

## **Time domain electromagnetic induction survey of sandstone aquifer in the Lake Winnebago area. [DNR-173] 2002**

Jansen, John Richard; Taylor, Robert (Associate Professor)  
Madison, Wisconsin: Wisconsin Department of Natural Resources,  
2002

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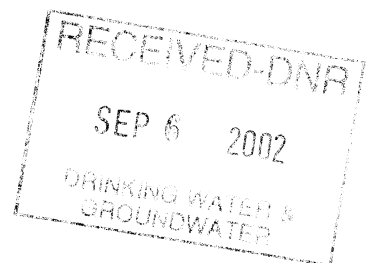
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# **TIME DOMAIN ELECTROMAGNETIC INDUCTION SURVEY OF SANDSTONE AQUIFER IN THE LAKE WINNEBAGO AREA**

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## **IV. PROJECT SUMMARY**

Project Title: Time Domain Electromagnetic Induction Survey of the Sandstone Aquifer in the Lake Winnebago Area

Project Number DNR Project #173

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Period of Contract: July 1, 2001 to June 30, 2002

### **Background/Need**

The Cambrian and Ordovician sandstone aquifer of eastern Wisconsin is a major source of water for municipalities and industry in eastern Wisconsin. This aquifer has been developed heavily in the Lake Winnebago area, particularly along the northern and southern ends of the lake. The rate of development has intensified over the last decade in response to strong economic growth and an increase in the population of the City of Fond du Lac and the developed corridor from Neenah to Kaukauna and surrounding areas (The Fox Cities). Declining water levels and deteriorating water quality has created concerns over the long term viability of the aquifer.

### **Objectives**

The objective of this study is to perform the first regional Time Domain Electromagnetic Induction (TEM) survey of sandstone aquifer around Lake Winnebago. The data goal is to map the thickness of the Cambrian and Ordovician Sandstone aquifer and identify areas of saline ground water. The results of this study will provide critical information needed by several water utilities to make informed water supply planning decisions.

### **Methods**

A geophysical survey consisting of 55 TEM soundings was conducted in Fond du Lac, Winnebago, Outagamie, and Calumet Counties using a Geonics EM57 system. The layout of the soundings was optimized to measure the electrical resistivity of the sandstone aquifer at depths of about 500 to 1,000 feet. The data were interpreted using the TEMIX two-dimensional modeling software by Interpex. Ltd.

### **Results and Discussion**

The TEM data detected significant changes in the salinity and geometry of the sandstone aquifer. The patterns detected in the Fond du Lac County portion of the study area are different than the pattern detected in the Fox Cities area. Significant topography was found on the Precambrian surface in the Fond du Lac area. Steep sided mounds and steep walled basins were found. The sandstone interval adjacent to the mounds or within the basins was found to be significantly more electrically conductive, suggesting more saline water in those areas. Areas with anomalously high resistivity in the sandstone section were also detected. These areas may represent thick carbonate sequences with relatively thin sandstone sections.



In the Fox Cities area, most TEM soundings detected high electrical conductivity in the sandstone section, indicating elevated total dissolved solids levels in the ground water. A few areas with higher resistivity in the sandstone section were detected. These areas could represent areas with better water quality. The pattern of the conductive zones in the sandstone indicated that the saline water was migrating upward from the lower portion of the aquifer in response to heavy pumpage and declining head. In some areas, the vertical contact between fresh water and more saline water in the aquifer appears to be relatively sharp. In many areas the contact could not be detected by the TEM data. This could indicate the transition is more gradational, possibly as a result of vertical migration after decades of heavy pumpage. Only a few soundings detected Precambrian rock, probably due to signal attenuation in the high conductivity sandstone section and from higher noise levels due to the developed nature of much of the survey area. The data indicated that two previously unknown mounds on the Precambrian surface may be present.

## **Conclusions**

The results of the TEM survey strongly suggest the presence of the high TDS water in the lower portion of the sandstone aquifer in portions of both areas. Saline water seems to be associated with structural features on the Precambrian surface in Fond du Lac County. High TDS water appears to be migrating upward in response to heavy pumpage in the Fox Cities area.

## **Implications**

The data suggest that the topography of the Precambrian surface should be considered when siting wells in Fond du Lac County. The data also suggests that some of the area designated for future well sites for the City of Fond du Lac may not be suitable for potable wells.

The data also suggests that water quality may continue to deteriorate in the Fox Cities area as a result of vertical migration from a saline water zone in the lower portion of the sandstone. Water quality could probably be improved by drilling shallower sandstone wells, backfilling the lower portion of existing wells, and pumping less. Additional investigation and ground water modeling will be needed to estimate the rate in change in water quality in the area for a variety of development scenarios. Alternate water sources may ultimately be needed to make up the loss in capacity. These alternate sources could include additional sandstone wells north or west of the area, a major sand and gravel aquifer approximately 15 miles to the northwest, or lake Winnebago.

## **Related Publications**

Jansen, J., Taylor, R.W., and Powell, T., 2003, A regional TEM Survey to Map Saline Water in the Cambrian-Ordovician Sandstone Aquifer of Eastern Wisconsin, abstract submitted for consideration, Proceedings of the Environmental and Engineering Geophysical Society.

**Key Words:** Sandstone aquifer, TDS levels, Water quality, TEM surveys

**Funding:** UWS-WRI with a donation of 22 TEM soundings from the Village of Oakfield and other data from McMahon and Associates, Kaempfer and Associates, and Badger Well Drilling.

## **V. INTRODUCTION**

The Cambrian and Ordovician sandstone aquifer of eastern Wisconsin is a major source of water for municipalities and industry in eastern Wisconsin. This aquifer has been developed heavily in the Lake Winnebago area, particularly along the northern and southern ends of the lake. The rate of development has intensified over the last decade in response to strong economic growth and an increase in the population of the City of Fond du Lac and the developed corridor from Neenah to Kaukauna and surrounding areas (The Fox Cities). Declining water levels and deteriorating water quality have created concerns over the long term viability of the aquifer.

The objective of this study is to perform the first regional Time Domain Electromagnetic Induction (TEM) survey of sandstone aquifer around Lake Winnebago. The data goal is to map the thickness of the Cambrian and Ordovician Sandstone aquifer and identify areas of saline ground water. The results of this study will provide critical information needed by several water utilities to make informed water supply planning decisions. The survey is regional in nature and cannot be practically conducted by any water utility working alone. This grant represents a cost effective approach to conduct a regional study that will benefit at least nine water utilities in the survey area that currently have wells in the sandstone aquifer, as well as several other communities that may consider drilling sandstone wells in the future

### **Background Information**

The sandstone aquifer is the major source of ground water for municipal supplies in eastern Wisconsin. The communities of Fond du Lac, North Fond du Lac, Oakfield, Little Chute, Kaukauna, Kimberly, Darboy, Combined Locks, Wrightstown, and the Menasha Sanitary District No. 4 all depend on the sandstone aquifer for their municipal supply. In addition, several industries operate high capacity sandstone wells to support their operations.

The concentrated demand has created a regional decline in water levels of about 2 feet per year in the Fox Cities. Water levels do not appear to be declining in the Fond du Lac area. However, several surrounding townships are concerned that with continued development regional water levels will decline. The largest cities in the area, Oshkosh, Appleton and Menasha get their municipal supplies from surface water plants.

Most of the sandstone aquifer wells in the study area produce water that exceeds the Maximum Contaminant Level (MCL) for radium and gross alpha. These constituents can generally be reduced to acceptable levels using ion exchange softeners. Most municipal systems on the north end of Lake Winnebago have softener plants to reduce elevated sulfate levels. These plants simultaneously reduce radium and gross alpha concentrations to levels below the MCL. However, most municipal systems on the southern end of Lake Winnebago do not have softeners. As a result, water systems such as Fond du Lac will probably have to make major investments in water treatment to comply with the radionuclide standards or find alternate sources of water.

In addition to declining head and elevated radionuclides, sulfate levels are high and rising in many wells. Several softening plants are reaching capacity and extensive expansions will be needed if sulfate levels continue to rise. New wells in Oakfield, Little Chute and Wrightstown have all hit unacceptably high sulfate levels (over 600 ppm). These wells were abandoned or will require extensive modification and treatment to be placed in service. These communities have undertaken expensive exploration programs to find acceptable alternative well sites.

The situation in the Fox Cities is similar to the ground water situation in suburban communities of Green Bay. In the 1950s, the City of Green Bay decided that the sandstone aquifer in Brown County could not sustain the regional demand. In 1957 Green Bay opened a

surface water plant and put its wells on standby. The surrounding communities continued to use the sandstone aquifer for their municipal water. Through decades of growing demand and a lack of regional planning, the communities began to mine the aquifer causing a regional decline in head of about 3 feet a year. As a result of the over development of the aquifer, the communities surrounding Green Bay have formed a water authority and are currently exploring options to develop alternative water sources. The Fox Cities will be facing similar choices within a few years due to declining water levels and rising TDS concentrations in the aquifer. Having a firm understanding on the number and location of potential well sites and the distribution of high sulfate water are critical first steps in making long term aquifer management decisions.

## **The Relationship Between Well Capacity, Water Quality, and the Shape of the Precambrian Surface**

The yield for the sandstone aquifer in the Lake Winnebago area is largely controlled by the thickness of the sandstone. The thickness of the sandstone is generally controlled by the shape of the Precambrian surface. The Precambrian surface generally slopes to the east with a dip of about 30 feet per mile. However, steep sided mounds of Precambrian rock, known as the Fond du Lac Range (Thwaites, 1957), are present on the Precambrian surface. In places these Precambrian mounds rise through all or most of the sandstone formations of the aquifer causing a substantial reduction in well capacity in those areas. In addition, zones of stagnant water in the aquifer form adjacent to the mounds. These stagnation zones are associated with elevated levels of TDS and sulfates (Ryling, 1961).

The distribution of the Precambrian mounds is only partially known. Thwaites (1957) mapped two elongated Precambrian mounds in the western half of Fond du Lac County that trend northeast-southwest. Thwaites also mapped a north-south elongated mound along the eastern shore of Lake Winnebago in Calumet County that he projects into the Sherwood area. Ryling (1961) mapped similar mounds in Fond du Lac and Calumet Counties. He associated these mounds with zones of elevated TDS in the aquifer due to zones of stagnation. Massie-Ferch (2001) mapped the Precambrian surface of Fond du Lac County as a series of fault blocks with vertical displacements of over 500 feet. She shows two large Precambrian mounds in the western half of the County that trend west-northwest to east-southeast. One of the mounds is composed of granite, the other is composed of quartzite. She also shows a smaller mound of granite in the center of the County. Her map does not extend beyond Fond du Lac County.

## **Impacts on Ground Water Resources in Fond du Lac County**

The Village of Oakfield recently drilled a new municipal well on the down gradient flank of an unmapped quartzite mound. The well encountered quartzite approximately 400 feet higher than expected and produced water with over 1,000 ppm sulfate. The Village conducted a TEM survey (Layne Northwest and Aquifer Science and Technology, 1999) to map the distribution of saline water in the aquifer. The survey identified a large ridge of Precambrian rock extending to the west and south of the new well. A zone of high electrical conductivity is present in the sandstone section on the down-gradient side of the ridge that is assumed to contain saline formation water. Regional gravity data indicates a gravity high is present in this area. The survey also identified a potential saline water zone in the deeper portion of the aquifer approximately 200 feet below wells 1 and 2.

The Village drilled a new well approximately one mile northwest of the existing wells on the basis of the TEM survey. The well produces adequate capacity with low TDS levels. The location of the TEM soundings conducted for Oakfield and geo-electrical cross sections illustrating the results of the TEM survey are included in Appendix A. The results of the survey are described in two engineering reports submitted to the Village (Layne Northwest and Aquifer Science and Technology, 1999).

Similar quartzite ridges may be present along the Lake Winnebago area, which could cause similar difficulties for other utilities. The City of Fond du Lac has conducted an extensive drilling and packer testing program over the last ten to twenty years to map the shape of the Precambrian surface and identify trends in water quality. Their investigations indicated that the TDS levels in the wells and test borings followed a predictable pattern from moderately high levels (600 to 800 ppm) in the area immediately south of Lake Winnebago to relatively low levels (480 to 270) ppm about five miles to the south in the south end of their well field. Sulfate levels follow the same pattern. Sulfate levels are over 200 ppm immediately south of the lake and are below 50 ppm in the south end of the well field. The Precambrian surface forms a gently sloping basin extending southward through the well field.

Based on this information, the City designated the area immediately south of their existing well field as their future well field expansion area. The Precambrian mound and high sulfate water encountered in Oakfield was anomalous to the predicted trend in water quality and aquifer thickness. Based on the Oakfield experience, the City is being forced to reconsider its proposed well field expansion area. A cursory review of the regional gravity data (WGNHS, 1994) indicates that a gravity high is present in the center of the proposed well field expansion area. This suggests that a Precambrian mound may be present in the area, which could cause the aquifer to be much thinner than predicted and produce poor water quality. If true, Fond du Lac would be forced to move their future well field into other areas, potentially conflicting with other municipalities. This would impose a serious stress on the future water development of the area.

## **Impacts on the Ground Water Resources of the Fox Cities Area**

The Fox Cities area has experienced water quality problems that are more immediate. Several new wells have encountered high sulfate levels. Several existing wells have experienced significant increases in sulfate over the last 20 years that are taxing the capacity of the treatment plants installed to soften the water.

McMahon and Associates has acted as the City Engineer for many of the Fox Cities for several decades. The following summary of water quality changes was prepared from correspondence prepared by McMahon (Rosenbeck, 1999). Water quality in the sandstone aquifer along the northern end of Lake Winnebago typically follows a predictable trend with the highest TDS levels (over 1,000 ppm) on the west side of Kaukauna and in Wrightstown. TDS levels generally decrease to less than about 500 ppm to the east in Kimberly and the Town of Menasha Sanitary District # 4. TDS levels also generally decrease to the north of the Fox River. These trends have been used to predict water quality and site new wells.

These trends were placed in doubt when Little Chute drilled Well 4 in 1998. Well 4 was drilled a depth of 750 feet at a location approximately a mile and a half north of Well 1. Well 1 has a TDS level of about 570 ppm. Well 4 encountered TDS levels of 1,400 ppm and hardness of 906 ppm. The water quality was much poorer than expected and would require expensive treatment for potable use.

A test well was drilled approximately one and a half miles west of Well 4 to try to find better water quality. Water samples were collected at 50 foot intervals by air lifting while drilling. The sample data indicated a gradual increase in hardness and sulfates between 450 feet to 650 feet with hardness rising from 290 ppm to 462 ppm and sulfates rising from 60 to 220 ppm. As the hole was advanced to 700 feet, hardness increased to 615 ppm and sulfates jumped to 380 ppm. The test well indicated that the area of poor water quality was fairly large, but appeared to be concentrated in the deeper part of the aquifer.

Given the observed increase in TDS with depth, Well 4 was backfilled to 620 feet. Hardness dropped to 342 ppm with about a 70% decrease in the specific capacity of the well. The water quality in Well 4 was acceptable, but the decrease in specific capacity created

substantially more draw down to produce the desired capacity of about 1,000 gpm. A sharp increase in sulfate levels from about 100 ppm to over 2,000 ppm occurred in several shallower private wells at about the time of backfilling the well. The cause of the increase in sulfates is not known, but it could be caused by dewatering of a sulfide cement horizon in the Sennepsee group that is open to the private wells.

Similar indications of increasing TDS with depth have been observed in Wrightstown where a test well drilled in 1998 detected an increase in sulfates from 200 to 500 ppm and hardness from 427 to 684 ppm as the well was deepened from 580 feet deep to 680 feet deep. A recent test well in the Darboy area was sampled as the well was advanced. The water quality samples indicated that hardness increases from about 430 ppm at 520 feet to approximately 1,500 ppm at 720 feet (Steffes, 2002). Kaukauna Wells 8 and 10 were deepened over the last few years to increase capacity. Both wells experienced an increase in TDS and hardness (Rosenbeck 1999).

The water produced by several existing wells in the area has grown harder over time, primarily due to increasing sulfates. Well 6 in the Town of Menasha Sanitary District # 4 has experienced an increase in hardness from 274 ppm in 1982 to 427 ppm in 1999. Hardness in Darboy Well 1 has risen from 342 ppm in 1984 to 462 ppm in 1999. Darboy Well 2 hardness levels have risen from 427 ppm in 1990 to 804 ppm in 1999.

Two of the sandstone wells supplying the City of Kaukauna have experienced increases in TDS of 40 to 80% over the last several decades. Rising TDS levels in the 1970s were correlated to increased pumpage in Kaukauna (Vollmer 1986). Water quality stabilized when pumping stabilized in the 1980s. Pumping rates have been increasing for most of the 1990's creating a risk for further increases in salinity.

The change in water quality over time in the Fox Cities area, combined with the unpredictable distribution of water quality, has limited the development of ground water supplies in the area. Unless the source of the poor quality water can be discovered and controlled, several Cities will be forced to develop alternative sources of water, such as surface water, or cope with regional declines in head and deteriorating water quality in the future.

While the sandstone aquifer is a major economic resource, the geometry of the aquifer and distribution of water quality is only known to a very limited degree. The need for additional data is obvious, but the cost to obtain this data has been prohibitive in the past. Obtaining data on aquifer thickness and the vertical distribution of water quality at more than a few locations by traditional drilling or packer testing methods is prohibitively expensive. Currently, there is no mechanism or agency to provide the financial resources or coordination needed to accumulate a significant body of data on the geometry of the aquifer and the distribution of water quality on a regional basis.

To bridge this gap, this study used the method of Time Domain Electromagnetic Induction (TEM) to map the thickness of the aquifer and the three dimensional distribution of saline ground water from the surface. TEM is a well proven geophysical exploration tool that has been used on a wide variety of aquifer mapping and water quality studies around the world, including several previous studies in Wisconsin (Jansen and Taylor 2000, Layne Northwest and Aquifer Science and Technology 1999, Layne GeoSciences, Inc. 1995). The TEM method has been used to measure changes in water salinity with depth, the thickness of aquifers, and position of fracture zones or faults.

## **VI. PROCEDURES AND METHODS**

A geophysical survey consisting of 55 Time Domain Electromagnetic Induction (TEM) soundings was conducted during January of 2002 in Fond du Lac, Winnebago, Calumet, and Outagamie and Milwaukee Counties using a Geonics EM57 system. Survey sites were chosen on the basis of site availability, adequate open area free of cultural interference, and position on or near three planned east west transects. In general, field sites were limited to parks, school sites, golf courses, and undeveloped private land without crops. Given the highly developed nature of the area north of Lake Winnebago, the availability of field sites was a limiting factor for the survey.

The TEM method uses a heavy gauge wire laid out as a square or rectangle to form a transmitter loop. A current of several amps is passed through the transmitter loop. The current is cut off with a steep ramp function creating a broad band EM pulse as the electric field of the transmitter loop collapses. The EM pulse propagates vertically into the subsurface and induces eddy currents in horizontal conductors. The intensity of the magnetic field created by the eddy currents is measured as a function of time by a receiver coil positioned in the center of the transmitter loop. The field data is then modeled to produce a horizontally layered resistivity model of the subsurface. Current modeling technology does not account for three dimensional structures so significant errors can occur near abrupt lateral resistivity contrasts such as faults.

The depth of maximum sensitivity of TEM surveys is limited and must be selected based on the desired target. The layout of the soundings was optimized by forward modeling to measure the electrical resistivity of the sandstone aquifer at depths of about 500 to 1,000 feet. The sensitivity of the survey to shallower interfaces was unavoidably sacrificed by the choice of instrument and layout of the transmitter loop. The forward modeling suggested that adequate penetration could be achieved with a 50 meter by 50 meter transmitter loop. This loop size was used as the nominal transmitter loop used for the survey. At a few locations, the loop size was increased to 100 meters by 100 meters to see if data quality was significantly improved. For most sites, the smaller loops produced essentially equivalent data quality. The data was interpreted using the TEMIX two dimensional modeling software by Interpex. Ltd.

## **VII. RESULTS AND DISCUSSION**

Figures 1 and 4 show the location of the 55 soundings conducted as part of this study. While the majority of the soundings produced useable data, several soundings were impacted by strong noise from cultural sources or three dimensional effects and could not be interpreted. In most soundings, the full 20 windows of the high frequency data set were useable for the interpretation process. In some soundings, the data from about the last five time windows was unusable due to a low signal to noise ratio. In several other soundings, only about ten time windows (out of 20) produced usable data. The field data and models for all soundings are included in Appendix A.

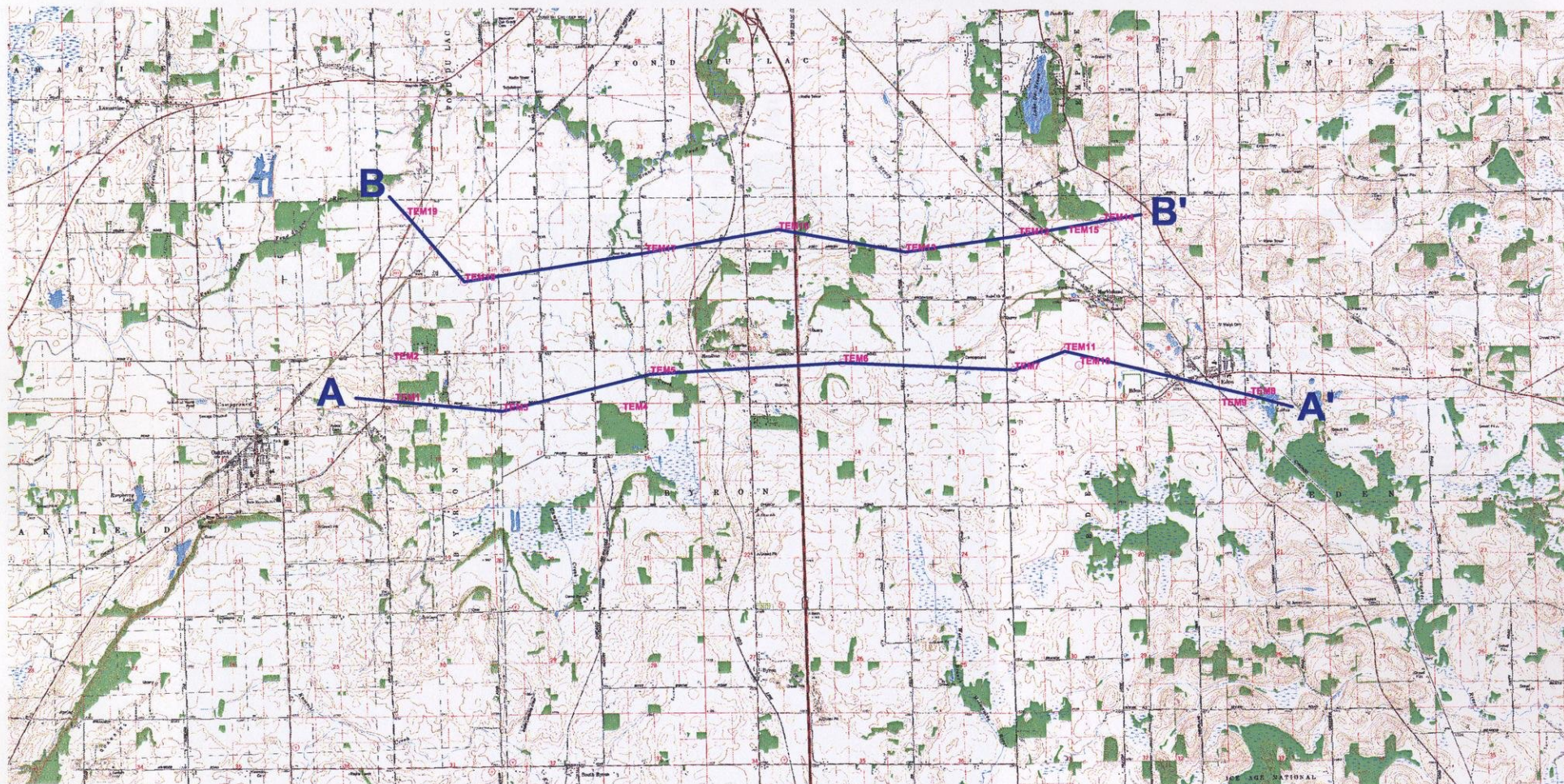
Five geo-electrical cross sections were constructed from the soundings as shown on Figures 1 and 4. Several soundings were not used for cross-sections because they were located too far off the line of transect to be of value.

### **Fond du Lac County Results**

Figures 2 and 3 are geo-electrical cross sections that transect the proposed well field area for the City of Fond du Lac area from west to east. The stratigraphy above the base of the Maquoketa shale was lumped into a single unit projected across the cross section from well control. The TEM soundings across this interval displayed significant variability partially due to changes in stratigraphy, but also due to the poor sensitivity of the TEM method to shallow units.



**FIGURE 1**  
**LOCATION OF TEM SOUNDINGS**  
**IN FOND DU LAC COUNTY**



**LEGEND**

TEM18

TEM SOUNDING LOCATION

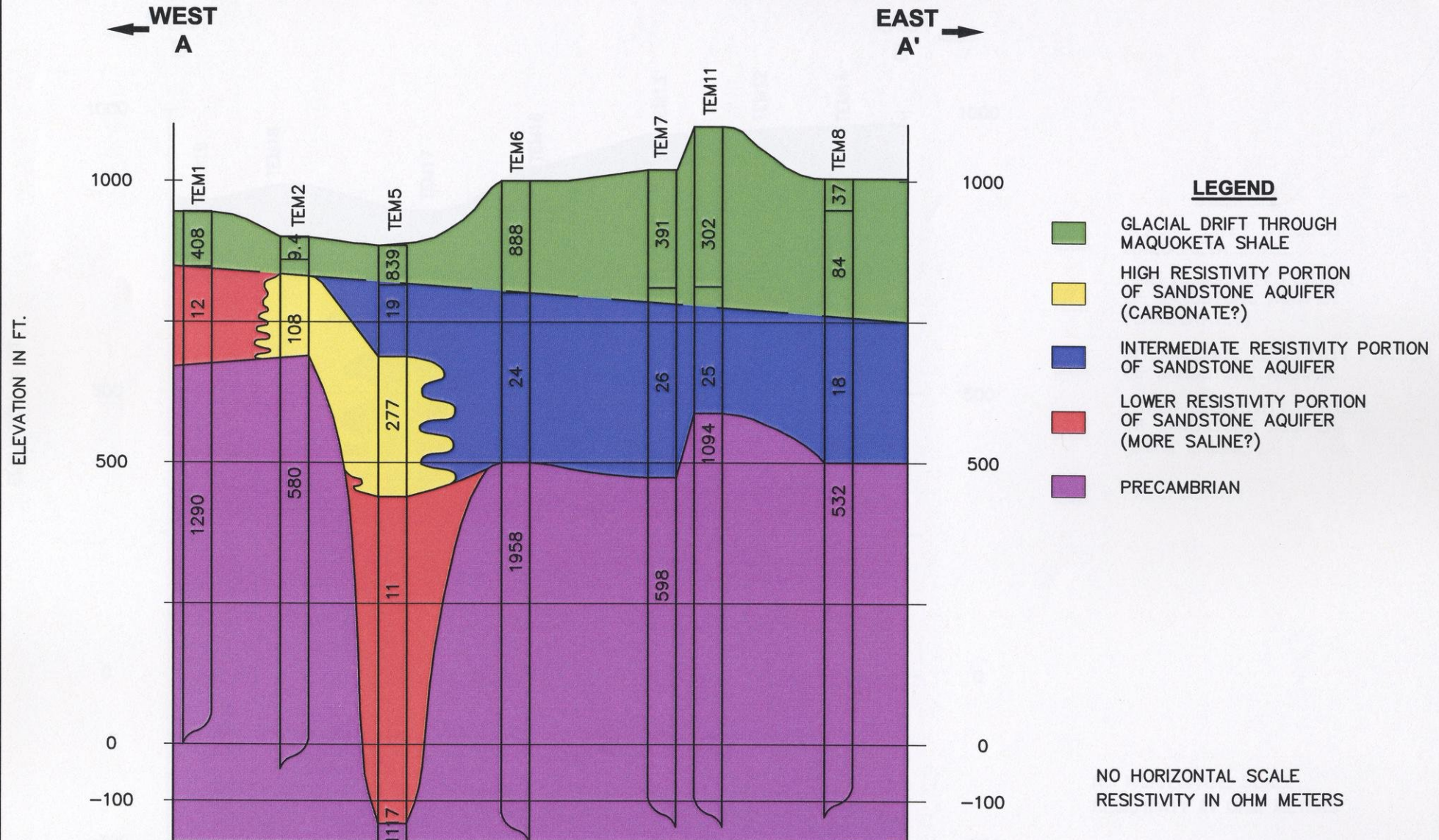
A—A'

GEO-ELECTRICAL CROSS-SECTION



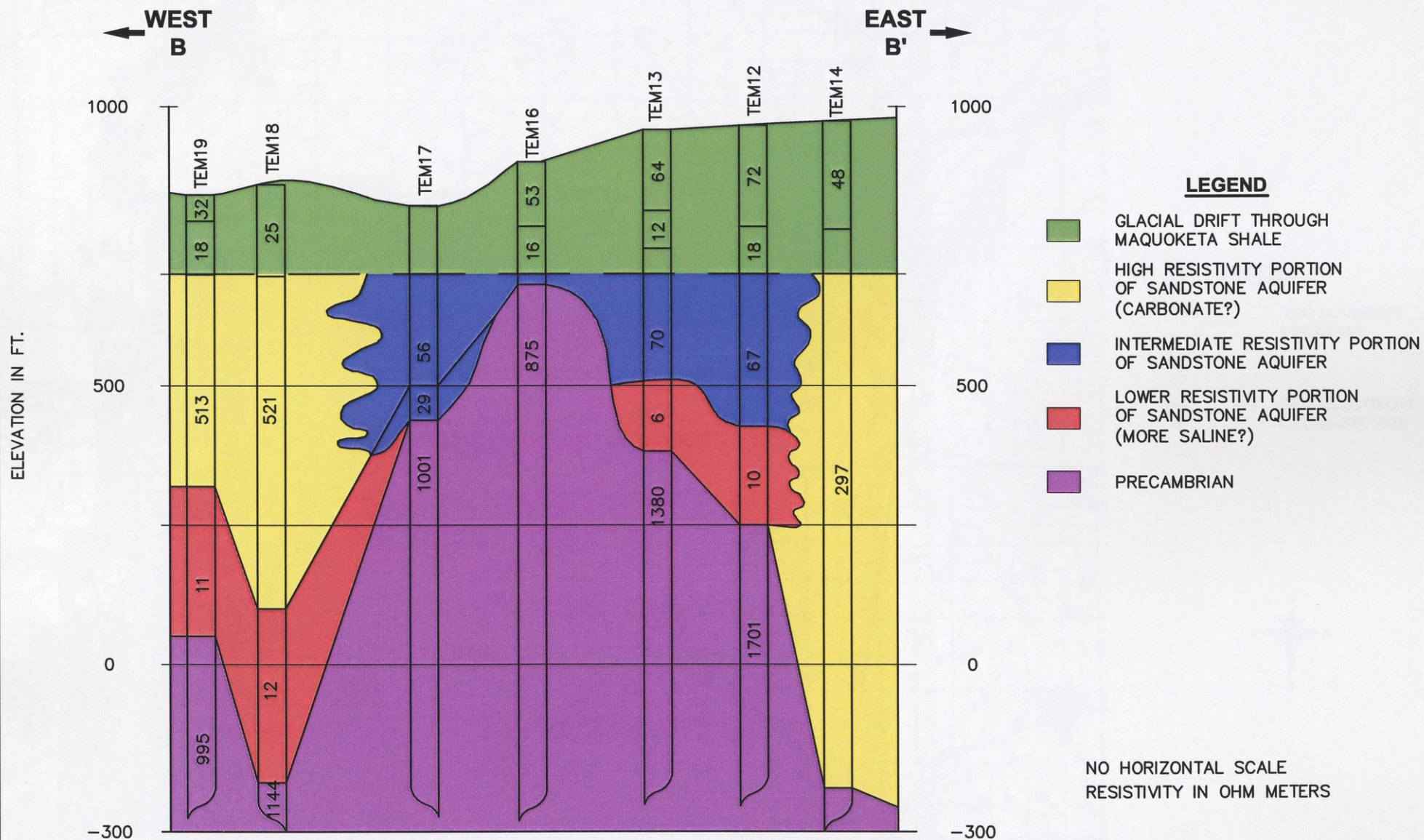


**FIGURE 2**  
**GEO-ELECTRICAL CROSS-SECTION A-A'**  
**THROUGH FOND DU LAC COUNTY**



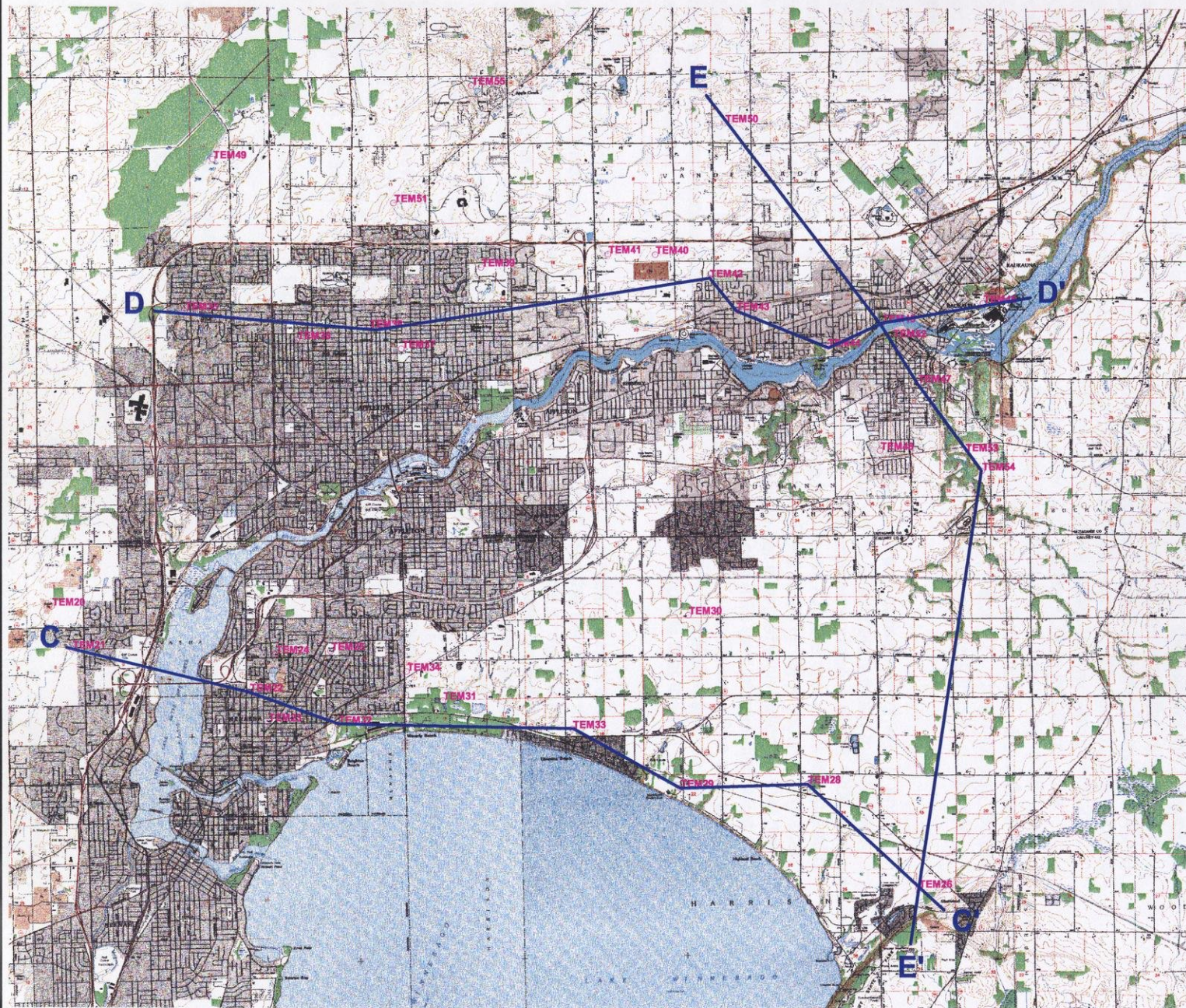


**FIGURE 3**  
**GEO-ELECTRICAL CROSS-SECTION B-B'**  
**THROUGH FOND DU LAC COUNTY**





**FIGURE 4**  
**LOCATION OF TEM SOUNDINGS**  
**IN WINNEBAGO, CALUMET AND OUTAGAMIE COUNTIES**



**LEGEND**

TEM18

**TEM SOUNDING  
LOCATION**

C—C'

**GEO-ELECTRICAL  
CROSS-SECTION**





Line A-A' runs along Highway B from Oakfield to Eden. The section shows significant topography on the Precambrian surface. The Precambrian surface is interpreted as varying from about 600 feet above mean sea level (msl) to below -100 feet msl. There is a depression on the Precambrian surface at TEM 5 where the sandstone aquifer may be approximately 600 feet thicker than at adjacent soundings. This interpretation of the bedrock surface is consistent with Massie-Ferch's (2001) interpretation based on well logs. She shows Precambrian bedrock at an elevation of about 350 to 650 feet msl on the west end of the profile line and between 300 to 350 feet msl on the eastern two thirds of the line. She also shows a fault bounded depression (graben) with steep walls at station TEM 5 where the surface of the Precambrian rock is at about -150 feet msl.

The sandstone aquifer lies between the Precambrian rock and the base of the Maquoketa shale. The TEM soundings indicated that the resistivity of the sandstone aquifer ranged from about 18 to 277 Ohm\*meters on cross section A-A'. Sounding TEM1 is immediately east (down-gradient) of a Precambrian ridge identified by the Oakfield TEM survey. The sandstone appears to be relatively thin (less than 300 feet) in this area and have a relatively low resistivity (12 Ohm\*meters), indicating that the formation water may have higher TDS in this area. The sandstone aquifer at soundings TEM 5, 6, 7, 11, and 8 has a higher resistivity (18 to 26 Ohm\*meters) suggesting that the formation water may have lower TDS values. Soundings TEM 3 and 5 detected a very high resistivity zone in the sandstone (108 to 277 Ohm\*meters). Based on drilling experience in the Oakfield study, this unit probably represents a thicker carbonate sequence with relatively thinner sandstone units.

Line B-B' runs along Lost Arrow Road and Brookside Road between Highway D and Highway 45. The elevation of the Precambrian surface varies significantly along the profile. There is a depression at sounding TEM 18 where the Precambrian surface is about -200 feet msl and a mound at sounding TEM 16 where the surface is at about 700 feet msl. This interpretation is consistent with the general trend of the map by Massie-Ferch (2001). She shows the graben from the area of TEM 5 extending toward TEM 18, though her interpretation indicates that the graben truncates against an up-thrown block approximately one mile east of sounding TEM 18. Our data suggests that the trend of the graben may be more to the northwest. She also shows a fault bounded granite mound near sounding TEM 16 where the Precambrian surface reaches to about 550 feet msl. Our data supports this interpretation but suggests that the top of the mound may be higher than shown on her map.

The thickness and resistivity of the sandstone section varies considerably across the cross section. The sandstone appears to be very thin or absent near the top of the mound (Soundings TEM 16 and 17). The sandstone appears to thicken on either side of the mound. At the soundings adjacent to the mound (TEM 19, 18, 13, and 12) the lower portion of the sandstone appears to have a relatively low resistivity (6 to 12 Ohm\*meters) suggesting that the formation water may have relatively high TDS values. This is consistent with the observed association with high TDS in zones of stagnation adjacent to Precambrian mounds (Ryling 1961, Layne Northwest /AST 1999). The upper portion of the sandstone at soundings TEM 17, 13, and 12 appears to have higher resistivity values (29 to 70 Ohm\*meters), which is consistent with sandstone saturated with low TDS ground water. Soundings TEM 19, 18, and 14 encountered high resistivity zones in the sandstone (297 to 521 Ohm\*meters), which may indicate thicker carbonate sections with relatively thin sandstone units.

## **The Fox Cities Area Results**

The TEM data collected in the Fox Cities area was collected in a highly developed area and was affected by cultural interference. As a result, only a few soundings were able to detect the Precambrian surface. Several soundings were excluded from the interpretation or cross sections due to poor data quality. However, the quality of the remaining soundings was sufficient to draw several interesting interpretations regarding the sandstone aquifer.

Only a few of the TEM soundings resolved a vertical difference in conductivity in the sandstone section. In one case, the contact has been independently confirmed by field data. Sounding TEM 30 was conducted south of Darboy. The sounding predicted a transition from relatively fresh water to saline water at a depth of about 500 feet. This is consistent with the water quality data collected while drilling a recent test well for a municipal well for the Darboy Sanitary District. The driller took water samples at 20 foot increments while drilling. Hardness levels increased from about 400 ppm at 520 feet to approximately 1,500 ppm at 720 feet (Steffes 2002).

It is unknown if the predicted depth of the saline water is as accurate at other soundings. In areas of heavier pumping and with more wells, significant upwelling has probably occurred through the aquifer and open boreholes. This may have caused extensive mixing of saline water in the aquifer and made the contact between fresh water and more saline water more gradational. It may also be possible to model the sandstone aquifer as two layers; a thin more resistive layer on top, and a thicker more conductive layer below. While this model may produce similar results we did not see changes in the curves of most soundings to support his interpretation. However, if more information on the vertical distribution of water quality becomes available, it may be possible to reinterpret this data showing two layers in the sandstone.

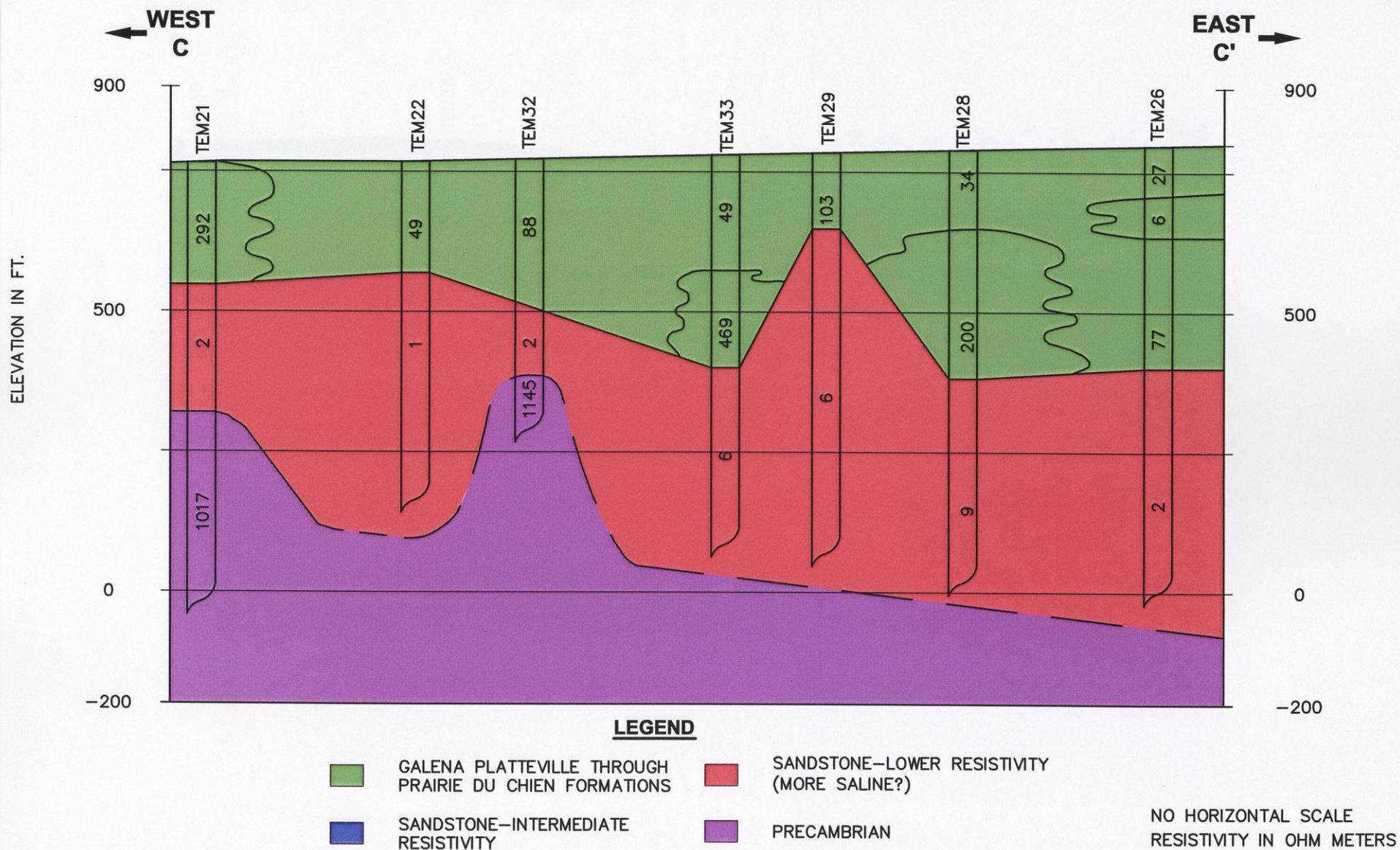
Figures 5, 6 and 7 are geo-electrical cross sections that transect the proposed well field area for the area on the northern end of Lake Winnebago (the Fox Cities area). The stratigraphy above the base of the Galena Platteville dolomite through Prairie du Chein dolomite was lumped into a single unit projected across the cross section from well control. The TEM soundings across this interval displayed significant variability partially due to changes in stratigraphy, but also due to the poor sensitivity of the TEM method to shallow units. The Precambrian surface was only detected by a few soundings in the area. This is probably due to higher noise levels in the sounding data due to the more developed nature of the area and greater signal attenuation from the higher conductivity units above the Precambrian rock. The general depth of the Precambrian surface is projected on the cross sections at the other soundings using information from high capacity well logs.

Line C-C' runs along the north shore of lake Winnebago from Menasha to Sherwood. The Precambrian surface was only detected at soundings TEM 21 and 32. The apparent high on the Precambrian surface at TEM 32 was previously unknown. The data from several adjacent soundings was corrupted by interference. As a result, the existence of the mound is based on a single sounding and it is indicated in dashed lines to denote the uncertainty.

The sandstone aquifer on the western side of the potential Precambrian mound has a relatively low resistivity (1 to 2 Ohm meters) suggesting that the water in this area may be more saline. The sandstone at soundings TEM 33, 29, and 28 has a slightly higher resistivity (6 to 9 Ohm meters), suggesting that the water in this area may be less saline. This area is generally undeveloped. The apparent lower salinity levels may be a function of lower pumpage from this area. The resistivity of the sandstone is lower (2 Ohm meters) at sounding TEM 26, suggesting that the water in this area may also be more saline. The apparent saline water at TEM 26 may represent the western edge of a zone of saline water known to present in the sandstone aquifer in Manitowoc and Sheboygan Counties (Ryling 1961)

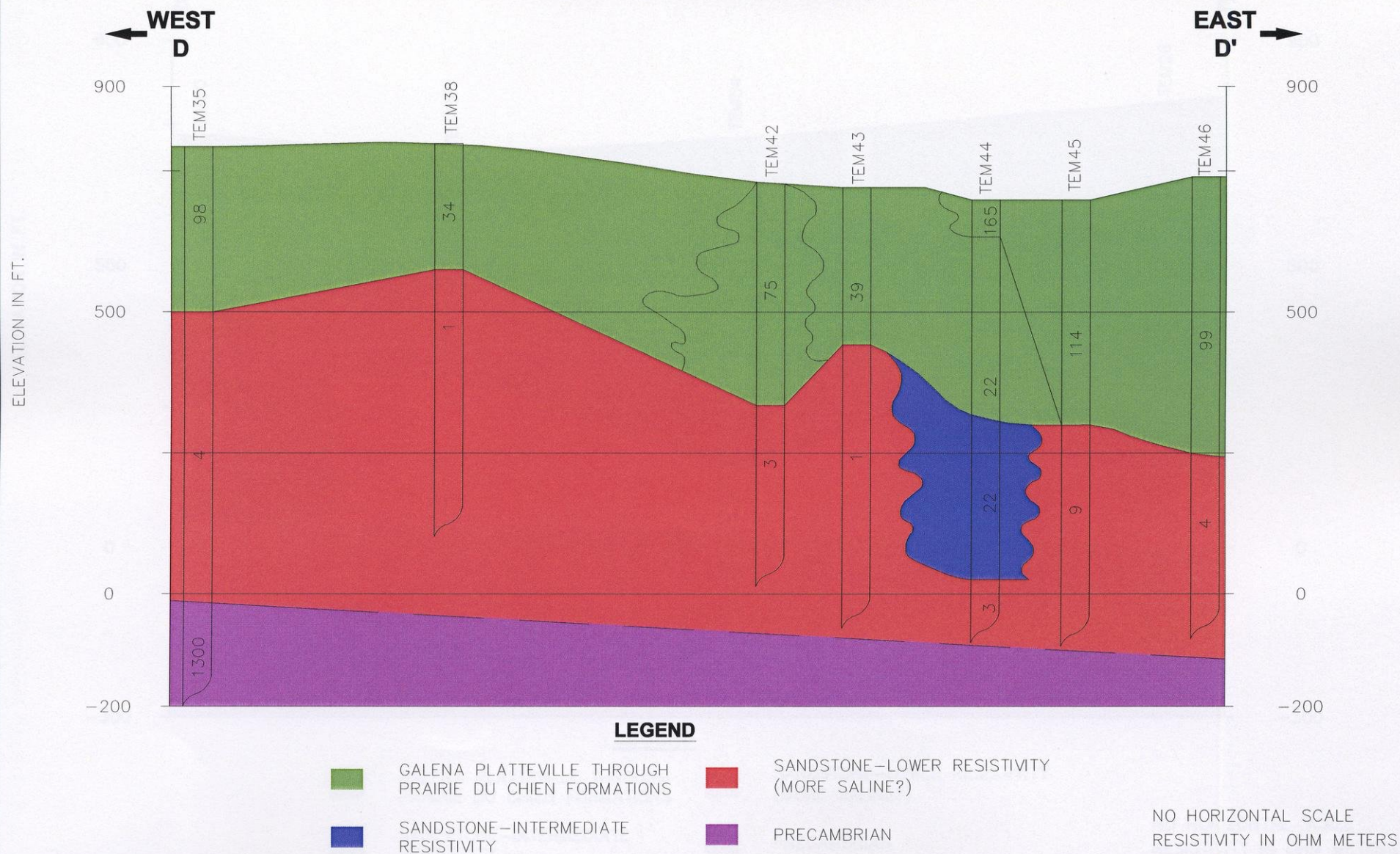
Line D-D' runs from west to east just south of Highway 41 from Appleton to Kaukauna. The Precambrian surface was only detected at sounding TEM 35. Sounding TEM 39 indicated that a mound may be present on the Precambrian surface. Unfortunately, the data from TEM 39 and several adjacent soundings was corrupted by interference and a brief review of well logs from the area did not find any logs deeper than 300 feet. As a result, the existence of the mound is based on a single noisy sounding. Due to the uncertainty, TEM 39 and the potential mound were not included on the cross section.

**FIGURE 5**  
**GEO-ELECTRICAL CROSS-SECTION C-C'**  
**THROUGH WINNEBAGO AND CALUMET COUNTIES**



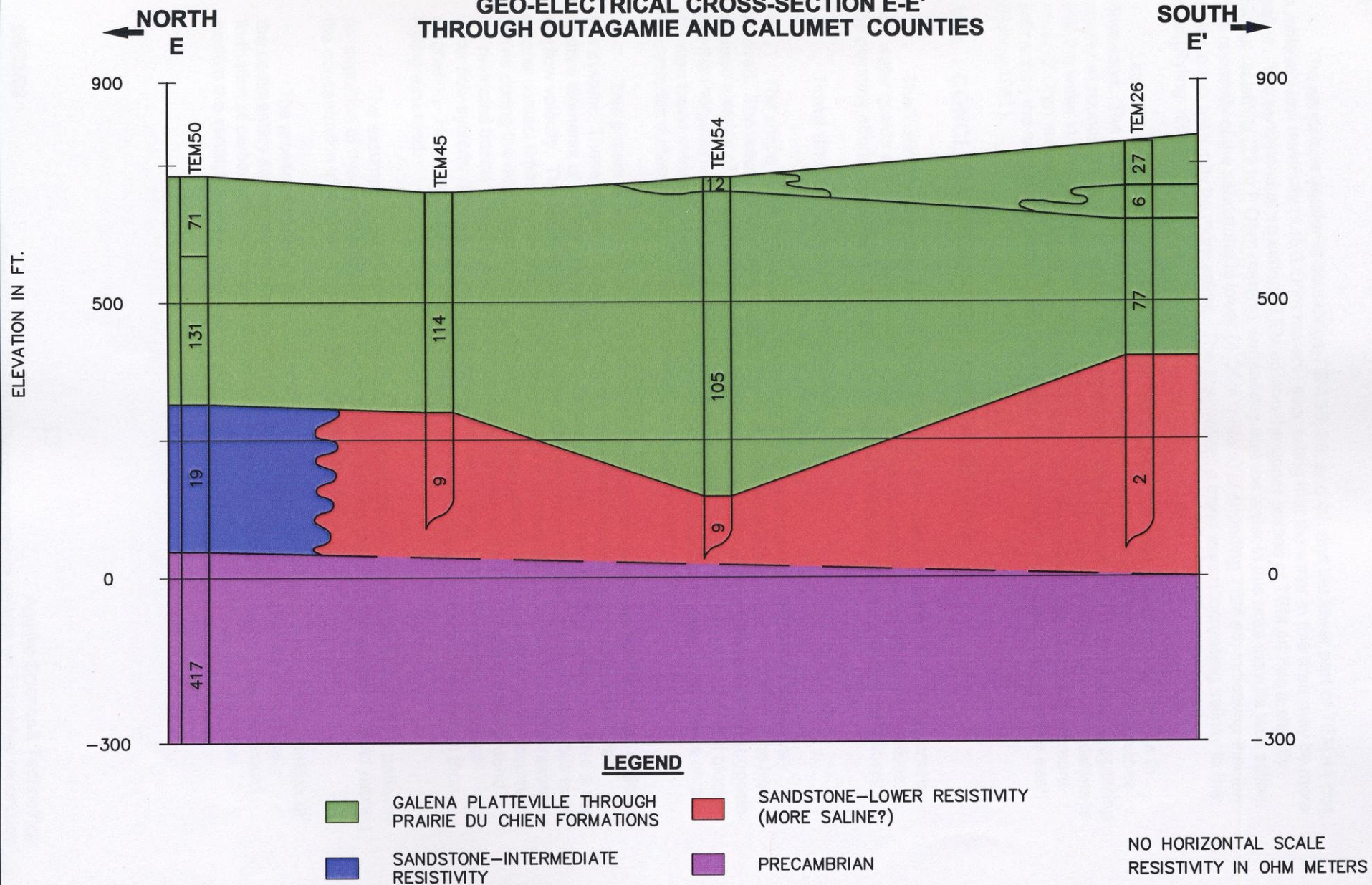


**FIGURE 6**  
**GEO-ELECTRICAL CROSS-SECTION D-D'**  
**THROUGH OUTAGAMIE COUNTY**





**FIGURE 7**  
**GEO-ELECTRICAL CROSS-SECTION E-E'**  
**THROUGH OUTAGAMIE AND CALUMET COUNTIES**



The sandstone aquifer at soundings TEM 35, 38, and 42, and the lower part of TEM 44 has a relatively low resistivity (1 to 3 Ohm meters) suggesting that the water in this area may be more saline. The sandstone at soundings TEM 45 and the upper portion of TEM 44 has a slightly higher resistivity (22 to 9 Ohm meters), suggesting that the water in this area may be less saline. The resistivity of the sandstone is lower (4 Ohm meters) at sounding TEM 46, indicating that the water in this area may be more saline. This may reflect a trend toward increasing salinity to the east (Ryling 1961).

Line E-E' runs from north to south from the area north of Little Chute and Kaukauna to Sherwood. The Precambrian surface was only detected at sounding TEM 50. The sandstone aquifer at soundings TEM 45 and 54 has a relatively lower resistivity (9 Ohm meters), suggesting that the water in this area may be more saline than at TEM 50. The resistivity of the sandstone is lower (2 Ohm meters) at sounding TEM 26, indicating that the water in this area may be more saline than the area to the west. This may reflect a trend toward increasing salinity to the east (Ryling 1961).

## **VIII. CONCLUSIONS AND RECOMMENDATIONS**

The TEM data collected for this study has provided useful information on the geometry and water quality of the sandstone aquifer. This information should assist local water utilities in the planning efforts. The major findings and relevant conclusions are summarized as follows:

### **Fond du Lac County Conclusions**

The shape of the Precambrian surface in the area is more complex than previously believed. The results of our study support the interpretation of Massie-Ferch (2001). She has mapped a series of steep fault blocks with vertical displacement of over 500 feet. This suggests that the Precambrian mounds mapped by Thwaites (1957) are likely to be horst-like fault blocks. We also found evidence of graben-like steep walled basins adjacent to positive elements on the Precambrian surface, which is also consistent with Massie-Ferch's work.

This pattern is likely to produce portions of the aquifer that are isolated from the regional flow system. These zones of isolation will likely form immediately adjacent to steep walled positive elements or in steep walled basins. Water in these areas will be stagnant or have a very low flow velocity. The water is likely to be older and may have elevated mineralization due to its greater contact time with the formation. These areas also have the potential of forming restricted basins during the depositional history of the area. Deposition of evaporites may have occurred in the restricted basins creating a source for elevated sulfates and other minerals in the ground water flow system. This interpretation is consistent with Ryling's (1961) inferred zones of stagnation. However, our data indicates that the stagnant zones may be more common than Ryling assumed.

The assumption that the Precambrian surface is heavily faulted also provides a pathway for migration of hydrothermal fluids. If this structural pattern continues northward, it could explain the concentration of sulfide minerals in Winnebago County.

The presence of positive elements on the Precambrian surface during the deposition of the sedimentary section could have controlled the distribution of sand deposition and the formation of carbonates. Viewed in this light, the structure of the Precambrian surface could explain the variations in the thickness of carbonate units and sandstone units in the area.



## **Recommendations for Future Well Siting in Fond du Lac County**

Based on the results of this survey, it appears that the geometry and water quality of the sandstone aquifer is more complex than previously believed. It is necessary to know the shape of the Precambrian surface to obtain viable capacity and water quality for a municipal well. Collecting this data by test drilling is probably impractical.

To avoid problems, geophysical surveys should be conducted prior to picking a new sandstone well site. The surveys should be designed to map the shape of the Precambrian surface and identify pockets of saline water. The specific geophysical method used should be selected on the basis of site conditions, specific survey objectives, and budget. Methods that could be useful include TEM, magnetotellurics, gravity, magnetics, and seismic reflection. When possible, several methods should be used conjunctively to improve the quality of the interpretation. Well sites should be selected to avoid mounds or steep basins on the Precambrian surface, avoid pockets of saline water, and avoid areas with anomalously thick carbonate sections. Any plans for major well field expansions in this area should consider the implications of the aquifer conditions before making major commitments of time or money.

### **Fox Cities Area Conclusions**

The TEM data from the Fox Cities area indicated that the saline water quality problems are laterally extensive in the area. Test drilling results have indicated that the highest TDS concentrations are at the base of the aquifer. The TEM data was not able to resolve the top of this layer, probably due to a gradational nature of the contact. The results suggest that TDS levels are likely to increase over time. This is consistent with the conclusions reached by Vollmer (1986). The increase will occur due to upward migration of saline water in response to vertical gradients created by pumping. Lateral migration of saline water from the east does not appear to be a significant factor

The survey indicated that elevated TDS levels are present in the aquifer in the Menasha area. It seems likely that the lower TDS levels in the water produced by wells in this area are because the Menasha Sanitary District #4 well does not penetrate the lower portion of the aquifer. The rise in hardness levels is likely to continue over time due to upward migration of saline water as the well is pumped.

The survey also identified a potential mound on the Precambrian surface at sounding TEM 32 as well as a possible mound at TEM 39. These mounds could not be confirmed by well log data. If present, the mounds could influence ground water flow and locally exacerbate TDS problems in the aquifer. The aquifer appears to be more saline west of the mound at sounding TEM 32 than east of the mound. However, the area east of the mound is largely undeveloped. The apparent lower TDS concentrations in the ground water in this area could be a function of the lower rates of pumping in the area.

## **Recommendations for Future Well Siting in Fond du Lac County**

The results of our survey suggests that water utilities pumping the sandstone aquifer in the Fox Cities area should expect to encounter rising TDS concentrations over time. The water quality in existing wells can probably be improved by backfilling the lower portion of the borehole at the expense of a significant portion of the well capacity. Any new wells should be terminated at least 100 feet above the base of the aquifer to avoid producing water from the most mineralized zones. The longevity of the improvement in water quality will depend on the degree of vertical isolation from confining units in the aquifer. A cursory review of geologic logs of wells in the area suggests that no thick continuous confining units are present in the lower portion of the aquifer. As a result, saline water is likely to migrate upward and TDS levels may increase over time even if the wells are partially backfilled.

The data suggests that better quality water may be available in the sandstone aquifer approximately one mile north of Highway 41, the area around the northern shore of Lake Winnebago near soundings TEM 33, 29, and 28, and possibly near the Fox River in Little Chute near soundings TEM 44 and 45. The longevity of the lower TDS levels in these areas if high capacity wells are installed is unknown.

The rate of change in water quality in the aquifer cannot be predicted without further investigation. Any modification of the construction of the municipal wells or the pumping pattern of the well field will introduce more variables making any predictions of future water quality changes more difficult. However, the existing data does make a compelling case that further increases in TDS and sulfate levels are likely in much of the area. Additional study including water sampling and regional ground water modeling should be conducted to predict future changes in water quality and evaluate alternatives to deal with the problem. The region may be faced with finding alternate sources of water if quality deteriorates in the future. These sources could include sandstone aquifer wells west or north of the Fox Cities area, the sand and gravel aquifer in a major bedrock valley approximately 15 miles northwest of the area, or Lake Winnebago.

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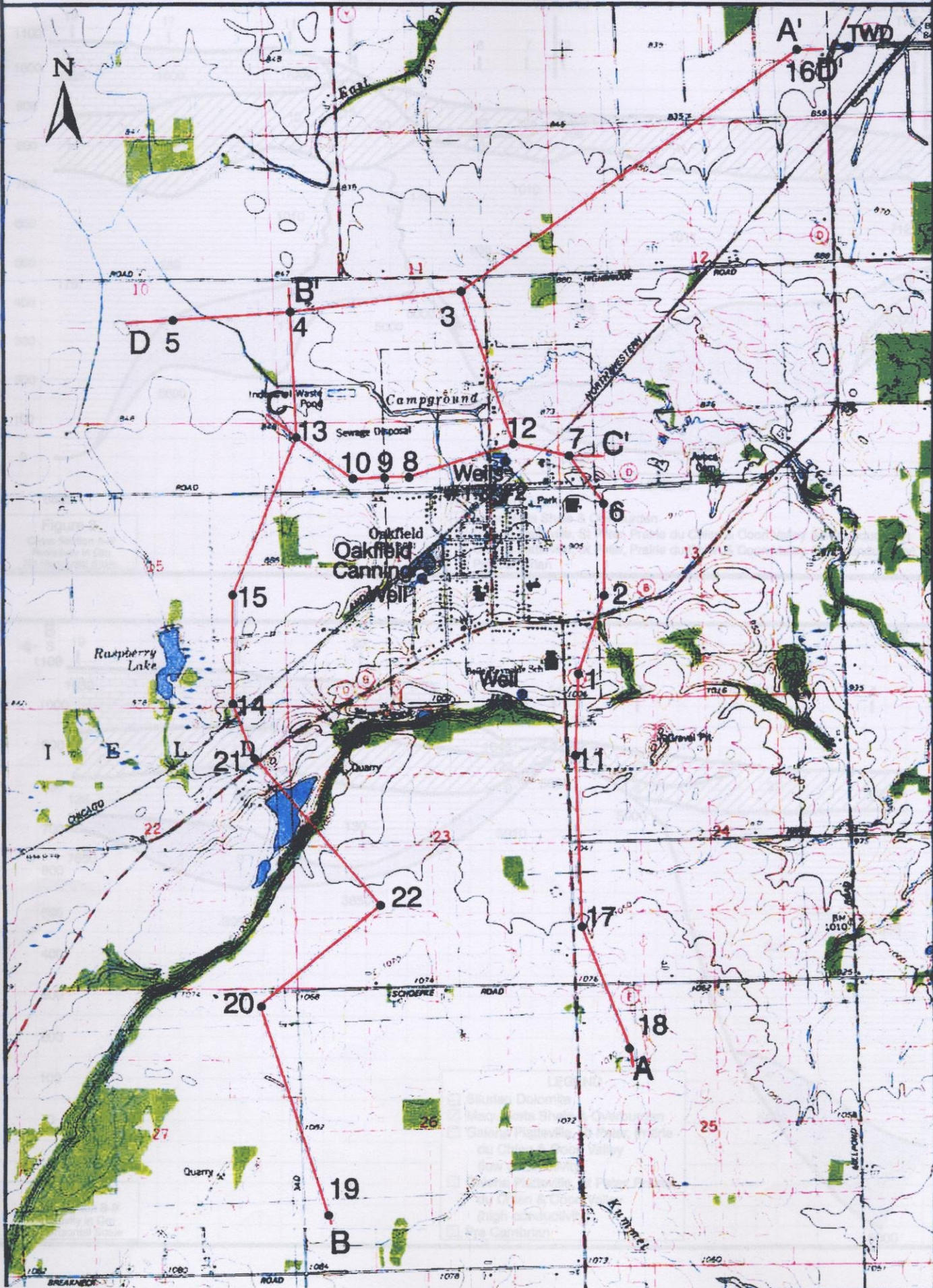
## **X. APPENDICES**

## **Appendix A**

### **Location Map and Geo-Electrical Cross Sections for Oakfield, Wisconsin**



Time Domain Survey Location Map  
Oakfield, Wisconsin







## **Appendix B**

### **Table of TEM Model Results**



# Fox Valley TEM Model Summary

Sounding #	$\Omega m$	$m$									Elev (ft.)	Error %
	$\rho_1$	$t_1$	$\rho_2$	$t_2$	$\rho_3$	$t_3$	$\rho_4$	$t_4$	$\rho_5$	$t_5$		
1	408	24.7	11.9	122.8	1102	122.7	0.11	$\infty$			945	13.7
2	116.8	9.4	22.1	32	34.3	92	6.9	57.8	96.5		885	5.6
3	25.6	18.1	108.1	78.4	580	$\infty$					895	6.6
4	Bad Data											
5	839.1	24.5	19.5	36.2	266.2	78.8	9.6	$\infty$			880	3.4
6	888.3	62.9	23.8	91.4	1958	$\infty$					1000	5.3
7	390.9	61.0	25.7	119.1	598	$\infty$					1055	4.6
8	36.8	10.4	83.6	97.3	17.6	51	532	$\infty$			1010	7.3
9	81.2	93.0	23.4	85.3	1003	176.1	7.2	$\infty$			1010	2.3
10	Bad Data											
11	301.7	78.0	25.0	80.7	1094	$\infty$					1085	8.3
12	71.5	47.8	17.8	30.3	67.4	80.9	10.1	59.4	1702	$\infty$	945	5.9
13	64.5	39.5	11.8	23.5	70.0	69.6	6.2	42.6	1380	$\infty$	940	6.4
14	47.7	50.4	297	338	969	$\infty$					950	6.6
15	53.7	33.0	26.5	12.6	778	78.9	200	$\infty$			950	5.9
16	53.5	32.2	16.1	32.3	875	$\infty$					900	6.1*
17	56.4	101.0	28.9	18.0	1001	$\infty$					835	5.5*
18	24.9	52.6	718	118	26.7	$\infty$					865	6.6
19	32.3	14.2	18.4	34.7	513	115.6	11.0	83.7	995	$\infty$	845	4.1*
20	144.6	85.4	16.4	154.5	1645	$\infty$					790	7.2*
21	292.2	7.2	2.2	70.1	1017	$\infty$					770	9.3
22	49.2	64	1.2	396	999	$\infty$					770	8.5
23	40.2	69.0	0.23	29	998	$\infty$					760	23.9
24	55.6	79	1.5	23.6	93.8	8.6	0.1	$\infty$			760	20.9
25	60.6	41.0	4.0	12.8	100	35.9	0.8	$\infty$			760	40.8
26	26.7	24	6.5	15.3	77.0	84.3	2.2	$\infty$			810	3.8
27	95.1	57.8	18.2	41.6	96.7	90.1	373	$\infty$				4.6
28	34.2	41.1	199.8	89.0	8.7	$\infty$					800	3.2
29	102.9	43.2	5.9	144.7	7.9	14.7	21.2	$\infty$			790	11.8
30	39.3	78.1	4.4	55.7	26.4	14.1	1.6	$\infty$			795	7.1
31	Bad Data											
32	88.1	81.6	1.7	28.2	1145	$\infty$					750	11.3

# Fox Valley TEM Model Summary

Sounding #	$\Omega m$	$m$									Elev (ft.)	Error %
	$\rho_1$	$t_1$	$\rho_2$	$t_2$	$\rho_3$	$t_3$	$\rho_4$	$t_4$	$\rho_5$	$t_5$		
33	49.6	53.8	46.9	59.7	6.3	$\infty$					780	3.1
34	Bad Data										765	
35	98	88	4	171	1300.0	$\infty$					790	5.1
36	52	3	43	96	1.4	$\infty$					810	24.1
37	12	3	82	106	1.0	$\infty$					780	43.1
38	34	67	0.6	293	1097.0	$\infty$					790	11.1
39	120	30	6.1	31	2308.0	$\infty$					750	16.1
40	Bad Data										730	
41	Bad Data										730	
42	19	5	107	113	2.8	$\infty$					730	7.8
43	36	3	39	85	1.0	$\infty$					730	10.7
44	165	23	22	187	2.8	$\infty$					710	2.7
45	114	121	9	257	3.0	$\infty$					700	6.7
46	99	142	4	302	2.8	$\infty$					725	16.9
47	9	5	1045	123	5.4	$\infty$					700	16.3
48	21	23	538	97	1.0	$\infty$						11.6
49	212	47	322	$\infty$							820	6.7
50	71	43	131	84	19.0	79	417	$\infty$			730	6.0
51	63	77	1.1	57	0.3	$\infty$					830	6.6
52	7	5	468	91	4.9	302	986	$\infty$			700	13.5
53	11	7	118	164	11.3	$\infty$					740	3.2
54	12	8	105	171	9.0	$\infty$					740	2.6
55	22	4.6	168	189	5.3	$\infty$					830	3.7

$\rho$  = Resistivity in  $\Omega$ \* meters

$t$  = Thickness in meters

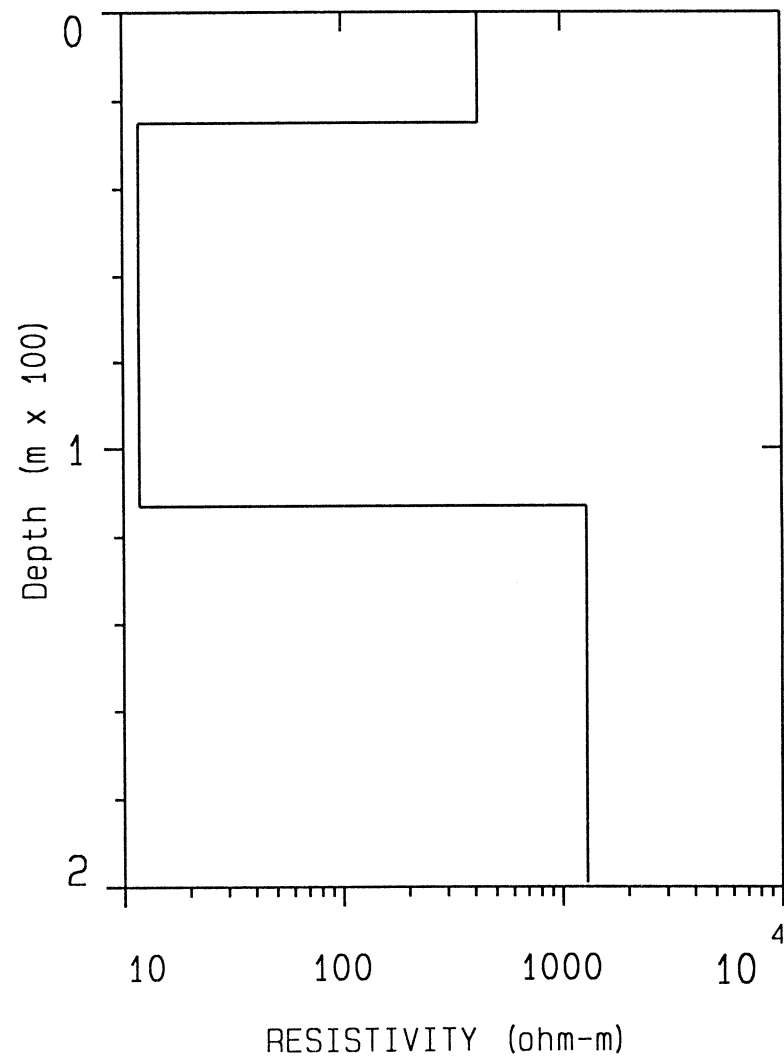
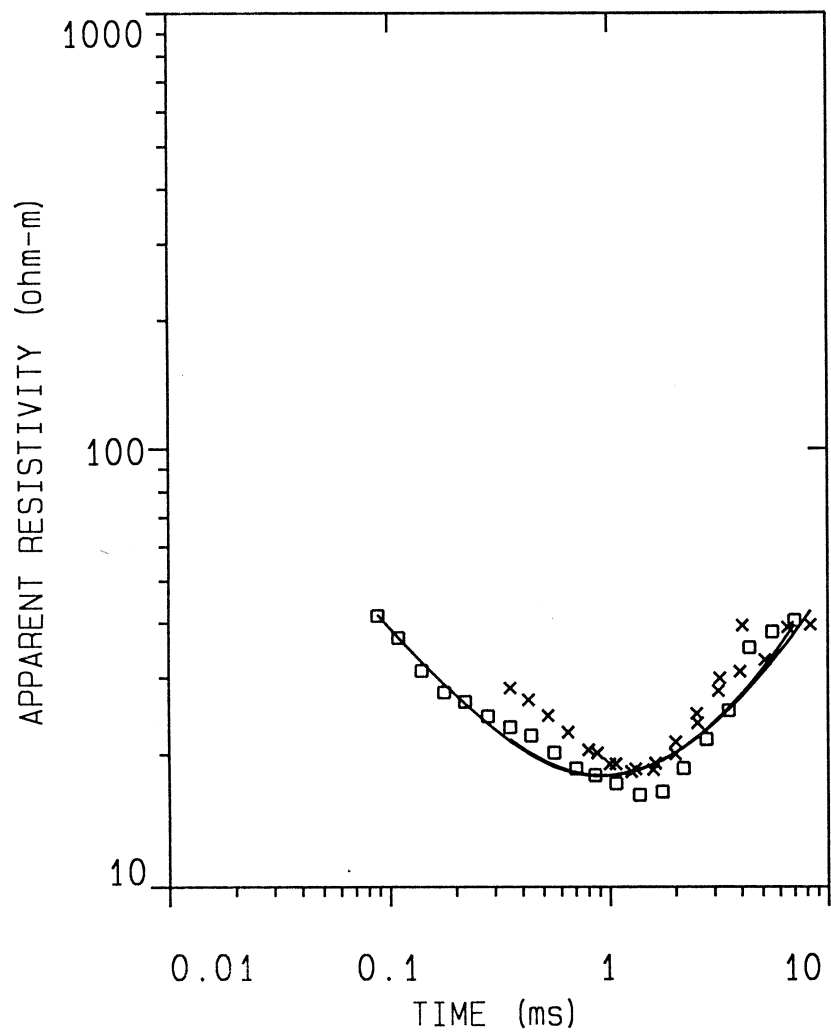
elevation in feet above mean sea level

\* Deleted several channels on high frequency

## **Appendix C**

### **Models for TEM Soundings Conducted for this Study**

# LINE1



DATA SET: LINE1

CLIENT: WDNR	DATE: 1/9/02
LOCATION: Brauer Farm, Fon du Lac	SOUNDING: 1
COUNTY: Fon Du Lac	ELEVATION: 0.00 m
PROJECT: Fox Valley Regional Study	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 2.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 13.656 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	418.4	24.97	-24.97	0.0596
2	11.84	88.07	-113.0	7.43
3	1290.9			

ALL PARAMETERS ARE FREE

CURRENT: 21.50 AMPS	EM-57	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	43673.7	43253.6	0.961
2	0.109	30254.6	30281.9	-0.0904
3	0.139	21430.3	20008.6	6.63
4	0.176	14135.8	13237.5	6.35
5	0.219	8832.0	8954.9	-1.39
6	0.279	5411.7	5741.6	-6.09
7	0.352	3301.6	3687.6	-11.69
8	0.439	2028.7	2370.3	-16.83
9	0.559	1270.5	1419.2	-11.70
10	0.703	811.0	844.6	-4.13
11	0.859	517.7	522.4	-0.903
12	1.06	321.4	301.9	6.06
13	1.37	188.0	154.5	17.80

\*

Ruekert & Mielke

\*

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.74	101.0	78.85	21.95
15	2.17	48.34	41.10	14.97
16	2.77	20.93	19.38	7.41
17	3.50	9.30	9.14	1.72
18	4.37	3.23	4.36	-34.84
19	5.56	1.56	1.90	-21.44
20	7.03	0.797	0.823	-3.30

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	2567.7	3849.0	-49.90 MASKED
22	0.427	1742.3	2624.0	-50.60 MASKED
23	0.525	1180.4	1708.3	-44.71 MASKED
24	0.647	796.6	1074.0	-34.81 MASKED
25	0.802	534.9	649.4	-21.40 MASKED
26	1.00	342.2	373.5	-9.13 MASKED
27	1.25	206.3	206.3	0.014 MASKED
28	1.58	114.1	109.6	3.96 MASKED
29	1.99	56.43	55.90	0.943 MASKED
30	2.52	24.63	27.61	-12.11 MASKED
31	3.19	9.56	13.15	-37.54 MASKED
32	4.05	3.47	6.08	-75.10 MASKED
33	5.14	2.51	2.73	-8.42 MASKED
34	6.54	1.06	1.20	-12.51 MASKED
35	8.32	0.573	0.513	10.56 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
36	0.881	437.3	521.3	-19.21 MASKED
37	1.06	293.9	319.8	-8.80 MASKED

\*

Ruekert & Mielke

\*

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	1.31	183.1	185.4	-1.28 MASKED
39	1.61	103.5	103.7	-0.164 MASKED
40	2.00	51.31	55.73	-8.61 MASKED
41	2.50	23.53	28.51	-21.18 MASKED
42	3.14	11.14	14.01	-25.75 MASKED
43	3.95	5.37	6.66	-23.89 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

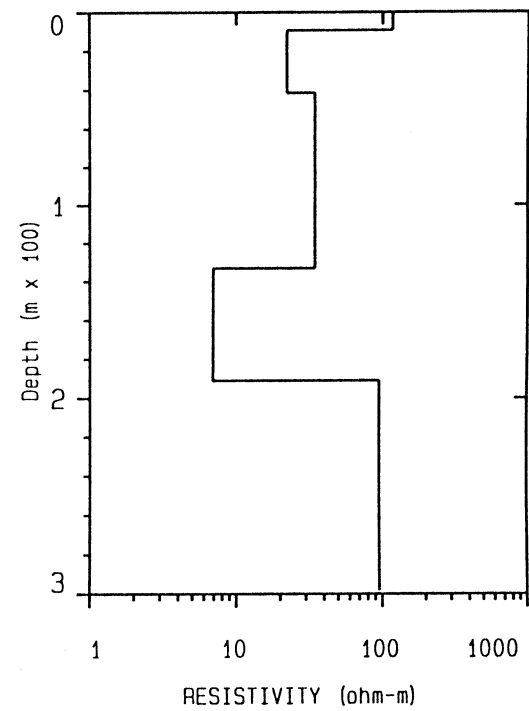
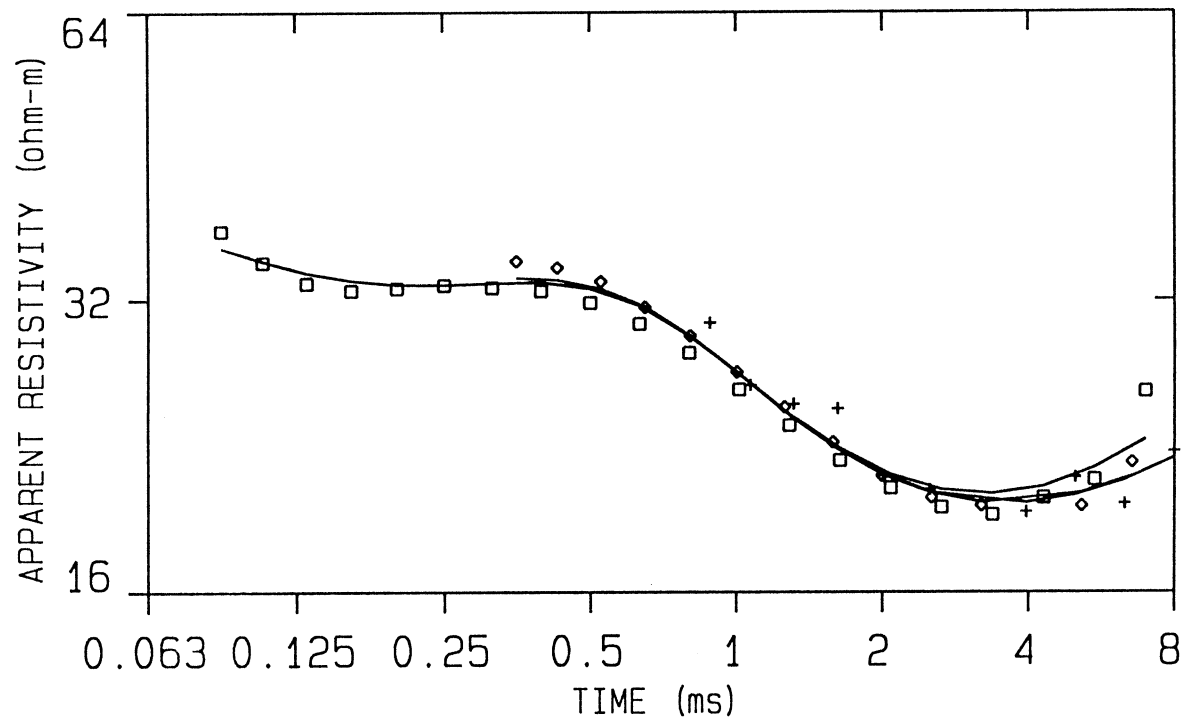
P 1	0.03				
P 2	0.00	0.96			
P 3	0.00	-0.01	0.00		
T 1	0.02	0.05	0.01	0.93	
T 2	0.00	-0.05	-0.02	0.06	0.93
	P 1	P 2	P 3	T 1	T 2

\*

Ruekert & Mielke

\*

# LINE2





DATA SET: LINE2

CLIENT: WDNR DATE: 1/9/02  
 LOCATION: Brauer Farm, Fon du Lac SOUNDING: 1  
 COUNTY: Fon Du Lac ELEVATION: 0.00 m  
 PROJECT: Fox Valley Regional Study EQUIPMENT: Geonics PROTEM  
 LOOP SIZE: 50.000 m by 50.000 m AZIMUTH:  
 COIL LOC: 0.000 m (X), 0.000 m (Y) TIME CONSTANT: NONE  
 SOUNDING COORDINATES: E: 1.0000 N: 2.0000 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 5.612 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	116.8	9.37	-9.37	0.0802
2	22.14	32.09	-41.46	1.44
3	34.35	91.78	-133.2	2.67
4	6.93	57.80	-191.0	8.33
5	95.47			

ALL PARAMETERS ARE FREE

CURRENT: 21.50 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 52.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	50449.4	53665.0	-6.37
2	0.106	34918.6	34738.9	0.514
3	0.131	22526.1	21675.4	3.77
4	0.161	13691.3	13201.9	3.57
5	0.200	7945.0	7838.8	1.33
6	0.250	4503.6	4498.5	0.112
7	0.314	2577.1	2534.9	1.63
8	0.395	1467.9	1424.0	2.98
9	0.499	855.1	813.0	4.92
10	0.631	513.5	481.3	6.25
11	0.799	315.8	297.2	5.88

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
12	1.01	198.8	187.8	5.54
13	1.28	124.4	119.6	3.90
14	1.63	77.45	74.14	4.26
15	2.08	46.79	44.59	4.70
16	2.64	27.41	25.75	6.06
17	3.37	15.36	14.26	7.18
18	4.29	7.89	7.59	3.83
19	5.47	4.04	3.87	4.12
20	6.97	1.61	1.91	-18.77

CURRENT: 22.50 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1841.4	1956.4	-6.24
22	0.427	1163.9	1217.0	-4.56
23	0.525	732.1	751.4	-2.63
24	0.647	475.3	474.7	0.139
25	0.802	308.0	308.0	-0.00103
26	1.00	200.8	200.7	0.0393
27	1.25	129.2	131.2	-1.58
28	1.58	82.48	83.55	-1.29
29	1.99	51.94	51.67	0.533
30	2.52	31.21	30.68	1.71
31	3.19	17.79	17.59	1.15
32	5.14	5.41	5.16	4.63
33	6.54	2.54	2.67	-5.01

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 2 RAMP TIME: 56.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
34	0.881	237.7	263.0	-10.62
35	1.06	183.4	182.2	0.638

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
36	1.31	117.4	123.7	-5.35
37	1.61	70.62	81.70	-15.68
38	2.00	52.49	52.41	0.157
39	2.50	31.63	31.93	-0.955
40	3.95	10.92	10.58	3.15
41	4.99	5.39	5.74	-6.49
42	6.31	3.29	3.03	7.87
43	7.99	1.52	1.55	-2.23

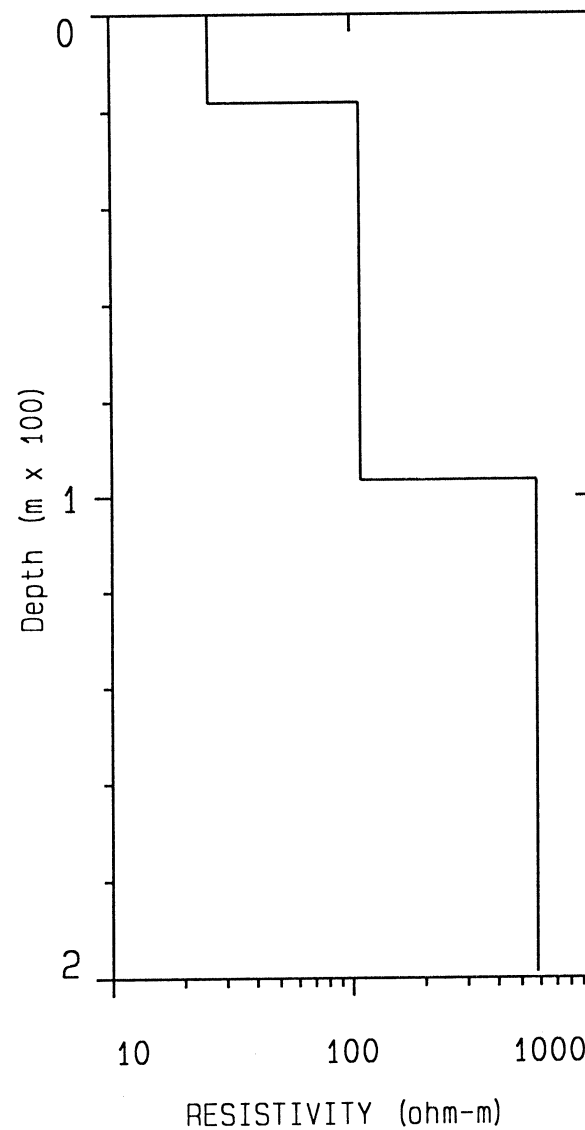
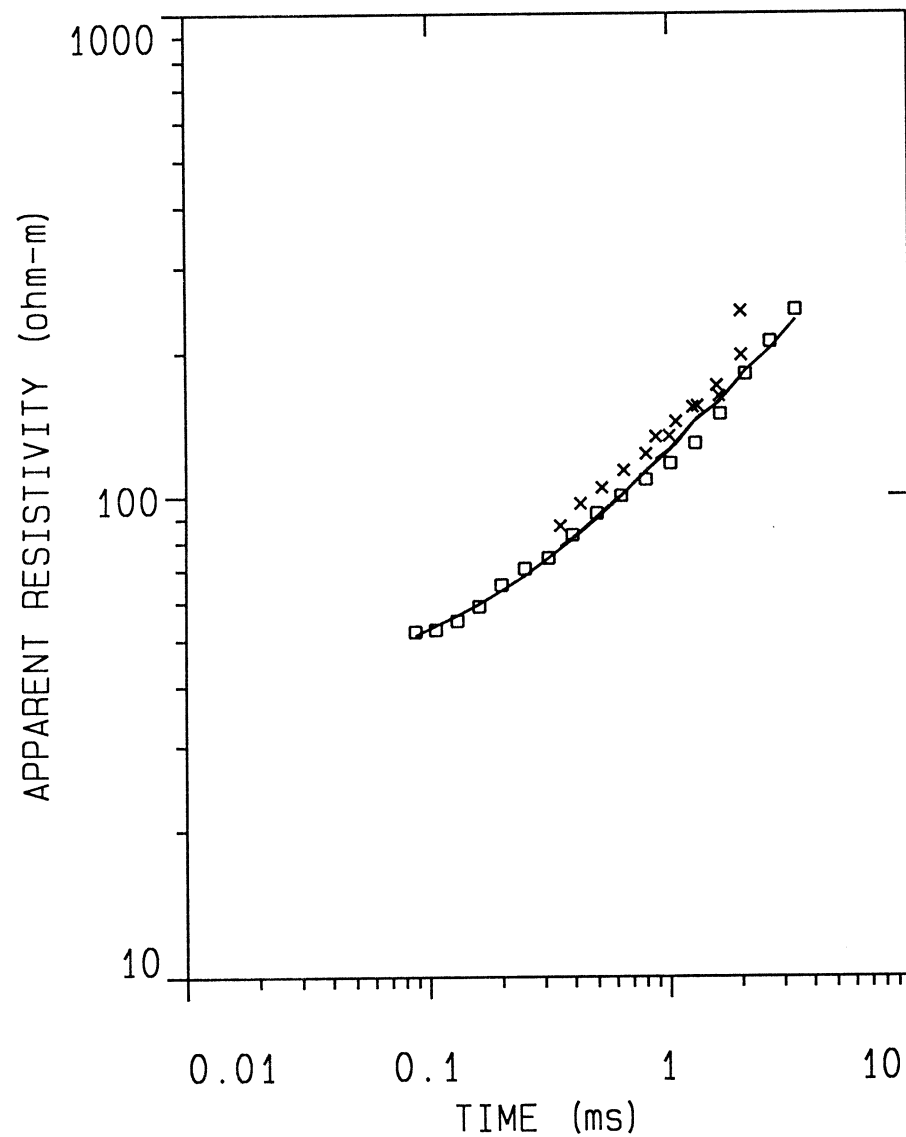
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE3



DATA SET: LINE3

CLIENT: WDNR	DATE: 1/9/02
LOCATION: Brauer Farm, Fon du Lac	SOUNDING: 1
COUNTY: Fon Du Lac	ELEVATION: 0.00 m
PROJECT: Fox Valley Regional Study	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 3.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 6.552 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	25.60	18.15	-18.15	0.708
2	108.1	78.35	-96.51	0.724
3	580.0			

ALL PARAMETERS ARE FREE

CURRENT: 21.40 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 54.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	31064.8	31985.6	-2.96
2	0.106	18930.3	18389.7	2.85
3	0.131	10611.3	10224.8	3.64
4	0.161	5665.7	5573.7	1.62
5	0.200	2841.8	2961.9	-4.22
6	0.250	1450.2	1526.7	-5.27
7	0.314	761.6	762.3	-0.0964
8	0.395	362.2	374.7	-3.44
9	0.499	172.8	179.8	-4.05
10	0.631	84.69	85.12	-0.509
11	0.799	41.79	39.37	5.77
12	1.01	20.44	18.47	9.62
13	1.28	9.73	8.24	15.23

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	4.32	3.94	8.82
15	2.08	1.78	1.74	1.97
16	2.64	0.774	0.816	-5.42
17	3.37	0.337	0.362	-7.46

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
18	0.352	481.9	560.4	-16.29 MASKED
19	0.427	253.2	310.2	-22.48 MASKED
20	0.525	134.9	160.6	-19.01 MASKED
21	0.647	70.25	83.21	-18.43 MASKED
22	0.802	36.42	41.08	-12.78 MASKED
23	1.00	18.32	20.24	-10.47 MASKED
24	1.25	8.46	9.46	-11.82 MASKED
25	1.58	4.08	4.66	-14.05 MASKED
26	1.99	1.34	2.14	-59.22 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
27	0.881	25.70	30.31	-17.93 MASKED
28	1.06	14.24	16.77	-17.75 MASKED
29	1.31	7.61	8.28	-8.83 MASKED
30	1.61	4.19	4.39	-4.64 MASKED
31	2.00	1.83	2.13	-16.17 MASKED

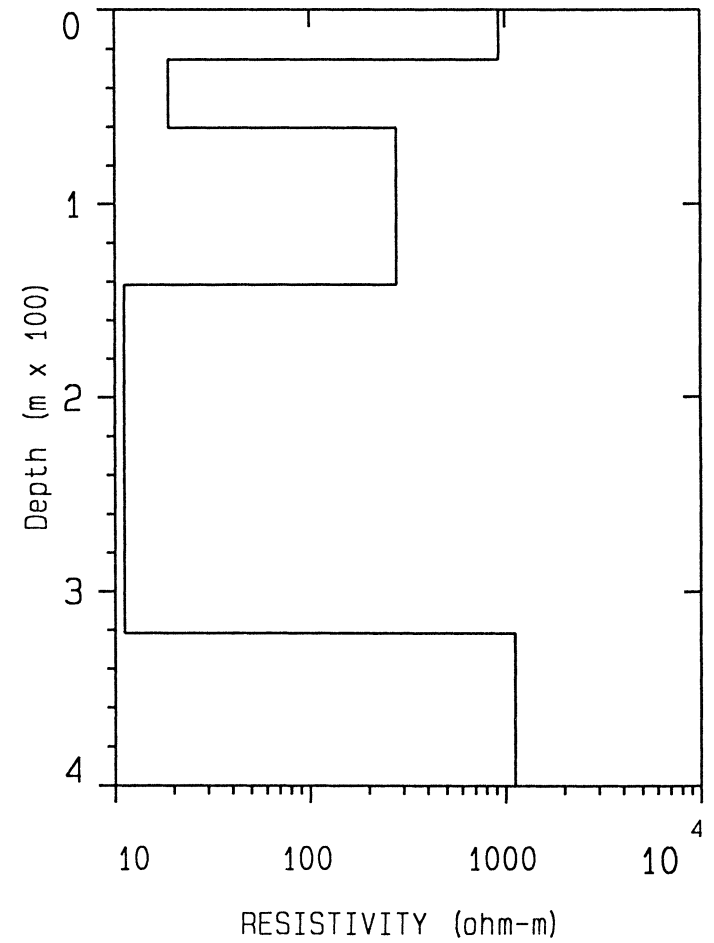
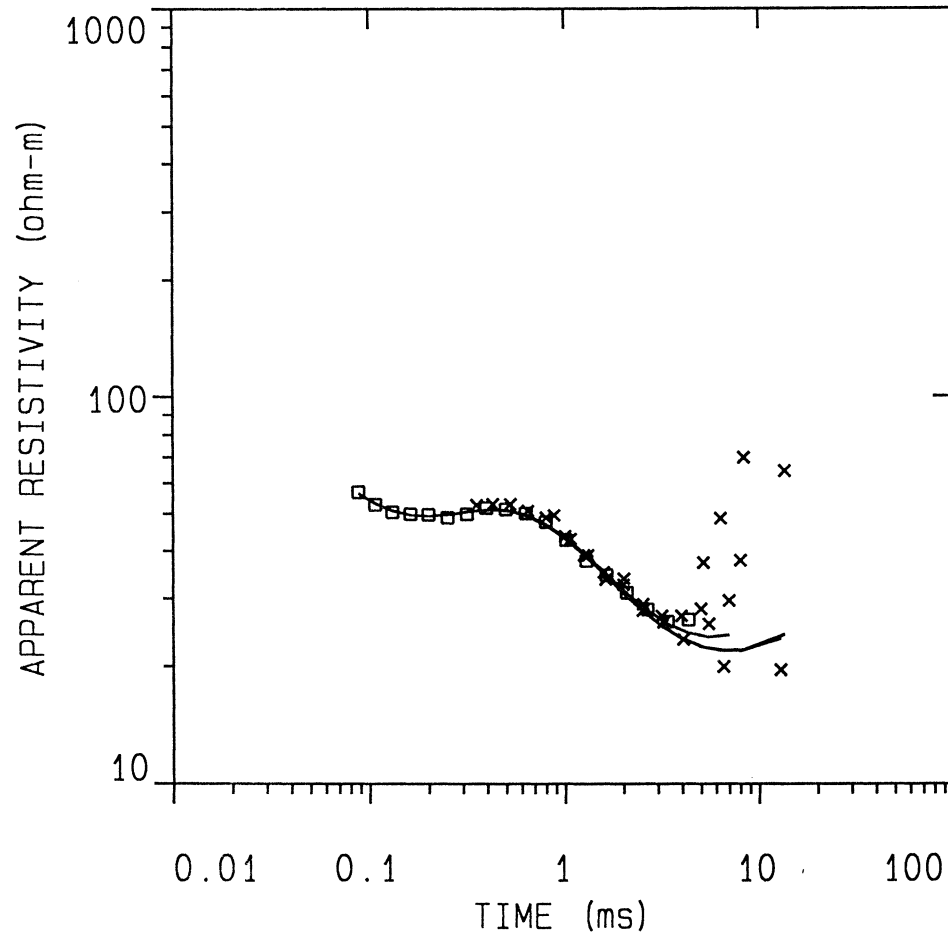
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE5



## DATA SET: LINE5

```

CLIENT:  WDNR                                DATE:  1/9/02
LOCATION:  Brauer Farm, Fon du Lac             SOUNDING:  1
COUNTY:  Fon Du Lac                         ELEVATION:  0.00 m
PROJECT:  Fox Valley Regional Study          EQUIPMENT:  Geonics PROTEM
LOOP SIZE:    50.000 m by 50.000 m          AZIMUTH:
COIL LOC:    0.000 m (X), 0.000 m (Y)      TIME CONSTANT:  NONE
SOUNDING COORDINATES:  E: 8.0000 N: 5.0000 SLOPE:  NONE

```

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 3.385 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	929.8	25.40	-25.40	0.0273
2	18.86	35.03	-60.43	1.85
3	277.8	81.24	-141.6	0.292
4	11.14	180.0	-321.7	16.15
5	1117.6			

ALL PARAMETERS ARE FREE

```

CURRENT:      22.40 AMPS      EM-58      COIL AREA:      100.00 sq m.
FREQUENCY:    30.00 Hz      GAIN: 1      RAMP TIME:      59.00 muSEC

```

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	28525.4	28860.6	-1.17
2	0.106	19662.5	19476.9	0.943
3	0.131	12595.7	12458.3	1.09
4	0.161	7596.6	7656.4	-0.787
5	0.200	4471.5	4525.7	-1.21
6	0.250	2625.5	2561.5	2.43
7	0.314	1444.4	1416.5	1.93
8	0.395	771.0	782.0	-1.43
9	0.499	434.9	438.0	-0.718
10	0.631	251.0	254.4	-1.34
11	0.799	150.4	153.6	-2.16



No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
12	1.01	97.55	96.08	1.50
13	1.28	65.01	61.73	5.04
14	1.63	40.69	40.15	1.31
15	2.08	26.02	26.15	-0.496
16	2.64	16.57	16.67	-0.609
17	3.37	10.07	10.31	-2.37
18	4.29	5.41	6.09	-12.47
19	5.47	3.06	3.45	-12.47 MASKED
20	6.97	1.35	1.84	-36.15 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1028.8	1085.1	-5.46 MASKED
22	0.427	630.1	662.8	-5.19 MASKED
23	0.525	377.5	401.2	-6.28 MASKED
24	0.647	236.7	248.5	-4.99 MASKED
25	0.802	147.2	157.9	-7.25 MASKED
26	1.00	99.56	101.9	-2.40 MASKED
27	1.25	67.14	67.14	-0.001MASKED
28	1.58	44.13	44.69	-1.26 MASKED
29	1.99	27.54	29.75	-8.05 MASKED
30	2.52	18.28	19.51	-6.70 MASKED
31	3.19	11.90	12.44	-4.49 MASKED
32	4.05	7.66	7.64	0.277MASKED
33	5.14	2.11	4.52	-113.3 MASKED
34	6.54	2.95	2.55	13.53 MASKED
35	8.32	0.248	1.39	-458.5 MASKED
36	13.49	0.0838	0.363	-333.7 MASKED

CURRENT: 23.30 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 60.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	

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37	0.881	115.5	132.4	-14.64 MASKED
38	1.06	88.36	91.46	-3.50 MASKED
39	1.31	61.28	62.94	-2.70 MASKED
40	1.61	44.98	43.50	3.30 MASKED
41	2.00	26.21	29.92	-14.16 MASKED
42	2.50	19.98	20.05	-0.302 MASKED
43	3.14	11.87	13.03	-9.76 MASKED
44	3.95	6.69	8.17	-22.18 MASKED
45	4.99	3.51	4.91	-39.98 MASKED
46	6.31	0.866	2.83	-227.0 MASKED
47	7.99	0.701	1.57	-124.5 MASKED
48	12.87	0.567	0.430	24.27 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

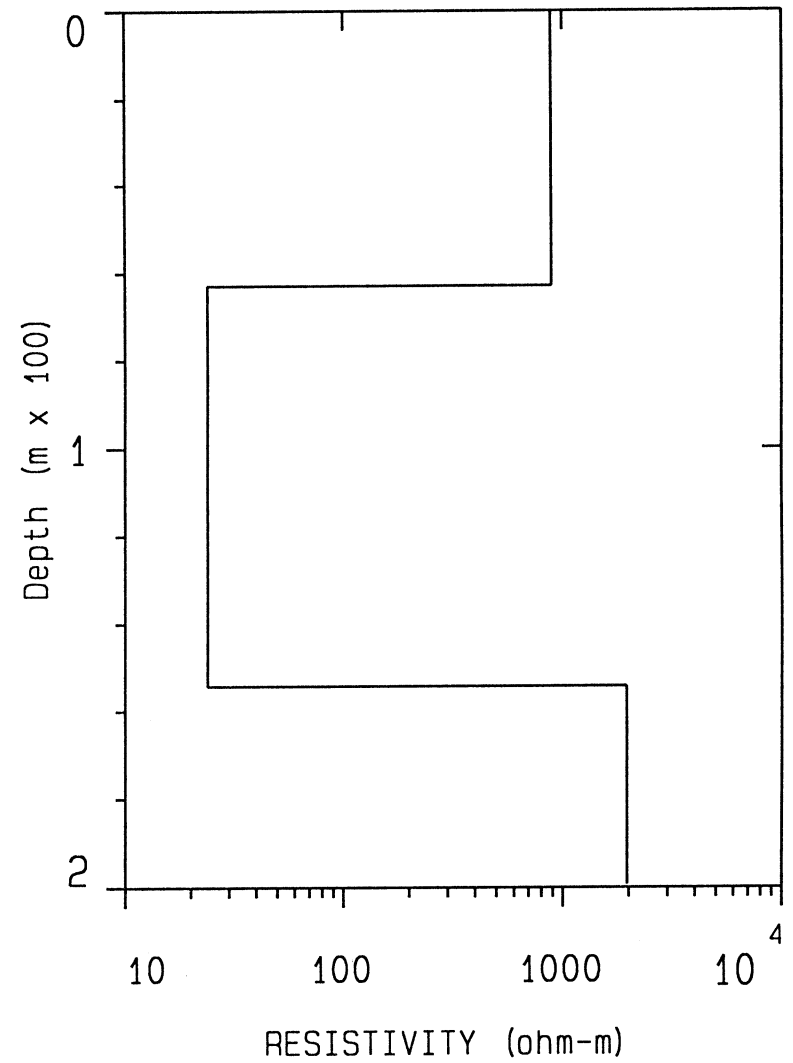
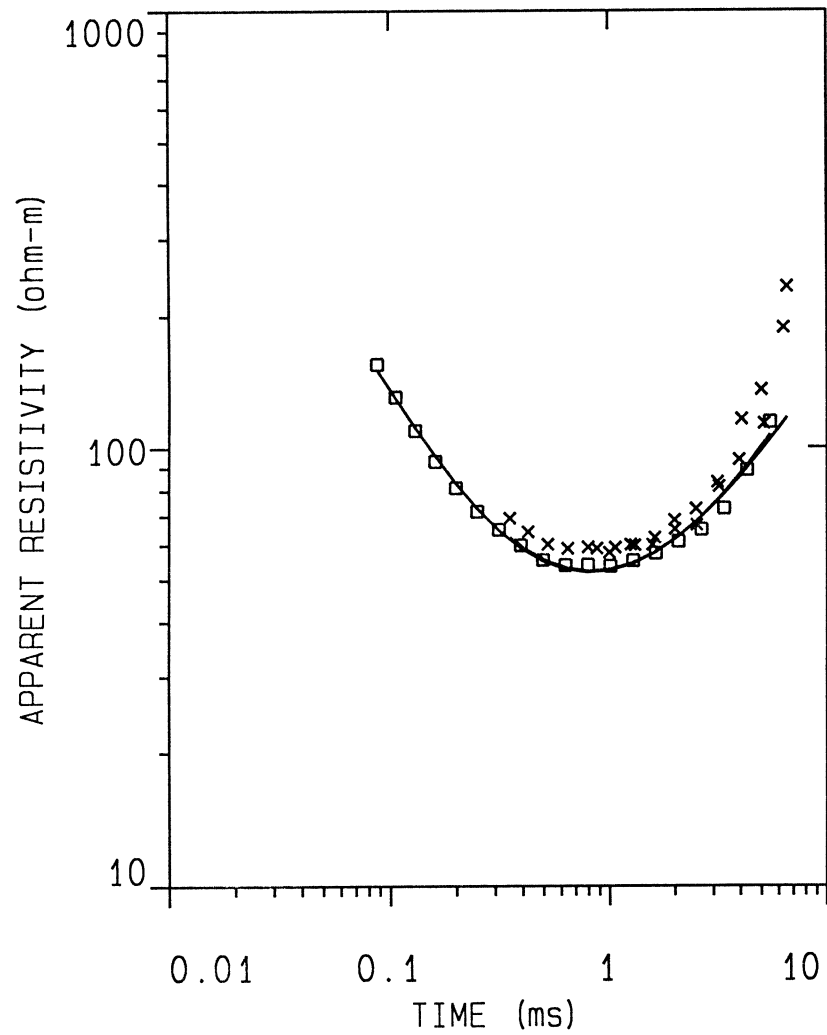
P 1	0.08								
P 2	0.00	0.68							
P 3	0.00	0.02	0.01						
P 4	-0.01	0.04	-0.01	0.94					
P 5	0.00	0.00	0.00	0.00	0.00				
T 1	0.03	0.26	-0.02	-0.01	0.00	0.74			
T 2	-0.01	-0.35	-0.04	0.06	0.00	0.25	0.58		
T 3	0.00	0.02	0.06	0.03	0.00	-0.01	0.01	0.97	
T 4	-0.01	0.06	-0.02	-0.09	-0.01	-0.02	0.10	0.04	0.85
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

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# LINE6



```

Tested Party          DATE: 01-DEC-92
Location Site         SOUNDING: 2
County, Colorado     ELEVATION: 0.00 m
a Demonstration Data EQUIPMENT: Geonics PROTEM
0 m by 50.000 m      AZIMUTH:
0 m (X), 0.000 m (Y) TIME CONSTANT: NONE
: E: 1.0000 N: 6.0000 SLOPE: NONE

```

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 5.334 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	888.2	62.88	-62.88	0.0707
2	23.82	91.43	-154.3	3.83
3	1958.3			

ALL PARAMETERS ARE FREE

CURRENT:	21.00 AMPS	EM-58	COIL AREA:	100.00 sq m.
FREQUENCY:	30.00 Hz	GAIN: 2	RAMP TIME:	51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	5927.0	6194.8	-4.51
2	0.106	4739.0	4774.3	-0.745
3	0.131	3678.8	3597.3	2.21
4	0.161	2786.0	2669.7	4.17
5	0.200	2008.8	1938.0	3.52
6	0.250	1387.8	1357.2	2.20
7	0.314	909.6	915.6	-0.657
8	0.395	579.1	592.8	-2.37
9	0.499	363.3	367.0	-0.997
10	0.631	211.1	217.7	-3.15
11	0.799	116.7	123.6	-5.92
12	1.01	64.99	67.24	-3.45
13	1.28	34.31	35.12	-2.34

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	17.77	17.64	0.745
15	2.08	8.87	8.52	3.91
16	2.64	4.42	3.99	9.63
17	3.37	2.04	1.80	11.59
18	4.29	0.824	0.795	3.47
19	5.47	0.306	0.339	-10.61

CURRENT: 22.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 59.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
20	0.352	680.9	791.9	-16.30 MASKED
21	0.427	468.3	543.6	-16.08 MASKED
22	0.525	309.7	353.6	-14.16 MASKED
23	0.647	189.4	220.8	-16.59 MASKED
24	0.802	109.6	131.9	-20.38 MASKED
25	1.00	65.46	74.75	-14.18 MASKED
26	1.25	34.90	40.51	-16.07 MASKED
27	1.58	19.65	21.09	-7.28 MASKED
28	1.99	9.05	10.51	-16.15 MASKED
29	2.52	5.24	5.08	2.99 MASKED
30	3.19	2.13	2.36	-10.94 MASKED
31	4.05	0.694	1.07	-55.04 MASKED
32	5.14	0.395	0.475	-20.10 MASKED
33	6.54	0.0738	0.207	-181.2 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 4 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
34	0.881	87.87	104.9	-19.46 MASKED
35	1.06	53.93	63.49	-17.73 MASKED
36	1.31	31.65	36.15	-14.22 MASKED
37	1.61	17.67	19.85	-12.31 MASKED

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	2.00	9.66	10.44	-8.02 MASKED
39	2.50	4.71	5.23	-11.04 MASKED
40	3.14	2.16	2.51	-16.15 MASKED
41	3.95	1.02	1.17	-15.14 MASKED
42	4.99	0.329	0.530	-61.17 MASKED
43	6.31	0.112	0.236	-111.0 MASKED

CURRENT RESOLUTION MATRIX NOT AVAILABLE

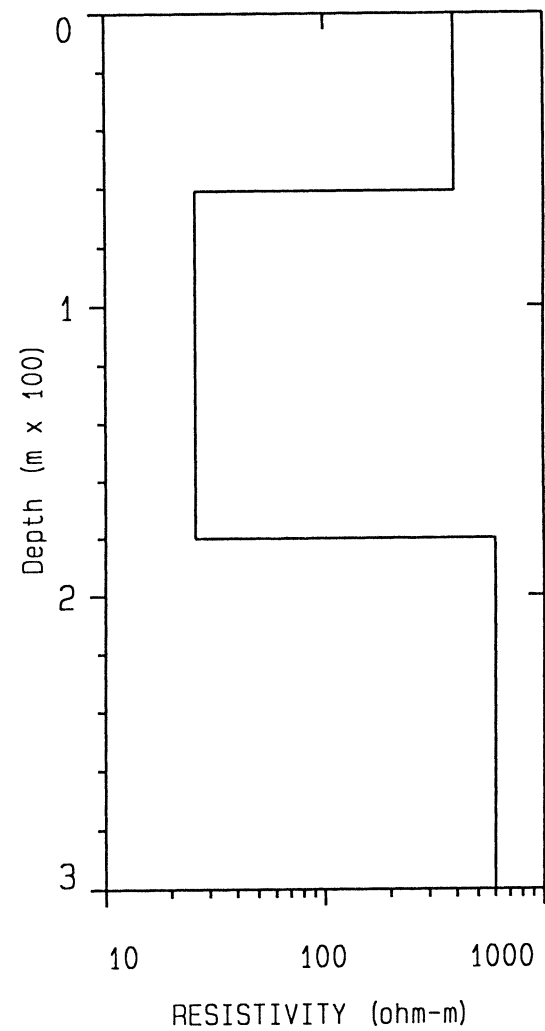
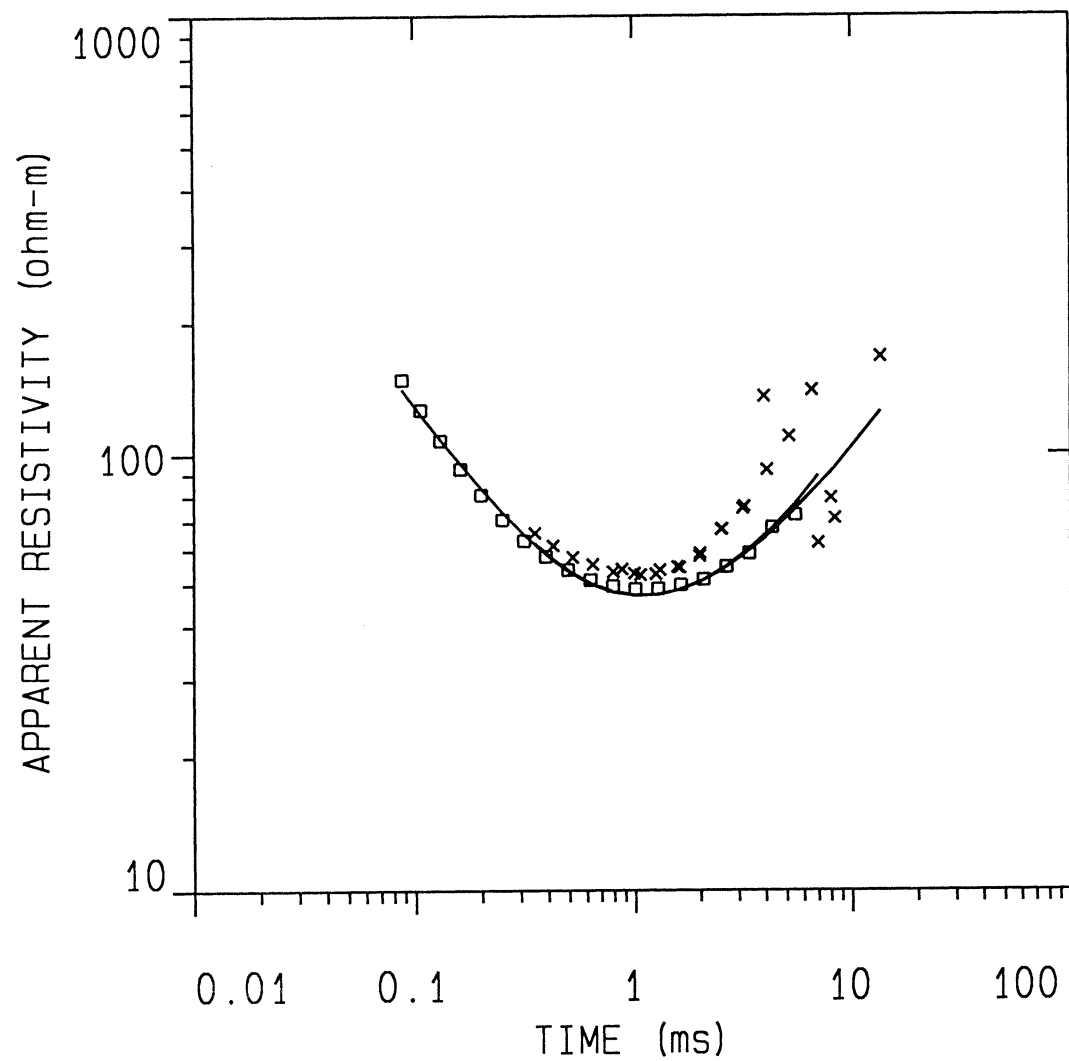
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# LINE7



CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 7.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 4.618 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	390.8	60.98	-60.98	0.156
2	25.74	119.0	-180.0	4.62
3	598.9			

ALL PARAMETERS ARE FREE

```

CURRENT:    21.00 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 7      RAMP TIME:    52.00 muSEC

```

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	6308.4	6807.2	-7.90
2	0.106	4949.6	5106.9	-3.17
3	0.131	3774.2	3738.0	0.957
4	0.161	2808.9	2697.0	3.98
5	0.200	2023.0	1918.1	5.18
6	0.250	1419.9	1333.9	6.05
7	0.314	954.0	907.1	4.90
8	0.395	610.7	600.4	1.69
9	0.499	378.8	383.6	-1.26
10	0.631	228.3	236.2	-3.47
11	0.799	132.9	139.8	-5.22
12	1.01	75.26	79.44	-5.55
13	1.28	41.38	43.47	-5.04

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	22.04	22.86	-3.74
15	2.08	11.56	11.60	-0.359
16	2.64	5.72	5.69	0.384
17	3.37	2.80	2.71	3.47
18	4.29	1.24	1.25	-0.592
19	5.47	0.615	0.560	8.92
20	6.97	0.419	0.244	41.85 MASKED

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	731.7	793.2	-8.40 MASKED
22	0.427	500.9	556.5	-11.10 MASKED
23	0.525	328.6	372.6	-13.39 MASKED
24	0.647	205.8	240.6	-16.87 MASKED
25	0.802	127.9	149.3	-16.74 MASKED
26	1.00	74.05	88.07	-18.93 MASKED
27	1.25	42.30	49.87	-17.88 MASKED
28	1.58	22.49	27.12	-20.58 MASKED
29	1.99	11.53	14.18	-22.96 MASKED
30	2.52	5.17	7.18	-38.87 MASKED
31	3.19	2.38	3.51	-47.65 MASKED
32	4.05	0.981	1.68	-71.28 MASKED
33	5.14	0.413	0.780	-88.67 MASKED
34	6.54	0.157	0.354	-125.2 MASKED
35	8.32	0.240	0.159	33.46 MASKED
36	13.49	0.0198	0.0305	-54.23 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
37	0.881	99.98	121.3	-21.41 MASKED

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	1.06	64.49	76.02	-17.86 MASKED
39	1.31	37.11	45.08	-21.45 MASKED
40	1.61	21.57	25.75	-19.40 MASKED
41	2.00	11.28	14.16	-25.53 MASKED
42	2.50	5.32	7.41	-39.23 MASKED
43	3.14	2.55	3.74	-46.59 MASKED
44	3.95	0.585	1.83	-213.4 MASKED
45	7.99	0.227	0.185	18.52 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

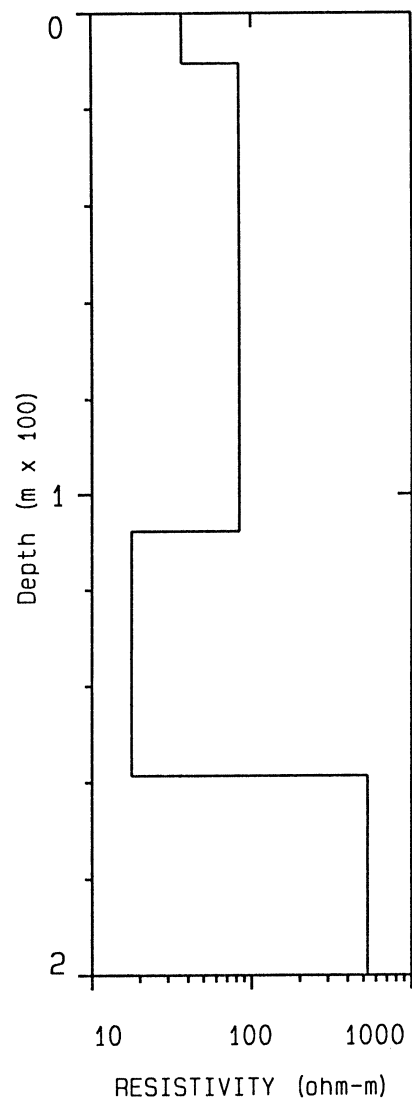
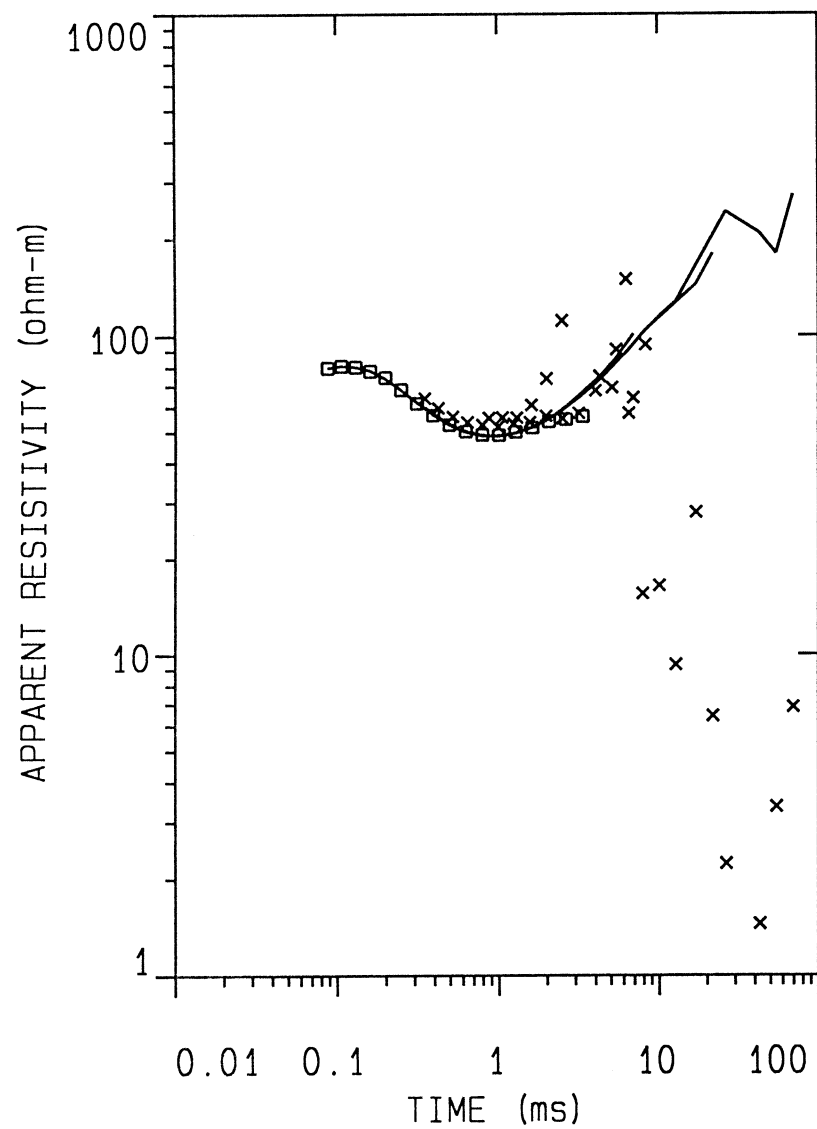
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P 1  0.05
P 2 -0.01  0.95
P 3 -0.01 -0.04  0.30
T 1  0.08  0.03  0.02  0.96
T 2 -0.05 -0.07 -0.10  0.05  0.90
      P 1    P 2    P 3    T 1    T 2

```



# LINE8



ested Party

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 7.305 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	36.87	10.44	-10.44	0.283
2	83.62	97.26	-107.7	1.16
3	17.67	50.91	-158.6	2.88
4	532.3			

ALL PARAMETERS ARE FREE

```

CURRENT:    21.00 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 2    RAMP TIME:    51.00 muSEC

```

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	16108.3	16101.1	0.0445
2	0.106	9741.9	9721.4	0.210
3	0.131	5897.7	5886.6	0.188
4	0.161	3652.5	3632.4	0.548
5	0.200	2287.0	2313.9	-1.17
6	0.250	1496.4	1496.8	-0.0259
7	0.314	984.6	974.1	1.06
8	0.395	629.8	627.3	0.398
9	0.499	391.4	391.5	-0.0380
10	0.631	234.1	235.8	-0.754
11	0.799	134.6	136.2	-1.22
12	1.01	74.59	75.58	-1.32

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	39.66	40.30	-1.61
14	1.63	20.78	20.76	0.101
15	2.08	10.63	10.34	2.76
16	2.64	5.69	4.97	12.54
17	3.37	3.02	2.34	22.47
18	4.29	1.06	1.07	-0.931 MASKED
19	5.47	0.436	0.476	-9.21 MASKED
20	6.97	0.399	0.201	49.46 MASKED

CURRENT: 22.70 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	754.6	833.7	-10.47 MASKED
22	0.427	519.5	572.0	-10.12 MASKED
23	0.525	341.2	376.2	-10.25 MASKED
24	0.647	214.7	238.0	-10.84 MASKED
25	0.802	129.2	144.5	-11.88 MASKED
26	1.00	75.76	83.38	-10.05 MASKED
27	1.25	41.52	46.06	-10.92 MASKED
28	1.58	22.98	24.58	-6.96 MASKED
29	1.99	12.00	12.60	-4.96 MASKED
30	2.52	6.87	6.27	8.77 MASKED
31	3.19	3.58	3.02	15.60 MASKED
32	4.05	1.55	1.44	6.90 MASKED
33	5.14	0.826	0.664	19.64 MASKED
34	6.54	0.600	0.300	49.89 MASKED
35	8.32	0.156	0.133	14.84 MASKED
36	17.19	0.158	0.0134	91.47 MASKED
37	21.90	0.780	0.00529	99.32 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	

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38	0.881	96.14	116.7	-21.47	MASKED
39	1.06	59.08	71.68	-21.33	MASKED
40	1.31	35.40	41.63	-17.58	MASKED
41	1.61	18.23	23.37	-28.13	MASKED
42	2.00	8.02	12.62	-57.39	MASKED
43	2.50	2.47	6.50	-163.0	MASKED
44	6.31	0.157	0.345	-118.9	MASKED
45	7.99	2.61	0.155	94.05	MASKED
46	10.14	1.32	0.0716	94.58	MASKED
47	12.87	1.71	0.0337	98.03	MASKED
48	26.48	2.40	0.00213	99.91	MASKED
49	42.97	1.37	7.959E-04	99.94	MASKED
50	54.75	0.212	5.432E-04	99.74	MASKED
51	69.78	0.0395	1.578E-04	99.60	MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	0.93						
P 2	0.00	0.95					
P 3	-0.05	0.04	0.66				
P 4	-0.02	0.01	0.12	0.52			
T 1	0.01	0.00	0.01	0.01	1.00		
T 2	0.02	0.02	0.10	-0.08	0.00	0.86	
T 3	-0.07	0.02	-0.36	0.05	0.01	0.12	0.58
	P 1	P 2	P 3	P 4	T 1	T 2	T 3

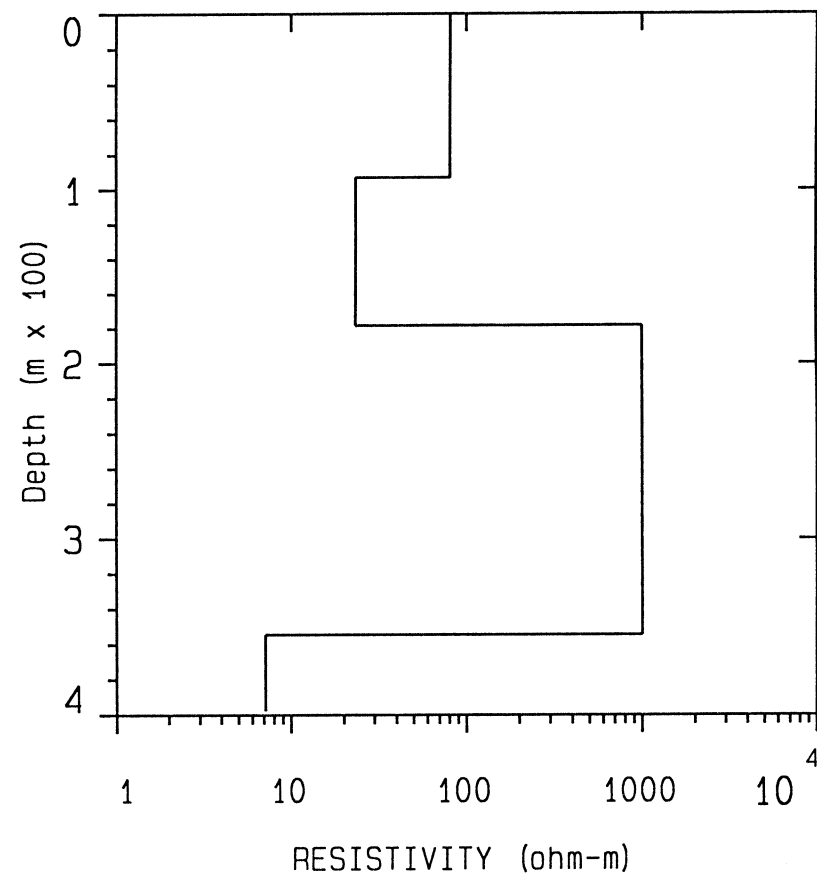
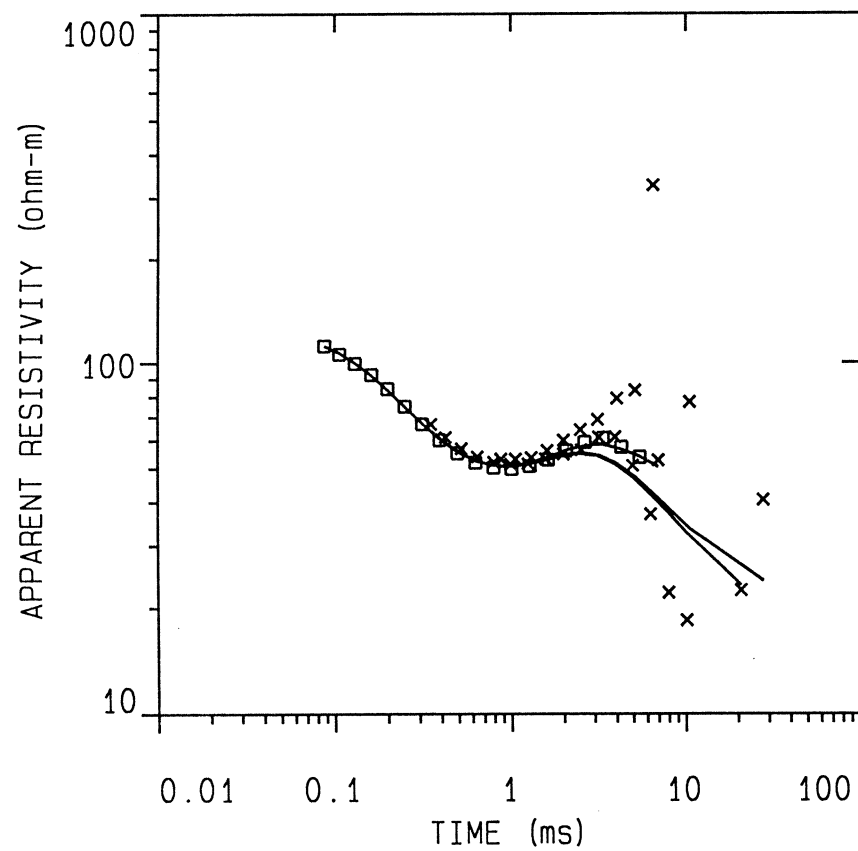
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LINE9



CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 100.000 m by 100.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 9.0000	SLOPE: NONE

FITTING ERROR: 2.250 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	81.23	92.99	-92.99	1.14
2	23.40	85.35	-178.3	3.64
3	1003.3	176.1	-354.4	0.175
4	7.13			

ALL PARAMETERS ARE FREE

CURRENT: 11.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 2 RAMP TIME: 61.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	21894.3	21958.0	-0.291
2	0.106	14692.0	14495.7	1.33
3	0.131	9634.0	9594.5	0.409
4	0.161	6371.8	6410.5	-0.607
5	0.200	4288.1	4341.5	-1.24
6	0.250	2919.3	2928.3	-0.308
7	0.314	1970.2	1963.8	0.327
8	0.395	1300.7	1290.4	0.792
9	0.499	826.8	817.3	1.15
10	0.631	504.9	496.7	1.61
11	0.799	294.5	288.2	2.14
12	1.01	164.5	159.8	2.82

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
13	1.28	88.12	85.15	3.36
14	1.63	45.40	44.26	2.49
15	2.08	22.75	22.65	0.449
16	2.64	11.50	11.88	-3.31
17	3.37	6.03	6.41	-6.39
18	4.29	3.59	3.66	-2.14
19	5.47	2.16	2.14	0.721
20	6.97	1.21	1.29	-6.68 MASKED

CURRENT: 12.50 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 3 RAMP TIME: 65.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	1562.6	1664.0	-6.48 MASKED
22	0.427	1097.7	1160.3	-5.70 MASKED
23	0.525	734.3	770.2	-4.89 MASKED
24	0.647	470.7	491.2	-4.35 MASKED
25	0.802	289.9	299.5	-3.29 MASKED
26	1.00	169.4	173.0	-2.12 MASKED
27	1.25	95.63	95.90	-0.279MASKED
28	1.58	51.47	51.86	-0.767MASKED
29	1.99	27.44	27.59	-0.559MASKED
30	2.52	14.62	15.07	-3.10 MASKED
31	3.19	7.16	8.52	-19.06 MASKED
32	4.05	2.70	5.12	-89.90 MASKED
33	5.14	1.37	3.21	-134.5 MASKED
34	6.54	0.0978	2.08	-2034.9 MASKED
35	10.59	0.253	0.888	-249.7 MASKED
36	27.92	0.0590	0.130	-121.8 MASKED

CURRENT: 12.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 4 RAMP TIME: 63.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
37	0.881	224.7	241.5	-7.50 MASKED
38	1.06	138.4	148.6	-7.34 MASKED
39	1.31	81.73	86.55	-5.88 MASKED
40	1.61	45.16	49.39	-9.36 MASKED
41	2.00	23.86	27.66	-15.91 MASKED
42	2.50	12.35	15.60	-26.32 MASKED
43	3.14	6.33	9.04	-42.73 MASKED
44	3.95	4.23	5.53	-30.49 MASKED
45	4.99	3.13	3.52	-12.57 MASKED
46	6.31	2.81	2.32	17.38 MASKED
47	7.99	3.37	1.54	54.16 MASKED
48	10.14	2.44	1.03	57.50 MASKED
49	20.81	0.301	0.287	4.78 MASKED

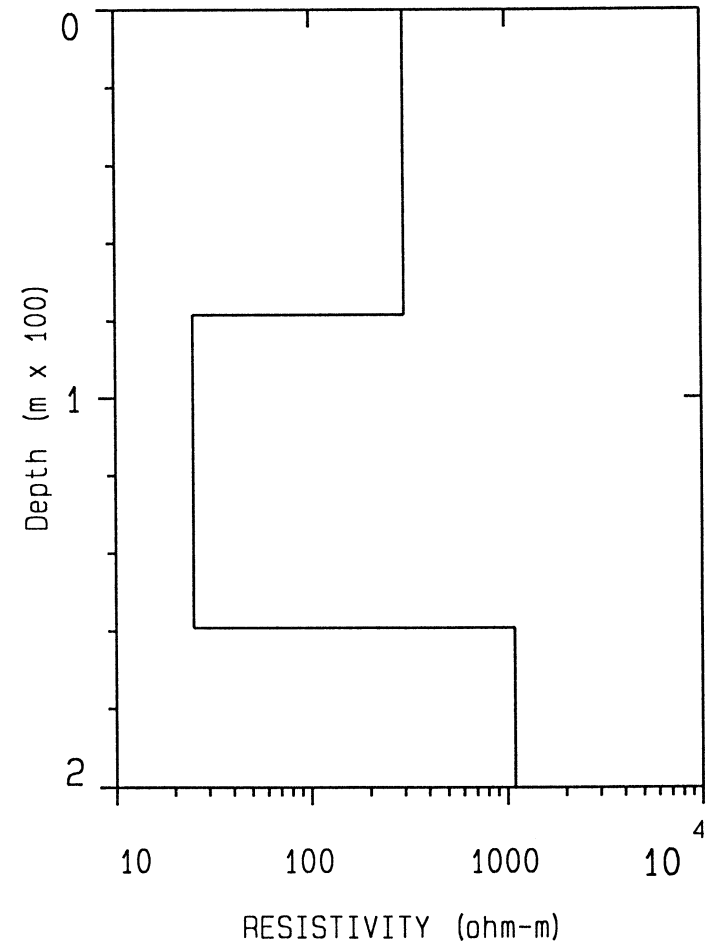
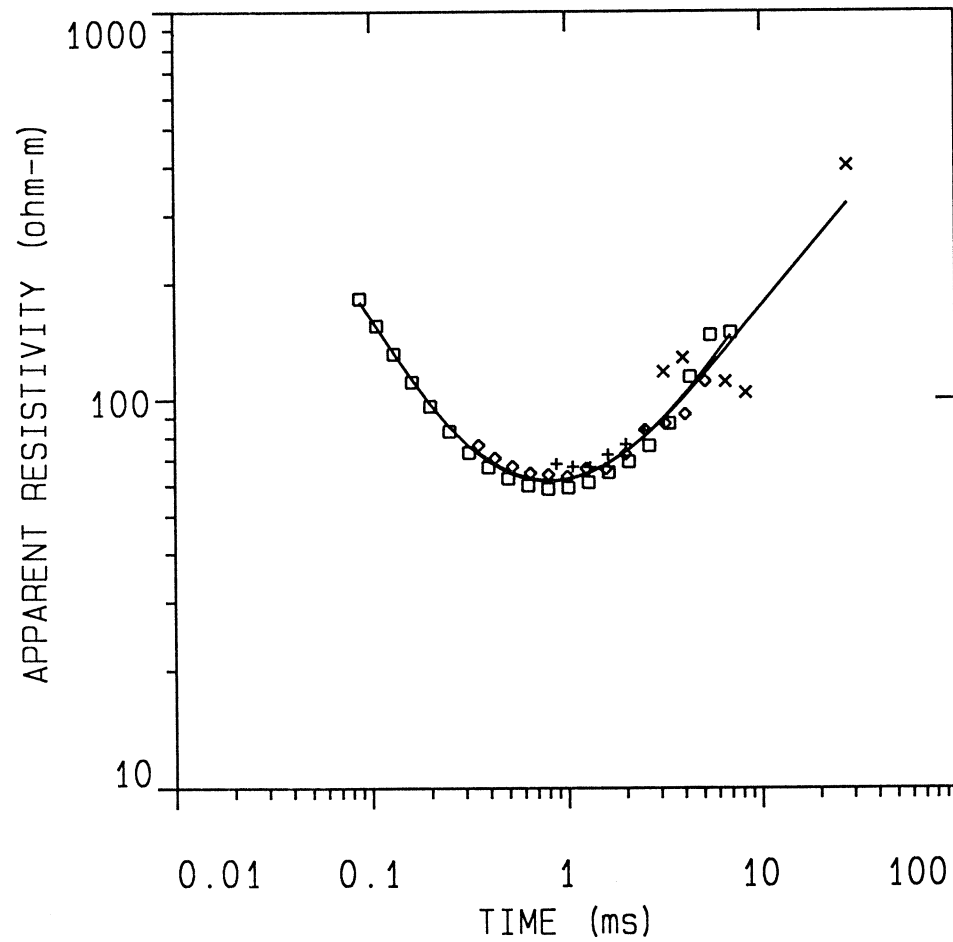
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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LINE11





## DATA SET: LINE11

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 11.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 8.280 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	301.7	78.43	-78.43	0.259
2	25.05	80.73	-159.1	3.22
3	1094.3			

ALL PARAMETERS ARE FREE

```

CURRENT: 21.10 AMPS    EM-58    COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz    GAIN: 1    RAMP TIME: 51.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	4638.2	4768.9	-2.81
2	0.106	3651.8	3666.7	-0.408
3	0.131	2810.3	2789.7	0.731
4	0.161	2138.1	2085.2	2.47
5	0.200	1555.4	1524.8	1.96
6	0.250	1116.9	1070.8	4.12
7	0.314	765.2	723.3	5.47
8	0.395	492.0	467.4	4.99
9	0.499	303.7	288.5	5.00
10	0.631	180.2	170.6	5.31
11	0.799	102.8	96.49	6.20
12	1.01	56.13	52.30	6.82
13	1.28	29.50	27.24	7.66

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	14.82	13.65	7.89
15	2.08	7.38	6.61	10.46
16	2.64	3.50	3.10	11.47
17	3.37	1.56	1.40	10.07
18	4.29	0.564	0.625	-10.66
19	5.47	0.212	0.270	-27.41
20	6.97	0.113	0.115	-2.02

CURRENT: 22.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 3 RAMP TIME: 59.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	584.9	622.2	-6.37
22	0.427	404.9	426.1	-5.23
23	0.525	261.3	276.5	-5.79
24	0.647	164.3	172.1	-4.77
25	0.802	97.32	102.5	-5.33
26	1.00	56.69	57.88	-2.09
27	1.25	29.95	31.28	-4.43
28	1.58	16.92	16.24	3.98
29	1.99	8.30	8.11	2.23
30	2.52	3.72	3.93	-5.55
31	3.19	1.94	1.84	5.26
32	4.05	0.989	0.842	14.89
33	5.14	0.406	0.377	6.98
34	6.54	0.223	0.167	24.95 MASKED
35	8.32	0.135	0.0732	45.84 MASKED
36	27.92	8.667E-04	0.00121	-39.73 MASKED

CURRENT: 23.10 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 2 RAMP TIME: 59.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
37	0.881	70.67	81.69	-15.58

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	1.06	44.66	49.26	-10.30
39	1.31	26.80	28.00	-4.43
40	1.61	14.21	15.34	-7.98
41	2.00	7.58	8.08	-6.60
42	2.50	3.83	4.06	-5.88
43	3.14	1.29	1.96	-52.47 MASKED
44	3.95	0.641	0.923	-43.98 MASKED

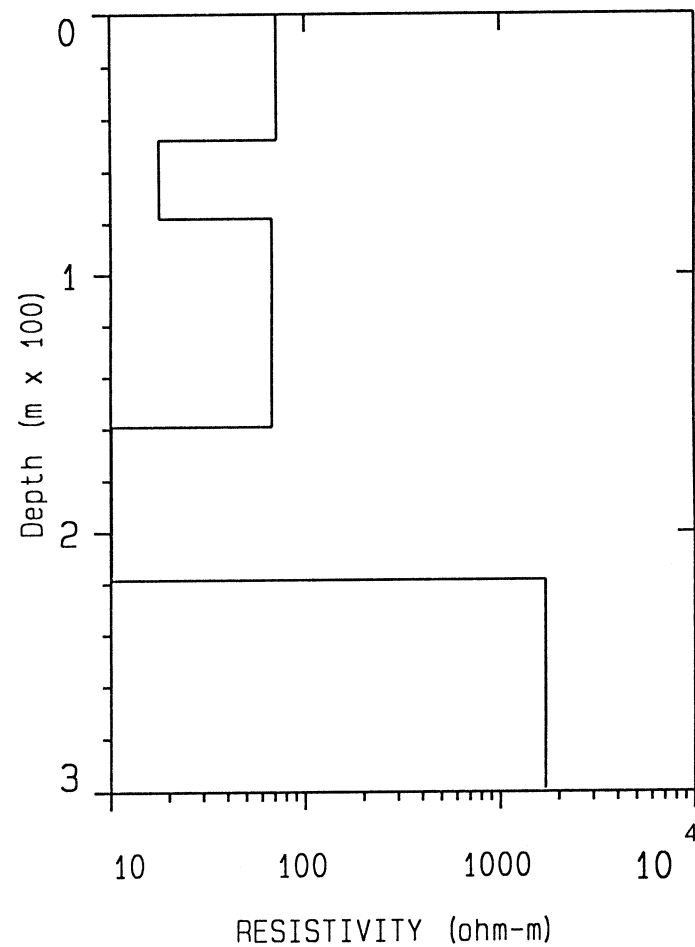
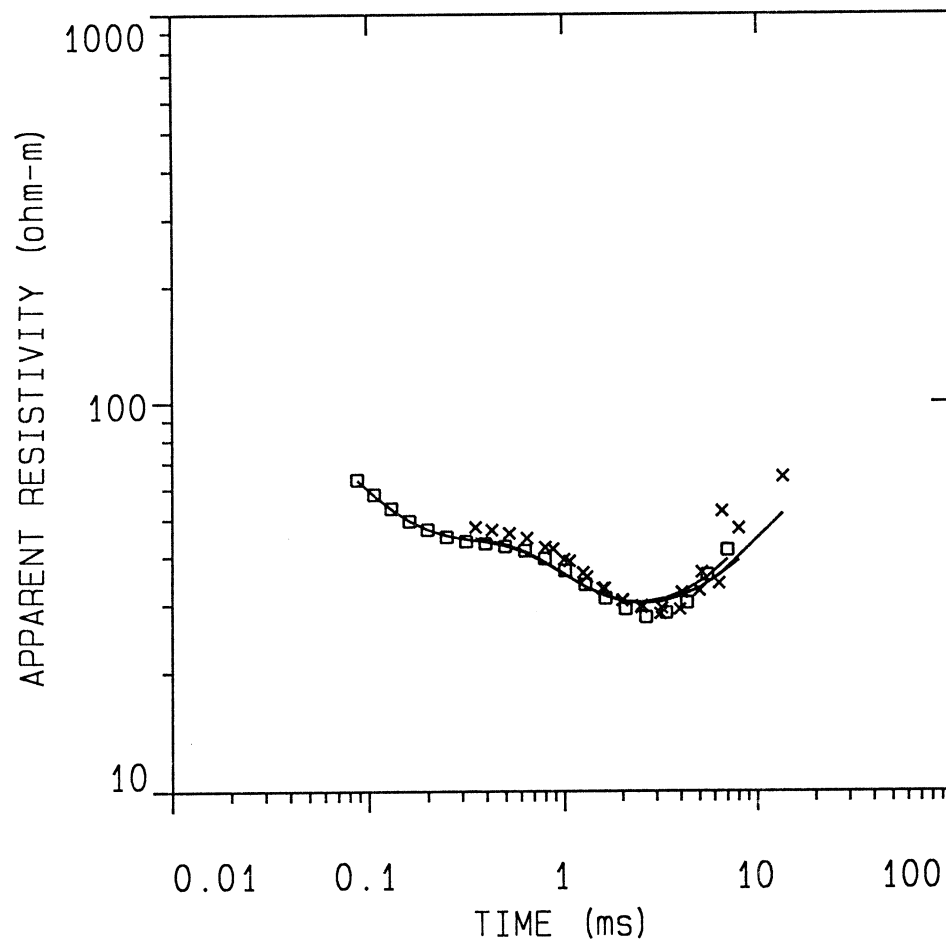
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE12



## DATA SET: LINE12

CLIENT:	Any Interested Party	DATE:	01-DEC-92
LOCATION:	Investigation Site	SOUNDING:	2
COUNTY:	Jefferson County, Colorado	ELEVATION:	0.00 m
PROJECT:	California Demonstration Data	EQUIPMENT:	Geonics PROTEM
LOOP SIZE:	50.000 m by 50.000 m	AZIMUTH:	
COIL LOC:	0.000 m (X), 0.000 m (Y)	TIME CONSTANT:	NONE
SOUNDING COORDINATES:	E: 1.0000 N: 12.0000	SLOPE:	NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 5.949 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	71.51	47.78	-47.78	0.668
2	17.78	30.34	-78.12	1.70
3	67.43	80.87	-159.0	1.19
4	10.07	59.49	-218.4	5.90
5	1701.8			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	22642.4	22769.4	-0.560
2	0.106	15937.8	16028.9	-0.571
3	0.131	10826.8	10900.5	-0.680
4	0.161	7180.3	7159.6	0.288
5	0.200	4540.9	4533.6	0.160
6	0.250	2779.6	2742.8	1.32
7	0.314	1642.1	1610.5	1.92
8	0.395	942.9	928.2	1.56
9	0.499	539.4	537.9	0.273
10	0.631	312.5	317.4	-1.57
11	0.799	186.1	193.1	-3.73



No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
12	1.01	114.3	118.6	-3.78
13	1.28	71.33	72.85	-2.13
14	1.63	44.27	43.29	2.19
15	2.08	26.75	24.94	6.77
16	2.64	15.73	13.72	12.74
17	3.37	8.27	7.25	12.28
18	4.29	4.12	3.67	10.98
19	5.47	1.75	1.79	-2.29
20	6.97	0.764	0.831	-8.85

CURRENT: 22.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1182.4	1306.1	-10.45 MASKED
22	0.427	749.0	827.9	-10.53 MASKED
23	0.525	461.7	515.7	-11.69 MASKED
24	0.647	285.5	324.4	-13.63 MASKED
25	0.802	181.4	207.5	-14.38 MASKED
26	1.00	115.9	131.8	-13.70 MASKED
27	1.25	74.05	83.21	-12.37 MASKED
28	1.58	48.14	50.87	-5.67 MASKED
29	1.99	29.94	30.14	-0.657 MASKED
30	2.52	17.47	17.07	2.26 MASKED
31	3.19	9.88	9.32	5.57 MASKED
32	4.05	4.74	4.88	-2.80 MASKED
33	5.14	2.18	2.47	-13.55 MASKED
34	6.54	0.690	1.20	-73.82 MASKED
35	13.49	0.0833	0.115	-38.61 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
36	0.881	146.1	172.2	-17.84 MASKED
37	1.06	100.8	116.3	-15.44 MASKED
38	1.31	69.51	76.46	-9.99 MASKED
39	1.61	45.53	48.63	-6.81 MASKED
40	2.00	29.61	29.99	-1.29 MASKED
41	2.50	18.15	17.47	3.71 MASKED
42	3.14	10.88	9.80	9.93 MASKED
43	3.95	5.90	5.25	11.02 MASKED
44	4.99	2.78	2.72	2.33 MASKED
45	6.31	1.45	1.34	7.20 MASKED
46	7.99	0.491	0.652	-32.90 MASKED

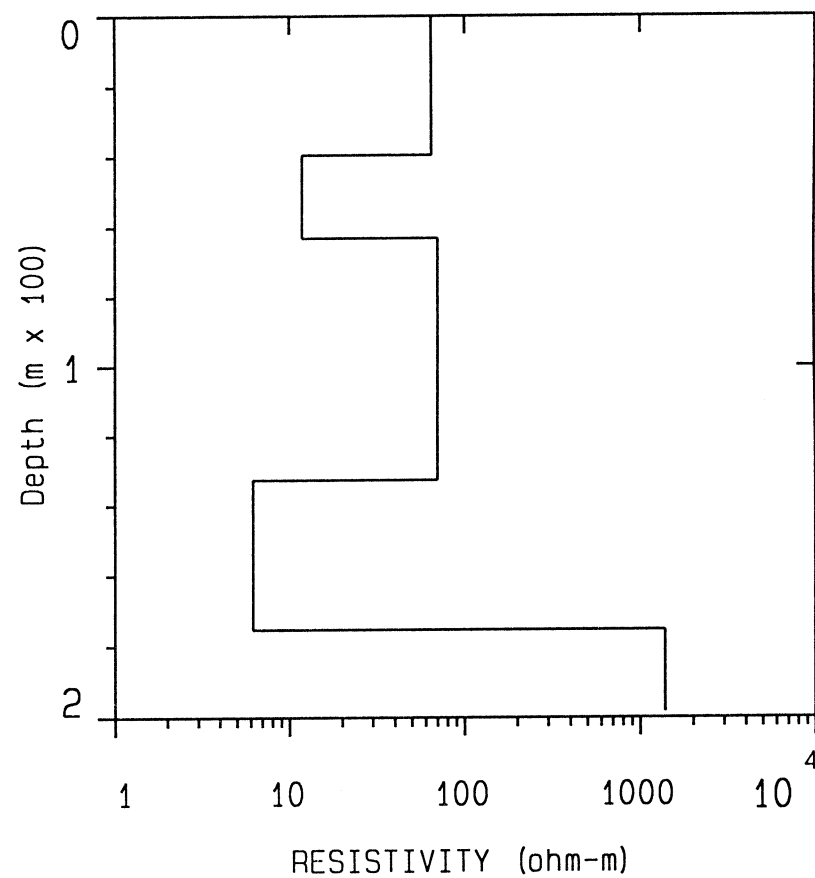
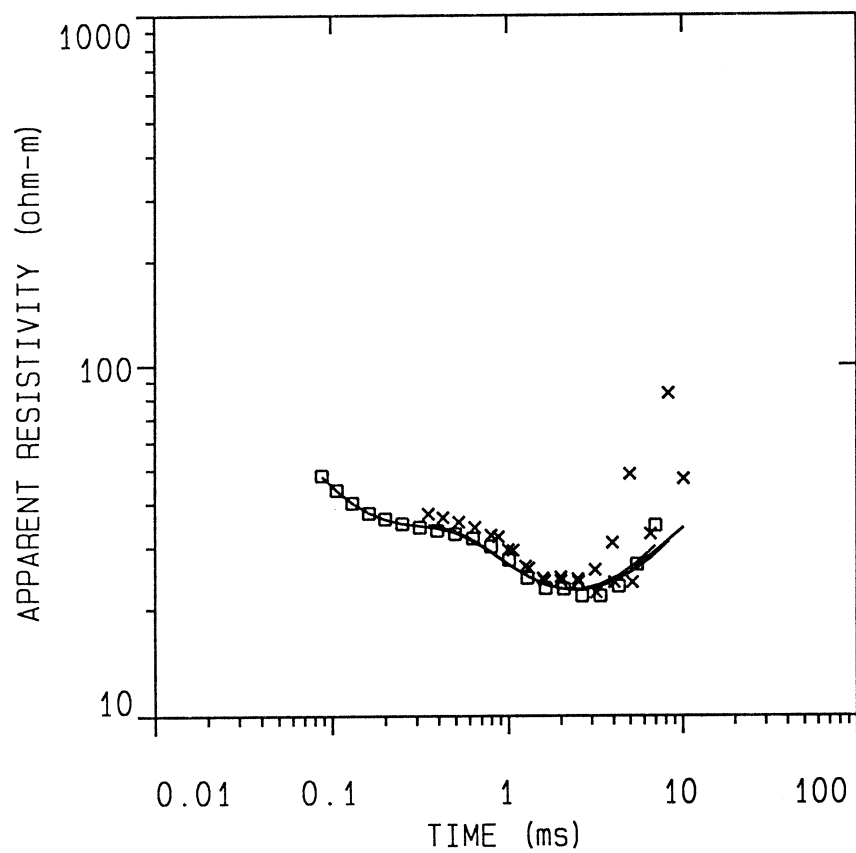
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert &amp; Mielke

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# LINE13



## DATA SET: LINE13

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 13.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 6.380 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	64.55	39.51	-39.51	0.612
2	11.79	23.57	-63.09	1.99
3	70.00	69.56	-132.6	0.993
4	6.17	42.57	-175.2	6.89
5	1380.8			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	34275.4	34513.8	-0.695
2	0.106	24453.1	24518.0	-0.265
3	0.131	16640.9	16637.4	0.0208
4	0.161	10896.5	10839.6	0.522
5	0.200	6737.0	6788.5	-0.764
6	0.250	4057.3	4053.9	0.0831
7	0.314	2386.4	2352.9	1.40
8	0.395	1383.7	1357.6	1.88
9	0.499	798.6	790.9	0.975
10	0.631	466.1	478.0	-2.53
11	0.799	279.1	295.8	-5.95

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
12	1.01	175.8	185.3	-5.37
13	1.28	115.8	113.7	1.75
14	1.63	70.33	67.98	3.33
15	2.08	38.77	38.69	0.209
16	2.64	22.72	21.22	6.61
17	3.37	12.42	11.09	10.70
18	4.29	6.16	5.56	9.75
19	5.47	2.71	2.67	1.71
20	6.97	1.01	1.23	-21.88

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 59.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)	
		DATA	SYNTHETIC		
21	0.352	1719.6	1910.6	-11.10	MASKED
22	0.427	1099.9	1213.1	-10.29	MASKED
23	0.525	687.6	764.2	-11.12	MASKED
24	0.647	429.0	491.1	-14.47	MASKED
25	0.802	271.3	319.0	-17.59	MASKED
26	1.00	179.0	206.4	-15.30	MASKED
27	1.25	119.8	130.3	-8.74	MASKED
28	1.58	75.67	80.22	-6.00	MASKED
29	1.99	41.91	46.90	-11.89	MASKED
30	2.52	24.42	26.57	-8.78	MASKED
31	3.19	15.04	14.30	4.95	MASKED
32	4.05	7.51	7.44	0.887	MASKED
33	5.14	4.14	3.70	10.46	MASKED
34	6.54	1.41	1.79	-27.45	MASKED
35	8.32	0.191	0.833	-334.7	MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 4 RAMP TIME: 59.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
36	0.881	218.1	265.8	-21.85 MASKED
37	1.06	153.5	181.8	-18.41 MASKED
38	1.31	109.7	119.3	-8.70 MASKED
39	1.61	73.49	76.31	-3.84 MASKED
40	2.00	42.98	46.47	-8.10 MASKED
41	2.50	24.26	27.09	-11.66 MASKED
42	3.14	12.56	14.97	-19.12 MASKED
43	3.95	5.41	7.99	-47.54 MASKED
44	4.99	1.53	4.06	-164.8 MASKED
45	10.14	0.273	0.442	-61.58 MASKED

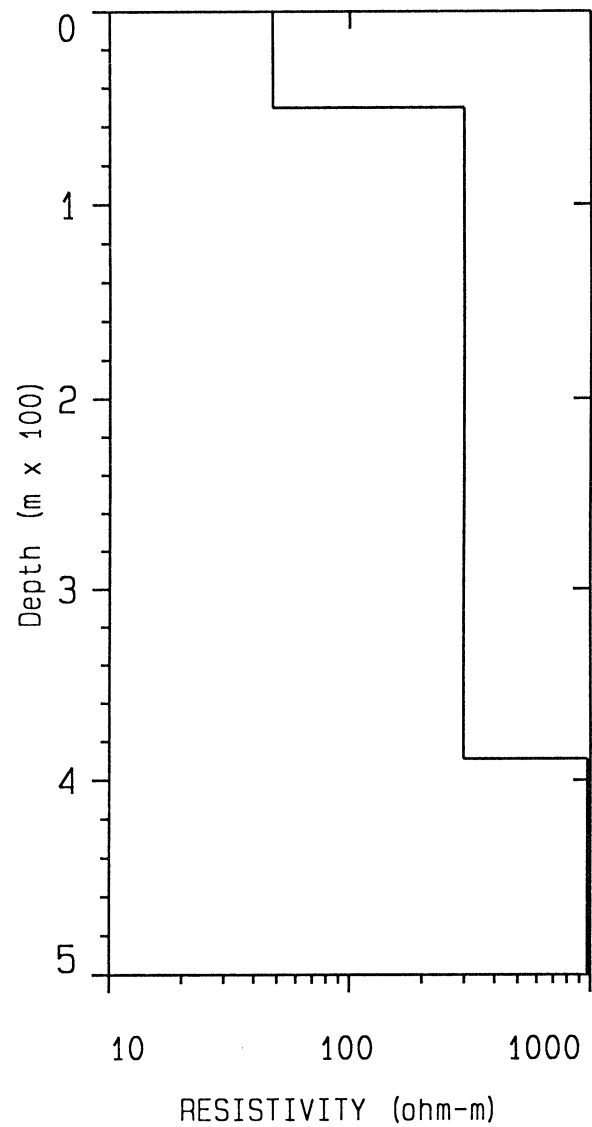
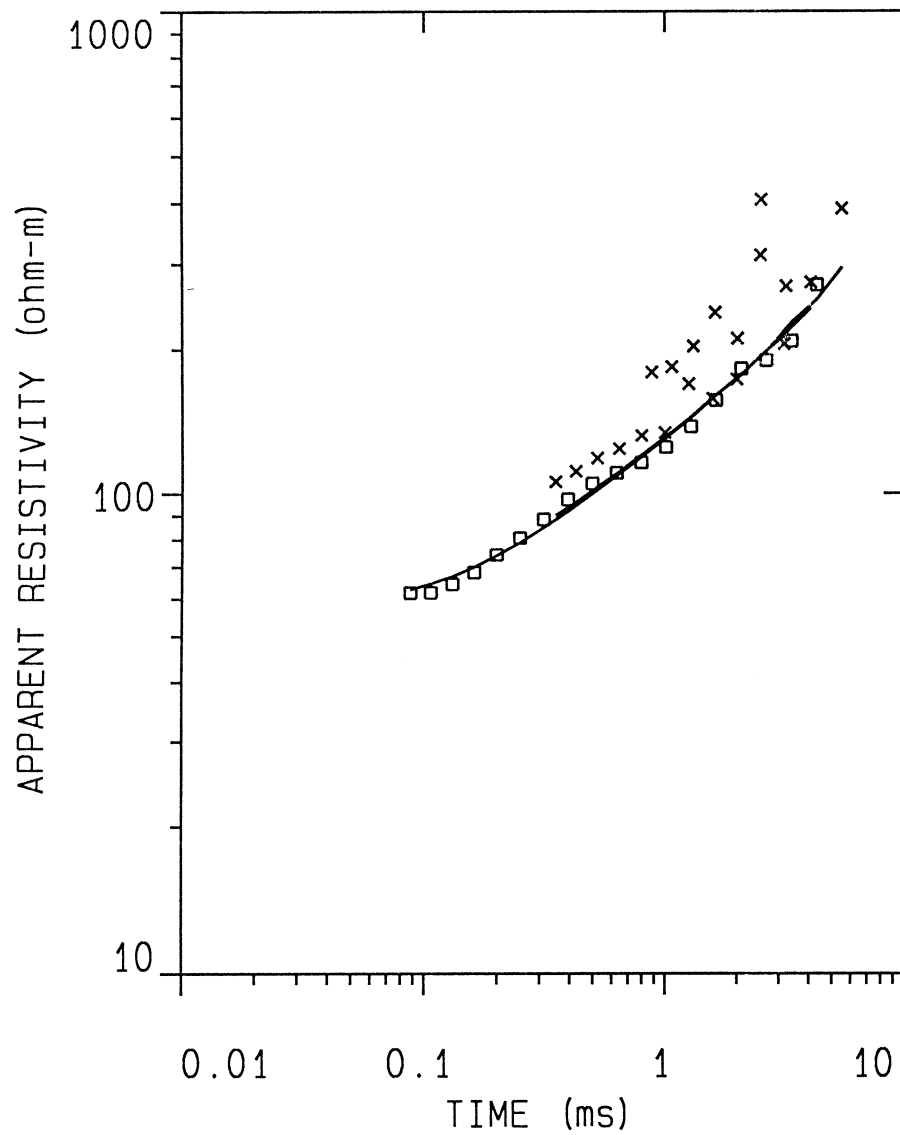
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert &amp; Mielke

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# LINE14



## DATA SET: LINE14

CLIENT: Any Interested Party                      DATE: 01-DEC-92  
 LOCATION: Investigation Site                      SOUNDING: 2  
 COUNTY: Jefferson County, Colorado              ELEVATION: 0.00 m  
 PROJECT: California Demonstration Data          EQUIPMENT: Geonics PROTEM  
 LOOP SIZE: 50.000 m by 50.000 m              AZIMUTH:  
 COIL LOC: 0.000 m (X), 0.000 m (Y)              TIME CONSTANT: NONE  
 SOUNDING COORDINATES: E: 1.0000 N: 14.0000 SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 6.593 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	47.69	50.40	-50.40	1.05
2	297.2	338.6	-389.0	1.13
3	969.6			

ALL PARAMETERS ARE FREE

CURRENT: 21.20 AMPS      EM-58      COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz      GAIN: 7      RAMP TIME: 52.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	23793.5	23247.6	2.29
2	0.106	14645.1	13732.0	6.23
3	0.131	8234.1	7799.1	5.28
4	0.161	4479.7	4309.1	3.80
5	0.200	2308.8	2322.8	-0.606
6	0.250	1169.1	1210.4	-3.53
7	0.314	579.3	614.0	-5.98
8	0.395	282.0	308.1	-9.23
9	0.499	140.6	151.5	-7.79
10	0.631	72.44	74.03	-2.19
11	0.799	37.23	35.86	3.68
12	1.01	18.39	17.17	6.65
13	1.28	8.72	8.19	6.04

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	3.95	3.81	3.47
15	2.08	1.72	1.80	-4.18
16	2.64	0.890	0.836	6.08
17	3.37	0.424	0.371	12.41
18	4.29	0.155	0.172	-11.16
19	5.47	0.0493	0.0749	-51.64 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 60.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
20	0.352	359.6	458.1	-27.36 MASKED
21	0.427	205.8	257.6	-25.14 MASKED
22	0.525	111.9	137.8	-23.11 MASKED
23	0.647	61.96	73.09	-17.95 MASKED
24	0.802	32.90	37.88	-15.10 MASKED
25	1.00	18.45	19.04	-3.19 MASKED
26	1.25	7.35	9.48	-29.01 MASKED
27	1.58	4.60	4.56	0.909 MASKED
28	1.99	2.23	2.23	0.095 MASKED
29	2.52	0.347	1.05	-202.4 MASKED
30	3.19	0.356	0.496	-39.37 MASKED
31	4.05	0.191	0.230	-20.29 MASKED

CURRENT: 23.30 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 59.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
32	0.881	16.66	28.72	-72.40 MASKED
33	1.06	9.90	15.92	-60.82 MASKED
34	1.31	5.11	8.39	-64.16 MASKED
35	1.61	2.38	4.31	-81.15 MASKED
36	2.00	1.67	2.23	-33.47 MASKED
37	2.50	0.531	1.09	-105.0 MASKED

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	3.14	0.567	0.535	5.66 MASKED

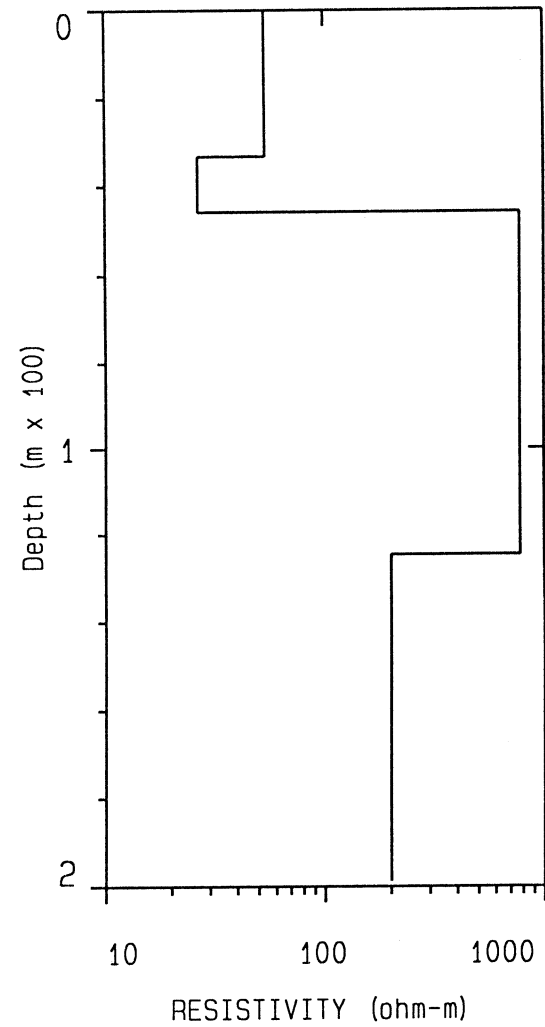
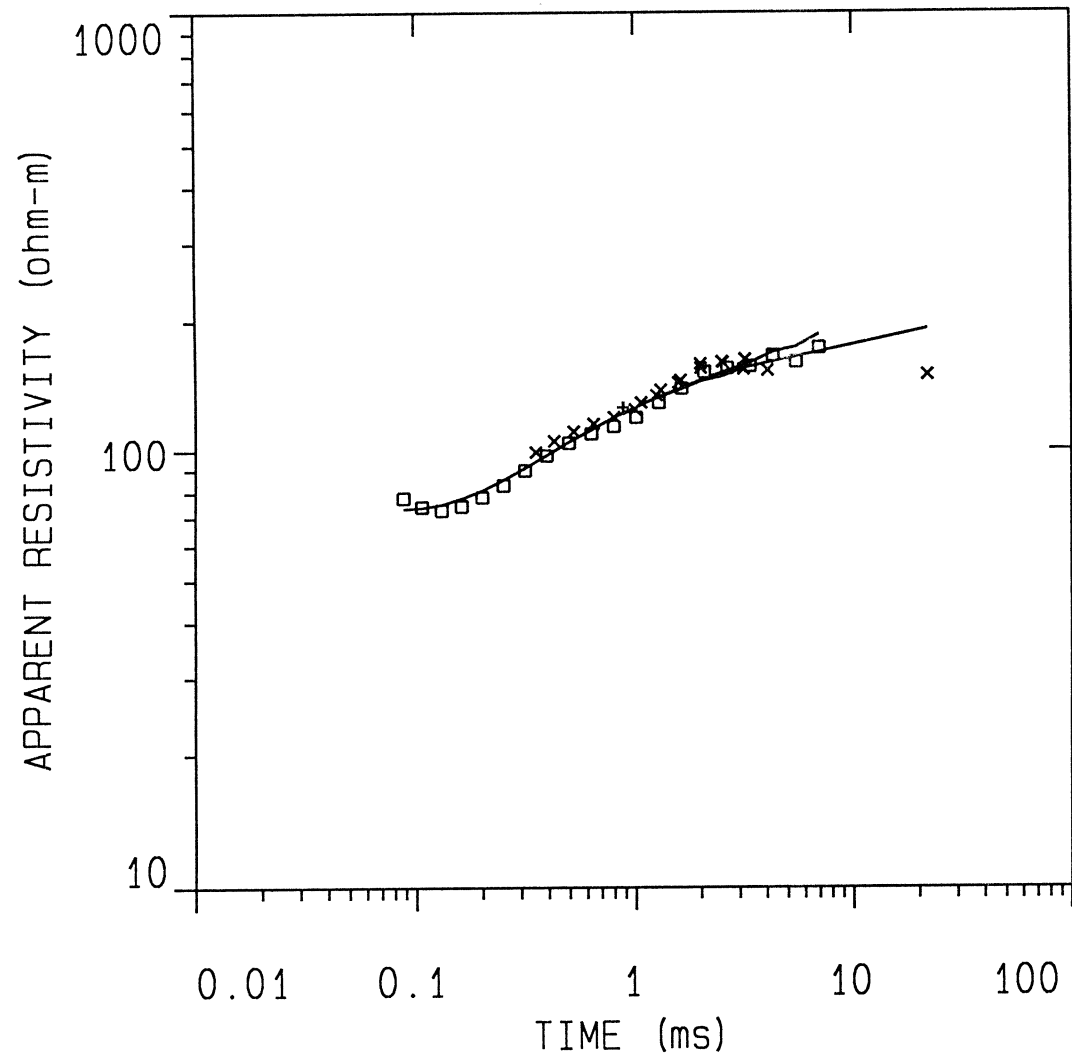
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE15





ested Party

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 100.000 m by 100.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 15.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 5.884 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	53.69	33.20	-33.20	0.618
2	26.50	12.60	-45.80	0.475
3	778.2	78.89	-124.7	0.101
4	200.0			

ALL PARAMETERS ARE FREE

CURRENT: 13.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 65.00 muSEC

## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	41543.5	45276.0	-8.98
2	0.106	27515.7	27669.3	-0.558
3	0.131	16892.6	16145.4	4.42
4	0.161	9679.1	9107.2	5.90
5	0.200	5278.3	5002.7	5.22
6	0.250	2751.4	2632.7	4.31
7	0.314	1386.7	1360.2	1.91
8	0.395	692.5	691.6	0.117
9	0.499	349.8	346.8	0.853
10	0.631	180.7	175.4	2.93
11	0.799	94.36	87.69	7.06
12	1.01	48.46	44.49	8.19

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	23.67	22.52	4.82
14	1.63	11.54	11.52	0.130
15	2.08	5.54	5.86	-5.64
16	2.64	2.95	3.01	-1.95
17	3.37	1.58	1.54	2.55
18	4.29	0.794	0.773	2.56
19	5.47	0.456	0.404	11.32
20	6.97	0.222	0.199	10.28

CURRENT: 13.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 66.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	939.7	1014.9	-8.00 MASKED
22	0.427	530.7	572.3	-7.83 MASKED
23	0.525	294.2	313.5	-6.53 MASKED
24	0.647	163.7	169.8	-3.73 MASKED
25	0.802	90.72	90.73	-0.009 MASKED
26	1.00	48.75	48.13	1.29 MASKED
27	1.25	24.71	25.17	-1.88 MASKED
28	1.58	12.57	13.34	-6.15 MASKED
29	1.99	6.03	6.93	-14.87 MASKED
30	2.52	3.32	3.70	-11.56 MASKED
31	3.19	1.79	1.92	-6.99 MASKED
32	4.05	1.08	1.02	5.87 MASKED
33	21.90	0.0166	0.0114	30.86 MASKED

CURRENT: 13.70 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 65.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
34	0.881	66.68	70.57	-5.83
35	1.06	39.61	40.24	-1.58 MASKED
36	1.31	21.41	22.59	-5.52 MASKED

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	. DIFFERENCE (percent)
37	1.61	11.73	12.62	-7.55 MASKED
38	2.00	6.23	6.91	-10.96 MASKED
39	2.50	3.39	3.81	-12.46 MASKED
40	3.14	2.04	2.02	0.908MASKED

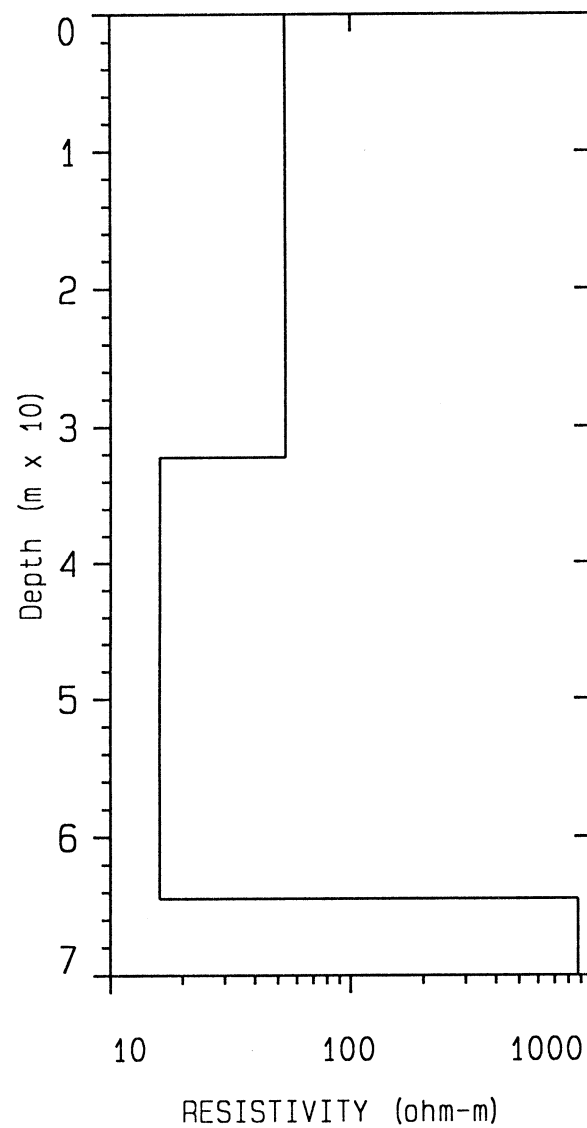
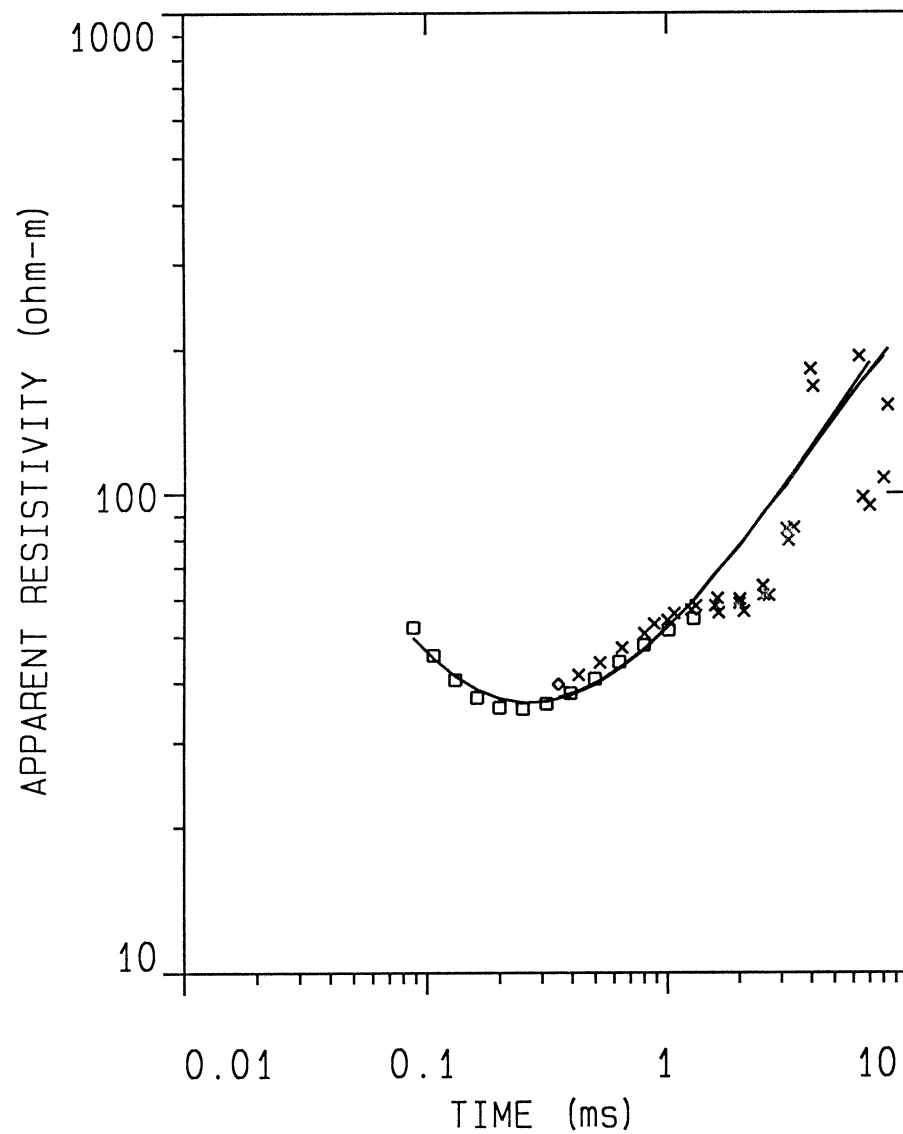
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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# LINE 16



## DATA SET: LINE16

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 100.000 m by 100.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 16.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 6.093 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	53.49	32.21	-32.21	0.602
2	16.00	32.26	-64.47	2.01
3	875.7			

ALL PARAMETERS ARE FREE

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CURRENT:    12.80 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 1      RAMP TIME:    62.00 muSEC

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## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	73960.8	79679.5	-7.73
2	0.106	56015.2	57062.7	-1.86
3	0.131	39933.5	38865.1	2.67
4	0.161	26921.1	25380.9	5.72
5	0.200	16931.1	15837.1	6.46
6	0.250	9789.2	9362.3	4.36
7	0.314	5345.4	5270.5	1.40
8	0.395	2792.8	2839.9	-1.68
9	0.499	1406.1	1468.5	-4.43
10	0.631	693.3	729.5	-5.22
11	0.799	339.8	352.1	-3.61
12	1.01	168.2	163.2	2.96
13	1.28	85.30	74.92	12.17

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	44.92	32.81	26.96 MASKED
15	2.08	24.32	14.49	40.39 MASKED
16	2.64	11.85	6.20	47.69 MASKED
17	3.37	3.94	2.63	33.19 MASKED
18	6.97	0.547	0.194	64.41 MASKED

CURRENT: 13.50 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 66.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
19	0.352	3689.4	4044.7	-9.63
20	0.427	2132.0	2386.6	-11.94 MASKED
21	0.525	1165.5	1322.6	-13.48 MASKED
22	0.647	619.7	706.5	-14.01 MASKED
23	0.802	326.4	364.1	-11.56 MASKED
24	1.00	169.8	177.3	-4.38 MASKED
25	1.25	89.34	84.91	4.95 MASKED
26	1.58	48.79	38.58	20.93 MASKED
27	1.99	26.80	17.68	34.02 MASKED
28	2.52	14.03	7.69	45.17 MASKED
29	3.19	5.22	3.43	34.31 MASKED
30	4.05	0.948	1.47	-55.14 MASKED
31	6.54	0.638	0.274	57.03 MASKED
32	8.32	0.180	0.119	33.40 MASKED

CURRENT: 13.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 3 RAMP TIME: 64.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
33	0.881	242.6	272.6	-12.40 MASKED
34	1.06	138.7	145.8	-5.09 MASKED
35	1.31	78.46	74.28	5.31 MASKED
36	1.61	44.06	36.09	18.07 MASKED
37	2.00	25.95	17.59	32.21 MASKED

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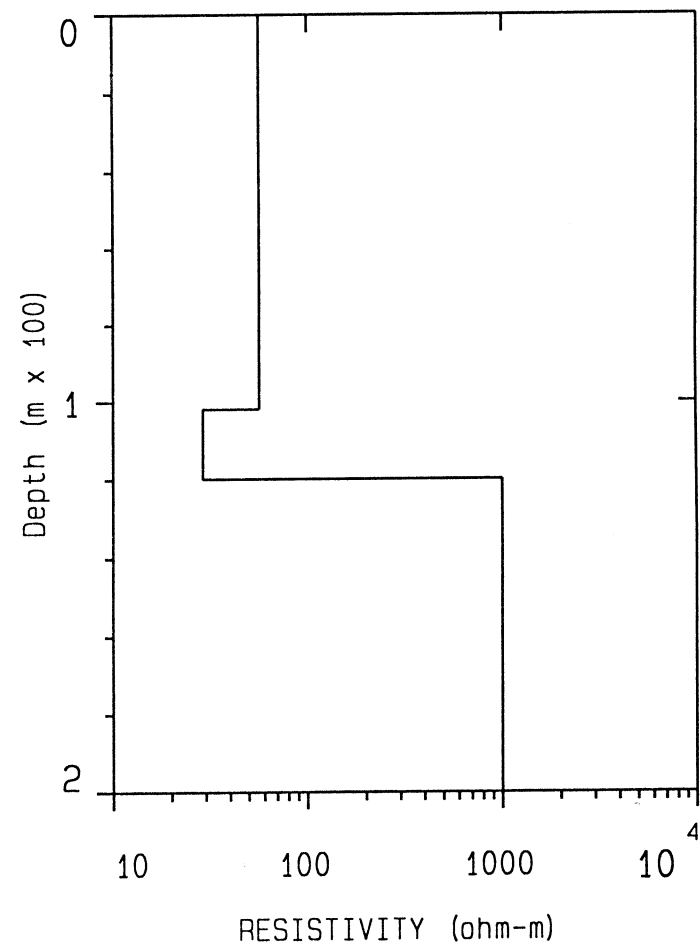
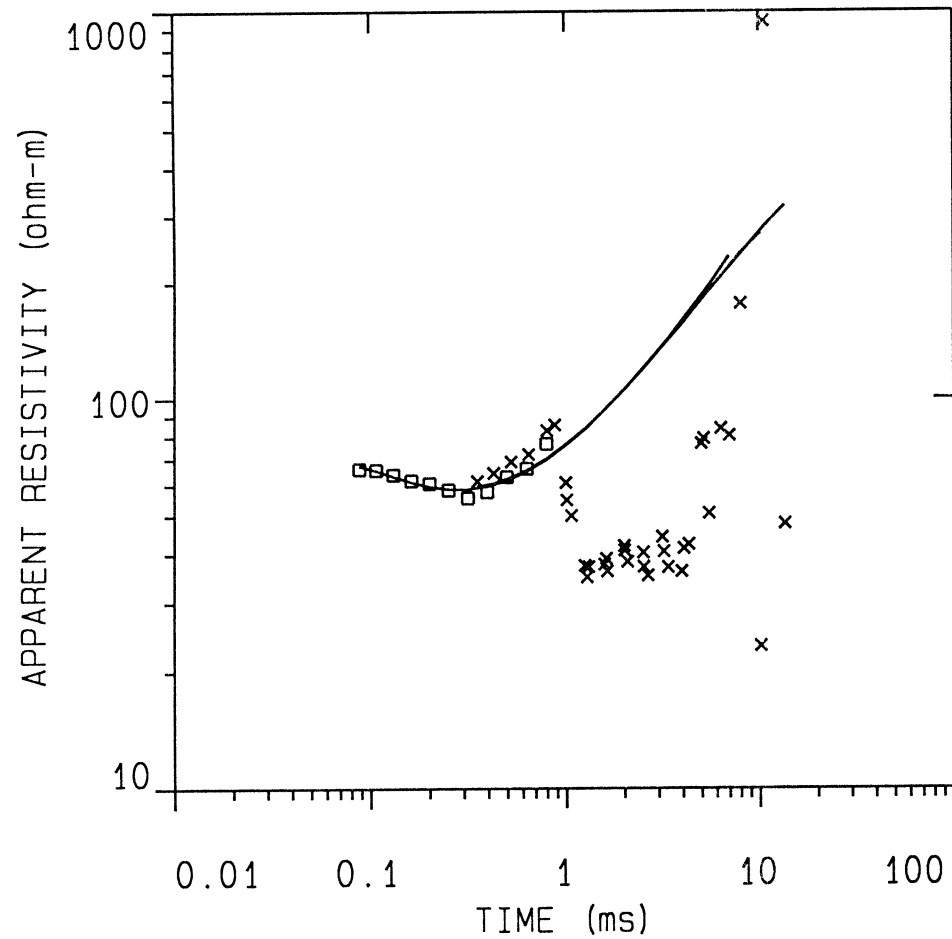
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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	2.50	13.47	7.96	40.87 MASKED
39	3.14	5.04	3.68	26.99 MASKED
40	3.95	0.898	1.61	-79.42 MASKED
41	6.31	0.254	0.312	-22.77 MASKED
42	7.99	0.339	0.141	58.32 MASKED

CURRENT RESOLUTION MATRIX NOT AVAILABLE

# LINE17



## DATA SET: LINE17

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 17.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 5.474 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	56.45	101.8	-101.8	1.80
2	28.97	17.98	-119.8	0.620
3	1001.0			

ALL PARAMETERS ARE FREE

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CURRENT:    20.50 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 1      RAMP TIME:    52.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m) DATA	sqr(d) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	20864.6	20312.9	2.64
2	0.106	13000.4	13024.9	-0.188
3	0.131	8095.8	8225.1	-1.59
4	0.161	5062.2	5109.7	-0.938
5	0.200	3030.5	3118.3	-2.89
6	0.250	1844.0	1830.2	0.748
7	0.314	1118.8	1038.0	7.22
8	0.395	598.6	570.9	4.62
9	0.499	292.9	302.2	-3.16
10	0.631	151.5	155.2	-2.43
11	0.799	67.34	77.55	-15.15
12	1.01	61.14	37.42	38.78 MASKED
13	1.28	66.38	17.76	73.24 MASKED

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	34.55	8.15	76.41 MASKED
15	2.08	17.41	3.69	78.77 MASKED
16	2.64	10.78	1.63	84.82 MASKED
17	3.37	5.46	0.725	86.72 MASKED
18	4.29	2.44	0.311	87.26 MASKED
19	5.47	1.01	0.133	86.85 MASKED
20	6.97	0.278	0.0556	79.97 MASKED

CURRENT: 22.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00  $\mu$ SEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	780.1	815.7	-4.57 MASKED
22	0.427	448.4	490.2	-9.32 MASKED
23	0.525	242.8	278.3	-14.60 MASKED
24	0.647	134.5	153.2	-13.90 MASKED
25	0.802	63.51	81.54	-28.38 MASKED
26	1.00	57.85	41.25	28.68 MASKED
27	1.25	68.13	20.38	70.07 MASKED
28	1.58	37.94	9.71	74.38 MASKED
29	1.99	18.05	4.53	74.88 MASKED
30	2.52	12.06	2.07	82.76 MASKED
31	3.19	5.83	0.938	83.92 MASKED
32	4.05	3.14	0.420	86.60 MASKED
33	5.14	0.655	0.185	71.74 MASKED
34	10.59	0.00261	0.0160	-515.8 MASKED
35	13.49	0.125	0.00724	94.22 MASKED

CURRENT: 22.20 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 4 RAMP TIME: 56.00  $\mu$ SEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
36	0.881	48.29	62.07	-28.52 MASKED
37	1.06	66.72	34.23	48.69 MASKED

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
38	1.31	62.44	17.99	71.18 MASKED
39	1.61	34.43	9.12	73.51 MASKED
40	2.00	18.74	4.52	75.88 MASKED
41	2.50	10.94	2.15	80.31 MASKED
42	3.14	5.41	1.00	81.51 MASKED
43	3.95	4.12	0.463	88.76 MASKED
44	4.99	0.746	0.207	72.25 MASKED
45	6.31	0.363	0.0933	74.30 MASKED
46	7.99	0.0657	0.0415	36.74 MASKED
47	10.14	0.757	0.0191	97.46 MASKED

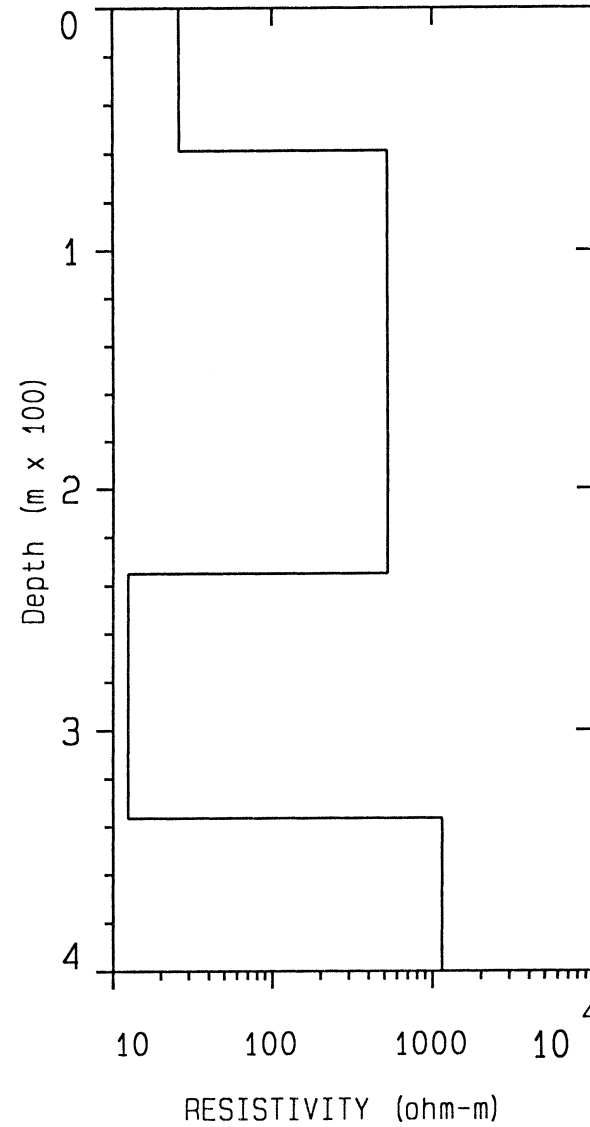
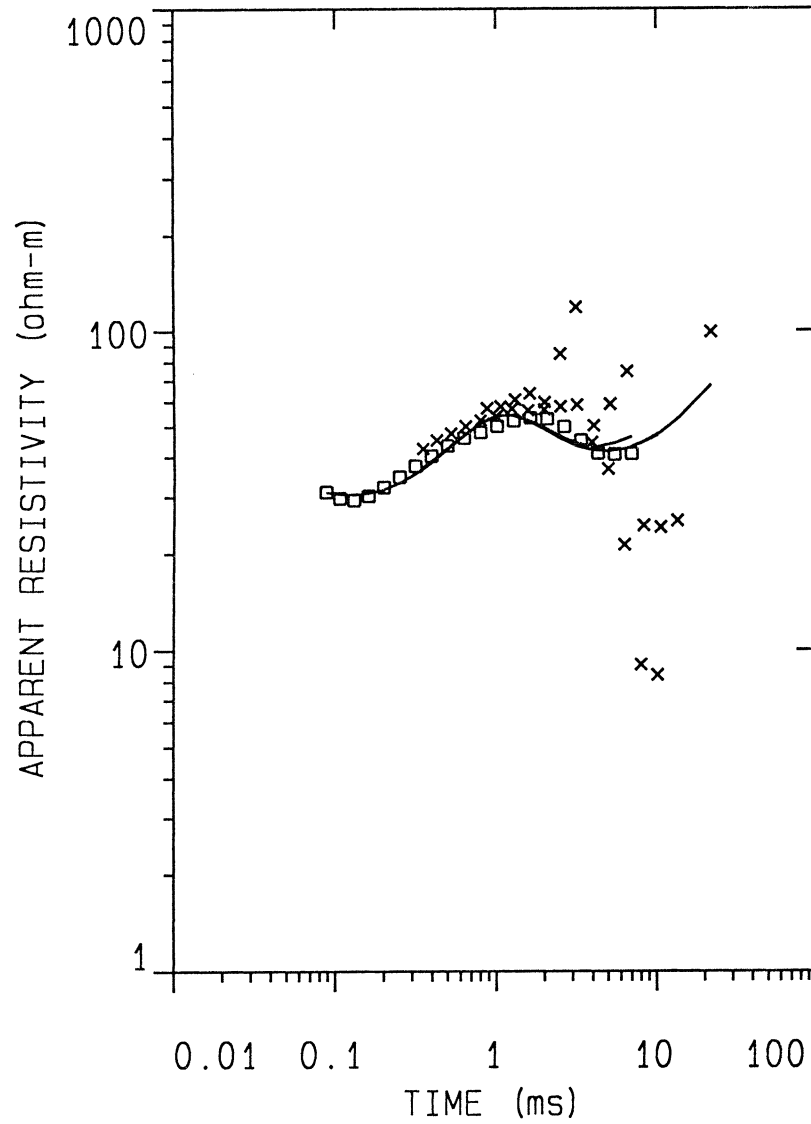
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE18





## DATA SET: LINE18

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 18.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 8.766 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	26.03	58.76	-58.76	2.25
2	521.6	176.0	-234.8	0.337
3	12.41	101.6	-336.5	8.19
4	1144.7			

ALL PARAMETERS ARE FREE

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CURRENT:    20.50 AMPS    EM-58    COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz     GAIN: 1    RAMP TIME:    51.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	64639.5	64929.6	-0.448
2	0.106	42516.5	40686.2	4.30
3	0.131	25979.1	24530.6	5.57
4	0.161	14731.8	14269.8	3.13
5	0.200	7840.6	8034.6	-2.47
6	0.250	4026.5	4295.6	-6.68
7	0.314	2030.8	2215.0	-9.06
8	0.395	1021.7	1104.7	-8.12
9	0.499	512.4	532.6	-3.94
10	0.631	261.5	255.9	2.10
11	0.799	136.1	123.3	9.40
12	1.01	70.33	62.88	10.59

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	36.43	34.13	6.33
14	1.63	19.35	20.04	-3.54
15	2.08	10.73	12.05	-12.28
16	2.64	6.40	7.26	-13.52
17	3.37	4.06	4.23	-4.04
18	4.29	2.55	2.37	7.18
19	5.47	1.41	1.25	11.53
20	6.97	0.766	0.635	17.09

CURRENT: 22.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 56.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1355.0	1654.7	-22.11 MASKED
22	0.427	762.3	916.3	-20.20 MASKED
23	0.525	423.6	482.2	-13.82 MASKED
24	0.647	230.8	251.2	-8.86 MASKED
25	0.802	126.8	130.0	-2.49 MASKED
26	1.00	69.52	69.37	0.216 MASKED
27	1.25	36.27	38.87	-7.14 MASKED
28	1.58	20.79	23.28	-11.93 MASKED
29	1.99	11.51	14.32	-24.42 MASKED
30	2.52	6.21	8.83	-42.26 MASKED
31	3.19	3.37	5.32	-57.55 MASKED
32	4.05	2.34	3.08	-31.64 MASKED
33	5.14	1.01	1.70	-67.12 MASKED
34	6.54	0.392	0.909	-131.6 MASKED
35	8.32	1.14	0.462	59.79 MASKED
36	10.59	0.640	0.229	64.18 MASKED
37	13.49	0.326	0.108	66.83 MASKED
38	21.90	0.0124	0.0221	-77.96 MASKED

CURRENT: 22.20 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 2 RAMP TIME: 56.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME	emf (nV/m sqrd)		DIFFERENCE
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	(ms)	DATA	SYNTHETIC	(percent)
39	0.881	88.72	99.78	-12.47 MASKED
40	1.06	53.58	59.25	-10.58 MASKED
41	1.31	29.80	35.40	-18.80 MASKED
42	1.61	16.51	22.42	-35.80 MASKED
43	2.00	10.62	14.33	-34.93 MASKED
44	2.50	3.59	9.06	-151.9 MASKED
45	3.14	1.23	5.58	-352.3 MASKED
46	3.95	3.01	3.30	-9.45 MASKED
47	4.99	2.25	1.86	17.43 MASKED
48	6.31	2.84	1.01	64.38 MASKED
49	7.99	5.69	0.525	90.77 MASKED
50	10.14	3.51	0.265	92.44 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

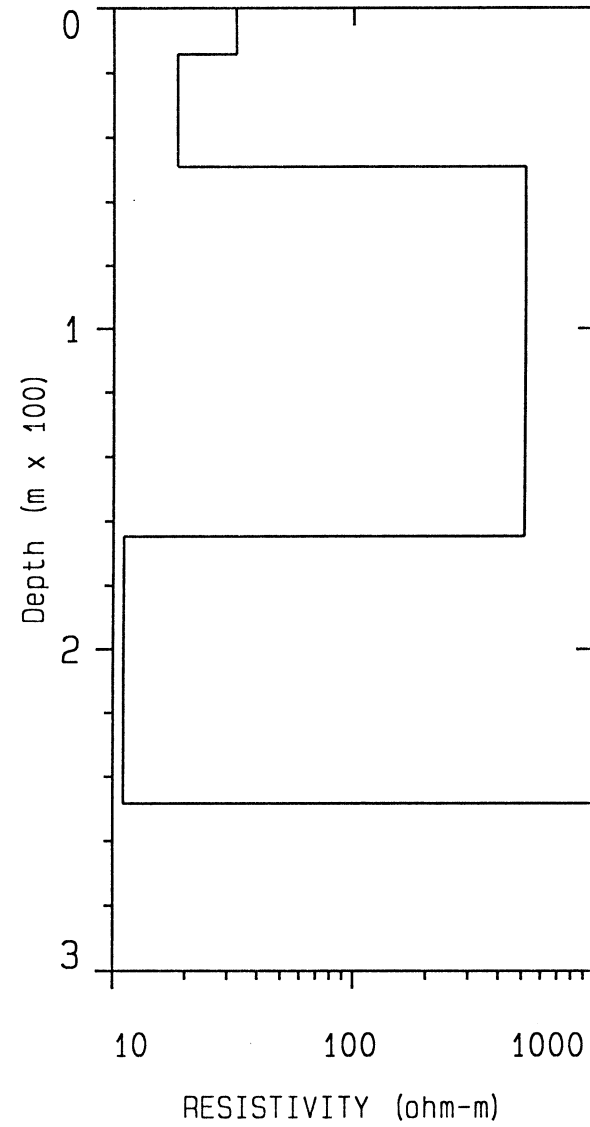
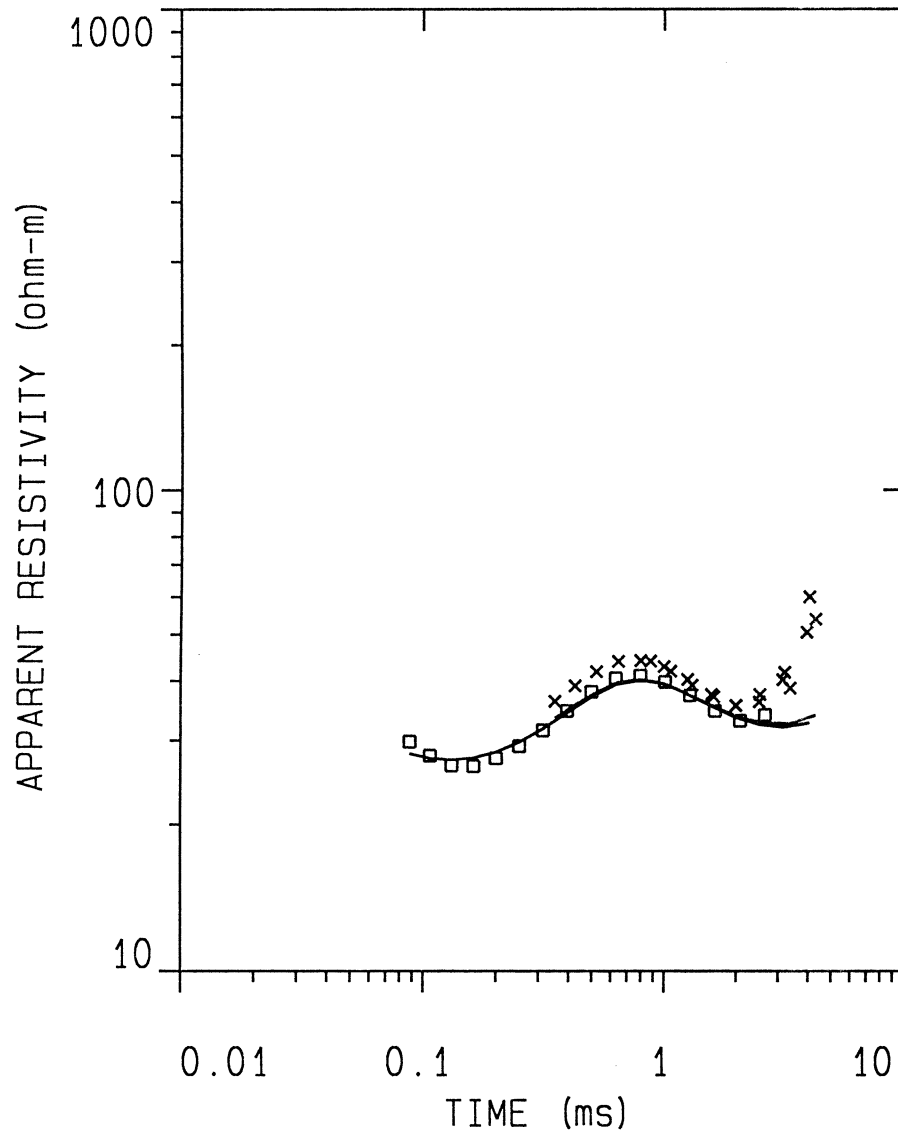
P 1	0.98						
P 2	-0.01	0.01					
P 3	0.01	0.00	0.59				
P 4	0.00	0.00	0.00	0.01			
T 1	-0.03	-0.05	0.03	-0.01	0.94		
T 2	0.00	0.04	0.12	0.00	-0.01	0.95	
T 3	0.01	-0.02	-0.44	-0.03	0.03	0.12	0.51
	P 1	P 2	P 3	P 4	T 1	T 2	T 3

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# LINE19



CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 19.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 4.108 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	32.35	14.19	-14.19	0.438
2	18.41	34.74	-48.94	1.88
3	513.2	115.7	-164.6	0.225
4	11.04	83.70	-248.4	7.57
5	995.8			

ALL PARAMETERS ARE FREE

CURRENT: 20.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	68883.1	75102.8	-9.02
2	0.106	47072.4	47874.2	-1.70
3	0.131	30172.3	28998.0	3.89
4	0.161	18009.4	16931.3	5.98
5	0.200	9940.5	9507.4	4.35
6	0.250	5224.8	5075.1	2.86
7	0.314	2641.9	2613.7	1.06
8	0.395	1292.6	1312.4	-1.53
9	0.499	628.5	653.3	-3.94
10	0.631	317.2	332.5	-4.82
11	0.799	172.6	178.6	-3.52

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
12	1.01	99.68	101.3	-1.66
13	1.28	60.64	60.59	0.0804
14	1.63	37.17	36.17	2.68
15	2.08	21.88	21.44	2.01
16	2.64	11.49	12.17	-5.88
17	3.37	5.16	6.66	-29.10 MASKED
18	4.29	1.71	3.43	-100.7 MASKED

CURRENT: 22.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
19	0.352	1718.6	1938.5	-12.79 MASKED
20	0.427	949.8	1088.0	-14.54 MASKED
21	0.525	512.2	593.7	-15.92 MASKED
22	0.647	281.3	327.3	-16.32 MASKED
23	0.802	163.7	187.7	-14.68 MASKED
24	1.00	97.91	110.6	-13.00 MASKED
25	1.25	61.05	67.95	-11.29 MASKED
26	1.58	38.33	41.66	-8.69 MASKED
27	1.99	23.21	25.29	-8.94 MASKED
28	2.52	11.94	14.82	-24.11 MASKED
29	3.19	5.62	8.36	-48.74 MASKED
30	4.05	1.79	4.48	-149.1 MASKED

CURRENT: 22.20 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 4 RAMP TIME: 56.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
31	0.881	131.2	151.4	-15.41 MASKED
32	1.06	87.17	96.92	-11.18 MASKED
33	1.31	57.62	62.74	-8.88 MASKED
34	1.61	37.17	40.09	-7.87 MASKED
35	2.00	23.17	25.32	-9.27 MASKED

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
36	2.50	12.95	15.24	-17.69 MASKED
37	3.14	6.24	8.81	-41.15 MASKED
38	3.95	2.49	4.84	-94.00 MASKED

CURRENT RESOLUTION MATRIX NOT AVAILABLE

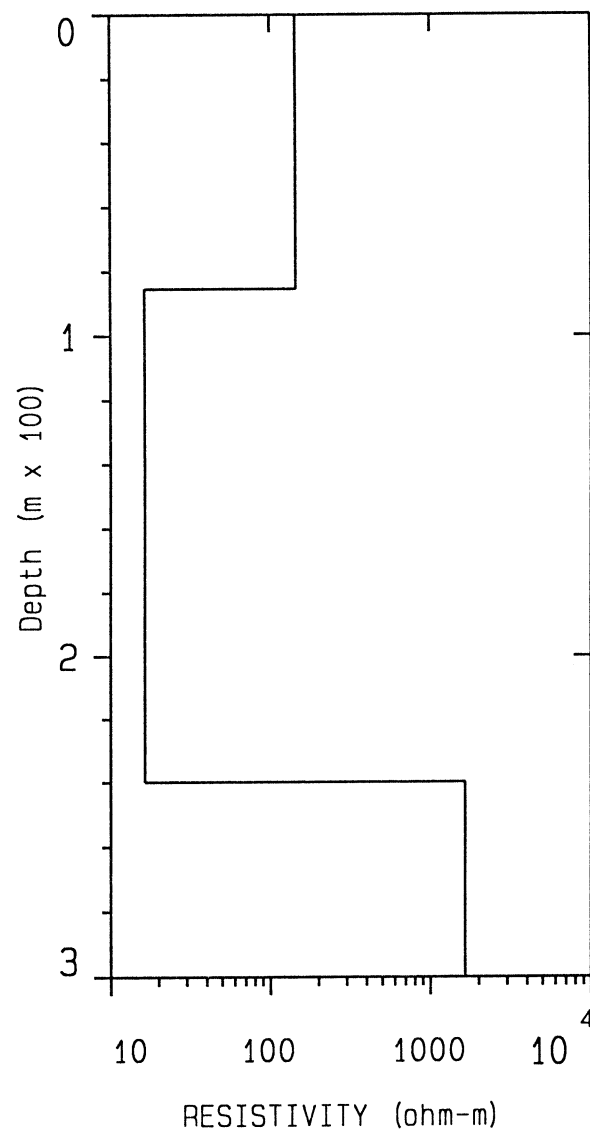
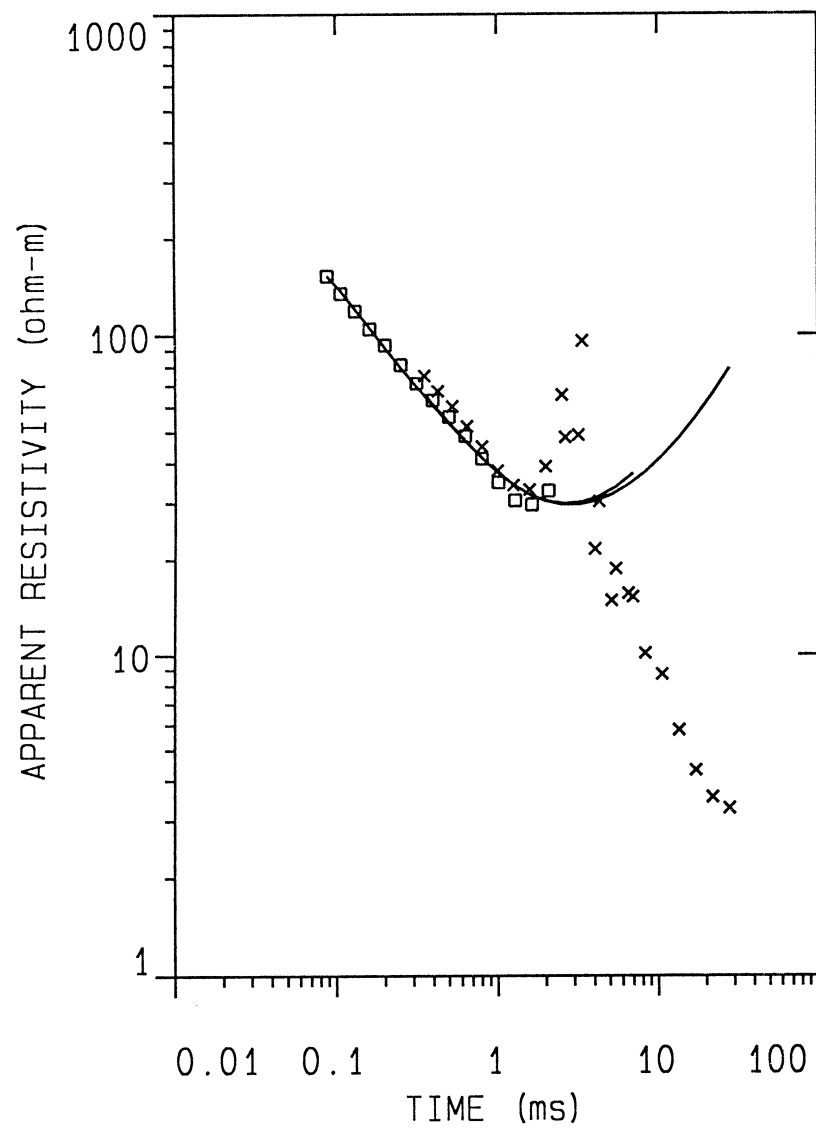
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# LINE20



CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 20.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 7.208 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	144.6	85.38	-85.38	0.590
2	16.38	154.4	-239.8	9.43
3	1645.8			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.10 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	6064.3	6037.7	0.438
2	0.106	4508.3	4372.1	3.02
3	0.131	3260.7	3202.3	1.78
4	0.161	2344.2	2323.9	0.862
5	0.200	1628.1	1675.0	-2.87
6	0.250	1150.8	1182.9	-2.79
7	0.314	797.1	824.0	-3.37
8	0.395	537.1	566.0	-5.37
9	0.499	360.1	385.3	-7.00
10	0.631	246.5	259.8	-5.39
11	0.799	174.5	173.1	0.819
12	1.01	124.9	112.7	9.80
13	1.28	83.48	71.32	14.57

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	47.92	43.37	9.49
15	2.08	22.62	25.36	-12.11
16	2.64	6.94	14.21	-104.6 MASKED
17	3.37	-1.34	7.63	467.0 MASKED
18	4.29	-4.14	3.92	-5.23 MASKED
19	5.47	-4.64	1.93	-58.30 MASKED
20	6.97	-3.44	0.911	-73.51 MASKED

CURRENT: 22.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	602.9	733.6	-21.66 MASKED
22	0.427	438.9	536.1	-22.13 MASKED
23	0.525	309.7	382.4	-23.47 MASKED
24	0.647	227.0	269.2	-18.56 MASKED
25	0.802	165.5	186.4	-12.58 MASKED
26	1.00	123.0	124.9	-1.56 MASKED
27	1.25	81.91	81.30	0.748 MASKED
28	1.58	48.41	50.86	-5.07 MASKED
29	1.99	21.03	30.57	-45.39 MASKED
30	2.52	5.40	17.64	-226.4 MASKED
31	3.19	-4.60	9.78	112.3 MASKED
32	4.05	-8.68	5.21	-39.94 MASKED
33	5.14	-8.34	2.67	-67.94 MASKED
34	6.54	-4.23	1.32	-68.86 MASKED
35	8.32	-4.46	0.629	-85.88 MASKED
36	10.59	-3.08	0.291	-90.56 MASKED
37	13.49	-3.10	0.130	-95.78 MASKED
38	17.19	-2.62	0.0568	-97.83 MASKED
39	21.90	-1.92	0.0242	-98.73 MASKED
40	27.92	-1.17	0.00997	-99.15 MASKED

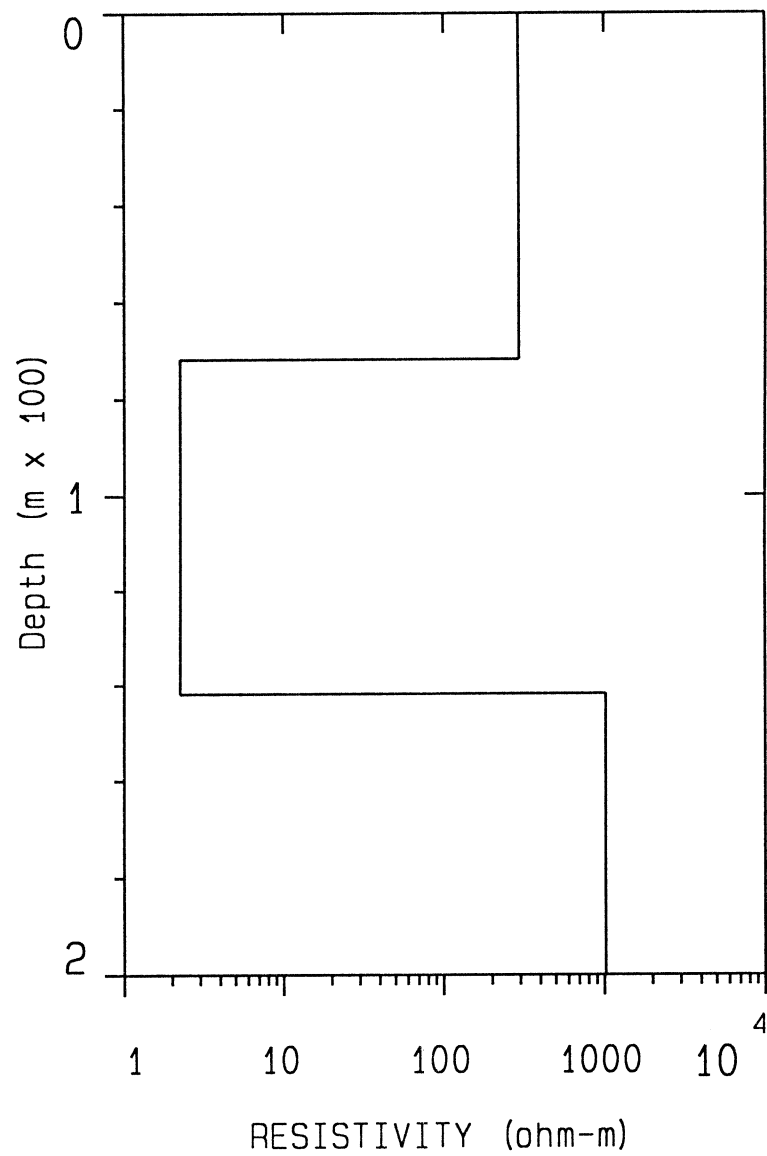
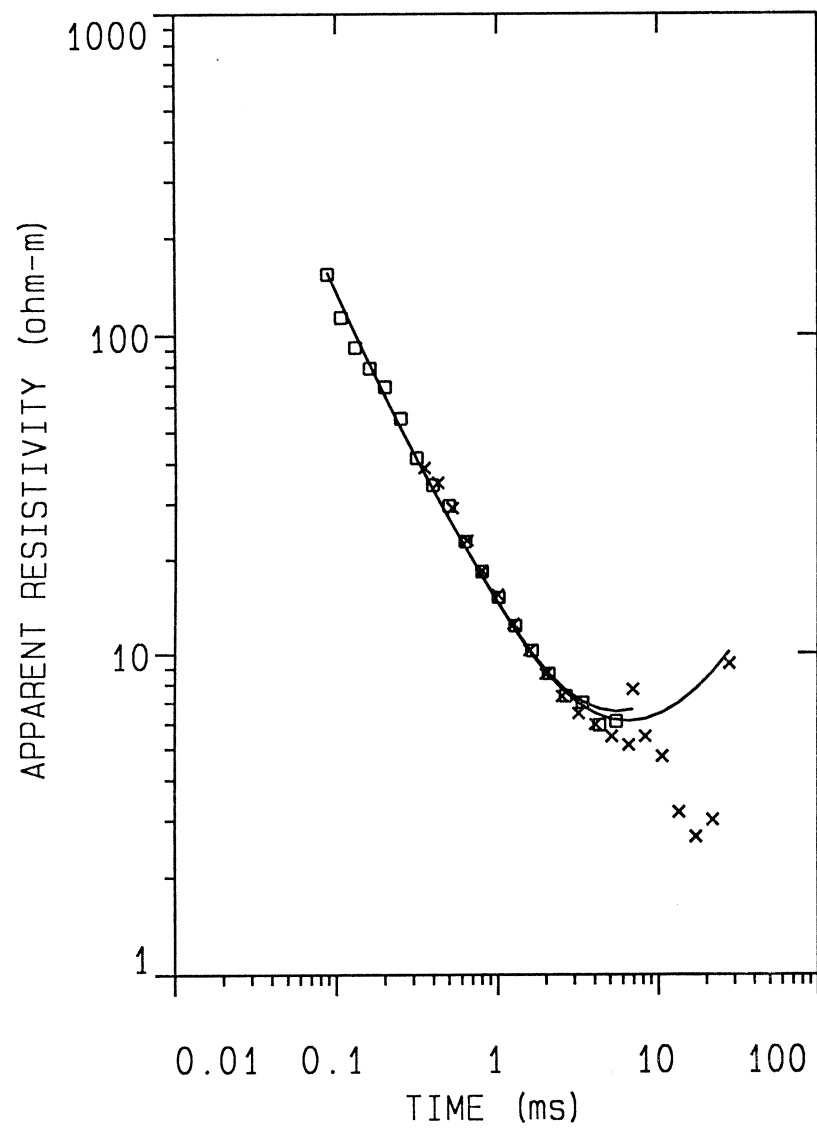
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE21



## DATA SET: LINE21

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 21.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 9.279 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	292.2	71.78	-71.78	0.245
2	2.23	70.07	-141.8	31.35
3	1017.6			

ALL PARAMETERS ARE FREE

CURRENT:	21.10 AMPS	EM-58	COIL AREA:	100.00 sq m.
FREQUENCY:	30.00 Hz	GAIN: 1	RAMP TIME:	52.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	6004.6	5861.8	2.37
2	0.106	5866.4	4969.5	15.28
3	0.131	4835.6	4170.5	13.75
4	0.161	3593.4	3455.6	3.83
5	0.200	2568.1	2827.5	-10.10
6	0.250	2062.2	2272.0	-10.17
7	0.314	1782.8	1796.6	-0.774
8	0.395	1342.4	1399.6	-4.26
9	0.499	936.9	1075.2	-14.75
10	0.631	771.2	818.4	-6.11
11	0.799	593.7	618.1	-4.10
12	1.01	435.1	462.0	-6.19
13	1.28	328.5	339.4	-3.30

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	236.3	242.0	-2.39
15	2.08	166.4	165.9	0.306
16	2.64	116.9	108.8	6.96
17	3.37	68.66	67.87	1.15
18	4.29	47.99	40.20	16.23
19	5.47	25.16	22.60	10.19
20	6.97	9.66	12.02	-24.38 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 60.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	1624.5	1720.6	-5.91 MASKED
22	0.427	1175.5	1393.7	-18.55 MASKED
23	0.525	925.1	1105.4	-19.48 MASKED
24	0.647	780.1	868.0	-11.27 MASKED
25	0.802	636.0	674.6	-6.06 MASKED
26	1.00	474.2	515.4	-8.70 MASKED
27	1.25	371.2	386.7	-4.17 MASKED
28	1.58	279.3	282.1	-1.00 MASKED
29	1.99	202.3	198.4	1.95 MASKED
30	2.52	144.1	133.9	7.08 MASKED
31	3.19	96.27	86.34	10.31 MASKED
32	4.05	60.07	53.14	11.52 MASKED
33	5.14	37.64	31.21	17.07 MASKED
34	6.54	22.73	17.48	23.07 MASKED
35	8.32	11.32	9.35	17.37 MASKED
36	10.59	7.69	4.79	37.66 MASKED
37	13.49	7.64	2.35	69.23 MASKED
38	17.19	5.41	1.10	79.59 MASKED
39	21.90	2.46	0.499	79.74 MASKED
40	27.92	0.247	0.216	12.46 MASKED

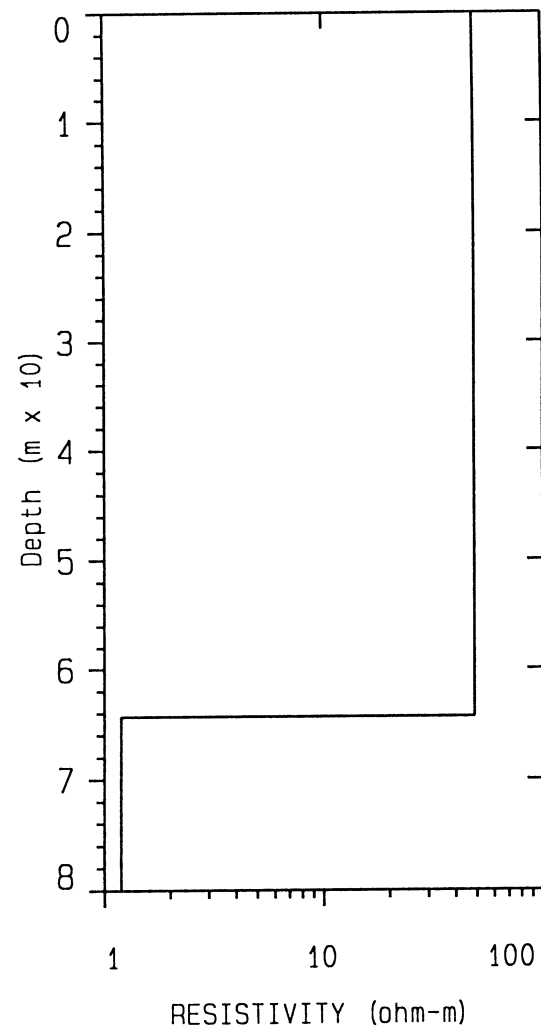
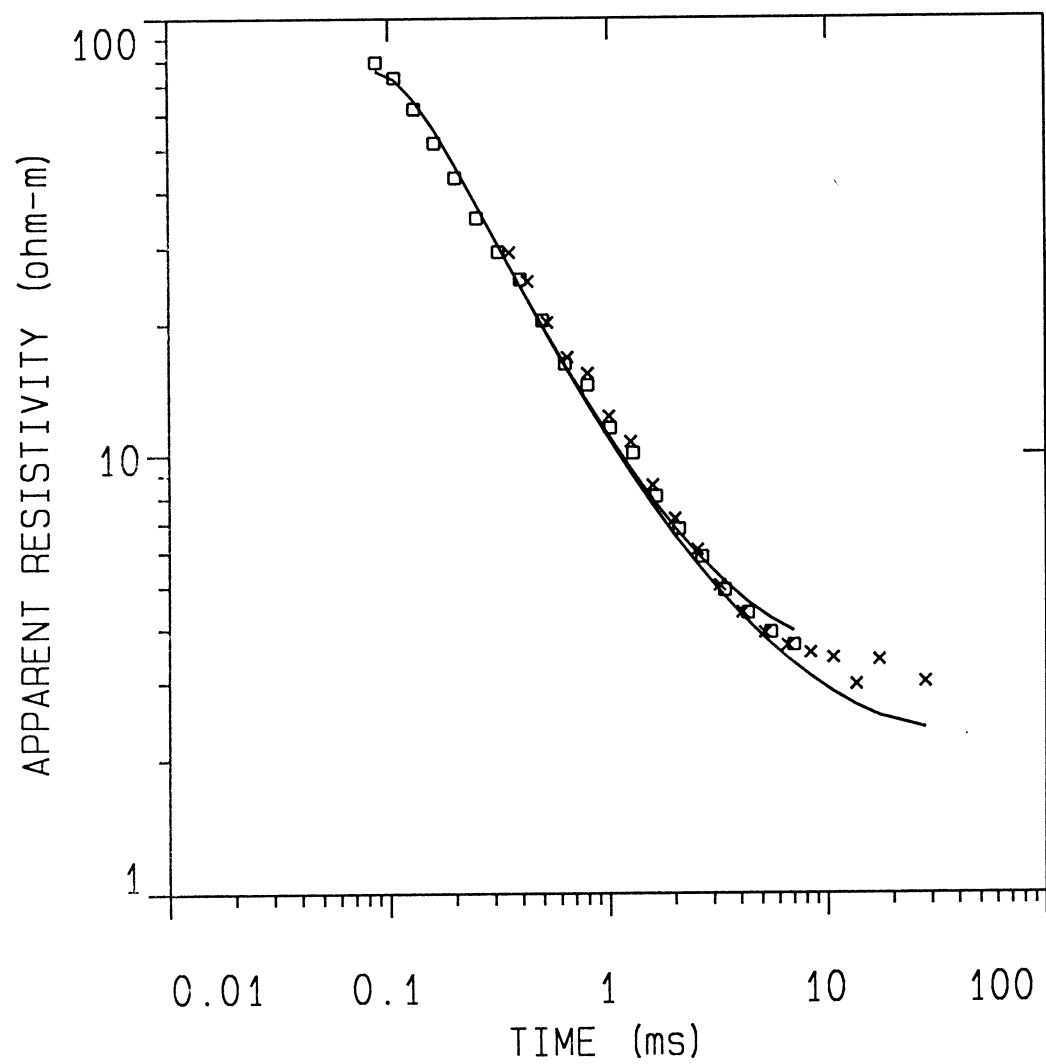
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE22



## DATA SET: LINE22

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 22.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 8.512 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
1	48.69	64.32	0.0	1.32
2	1.19		-64.32	

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	16158.2	17388.3	-7.61
2	0.106	11317.7	11482.7	-1.45
3	0.131	8688.4	8164.0	6.03
4	0.161	6719.9	6088.3	9.39
5	0.200	5170.9	4705.4	9.00
6	0.250	4065.0	3674.8	9.59
7	0.314	3006.0	2870.2	4.51
8	0.395	2101.0	2224.4	-5.87
9	0.499	1628.8	1708.4	-4.88
10	0.631	1281.2	1292.4	-0.873
11	0.799	842.8	964.7	-14.46
12	1.01	652.6	706.5	-8.24
13	1.28	438.2	508.6	-16.07
14	1.63	338.1	358.2	-5.94



No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
15	2.08	239.7	247.0	-3.05
16	2.64	164.0	166.4	-1.43
17	3.37	116.5	109.2	6.23
18	4.29	76.10	69.82	8.25
19	5.47	48.36	43.38	10.30
20	6.97	29.26	26.13	10.71

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	2485.4	2763.8	-11.19 MASKED
22	0.427	1927.3	2238.1	-16.12 MASKED
23	0.525	1601.2	1775.7	-10.89 MASKED
24	0.647	1250.4	1387.9	-10.99 MASKED
25	0.802	831.4	1069.4	-28.62 MASKED
26	1.00	670.9	804.6	-19.93 MASKED
27	1.25	466.0	595.1	-27.70 MASKED
28	1.58	368.9	431.6	-16.99 MASKED
29	1.99	267.7	307.0	-14.64 MASKED
30	2.52	191.4	214.3	-11.99 MASKED
31	3.19	140.3	146.7	-4.57 MASKED
32	4.05	95.97	98.57	-2.70 MASKED
33	5.14	62.06	64.91	-4.59 MASKED
34	6.54	37.70	41.90	-11.14 MASKED
35	8.32	21.96	26.53	-20.80 MASKED
36	10.59	12.51	16.46	-31.55 MASKED
37	13.49	8.46	9.98	-17.89 MASKED
38	17.19	3.79	5.92	-56.08 MASKED
39	27.92	1.34	1.93	-43.56 MASKED

## PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.96

P 2 -0.01 0.98

T 1 0.00 0.00 1.00

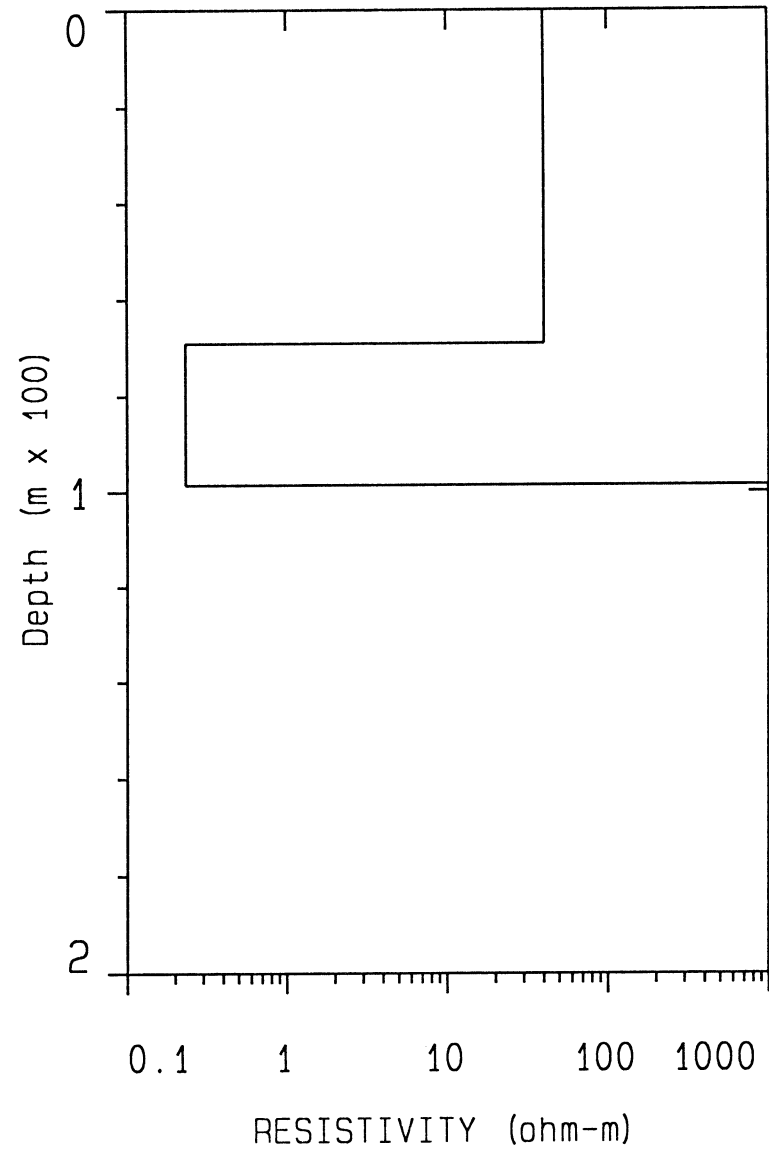
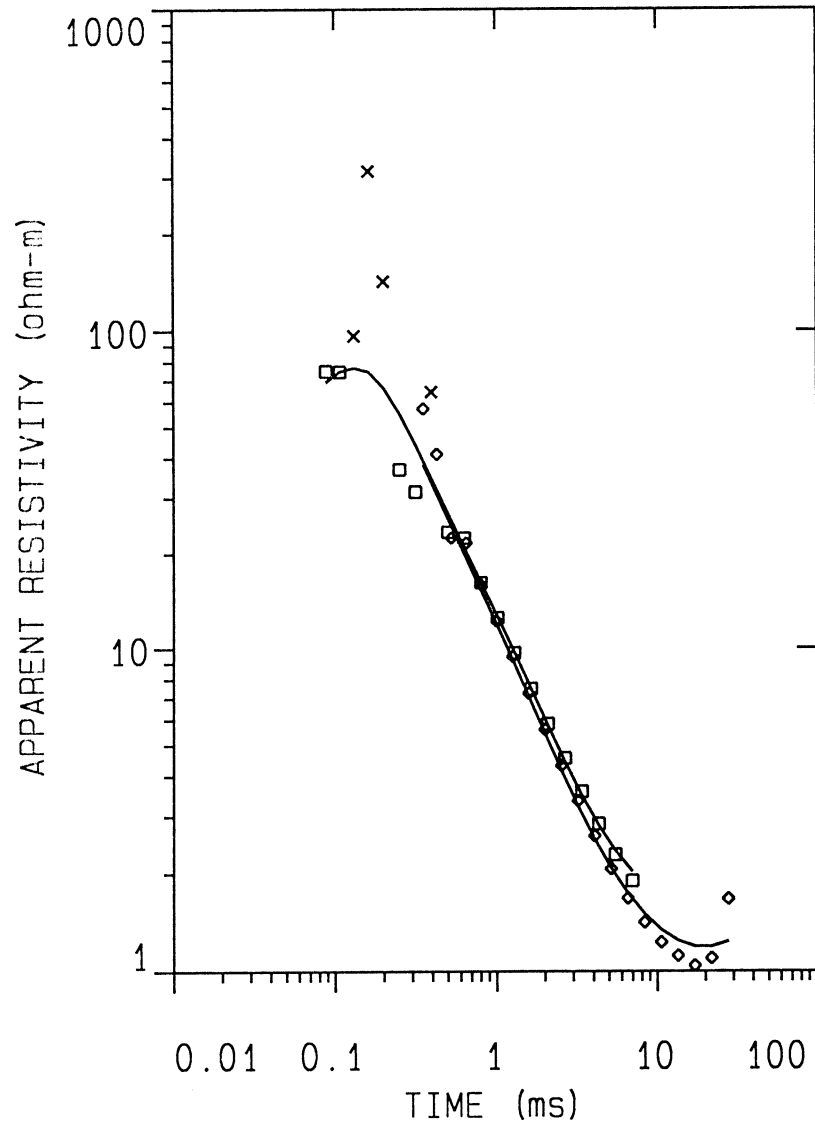
P 1 P 2 T 1

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# LINE23



## DATA SET: LINE23

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 23.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 23.950 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	40.16	69.03	-69.03	1.71
2	0.231	29.55	-98.59	127.4
3	998.4			

ALL PARAMETERS ARE FREE

```

CURRENT:    21.00 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:  30.00 Hz      GAIN: 1      RAMP TIME:    51.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m DATA	sqr(d) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	17635.5	19827.0	-12.42
2	0.106	10958.8	10941.3	0.160
3	0.131	4452.5	6288.8	-41.24 MASKED
4	0.161	447.1	3880.4	-767.9 MASKED
5	0.200	862.7	2708.0	-213.8 MASKED
6	0.250	3751.0	2042.9	45.53
7	0.314	2720.4	1621.9	40.38
8	0.395	517.4	1322.5	-155.5 MASKED
9	0.499	1323.2	1072.7	18.93
10	0.631	785.1	872.7	-11.16
11	0.799	709.0	704.4	0.644
12	1.01	577.0	567.8	1.59
13	1.28	466.2	459.6	1.41

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	376.2	374.2	0.543
15	2.08	300.8	305.3	-1.50
16	2.64	238.5	246.3	-3.25
17	3.37	186.6	193.2	-3.52
18	4.29	143.6	145.6	-1.39
19	5.47	108.6	104.5	3.76
20	6.97	78.45	71.07	9.40

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 60.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	907.0	1668.4	-83.93
22	0.427	916.5	1420.6	-54.99
23	0.525	1362.2	1195.7	12.22
24	0.647	853.6	1006.9	-17.96
25	0.802	789.4	840.6	-6.48
26	1.00	674.4	698.3	-3.54
27	1.25	562.4	581.4	-3.37
28	1.58	469.8	485.7	-3.37
29	1.99	387.4	406.1	-4.84
30	2.52	318.9	336.5	-5.52
31	3.19	257.5	272.6	-5.84
32	4.05	206.9	213.6	-3.23
33	5.14	161.8	160.6	0.741
34	6.54	121.6	115.3	5.20
35	8.32	86.09	78.76	8.51
36	10.59	58.29	51.05	12.41
37	13.49	36.68	31.28	14.70
38	17.19	22.24	18.11	18.56
39	21.90	11.22	9.91	11.69
40	27.92	3.25	5.11	-57.06

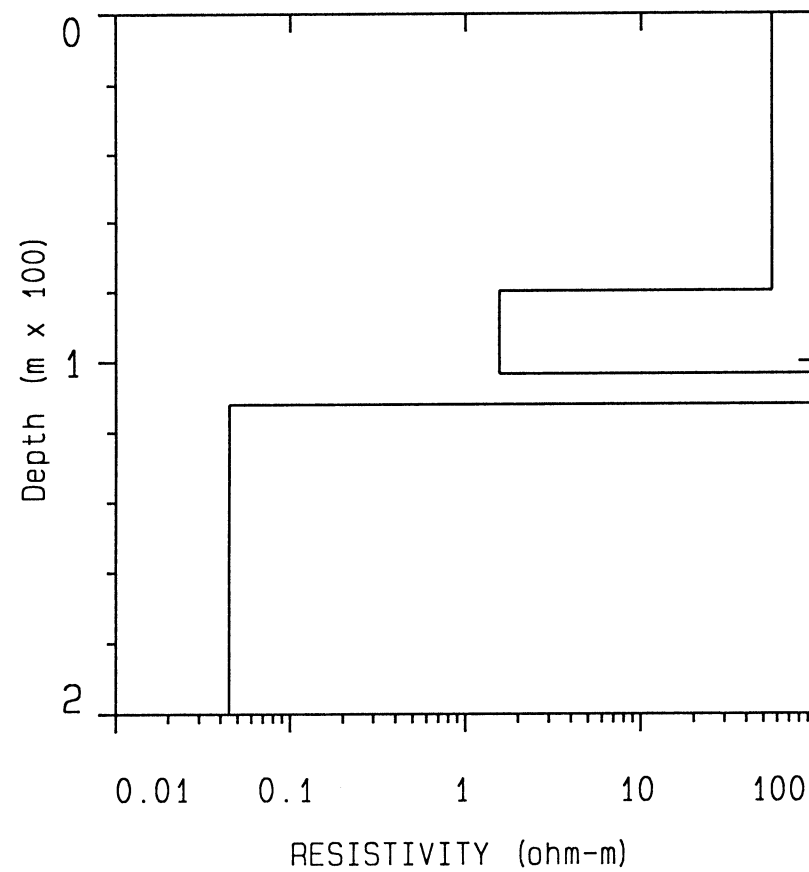
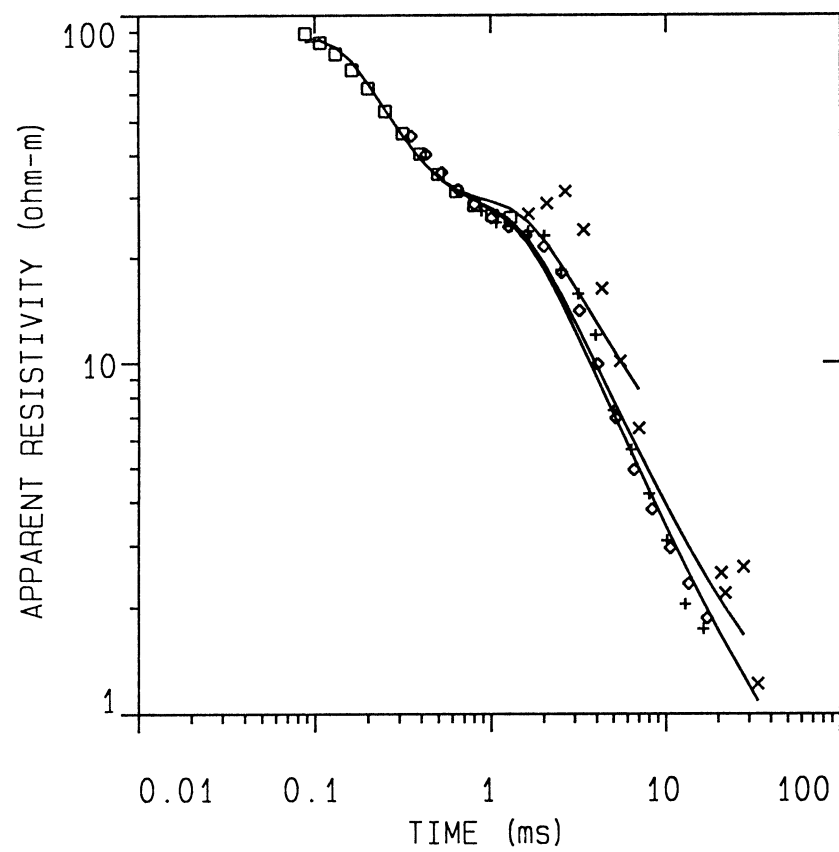
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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LINE24



## DATA SET: LINE24

CLIENT:	Any Interested Party	DATE:	01-DEC-92
LOCATION:	Investigation Site	SOUNDING:	2
COUNTY:	Jefferson County, Colorado	ELEVATION:	0.00 m
PROJECT:	California Demonstration Data	EQUIPMENT:	Geonics PROTEM
LOOP SIZE:	50.000 m by 50.000 m	AZIMUTH:	
COIL LOC:	0.000 m (X), 0.000 m (Y)	TIME CONSTANT:	NONE
SOUNDING COORDINATES:	E: 1.0000 N: 24.0000	SLOPE:	NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 20.893 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	55.68	79.83	-79.83	1.43
2	1.55	23.65	-103.4	15.16
3	93.84	8.59	-112.0	0.0915
4	0.0447			

# ALL PARAMETERS ARE FREE

```

CURRENT:    21.20 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz       GAIN: 1     RAMP TIME:    52.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	13789.1	14918.0	-8.18
2	0.106	9285.9	9074.3	2.27
3	0.131	6219.9	5830.0	6.26
4	0.161	4295.5	3955.9	7.90
5	0.200	3013.7	2873.3	4.65
6	0.250	2165.7	2127.1	1.78
7	0.314	1532.8	1565.3	-2.12
8	0.395	1058.8	1113.1	-5.12
9	0.499	728.1	745.4	-2.38
10	0.631	483.0	471.6	2.36
11	0.799	310.3	281.9	9.14
12	1.01	189.0	164.4	13.03

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	106.4	97.16	8.70
14	1.63	56.33	61.37	-8.95 MASKED
15	2.08	27.72	41.60	-50.04 MASKED
16	2.64	13.39	29.94	-123.5 MASKED
17	3.37	10.82	21.95	-102.7 MASKED
18	4.29	10.61	16.20	-52.70 MASKED
19	5.47	11.85	11.84	0.122 MASKED
20	6.97	12.53	8.54	31.82 MASKED

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1284.2	1439.1	-12.06
22	0.427	952.9	1066.7	-11.94
23	0.525	684.7	744.1	-8.66
24	0.647	482.1	495.3	-2.74
25	0.802	328.6	315.0	4.12
26	1.00	216.4	195.6	9.62
27	1.25	134.1	123.6	7.77
28	1.58	82.40	83.46	-1.27
29	1.99	51.43	60.41	-17.44
30	2.52	37.17	46.37	-24.73
31	3.19	29.97	36.55	-21.93
32	4.05	28.06	29.08	-3.64
33	5.14	26.28	23.14	11.92
34	6.54	24.08	18.29	24.01
35	8.32	19.47	14.32	26.43
36	10.59	15.61	11.07	29.09
37	13.49	12.10	8.41	30.49
38	17.19	9.25	6.27	32.22
39	21.90	3.95	4.57	-15.65 MASKED
40	27.92	1.66	3.25	-95.39 MASKED

CURRENT: 23.20 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 3.00 Hz GAIN: 5 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
41	0.881	280.8	263.9	5.99
42	1.06	194.5	176.8	9.11
43	1.31	120.9	119.0	1.57
44	1.61	75.42	85.18	-12.93
45	2.00	46.13	64.37	-39.54
46	2.50	37.21	50.80	-36.53
47	3.14	26.76	41.06	-53.41
48	3.95	22.58	33.48	-48.29
49	4.99	26.51	27.37	-3.26
50	6.31	21.76	22.30	-2.44
51	7.99	18.67	18.06	3.24
52	10.14	16.32	14.49	11.20
53	12.87	16.79	11.51	31.42
54	16.36	11.74	9.01	23.24
55	20.81	3.72	6.94	-86.77 MASKED
56	33.73	3.29	3.89	-18.38 MASKED

CURRENT RESOLUTION MATRIX NOT AVAILABLE

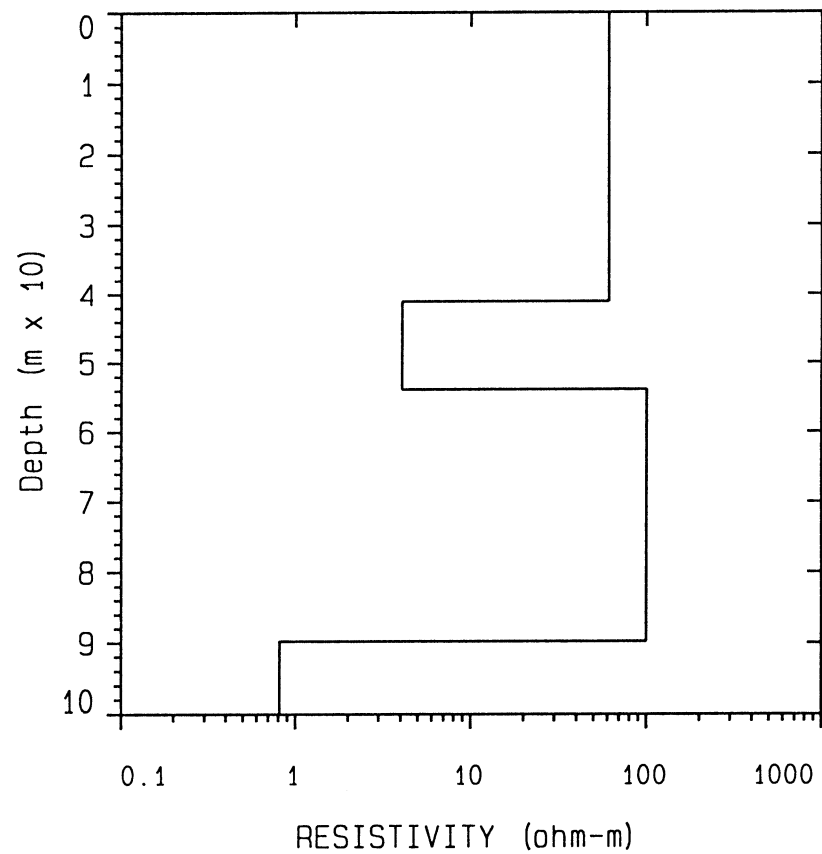
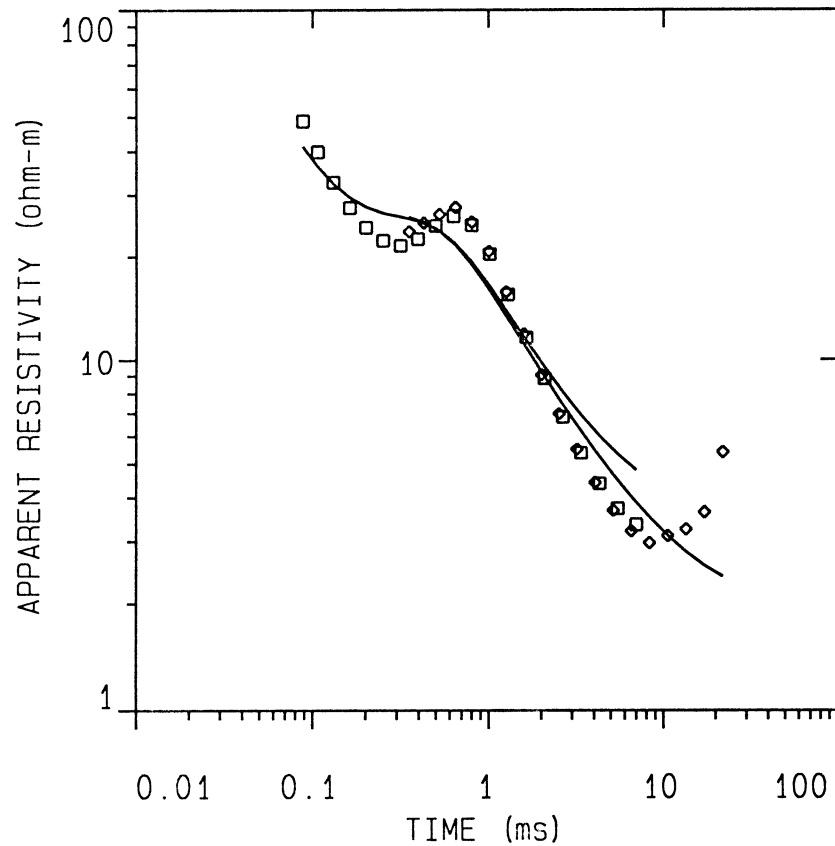
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LINE25



## DATA SET: LINE25

CLIENT: Any Interested Party                      DATE: 01-DEC-92  
 LOCATION: Investigation Site                      SOUNDING: 2  
 COUNTY: Jefferson County, Colorado              ELEVATION: 0.00 m  
 PROJECT: California Demonstration Data          EQUIPMENT: Geonics PROTEM  
 LOOP SIZE: 50.000 m by 50.000 m              AZIMUTH:  
 COIL LOC: 0.000 m (X), 0.000 m (Y)          TIME CONSTANT: NONE  
 SOUNDING COORDINATES: E: 1.0000 N: 25.0000 SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 40.770 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	60.62	41.08	-41.08	0.677
2	4.02	12.77	-53.85	3.17
3	100.1	35.91	-89.77	0.358
4	0.811			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58      COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1      RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	33703.8	43322.3	-28.53
2	0.106	28175.8	32383.1	-14.93
3	0.131	22736.7	23029.5	-1.28
4	0.161	17294.0	15568.7	9.97
5	0.200	12265.0	10013.7	18.35
6	0.250	7994.3	6105.6	23.62
7	0.314	4769.2	3589.4	24.73
8	0.395	2515.8	2104.0	16.36
9	0.499	1233.9	1262.2	-2.28
10	0.631	624.3	803.8	-28.76
11	0.799	378.0	543.2	-43.67
12	1.01	278.3	383.7	-37.88

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	230.0	276.5	-20.17
14	1.63	194.2	199.7	-2.80
15	2.08	161.1	142.8	11.34
16	2.64	129.9	100.6	22.50
17	3.37	101.5	69.44	31.59
18	4.29	74.98	46.81	37.57
19	5.47	52.43	30.68	41.48
20	6.97	33.53	19.53	41.74

CURRENT: 22.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	3356.7	2913.4	13.20
22	0.427	1904.3	1891.0	0.702
23	0.525	1048.4	1232.4	-17.54
24	0.647	579.7	841.0	-45.06
25	0.802	391.1	597.8	-52.85
26	1.00	299.2	437.1	-46.06
27	1.25	255.1	324.7	-27.28
28	1.58	218.3	241.9	-10.81
29	1.99	184.8	179.0	3.12
30	2.52	152.2	131.2	13.84
31	3.19	120.4	94.75	21.30
32	4.05	92.46	67.35	27.15
33	5.14	67.18	47.01	30.02
34	6.54	45.10	32.19	28.62
35	8.32	27.78	21.57	22.36
36	10.59	14.20	14.15	0.316
37	13.49	7.26	9.05	-24.78
38	17.19	3.35	5.65	-68.55
39	21.90	1.00	3.43	-239.9

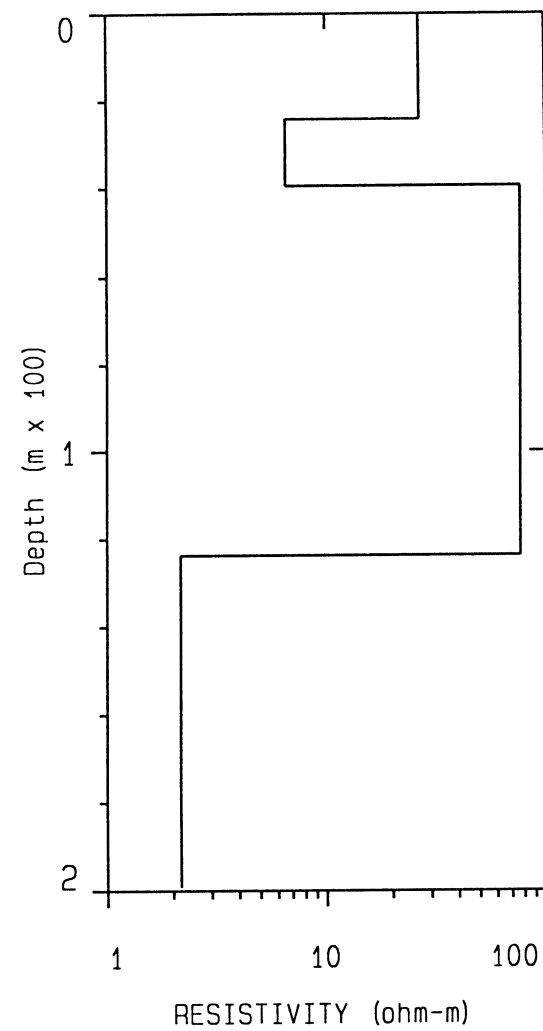
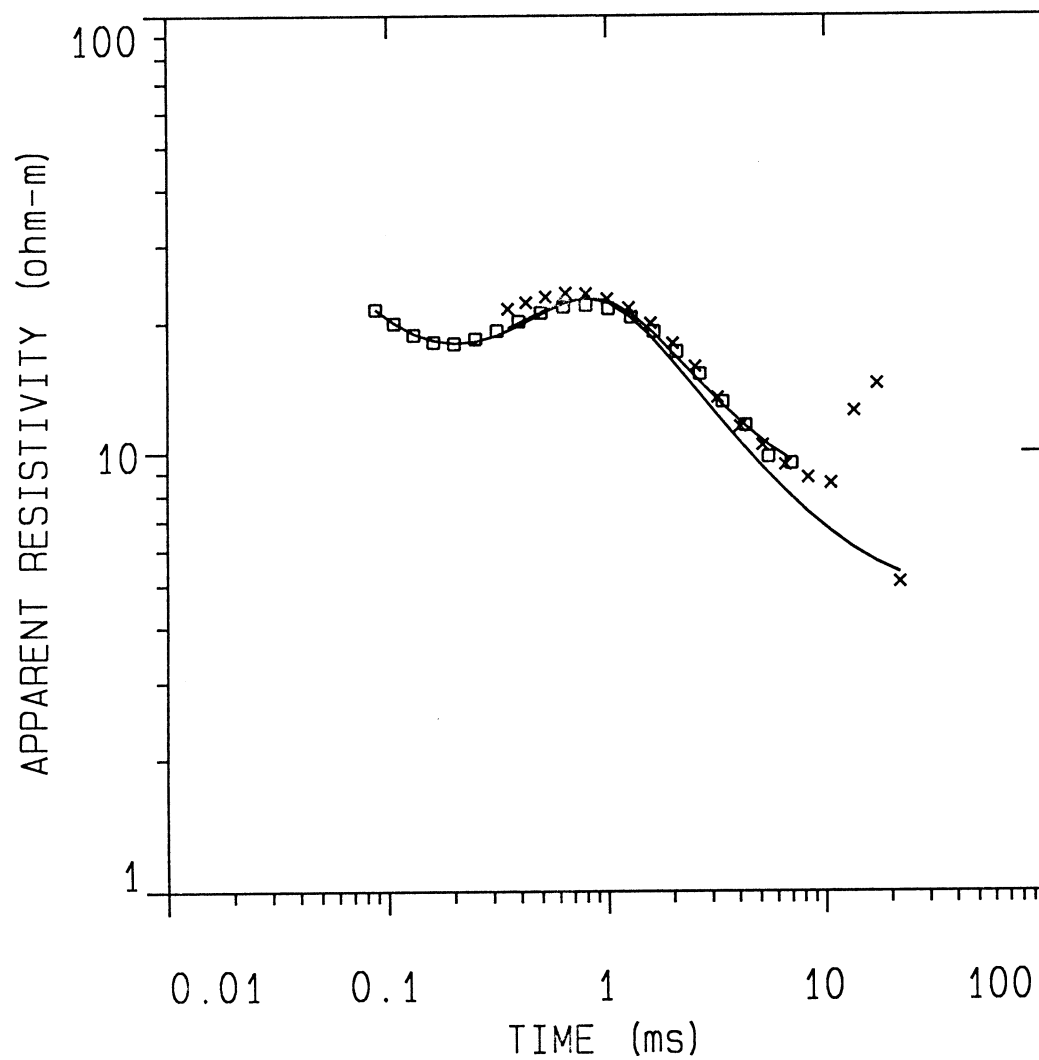
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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# LINE26



## DATA SET: LINE26

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 26.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 3.793 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	26.71	24.20	-24.20	0.905
2	6.57	15.27	-39.47	2.32
3	77.01	84.28	-123.7	1.09
4	2.16			

# ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	115103.1	114985.5	0.102
2	0.106	79305.0	78929.1	0.473
3	0.131	52023.0	51530.8	0.946
4	0.161	32629.7	32209.2	1.28
5	0.200	19300.8	19282.8	0.0932
6	0.250	10659.6	10882.2	-2.08
7	0.314	5673.7	5895.1	-3.90
8	0.395	2967.7	3067.2	-3.35
9	0.499	1546.4	1564.1	-1.14
10	0.631	820.1	800.0	2.45
11	0.799	449.1	424.4	5.51
12	1.01	255.0	239.5	6.06

\*

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	150.4	146.2	2.77
14	1.63	92.57	93.73	-1.25
15	2.08	59.46	62.27	-4.72
16	2.64	38.94	41.34	-6.17
17	3.37	26.61	27.30	-2.60
18	4.29	17.55	17.65	-0.548
19	5.47	12.29	11.21	8.82
20	6.97	7.07	6.88	2.58

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	3892.3	4529.9	-16.37 MASKED
22	0.427	2286.7	2609.5	-14.11 MASKED
23	0.525	1307.5	1451.5	-11.00 MASKED
24	0.647	751.6	804.1	-6.97 MASKED
25	0.802	441.2	458.2	-3.85 MASKED
26	1.00	263.7	271.1	-2.81 MASKED
27	1.25	160.8	171.2	-6.46 MASKED
28	1.58	102.2	113.3	-10.78 MASKED
29	1.99	67.10	77.62	-15.67 MASKED
30	2.52	44.93	53.47	-19.00 MASKED
31	3.19	31.92	36.87	-15.51 MASKED
32	4.05	22.22	25.10	-12.96 MASKED
33	5.14	14.18	16.92	-19.32 MASKED
34	6.54	9.11	11.15	-22.38 MASKED
35	8.32	5.52	7.26	-31.55 MASKED
36	10.59	3.16	4.61	-45.88 MASKED
37	13.49	0.973	2.87	-195.5 MASKED
38	17.19	0.426	1.74	-309.7 MASKED
39	21.90	1.11	1.03	7.34 MASKED

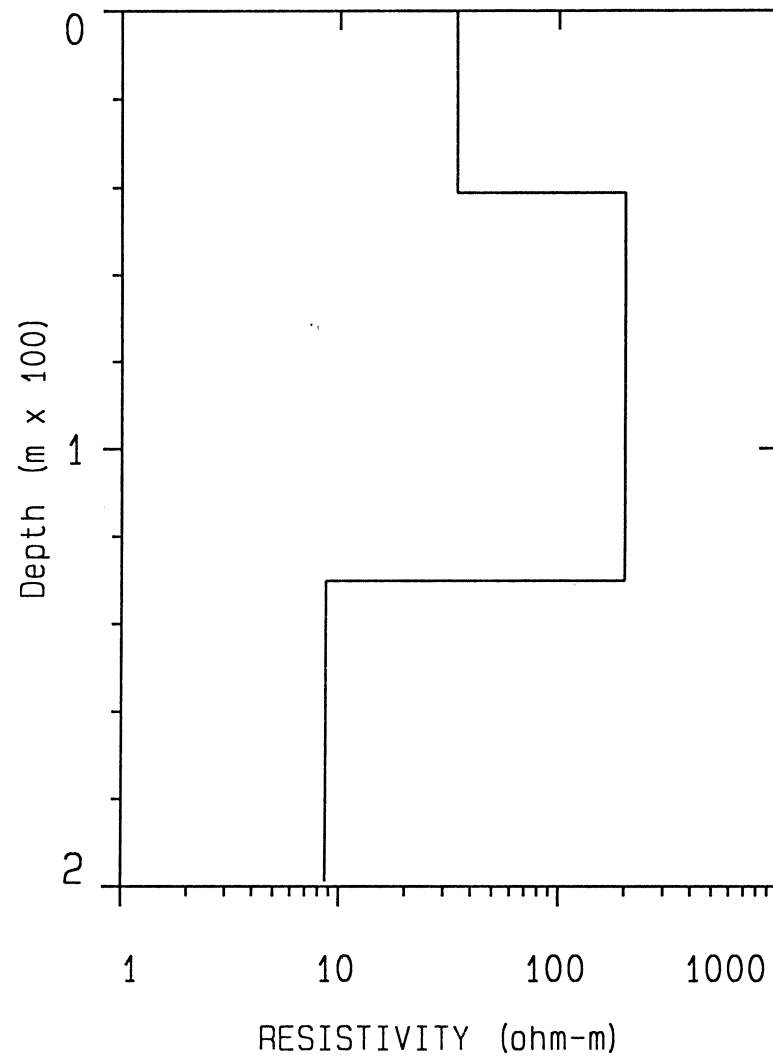
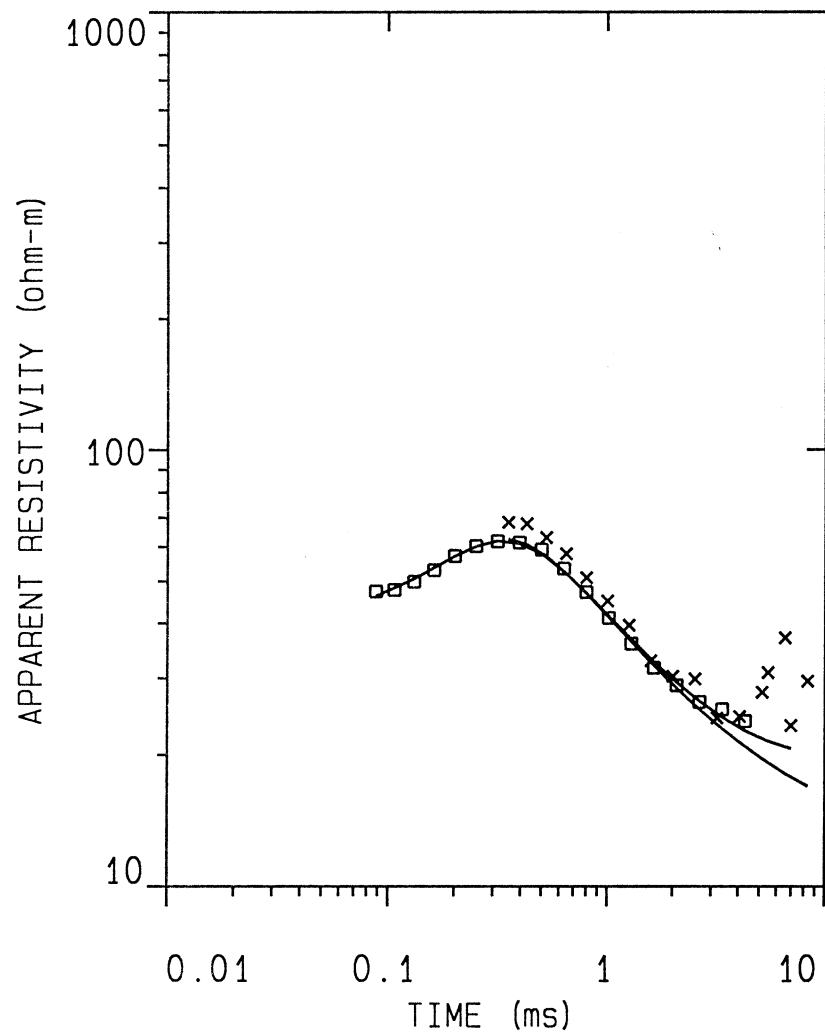
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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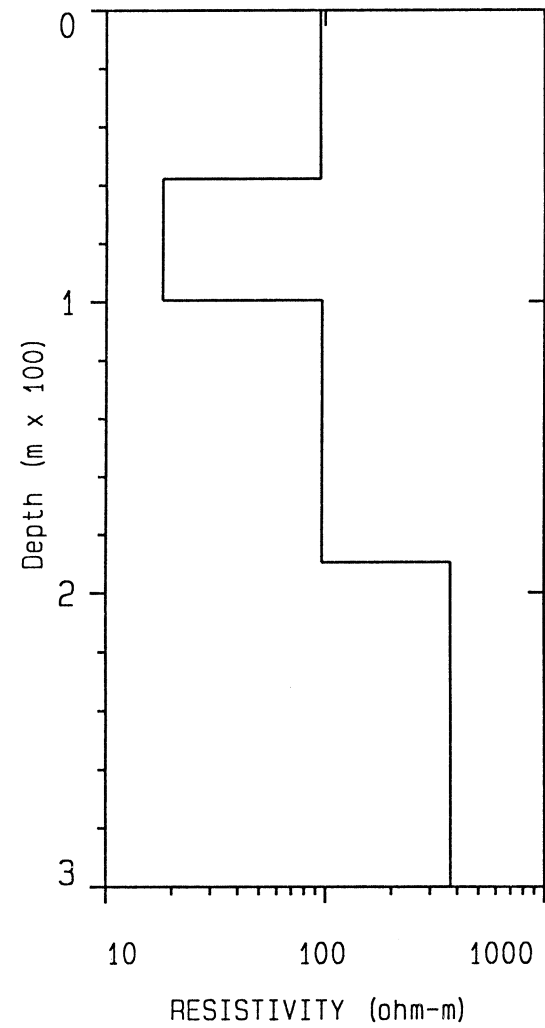
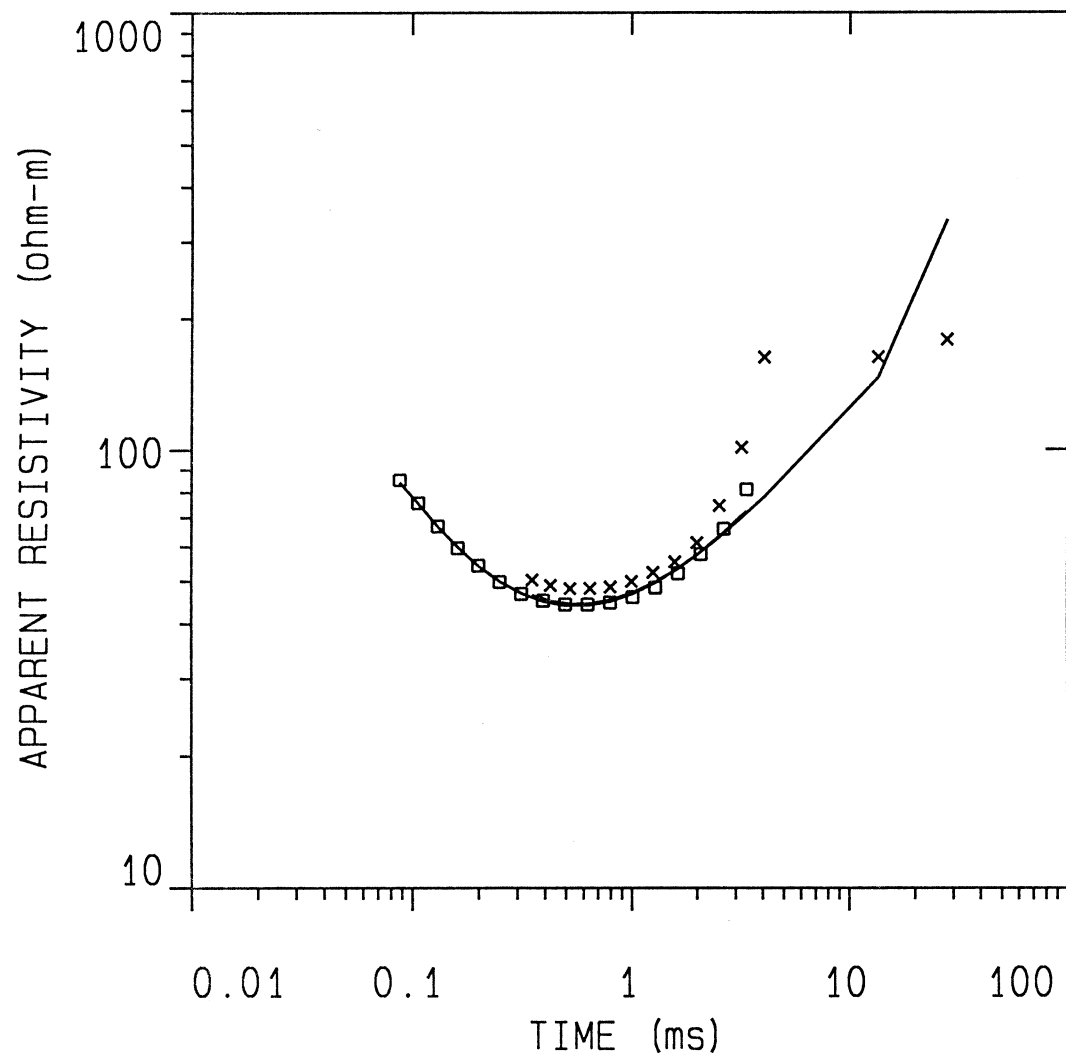
Ruekert & Mielke

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# LINE28



# LINE27





## DATA SET: LINE27

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 27.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 4.640 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	95.11	57.78	-57.78	0.607
2	18.17	41.63	-99.41	2.29
3	96.67	90.11	-189.5	0.932
4	373.1			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	14543.7	14803.7	-1.78
2	0.106	10758.9	10808.4	-0.459
3	0.131	7752.5	7767.9	-0.198
4	0.161	5455.6	5423.4	0.588
5	0.200	3670.9	3677.7	-0.183
6	0.250	2391.5	2383.1	0.350
7	0.314	1491.6	1486.1	0.365
8	0.395	885.4	890.5	-0.576
9	0.499	508.9	513.5	-0.918
10	0.631	283.8	285.6	-0.629
11	0.799	154.7	153.5	0.747
12	1.01	81.82	79.84	2.42

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	41.87	40.36	3.59
14	1.63	20.58	19.81	3.71
15	2.08	9.69	9.50	1.98
16	2.64	4.34	4.46	-2.85
17	3.37	1.73	2.05	-18.83

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
18	0.352	1091.0	1230.1	-12.74 MASKED
19	0.427	703.2	793.3	-12.80 MASKED
20	0.525	431.6	485.8	-12.56 MASKED
21	0.647	255.2	286.6	-12.33 MASKED
22	0.802	147.5	163.2	-10.62 MASKED
23	1.00	80.97	88.62	-9.44 MASKED
24	1.25	42.73	46.52	-8.87 MASKED
25	1.58	22.12	23.67	-7.00 MASKED
26	1.99	10.64	11.69	-9.85 MASKED
27	2.52	4.41	5.67	-28.66 MASKED
28	3.19	1.53	2.68	-74.63 MASKED
29	4.05	0.415	1.26	-203.3 MASKED
30	13.49	0.0205	0.0242	-17.66 MASKED
31	27.92	0.00291	0.00113	61.15 MASKED

CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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## DATA SET: LINE28

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 28.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 3.217 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	34.17	41.11	-41.11	1.20
2	199.8	88.98	-130.0	0.445
3	8.67			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	35117.3	36340.7	-3.48
2	0.106	21401.6	21073.9	1.53
3	0.131	11992.1	11726.1	2.21
4	0.161	6472.1	6349.7	1.89
5	0.200	3388.6	3399.8	-0.331
6	0.250	1798.0	1802.7	-0.261
7	0.314	983.0	979.0	0.406
8	0.395	557.8	563.5	-1.01
9	0.499	330.0	340.5	-3.18
10	0.631	213.2	218.1	-2.33
11	0.799	142.3	142.9	-0.378
12	1.01	96.30	95.04	1.30
13	1.28	65.14	62.80	3.58

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	43.22	41.22	4.64
15	2.08	27.21	26.56	2.38
16	2.64	16.98	16.87	0.650
17	3.37	9.83	10.46	-6.38
18	4.29	5.89	6.36	-7.96
19	5.47	2.18	3.77	-72.25 MASKED
20	6.97	1.81	2.18	-20.02 MASKED

CURRENT: 22.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 7 RAMP TIME: 57.00 muSEC

## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	692.0	789.3	-14.06 MASKED
22	0.427	432.3	509.4	-17.83 MASKED
23	0.525	288.5	334.2	-15.83 MASKED
24	0.647	193.8	226.9	-17.05 MASKED
25	0.802	137.1	155.5	-13.37 MASKED
26	1.00	94.45	106.7	-13.02 MASKED
27	1.25	65.07	72.62	-11.60 MASKED
28	1.58	48.44	49.05	-1.25 MASKED
29	1.99	30.60	32.57	-6.45 MASKED
30	2.52	17.40	21.39	-22.92 MASKED
31	3.19	13.12	13.81	-5.25 MASKED
32	4.05	7.16	8.79	-22.64 MASKED
33	5.14	3.25	5.50	-69.34 MASKED
34	6.54	1.16	3.40	-192.3 MASKED
35	8.32	0.896	2.06	-130.0 MASKED

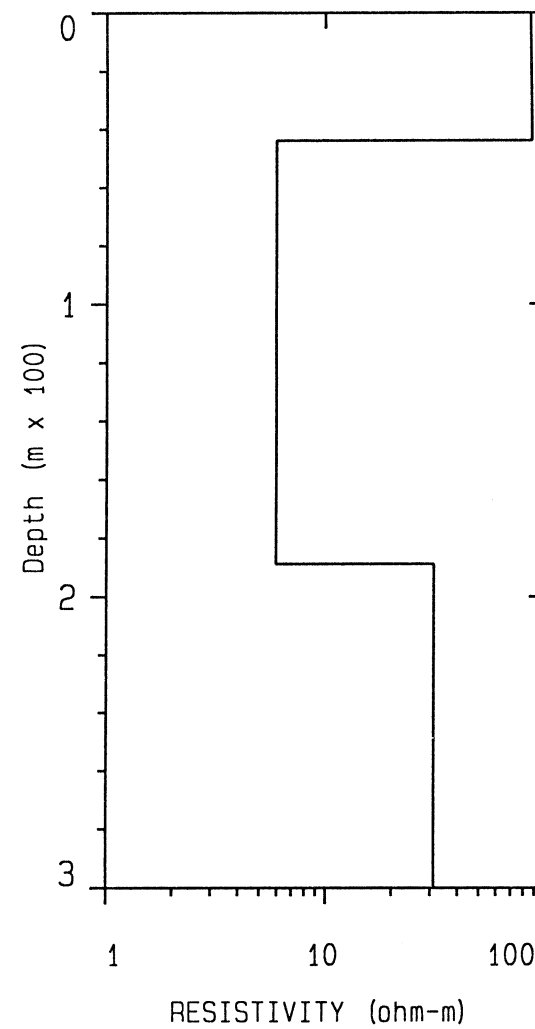
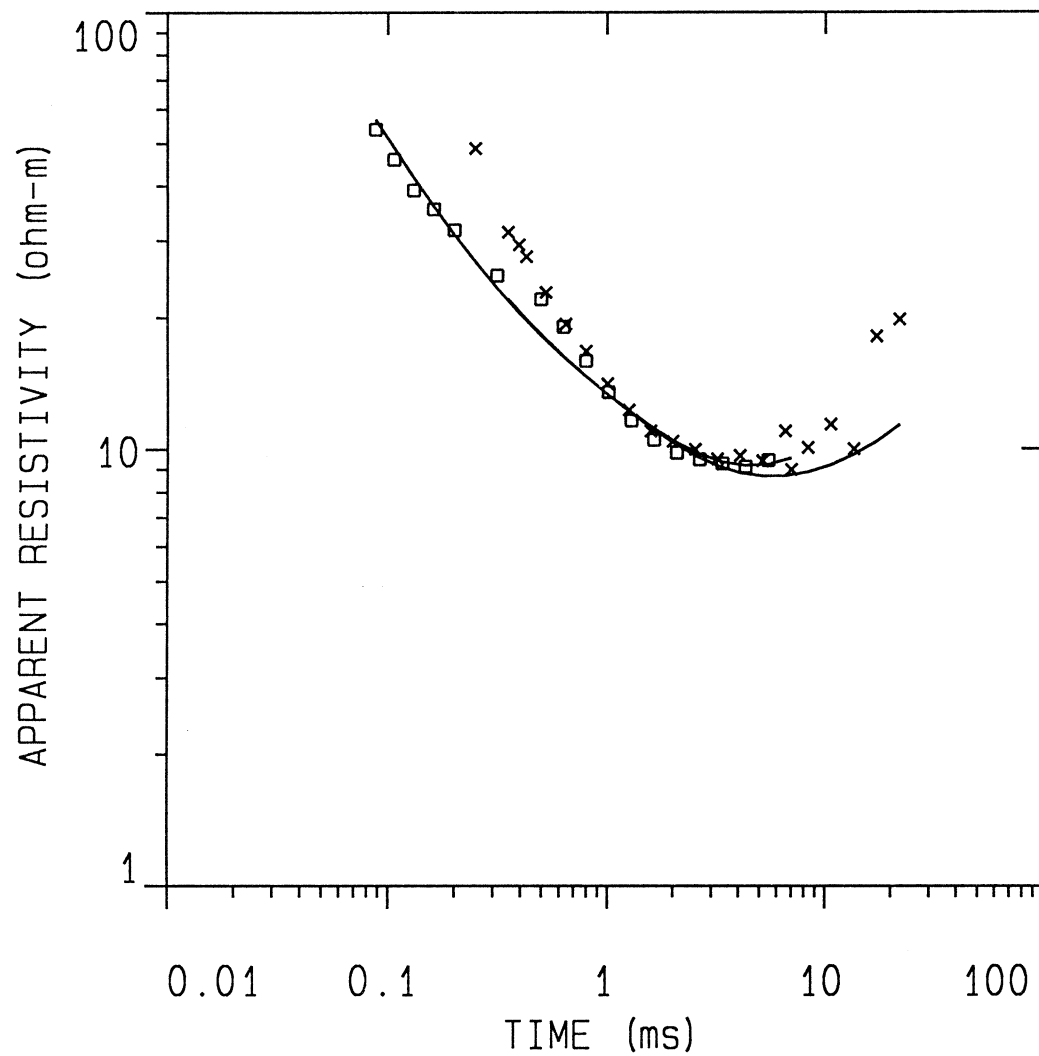
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert &amp; Mielke

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# LINE29



## DATA SET: LINE29

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 29.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 11.853 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	87.06	43.91	-43.91	0.504
2	5.94	144.9	-188.8	24.37
3	31.14			

ALL PARAMETERS ARE FREE

CURRENT: 21.10 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf DATA (nV/m)	sqr(d) SYNTHETIC	DIFFERENCE (percent)	
1	0.0881	29105.0	26894.8	7.59	
2	0.106	22791.0	20754.3	8.93	
3	0.131	17355.0	15719.5	9.42	
4	0.161	11926.7	11689.2	1.99	
5	0.200	8255.4	8546.1	-3.52	
6	0.250	2483.4	6082.0	-144.9	MASKED
7	0.314	3842.2	4241.1	-10.38	
8	0.395	1697.9	2898.1	-70.69	MASKED
9	0.499	1456.1	1939.8	-33.22	
10	0.631	1006.1	1276.3	-26.85	
11	0.799	728.7	826.2	-13.38	
12	1.01	516.5	527.4	-2.11	
13	1.28	356.1	333.3	6.41	

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	227.4	207.7	8.66
15	2.08	137.9	127.4	7.64
16	2.64	79.73	76.37	4.21
17	3.37	45.03	44.35	1.50
18	4.29	25.15	24.91	0.962
19	5.47	13.05	13.46	-3.13
20	6.97	7.65	6.99	8.59 MASKED

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	2215.8	3746.0	-69.05 MASKED
22	0.427	1657.3	2713.0	-63.69 MASKED
23	0.525	1317.1	1902.8	-44.46 MASKED
24	0.647	999.4	1309.2	-31.00 MASKED
25	0.802	724.3	883.9	-22.02 MASKED
26	1.00	536.4	582.4	-8.58 MASKED
27	1.25	375.3	378.4	-0.830 MASKED
28	1.58	249.1	242.3	2.73 MASKED
29	1.99	150.9	152.5	-1.06 MASKED
30	2.52	89.68	94.09	-4.91 MASKED
31	3.19	53.56	56.47	-5.43 MASKED
32	4.05	28.80	32.93	-14.33 MASKED
33	5.14	16.52	18.60	-12.63 MASKED
34	6.54	7.18	10.20	-42.02 MASKED
35	8.32	4.48	5.42	-20.87 MASKED
36	10.59	2.04	2.81	-37.54 MASKED
37	13.49	1.35	1.41	-4.28 MASKED
38	17.19	0.303	0.695	-129.3 MASKED
39	21.90	0.144	0.333	-129.9 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.08  
 P 2 -0.02 0.99  
 P 3 -0.03 -0.01 0.16  
 T 1 0.08 0.01 0.01 0.99

T 2	-0.05	-0.02	-0.15	0.01	0.93
	P 1	P 2	P 3	T 1	T 2

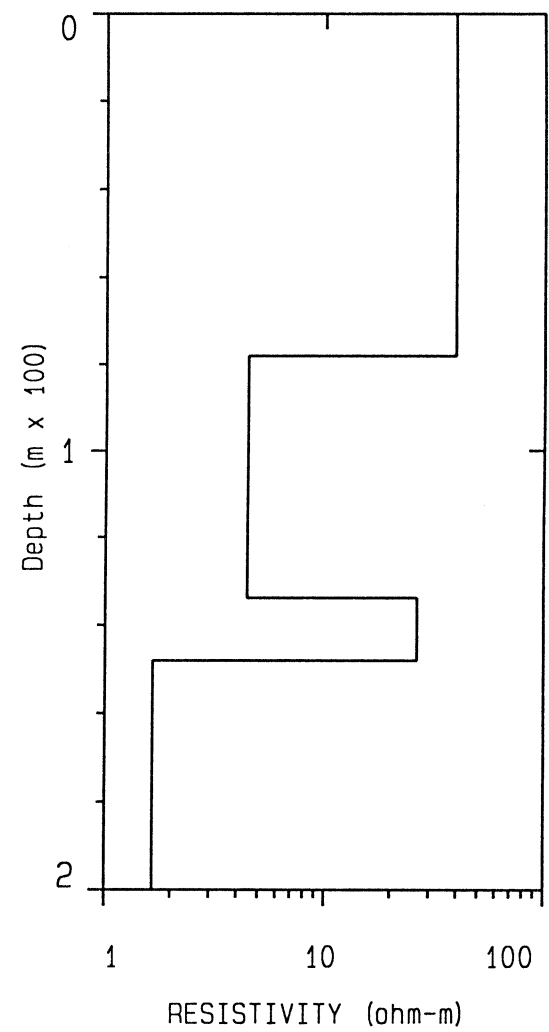
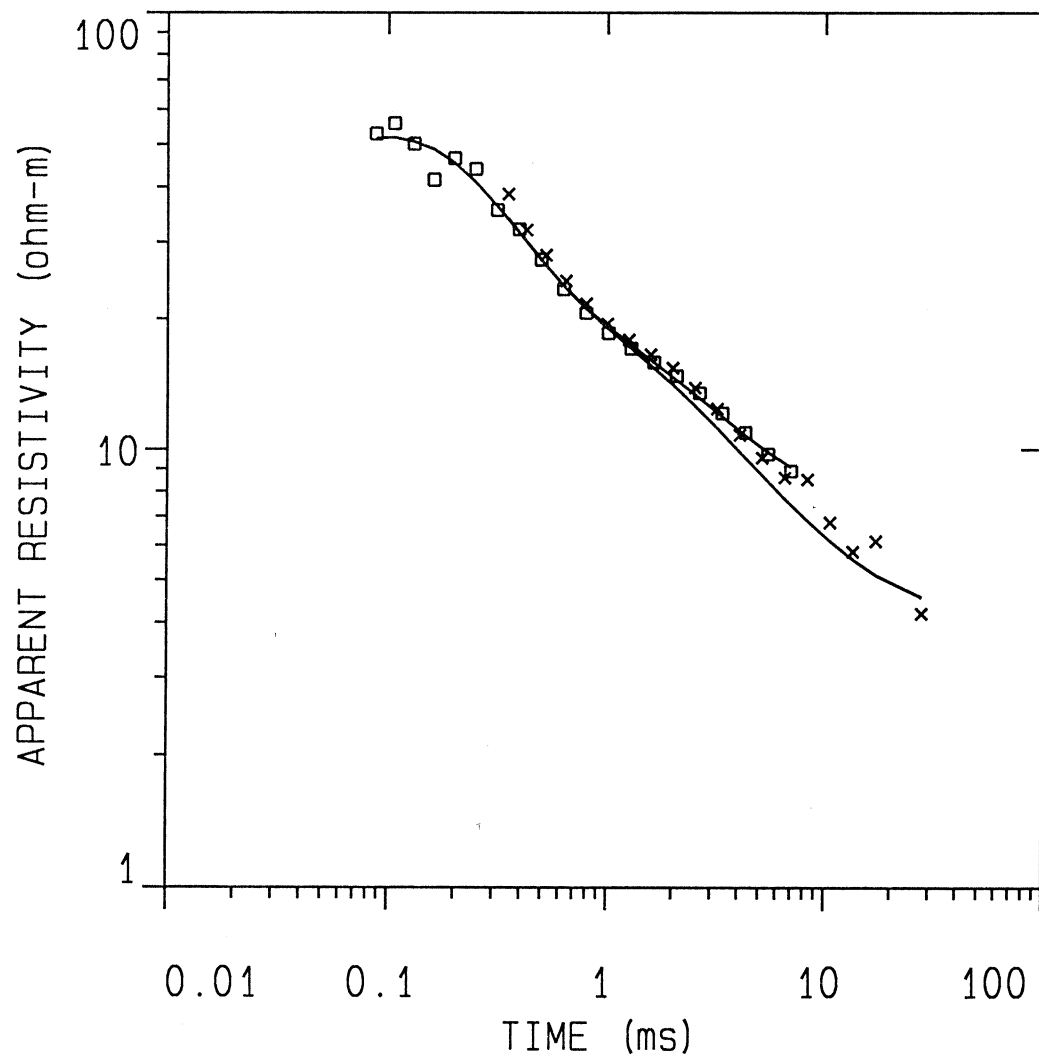
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Ruekert &amp; Mielke

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# LINE30



## DATA SET: LINE30

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 30.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 7.106 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	39.33	78.11	-78.11	1.98
2	4.44	55.71	-133.8	12.54
3	26.42	14.18	-148.0	0.536
4	1.65			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	29795.9	30790.4	-3.33
2	0.106	16972.5	18921.5	-11.48
3	0.131	11903.9	11705.8	1.66
4	0.161	9336.4	7359.7	21.17
5	0.200	4620.5	4788.0	-3.62
6	0.250	2878.7	3194.0	-10.95
7	0.314	2251.6	2189.5	2.75
8	0.395	1475.4	1515.4	-2.71
9	0.499	1045.4	1047.4	-0.187
10	0.631	731.8	710.7	2.89
11	0.799	491.3	470.6	4.22
12	1.01	318.8	304.0	4.65

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	198.7	193.1	2.83
14	1.63	121.3	121.6	-0.188
15	2.08	74.32	76.60	-3.07
16	2.64	46.55	48.55	-4.29
17	3.37	29.93	30.77	-2.80
18	4.29	19.07	19.47	-2.07
19	5.47	12.36	12.17	1.49
20	6.97	7.72	7.48	3.09

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1621.6	1960.0	-20.86 MASKED
22	0.427	1326.6	1448.6	-9.19 MASKED
23	0.525	968.1	1047.5	-8.20 MASKED
24	0.647	699.2	741.0	-5.96 MASKED
25	0.802	489.2	511.6	-4.59 MASKED
26	1.00	329.9	342.3	-3.75 MASKED
27	1.25	213.1	224.9	-5.55 MASKED
28	1.58	134.8	146.7	-8.86 MASKED
29	1.99	83.84	95.67	-14.10 MASKED
30	2.52	54.71	63.08	-15.28 MASKED
31	3.19	35.84	41.80	-16.60 MASKED
32	4.05	24.38	27.90	-14.43 MASKED
33	5.14	16.11	18.56	-15.15 MASKED
34	6.54	10.37	12.29	-18.44 MASKED
35	8.32	5.77	8.02	-38.93 MASKED
36	10.59	4.46	5.17	-15.93 MASKED
37	13.49	3.07	3.26	-6.23 MASKED
38	17.19	1.54	2.01	-30.67 MASKED
39	27.92	0.809	0.712	11.98 MASKED

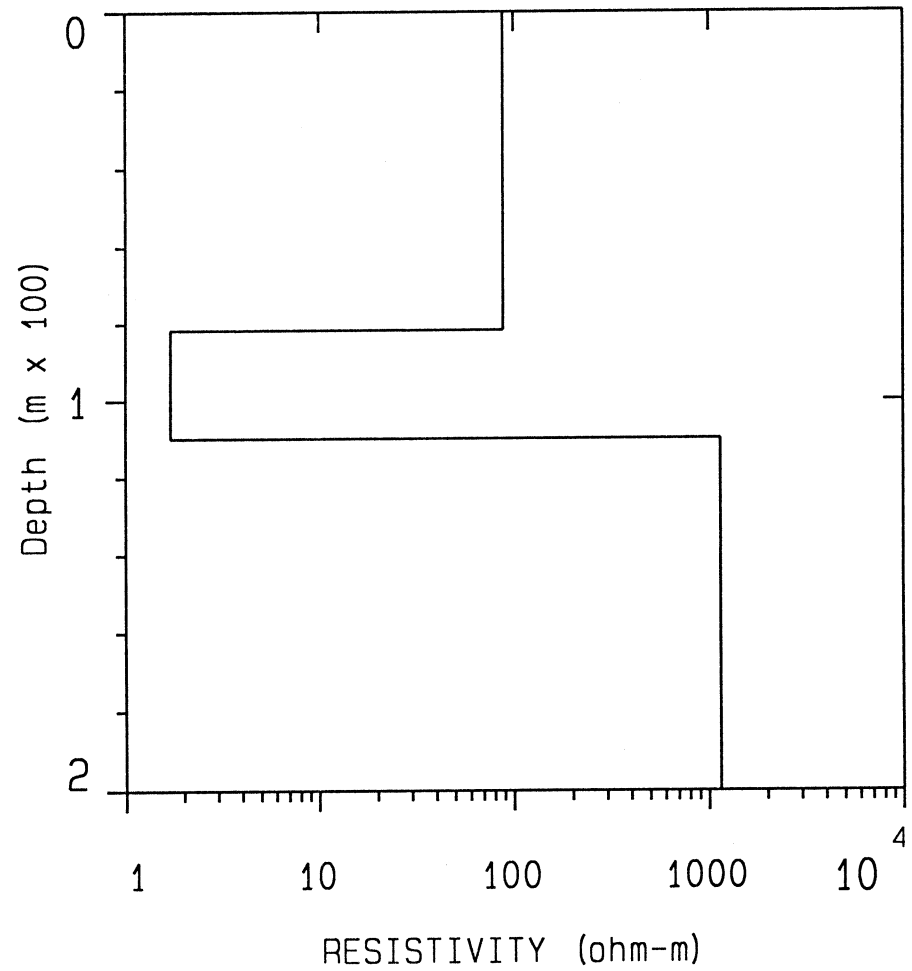
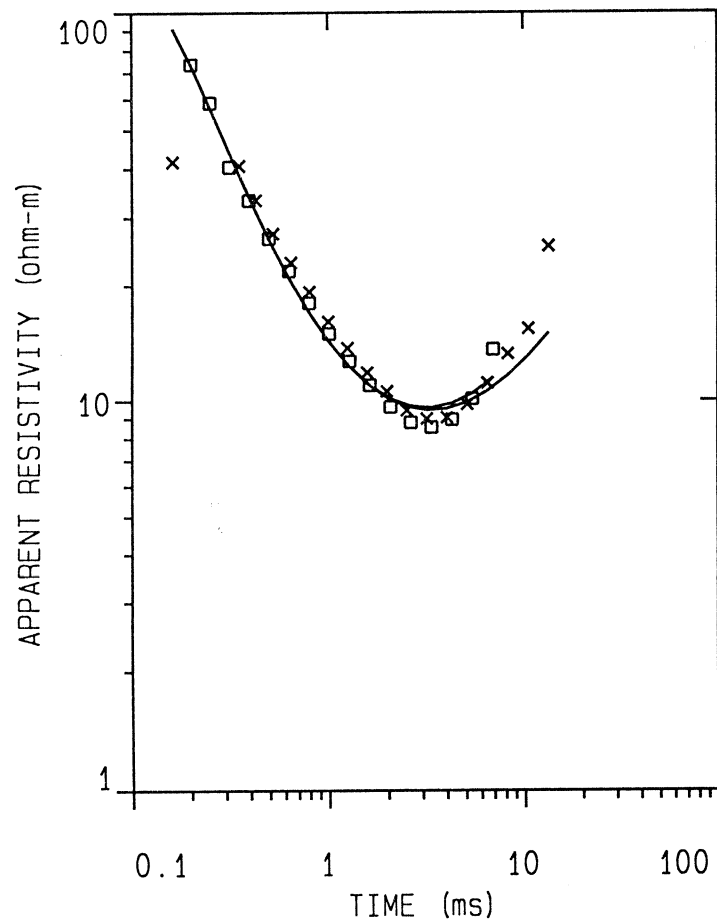
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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# LINE32



## DATA SET: LINE32

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 32.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 11.322 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	88.14	81.64	-81.64	0.926
2	1.70	28.18	-109.8	16.48
3	1145.4			

ALL PARAMETERS ARE FREE

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CURRENT:    21.00 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz       GAIN: 1     RAMP TIME:    50.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.161	9305.5	2876.5	69.08 MASKED
2	0.200	2320.9	2342.1	-0.913
3	0.250	1864.2	1949.1	-4.55
4	0.314	1852.3	1631.5	11.91
5	0.395	1400.5	1360.4	2.86
6	0.499	1097.1	1106.8	-0.878
7	0.631	815.3	870.0	-6.70
8	0.799	604.7	657.0	-8.64
9	1.01	440.2	473.2	-7.51
10	1.28	310.5	325.0	-4.64
11	1.63	211.7	211.6	0.0352
12	2.08	141.1	130.7	7.36
13	2.64	88.68	76.55	13.67

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	3.37	50.59	42.41	16.16
15	4.29	25.77	22.28	13.55
16	5.47	11.67	11.11	4.83
17	6.97	4.08	5.26	-28.88

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
18	0.352	1509.0	1625.4	-7.71 MASKED
19	0.427	1261.7	1389.6	-10.13 MASKED
20	0.525	1016.1	1150.4	-13.21 MASKED
21	0.647	777.6	924.0	-18.82 MASKED
22	0.802	592.3	714.9	-20.69 MASKED
23	1.00	444.1	526.7	-18.60 MASKED
24	1.25	320.0	370.5	-15.78 MASKED
25	1.58	224.3	247.8	-10.46 MASKED
26	1.99	148.7	157.3	-5.73 MASKED
27	2.52	98.29	94.94	3.40 MASKED
28	3.19	58.68	54.35	7.38 MASKED
29	4.05	32.10	29.61	7.76 MASKED
30	5.14	15.69	15.37	2.01 MASKED
31	6.54	7.11	7.63	-7.29 MASKED
32	8.32	2.99	3.63	-21.39 MASKED
33	10.59	1.30	1.66	-27.55 MASKED
34	13.49	0.340	0.740	-117.6 MASKED

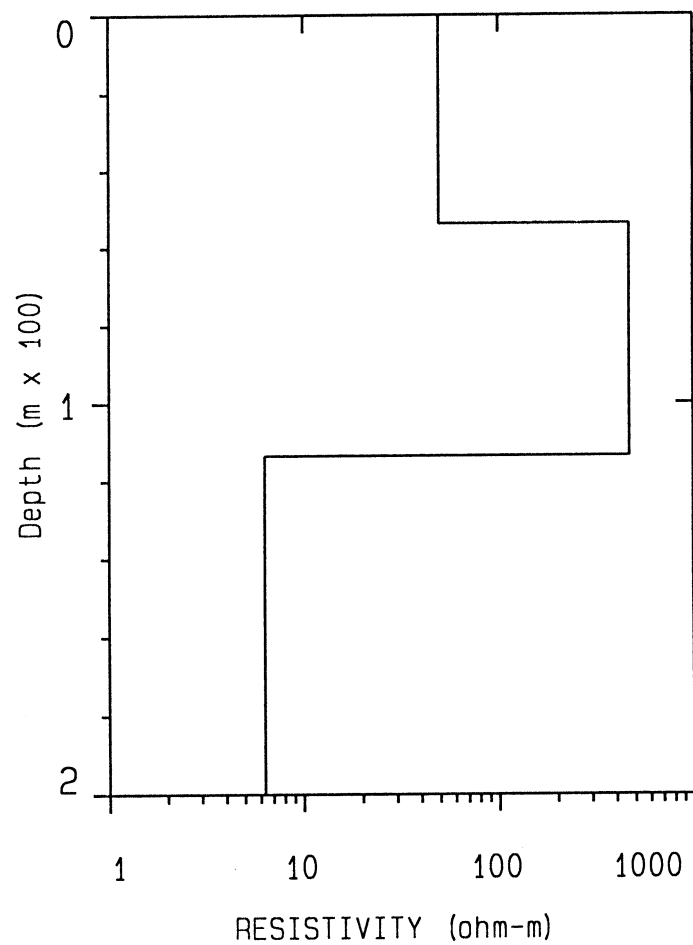
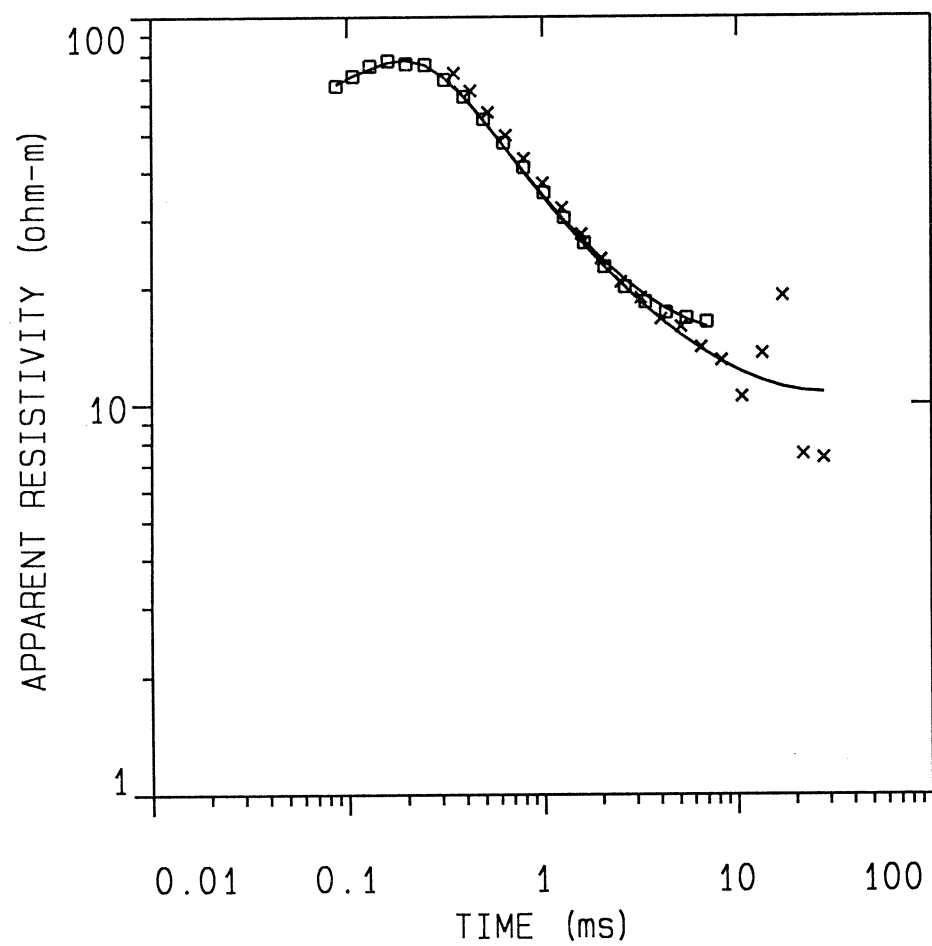
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE33



## DATA SET: LINE33

CLIENT: Any Interested Party                      DATE: 01-DEC-92  
 LOCATION: Investigation Site                      SOUNDING: 2  
 COUNTY: Jefferson County, Colorado              ELEVATION: 0.00 m  
 PROJECT: California Demonstration Data          EQUIPMENT: Geonics PROTEM  
 LOOP SIZE: 50.000 m by 50.000 m              AZIMUTH:  
 COIL LOC: 0.000 m (X), 0.000 m (Y)          TIME CONSTANT: NONE  
 SOUNDING COORDINATES: E: 1.0000 N: 33.0000 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 3.123 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	49.60	53.81	-53.81	1.08
2	469.6	59.66	-113.4	0.127
3	6.31			

ALL PARAMETERS ARE FREE

CURRENT: 21.10 AMPS    EM-58    COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz    GAIN: 1    RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	20972.4	20752.3	1.04
2	0.106	11910.9	11869.8	0.344
3	0.131	6518.9	6687.7	-2.58
4	0.161	3691.0	3739.2	-1.30
5	0.200	2217.3	2150.7	3.00
6	0.250	1281.0	1285.1	-0.319
7	0.314	827.6	814.7	1.56
8	0.395	542.4	543.8	-0.246
9	0.499	370.9	375.8	-1.33
10	0.631	255.0	261.6	-2.56
11	0.799	176.4	182.8	-3.64
12	1.01	122.0	125.8	-3.09
13	1.28	84.29	85.89	-1.90

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	58.28	57.28	1.72
15	2.08	39.56	37.69	4.70
16	2.64	25.86	24.21	6.35
17	3.37	16.16	15.23	5.71
18	4.29	9.68	9.35	3.49
19	5.47	5.54	5.59	-0.908
20	6.97	3.12	3.25	-4.12

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	640.5	712.5	-11.25 MASKED
22	0.427	462.3	519.7	-12.41 MASKED
23	0.525	335.8	378.1	-12.60 MASKED
24	0.647	244.5	275.2	-12.56 MASKED
25	0.802	175.9	199.7	-13.48 MASKED
26	1.00	125.7	141.5	-12.57 MASKED
27	1.25	88.96	99.32	-11.64 MASKED
28	1.58	63.79	68.21	-6.92 MASKED
29	1.99	44.36	46.24	-4.23 MASKED
30	2.52	30.40	30.74	-1.10 MASKED
31	3.19	19.39	20.14	-3.86 MASKED
32	4.05	12.91	12.95	-0.285 MASKED
33	5.14	7.61	8.19	-7.68 MASKED
34	6.54	5.01	5.09	-1.66 MASKED
35	8.32	3.08	3.12	-1.19 MASKED
36	10.59	2.33	1.87	19.71 MASKED
37	13.49	0.867	1.10	-27.37 MASKED
38	17.19	0.283	0.638	-124.9 MASKED
39	21.90	0.631	0.360	42.90 MASKED
40	27.92	0.356	0.199	44.15 MASKED

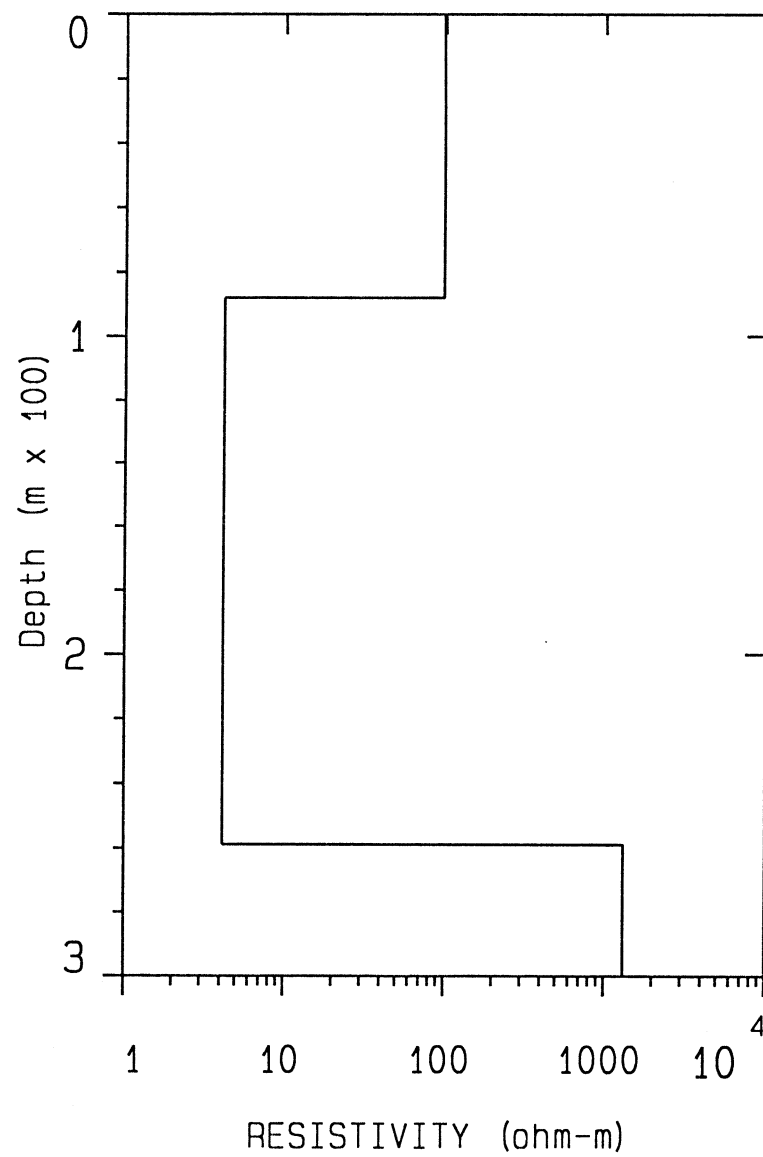
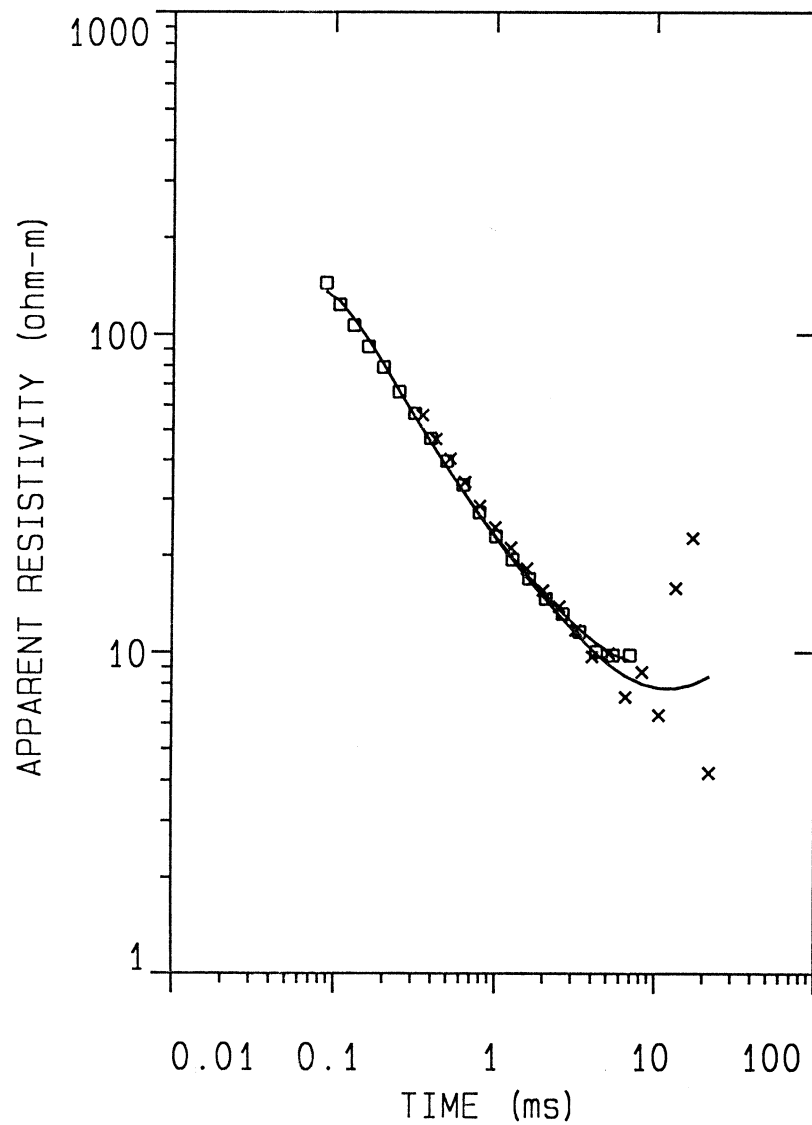
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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# LINE35



CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 35.0000	SLOPE: NONE

FITTING ERROR: 5.047 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	97.94	87.90	-87.90	0.897
2	4.15	170.8	-258.7	41.11
3	1318.3			

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CURRENT:    21.00 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:  30.00 Hz      GAIN: 1    RAMP TIME:    50.00 muSEC

```

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	6565.3	7182.7	-9.40
2	0.106	5111.5	4912.0	3.90
3	0.131	3822.1	3561.8	6.81
4	0.161	2851.1	2651.4	7.00
5	0.200	2086.0	2016.4	3.33
6	0.250	1556.6	1533.4	1.49
7	0.314	1121.3	1157.1	-3.19
8	0.395	832.7	865.2	-3.90
9	0.499	598.2	637.8	-6.62
10	0.631	433.1	462.8	-6.85
11	0.799	323.7	330.6	-2.14
12	1.01	231.3	231.6	-0.130
13	1.28	163.8	159.6	2.56

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	110.3	108.0	2.02
15	2.08	75.00	72.26	3.65
16	2.64	48.28	47.74	1.12
17	3.37	31.97	31.07	2.81
18	4.29	21.64	19.74	8.79
19	5.47	12.25	12.12	1.05
20	6.97	6.69	7.11	-6.32

CURRENT: 22.70 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	930.5	1076.4	-15.67 MASKED
22	0.427	746.1	844.1	-13.13 MASKED
23	0.525	555.4	645.0	-16.11 MASKED
24	0.647	426.4	485.2	-13.79 MASKED
25	0.802	323.7	358.8	-10.82 MASKED
26	1.00	233.3	258.6	-10.82 MASKED
27	1.25	165.2	183.2	-10.91 MASKED
28	1.58	116.3	127.5	-9.65 MASKED
29	1.99	82.08	87.70	-6.85 MASKED
30	2.52	54.47	59.72	-9.62 MASKED
31	3.19	38.80	40.19	-3.58 MASKED
32	4.05	28.56	26.57	6.98 MASKED
33	5.14	15.14	17.10	-12.90 MASKED
34	6.54	13.33	10.62	20.36 MASKED
35	8.32	5.58	6.33	-13.53 MASKED
36	10.59	4.86	3.62	25.47 MASKED
37	13.49	0.676	1.98	-193.0 MASKED
38	17.19	0.215	1.03	-382.6 MASKED
39	21.90	1.46	0.520	64.44 MASKED

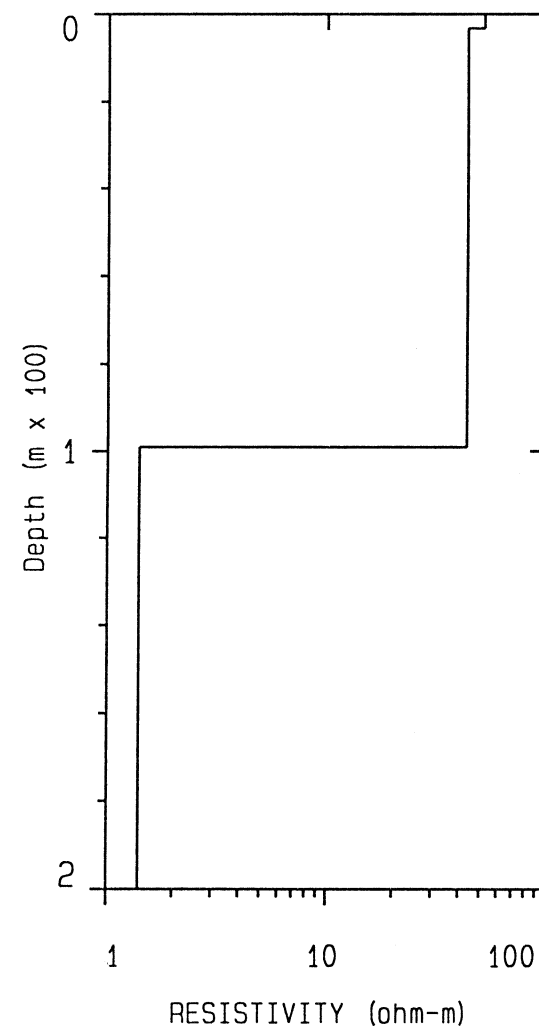
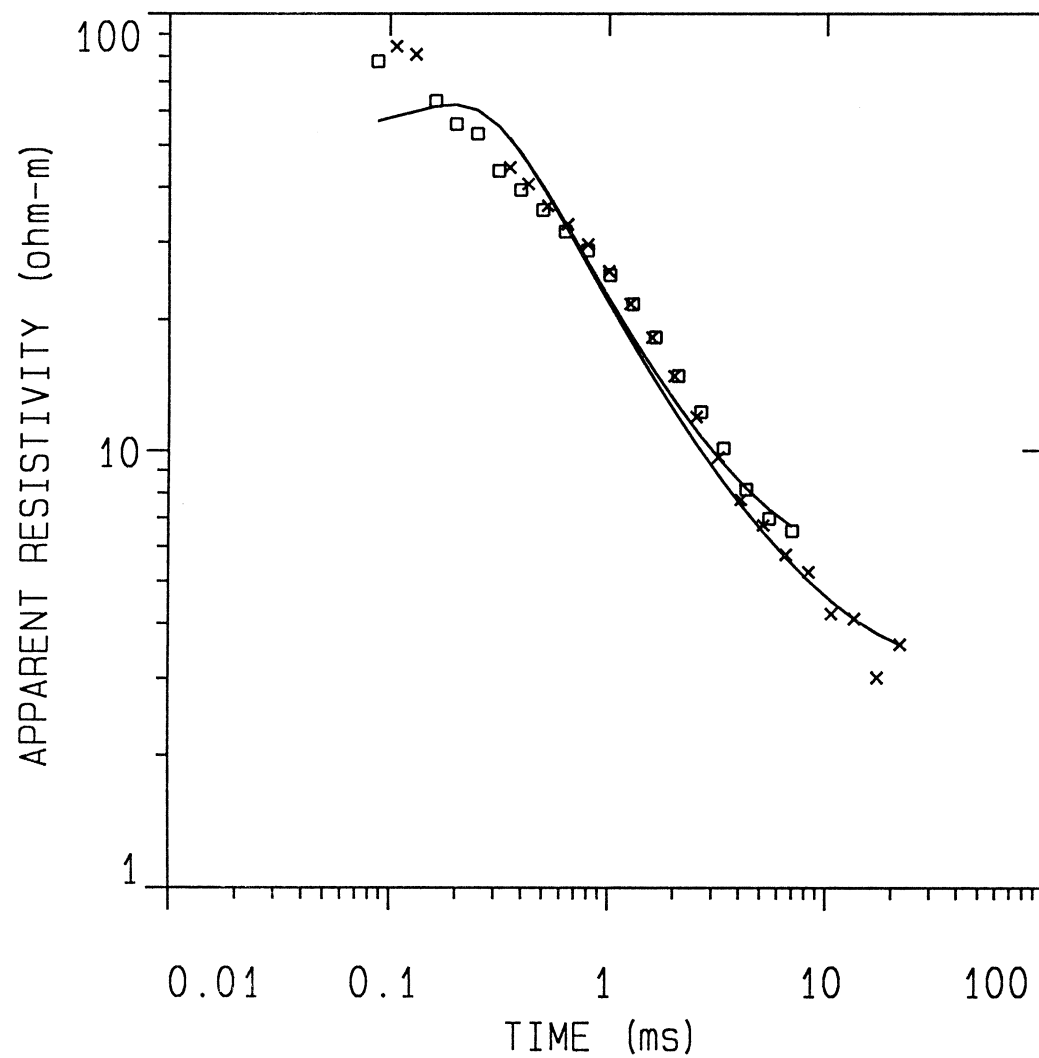
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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# LINE36





No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	98.85	130.4	-31.94
15	2.08	73.52	92.97	-26.44
16	2.64	53.60	64.89	-21.07
17	3.37	39.11	44.19	-12.98
18	4.29	29.61	29.32	0.971
19	5.47	20.38	18.93	7.14
20	6.97	12.28	11.84	3.55

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1312.6	1039.5	20.80 MASKED
22	0.427	924.9	787.0	14.90 MASKED
23	0.525	658.0	604.8	8.07 MASKED
24	0.647	451.0	469.3	-4.07 MASKED
25	0.802	309.4	364.3	-17.72 MASKED
26	1.00	218.3	279.4	-28.02 MASKED
27	1.25	159.9	212.1	-32.68 MASKED
28	1.58	117.2	158.7	-35.44 MASKED
29	1.99	88.91	116.9	-31.51 MASKED
30	2.52	68.40	84.78	-23.96 MASKED
31	3.19	52.16	60.34	-15.68 MASKED
32	4.05	40.55	42.18	-4.02 MASKED
33	5.14	27.34	28.93	-5.80 MASKED
34	6.54	18.98	19.44	-2.41 MASKED
35	8.32	11.93	12.79	-7.17 MASKED
36	10.59	9.09	8.23	9.49 MASKED
37	13.49	5.16	5.16	-0.031MASKED
38	17.19	4.47	3.16	29.23 MASKED
39	21.90	1.88	1.89	-0.364MASKED

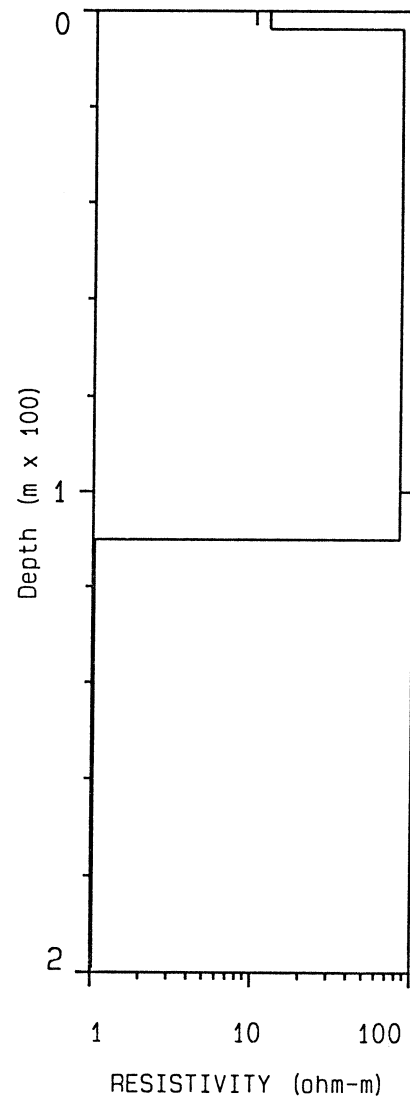
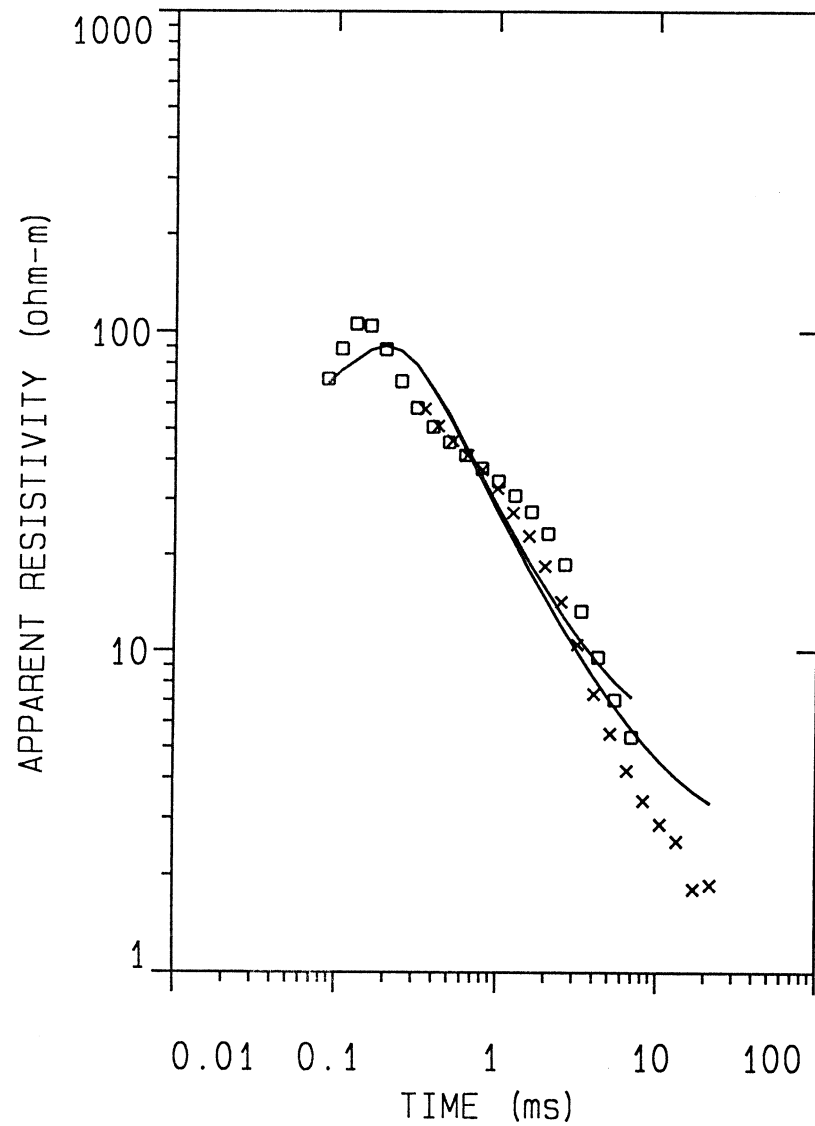
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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# LINE37





## DATA SET: LINE37

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 37.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 43.060 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	12.18	3.71	-3.71	0.305
2	82.91	106.3	-110.0	1.28
3	1.02			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	18884.6	19735.2	-4.50
2	0.106	8461.7	10635.9	-25.69
3	0.131	3889.4	5717.8	-47.00
4	0.161	2347.6	3037.1	-29.37
5	0.200	1761.9	1699.3	3.55
6	0.250	1421.8	1026.5	27.80
7	0.314	1071.2	676.6	36.83
8	0.395	740.1	488.8	33.94
9	0.499	487.8	357.4	26.72
10	0.631	312.7	281.1	10.11
11	0.799	199.9	216.3	-8.22
12	1.01	127.1	168.4	-32.52
13	1.28	81.97	127.0	-54.96

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	53.63	96.64	-80.19
15	2.08	37.34	70.60	-89.02
16	2.64	28.69	51.31	-78.79
17	3.37	26.01	36.20	-39.14
18	4.29	23.38	24.79	-6.03
19	5.47	20.22	16.64	17.68
20	6.97	16.41	10.74	34.52

CURRENT: 22.70 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	880.1	622.2	29.29 MASKED
22	0.427	652.4	482.0	26.12 MASKED
23	0.525	457.6	375.4	17.95 MASKED
24	0.647	317.5	306.5	3.44 MASKED
25	0.802	218.0	243.5	-11.70 MASKED
26	1.00	152.5	194.9	-27.76 MASKED
27	1.25	113.0	151.5	-34.07 MASKED
28	1.58	82.03	118.7	-44.79 MASKED
29	1.99	63.99	89.74	-40.24 MASKED
30	2.52	52.48	68.12	-29.79 MASKED
31	3.19	46.12	50.10	-8.63 MASKED
32	4.05	43.36	36.42	16.00 MASKED
33	5.14	36.61	25.94	29.12 MASKED
34	6.54	30.02	18.05	39.85 MASKED
35	8.32	22.67	12.34	45.58 MASKED
36	10.59	15.99	8.21	48.65 MASKED
37	13.49	10.47	5.33	49.04 MASKED
38	17.19	9.52	3.37	64.55 MASKED
39	21.90	4.96	2.07	58.20 MASKED

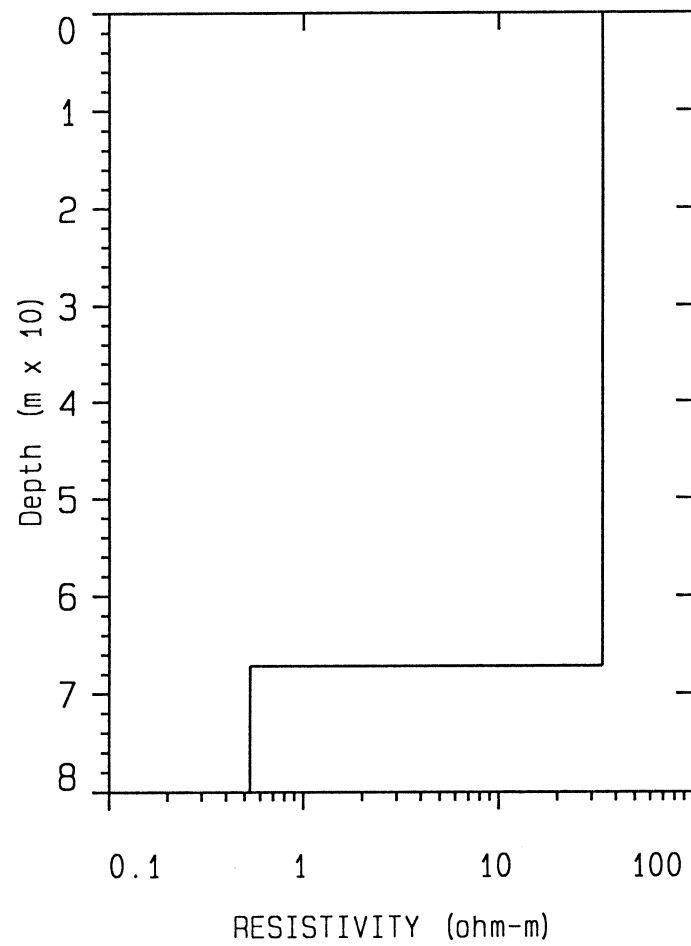
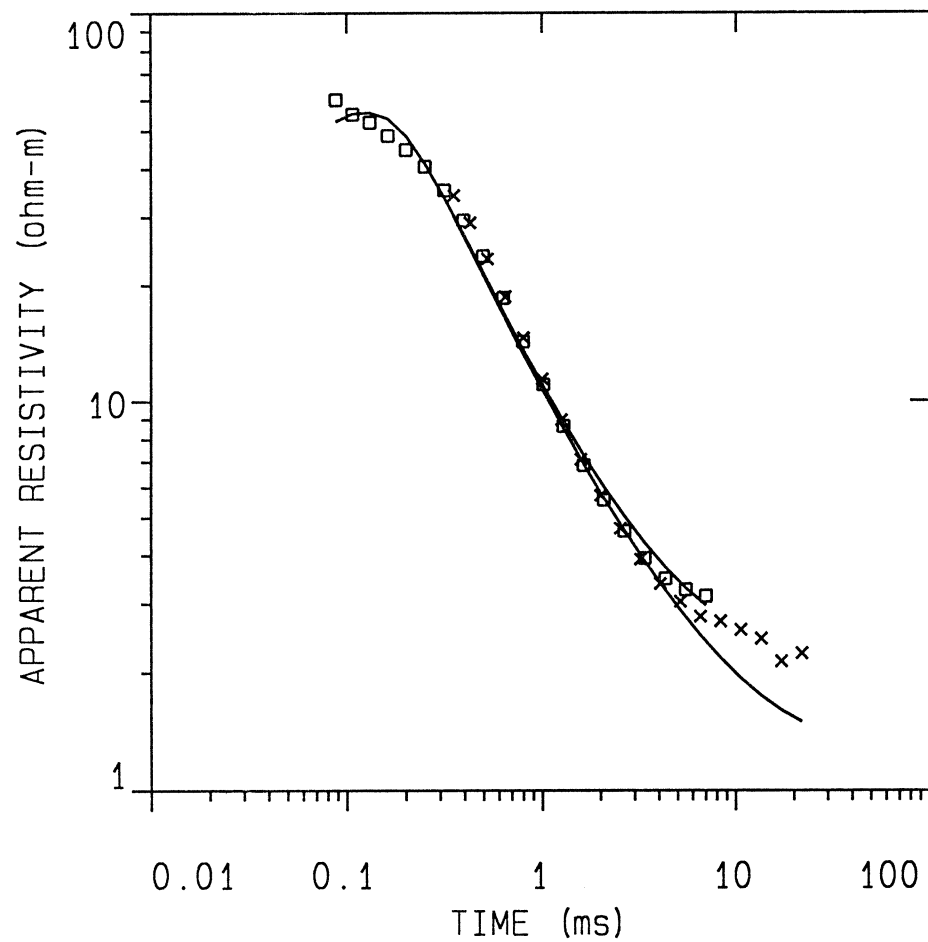
CURRENT RESOLUTION MATRIX NOT AVAILABLE

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Ruekert & Mielke

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# LINE38



## DATA SET: LINE38

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 38.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 11.069 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
1	34.07	67.12	0.0 -67.12	1.96
2	0.532			

ALL PARAMETERS ARE FREE

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CURRENT:    21.10 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 1      RAMP TIME:    51.00 muSEC

```

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	24679.1	29868.6	-21.02
2	0.106	17327.9	17255.9	0.415
3	0.131	11110.7	10213.1	8.07
4	0.161	7401.4	6368.3	13.95
5	0.200	4914.8	4341.8	11.65
6	0.250	3269.2	3176.9	2.82
7	0.314	2286.4	2430.8	-6.31
8	0.395	1687.1	1910.6	-13.24
9	0.499	1300.8	1505.3	-15.71
10	0.631	1048.1	1179.9	-12.57
11	0.799	854.4	918.8	-7.54
12	1.01	694.6	704.4	-1.40
13	1.28	556.3	533.6	4.07
14	1.63	433.1	396.0	8.56

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
15	2.08	324.9	288.6	11.15
16	2.64	235.0	205.5	12.52
17	3.37	163.5	142.8	12.66
18	4.29	107.1	96.59	9.86
19	5.47	64.45	63.44	1.56
20	6.97	37.10	40.35	-8.75

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	1944.7	2347.4	-20.70 MASKED
22	0.427	1537.2	1938.4	-26.09 MASKED
23	0.525	1271.0	1578.5	-24.19 MASKED
24	0.647	1051.5	1278.7	-21.61 MASKED
25	0.802	884.1	1026.4	-16.10 MASKED
26	1.00	734.0	808.4	-10.13 MASKED
27	1.25	601.3	629.5	-4.68 MASKED
28	1.58	482.1	481.7	0.077 MASKED
29	1.99	372.6	362.9	2.60 MASKED
30	2.52	279.3	268.7	3.79 MASKED
31	3.19	203.7	195.3	4.13 MASKED
32	4.05	139.7	139.2	0.374 MASKED
33	5.14	90.08	97.32	-8.03 MASKED
34	6.54	56.47	66.55	-17.84 MASKED
35	8.32	32.25	44.52	-38.02 MASKED
36	10.59	19.03	29.12	-52.99 MASKED
37	13.49	11.22	18.56	-65.33 MASKED
38	17.19	7.48	11.53	-54.14 MASKED
39	21.90	3.80	6.98	-83.34 MASKED

PARAMETER RESOLUTION MATRIX:  
 "F" INDICATES FIXED PARAMETER

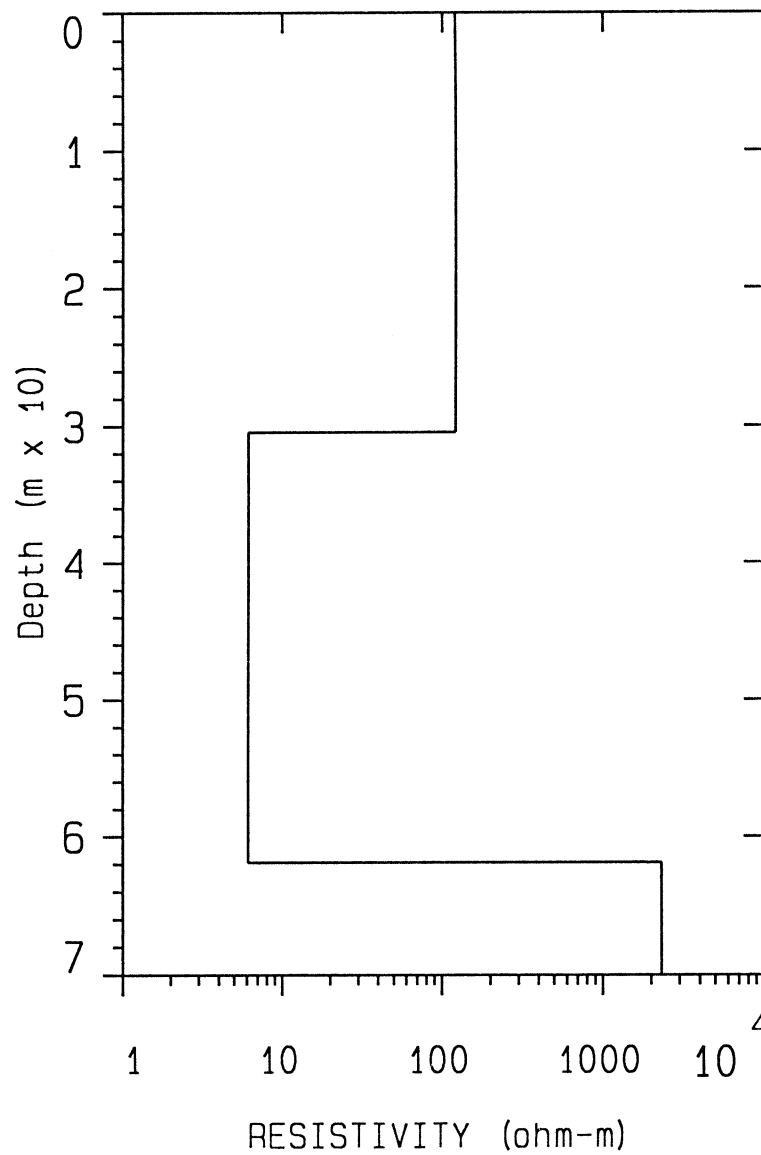
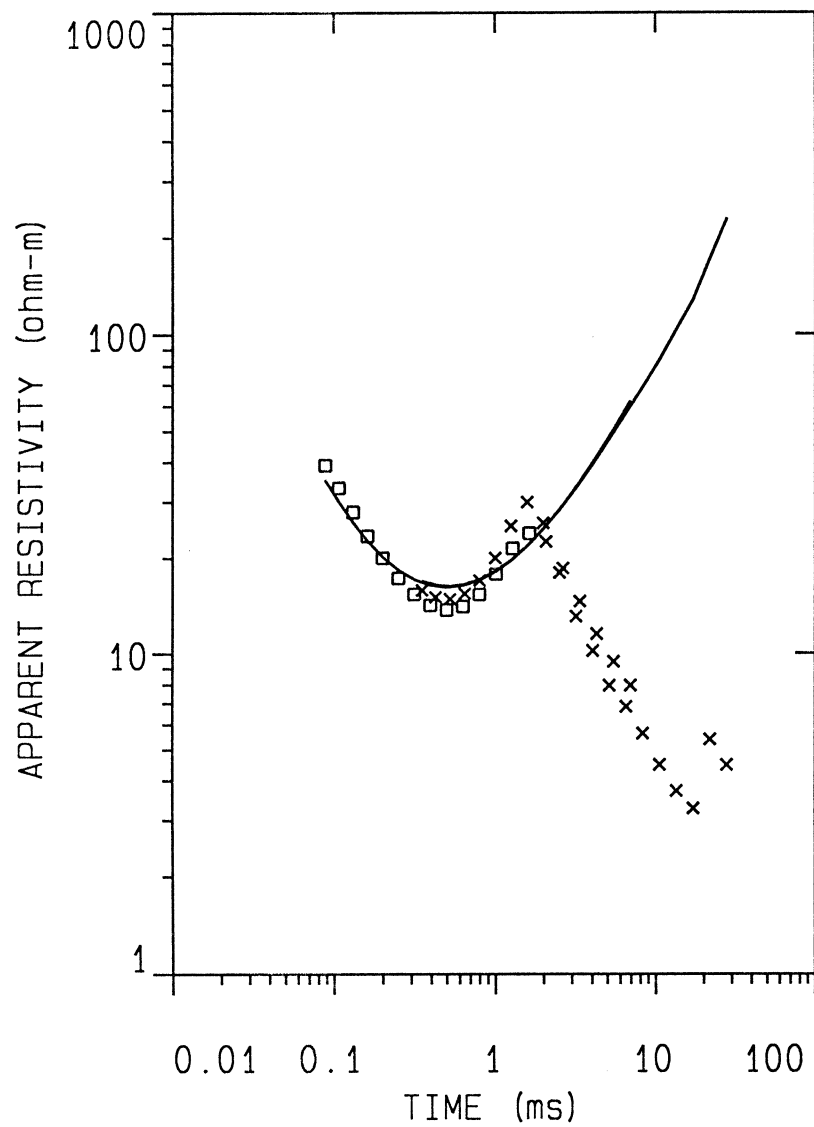
P 1 0.98  
 P 2 -0.01 0.95  
 T 1 0.00 0.00 1.00  
 P 1 P 2 T 1

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Ruekert &amp; Mielke

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# LINE39



## DATA SET: LINE39

CLIENT: Any Interested Party	DATE: 01-DEC-92
LOCATION: Investigation Site	SOUNDING: 2
COUNTY: Jefferson County, Colorado	ELEVATION: 0.00 m
PROJECT: California Demonstration Data	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 39.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 16.097 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	120.1	30.43	-30.43	0.253
2	6.12	31.45	-61.89	5.13
3	2308.1			

ALL PARAMETERS ARE FREE

```

CURRENT:    21.20 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 1      RAMP TIME:    51.00 muSEC

```

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	47239.9	55430.5	-17.33
2	0.106	37331.5	43094.8	-15.43
3	0.131	29030.1	32352.1	-11.44
4	0.161	22237.3	23455.5	-5.47
5	0.200	16551.9	16329.9	1.34
6	0.250	11816.8	10785.1	8.73
7	0.314	7995.3	6793.0	15.03
8	0.395	5075.8	4075.6	19.70
9	0.499	2990.7	2330.5	22.07
10	0.631	1602.9	1273.4	20.55
11	0.799	778.2	666.1	14.39
12	1.01	343.4	333.8	2.78
13	1.28	142.9	161.0	-12.65

\*

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	66.68	74.91	-12.33
15	2.08	39.92	33.71	15.57 MASKED
16	2.64	29.23	14.77	49.46 MASKED
17	3.37	22.97	6.28	72.65 MASKED
18	4.29	17.82	2.60	85.39 MASKED
19	5.47	13.10	1.06	91.89 MASKED
20	6.97	9.24	0.423	95.41 MASKED

CURRENT: 22.90 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	6209.3	5620.3	9.48 MASKED
22	0.427	4134.2	3614.4	12.57 MASKED
23	0.525	2524.5	2190.5	13.23 MASKED
24	0.647	1410.2	1270.2	9.92 MASKED
25	0.802	714.2	704.6	1.33 MASKED
26	1.00	319.8	369.4	-15.51 MASKED
27	1.25	128.3	185.6	-44.64 MASKED
28	1.58	55.88	89.66	-60.44 MASKED
29	1.99	39.02	41.64	-6.71 MASKED
30	2.52	37.37	18.86	49.51 MASKED
31	3.19	33.34	8.24	75.26 MASKED
32	4.05	26.67	3.53	86.73 MASKED
33	5.14	21.37	1.48	93.07 MASKED
34	6.54	14.76	0.614	95.83 MASKED
35	8.32	10.80	0.253	97.65 MASKED
36	10.59	8.32	0.104	98.75 MASKED
37	13.49	6.03	0.0410	99.31 MASKED
38	17.19	3.97	0.0162	99.59 MASKED
39	21.90	1.02	0.00571	99.44 MASKED
40	27.92	0.739	0.00201	99.72 MASKED

CURRENT RESOLUTION MATRIX NOT AVAILABLE

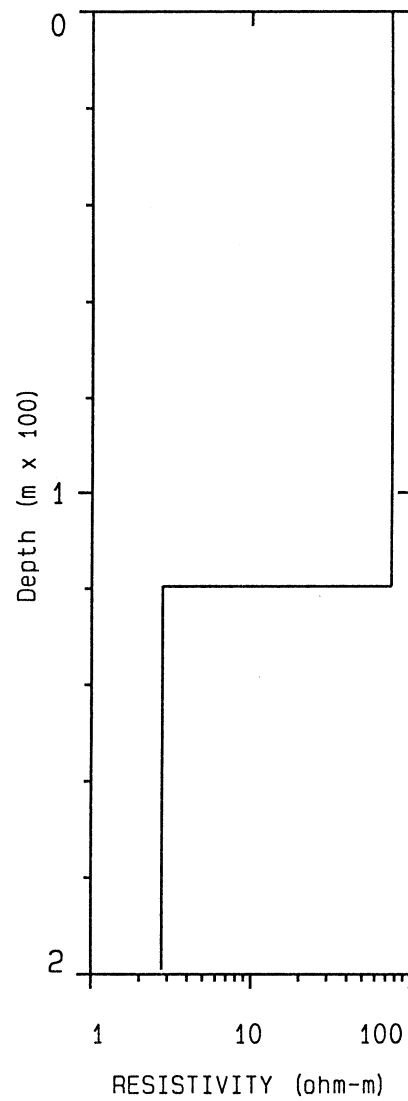
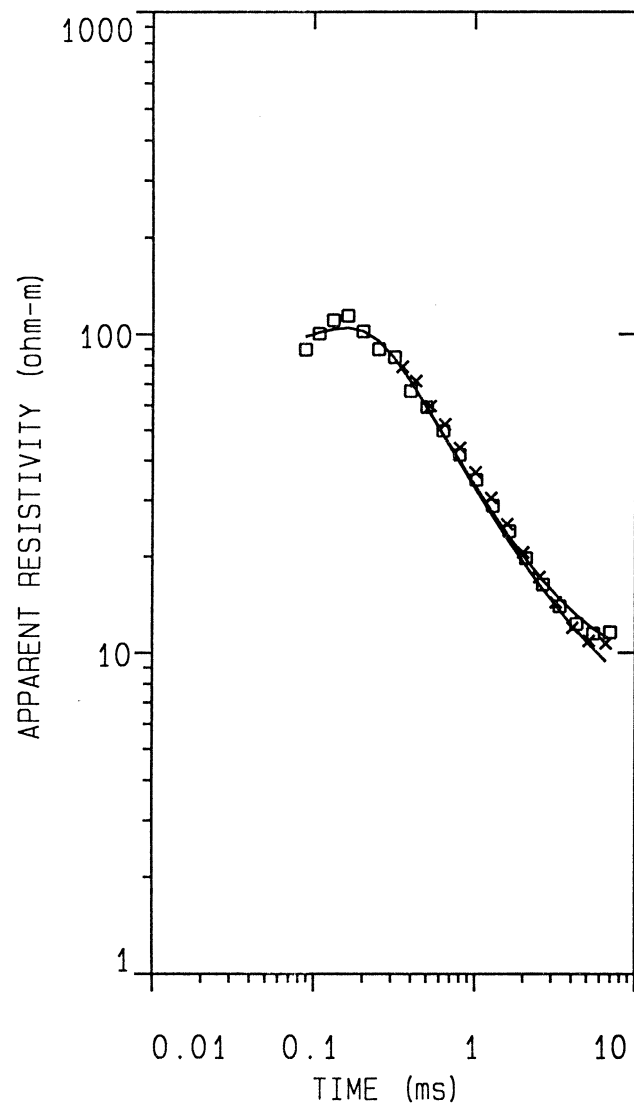
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# LINE42



DATA SET: LINE42

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 0.0000 N: 0.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 7.791 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	75.12	119.5	-119.5	1.59
2	2.77			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	13507.6	11733.8	13.13
2	0.106	7023.4	6931.0	1.31
3	0.131	3624.3	4002.5	-10.43
4	0.161	2050.8	2333.1	-13.76
5	0.200	1419.4	1416.6	0.191
6	0.250	988.6	903.4	8.61
7	0.314	609.5	618.1	-1.40
8	0.395	493.7	445.5	9.76
9	0.499	328.7	328.6	0.0295
10	0.631	237.5	245.8	-3.47
11	0.799	171.4	182.5	-6.50
12	1.01	124.4	134.5	-8.08
13	1.28	90.88	97.65	-7.45
14	1.63	65.57	69.66	-6.22

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
15	2.08	48.14	48.75	-1.28
16	2.64	35.01	33.38	4.64
17	3.37	24.20	22.30	7.87
18	4.29	15.96	14.51	9.06
19	5.47	9.65	9.18	4.88
20	6.97	5.19	5.63	-8.41

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	556.9	570.0	-2.33 MASKED
22	0.427	400.2	440.6	-10.08 MASKED
23	0.525	315.0	340.9	-8.21 MASKED
24	0.647	227.6	264.6	-16.23 MASKED
25	0.802	172.5	203.2	-17.75 MASKED
26	1.00	129.2	153.9	-19.10 MASKED
27	1.25	96.90	114.9	-18.60 MASKED
28	1.58	72.43	84.42	-16.55 MASKED
29	1.99	54.95	61.02	-11.04 MASKED
30	2.52	39.90	43.34	-8.61 MASKED
31	3.19	29.01	30.23	-4.20 MASKED
32	4.05	21.09	20.69	1.90 MASKED
33	5.14	13.36	13.90	-4.06 MASKED
34	6.54	7.55	9.15	-21.20 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.99

P 2 -0.01 0.94

T 1 0.00 0.01 1.00

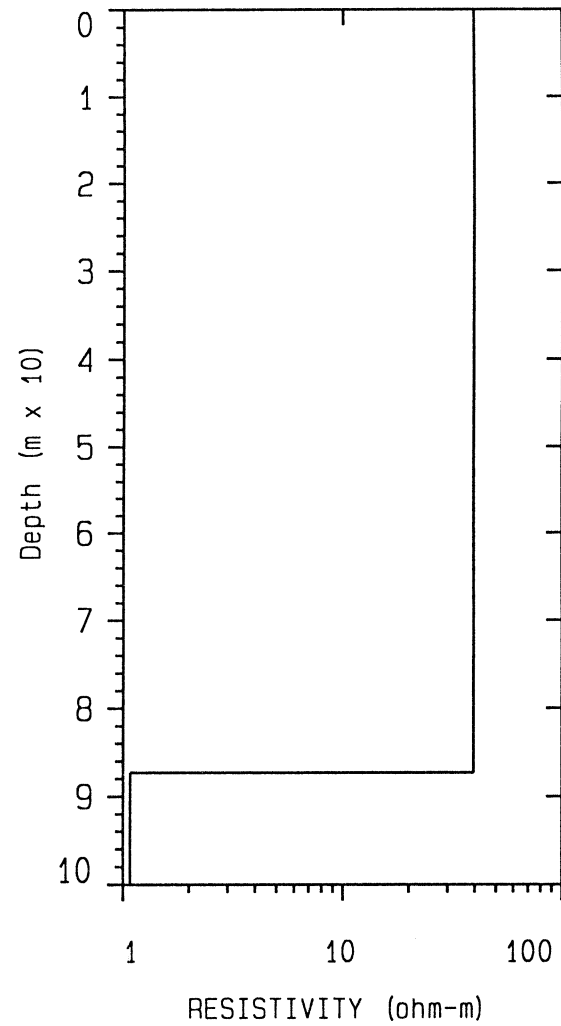
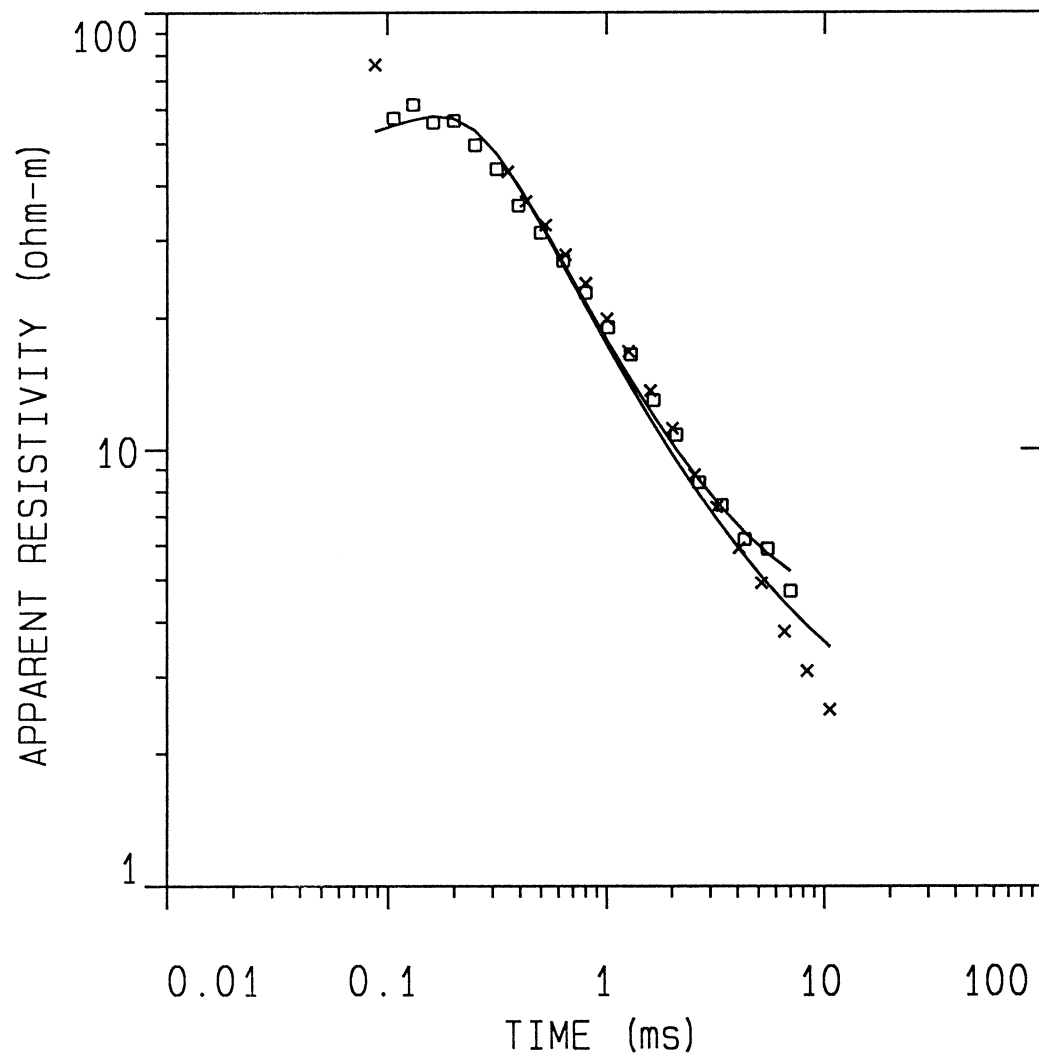
P 1 P 2 T 1

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# LINE43



DATA SET: LINE42

CLIENT: GRCC  
 LOCATION: Fox River Valley  
 COUNTY: Wisconsin  
 PROJECT: Mapping Sandstone Aquifer  
 LOOP SIZE: 50.000 m by 50.000 m  
 COIL LOC: 0.000 m (X), 0.000 m (Y)  
 SOUNDING COORDINATES: E: 0.0000 N: 0.0000

DATE: Jan, 2002  
 SOUNDING: 42  
 ELEVATION: 0.00 m  
 EQUIPMENT: Geonics PROTEM  
 AZIMUTH:  
 TIME CONSTANT: NONE  
 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 7.791 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
1	75.12	119.5	0.0 -119.5	1.59
2	2.77			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	DATA	emf (nV/m sqrd) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	13507.6	11733.8	13.13
2	0.106	7023.4	6931.0	1.31
3	0.131	3624.3	4002.5	-10.43
4	0.161	2050.8	2333.1	-13.76
5	0.200	1419.4	1416.6	0.191
6	0.250	988.6	903.4	8.61
7	0.314	609.5	618.1	-1.40
8	0.395	493.7	445.5	9.76
9	0.499	328.7	328.6	0.0295
10	0.631	237.5	245.8	-3.47
11	0.799	171.4	182.5	-6.50
12	1.01	124.4	134.5	-8.08
13	1.28	90.88	97.65	-7.45
14	1.63	65.57	69.66	-6.22

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
15	2.08	48.14	48.75	-1.28
16	2.64	35.01	33.38	4.64
17	3.37	24.20	22.30	7.87
18	4.29	15.96	14.51	9.06
19	5.47	9.65	9.18	4.88
20	6.97	5.19	5.63	-8.41

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 58.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	556.9	570.0	-2.33 MASKED
22	0.427	400.2	440.6	-10.08 MASKED
23	0.525	315.0	340.9	-8.21 MASKED
24	0.647	227.6	264.6	-16.23 MASKED
25	0.802	172.5	203.2	-17.75 MASKED
26	1.00	129.2	153.9	-19.10 MASKED
27	1.25	96.90	114.9	-18.60 MASKED
28	1.58	72.43	84.42	-16.55 MASKED
29	1.99	54.95	61.02	-11.04 MASKED
30	2.52	39.90	43.34	-8.61 MASKED
31	3.19	29.01	30.23	-4.20 MASKED
32	4.05	21.09	20.69	1.90 MASKED
33	5.14	13.36	13.90	-4.06 MASKED
34	6.54	7.55	9.15	-21.20 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.99

P 2 -0.01 0.94

T 1 0.00 0.01 1.00

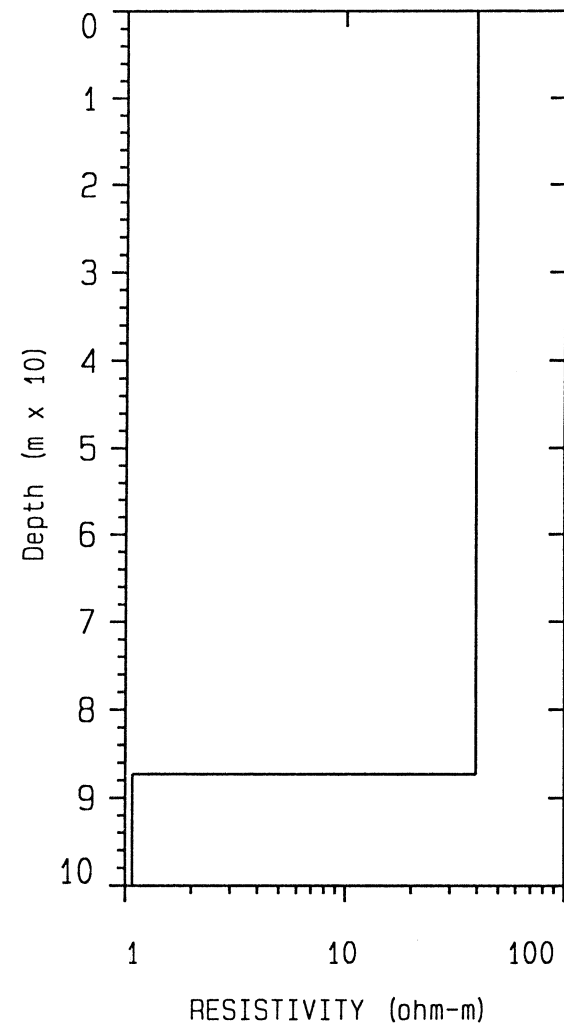
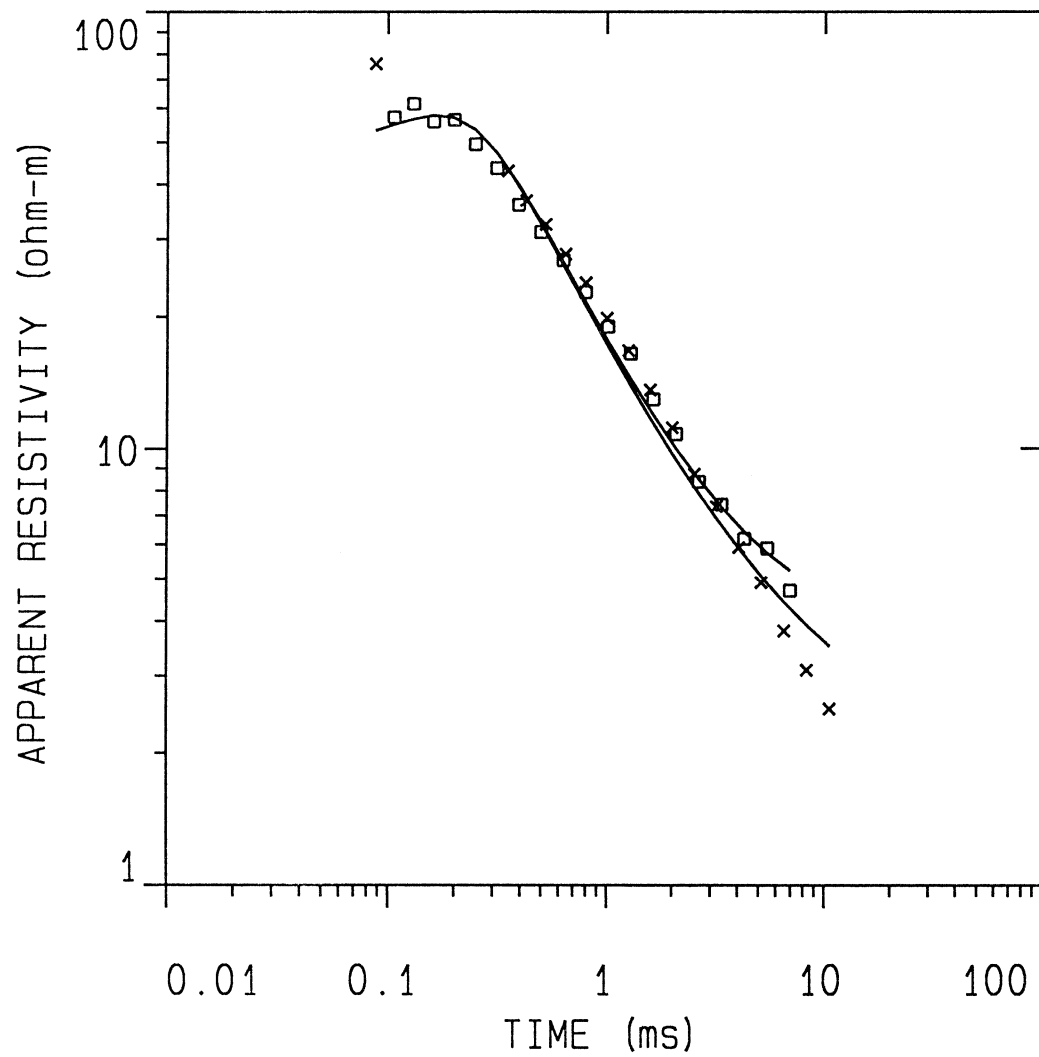
P 1 P 2 T 1

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# LINE43



## DATA SET: LINE43

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 43.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 10.715 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
1	39.49	87.29	0.0 -87.29	2.21
2	1.08			

ALL PARAMETERS ARE FREE

```

CURRENT:    21.20 AMPS      EM-58      COIL AREA:    100.00 sq m.
FREQUENCY:   30.00 Hz      GAIN: 1    RAMP TIME:    51.00 muSEC

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SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	17411.0	29741.4	-70.81 MASKED
2	0.106	16497.9	17500.2	-6.07
3	0.131	8862.4	10014.7	-13.00
4	0.161	6052.4	5753.7	4.93
5	0.200	3498.2	3439.2	1.68
6	0.250	2432.2	2167.0	10.90
7	0.314	1670.2	1479.6	11.41
8	0.395	1256.2	1074.8	14.43
9	0.499	871.5	803.7	7.77
10	0.631	603.4	611.8	-1.39
11	0.799	429.6	463.0	-7.79
12	1.01	311.1	348.1	-11.88
13	1.28	211.6	258.2	-21.99
14	1.63	166.6	188.2	-12.94



No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
15	2.08	120.1	134.7	-12.10
16	2.64	96.27	94.31	2.04
17	3.37	63.29	64.41	-1.75
18	4.29	45.39	42.85	5.59
19	5.47	26.70	27.70	-3.75
20	6.97	20.36	17.35	14.74

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	1390.9	1365.8	1.80 MASKED
22	0.427	1087.1	1065.5	1.99 MASKED
23	0.525	786.0	835.4	-6.28 MASKED
24	0.647	587.3	659.3	-12.25 MASKED
25	0.802	429.4	515.5	-20.05 MASKED
26	1.00	324.8	398.3	-22.63 MASKED
27	1.25	237.7	303.7	-27.79 MASKED
28	1.58	182.5	228.1	-24.99 MASKED
29	1.99	137.1	168.7	-23.01 MASKED
30	2.52	110.6	122.6	-10.85 MASKED
31	3.19	79.61	87.60	-10.03 MASKED
32	4.05	60.96	61.37	-0.672 MASKED
33	5.14	44.29	42.18	4.76 MASKED
34	6.54	35.71	28.39	20.50 MASKED
35	8.32	26.64	18.70	29.80 MASKED
36	10.59	19.81	12.05	39.14 MASKED

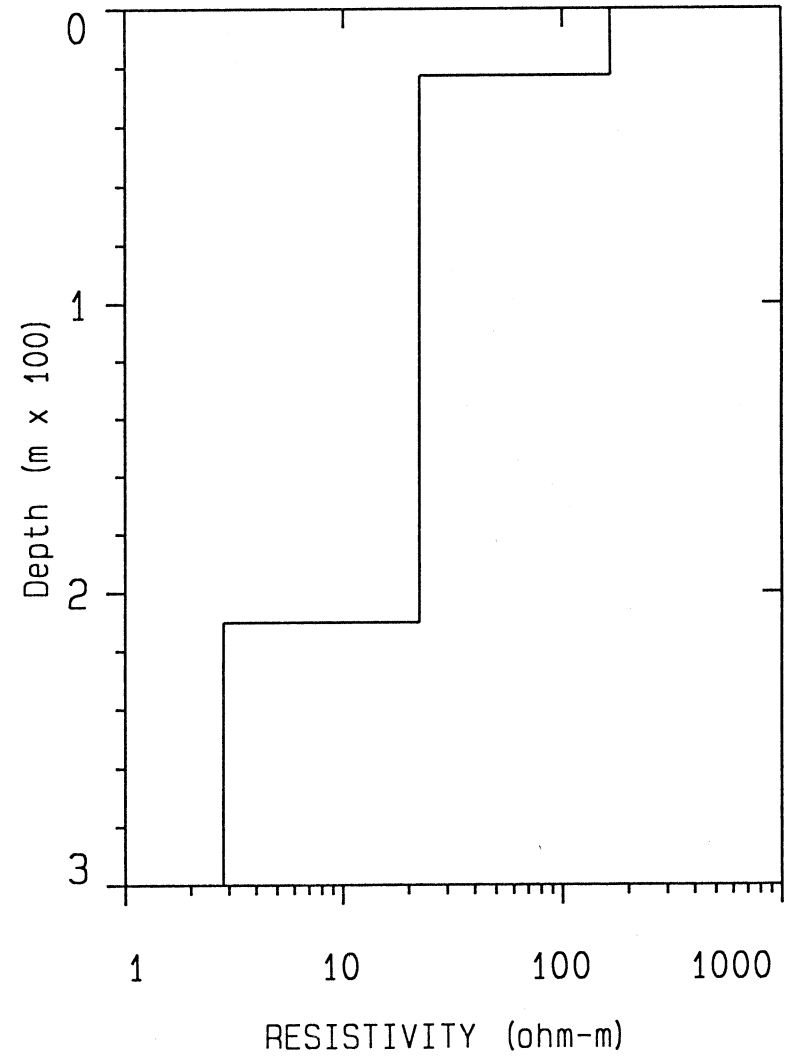
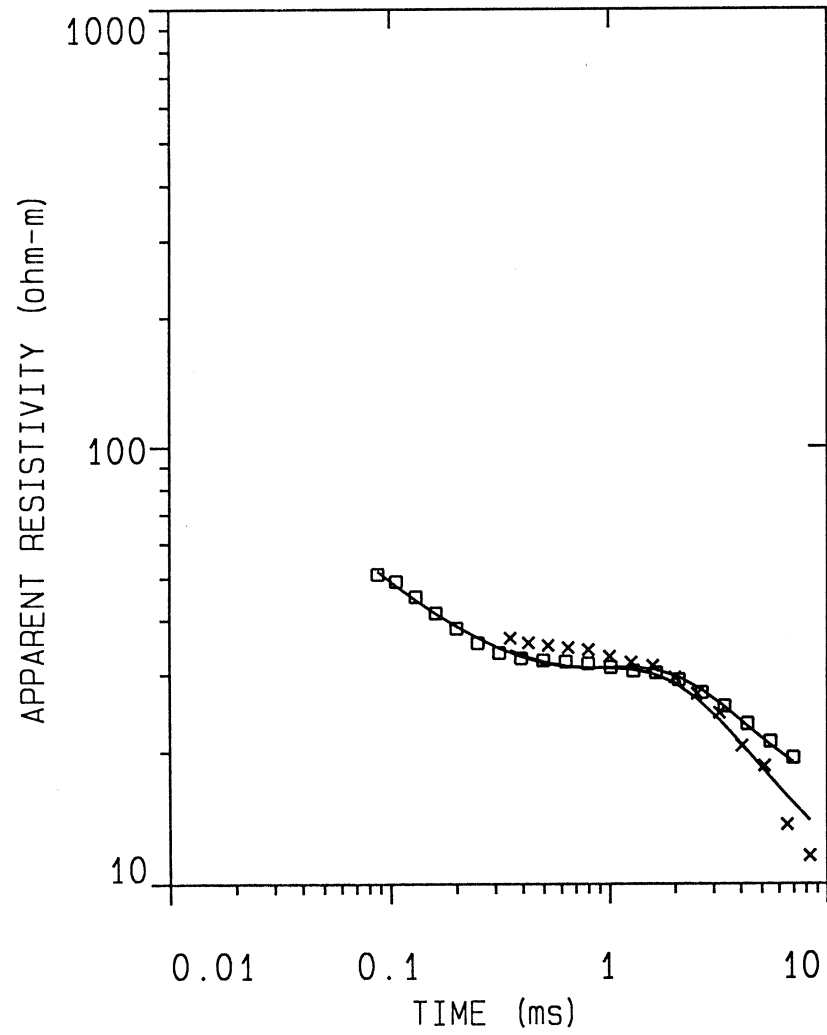
PARAMETER RESOLUTION MATRIX:  
 "F" INDICATES FIXED PARAMETER  
 P 1 0.99  
 P 2 -0.01 0.93  
 T 1 0.00 0.00 1.00  
 P 1 P 2 T 1

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# LINE44



DATA SET: LINE44

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 44.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 2.663 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	165.0	22.78	-22.78	0.138
2	22.29	187.4	-210.2	8.40
3	2.82			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	DATA	emf (nV/m sqrd) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	31401.5	30717.3	2.17
2	0.106	20510.6	21237.8	-3.54
3	0.131	13879.0	14248.2	-2.65
4	0.161	9355.7	9389.4	-0.360
5	0.200	6184.5	6072.5	1.81
6	0.250	3974.5	3818.6	3.92
7	0.314	2440.0	2352.5	3.58
8	0.395	1433.7	1418.2	1.08
9	0.499	815.9	833.7	-2.18
10	0.631	458.5	477.8	-4.20
11	0.799	258.1	267.2	-3.50
12	1.01	146.5	146.8	-0.149
13	1.28	83.25	80.77	2.98

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	32.42	40.62	-25.29 MASKED
15	2.08	27.90	26.26	5.87 MASKED

CURRENT: 22.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 3 RAMP TIME: 56.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
16	0.352	462.7	477.3	-3.15 MASKED
17	0.427	356.0	362.5	-1.83 MASKED
18	0.525	256.8	269.1	-4.75 MASKED
19	0.647	179.1	197.6	-10.33 MASKED
20	0.802	129.8	142.9	-10.09 MASKED
21	1.00	108.2	100.7	6.86 MASKED
22	1.25	72.04	69.96	2.88 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

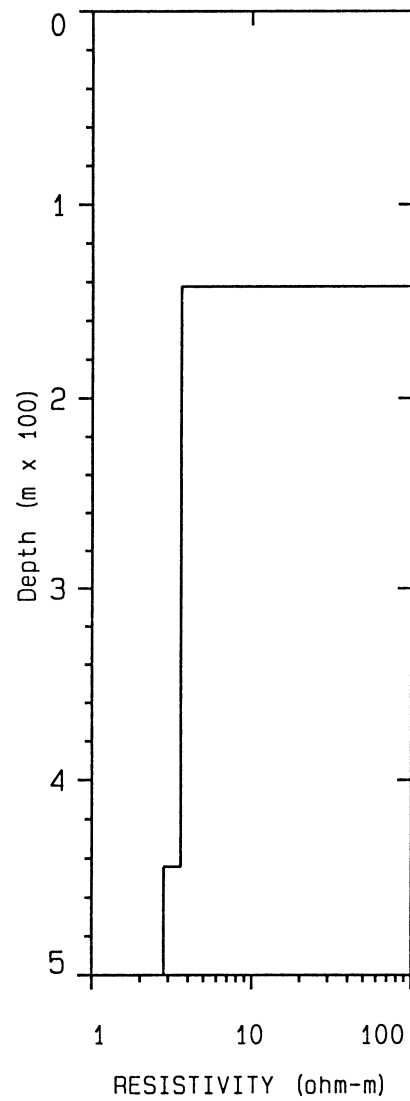
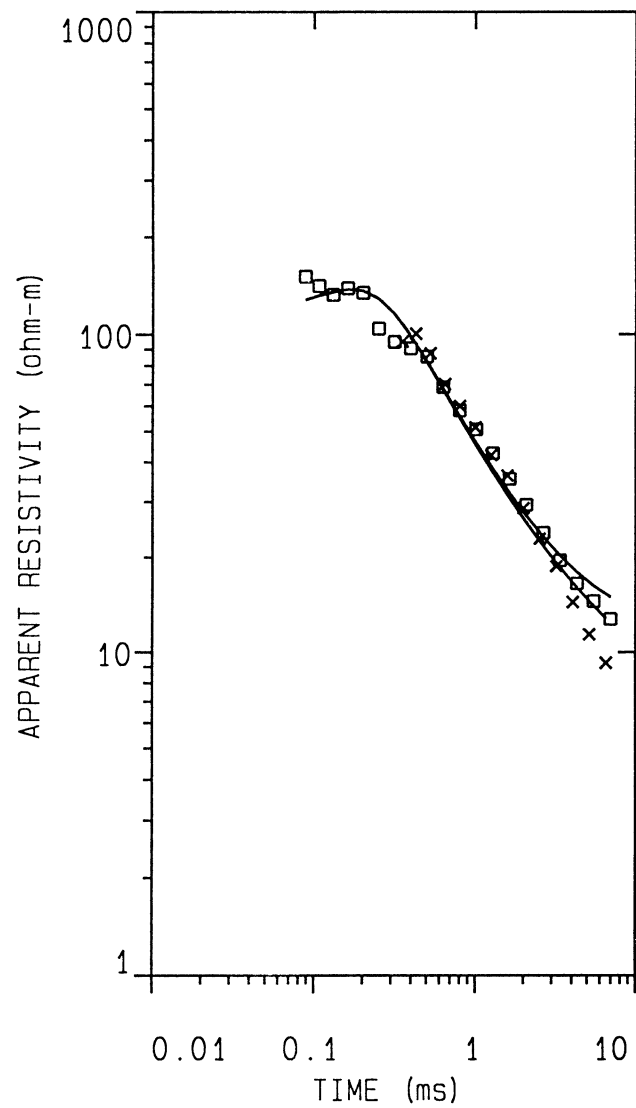
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 P 2 -0.01 0.92  
 P 3 0.00 0.00 0.00  
 T 1 0.00 0.01 0.00 1.00  
 T 2 0.00 -0.04 0.00 0.00 0.02  
       P 1 P 2 P 3 T 1 T 2

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Ruekert & Mielke

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# LINE 46



## DATA SET: LINE46

CLIENT: GRCC  
 LOCATION: Fox River Valley  
 COUNTY: Wisconsin  
 PROJECT: Mapping Sandstone Aquifer  
 LOOP SIZE: 50.000 m by 50.000 m  
 COIL LOC: 0.000 m (X), 0.000 m (Y)  
 SOUNDING COORDINATES: E: 1.0000 N: 46.0000

DATE: Jan, 2002  
 SOUNDING: 42  
 ELEVATION: 0.00 m  
 EQUIPMENT: Geonics PROTEM  
 AZIMUTH:  
 TIME CONSTANT: NONE  
 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 16.851 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	99.56	142.3	-142.3	1.42
2	3.59	301.8	-444.2	83.95
3	2.81			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	DATA	emf (nV/m sqrd) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	6156.4	7898.1	-28.28
2	0.106	4209.2	4667.9	-10.89
3	0.131	2762.1	2684.4	2.81
4	0.161	1526.2	1544.0	-1.16
5	0.200	939.2	918.4	2.20
6	0.250	789.2	571.4	27.59
7	0.314	515.6	381.4	26.01
8	0.395	311.0	271.3	12.77
9	0.499	189.9	198.6	-4.62
10	0.631	146.5	148.3	-1.21
11	0.799	104.3	110.4	-5.80
12	1.01	70.49	81.48	-15.57
13	1.28	50.51	59.44	-17.68

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	36.56	42.55	-16.38
15	2.08	26.57	29.94	-12.68
16	2.64	19.79	20.60	-4.08
17	3.37	14.62	13.84	5.30
18	4.29	10.31	9.06	12.14
19	5.47	6.81	5.76	15.42
20	6.97	4.52	3.55	21.33

CURRENT: 22.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	415.3	343.4	17.32 MASKED
22	0.427	235.6	263.4	-11.80 MASKED
23	0.525	173.9	202.6	-16.50 MASKED
24	0.647	143.4	157.2	-9.63 MASKED
25	0.802	105.9	121.0	-14.24 MASKED
26	1.00	76.41	91.83	-20.18 MASKED
27	1.25	58.71	68.87	-17.30 MASKED
28	1.58	41.22	50.78	-23.17 MASKED
29	1.99	32.90	36.89	-12.11 MASKED
30	2.52	25.58	26.33	-2.91 MASKED
31	3.19	19.15	18.47	3.56 MASKED
32	4.05	15.68	12.71	18.93 MASKED
33	5.14	12.29	8.58	30.20 MASKED
34	6.54	9.20	5.67	38.36 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.99

P 2 -0.01 0.93

P 3 0.00 0.01 0.00

T 1 0.00 0.01 0.00 1.00

T 2 0.00 0.00 0.00 0.00 0.00

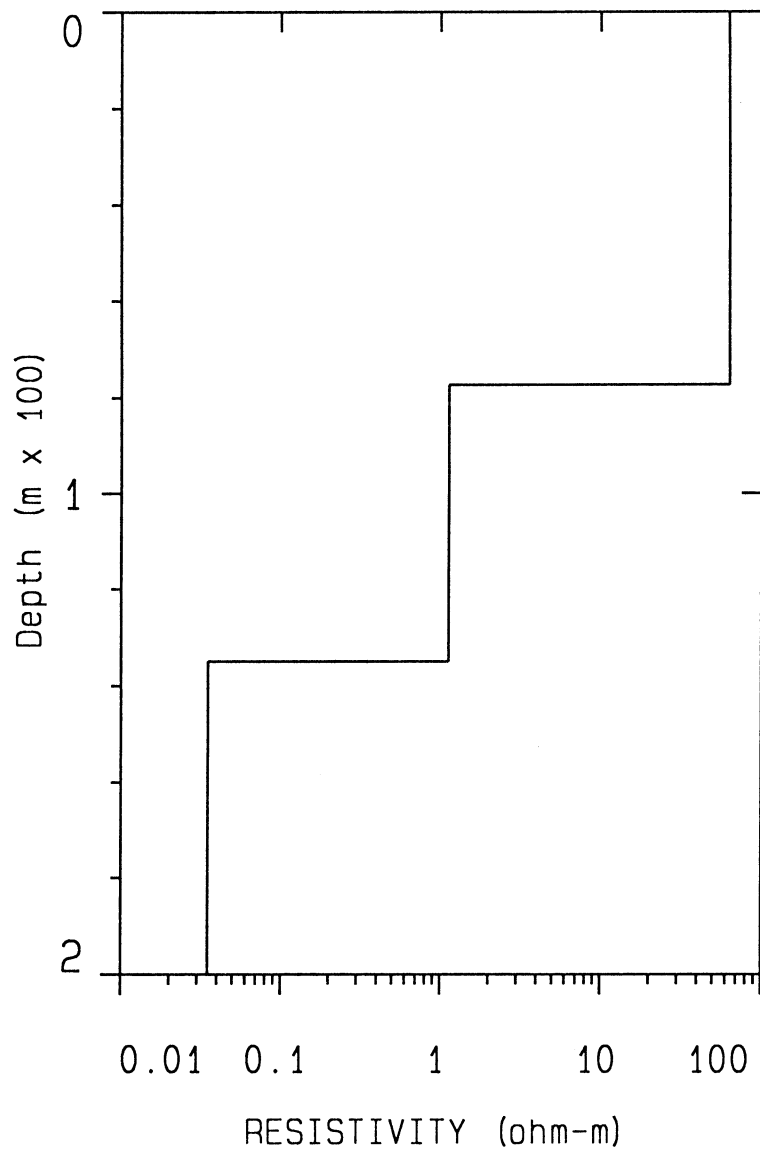
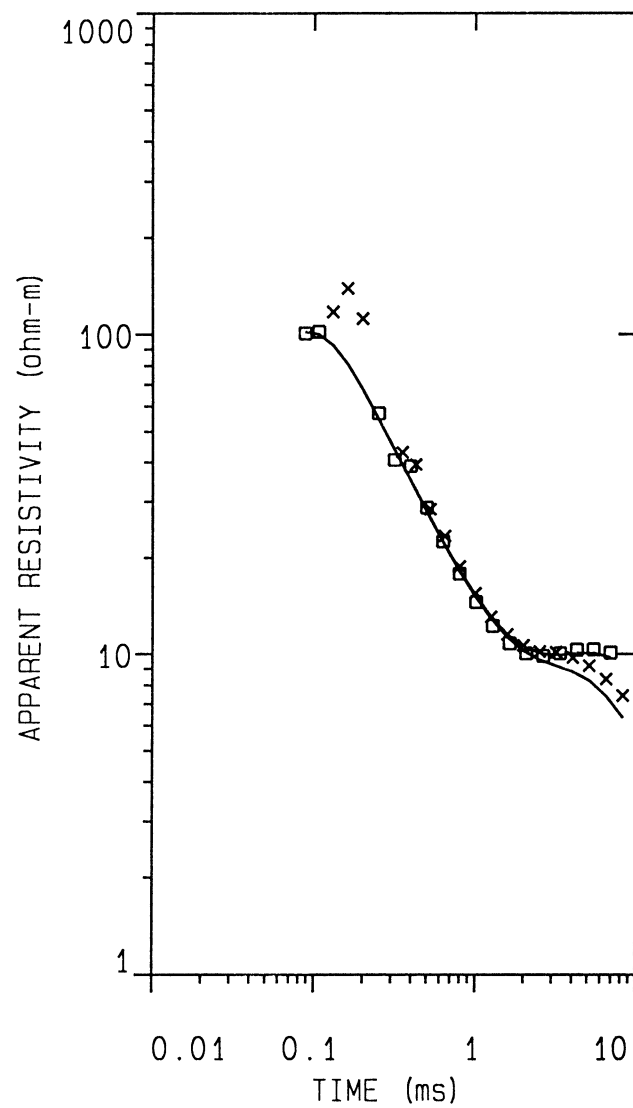
P 1 P 2 P 3 T 1 T 2

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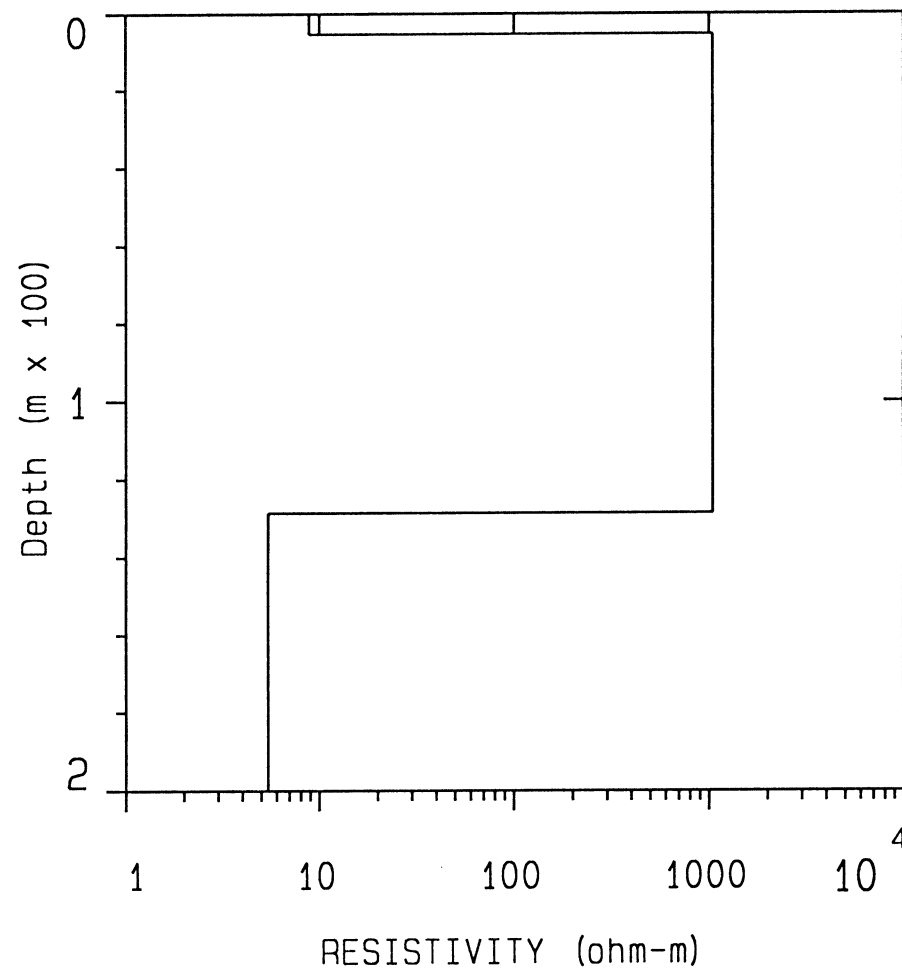
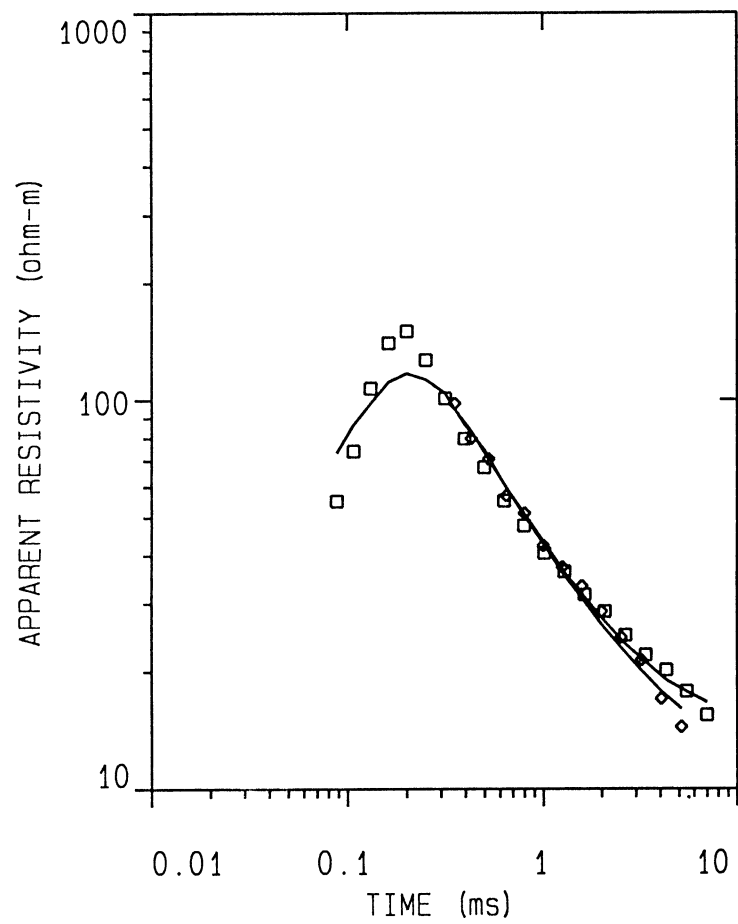
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LINE51





LINE47



DATA SET: LINE47

CLIENT: GRCC  
 LOCATION: Fox River Valley  
 COUNTY: Wisconsin  
 PROJECT: Mapping Sandstone Aquifer  
 LOOP SIZE: 50.000 m by 50.000 m  
 COIL LOC: 0.000 m (X), 0.000 m (Y)  
 SOUNDING COORDINATES: E: 1.0000 N: 47.0000

DATE: Jan, 2002  
 SOUNDING: 42  
 ELEVATION: 0.00 m  
 EQUIPMENT: Geonics PROTEM  
 AZIMUTH:  
 TIME CONSTANT: NONE  
 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 16.340 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	8.84	5.24	-5.24	0.592
2	1045.7	123.3	-128.6	0.117
3	5.43			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	DATA	emf (nV/m sqrd) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	28003.2	18280.0	34.72
2	0.106	11125.9	8827.6	20.65
3	0.131	3807.5	4332.9	-13.79
4	0.161	1508.1	2129.6	-41.20
5	0.200	794.9	1156.5	-45.47
6	0.250	587.5	699.7	-19.10
7	0.314	468.7	447.2	4.58
8	0.395	377.7	332.2	12.04
9	0.499	272.0	232.9	14.37
10	0.631	203.6	175.3	13.89
11	0.799	140.4	126.4	9.97
12	1.01	98.86	90.14	8.81
13	1.28	64.30	64.62	-0.503

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	43.33	44.26	-2.16
15	2.08	27.55	30.24	-9.76
16	2.64	18.70	20.26	-8.34
17	3.37	12.18	12.97	-6.48
18	4.29	7.60	8.31	-9.31
19	5.47	5.01	5.02	-0.173
20	6.97	3.38	3.01	10.76

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	399.5	419.4	-4.97
22	0.427	337.6	314.7	6.79
23	0.525	241.9	242.0	-0.0472
24	0.647	197.9	184.1	6.97
25	0.802	135.5	138.7	-2.32
26	1.00	103.3	101.6	1.66
27	1.25	71.01	74.76	-5.26
28	1.58	47.35	52.68	-11.25
29	1.99	33.16	37.30	-12.47
30	2.52	23.34	25.62	-9.77
31	3.19	15.84	17.31	-9.29
32	4.05	12.33	11.54	6.40
33	5.14	8.73	7.42	14.97

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.96

P 2 0.02 0.02

P 3 0.00 -0.02 0.94

T 1 -0.04 -0.03 0.00 0.96

T 2 0.00 0.01 0.01 0.00 1.00

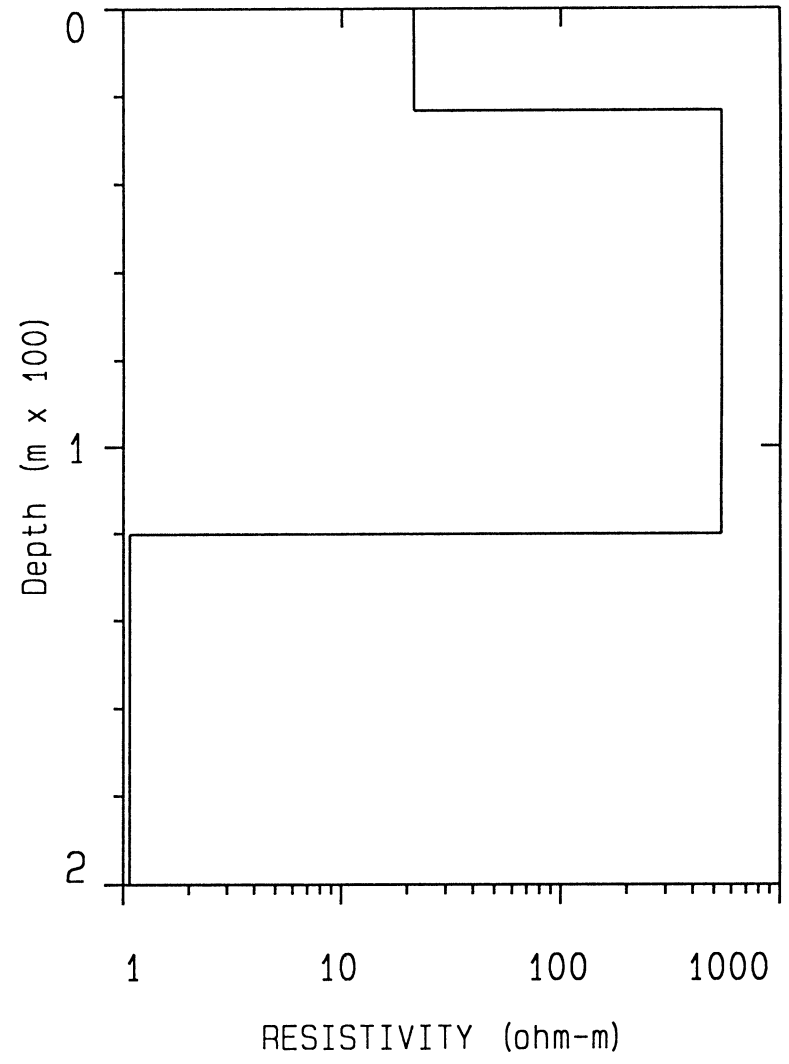
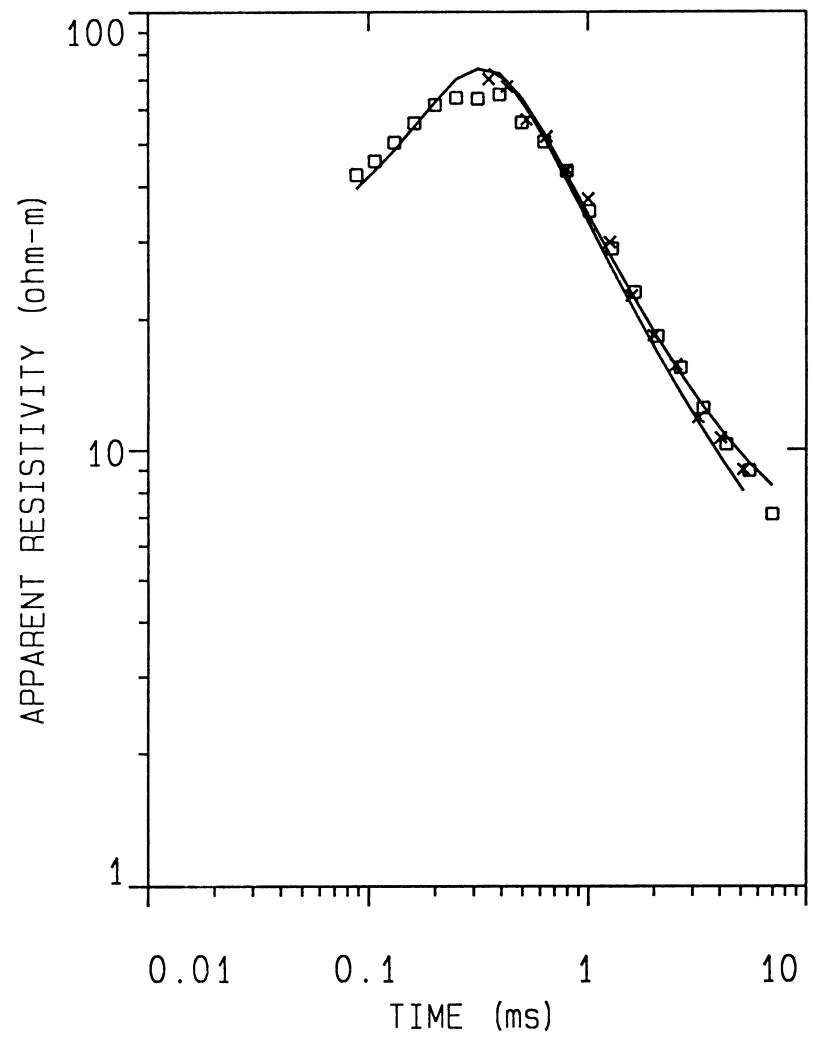
P 1 P 2 P 3 T 1 T 2

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# LINE48



DATA SET: LINE48

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 48.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 11.582 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	21.35	23.37	-23.37	1.09
2	538.6	96.84	-120.2	0.179
3	1.06			

ALL PARAMETERS ARE FREE

CURRENT: 20.90 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	DATA	emf (nV/m sqrd) SYNTHETIC	DIFFERENCE (percent)
1	0.0881	41140.4	45854.4	-11.45
2	0.106	22798.8	24579.8	-7.81
3	0.131	11774.8	12497.3	-6.13
4	0.161	5990.0	6132.5	-2.37
5	0.200	3032.3	2973.5	1.93
6	0.250	1646.8	1422.1	13.64
7	0.314	941.1	744.9	20.83
8	0.395	512.2	434.9	15.09
9	0.499	356.7	294.5	17.42
10	0.631	230.9	216.0	6.47
11	0.799	161.3	165.7	-2.75
12	1.01	121.9	126.9	-4.11
13	1.28	90.16	97.68	-8.33

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	69.66	73.39	-5.35
15	2.08	54.00	54.60	-1.11
16	2.64	37.88	39.70	-4.79
17	3.37	28.56	28.22	1.17
18	4.29	20.82	19.55	6.10
19	5.47	13.99	13.17	5.86
20	6.97	10.82	8.60	20.51

CURRENT: 22.60 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 56.00 muSEC

## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	655.2	606.0	7.50 MASKED
22	0.427	428.7	411.8	3.95 MASKED
23	0.525	332.9	305.3	8.31 MASKED
24	0.647	225.5	235.0	-4.20 MASKED
25	0.802	171.2	187.4	-9.49 MASKED
26	1.00	123.2	147.8	-19.96 MASKED
27	1.25	98.36	117.0	-18.97 MASKED
28	1.58	84.05	90.83	-8.06 MASKED
29	1.99	64.24	69.99	-8.96 MASKED
30	2.52	45.20	52.96	-17.16 MASKED
31	3.19	38.00	39.50	-3.95 MASKED
32	4.05	24.72	28.89	-16.86 MASKED
33	5.14	17.49	20.75	-18.67 MASKED

## PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.87

P 2 0.00 0.01

P 3 0.04 -0.02 0.80

T 1 -0.16 -0.04 0.06 0.80

T 2 0.02 0.01 -0.01 0.03 0.99

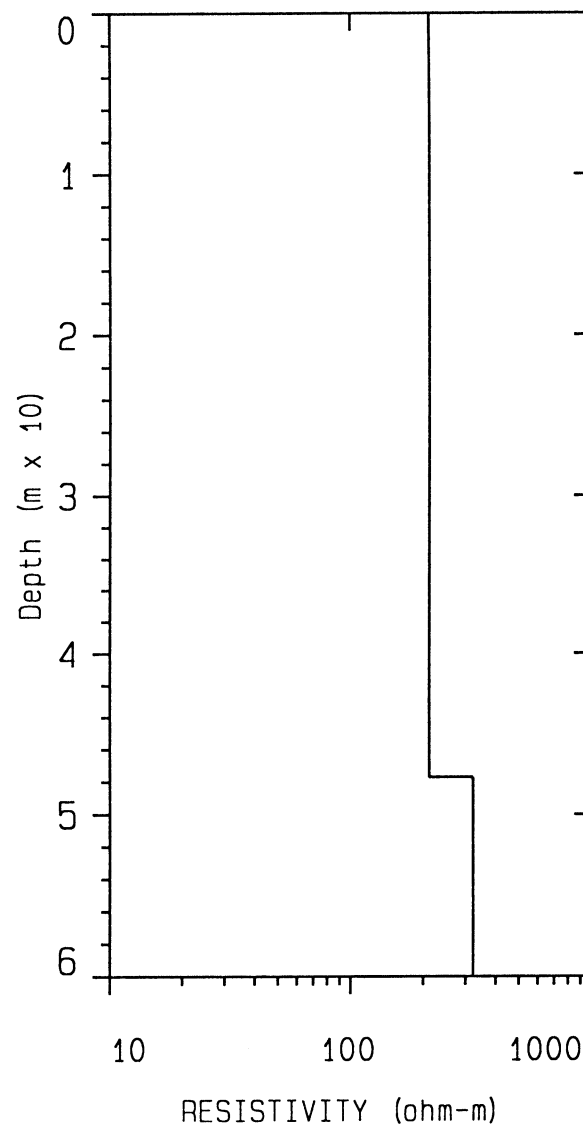
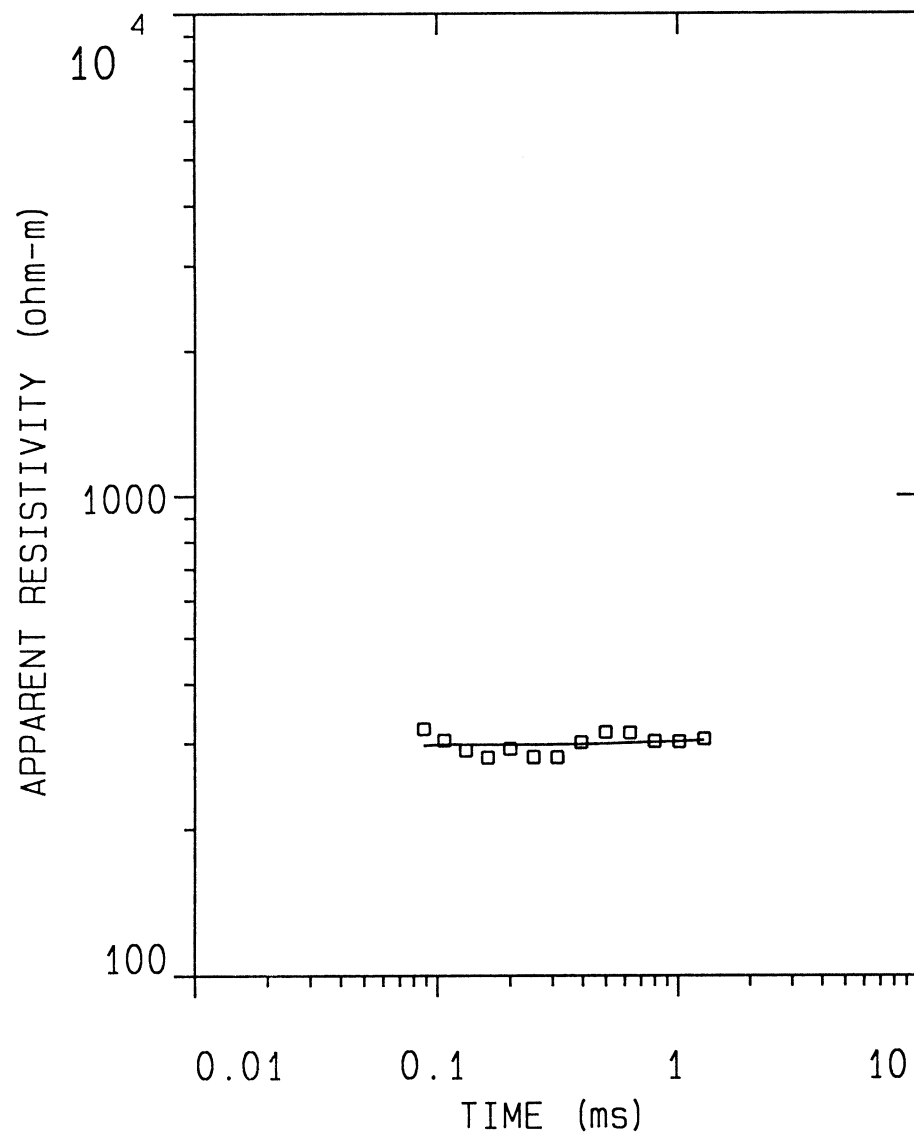
P 1 P 2 P 3 T 1 T 2

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# LINE49



DATA SET: LINE49

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 49.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 6.698 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	212.5	47.71	-47.71	0.224
2	322.3			

ALL PARAMETERS ARE FREE

CURRENT: 20.80 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	1964.2	2213.5	-12.69
2	0.106	1318.6	1355.8	-2.82
3	0.131	846.8	811.8	4.13
4	0.161	527.2	480.6	8.85
5	0.200	289.8	281.5	2.86
6	0.250	176.3	161.3	8.45
7	0.314	100.1	91.33	8.75
8	0.395	50.71	51.38	-1.32
9	0.499	26.33	28.56	-8.45
10	0.631	14.70	15.81	-7.54
11	0.799	8.66	8.72	-0.661
12	1.01	4.79	4.79	0.108
13	1.28	2.59	2.61	-0.828

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PARAMETER RESOLUTION MATRIX:  
"F" INDICATES FIXED PARAMETER

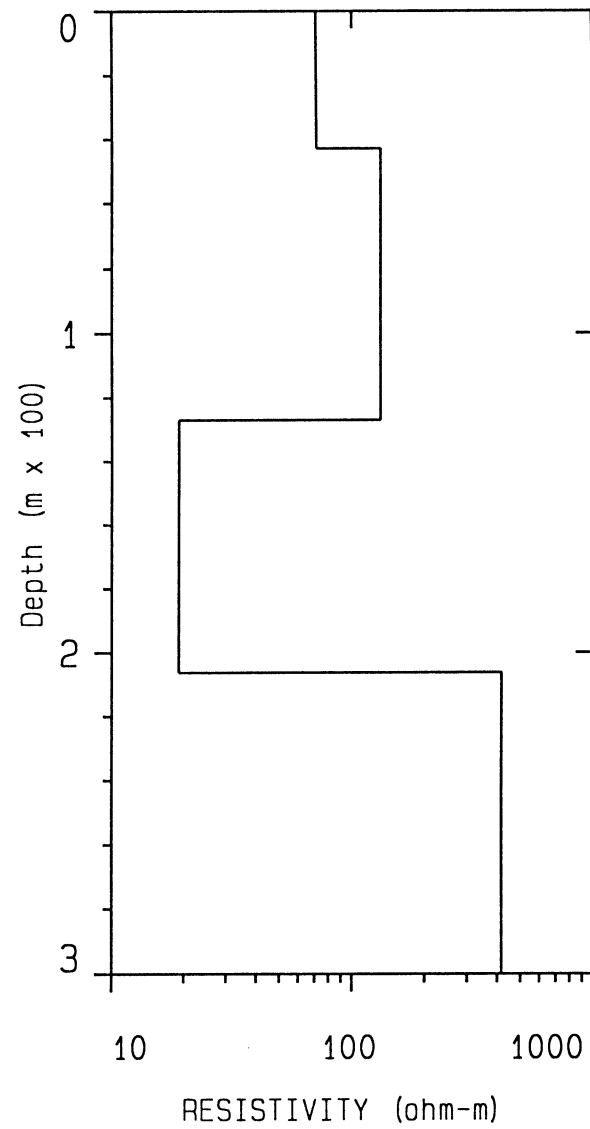
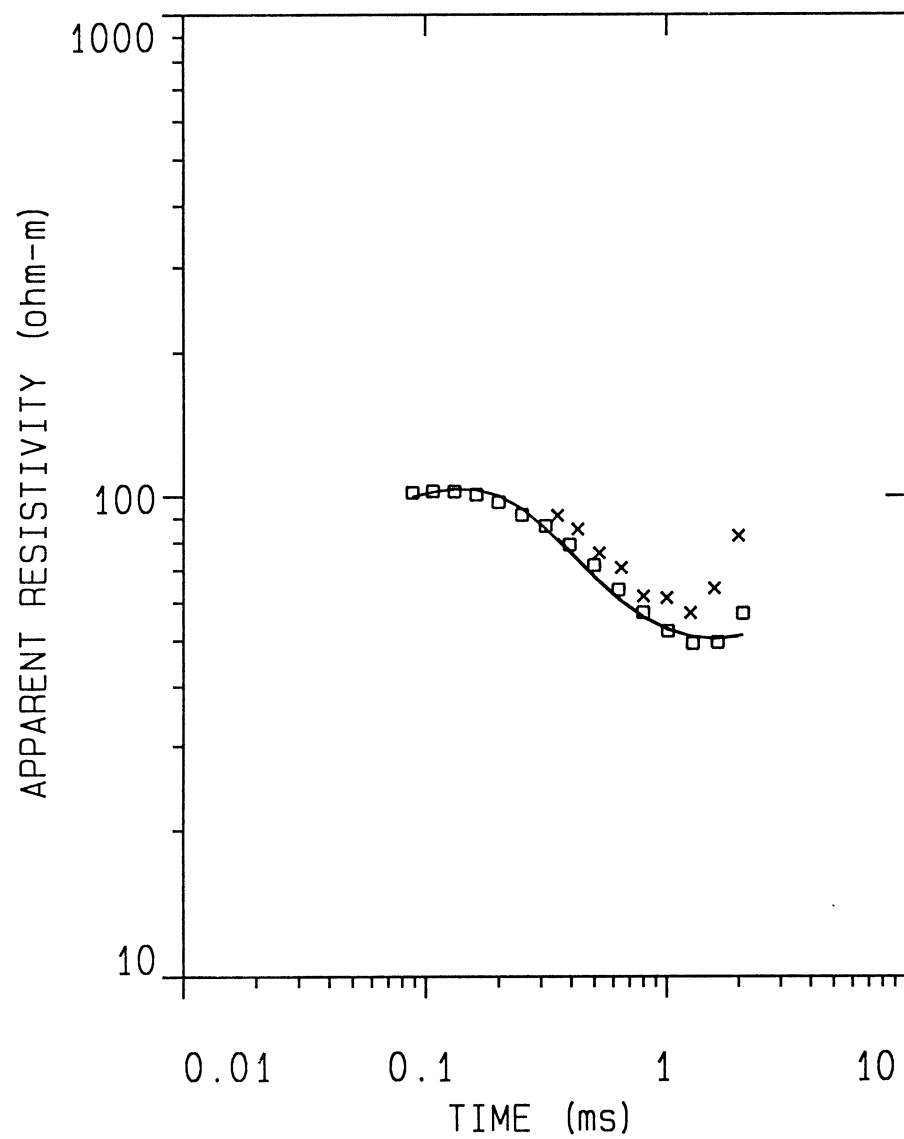
P 1	0.90		
P 2	0.00	0.99	
T 1	-0.27	-0.02	0.18
	P 1	P 2	T 1

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# LINE50



DATA SET: LINE50

CLIENT: GRCC  
 LOCATION: Fox River Valley  
 COUNTY: Wisconsin  
 PROJECT: Mapping Sandstone Aquifer  
 LOOP SIZE: 50.000 m by 50.000 m  
 COIL LOC: 0.000 m (X), 0.000 m (Y)  
 SOUNDING COORDINATES: E: 1.0000 N: 50.0000

DATE: Jan, 2002  
 SOUNDING: 42  
 ELEVATION: 0.00 m  
 EQUIPMENT: Geonics PROTEM  
 AZIMUTH:  
 TIME CONSTANT: NONE  
 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 6.044 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	71.01	42.84	-42.84	0.603
2	131.0	84.16	-127.0	0.642
3	19.05	79.26	-206.2	4.15
4	417.2			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.0881	11137.2	11484.9	-3.12
2	0.106	6816.4	6841.3	-0.364
3	0.131	4079.5	4015.2	1.57
4	0.161	2474.0	2387.6	3.49
5	0.200	1530.0	1460.6	4.53
6	0.250	962.0	919.9	4.38
7	0.314	590.3	602.5	-2.06
8	0.395	380.9	402.9	-5.76
9	0.499	246.6	269.0	-9.07
10	0.631	163.8	175.6	-7.20
11	0.799	107.0	110.7	-3.42
12	1.01	67.54	66.91	0.936

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
13	1.28	40.63	38.85	4.37
14	1.63	22.15	21.58	2.55
15	2.08	9.85	11.54	-17.19

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 56.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
16	0.352	451.2	531.7	-17.85 MASKED
17	0.427	307.5	381.8	-24.17 MASKED
18	0.525	218.5	267.2	-22.28 MASKED
19	0.647	143.9	182.0	-26.45 MASKED
20	0.802	103.3	119.6	-15.78 MASKED
21	1.00	59.93	74.72	-24.67 MASKED
22	1.25	37.87	44.79	-18.26 MASKED
23	1.58	17.85	25.68	-43.80 MASKED
24	1.99	6.83	14.15	-106.9 MASKED

# PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	0.84						
P 2	0.12	0.25					
P 3	0.05	-0.07	0.75				
P 4	-0.01	0.03	-0.03	0.15			
T 1	-0.27	-0.15	0.11	-0.01	0.32		
T 2	0.07	0.18	0.07	0.01	0.23	0.86	
T 3	0.07	-0.13	-0.32	-0.12	0.12	0.10	0.56
	P 1	P 2	P 3	P 4	T 1	T 2	T 3

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## DATA SET: LINE51

CLIENT: GRCC DATE: Jan, 2002  
 LOCATION: Fox River Valley SOUNDING: 42  
 COUNTY: Wisconsin ELEVATION: 0.00 m  
 PROJECT: Mapping Sandstone Aquifer EQUIPMENT: Geonics PROTEM  
 LOOP SIZE: 50.000 m by 50.000 m AZIMUTH:  
 COIL LOC: 0.000 m (X), 0.000 m (Y) TIME CONSTANT: NONE  
 SOUNDING COORDINATES: E: 1.0000 N: 51.0000 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 6.569 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	63.11	77.37	-77.37	1.22
2	1.11	57.58	-134.9	51.42
3	0.0349			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 30.00 Hz GAIN: 1 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	11311.3	11160.1	1.33
2	0.106	6886.4	7044.4	-2.29
3	0.131	3322.9	4750.6	-42.96 MASKED
4	0.161	1529.1	3446.0	-125.3 MASKED
5	0.200	1235.6	2637.4	-113.4 MASKED
6	0.250	1947.8	2063.8	-5.95
7	0.314	1837.7	1636.1	10.96
8	0.395	1106.7	1289.3	-16.49
9	0.499	971.4	1010.5	-4.01
10	0.631	781.7	781.2	0.0622
11	0.799	614.3	591.8	3.66
12	1.01	462.7	434.2	6.17
13	1.28	328.8	304.7	7.32

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
14	1.63	217.7	201.9	7.24
15	2.08	132.8	125.4	5.57
16	2.64	74.56	73.10	1.96
17	3.37	39.56	40.27	-1.78
18	4.29	20.85	21.65	-3.84
19	5.47	11.33	11.76	-3.80
20	6.97	6.39	6.73	-5.32

CURRENT: 23.00 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 56.00 muSEC

## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	1391.2	1588.2	-14.16 MASKED
22	0.427	983.0	1302.7	-32.52 MASKED
23	0.525	957.7	1052.0	-9.84 MASKED
24	0.647	756.5	835.9	-10.48 MASKED
25	0.802	616.5	650.9	-5.58 MASKED
26	1.00	473.3	489.2	-3.36 MASKED
27	1.25	345.8	352.8	-2.03 MASKED
28	1.58	235.3	241.9	-2.79 MASKED
29	1.99	148.0	156.4	-5.69 MASKED
30	2.52	87.92	96.18	-9.39 MASKED
31	3.19	49.18	56.75	-15.39 MASKED
32	4.05	28.68	33.30	-16.11 MASKED
33	5.14	17.22	20.19	-17.25 MASKED
34	6.54	10.92	13.08	-19.67 MASKED
35	8.32	7.12	9.04	-26.81 MASKED

## PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.96

P 2 -0.04 0.81

P 3 -0.03 -0.19 0.52

T 1 0.00 0.00 0.00 1.00

T 2 -0.03 -0.15 -0.12 0.00 0.86

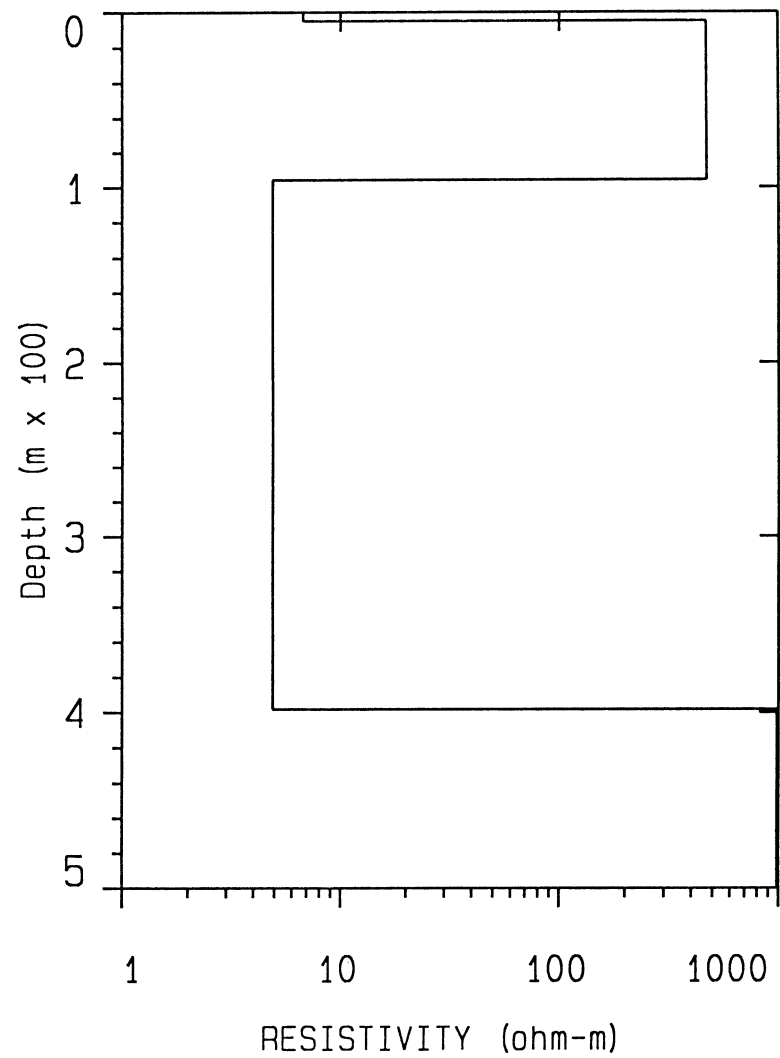
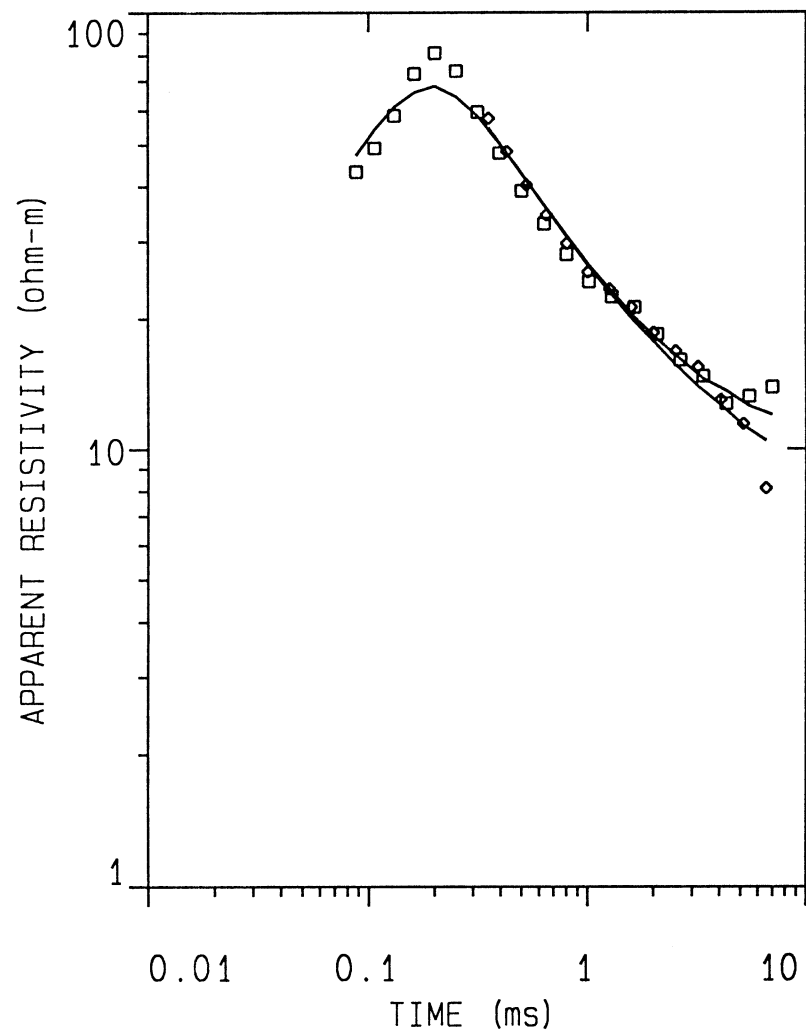
P 1 P 2 P 3 T 1 T 2

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LINE52



DATA SET: LINE52

CLIENT: GRCC  
 LOCATION: Fox River Valley  
 COUNTY: Wisconsin  
 PROJECT: Mapping Sandstone Aquifer  
 LOOP SIZE: 50.000 m by 50.000 m  
 COIL LOC: 0.000 m (X), 0.000 m (Y)  
 SOUNDING COORDINATES: E: 1.0000 N: 52.0000

DATE: Jan, 2002  
 SOUNDING: 42  
 ELEVATION: 0.00 m  
 EQUIPMENT: Geonics PROTEM  
 AZIMUTH:  
 TIME CONSTANT: NONE  
 SLOPE: NONE

Central Loop Configuration  
 Geonics PROTEM System

FITTING ERROR: 13.511 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	6.75	4.99	-4.99	0.738
2	468.5	90.77	-95.76	0.193
3	4.89	302.3	-398.1	61.72
4	986.2			

ALL PARAMETERS ARE FREE

CURRENT: 20.70 AMPS EM-58  
 FREQUENCY: 30.00 Hz GAIN: 1

COIL AREA: 100.00 sq m.  
 RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf DATA (nV/m sqrd)	SYNTHETIC (nV/m sqrd)	DIFFERENCE (percent)
1	0.0881	39668.9	34817.0	12.23
2	0.106	20271.6	17413.6	14.09
3	0.131	9336.5	8722.6	6.57
4	0.161	3980.4	4607.1	-15.74
5	0.200	1977.6	2564.8	-29.68
6	0.250	1306.6	1598.8	-22.36
7	0.314	1024.8	1053.7	-2.82
8	0.395	799.6	741.7	7.23
9	0.499	603.1	528.0	12.45
10	0.631	436.7	375.6	13.98
11	0.799	306.8	264.4	13.79
12	1.01	209.6	184.0	12.21

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No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
13	1.28	130.2	124.9	4.06
14	1.63	77.68	83.99	-8.12
15	2.08	52.75	54.99	-4.25
16	2.64	35.42	35.15	0.774
17	3.37	22.00	22.45	-2.03
18	4.29	14.93	13.49	9.65
19	5.47	7.69	8.30	-7.94
20	6.97	3.89	4.85	-24.63

CURRENT: 22.70 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
21	0.352	885.4	953.2	-7.65
22	0.427	713.0	724.4	-1.59
23	0.525	557.5	537.4	3.60
24	0.647	419.0	398.8	4.80
25	0.802	306.3	290.9	5.02
26	1.00	219.3	208.4	4.96
27	1.25	142.5	145.5	-2.09
28	1.58	92.53	101.0	-9.23
29	1.99	63.31	67.88	-7.22
30	2.52	40.82	45.50	-11.47
31	3.19	25.63	29.93	-16.78
32	4.05	18.34	19.13	-4.32
33	5.14	12.24	12.40	-1.29
34	6.54	11.27	7.69	31.70

# PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

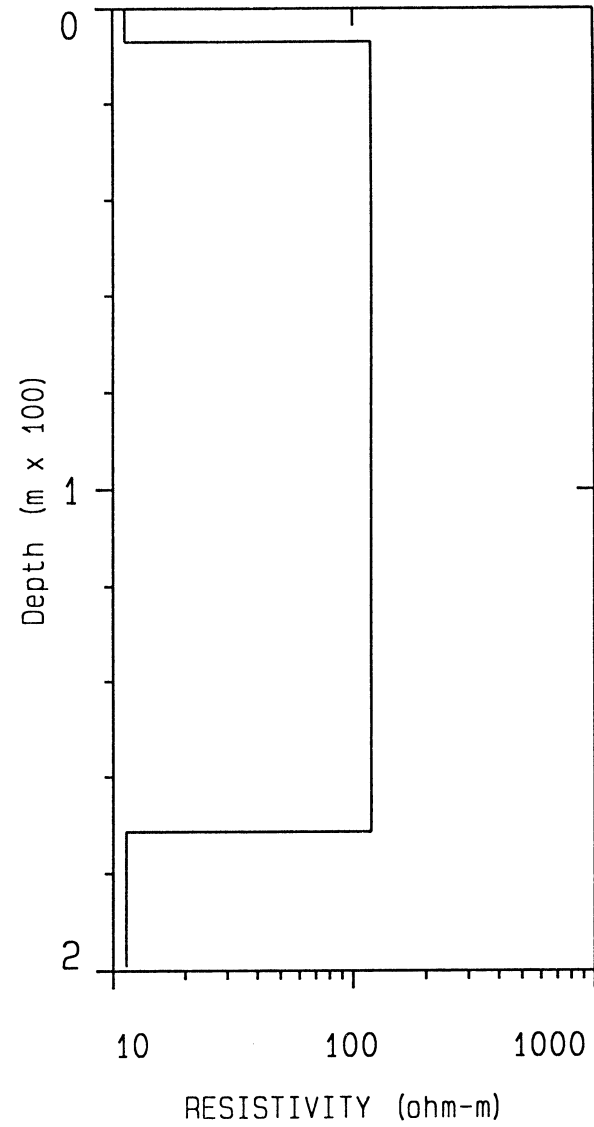
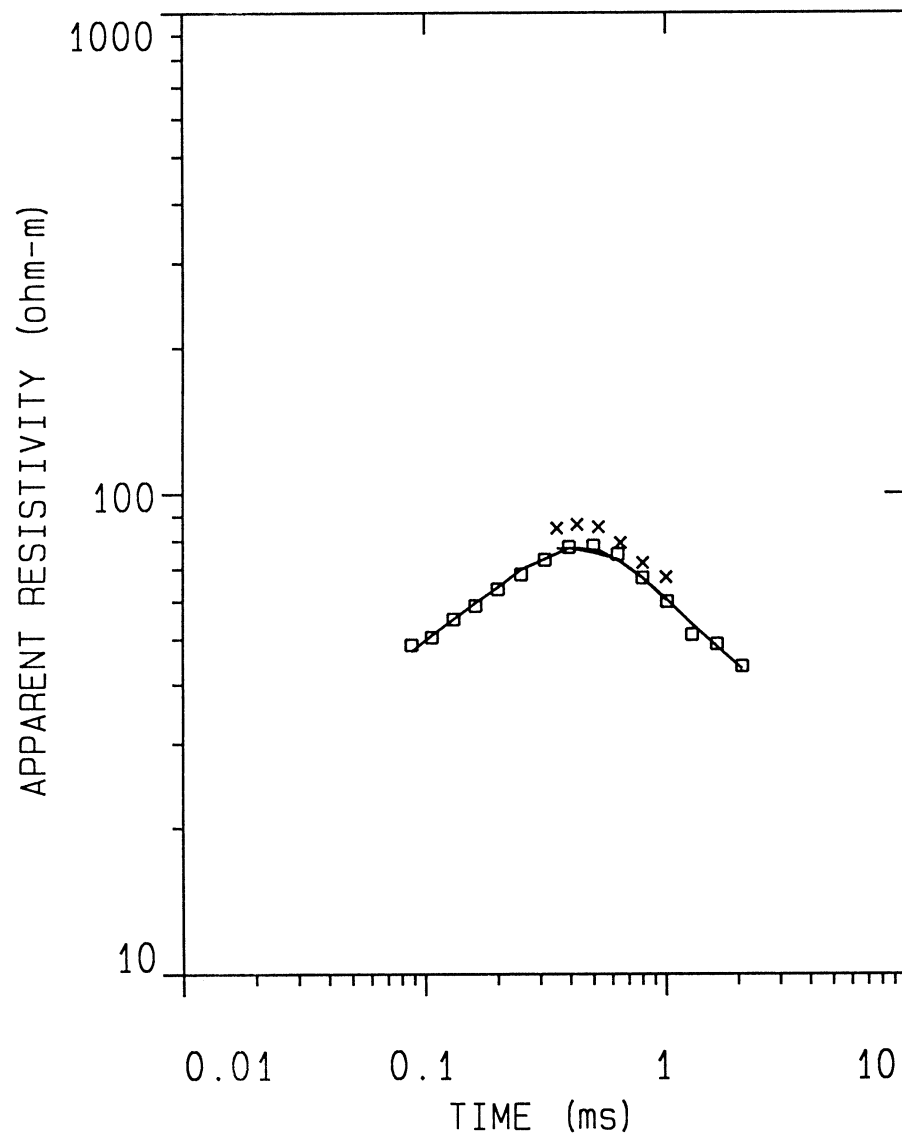
P 1	0.93							
P 2	0.04	0.03						
P 3	0.00	-0.02	0.96					
P 4	0.00	0.00	0.00	0.00				
T 1	-0.07	-0.04	0.00	0.00	0.93			
T 2	0.00	0.02	0.01	0.00	0.00	1.00		
T 3	-0.01	0.00	0.06	0.00	-0.01	-0.01	0.23	
	P 1	P 2	P 3	P 4	T 1	T 2	T 3	

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# LINE53



DATA SET: LINE53

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 53.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 3.163 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	11.25	6.84	-6.84	0.607
2	118.7	164.5	-171.3	1.38
3	11.32			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 6	RAMP TIME: 50.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	33834.9	35519.1	-4.97
2	0.106	19752.5	19473.4	1.41
3	0.131	10372.7	10383.2	-0.100
4	0.161	5571.6	5457.2	2.05
5	0.200	2892.5	2857.2	1.22
6	0.250	1493.2	1441.9	3.43
7	0.314	762.2	759.2	0.390
8	0.395	392.9	395.4	-0.620
9	0.499	217.3	228.0	-4.92
10	0.631	128.4	133.1	-3.67
11	0.799	84.15	84.16	-0.0107
12	1.01	55.10	54.46	1.15
13	1.28	38.58	35.79	7.22

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	22.68	23.12	-1.94
15	2.08	14.64	14.93	-1.96

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 2 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
16	0.352	497.1	574.3	-15.53 MASKED
17	0.427	299.2	353.7	-18.23 MASKED
18	0.525	182.1	214.7	-17.88 MASKED
19	0.647	120.6	138.1	-14.50 MASKED
20	0.802	81.44	90.96	-11.69 MASKED
21	1.00	51.60	60.91	-18.05 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

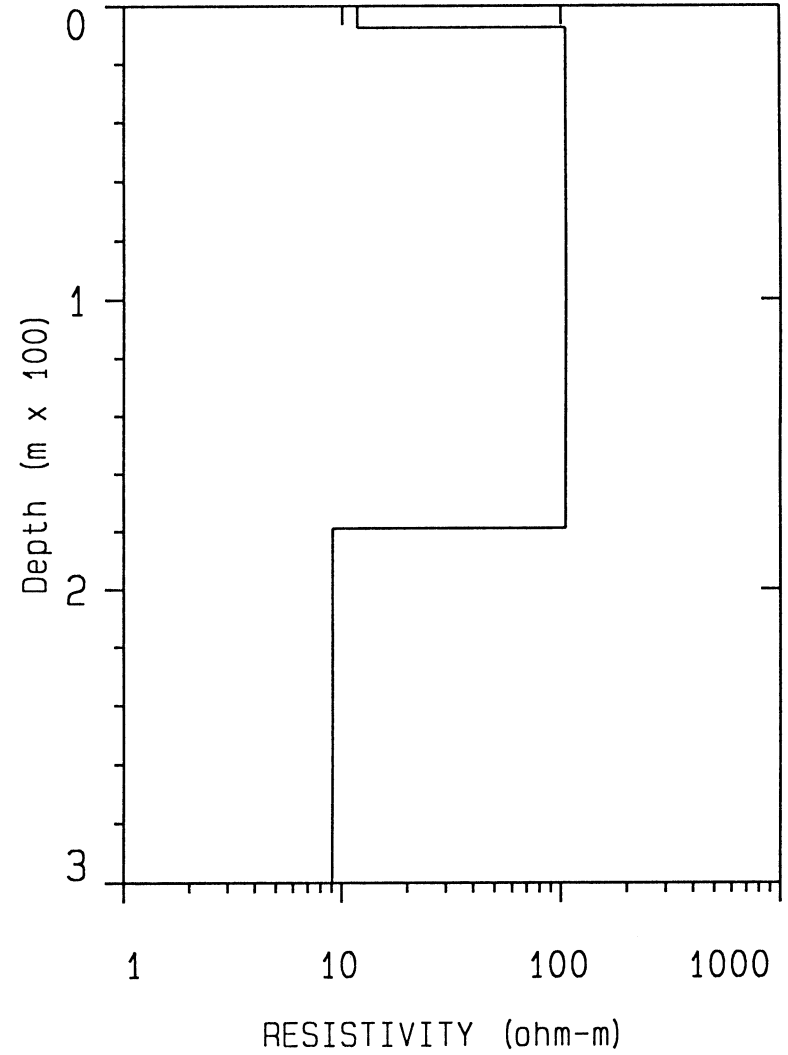
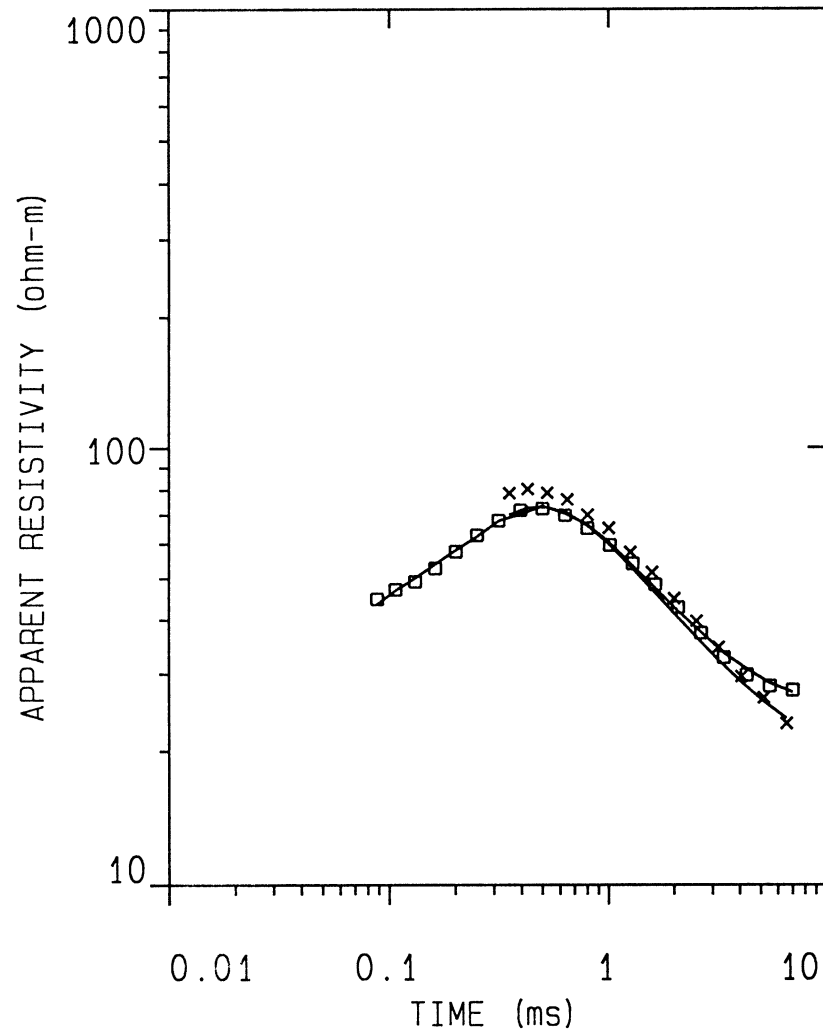
P 1	0.60				
P 2	0.12	0.57			
P 3	0.01	-0.13	0.20		
T 1	-0.33	-0.13	-0.04	0.56	
T 2	-0.02	0.09	0.10	0.02	0.94
	P 1	P 2	P 3	T 1	T 2

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LINE54



DATA SET: LINE54

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 54.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 2.590 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	11.74	7.52	-7.52	0.640
2	104.8	171.4	-178.9	1.63
3	9.10			

ALL PARAMETERS ARE FREE

CURRENT: 21.00 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 51.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	38287.5	39873.9	-4.14
2	0.106	21877.9	22048.3	-0.778
3	0.131	12278.6	11938.7	2.76
4	0.161	6551.2	6317.9	3.56
5	0.200	3354.0	3318.6	1.05
6	0.250	1692.0	1708.3	-0.962
7	0.314	853.8	855.7	-0.215
8	0.395	442.6	457.3	-3.33
9	0.499	244.0	239.0	2.02
10	0.631	143.1	141.3	1.20
11	0.799	88.02	85.64	2.70
12	1.01	55.55	54.62	1.68
13	1.28	35.38	36.09	-2.00

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	22.99	23.61	-2.71
15	2.08	15.13	15.60	-3.14
16	2.64	10.19	10.11	0.831
17	3.37	6.76	6.53	3.41
18	4.29	4.23	4.04	4.60
19	5.47	2.52	2.46	2.17
20	6.97	1.41	1.44	-1.81

CURRENT: 22.70 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 58.00 muSEC

## SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
21	0.352	556.5	662.8	-19.08 MASKED
22	0.427	332.5	385.0	-15.76 MASKED
23	0.525	204.8	230.6	-12.59 MASKED
24	0.647	128.1	142.7	-11.35 MASKED
25	0.802	84.74	92.60	-9.27 MASKED
26	1.00	53.86	61.22	-13.65 MASKED
27	1.25	37.04	41.49	-11.99 MASKED
28	1.58	24.48	28.09	-14.73 MASKED
29	1.99	16.84	19.02	-12.95 MASKED
30	2.52	11.25	12.84	-14.08 MASKED
31	3.19	7.69	8.56	-11.23 MASKED
32	4.05	5.35	5.59	-4.47 MASKED
33	5.14	3.48	3.60	-3.38 MASKED
34	6.54	2.34	2.25	3.78 MASKED

## PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.39

P 2 0.21 0.25

P 3 -0.01 -0.03 0.15

T 1 -0.29 -0.20 0.02 0.33

T 2 0.00 0.10 0.15 0.02 0.79

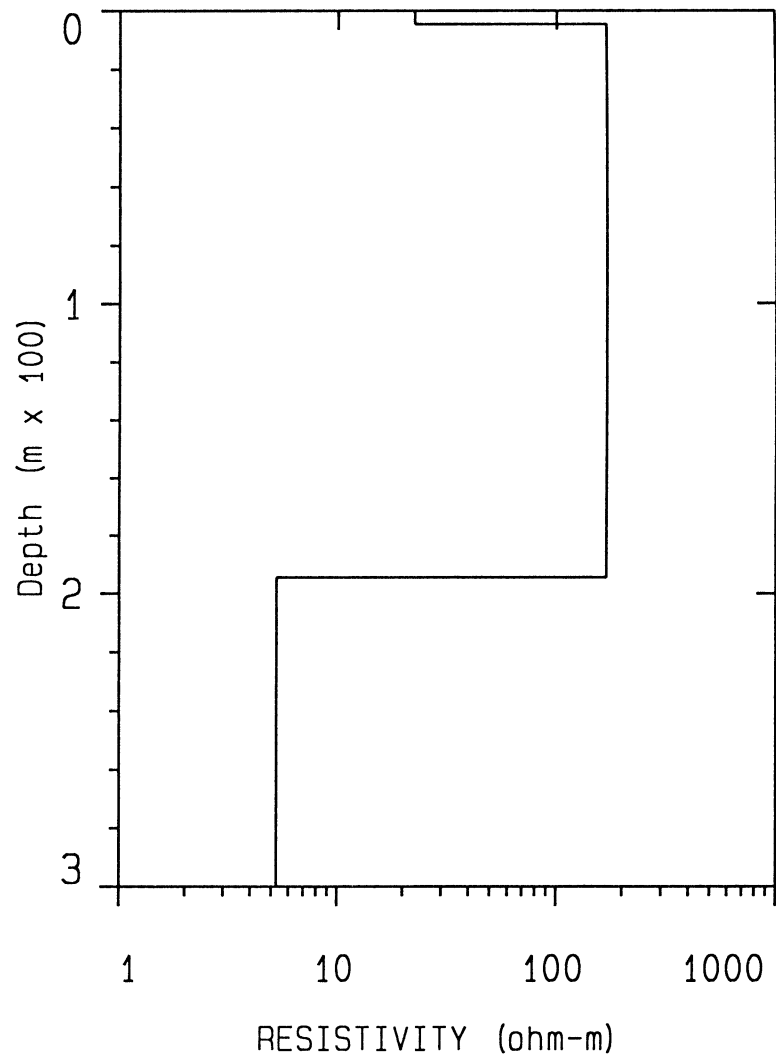
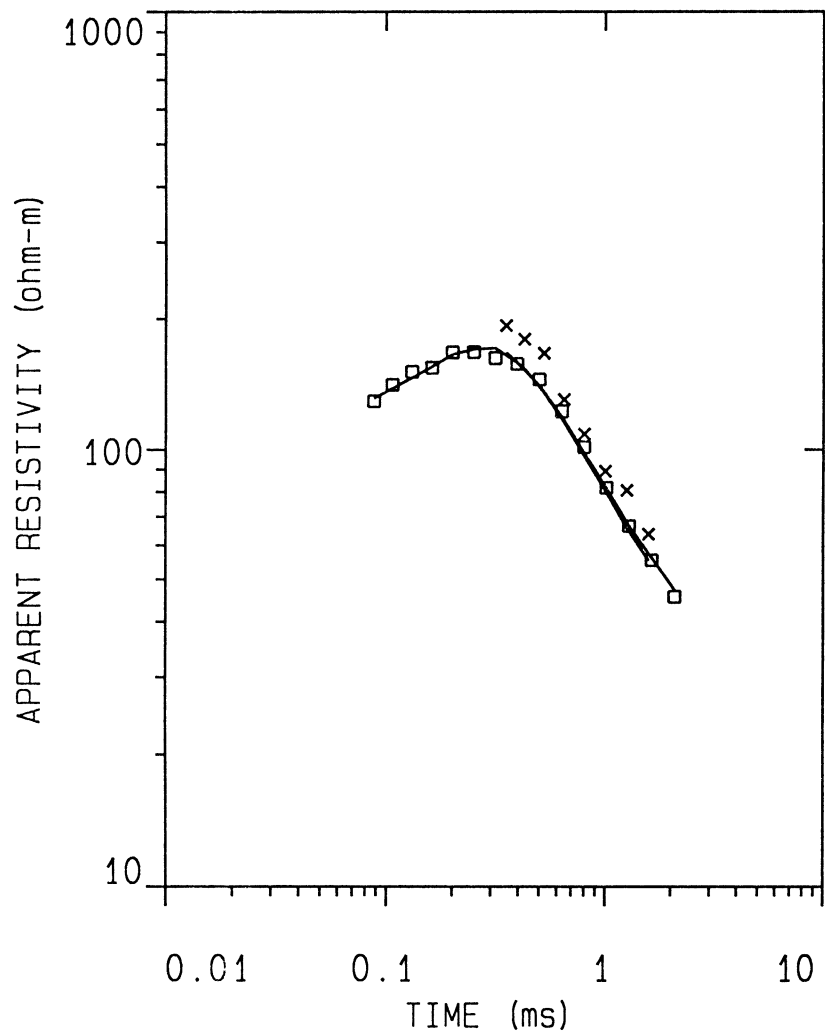
P 1 P 2 P 3 T 1 T 2

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# LINE55





DATA SET: LINE55

CLIENT: GRCC	DATE: Jan, 2002
LOCATION: Fox River Valley	SOUNDING: 42
COUNTY: Wisconsin	ELEVATION: 0.00 m
PROJECT: Mapping Sandstone Aquifer	EQUIPMENT: Geonics PROTEM
LOOP SIZE: 50.000 m by 50.000 m	AZIMUTH:
COIL LOC: 0.000 m (X), 0.000 m (Y)	TIME CONSTANT: NONE
SOUNDING COORDINATES: E: 1.0000 N: 55.0000	SLOPE: NONE

Central Loop Configuration  
Geonics PROTEM System

FITTING ERROR: 3.684 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	CONDUCTANCE (Siemens)
			0.0	
1	22.44	4.61	-4.61	0.205
2	168.6	189.9	-194.5	1.12
3	5.26			

ALL PARAMETERS ARE FREE

CURRENT: 20.70 AMPS	EM-58	COIL AREA: 100.00 sq m.
FREQUENCY: 30.00 Hz	GAIN: 1	RAMP TIME: 49.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0881	7661.4	7497.6	2.13
2	0.106	4152.9	4265.1	-2.70
3	0.131	2240.2	2346.1	-4.72
4	0.161	1283.2	1273.1	0.783
5	0.200	665.1	676.3	-1.67
6	0.250	380.1	372.2	2.06
7	0.314	226.3	209.2	7.57
8	0.395	133.4	132.4	0.796
9	0.499	84.38	88.54	-4.94
10	0.631	60.51	63.15	-4.37
11	0.799	44.60	46.58	-4.42
12	1.01	34.09	34.05	0.0937
13	1.28	25.53	25.46	0.279

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No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
14	1.63	18.41	18.06	1.91
15	2.08	13.49	12.78	5.20

CURRENT: 22.80 AMPS EM-58 COIL AREA: 100.00 sq m.  
 FREQUENCY: 7.50 Hz GAIN: 1 RAMP TIME: 57.00 muSEC

SYNTHETIC FROM LAYERED MODEL:

No.	TIME (ms)	emf (nV/m sqrd)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
16	0.352	145.0	179.4	-23.69 MASKED
17	0.427	99.78	126.0	-26.28 MASKED
18	0.525	66.63	91.45	-37.24 MASKED
19	0.647	56.96	68.22	-19.75 MASKED
20	0.802	43.85	52.37	-19.43 MASKED
21	1.00	33.75	39.41	-16.76 MASKED
22	1.25	22.30	30.29	-35.81 MASKED
23	1.58	17.90	22.13	-23.57 MASKED

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1 0.80  
 P 2 0.07 0.92  
 P 3 0.07 -0.07 0.67  
 T 1 -0.06 -0.07 -0.03 0.78  
 T 2 0.00 0.01 0.01 0.01 1.00  
     P 1 P 2 P 3 T 1 T 2

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