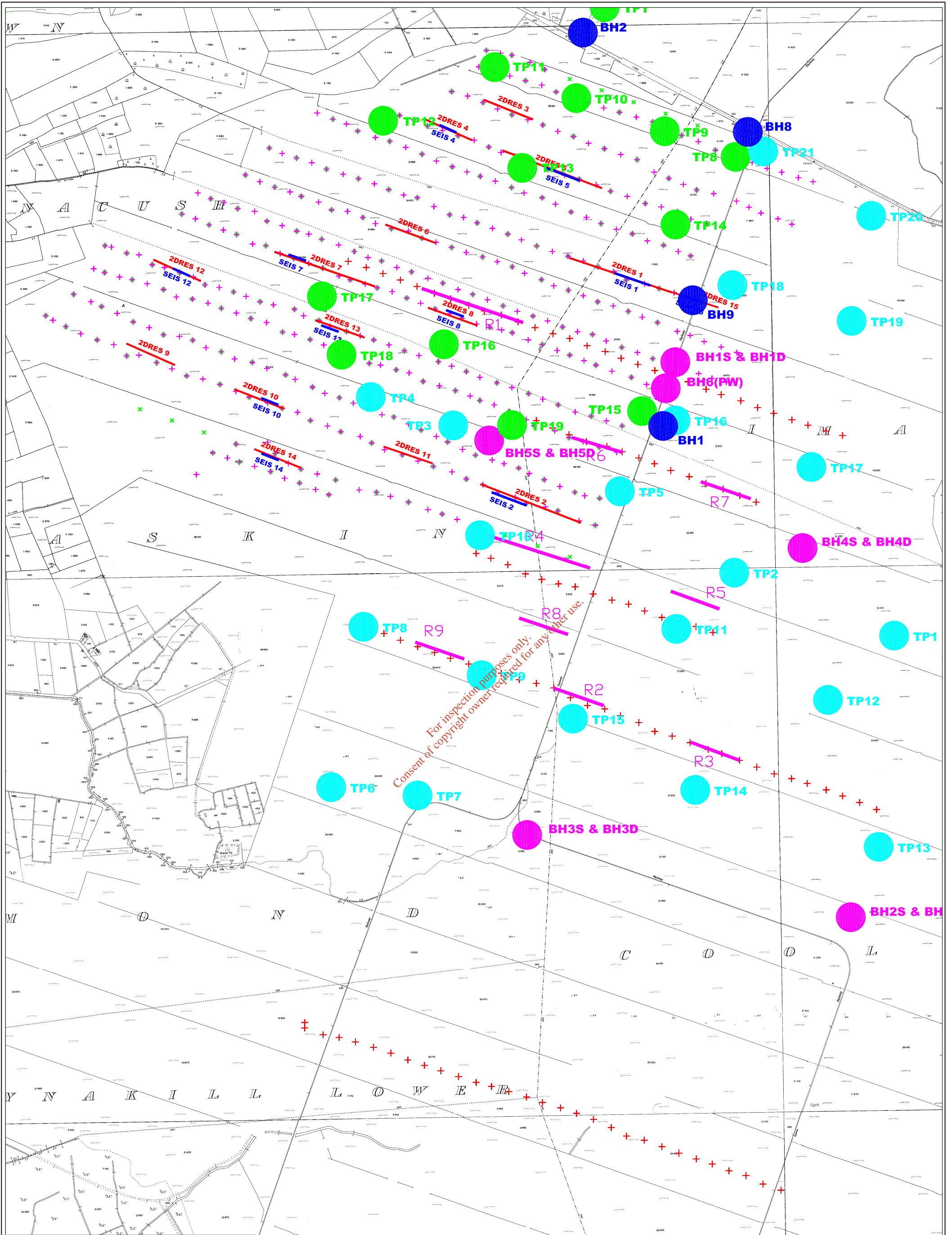


PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: Map 1 - Site Location Map
 DATE: March 2003
 SCALE: 1:50,000



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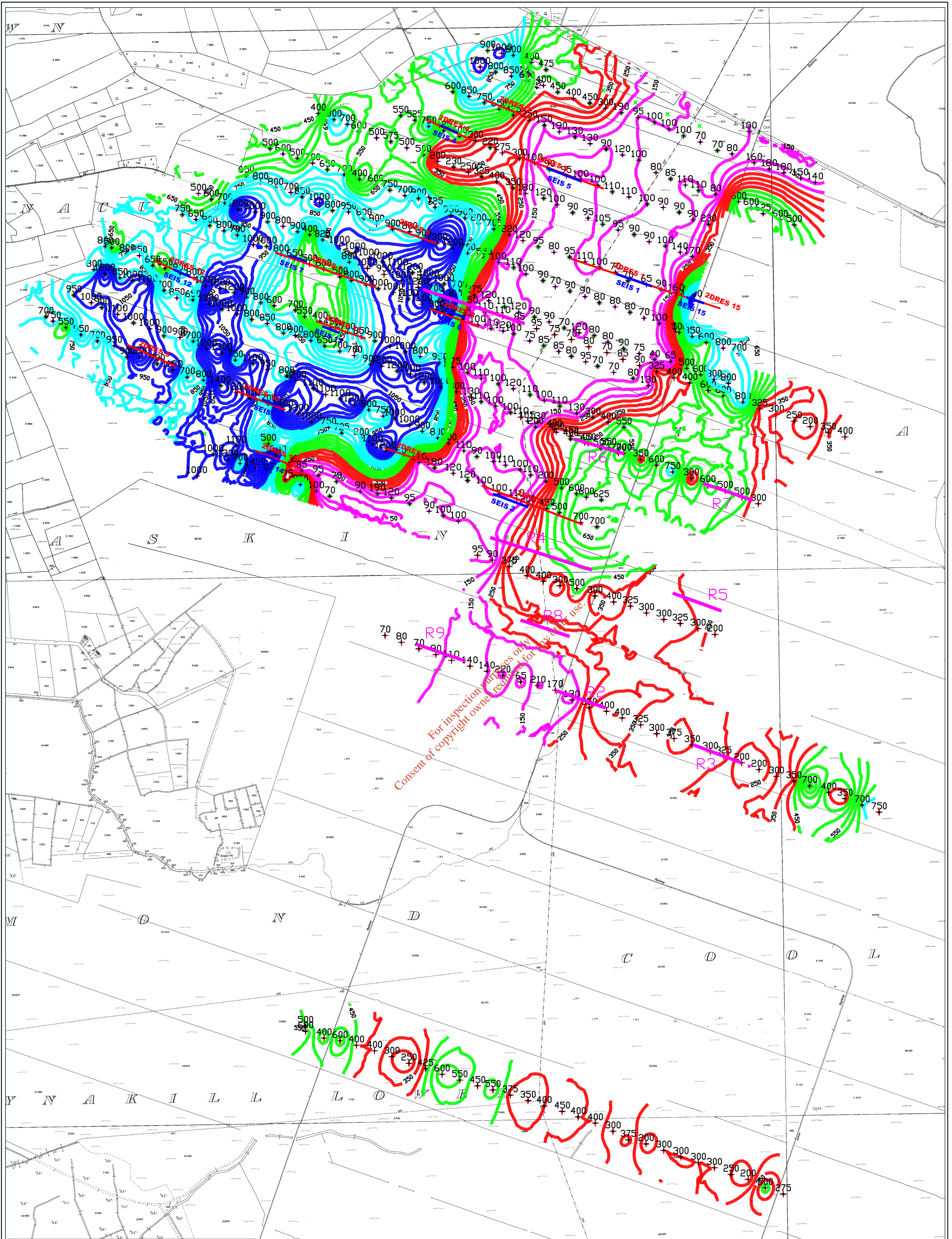


PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: Map 2 - Location of Readings
 DATE: March 2003
 SCALE: 1:10,000

- | | | | |
|--|-----------------------------|--|-----------------|
| | VLF-R Location 2001 | | Peat Probe 2001 |
| | VLF-R Location 2002 | | Trial Pit 2001 |
| | 2D Resistivity Profile 2001 | | Borehole 2001 |
| | 2D Resistivity Profile 2002 | | Trial Pit 2001 |
| | Seismic Profile 2001 | | Borehole 2002 |

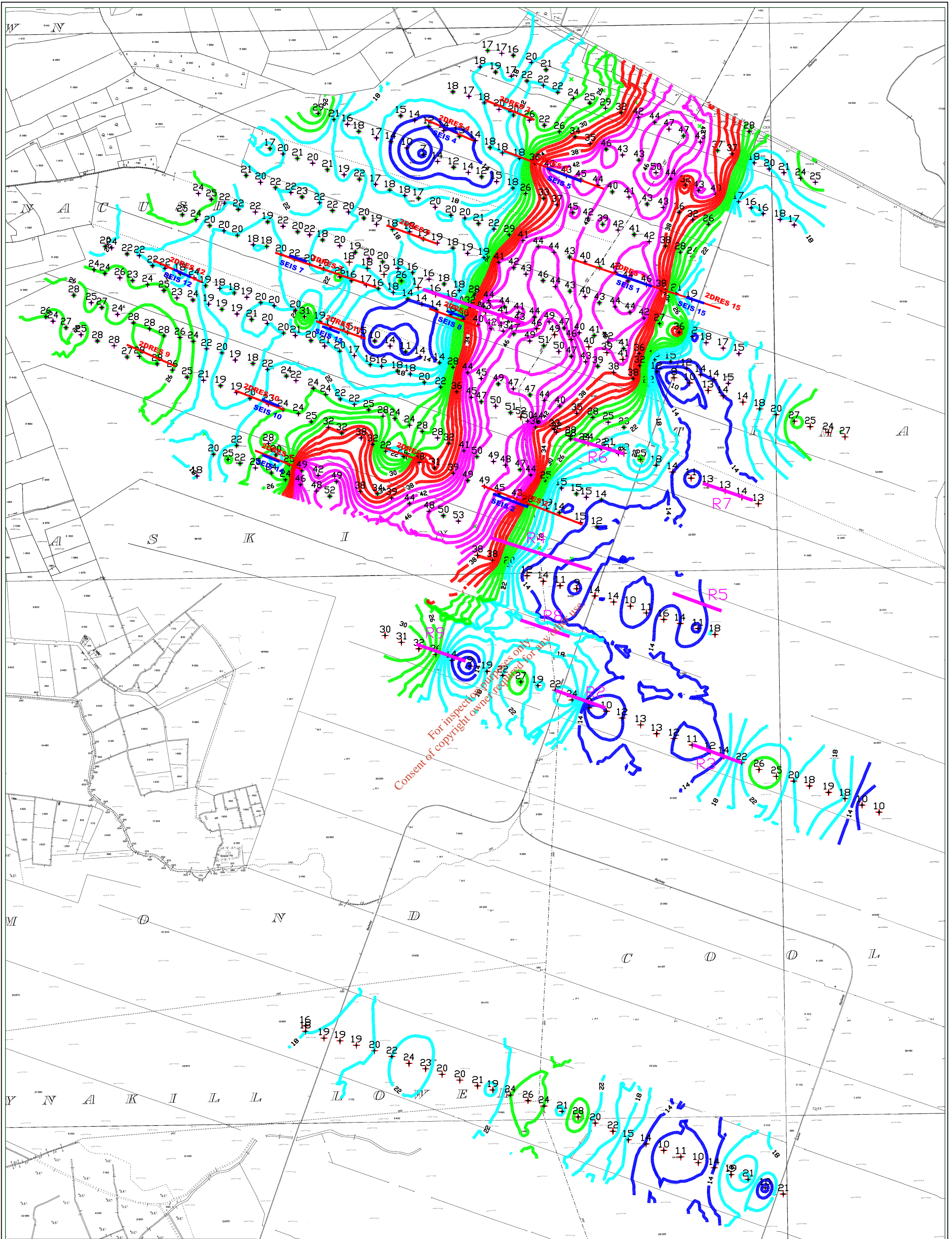
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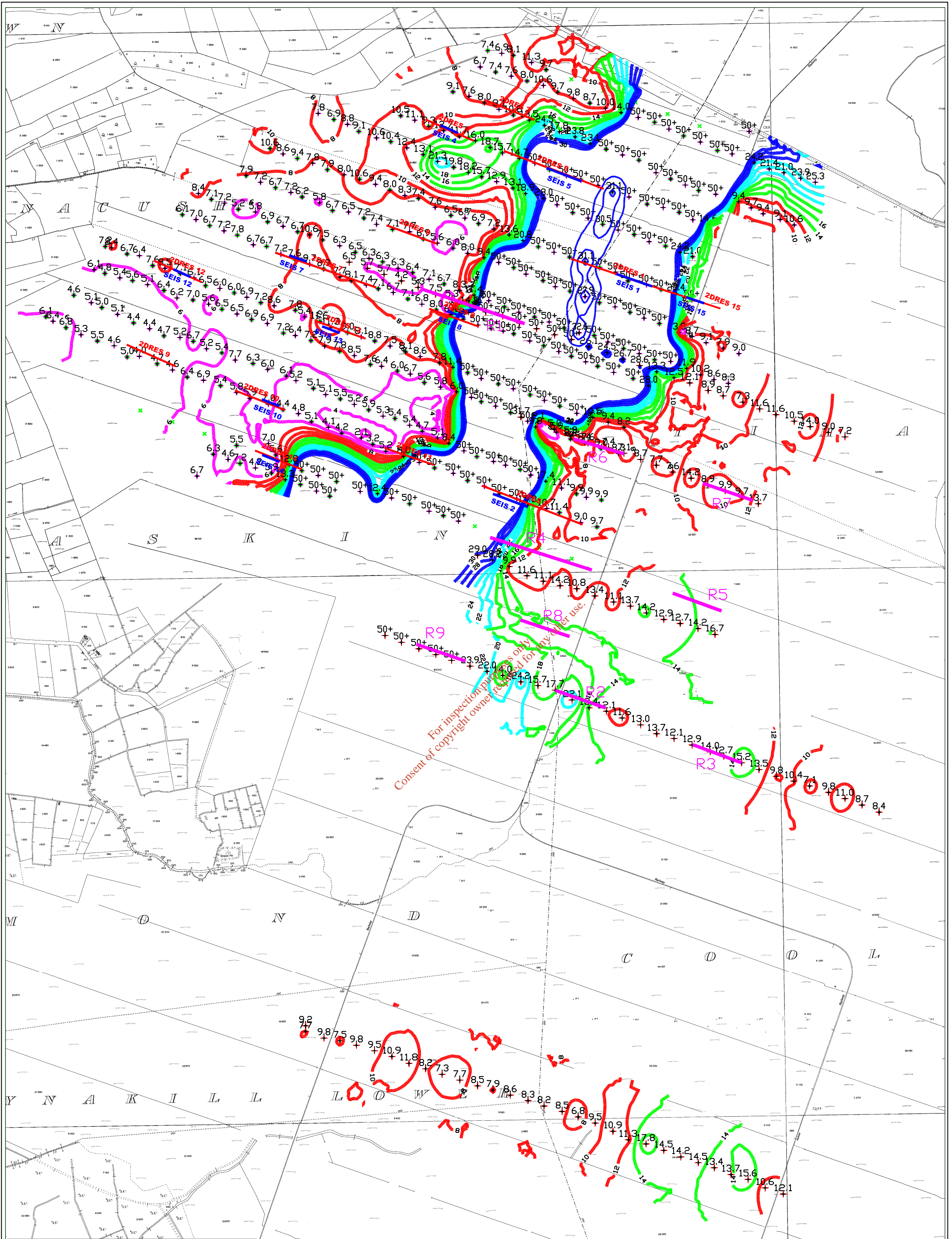
PROJECT: Proposed Landfill Site - Drehid, Co. Kildare CLIENT: TES Consulting Engineers DWG NO.: Map 3 - VLF-R Apparent Resistivity DATE: March 2003 SCALE: 1:10,000	VLF-R Location 2001	Apparent Resistivity (Ohm-m)	APEX Geoservices Ltd. Kilnerin 4 Sandyford Office Park Gorey Sandyford Industrial Estate Co. Wexford Dublin 18 Ireland Ireland Tel. 353-402-21842 Tel. 353-1-2940057 Fax. 353-402-21843 Fax. 353-1-2940756 www.apexgeoservices.ie
	VLF-R Location 2002	50-200 Ohm-m	
	2D Resistivity Profile 2001	250-400 Ohm-m	
	2D Resistivity Profile 2002	450-650 Ohm-m	
	Seismic Profile 2001	700-900 Ohm-m 950-1300 Ohm-m	



PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: Map 4 - VLF-R Phase Angle
 DATE: March 2003
 SCALE: 1:10,000

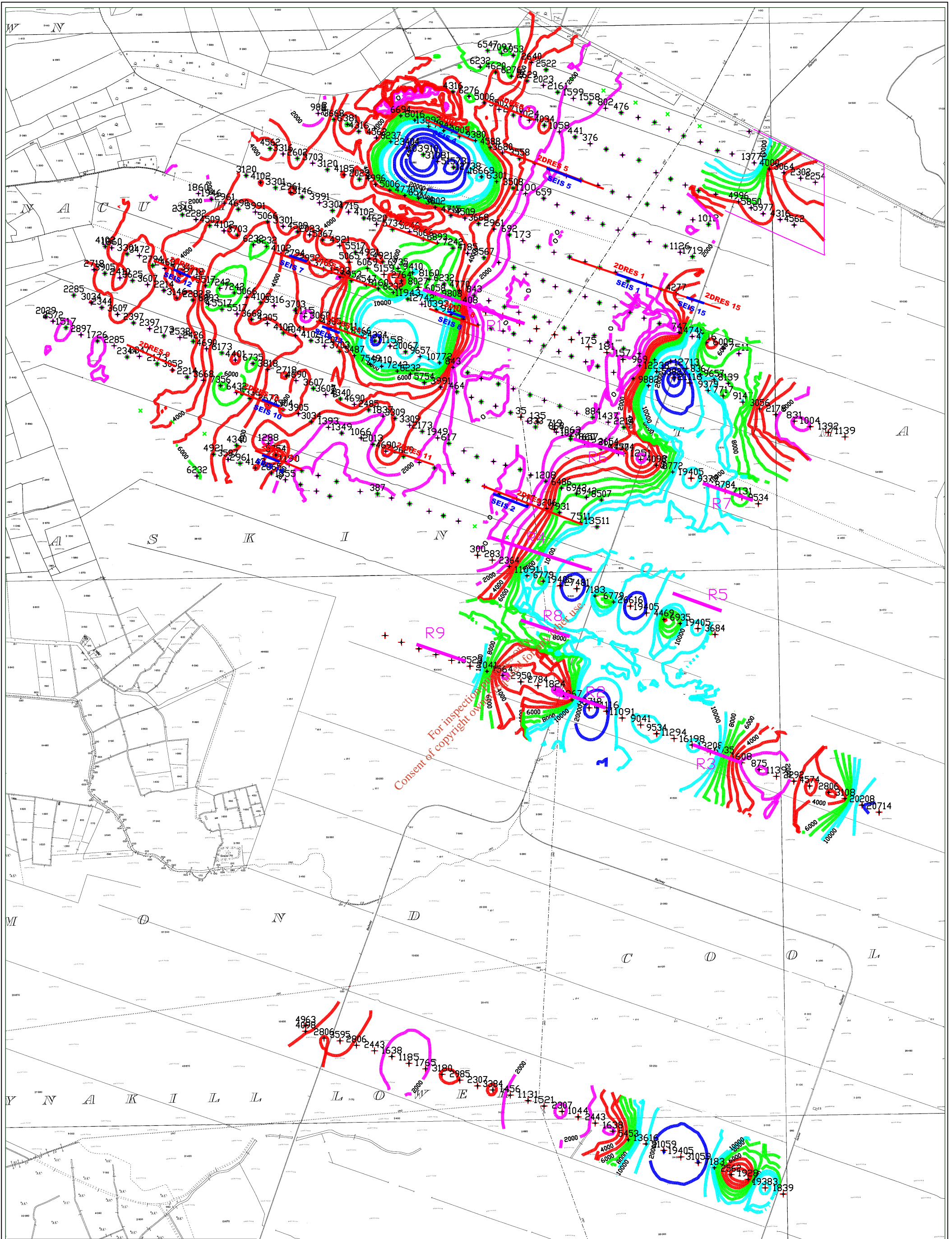
	VLF-R Location 2001	Phase Angle (degrees)
	VLF-R Location 2002	
	2D Resistivity Profile 2001	
	2D Resistivity Profile 2002	
	Seismic Profile 2001	

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<p>PROJECT: Proposed Landfill Site - Drehid, Co. Kildare</p> <p>CLIENT: TES Consulting Engineers</p> <p>DWG NO.: Map 5 - Interpreted Overburden Thickness</p> <p>DATE: March 2003</p> <p>SCALE: 1:10,000</p>	<table border="0"> <tr> <td style="vertical-align: top;"> <p>+</p> VLF-R Location 2001 <p>+</p> VLF-R Location 2002 <p>2DRES1</p> 2D Resistivity Profile 2001 <p>R1</p> 2D Resistivity Profile 2002 <p>Seis1</p> Seismic Profile 2001 </td> <td style="vertical-align: top;"> <p>Interpreted Overburden Thickness (m)</p> <p>~ 2 - 6m</p> <p>~ 8 - 12m</p> <p>~ 14-18m</p> <p>~ 20-24m</p> <p>~ 26->50m</p> </td> </tr> </table>	<p>+</p> VLF-R Location 2001 <p>+</p> VLF-R Location 2002 <p>2DRES1</p> 2D Resistivity Profile 2001 <p>R1</p> 2D Resistivity Profile 2002 <p>Seis1</p> Seismic Profile 2001	<p>Interpreted Overburden Thickness (m)</p> <p>~ 2 - 6m</p> <p>~ 8 - 12m</p> <p>~ 14-18m</p> <p>~ 20-24m</p> <p>~ 26->50m</p>	<div style="display: flex; align-items: center;"> <div> <p>APEX Geoservices Ltd.</p> <p>Kilnerin Gorey Co. Wexford Ireland</p> <p>4 Sandyford Office Park Sandyford Industrial Estate Dublin 18 Ireland</p> <p>Tel. 353-402-21842 Tel. 353-1-2940057 Fax. 353-402-21843 Fax. 353-1-2940756</p> <p>www.apexgeoservices.ie</p> </div> </div>
<p>+</p> VLF-R Location 2001 <p>+</p> VLF-R Location 2002 <p>2DRES1</p> 2D Resistivity Profile 2001 <p>R1</p> 2D Resistivity Profile 2002 <p>Seis1</p> Seismic Profile 2001	<p>Interpreted Overburden Thickness (m)</p> <p>~ 2 - 6m</p> <p>~ 8 - 12m</p> <p>~ 14-18m</p> <p>~ 20-24m</p> <p>~ 26->50m</p>			



PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: Map 6 - Interpreted Bedrock Resistivity
 DATE: March 2003
 SCALE: 1:10,000

	VLF-R Location 2001	Bedrock Resistivity (Ohm-m)
	VLF-R Location 2002	0-2000 Ohm-m
	2D Resistivity Profile 2001	3000-5000 Ohm-m
	2D Resistivity Profile 2002	6000-8000 Ohm-m
	Seismic Profile 2001	9000-15000 Ohm-m
		16000-50000 Ohm-m

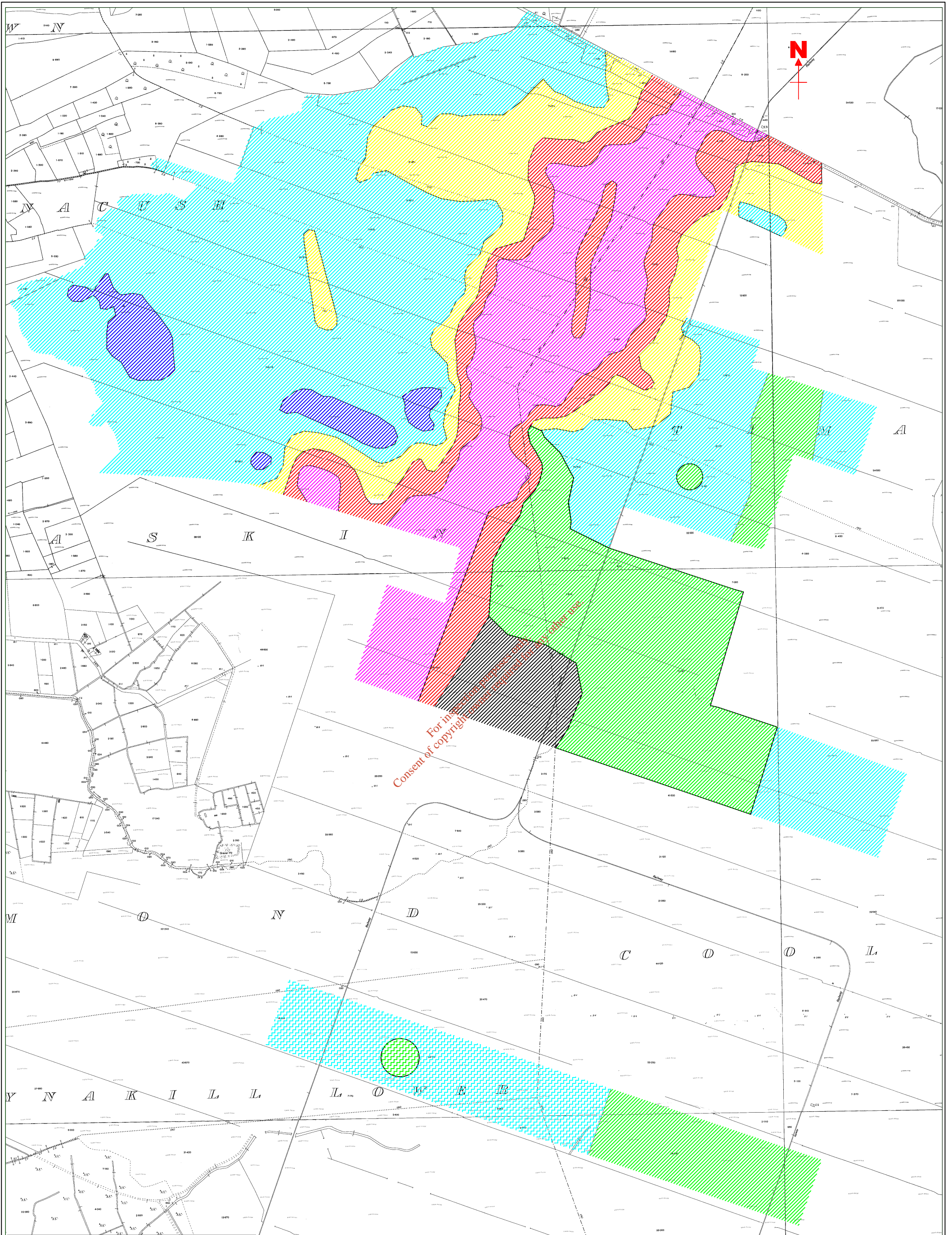
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PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: Map 7 - Summary Map
 DATE: March 2003
 SCALE: 1:10,000

	0 - 5m Overburden over Waulsortian Limestone		>50m Overburden (SSW Trending Channel)
	5 - 10m Overburden over Waulsortian Limestone		5 - 10m Overburden over Boston Hill Fm.
	10 - 15m Overburden over Waulsortian Limestone		10 - 15m Overburden over Boston Hill Fm.
	10 - 25m Overburden over Waulsortian Limestone		
	15 - 25m Overburden over Waulsortian Limestone		
	25 - 50m Overburden (SSW Trending Channel)		



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APPENDIX I GEOPHYSICAL METHODOLOGY

- M1. Methods Used**
- 1.1 VLF – Resistivity Surveying
 - 1.2 2D-Resistivity Profiling
 - 1.3 Seismic Refraction Profiling
 - 1.4 Peat Probing
- M2. Equipment Used**
- 2.1 VLF – Resistivity Surveying
 - 2.2 2D-Resistivity Profiling
 - 2.3 Seismic Refraction Profiling
 - 2.4 Peat Probing
- M3. Field Procedure**
- 3.1 VLF – Resistivity Surveying
 - 3.2 2D-Resistivity Profiling
 - 3.3 Seismic Refraction Profiling
 - 3.4 Peat Probing
- M4. Data Processing**
- 4.1 VLF – Resistivity Surveying
 - 4.2 2D-Resistivity Profiling
 - 4.3 Seismic Refraction Profiling
 - 4.4 Peat Probing

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M1. Methods Used

1.1 VLF – Resistivity Surveying

The VLF-R method determines subsurface apparent resistivity values by measuring the horizontal magnetic and vertical electrical components of waves transmitted by high-power military communications transmitters which operate in the 15-25kHz frequency band.

1.2 2D-Resistivity Profiling

The resistivity surveying technique used for the survey makes use of the Wenner resistivity array whereby four electrodes are placed in a line in the ground and a current is passed through the two outer electrodes. The potential difference is measured across the two inner electrodes. The measured potential is divided by the current value to obtain the resistance. The resistivity is determined from the resistance using the following formula: $\text{Resistivity} = \text{Resistance} \times 2 \times \pi \times \text{Spacing}$.

The 2D-Resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. The 2D-Resistivity profiling method involves the use of 32 to 64 electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

1.3 Seismic Refraction Profiling

This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

1.4 Peat Probing

The thickness of the peat is measured as 1m steel rods are pushed to refusal in the overburden.

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M2. Equipment Used

2.1 VLF – Resistivity Surveying

The VLF-R survey was carried out from the 26th November to the 12th December, 2001 and the 11th to the 13th November, 2002 using a Geonics EM-16R VLF meter and a 10m shielded cable. All readings were surveyed to give Irish National Grid Co-ordinates using a handheld Garmin 12XL .

2.2 2D-Resistivity Profiling

The profiles were recorded from the 5th to the 8th December, 2001 and the 12th to the 14th November, 2002 using a Tigre resistivity meter, imaging software, two 32 takeout multicore cables and 64 stainless steel electrodes. The recorded data were processed and viewed immediately after the survey.

2.3 Seismic Refraction Profiling

The data were recorded using a Geode 12 channel seismograph with geophone spacings of 5m and 10m. The sources used to generate the seismic waves were a sledgehammer and plate and a buffalo gun. A total of eleven seismic spreads were recorded from the 10th to the 14th December, 2001.

2.4 Peat Probing

Peat thicknesses were measured using a Hillerborer probe with a 35cm sampler at the base. This enabled recovery of a 35 cm sample from the base of the probe. The probing was carried out from the 28th to the 6th Decembe, 2001r.

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M3. Field Procedure

3.1 VLF – Resistivity Surveying

Readings were taken at 50m intervals along three 1.5km long lines. After assessing the results obtained for the three lines a further two lines of data, 0.75km in length were recorded with readings at 50m intervals. VLF-R readings were taken at a total of 120 locations.

To obtain the readings the 10m shielded cable is attached to the VLF-R meter and aligned towards the transmitter (GBR). A 'null' is obtained by adjusting controls to determine the subsurface resistivity and phase shift. Local conditions and variations were noted.

3.2 2D-Resistivity Profiling

Profiles were recorded at locations based on the findings of the VLF-R survey.

The 2D-Resistivity profiles have the following recording parameters:

Profile	Electrodes	Spacing	Length	Depth of Investigation	Azimuth
No.	No.	(m)	(m)	(m)	
1	64	5	315	50	NW-SE
2	32	5	155	30	NW-SE
3	32	5	155	30	NW-SE
4	64	5	315	40	NW-SE
5	32	5	155	30	NW-SE
6	32	5	155	30	SE-NW
7	32	5	155	30	NW-SE
8	32	5	155	30	NW-SE
9	32	5	155	20	NW-SE

3.3 Seismic Refraction Profiling

Profiles were recorded at locations based on the findings of the VLF-R and 2D-Resistivity surveys and on the available geological data. At least five shots were recorded per seismic spread. The geophone spacings of 5m and 10m and shot offsets were determined by the depth to rock as indicated by the VLF-R and 2D-Resistivity data.

3.4 Peat Probing

Probes were carried out on a 100m x 100m grid at a total of 205 locations.

M4. Data Processing

4.1 VLF – Resistivity Surveying

The 2-layer Greissman-Reitmayer algorithm was applied to the recorded resistivity and phase shift values to calculate the overburden thickness and bedrock resistivity. Possible material types and properties were assigned based on the geophysical and geological data and on surveying experience.

Contoured plots of interpreted overburden thickness and bedrock resistivity were produced. The results are shown on Maps 3 to 6.

4.2 2D-Resistivity Profiling

The field readings were stored in computer files and inverted using the RES2DINV package (Campus Geophysical Instruments, 1997) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-Depth model of the resistivities.

The inverted 2D-Resistivity models and corresponding interpreted geology are displayed in Appendices II and III. The chainage is indicated along the horizontal axis of the profile and the depth below ground level is indicated on the vertical axis. All profiles have been contoured using the same contour intervals and colour codes.

It is important to note that the data displayed on the 2D-Resistivity profiles is real physical data however interpretation of the geophysical results is required to transform the resistivities directly into geological layers.

4.3 Seismic Refraction Profiling

First breaks are picked and the traveltimes adjusted. This data is then processed and interpreted using software that applies the ray-tracing and intercept time methods to determine the subsurface layer thicknesses and velocities.

Possible material types and properties are assigned based on the geophysical and geological data and on surveying experience. Scaled plates are produced for each spread showing the interpreted depth section with a corresponding geological interpretation.

The results are contained in Appendix IV and the thickness estimates are also plotted at the relevant locations on January 2002 2DRES1-15.

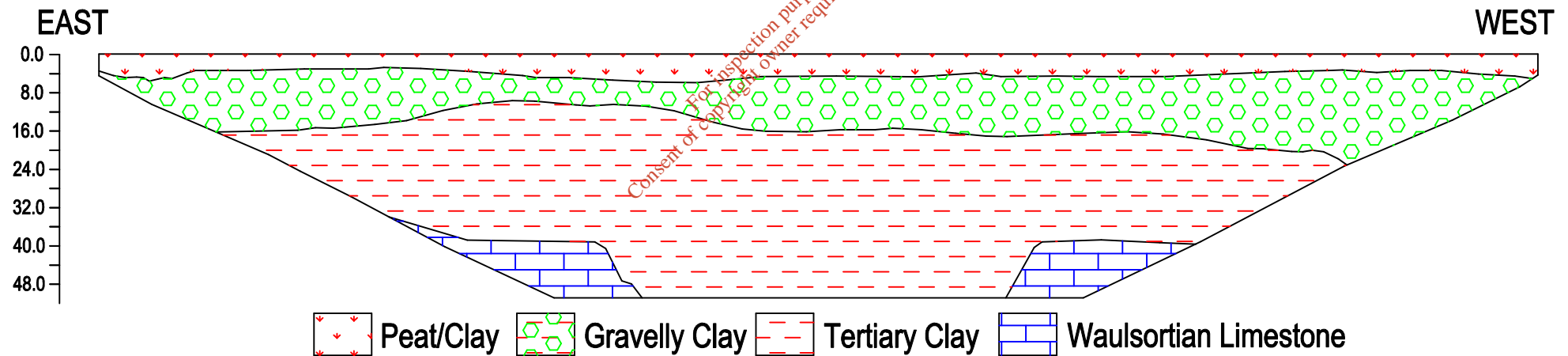
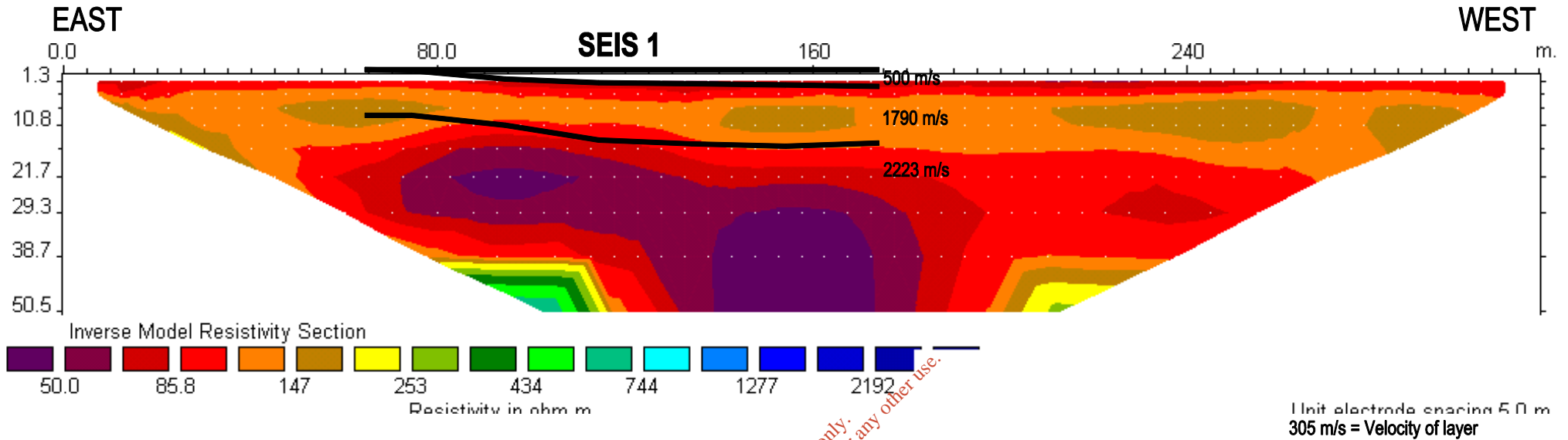
4.4 Peat Probing

The peat thicknesses as indicated by the probes were incorporated into the VLF-R calculations to obtain a ground model of the site. A contour plot of peat thickness across the site is contained in Appendix V.

APPENDIX II JANUARY 2002 2D RESISTIVITY PROFILES

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2DRES PROFILE 1

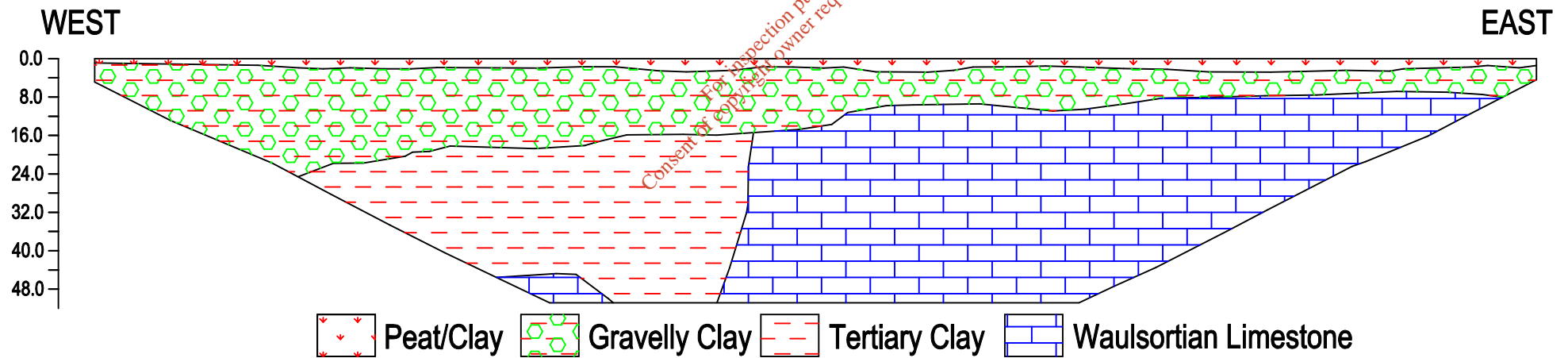
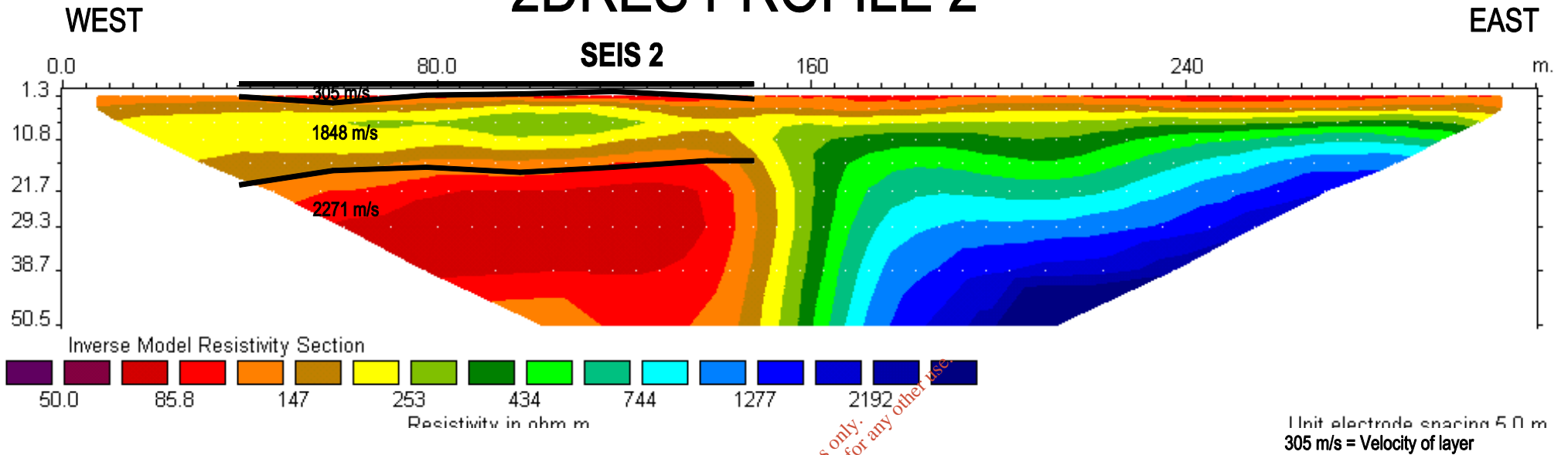


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 1
 DATE: January 2002
 SCALE: 1:1250

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2DRES PROFILE 2

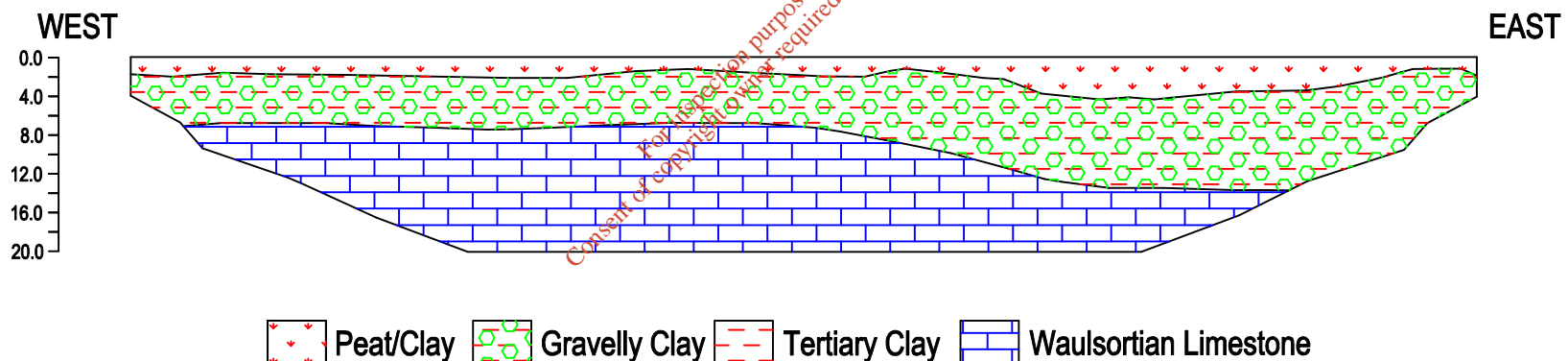
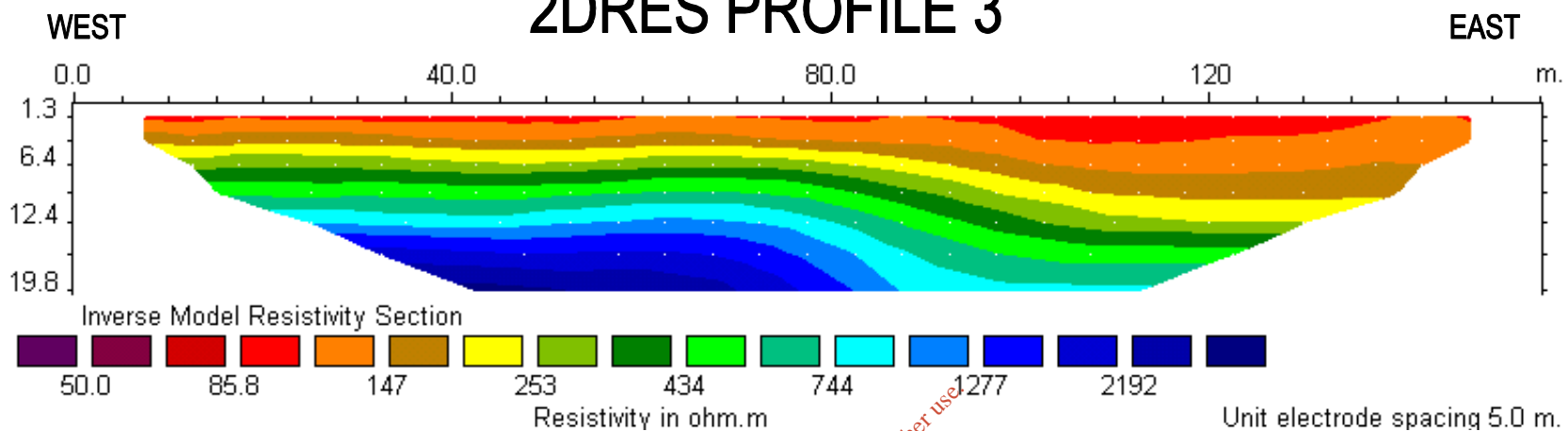


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 2
 DATE: January 2002
 SCALE: 1:1250

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2DRES PROFILE 3



PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 3
 DATE: January 2002
 SCALE: 1:750

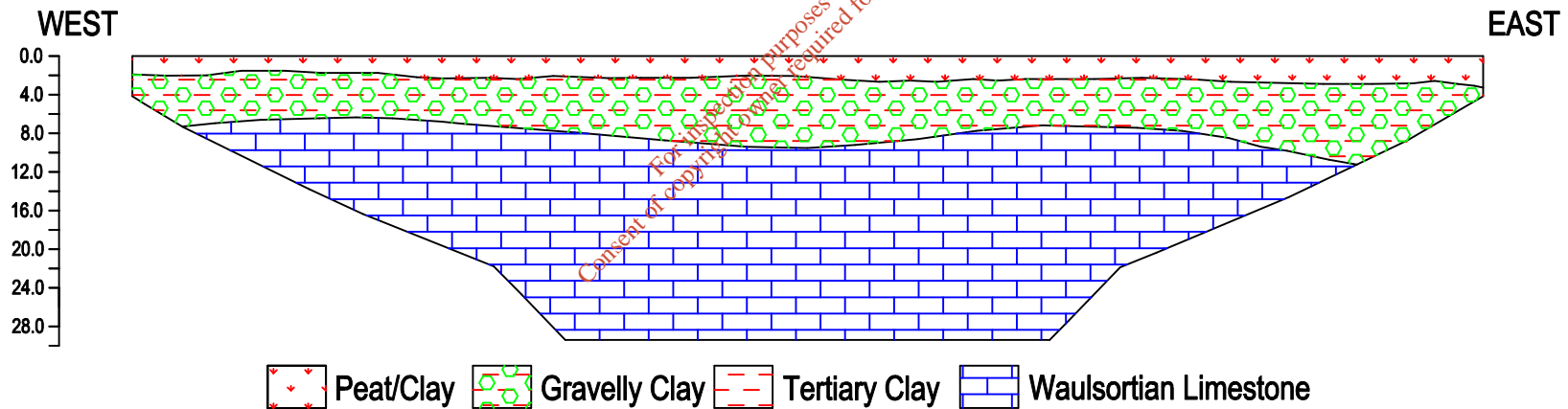
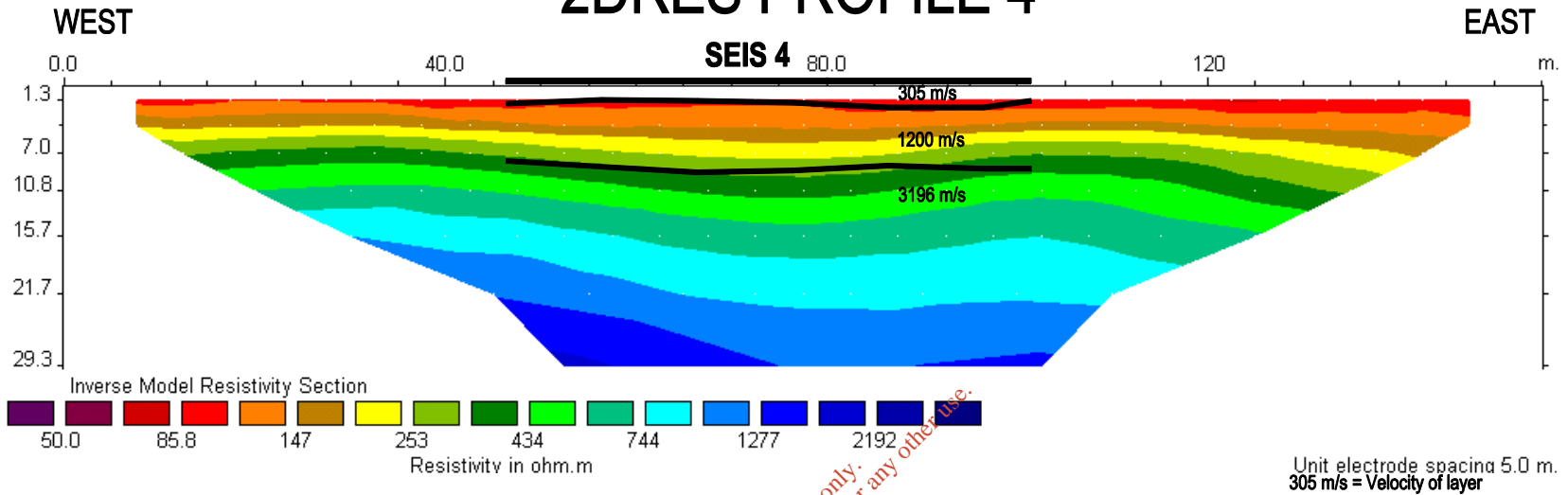


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2DRES PROFILE 4



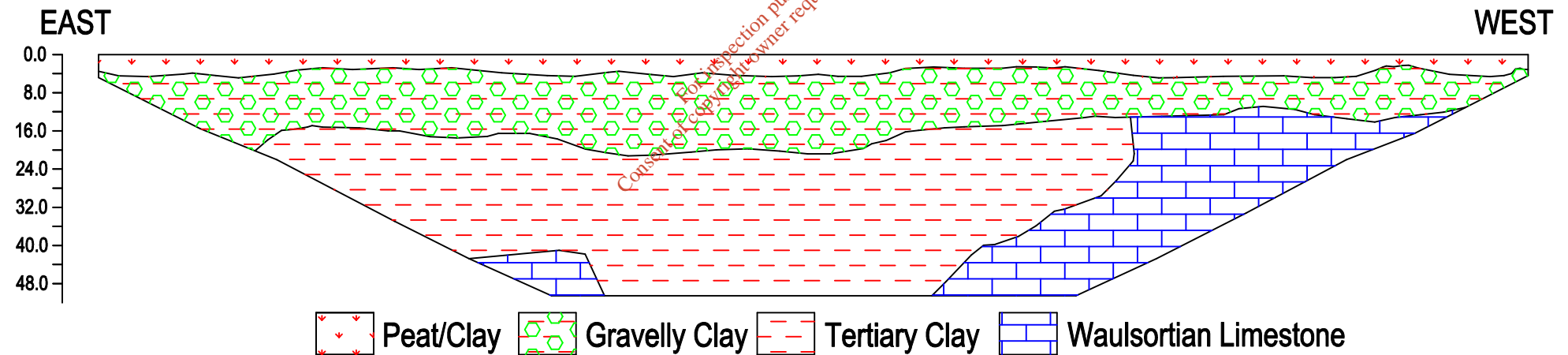
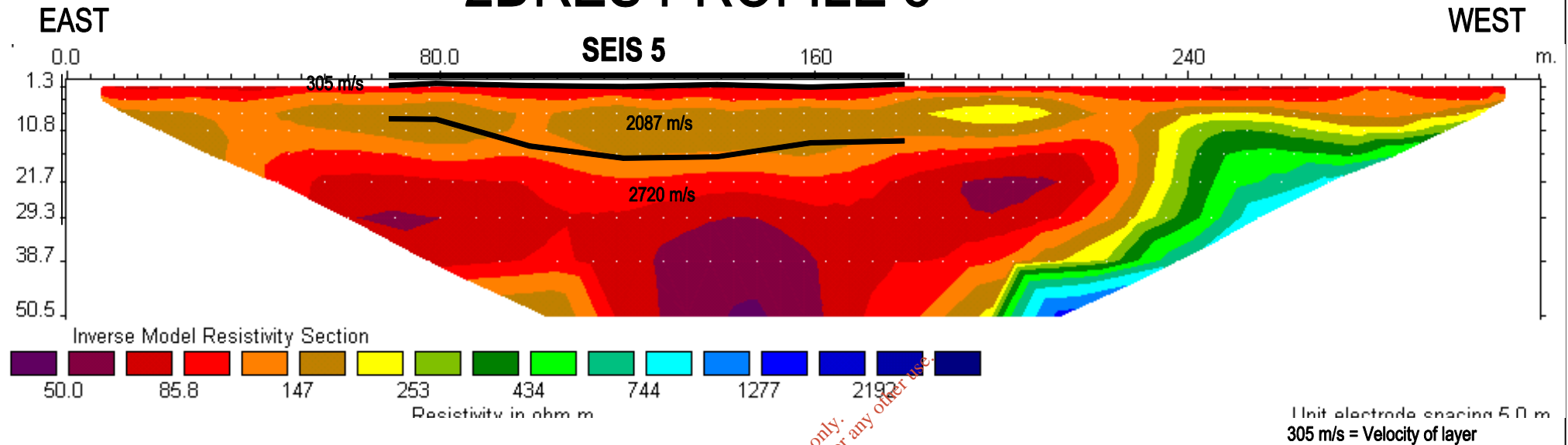
PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 4
 DATE: January 2002
 SCALE: 1:750



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2DRES PROFILE 5

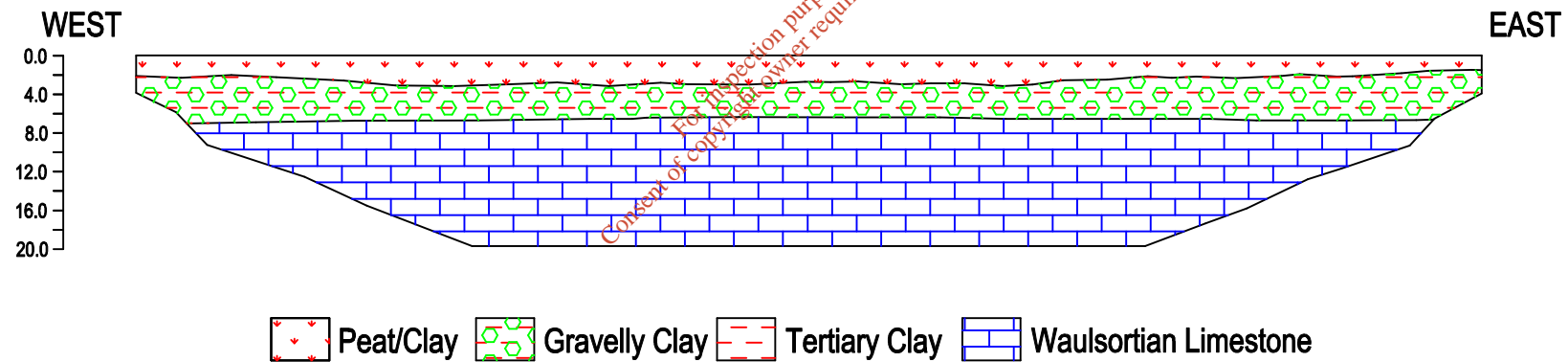
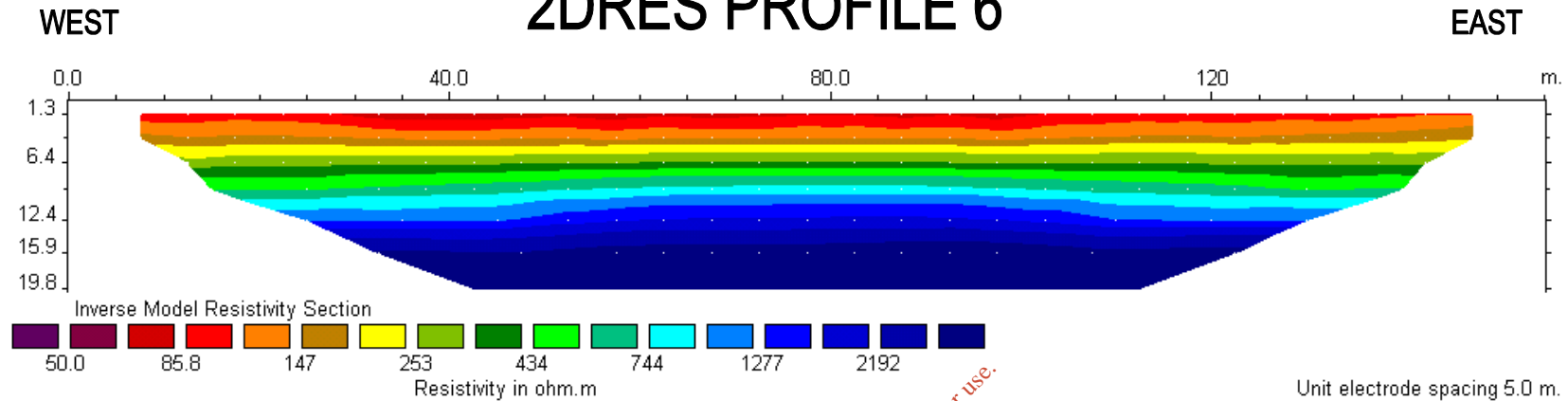


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 5
 DATE: January 2002
 SCALE: 1:1250

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2DRES PROFILE 6



PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 6
 DATE: January 2002
 SCALE: 1:750

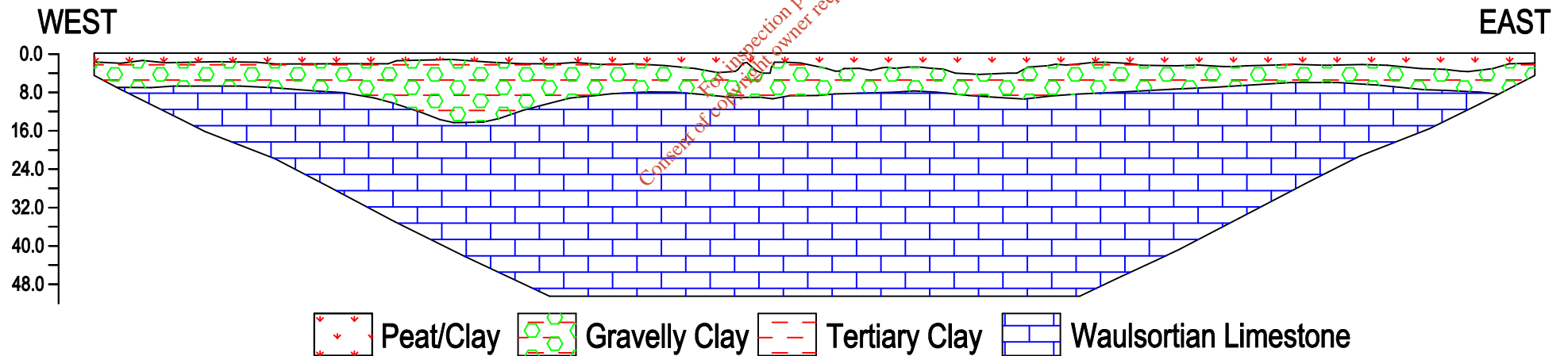
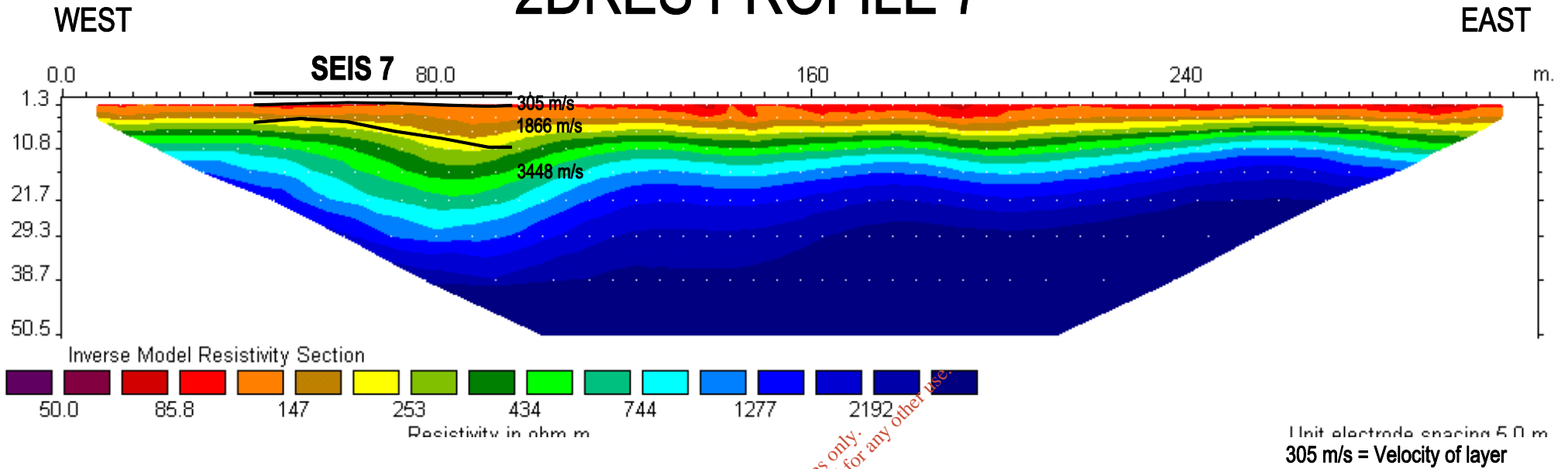


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2DRES PROFILE 7

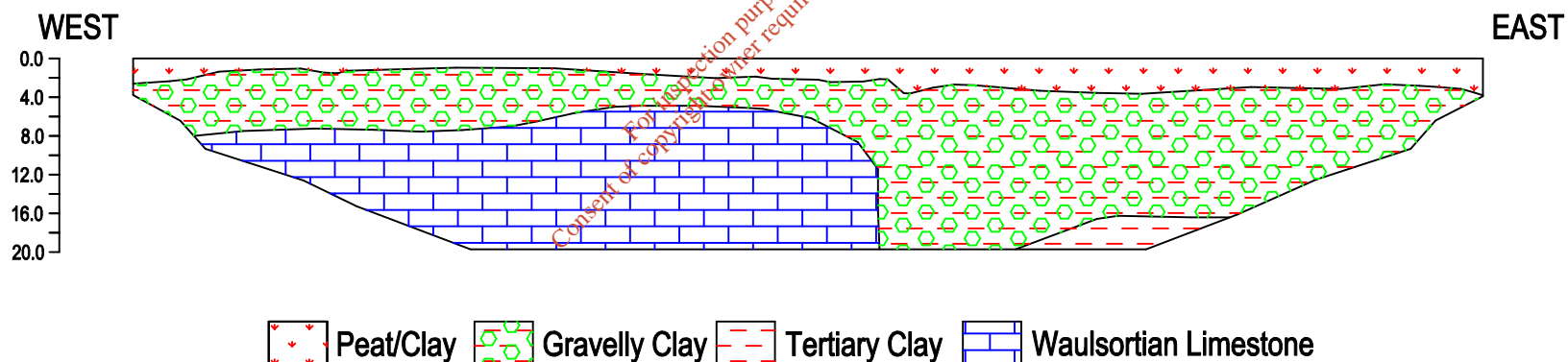
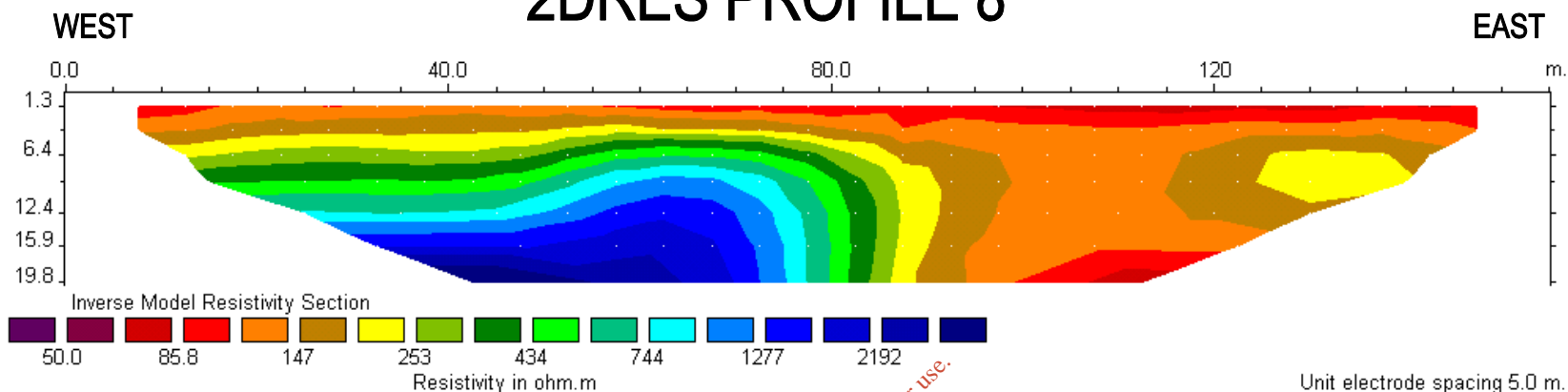


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 7
 DATE: January 2002
 SCALE: 1:1250

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2DRES PROFILE 8

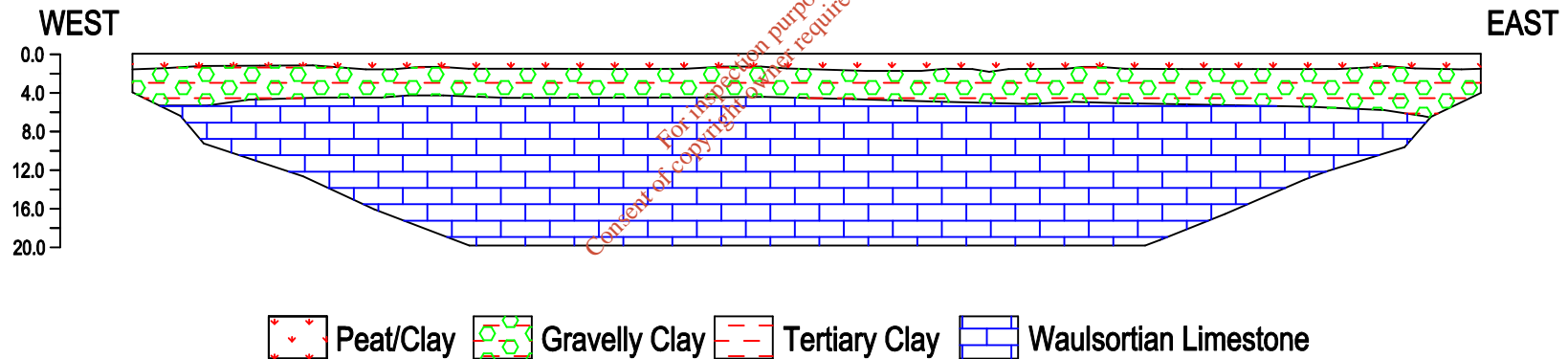
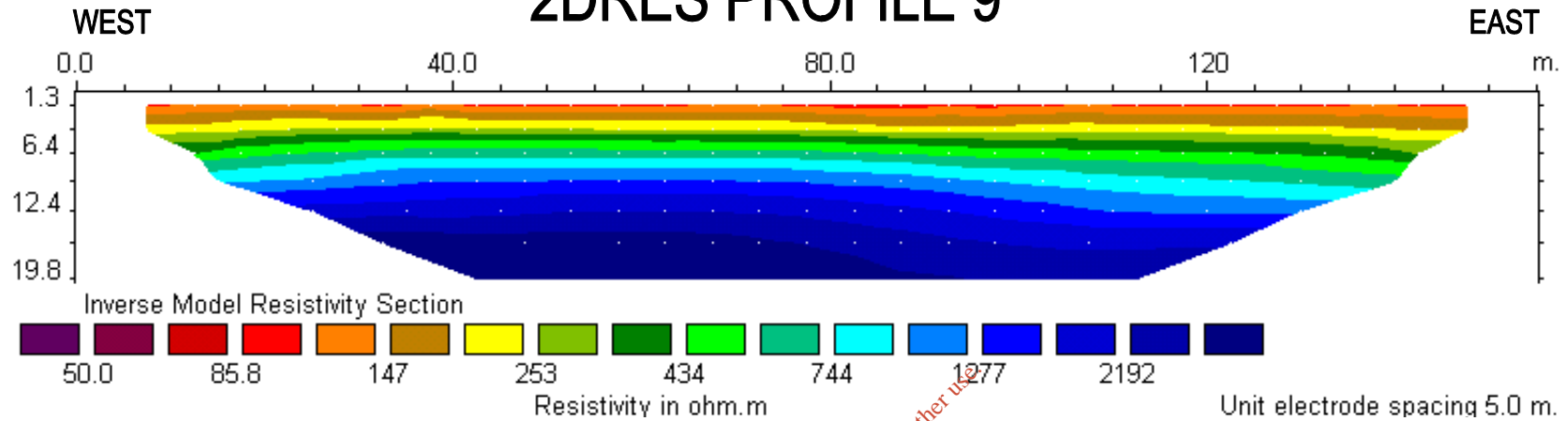


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 8
 DATE: January 2002
 SCALE: 1:750

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2DRES PROFILE 9

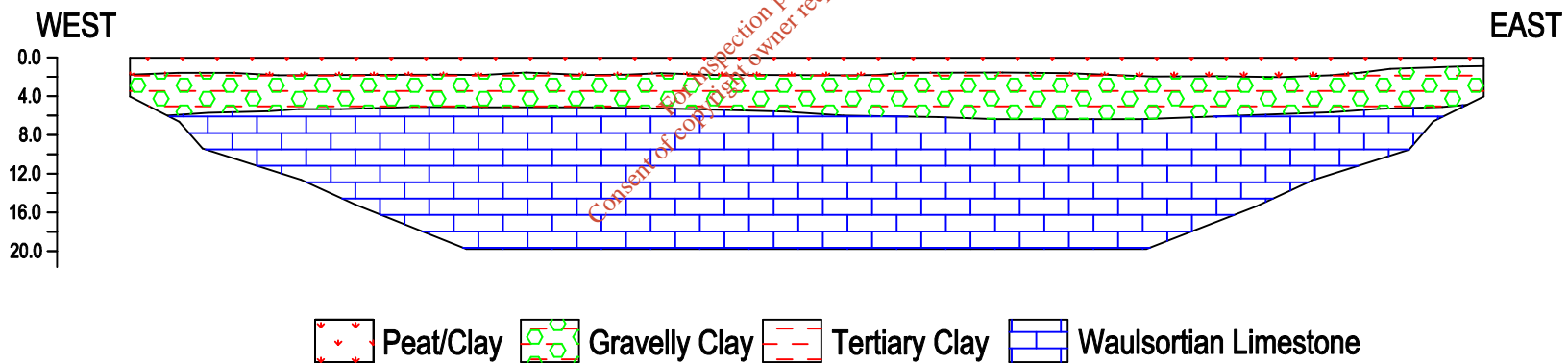
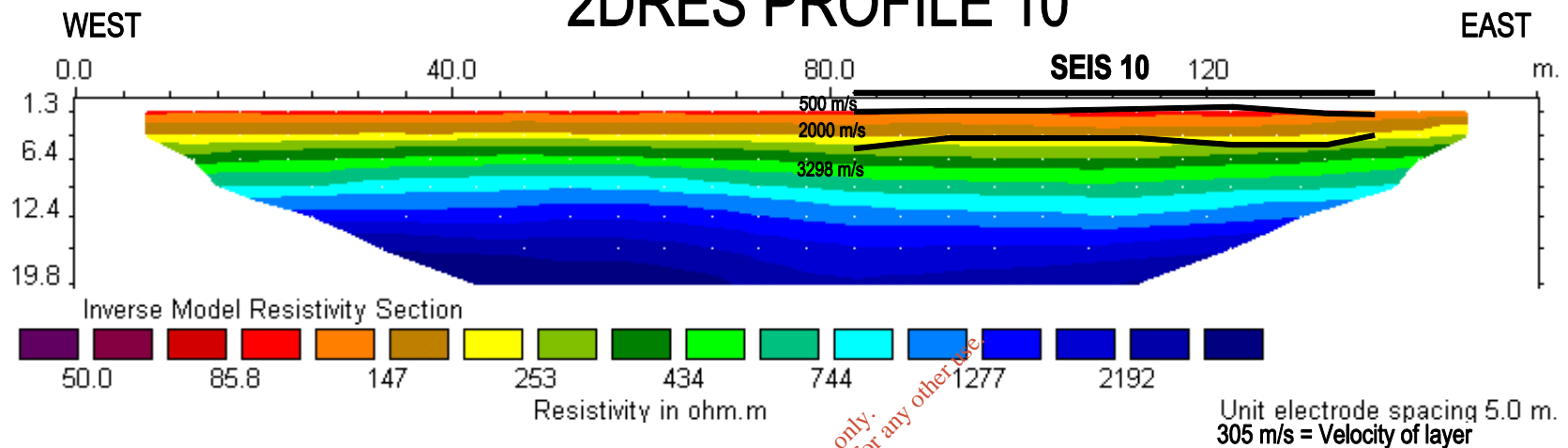


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 9
 DATE: January 2002
 SCALE: 1:750

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2DRES PROFILE 10

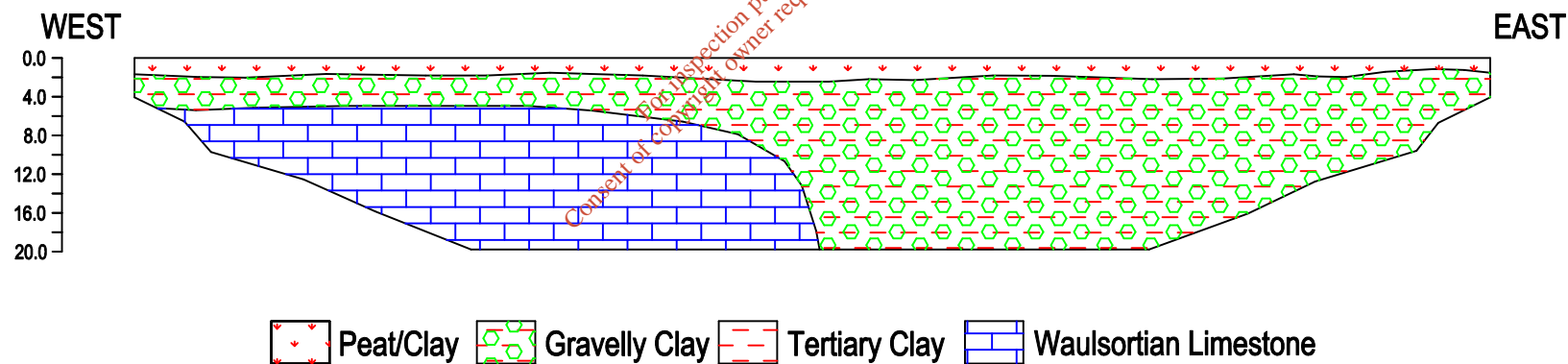
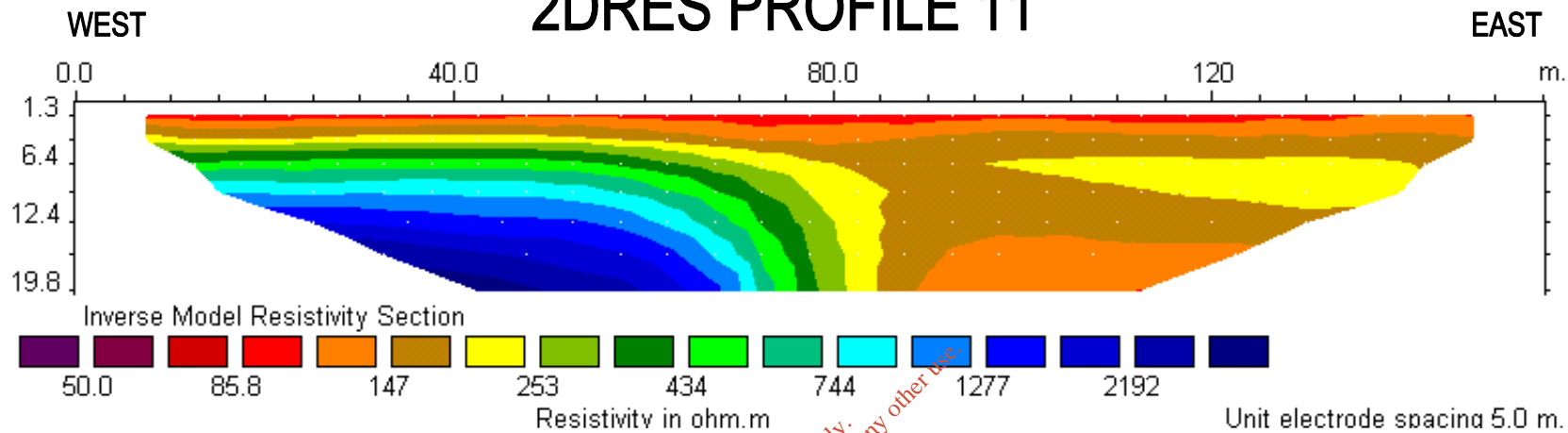


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 10
 DATE: January 2002
 SCALE: 1:750

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2DRES PROFILE 11

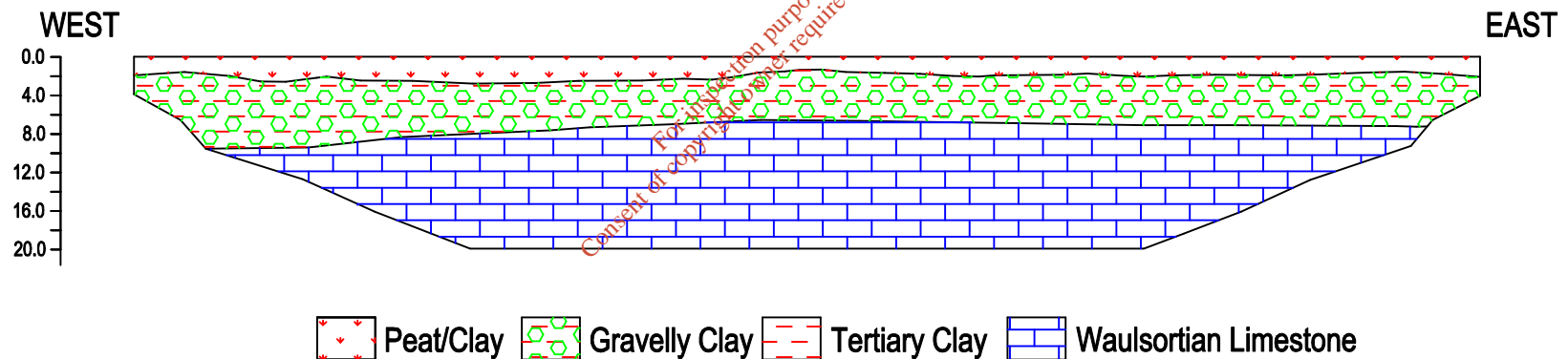
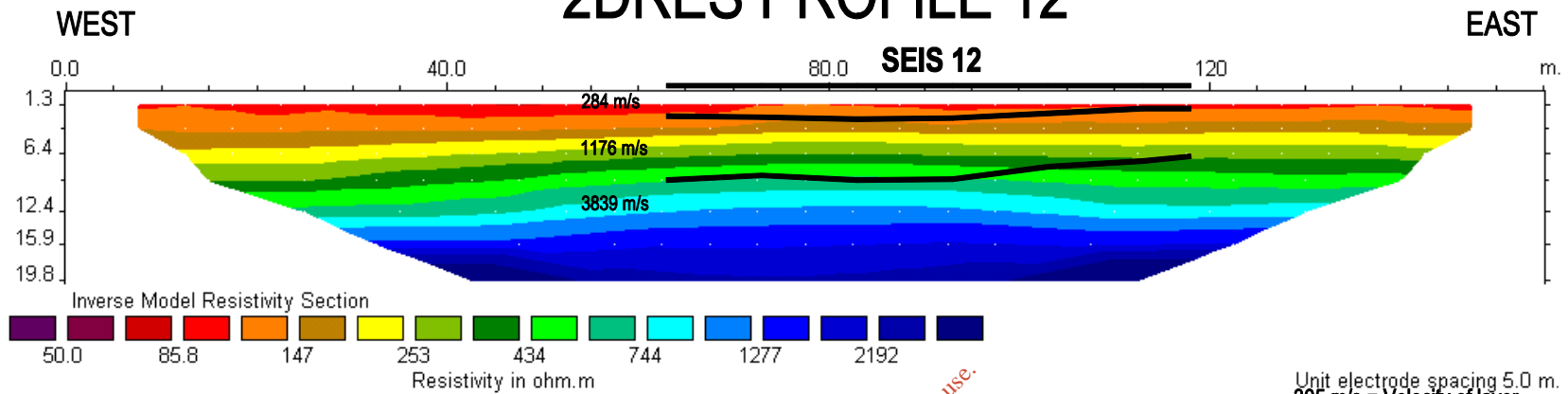


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 11
 DATE: January 2002
 SCALE: 1:750

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2DRES PROFILE 12



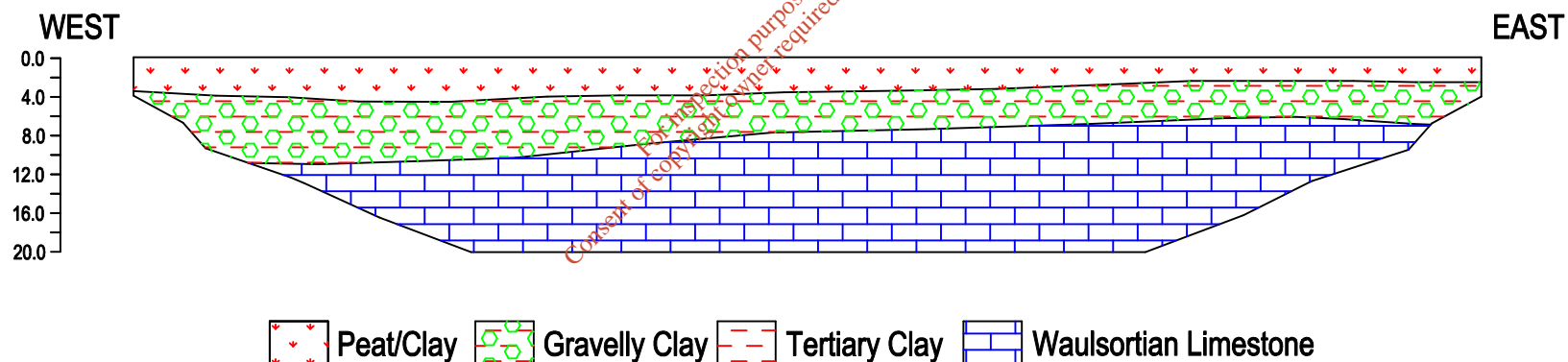
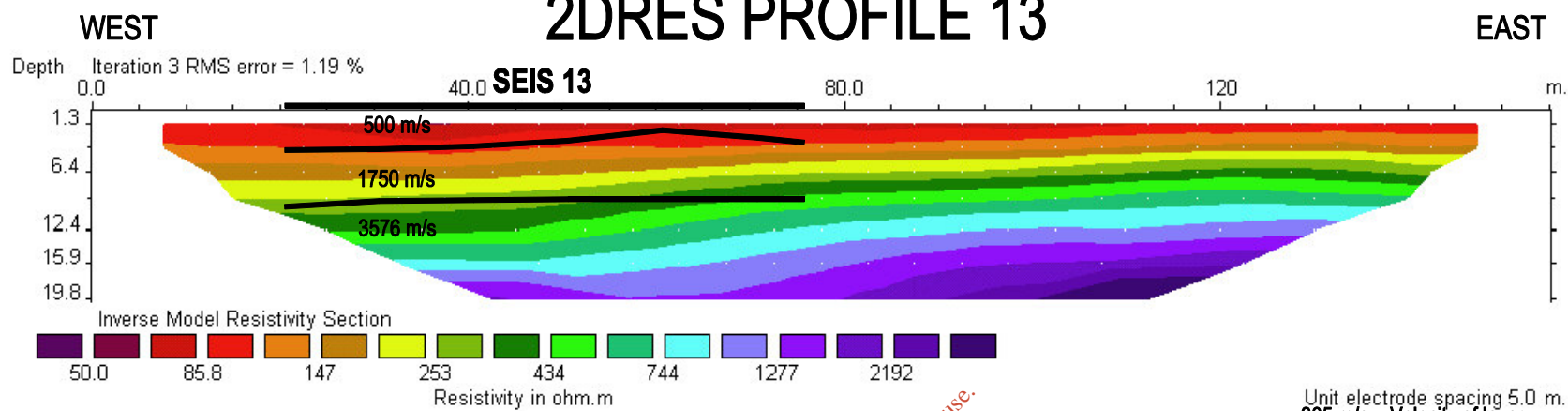
PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 12
 DATE: January 2002
 SCALE: 1:750



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2DRES PROFILE 13

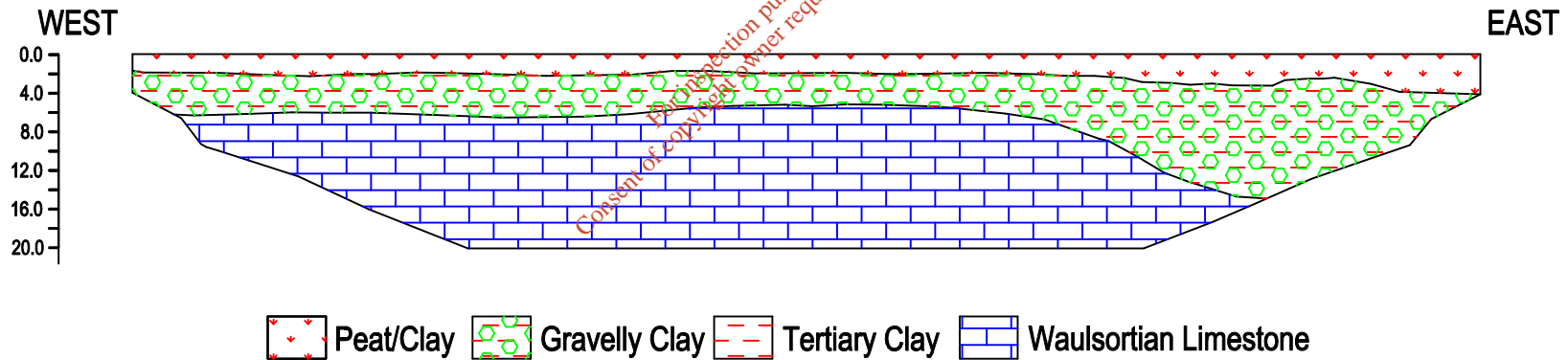
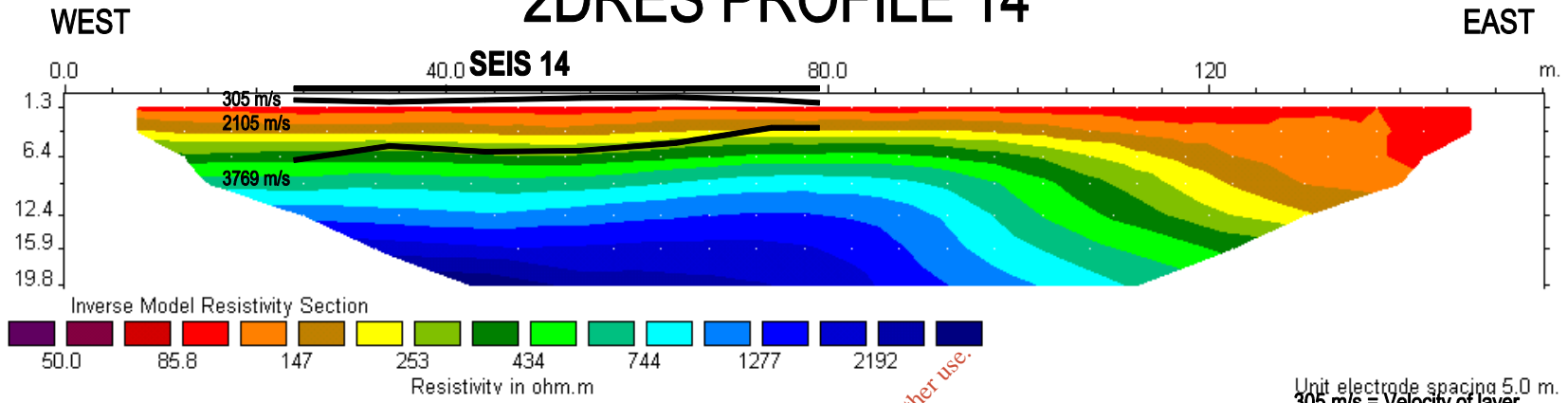


PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 13
 DATE: January 2002
 SCALE: 1:750

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2DRES PROFILE 14



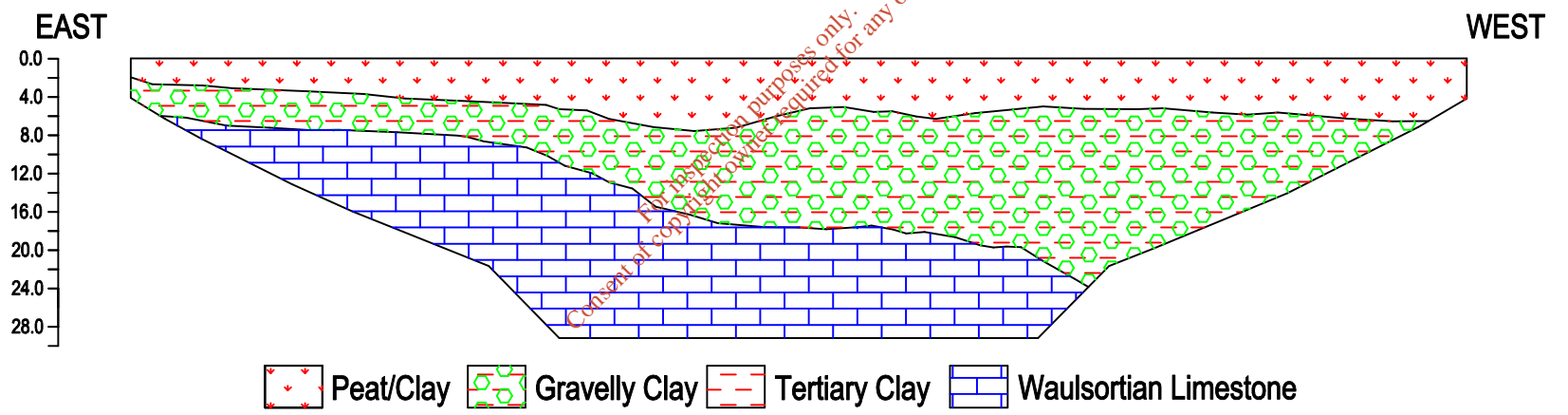
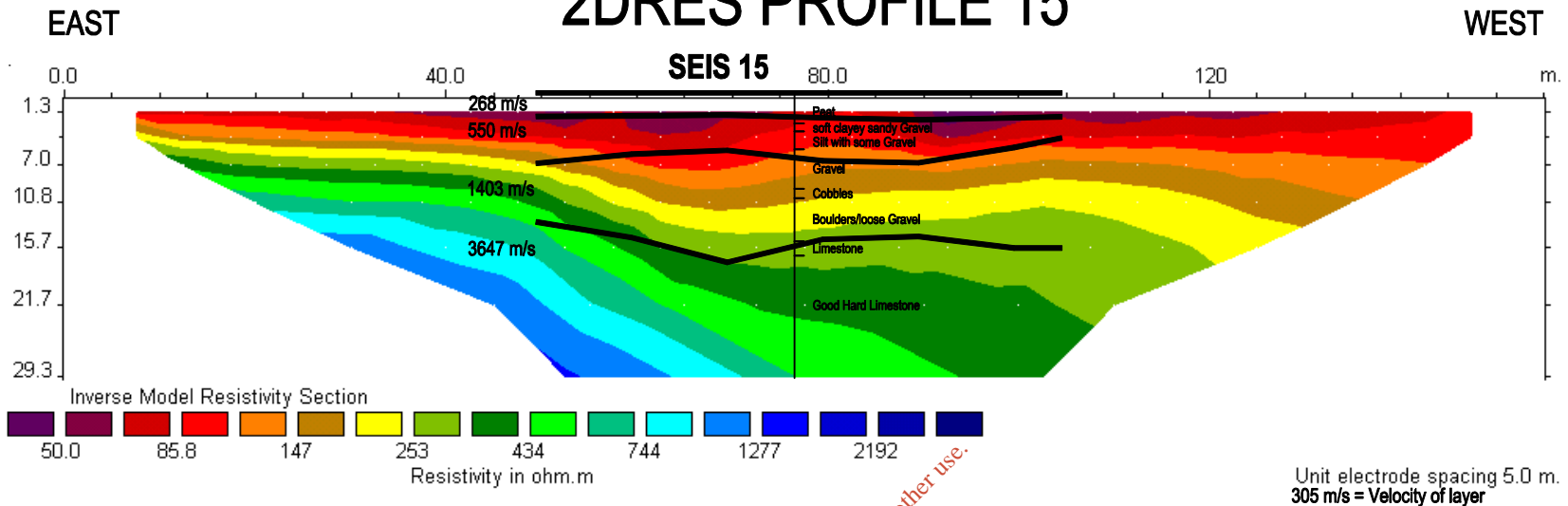
PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 14
 DATE: January 2002
 SCALE: 1:750



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2DRES PROFILE 15



PROJECT: Geophysical Survey, Drehid, Co. Kildare
 CLIENT: Kildare County Council
 DWG NO.: Section 15
 DATE: January 2002
 SCALE: 1:750



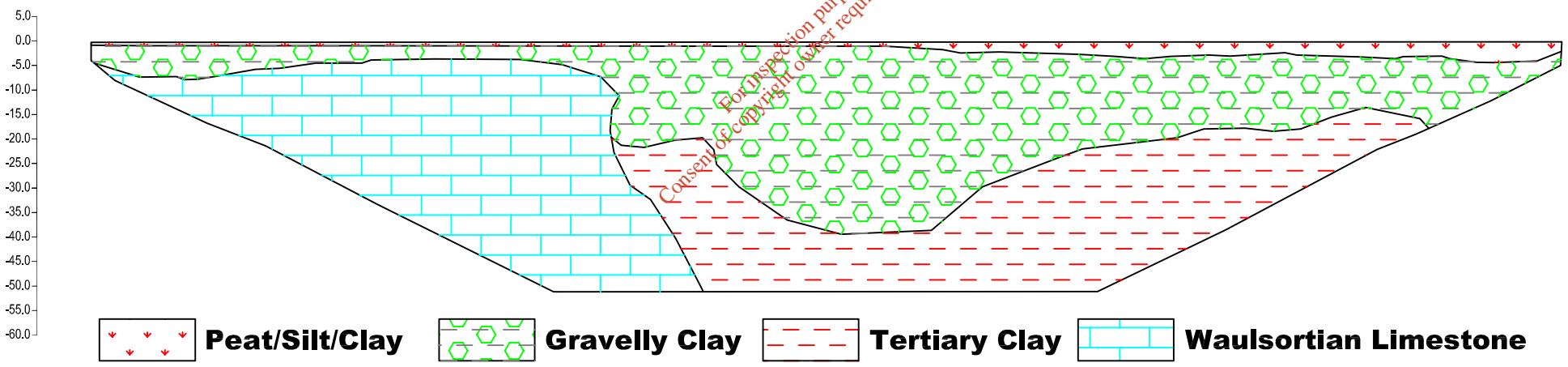
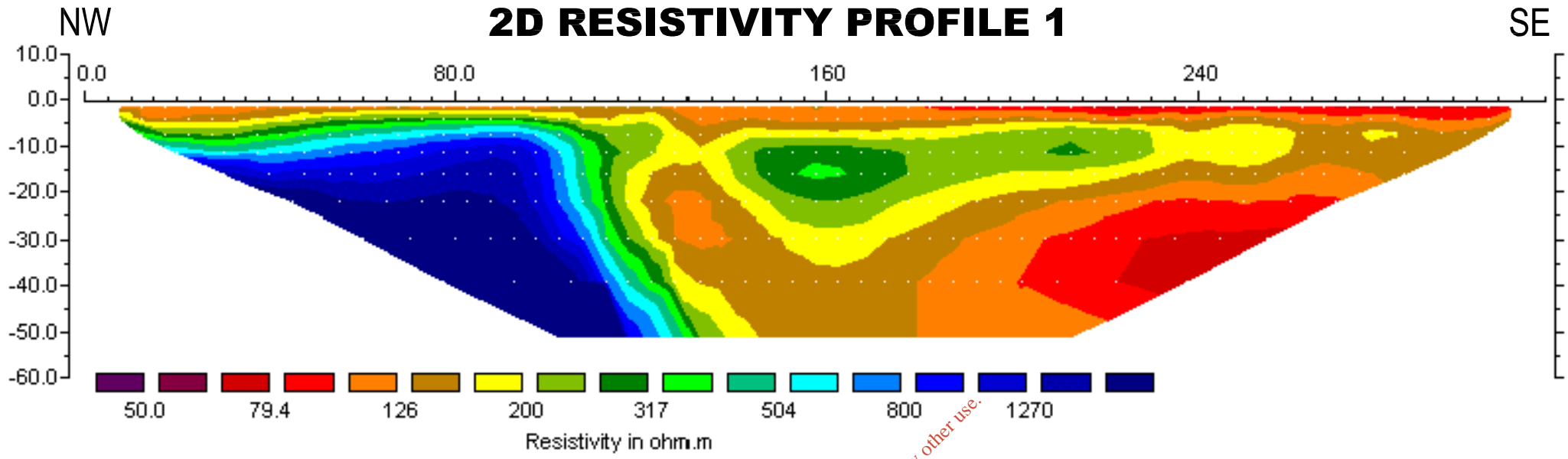
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APPENDIX III NOVEMBER 2002 2D RESISTIVITY PROFILES

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2D RESISTIVITY PROFILE 1

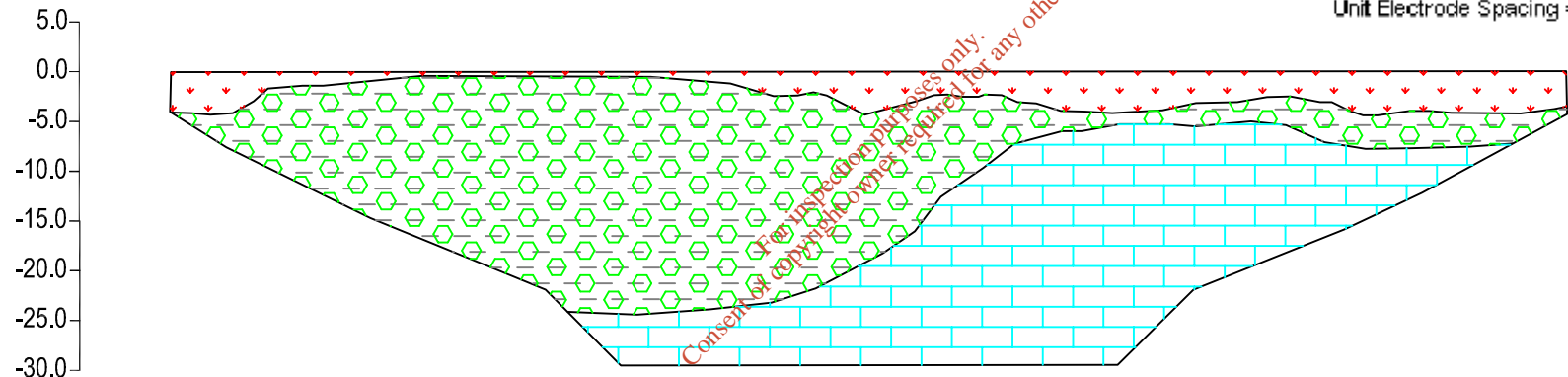
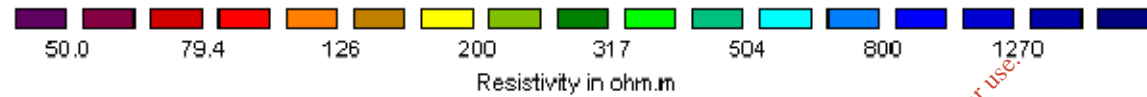
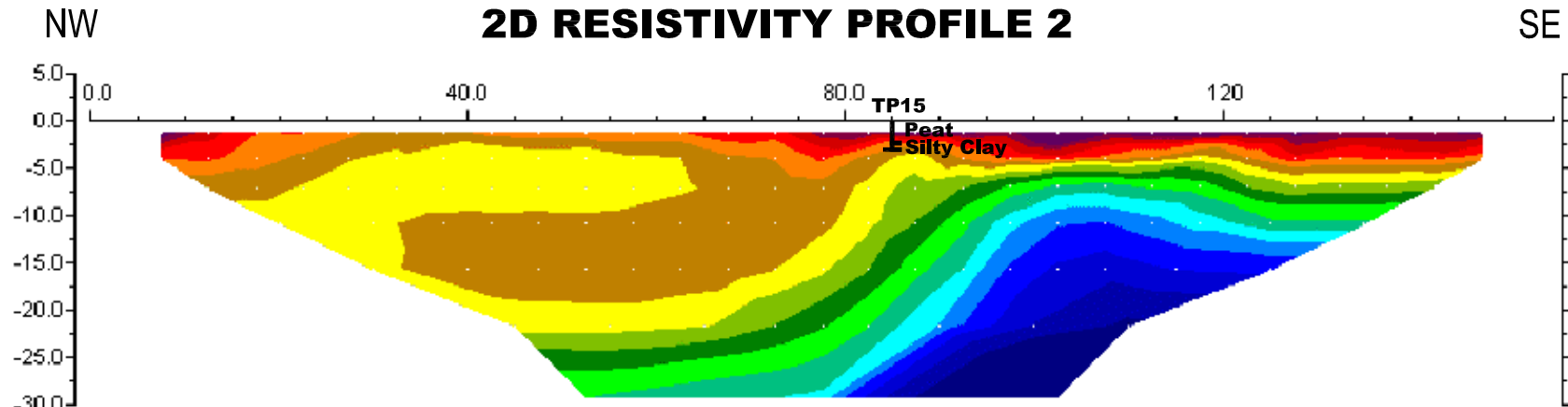


PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: 2D Resistivity Profile 1
 DATE: November 2002
 SCALE: 1:1250



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Peat/Silt/Clay

Gravelly Clay

Tertiary Clay

Waulsortian Limestone

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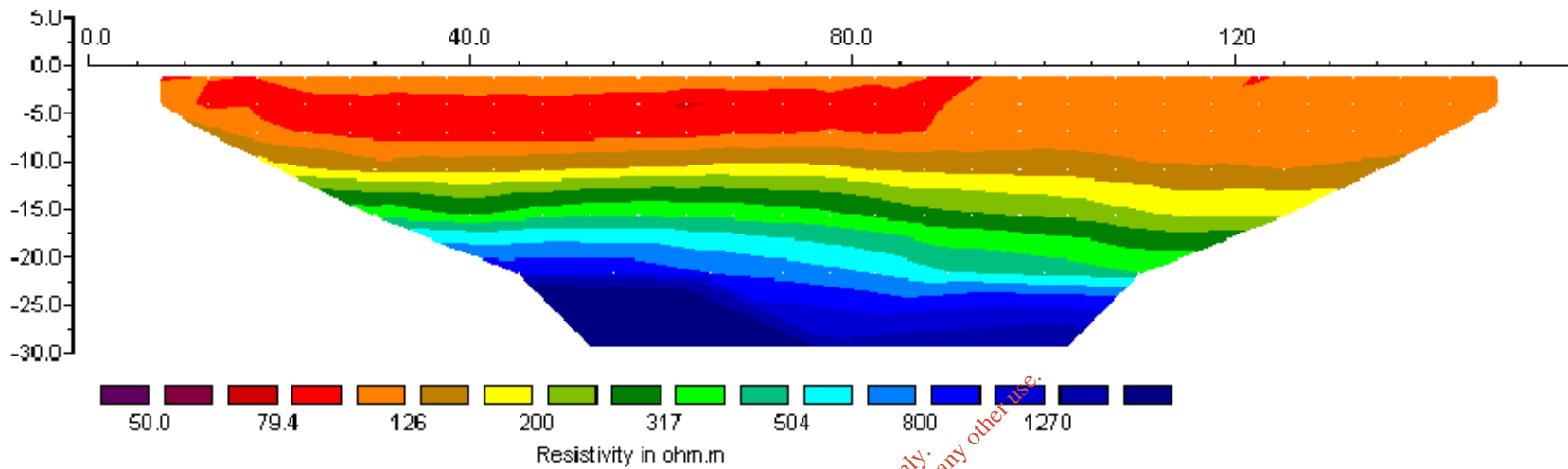
PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: 2D Resistivity Profile 2
 DATE: January 2003
 SCALE: 1:750

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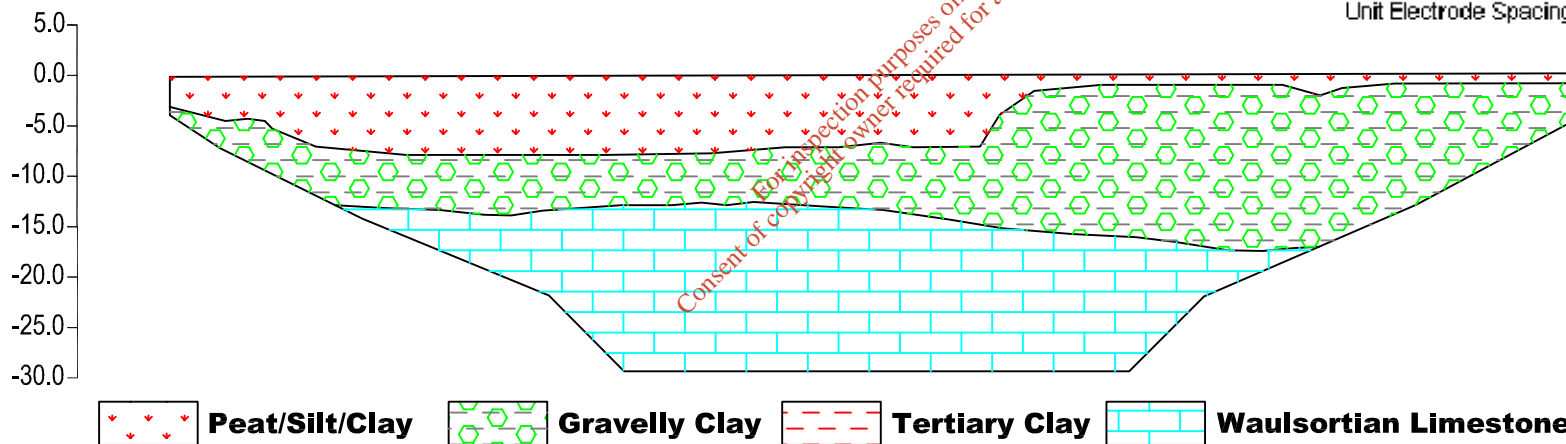
NW

2D RESISTIVITY PROFILE 3

SE



Unit Electrode Spacing = 5.0 m.



Peat/Silt/Clay
 Gravelly Clay
 Tertiary Clay
 Waulsortian Limestone

PROJECT: Proposed Landfill Site - Drehid, Co. Kildare

CLIENT: TES Consulting Engineers

DWG NO.: 2D Resistivity Profile 3

DATE: November 2002

SCALE: 1:750



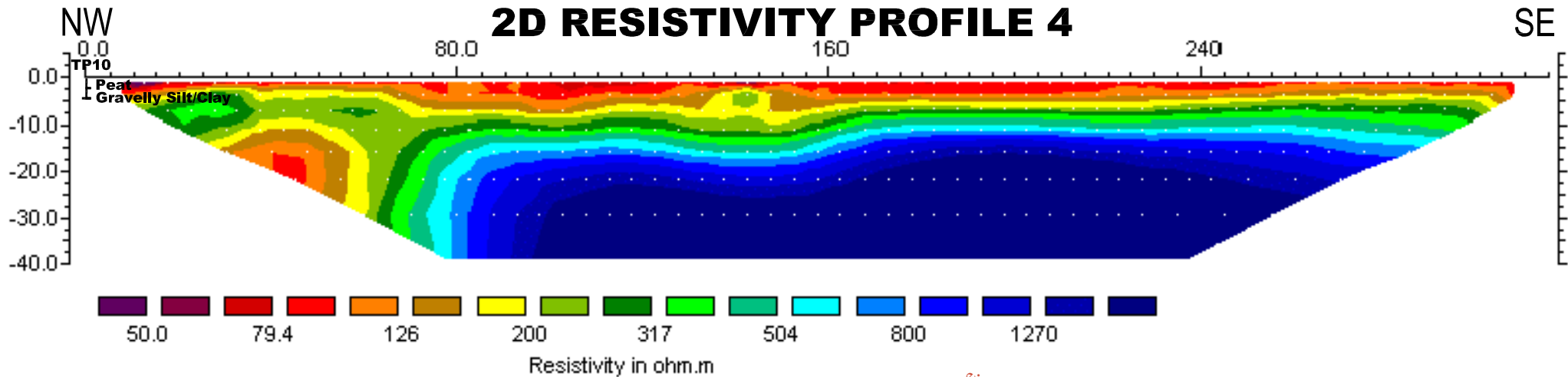
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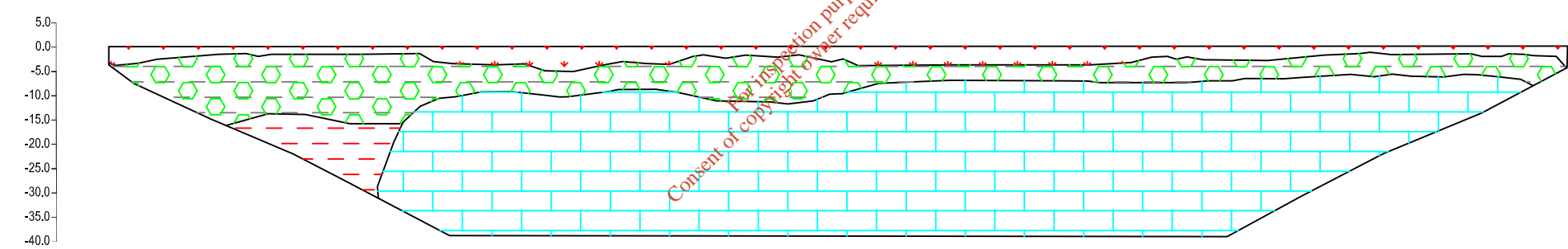
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2D RESISTIVITY PROFILE 4



Unit Electrode Spacing = 5.0 m.

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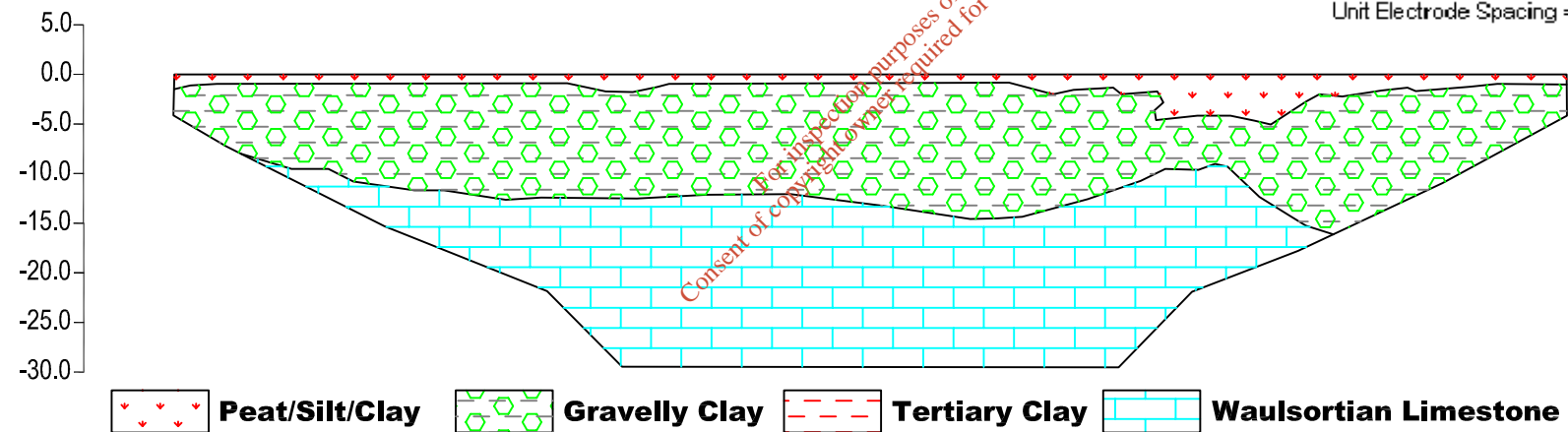
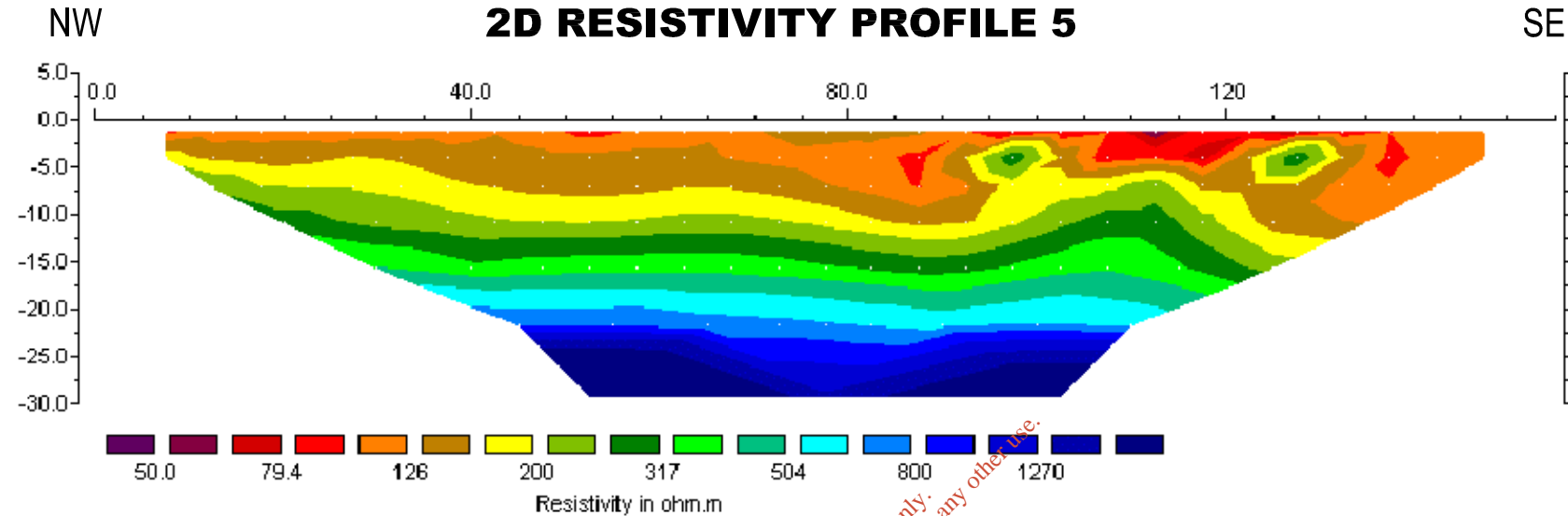


- Peat/Silt/Clay**
- Gravelly Clay**
- Tertiary Clay**
- Waulsortian Limestone**

PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: 2D Resistivity Profile 4
 DATE: January 2003
 SCALE: 1:1250

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PROJECT: Proposed Landfill Site - Drehid, Co. Kildare

CLIENT: TES Consulting Engineers

DWG NO.: 2D Resistivity Profile 5

DATE: November 2002

SCALE: 1:750

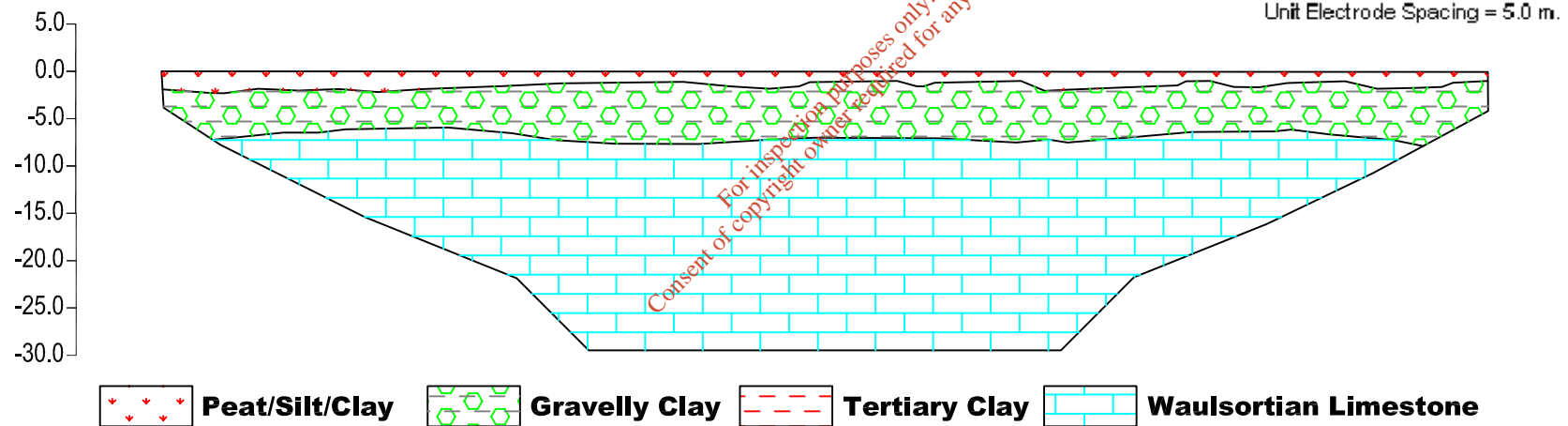
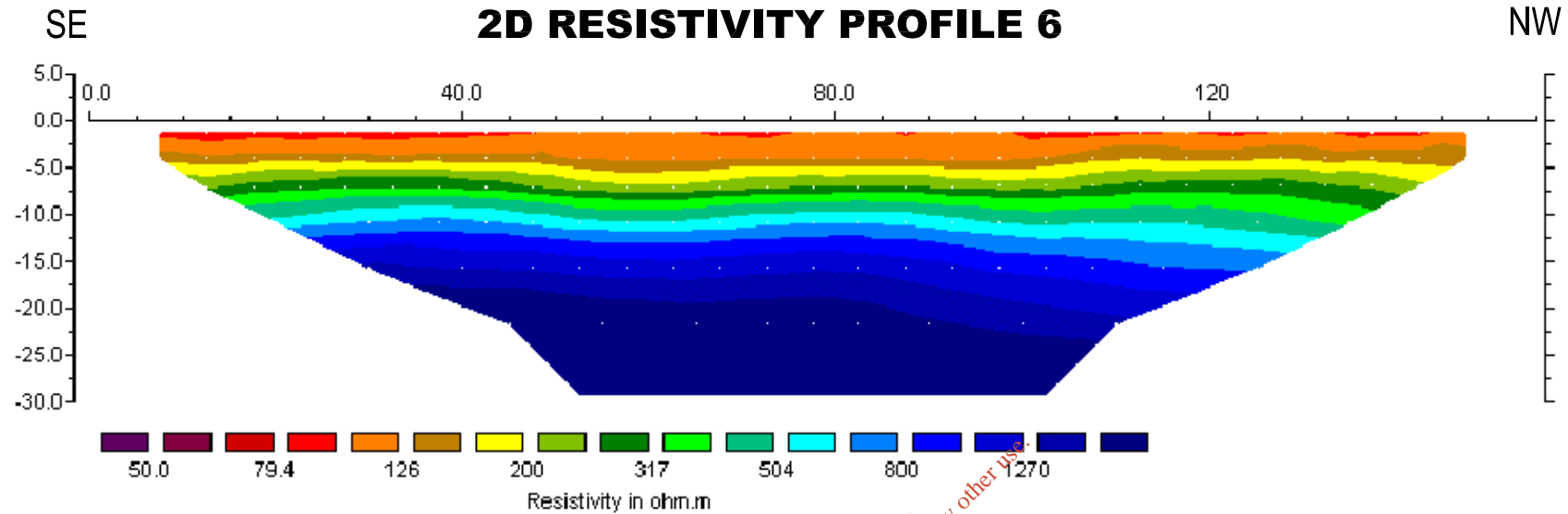


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PROJECT: Proposed Landfill Site - Drehid, Co. Kildare

CLIENT: TES Consulting Engineers

DWG NO.: 2D Resistivity Profile 6

DATE: November 2002

SCALE: 1:750

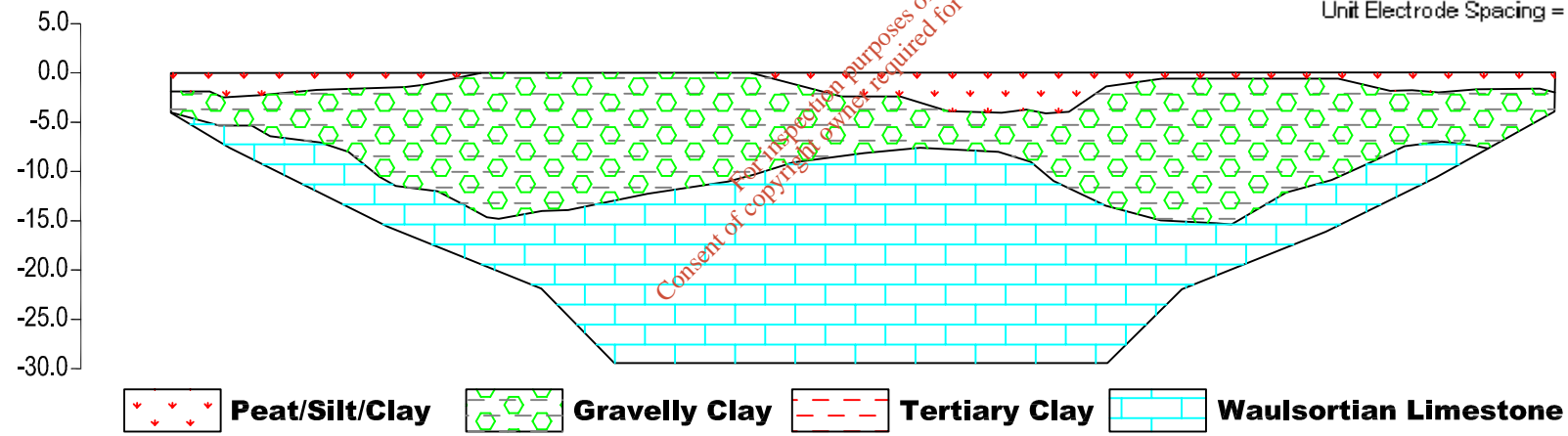
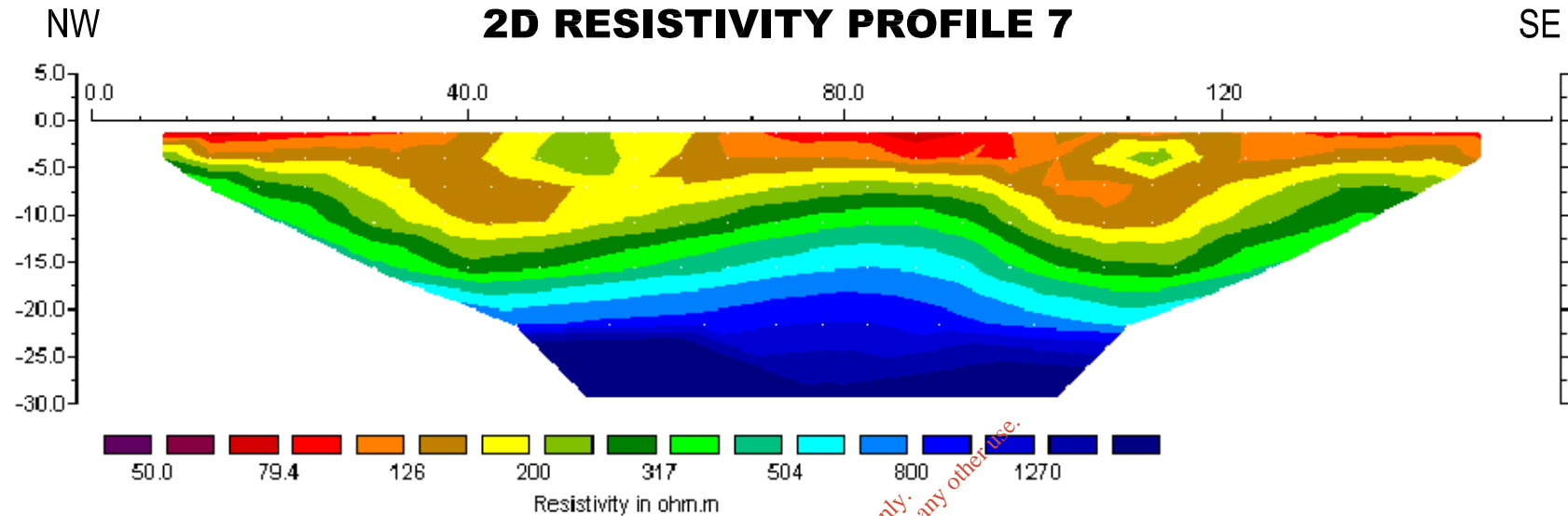


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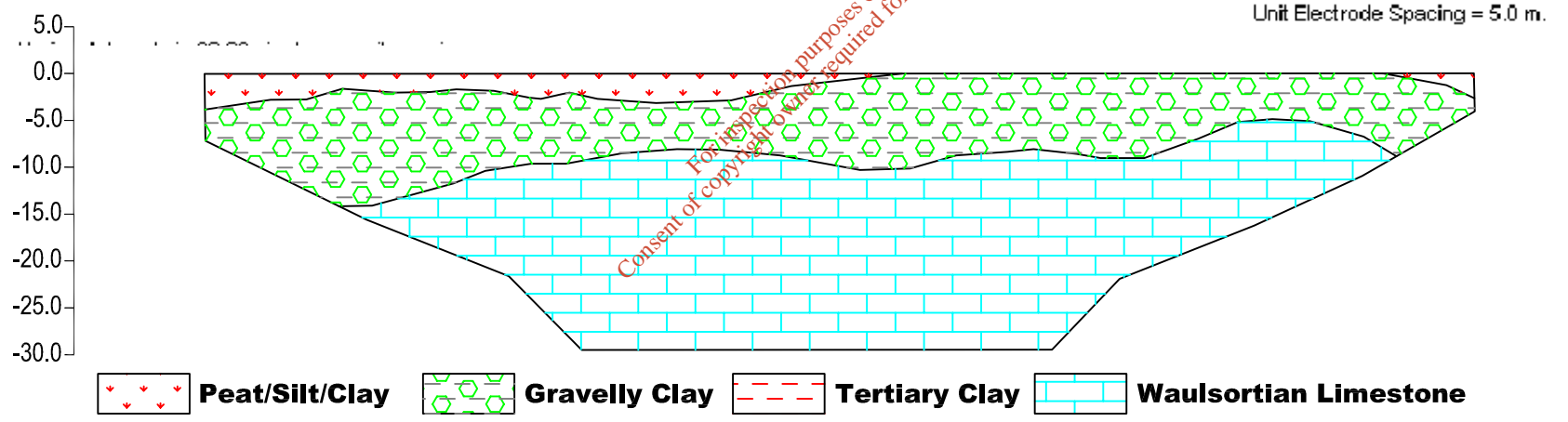
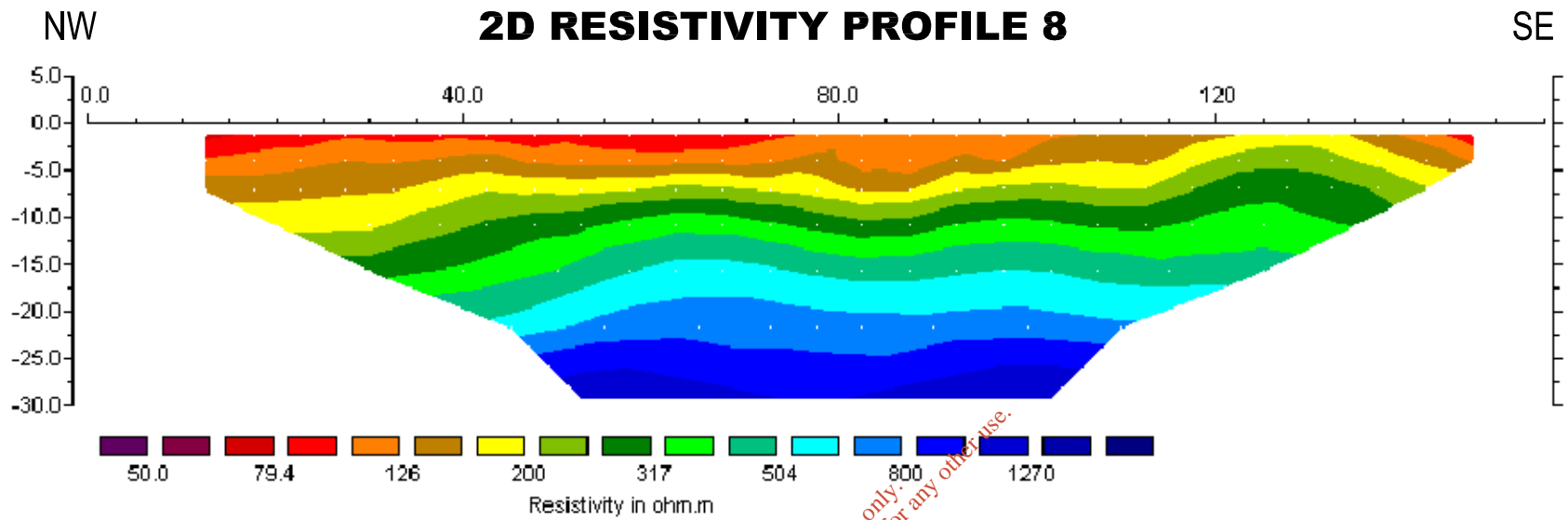


PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: 2D Resistivity Profile 7
 DATE: November 2002
 SCALE: 1:750



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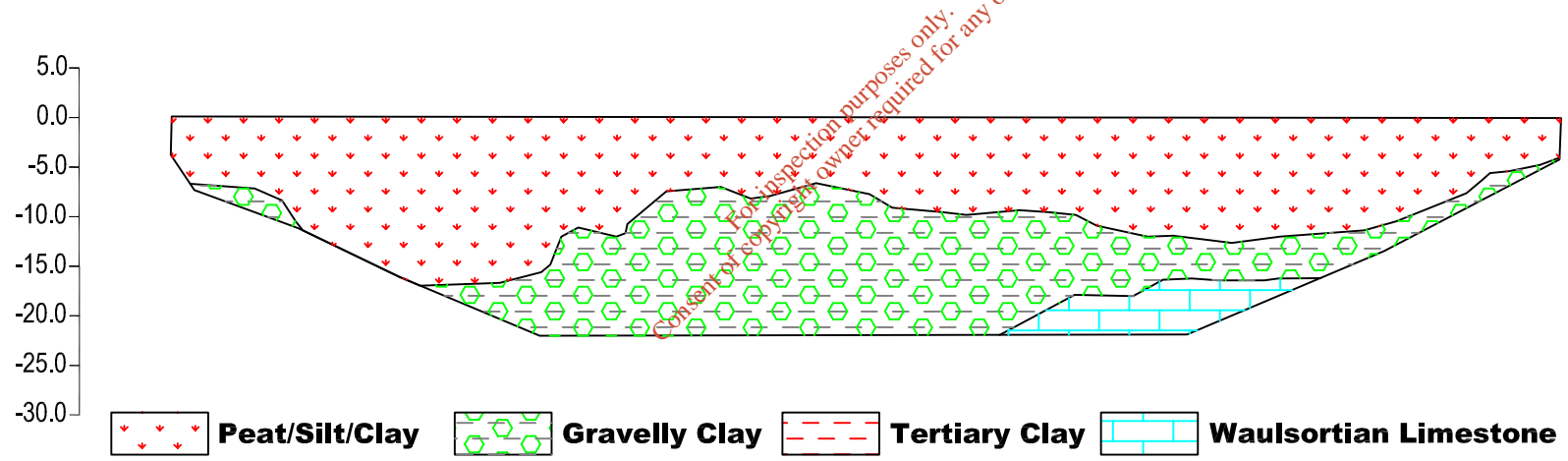
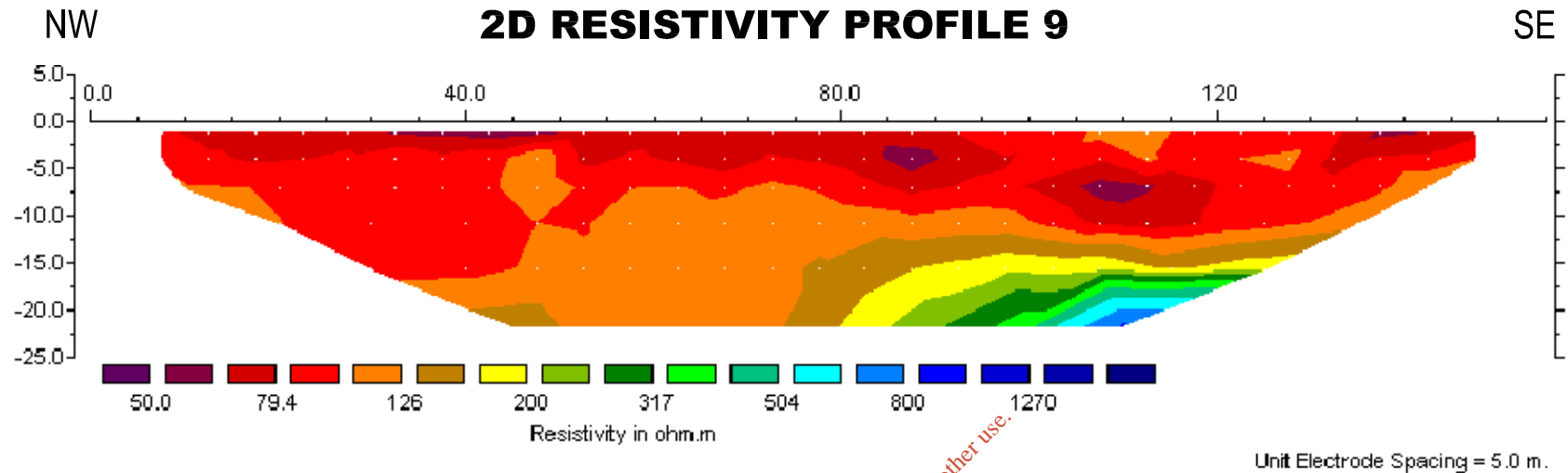


PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: 2D Resistivity Profile 8
 DATE: November 2002
 SCALE: 1:750



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PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: 2D Resistivity Profile 9
 DATE: November 2002
 SCALE: 1:750



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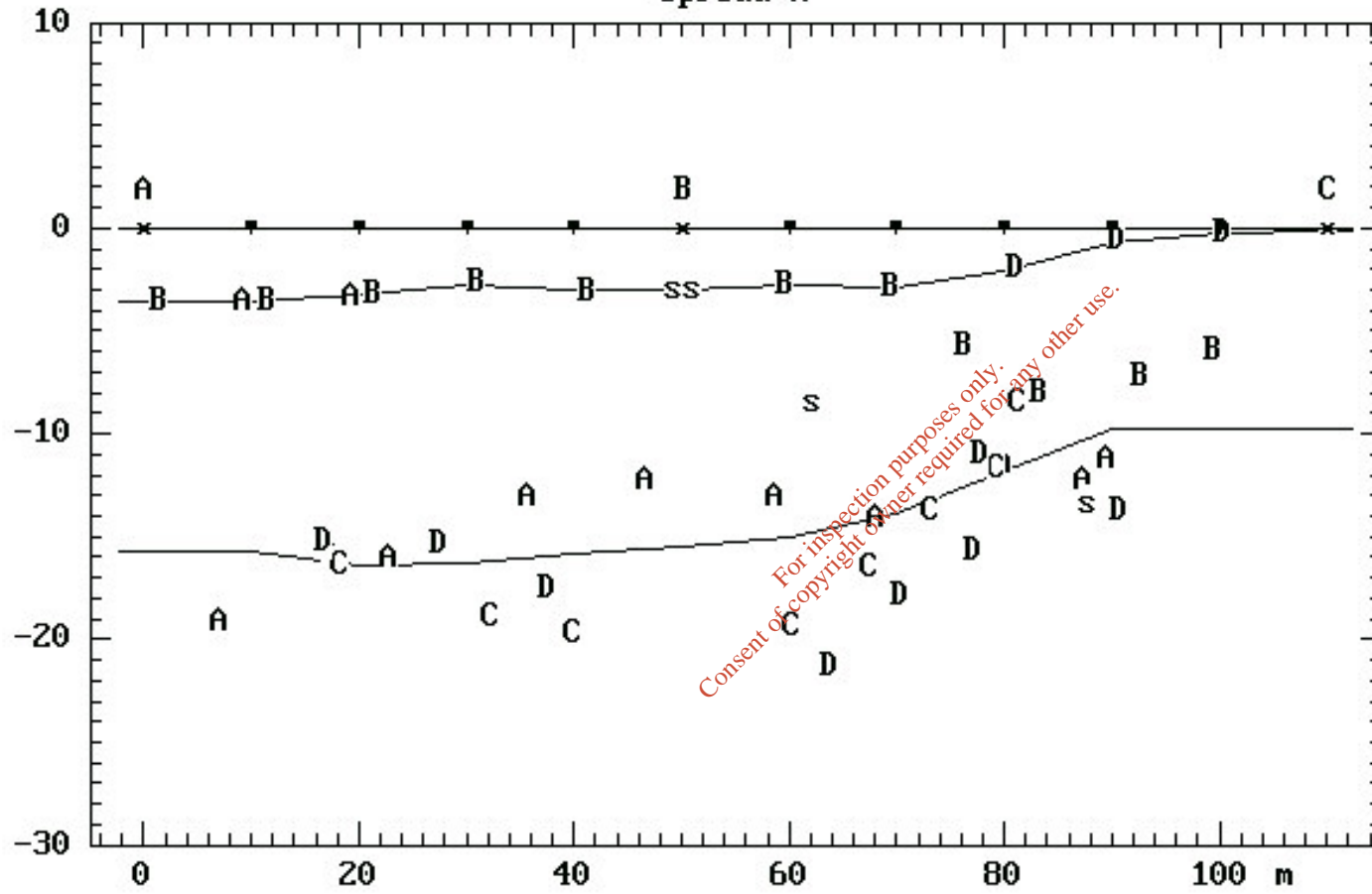
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APPENDIX IV JANUARY 2002 SEISMIC PROFILES

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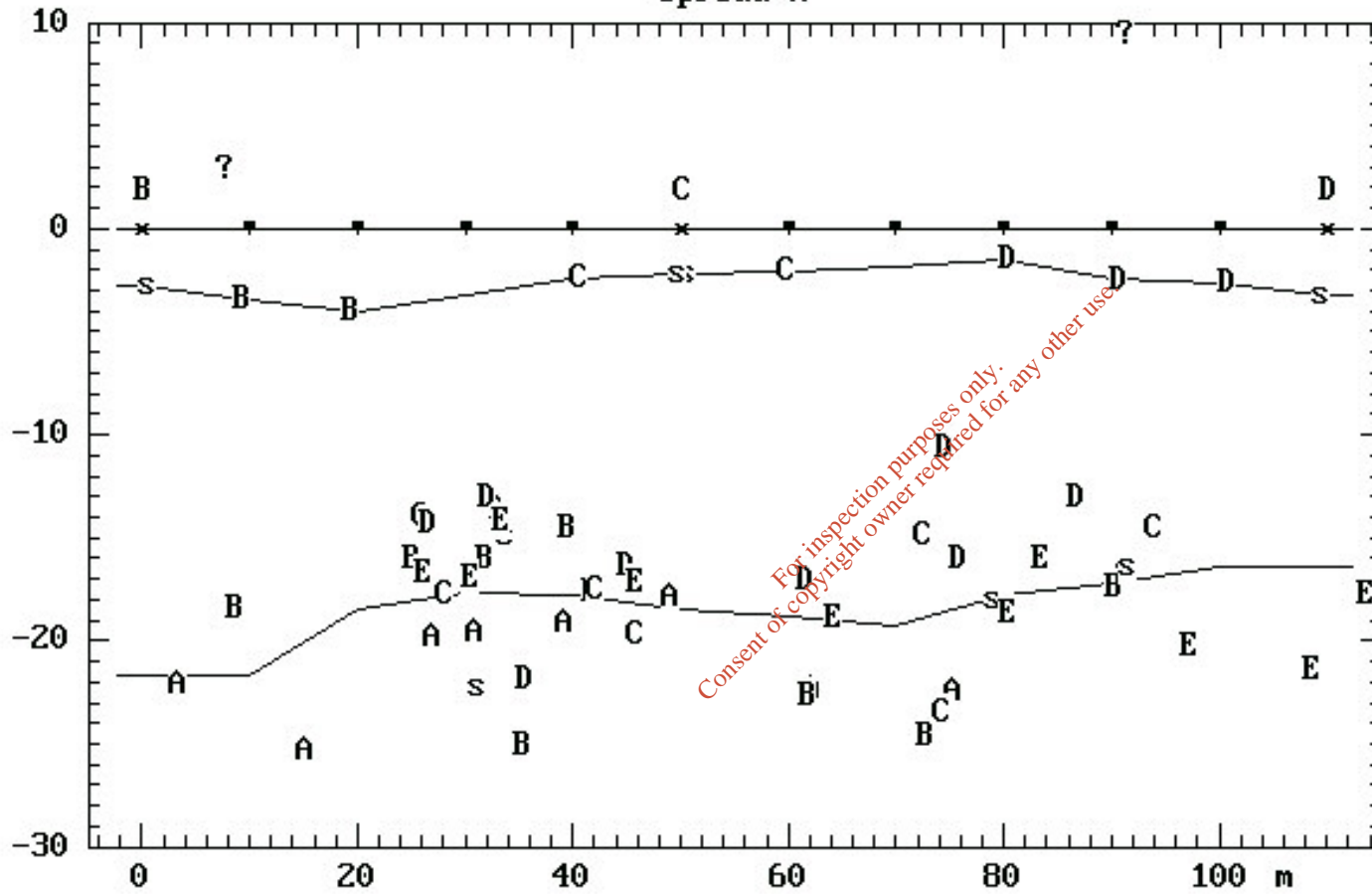
S1.SIP: DREHID

Spread A



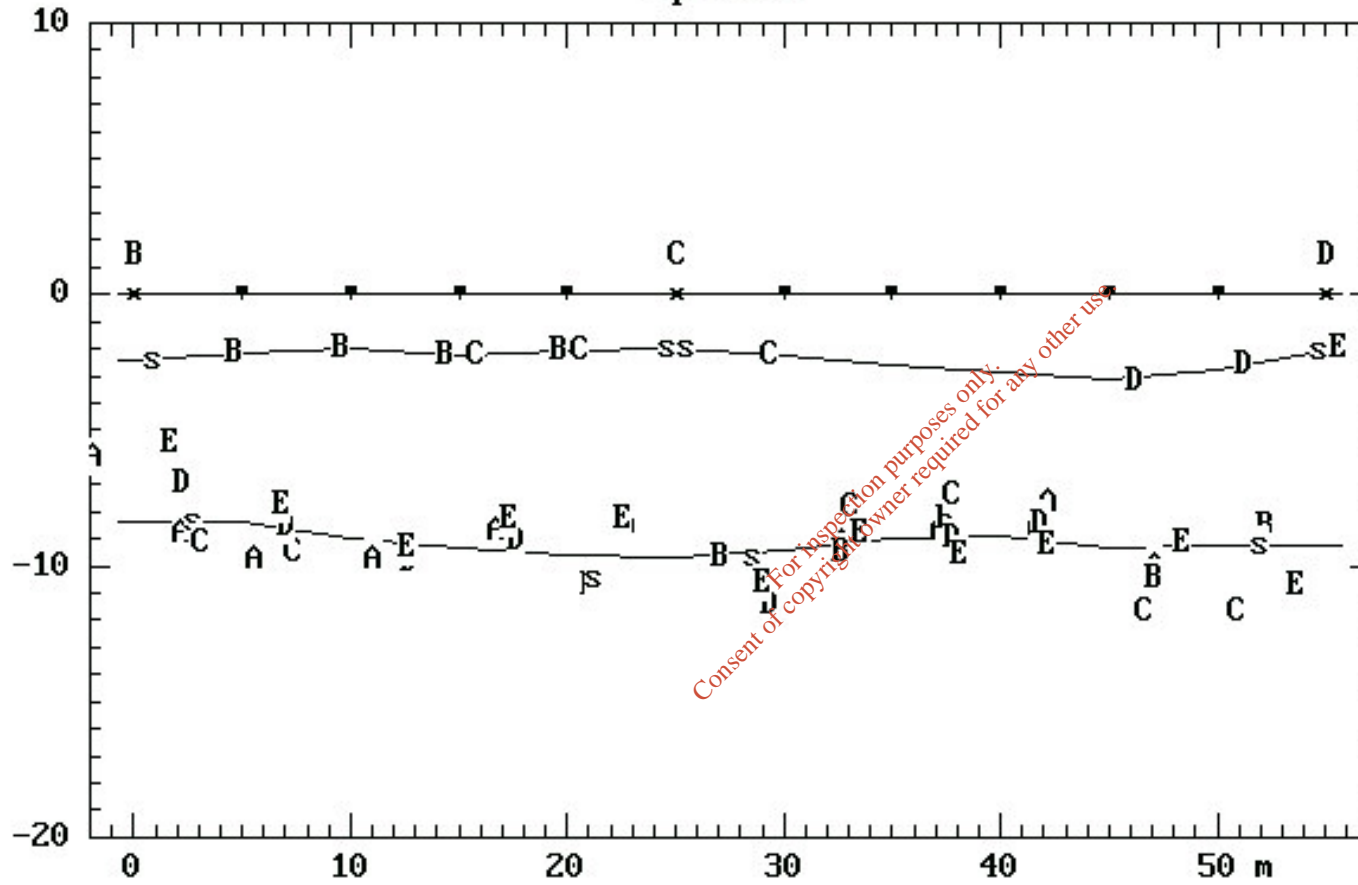
SZ.SIP: DREHID

Spread A



S4.SIP: Drehid, Co. Kildare

Spread A

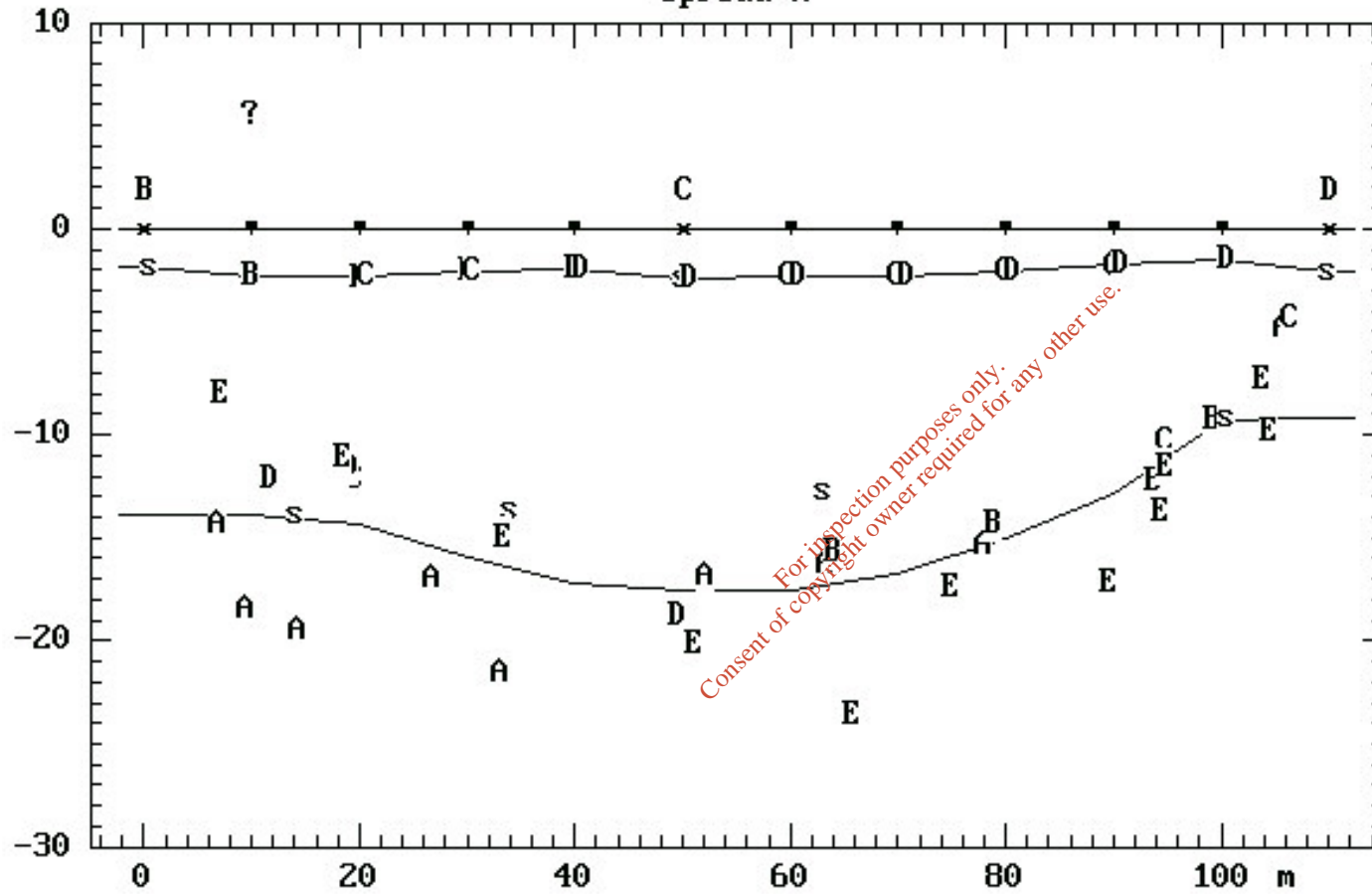


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S5.SIP: DREHID

?

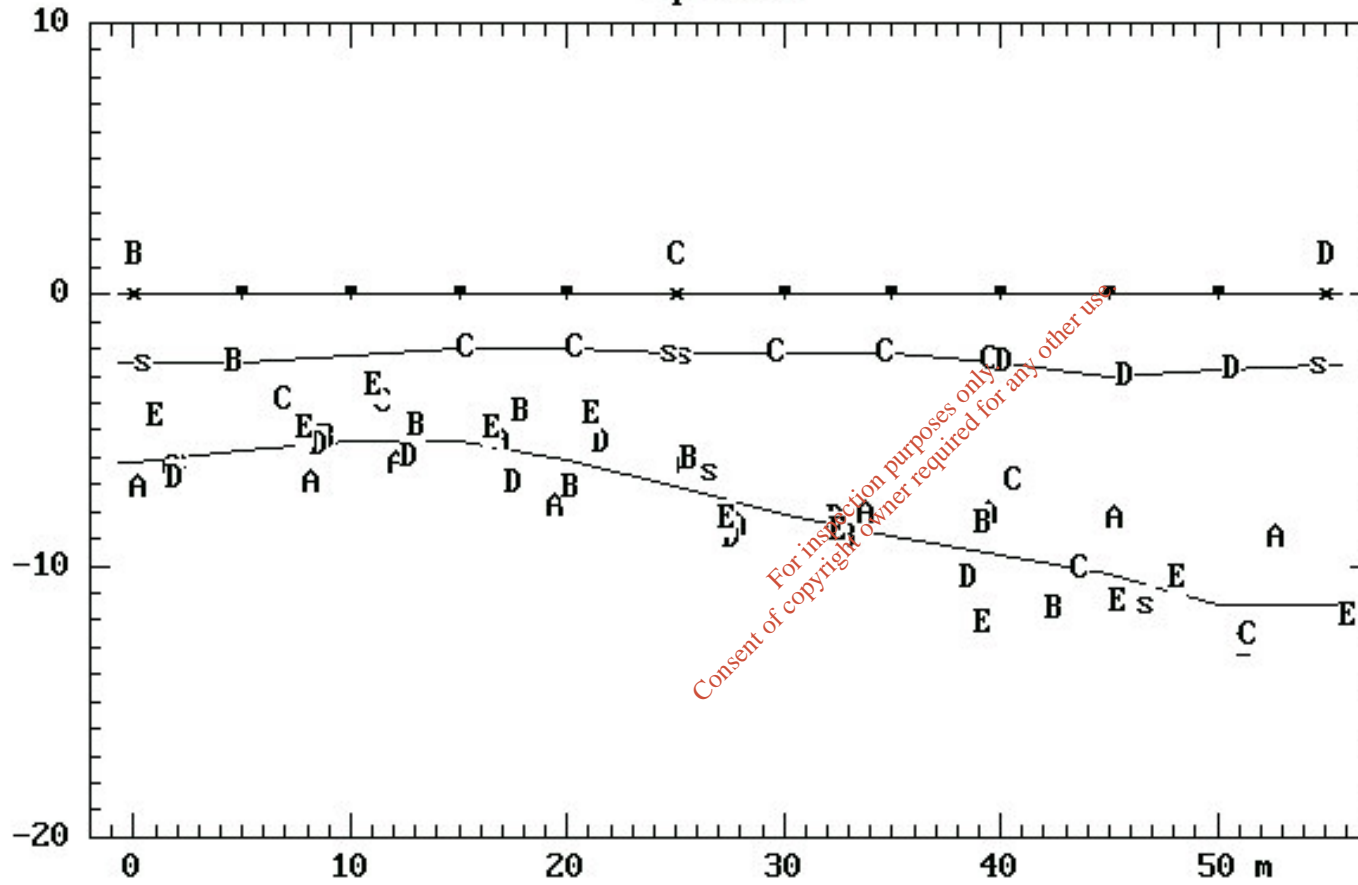
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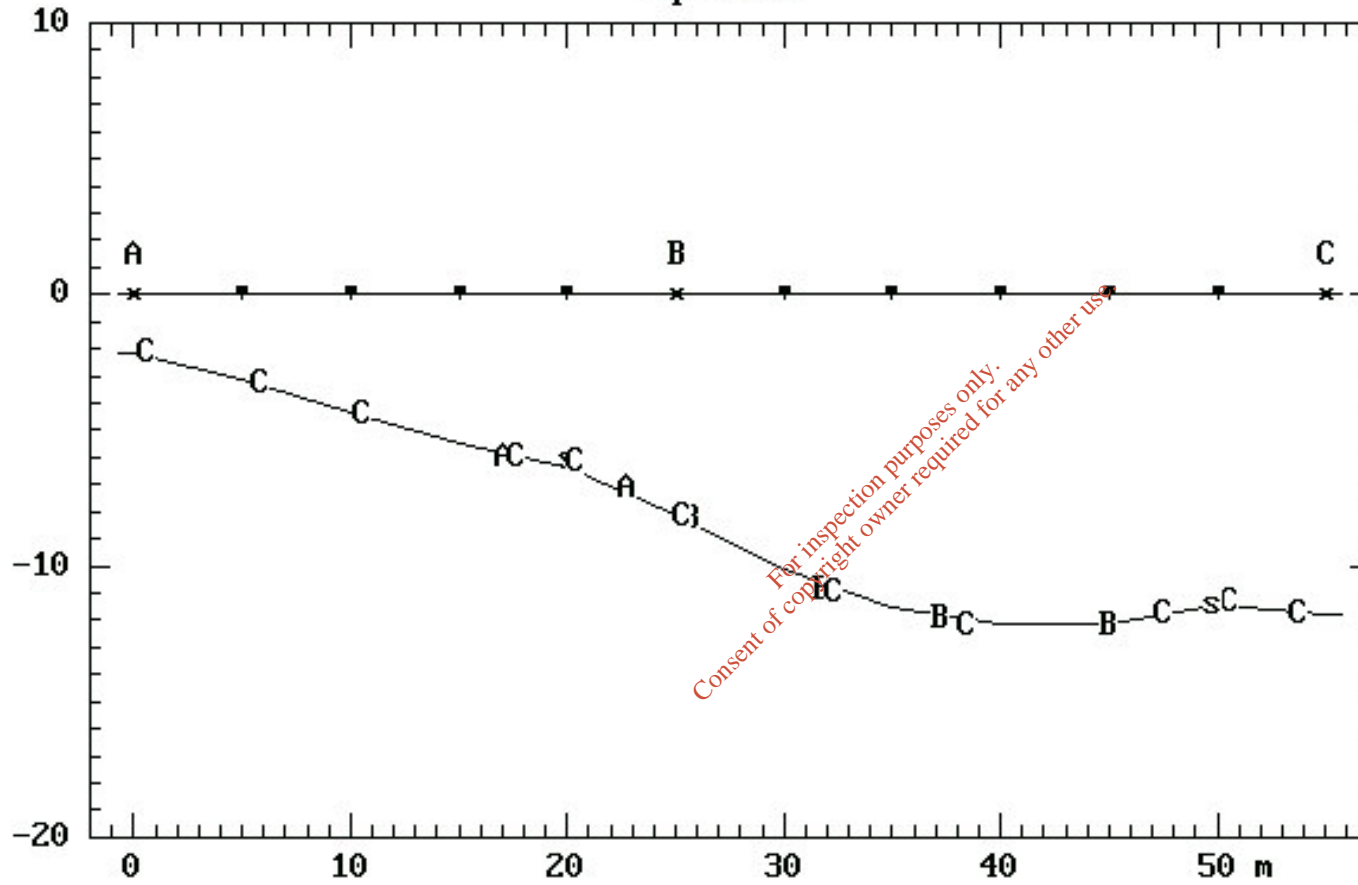
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Spread A



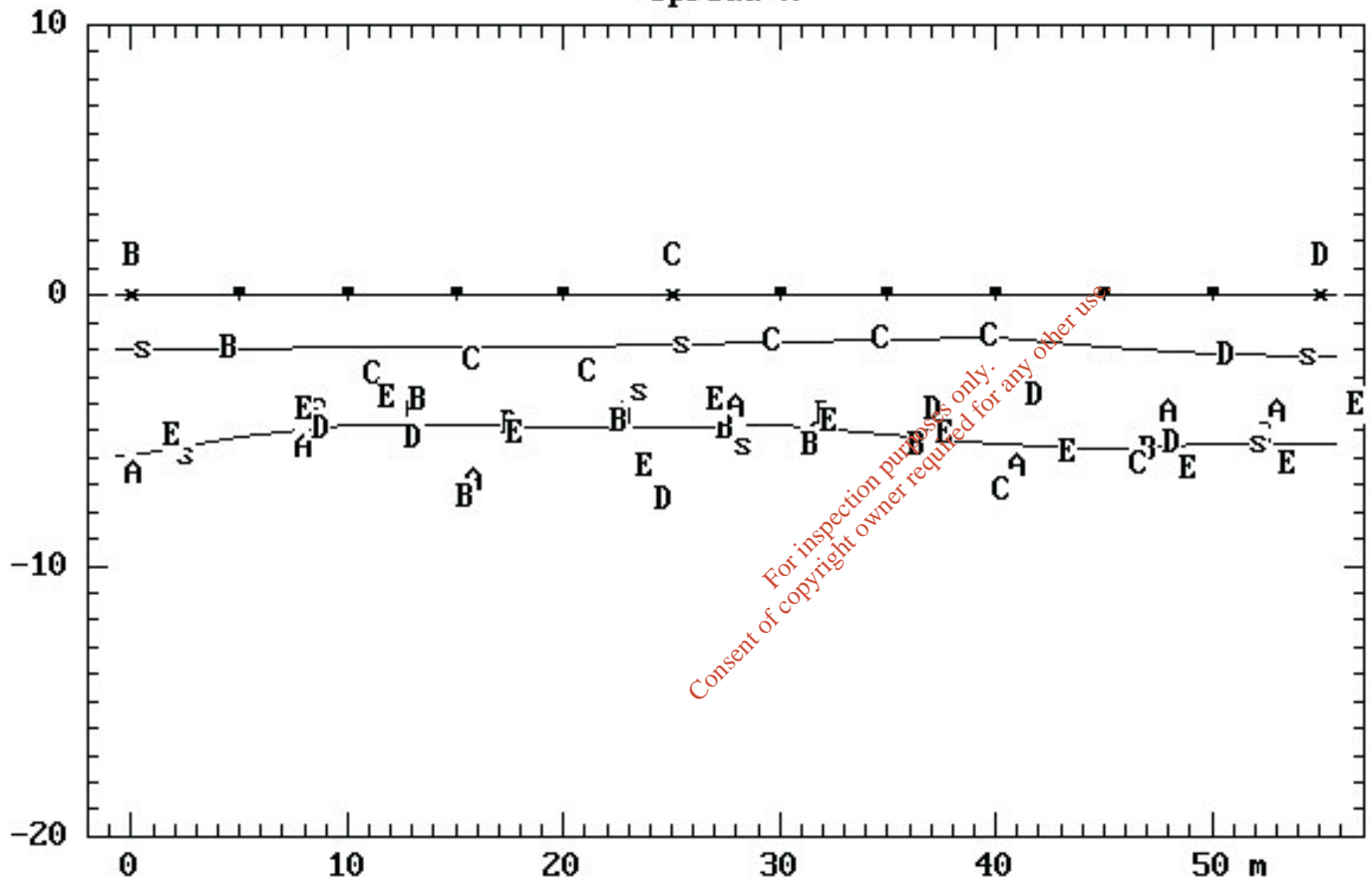
SB.SIP: DREHID, CO. KILDARE

Spread A



S10.SIP: DREHID

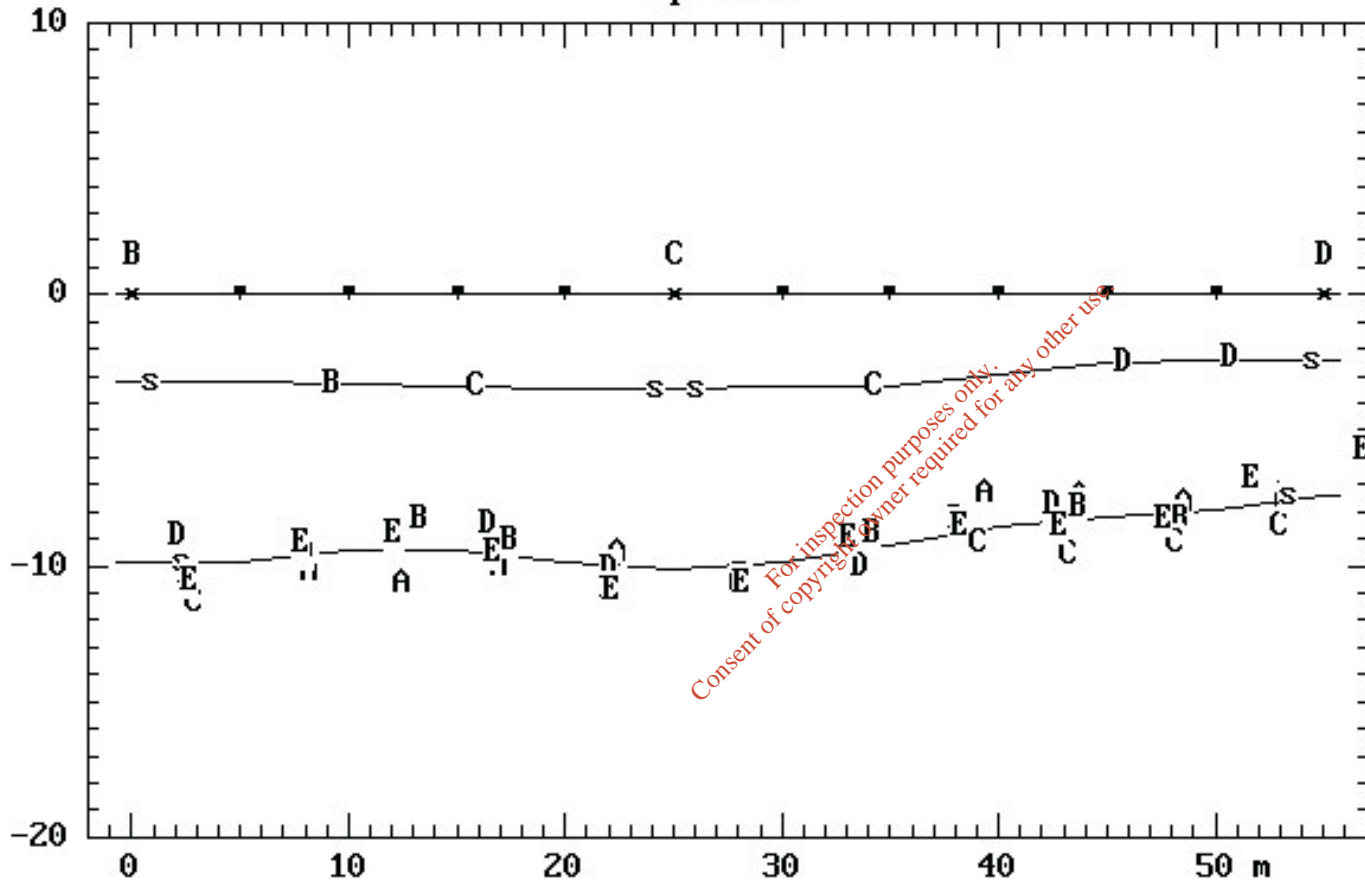
Spread A



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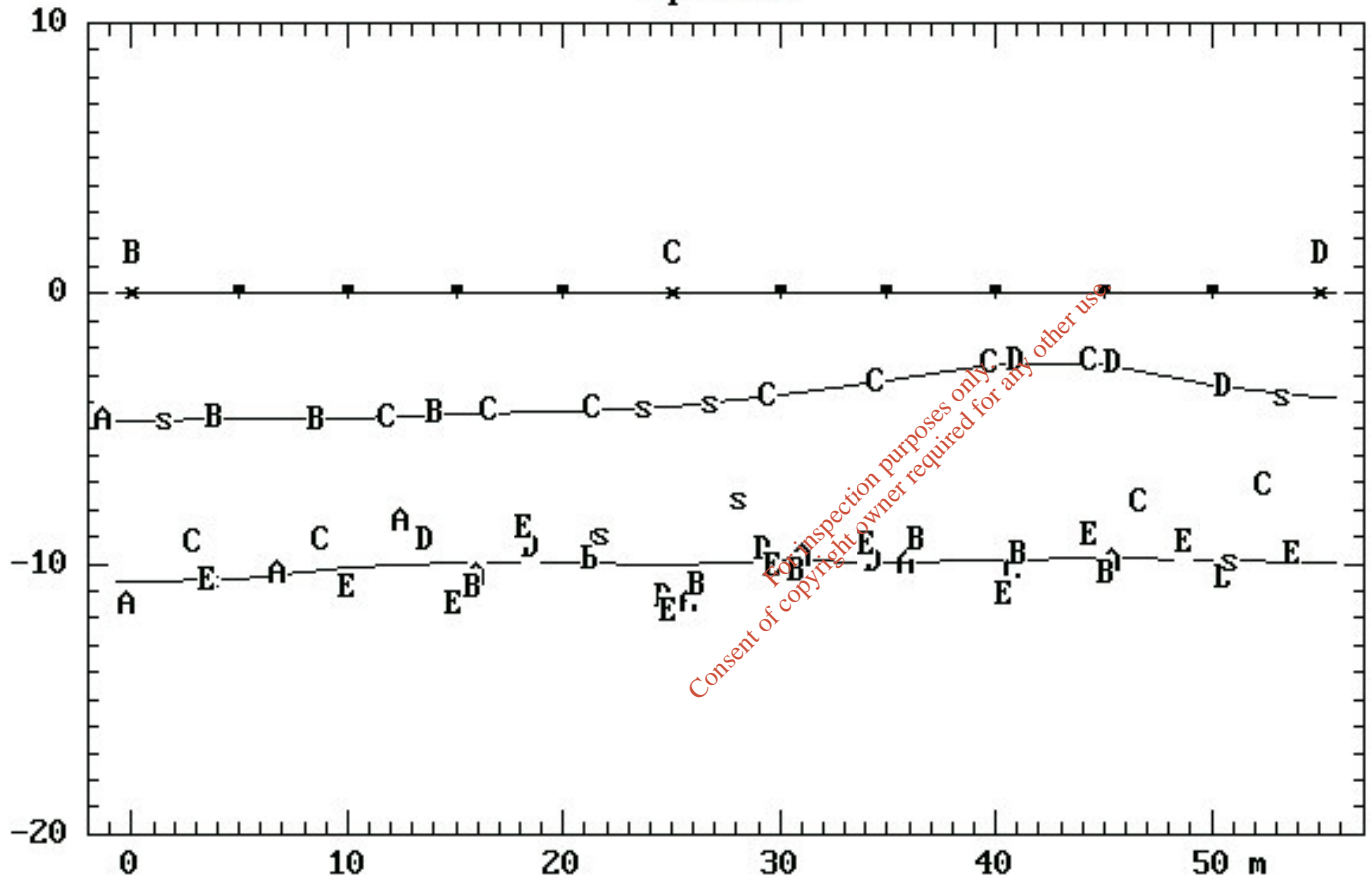
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Spread A



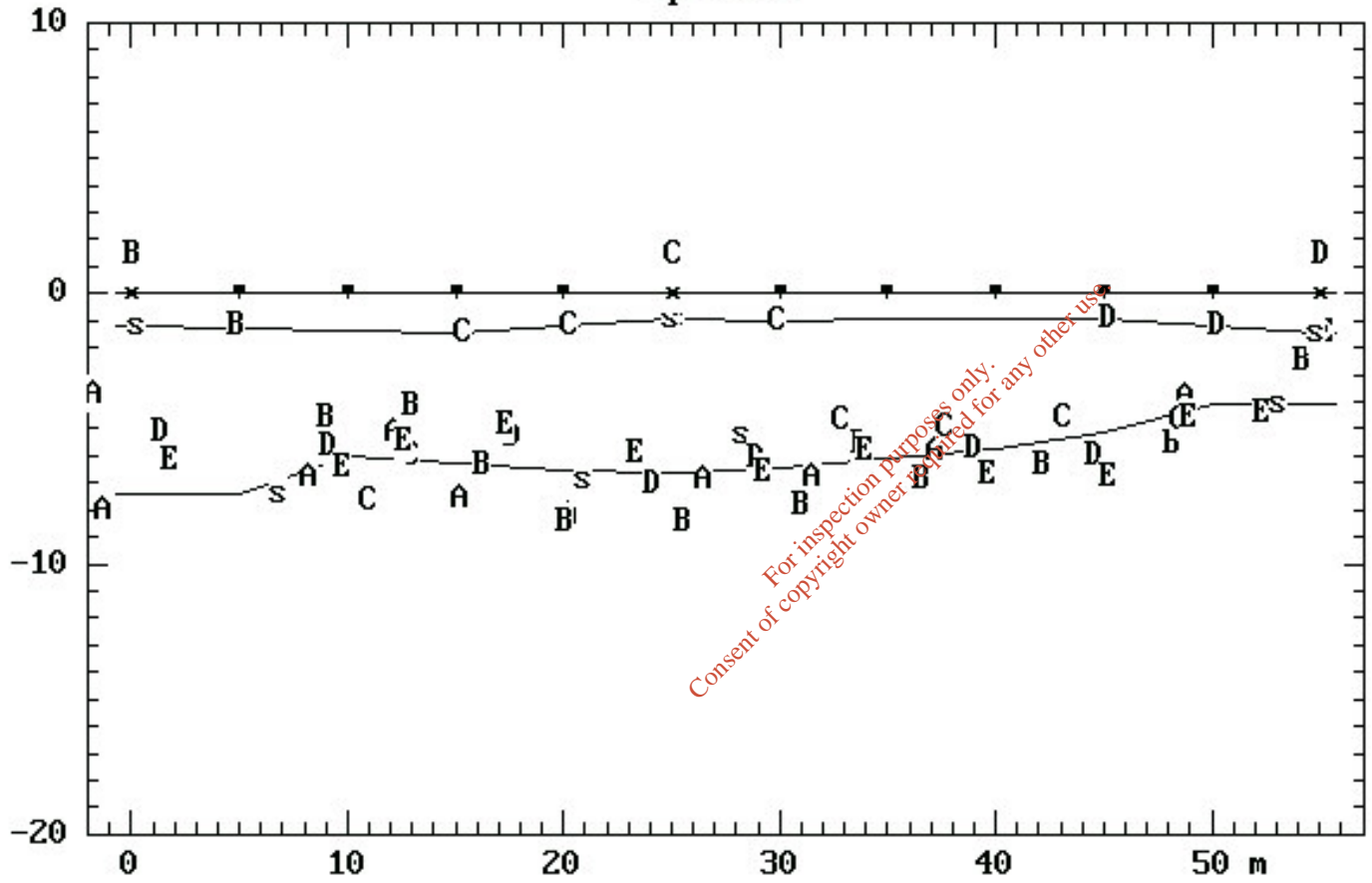
S13.SIP: DREHID

Spread A



S14.SIP: DREHID

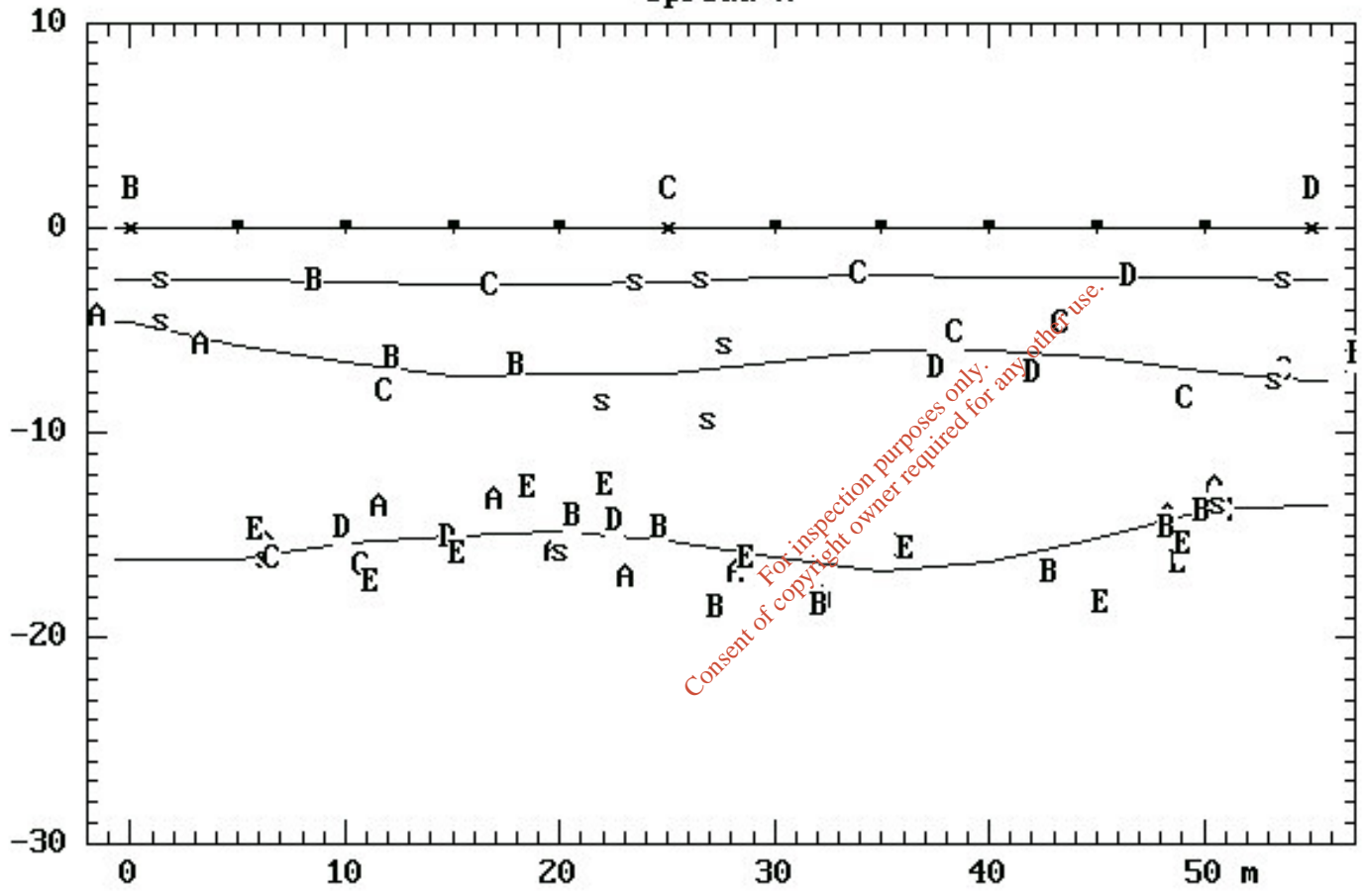
Spread A



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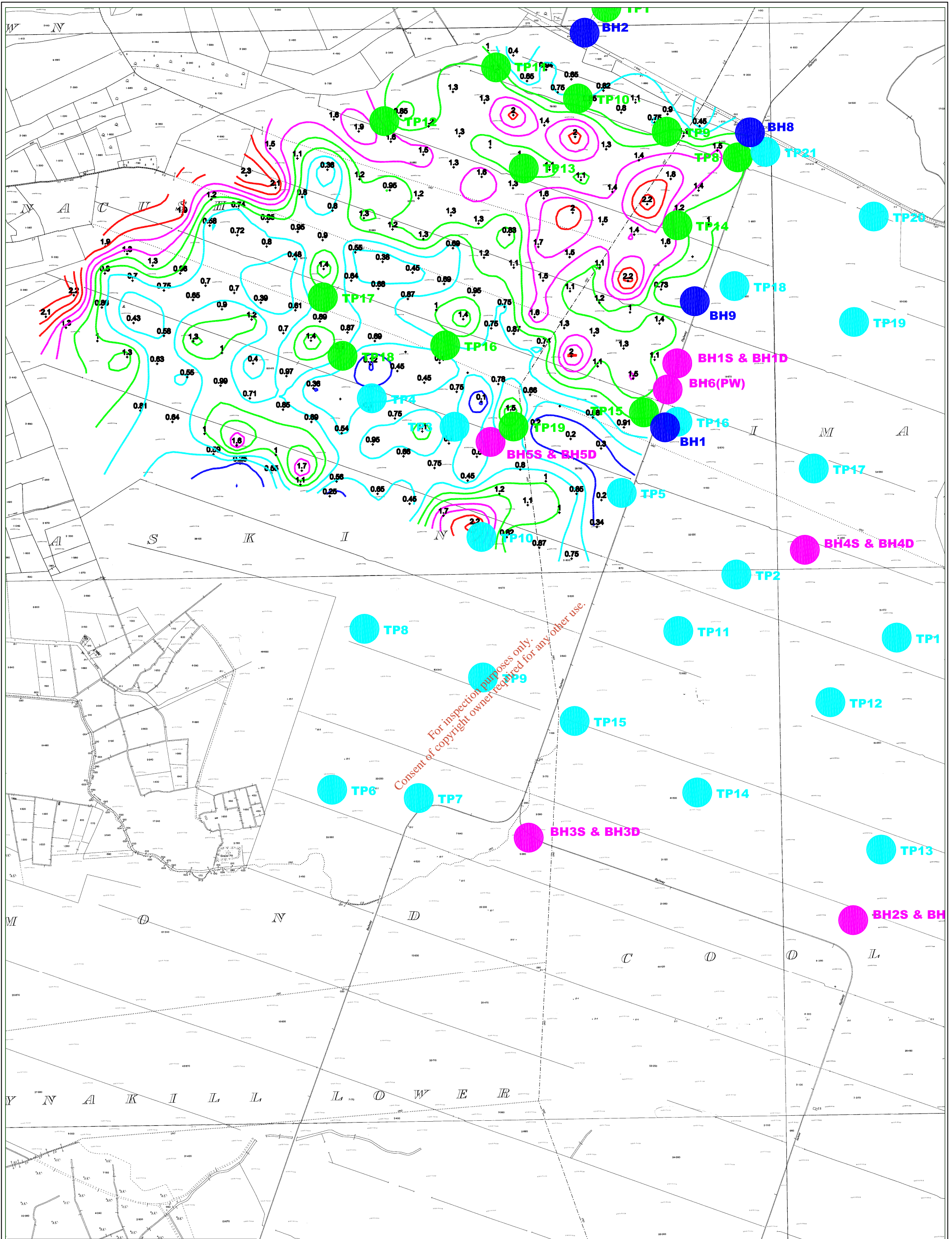
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Spread A

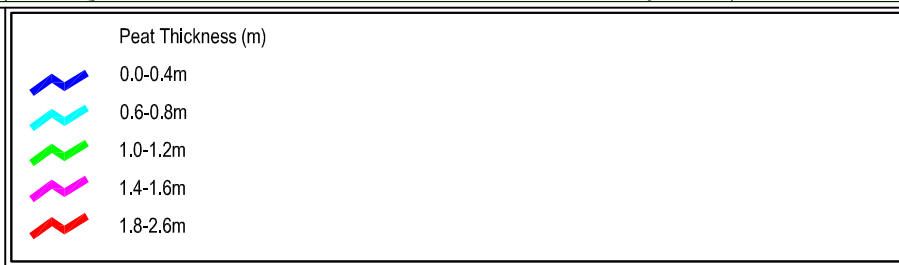


APPENDIX V JANUARY 2002 PEAT THICKNESS CONTOURS

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PROJECT: Proposed Landfill Site - Drehid, Co. Kildare
 CLIENT: TES Consulting Engineers
 DWG NO.: Peat Thickness (m)
 DATE: March 2003
 SCALE: 1:10,000



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