Instituto Tecnológico
GeoMinero de España

JUNTA DE ANDALUCIA
Consejería de Obras Públicas y Transportes

CONVENIO DE COLABORACIÓN CON LA CONSEJERÍA DE OBRAS PÚBLICAS Y TRANSPORTES PARA EL DESARROLLO DEL PROGRAMA DE ASISTENCIA EN AGUAS SUBTERRÁNEAS PARA ABASTECIMIENTOS

1996-2000

ACTIVIDAD Nº 19. PLAN DE INTEGRACIÓN DE LOS RECURSOS HÍDRICOS SUBTERRÁNEOS EN LOS SISTEMAS DE ABASTECIMIENTO PÚBLICO DE ANDALUCÍA. ACUÍFERO DE LA SIERRA DE ESTEPA Y LOS CABALLOS(U.H.05.43).

Documento 19.1.- Investigación geofísica en Estepa (Sevilla)

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Documento 19.1.- Investigación geofísica en Estepa (Sevilla)

RESUMEN EJECUTIVO Y CONCLUSIONES DEL INFORME: G5-002.98

TITULO: **INVESTIGACION GEOFISICA EN ESTEPA (SEVILLA).**

Autor: **Javier Navas Madrazo**
Jefe de proyecto: **Juan Antonio Lopez Geta**
Fecha: **Madrid 19-Agosto-1998**

1.- RESUMEN EJECUTIVO

Dentro del Proyecto **APOYO A LAS DIRECCIONES TECNICAS** (1997-2000) y como consecuencia de una petición de la Dirección de Aguas Subterráneas del ITGE, Oficina Técnica Regional de Sevilla, un equipo de Prospección Eléctrica del área de Geofísica y Teledetección del ITGE se desplazó en Marzo de 1998 a la localidad de Estepa (Sevilla) para realizar una campaña de prospección eléctrica de corriente continua modalidad Sondeos Eléctricos Verticales (SEV), dispositivo Schlumberger.

El área de estudio, ocupa parte de las hojas topograficas 1:50.000 números 1005 (Osuna) y 1006 (Benamejí) se subdivide en tres zonas, Sureste y Sur de la localidad de Estepa y el área entre Gilena y Pedrera. Este informe complementa los trabajos precedentes en la zona:

- Estudio hidrogeológico de la Sierra de la Estepa (Sevilla) Julio 1976. Programa Nacional de la minería (CGS)
- Cuantificación de los recursos del macizo calizo de Estepa a partir de su evolución Hidrodinámica. Alberto Batlle Gargallo (CGS) , Miguel Martin-Machuca (ITGE). Simposio sobre el agua en Andalucía.
- Investigación Geofísica Eléctrica por medio de S.E.V. en Estepa y Casariche (Sevilla). Enero 1986 (ITGE).
- Trabajos Geofísicos Complementarios en tres zonas de interés hidrogeológico (1987/1988). Macizo calizo de Estepa (ITGE).

El acusado relieve topográfico presentó dificultades en algunas de las zonas requiriendo un meticuloso control geométrico del dispositivo de medida. Los trabajos de campo se realizaron en Marzo de 1998. Se efectuaron 29 SEV de AB entre 1000 y 3000 m en los que 3 corresponden a repeticiones. El 11 fue un SEV paramétrico cercano al sondeo 1 (S-1 en el plano se posicionamiento)

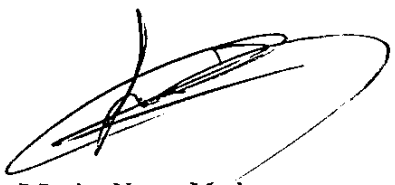
2.- CONCLUSIONES

De la interpretación efectuada de los SEV y con el apoyo de las columnas litológicas aportadas por los sondeos mecánicos, se han trazado 7 secciones o cortes geoeléctricos que se presentan en el Anexo 2 del informe.

Con la información aportada por las secciones eléctricas se concluye que:

- En los cortes 1 a 6 se detectan dos niveles de baja y media resistividad representados con trama de color rojo atribuible a margas y margocaliazas Cretáceas respectivamente.
- A muro del paquete margoso se ha encontrado un nivel resistivo atribuido a calizas y dolomías Jurásicas que afloran por discontinuidad en los cortes 2 y 3.
- En los cortes 6 y 7 se ha identificado un nivel aflorante de baja resistividad atribuido al Trías compuesto por arcillas, margas y yesos.
- Bajo el paquete yesífero se detecta en los Cortes 6 y 7 un material resistivo posiblemente cálcareo-dolomítico de dudosa atribución.

Madrid 20 de Agosto de 1998



J.Javier Navas Madrazo

INDICE

1.- INTRODUCCION

Como consecuencia de una petición de la Dirección de Aguas Subterráneas del ITGE, Oficina Técnica Regional de Sevilla, un equipo de Prospección Eléctrica del área de Geofísica y Teledetección del ITGE se desplazó en Marzo de 1998 a la localidad de Estepa (Sevilla) para realizar una campaña de prospección eléctrica de corriente continua modalidad Sondeos Eléctricos Verticales (SEV), dispositivo Schlumberger.

2.- LOCALIZACION DE LA ZONA DE TRABAJO

El área de estudio, definida por la Oficina Técnica de Sevilla, queda incluida entre las hojas topográficas 1:50.000 números 1005 (Osuna) y 1006 (Benamejí) se subdivide en tres zonas. Sureste y Sur de la localidad de Estepa y el área entre Gilena y Pedrera.. La ubicación de las zonas amplia y complementa la estudiada por trabajos anteriores.

El acusado relieve topográfico presentó dificultades en alguna de las zonas requiriendo un meticuloso control geométrico del dispositivo de medida.

3.- OBJETIVOS

Esta campaña de prospección geofísica complementa la identificación litológica de las unidades geológicas definidas por estudios precedentes en la zona estudiada. Considerando la importancia hidrogeológica del Macizo de La Estepa se interesa por conocer su potencia y continuidad a partir de sus bordes aflorantes.

4.- GEOLOGIA

La zona estudiada se incluye en el conjunto subbético andaluz. Afloran materiales desde el Trías al Cuaternario

El Trías forma el zócalo impermeable constituido por arcillas y yesos, aflora de forma generalizada en el valle de Gilena.

El Jurásico compuesto por calizas y dolomías constituye el acuífero principal que aflora de forma extensa formado la Sierra de Estepa y la Sierra de los Caballos.

El Cretácico compuesto por margas y margocalizas presenta variaciones bruscas de potencia, aflora en los bordes de las Sierras.

El Terciario y Cuaternario incluyen materiales detríticos de poco espesor.

5.- MEMORIA

5.1 Trabajo de campo

Los trabajos de campo se realizaron en Marzo de 1998. Se efectuaron 29 SEV de los que 3 corresponden a repeticiones. El 11 fue un SEV paramétrico cercano al sondeo 1 (S-1 en el plano se posicionamiento)

El siguiente cuadro refleja las características y fecha de realización de cada SEV.

Nº SEV	AB/2 (m)	Fecha
Estepa 01	1000	04-3-98
Estepa 02	1000	05-3-98
Estepa 03	1000	05-3-98
Estepa 04	1000	06-3-98
Estepa 05	1000	06-3-98
Estepa 06	1000	09-3-98
Estepa 07	1000	09-3-98
Estepa 07*	1000	20-3-98
Estepa 08	1000	10-3-98
Estepa 09	1000	10-3-98
Estepa 10	1500	16-3-98
Estepa 11	1500	13-3-98
Estepa 14	1000	23-3-98
Estepa 16	1000	23-3-98
Estepa 17	1000	25-3-98
Estepa 21	1000	19-3-98
Estepa 22	320	19-3-98
Estepa 23	320	18-3-98
Estepa 24	1000	17-3-98
Estepa 24*	1000	18-3-98
Estepa 26	500	17-3-98
Estepa 31	1000	19-3-98
Estepa 31	1000	11-3-98
Estepa 32	1000	11-3-98
Estepa 32*	1000	20-3-98
Estepa 33	1000	12-3-98
Estepa 34	1000	12-3-98
Estepa 35	1000	24-3-98
Estepa 36	1000	24-3-98

5.2.- MEDIOS EMPLEADOS

Se utilizó el siguiente instrumental:

- Medición:
  Resistivímetro : SYSCAL
  Posicionamiento: GPS MAGELLAN
- Auxiliar:
  Electrodos impolarizables, barrenas, radioteléfonos, cables y accesorios.
- Desplazamiento:
  Vehículo todoterreno propiedad del ITGE.

Equipo humano:

- Personal auxiliar
  5 peones contratados en la zona
- Operadores:
  José María Llorente y Agustín Gonzalez.
- Supervisión de trabajos de Campo :
  Ceferino Avilero Hurtado.
- Interpretación :
  Ceferino Avilero Hurtado y Javier Navas Madrazo
- Elaboración del informe :
  Javier Navas Madrazo

6.- ANTECEDENTES

Se dispone de la siguiente información sobre la zona:

- Cartografía Geológica 1:50.000. Hoja Número 1005 Osuna (ITGE)
- Cartografía Geológica 1:50.000. Hoja Número 1006 Benamejí (ITGE)
- Estudio hidrogeológico de la Sierra de la Estepa (Sevilla) Julio 1976. Programa Nacional de la minería (CGS)
- Cuantificación de los recursos del macizo calizo de Estepa a partir de su evolución Hidrodinámica. Alberto Batlle Gargallo (CGS) , Miguel Martin-Machuca (ITGE). Simposio sobre el agua en Andalucía.
- Investigación Geofísica Eléctrica por medio de S.E.V. en Estepa y Casariche (Sevilla). Enero 1986 (ITGE).
- Trabajos Geofísicos Complementarios en tres zonas de interés hidrogeológico (1987/1988). Macizo calizo de Estepa (ITGE).

7.- SONDEOS MECANICOS

La Oficina Técnica Regional de Sevilla, proporcionó la columna litológica de los siguientes sondeos mecánicos de la zona.

Sondeo: 1541.8.0011	Osuna	
X: 333031	Y:4.122.635	Z:525
0.	170	Calizas con alternancias de margocalizas

Sondeo: 1541.4.0037	Osuna	
X: 332221	Y:4.125.272	Z:
0	37	Calizas oolíticas blancas
37	39	Calizas oolíticas amarillas
39	90	Calizas oolíticas blancas
90	94	Margas rojas (Trías)
94	107	Margas verdes-rojas (Trías)

Sondeo: 1541.4.0025	Osuna	
X: 329132	Y:4.124.868	Z:440
0	25	Arcilla
25	37	Conglomerados
37	84	Calizas

Sondeo: 1541.4.0032	Osuna	
X: 329480	Y:4.124.953	Z:
0	38	Margas con intercalaciones calizas
38	102	Margas azules
102	104	Calizas trituradas
104	111	Margas abigarradas (Trías)

Sondeo: 1541.4.0033	Osuna	
X: 329381	Y:4.124.925	Z:450
0	177	Alternancia de margocalizas, calizas margosas , calizas trituradas y arcillas grises

Sondeo: 1541.4.0036	Osuna	
X: 329.581	Y:4.126.306	Z:
0	7	Arcillas rojas
7	24	Arcillas amarillas
24	31	Calizas oolíticas
31	50	Margas grises, materia orgánica.
50	88	Margocalizas gris-verde
88	114	Calizas oolíticas blancas
114	128	Calizas oolíticas blancas y nódulos arcillosos
128	131	Calizas amarillas
131	153	Margas gris obscuro y calizas
153	200	Calizas blancas

Sondeo: 1541.4.0042	Gilena	
X: 330.947	Y:4.125.150	Z:
0	67	Calizas compactas blancas
67	81	Calizas fisuradas blancas
81	106	Calizas compactas blancas
106	135	Calizas fisuradas blancas
135	139	Calizas con arcillas blancas

Sondeo: 1541.4.0043	Osuna	
X: 330.550	Y:4.125.150	Z:492
0	165	Calizas

Sondeo: 1541.8.0012	Osuna	
X: 332.008	Y:4.123.206	Z:480
0	100	Calizas
100	101	Trías

Sondeo: 1541.8.0039	Osuna	
X: 332.351	Y:4.123.107	Z:480
0	100	Margas
100	128	Margocalizas blancas
128	158	Margocalizas ocres , calizas trituradas
158	180	Margas rosadas, margocalizas
180	207	Calizas trituradas blancas
207	210	Calizas trituradas y margas
210	213	Calizas trituradas

Sondeo: 1541.8.0040	Osuna	
X: 331.914	Y:4.123.455	Z:490
0	100	Calizas

Sondeo: 1541.8.0041	Osuna	
X: 332.745	Y:4.124.331	Z:
0	112	Calizas
112	118	Calizas trituradas
118	124	Calizas blanco-rosadas
124	150	Calizas oolíticas blancas

Sondeo: 1541.8.0042	Osuna	
X: 331.432	Y:4.124.048	Z:
0	86	Calizas
86	140	Calizas trituradas

Sondeo: 1541.8.0043	Osuna	
X: 332.903	Y:4.123.991	Z: 540
0	175	Calizas blancas-rosadas oolíticas

Sondeo: 1641.1.0020	Benamejí	
X:338069	Y:4.126.408	Z:445
0	15	Margas
15	20	Arcillas
20	32	Calizas con nódulos arcillosos
32	40	Calizas trituradas
40	44	Margas rojas-Trías

Sondeo: 1641.1.0035	Benamejí	
X:337200	Y:4.125.408	Z:465
0	40	-----

Sondeo: 1641.1.0037	Benamejí	
X:336100	Y:4.125.400	Z:520
0	252	Calizas

Sondeo: 1641.1.0038	Benamejí	
X:336300	Y:4.126.000	Z:485
0	150	Calizas

Sondeo: 1641.5.0039	Benamejí	
X:340500	Y:4.126.500	Z:380
0	40	Calizas beige y rojas
40	73	Calizas fracturadas beige
73	86	Calizas muy fracturadas
86	105	Calizas fracturadas blancas
105	117	Brechas calizas
117	134	Calizas masivas Blancas

Sondeo: 1641.1.0024	Benamejí	
X:340072	Y:4.126.999	Z:400
0	150	Calizas

Sondeo: 1641.5.0036	Benamejí	
X:340625	Y:4.124.100	Z:410
0	60	Calizas

Sondeo: 1641.5.0042	Benamejí	
X:338000	Y:4.122.100	Z:485
0	50	Calizas

Sondeo: 1641.5.0044	Benamejí	
X:339200	Y:4.122.450	Z:490
0	120	Calizas

Sondeo: 1641.5.0045	Benamejí	
X:338900	Y:4.122.100	Z:450
0	120	Calizas

Sondeo: 1		
X:337900	Y:4.121.800	Z:500
0	90	Calizas
90		Yesos

Sondeo: 2		
X:337200	Y:4.126.900	Z:500
0	920	Margas

8.- INTERPRETACION Y REPRESENTACION.

La interpretación de las curvas de SEV se realizó por parte de los técnicos indicados del ITGE en sus oficinas de Madrid. Para este proceso se utilizó la aplicación RESIXIP de la compañía INTERPEX.

La representación gráfica de los resultados, plano de posicionamiento y secciones eléctricas se llevo a cabo con la aplicación CORTES del ITGE.

El Anexo 1 presenta el listado numérico la representación gráfica de datos de campo y la interpretación obtenida para cada SEV.

En el Anexo 2 se presenta el plano de situación de los SEV realizados en esta campaña (ESTEPA 1 a 36) así como los realizados en trabajos precedentes según el criterio siguiente:

- SEV 101 a 128. Corresponden a los SEV 1 a 28 de la Campaña: Estudio hidrogeológico de la Sierra de la Estepa (Sevilla) Julio 1976. Programa Nacional de la minería (CGS)

- SEV 201 a 208. Corresponden a los SEV C-1 a C-8 de la Campaña: Investigación Geofísica Eléctrica por medio de S.E.V. en Estepa y Casariche (Sevilla). Enero 1986 (ITGE).

- SEV 301 a 314. Corresponden a los SEV E-1 a E-14 de la Campaña: Investigación Geofísica Eléctrica por medio de S.E.V. en Estepa y Casariche (Sevilla). Enero 1986 (ITGE).

- SEV 401 a 478. Corresponden a los SEDT 1 a 78 de la Campaña: Trabajos Geofísicos Complementarios en tres zonas de interés hidrogeológico (1987/1988). Macizo calizo de Estepa (ITGE).

En el anexo 3 se adjunta un disco de 3.5" con el siguiente contenido:

- Ficheros ASCII: ESTEPA_??.RPD, siendo (??) el número identificativo del SEV. Contienen las mediciones efectuadas en cada SEV, es decir, los valores de diferencia de potencial e intensidad para cada abertura de electrodos de corriente.

- Ficheros ASCII: ESTEPA_??.MDL, siendo (??) el número identificativo del SEV. Contienen datos correspondientes a la interpretación de cada SEV (Espesores y resistividades).

- Fichero ASCII: ESTEPA.DAT, contiene toda la información del plano de posicionamiento, según el formato del programa CORTES del ITGE.

- Fichero ASCII ESTEPA.COR, contiene toda la información de los cortes o secciones geoeléctricas, según el formato del programa CORTES del ITGE.

- Fichero WORD INFORME.DOC. Contiene el texto del presente informe .

9.- CONCLUSIONES

De la interpretación efectuada de los SEV y con el apoyo de las columnas litológicas aportadas por los sondeos mecánicos, se han trazado 7 secciones o cortes geoeléctricos que se presentan en el Anexo 2.

Con la información aportada por las secciones eléctricas se concluye que:

- En los cortes 1 a 6 se detectan dos niveles de baja y media resistividad representados con trama de color rojo atribuible a margas y margocaliazas Cretáceas respectivamente.
- A muro del paquete margoso se ha encontrado un nivel resistivo atribuido a calizas y dolomías Jurásicas que afloran por discontinuidad en los cortes 2 y 3.
- En los cortes 6 y 7 se ha identificado un nivel aflorante de baja resistividad atribuido al Trías compueto por arcillas, margas y yesos.
- Bajo el paquete yesífero se detecta en los Cortes 6 y 7 un material resistivo posiblemente calcáreo-dolomítico de dudosa atribución.

J.Javier Navas Madrazo

Madrid 19 de agosto de 1998

ANEXO 1: CURVAS DE CAMPO E INTERPRETACIONES.

DATA SET: ESTEPA01

CLIENT: I.T.G.E.
LOCATION: LA RODA-PEDRERA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 490.00
SOUNDING COORDINATES: E: 337872.0000 N: 4122011.0000

DATE: 04-03-98
SOUNDING: 01
AZIMUTH: 107
EQUIPMENT: SYSCALR2E

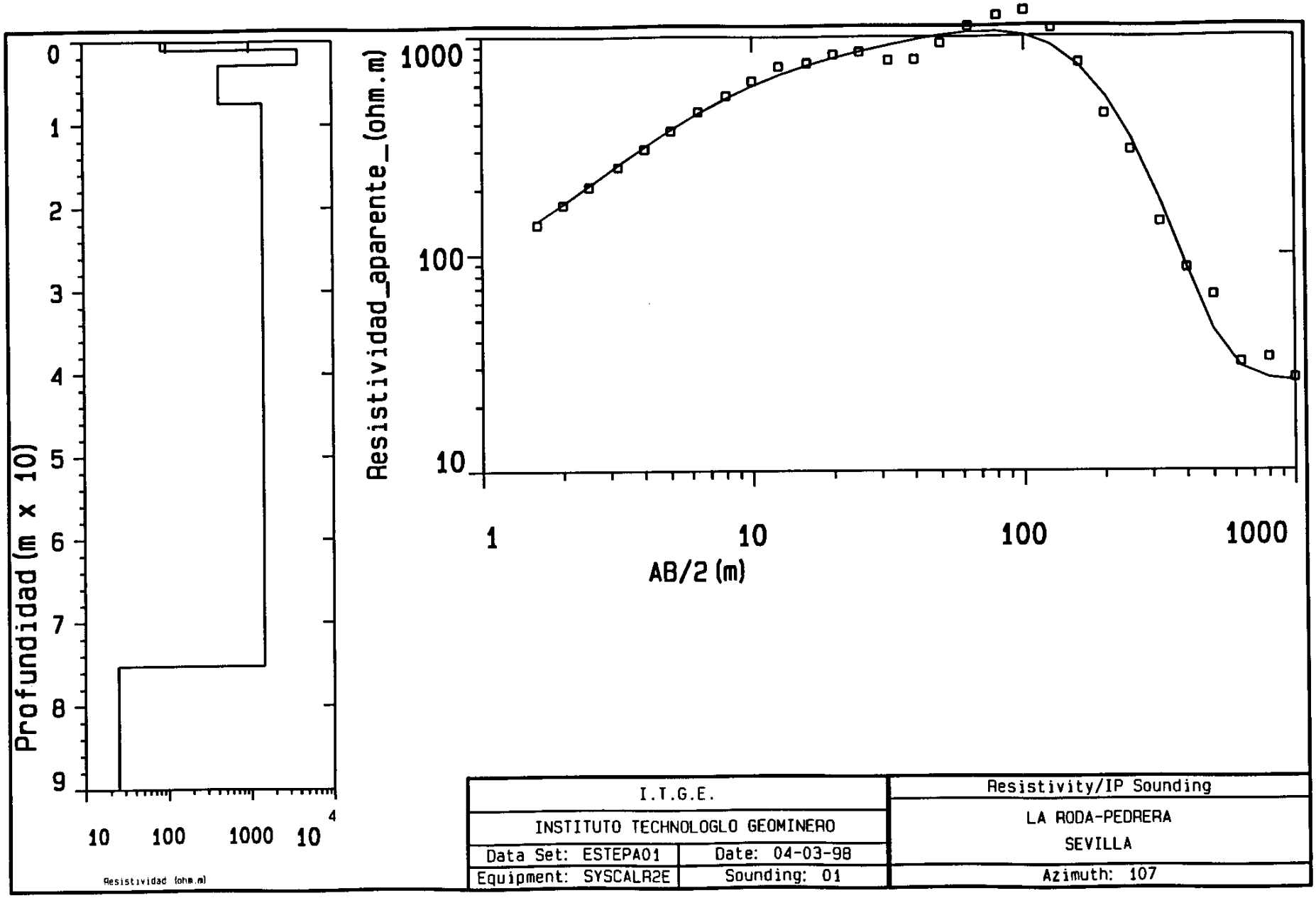
Schlumberger Configuration

FITTING ERROR: 14.420 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	137.9	142.8	-3.58
2	2.00	169.9	171.7	-1.03
3	2.50	205.5	208.8	-1.59
4	3.20	253.2	259.2	-2.40
5	4.00	305.5	313.2	-2.52
6	5.00	370.7	374.5	-1.02
7	6.30	451.0	444.6	1.42
8	8.00	535.3	521.6	2.55
9	10.00	626.8	594.5	5.16
10	12.60	731.9	667.4	8.80
11	16.00	754.9	737.2	2.34
12	20.00	825.1	796.3	3.48
13	25.00	849.3	851.5	-0.260
14	32.00	777.6	911.4	-17.20
15	40.00	785.7	965.3	-22.86
16	50.00	933.6	1014.3	-8.65
17	63.00	1118.6	1049.0	6.21
18	80.00	1247.4	1051.5	15.70
19	100.0	1307.6	1007.5	22.95
20	126.0	1084.3	902.9	16.73
21	160.0	752.4	732.4	2.66
22	200.0	442.0	537.0	-21.50
23	250.0	301.6	344.0	-14.04
24	320.0	140.6	177.1	-25.96
25	400.0	86.14	86.58	-0.501
26	500.0	64.50	44.49	31.02
27	630.0	31.50	30.02	4.68
28	800.0	33.20	26.59	19.90
29	1000.0	26.70	25.76	3.50

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				490.0	
1	86.76		0.967	489.0	0.0111
2	3928.3		1.86	487.1	4.754E-04
3	431.6		4.60	482.5	0.0106
4	1442.8		67.78	414.7	0.0469
5	25.00				

ALL PARAMETERS ARE FREE



I.T.G.E.	Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO	LA RODA-PEDRERA SEVILLA
Data Set: ESTEPA01 — Date: 04-03-98	
Equipment: SYSCALR2E — Sounding: 01	Azimuth: 107

DATA SET: ESTEPA02

CLIENT: I.T.G.E. DATE: 05-03-98
LOCATION: LA RODA DE ANDALUCIA SOUNDING: 02
COUNTY: SEVILLA AZIMUTH: 70
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 460.00
SOUNDING COORDINATES: E: 338057.0000 N: 4120766.0000

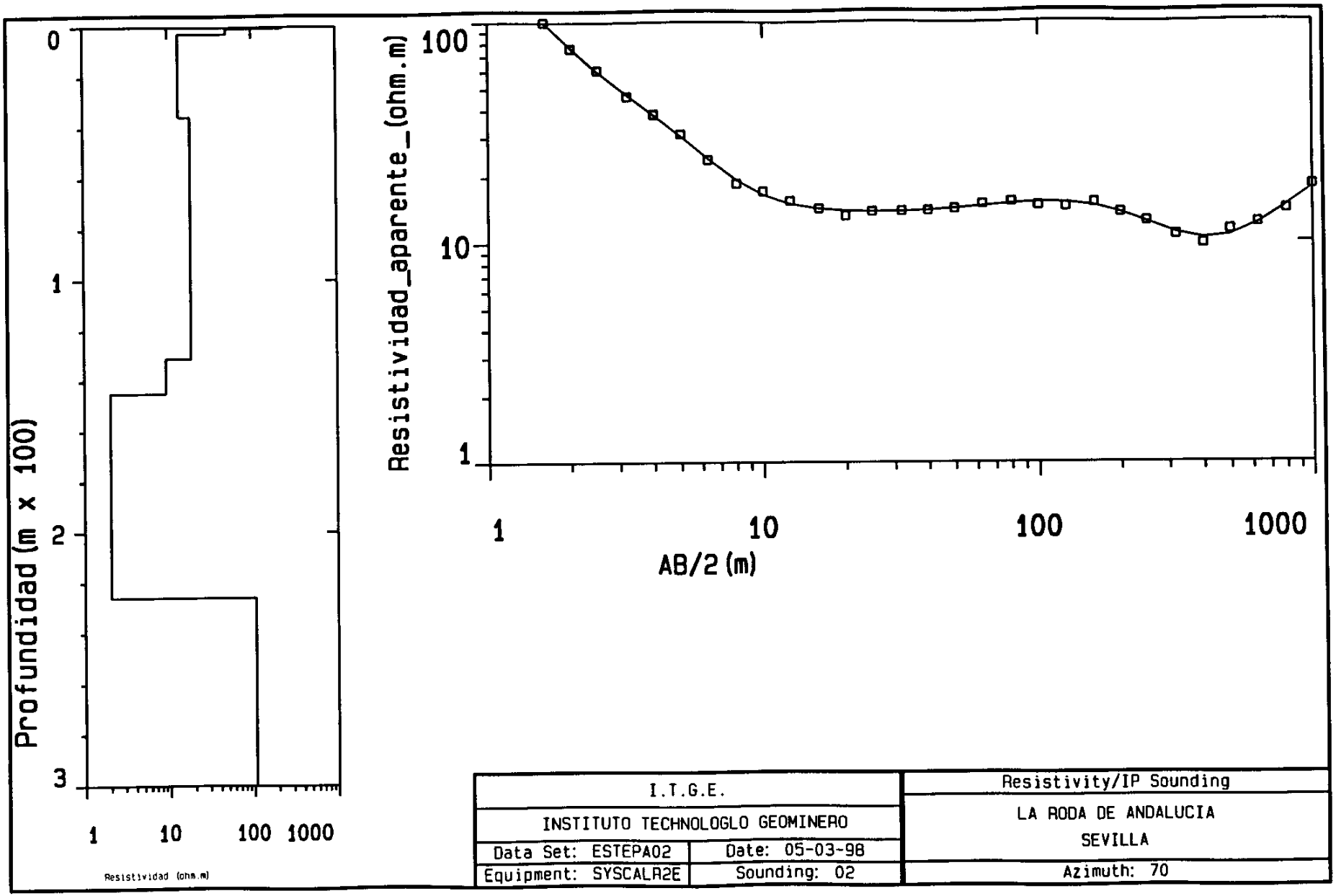
Schlumberger Configuration

FITTING ERROR: 2.830 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	100.1	99.99	0.136
2	2.00	76.22	76.78	-0.739
3	2.50	60.64	59.80	1.38
4	3.20	46.14	46.85	-1.53
5	4.00	38.25	38.05	0.544
6	5.00	31.15	30.57	1.87
7	6.30	23.86	24.13	-1.12
8	8.00	18.53	19.30	-4.11
9	10.00	17.14	16.53	3.59
10	12.60	15.48	15.00	3.08
11	16.00	14.30	14.25	0.352
12	20.00	13.22	13.93	-5.33
13	25.00	13.81	13.80	0.0587
14	32.00	13.91	13.82	0.615
15	40.00	13.93	13.97	-0.263
16	50.00	14.20	14.23	-0.184
17	63.00	14.92	14.58	2.27
18	80.00	15.28	14.94	2.20
19	100.0	14.65	15.15	-3.40
20	126.0	14.47	15.08	-4.18
21	160.0	15.04	14.55	3.21
22	200.0	13.66	13.61	0.409
23	250.0	12.47	12.34	1.04
24	320.0	10.77	10.99	-2.02
25	400.0	9.81	10.35	-5.47
26	500.0	11.35	10.64	6.18
27	630.0	12.20	12.04	1.27
28	800.0	14.00	14.48	-3.47
29	1000.0	18.10	17.48	3.40

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				460.0	
1	234.6		0.581	459.4	0.00248
2	49.81		1.98	457.4	0.0398
3	13.33		32.85	424.5	2.46
4	18.39		95.62	328.9	5.19
5	9.22		13.88	315.0	1.50
6	2.03		80.94	234.1	39.72
7	105.7				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		LA RODA DE ANDALUCIA SEVILLA
Data Set: ESTEPA02	Date: 05-03-98	
Equipment: SYSCALR2E	Sounding: 02	Azimuth: 70

DATA SET: ESTEPA03

CLIENT: I.T.G.E.
LOCATION: LA RODA DE ANDALUCIA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 460.00
SOUNDING COORDINATES: E: 338043.0000 N: 4120346.0000

DATE: 05-03-98
SOUNDING: 03
AZIMUTH: 70
EQUIPMENT: SYSCALR2E

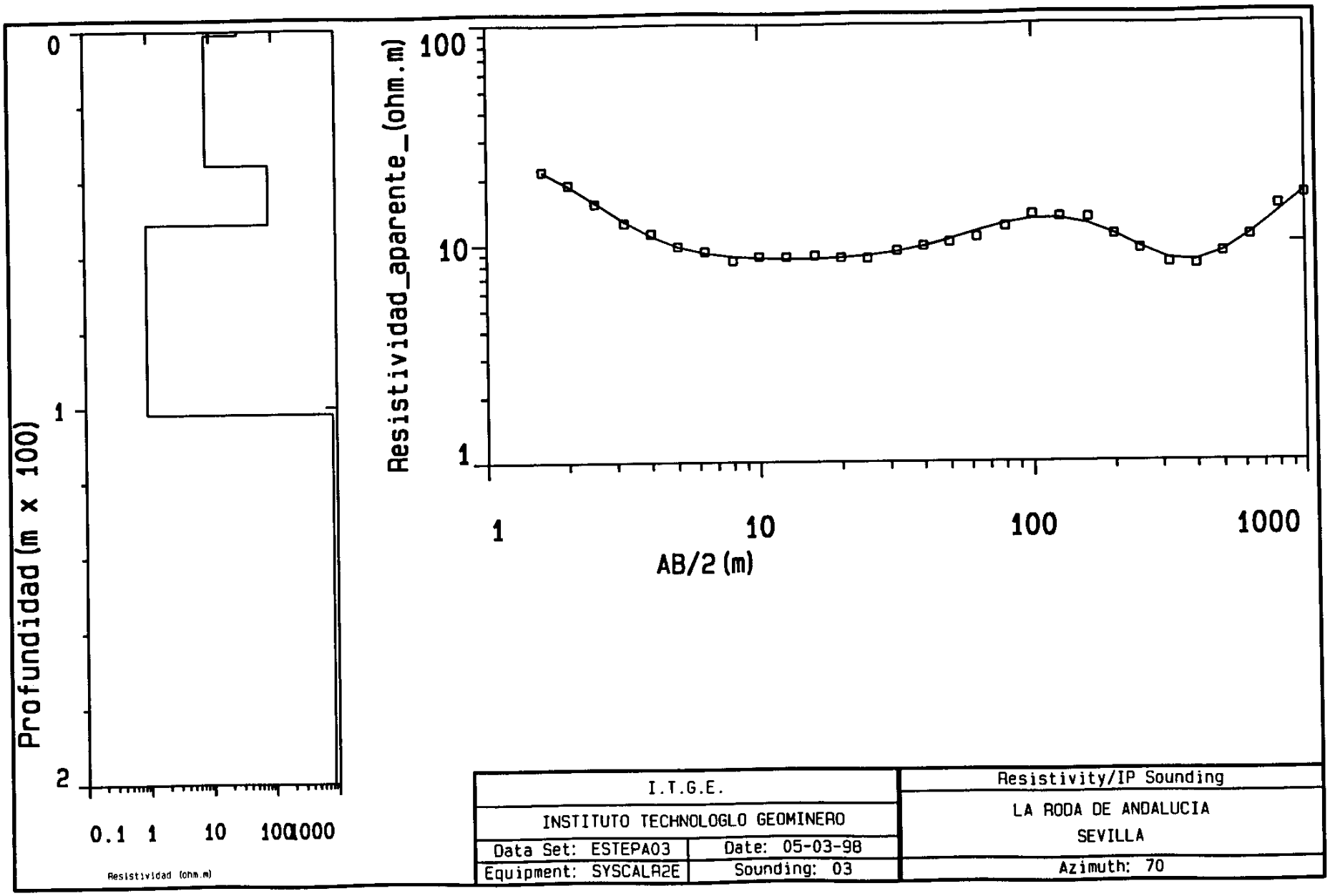
Schlumberger Configuration

FITTING ERROR: 3.208 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	21.63	21.58	0.236
2	2.00	18.84	18.65	1.00
3	2.50	15.40	15.63	-1.45
4	3.20	12.53	12.75	-1.76
5	4.00	11.17	10.89	2.54
6	5.00	9.73	9.74	-0.0181
7	6.30	9.26	9.09	1.73
8	8.00	8.38	8.77	-4.68
9	10.00	8.76	8.62	1.60
10	12.60	8.70	8.56	1.60
11	16.00	8.83	8.56	3.05
12	20.00	8.63	8.63	-0.0489
13	25.00	8.56	8.80	-2.80
14	32.00	9.23	9.16	0.773
15	40.00	9.71	9.68	0.372
16	50.00	10.09	10.42	-3.21
17	63.00	10.69	11.34	-6.04
18	80.00	11.90	12.26	-3.03
19	100.0	13.48	12.82	4.92
20	126.0	13.07	12.83	1.80
21	160.0	12.95	12.12	6.38
22	200.0	10.88	10.90	-0.196
23	250.0	9.38	9.51	-1.39
24	320.0	8.07	8.38	-3.85
25	400.0	7.93	8.20	-3.46
26	500.0	9.00	9.02	-0.253
27	630.0	10.70	10.83	-1.27
28	800.0	14.75	13.58	7.92
29	1000.0	16.50	16.89	-2.39

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				460.0	
1	28.69		0.985	459.0	0.0343
2	8.34		34.49	424.5	4.13
3	83.42		15.68	408.8	0.188
4	0.942		50.56	358.2	53.63
5	860.6				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		LA RODA DE ANDALUCIA SEVILLA
Data Set: ESTEPA03	Date: 05-03-98	
Equipment: SYSCALR2E	Sounding: 03	Azimuth: 70

DATA SET: ESTEPA04

CLIENT: I.T.G.E.
LOCATION: LA RODA DE ANDALUCIA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 445.00
SOUNDING COORDINATES: E: 338626.0000 N: 4117123.0000

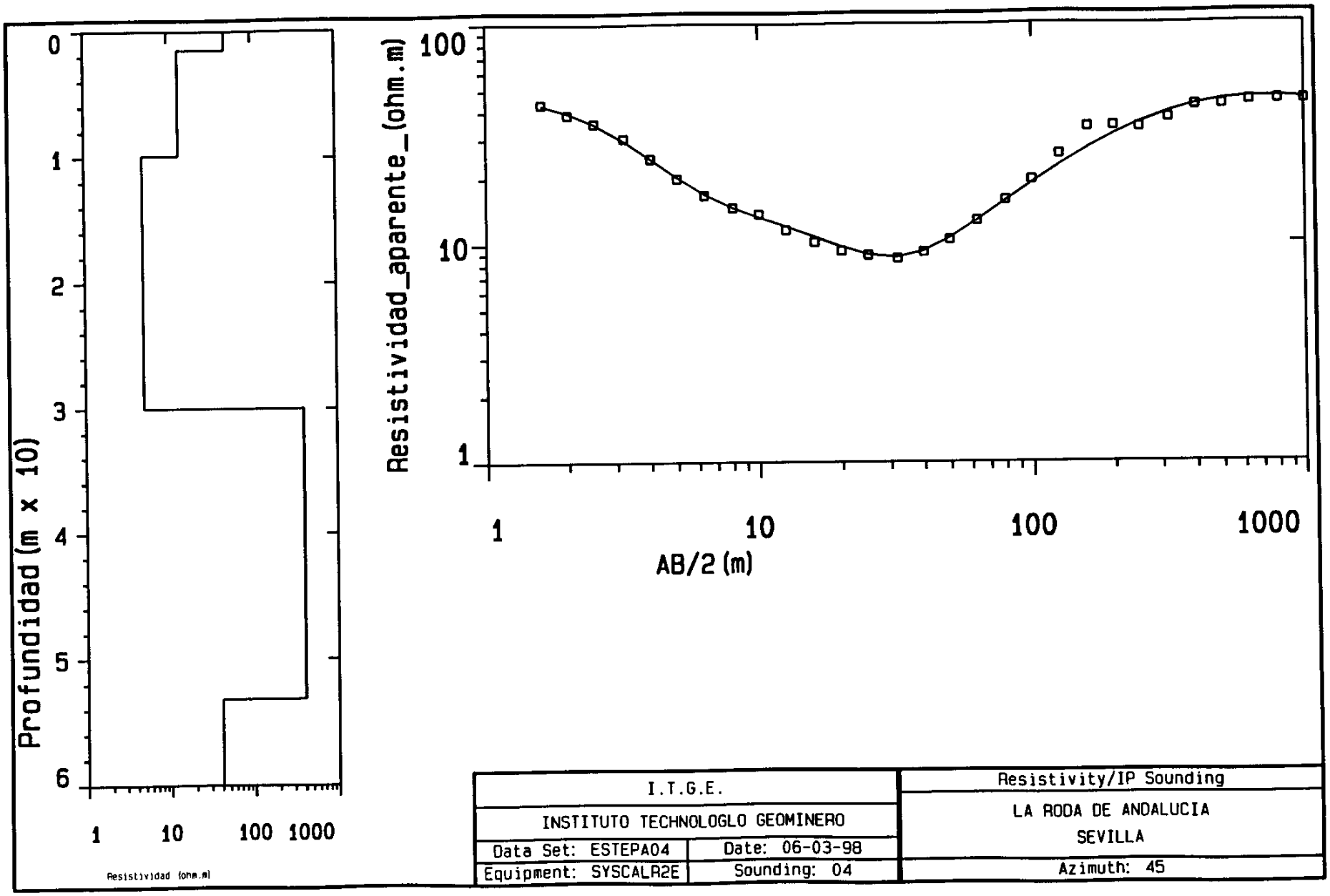
DATE: 06-03-98
SOUNDING: 04
AZIMUTH: 45
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	43.28		
2	2.00	38.84		
3	2.50	35.45		
4	3.20	30.26		
5	4.00	24.44		
6	5.00	19.79		
7	6.30	16.61		
8	8.00	14.60		
9	10.00	13.63		
10	12.60	11.53		
11	16.00	10.17		
12	20.00	9.22		
13	25.00	8.80		
14	32.00	8.49		
15	40.00	9.12		
16	50.00	10.38		
17	63.00	12.68		
18	80.00	15.73		
19	100.0	19.40		
20	126.0	25.37		
21	160.0	33.66		
22	200.0	33.87		
23	250.0	33.45		
24	320.0	36.90		
25	400.0	41.92		
26	500.0	42.20		
27	630.0	43.70		
28	800.0	44.20		
29	1000.0	44.15		

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				445.0	
1	48.29		1.49	443.5	0.0309
2	13.40		8.37	435.1	0.624
3	5.00		20.13	415.0	4.02
4	400.0		23.17	391.8	0.0579
5	40.72				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		LA RODA DE ANDALUCIA SEVILLA
Data Set: ESTEPA04	Date: 06-03-98	
Equipment: SYSCALR2E	Sounding: 04	Azimuth: 45

DATA SET: ESTEPA05

CLIENT: I.T.G.E.
LOCATION: SIERRA DE YEGUAS
COUNTY: MALAGA
PROJECT: Resistivity/IP Sounding
ELEVATION: 450.00
SOUNDING COORDINATES: E: 338475.0000 N: 4117941.0000

DATE: 06-03-98
SOUNDING: 05
AZIMUTH: 150
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

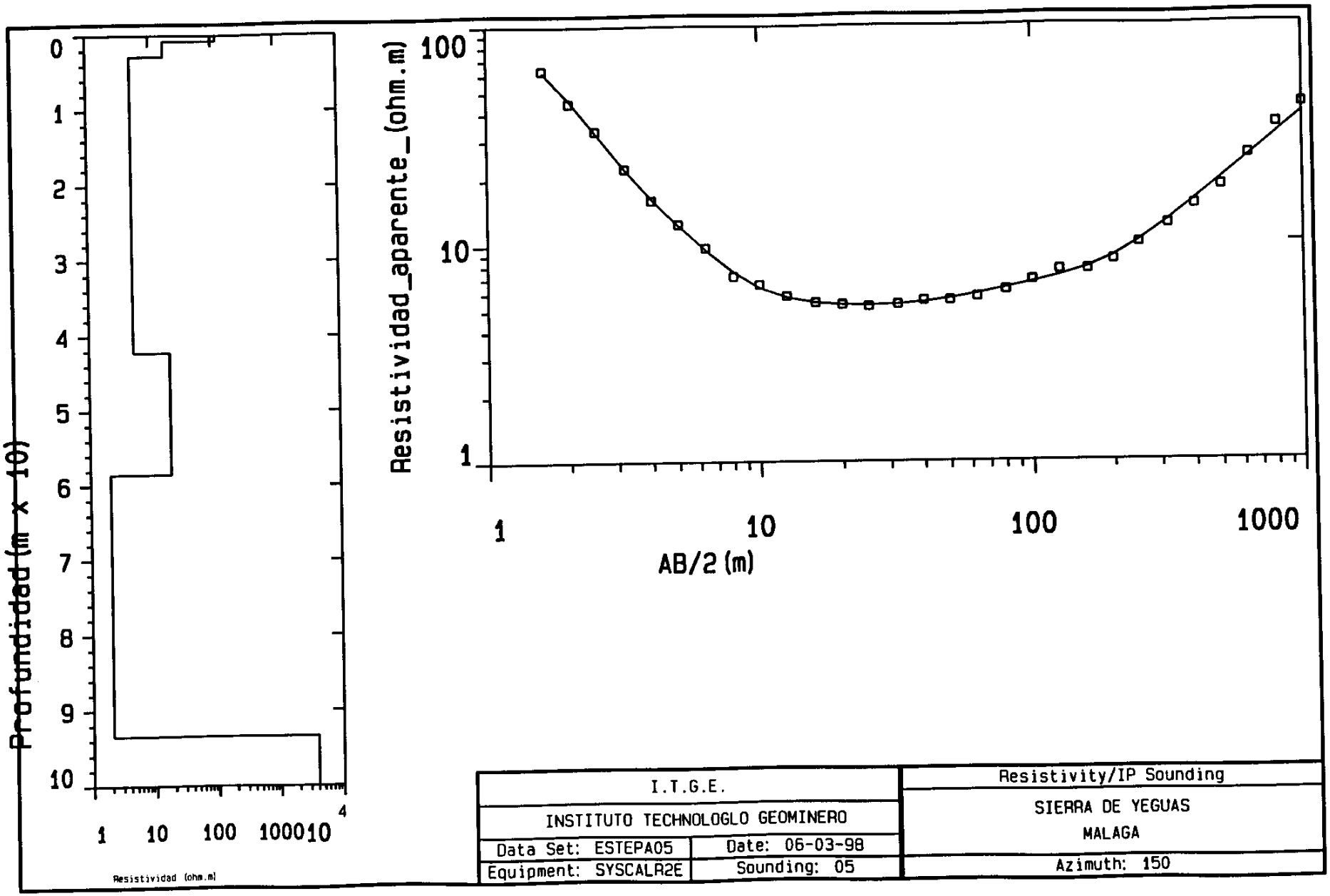
FITTING ERROR: 3.970 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	63.11	62.15	1.51
2	2.00	44.68	46.19	-3.37
3	2.50	33.38	32.74	1.92
4	3.20	22.39	22.23	0.708
5	4.00	15.98	16.22	-1.55
6	5.00	12.41	12.31	0.834
7	6.30	9.67	9.49	1.80
8	8.00	7.12	7.49	-5.17
9	10.00	6.54	6.34	3.03
10	12.60	5.80	5.70	1.69
11	16.00	5.38	5.39	-0.274
12	20.00	5.27	5.26	0.141
13	25.00	5.16	5.22	-1.13
14	32.00	5.27	5.27	0.0848
15	40.00	5.48	5.38	1.80
16	50.00	5.48	5.58	-1.76
17	63.00	5.69	5.86	-2.96
18	80.00	6.11	6.22	-1.68
19	100.0	6.75	6.58	2.41
20	126.0	7.48	7.02	6.17
21	160.0	7.52	7.66	-1.96
22	200.0	8.33	8.62	-3.52
23	250.0	9.96	10.12	-1.64
24	320.0	12.09	12.56	-3.86
25	400.0	14.83	15.55	-4.85
26	500.0	18.00	19.39	-7.73
27	630.0	24.90	24.39	2.01
28	800.0	34.40	30.93	10.08
29	1000.0	42.30	38.59	8.76

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				450.0	
1	118.9		0.767	449.2	0.00646
2	17.33		2.05	447.1	0.118
3	5.00		39.40	407.7	7.87
4	19.09		16.34	391.4	0.856
5	2.08		34.87	356.5	16.76
6	4000.0				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *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Resistividad (ohm.m)
Resistividad_aparente_(ohm.m)
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10
1
1
10
100
1000
AB/2 (m)
I.T.G.E.
INSTITUTO TECHNOLOGLO GEOMINERO
Data Set: ESTEPA05
Date: 06-03-98
Equipment: SYSCALR2E
Sounding: 05
Resistivity/IP Sounding
SIERRA DE YEGUAS
MALAGA
Azimuth: 150

DATA SET: ESTEPA06

CLIENT: I.T.G.E.
LOCATION: LA RODA DE ANDALUCIA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 445.00
SOUNDING COORDINATES: E: 338650.0000 N: 4116810.0000

DATE: 09-03-98
SOUNDING: 06
AZIMUTH: 133
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

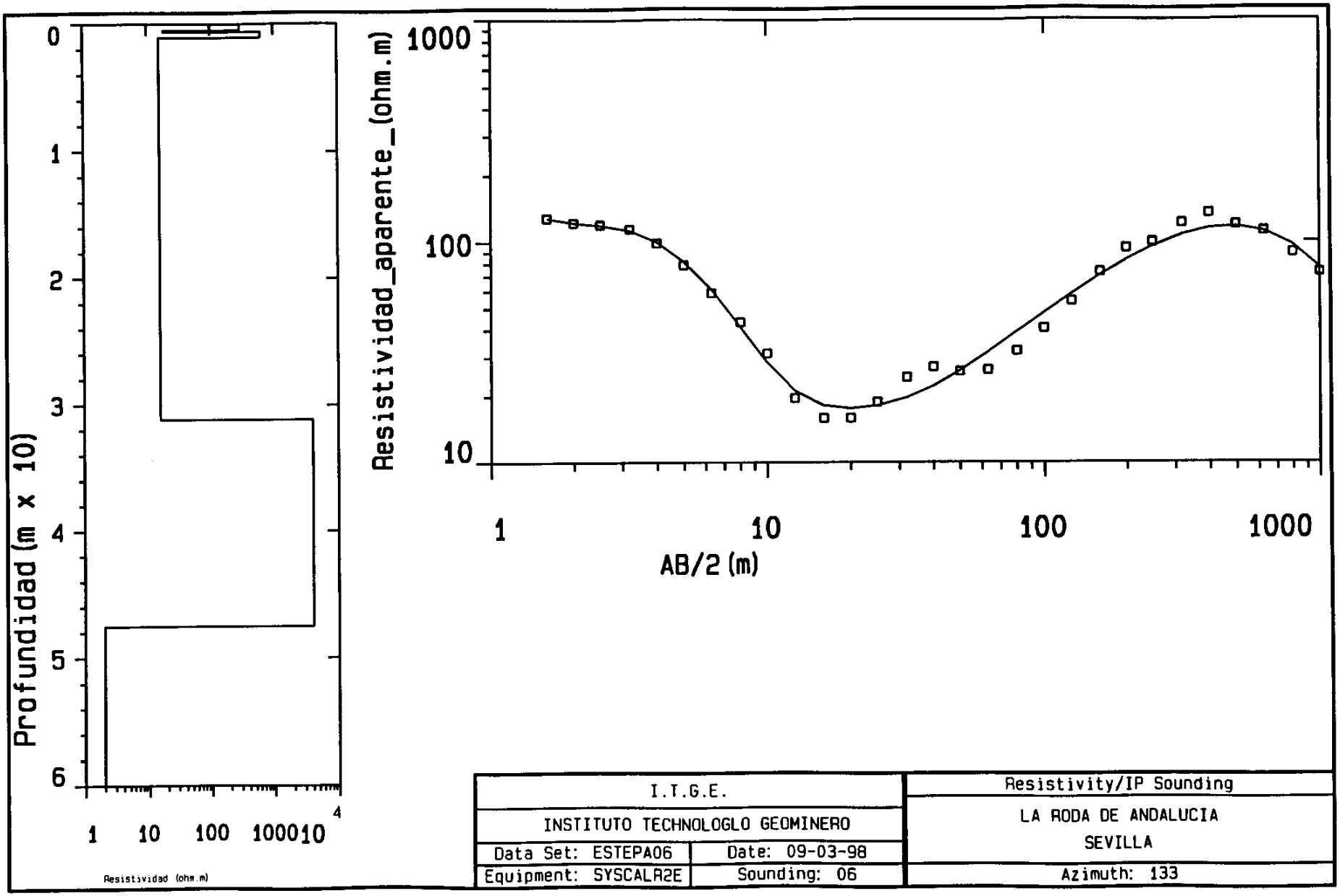
FITTING ERROR: 10.833 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	128.2	128.2	0.0333
2	2.00	122.1	122.1	-0.0342
3	2.50	119.8	119.2	0.560
4	3.20	114.2	112.4	1.60
5	4.00	99.05	99.85	-0.816
6	5.00	78.62	81.70	-3.92
7	6.30	58.75	60.61	-3.16
8	8.00	43.36	41.23	4.91
9	10.00	31.28	28.48	8.95
10	12.60	19.58	21.16	-8.05
11	16.00	15.91	18.14	-14.02
12	20.00	15.91	17.56	-10.34
13	25.00	18.77	18.06	3.77
14	32.00	24.21	19.62	18.94
15	40.00	27.04	22.15	18.08
16	50.00	25.84	25.99	-0.606
17	63.00	26.24	31.54	-20.21
18	80.00	31.97	39.00	-21.99
19	100.0	40.49	47.52	-17.34
20	126.0	53.68	57.86	-7.78
21	160.0	72.55	70.00	3.51
22	200.0	93.38	82.26	11.90
23	250.0	99.18	94.59	4.62
24	320.0	120.8	106.6	11.76
25	400.0	134.0	114.1	14.83
26	500.0	118.5	116.1	1.95
27	630.0	111.3	110.6	0.554
28	800.0	88.80	96.07	-8.19
29	1000.0	72.35	75.65	-4.57

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				445.0	
1	295.2		0.472	444.5	0.00160
2	18.51		0.154	444.3	0.00837
3	626.8		0.452	443.9	7.212E-04
4	15.49		30.08	413.8	1.94
5	4000.3		16.35	397.4	0.00409
6	2.00				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		LA RODA DE ANDALUCIA SEVILLA
Data Set: ESTEPA06	Date: 09-03-98	
Equipment: SYSCALR2E	Sounding: 06	Azimuth: 133

DATA SET: ESTEPA07

CLIENT: I.T.G.E.
LOCATION: SIERRA DE YEGUAS
COUNTY: MALAGA
PROJECT: Resistivity/IP Sounding
ELEVATION: 460.00
SOUNDING COORDINATES: E: 337623.0000 N: 4117897.0000

DATE: 20-03-98
SOUNDING: 07
AZIMUTH: 117
EQUIPMENT: SYSCALR2E

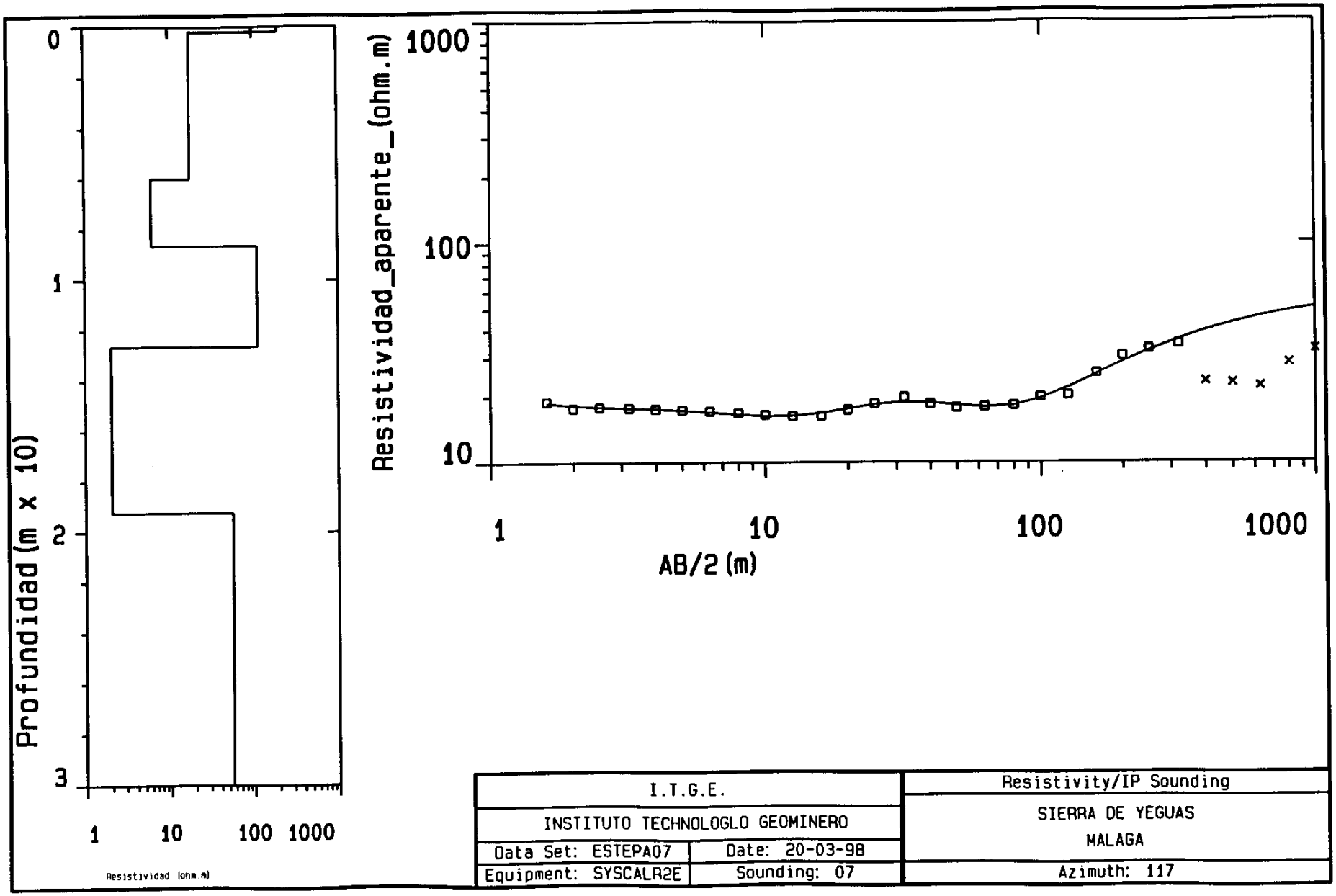
Schlumberger Configuration

FITTING ERROR: 2.900 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	18.99	18.75	1.28
2	2.00	17.72	18.24	-2.92
3	2.50	17.90	17.95	-0.280
4	3.20	17.72	17.73	-0.0545
5	4.00	17.54	17.53	0.0462
6	5.00	17.36	17.28	0.450
7	6.30	17.08	16.95	0.797
8	8.00	16.81	16.57	1.43
9	10.00	16.45	16.30	0.900
10	12.60	16.27	16.31	-0.275
11	16.00	16.27	16.77	-3.11
12	20.00	17.29	17.54	-1.46
13	25.00	18.50	18.33	0.903
14	32.00	19.80	18.80	5.03
15	40.00	18.44	18.69	-1.35
16	50.00	17.75	18.21	-2.59
17	63.00	17.93	17.82	0.596
18	80.00	18.18	18.12	0.347
19	100.0	19.80	19.41	1.99
20	126.0	20.15	21.77	-8.05
21	160.0	25.40	25.00	1.55
22	200.0	30.39	28.42	6.48
23	250.0	32.62	32.00	1.91
24	320.0	34.43	35.96	-4.45
25	400.0	23.22	39.42	-69.76
26	500.0	22.80	42.63	-86.99
27	630.0	22.00	45.60	-107.2
28	800.0	28.05	48.21	-71.88
29	1000.0	32.35	50.20	-55.18

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				460.0	
1	200.6		0.203	459.7	0.00101
2	17.66		5.77	454.0	0.327
3	6.11		2.66	451.3	0.435
4	111.1		3.99	447.3	0.0359
5	2.02		6.60	440.7	3.26
6	55.72				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		SIERRA DE YEGUAS MALAGA
Data Set: ESTEPA07	Date: 20-03-98	
Equipment: SYSCALR2E	Sounding: 07	Azimuth: 117

DATA SET: ESTEPA08

CLIENT: I.T.G.E. DATE: 10-03-98
LOCATION: SIERRA DE YEGUAS SOUNDING: 08
COUNTY: MALAGA AZIMUTH: 135
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 450.00
SOUNDING COORDINATES: E: 337983.0000 N: 4118475.0000

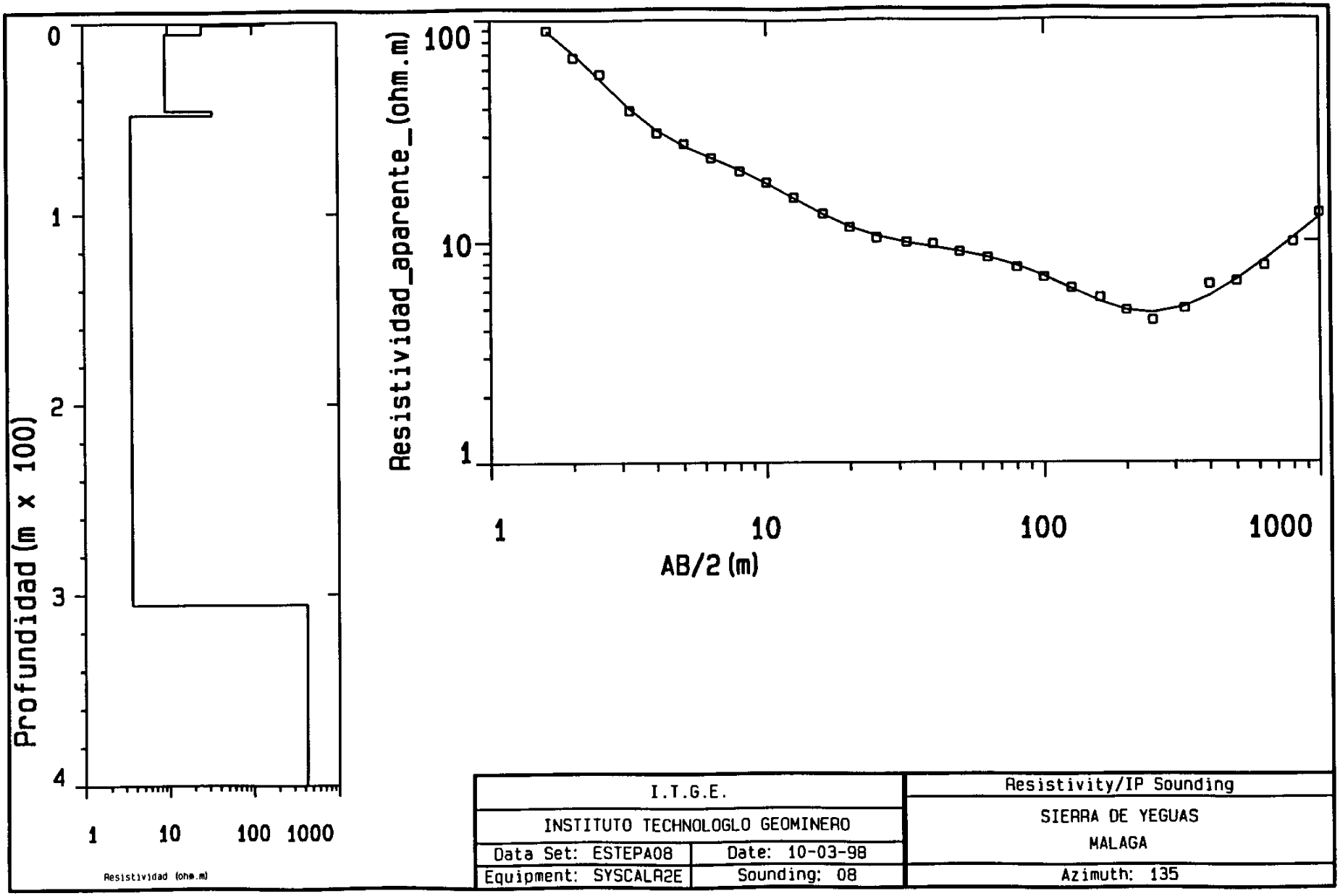
Schlumberger Configuration

FITTING ERROR: 3.802 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	90.12	89.26	0.960
2	2.00	67.88	70.83	-4.34
3	2.50	57.07	53.93	5.49
4	3.20	39.11	39.83	-1.82
5	4.00	31.05	31.82	-2.47
6	5.00	27.69	27.12	2.07
7	6.30	23.96	23.95	0.0323
8	8.00	20.88	21.13	-1.16
9	10.00	18.57	18.44	0.685
10	12.60	15.85	15.73	0.731
11	16.00	13.41	13.35	0.452
12	20.00	11.63	11.71	-0.732
13	25.00	10.41	10.64	-2.20
14	32.00	9.94	9.91	0.326
15	40.00	9.74	9.45	3.01
16	50.00	9.00	9.02	-0.194
17	63.00	8.47	8.49	-0.174
18	80.00	7.62	7.77	-1.92
19	100.0	6.88	6.96	-1.17
20	126.0	6.14	6.09	0.815
21	160.0	5.55	5.32	4.11
22	200.0	4.87	4.87	0.0315
23	250.0	4.38	4.73	-8.05
24	326.0	4.97	5.03	-1.31
25	400.0	6.38	5.62	11.91
26	500.0	6.55	6.64	-1.52
27	630.0	7.70	8.16	-6.07
28	800.0	9.85	10.25	-4.11
29	1000.0	13.35	12.73	4.62

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				450.0	
1	143.5		0.866	449.1	0.00604
2	25.45		4.73	444.4	0.185
3	9.35		40.14	404.2	4.29
4	33.63		2.28	401.9	0.0678
5	3.58		257.4	144.4	71.74
6	428.9				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		SIERRA DE YEGUAS MALAGA
Data Set: ESTEPA08	Date: 10-03-98	
Equipment: SYSCALA2E	Sounding: 08	Azimuth: 135

DATA SET: ESTEPA09

CLIENT: I.T.G.E. DATE: 10-03-98
LOCATION: LA RODA DE ANDALUCIA SOUNDING: 09
COUNTY: SEVILLA AZIMUTH: 143
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 450.00
SOUNDING COORDINATES: E: 338359.0000 N: 4119332.0000

Schlumberger Configuration

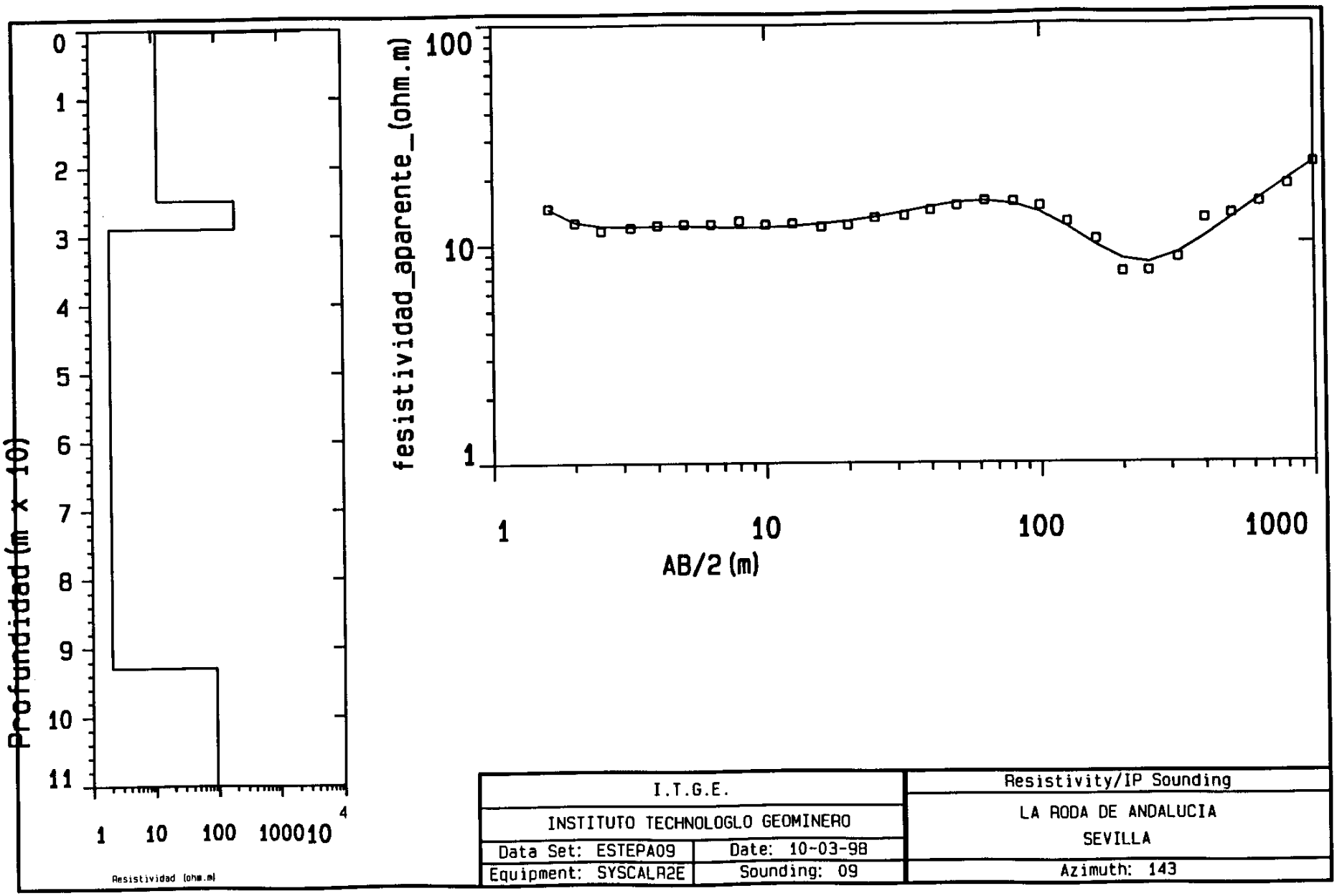
FITTING ERROR: 6.047 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	14.70	14.64	0.365
2	2.00	12.63	12.72	-0.733
3	2.50	11.59	12.19	-5.21
4	3.20	11.97	12.07	-0.852
5	4.00	12.25	12.17	0.645
6	5.00	12.34	12.18	1.34
7	6.30	12.34	12.06	2.31
8	8.00	12.81	11.97	6.59
9	10.00	12.33	12.01	2.61
10	12.60	12.44	12.17	2.18
11	16.00	12.02	12.42	-3.29
12	20.00	12.23	12.76	-4.30
13	25.00	13.16	13.23	-0.551
14	32.00	13.37	13.96	-4.42
15	40.00	14.18	14.73	-3.82
16	50.00	14.92	15.39	-3.09
17	63.00	15.67	15.64	0.171
18	80.00	15.45	15.12	2.18
19	100.0	14.82	13.81	6.78
20	126.0	12.49	11.86	5.01
21	160.0	10.41	9.80	5.94
22	200.0	7.41	8.47	-14.27
23	250.0	7.46	8.14	-9.05
24	320.0	8.59	8.99	-4.72
25	400.0	12.94	10.64	17.73
26	500.0	13.50	12.89	4.51
27	630.0	15.20	15.72	-3.45
28	800.0	18.20	19.20	-5.50
29	1000.0	22.95	22.98	-0.147

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				450.0	
1	2414.5		0.220	449.7	9.143E-05
2	11.97		24.54	425.2	2.05
3	200.0		4.07	421.1	0.0203
4	2.00		64.06	357.0	32.03
5	93.43				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *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4
Resistividad (ohm.m)
fesistividad_aparente_(ohm.m)
100
10
1
1
10
100
1000
AB/2 (m)
I.T.G.E.
INSTITUTO TECHNOLOGLO GEOMINERO
Data Set: ESTEPA09
Date: 10-03-98
Equipment: SYSCALR2E
Sounding: 09
Resistivity/IP Sounding
LA RODA DE ANDALUCIA
SEVILLA
Azimuth: 143

DATA SET: ESTEPA10

CLIENT: I.T.G.E. DATE: 16-03-98
LOCATION: ESTEPA SOUNDING: 10
COUNTY: SEVILLA AZIMUTH: 122
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 515.00
SOUNDING COORDINATES: E: 336617.0000 N: 4127447.0000

Schlumberger Configuration

FITTING ERROR: 4.366 PERCENT

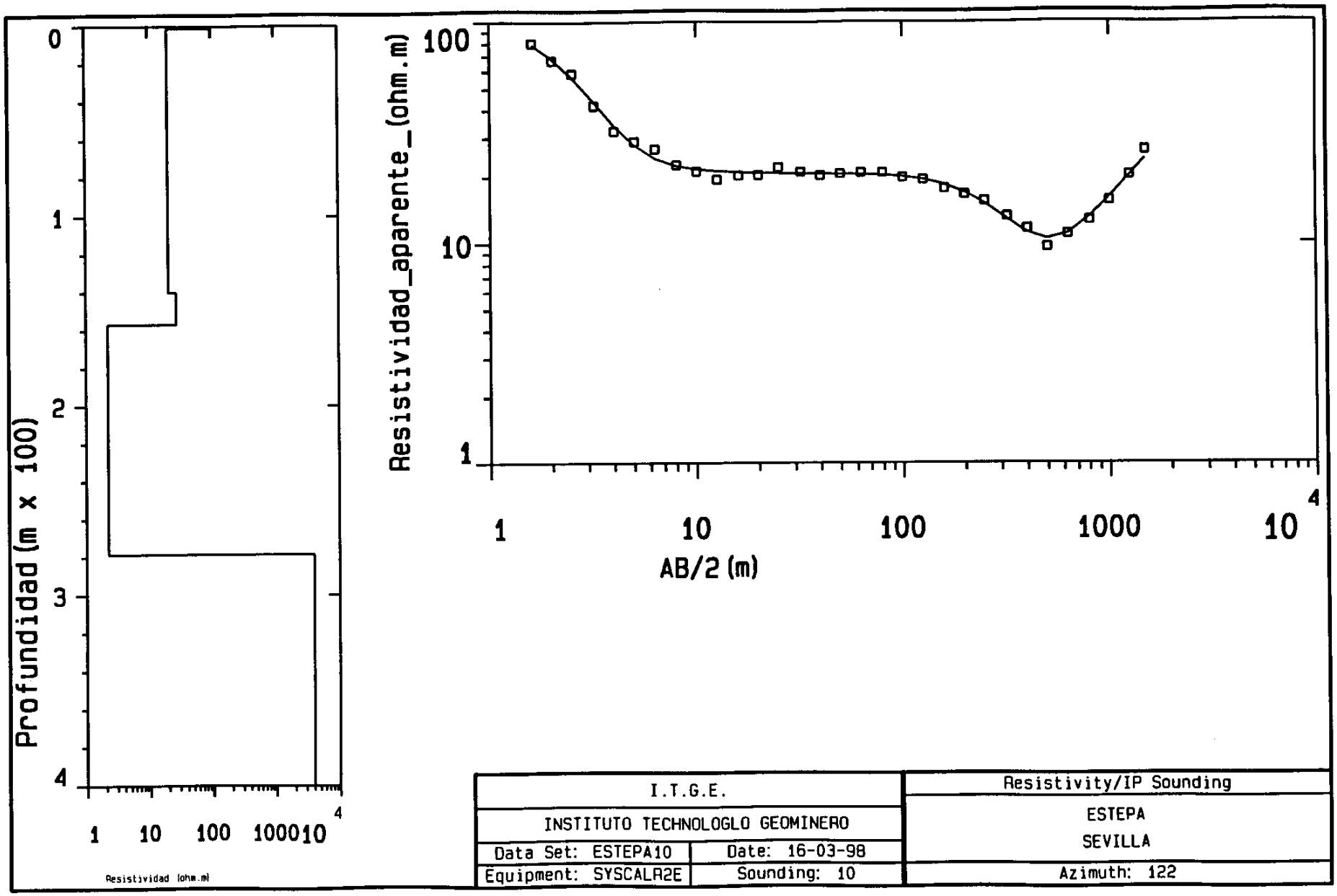
No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	80.44	78.74	2.11
2	2.00	67.06	68.37	-1.95
3	2.50	58.40	56.40	3.42
4	3.20	41.93	43.48	-3.71
5	4.00	32.10	34.09	-6.19
6	5.00	28.82	27.77	3.63
7	6.30	26.67	24.13	9.52
8	8.00	22.55	22.35	0.915
9	10.00	21.12	21.58	-2.18
10	12.60	19.37	21.17	-9.28
11	16.00	20.24	20.94	-3.42
12	20.00	20.33	20.81	-2.35
13	25.00	22.03	20.73	5.92
14	32.00	20.94	20.65	1.37
15	40.00	20.24	20.59	-1.75
16	50.00	20.59	20.52	0.336
17	63.00	20.77	20.42	1.66
18	80.00	20.77	20.24	2.54
19	100.0	19.79	19.92	-0.639
20	126.0	19.35	19.33	0.0906
21	160.0	17.57	18.32	-4.28
22	200.0	16.60	16.91	-1.85
23	250.0	15.45	15.04	2.61
24	320.0	13.15	12.78	2.86
25	400.0	11.61	11.10	4.36
26	500.0	9.55	10.38	-8.72
27	630.0	10.95	10.98	-0.337
28	800.0	12.65	13.02	-2.96
29	1000.0	15.50	16.01	-3.35
30	1260.0	20.20	20.11	0.420

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
31	1500.0	26.20	23.91	8.70

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				515.0	
1	99.46		1.18	513.8	0.0118
2	20.60		138.6	375.1	6.73
3	26.97		17.01	358.1	0.630
4	2.21		121.6	236.4	54.85
5	4000.5				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *


Profundidad (m x 100)
0
1
2
3
4
1
10
100
100010
4
Resistividad (ohm.m)
Resistividad_aparente_(ohm.m)
100
10
1
1
10
100
1000
10
4
AB/2 (m)
I.T.G.E.
INSTITUTO TECHNOLOGLO GEOMINERO
Data Set: ESTEPA10
Date: 16-03-98
Equipment: SYSCALR2E
Sounding: 10
Resistivity/IP Sounding
ESTEPA
SEVILLA
Azimuth: 122

DATA SET: ESTEPA11

CLIENT: I.T.G.E. DATE: 13-03-98
LOCATION: ESTEPA SOUNDING: 11
COUNTY: SEVILLA AZIMUTH: 90
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 495.00
SOUNDING COORDINATES: E: 334203.0000 N: 4126863.0000

Schlumberger Configuration

FITTING ERROR: 3.568 PERCENT

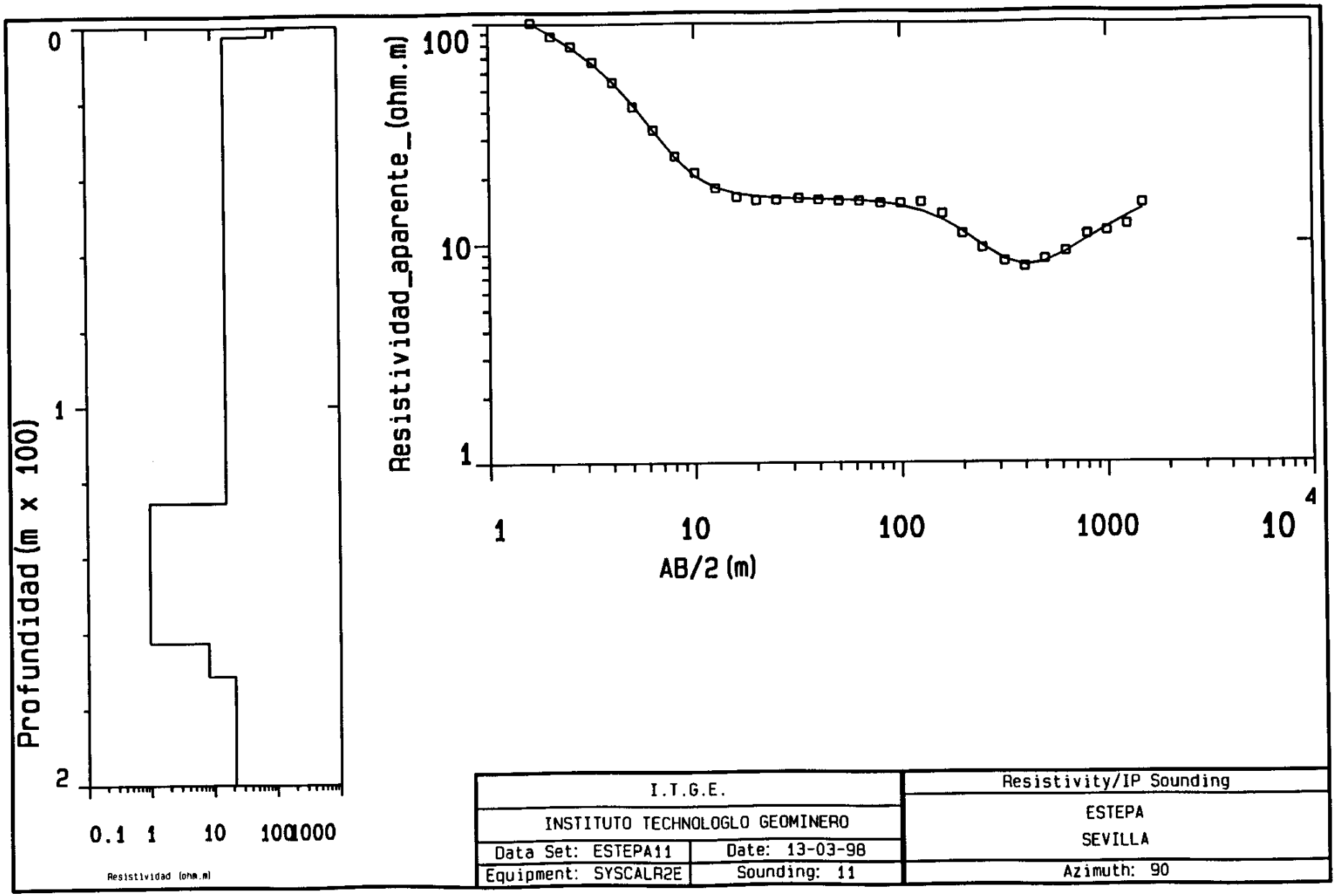
No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	101.0	100.6	0.420
2	2.00	87.98	89.39	-1.61
3	2.50	79.38	78.47	1.15
4	3.20	67.41	66.22	1.76
5	4.00	54.32	54.67	-0.644
6	5.00	42.04	43.19	-2.73
7	6.30	32.94	32.75	0.564
8	8.00	25.06	24.86	0.803
9	10.00	21.05	20.40	3.08
10	12.60	17.90	18.04	-0.794
11	16.00	16.27	16.95	-4.14
12	20.00	15.76	16.46	-4.45
13	25.00	15.86	16.20	-2.09
14	32.00	16.07	16.01	0.337
15	40.00	15.76	15.89	-0.834
16	50.00	15.56	15.77	-1.35
17	63.00	15.46	15.59	-0.838
18	80.00	15.15	15.27	-0.772
19	100.0	15.15	14.78	2.47
20	126.0	15.36	13.97	8.99
21	160.0	13.55	12.75	5.87
22	200.0	11.01	11.29	-2.54
23	250.0	9.48	9.75	-2.86
24	320.0	8.23	8.41	-2.15
25	400.0	7.75	7.90	-1.88
26	500.0	8.40	8.15	2.87
27	630.0	9.10	9.04	0.572
28	800.0	10.90	10.34	5.10
29	1000.0	11.30	11.69	-3.50
30	1260.0	12.10	13.13	-8.53

* INSTITUTO TECHNOLOGLO GEOMINERO *

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
31	1500.0	15.15	14.20	6.23

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				495.0	
1	148.6		0.573	494.4	0.00386
2	78.82		1.83	492.5	0.0232
3	15.84		123.2	369.3	7.77
4	0.967		37.02	332.3	38.25
5	8.17		8.81	323.5	1.07
6	21.54				

ALL PARAMETERS ARE FREE



I.T.G.E.	Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO	ESTEPA SEVILLA
Data Set: ESTEPA11 / Date: 13-03-98	
Equipment: SYSCALR2E / Sounding: 11	Azimuth: 90

DATA SET: ESTEPA12

CLIENT: I.T.G.E.
LOCATION: ESTEPA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 500.00
SOUNDING COORDINATES: E: 336925.0000 N: 4126550.0000

DATE: 13-05-85
SOUNDING: 12
AZIMUTH: 135
EQUIPMENT: SYSCALR2E

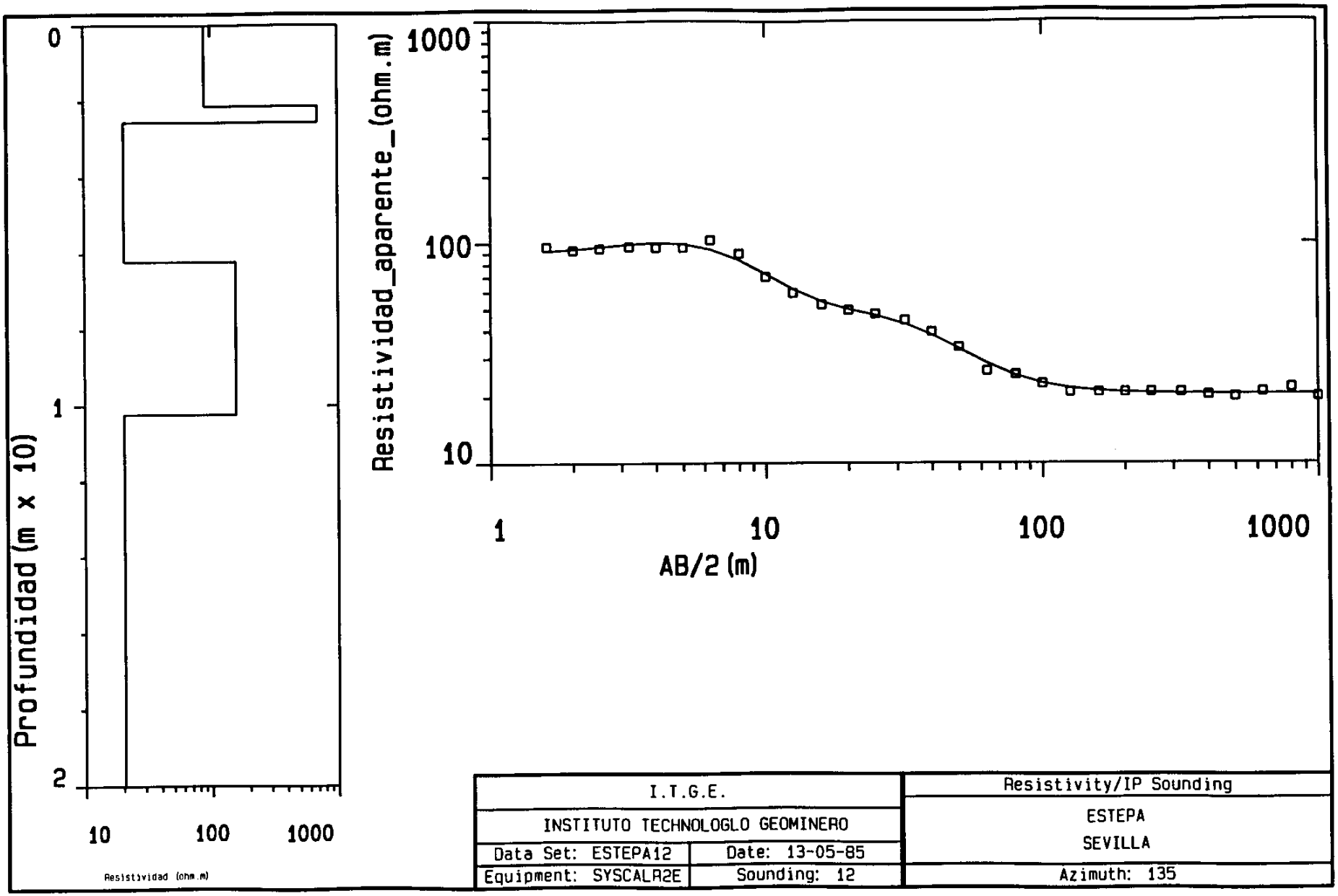
Schlumberger Configuration

FITTING ERROR: 3.957 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	96.24	92.12	4.27
2	2.00	92.80	93.85	-1.12
3	2.50	94.52	96.16	-1.73
4	3.20	96.24	98.85	-2.70
5	4.00	95.38	100.2	-5.04
6	5.00	95.38	98.90	-3.68
7	6.30	103.1	93.45	9.37
8	8.00	89.37	83.56	6.50
9	10.00	70.16	72.38	-3.15
10	12.60	59.29	61.79	-4.22
11	16.00	52.37	54.13	-3.35
12	20.00	49.41	49.88	-0.949
13	25.00	47.43	46.78	1.37
14	32.00	44.47	42.76	3.83
15	40.00	39.37	38.08	3.26
16	50.00	33.60	33.04	1.65
17	63.00	26.25	28.42	-8.28
18	80.00	25.20	24.96	0.921
19	100.0	22.83	22.97	-0.620
20	126.0	21.00	21.83	-3.98
21	160.0	21.00	21.22	-1.05
22	200.0	21.00	20.91	0.419
23	250.0	21.00	20.73	1.27
24	320.0	21.00	20.61	1.81
25	400.0	20.31	20.55	-1.17
26	500.0	20.00	20.51	-2.58
27	630.0	21.00	20.48	2.43
28	800.0	22.00	20.47	6.95
29	1000.0	20.00	20.46	-2.30

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				500.0	
1	89.59		2.12	497.8	0.0237
2	702.1		0.421	497.4	5.998E-04
3	20.58		3.66	493.7	0.177
4	157.0		4.02	489.7	0.0256
5	20.44				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		ESTEPA SEVILLA
Data Set: ESTEPA12	Date: 13-05-85	
Equipment: SYSCALR2E	Sounding: 12	Azimuth: 135

DATA SET: ESTEPA14

CLIENT: I.T.G.E. DATE: 23-03-98
LOCATION: ESTEPA SOUNDING: 14
COUNTY: SEVILLA AZIMUTH: 0
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 480.00
SOUNDING COORDINATES: E: 336543.0000 N: 4125775.0000

Schlumberger Configuration

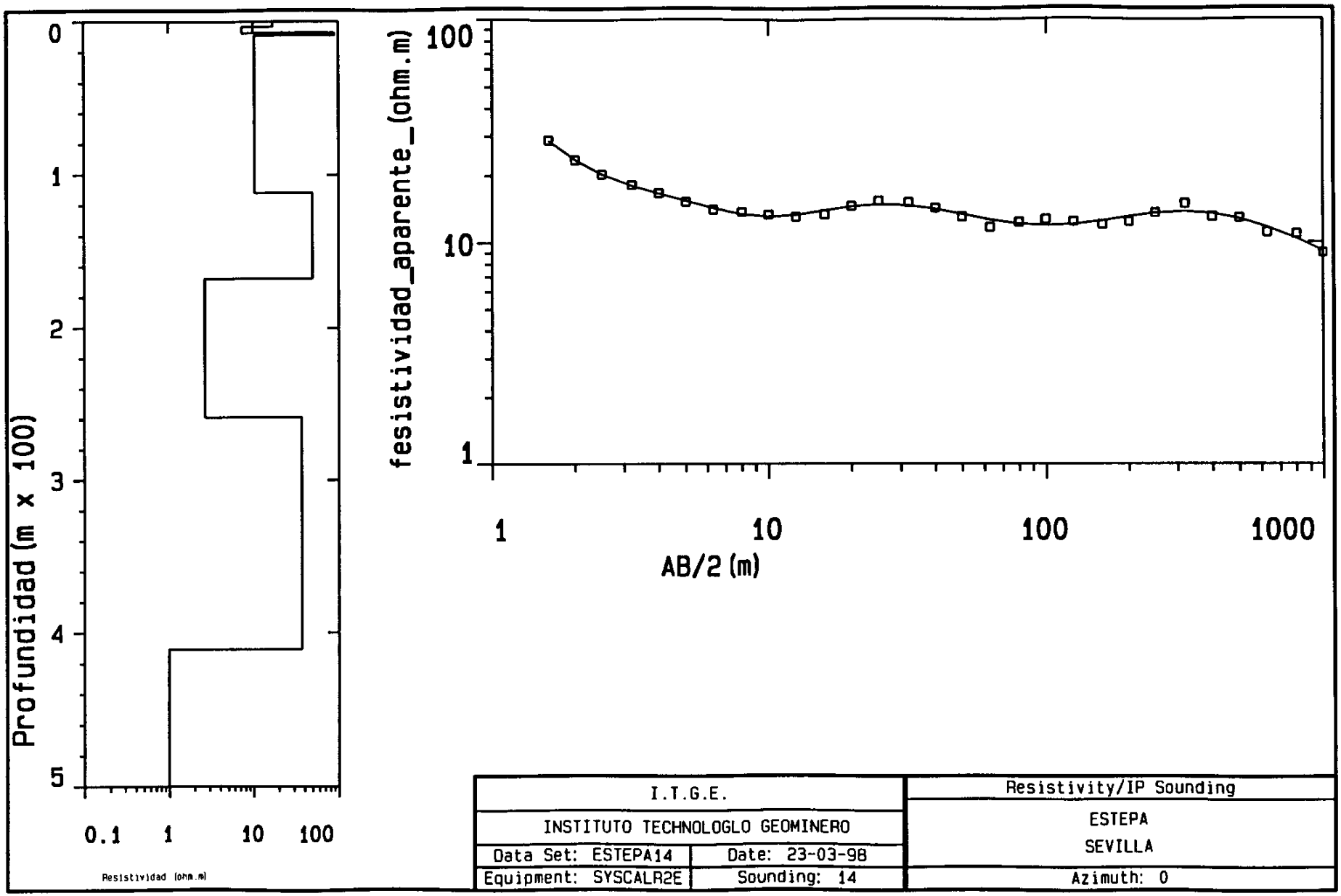
FITTING ERROR: 3.540 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	28.80	28.74	0.197
2	2.00	23.49	23.59	-0.396
3	2.50	20.20	20.22	-0.131
4	3.20	18.12	17.98	0.798
5	4.00	16.69	16.59	0.610
6	5.00	15.18	15.39	-1.34
7	6.30	14.04	14.26	-1.58
8	8.00	13.68	13.39	2.11
9	10.00	13.32	13.07	1.93
10	12.60	13.03	13.29	-1.98
11	16.00	13.32	13.91	-4.40
12	20.00	14.56	14.49	0.475
13	25.00	15.28	14.76	3.36
14	32.00	15.06	14.58	3.17
15	40.00	14.22	14.04	1.30
16	50.00	12.96	13.31	-2.65
17	63.00	11.63	12.57	-8.11
18	80.00	12.26	12.04	1.76
19	100.0	12.61	11.85	6.00
20	126.0	12.33	11.98	2.81
21	160.0	11.94	12.42	-4.02
22	200.0	12.33	12.98	-5.23
23	250.0	13.51	13.48	0.233
24	320.0	14.85	13.69	7.78
25	400.0	12.96	13.40	-3.41
26	500.0	12.80	12.67	1.00
27	630.0	11.00	11.59	-5.38
28	800.0	10.85	10.33	4.76
29	1000.0	8.95	9.07	-1.42

* INSTITUTO TECHNOLOGLO GEOMINERO *

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				480.0	
1	68.47		0.516	479.4	0.00754
2	17.19		3.00	476.4	0.175
3	7.43		3.93	472.5	0.529
4	89.72		1.87	470.6	0.0208
5	10.39		102.2	368.4	9.82
6	49.68		56.11	312.3	1.12
7	2.65		90.95	221.3	34.31
8	36.73		152.2	69.14	4.14
9	0.990				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		ESTEPA SEVILLA
Data Set: ESTEPA14	Date: 23-03-98	
Equipment: SYSCALR2E	Sounding: 14	Azimuth: 0

DATA SET: ESTEPA16

CLIENT: I.T.G.E. DATE: 23-03-98
LOCATION: ESTEPA SOUNDING: 16
COUNTY: SEVILLA AZIMUTH: 152
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 520.00
SOUNDING COORDINATES: E: 337136.0000 N: 4124464.0000

Schlumberger Configuration

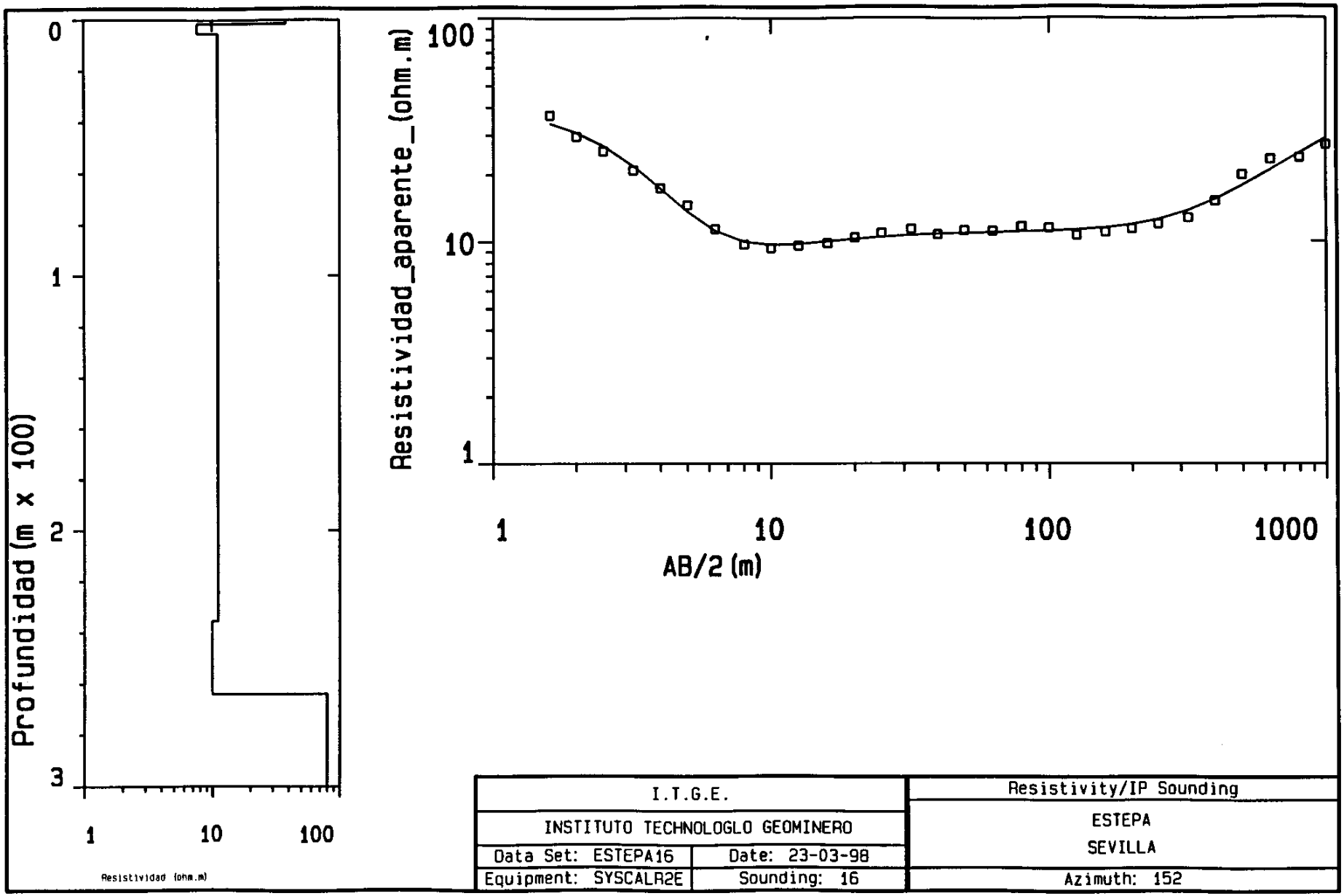
FITTING ERROR: 5.255 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	36.77	33.75	8.20
2	2.00	29.69	30.83	-3.85
3	2.50	25.54	26.92	-5.37
4	3.20	20.93	21.82	-4.27
5	4.00	17.36	17.29	0.420
6	5.00	14.53	13.61	6.32
7	6.30	11.33	11.14	1.62
8	8.00	9.65	9.94	-3.03
9	10.00	9.33	9.64	-3.33
10	12.60	9.59	9.75	-1.57
11	16.00	9.80	10.00	-1.97
12	20.00	10.38	10.25	1.29
13	25.00	10.91	10.47	4.04
14	32.00	11.38	10.66	6.33
15	40.00	10.73	10.79	-0.493
16	50.00	11.17	10.89	2.52
17	63.00	11.11	10.97	1.31
18	80.00	11.66	11.05	5.23
19	100.0	11.49	11.13	3.15
20	126.0	10.63	11.26	-5.96
21	160.0	10.97	11.49	-4.78
22	200.0	11.39	11.88	-4.29
23	250.0	11.97	12.53	-4.62
24	320.0	12.73	13.72	-7.84
25	400.0	15.15	15.40	-1.62
26	500.0	19.75	17.74	10.15
27	630.0	23.20	20.87	10.01
28	800.0	23.65	24.79	-4.85
29	1000.0	27.10	28.99	-6.98

* INSTITUTO TECHNOLOGLO GEOMINERO *

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				520.0	
1	38.43		1.52	518.4	0.0396
2	7.61		3.80	514.6	0.499
3	11.07		230.2	284.4	20.79
4	9.93		28.47	255.9	2.86
5	80.00				

ALL PARAMETERS ARE FREE


Profundidad (m x 100)
0
1
2
3
1
10
100
Resistividad (ohm.m)
Resistividad_aparente_(ohm.m)
100
10
1
1
10
100
1000
AB/2 (m)
I.T.G.E.
INSTITUTO TECHNOLOGLO GEOMINERO
Data Set: ESTEPA16
Date: 23-03-98
Equipment: SYSCALR2E
Sounding: 16
Resistivity/IP Sounding
ESTEPA
SEVILLA
Azimuth: 152

DATA SET: ESTEPA17

CLIENT: I.T.G.E. DATE: 25-03-98
LOCATION: ESTEPA SOUNDING: 17
COUNTY: SEVILLA AZIMUTH: 10
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 560.00
SOUNDING COORDINATES: E: 337742.0000 N: 4123402.0000

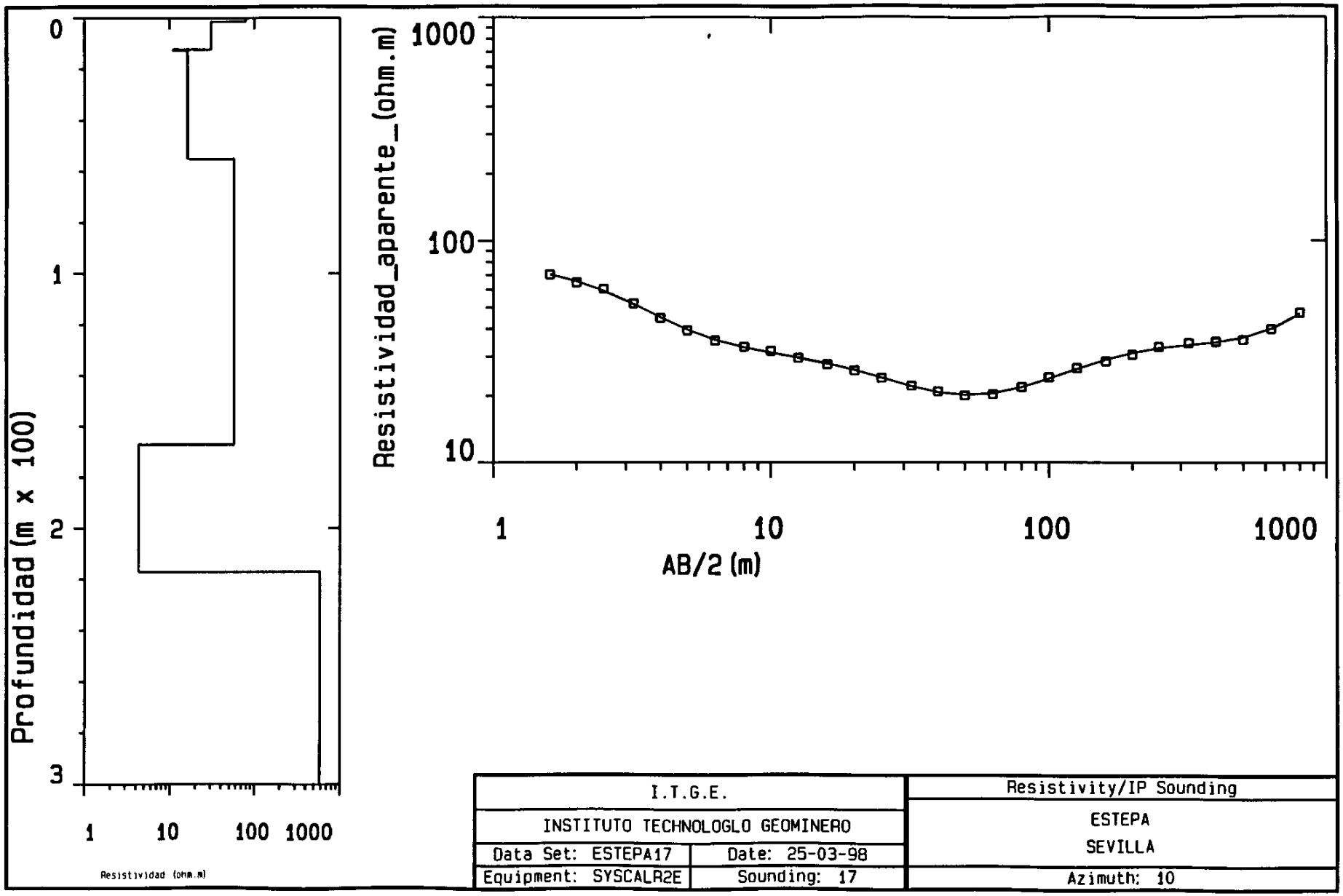
Schlumberger Configuration

FITTING ERROR: 1.150 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	70.29	70.55	-0.366
2	2.00	64.94	65.68	-1.13
3	2.50	60.57	59.45	1.86
4	3.20	52.07	51.72	0.669
5	4.00	44.83	45.08	-0.563
6	5.00	39.31	39.66	-0.903
7	6.30	35.40	35.68	-0.791
8	8.00	33.22	33.00	0.637
9	10.00	31.82	31.27	1.74
10	12.60	29.54	29.70	-0.537
11	16.00	27.71	27.95	-0.841
12	20.00	26.00	26.07	-0.250
13	25.00	24.06	24.06	0.0108
14	32.00	22.12	22.03	0.427
15	40.00	20.86	20.72	0.658
16	50.00	20.07	20.16	-0.445
17	63.00	20.29	20.50	-1.01
18	80.00	21.86	21.83	0.168
19	100.0	24.11	23.82	1.21
20	126.0	26.58	26.33	0.920
21	160.0	28.50	28.99	-1.72
22	200.0	30.50	31.14	-2.08
23	250.0	33.14	32.72	1.26
24	320.0	34.56	33.84	2.08
25	400.0	34.93	34.76	0.505
26	500.0	35.60	36.45	-2.38
27	630.0	39.90	40.08	-0.465
28	800.0	47.30	46.74	1.17

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				560.0	
1	78.92		1.36	558.6	0.0173
2	30.71		10.93	547.6	0.355
3	10.90		0.417	547.2	0.0383
4	16.22		42.20	505.0	2.60
5	57.91		112.2	392.8	1.93
6	4.32		50.08	342.7	11.58
7	583.5				

ALL PARAMETERS ARE FREE



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		ESTEPA SEVILLA
Data Set: ESTEPA17	Date: 25-03-98	
Equipment: SYSCALR2E	Sounding: 17	Azimuth: 10

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				620.0	
1	130.8		2.74	617.2	0.0209
2	3.96		1.44	615.8	0.365
3	72.75		1.76	614.0	0.0242
4	24.14		68.81	545.2	2.84
5	4.07		42.96	502.2	10.53
6	80.84		80.28	421.9	0.993
7	3.46				

ALL PARAMETERS ARE FREE

DATA SET: ESTEPA21

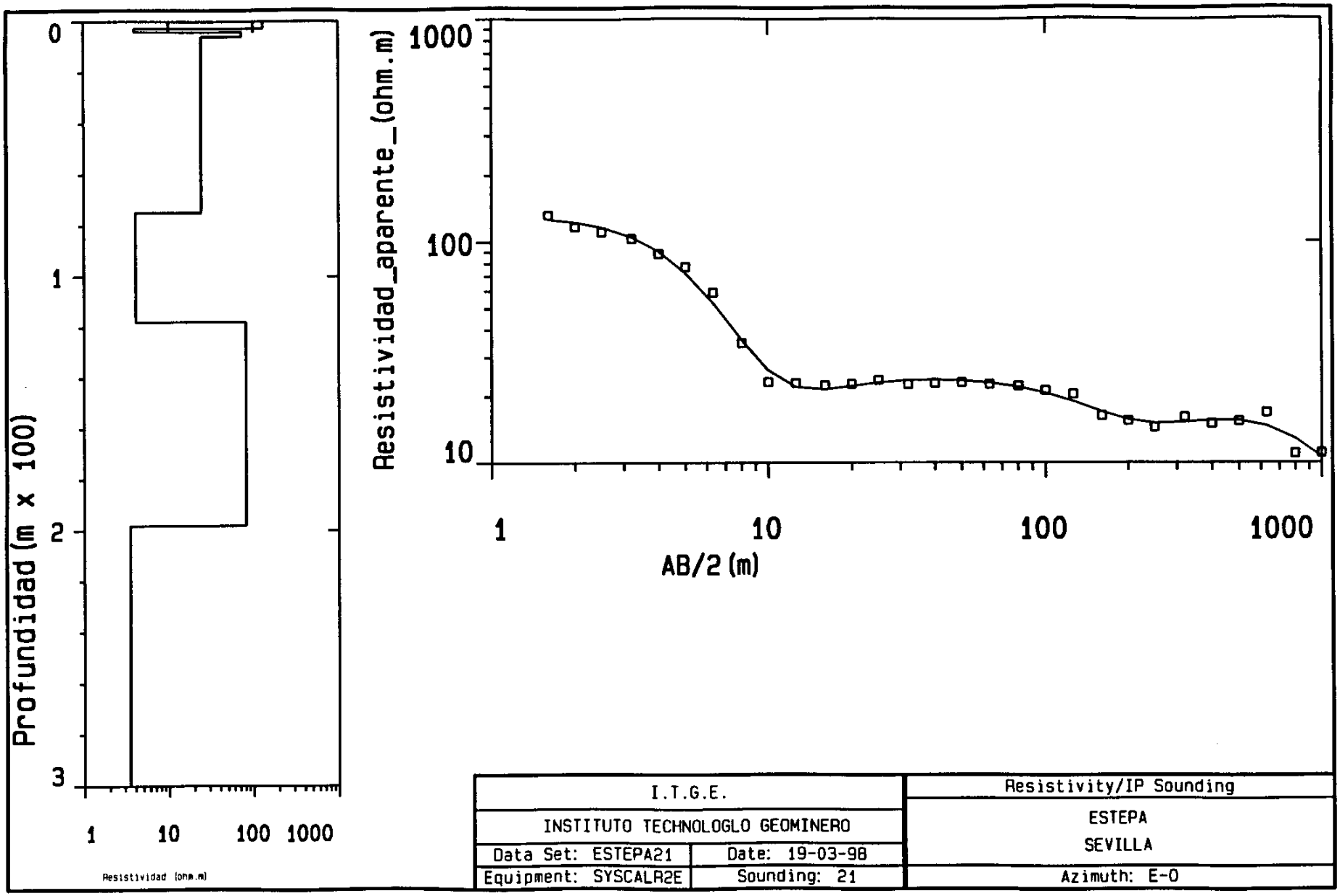
CLIENT: I.T.G.E. DATE: 19-03-98
LOCATION: ESTEPA SOUNDING: 21
COUNTY: SEVILLA AZIMUTH: E-O
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 620.00
SOUNDING COORDINATES: E: 332113.0000 N: 4128514.0000

Schlumberger Configuration

FITTING ERROR: 6.382 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	131.9	126.2	4.29
2	2.00	116.6	122.4	-4.95
3	2.50	110.7	115.9	-4.71
4	3.20	103.2	104.6	-1.35
5	4.00	87.77	89.98	-2.51
6	5.00	76.72	71.97	6.19
7	6.30	58.80	52.59	10.56
8	8.00	34.81	36.00	-3.39
9	10.00	23.17	26.29	-13.45
10	12.60	22.96	22.03	4.08
11	16.00	22.44	21.47	4.33
12	20.00	22.65	22.22	1.89
13	25.00	23.65	23.01	2.69
14	32.00	22.54	23.54	-4.39
15	40.00	22.86	23.68	-3.61
16	50.00	23.07	23.52	-1.94
17	63.00	22.64	22.98	-1.49
18	80.00	22.22	22.00	1.00
19	100.0	21.16	20.64	2.44
20	126.0	20.42	18.88	7.55
21	160.0	16.24	17.00	-4.66
22	200.0	15.45	15.66	-1.39
23	250.0	14.45	15.08	-4.40
24	320.0	16.03	15.23	4.99
25	400.0	15.00	15.56	-3.78
26	500.0	15.40	15.51	-0.756
27	630.0	16.90	14.65	13.27
28	800.0	11.00	12.84	-16.75
29	1000.0	11.10	10.57	4.72

* INSTITUTO TECHNOLOGLO GEOMINERO *



I.T.G.E.	Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO	ESTEPA SEVILLA
Data Set: ESTEPA21 — Date: 19-03-98	
Equipment: SYSCALR2E — Sounding: 21	Azimuth: E-O

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				520.0	
1	38.48		1.27	518.7	0.0330
2	12.28		1.79	516.9	0.145
3	39.19		2.89	514.0	0.0737
4	10.66		16.55	497.4	1.55
5	23.64		31.60	465.8	1.33
6	5.59		149.2	316.6	26.66
7	165.0				

ALL PARAMETERS ARE FREE

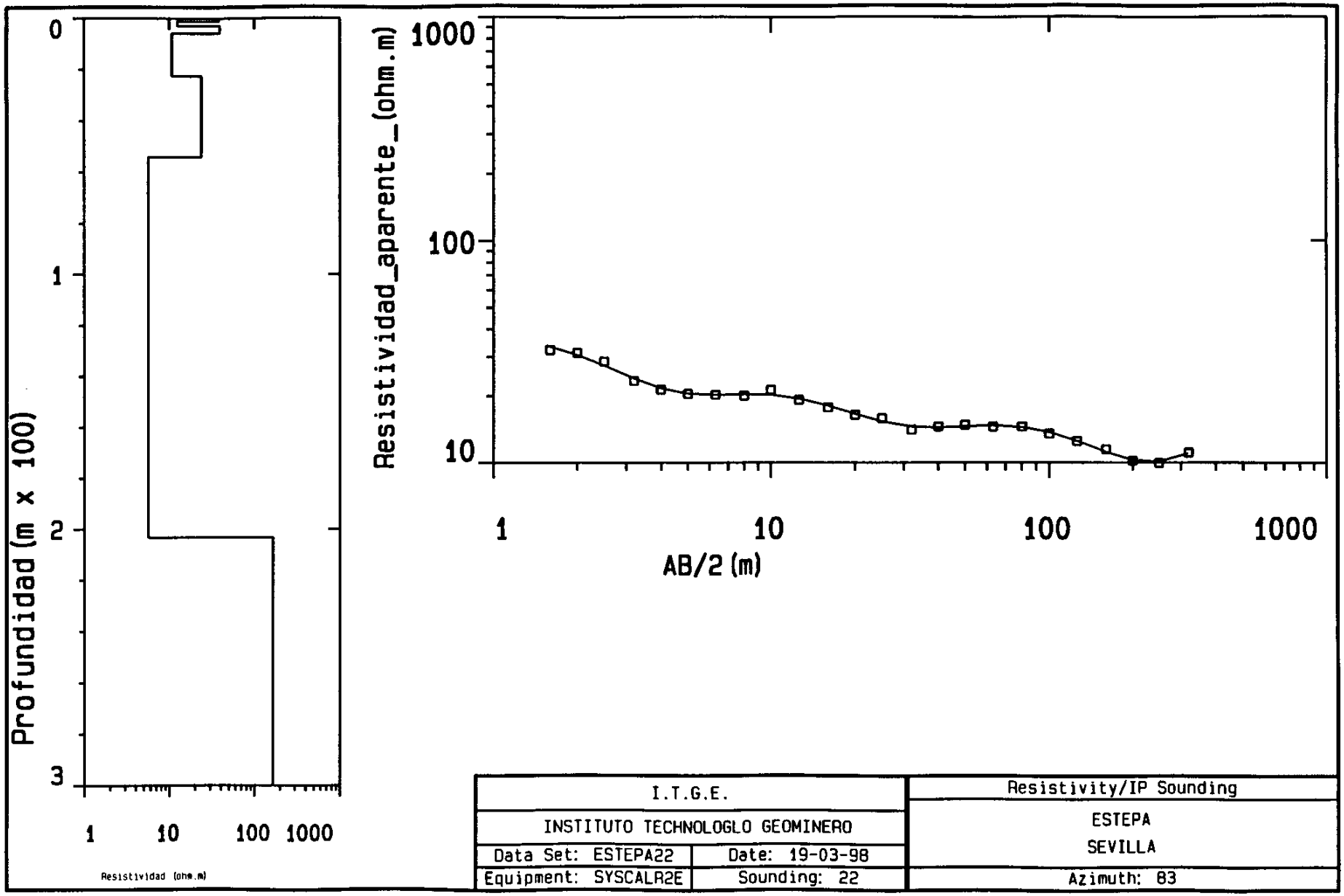
DATA SET: ESTEPA22

CLIENT: I.T.G.E. DATE: 19-03-98
LOCATION: ESTEPA SOUNDING: 22
COUNTY: SEVILLA AZIMUTH: 83
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 520.00
SOUNDING COORDINATES: E: 332408.0000 N: 4128808.0000

Schlumberger Configuration

FITTING ERROR: 2.200 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	32.19	33.30	-3.45
2	2.00	31.23	30.58	2.08
3	2.50	28.52	27.38	3.99
4	3.20	23.42	23.95	-2.25
5	4.00	21.35	21.64	-1.35
6	5.00	20.39	20.45	-0.272
7	6.30	20.24	20.21	0.117
8	8.00	20.08	20.36	-1.40
9	10.00	21.29	20.22	5.04
10	12.60	19.12	19.45	-1.73
11	16.00	17.76	18.07	-1.73
12	20.00	16.41	16.59	-1.12
13	25.00	15.86	15.33	3.35
14	32.00	14.10	14.54	-3.07
15	40.00	14.55	14.39	1.12
16	50.00	14.78	14.56	1.48
17	63.00	14.55	14.71	-1.09
18	80.00	14.55	14.47	0.519
19	100.0	13.52	13.74	-1.61
20	126.0	12.49	12.54	-0.419
21	160.0	11.50	11.19	2.63
22	200.0	10.20	10.29	-0.891
23	250.0	10.00	10.11	-1.16
24	320.0	11.10	11.02	0.699



I.T.G.E.	Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO	ESTEPA SEVILLA
Data Set: ESTEPA22 — Date: 19-03-98	
Equipment: SYSCALR2E — Sounding: 22	Azimuth: 83

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				620.0	
1	3674.0		2.95	617.0	8.048E-04
2	277.0		13.13	603.9	0.0474
3	1491.0		3.76	600.1	0.00253
4	70.20				

ALL PARAMETERS ARE FREE

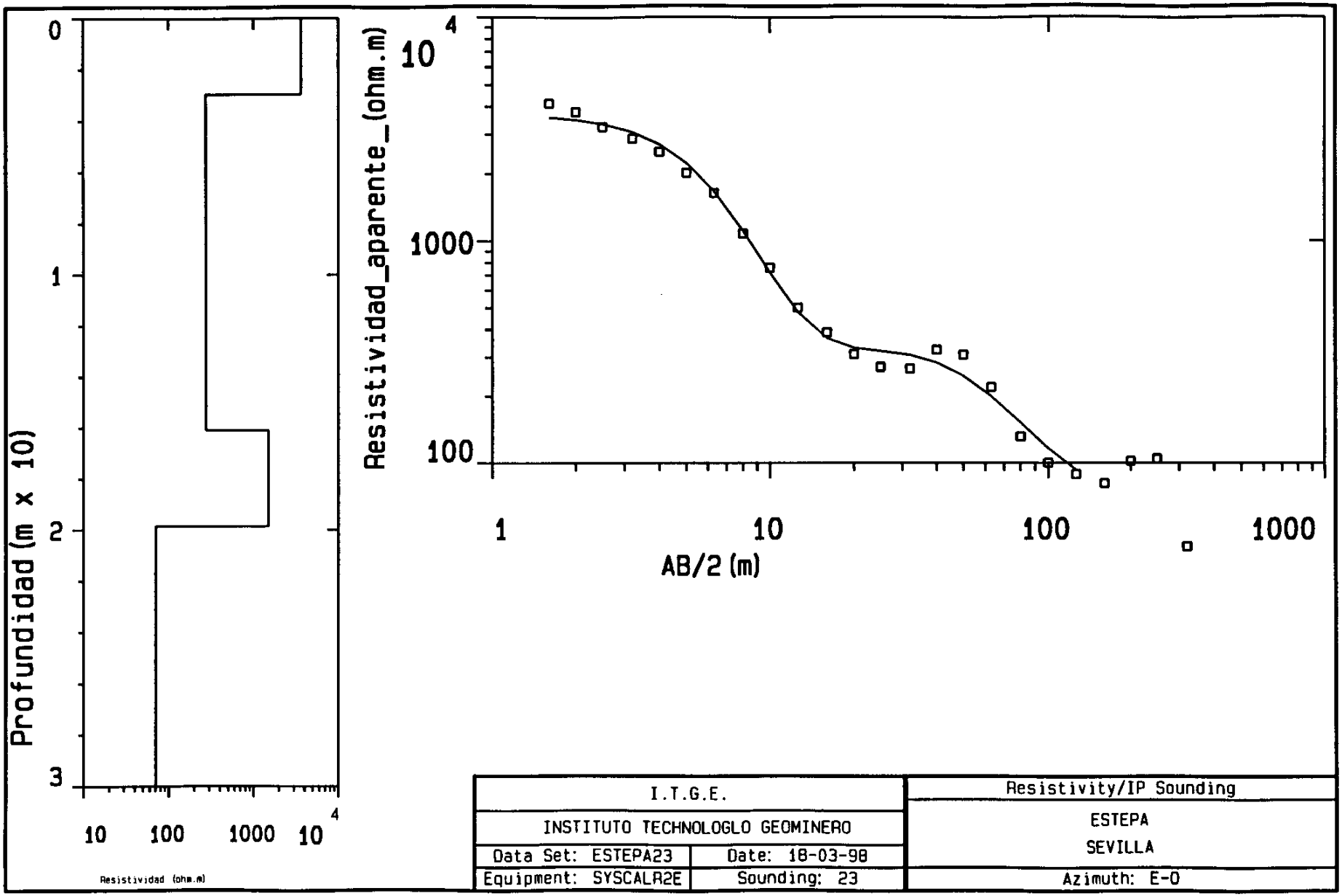
DATA SET: ESTEPA23

CLIENT: I.T.G.E. DATE: 18-03-98
LOCATION: ESTEPA SOUNDING: 23
COUNTY: SEVILLA AZIMUTH: E-O
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 620.00
SOUNDING COORDINATES: E: 332799.0000 N: 4128539.0000

Schlumberger Configuration

FITTING ERROR: 19.002 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	4122.6	3573.1	13.32
2	2.00	3783.5	3487.5	7.82
3	2.50	3241.2	3339.7	-3.03
4	3.20	2872.8	3070.3	-6.87
5	4.00	2502.8	2705.5	-8.09
6	5.00	2019.0	2227.0	-10.30
7	6.30	1637.9	1663.7	-1.57
8	8.00	1079.0	1113.7	-3.21
9	10.00	755.1	722.1	4.37
10	12.60	500.4	477.3	4.59
11	16.00	386.5	364.2	5.78
12	20.00	308.8	329.5	-6.70
13	25.00	269.9	318.5	-17.99
14	32.00	265.8	305.6	-14.98
15	40.00	323.2	282.5	12.58
16	50.00	306.7	246.4	19.67
17	63.00	219.3	199.9	8.87
18	80.00	131.6	152.1	-15.59
19	100.0	100.0	116.6	-16.58
20	126.0	89.11	93.08	-4.45
21	160.0	80.90	80.60	0.365
22	200.0	101.8	75.49	25.83
23	250.0	104.6	73.23	29.98
24	320.0	42.40	72.01	-69.84



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		ESTEPA SEVILLA
Data Set: ESTEPA23	Date: 18-03-98	
Equipment: SYSCALR2E	Sounding: 23	Azimuth: E-O

DATA SET: ESTEPA24

CLIENT: I.T.G.E. DATE: 18-03-98
LOCATION: ESTEPA SOUNDING: 24
COUNTY: SEVILLA AZIMUTH: 135
PROJECT: Resistivity/IP Sounding EQUIPMENT: SYSCALR2E
ELEVATION: 670.00
SOUNDING COORDINATES: E: 333269.0000 N: 4128029.0000

Schlumberger Configuration

FITTING ERROR: 10.325 PERCENT

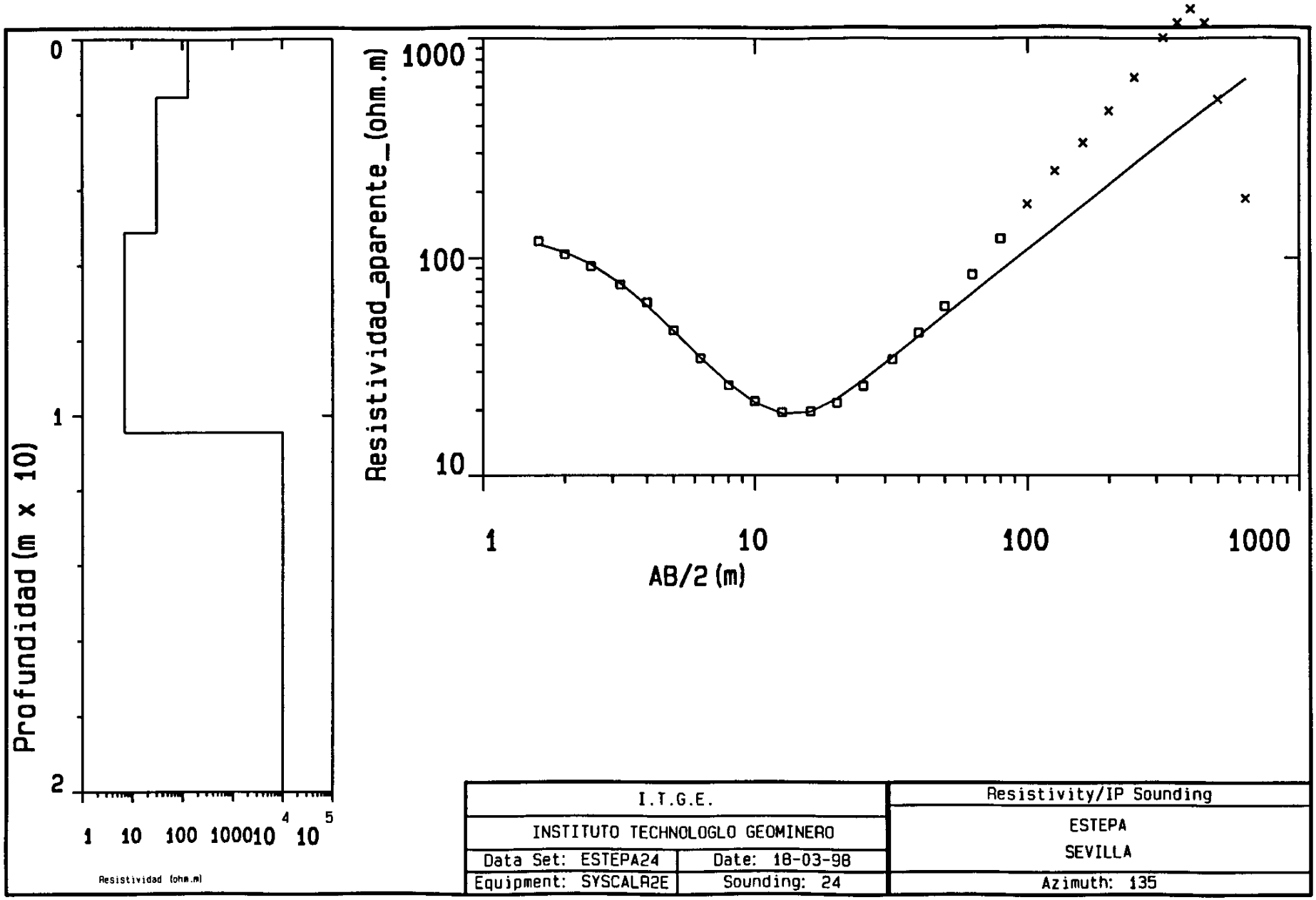
No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	118.9	115.4	2.95
2	2.00	103.7	106.0	-2.25
3	2.50	91.58	93.34	-1.91
4	3.20	75.41	76.28	-1.15
5	4.00	62.17	60.33	2.95
6	5.00	46.33	46.17	0.338
7	6.30	34.61	34.76	-0.436
8	8.00	25.93	26.52	-2.25
9	10.00	21.91	21.61	1.33
10	12.60	19.53	19.21	1.64
11	16.00	19.69	19.61	0.401
12	20.00	21.58	22.50	-4.30
13	25.00	25.78	27.43	-6.40
14	32.00	34.08	34.93	-2.48
15	40.00	45.17	43.60	3.47
16	50.00	59.87	54.44	9.06
17	63.00	83.60	68.50	18.05
18	80.00	121.7	86.84	28.63
19	100.0	174.6	108.3	37.95
20	126.0	248.0	136.1	45.11
21	160.0	332.3	172.3	48.15
22	200.0	464.3	214.5	53.80
23	250.0	661.4	266.8	59.65
24	320.0	1006.9	339.2	66.31
25	360.0	1176.3	380.1	67.68
26	400.0	1363.6	420.7	69.14
27	450.0	1174.1	471.1	59.87
28	500.0	524.4	520.9	0.653
29	630.0	185.5	648.4	-249.5

* INSTITUTO TECHNOLOGLO GEOMINERO *

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				670.0	
1	130.2		1.53	668.4	0.0118
2	30.29		3.58	664.8	0.118
3	6.81		5.32	659.5	0.781
4	10000.0				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		ESTEPA SEVILLA
Data Set: ESTEPA24	Date: 18-03-98	
Equipment: SYSCALA2E	Sounding: 24	Azimuth: 135

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				685.0	
1	312.1		1.40	683.5	0.00449
2	2450.2		5.25	678.3	0.00214
3	127.9		3.19	675.1	0.0249
4	3972.9		10.19	664.9	0.00257
5	34.30		14.19	650.7	0.413
6	1200.0		67.07	583.6	0.0558
7	7.89				

ALL PARAMETERS ARE FREE

DATA SET: ESTEPA26

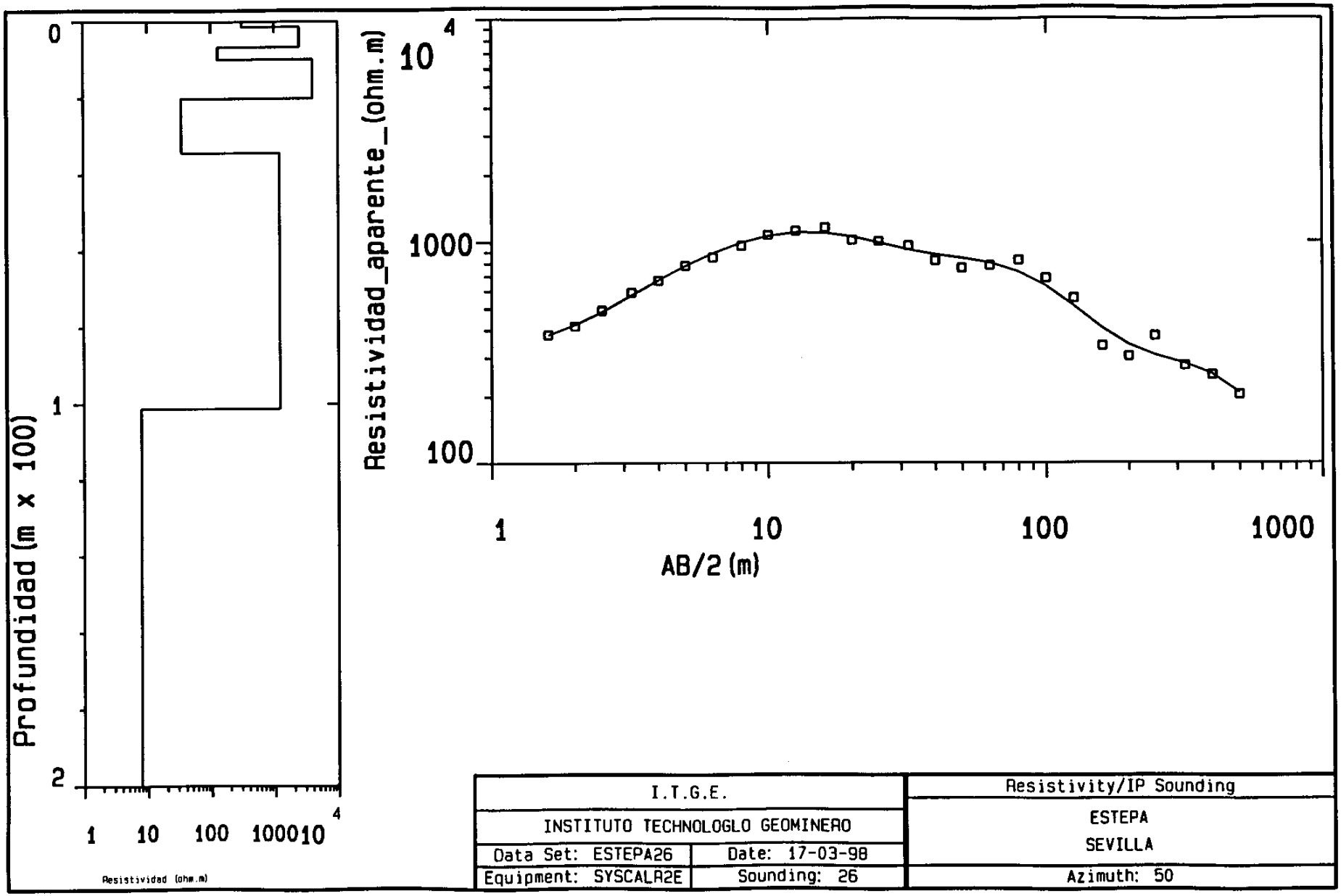
CLIENT: I.T.G.E.
LOCATION: ESTEPA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 685.00
SOUNDING COORDINATES: E: 333937.0000 N: 4127786.0000

DATE: 17-03-98
SOUNDING: 26
AZIMUTH: 50
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 7.740 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	381.5	380.5	0.267
2	2.00	418.5	424.1	-1.33
3	2.50	490.9	485.5	1.11
4	3.20	590.1	574.3	2.68
5	4.00	665.9	670.2	-0.641
6	5.00	779.5	775.3	0.534
7	6.30	845.9	885.5	-4.68
8	8.00	958.5	988.9	-3.16
9	10.00	1073.9	1062.4	1.06
10	12.60	1119.6	1102.1	1.56
11	16.00	1157.5	1095.9	5.32
12	20.00	1017.9	1050.7	-3.22
13	25.00	1000.0	984.4	1.56
14	32.00	951.7	914.2	3.94
15	40.00	818.1	870.0	-6.33
16	50.00	757.9	839.2	-10.72
17	63.00	778.2	799.3	-2.71
18	80.00	820.5	726.4	11.46
19	100.0	682.2	626.5	8.16
20	126.0	553.2	509.9	7.81
21	160.0	337.1	405.8	-20.37
22	200.0	302.5	341.6	-12.92
23	250.0	375.2	306.7	18.25
24	320.0	275.8	281.2	-1.95
25	400.0	248.9	251.0	-0.838
26	500.0	203.4	206.4	-1.48



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		ESTEPA SEVILLA
Data Set: ESTEPA26	Date: 17-03-98	
Equipment: SYSCALR2E	Sounding: 26	Azimuth: 50

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				500.0	
1	226.6		1.37	498.6	0.00605
2	143.4		10.68	487.9	0.0745
3	48.95		6.65	481.2	0.135
4	331.9		11.88	469.4	0.0357
5	62.04		97.21	372.1	1.56
6	29.46		91.48	280.7	3.10
7	3000.0				

ALL PARAMETERS ARE FREE

DATA SET: ESTEPA31

CLIENT: I.T.G.E.
LOCATION: GILENA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 500.00
SOUNDING COORDINATES: E: 331315.0000 N: 4123959.0000

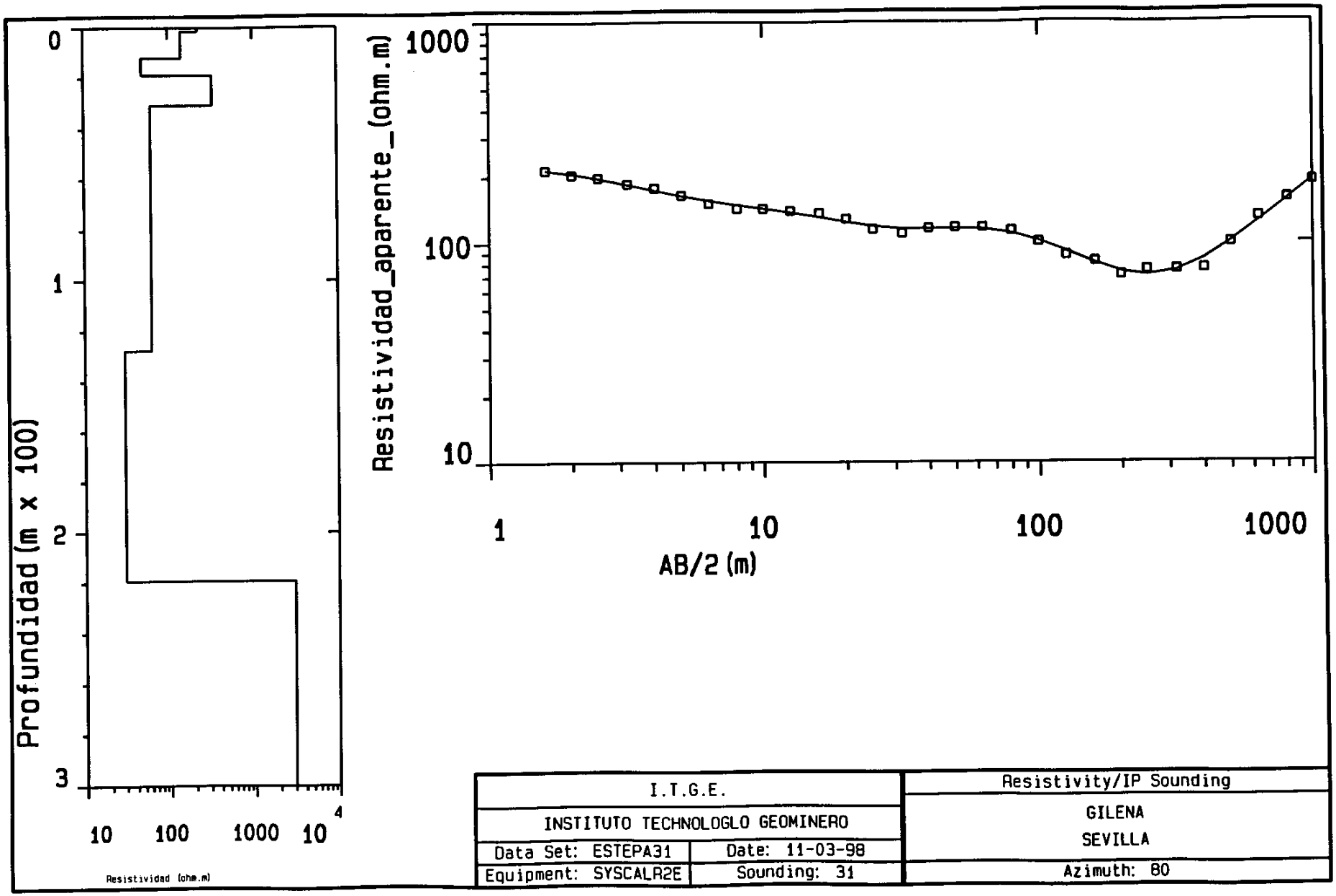
DATE: 11-03-98
SOUNDING: 31
AZIMUTH: 80
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 3.335 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	213.4	214.0	-0.286
2	2.00	204.5	206.5	-1.00
3	2.50	197.7	196.8	0.471
4	3.20	185.7	184.4	0.715
5	4.00	177.6	173.2	2.48
6	5.00	163.9	163.4	0.288
7	6.30	150.4	155.2	-3.20
8	8.00	142.7	148.5	-4.04
9	10.00	142.5	143.0	-0.339
10	12.60	139.6	137.2	1.73
11	16.00	136.7	130.5	4.52
12	20.00	127.7	124.0	2.94
13	25.00	114.7	118.4	-3.26
14	32.00	109.9	115.2	-4.76
15	40.00	115.7	115.0	0.612
16	50.00	117.2	115.7	1.22
17	63.00	116.7	114.7	1.76
18	80.00	112.7	109.6	2.76
19	100.0	100.1	101.2	-1.08
20	126.0	86.98	90.63	-4.19
21	160.0	81.68	80.27	1.73
22	200.0	71.02	73.28	-3.18
23	250.0	75.17	70.52	6.19
24	320.0	74.95	73.88	1.43
25	400.0	75.74	83.60	-10.37
26	500.0	99.50	99.86	-0.362
27	630.0	129.6	123.3	4.82
28	800.0	157.3	154.6	1.73
29	1000.0	189.5	191.0	-0.803

* INSTITUTO TECHNOLOGLO GEOMINERO *



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		GILENA SEVILLA
Data Set: ESTEPA31	Date: 11-03-98	
Equipment: SYSCALR2E	Sounding: 31	Azimuth: 80

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				520.0	
1	33.94		1.08	518.9	0.0318
2	12.35		9.04	509.8	0.732
3	4.41		11.29	498.5	2.55
4	686.1		11.62	486.9	0.0169
5	37.42				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *

DATA SET: ESTEPA32

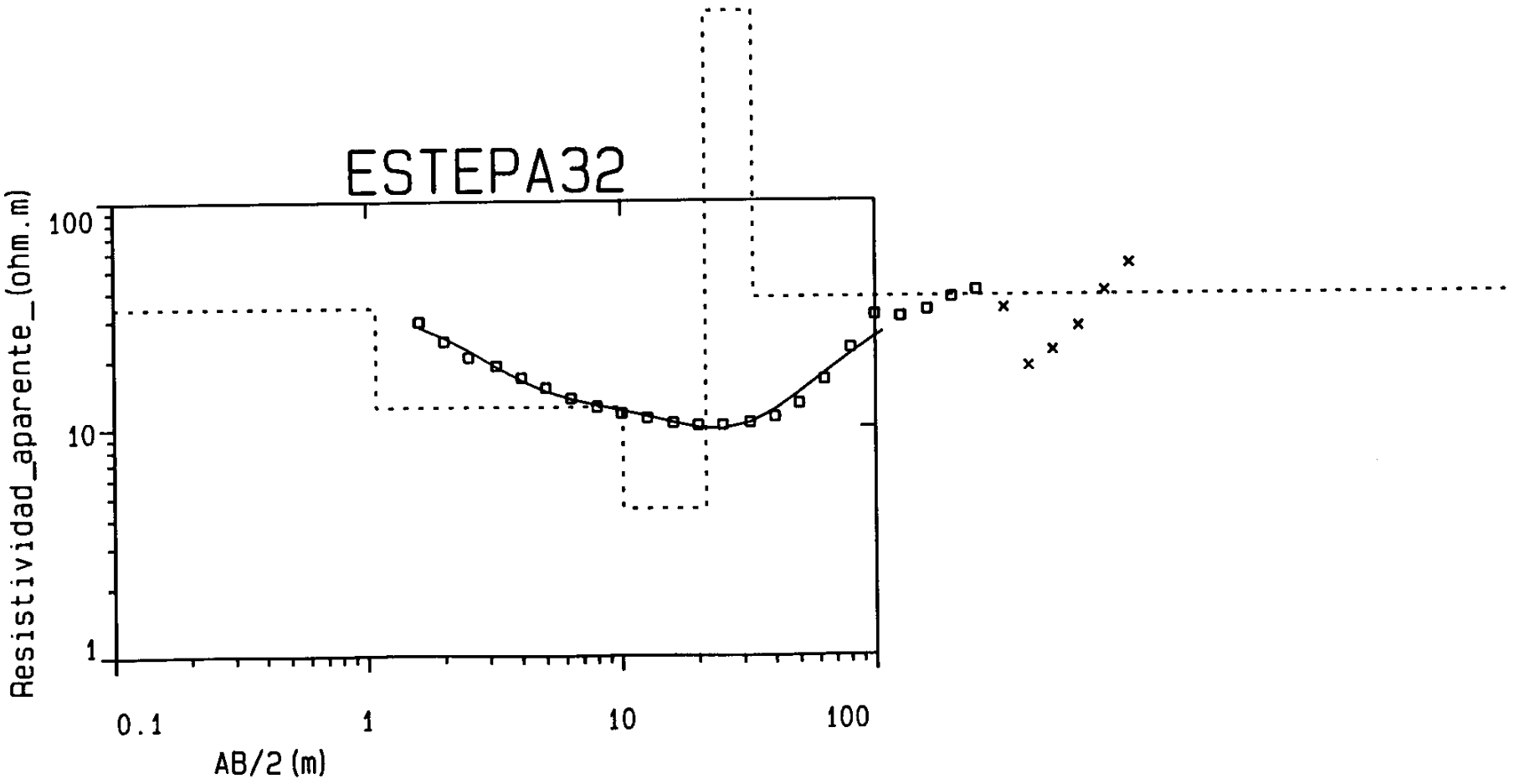
CLIENT: I.T.G.E.
LOCATION: GILENA-PEDRERA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 520.00
SOUNDING COORDINATES: E: 331684.0000 N: 4123455.0000

DATE: 20-03-98
SOUNDING: 32
AZIMUTH: 58
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 6.693 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	29.42	27.83	5.40
2	2.00	24.10	24.98	-3.64
3	2.50	20.52	21.82	-6.35
4	3.20	18.78	18.52	1.42
5	4.00	16.56	16.13	2.58
6	5.00	14.95	14.46	3.31
7	6.30	13.47	13.33	1.02
8	8.00	12.36	12.54	-1.45
9	10.00	11.51	11.90	-3.37
10	12.60	11.00	11.23	-2.10
11	16.00	10.48	10.51	-0.281
12	20.00	10.22	9.97	2.46
13	25.00	10.22	9.82	3.87
14	32.00	10.48	10.46	0.175
15	40.00	11.05	11.92	-7.85
16	50.00	12.68	14.17	-11.76
17	63.00	16.20	17.22	-6.29
18	80.00	22.35	20.97	6.16
19	100.0	31.14	24.93	19.94
20	126.0	30.51	29.35	3.81
21	160.0	32.61	34.01	-4.30
22	200.0	36.92	38.15	-3.32
23	250.0	39.63	41.69	-5.22
24	320.0	32.86	44.52	-35.48
25	400.0	18.21	45.82	-151.5
26	500.0	21.40	45.89	-114.4
27	630.0	27.20	44.92	-65.17
28	800.0	39.00	43.30	-11.02
29	1000.0	51.35	41.68	18.81


ESTEPA32
Resistividad_aparente_(ohm.m)
100
10
1
0.1
1
10
100
AB/2 (m)

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				440.0	
1	60.51		0.733	439.2	0.0121
2	18.07		1.73	437.5	0.0962
3	5.82		21.89	415.6	3.75
4	11.74		118.4	297.1	10.08
5	0.333		21.67	275.4	64.98
6	1100.0				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *

DATA SET: ESTEPA33

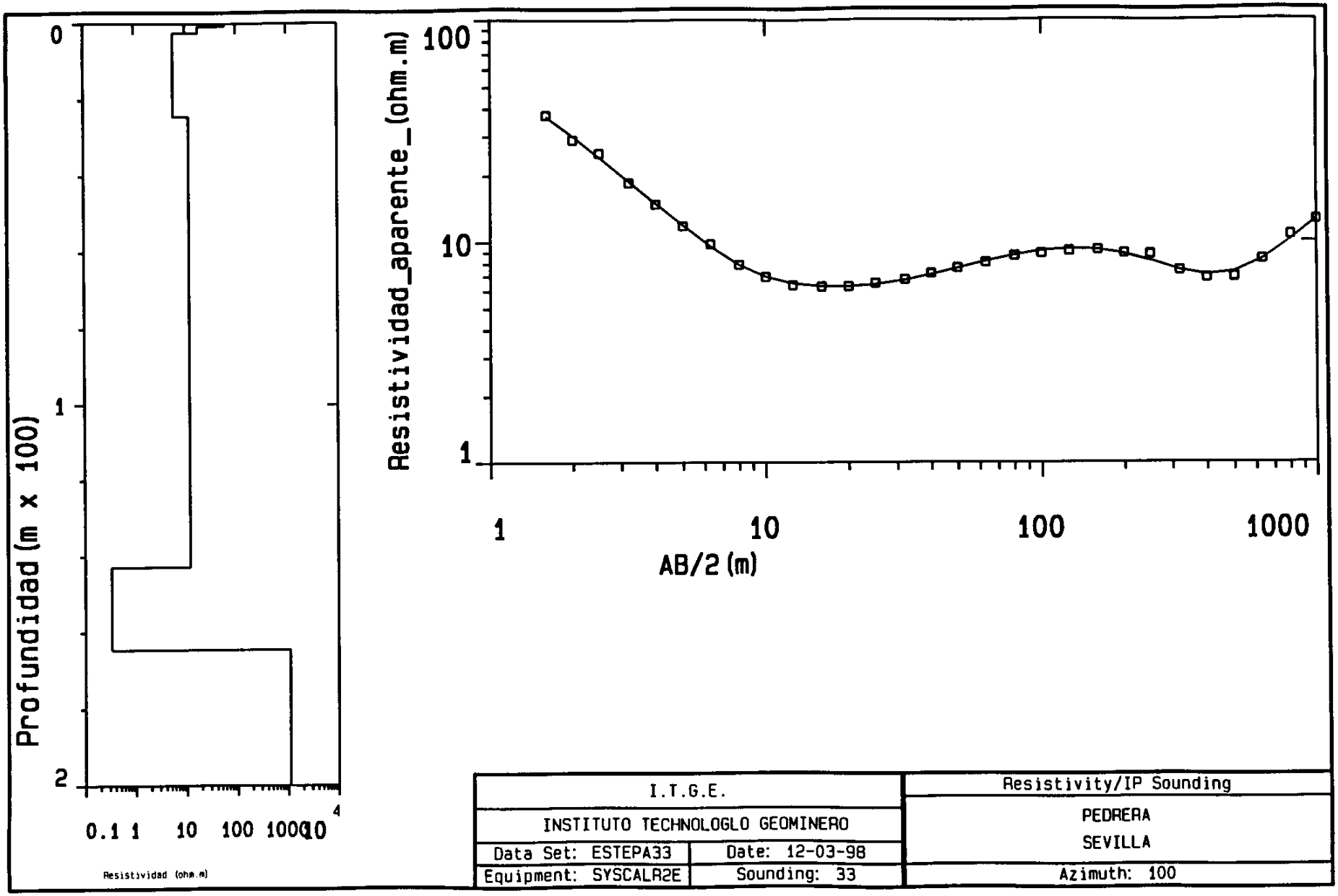
CLIENT: I.T.G.E.
LOCATION: PEDRERA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 440.00
SOUNDING COORDINATES: E: 330833.0000 N: 4122314.0000

DATE: 12-03-98
SOUNDING: 33
AZIMUTH: 100
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 2.497 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	37.33	36.85	1.28
2	2.00	28.95	30.14	-4.11
3	2.50	25.21	24.12	4.32
4	3.20	18.50	18.74	-1.27
5	4.00	14.82	14.93	-0.757
6	5.00	11.79	11.92	-1.09
7	6.30	9.74	9.54	1.97
8	8.00	7.90	7.87	0.264
9	10.00	6.94	6.96	-0.296
10	12.60	6.38	6.49	-1.63
11	16.00	6.27	6.29	-0.412
12	20.00	6.27	6.28	-0.239
13	25.00	6.49	6.40	1.40
14	32.00	6.72	6.68	0.506
15	40.00	7.17	7.07	1.39
16	50.00	7.61	7.56	0.668
17	63.00	8.05	8.12	-0.803
18	80.00	8.61	8.66	-0.626
19	100.0	8.83	9.05	-2.48
20	126.0	9.05	9.24	-2.15
21	160.0	9.15	9.15	-0.0625
22	200.0	8.83	8.76	0.714
23	250.0	8.72	8.14	6.67
24	320.0	7.39	7.40	-0.149
25	400.0	6.86	7.03	-2.53
26	500.0	6.90	7.25	-5.15
27	630.0	8.30	8.25	0.492
28	800.0	10.70	10.11	5.50
29	1000.0	12.50	12.52	-0.179



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		PEDRERA SEVILLA
Data Set: ESTEPA33	Date: 12-03-98	
Equipment: SYSCALR2E	Sounding: 33	Azimuth: 100

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				475.0	
1	30.03		0.800	474.1	0.0266
2	12.12		2.70	471.4	0.223
3	8.20		73.03	398.4	8.90
4	221.2		54.78	343.6	0.247
5	6.51		90.40	253.2	13.87
6	2502.7				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *

DATA SET: ESTEPA34

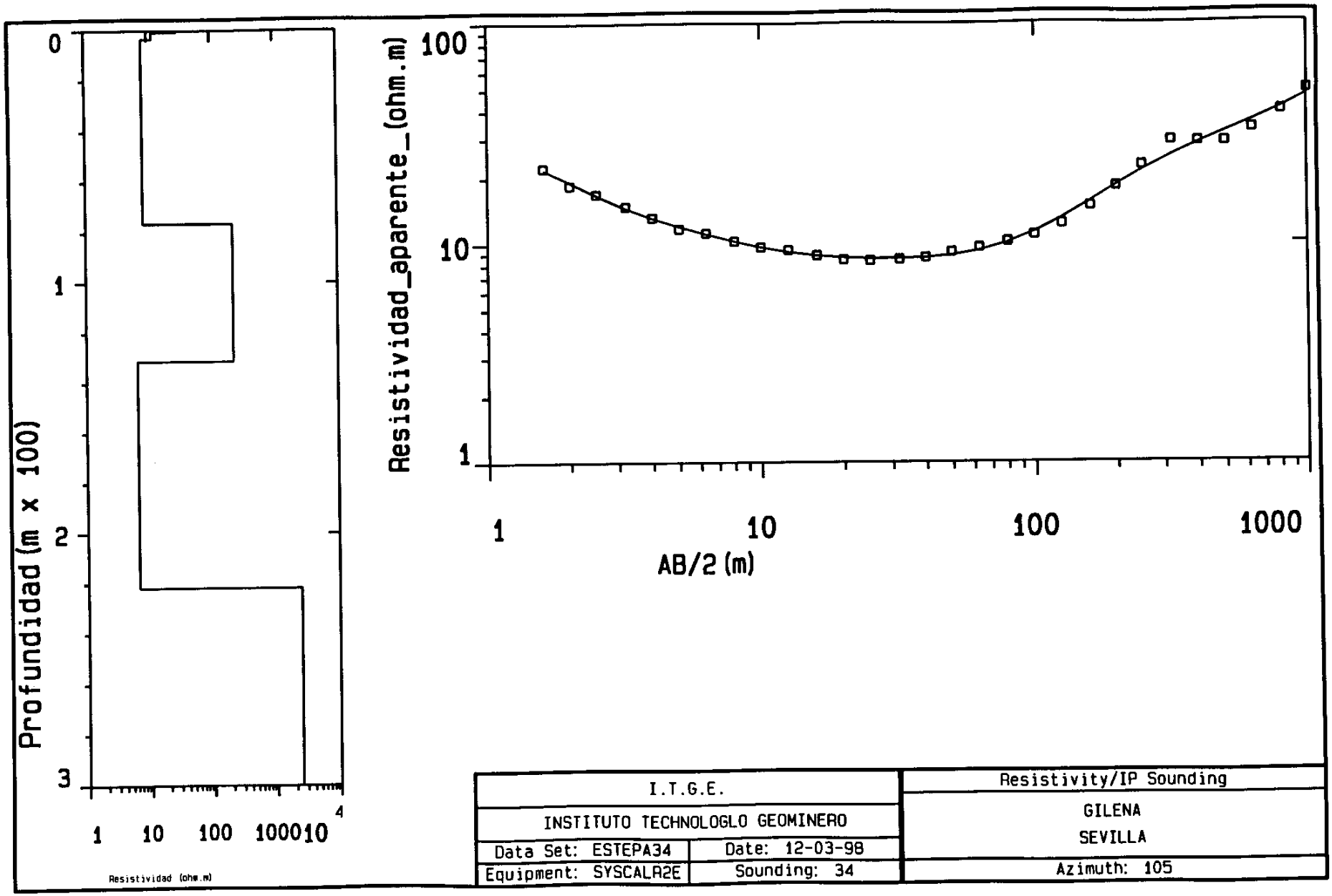
CLIENT: I.T.G.E.
LOCATION: GILENA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 475.00
SOUNDING COORDINATES: E: 331177.0000 N: 4122996.0000

DATE: 12-03-98
SOUNDING: 34
AZIMUTH: 105
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 4.776 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	22.15	21.79	1.61
2	2.00	18.52	19.15	-3.37
3	2.50	16.87	16.71	0.945
4	3.20	14.80	14.54	1.76
5	4.00	13.14	13.09	0.417
6	5.00	11.69	11.99	-2.54
7	6.30	11.17	11.07	0.961
8	8.00	10.24	10.26	-0.123
9	10.00	9.61	9.63	-0.189
10	12.60	9.31	9.14	1.85
11	16.00	8.81	8.80	0.165
12	20.00	8.41	8.60	-2.28
13	25.00	8.31	8.50	-2.31
14	32.00	8.41	8.49	-0.924
15	40.00	8.60	8.57	0.319
16	50.00	9.11	8.78	3.57
17	63.00	9.52	9.21	3.22
18	80.00	10.14	10.00	1.38
19	100.0	10.85	11.16	-2.87
20	126.0	12.18	12.93	-6.11
21	160.0	14.67	15.36	-4.74
22	200.0	18.02	18.11	-0.505
23	250.0	22.42	21.18	5.55
24	320.0	29.13	24.77	14.96
25	400.0	28.66	28.10	1.94
26	500.0	28.60	31.53	-10.25
27	630.0	32.70	35.38	-8.21
28	800.0	39.40	40.23	-2.10
29	1000.0	49.30	46.32	6.03



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		GILENA SEVILLA
Data Set: ESTEPA34	Date: 12-03-98	
Equipment: SYSCALR2E	Sounding: 34	Azimuth: 105

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				480.0	
1	52.55		1.45	478.5	0.0277
2	8.14		3.90	474.6	0.478
3	6.24		11.61	463.0	1.85
4	9.50		99.74	363.2	10.49
5	5000.0				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *

DATA SET: ESTEPC35

CLIENT: I.T.G.E.
LOCATION: GILENA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 480.00
SOUNDING COORDINATES: E: 330953.0000 N: 4123417.0000

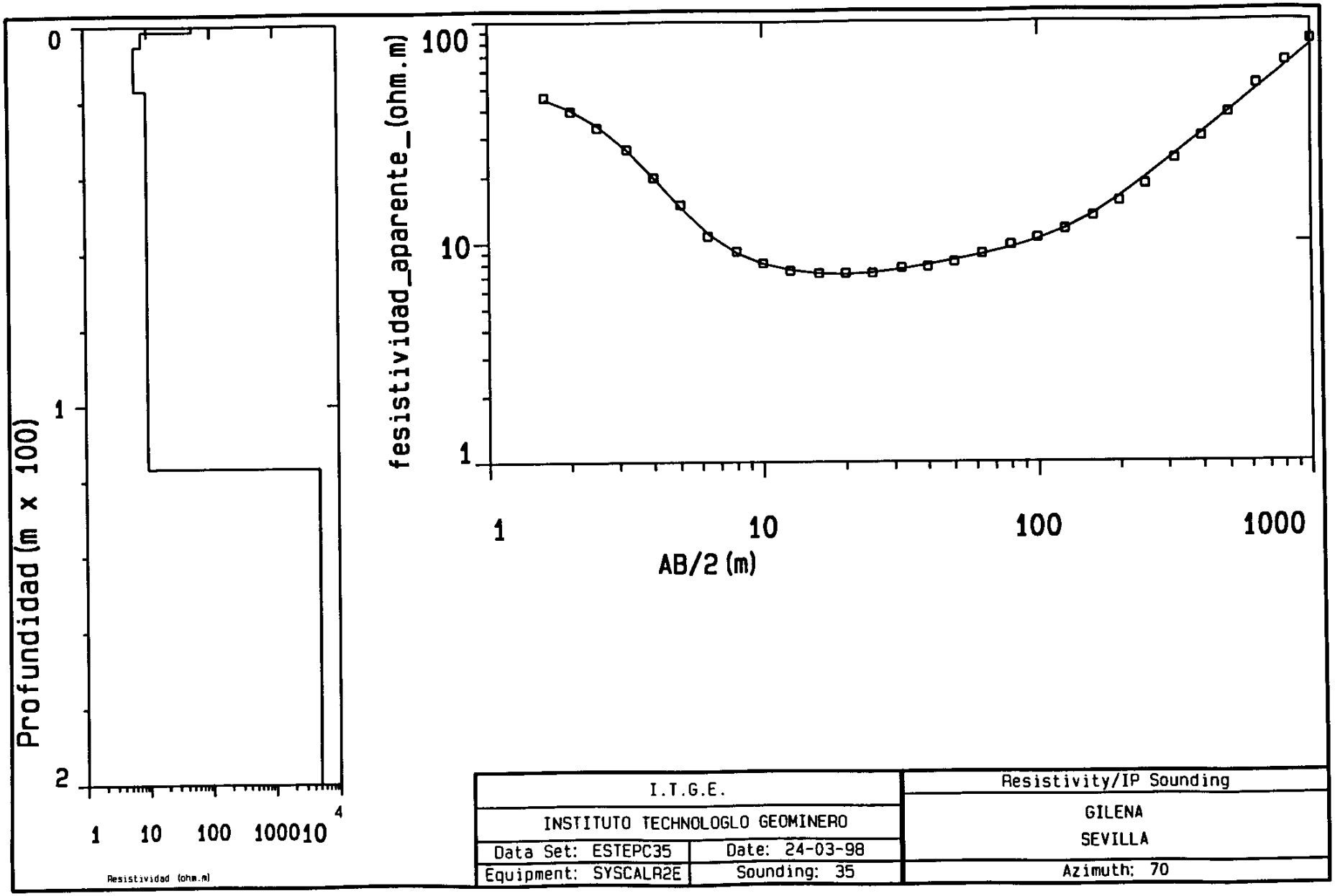
DATE: 24-03-98
SOUNDING: 35
AZIMUTH: 70
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 2.937 PERCENT

No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	45.73	44.82	2.00
2	2.00	39.66	40.16	-1.25
3	2.50	33.38	34.07	-2.05
4	3.20	26.58	26.39	0.727
5	4.00	19.78	19.77	0.0287
6	5.00	14.86	14.53	2.20
7	6.30	10.67	10.98	-2.87
8	8.00	9.10	8.98	1.37
9	10.00	8.05	8.03	0.252
10	12.60	7.43	7.50	-0.959
11	16.00	7.22	7.22	0.00236
12	20.00	7.22	7.15	0.901
13	25.00	7.22	7.26	-0.536
14	32.00	7.63	7.53	1.31
15	40.00	7.74	7.88	-1.87
16	50.00	8.15	8.29	-1.78
17	63.00	8.87	8.79	0.899
18	80.00	9.70	9.43	2.78
19	100.0	10.42	10.23	1.80
20	126.0	11.40	11.45	-0.415
21	160.0	13.10	13.35	-1.86
22	200.0	15.27	15.94	-4.38
23	250.0	18.26	19.51	-6.79
24	320.0	23.84	24.76	-3.86
25	400.0	29.93	30.87	-3.14
26	500.0	38.20	38.52	-0.850
27	630.0	51.40	48.44	5.74
28	800.0	65.00	61.36	5.58
29	1000.0	81.30	76.49	5.91

* INSTITUTO TECHNOLOGLO GEOMINERO *



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		GILENA SEVILLA
Data Set: ESTEPC35	Date: 24-03-98	
Equipment: SYSCALR2E	Sounding: 35	Azimuth: 70

L #	RESISTIVITY (ohm-m)	CHARGEABILITY (pfe)	THICKNESS (m)	ELEVATION (m)	CONDUCTANCE (Siemens)
				480.0	
1	22.06		2.94	477.0	0.133
2	8.60		37.97	439.0	4.41
3	6.70		33.78	405.2	5.04
4	6000.0		200.0	205.2	0.0333
5	232.1				

ALL PARAMETERS ARE FREE

* INSTITUTO TECHNOLOGLO GEOMINERO *

DATA SET: ESTEPA36

CLIENT: I.T.G.E.
LOCATION: GILENA
COUNTY: SEVILLA
PROJECT: Resistivity/IP Sounding
ELEVATION: 480.00
SOUNDING COORDINATES: E: 330884.0000 N: 4124557.0000

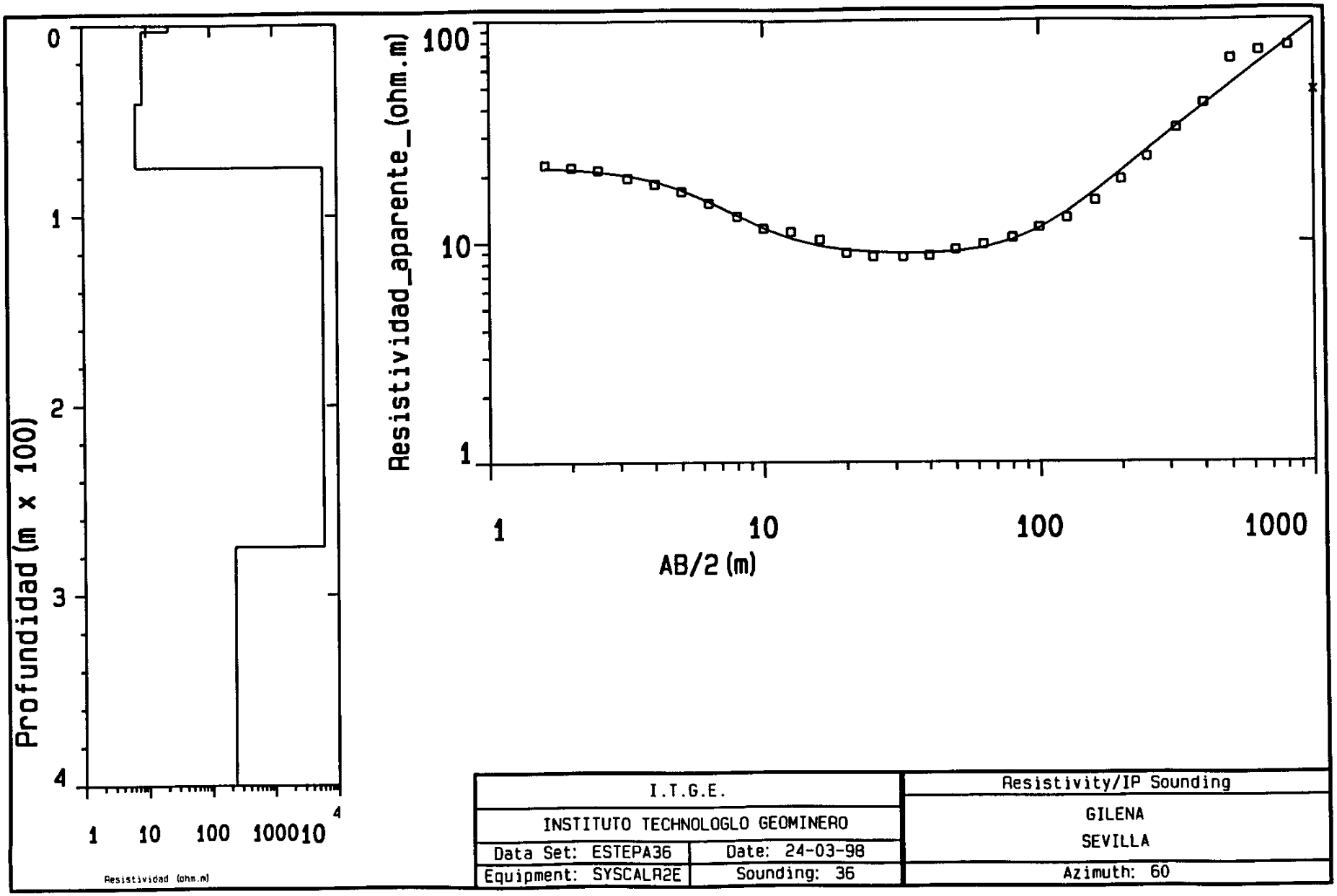
DATE: 24-03-98
SOUNDING: 36
AZIMUTH: 60
EQUIPMENT: SYSCALR2E

Schlumberger Configuration

FITTING ERROR: 7.196 PERCENT

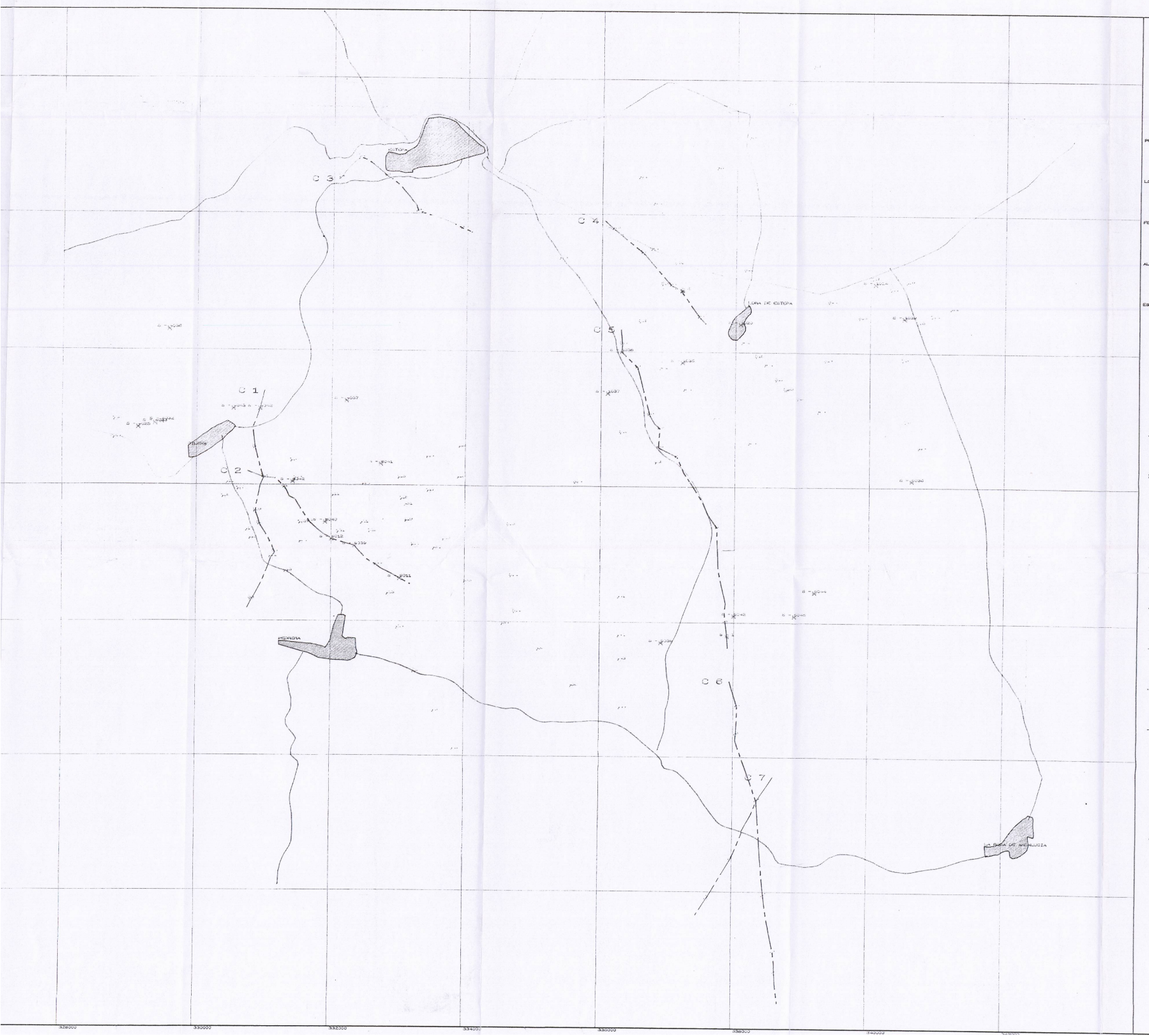
No.	Spacing (m)	PA (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	1.60	22.49	21.73	3.39
2	2.00	21.89	21.45	2.00
3	2.50	21.28	20.97	1.48
4	3.20	19.47	20.08	-3.11
5	4.00	18.35	18.87	-2.79
6	5.00	16.97	17.25	-1.59
7	6.30	14.99	15.27	-1.88
8	8.00	13.10	13.23	-0.995
9	10.00	11.54	11.60	-0.509
10	12.60	11.11	10.38	6.61
11	16.00	10.26	9.60	6.44
12	20.00	8.89	9.19	-3.38
13	25.00	8.55	8.97	-4.99
14	32.00	8.55	8.87	-3.80
15	40.00	8.64	8.88	-2.78
16	50.00	9.23	9.02	2.24
17	63.00	9.74	9.39	3.58
18	80.00	10.41	10.16	2.41
19	100.0	11.58	11.44	1.23
20	126.0	12.76	13.56	-6.24
21	160.0	15.30	16.75	-9.48
22	200.0	19.06	20.75	-8.85
23	250.0	24.10	25.84	-7.20
24	320.0	32.56	32.95	-1.18
25	400.0	41.96	40.99	2.32
26	500.0	66.30	50.88	23.25
27	630.0	72.10	63.45	11.99
28	800.0	75.35	79.34	-5.30
29	1000.0	47.70	97.21	-103.8

* INSTITUTO TECHNOLOGLO GEOMINERO *



I.T.G.E.		Resistivity/IP Sounding
INSTITUTO TECHNOLOGLO GEOMINERO		GILENA SEVILLA
Data Set: ESTEPA36	Date: 24-03-98	
Equipment: SYSCALR2E	Sounding: 36	Azimuth: 60

ANEXO 2: PLANOS DE POSICIONAMIENTO Y SECCIONES.



PLANO DE SITUACION

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA

LOCALIDAD: ESTEPA (Sevilla)

FECHA: Mayo 1998

AUTOR: ITGE

ESCALA: 25000

LEYENDA

C 1 NUMERO DE SEV.

X345 NUMERO DE COLUMNA

C 2 NUMERO DE CORTE

RIO

CARRETERA PRINCIPAL

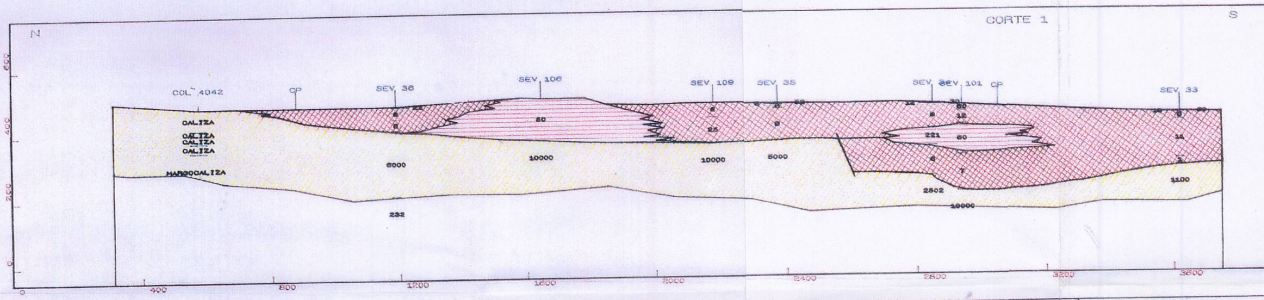
CARRETERA SECUNDARIA

FERROCARRIL

L. TENSION

Lepe

POBLACION



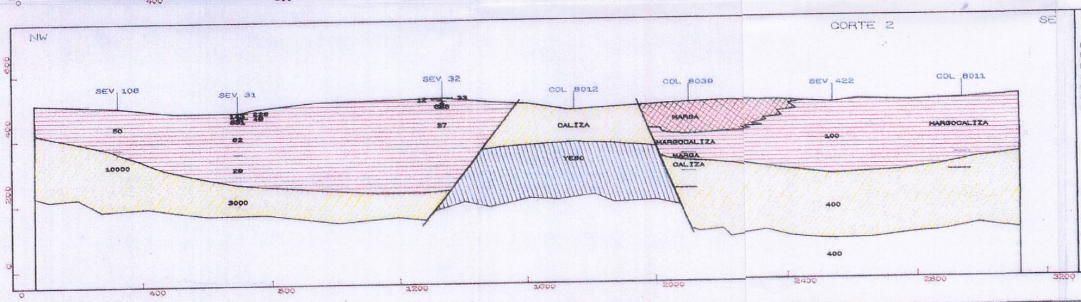
CORTE GEOELECTRICO Nº: 1

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: NW SE

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO



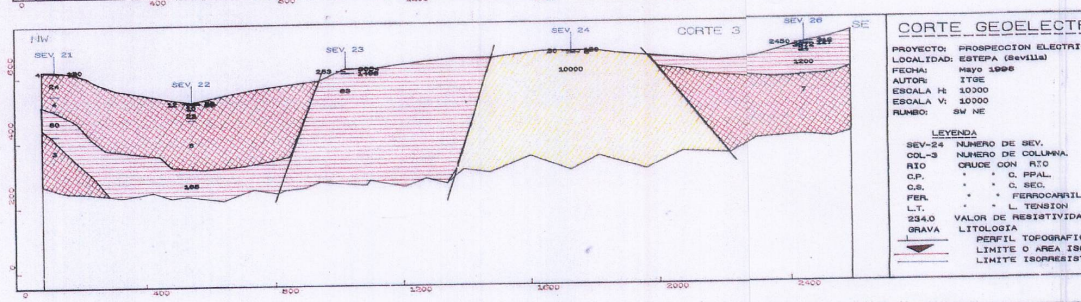
CORTE GEOELECTRICO Nº: 2

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: NW SE

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO



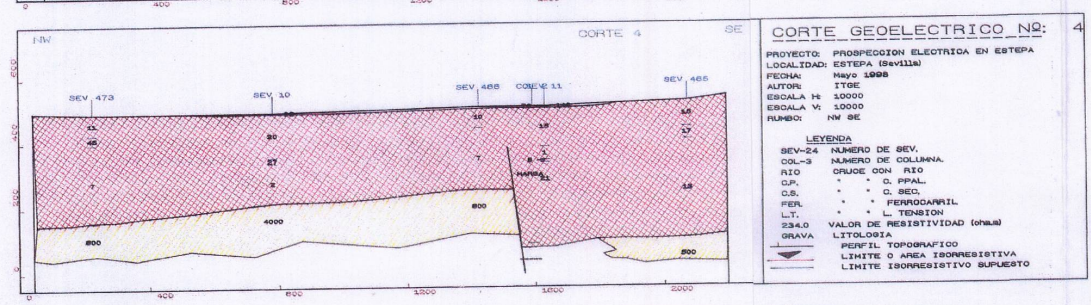
CORTE GEOELECTRICO Nº: 3

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: SW NE

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO



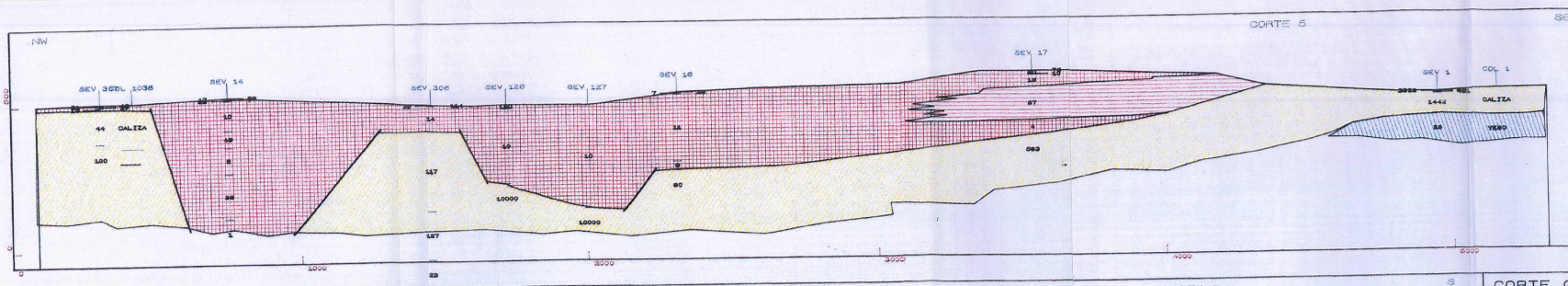
CORTE GEOELECTRICO Nº: 4

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: NW SE

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO



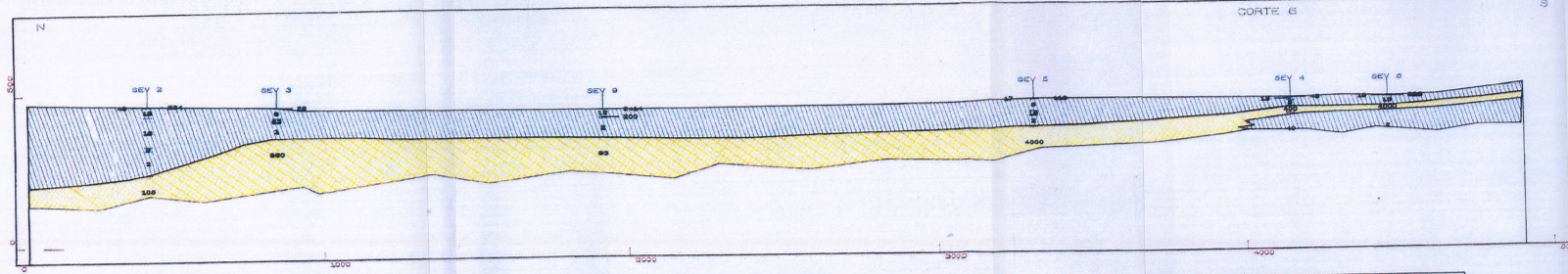
CORTE GEOELECTRICO Nº: 5

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: NE SW

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO



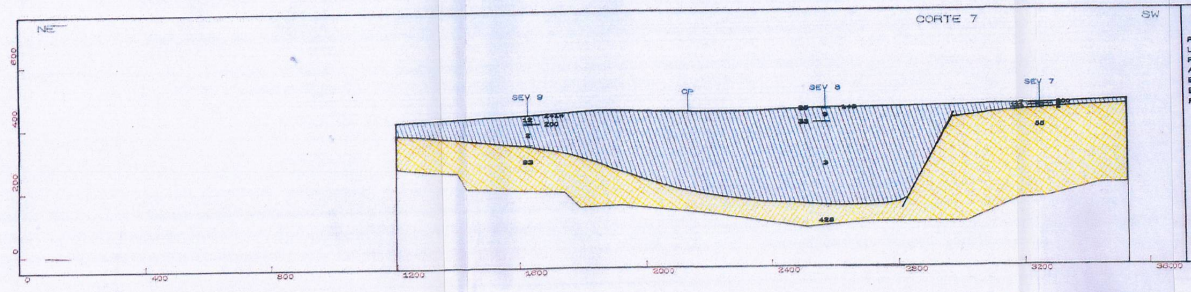
CORTE GEOELECTRICO Nº: 6

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: NW SE

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO



CORTE GEOELECTRICO Nº: 7

PROYECTO: PROSPECCION ELECTRICA EN ESTEPA
LOCALIDAD: ESTEPA (Sevilla)
FECHA: Mayo 1998
AUTOR: ITGE
ESCALA H: 10000
ESCALA V: 10000
RUMBO: N S

LEYENDA

SEV-24	NUMERO DE SEV.
COL-3	NUMERO DE COLUMNA.
RIO	CRUCE CON RIO
C.P.	" " C. PPAL.
C.S.	" " C. SEC.
FER.	" " FERROCARRIL
L.T.	" " L. TENSION
234.0	VALOR DE RESISTIVIDAD (ohm.m)
GRAVA	LITOLOGIA

PERFIL TOPOGRAFICO
LIMITE O AREA ISORRESISTIVA
LIMITE ISORRESISTIVO SUPUESTO