GEOPEKO
A Division of Peko-Wallsend Operations Ltd
ACN 000 081 434

REPORT No. MI94/11S

EL 7313 "ROSIE CREEK"

REPORT FOR THE TWELVE MONTHS ENDED

21 February 1994

by
A. ALLAN

VOLUME 1 OF 2 VOLUMES
TEXT AND APPENDICES

Distribution:

Geopeko - Melbourne (mf)
Geopeko - Brisbane
Geopeko - Mount Isa (2)
Department of Mines and Energy - NT

Base	:	Mount Isa
Date	:	April, 1994
MOUNT YOUNG		SD53-15
Rosie Creek		6167
Bing Bong		6166

CR 94/274A

GEOPEKO

Bibliographic Data Sheet

Project: McARTHUR RIVER

Prospect: ROSIE CREEK

State: NT **Country:** AUS **Tenement:** EL 7313

Organisation: PEKO-WALLSEND OPERATIONS LTD

Title: EL 7313 "ROSIE CREEK" REPORT FOR THE TWELVE MONTHS ENDED 21 FEBRUARY 1994

Authors: ALLAN,A.

Imprint: MOUNT ISA, QUEENSLAND

Pages, figs, plans: 15 PAGES, 2 TABLES, 6 APPENDICES & 9 FIG.

Report No.: MI94/11S

KEYWORDS: McARTHUR GROUP; EMU FAULT; HYC DEPOSIT; GRAVITY; TEM; BALBIRINI DOLOMITE; NYANANTU SANDSTONE

Commodities: BASE METALS **Locality/Nearest Town:** BORROLOOLA

Latitude: 15°25'S **Longitude:** 136°05'E **Report Date:** FEBRUARY 1994

1:250K Map No.: SD53-15 **1:250K Map Name:** MOUNT YOUNG

1:100K Map No.: 6167 **1:100K Map Name:** ROSIE CREEK
6166 BING BONG

ABSTRACT

Previous interpretation of regional gravity and magnetic data suggested that the Rosie Creek area has structural and stratigraphic elements in common with those at the HYC Pb-Zn deposit. Prospective stratigraphy has been intersected in drilling by other companies not far to the south of the EL. Drilling by Geopeko, targeted on EM anomalies, has intersected likely McArthur Group equivalents. Unconfirmed correlation with regional stratigraphy suggests prospective units of the Umbolooga Subgroup may be present in the area. Future work will test for these units using stratigraphic drilling and geophysical techniques.

Database No.: **Microfiche No.:**
Hard Copy Stored at: MOUNT ISA

CONTENTS

TABLES

APPENDICES

FIGURES

EL 7313 - ROSIE CREEK

5	Rosie Creek Gravity Survey Gravity Stations, Reduced Levels and Bouguer Corrected Gravity (2.67 g/cc)	1:25 000	QLD 1455
6.	EL 7313 - Rosie Creek Line 540N-3 Layer Earth TEM Inversion and Drill Hole Geology	1:20 000L 1:1 000V	QLD 1453
7	Rosie Creek Area Reconnaissance Geological Mapping	1:50 000	QLD 1337
8	Rosie Creek Grid TEM Interpretation and Drill Hole Locations	1:25 000	QLD 1456
9	Rosie Creek Grid Lithologic Correlation Drill Section - 540N	1:20 000H 1:2 000V	QLD 1451

A. SUMMARY

Previous interpretation of regional gravity and magnetic data suggested that the Rosie Creek area has structural and stratigraphic elements in common with those at the HYC Pb-Zn deposit. Prospective stratigraphy has been intersected in drilling by other companies not far to the south of the EL. Drilling by Geopeko, targeted on EM anomalies, has intersected likely McArthur Group equivalents. Unconfirmed correlation with regional stratigraphy suggests prospective units of the Umbolooga Subgroup may be present in the area. Future work will test for these units using stratigraphic drilling and geophysical techniques.

B. CONCLUSIONS

McArthur Group sediments including the Reward Dolomite (Umbolooga Subgroup), Hot Springs and Caranbirini Members (Lynott Formation, Batten Subgroup) have been tentatively identified by diamond drilling in EL 7313. Correlation suggests substantial thickness changes and by implication, possible growth faulting in the area. Initial results show surface EM anomalies are caused by variations in conductive fluviatile cover.

C. RECOMMENDATIONS

The direction of future exploration in EL 7313 depends on positive correlation of our core with the regionally established stratigraphy. This will be achieved by examining core held by the NTGS in Darwin and possibly having an NTGS geologist with expertise in the area examine our core at Mount Isa. If, as suggested herein, the Reward Dolomite has been intersected in MRSD01, then the prospective Barney Creek Formation may lie at depths detectable by the EM system within the EL. Initial drilling indicates surface TEM responds to variation in conductive cover. More soundings and one, possibly two shallow percussion holes will be drilled to confirm this. Drilling two or more stratigraphic holes in untested areas will better define local geology. It is also intended to sample MRSD01 for whole-rock analysis as part of an AMIRA lithogeochemical project. It may be possible to "lithogeochemically" correlate the sequence at Rosie Creek with prospective sequences elsewhere in the southern McArthur Basin. Further structural interpretation using aeromagnetic data should be undertaken.

1. INTRODUCTION

1.1 LOCATION, ACCESS AND PHYSIOGRAPHY

EL 7313 is located approximately 60 km north of Borroloola within 15 km of the Gulf of Carpentaria (Fig. 1). Access from Borroloola is via the well maintained gravel road (the Bing Bong Road) to Bone Lagoon then bulldozed exploration and station tracks to "Rosie Creek". Creek crossings require post-wet season rebuilding. Access on dozed exploration tracks is made difficult by their tendency to become sandy following continued usage.

The EL occupies part of a low lying sandy coastal plain (Coastal Plain of Stewart, 1954) to the east of the Tawallah Ranges. The principal drainage is Rosie Creek and its tributaries. Rosie Creek forms a deeply incised tidal channel through most of the EL. Higher ground supports open to moderately dense messmate, bloodwood and cypress forests. Low lying areas (most of the EL) support paper-bark swamps. Distinctive Kapoch trees correlate broadly with areas of dolomitic bedrock. Pisolitic ferricrete and laterite (Tertiary) form distinctive cappings on low ridges, particularly in the north of the EL. Outcrops of grey weathered limestone, probably Cambrian in age, have been noted on one line (60000N) cleared across the area.

1.2 TENURE

EL 7313 "Rosie Creek" was granted to Peko-Wallsend Operations Ltd on 22.02.91. The EL was originally 68 graticular blocks (219 km^2). Geopeko has requested renewal (from 22 February 1994) of only 34 blocks (110 km^2).

1.3 REGIONAL GEOLOGY

Exploration Licence 7313 falls in the southern McArthur Basin, a thick Palaeo-Mesoproterozoic platform-cover sequence overlying the eastern edge of the North Australian Craton which consists of Lower Proterozoic basement rocks. The McArthur Basin has a stratigraphic succession similar to those in the Lawn Hill Platform and Mount Isa Orogen (cover sequence three, Western Fold Belt - Blake et al, 1987). It comprises a sequence of essentially unmetamorphosed and undeformed sedimentary and volcanic rocks deposited in largely shallow marine and lacustrine intracratonic settings. Stratigraphic relationships of Proterozoic units in the southern McArthur Basin are shown in Fig. 2. The basin sequence is divided into four groups, each separated by unconformities. The basal Tawallah Group is approximately 4000 m thick and dominated by sandstone, dolostone with minor volcanics. Separating this group from the overlying McArthur Group is a thin localised sandstone conglomerate unit, the Nyanantu Formation, which exhibits conformable / dis-conformable contacts with units above and below.

The McArthur Group consists of approximately 4000 m of evaporitic and stromatolitic dolostone with subordinate fine grained siliciclastic rocks. A local internal unconformity divides the group into the Umbolooga and Batten Subgroups.

The overlying Nathan group, comprising similar lithologies to the McArthur Group, is relatively thin and widespread and tentatively correlated with the Karns dolomite on the Wearyan shelf to the east of the Rosie Creek area (Pietsch et al, 1991a).

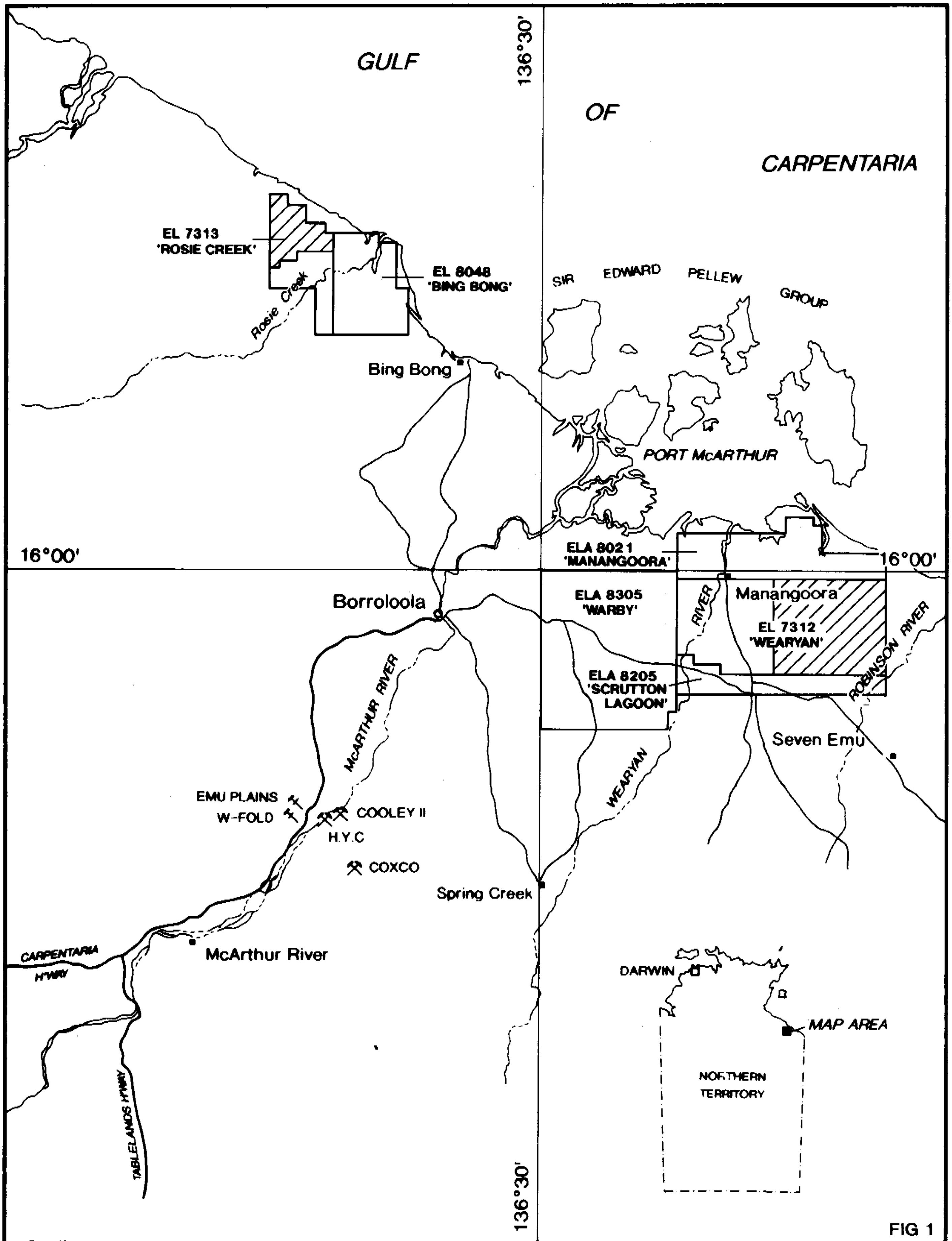


FIG 1

▨ Area Relinquished 21/2/94

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
A.C.N. 000 081 434

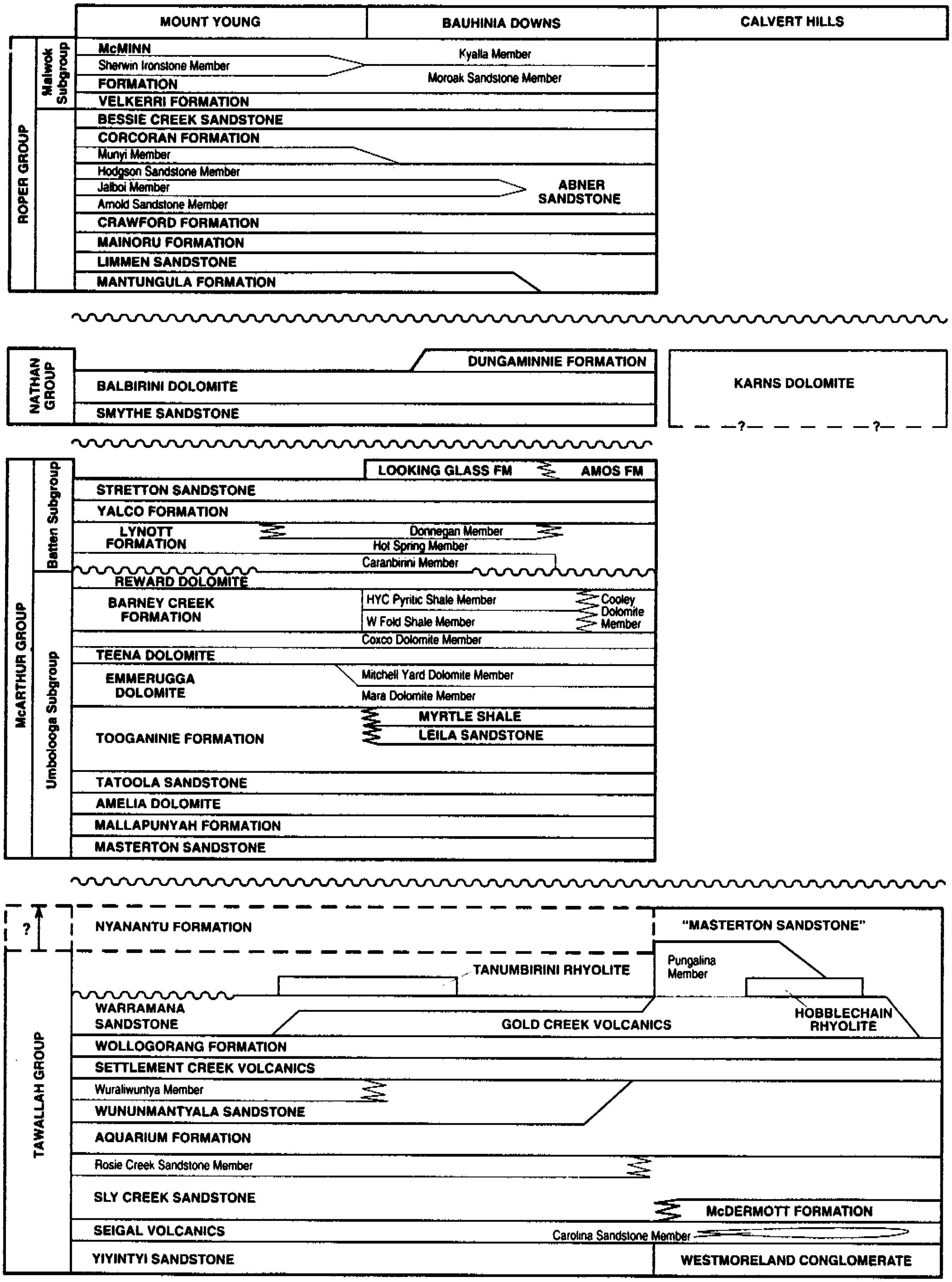
BRISBANE

Scale 1: 1000000

10 0 10 20 30 40 50 km

Geo IM	Map Ref. ROPER RIVER, SD53 & NEWCASTLE WATERS, SE53	
Drawn RH	**McARTHUR RIVER PROJECT** LOCATION AND TENURE PLAN	
Checked		
Date 9/2/94	REV. 9/2/94	Dwg. No QLD 1396

Reports: MI94/11S & MI94/12S



Stratigraphic Relationships of Proterozoic Units in the Southern McArthur Basin

Reference: Rawlings,D.J., Madigan,T.L., Pietsch,B.A. and Haines,P.W., 1993 - Tawallah Range (6066) Northern Territory 1: 100000 geological map series. NTGS Explanotory Notes.

Dwg No. QLD 1452 - Reports: MI94/11S and MI94/12S

FIG. 2

The uppermost unit of the basin succession is the widespread Roper Group, a cyclic sequence of fine (mud-siltstone) coarse (quartzarenites) grained clastic rocks up to 5000 m thick, deposited in a shallow intracratonic basin. Sediment type and depositional environment, (shallow marine to fluvial), for this group is very different to the rift related carbonates of the underlying groups.

The two principal structural elements of the McArthur Basin are the Batten and Walker Fault Zones (or Troughs). Both troughs are flanked by structurally "uncomplicated" shelves or platforms, and are interpreted as graben or half graben like features. In the southern McArthur Basin, the Batten Trough dominated the palaeogeography (eg. Plumb et al, 1980). The trough was controlled by syndepositional faults and contains up to 12 km of shallow water sediments. Only a few kilometres of rocks (~ 4) accumulated on the adjacent shelves (the Bauhinia [west] and Wearyan [east] - Shelves). The Nathan and Tawallah Groups maintain thicknesses of approximately 1 and 3-4.5 km across the Wearyan, Bauhinia Shelves and Batten Trough whilst very little of the intervening McArthur Group is preserved on these shelves. Plumb and Wellman (1987) suggest this is because McArthur Group sedimentation was largely restricted to the trough with little deposition on the adjacent stable shelves (horsts). Conversely Pietsch et al (1991a) propose that the McArthur Group was deposited over a much greater area but was only preserved locally in areas of down-faulting such as the Batten "Fault Zone". This interpretation implies that the bounding faults (eg. Emu Fault) provided only a small influence on deposition. The interpretation has implications for exploration allowing for the presence of thickened prospective McArthur Group sediment packages (in sub-basins, half-grabens etc.) on shelves adjacent the Batten Trough.

1.4 TARGETS AND PHILOSOPHY

Interpretation of regional gravity and magnetic data (see Sowerby, 1992, Mathison, 1993), suggested that the Rosie Creek area is prospective having structural and stratigraphic elements in common with those at McArthur River. Further, that the depo-centre of the Batten Trough had shifted from west to east of the Emu Fault in this area. Drilling by other companies to the south of the EL has intersected pyritic black shale correlated with Barney Creek Formation, host to the HYC mineralisation. Drilling by Geopeko (see this report) has intersected a dolomitic sequence tentatively correlated with the upper portion of the McArthur Group (possibly about the Umbolooga-Batten Sub-group Contact). Given this correlation, it is possible that prospective correlatives of the Umbolooga Sub-group (ie. Barney Creek Formation) are at reasonable depths (ie. ≤ 200 - 300 m) in EL 7313, and to the east in EL 8048, also held by Geopeko. Potential exists therefore, for discovery of third order sub-basins hosting stratiform Pb-Zn-Ag deposits of the McArthur River type.

1.5 PREVIOUS EXPLORATION

EL 7313 has not been covered by detailed exploration other than geophysical surveys carried out by the BMR (now AGSO) and the NTGS. Areas directly to the south and west, however, have been actively explored in the past ten years.

Extensive geophysical and stratigraphic drilling programs were conducted during the 1980's, chiefly by Shell and BHP Minerals in the Warramarra Creek area immediately south west of EL 7313. More recently, MIM Exploration have conducted similar detailed geophysical (moving loop EM) and diamond drilling programs on EL 6048 "Lorella" adjoining the SW corner of EL 7313.

2. CURRENT EXPLORATION PROGRAM

2.1 PROGRESS TO 1992

Access tracks and grid lines were bulldozed into the southern portion of the EL. Attempts to move a drill rig into the area along these tracks failed.

A 92 station gravity survey was completed along an east-west traverse across the southern part of the EL. This data was interpreted by David Leaman in the context of the BMR regional data set. Main conclusions of this study were:

(i) The Geopeko survey was consistent with the regional data base.

(ii) The Rosie Creek area bears some resemblance to the HYC region in that it corresponds with an inferred thickened pre-Tawallah Group felsic volcanic pile trending ENE - NE (Scrutton Volcanics), lies in a complex zone with (gravity) re-entrants implying active faulting during and after deposition of the pile, a thick (≥ 2 km) pile of McArthur Group sediments overlies a variable Tawallah Group sequence and negligible (or absent) pre-Tawallah mafic volcanic pile.

(iii) It is possible that the eastern arm of the Emu Fault trends northwest through the area.

(iv) A major fault presumed active throughout sedimentation and possibly the eastern arm of the Emu Fault passes along the eastern margin of the EL, trending WNW.

2.2 WORK COMPLETED - MARCH 1993 TO FEBRUARY 1994

2.2.1 Access Preparation

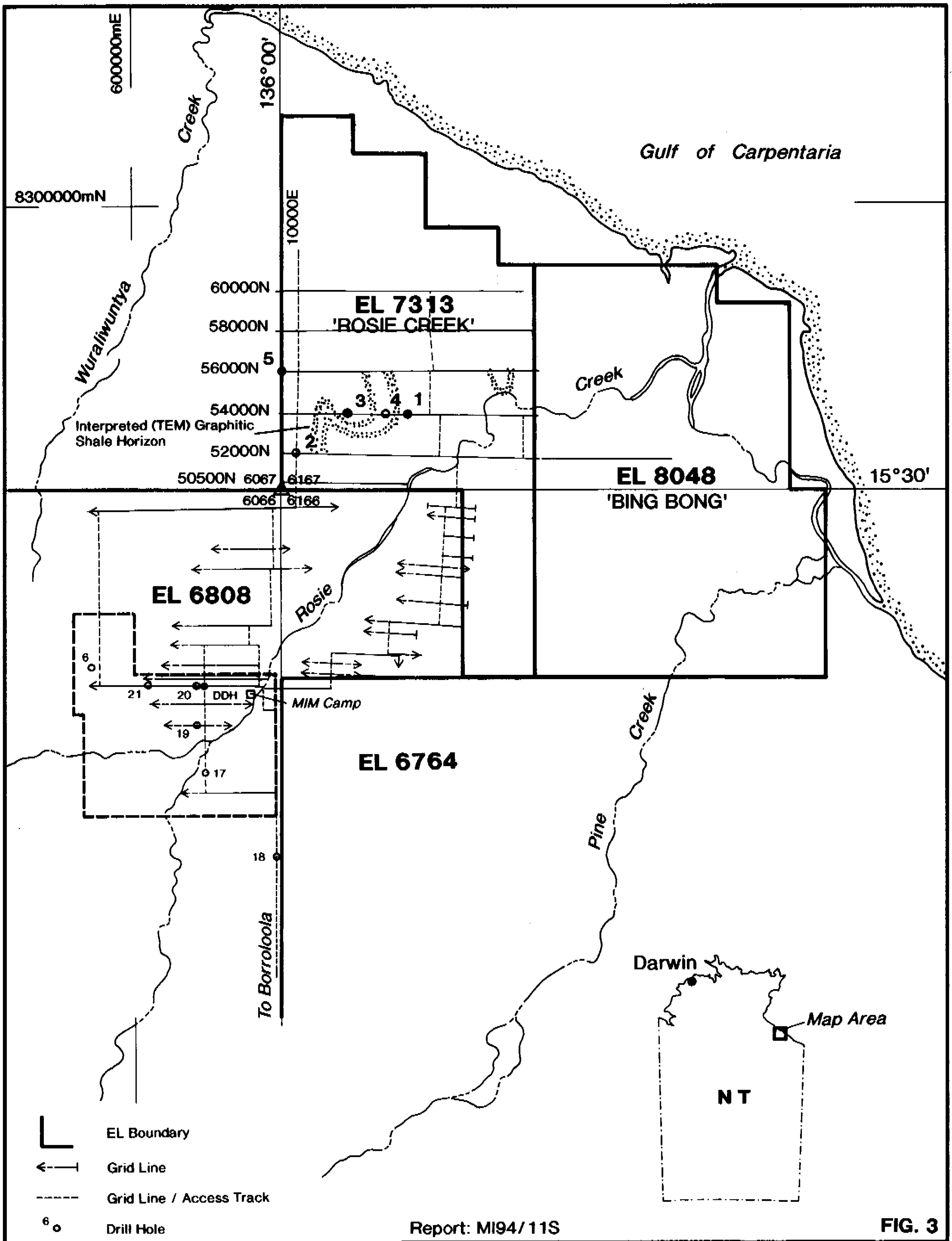
A further 54 line-kilometres of grid tracks were bulldozed (Fig. 3) to enable access for a moving loop SIROTEM survey, drilling and detailed gravity survey. A 20 m wide fire break was cleared around the camp site (approximately 10000E, 52000N, Fig. 3).

2.2.2 Geophysical Surveys

Gravity

A detailed gravity survey (200 m along line station spacing), was carried out along lines 520N, 540N and 560N (Fig. 3) and N-S cross-lines. Four GPS control points were established and these, together with a digibar network were used for levelling. Survey details and results are presented in Appendix 1. Data are yet to be interpreted by David Leaman in terms of his previous work. It is expected that Leaman's interpretation will be available for planning of the 1994 field season.

A contoured plot of gravity data available on the Rosie Creek Grid (Fig. 4) confirms the presence of a significant E-W local gradient which regionally extends from the Emu Fault to the Gulf of Carpentaria (see comments by Leaman in Mathison 1993, Appendix 1). The gradient is irregular but the subtle N-S "protrusion" seen in the regional survey is better defined, but complex. This feature, seen to trend NW-SE in the 1992 survey trends grid north through 15000E (~ 613000 mE) on lines 520N and 540N.



Report: MI94/11S

FIG. 3

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
A.C.N. 000 081 434

BRISBANE

Scale 1: 250000
5000 0 5000 10000 metres

Geo IM/AL

Map Ref. MOUNT YOUNG, SD53-15

Drawn RH

Checked

McARTHUR RIVER GROUP LOCATION DIAGRAM

Date 28/09/93

McARTHUR RIVER

Dwg. No QLD 1336

Another low trends WNW from 12000E on line 520N to approximately 10500E on line 560N. To the west of this feature is a poorly constrained 1.5 - 2.0 mgal isolated high. Further readings are required to better define and assess the importance of this feature.

SIROTEM Surveys

A 36 line kilometre moving loop SIROTEM Survey was conducted on lines 520N, 540N and 560N of the Rosie Creek Grid. The field operator was Solo Geophysics using the SIROTEM Mk III transient EM system with an in-loop array, the transmitting loop having a 200 m side dimension. Readings were taken at 100 m intervals.

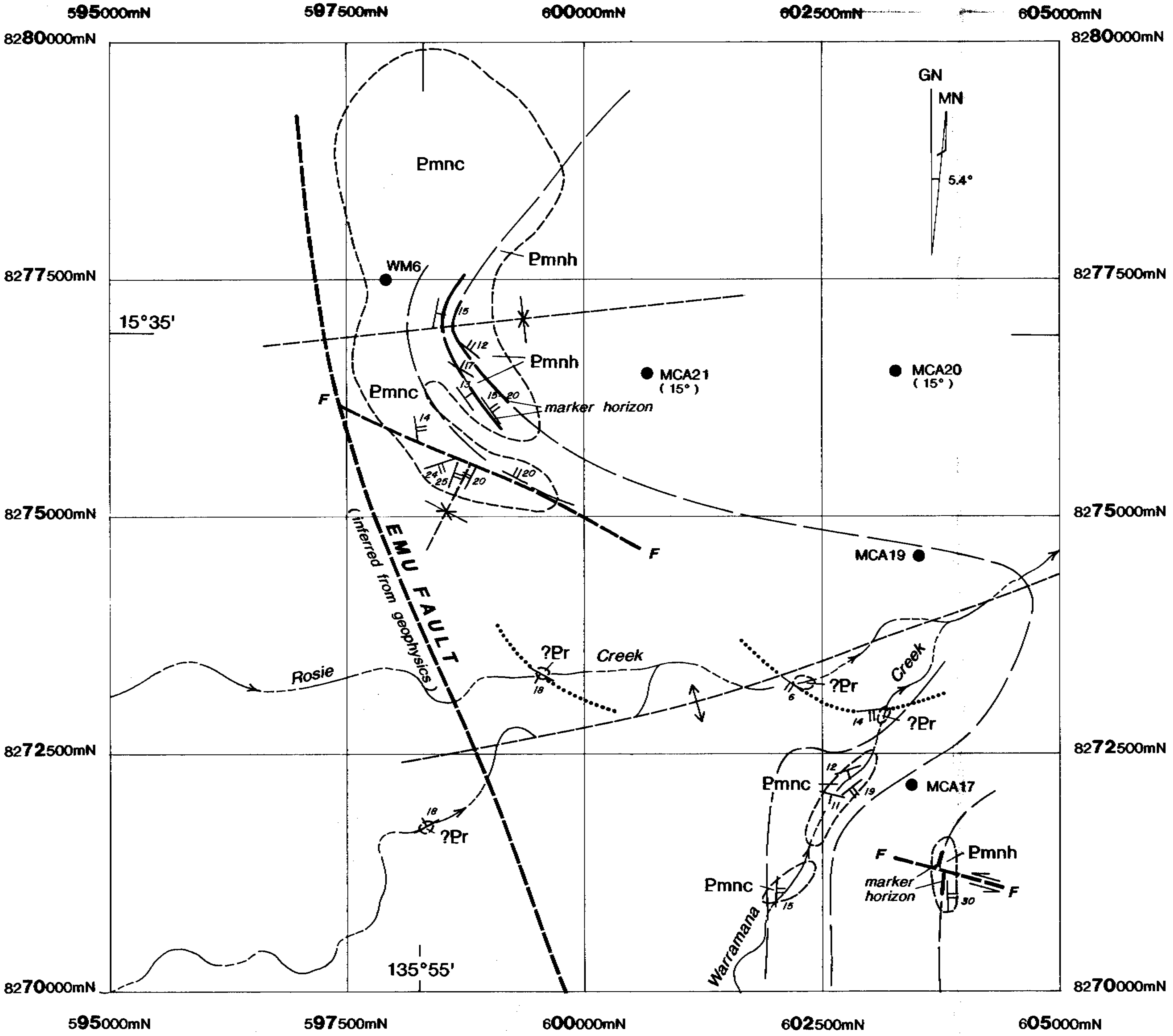
A full interpretation of the data by Hugh Rutter is presented in Appendix 2. Fig. 7 in Rutter's report is a summary of his EM interpretation showing the position of inferred bedrock conductors. Conclusions of his initial report were:

- Late-time voltage increases are due to increased conductivity of the geo-electric section.
- Resistivity of the cover sequence is low - not an ideal environment for the EM system.
- Rock resistivities of approx. 1 Ω m were interpreted from inversion of late-time voltage anomalies.
- Shallow-dipping graphitic and / or pyritic shale horizons were interpreted as the source of these anomalies and drilling of these targets recommended.

Drilling of the anomalies (see section 2.2.4, this report), failed to locate a significant bedrock conductor. Down hole EM surveys using SIROTEM Mk III EM system were conducted by Solo Geophysics and interpreted by Hugh Rutter (Appendix 3). A 200 m x 200 m transmitting loop was centred on each drill hole with secondary EM field measurements at 10 m down hole intervals. These surveys revealed no bedrock conductors. No off-hole effects were noted. It appears that the anomalies detected by the moving-loop survey, were caused by variations in the conductivity of the cover sequence (clay, sand, conglomerate and black plant matter). This suggestion is supported when drill-hole lithological data is plotted on Rutter's "3-layer earth" inversions (Fig. 6) which clearly map resistivity contrast between fluviatile cover and dolomitic bedrock. To be completely assured that there are no bedrock conductors sourcing the surface EM data, one or two shallow (≤ 80 m) percussion holes will be drilled on lines 520 and 540N, guided by Rutter's interpretation.

2.2.3 Reconnaissance Geological Mapping

Reconnaissance mapping on access tracks in the NW of the Tawallah Sheet was undertaken to gain familiarity with the nature of the outcrop and stratigraphy. Fig. 7 is a compilation of this work and shows location and stratigraphy intersected in drilling by Shell (1981) and BHP (1986). Logs of these holes are presented in the recently published notes to accompany the NTGS Tawallah Range (6066) 1:100 000 Geological Map (Rawlings et al, 1993). Units outcropping in the area include the Hot Springs and Caranbirini members of the Lynott Formation with depositional environments ranging from shallow water (saline lake to lagoonal) to inter-supertidal. Major fold axes inferred from "patchy" outcrop measurements



Key to Abbreviations (oldest to youngest units)

Ꝑmq = Barney Creek Fm; Ꝑmx = Reward Dolomite; Ꝑmnc = Caranbirini Mbr; Ꝑmnh = Hot springs Mbr.

● MCA18
(5-15°)

Stratigraphic Reference

Lynott Formation

Ꝑr — **Roper Group**
quartz sandstone, pebbly sandstone, minor conglomerate, cross bedded

Ꝑmnh — **Hot Springs Member**
coarse quartzo-feldspathic sandstone, chertified stromatolite, dolostone dololutite, doloarenite, thin bedded dolomitic siltstone, pseudomorphs after gypsum, halite, stromatolitic shrinkage cracks; forms low strike ridges
marker horizon

Ꝑmnc — **Caranbirini Member**
bleached cream-buff, thin bedded mudstone and shale (some pyritic), poorly outcropping, no coarse arenite or stromatolitic dolostone

Symbols

Approximate subcrop/outcrop limit (no air-photo control)

Trend line on bedding (Lynott Formaton)

Trend line on bedding (? Roper Group)

12 19 Dip and strike of bedding

facing not determined

F Inferred fault

Inferred fold axis (anticline / syncline)

● MCA21 (15°) Diamond drill hole (with approximate dip of bedding)

(WM6 = Shell, 1981; MCA17-21 = BHP, 1986)

Drill Hole Summary

Hole ID	EOH m.	Summary
WM6	545	66-87m = Ꝑmx, 87-545m = Ꝑmq
MCA21	230	38-230m = Ꝑmnc
MCA20	430	30-214m = Ꝑmnc, 214-281m = Ꝑmx, 281-430m = Ꝑmq
MCA19	352	?≃ 200m = Ꝑmnc, 200-300m = Ꝑmx, 300-352m = Ꝑmq
MCA18	453	27-67.5m = ?Ꝑmnh, 67.5-453m = Ꝑmnc
MCA17	358	?-50m = Ꝑmnh, 50-250m = Ꝑmnc, 250-350m = Ꝑmx, 350-358m = Ꝑmq.

Report: MI94/11S

FIG. 7

BRISBANE

GEOPEKO
A DIVISION OF
PEKO-WALLSEND OPERATIONS LTD.
A.C.N. 000 081 434

Scale 1: 50000
1000 0 1000 2000 3000 metres

Geo A.Allan
Map Ref. MOUNT YOUNG SD53-15 . 6066
Drawn RH
Checked

ROSIE CREEK
GEOLOGY - INTERPRETATIVE

Date 30/09/93
McARTHUR RIVER GROUP
Dwg. No QLD 1337

trend approximately ENE consistent with axial trends (perpendicular to sigma 1) that would result from right lateral displacement on the Emu Fault or structures parallel the Batten Fault Trough.

2.2.4 Drilling

Three drill holes were targeted on interpreted EM conductors on line 540N. One percussion hole drilled as a water bore near the exploration camp on line 520N and a fifth stratigraphic hole drilled at the western end of line 560N. Hole locations are shown in Fig. 8. Drill logs are presented in Appendix 4 and analytical results in Appendix 5. Drill core specific gravity measurements are in Appendix 6.

As indicated in Section 2.2.2 above, no significant bedrock conductors were intersected in any of these holes or indicated by down-hole EM. The surface EM survey responded to variation in conductive cover which drilling indicates is 50 (MRSP02, MRSD05) to 80 m (MRSD01, 3, 4) thick consisting of clayey deeply weathered siltstone, sandstone pebble-cobble conglomerate and minor black carbonaceous plant matter (MRSP04). These are likely Cainozoic alluvial deposits though thin (~ 5 m) beds of plant matter are reported in the Lower Cretaceous terrestrial-shallow marine sequence that blankets much of this area (eg. Rawlings, 1993).

The table below summarises drill hole collar, depth and type data.

Hole No.	**Collar**	**AMG Co-ords**	**Dip**	**Depth (m)**	**Percussion (m)**	**RC (m)**	**HQ (m)**	**NQ (m)**
MRSD01	540N	613501mE	vert	400.4	84		52.2	264.2
	15500E	8289691mN						
MRSP02	520N	607983mE	vert	54	54	water	bore	
	10000E	8289691mN						
MRSD03	540N	610056mE	vert	252.0	81.2		47.9	122.9
	12100E	8289800mN						
MRSP04	540N	612437mE	vert	90.0		90.0		
	14400E	8289713mN						
MRSD05	560N	607332mE	vert	219.3	114		35.6	69.7
	9400E	8291860mN						

Line 520N

Hole MRSP02 was drilled as a bore to supply the exploration camp, and provide water for the diamond drilling. Drilling (Appendix 4) encountered 45 m of cover (mudstone, clay pebble-cobble conglomerate, clasts of quartz sandstone and dolomitic lithologies) resting unconformably on dolomitic siltstone (cherty in part) and cherty dolostone. The water table is at approximately 36 m with a flow in excess of 1500 gph. The hole was sampled from 36-54 m in 3 m intervals (Appendix 5). No base metal anomalism was reported. Iron and manganese are elevated (to 5-36%, 2800 ppm respectively).

Line 540N

Holes MRSD01, MRSD03 and MRSD04 were drilled to test the source of EM conductors on line 540N. Preliminary interpretation of EM data suggested conductors were dipping shallowly to the east so holes MRSD01 and 03 were collared so as to reach target depth below the base of oxidation. Lithologic correlation between these holes (Fig. 9) implied bedding is dipping < 1° so both holes had tested the EM anomalies. As discussed above, the surface EM survey was likely responding to the fluviatile cover. Hole MRSP04 was drilled directly over a strong EM anomaly. It intersected highly weathered, clayey ?fluviatile (54 - 60 m) and clean quartz sandstone and siltstone with abundant fragments of black plant matter from 60 - 66 m (Appendix 4). Basement from 78 - 90 m (EOH) consisted of dololutile-arenite.

Lithology Summaries for this hole, and cored holes MRSD01 and MRSD03 are presented in Table 1. A possible correlation with the regional stratigraphy is made for the two cored holes. Alternative interpretations are:

(i) The dolomitic sequence above the unconformity in MRSD01 (79 - 330 m) is part of the Balbirini Dolomite (Nathan Group) overlying the McArthur Group or the entire hole is within Balbirini Dolomite with a local unconformity at 330 m.

(ii) Umbolooga Subgroup - possibly Emmerugga Dolomite.

Correlations will be confirmed by examining Shell and BHP core at the NTGS core library in Darwin. If the suggestion in Table 1 is correct, then the Caranbirini member, indicated to be 300 - 380 m + thick by drilling to the south (Rawlings et al, 1993), has thinned to only 60 m which may imply active growth faulting in the area. Further, if the Reward Dolomite is only 30 - 80 m thick as postulated for "Tawallah" -1:100 000 sheet (Rawlings et al, op. cit.), the prospective Barney Creek Formation may lie at depths detectable by the EM system (in EL 7313 or to the east in EL 8048).

Previous workers have noted local unconformity where karstic weathering of Reward Dolomite preceded deposition of the Caranbirini Member (eg. Jackson et al, 1987). Epigenetic Pb-Zn mineralisation at the Coxco deposit is reported associated with a karstic breccia between Reward Dolomite and Lynott Formation in the Bauhinia Downs Area (Pietsch et al, 1991). Only minor pyrite is associated with this contact in MRSD01.

Analytical results for holes on line 540N were disappointing. Samples were analysed for Cu, Pb, Zn, Mn, Fe and Ag by AAS, and Ba, Tl by XRF (Appendix 5). Results are summarised below:

TABLE 1
SUMMARY LITHOLOGICAL LOGS: MRSD01, MRSD03, MRSP04 TENTATIVE CORRELATION WITH REGIONAL STRATIGRAPHY

From	To	Description
0	79	Fluviatile Cover Cenozoic.
LYNOTT FORMATION (BATTEN SUBGROUP) HOT SPRINGS MEMBER OR BALBARINI DOLOMITE		
79	123	Laminated gy-gn dololutite-arenite in upward fining cycles.
123	137	Algally laminated dolostone (± low relief stromatolites, intraclast rudite - breccia).
137	150	Doloarenite-lutite-grey green siltstone in upward fining cycles.
150	167	Algally laminated dolostone facies, minor clastic debris, framework/fenestral porosity.
167	212	Thick stromatolitic dolomite, high relief forms (to 40cm synoptic height). Kussiella kussiensis bioherm.
212	228	Doloarenite-dololutite in upward fining cycles, arenite beds to 0.5m thick.
228	271	Laminated dolostone facies, algal lamination, white ?fenestral-framework porosity (ooid marker 247m).
LYNOTT FORMATION (BATTEN SUBGROUP) CARANBIRINI MEMBER OR BALBARINI DOLOMITE		
271	310	Interbedded (-laminated) doloarenite - lutite - (black-dark green)carbonaceous siltsone (± Cu staining); upward fining cycles (enterolithic structures 303m).
310	329.5	Laminated very fine grained doloarenite, dololutite and green/black siltstone, upward fining cycles. Characteristic black "striping" - ?organic matter rich with cross laminations, ripple drift cross lamination.
REWARD DOLOMITE OR BALBARINI DOLOMITE		
329.5	332	Silicified ?karsitic breccia (paleoweathering surface). Unconformity surface.
332	337	Algally laminated stromatolitic dolostone.
337	341	Stromatolitic dolostone, tall forms to 40cm (Balbirini prima bioherm).
341	348	Algally laminated dolostone.
348	353	Dolorudite-lutite, upward fining cycles.
353	357	Algally dolostone ± "button" stromatolites.
357	367	Dolorudite-lutite, upward fining cycles.
367	379	Algally laminated dolostone, overlying laminated dololutite, intraclast dolorudite, (ooid marker 337m).
379	382	Algally laminated dolostone partly chertified.
382	400.4	Dololutite, rudite, minor siltstone, partly chertified.
400.4		E.O.H

*** Examination of core 10-03-94 by Dr P. Haines (NTGS) confirmed alternative interpretation that the proterozoic sequence in holes MRSD01 and MRSD03 falls wholly within the Balbirini Dolomite.**

MRSD03 - SUMMARY LOG

From	To	Description
0	81.2	Cenozoic ?fluviatile cover
81.2	83.3	Cenozoic fluviatile cover, dark grey matrix supported conglomerate - angular clasts to 2cm of dolostone, 1cm siltstone in a sandy, clayey matrix with lots of black plant material.
HOT SPRINGS MEMBER OR BALBIRINI DOLOMITE		
83.3	110.4	Slumped, laminated green siltstone (slump breccia) - probably Proterozoic, formed during growth faulting.
110.4	162.8	Stromatolitic dololutite - tall forms (likely correlative of 166-212m in MRSD01).
162.8	179	Upward fining cycles of doloarenite - dololutite - green/grey siltstone (likely correlative of 212-230m in MRSD01).
179	203	Laminated dololutite facies, algal lamination (ooid marker 201m).
203	225	Grey laminated doloarenite - dololutite, a few ?columnar stromatolites, deposited in upward fining cycles but overall coarsening uphole.
225	232	Upward fining cyles of doloarenite - dololutite - green laminated siltstone, weakly pyritic.
CARANBIRINI MEMBER OR BALBARINI DOLOMITE		
232	252	Upward fining cycles of dololutite/ arenite and black (-pyritic) carbonaceous laminated siltstone; some entrolithic textures at ≈250m; slumping, possible fine grained sphalerite in some of the carbonaceous interbeds.
252		E.O.H.

MRSP04 - SUMMARY LOG

From	To	Description
0	78	?Fluviatile sequence including grey-black clay (54-60m) and clean quartz sandstone with abundant fragments of black plant matter (60-66m).
HOT SPRINGS MEMBER		
78	90	Dololutite - doloarenite (Proterozoic sequence).
90		E.O.H.

MRSD01

Metal	Result
Ag	All below analytical detection limit (1 ppm)
Cu	Largely ≤ 10 ppm, maximum 130 ppm associated with karstic breccia at 330 - 332 m.
Pb	Mainly 10 - 30 ppm, maximum 130 ppm in laminated dolostone.
Zn	Generally < 2 ppm - 40 ppm, maximum 145 ppm (250 - 252 m) in dolorudite - lutite.
Mn	Approx. 500 - 700 ppm apart from interval with carbonaceous siltstone interbeds from 270 - 332 m where Mn was elevated (~ 2 - 5000 ppm).
Fe	Approx. 3 - 6000 ppm throughout, apart from 270 - 332 ppm elevated with Mn, 0.8 - 1.3% Fe.
Note	Six samples within this interval which were carbonaceous were analysed for total organic elemental carbon and found to contain up to 0.70% TOEC.
Ba	~ 100 - 200 ppm (max. 5800 ppm) in unit of laminated dololutite - arenite with dolosiltstone from 79 - 125 m and in the interval from 270 - 332 m with elevated Mn / Fe, otherwise > 10 - 30 ppm.
Tl	All at or below analytical detection limit of 10 ppm.

MRSD03 **(Only carbonaceous, weakly pyritic interval 230 - 252 m sampled)**

Metal	Results
Ag	All < 1 ppm.
Cu	2 - 40 ppm.
Pb	7 - 28 ppm.
Zn	4 - 30 ppm.
Mn	1500 - 3300 ppm.
Fe	7000 ppm - 1.1%.
Ba	Generally 100 - 200 ppm, max. 1020 ppm.
Tl	All ≤ 10 ppm.

MRSP04 **(0 - 78 m fluviatile cover, 78 - 90 m - EOH - dolostone)**

Metal	Results
Ag	All < 1 ppm.
Cu	5 - 50 ppm in the cover, < 2 - 6 ppm in basement.
Pb	Generally 10 - 20 ppm in cover (up to 125 ppm); only 10 ppm in basement.
Zn	Approx. 40 - 100 ppm (max. 280 ppm) in cover, only 5 - 10 (max 54 ppm) in basement.
Mn	200 - 600 ppm in cover, 800 - 1100 in basement.
Fe	Generally 2 - 3% in cover but up to 17%, 8000 - 9000 ppm in basement.
Ba	300 - 1400 in the cover, only 100 - 200 (max. 600) in basement.
Tl	All ≤ 10 ppm.

The data shows that the Mn-Fe (-Ba) geochemistry clearly reflect lithologic variation in the Proterozoic sequence.

Line 560N

Hole MRSD05 (lithologic summary, Table 2 below) was drilled to test the stratigraphy on the western margin of the EL on the western side of a possible NNW trending fault interpreted from gravity data. It intersected a sequence of medium grained quartz (to quartz-lithic) sandstones (cross-bedded) with minor interbedded red-brown mudstone and conglomerate interpreted as Roper Group (?Limmen Sandstone). The hole was drilled to a depth that covered the possibility of intersecting the basal units of the Roper Group and was terminated as the Roper Group may be hundreds of metres thick. None of the core was geochemically analysed. An alternative correlation would be that this unit is pre-McArthur Group (possibly a correlative of the Masterton Sandstone or Nyamantu Sandstone as described by Rawlings et al, 1993). In support of the latter suggestion is the lithic component of the sandstone (ie. "dirtier" than typical Roper Group sandstone) and the presence of beds of poly-lithic conglomerate (? channels). This correlation would imply a horst-like structure at the western margin of EL 7313 with McArthur or Nathan Group Sediments (MRSD01, D03, P04) lying on the down thrown side (to the east of a normal fault).

Samples have been taken for petrographic description.

TABLE 2
SUMMARY LOG - MRSD05

From	To	Description
0	6	Clay, sand, lateritic pisolites.
6	48	Deeply weathered hematitic/limonitic quartz sandstone with interbedded siltstone (now clay).
48	114	Pinkish-red to brown quartz sandstone with minor interbedded siltstone.
114	219.3	Sequence dominated by medium grained quartz sandstone, cross-bedded in part, minor interbedded red-brown mudstone, minor lithic (quartzite-mudstone) component but dominated by quartz detritis. Some detrital mica and possible glauconite.
219.3		E.O.H.

NB: THIS UNIT IS SUGGESTED TO BE NYANANTU FORMATION (TOP OF THE TAWALLAH GROUP) BY DR. P HAINES (N.T.G.S.).

3. CONCLUSIONS AND RECOMMENDATIONS

The direction of future exploration in EL 7313 depends on positive correlation of our core with the regionally established stratigraphy. This will be achieved by examining core held by the NTGS in Darwin and possibly having an NTGS geologist with expertise in the area examine our core at Mount Isa. If, as suggested herein, the Reward Dolomite has been intersected in MRSD01, then the prospective Barney Creek Formation may lie at depths detectable by the EM system within the EL. Initial drilling indicates surface TEM responds to variation in conductive cover. More soundings and one, possibly two shallow percussion holes will be drilled to confirm this. Drilling two or more stratigraphic holes in untested areas will better define local geology. It is also intended to sample MRSD01 for whole-rock analysis as part of an AMIRA lithogeochemical project. It may be possible to "lithogeochemically" correlate the sequence at Rosie Creek with prospective sequences elsewhere in the southern McArthur Basin.

An outline of the proposed program follows:

1993 - 94

Jan - March	Core sampling for lithogeochemical study, reporting.
April - June	Core logging in Darwin. NTGS Geologists examines Rosie Creek core.

1994 - 95

July - September	Line clearing, EM soundings, drilling.
October - December	Complete drilling.
January - March	Data interpretation, reporting.

Proposed Expenditure is as follows:

March - June 1994

Salary & Wages	3 200
Base Support	1 000
Travel & Accommodation	1 300
Assay	5 000
Consultants (NTGS, CODES)	3 000
Administration	1 500
TOTAL	15 000

1994-95

Salaries & Wages	20 000
Base Support	5 500
Vehicles & Supplies	6 500
Freight	2 000
Percussion Drilling (200 m)	10 000
Diamond Drilling (600 m)	60 000
Assay	4 000
EM Survey	8 000
Administration	10 000
TOTAL	125 000

4. ACCOUNTED EXPENDITURE

Expenditure recorded for the 12 months period ending February 1994 is as follows:
GRANTED 22.2.91 1.3.93 - 28.2.94 GEOPEKO COST STATEMENT

SALARIES:	Geologists		30 167
	Geochemists		00
	Geophysicists		1 453
	Draftsmen		2 322
	Other Tech. & Gen.		1 498
	Enginrs. & Metall.		00
Sub-total Salaries			35 440
WAGES:	Field Assistants		24 068
	Drafting		235
	Other		1 352
Sub-total Wages			25 655
Total Payroll			61 094
TENEMENT EXPENSES			4 120
BASE SUPPORT COSTS			30 937
FIELD SUPPORT:			
	Vehicles		8 257
	Travel & Accom.		2 409
	Freight		351
	Supplies		5 924
	Sustenance		6 443
	Premises:	Office	60
		Housing	00
		Other	00
	Communications		97
	Maintenance		296
	Other Costs		15
Depreciation			00
Total Field Support			23 852
Total Fixed Costs			120 003
Drilling:	Soil Probe (RAB)		00
	Rev. Circ. (Air Core)		00
	Percussion		00
	Diamond		100 048
Total Drilling			100 048
Geological Consultants & Maps			4 737
Geochemistry			3 700
Assaying			625
Mineralogy & Petrology			00
Geophysics:			
	Airborne		00
	Ground		30 355
General Contractors			34 716
Survey & Gridding			1 053
Data Processing			1 215
Total Exploration Services			76 401
Joint Venture Payments			00
Sundry Income			00
Total Variable Costs			176 449
Total Fixed & Variable Costs			296 452
Management Charge			15 273
TOTAL PROJECT COSTS			311 725

5. REFERENCES CITED

BLAKE, D.H., 1987 - Geology of Mount Isa inlier and environs, Queensland and Northern Territory. *Bureau of Mineral Resources.* Bull. 225.

MATHISON, I., 1993 - EL 7313 "Rosie Creek", Report for the Twelve Months ended 21 February 1993. *Geopeko Report* No. QB93/8S (unpublished).

PIETSCH, B.A., RAWLINGS, D.J., CREASER, P.M., KRUSE, P.D., AHMAD, M., FERENCZI, P.A. AND FINDHAMMER, T.L.R., 1991 - Bauhinia Downs, Northern Territory 1:250 000 geological map series. *Northern Territory Geological Survey, Explanatory Notes* SD 52 - 4.

PLUMB, K.A., DERRICK, G.M., NEEDHAM, R.S. and SHAW, R.D., 1981 - The Precambrian geology of the McArthur River - Mount Isa region, northern Australia. *In* HENDERSON, R.A. and STEPHENSON, P.J., (Editors), THE GEOLOGY AND GEOPHYSICS OF NORTHEASTERN AUSTRALIA, 4, 71 - 88. *Geological Society of Australia, Inc., Queensland Division, Brisbane.*

PLUMB, K.A. and WELLMAN, P., 1987 - McArthur Basin, Northern Territory: mapping of deep troughs using gravity and magnetic anomalies. *BMR Journal of Australian Geology and Geophysics* 10, 243-252.

RAWLINGS, D.J., MADIGAN, T.L., PIETSCH, B.A. and HAINES, P.W., 1993 - Tawallah Range, Northern Territory 1:100 000 geological map series. *Northern Territory Geological Survey, Explanatory Notes.*

SOWERBY, R.D., 1992 - Annual Report of Exploration Licence No 7313, 22.2.91 - 21.2.92. *Geopeko Report* (unpublished).

STEWART, G.A., 1954 - Geomorphology of the Barkly region. *In* CSIRO - Melbourne, SURVEY OF THE BARKLY REGION 1947-8, 3, 42 - 58. *Land Research Series.*

SURTEC GEOSURVEYS PTY LTD

ROSIE CREEK PROJECT, N.T.
REGIONAL INFILL GRAVITY SURVEY
NORTHERN TERRITORY EL 7313
FOR
GEOPEKO LTD

R. J. COURT

SURTEC GEOSURVEYS PTY LTD.
Suite 9, Level 1,
859 Pacific Highway,
Pymble N.S.W 2073

14 March 1994

CONTENTS

FIGURES IN TEXT

PLATES

(under separate cover)

1. INTRODUCTION

A semi regional gravity survey and control survey has been carried out by SURTEC GEOSURVEYS PTY LTD (SURTEC) and GEOPEKO LTD (GEOPEKO) for and on behalf of GEOPEKO within Northern Territory Exploration Licence No 7313.

Field work was conducted along previously established grid lines and base lines from the 5th to the 9th of August.

Four new survey stations, 2 gravity base stations and 85 routine gravity stations have been established. Ten stations from a survey conducted in 1992 were re-observed.

Survey stations were established using LEICA GPS 200 geodetic GPS receivers, gravity stations were co-ordinated with MAGELLAN & GARMIN navigation GPS receivers and levelled with 5 DIGIBAR digital microbarometers. Gravity observations were made with 2 LACOSTE & ROMBERG gravity meters.

The estimated overall accuracy of routine gravity stations is +/-0.10 mgals.

All gravity stations are connected to the Australian Map Grid (AMG), the Australian Height Datum (AHD) and the ISOGAL84 gravity datum.

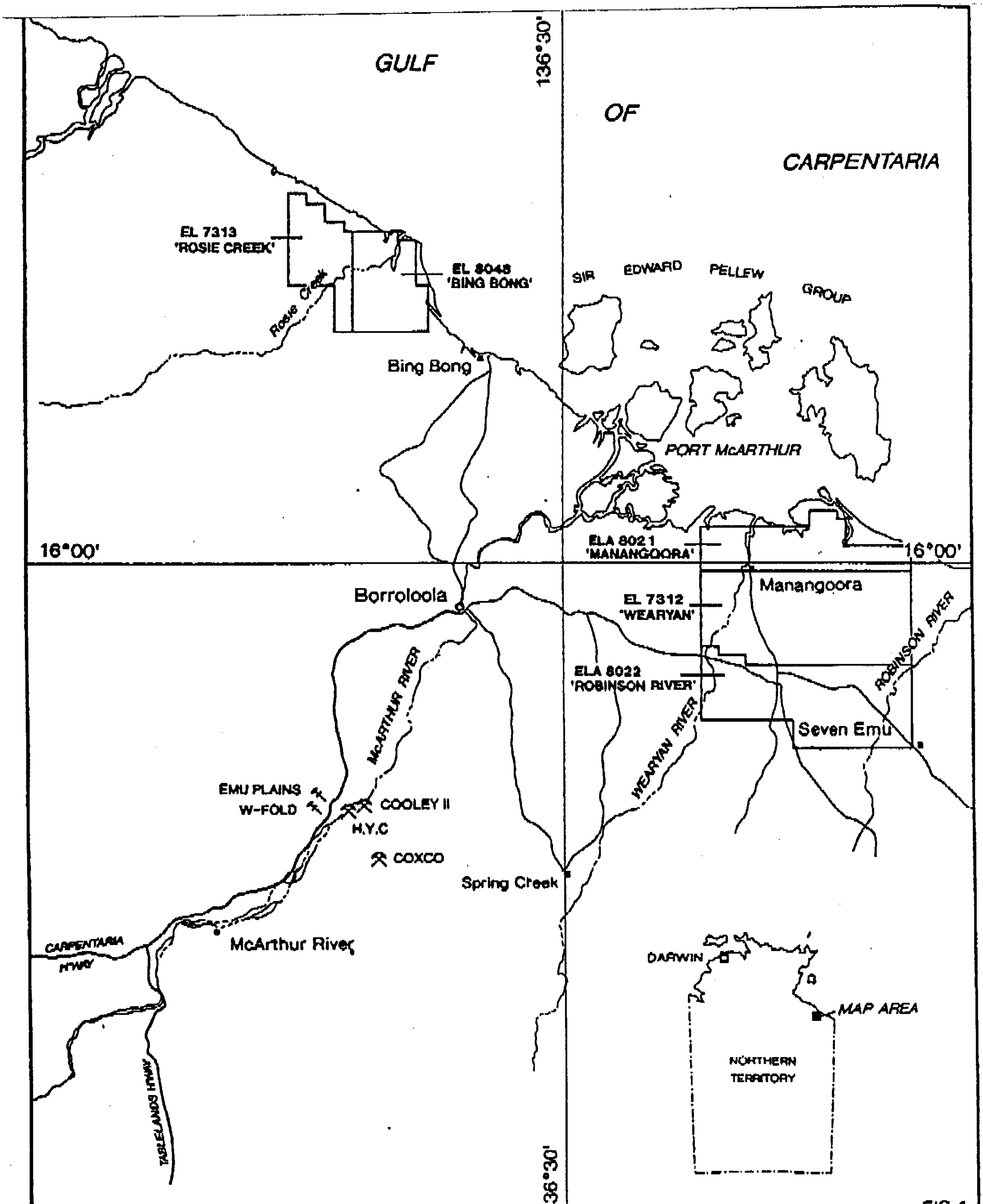


FIG 1

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
A.C.N. 000 081 434

BRISBANE

Scale 1 : 1000000

10 0 10 20 30 40 50 km

Geo IM	Map Ref. ROPER RIVER, SD53 & NEWCASTLE WATERS, SE53
Drawn RH	**McARTHUR RIVER PROJECT** LOCATION AND TENURE PLAN
Checked	
Date 09/03/93	Dwg. No QLD 1236

2. SURVEYING

2.1 EXISTING SURVEY CONTROL

SURTEC was advised by GEOPEKO that the only survey control available in the project area was a survey mark (STN GPS 9052) placed by GEOTERREX in 1992 using a SERCEL GPS system. No information was provided on the accuracy of this mark.

The co-ordinates for the station were given as:-
AMG ZONE 53

606 856.315E	8 284 639.188N	RL 15.720

2.2 CONTROL SURVEY

A control survey was conducted by Nick Giles and Richard Duggan of SURTEC using 2 LEICA GPS 200 geodetic GPS receivers. A BELL KAWASAKI KH4 helicopter was used for transport.

The existing station GPS 9052 was used as a fixed reference station from which four base lines were observed to stations 1001 to 1004 inclusive using the RAPID STATIC observation technique and observation times of 8 to 20 minutes per line.

On completion of fieldwork, WGS84 co-ordinates were transformed for STN GPS9052 using Higgins Parameters. These values were input to the Datum & Map component of the SKI GPS reduction software and base line observations were reduced. AMG co-ordinates were then transformed from computed WGS84 co-ordinates using the interpolation method.

No attempt was made to obtain geoidal heights for the new station. Reported heights for new stations are ellipsoidal relative to STN GPS9052.

It should be noted that the SURTEC STN 1001 is a previously established gravity base no. RCB1 and 1002 is approximately 25m from old gravity base no. RC2.

2.3 CO-ORDINATION OF ROUTINE GRAVITY STATIONS

Routine gravity stations were co-ordinated with MAGELLAN NAVPRO 5000 navigation GPS receivers fitted with survey upgrades and external antennaes.

At each gravity station, 75 position fixes on the Australian Map Grid were observed, stored and averaged in 3D mode.

Co-ordinates were entered to PSION electronic notebooks along with gravity observations.

Observations with the MAGELLANS at known points suggest the general accuracy of routine gravity stations will be in the order of +/-30m.

2.4 LEVELLING OF ROUTINE GRAVITY STATIONS

Gravity stations were levelled using 5 GEOBAR DIGIBAR 2000 digital microbarometers; two as base stations and two for traversing.

These instruments, which measure air pressure to an accuracy of 0.01 millibars, were configured such that pressure measurements were made at intervals of 4 seconds. Each 3 readings were averaged and stored as 3 point running averages.

Base stations were set up each day at known height control points straddling the day's planned work area. Observations were made at each base with both traverse barometers at the beginning and end of each day's work to correlate each barometer against the other and as a test of drift.

Base barometers were left to sample and record air pressure throughout the day. Traverse barometers were taken to routine gravity stations and switched on for generally 5 minutes at each station.

Wherever possible, air pressure was sampled at known height control points throughout the day.

Through the course of the survey, the air column was stable and very good results were derived.

3. GRAVIMETRY

Gravity observations were made by SURTEC technician Rick Duggan and GEOPEKO technician John MacCarthey using LACOSTE & ROMBERG gravity meters with serial numbers 508 and 704.

The survey was connected to the ISOGAL84 gravity datum by observation of gravity bases RCB1 (SURTEC base 1001) and RC2 (SURTEC BASE 1002) which were established by GEOPEKO in 1992 by the observation of multiple connections from a MOUNT ISA MINES gravity base numbered 9052. This base was apparently established in 1992 by multiple connection to an AGSO gravity base.

3.1 GRAVITY BASE STATIONS

Two new gravity base stations were established by the observation of a loop from STN 1001 (RCB1) through bases 1003 and 1004 thence to STN 1002 (RC2) using 2 gravity meters.

Base station details are listed below:-

	ZONE 53 AMG CO-ORDS		ELLIPS RL	ISOGAL84
	E	N	AHD	Observed Grav
Base 1001 (RCB1)	607 984.66	8 287 825.01	14.82	978 416.39
Base 1002 (RC1)	615 723.27	8 287 450.05	12.02	978 416.35
Base 1003 (New)	619 866.54	8 291 789.10	5.82	978 417.49
Base 1004 (New)	608 105.57	8 291 854.97	12.49	978 415.40
Base GPS 9052	606 856.32	8 284 639.19	15.72	978 414.87

3.2 ROUTINE METERING

The daily routine for the 2 gravity operators was as follows:-

a) Set up barometric base stations at control and observe traverse barometer,
b) check onto gravity and elevations control close to work area,
c) observe gravity, air pressure and co-ordinate at planned gravity station locations,
d) observe gravity and air pressure at gravity base and height control points at 2-3 hourly intervals,
e) repeat (c) and (d) throughout the day,
f) check onto gravity and elevation control,
g) observe traverse barometers at barometric bases, pick up bases and return to base,
h) download gravity and barometric observations to computer, process and

plot,

i) examine processed data and plots to check data quality.

All gravity observations and co-ordinates were recorded on PSION hand held electronic notebooks using proprietary SURTEC software.

3.3 RE-OBSERVATION OF EXISTING GRAVITY STATIONS

During the course of the survey, 9 gravity stations observed by GEOPEKO during the 1992 field season were re-observed. SURTEC does not have the observed gravity values for these stations and so cannot comment on replication of results.

Re-observed stations are:-

GEOPEKO No	SURTEC No
RC50	50
RC53	53
RC70	70
RC72	72
RC4	4
?	223
?	224
?	232
?	233

4. SOFTWARE DESCRIPTION

4.1 GENERAL

All gravity data processing was carried out using proprietary SURTEC software. Barometric data processing was carried out using modified versions of the software supplied with the digital microbarometers. Geodetic survey observations were reduced using the SKI software package developed by LEICA.

4.2 SURVEYING SOFTWARE

The SKI Static Kinematic Software is a specialised group of programs for the reduction of geodetic GPS observations that operates under a Windows environment.

Software routines included with the package include field planning and satellite ephemeris prediction, data management, 5 different approaches to reducing observations, ionspheric and tropospheric correction modelling, geoid-ellipsoid separation modelling, and routines for datum and map projection transformations.

Proprietary algorithms are used which facilitate considerable reduction in the observation time required to ensure resolution of all ambiguities.

4.3 BAROMETRIC SOFTWARE

Barometric software described below was written by either Graeme Boyd or SURTEC.

BARIN:	Program used to download barometric data to PC. (G.Boyd)
ESDRIFT:	Program used to drift correct traverse barometer files on the basis of daily initial and final observations against base stations. (G.Boyd)
EAVDAT:	Program used to convert observed pressure variations to actual pressure measurements. The program applies a user specified running point average to de-spike base and traverse barometer observations. Output is a file labelled ____.AVD. (G.Boyd)

GRAVCORD: Program used to insert gravity station co-ordinates from PSION output to traverse barometer.AVD data files on the basis of station number. (SURTEC)

ECELSS: Program used to compute elevations from .AVD file using the station step method after entry of known elevations to a control file. (G.Boyd) Computation steps are:-

a) Elevations for each point are computed relative to each base station.

b) Point elevations are adjusted on the basis of the distance of each station from each base. (G.Boyd)

c) Computed and adjusted observations at control points are compared to actual elevations to determine a misclose from control to control.

d) Miscloses are adjusted from control to control on the basis of time to derive an adopted elevation for each gravity station.

HTINSERT: Program used to insert adopted station elevations to gravity observation files. (SURTEC)

4.4 GRAVITY SOFTWARE

The programs developed by SURTEC and used in data reductions are listed and described below:-

GRAVIN: A program used to download data from the PSION electronic notebook to the field computer. The output file is in a "free-read" format.

GRAVRED: This program takes a field gravity file (output from GRAVIN) and computes observed gravity and normal gravity by applying corrections for instrument factor then tide and then drift against known bases (in separate file) to give observed gravity. Latitude corrections are then computed from AMG co-ordinates converted to UTM to give normal gravity.

The program can be used on local grids (with skewed azimuth) or with AMG co-ordinates. A local or ISOGAL84 gravity datum can be used.

Tide corrections for each gravity station are computed within the gravred program using an upgraded variation of the BMR's program ERTIDE1. Tide corrections are applied before drift corrections.

After application of tide corrections, the data is scanned for base stations (defined by co-ordinate in a base station file) or repeat stations which are then flagged. Each base is then examined and assigned a value that is a linear interpolation of known drift on either side of it. Each of these is then assigned a weight that is the inverse of the product of the time to the adjacent known values. For each base station, the weights are summed and a weighted average of assigned values calculated. The base with the most weight is then given the true value of the weighted average and is flagged as another known station. This process is repeated until all the repeated stations are assigned values.

These stations are then used to correct the rest of the data.

Latitude corrections are computed (in this case) using the formula:

$$\text{Latitude correction} = 978031.8(1 + 0.0053024\sin^2\theta - 0.0000059\sin^2 2\theta)$$

(where θ = latitude)

Dependant on input data and requirements, the following outputs are written to separate files:

nnnn.CHK	A formatted file of raw gravity observations.
nnnn.COR	A file listing station number, co-ordinate, elevation, tide, drift and latitude corrections with observed gravity.
nnnn.ABS	A file listing XY co-ordinates and observed gravity.
nnnn.UTM	A file listing principal facts.
nnnn.RED	A file listing station number, co-ordinate, elevation, Terrain corrections (if appropriate - output from separate program) and normal gravity - input to BOUGUER for Bouguer reductions.

BOUGUER: This program follows GRAVRED (and TERRAIN) and calculates the free air and Bouguer effects. Provision is made for calculating the density which gives the flattest final gravity including terrain effects.

The formula used for free air and Bouguer corrections is, as defined in BMR publication No. 261 by Wellman, Barlow and Murray, 1985 (Gravity Base Station Network Values, Australia):-

$$\Delta g_{BA}(1984) = g_{obs} - [978031.8(1 + 0.0053024 \sin^2\Phi - 0.0000059 \sin^2 2\Phi)] + 0.3086\mathbf{h} - 0.0419\rho\mathbf{h} \quad \text{(in milligals).}$$

Where:

$\Delta g_{BA}(1984)$ = Bouguer Anomaly (ISOGAL84 Datum)
g_{obs} = Observed Gravity (ISOGAL84 Datum)
Φ = Latitude
$\mathbf{h}$ = AHD Elevation
ρ = Density (g/cm^3)

The following outputs are written to separate files:

nnnn.BOU	A file listing station number, co-ordinates, elevation, free air and Bouguer corrections and Bouguer corrected gravity.
nnnn.BGR	A plot file listing co-ordinates and Bouguer corrected gravity.
nnnn.ELE	A plot file listing co-ordinates and elevations.

TEXTSORT:	A program used to sort data on the basis of a selected column. Used to strip unnecessary base readings from .RED files.
GSORTSTD:	A program used to sort gravity files on the basis of time.
LSADJUST:	A program used to transform co-ordinates from one co-ordinate system to another.

APPENDIX 2

AN INTERPRETATION OF IN-LOOP SIROTEM DATA
From the Rosie Creek Prospect for Geopeko
By Hugh Rutter, Geophysical Exploration Consultants Pty Ltd

GEOPHYSICAL EXPLORATION CONSULTANTS
PTY LTD

AN INTERPRETATION OF IN-LOOP SIROTEM DATA FROM THE ROSIE CREEK PROSPECT FOR GEOPEKO

Hugh Rutter

AN INTERPRETATION OF IN-LOOP SIROTEM DATA FROM THE ROSIE CREEK PROSPECT FOR GEOPEKO

HUGH RUTTER

SEPTEMBER 1993

CONTENTS

FIGURES

1. INTRODUCTION

The Rosie Creek E.L. is in the northern extension of the Batten Trough and is prospective for strata-form base metal mineralisation. At McArthur River the HYC deposit is hosted by a pyrite black shale and it is possible that a stratigraphic equivalent occurs at Rosie Creek. The area is covered by Cenozoic/Mesozoic sediments making exploration difficult. A transient electromagnetic system, the Sirotem Mk III was chosen as a means of exploring beneath the cover and identifying a pyritic shale horizon below. An in-loop array was selected with the transmitting loop having a 200m side dimension. Readings were taken at 100m intervals along three east-west lines which were spaced at 2000m. Approximately 36 line kilometres of data were collected with close to 360 TEM soundings.

The field operator was Solo Geophysics. The results were subsequently analysed using Siroex software. The dip of the prospective horizons is considered to be shallow, therefore it was this style of conductor that was sought in the data.

2. DATA PREPARATION

The data was received on disk in an AMIRA format. The input specifications were checked and corrected where necessary before dividing each line into a number of smaller files for ease of handling.

The earlier channels, ie 1-7, were saturated and were generally omitted from the plotting and analysis; similarly the later channels, ie 26-32 were often in the background noise level and were also omitted. For the individual decay analysis and inversions each decay curve was examined and only the appropriate part used for analysis. In most cases this consisted of about 20 channels, ie ch 8 to ch 27, or 0.575 msecs to 23.825 msecs.

A 3-layer seed model was used to start the inversions. If the first iteration did not produce a model with a standard error close to 10.00, the process was re-started with a new seed which was closer to the geo-electric section. Copies of all sections and decay curves used for this interpretation are included with this report.

3. INTERPRETATION

In all cases the field data are presented with logarithmic and linear amplitude scales. The former is a useful way of displaying the data with a single scale, but the latter provides a means of quickly assessing the anomalous part of a profile, ie early, middle or late channels. Individual decay curves were examined for particular characteristics. A power law decay with an index of -3.5 is typical of a conductive horizontal layer ie the Cenozoic/Mesozoic cover; an index of -2,5 is more typical of a half space, ie reasonably homogeneous bedrock. A negative exponential decay at late times quite often represents a much more conductive body, ie graphitic or sulphidic. These are not exact interpretation rules, but good indicators of the likely geological section. The earth is rarely homogeneous vertically or horizontally. The negative exponential decay from a confined conductive mass becomes a series of exponentials as the body becomes more sheet-like, ie when it increases in depth or strike extent. The result is no longer a straight line in the log/linear format of the decay curve, but a curve.

Each inversion result is accompanied by an extensive statistical reports. These statistical reports were examined carefully so as to reduce the number of poor inversions that were accepted. The final geo-electric sections take into account these reports and wildly unbounded parameters, either depth or resistivity are downgraded. When viewing these sections which result from an inversion it should be noted that the vertical exaggeration is excessive, often as high as 10, which makes the dip appear unrealistically steep.

3.1 Line 51900N

Data points were extracted at 500m intervals (Figs 1.1.1 and 1.1.2) to see if the bedrock conductors could be identified from what would have been a quicker and cheaper field survey; but this was not the case. The full data set is presented in figures 1.2.1 to 1.2.8 with logarithmic amplitude scales, and figures 1.3.1 to 1.3.8 with linear amplitude scales.

A late time anomaly occurs between 10700E and 11600E. The asymmetry suggests a reasonably sharp introduction to the conductor on the western side, and an extensive but reducing continuation to the east. There are two possible interpretations (at least 2). Firstly, that the late time increase in amplitude is caused by an increase in the conductivity of the bedrock. This would be a pyritic shale, dipping at about 10^0 to the east. Secondly it could be caused by an increase in either the conductivity or thickness of the cover sequence.

The decay curves at 11,000E (Figures 1.4.4.1 and 1.4.4.2) and 11,300E (Figures 1.4.5.1 to 1.4.5.3) were analysed. In both cases the purpose was to see if a response from the cover sequence could be identified in the early time channels and extracted from the full field curve. The residual was then examined for a conductive response at the later time channels which could indicate the presence of graphite or pyrite. At 11,000E a power law decay with an index of -3.56 was the best fit for the early time data, and a negative exponential with a time constant of -1.92 was fitted to the late time component of the residual. The curve fitting is not good, but it does imply that the geological section is not simply a conductive cover sequence and a barren bedrock. A similar result was obtained from the decay curve at 11,300E.

At 21500E, which is well away from the 10700E to 11600E anomaly, the late time channels are relatively high; but an analysis of the decay curve (Figures 1.4.6.1 and 1.4.6.2) shows that a cover sequence and barren bedrock is the most probable geological section.

The TEM data between 9400E and 12600E was inverted for a 3-layer earth model using the GRENDL software. The three layers represent the drier part of the cover sequence, the water saturated cover sequence, and bedrock. The results of the inversion are shown in figures 1.5.1 and 1.5.2. Between 10,600E and 11,400E there is clearly a change in the character of the geological section. The depth of weathering is less which may be caused by the presence of a shale as opposed to a sandstone (which is more porous) to the east and west.

The resistivity of the second layer drops to 1Ωm and less which could be caused by a graphite/pyrite component. The second interface and the bedrock resistivity are not well defined by the inversion process; the bedrock resistivity is unbounded which means it ranges over a number of decades from very low to very high.

Data selected at approximately 500m intervals from between 18500E and 21500E was inverted using a 3-layer model and the geological conditions appeared reasonably uniform (figure 1.5.3).

3.2 Line 52100N

The EM data for this line are shown in figures 2.1.1 and 2.1.2. Decay curves were analysed from 14,000E and 14,400E but the results strongly suggested only a cover sequence and a barren bedrock.

3.3 Line 53900N

The EM data with logarithmic scaling are shown in figures 3.1.1 to 3.1.4, and with linear scaling in figures 3.2.1 to 3.2.4. An anomalous section lies between 10800E and 12000E where the late time channels increase in amplitude. An analysis of the decay curve at 11500E (figures 3.3.1.1 and 3.3.1.2) indicates a horizontal conductive layer, the cover sequence, with a power index of -3.12, and possibly a negative exponential at the later times, with a time constant of -3.08. This could be a graphitic horizon. The data at this location was inverted to determine the relationship between the decay curve analysis and a GRENDL inversion. The inversion result is shown in figure 3.3.1.3. The central layer, with a resistivity of 3Ωm could be a graphitic shale, but resistivities in this range could also be attributed to saline ground water. It cannot be conclusively established that the conductive unit is graphitic, but the odds are in favour of it being so.

The profile inversion between 9400E and 12500E is shown in figure 3.4. It clearly illustrates the possibility that the increased secondary voltages at the later times between 10900E and 11700E could be caused by an increased thickness of the conductive cover sequence. There is not a unique interpretation.

Decay curves from 14000E, 17500E, 18000E, 18400E, 21000E and 21500E were analysed. These positions were selected because of a rise in amplitude in the later time channels. The analyses are presented in figures 3.3.2.1 to 3.3.7.1. The results from 14000E suggests the presence of a geological sequence consisting of more than a cover sequence and a barren bedrock. The section between 12500E and 15600E was inverted using a 3-layer model as a seed. The result of the inversion is shown in figure 3.5. In two places, the second layer, which could be a water saturated part of the cover sequence, or weathered bedrock (or a combination of both) has a resistivity of 3Ωm in a slightly higher background of 10-14Ωm. These two horizons, between 13500E to 13900E, and 14600E to 15100E, could be graphitic shales. The vertical exaggeration of the electrical sections resulting from the inversions is close to 20 and the visual representation of dip is misleading: the actual dip is between 10^0 and 15^0.

The decay analysis further east did not highlight the possibility of bedrock conductors and no further inversions were undertaken.

3.4 Line 54100N

The EM data for this line is presented in figures 4.1 and 4.2. There are no anomalous features that relate to variations in bedrock conductivity.

3.5 Line 55900N

The EM data with logarithmic scaling is shown in figures 5.1.1 to 5.1.4, and with linear scaling in figures 5.2.1 to 5.2.4. The first anomalous feature is between 14300E and 15000E. The decay curve at 14,700E (figures 5.3.1.1 and 5.3.1.2) indicate the presence of a conductive unit in bedrock.

The section between 12500E and 15600E was inverted using a 3-layer model. The result is shown in figure 5.4. Graphitic shales may be represented by the two shallower sections with a resistivity of 1.0Ωm at 13000E to 13400E and 14100E to 14700E. The dip is eastwards at a shallower angle.

The decay curves at 19100E and 20400E were also analysed and both gave results suggesting the presence of a bedrock conductor (Figures 5.3.2 and 5.3.3). The section from 18700E to 21800E was inverted using a 3-layer model: the result of the inversion is presented in figure 5.5. The two anomalous sections which have increased voltages at late times in the field data, relate to ground resistivities of 1Ωm and 2Ωm; they are between the co-ordinates 18800E to 19200E and 20200E to 20600E. The eastern anomaly appears to dip to the east forming a shallow anticline with the western conductor. However, the dips are most inconclusive here, and it is possible to interpret the geo electrical section in the form of a syncline.

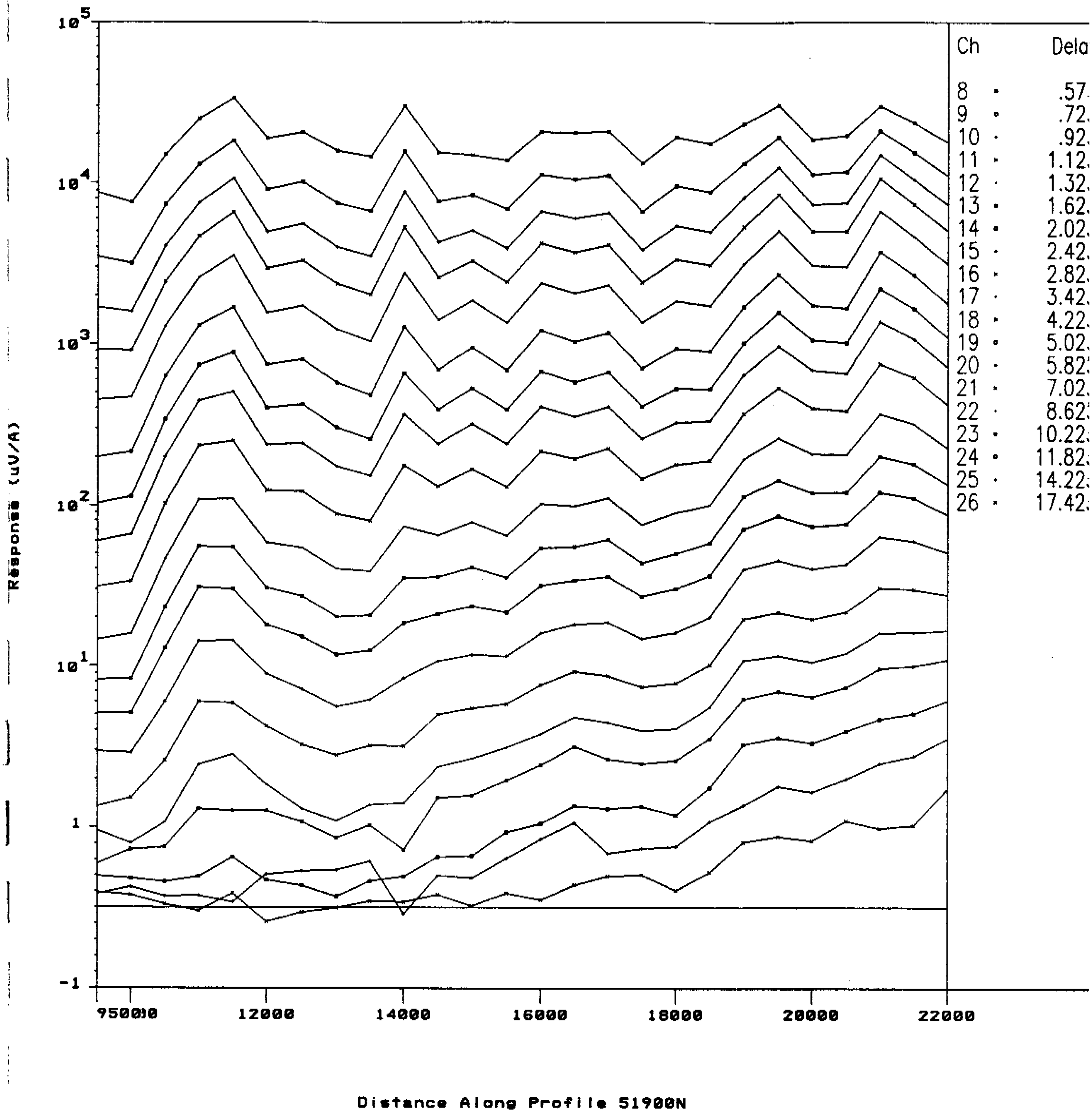
4. CONCLUSION AND RECOMMENDATIONS

The late-time voltage increases are due to an increase in the conductivity of the geo-electric section. These can be identified in the field data and confirmed by analysing individual decay curves and by using a 3-layer earth model to invert the TEM data into a geo-electric section. The resistivity of the cover sequence is generally low which does not produce an ideal working environment for an EM system. But the inversions produce a rock resistivity of about 1.0Ωm where the late time voltage anomalies occur. It seems more likely that this represents a shale horizon enriched with graphite and pyrite in the underlying bedrock, than saline water in the cover sequence. The spatial relationship of these conductors is shown in figure 7; in compiling this plan, the general form of the gravity data (figure 6) has been taken into account. The dips are shallow, which is not always apparent in the sections resulting from the inversions where the vertical exaggeration is very large.

In the next stage of exploration, shallow drilling should be programmed for the sections interpreted to be graphitic shales. Once they are confirmed as such, exploration can proceed with a greater degree of confidence. At the moment there is still the slight possibility that the anomalies are caused by saline ground water.

Hugh Rutter

HUGH RUTTER
CONSULTING GEOPHYSICIST



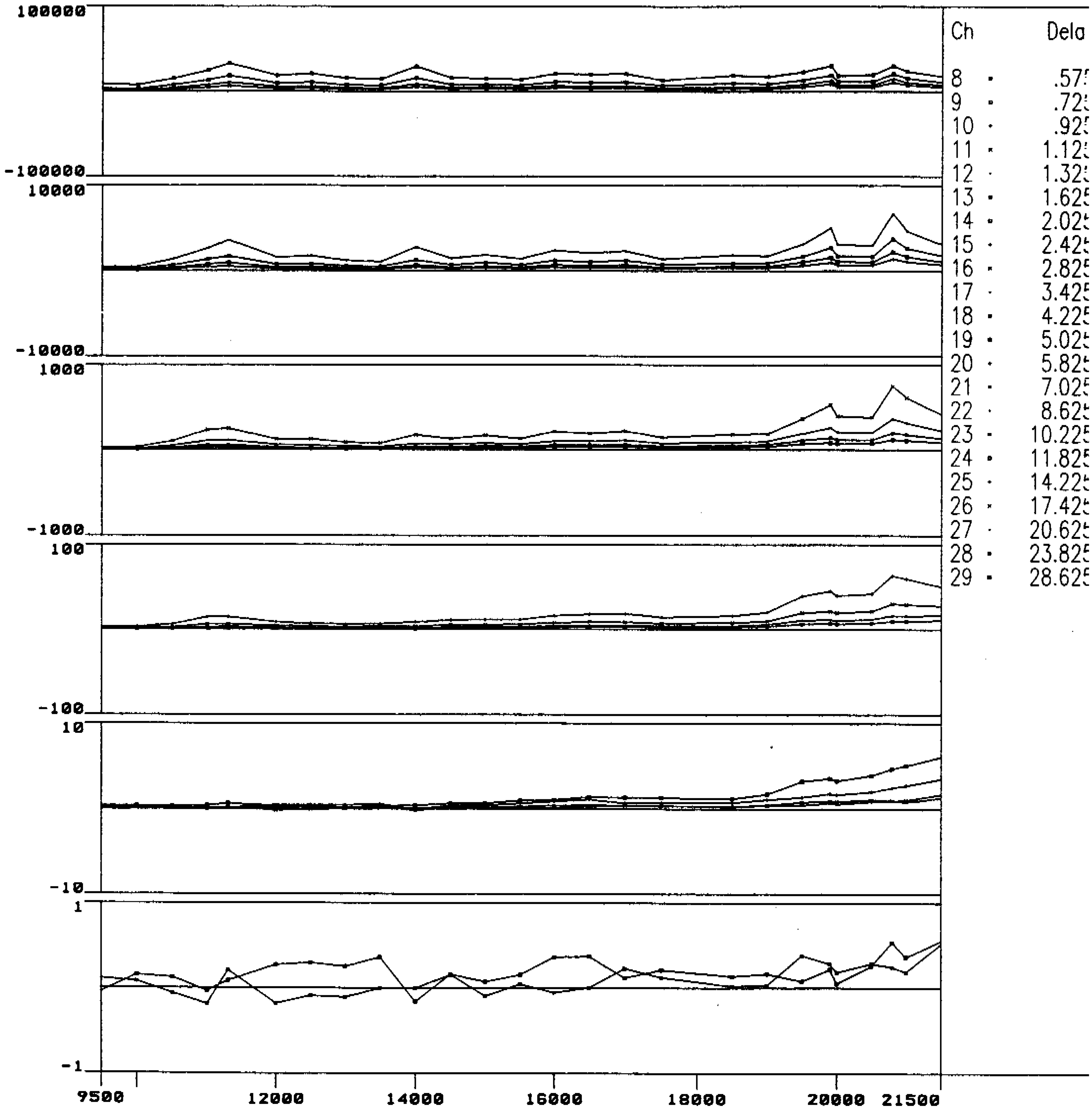
GEOPEKO Rosie Creek : Line 51,900N	Geophysical Exploration Consultants
Configuration : In-Loop, with 200.200 Tx Instrument : Sirotem MK.3 Channels : Composite Data : Field data, 500m intervals Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds Date : 09/09/93 Figure :1-1-1

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only



Distance Along Profile 51900N
(500m stations)

Fig: 1-1-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

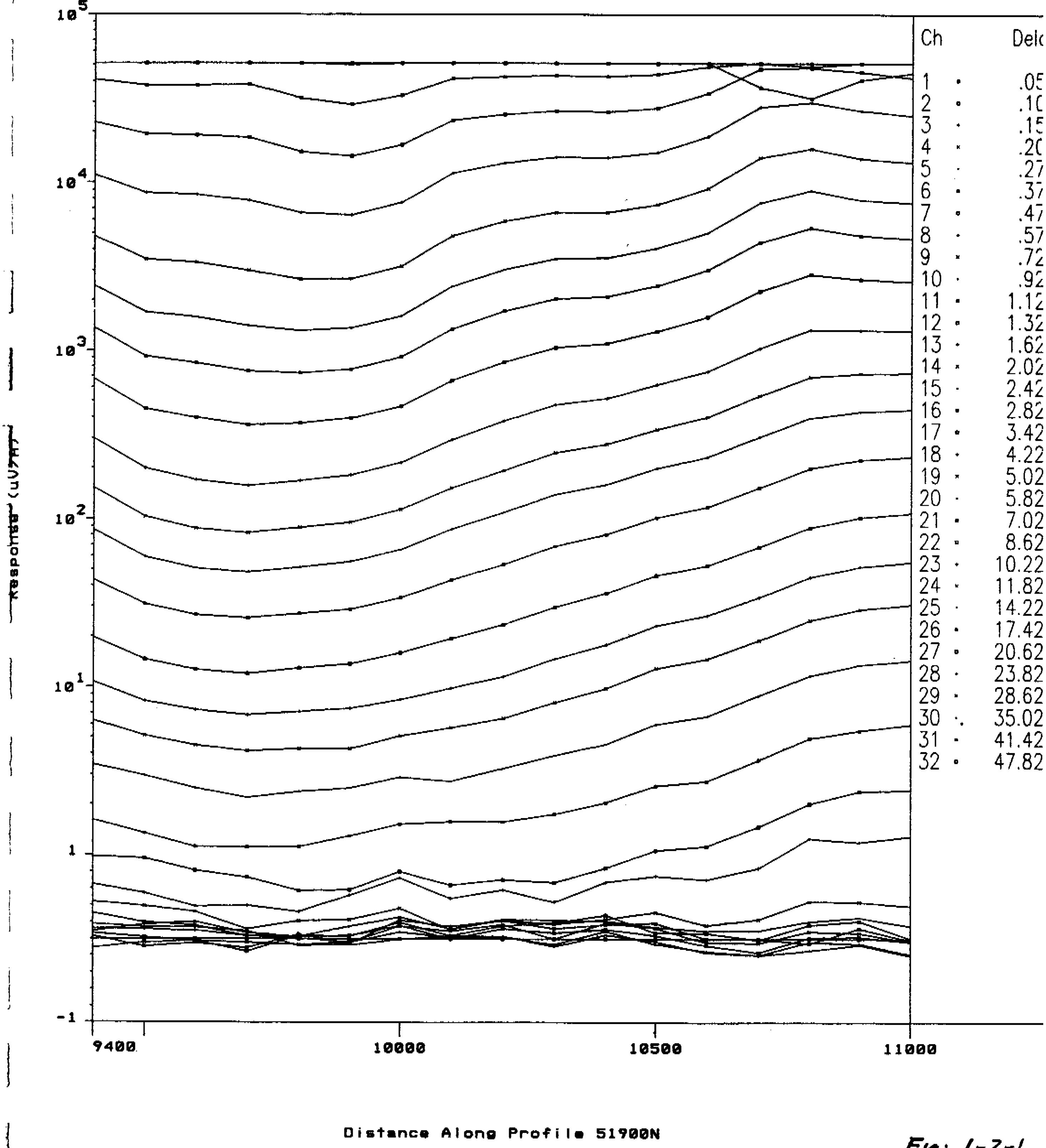


Fig: 1-2-1

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

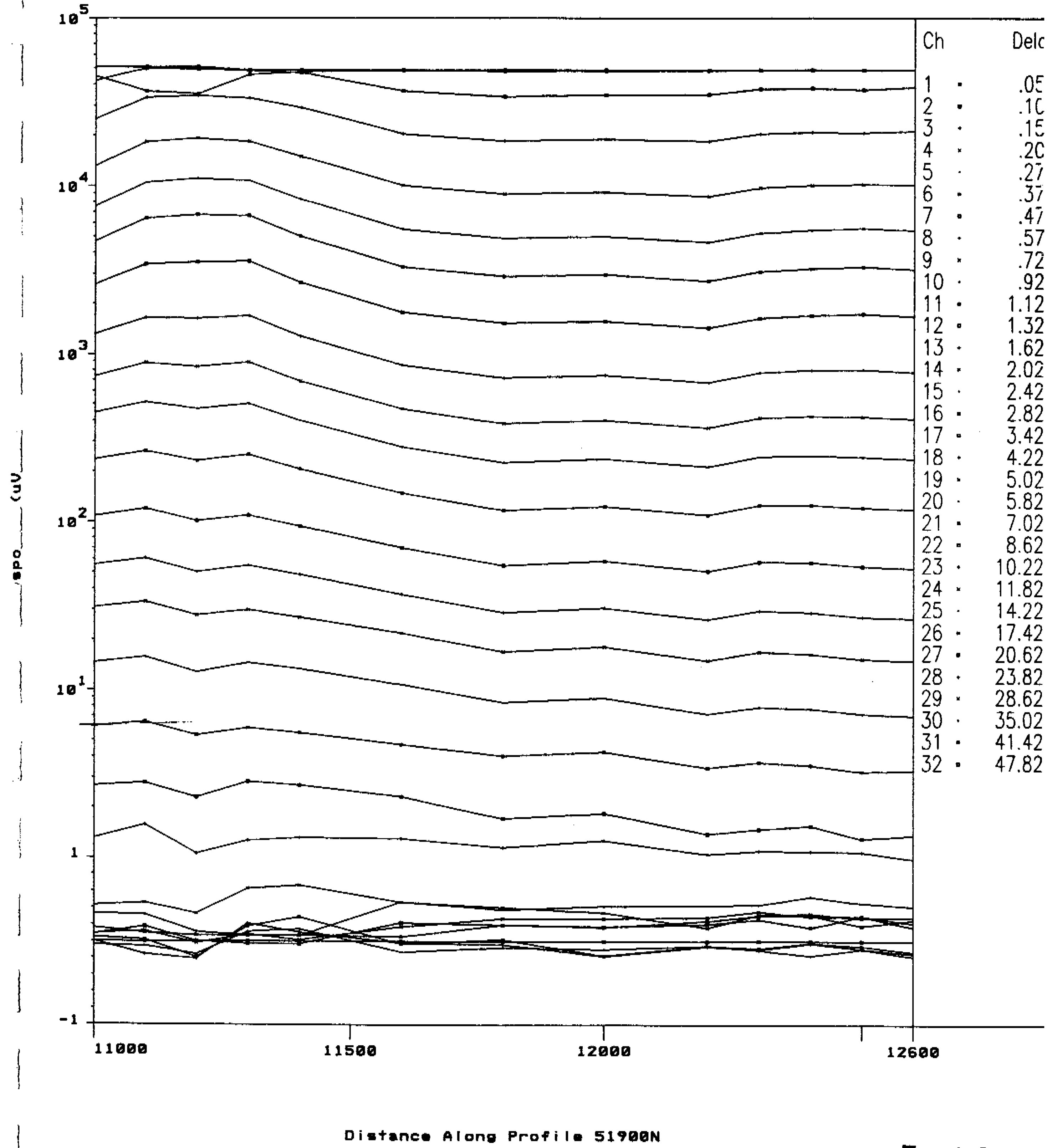


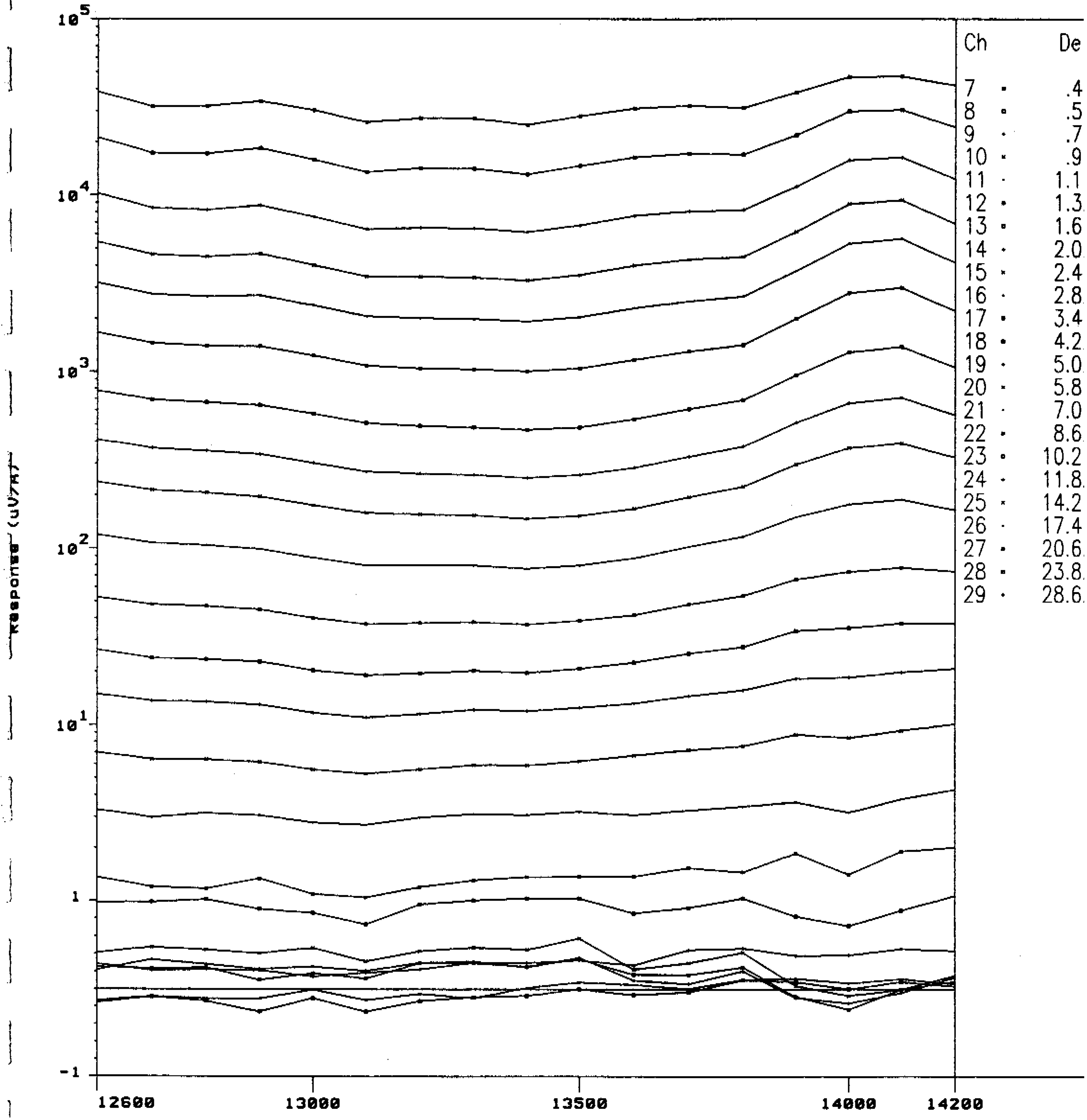
Fig: 1-2-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx. In Loop Dipole Rx. I Component

Field Data Only



Distance Along Profile 51900N

Fig. 1-2-3

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

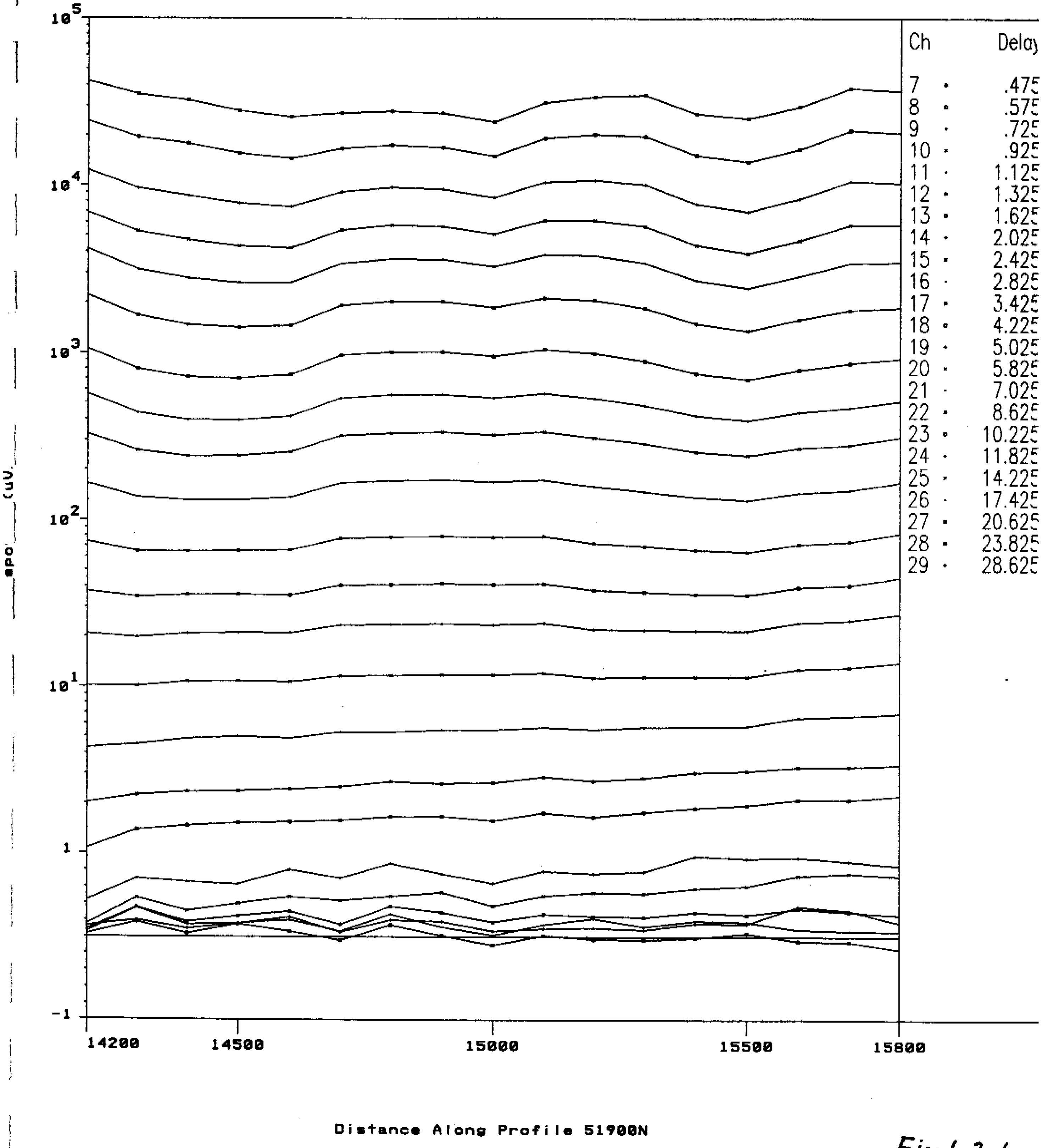


Fig: 1-2-4

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

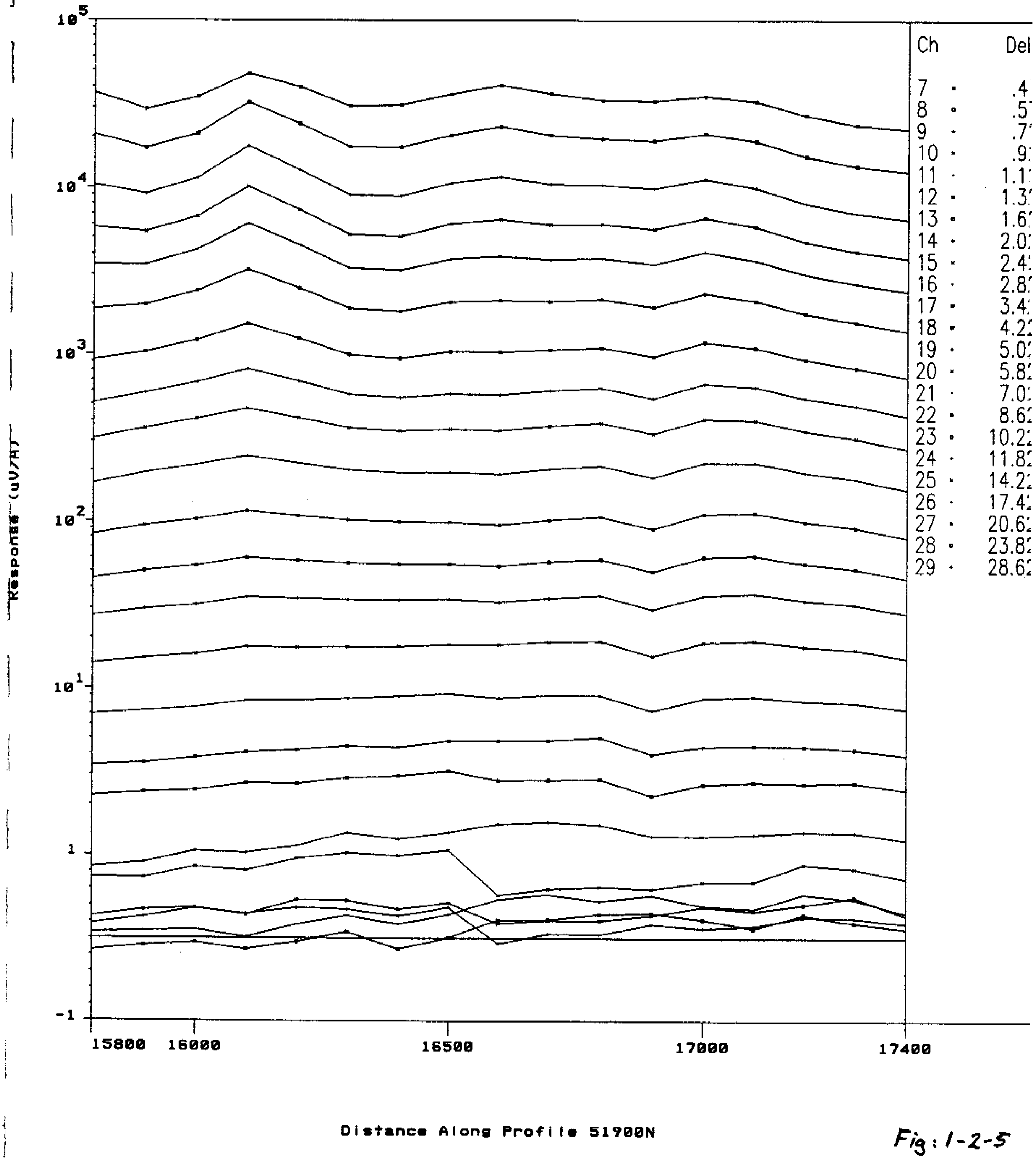


Fig: 1-2-5

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

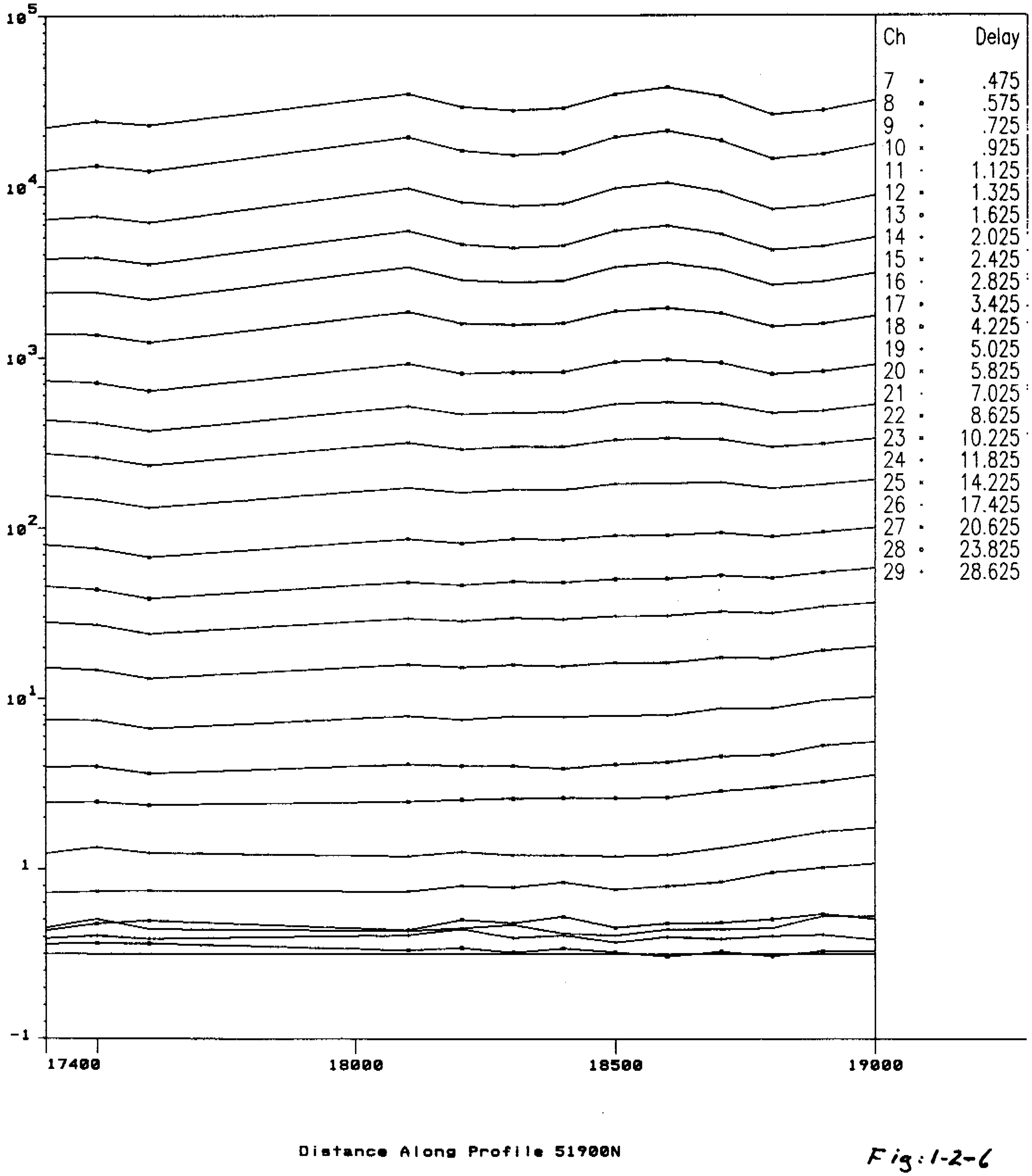


Fig: 1-2-6

Siro-ex : TEM Response Profile

GEOFEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

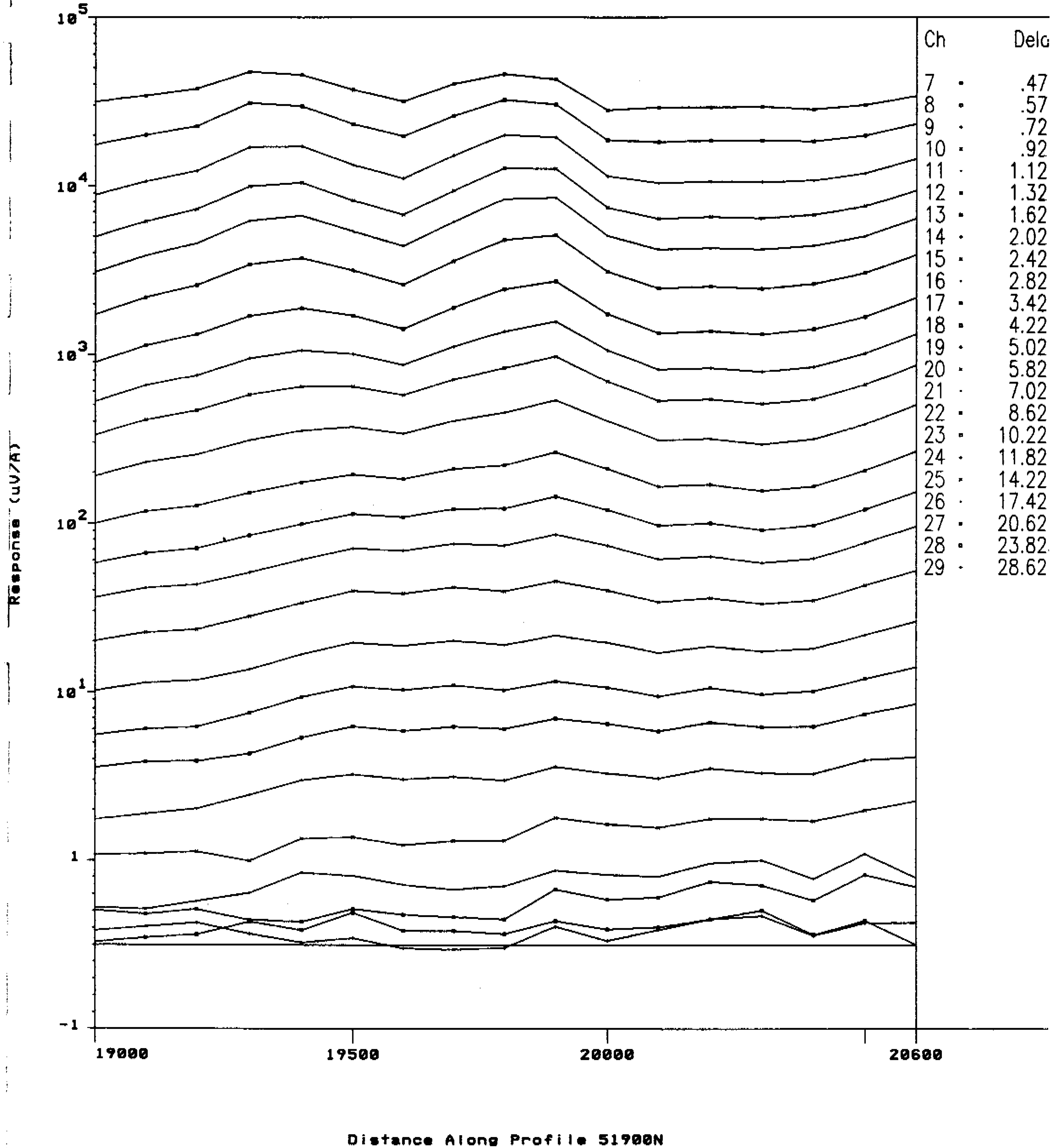


Fig: 1-2-7

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

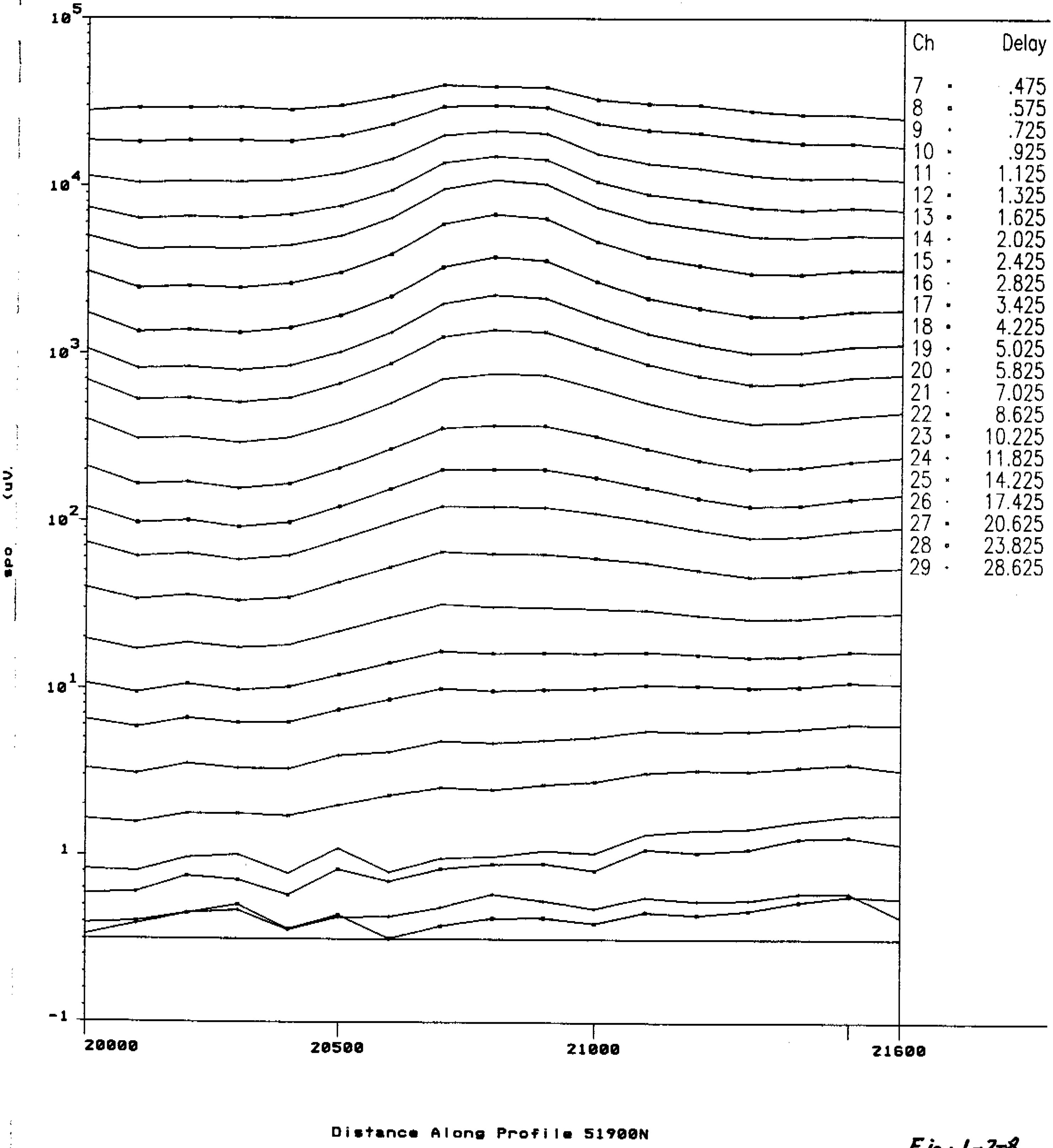


Fig: 1-2-8

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

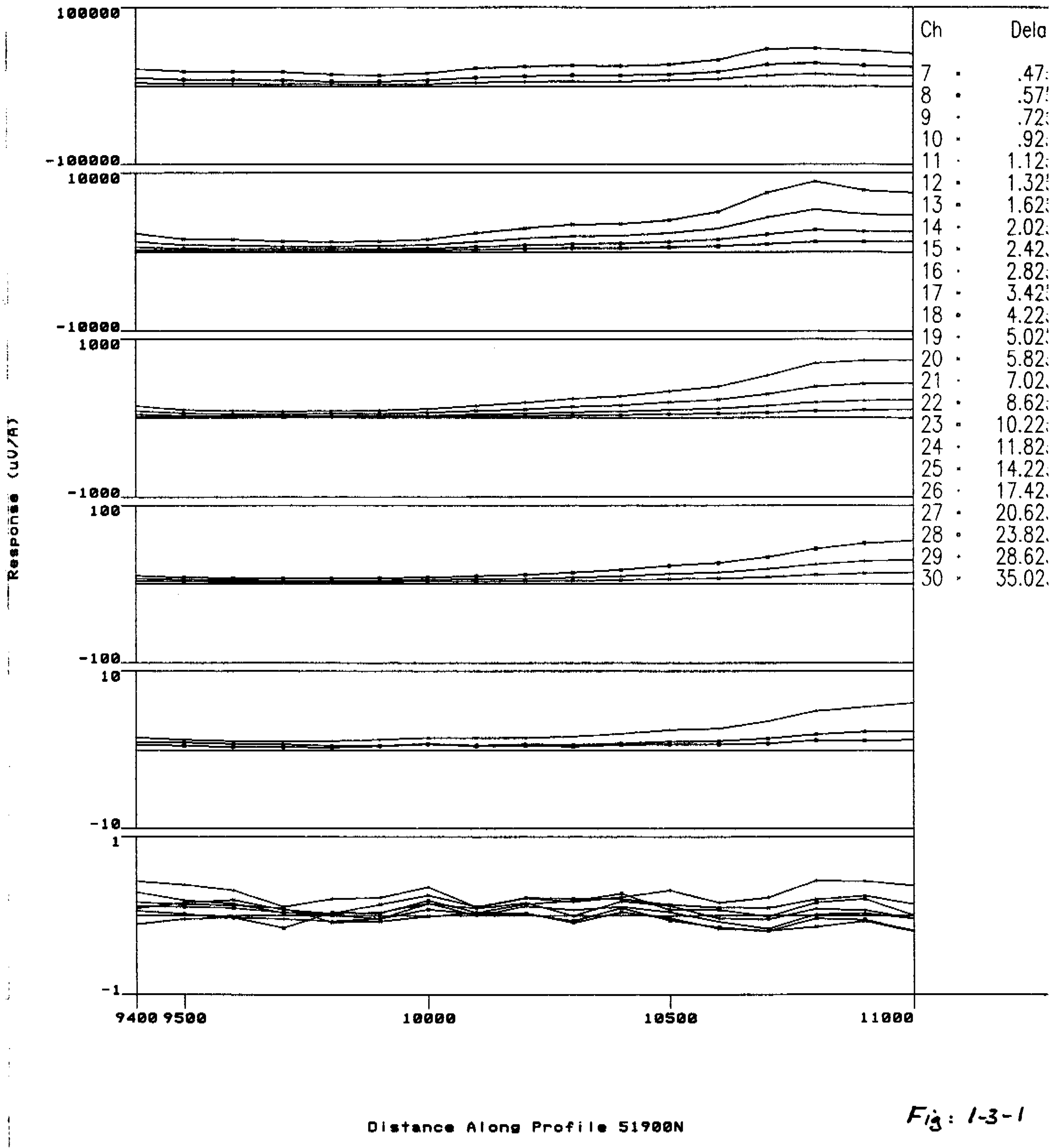


Fig: 1-3-1

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

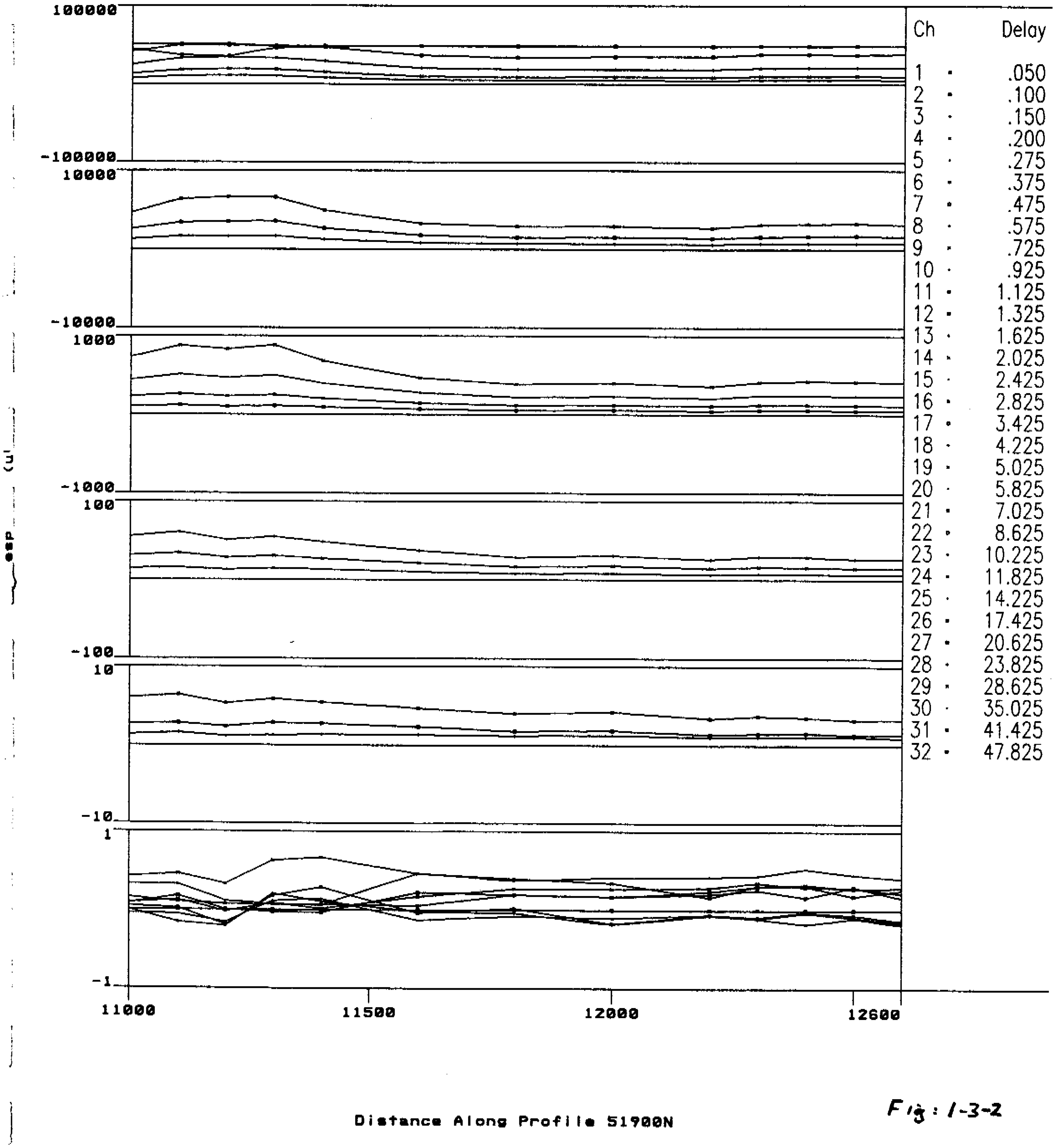


Fig: 1-3-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

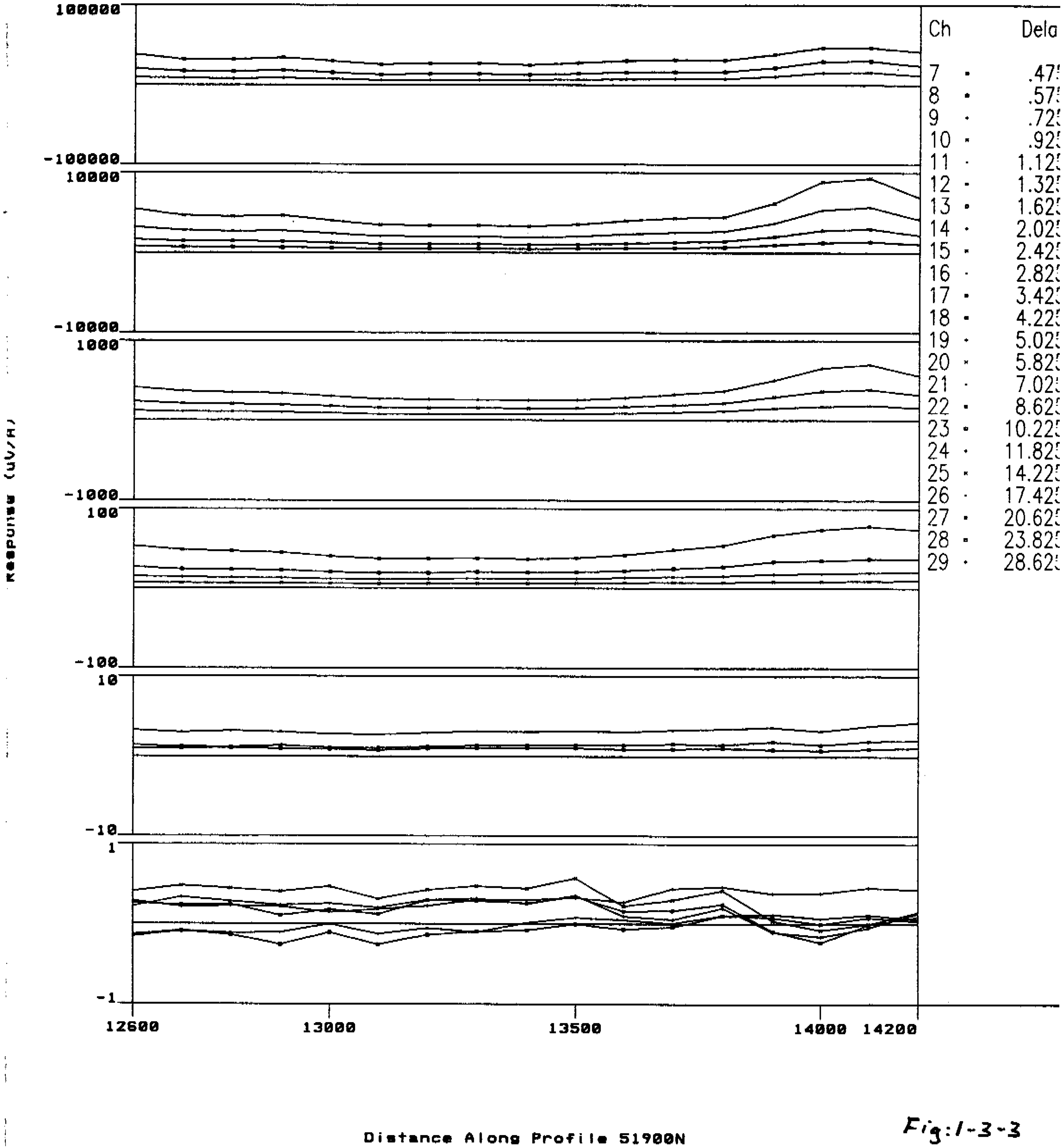


Fig: 1-3-3

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

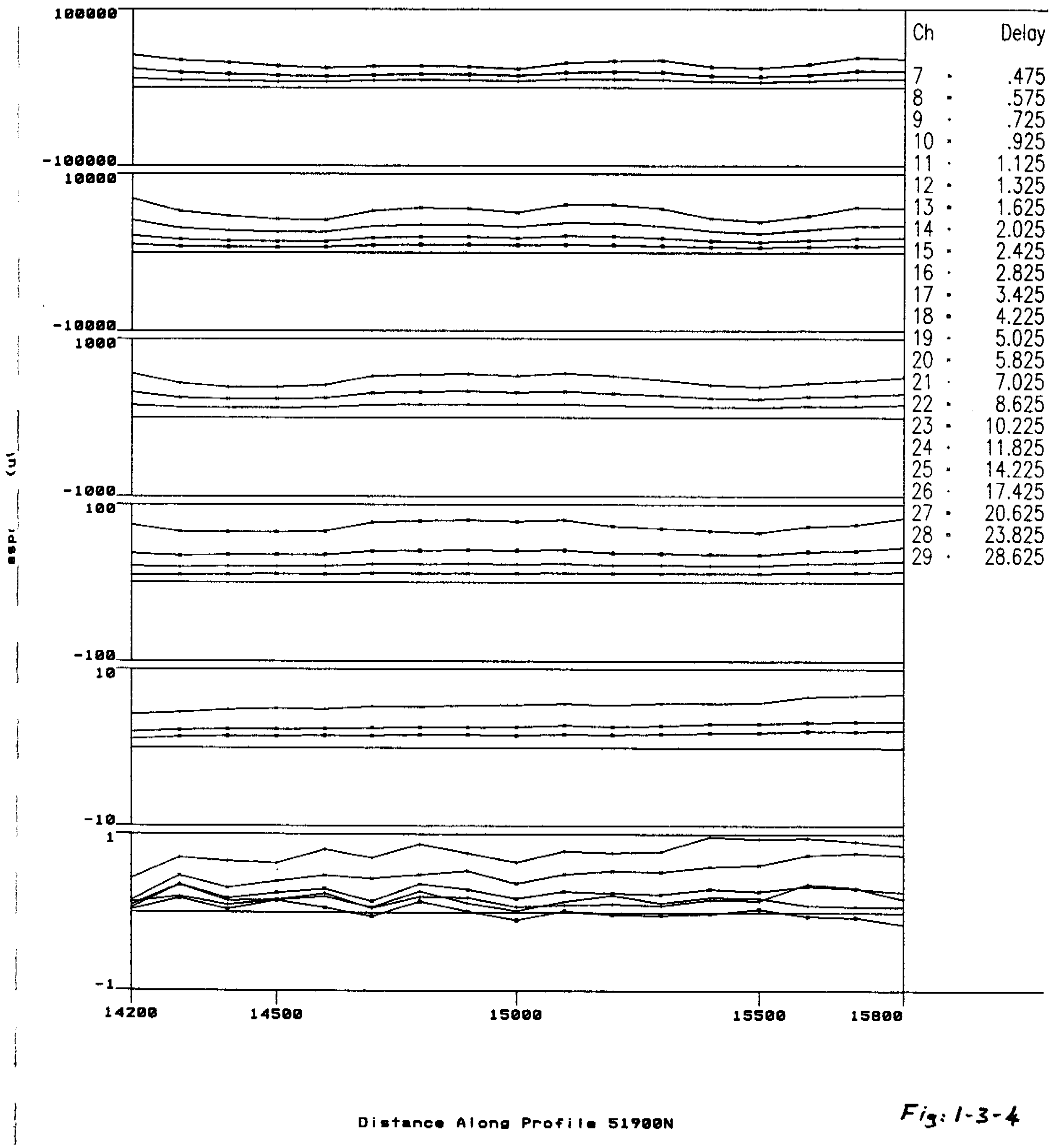


Fig: 1-3-4

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

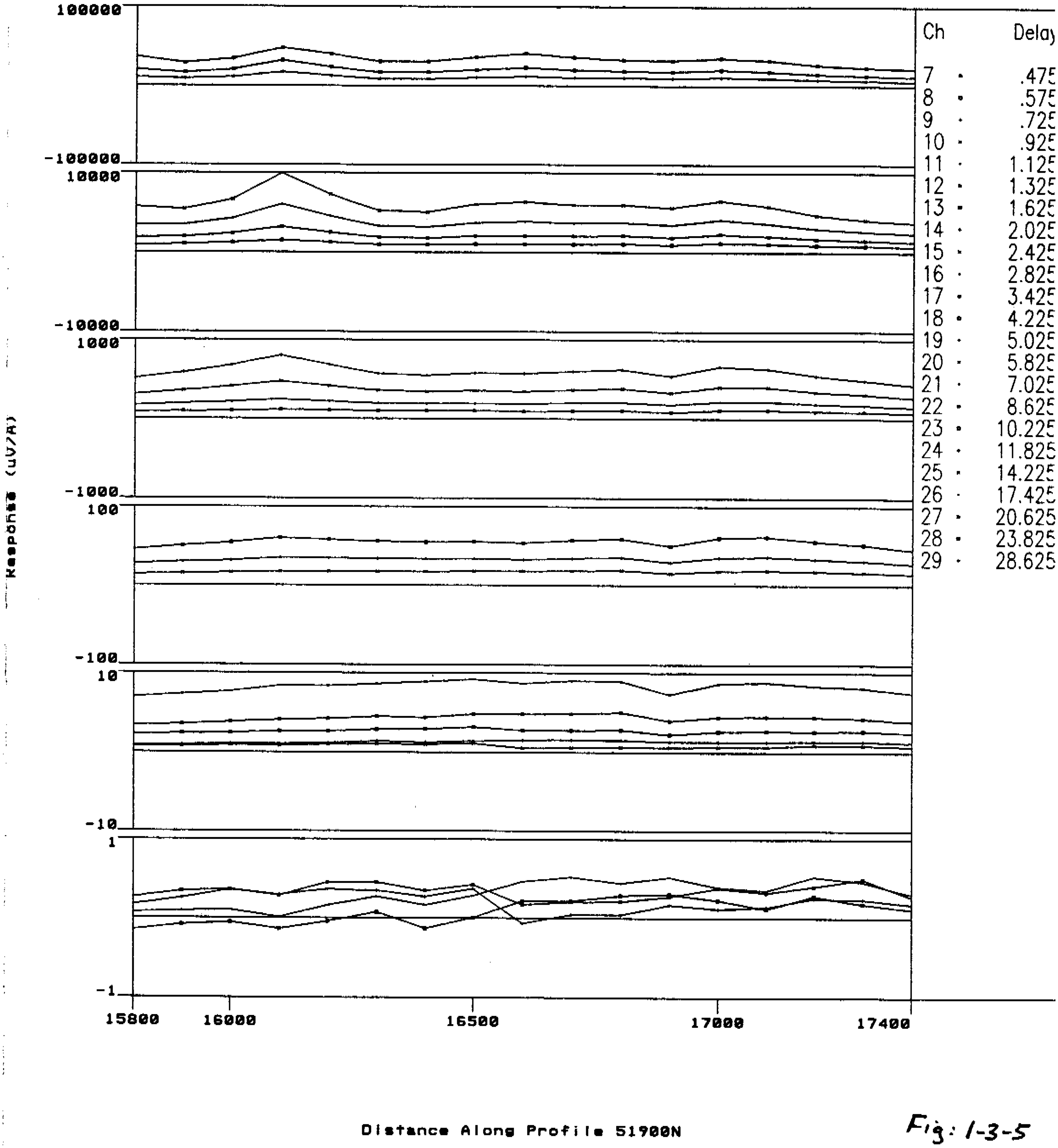


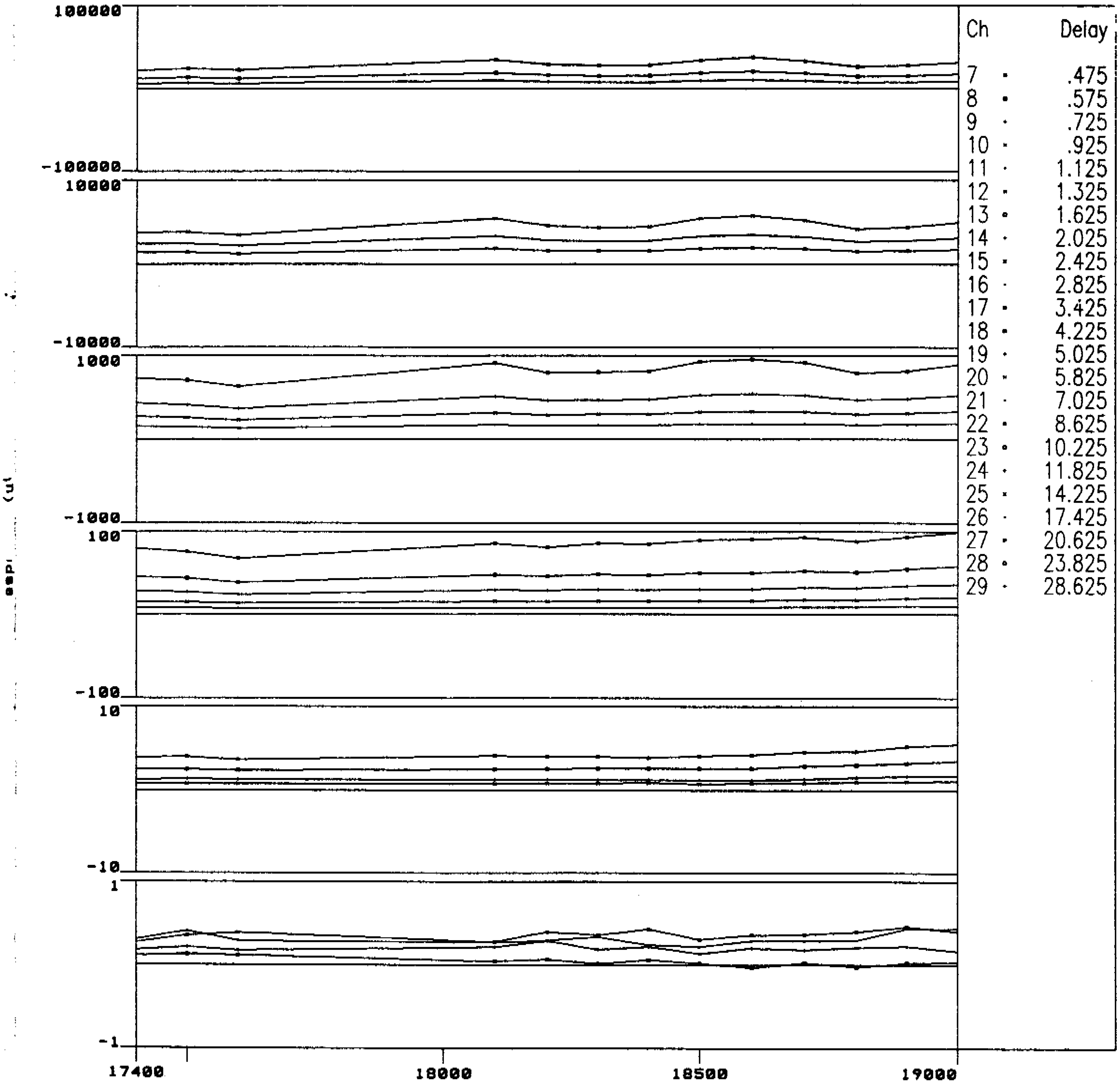
Fig: 1-3-5

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only



Distance Along Profile 51900N

Fig: 1-3-6

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

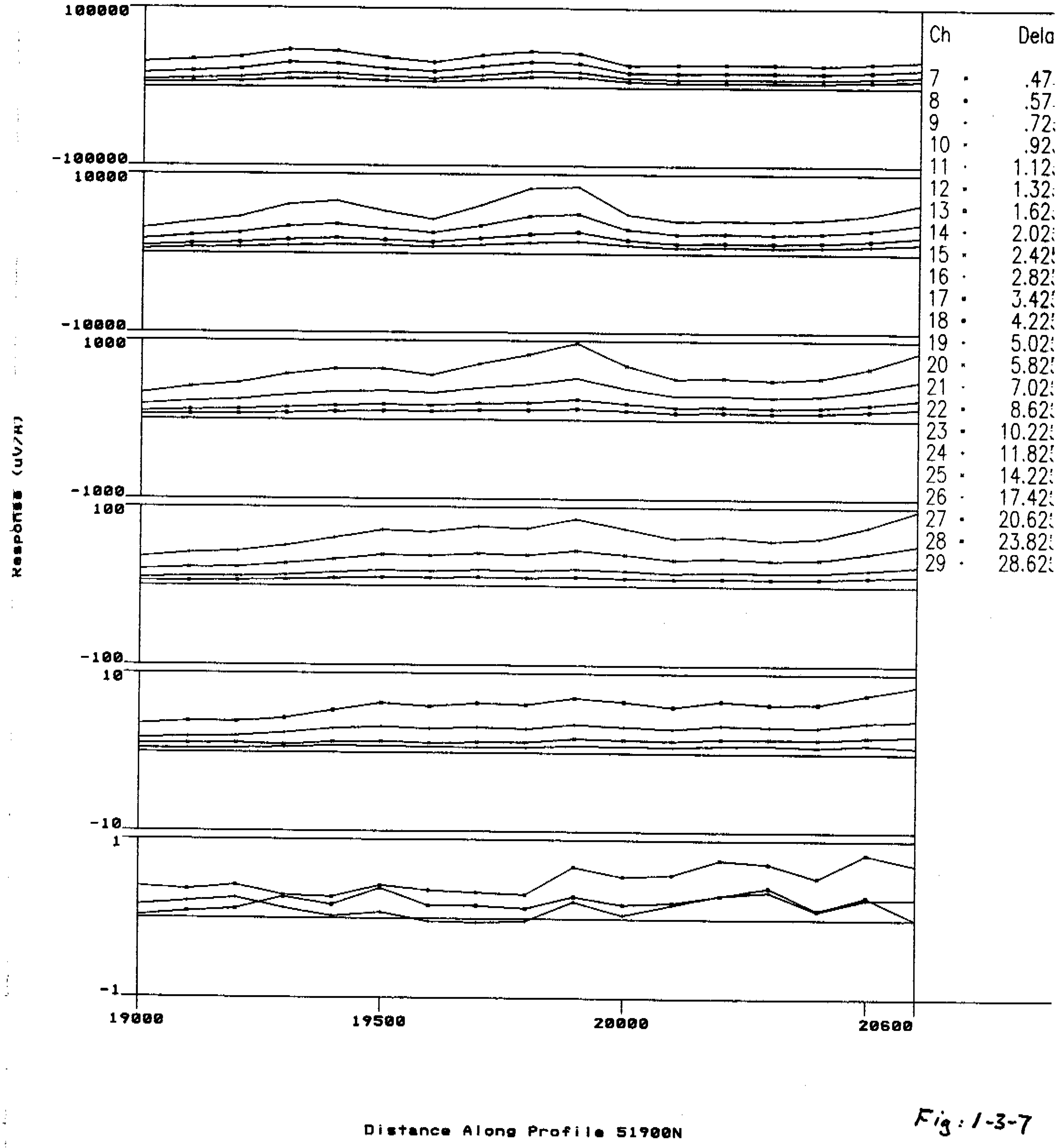


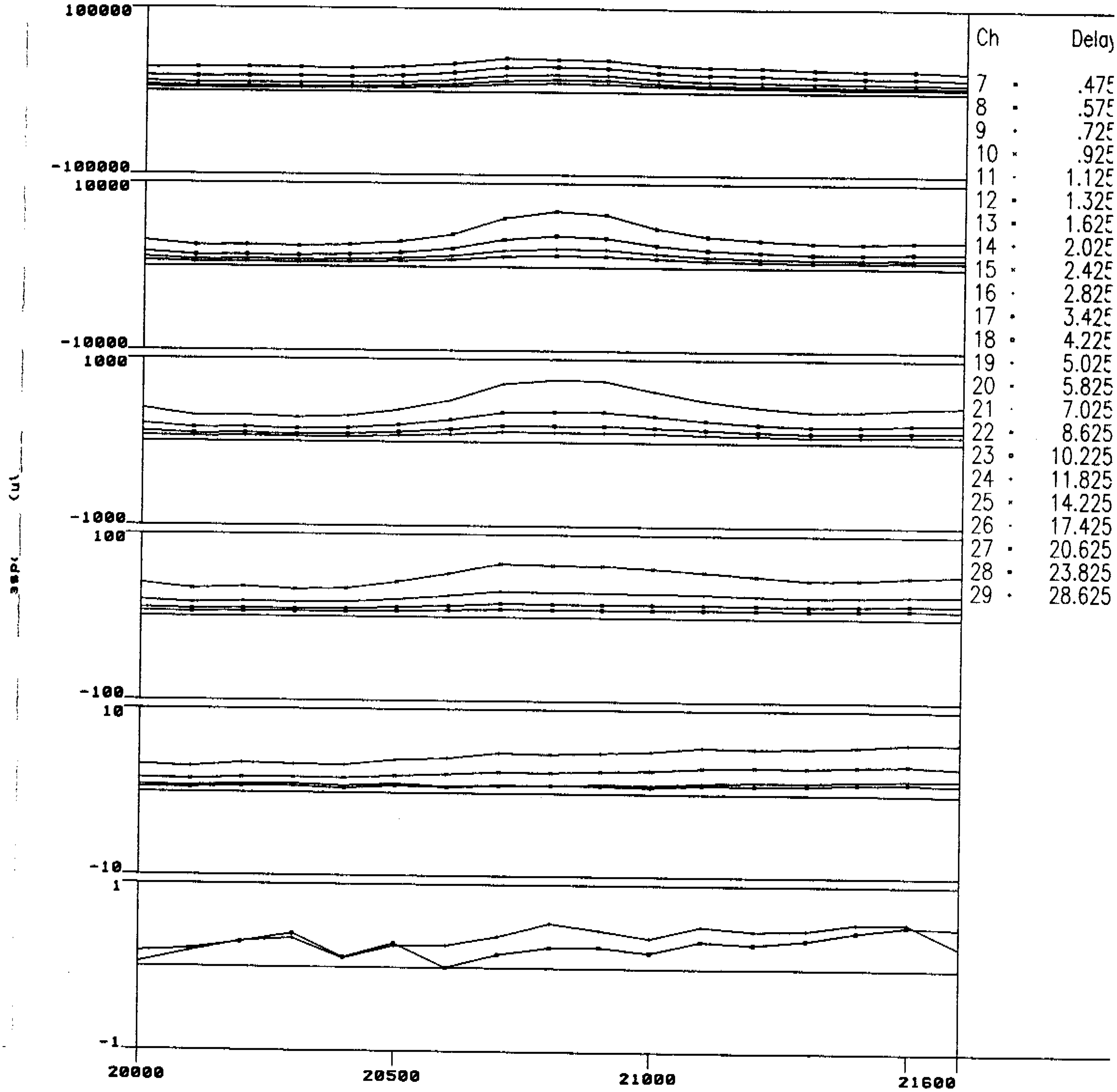
Fig: 1-3-7

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only



Distance Along Profile 51900N

Fig: 1-3-8

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data

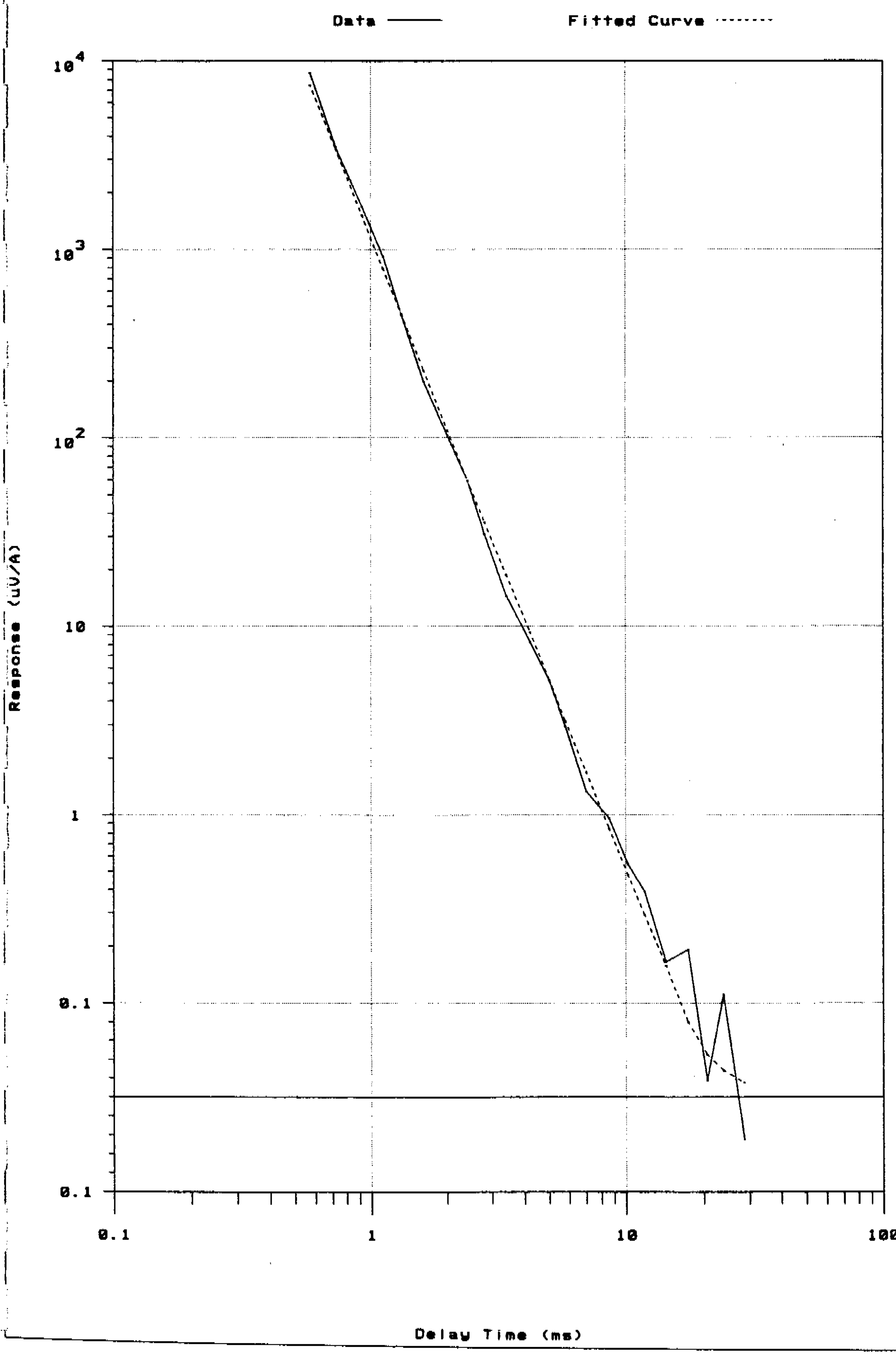


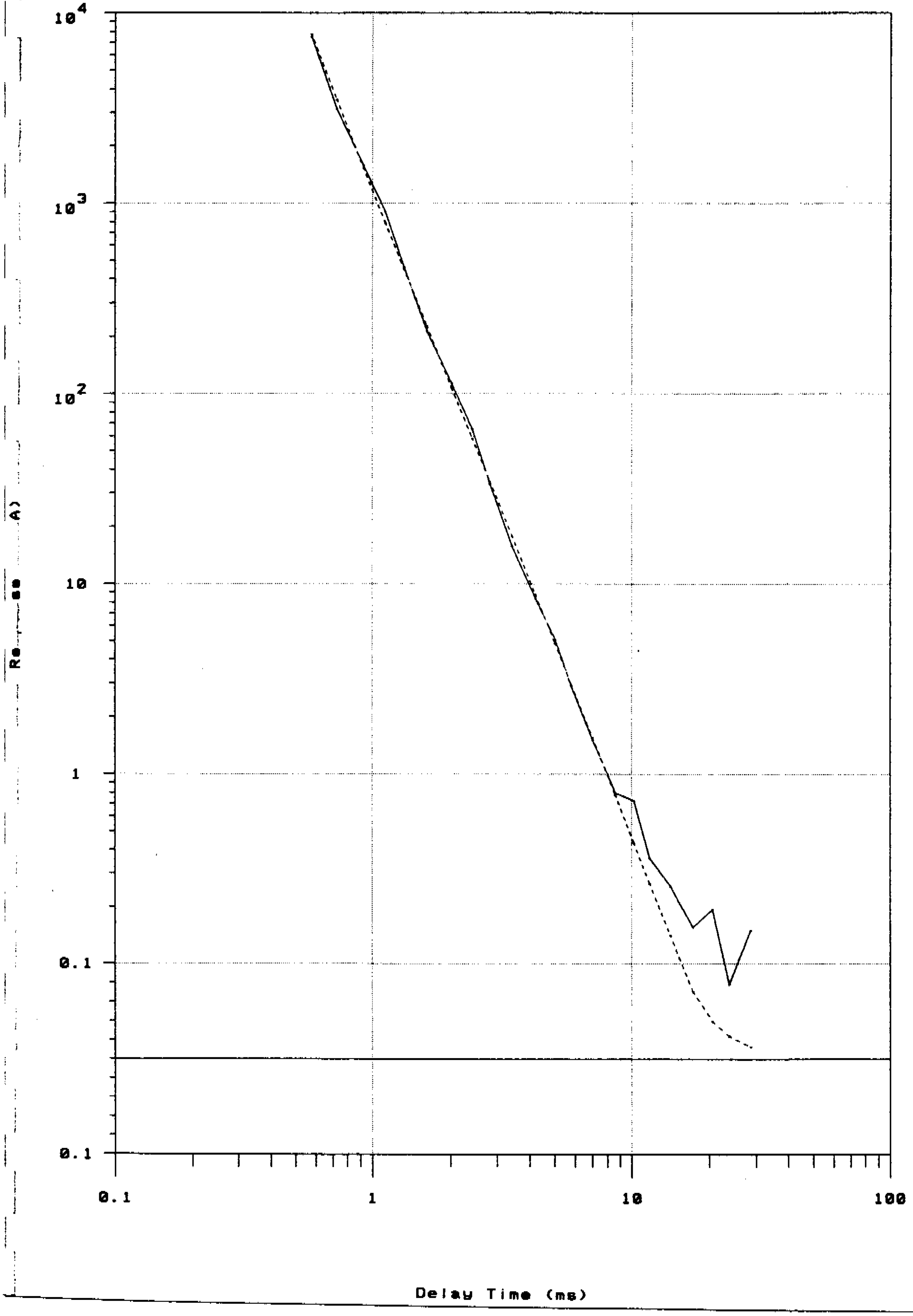
Fig: 1-4-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data

Data ——— Fitted Curve -------



Line: 51900N

Stn : 10000E

Fit Params

d = Kt**a

a = -3.40

K = 1179.27

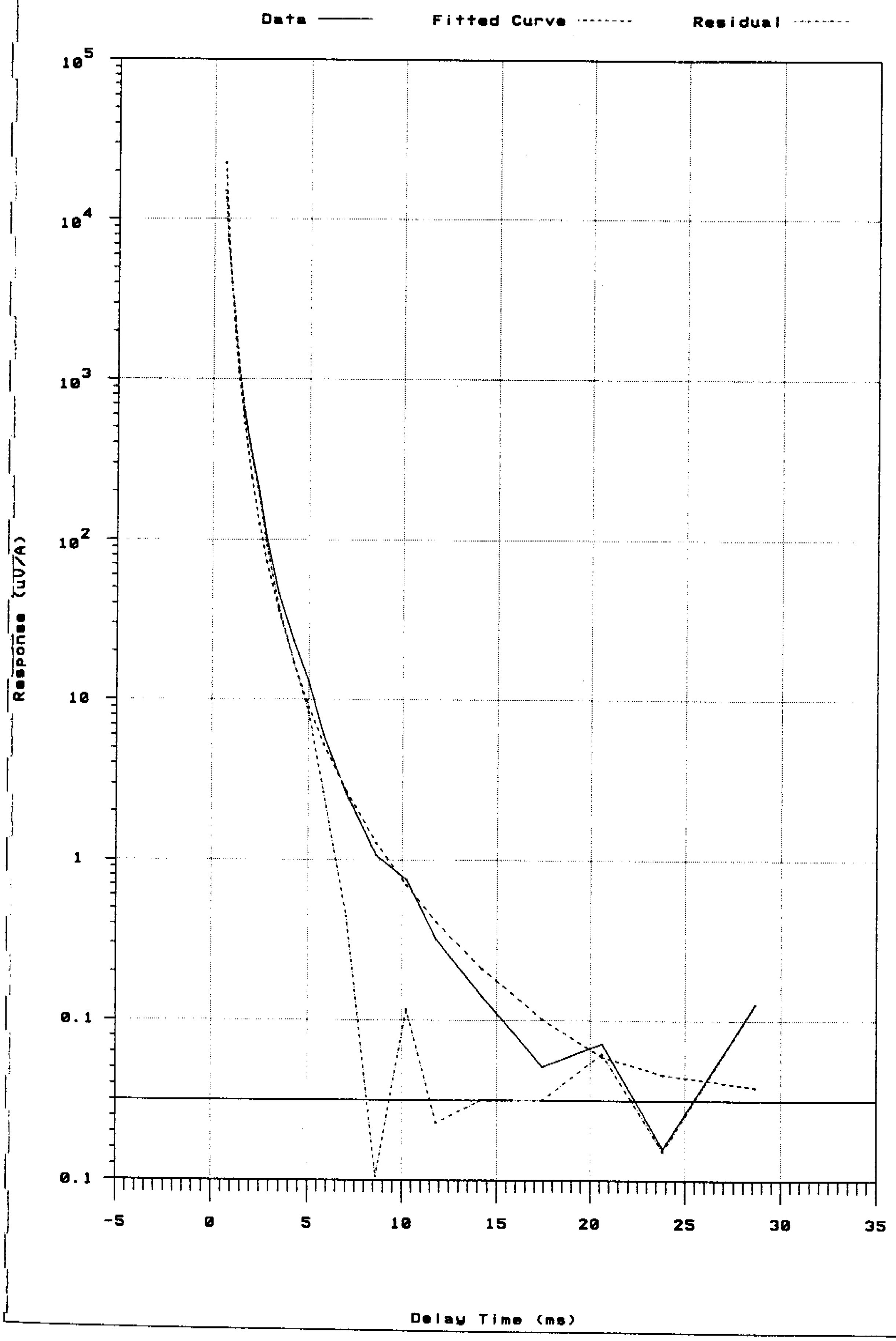
R-Sq = 99.9%

Fig:1-4-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem Mk3 data



Line: 51900N

Stn : 10500E

Fit Params

d = Kt**a

a = -3.61

k = 3057.68

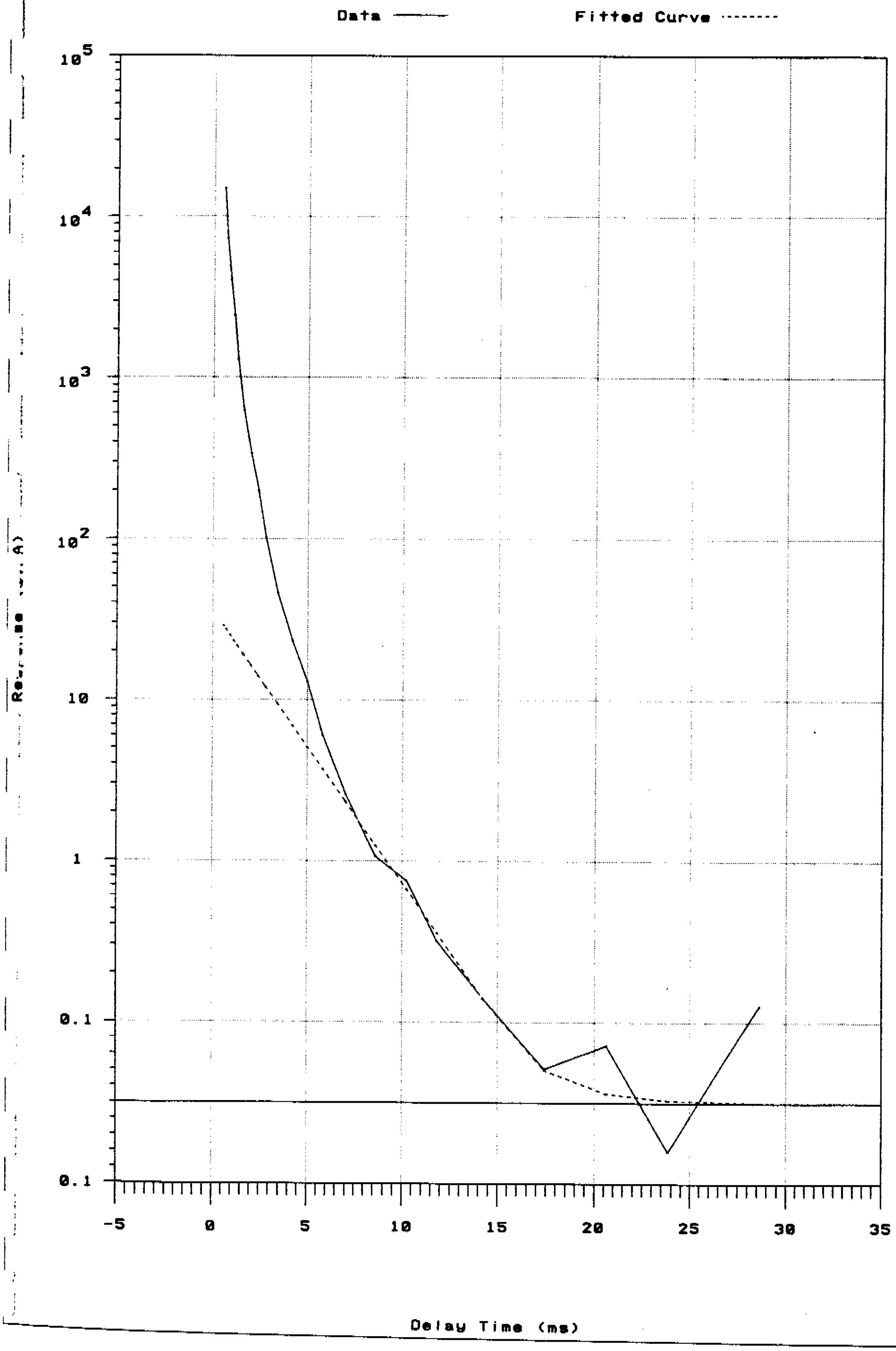
R-Sq = 98.7%

Fig: 1-4-

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 51900N

Stn : 10500E

Fit Params

d = KEXP(-t/τ)

τ = 2.56

K = 36.09

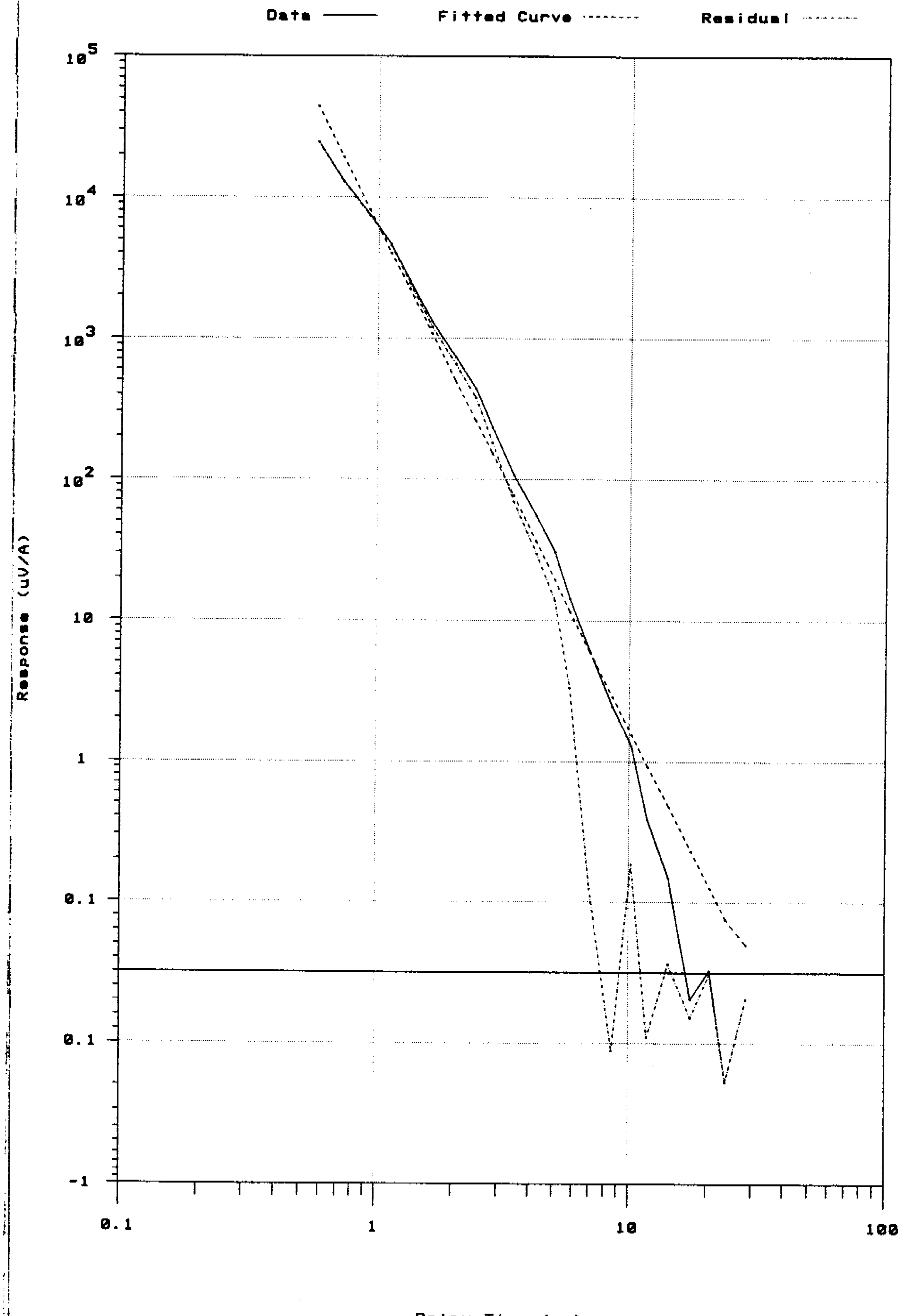
R-Sq = 99.4%

Fig: 1-4-3-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 51900N

Stn : 11000E

Fit Params

d = K†**a

a = -3.56

K = 6158.11

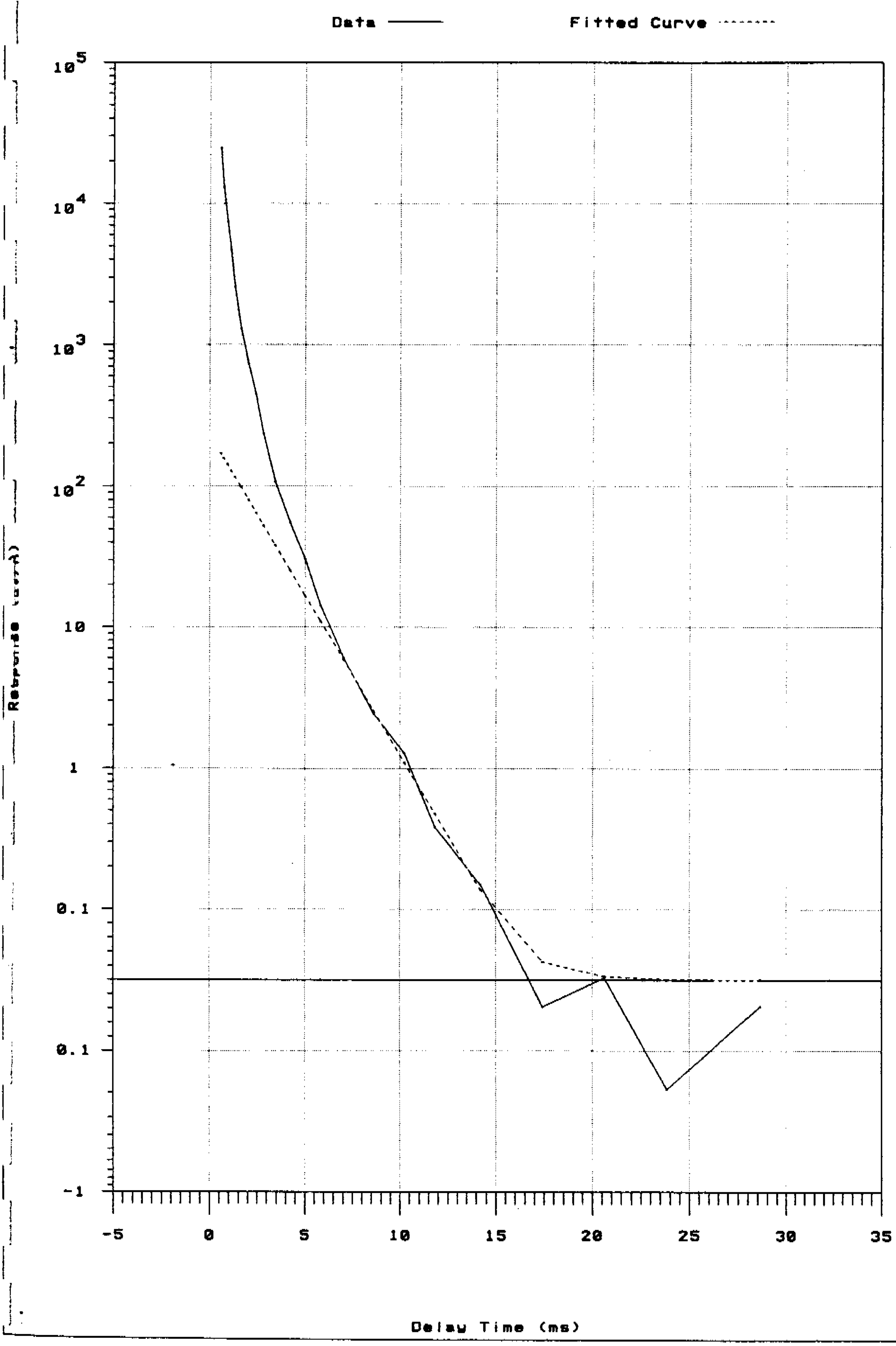
R-Sq = 98.8%

Fig: 1-4-4-

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 51900N

Stn : 11000E

Fit Params

$d = K\text{EXP}(-t/\tau)$

$\tau = 1.92$

$K = 229.72$

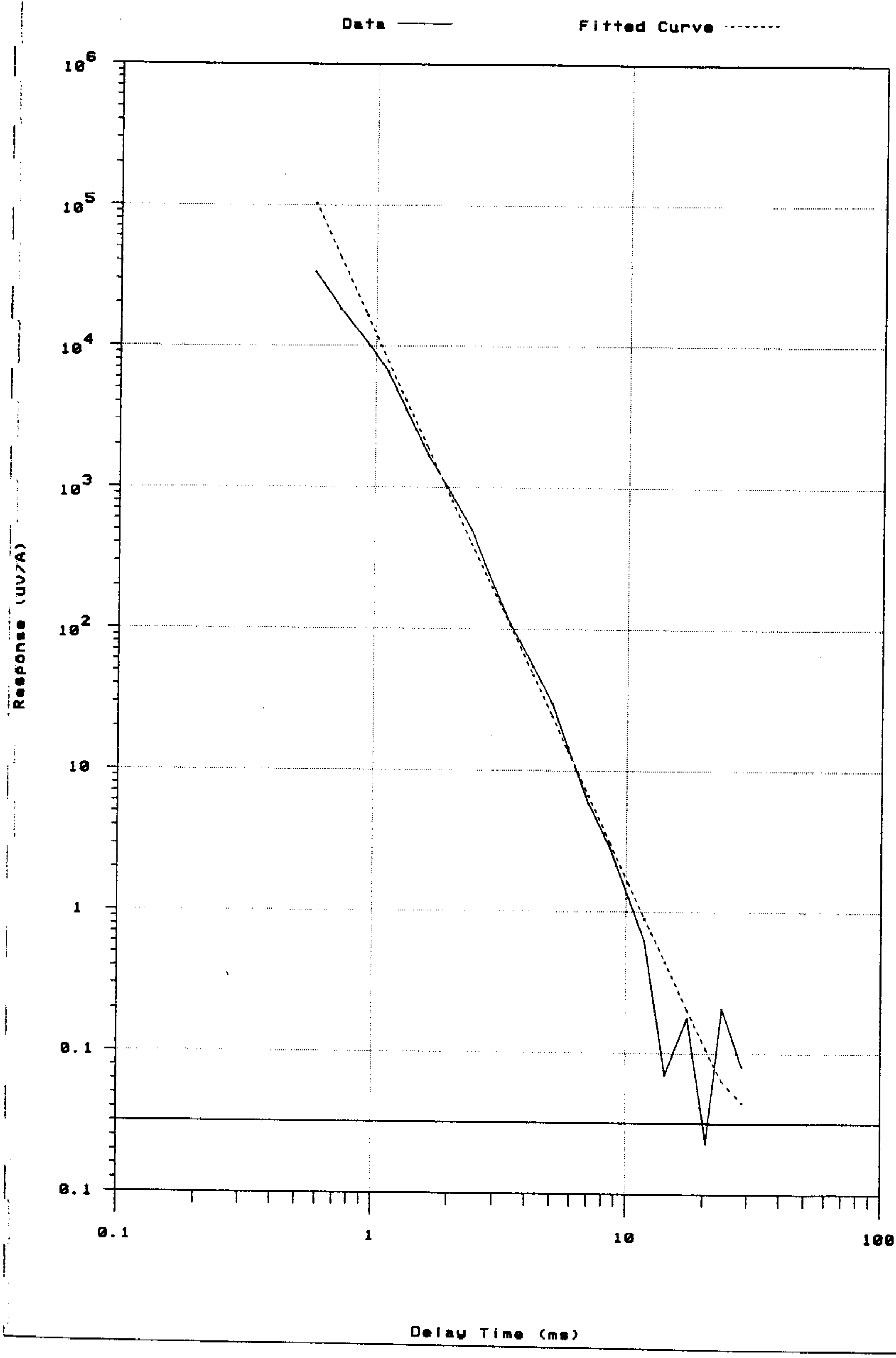
R-Sq = 99.1%

Fig: 1-4-4-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 51900N

Stn : 11300E

Fit Params

d = Kt**a

a = -3.85

K = 12216.30

R-Sq = 99.7%

Fig: 1-4-5-1

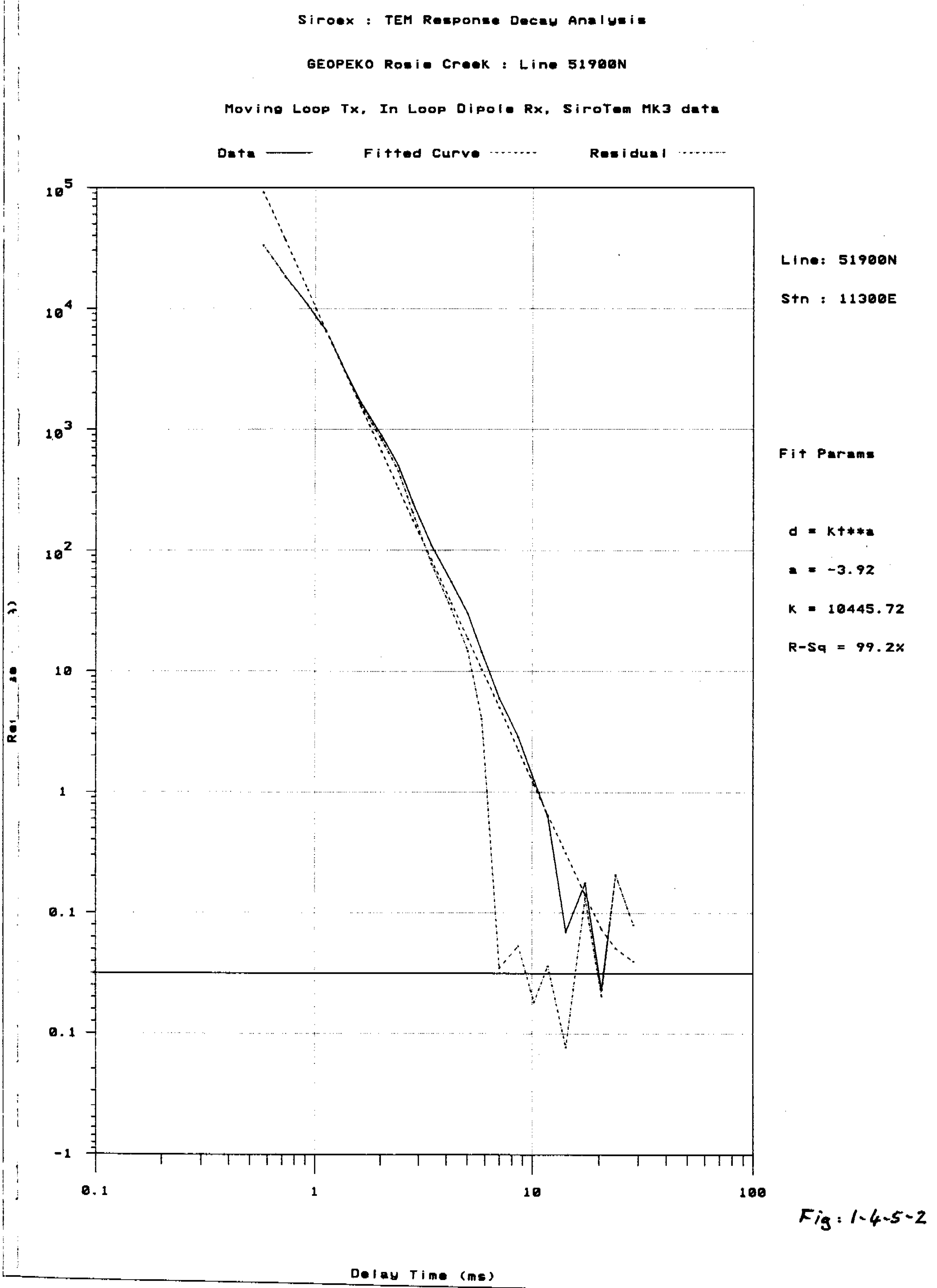
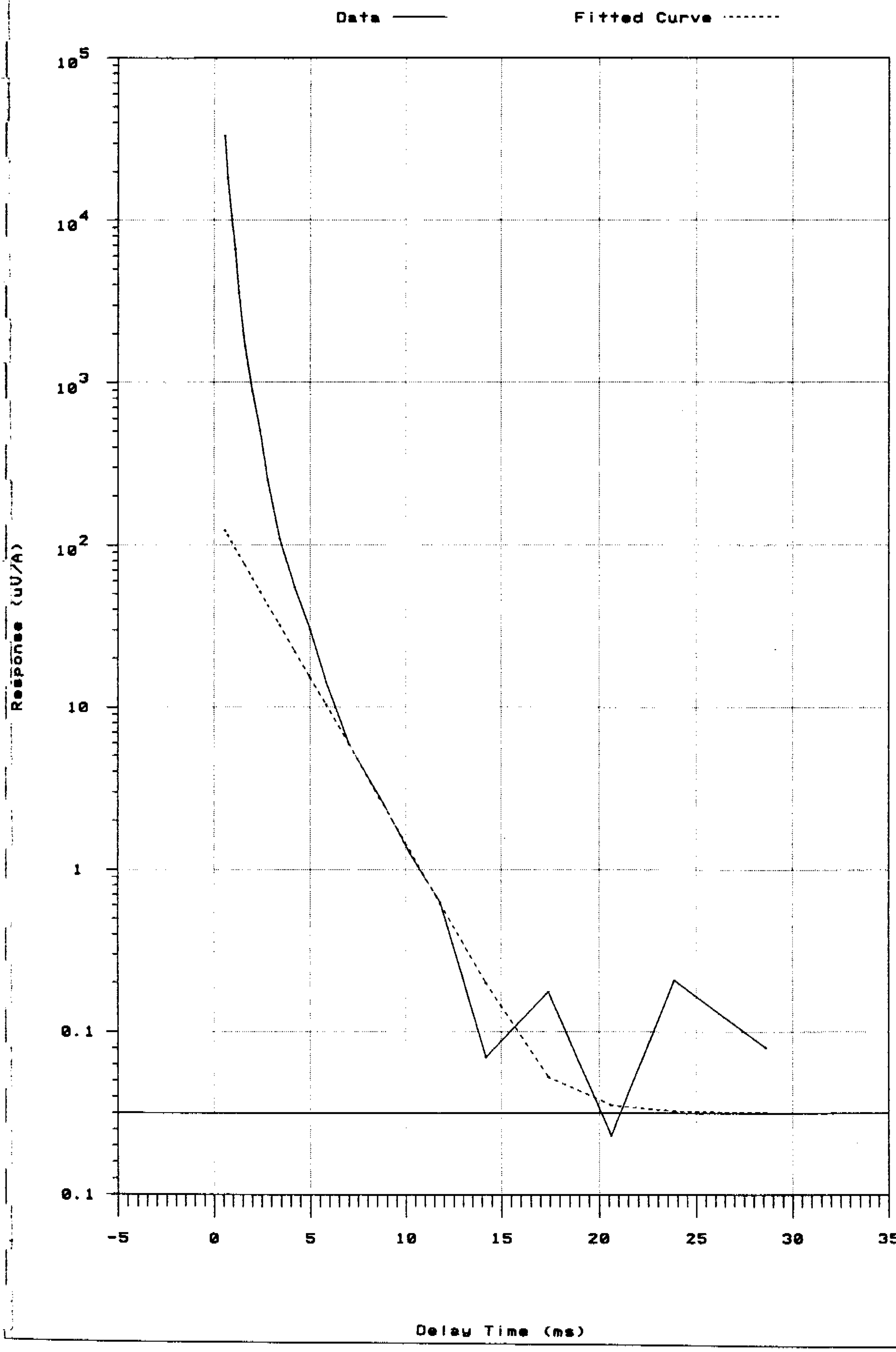

Siroex : TEM Response Decay Analysis
GEOPEKO Rosie CreeK : Line 51900N
Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data
Data
Fitted Curve
Residual
10^5
10^4
10^3
10^2
10
1
0.1
0.1
-1
0.1
1
10
100
Delay Time (ms)
Line: 51900N
Stn : 11300E
Fit Params
d = Kt**a
a = -3.92
K = 10445.72
R-Sq = 99.2%

Fig: 1-4-5-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 51900N

Stn : 11300E

Fit Params

d = KEXP(-t/τ)

τ = 2.12

K = 161.23

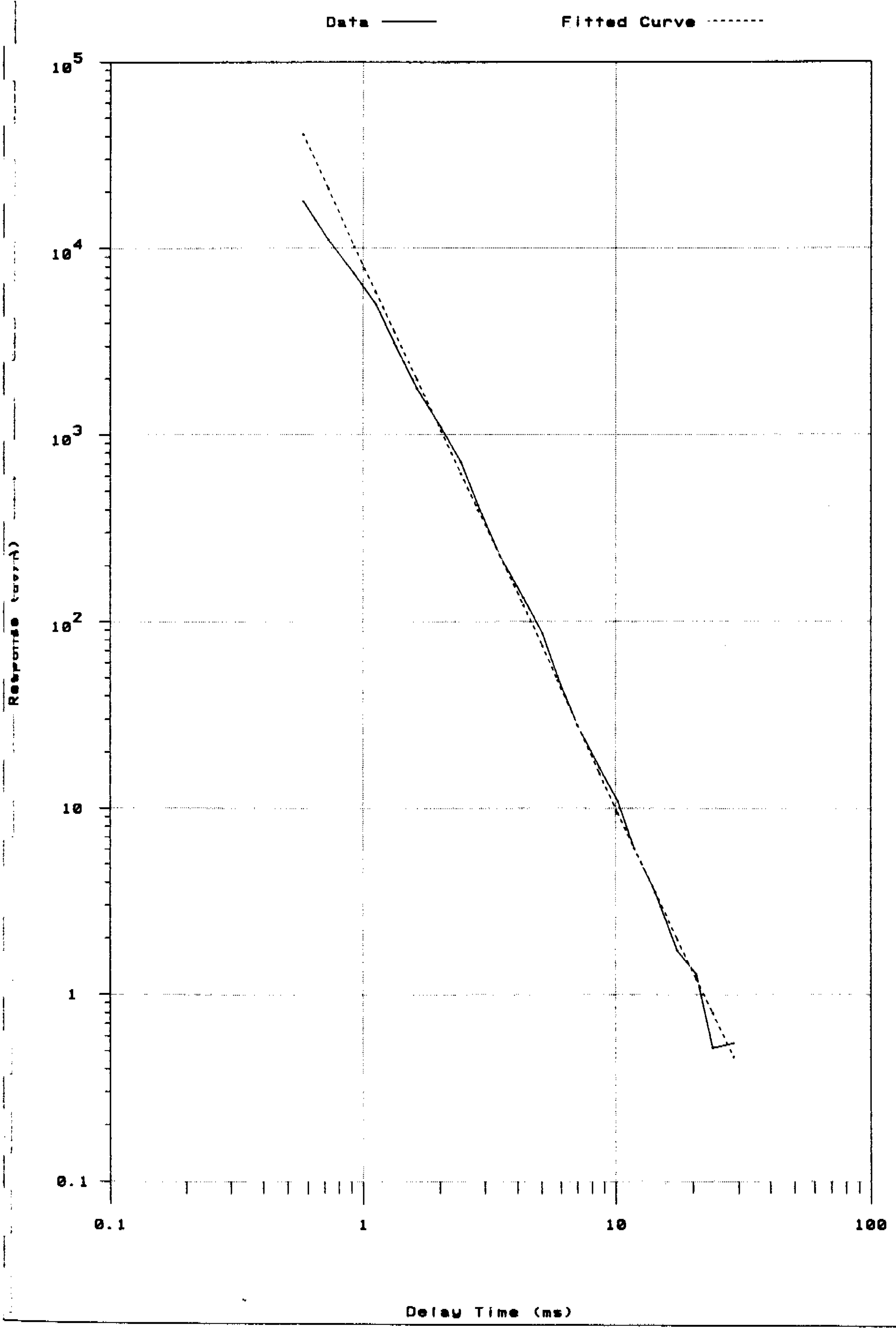
R-Sq = 99.9%

Fig 1-4-5-3

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek : Line 51900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 51900N

Stn : 21500E

Fit Params

d = kt**a

a = -2.91

k = 8167.62

R-Sq = 99.8%

Fig: 1-4-6-1

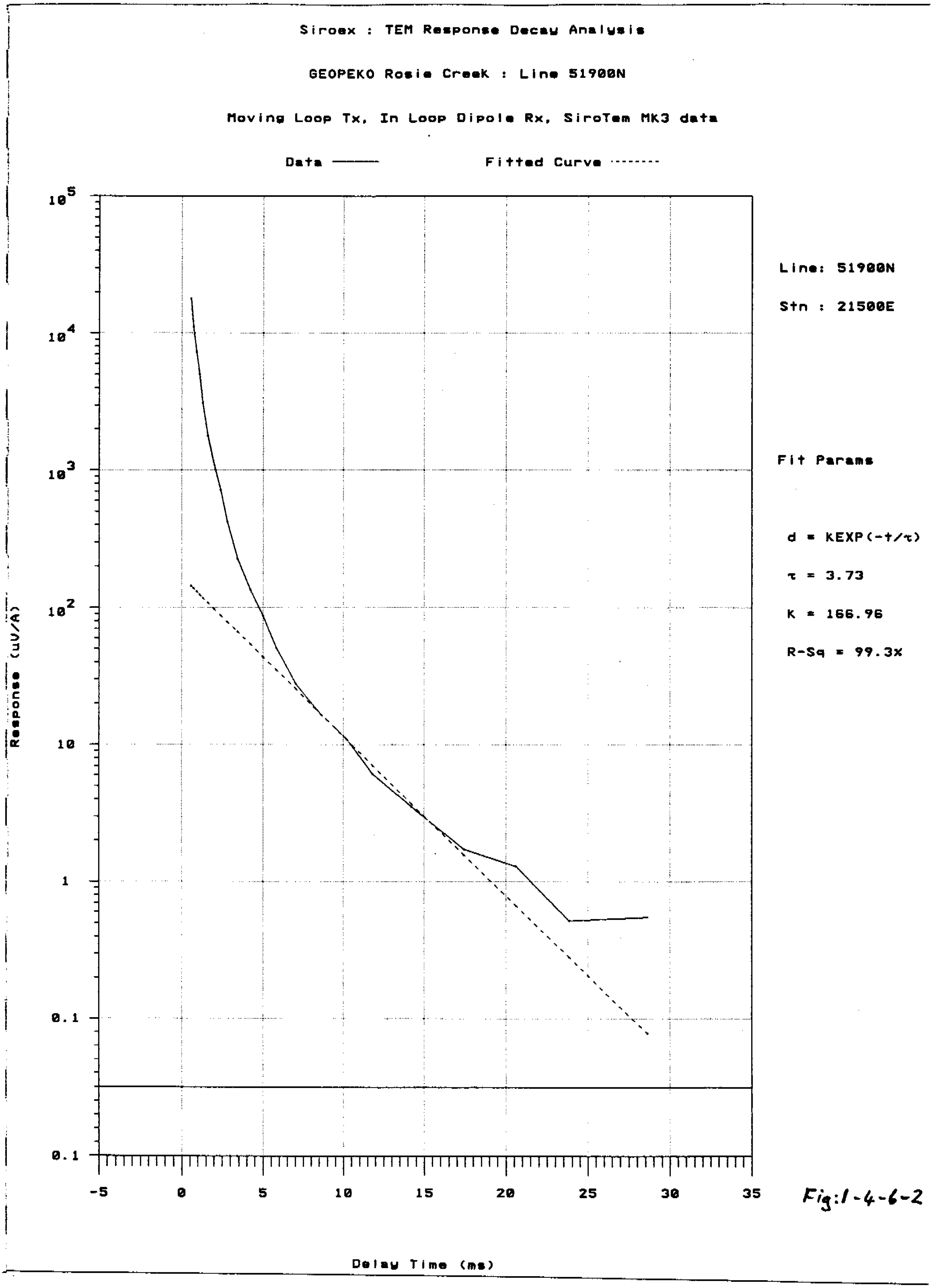
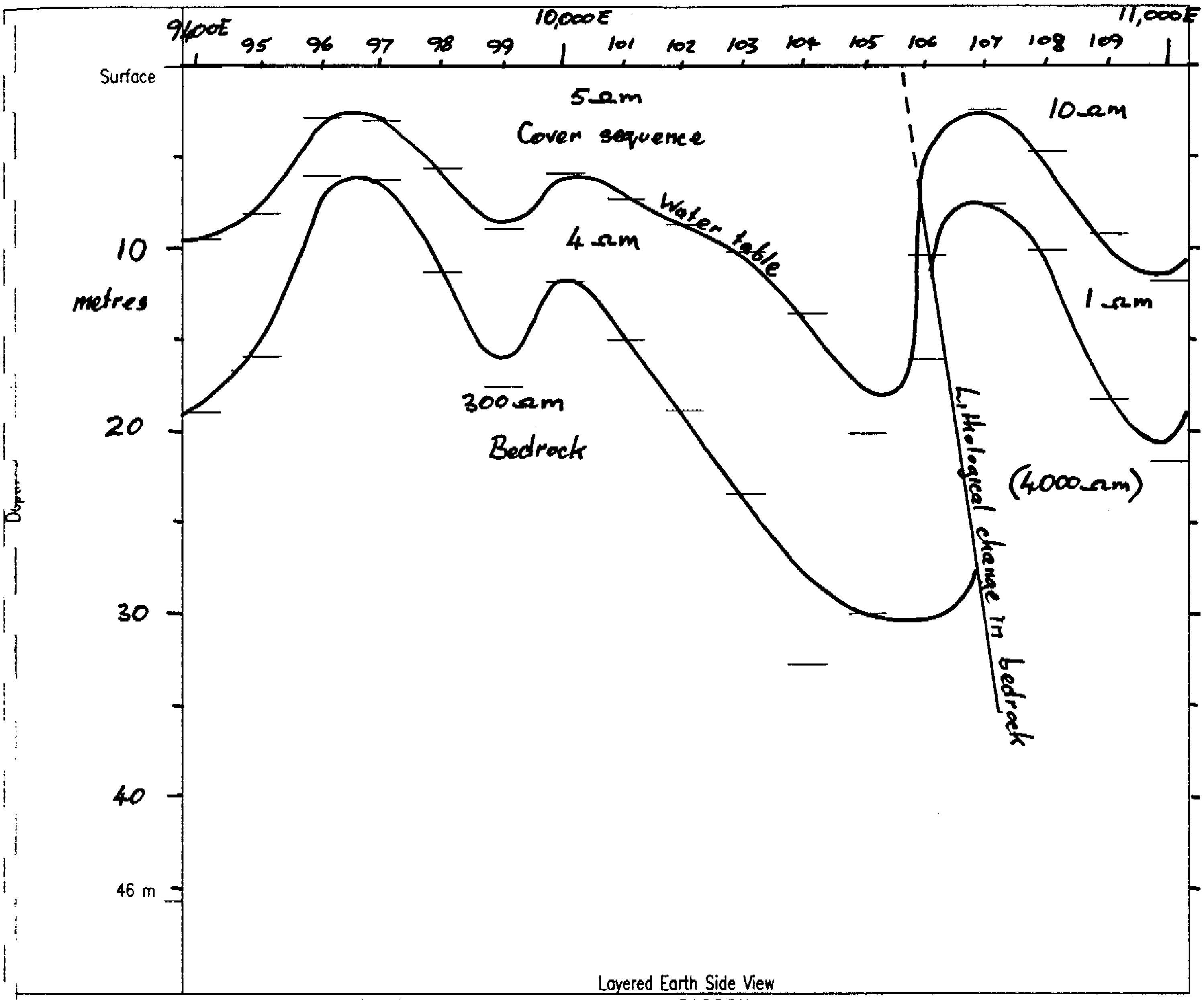

Siroex : TEM Response Decay Analysis
GEOPEKO Rosie Creek : Line 51900N
Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data
Data
Fitted Curve
10^5
10^4
10^3
10^2
10
1
0.1
0.1
Response (uV/A)
-5
0
5
10
15
20
25
30
35
Delay Time (ms)
Line: 51900N
Stn : 21500E
Fit Params
d = KEXP(-t/τ)
τ = 3.73
K = 166.96
R-Sq = 99.3%

Fig:1-4-6-2



Survey : GEOPEKO Rosie Creek : Line 51900N

Tx Area : 40000

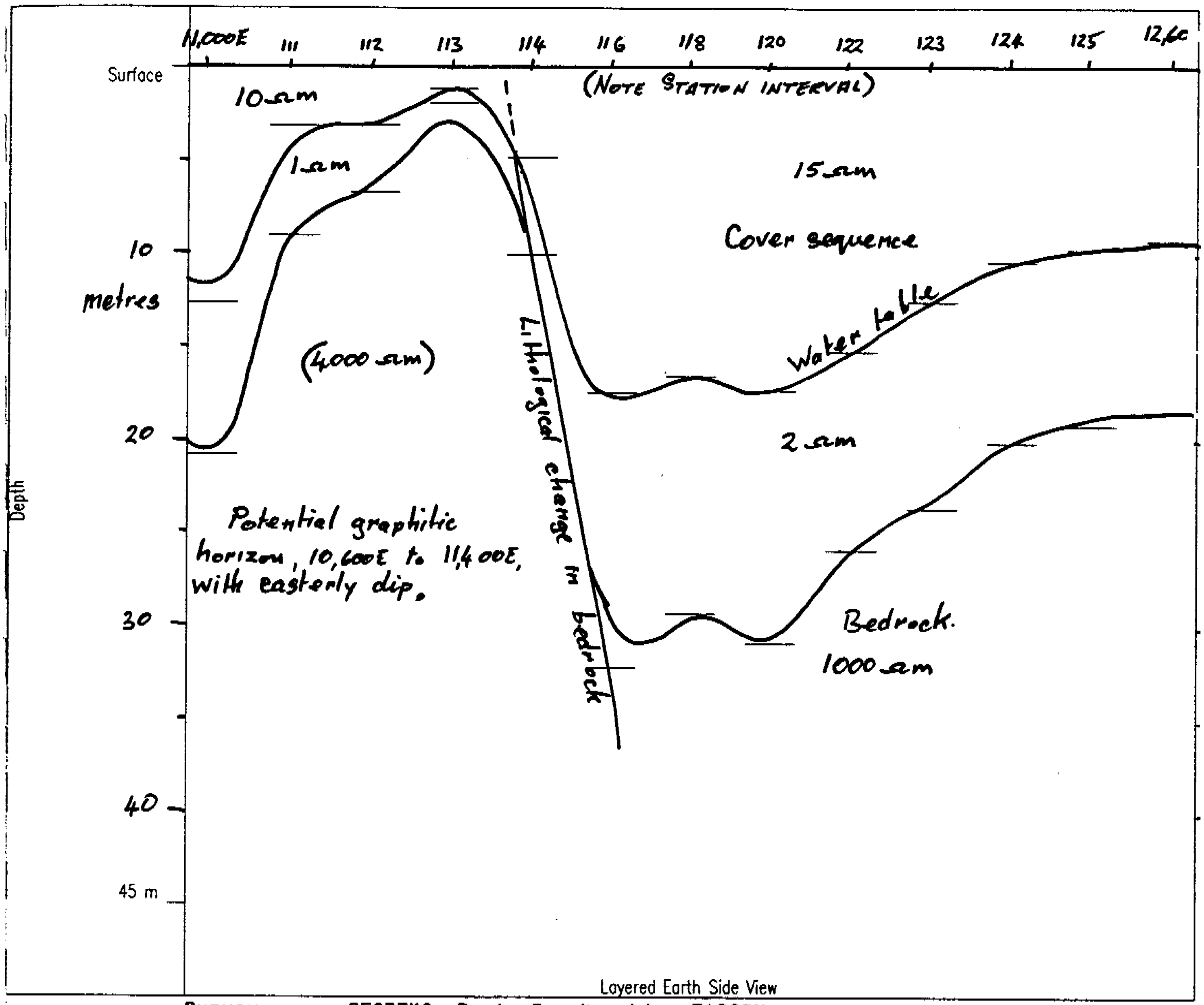
Rx Area : 10000

Instrument : SiroTem Mk3

Channels : Composite Times

Profile : 51900N

Figure 1-5-1



Survey : GEOPEKO, Rosie Creek : Line 51900N

Tx Area : 40000

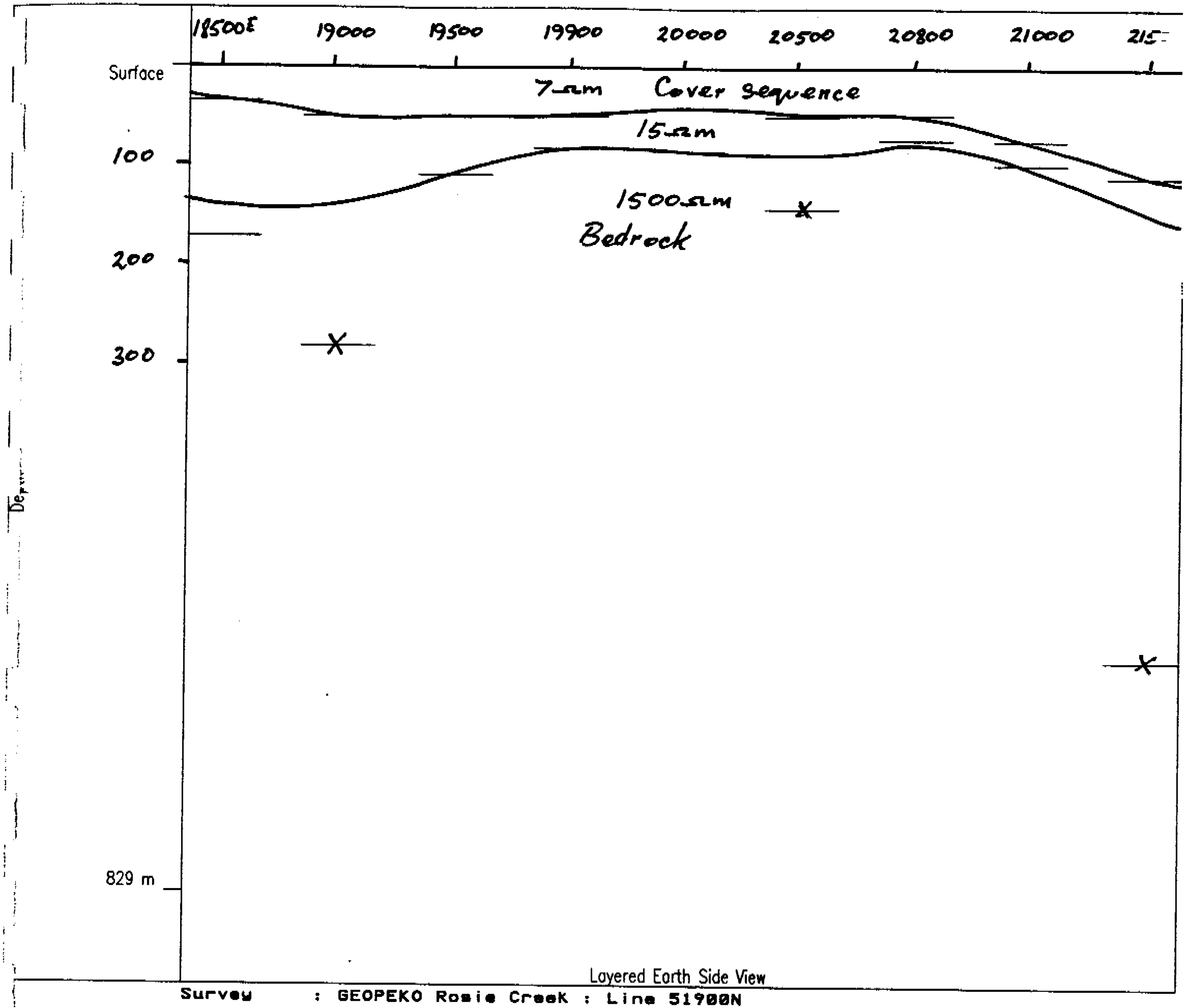
Rx Area : 10000

Instrument : SiroTem MK3

Channels : Composite Times

Profile : 51900N

Figure 1-5-2



Survey : GEOPEKO Rosie Creek : Line 51900N

Tx Area : 40000

Rx Area : 10000

Instrument : SiroTem MK3

Channels : Composite Times

Profile : 51900N

Figure 1-5-3

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 52100N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

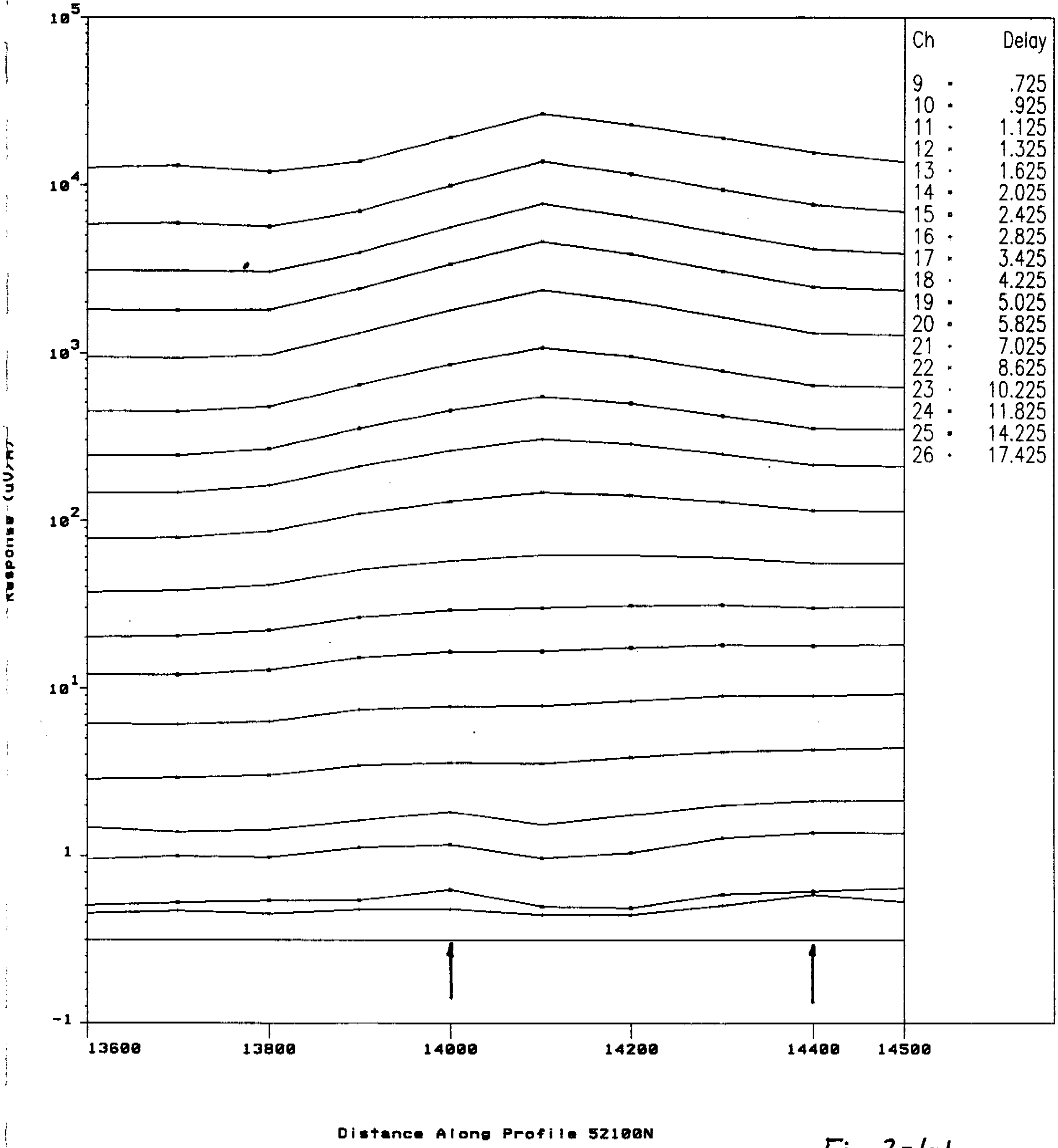


Fig: 2-1-1

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 52100N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

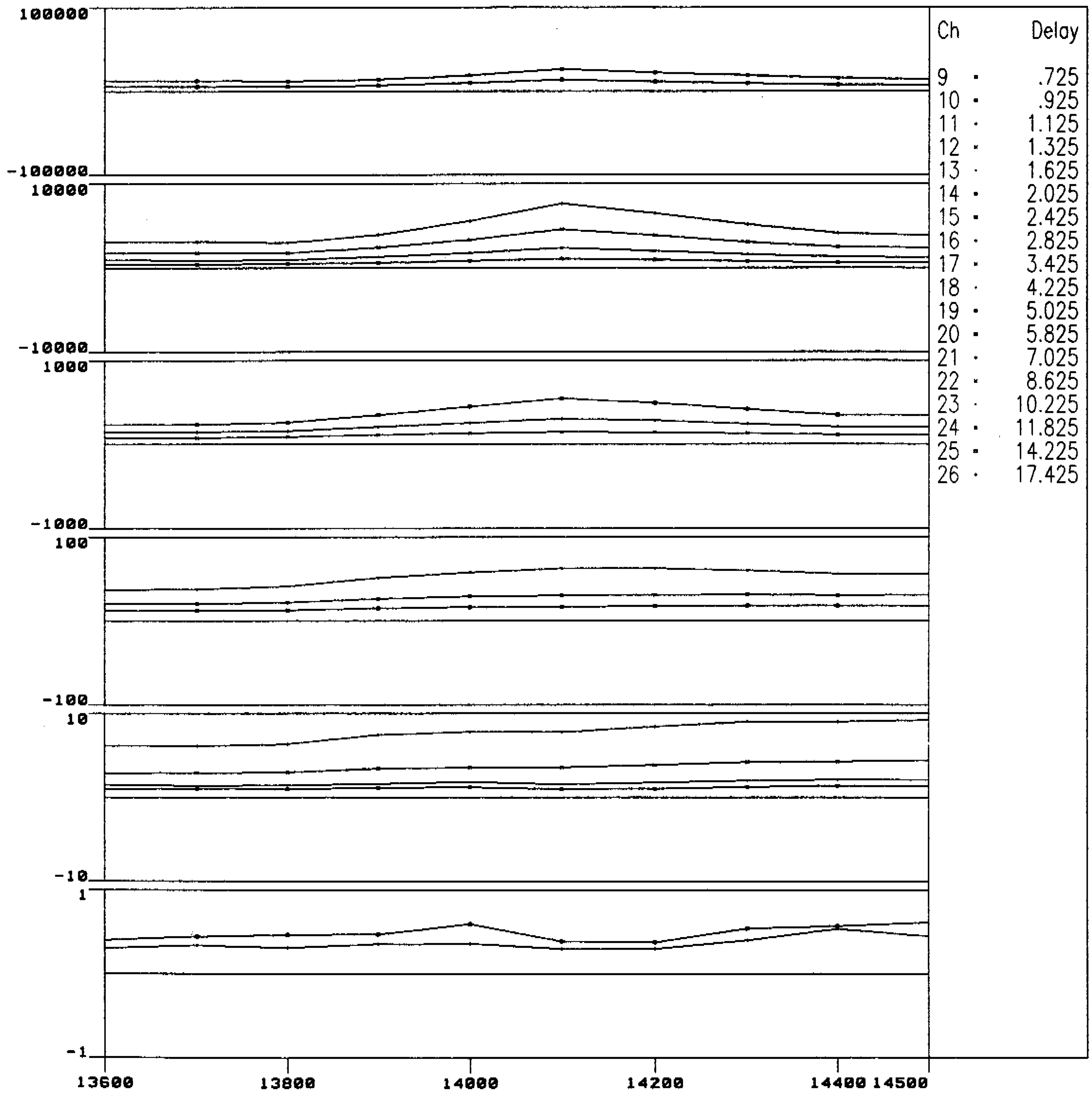


Fig:2-1-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 52100N

Moving Loop Tx, In Loop Dipole Rx, SiroTem Mk3 data

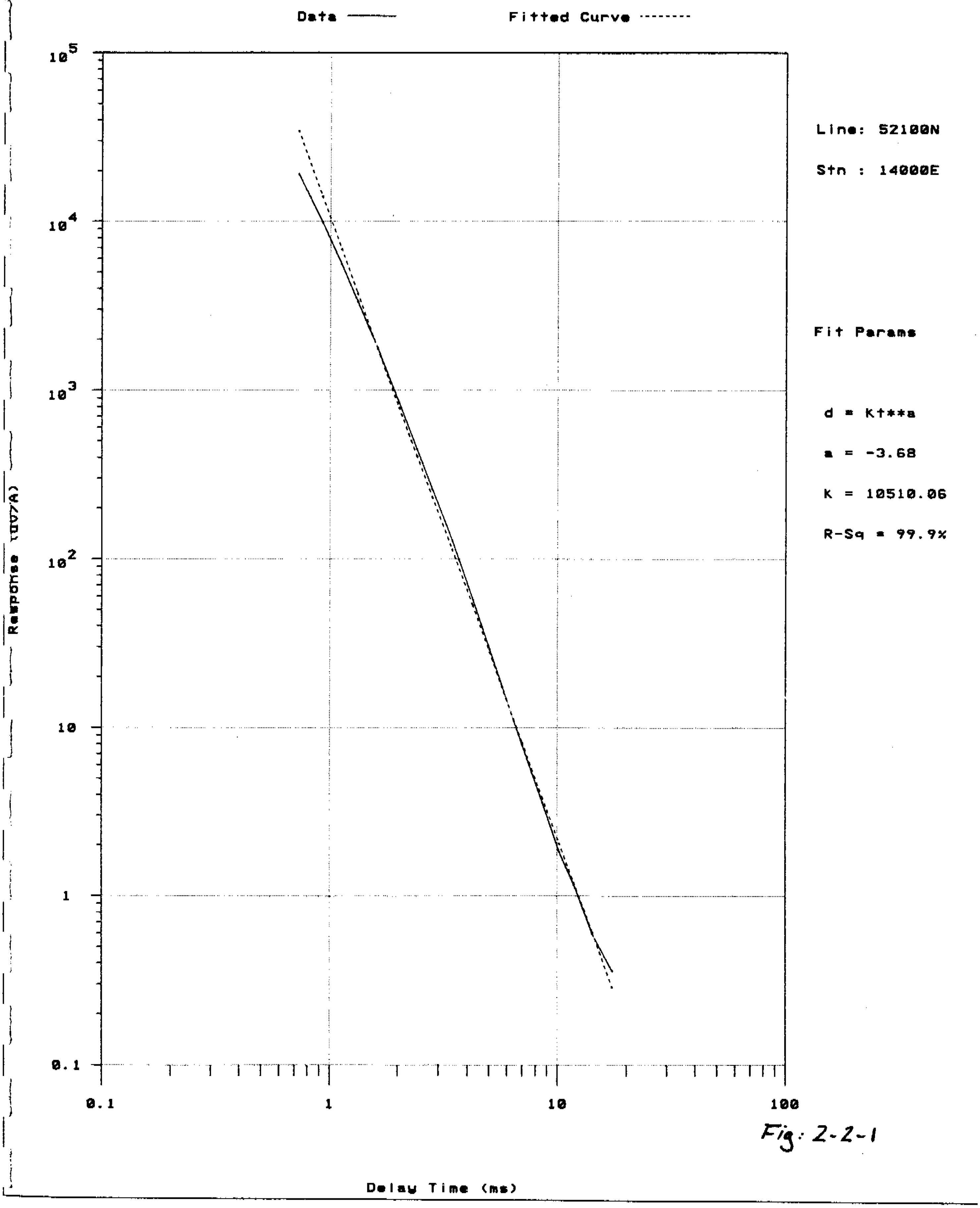
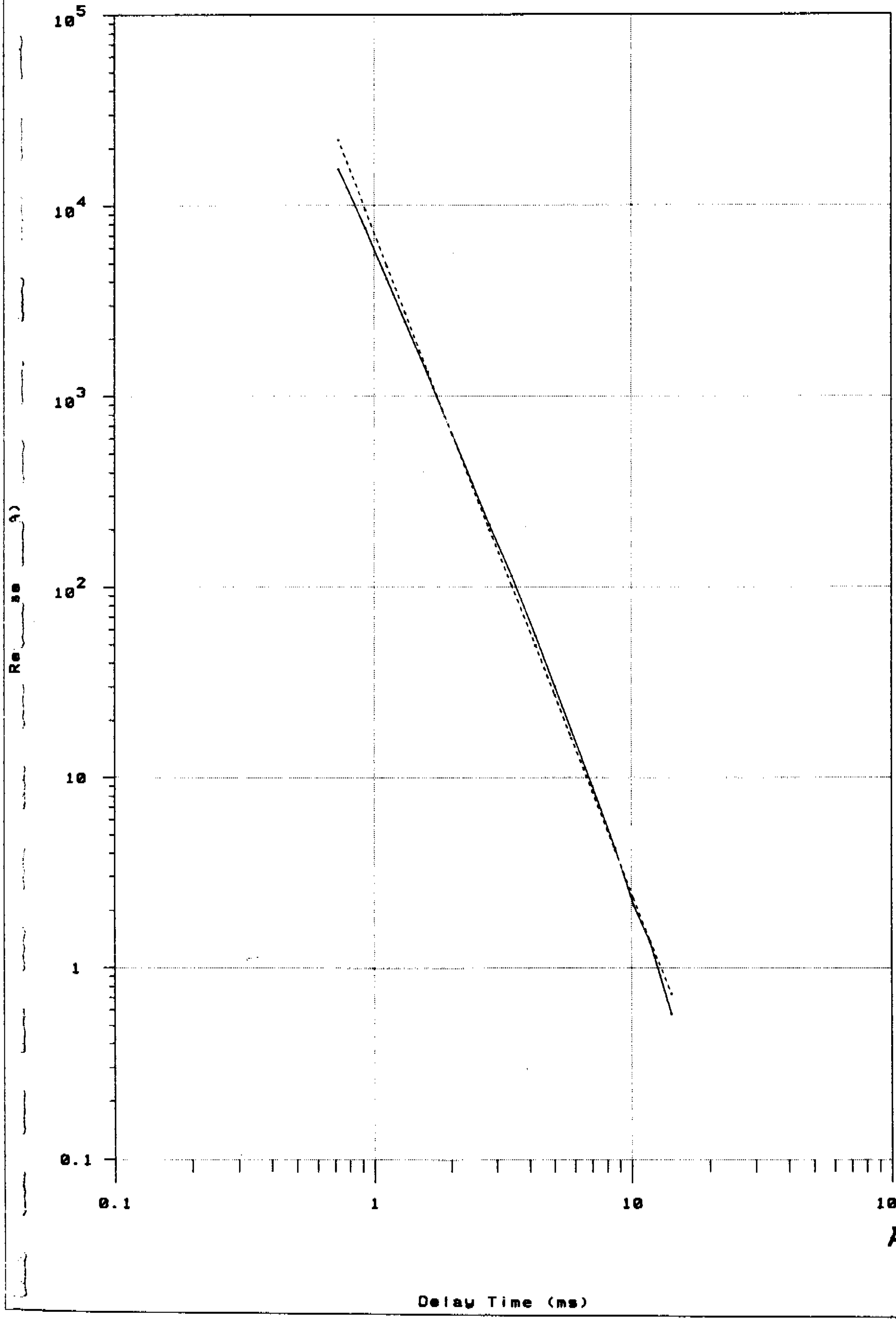


Fig. 2-2-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 52100N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 52100N

Stn : 14400E

Fit Params

d = Kt**a

a = -3.47

k = 7264.41

R-Sq = 99.9%

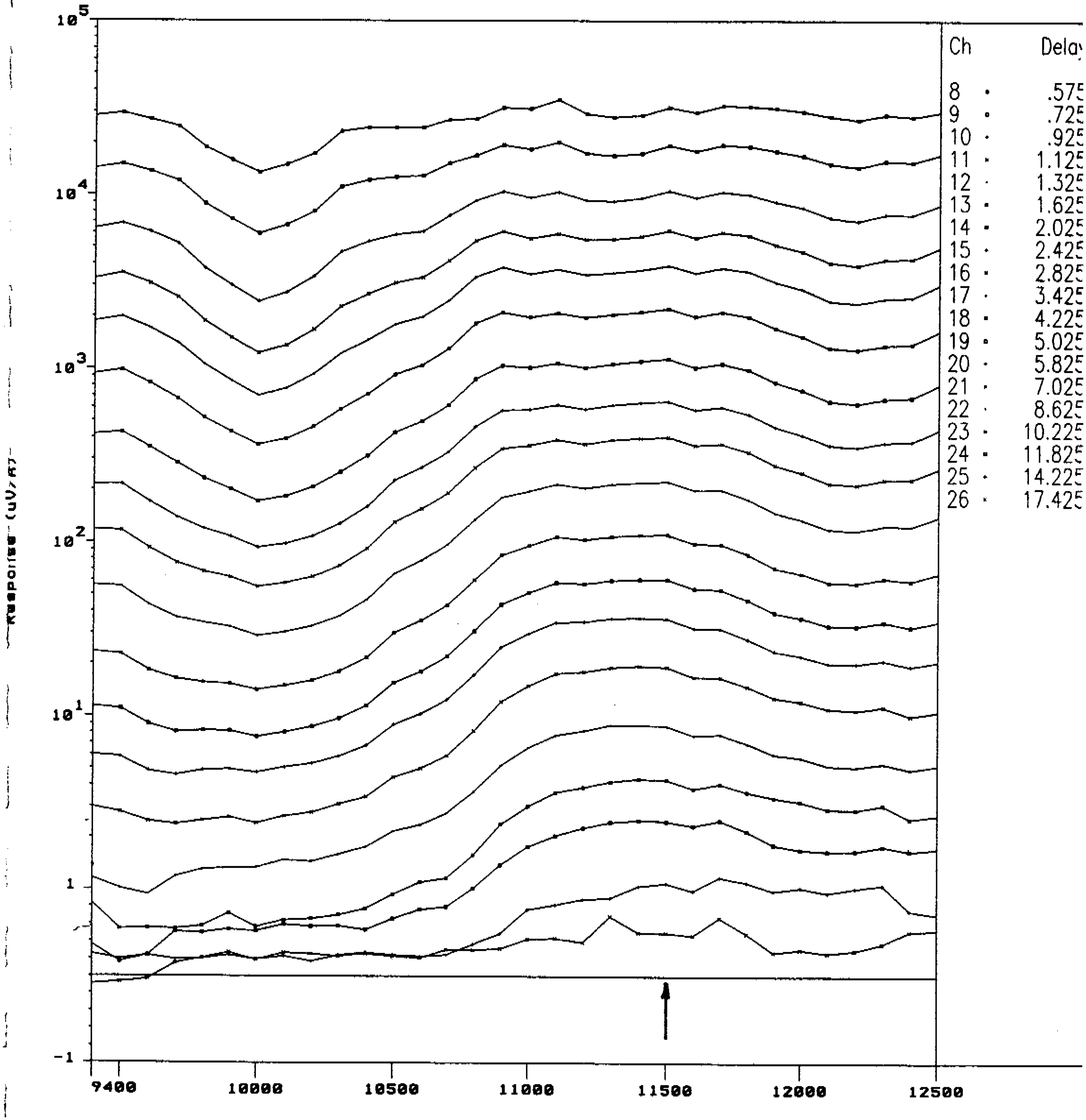
Fig. 2-2-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only



Distance Along Profile 53900N

Fig: 3-1-1

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

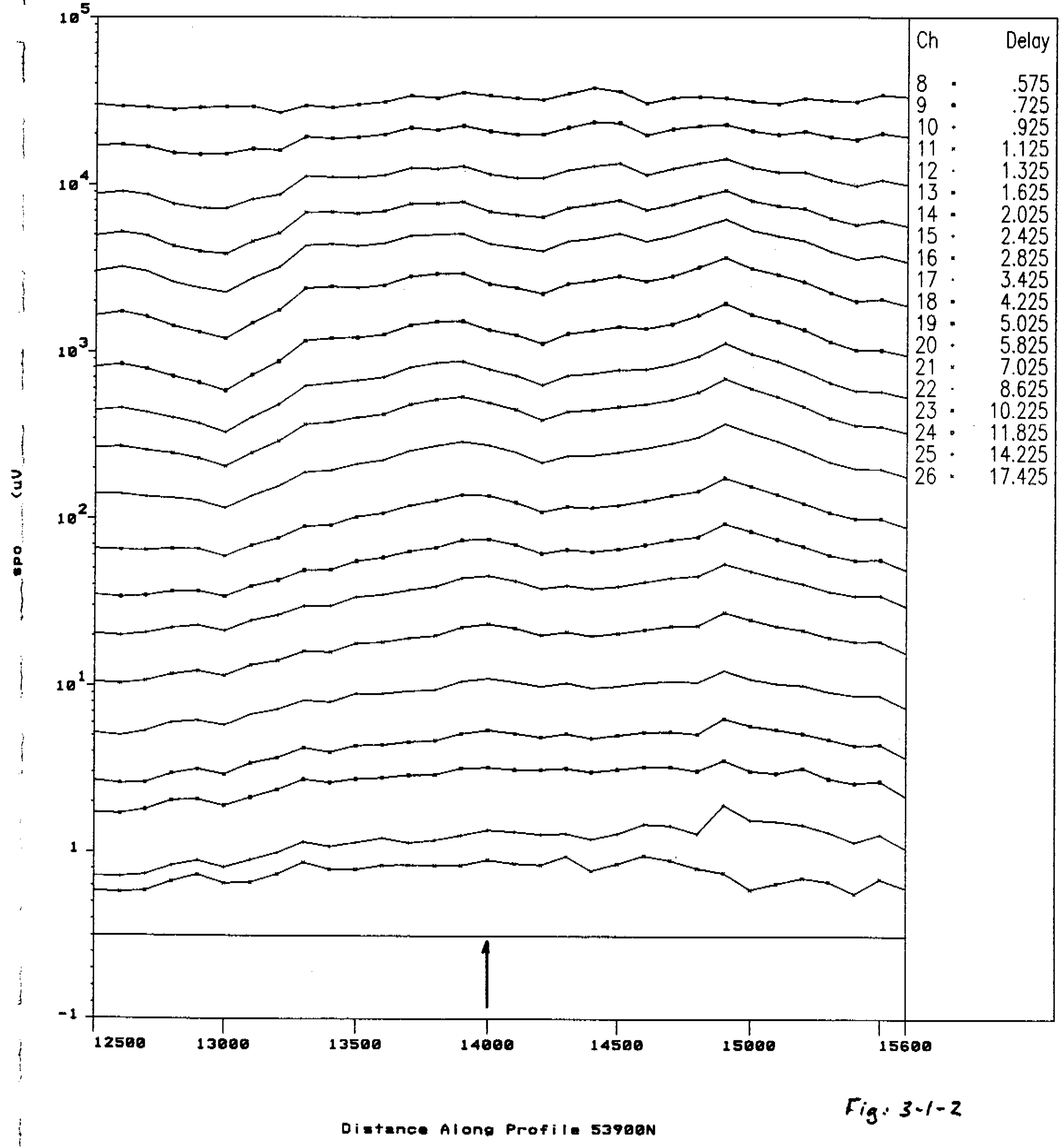


Fig: 3-1-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

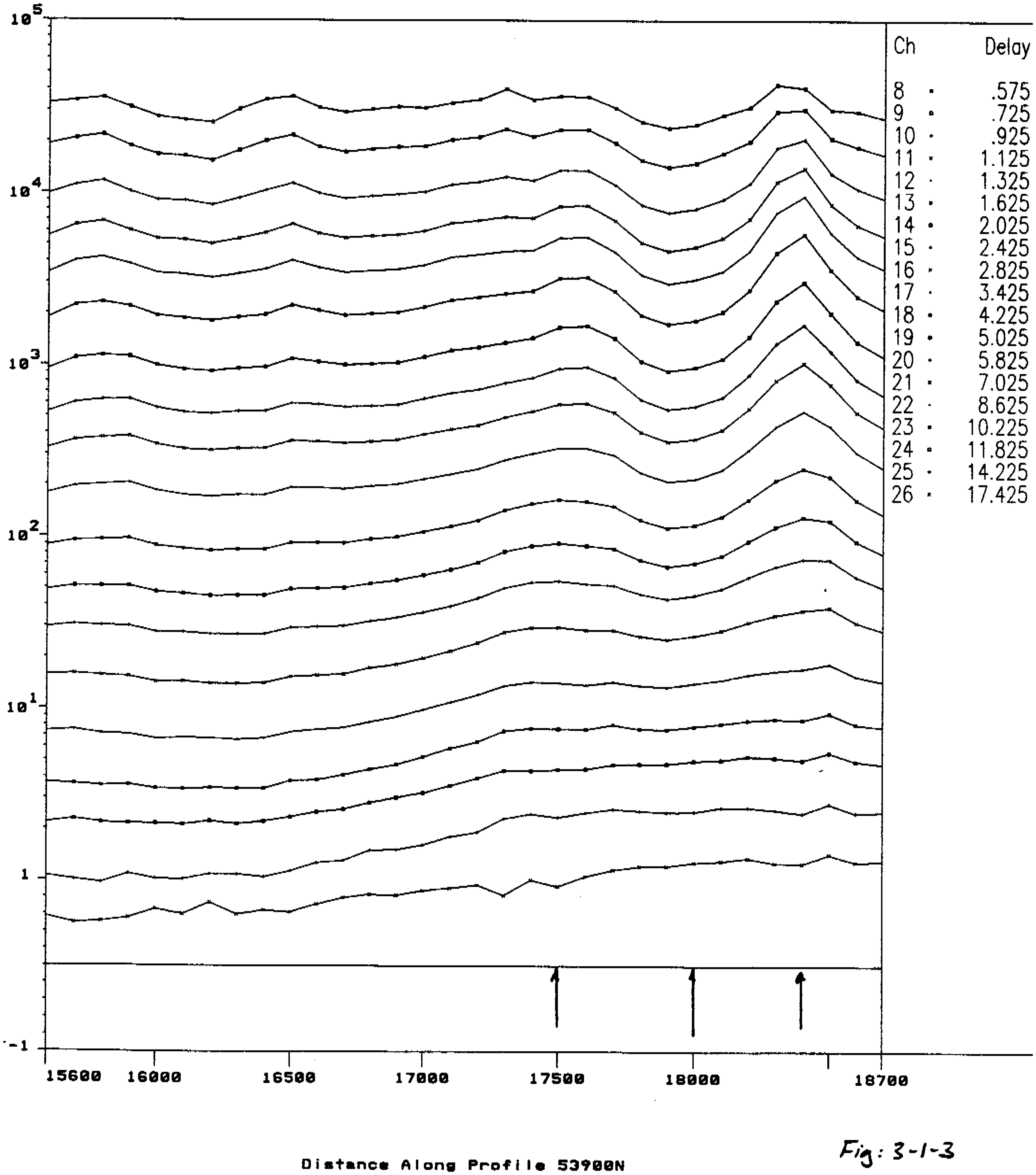


Fig: 3-1-3

Siro-ex : TEM Response Profile

GEOPEKO Rosia Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

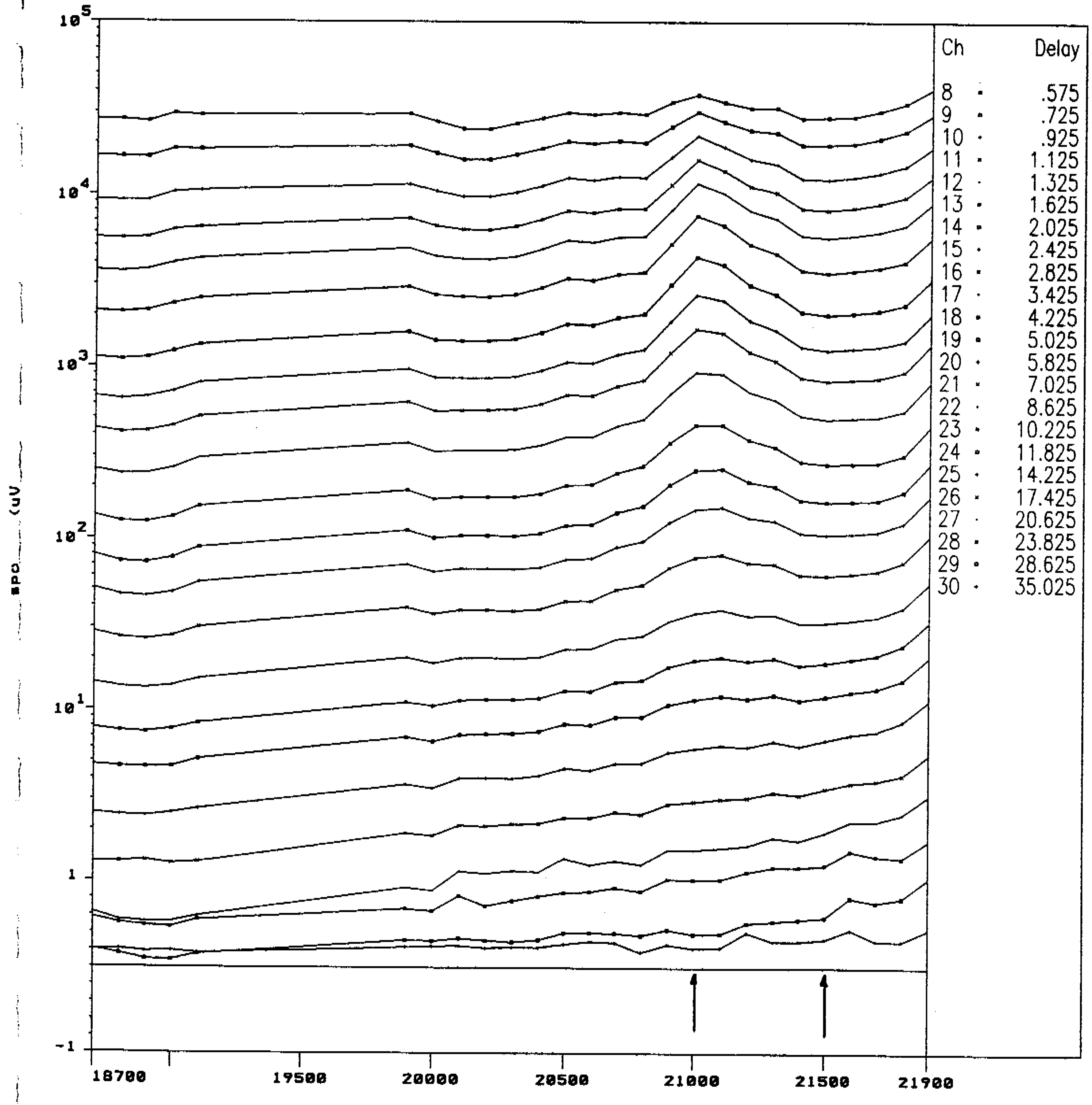


Fig:3-1-4

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

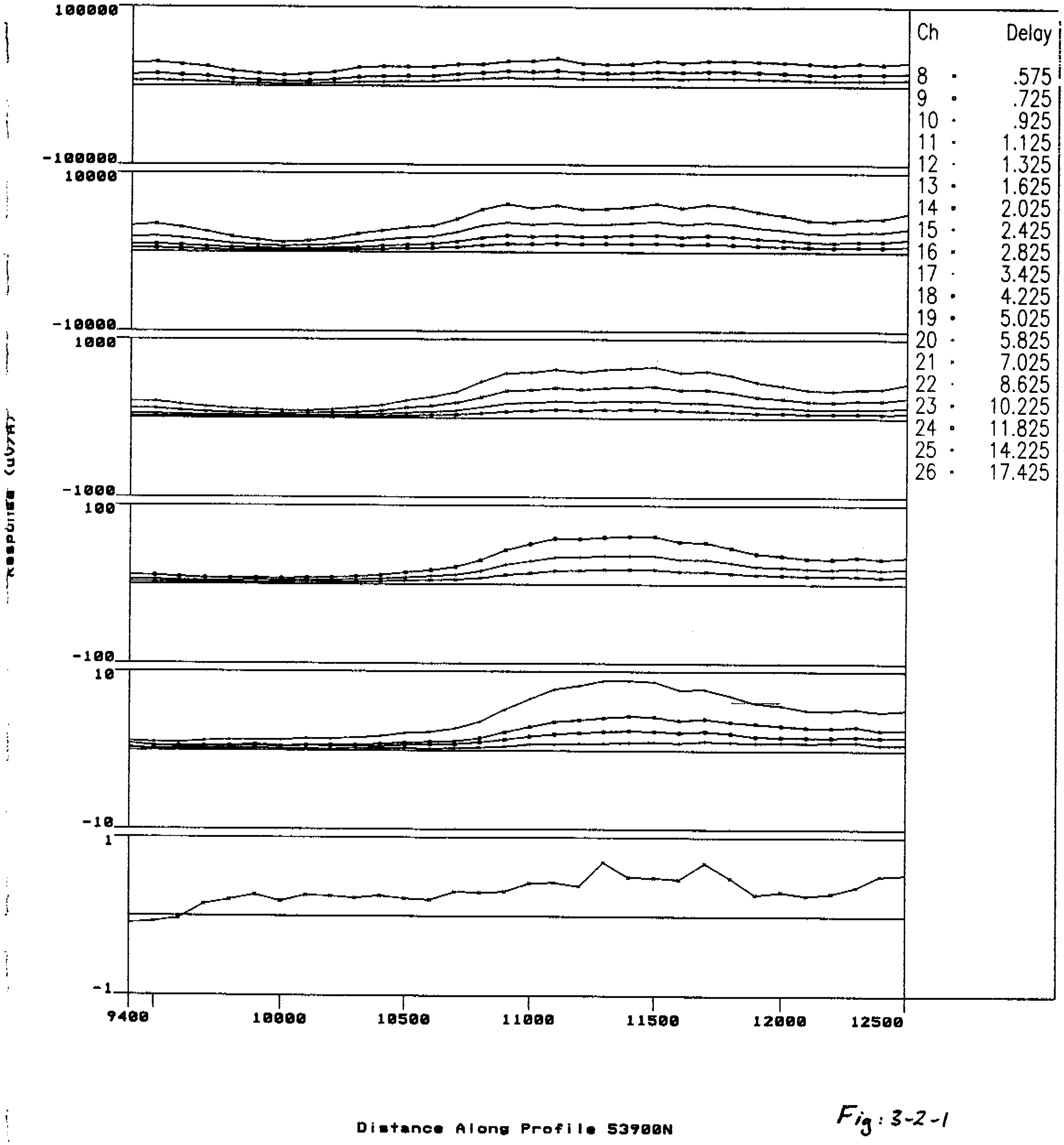


Fig: 3-2-1

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

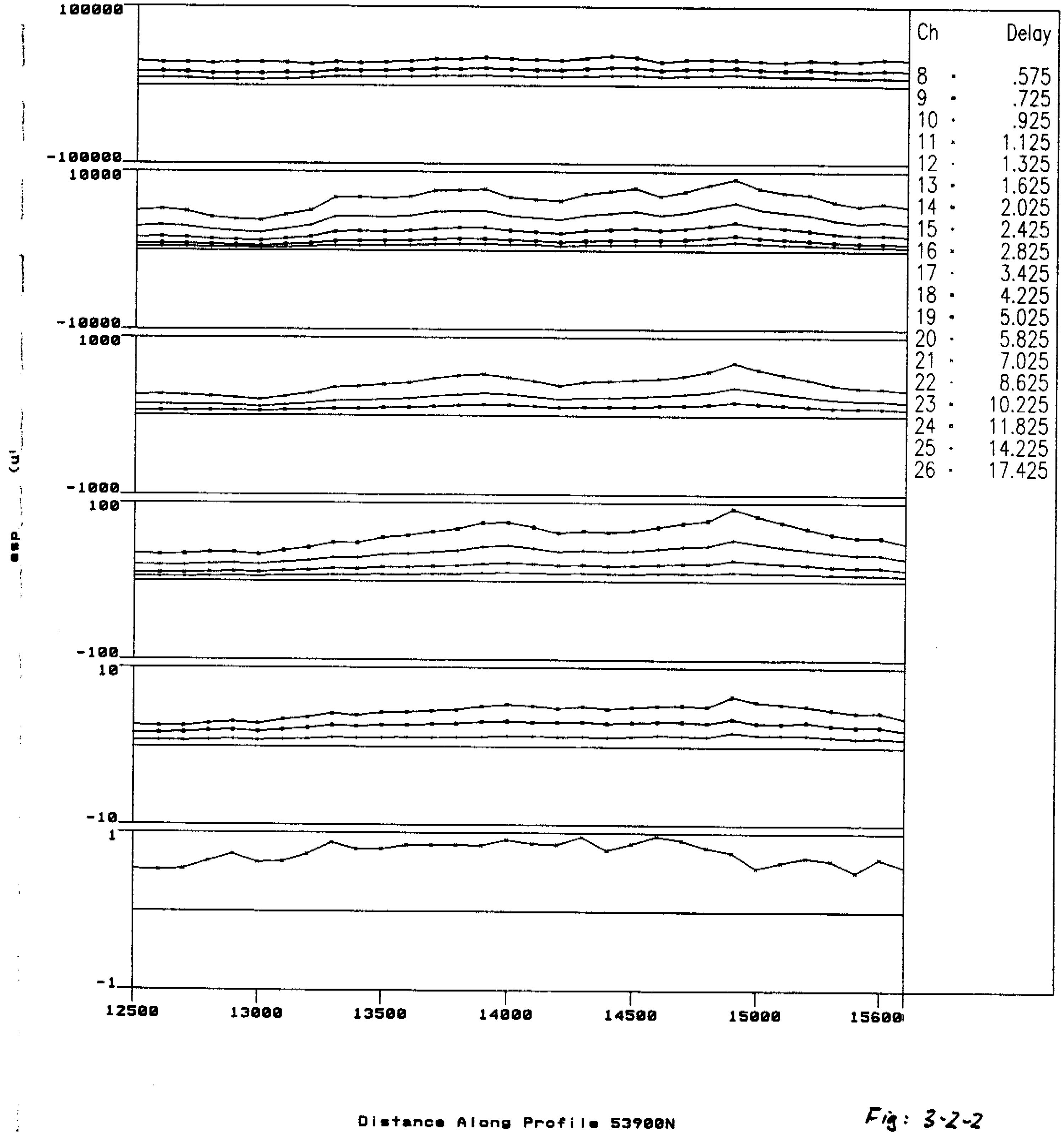


Fig: 3-2-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

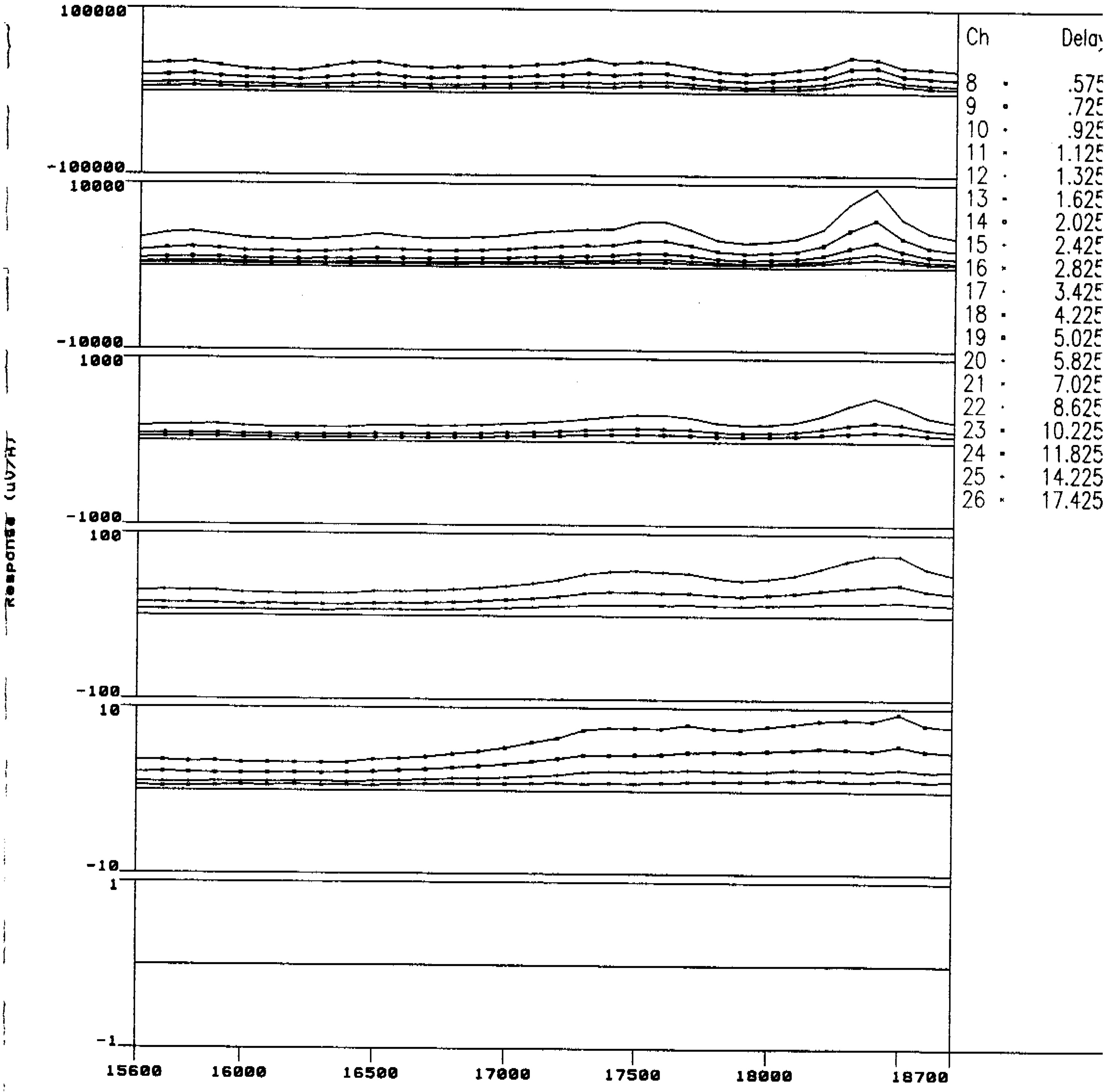


Fig:3-2-3

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

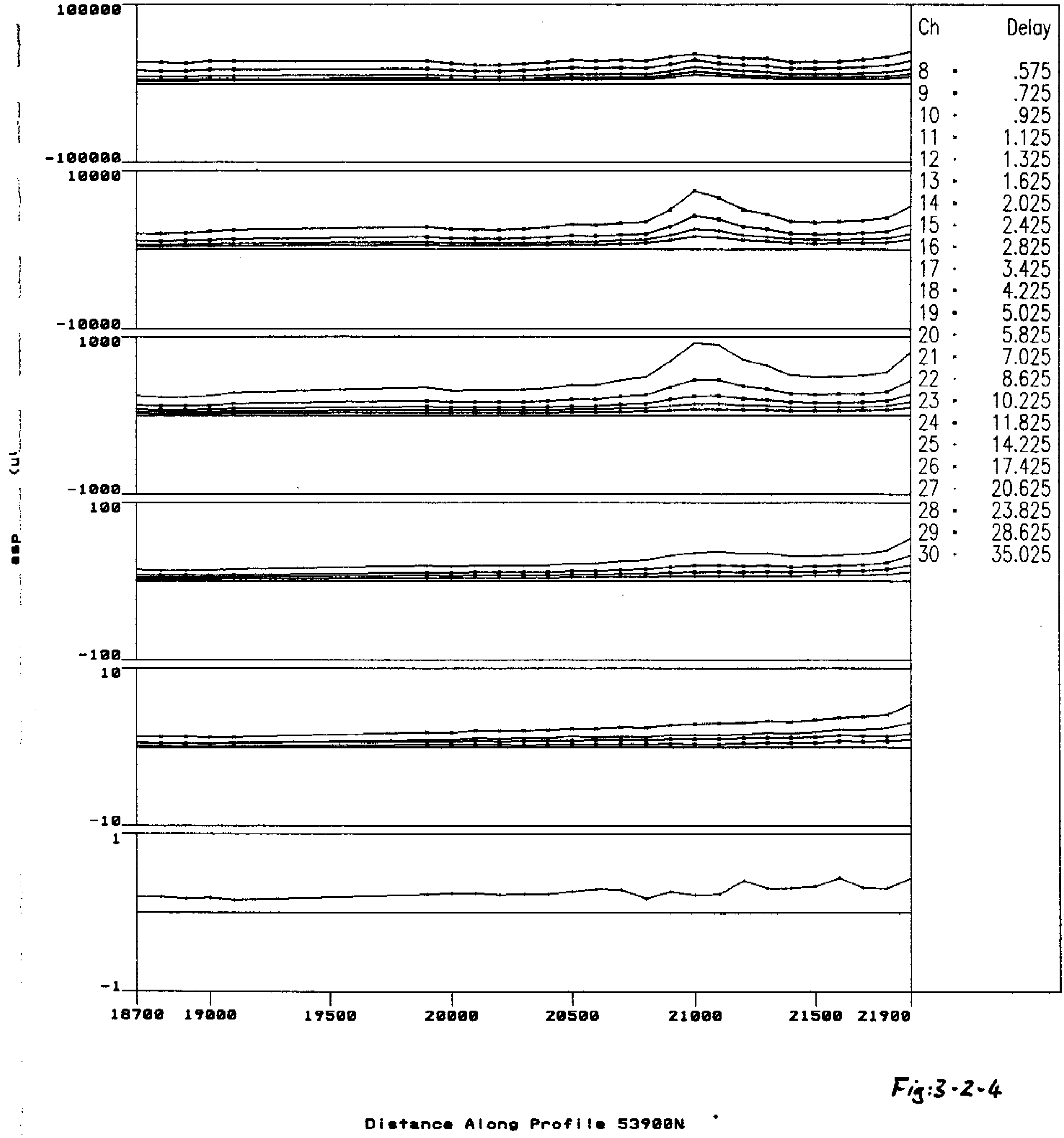
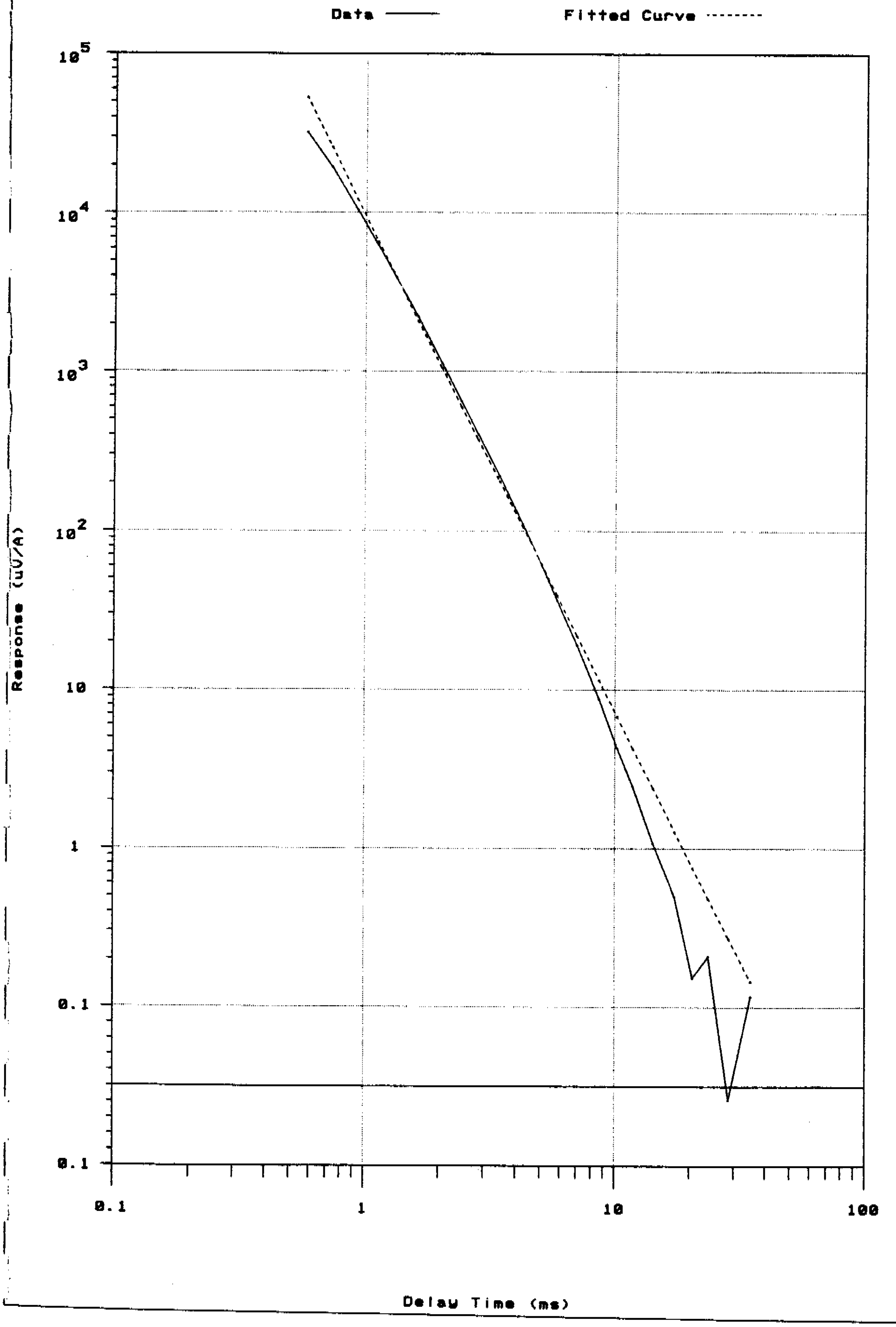


Fig:3-2-4

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line: 53900N

Stn : 11500E

Fit Params

d = Kt**a

a = -3.12

K = 9465.27

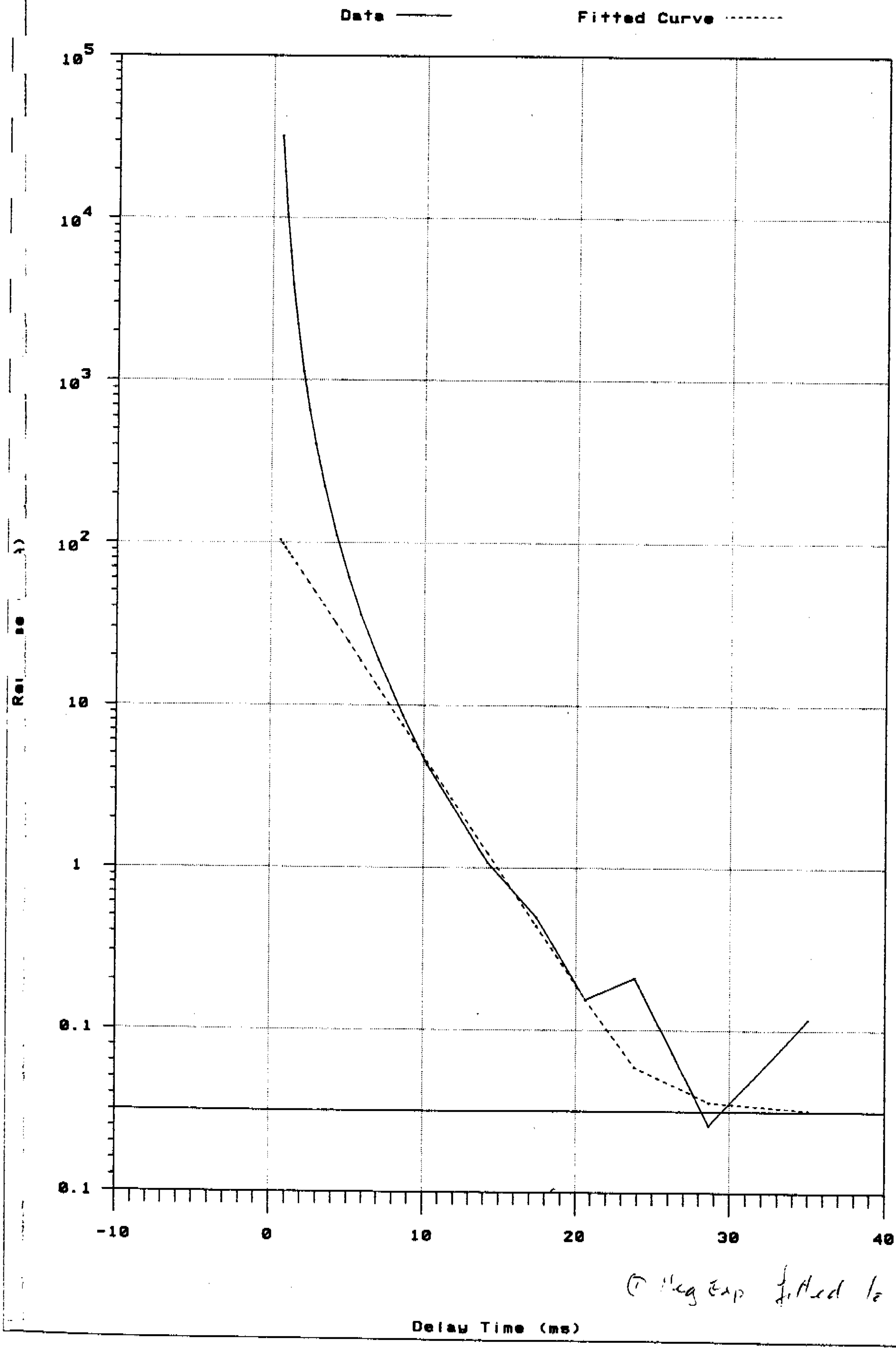
R-Sq = 99.8%

Fig: 3-3-1-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line: 53900N

Stn : 11500E

Fit Params

$d = K\mathrm{EXP}(-t/\tau)$

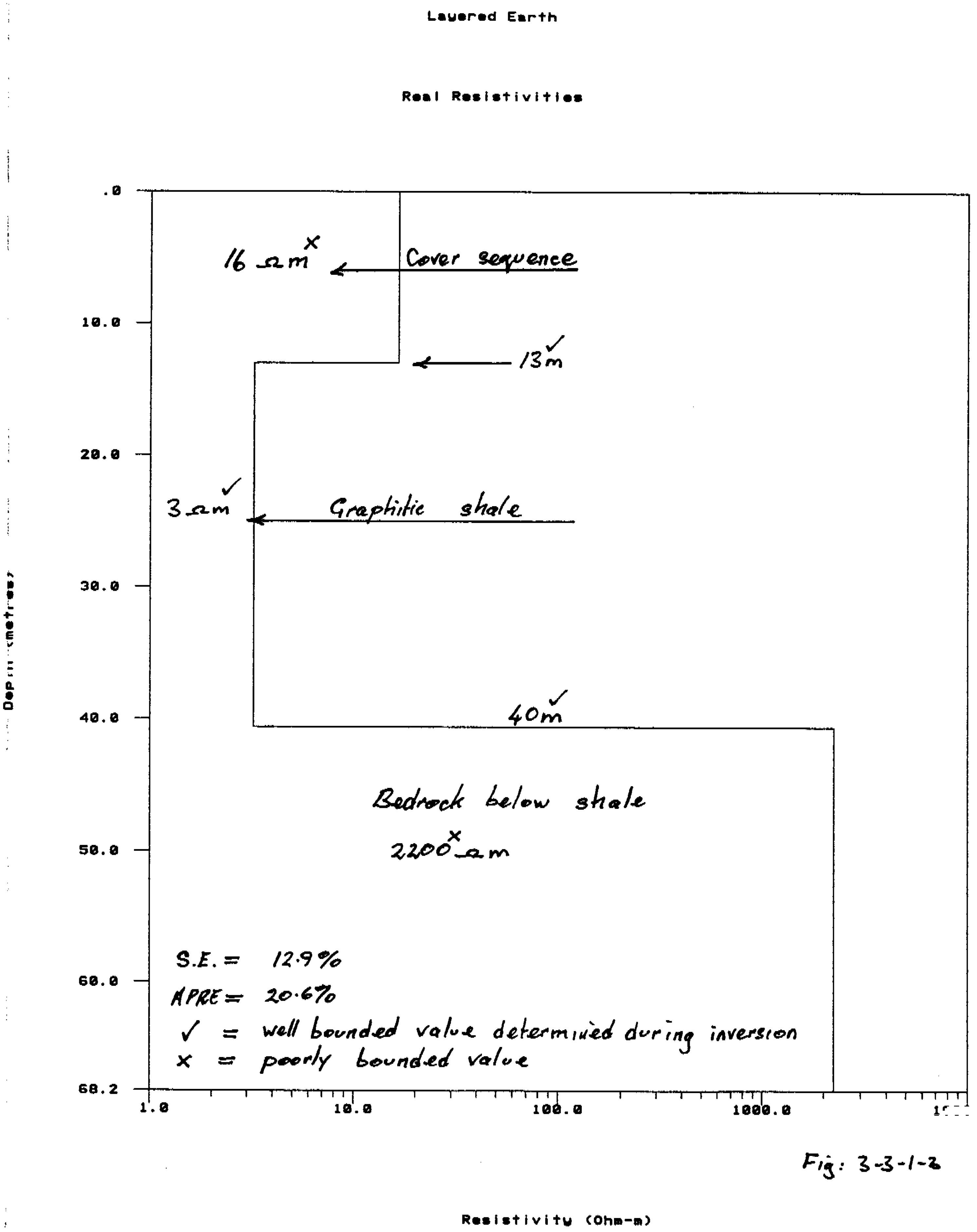
$\tau = 3.08$

$K = 124.92$

R-Sq = 99.4%

Figure:3-3-1-2

① Neg Exp fitted to late times



S.E. = 12.9%
APRE = 20.6%
✓ = well bounded value determined during inversion
× = poorly bounded value

Fig: 3-3-1-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data

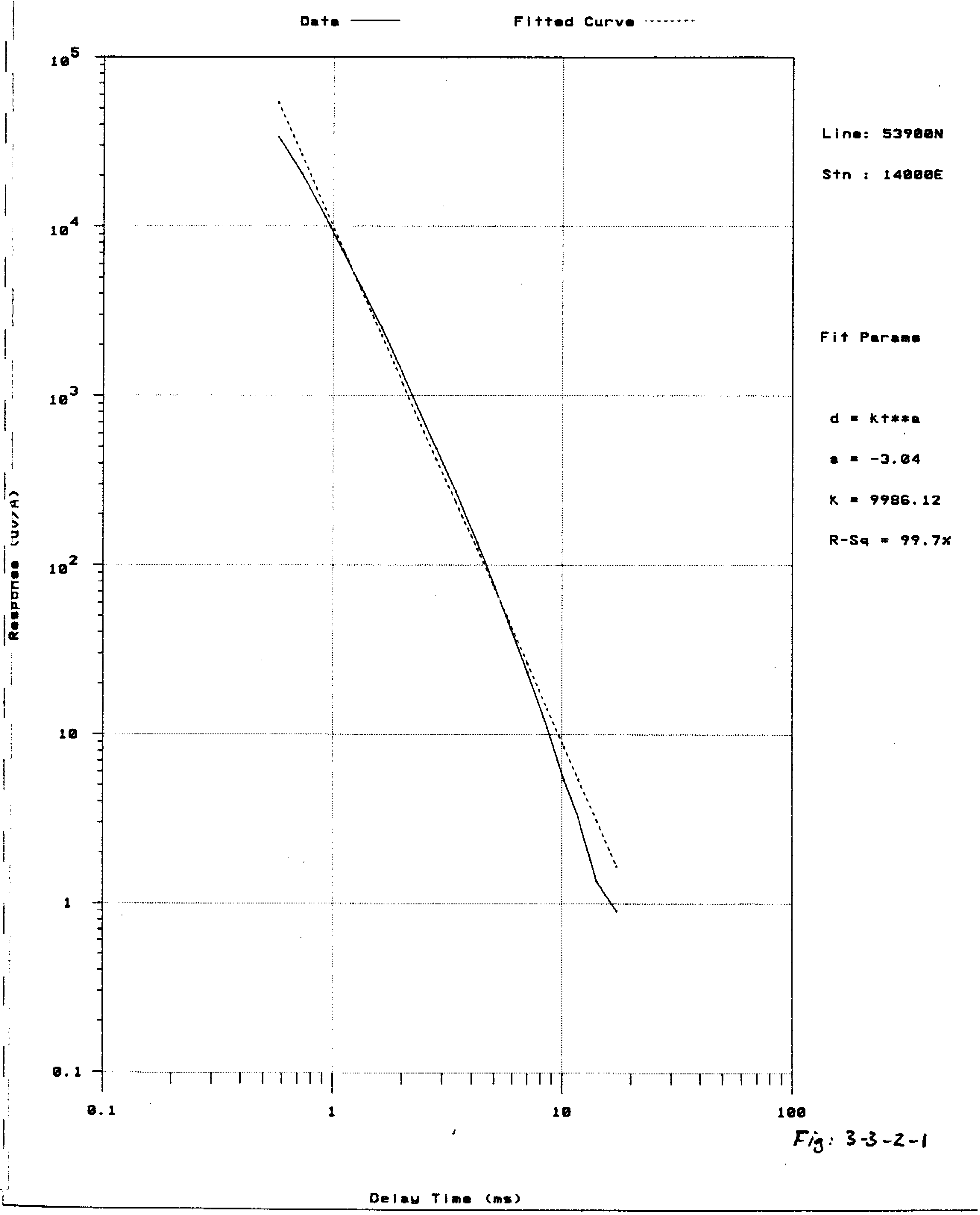
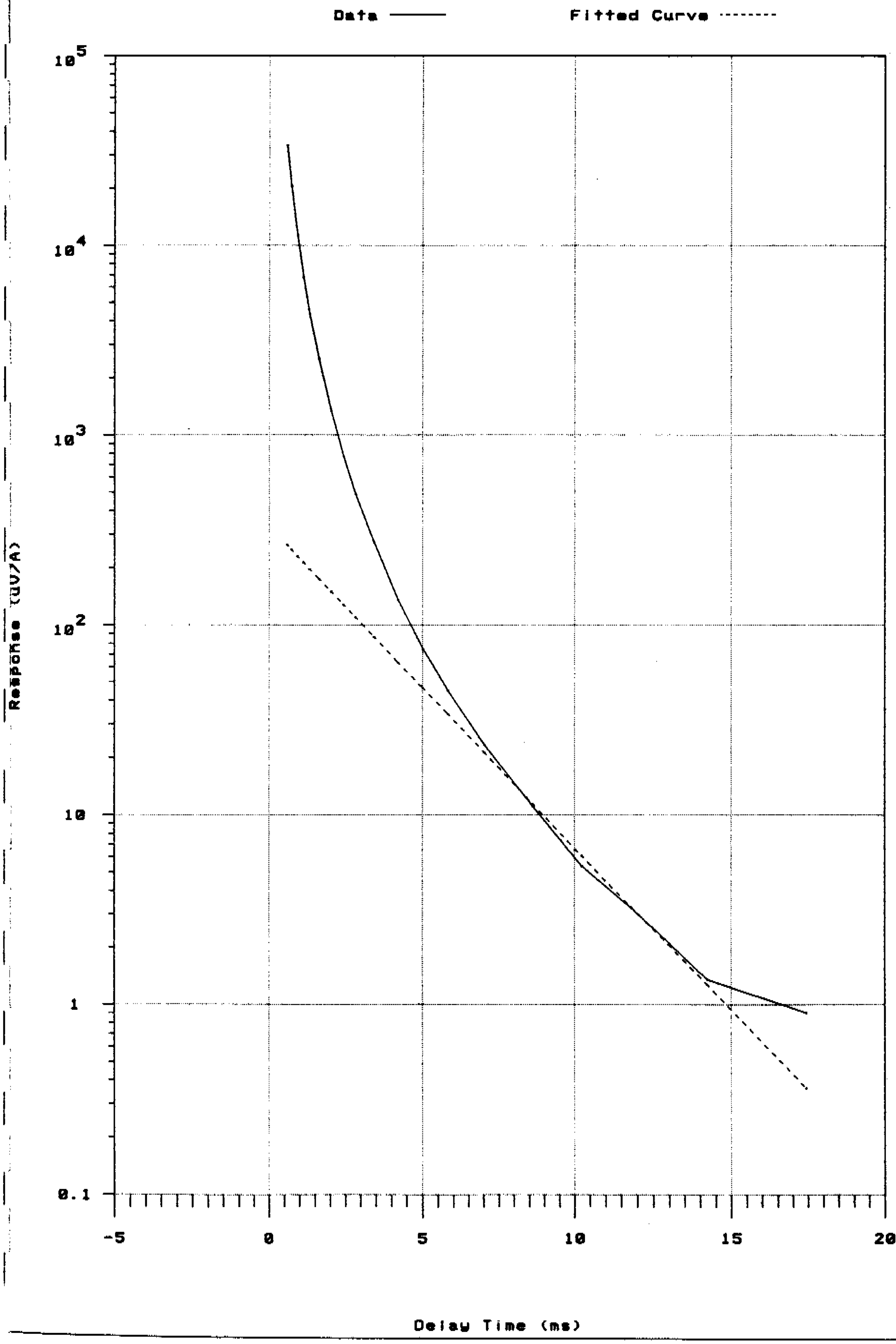


Fig: 3-3-2-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line: 53900N

Stn : 14000E

Fit Params

$d = KEXP(-t/\tau)$

$\tau = 2.56$

$K = 331.42$

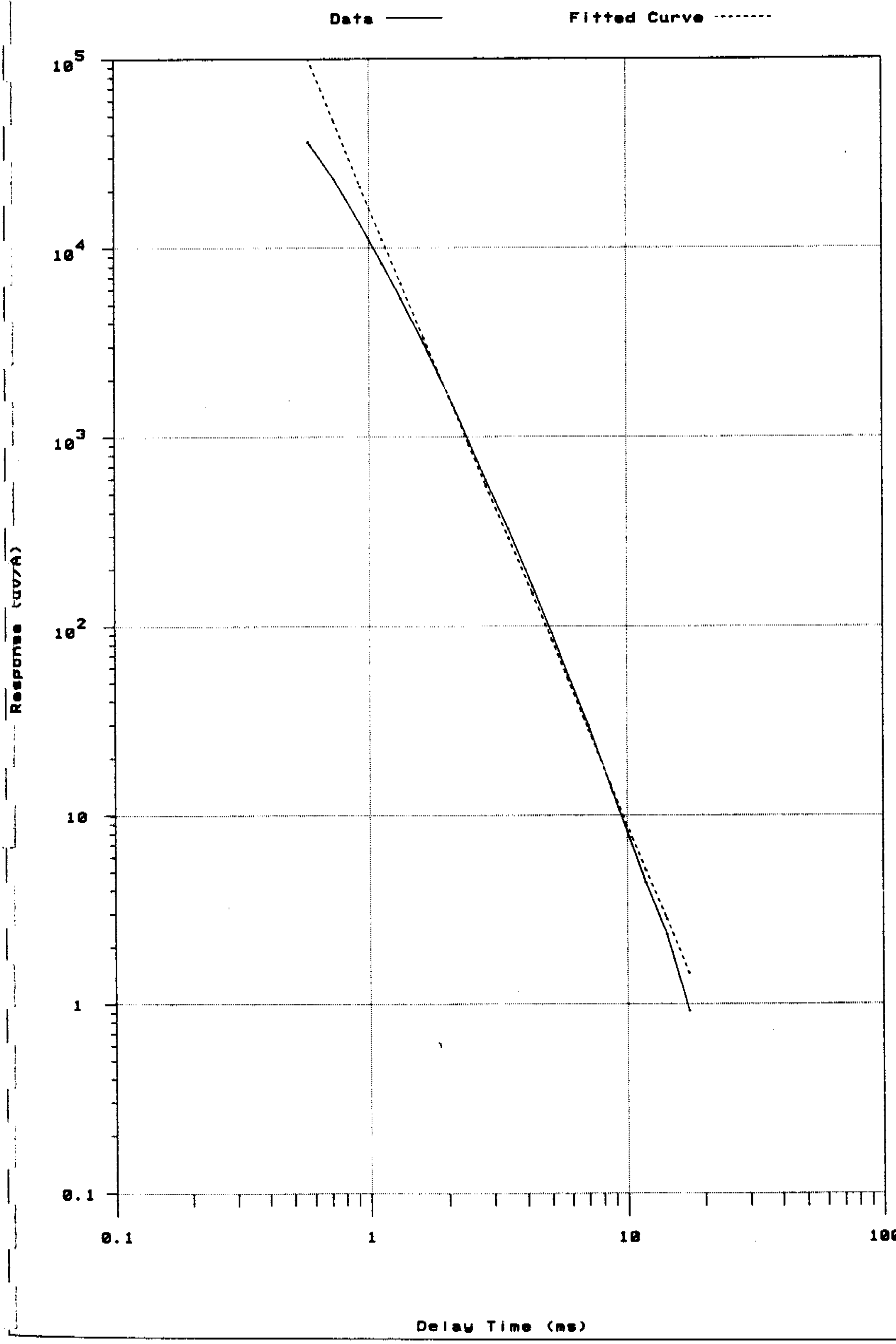
R-Sq = 99.4%

Fig: 3-3-2-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line: 53900N

Stn : 17500E

Fit Params

d = Kt**a

a = -3.26

K = 16340.43

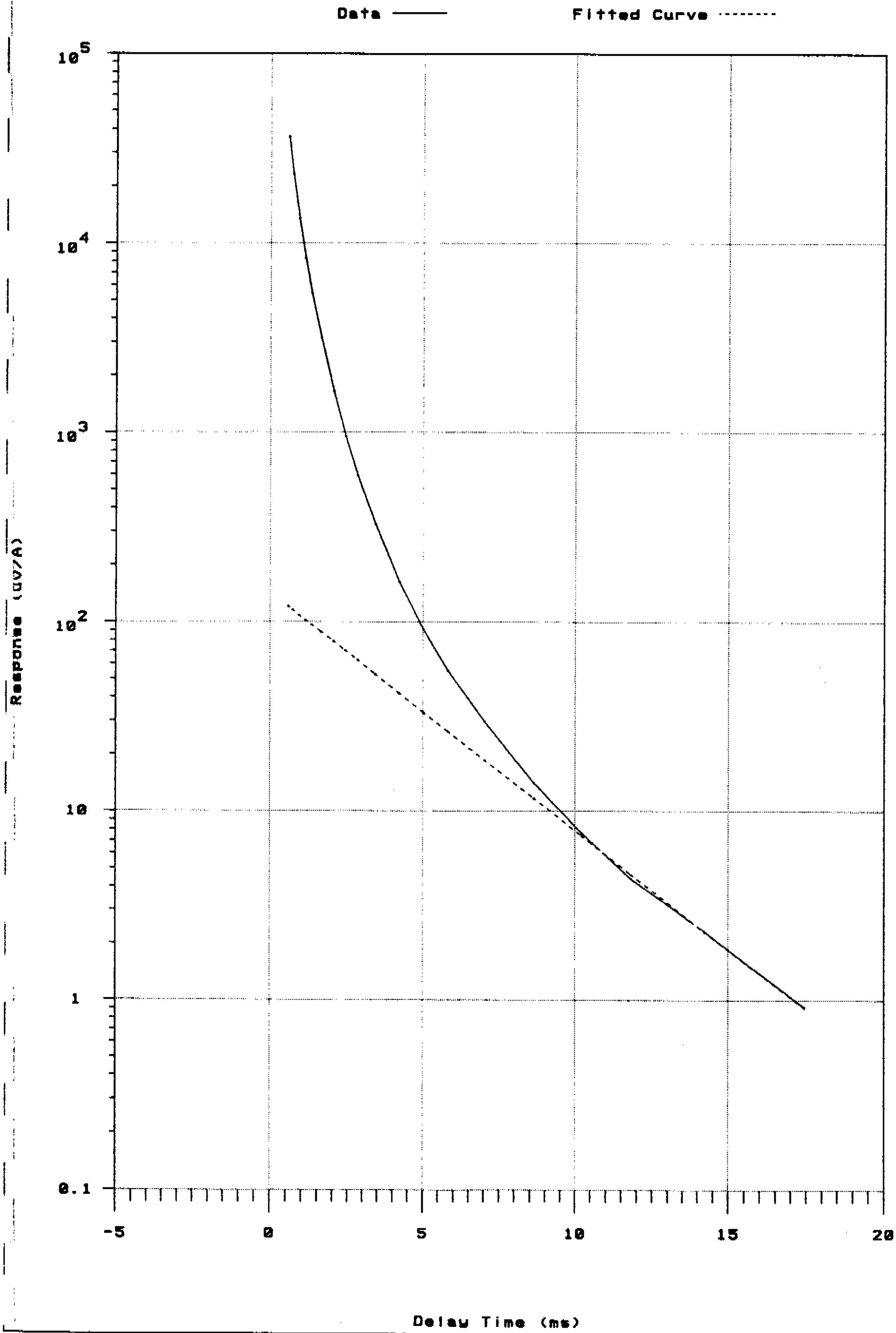
R-Sq = 99.8%

Fig : 3-3-3-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem Mk3 data



Line: 53900N

Stn : 17500E

Fit Params

$d = KEXP(-t/\tau)$

$\tau = 3.45$

K = 142.26

R-Sq = 99.8%

Fig. 3-3-3-2

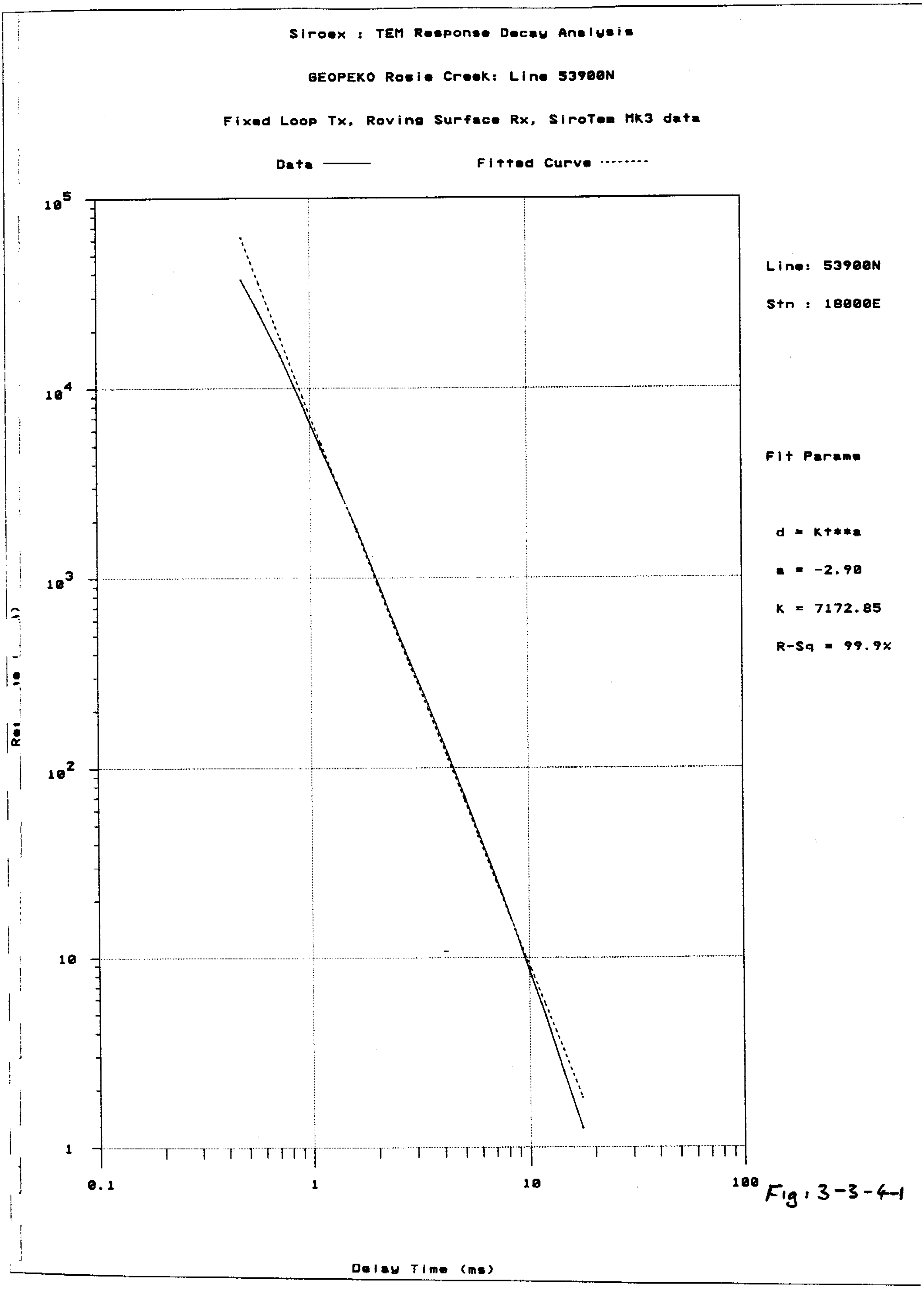
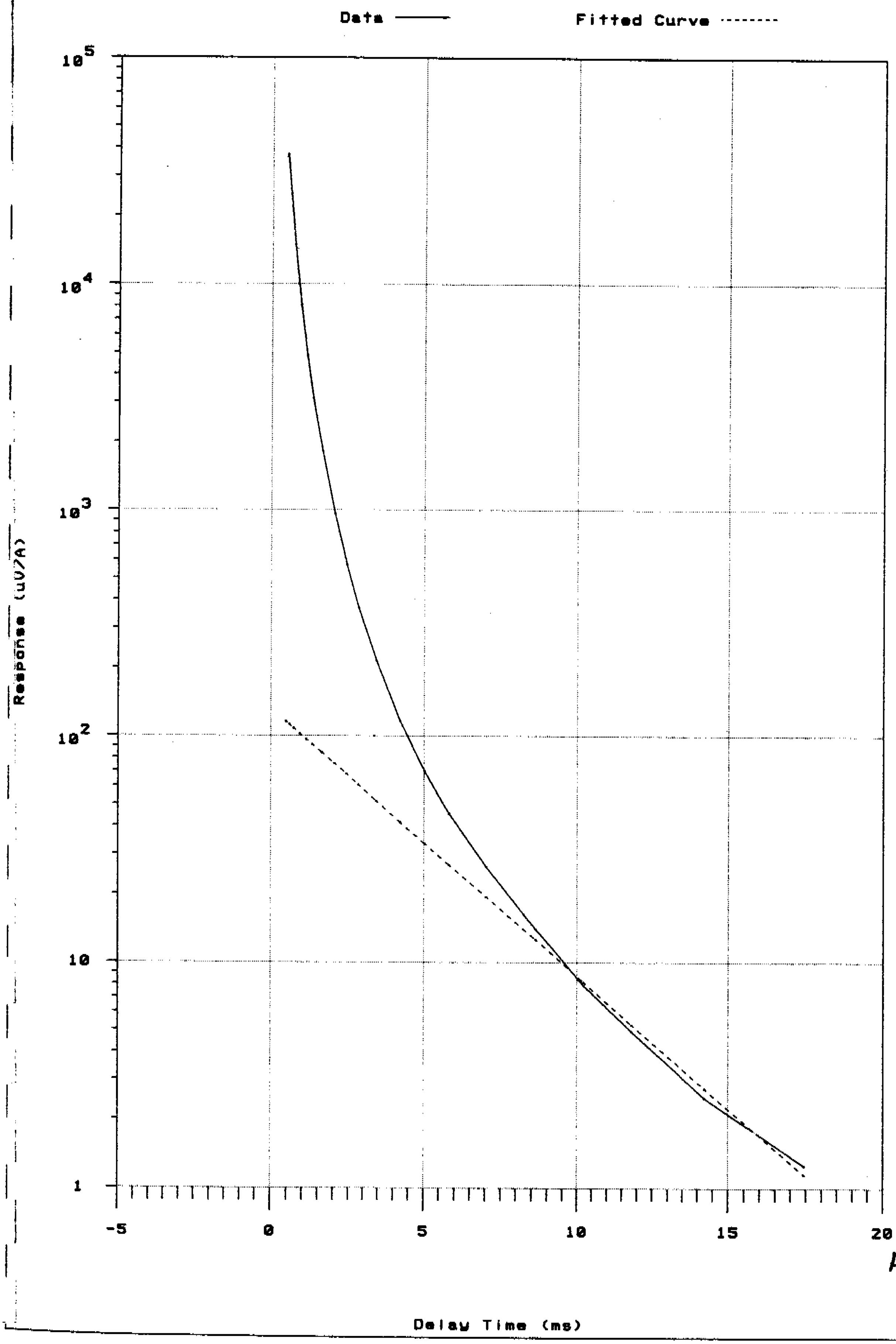

Siroex : TEM Response Decay Analysis
GEOPEKO Rosie Creek: Line 53900N
Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data
Data
Fitted Curve
10^5
10^4
10^3
10^2
10
1
0.1
1
10
100
Delay Time (ms)
Line: 53900N
Stn : 18000E
Fit Params
d = Kt**a
a = -2.90
K = 7172.85
R-Sq = 99.9%

Fig. 3-3-4-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line: 53900N

Stn : 18000E

Fit Params

d = KEXP(-t/τ)

τ = 3.68

k = 131.24

R-Sq = 99.0%

Fig: 3-3-4-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data

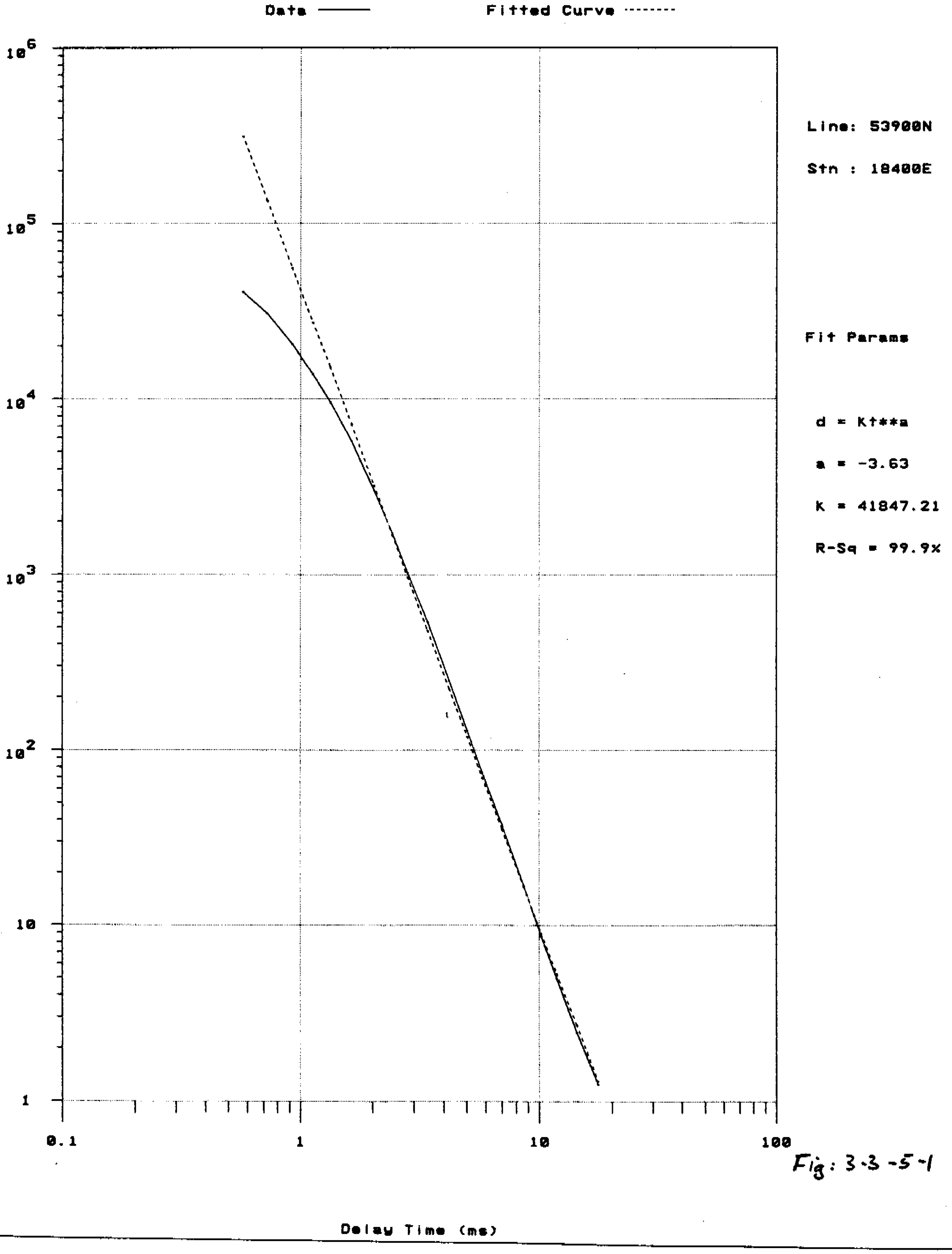


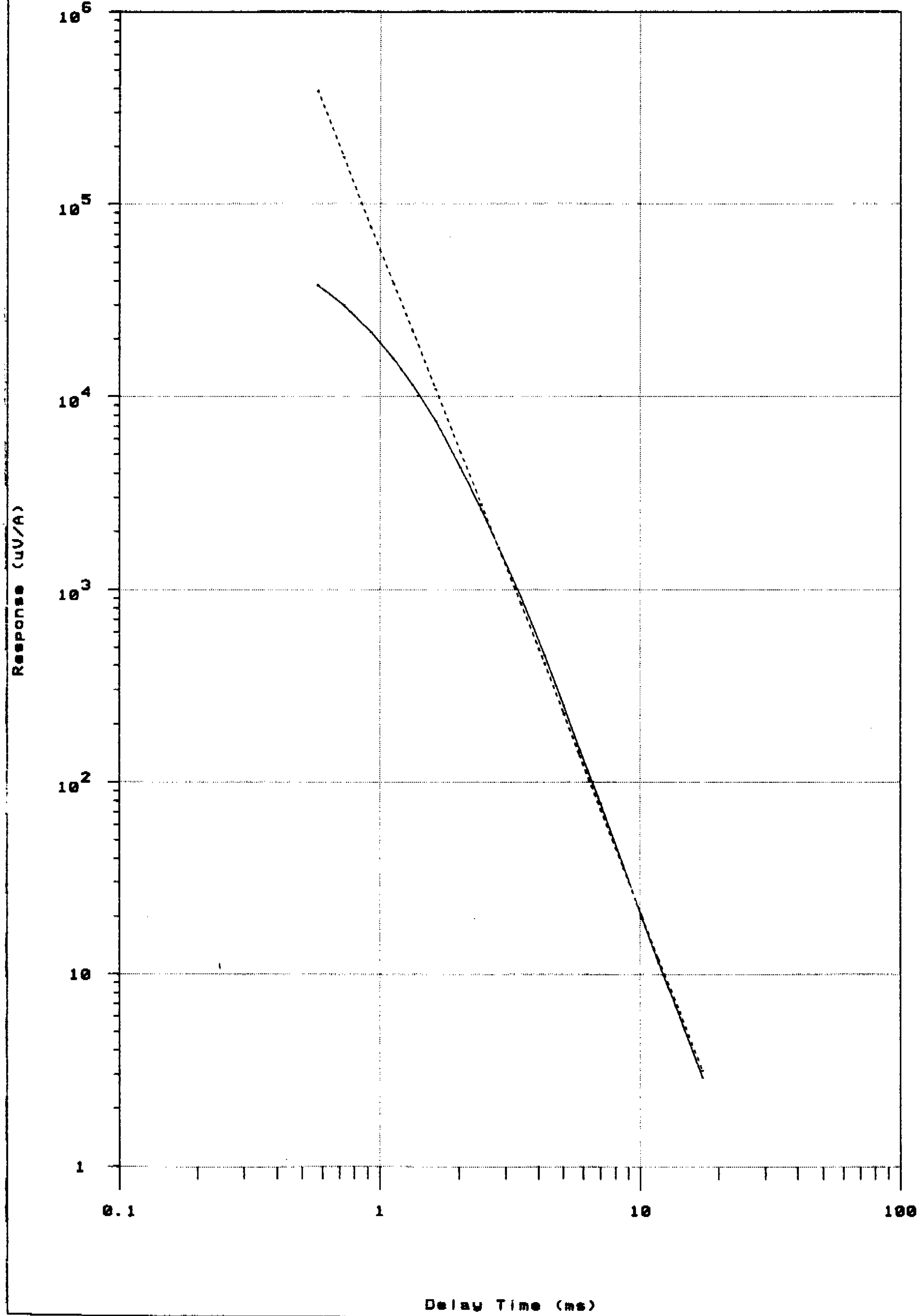
Fig: 3-3-5-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data

Data ——— Fitted Curve ·······



Line: 53900N

Stn : 21000E

Fit Params

d = Kt**a

a = -3.43

K = 57987.60

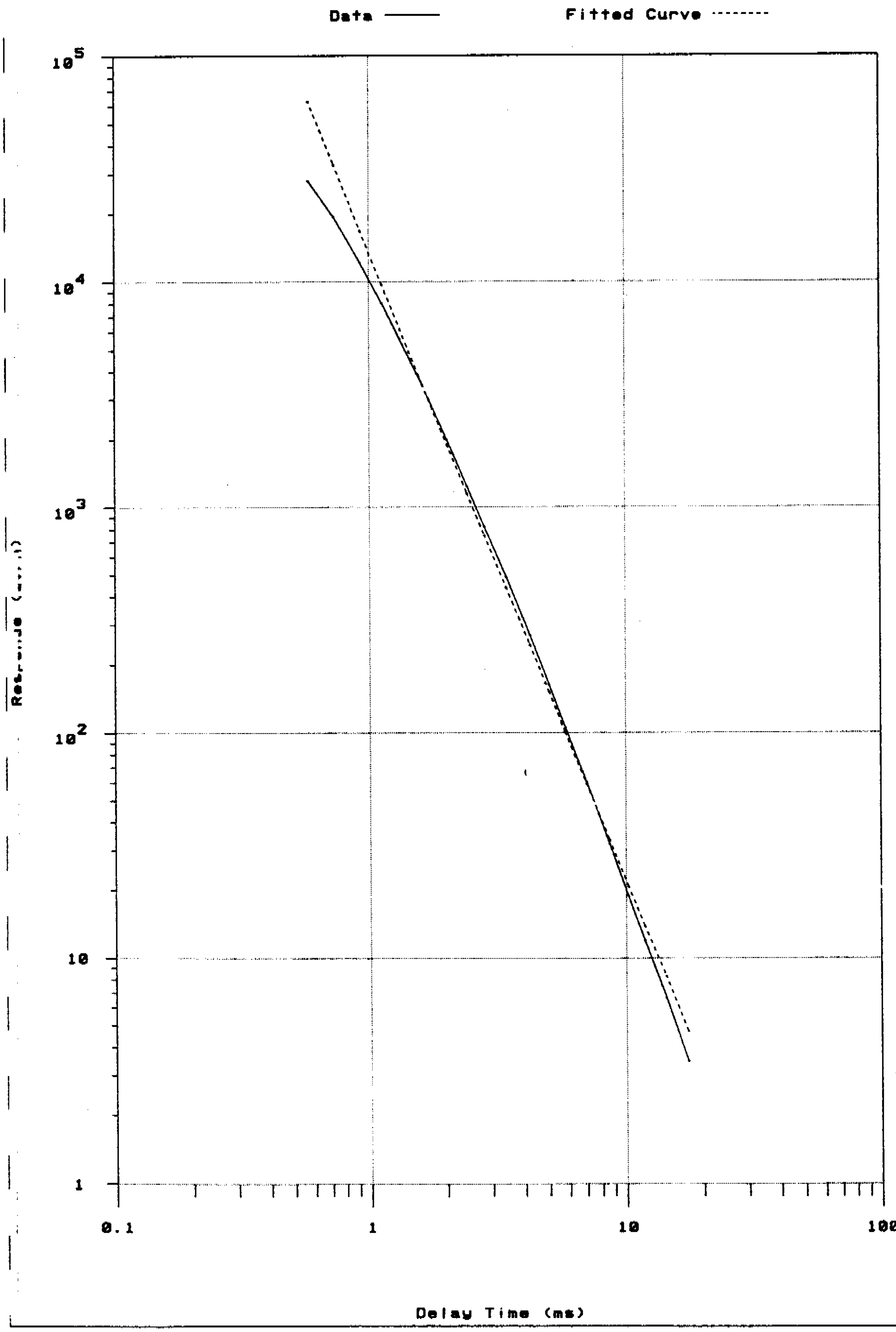
R-Sq = 99.9%

Fig: 3-3-6-1

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 53900N

Fixed Loop Tx, Roving Surface Rx, SiroTem Mk3 data



Line: 53900N

Stn : 21500E

Fit Params

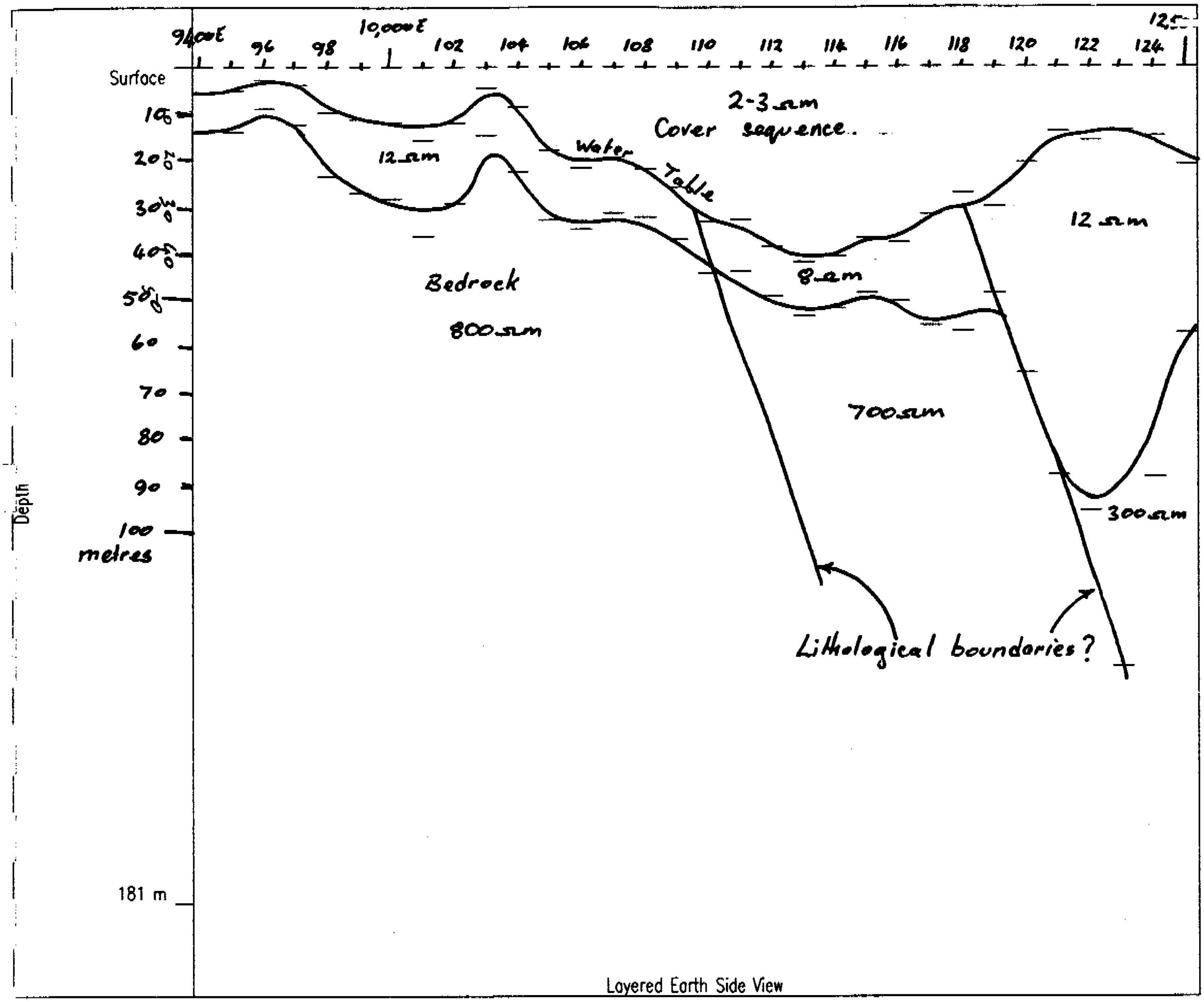
d = Kt**a

a = -2.78

K = 13444.71

R-Sq = 99.8%

Fig: 3-3-7-1



Survey : GEOPEKO, Rosie Creek : Line 53900N

Tx Area : 10000

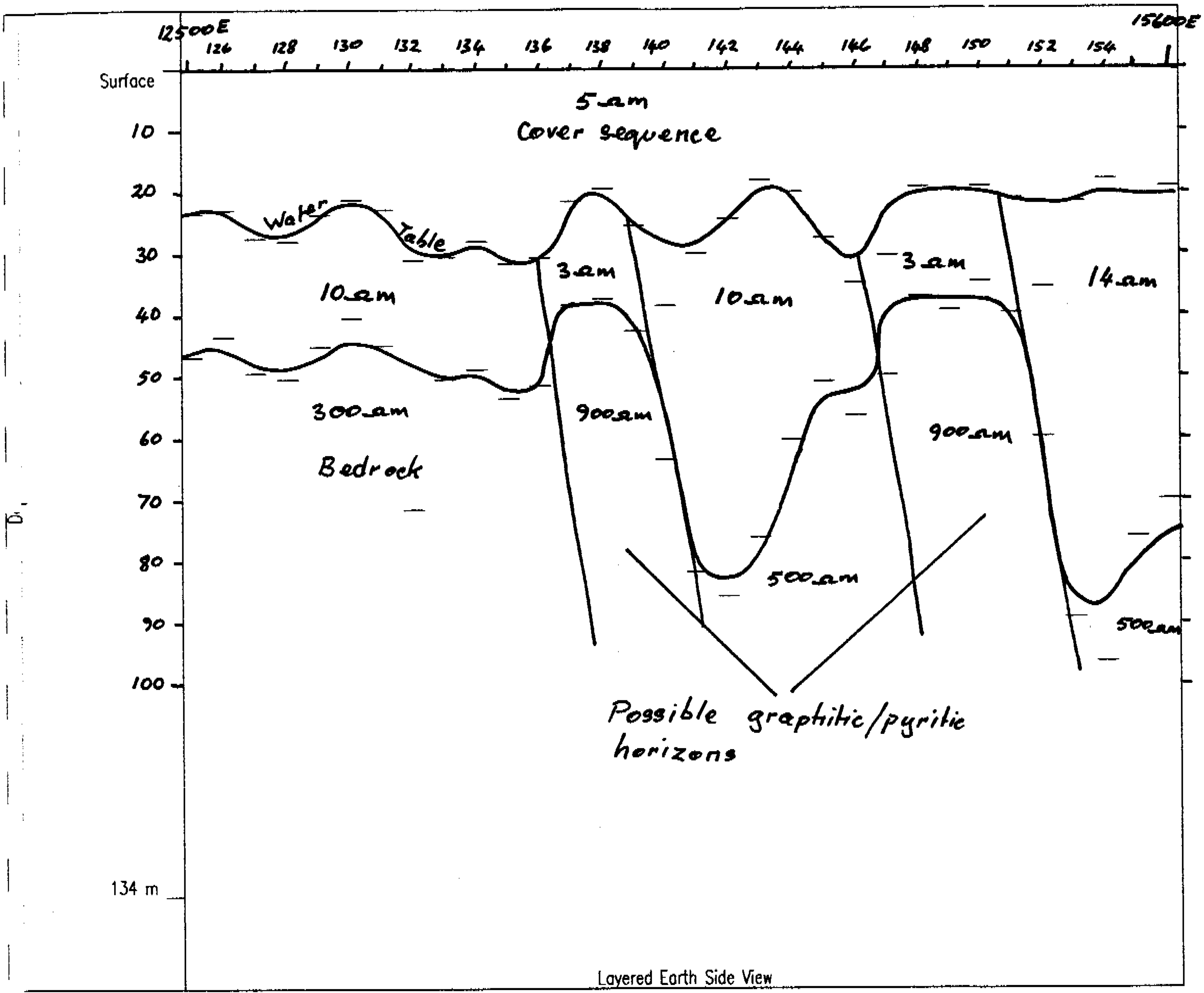
Rx Area : 10000

Instrument : SiroTem MK3

Channels : Composite Times

Profile : 53900N

Figure 3-4



Survey : GEOPEKO Rosie Creek : Line 53900N

Tx Area : 40000

Rx Area : 10000

Instrument : SiroTem MK3

Channels : Composite Times

Profile : 53900N

Figure 3-5

Siro-ex : TEM Response Profile

Rosie Creek

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

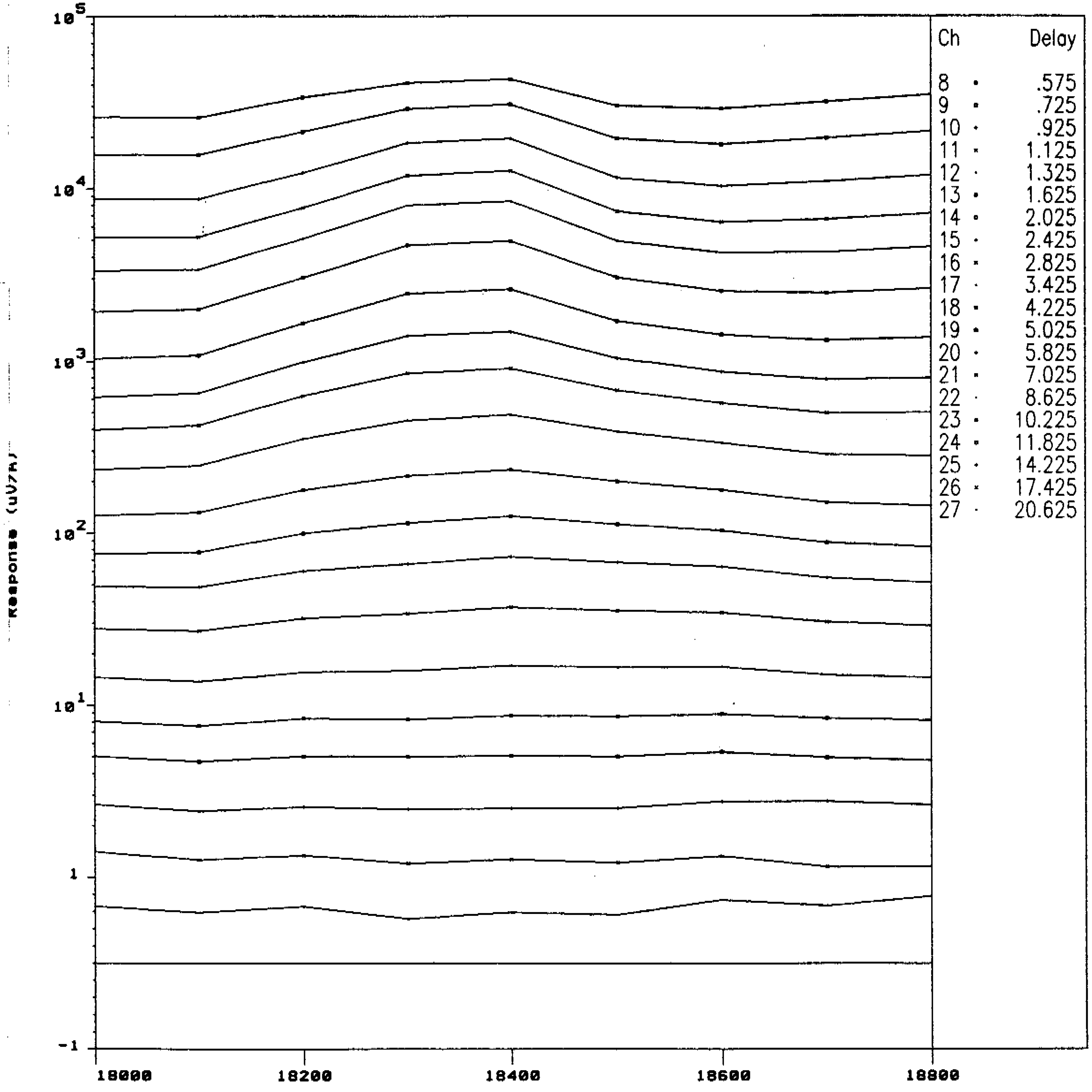


Fig: 4-1

Siro-ex : TEM Response Profile

Rosie Creek

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

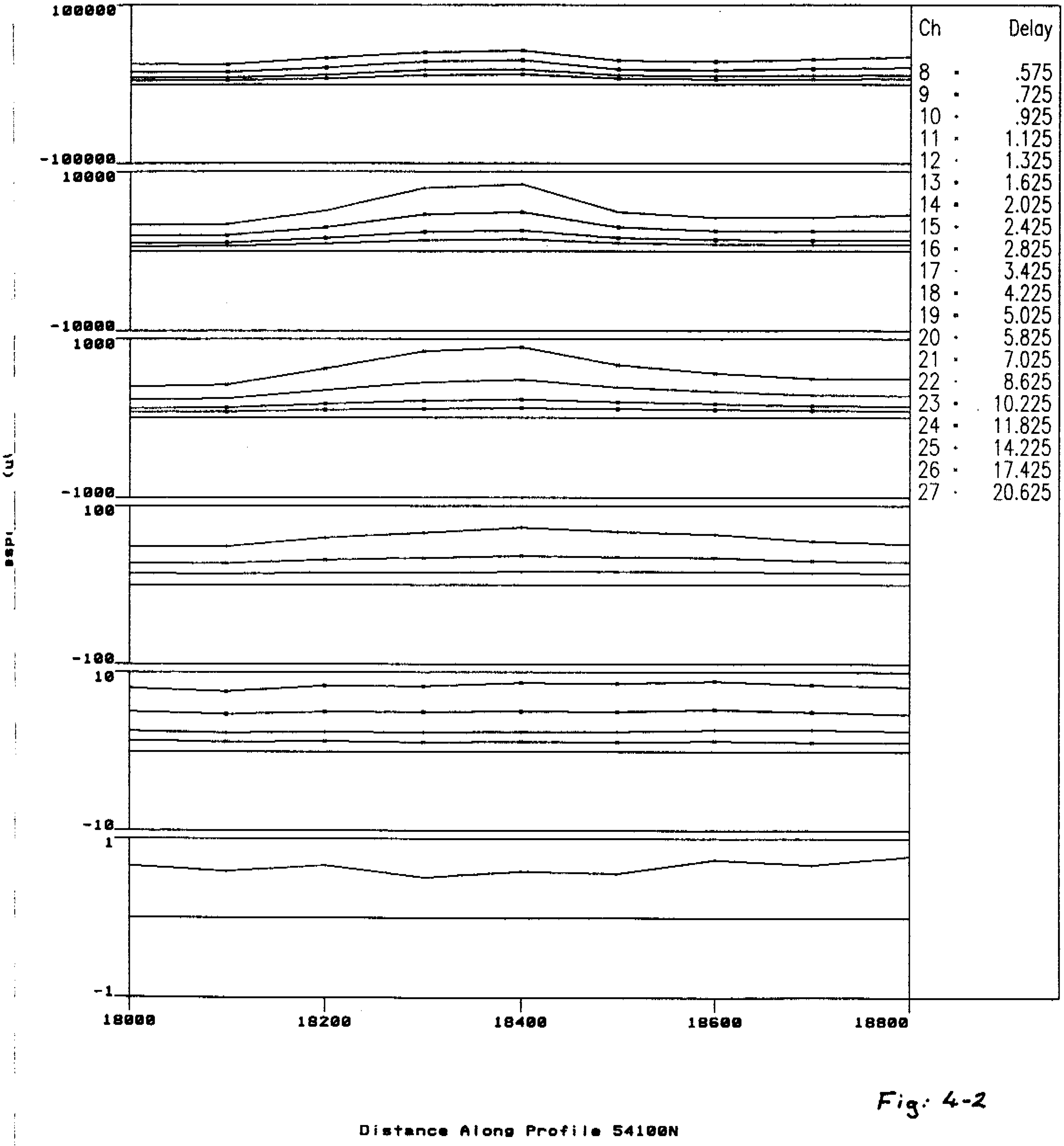


Fig. 4-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx. In Loop Dipole Rx. I Component

Field Data Only

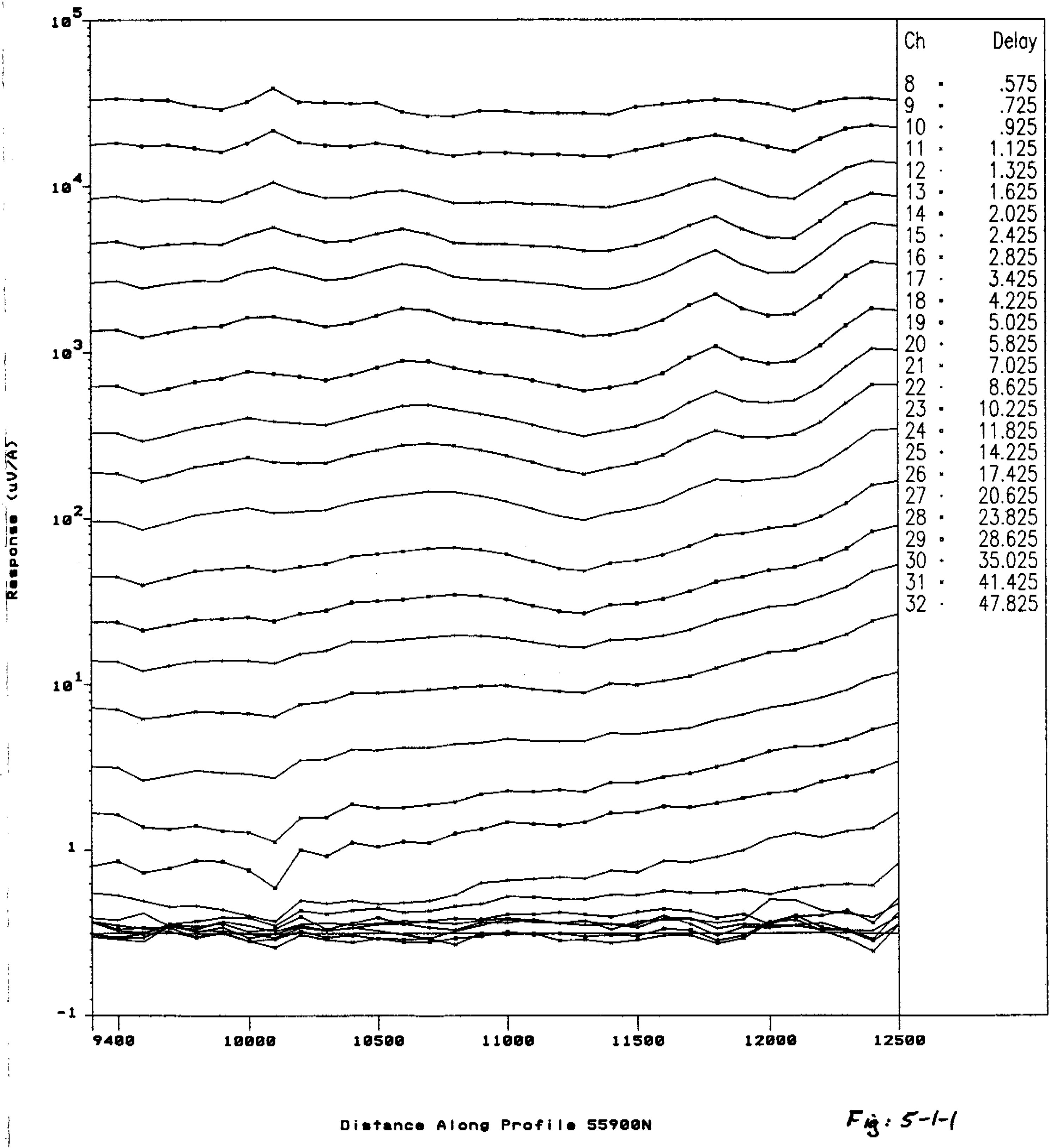


Fig: 5-1-1

Siro-ex : TEM Response Profile

Rosie Creek

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

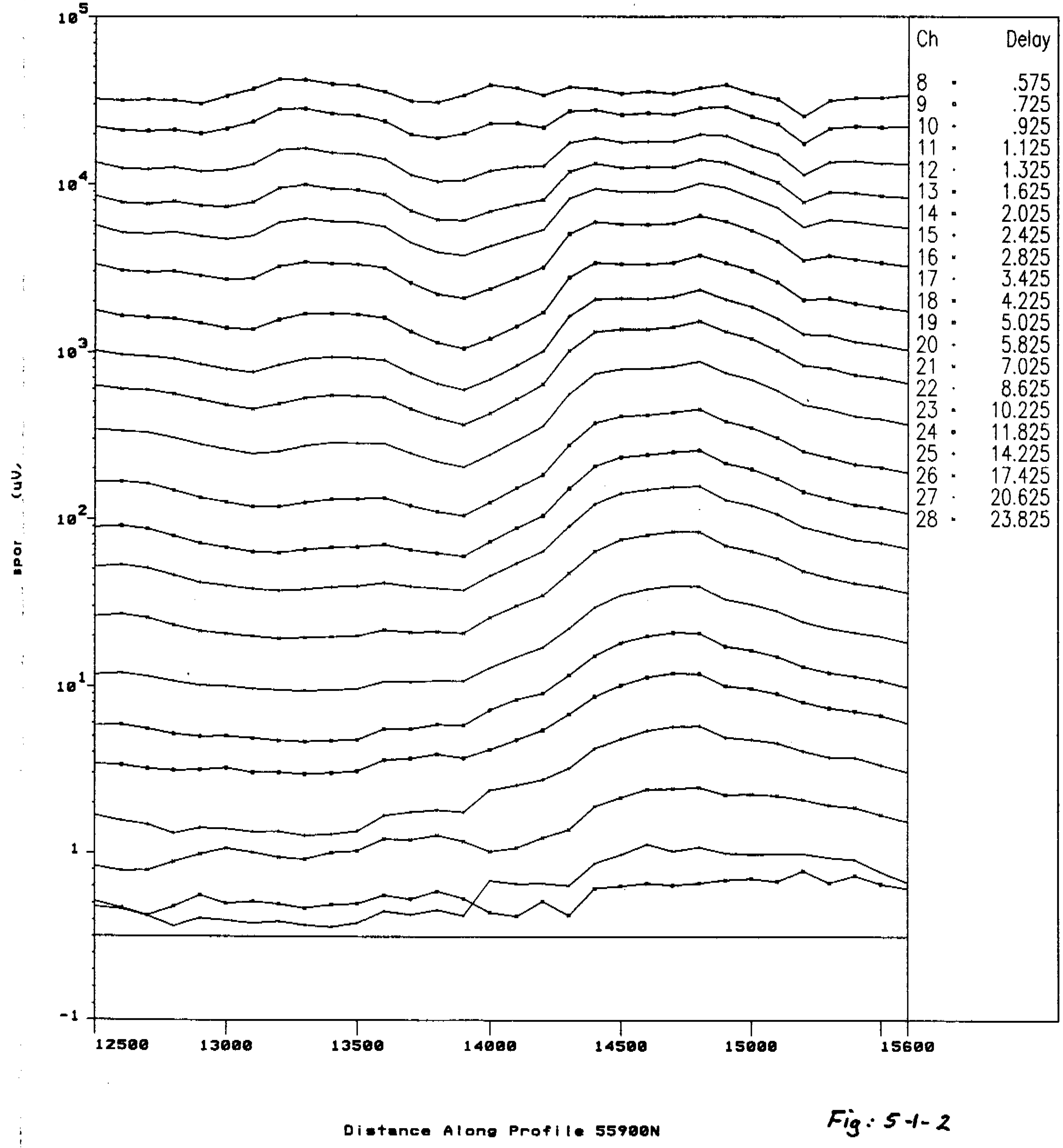


Fig.: 5-1-2

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

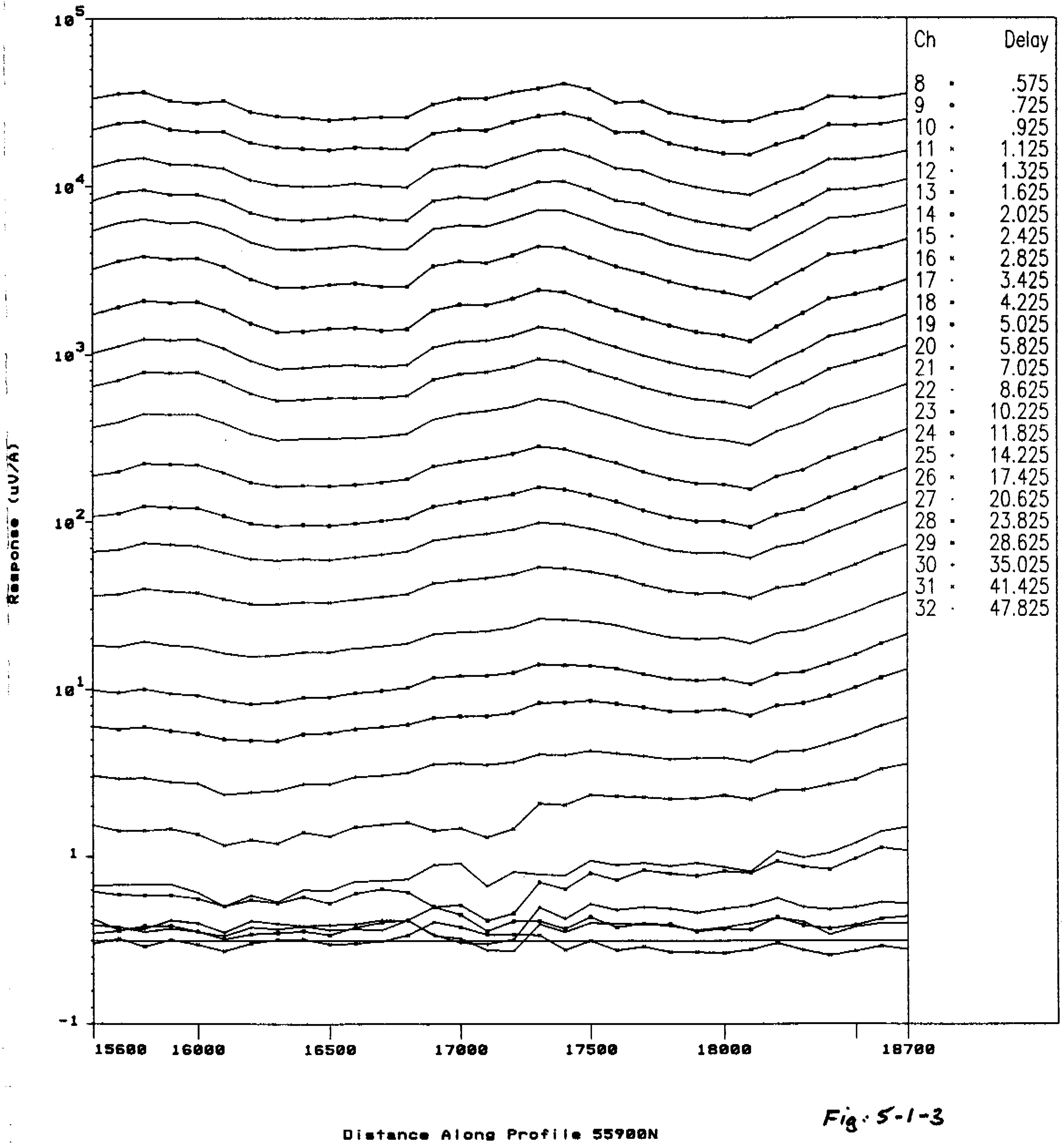


Fig. 5-1-3

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

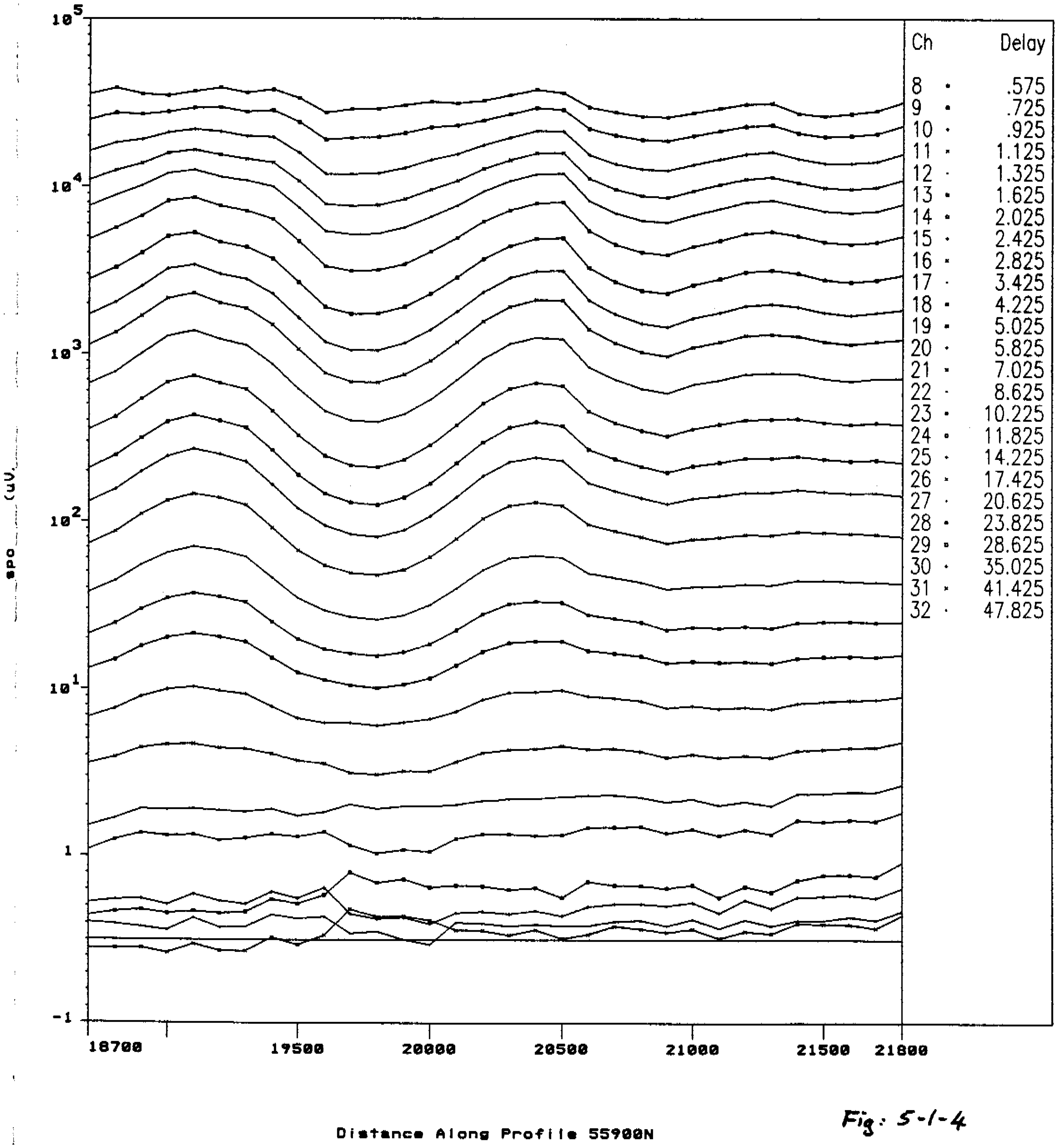


Fig: 5-1-4

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

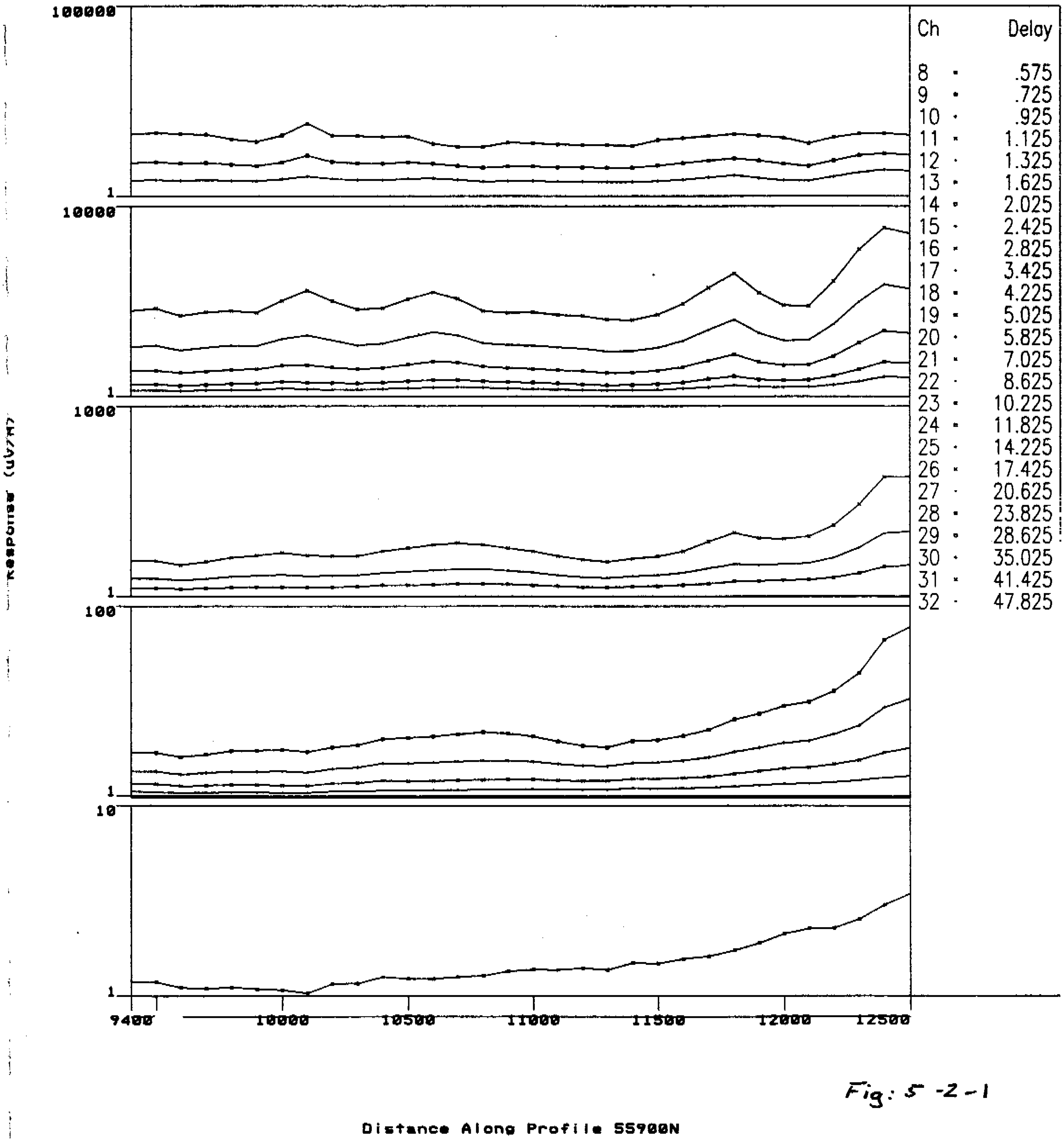


Fig: 5-2-1

Siro-ex : TEM Response Profile

GEOPEXO Rosie Creek: Line 55900N

Fixed Loop Tx, Roving Surface Rx, Z Component

Field Data Only

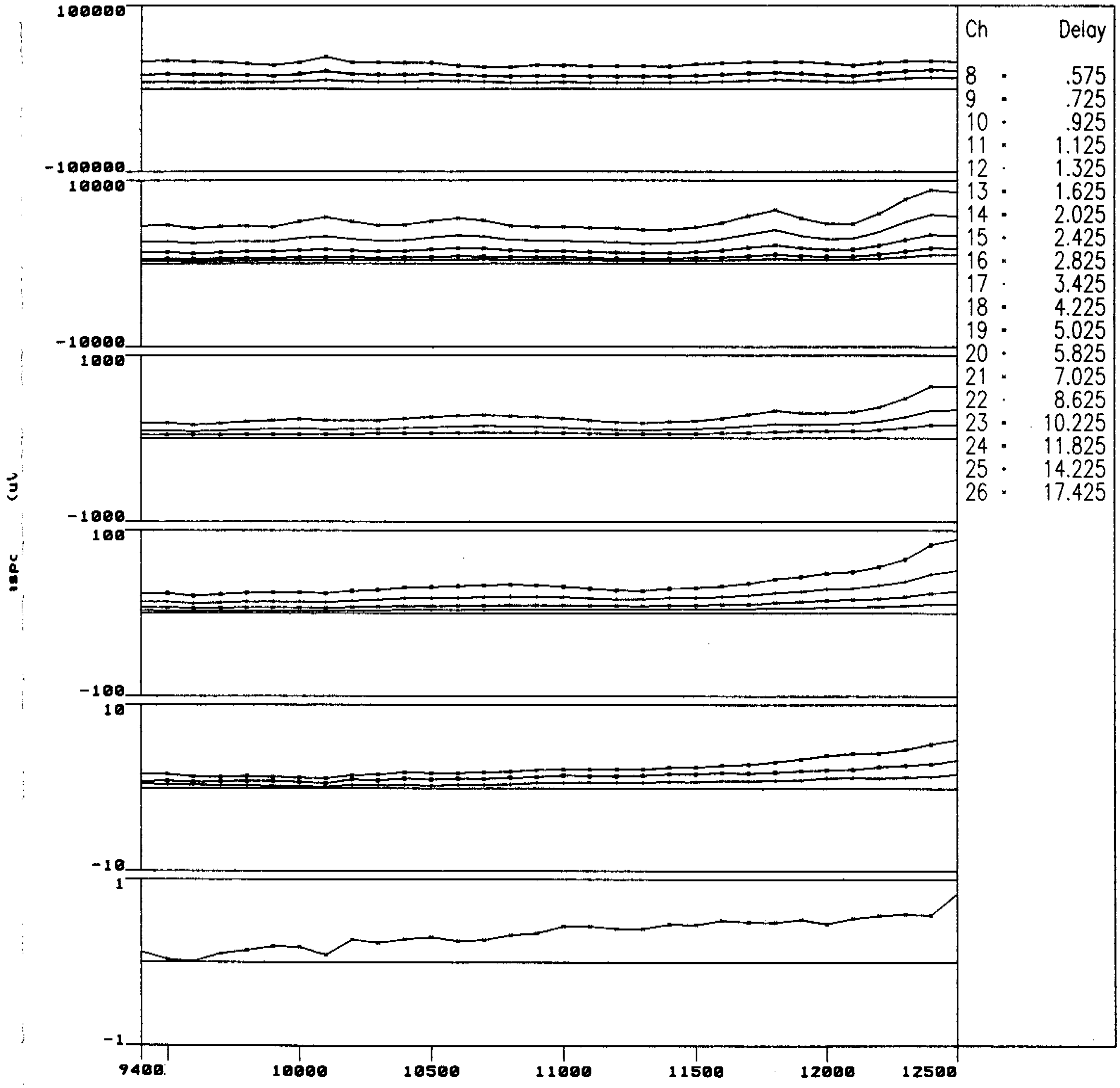


Fig: 5-21 (b)

Siro-ex : TEM Response Profile

Rosie Creek

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

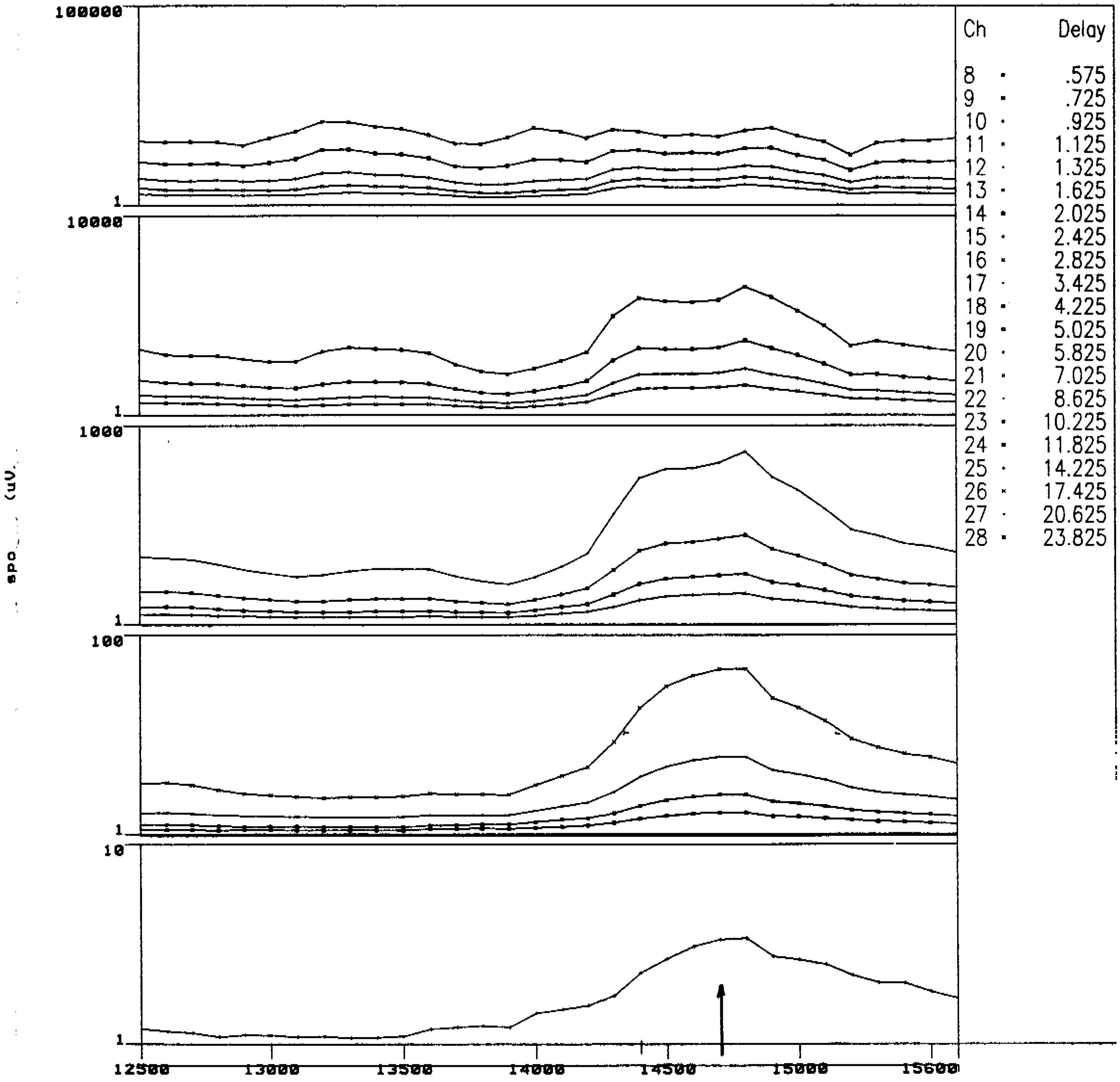


Fig: 5-22

Distance Along Profile 55900N

Siro-ex : TEM Response Profile

GEOPEKO Rosia Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, I Component

Field Data Only

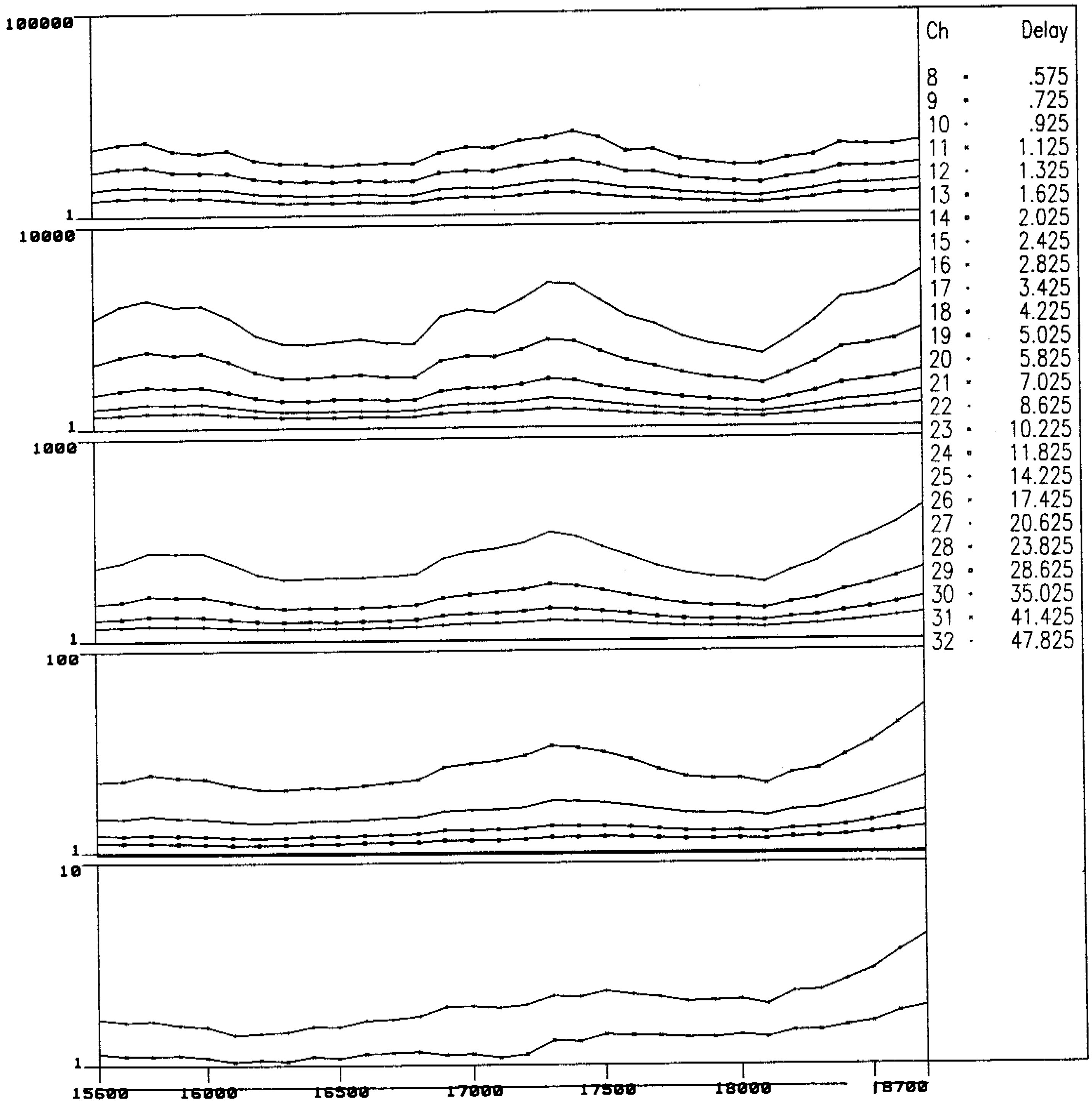


Fig. 5-2-3

Distance Along Profile 55900N

Siro-ex : TEM Response Profile

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, I Component

• Field Data Only

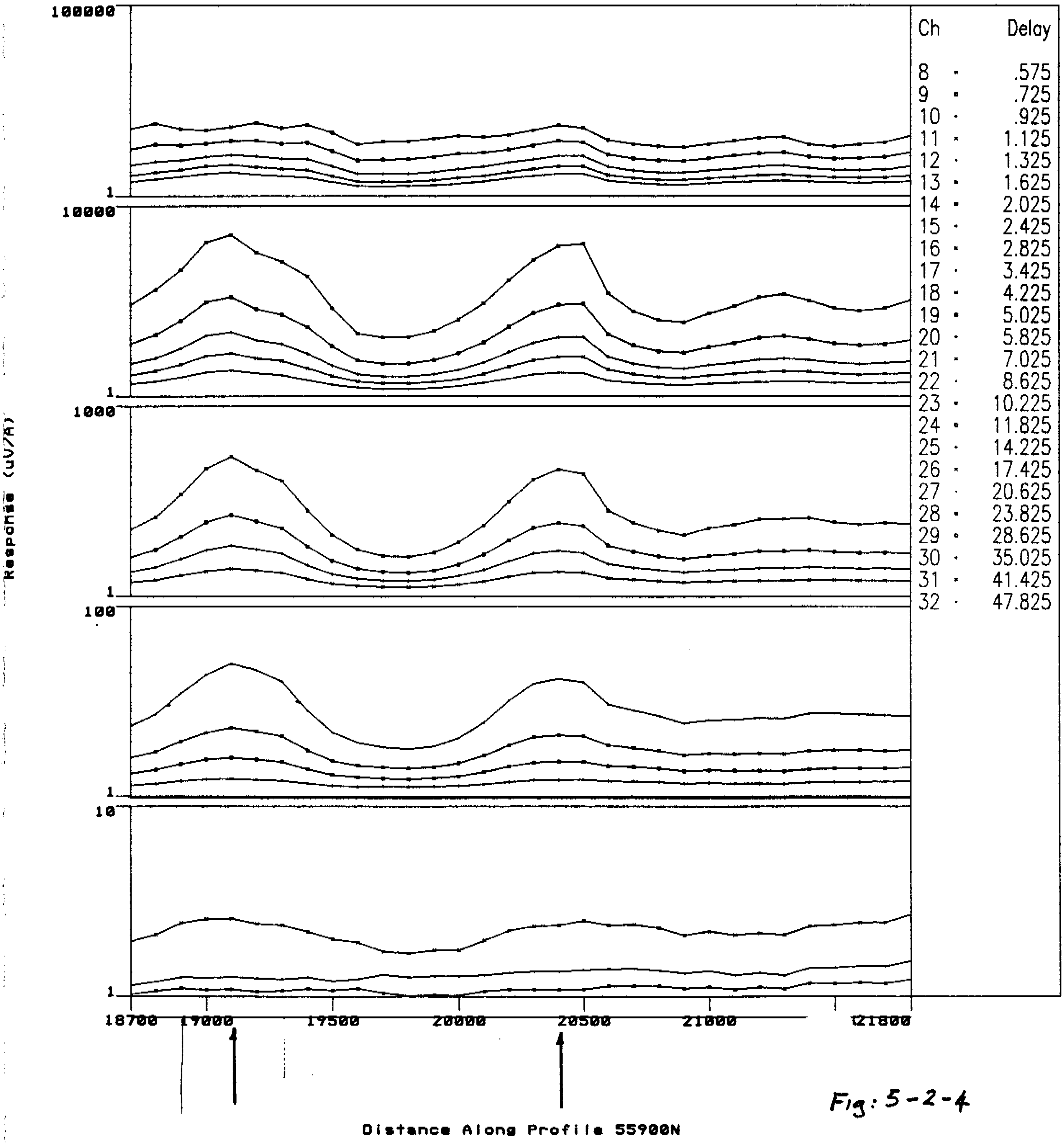


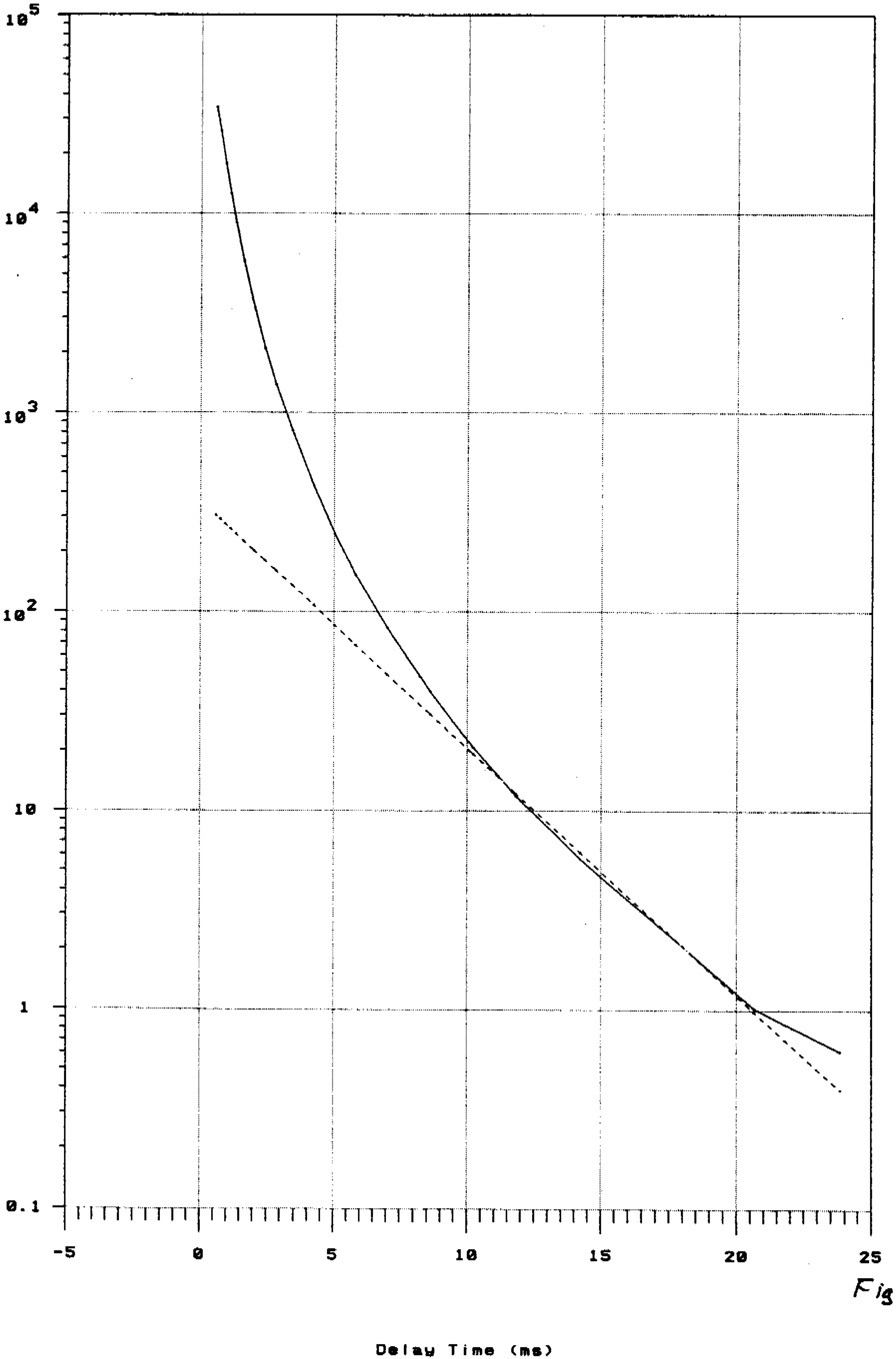
Fig: 5-2-4

Siroex : TEM Response Decay Analysis

Rosie Creek

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data

Data ——— Fitted Curve -------



Line: 55900N

Stn : 14700E

Fit Params

$d = K\mathrm{EXP}(-t/\tau)$

$\tau = 3.50$

$K = 360.33$

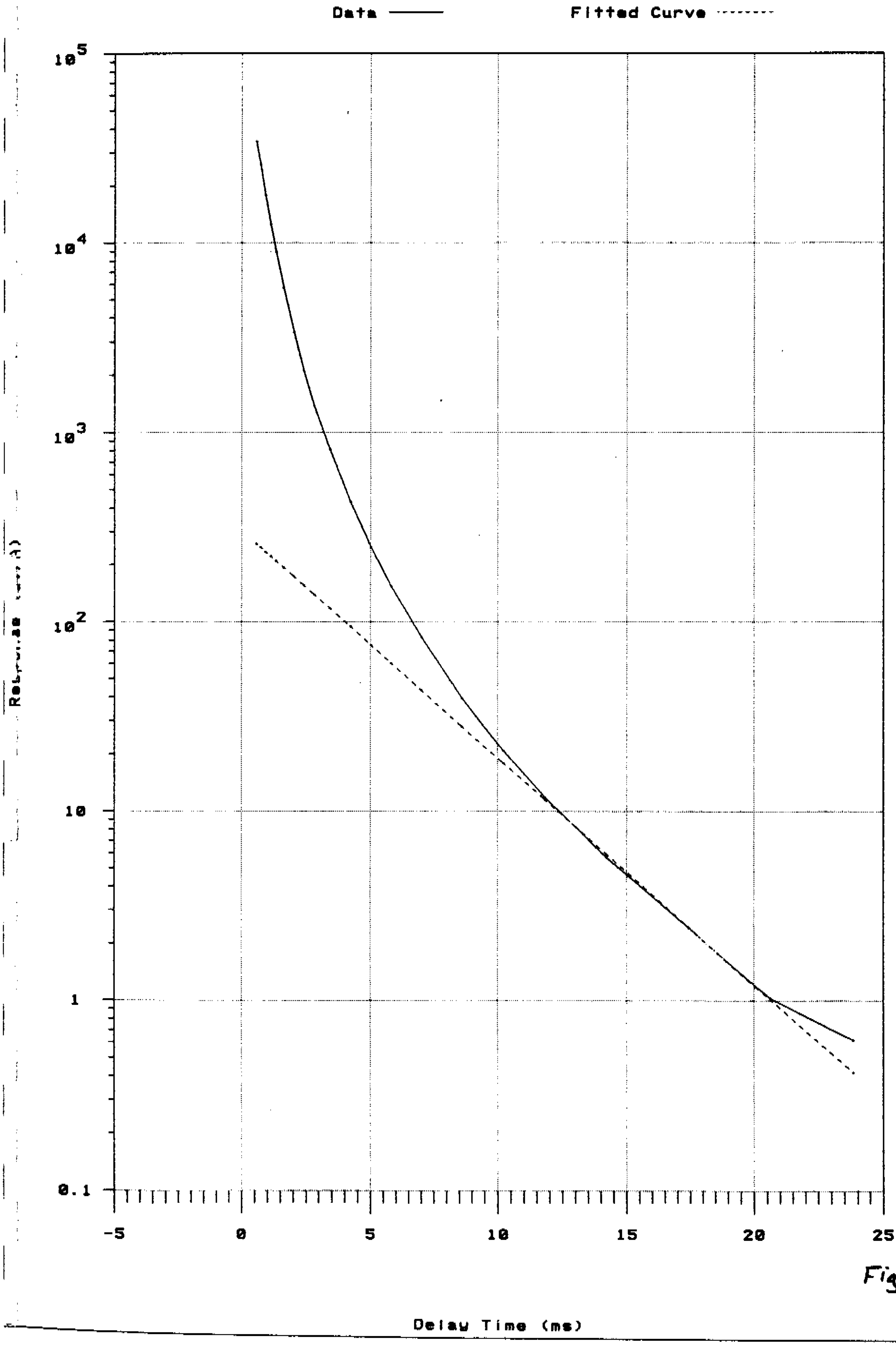
R-Sq = 99.8%

Fig: 5-3-1-1

Siroex : TEM Response Decay Analysis

Rosie Creek

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line: 55900N

Stn : 14700E

Fit Params

d = KEXP(-t/τ)

τ = 3.62

K = 303.09

R-Sq = 99.9%

Fig: 5-3-1-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem Mk3 data

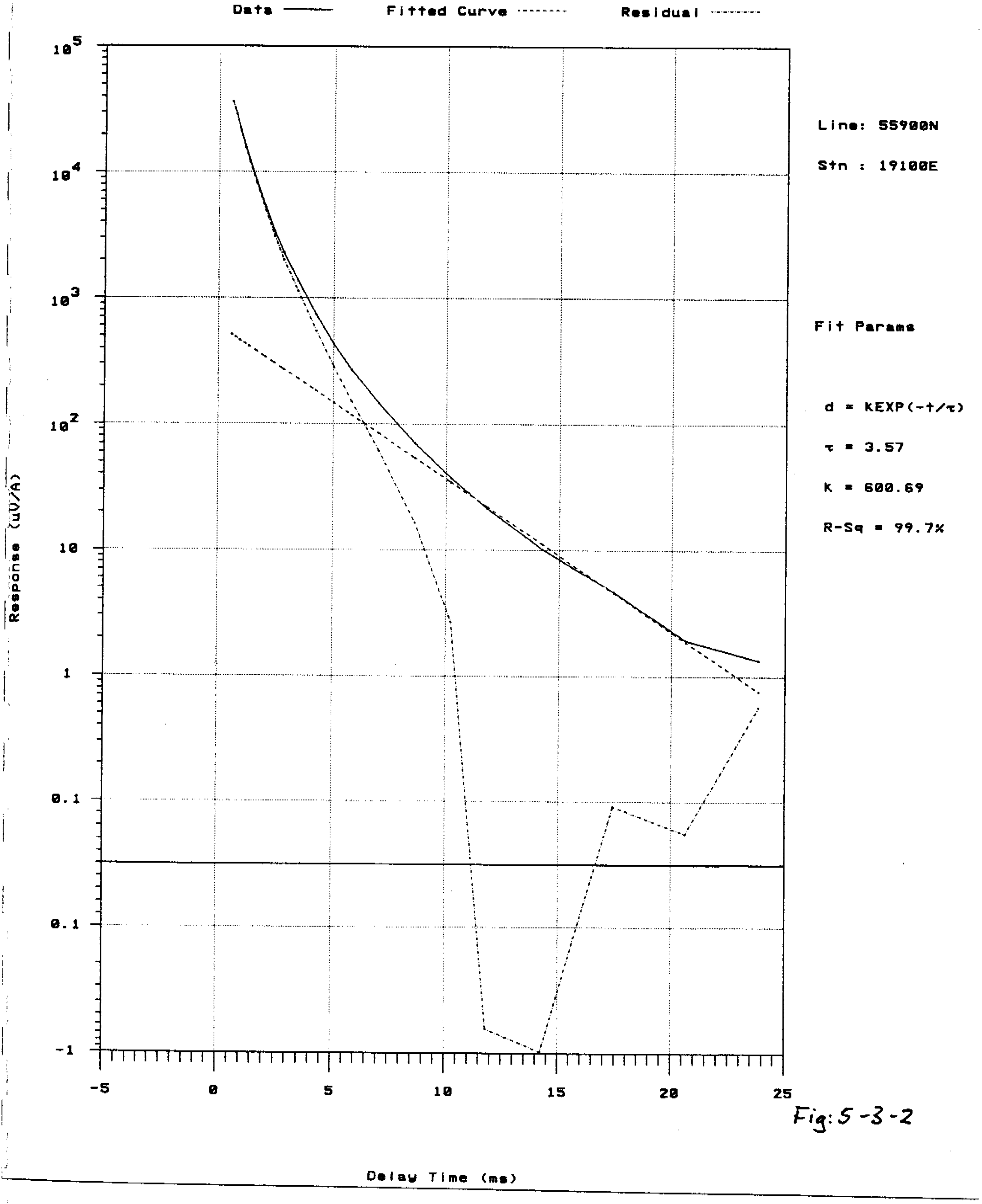
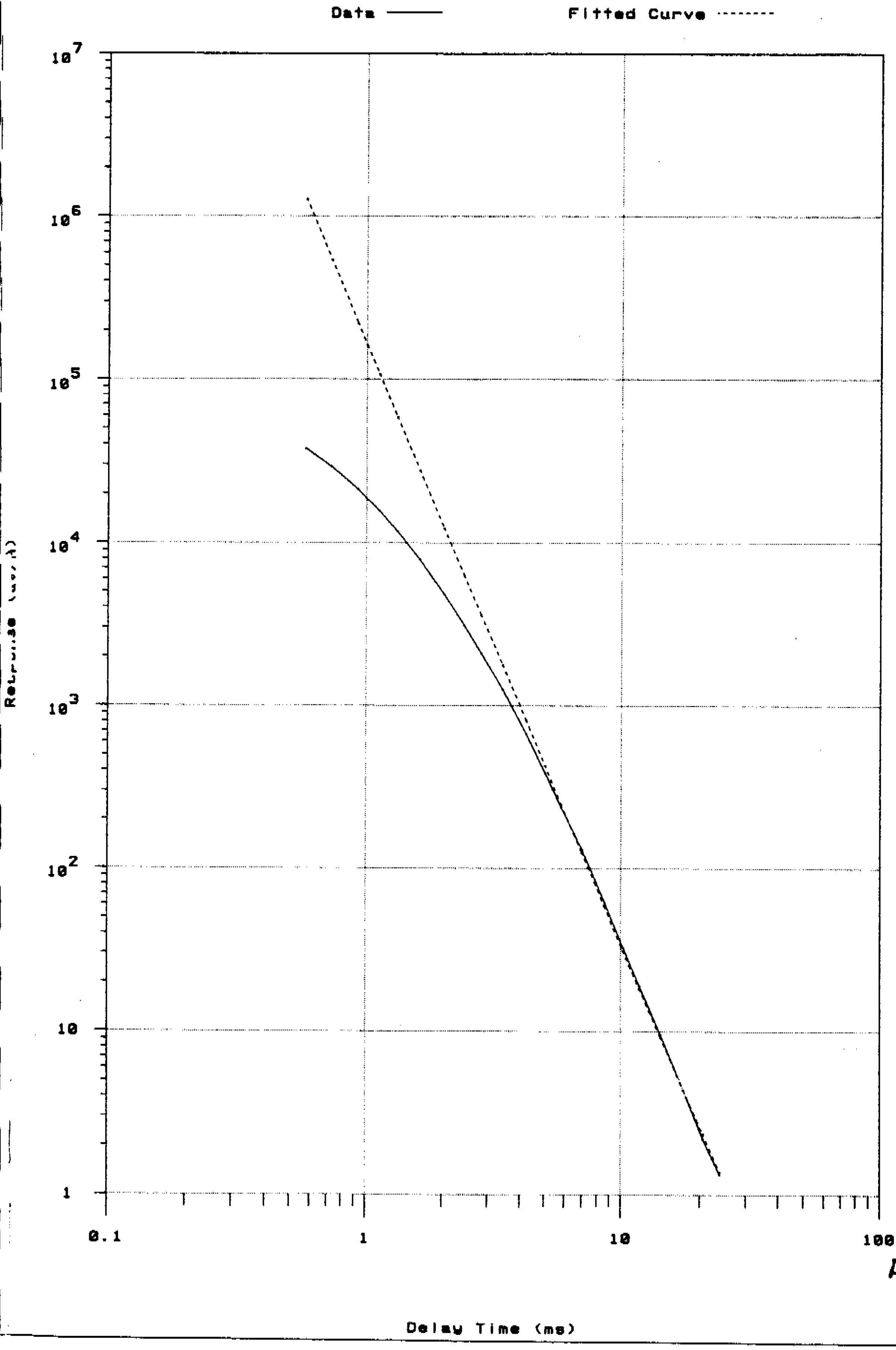


Fig: 5-3-2

Siroex : TEM Response Decay Analysis

GEOPEKO Rosie Creek: Line 55900N

Moving Loop Tx, In Loop Dipole Rx, SiroTem MK3 data



Line: 55900N

Stn : 20400E

Fit Params

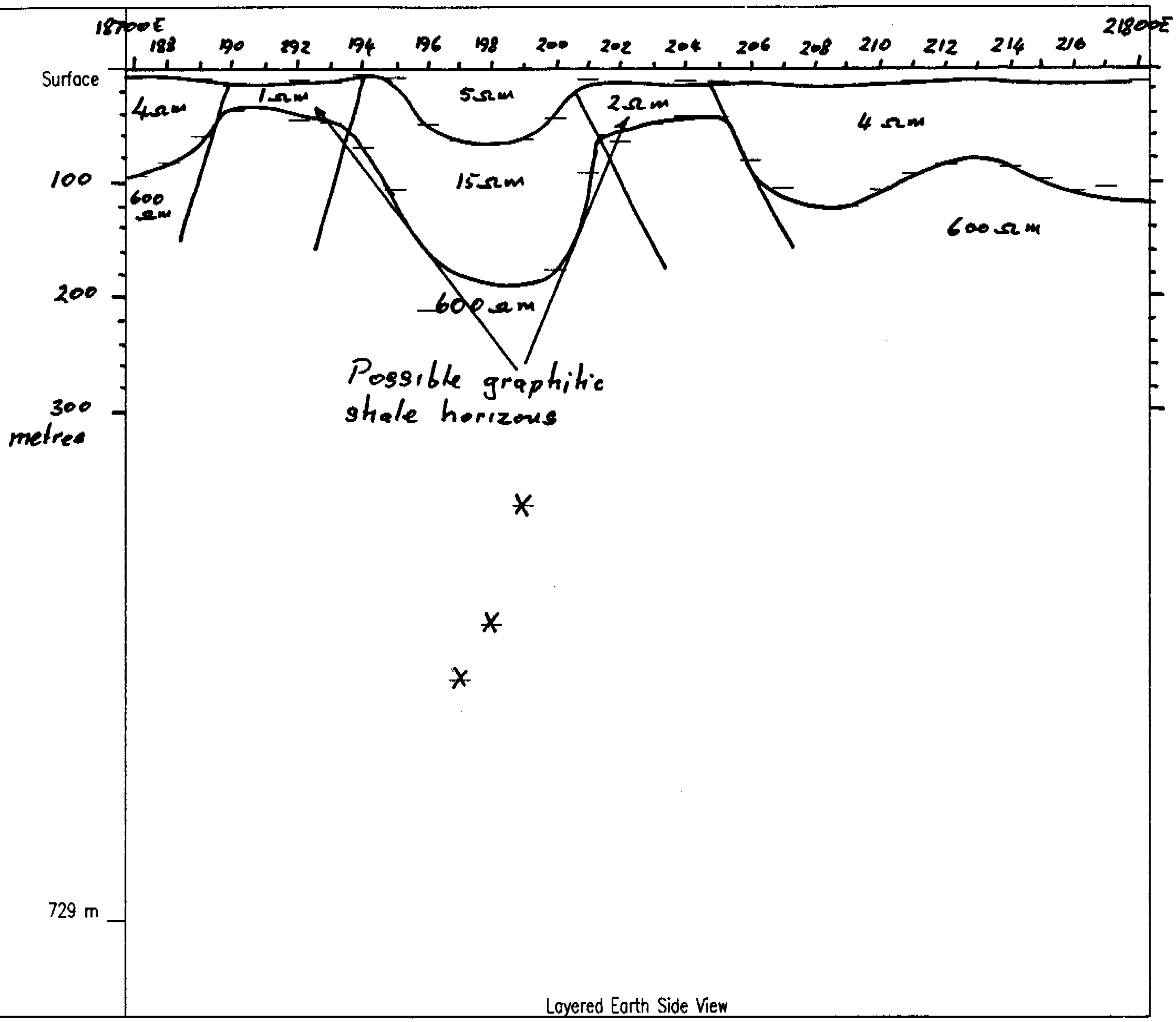
d = Kt**a

a = -3.69

K = 165232.71

R-Sq = 99.9x

Fig. 5-3-3



Survey : GEOPEKO, Rosie Creek : Line 55900N

Tx Area : 40000

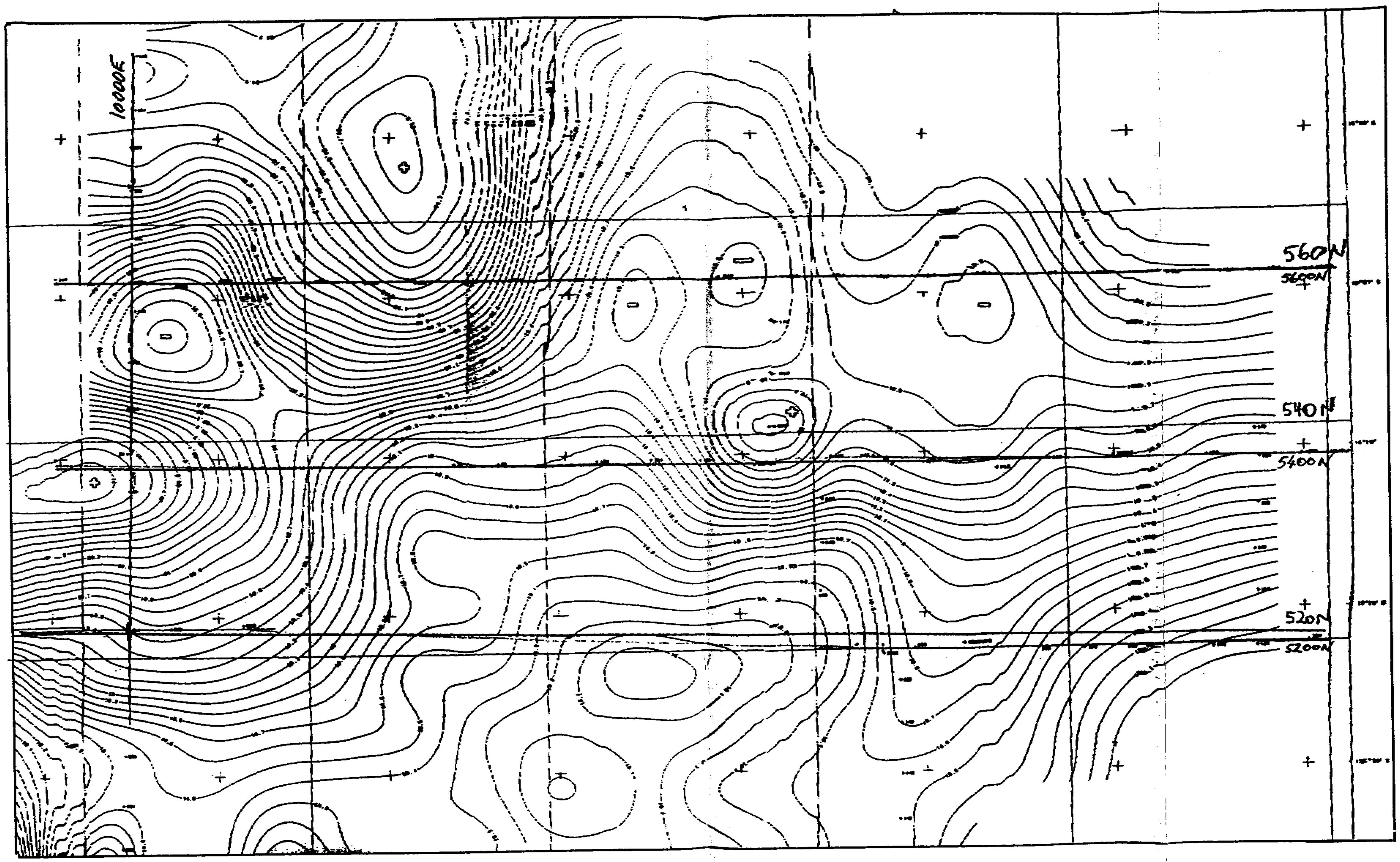
Rx Area : 10000

Instrument : SiroTem MK3

Channels : Composite Times

Profile : 55900N

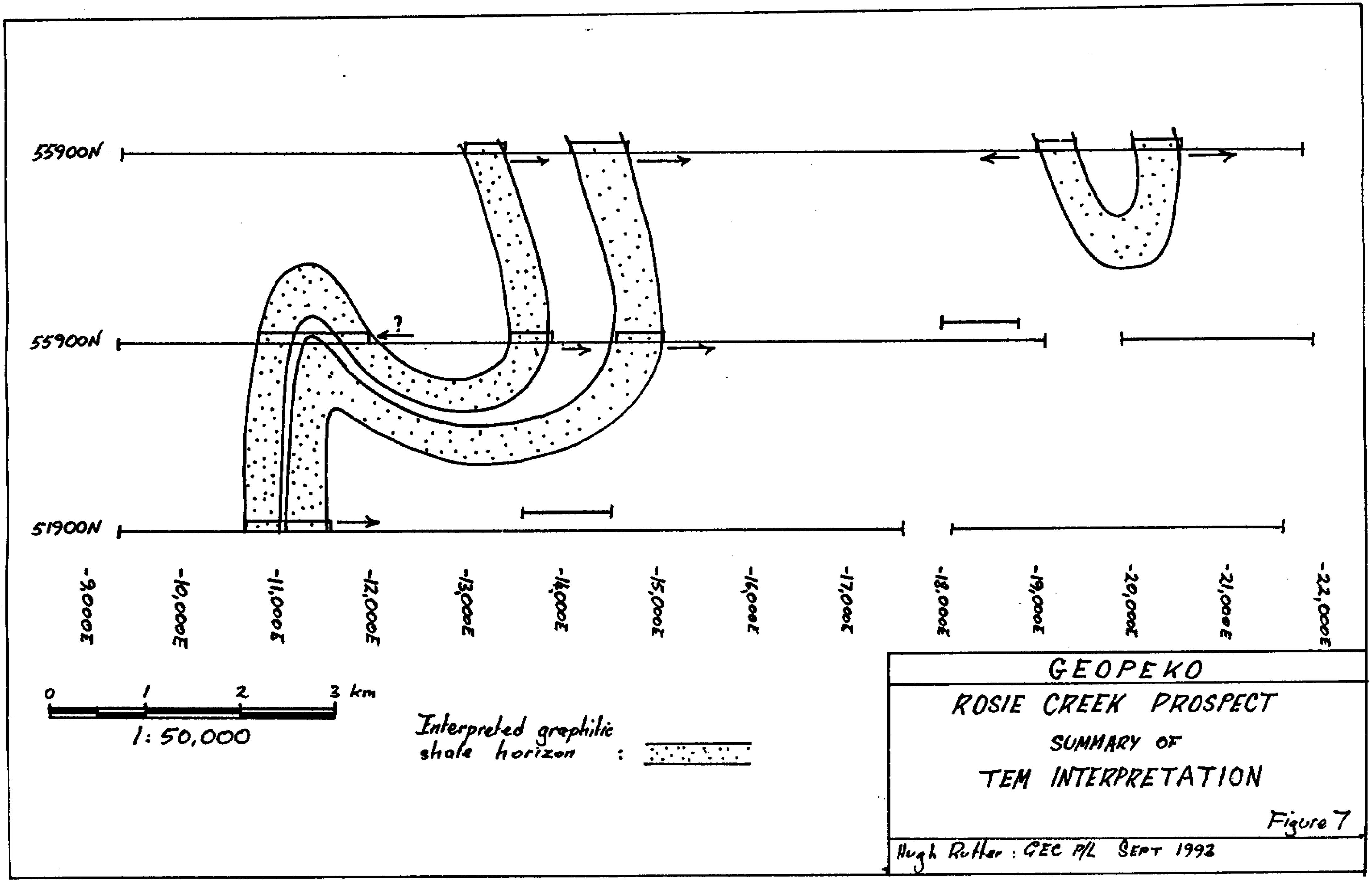
Figure: 5-5



GEOPEKO

ROSIE CREEK
BOUGUER ANOMALY CONTOURS
1:50,000
Figure 6

Data Supplied by Geopeko.



GEOPEKO

ROSIE CREEK PROSPECT

SUMMARY OF

TEM INTERPRETATION

Figure 7

Hugh Rutter : GEC P/L Sept 1993

APPENDIX 3

A REPORT ON DOWN HOLE TEM DATA FROM ROSIE CREEK AND WEARYAN

By Hugh Rutter, Geophysical Exploration Consultants Pty Ltd

GEOPHYSICAL EXPLORATION CONSULTANTS PTY LTD

A REPORT ON DOWN-HOLE TEM DATA FROM ROSIE CREEK AND WEARYAN

FOR GEOPEKO

Hugh Rutter

A REPORT ON DOWN-HOLE TEM
DATA FROM ROSIE CREEK
AND WEARYAN
FOR GEOPEKO

HUGH RUTTER

NOVEMBER 1993

CONTENTS

FIGURES

APPENDIX

1. ROSIE CREEK

1.1 INTRODUCTION

At Rosie Creek four holes were drilled as part of the exploration program for carbonaceous shale hosted base metal and gold mineralisation. The co-ordinates of each hole, and the total depth are as follows:-

Hole	Co-ordinate	Depth
MRSD-01	540N 155E	400.4m
MRSD-03	540N 121E	252m
MRSD-04	540N 144E	90m
MRSD-05	560N 94E	219.3m

All holes are vertical. The holes were surveyed using the Sirotem Mk III EM system by Solo Geophysics. In each location a 200m x 200m transmitting loop was centred on the drill hole, and in addition at MRSD-01 a loop was placed 300m to the east. The transmitting loop used a current of 14 amps. The secondary EM field was measured at 10m intervals using the composite time sequence for 36 channels. The brief logistic report supplied by Solo Geophysics is in the appendix of this report.

1.2 DATA INTERPRETATION

1.2.1 MRSD-01 (54,000N 15,500E)

Data was obtained at 10m intervals between 10m and 395m which is the entire length of the hole. The results are presented in figures 1a, 1b and 1c. The TEM logs show the response from a conductive cover over a moderately conductive halfspace, ie bedrock. There is no indication that highly conductive geological unit such as a graphitic/pyritic shale has been intersected in the drill-hole; nor is there any indication that a unit of this type occurs within a detectable distance (100m) beyond the bottom of the drill-hole.

The drill-hole is 500m east of a TEM anomaly identified in the surface profile. If this surface anomaly was a graphitic/pyritic unit dipping at 10°E it should have been intersected at a depth of 150m in MRSD-01. To be at a depth of 500m at the site of MRSD-01 the unit would have to dip at 30°E. Therefore, either the conductor at the surface between 14550E and 15050E on Line 53900N is dipping at an angle steeper than 30° close to outcrop, and flattening at a depth of 500m below MRSD-01; or the surface conductor is a local feature and not an extensive stratigraphic unit.

1.2.2 MRSD-03 (54,000N 12,100E)

The TEM log of this drill-hole is shown in figure 2. The hole is sited 150m east of a surface EM anomaly. The surface EM anomaly was interpreted as potentially being caused by a carbonaceous shale. If this is correct, it would have to be dipping to the west so as to conform with the interpreted dips of other interpreted conductors on the adjacent lines. Therefore the drill-hole is 150m up-dip. There is no indication of an off-hole conductor in the TEM log. The upper part of the log, 10m to 80m has a power decay of -3.2, which is close to that expected from a conductive surface layer, and at 200m the power decay is -2.6, typical of a half-space, or normal bedrock. In this instance a drill 300m west, at 11,800E, would have been in the centre of this surface TEM anomaly.

1.2.3 MRSD-04 (54,000N 14,400E)

The drill-hole was logged to its full depth of 90m: the profile is shown in figure 3. At 50m the decay curve fits a power law with an index of -3.2 which is close to the representation of a horizontal layer. Also, at 85m the decay has a similar form. The predominant influence appears to be from the conductive surface layer. There are no off-hole effects in the log.

1.2.4 MRSD-05 (56,000N 9400E)

The drill-hole was logged to 210m and the results shown in figure 4. The nearest conductors in the surface profiles are 2-3 km away. The log shows the influence of the conductive overburden in the upper section, and of bedrock in the lower section. Decay curves to illustrate this are presented in figures 4a and 4b. There are no indications of off-hole conductors.

1.3 CONCLUSION AND RECOMMENDATION

None of the drill holes intersected the target which was a carbonaceous shale containing graphite and/or pyrite with associated economic mineralisation. Drill-holes MRSD-01, 03 and 04 were close to surface TEM anomalies which were interpreted as possibly representing bedrock conductors. The interpretation of the surface data was not unambiguous and there was the possibility that the anomalies were caused by variations in the conductivity of the surface cover sequence. If the anomalies were due to bedrock conductors and the dips were 10^0 or less, then they should have been intersected in the three drill-holes on line 54,000N. The dips encountered in the drill-holes were close to horizontal but no conductors were intersected. It seems that the most logical conclusion is that the surface anomalies are not caused by bedrock conductors; in which case the surface EM survey has not located any bedrock conductors in the area. If complete assurity of this is required then drill holes at the following locations are required:

Line 56000N at 13200E and 14400E
Line 54000N at 11400E, 13700E and 14800E
Line 52000N at 10900E and 11300E

2. WEARYAN

2.1 INTRODUCTION

Four reconnaissance Geotem lines were flown at Wearyan. A central zone trending north west to south east had lower surface resistivities where bedrock conductors could be identified. The two drill-holes MWSD-05 and MWSD-07 were drilled to investigate the subsurface geology: neither hole coincides with a Geotem line or one of the interpreted anomalies but MWSD-07 is close to what could be the strike connection of two of the anomalies.

The conditions of the down-hole TEM survey are the same as those at Rosie Creek.

2.2 DATA INTERPRETATION

2.2.1 MWSD-05 (AMG 699471E, 8214643N)

The cover sequence consists of clayey weathered sandstone to a depth of 93m. Below this is the Karns Dolomite. The TEM down-hole data is shown in figures 5a and 5b with a gain of 1.0 and 10 respectively. A metallic object is stuck in the drill-hole at a depth of 110m. It has a quite local effect and does not influence readings 10m above and 10m below. The TEM log is responding to the cover sequence and the bedrock; there are no conductors of significance.

The TEM sounding at this location links the EM data to the geology quite accurately (Figure 5c). The interface at 93m was fixed during the inversion and the resistivities derived for the cover sequence and the Karns Dolomite. The result of the inversion was good, confirming that the geology is a layered sequence of overburden and bedrock.

2.2.2 MWSD-07 (AMG 690929E, 8212936N)

The geological sequence is the same as at MWSD-05 with a weathered clay-sandstone cover over the Karns Dolomite. The TEM data is displayed in figures 6a and 6b with gains of 1.0 and 10 respectively. The profile is what would be expected from a layered sequence with no highly conductive bodies either in the hole or nearby. The sounding relates the TEM data to the geology, although not as reliably as the relationship at MWSD-05. The cover sequence is much more resistive at this location.

2.3 CONCLUSION AND RECOMMENDATION

The drilling results and the down-hole TEM data do not indicate the presence in, or near either of the drill-holes, of a carbonaceous shale. The apparent variation of the cover sequence from a resistivity of 45Ωm at MWSD-05 to 990Ωm at MWSD-07 goes a long way to explaining the TEM anomalies identified in the Geotem survey. It is still possible that the "better" anomalies selected from the Geotem data have not been tested. In which case ground TEM should be targeted specifically at the three areas where these anomalies occur.

?4

Hugh Rutter

HUGH RUTTER
CONSULTING GEOPHYSICIST

APPENDIX

LOGISTIC REPORT FROM SOLO GEOPHYSICS

Solo Geophysics & Co. field report for:

Client: Geopeko.
Survey: Sirotem drill hole logging
Areas: Boroloola N.T.
Grids: Rosie Creek, Wearyan
Period: Oct 6th to 9th Oct 1993
Crew: Brian Rau, Boyd Ward, Marcel van Lochem
Equipment: Sirotem MkIII and Satx, cables, Toyota 4WD
generator, computer, plotter, field camp

6th. Oct.
Grid: Rosie Creek
Travelled from McArthur River to Boroloola to meet Andrew, collect location maps and survey details.
Travelled to Rosie Creek grid, four hours with all gear, very bad track, deep bulldust.
Hole locations:

MRSD01	540N,	15500E
MRSD03	540N,	12100E
MRSRP04	540N,	14400E
MRSD05	560N,	9400E

Located hole MRSD01, laid out loop 200 x 200m centred on hole.
all holes vertical and cased with PVC pipe.
36 channels, gains x1, x10, 128 stacks, 72 volts, 14.2 amps, 10m reading interval, TOT 260us

logged MRSD01 10m to 395m at 10m
camped onsite overnight

7th. Oct.
Grid: Rosie Creek

Located hole MRSRP4, laid out loop 200 x 200m centred on hole.
logged MRSRP4 10m to 85m at 10m

Located hole MRSD03, laid out loop 200 x 200m centred on hole.
logged MRSD03 10m to 240m at 10m

Located hole MRSD05, laid out loop 200 x 200m centred on hole.
logged MRSD05 10m to 210m at 10m

extra loop to do hole 1

Located hole MRSD01, laid out loop 200 x 200m centred 300m east of hole.
logged MRSD01 10m to 395m at 10m
packed up all gear, drove back to Boroloola, arrived 10pm.

8th. Oct.
Grid: Wearyan
Located hole MWSD07 laid loop 200m x 200m centred on hole
logged MWSD07 from 10m to 245m at 10m

Located hole MWSD05 laid loop 200m x 200m centred on hole
logged MWSD05 from 10m to 295m at 10m
steel casing in hole at 110m
packed up all gear returned to Boroloola for the night.

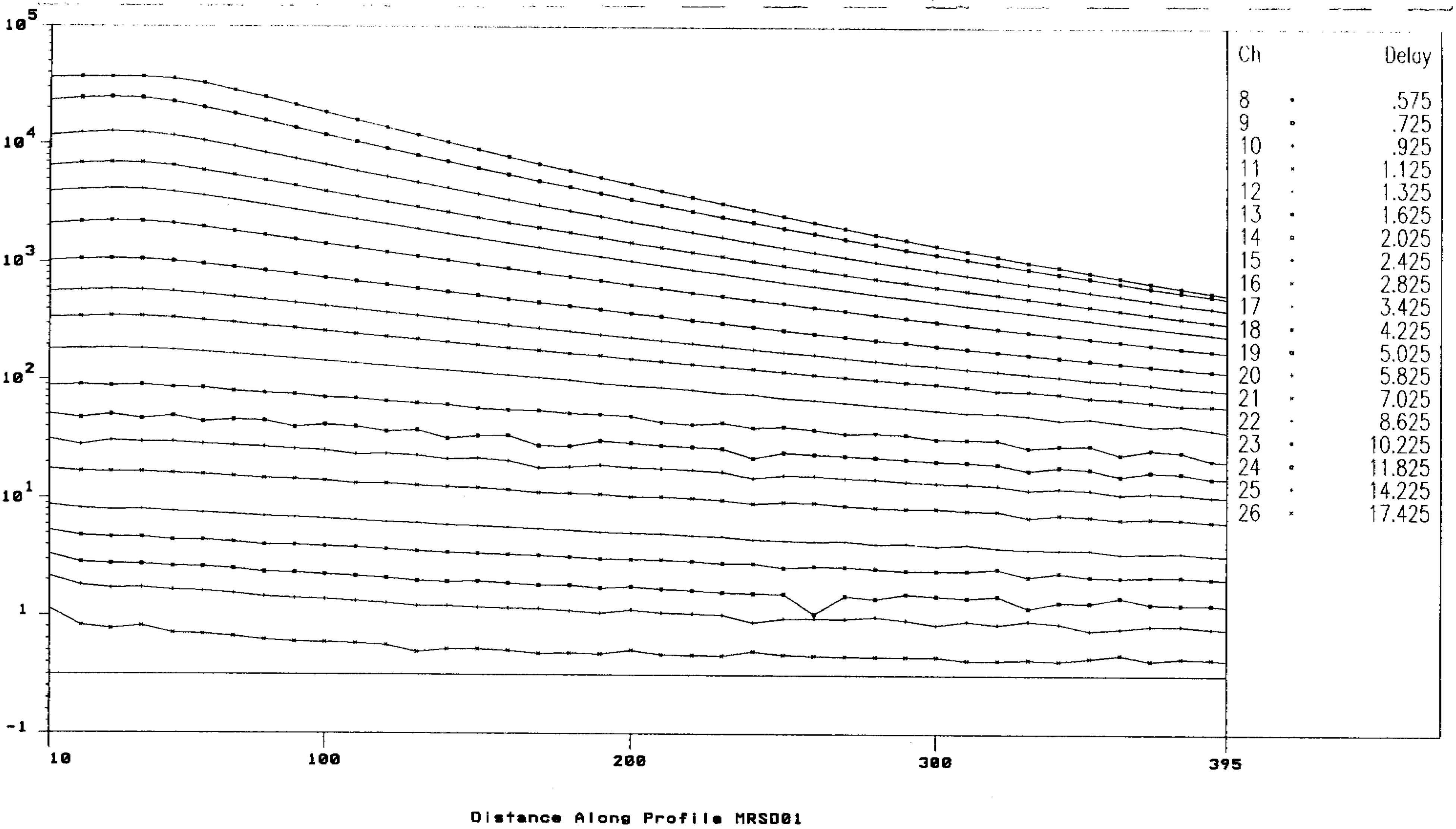
9th. Oct.
Travelled back to Mt. Isa, end of survey.

Summary:
Survey:Oct: 6,7,8
Demobilization : Oct 9

for Solo Geophysics & Co.

Brian Rau.

Brian Rau.



GEOPEKO

ROSIE CREEK

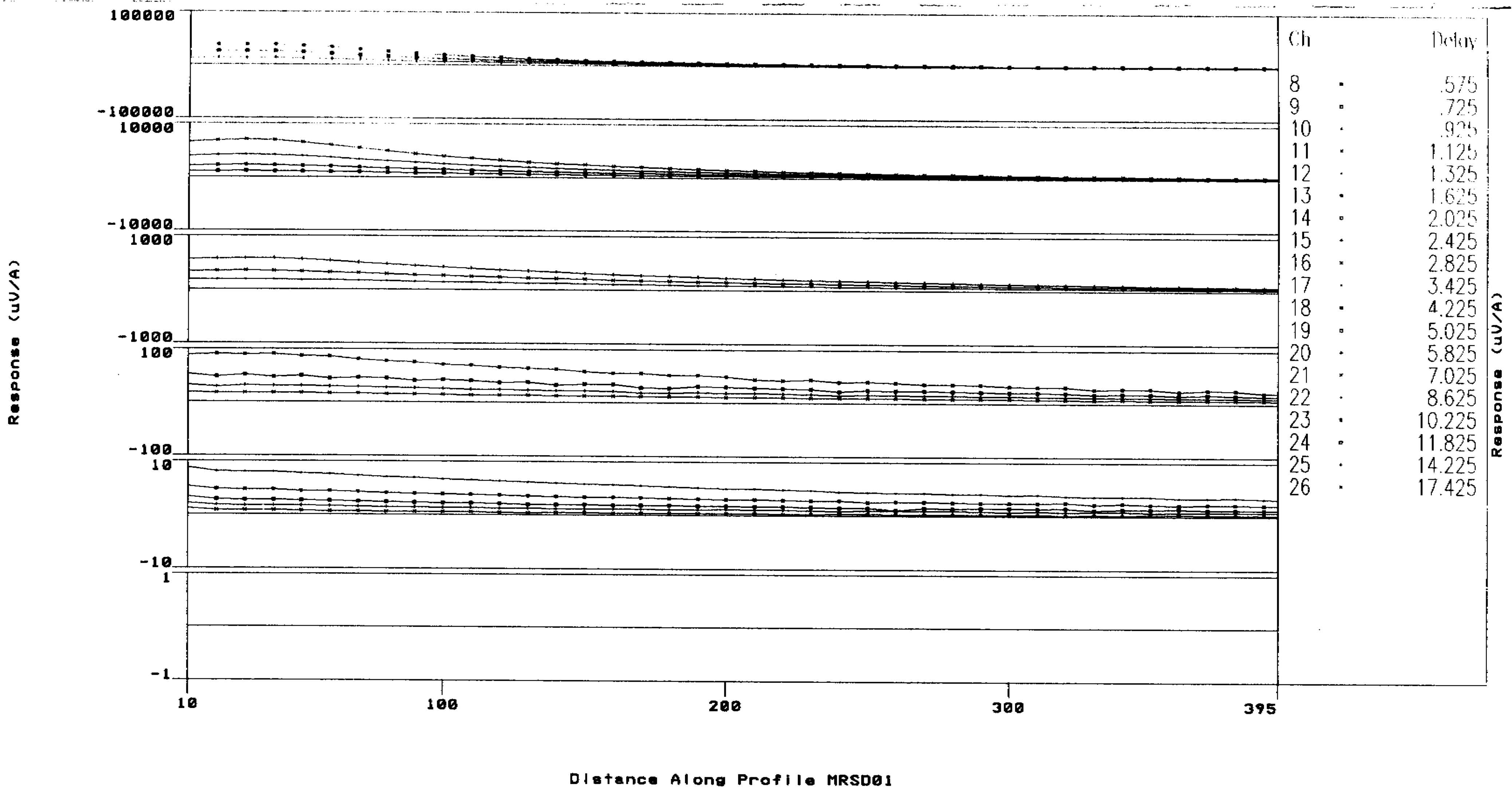
Drill-hole MRSD-01 (540N 155 E)
Transient EM data: Gain of 1.0
Operator : SOLO Geophysics

Geophysical Exploration Consultants P/L

Horizontal Scale : Default
Vertical Scale : Default
Time Delay In : Milliseconds

Date : 01/11/93

Figure : 1a



GEOPEKO

ROSIE CREEK

Drill-hole MRSD-01 (540N 155E)

Transient EM data: Gain of 1.0

Operator : SOLO Geophysics

Geophysical Exploration Consultants P/L

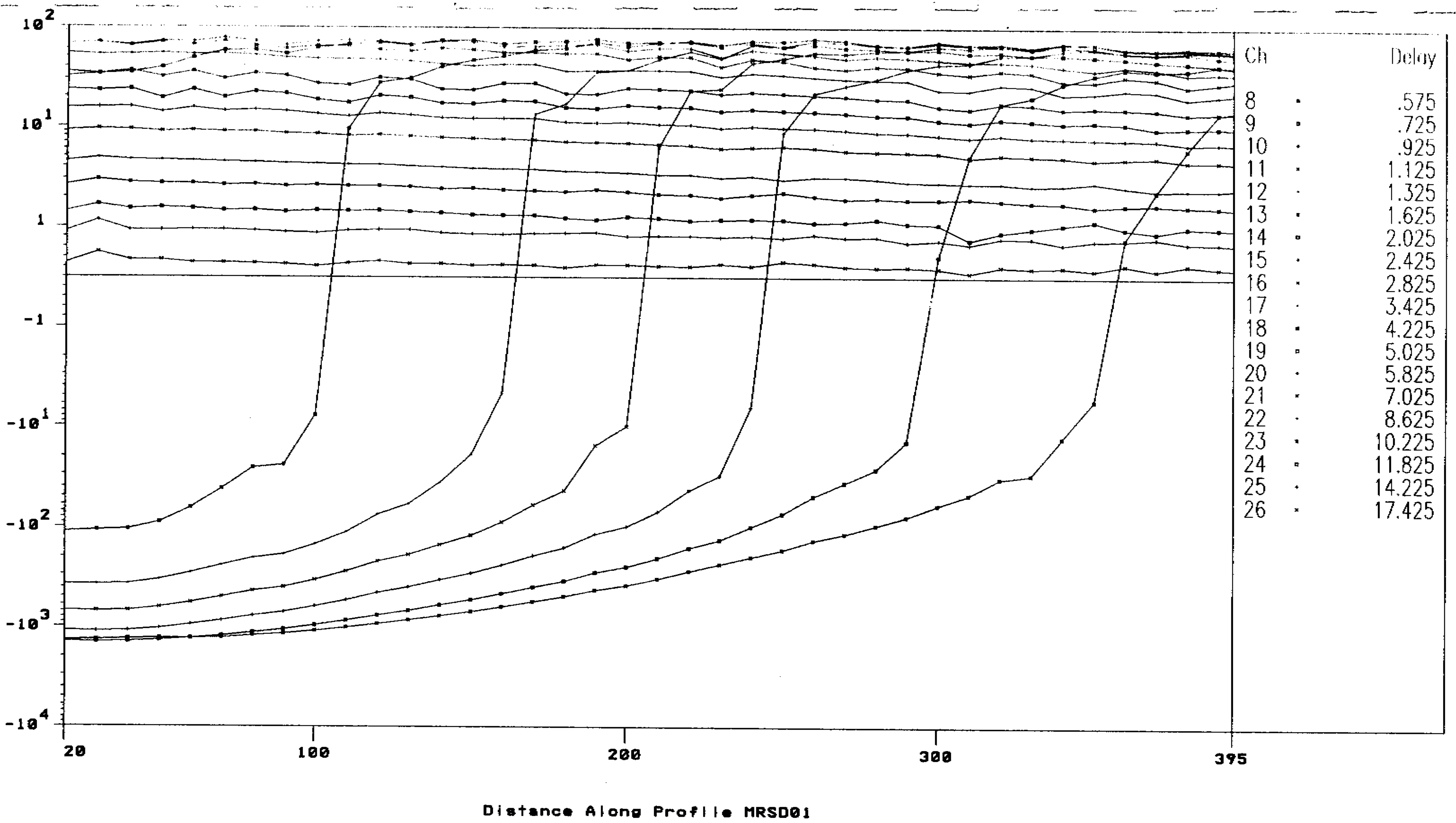
Horizontal Scale : Default

Vertical Scale : Default

Time Delay In : Milliseconds

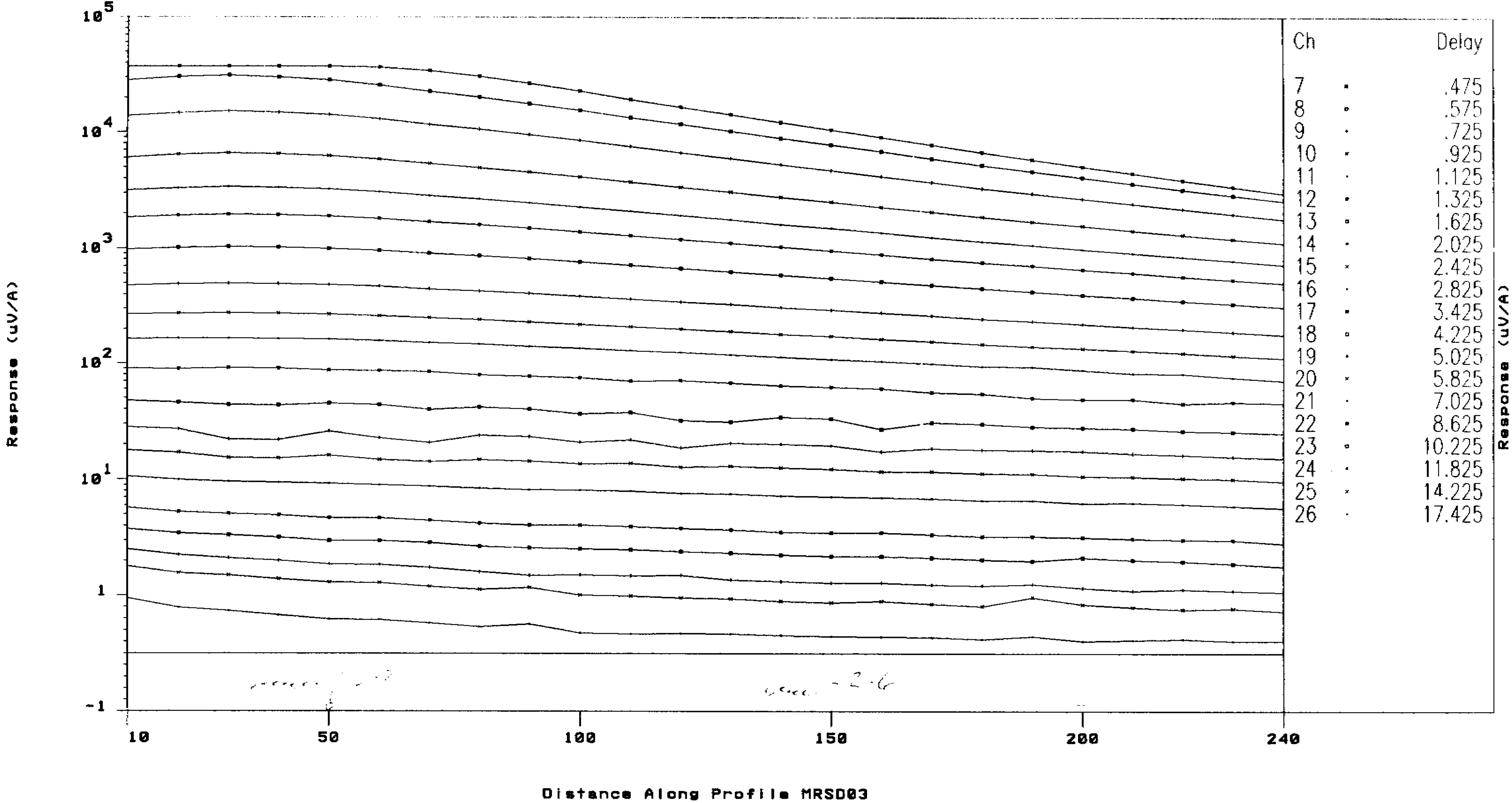
Date : 01/11/93

Figure : 16

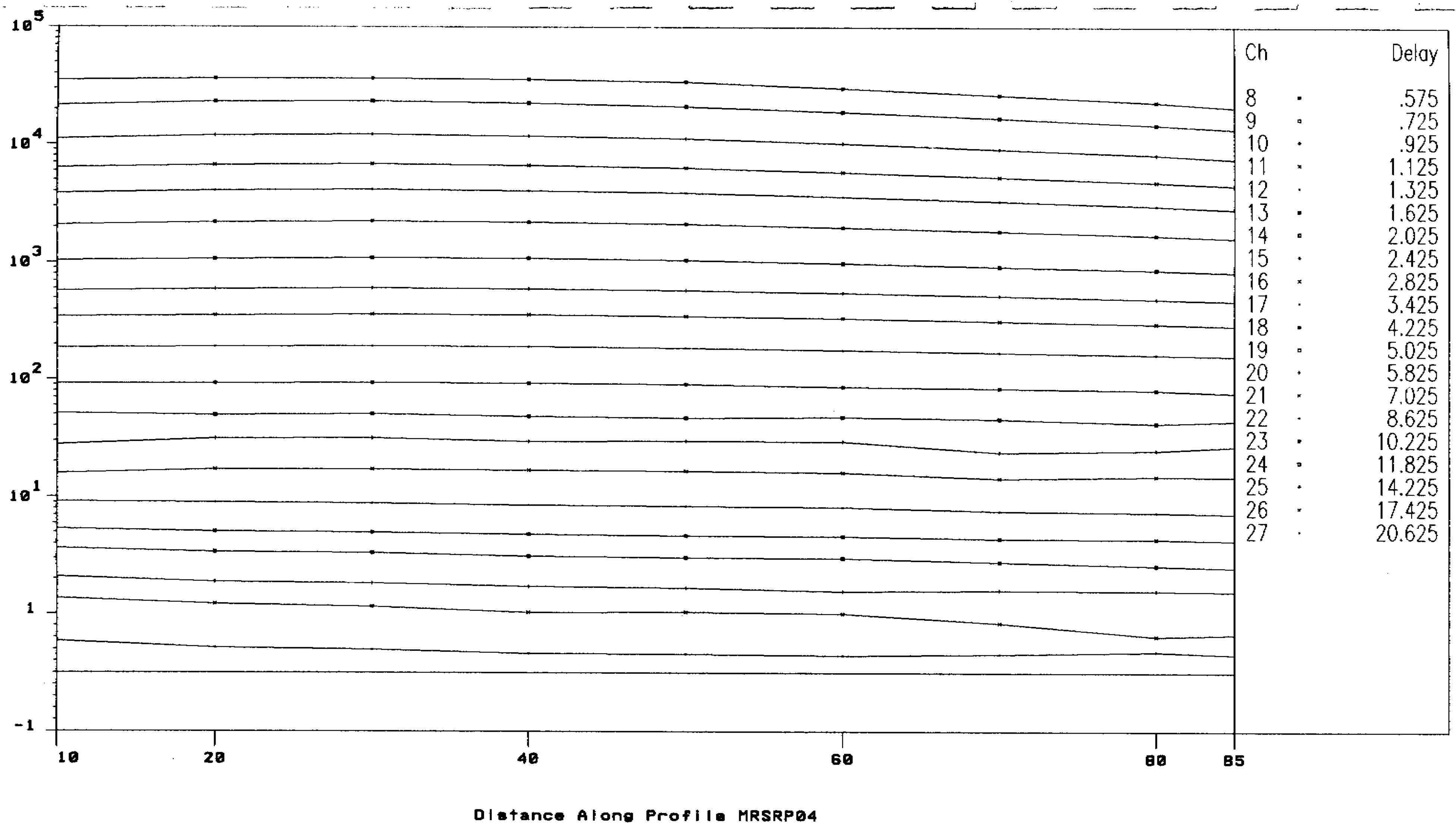


Ch		Delay
8	·	.575
9	▫	.725
10	·	.925
11	×	1.125
12	·	1.325
13	·	1.625
14	▫	2.025
15	·	2.425
16	·	2.825
17	·	3.425
18	·	4.225
19	▫	5.025
20	·	5.825
21	×	7.025
22	·	8.625
23	·	10.225
24	▫	11.825
25	·	14.225
26	×	17.425

GEOPEKO	Geophysical Exploration Consultants P/L
ROSIE CREEK Drill-hole MRSD-01 (540 N 155E) Transient EM data: Loop at 5399N,5401N..157E,159E Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds
	Date : 01/11/93
	Figure : 1c



GEOPEKO	Geophysical Exploration Consultants P/L
ROSIE CREEK Drill-hole MRSD-03 (540 N 121E) Transient EM data: Loop centred on the drill-hole Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds
	Date : 01/11/93 Figure : 2



GEOPEKO

ROSIE CREEK

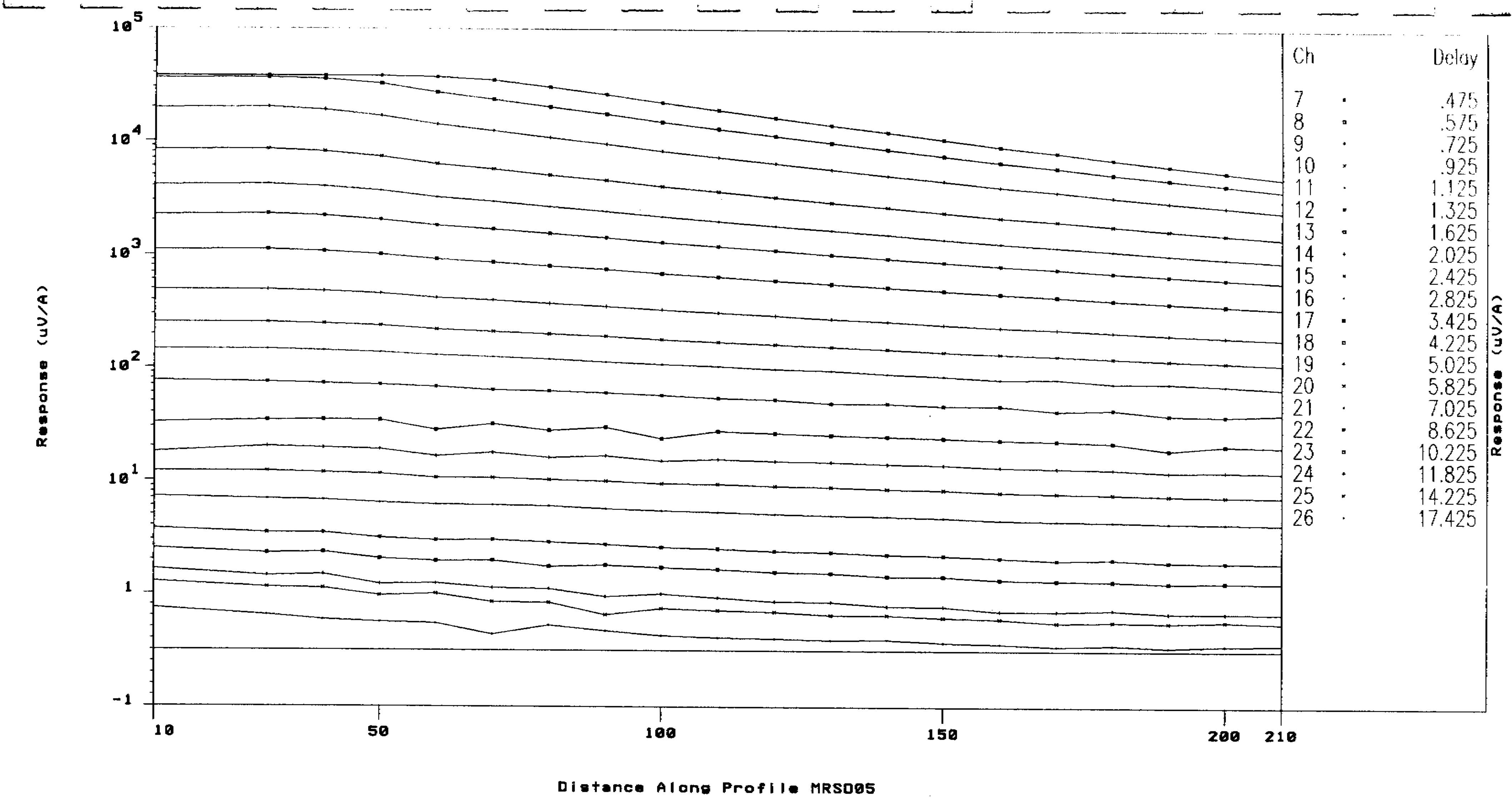
Drill-hole MRSD-04 (540 N 144E)
Transient EM data: Loop centred on the drill-hole
Operator : SOLO Geophysics

Geophysical Exploration Consultants P/L

Horizontal Scale : Default
Vertical Scale : Default
Time Delay In : Milliseconds

Date : 01/11/93

Figure : 3



GEOPEKO	**Geophysical Exploration Consultants P/L**
ROSIE CREEK Drill-hole MRSD-05 (560 N 094E) Transient EM data: Loop centred on the drill-hole Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds
	Date : 01/11/93 Figure : 4

Siroex : TEM Response Decay Analysis

GEOPEKO ROSIE CREEK: MRSD-05

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data

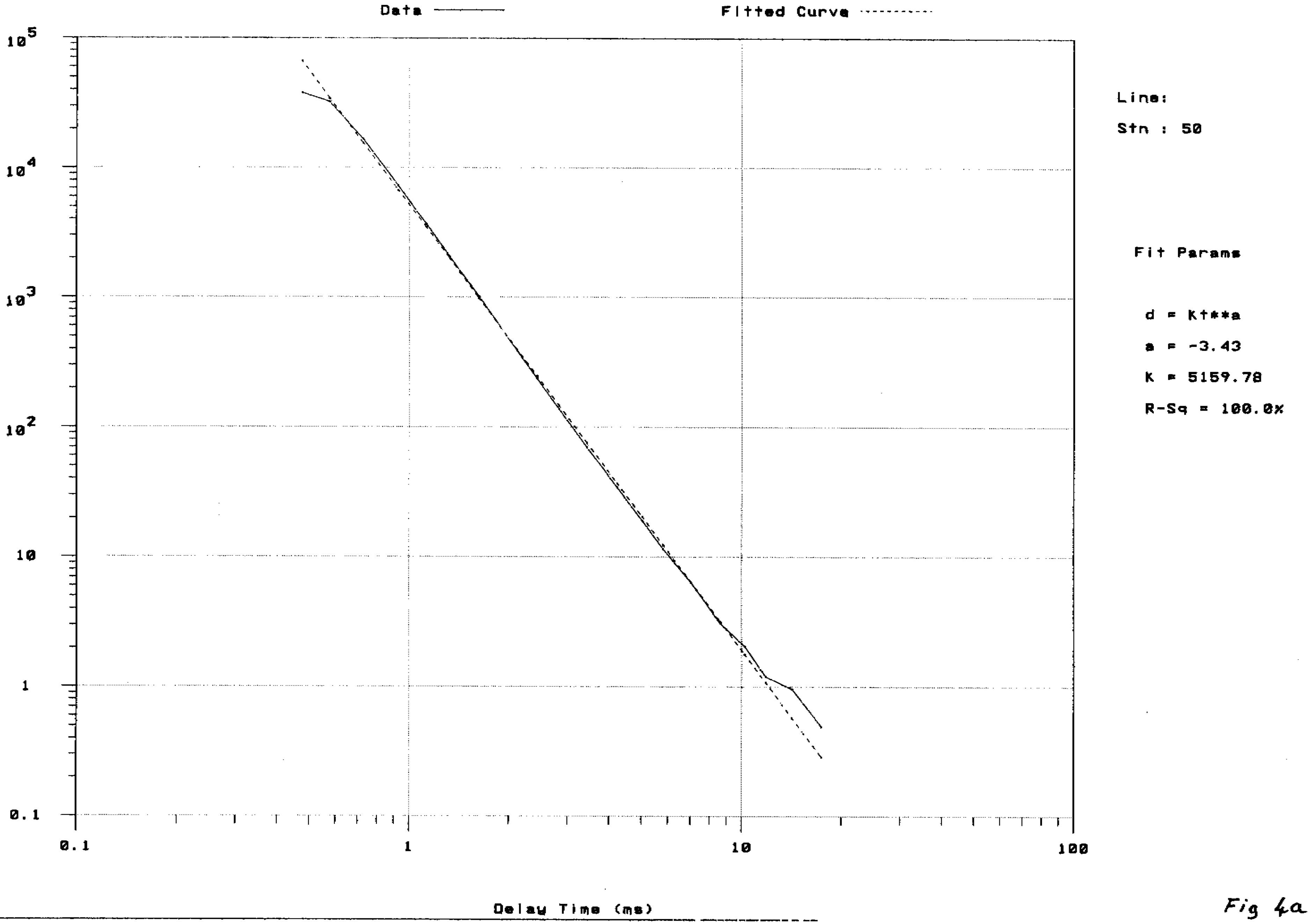
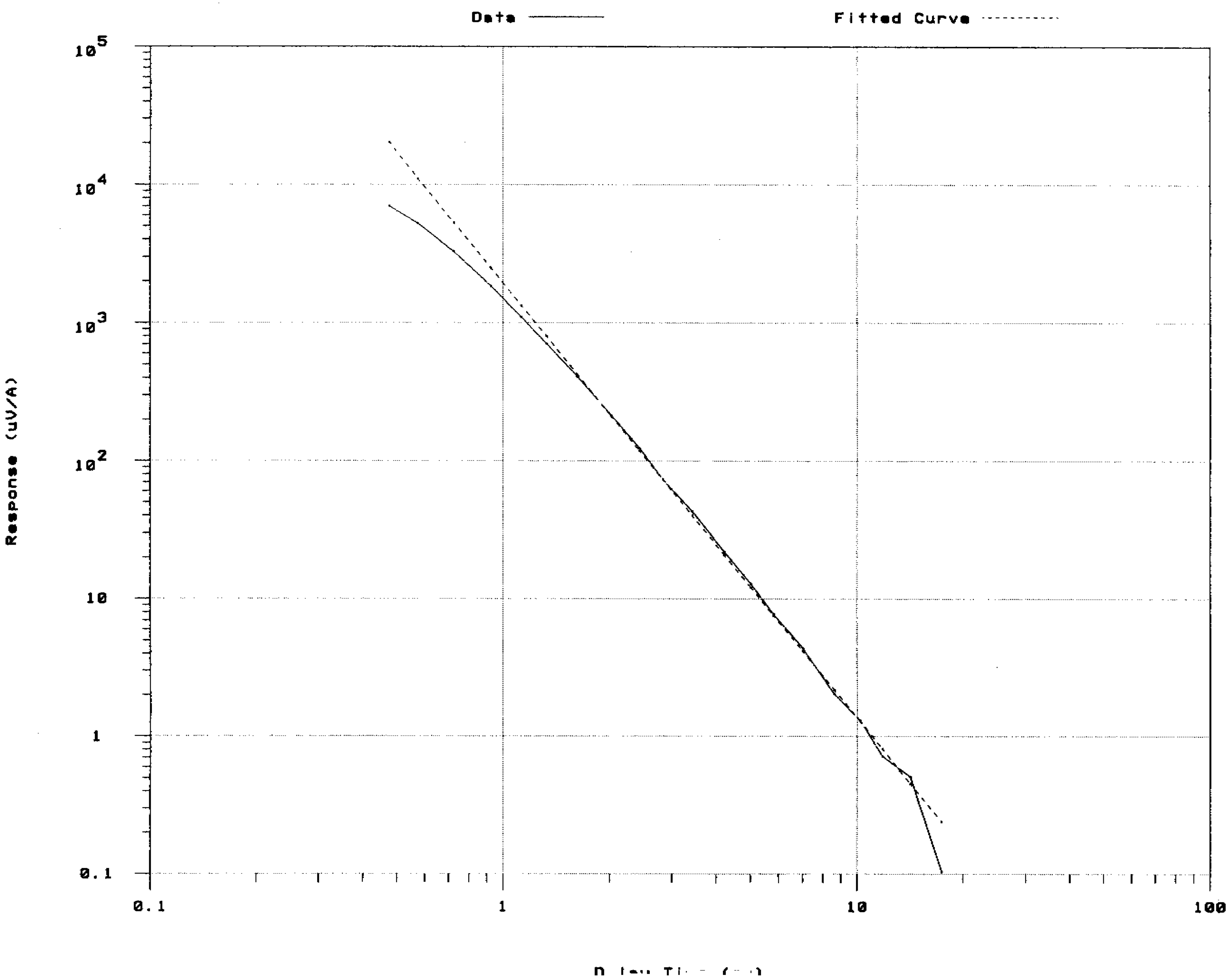


Fig 4a

Siroex : TEM Response Decay Analysis

GEOPEKO ROSIE CREEK: MRSD-05

Fixed Loop Tx, Roving Surface Rx, SiroTem MK3 data



Line:

Stn : 180

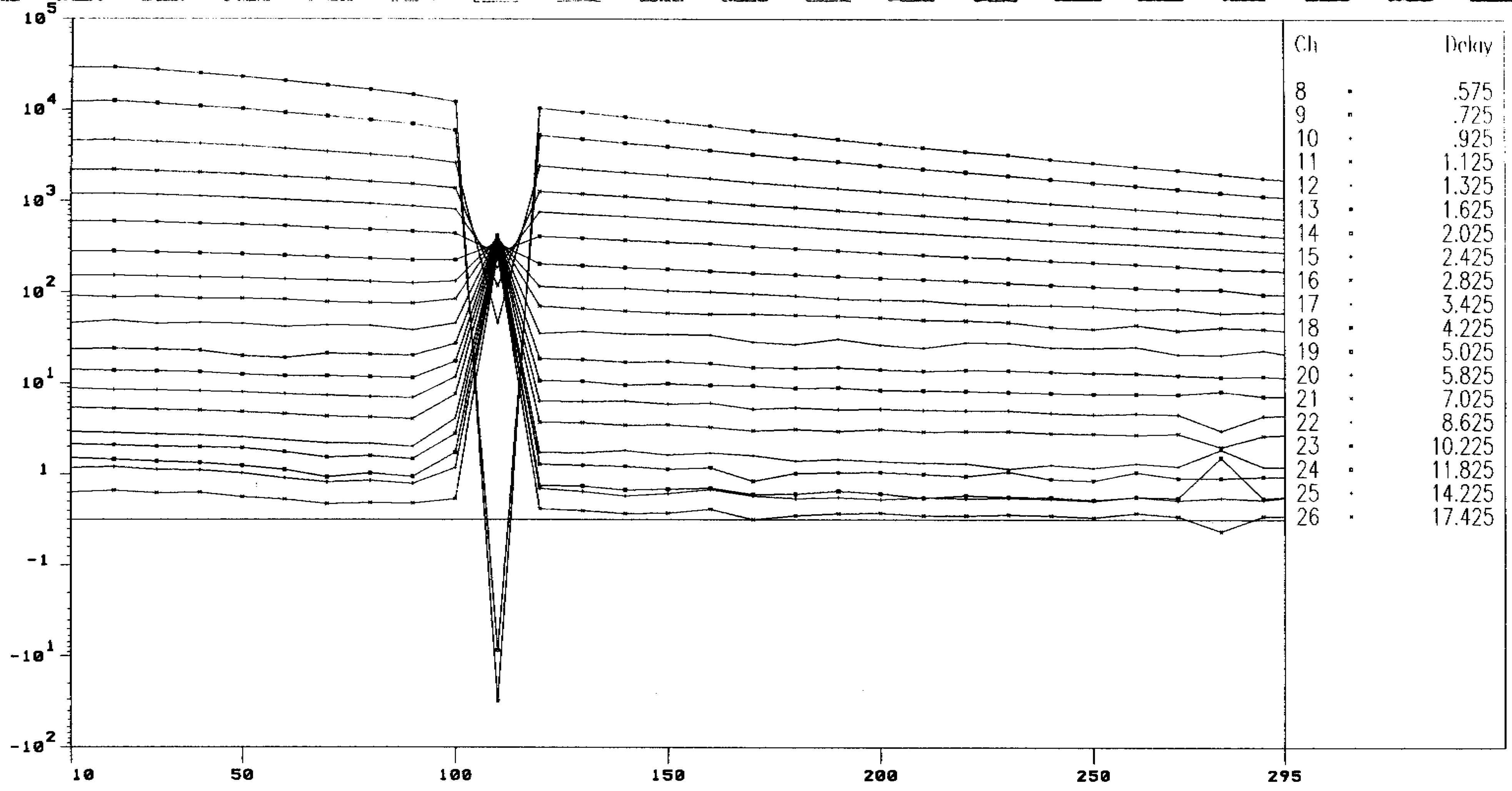
Fit Params

d = Kt**a

a = -3.15

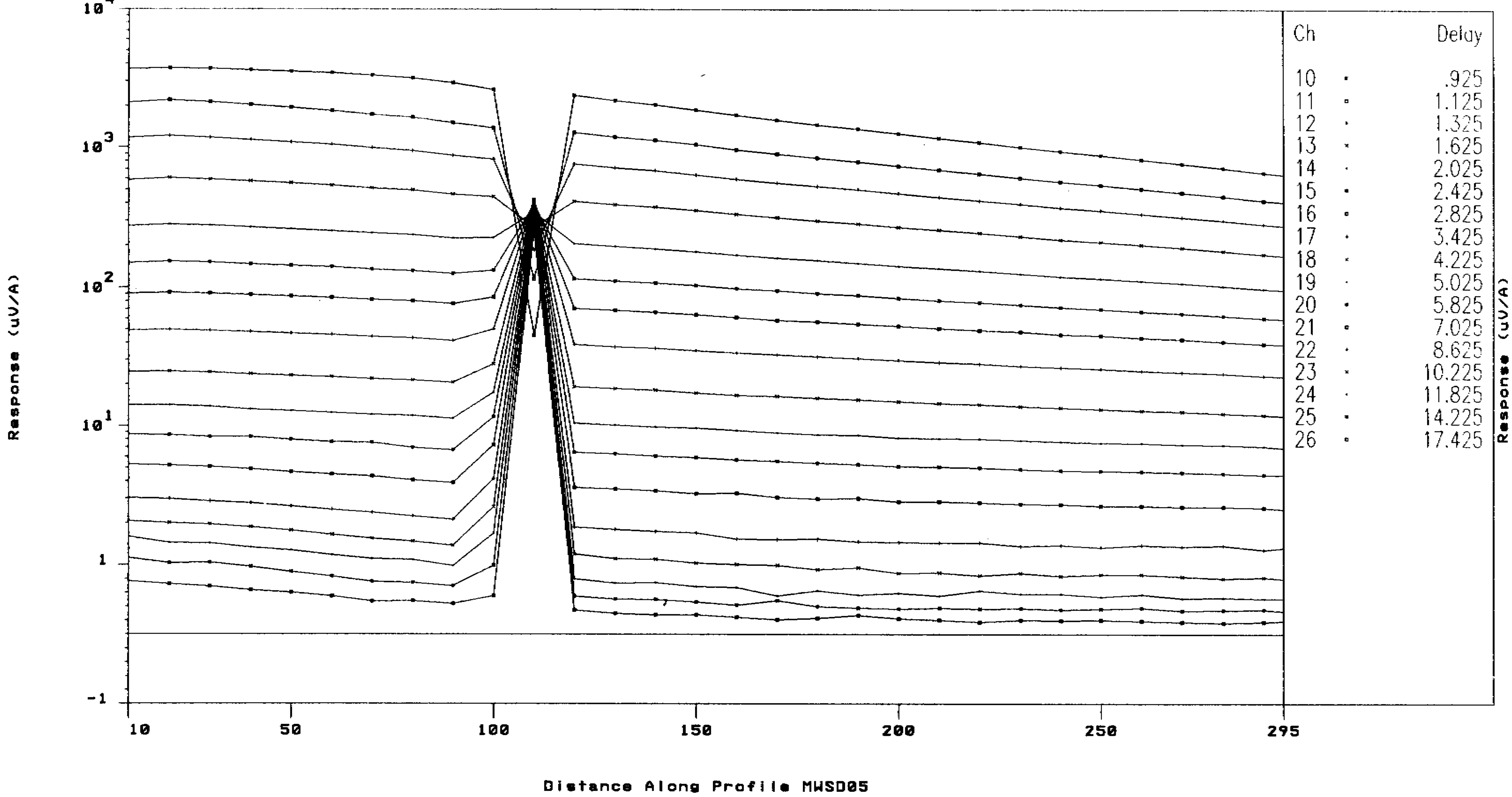
K = 1930.76

R-Sq = 99.9%



Distance Along Profile MWSD05

GEOPEKO	Geophysical Exploration Consultants P/L
WEARYAN AREA Drill-hole MWSD05 Transient EM data: Gain of 1.0 Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds
	Date : 01/11/93
	Figure : 5a



GEOPEKO	Geophysical Exploration Consultants P/L
WEARYAN AREA Drill-hole MWSD05 Transient EM data: Gain of 10 Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds Date : 01/11/93 Figure : 5b

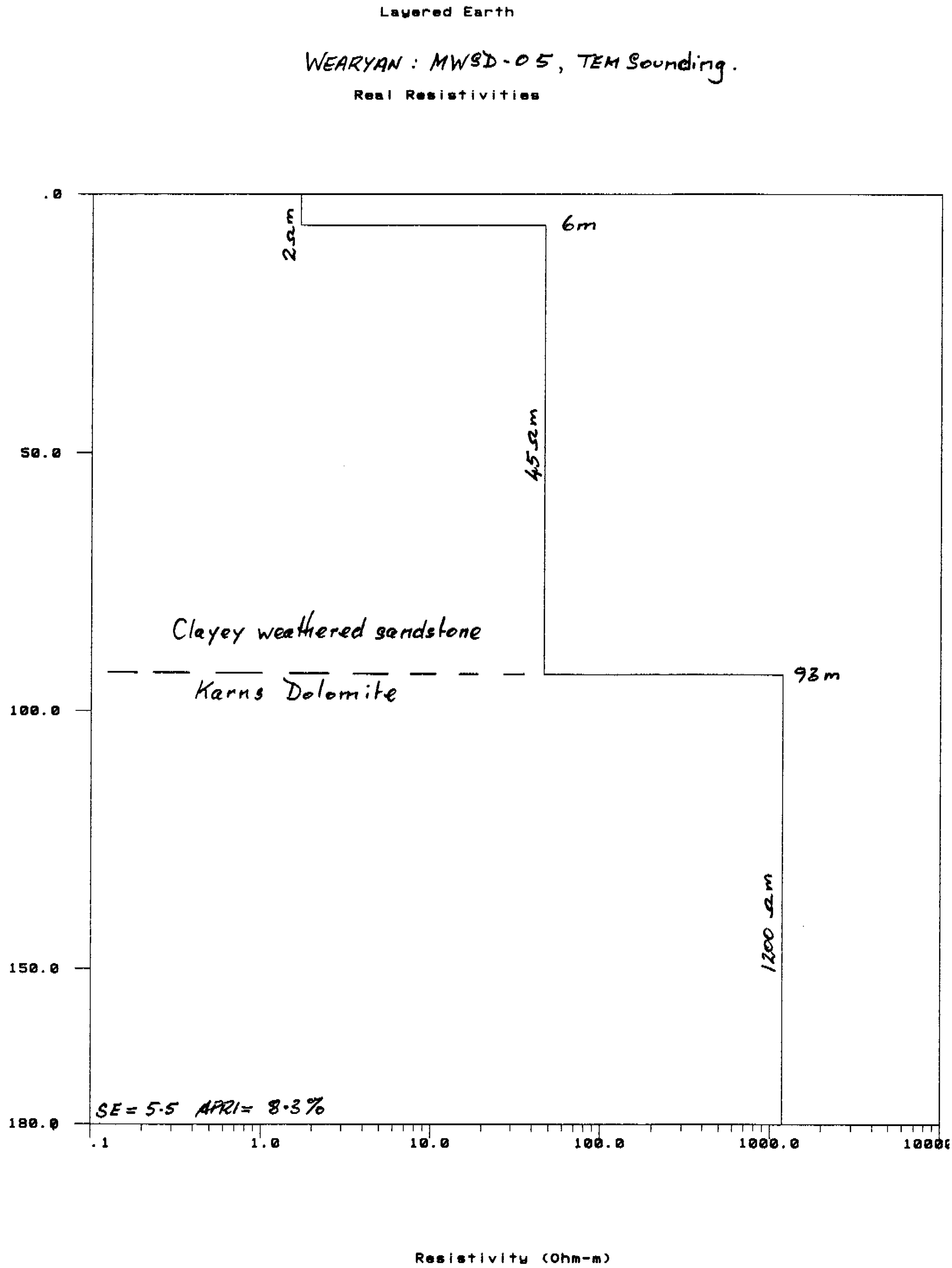
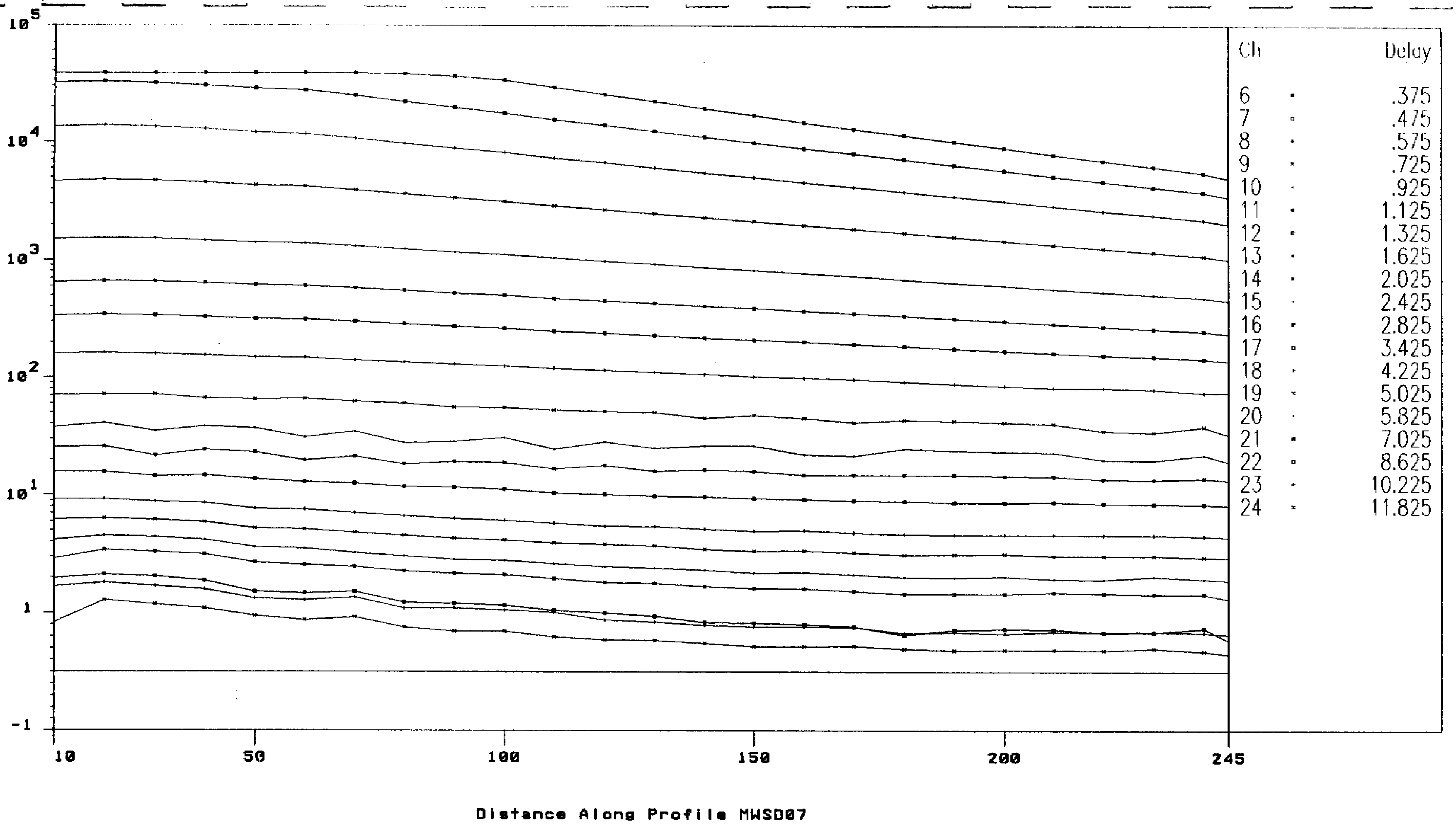
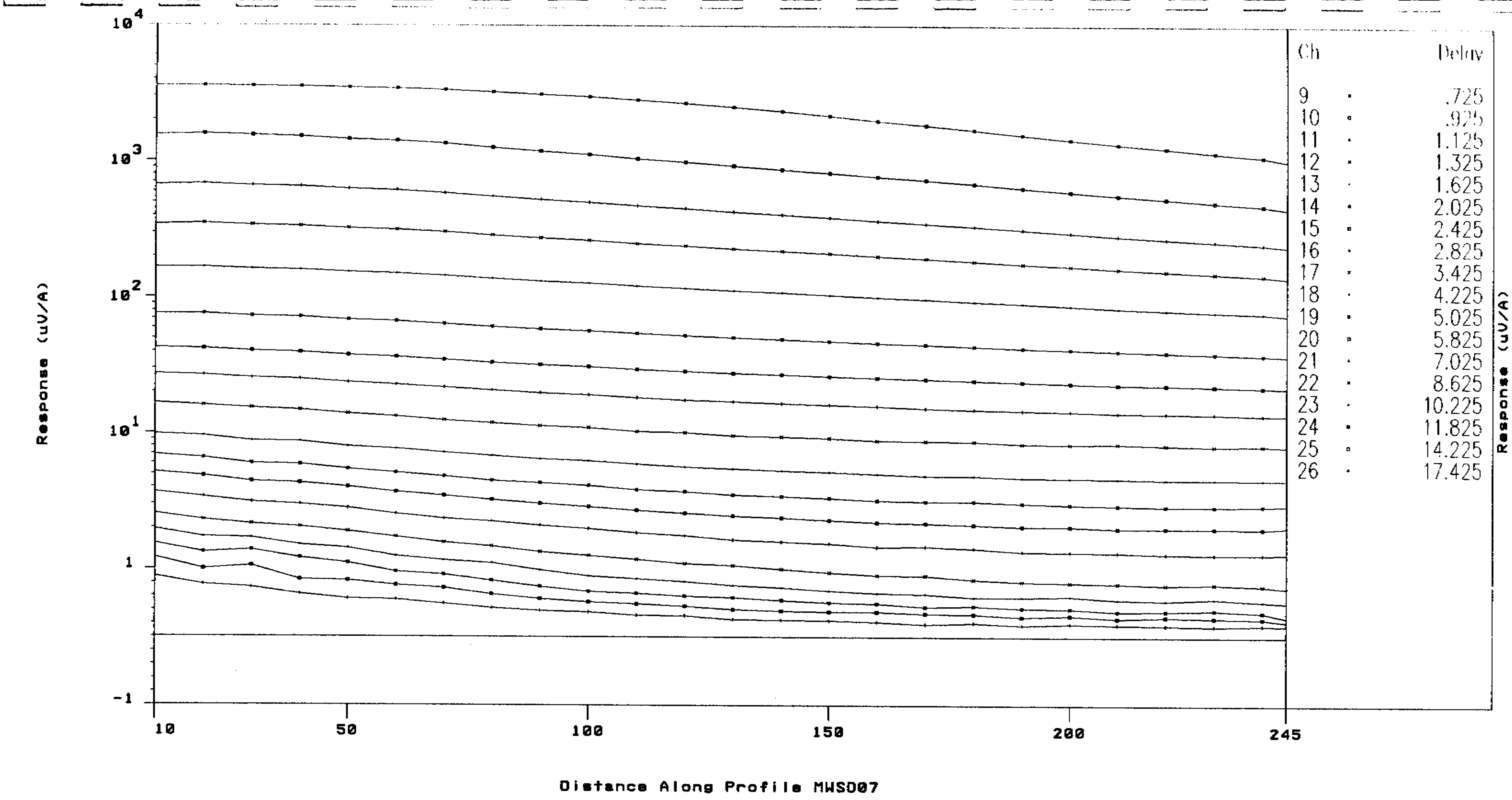

Layered Earth
WEARYAN : MWSD-05, TEM Sounding.
Real Resistivities
.0
50.0
100.0
150.0
180.0
2Ωm
6m
45Ωm
Clayey weathered sandstone
93m
Karns Dolomite
1200 Ωm
SE = 5·5 APRI = 8·3%
.1
1.0
10.0
100.0
1000.0
Resistivity (Ohm-m)

Fig. 5c.



GEOPEKO	Geophysical Exploration Consultants P/L
WEARYAN AREA Drill-hole MWSD07 Transient EM data: Gain of 1.0 Operator : SOLO Geophysics	Horizontal Scale : Default Vertical Scale : Default Time Delay In : Milliseconds Date : 01/11/93 Figure : 6a



GEOPEKO

WEARYAN AREA

Drill-hole MWSD07

Transient EM data: Gain of 10

Operator : SOLO Geophysics

Geophysical Exploration Consultants P/L

Horizontal Scale : Default

Vertical Scale : Default

Time Delay In : Milliseconds

Date : 01/11/93

Figure : 6b

Layered Earth

WEARYAN : MWSD-0 , TEM Sounding

Real Resistivities

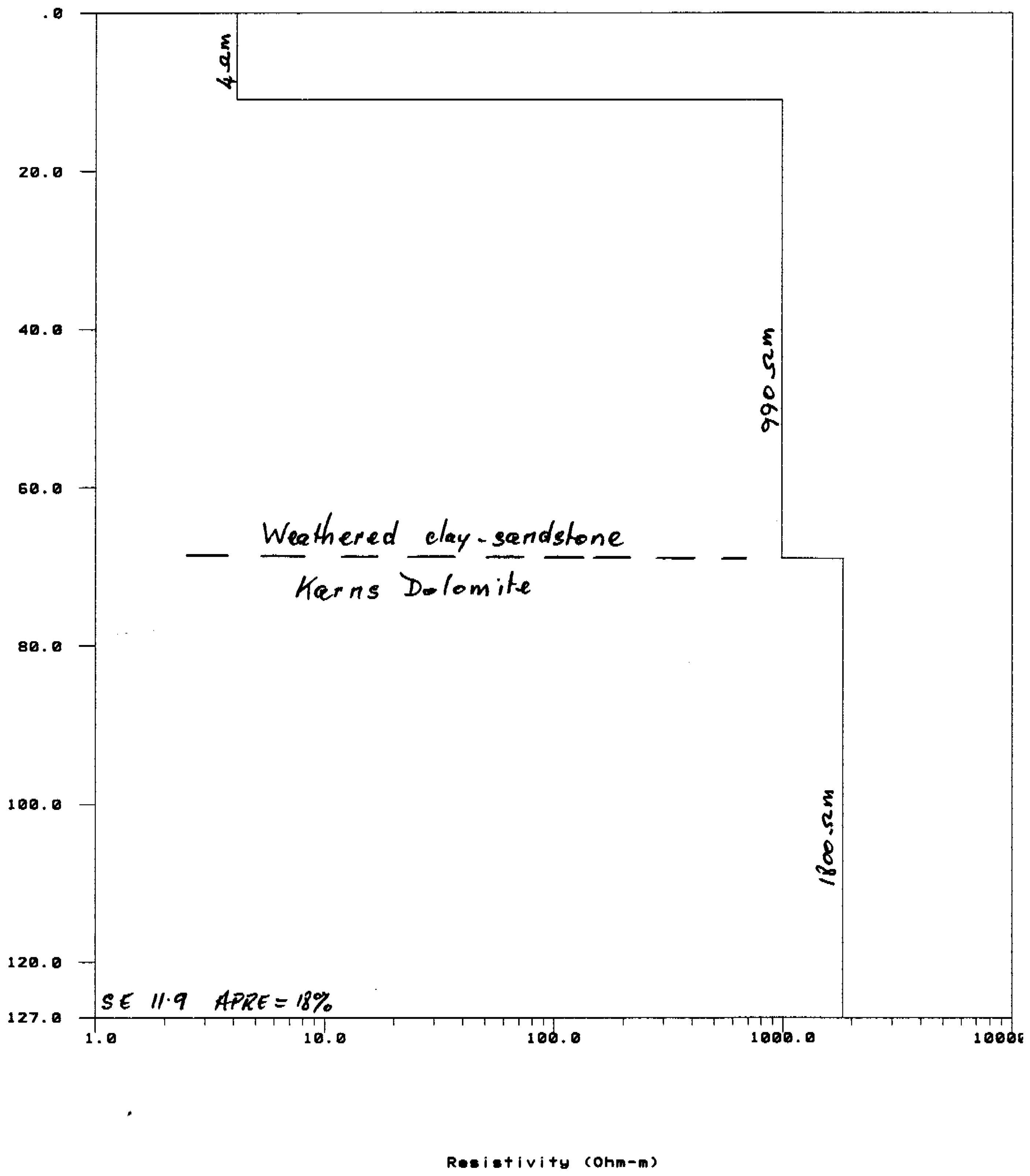


Figure 6c

APPENDIX 4

1993 DRILLING PROGRAMME - DRILL LOGS

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS D1
LOGGED BY A.Allan
DATE August 1993

DIAMOND DRILL LOG

THIS SEQUENCE LIKELY WHOLLY WITHIN THE BALBIRINI DOLOMITE 10-03-94 (Confirmed by P.Haines NT.G.S)

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
NOTE:	OPEN	HOLE PERCUSSION 0 – 79m.
0 – 3m		brown ferruginous, clayey, deeply weathered sandstone (?quartz sandstone), heavily limonite stained with black Mn-oxide coatings.
3 – 6m		" " but largely brown clay with highly ferrug. chips
6 – 9m		very clayey brown deeply weathered ?Quartz sandstone + pisolites – some maghemitic (magnetic)
9 – 12m		" " more clayey.
12 – 15m		clayey brown deeply weathered quartz sandstone – argillaceous matrix, Mn-oxide stained
15 – 18m		" " still clayey with some pisolites (some maghemitic), manganiferous
18 – 21m		choc. brown limonitic weathered quartz sandstone, ferrug. with pisolites (?from uphole); moisture in hole ~20m, water injected 21m.
21 – 27m		limonitic brown – purple brown f.g. Quartz sandstone, rounded chips to 3-4cm, also chips (rounded pebble) of brown dolomitic siltstone – mudstone, some grey cherty mudstone, cubic casts after ?pyrite – cover. Poor samples.
27-30		" " but more deeply weathered and clayey with chips of the quartz sandstone (tightly interlocking mosaic) – same as that seen in Warramana and Rosie Cks.
30 – 33m		rounded milky white quartz pebbles, lim. red-brown qtz sandstone, Mn stained – likely fluvial cover

Sheet 1 of ____ Sheets

GEOPEKO

BRISBANE

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
33-36 36		clayey fluvial sequence (as above) (quartz, slst, quartzite clasts)
36-39 39		clay and large (1-5cm) semi-rounded pebble-cobble of m.g. Q.Sst with red-brown ferrug. matrix + 'clean' quartzite
39- 42		cream clay with clean rounded quartz grains + pebbles - cobbles of quartzite, ferrug f-m.g QSst
42-45		limonite brown - off cream highly weathered clayey bedrock (? Slst. -Sst with argillaceous matrix). Clear subrounded quartz grains (≤0.25mm) embedded in clay
45-48		" "
48-51		" "
51-54		clay as above but with > large (up to 6cm) cobbles of subrounded brown quartzite + brown (? Ᵽ) shale
54-57		" " but with likely cobble of Precamb. basement (dolostone, thin laminated arenite and shale)
57-60		" " + grey-black clay; water grey
60-63		" " + grey f.g Slst chips
63-66		" " - very poor return BASE OF OXIDATION ~ 64m DOWNHOLE
66-69		" " sampling hopeless, chips of clay

Sheet 2 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT ____________
HOLE No MRS D01
LOGGED BY ____________
DATE ____________

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		fer.- Sst
69- 72		pale grey clay with tiny clean quartz
		grains, a few ferrug. Sst chips which are
		strongly HCl +ve >1500 gph water.
72-79		" " cased. off.
		END OF PERCUSSION DRILLING. 79.0m.
79 — 8420		grey clay, laminated (2-3mm) cream
	NOT	dolostone fragments; silicified cream-pale
	TO	grey dolostone ; badly broken, poor recovery.
84.20 -92		medium grey (partly clayey) laminated
	SCALE	(1-3mm) clayey Slst (– shale with fissility)
		with interbeds of v. fg. dolomitic sandstone
		(88.8-89.06m) — Sst with fine (<1mm)
		dark grey-green mudstone partings; very
		weakly HCl +ve the fg. Sst is strongly
		HCl +ve and quite massive, detrital mica
		visible, entire interval is bleached
		• S_0 at 86° to LCA.
		traces of py on fractures cutting S_0.
92-95m		pale grey-cream, bleached dolostone
		(largely dololuble), massive
		• intraclast breccia 94.4-94.8m (grey
		clasts flattened // S_0 with white dolomitic
		matrix.
		• traces of py as fine cubes (<1mm)

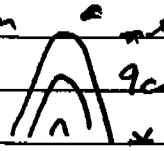
HQ
RE

Sheet 3 of ____ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRSD01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
95-97.7m		mid grey (partings) - green parallel laminated (5-10mm) to very thin bedded (10-15mm) dolomitic siltstone • irregular contacts between beds (soft sediment compaction • trace pyrite on fractures k 7cm x • possible chert nodule  3cm @ 97.65m • the green mudstone partings give distinctive appearance. • S_0 at 89-90° to LCA.
99.7-103.7m		"stromatolitic unit" → mid grey partly chertified dolostone (largely lutite) largely laminated (few mm to 1cm scale) • whole interval with saw-tooth "classic" stylolites (~4/m) all at 90° to LCA (// S_0) • sed. 'breccias' 99.7 (10cm) - flat intraclastic pebble and 99.86-99.88m • from 100-101.5m S_0 is 'wavy' • trace py throughout • @ 102m distinctive ? laminar fenestrae (white dolomite filled) and 20cm interbed of v.fg doloarenite • 102.8m ~~few~~ a stromatolite  9cm • S_0 at 88-90° to LCA
103.7-104.5		mid grey massive fine grained siliciclastic doloarenite (qtz. detritus) • a few stylolites // S_0 • trace disseminated pyrite

SEDIMENTOLOGICAL NOTE: so far upward fining cycles from arenites (eg 103.7-104.5m) to strom. dolostone (97-103) to dolomitic siltstone

Sheet 4 of ___ Sheets

GEOPEKO

BRISBANE

PROSPECT

HOLE No MRS D01

LOGGED BY

DATE

DIAMOND DRILL LOG

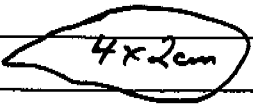
DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
104·5 – 107·5m		grey-green (?? tuffaceous) laminated (1-10mm) – very thin bedded (≤15mm) dolomitic siltstone (HCl +ve) – as with previous interval carbonate is 'capped' by f.g silt with green laminae • mud grade intraclasts (esp. 104·5–105m • So at 86° to LCA • overall seds. of alternating coarser grey – finer (green) bands with bedding becoming finer up interval.
107·5 – 113·8m		mid grey dolostone unit; largely dololutite but with significant doloarenite (quartz detritus, vf sst. grade) ⇒ arenite – lutite in fining upwards cycles • laminated to thin bedded • algal (? laminar strom) laminations @ 107·8, 113·0m • cherty @ 110m • intraclastic mudstone debris throughout – generally flattened // So . 110.6 – 110.8m green wispy bedded int.
113·8 – 114·5m		grey-green parallel laminated siltstone (– shale – fissile); So at 87° to LCA.
114·5 – 118·7m		interbedded (in upward fining cycles) f.g. grey siliciclastic doloarenite (v.f sand grade quartz) and dololutite; arenitic intervals stylolitic • thin bedded (max 15mm) bases, laminated 'tops' (few mm – 10mm) • traces of py on fractures cycles include 118.7 – 118 coarse 118 – 116·5 " (? lamina fenestrae @ 117·4m 116·5 – 115·7 = fine grained unit 116·5 – 115·7 fine unit

Sheet 5 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS 001
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
		115.7–114.8 coarse unit
		114.8–114.5 fine grained passing to siltstone unit described above.
118.7–119.5m:		mid grey doloarenite (–rudite) in upward fining cycle with grey flat intraclasts @ base (30 cm) f.g doloarenite at top. trace pyrite on fractures
119.5–121.9m		one cycle from 121.9–121.4 = grey dolorudite (flat pebbles, intraclastic) to 121.4–119.5 grey green siltstone, thin bedded at base → laminated at top largely dolomitic (HCl -ve).
121.9–123.7m		upward fining cycle of grey dolorudite – arenite base (intraclastic mud + qtz) passes up into grey dololutite (123–122.5m) which is laminated · slump @ 122.8m then (122.5–121.9) laminated dolomitic grey-green siltstone.
123.7–130m		mid grey stromatolitic dolostone (lutite – arenite; stratiform stromatolites (low ? bulbous forms); distinctive quartz nodules  – upward fining cycles with stylolites. c127–129m White ? fenestral porosity occluded by dolomite
130–132.6		cream – pale grey bleached dolostone (silt – v.fine sand grade), massive
132.6–132.8m		rubble after v.coarse grained sandstone – grains of green siltstone, quartz (sub-rounded) and dolostone in a clayey matrix
132.8–133.8		grey laminated (? algal lamination) dolostone, a few flat pebble beds (< 2cm thick.)

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
133.8–134.6m		v.fg doloarenite (c̄ Qtz. debris) — dololutite in an upward fining cycle capped by green mud grade dololutete — excellent flat pebble 'breccia' 133.9–134.0m
134.6–136.47m		fining upward cycle of dolostone from base of cycle up: → 136.47–135.4 = flat pebble breccia
	OOID	→ 136.3 ooid grainstone c̄ intraformational pebble trains → 135.1 lam–thin bedded v fg doloarenite → fining up to → 134.6 massive grey dololutite
136.47–137.4m		fining upward cycle: base 30cm intraclast dolorudite (mudst clasts grey to 3cm) — some ? flat pebble imbrication → passes up into grey laminated dololutite to 136.47m
137.4–141.0m		mid grey – green parallel laminated dolomitic siltstone • S_0 at 88° to LCA • some classic stylolites at 90° to S_0
141.0–143.4m		upward fining cycle of mid grey dolostone comprising : 143.4–142.8 . slump breccia (rudite of tightly packed (jig-saw) dolostone 142.8–141 laminated grey dololutite.
143.4–148.5m		massive grey / pale grey dololutite with grey-green 2cm 'shaley' bands at 146, 144.4m appears silicified (slightly conchoidal fracture) ; microcrystalline
148.5–149.5m		stromatolitic dolostone unit with characteristic ? fenestral (or framework) porosity filled by clear colloform silica – white dolomite , layered (thin bedded) with some

Sheet 7 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS 001
LOGGED BY
DATE

DIAMOND DRILL LOG

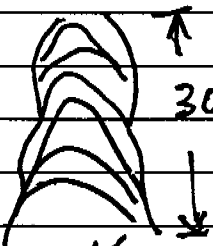
DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		siliciclastic debris and a coarse doloarenite base ~10cm thick
149.5-150m		grey massive dololutite passing up into laminated grey-green dolomitic shale.
150.0-160.8m		grey laminated stromatolitic dolostone unit, distinct with pale grey-cream 'fenestrae' of dolomite • largely stratiform strom. layering with a few mm/m (// S_0). • interbedded coarse doloarenite at 156.6-157.25m • base of unit marked by 60cm of flat pebble sed. breccia at 160.8m → fines up into coarse doloarenite and dolorudite with clasts of dololutite.
160.8-164.6m		grey partly silicified dololutite, massive - thin bedded a few 1-2cm doloarenitic interbeds. @ 162.5m - 162.6m algal laminations
164.6-166.2m ? sst marker seen at surface ⇒		mid (= medium) grey medium grained quartz-lithic (lithics = fg-dolostone) sandstone ?? marker horizon with thin greyish-green dolomitic siltstone interbeds in fining up cycles of approx. 2-10cm sst. overlain by ½-1cm dolomitic siltstone; thickest sand at base (166.2m) is 25cm thick; bases are relatively sharp • S_0 at 90° to LCA.
166.2-212m. like the Kussiella kussiensis bioherm described in Jackson et al 1987 (P. Haines NTGS pers comm.)		THICK STROMATOLITE (MARKER) UNIT: grey stromatolitic (algally laminated) dololutite; distinctive with 'tall' stromatolite forms; these are

Sheet 8 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
		likely (branching) columnar forms – branching form implied by odd angles to axes – look like forms in Balbirini Dolomite (see Jackson et al 1987) Sketch  eg. 171.5 – 172m. • at 184m : thin branching form 30–40cm height • sediment in between branches with 'flat-pebble' alligned parallel to the side of the strom. • overall unit is laminated (3–10mm) – this is algal. • occassional horsetail-like stylolites rich in organic matter • a few classic (saw-tooth) stylolites/m. • nearly entire interval is lutite grade • green ?Cu-oxide staining 201m, 201.5m.
212.0 – 215.27m		distinctive mid grey clastic unit of upward fining cycles of m.g qtz-lithic sandstone and calcirudite (intraformational flat-pebble) – grey wispy laminated shale, the sandstone has intraformational (rip-up) clasts of grey-green lutite cycles are 215.27 – 214.6 = arenite 214.6 – 214.4 = shale 214.4 – 213.8 = arenite 213.8 – 213.4 = shale 213.4 – 213.1 calcirudite then small cycle of sst – shale (~4cm sst/

Sheet 9 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT ______
HOLE No MRS D01
LOGGED BY ______
DATE ______

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
		1-2cm shale) to 212m • S_0 at 89-90° to L-CA
215·27 – 219·5m		clastic dominated sequence of upward fining cycles – dominantly carbonate detritus → i.e interbedded calcarenite (–rudite) and grey (–green) dolomitic siltstone (v. thin bedded to parallel laminated); also, flat pebble intraclast rudites • 218·8m a small 4cm 'high' conical strom  • calc. arenites up to 30–40cm thick some only a few cm. • ? algal lamination 218–219·5m • some stylolites with black organic matter
219·5 – 227·5		distinctive grey clastic dominated unit (similar to 212–215m) of upward fining cycles of m.g. calcarenite (20–50cm) and grey-green dolomitic siltstone (wavy laminated) and dololutite • toward top of the unit the coarse grained intervals become thinner (to a few cm)
227·5 – 244·6m: NB: 227-271m Same depositional facies.		grey laminated (algal) dololutite with minor graded doloarenite a few beds up to 5cm and one (234·5–234·7) intraclast dolorudite • core loss 229–234m likely due to presence of interbeds (?0·5m) of medium-coarse grained arenite (sim. to 132m) • a few classic stylolites/m • some white dolomite 'pods'  5-10mm thick — S_0 • flat pebble breccia 244·5–244·6m appear imbricated – this is base of the algally lam. unit

Sheet 10 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS 201
LOGGED BY
DATE

DIAMOND DRILL LOG

oid

fining

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
244.6–251.2m		grey dolostone (arenite/lutite) unit, lacks algal lamination/stromatolites – consists of upward fining cycles with a white distinctive ooid grainstone (12cm thick) at 247m • cycles are 30–40cm thick with 5–10cm of coarse grained doloarenite/intraclastic grading (fining) up into grey med- fine grained doloarenite, some of these with erosive scoured bases • possible algal lamination 247.6–248.4m • 249–250 = interval of grey homogenous dololutite
251.2–273.0m:		distinctive grey laminated doloarenite/lutite – "rhythmically interbedded lutite/arenite" • cross bedded at 252m 30° • a few classic stylolites per m. • 255.15–255.23m = dolorudite (intraformational • So at 90° throughout • the lamination produced by grey do. slst or do. lutite itbs ½–1mm alternating with 2–3mm sandy beds which are lighter coloured • rhythmic layering must be indicative of a specific environment of deposition • 258–259: py on fracture @ 90° to So • 264m x-bedded – foreset dip at 25° • interval as a whole fines downhole, to unit below
273.0–281.0m		pale – medium grey interbedded fine – medium grained doloarenite to dololutite and dolomitic dark grey-green and black laminated

Sheet 11 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from–to	GRAPHIC LOG	DESCRIPTION
→ entrolithic textures. (dewatering structures more likely!)		siltstone • deposited in 60-70 cm upward fining cycles (c 50-20cm slst). • Cu-oxide staining assoc. with coarser grained intervals @ 274.3m, 275.5m • Some slumping in the shaley intervals which are parallel to wavy irregular laminated • silty intervals are carbonaceous • within the black siltstone there are ?entrolithic textured grey dolomitic beds (few mm thick). — these intervals are more pyritic [is this transitional to Pmnc ??]
281.0 –	310.0m:	interbedded light grey fine medium grained doloarenite (HCl +ve) and black (- dk grey-green) weakly pyritic laminated carbonaceous siltstone (not HCl +ve) • in upward fining cycles of 50-80cm of m.g.-f.g. sst which is parallel thin) bedded (< 3cm) and with low angle cross strat. • the shaley bands are laminated, from a few cm to 20cm thick, and as with previous interval, contain
→		?entrolithic textures. — Superb example dewatering injection dykes - convoluted at 303.1 – 303.3m • soft sediment slumping in the black shale at 293.4m • distinct green ?Cu staining 293m, 294.5m, 303.0m 307.5m • So at 89-90° to LCA • cross bedded 294.7m (~20° dip on foreset

Sheet 12 of ___ Sheets

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION

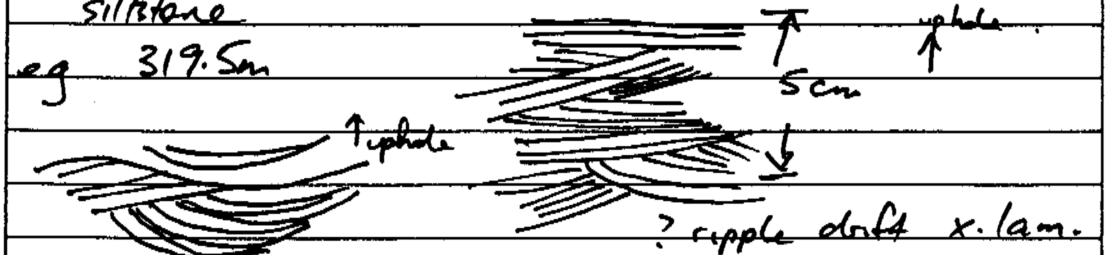
NB: on wet core using digital multimetre
dolomite seds ~ 900-1100 KΩ
Carbonaceous siltstone ~400-600KΩ
(1 cm electrode gap)
S.G's: - black carbonaceous shale (281m) 2.61
- doloarenite (215m) 2.82
- lam stromatolitic dololutite (198m) 2.83
- silic. lam. dololutite (160m) 2.82
- grey-green lam. siltstone (97m) 2.67

Some of the dololutite bands in the interval 281-310m record horsetail stylolites and apparent 'stylobedding'

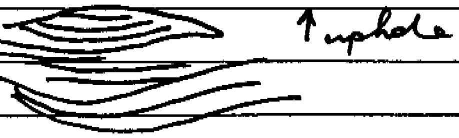

wispy dark stylolites wrap around cte! remains (less sol.)-

310.0 - 329.9m interbedded grey fine - medium grained laminated doloarenite - green/grey siltstone with characteristic black (o.m.) lamination, minor rudite; cross lamination and possible ripple drift cross lamination
. unit is upward fining cycles 30-100cm thick passing from dolo arenite - rudite which is typically with black o.m rich matrix (o.m surrounds cte. detritus at all scales, defining features such as cross.lam. parallel lam.) and may show x.lam to parallel lam. black - green (?glauconitic) siltstone

eg 319.5m



323m



GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS DO1
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
	O.M.	• this unit is very district with its black/pale grey stripey appearance • some fractures (eg 326.5m) in fine grained carbonate with soft black organic matter (? bituminous) • possible mud cracks ⊥ S_0 • a few cycles from intraformational dolorudite (15cm) $\xrightarrow{\text{fining}}$ doloarenite (10cm) → laminated dolomitic siltstone with black organic matter → dololutite with district black organic matter in fractures (original ? cavity porosity) • S_0 85–86° to LCA. • traces of pyrite throughout • at 329.9m this unit 'drapes' over the silicified breccia described below ~~~ ?UNCONFORMITY ~~~
329.9-330.9		grey intensly silicified breccia comprising clasts of silicified fractured ?carbonate in a sandy grey-green-black (organic matter) matrix, matrix also with pyritic bands 'which' mimic the darker organic matter rich layers → precursor a likely carbonate weathered at an ?unconformity surface. NB: this silicification appears to predate the overlying unit but post-dates the Karstic breccia (below) and is likely to represent a regolithic surface • there are scattered grains of cpy • this is the most pyritic interval of the hole
330.9-331.1m		partly silicified grey doloarenite, graded @ base → laminated at top; S_0 at 88° to LCA.; sits with an irregular contact

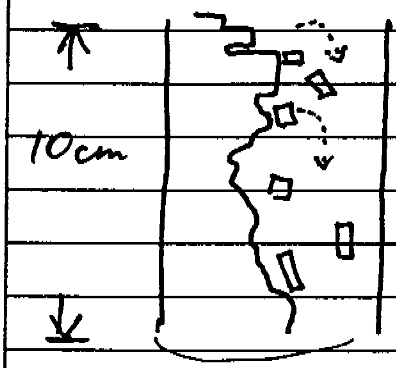
Sheet 14 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		on following unit:
331.1—333.0m:		angular "karstic" sedimentary" breccia: grey angular clasts (3-20mm) of dololutite in a green-grey matrix; clast:matrix ratio is low (matrix dominates) → the breccia forms a karstic infill in grey dololutite NB: the Bauhinia Downs NTGS note describe similar feature at the top of the Reward Dolomite (± mineralisation)



'clasts' of dololutite spald off into the bx. matrix.

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
333.0-336.0m:		grey-brown silicified algally laminated dolostone • translucent silica fills a ? fenestral porosity (? microregolithic feature) • the breccia from previous interval fills cavity porosity in this rock - this has been silicified • 333.9m black ? bituminous organic matter fills a cavity within the cavity filling material • So is 90° to LCA. • 334.06—334.30m a lovely intraclast breccia (clasts to 1cm wide), normally graded with black ?bituminous matter in bedding parallel porosity
	transitional // ↓	

Sheet 15 of ___ Sheets

GEOPEKO

BRISBANE

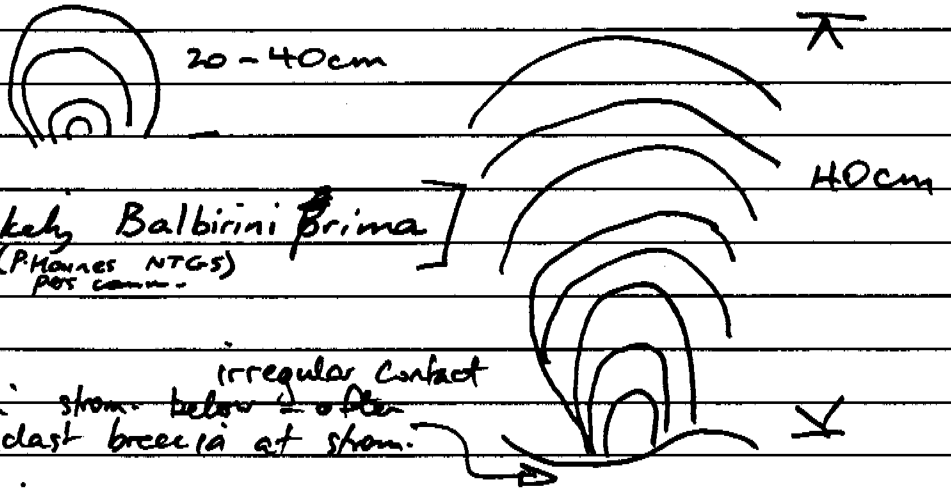
PROSPECT ____________

HOLE No MRS D01

LOGGED BY ____________

DATE ____________

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
336 – 341.0m		: grey stromatolitic dololutite ; stromatolites are <u>upright</u> 'tall' forms (20–40cm)  [likely Balbirini Prima (P.Haines NTGS) pers comm.] irregular contact ~~with strom. below & often~~ intraclast breccia at strom. base.
341.0 – 344.0m		algally laminated – thin bedded grey (with white porosity selective do. fill) dolostone (largely (white) interbedded, in upward fining cycle, with intraclastic breccias (rudites), vuggy porosity is filled with concentric (colloform) opaline silica (eg 341.6m)
344.0 – 347.5m		grey stromatolitic dolostone; stromatolites are upright, ~15cm in height (or less), silicified with some cubes of Fe-oxide (? after halite) and cubic casts, some fabric selective porosity between curved strom. lamellae • some black organic matter between mats within the porosity • interval is variably brecciated • traces of cpy
347.5 – 353.3m		dolorudite to dololutite in upward fining cycles, bases are intraclast breccias (15–40cm thick) fining up into thin bedded grey dololutite

Sheet 16 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D01
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
353.3-	356.8m	pale - medium grey algally laminated dolostone (lutite - very fine sand grade) • 354.1m: low strom. forms (few cm) ? button-like (sim. to Yalco fm). • laminations to 75° to LCA • interval variably chertified with silica filling (concentric) some of the vuggy porosity • trace dissem. cpy
356.5 -	367.0m	pale - medium grey dolostone comprising upward fining cycles (with erosive bases) of intraclastic rudite (clasts to 1-2cm) → grading up into laminated dololutite 359.6 - 360 is a ? brecciated (?talus) strom. → 359.6 - 367 is slumped, brecciated
367.0-370.8m S^{2-}		algally laminated dolostone with significant (fenestral) porosity filled with cream dolomite (? growth or framework porosity) → stroms. are stratiform (shallow water) → from 369.7-370.2 the interval is brecciated with irregular porosity filled with cream - white dolomite and... from 369.8-370.0 fairly massive py (± cpy) occurs as a matrix selective fill.
370.8 -	378.5m	pale grey laminated somewhat bleached dololutite with thin (10-20cm) dolorudite (intraclastic) interbeds - minor algal lamination - 10cm lam. slst (gy-gn) @ 375.4m - 375.6/377m low (1-2cm) button-like stromatolites

Sheet 17 of ____ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRSD01
LOGGED BY
DATE

DIAMOND DRILL LOG

ooid.

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		. 376.4-376.85 is an <u>ooid</u> <u>packstone</u> (i.e. some interclastic mud) - some pyrite in matrix 376.8m. . 377.2-377.4 c.g. dolarenite of ooids
378.5-381.7m		laminated grey-cream (where cherty) algal dolostone, partly chertified with flat pebble breccia developed (eg 381m) and creamy dolomitic fabric selective porosity fill (growth/framework Φ?) - some low (1-2cm) domal stromatolites
381.7-394.0m		grey dololutite (+ minor silty interbeds) with intraformational breccia with some green ?Cu staining in matrix of breccia at 382.5m and 384.6-384.8m - intraclast breccia (clasts to 30cm) alligned // S_0
394.0-400.4m E.O.H		grey (-black banded where chertified) partly chertified dolostone with minor interbedded grey-green laminated siltstone (1-10cm 'beds') - 394.3-394.7 = chertified stromatolitic lutite • S_0 at 85-90° to LCA.

Sheet 18 of 18 Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS P02
LOGGED BY A.Allan
DATE 27-08-93

DRILL LOG

NB: MRS P02 IS WATER BORE AT PEKO'S CAMP.

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
0 – 3m		light brown clay and dark brown pisolitic ferricrete, no magnetic fraction
3-6m		as above
6-9m		cream-buff brown largely clay with minor dark brown ferrug. lateritic material, small (<.25mm) grains of clear quartz in the clay (?after siltstone)
9-12m		brown limonitic very clayey fine quartz sandstone (0.125-0.25mm), though largely clay (?argillaceous matrix), cream colour in well washed chips WATER INJECTED.
12-15m		as above – significantly more clay + small rounded quartz pebbles (to 4mm), limonitic mudstone (transported E-cover)
15 – 18m		grey, bleached highly weathered mudstone
18 - 21m		" " + ferruginous material (?ferricrete) – poor sampling
21 – 24m		"" definitely cover fine cream-grey groundmass with tiny qtz. grains + Fe-stained brown chips of Qtz Sst (?Roper Gp detritus)
24 - 27m		" " : transported ?Roper Gp Qtz Sst + cherty Prot. cherty rock, clayey, limonitic.
27 - 30m		" " → largely cream-brown Fe-stained Sst, more competent ground
30 - 33m		" "
33 – 36		" " – with limonitic Sst.

Sheet 1 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS P02
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		WATER IN HOLE 36m. (≃ 1500 gph)
36 - 39m		fine - medium grained quartz sandstone (cream when washed), some rounded cherty clasts, pebble to 6mm, sst. has clayey matrix, all limonitic.
39 - 42m	still transported	1. grey weathered chert (cherty dolostone) 2. laminated cherty dolostone 3. limonitic quartz sstone 4. ? sed. breccia ("intraclast" dolostone,
42 - 45m		" "
45 - 48m		basement: grey thin laminated (.5-2mm) dolomitic siltstone
48 - 51m		" " - cherty with limonite / Mn-oxide stains / coatings on fractures
51 - 54m E.O.H.		1. large (10cm) chips of limonitic quartz sandstone 2. cherty dolostone, finely laminated, Mn-oxide dendrites

Sheet 2 of 2 Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS D03
LOGGED BY A·ALLAN
DATE : Collared 11-9-93

DIAMOND DRILL LOG

THIS SEQUENCE WHOLLY WITHIN THE BALBIRINI DOLOMITE [confirmed by P.Haines, N.T.G.S 10-03-94]

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
NB: OPEN HOLE PERCUSSION FROM 0-81·2m		
0 - 3m		limonitic brown ferruginous Quartz Sandstone gravel and laterite pisolites, clayey, manganiferous
3 - 6m		limonitic brown, clayey deeply weathered fine-medium grained quartz sandstone with argillaceous matrix - pale grey/cream on 'fresh' surfaces, some 'laterite' pisolites (to 0·5cm)
6 - 9m		" " but no 'laterite' rubble
9 - 12m		" ", slightly more clayey
12 - 15m		" " limonitic, more manganiferous
15 - 18m		" "
		WATER IN HOLE 21m
18 - 21m		" " but very clayey
21 - 24m		" "
24 - 27m		brown clayey highly weathered quartz sandstone, possibly siltstone, ferruginous, manganiferous
27 - 30m		clay after " " but with definite rounded gravels (to 0·5cm) of quartz, fine brown slst (E) and cherty ?dolostone (basement input).
30 - 33m		cream clay after weathered quartz sandstone (argillaceous matrix as above) - some large chips of clean quartz sandstone (Roper Gp. detritus,

Sheet 1 of ____ Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS D03
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
33-36m		cream, clayey, deeply weathered quartz arenite, fine-medium grained, matrix v. clayey and HCl +ve
36-39m		pale grey limonitic dololutite (HCl +ve)
39-42m		" " poss. uphole contamination of rounded dolostone 'clasts'
42-45m		bleached cream-brown dololutite: this is still ?Cenozoic cover.
45-48m		yellowish-brown clay, fragments of dololutite
48-51m		cream-brown deeply weathered quartz sandstone clayey matrix
51-54m		" "
		BASE OF OXIDATION ~ 55m
54-57m		clayey brown-grey deeply weathered fine sandstone - siltstone + some pebbles of clean quartz sandstone
57-60m		dark grey clay
60-63m		" "
63-66m		quartz sand (clear fine grained rounded quartz - after clean qtz arenite (?Roper Gp) Plentiful clean water
66-69m		coarse - very coarse pebbly sandstone to

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D03
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
		Conglomerate – subrounded clasts to 1cm of
		siliched laminated dolomitic siltstone + translucent qtz
69 – 72		" "
72–75		conglomerate as above – pebble – cobble
		grade, mainly translucent quartz + grey siliched
		dolostone, some laminated clasts
75 – 78		" , " but less coarse fraction +
		some algally laminated detritus
78–81·2m		grey (?siliched) dololutite (clast)
		?algal lamination; few chips of weakly
HQ CORE ⇓		pyritic arenite → still Cenozoic Cover?
CORE		LOG:
81·2–83·3m:		dark grey matrix supported conglomerate
	NOT	Angular clasts from 1–2mm to 1½cm
		of grey siliched dolostone, minor laminated
	TO	grey-green siltstone in a sandy, clayey
	SCALE	grey matrix with abundant black carbon
~~CARBON~~		after ?plant matter → Cretaceous/?Cenozoic
→ ~~Conductive~~ Cover		Cover possibly fluviatile – not very well
		indurated – suspect Cenozoic
	WCO	
83·3 – 110·4m		clayey bleached pale green – pale
		grey Slumped laminated siltstone and
?? THIS COULD		Sedimentary breccia (slump related) –
REPRESENT A		coherent laminated siltstone bands are
BASAL CRETACEOUS		green – pale green – cream (defining S_0) and
BRECCIA.		up to 10–15cm thick – otherwise the rock
		is brecciated – angular intraformational clasts
		of green siltstone (some clasts with internal
		slumping – ?syn-sed.) chaotically arranged
		also, grey fine sandstone – laminated

GEOPEKO
BRISBANE

PROSPECT Rosie Ck.
HOLE No MRS D03
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		The sequence was probably in upward fining cycles prior to slumping • S_0 (though slumped) ≃ 85° to LCA • where coherent, bands of unslumped siltstone are extensively microfaulted • traces of pyrite
110.4 – 111.15m		White (– off white) fine grained sandstone (– slst – clayey material – little quartz at all) with HCl +ve dolomitic matrix resting on 20cm of algally laminated silicified, but now clayey weathered dolostone
111.15 – 117.7m		largely duck-egg-green clay with significant core loss – clay contains pebble grade 'clasts' of grey dolostone, green siltstone and is probably a conglom. with argillaceous matrix • 1m core loss (?cavity) at ~115.0 and 117.0m
▲ to Q 129.1m 117.7 – 162.8		light grey stromatolitic dololutite; massive to algally laminated (– not stratiform stroms – see below) • largely domal stroms to 30cm tall • silty green partings ≤1mm capping cycles of intraclastic conglomerate • not a massive bioherm • but for the stromatolite this dominantly fine grained rock matches description of Coranbirini Mbr (Lynott Fm.) • stromatolite layering is up to 70° to LCA but S_0 (defined by siltstone interbeds) is generally ~88° to LCA. • poss. low angle cross-stratification at 141.0m. • remarkably homogeneous unit – correlates with thick stromatolite unit in MRSD01

Sheet 4 of ___ Sheets (166-212m)

GEOPEKO
BRISBANE

PROSPECT
HOLE No MRS D03
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		• limonitic coatings on ?joint surfaces
		• 1.6m cavity at 161.2m (no core recovery)
162.8-169.1m		'clastic unit' comprising upward fining cycles
		of grey dololutite - arenite → thin
		grey green siltstone from base to top
		169.1-168 = thin bedded (½-1cm)
		doloarenite → grey siltstone in packets
		('complete'), slumped, brecciated and
		capped by lutite (168-168.5m)
		168-167.1 6-10cm upward fining cycle
		from grey very fine sandstone (doloarenite) →
		grey-green siltstone
		167.1-166 2 cycles of medium grained
		doloarenite capped by 1-2cm shale
		166-165.5 thin 2-3 cm cycles from
		arenite - siltstone ('complete')
		165.5-165 1 cycle of dolorudite with
		flat pebble breccia at base to laminated
		dololutite
		165-164.3 " "
		164.3-162.8 intraclastic doloarenite c̄ some
		intraformational mud clasts.
169.1 - 178.0m		pinkish (Fe/?Mn stained) silicified interlaminated.
palaeo		very thin bedded coarse - 'fine grained'
? regolith		doloarenite significant brown limonite
		staining ~~with~~ - upward fining - this
		may represent paleoregolith - it's like
		prev. int. but highly ferruginous
		• at 169.75m an 8cm band of translucent
		silica - pink dolomite rock
		• 170-170.4 black 'speckles' of tiny
		Fe oxide /Mn after ?pyrite (cubic)
		• some ?microregolithic bands (2-3mm)
		of translucent silica

GEOPEKO
BRISBANE

PROSPECT ROSIE CREEK
HOLE No MRS D 03
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
		• @172.2m 2.2m core loss in cavity then a 'highly ferruginous 3cm band passes down gradually losing pinkish colour to become weakily silicified grey (greenish). doloarenite with minor interbedded siltstone from 177–178m • at 175.4m a 3mm silica 'band'
178.0–179.5m		grey dololutite capped by green and black siltstone (parallel laminated)
179.5–203m		"laminated (algally) dolostone facies" of grey lam. weakly silicified dolostone with characteristic banding – occ. lighter cream dolomite laminae. black MnOx on joints at 90° to S_o. • S_o ~ 87–89° to LCA. • looks like a framework porosity in algally laminated dolostone from 185–187 • 190–191 cubic casts (?after Halite) – or pyrite – bleached halos • at 190.5m a 10cm band of white quartz parallel to S_o
OOID.		• white ooid marker beds at: *198.01m (2cm, silicified) with definite low stromatolite (17cm tall) * 201.02m – 1cm silicified white ooid grainstone * 201.15 – 201.80m thick ooid marker the basal 20cm is intensely silicified with horizontal bands (? // S_o) of translucent silica – also, cutting across S_o – silica possibly after dessication

Sheet 6 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek.
HOLE No MRS DØ3
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		features the ooid grainstone has flat (1-2mm) grey lutite intraclasts that are roughly ~~atting~~ alligned with S_0 at 85° to LCA . at 201.2m there are large (3x2cm) clasts of grey lutite in the clean white ooid grainstone 'matrix' + minor pyrite.
203.0–225.0m		grey laminated (– very thin bedded) doloarenite – lutite – this correlates with 251-273m in MRSDØ1. • cross bedded at 208.5m • a few classic stylolites /m • Some ½-1cm bands of silica • 22cm stromatolite form at 206.6m • characteristic silica bands (3/4-1cm) at 216.4m (x3), 214.3m (x4) • deposited in upward fining cycles of 30-50cm with the entire interval becoming fine grained downhole.
225.0–232.0m		upward fining cycles of grey doloarenite → grey dololutite → green laminated siltstone. The arenites are fine-medium grained, largely intraclastic debris with some green' (?Cu) staining on some beds (eg. 227.15m). There are some wispy horsetail stylolite-like partings • S_0 88-89° to LCA.
232.0 – E.O.H	252.0	upward fining cycles (~10-60cm) of fine grained grey doloarenite → grey dololutite → black (weakly pyritic) carbonaceous laminated siltstone ('shale')

GEOPEKO

BRISBANE

PROSPECT Rosie Ck.

HOLE No MRS D03

LOGGED BY

DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
⇒ ENTROLITHIC		• entrolithic textures 249.0m, 247.2m,
TEXTURES		2362m (similar to 303m in MRSD01)
		• low angle cross-strat. at 243m.
		• the darker siltstone has some pyrite
		// S_0
		• silicified 234-234.6m
SLUMP		• definite <u>slump</u> at 234.6m
		• the thickness of the siltstone bands
		increases downhole
		eg ~40cm @ 250.3, 248.6-249.6m;
		235.7-236.56 - are the thickest
		Conversely, the fine grained mid grey
		arenite-lutite bands become thicker up
		hole.
E.O.H		

Sheet 8 of ____ Sheets

GEOPEKO
BRISBANE

PROSPECT ROSIE CREEK
HOLE No MRS P04
LOGGED BY A. ALLAN
DATE COLLARED 19-09-93

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
0 - 3m		brown laterite, lateritic pisolites to 4mm, brown sandy soil + highly ferruginous ?quartz sandstone
3 - 6m		" " but more brown clay
6 - 9m		cream clay, brown chips of ferruginous quartz sandstone, rounded quartz pebbles, ferruginous brown siltstone, ?pebble of Є carbonate. ?fluviatile
9 - 12m		cream-brown clay, a few pisolites, cream-br. limonite chips of ?chertified basement
12 - 15m		" " but no cream cherty rock
15 - 18m		cream-brown clay (95%) some grey-green ?slst. chips - likely clasts in core
18 - 21m		brown deeply weathered ?fluviatile gravelly sandstone ⇒ some rounded qtz. pebbles, chips of ferruginous highly weathered sandstone; moisture in hole 18m
21 - 24m		" " clayey SIGNIFICANT (?2000 GPH) WATER IN HOLE 24m
24 - 27m		" " but largely brown clay
27 - 30m		br. clay after brown silty-sandy ?fluviatile rock.
30 - 33m		" "
33 - 36m		brown clay, some deeply weathered siltstone

Sheet 1 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS P04
LOGGED BY
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
36 - 39m		brown clay after ferruginous Quartz sandstone with an argillaceous cream-brown ~~cl~~ matrix, has fairly well rounded qtz-grains in clayey matrix, mottled appearance (hematite - limonite)
39 - 42m		" " - pebbly fine-sandstone
42 - 45m		khaki-brown clayey deeply weathered fine grained quartz sandstone : poor sample.
45 - 48m		"
48 - 51m		" "
51 - 54m		" "
54 - 57m		brown clay as above + dk. grey clay (? with silt).
57 - 60m		grey-black clay (? highly weathered siltstone) - sulphides smell
60 - 63m		" "
63 - 66m		sandy aquifer (also in ~~[illegible]~~ MRS D01) clean quartz sand (very fine - fine grade) and lots of black ?carbon (plant matter)
CARBON (plant matter) 66-~~69m~~ 75m		traces of pyrite and cream ? former clasts of Prot- basement

see over

Sheet 2 of

GEOPEKO
BRISBANE

DIAMOND DRILL LOG

PROSPECT
HOLE No MRS P04
LOGGED BY
DATE

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
(66-75m)		cream fine grained sandstone + grains of clear quartz + clayey white weathered siltstone, limonitic brown sandstone + black organic matter
-75m		
75–81m:		" " → + pale grey siltstone + grey-green siltstone + mid grey silicified ± laminated dolostone
		CONTACT WITH PROT. BASEMENT ~78/79m.
81–84		fairly homogenous grey siltstone some chips of laminated ? Prot dolostone (slow reaction with HCl)
84–87		" " plus some very fine grained doloarenite (interbedded arenite – lutite).
87-90m		" "
E.O.H		

GEOPEKO
BRISBANE

PROSPECT ROSIE CREEK
HOLE No MRS D 05
LOGGED BY A.ALLAN
DATE COLLARED 20.09.93

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
NOTE:	OPEN	HOLE PRECOLLAR TO 113.7m
0 – 3m		buff brown sandy soil, lateritic pisolites and clay
3 – 6m		" " : some pisolites weakly magnetic (? maghemite)
6 – 9m		" " → after quartz sandstone with argillaceous cream matrix, some pebbles to 8mm of brown quartzite, clayey, less ferricrete
9 – 12m		cream-brown limonite stained fine quartz sandstone with argillaceous matrix, Mn-oxide stained
12 – 15m		" " + reddish-brown (hematitic) stain
15 – 18m		" " + well rounded gravel (3-10mm) of ferruginous brown sandstone and some pisolitic material
18 – 21m		brown-cream limonitic clayey deeply weathered sandstone (as for 9-15m)
21–24m		" " some hematitic mottling
		MUCH (>2000 GPH) WATER IN HOLE 24–27m.
24–27m		" " : alot more clay (after ? siltstone)
27–30m		clayey cream deeply weathered siltstone with some clear quartz grains embedded, Mn-oxide stained, limonitic HCl -ve
30–33m		" "

Sheet 1 of ____ Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS D 05
LOGGED BY A. Allan
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
33-36m		clayey deeply weathered siltstone and quartz Sandstone with clayey matrix
36-39m		cream-brown limonite, hematitic weathered siltstone and quartz sandstone, argillaceous matrix, Mn-oxide stained
39-42m		clean cream quartz sandstone with argillaceous matrix, a few cobbles of Prot. dolostone
42-45m		" "
45-48m		chips of 1. clean fine grained Q Sst - cream 2. Prot. { dolostone - laminated silt grade silicified dolostone - grey } 3. cream siltstone
48-51m ROPER GP.	↓	cream - pinkish fine grained Q Sst, some cream clayey deeply weathered siltstone
51-54m		" "
54-57m		red-brown hematitic quartz sandstone
57-60m		" "
60-63m		" " with a few rounded pebbles of Prot. dolostone
63-66m		" "
66-69m		" "

Sheet 2 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS D05
LOGGED BY A.Allan
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
69-72		" "
72-75		" "
75-78		" "
78-81		" "
81-84		" " – pinkish-brown f-m.g Qsst – little matrix
84-87		" " + a few chips of lam cherty dolostone (as clasts in the sst)
87-90		70% pinkish m.g Qsst 30% cream f.g Qsst
90-93		" "
93-96		" "
96-99		" " 60/40
99-102		" "

Sheet 3 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT Rosie Creek
HOLE No MRS D 05
LOGGED BY A. Allan
DATE

DIAMOND DRILL LOG

DEPTH–m from–to	GRAPHIC LOG	DESCRIPTION
102 – 105		" " c̄ possible coss-bedding
105 – 108		" "
108 – 111		" "
111 – 113.7		" "
113.7 – 151.0m		reddish-brown medium grained quartz sandstone (grain size increases overall to medium-coarse from 135m downhole): Comprises subrounded-rounded quartz grains, mod-well sorted with (very little) red-brown hematitic, clayey matrix (hem./lim. stained kaolinite?). Some bedding parallel partings ~1-3cm spaced at 87-90° to LCA
'spots'		• ½-1cm diameter spots of lighter red-brown coloured sandstone where the matrix has been removed (?selective leaching) leaving a 'rough-textured' surface, frequently more limonitic • all HCl-ve • ?stylolite features give the rock a thin bedded - bedded appearance (1-5cm) • S_0 85-88° to LCA • deposited in upward fining cycles grading from m.g - f.g Sst over ~10-30cm • joints at 20°/45° are limonitic

HQ CORE ⇓

Sheet 4 of ___ Sheets

GEOPEKO
BRISBANE

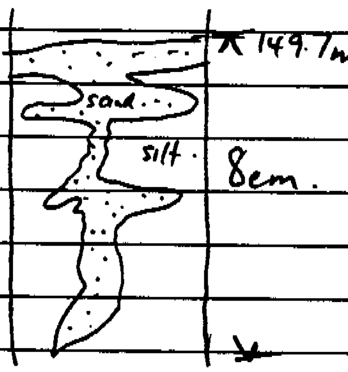
PROSPECT Rosie Creek
HOLE No MRS DD5
LOGGED BY A Allan
DATE

DIAMOND DRILL LOG

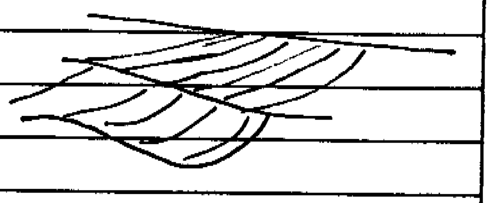
DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION

- low angle cross-stratification 131m
- 135-135.3 coarse pebbly sandstone with clasts of quartz (lim. yellow - White) grading up to f.-m.g.
- 136.7-137.5m = pebble conglomerate fining up unit ; erosive base @ 82° - pebbles 1-3mm, subrounded of qtz (lim/hem stained)' - possible clay after feldspathic detritus
- at 136.4m ovoid red-brown siltstone ?intraformational rip-up clasts - distinct sharp margins (2x1cm avg. but up to 7x5cm) " " at 140.6m.
- as we go down sequence, the cycles are thicker and coarser grained (eg from v.c.s - f.s ~ 70cm cycles eg. 138.8-139.5m)
- @ 142.5m ▭ shaped intraclasts of red-brown siltstone (1X3 - 2x1 cm, approx // S_0 at 90° to LCA)

- red shale interbed at 149.6-150.2m (likely intraclast source) contains irregular sand lenses in it that are both // and ⊥ to So - possible dewatering ~~or~~ ?injection features



also, some cross-lamination



GEOPEKO
BRISBANE

PROSPECT: ROSIE CREEK
HOLE No: MRS D05
LOGGED BY: A. ALLAN.
DATE:

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
151 – 175.86		red-brown medium grained Quartz sandstone
		with massive appearance. Unusual round
		lighter red-br. coloured 'pits', entirely
		HCL -ve.
		· poorly defined upward fining units
	→	BUT OVERALL GRAINSIZE DIMINISHES
		DOWNHOLE
		· at 158.7m red shale intraformational
		rip-up clasts 2-3mm x 10-20mm
		roughly oriented 85-90° to LCA
		· occasional pebble trains (1-2mm)
? FLUVIAL/		· ? Glauconite tray 12.
DELTAIC		
SEQUENCE.		· 168.85 – 169.4 and 172.7 – 172.8m interbeds
		of structureless red mudstone - v. fsst
		laminae in mudst. define S_0 @ 83° LCA
	mica	there are fine specks of white mica in
		the mudstone
		· 174.3 → 7 x 4cm round cobble of quartzite
		· 175.4m ? tabular cross bed - foreset dip
		of ~30°
175.86 – 177.2		matrix supported (? debris flow)
		Conglomerate: subrounded to rounded
		clasts of white sandstone (quartzite),
		brown siltstone (up to 10cm x > core width);
		poorly sorted matrix of brown medium grained
		quartz sandstone - appears to become finer
		grained up interval
177.2 – 179.5m		red mudstone, laminated, some syn-sedimentary
		slumping, microfaulting and possible
		tuffaceous beds at 178.46 (4mm) ⎤ pinkish-brown
		179.46 (4mm) ⎥ red fine sand size - could be
		179.36 – 179.40 ⎦ arkosic sed.
		· S_0 89° at 177.2m
		· some gradation from massive → lam. uphole

Sheet 6 of ___ Sheets

GEOPEKO

BRISBANE

PROSPECT ROSIE CREEK
HOLE No MRS D05
LOGGED BY A. ALLAN.
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
179.5-189.2m		reddish brown ARKOSIC sandstone, largely fine grained with pinkish spotted appearance, largely quartz detritus but appears arkosic (ie Q (70-85%) - f pink hem/lim clay after feldspar) ⇒ definitely < Qtz than uphole • DETRITAL WHITE MICA • Thin red-br mudstone interbeds at 182.16 (3cm) and 182.24 (7cm) • lighter brown coloured 'spots' generally 2-3mm ? diagenetic • x-bedding at 184.5m • brown mudstone intraformational rip-up clasts (flattened // S_0) at 185.7m • orthoconglomerate at 187.9-188.25m (capped by 2cm of mudstone): rounded cream quartzite clasts + ~~red~~ red-br Q Sst clasts to 8 x 4cm in hematitic sandy matrix • paraconglomerate 188.8-189m clasts of quartzite (cream) + Qsst (red-br), rounded in sandy matrix.
189.2-196.3m		medium-coarse grained moderately well sorted Quartz sandstone (rusty) pale brown colour paler than sequence above very little matrix; approx ≤10% lithic component → small reddish-br. mudstone grains and a green mineral on broken surface ?GLAUCONITE (c. 194.3m) • rounded cobbles of red-brown siltstone - sandstone and white quartz at 191.7, 192.2m
196.3-219.30m E.O.H		medium (rather than med-coarse) quartz sandstone (as above) with 16cm mudstone interbed at 196.3m

Sheet 7 of ___ Sheets

GEOPEKO
BRISBANE

PROSPECT ROSIE CREEK
HOLE No MRS 205
LOGGED BY A. Allan.
DATE

DIAMOND DRILL LOG

DEPTH-m from-to	GRAPHIC LOG	DESCRIPTION
		. capping 0.7m of fine grained quartz sandstone. • low angle cross bedding at 1-2cm spacing throughout foreset dips of ~25-30° (eg 202-204m) • progressing downhole, the reddish lithic component is diminishing (hence paler colour).
E.O.H.		
		NB hole stopped – basal Limmen Sst. of Roper Gp is ~110m in Tawallah Range – we have tested 180m of likely Roper Gp ∴ not likely near base of Roper Gp – could be thick.

APPENDIX 5

1993 DRILLING PROGRAMME - ANALYTICAL RESULTS

amdel

21 Marjorie Street, Berrimah, Northern Territory
Postal Address : P.O. Box 58, Berrimah, N.T. 0828
Telephone: (089) 322 637 Facsimile: (089) 323 531

GEOPEKO
P.O.Box 713
Mt. Isa

QLD 4825

ANALYSIS REPORT :

Your Reference : Q 7758
Our Reference : 3DN0858

Samples Received : 20/09/93
Number of Samples : 153
Results Reported : 01/10/93
Report Pages : 1 to 8

This report relates specifically to the samples tested in so far as the samples supplied are truly representative of the sample source.

If you have any enquiries please contact the undersigned quoting our reference as above.

Report Codes:
N.A. -Not Analysed
L.N.R. -Listed But Not Received
I.S. -Insufficient Sample

A Ciplys

Approved Signature:

for

ALAN CIPLYS
Manager - Darwin
AMDEL LABORATORIES LIMITED
A.C.N. 009 076 555

Sample Numbers and Hole Depths.

amdel

Job: 3DN0858
O/N: Q 7758

Final

ANALYTICAL REPORT

Job: 3DN0858
O/N: Q 7758

ANALYTICAL REPORT

		SAMPLE	Ag	Cu	Pb	Zn	Mn	Fe	TOEC	Ba	Tl
MRS P02	36-39m	2051	<1	15	32	25	64	5.36%	--	330	<10
Water	-42	2052	<1	6	16	13	105	1.81%	--	610	<10
bore	-45	2053	<1	21	17	14	2540	1.80%	--	700	<10
	-48	2054	<1	28	6	6	870	6800	--	570	<10
	-51	2055	<1	41	12	13	2100	1.21%	--	810	<10
	-54 EOH	2056	<1	38	8	10	2370	1.04%	--	690	<10
MRS D01	79-84m	2057	<1	12	40	56	33	5600	--	50	<10
	-86	2058	<1	15	20	39	32	7500	--	250	<10
15500E/	-88	2059	<1	13	32	35	21	8500	--	290	<10
540N	-90	2060	<1	5	22	22	600	5500	--	155	<10
	-92	2061	<1	4	57	12	610	7500	--	490	<10
	-94	2062	<1	5	20	21	480	6600	--	160	<10
	-96	2063	<1	4	27	34	930	6100	--	45	<10
	-98	2064	<1	4	7	11	690	7000	--	200	<10
	-100	2065	<1	8	34	18	1270	1.11%	--	30	<10
	-102	2066	<1	3	9	20	950	7100	--	110	<10
	7-104	2067	<1	3	20	12	1100	6100	--	25	<10
	-106	2068	<1	4	10	9	840	6900	--	125	<10
	-108	2069	<1	4	6	14	810	7300	--	240	<10
	-110	2070	<1	3	12	15	840	5700	--	120	<10
	-112	2071	<1	4	13	22	820	6400	--	125	<10
	-114	2072	<1	3	9	9	970	6400	--	85	<10
	-116	2073	<1	4	18	11	680	7100	--	180	<10
	-118	2074	<1	3	18	39	610	5800	--	60	<10
	-120	2075	<1	4	9	13	660	5600	--	115	<10
	-122	2076	<1	5	16	14	630	7600	--	5800	<10
	-124	2077	<1	4	13	9	880	7000	--	135	<10
	-126	2078	<1	3	11	15	870	6100	--	20	<10
	-128	2079	<1	3	10	10	650	4200	--	30	<10
	-130	2080	<1	3	10	8	590	4100	--	60	<10
	-132	2081	<1	3	24	10	2690	1.52%	--	35	<10
	-134	2082	<1	8	22	11	890	5900	--	520	<10
	-136	2083	<1	4	8	8	650	5200	--	75	<10
	-138	2084	<1	7	9	8	670	5800	--	65	<10
	-140	2085	<1	5	7	15	670	7700	--	170	<10
	-142	2086	<1	4	7	6	720	6900	--	85	<10
	-144	2087	<1	4	5	14	580	5500	--	60	<10
	-146	2088	<1	3	6	29	700	6800	--	30	<10
	-148	2089	<1	5	8	9	640	5800	--	40	<10
	-150	2090	<1	17	7	33	600	6000	--	120	<10
	-152	2091	<1	4	8	9	620	5000	--	30	<10
	-154	2092	<1	2	8	15	630	4800	--	20	<10
	-156	2093	<1	3	11	27	660	4900	--	10	<10
	-158	2094	<1	3	7	15	780	5600	--	20	<10
	-160	2095	<1	3	6	8	500	4200	--	15	<10
	-162	2096	<1	3	9	12	720	5600	--	45	<10
	-164	2097	<1	2	7	5	490	4300	--	15	<10
	-166	2098	<1	3	8	9	560	4800	--	55	<10
	-168	2099	<1	3	6	5	560	4800	--	85	<10
	-170	2100	<1	2	5	4	580	4500	--	90	<10
		UNITS	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm
		DET.LIM	1	2	4	2	4	5	0.05	10	10
		SCHEME	AA1	AA1	AA1	AA1	AA1	AA1	GRAV4B	XRF1	XRF1

amdel

Job: 3DN0858
O/N: Q 7758

Final

ANALYTICAL REPORT

MRSD01
Cont.

	SAMPLE	Ag	Cu	Pb	Zn	Mn	Fe	TOEC	Ba	Tl
170-172	2101	<1	2	5	5	580	4600	--	75	<10
-174	2102	<1	2	5	5	450	4600	--	90	<10
-176	2103	<1	3	7	5	450	5000	--	65	<10
-178	2104	<1	2	8	2	430	4100	--	80	<10
-180	2105	<1	3	4	2	410	4000	--	90	<10
-182	2106	<1	2	5	<2	400	4100	--	60	<10
-184	2107	<1	2	5	4	390	4400	--	75	<10
-186	2108	<1	2	7	2	370	4300	--	85	<10
-188	2109	<1	4	8	3	400	4500	--	100	<10
-190	2110	<1	3	8	2	360	4900	--	95	<10
-192	2111	<1	2	8	<2	390	4800	--	85	<10
-194	2112	<1	3	8	<2	390	4800	--	85	<10
-196	2113	<1	3	7	2	420	4800	--	90	<10
-198	2114	<1	2	11	3	420	5200	--	85	<10
-200	2115	<1	4	11	6	510	6700	<0.05	95	<10
-202	2116	<1	4	9	3	430	5400	--	90	<10
-204	2117	<1	2	6	2	400	5000	--	90	<10
-206	2118	<1	2	6	2	400	4400	--	85	<10
-208	2119	<1	4	7	3	420	5300	--	85	<10
-210	2120	<1	3	7	3	430	4600	--	55	<10
-212	2121	<1	4	6	3	460	5300	--	120	<10
-214	2122	<1	4	6	5	710	6400	--	75	<10
-216	2123	<1	3	5	5	840	7000	--	100	<10
-218	2124	<1	3	10	36	1000	6800	--	40	<10
-220	2125	<1	3	11	21	1090	6800	--	75	<10
-222	2126	<1	5	9	6	840	6600	--	105	<10
-224	2127	<1	4	14	6	910	8600	--	25	<10
-226	2128	<1	4	25	4	700	6000	--	65	<10
-228	2129	<1	4	8	11	590	6200	--	105	<10
-230	2130	<1	3	9	5	740	5600	--	<10	<10
-232	2131	<1	4	9	7	670	5500	--	10	<10
-234	2132	<1	43	19	27	570	8700	--	100	<10
-236	2133	<1	3	10	12	710	5700	--	<10	<10
-238	2134	<1	3	12	16	630	6700	--	<10	<10
-240	2135	<1	4	12	31	640	4900	--	<10	<10
-242	2136	<1	3	10	12	650	4800	--	<10	<10
-244	2137	<1	4	13	40	720	5000	--	<10	<10
-246	2138	<1	3	10	10	680	5300	--	<10	<10
-248	2139	<1	3	10	12	680	5100	--	<10	<10
-250	2140	<1	2	20	93	710	5300	--	<10	<10
-252	2141	<1	3	34	145	940	6500	--	<10	<10
-254	2142	<1	4	14	18	860	5400	--	<10	<10
-256	2143	<1	3	20	11	860	5900	--	<10	<10
-258	2144	<1	2	20	36	920	6400	--	<10	<10
-260	2145	<1	4	22	27	880	1.00%	--	<10	<10
-262	2146	<1	3	24	39	830	6400	--	<10	<10
-264	2147	<1	3	13	33	800	6100	--	<10	<10
-266	2148	<1	3	11	13	830	5900	--	<10	<10
-268	2149	<1	3	10	37	790	5600	--	<10	<10
-270	2150	<1	3	11	12	760	5000	--	<10	<10
	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm
	DET.LIM	1	2	4	2	4	5	0.05	10	10
	SCHEME	AA1	AA1	AA1	AA1	AA1	AA1	GRAV4B	XRF1	XRF1

Job: 3DN0858
O/N: Q 7758

ANALYTICAL REPORT

ndel

ANALYTICAL REPORT

ANALYTICAL REPORT

MRSDØ1 Continued.	SAMPLE	Ag	Cu	Pb	Zn	Mn	Fe	Ba	Tl
370-372m	2201	<1	18	16	38	820	4400	25	<10
-374	2202	<1	39	87	61	1050	5300	25	<10
-376	2203	<1	19	13	24	1060	6400	35	<10
-378	2204	<1	55	130	81	780	7100	35	<10
-380	2205	<1	18	9	44	790	5700	20	<10
-382	2206	<1	29	24	26	850	5500	25	<10
-384	2207	<1	38	10	14	750	5200	30	<10
-386	2208	<1	37	47	33	720	4900	30	<10
-388	2209	<1	31	6	6	780	5600	50	<10
-390	2210	<1	22	30	20	730	5100	30	<10
-392	2211	<1	11	9	6	620	4000	45	<10
-394	2212	<1	16	36	20	820	4900	15	<10
-396	2213	<1	5	6	5	670	4700	<10	<10
EOH. 396-400m	2214	<1	15	26	14	650	5100	70	<10
MRS RP14 [illegible] 540N/1440E 0-3m	2218	<1	46	57	22	1290	17.1%	460	10
-6	2219	<1	35	125	60	770	7.16%	490	<10
-9	2220	<1	19	57	280	610	3.06%	470	<10
-12	2221	<1	12	17	60	230	2.60%	1420	<10
-15	2222	<1	12	16	44	120	3.28%	170	<10
-18	2223	<1	8	17	30	86	2.86%	125	<10
-21	2224	<1	9	30	65	66	4.74%	100	<10
-24	2225	<1	9	17	24	340	3.06%	2150	10
-27	2226	<1	14	36	37	240	3.56%	320	<10
-30	2227	<1	24	120	195	430	2.94%	250	<10
-33	2228	<1	15	38	71	460	2.38%	600	10
-36	2229	<1	12	21	26	570	2.08%	730	<10
-39	2230	<1	12	21	32	550	1.74%	360	<10
-42	2231	<1	10	14	86	190	2.02%	1040	<10
-45	2232	<1	16	19	74	340	2.54%	1140	<10
-48	2233	<1	6	15	90	130	1.90%	1820	<10
-51	2234	<1	8	13	98	140	2.16%	840	<10
-54	2235	<1	7	12	80	115	1.67%	910	<10
-57	2236	<1	9	15	99	200	2.16%	510	<10
-60	2237	<1	9	12	145	105	2.68%	230	<10
-63	2238	<1	16	17	100	140	3.06%	360	<10
-66	2239	<1	16	<4	6	94	1.04%	15	<10
-69	2240	<1	<2	<4	4	14	900	<10	10
-72	2241	<1	4	<4	6	36	4800	25	<10
-75	2242	<1	12	11	15	165	2.20%	125	<10
-78	2243	<1	7	11	54	30	6100	60	<10
-81	2244	<1	6	11	30	810	2.14%	190	<10
-84	2245	<1	2	12	11	890	1.00%	630	<10
-87	2246	<1	<2	10	10	940	8200	150	<10
E.O.H. -90	2247	<1	<2	10	11	1110	9100	95	<10
MRSDØ3, core (see 2215-2217 = pre-collar samples from this hole) 230-31	2248	<1	3	7	7	1690	5600	65	<10
-232	2249	<1	5	13	8	1540	6500	1020	<10
-233	2250	<1	12	23	13	1990	7600	105	<10
-234	2251	<1	8	19	9	2550	8000	80	<10
-235	2252	<1	5	10	4	1890	7300	40	<10
-236	2253	<1	13	18	30	1810	8000	145	<10
	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	DET.LIM	1	2	4	2	4	5	10	10
	SCHEME	AA1	AA1	AA1	AA1	AA1	AA1	XRF1	XRF1

amdel

Job: 3DN0858
O/N: Q 7758

Final

ANALYTICAL REPORT

		SAMPLE	Ag	Cu	Pb	Zn	Mn	Fe	TOEC
MRSD03	72-75m	2215	<1	10	10	5	89	8500	--
PRECOLLAR	75-78m	2216	<1	6	<4	4	32	6500	--
	78-81m	2217	<1	9	10	4	40	8300	--
		UNITS	ppm	ppm	ppm	ppm	ppm	ppm	%
		DET.LIM	1	2	4	2	4	5	0.05
		SCHEME	AA1	AA1	AA1	AA1	AA1	AA1	GRAV4B

end
precollar.

amdel

21 Marjorie Street, Berrimah, Northern Territory
Postal Address : P.O. Box 58, Berrimah, N.T. 0828
Telephone: (089) 322 637 Facsimile: (089) 323 531

GEOPEKO
P.O.Box 713
Mt. Isa

QLD 4825

ANALYSIS REPORT :

Your Reference : Q 7760
Our Reference : 3DN0888

Samples Received : 28/09/93
Number of Samples : 66
Results Reported : 06/10/93
Report Pages : 1 to 4

This report relates specifically to the samples tested in so far as the samples supplied are truly representative of the sample source.

If you have any enquiries please contact the undersigned quoting our reference as above.

Report Codes:
N.A. -Not Analysed
L.N.R. -Listed But Not Received
I.S. -Insufficient Sample

A Ciplys

Approved Signature:

for

ALAN CIPLYS
Manager - Darwin
AMDEL LABORATORIES LIMITED
A.C.N. 009 076 555

ndel

Job: 3DN0888
O/N: Q 7760

ANALYTICAL REPORT

SAMPLE	Ag	Cu	Pb	Zn	Mn	Fe
MCSD9/3(Cont)						
236-237 2254	<1	16	19	8	1500	8400
-238 2255	<1	5	13	8	2870	9000
-239 2256	<1	7	12	17	2930	8200
-240 2257	<1	18	11	8	3480	7600
-241 2258	<1	18	21	8	3140	1.02%
-242 2259	<1	6	11	5	3260	7800
-243 2260	<1	3	13	6	3600	8100
-244 2261	<1	9	28	18	2660	7500
-245 2262	<1	4	11	4	2960	7200
-246 2263	<1	8	19	7	2750	7800
-247 2264	<1	8	12	5	2020	8000
-248 2265	<1	12	15	7	1940	8700
-249 2266	<1	40	9	6	1580	8900
-250 2267	<1	12	18	8	1850	9700
-251 2268	<1	10	9	5	2190	1.10%
251-252 2269	<1	2	10	12	3330	1.00%
E.O.H.						

UNITS	ppm	ppm	ppm	ppm	ppm	ppm
DET.LIM	1	2	4	2	4	5
SCHEME	AA1	AA1	AA1	AA1	AA1	AA1

ndel

Job: 3DN0888
O/N: Q 7760

ANALYTICAL REPORT

SAMPLE	Ag	Cu	Pb	Zn	Mn	Fe
MRSD9/3(Cont)						
236-237 2254	<1	16	19	8	1500	8400
-238 2255	<1	5	13	8	2870	9000
-239 2256	<1	7	12	17	2930	8200
-240 2257	<1	18	11	8	3480	7600
-241 2258	<1	18	21	8	3140	1.02%
-242 2259	<1	6	11	5	3260	7800
-243 2260	<1	3	13	6	3600	8100
-244 2261	<1	9	28	18	2660	7500
-245 2262	<1	4	11	4	2960	7200
-246 2263	<1	8	19	7	2750	7800
-247 2264	<1	8	12	5	2020	8000
-248 2265	<1	12	15	7	1940	8700
-249 2266	<1	40	9	6	1580	8900
-250 2267	<1	12	18	8	1850	9700
-251 2268	<1	10	9	5	2190	1.10%
251-252 2269	<1	2	10	12	3330	1.00%
EOH.						

UNITS	ppm	ppm	ppm	ppm	ppm	ppm
DET.LIM	1	2	4	2	4	5
SCHEME	AA1	AA1	AA1	AA1	AA1	AA1

APPENDIX 6

DRILL CORE SPECIFIC GRAVITY MEASUREMENTS
HOLES MRSD01 AND MRSD05

EL 7313 "ROSIE CREEK"

DRILL CORE SPECIFIC GRAVITY MEASUREMENTS

HOLES MRSD01 AND MRSD05

Depth (m)		SG	Comments
From	To		
MRSD01			
198.00	198.10	2.83	laminated stromatolitic dololutite
214.60	214.68	2.82	doloarenite
281.08	281.16	2.61	grey-black laminated carbonaceous siltstone
159.70	159.80	2.82	partly silicified algally laminated dololutite
97.24	97.29	2.67	grey-green laminated dolomitic siltstone
MRSD05			
122.20	122.29	2.59	brown quartz sandstone

GEOPEKO
A Division of Peko-Wallsend Operations Ltd
ACN 000 081 434

REPORT No. MI94/11S

EL 7313 "ROSIE CREEK"

REPORT FOR THE TWELVE MONTHS ENDED

21 February 1994

by
A. ALLAN

VOLUME 2 OF 2 VOLUMES
FIGURES

Distribution:

Geopeko - Melbourne (mf)
Geopeko - Brisbane
Geopeko - Mount Isa (2)
Department of Mines and Energy - NT

Base :	Mount Isa
Date :	April, 1994
MOUNT YOUNG	SD53-15
Rosie Creek	6167
Bing Bong	6166

CR 94/274B

MI94/11S/APR 1994/7313

GEOPEKO

Bibliographic Data Sheet

Project: McARTHUR RIVER

Prospect: ROSIE CREEK

State: NT **Country:** AUS **Tenement:** EL 7313

Organisation: PEKO-WALLSEND OPERATIONS LTD

Title: EL 7313 "ROSIE CREEK" REPORT FOR THE TWELVE MONTHS ENDED 21 FEBRUARY 1994

Authors: ALLAN,A.

Imprint: MOUNT ISA, QUEENSLAND

Pages, figs, plans: 15 PAGES, 2 TABLES, 6 APPENDICES & 9 FIG.

Report No.: MI94/11S

KEYWORDS: McARTHUR GROUP; EMU FAULT; HYC DEPOSIT; GRAVITY; TEM; BALBIRINI DOLOMITE; NYANANTU SANDSTONE

Commodities: BASE METALS **Locality/Nearest Town:** BORROLOOLA

Latitude: 15°25'S **Longitude:** 136°05'E **Report Date:** FEBRUARY 1994

1:250K Map No.: SD53-15 **1:250K Map Name:** MOUNT YOUNG

1:100K Map No.:	6167 6166	**1:100K Map Name:**	ROSIE CREEK BING BONG

ABSTRACT

Previous interpretation of regional gravity and magnetic data suggested that the Rosie Creek area has structural and stratigraphic elements in common with those at the HYC Pb-Zn deposit. Prospective stratigraphy has been intersected in drilling by other companies not far to the south of the EL. Drilling by Geopeko, targeted on EM anomalies, has intersected likely McArthur Group equivalents. Unconfirmed correlation with regional stratigraphy suggests prospective units of the Umbolooga Subgroup may be present in the area. Future work will test for these units using stratigraphic drilling and geophysical techniques.

Database No.: **Microfiche No.:**

Hard Copy Stored at: MOUNT ISA

CONTENTS

TABLES

APPENDICES

FIGURES

EL 7313 - ROSIE CREEK

5	Rosie Creek Gravity Survey Gravity Stations, Reduced Levels and Bouguer Corrected Gravity (2.67 g/cc)	1:25 000	QLD 1455
6.	EL 7313 - Rosie Creek Line 540N-3 Layer Earth TEM Inversion and Drill Hole Geology	1:20 000L 1:1 000V	QLD 1453
7	Rosie Creek Area Reconnaissance Geological Mapping	1:50 000	QLD 1337
8	Rosie Creek Grid TEM Interpretation and Drill Hole Locations	1:25 000	QLD 1456
9	Rosie Creek Grid Lithologic Correlation Drill Section - 540N	1:20 000H 1:2 000V	QLD 1451

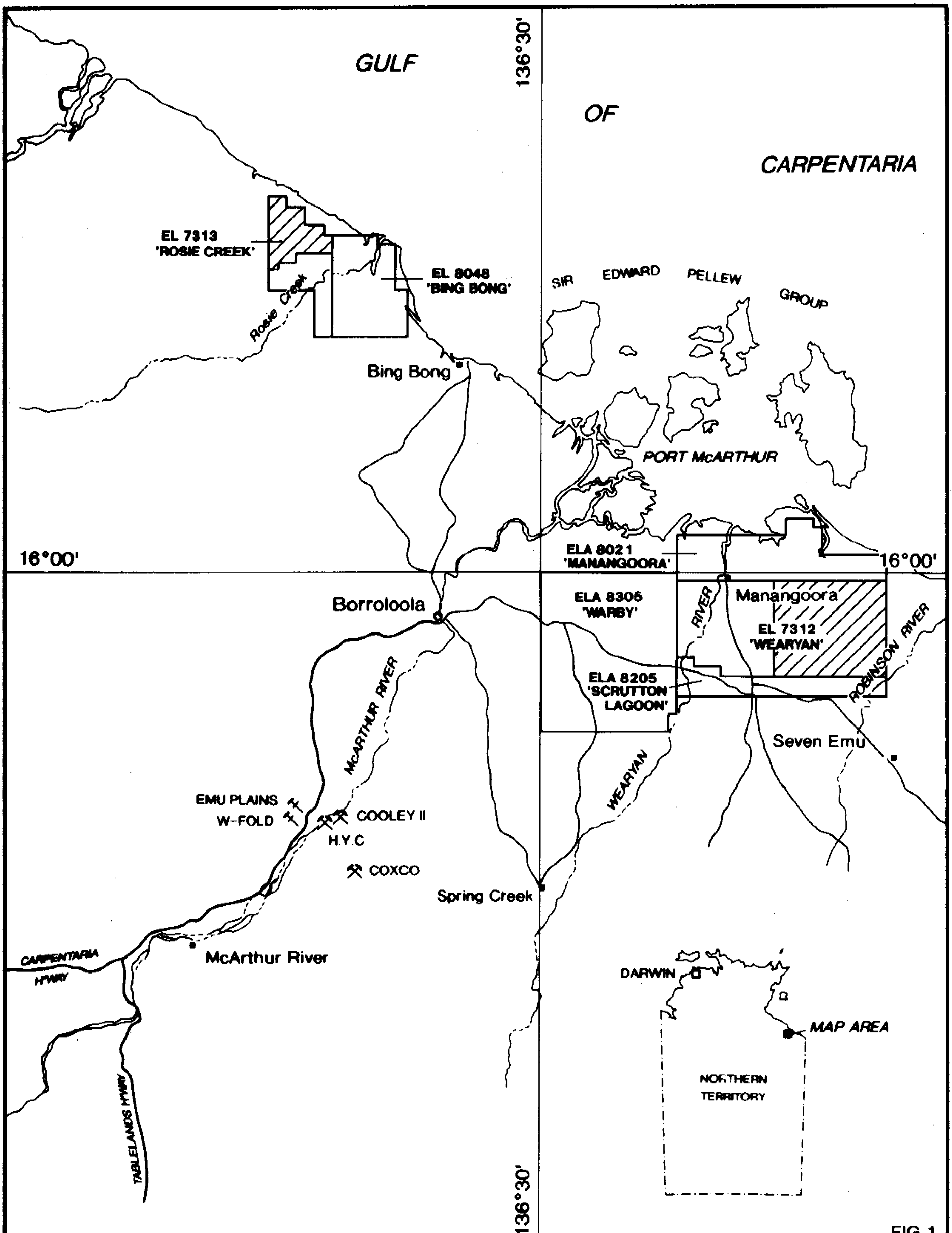


FIG 1

▨ Area Relinquished 21/2/94

Reports: MI94/11S & MI94/12S

BRISBANE

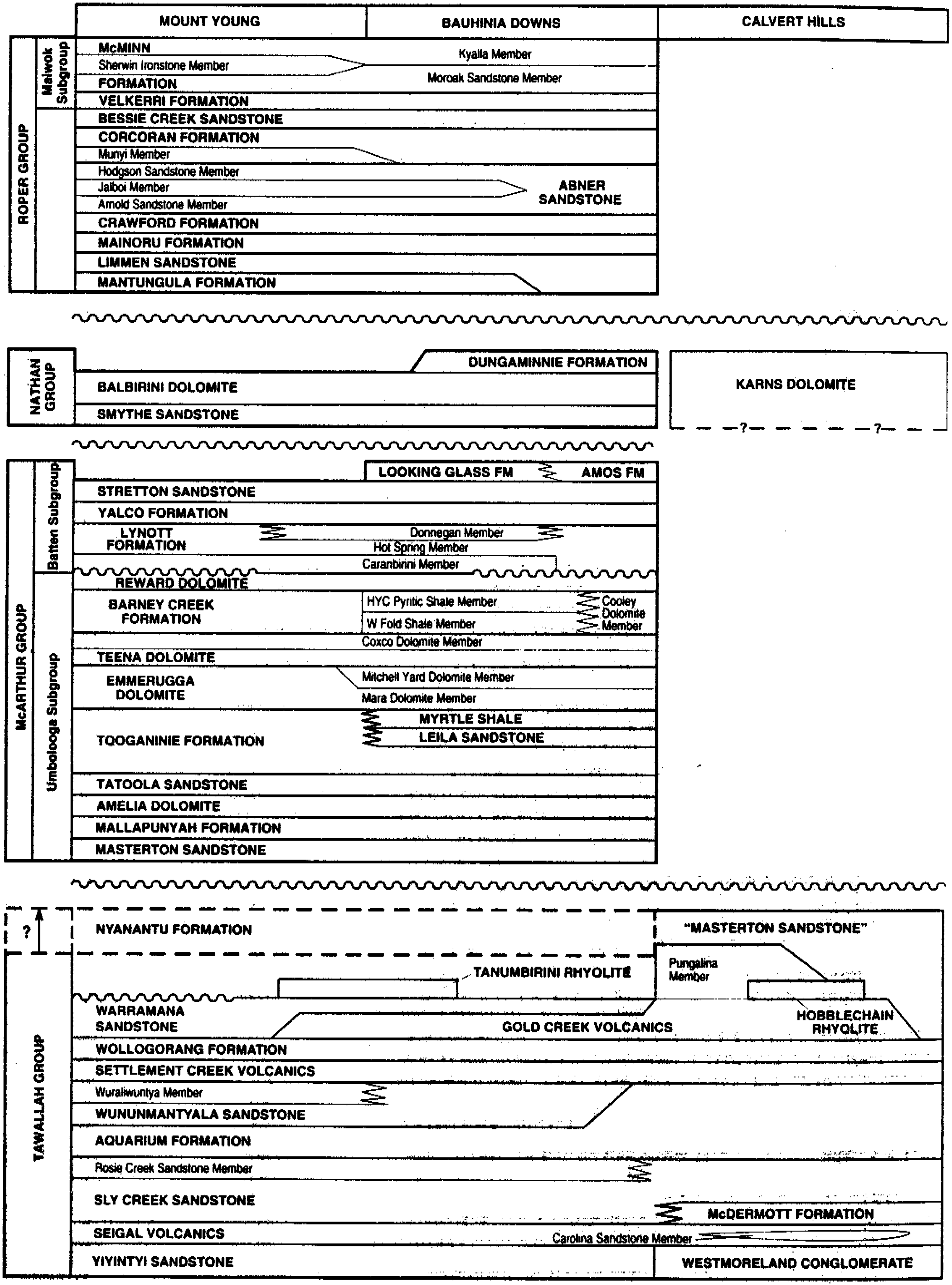
GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
A.C.N. 000 081 434

Scale 1: 1000000
10 0 10 20 30 40 50 km

Geo IM
Map Ref. ROPER RIVER, SD53 & NEWCASTLE WATERS, SE53
Drawn RH
Checked

McARTHUR RIVER PROJECT
LOCATION AND TENURE PLAN

Date 9/2/94
REV. 9/2/94
Dwg. No QLD 1396

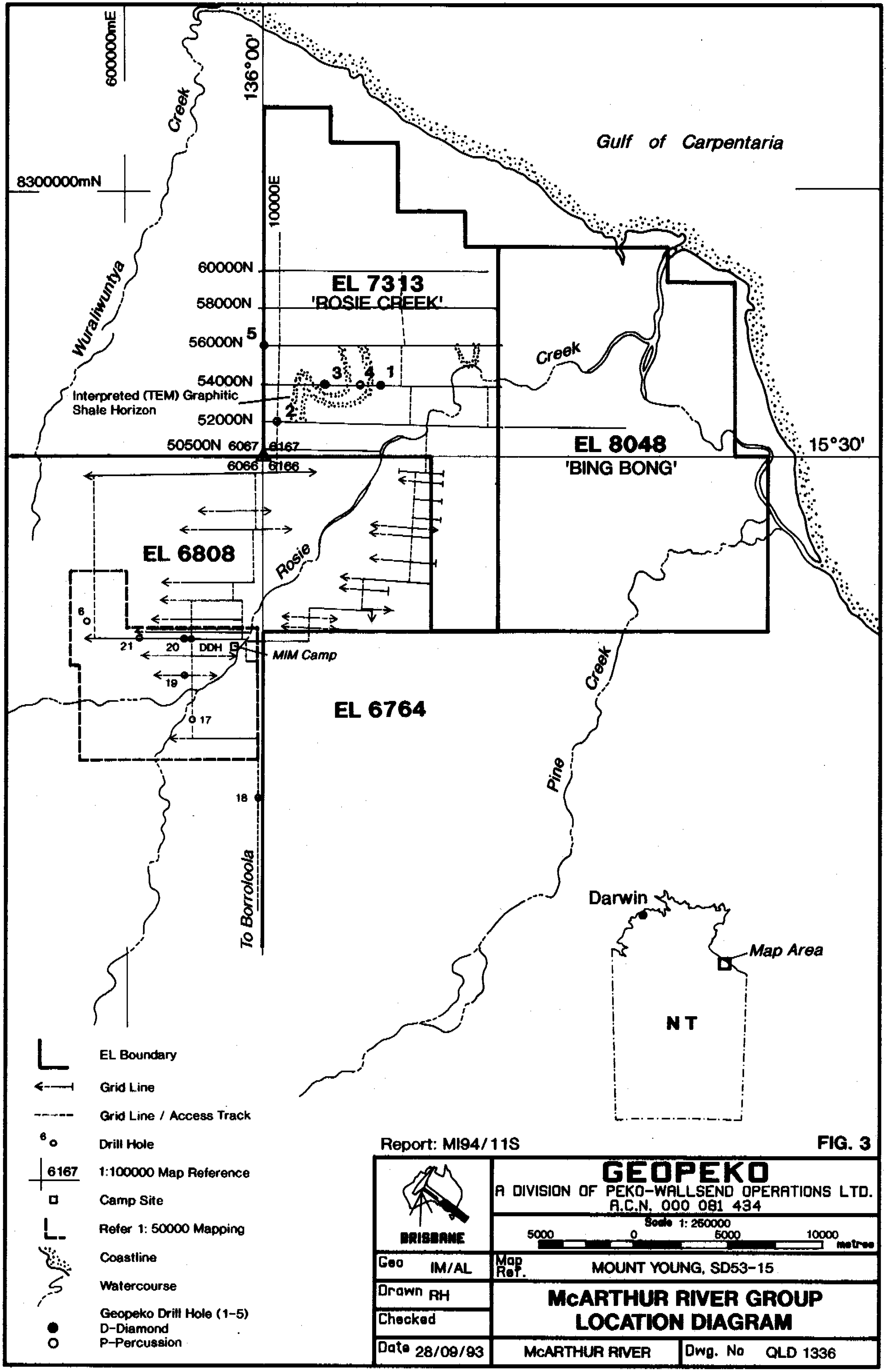


Stratigraphic Relationships of Proterozoic Units in the Southern McArthur Basin

Reference: Rawlings,D.J., Madigan,T.L., Pietsch,B.A. and Haines,P.W., 1993 – Tawallah Range (6066) Northern Territory 1: 100000 geological map series. NTGS Explanatory Notes.

Dwg No. QLD 1452 – Reports: MI94/11S and MI94/12S

FIG. 2



Report: MI94/11S

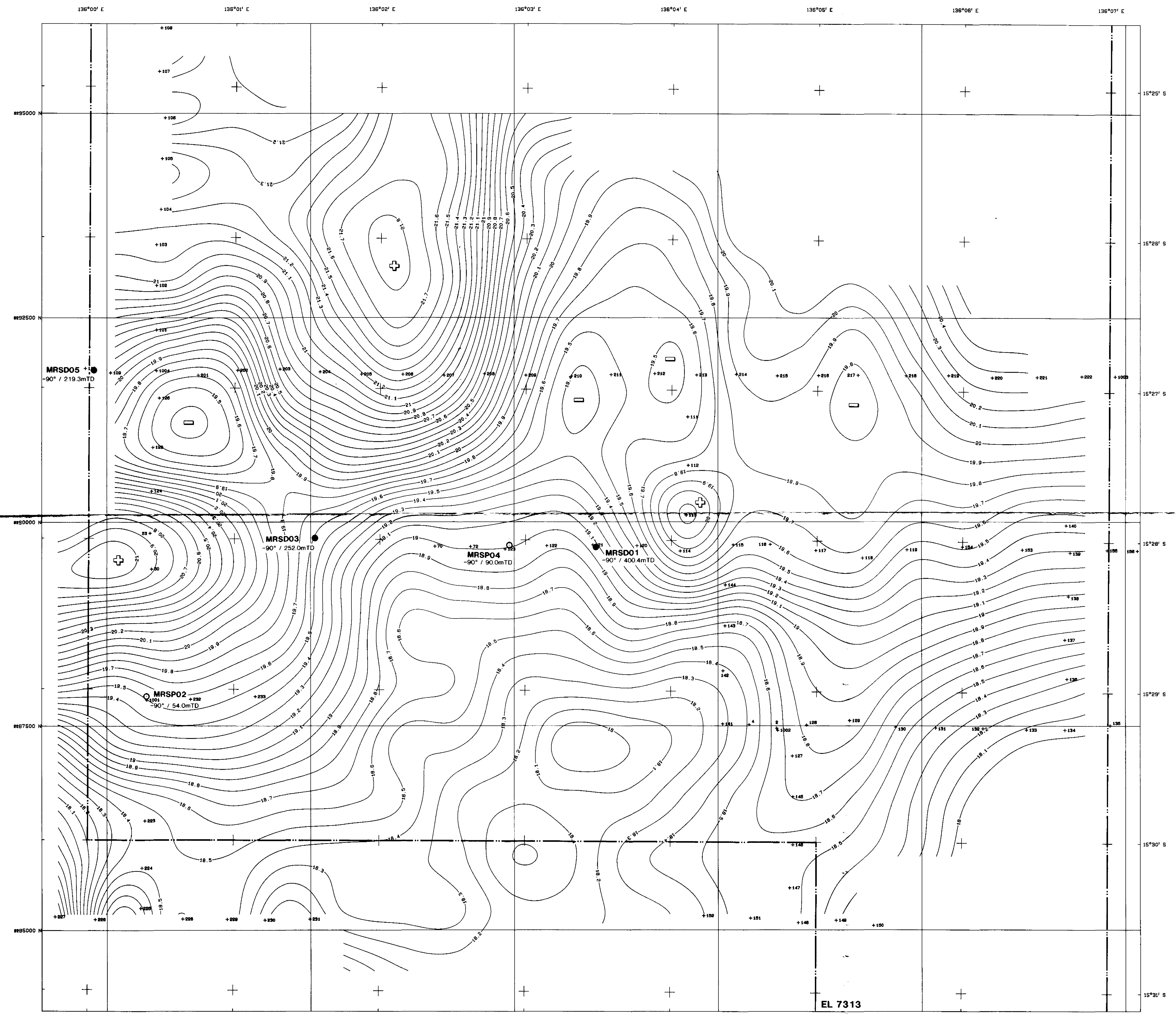
FIG. 3

GEOPEKO

A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.

A.C.N. 000 081 434

Geo IM/AL	Map Ref. MOUNT YOUNG, SD53-15		
Drawn RH	**McARTHUR RIVER GROUP LOCATION DIAGRAM**		
Checked			
Date 28/09/93	McARTHUR RIVER	Dwg. No	QLD 1336



REFERENCE

Contour Interval 0.1 mgals

+222 Station No. & Location

✚ Gravity High

▭ Gravity Low

GRAVITY DATUM : ISOGAL84

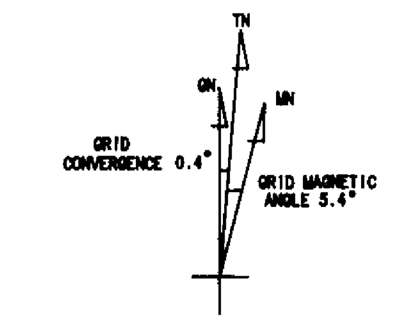
Geopeko Drill Hole - with Dip & EOH

● **Diamond**

○ **Percussion**

EL 7313 Boundary

SURTEC



TRUE NORTH,GRID NORTH AND MAGNETIC
NORTH ARE SHOWN DIAGRAMMATICALLY
FOR THE CENTRE OF THE MAP. MAGNETIC
NORTH IS CORRECT FOR 1990 AND MOVES
BY LESS THAN 0.1° IN TEN YEARS

0.5 0.25 0 0.5 1 1.5 2 2.5
km km

SCALE 1 : 25 000

AUSTRALIAN HEIGHT DATUM
AUSTRALIAN MAP GRID ZONE 53
UNIVERSAL TRANSVERSE MERCATOR PROJECTION
MT. YOUNG. SD53-15 / 6167 / 6166

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD
ACN 000 081 434

ROSIE CREEK GRAVITY SURVEY
EL 7313

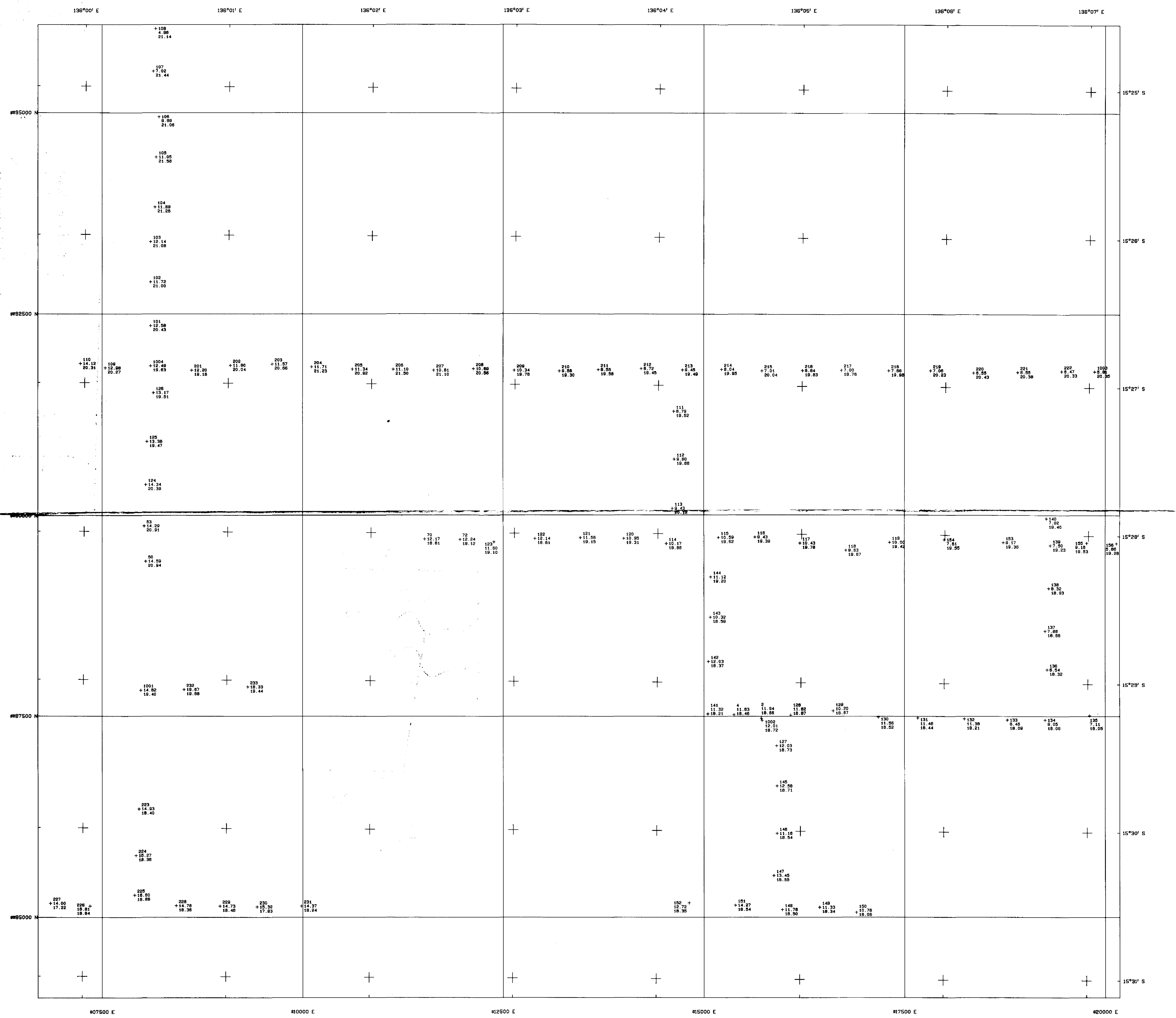
CONTOURED
BOUGUER CORRECTED GRAVITY
2.67 g/cc

Author: R.Court
Drawn: S.E.Armsworth
Date: July 1993
Scale 1 : 25 000
Computer File No. ROSIE-CONT
Dwg No. QLD 1454
Report: MI94/11S

CR94/274B

FIG. 4

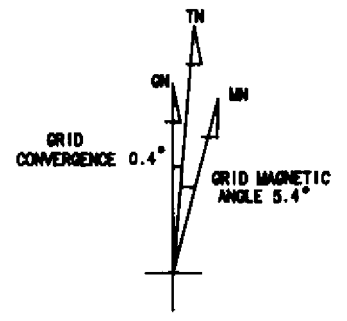
Revision by: RH, 22/03/94



REFERENCE

210 — Gravity Station Number
+9.58 — Reduced Level
19.30 — Gravity Value

GRAVITY DATUM : ISOGAL84



TRUE NORTH,GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1990 AND MOVES BY LESS THAN 0.1° IN TEN YEARS

0.5 0.25 0 0.5 1 1.5 2 2.5
km km

SCALE 1 : 25 000

MT. YOUNG, SD53-15 / 6167 / 6166

AUSTRALIAN HEIGHT DATUM

AUSTRALIAN MAP GRID ZONE 53

UNIVERSAL TRANSVERSE MERCATOR PROJECTION

GEOPEKO

A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
ACN 000 081 434

ROSIE CREEK GRAVITY SURVEY
EL 7313

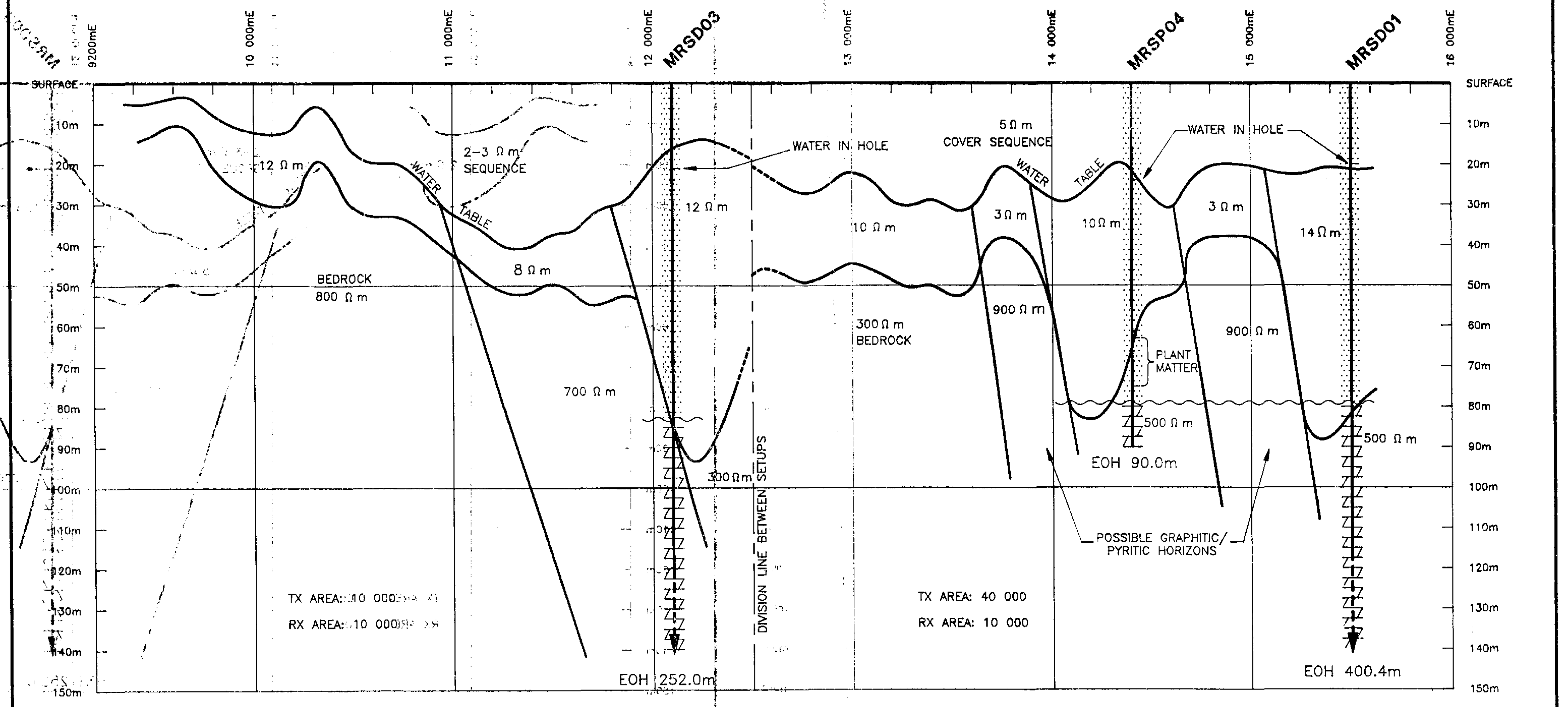
GRAVITY STATIONS, REDUCED LEVELS & BOUGUER CORRECTED GRAVITY (2.67g/cc)

Author: R.Court
Drawn: S.E.Armsworth
Date: July 1993
Scale 1 : 25 000
Computer File No. ROSIE-RL-GRAV
Dwg No. QLD 1455
Report: MI94/11S

CR94/274B

FIG. 5

Revision by: RH, 12/04/94



?FLUVIATILE COVER (CLAY, CONGLOMERATE, PLANT MATTER, QUARTZ SAND) ▒

PROTEROZIC SEQUENCE (BALBIRINI DOLOMITE) ▨

LITHOLOGICAL BOUNDARIES ―

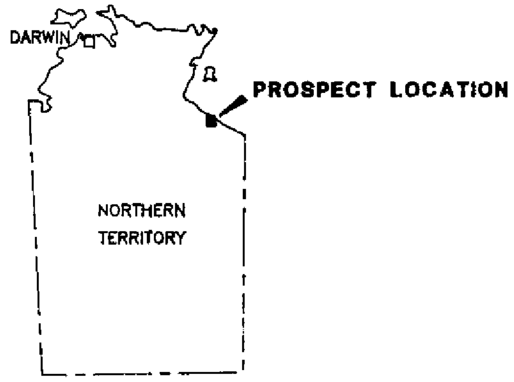
INSTRUMENT: SIROTEM MK3

CHANNELS: COMPOSITE TIMES

PROFILE: 53900N

NOTE: REFER TO REPORT BY HUGH RUTTER, SEPT 1993.
"AN INTERPRETATION OF IN-LOOP SIROTEM DATA
FROM THE ROSIE CREEK PROSPECT FOR GEOPEKO"

CR94/274B



REPORT MI94/11S

FIG. 6

GEOPEKO

A DIVISION OF
PEKO-WALLSEND OPERATIONS LTD.
A.C.N. 000 081 434

BRISBANE

HORIZONTAL SCALE 1:20 000 (VERTICAL SCALE 1:1000)
400 0 400 800 1200 metres

Geo A.A.

Drawn N.P.

Checked

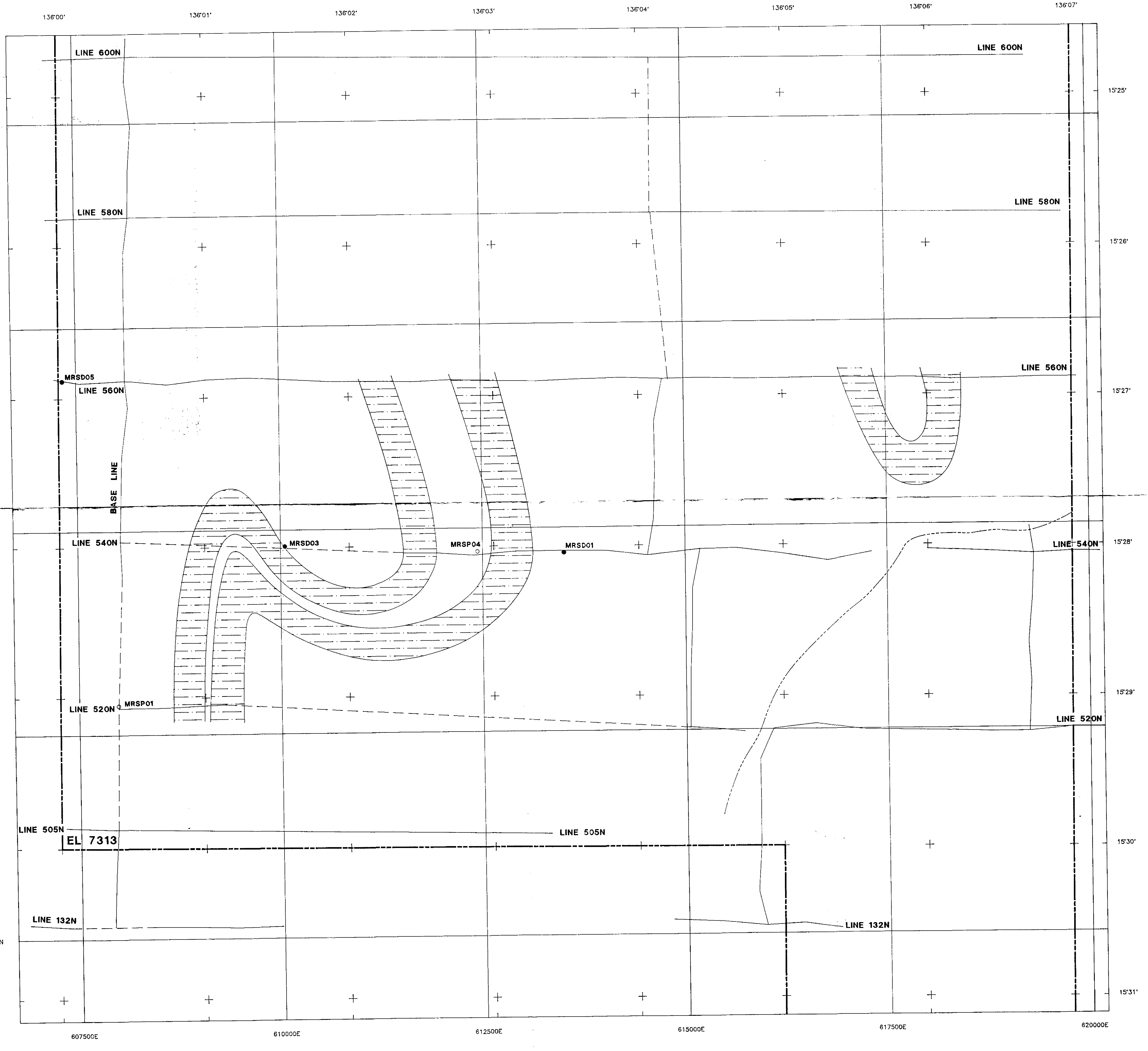
Date 24-3-94

Map Ref. MOUNT YOUNG SD53-15 / 6167

EL 7313 - ROSIE CREEK
LINE 540N - 3 LAYER EARTH TEM
INVERSION & DRILL HOLE GEOLOGY

McARTHUR RIVER

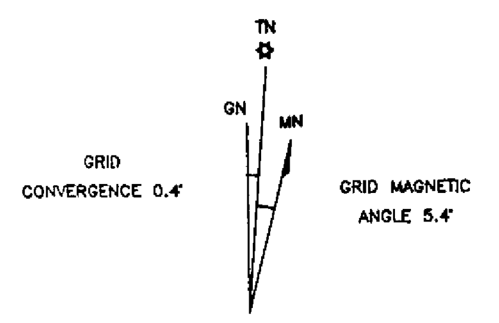
Dwg. No QLD 1453



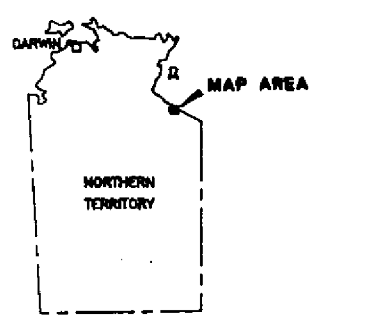
INTERPRETED GRAPHITIC SHALE HORIZON ▤

CLEARED TRAVERSE LINE — LINE 540N

NOTE: Refer to report by Hugh Rutter, Sept 1993,
"An interpretation of In-loop Sirotem Data from the
Rosie Creek Prospect for Geopeko"



TRUE NORTH, GRID NORTH AND MAGNETIC
NORTH ARE SHOWN DIAGRAMMATICALLY
FOR THE CENTRE OF THE MAP. MAGNETIC
NORTH IS CORRECT FOR 1990 AND MOVES
BY LESS THAN 0.1° IN TEN YEARS



CR94/274B

REPORT MI94/11S

GEOPEKO

A DIVISION OF
PEKO-WALLSEND OPERATIONS LTD.
ACN 000 081 434

SCALE 1:25 000
500 0 500 1000 1500 2000 2500 metres
PROSPECT GRID AUSTRALIAN HEIGHT DATUM

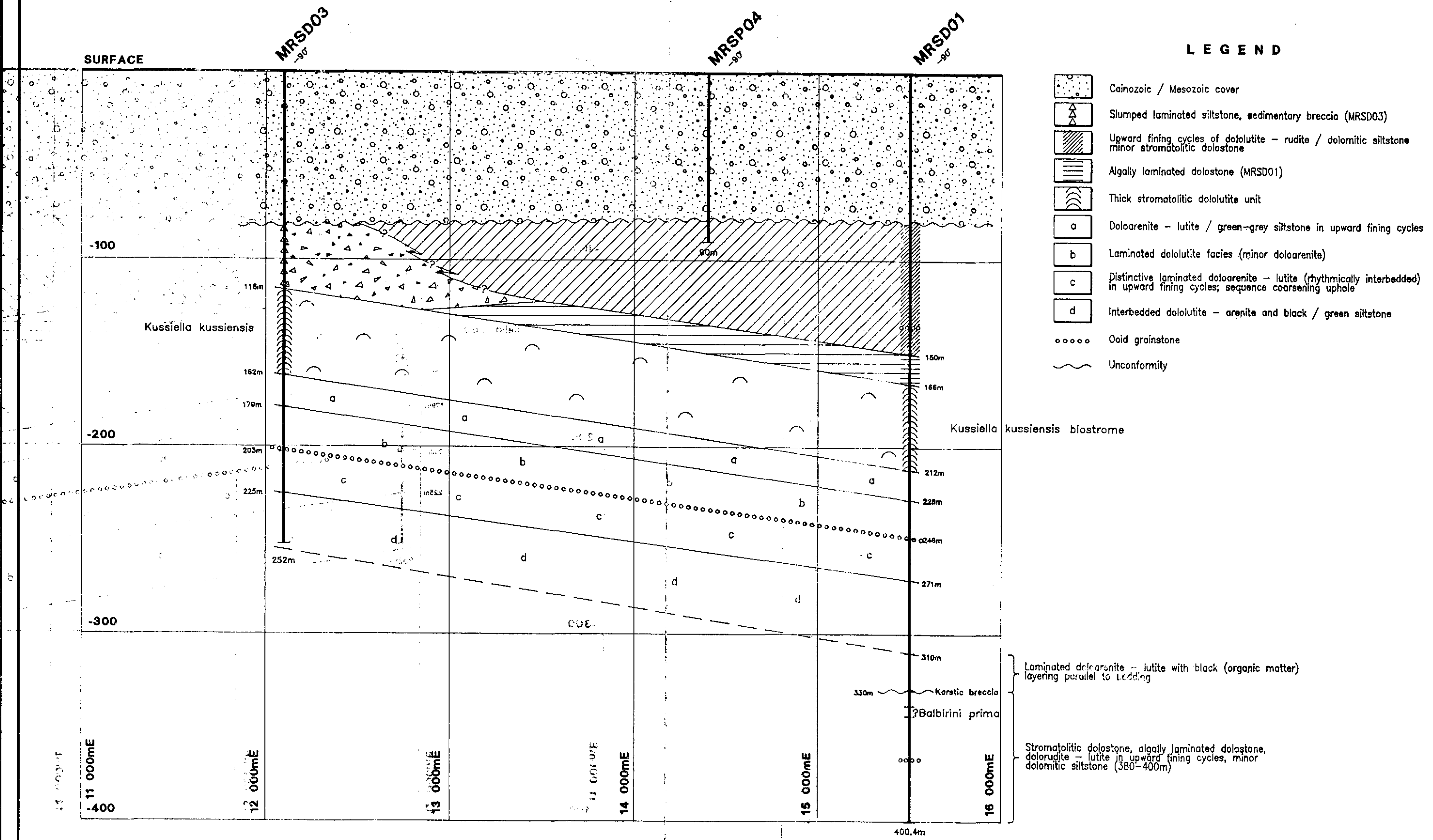
BRISBANE

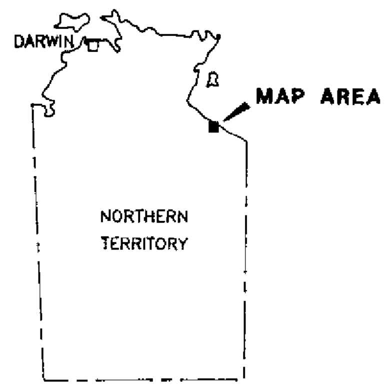
Map Ref. MOUNT YOUNG SD53-15 / 6167

Geo.	A.A.
Drawn	N.P.
Checked	
Date	23-3-94

ROSIE CREEK GRID
TEM INTERPRETATION
AND DRILL HOLE LOCATIONS

EL 7313 - ROSIE CREEK | REV-0 / FIG. 8 | Dwg No. QLD 1456





CR94/274B

REPORT MI94/11S

FIG. 9

GEOPEKO A DIVISION OF PEKO-WALLSEND OPERATIONS LTD. A.C.N. 000 081 434

BRISBANE

HORIZONTAL SCALE 1:20 000 (VERTICAL SCALE 1:2000)
400 0 400 800 1200 metres

Geo	A.A.	Map Ref.	MOUNT YOUNG SD53-15 / 6167
Drawn	N.P.	ROSIE CREEK GRID LITHOLOGIC CORRELATION DRILL SECTION - 540N	
Checked			
Date	22-3-94	EL 7313 - ROSIE CREEK	Dwg. No QLD 1451