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Seismic Refraction Survey of the ANS Preferred Site

R. K. Davis
R. A. Hopkins
W. E. Doll

Advanced Neutron Source

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SEISMIC REFRACTION SURVEY

OF THE

ANS PREFERRED SITE

R. K. Davis[a]
R. A. Hopkins[b]
W. E. Doll

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[a]Automated Sciences Group, Inc.
[b]Marrich, Inc.

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Acronyms

ANS	Advanced Neutron Source
BDPFR	Betsy Downhole Percussion Firing Rod
CRM	Conventional Reciprocal Method
DOE-ORR	Department of Energy Oak Ridge Reservation
GRM	Generalized Reciprocal Method
HPRR	Health Physics Research Reactor
ITM	Intercept Time Method
TD	Time-Distance

ABSTRACT

Between September 19, 1991 and October 8, 1991 personnel from Martin Marietta Energy Systems, Inc. (Energy Systems), Automated Sciences Group, Inc., and Marrich, Inc. performed a seismic refraction survey at the Advanced Neutron Source (ANS) preferred site. The purpose of this survey was to provide estimates of top-of-rock topography, based on seismic velocities, and to delineate variations in rock and soil velocities.

Forty-four seismic refraction spreads were shot to determine top-of-rock depths at 42 locations. Nine of the seismic spreads were shot with long offsets to provide 216 top-of-rock depths for 4 seismic refraction profiles. The refraction spread locations were based on the grid for the ANS Phase I drilling program.

Interpretation of the seismic refraction data supports the assumption that the top-of-rock surface generally follows the local topography. The shallow top-of-rock interface interpreted from the seismic refraction data is also supported by limited drill information at the site. Some zones of anomalous data are present that could be the result of locally variable weathering, a localized variation in shale content, or depth to top-of-rock greater than the site norm.

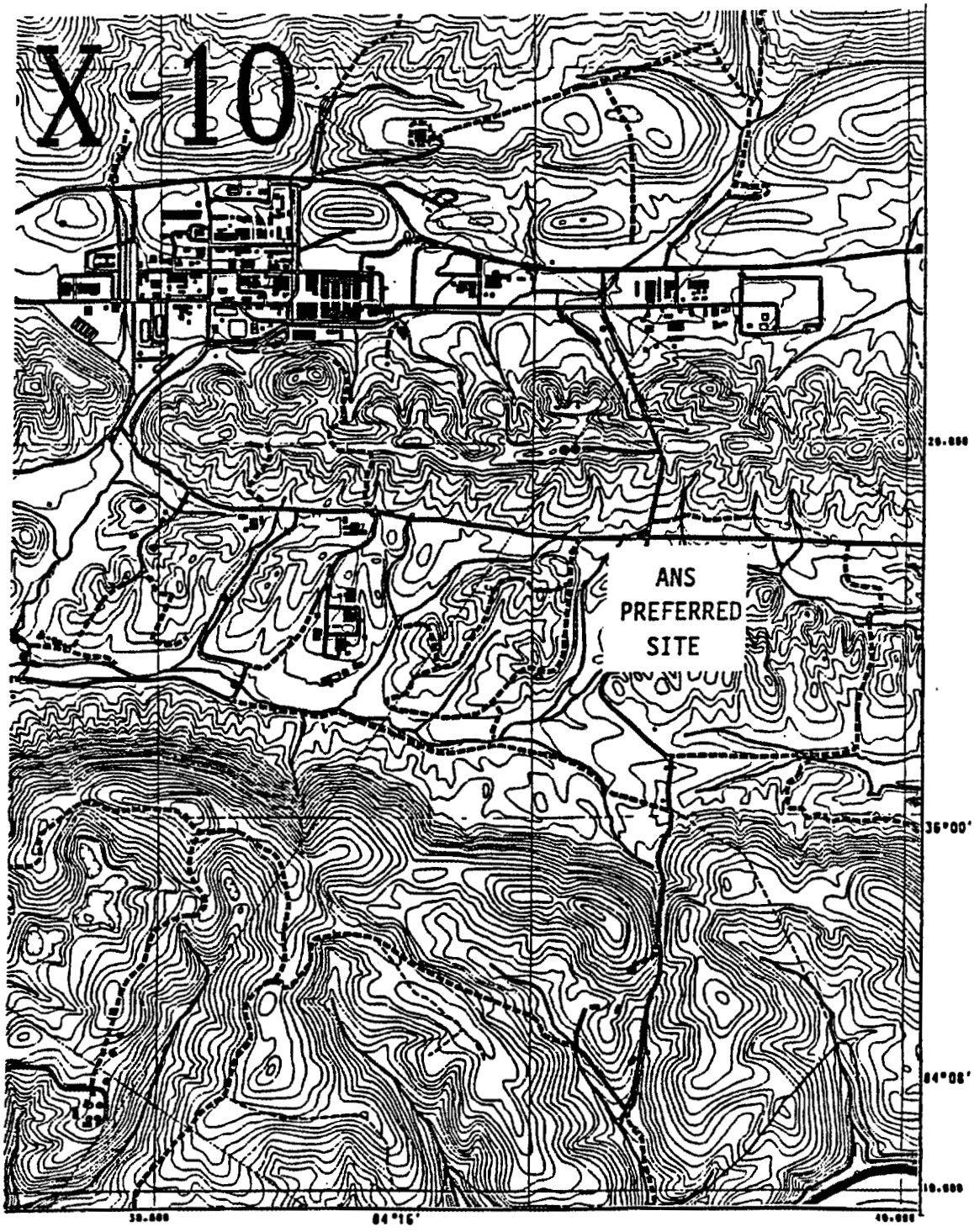
1. INTRODUCTION

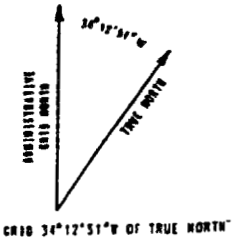
1.1 LOCATION AND DESCRIPTION

The ANS preferred site located on the U.S. Department of Energy Oak Ridge Reservation (DOE-ORR) at Oak Ridge, Tennessee, is shown in Fig. 1.1. The specific site surveyed during this investigation is south of Ramsey Road and generally east of the Health Physics Research Reactor (HPRR) access road (Fig. 1.2). Surface elevations on the site range from 827 to 938 ft above sea level. The varied topographic relief is expressed as gentle to very steep slopes. The site is predominately light to moderately wooded with very few open areas.

1.2 SITE GEOLOGY

The ANS site is located in the Tennessee section of the Valley and Ridge province, in which the valleys and ridges generally trend southwest (SW) to northeast (NE) in a direction that mimics the strike of underlying rock units.[1] The ANS site is underlain by southeast (SE) dipping limestone and shale units of the Middle Cambrian Age Conasauga Group, specifically the Maryville Limestone, the Rogersville shale, the Rutledge Limestone, and the Pumpkin Valley Shale formations.[2]





DECLINATION OF GRID 34°12'51"W OF TRUE NORTH

Fig. 1.1. Site location map.

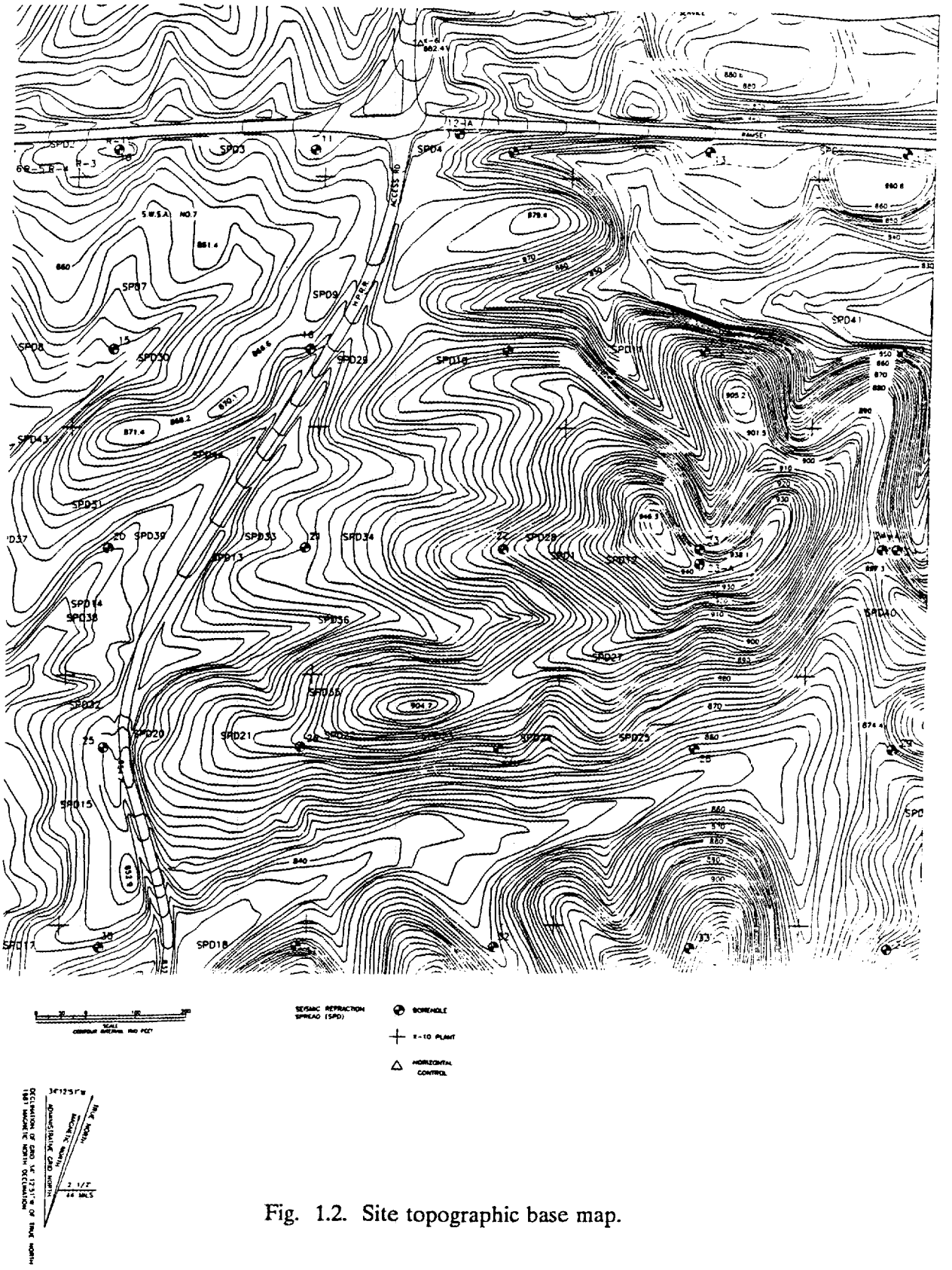


Fig. 1.2. Site topographic base map.

2. SEISMIC REFRACTION SURVEY DESCRIPTION

2.1 OBJECTIVES

The purpose of this survey is to provide top-of-rock topographic data, based on seismic velocities, and to determine anomalous velocity zones in the near surface (soil or rock). This is to be accomplished by producing a top-of-rock surface contour map based on at least 40 locations and 4 profiles based on 2000 ft of continous data at 10-ft spacing. The survey location grid is to correspond to the ANS Phase I drilling program.[3] The top-of-rock surface is to be defined by a seismic velocity and not tied to a specific geologic contact (Appendix G, p. G-3).

To investigate the applicability of seismic reflection as an exploration tool at the site, a seismic reflection "walkaway noise test" was conducted in the NW corner, near Phase I borehole #10 (Plate 1).

2.2 SEISMIC REFRACTION LINE LOCATIONS

Plate 1 shows the locations of the 44 seismic refraction spreads. A spread is defined as an arrangement of geophone groups (for this survey a group consisted of one geophone) in relation to the source point.[4] Twenty-four seismic refraction spreads were located at Phase I boreholes #10 through #33 (only #22 has been drilled). To investigate the effect of spread orientation on depth determinations, a S-N and a W-E spread were located at both ANS boreholes #15 and #30. Additionally, nine spreads were located on 200-ft centers in the central area of the site. To maximize data collection beneath the main ANS structure (Appendix G, p. G-19), nine spreads were located around ANS boreholes #20, #21, and #22. These nine spreads were shot as profiles (Plate 1). The shot points, geophone 1 and geophone 24 for all 44 spreads, were located and marked with labeled flags by the field crew. These flagged points were later located by surveying (Appendix F). The locations estimated by the seismic field crew agreed to within 2 ft of the final surveyed locations. Flags for spreads 1, 7, 8, and 14 were moved by animals, thus final surveyed locations varied from the estimated field location by as much as 5 ft. Elevations for geophones 2 through 23, required for profile interpretations (Appendix E), were visually estimated during data acquisition and checked against final survey information (Appendix F). The error encountered by the delayed surveying and estimating the locations and elevations for the intermediate profile geophones is acceptable for this level of investigation.

2.3 EQUIPMENT AND PROCEDURES

2.3.1 Data Acquisition

Data were acquired digitally using an EG&G ES-2401 seismograph. The output from 14 Hz geophones was recorded with a 250 Hz, high-cut filter to reduce unwanted transient high-frequency noise. To ensure precise, first-break information, data were sampled at 0.10 ms. Because the ES-2401 system has floating-point capability, no amplifier gains needed to be specified during acquisition.

A seismic spread for the station method consisted of 24 single-station geophones at 10 ft spacing. Two shot points were located 10 ft off each end, and a third was located at the center point of the spread. Refracted seismic energy was generated by impacting an aluminum plate with a sledge hammer. The off-end shot points generally required 8 stacks per shot point (stacks are multiple hits of the hammer to further enhance the record). The center-point shot generally required 4 stacks.

A seismic spread for the profile method consisted of 24 single-station geophones with 10 ft spacing and 5 shot points. Three of the shots used the same source and location layout as the station spreads. These near off-end and center-point shots provided data for velocity control and depth estimations. Two shot points were located 150 ft off each end of the spread. At these two points, refracted seismic energy was generated by firing an 8-gauge, 300-grain, black-powder blank shell in a Betsy Downhole Percussion Firing Rod (BDPFR) (Appendix G, p. G-11). Shot holes 2 to 3 ft deep were drilled by hand or power auger for the BDPFR shots. BDPFR stacks generally ranged from 1 to 3 per shot point. Additional information regarding equipment and procedures is discussed in Appendix A and Appendix G.

2.3.2 Data Reduction

Data reduction procedures followed the flowchart shown in Fig. 2.1. Raw field data were recorded both digitally (on a 3.5 in., 1.44-MB floppy disk using industry standard SEG-2 format) and in analog form as field displays. Following each shot, analog field records were printed, documented, and immediately reviewed for quality control (e.g., signal amplitude and noise) (Appendix B).

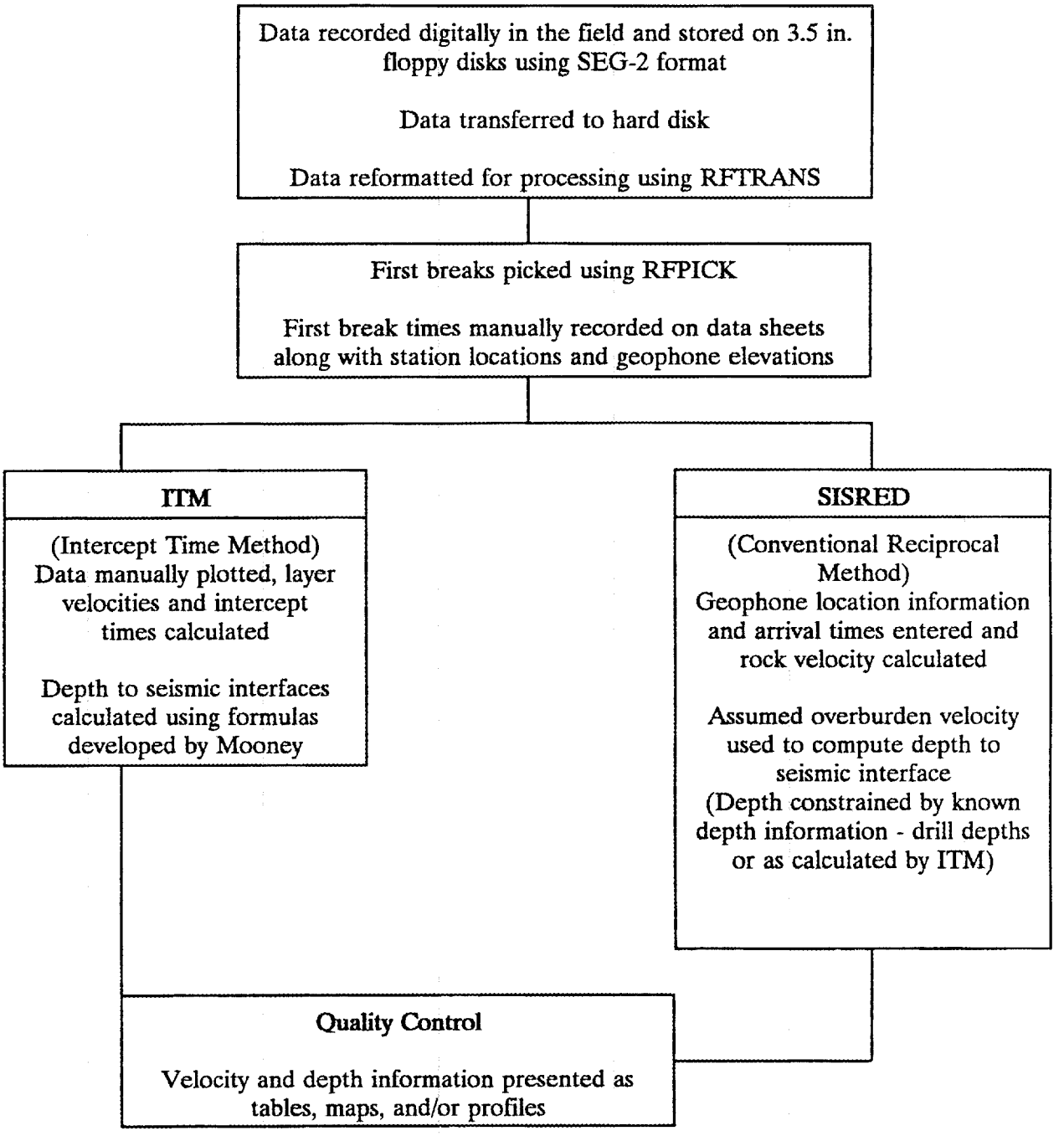


Fig. 2.1. Data processing flowchart.

RFPICK[5] was used to read the digital field files and to pick the first break arrival times, which were output as ".PIK" files. Surveyed profile elevations (Appendix F) were used to correct field-estimated elevations for each geophone location. The revised elevation data were manually entered into the computer, combined with the first-break pick data, and stored in RF[5] data files for archival purposes only.

Upon completion of all field work, data were reviewed for proper documentation, and first breaks were verified. First-break and geophone information (e.g., location and elevation) data were manually recorded on the field data sheets.

With the corrected travel time data, a time-distance (TD) plot of arrival times versus source-to-geophone distance can be constructed (Appendix C). These TD plots are the foundation of seismic refraction interpretation.

The above data sets are then used as input into either the Intercept Time Method (ITM) (in the case of station method processing) or into SISRED[6] (in the case of profile method processing). The SISRED program is similar to the familiar Generalized Reciprocal Method (GRM)[7] and is a variation of the Conventional Reciprocal Time or Delay Time Method (CRM)[8] for reducing seismic refraction data. It differs in that with SISRED, the user assigns overburden velocities to calculate depths to the seismic interface. This implies that the user has some knowledge of the actual depths to the seismic interface before processing. The seismic interface depths calculated using ITM and depths obtained from ANS Phase I borehole #22[9] were used to constrain overburden velocities for SISRED. The SISRED results are presented in Appendix E. For a general discussion of other seismic refraction schemes see Appendix A.

Seismic refraction data from 42 locations at the site were reduced using the ITM data reduction scheme (Appendix D). A wide variety of formulas, monographs, and computer programs are available for solving the ITM (or the crossover distance method). A detailed description of the manual technique used for this investigation has been published by Bison Instruments.[10]

3. SEISMIC REFRACTION RESULTS

3.1 COMPRESSIONAL WAVE SEISMIC REFRACTION SURVEY

ITM (station method) results define three seismic layers at the site: an upper layer from 0 to 5 ft with P-wave velocities from 1200 to 1450 ft/s (V1), an intermediate layer with P-wave velocities from 2000 to 6300 ft/s (V2) and a bedrock layer (V3). The velocity variation present in the intermediate layer is attributed to lateral changes in material and saturation. The third, and deepest, seismic interface ranges from 9 to 42 ft and is interpreted to represent top-of-rock contact. P-wave velocities greater than 9000 ft/s (V3) were obtained in the material below this seismic interface. Also, some zones of anomalous data are present, —specifically, spreads 3, 22, 25, and 38. These spreads exhibit variations in overall consistency of arrival times, signature, velocity, and depth. This could be the result of locally variable weathering resulting in depths to top-of-rock greater than the site norm or localized variations in lithology and/or structure. To resolve the source(s) of these anomalies is beyond the scope of this survey.

SISRED (profile method) processing only calculates the bedrock velocities, which ranged from 9,786 to 12,206 ft/s. SISRED overburden velocities were assigned to produce top-of-rock depths that agreed with those calculated by the ITM method. It is important to mention that the SISRED overburden velocities were consistent from profile to profile, which implies consistency in interpretation. Some of the station data (spreads 13, 14, 15, 31, and 32) were of such quality that they could be analyzed to yield top-of-rock values at some or all geophones. By performing "profile analysis" of these station data, about 500 additional feet of profile coverage was acquired.

Profiles generated by the SISRED process are shown in Figs. 3.1 - 3.4 and summarized in Tables 3.1 - 3.4 and Appendix E. Interpretation results using the ITM method are presented in Table 3.5 and Appendix D. Table 3.6 is included to aide the reader in associating analog records in Appendix B with spread locations shown in Plate 1.

3.2 CONTOUR MAPS

A topographic contour map using only the surface elevations of the center points of each refraction spread (taken from Table 3.5), is shown in Fig. 3.5. A top-of-rock surface contour map using only the average elevations of the V2-V3 interface (taken from Table 3.5), is shown in Fig. 3.6. Both contour maps were produced by TOPO[11] from gridded data

calculated by GRID.[11] Two methods evaluated for gridding the refraction data were inverse distance and kriging.[12] The inverse distance method with a 100 ft grid size produced the best results, that is, the best fit of Fig. 3.5 to the topographic base map shown in Fig. 1.2. The comparison of Fig. 3.5 to Fig. 1.2 demonstrates the loss of resolution caused from under sampling.

A 5-ft contour interval was used in Fig. 3.5 and Fig. 3.6 to emphasize the ±5 ft accuracy of this survey (Sec. 3.4). The V2-V3 elevation data used in Fig. 3.6 was also mapped with a 2-ft contour interval (Fig. 3.7) to facilitate the extrapolation of top-of-rock values between the measured V2-V3 elevation data points.

A strong correlation between the surface topographic contour map (Fig. 3.5) and the top-of-rock contour map (Fig. 3.6) indicates that top-of-rock generally follows surface topography. This correlation implies that an estimation method known as cokriging[12] could be applied to the seismic refraction data to produce an enhanced, top-of-rock-surface projected contour map. This method would involve combining the under-sampled V2-V3 elevation data with densely sampled topographic data. The cokriging method would then calculate a V2-V3 elevation for each topographic data point that did not have a corresponding measured V2-V3 elevation data point.

3.3 COMPARISON OF DRILL DATA WITH SEISMIC REFRACTION RESULTS

The final step in evaluating the results of this seismic refraction survey is to compare the V2-V3 elevation data with top-of-rock elevation data from cored borings. During November of 1989, ERC/EDGe published a preliminary geotechnical investigation of the ANS preferred site.[9] Included in the ERC/EDGe report are two plates that present graphical core information from five borings (1, 3, 5, 7,and 9). The base of the weathered zone for each of the five borings was assumed to be the top-of-rock elevation.

Results from the cored borings and the seismic refraction survey are summarized in Table 3.7. The V2-V3 elevations used to compare with borings 1, 5, 7, and 9 were calculated by GRID (using the inverse distance interpolation method) to produce the contour maps shown in Fig. 3.6 and Fig. 3.7. The gridded V2-V3 data is shown posted with the five cored borings in Fig. 3.8. Boring 3 was compared with the V2-V3 elevation taken from geophone one of spread 34 included in profile one (Fig. 3.1 and Table 3.1).

3.4 QUALITY ASSURANCE

This survey was performed as an economic evaluation and, as such, was considered to be NQA-1 Category III. For this reason no attempt should be made to compute engineering parameters from these data.

Quality control of the field acquisition consisted of varying spread orientation (E-W, N-S, etc.), recording repeat records, stacking shots, and recording in both forward and reverse directions. Extensive field records were maintained and checked daily, and all data underwent a preliminary data reduction prior to termination of data acquisition. The field crew took care to minimize cultural and weather related noise by delaying between shots and stacking of shots. This resulted in high-quality records with sharp first breaks. Consistency of interpretations spread-to-spread and profile-to-profile also aided in quality control.

Errors due to location and elevation control, equipment error (trigger timing), data reduction (first break pick within ±1 ms), and interpretation (velocity calculations and\or assumptions), when combined, are estimated to give the depth calculation an accuracy to within ±5 ft.

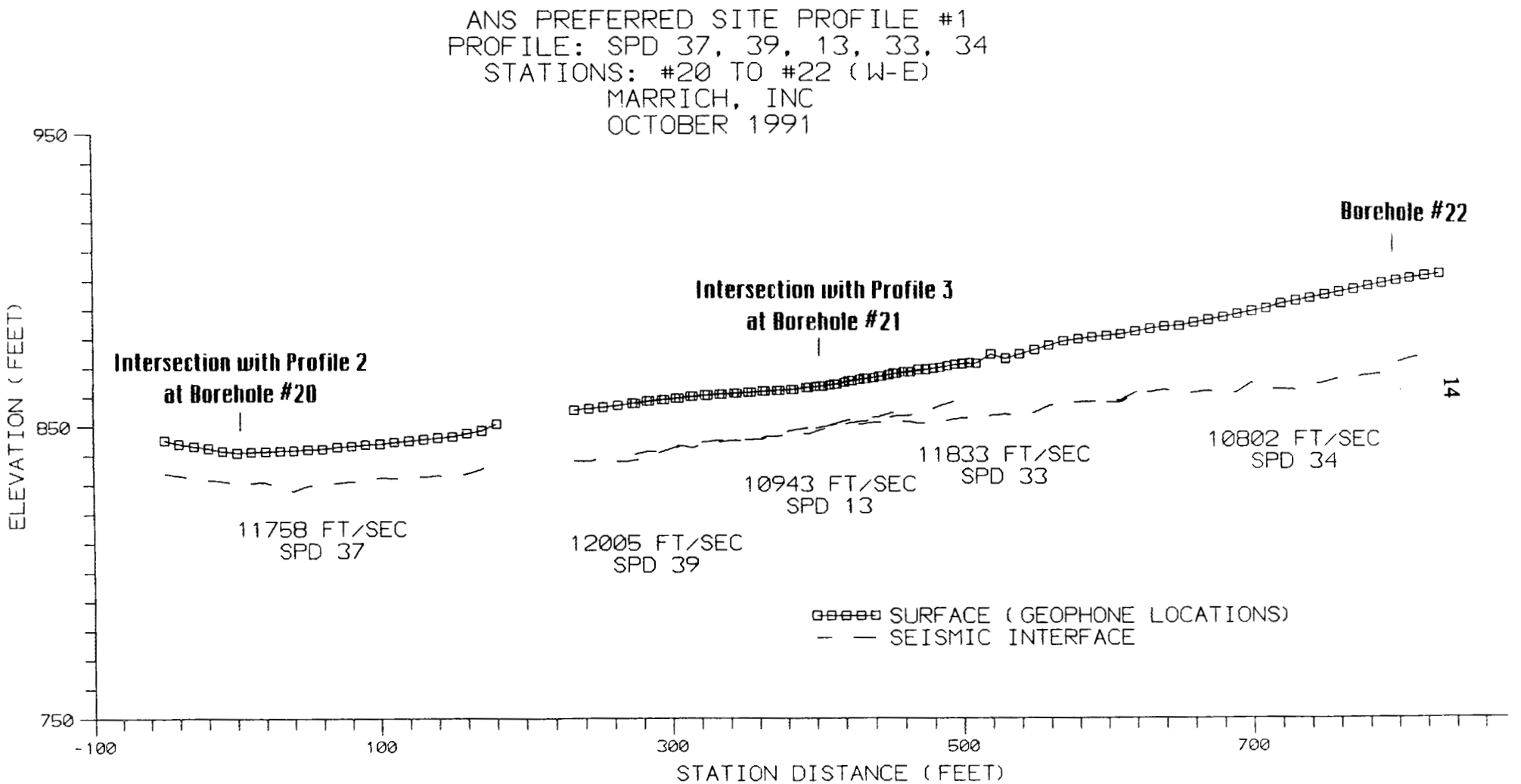


Fig. 3.1. SISRED Profile 1.

Table 3.1 Profile 1 Data

SPREADS 37, 39, 13, 33, and 34

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
SPD 37 1	17755	36030	845	11	834
2	17755	36040	844	11	833
3	17755	36050	843	11	832
4	17755	36060	843	11	832
5	17755	36070	842	10	832
6	17755	36080	841	11	830
7	17755	36090	841	11	830
8	17755	36100	841	11	830
9	17755	36110	842	13	829
10	17755	36120	842	14	828
11	17755	36130	842	12	830
12	17755	36140	842	13	829
13	17755	36150	843	12	831
14	17755	36160	843	12	831
15	17755	36170	844	12	832
16	17755	36180	844	12	832
17	17755	36190	845	12	833
18	17755	36200	845	12	833
19	17755	36210	846	13	833
20	17755	36220	846	13	833
21	17755	36230	847	14	833
22	17755	36240	848	14	834
23	17755	36250	849	13	836
24	17755	36260	851	12	839
SPD 39 1	17755	36312	856	17	839
2	17755	36322	856	18	838
3	17755	36332	857	17	840
4	17755	36342	857	19	838
5	17755	36352	858	20	838
6	17755	36362	859	19	840
7	17755	36372	859	18	841
8	17755	36382	860	17	843
9	17755	36392	860	16	844
10	17755	36402	861	16	845
11	17755	36412	861	16	845
12	17755	36422	861	16	845
13	17755	36432	861	16	845
14	17755	36442	862	16	846
15	17755	36452	862	15	847
16	17755	36462	862	14	848
17	17755	36472	863	14	849
18	17755	36482	863	15	848
19	17755	36492	864	14	850
20	17755	36502	865	13	852
21	17755	36512	866	14	852
22	17755	36522	867	14	853
23	17755	36532	868	13	855
24	17755	36542	868	14	854
SPD 13 1	17754	36355	858	17	841

Table 3.1 (continued)

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
2	17754	36365	859	17	842
3	17754	36375	859	18	841
4	17754	36385	860	16	844
5	17754	36395	860	17	843
6	17754	36405	861	16	845
7	17754	36415	861	16	845
8	17754	36425	861	16	845
9	17754	36435	861	17	844
10	17754	36445	862	16	846
11	17754	36455	862	16	846
12	17754	36465	862	15	847
13	17754	36475	863	16	847
14	17754	36485	863	15	848
15	17754	36495	864	14	850
16	17754	36505	865	14	851
17	17754	36515	866	15	851
18	17754	36525	867	14	853
19	17754	36535	868	15	853
20	17754	36545	868	15	853
21	17754	36555	869	14	855
22	17754	36565	870	13	857
23	17754	36575	871	13	858
24	17754	36585	871	12	859
SPD 33 1	17755	36480	863	14	849
2	17755	36490	864	14	850
3	17755	36500	865	14	851
4	17755	36510	866	15	851
5	17755	36520	866	15	851
6	17755	36530	867	16	851
7	17755	36540	868	17	851
8	17755	36550	869	18	851
9	17755	36560	869	19	850
10	17755	36570	870	19	851
11	17755	36580	871	19	852
12	17755	36590	871	19	852
14	17755	36610	873	19	854
15	17755	36620	874	21	853
16	17755	36630	876	22	854
17	17755	36640	877	21	856
18	17755	36650	879	21	858
19	17755	36660	879	22	857
20	17755	36670	880	22	858
21	17755	36680	881	23	858
22	17755	36690	881	23	858
23	17755	36700	882	21	861
24	17755	36710	883	21	862
SPD 34 1	17755	36678	881	23	858
2	17755	36688	881	24	857
3	17755	36698	882	22	860

Table 3.1 (continued)

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
4	17755	36708	883	22	861
5	17755	36718	884	22	862
6	17755	36728	884	23	861
7	17755	36738	885	24	861
8	17755	36748	886	24	862
9	17755	36758	887	26	861
10	17755	36768	888	27	861
11	17755	36778	889	25	864
12	17755	36788	890	28	862
13	17755	36798	892	29	863
14	17755	36808	893	31	862
15	17755	36818	894	30	864
16	17755	36828	895	30	865
17	17755	36838	896	30	866
18	17755	36848	897	30	867
19	17755	36858	898	31	867
20	17755	36868	899	31	868
21	17755	36878	900	28	872
22	17755	36888	900	28	872
23	17755	36898	901	27	874
24	17755	36908	902	29	873

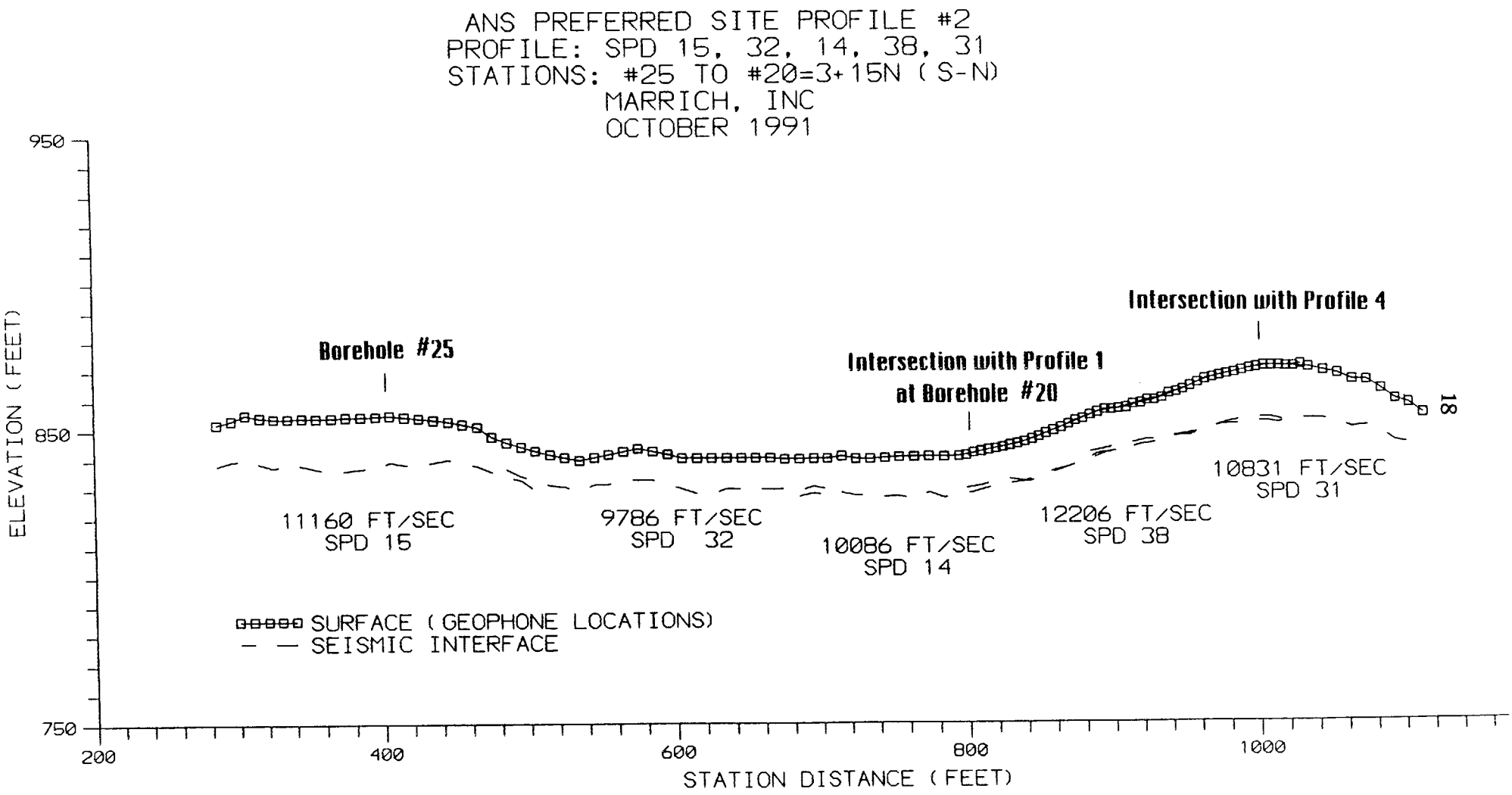


Fig. 3.2. SISRED Profile 2.

Table 3.2 Profile 2 Data

SPREADS 15, 32, 14, 38, and 31

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
SPD 15 1	17242	36080	852	14	838
2	17252	36080	854	14	840
3	17262	36080	856	15	841
4	17272	36080	855	16	839
5	17282	36080	854	17	837
6	17292	36080	854	16	838
7	17302	36080	854	16	838
8	17312	36080	854	17	837
9	17322	36080	854	18	836
10	17332	36080	855	18	837
11	17342	36080	855	18	837
12	17352	36080	855	18	837
13	17362	36080	855	16	839
14	17372	36080	855	16	839
15	17382	36080	854	16	838
16	17392	36080	854	14	840
17	17402	36080	853	13	840
18	17412	36080	852	13	839
19	17422	36080	851	13	838
20	17432	36080	848	12	836
21	17442	36080	846	12	834
22	17452	36080	844	11	833
23	17462	36080	843	13	830
24	17472	36080	842	13	829
SPD 32 1	17443	36080	846	9	837
2	17453	36080	844	10	834
3	17463	36080	843	10	833
4	17473	36080	842	10	832
5	17483	36080	841	10	831
6	17493	36080	840	10	830
7	17503	36080	841	9	832
8	17513	36080	842	10	832
9	17523	36080	843	9	834
10	17533	36080	844	11	833
11	17543	36080	843	10	833
12	17553	36080	842	10	832
13	17563	36080	840	11	829
14	17573	36080	840	12	828
15	17583	36080	840	12	828
16	17593	36080	840	11	829
17	17603	36080	840	11	829
18	17613	36080	840	11	829
19	17623	36080	840	11	829
20	17633	36080	840	10	830
21	17643	36080	840	11	829
22	17653	36080	840	10	830
23	17663	36080	840	11	829
24	17673	36080	841	11	829
SPD 14 1	17647	36080	840	13	827

Table 3.2 (continued)

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
2	17657	36080	840	12	828
3	17667	36080	840	13	827
4	17677	36080	841	13	828
5	17687	36080	840	13	827
6	17697	36080	840	13	827
7	17707	36080	840	13	827
8	17717	36080	840	13	827
9	17727	36080	840	15	825
10	17737	36080	841	12	829
11	17747	36080	840	14	826
12	17757	36080	841	13	828
13	17767	36080	842	13	829
14	17777	36080	843	13	830
15	17787	36080	844	13	831
16	17797	36080	845	13	832
17	17807	36080	846	14	832
18	17817	36080	848	14	834
19	17827	36080	850	14	836
20	17837	36080	852	15	837
21	17847	36080	854	15	839
22	17857	36080	856	15	841
23	17867	36080	856	14	842
24	17877	36080	858	14	844
SPD 38 1	17757	36080	841	11	830
2	17767	36080	842	12	830
3	17777	36080	843	11	832
4	17787	36080	844	12	832
5	17797	36080	845	14	831
6	17807	36080	847	14	833
7	17817	36080	849	14	835
8	17827	36080	851	15	836
9	17837	36080	853	15	838
10	17847	36080	855	14	841
11	17857	36080	856	14	842
12	17867	36080	857	14	843
13	17877	36080	858	14	844
14	17887	36080	859	15	844
15	17897	36080	861	15	846
16	17907	36080	863	15	848
17	17917	36080	865	17	848
18	17927	36080	867	17	850
19	17937	36080	868	16	852
20	17947	36080	869	17	852
21	17957	36080	870	17	853
22	17967	36080	871	18	853
23	17977	36080	870	18	852
24	17987	36080	871	17	854
SPD 31 1	17842	36080	854	13	841
2	17852	36080	856	13	843
3	17862	36080	856	13	843

Table 3.2 (continued)

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
4	17872	36080	858	13	845
5	17882	36080	859	13	846
6	17892	36080	860	14	846
7	17902	36080	862	15	847
8	17912	36080	864	17	847
9	17922	36080	866	17	849
10	17932	36080	867	17	850
11	17942	36080	868	18	852
12	17952	36080	870	19	851
13	17962	36080	871	19	852
14	17972	36080	871	19	852
15	17982	36080	870	18	852
16	17992	36080	870	17	853
17	18002	36080	869	16	853
18	18012	36080	868	16	852
19	18022	36080	866	16	850
20	18032	36080	866	15	851
21	18042	36080	863	14	849
22	18052	36080	859	14	845
23	18062	36080	858	14	844
24	18072	36080	854	13	841

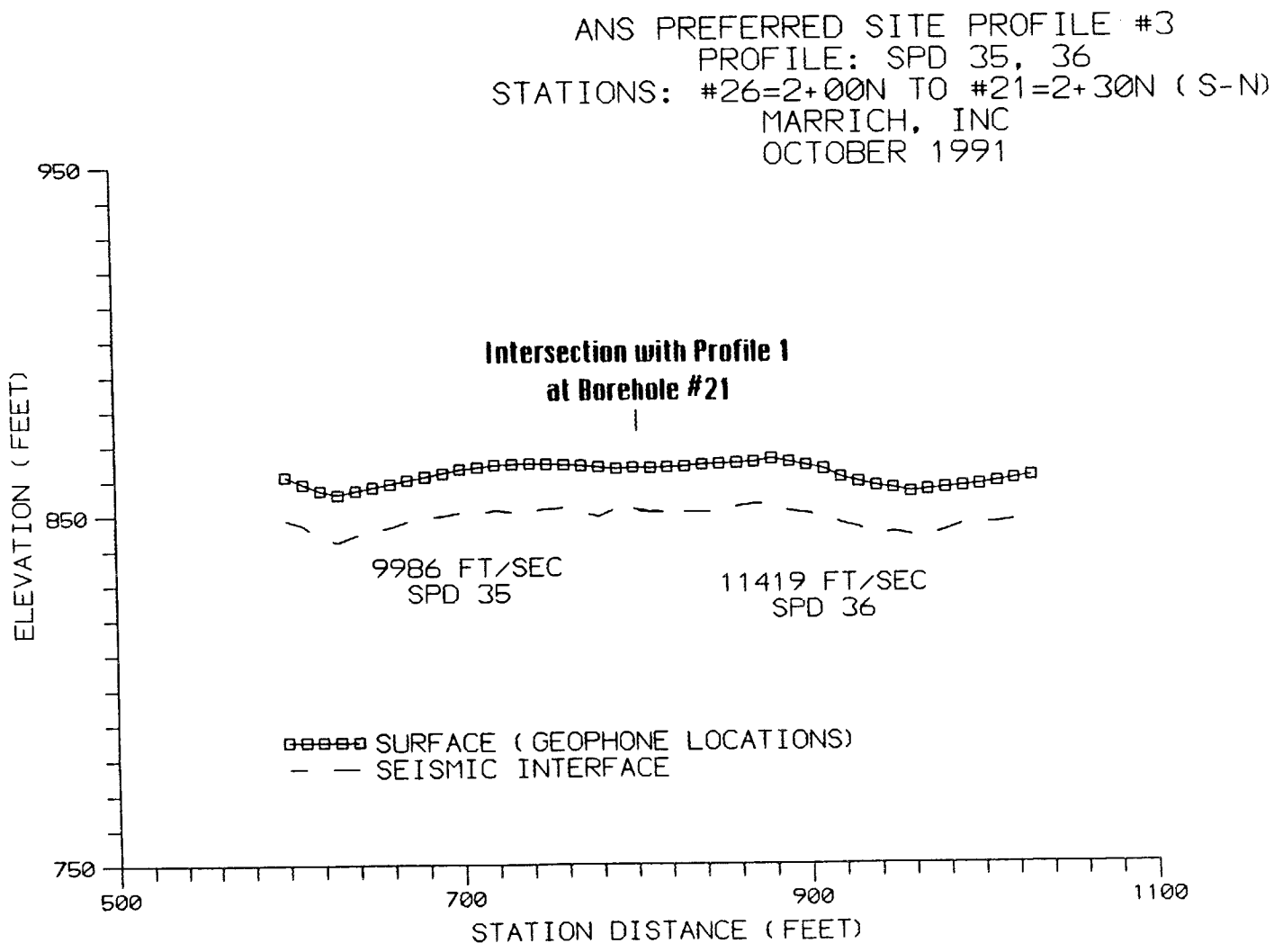


Fig. 3.3. SISRED Profile 3.

Table 3.3 Profile 3 Data

SPREADS 37, 39, 13, 33, and 34

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
SPD 35 1	17555	36480	861	13	848
2	17565	36480	859	12	847
3	17575	36480	857	14	843
4	17585	36480	856	14	842
5	17595	36480	857	13	844
6	17605	36480	858	13	845
7	17615	36480	859	13	846
8	17625	36480	860	12	848
9	17635	36480	861	12	849
10	17645	36480	862	12	850
11	17655	36480	863	13	850
12	17665	36480	864	13	851
13	17675	36480	864	13	851
14	17685	36480	864	14	850
15	17695	36480	865	14	851
16	17705	36480	864	13	851
17	17715	36480	864	12	852
18	17725	36480	864	13	851
19	17735	36480	864	14	850
20	17745	36480	863	12	851
21	17755	36480	863	12	851
22	17765	36480	863	13	850
23	17775	36480	863	13	850
24	17785	36480	864	15	849
SPD 36 1	17753	36480	863	12	851
2	17763	36480	863	13	850
3	17773	36480	863	12	851
4	17783	36480	864	13	851
5	17793	36480	864	14	850
6	17803	36480	864	14	850
7	17813	36480	865	13	852
8	17823	36480	865	12	853
9	17833	36480	866	13	853
10	17843	36480	865	14	851
11	17853	36480	864	14	850
12	17863	36480	863	13	850
13	17873	36480	860	13	847
14	17883	36480	859	13	846
15	17893	36480	858	14	844
16	17903	36480	857	13	844
17	17913	36480	856	12	844
18	17923	36480	857	13	844
19	17933	36480	857	12	845
20	17943	36480	858	11	847
21	17953	36480	858	11	847
22	17963	36480	859	12	847
23	17973	36480	860	12	848
24	17983	36480	860	12	848

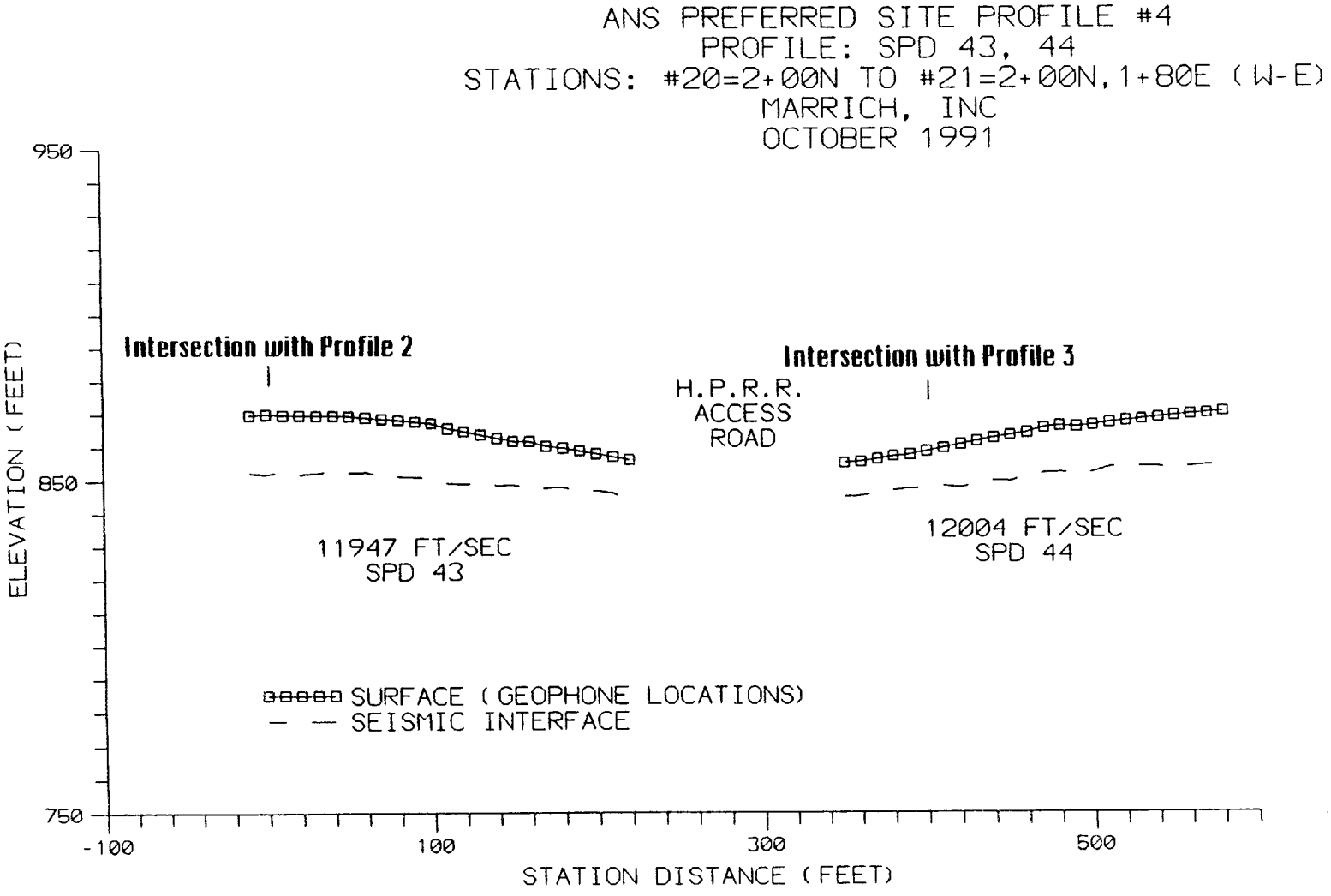


Fig. 3.4. SISRED Profile 4.

Table 3.4 Profile 4 Data

SPREADS 43 and 44

Geophone	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Depth to V2-V3 Interface (ft)	Elevation of V2-V3 Interface (ft)
SPD 43 1	17955	36070	870	18	852
2	17955	36080	870	18	852
3	17955	36090	870	17	853
4	17955	36100	870	18	852
5	17955	36110	870	17	853
6	17955	36120	870	17	853
7	17955	36130	869	17	852
8	17955	36140	869	16	853
9	17955	36150	869	17	852
10	17955	36160	868	17	851
11	17955	36170	868	17	851
12	17955	36180	867	16	851
13	17955	36190	866	17	849
14	17955	36200	865	16	849
15	17955	36210	864	15	849
16	17955	36220	863	14	849
17	17955	36230	862	13	849
18	17955	36240	862	14	848
19	17955	36250	860	13	847
20	17955	36260	860	12	848
21	17955	36270	859	12	847
22	17955	36280	858	11	847
23	17955	36290	857	11	846
24	17955	36300	856	12	844
SPD 44 1	17955	36451	855	10	845
2	17955	36461	856	10	846
3	17955	36471	856	10	846
4	17955	36481	857	10	847
5	17955	36491	858	10	848
6	17955	36501	859	11	848
7	17955	36511	860	12	848
8	17955	36521	861	13	848
9	17955	36531	862	13	849
10	17955	36541	863	13	850
11	17955	36551	863	14	849
12	17955	36561	864	13	851
13	17955	36571	866	14	852
14	17955	36581	866	14	852
15	17955	36591	866	14	852
16	17955	36601	866	14	852
17	17955	36611	867	13	854
18	17955	36621	868	14	854
19	17955	36631	868	14	854
20	17955	36641	869	15	854
21	17955	36651	869	16	853
22	17955	36661	869	16	853
23	17955	36671	870	16	854
24	17955	36681	870	16	854

Table 3.5 Seismic Refraction Survey Summary

Spread Number	----- Spread Center Point ----- Station Coordinates (ft)	(ft)	Northing (ft)	Easting (ft)	V1 (ft/sec)	Average Velocity V2 (ft/sec)	V3 (ft/sec)	Surface Elevation Of Center Point (ft)	Average Depth To V2-V3 Interface (ft)	Average Elevation Of V2-V3 Interface (ft)
1	8+00N	8+00E	17755	36879	1450	4246	11571	901	23	878
2	16+00N	0+00	18557	36079	1300	3924	14480	875	19	856
3	16+00N	4+00E	18557	36480	1300	3528	10286	878	13	865
4	16+00N	8+00E	18554	36881	1200	4197	11026	855	12	843
5	16+00N	12+25E	18556	37304	1250	3317	11196	856	11	845
6	16+00N	16+00E	18557	37679	1400	3617	11566	853	14	839
7	12+00N	0+00	18155	36080	1200	2448	11183	848	14	834
8	12+00N	0+00	18155	36080	1200	2500	11452	848	10	838
9	11+97N	4+07E	18152	36486	1400	3867	10374	862	12	850
10	12+00N	8+00E	18155	36880	1200	3892	11502	881	25	856
11	12+00N	12+00E	18156	37279	1200	4156	14728	882	25	857
12	7+75N	12+00E	17732	37281	1200	3897	13138	938	21	917
13	8+00N	3+90E	17754	36469	1300	2941	11343	863	15	848
14	8+00N	0+00	17755	36080	1200	2740	10410	841	13	828
15	4+00N	0+00	17356	36080	1200	2237	11257	855	14	841
16	0+00	0+00	16955	36080	1200	2338	15393	842	18	824
17	0+00	0+00	16955	36080	1200	4197	13026	842	20	822
18	0+00	4+00E	16955	36479	1200	2576	13145	855	13	842
19	0+01N	8+00E	16956	36880	1200	2216	10974	850	11	839
20	4+00N	2+00E	17354	36279	1300	3897	10862	870	22	848
21	4+00N	4+00E	17355	36479	1300	4076	10696	878	26	852
22	4+00N	6+00E	17355	36680	1300	5512	14407	884	42	842
23	4+00N	8+00E	17355	36880	1300	3278	12121	875	24	851
24	4+00N	10+00E	17354	37081	1200	2802	13295	874	20	854
25	4+00N	12+00E	17357	37262	1300	3228	11495	857	18	839
26	0+00N	12+00E	16955	37280	1200	3128	10890	914	30	884
27	6+00N	12+00E	17556	37280	1200	4200	12786	892	35	857
28	8+00N	10+00E	17754	37080	1200	4297	11797	923	29	894
29	12+00N	6+00E	18156	36680	1200	2748	11701	873	15	858
30	12+00N	2+00E	18155	36280	1200	3371	11114	863	15	848
31	10+00N	0+00	17955	36080	1200	2253	11265	870	12	858
32	6+00N	0+00	17555	36080	1250	2582	9666	842	9	833
33	8+00N	5+15E	17755	36592	1200	4390	11654	872	17	855
34	8+00N	7+15E	17753	36792	1200	4490	12378	891	27	864
35	7+15N	4+00E	17669	36481	1200	2763	9614	864	12	852
36	9+15N	4+00E	17867	36479	1200	2695	10485	862	12	850
37	8+00N	0+65E	17756	36144	1200	3000	11140	842	12	830
38	9+15N	0+00	17870	36078	1200	2597	9588	858	12	846
39	8+00N	3+48E	17756	36428	1200	3349	11468	861	16	845
40	8+00N	15+00E	17754	37578	1200	2279	10683	894	17	877
41	12+40N	16+07E	18192	37685	1200	3897	12736	827	15	812
42	4+00N	16+00E	17356	37679	1200	3310	10548	874	23	851
43	10+00N	1+05E	17955	36184	1200	3218	9149	867	18	849
44	10+00N	4+66E	17954	36545	1200	3387	10742	864	13	851

Table 3.6 Seismic Refraction Digital Field Data Directory

File	Date	Time	Spread	Shot Location
2.DAT	09-18-91	4:06p	SPD 1	Shot Point 1
4.DAT	09-18-91	5:00p	SPD 1	Shot Point 2
5.DAT	09-18-91	5:11p	SPD 1	Shot Point 3
6.DAT	09-18-91	5:21p	SPD 1	Shot Point 4
7.DAT	09-18-91	5:28p	SPD 1	Shot Point 5
8.DAT	09-19-91	3:47p	SPD 2	Shot Point 1
9.DAT	09-19-91	3:56p	SPD 2	Shot Point 2
10.DAT	09-19-91	4:04p	SPD 2	Shot Point 3
11.DAT	09-19-91	5:11p	SPD 3	Shot Point 1
12.DAT	09-19-91	5:20p	SPD 3	Shot Point 2
14.DAT	09-19-91	5:36p	SPD 3	Shot Point 3
15.DAT	09-20-91	10:52a	SPD 4	Shot Point 1
16.DAT	09-20-91	11:18a	SPD 4	Shot Point 2
17.DAT	09-20-91	1:47p	SPD 4	Shot Point 3
18.DAT	09-20-91	3:03p	SPD 5	Shot Point 1
19.DAT	09-20-91	3:15p	SPD 5	Shot Point 2
20.DAT	09-20-91	3:23p	SPD 5	Shot Point 3
21.DAT	09-20-91	4:08p	SPD 6	Shot Point 1
22.DAT	09-20-91	4:21p	SPD 6	Shot Point 2
23.DAT	09-20-91	4:53p	SPD 6	Shot Point 3
25.DAT	09-23-91	3:33p	SPD 7	Shot Point 1
26.DAT	09-23-91	3:41p	SPD 7	Shot Point 2
28.DAT	09-23-91	4:02p	SPD 7	Shot Point 3
29.DAT	09-23-91	5:01p	SPD 8	Shot Point 1
30.DAT	09-23-91	5:15p	SPD 8	Shot Point 2
31.DAT	09-23-91	5:22p	SPD 8	Shot Point 3
33.DAT	09-26-91	9:06a	SPD 9	Shot Point 1
34.DAT	09-26-91	9:19a	SPD 9	Shot Point 2
35.DAT	09-26-91	9:32a	SPD 9	Shot Point 3
37.DAT	09-26-91	11:02a	SPD 10	Shot Point 1
38.DAT	09-26-91	11:11a	SPD 10	Shot Point 2
39.DAT	09-26-91	11:48a	SPD 10	Shot Point 3
40.DAT	09-26-91	2:40p	SPD 11	Shot Point 1
41.DAT	09-26-91	3:00p	SPD 11	Shot Point 2
42.DAT	09-26-91	3:41p	SPD 11	Shot Point 3
43.DAT	09-26-91	5:11p	SPD 12	Shot Point 1
44.DAT	09-26-91	5:24p	SPD 12	Shot Point 2
45.DAT	09-26-91	5:36p	SPD 12	Shot Point 3
46.DAT	09-27-91	8:52a	SPD 13	Shot Point 1
47.DAT	09-27-91	8:57a	SPD 13	Shot Point 2
48.DAT	09-27-91	9:04a	SPD 13	Shot Point 3
49.DAT	09-27-91	9:57a	SPD 14	Shot Point 1
50.DAT	09-27-91	10:02a	SPD 14	Shot Point 2
51.DAT	09-27-91	10:08a	SPD 14	Shot Point 3
52.DAT	09-27-91	10:49a	SPD 15	Shot Point 1
53.DAT	09-27-91	10:54a	SPD 15	Shot Point 2
54.DAT	09-27-91	11:09a	SPD 15	Shot Point 3
55.DAT	09-27-91	1:45p	SPD 16	Shot Point 1
56.DAT	09-27-91	1:52p	SPD 16	Shot Point 2
57.DAT	09-27-91	2:00p	SPD 16	Shot Point 3
59.DAT	09-27-91	2:51p	SPD 17	Shot Point 1

Table 3.6 (continued)

File	Date	Time	Spread	Shot Location
60.DAT	09-27-91	2:57p	SPD 17	Shot Point 2
61.DAT	09-27-91	3:05p	SPD 17	Shot Point 3
62.DAT	09-27-91	3:32p	SPD 18	Shot Point 1
63.DAT	09-27-91	3:38p	SPD 18	Shot Point 2
64.DAT	09-27-91	3:52p	SPD 18	Shot Point 3
65.DAT	09-27-91	4:47p	SPD 19	Shot Point 1
66.DAT	09-27-91	4:58p	SPD 19	Shot Point 2
67.DAT	09-27-91	5:09p	SPD 19	Shot Point 3
68.DAT	09-30-91	9:04a	SPD 20	Shot Point 1
69.DAT	09-30-91	9:10a	SPD 20	Shot Point 2
70.DAT	09-30-91	9:21a	SPD 20	Shot Point 3
71.DAT	09-30-91	9:48a	SPD 21	Shot Point 1
72.DAT	09-30-91	9:53a	SPD 21	Shot Point 2
73.DAT	09-30-91	10:05a	SPD 21	Shot Point 3
74.DAT	09-30-91	10:45a	SPD 22	Shot Point 1
75.DAT	09-30-91	10:52a	SPD 22	Shot Point 2
76.DAT	09-30-91	11:02a	SPD 22	Shot Point 3
77.DAT	09-30-91	11:30a	SPD 23	Shot Point 1
78.DAT	09-30-91	11:37a	SPD 23	Shot Point 2
79.DAT	09-30-91	11:47a	SPD 23	Shot Point 3
80.DAT	09-30-91	1:38p	SPD 24	Shot Point 1
81.DAT	09-30-91	1:44p	SPD 24	Shot Point 2
82.DAT	09-30-91	1:51p	SPD 24	Shot Point 3
83.DAT	09-30-91	2:14p	SPD 25	Shot Point 1
84.DAT	09-30-91	2:21p	SPD 25	Shot Point 2
85.DAT	09-30-91	2:29p	SPD 25	Shot Point 3
86.DAT	09-30-91	3:10p	SPD 26	Shot Point 1
88.DAT	09-30-91	3:19p	SPD 26	Shot Point 2
89.DAT	09-30-91	3:27p	SPD 26	Shot Point 3
90.DAT	09-30-91	4:10p	SPD 27	Shot Point 1
91.DAT	09-30-91	4:21p	SPD 27	Shot Point 2
92.DAT	09-30-91	4:27p	SPD 27	Shot Point 3
93.DAT	09-30-91	5:08p	SPD 28	Shot Point 1
94.DAT	09-30-91	5:13p	SPD 28	Shot Point 2
95.DAT	09-30-91	5:23p	SPD 28	Shot Point 3
96.DAT	10-01-91	9:05a	SPD 29	Shot Point 1
97.DAT	10-01-91	9:18a	SPD 29	Shot Point 2
98.DAT	10-01-91	9:27a	SPD 29	Shot Point 3
99.DAT	10-01-91	10:04a	SPD 30	Shot Point 1
100.DAT	10-01-91	10:14a	SPD 30	Shot Point 2
101.DAT	10-01-91	10:20a	SPD 30	Shot Point 3
102.DAT	10-01-91	11:01a	SPD 31	Shot Point 1
103.DAT	10-01-91	11:05a	SPD 31	Shot Point 2
104.DAT	10-01-91	11:15a	SPD 31	Shot Point 3
105.DAT	10-01-91	11:55a	SPD 32	Shot Point 1
106.DAT	10-01-91	12:04p	SPD 32	Shot Point 2
107.DAT	10-01-91	12:14p	SPD 32	Shot Point 3
108.DAT	10-01-91	4:16p	SPD 33	Shot Point 2
110.DAT	10-01-91	5:02p	SPD 33	Shot Point 1
112.DAT	10-01-91	5:35p	SPD 33	Shot Point 3
114.DAT	10-01-91	5:47p	SPD 33	Shot Point 4

Table 3.6 (continued)

File	Date	Time	Spread	Shot Location
116.DAT	10-01-91	6:17p	SPD 33	Shot Point 5
118.DAT	10-02-91	11:11a	SPD 34	Shot Point 1
119.DAT	10-02-91	11:33a	SPD 34	Shot Point 2
120.DAT	10-02-91	11:45a	SPD 34	Shot Point 3
121.DAT	10-02-91	11:56a	SPD 34	Shot Point 4
122.DAT	10-02-91	12:12p	SPD 34	Shot Point 5
123.DAT	10-02-91	3:56p	SPD 35	Shot Point 1
124.DAT	10-02-91	4:07p	SPD 35	Shot Point 2
125.DAT	10-02-91	4:18p	SPD 35	Shot Point 3
126.DAT	10-02-91	4:35p	SPD 35	Shot Point 4
127.DAT	10-02-91	4:52p	SPD 35	Shot Point 5
132.DAT	10-03-91	10:55a	SPD 36	Shot Point 1
133.DAT	10-03-91	11:05a	SPD 36	Shot Point 2
134.DAT	10-03-91	11:14a	SPD 36	Shot Point 3
135.DAT	10-03-91	11:22a	SPD 36	Shot Point 4
136.DAT	10-03-91	12:36p	SPD 36	Shot Point 5
137.DAT	10-04-91	10:06a	SPD 37	Shot Point 1
138.DAT	10-04-91	10:21a	SPD 37	Shot Point 2
139.DAT	10-04-91	10:29a	SPD 37	Shot Point 3
140.DAT	10-04-91	10:40a	SPD 37	Shot Point 4
141.DAT	10-04-91	11:06a	SPD 37	Shot Point 5
142.DAT	10-04-91	11:51a	SPD 38	Shot Point 1
143.DAT	10-04-91	1:42p	SPD 38	Shot Point 2
144.DAT	10-04-91	1:48p	SPD 38	Shot Point 3
145.DAT	10-04-91	1:59p	SPD 38	Shot Point 4
146.DAT	10-04-91	2:28p	SPD 38	Shot Point 5
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149.DAT	10-04-91	3:52p	SPD 39	Shot Point 2
150.DAT	10-04-91	4:06p	SPD 39	Shot Point 3
151.DAT	10-04-91	4:13p	SPD 39	Shot Point 4
152.DAT	10-04-91	4:24p	SPD 39	Shot Point 5
154.DAT	10-07-91	11:13a	SPD 40	Shot Point 1
155.DAT	10-07-91	11:20a	SPD 40	Shot Point 2
156.DAT	10-07-91	11:40a	SPD 40	Shot Point 3
157.DAT	10-07-91	2:22p	SPD 41	Shot Point 1
158.DAT	10-07-91	2:27p	SPD 41	Shot Point 2
159.DAT	10-07-91	2:45p	SPD 41	Shot Point 3
160.DAT	10-07-91	4:24p	SPD 42	Shot Point 1
161.DAT	10-07-91	4:32p	SPD 42	Shot Point 2
162.DAT	10-07-91	4:43p	SPD 42	Shot Point 3
163.DAT	10-08-91	11:32a	SPD 43	Shot Point 1
164.DAT	10-08-91	11:40a	SPD 43	Shot Point 2
165.DAT	10-08-91	11:51a	SPD 43	Shot Point 3
166.DAT	10-08-91	12:04p	SPD 43	Shot Point 4
167.DAT	10-08-91	12:13p	SPD 43	Shot Point 5
169.DAT	10-08-91	4:05p	SPD 44	Shot Point 1
170.DAT	10-08-91	4:19p	SPD 44	Shot Point 2
171.DAT	10-08-91	4:25p	SPD 44	Shot Point 3
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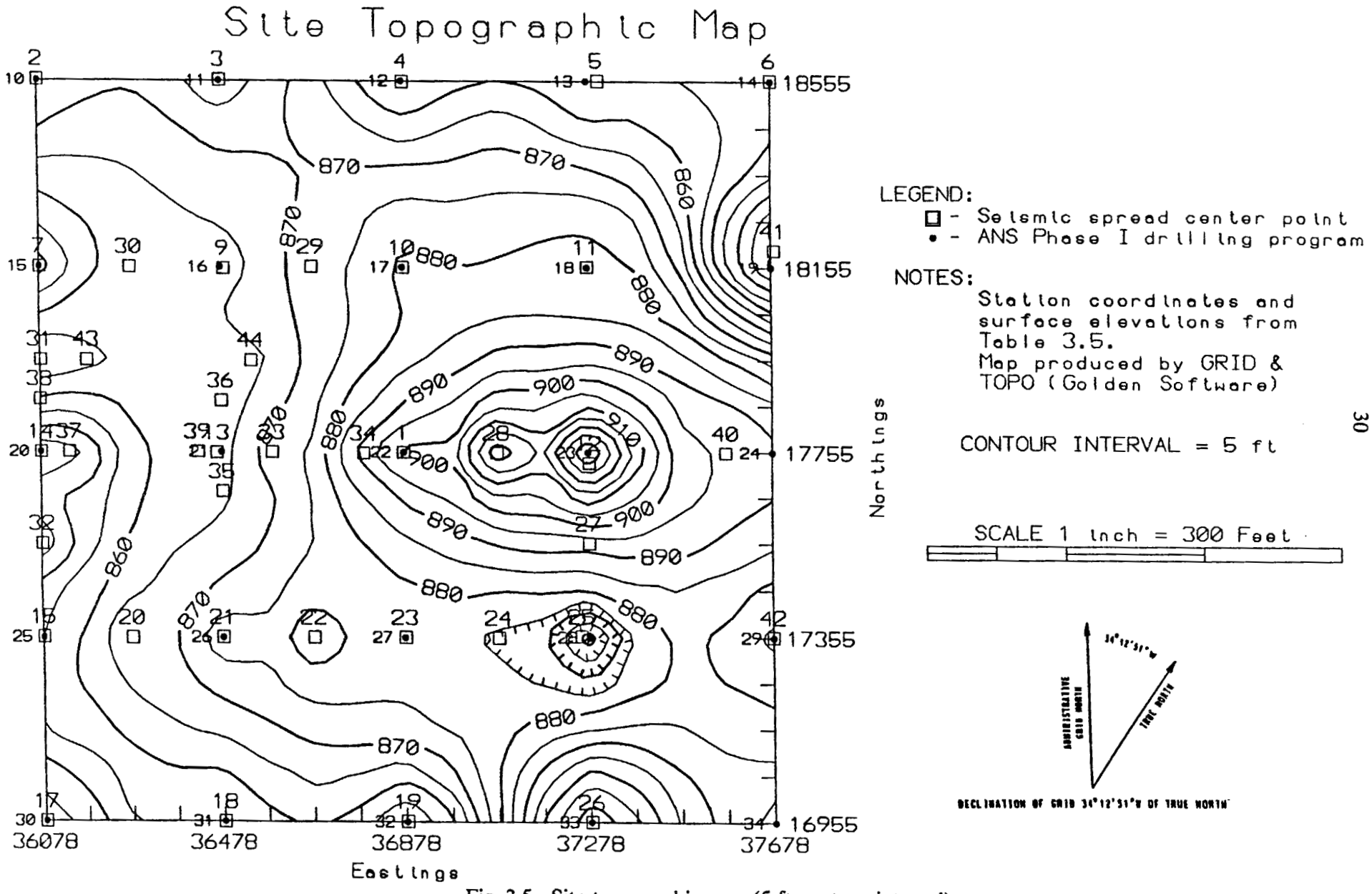

Fig. 3.5. Site topographic map (5 ft contour interval).

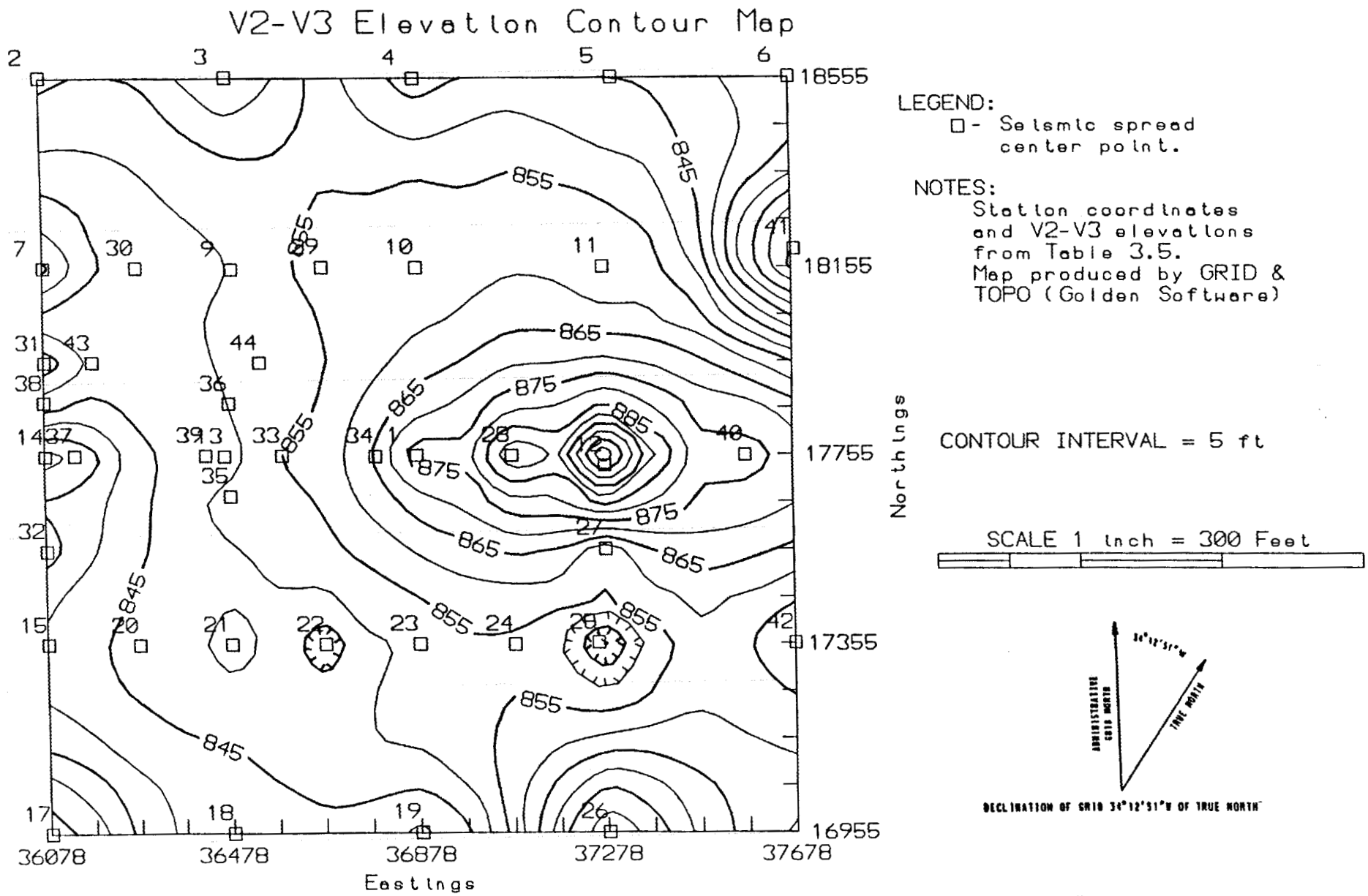

Fig. 3.6. Top-of-rock surface contour map (5 ft contour interval).

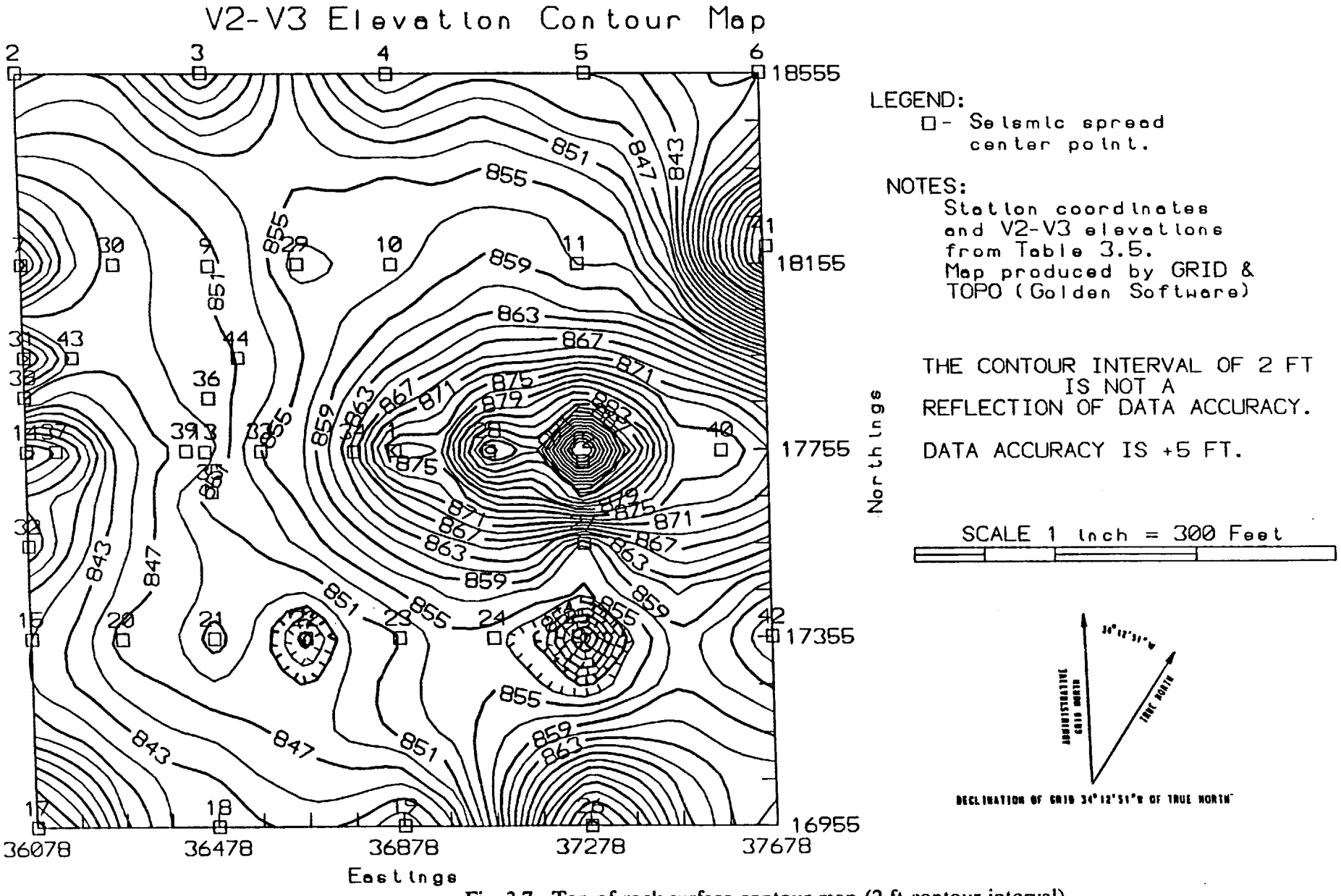

Fig. 3.7. Top-of-rock surface contour map (2 ft contour interval).

Table 3.7 Comparison of Drilling with Seismic Refraction Results

ERC/EDGe Boring	Siesmic Refraction Spread	Northing (ft)	Easting (ft)	Surface Elevation (ft)	Top of Rock Elevation (ft)		Depth to Rock (ft)		
					Core Log	Seismic V2-V3	Core Log	Seismic V2-V3	Difference
1	*	17955	36880	886	861	862	25	24	+1
3	**	17755	36680	881	859	858	22	23	-1
5	1	17755	36880	901	872	878	29	23	+6
7	28	17755	37080	923	898	894	25	29	-4
9	*	17755	36880	886	858	861	28	25	+3

* Values interpolated by GRID using the inverse distance method.

** Profile 1 - geophone 1 of spread 34.

NOTE: All values rounded to nearest foot.

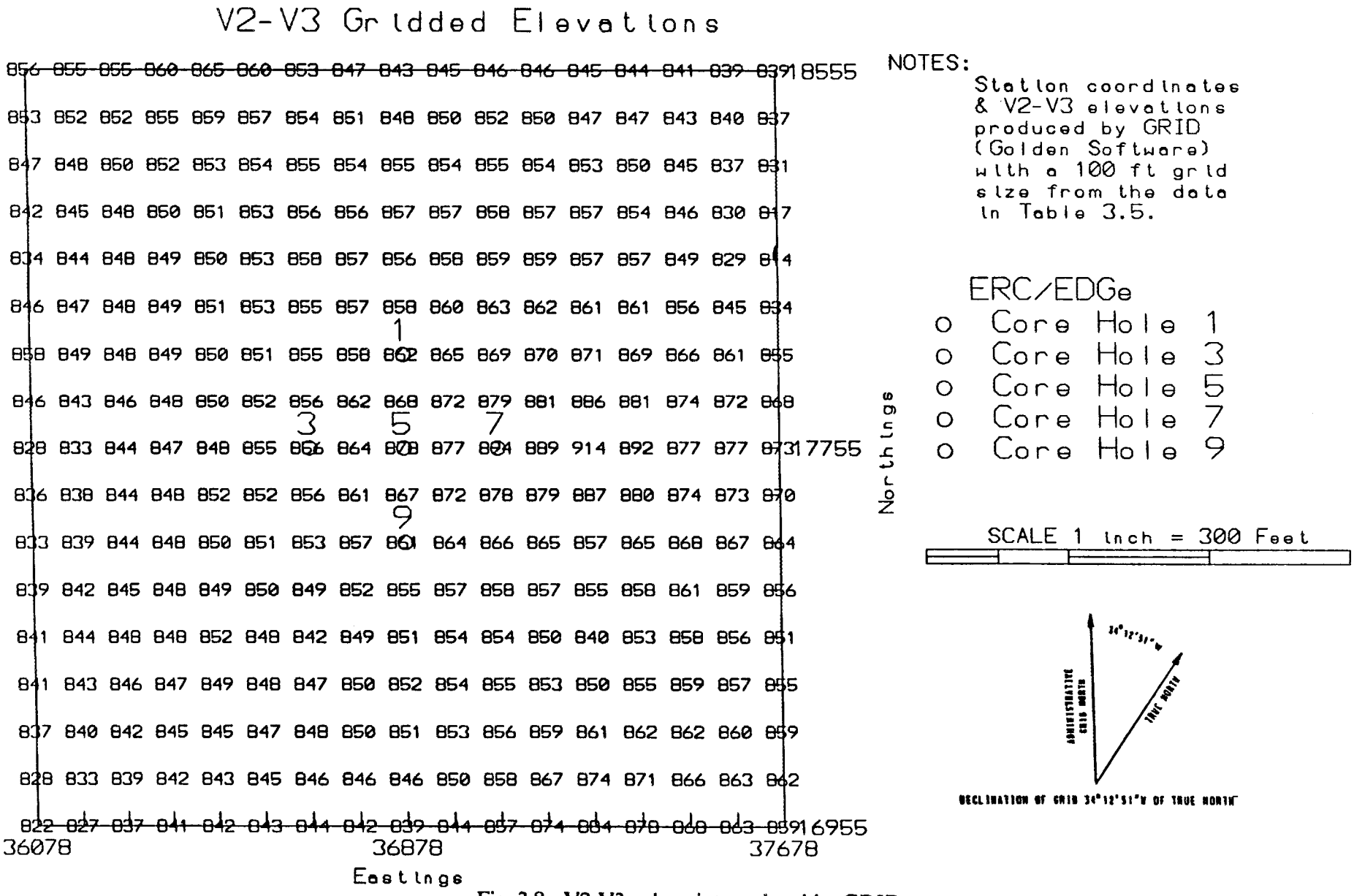

Fig. 3.8. V2-V3 values interpolated by GRID.

4. SEISMIC REFLECTION WALKAWAY NOISE TEST

To evaluate the feasibility of using the seismic reflection method to image near-surface structural features at the ANS site, data were collected along eight sequential spread deployments at incremental distances from a stationary shot point. These data were gathered along a strike-parallel line along Melton Valley Drive, west of the HPRR access road (Fig. 2.1). Twenty-four 40 Hz geophones were spaced 0.5 m apart, and there were always two overlapping geophones between deployments. The closest geophone was 1.0 m from the shot, and the most distant was 90.0 m from the shot. By combining the data from the eight deployments into a single plot, one can examine the detailed wavefield at half-meter increments out to 90 m. This data collection procedure and the ensuing plot constitute a "walkaway noise test." It allows the geophysicist to determine which types of waves are present in the data, and their velocities and to isolate the portion of the record where reflected waves are observed, if they are present. Generally, available software is used to apply a series of frequency filters to the data, and these are used to select data acquisition parameters (e.g., receiver separation and analog filter setting on the seismograph). One usually plans reflection data collection so that the distance from the source to the most distant geophone is approximately equal to the target depth. Because of time limitations, we were unable to extend our test beyond 90 m. Further test data will be required if a target deeper than 90 m is selected.

Source comparisons may be accomplished by examining walkaway noise tests from different source types. We compared a walkaway plot from records shot with 8-gauge blanks with one from data shot with 12-gauge blanks. The 12-gauge data were collected only at the first five deployments, 0-68 m.

Following acquisition of the data, one of the authors (Doll) attended a workshop on shallow seismic reflection that was organized by the manufacturer of the seismograph we used. The manufacturer will send a software routine that will translate the data to a format that is compatible with our seismic reflection processing software. At that time, we will be able to form a walkaway noise plot from our records and compare filters. At present, we can make some significant comments on the data in its present form. Most importantly, the data clearly contain some strong, continuous reflectors. The strongest of these occurs at a two-way travel time (down and up) of about 70 ms. Using the velocity model provided by the seismic refraction data, this would correspond to a depth of about 120 m. Although this reflector was

clearest on the data from 8-gauge shots, it is quite strong on the 12-gauge shots as well, suggesting that the smaller source might be adequate for target depths that do not exceed 120 m. Before collecting actual seismic reflection data on-site, we would like to test additional sources, particularly surface sources such as a Betsy seisgun or a silenced 50-caliber rifle that would substantially increase the rate of data acquisition. Overall, the preliminary examination of the walkaway noise test provides convincing evidence that the seismic reflection method can be effective for imaging subsurface structural and stratigraphic features at this site. In particular, we anticipate using seismic reflection to determine the existence and possibly the character of a tear fault that has been hypothesized at the western boundary of the ANS preferred site.

5. CONCLUSIONS

Results from both methods used in this survey, ITM (station method) and SISRED (profile method), indicate that the top-of-rock is shallow (9-42 ft) across the site. Generally, the seismic refraction interpretations are consistent from spread to spread and support the assumption that the top-of-rock surface correlates well with surface topography. Seismic refraction methods average a large volume of subsurface materials to obtain an average velocity for each seismic layer. The results are inferential in nature and, as such, require confirmation from limited drilling. A comparison of the available cored boring information from the site shows a close correlation with the results from this survey. However, additional boring information from west of the HPRR road would be beneficial to confirming the refraction profiles.

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Appendix A

DESCRIPTION OF THE SEISMIC REFRACTION TECHNIQUE

GENERAL SEISMIC REFRACTION TECHNIQUES

SCOPE

Figure A-1 is a flowchart showing the steps involved in performing a seismic refraction survey. The seismic refraction method can be used to interpret subsurface conditions and materials based on the travel time of a seismic compressional (P-) or shear (S-) wave between an induced surface energy source and one or more geophones. Travel time, along with distance between the source and the geophone(s), can be interpreted to yield the depth to a refracting layer(s). The calculated seismic velocities of the layers can be used to characterize the properties of the corresponding subsurface material.

The critical ingredients of successful refraction profiling include the following:

- accurate horizontal and vertical control for geophone locations,
- timing of relative arrivals to precisions of ± 1 millisecond,
- accurate and detailed field notes,
- proper calculation of seismic velocities, and
- modeling subsurface structure based on seismic velocities.

METHODOLOGY

Measurement of subsurface conditions by the seismic refraction method requires a seismic energy source, trigger cable (or radio link), geophones, geophone cable, and a seismograph (Fig. A-2). The seismic source may be a simple sledge hammer, a mechanical source with which to strike the ground, or some other type of impulse source. Explosives are used for deeper applications that require greater energy. Geophones translate the ground vibrations (seismic compressional waves or shear waves) into electrical signals, which are processed by the seismograph. The travel time of the seismic wave (from source to geophone) is measured on the seismic wave form displayed on an oscillograph, a computer terminal, or a printout from the seismograph.

The seismic energy source generates elastic waves that travel through the surrounding soil and/or rock, away from the source. When these waves reach the critical angle at the interface between two materials of different seismic velocities, they are refracted according to Snell's Law. As the refracted wave moves along the interface between two materials, it transmits elastic energy back to the surface in the form of S- and P- waves (Fig. A-2).

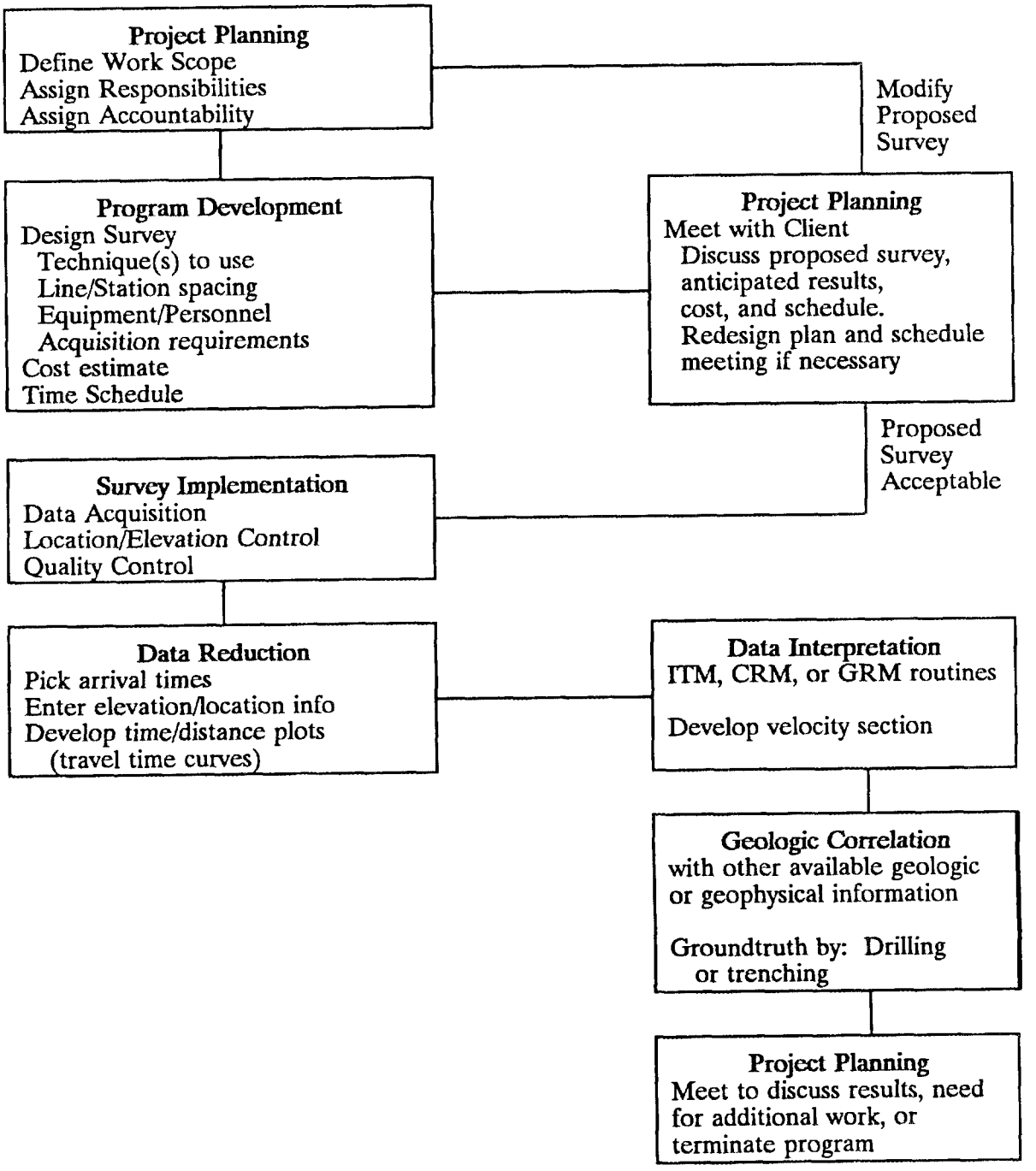
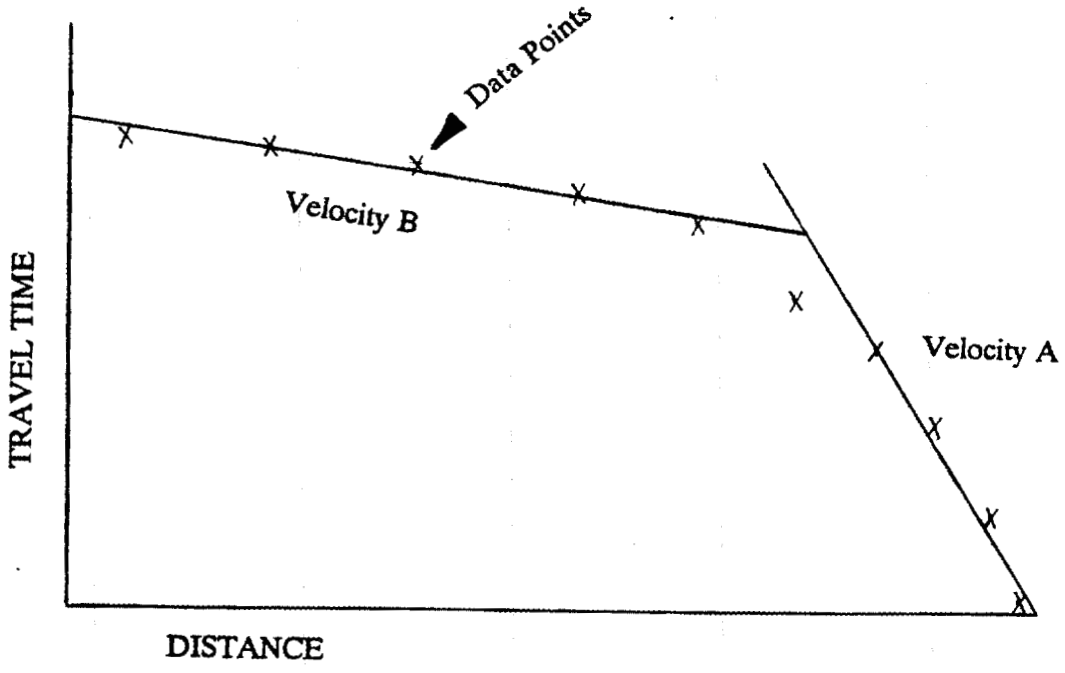
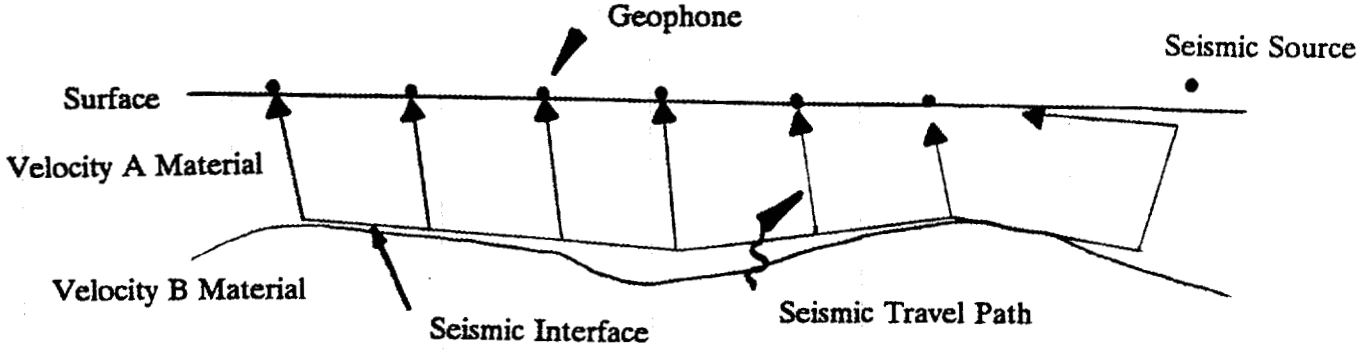


Fig. A-1. Seismic Refraction Survey.

TD PLOT



FIELD LAYOUT



NOTE: For simplicity, this figure illustrates single-ended (forward) recording data by placing a seismic source at the other end; reverse data is recorded and plotted in similar fashion.

Fig. A-2. Time-distance plot and field layout.

Several types of elastic waves are produced by a seismic energy source. Because the compressional (P) waves have the highest seismic velocity, they are the first waves to arrive at a given geophone (Fig. A-2). The S and P wave velocities are related to the density of the material from which they are refracted, as well as to the elastic constants (Young's, bulk, and shear moduli) of the material. P-wave velocities are also influenced by the degree of saturation of the material.

Travel time [the time it takes for the seismic wave to travel from the seismic energy source to the geophone(s)] is measured at each geophone (Fig. A-2). The unit of time is usually milliseconds. Geophone locations are routinely surveyed for elevation control to within ±0.5 ft. They are located relative to shot point locations to precisions of ±1.0 ft. The relative arrival times of the energy transmitted to each of the geophones are used to define the velocity section and subsequently the subsurface geologic structure.

The resulting travel times for the various source-to-geophone distances are plotted to make a time-distance (TD) plot (Fig. A-2).

The travel time of the seismic wave between the seismic energy source and a geophone(s) is a function of the distance between them, the depth to the refractor(s), and the seismic velocities of the materials. Velocities calculated using data recorded from single-ended source locations are referred to as "apparent" velocities. If the data is recorded from sources located at both ends of the seismic line, the velocities are then referred to as "true" velocities.

The depth to a refractor can be calculated by knowing the source-to-geophone geometry (spacing and elevation), the seismic velocities (which are the reciprocals of the slopes of the plotted lines in the TD plot), and the intercept time or crossover points on the TD plot. About three or four layers are usually the most that can be resolved by seismic refraction measurements. For a more in-depth discussion, refer to Mooney.[10]

The refraction method is used to define the depth to and/or profile of the top of a refractor (that is, the soil/bedrock interface). In some cases, the objective of a refraction survey is to attempt to define the depth and thickness of the intermediate layers between the surface and the deepest refractor.

In a simple refraction survey, the impact source is usually placed off each end of the geophone array to provide a measurement in each direction (referred to as forward and reverse measurements), which can be used to account for a dipping interface. The reversed data is necessary to resolve the true seismic velocity and the dip of the layers unless other geologic or geophysical data are available.

EQUIPMENT

The equipment used for surface seismic refraction measurements includes a seismograph, with the necessary geophones; geophone cable; a seismic energy source; and a trigger cable. Seismographs range from relatively simple, inexpensive single-channel units to very sophisticated, multichannel units. The type of seismograph most commonly used is a multichannel unit consisting of 12, 24, or 48 channels. With a multichannel seismograph, the travel times from a single source impact are recorded simultaneously at all geophones. Signal enhancement capability, which is available for most seismographs, is very desirable when working in noisy areas or with small energy sources. Enhancement is accomplished by adding the refracted seismic signals for a number of impacts. A timing signal must be sent to the seismograph by a trigger cable or radio link to trigger the seismograph when the seismic energy source impacts the ground. Although a number of methods can be used to generate a timing signal, care should be taken to maintain accurate and repeatable timing. Recording instruments should have an accuracy of ± 1 ms.

A geophone transforms seismic wave energy into an electric voltage that can be recorded by the seismograph. For refraction work, natural frequency response of the geophones is usually between 8 and 14 Hz. P-wave surveys use vertical geophones, whereas S-wave surveys require geophones sensitive to horizontal ground motion. The horizontal geophones are planted with their sensitive axis oriented parallel to the source-motion direction. The geophones are connected to a geophone cable, usually at uniform intervals, which is connected to the seismograph. Geophone spacing is a trade-off decision between data detail versus cost and should be carefully considered when planning the survey.

The selection of seismic energy sources depends on the depth of investigation (offset and line length) and geologic conditions. For shallow refractor depths, a sledge hammer and plate can be used for P-wave studies. A plank, usually secured in place by driving a vehicle on top, is used for S-wave surveys. The plank is oriented perpendicular to the line and struck with the sledge hammer on both ends (recorded independently) to produce a "polarized" seismic wave with particle motion parallel to the axis of the geophones.

DATA REDUCTION

Seismic data reduction should be performed as soon as possible after the data is acquired. It is preferable to process the data immediately and to provide feedback to the field crew before the next day's acquisition begins.

Data analysis usually begins by reformatting field digital data to floppy disks in a format compatible to using computer-aided picking routines. The field sheets are reviewed for errors and completeness. The arrivals may also be picked manually from the analog field plots. The main problem with manual picking of arrival times is that an added step of inputting the picks into the computer for the next step can result in data entry mistakes.

The first step in reducing seismic refraction data is to pick the source-to-receiver arrival times from the seismograms. These travel times, along with source-to-receiver distances, are used to construct a TD plot for each shotpoint. The velocities calculated from these TD plots (or travel time curves) are apparent velocities and not necessarily true velocities. Individual data points may show small variations from a true "straight-line" velocity on the time/distance curve. Such variations can be related to topographic relief, lateral velocity changes, and/or subsurface structure. In some instances, accurate arrival times may be difficult to pick because of inadequate shot or geophone coupling or excessive cultural noise; such data may have to be discarded. Accurate arrival picks, and horizontal station locations are required to produce reliable TD plots, which are the foundation of the seismic refraction interpretation. The TD plots can be generated manually or by computer. However, manually plotted data is subject to transcription errors, and some computer software may not have the flexibility needed for reducing seismic data. Care should be taken in using either method.

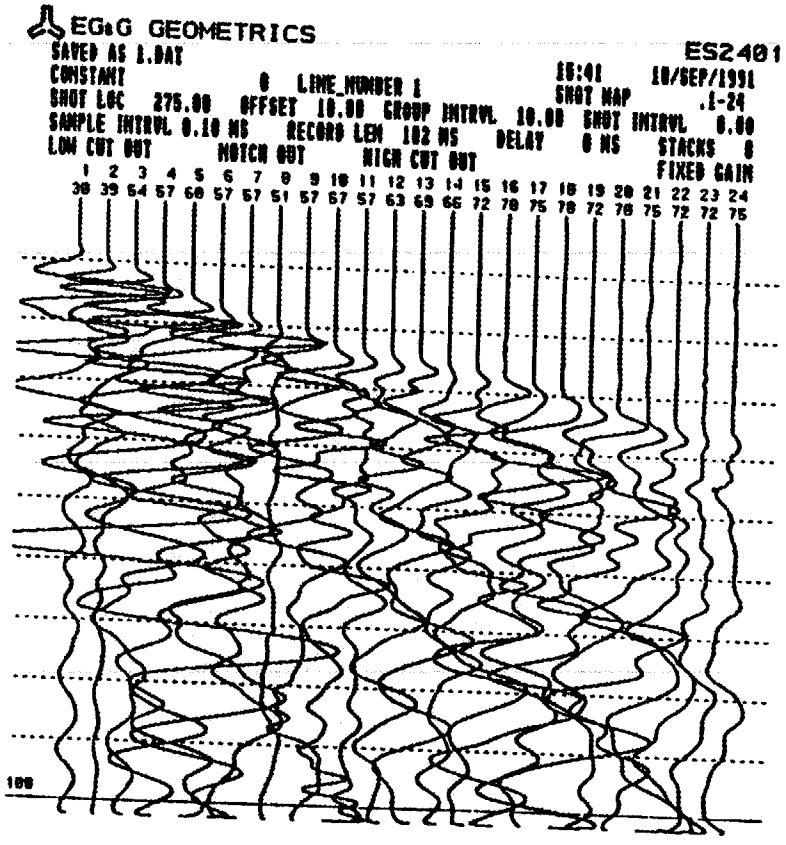
INTERPRETATION

The level of effort involved in interpretation will depend on the amount of detail desired, which in turn will determine the method of interpretation. A number of manual and computer programs can be used for interpretation, including the Intercept Time Method (ITM), the Conventional Reciprocal Method (CRM), and the Generalized Reciprocal Method (GRM). The ITM, the CRM, and the GRM represent a logical sequence of increasing sophistication, performance, and complexity. The ITM assumes a constant seismic velocity within the overlying media and within the refractor. This method also assumes that the refractors are planar surfaces. The CRM provides detailed refraction data because depths are obtained under every geophone, and this method is thereby able to account for irregular refracting surfaces. The level of detail of the refracting surface's topography is proportional to the spacing between the geophones. The GRM should be applied when the most detailed knowledge of subsurface conditions is required. In addition to the ability to define rapid lateral variations in the depth to a refractor and the seismic velocity within the refractor, the GRM can sometimes resolve complex overburden conditions including undetected layers, variable velocity media, and anisotropic layers.

Appendix B

FIELD ANALOG RECORDS

The Line Number in each record header corresponds to the spread (SPD) numbers of the seismic spreads shown in Plate 1.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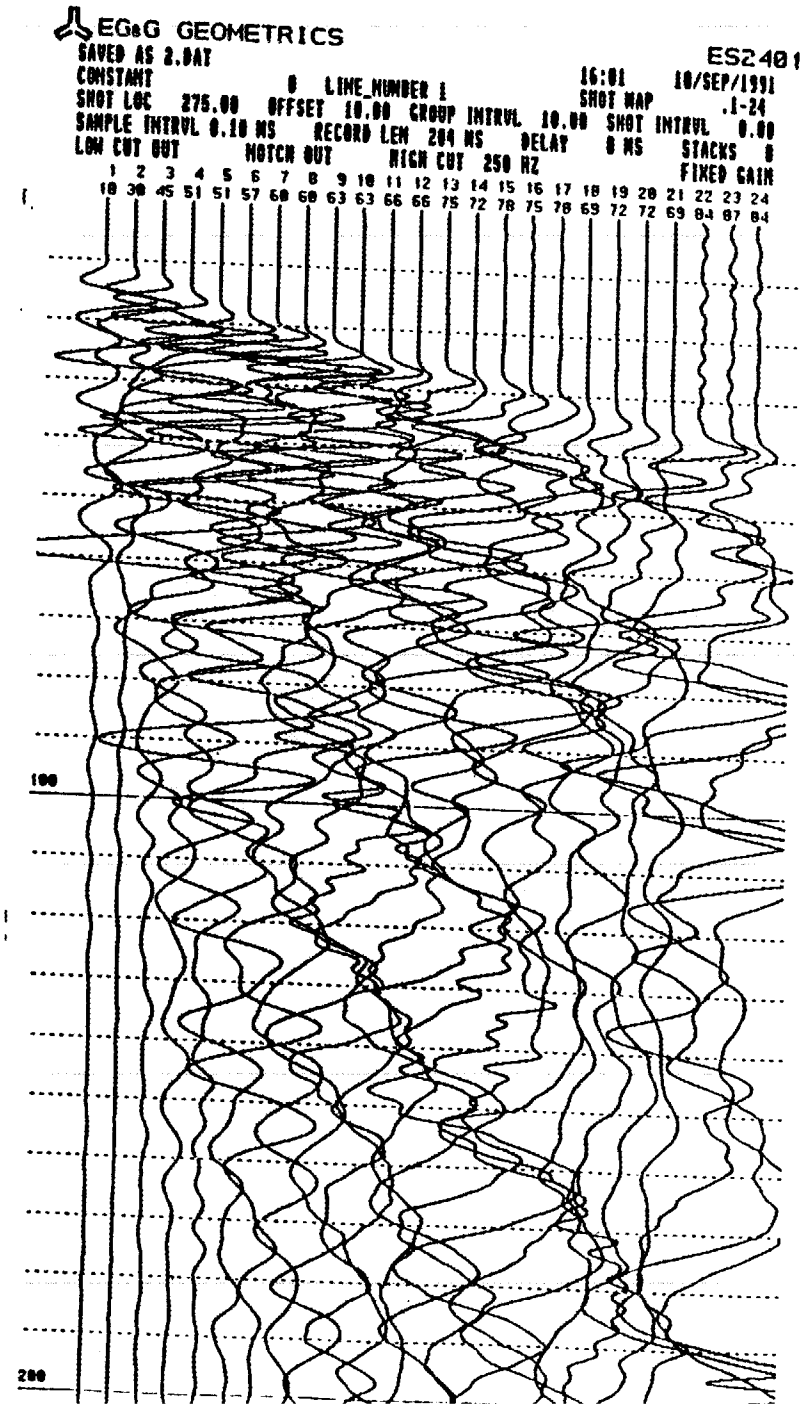
100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SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
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FIXED GAIN
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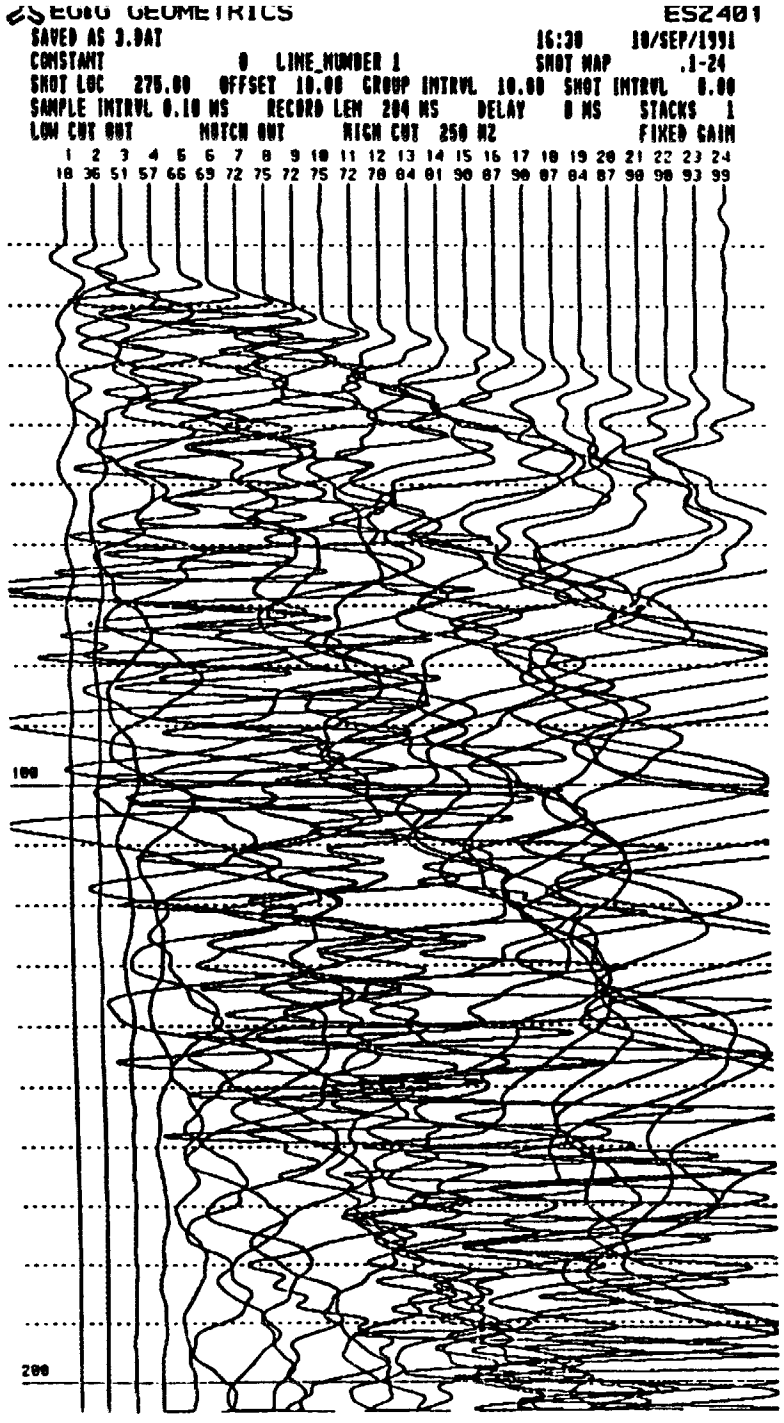
18 30 45 51 51 57 60 60 63 63 66 66 75 72 78 75 78 69 72 72 69 84 87 84
100
200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SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 1
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
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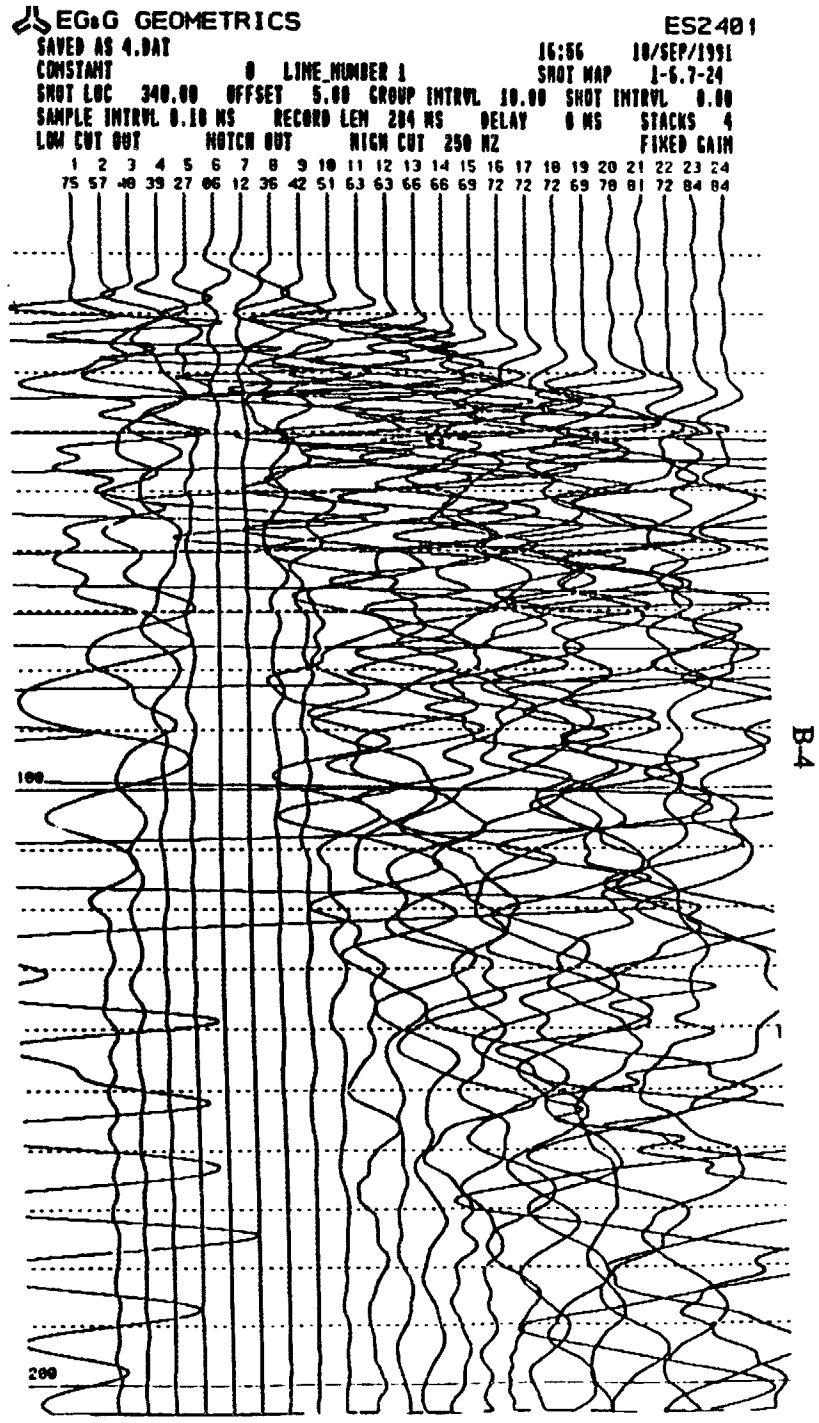
18 36 51 57 66 69 72 75 72 75 72 78 84 81 90 87 90 87 84 87 90 90 93 99
100
200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SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
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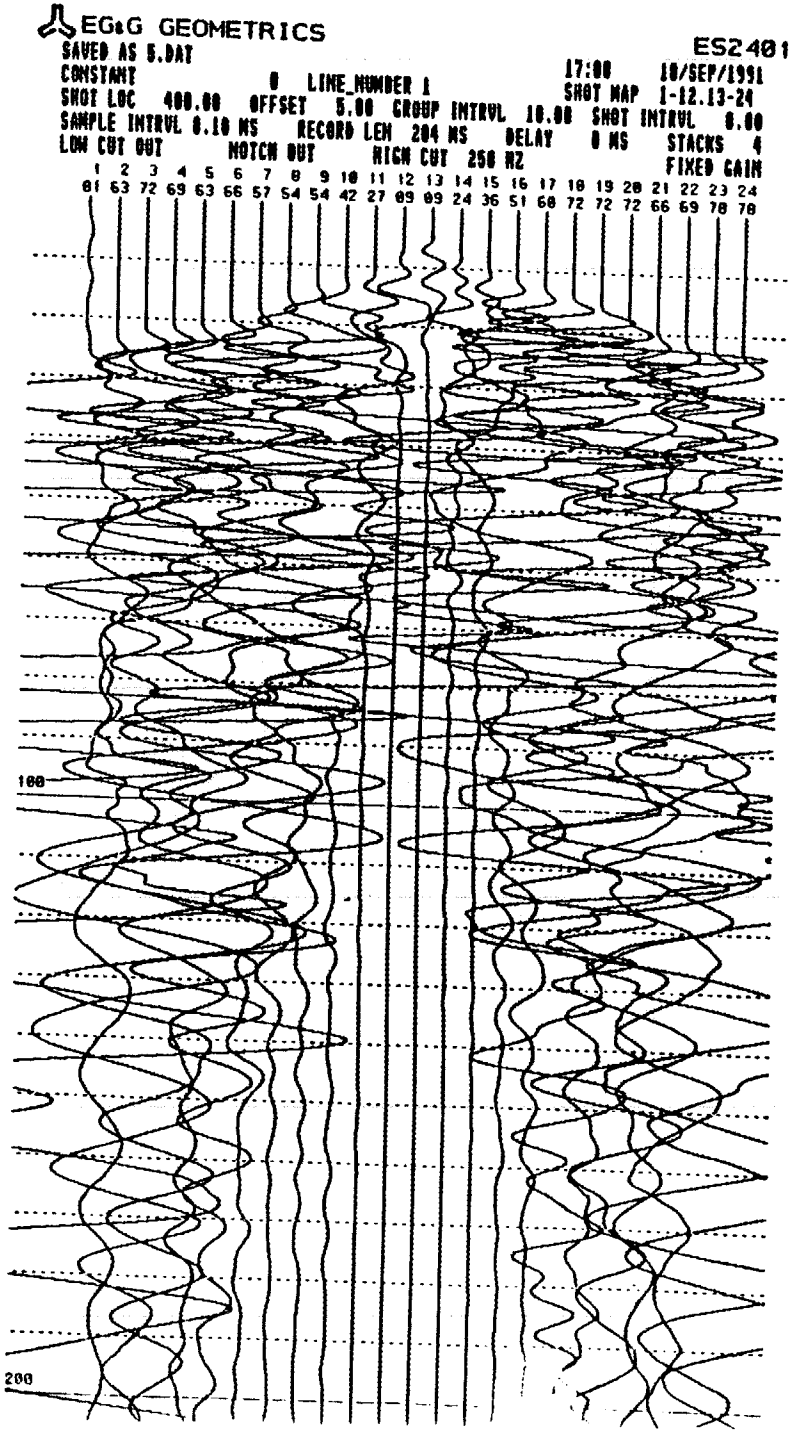
100
200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FIXED GAIN
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100
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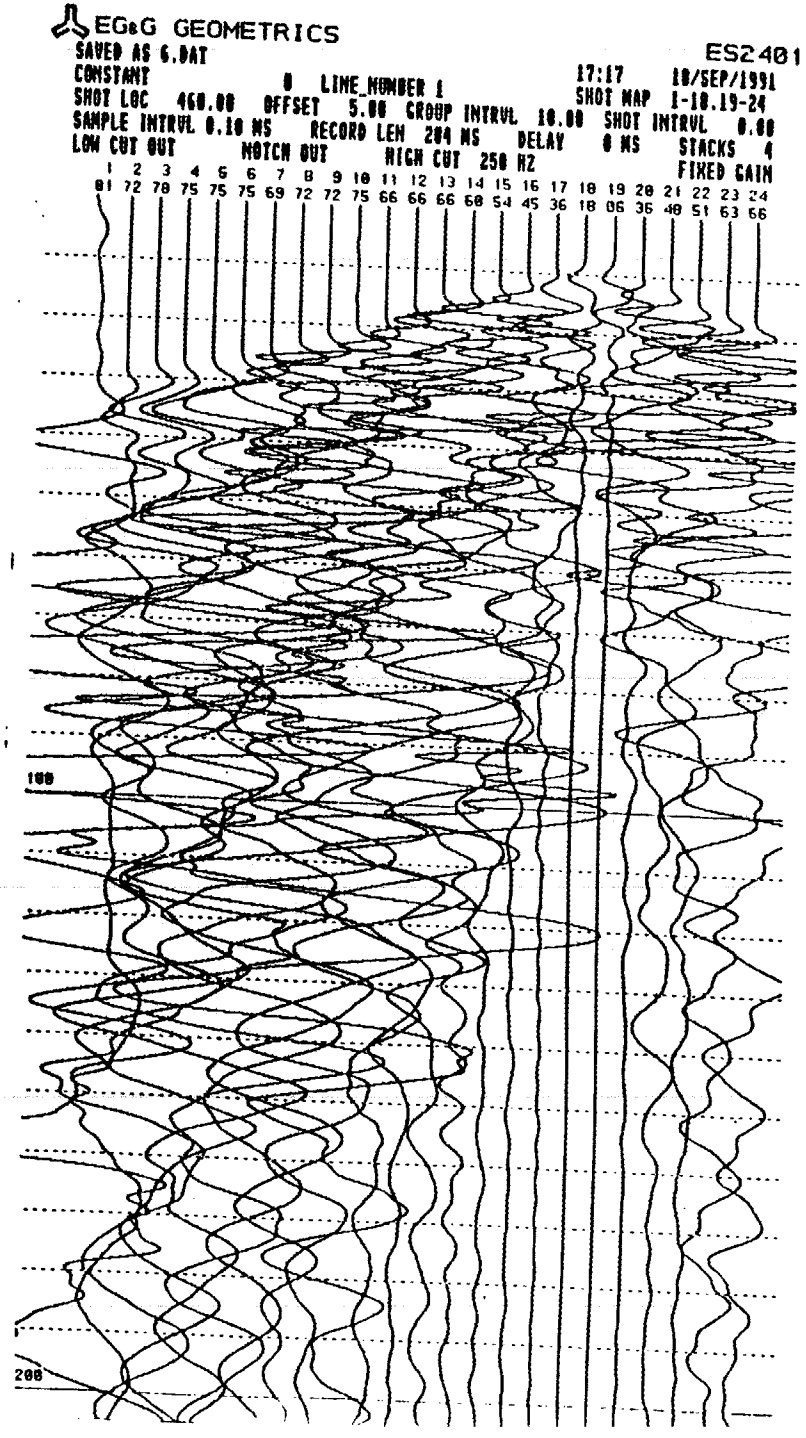
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LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
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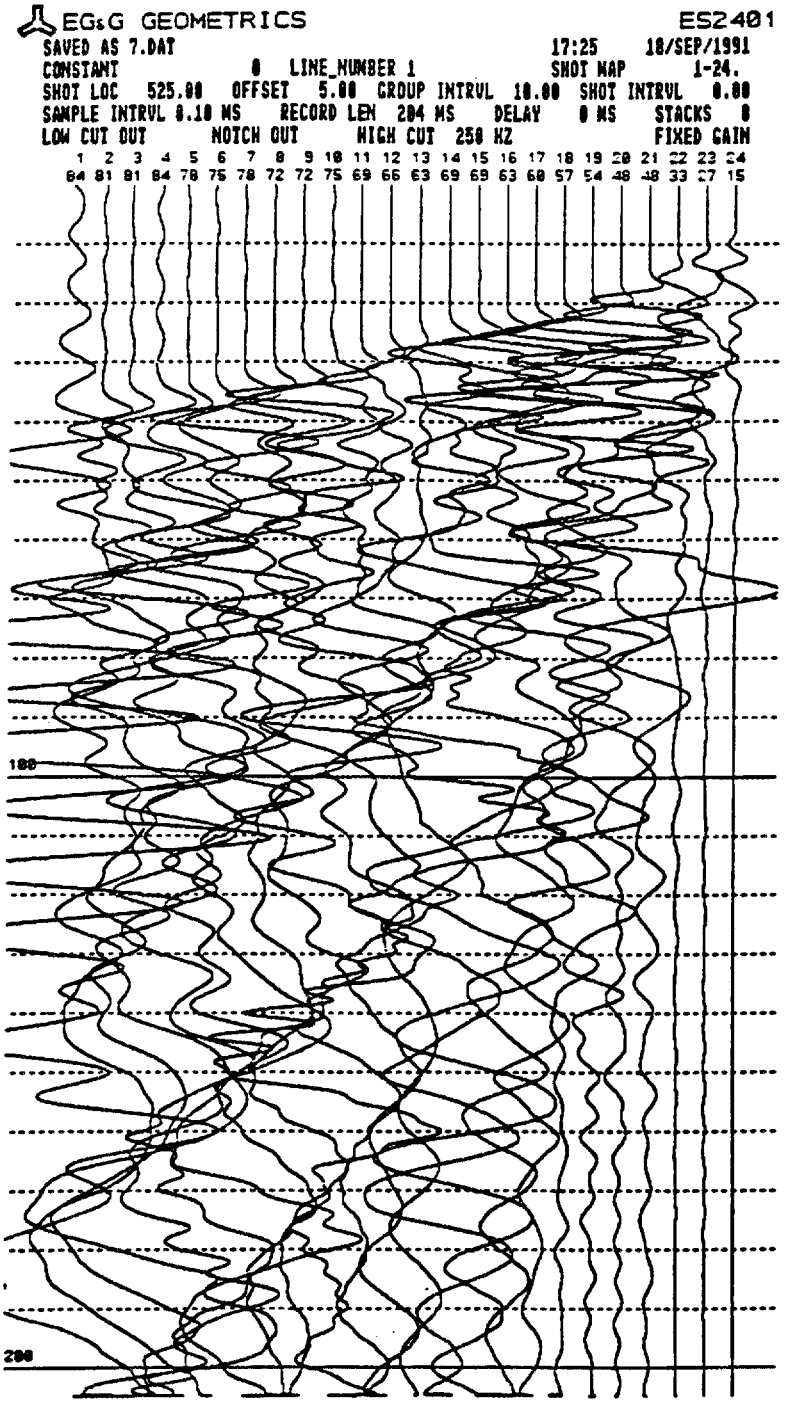
81 72 78 75 75 75 69 72 72 75 66 66 66 60 54 45 36 18 06 36 40 51 63 66
100
200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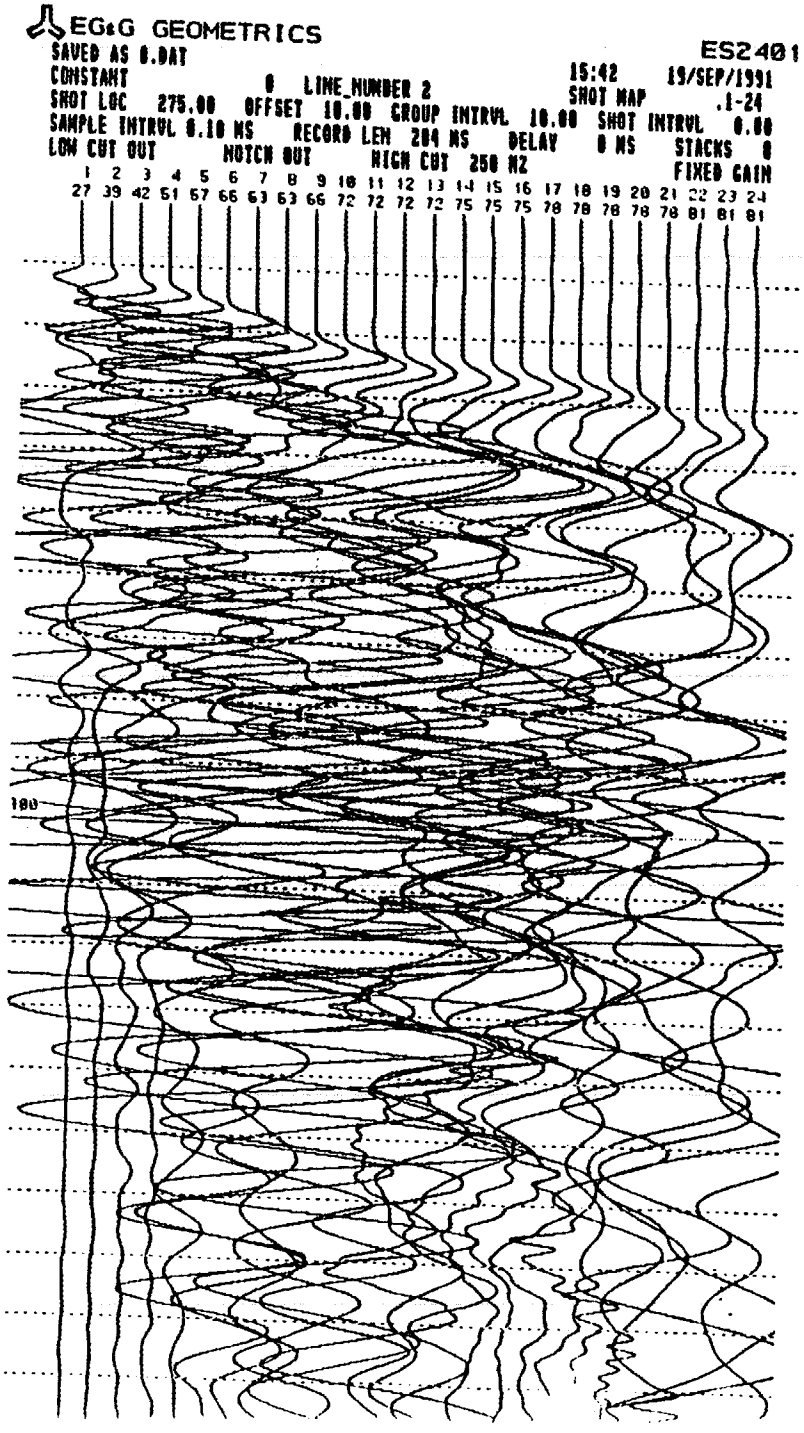
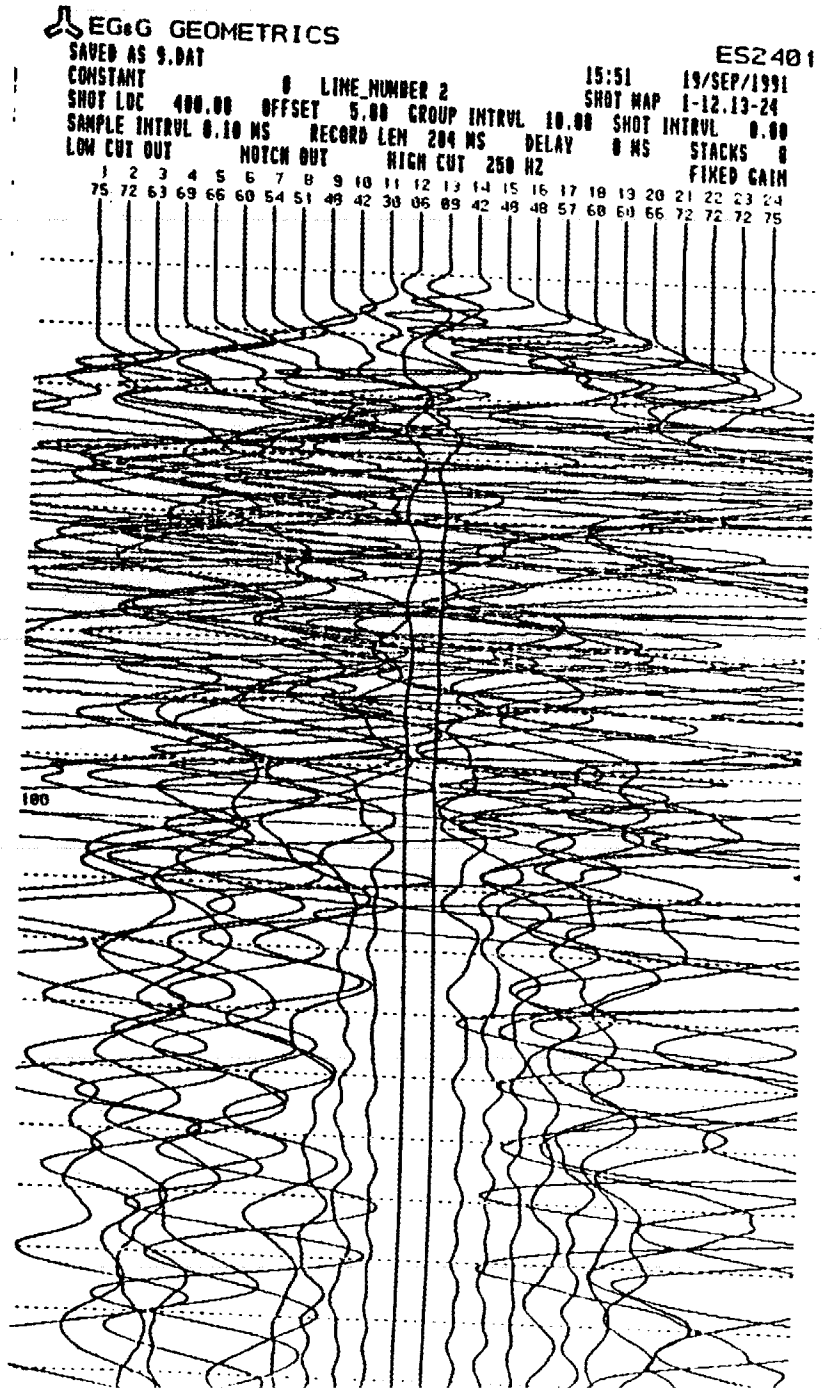
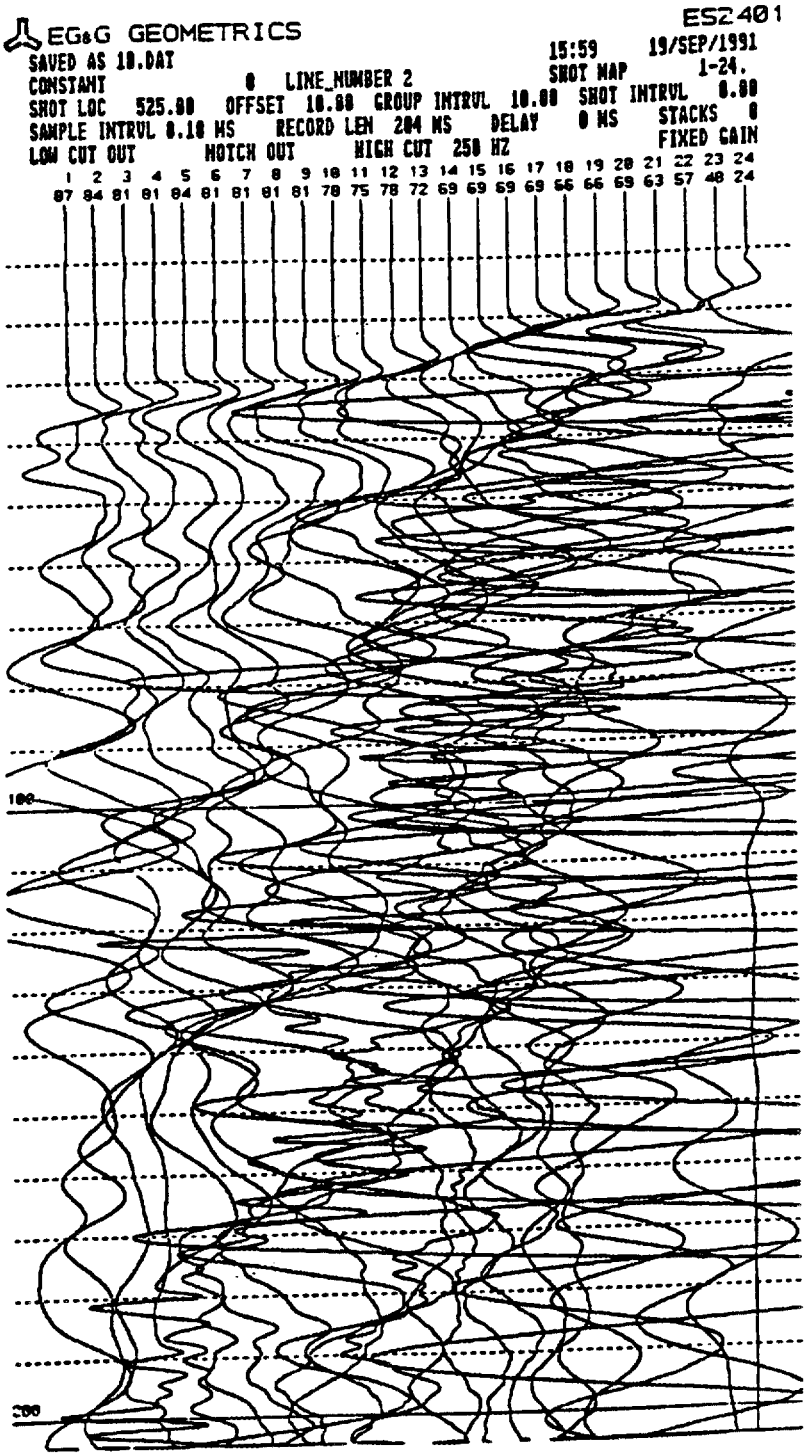
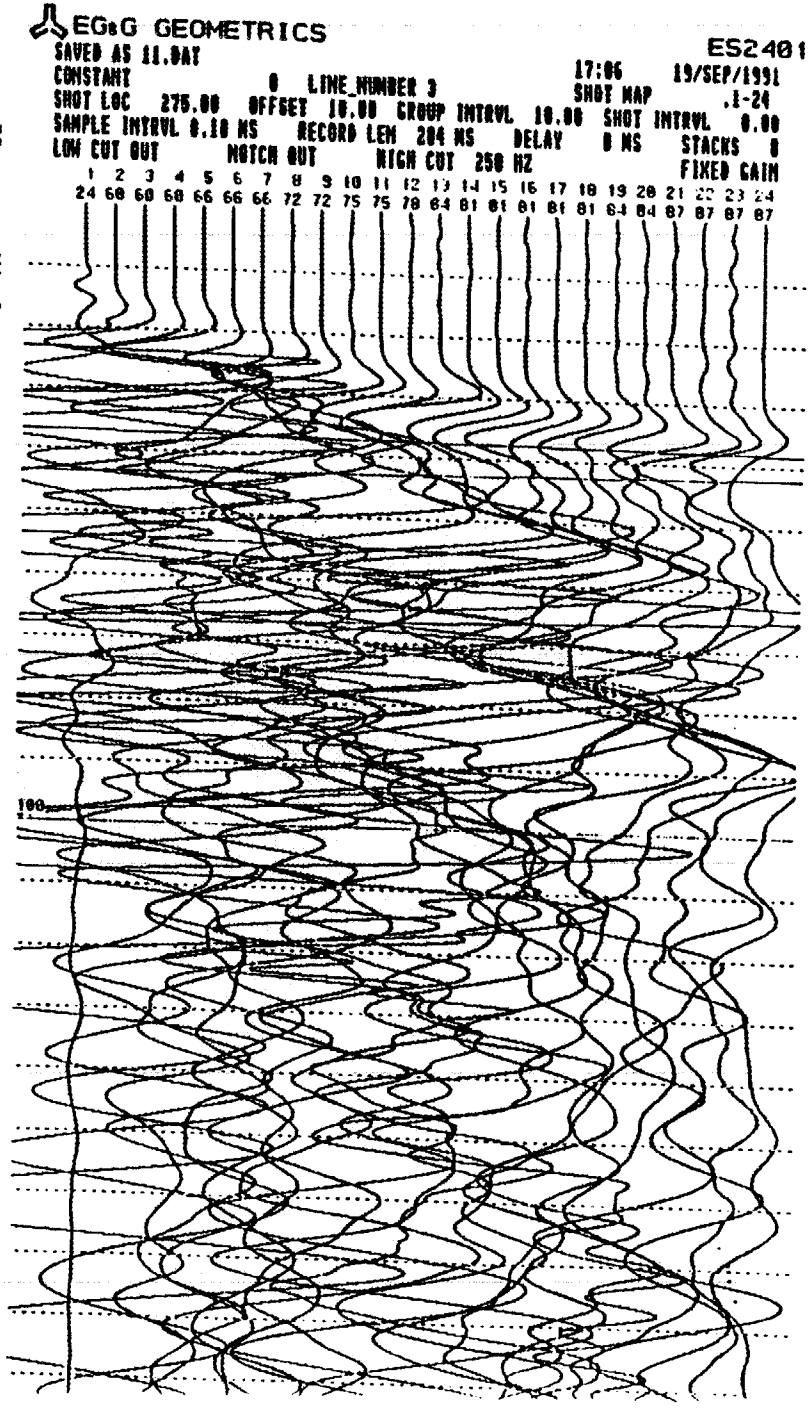
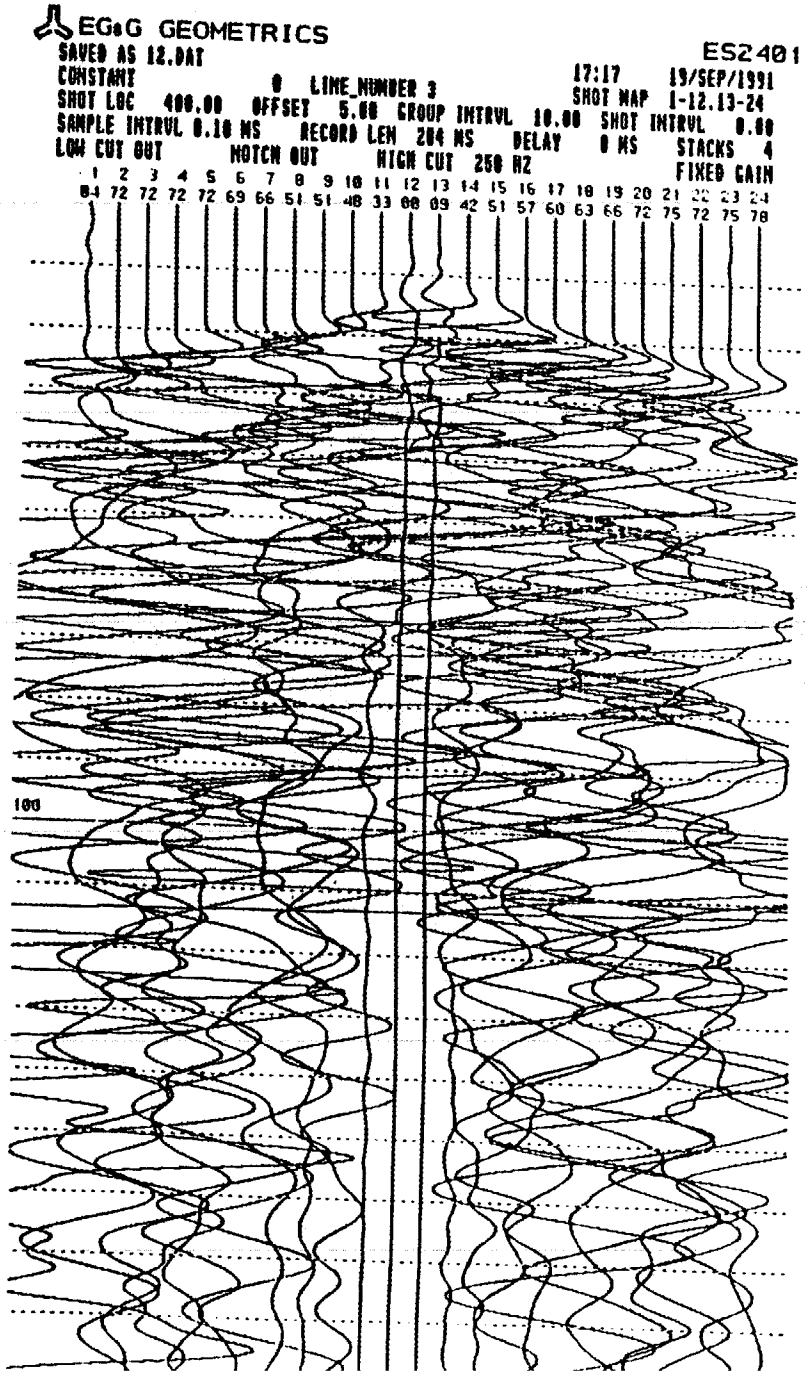
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 81 81 84 78 75 78 72 72 75 69 66 63 69 69 63 60 57 54 48 48 33 27 15
100
200

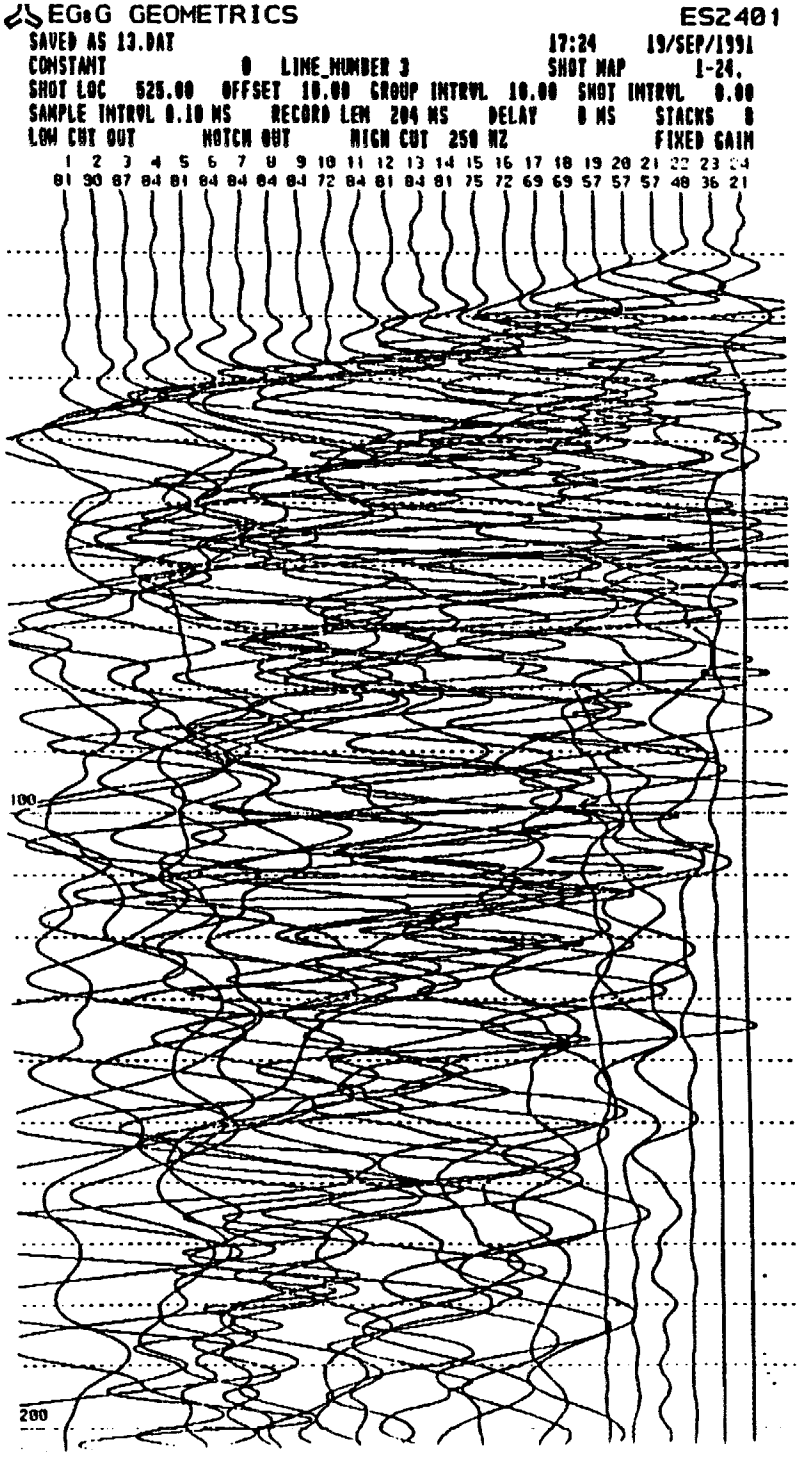

EG&G GEOMETRICS
ES2401
SAVED AS 8.DAT
CONSTANT 0 LINE_NUMBER 2
15:42 19/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS
SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
STACKS 0
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
27 39 42 51 57 66 63 63 66 72 72 72 72 75 75 75 78 78 78 78 78 81 81 81
100

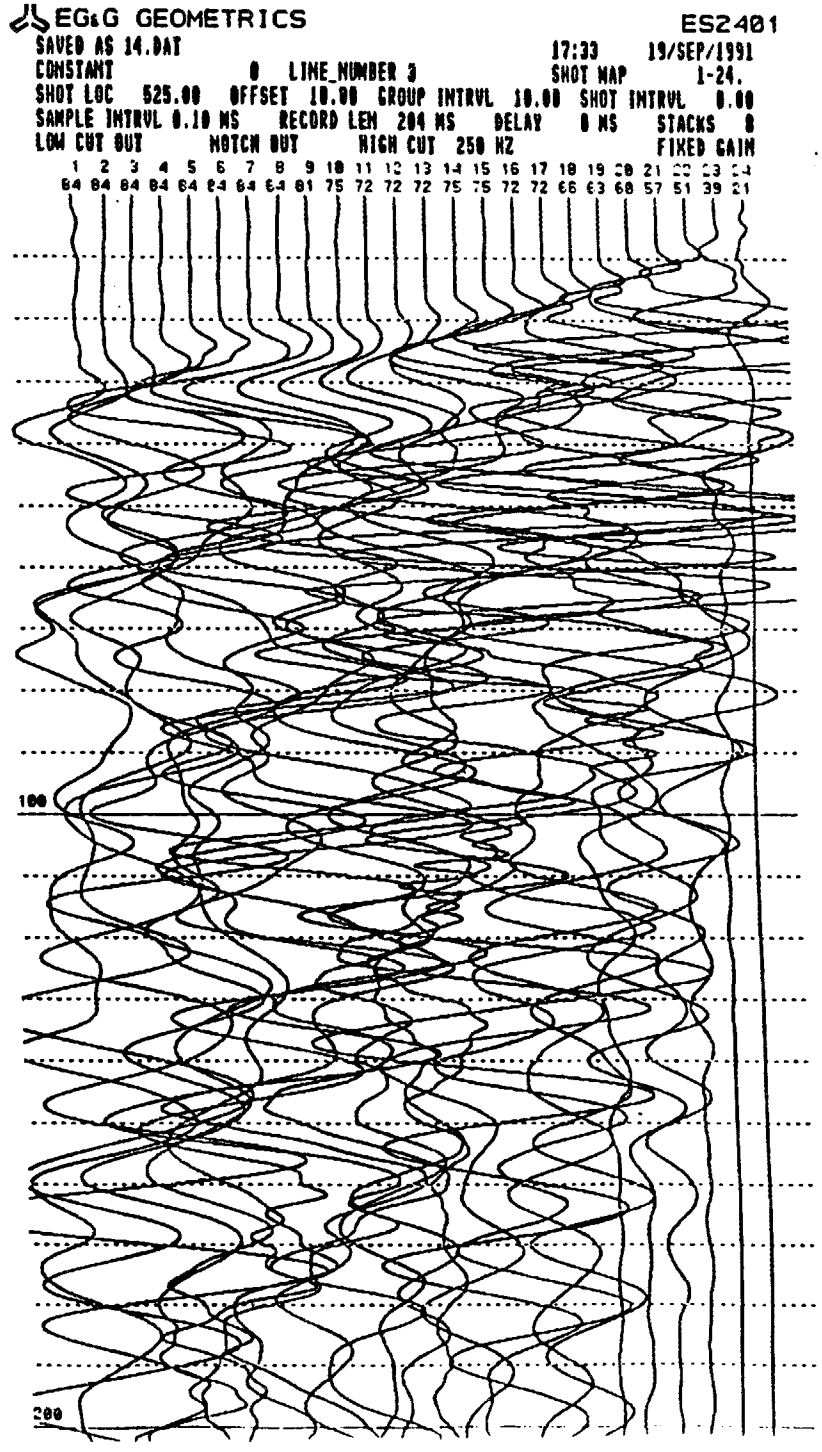

EG&G GEOMETRICS
ES2401
SAVED AS 9.DAT
CONSTANT 0 LINE_NUMBER 2
15:51 19/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00
SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS
SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
STACKS 0
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
75 72 63 69 66 60 54 51 48 42 30 06 09 42 48 48 57 60 60 66 72 72 72 75
100

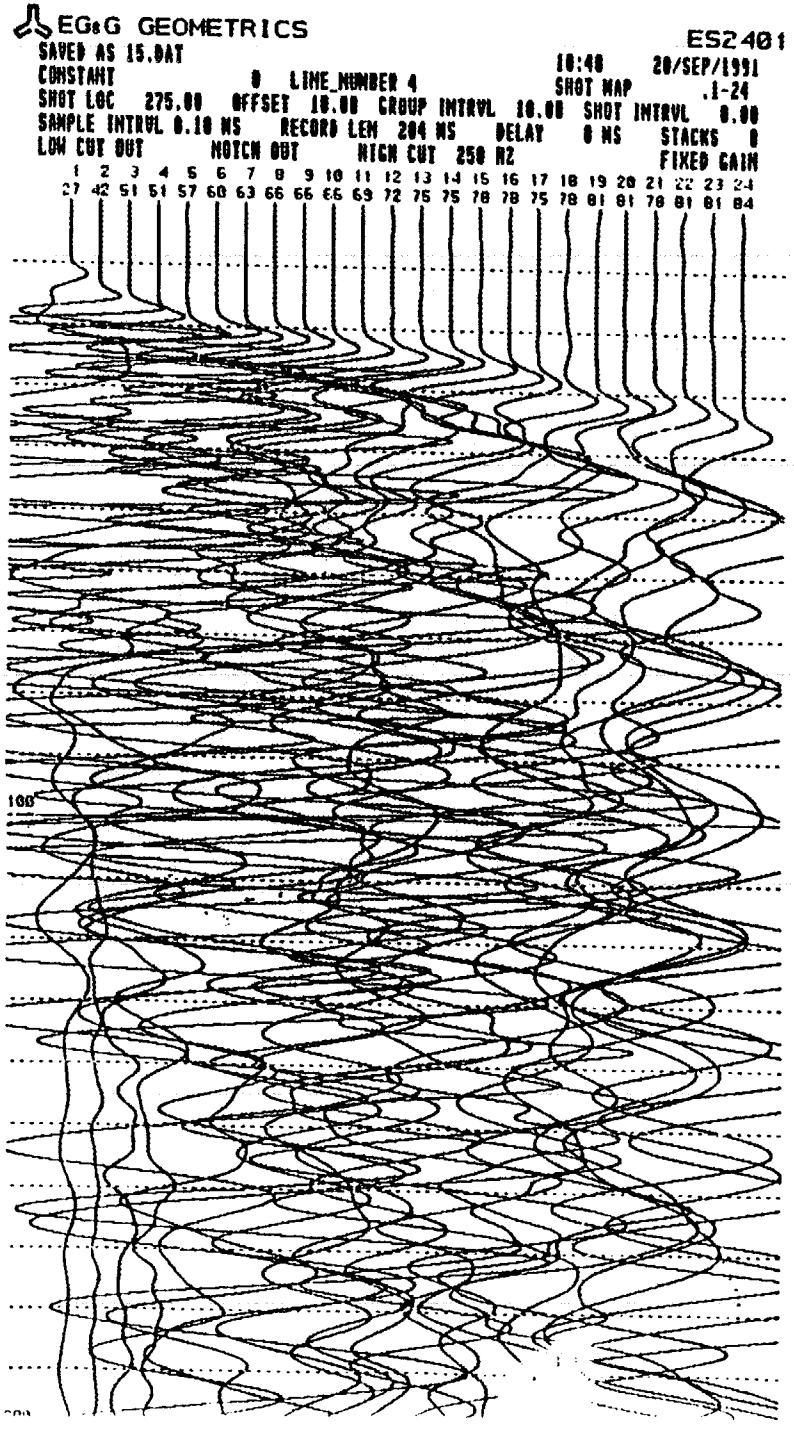

EG&G GEOMETRICS
ES2401
SAVED AS 10.DAT
15:59
19/SEP/1991
CONSTANT
0
LINE_NUMBER 2
SHOT MAP
1-24.
SHOT LOC 525.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY 0 MS
STACKS 0
FIXED GAIN
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 81 81 84 81 81 81 81 78 75 78 72 69 69 69 69 66 66 69 63 57 48 24
100
200

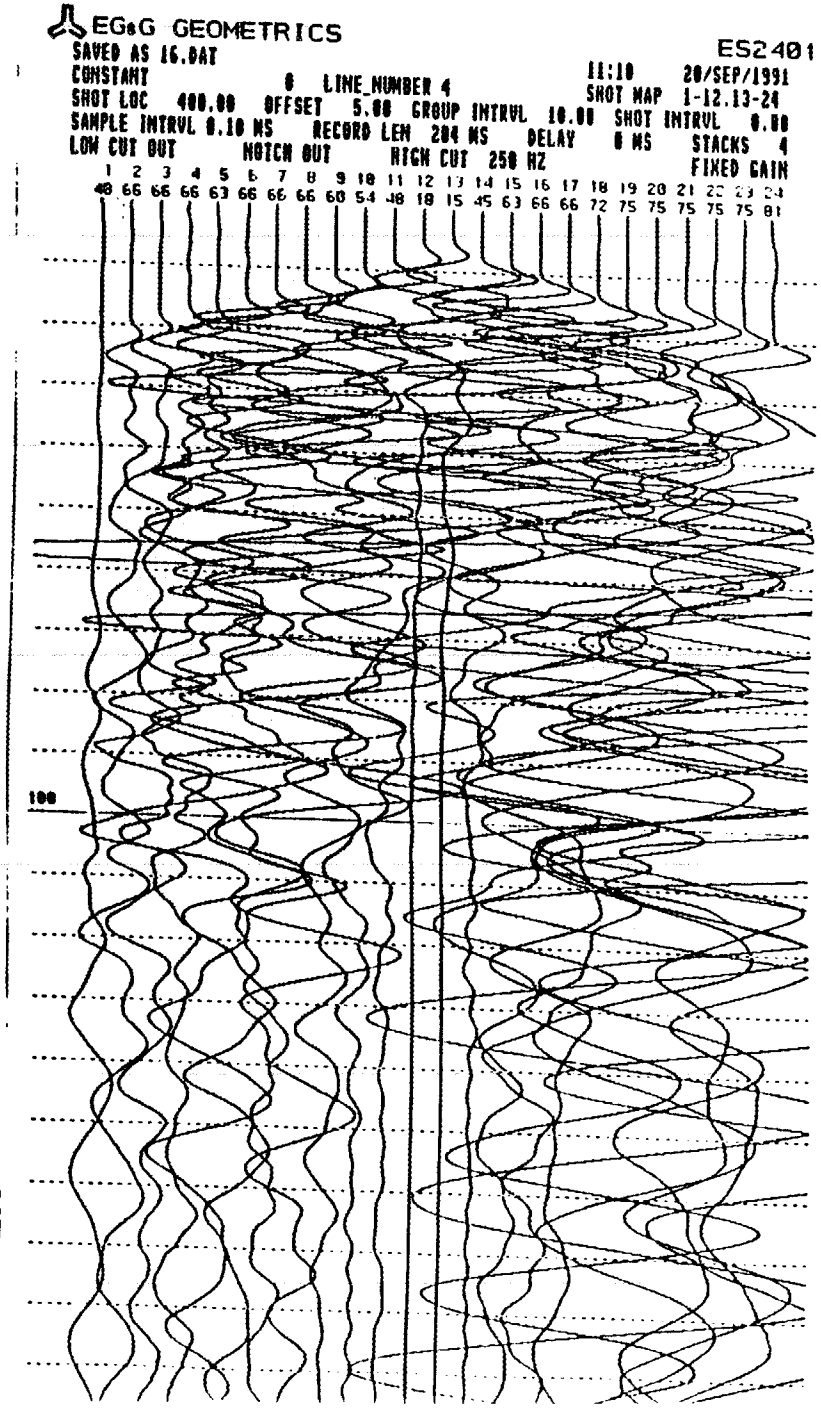

EG&G GEOMETRICS
ES2401
SAVED AS 11.DAT
CONSTANT 0 LINE_NUMBER 3
17:06 19/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
24 60 60 60 66 66 66 72 72 75 75 78 84 81 81 81 81 81 84 84 87 87 87 87
100

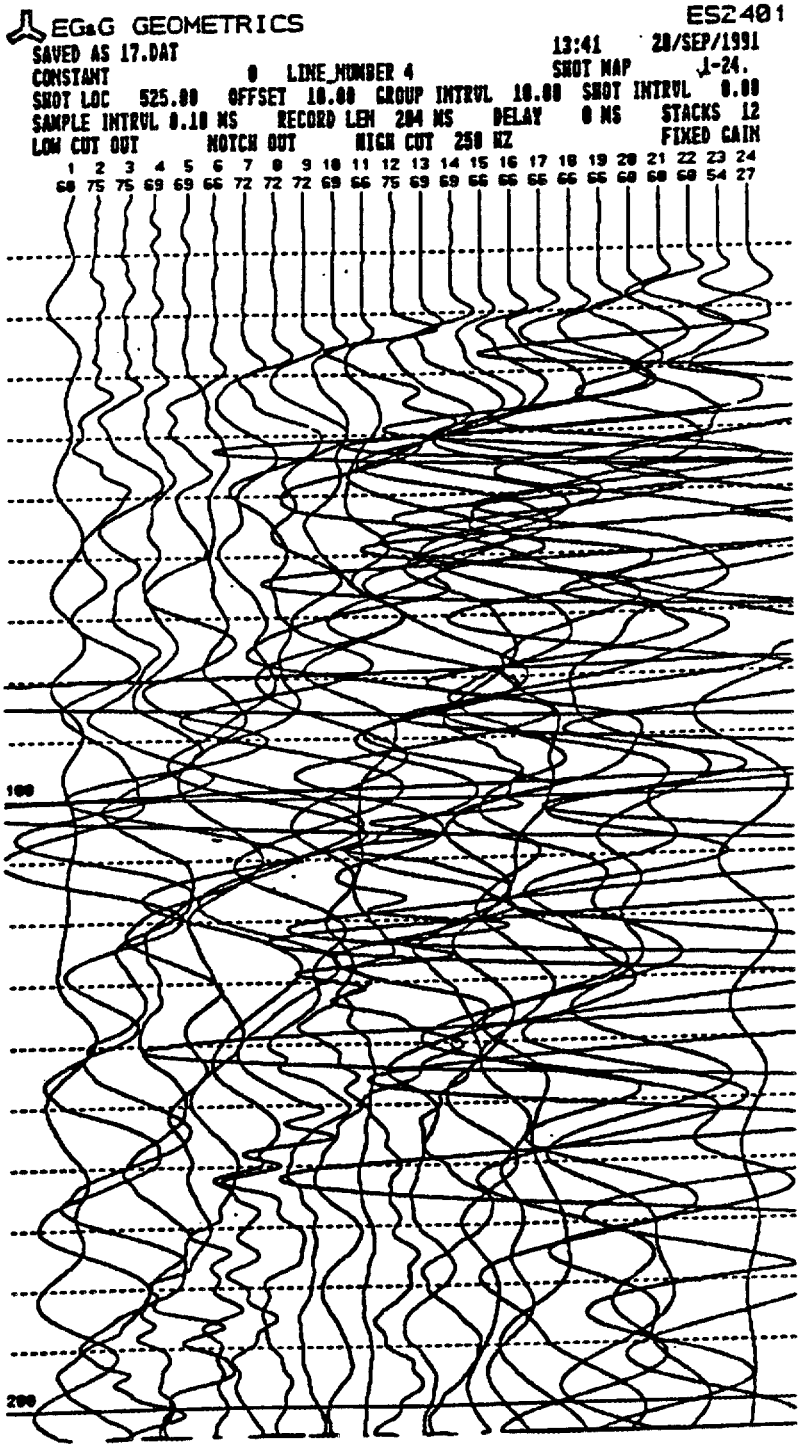

EG&G GEOMETRICS
ES2401
SAVED AS 12.DAT
CONSTANT 0 LINE_NUMBER 3
17:17 19/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 72 72 72 72 69 66 51 51 48 33 00 09 42 51 57 60 63 66 72 75 72 75 78
100


EG&G GEOMETRICS
ES2401
SAVED AS 13.DAT
17:24 19/SEP/1991
CONSTANT 0 LINE_NUMBER 3
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 90 87 84 81 84 84 84 84 72 84 81 84 81 75 72 69 69 57 57 57 48 36 21
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 14.DAT
17:33 19/SEP/1991
CONSTANT 0 LINE_NUMBER 3
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 84 84 84 84 84 84 81 75 72 72 72 75 75 72 72 66 63 60 57 51 39 21
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 15.DAT
10:40 20/SEP/1991
CONSTANT 0 LINE_NUMBER 4 SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
27 42 51 51 57 60 63 66 66 66 69 72 75 75 78 78 75 78 81 81 78 81 81 84
100

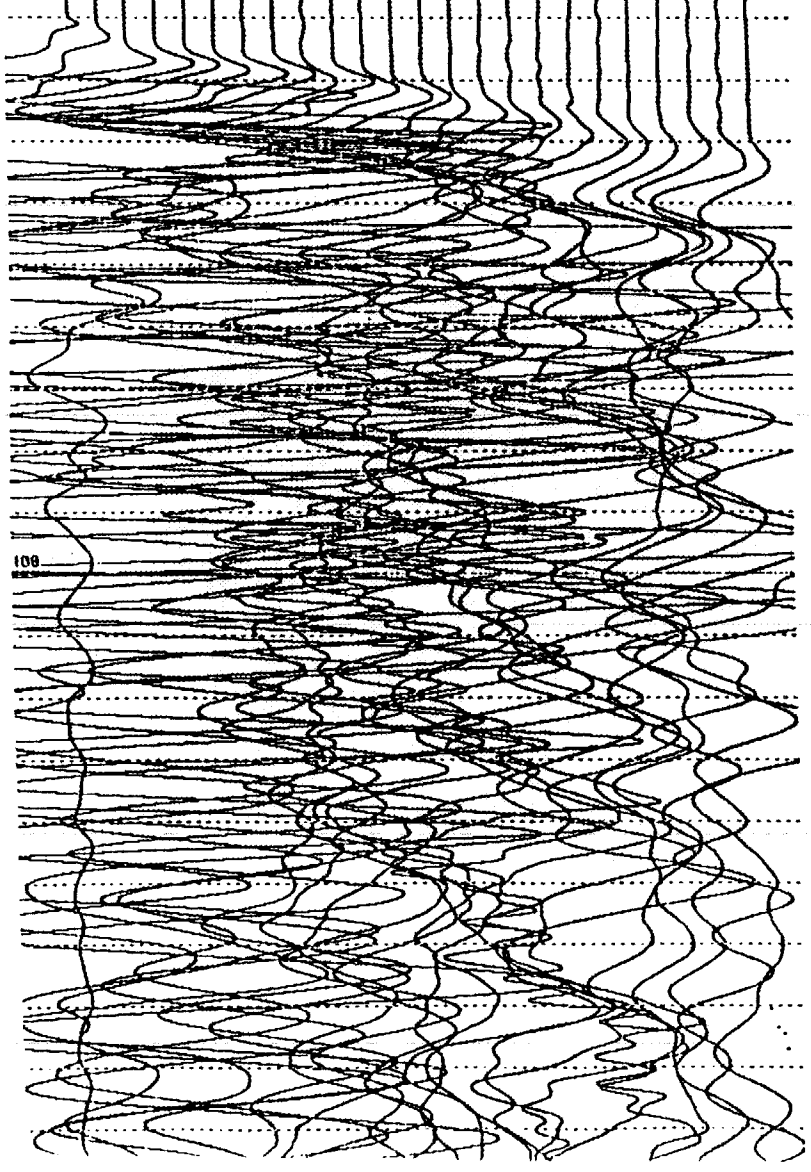

EG&G GEOMETRICS
ES2401
SAVED AS 16.DAT
11:10 20/SEP/1991
CONSTANT 0 LINE_NUMBER 4 SHOT MAP 1-12.13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
48 66 66 66 63 66 66 66 60 54 48 18 15 45 63 66 66 72 75 75 75 75 75 81
100


EGaG GEOMETRICS
ES2401
SAVED AS 17.DAT
13:41 28/SEP/1991
CONSTANT 0 LINE NUMBER 4
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 12
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
60 75 75 69 69 66 72 72 72 69 66 75 69 69 66 66 66 66 66 60 60 60 54 27
100
200

EG&G GEOMETRICS ES2401

SAVED AS 18.DAT 14:57 20/SEP/1991
CONSTANT 0 LINE_NUMBER 5 SHOT MAP .1-24
SHOT LOC 300.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN

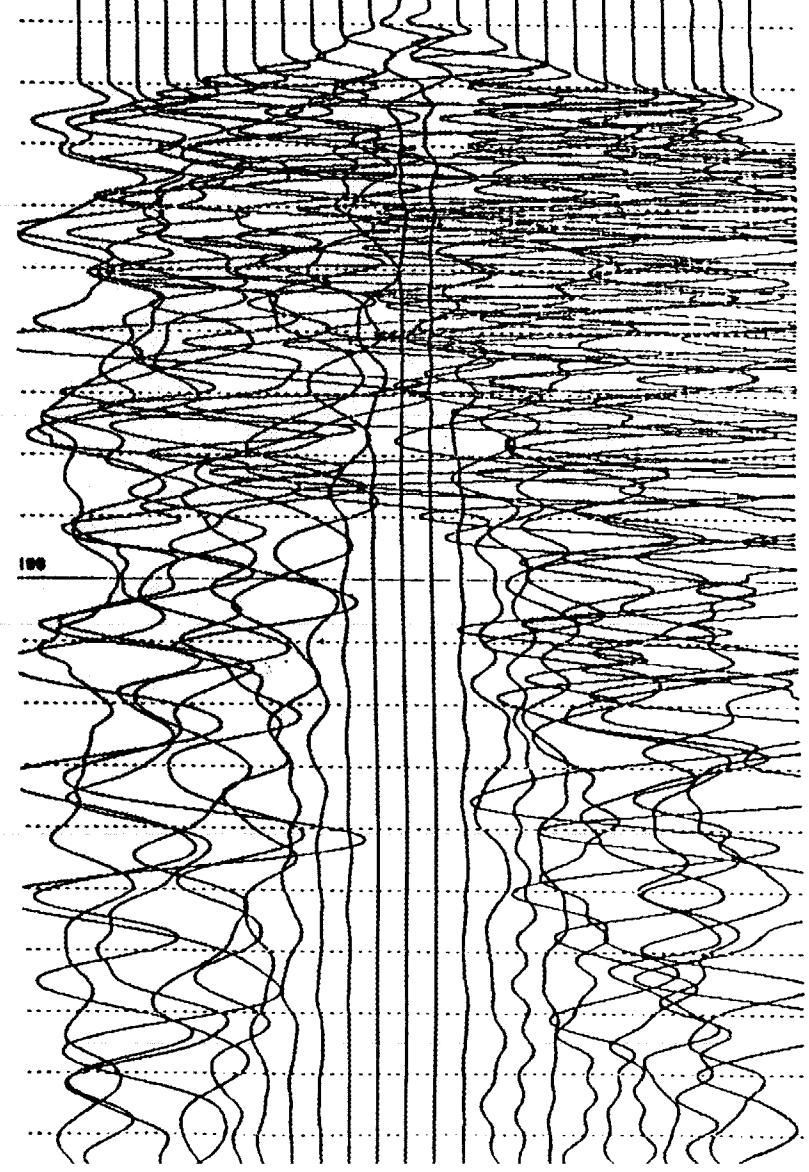
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
48	69	72	78	72	72	75	78	75	78	78	78	78	75	81	78	81	81	81	78	78	81	84	84

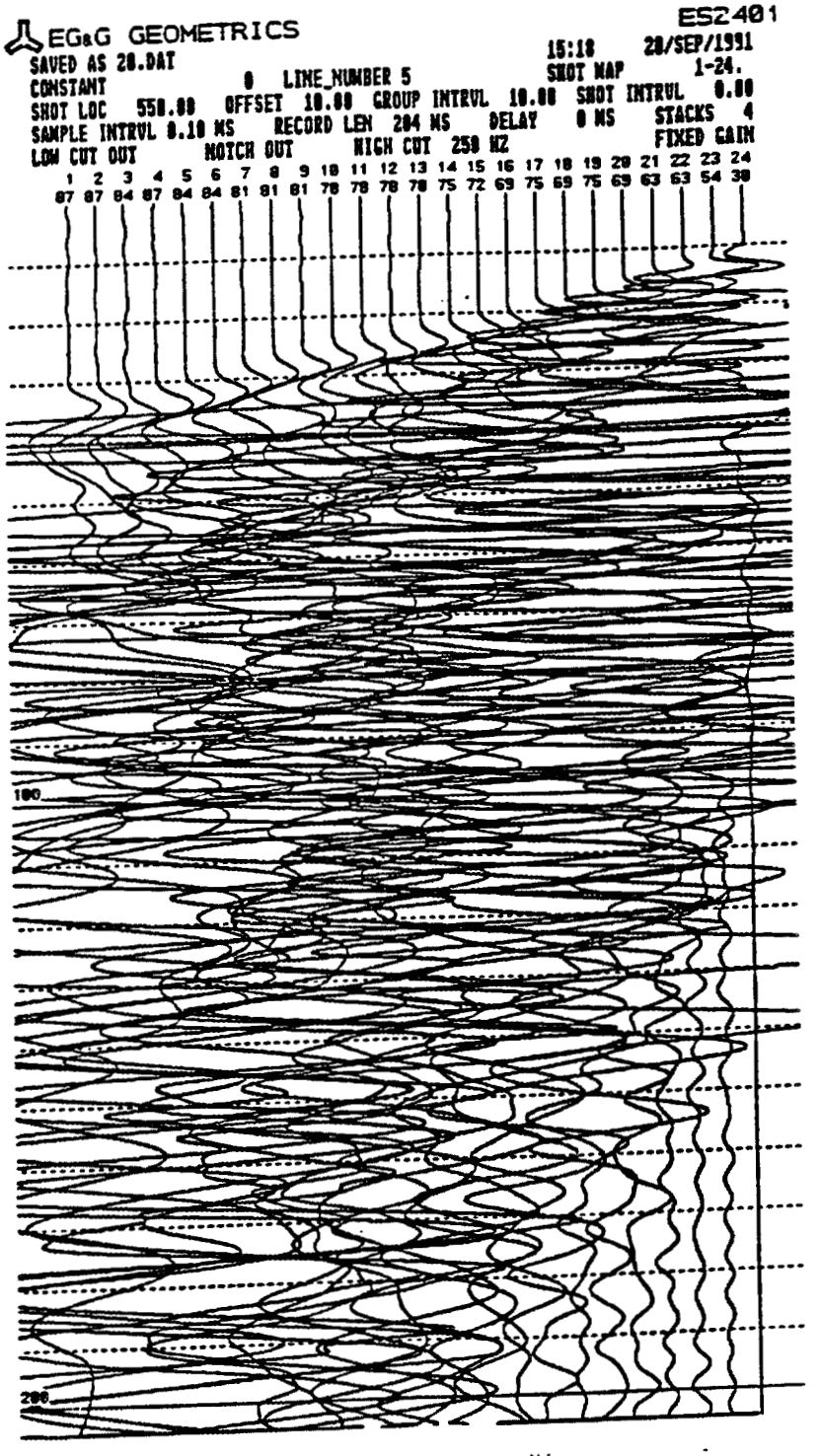


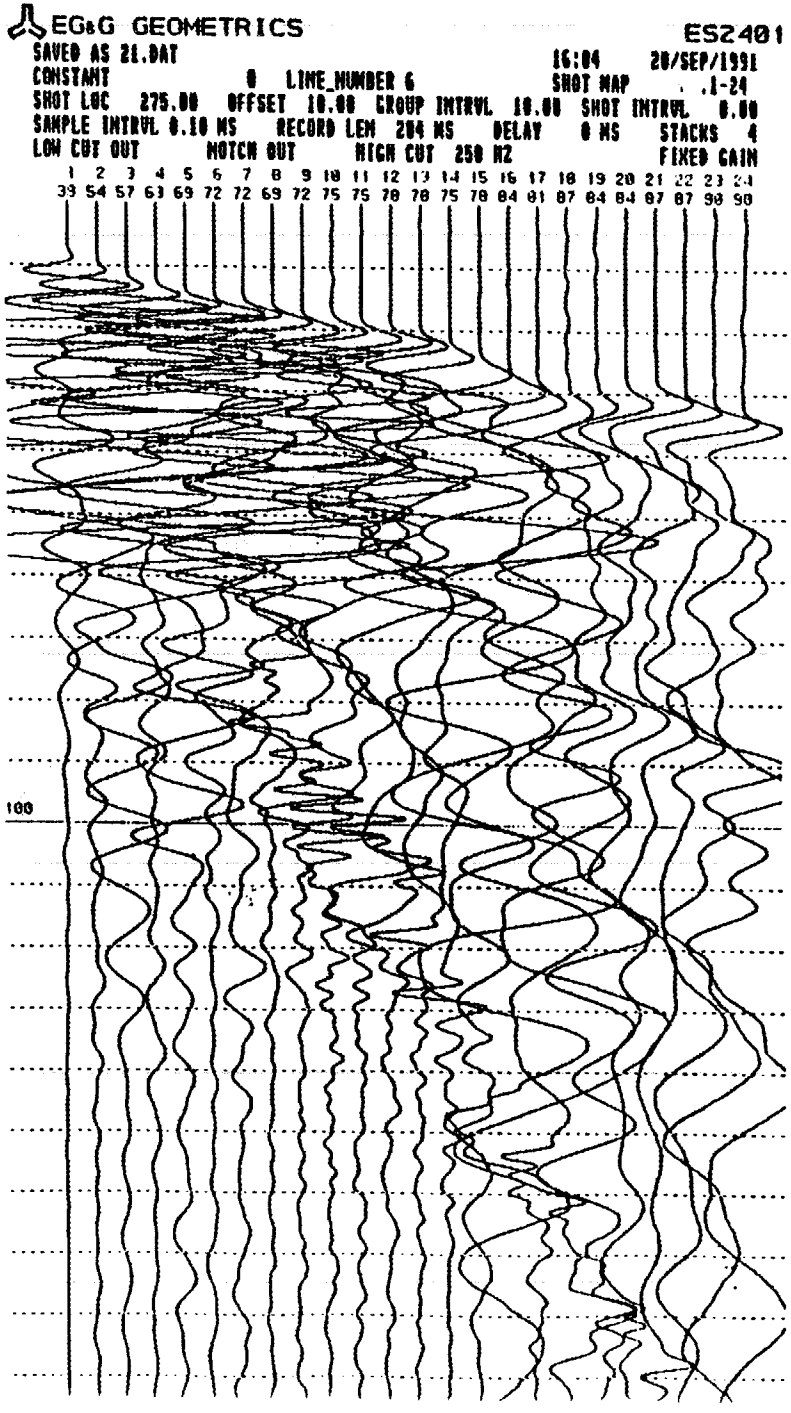
EG&G GEOMETRICS ES2401

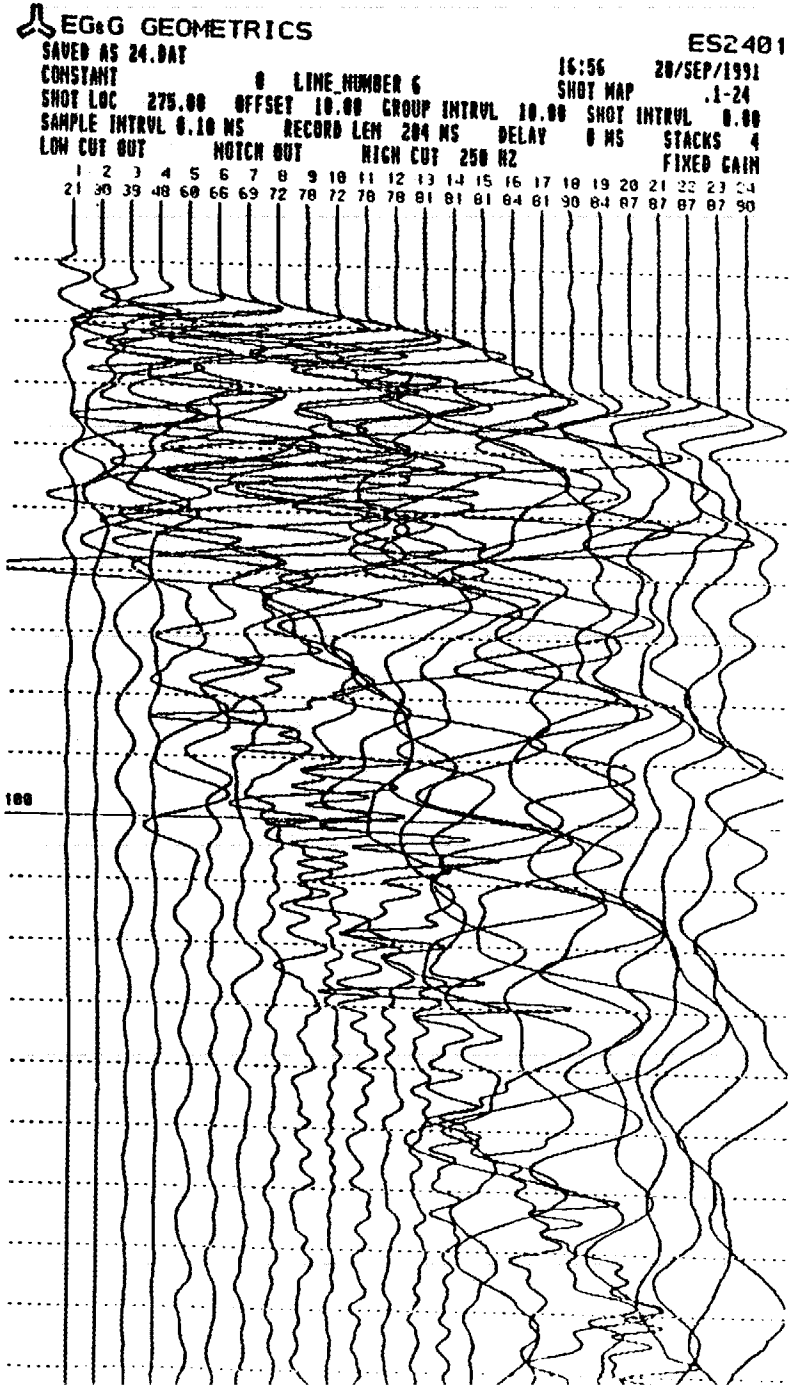
SAVED AS 19.DAT 15:09 20/SEP/1991
CONSTANT 0 LINE_NUMBER 5 SHOT MAP 1-12.13-24
SHOT LOC 425.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN

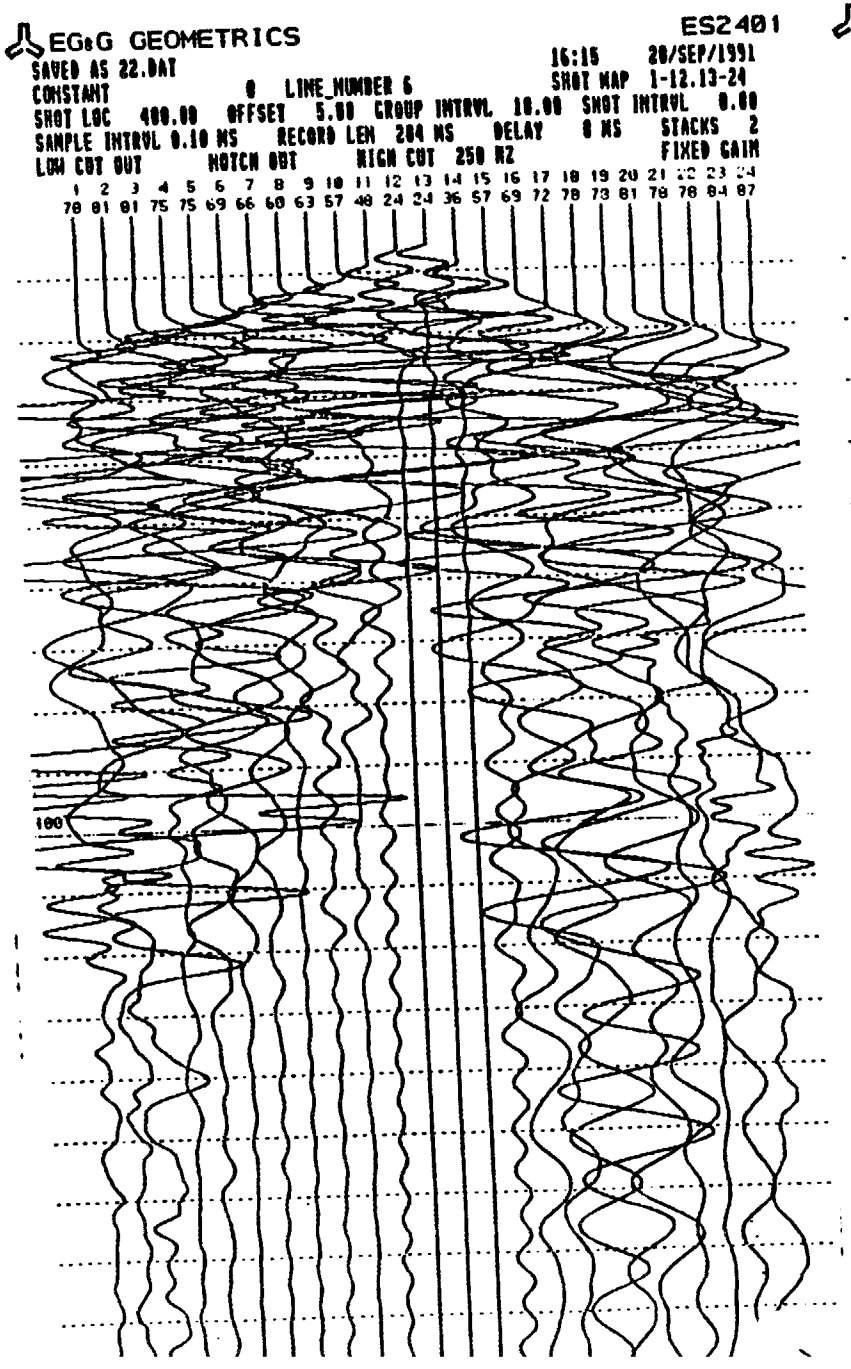
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
78	78	72	75	69	69	63	60	51	45	36	18	18	45	60	54	60	69	72	75	75	78	81	84

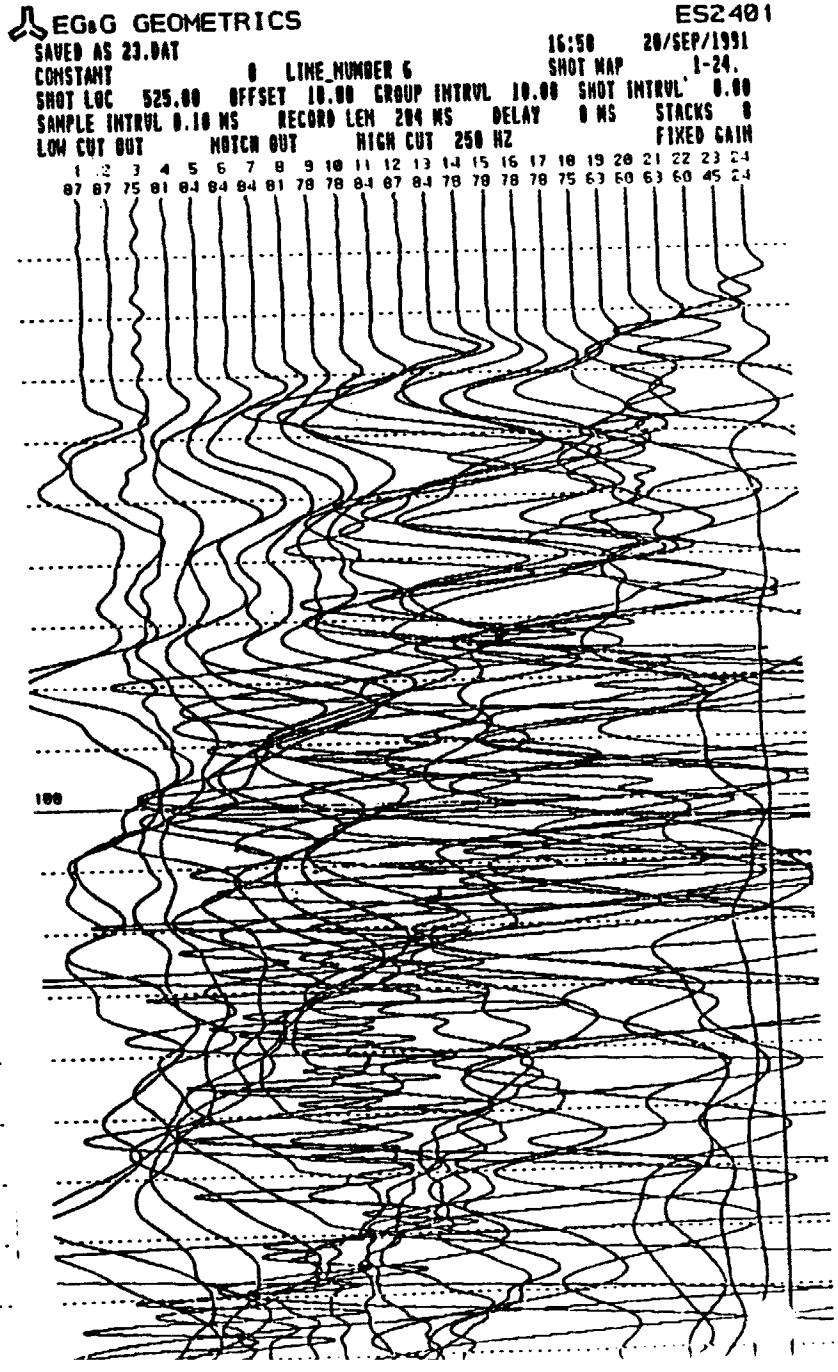


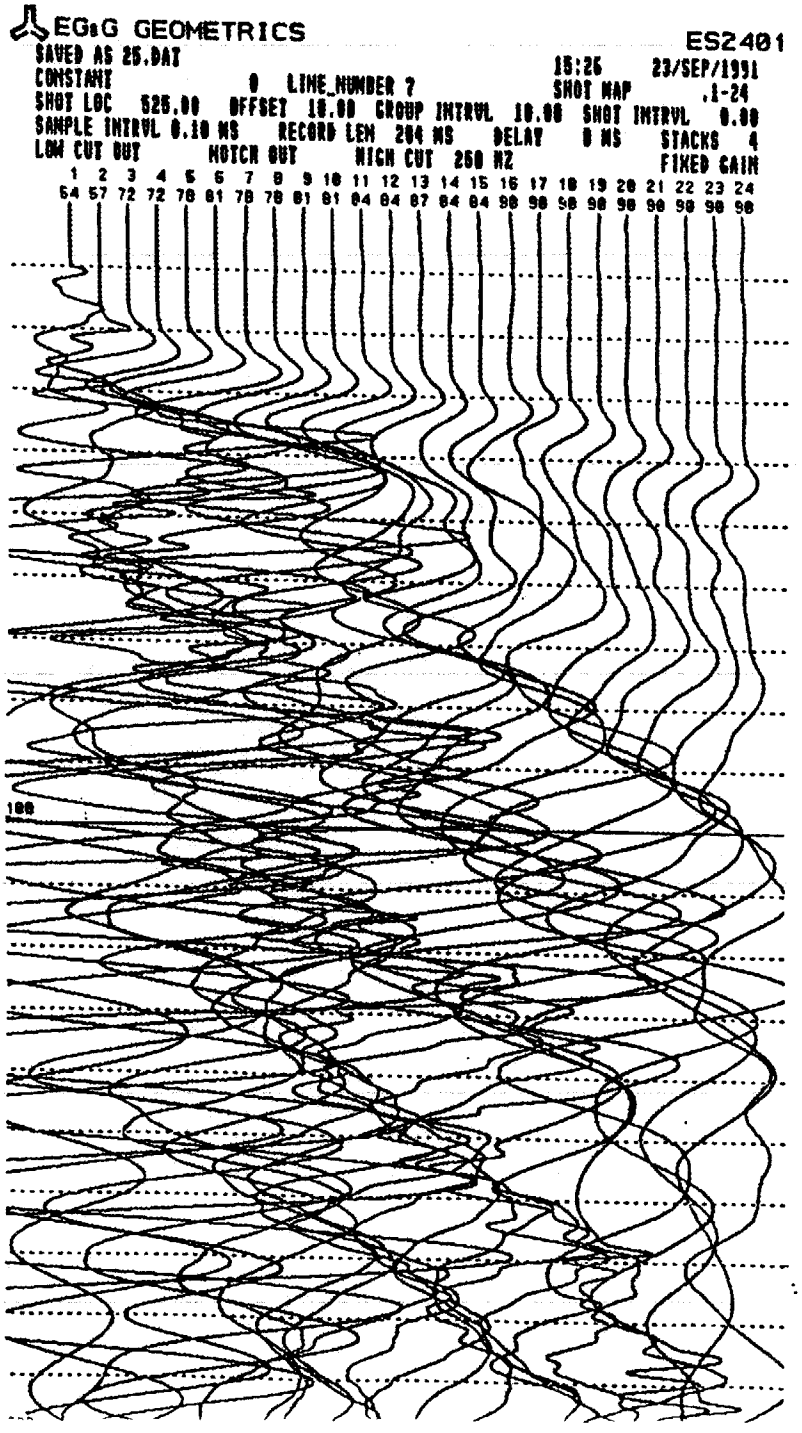

EG&G GEOMETRICS
ES2401
SAVED AS 20.DAT
15:18
20/SEP/1991
SHOT MAP
1-24.
CONSTANT
0
LINE NUMBER 5
SHOT LOC 550.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY 0 MS
STACKS 4
FIXED GAIN
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 84 87 84 84 81 81 81 78 78 78 78 75 72 69 75 69 75 69 63 63 54 30
100
200

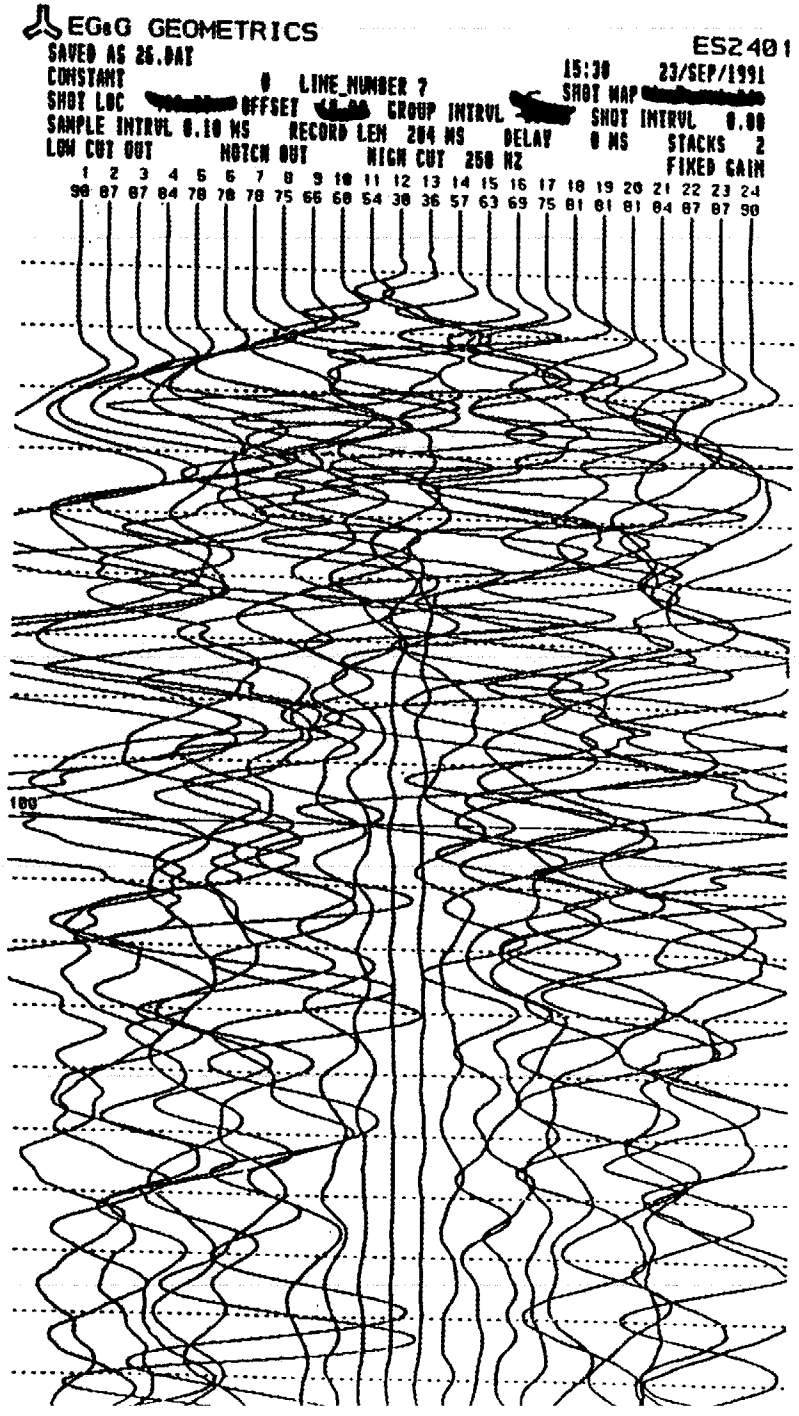

EG&G GEOMETRICS
ES2401
SAVED AS 21.DAT
16:04 20/SEP/1991
CONSTANT 0 LINE_NUMBER 6
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
39 54 57 63 69 72 72 69 72 75 75 78 78 75 78 84 81 87 84 84 87 87 90 90
100

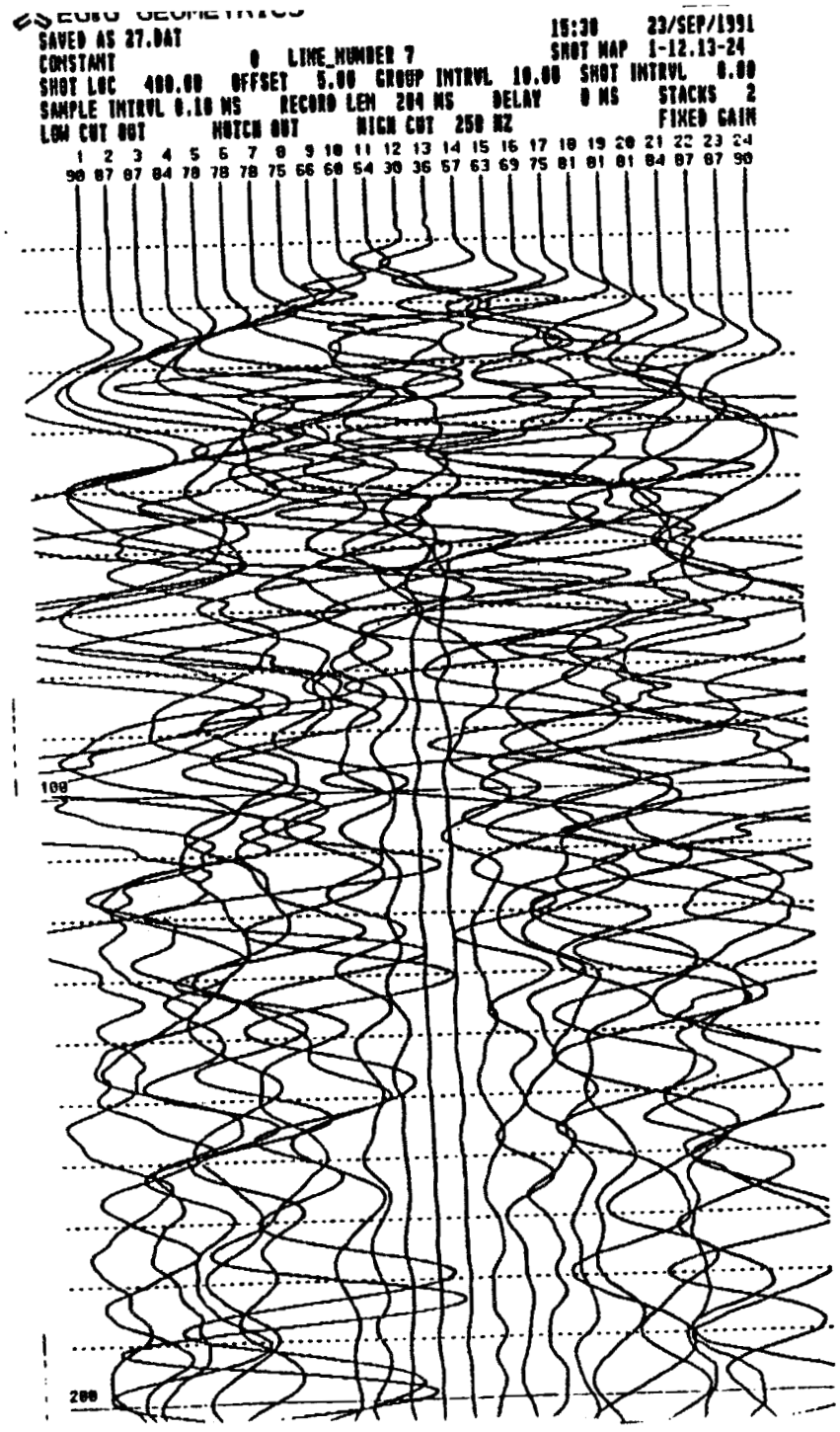

EG&G GEOMETRICS
ES2401
SAVED AS 24.DAT
16:56 20/SEP/1991
CONSTANT 0 LINE_NUMBER 6
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
21 30 39 48 60 66 69 72 78 72 78 78 81 81 81 84 81 90 84 87 87 87 87 90
100

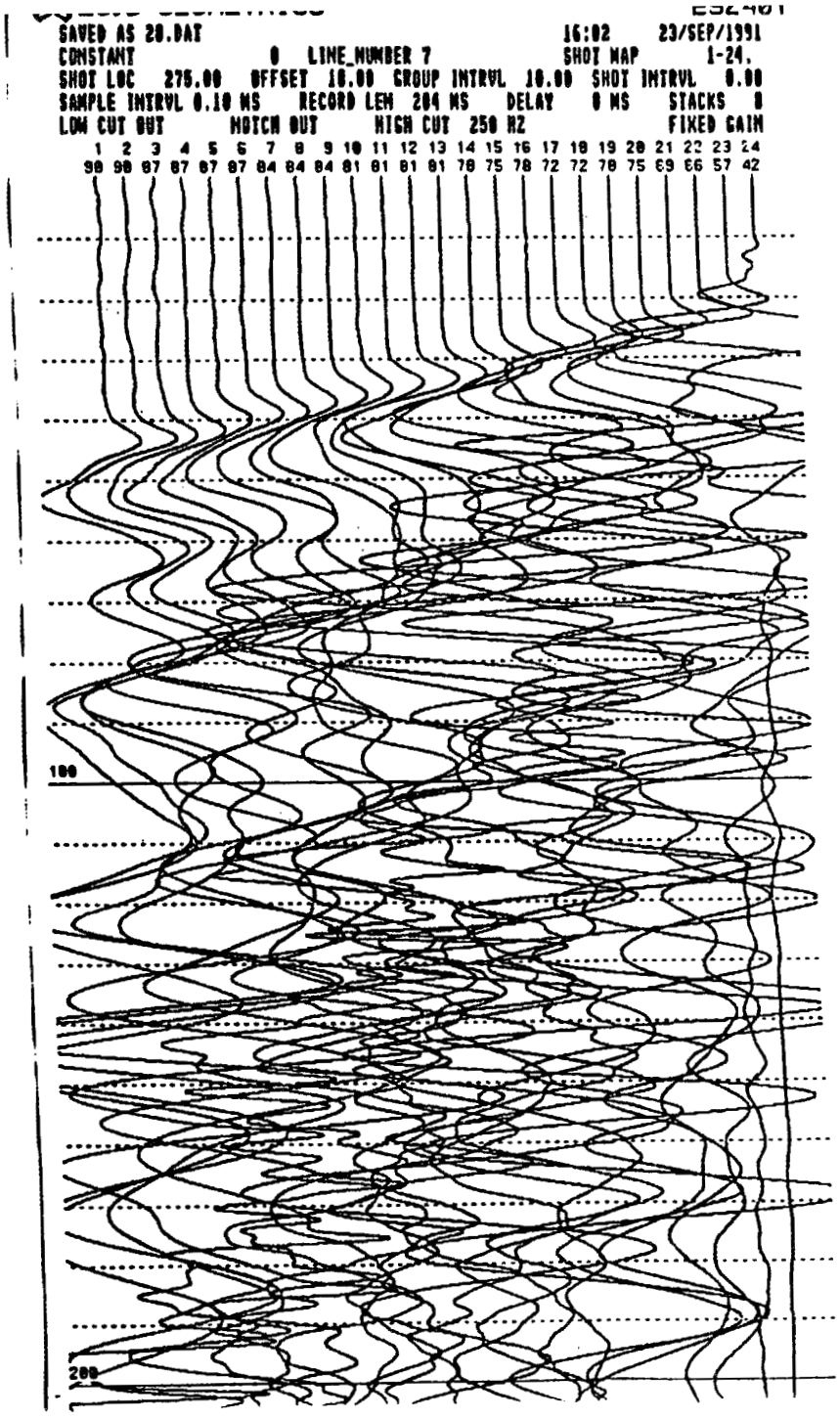

EG&G GEOMETRICS
ES2401
SAVED AS 22.DAT
16:15 20/SEP/1991
CONSTANT 0 LINE_NUMBER 6 SHOT MAP 1-12.13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 81 81 75 75 69 66 60 63 57 48 24 24 36 57 69 72 78 78 81 78 78 84 87
100


EG&G GEOMETRICS
ES2401
SAVED AS 23.DAT
16:50 20/SEP/1991
CONSTANT 0 LINE_NUMBER 6 SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 75 81 84 84 84 81 78 78 84 87 84 78 78 78 78 75 63 60 63 60 45 24
100


EG&G GEOMETRICS
ES2401
SAVED AS 25.DAT
CONSTANT 0 LINE NUMBER 7
15:26 23/SEP/1991
SHOT MAP .1-24
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
64 57 72 72 78 81 78 78 81 81 84 84 87 84 84 90 90 90 90 90 90 90 90 90
100


EG&G GEOMETRICS
ES2401
SAVED AS 26.DAT
CONSTANT 0 LINE NUMBER 7
15:30 23/SEP/1991
SHOT LOC [redacted] OFFSET [redacted] GROUP INTRVL [redacted] SHOT MAP [redacted]
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 87 87 84 78 78 78 75 66 60 54 30 36 57 63 69 75 81 81 81 84 87 87 90
100


SAVED AS 27.DAT
15:30 23/SEP/1991
CONSTANT 0 LINE_NUMBER 7
SHOT MAP 1-12,13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 87 87 84 78 78 78 75 66 60 54 30 36 57 63 69 75 81 81 81 84 87 87 90
100
200


SAVED AS 28.DAT
16:02 23/SEP/1991
CONSTANT 0 LINE_NUMBER 7
SHOT MAP 1-24.
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 90 87 87 87 87 84 84 84 81 81 81 81 78 75 78 72 72 78 75 69 66 57 42
100
200

EG&G GEOMETRICS

ES2401

SAVED AS 29.DAT

CONSTANT 0 LINE NUMBER 0 16:56 23/SEP/1991

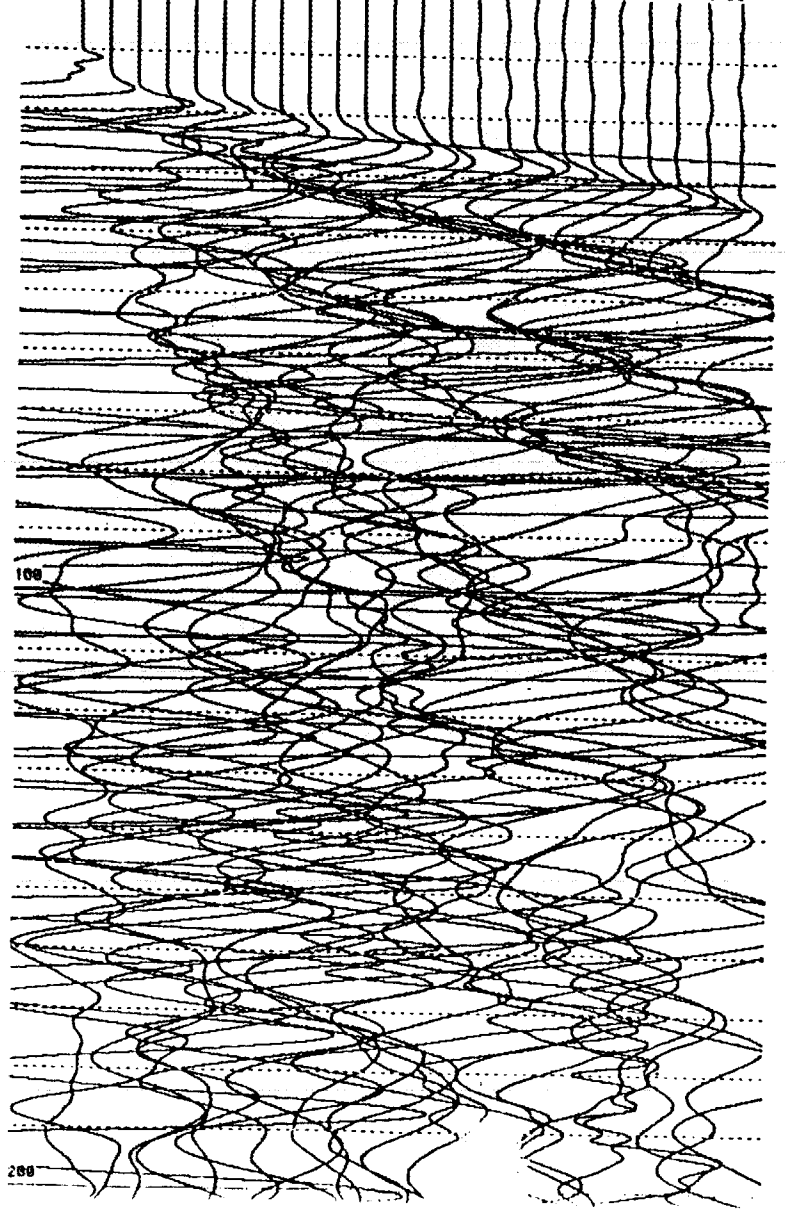
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24

SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00

LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4

FIXED GAIN

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
60	72	75	66	72	72	75	78	78	84	87	90	81	81	90	90	90	90	90	90	93	93	93	93



EG&G GEOMETRICS

ES2401

SAVED AS 30.DAT

CONSTANT 0 LINE NUMBER 0 17:13 23/SEP/1991

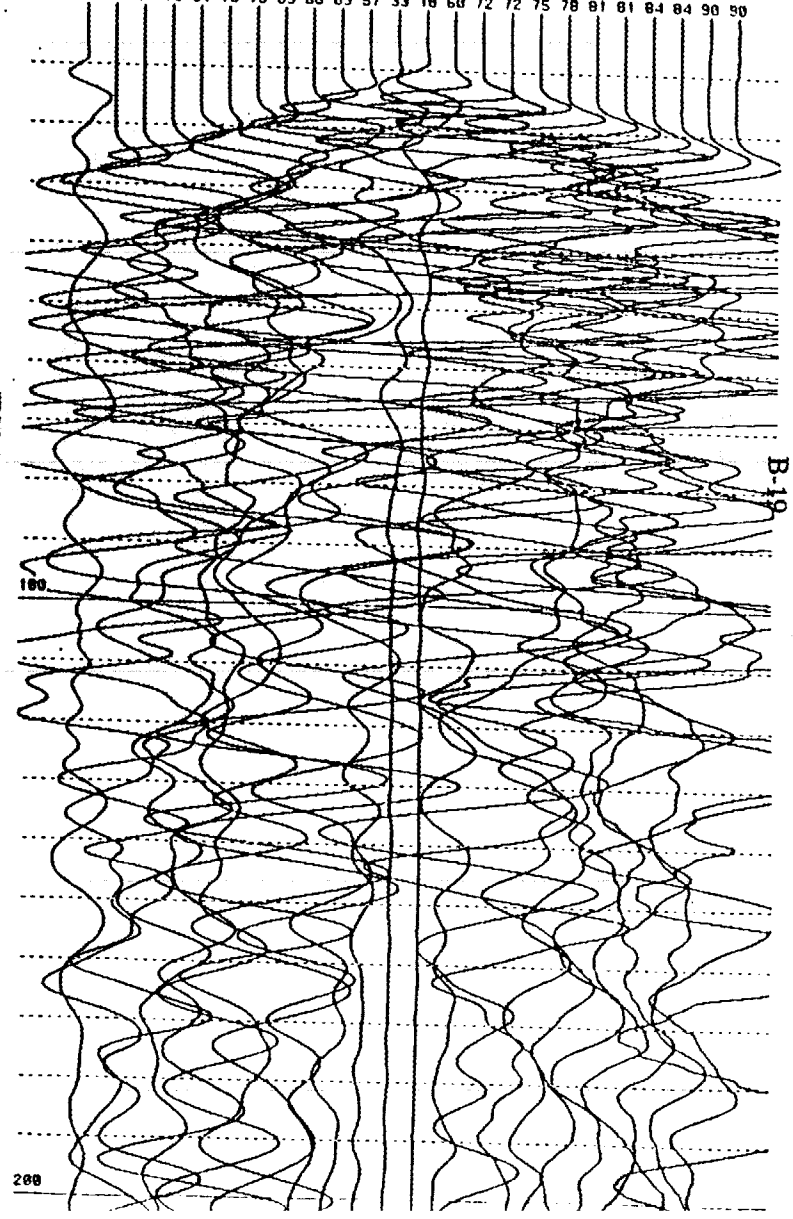
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24

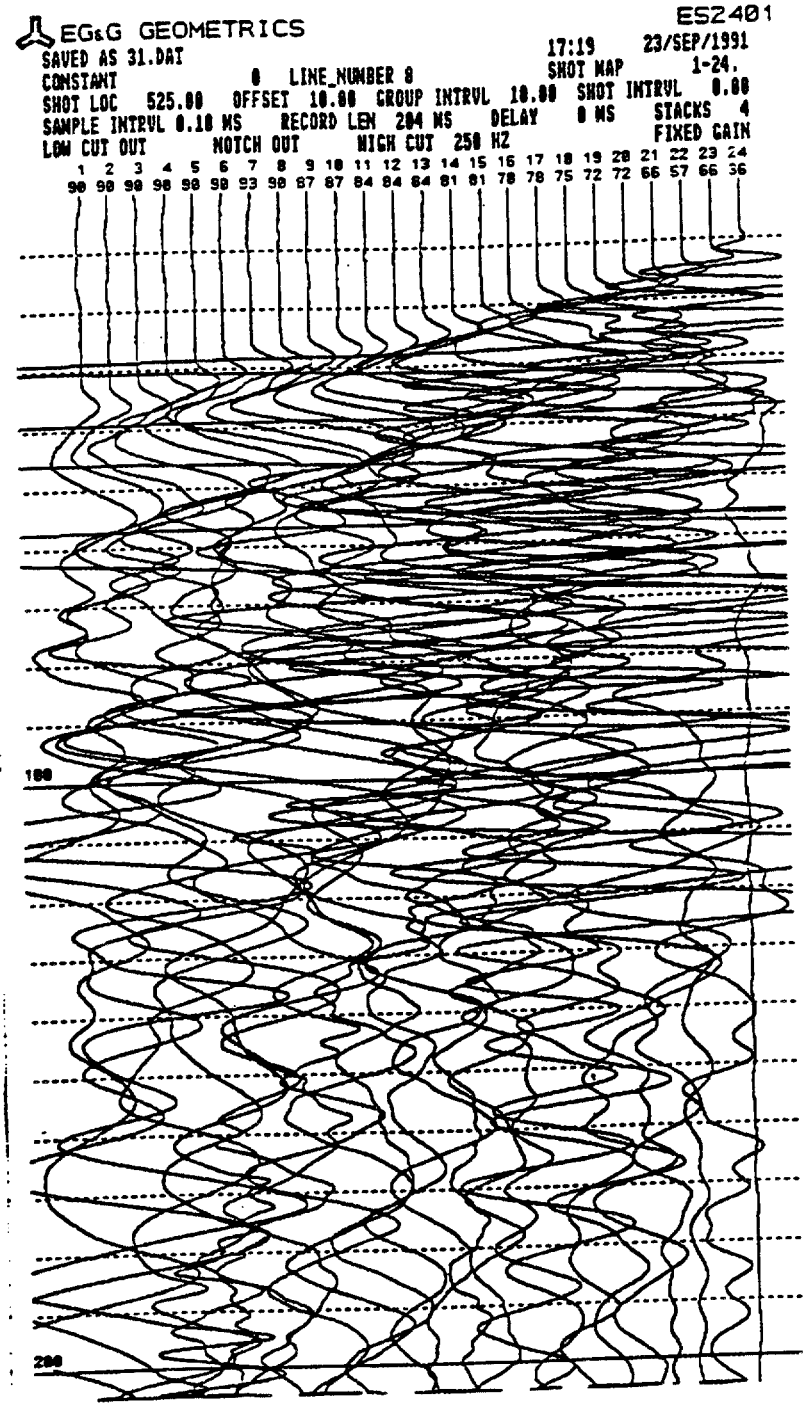
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00

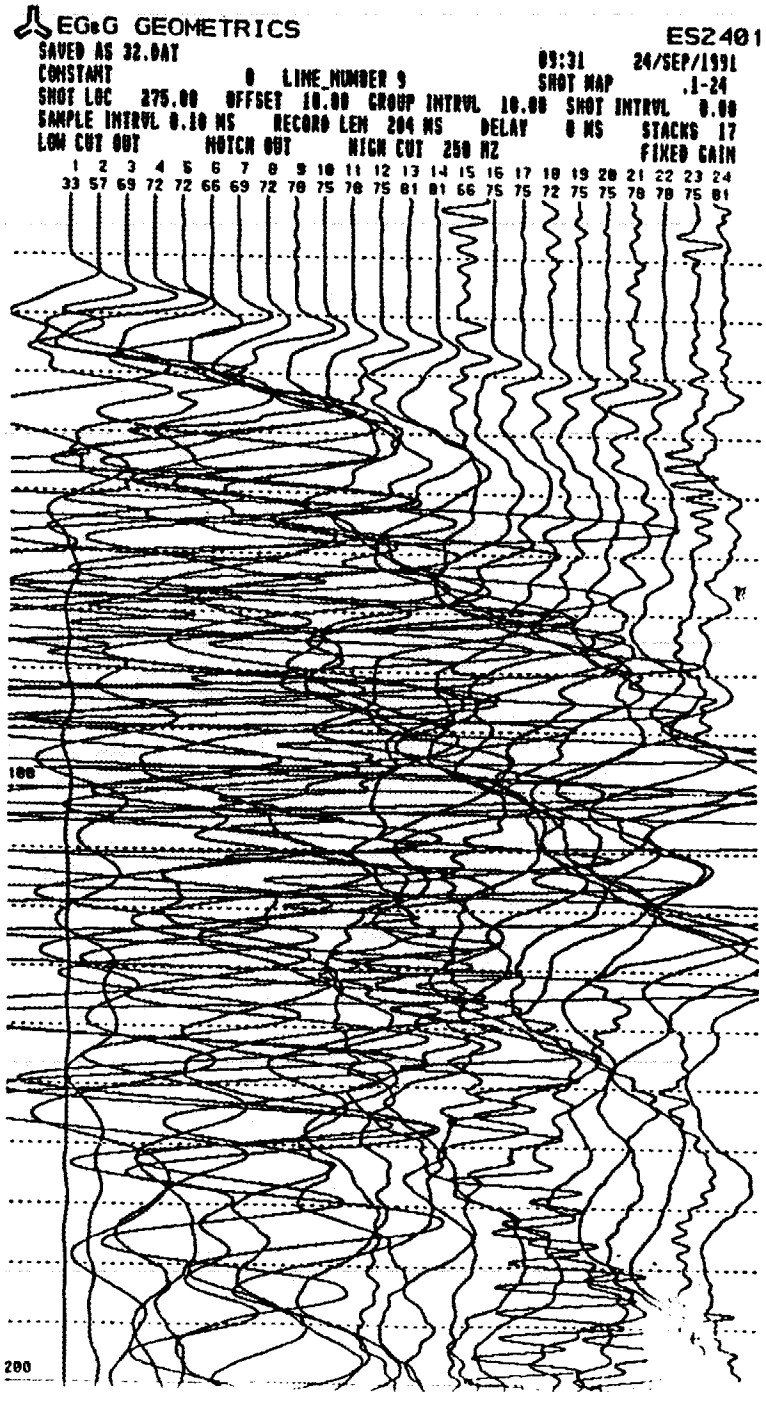
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4

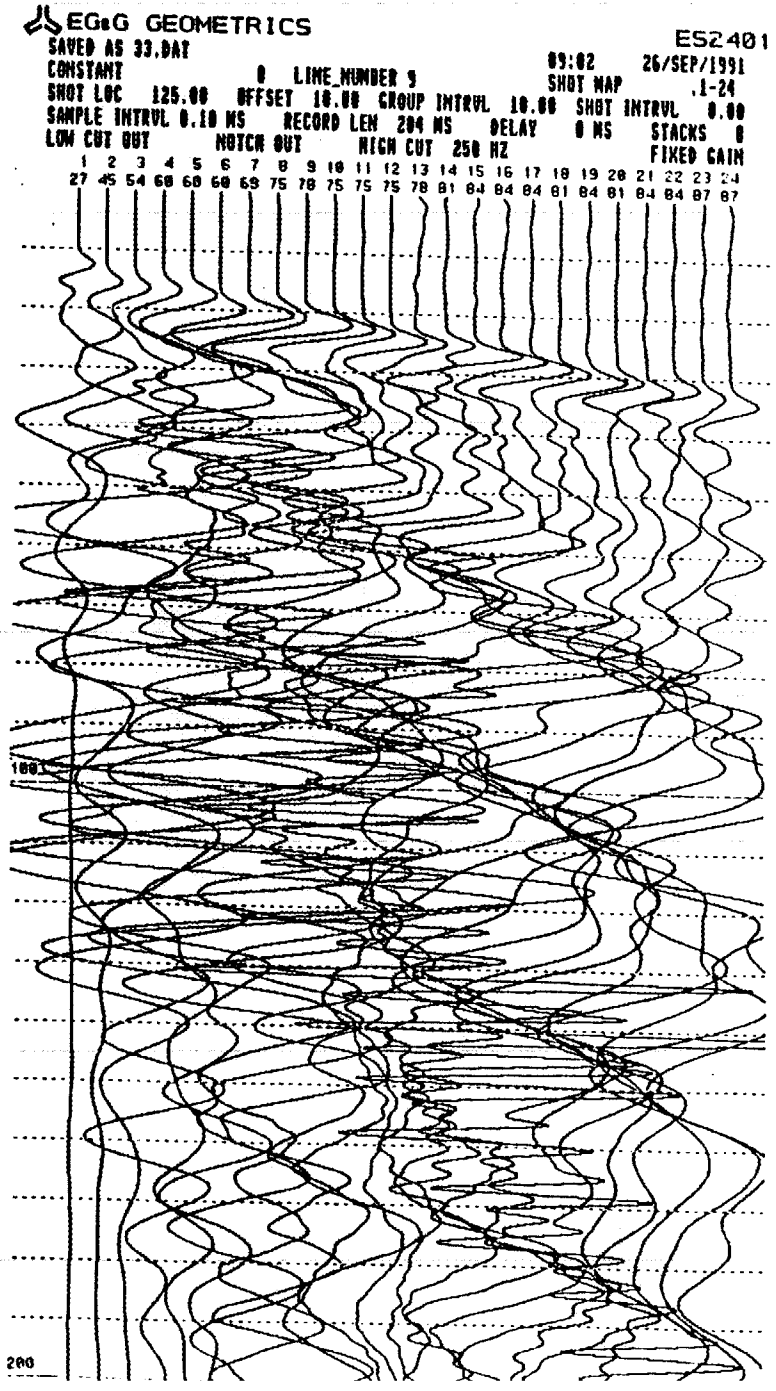
FIXED GAIN

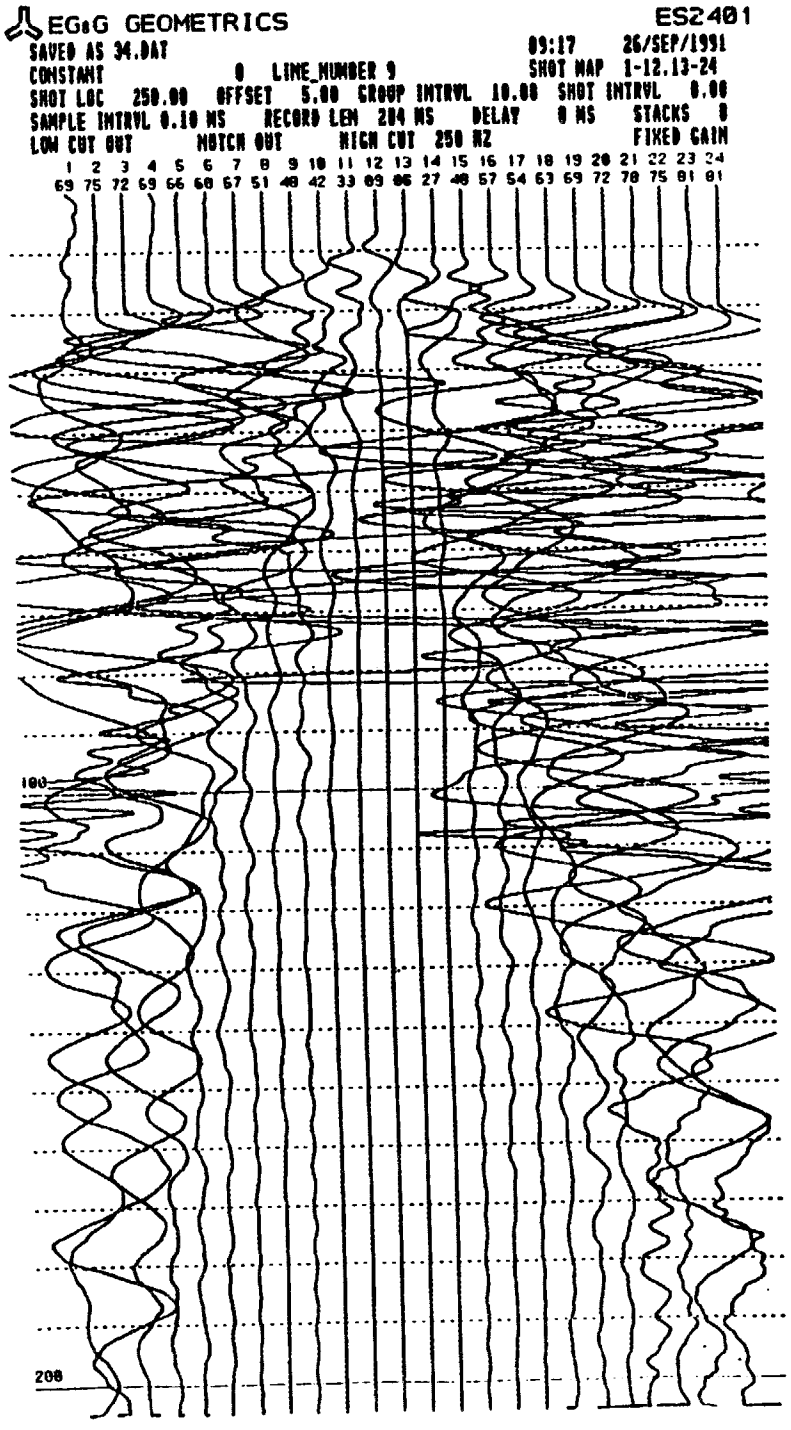
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
75	84	81	78	81	75	75	69	66	63	57	33	18	60	72	72	75	78	81	81	84	84	90	90

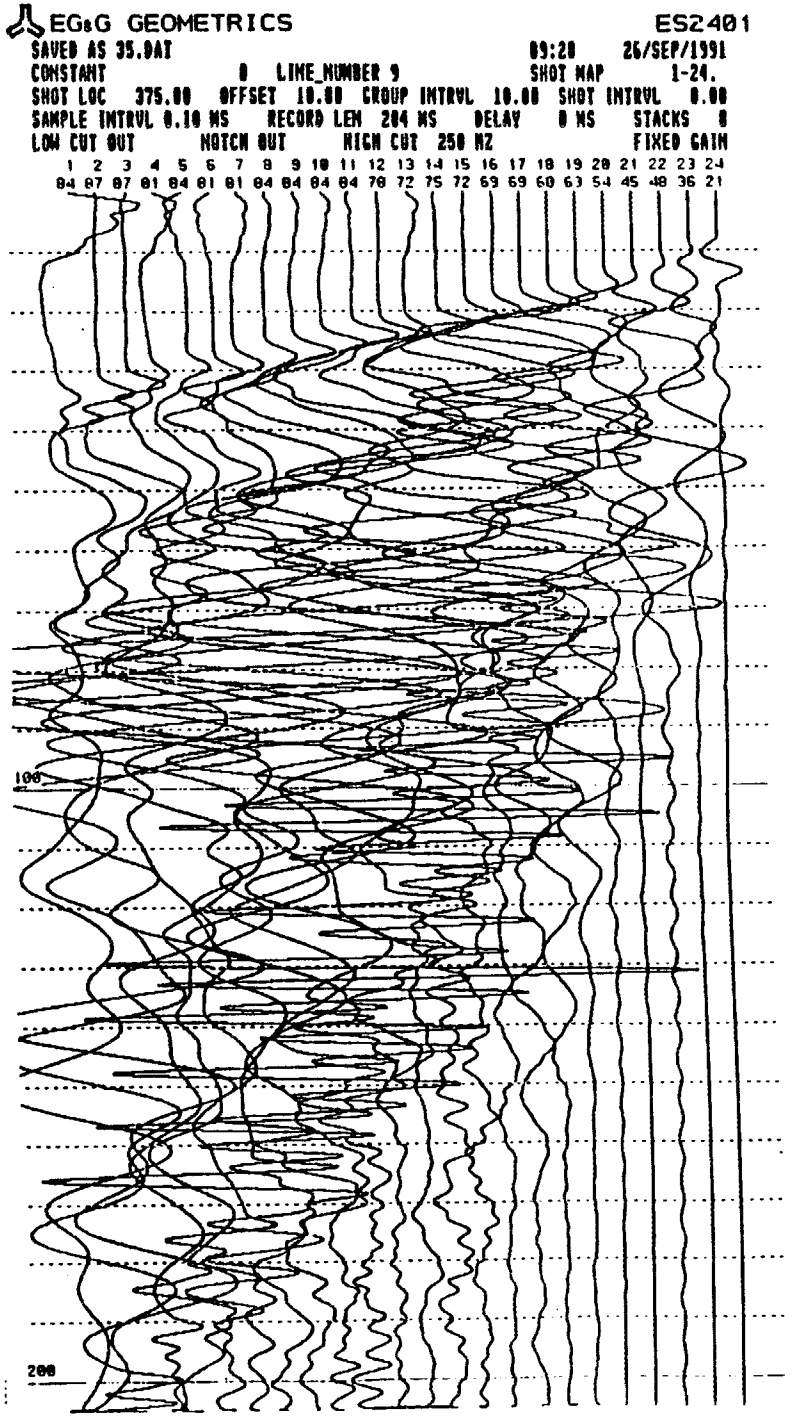


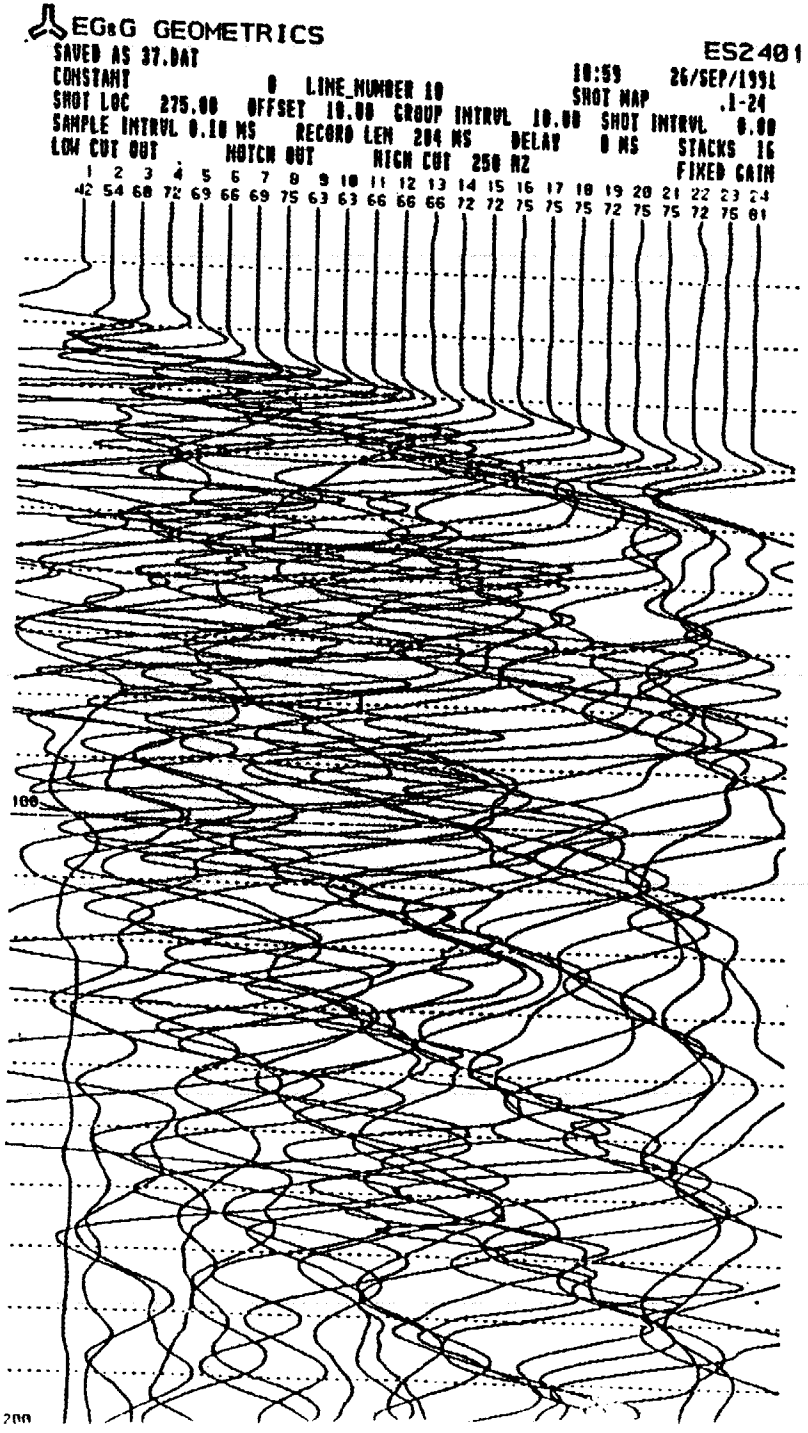

EG&G GEOMETRICS
ES2401
SAVED AS 31.DAT
17:19
23/SEP/1991
CONSTANT
0 LINE_NUMBER 8
SHOT MAP
1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 90 90 90 90 90 93 90 87 87 84 84 84 81 81 78 78 75 72 72 66 57 66 36
100
200

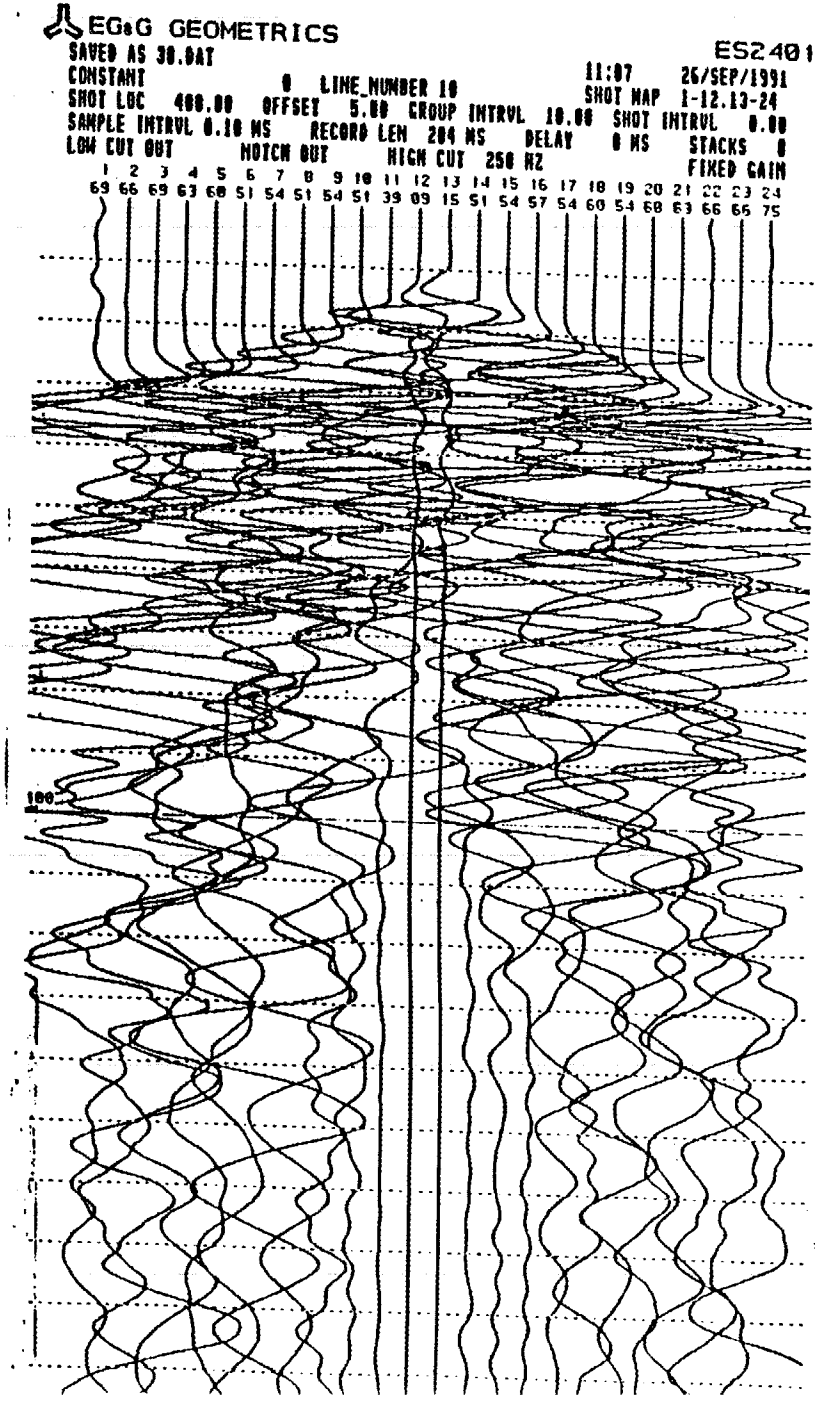

EG&G GEOMETRICS
ES2401
SAVED AS 32.DAT
09:31 24/SEP/1991
CONSTANT 0 LINE_NUMBER 9
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 17
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
33 57 69 72 72 66 69 72 78 75 78 75 81 81 66 75 75 72 75 75 78 78 75 81
100
200

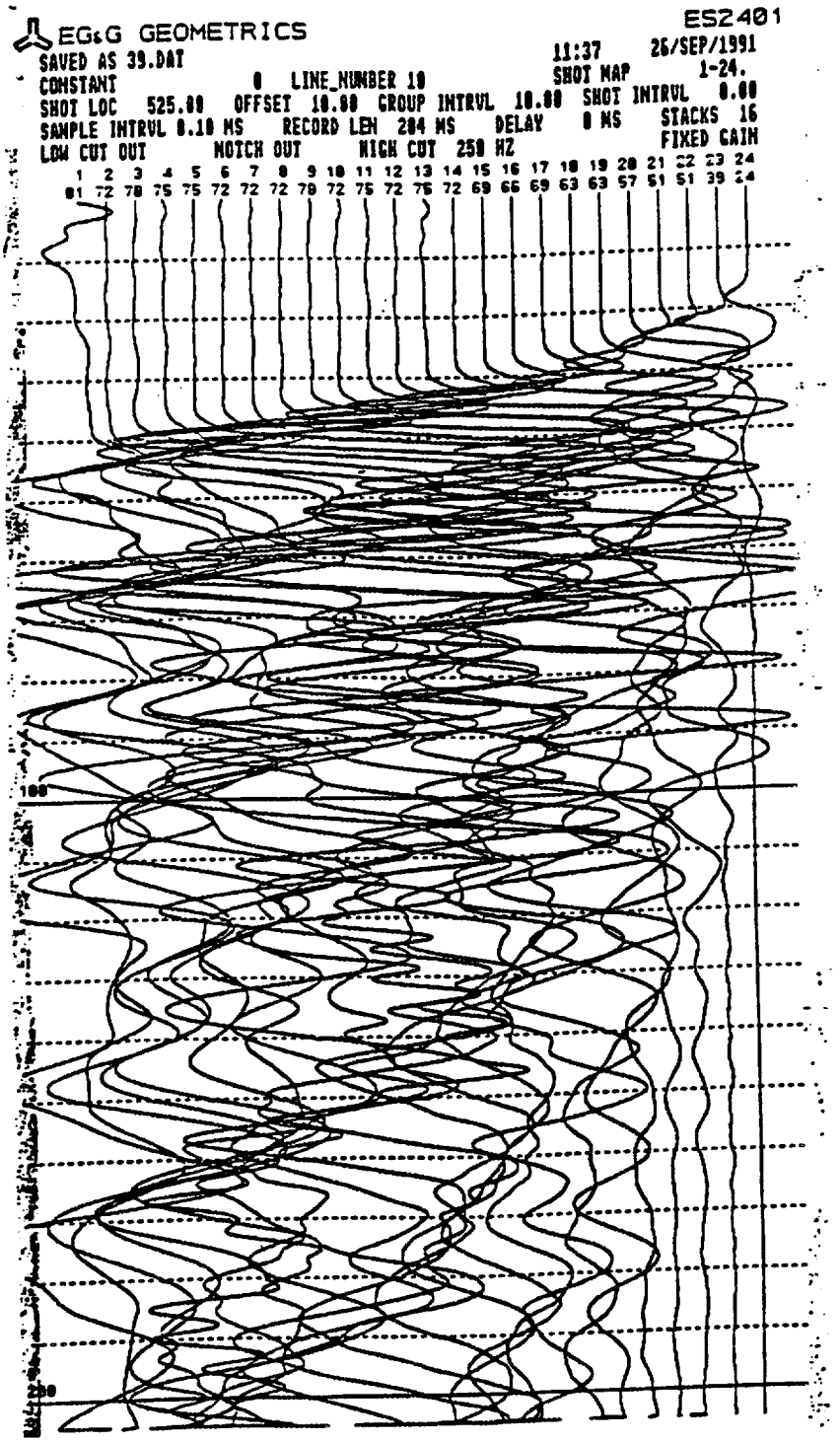

EG&G GEOMETRICS
ES2401
SAVED AS 33.DAT
09:02 26/SEP/1991
CONSTANT 0 LINE_NUMBER 9
SHOT MAP .1-24
SHOT LOC 125.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
27 45 54 60 60 60 69 75 78 75 75 75 78 81 84 84 84 81 84 81 84 84 87 87
100
200

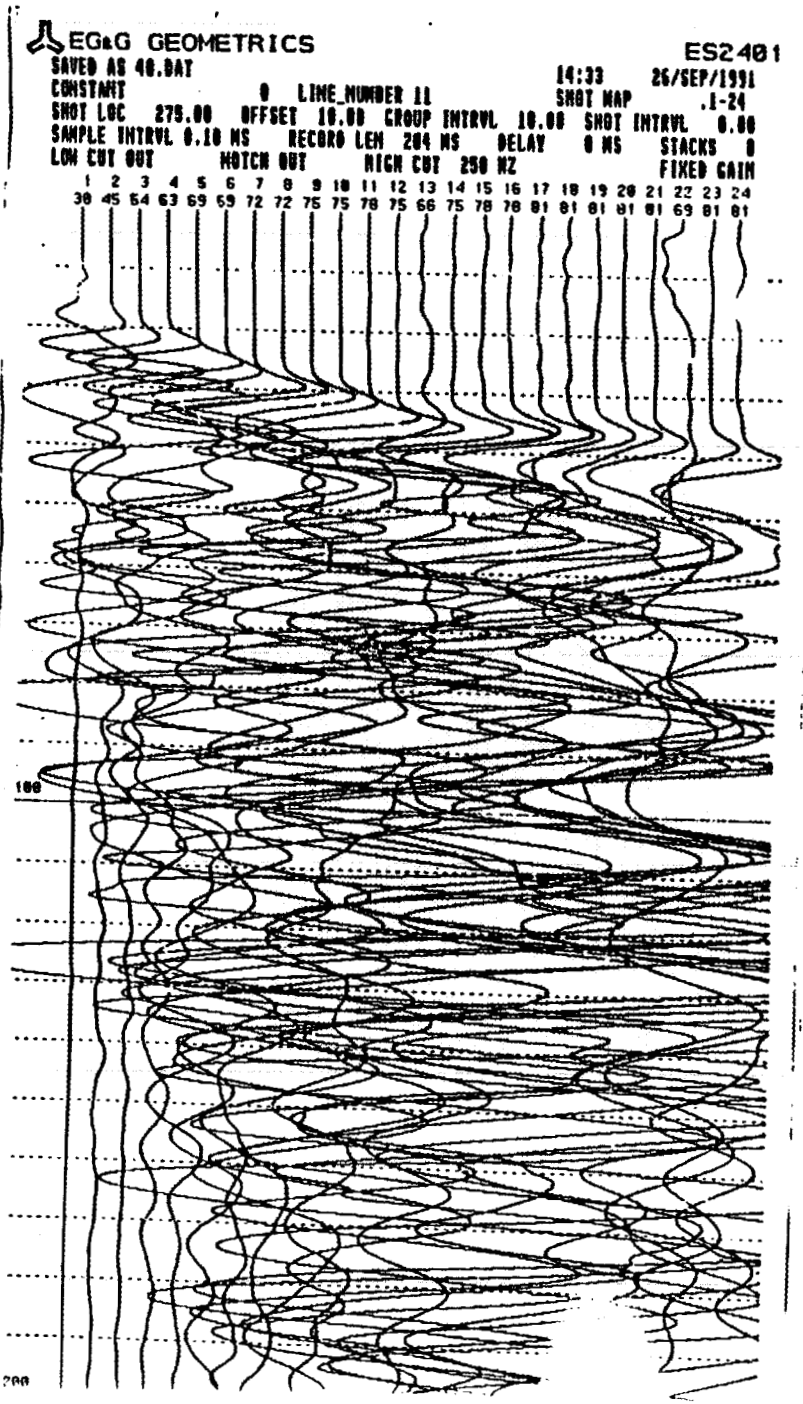

EG&G GEOMETRICS
ES2401
SAVED AS 34.DAT
09:17 26/SEP/1991
CONSTANT 0 LINE_NUMBER 9 SHOT MAP 1-12,13-24
SHOT LOC 250.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
69 75 72 69 66 60 67 51 48 42 33 09 06 27 48 57 54 63 69 72 70 75 81 81
100
200

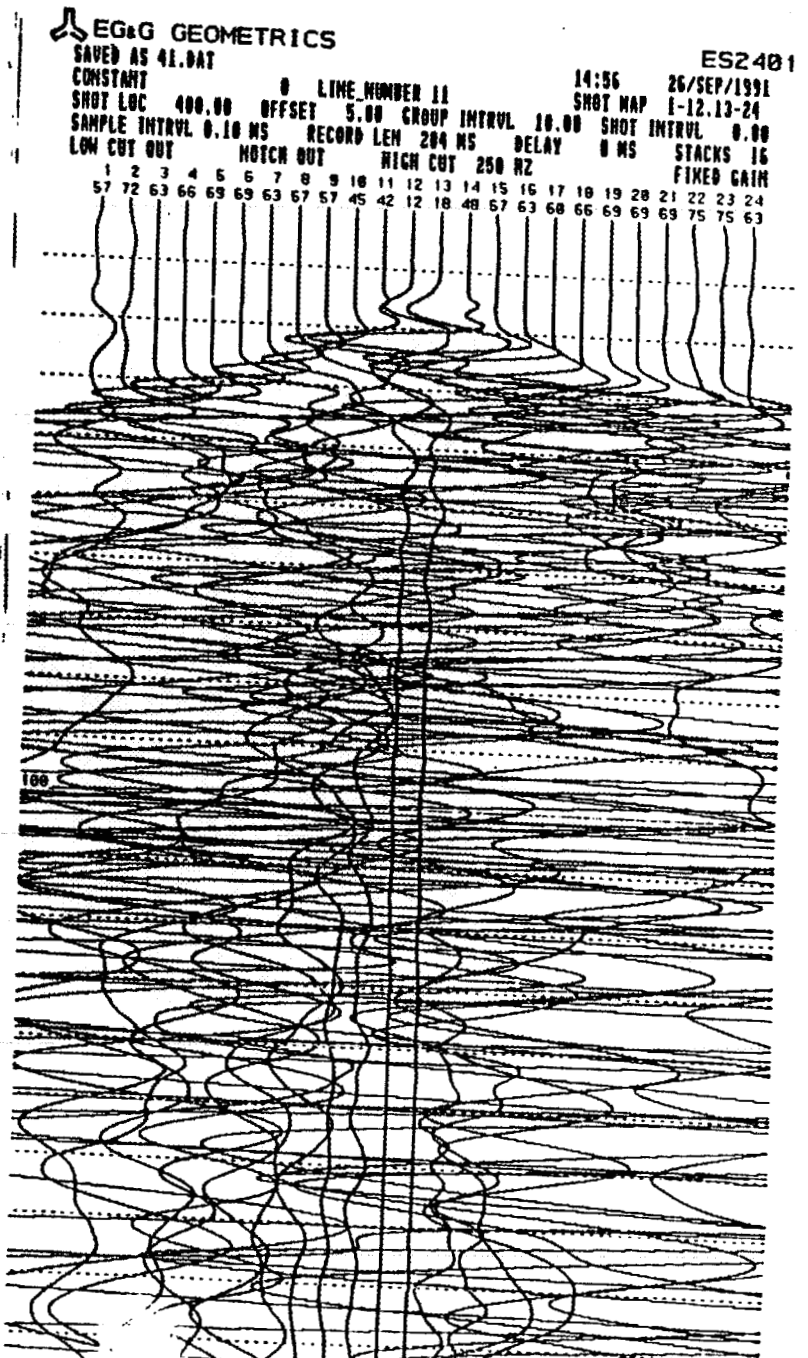

EG&G GEOMETRICS
ES2401
SAVED AS 35.DAT
09:20 26/SEP/1991
CONSTANT 0 LINE_NUMBER 9 SHOT MAP 1-24.
SHOT LOC 375.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 87 87 81 84 81 81 84 84 84 84 78 72 75 72 69 69 60 63 54 45 48 36 21
100
200

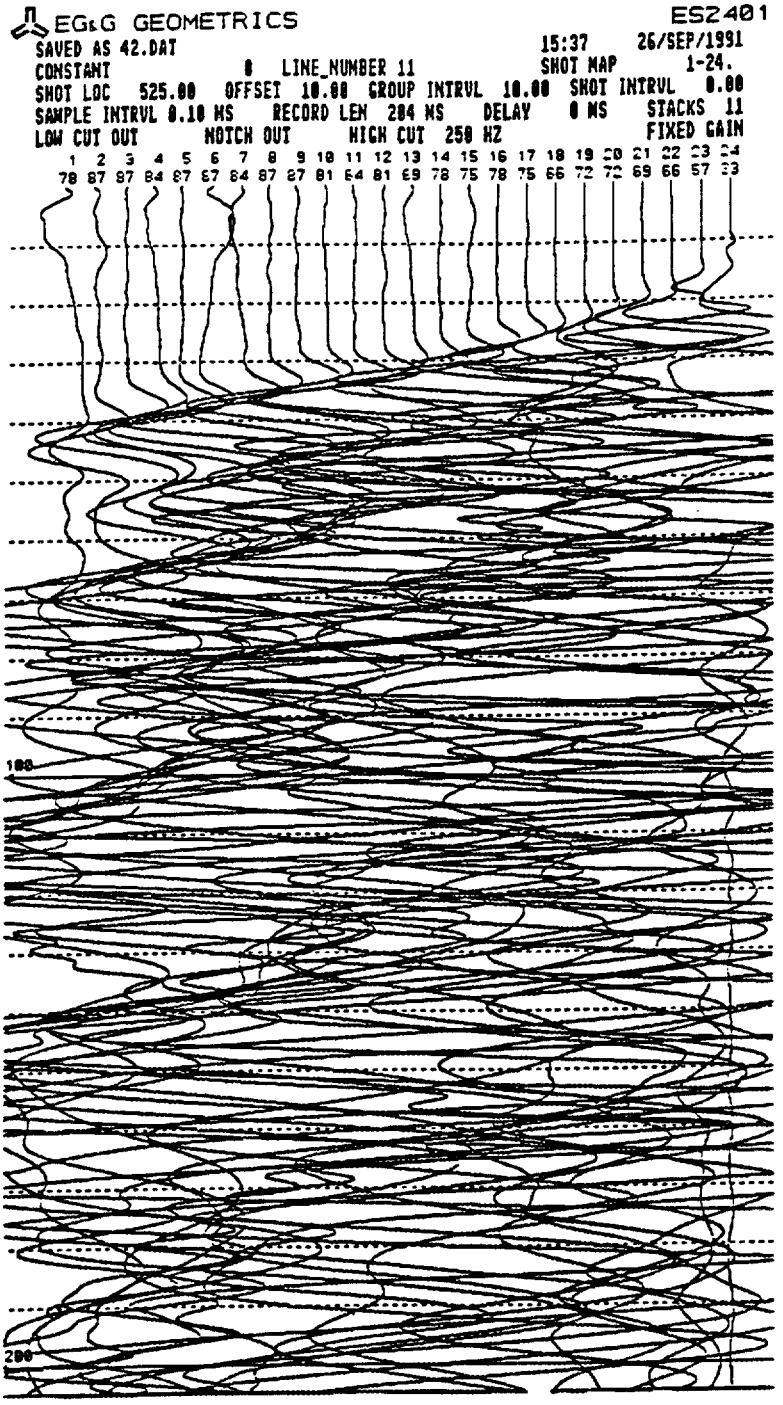

EG&G GEOMETRICS
ES2401
SAVED AS 37.DAT
CONSTANT 0 LINE NUMBER 10
10:59 26/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
42 54 68 72 69 66 69 75 63 63 66 66 66 72 72 75 75 75 72 75 75 72 75 81
100
200

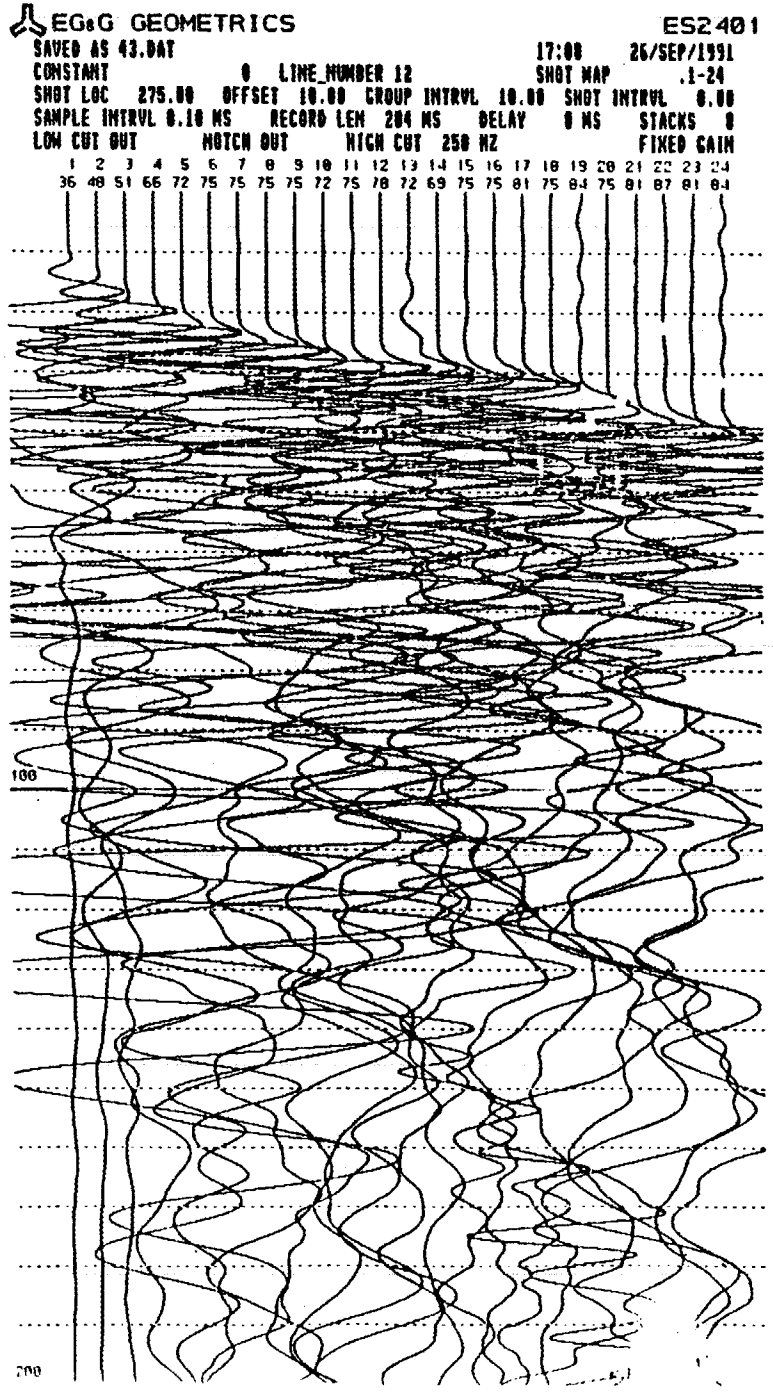

EG&G GEOMETRICS
ES2401
SAVED AS 38.DAT
CONSTANT 0 LINE NUMBER 10
11:07 26/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
69 66 69 63 60 51 54 51 54 51 39 09 15 51 54 57 54 60 54 60 63 66 66 75
100

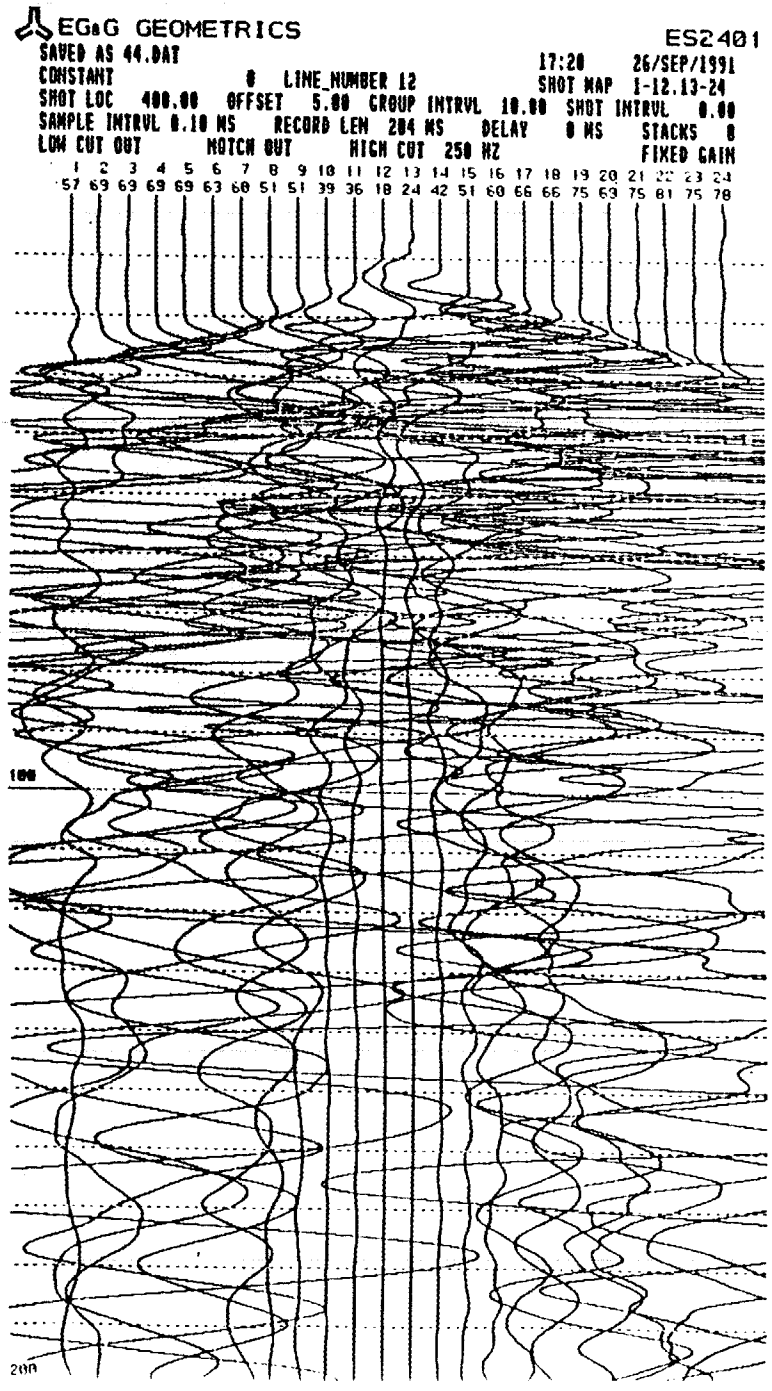

EG&G GEOMETRICS
ES2401
SAVED AS 39.DAT
11:37
26/SEP/1991
CONSTANT
0 LINE_NUMBER 10
SHOT MAP
1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS
STACKS 16
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 72 78 75 75 72 72 72 78 72 75 72 75 72 69 66 69 63 63 57 51 51 39 24
100
200

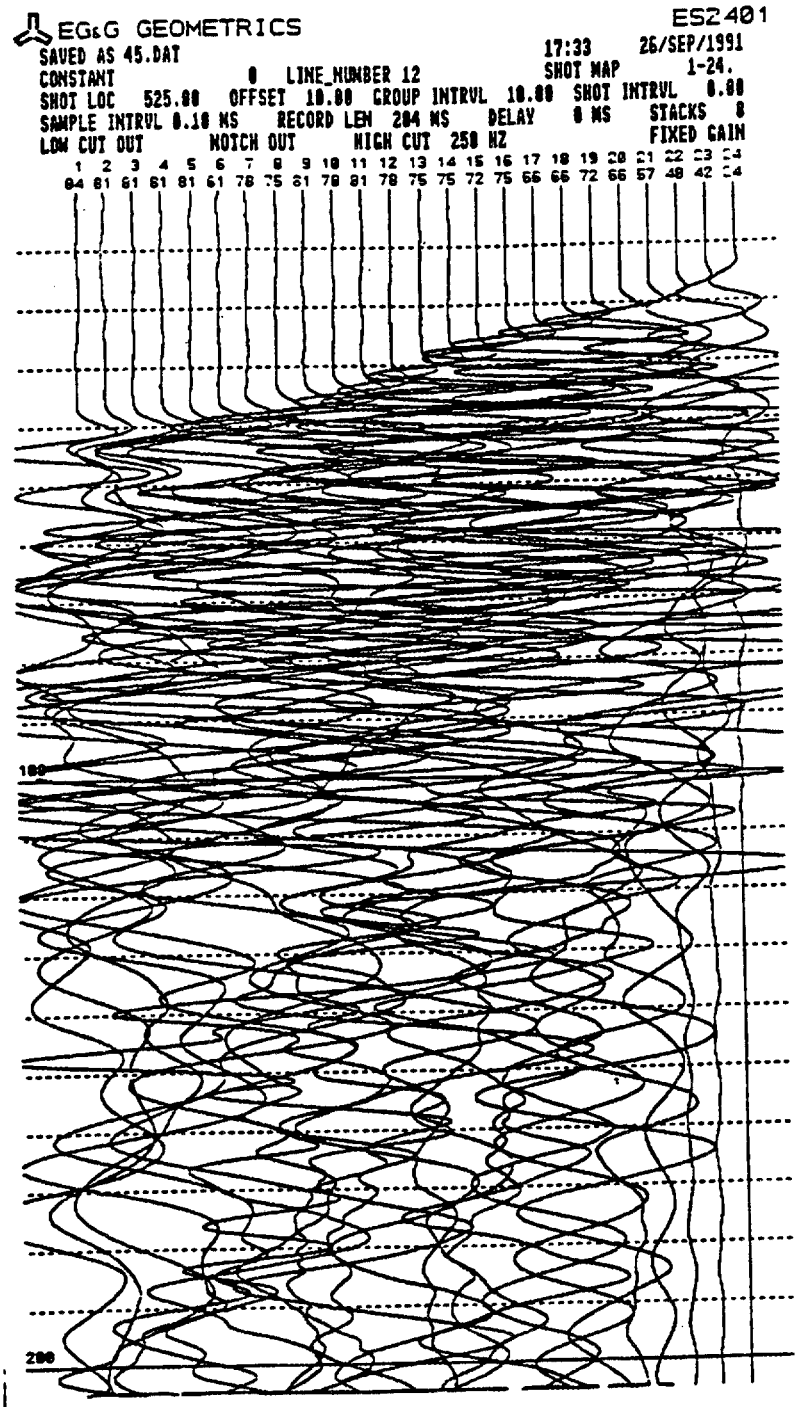

EG&G GEOMETRICS
ES2401
SAVED AS 40.DAT
CONSTANT 0 LINE_NUMBER 11
14:33 26/SEP/1991
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
30 45 64 63 69 69 72 72 75 75 78 75 66 75 78 78 81 81 81 81 81 69 81 81
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 41.DAT
CONSTANT 0 LINE_NUMBER 11
14:56 26/SEP/1991
SHOT MAP 1-12.13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
57 72 63 66 69 69 63 67 57 45 42 12 18 48 67 63 68 66 69 69 69 75 75 63
100


EG&G GEOMETRICS
ES2401
SAVED AS 42.DAT
15:37 26/SEP/1991
CONSTANT 0 LINE_NUMBER 11
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 11
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 87 87 84 87 87 84 87 87 81 64 81 69 78 75 78 75 66 72 72 69 66 57 33
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 43.DAT
17:00 26/SEP/1991
CONSTANT 0 LINE_NUMBER 12 SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
36 48 51 66 72 75 75 75 75 72 75 78 72 69 75 75 81 75 84 75 81 87 81 84
100
200

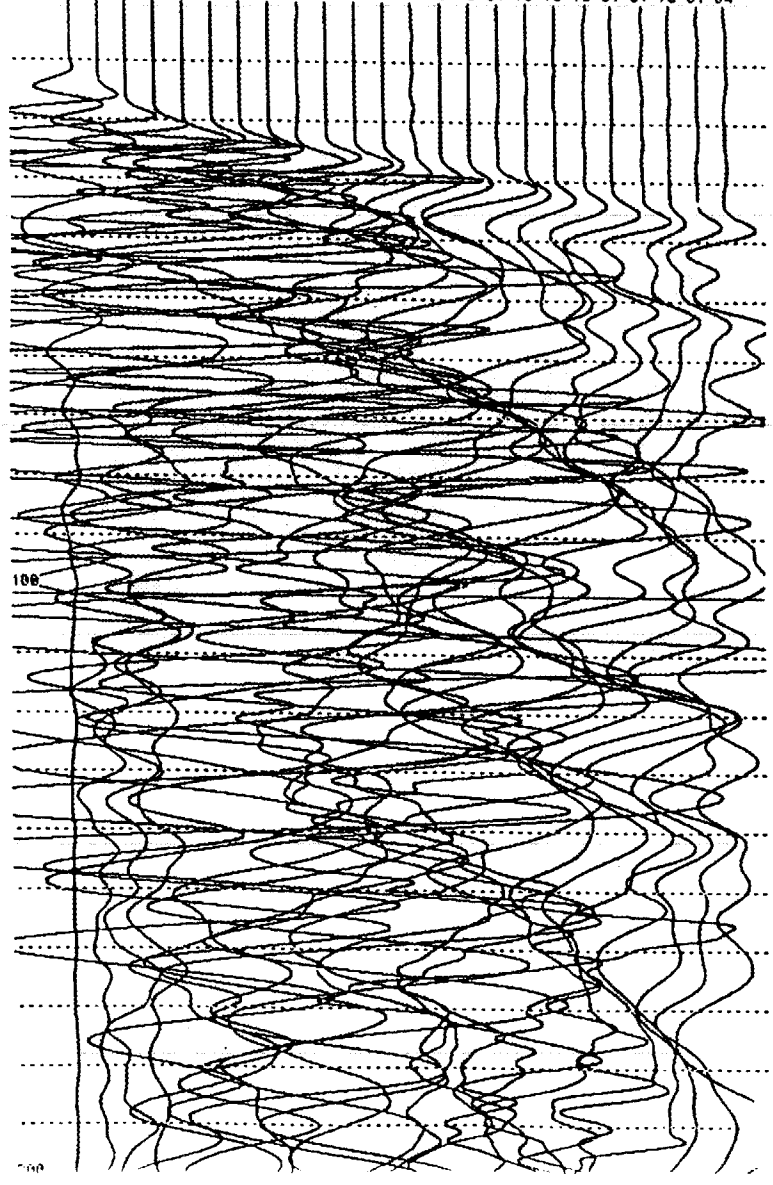

EG&G GEOMETRICS
ES2401
SAVED AS 44.DAT
17:20 26/SEP/1991
CONSTANT 0 LINE_NUMBER 12 SHOT MAP 1-12.13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
57 69 69 69 69 63 60 51 51 39 36 18 24 42 51 60 66 66 75 69 75 81 75 78
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 45.DAT
17:33
26/SEP/1991
CONSTANT 0 LINE_NUMBER 12
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 81 61 61 81 61 78 75 81 78 81 78 75 75 72 75 66 66 72 66 57 48 42 24
100
200

EG&G GEOMETRICS ES2401

SAVED AS 46.DAT 08:49 27/SEP/1991
CONSTANT 0 LINE NUMBER 13 SHOT MAP .1-24
SHOT LOC 265.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN

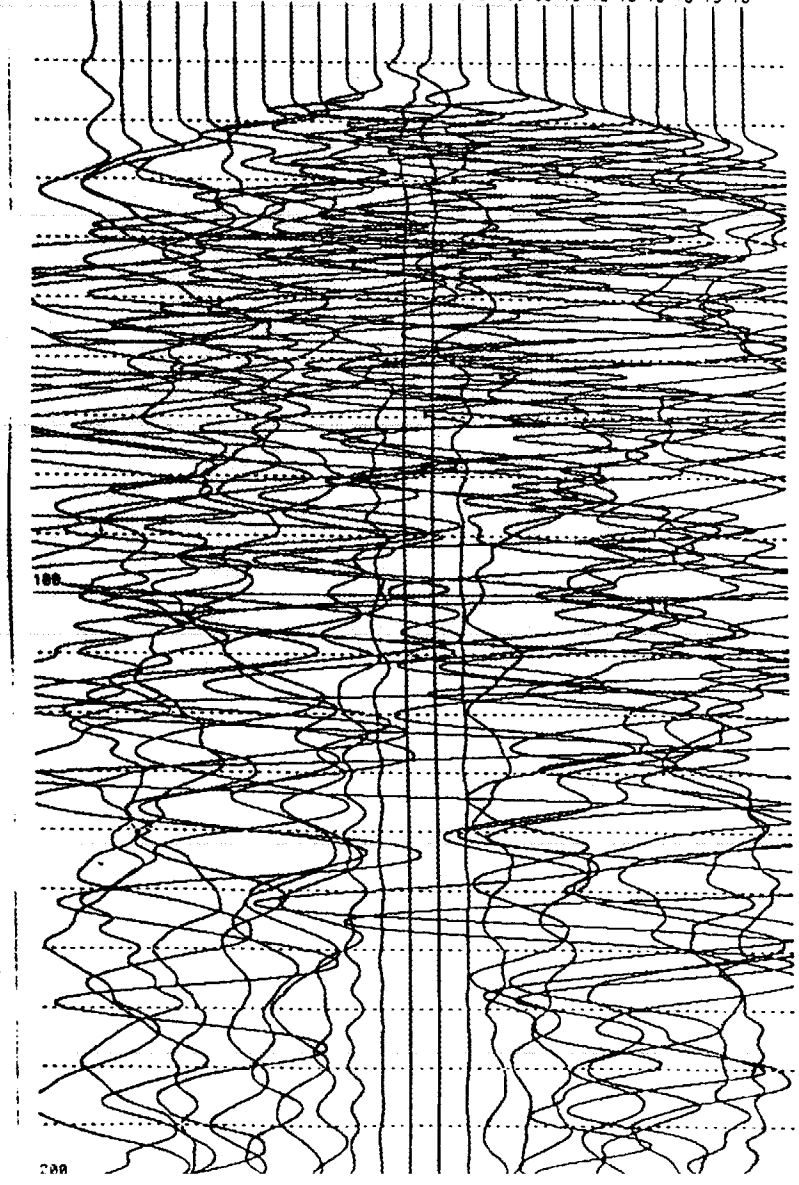
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
30	54	60	57	63	66	66	66	69	69	72	72	72	72	75	81	78	78	78	81	81	78	81	84

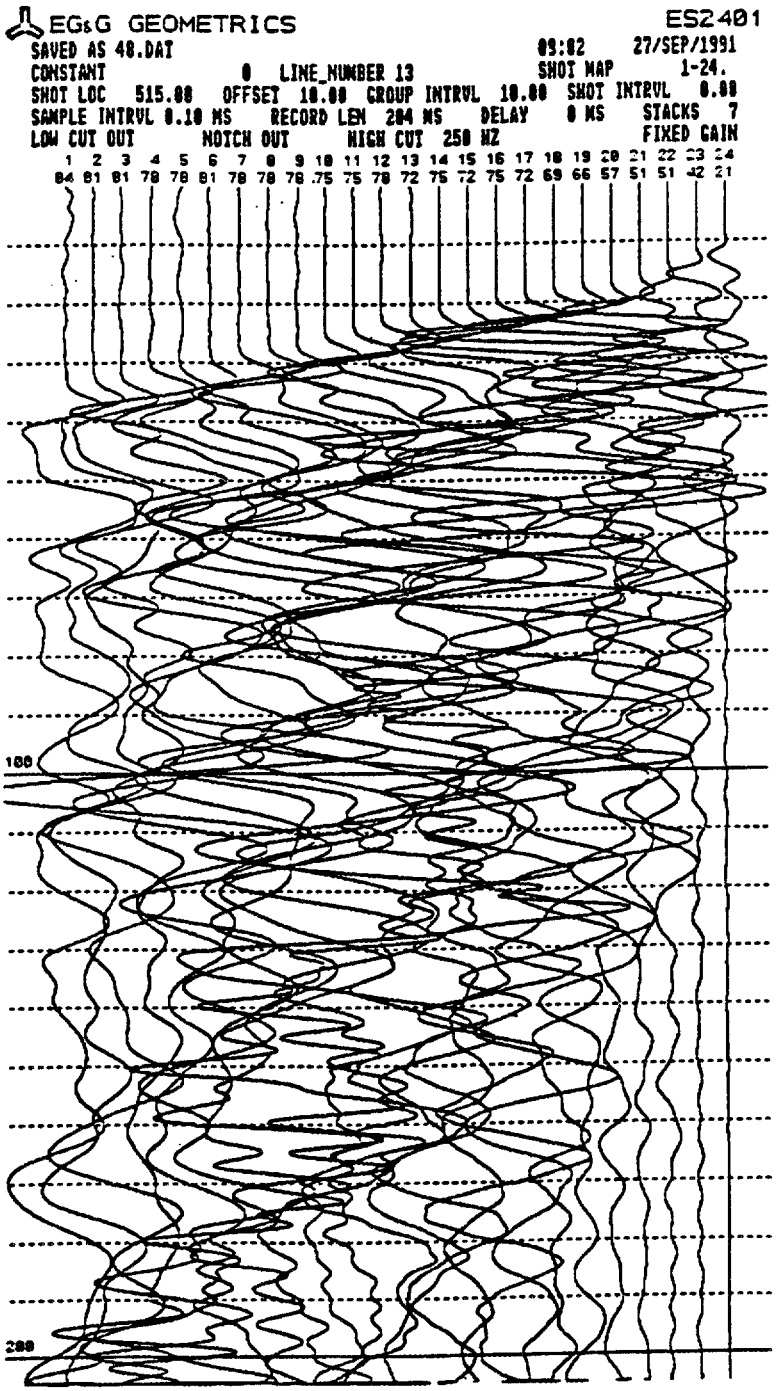


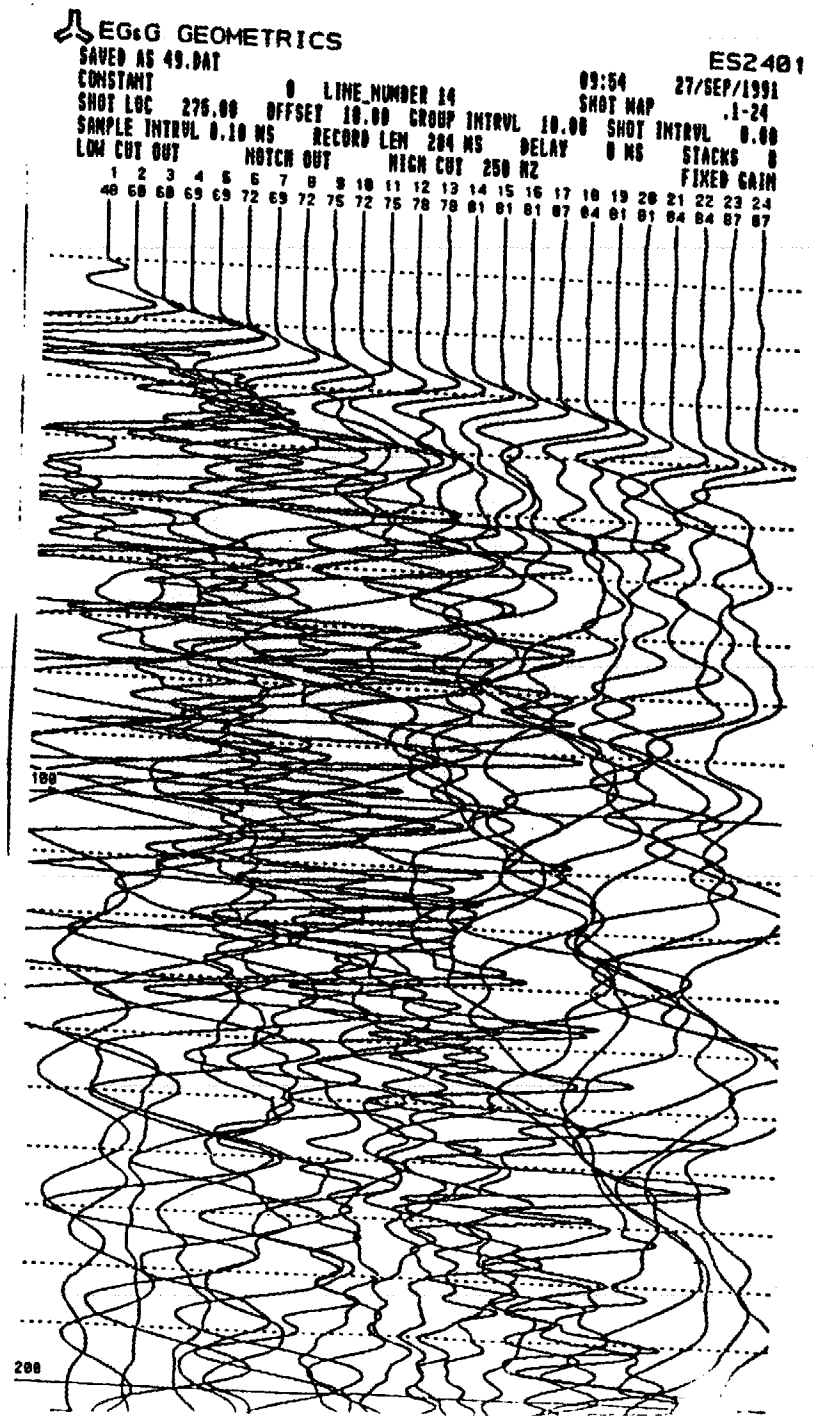
EG&G GEOMETRICS ES2401

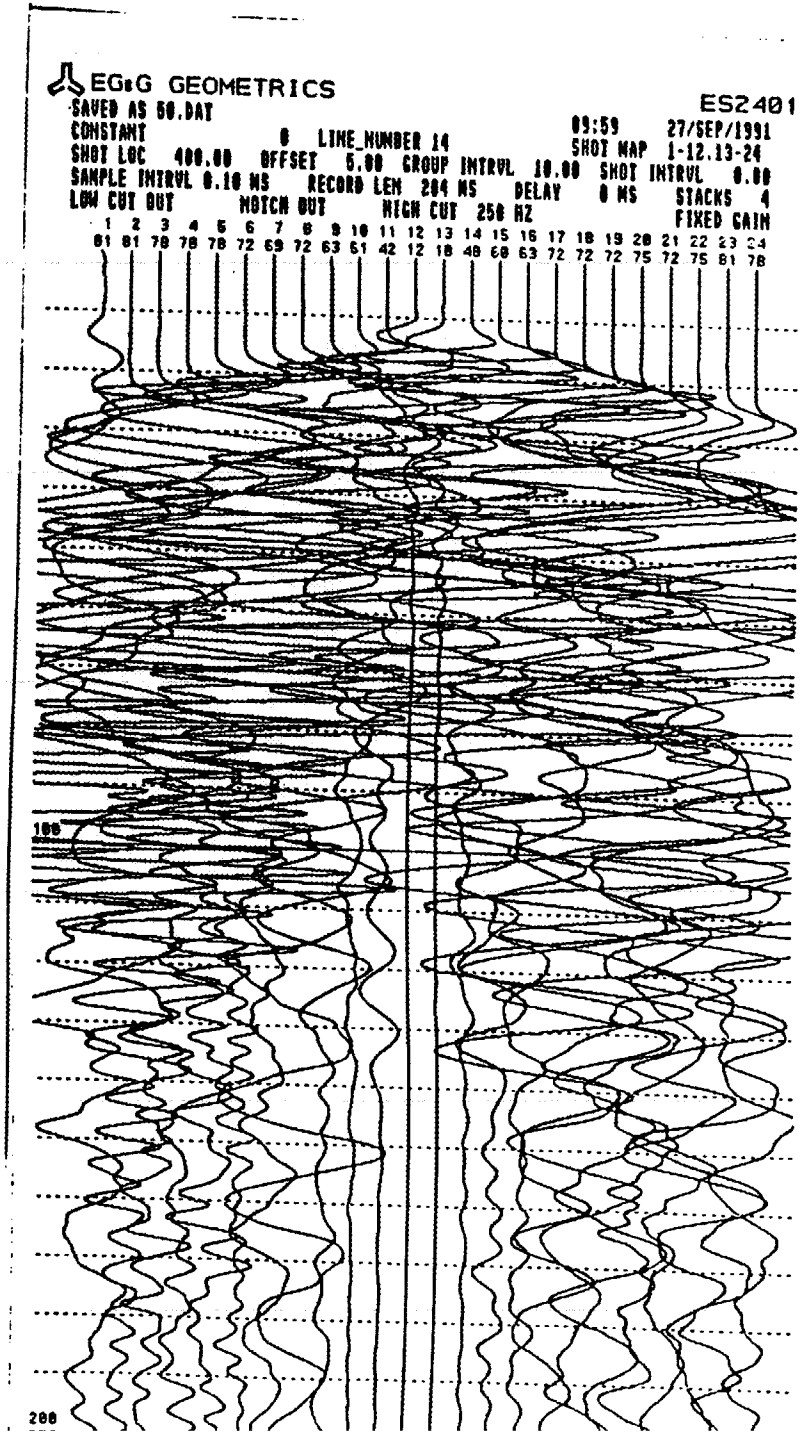
SAVED AS 47.DAT 08:55 27/SEP/1991
CONSTANT 0 LINE NUMBER 13 SHOT MAP 1-12.13-24
SHOT LOC 390.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN

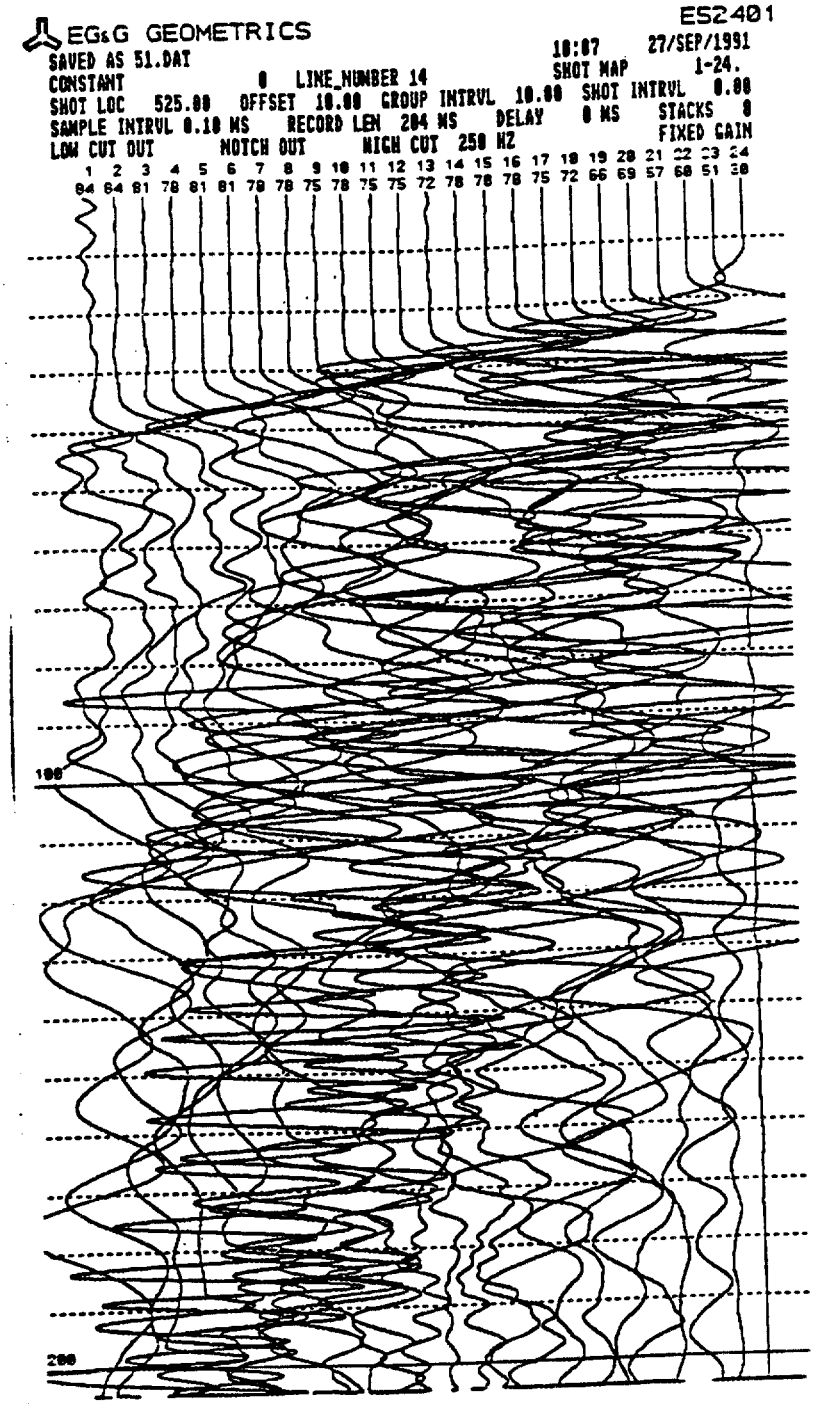
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
78	75	78	69	72	68	66	63	57	54	42	09	06	33	57	63	69	75	75	78	75	78	75	78

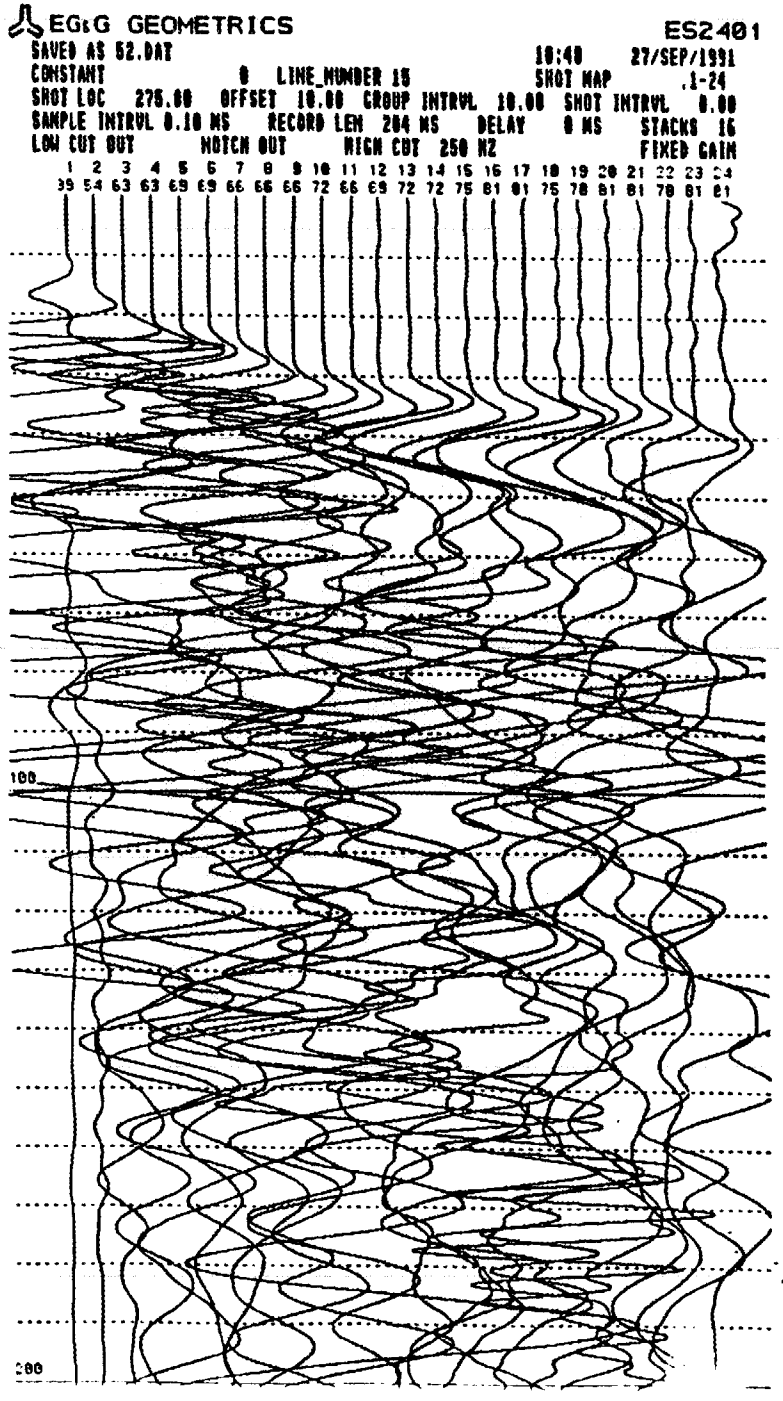


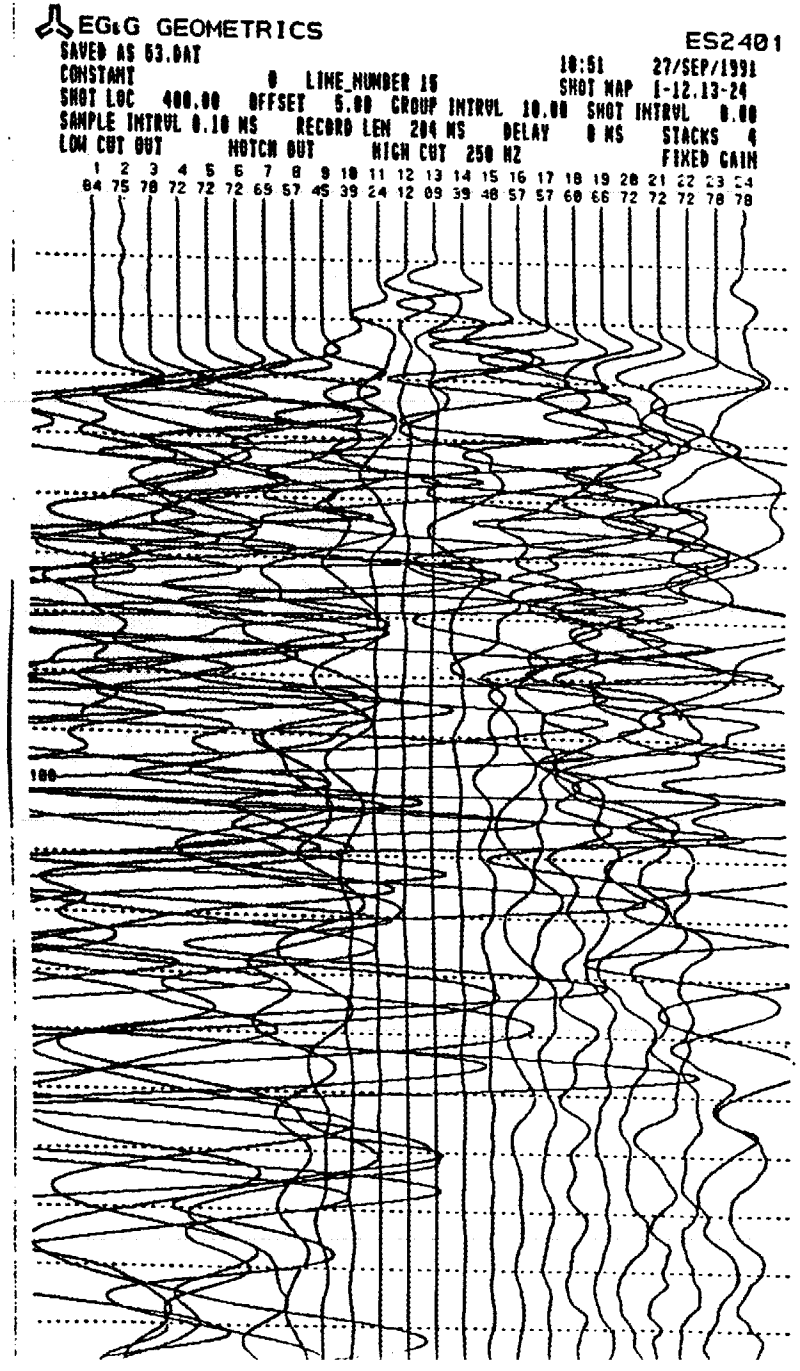

EG&G GEOMETRICS
ES2401
SAVED AS 48.DAT
09:02 27/SEP/1991
CONSTANT 0 LINE_NUMBER 13
SHOT MAP 1-24.
SHOT LOC 515.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 7
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 81 81 78 78 81 78 78 78 75 75 78 72 75 72 75 72 69 66 57 51 51 42 21
100
200

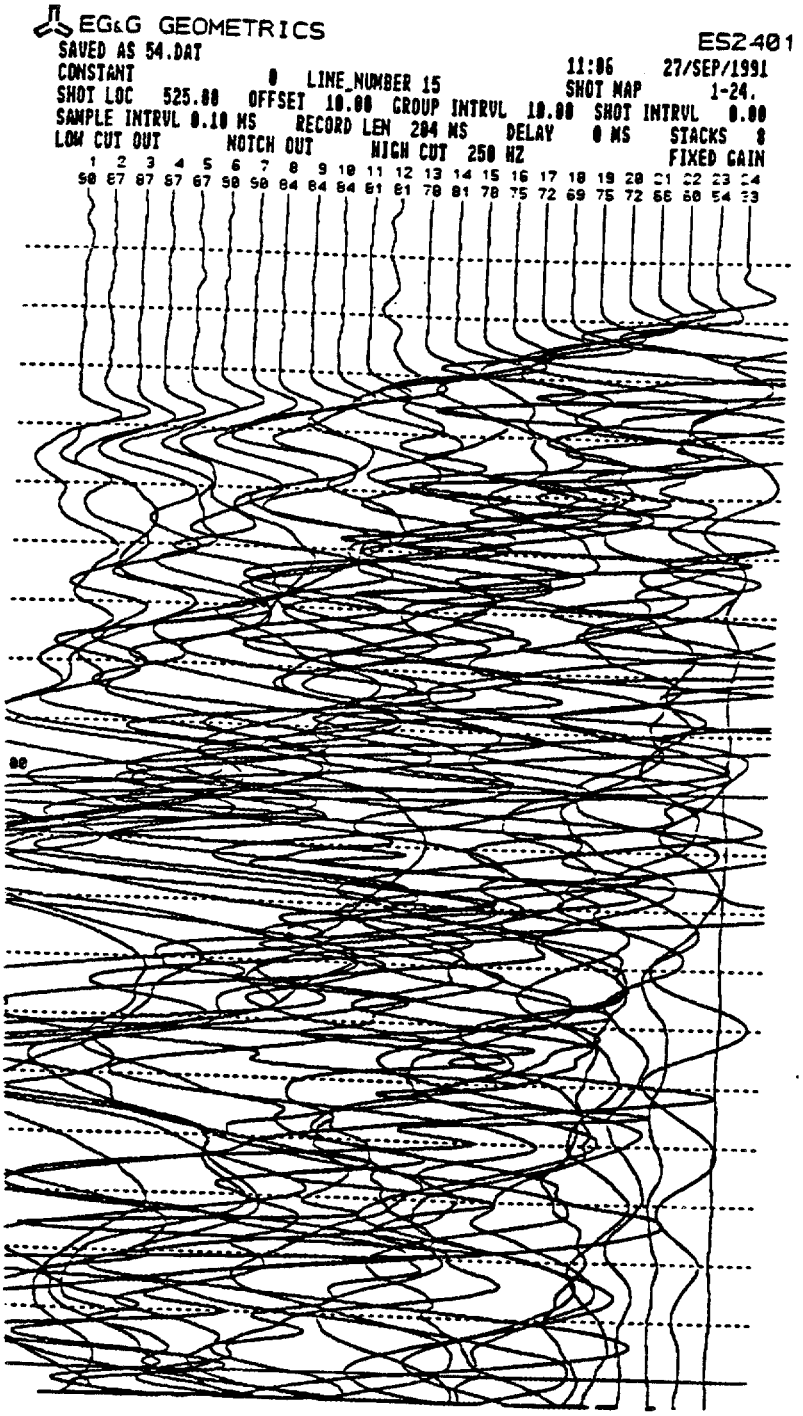

EG&G GEOMETRICS
SAVED AS 49.DAT
ES2401
CONSTANT 0 LINE_NUMBER 14 09:54 27/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 0
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
48 68 68 69 69 72 69 72 75 72 75 78 78 81 81 81 87 84 81 81 84 84 87 87
100
200

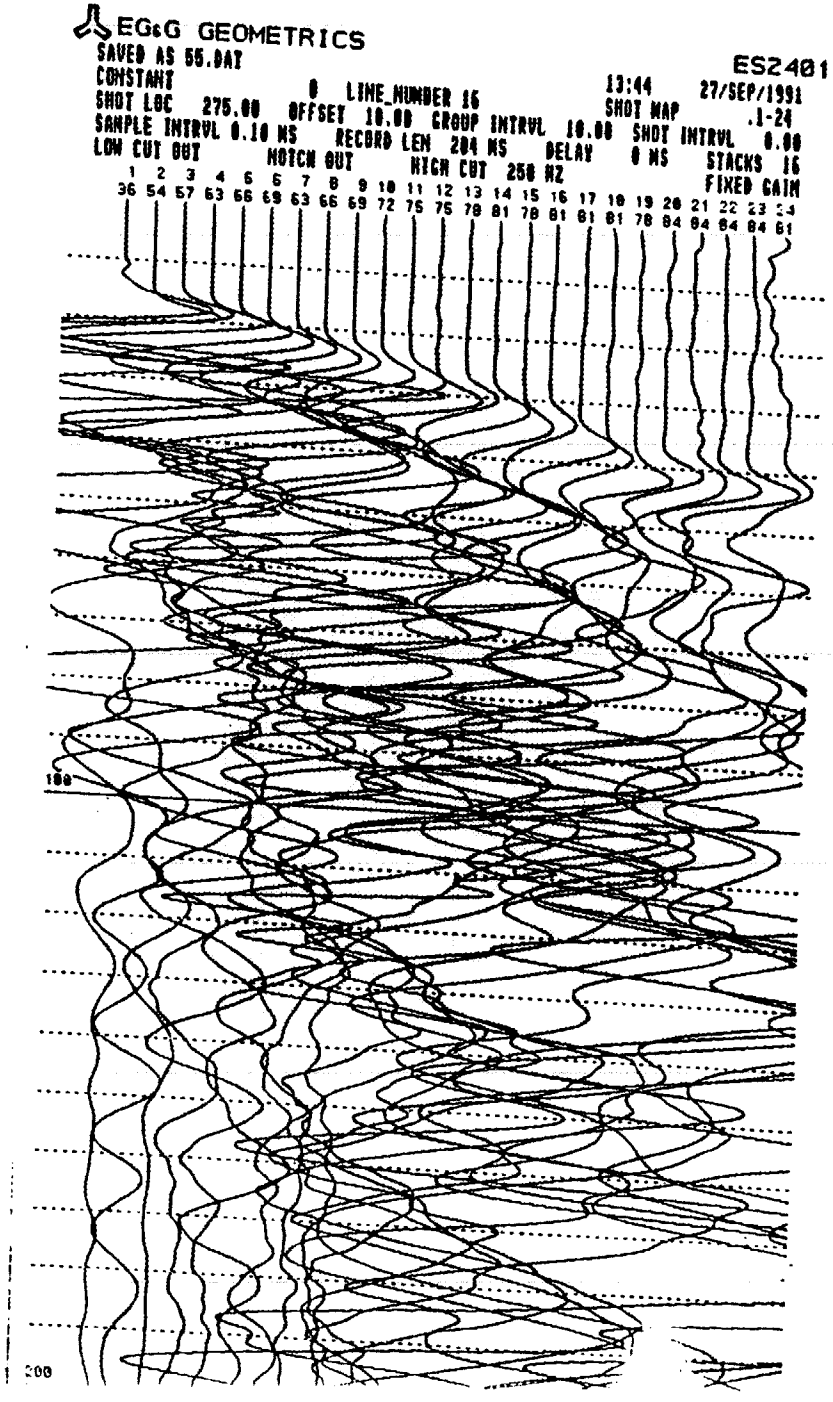

EG&G GEOMETRICS
SAVED AS 50.DAT
ES2401
CONSTANT 0 LINE_NUMBER 14 09:59 27/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 81 78 78 78 72 69 72 63 61 42 12 18 48 60 63 72 72 72 75 72 75 81 78
100
200

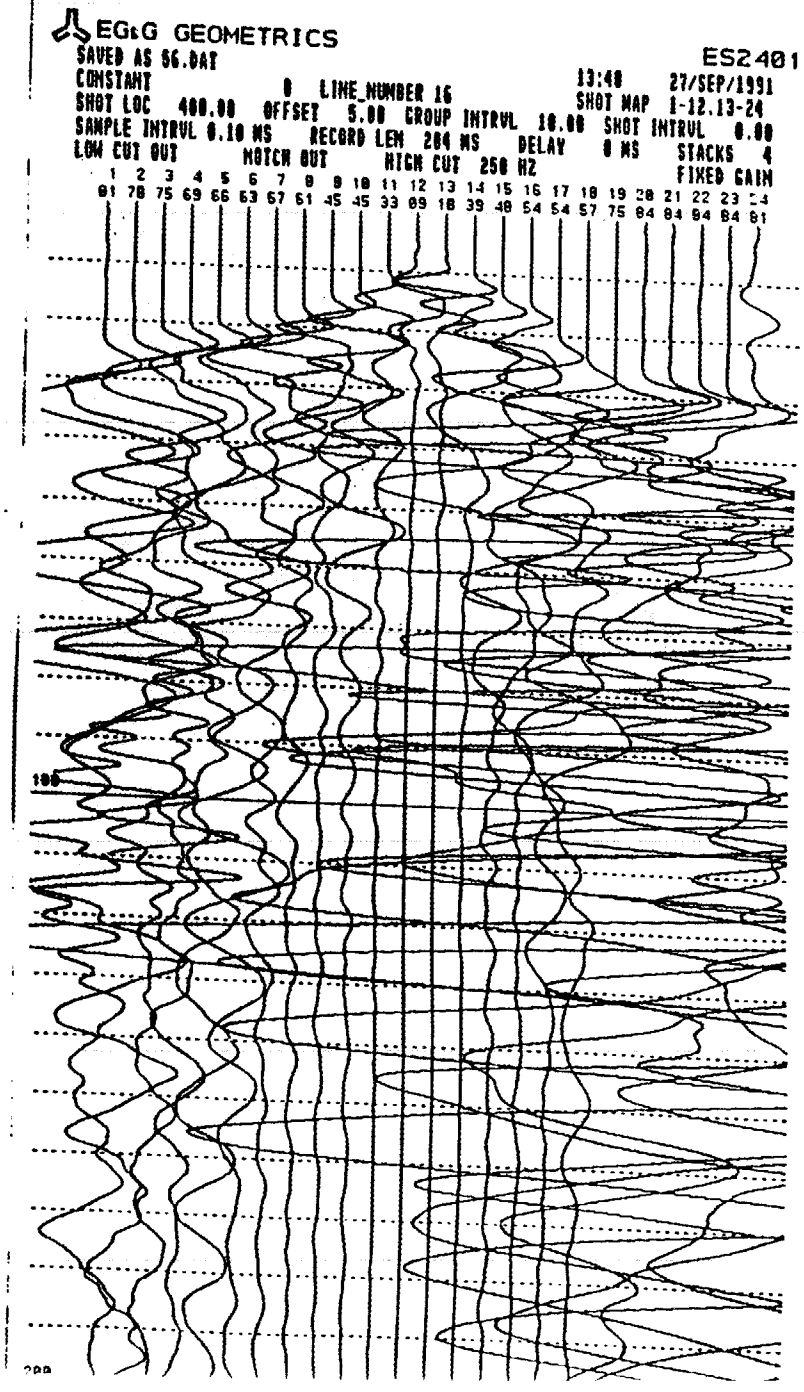

EG&G GEOMETRICS
ES2401
SAVED AS 51.DAT
10:07 27/SEP/1991
SHOT MAP 1-24.
CONSTANT 0 LINE NUMBER 14
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 81 78 81 81 78 78 75 78 75 75 72 78 78 78 75 72 66 69 57 60 51 30
100
200

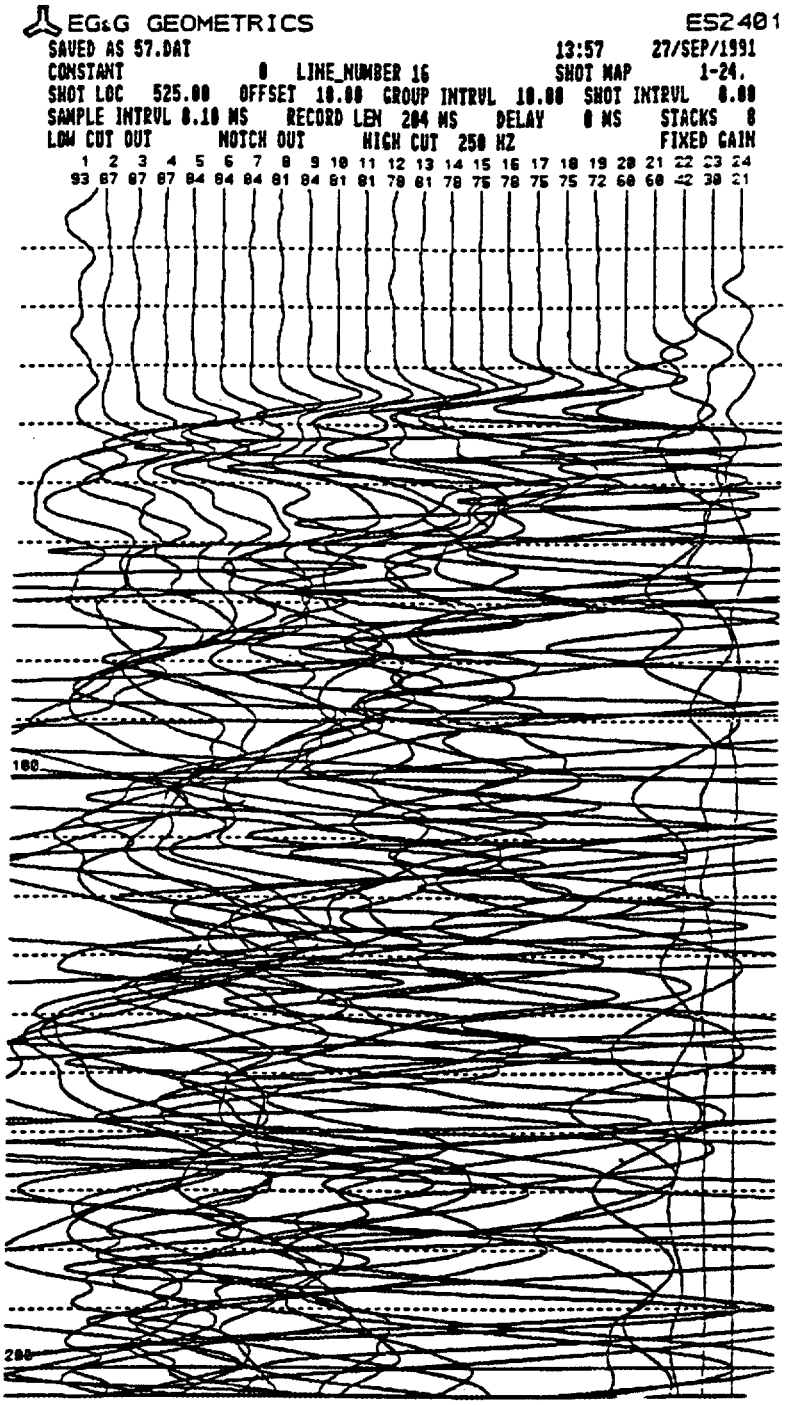

EG&G GEOMETRICS
ES2401
SAVED AS 52.DAT
10:40 27/SEP/1991
CONSTANT 0 LINE NUMBER 15
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
39 54 63 63 69 69 66 66 66 72 66 69 72 72 75 81 81 75 78 81 81 78 81 81
100
200

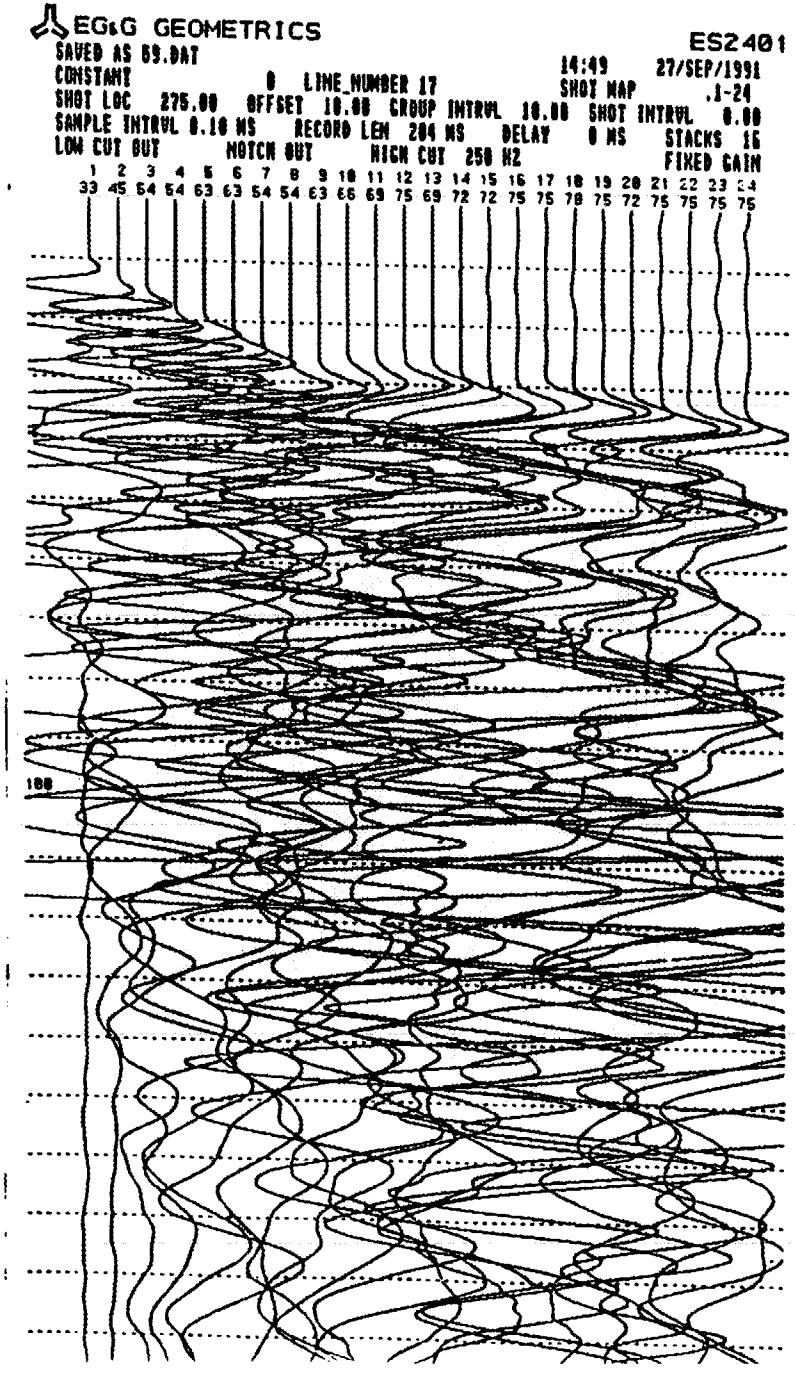

EG&G GEOMETRICS
ES2401
SAVED AS 53.DAT
10:51 27/SEP/1991
CONSTANT 0 LINE NUMBER 15
SHOT MAP 1-12,13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 75 78 72 72 72 65 57 45 39 24 12 09 39 48 57 57 60 66 72 72 72 78 78
100

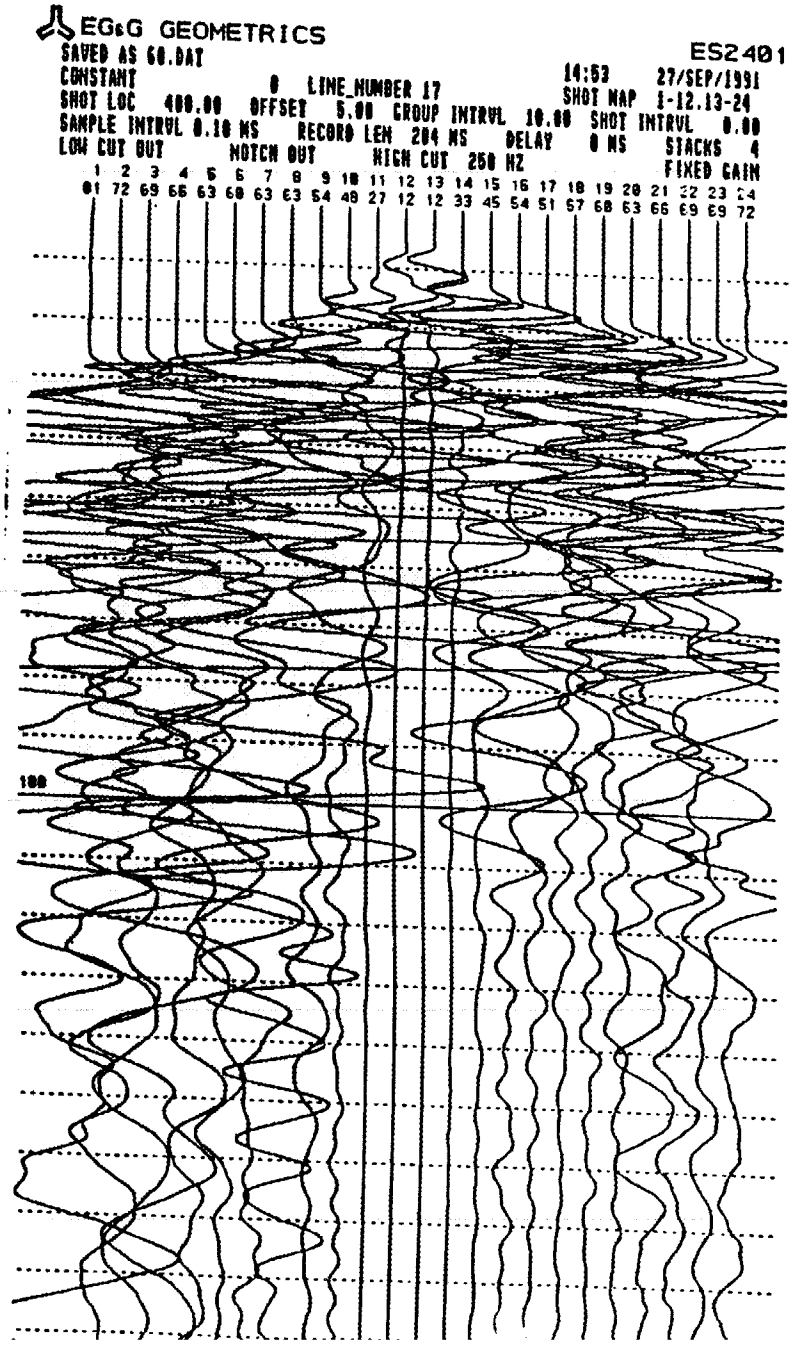

EG&G GEOMETRICS
ES2401
SAVED AS 54.DAT
CONSTANT 0 LINE NUMBER 15
11:06 27/SEP/1991
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 87 87 87 67 90 90 84 84 84 81 81 78 81 78 75 72 69 75 72 66 60 54 33

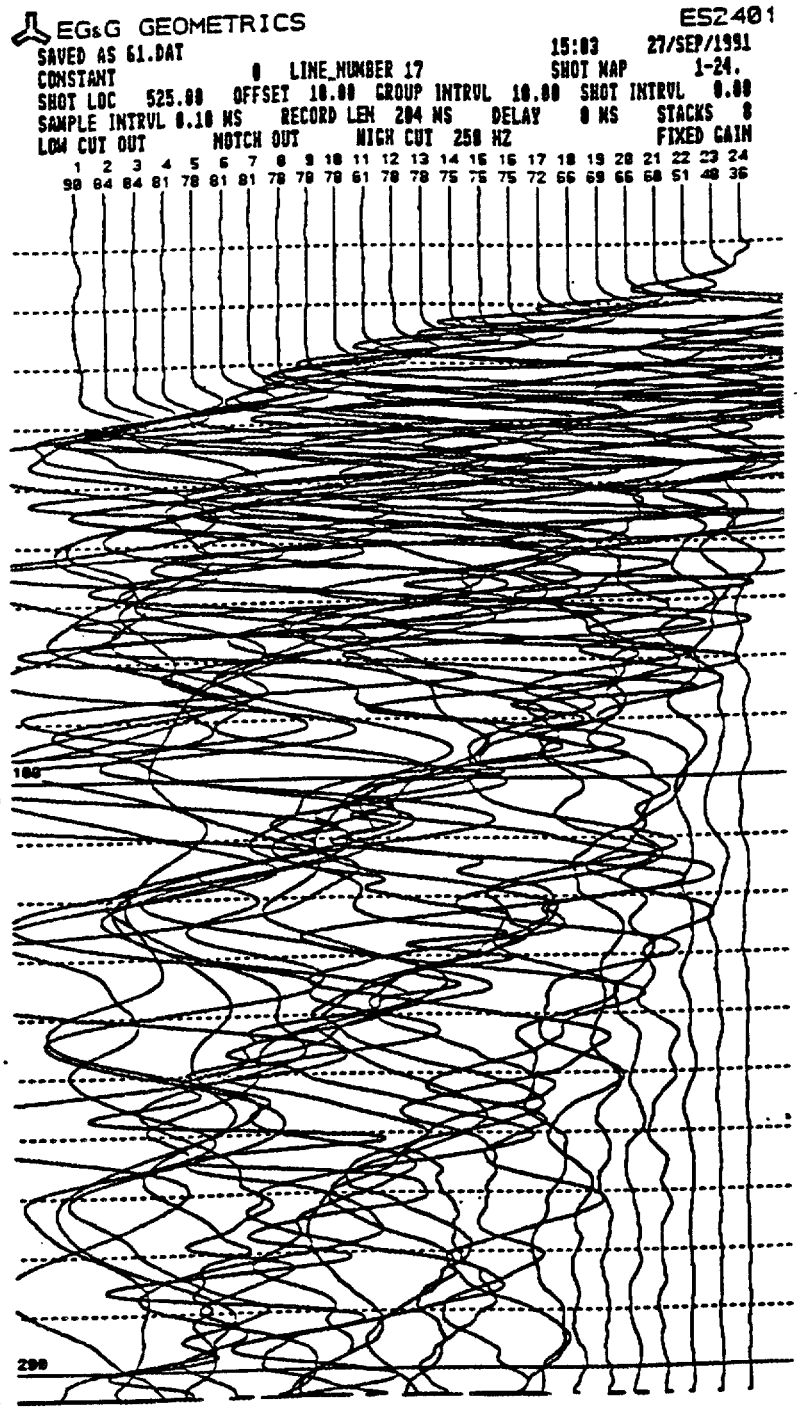

EG&G GEOMETRICS
SAVED AS 55.DAT
ES2401
CONSTANT 0 LINE_NUMBER 16
13:44 27/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 16
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
36 54 57 63 66 69 63 66 69 72 75 75 78 81 78 81 81 81 78 84 84 84 84 81
100
200

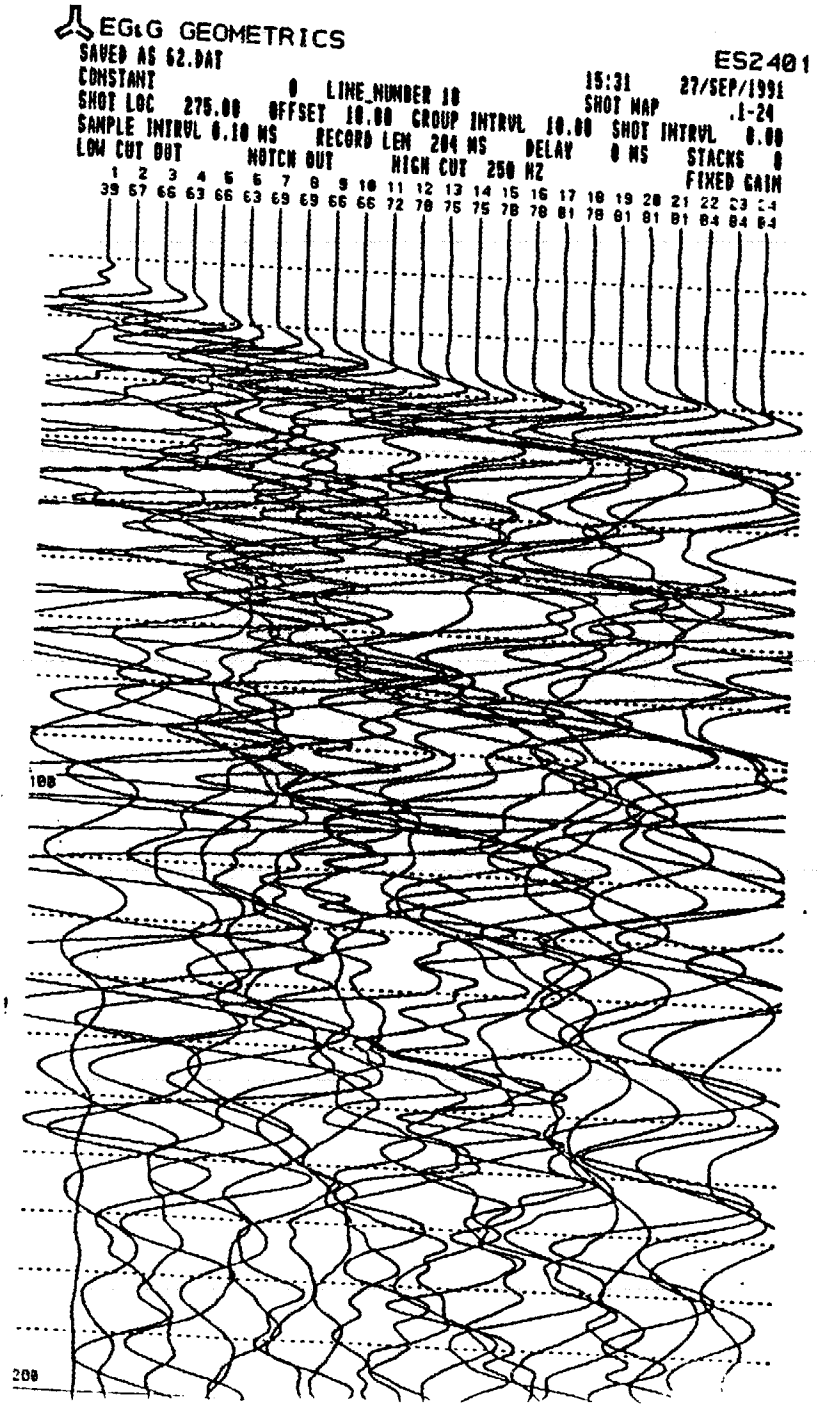

EG&G GEOMETRICS
SAVED AS 56.DAT
ES2401
CONSTANT 0 LINE_NUMBER 16
13:48 27/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 78 75 69 66 63 67 61 45 45 33 09 18 39 48 54 54 57 75 84 84 84 84 81
100
200

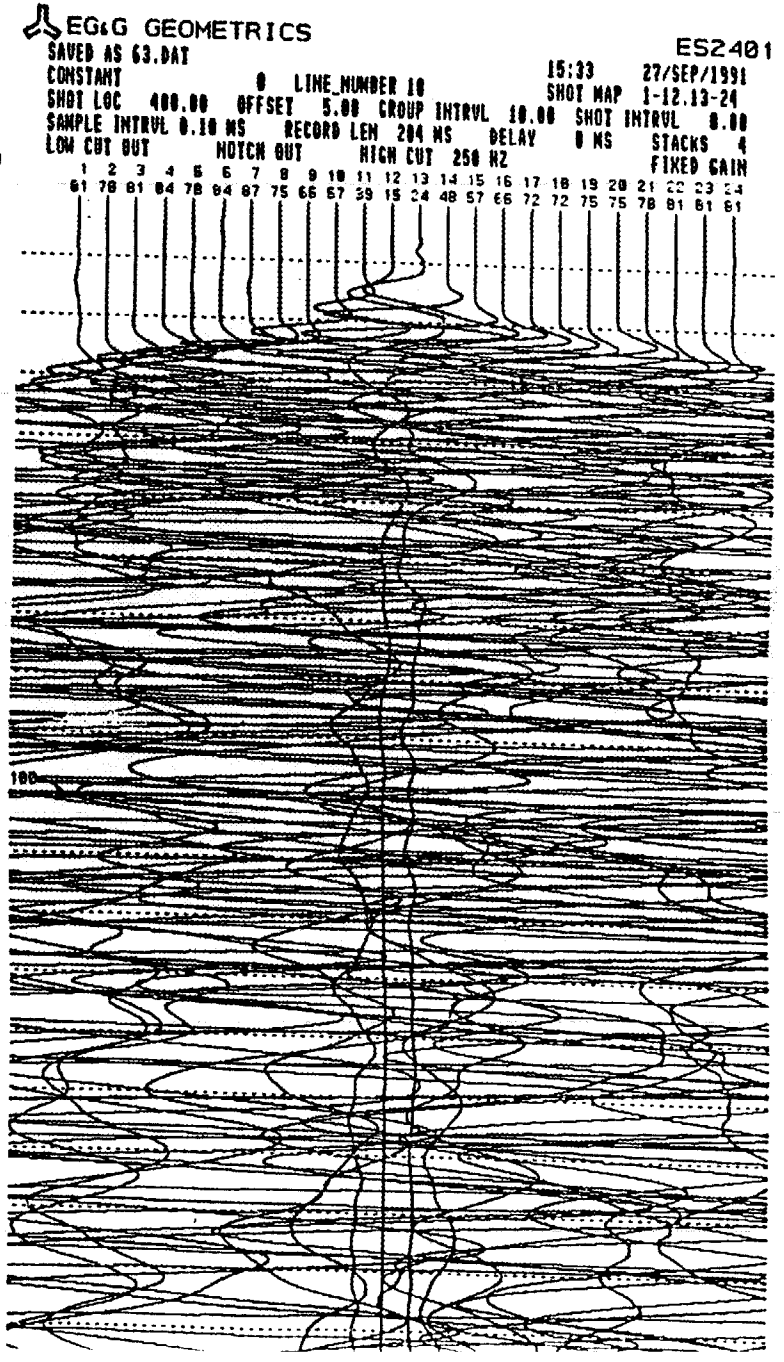

EG&G GEOMETRICS
ES2401
SAVED AS 57.DAT
13:57 27/SEP/1991
CONSTANT 0 LINE_NUMBER 16
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 87 87 87 84 84 84 81 84 81 81 78 81 78 75 78 75 75 72 60 60 42 30 21
100
200

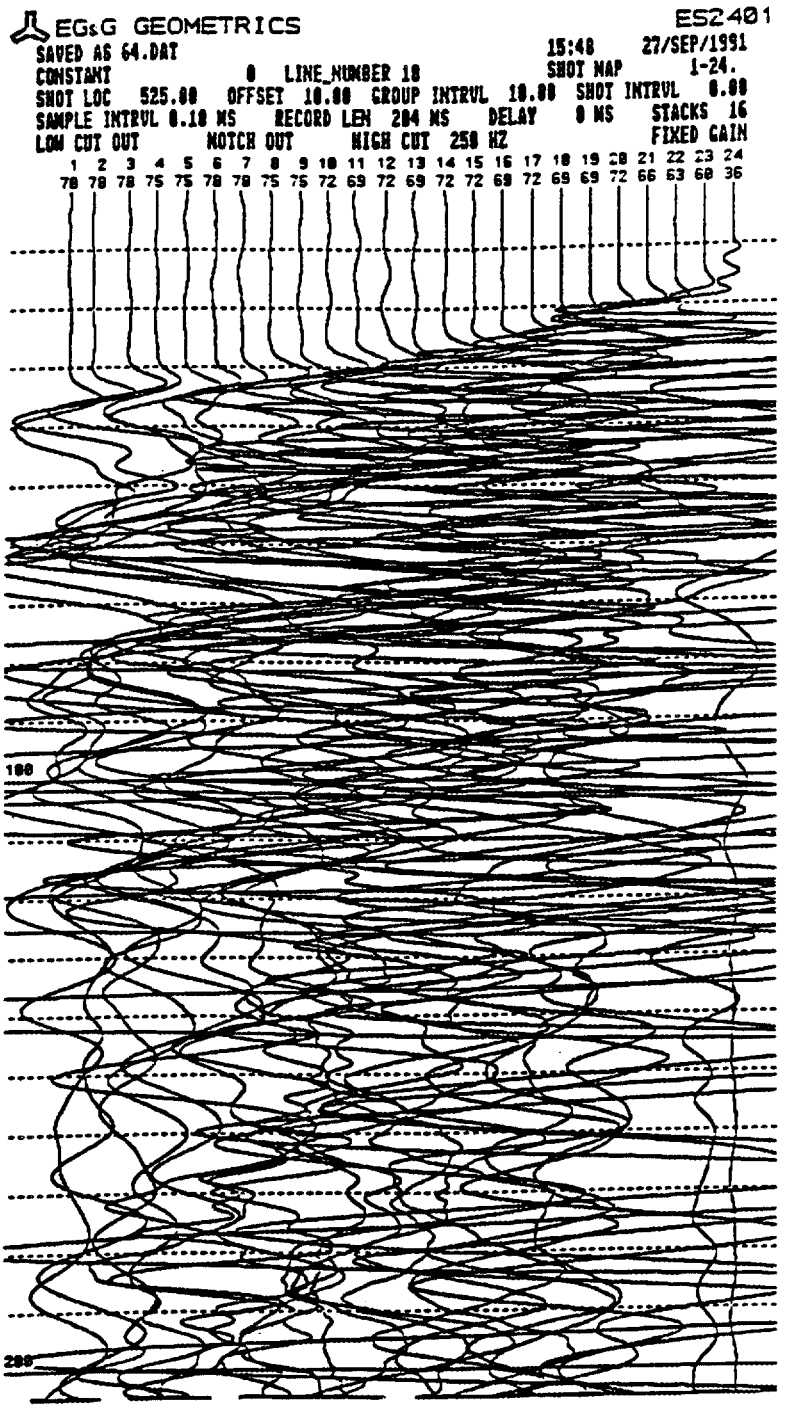

EG&G GEOMETRICS
ES2401
SAVED AS 59.DAT
CONSTANT 0 LINE_NUMBER 17
14:49 27/SEP/1991
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
33 45 54 54 63 63 54 54 63 66 69 75 69 72 72 75 75 78 75 72 75 75 75 75
100

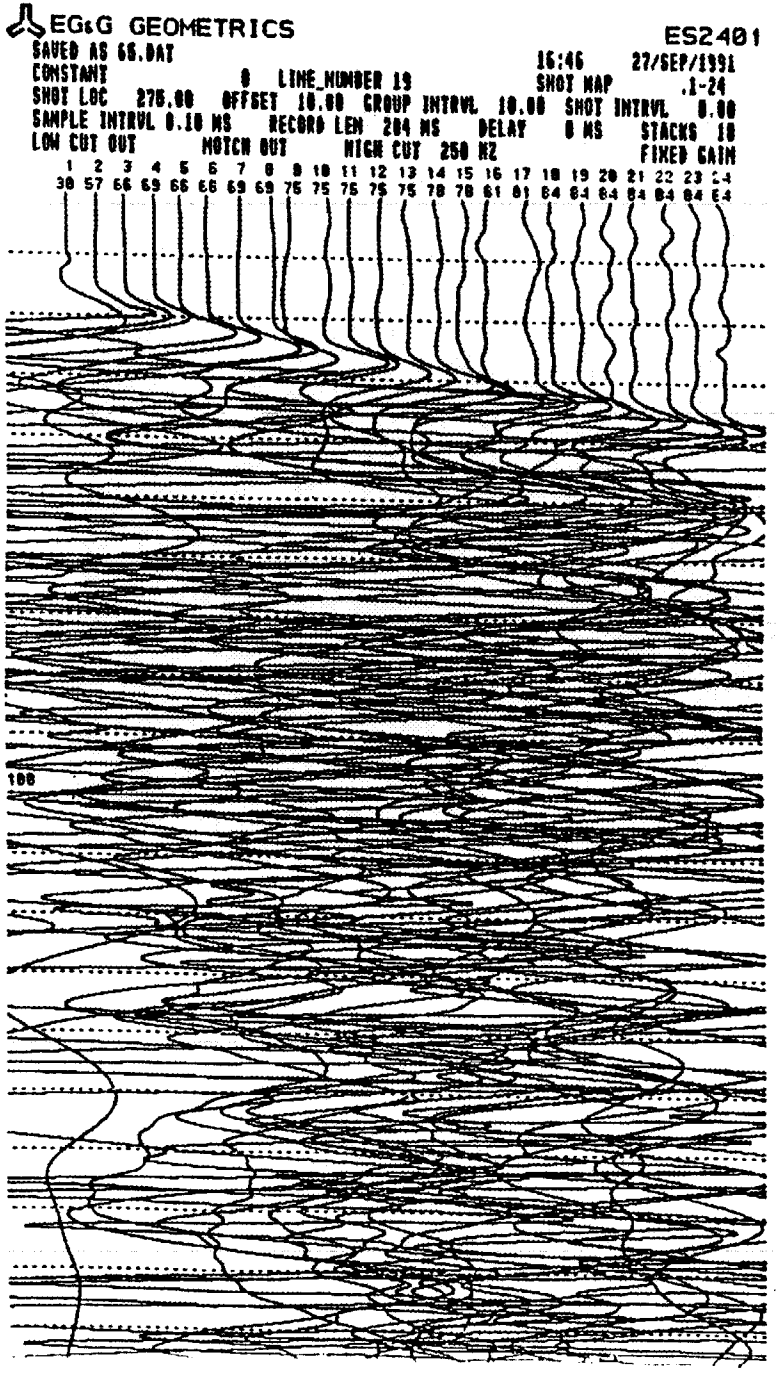

EG&G GEOMETRICS
ES2401
SAVED AS 60.DAT
CONSTANT 0 LINE_NUMBER 17
14:53 27/SEP/1991
SHOT MAP 1-12.13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 72 69 66 63 60 63 63 54 48 27 12 12 33 45 54 51 57 60 63 66 69 69 72
100

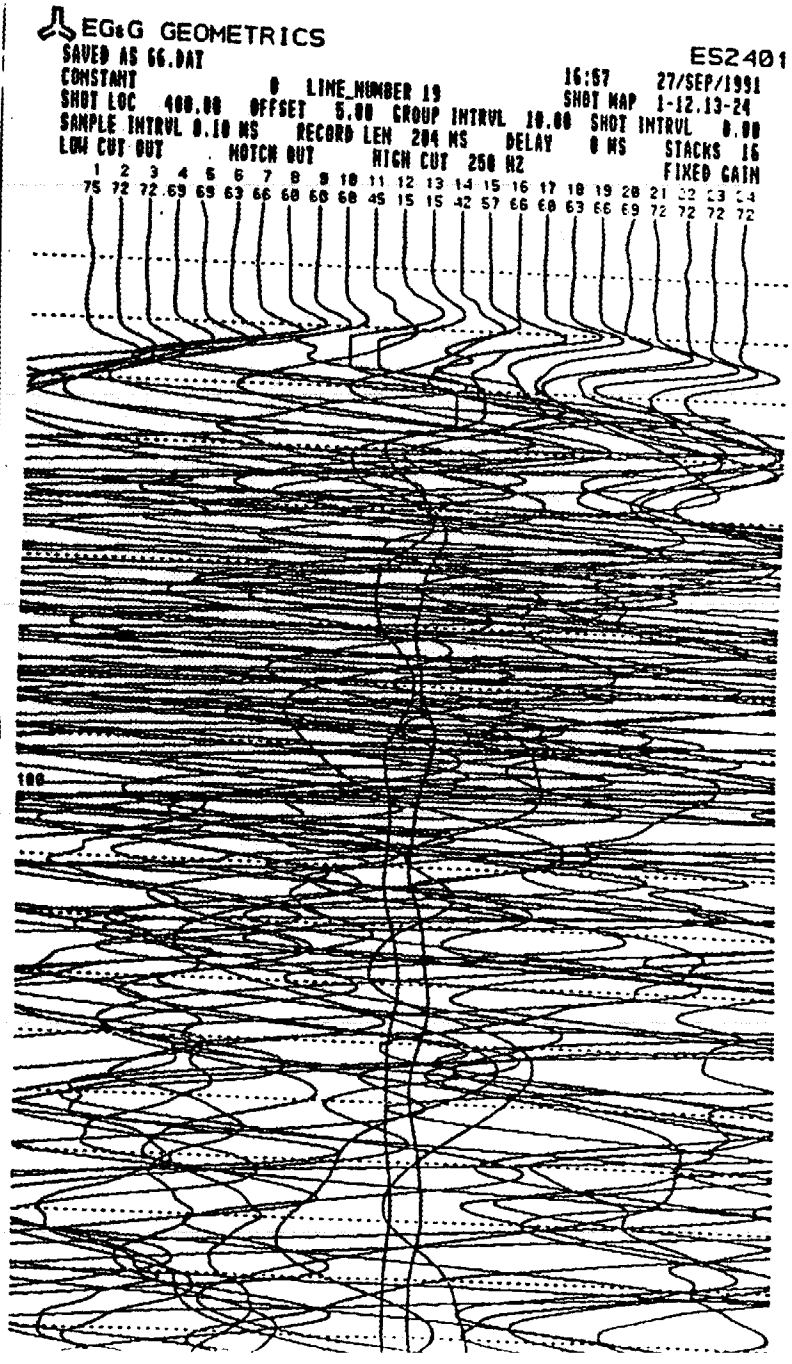

EG&G GEOMETRICS
ES2401
SAVED AS 61.DAT
15:03 27/SEP/1991
CONSTANT 0 LINE NUMBER 17
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
98 84 84 81 78 81 81 78 78 78 61 78 78 75 75 75 72 66 69 66 60 51 48 36
100
200

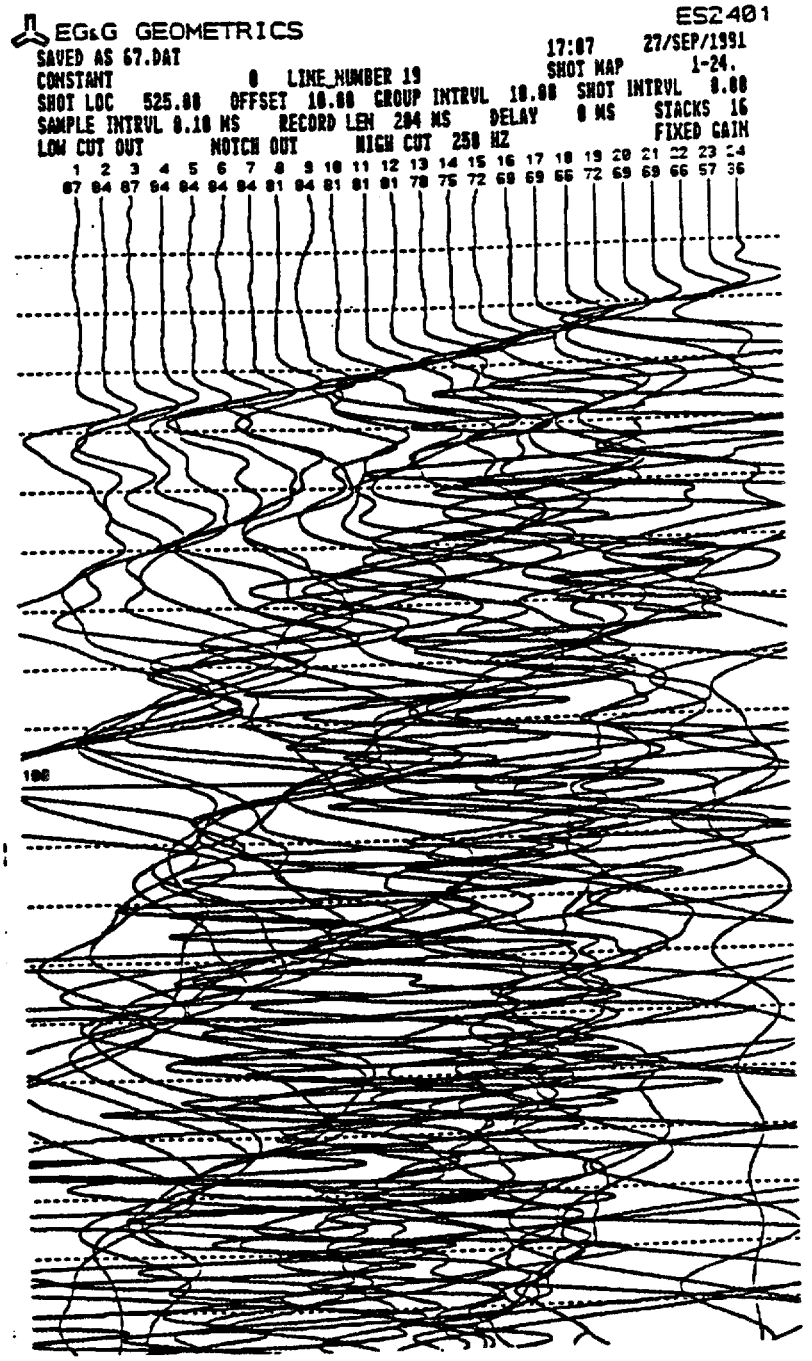

EG&G GEOMETRICS
ES2401
SAVED AS 62.DAT
CONSTANT 0 LINE_NUMBER 10
15:31 27/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00
SHOT MAP .1-24
SHOT INTRVL 8.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS
STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
39 67 66 63 66 63 69 69 66 66 72 78 75 75 78 78 81 78 81 81 81 84 84 84
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 63.DAT
CONSTANT 0 LINE_NUMBER 10
15:33 27/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00
SHOT MAP 1-12.13-24
SHOT INTRVL 8.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS
STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 78 81 84 78 84 87 75 66 67 39 15 24 48 57 66 72 72 75 75 78 81 81 81
100


EG&G GEOMETRICS
ES2401
SAVED AS 64.DAT
15:48
27/SEP/1991
CONSTANT 0 LINE_NUMBER 18
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 78 78 75 75 78 78 75 75 72 69 72 69 72 72 69 72 69 69 72 66 63 60 36
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 66.DAT
CONSTANT 0 LINE NUMBER 19
16:46 27/SEP/1991
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
38 57 66 69 66 66 69 69 75 75 75 75 75 78 78 81 81 84 84 84 84 84 84 84
100


EG&G GEOMETRICS
ES2401
SAVED AS 66.DAT
CONSTANT 0 LINE NUMBER 19
16:57 27/SEP/1991
SHOT MAP 1-12,13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
75 72 72 69 69 63 66 60 60 60 45 15 15 42 57 66 60 63 66 69 72 72 72 72
100


EG&G GEOMETRICS
ES2401
SAVED AS 67.DAT
17:07 27/SEP/1991
CONSTANT 0 LINE NUMBER 19
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 87 94 84 84 84 81 84 81 81 81 78 75 72 68 69 66 72 69 69 66 57 36
100

EG&G GEOMETRICS ES2401

SAVED AS 68.DAT 09:03 30/SEP/1991

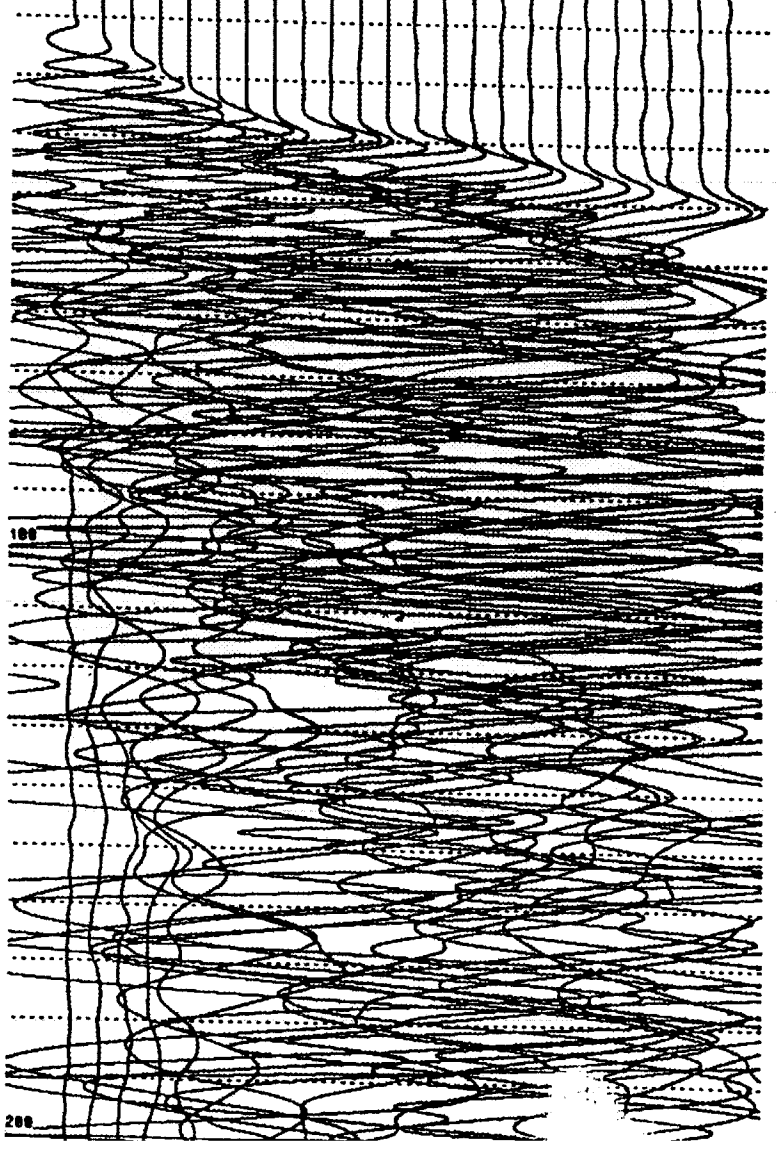
CONSTANT 0 LINE_NUMBER 20 SHOT MAP .1-24

SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00

SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16

LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
*	33	45	51	54	57	66	69	72	84	84	84	84	75	75	75	75	75	78	78	78	81	78	81	81



EG&G GEOMETRICS ES2401

SAVED AS 69.DAT 09:09 30/SEP/1991

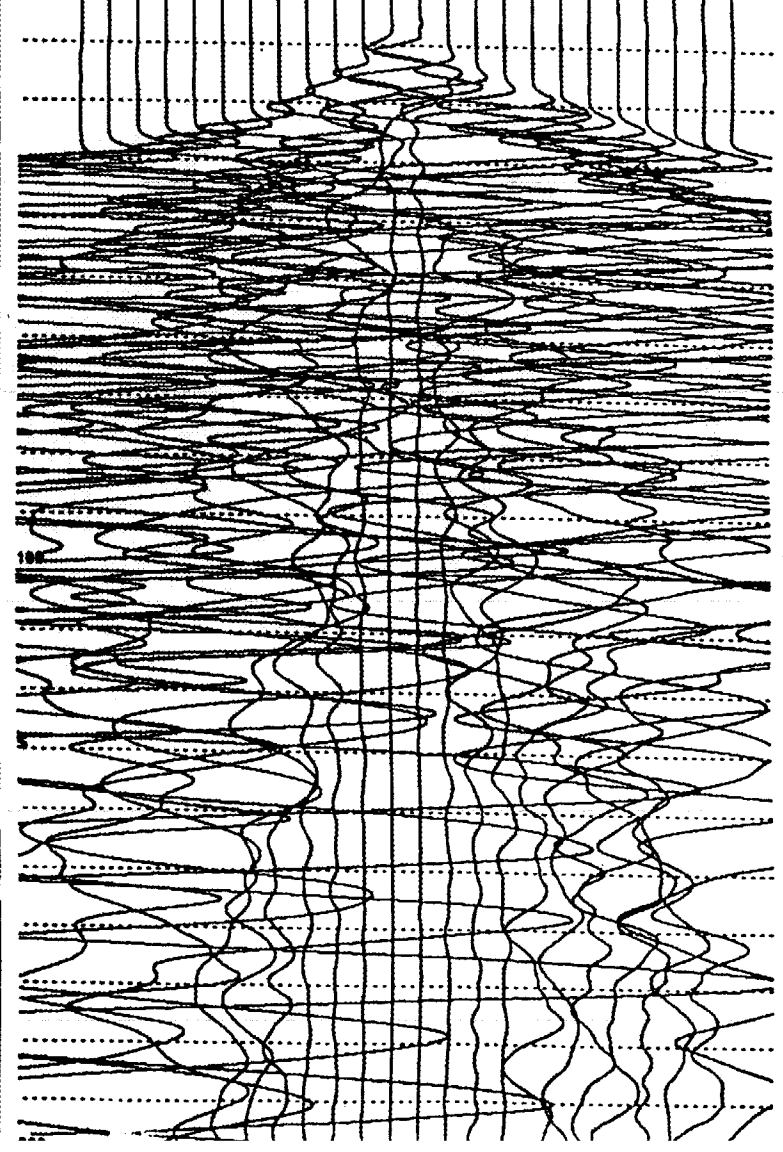
CONSTANT 0 LINE_NUMBER 20 SHOT MAP 1-12.13-24

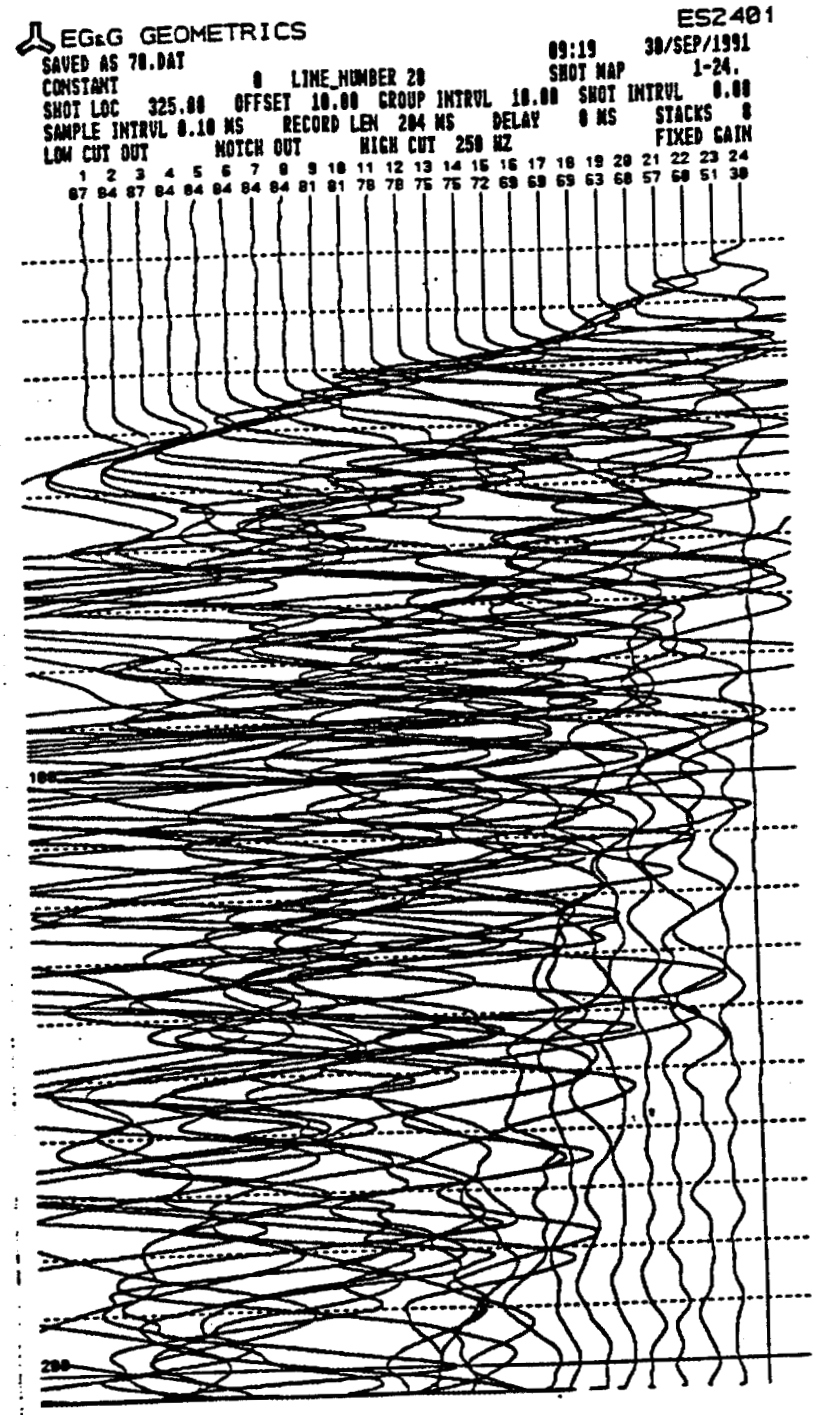
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00

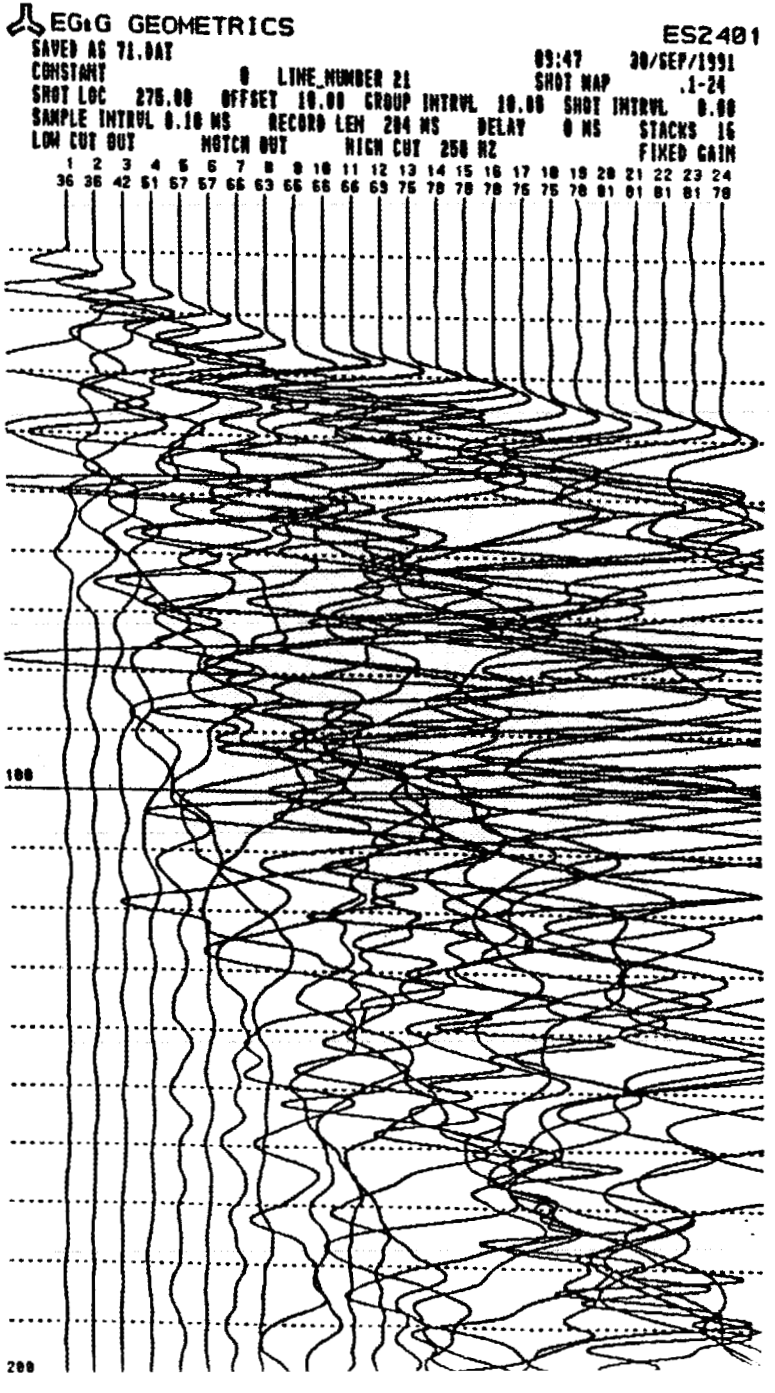
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4

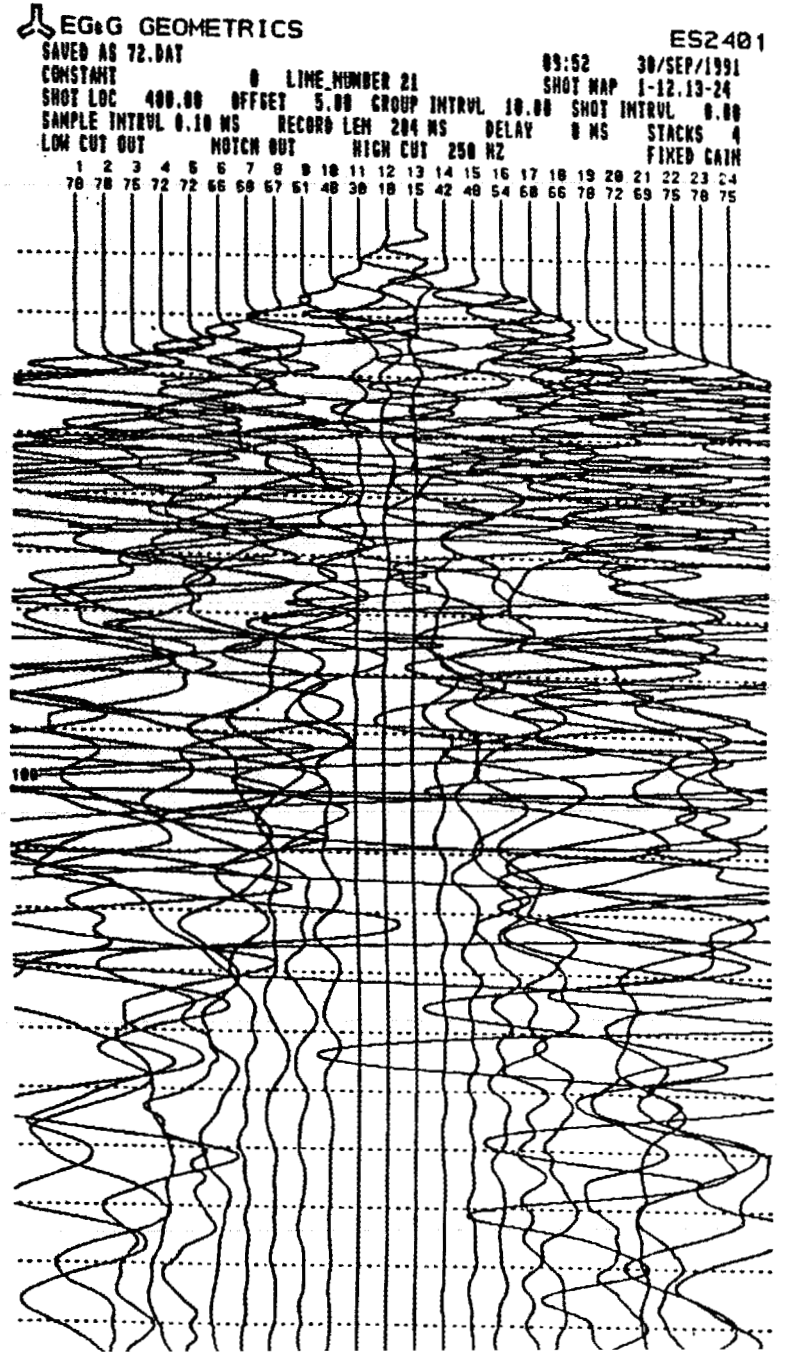
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN

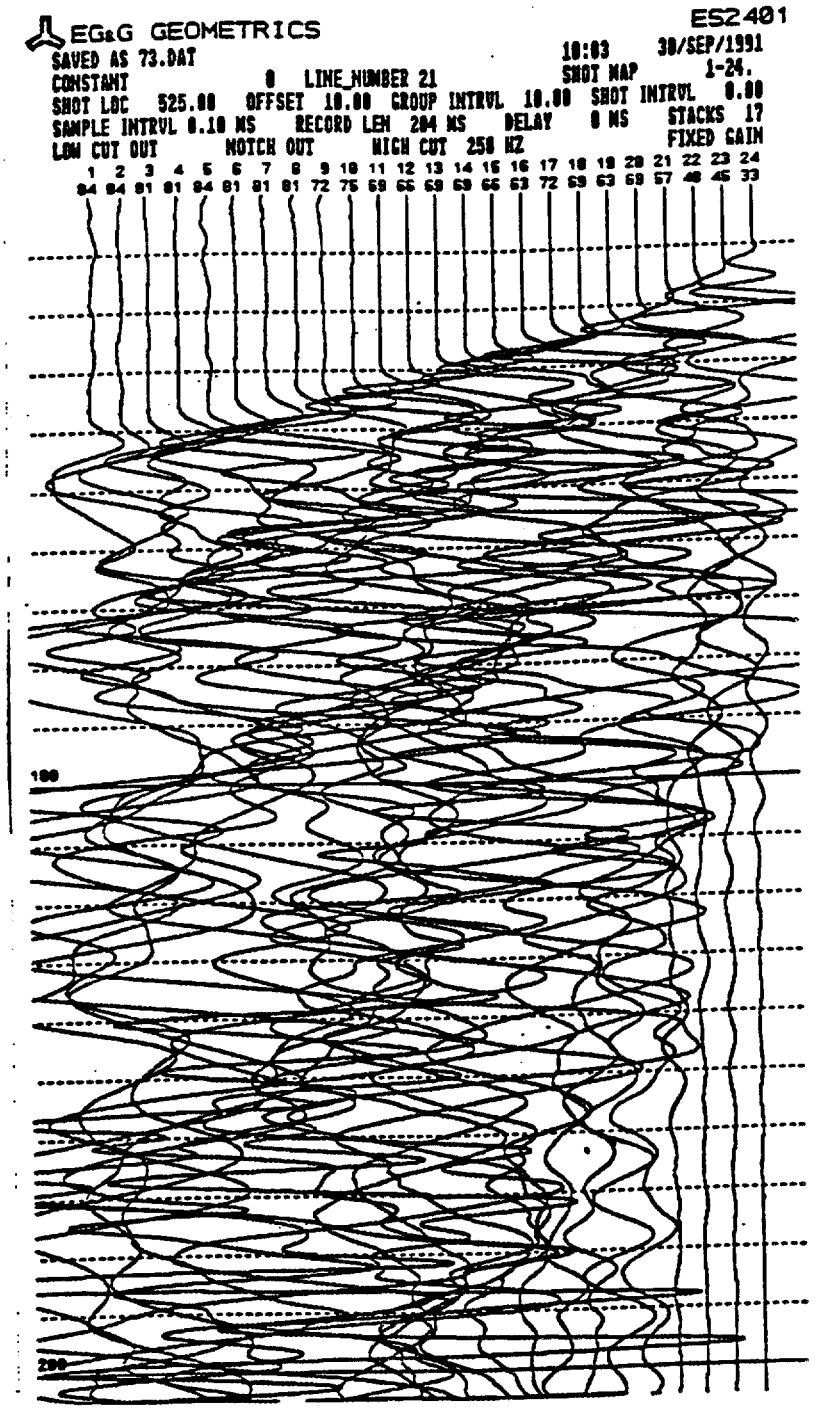
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
81	81	78	78	75	63	60	57	48	45	33	15	18	45	51	57	69	69	69	72	72	72	75	81

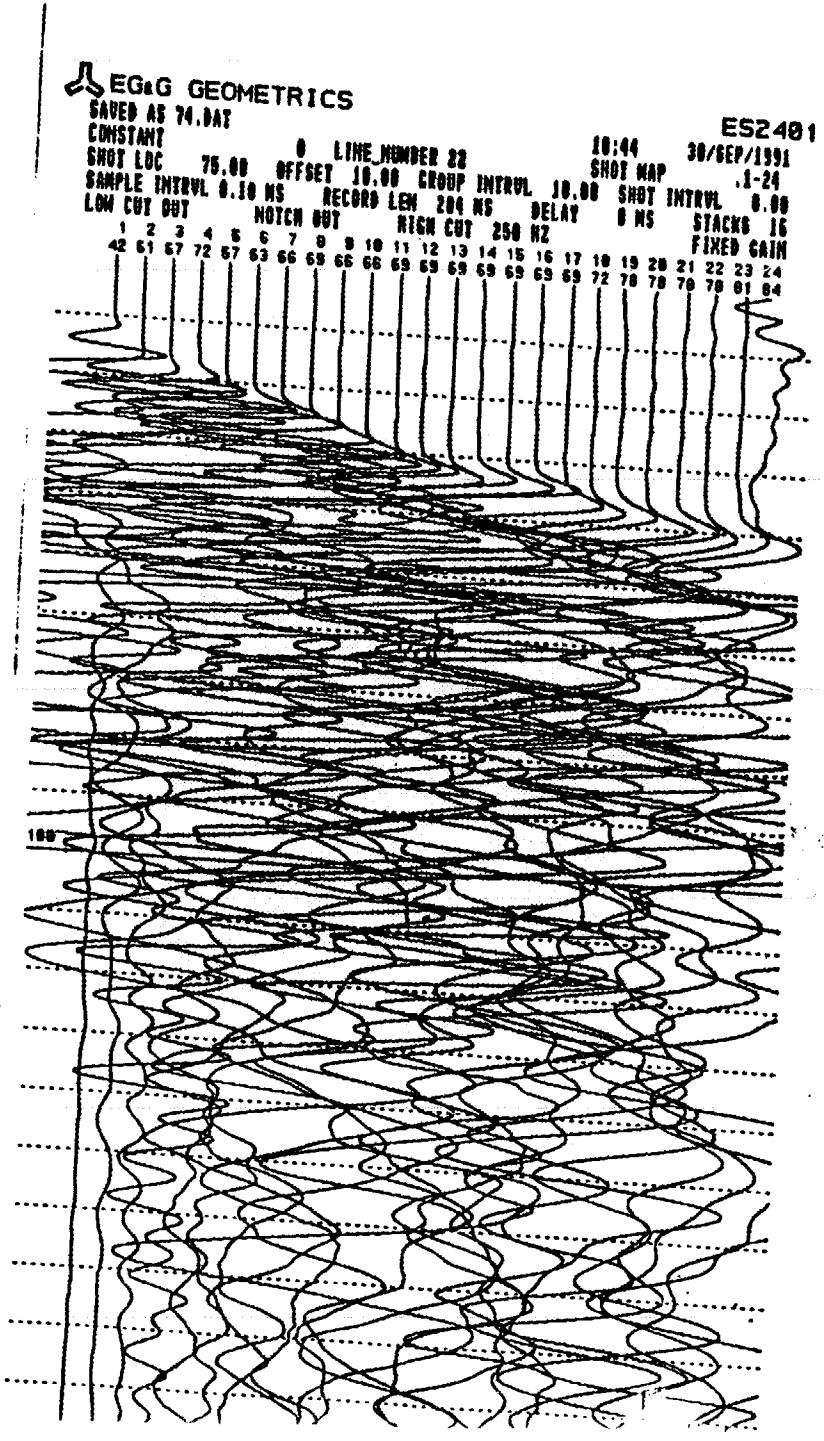


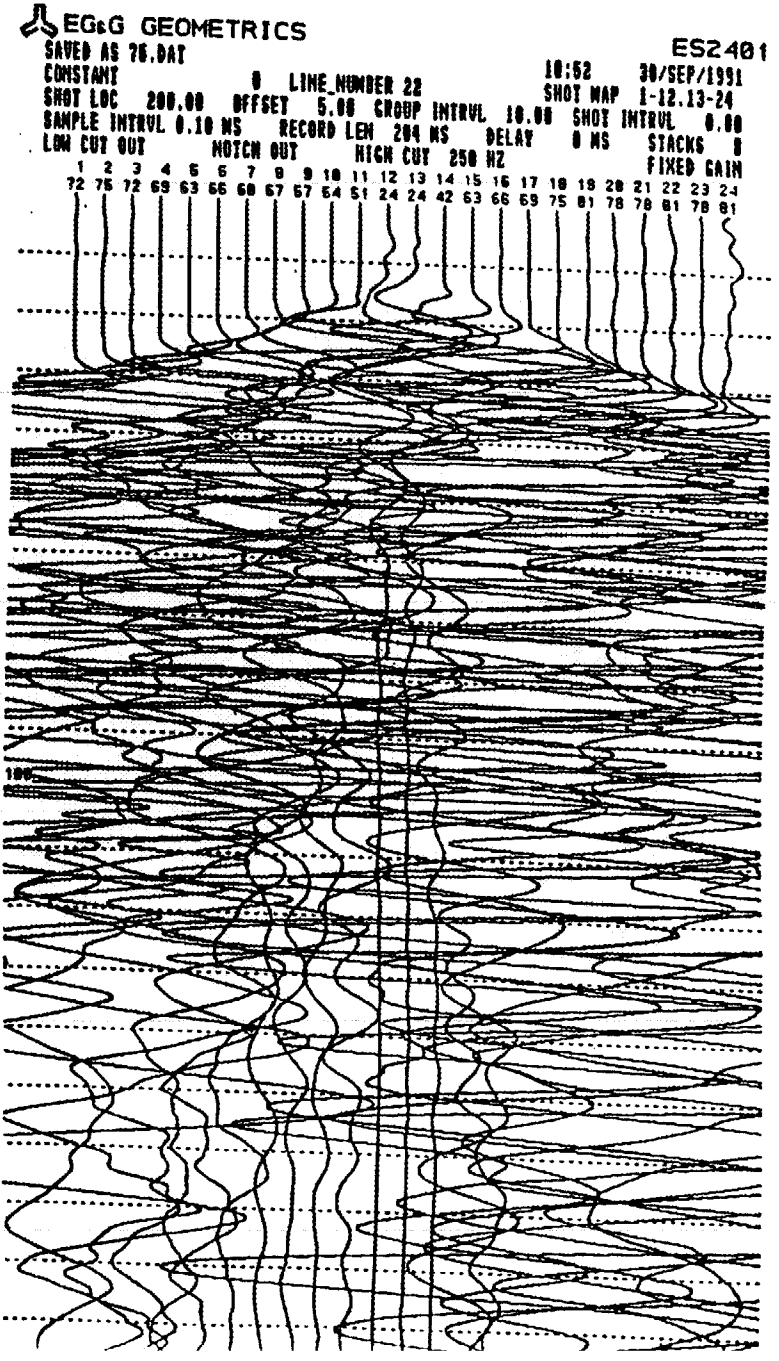

EG&G GEOMETRICS
ES2401
09:19 30/SEP/1991
SAVED AS 70.DAT
SHOT MAP 1-24.
CONSTANT 0 LINE_NUMBER 20
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 87 84 84 84 84 84 81 81 78 78 75 75 72 69 69 69 63 60 57 60 51 30
100
200

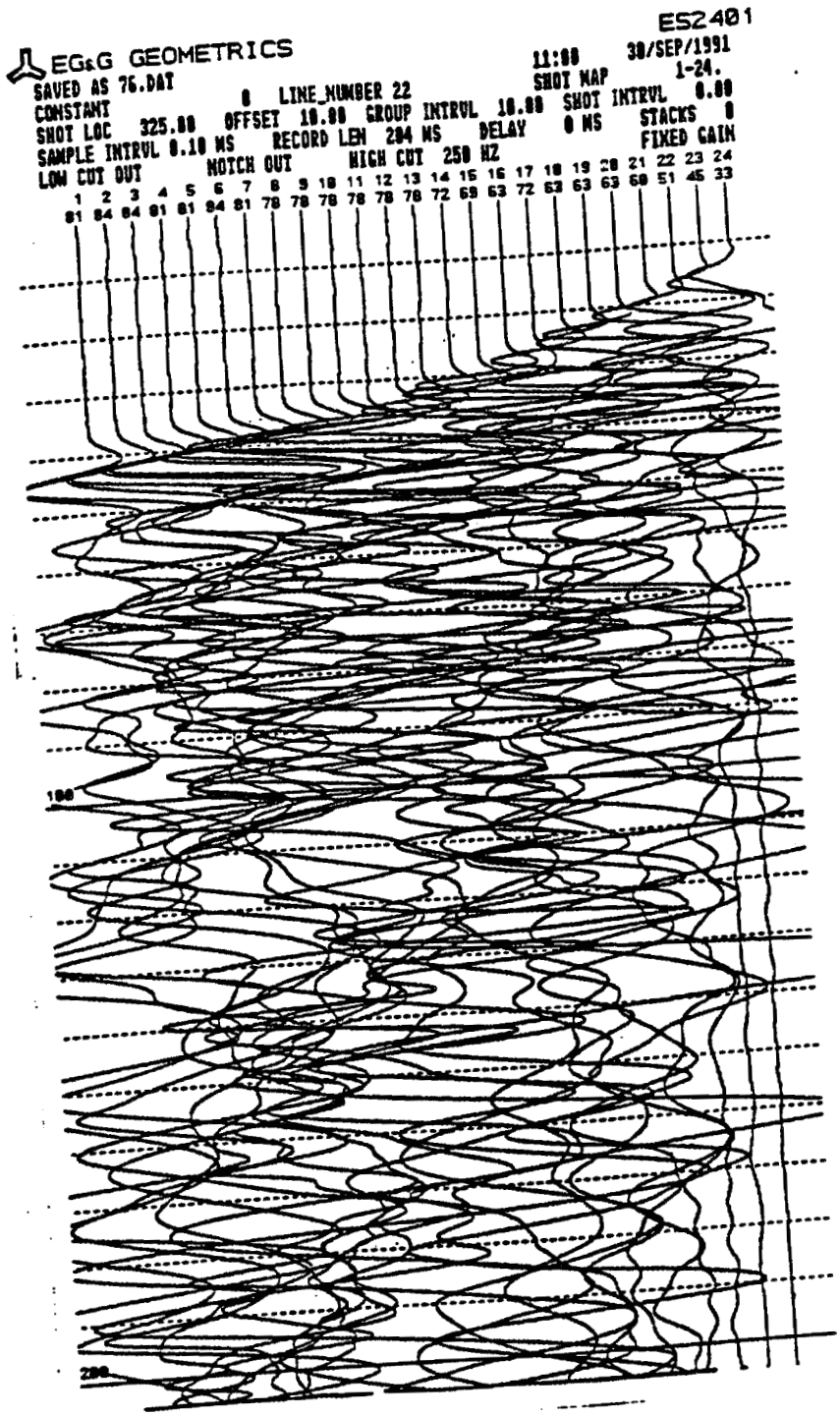

EG&G GEOMETRICS
ES2401
SAVED AS 71.DAT
09:47 30/SEP/1991
CONSTANT 0 LINE_NUMBER 21 SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
36 36 42 51 57 57 66 63 66 66 66 69 75 78 78 78 75 75 78 81 81 81 81 78
100
200

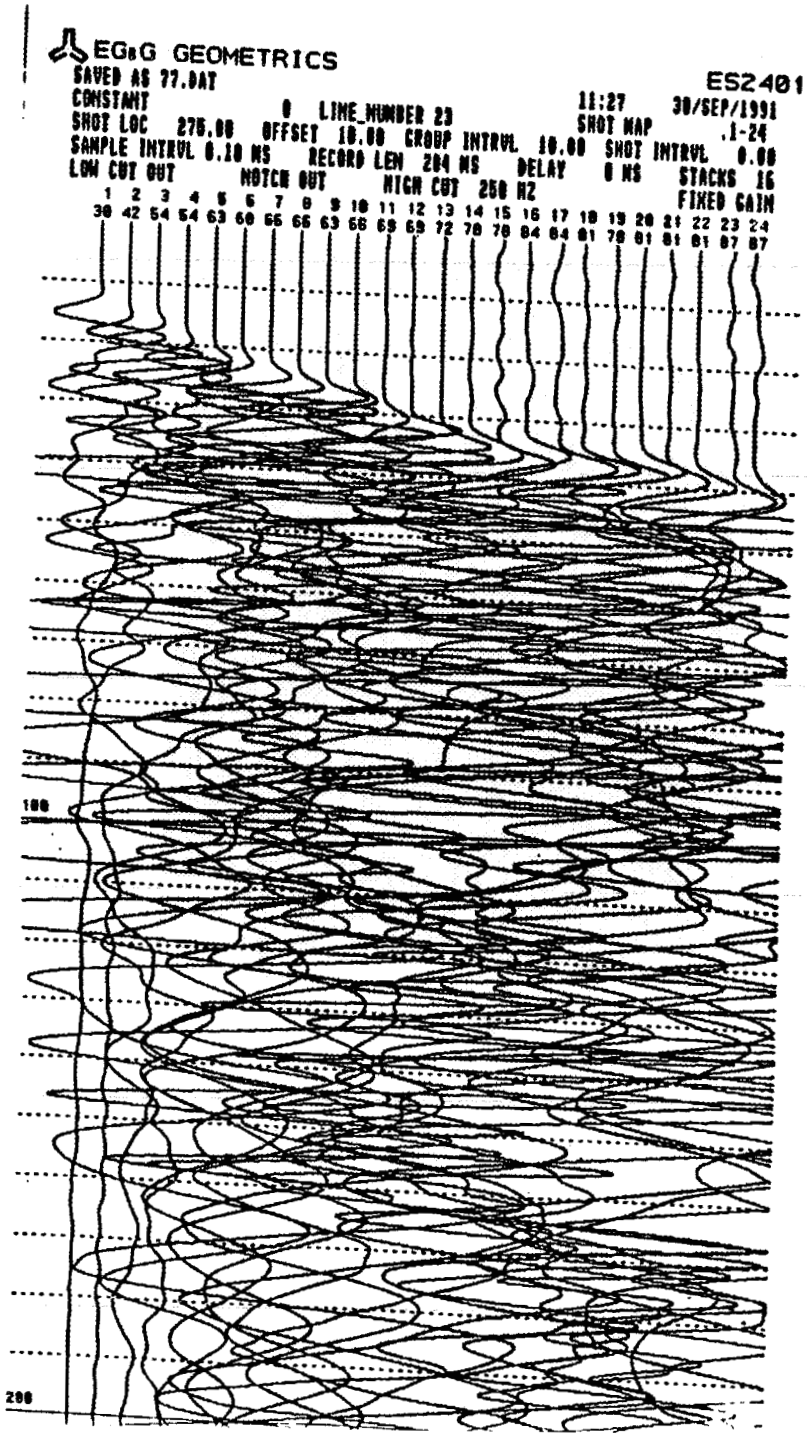

EG&G GEOMETRICS
ES2401
SAVED AS 72.DAT
09:52 30/SEP/1991
CONSTANT 0 LINE_NUMBER 21 SHOT MAP 1-12,13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 78 75 72 72 66 60 67 51 48 30 18 15 42 48 54 60 66 78 72 69 75 78 75
100

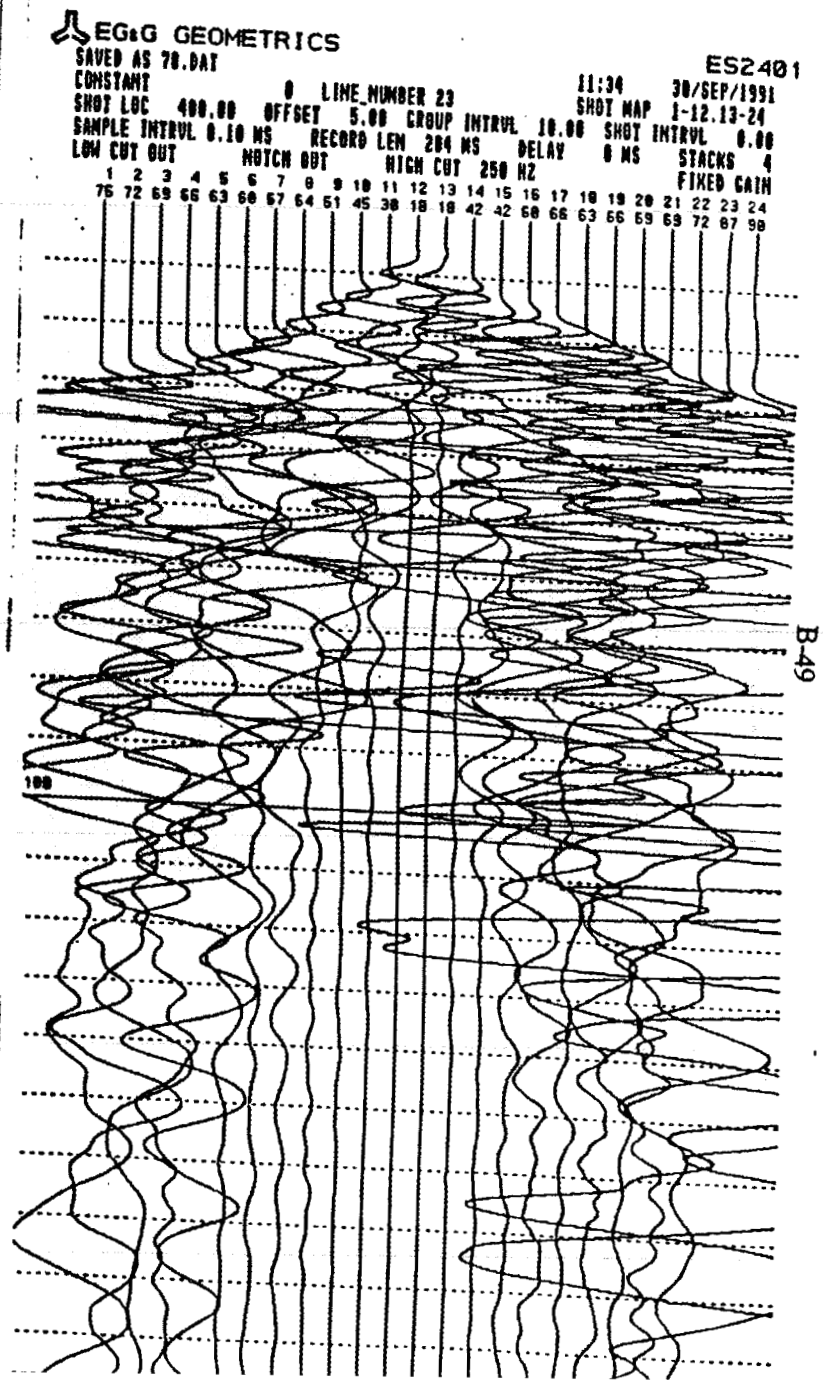

EG&G GEOMETRICS
ES2401
SAVED AS 73.DAT
10:03 30/SEP/1991
CONSTANT 0 LINE_NUMBER 21
SHOT MAP 1-24.
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 17
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 81 81 84 81 81 81 72 75 69 65 69 69 66 63 72 69 63 69 57 48 45 33
100
200

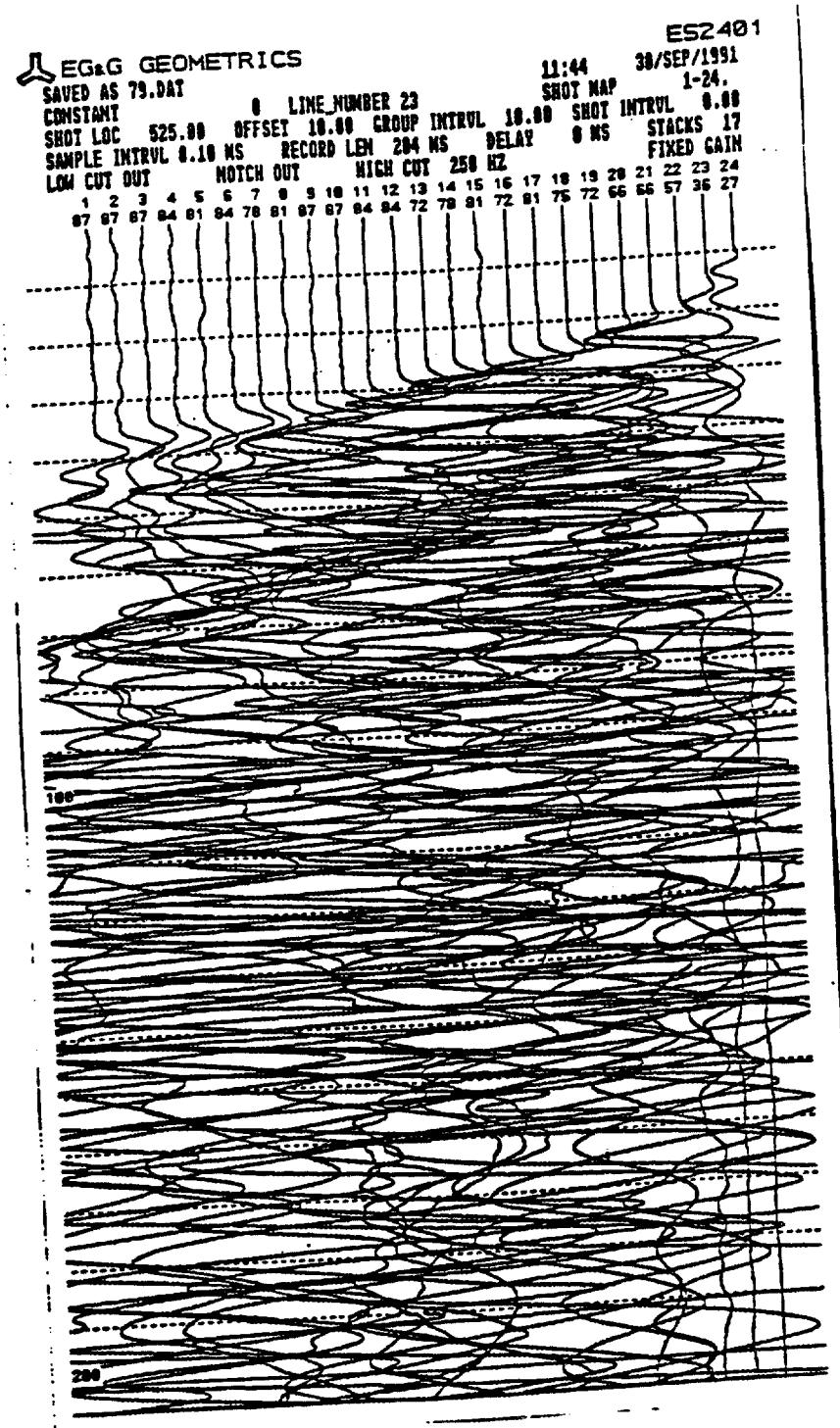

EG&G GEOMETRICS
SAVED AS 74.DAT
ES2401
CONSTANT 0 LINE NUMBER 22 10:44 30/SEP/1991
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 16
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
42 61 67 72 67 63 66 69 66 66 69 69 69 69 69 69 69 72 78 78 78 78 81 84
100


EG&G GEOMETRICS
SAVED AS 76.DAT
ES2401
CONSTANT 0 LINE NUMBER 22 10:52 30/SEP/1991
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 8
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
72 76 72 69 63 66 60 67 57 54 51 24 24 42 63 66 69 75 81 78 78 81 78 81
100


ES2401
EG&G GEOMETRICS
11:00
30/SEP/1991
SAVED AS 76.DAT
SHOT MAP
1-24.
0 LINE_NUMBER 22
CONSTANT
SHOT INTRVL 0.00
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00
STACKS 0
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 84 84 81 81 84 81 78 78 78 78 78 78 72 69 63 72 63 63 63 60 51 45 33
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 77.DAT
CONSTANT 0 LINE NUMBER 23 11:27 30/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 16
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
30 42 54 54 63 60 66 66 63 66 69 69 72 78 78 84 84 81 78 81 81 81 87 87
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 78.DAT
CONSTANT 0 LINE NUMBER 23 11:34 30/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
75 72 69 66 63 60 57 54 51 45 38 18 18 42 42 60 66 63 66 69 69 72 87 90
100


ES2401
EG&G GEOMETRICS
11:44 30/SEP/1991
SAVED AS 79.DAT
SHOT MAP 1-24.
CONSTANT 0 LINE NUMBER 23
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 17
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 87 84 81 84 78 81 87 87 84 84 72 78 81 72 81 75 72 66 66 57 36 27
100
200

EG&G GEOMETRICS

ES2401

SAVED AS 00.DAT

CONSTANT 0 LINE NUMBER 24 13:37 30/SEP/1991

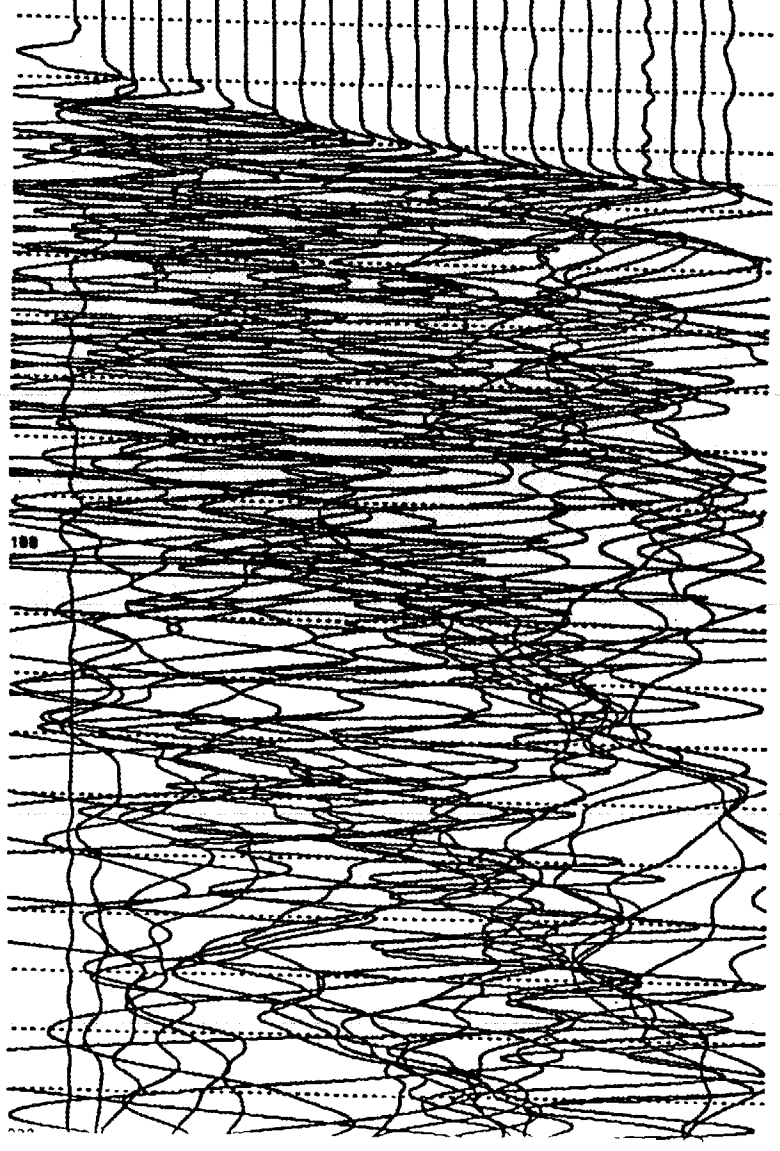
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24

SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00

LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 16

FIXED GAIN

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
36	40	63	69	72	72	69	69	72	72	75	78	78	78	78	81	81	81	81	81	81	84	81	84



EG&G GEOMETRICS

ES2401

SAVED AS 01.DAT

CONSTANT 0 LINE NUMBER 24 13:43 30/SEP/1991

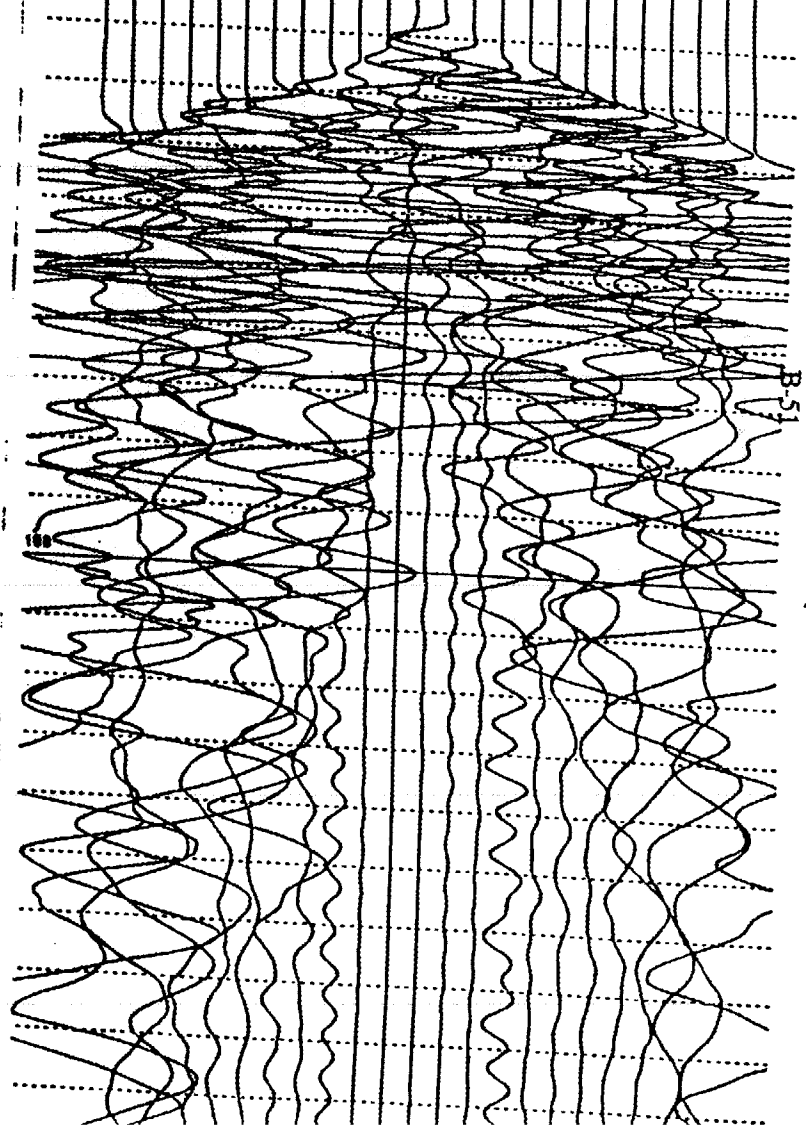
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24

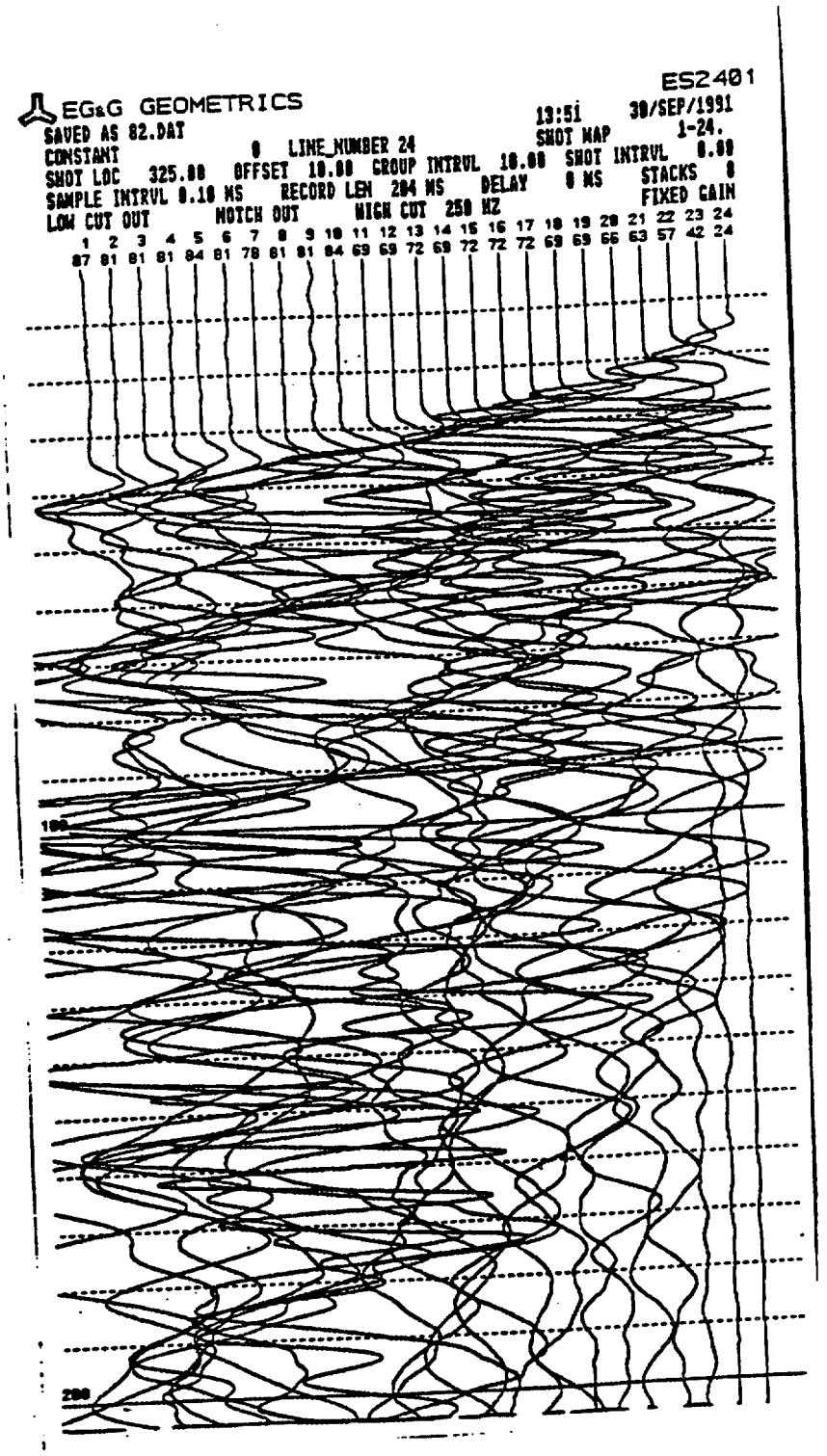
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00

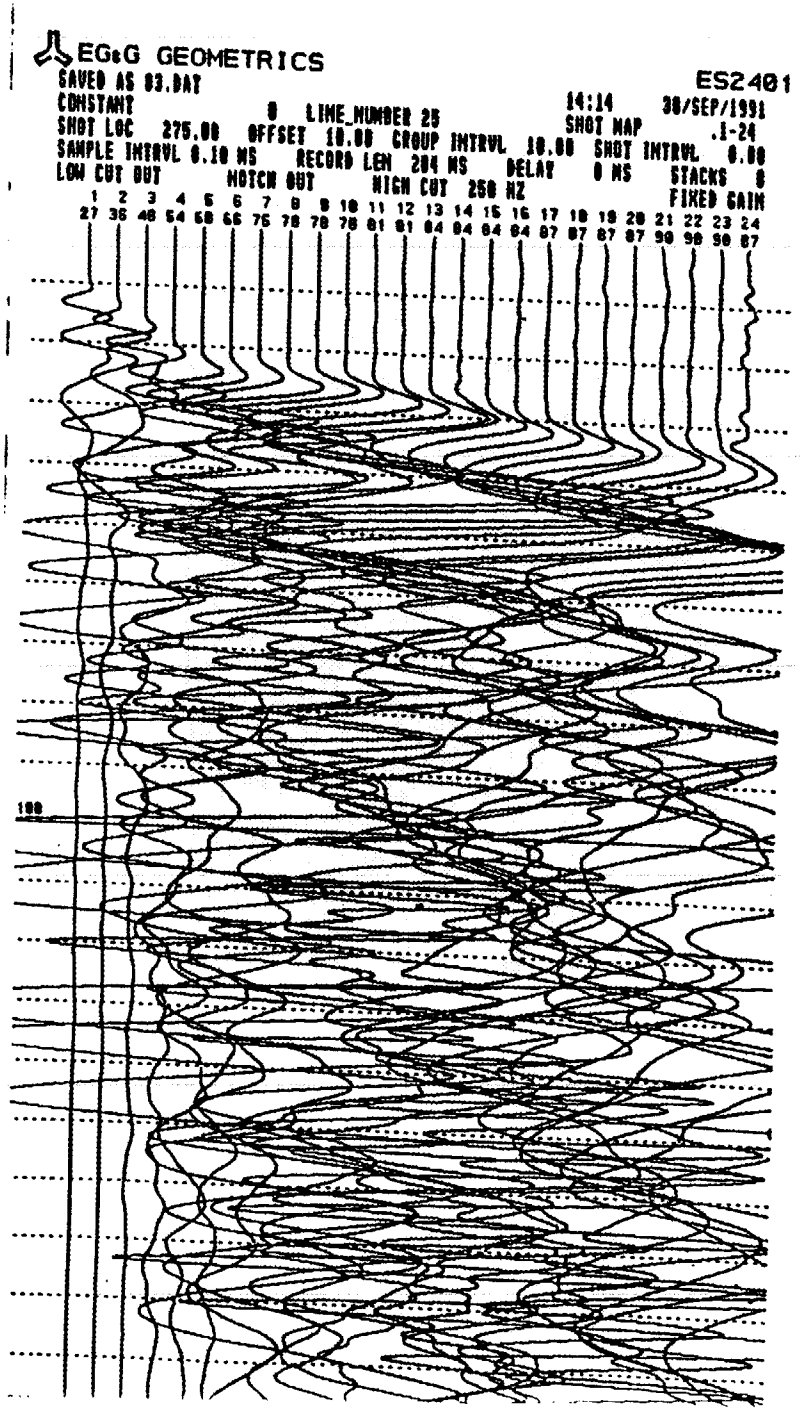
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4

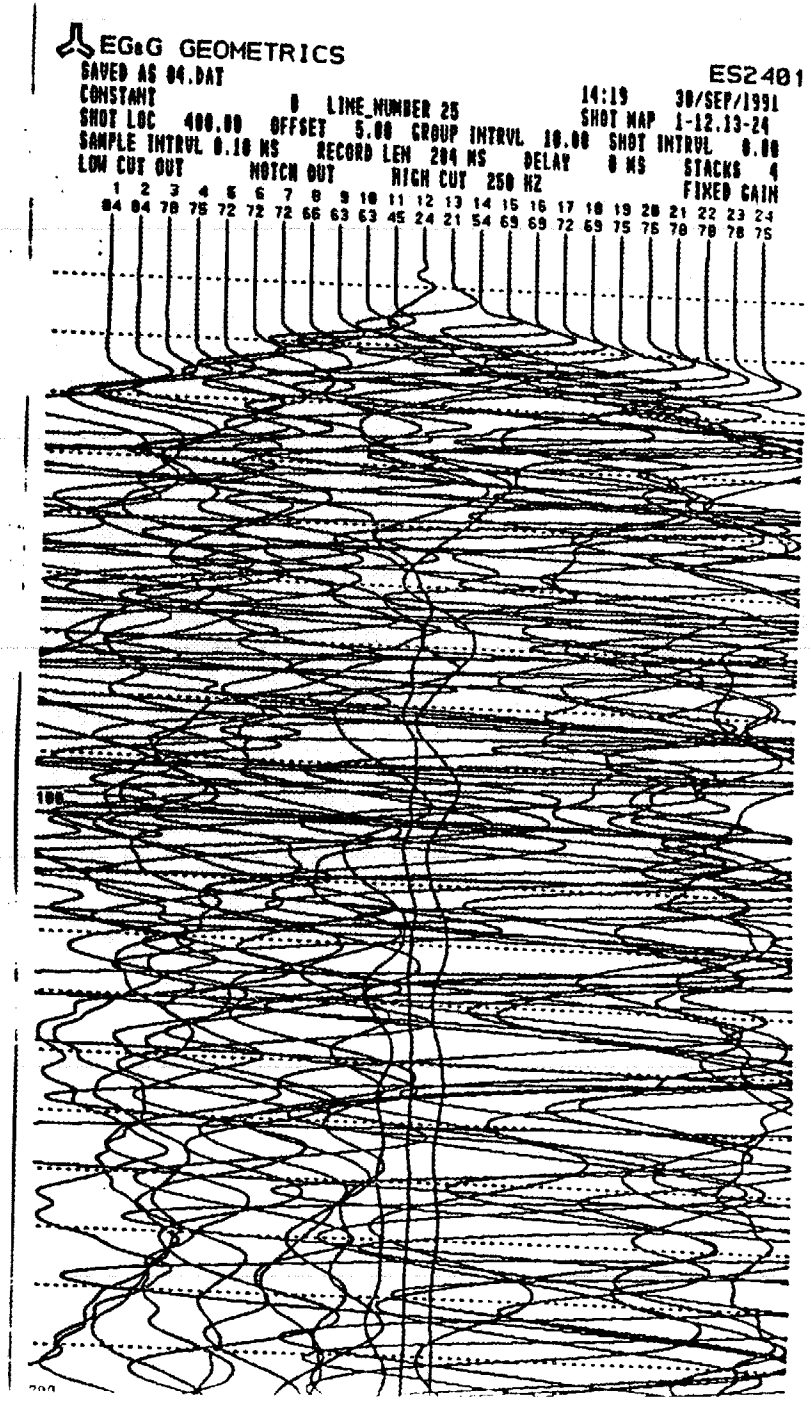
FIXED GAIN

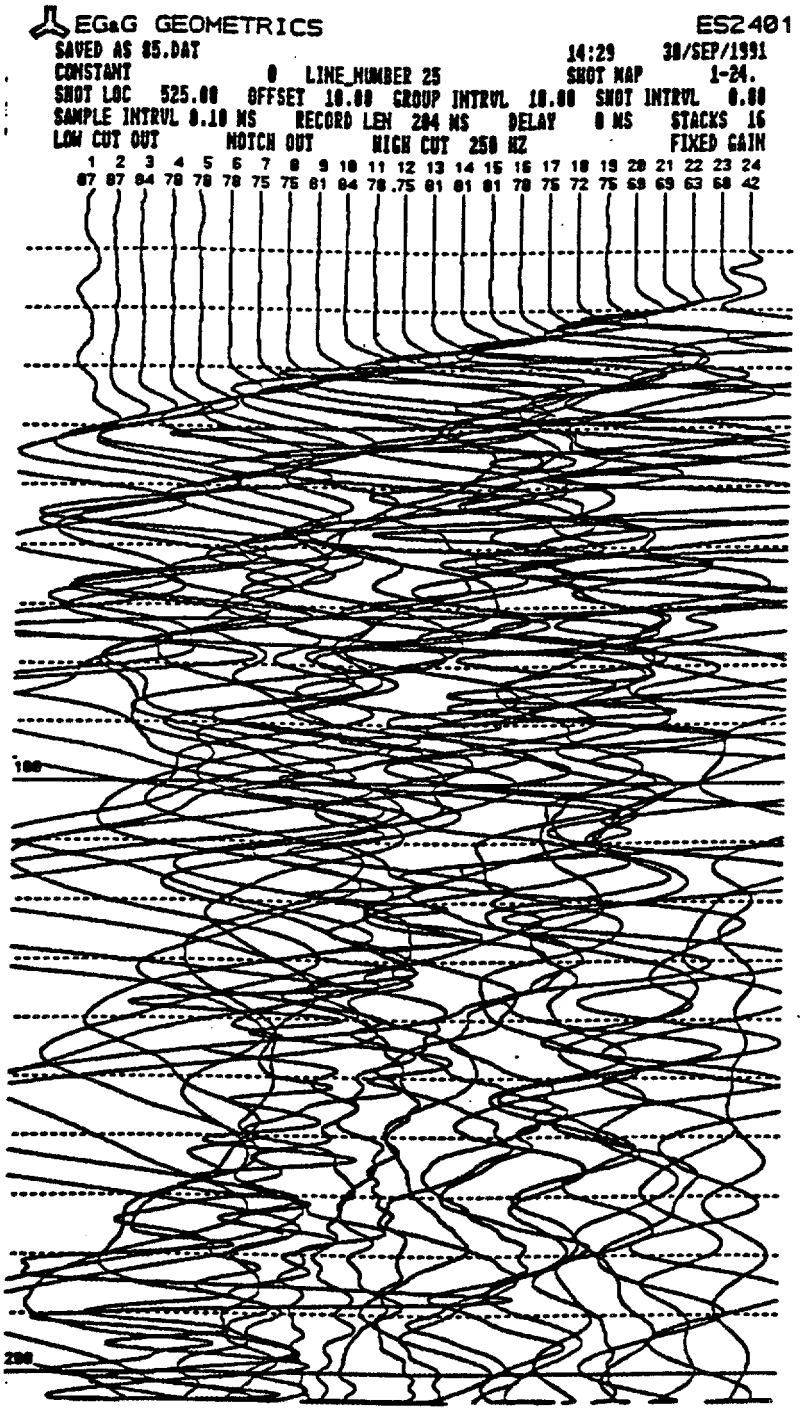
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
84	72	63	69	72	63	60	66	67	64	30	15	30	42	45	66	67	60	63	66	69	66	66	75

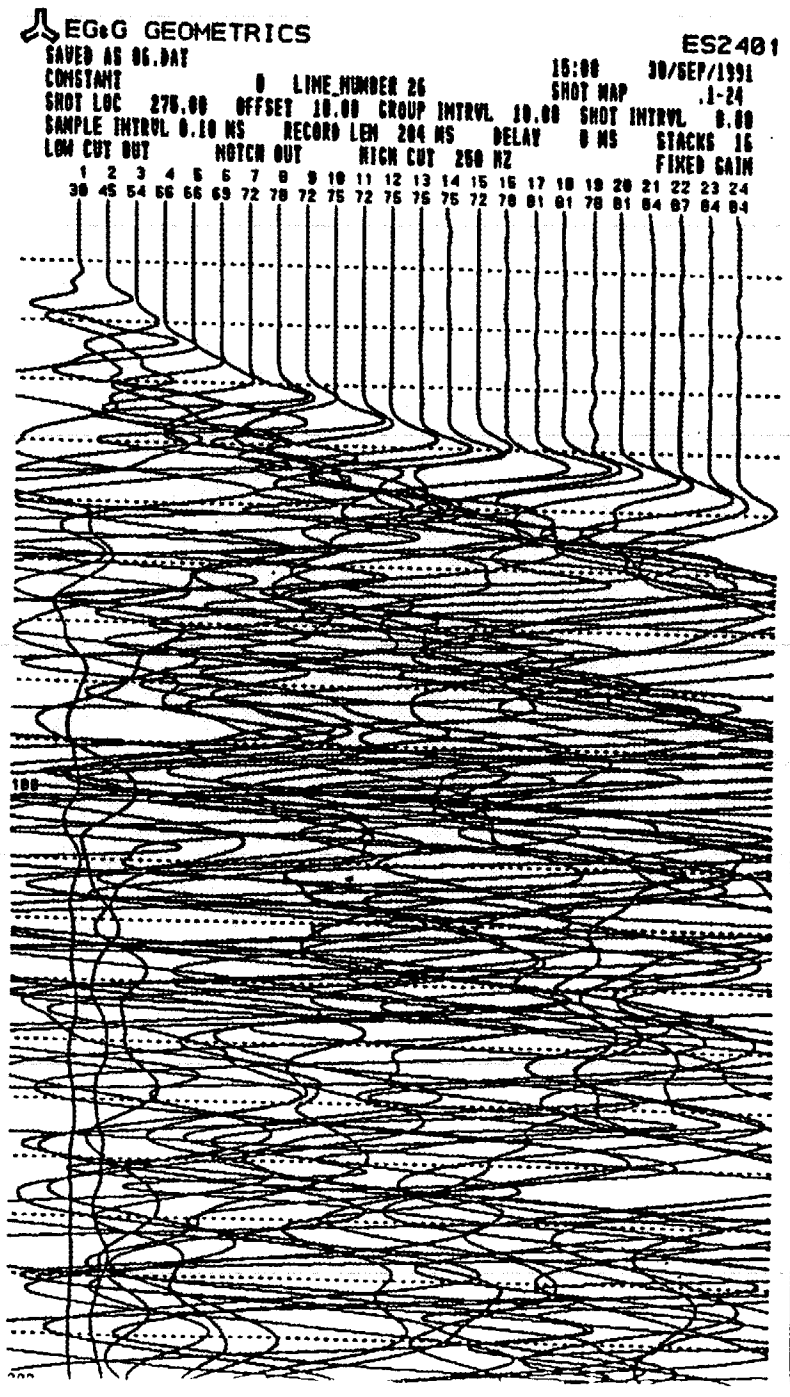


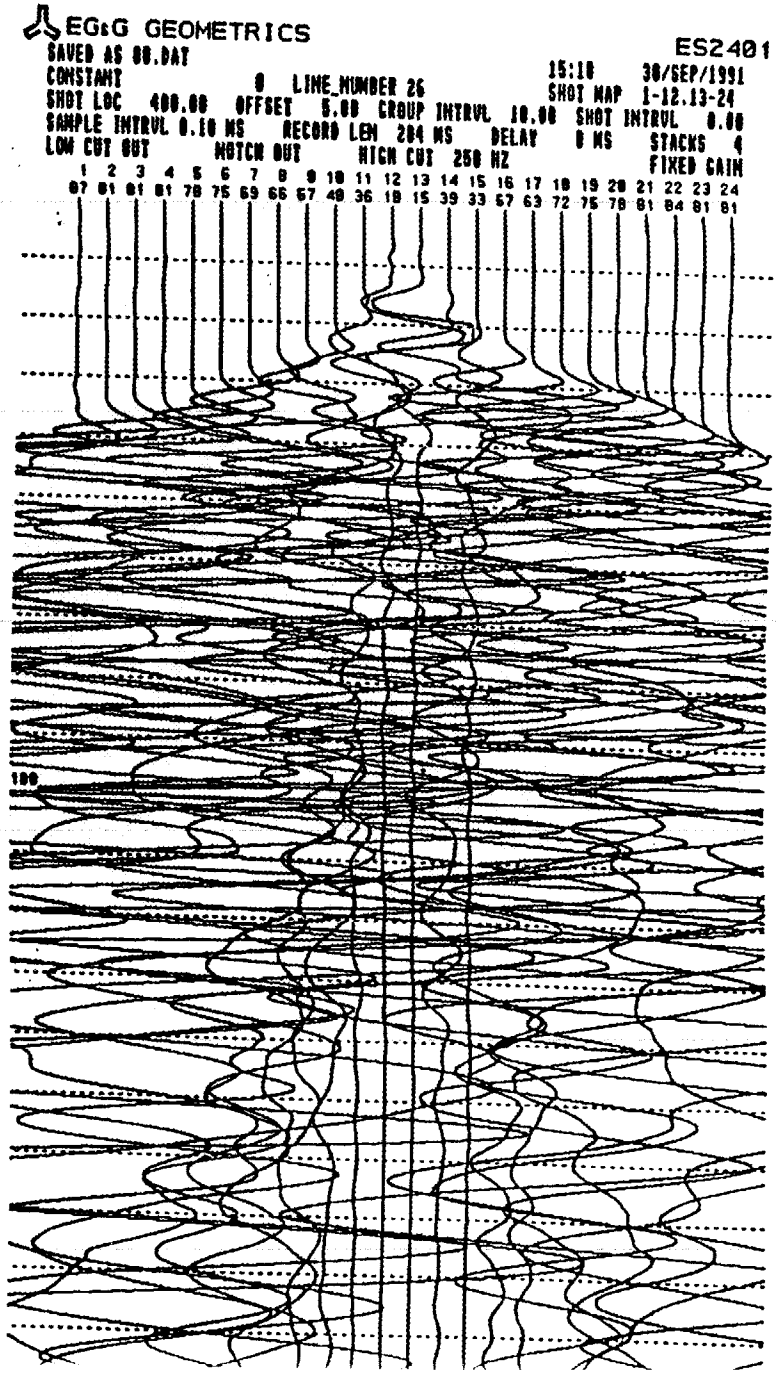

ES2401
EG&G GEOMETRICS
13:51 30/SEP/1991
SAVED AS 82.DAT
SHOT MAP 1-24.
CONSTANT 0 LINE_NUMBER 24
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 81 81 81 84 81 78 81 81 84 69 69 72 69 72 72 72 69 69 66 63 57 42 24
100
200

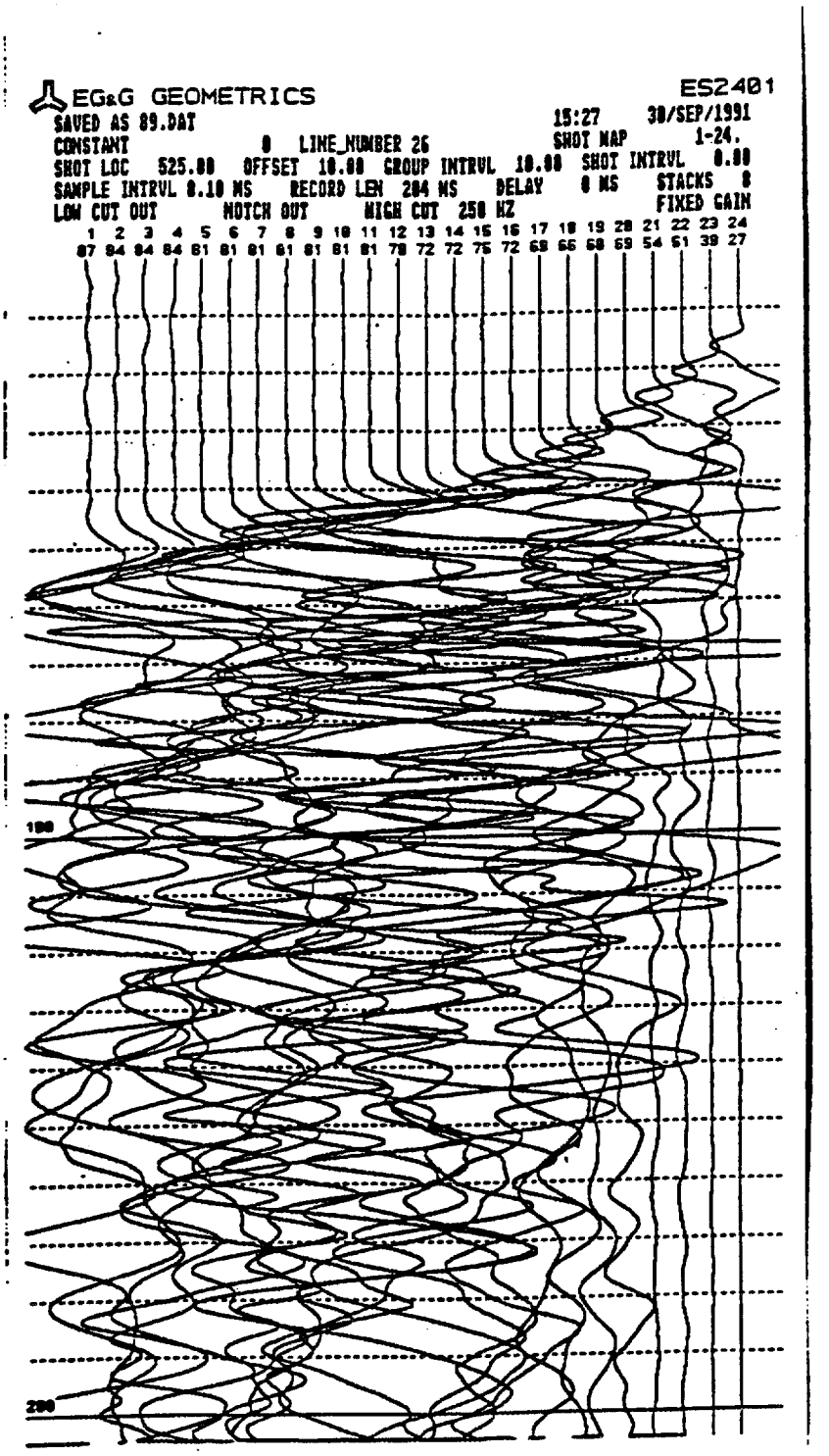

EG&G GEOMETRICS
ES2401
SAVED AS 03.DAT
CONSTANT 0 LINE_NUMBER 25 14:14 30/SEP/1991
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 8
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
27 36 48 54 60 66 75 78 78 78 81 81 84 84 84 84 87 87 87 87 90 90 90 87
100

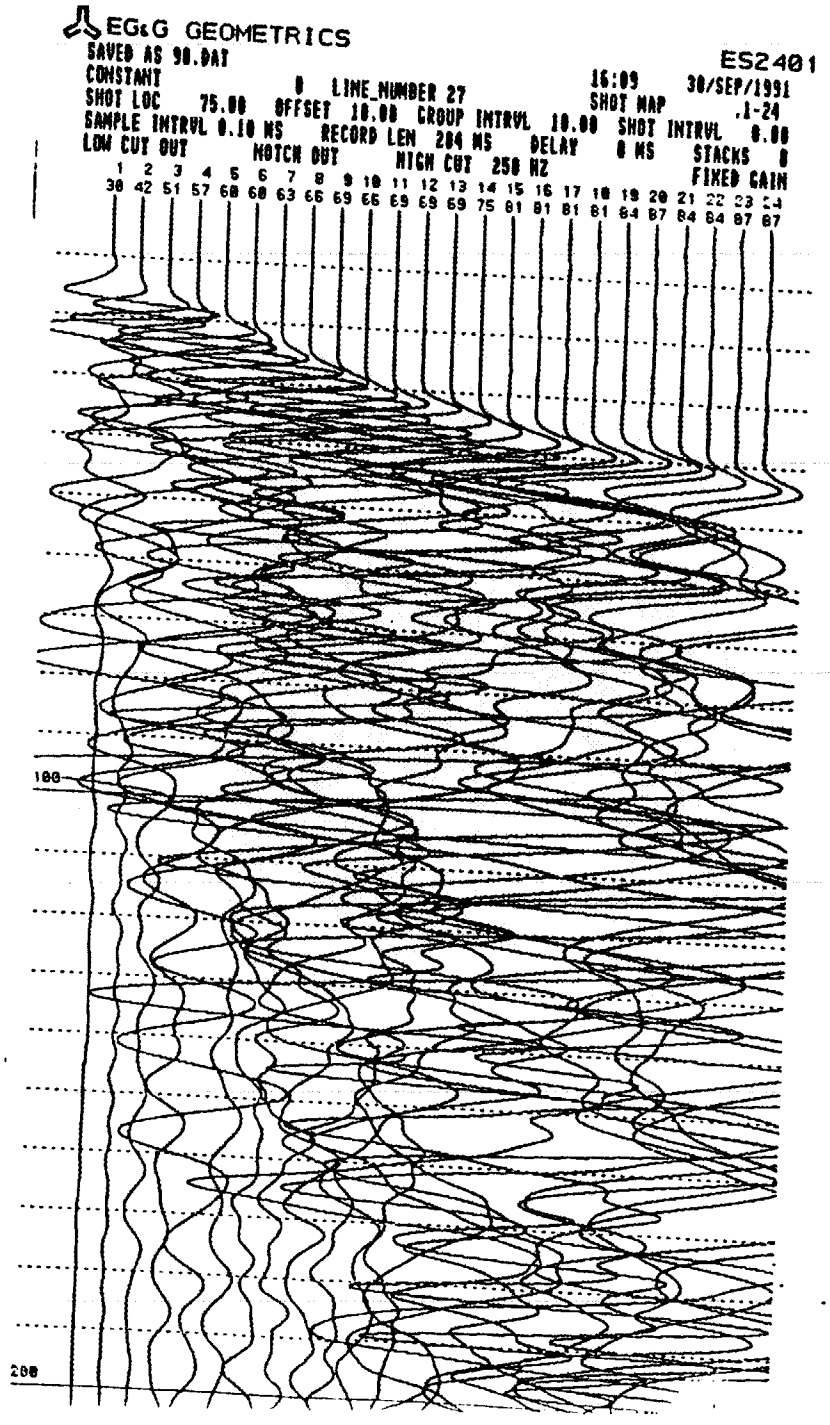

EG&G GEOMETRICS
ES2401
SAVED AS 04.DAT
CONSTANT 0 LINE_NUMBER 25 14:19 30/SEP/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 78 75 72 72 72 66 63 63 45 24 21 54 69 69 72 69 75 75 78 78 78 75
100

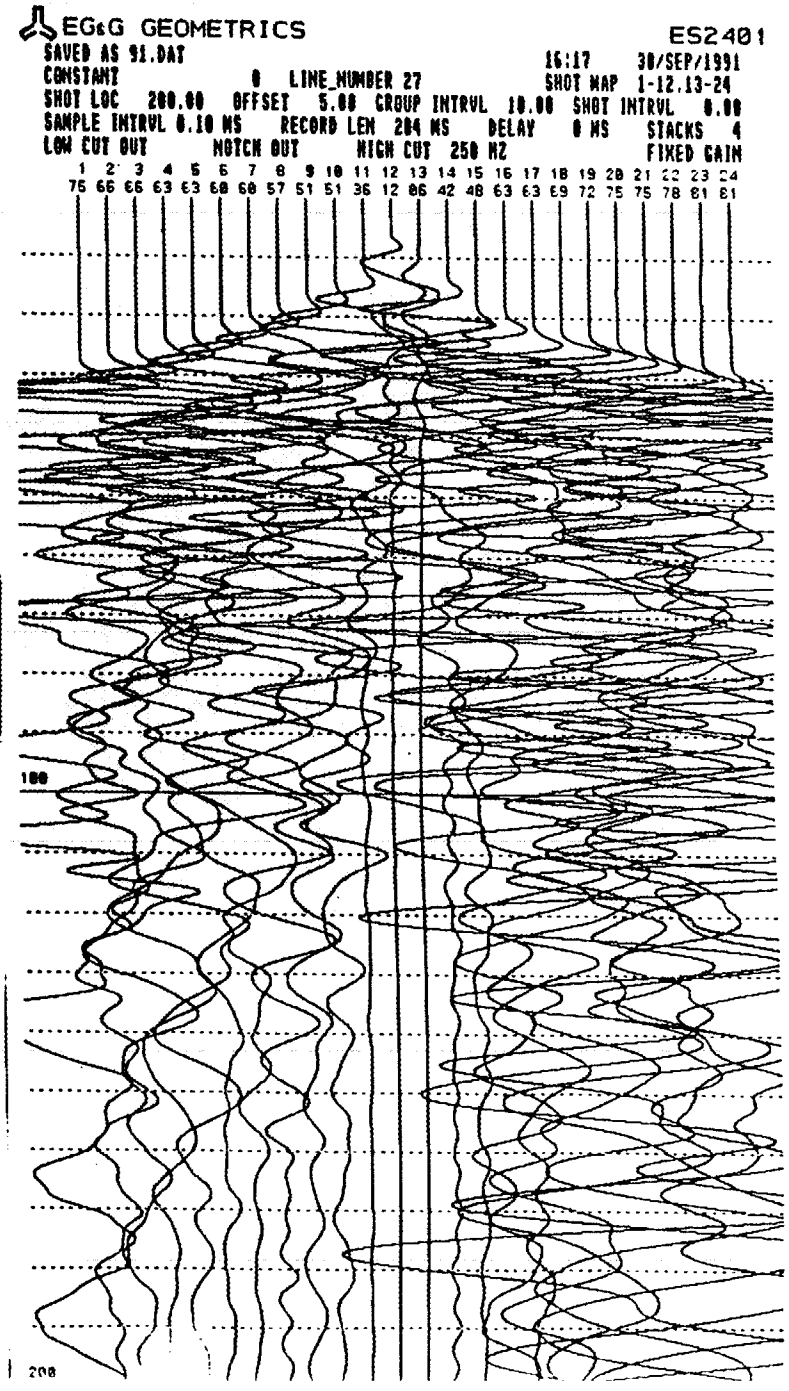

EG&G GEOMETRICS
ES2401
SAVED AS 85.DAT
14:29
30/SEP/1991
CONSTANT
0
LINE NUMBER 25
SHOT MAP
1-24.
SHOT LOC 525.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY 0 MS
STACKS 16
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 84 78 78 78 75 75 81 84 78 .75 81 81 81 78 75 72 75 69 69 63 68 42
100
200

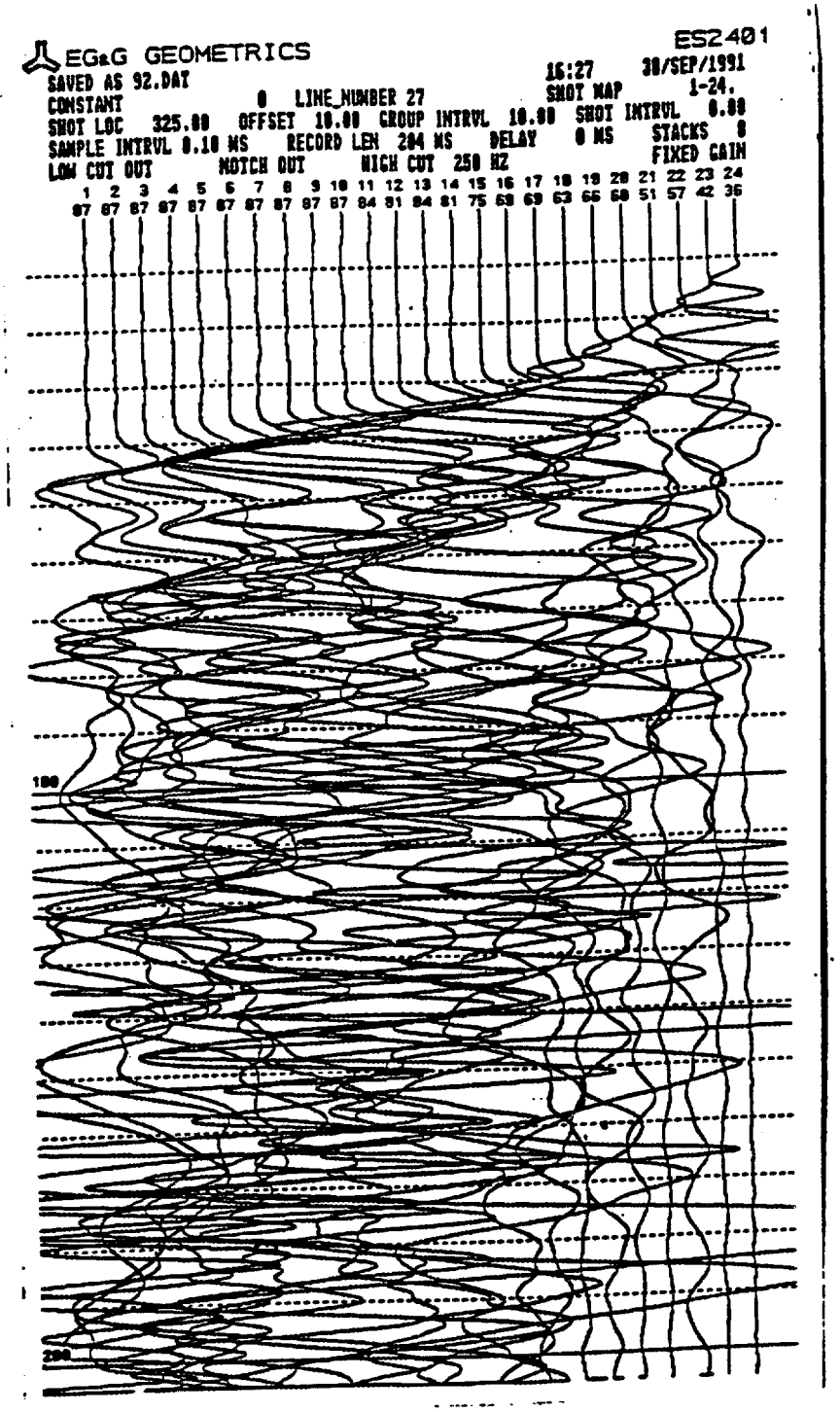

EG&G GEOMETRICS
ES2401
SAVED AS 06.DAT
CONSTANT 0 LINE NUMBER 26
15:08 30/SEP/1991
SHOT MAP .1-24
SHOT LOC 275.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
30 45 54 66 66 69 72 78 72 75 72 75 75 75 72 78 81 81 78 81 84 87 84 84
100

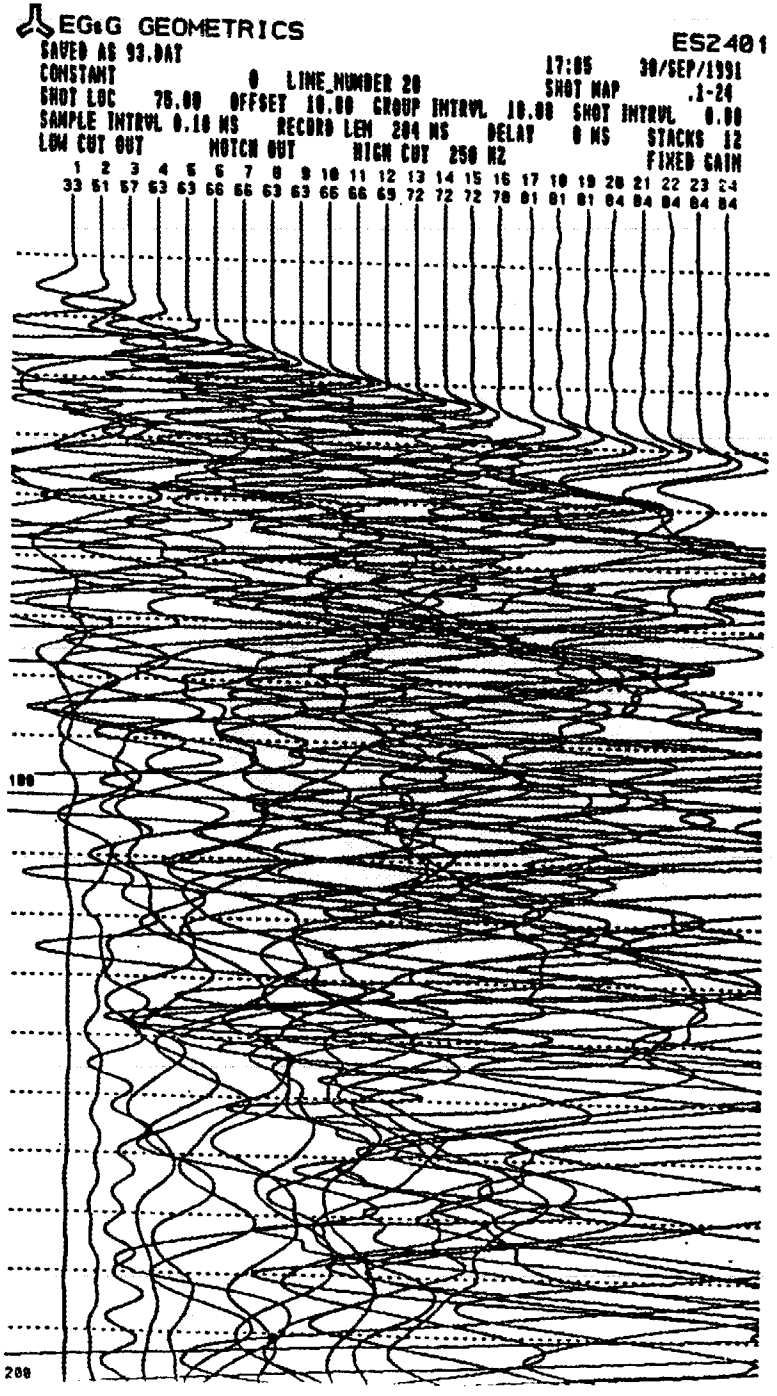

EG&G GEOMETRICS
ES2401
SAVED AS 08.DAT
CONSTANT 0 LINE NUMBER 26
15:10 30/SEP/1991
SHOT MAP 1-12.13-24
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 81 81 81 78 75 69 66 57 48 36 18 15 39 33 57 63 72 75 78 81 84 81 81
100

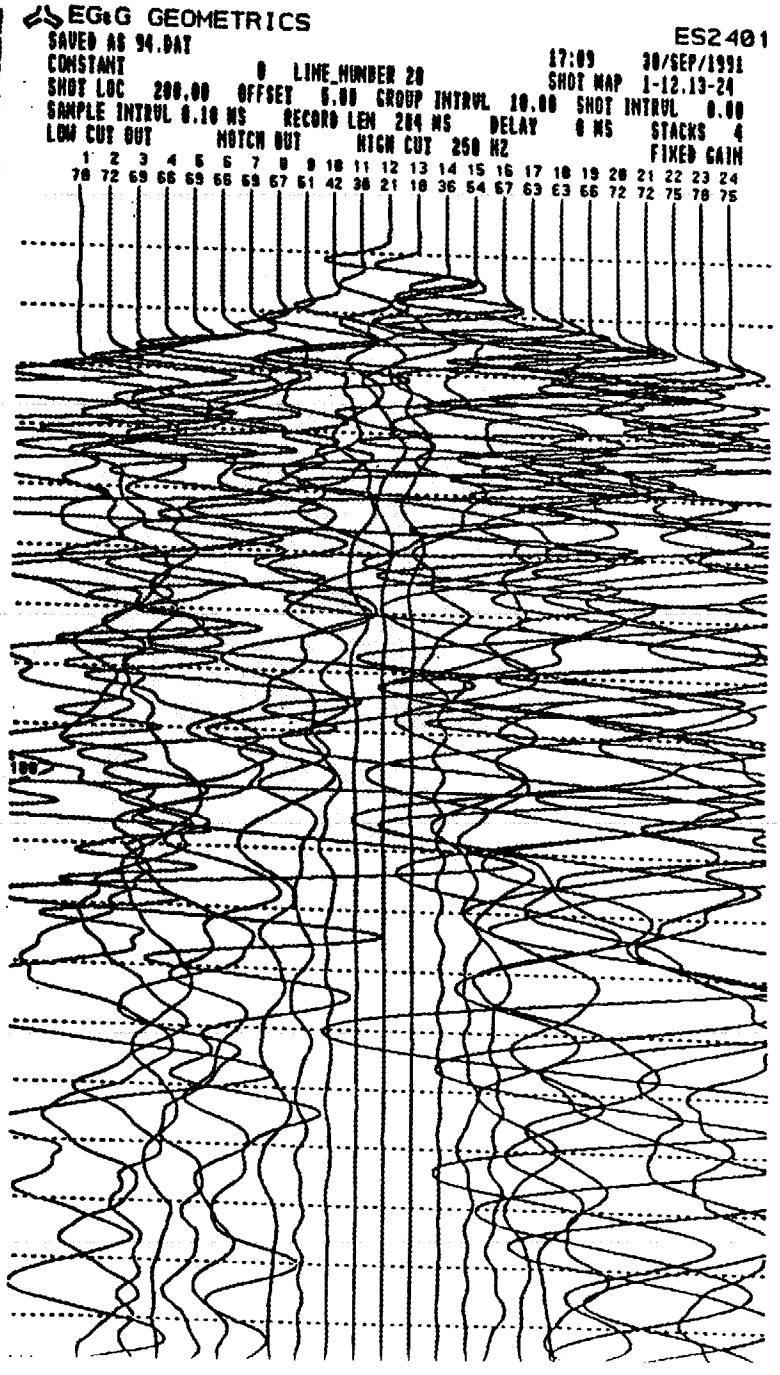

EG&G GEOMETRICS
ES2401
SAVED AS 89.DAT
15:27
30/SEP/1991
CONSTANT
0
LINE NUMBER 26
SHOT MAP
1-24.
SHOT LOC 525.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY
0 MS
STACKS 0
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 84 84 81 81 81 81 81 81 81 78 72 72 75 72 68 66 68 69 54 61 39 27
100
200

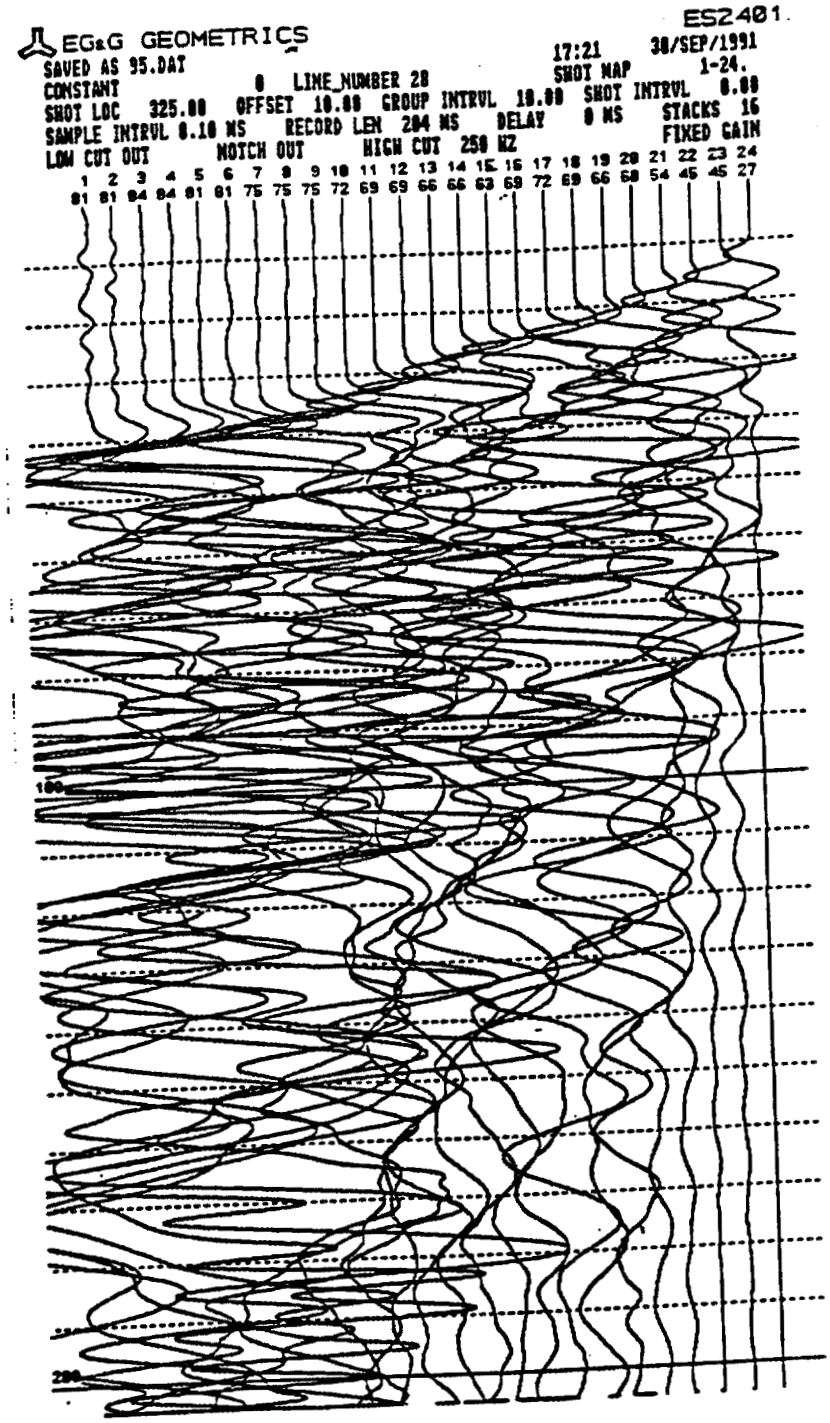

EG&G GEOMETRICS
ES2401
SAVED AS 90.DAT
CONSTANT 0 LINE_NUMBER 27 16:09 30/SEP/1991
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 0
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
30 42 51 57 60 60 63 66 69 66 69 69 69 75 81 81 81 81 84 87 84 84 87 87
100
200

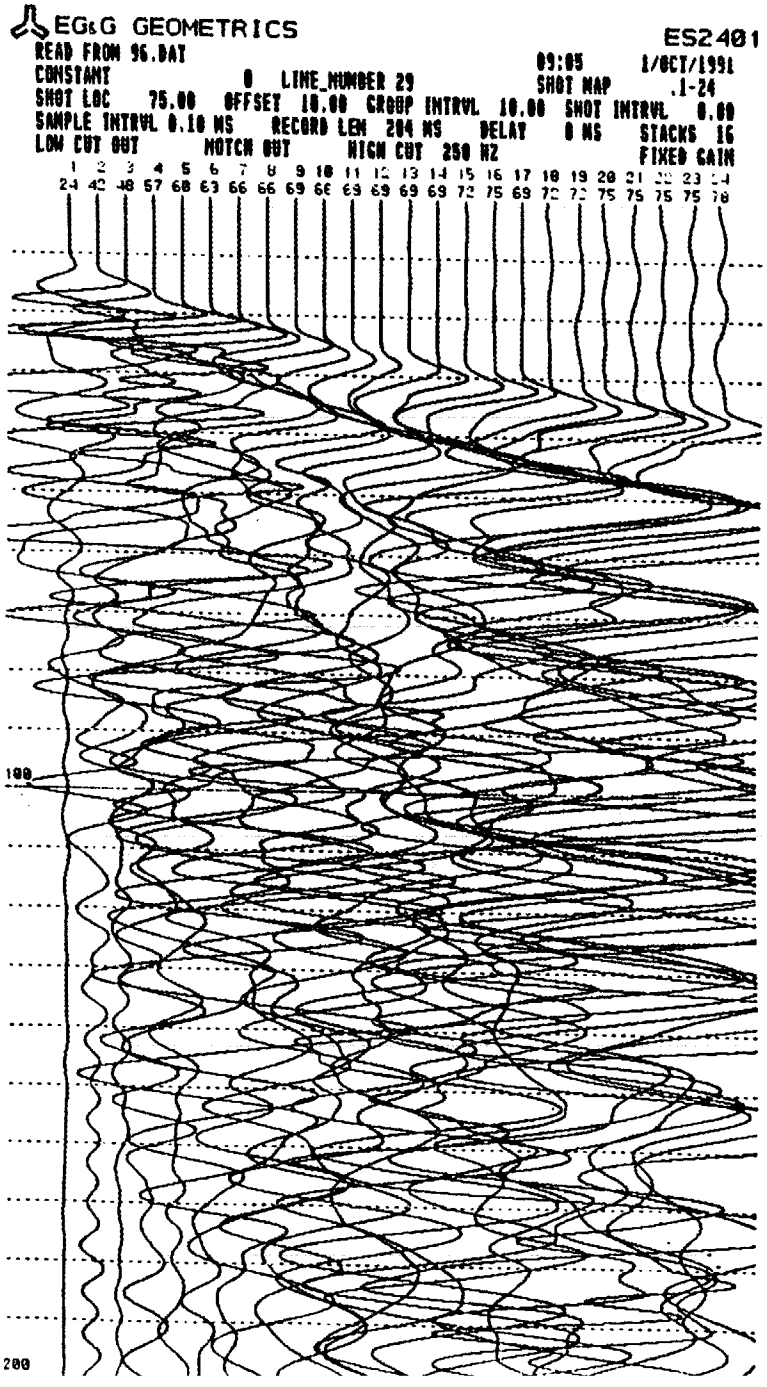

EG&G GEOMETRICS
ES2401
SAVED AS 91.DAT
CONSTANT 0 LINE_NUMBER 27 16:17 30/SEP/1991
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12,13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
75 66 66 63 63 60 60 57 51 51 36 12 06 42 48 63 63 69 72 75 75 78 81 81
100
200

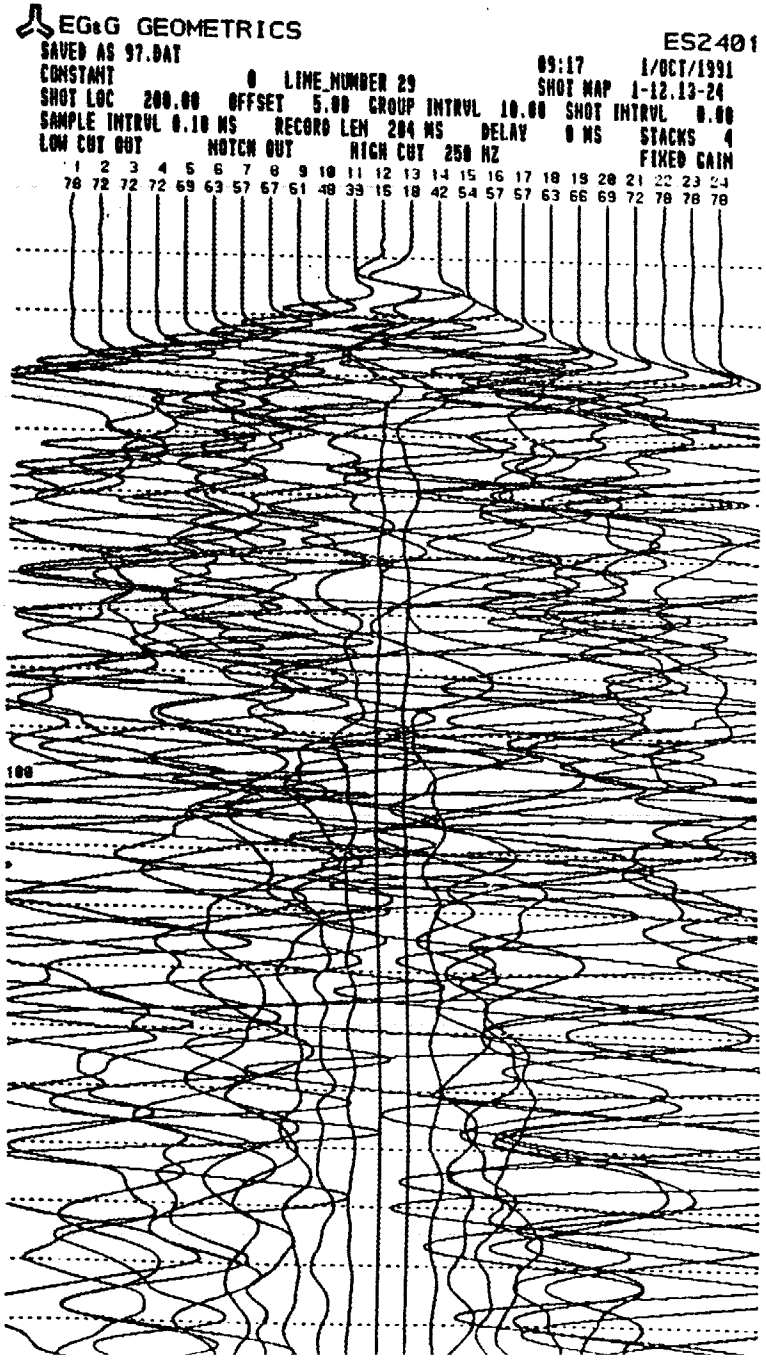

EG&G GEOMETRICS
ES2401
SAVED AS 92.DAT
16:27
30/SEP/1991
SHOT MAP
1-24.
CONSTANT
0 LINE NUMBER 27
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 87 87 87 87 87 87 87 87 84 81 84 81 75 69 69 63 66 60 51 57 42 36
100
200

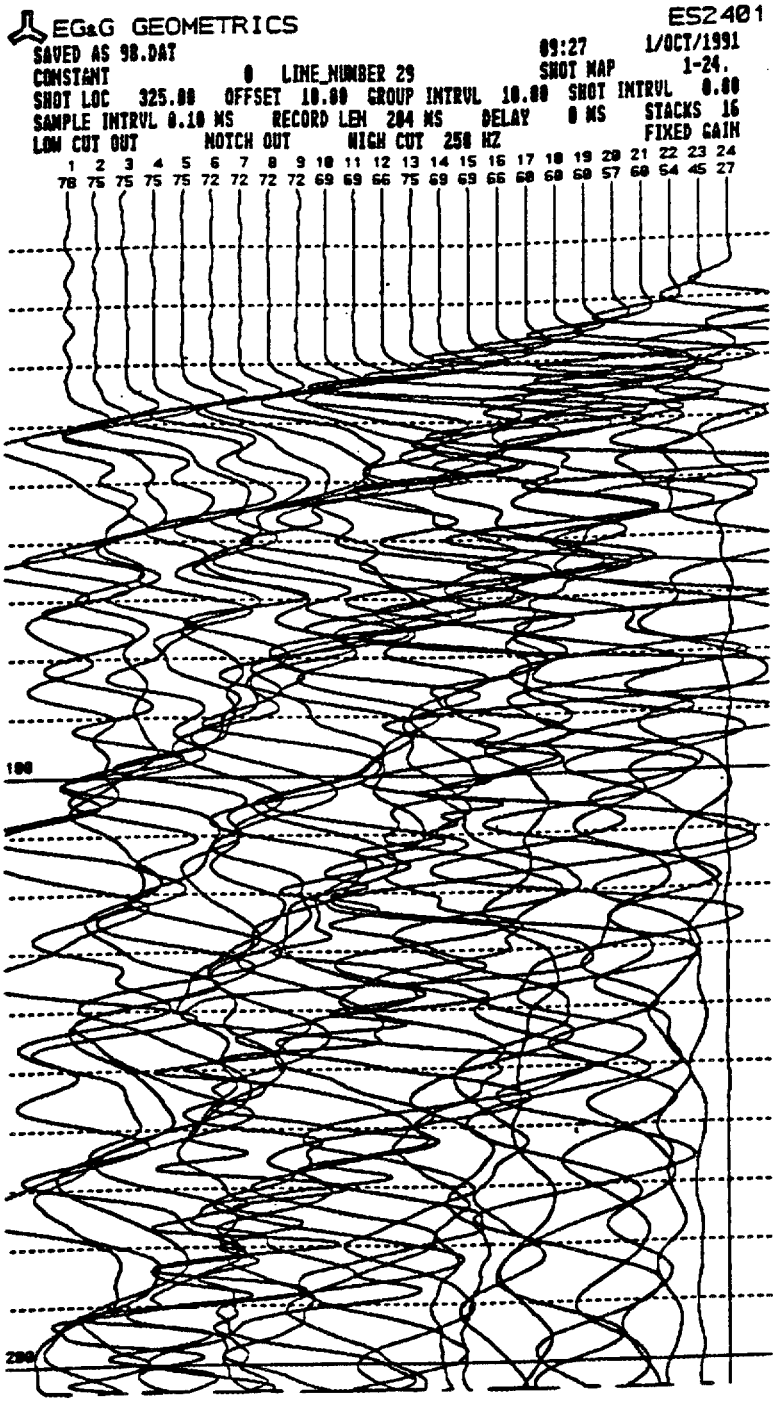

EG&G GEOMETRICS
ES2401
SAVED AS 93.DAT
CONSTANT 0 LINE_NUMBER 20
17:05 30/SEP/1991
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 12
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
33 51 57 63 63 66 66 63 63 66 66 69 72 72 72 78 81 81 81 84 84 84 84 84
100
200

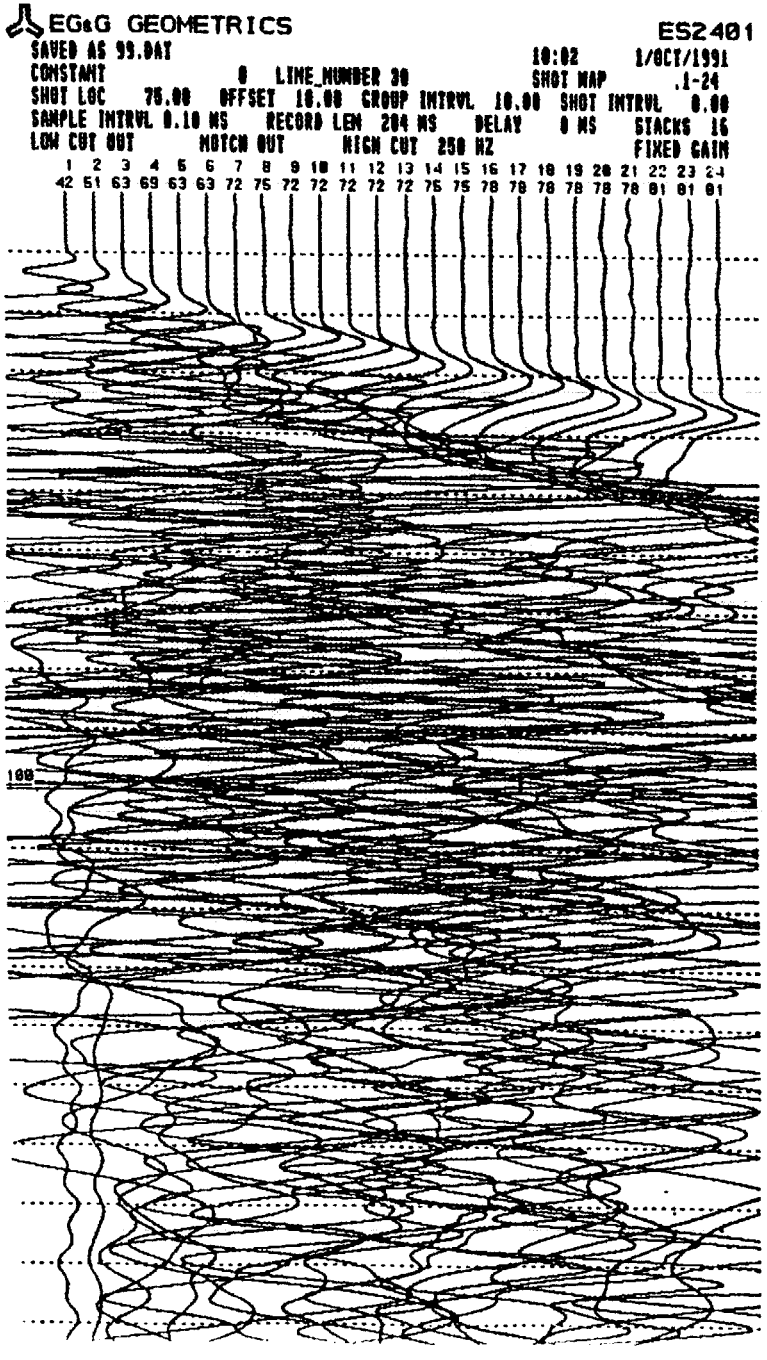

EG&G GEOMETRICS
ES2401
SAVED AS 94.DAT
CONSTANT 0 LINE_NUMBER 20
17:09 30/SEP/1991
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-12,13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 72 69 66 69 66 69 67 51 42 30 21 18 36 54 67 63 63 66 72 72 75 78 75
100

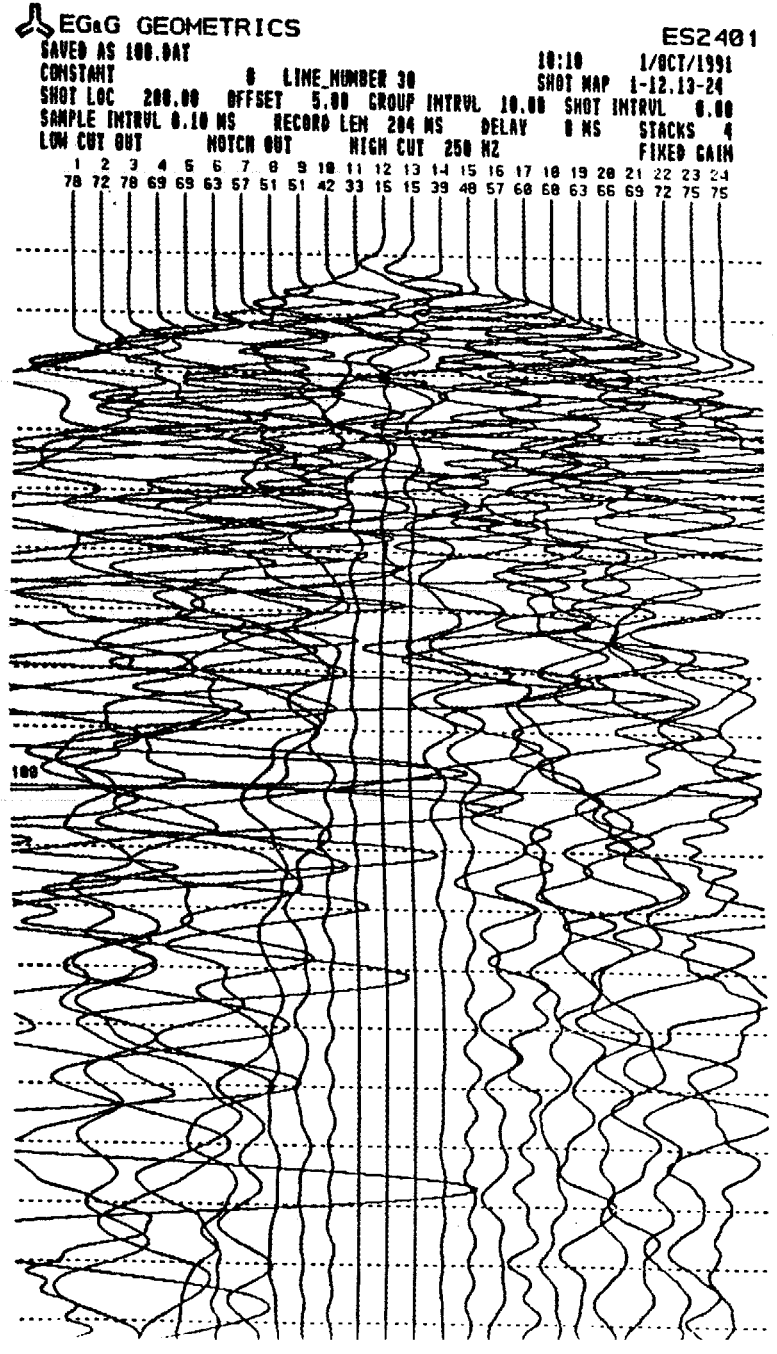

ES2401
EG&G GEOMETRICS
SAVED AS 95.DAT
17:21
30/SEP/1991
SHOT MAP
1-24.
CONSTANT
0 LINE NUMBER 28
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 81 84 84 81 81 75 75 75 72 69 69 66 66 63 69 72 69 66 60 54 45 45 27
100
200

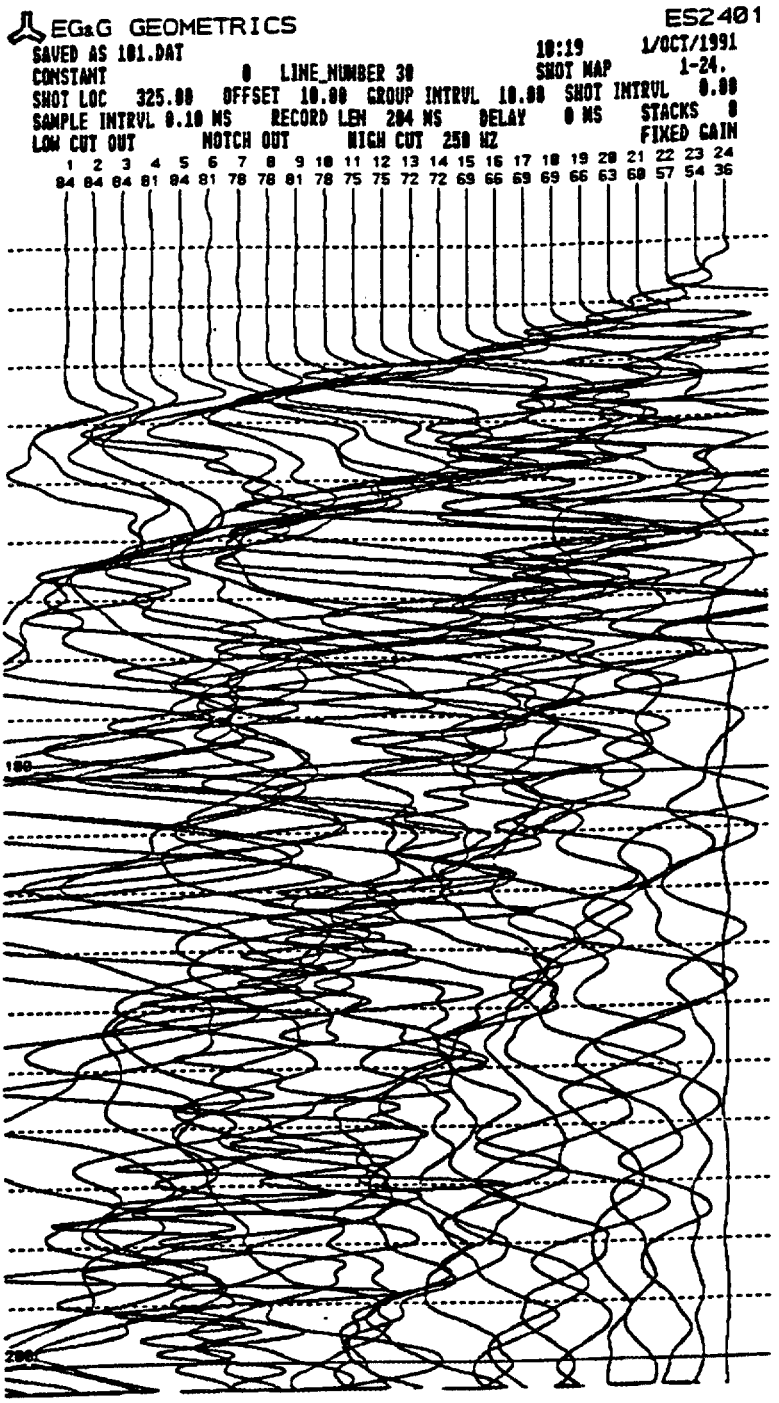

EG&G GEOMETRICS
ES2401
READ FROM 96.DAT
09:05 1/OCT/1991
CONSTANT 0 LINE_NUMBER 29
SHOT MAP .1-24
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
24 42 48 57 68 63 66 66 69 66 69 69 69 69 72 75 69 72 72 75 75 75 75 78
100
200

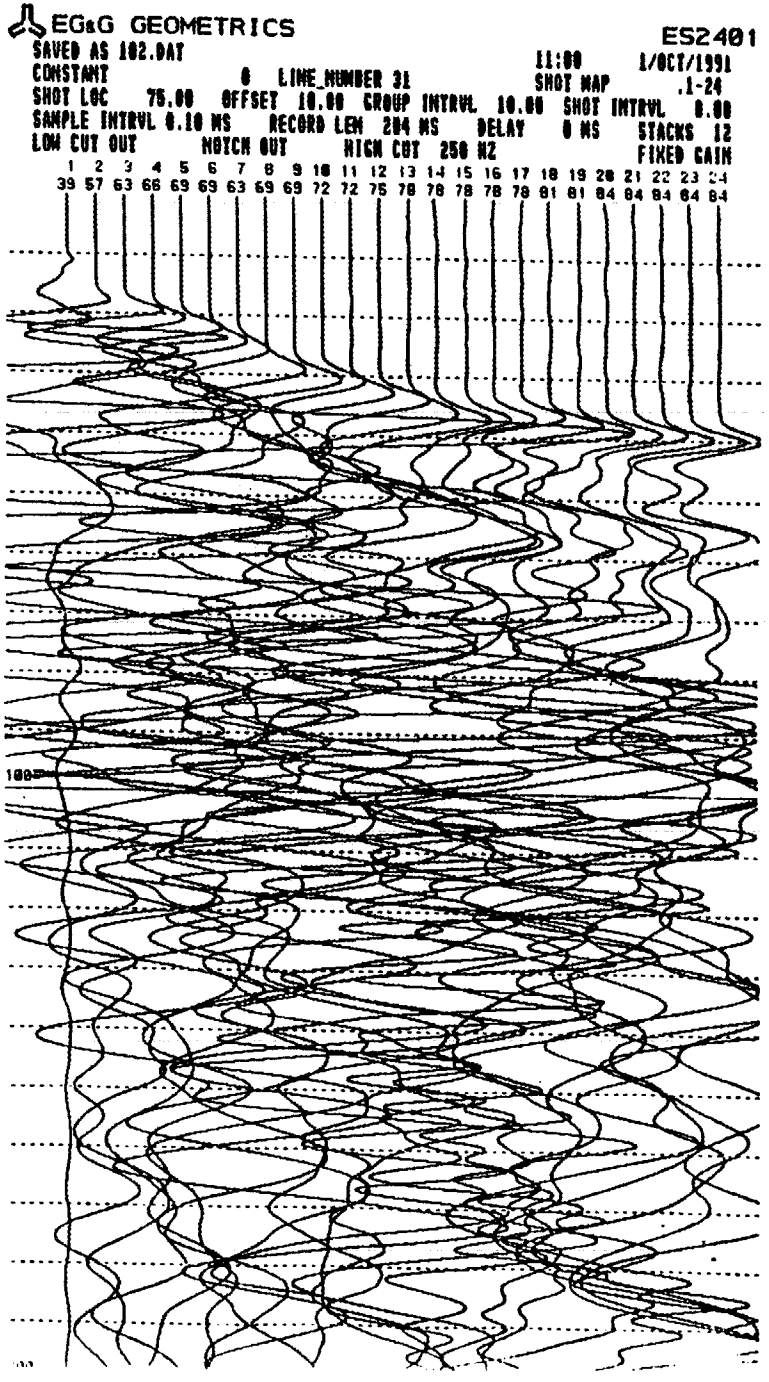

EG&G GEOMETRICS
ES2401
SAVED AS 97.DAT
09:17 1/OCT/1991
CONSTANT 0 LINE_NUMBER 29
SHOT MAP 1-12.13-24
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 72 72 72 69 63 57 67 61 48 39 15 18 42 54 57 57 63 66 69 72 78 78 78
100

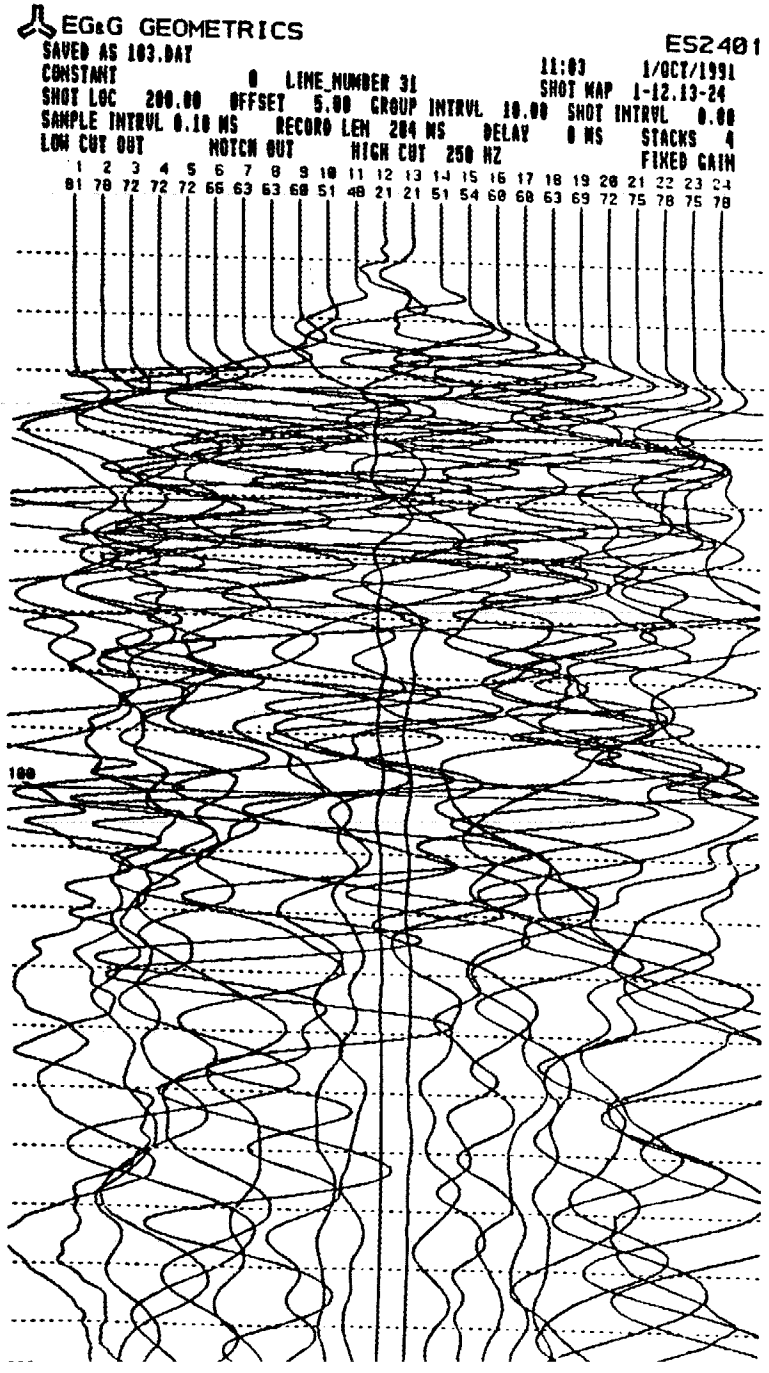

EG&G GEOMETRICS
ES2401
SAVED AS 98.DAT
09:27
1/OCT/1991
CONSTANT
0
LINE_NUMBER 29
SHOT MAP
1-24.
SHOT LOC 325.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY
0 MS
STACKS 16
FIXED GAIN
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 75 75 75 75 72 72 72 72 69 69 66 75 69 69 66 60 60 60 57 60 54 45 27
100
200

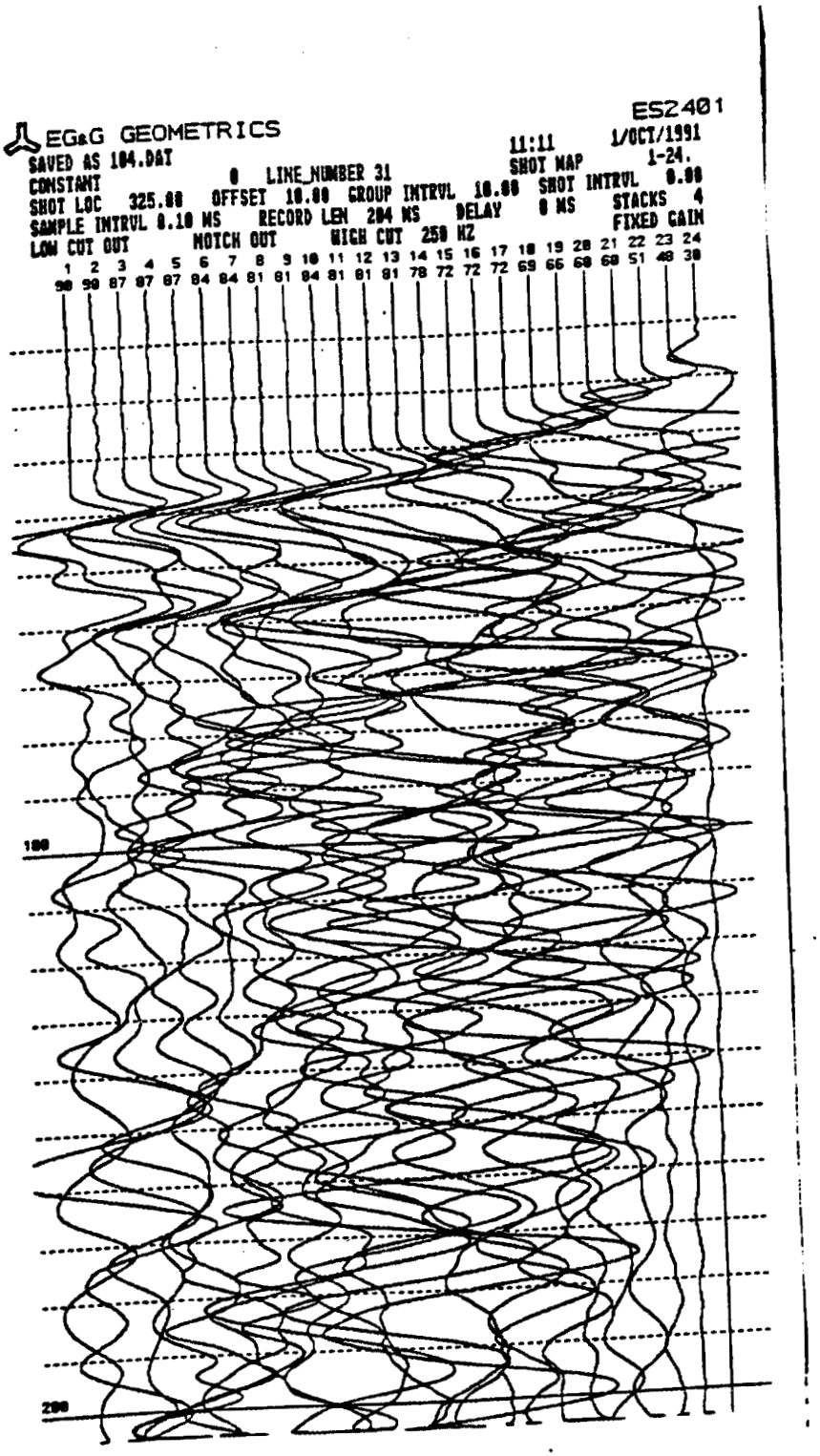

EG&G GEOMETRICS
ES2401
SAVED AS 99.DAT
10:02 1/OCT/1991
CONSTANT 0 LINE NUMBER 30
SHOT MAP .1-24
SHOT LOC 75.00 OFFSET 16.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
42 51 63 69 63 63 72 75 72 72 72 72 72 72 75 75 78 78 78 78 78 78 81 81 81
100

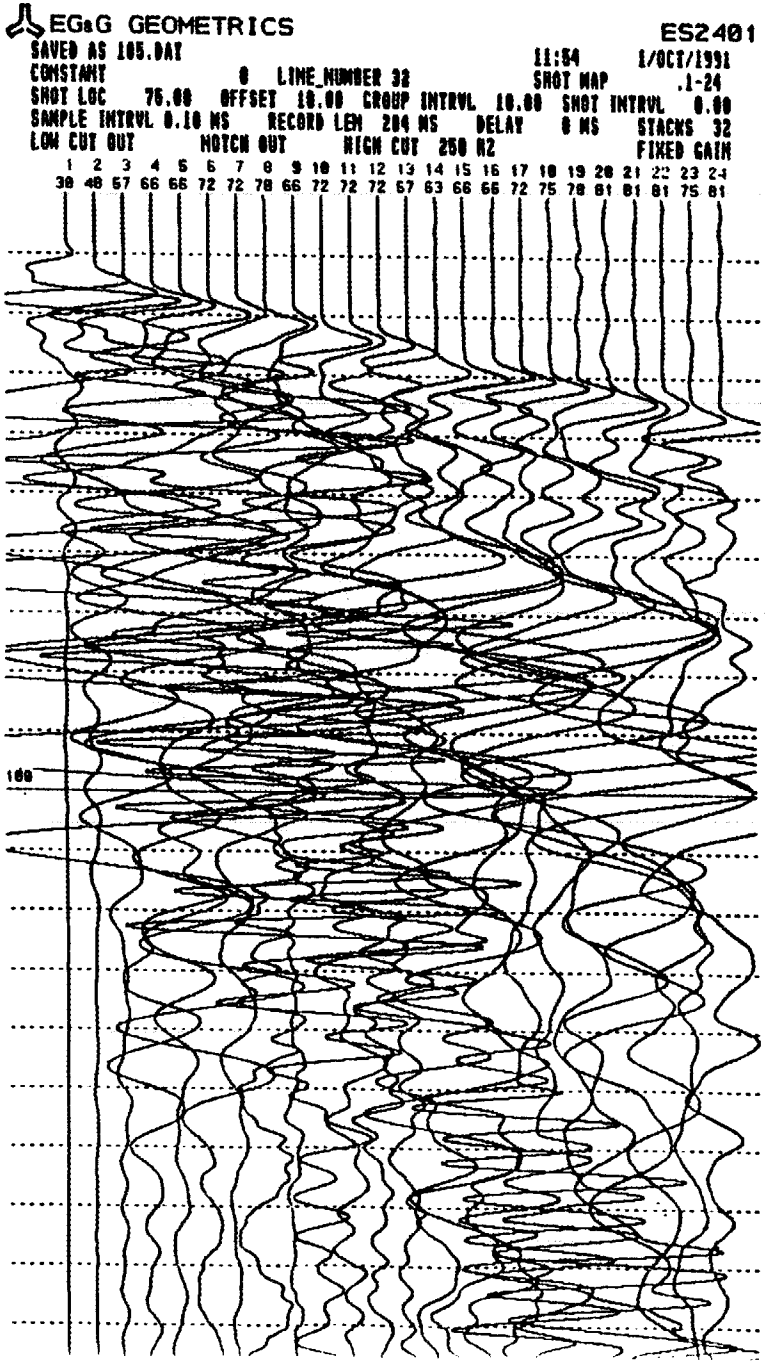

EG&G GEOMETRICS
ES2401
SAVED AS 100.DAT
10:10 1/OCT/1991
CONSTANT 0 LINE NUMBER 30
SHOT MAP 1-12,13-24
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 72 78 69 69 63 57 51 51 42 33 15 15 39 48 57 60 60 63 66 69 72 75 75
100

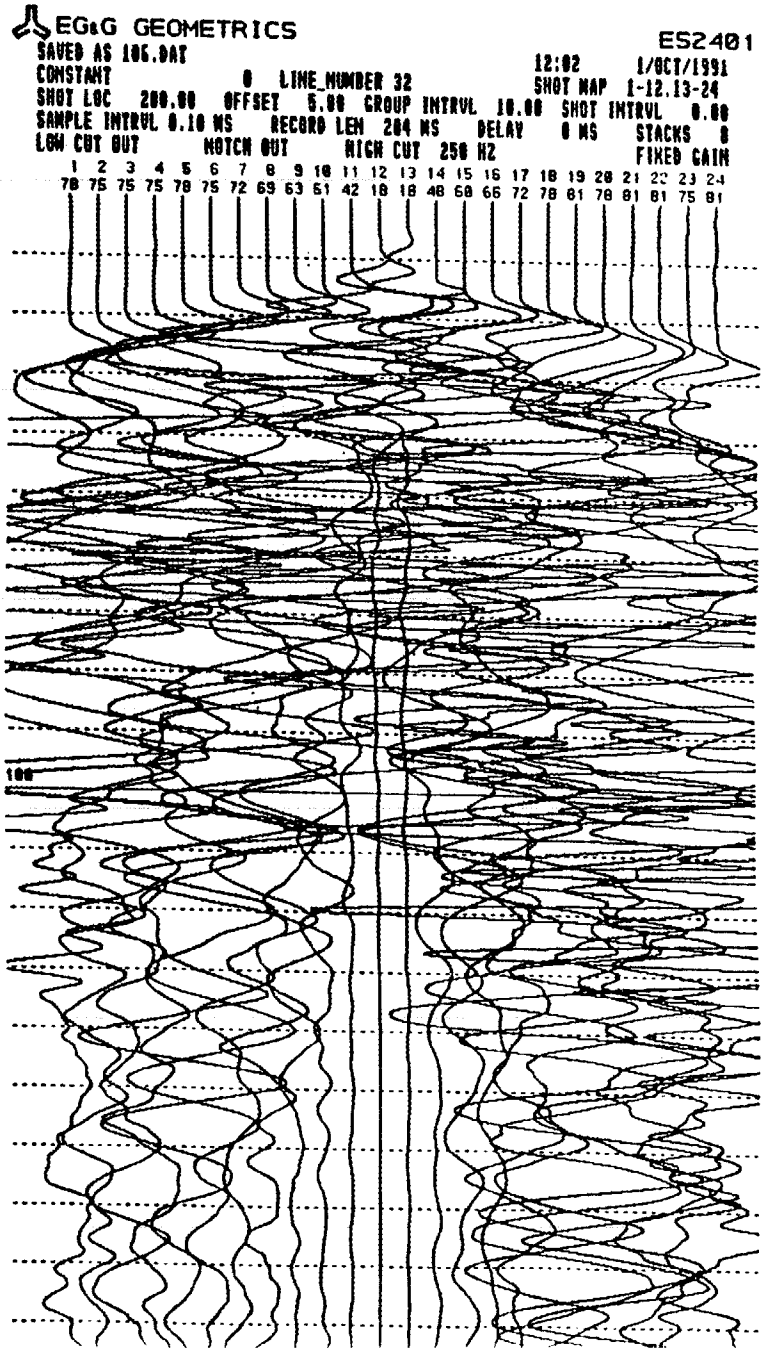

EG&G GEOMETRICS
ES2401
SAVED AS 101.DAT
10:19
1/OCT/1991
CONSTANT 0 LINE NUMBER 30
SHOT MAP 1-24.
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 84 81 84 81 78 78 81 78 75 75 72 72 69 66 69 69 66 63 60 57 54 36
100
200

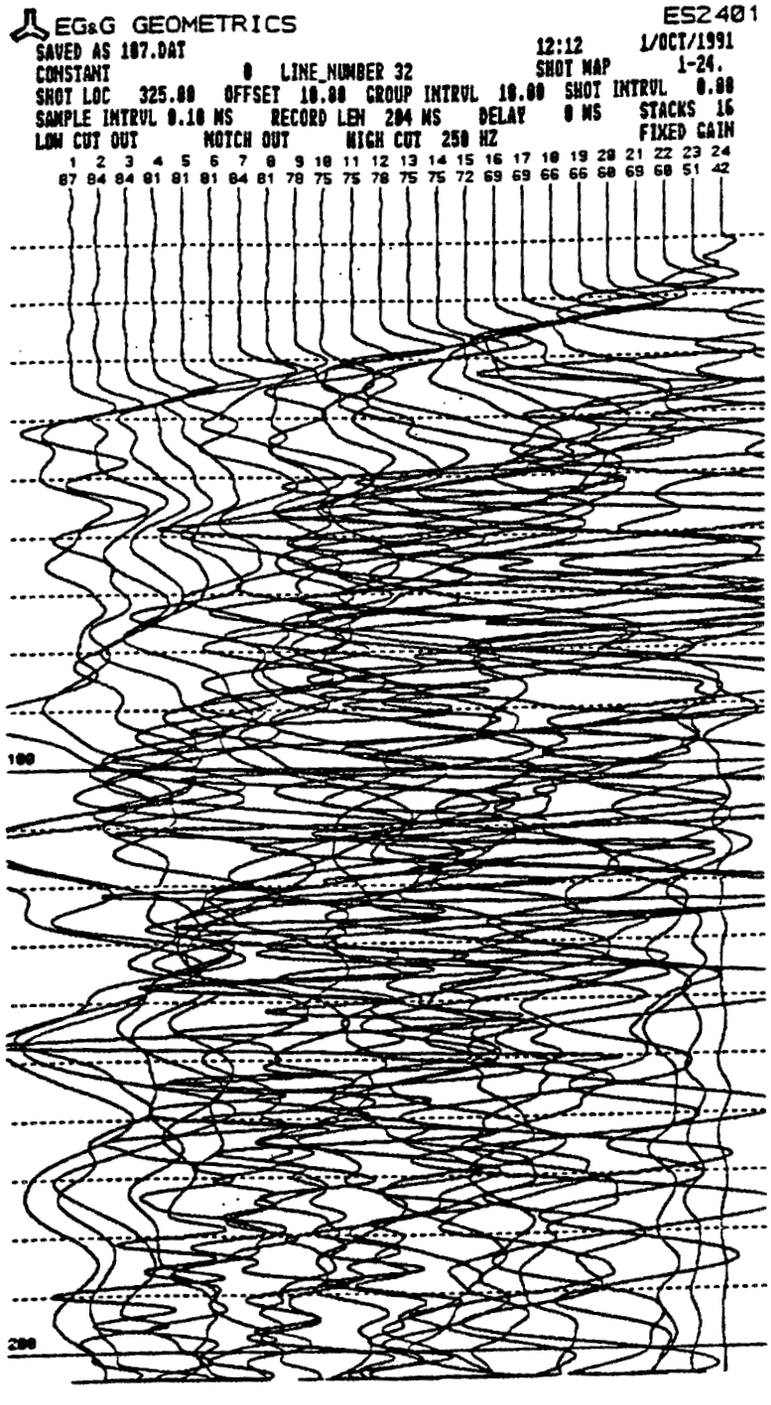

EG&G GEOMETRICS
ES2401
SAVED AS 102.DAT
11:00 1/OCT/1991
CONSTANT 0 LINE NUMBER 31
SHOT MAP .1-24
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 12
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
39 57 63 66 69 69 63 69 69 72 72 75 78 78 78 78 78 81 81 84 84 84 84 84
100

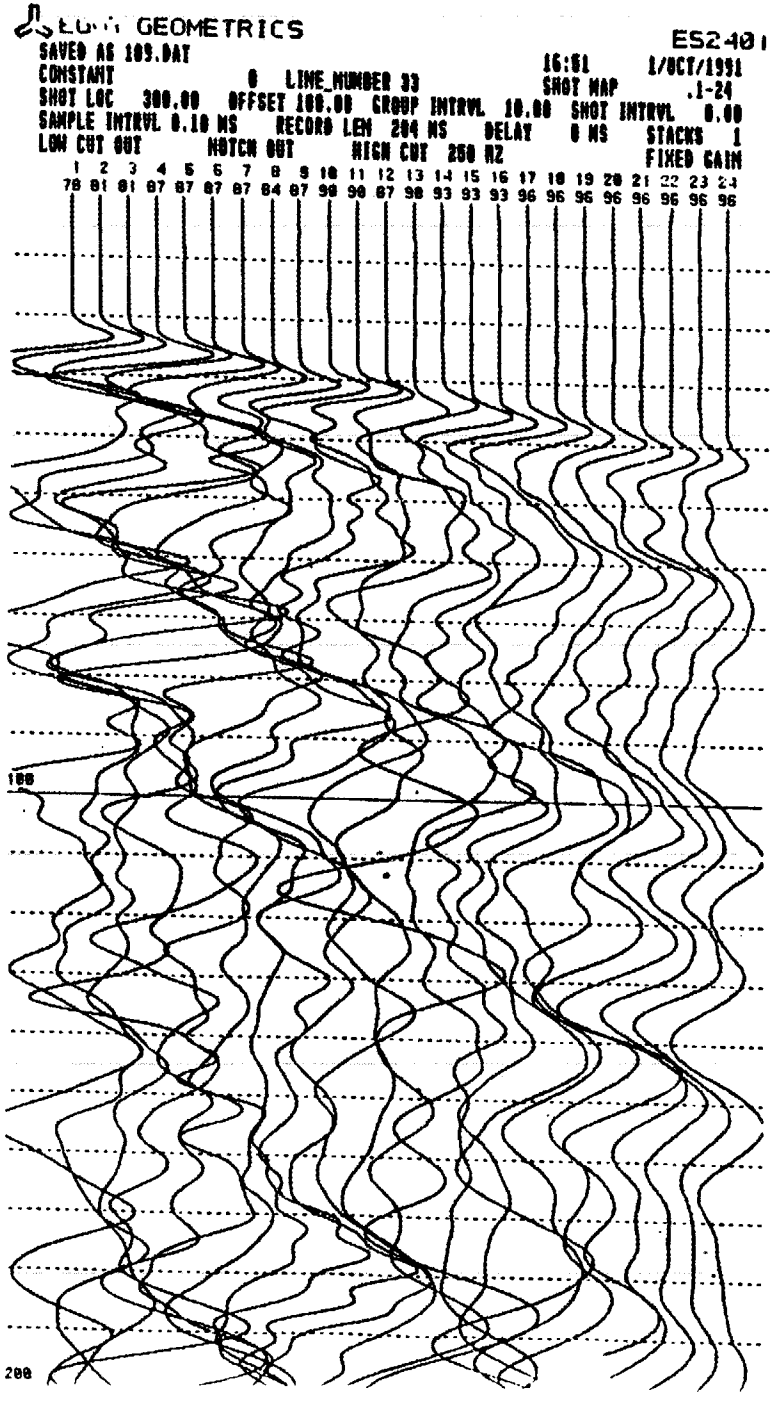

EG&G GEOMETRICS
ES2401
SAVED AS 103.DAT
11:03 1/OCT/1991
CONSTANT 0 LINE NUMBER 31
SHOT MAP 1-12.13-24
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 78 72 72 72 66 63 63 60 51 48 21 21 51 54 60 60 63 69 72 75 78 75 78
100

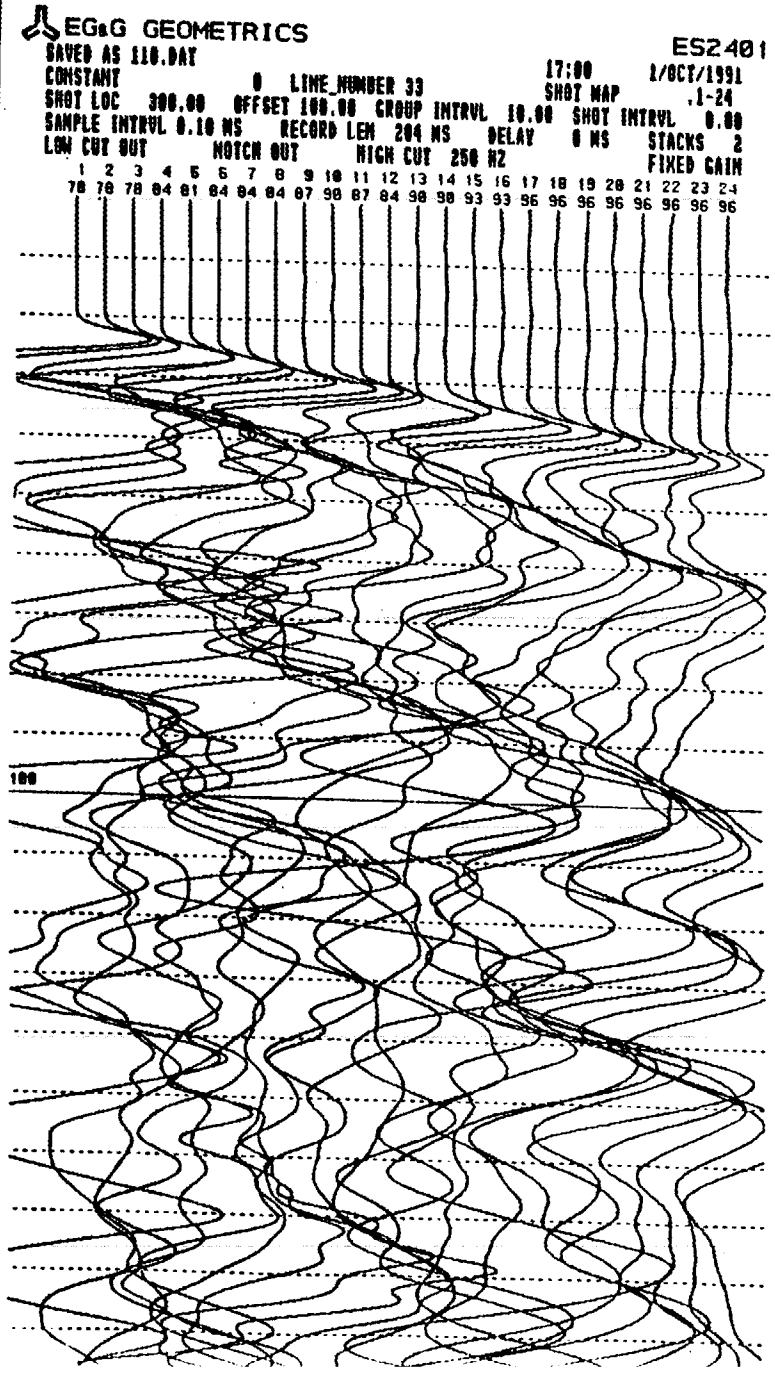

ES2401
EG&G GEOMETRICS
11:11
1/OCT/1991
SAVED AS 104.DAT
SHOT MAP
1-24.
CONSTANT
0 LINE NUMBER 31
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 90 87 87 87 84 84 81 81 84 81 81 81 78 72 72 72 69 66 60 60 51 48 30
100
200

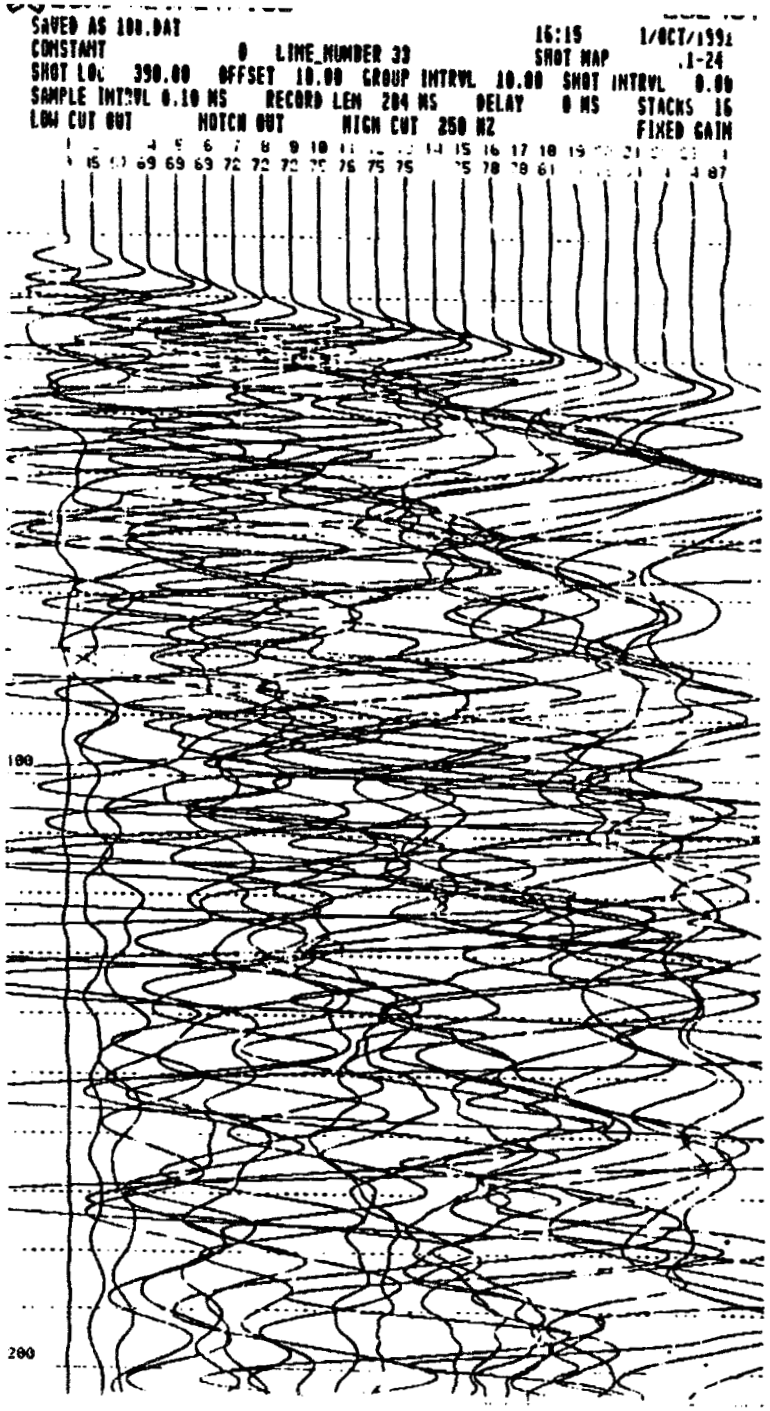

EG&G GEOMETRICS
ES2401
SAVED AS 105.DAT
11:54 1/OCT/1991
CONSTANT 0 LINE_NUMBER 32
SHOT MAP .1-24
SHOT LOC 75.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 32
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
30 48 57 66 66 72 72 78 66 72 72 72 67 63 66 66 72 75 78 81 81 81 75 81
100

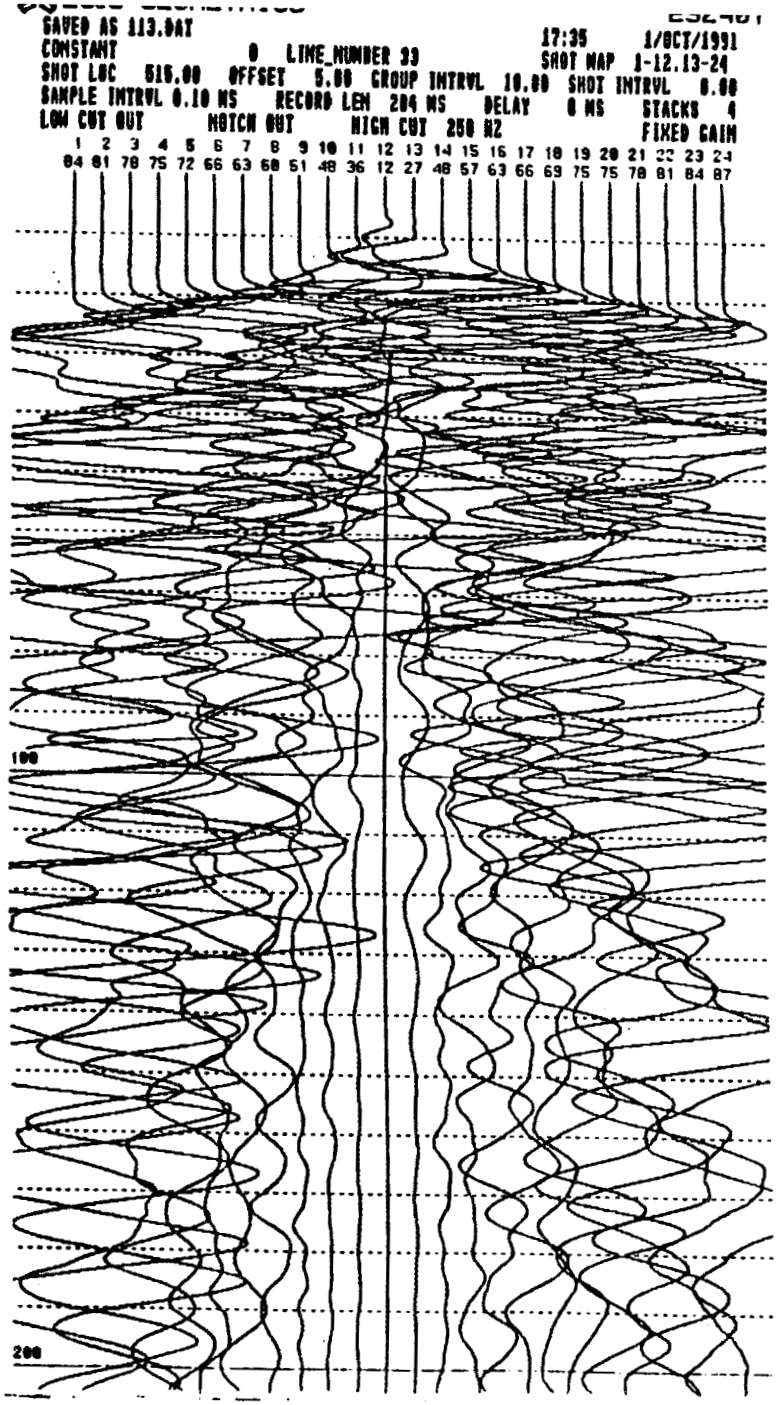

EG&G GEOMETRICS
ES2401
SAVED AS 105.DAT
12:02 1/OCT/1991
CONSTANT 0 LINE_NUMBER 32
SHOT MAP 1-12.13-24
SHOT LOC 200.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 75 75 75 78 75 72 69 63 51 42 18 18 48 60 66 72 78 81 78 81 81 75 81
100

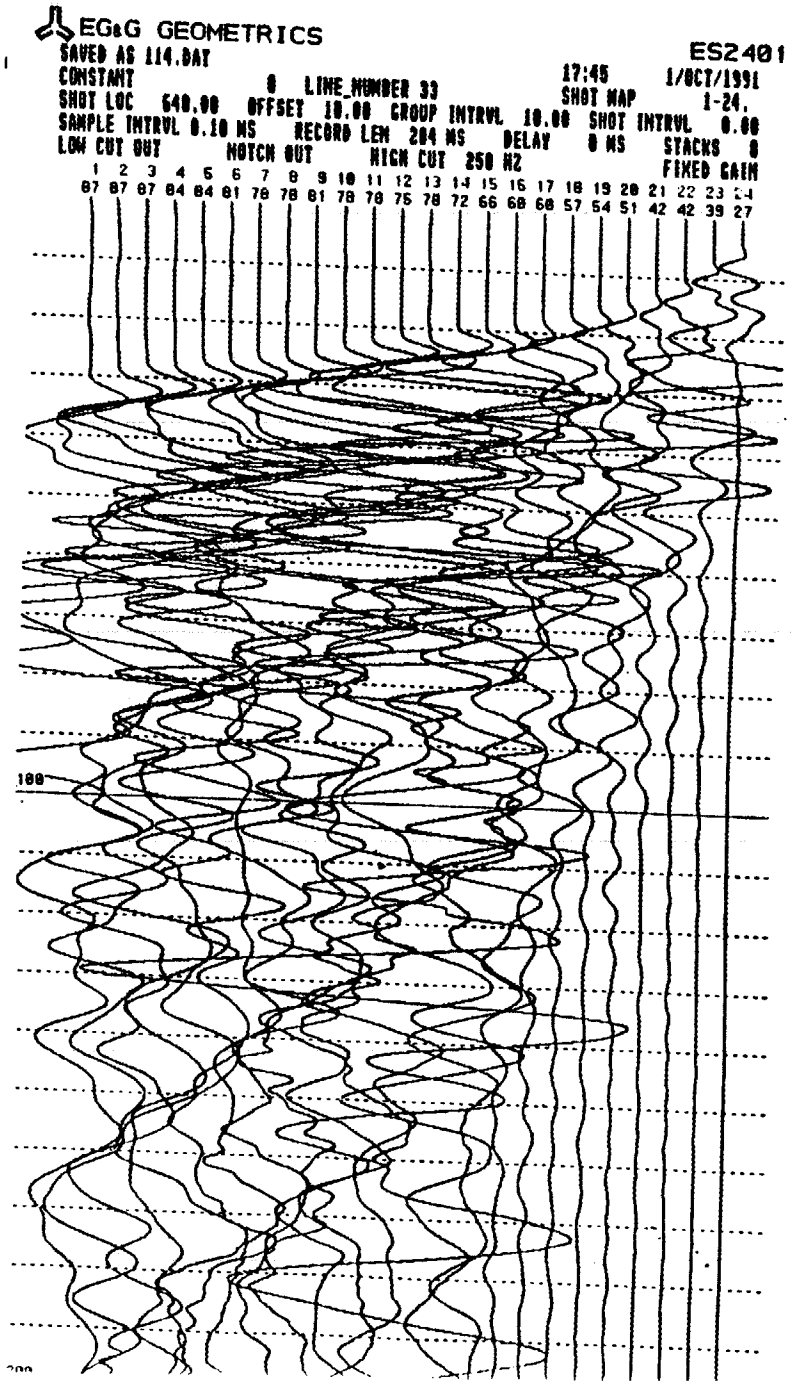

EG&G GEOMETRICS
ES2401
SAVED AS 107.DAT
12:12
1/OCT/1991
CONSTANT 0 LINE_NUMBER 32
SHOT MAP 1-24.
SHOT LOC 325.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 84 81 81 81 84 81 78 75 75 78 75 75 72 69 69 66 66 60 69 60 51 42
100
200

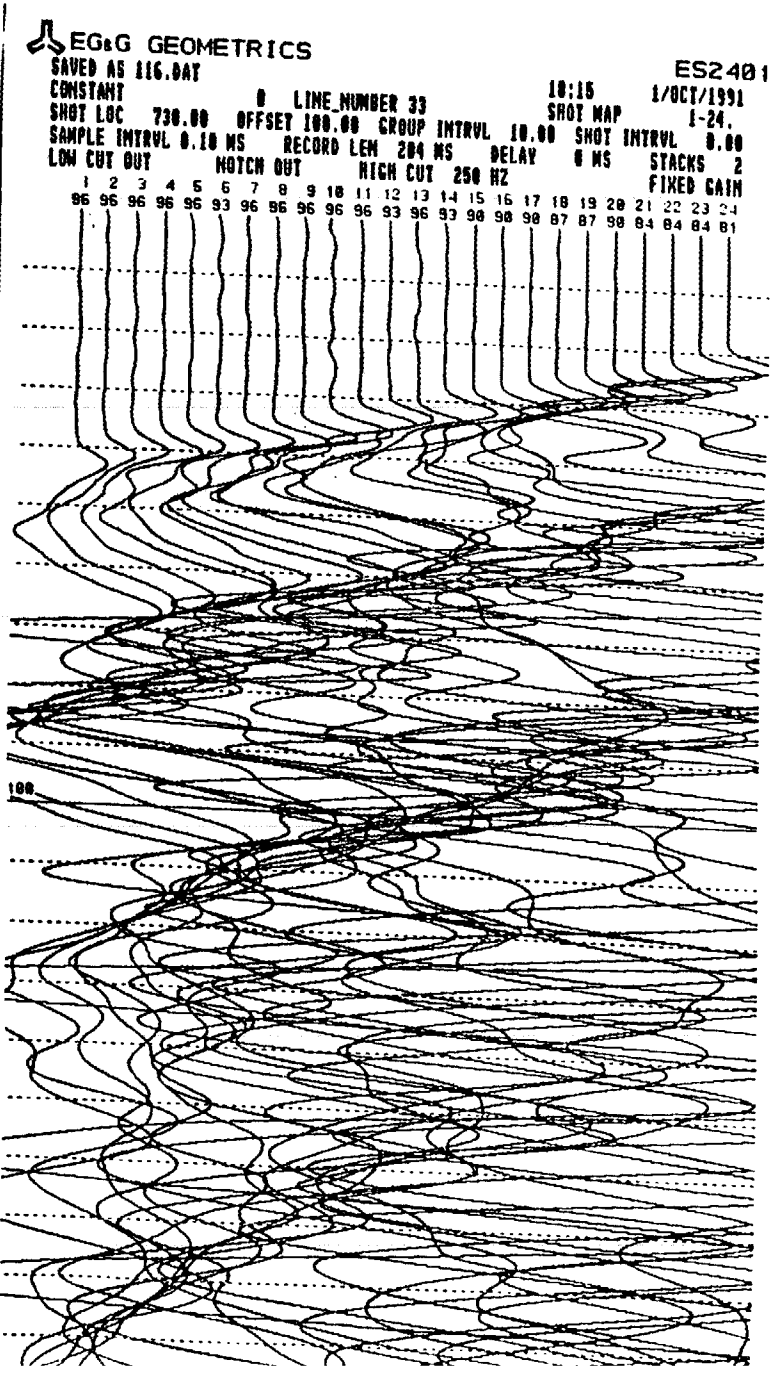

EG&G GEOMETRICS
ES2401
SAVED AS 109.DAT
CONSTANT 0 LINE_NUMBER 33 16:01 1/OCT/1991
SHOT LOC 300.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 1
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 81 81 87 87 87 87 84 87 90 90 87 90 93 93 93 96 96 96 96 96 96 96 96
100
200

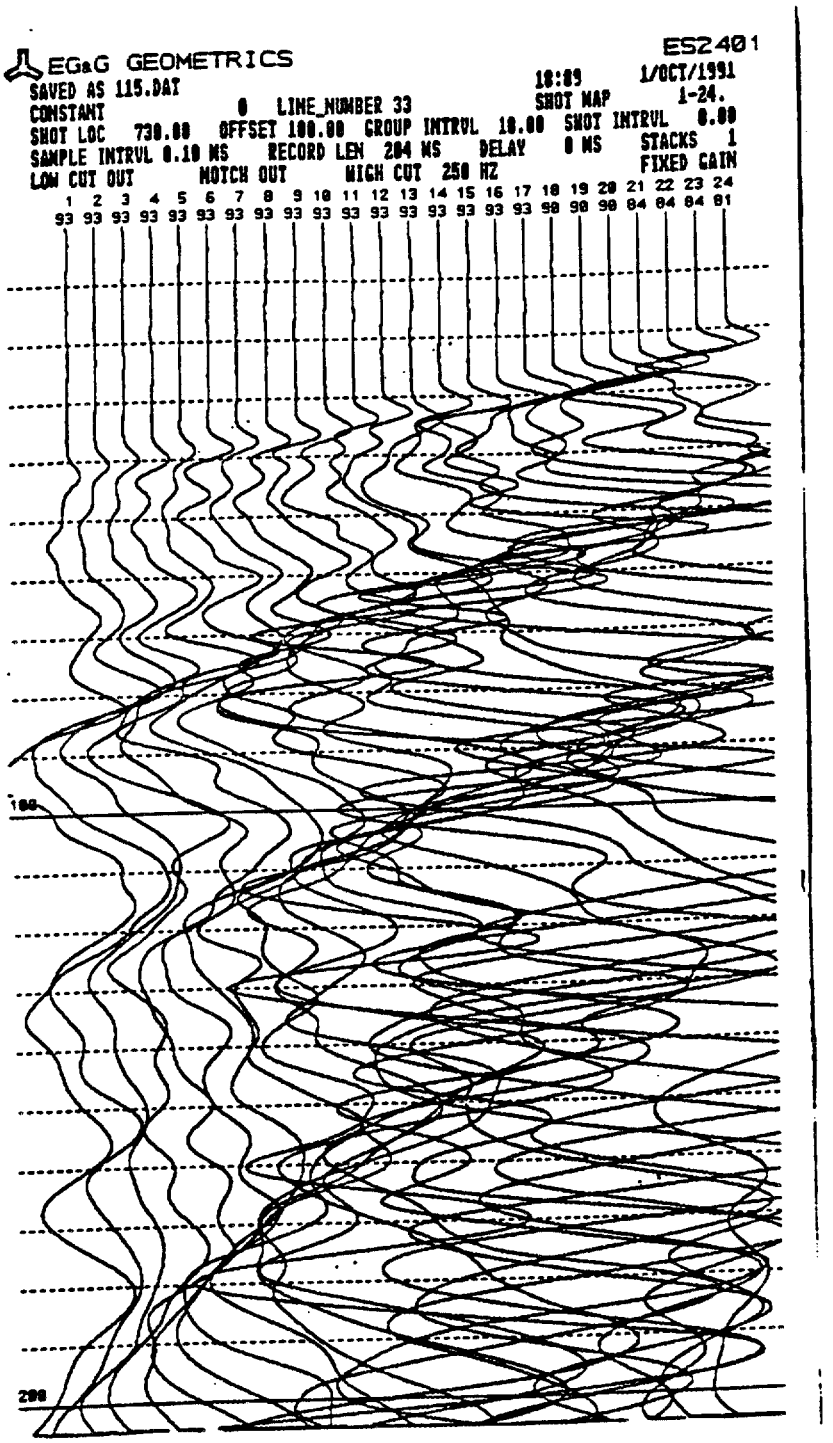

EG&G GEOMETRICS
ES2401
SAVED AS 110.DAT
CONSTANT 0 LINE_NUMBER 33 17:00 1/OCT/1991
SHOT LOC 300.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 78 78 84 81 84 84 84 87 90 87 84 90 90 93 93 96 96 96 96 96 96 96 96
100

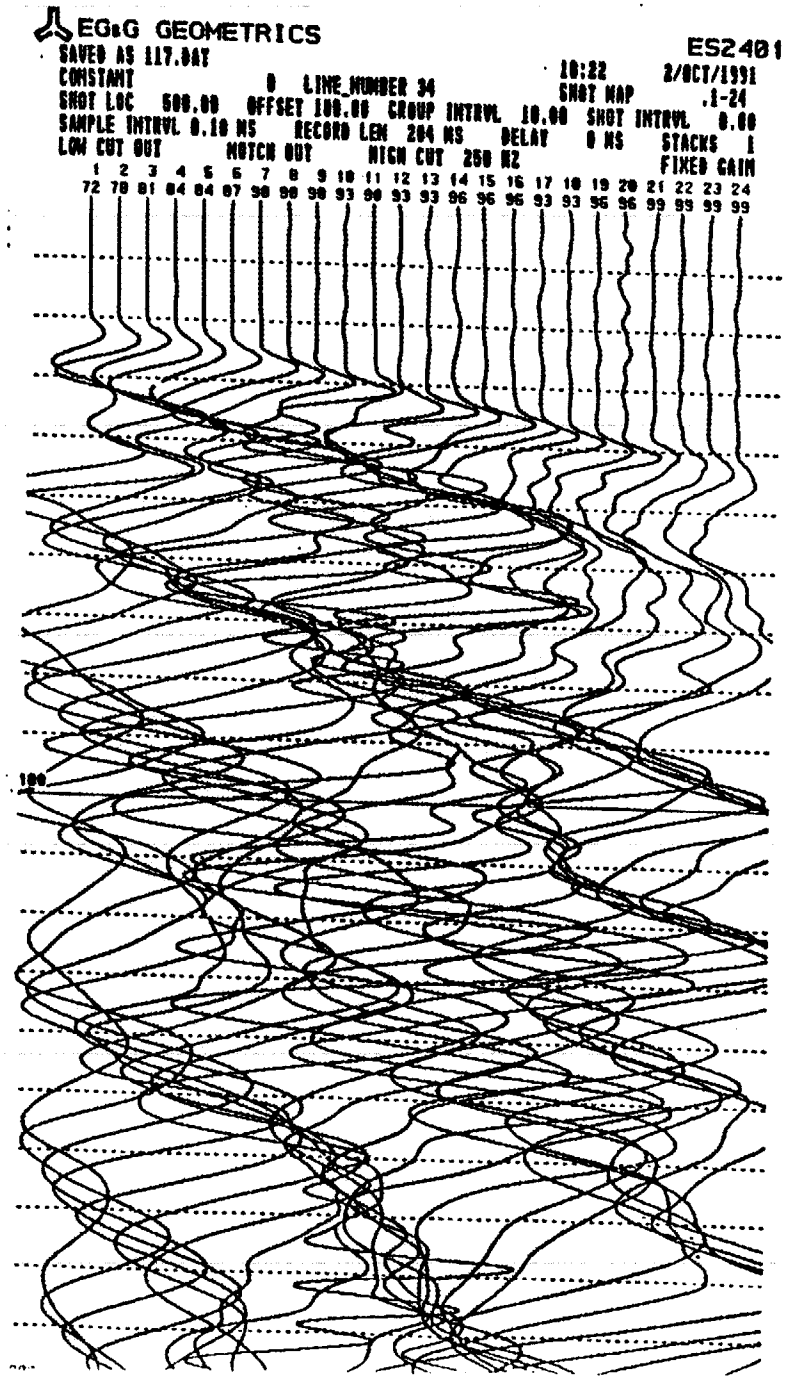

SAVED AS 100.DAT
CONSTANT 0 LINE NUMBER 33
16:15 1/OCT/1991
SHOT MAP .1-24
SHOT LOC 390.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
100
200

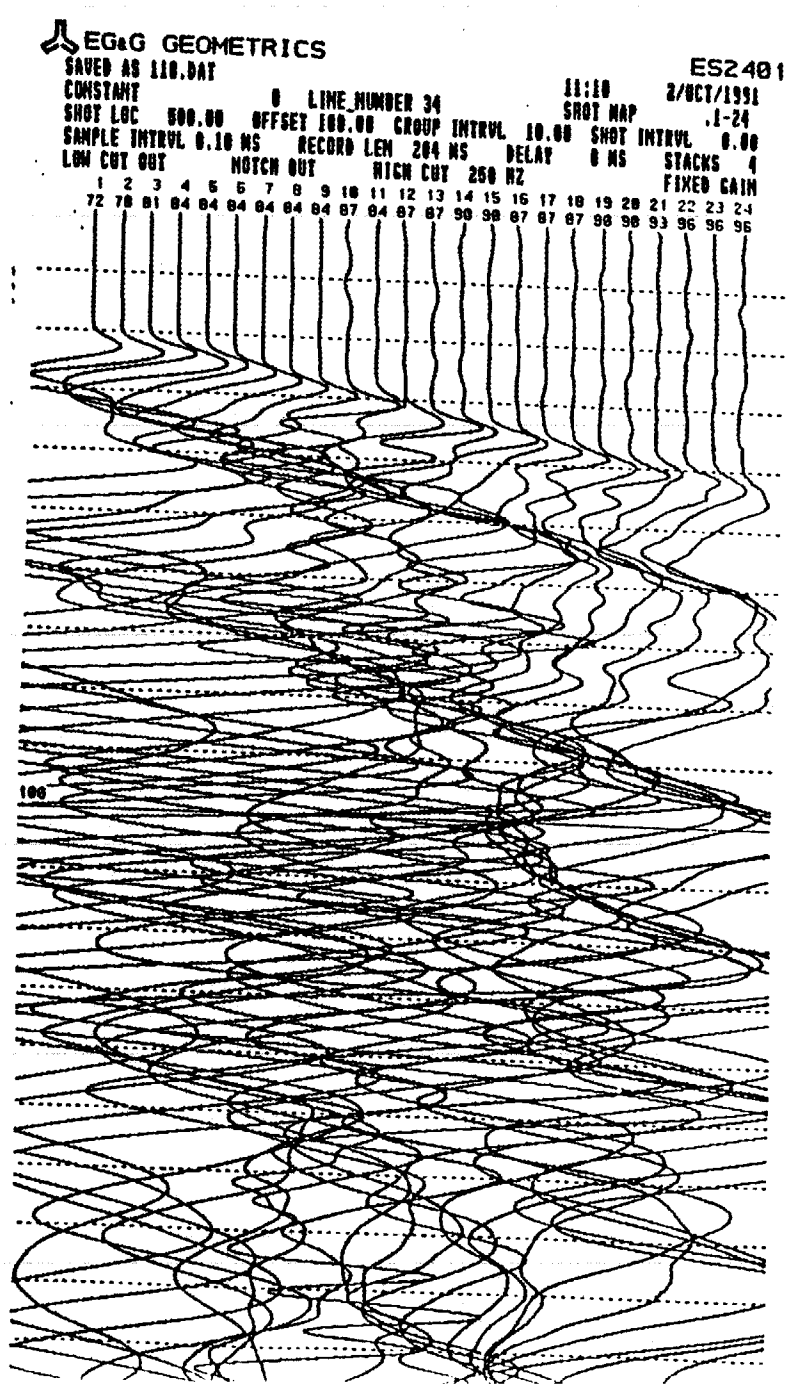

SAVED AS 113.DAT
CONSTANT 0 LINE NUMBER 33
17:35 1/OCT/1991
SHOT MAP 1-12.13-24
SHOT LOC 516.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 81 78 75 72 66 63 60 51 48 36 12 27 48 57 63 66 69 75 75 78 81 84 87
100
200

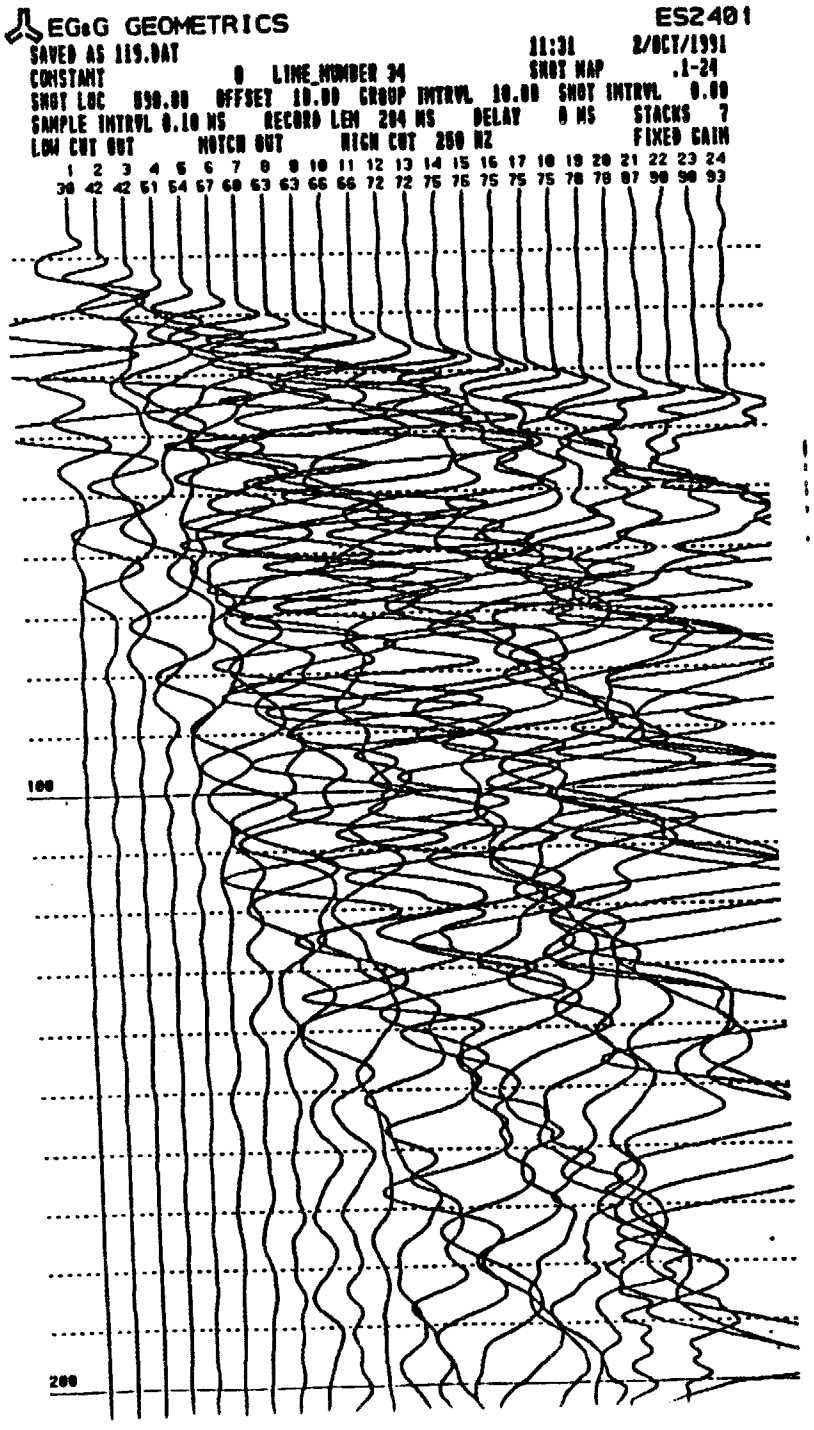

EG&G GEOMETRICS
ES2401
SAVED AS 114.DAT
CONSTANT 0 LINE NUMBER 33 17:45 1/OCT/1991
SHOT LOC 640.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 0
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 87 84 84 81 78 78 81 78 78 75 78 72 66 60 60 57 54 51 42 42 39 27
100

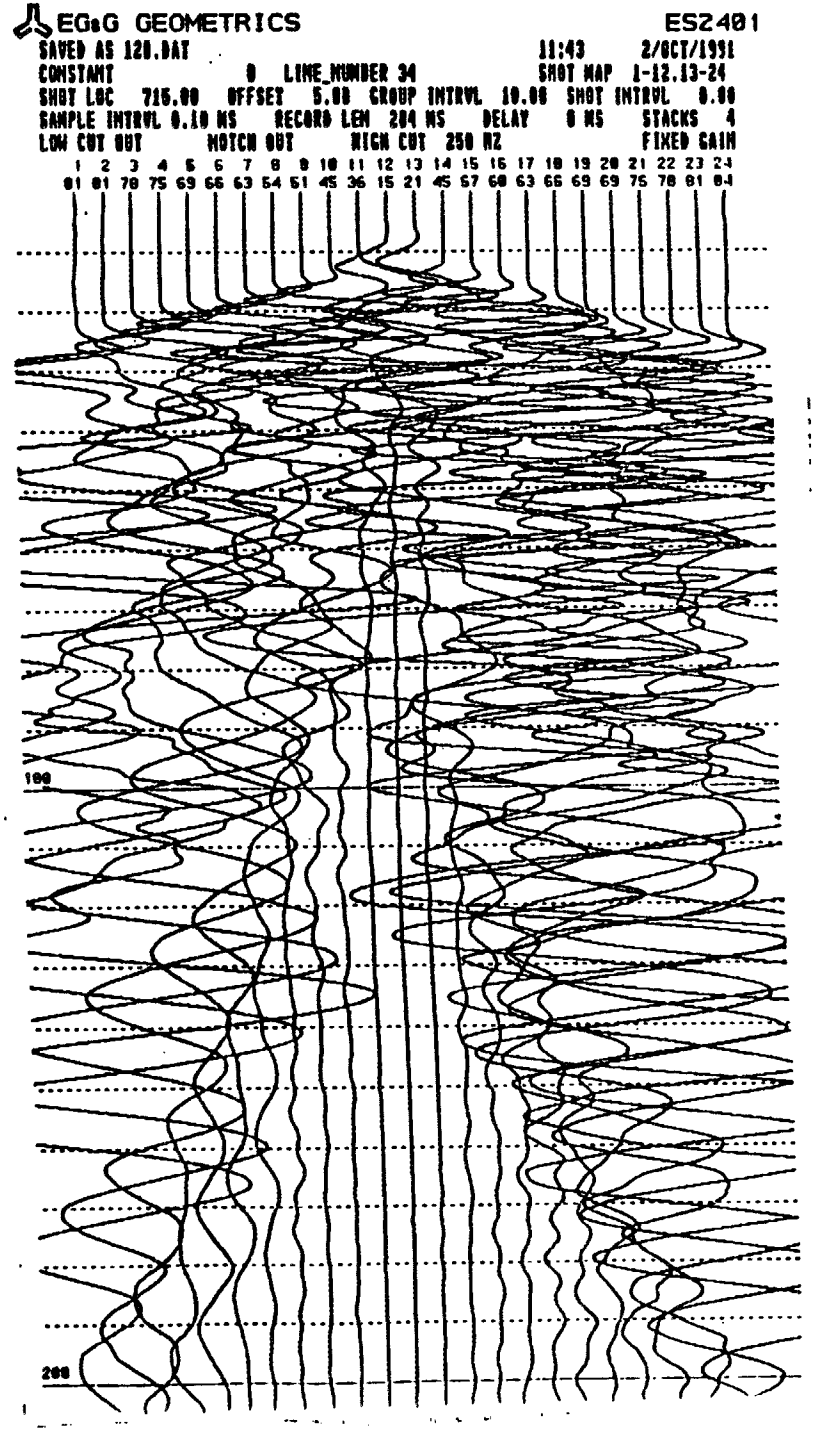

EG&G GEOMETRICS
ES2401
SAVED AS 116.DAT
CONSTANT 0 LINE NUMBER 33 18:15 1/OCT/1991
SHOT LOC 730.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 2
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
96 96 96 96 96 93 96 96 96 96 96 93 96 93 90 90 90 87 87 90 84 84 84 81
100

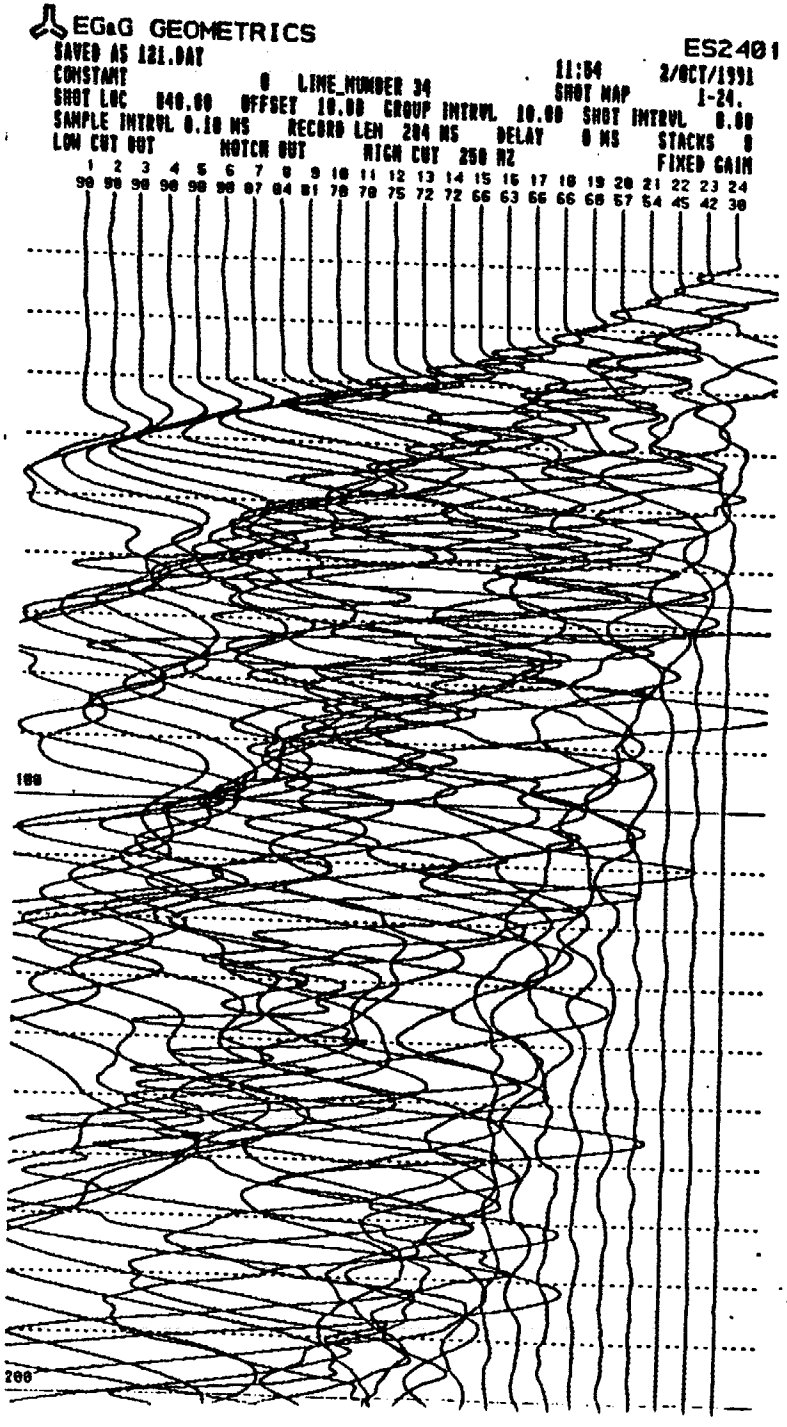

EGaG GEOMETRICS
ES2401
SAVED AS 115.DAT
18:09
1/OCT/1991
CONSTANT
0 LINE_NUMBER 33
SHOT MAP
1-24.
SHOT LOC 730.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 1
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 93 93 93 93 93 93 93 93 93 93 93 93 93 93 90 90 90 84 84 84 81
100
200

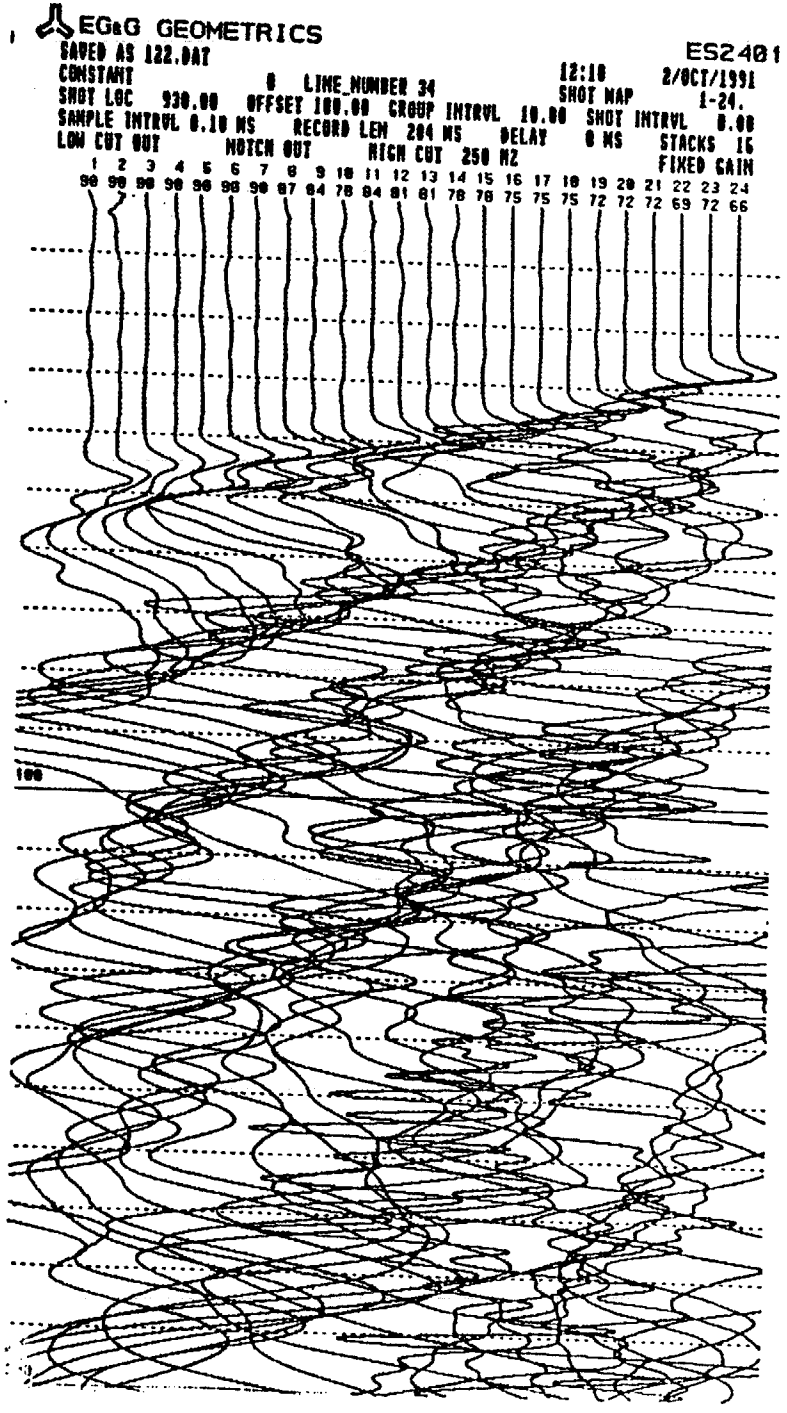

EG&G GEOMETRICS
ES2401
SAVED AS 117.DAT
CONSTANT 0 LINE NUMBER 34 10:22 2/OCT/1991
SHOT LOC 500.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 1
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
72 78 81 84 84 87 90 90 90 93 90 93 93 96 96 96 93 93 96 96 99 99 99 99
100


EG&G GEOMETRICS
ES2401
SAVED AS 118.DAT
CONSTANT 0 LINE NUMBER 34 11:10 2/OCT/1991
SHOT LOC 500.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
72 78 81 84 84 84 84 84 84 87 84 87 87 90 90 87 87 87 90 90 93 96 96 96
100


EG&G GEOMETRICS
ES2401
SAVED AS 119.DAT
11:31 2/OCT/1991
CONSTANT 0 LINE NUMBER 34 SHOT MAP .1-24
SHOT LOC 890.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 7
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
38 42 42 61 64 67 60 63 63 66 66 72 72 75 75 75 75 75 78 78 87 90 90 93
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 120.DAT
11:43 2/OCT/1991
CONSTANT 0 LINE NUMBER 34 SHOT MAP 1-12.13-24
SHOT LOC 715.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 81 78 75 69 66 63 54 51 45 36 15 21 45 57 60 63 66 69 69 75 78 81 84
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 121.DAT
CONSTANT 0 LINE_NUMBER 34
11:04 2/OCT/1991
SHOT LOC 840.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
99 99 99 99 99 99 87 84 81 78 78 75 72 72 66 63 66 66 60 57 54 45 42 30
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 122.DAT
CONSTANT 0 LINE_NUMBER 34
12:10 2/OCT/1991
SHOT LOC 930.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
99 99 99 99 99 99 99 87 84 78 84 81 81 78 78 75 75 75 72 72 72 69 72 66
100

EG&G GEOMETRICS

SAVED AS 123.DAT

ES2401

CONSTANT 0 LINE_NUMBER 35 16:56 2/OCT/1991

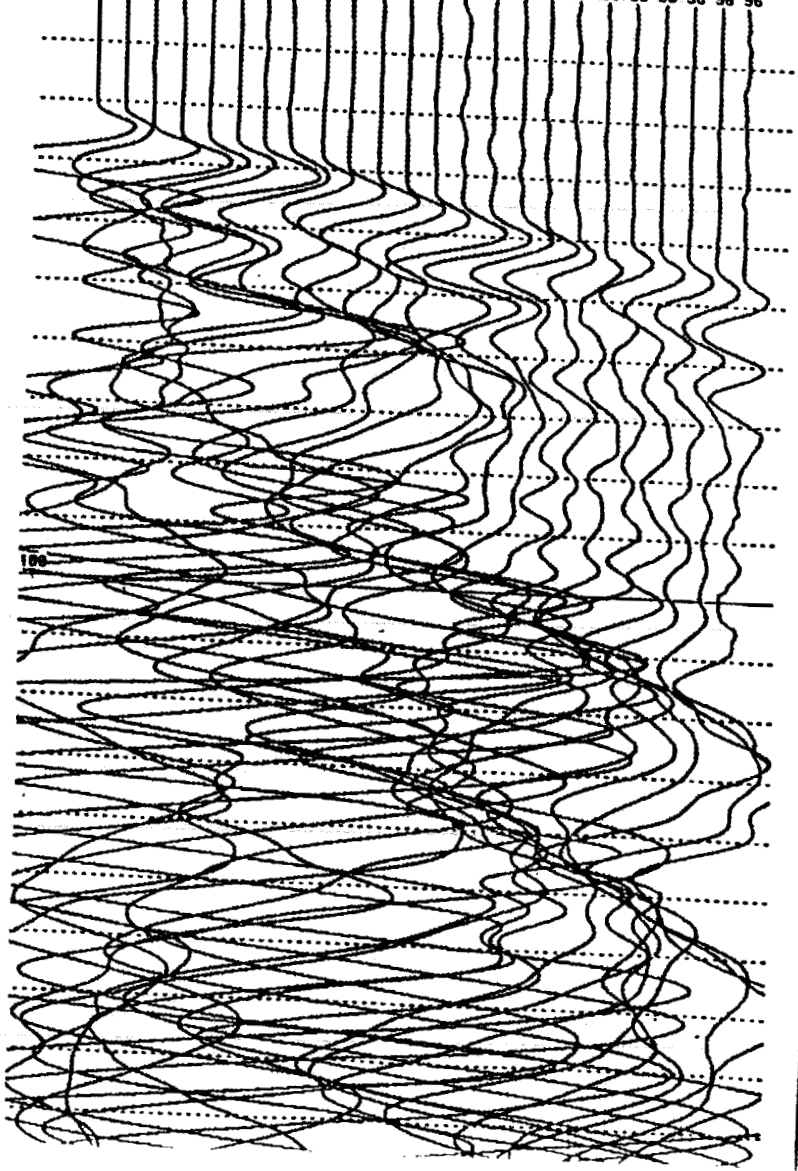
SHOT LOC 100.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT MAP .1-24

SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00

LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 2

FIXED GAIN

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
81	81	84	90	90	93	96	96	93	93	96	96	96	96	96	96	96	96	96	96	96	96	96	96



EG&G GEOMETRICS

SAVED AS 124.DAT

ES2401

CONSTANT 0 LINE_NUMBER 35 16:06 2/OCT/1991

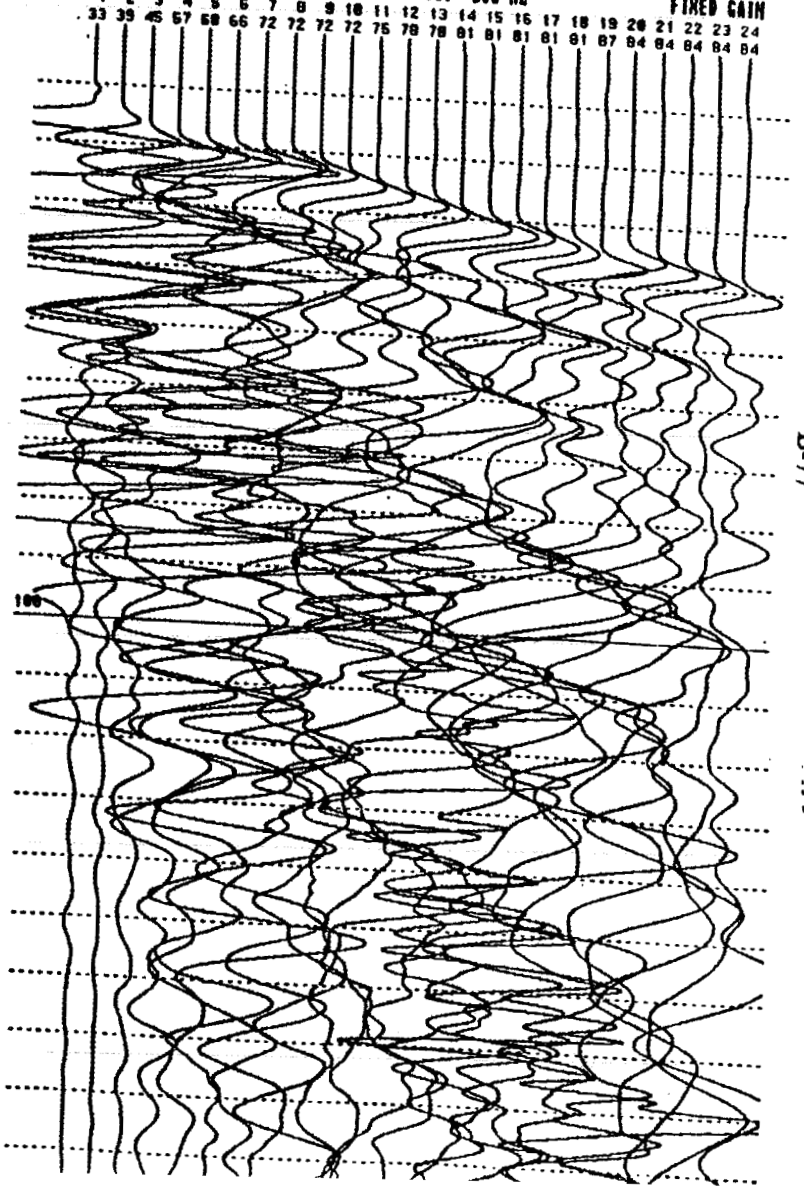
SHOT LOC 190.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24

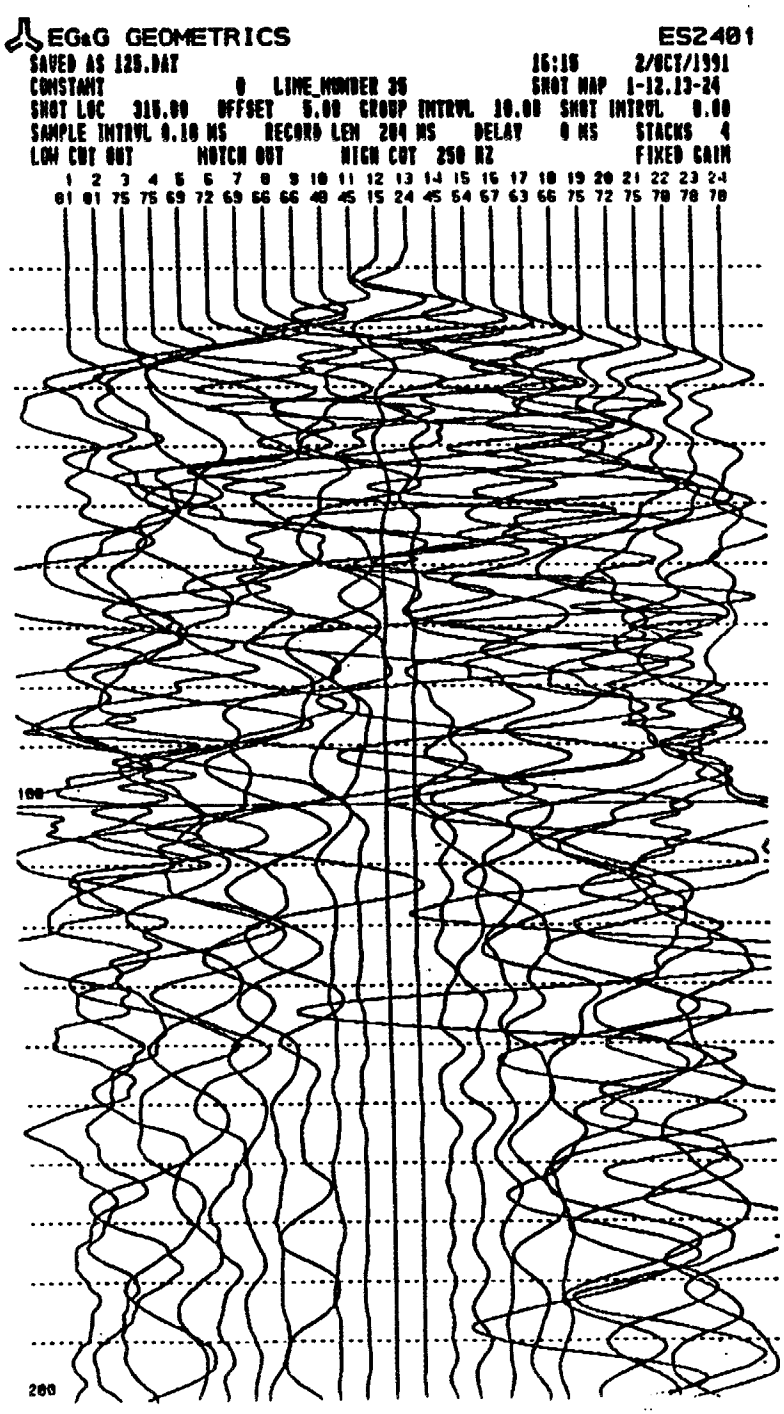
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00

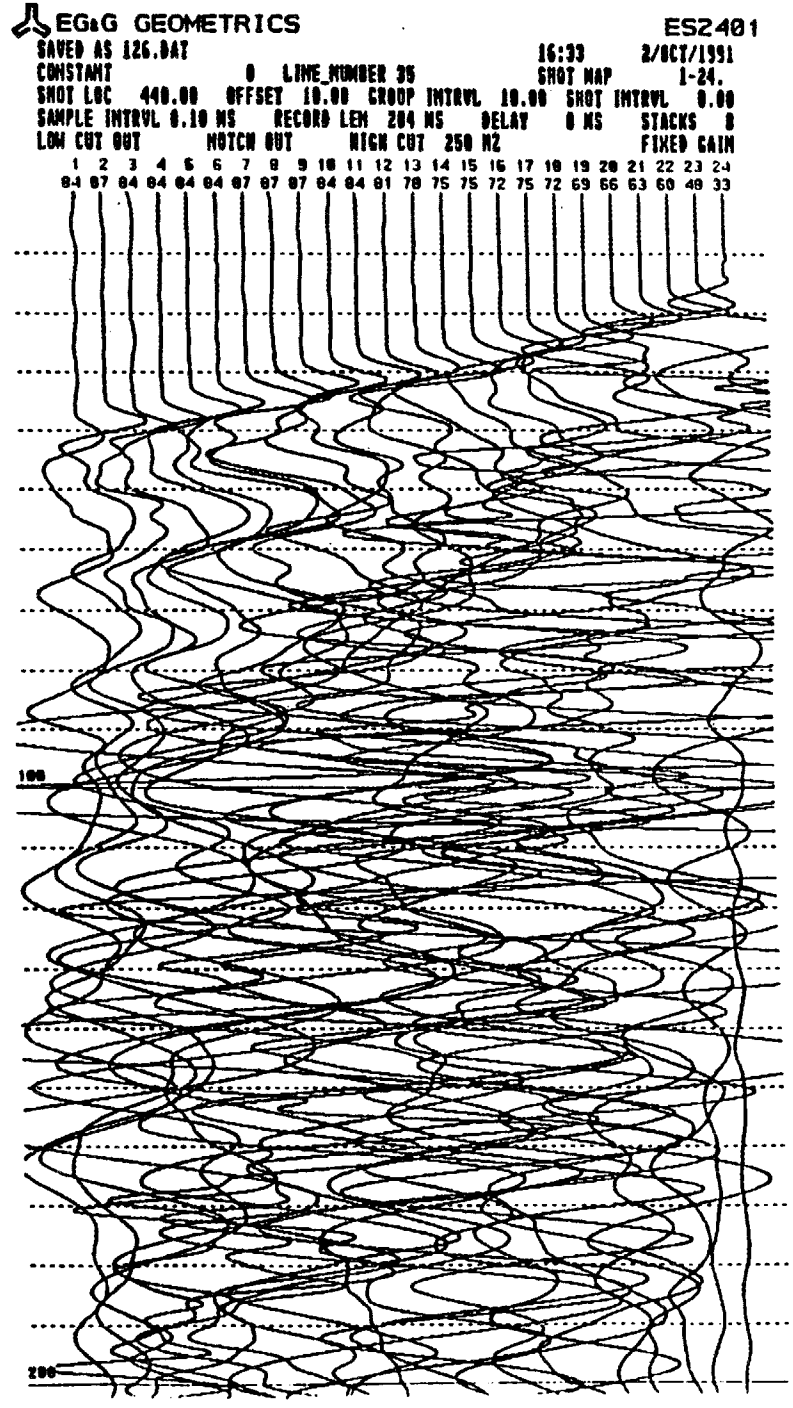
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 0

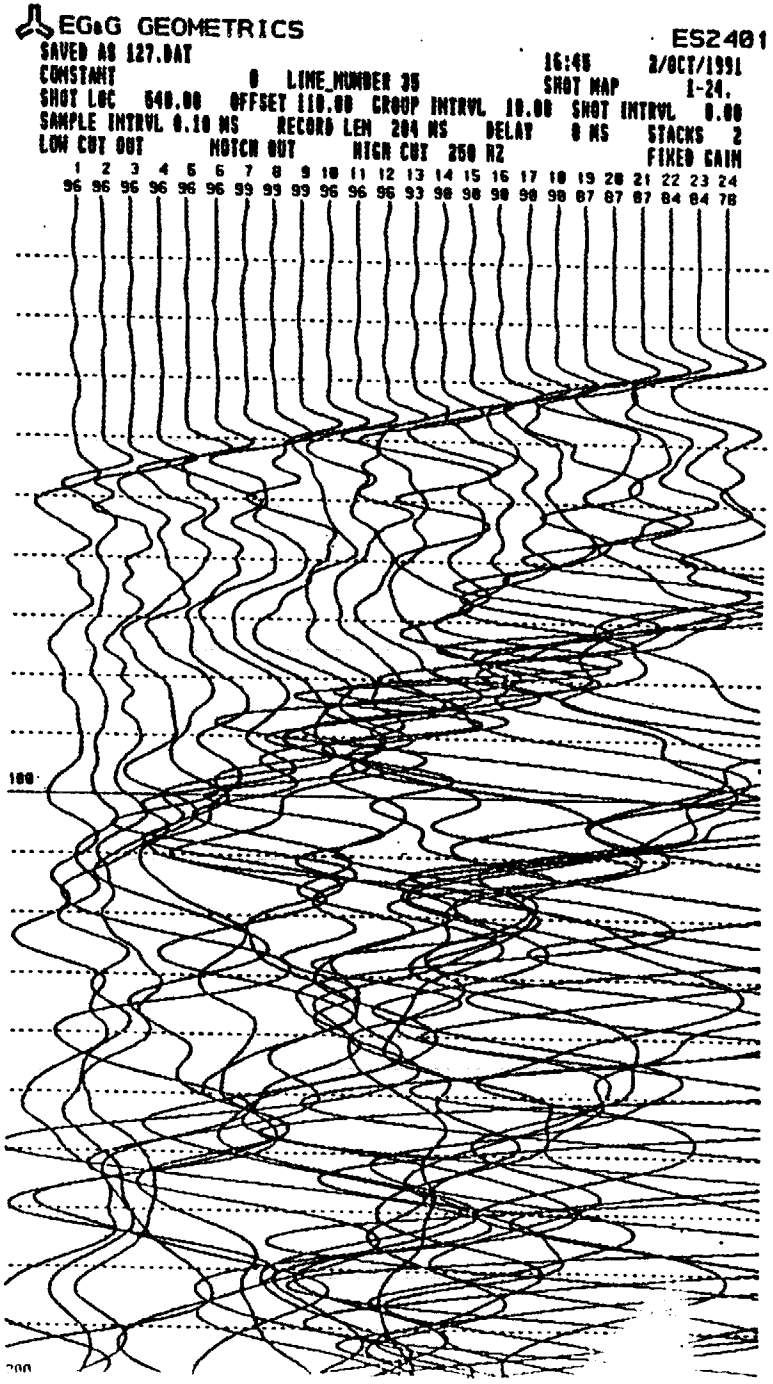
FIXED GAIN

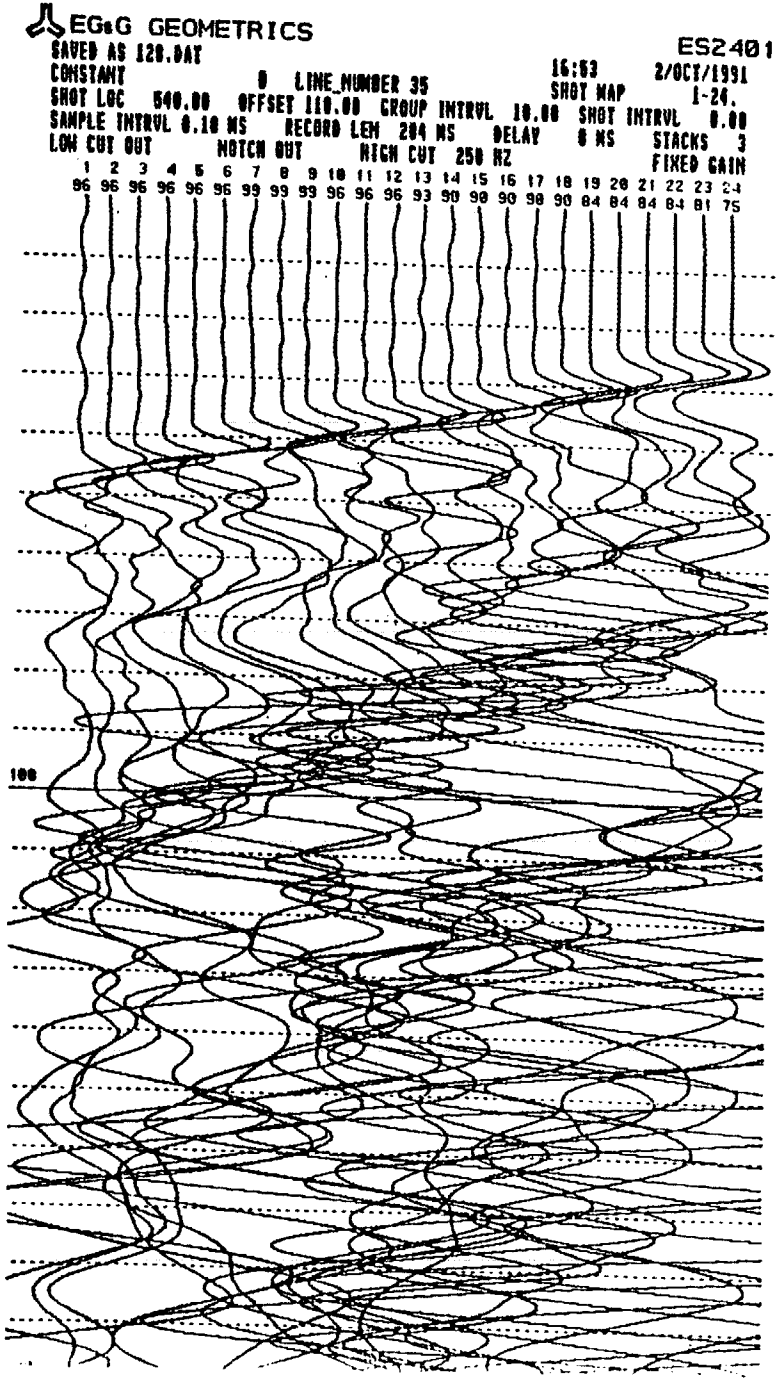
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
33	39	45	57	60	66	72	72	72	72	75	78	78	81	81	81	81	81	87	84	84	84	84	84

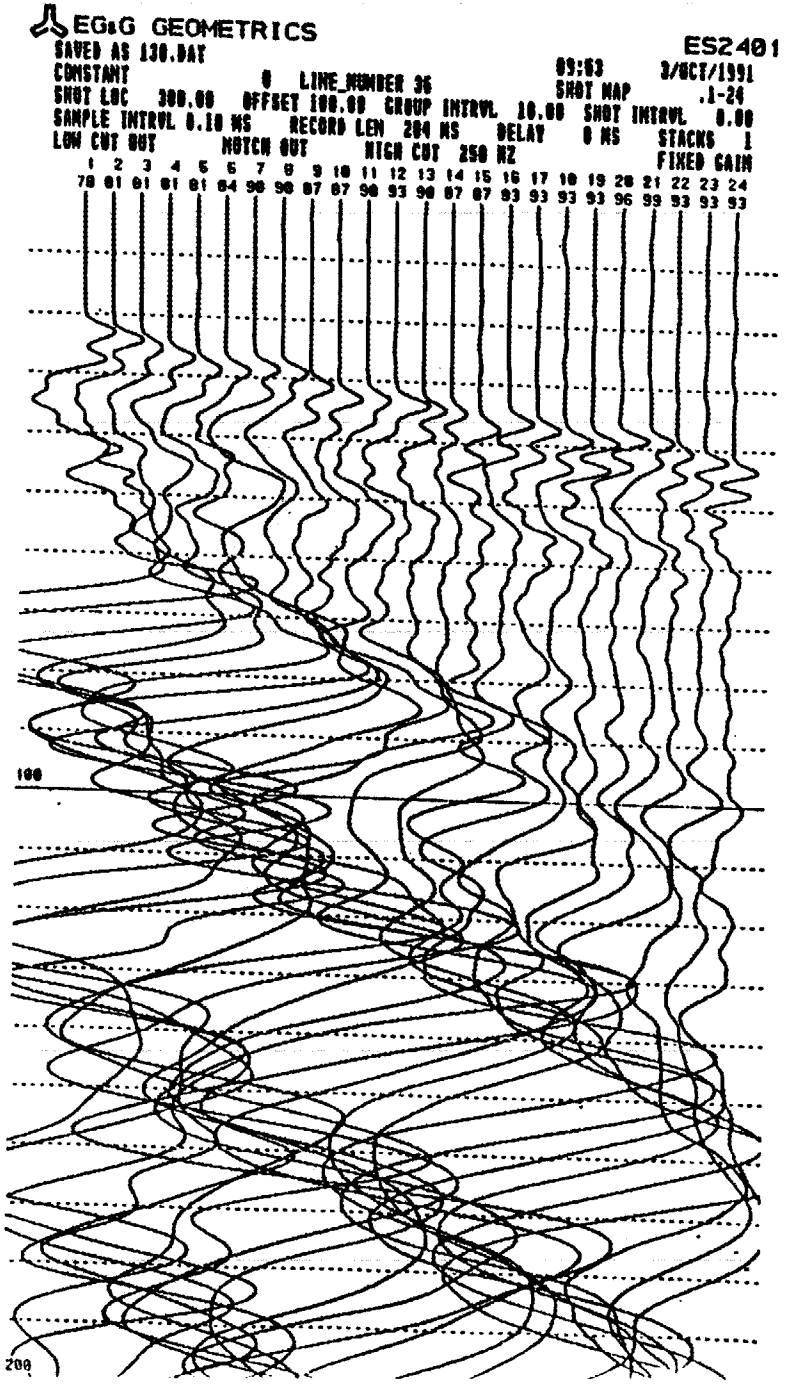


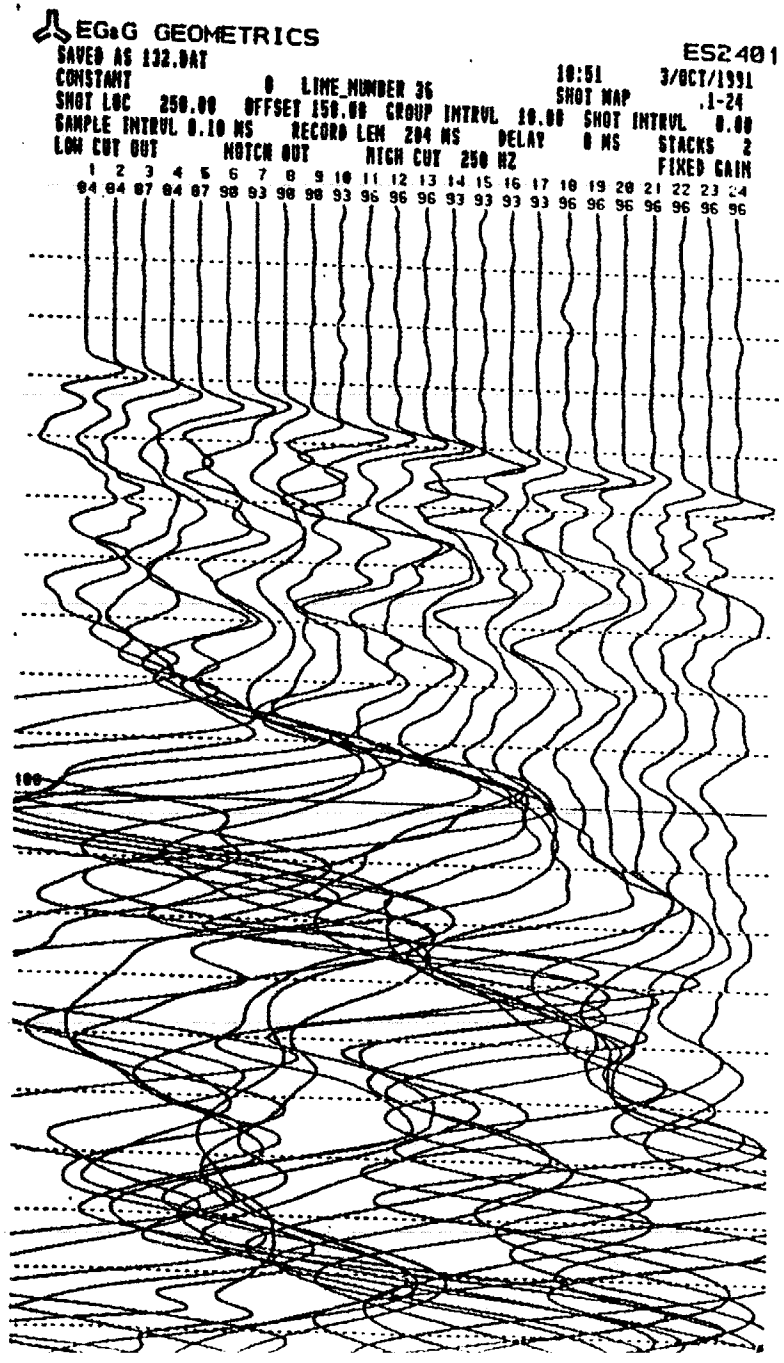

EG&G GEOMETRICS
ES2401
SAVED AS 125.DAT
16:16 2/OCT/1991
CONSTANT 0 LINE_NUMBER 36
SHOT MAP 1-12.13-24
SHOT LOC 315.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 81 75 75 69 72 69 66 66 48 45 15 24 45 54 67 63 66 75 72 75 78 78 78
100
200

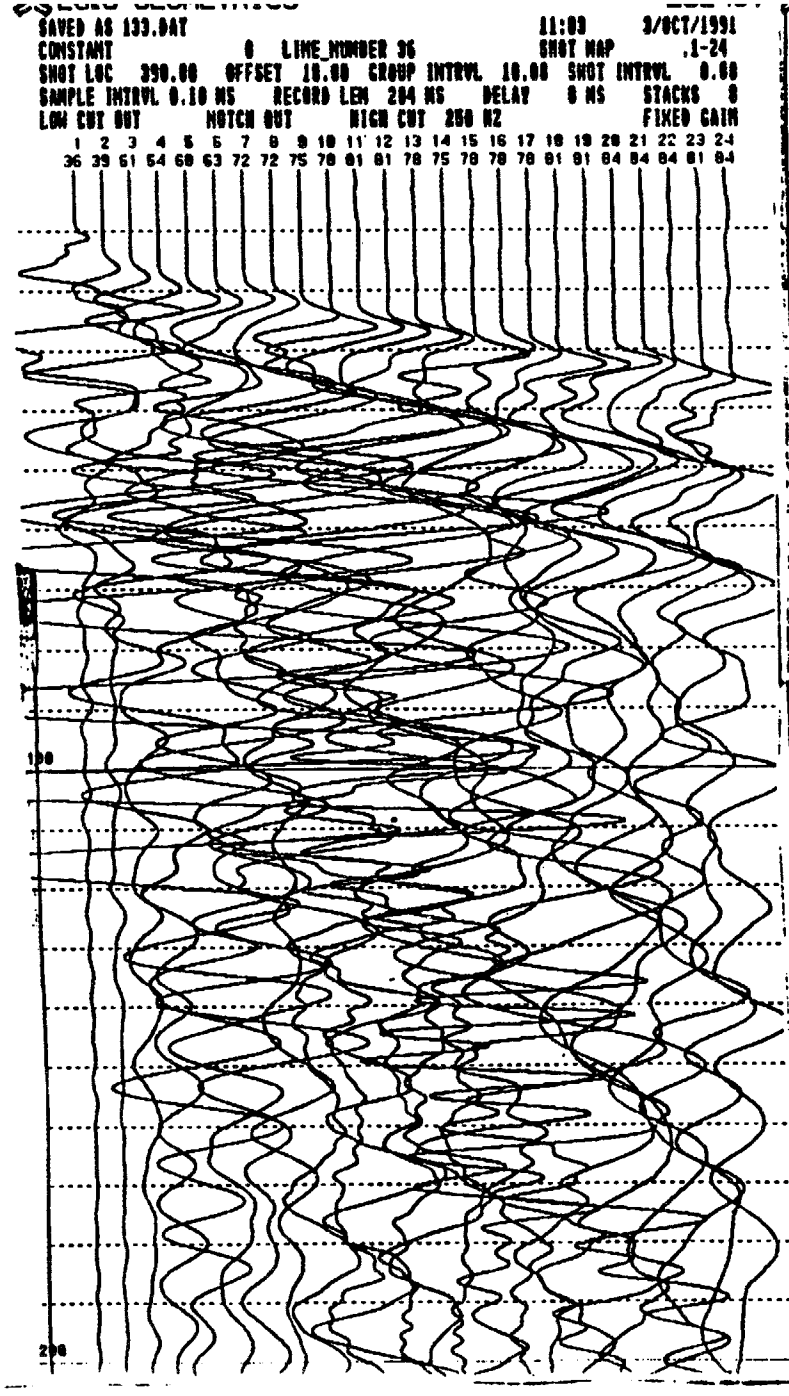

EG&G GEOMETRICS
ES2401
SAVED AS 126.DAT
16:33 2/OCT/1991
CONSTANT 0 LINE_NUMBER 36
SHOT MAP 1-24.
SHOT LOC 440.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 87 84 84 84 84 87 87 87 84 84 81 78 75 75 72 75 72 69 66 63 60 48 33
100
200

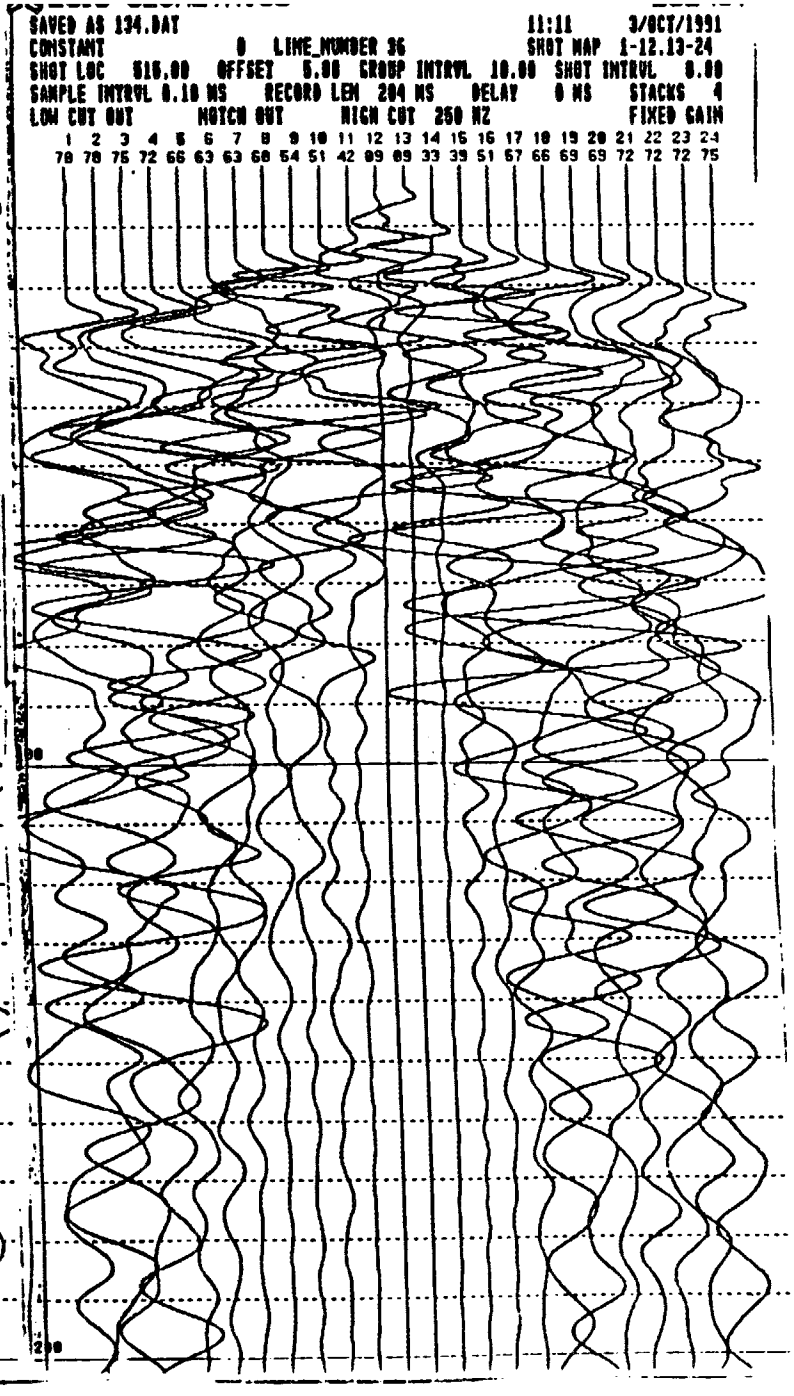

EG&G GEOMETRICS
ES2401
SAVED AS 127.DAT
CONSTANT 0 LINE_NUMBER 35
16:46 2/OCT/1991
SHOT MAP 1-24.
SHOT LOC 540.00 OFFSET 110.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
96 96 96 96 96 96 99 99 99 96 96 96 93 90 90 90 90 90 87 87 87 84 84 78
100

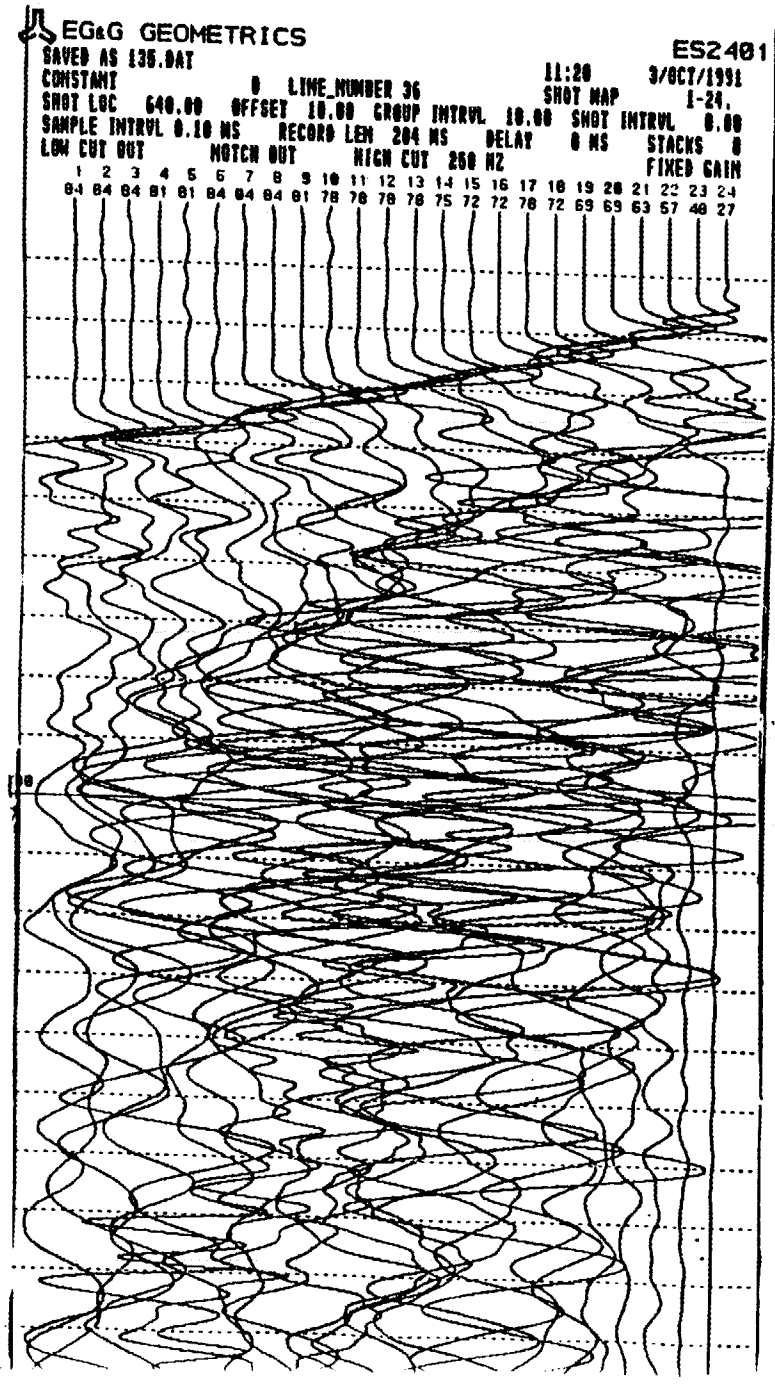

EG&G GEOMETRICS
ES2401
SAVED AS 128.DAT
CONSTANT 0 LINE_NUMBER 35
16:53 2/OCT/1991
SHOT MAP 1-24.
SHOT LOC 540.00 OFFSET 110.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
96 96 96 96 96 96 99 99 99 96 96 96 93 90 90 90 90 90 84 84 84 84 81 75
100

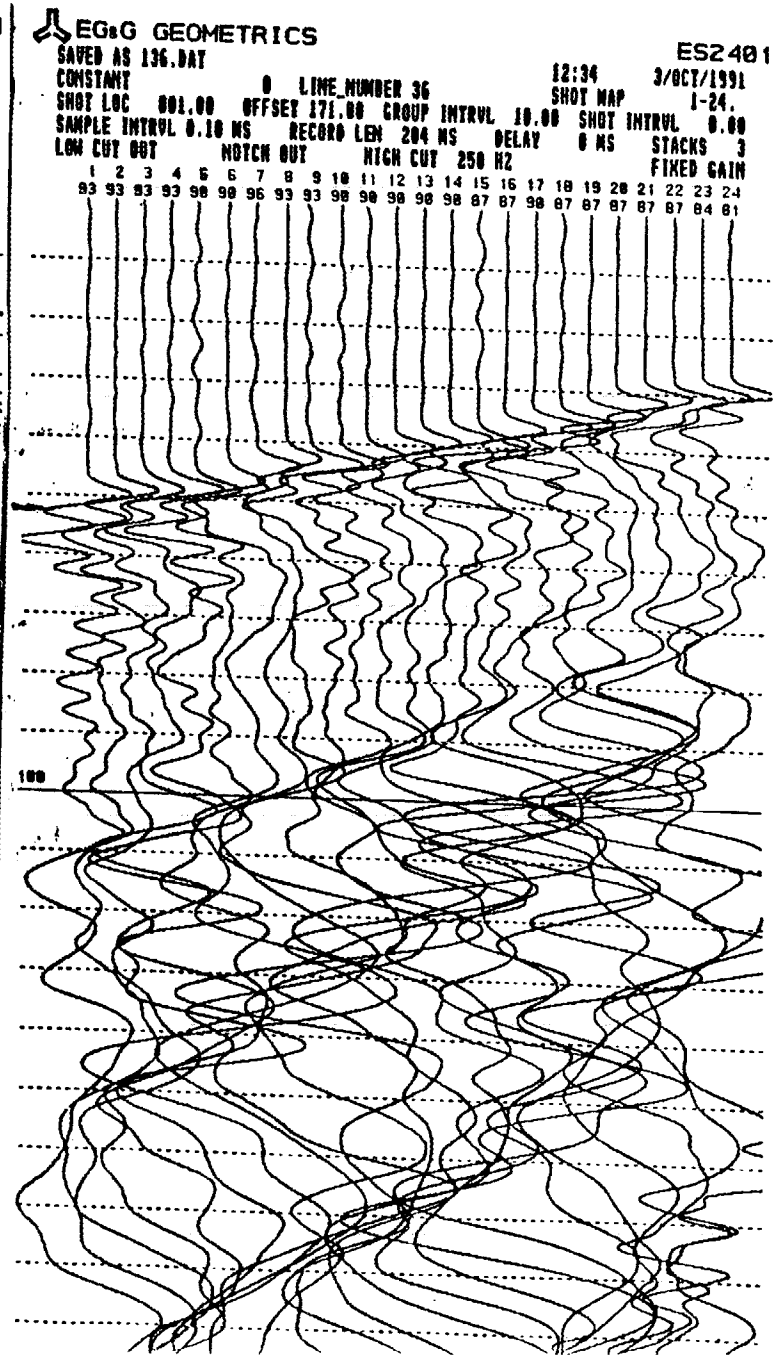

EG&G GEOMETRICS
ES2401
SAVED AS 130.DAT
CONSTANT 0 LINE_NUMBER 36 09:03 3/OCT/1991
SHOT LOC 300.00 OFFSET 100.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 1
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 81 81 81 81 84 90 90 87 87 90 93 90 87 87 93 93 93 93 96 99 93 93 93
100
200

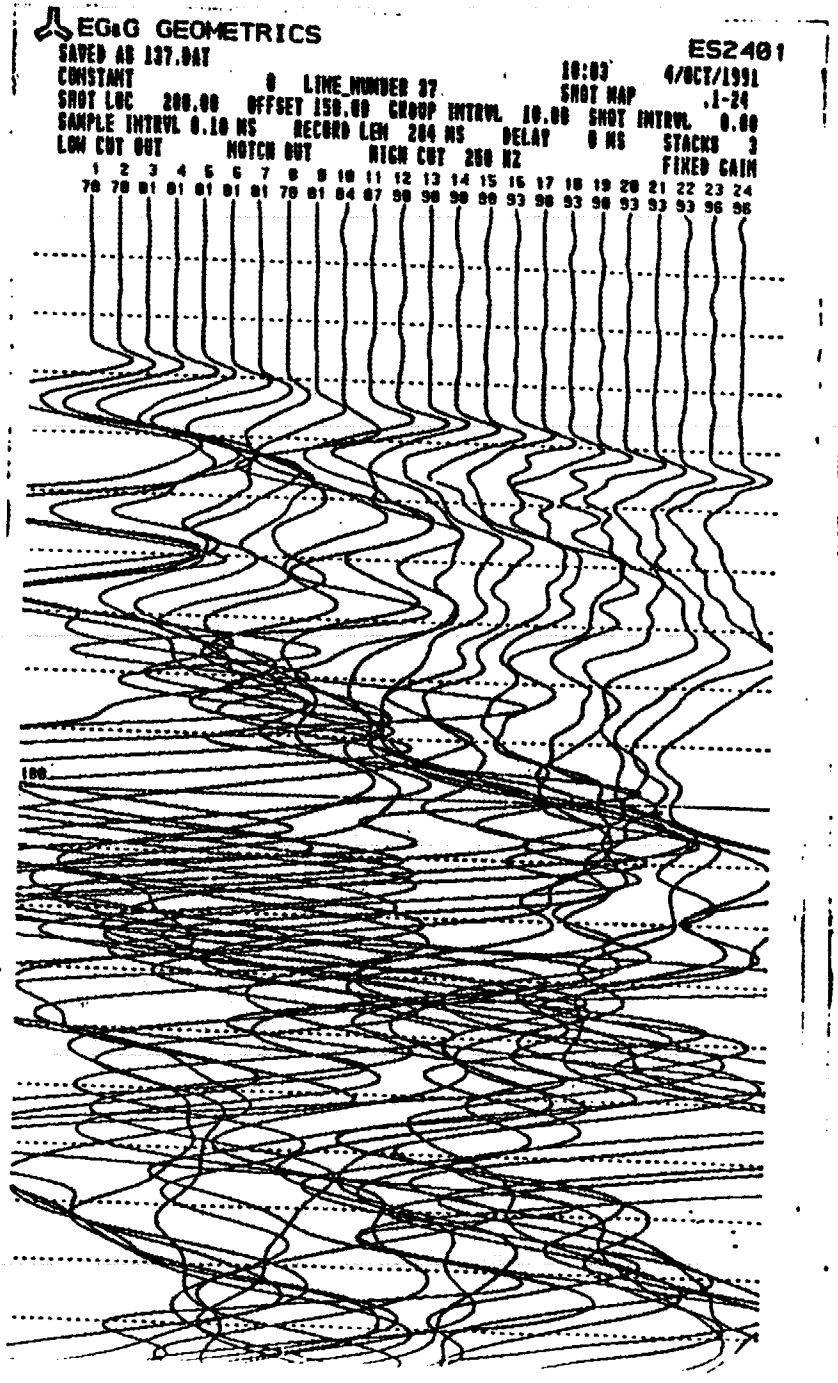

EG&G GEOMETRICS
ES2401
SAVED AS 132.DAT
CONSTANT 0 LINE_NUMBER 36 10:51 3/OCT/1991
SHOT LOC 250.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 2
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 87 84 87 90 93 90 90 93 96 96 96 93 93 93 93 96 96 96 96 96 96 96
100

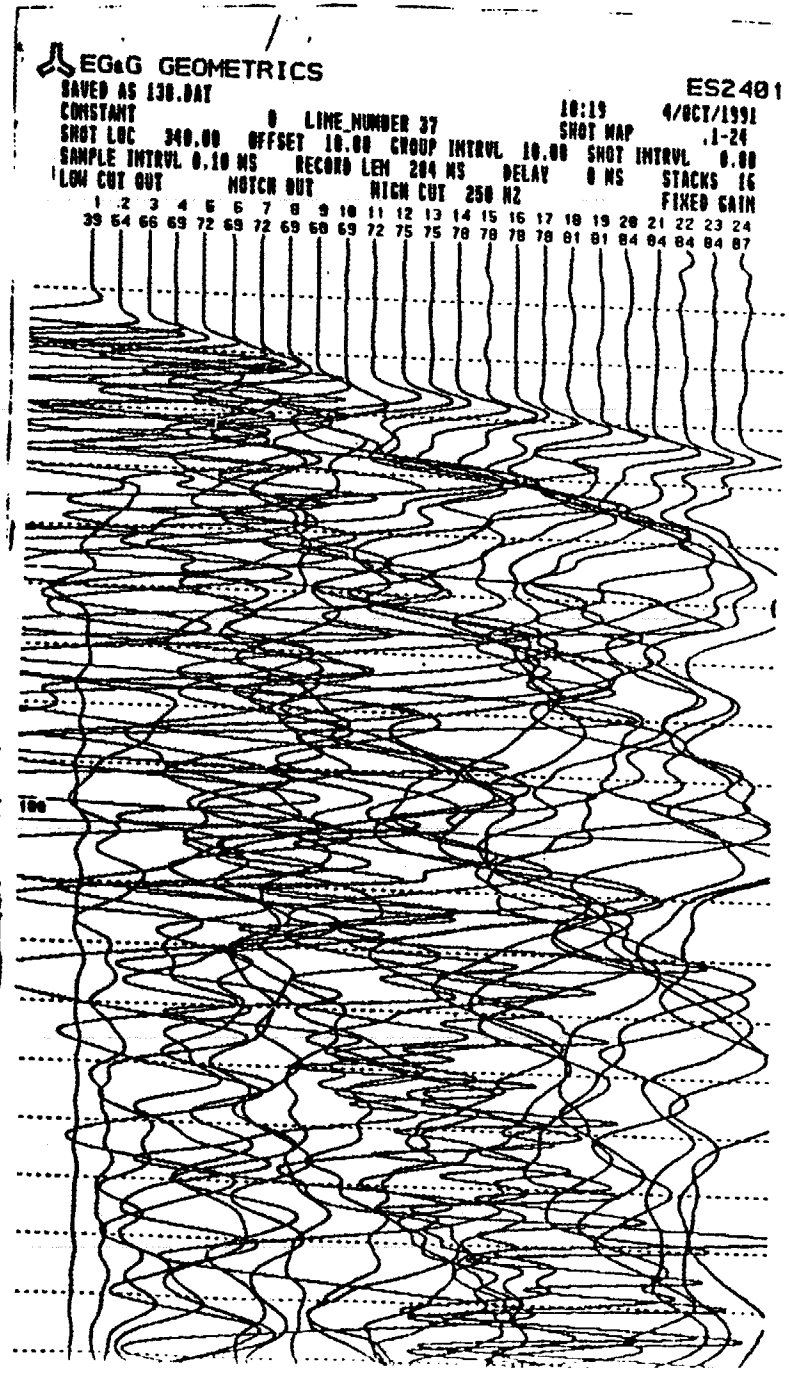

SAVED AS 133.DAT 11:03 3/OCT/1991
CONSTANT 0 LINE_NUMBER 36 SHOT MAP .1-24
SHOT LOC 390.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
36 39 61 64 60 63 72 72 75 78 81 81 78 75 78 78 78 81 81 84 84 84 81 84
100
200

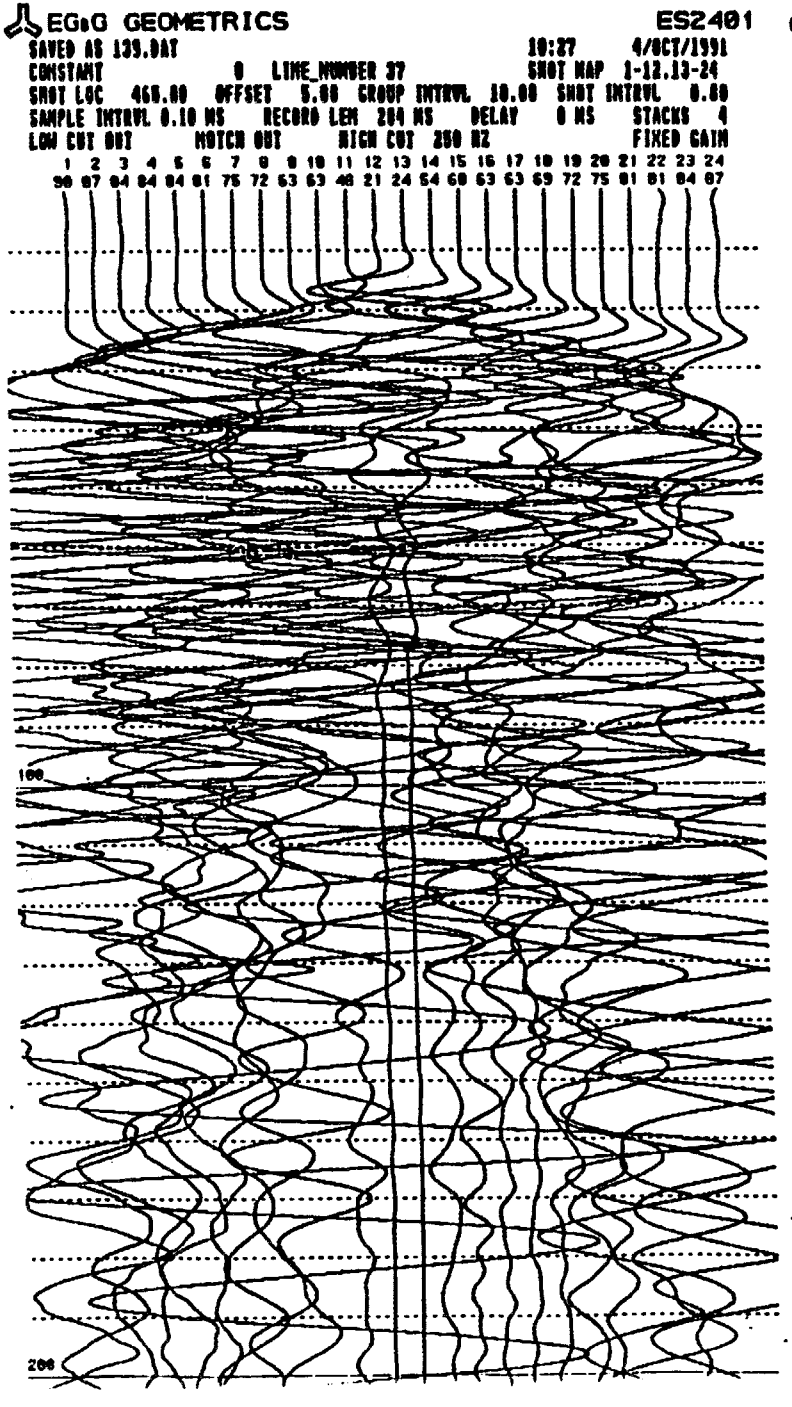

SAVED AS 134.DAT 11:11 3/OCT/1991
CONSTANT 0 LINE_NUMBER 36 SHOT MAP 1-12.13-24
SHOT LOC 516.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 78 75 72 66 63 63 60 54 51 42 39 39 33 39 51 57 66 69 69 72 72 72 75
100
200

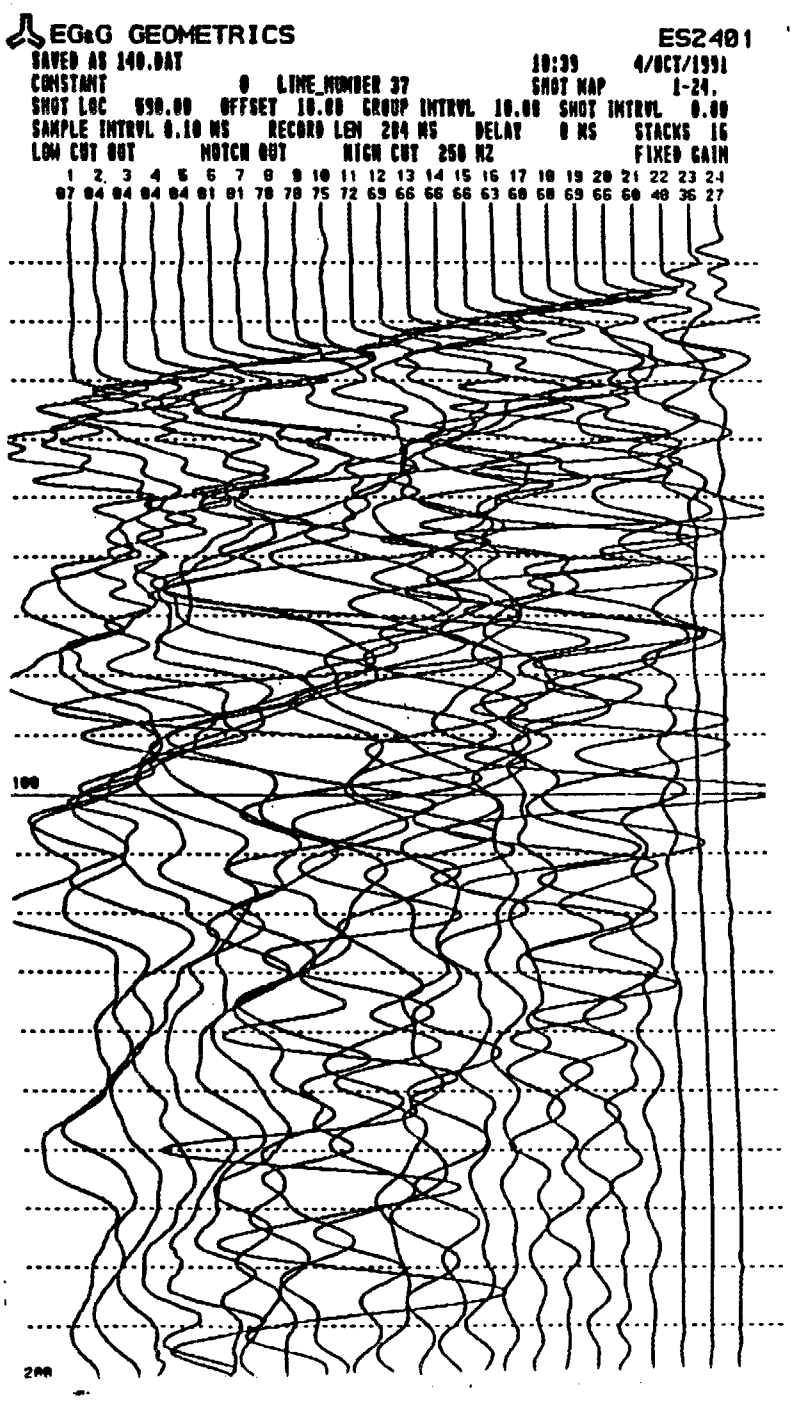

EG&G GEOMETRICS
ES2401
SAVED AS 136.DAT
CONSTANT 0 LINE_NUMBER 36
11:20 3/OCT/1991
SHOT LOC 640.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 84 81 81 84 84 84 81 78 78 78 78 75 72 72 78 72 69 69 63 57 48 27
100

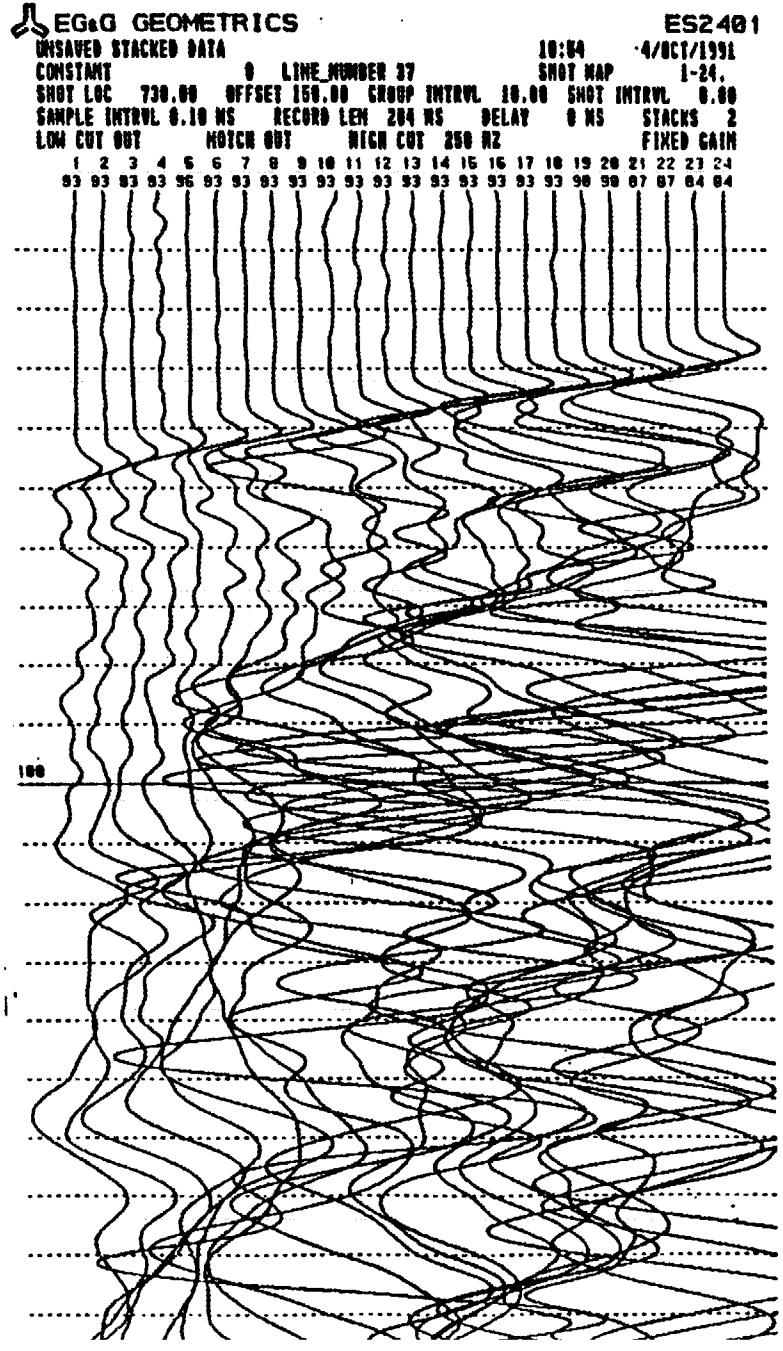

EG&G GEOMETRICS
ES2401
SAVED AS 136.DAT
CONSTANT 0 LINE_NUMBER 36
12:34 3/OCT/1991
SHOT LOC 801.00 OFFSET 171.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 90 90 96 93 93 90 90 90 90 90 87 87 90 87 87 87 87 87 84 81
100

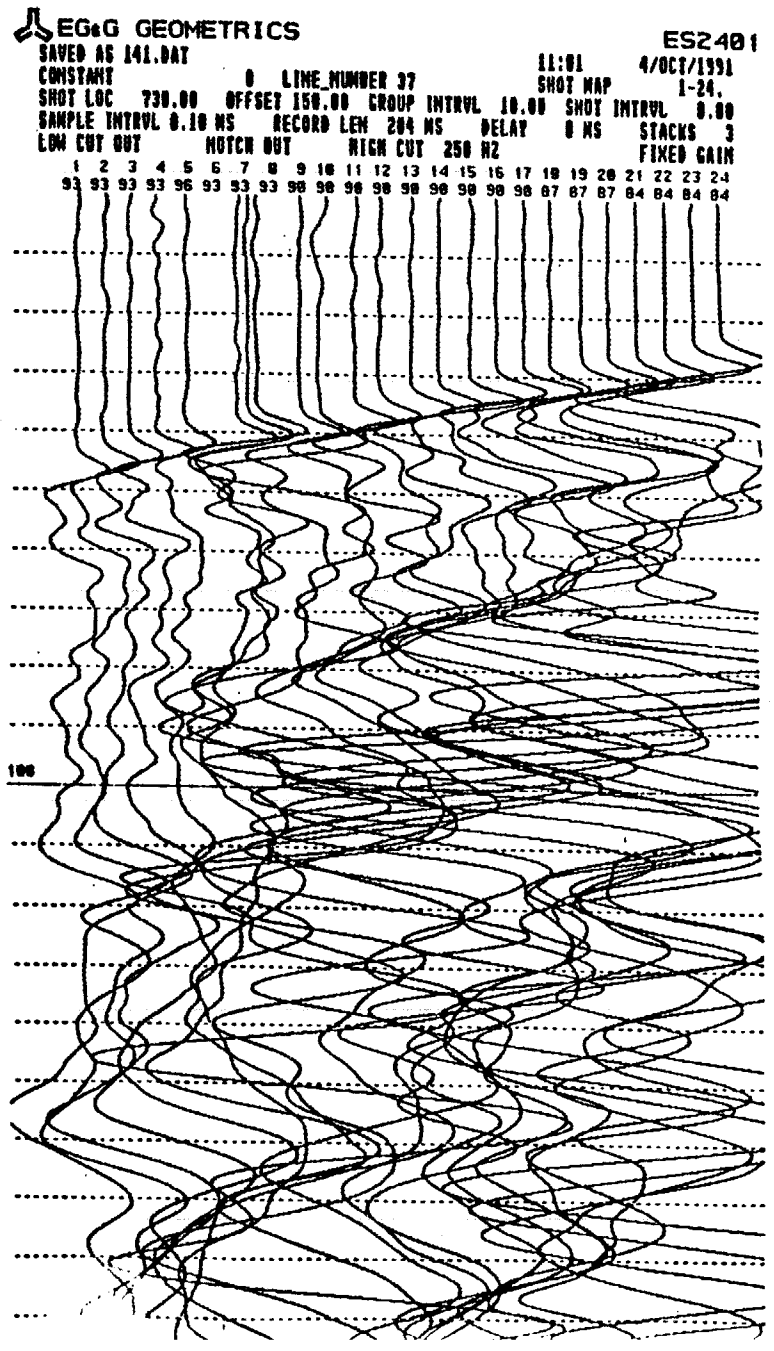

EG&G GEOMETRICS
ES2401
SAVED AS 137.DAT
CONSTANT 0 LINE_NUMBER 37
10:03 4/OCT/1991
SHOT LOC 200.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 78 81 81 81 81 81 78 81 84 87 90 90 90 90 93 90 93 90 93 93 93 96 96
100

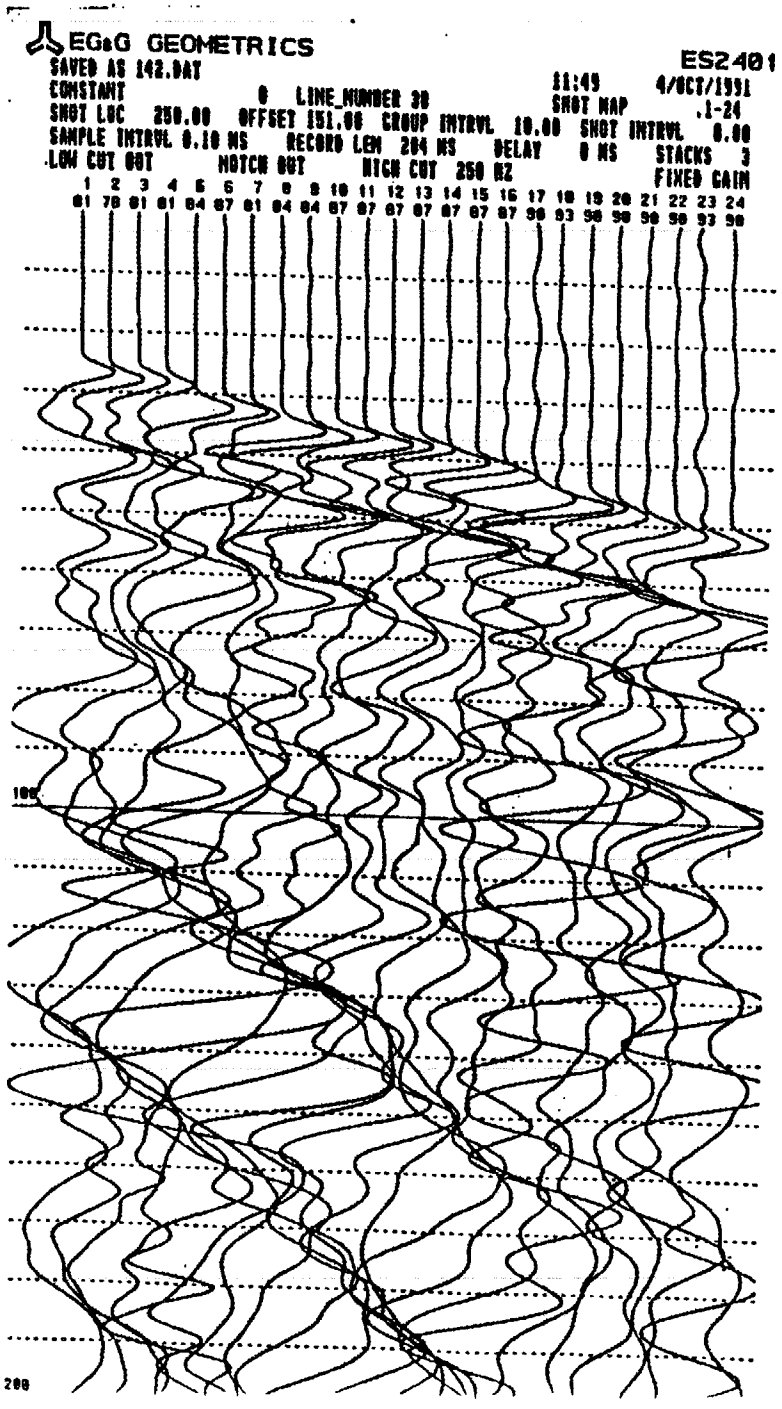

EG&G GEOMETRICS
ES2401
SAVED AS 138.DAT
CONSTANT 0 LINE_NUMBER 37
10:19 4/OCT/1991
SHOT LOC 340.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
39 64 66 69 72 69 72 69 68 69 72 75 75 78 78 78 78 81 81 84 84 84 84 87
100

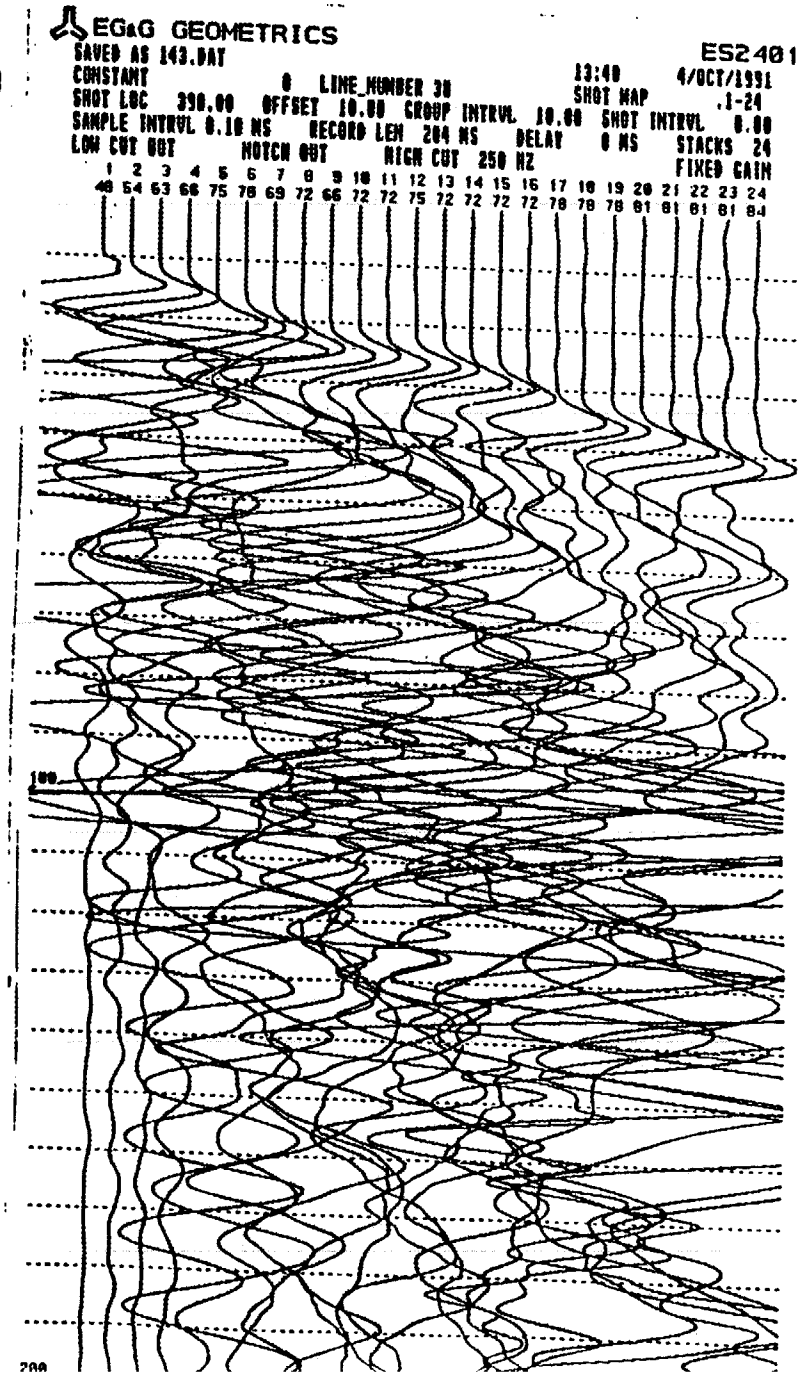

EG&G GEOMETRICS
ES2401
SAVED AS 139.DAT
10:27 4/OCT/1991
CONSTANT 0 LINE_NUMBER 37
SHOT MAP 1-12,13-24
SHOT LOC 468.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 87 84 84 84 81 75 72 63 63 48 21 24 54 60 63 63 69 72 75 81 81 84 87
100
200

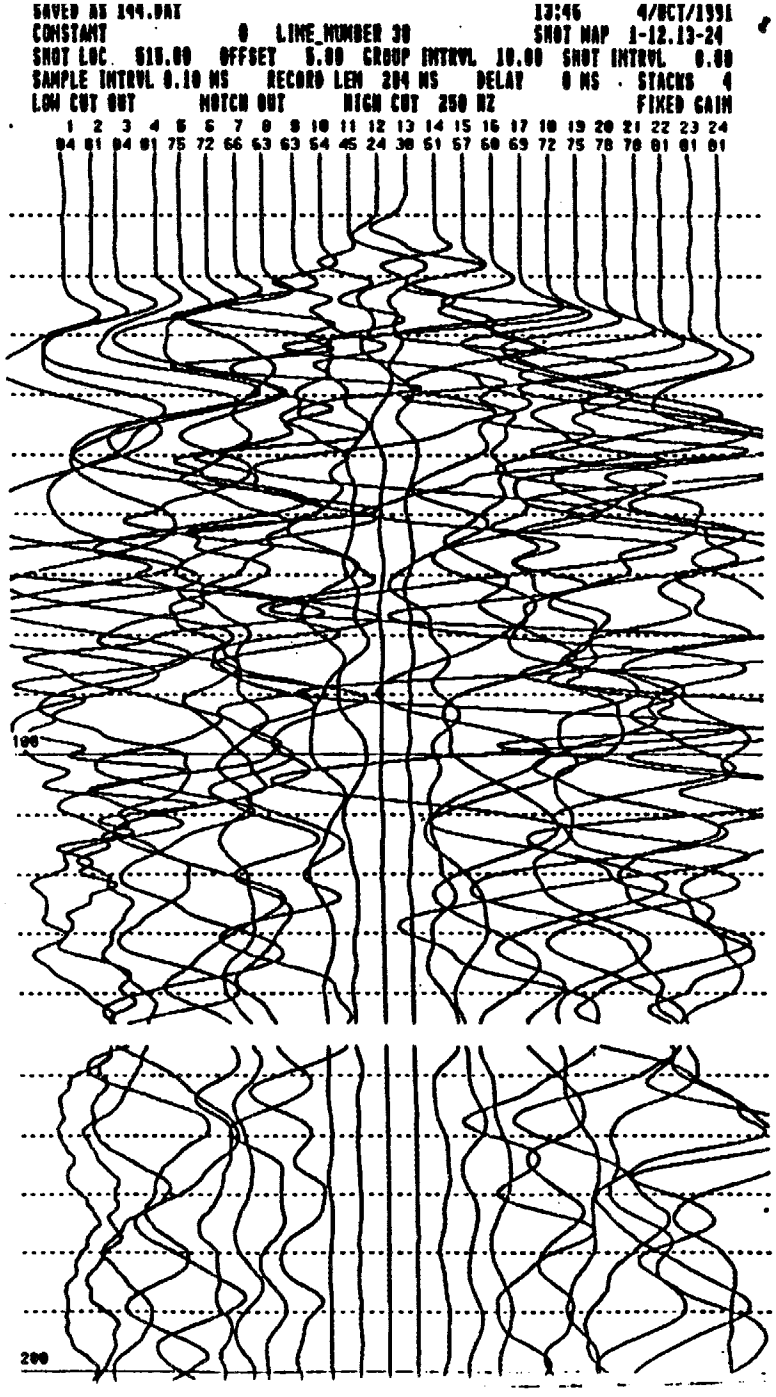

EG&G GEOMETRICS
ES2401
SAVED AS 140.DAT
10:39 4/OCT/1991
CONSTANT 0 LINE_NUMBER 37
SHOT MAP 1-24,
SHOT LOC 990.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 84 84 84 81 81 78 78 75 72 69 66 66 66 63 60 60 69 66 60 48 36 27
100
200

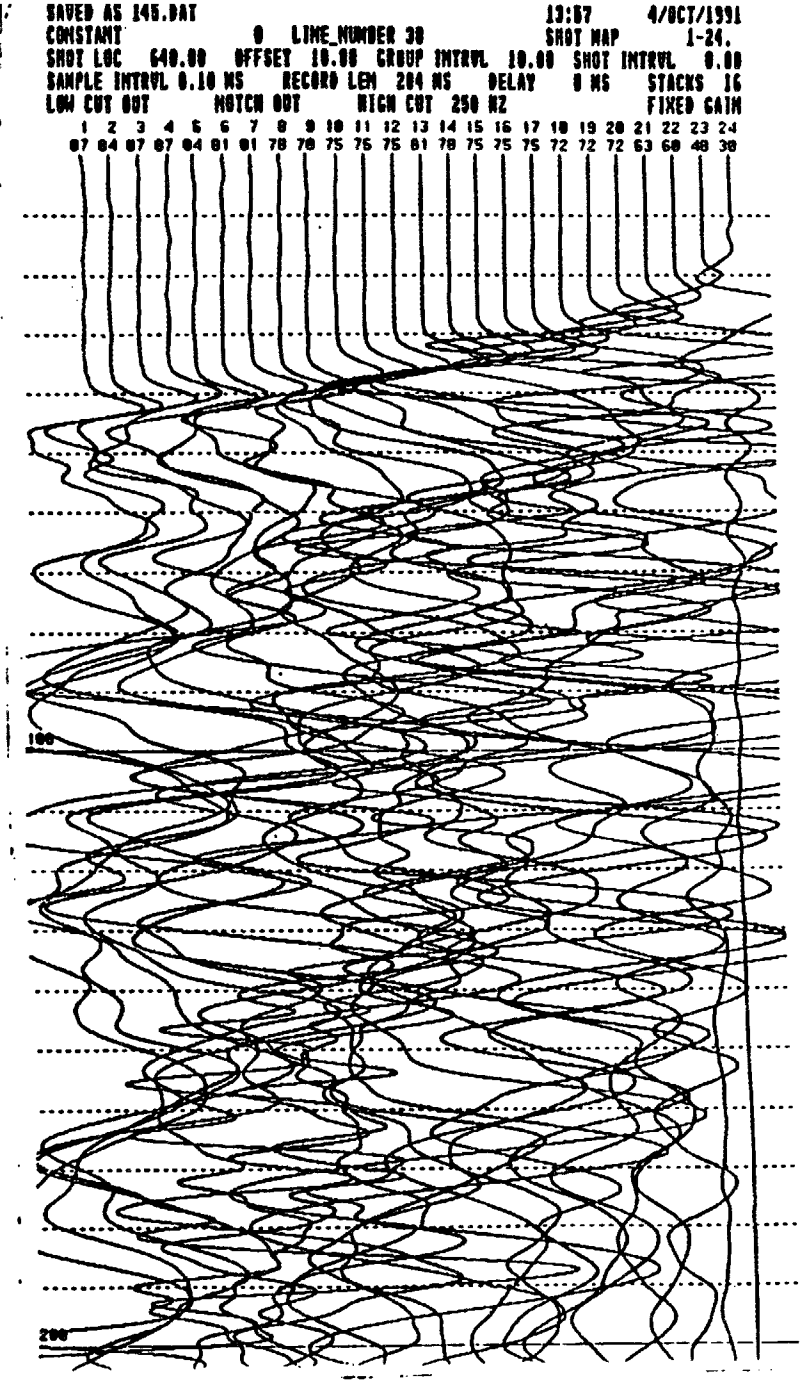

EG&G GEOMETRICS
ES2401
UNSAVED STACKED DATA
10:04
4/OCT/1991
CONSTANT 0 LINE_NUMBER 37
SHOT MAP 1-24.
SHOT LOC 730.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 96 93 93 93 93 93 93 93 93 93 93 93 93 93 90 90 87 87 84 84
100

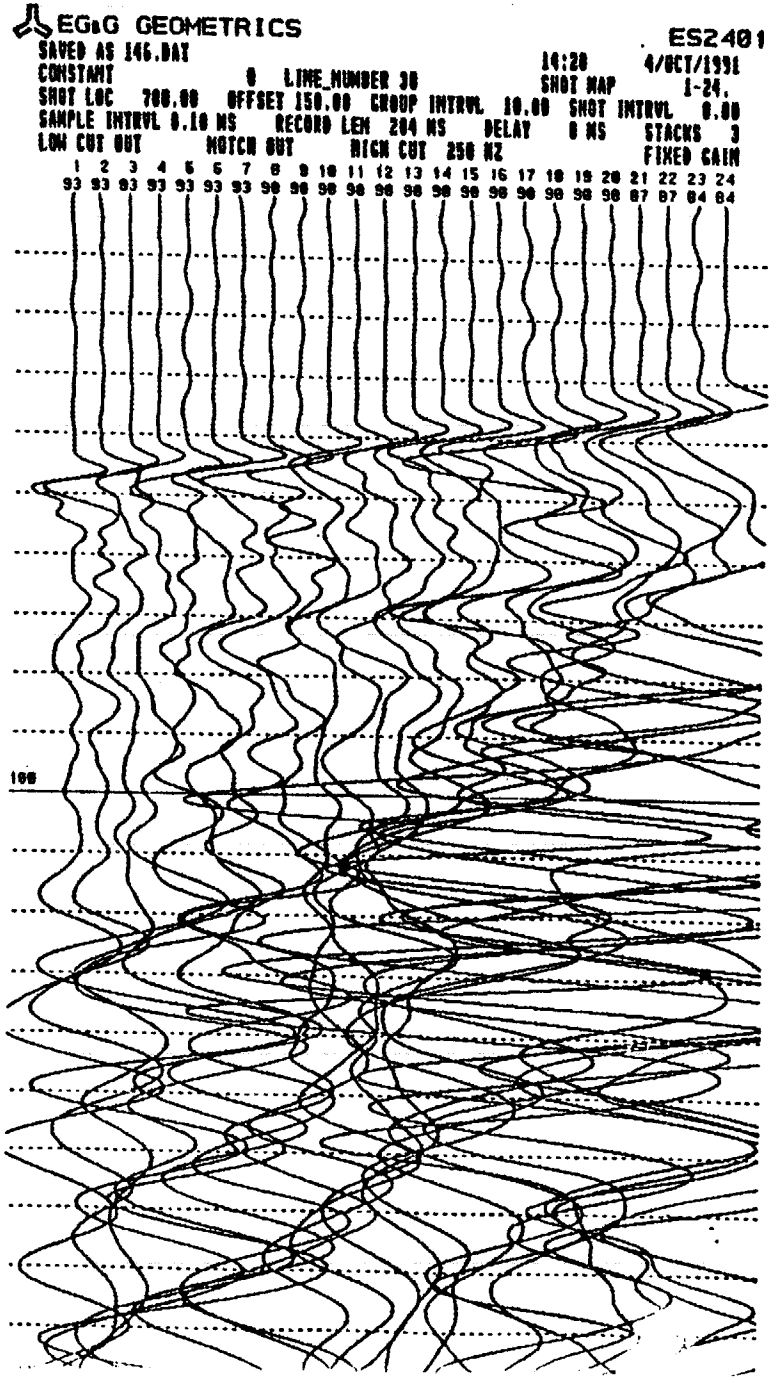

EG&G GEOMETRICS
ES2401
SAVED AS 141.DAT
11:01
4/OCT/1991
CONSTANT 0 LINE_NUMBER 37
SHOT MAP 1-24.
SHOT LOC 730.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 96 93 93 93 90 90 90 90 90 90 90 90 87 87 87 84 84 84 84
100

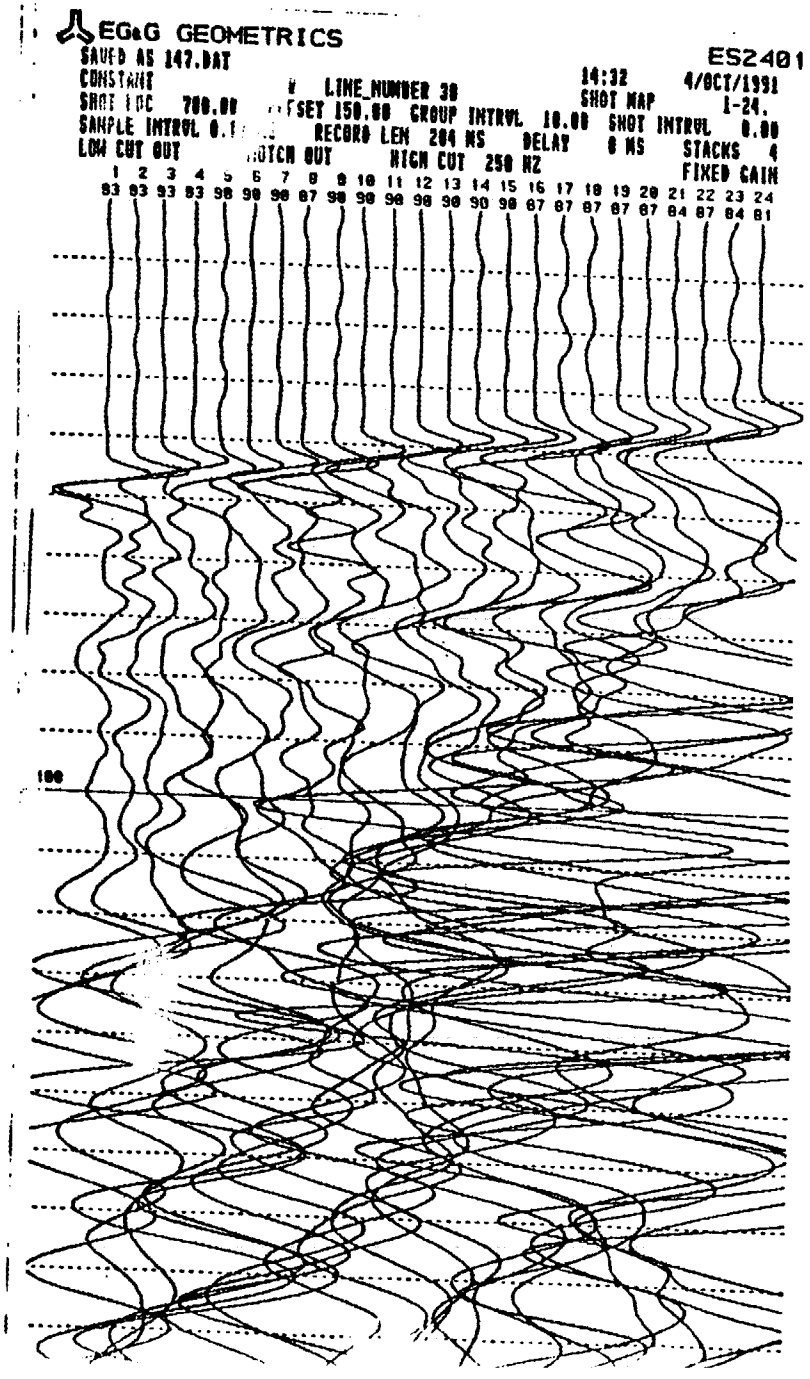

EG&G GEOMETRICS
ES2401
SAVED AS 142.DAT
CONSTANT 0 LINE_NUMBER 30
11:49 4/OCT/1991
SHOT LOC 250.00 OFFSET 151.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 78 81 81 84 87 81 84 84 87 87 87 87 87 87 87 90 93 90 90 90 90 93 90
100
200

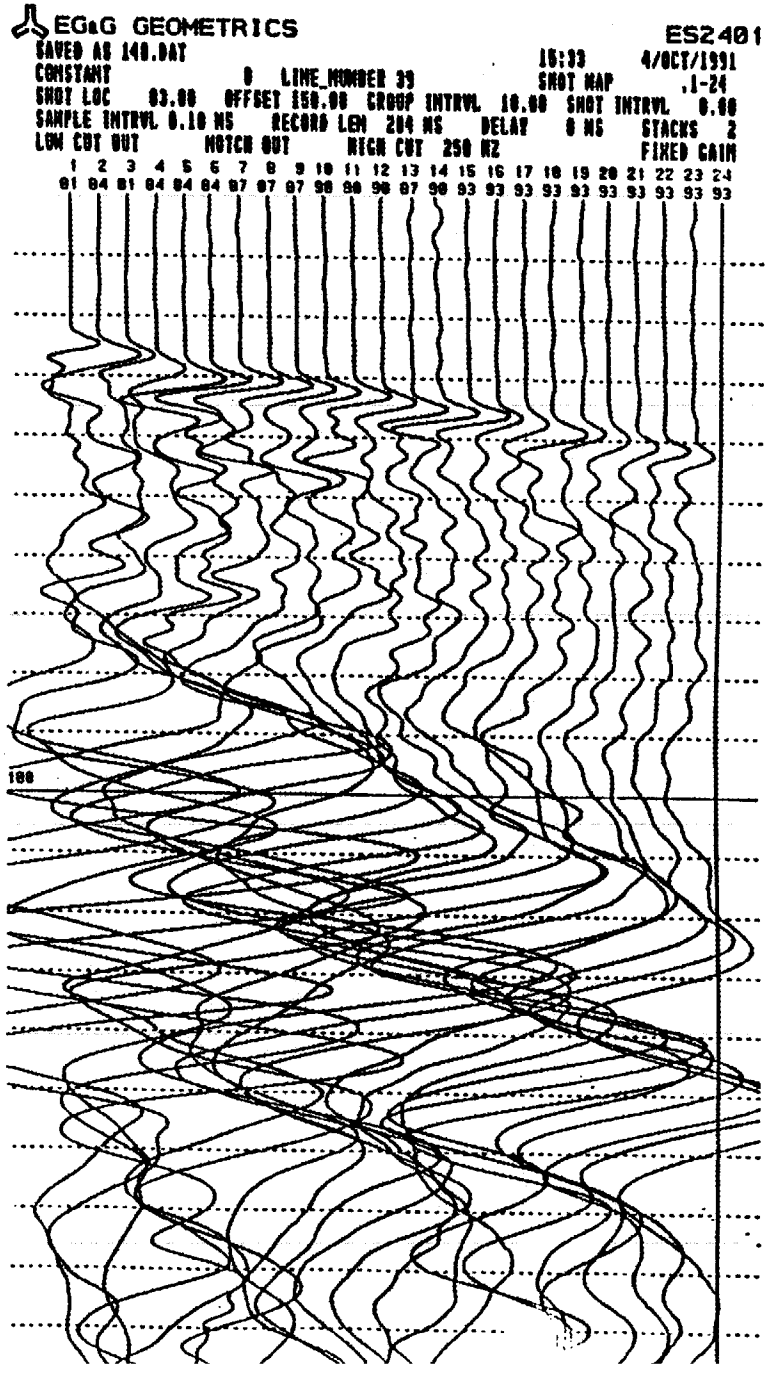

EG&G GEOMETRICS
ES2401
SAVED AS 143.DAT
CONSTANT 0 LINE_NUMBER 30
13:40 4/OCT/1991
SHOT LOC 390.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 24
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
48 54 63 66 75 78 69 72 66 72 72 75 72 72 72 72 78 78 78 81 81 81 81 84
100
200

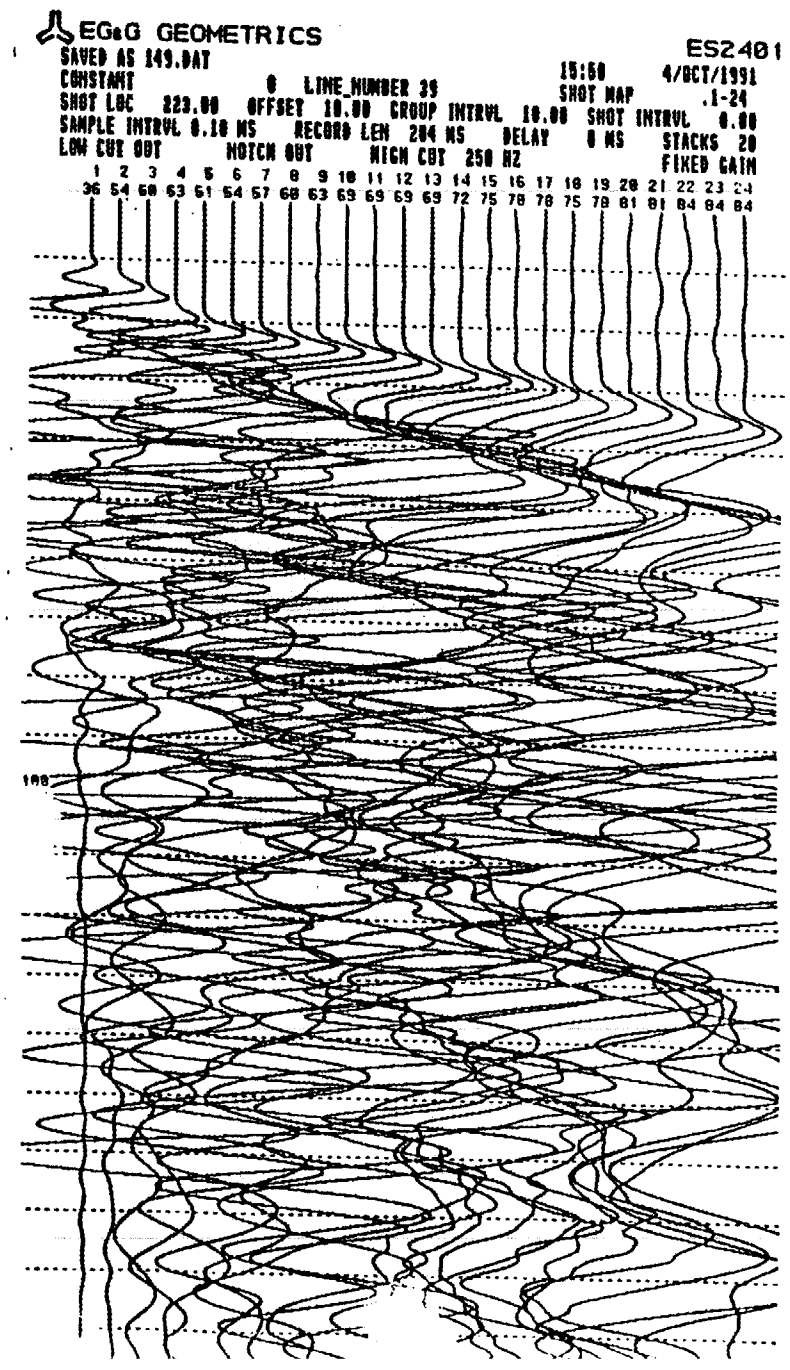

SAVED AS 144.DAT 13:46 4/OCT/1991
CONSTANT 0 LINE_NUMBER 30 SHOT MAP 1-12.13-24
SHOT LOC 510.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 81 84 81 75 72 66 63 63 54 45 24 30 51 57 60 69 72 75 78 78 81 81 81
100
200

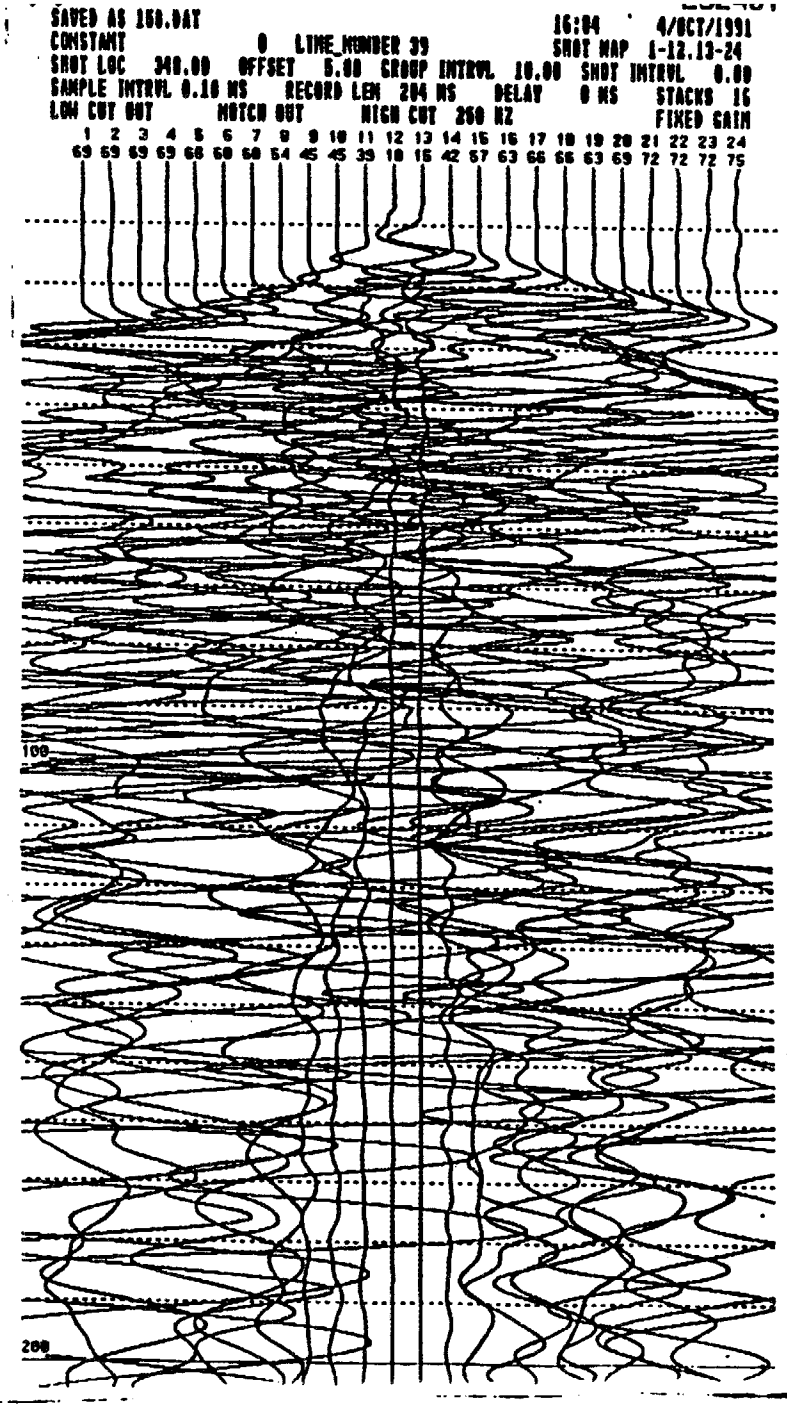

SAVED AS 145.DAT 13:57 4/OCT/1991
CONSTANT 0 LINE_NUMBER 30 SHOT MAP 1-24.
SHOT LOC 640.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 87 87 84 81 81 78 78 75 75 75 81 78 75 75 75 72 72 72 63 60 48 30
100
200

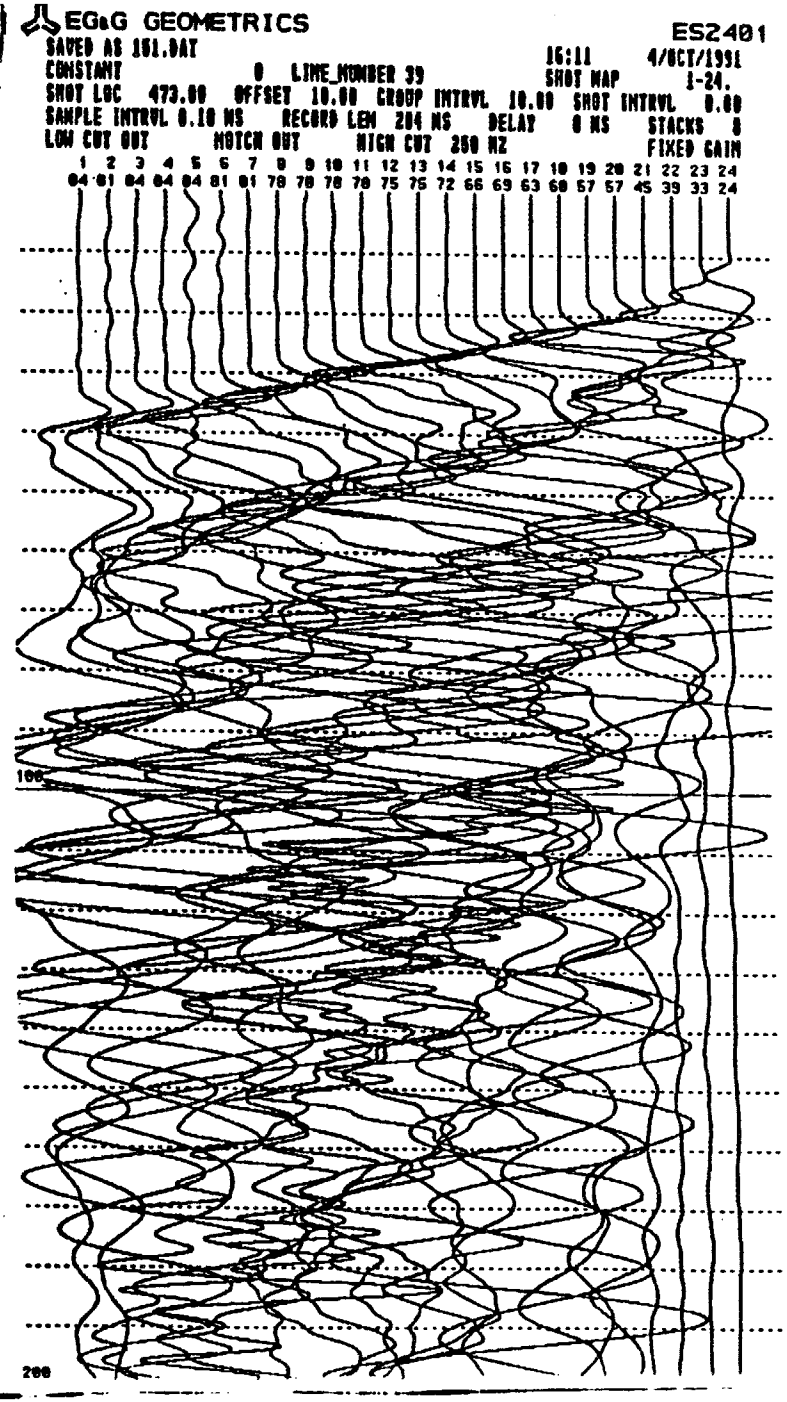

EG&G GEOMETRICS
ES2401
SAVED AS 146.DAT
CONSTANT 0 LINE_NUMBER 30
14:20 4/OCT/1991
SHOT LOC 700.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 93 93 93 90 90 90 90 90 90 90 90 90 90 90 90 90 87 87 84 84
100

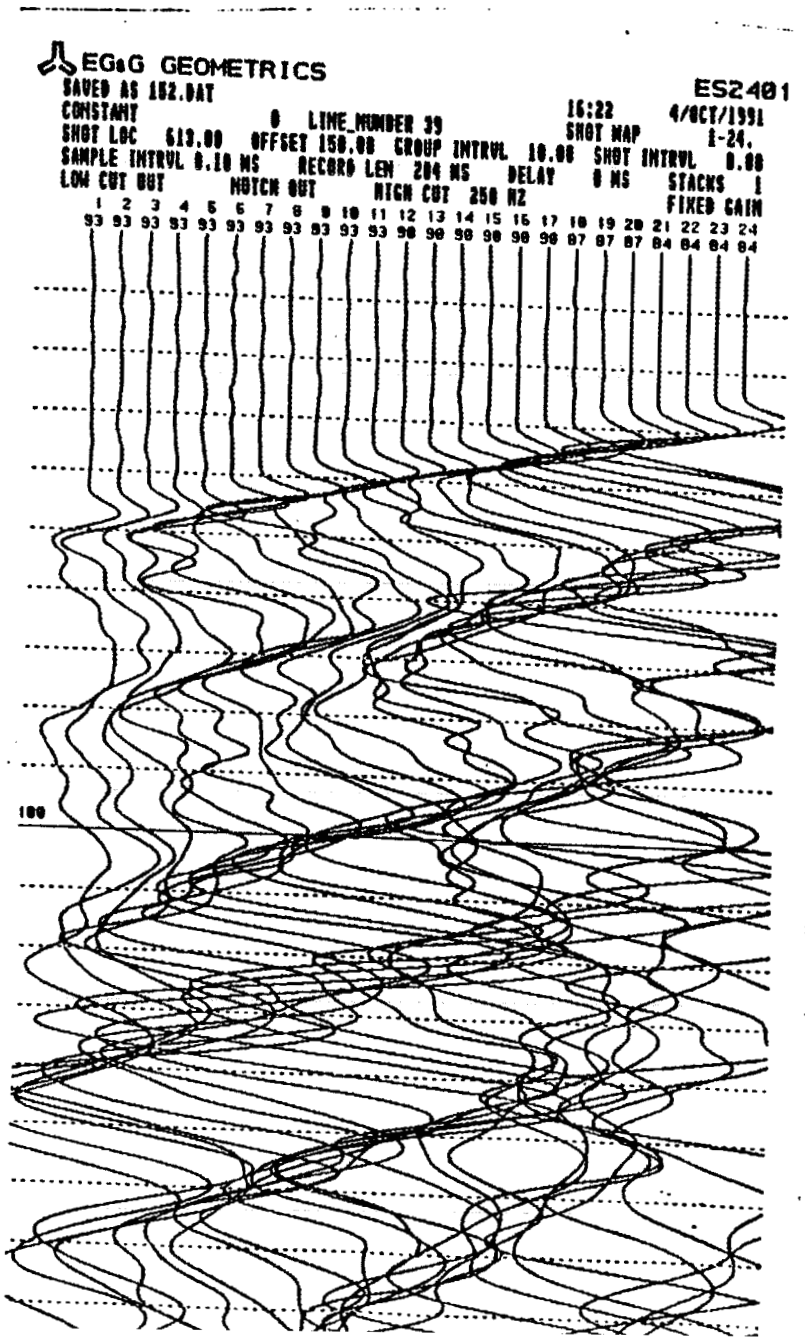

EG&G GEOMETRICS
ES2401
SAVED AS 147.DAT
CONSTANT LINE_NUMBER 30
14:32 4/OCT/1991
SHOT LOC 700.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
83 83 93 83 90 90 90 87 90 90 90 90 90 90 90 87 87 87 87 87 84 87 84 81
100

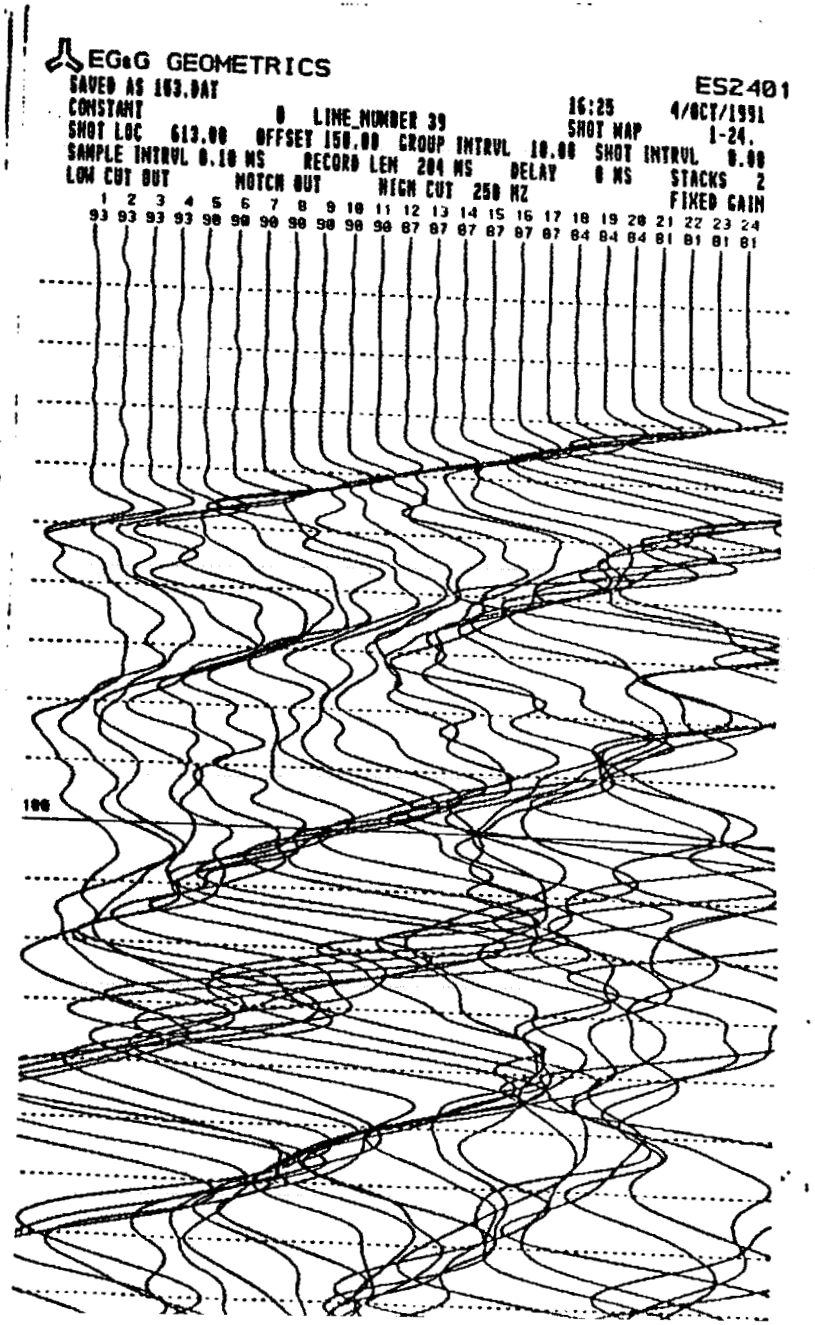

EG&G GEOMETRICS
ES2401
SAVED AS 148.DAT
16:33 4/OCT/1991
CONSTANT 0 LINE_NUMBER 39 SHOT MAP .1-24
SHOT LOC 83.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 84 81 84 84 84 87 87 87 90 90 90 87 90 93 93 93 93 93 93 93 93 93 93
100

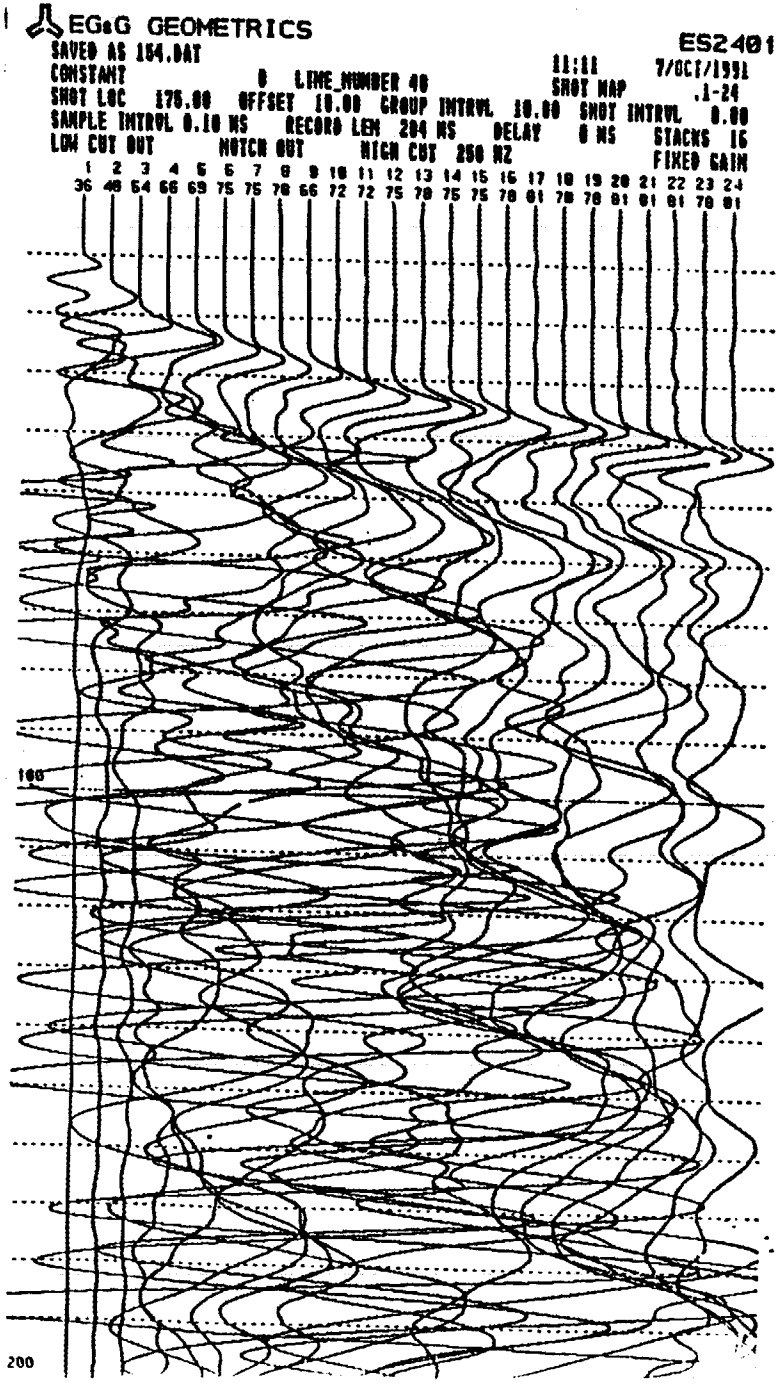

EG&G GEOMETRICS
ES2401
SAVED AS 149.DAT
15:50 4/OCT/1991
CONSTANT 0 LINE_NUMBER 39 SHOT MAP .1-24
SHOT LOC 223.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 20
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
36 54 60 63 51 54 57 60 63 69 69 69 69 69 72 75 78 78 75 78 81 81 84 84 84
100

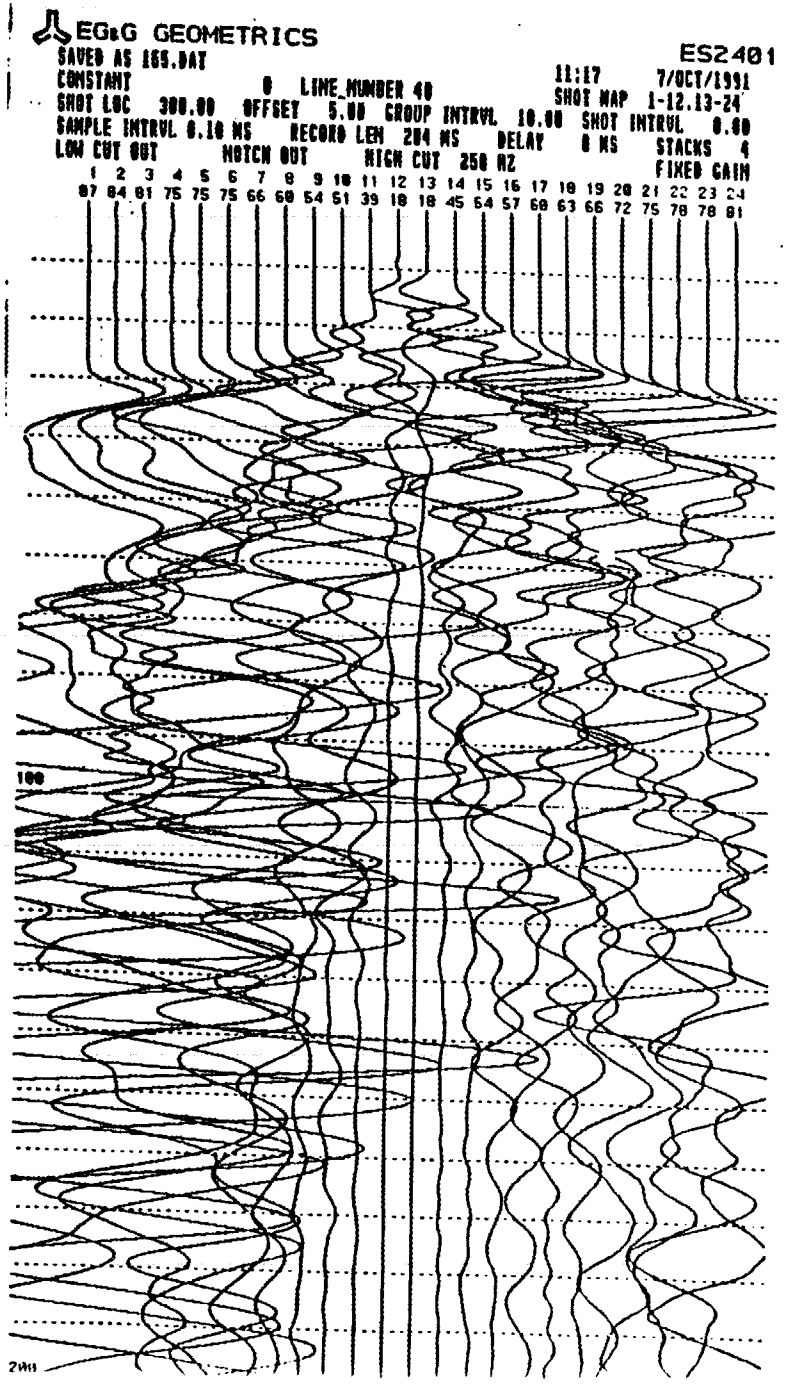

SAVED AS 160.DAT
16:04 4/OCT/1991
CONSTANT 0 LINE NUMBER 39
SHOT MAP 1-12.13-24
SHOT LOC 348.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
69 69 69 69 68 60 60 64 45 45 39 10 16 42 57 63 66 66 63 69 72 72 72 75
100
200

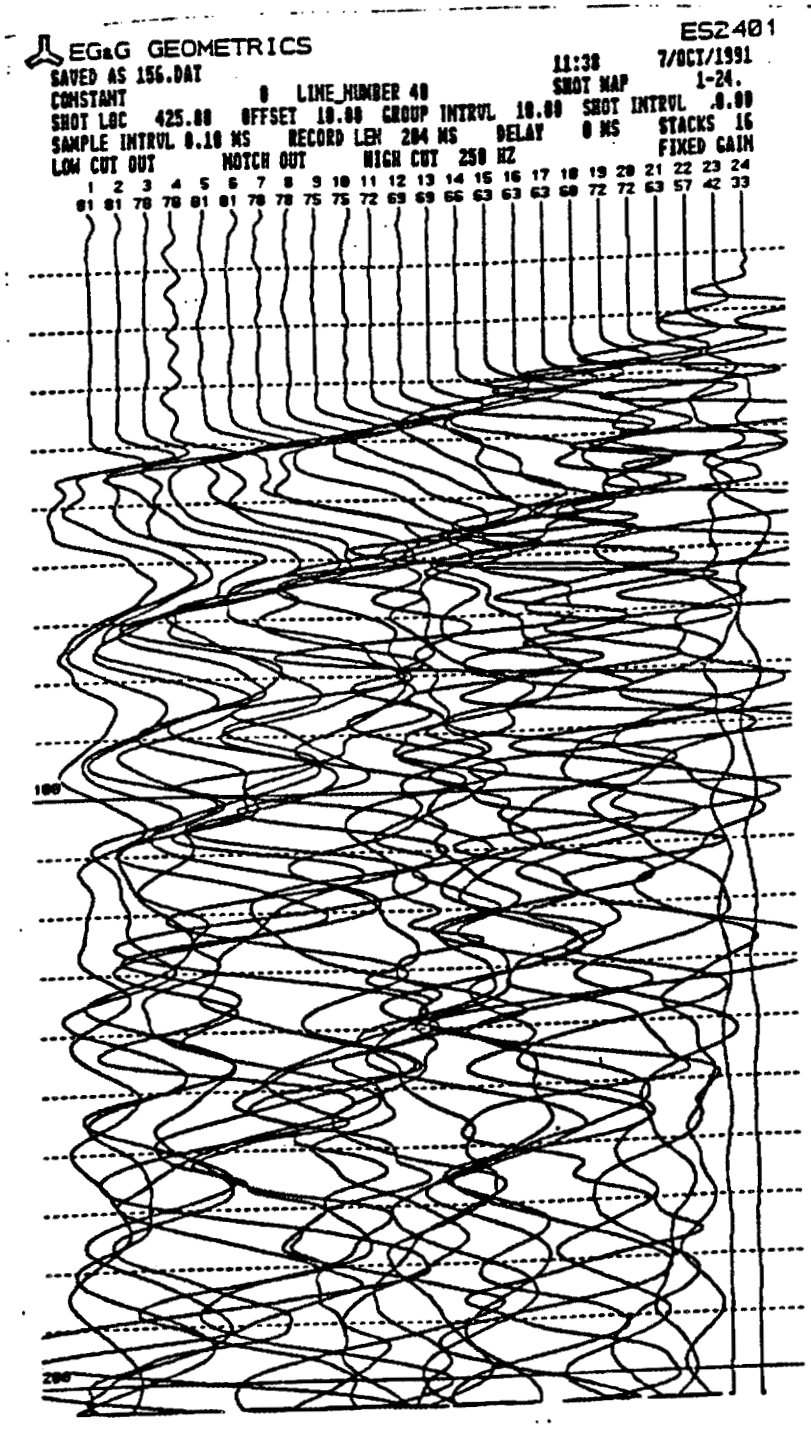

EG&G GEOMETRICS
ES2401
SAVED AS 161.DAT
16:11 4/OCT/1991
CONSTANT 0 LINE NUMBER 39
SHOT MAP 1-24.
SHOT LOC 473.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 81 84 84 84 81 81 78 78 78 78 75 75 72 66 69 63 60 57 57 45 39 33 24
100
200

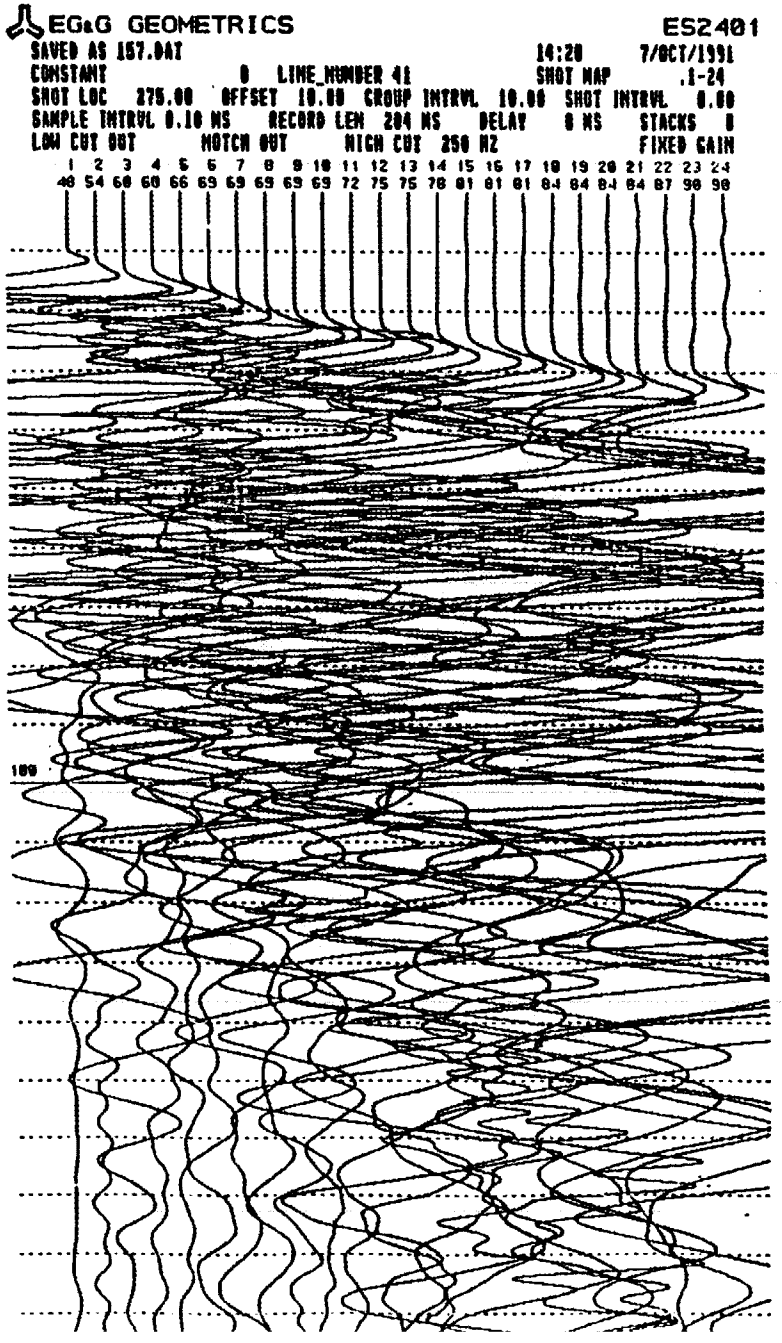

EG&G GEOMETRICS
ES2401
SAVED AS 102.DAT
CONSTANT 0 LINE_NUMBER 39
16:22 4/OCT/1991
SHOT LOC 613.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 1
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 93 93 93 93 93 93 93 93 90 90 90 90 90 90 87 87 87 84 84 84 84
100

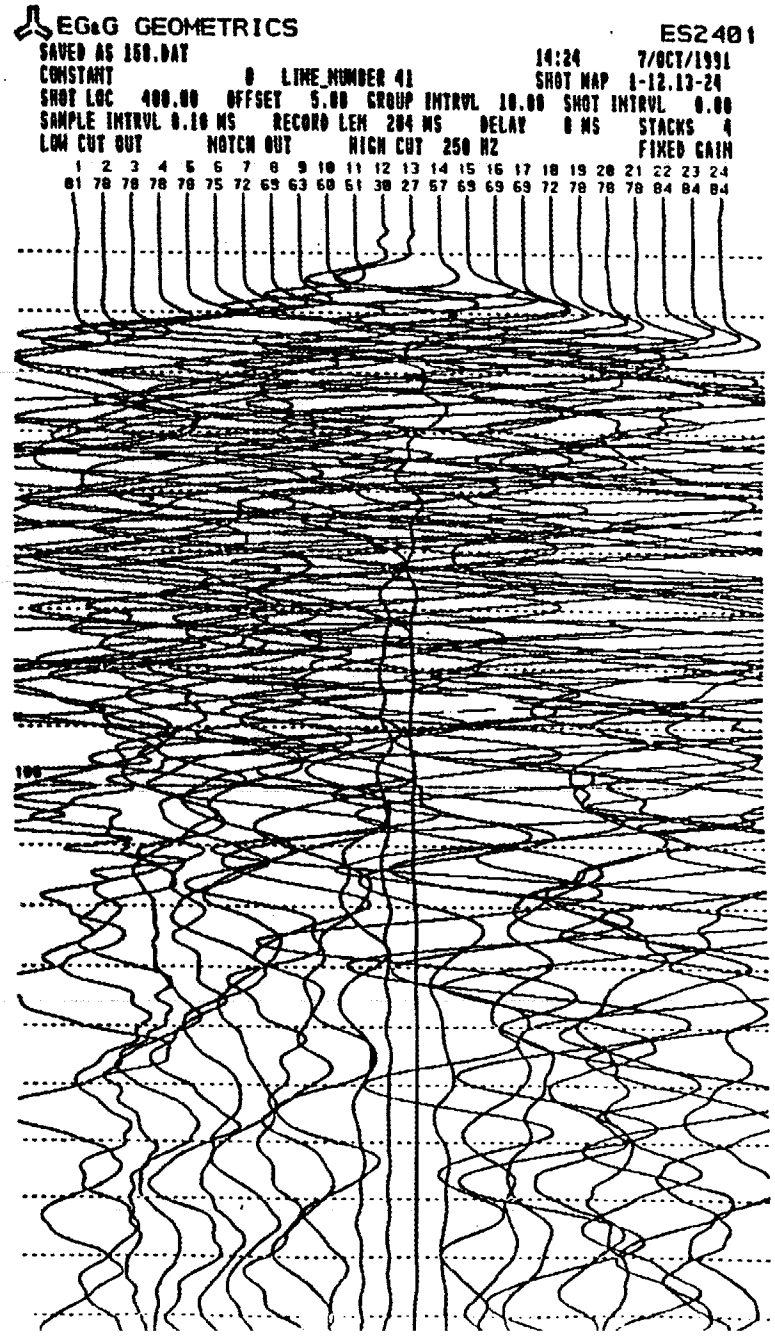

EG&G GEOMETRICS
ES2401
SAVED AS 103.DAT
CONSTANT 0 LINE_NUMBER 39
16:25 4/OCT/1991
SHOT LOC 613.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SHOT MAP 1-24.
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 2
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
93 93 93 93 90 90 90 90 90 90 90 87 87 87 87 87 87 84 84 84 81 81 81 81
100

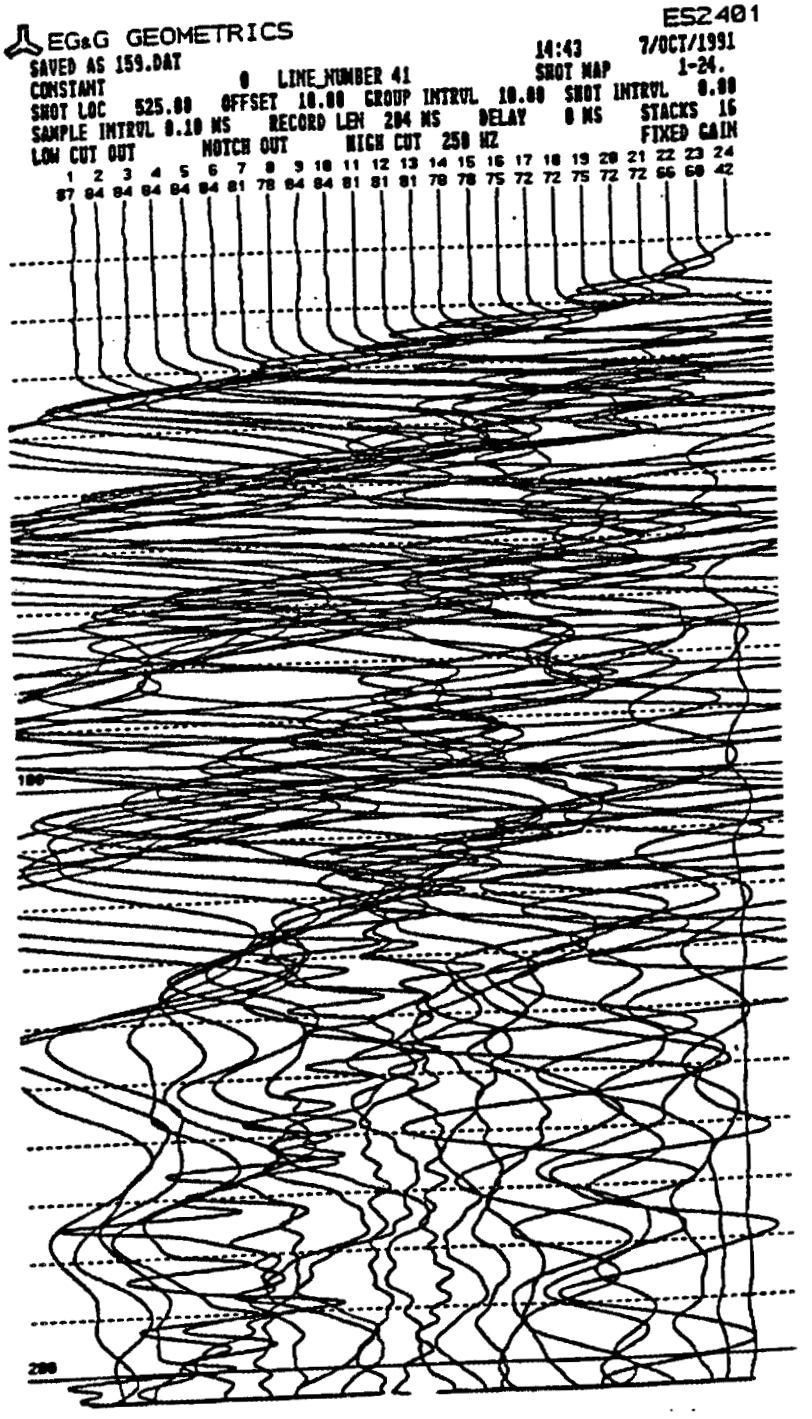

EG&G GEOMETRICS
ES2401
SAVED AS 154.DAT
CONSTANT 0 LINE_NUMBER 40
11:11 7/OCT/1991
SHOT LOC 175.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
36 48 54 66 69 75 75 78 66 72 72 75 78 75 75 78 81 78 78 81 81 81 78 81
100
200

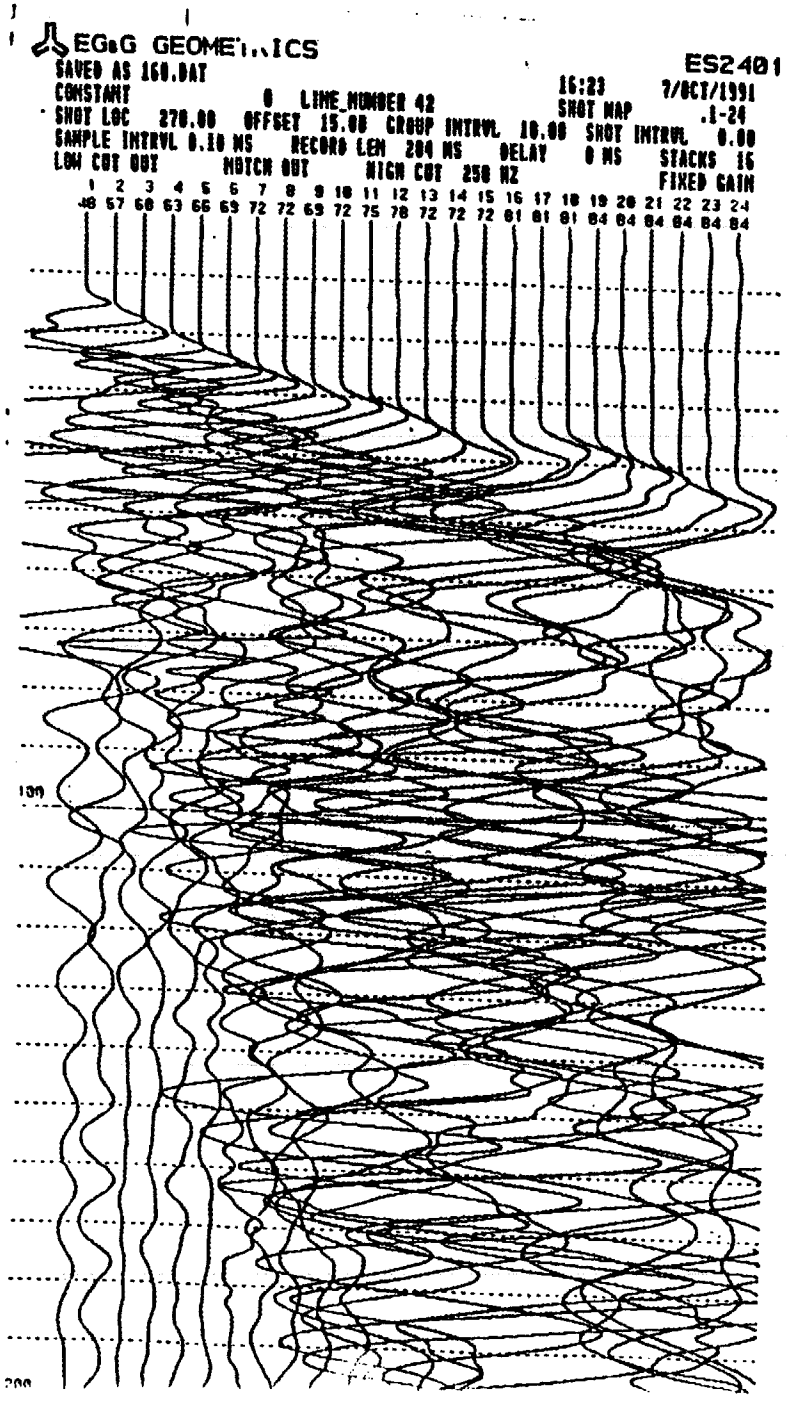

EG&G GEOMETRICS
ES2401
SAVED AS 155.DAT
CONSTANT 0 LINE_NUMBER 40
11:17 7/OCT/1991
SHOT LOC 300.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12.13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 81 75 75 75 66 60 54 51 39 18 18 45 54 57 60 63 66 72 75 78 78 81
100
200

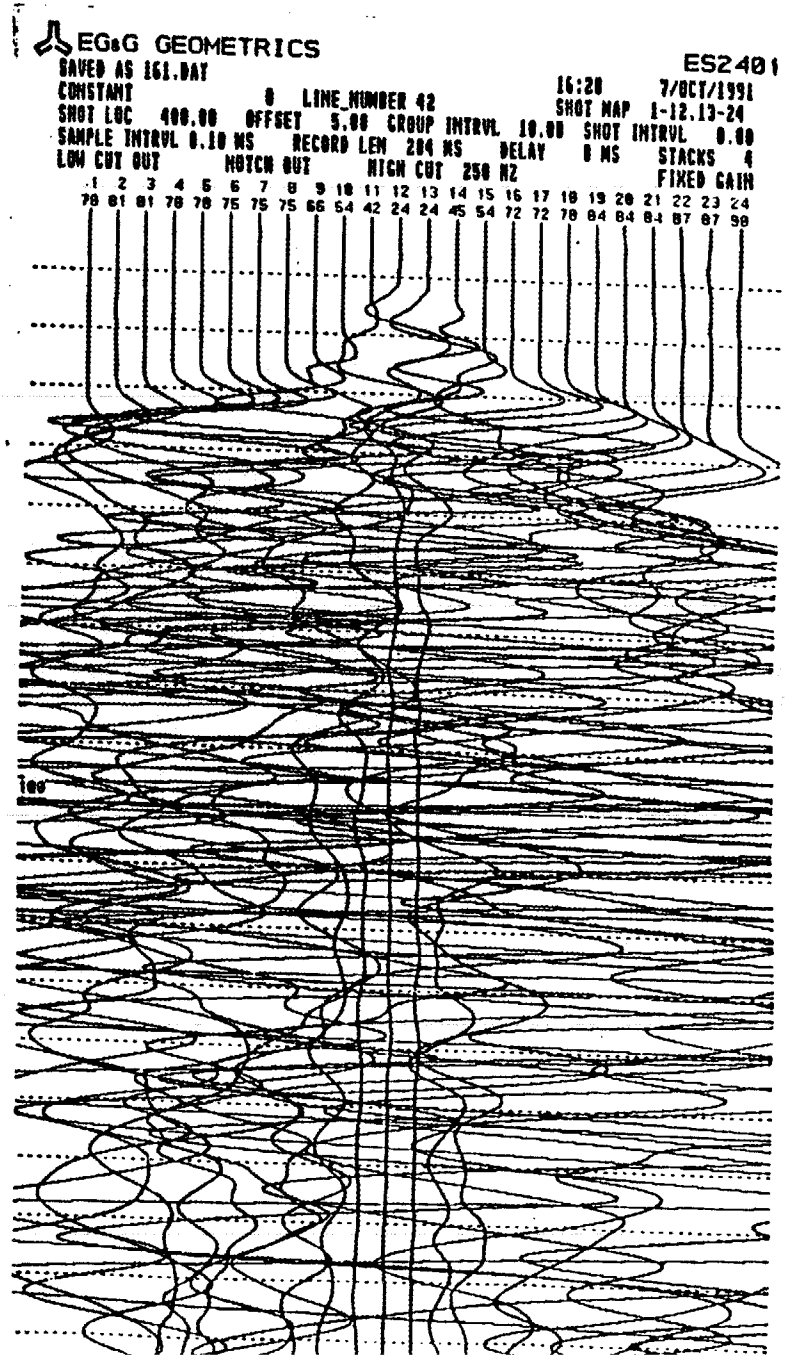

EG&G GEOMETRICS
ES2401
SAVED AS 156.DAT
11:38
7/OCT/1991
SHOT MAP
1-24.
CONSTANT
0 LINE NUMBER 40
SHOT LOC 425.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 81 78 78 81 81 78 78 75 75 72 69 69 66 63 63 63 60 72 72 63 57 42 33
100
200

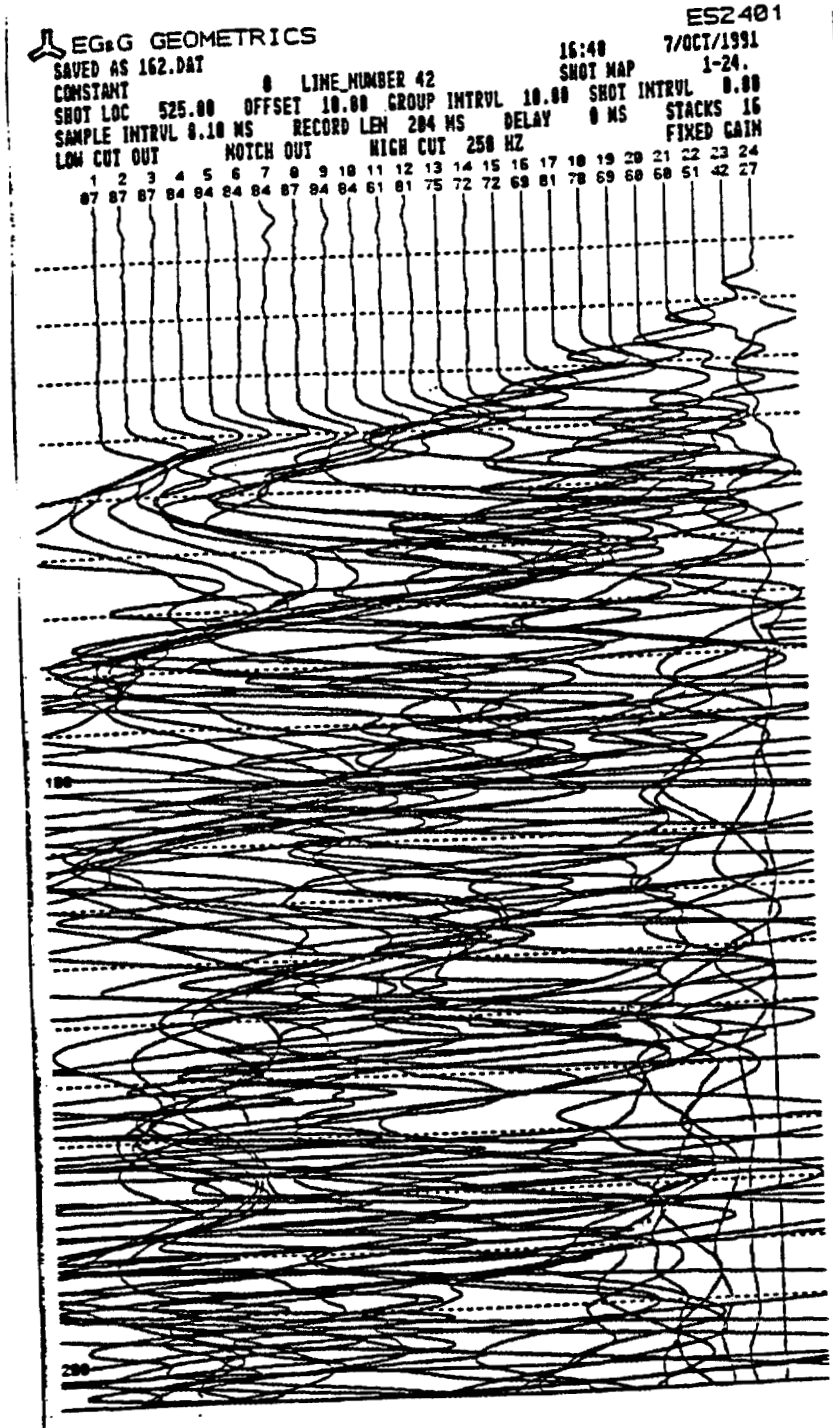

EG&G GEOMETRICS
ES2401
SAVED AS 157.DAT
14:20
7/OCT/1991
CONSTANT
0
LINE_NUMBER 41
SHOT MAP
.1-24
SHOT LOC 275.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY 0 MS
STACKS 0
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
48 54 60 60 66 69 69 69 69 69 72 75 75 78 81 81 81 84 84 84 84 87 90 90
100

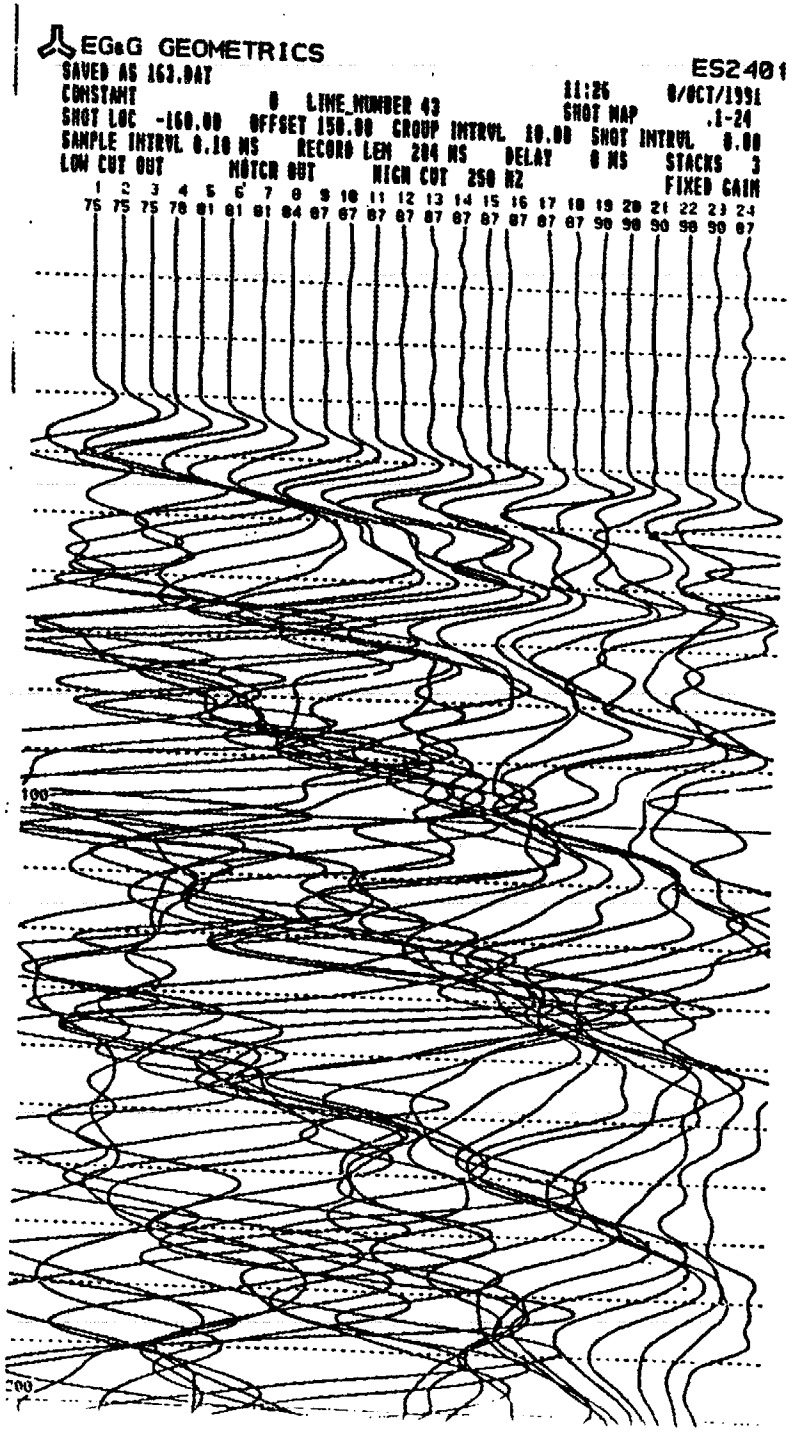

EG&G GEOMETRICS
ES2401
SAVED AS 158.DAT
14:24
7/OCT/1991
CONSTANT
0
LINE_NUMBER 41
SHOT MAP
1-12,13-24
SHOT LOC 400.00
OFFSET 5.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY 0 MS
STACKS 4
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 78 78 78 78 75 72 69 63 60 51 30 27 57 69 69 69 72 78 78 78 84 84 84
100

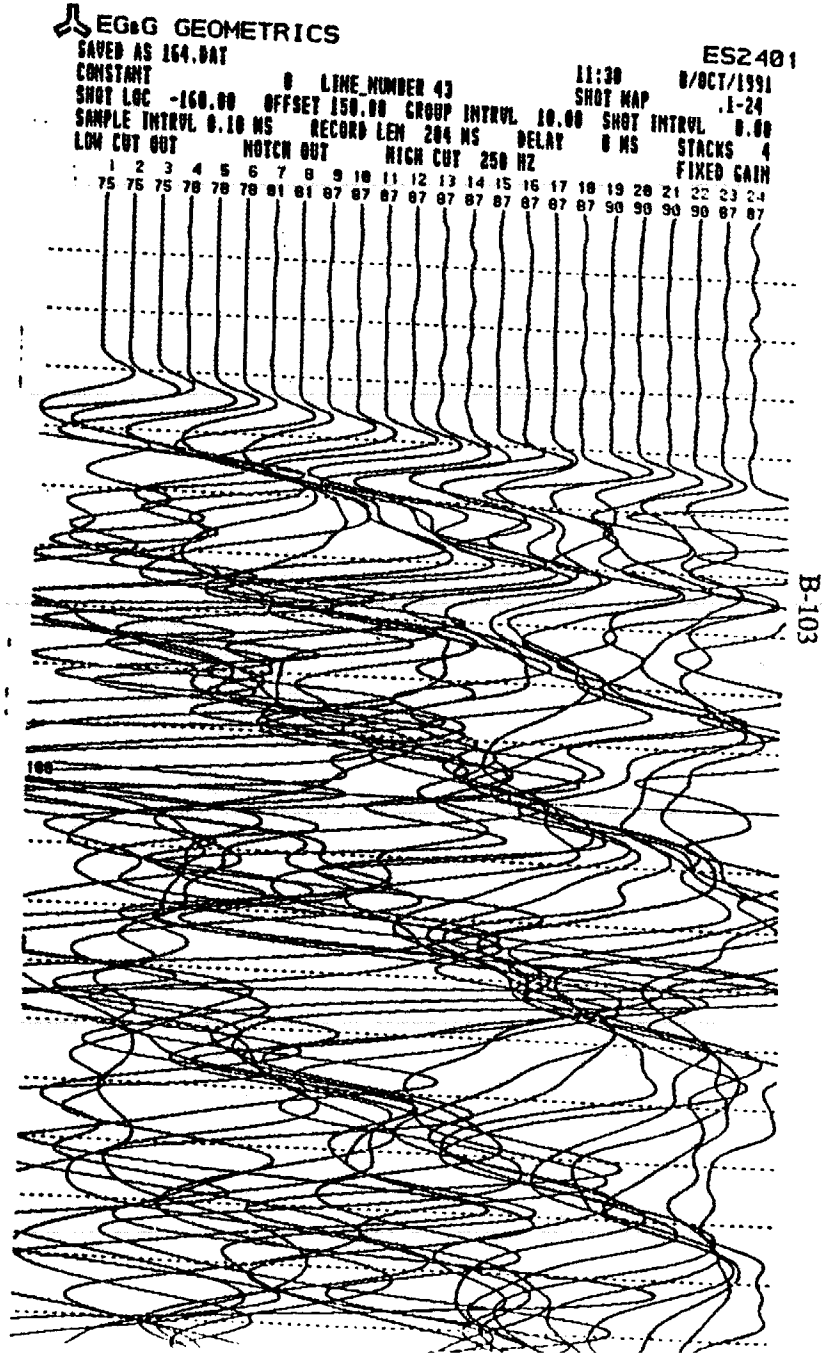

EG&G GEOMETRICS
ES2401
SAVED AS 159.DAT
14:43
7/OCT/1991
SHOT MAP
1-24.
CONSTANT
0 LINE NUMBER 41
SHOT LOC 525.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
FIXED GAIN
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 84 84 84 84 84 81 78 84 84 81 81 81 78 78 75 72 72 75 72 72 66 60 42
100
200

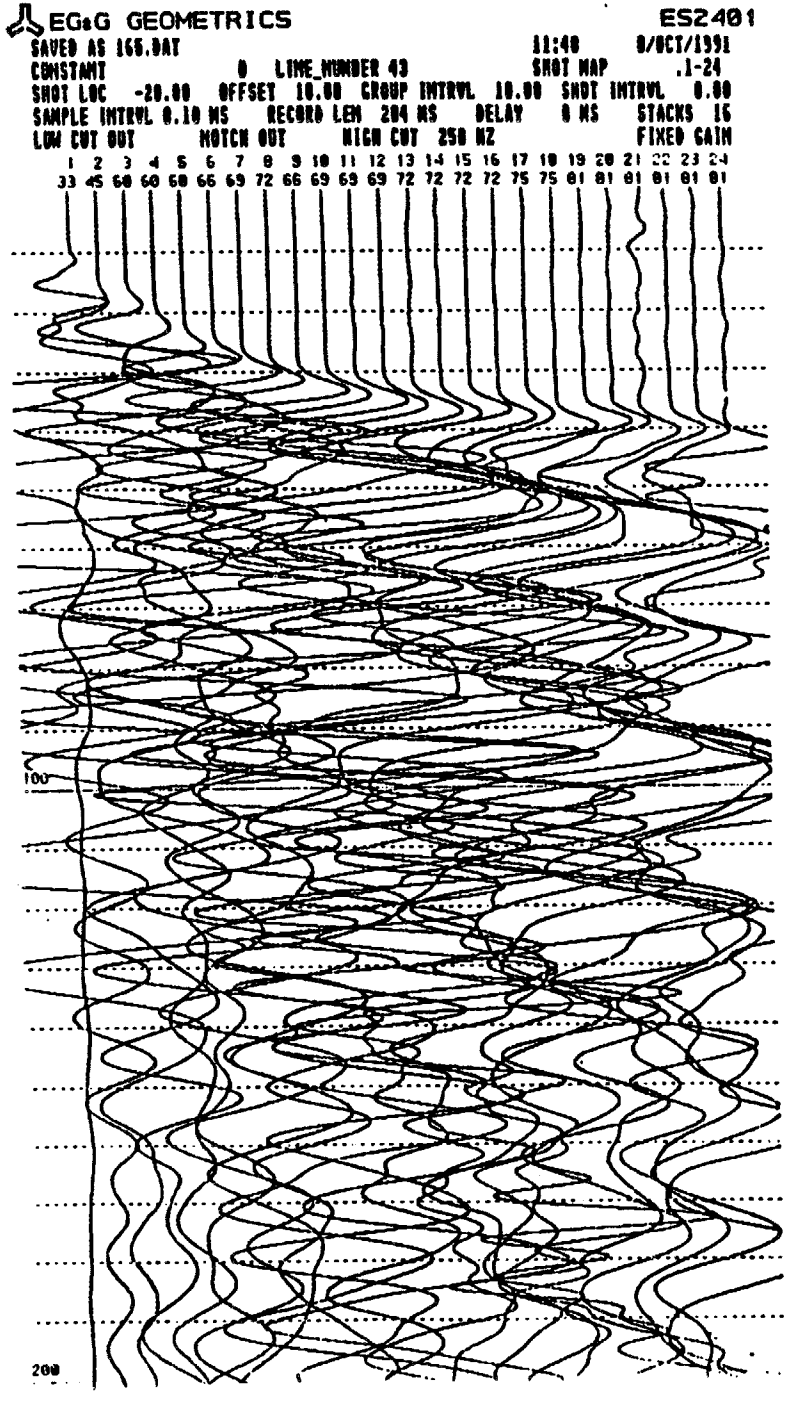

EG&G GEOMETRICS
ES2401
SAVED AS 160.DAT
CONSTANT 0 LINE NUMBER 42 16:23 7/OCT/1991
SHOT LOC 270.00 OFFSET 15.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 16
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
48 57 60 63 66 69 72 72 69 72 75 78 72 72 72 81 81 81 84 84 84 84 84 84
100
200

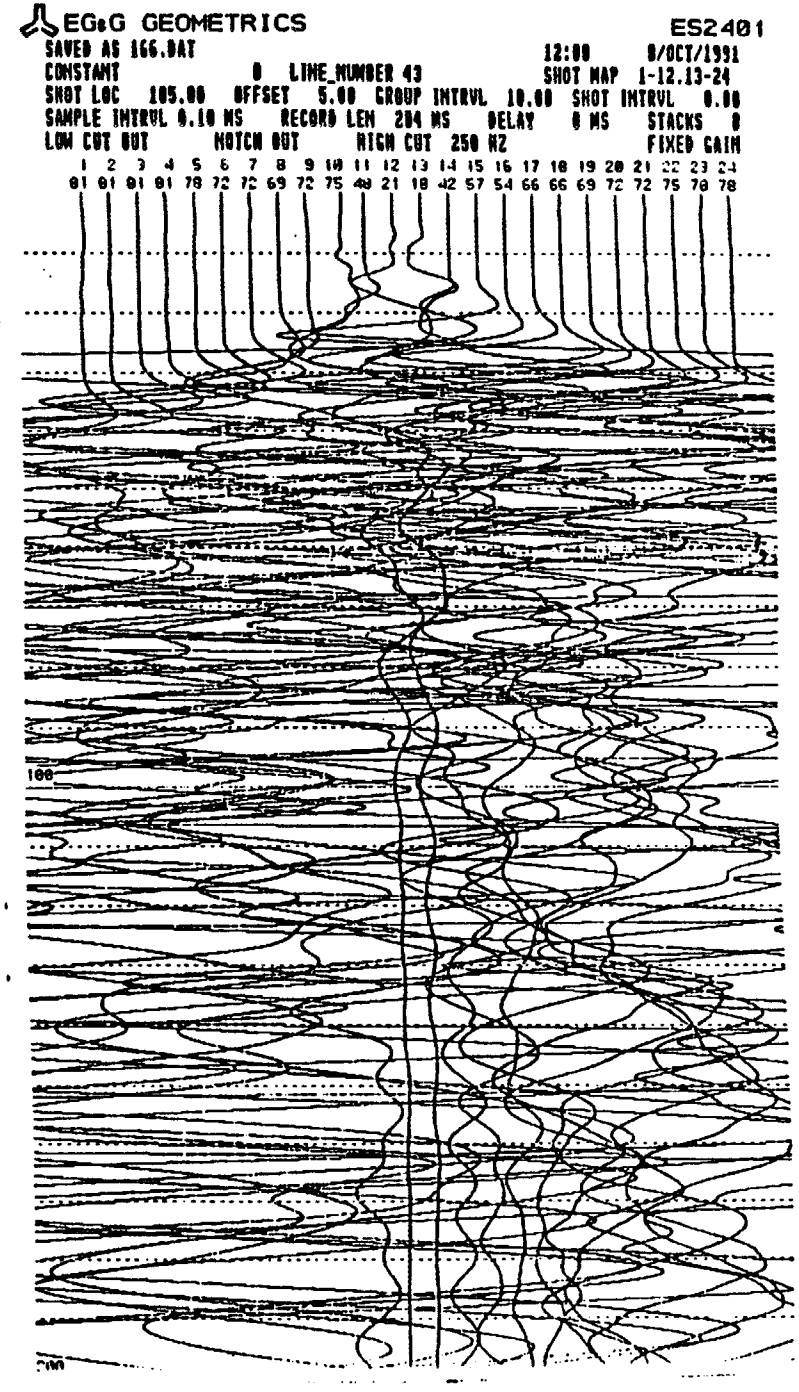

EG&G GEOMETRICS
ES2401
SAVED AS 161.DAT
CONSTANT 0 LINE NUMBER 42 16:20 7/OCT/1991
SHOT LOC 400.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT MAP 1-12,13-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 81 81 78 78 75 75 75 66 54 42 24 24 45 54 72 72 78 84 84 84 87 87 90
100

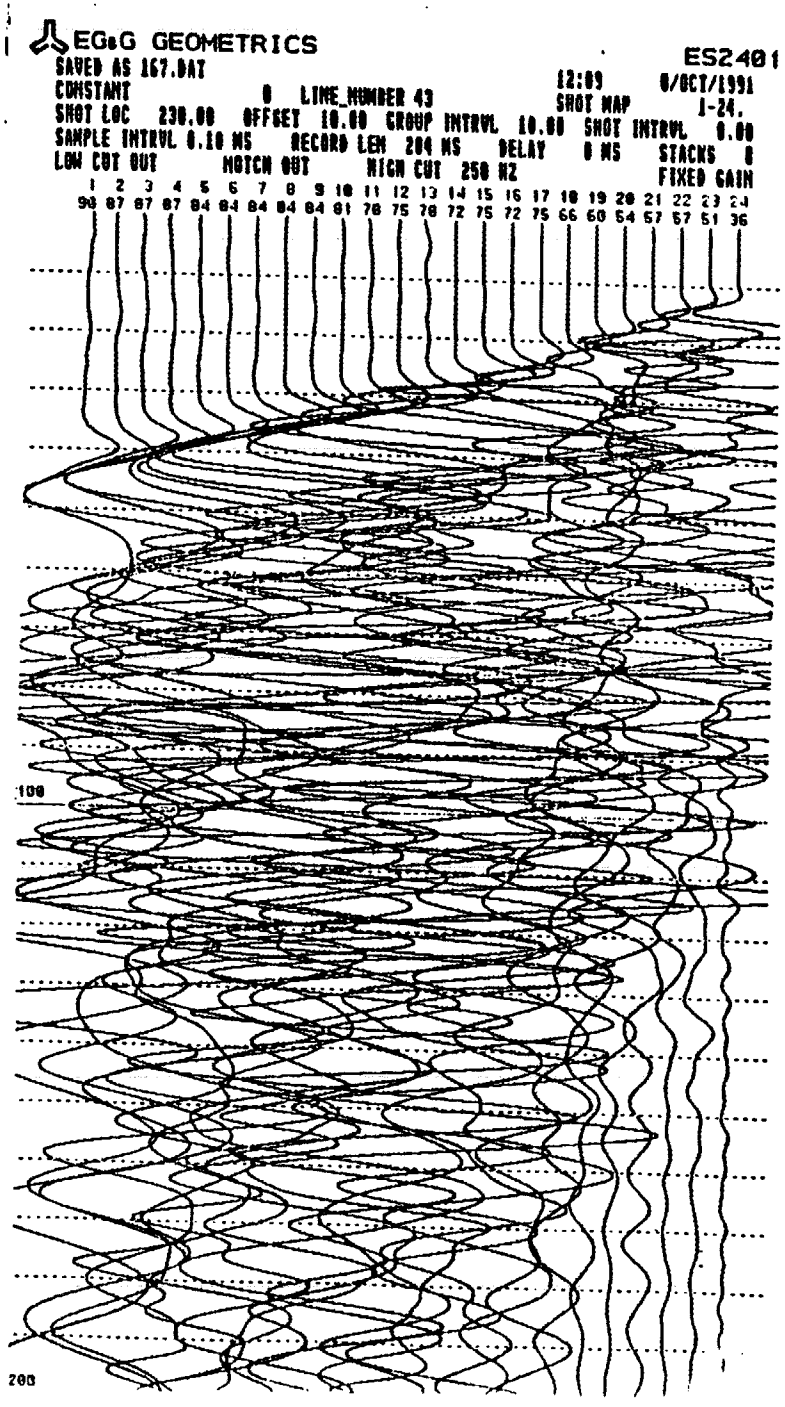

ES2401
EG&G GEOMETRICS
SAVED AS 162.DAT
16:40
7/OCT/1991
SHOT MAP
1-24.
CONSTANT
0
LINE NUMBER 42
SHOT LOC 525.00
OFFSET 10.00
GROUP INTRVL 10.00
SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS
RECORD LEN 204 MS
DELAY 0 MS
STACKS 16
FIXED GAIN
LOW CUT OUT
NOTCH OUT
HIGH CUT 250 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 87 84 84 84 84 87 84 84 61 81 75 72 72 69 81 78 69 60 60 51 42 27
100
200

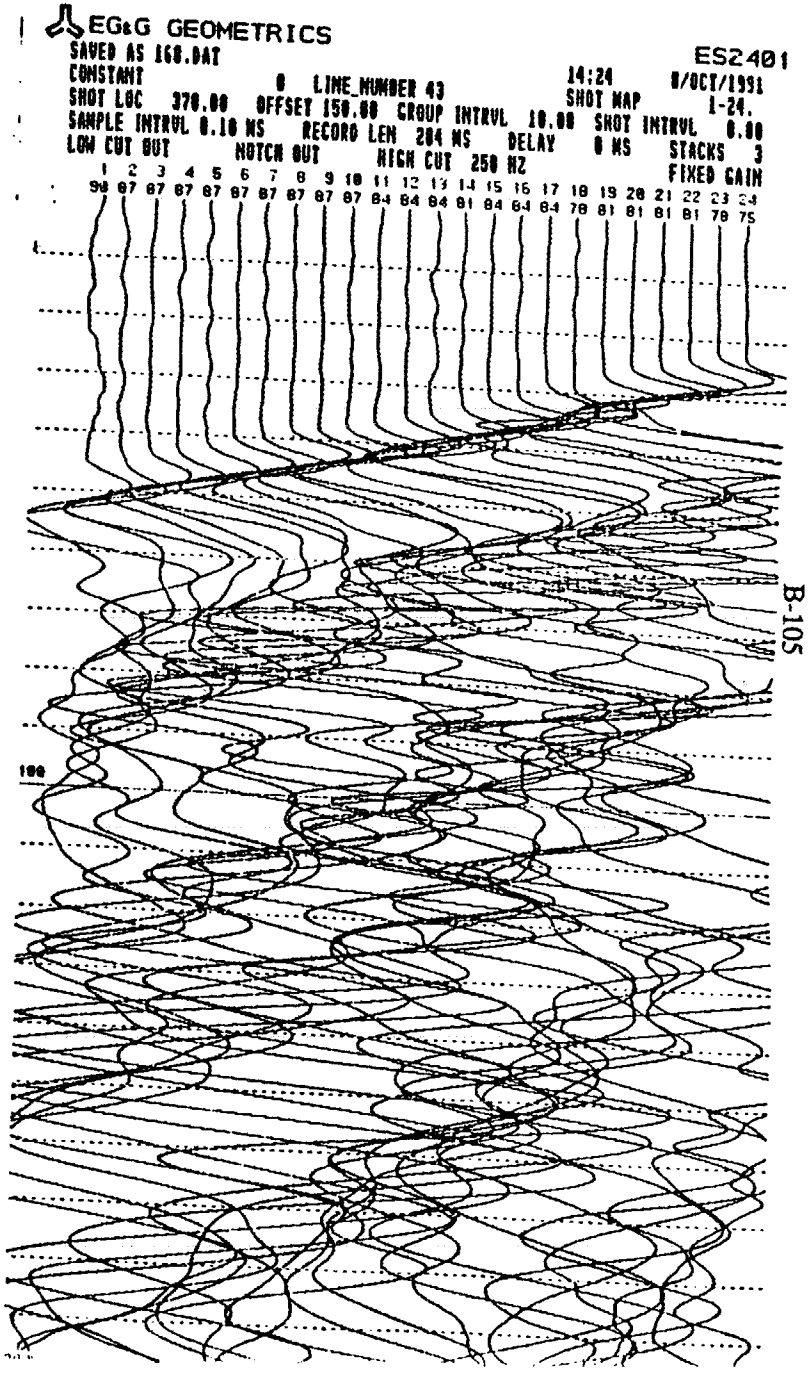

EG&G GEOMETRICS
ES2401
SAVED AS 163.DAT
CONSTANT 0 LINE NUMBER 43 11:26 8/OCT/1991
SHOT LOC -160.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 3
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
75 75 75 78 81 81 81 84 87 87 87 87 87 87 87 87 87 87 87 90 90 90 90 90 87
100
200

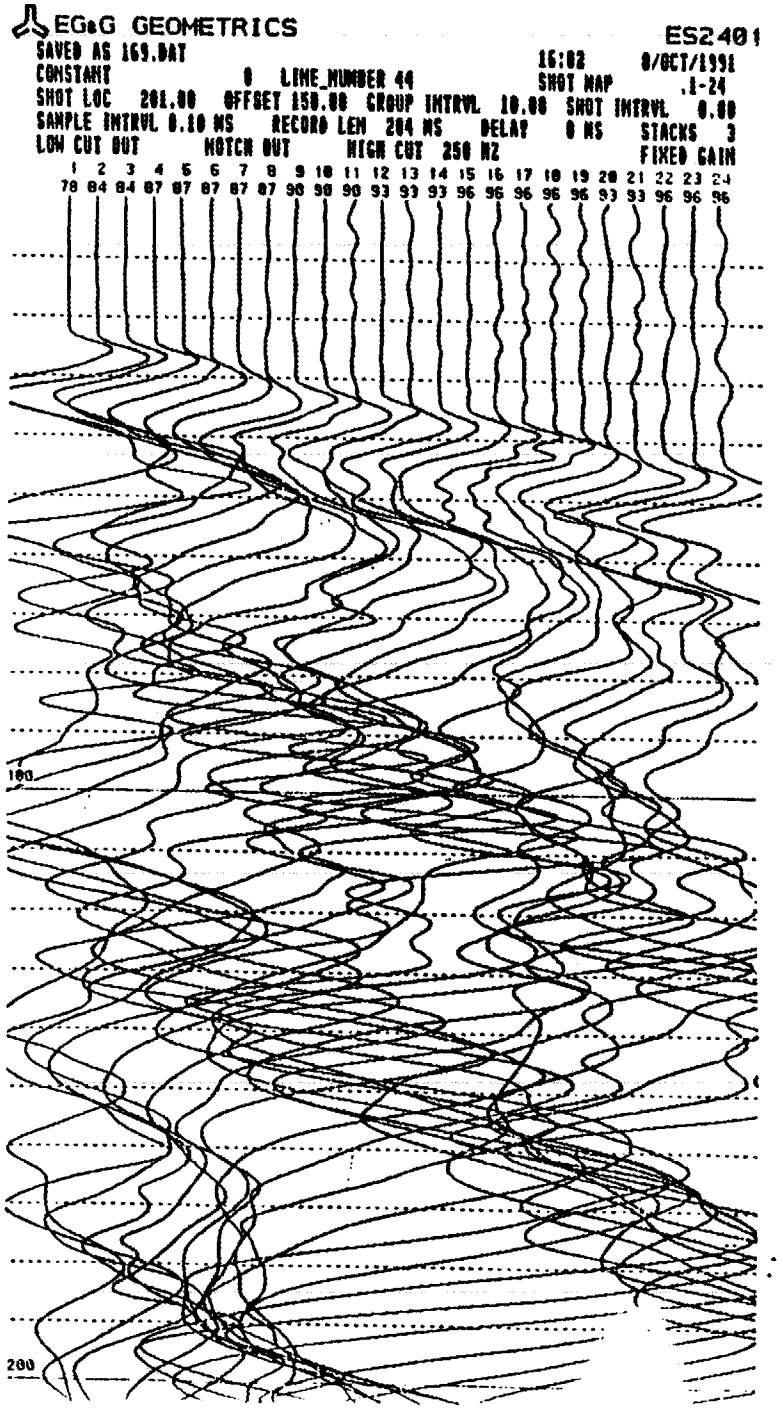

EG&G GEOMETRICS
ES2401
SAVED AS 164.DAT
CONSTANT 0 LINE NUMBER 43 11:30 8/OCT/1991
SHOT LOC -160.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT MAP .1-24
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS SHOT INTRVL 0.00
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ STACKS 4
FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
75 75 75 78 78 78 81 81 87 87 87 87 87 87 87 87 87 87 87 90 90 90 90 87 87
100

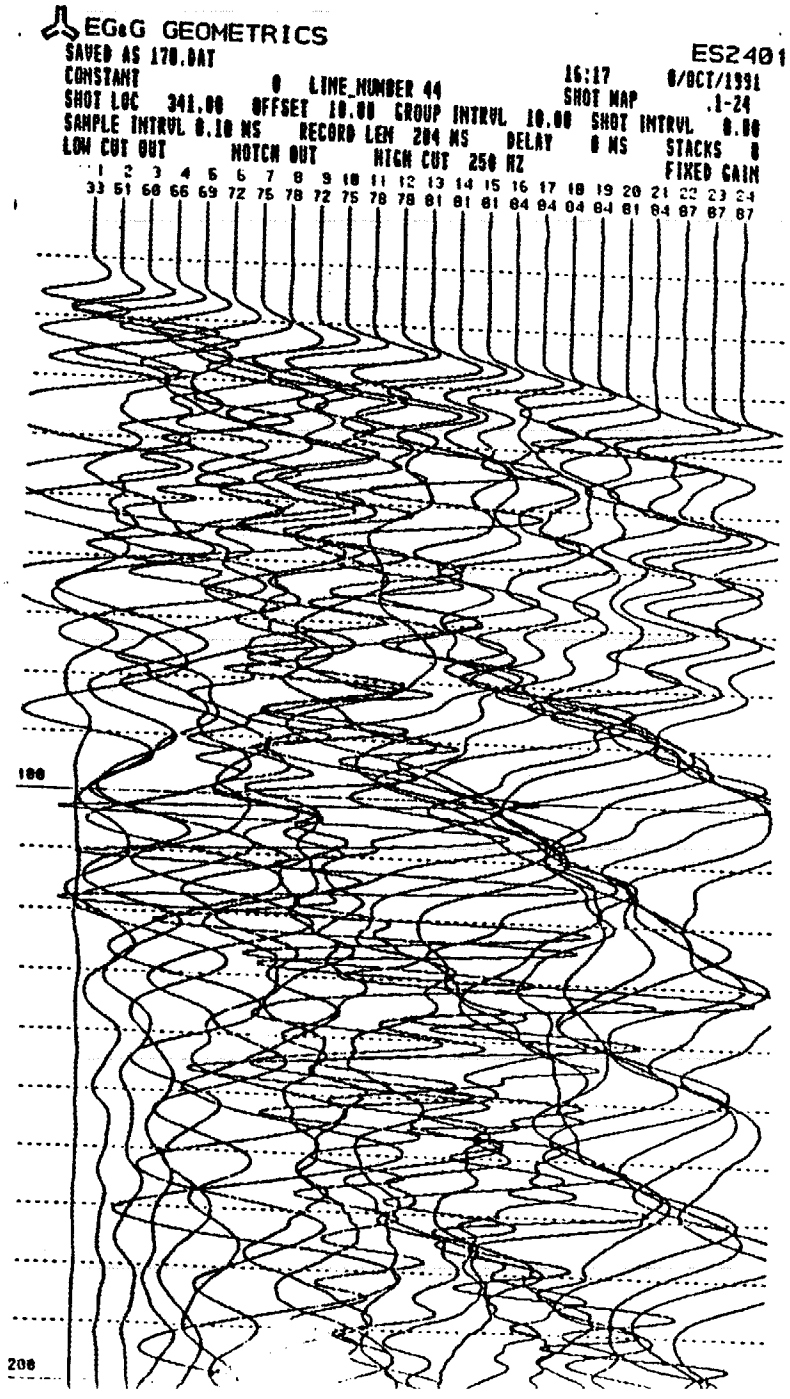

EG&G GEOMETRICS
ES2401
SAVED AS 166.DAT
11:40
8/OCT/1991
CONSTANT 0 LINE_NUMBER 43
SHOT MAP .1-24
SHOT LOC -20.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 16
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
33 45 60 60 60 66 69 72 66 69 69 69 72 72 72 72 75 75 81 81 81 81 81 81
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 166.DAT
12:00
8/OCT/1991
CONSTANT 0 LINE_NUMBER 43
SHOT MAP 1-12.13-24
SHOT LOC 105.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
81 81 81 81 78 72 72 69 72 75 48 21 18 42 57 54 66 66 69 72 72 75 78 78
100


EG&G GEOMETRICS
ES2401
SAVED AS 167.DAT
CONSTANT 0 LINE NUMBER 43
12:09 8/OCT/1991
SHOT MAP 1-24.
SHOT LOC 230.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 0
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 87 87 87 84 84 84 84 84 81 78 75 78 72 75 72 75 66 60 54 57 57 51 36
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 168.DAT
CONSTANT 0 LINE NUMBER 43
14:24 8/OCT/1991
SHOT MAP 1-24.
SHOT LOC 370.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90 87 87 87 87 87 87 87 87 87 84 84 84 81 84 84 84 78 81 81 81 81 78 75
100


EG&G GEOMETRICS
ES2401
SAVED AS 169.DAT
16:02 8/OCT/1991
CONSTANT 0 LINE_NUMBER 44 SHOT MAP .1-24
SHOT LOC 201.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 3
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
78 84 84 87 87 87 87 87 90 90 90 93 93 93 96 96 96 96 96 93 93 96 96 96
100
200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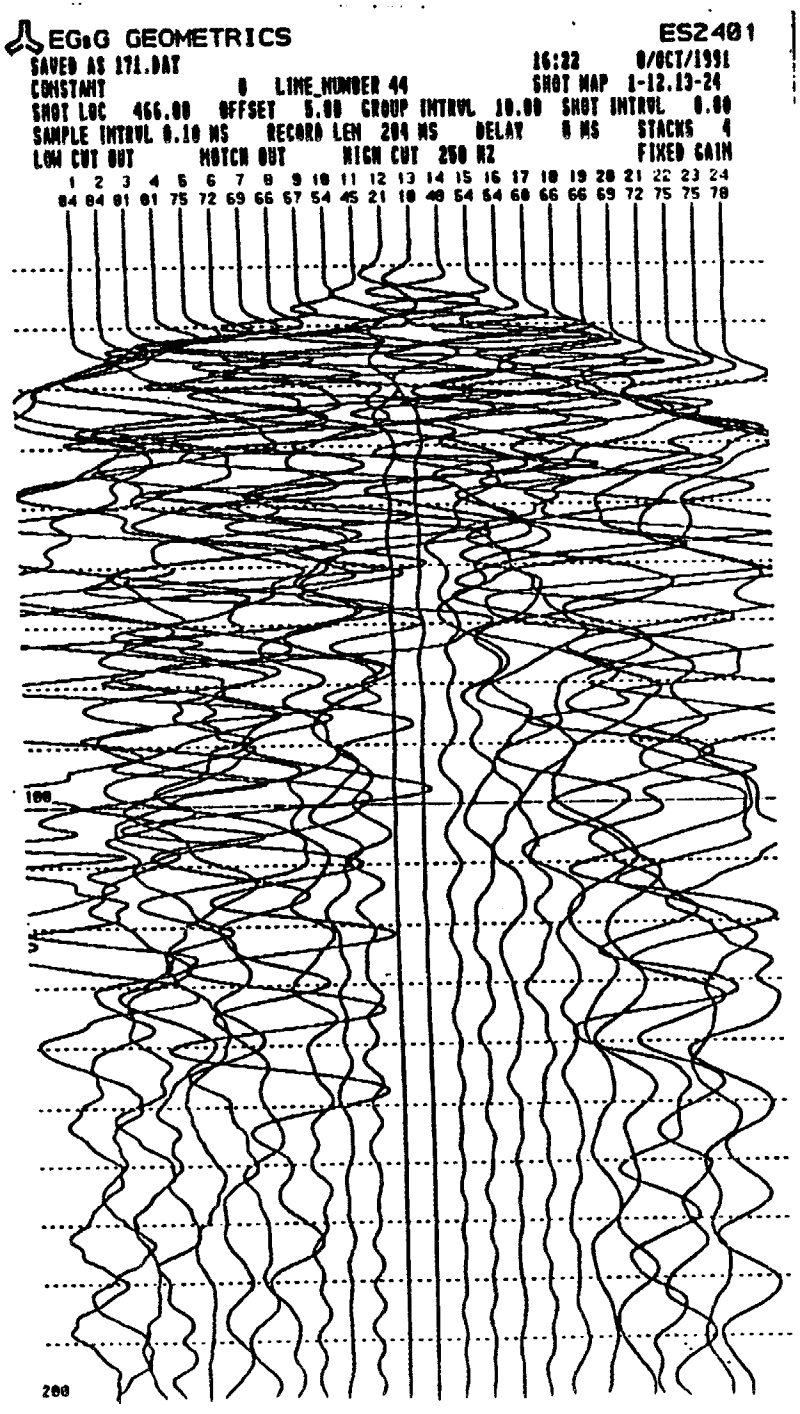
ES2401
SAVED AS 170.DAT
16:17 8/OCT/1991
CONSTANT 0 LINE_NUMBER 44 SHOT MAP .1-24
SHOT LOC 341.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
33 51 60 66 69 72 75 78 72 75 78 78 81 81 81 84 84 84 84 81 84 87 87 87
100
200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ES2401
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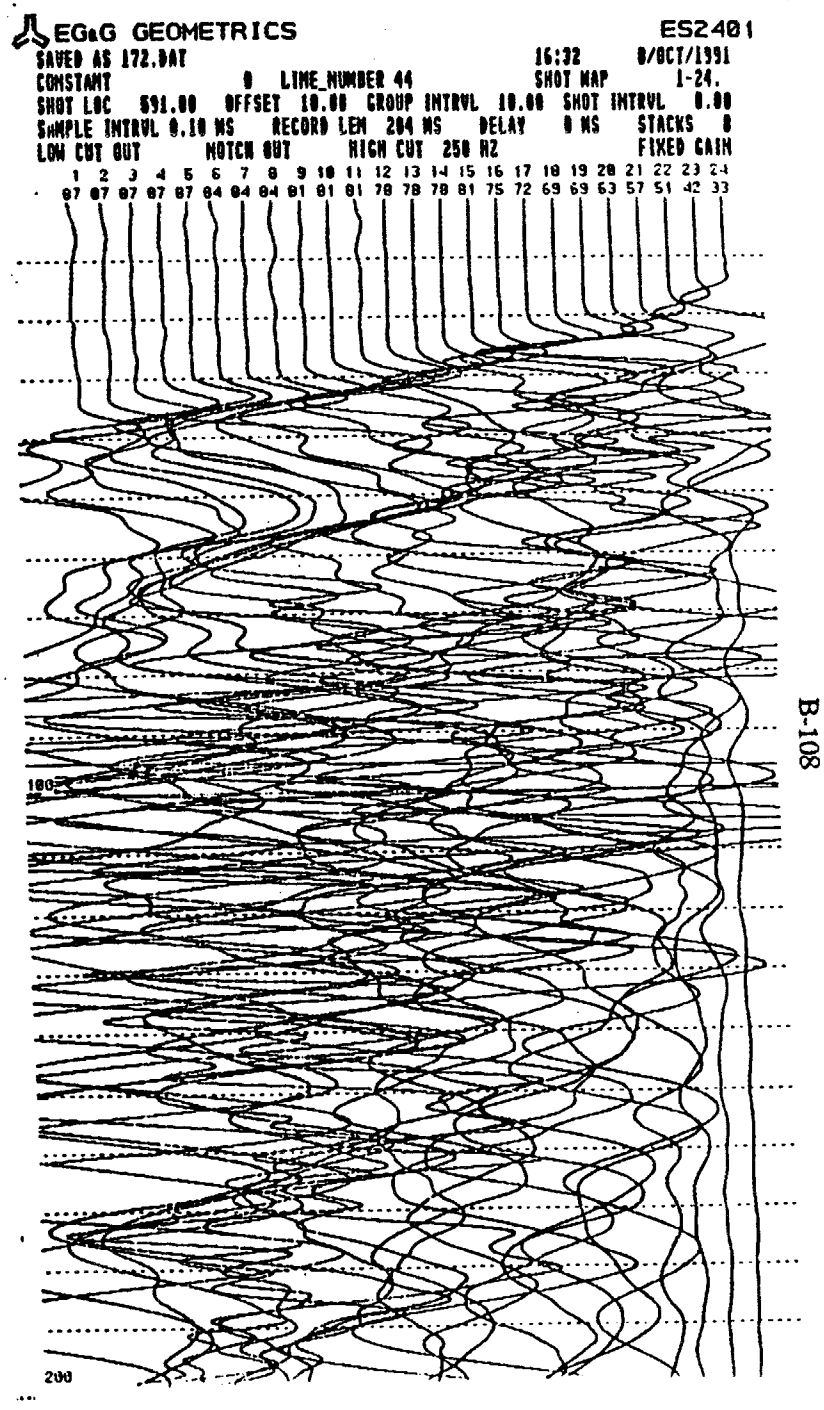
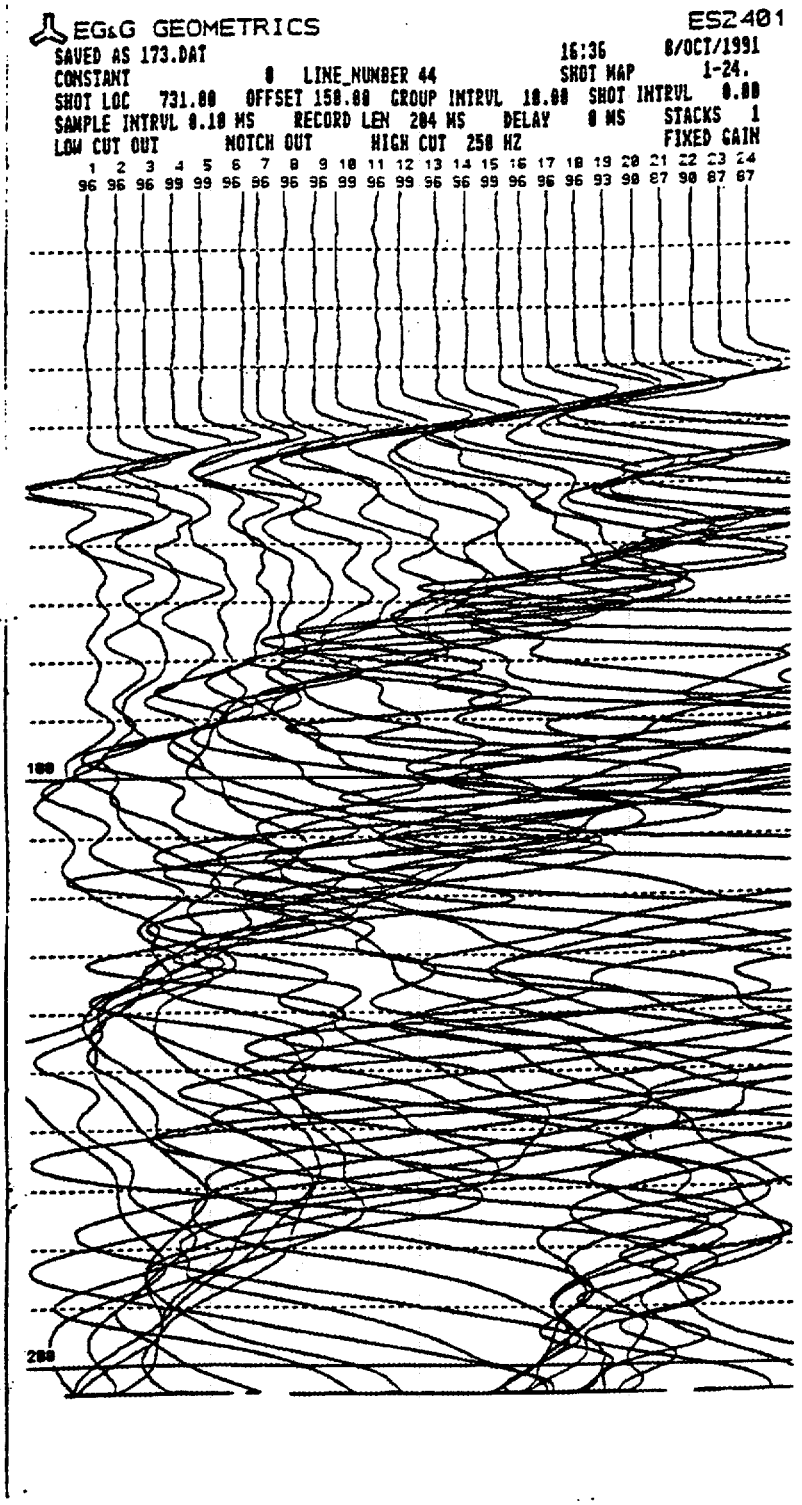
CONSTANT 0 LINE_NUMBER 44
SHOT MAP 1-12.13-24
SHOT LOC 466.00 OFFSET 5.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 4
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
84 84 81 81 75 72 69 66 67 54 45 21 10 40 54 54 60 66 66 69 72 75 75 78
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 172.DAT
16:32 8/OCT/1991
CONSTANT 0 LINE_NUMBER 44
SHOT MAP 1-24.
SHOT LOC 591.00 OFFSET 10.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 8
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
87 87 87 87 87 84 84 84 81 81 81 78 78 78 81 75 72 69 69 63 57 51 42 33
100
200


EG&G GEOMETRICS
ES2401
SAVED AS 173.DAT
16:36
8/OCT/1991
CONSTANT 0 LINE_NUMBER 44
SHOT MAP 1-24.
SHOT LOC 731.00 OFFSET 150.00 GROUP INTRVL 10.00 SHOT INTRVL 0.00
SAMPLE INTRVL 0.10 MS RECORD LEN 204 MS DELAY 0 MS STACKS 1
LOW CUT OUT NOTCH OUT HIGH CUT 250 HZ FIXED GAIN
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
96 96 96 99 99 96 96 96 96 99 96 99 96 96 99 96 96 96 93 90 87 90 87 87
100
200

Appendix C

TIME-DISTANCE CURVES

SEISMIC TIME-DISTANCE GRAPH

PROJECT _____

LOCATION _____

STATION _____

DATE _____

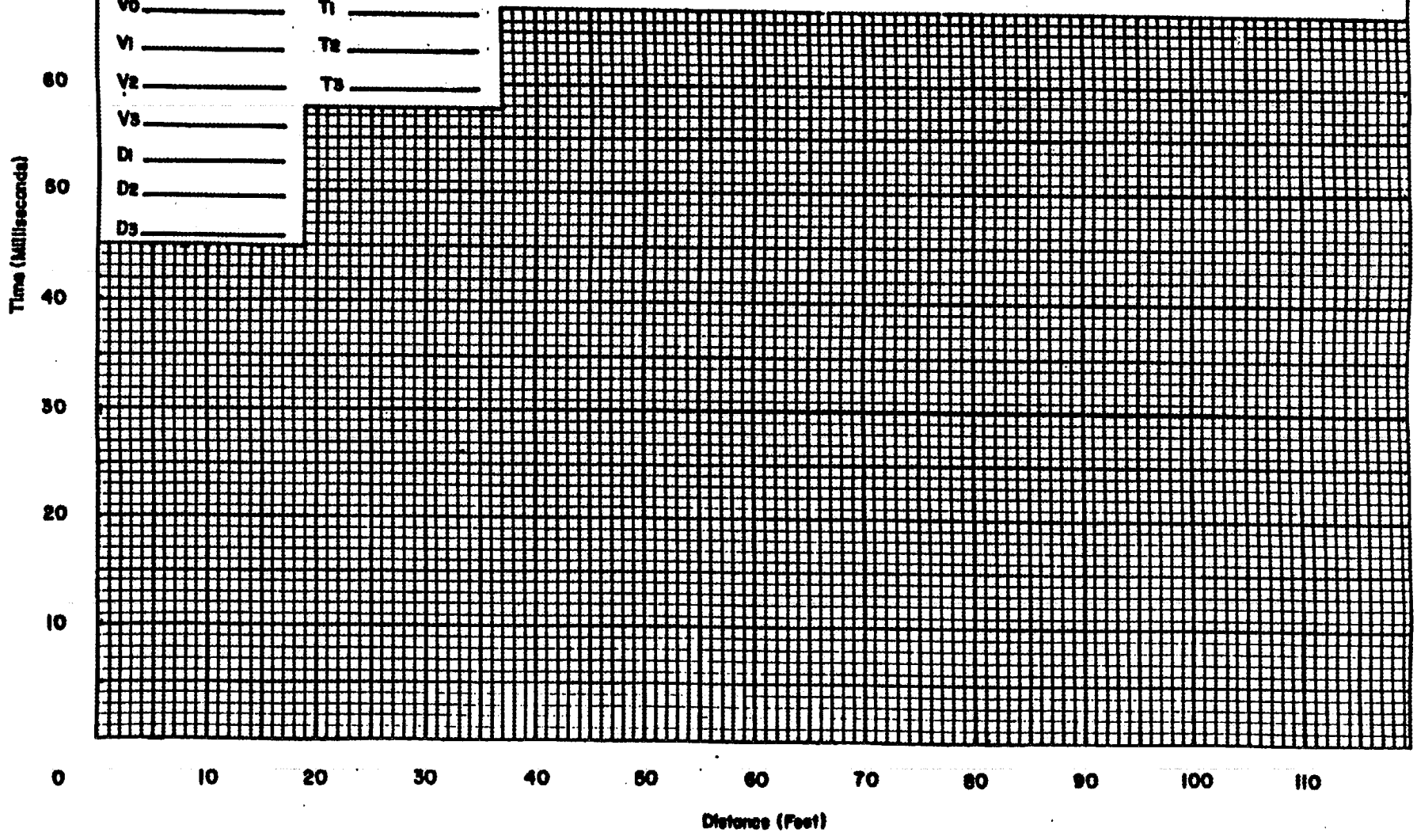
SURFACE ELEVATION _____

LINE BEARING _____

Vo _____	T1 _____
V1 _____	T2 _____
V2 _____	T3 _____
V3 _____	
D1 _____	
D2 _____	
D3 _____	

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET)	ELEVATIONS
	Vo _____	_____	_____	_____
	V1 _____	_____	_____	_____
	V2 _____	_____	_____	_____



SEISMIC TIME-DISTANCE GRAPH

PROJECT: ANS
LOCATION: SPD 1
STATION: #22
DATE: 9/18/91
SURFACE ELEVATION: 901
LINE BEARING: W → E

V_0	1200	1700	
V_1	5000	3700	
V_2	10800	13000	
V_3			
D_1			
D_2			
D_3			

T_1	.0055	.0025
T_2	.013	.0135
T_3		

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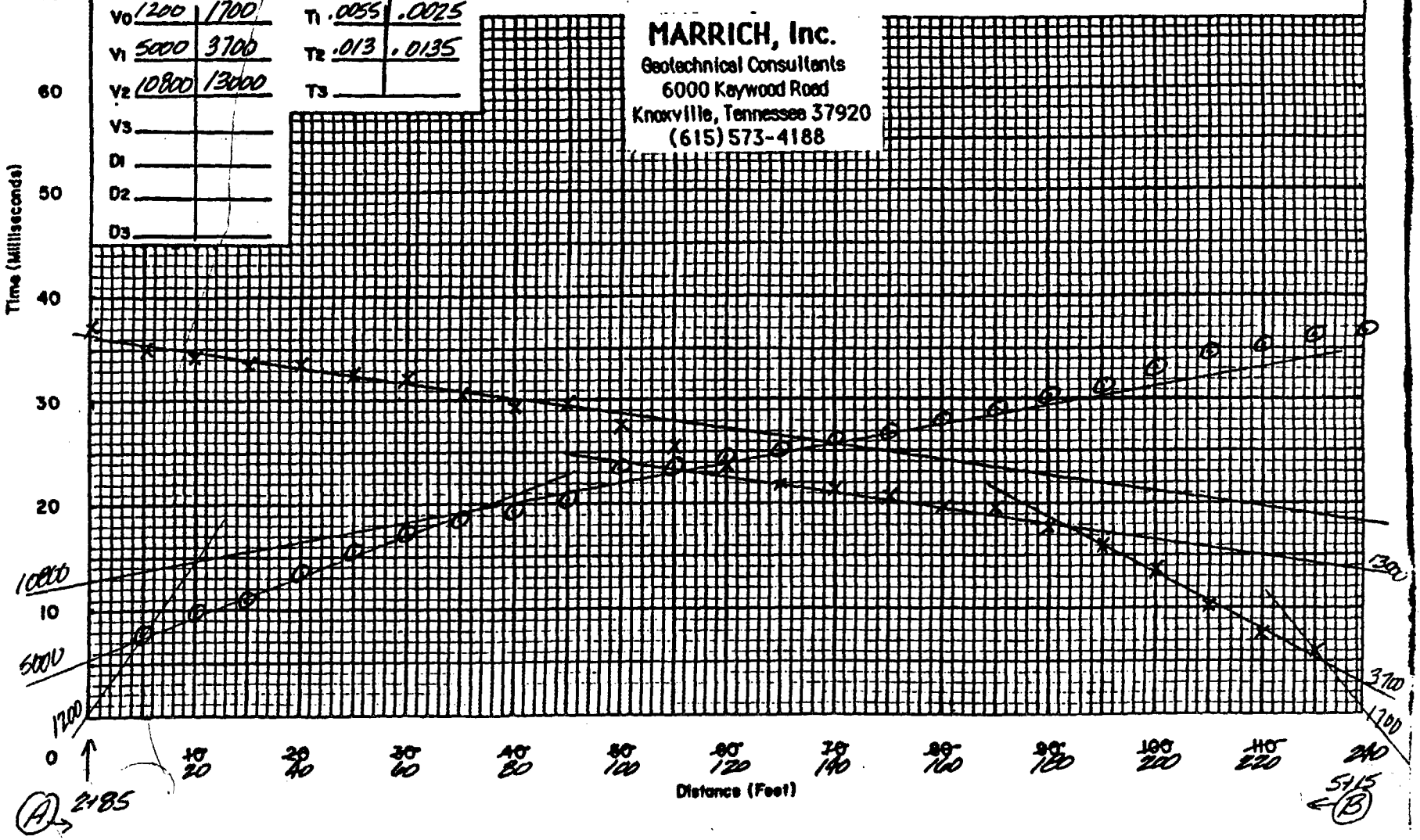
SUMMARY

10/29/91 RAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A) AVG	(B)	ELEVATIONS
V_0	1450		4	3 1	898
V_1	4246		20	23 27	878
V_2	11571				



5425

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AWS Site

LOCATION SPD #2

STATION #10

DATE 9/19/91

SURFACE ELEVATION 875.

LINE BEARING W → E

Vo	1400	1200
V1	6800	2800
V2	17000	15000
V3		
D1		
D2		
D3		

T1	.006	.0055
T2	.0145	.0125
T3		

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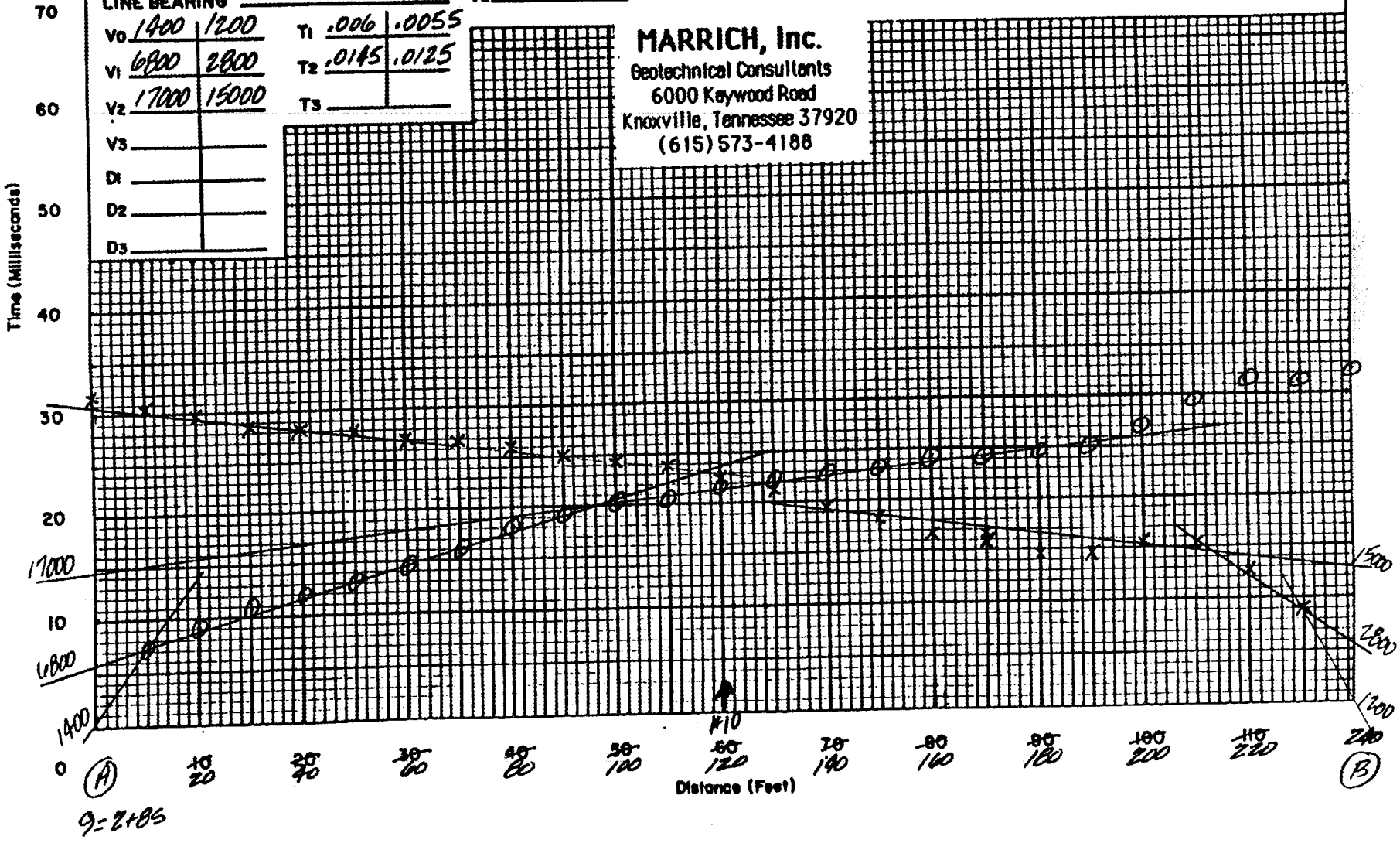
SUMMARY AWG 10/29/91 BAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
Vo	1300		4	3	4	872
V1	3924		21	19	18	856
V2	14480					



9=2+85

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AWS Site
LOCATION SPD #3
STATION #11
DATE 9/19/91
SURFACE ELEVATION 878.
LINE BEARING W → E

10/29/91 RAA

Vo	1300	(1300)
V1	2500	6300
V2	10400	12600
V3		
D1		
D2		
D3		

T1	.0045	.0005
T2	.0105	.007
T3		

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	AVG	(B)	ELEVATIONS
Vo	1300		3	1	0	877
V1	3528		14	13	13	865
V2	10286					

? FILL @ "B" END

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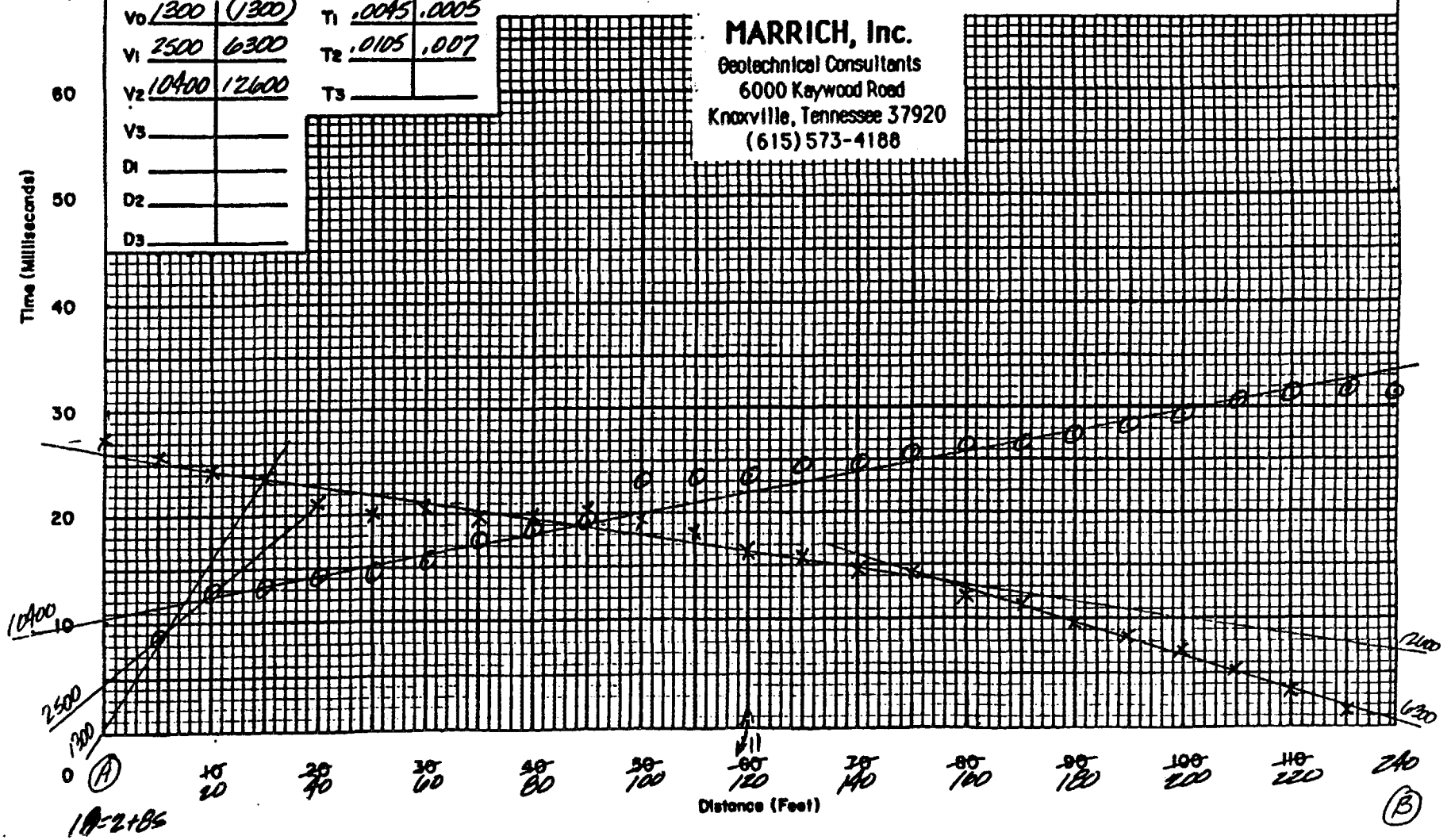

SEISMIC TIME-DISTANCE GRAPH

PROJECT: PROPOSED AWS
LOCATION: SPD #4
STATION: #12
DATE: 9/20/91
SURFACE ELEVATION: 856
LINE BEARING: N-7E

Vo	1200	1200
V1	4300	4100
V2	12000	10200
V3		
D1		
D2		
D3		

T1	.006	.0055
T2	.012	.008
T3		

SUMMARY

10/29/91 RAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	AVG	(B)	ELEVATIONS
Vo	1200		3	3	3	852
V1	4197		16	12	8	843
V2	11026					

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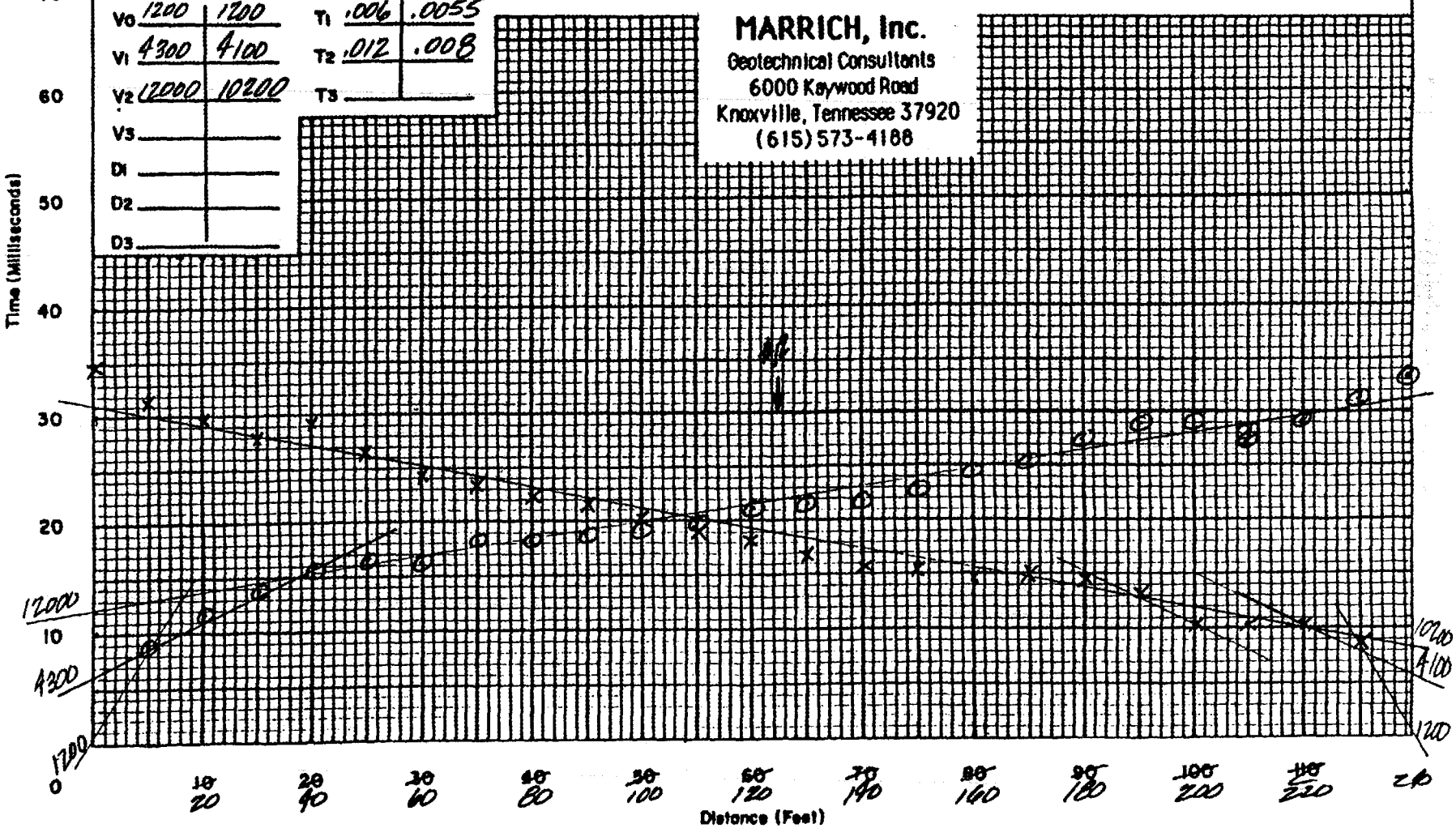

SEISMIC TIME-DISTANCE GRAPH

PROJECT: PROPOSED RNS SITE
LOCATION: SPD # 5
STATION: #13
DATE: 9/20/91
SURFACE ELEVATION: 856
LINE BEARING: W → E

V_0	1200	1300
V_1	4100	2800
V_2	12800	10200
V_3		
D_1		
D_2		
D_3		

T_1	.006	.0035
T_2	.011	.009
T_3		

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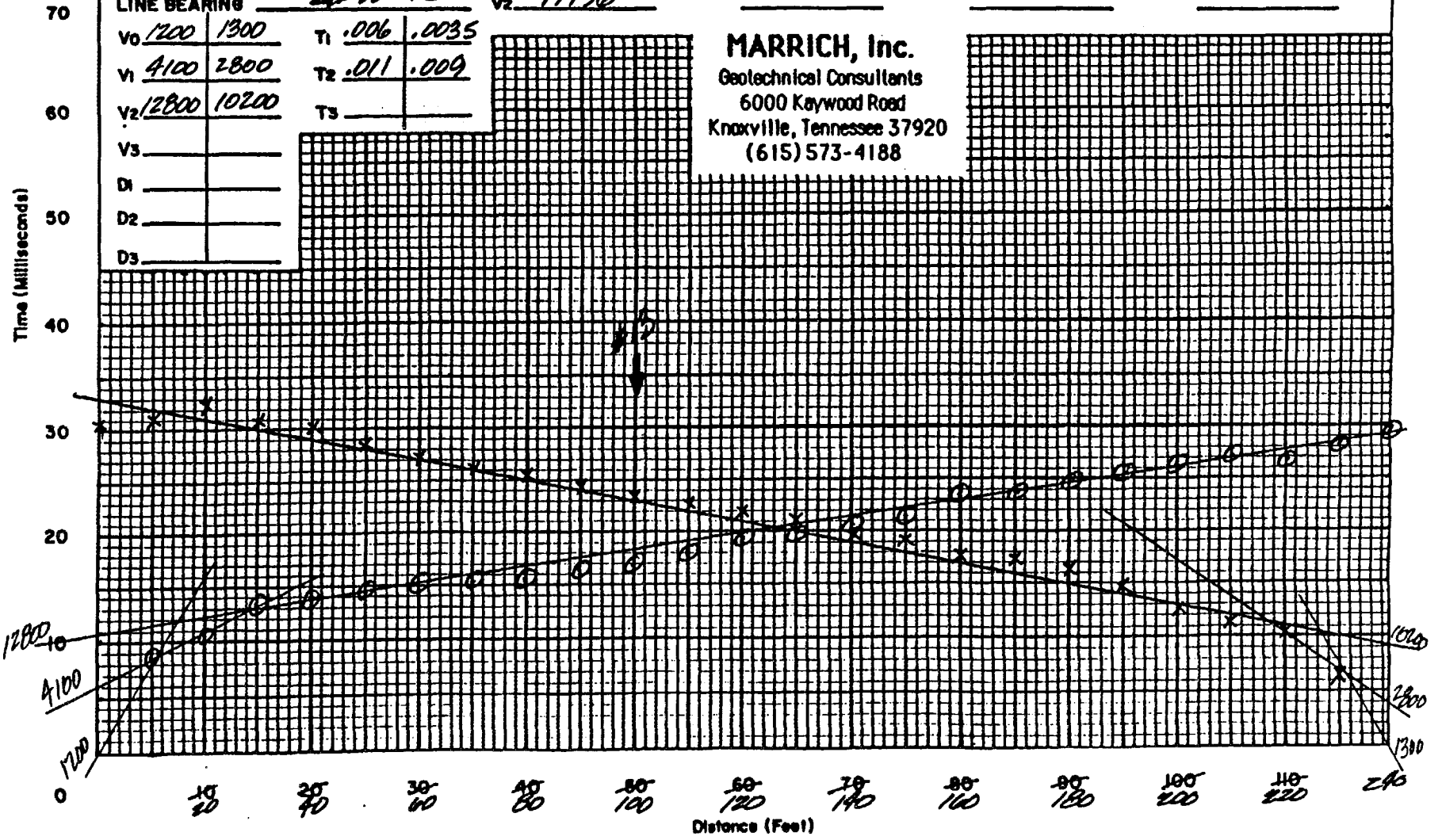
SUMMARY DHG 10/29/91 RLM

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
V_0	1250		4	3	2	853
V_1	3317		11	11	11	845
V_2	11196					



SEISMIC TIME–DISTANCE GRAPH

PROJECT PROPOSED AWS SITE

LOCATION SPD #6

STATION #14

DATE 9/20/91

SURFACE ELEVATION 858

LINE BEARING W → E

V_0	1400	1400	T_1 .004	.005
V_1	4600	3000	T_2 .0095	.012
V_2	12400	11300	T_3	
V_3				
D_1				
D_2				
D_3				

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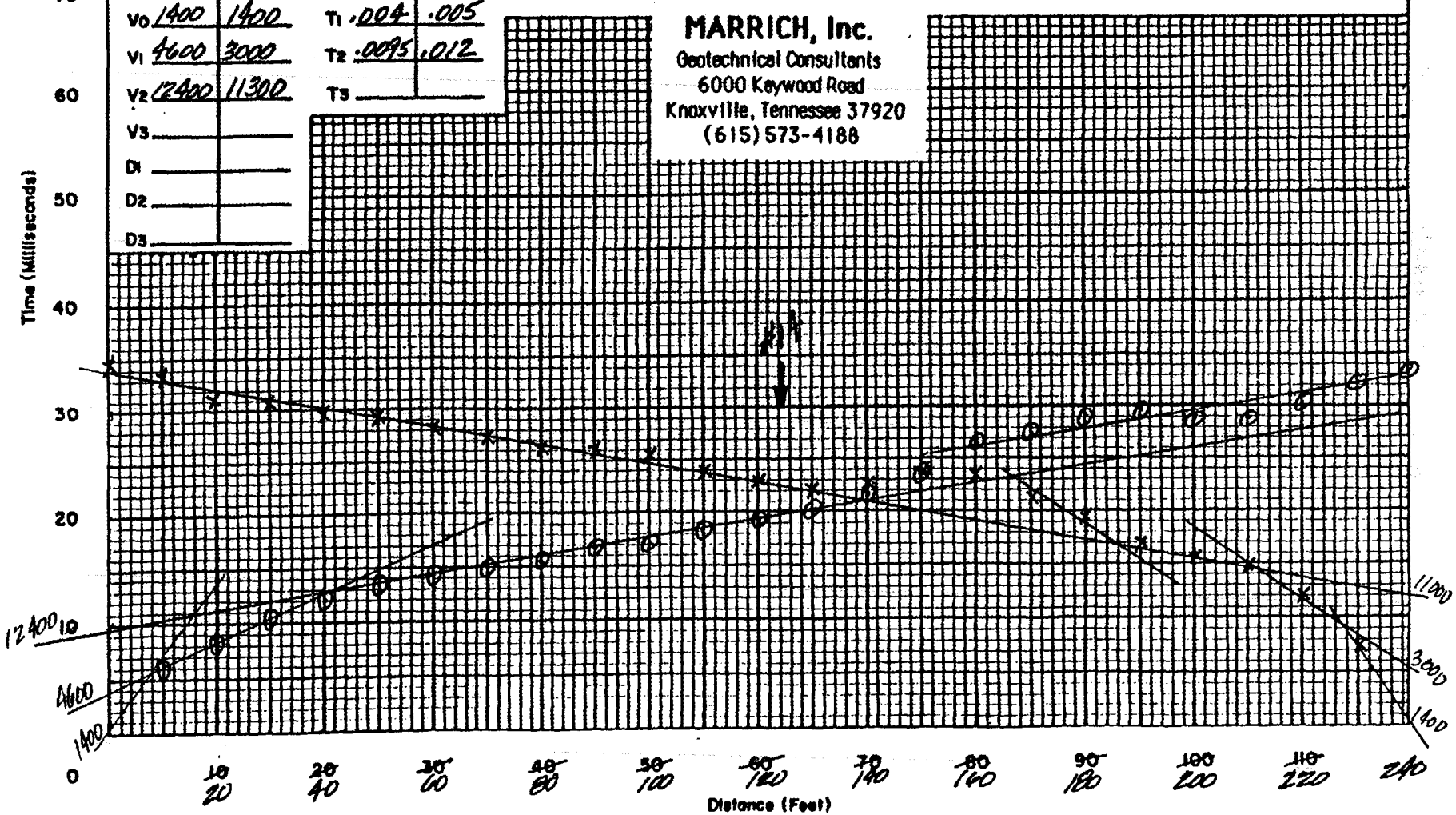
SUMMARY

10/29/RAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)	ELEVATIONS
V_0	1400		3	3	850
V_1	3617		12	14	839
V_2	11566		16		



SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AWS Site
LOCATION SPD #7 (L #8)
STATION #15
DATE 9/23/91
SURFACE ELEVATION 848
LINE BEARING S-N

Vo	1200	1200
V1	2500	2400
V2	13400	9600
V3		
D1		
D2		
D3		

T1	.0055	.0065
T2	.0155	.0145
T3		

10/28/91 RAH

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	AVG DEPTHS (FEET) (A)	(B)	ELEVATIONS
Vo	1200		3	4 4	844
V1	2448		15	14 13	834
V2	11183				

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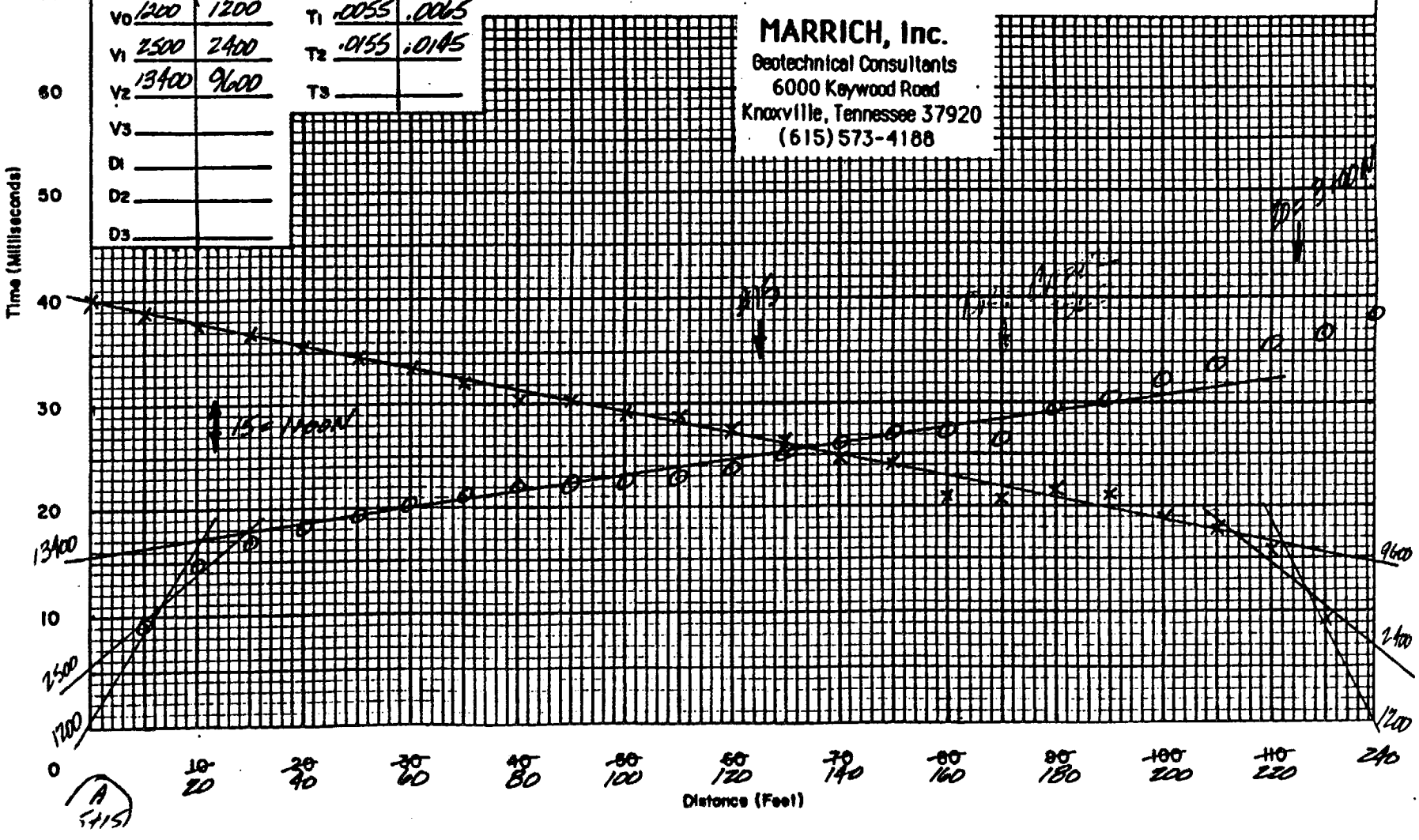

SEISMIC TIME–DISTANCE GRAPH

PROJECT Proposed Ash Site
LOCATION SPD #8 (L #7)
STATION #15
DATE 9/23/91
SURFACE ELEVATION 848
LINE BEARING NW→E

V_0	1200	1200
V_1	2500	2500
V_2	13800	9800
V_3		
D_1		
D_2		
D_3		

T_1	.0055	.0035
T_2	.013	.009
T_3		

SUMMARY 10/29/91 RAH

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	AVG	(B)	ELEVATIONS
V_0	1200		3	3	2	845
V_1	2500		12	10	8	838
V_2	11452					

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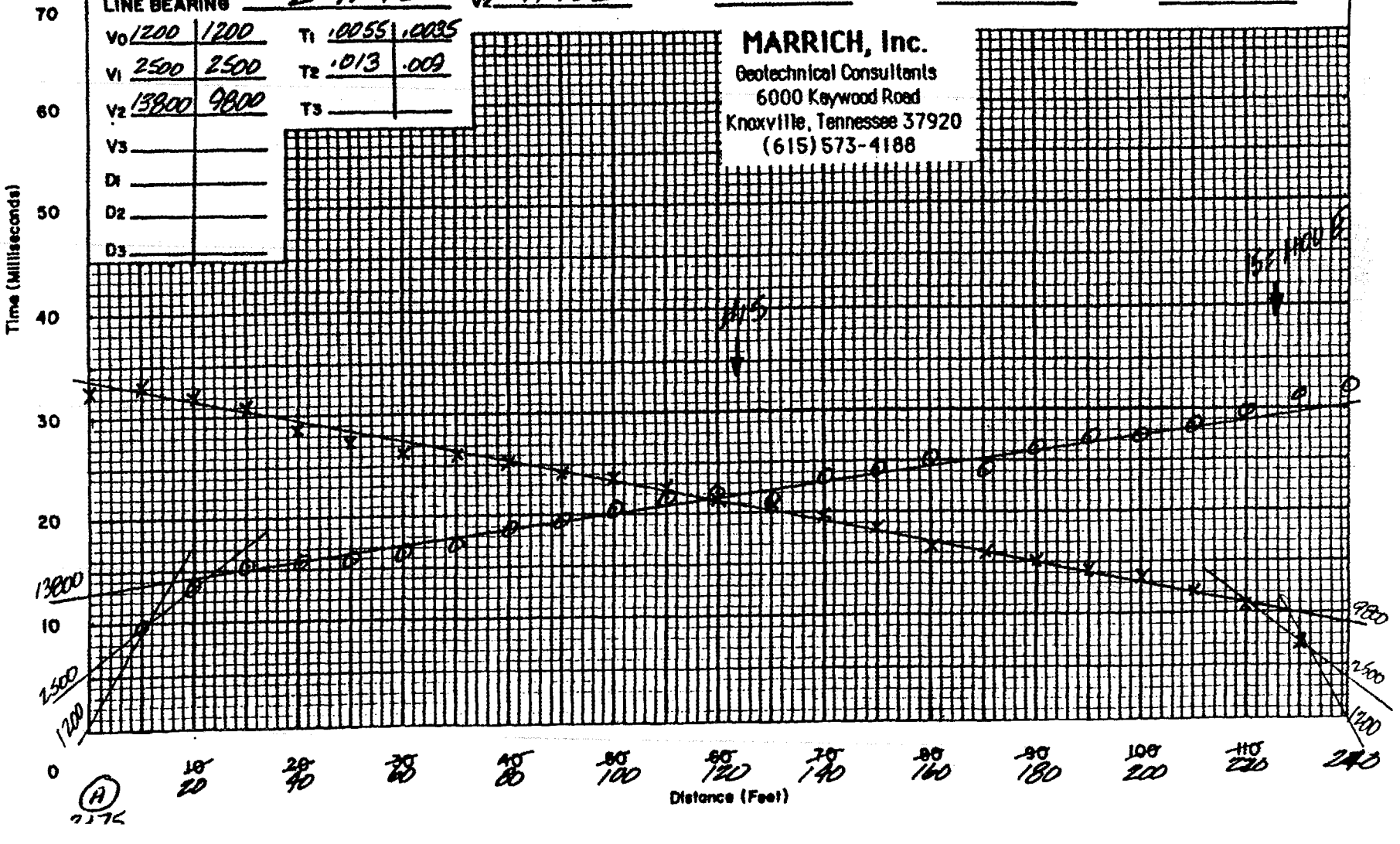

SEISMIC TIME–DISTANCE GRAPH

PROJECT Proposed Bins Site

LOCATION SPD #9

STATION ≈ #16 (7' East)

DATE 9/26/91

SURFACE ELEVATION 862.8

LINE BEARING S→N

Vo	1200	1600	
V1	3400	4500	
V2	10600	10400	
V3			
D1			
D2			
D3			

T1	.005	.003
T2	.0095	.0085
T3		

SUMMARY AVG 10/29/91 RCA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
Vo	1400		3	3	2	859
V1	3867		12	12	13	850
V2	10374					

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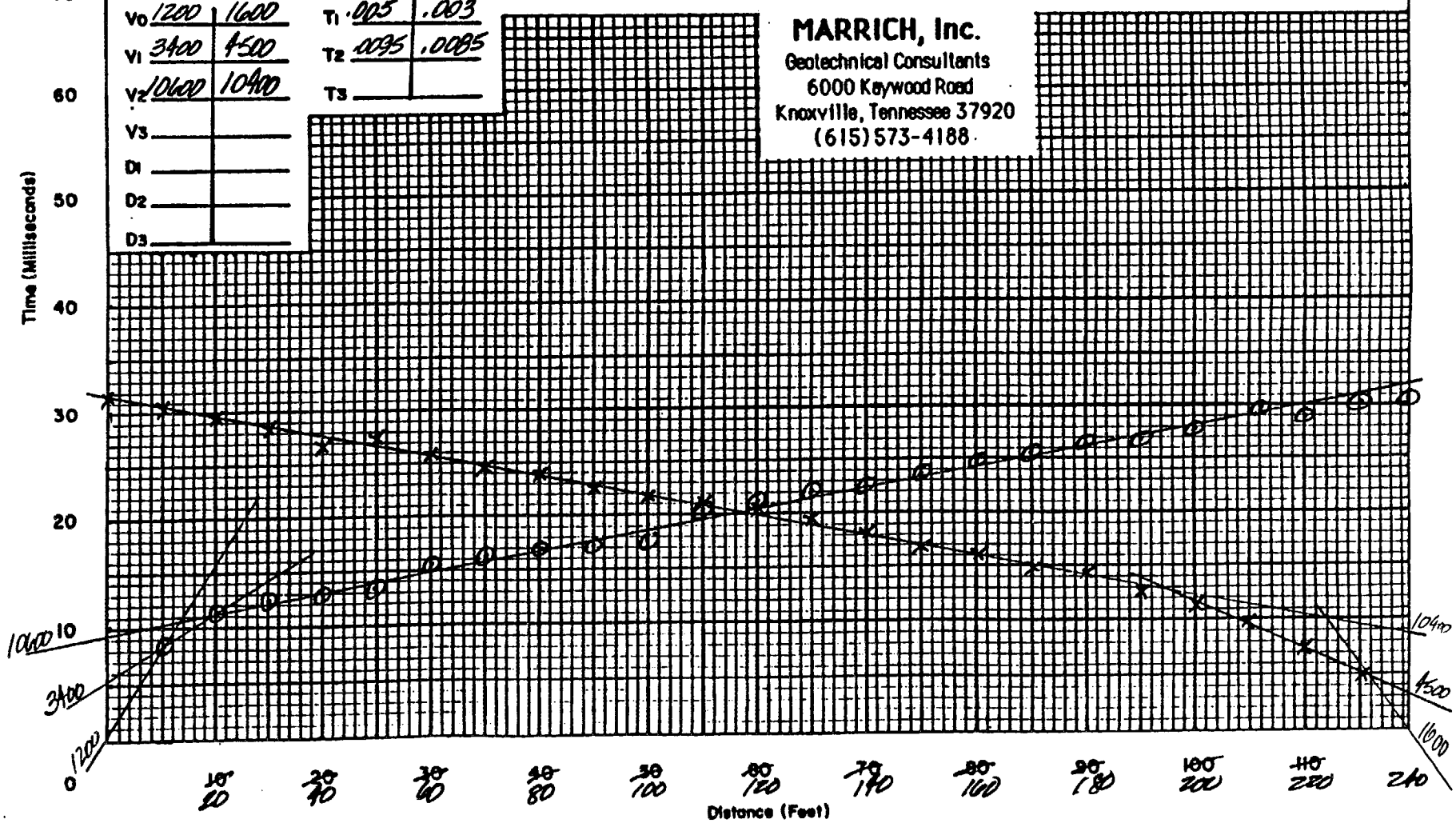

SEISMIC TIME-DISTANCE GRAPH

10/29/91 RAA

PROJECT PROPOSED KNX SITE
LOCATION SPD #10
STATION #17
DATE 9/26/91
SURFACE ELEVATION 881
LINE BEARING W→E

V_0	1200	1200
V_1	5000	3200
V_2	11000	13000
V_3		
D_1		
D_2		
D_3		

T_1	.008	.006
T_2	.0155	.0195
T_3		

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	AVG	(B)	ELEVATIONS
V_0	1200		5	4	3	877
V_1	3892		20	25	31	856
V_2	11502					

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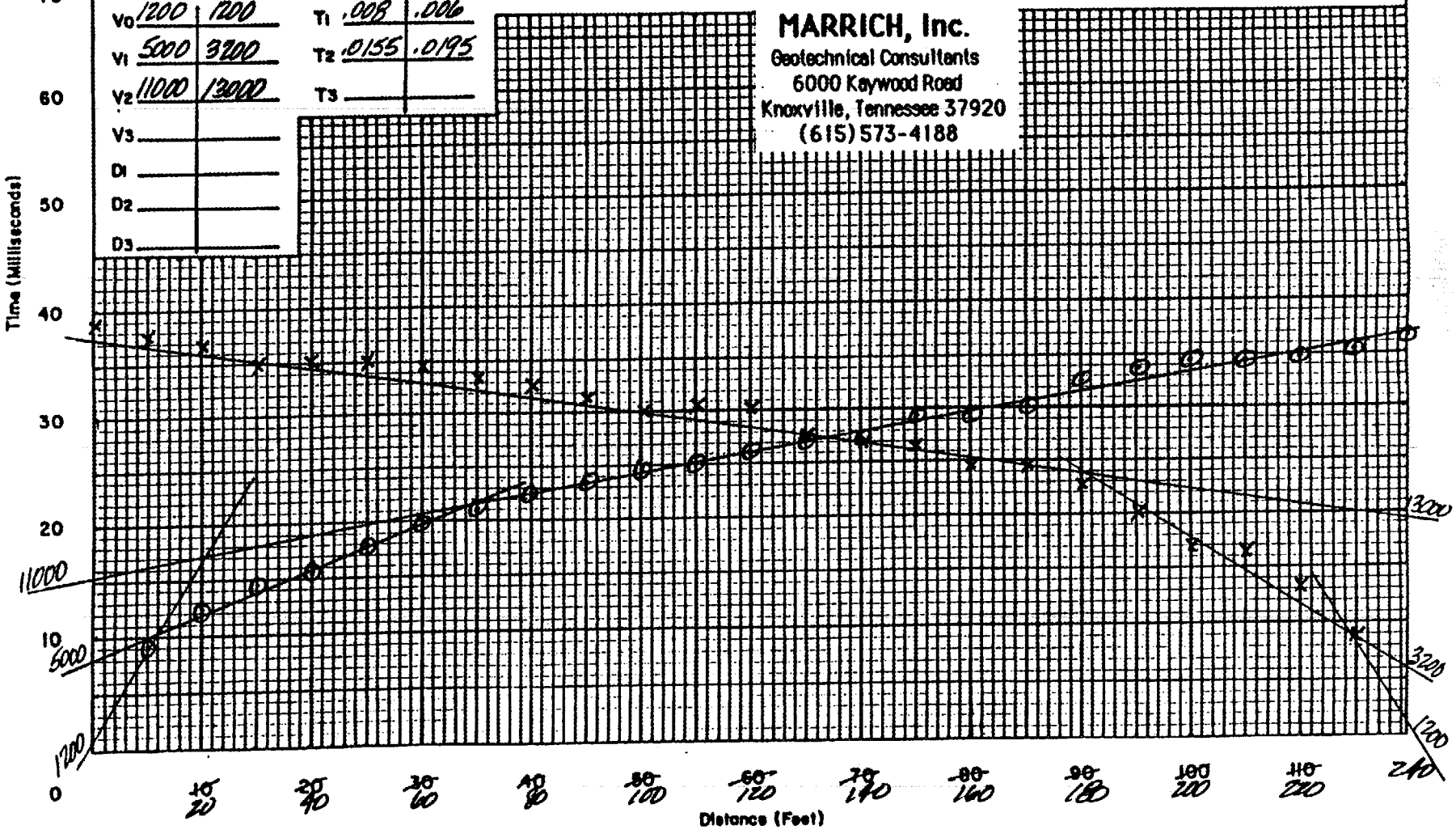

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed ANS Site

LOCATION SPD #11

STATION #18

DATE 9/26/91

SURFACE ELEVATION 882

LINE BEARING W→E

V_0	1200	T_1	.0115
V_1	6000	T_2	.022
V_2	16000	T_3	
V_3			
D_1			
D_2			
D_3			

SUMMARY

AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
V_0 1200		7	5	3	877
V_1 4156		29	25	20	857
V_2 14728					

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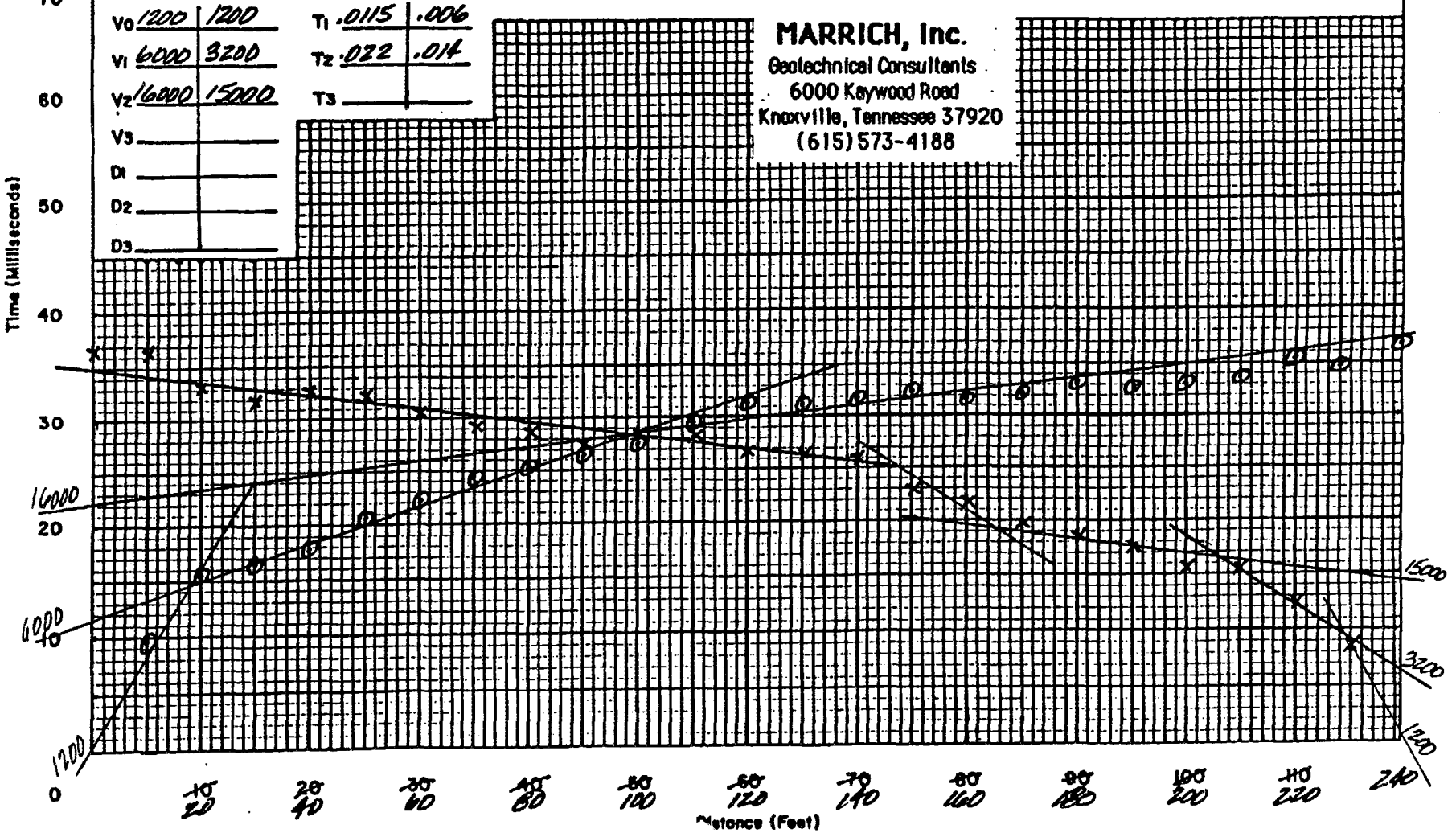

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Haul Site
LOCATION SPO #12
STATION x #23 (25' South)
DATE 9/26/91
SURFACE ELEVATION 938
LINE BEARING W→E

Vo	1200	1200
V1	4000	3800
V2	12400	14000
V3		
D1		
D2		
D3		

T1	.0065	.007
T2	.0155	.0155
T3		

SUMMARY AHG 10/29/91 RAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
Vo	1200		4	4	4	934
V1	3897		21	21	21	917
V2	13138					

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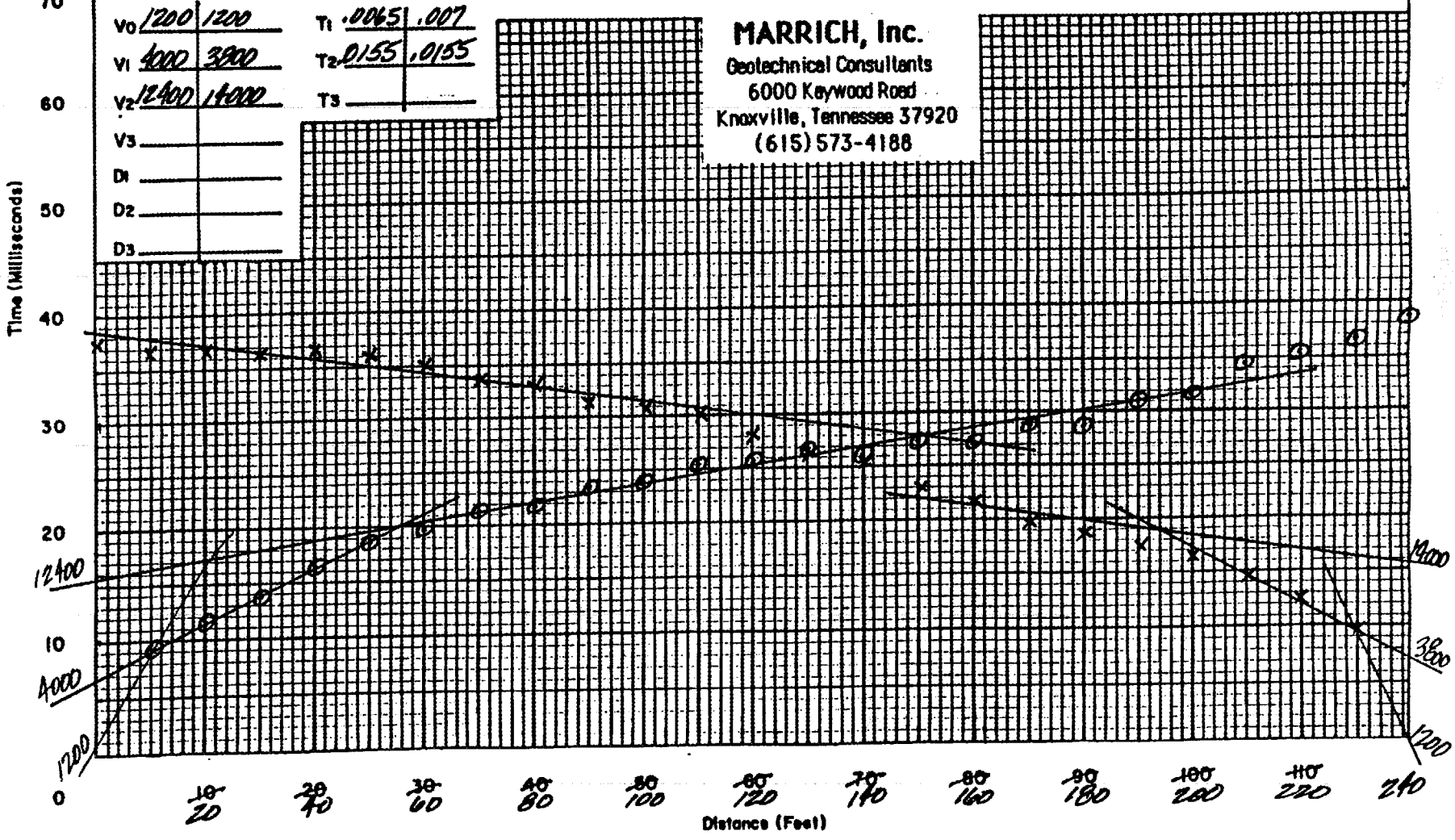

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Dams Site
LOCATION SPD #13
STATION # 21
DATE 9/27/91
SURFACE ELEVATION 863
LINE BEARING W→E

Vo	1300	1300
V1	2800	3100
V2	12000	10800
V3		
D1		
D2		
D3		

T1	.0035	.0045
T2	.014	.0115
T3		

RAH 10/28/91

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	AVG	(B)	ELEVATIONS
Vo	1300		2	2	3	861
V1	2941		17	15	13	848
V2	11343					

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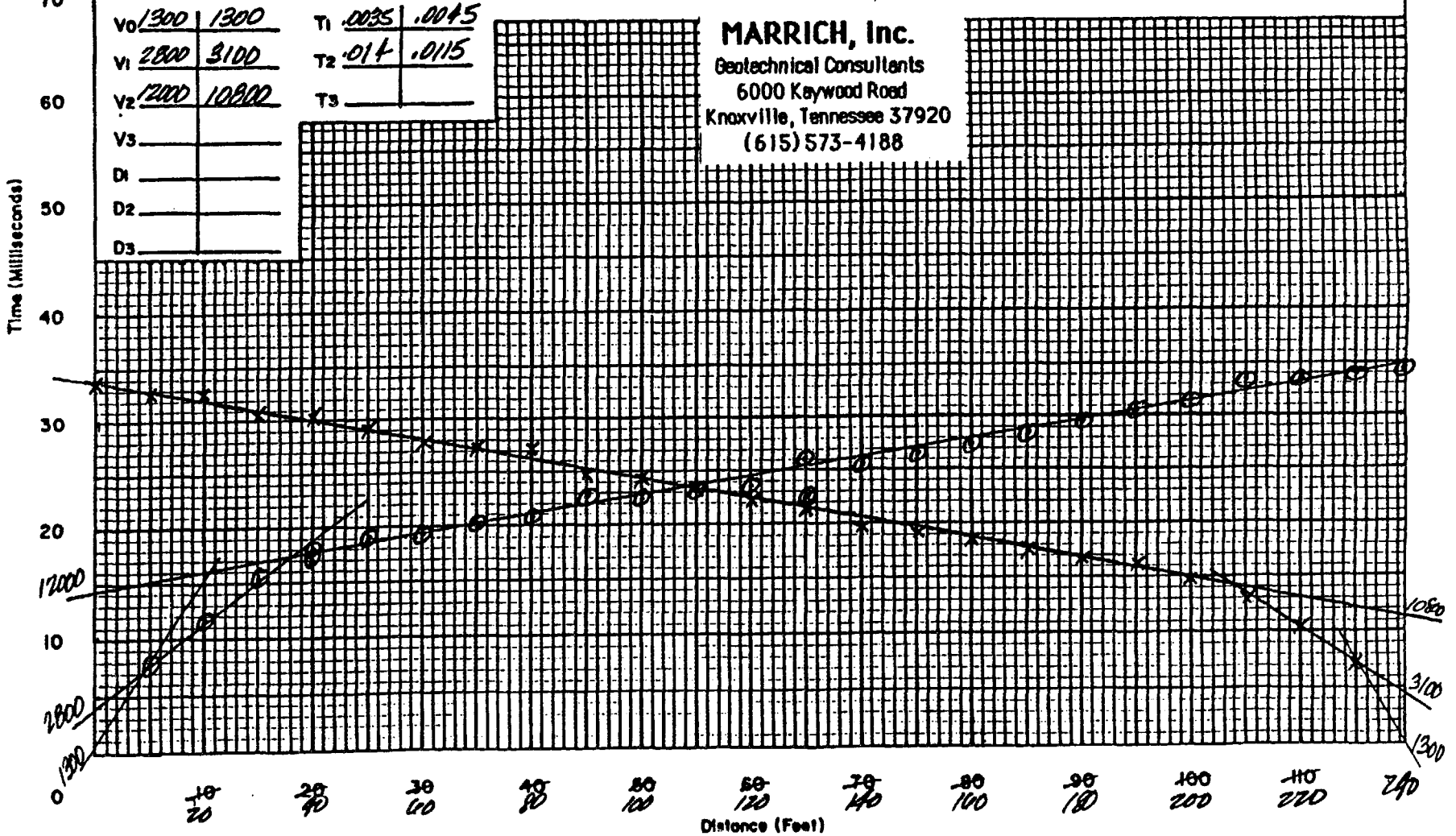

SEISMIC TIME–DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #14
STATION # 20
DATE 9/27/91
SURFACE ELEVATION 841
LINE BEARING S→N

V_0	1200	1200	T_1 .0055	.0055
V_1	2600	2900	T_2 .013	.0135
V_2	9900	11000	T_3	
V_3				
D_1				
D_2				
D_3				

SUMMARY Avg. 10/28/91 RAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
V_0	1200		3	3	3	838
V_1	2740		13	13	14	828
V_2	10410					

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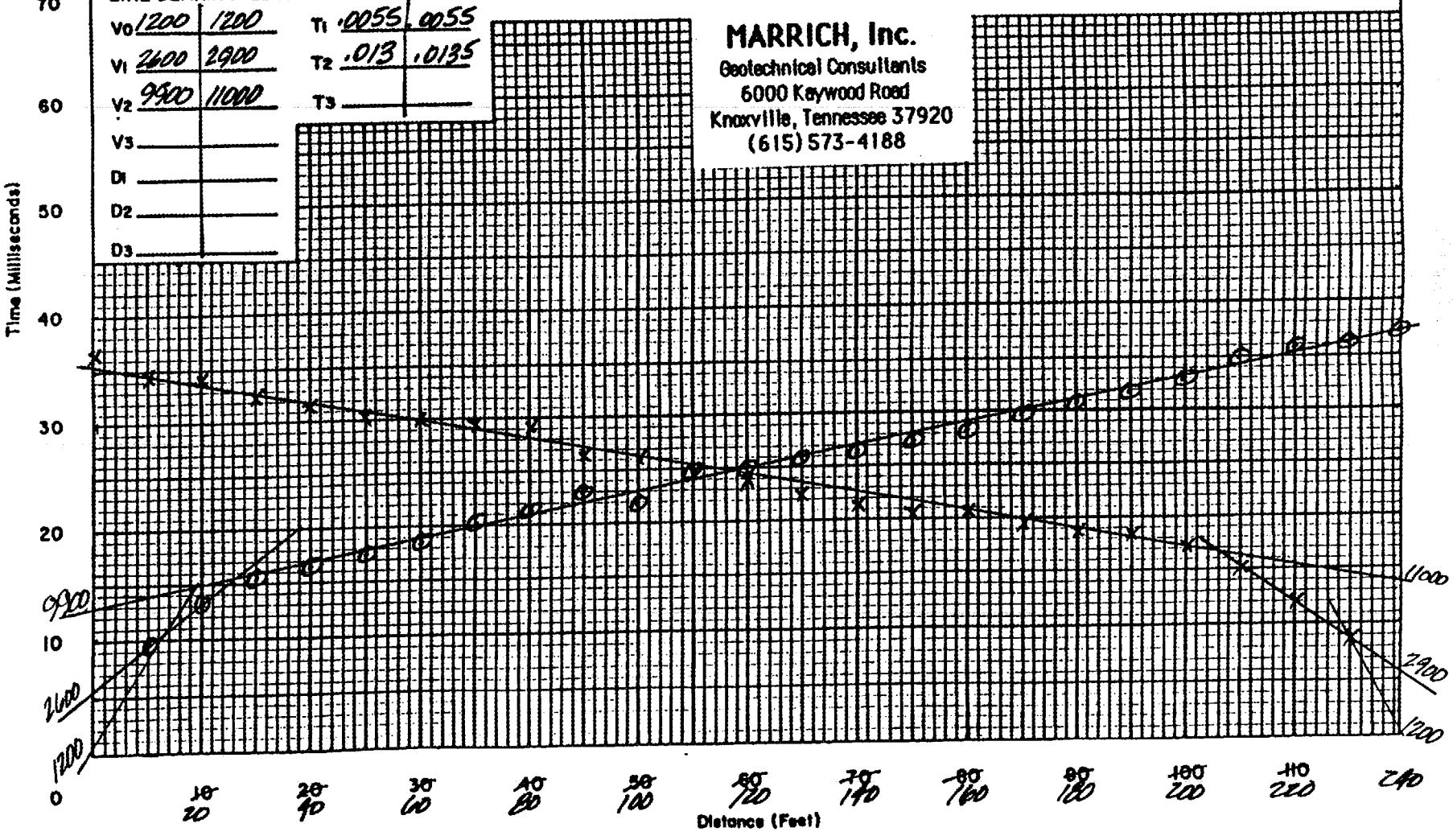

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #15
STATION #25
DATE 9/27/91
SURFACE ELEVATION 855
LINE BEARING N-S → N

V_0	1200	1200
V_1	2400	2100
V_2	11800	10800
V_3		
D_1		
D_2		
D_3		

T_1	.005	.0055
T_2	.017	.0145
T_3		

10/28/91 RAA

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
V_0	1200		3	3	3	852
V_1	2237		16	14	13	841
V_2	11257					

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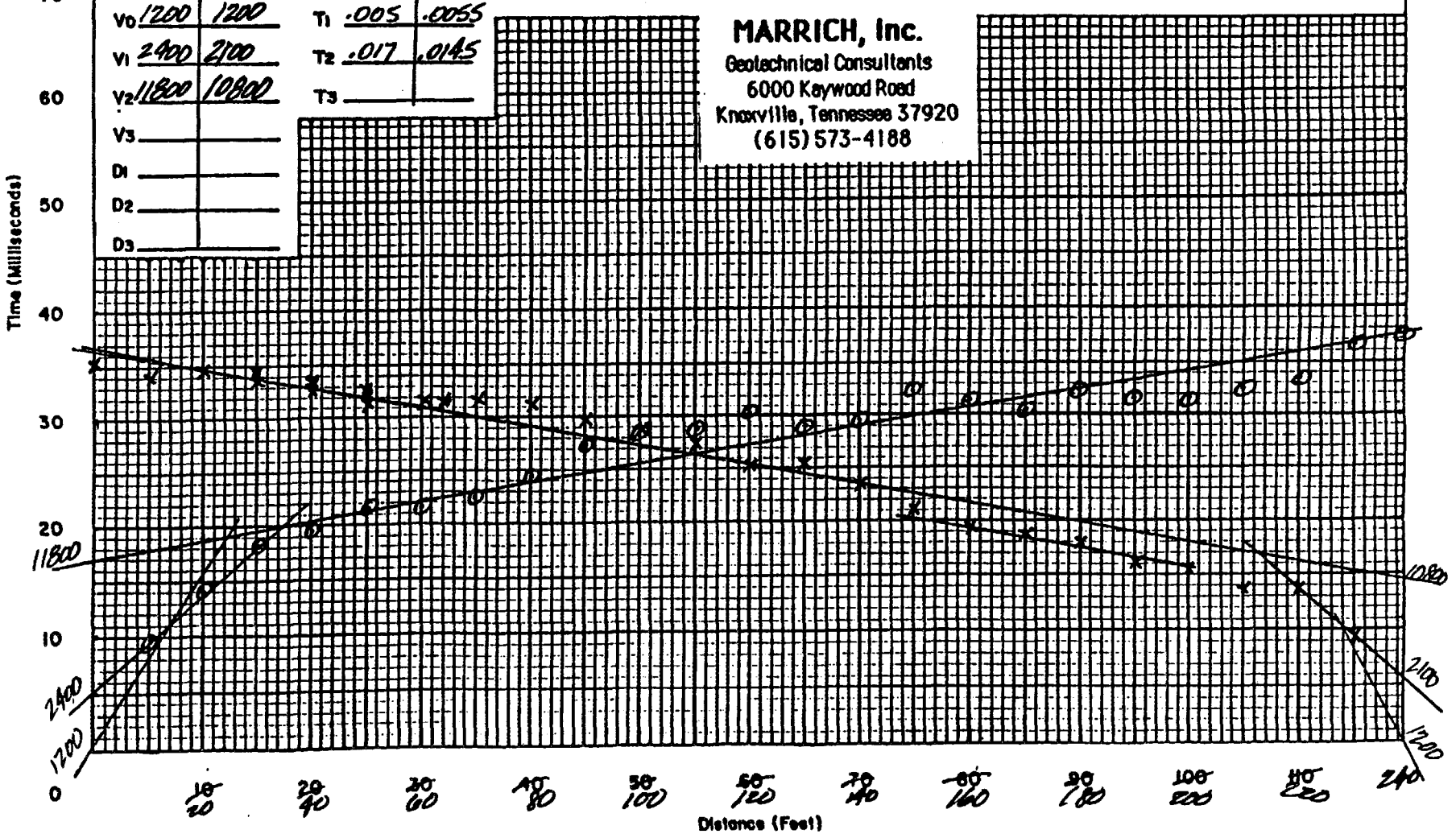

SEISMIC TIME–DISTANCE GRAPH

10/29/91 BOA

PROJECT Proposed Ans Site
LOCATION 500 # 16
STATION # 30
DATE 9/27/91
SURFACE ELEVATION 842
LINE BEARING 180 S→N

V_0	1200	1200
V_1	2200	2500
V_2	14100	12000
V_3		
D_1		
D_2		
D_3		

T_1	.0045	.006
T_2	.013	.0235
T_3		

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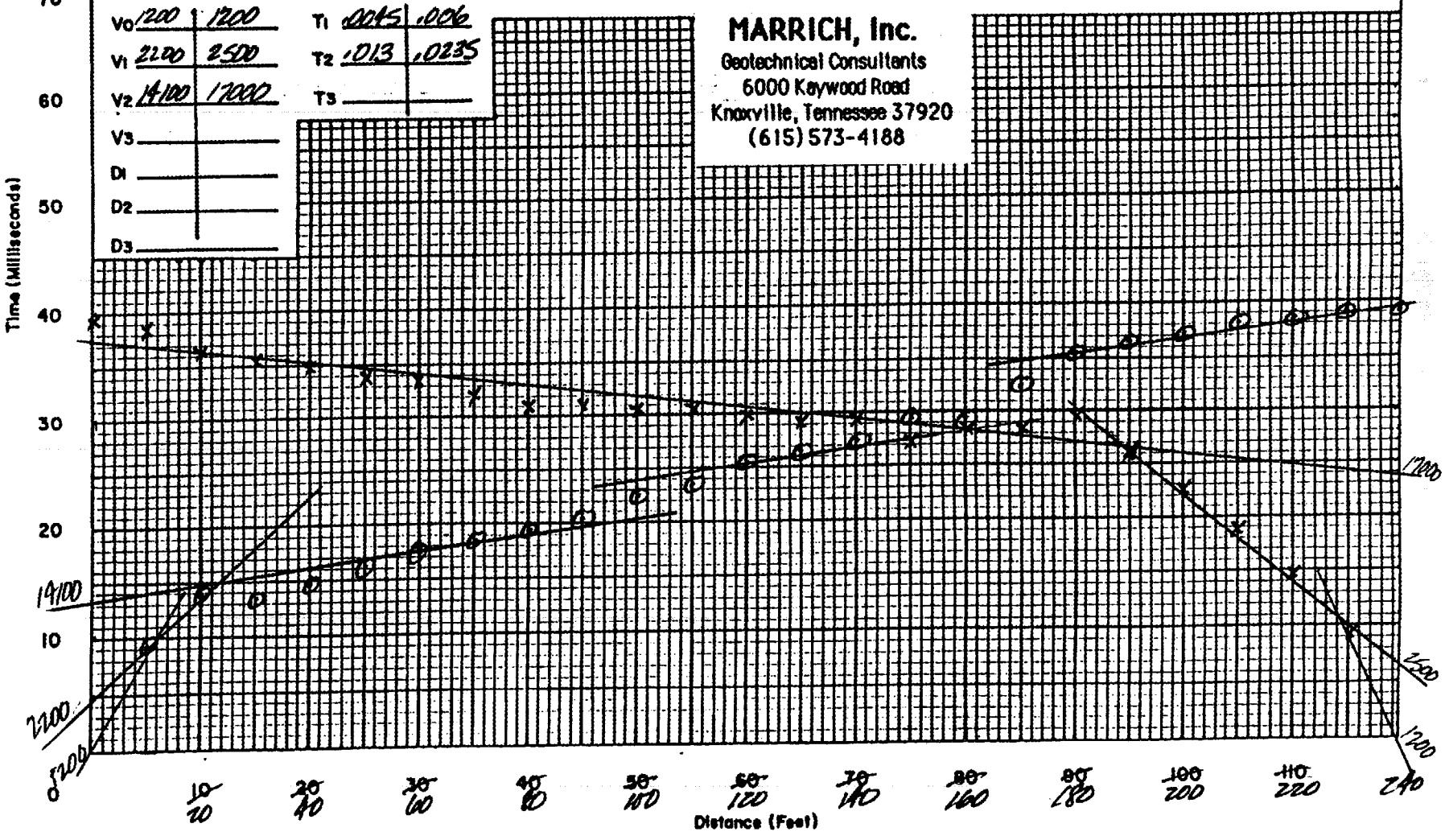
SUMMARY

AVERAGE VELOCITIES		TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
V_0	1200		3	3	4	839
V_1	2338		12	18	23	824
V_2	15393					



SEISMIC TIME–DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #17
STATION #30
DATE 9/27/90
SURFACE ELEVATION 842
LINE BEARING 270 – W-E

Vo	1200	1200
V1	4300	4100
V2	16000	11000
V3		
D1		
D2		
D3		

T1	.0065	.0055
T2	.018	.010
T3		

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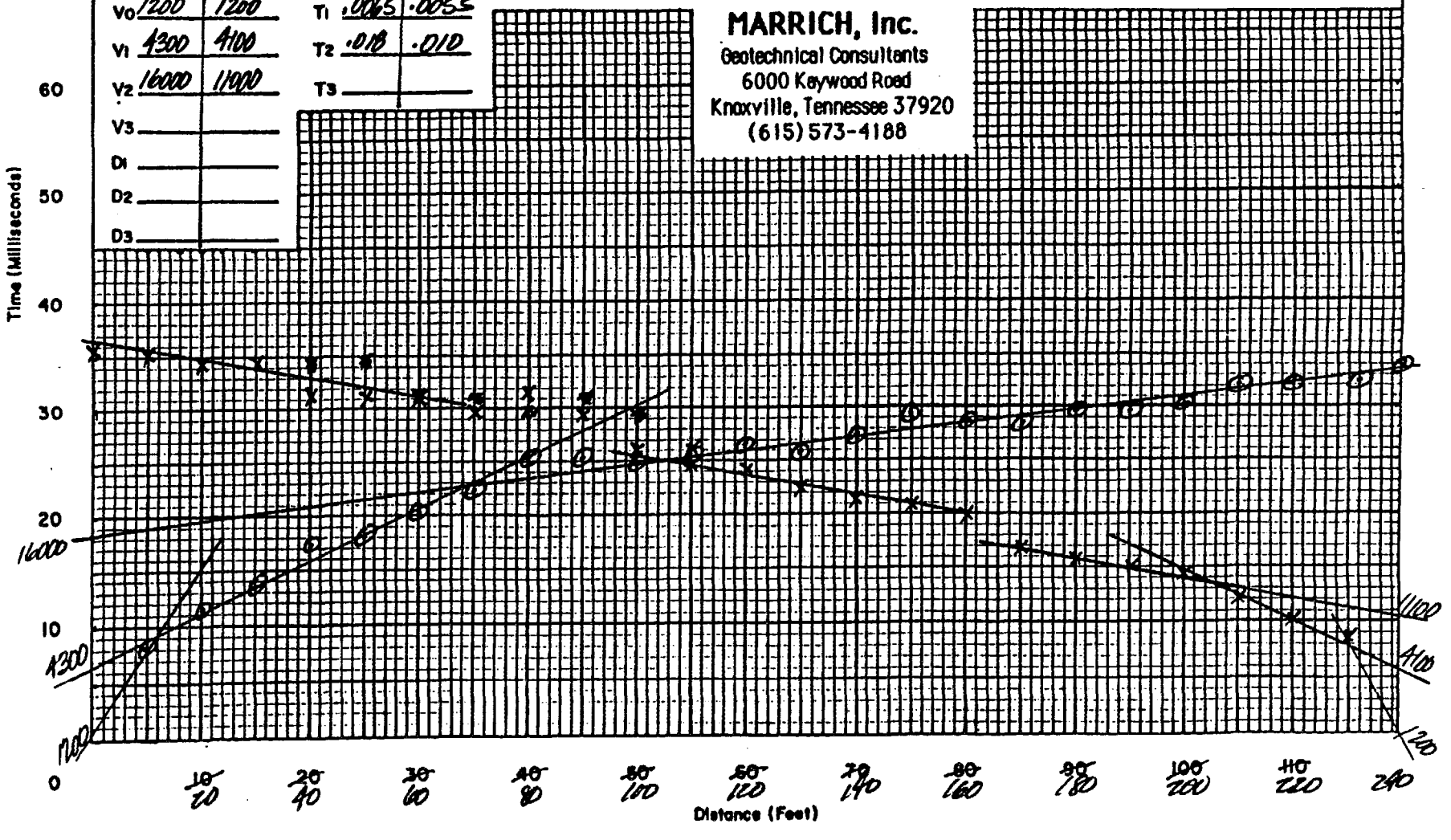
SUMMARY AVG 10/29/81 RAH

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
Vo	1200		4	3	3	839
V1	4197		29	20	12	822
V2	13026					



SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #18
STATION #31
DATE 9/27/91
SURFACE ELEVATION 855
LINE BEARING N-E

V0	1200	1200	T1 .005	.005
V1	3400	2100	T2 .013	.013
V2	14800	12400	T3	
V3				
D1				
D2				
D3				

SUMMARY AVG 10/29/91 RLH

AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)	ELEVATIONS
V0 1200		3	3 3	852
V1 2576		13	13 13	842
V2 13145				

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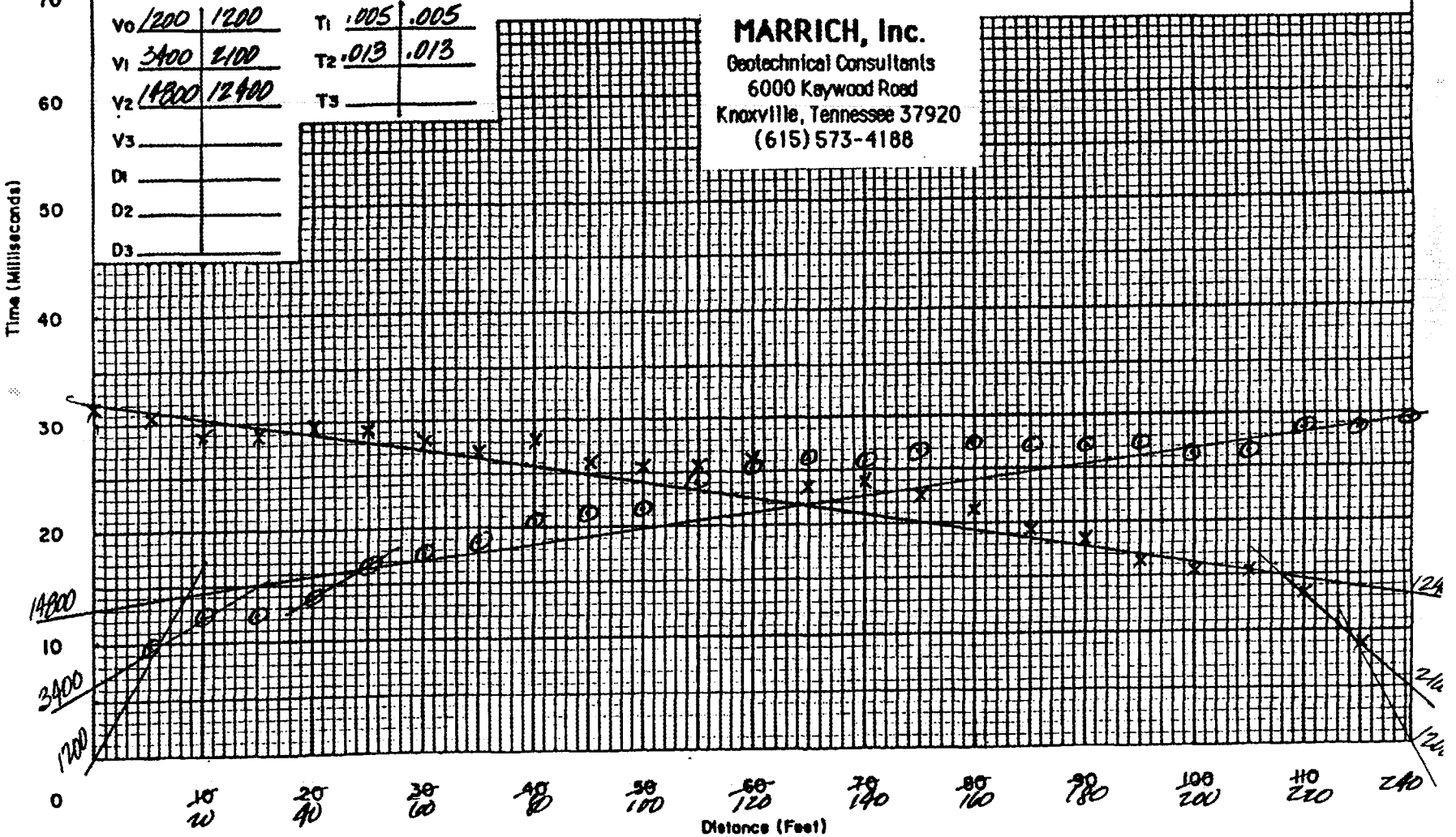

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Rail Site
LOCATION BPO # 19
STATION # 32
DATE 9/27/91
SURFACE ELEVATION 850
LINE BEARING W→E (N75E)

Vo	1200	1200
V1	2000	2500
V2	10700	11400
V3		
D1		
D2		
D3		

T1	.0045	.0055
T2	.013	.012
T3		

SUMMARY

10/28/91 RCH

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)	ELEVATIONS
Vo	1200		3	3 3	847
V1	2216		11	11 10	839
V2	10974				

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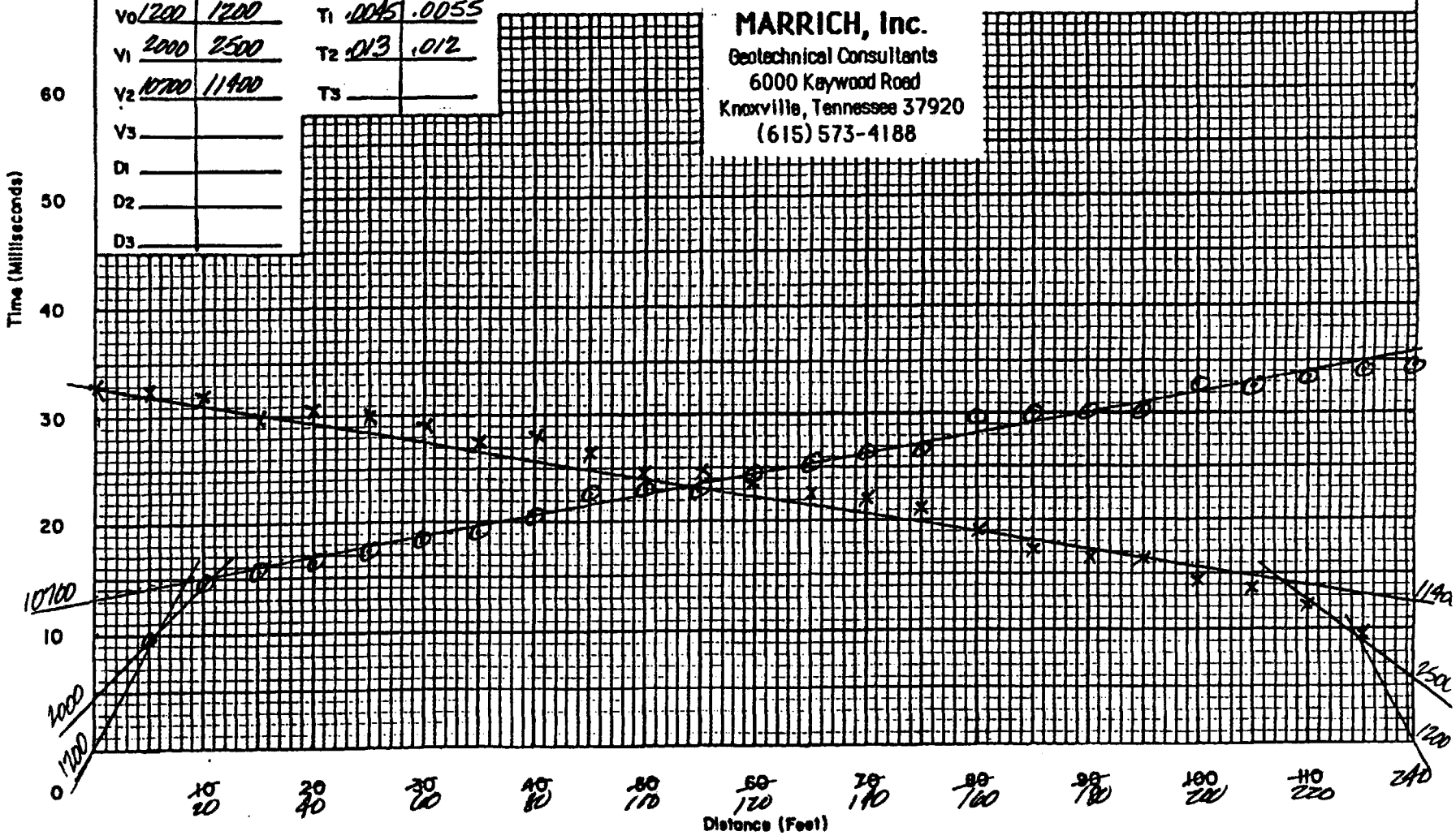

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed ANS Site

LOCATION STD #20

STATION 25 = 2400E

DATE 9/30/91

SURFACE ELEVATION 870

LINE BEARING E-W → E

V_0	1300	1300	T_1 .0065	.0055
V_1	4000	3800	T_2 .019	.0116
V_2	14000	8900	T_3	
V_3				
D_1				
D_2				
D_3				

SUMMARY AVG 10/29/91 RBA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) (A)	(B)		ELEVATIONS
V_0	1300		4	4	3	866
V_1	3897		29	22	15	848
V_2	10862					

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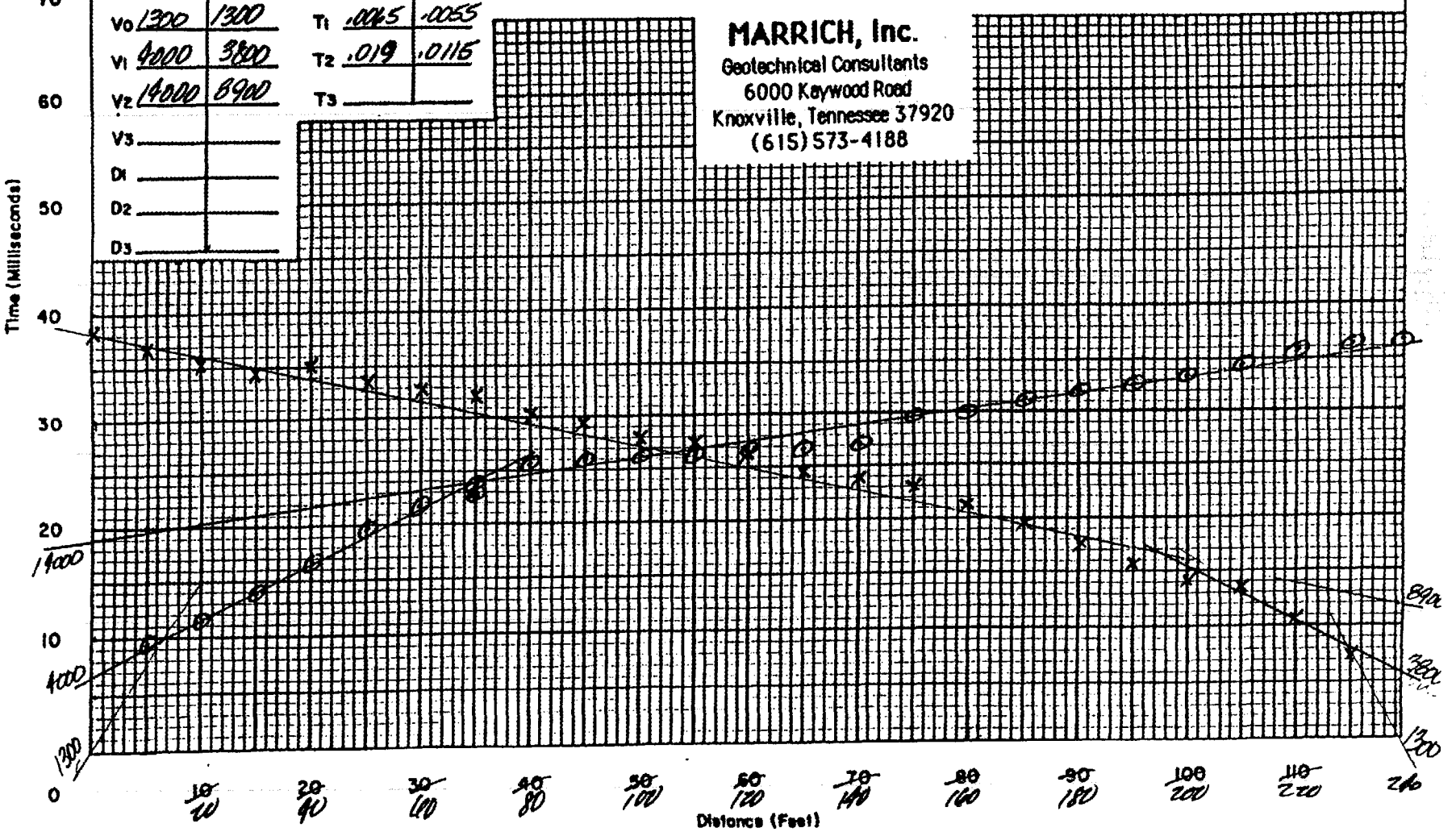

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPO #21
STATION #26
DATE 9/30/91
SURFACE ELEVATION 878
LINE BEARING E-W-7E

Vo	1300	1300
V1	4400	3800
V2	11800	9800
V3		
D1		
D2		
D3		

T1	.0045	.0055
T2	.016	.015
T3		

SUMMARY 10/28/91 RAA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	AVG	B	ELEVATIONS
Vo	1300		3	3	3	875
V1	4076		27	26	24	852
V2	10696					

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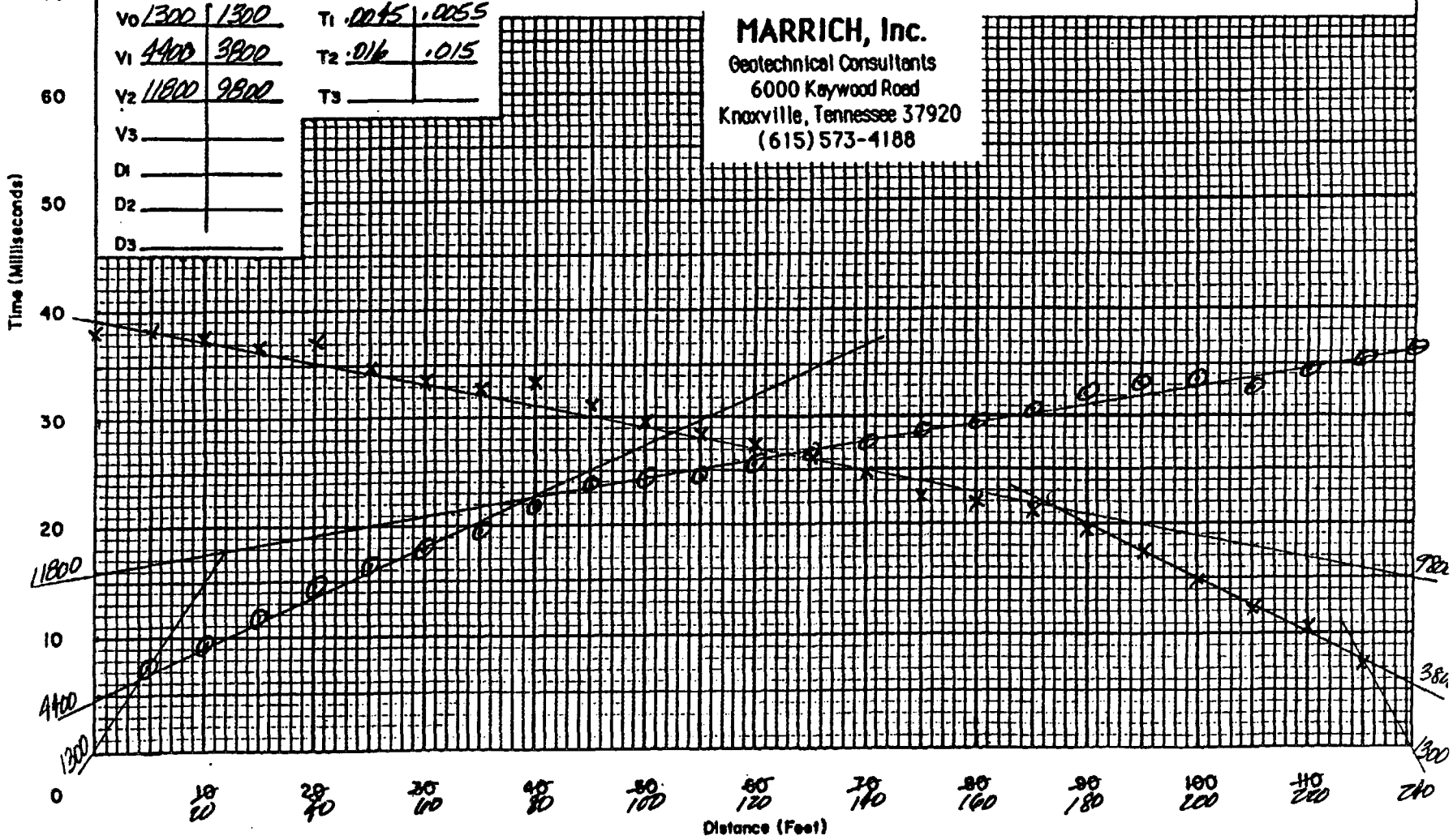

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AWS Site
LOCATION SPD #22
STATION #26 = 2+00 E
DATE 9/30/91
SURFACE ELEVATION 884
LINE BEARING E-W → E

Vo	1300	1300
V1	6000	5100
V2	14000	15000
V3		
D1		
D2		
D3		

T1	.009	.0075
T2	.020	.0215
T3		

10/29/91 RDA

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B	AVG	ELEVATIONS
Vo	1300		6	5	5	879
V1	5512		38	42	46	842
V2	14407					

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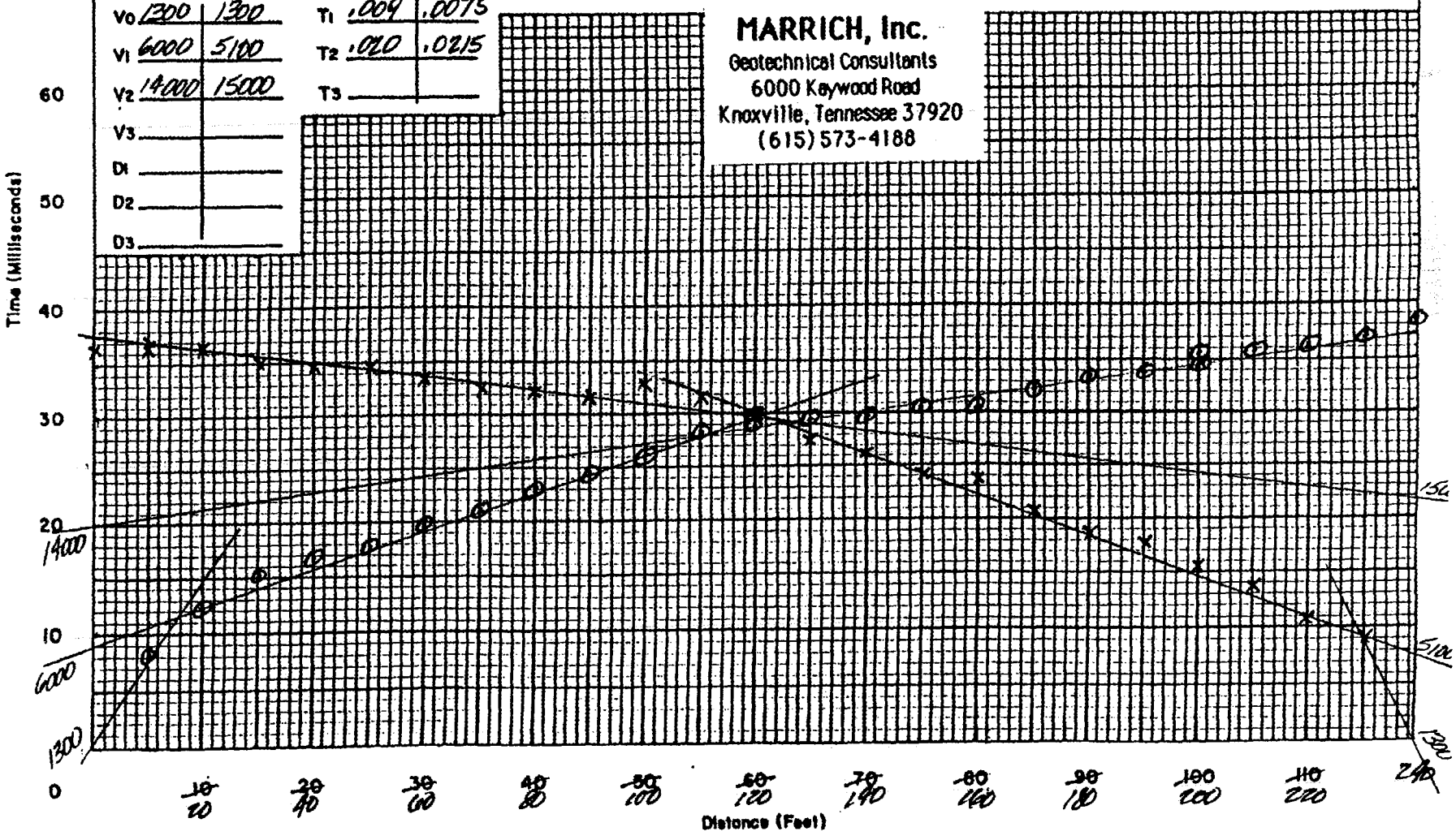

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION ~~#27~~ SP #23
STATION #27
DATE 9/30/91
SURFACE ELEVATION 875
LINE BEARING E-W → E

V0	1300	1300
V1	5400	2400
V2	14400	12000
V3		
D1		
D2		
D3		

T1	.008	.0045
T2	.020	.0165
T3		

SUMMARY Avg 10/29/91 RWA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) B	ELEVATIONS
V0	1300		5	4 3	871
V1	3278		25	24 23	851
V2	12121				

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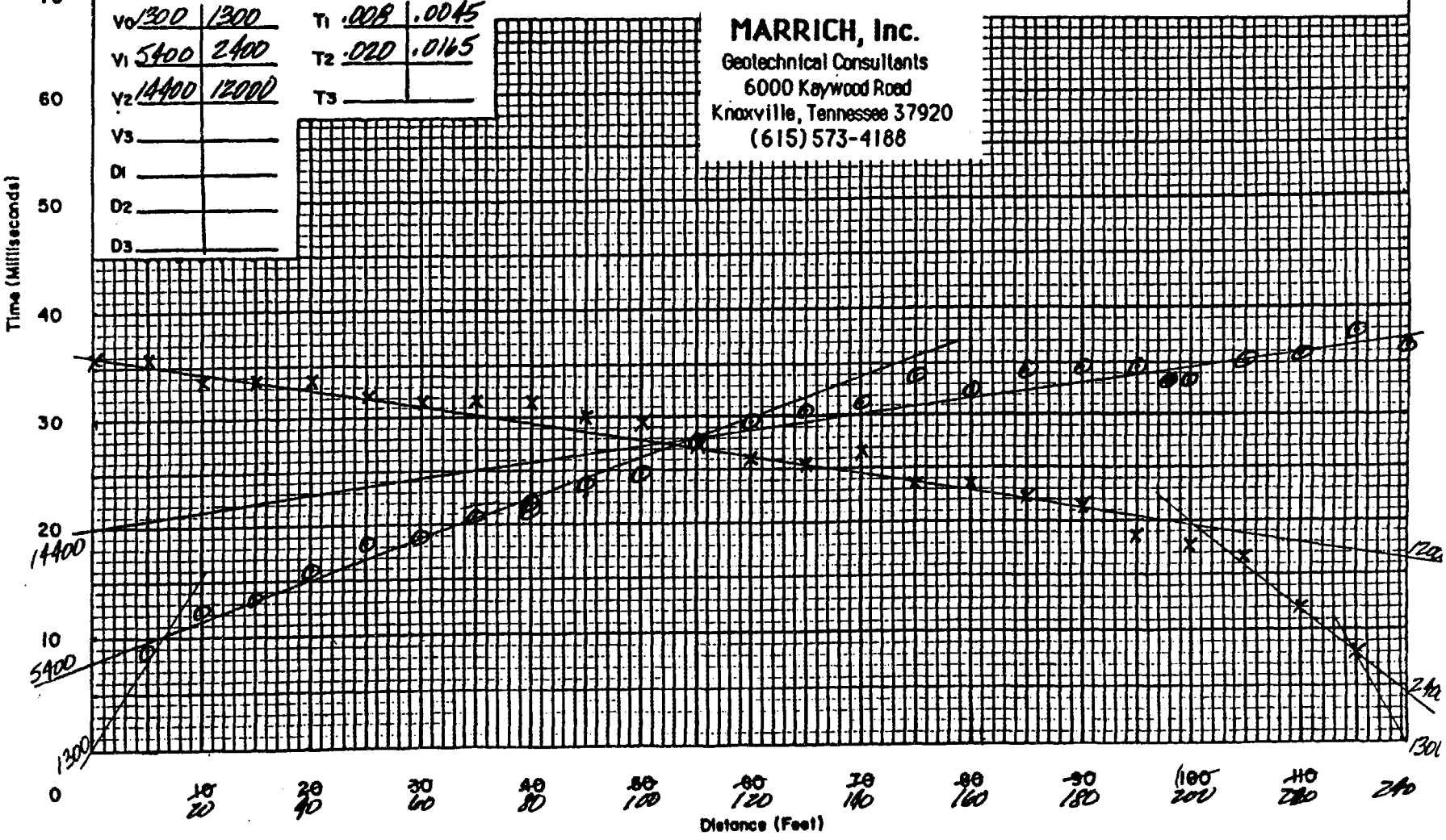

SEISMIC TIME–DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPO #24
STATION #27 = 2+00E
DATE 9/30/91
SURFACE ELEVATION 874
LINE BEARING E W → E

V_0	1200	1200
V_1	2500	3200
V_2	13300	13500
V_3		
D_1		
D_2		
D_3		

T_1	.0055	.0055
T_2	.0175	.018
T_3		

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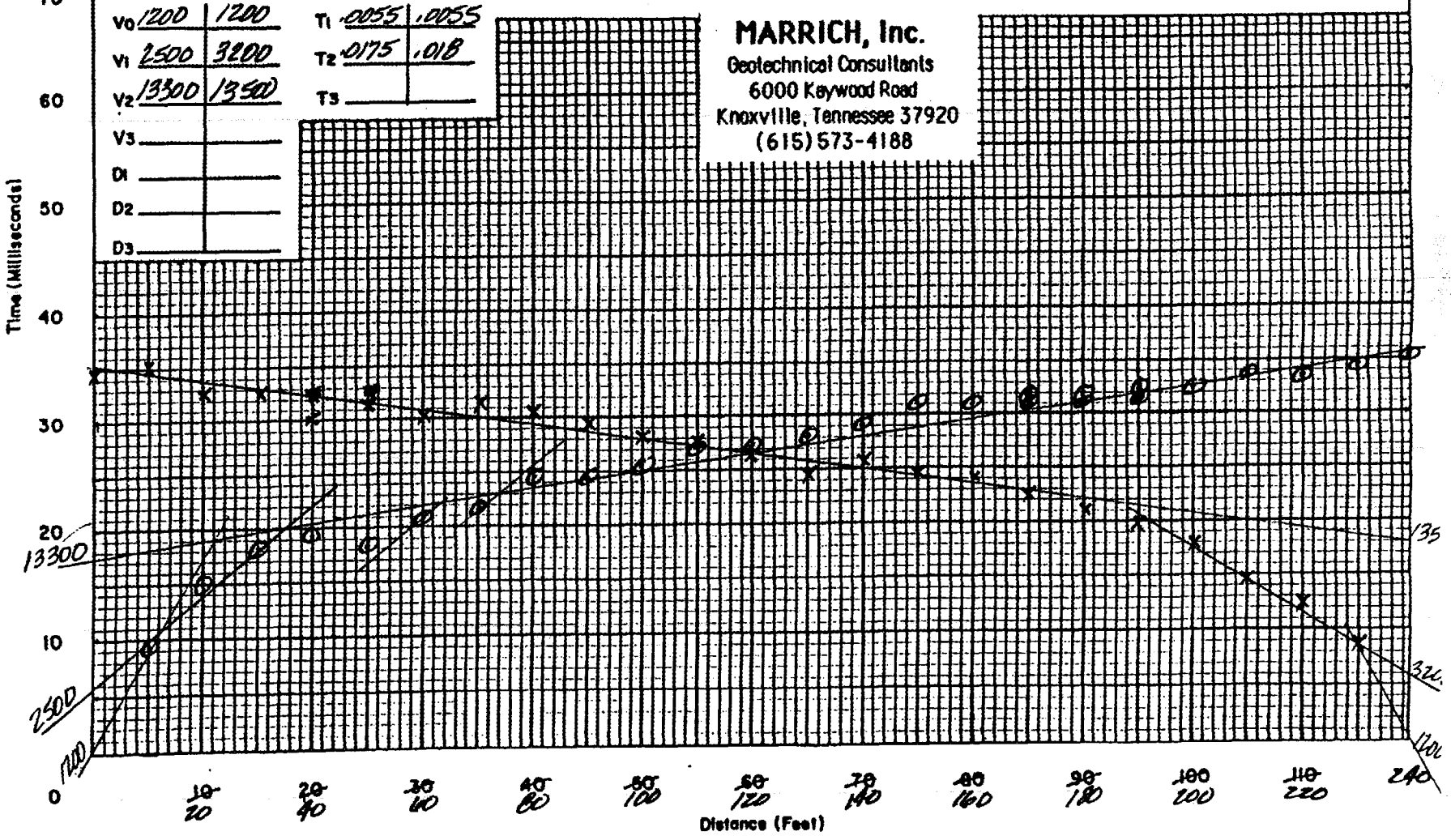
SUMMARY Auto 10/29/91 RLA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) B	ELEVATIONS
V_0	1200		3	3 3	871
V_1	2802		20	20 20	854
V_2	13295				



SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed RMS Site
LOCATION SPD #25
STATION #28
DATE 9/30/91
SURFACE ELEVATION 854
LINE BEARING E-W→E

Vo	1300	1300	
V1	3000	3500	
V2	13200	10300	
V3			
D1			
D2			
D3			

T1	.0035	.0065
T2	.016	.012
T3		

SUMMARY 10/29/91 RDH

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B	AVG	ELEVATIONS
Vo	1300		2	3	4	854
V1	3228		23	18	12	839
V2	11495					

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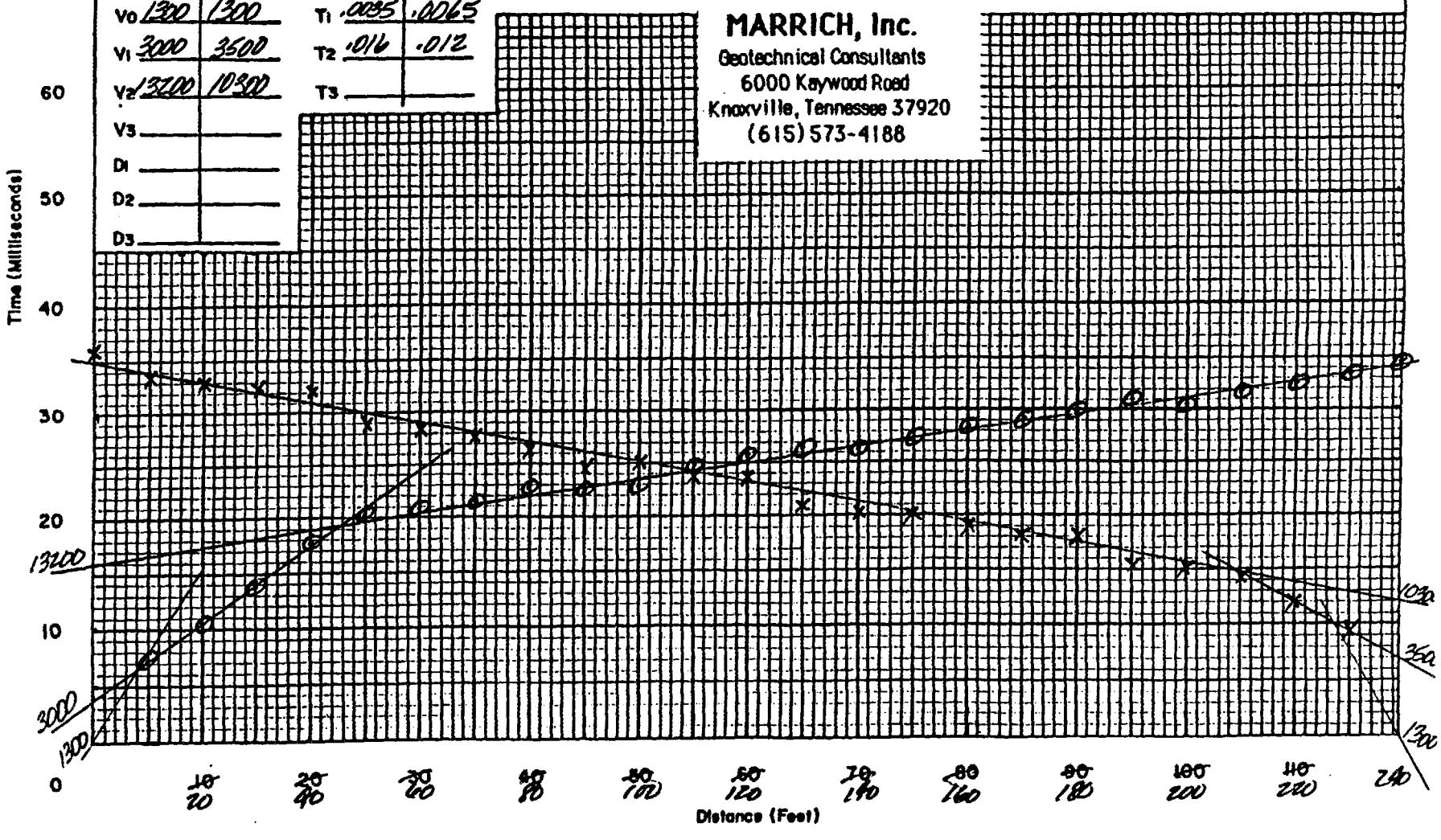

SEISMIC TIME–DISTANCE GRAPH

PROJECT: PROPOSED HAZ SITE
LOCATION: #33 SPD #26
STATION: #33
DATE: 9/30/91
SURFACE ELEVATION: 914'
LINE BEARING: N.S → N

V_0	1200	1200
V_1	2900	3400
V_2	10000	12000
V_3		
D_1		
D_2		
D_3		

T_1	.005	.0065
T_2	.0195	.026
T_3		

SUMMARY AVG 10/29/91 RDA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B		ELEVATIONS
V_0	1200		3	3	4	911
V_1	3128		26	30	35	884
V_2	10890					

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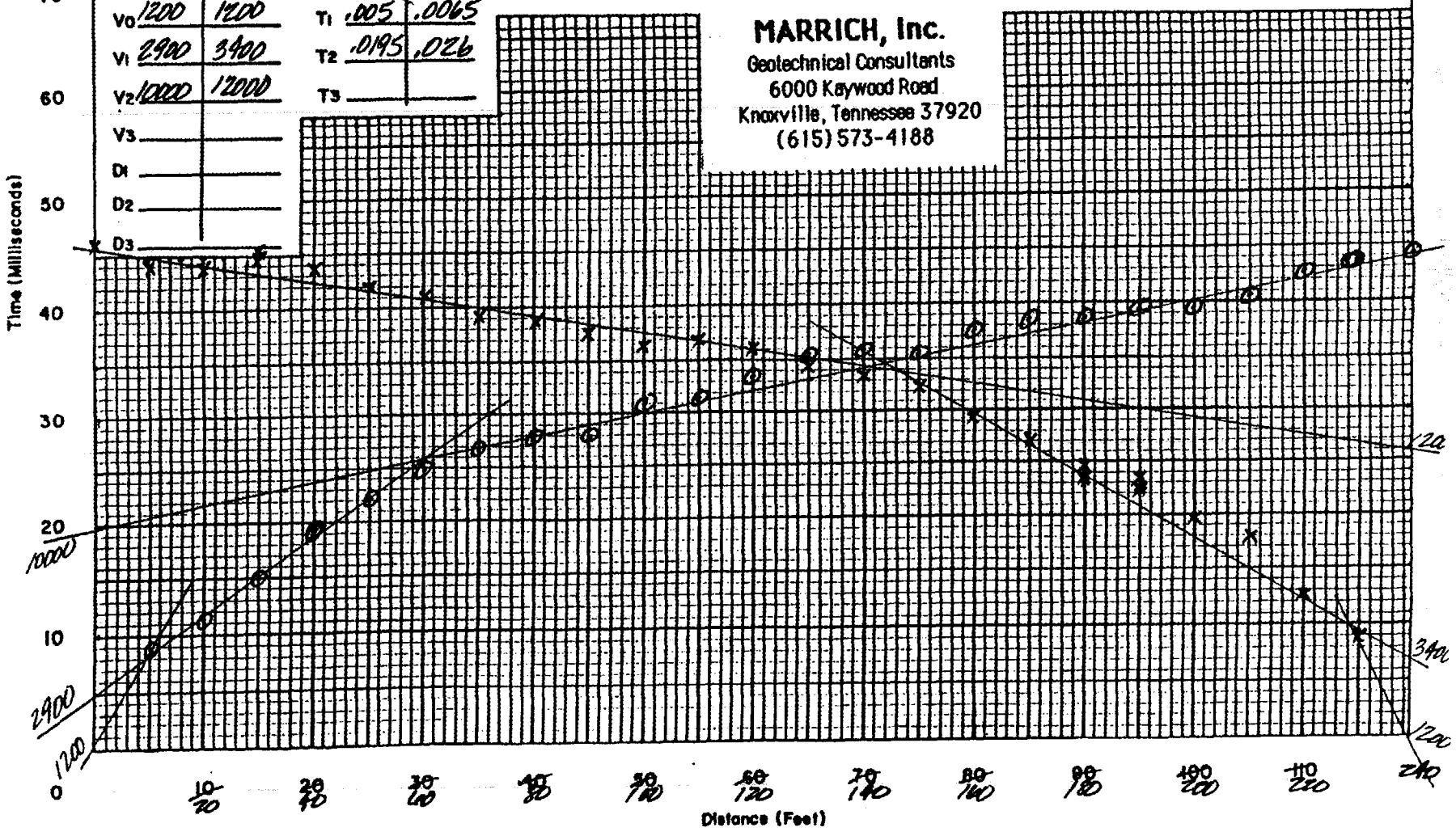

SEISMIC TIME-DISTANCE GRAPH

PROJECT Rockbed Ars Site
LOCATION SPD #27
STATION #28 = 2800N
DATE 9/20/91
SURFACE ELEVATION 892
LINE BEARING N 50°E

Vo	1200	1200
V1	4700	3800
V2	13800	12000
V3		
D1		
D2		
D3		

T1	.006	.006
T2	.021	.020
T3		

SUMMARY AVG

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B		ELEVATIONS
Vo	1200		3	3	3	889
V1	4200		36	35	34	857
V2	12786					

10/29/91 RAA

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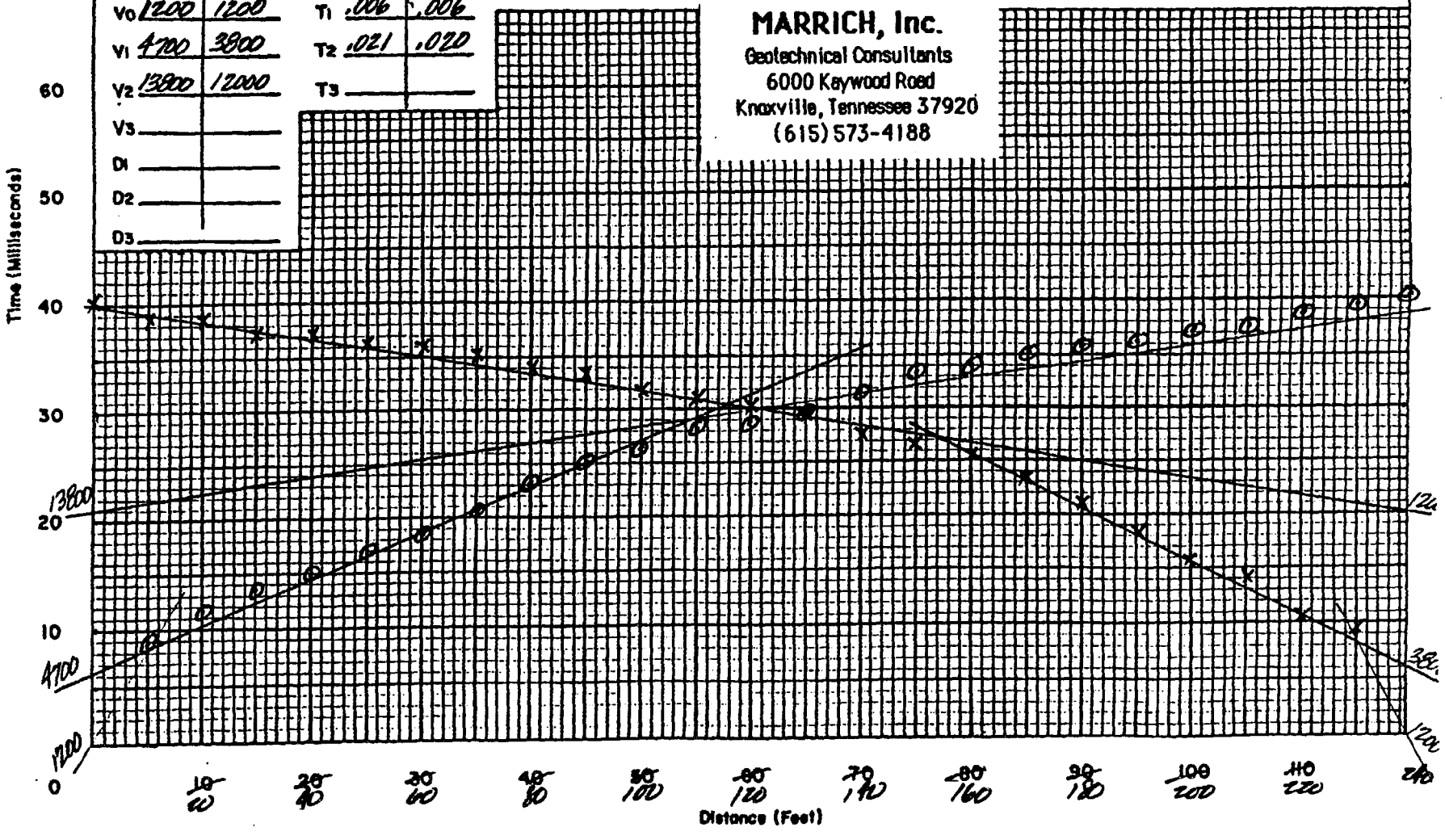

SEISMIC TIME-DISTANCE GRAPH

PROJECT PROPOSED ANS SITE
LOCATION SPD #28
STATION #22 = 2400E
DATE 9/30/91
SURFACE ELEVATION 923
LINE BEARING E-W-7E

V_0	1200	1200	
V_1	4200	4400	
V_2	10800	13000	
V_3			
D_1			
D_2			
D_3			

T_1	.006	.005
T_2	.0175	.0165
T_3		

SUMMARY AVG 10/29/91 RLA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B		ELEVATIONS
V_0	1200		3	3	3	920
V_1	4297		29	29	29	894
V_2	11797					

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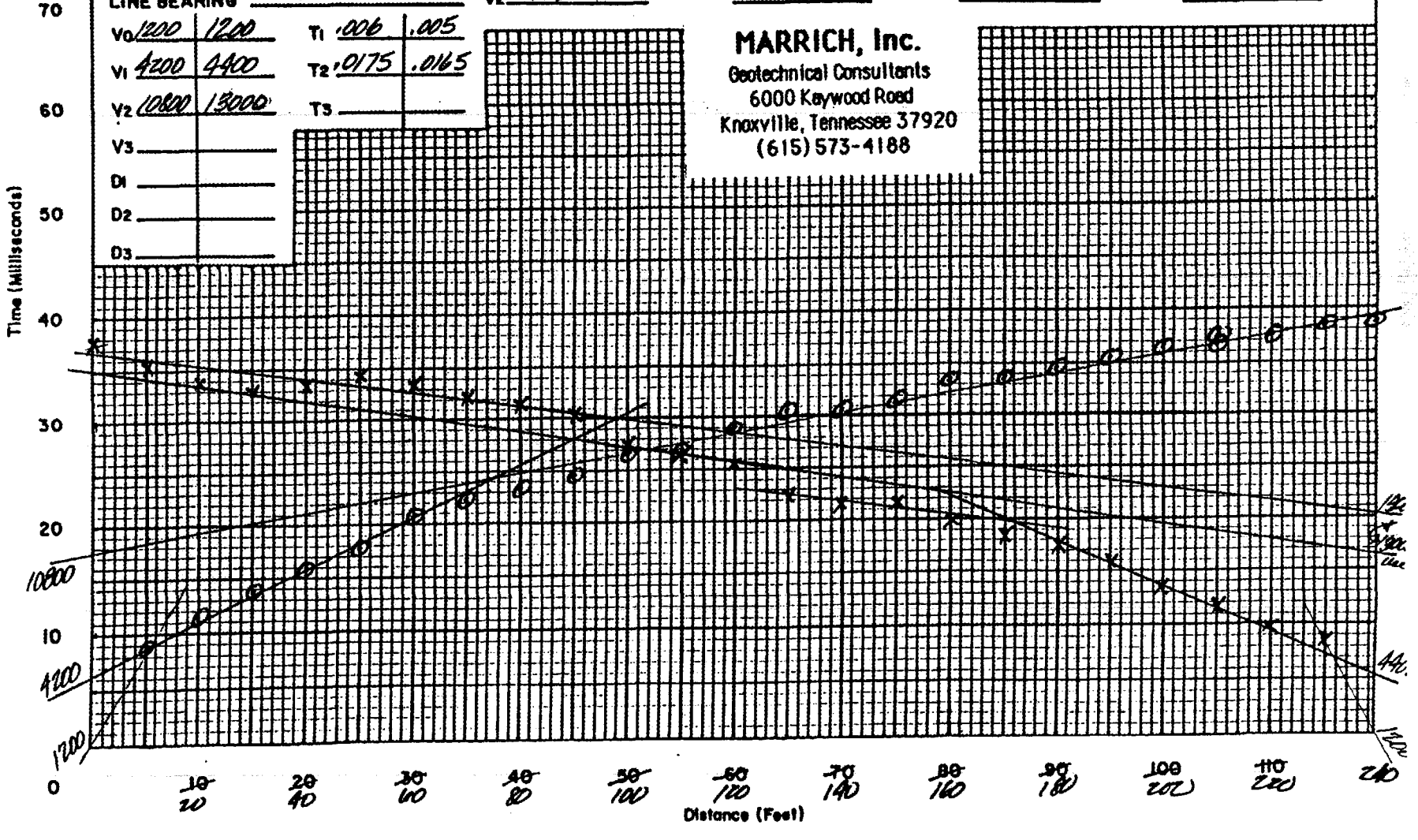

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AWS Site

LOCATION SP#29

STATION #16 = 2+00E

DATE 10/1/91

SURFACE ELEVATION 873

LINE BEARING E→W→E

V_0	1200	1200	T_1 .004	.006
V_1	2700	2800	T_2 .013	.0155
V_2	11000	12500	T_3	
V_3				
D_1				
D_2				
D_3				

SUMMARY

10/09/91 RCM

AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) AVG	DEPTHS (FEET) B	ELEVATIONS
V_0 1200		2	3	4	870
V_1 2748		14	15	16	858
V_2 11701					

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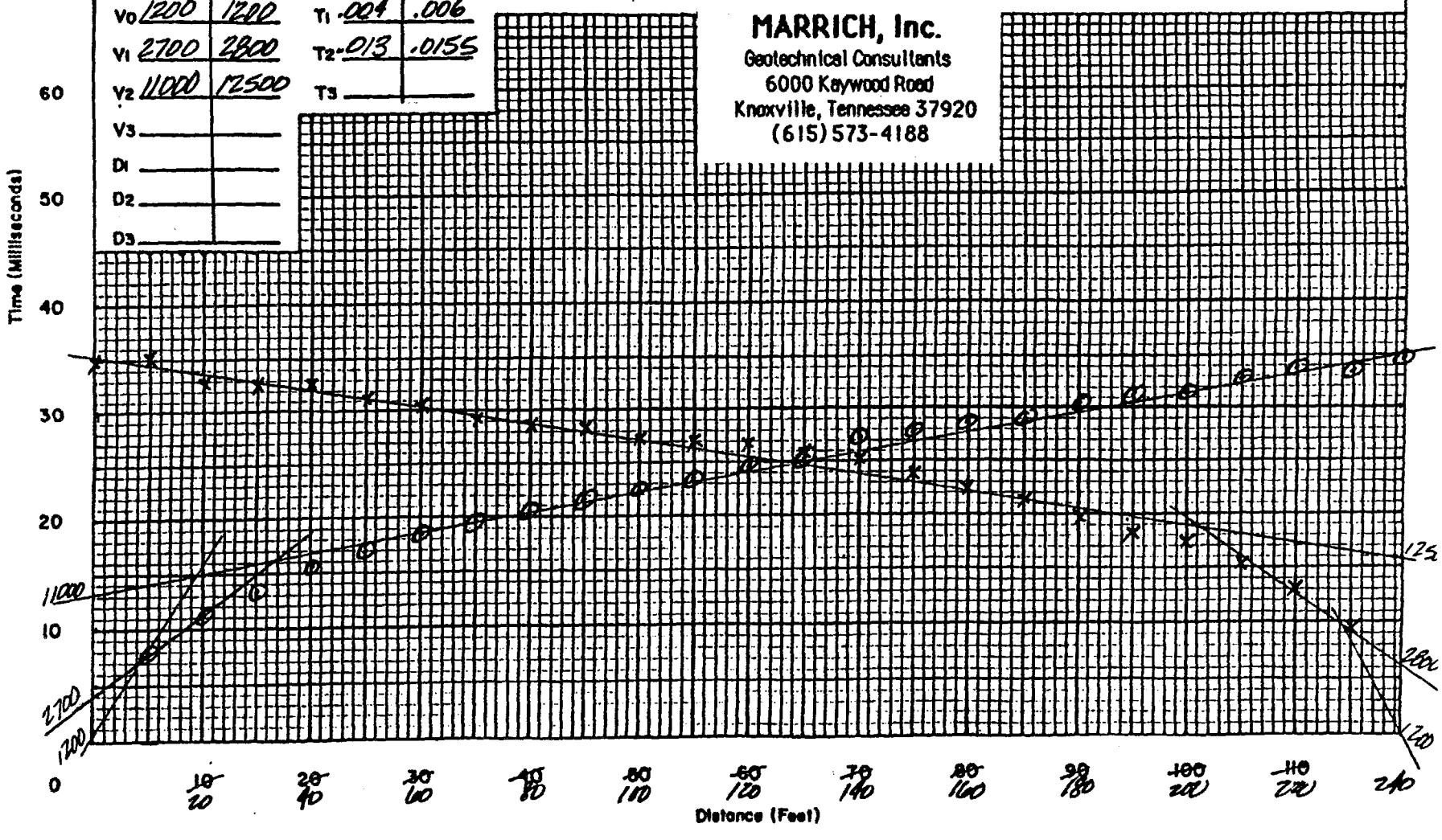

SEISMIC TIME–DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #30
STATION #15 = 2+00E
DATE 10/1/91
SURFACE ELEVATION 863
LINE BEARING E-W → E

10/09/91 RHH

Vo	1200	1200
V1	3100	3700
V2	10400	12000
V3		
D1		
D2		
D3		

T1	.005	.007
T2	.0105	.015
T3		

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) B	DEPTHS (FEET) AVG	ELEVATIONS
Vo	1200		3	3	4	860
V1	3371		12	15	17	848
V2	11114					

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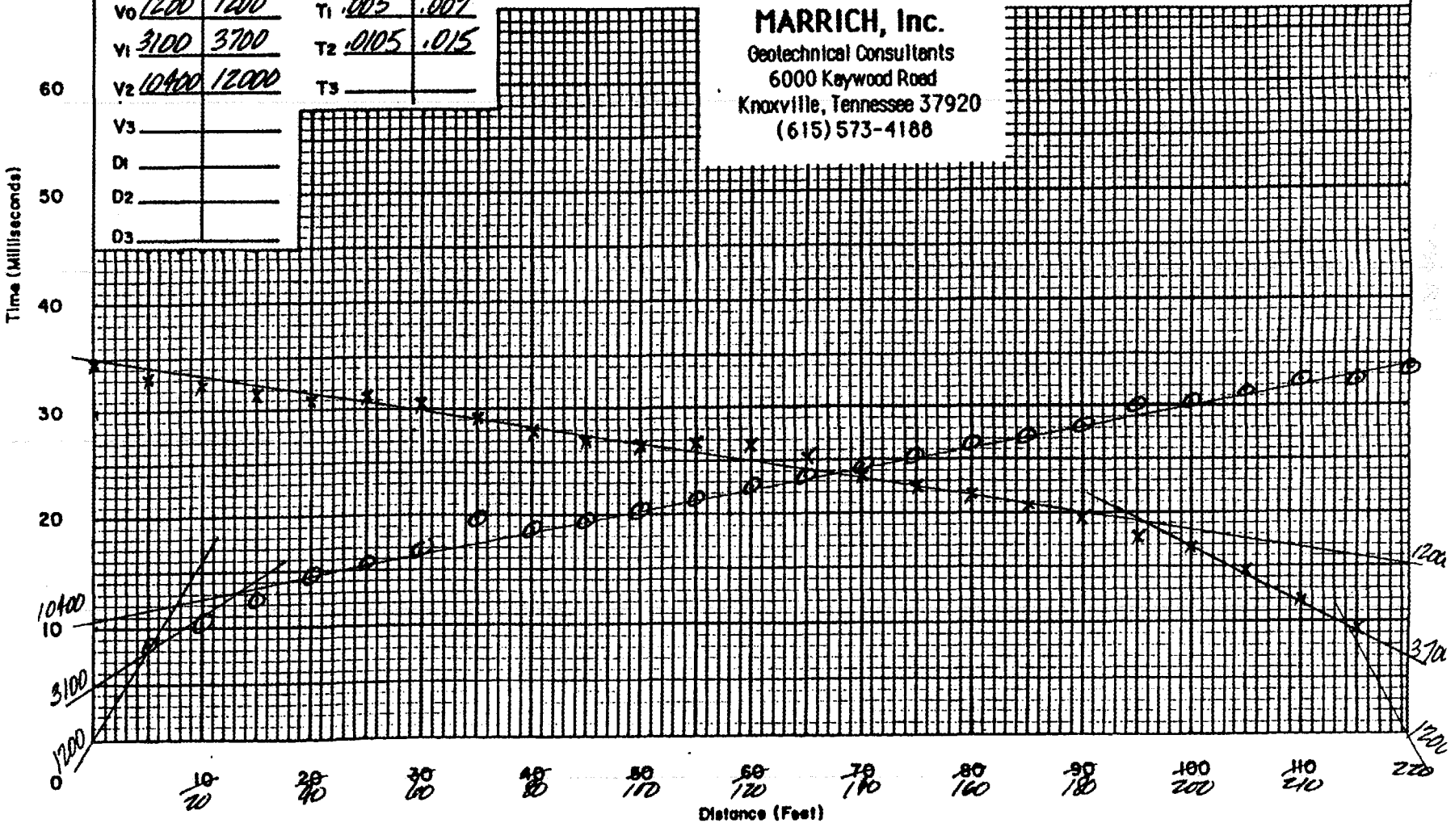

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AHS Site
LOCATION SPD #31
STATION #20 = 2+00N
DATE 10/1/91
SURFACE ELEVATION 870
LINE BEARING S-N (180)

V_0	1200	1200
V_1	2000	2600
V_2	12600	10400
V_3		
D_1		
D_2		
D_3		

T_1	.004	.006
T_2	.0125	.0145
T_3		

SUMMARY AVG 10/28/91 RDH

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B	ELEVATIONS
V_0	1200		2	3 4	867
V_1	2253		11	12 12	858
V_2	11265				

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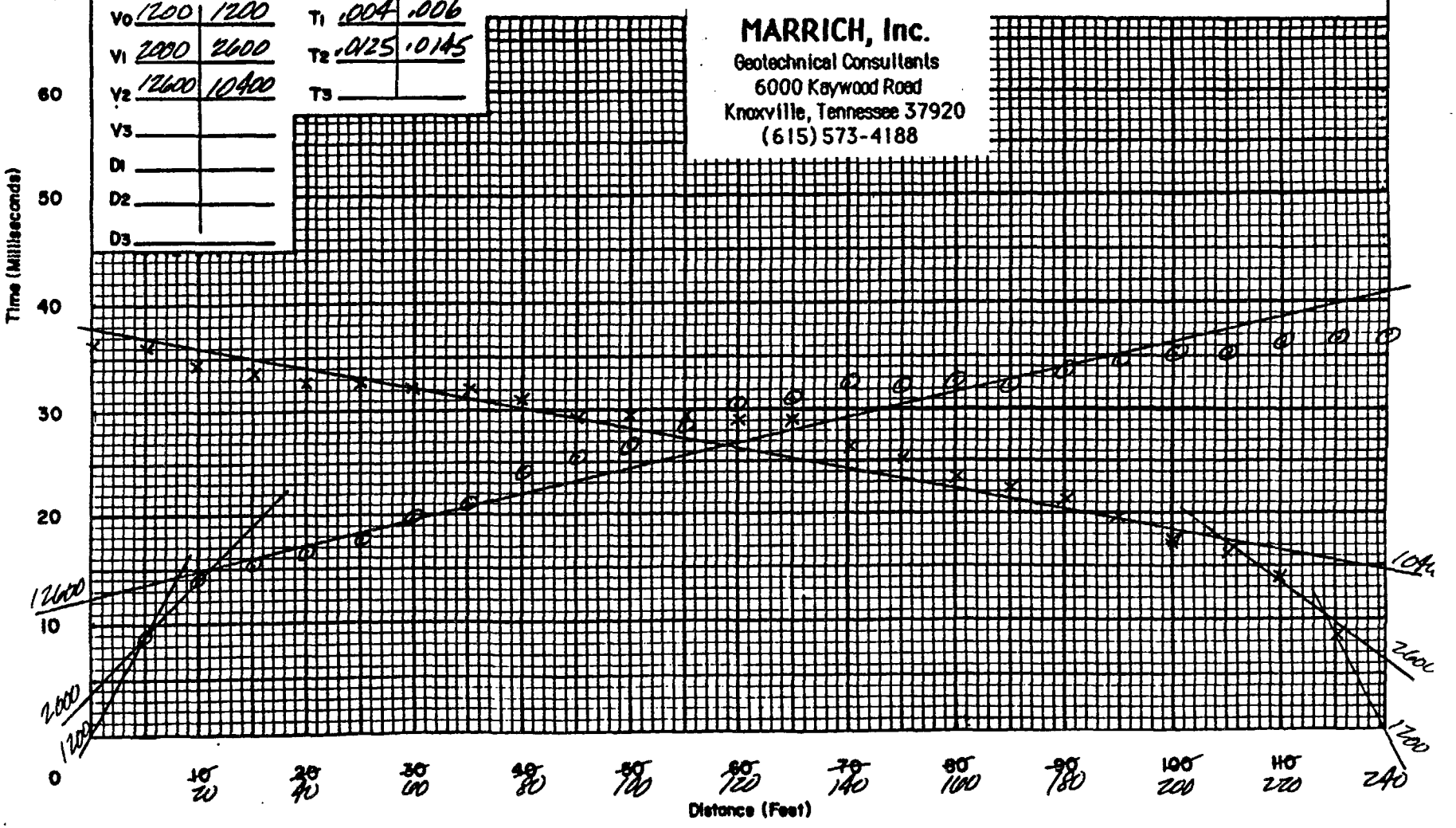

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #32
STATION #25 = 2+00N
DATE 10/1/91
SURFACE ELEVATION 842
LINE BEARING N-S → N

V0	1300	1200	
V1	2800	2400	
V2	9600	9800	
V3			
D1			
D2			
D3			

T1	.0035	.005	
T2	.009	.0105	
T3			

10/28/91 RAA

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B	Avg	ELEVATIONS
V0	1250		2	3	3	838
V1	2582		9	9	10	833
V2	9666					

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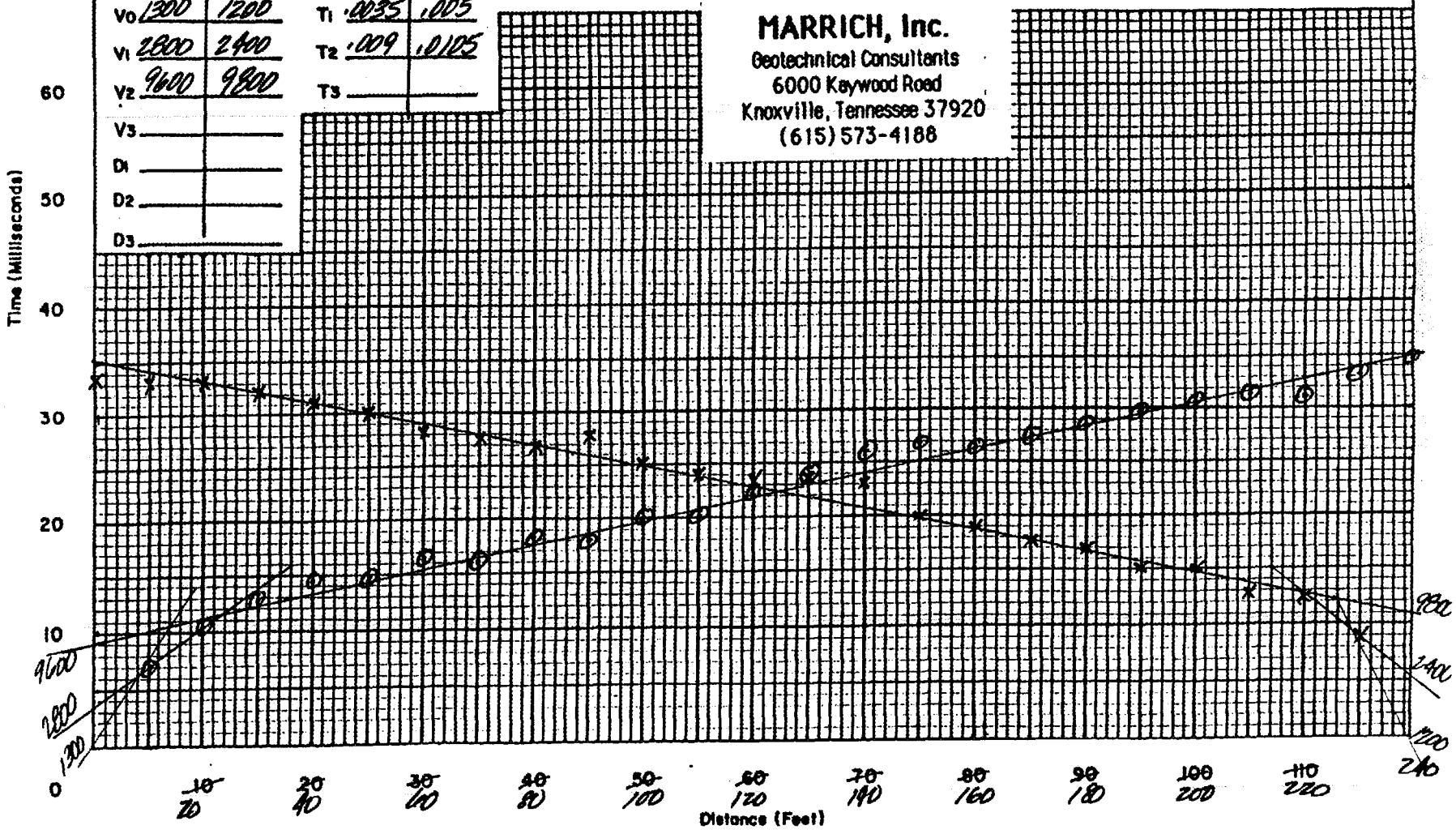

SEISMIC TIME-DISTANCE GRAPH

RAH 10/28/91

PROJECT Proposed HWS Site
LOCATION SPD 33
STATION ≈ 21+1400E
DATE 10/1/91
SURFACE ELEVATION 872±
LINE BEARING E-W→E

V_0	1200	1200	
V_1	4200	4600	
V_2	11000	12400	
V_3			
D_1			
D_2			
D_3			

T_1	.0016	.0025
T_2	.0105	.011
T_3		

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) AVG	DEPTHS (FEET) B	ELEVATIONS
V_0	1200		3	2	1	870
V_1	4390		13	17	21	855
V_2	11654					

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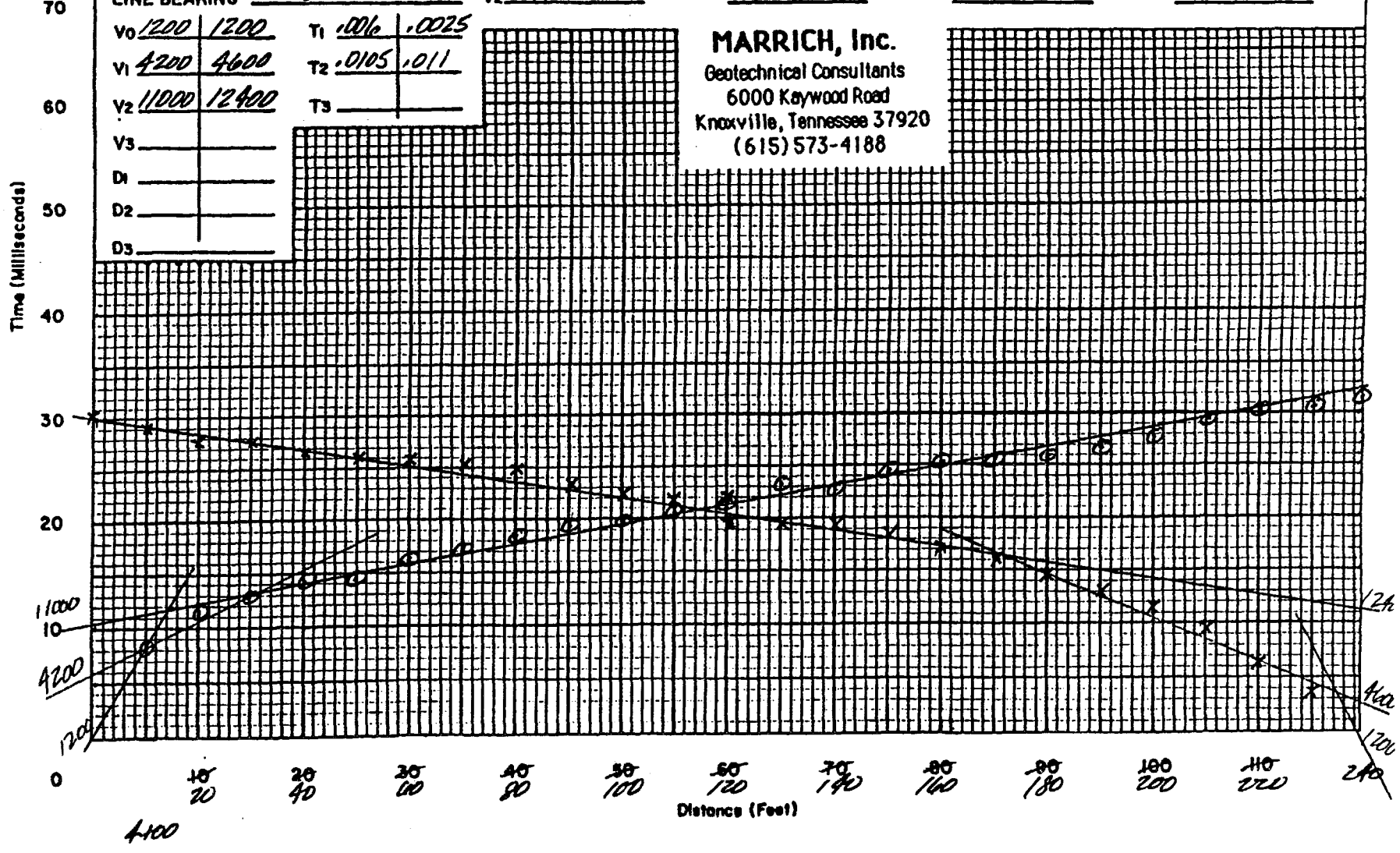

SEISMIC TIME–DISTANCE GRAPH

RAH 10/28/91

PROJECT Proposed Ans Site
LOCATION SPD 34
STATION x#21 = 3+00E
DATE 10/2/91
SURFACE ELEVATION 891.2
LINE BEARING E. N → E

V_0	1200	1200	T_1 .0025	.0035
V_1	4100	4300	T_2 .013	.0145
V_2	12200	12600	T_3	
V_3				
D_1				
D_2				
D_3				

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	AVG	B	ELEVATIONS
V_0	1200		1	1	2	890
V_1	4490		26	27	28	864
V_2	12378					

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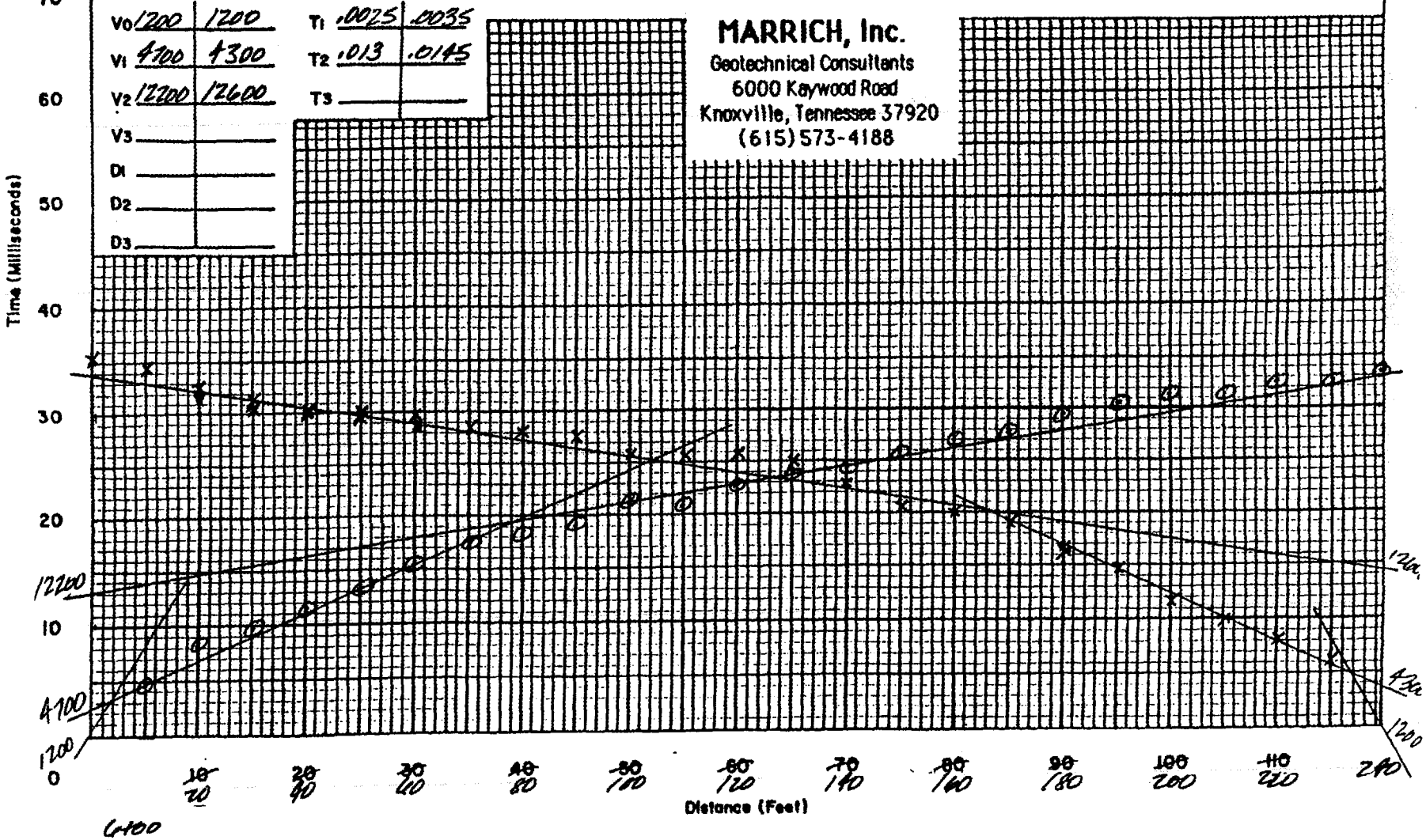

SEISMIC TIME-DISTANCE GRAPH

RAM 10/28/91

PROJECT: PROPOSED AWS Site
LOCATION: SPD #35
STATION: ≈ #26 = 3+45N
DATE: 10/2/91
SURFACE ELEVATION: 864
LINE BEARING: N-S W (180°)

Vo	1200	1200
V1	3800	2200
V2	10600	9400
V3		
D1		
D2		
D3		

T1	.006	.005
T2	.0125	.0115
T3		

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	AVG	B	ELEVATIONS
Vo	1200		4	3	3	861
V1	2763		12	12	12	852
V2	9614					

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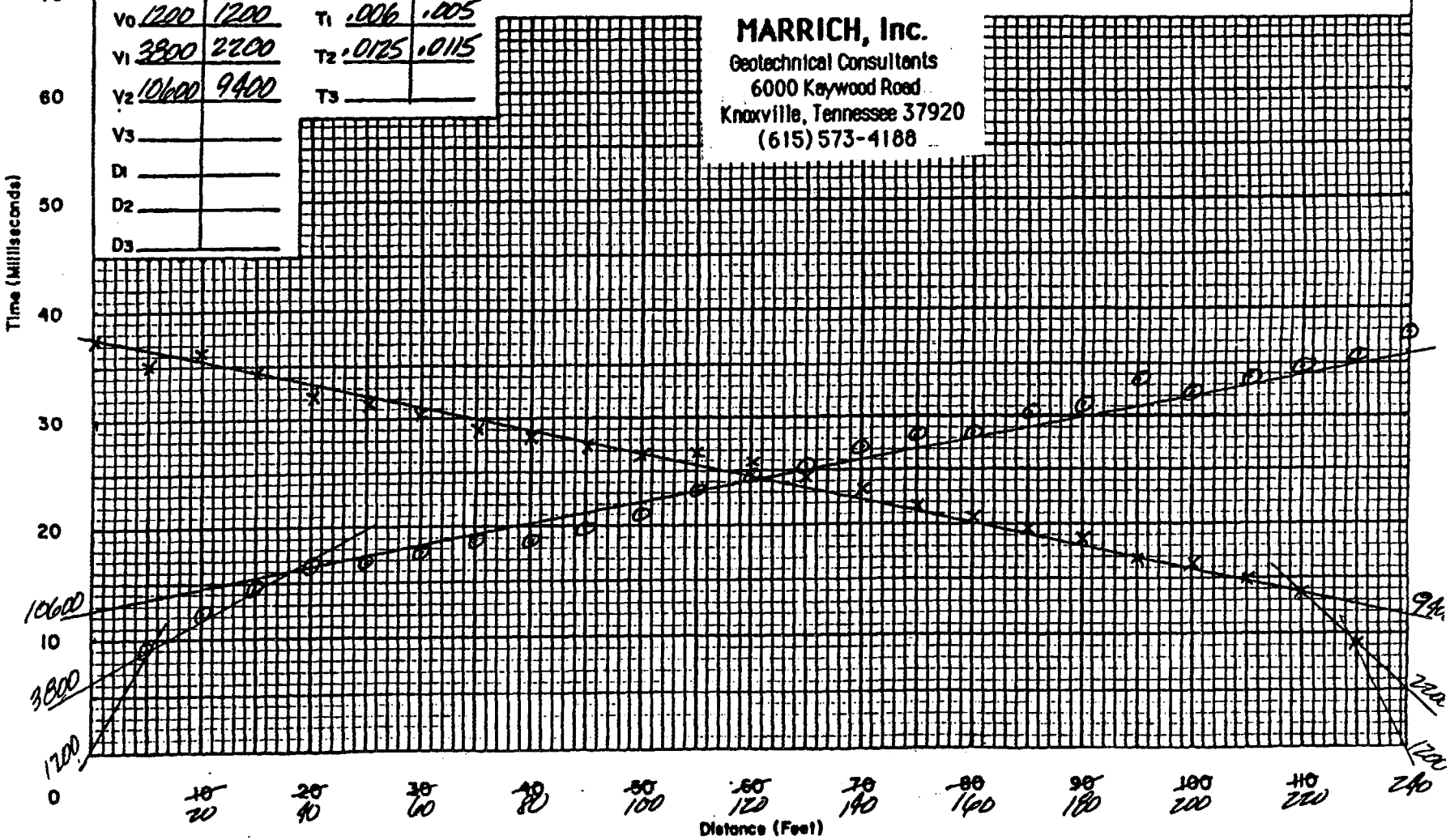

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Haul Site
LOCATION SPD #36.
STATION x#21 = 1+05N
DATE 10/3/91
SURFACE ELEVATION 862
LINE BEARING S-N (180)

Vo	1200	1200	T1 .003	.0055
V1	2600	2800	T2 .012	.011
V2	11600	9600	T3	
V3				
D1				
D2				
D3				

10/28/91 RAA

SUMMARY AVG

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B		ELEVATIONS
Vo	1200		2	2	3	860
V1	2695		14	12	10	850
V2	10485					

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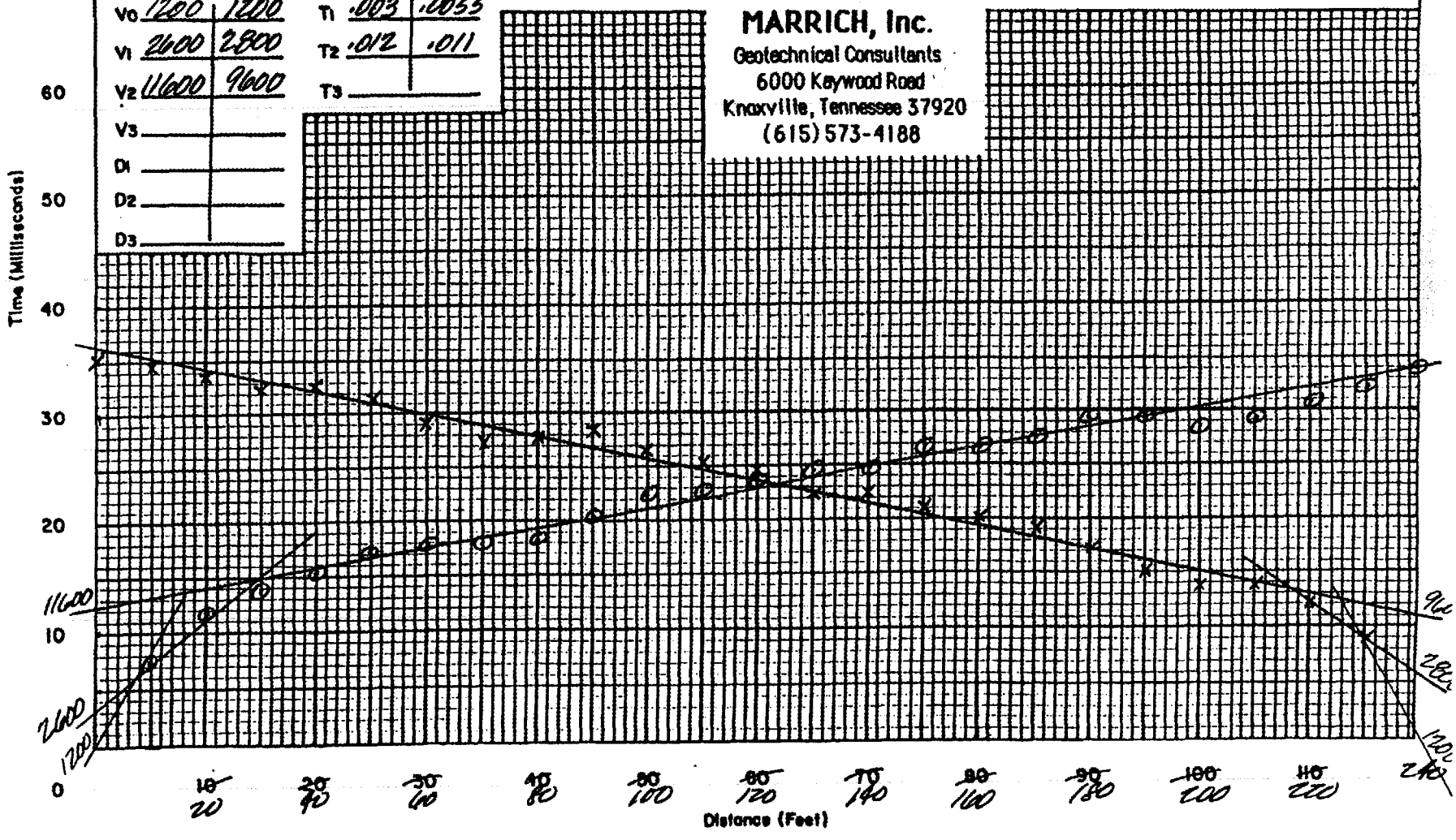

SEISMIC TIME-DISTANCE GRAPH

1

RAH 10/28/91

PROJECT Proposed RWS Site

LOCATION SPD 37

STATION x #20 - 0+65E

DATE 10/4/91

SURFACE ELEVATION 842.8

LINE BEARING N→E

Vo	1200	1200
V1	3000	3000
V2	10400	12000
V3		
D1		
D2		
D3		

T1	.005	.001
T2	.0105	.009
T3		

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	AVG	B	ELEVATIONS
Vo	1200		3	1	0	841
V1	3000		11	12	12	830
V2	11140					

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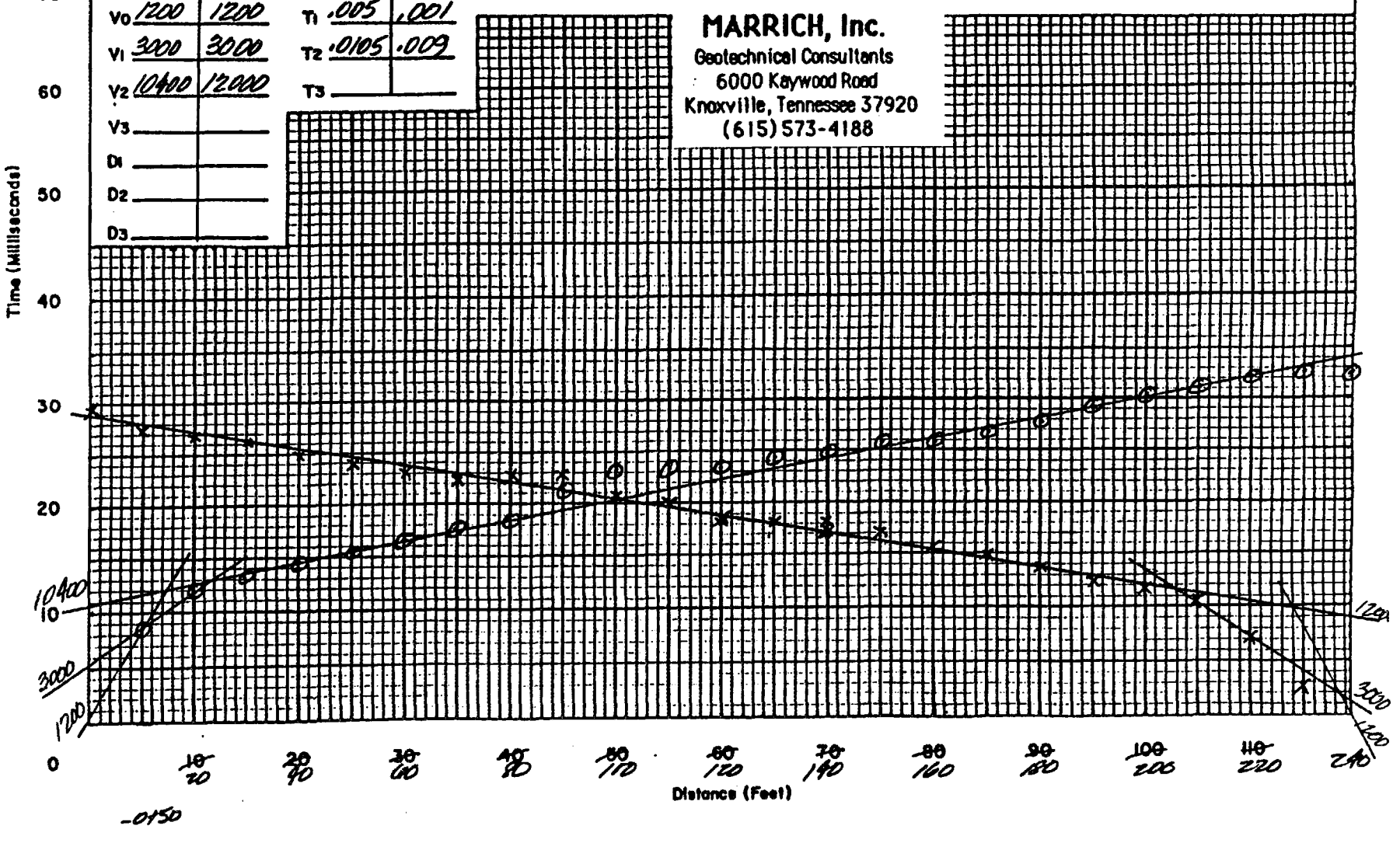

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed AWS Site
LOCATION JPD #38
STATION ~~x~~ #20 = 1+15N
DATE 10/4/91
SURFACE ELEVATION 858
LINE BEARING N-S (180)

Vo	1200	1200
V1	3000	2300
V2	9400	10000
V3		
D1		
D2		
D3		

T1	.005	.0075
T2	.010	.0165
T3		

SUMMARY

10/28/91 RMA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B		ELEVATIONS
Vo	1200		3	4	5	853
V1	2597		9	12	16	846
V2	9588					

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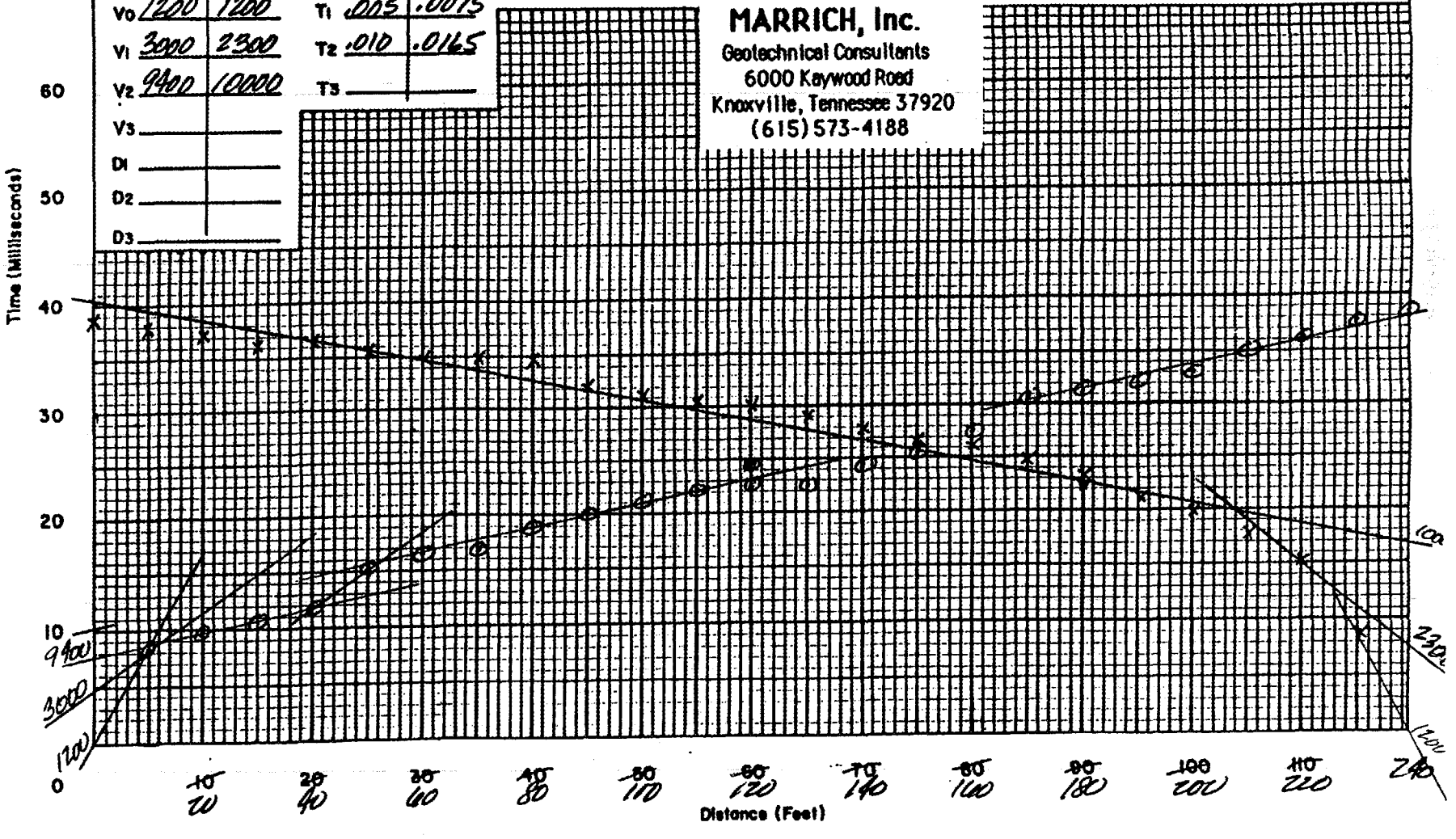

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed ANS Site
LOCATION SPD 39
STATION 1 = #20 = 3155E
DATE 10/4/91
SURFACE ELEVATION 861.5
LINE BEARING E.-W → E

Vo	1200	1200
V1	3300	3400
V2	13500	10000
V3		
D1		
D2		
D3		

T1	.004	.005
T2	.014	.0115
T3		

RAH 10/28/91

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	AVG DEPTHS (FEET) A	B		ELEVATIONS
Vo	1200		2	2	3	859
V1	3349		19	16	14	845
V2	11468					

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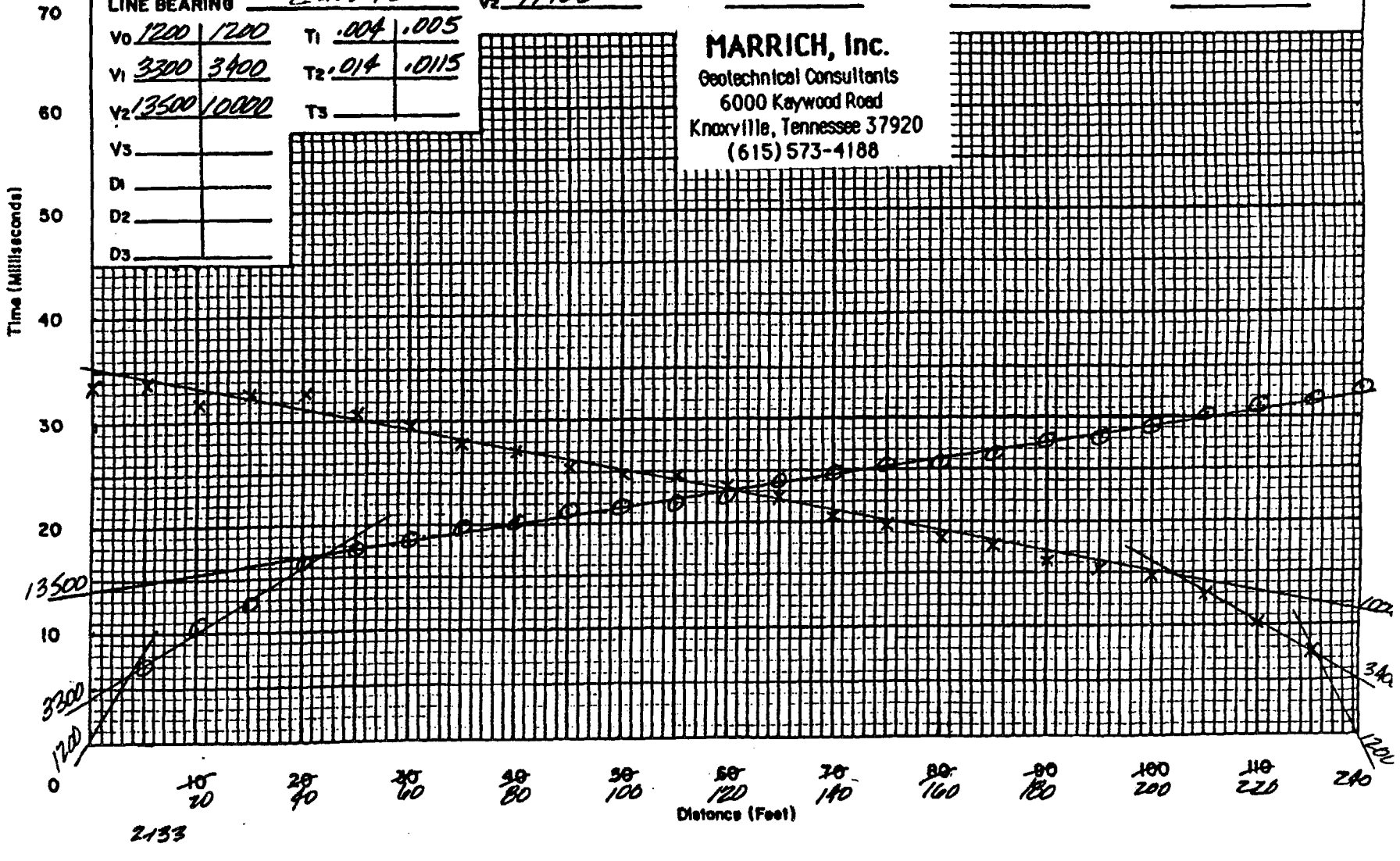

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD #40
STATION #23 = 3+00E
DATE 10/7/91
SURFACE ELEVATION 894
LINE BEARING S→N 180°

Vo	1200	1200
V1	2500	2100
V2	10000	11600
V3		
D1		
D2		
D3		

T1	.004	.0045
T2	.0155	.019
T3		

SUMMARY

10/29/91 RMA

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) B	ELEVATIONS
Vo	1200		2	3	891
V1	2279		15	17	877
V2	10683			19	

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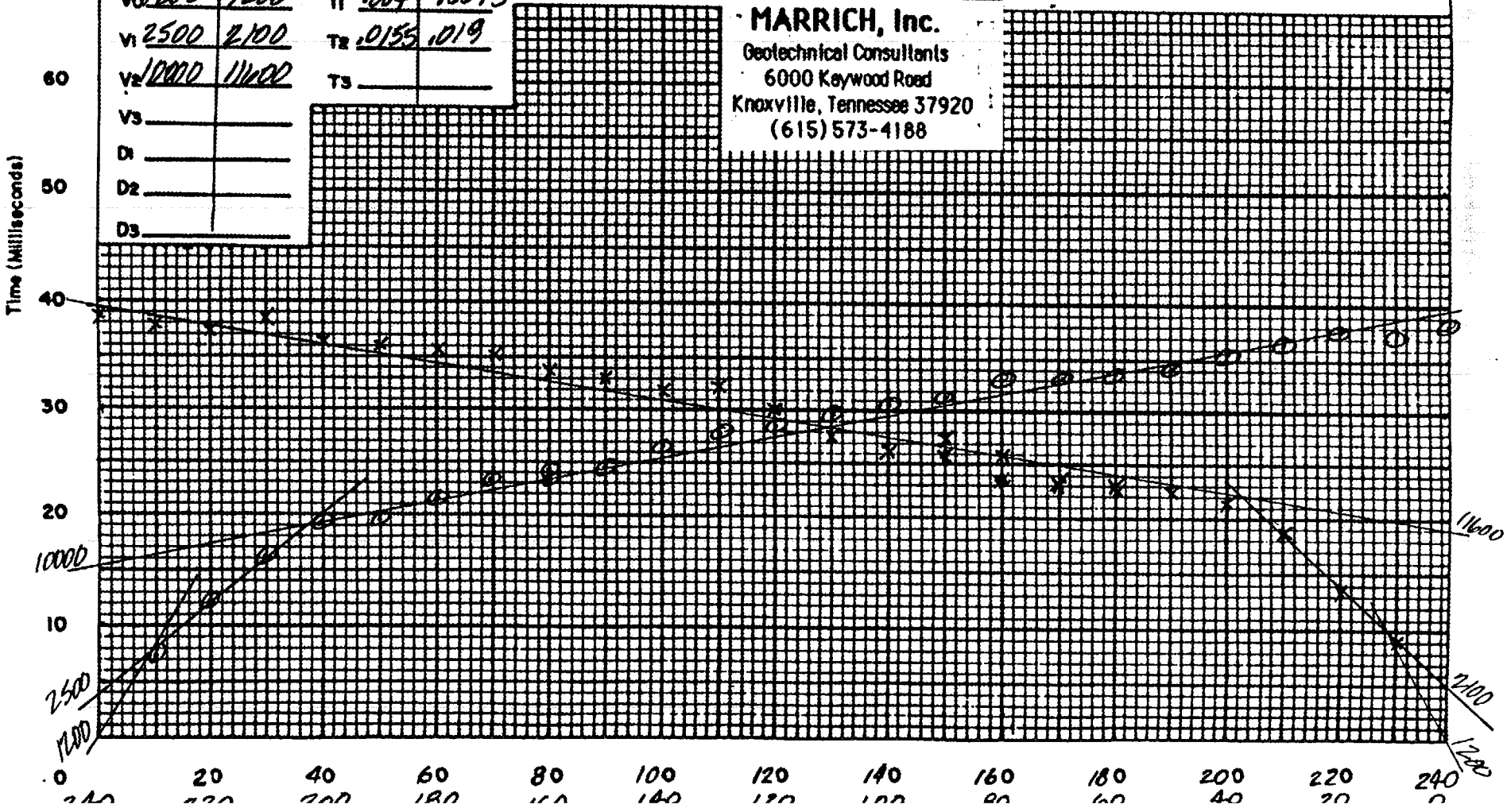

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ash Site
LOCATION SPD #41
STATION x #19 = 0+40 N
DATE 10/7/91
SURFACE ELEVATION 827
LINE BEARING W+E 270°

Vo	1200	1200
V1	4000	3800
V2	12000	13600
V3		
D1		
D2		
D3		

T1	.0055	.0045
T2	.010	.0125
T3		

Marshy Bottom

SUMMARY

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B	AVG	ELEVATIONS
Vo	1200		3	2	3	825
V1	3897		12	15	18	812
V2	12736					

10/29/91 RAM

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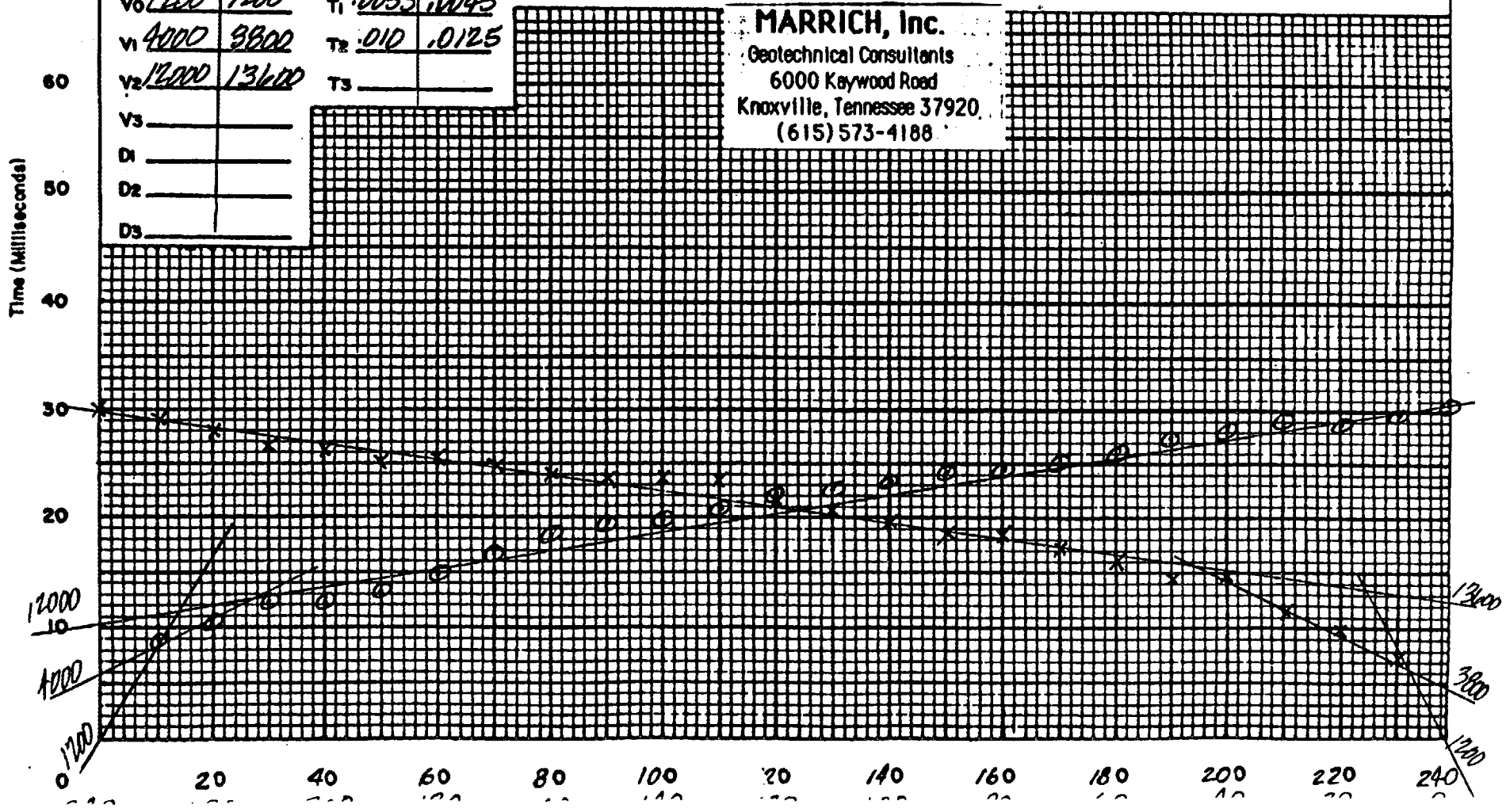

SEISMIC TIME-DISTANCE GRAPH

PROJECT: PROPOSED ANS SITE
LOCATION: SPD #42
STATION: #29
DATE: 10/7/91
SURFACE ELEVATION: 874
LINE BEARING: A: S+N 180°

V_0	1200	1200
V_1	3700	3000
V_2	9000	13200
V_3		
D_1		
D_2		
D_3		

T_1	.0045	.008
T_2	.0155	.021
T_3		

SUMMARY AVG 10/29/91 RAA

AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) B	ELEVATIONS
V_0 1200		4	4 5	870
V_1 3310		19	23 27	851
V_2 10548				

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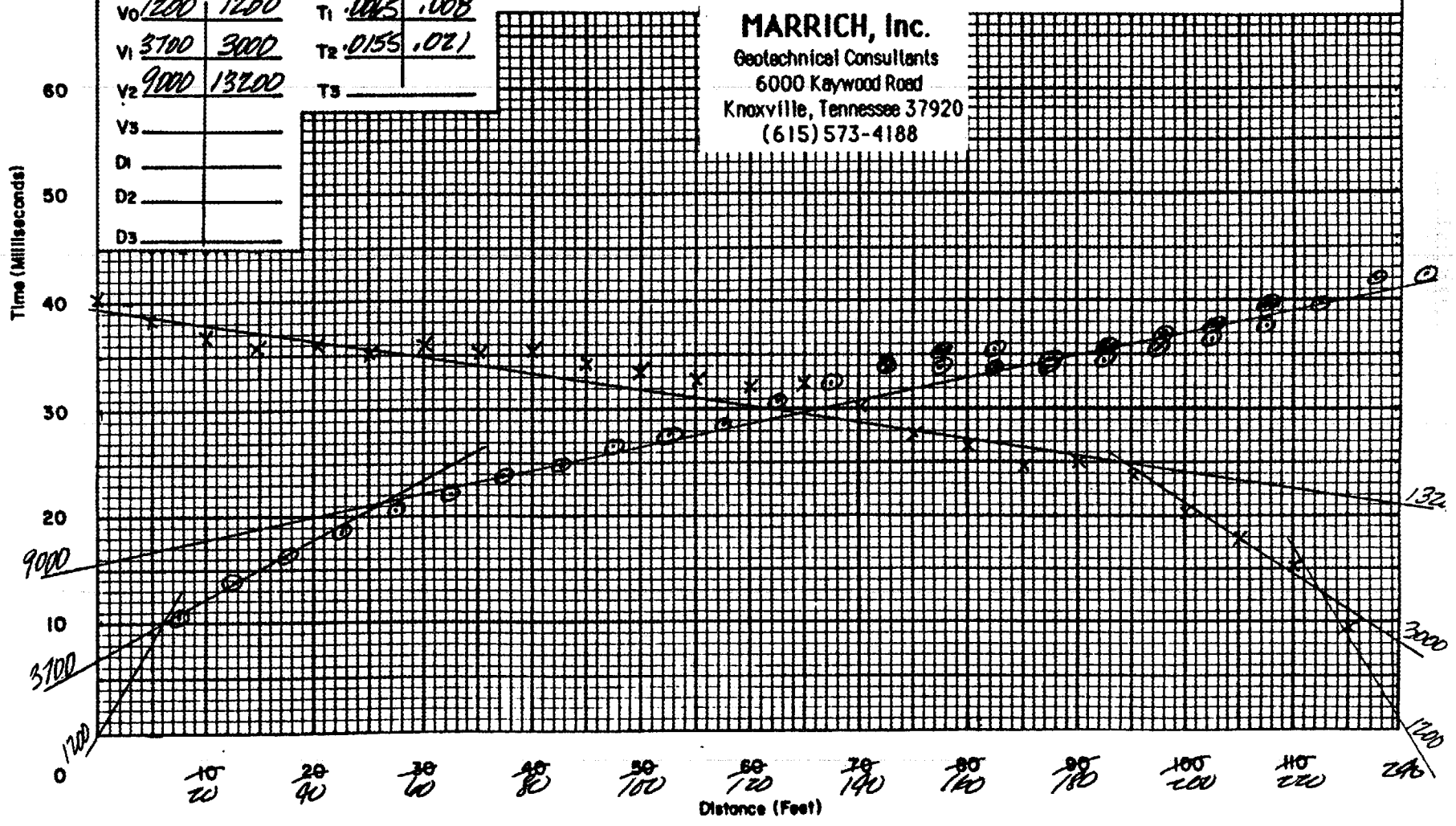

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ams Site
LOCATION SPD #43
STATION #20 = 2400N 1400E
DATE 10/8/91
SURFACE ELEVATION 869
LINE BEARING N-S E

Vo	200	1200	
V1	2800	3800	
V2	9600	9000	
V3			
D1			
D2			
D3			

T1	.004	.003
T2	.016	.010
T3		

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	DEPTHS (FEET) B	ELEVATIONS
Vo	1200		2	2 1	865
V1	3218		22	18 13	849
V2	9149				

SUMMARY AVG 10/29/91 BAH

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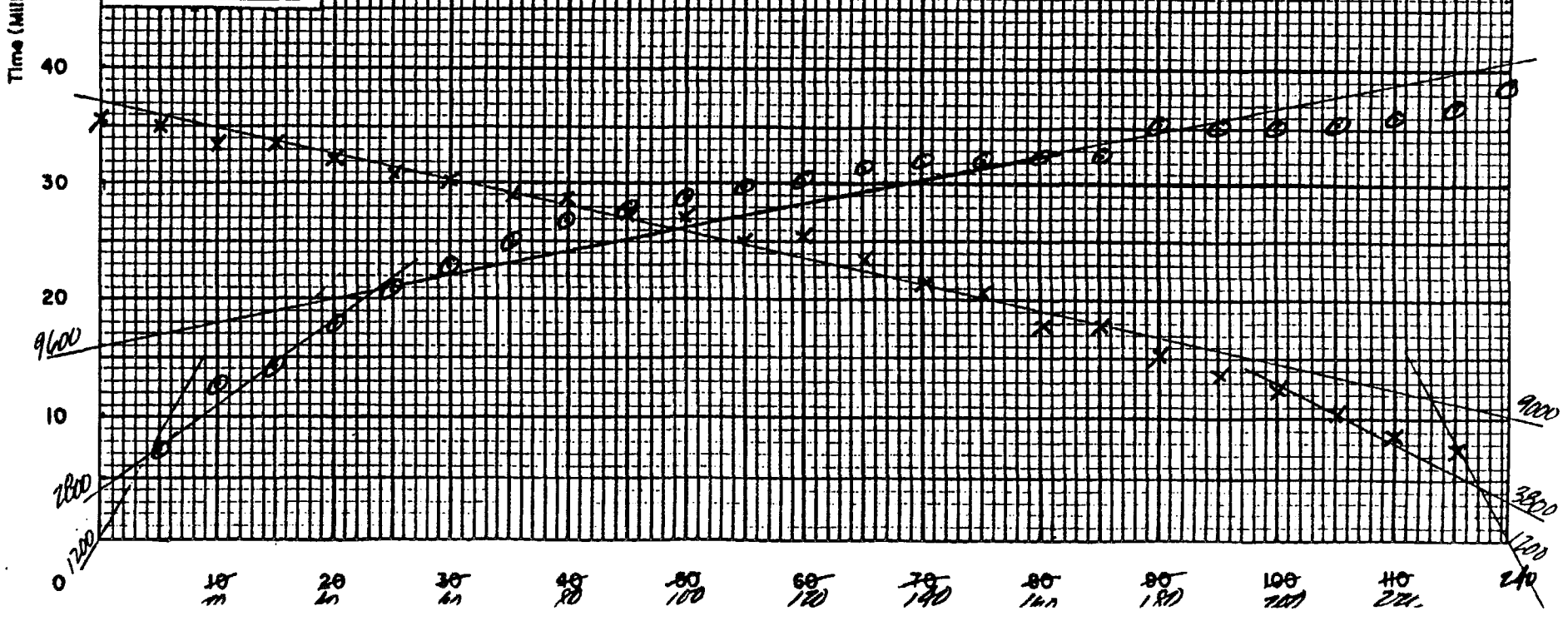

SEISMIC TIME-DISTANCE GRAPH

PROJECT Proposed Ans Site
LOCATION SPD # 4
STATION ≈ H 21 = 2165 N
DATE 10/8/91
SURFACE ELEVATION 864
LINE BEARING N-E 270°

Vo	1200	1200	
V1	3600	3200	
V2	10000	11700	
V3			
D1			
D2			
D3			

T1	.005	.0055
T2	.009	.0135
T3		

SUMMARY

10/29/91 RAH

	AVERAGE VELOCITIES	TYPE MATERIAL	DEPTHS (FEET) A	B		ELEVATIONS
Vo	1200		3	3	3	861
V1	3387		9	13	17	851
V2	10742					

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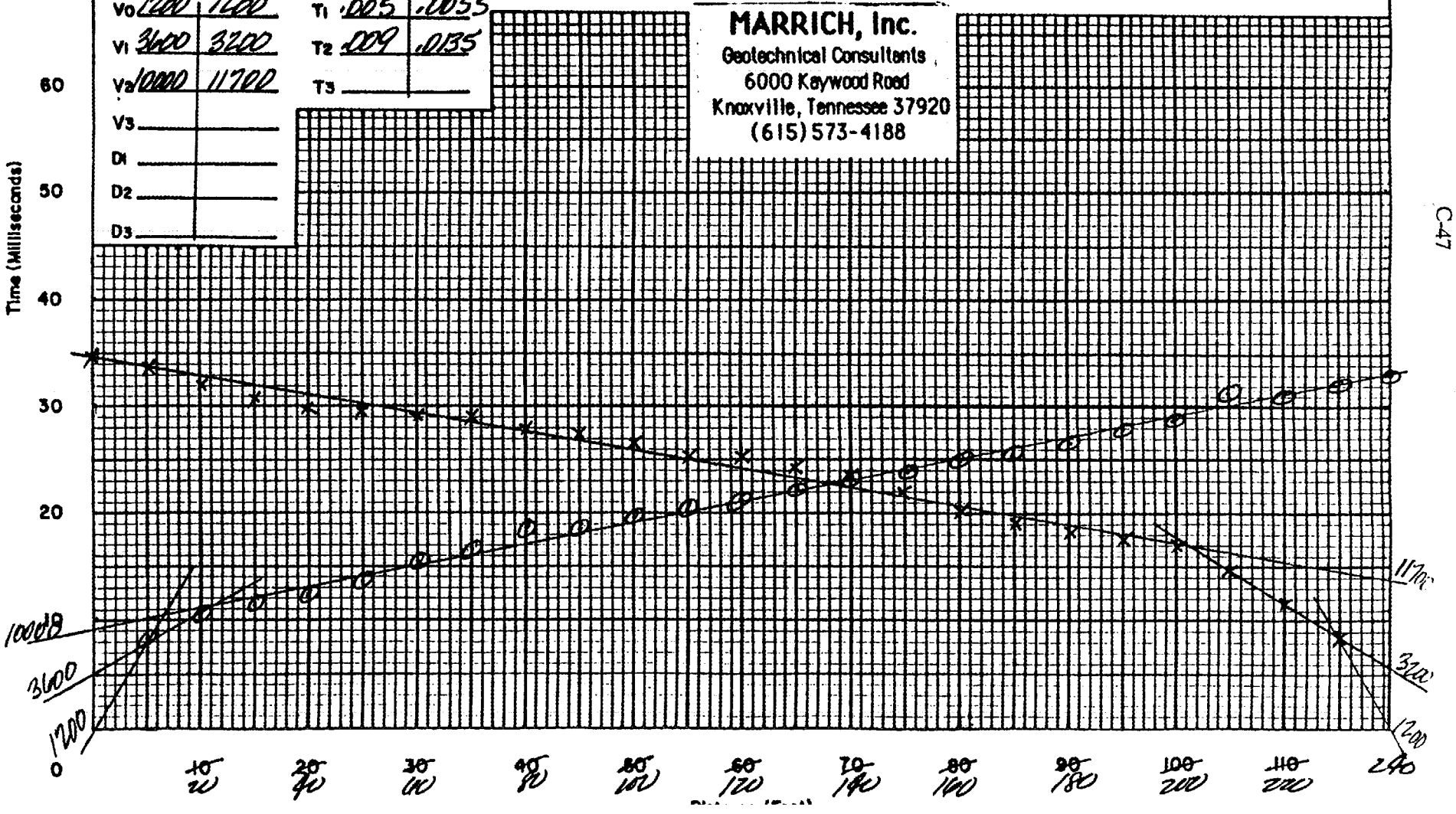

Appendix D

Spread Summary Sheets for Station Data

ANS Seismic Refraction Spread 1

Recorded: 9-18-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 22 Surface Elevation: 901 (ft)

AVERAGE VELOCITIES: AVERAGE INTERFACE DEPTH & ELEVATION:

V1 1450 ft/sec 3 898 (ft)

V2 4246 ft/sec 23 878 (ft)

V3 11571 ft/sec

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	8+00N 6+75E										
1	8+00N 6+85E	7.8	10	17.7	55	26.3	115	31.7	175	37.2	240
2	8+00N 6+95E	9.8	20	13.4	45	22.6	105	28.7	165	35	230
3	8+00N 7+05E	10.9	30	11.1	35	21.6	95	26.8	155	34.2	220
4	8+00N 7+15E	13.5	40	9.8	25	20.6	85	26.7	145	33.4	210
5	8+00N 7+25E	15.5	50	8.1	15	20.2	75	26.7	135	33.4	200
6	8+00N 7+35E	17.3	60	3.4	5	20.2	65	25.6	125	32.9	190
SP2	8+00N 7+40E										
7	8+00N 7+45E	18.3	70	3.7	5	17.7	55	24.9	115	32.2	180
8	8+00N 7+55E	19.3	80	8.3	15	14.7	45	22.7	105	30.2	170
9	8+00N 7+65E	20.4	90	10.2	25	12.8	35	21.2	95	29.4	160
10	8+00N 7+75E	23.6	100	13.3	35	10.8	25	20.2	85	29.8	150
11	8+00N 7+85E	23.6	110	14.4	45	8.8	15	19	75	27.8	140
12	8+00N 7+95E	24.6	120	16.4	55	4.8	5	16.9	65	25.8	130
SP3	8+00N 8+00E										
13	8+00N 8+05E	25	130	17.2	65	3.6	5	14.6	55	23.8	120
14	8+00N 8+15E	26.2	140	18.2	75	6.2	15	12.6	45	21.8	110
15	8+00N 8+25E	26.9	150	20.2	85	8.2	25	11.6	35	21.5	100
16	8+00N 8+35E	28	160	21.4	95	10.6	35	9.8	25	20.8	90
17	8+00N 8+45E	29	170	22.5	105	12.2	45	7.6	15	19.7	80
18	8+00N 8+55E	30.1	180	24.2	115	13.9	55	5.4	5	19.5	70
SP4	8+00N 8+60E										
19	8+00N 8+65E	31.1	190	25.8	125	15.3	65	4.2	5	17.8	60
20	8+00N 8+75E	33.1	200	26.8	135	17.3	75	8.2	15	16	50
21	8+00N 8+85E	34.8	210	28.1	145	19.3	85	10.2	25	13.4	40
22	8+00N 8+95E	35.3	220	29.5	155	20.8	95	12.7	35	10.2	30
23	8+00N 9+05E	36.3	230	29.5	165	22.1	105	14.7	45	7.7	20
24	8+00N 9+15E	36.6	240	29.8	175	22.6	115	16.2	55	6	10
SP5	8+00N 9+25E										

NOTES: Shot Point 1 Digital Field File: 2.dat Source: Hammer

Shot Point 2 Digital Field File: 4.dat Source: Hammer

Shot Point 3 Digital Field File: 5.dat Source: Hammer

Shot Point 4 Digital Field File: 6.dat Source: Hammer

Shot Point 5 Digital Field File: 7.dat Source: Hammer

ANS Seismic Refraction Spread 2

Recorded: 9-19-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 10 Surface Elevation: 875 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1300 ft/sec	3	872	(ft)
V2 3924 ft/sec	19	856	(ft)
V3 14480 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	16+00N	1+25W						
1	16+00N	1+15W	7.2	10	22.1	115	31.9	240
2	16+00N	1+05W	9	20	20.6	105	30.5	230
3	16+00N	0+95W	10.7	30	19.6	95	29.7	220
4	16+00N	0+85W	11.8	40	18.4	85	28.6	210
5	16+00N	0+75W	13.1	50	17.7	75	28	200
6	16+00N	0+65W	14.5	60	17.7	65	28	190
7	16+00N	0+55W	16	70	16.5	55	27	180
8	16+00N	0+45W	18	80	15.7	45	26.8	170
9	16+00N	0+35W	19.2	90	13.4	35	26.3	160
10	16+00N	0+25W	20.1	100	11.8	25	25.3	150
11	16+00N	0+15W	20.4	110	7.1	15	24.3	140
12	16+00N	0+05W	21.8	120	4.7	5	23.8	130
SP2	16+00N	0+00						
13	16+00N	0+05E	22.1	130	4.4	5	22.5	120
14	16+00N	0+15E	22.8	140	8.4	15	21.1	110
15	16+00N	0+25E	23.1	150	10.6	25	19.5	100
16	16+00N	0+35E	24.1	160	12.6	35	18.2	90
17	16+00N	0+45E	24.1	170	13.9	45	16.6	80
18	16+00N	0+55E	24.7	180	15.2	55	15.8	70
19	16+00N	0+65E	25	190	15.9	65	14.6	60
20	16+00N	0+75E	27	200	17.9	75	14.6	50
21	16+00N	0+85E	29.7	210	19.9	85	15.6	40
22	16+00N	0+95E	31.4	220	22.2	95	15.1	30
23	16+00N	1+05E	31.1	230	22	105	11.8	20
24	16+00N	1+15E	32.2	240	23.3	115	9	10
SP3	16+00N	1+25E						

NOTES: Shot Point 1 Digital Field File: 8.dat Source: Hammer
Shot Point 2 Digital Field File: 9.dat Source: Hammer
Shot Point 3 Digital Field File: 10.dat Source: Hammer

ANS Seismic Refraction Spread 3

Recorded: 9-19-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 11 Surface Elevation: 878 (ft)

AVERAGE VELOCITIES:

V1 1300 ft/sec

V2 3528 ft/sec

V3 10286 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

1	877	(ft)
13	865	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	16+00N	2+75E						
1	16+00N	2+85E	8.8	10	25	115	27.3	240
2	16+00N	2+95E	12.8	20	23.9	105	25.7	230
3	16+00N	3+05E	13.2	30	22.2	95	24.1	220
4	16+00N	3+15E	14.2	40	20.7	85	23.5	210
5	16+00N	3+25E	14.5	50	18.5	75	21.1	200
6	16+00N	3+35E	15.5	60	18.1	65	20.1	190
7	16+00N	3+45E	17.5	70	18.2	55	20.6	180
8	16+00N	3+55E	18.3	80	16.4	45	19.5	170
9	16+00N	3+65E	19.3	90	15.4	35	19.8	160
10	16+00N	3+75E	23	100	14.5	25	20.2	150
11	16+00N	3+85E	23.2	110	11.5	15	19.2	140
12	16+00N	3+95E	23.6	120	3.1	5	18.1	130
SP2	16+00N	4+00E						
13	16+00N	4+05E	24.3	130	3.7	5	16.4	120
14	16+00N	4+15E	24.9	140	10.6	15	15.7	110
15	16+00N	4+25E	25.7	150	12.6	25	14.8	100
16	16+00N	4+35E	26.6	160	14.9	35	14.1	90
17	16+00N	4+45E	26.5	170	15.9	45	12	80
18	16+00N	4+55E	27.6	180	17.9	55	11.3	70
19	16+00N	4+65E	28.4	190	18.3	65	9.6	60
20	16+00N	4+75E	29.6	200	19.5	75	8.3	50
21	16+00N	4+85E	30.7	210	21	85	7.3	40
22	16+00N	4+95E	31.5	220	21.5	95	5.4	30
23	16+00N	5+05E	31.8	230	22	105	3.4	20
24	16+00N	5+15E	31.3	240	22	115	1.9	10
SP3	16+00N	5+25E						

NOTES: Shot Point 1 Digital Field File: 11.dat Source: Hammer

Shot Point 2 Digital Field File: 12.dat Source: Hammer

Shot Point 3 Digital Field File: 14.dat Source: Hammer

ANS Seismic Refraction Spread 4

Recorded: 9-20-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 12 Surface Elevation: 855 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	852	(ft)
V2 4197 ft/sec	12	843	(ft)
V3 11026 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	16+00N	6+75E						
1	16+00N	6+85E	8.9	10	19.8	115	34.8	240
2	16+00N	6+95E	11.9	20	18.8	105	31.3	230
3	16+00N	7+05E	13.8	30	17.7	95	29.6	220
4	16+00N	7+15E	15.1	40	16.3	85	28	210
5	16+00N	7+25E	16.2	50	16.7	75	29.2	200
6	16+00N	7+35E	16	60	15	65	26.4	190
7	16+00N	7+45E	18.1	70	13.7	55	24.3	180
8	16+00N	7+55E	18.2	80	12.2	45	23.4	170
9	16+00N	7+65E	18.7	90	10.8	35	22.1	160
10	16+00N	7+75E	19.2	100	9.5	25	21.4	150
11	16+00N	7+85E	19.7	110	8.1	15	20.3	140
12	16+00N	7+95E	21.1	120	4.7	5	19.1	130
SP2	16+00N	8+00E						
13	16+00N	8+05E	21.4	130	3.3	5	18.1	120
14	16+00N	8+15E	21.9	140	6.3	15	16.8	110
15	16+00N	8+25E	22.8	150	8.3	25	15.9	100
16	16+00N	8+35E	24.5	160	9.8	35	15.3	90
17	16+00N	8+45E	25.1	170	10.8	45	14.8	80
18	16+00N	8+55E	27.6	180	12.8	55	15	70
19	16+00N	8+65E	29	190	14.4	65	14.4	60
20	16+00N	8+75E	29	200	14.8	75	13.2	50
21	16+00N	8+85E	28.1	210	13.8	85	10.4	40
22	16+00N	8+95E	29.1	220	15.4	95	10.3	30
23	16+00N	9+05E	31.5	230	17.3	105	10.3	20
24	16+00N	9+15E	33.5	240	19.2	115	8.7	10
SP3	16+00N	9+25E						

NOTES: Shot Point 1 Digital Field File: 15.dat Source: Hammer
Shot Point 2 Digital Field File: 16.dat Source: Hammer
Shot Point 3 Digital Field File: 17.dat Source: Hammer

ANS Seismic Refraction Spread 5

Recorded: 9-20-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 13=0+25E Surface Elevation: 856 (ft)

AVERAGE VELOCITIES:

V1 1250 ft/sec

V2 3317 ft/sec

V3 11196 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	853	(ft)
11	845	(ft)

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	16+00N 11+00E						
1	16+00N 11+10E	8.8	10	19.7	115	30.8	240
2	16+00N 11+20E	10.6	20	19.9	105	31	230
3	16+00N 11+30E	13.6	30	21	95	32.7	220
4	16+00N 11+40E	13.9	40	19.5	85	30.8	210
5	16+00N 11+50E	14.7	50	18.9	75	30.3	200
6	16+00N 11+60E	15.1	60	17.6	65	28.8	190
7	16+00N 11+70E	15.6	70	16.1	55	27.7	180
8	16+00N 11+80E	15.6	80	14.3	45	26.3	170
9	16+00N 11+90E	16.6	90	12.9	35	25.7	160
10	16+00N 12+00E	17	100	10.6	25	24.4	150
11	16+00N 12+10E	18	110	7.9	15	23.4	140
12	16+00N 12+20E	19.3	120	4.1	5	22.8	130
SP2	16+00N 12+25E						
13	16+00N 12+30E	19.7	130	4.7	5	21.8	120
14	16+00N 12+40E	20.7	140	8.9	15	21	110
15	16+00N 12+50E	21.7	150	11.4	25	19.8	100
16	16+00N 12+60E	23.7	160	13.8	35	19.2	90
17	16+00N 12+70E	23.9	170	15.2	45	17.8	80
18	16+00N 12+80E	24.9	180	17.1	55	17.2	70
19	16+00N 12+90E	25.9	190	18.3	65	16.4	60
20	16+00N 13+00E	26.6	200	18.9	75	14.7	50
21	16+00N 13+10E	27.1	210	19.5	85	12.7	40
22	16+00N 13+20E	26.8	220	19.5	95	11.2	30
23	16+00N 13+30E	28.2	230	20.2	105	10.5	20
24	16+00N 13+40E	29.4	240	21.3	115	6.5	10
SP3	16+00N 13+50E						

NOTES: Shot Point 1 Digital Field File: 18.dat Source: Hammer

Shot Point 2 Digital Field File: 19.dat Source: Hammer

Shot Point 3 Digital Field File: 20.dat Source: Hammer

ANS Seismic Refraction Spread 6

Recorded: 9-20-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 14 Surface Elevation: 853 (ft)

AVERAGE VELOCITIES:

V1 1400 ft/sec

V2 3617 ft/sec

V3 11566 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	850	(ft)
14	839	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	16+00N	14+75E						
1	16+00N	14+85E	6.2	10	20.1	115	34.6	240
2	16+00N	14+95E	8.6	20	18.7	105	33.4	230
3	16+00N	15+05E	10.5	30	17.9	95	31.2	220
4	16+00N	15+15E	12.1	40	15.9	85	30.7	210
5	16+00N	15+25E	13.6	50	15.4	75	29.4	200
6	16+00N	15+35E	14.6	60	14.2	65	29.1	190
7	16+00N	15+45E	15	70	12.8	55	28.1	180
8	16+00N	15+55E	15.7	80	11.5	45	27.3	170
9	16+00N	15+65E	16.9	90	10.2	35	26.3	160
10	16+00N	15+75E	17.2	100	8.8	25	26.2	150
11	16+00N	15+85E	18.6	110	7.4	15	25.4	140
12	16+00N	15+95E	19.2	120	5.1	5	23.8	130
SP2	16+00N	16+00E						
13	16+00N	16+05E	20.1	130	4.3	5	22.8	120
14	16+00N	16+15E	21.7	140	6.9	15	22.1	110
15	16+00N	16+25E	23.7	150	9.9	25	22.7	100
16	16+00N	16+35E	26.7	160	13.5	35	23.7	90
17	16+00N	16+45E	27.8	170	15.8	45	23.4	80
18	16+00N	16+55E	29.2	180	17.6	55	21.4	70
19	16+00N	16+65E	29.5	190	17.9	65	19.4	60
20	16+00N	16+75E	28.9	200	17.7	75	17	50
21	16+00N	16+85E	28.7	210	17.5	85	15.6	40
22	16+00N	16+95E	30.1	220	19.3	95	14.9	30
23	16+00N	17+05E	32.1	230	21	105	12.2	20
24	16+00N	17+15E	33.1	240	21.8	115	7.7	10
SP3	16+00N	17+25E						

NOTES: Shot Point 1 Digital Field File: 21.dat Source: Hammer

Shot Point 2 Digital Field File: 22.dat Source: Hammer

Shot Point 3 Digital Field File: 23.dat Source: Hammer

ANS Seismic Refraction Spread 7

Recorded: 9-23-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 15 Surface Elevation: 848 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	4	844	(ft)
V2 2448 ft/sec	14	834	(ft)
V3 11183 ft/sec			

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	10+75N 0+00						
1	10+85N 0+00	9.3	10	22.1	115	39.9	240
2	10+95N 0+00	14.8	20	21.7	105	38.7	230
3	11+05N 0+00	16.8	30	21.1	95	37.4	220
4	11+15N 0+00	18.1	40	19.9	85	36.9	210
5	11+25N 0+00	19.1	50	18.1	75	35.6	200
6	11+35N 0+00	20.1	60	16.9	65	34.6	190
7	11+45N 0+00	21.1	70	15.9	55	33.4	180
8	11+55N 0+00	22	80	13.9	45	32.1	170
9	11+65N 0+00	22.3	90	12.9	35	30.4	160
10	11+75N 0+00	22.5	100	10.9	25	30.4	150
11	11+85N 0+00	22.9	110	8.9	15	29.2	140
12	11+95N 0+00	23.8	120	4.8	5	28.7	130
SP2	12+00N 0+00						
13	12+05N 0+00	25.1	130	4.9	5	27.5	120
14	12+15N 0+00	26.1	140	8.9	15	26.4	110
15	12+25N 0+00	27.1	150	11.7	25	24.7	100
16	12+35N 0+00	27.5	160	12.2	35	24	90
17	12+45N 0+00	26.6	170	12.1	45	21	80
18	12+55N 0+00	29.8	180	14.4	55	20.7	70
19	12+65N 0+00	30.5	190	16.4	65	21.7	60
20	12+75N 0+00	32.5	200	19.1	75	21.3	50
21	12+85N 0+00	33.8	210	19.5	85	19	40
22	12+95N 0+00	35.8	220	21.2	95	17.8	30
23	13+05N 0+00	36.8	230	23.2	105	16	20
24	13+15N 0+00	38.6	240	25.2	115	9.3	10
SP3	13+25N 0+00						

NOTES: Shot Point 1 Digital Field File: 25.dat Source: Hammer
Shot Point 2 Digital Field File: 26.dat Source: Hammer
Shot Point 3 Digital Field File: 28.dat Source: Hammer

ANS Seismic Refraction Spread 8

Recorded: 9-23-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 15 Surface Elevation: 848 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 2500 ft/sec

V3 11452 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	845	(ft)
10	838	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	12+00N	1+25W						
1	12+00N	1+15W	9.8	10	23.5	115	32.6	240
2	12+00N	1+05W	13.5	20	22.3	105	33	230
3	12+00N	0+95W	15.5	30	21.5	95	32.1	220
4	12+00N	0+85W	15.7	40	20	85	31	210
5	12+00N	0+75W	16	50	18.1	75	28.9	200
6	12+00N	0+65W	16.4	60	16.7	65	27.2	190
7	12+00N	0+55W	17.1	70	15.4	55	26.3	180
8	12+00N	0+45W	18.9	80	14.5	45	26	170
9	12+00N	0+35W	19.6	90	12.7	35	25.2	160
10	12+00N	0+25W	20.4	100	11	25	24	150
11	12+00N	0+15W	21.7	110	9.4	15	23.6	140
12	12+00N	0+05W	22.3	120	5.8	5	22.7	130
SP2	12+00N	0+00						
13	12+00N	0+05E	21.3	130	3.4	5	21.4	120
14	12+00N	0+15E	23.6	140	8.8	15	20.7	110
15	12+00N	0+25E	24.3	150	10.8	25	19.7	100
16	12+00N	0+35E	25.3	160	12.8	35	18.7	90
17	12+00N	0+45E	24.4	170	12.1	45	16.7	80
18	12+00N	0+55E	26.4	180	14.1	55	16.1	70
19	12+00N	0+65E	27.1	190	15.1	65	15.3	60
20	12+00N	0+75E	27.6	200	16.1	75	14.3	50
21	12+00N	0+85E	28.6	210	17.4	85	13.6	40
22	12+00N	0+95E	29.9	220	18.4	95	12.1	30
23	12+00N	1+05E	31.2	230	20.1	105	10.9	20
24	12+00N	1+15E	32.2	240	21.1	115	7.2	10
SP3	12+00N	1+25E						

NOTES: Shot Point 1 Digital Field File: 29.dat Source: Hammer

Shot Point 2 Digital Field File: 30.dat Source: Hammer

Shot Point 3 Digital Field File: 31.dat Source: Hammer

ANS Seismic Refraction Spread 9

Recorded: 9-26-91 Azimuth: N05W Geophone Spacing: 10 (ft)

Center Point: ANS# 16 Surface Elevation: 862 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1400 ft/sec	3	859	(ft)
V2 3867 ft/sec	12	850	(ft)
V3 10374 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	10+88N	3+44E						
1	10+98N	3+50E	8.5	10	21.9	115	31.9	240
2	11+06N	3+54E	11.5	20	20.5	105	30.9	230
3	11+15N	3+59E	12.5	30	18.6	95	29.3	220
4	11+24N	3+64E	12.9	40	16.9	85	28.3	210
5	11+32N	3+69E	13.4	50	15.3	75	26.9	200
6	11+41N	3+75E	15.7	60	15.7	65	27.5	190
7	11+49N	3+79E	16.6	70	14.5	55	25.8	180
8	11+58N	3+84E	17	80	12.3	45	24.5	170
9	11+66N	3+89E	18.3	90	10.6	35	23.9	160
10	11+75N	3+94E	18.8	100	8.8	25	22.4	150
11	11+84N	3+99E	20.3	110	6.2	15	21.2	140
12	11+92N	4+04E	21.2	120	4.2	5	21	130
SP2	11+97N	4+07E						
13	12+01N	4+09E	22.3	130	4.7	5	20.7	120
14	12+09N	4+14E	22.6	140	7.1	15	19.3	110
15	12+18N	4+19E	23.9	150	9.4	25	18.2	100
16	12+27N	4+24E	24.7	160	11.4	35	16.8	90
17	12+35N	4+29E	25.9	170	12.4	45	16.1	80
18	12+44N	4+34E	26.4	180	14.4	55	14.9	70
19	12+52N	4+39E	26.8	190	15.5	65	14.4	60
20	12+61N	4+44E	27.8	200	16	75	12.4	50
21	12+70N	4+49E	29.7	210	17.5	85	11.4	40
22	12+78N	4+54E	29	220	17.3	95	9.7	30
23	12+87N	4+59E	30.2	230	18.4	105	7.5	20
24	12+96N	4+64E	31.3	240	19.7	115	5	10
SP3	13+04N	4+68E						

NOTES: Shot Point 1 Digital Field File: 33.dat Source: Hammer
Shot Point 2 Digital Field File: 34.dat Source: Hammer
Shot Point 3 Digital Field File: 35.dat Source: Hammer

ANS Seismic Refraction Spread 10

Recorded: 9-26-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 17 Surface Elevation: 881 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	4	877	(ft)
V2 3892 ft/sec	25	856	(ft)
V3 11502 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	12+00N	6+75E						
1	12+00N	6+85E	9.3	10	25	115	38.9	240
2	12+00N	6+95E	12.3	20	25	105	37.9	230
3	12+00N	7+05E	14.4	30	23.6	95	36.7	220
4	12+00N	7+15E	15.6	40	21.9	85	34.9	210
5	12+00N	7+25E	17.9	50	21.8	75	35.3	200
6	12+00N	7+35E	19.9	60	20.8	65	35	190
7	12+00N	7+45E	22.1	70	20.9	55	34.6	180
8	12+00N	7+55E	22.5	80	17.9	45	33.6	170
9	12+00N	7+65E	23.5	90	15.9	35	32.9	160
10	12+00N	7+75E	24.6	100	13.5	25	31.4	150
11	12+00N	7+85E	25.2	110	10.5	15	30	140
12	12+00N	7+95E	26.2	120	5	5	30.4	130
SP2	12+00N	8+00E						
13	12+00N	8+05E	27.2	130	4.7	5	30.1	120
14	12+00N	8+15E	27.3	140	9.7	15	27.4	110
15	12+00N	8+25E	29.3	150	12.7	25	27.1	100
16	12+00N	8+35E	29.6	160	15	35	26.4	90
17	12+00N	8+45E	30.5	170	17	45	24.6	80
18	12+00N	8+55E	32.8	180	19	55	24.4	70
19	12+00N	8+65E	33.8	190	22	65	22.7	60
20	12+00N	8+75E	34.4	200	23	75	20	50
21	12+00N	8+85E	34.6	210	23.7	85	17	40
22	12+00N	8+95E	34.9	220	24.9	95	16.5	30
23	12+00N	9+05E	35.5	230	25.9	105	14.5	20
24	12+00N	9+15E	36.5	240	26.6	115	9	10
SP3	12+00N	9+25E						

NOTES: Shot Point 1 Digital Field File: 37.dat Source: Hammer
Shot Point 2 Digital Field File: 38.dat Source: Hammer
Shot Point 3 Digital Field File: 39.dat Source: Hammer

ANS Seismic Refraction Spread 11

Recorded: 9-26-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 18 Surface Elevation: 882 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 4156 ft/sec

V3 14728 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

5	877	(ft)
25	857	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	12+00N	10+75E						
1	12+00N	10+85E	9.7	10	31.5	115	36.8	240
2	12+00N	10+95E	15.6	20	30.5	105	36.3	230
3	12+00N	11+05E	16.6	30	27.2	95	33.3	220
4	12+00N	11+15E	17.9	40	26.2	85	31.8	210
5	12+00N	11+25E	20.9	50	27.2	75	32.8	200
6	12+00N	11+35E	22.1	60	24.6	65	32.3	190
7	12+00N	11+45E	24.3	70	22.6	55	30.6	180
8	12+00N	11+55E	25.4	80	20.4	45	29.3	170
9	12+00N	11+65E	26.4	90	18.4	35	28.6	160
10	12+00N	11+75E	27.4	100	15.2	25	27.6	150
11	12+00N	11+85E	29.4	110	13.5	15	28.6	140
12	12+00N	11+95E	31.4	120	4.7	5	28.3	130
SP2	12+00N	12+00E						
13	12+00N	12+05E	31.2	130	4.7	5	26.7	120
14	12+00N	12+15E	31.9	140	13.8	15	26.4	110
15	12+00N	12+25E	32.3	150	17	25	26	100
16	12+00N	12+35E	31.7	160	18.4	35	23	90
17	12+00N	12+45E	32.2	170	20.4	45	21.7	80
18	12+00N	12+55E	33.2	180	22.4	55	19.7	70
19	12+00N	12+65E	32.7	190	22.7	65	18.9	60
20	12+00N	12+75E	33.2	200	23.7	75	17.9	50
21	12+00N	12+85E	33.7	210	22.7	85	15.7	40
22	12+00N	12+95E	35.5	220	27.7	95	15.6	30
23	12+00N	13+05E	34.7	230	26.3	105	12.5	20
24	12+00N	13+15E	36.7	240	29.3	115	8.7	10
SP3	12+00N	13+25E						

NOTES: Shot Point 1 Digital Field File: 40.dat Source: Hammer

Shot Point 2 Digital Field File: 41.dat Source: Hammer

Shot Point 3 Digital Field File: 42.dat Source: Hammer

ANS Seismic Refraction Spread 12

Recorded: 9-26-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 28=3+75N Surface Elevation: 938 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 3897 ft/sec

V3 13138 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

4	934	(ft)
21	917	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	7+75N	10+75E						
1	7+75N	10+85E	9.2	10	24.9	115	37.3	240
2	7+75N	10+95E	11.4	20	22.9	105	36.7	230
3	7+75N	11+05E	13.9	30	21.7	95	36.8	220
4	7+75N	11+15E	16.6	40	21.1	85	36.3	210
5	7+75N	11+25E	18.9	50	20.4	75	36.8	200
6	7+75N	11+35E	19.9	60	18.8	65	36.2	190
7	7+75N	11+45E	21.4	70	17.3	55	35.2	180
8	7+75N	11+55E	21.8	80	15.5	45	33.7	170
9	7+75N	11+65E	23.5	90	14.5	35	33.1	160
10	7+75N	11+75E	24	100	12.5	25	31.5	150
11	7+75N	11+85E	25.4	110	10.8	15	31	140
12	7+75N	11+95E	25.7	120	4.8	5	30	130
SP2	7+75N	12+00E						
13	7+75N	12+05E	27	130	4.7	5	28	120
14	7+75N	12+15E	26.3	140	9.7	15	26.5	110
15	7+75N	12+25E	27.6	150	13.2	25	25.5	100
16	7+75N	12+35E	27.1	160	13	35	23	90
17	7+75N	12+45E	28.7	170	16.2	45	21.8	80
18	7+75N	12+55E	28.8	180	16.5	55	19.8	70
19	7+75N	12+65E	31.1	190	19.3	65	18.8	60
20	7+75N	12+75E	32.7	200	20	75	17.6	50
21	7+75N	12+85E	34.7	210	23.2	85	16.3	40
22	7+75N	12+95E	35.6	220	24.7	95	14.3	30
23	7+75N	13+05E	36.7	230	25.7	105	12.6	20
24	7+75N	13+15E	38.7	240	26.8	115	9.9	10
SP3	7+75N	13+25E						

NOTES: Shot Point 1 Digital Field File: 43.dat Source: Hammer

Shot Point 2 Digital Field File: 44.dat Source: Hammer

Shot Point 3 Digital Field File: 45.dat Source: Hammer

ANS Seismic Refraction Spread 13

Recorded: 9-27-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 20=3+90E Surface Elevation: 863 (ft)

AVERAGE VELOCITIES:

V1 1300 ft/sec

V2 2941 ft/sec

V3 11343 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

2	861	(ft)
15	848	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	8+00N	2+65E						
1	8+00N	2+75E	6.9	10	22.4	115	33.8	240
2	8+00N	2+85E	11.9	20	21.6	105	32.8	230
3	8+00N	2+95E	15.6	30	20.7	95	32.8	220
4	8+00N	3+05E	17	40	19	85	30.4	210
5	8+00N	3+15E	19	50	19	75	30.4	200
6	8+00N	3+25E	19.1	60	17.5	65	29.1	190
7	8+00N	3+35E	20.1	70	16.4	55	27.9	180
8	8+00N	3+45E	20.9	80	15.4	45	27.2	170
9	8+00N	3+55E	22.9	90	15.1	35	27.1	160
10	8+00N	3+65E	22.6	100	12.5	25	24.8	150
11	8+00N	3+75E	23.3	110	10.8	15	24.5	140
12	8+00N	3+85E	23.6	120	4.7	5	23.4	130
SP2	8+00N	3+90E						
13	8+00N	3+95E	26.1	130	5.5	5	22.4	120
14	8+00N	4+05E	25.4	140	9.6	15	21.2	110
15	8+00N	4+15E	26.4	150	12.3	25	19.7	100
16	8+00N	4+25E	27.4	160	13.3	35	19.1	90
17	8+00N	4+35E	28.4	170	14.3	45	18.4	80
18	8+00N	4+45E	29.4	180	15.5	55	17.4	70
19	8+00N	4+55E	30.4	190	16.5	65	16.7	60
20	8+00N	4+65E	31.4	200	17.9	75	16.2	50
21	8+00N	4+75E	33.4	210	19.1	85	14.8	40
22	8+00N	4+85E	33.4	220	19.8	95	13	30
23	8+00N	4+95E	34	230	20.5	105	10.4	20
24	8+00N	5+05E	34.5	240	21.3	115	7.2	10
SP3	8+00N	5+15E						

NOTES: Shot Point 1 Digital Field File: 46.dat Source: Hammer

Shot Point 2 Digital Field File: 47.dat Source: Hammer

Shot Point 3 Digital Field File: 48.dat Source: Hammer

ANS Seismic Refraction Spread 14

Recorded: 9-27-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 20 Surface Elevation: 841 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	838	(ft)
V2 2740 ft/sec	13	828	(ft)
V3 10410 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	6+75N	0+00						
1	6+85N	0+00	9.8	10	22.6	115	36.5	240
2	6+95N	0+00	13.1	20	21.6	105	34.5	230
3	7+05N	0+00	15.4	30	20.6	95	34.1	220
4	7+15N	0+00	16.4	40	18.6	85	32.4	210
5	7+25N	0+00	17.4	50	17.6	75	31.6	200
6	7+35N	0+00	18.4	60	15.8	65	30.3	190
7	7+45N	0+00	20.1	70	15	55	29.8	180
8	7+55N	0+00	21.1	80	14.7	45	29.1	170
9	7+65N	0+00	23	90	14	35	29.3	160
10	7+75N	0+00	21.9	100	11.8	25	26.3	150
11	7+85N	0+00	24.9	110	10.9	15	26.3	140
12	7+95N	0+00	25	120	4	5	24.8	130
SP2	8+00N	0+00						
13	8+05N	0+00	26	130	5	5	23.8	120
14	8+15N	0+00	26.2	140	9.6	15	22.6	110
15	8+25N	0+00	27.2	150	11.6	25	21.6	100
16	8+35N	0+00	28.2	160	12.7	35	20.6	90
17	8+45N	0+00	29.9	170	15.3	45	20.7	80
18	8+55N	0+00	30.9	180	16.3	55	19.5	70
19	8+65N	0+00	32	190	17.3	65	18.8	60
20	8+75N	0+00	33	200	18.9	75	18.1	50
21	8+85N	0+00	35	210	20.5	85	17.1	40
22	8+95N	0+00	35.8	220	21.5	95	15.1	30
23	9+05N	0+00	36.2	230	21.6	105	12.1	20
24	9+15N	0+00	37.1	240	22.7	115	8.9	10
SP3	9+25N	0+00						

NOTES: Shot Point 1 Digital Field File: 49.dat Source: Hammer
Shot Point 2 Digital Field File: 50.dat Source: Hammer
Shot Point 3 Digital Field File: 51.dat Source: Hammer

ANS Seismic Refraction Spread 15

Recorded: 9-27-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 25 Surface Elevation: 855 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 2237 ft/sec

V3 11257 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	852	(ft)
14	841	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	2+75N	0+00						
1	2+85N	0+00	9.5	10	26.5	115	35.1	240
2	2+95N	0+00	14	20	26	105	34	230
3	3+05N	0+00	18	30	26.1	95	34.5	220
4	3+15N	0+00	19.5	40	25.2	85	33.5	210
5	3+25N	0+00	21.5	50	24.5	75	32.8	200
6	3+35N	0+00	21.4	60	23	65	31.6	190
7	3+45N	0+00	22.4	70	23.3	55	31.9	180
8	3+55N	0+00	24.6	80	22.9	45	31.7	170
9	3+65N	0+00	27.6	90	20.7	35	31.1	160
10	3+75N	0+00	28.4	100	16.5	25	29.9	150
11	3+85N	0+00	28.7	110	11.5	15	28.9	140
12	3+95N	0+00	30.2	120	6.5	5	27.6	130
SP2	4+00N	0+00						
13	4+05N	0+00	29.2	130	4.8	5	25.3	120
14	4+15N	0+00	29.5	140	10.2	15	23.5	110
15	4+25N	0+00	32.6	150	15.2	25	23.5	100
16	4+35N	0+00	31.6	160	16.2	35	21.3	90
17	4+45N	0+00	30.4	170	18.2	45	19.4	80
18	4+55N	0+00	32.5	180	19.7	55	18.7	70
19	4+65N	0+00	31.8	190	19.6	65	18.1	60
20	4+75N	0+00	31.6	200	19.8	75	16.1	50
21	4+85N	0+00	32.6	210	20.8	85	15.2	40
22	4+95N	0+00	33.6	220	21.8	95	13.8	30
23	5+05N	0+00	36.6	230	24.8	105	13.8	20
24	5+15N	0+00	37.3	240	25.8	115	9.5	10
SP3	5+25N	0+00						

NOTES: Shot Point 1 Digital Field File: 52.dat Source: Hammer

Shot Point 2 Digital Field File: 53.dat Source: Hammer

Shot Point 3 Digital Field File: 54.dat Source: Hammer

ANS Seismic Refraction Spread 16

Recorded: 9-27-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 30 Surface Elevation: 842 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	839	(ft)
V2 2338 ft/sec	18	824	(ft)
V3 15393 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	1+25S	0+00						
1	1+15S	0+00	9.2	10	23.7	115	39.3	240
2	1+05S	0+00	13.9	20	22.8	105	38.5	230
3	0+95S	0+00	13.5	30	20.3	95	36.5	220
4	0+85S	0+00	14.8	40	19.7	85	35.5	210
5	0+75S	0+00	16.1	50	18.9	75	34.9	200
6	0+65S	0+00	17.6	60	17.8	65	33.9	190
7	0+55S	0+00	18.4	70	16.8	55	33.2	180
8	0+45S	0+00	19.5	80	15.8	45	32.3	170
9	0+35S	0+00	20.5	90	13.7	35	31	160
10	0+25S	0+00	22.5	100	12.3	25	31	150
11	0+15S	0+00	23.5	110	8.8	15	30.3	140
12	0+05S	0+00	25.5	120	4.1	5	30.4	130
SP2	0+00	0+00						
13	0+05N	0+00	26.5	130	5.3	5	29.7	120
14	0+15N	0+00	27.5	140	8.6	15	29.1	110
15	0+25N	0+00	29.5	150	12.6	25	29.4	100
16	0+35N	0+00	29.5	160	13.6	35	27.2	90
17	0+45N	0+00	32.5	170	18.8	45	28.6	80
18	0+55N	0+00	35.5	180	22.6	55	28.4	70
19	0+65N	0+00	36.5	190	26.6	65	29.6	60
20	0+75N	0+00	37.2	200	25.8	75	26.6	50
21	0+85N	0+00	38.1	210	26.6	85	22.7	40
22	0+95N	0+00	38.4	220	26.8	95	19	30
23	1+05N	0+00	39.1	230	28.7	105	14.9	20
24	1+15N	0+00	39	240	28.2	115	9.3	10
SP3	1+25N	0+00						

NOTES: Shot Point 1 Digital Field File: 55.dat Source: Hammer
Shot Point 2 Digital Field File: 56.dat Source: Hammer
Shot Point 3 Digital Field File: 57.dat Source: Hammer

ANS Seismic Refraction Spread 17

Recorded: 9-27-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 30 Surface Elevation: 842 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 4197 ft/sec

V3 13026 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	839	(ft)
20	822	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	0+00	1+25W						
1	0+00	1+15W	8.2	10	26	115	35.9	240
2	0+00	1+05W	11.5	20	25.2	105	35.1	230
3	0+00	0+95W	13.5	30	24.4	95	34.3	220
4	0+00	0+85W	17.2	40	24.5	85	34.5	210
5	0+00	0+75W	18.2	50	22.1	75	31.5	200
6	0+00	0+65W	20.2	60	21	65	31	190
7	0+00	0+55W	22.2	70	19.5	55	29.7	180
8	0+00	0+45W	25.6	80	18.3	45	31.3	170
9	0+00	0+35W	25.6	90	14.7	35	29.3	160
10	0+00	0+25W	24.8	100	11.2	25	26.1	150
11	0+00	0+15W	25.5	110	7.2	15	24.8	140
12	0+00	0+05W	26.4	120	4.7	5	24.1	130
SP2	0+00	0+00						
13	0+00	0+05E	25.9	130	4.7	5	22.4	120
14	0+00	0+15E	27.6	140	8.7	15	21.4	110
15	0+00	0+25E	29.4	150	11.4	25	21	100
16	0+00	0+35E	28.7	160	13.4	35	20	90
17	0+00	0+45E	28.5	170	14.3	45	17.3	80
18	0+00	0+55E	29.7	180	16.3	55	17	70
19	0+00	0+65E	29.8	190	16.6	65	16	60
20	0+00	0+75E	30.3	200	17.1	75	15.1	50
21	0+00	0+85E	32.2	210	18.5	85	14.4	40
22	0+00	0+95E	32.2	220	19.7	95	12.2	30
23	0+00	1+05E	32.6	230	20.1	105	10.1	20
24	0+00	1+15E	34	240	22.1	115	8.9	10
SP3	0+00	1+25E						

NOTES: Shot Point 1 Digital Field File: 59.dat Source: Hammer

Shot Point 2 Digital Field File: 60.dat Source: Hammer

Shot Point 3 Digital Field File: 61.dat Source: Hammer

ANS Seismic Refraction Spread 18

Recorded: 9-27-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 31 Surface Elevation: 855 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	852	(ft)
V2 2576 ft/sec	13	842	(ft)
V3 13145 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	0+00	2+75E						
1	0+00	2+85E	9.8	10	25.3	115	31.6	240
2	0+00	2+95E	12.3	20	24.1	105	30.9	230
3	0+00	3+05E	12.5	30	22.5	95	28.9	220
4	0+00	3+15E	13.7	40	21.8	85	28.7	210
5	0+00	3+25E	16.7	50	22.3	75	29.4	200
6	0+00	3+35E	17.7	60	21.3	65	29	190
7	0+00	3+45E	18.8	70	20.7	55	28.2	180
8	0+00	3+55E	20.8	80	20.3	45	27.1	170
9	0+00	3+65E	21.6	90	19.3	35	28.1	160
10	0+00	3+75E	21.9	100	15.1	25	26	150
11	0+00	3+85E	24.3	110	11	15	25.8	140
12	0+00	3+95E	25.4	120	4.9	5	25.8	130
SP2	0+00	4+00E						
13	0+00	4+05E	26.1	130	4.9	5	26.1	120
14	0+00	4+15E	25.9	140	12	15	23.7	110
15	0+00	4+25E	26.9	150	15.5	25	24	100
16	0+00	4+35E	27.4	160	17.5	35	22.9	90
17	0+00	4+45E	27.2	170	18.5	45	21.3	80
18	0+00	4+55E	27.1	180	19	55	19.3	70
19	0+00	4+65E	27.3	190	19.9	65	18.4	60
20	0+00	4+75E	26.1	200	19.1	75	16.4	50
21	0+00	4+85E	26.6	210	20.1	85	15.3	40
22	0+00	4+95E	28.8	220	21.6	95	15.4	30
23	0+00	5+05E	28.9	230	22.2	105	13.3	20
24	0+00	5+15E	29.6	240	22.9	115	9	10
SP3	0+00	5+25E						

NOTES: Shot Point 1 Digital Field File: 62.dat Source: Hammer
Shot Point 2 Digital Field File: 63.dat Source: Hammer
Shot Point 3 Digital Field File: 64.dat Source: Hammer

ANS Seismic Refraction Spread 19

Recorded: 9-27-91 Azimuth: S76E Geophone Spacing: 10 (ft)

Center Point: ANS# 32 Surface Elevation: 850 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 2216 ft/sec

V3 10974 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	847	(ft)
11	839	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	0+91S	8+83E						
1	0+84S	8+76E	9.3	10	20.4	115	32.8	240
2	0+76S	8+69E	14.3	20	19.7	105	32.6	230
3	0+69S	8+63E	15.6	30	19.7	95	32	220
4	0+61S	8+56E	16.3	40	18	85	30	210
5	0+54S	8+49E	17.5	50	18.1	75	30.9	200
6	0+47S	8+42E	18.5	60	17.1	65	29.7	190
7	0+39S	8+36E	19.3	70	16.1	55	29	180
8	0+32S	8+29E	20.7	80	15.3	45	27.5	170
9	0+24S	8+23E	22.7	90	15.4	35	28	160
10	0+17S	8+16E	23	100	13.7	25	26.5	150
11	0+10S	8+09E	23	110	12.6	15	24.8	140
12	0+03S	8+03E	24.6	120	4.4	5	24.7	130
SP2	0+01N	8+00E						
13	0+05N	7+96E	25.5	130	5.3	5	23.9	120
14	0+12N	7+90E	26.5	140	12.6	15	22.9	110
15	0+19N	7+83E	26.8	150	14.6	25	22	100
16	0+27N	7+76E	29.6	160	16.4	35	21.1	90
17	0+34N	7+70E	30	170	16.2	45	19.1	80
18	0+42N	7+63E	30	180	16.8	55	17.2	70
19	0+49N	7+57E	30.1	190	16.9	65	16.7	60
20	0+56N	7+50E	32.8	200	18.9	75	16.6	50
21	0+64N	7+43E	32.6	210	19.4	85	14.3	40
22	0+71N	7+37E	33.6	220	20.9	95	13.7	30
23	0+79N	7+30E	34	230	21.9	105	12.3	20
24	0+86N	7+24E	34.6	240	22.9	115	9.8	10
SP3	0+95N	7+18E						

NOTES: Shot Point 1 Digital Field File: 65.dat Source: Hammer

Shot Point 2 Digital Field File: 66.dat Source: Hammer

Shot Point 3 Digital Field File: 67.dat Source: Hammer

ANS Seismic Refraction Spread 20

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 25=2+00E Surface Elevation: 870 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1300 ft/sec	4	866	(ft)
V2 3897 ft/sec	22	848	(ft)
V3 10862 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+00N	0+75E						
1	4+00N	0+85E	9.4	10	27.9	115	38.3	240
2	4+00N	0+95E	11.4	20	26.1	105	36.9	230
3	4+00N	1+05E	13.8	30	24.9	95	35.3	220
4	4+00N	1+15E	16.8	40	24.2	85	34.6	210
5	4+00N	1+25E	19.8	50	23.7	75	35.1	200
6	4+00N	1+35E	21.8	60	22	65	33.5	190
7	4+00N	1+45E	23.8	70	20	55	32.9	180
8	4+00N	1+55E	25.9	80	19.2	45	32.1	170
9	4+00N	1+65E	26	90	15.2	35	30.4	160
10	4+00N	1+75E	26.3	100	12.6	25	29.3	150
11	4+00N	1+85E	26.4	110	9.5	15	28	140
12	4+00N	1+95E	26.7	120	4.9	5	27.3	130
SP2	4+00N	2+00E						
13	4+00N	2+05E	26.9	130	4.7	5	26.5	120
14	4+00N	2+15E	27.2	140	8.7	15	24.4	110
15	4+00N	2+25E	29.8	150	11.9	25	23.7	100
16	4+00N	2+35E	30	160	13.9	35	23	90
17	4+00N	2+45E	31.2	170	15.9	45	21.4	80
18	4+00N	2+55E	32	180	17.6	55	19.6	70
19	4+00N	2+65E	32.7	190	19.2	65	17.9	60
20	4+00N	2+75E	33.4	200	20.2	75	15.7	50
21	4+00N	2+85E	34.4	210	22.2	85	14.1	40
22	4+00N	2+95E	35.7	220	24	95	13.4	30
23	4+00N	3+05E	36.1	230	25	105	10.8	20
24	4+00N	3+15E	36.6	240	25.3	115	7.3	10
SP3	4+00N	3+25E						

NOTES: Shot Point 1 Digital Field File: 68.dat Source: Hammer
Shot Point 2 Digital Field File: 69.dat Source: Hammer
Shot Point 3 Digital Field File: 70.dat Source: Hammer

ANS Seismic Refraction Spread 21

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 26 Surface Elevation: 878 (ft)

AVERAGE VELOCITIES:

V1 1300 ft/sec

V2 4076 ft/sec

V3 10696 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	875	(ft)
26	852	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+00N	2+75E						
1	4+00N	2+85E	7.3	10	26.3	115	38	240
2	4+00N	2+95E	9.3	20	25.8	105	38.2	230
3	4+00N	3+05E	11.9	30	24.8	95	37.5	220
4	4+00N	3+15E	13.7	40	22.1	85	35.8	210
5	4+00N	3+25E	16.3	50	21.4	75	37.1	200
6	4+00N	3+35E	17.7	60	19.4	65	34.8	190
7	4+00N	3+45E	19.8	70	16.9	55	33.6	180
8	4+00N	3+55E	21.8	80	15.7	45	32.9	170
9	4+00N	3+65E	23.9	90	14.3	35	33.1	160
10	4+00N	3+75E	24.3	100	12.3	25	31.1	150
11	4+00N	3+85E	24.5	110	8.3	15	29.3	140
12	4+00N	3+95E	25.7	120	4.5	5	28.6	130
SP2	4+00N	4+00E						
13	4+00N	4+05E	26.7	130	3.9	5	27.6	120
14	4+00N	4+15E	27.7	140	8	15	26.6	110
15	4+00N	4+25E	28.7	150	10.2	25	24.8	100
16	4+00N	4+35E	29.5	160	12.2	35	22.8	90
17	4+00N	4+45E	30.7	170	15.2	45	22	80
18	4+00N	4+55E	32.3	180	18.2	55	21.2	70
19	4+00N	4+65E	33.3	190	20.2	65	19.6	60
20	4+00N	4+75E	33.5	200	21.5	75	17.6	50
21	4+00N	4+85E	32.7	210	21.5	85	14.9	40
22	4+00N	4+95E	34.3	220	23.6	95	12.2	30
23	4+00N	5+05E	35.3	230	25.1	105	10.8	20
24	4+00N	5+15E	36.3	240	26.3	115	7.6	10
SP3	4+00N	5+25E						

NOTES: Shot Point 1 Digital Field File: 71.dat Source: Hammer

Shot Point 2 Digital Field File: 72.dat Source: Hammer

Shot Point 3 Digital Field File: 73.dat Source: Hammer

ANS Seismic Refraction Spread 22

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 26=2+00E Surface Elevation: 884 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1300 ft/sec	5	879	(ft)
V2 5512 ft/sec	42	842	(ft)
V3 14407 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+00N	4+75E						
1	4+00N	4+85E	8.2	10	27.1	115	36.1	240
2	4+00N	4+95E	13.2	20	26.6	105	36.3	230
3	4+00N	5+05E	15.2	30	26.4	95	36.6	220
4	4+00N	5+15E	16.8	40	23.8	85	35.1	210
5	4+00N	5+25E	17.8	50	22.4	75	34.5	200
6	4+00N	5+35E	19.8	60	20.5	65	34.6	190
7	4+00N	5+45E	21	70	18.3	55	33.6	180
8	4+00N	5+55E	23	80	16.3	45	32.6	170
9	4+00N	5+65E	24.5	90	14.7	35	32.1	160
10	4+00N	5+75E	26.2	100	12.7	25	31.9	150
11	4+00N	5+85E	28.2	110	13.9	15	33	140
12	4+00N	5+95E	28.9	120	3.3	5	31.8	130
SP2	4+00N	6+00E						
13	4+00N	6+05E	29.6	130	4.4	5	29.6	120
14	4+00N	6+15E	29.7	140	10.9	15	27.5	110
15	4+00N	6+25E	30.6	150	13.8	25	26.3	100
16	4+00N	6+35E	30.6	160	15.9	35	24.3	90
17	4+00N	6+45E	32.6	170	19	45	23.9	80
18	4+00N	6+55E	33.6	180	21.2	55	20.9	70
19	4+00N	6+65E	33.9	190	23.2	65	18.9	60
20	4+00N	6+75E	35.4	200	24.6	75	17.9	50
21	4+00N	6+85E	35.8	210	26.2	85	15.5	40
22	4+00N	6+95E	36.2	220	28.2	95	13.8	30
23	4+00N	7+05E	37	230	28.4	105	10.8	20
24	4+00N	7+15E	38.4	240	30.1	115	9.2	10
SP3	4+00N	7+25E						

NOTES: Shot Point 1 Digital Field File: 74.dat Source: Hammer
Shot Point 2 Digital Field File: 75.dat Source: Hammer
Shot Point 3 Digital Field File: 76.dat Source: Hammer

ANS Seismic Refraction Spread 23

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 27 Surface Elevation: 875 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1300 ft/sec	4	871	(ft)
V2 3278 ft/sec	24	851	(ft)
V3 12121 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+00N	6+75E						
1	4+00N	6+85E	9	10	27.4	115	35.8	240
2	4+00N	6+95E	12.3	20	26.1	105	35.9	230
3	4+00N	7+05E	13.3	30	23.8	95	33.9	220
4	4+00N	7+15E	16	40	23.1	85	33.8	210
5	4+00N	7+25E	18.3	50	22.7	75	33.8	200
6	4+00N	7+35E	18.9	60	19.4	65	32.1	190
7	4+00N	7+45E	20.9	70	17.9	55	31.7	180
8	4+00N	7+55E	22.2	80	16.2	45	31.9	170
9	4+00N	7+65E	23.7	90	12.4	35	31.8	160
10	4+00N	7+75E	24.7	100	9.6	25	30	150
11	4+00N	7+85E	27.7	110	7.6	15	29.4	140
12	4+00N	7+95E	29.4	120	4	5	27.7	130
SP2	4+00N	8+00E						
13	4+00N	8+05E	30.4	130	4.3	5	26	120
14	4+00N	8+15E	31.1	140	8.7	15	25.5	110
15	4+00N	8+25E	33.9	150	11.9	25	26.9	100
16	4+00N	8+35E	32.2	160	12.2	35	23.8	90
17	4+00N	8+45E	34.2	170	15	45	23.7	80
18	4+00N	8+55E	34.4	180	16.4	55	22.3	70
19	4+00N	8+65E	34.5	190	18.6	65	21.6	60
20	4+00N	8+75E	33.2	200	19.6	75	18.4	50
21	4+00N	8+85E	35.2	210	22.6	85	17.7	40
22	4+00N	8+95E	35.8	220	23.6	95	16.9	30
23	4+00N	9+05E	37.9	230	25.6	105	12.1	20
24	4+00N	9+15E	36.6	240	25.8	115	8.1	10
SP3	4+00N	9+25E						

NOTES: Shot Point 1 Digital Field File: 77.dat Source: Hammer
Shot Point 2 Digital Field File: 78.dat Source: Hammer
Shot Point 3 Digital Field File: 79.dat Source: Hammer

ANS Seismic Refraction Spread 24

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 27=2+00E Surface Elevation: 874 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 2802 ft/sec

V3 13295 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	871	(ft)
20	854	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+00N	8+75E						
1	4+00N	8+85E	9.3	10	25.8	115	34.6	240
2	4+00N	8+95E	15	20	26.1	105	35.3	230
3	4+00N	9+05E	18.2	30	24.6	95	32.8	220
4	4+00N	9+15E	19.2	40	23.4	85	32.9	210
5	4+00N	9+25E	18.1	50	20.2	75	30.3	200
6	4+00N	9+35E	20.9	60	19.3	65	31.3	190
7	4+00N	9+45E	21.7	70	17.3	55	30.1	180
8	4+00N	9+55E	24.4	80	17.1	45	31.6	170
9	4+00N	9+65E	24.6	90	13.9	35	30.5	160
10	4+00N	9+75E	25.6	100	11.9	25	29.5	150
11	4+00N	9+85E	27.2	110	8.1	15	28.1	140
12	4+00N	9+95E	27.2	120	4.1	5	27.7	130
SP2	4+00N	10+00E						
13	4+00N	10+05E	28.1	130	5.3	5	26.6	120
14	4+00N	10+15E	29.1	140	7.8	15	25.4	110
15	4+00N	10+25E	31.1	150	11.4	25	26	100
16	4+00N	10+35E	31	160	12.8	35	24.5	90
17	4+00N	10+45E	32	170	15	45	24.1	80
18	4+00N	10+55E	32	180	16.4	55	22.5	70
19	4+00N	10+65E	32.4	190	17.7	65	21	60
20	4+00N	10+75E	32.5	200	19.1	75	19.8	50
21	4+00N	10+85E	33.9	210	20.2	85	18.1	40
22	4+00N	10+95E	33.5	220	21.2	95	14.7	30
23	4+00N	11+05E	34.5	230	23.5	105	12.7	20
24	4+00N	11+15E	35.1	240	25.7	115	8.8	10
SP3	4+00N	11+25E						

NOTES: Shot Point 1 Digital Field File: 80.dat Source: Hammer

Shot Point 2 Digital Field File: 81.dat Source: Hammer

Shot Point 3 Digital Field File: 82.dat Source: Hammer

ANS Seismic Refraction Spread 25

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 28 Surface Elevation: 857 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1300 ft/sec	3	854	(ft)
V2 3228 ft/sec	18	839	(ft)
V3 11495 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+00N	10+75E						
1	4+00N	10+85E	7.3	10	24.3	115	36	240
2	4+00N	10+95E	10.6	20	22.5	105	33.6	230
3	4+00N	11+05E	13.9	30	21.7	95	33	220
4	4+00N	11+15E	17.9	40	21.1	85	32.7	210
5	4+00N	11+25E	20.3	50	20.3	75	32.2	200
6	4+00N	11+35E	20.9	60	18	65	29	190
7	4+00N	11+45E	21.4	70	16.6	55	28.3	180
8	4+00N	11+55E	22.8	80	16.1	45	27.8	170
9	4+00N	11+65E	22.5	90	14.4	35	26.3	160
10	4+00N	11+75E	22.8	100	12.4	25	24.7	150
11	4+00N	11+85E	24.8	110	11.9	15	25	140
12	4+00N	11+95E	25.8	120	4.7	5	23.6	130
SP2	4+00N	12+00E						
13	4+00N	12+05E	26.5	130	4.5	5	23.3	120
14	4+00N	12+15E	26.3	140	11.5	15	20.9	110
15	4+00N	12+25E	27.1	150	13	25	20.2	100
16	4+00N	12+35E	28.3	160	14	35	20	90
17	4+00N	12+45E	29	170	15.1	45	19	80
18	4+00N	12+55E	30	180	16.1	55	18	70
19	4+00N	12+65E	31.2	190	17.5	65	18	60
20	4+00N	12+75E	30.4	200	17	75	15.3	50
21	4+00N	12+85E	31.7	210	18.3	85	15	40
22	4+00N	12+95E	32.3	220	19.1	95	14.4	30
23	4+00N	13+05E	33.3	230	19.5	105	12	20
24	4+00N	13+15E	34.3	240	20.5	115	9.7	10
SP3	4+00N	13+25E						

NOTES: Shot Point 1 Digital Field File: 83.dat Source: Hammer
Shot Point 2 Digital Field File: 84.dat Source: Hammer
Shot Point 3 Digital Field File: 85.dat Source: Hammer

ANS Seismic Refraction Spread 26

Recorded: 9-30-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 33 Surface Elevation: 914 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	911	(ft)
V2 3128 ft/sec	30	884	(ft)
V3 10890 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	1+25S	12+00E						
1	1+15S	12+00E	8.8	10	36.3	115	46	240
2	1+05S	12+00E	11.8	20	34	105	44	230
3	0+95S	12+00E	14.8	30	33.2	95	43.7	220
4	0+85S	12+00E	19.5	40	33.1	85	44.8	210
5	0+75S	12+00E	22	50	31.4	75	43.8	200
6	0+65S	12+00E	24.7	60	28.9	65	42.1	190
7	0+55S	12+00E	26.9	70	26.9	55	41.1	180
8	0+45S	12+00E	27.7	80	24.1	45	39.1	170
9	0+35S	12+00E	27.7	90	22.1	35	38.6	160
10	0+25S	12+00E	31	100	19	25	37.8	150
11	0+15S	12+00E	31.6	110	13.6	15	36.5	140
12	0+05S	12+00E	33.5	120	4.9	5	37	130
SP2	0+00N	12+00E						
13	0+05N	12+00E	35.5	130	4.7	5	36	120
14	0+15N	12+00E	35.8	140	13	15	35.4	110
15	0+25N	12+00E	35.5	150	16.5	25	33.4	100
16	0+35N	12+00E	37.5	160	19.7	35	32.4	90
17	0+45N	12+00E	38.5	170	23.7	45	29.9	80
18	0+55N	12+00E	38.5	180	24.9	55	27	70
19	0+65N	12+00E	39.6	190	26.3	65	24.8	60
20	0+75N	12+00E	39.6	200	28.1	75	23.8	50
21	0+85N	12+00E	40.6	210	30.1	85	19.5	40
22	0+95N	12+00E	42.6	220	32.4	95	17	30
23	1+05N	12+00E	43.4	230	34	105	12.7	20
24	1+15N	12+00E	44.1	240	35.5	115	9	10
SP3	1+25N	12+00E						

NOTES: Shot Point 1 Digital Field File: 86.dat Source: Hammer
Shot Point 2 Digital Field File: 88.dat Source: Hammer
Shot Point 3 Digital Field File: 89.dat Source: Hammer

ANS Seismic Refraction Spread 27

Recorded: 9-30-91 Azimuth: N48E Geophone Spacing: 10 (ft)

Center Point: ANS# 28=2+00N Surface Elevation: 892 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	889	(ft)
V2 4200 ft/sec	35	857	(ft)
V3 12786 ft/sec			

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)
SP1	5+81N 10+78E					
1	5+83N 10+88E	8.9	10	27.7	115	40.6
2	5+84N 10+97E	11.5	20	26.1	105	38.6
3	5+85N 11+07E	13.5	30	25.1	95	38.5
4	5+87N 11+17E	15	40	23	85	37.3
5	5+88N 11+26E	17	50	22.4	75	37.2
6	5+90N 11+36E	18.6	60	20	65	36.2
7	5+91N 11+46E	20.7	70	18.7	55	36
8	5+93N 11+56E	23.2	80	17.3	45	35.3
9	5+94N 11+65E	25.2	90	15.1	35	34.1
10	5+95N 11+75E	26.6	100	13.1	25	33.5
11	5+97N 11+85E	28.1	110	11.3	15	32
12	5+99N 11+95E	28.8	120	4.3	5	31.3
SP2	6+00N 12+00E					
13	6+00N 12+04E	29.8	130	4.6	5	30.1
14	6+01N 12+14E	31.6	140	12.9	15	29.6
15	6+03N 12+24E	33.6	150	16.9	25	27.9
16	6+04N 12+34E	34	160	17.9	35	26.7
17	6+05N 12+44E	35.2	170	20.6	45	25.9
18	6+07N 12+53E	35.9	180	22.1	55	23.6
19	6+08N 12+63E	36.1	190	22.6	65	21.3
20	6+10N 12+73E	37.1	200	23.8	75	18.4
21	6+11N 12+82E	37.6	210	24.5	85	15.9
22	6+13N 12+92E	38.8	220	25.8	95	14.2
23	6+14N 13+02E	39.5	230	27.2	105	10.8
24	6+16N 13+12E	40.2	240	28.2	115	9.8
SP3	6+17N 13+21E					

NOTES: Shot Point 1 Digital Field File: 90.dat Source: Hammer
Shot Point 2 Digital Field File: 91.dat Source: Hammer
Shot Point 3 Digital Field File: 92.dat Source: Hammer

ANS Seismic Refraction Spread 28

Recorded: 9-30-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 22=2+00E Surface Elevation: 923 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	920	(ft)
V2 4297 ft/sec	29	894	(ft)
V3 11797 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	8+00N	8+75E						
1	8+00N	8+85E	8.8	10	27.3	115	37.7	240
2	8+00N	8+95E	11.3	20	24.3	105	35.2	230
3	8+00N	9+05E	13.9	30	23.5	95	33.8	220
4	8+00N	9+15E	15.9	40	22.1	85	33	210
5	8+00N	9+25E	17.9	50	21.1	75	33.5	200
6	8+00N	9+35E	20.7	60	20.1	65	34.3	190
7	8+00N	9+45E	22.2	70	19.3	55	33.4	180
8	8+00N	9+55E	23.2	80	16.9	45	32.1	170
9	8+00N	9+65E	24.6	90	14.8	35	31.5	160
10	8+00N	9+75E	26.4	100	13	25	30.3	150
11	8+00N	9+85E	26.9	110	9.2	15	27.7	140
12	8+00N	9+95E	28.9	120	4.4	5	26.9	130
SP2	8+00N	10+00E						
13	8+00N	10+05E	30.3	130	5	5	25.3	120
14	8+00N	10+15E	30.4	140	9.7	15	22.6	110
15	8+00N	10+25E	31.4	150	12.1	25	21.6	100
16	8+00N	10+35E	33.4	160	15.1	35	21.8	90
17	8+00N	10+45E	33.5	170	17.7	45	19.9	80
18	8+00N	10+55E	34.6	180	18.7	55	18.4	70
19	8+00N	10+65E	35.6	190	20.7	65	17.8	60
20	8+00N	10+75E	36.1	200	21.8	75	16.1	50
21	8+00N	10+85E	36.4	210	22.4	85	13.4	40
22	8+00N	10+95E	37.4	220	23.6	95	12	30
23	8+00N	11+05E	38.6	230	25	105	9.8	20
24	8+00N	11+15E	38.9	240	26	115	8.8	10
SP3	8+00N	11+25E						

NOTES: Shot Point 1 Digital Field File: 93.dat Source: Hammer
Shot Point 2 Digital Field File: 94.dat Source: Hammer
Shot Point 3 Digital Field File: 95.dat Source: Hammer

ANS Seismic Refraction Spread 29

Recorded: 10-1-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 16=2+00E Surface Elevation: 873 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 2748 ft/sec

V3 11701 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	870	(ft)
15	858	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	12+00N	4+75E						
1	12+00N	4+85E	7.8	10	24.5	115	34.8	240
2	12+00N	4+95E	11.2	20	23.9	105	35	230
3	12+00N	5+05E	13.3	30	22.6	95	32.8	220
4	12+00N	5+15E	15.6	40	22.3	85	32.8	210
5	12+00N	5+25E	17	50	21.1	75	32.1	200
6	12+00N	5+35E	18.1	60	19.8	65	31.1	190
7	12+00N	5+45E	19.6	70	18.3	55	30.4	180
8	12+00N	5+55E	20.4	80	17.4	45	29.3	170
9	12+00N	5+65E	21.5	90	16.3	35	28.5	160
10	12+00N	5+75E	22.4	100	14.6	25	28.3	150
11	12+00N	5+85E	23.4	110	12.1	15	27.5	140
12	12+00N	5+95E	24.8	120	4.5	5	27	130
SP2	12+00N	6+00E						
13	12+00N	6+05E	25.2	130	4.3	5	26.9	120
14	12+00N	6+15E	27.3	140	11.3	15	25.9	110
15	12+00N	6+25E	27.7	150	14.3	25	25.3	100
16	12+00N	6+35E	28.7	160	16.8	35	23.8	90
17	12+00N	6+45E	28.9	170	18.5	45	22.6	80
18	12+00N	6+55E	30.1	180	21.2	55	21.3	70
19	12+00N	6+65E	31.3	190	23.2	65	19.7	60
20	12+00N	6+75E	31.4	200	22.9	75	18	50
21	12+00N	6+85E	32.9	210	24.3	85	17.3	40
22	12+00N	6+95E	33.7	220	25.1	95	15.5	30
23	12+00N	7+05E	33.4	230	25.1	105	13.2	20
24	12+00N	7+15E	34.7	240	25.9	115	9.7	10
SP3	12+00N	7+25E						

NOTES: Shot Point 1 Digital Field File: 96.dat Source: Hammer

Shot Point 2 Digital Field File: 97.dat Source: Hammer

Shot Point 3 Digital Field File: 98.dat Source: Hammer

ANS Seismic Refraction Spread 30

Recorded: 10-1-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 15=2+00E Surface Elevation: 863 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 3371 ft/sec

V3 11114 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

3	860	(ft)
15	848	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	12+00N	0+75E						
1	12+00N	0+85E	8.5	10	23	115	34.5	240
2	12+00N	0+95E	10.6	20	21.6	105	33.2	230
3	12+00N	1+05E	12.6	30	21.2	95	32.4	220
4	12+00N	1+15E	14.6	40	19.6	85	31.5	210
5	12+00N	1+25E	15.5	50	18.8	75	30.9	200
6	12+00N	1+35E	16.7	60	18.3	65	31.3	190
7	12+00N	1+45E	19.7	70	17.1	55	30.6	180
8	12+00N	1+55E	18.8	80	15.1	45	29.1	170
9	12+00N	1+65E	19.4	90	12.9	35	28	160
10	12+00N	1+75E	20.4	100	11	25	27	150
11	12+00N	1+85E	21.4	110	8.8	15	26.6	140
12	12+00N	1+95E	22.4	120	4.5	5	26.9	130
SP2	12+00N	2+00E						
13	12+00N	2+05E	23.4	130	4.3	5	26.6	120
14	12+00N	2+15E	24.4	140	10.7	15	25.4	110
15	12+00N	2+25E	25.4	150	12	25	23.4	100
16	12+00N	2+35E	26.5	160	14	35	22.4	90
17	12+00N	2+45E	27.2	170	15.5	45	21.6	80
18	12+00N	2+55E	28.2	180	16.9	55	20.7	70
19	12+00N	2+65E	30	190	18.9	65	19.6	60
20	12+00N	2+75E	30.4	200	20	75	17.7	50
21	12+00N	2+85E	31.6	210	22.3	85	16.8	40
22	12+00N	2+95E	32.5	220	22.5	95	14.8	30
23	12+00N	3+05E	32.4	230	23.5	105	12	20
24	12+00N	3+15E	33.6	240	24.5	115	9.6	10
SP3	12+00N	3+25E						

NOTES: Shot Point 1 Digital Field File: 99.dat Source: Hammer

Shot Point 2 Digital Field File: 100.dat Source: Hammer

Shot Point 3 Digital Field File: 101.dat Source: Hammer

ANS Seismic Refraction Spread 31

Recorded: 10-1-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 20=2+00N Surface Elevation: 870 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	867	(ft)
V2 2253 ft/sec	12	858	(ft)
V3 11265 ft/sec			

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	8+75N 0+00						
1	8+85N 0+00	8.9	10	29.2	115	36.3	240
2	8+95N 0+00	13.9	20	28.4	105	36.2	230
3	9+05N 0+00	15.1	30	26.7	95	34.3	220
4	9+15N 0+00	16.4	40	25.7	85	33.9	210
5	9+25N 0+00	17.7	50	24.4	75	32.9	200
6	9+35N 0+00	19.7	60	23.9	65	32.7	190
7	9+45N 0+00	21.1	70	22.9	55	32.3	180
8	9+55N 0+00	24.1	80	21.3	45	32.1	170
9	9+65N 0+00	25.6	90	17.9	35	31.2	160
10	9+75N 0+00	26.5	100	13.9	25	29.6	150
11	9+85N 0+00	28.5	110	11.9	15	29.6	140
12	9+95N 0+00	30.5	120	4.8	5	29.6	130
SP2	10+00N 0+00						
13	10+05N 0+00	31.2	130	4.8	5	29.4	120
14	10+15N 0+00	32.6	140	13	15	29.1	110
15	10+25N 0+00	32.3	150	16.2	25	26.6	100
16	10+35N 0+00	32.8	160	18.4	35	25.1	90
17	10+45N 0+00	32.3	170	19	45	23.6	80
18	10+55N 0+00	33.5	180	21.9	55	22.6	70
19	10+65N 0+00	34.5	190	23.9	65	21.4	60
20	10+75N 0+00	35.2	200	24.9	75	19.7	50
21	10+85N 0+00	35.3	210	25.4	85	17.7	40
22	10+95N 0+00	36.2	220	26.6	95	16.3	30
23	11+05N 0+00	36.5	230	26.9	105	14	20
24	11+15N 0+00	36.5	240	27.4	115	8.9	10
SP3	11+25N 0+00						

NOTES: Shot Point 1 Digital Field File: 102.dat Source: Hammer
Shot Point 2 Digital Field File: 103.dat Source: Hammer
Shot Point 3 Digital Field File: 104.dat Source: Hammer

ANS Seismic Refraction Spread 32

Recorded: 10-1-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 25=2+00N Surface Elevation: 842 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1250 ft/sec	3	839	(ft)
V2 2582 ft/sec	9	833	(ft)
V3 9666 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	4+75N	0+00						
1	4+85N	0+00	7	10	21.7	115	34.5	240
2	4+95N	0+00	10.6	20	21	105	34.3	230
3	5+05N	0+00	12.9	30	19.9	95	33.2	220
4	5+15N	0+00	14.4	40	19.1	85	32.2	210
5	5+25N	0+00	14.9	50	17.8	75	31.2	200
6	5+35N	0+00	16.4	60	16.6	65	30.2	190
7	5+45N	0+00	16.2	70	14.4	55	28.2	180
8	5+55N	0+00	18.2	80	14.6	45	27.9	170
9	5+65N	0+00	18	90	12.8	35	26.9	160
10	5+75N	0+00	20	100	13.6	25	27.9	150
11	5+85N	0+00	20.3	110	9.8	15	25.2	140
12	5+95N	0+00	22.1	120	5.4	5	24.2	130
SP2	6+00N	0+00						
13	6+05N	0+00	23	130	4	5	23.6	120
14	6+15N	0+00	26	140	13	15	23.9	110
15	6+25N	0+00	26.8	150	14.7	25	23.2	100
16	6+35N	0+00	26.4	160	14.6	35	20	90
17	6+45N	0+00	27.4	170	15.9	45	19	80
18	6+55N	0+00	28.7	180	17.3	55	17.7	70
19	6+65N	0+00	29.7	190	18.4	65	17.1	60
20	6+75N	0+00	30.9	200	19.5	75	15.2	50
21	6+85N	0+00	31.4	210	19.8	85	15.2	40
22	6+95N	0+00	31.2	220	20.1	95	12.8	30
23	7+05N	0+00	33.2	230	22.2	105	12.5	20
24	7+15N	0+00	34.9	240	24	115	9	10
SP3	7+25N	0+00						

NOTES: Shot Point 1 Digital Field File: 105.dat Source: Hammer
Shot Point 2 Digital Field File: 106.dat Source: Hammer
Shot Point 3 Digital Field File: 107.dat Source: Hammer

ANS Seismic Refraction Spread 33

Recorded: 10-1-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 21=1+15E Surface Elevation: 872 (ft)

AVERAGE VELOCITIES: AVERAGE INTERFACE DEPTH & ELEVATION:

V1 1200 ft/sec 2 870 (ft)

V2 4390 ft/sec 17 855 (ft)

V3 11654 ft/sec

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	8+00N 3+00E										
SP2	8+00N 3+90E										
1	8+00N 4+00E	19.7	100	8.1	10	21.8	115	30.2	240	39.2	330
2	8+00N 4+10E	19.9	110	11.3	20	19.9	105	29.1	230	37.7	320
3	8+00N 4+20E	20.8	120	12.7	30	18.7	95	27.9	220	36.2	310
4	8+00N 4+30E	22.6	130	14	40	18.6	85	27.7	210	36.2	300
5	8+00N 4+40E	22.9	140	14.6	50	17.5	75	26.7	200	35.4	290
6	8+00N 4+50E	24	150	16.4	60	17	65	26.3	190	35.2	280
7	8+00N 4+60E	25	160	17.1	70	16.2	55	25.8	180	34.4	270
8	8+00N 4+70E	26.4	170	18.5	80	15.5	45	25.3	170	34.6	260
9	8+00N 4+80E	27.4	180	19.5	90	14.1	35	24.8	160	33.7	250
10	8+00N 4+90E	27.8	190	19.8	100	10.9	25	23.4	150	32.5	240
11	8+00N 5+00E	28.5	200	20.8	110	8.6	15	22.4	140	31.2	230
12	8+00N 5+10E	29.2	210	21.5	120	3.9	5	21.8	130	30.3	220
SP3	8+00N 5+15E										
13	8+00N 5+20E	31.2	220	23.1	130	5.7	5	22	120	30.5	210
14	8+00N 5+30E	30.7	230	22.7	140	9.5	15	19.5	110	28.2	200
15	8+00N 5+40E	32.6	240	24.5	150	12.4	25	19.4	100	28.1	190
16	8+00N 5+50E	33.5	250	25.2	160	13.7	35	18.4	90	27.4	180
17	8+00N 5+60E	33.1	260	25.5	170	14.7	45	17.1	80	26.2	170
18	8+00N 5+70E	34.1	270	26	180	16.2	55	16.3	70	25.2	160
19	8+00N 5+80E	35.1	280	27	190	17.1	65	14.7	60	24.4	150
20	8+00N 5+90E	36	290	27.7	200	18.1	75	13.1	50	23.6	140
21	8+00N 6+00E	37	300	29.4	210	19.4	85	11.4	40	22.6	130
22	8+00N 6+10E	38	310	30.2	220	20.1	95	9.4	30	21.6	120
23	8+00N 6+20E	38.1	320	30.7	230	20.3	105	6.3	20	19.6	110
24	8+00N 6+30E	38.1	330	31.3	240	21	115	3.7	10	18.5	100
SP4	8+00N 6+40E										
SP5	8+00N 7+30E										

NOTES: Shot Point 1 Digital Field File: 110.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 108.dat Source: Hammer

Shot Point 3 Digital Field File: 112.dat Source: Hammer

Shot Point 4 Digital Field File: 114.dat Source: Hammer

Shot Point 5 Digital Field File: 116.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 34

Recorded: 10-2-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 21=3+15E Surface Elevation: 891 (ft)

AVERAGE VELOCITIES: AVERAGE INTERFACE DEPTH & ELEVATION:

V1 1200 ft/sec 1 890 (ft)

V2 4490 ft/sec 27 864 (ft)

V3 12378 ft/sec

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	8+00N 5+00E										
SP2	8+00N 5+90E										
1	8+00N 6+00E	18.5	100	4.8	10	23.2	115	35.5	240	44.7	330
2	8+00N 6+10E	19.6	110	8.1	20	21.7	105	34.2	230	43.9	320
3	8+00N 6+20E	19.6	120	9.8	30	19.3	95	32.2	220	41.7	310
4	8+00N 6+30E	20.5	130	11.6	40	18	85	31.4	210	41	300
5	8+00N 6+40E	21.3	140	13.1	50	17.3	75	30.6	200	40	290
6	8+00N 6+50E	22.6	150	15.2	60	16.5	65	30	190	39.8	280
7	8+00N 6+60E	24	160	17.1	70	15	55	29.6	180	38.9	270
8	8+00N 6+70E	25	170	18.2	80	14	45	28.8	170	37.9	260
9	8+00N 6+80E	26.5	180	19.2	90	12.9	35	28	160	38.2	250
10	8+00N 6+90E	27.4	190	21.3	100	11.2	25	27.8	150	37.8	240
11	8+00N 7+00E	27.1	200	20.8	110	7.8	15	25.9	140	35.8	230
12	8+00N 7+10E	29.5	210	22.8	120	3.8	5	25.9	130	35.9	220
SP3	8+00N 7+15E										
13	8+00N 7+20E	30.8	220	23.8	130	5.1	5	25.9	120	35.8	210
14	8+00N 7+30E	32.1	230	24.6	140	10.1	15	25	110	35.4	200
15	8+00N 7+40E	32.8	240	25.8	150	11.3	25	23.1	100	33.9	190
16	8+00N 7+50E	33.6	250	27	160	13.2	35	21.8	90	32.9	180
17	8+00N 7+60E	33.8	260	27.9	170	14.8	45	20.2	80	32.1	170
18	8+00N 7+70E	34.9	270	29.4	180	17.1	55	19.1	70	31.1	160
19	8+00N 7+80E	36.1	280	30.4	190	18.7	65	16.1	60	30	150
20	8+00N 7+90E	37.5	290	31.4	200	20.1	75	14.8	50	28.8	140
21	8+00N 8+00E	37.5	300	31.4	210	20.5	85	11.8	40	26.2	130
22	8+00N 8+10E	38.7	310	32.4	220	22.5	95	9.9	30	24.4	120
23	8+00N 8+20E	39.3	320	32.4	230	22.7	105	8.2	20	23.4	110
24	8+00N 8+30E	40.3	330	33.6	240	23.9	115	6.3	10	23.1	100
SP4	8+00N 8+40E										
SP5	8+00N 9+30E										

NOTES: Shot Point 1 Digital Field File: 118.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 119.dat Source: Hammer

Shot Point 3 Digital Field File: 120.dat Source: Hammer

Shot Point 4 Digital Field File: 121.dat Source: Hammer

Shot Point 5 Digital Field File: 122.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 35

Recorded: 10-2-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 26=3+15N Surface Elevation: 864 (ft)

AVERAGE VELOCITIES: AVERAGE INTERFACE DEPTH & ELEVATION:

V1 1200 ft/sec 3 861 (ft)

V2 2763 ft/sec 12 852 (ft)

V3 9614 ft/sec

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	5+00N 4+00E										
SP2	5+90N 4+00E										
1	6+00N 4+00E	20.5	100	9.1	10	23.4	115	37.1	240	42.6	340
2	6+10N 4+00E	21.1	110	12.1	20	21.5	105	35.1	230	41	330
3	6+20N 4+00E	23.4	120	14.6	30	21.9	95	36.1	220	41.5	320
4	6+30N 4+00E	24.8	130	16.4	40	20.5	85	34.1	210	40.3	310
5	6+40N 4+00E	25.4	140	16.9	50	18.2	75	32.2	200	38.2	300
6	6+50N 4+00E	26.1	150	17.7	60	17.5	65	31.4	190	37.2	290
7	6+60N 4+00E	26.9	160	18.7	70	16	55	30.4	180	36.6	280
8	6+70N 4+00E	27.1	170	18.8	80	15	45	29.1	170	35.6	270
9	6+80N 4+00E	28.1	180	19.9	90	14	35	28.3	160	34.6	260
10	6+90N 4+00E	29.7	190	21.3	100	12.8	25	27.4	150	33.8	250
11	7+00N 4+00E	30.9	200	23.1	110	10.5	15	26.6	140	33	240
12	7+10N 4+00E	32.5	210	24.4	120	4.9	5	26.9	130	32.9	230
SP3	7+15N 4+00E										
13	7+20N 4+00E	33.7	220	25.4	130	4.8	5	25.7	120	31.3	220
14	7+30N 4+00E	34.9	230	27.3	140	12.2	15	24.6	110	31.3	210
15	7+40N 4+00E	35.9	240	28.3	150	13.8	25	23.2	100	30.3	200
16	7+50N 4+00E	36.2	250	28.6	160	14.8	35	21.8	90	28.6	190
17	7+60N 4+00E	37.9	260	30.3	170	16.2	45	20.8	80	26.8	180
18	7+70N 4+00E	39.6	270	31.1	180	17.1	55	19.4	70	26.7	170
19	7+80N 4+00E	41.9	280	33.5	190	19.7	65	18.8	60	26.1	160
20	7+90N 4+00E	40.6	290	32.3	200	18.8	75	16.8	50	23.2	150
21	8+00N 4+00E	41.8	300	33.8	210	20.8	85	16.5	40	23	140
22	8+10N 4+00E	42.8	310	34.9	220	22	95	14.8	30	22.7	130
23	8+20N 4+00E	43.8	320	35.9	230	22.9	105	13.7	20	22	120
24	8+30N 4+00E	46	330	37.7	240	24.9	115	9.3	10	22.3	110
SP4	8+40N 4+00E										
SP5	9+40N 4+00E										

NOTES: Shot Point 1 Digital Field File: 123.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 124.dat Source: Hammer

Shot Point 3 Digital Field File: 125.dat Source: Hammer

Shot Point 4 Digital Field File: 126.dat Source: Hammer

Shot Point 5 Digital Field File: 127.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 36

Recorded: 10-3-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 21=1+15N Surface Elevation: 862 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 2695 ft/sec

V3 10485 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

2	860	(ft)
12	850	(ft)

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	6+50N 4+00E										
SP2	7+90N 4+00E										
1	8+00N 4+00E	25.3	150	7.3	10	21.8	115	35.1	240	46.4	400
2	8+10N 4+00E	26.8	160	11.9	20	21.1	105	34.5	230	46	390
3	8+20N 4+00E	27.6	170	13.7	30	20.2	95	33.7	220	44.7	380
4	8+30N 4+00E	29.6	180	15.5	40	19.6	85	32.7	210	44.5	370
5	8+40N 4+00E	30.9	190	17.3	50	19.2	75	32.9	200	44.3	360
6	8+50N 4+00E	31.5	200	17.7	60	17.1	65	31.9	190	43.6	350
7	8+60N 4+00E	31.4	210	17.9	70	14.5	55	29	180	41.6	340
8	8+70N 4+00E	31.8	220	18.1	80	12.8	45	27.4	170	40.1	330
9	8+80N 4+00E	33.8	230	20.4	90	12.8	35	27.8	160	40.3	320
10	8+90N 4+00E	35.9	240	22.4	100	12.2	25	28.4	150	40.4	310
11	9+00N 4+00E	36.1	250	22.7	110	9.4	15	26.7	140	39.3	300
12	9+10N 4+00E	36.9	260	23.7	120	2.7	5	25.5	130	38	290
SP3	9+15N 4+00E										
13	9+20N 4+00E	37.6	270	24.5	130	3	5	24.5	120	36.7	280
14	9+30N 4+00E	38.4	280	24.8	140	7.9	15	23.3	110	36	270
15	9+40N 4+00E	40.4	290	26.8	150	11.4	25	23.6	100	36.2	260
16	9+50N 4+00E	39.1	300	26.5	160	12.1	35	21	90	34.2	250
17	9+60N 4+00E	40.4	310	27.5	170	13.6	45	20.3	80	32.8	240
18	9+70N 4+00E	42	320	29.5	180	15.6	55	19	70	32.6	230
19	9+80N 4+00E	41.9	330	29.2	190	16	65	17.3	60	31	220
20	9+90N 4+00E	41.6	340	28.6	200	15.7	75	15	50	28.8	210
21	10+00N 4+00E	42.6	350	29.1	210	16.1	85	13.8	40	28	200
22	10+10N 4+00E	43.6	360	30.9	220	17.7	95	13.8	30	28.1	190
23	10+20N 4+00E	45.1	370	32.1	230	19.1	105	12.3	20	27.3	180
24	10+30N 4+00E	46.7	380	34	240	21.1	115	9.3	10	26.9	170
SP4	10+40N 4+00E										
SP5	12+00N 4+00E										

NOTES: Shot Point 1 Digital Field File: 132.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 133.dat Source: Hammer

Shot Point 3 Digital Field File: 134.dat Source: Hammer

Shot Point 4 Digital Field File: 135.dat Source: Hammer

Shot Point 5 Digital Field File: 136.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 37

Recorded: 10-4-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 20=0+65E Surface Elevation: 842 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 3000 ft/sec

V3 11140 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

1	841	(ft)
12	830	(ft)

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	8+00N 2+00W										
SP2	8+00N 0+60W										
1	8+00N 0+50W	23.9	150	8.4	10	23.8	115	29.6	240	43.4	380
2	8+00N 0+40W	24.4	160	11.7	20	22.3	105	28.4	230	42	370
3	8+00N 0+30W	24.9	170	13.1	30	21.1	95	26.9	220	40.7	360
4	8+00N 0+20W	25.6	180	14.4	40	19.9	85	26.3	210	40.4	350
5	8+00N 0+10W	25.9	190	15.1	50	18.2	75	24.8	200	38.4	340
6	8+00N 0+00	27.2	200	16.6	60	17.2	65	23.8	190	37.8	330
7	8+00N 0+10E	27.6	210	17.7	70	15.7	55	23	180	36.9	320
8	8+00N 0+20E	28.4	220	18.3	80	14.2	45	22	170	35.9	310
9	8+00N 0+30E	31.4	230	21.2	90	14.8	35	22.5	160	36.6	300
10	8+00N 0+40E	33.4	240	23.2	100	15.1	25	22.9	150	36.6	290
11	8+00N 0+50E	32.7	250	23.1	110	11.1	15	20.7	140	34.4	280
12	8+00N 0+60E	33.7	260	23.3	120	4.5	5	20	130	33.4	270
SP3	8+00N 0+65E										
13	8+00N 0+70E	34.4	270	24.3	130	4.8	5	18.7	120	32	260
14	8+00N 0+80E	34.6	280	24.7	140	10.1	15	18	110	31.6	250
15	8+00N 0+90E	35.4	290	25.7	150	11.9	25	17.2	100	30.5	240
16	8+00N 1+00E	35.6	300	25.9	160	12	35	15.3	90	29.2	230
17	8+00N 1+10E	37	310	26.9	170	14	45	14.8	80	28.9	220
18	8+00N 1+20E	37.6	320	27.9	180	15.5	55	13.8	70	28.1	210
19	8+00N 1+30E	38.7	330	29.3	190	17.2	65	13.1	60	27.5	200
20	8+00N 1+40E	39.7	340	30.3	200	18.6	75	12.7	50	26.5	190
21	8+00N 1+50E	40.7	350	31.1	210	19.6	85	11.8	40	26.4	180
22	8+00N 1+60E	41.7	360	32.1	220	20.6	95	10.5	30	25.4	170
23	8+00N 1+70E	42.1	370	32.6	230	21.1	105	7.1	20	24	160
24	8+00N 1+80E	41.8	380	32.3	240	21.1	115	2.4	10	22.4	150
SP4	8+00N 1+90E										
SP5	8+00N 3+30E										

NOTES: Shot Point 1 Digital Field File: 137.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 138.dat Source: Hammer

Shot Point 3 Digital Field File: 139.dat Source: Hammer

Shot Point 4 Digital Field File: 140.dat Source: Hammer

Shot Point 5 Digital Field File: 141.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 38

Recorded: 10-4-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 20=1+15N Surface Elevation: 858 (ft)

AVERAGE VELOCITIES: AVERAGE INTERFACE DEPTH & ELEVATION:

V1 1200 ft/sec 4 854 (ft)

V2 2597 ft/sec 12 846 (ft)

V3 9588 ft/sec

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	6+50N 0+00										
SP2	7+90N 0+00										
1	8+00N 0+00	23.1	150	8.1	10	21.8	115	38.8	240	43.6	380
2	8+10N 0+00	24.5	160	9.8	20	21.6	105	37.8	230	42.9	370
3	8+20N 0+00	24.8	170	10.6	30	21	95	37.2	220	41.9	360
4	8+30N 0+00	25.8	180	11.9	40	19.9	85	36.1	210	41.1	350
5	8+40N 0+00	28.8	190	15.3	50	19.3	75	36.6	200	41.9	340
6	8+50N 0+00	29.8	200	16.6	60	19.7	65	35.6	190	41.2	330
7	8+60N 0+00	30.4	210	16.9	70	17.8	55	34.8	180	40.6	320
8	8+70N 0+00	32.1	220	18.9	80	17.9	45	34.9	170	40.6	310
9	8+80N 0+00	33.1	230	20	90	17	35	34.8	160	40	300
10	8+90N 0+00	33.5	240	20.9	100	13.7	25	32.1	150	38	290
11	9+00N 0+00	34.5	250	22.1	110	12.2	15	31.3	140	37.7	280
12	9+10N 0+00	34.9	260	22.4	120	4.4	5	30.5	130	36.5	270
SP3	9+15N 0+00										
13	9+20N 0+00	35.7	270	22.5	130	4.4	5	30	120	35.7	260
14	9+30N 0+00	37.3	280	24.5	140	11.1	15	29.2	110	35.1	250
15	9+40N 0+00	38.3	290	25.5	150	13.9	25	27.8	100	34.4	240
16	9+50N 0+00	39.3	300	27.5	160	15.9	35	26.9	90	34.4	230
17	9+60N 0+00	42.3	310	30.4	170	19.4	45	26.1	80	34.6	220
18	9+70N 0+00	44.3	320	31.6	180	21.3	55	24.9	70	33.6	210
19	9+80N 0+00	44.2	330	32	190	22.8	65	23.2	60	32.3	200
20	9+90N 0+00	45.4	340	33	200	24.3	75	21.2	50	31.6	190
21	10+00N 0+00	47.4	350	35	210	26.3	85	19.7	40	31	180
22	10+10N 0+00	48.4	360	36.2	220	27.6	95	17.9	30	30.8	170
23	10+20N 0+00	49.6	370	37.4	230	29.3	105	15.1	20	31.1	160
24	10+30N 0+00	49.9	380	38.4	240	29.1	115	8.7	10	28.6	150
SP4	10+40N 0+00										
SP5	11+80N 0+00										

NOTES: Shot Point 1 Digital Field File: 142.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 143.dat Source: Hammer

Shot Point 3 Digital Field File: 144.dat Source: Hammer

Shot Point 4 Digital Field File: 145.dat Source: Hammer

Shot Point 5 Digital Field File: 146.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 39

Recorded: 10-4-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 20=3+48E Surface Elevation: 861 (ft)

AVERAGE VELOCITIES: AVERAGE INTERFACE DEPTH & ELEVATION:

V1 1200 ft/sec 2 859 (ft)

V2 3349 ft/sec 16 845 (ft)

V3 11468 ft/sec

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	8+00N 0+83E										
SP2	8+00N 2+23E										
1	8+00N 2+33E	21.8	150	7	10	22.6	115	33.5	240	43.5	380
2	8+00N 2+43E	23.2	160	10.6	20	22.9	105	33.7	230	42.9	370
3	8+00N 2+53E	23.4	170	12.7	30	21.1	95	31.7	220	42.5	360
4	8+00N 2+63E	25.5	180	16.2	40	21.9	85	32.7	210	42.5	350
5	8+00N 2+73E	26.5	190	17.6	50	21.9	75	32.8	200	42.7	340
6	8+00N 2+83E	27.6	200	18.6	60	19.9	65	30.8	190	41	330
7	8+00N 2+93E	27.5	210	19.8	70	18.2	55	29.5	180	39.5	320
8	8+00N 3+03E	27.8	220	20.2	80	16.2	45	27.8	170	38	310
9	8+00N 3+13E	28.6	230	21.2	90	14.6	35	27	160	36.8	300
10	8+00N 3+23E	29	240	21.5	100	12.9	25	25.4	150	36.2	290
11	8+00N 3+33E	30	250	21.9	110	9.9	15	24.6	140	35.1	280
12	8+00N 3+43E	31.1	260	22.5	120	3.9	5	24.6	130	34.4	270
SP3	8+00N 3+48E										
13	8+00N 3+53E	32.3	270	23.7	130	3.9	5	23.6	120	33.7	260
14	8+00N 3+63E	33	280	24.7	140	10.6	15	22.6	110	33.1	250
15	8+00N 3+73E	33.3	290	25.3	150	12.8	25	20.6	100	31.5	240
16	8+00N 3+83E	33.6	300	25.6	160	14.8	35	19.7	90	30.2	230
17	8+00N 3+93E	34	310	26.6	170	15.2	45	18.5	80	29.6	220
18	8+00N 4+03E	35.5	320	27.9	180	17.2	55	17.9	70	29.3	210
19	8+00N 4+13E	35.9	330	28	190	17	65	16.1	60	27.7	200
20	8+00N 4+23E	36.9	340	29.3	200	18.4	75	15.3	50	26.7	190
21	8+00N 4+33E	38.1	350	30.3	210	19.4	85	14.5	40	26.4	180
22	8+00N 4+43E	39.1	360	31.2	220	20.4	95	13	30	25.7	170
23	8+00N 4+53E	40	370	31.7	230	21.4	105	10	20	24.4	160
24	8+00N 4+63E	0	380	32.9	240	22.4	115	7.7	10	24.4	150
SP4	8+00N 4+73E										
SP5	8+00N 6+13E										

NOTES: Shot Point 1 Digital Field File: 148.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 149.dat Source: Hammer

Shot Point 3 Digital Field File: 150.dat Source: Hammer

Shot Point 4 Digital Field File: 151.dat Source: Hammer

Shot Point 5 Digital Field File: 152.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 40

Recorded: 10-7-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 23=3+00E Surface Elevation: 894 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	891	(ft)
V2 2279 ft/sec	17	877	(ft)
V3 10683 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	6+75N	15+00E						
1	6+85N	15+00E	7.5	10	28.7	115	38.7	240
2	6+95N	15+00E	12.3	20	27.2	105	37.9	230
3	7+05N	15+00E	16.3	30	26.5	95	37.4	220
4	7+15N	15+00E	19.3	40	26.9	85	38.5	210
5	7+25N	15+00E	19.6	50	25.4	75	36.4	200
6	7+35N	15+00E	21.6	60	24.7	65	36.2	190
7	7+45N	15+00E	23.3	70	24.2	55	35.6	180
8	7+55N	15+00E	24.3	80	23	45	35.1	170
9	7+65N	15+00E	24.6	90	19.6	35	33.7	160
10	7+75N	15+00E	26.9	100	16.6	25	33	150
11	7+85N	15+00E	27.9	110	13.6	15	32	140
12	7+95N	15+00E	28.3	120	5.4	5	32.3	130
SP2	8+00N	15+00E						
13	8+05N	15+00E	29.8	130	4.8	5	30	120
14	8+15N	15+00E	30.8	140	11.1	15	27.6	110
15	8+25N	15+00E	31.2	150	15.1	25	26.1	100
16	8+35N	15+00E	33.3	160	18.7	35	27.3	90
17	8+45N	15+00E	33	170	20.2	45	26	80
18	8+55N	15+00E	33.6	180	22.2	55	23.5	70
19	8+65N	15+00E	34.3	190	23.2	65	23	60
20	8+75N	15+00E	35.5	200	24.7	75	22.6	50
21	8+85N	15+00E	36.5	210	26.7	85	21.3	40
22	8+95N	15+00E	37.5	220	27.9	95	18.7	30
23	9+05N	15+00E	37	230	27.7	105	13.4	20
24	9+15N	15+00E	38.3	240	28.7	115	9.3	10
SP3	9+25N	15+00E						

NOTES: Shot Point 1 Digital Field File: 154.dat Source: Hammer
Shot Point 2 Digital Field File: 155.dat Source: Hammer
Shot Point 3 Digital Field File: 156.dat Source: Hammer

ANS Seismic Refraction Spread 41

Recorded: 10-7-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 19=0+40N 0+07E Surface Elevation: 827 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 3897 ft/sec

V3 12736 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

2	825	(ft)
15	812	(ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	12+32N	14+81E						
1	12+33N	14+91E	8.9	10	20.2	115	30.1	240
2	12+33N	15+01E	10.2	20	19.8	105	29.3	230
3	12+34N	15+11E	12.3	30	19	95	28.1	220
4	12+35N	15+21E	12	40	16.8	85	26.7	210
5	12+35N	15+31E	13.2	50	16	75	26.2	200
6	12+36N	15+41E	14.7	60	14.9	65	25.2	190
7	12+36N	15+51E	16.3	70	14.1	55	25.6	180
8	12+37N	15+61E	18.1	80	13.7	45	24.9	170
9	12+37N	15+72E	19.4	90	13.1	35	24.3	160
10	12+38N	15+82E	19.7	100	11.2	25	23.5	150
11	12+39N	15+92E	20.8	110	9.9	15	23.8	140
12	12+39N	16+02E	22.1	120	4.7	5	23.6	130
SP2	12+40N	16+07E						
13	12+40N	16+12E	22.6	130	4.8	5	22.0	120
14	12+40N	16+22E	23.3	140	9.4	15	20.9	110
15	12+41N	16+32E	24.3	150	11	25	19.9	100
16	12+42N	16+42E	24.6	160	12.8	35	18.6	90
17	12+42N	16+53E	25	170	14.2	45	18.6	80
18	12+43N	16+63E	26	180	15.2	55	17.3	70
19	12+43N	16+73E	27.6	190	17	65	16.0	60
20	12+44N	16+83E	28.1	200	17.9	75	14.6	50
21	12+45N	16+93E	29.1	210	19.3	85	14.8	40
22	12+45N	17+03E	28.8	220	18.9	95	11.5	30
23	12+46N	17+13E	29.8	230	19.6	105	9.8	20
24	12+47N	17+24E	30.8	240	20.7	115	7.4	10
SP3	12+47N	17+34E						

NOTES: Shot Point 1 Digital Field File: 157.dat Source: Hammer

Shot Point 2 Digital Field File: 158.dat Source: Hammer

Shot Point 3 Digital Field File: 159.dat Source: Hammer

ANS Seismic Refraction Spread 42

Recorded: 10-7-91 Azimuth: S-N Geophone Spacing: 10 (ft)

Center Point: ANS# 29 Surface Elevation: 874 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	4	870	(ft)
V2 3310 ft/sec	23	851	(ft)
V3 10548 ft/sec			

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)
SP1	2+70N	16+00E						
1	2+85N	16+00E	11.4	15	31.8	115	40.4	20
2	2+95N	16+00E	13.8	25	29.6	105	38.6	20
3	3+05N	16+00E	16.2	35	28.1	95	37	20
4	3+15N	16+00E	18.5	45	26.3	85	36	20
5	3+25N	16+00E	20.5	55	26.1	75	36	20
6	3+35N	16+00E	22	65	26	65	35.3	19
7	3+45N	16+00E	23.7	75	26.4	55	36.1	18
8	3+55N	16+00E	24.7	85	25.2	45	35.2	17
9	3+65N	16+00E	26.6	95	22.8	35	35.6	16
10	3+75N	16+00E	27.4	105	17.6	25	34.3	15
11	3+85N	16+00E	28.4	115	13.7	15	33.7	14
12	3+95N	16+00E	30.4	125	4.9	5	32.8	13
SP2	4+00N	16+00E						
13	4+05N	16+00E	32.3	135	4.9	5	32.3	12
14	4+15N	16+00E	34.3	145	13.8	15	32.6	11
15	4+25N	16+00E	33.7	155	20.8	25	30.3	10
16	4+35N	16+00E	35.4	165	24.9	35	27.8	9
17	4+45N	16+00E	33.8	175	24.7	45	25.7	8
18	4+55N	16+00E	34.4	185	25.7	55	24.7	7
19	4+65N	16+00E	35.4	195	28.3	65	25	6
20	4+75N	16+00E	36.7	205	30.1	75	23.8	5
21	4+85N	16+00E	37.7	215	31.1	85	20.2	4
22	4+95N	16+00E	39.7	225	33.5	95	17.8	3
23	5+05N	16+00E	42	235	35.5	105	15.1	2
24	5+15N	16+00E	42.2	245	35.8	115	9.5	1
SP3	5+25N	16+00E						

NOTES: Shot Point 1 Digital Field File: 160.dat Source: Hammer
Shot Point 2 Digital Field File: 161.dat Source: Hammer
Shot Point 3 Digital Field File: 162.dat Source: Hammer

ANS Seismic Refraction Spread 43

Recorded: 10-8-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 20=2+00N 1+05E Surface Elevation: 867 (ft)

AVERAGE VELOCITIES:

V1 1200 ft/sec

V2 3218 ft/sec

V3 9149 ft/sec

AVERAGE INTERFACE DEPTH & ELEVATION:

2 865 (ft)

18 849 (ft)

Geophone & Shot	Station Coordinates		SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	10+00N	1+60W										
SP2	10+00N	0+20W										
1	10+00N	0+10W	26.4	150	7.2	10	31.4	115	35.9	240	45.1	380
2	10+00N	0+00	28.2	160	12.7	20	30.7	105	35	230	44.4	370
3	10+00N	0+10E	27.9	170	14.1	30	28.4	95	33.7	220	43.3	360
4	10+00N	0+20E	29.9	180	17.8	40	28.2	85	33.6	210	42.5	350
5	10+00N	0+30E	30.4	190	20.8	50	26.2	75	32.1	200	41.4	340
6	10+00N	0+40E	30.9	200	22.8	60	24.6	65	31.1	190	40.2	330
7	10+00N	0+50E	32.5	210	24.9	70	22.9	55	30.3	180	39.3	320
8	10+00N	0+60E	32.9	220	26.9	80	18.9	45	29.1	170	38.3	310
9	10+00N	0+70E	34.5	230	27.9	90	17.9	35	28.9	160	38.3	300
10	10+00N	0+80E	35.2	240	28.7	100	14.5	25	27.5	150	37.5	290
11	10+00N	0+90E	35.8	250	29.7	110	10.8	15	27.3	140	36.8	280
12	10+00N	1+00E	36	260	30.2	120	4.5	5	25.2	130	35.8	270
SP3	10+00N	1+05E										
13	10+00N	1+10E	37.2	270	31.5	130	4	5	25.4	120	35.4	260
14	10+00N	1+20E	38	280	32	140	13.3	15	23.4	110	33.6	250
15	10+00N	1+30E	38	290	32	150	13.9	25	21.3	100	31.6	240
16	10+00N	1+40E	38.8	300	32.6	160	15.9	35	20.3	90	30.5	230
17	10+00N	1+50E	38.5	310	32.6	170	16.9	45	17.9	80	28.6	220
18	10+00N	1+60E	40.7	320	35.3	180	20.4	55	17.7	70	29	210
19	10+00N	1+70E	40.3	330	35	190	21.2	65	15.3	60	26.8	200
20	10+00N	1+80E	40.5	340	35	200	22.6	75	13.8	50	25.3	190
21	10+00N	1+90E	41.5	350	35.6	210	24.6	85	12.5	40	25.1	180
22	10+00N	2+00E	41.7	360	36	220	24.4	95	10.7	30	23.1	170
23	10+00N	2+10E	42.1	370	37	230	24.9	105	8.9	20	22.2	160
24	10+00N	2+20E	44.1	380	38.7	240	27.6	115	7.5	10	23.1	150
SP4	10+00N	2+30E										
SP5	10+00N	3+70E										

NOTES: Shot Point 1 Digital Field File: 164.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 165.dat Source: Hammer

Shot Point 3 Digital Field File: 166.dat Source: Hammer

Shot Point 4 Digital Field File: 167.dat Source: Hammer

Shot Point 5 Digital Field File: 168.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

ANS Seismic Refraction Spread 44

Recorded: 10-8-91 Azimuth: W-E Geophone Spacing: 10 (ft)

Center Point: ANS# 21=2+00N 0+66E Surface Elevation: 864 (ft)

AVERAGE VELOCITIES:	AVERAGE INTERFACE DEPTH & ELEVATION:		
V1 1200 ft/sec	3	861	(ft)
V2 3387 ft/sec	13	851	(ft)
V3 10742 ft/sec			

Geophone & Shot	Station Coordinates	SP1 First Break Arrival Times (msec)	Distance From Sp1 To Phones (ft)	SP2 First Break Arrival Times (msec)	Distance From Sp2 To Phones (ft)	SP3 First Break Arrival Times (msec)	Distance From Sp3 To Phones (ft)	SP4 First Break Arrival Times (msec)	Distance From Sp4 To Phones (ft)	SP5 First Break Arrival Times (msec)	Distance From Sp5 To Phones (ft)
SP1	10+00N 2+01W										
SP2	10+00N 3+41E										
1	10+00N 3+51E	22.2	150	8.2	10	22.5	115	34.7	240	42.9	380
2	10+00N 3+61E	23.2	160	10.4	20	21.4	105	33.7	230	42.1	370
3	10+00N 3+71E	23.7	170	11.4	30	19.8	95	32.1	220	40.8	360
4	10+00N 3+81E	24.5	180	12.4	40	18.5	85	30.8	210	39.5	350
5	10+00N 3+91E	25.3	190	13.6	50	17.1	75	29.8	200	38.5	340
6	10+00N 4+01E	26.6	200	15.4	60	16.7	65	29.6	190	38.7	330
7	10+00N 4+11E	27.8	210	16.4	70	16	55	29.3	180	38.1	320
8	10+00N 4+21E	29.7	220	18.4	80	15.6	45	29	170	38.6	310
9	10+00N 4+31E	30.7	230	18.4	90	14	35	28.2	160	37.6	300
10	10+00N 4+41E	31.3	240	19.4	100	12	25	27.6	150	36.3	290
11	10+00N 4+51E	32.8	250	20.4	110	9.4	15	26.4	140	36.1	280
12	10+00N 4+61E	32.7	260	21.1	120	4.8	5	25.5	130	34.3	270
SP3	10+00N 4+66E										
13	10+00N 4+71E	34	270	22.2	130	4.6	5	25.5	120	34.2	260
14	10+00N 4+81E	34.8	280	23.2	140	8.6	15	24.4	110	33.5	250
15	10+00N 4+91E	35	290	23.7	150	10.4	25	23.7	100	32.8	240
16	10+00N 5+01E	36	300	24.7	160	12.5	35	22.1	90	32.1	230
17	10+00N 5+11E	36.8	310	25.5	170	14.6	45	20.4	80	30	220
18	10+00N 5+21E	37.8	320	26.5	180	16.5	55	19.2	70	29.5	210
19	10+00N 5+31E	38.8	330	27.7	190	18.1	65	18.2	60	28.8	200
20	10+00N 5+41E	40	340	28.9	200	19.8	75	17.5	50	28.4	190
21	10+00N 5+51E	41.6	350	31.6	210	21.8	85	17.2	40	28.1	180
22	10+00N 5+61E	42.1	360	31.2	220	22	95	14.8	30	27.1	170
23	10+00N 5+71E	43.1	370	32	230	22.8	105	11.9	20	26.1	160
24	10+00N 5+81E	43.5	380	33	240	23.5	115	8.6	10	25.4	150
SP4	10+00N 5+91E										
SP5	10+00N 7+31E										

NOTES: Shot Point 1 Digital Field File: 169.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Shot Point 2 Digital Field File: 170.dat Source: Hammer

Shot Point 3 Digital Field File: 171.dat Source: Hammer

Shot Point 4 Digital Field File: 172.dat Source: Hammer

Shot Point 5 Digital Field File: 173.dat Source: 8 Gauge Blanks (300 Grain Black Powder)

Appendix E

SPREAD SUMMARY SHEETS FOR PROFILE DATA

MARRICH INCORPORATED
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PROPOSED ANS SITE
Line SPD 13
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 9/27/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... HAMMER
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 2+65
Forward Shot Surf Elev 857
Reverse Shot Station.. 5+15
Reverse Shot Surf Elev 872

Forward Shot Depth..... 0
Forward Calc Rock Vel.. 11520
Reverse Shot Depth..... 0
Reverse Calc Rock Vel.. 10366

Forward Rock Velocity Used In Model = 11520
Reverse Rock Velocity Used In Model = 10366

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
2+75	858	840	17	1250	Auto-R
2+85	859	841	17	1250	Auto-R
2+95	859	841	18	1250	Auto-R
3+05	860	843	16	1250	Auto
3+15	860	843	17	1250	Auto
3+25	861	844	16	1250	Auto
3+35	861	845	16	1250	Auto
3+45	861	845	16	1250	Auto
3+55	861	844	17	1250	Auto
3+65	862	846	15	1250	Auto
3+75	862	846	16	1250	Auto
3+85	862	847	15	1250	Auto
3+95	863	847	16	1250	Auto
4+05	863	849	15	1250	Auto
4+15	864	850	14	1250	Auto
4+25	865	851	14	1250	Auto
4+35	866	852	14	1250	Auto
4+45	867	852	14	1250	Auto
4+55	868	853	15	1250	Auto
4+65	868	853	15	1250	Auto
4+75	869	855	14	1250	Auto
4+85	870	857	13	1250	Auto-F
4+95	871	858	13	1250	Auto-F
5+05	871	859	12	1250	Auto-F

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PROPOSED ANS SITE
Line SPD 14
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 9/27/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... HAMMER
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 6+75
Forward Shot Surf Elev 840
Reverse Shot Station.. 9+25
Reverse Shot Surf Elev 859

Forward Shot Depth..... 0
Forward Calc Rock Vel.. 9669
Reverse Shot Depth..... 0
Reverse Calc Rock Vel.. 10505

Forward Rock Velocity Used In Model = 9669
Reverse Rock Velocity Used In Model = 10505

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
6+85	840	827	13	1000	Auto-R
6+95	840	828	12	1007	Auto-R
7+05	840	827	13	1013	Auto
7+15	841	828	13	1020	Auto
7+25	840	827	13	1026	Auto
7+35	840	827	13	1033	Auto
7+45	840	827	13	1039	Auto
7+55	840	827	13	1046	Auto
7+65	840	826	15	1052	Auto
7+75	841	828	12	1059	Auto
7+85	840	826	14	1065	Auto
7+95	841	827	13	1072	Auto
8+05	842	828	13	1078	Auto
8+15	843	830	13	1085	Auto
8+25	844	830	13	1091	Auto
8+35	845	831	13	1098	Auto
8+45	846	832	14	1104	Auto
8+55	848	834	14	1111	Auto
8+65	850	836	14	1117	Auto
8+75	852	838	15	1124	Auto
8+85	854	839	15	1130	Auto
8+95	856	841	15	1137	Auto-F
9+05	856	842	14	1143	Auto-F
9+15	858	844	14	1150	Auto-F

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PROPOSED ANS SITE
Line SPD 15
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 9/27/91
Instrument Id... ES 2401
Sample Rate..... 0.1
Geophone Spacing 10

Crew Id..... MMES
Source..... HAMMER
Rec. Filter.. OUT/OUT/250
Number of Geophones.. 24

Forward Shot Station.. 2+75
Forward Shot Surf Elev 852
Reverse Shot Station.. 5+25
Reverse Shot Surf Elev 841

Forward Shot Depth..... 0
Forward Calc Rock Vel.. 12807
Reverse Shot Depth..... 0
Reverse Calc Rock Vel.. 9513

Forward Rock Velocity Used In Model = 12807
Reverse Rock Velocity Used In Model = 9513

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
2+85	852	838	14	1000	Auto-R
2+95	854	840	14	1000	Auto-R
3+05	856	840	15	1000	Auto
3+15	855	839	16	1000	Auto
3+25	854	837	17	1000	Auto
3+35	854	838	16	1000	Auto
3+45	854	838	16	1000	Auto
3+55	854	837	17	1000	Auto
3+65	854	836	18	1000	Auto
3+75	855	836	18	1000	Auto
3+85	855	837	18	1000	Auto
3+95	855	837	18	1000	Auto
4+05	855	839	16	1000	Auto
4+15	855	838	16	1000	Auto
4+25	854	838	16	1000	Auto
4+35	854	839	14	1000	Auto
4+45	853	840	13	1000	Auto
4+55	852	839	13	1000	Auto
4+65	851	838	13	1000	Auto
4+75	848	836	12	1000	Auto
4+85	846	834	12	1000	Auto
4+95	844	833	11	1000	Auto
5+05	843	830	13	1000	Auto-F
5+15	842	828	13	1000	Auto-F

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PROPOSED ANS SITE
Line SPD 31
Monday - October 28. 1991

Top Of Rock Summary

Field Date..... 10/1/91
Instrument Id... ES 2401
Sample Rate..... 0.1
Geophone Spacing 10

Crew Id..... MMES
Source..... HAMMER
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 8+75
Forward Shot Surf Elev 852
Reverse Shot Station.. 11+25
Reverse Shot Surf Elev 852

Forward Shot Depth..... 0
Forward Calc Rock Vel.. 9744
Reverse Shot Depth..... 0
Reverse Calc Rock Vel.. 11920

Forward Rock Velocity Used In Model = 9744
Reverse Rock Velocity Used In Model = 11920

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
8+85	854	842	13	1000	Auto-R
8+95	856	843	13	1000	Auto-R
9+05	856	844	13	1000	Auto
9+15	858	845	13	1000	Auto
9+25	859	846	13	1000	Auto
9+35	860	845	14	1000	Auto
9+45	862	847	15	1000	Auto
9+55	864	847	17	1000	Auto
9+65	866	849	17	1000	Auto
9+75	867	851	17	1000	Auto
9+85	868	851	18	1000	Auto
9+95	870	851	18	1000	Auto
10+05	871	852	19	1000	Auto
10+15	871	851	19	1000	Auto
10+25	870	852	18	1000	Auto
10+35	870	853	17	1000	Auto
10+45	869	852	16	1000	Auto
10+55	868	851	16	1000	Auto
10+65	866	849	16	1000	Auto
10+75	866	850	15	1000	Auto
10+85	863	848	14	1000	Auto
10+95	859	845	14	1000	Auto-F
11+05	858	844	13	1000	Auto-F
11+15	854	842	12	1000	Auto-F

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PROPOSED ANS SITE
Line SPD 32
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 10/1/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... HAMMER
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 4+75
Forward Shot Surf Elev 848
Reverse Shot Station.. 7+25
Reverse Shot Surf Elev 840

Forward Shot Depth..... 0
Forward Calc Rock Vel.. 9653
Reverse Shot Depth..... 0
Reverse Calc Rock Vel.. 9919

Forward Rock Velocity Used In Model = 9653
Reverse Rock Velocity Used In Model = 9919

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
4+85	846	837	9	1000	Auto-R
4+95	844	834	10	1000	Auto-R
5+05	843	833	10	1000	Auto
5+15	842	831	10	1000	Auto
5+25	841	831	10	1000	Auto
5+35	840	829	10	1000	Auto
5+45	841	831	9	1000	Auto
5+55	842	831	10	1000	Auto
5+65	843	833	9	1000	Auto
5+75	844	833	11	1000	Auto
5+85	843	833	10	1000	Auto
5+95	842	831	10	1000	Auto
6+05	840	830	11	1000	Auto
6+15	840	828	12	1000	Auto
6+25	840	828	12	1000	Auto
6+35	840	830	11	1000	Auto
6+45	840	830	11	1000	Auto
6+55	840	830	10	1000	Auto
6+65	840	830	11	1000	Auto
6+75	840	830	10	1000	Auto
6+85	840	829	11	1000	Auto
6+95	840	830	10	1000	Auto
7+05	840	829	11	1000	Auto-F
7+15	841	829	11	1000	Auto-F

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PROPOSED ANS SITE
Line SPD 33
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 10/01/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 3+00
Forward Shot Surf Elev 859
Reverse Shot Station.. 7+27
Reverse Shot Surf Elev 892

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 11774
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 11893

Forward Rock Velocity Used In Model = 11774
Reverse Rock Velocity Used In Model = 11893

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
4+00	863	849	14	1250	Auto
4+10	864	850	14	1283	Auto
4+20	865	851	14	1315	Auto
4+30	866	850	15	1348	Auto
4+40	866	851	15	1380	Auto
4+50	867	851	16	1413	Auto
4+60	868	851	17	1446	Auto
4+70	869	851	18	1478	Auto
4+80	869	851	19	1511	Auto
4+90	870	852	19	1543	Auto
5+00	871	852	19	1576	Auto
5+10	871	852	19	1609	Auto
5+20	874	853	21	1641	Auto
5+30	873	854	19	1674	Auto
5+40	874	853	21	1707	Auto
5+50	876	854	22	1739	Auto
5+60	877	856	21	1772	Auto
5+70	879	858	21	1804	Auto
5+80	879	858	22	1837	Auto
5+90	880	858	22	1870	Auto
6+00	881	858	22	1902	Auto
6+10	881	858	23	1935	Auto
6+20	882	861	21	1967	Auto
6+30	883	862	21	2000	Auto

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PROPOSED ANS SITE
Line SPD 34
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 10/02/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 5+00
Forward Shot Surf Elev 871
Reverse Shot Station.. 9+30
Reverse Shot Surf Elev 913

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 10098
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 11506

Forward Rock Velocity Used In Model = 10098
Reverse Rock Velocity Used In Model = 11506

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
6+00	881	858	23	2250	Auto
6+10	881	858	24	2250	Auto
6+20	882	860	22	2250	Auto
6+30	883	861	22	2250	Auto
6+40	884	862	22	2250	Auto
6+50	884	861	23	2250	Auto
6+60	885	861	24	2250	Auto
6+70	886	862	24	2250	Auto
6+80	887	861	26	2250	Auto
6+90	888	861	27	2250	Auto
7+00	889	864	25	2250	Auto
7+10	890	862	28	2250	Auto
7+20	892	862	29	2250	Auto
7+30	893	862	31	2250	Auto
7+40	894	863	30	2250	Auto
7+50	895	864	30	2250	Auto
7+60	896	866	30	2250	Auto
7+70	897	866	30	2250	Auto
7+80	898	867	31	2250	Auto
7+90	899	867	31	2250	Auto
8+00	900	871	28	2250	Auto
8+10	900	873	28	2250	Auto
8+20	901	874	27	2250	Auto
8+30	902	873	29	2250	Auto

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PROPOSED ANS SITE
Line SPD 35
Tuesday - October 29, 1991

Top Of Rock Summary

Field Date..... 10/02/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 5+00
Forward Shot Surf Elev 877
Reverse Shot Station.. 9+40
Reverse Shot Surf Elev 858

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 9230
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 10744

Forward Rock Velocity Used In Model = 9230
Reverse Rock Velocity Used In Model = 10744

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
6+00	861	849	13	1250	Auto
6+10	859	847	12	1250	Auto
6+20	857	843	14	1250	Auto
6+30	856	842	14	1250	Auto
6+40	857	844	13	1250	Auto
6+50	858	846	12	1250	Auto
6+60	859	847	12	1250	Auto
6+70	860	848	12	1250	Auto
6+80	861	849	12	1250	Auto
6+90	862	850	12	1250	Auto
7+00	863	851	12	1250	Auto
7+10	864	850	13	1250	Auto
7+20	864	851	13	1250	Auto
7+30	864	851	14	1250	Auto
7+40	865	851	14	1250	Auto
7+50	864	852	13	1250	Auto
7+60	864	852	12	1250	Auto
7+70	864	851	13	1250	Auto
7+80	864	849	14	1250	Auto
7+90	863	851	12	1250	Auto
8+00	863	851	12	1250	Auto
8+10	863	850	13	1250	Auto
8+20	863	850	13	1250	Auto
8+30	864	849	15	1250	Auto

MARRICH INCORPORATED
Geotechnical Consultants

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PROPOSED ANS SITE
Line SPD 36
Tuesday - October 29, 1991

Top Of Rock Summary

Field Date..... 10/03/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 6+50
Forward Shot Surf Elev 857
Reverse Shot Station.. 12+00
Reverse Shot Surf Elev 864

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 11744
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 11095

Forward Rock Velocity Used In Model = 11744
Reverse Rock Velocity Used In Model = 11095

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
8+00	863	851	12	1000	Auto
8+10	863	851	13	1000	Auto
8+20	863	851	12	1000	Auto
8+30	864	850	13	1000	Auto
8+40	864	850	14	1000	Auto
8+50	864	851	14	1000	Auto
8+60	865	852	13	1000	Auto
8+70	865	853	12	1000	Auto
8+80	866	853	13	1000	Auto
8+90	865	851	14	1000	Auto
9+00	864	850	14	1000	Auto
9+10	863	849	13	1000	Auto
9+20	860	847	13	1000	Auto
9+30	859	846	13	1000	Auto
9+40	858	844	14	1000	Auto
9+50	857	844	13	1000	Auto
9+60	856	844	12	1000	Auto
9+70	857	843	13	1000	Auto
9+80	857	845	12	1000	Auto
9+90	858	847	11	1000	Auto
10+00	858	847	11	1000	Auto
10+10	859	847	12	1000	Auto
10+20	860	848	12	1000	Auto
10+30	860	848	12	1000	Auto

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PROPOSED ANS SITE
Line SPD 37
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 10/04/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT/OUT/250
Number of Geophones.. 24

Forward Shot Station.. -2+00
Forward Shot Surf Elev 846
Reverse Shot Station.. 3+27
Reverse Shot Surf Elev 861

Forward Shot Depth..... 0
Forward Calc Rock Vel.. 11801
Reverse Shot Depth..... 0
Reverse Calc Rock Vel.. 11716

Forward Rock Velocity Used In Model = 11801
Reverse Rock Velocity Used In Model = 11716

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
-0+50	845	834	11	1000	Auto
-0+40	844	833	11	1011	Auto
-0+30	843	833	11	1022	Auto
-0+20	843	832	11	1033	Auto
-0+10	842	831	10	1043	Auto
0+00	841	830	11	1054	Auto
0+10	841	831	10	1065	Auto
0+20	841	831	10	1076	Auto
0+30	842	829	13	1087	Auto
0+40	842	828	14	1098	Auto
0+50	842	830	12	1109	Auto
0+60	842	830	12	1120	Auto
0+70	843	831	12	1130	Auto
0+80	843	831	12	1141	Auto
0+90	844	832	12	1152	Auto
1+00	844	832	12	1163	Auto
1+10	845	832	12	1174	Auto
1+20	845	833	12	1185	Auto
1+30	846	833	13	1196	Auto
1+40	846	833	13	1207	Auto
1+50	847	833	14	1217	Auto
1+60	848	834	14	1228	Auto
1+70	849	835	13	1239	Auto
1+80	851	838	12	1250	Auto

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PROPOSED ANS SITE
Line SPD 38
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 10/04/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 6+50
Forward Shot Surf Elev 841
Reverse Shot Station.. 11+80
Reverse Shot Surf Elev 847

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 8466
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 15946

Forward Rock Velocity Used In Model = 8466
Reverse Rock Velocity Used In Model = 15946

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
8+00	841	830	11	1000	Auto
8+10	842	830	12	1000	Auto
8+20	843	832	11	1000	Auto
8+30	844	833	11	1000	Auto
8+40	845	832	14	1000	Auto
8+50	847	833	14	1000	Auto
8+60	849	835	14	1000	Auto
8+70	851	836	15	1000	Auto
8+80	853	838	15	1000	Auto
8+90	855	841	14	1000	Auto
9+00	856	842	14	1000	Auto
9+10	857	843	14	1000	Auto
9+20	858	844	14	1000	Auto
9+30	859	845	14	1000	Auto
9+40	861	847	15	1000	Auto
9+50	863	847	15	1000	Auto
9+60	865	848	17	1000	Auto
9+70	867	850	17	1000	Auto
9+80	868	851	16	1000	Auto
9+90	869	852	17	1000	Auto
10+00	870	853	17	1000	Auto
10+10	871	853	17	1000	Auto
10+20	870	852	18	1000	Auto
10+30	871	854	17	1000	Auto

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PROPOSED ANS SITE
Line SPD 39
Monday - October 28, 1991

Top Of Rock Summary

Field Date..... 10/04/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT\OUT\250
Number of Geophones.. 24

Forward Shot Station.. 0+83
Forward Shot Surf Elev 843
Reverse Shot Station.. 6+13
Reverse Shot Surf Elev 882

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 13041
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 10970

Forward Rock Velocity Used In Model = 13041
Reverse Rock Velocity Used In Model = 10970

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
2+33	856	838	17	1750	Auto
2+43	856	838	18	1728	Auto
2+53	857	839	17	1707	Auto
2+63	857	838	19	1685	Auto
2+73	858	838	20	1663	Auto
2+83	859	839	19	1641	Auto
2+93	859	841	18	1620	Auto
3+03	860	843	17	1598	Auto
3+13	860	844	16	1576	Auto
3+23	861	845	16	1554	Auto
3+33	861	845	16	1533	Auto
3+43	861	845	16	1511	Auto
3+53	861	845	16	1489	Auto
3+63	862	845	16	1467	Auto
3+73	862	847	15	1446	Auto
3+83	862	848	14	1424	Auto
3+93	863	849	14	1402	Auto
4+03	863	849	15	1380	Auto
4+13	864	851	14	1359	Auto
4+23	865	852	13	1337	Auto
4+33	866	852	14	1315	Auto
4+43	867	853	14	1293	Auto
4+53	868	854	13	1272	Auto
4+63	868	854	14	1250	Auto-R

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PROPOSED ANS SITE
Line SPD 43
Tuesday - October 29, 1991

Top Of Rock Summary

Field Date..... 10/8/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT/OUT/250
Number of Geophones.. 24

Forward Shot Station.. -1+00
Forward Shot Surf Elev 849
Reverse Shot Station.. 3+70
Reverse Shot Surf Elev 855

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 14157
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 9737

Forward Rock Velocity Used In Model = 14157
Reverse Rock Velocity Used In Model = 9737

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
-0+10	870	852	18	1000	Auto
0+00	870	852	18	1000	Auto
0+10	870	853	17	1000	Auto
0+20	870	852	18	1000	Auto
0+30	870	852	17	1000	Auto
0+40	870	853	17	1000	Auto
0+50	869	853	17	1000	Auto
0+60	869	853	16	1000	Auto
0+70	869	852	17	1000	Auto
0+80	868	851	17	1000	Auto
0+90	868	851	17	1000	Auto
1+00	867	851	16	1000	Auto
1+10	866	849	16	1000	Auto
1+20	865	849	16	1000	Auto
1+30	864	849	15	1000	Auto
1+40	863	848	14	1000	Auto
1+50	862	849	13	1000	Auto
1+60	862	848	14	1000	Auto
1+70	860	848	13	1000	Auto
1+80	860	848	12	1000	Auto
1+90	859	847	12	1000	Auto
2+00	858	847	11	1000	Auto
2+10	857	846	11	1000	Auto
2+20	856	844	12	1000	Auto

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PROPOSED ANS SITE
Line SPD 44
Tuesday - October 29, 1991

Top Of Rock Summary

Field Date..... 10/8/91
Instrument Id... ES 2401
Sample Rate..... 0.10
Geophone Spacing 10

Crew Id..... MMES
Source..... BETSY (BDP)
Rec. Filter.. OUT/OUT/250
Number of Geophones.. 24

Forward Shot Station.. 2+01
Forward Shot Surf Elev 858
Reverse Shot Station.. 7+31
Reverse Shot Surf Elev 879

Forward Shot Depth..... 2
Forward Calc Rock Vel.. 10628
Reverse Shot Depth..... 2
Reverse Calc Rock Vel.. 13461

Forward Rock Velocity Used In Model = 10628
Reverse Rock Velocity Used In Model = 13461

STATION	SURFACE ELEV (ft)	ROCK ELEV (ft)	DEPTH TO ROCK (ft)	ASSUMED OVB VEL (ft/sec)	TIME USED
3+51	855	845	10	1000	Auto
3+61	856	845	10	1011	Auto
3+71	856	846	10	1022	Auto
3+81	857	847	10	1033	Auto
3+91	858	847	10	1043	Auto
4+01	859	847	11	1054	Auto
4+11	860	848	12	1065	Auto
4+21	861	848	13	1076	Auto
4+31	862	848	13	1087	Auto
4+41	863	850	13	1098	Auto
4+51	863	849	14	1109	Auto
4+61	864	851	13	1120	Auto
4+71	866	852	14	1130	Auto
4+81	866	852	14	1141	Auto
4+91	866	852	14	1152	Auto
5+01	866	852	14	1163	Auto
5+11	867	854	13	1174	Auto
5+21	868	854	14	1185	Auto
5+31	868	854	14	1196	Auto
5+41	869	854	15	1207	Auto
5+51	869	853	16	1217	Auto
5+61	869	854	16	1228	Auto
5+71	870	854	16	1239	Auto
5+81	870	854	16	1250	Auto

Appendix F

SURVEY DATA

ADAMS CRAFT HERZ WALKER
Architects - Engineers - Planners - Surveyors
P.O. Box 3114 • 106 Administration Road
OAK RIDGE, TENNESSEE 37831-3114

(615) 482-4451

LETTER OF TRANSMITTAL

DATE 10-29-91	JOB NO. 91945
ATTENTION STEVE JONES (mmes)	
RE ANS PRELIMINARY SEISMIC REFRACTION SURVEY @ X-10 ANS SPD-1 THRU ANS SPD-44 BORINGS & ANS #R-1, ANS #R-3 THRU ANS #8 REFRACTION NOISE TEST.	

TO C.R. BRIDGES (mmes)
SURVEY COORDINATOR

GENTLEMEN:

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
2	10-29-91		BORING LOG DATA INFORMATION FOR GEOTECHNICAL INVESTIGATION @ X-10. (PAGE 1 THRU 13 OF 13.)

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 19 _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS REF. FIELD NOTES FROM F.B X-10 BK# 35; pg. 72-75 & F.B X-10 BK# 38; pg. 1-27.
(574-7420)
* NOTE: FAX KIM DAVIS (mmes) 10-24-91 ANS SPD-29 THRU ANS SPD-44 (PAGE 8-12 OF 13.); 10-28-91 ANS-SPD-1 THRU ANS SPD-28 (PAGE 1-7 OF 13.) & 10-29-91 ANS #R-1, ANS #R-3 THRU ANS #R (PAGE 13 OF 13) REFRACTION NOISE TEST

COPY TO KIM DAVIS (mmes) 574-4558
SITE GEOPHYSICIST

SIGNED: Larry H Williams

If enclosures are not as noted, kindly notify us at once.

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Ref. F.B. X-10 BK# 38 PG. 1,7 & 8.

FOR GEOTECHNICAL INVESTIGATION AT X-10

"ANS PRELIMINARY SEISMIC REFRACTION SURVEY @ X-10"

Date: 10-27-91

Page 1 of 13

CORE HOLE DESIGNATION	COORDINATE LOCATION ST= Staked S = Scaled F = Field Location NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 F.B. BK#	PLANT BLOCK PLAN
ANS SPD-1									
ANS SPD-1									
ANS SPD-1									
ANS SPD-1	N-17756.353	E-36994.290	911.14	10-9-91		F	GEO #24	#38; Pg. 1	S.8.0
ANS SPD-1									
ANS SPD-2	N-18550.203	E-35954.709	872.16	10-9-91		F	SP 1	#38; Pg-7	S.6 M
ANS SPD-2	N-18550.012	E-35966.704	871.78	10-9-91		F	GEO #1	#38; Pg-7	"
ANS SPD-2	N-18557.113	E-36079.160	875.41	10-9-91		F	SP 2	#38; Pg-7	"
ANS SPD-2	N-18560.592	E-36193.182	867.58	10-9-91		F	GEO #24	#38; Pg-7	S.6.M
ANS SPD-2	N-18559.489	E-36203.187	867.81	10-9-91		F	SP-3	#38; Pg-7	S.6.N
ANS SPD-3	N-18555.042	E-36355.860	869.12	10-9-91		F	SP 1	#38; Pg-7	S.6.N
ANS SPD-3	N-18555.703	E-36365.921	869.31	10-9-91		F	GEO #1	#38; Pg-7	"
ANS SPD-3	N-18556.602	E-36479.970	878.26	10-9-91		F	SP 2	#38; Pg-7	"
ANS SPD-3	N-18555.601	E-36593.346	873.56	10-9-91		F	GEO #24	#38; Pg-7	"
ANS SPD-3	N-18556.124	E-36603.146	873.24	10-9-91		F	SP 3	#38; Pg-7	S.6.N
ANS SPD-4	N-18556.121	E-36756.681	870.18	10-9-91		F	SP 1	#38 Pg-7	S.6 N
ANS SPD-4	N-18554.736	E-36766.768	869.45	10-9-91		F	GEO #1	#38 Pg-7	S.6.N
ANS SPD-4	N-18553.836	E-36880.783	855.01	10-9-91		F	SP 2	#38 Pg-7	S.6.0
ANS SPD-4	N-18555.146	E-36992.529	851.86	10-9-91		F	GEO #24	#38 Pg-7	"
ANS SPD-4	N-18555.310	E-37002.286	851.27	10-9-91		F	SP 3	#38 Pg-8	S.6.0

F4

ACHW Job No. 91945

BORING LOG DATA INFORMATION

Date: 10-27-91

Ref. F.B. X-10 BK# 38 PG. 5,6,8 & 9. FOR GEOTECHNICAL INVESTIGATION AT X-10

Page 2 of 13

CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked		ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 F.B. BK#	PLANT BLOCK PLAN
	NORTH	EAST							
ANS SPD-5	N-18556.318	E-37179.940	847.79	10-9-91		F	SP 1	#38; PG-8	S.6 O
ANS SPD-5	N-18563.796	E-37192.026	848.92	10-9-91		F	GEO#1	#38; PG-8	"
ANS SPD-5	N-18556.036	E-37304.231	855.94	10-9-91		F	SP 2	#38; PG-8	S.6.O
ANS SPD-5	N-18555.827	E-37418.704	854.93	10-9-91		F	GEO#24	#38; PG 8	S.6.P
ANS SPD-5	N-18554.636	E-37429.029	854.80	10-9-91		F	SP 3	#38; PG-8	S.6. P
ANS SPD-6	N-18558.488	E-37555.976	854.50	10-10-91		F	SP 1	#38; PG-9	S.6.P
ANS SPD-6	N-18559.564	E-37567.448	854.19	10-10-91		F	GEO #1 (NOT FOUND APPROX. LOC)	#38; PG-9	"
ANS SPD-6	N-18556.580	E-37679.505	853.32	10-10-91		F	SP 2	#38; PG-9	"
ANS SPD-6	N-18554.806	E-37793.892	850.66	10-10-91		F	GEO#24	#38; PG-9	"
ANS SPD-6	N-18553.582	E-37804.288	850.79	10-10-91		F	SP-3	#38; PG-9	S.6.P
ANS SPD-7	N-18279.077	E-36080.692	851.82	10-9-91		F	SP 1	#38; PG-6	S.7.M
ANS SPD-7	N-18268.781	E-36079.305	851.62	10-9-91		F	GEO#1	#38; PG-6	"
ANS SPD-7	N-18154.885	E-36079.713	847.69	10-9-91		F	SP 2 (N-S SP2 E-W ANS SPD-8)	#38; PG-5	"
ANS SPD-7							GEO#24		
ANS SPD-7	N-18027.051	E-36077.563	865.50	10-9-91		F	SP 3 (LYING ON GRND)	#38; PG-5	S.7.M
ANS SPD-8	N-18279.352	E-36064.835	851.48	10-22-91		F	SD-1	#38; PG-6	S.7.M
ANS SPD-8	N-18268.352	E-36065.301	851.75	10-22-91		F	GEO#1	#38; PG-6	"
ANS SPD-8	N-18154.885	E-36079.713	847.69	10-9-91		F	SP 2 (E-W SP2 N-S ANS SPD-7)	#38; PG-5	"
ANS SPD-8	N-18155.104	E-36189.903	853.63	10-9-91		F	GEO#24	#38; PG-6	S.7.M
ANS SPD-8	N-18155.308	E-36202.846	855.24	10-9-91		F	SP 3	#38; PG-6	S.7.N

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Date: 10-27-91

Ref. F.B. X-10 BK#35 pg. 73. BK#38 PG. 2, 12, 27. FOR GEOTECHNICAL INVESTIGATION AT X-10

Page 3 of 13

CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 FB BK#	PLANT BLOCK PLAN
ANS SPD-9	N-18043.445	E-36423.524	856.14	10-7-91		F	SP-1	#35; PG 73	S.7.N
ANS SPD-9	N-18053.322	E-36429.430	856.54	10-7-91		F	GEO#1	#35; PG-73	"
ANS SPD-9	N-18151.842	E-36486.501	862.25	10-7-91		F	SP#2	#35; PG-73	"
ANS SPD-9	N-18251.405	E-36543.332	866.18	10-8-91		F	GEO#24	#38; PG 2	"
ANS SPD-9	N-18259.282	E-36547.913	866.31	10-8-91		F	SP 3	#35; PG 2	S.7.N
ANS SPD-10	N-18155.395	E-36755.178	877.11	10-8-91		F	SP 1	#38; PG 2	S.7.N
ANS SPD-10	N-18154.966	E-36765.251	877.61	10-8-91		F	GEO#1	#38; PG-2	S.7.N
ANS SPD-10	N-18154.525	E-36879.590	880.91	10-8-91		F	SP 6-2	#38; PG-2	S.7.O
ANS SPD-10	N-18154.921	E-36993.751	879.67	10-22-91		F	GEO#24	#38; PG-27	"
ANS SPD-10	N-18154.803	E-37004.029	878.64	10-22-91		F	SP-3	#38; PG-27	S.7.O
ANS SPD-11	N-18154.854	E-37155.794	865.91	10-22-91		F	SP-1	#38; PG-27	S.7.O
ANS SPD-11	N-18155.086	E-37166.085	868.24	10-22-91		F	GEO#1	#38; PG-27	"
ANS SPD-11	N-18156.536	E-37279.363	882.47	10-22-91		F	SP-2	#38; PG-27	"
ANS SPD-11	N-18154.489	E-37393.222	875.05	10-22-91		F	GEO#24	#38; PG-27	S.7.O
ANS SPD-11	N-18153.724	E-37402.539	873.43	10-22-91		F	SP-3	#38; PG-27	S.7.P
ANS SPD-12	N-17730.352	E-37157.703	930.86	10-10-91		F	SP-1	#38; PG-12	S.8.O
ANS SPD-12	N-17730.418	E-37167.377	932.18	10-10-91		F	GEO#1	#38; PG-12	"
ANS SPD-12	N-17731.787	E-37280.611	937.76	10-10-91		F	SP-2	#38; PG-12	"
ANS SPD-12	N-17729.349	E-37394.016	937.14	10-10-91		F	GEO#24	#38; PG-12	S.8.O
ANS SPD-12	N-17731.038	E-37404.792	936.37	10-10-91		F	SP-3	#38; PG-12	S.8.P

ACHW Job No. 91945. BK# 35 PG. 74-75. BORING LOG DATA INFORMATION Date: 10-27-91

Ref. F.B. x-10 BK# 38 PG. 3, 9, 10-19. FOR GEOTECHNICAL INVESTIGATION AT x-10 Page 4 of 13

CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE x-10 FB BK#	PLANT BLOCK PLAN
ANS SPD-13	N-17754.456	E-36344.825	857.01	10-8-91		F	SP1	#35; PG 74	S.B.N
ANS SPD-13	N-17753.858	E-36355.472	857.69	10-8-91		F	GEO#1	#35; PG 74	"
ANS SPD-13	N-17754.152	E-36469.305	862.55	10-8-91		F	SP-2 (ANS SPD-33 PROFILE #1 10-1-91)	#35; PG 74	"
ANS SPD-13	N-17754.835	E-36582.662	871.30	10-8-91		F	GEO#24	#35; PG 75	"
ANS SPD-13	N-17755.012	E-36592.056	872.18	10-8-91		F	SP 3	#35; PG 75	S.B.N
ANS SPD-14	N-17631.121	E-36079.558	839.84	10-9-91		F	SP1	#38; PG-3	S.B.M
ANS SPD-14	N-17646.867	E-36077.645	839.82	10-9-91		F	GEO#1	#38; PG-3	"
ANS SPD-14	N-17755.253	E-36079.739	840.66	10-8-91		F	SP 2	#35; PG 74	"
ANS SPD-14	N-17868.581	E-36079.311	857.65	10-9-91		F	GEO#24	#38; PG-4	"
ANS SPD-14	N-17878.095	E-36077.373	859.08	10-9-91		F	SP-3	#38; PG-4	S.B.M
ANS SPD-15	N-17230.993	E-36080.134	851.73	10-10-91		F	SP-1	#38; PG-10	S.9.M
ANS SPD-15	N-17241.580	E-36079.729	852.31	10-10-91		F	GEO#1	#38; PG-10	"
ANS SPD-15	N-17355.667	E-36080.349	854.71	10-9-91		F	SP-2	#38; PG-3	"
ANS SPD-15	N-17468.518	E-36080.334	841.55	10-9-91		F	GEO#24	#38; PG-3	"
ANS SPD-15	N-17478.402	E-36078.465	840.59	10-9-91		F	SP-3	#38; PG-3	S.9.M
ANS SPD-16	N-16832.246	E-36076.831	829.38	10-14-91		F	SP-1	#38; PG-19	S.10.M
ANS SPD-16	N-16842.247	E-36077.506	829.70	10-14-91		F	GEO#1	#38; PG-19	"
ANS SPD-16	N-16954.586	E-36079.849	841.74	10-10-91		F	SP-2 (ANS SPD-17)	#38; PG-10	"
ANS SPD-16	N-17069.566	E-36080.215	847.41	10-14-91		F	GEO#24	#38; PG-19	"
ANS SPD-16	N-17079.777	E-36078.991	848.00	10-14-91		F	SP-3	#38; PG-19	S.10.M

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Date: 10-27-91

Ref. F.B. X-10 BK# 38 PG. 10&19-21. FOR GEOTECHNICAL INVESTIGATION AT X-10

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CORE HOLE DESIGNATION	COORDINATE LOCATION ST= Staked S = Scaled F = Field Location NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 FIB BK#	PLANT BLOCK PLAN
ANS SPD-17	N-16955.605	E-35955.829	842.27	10-14-91		F	SP-1	#38; PG-19	S.10.M
ANS SPD-17	N-16955.884	E-35966.347	843.50	10-14-91		F	GEO #1	#38; PG-19	"
ANS SPD-17	N-16954.587	E-36079.849	841.74	10-10-91		F	SP-2 (ANS SPD-16)	#38; PG-10	"
ANS SPD-17	N-16955.976	E-36193.185	834.18	10-14-91		F	GEO #24	#38; PG-19	S.10.M
ANS SPD-17	N-16957.369	E-36202.466	834.63	10-14-91		F	SP-3	#38; PG-19	S.10.N
ANS SPD-18	N-16955.010	E-36355.718	835.18	10-14-91		F	SP-1 (PLATE IMPRESSION(S))	#38; PG-20	S.10.N
ANS SPD-18	N-16955.055	E-36365.838	837.25	10-14-91		F	GEO #1 (NOT FOUND APPROX. LOC)	#38; PG-20	"
ANS SPD-18	N-16954.831	E-36479.336	854.91	10-14-91		F	SP-2	#38; PG-20	"
ANS SPD-18	N-16954.644	E-36592.932	847.65	10-14-91		F	GEO #24	#38; PG-20	"
ANS SPD-18	N-16955.283	E-36602.279	849.77	10-14-91		F	SP-3	#38; PG-20	S.10.N
ANS SPD-19	N-16863.674	E-36962.314	855.06	10-14-91		F	SP-1	#38; PG-21	S.10.O
ANS SPD-19	N-16870.876	E-36955.325	854.46	10-14-91		F	GEO #1	#38; PG-21	"
ANS SPD-19	N-16956.321	E-36879.984	849.55	10-14-91		F	SP-2	#38; PG-21	"
ANS SPD-19	N-17041.217	E-36803.993	845.72	10-14-91		F	GEO #24	#38; PG-21	S.10.O
ANS SPD-19	N-17049.618	E-36797.396	845.01	10-14-91		F	SP-3	#38; PG-21	S.10.N
ANS SPD-20	N-17355.079	E-36154.001	859.36	10-10-91		F	SP-1	#38; PG-10	S.9.M
ANS SPD-20	N-17354.719	E-36164.892	860.41	10-10-91		F	GEO #1	#38; PG-10	S.9.M
ANS SPD-20	N-17354.279	E-36278.991	869.93	10-10-91		F	SP-2	#38; PG-10	S.9.N
ANS SPD-20	N-17354.946	E-36392.465	877.21	10-10-91		F	GEO #24	#38; PG-10	"
ANS SPD-20	N-17354.624	E-36402.829	877.53	10-10-91		F	SP-3	#38; PG-10	S.9.N

ACHW Job No. 919#5 BOORING LOG DATA INFORMATION Date: 10-27-91

Ref. F.B. X-10 BK# 35 PG. 72. BK# 38 PG. 10, 11, 15 & 17. FOR GEOTECHNICAL INVESTIGATION AT X-10 Page 6 of 13

CORE HOLE DESIGNATION	COORDINATE LOCATION ST= Staked S = Scaled F = Field Location NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 FIB BK#	PLANT BLOCK PLAN
ANS SPD-21	N-17355.046	E-36352.828	876.29	10-10-91		F	SP-1	#38; Pg-10	S.9.N
ANS SPD-21	N-17354.800	E-36362.961	876.44	10-10-91		F	GEO#1	#38; Pg-10	"
ANS SPD-21	N-17355.124	E-36479.486	878.28	10-7-91		F	SP-2	#35; Pg-72	"
ANS SPD-21	N-17354.511	E-36594.727	882.32	10-10-91		F	GEO#24	#38; Pg-11	"
ANS SPD-21	N-17355.144	E-36604.637	882.81	10-10-91		F	SP-3	#38; Pg-11	S.9.N
ANS SPD-22	N-17354.594	E-36553.788	880.57	10-10-91		F	SP-1	#38; Pg-11	S.9.N
ANS SPD-22	N-17354.330	E-36564.908	881.02	10-10-91		F	GEO#1	#38; Pg-11	"
ANS SPD-22	N-17354.969	E-36679.599	883.95	10-10-91		F	SP-2	#38; Pg-11	"
ANS SPD-22	N-17355.129	E-36793.193	876.01	10-10-91		F	GEO#24	#38; Pg-17	S.9.N
ANS SPD-22	N-17355.121	E-36803.705	875.78	10-10-91		F	SP-3	#38; Pg-17	S.9.O
ANS SPD-23	N-17354.276	E-36753.244	878.82	10-10-91		F	SP-1	#38; Pg-17	S.9.N
ANS SPD-23	N-17354.813	E-36763.376	878.15	10-10-91		F	GEO#1	#38; Pg-17	S.9.N
ANS SPD-23	N-17355.134	E-36879.847	875.02	10-10-91		F	SP-2	#38; Pg-17	S.9.O
ANS SPD-23	N-17355.327	E-36991.117	868.06	10-10-91		F	GEO#24	#38; Pg-17	"
ANS SPD-23	N-17356.168	E-37000.555	868.67	10-10-91		F	SP-3	#38; Pg-17	S.9.O
ANS SPD-24	N-17353.767	E-36956.627	870.31	10-10-91		F	SP-1	#38; Pg-17	S.9.O
ANS SPD-24	N-17354.848	E-36966.910	868.34	10-10-91		F	GEO#1	#38; Pg-17	"
ANS SPD-24	N-17354.030	E-37080.576	874.12	10-10-91		F	SP-2	#38; Pg-17	"
ANS SPD-24	N-17355.023	E-37193.989	862.48	10-10-91		F	GEO#24	#38; Pg-15	"
ANS SPD-24	N-17354.873	E-37204.011	861.57	10-10-91		F	SP-3	#38; Pg-15	S.9.O

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Date: 10-27-91

Ref. F.B. X-10 BK# 3 B PG.1,15,16 & 22. FOR GEOTECHNICAL INVESTIGATION AT X-10

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CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked		ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 FB BK#	PLANT BLOCK PLAN
	NORTH	EAST							
ANS SPD-25	N-17356.075	E-37154.676	868.30	10-10-91		F-	SP-1	#38; PG-15	S.9.0
ANS SPD-25	N-17355.215	E-37164.446	866.10	10-10-91		F	6EO#1	#38; PG-15	"
ANS SPD-25	N-17357.507	E-37261.950	856.66	10-10-91		F	SP-2	#38; PG-15	"
ANS SPD-25	N-17355.005	E-37392.609	853.58	10-10-91		F	6EO#24	#38; PG-15	S.9.0
ANS SPD-25	N-17355.116	E-37402.874	853.83	10-10-91		F	SP-3	#38; PG-15	S.9.P
ANS SPD-26	N-16831.005	E-37277.484	914.10	10-14-91		F	SP-1	#38; PG-22	S.10.0
ANS SPD-26	N-16841.474	E-37277.119	914.01	10-14-91		F	6EO#1	#38; PG-22	"
ANS SPD-26	N-16955.383	E-37279.606	913.60	10-14-91		F	SP-2	#38; PG-22	"
ANS SPD-26	N-17068.611	E-37279.666	900.00	10-14-91		F	6EO#24	#38; PG-22	"
ANS SPD-26	N-17078.356	E-37279.301	897.41	10-14-91		F	SP-3	#38; PG-22	S.10.0
ANS SPD-27	N-17536.220	E-37157.142	899.84	10-10-91		F	SP-1	#38; PG-16	S.8.0
ANS SPD-27	N-17538.541	E-37166.979	899.05	10-10-91		F	6EO#1	#38; PG-16	"
ANS SPD-27	N-17556.449	E-37279.698	891.84	10-10-91		F	SP-2	#38; PG-15	"
ANS SPD-27	N-17571.084	E-37391.569	900.15	10-10-91		F	6EO#24	#38; PG-16	S.8.0
ANS SPD-27	N-17571.912	E-37402.174	900.79	10-10-91		F	SP-3	#38; PG-16	S.8.P
ANS SPD-28	N-17756.292	E-36955.740	906.94	10-8-91		F	SP1	#38; PG-1	S.8.0
ANS SPD-28	N-17756.256	E-36966.001	908.17	10-8-91		F	6EO#1	#38; PG-1	"
ANS SPD-28	N-17754.278	E-37079.163	923.02	10-8-91		F	SP2	#38; PG-1	"
ANS SPD-28	N-17755.652	E-37192.613	940.90	10-8-91		F	6EO#24	#38; PG-1	"
ANS SPD-28	N-17754.801	E-37202.413	941.74	10-8-91		F	SP 3	#38; PG-1	S.8.0

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Date: 10-23-91

Ref. F.B. X-10 BK# 3B PG. 2-6. FOR GEOTECHNICAL INVESTIGATION AT X=10

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CORE HOLE DESIGNATION	COORDINATE LOCATION ST= Staked S = Scaled F = Field Location NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X=10 FB BK#	PLANT BLOCK PLAN
ANS SPD-29	N-18156.286	E-36556.005	863.86	10-8-91		F	SP-1	#38; PG-2	S.7.N
ANS SPD-29	N-18155.476	E-36566.829	863.51	10-8-91		F	GEO #1	#38; PG-2	"
ANS SPD-29	N-18155.667	E-36679.598	872.80	10-8-91		F	SP 2	#38; PG-2	"
ANS SPD-29	N-18155.706	E-36795.055	878.45	10-8-91		F	GEO #24	#38; PG-2	"
ANS SPD-29	N-18155.019	E-36805.205	879.06	10-8-91		F	SP 3	#38; PG-2	S.7.N
ANS SPD-30	N-18154.251	E-36153.137	849.57	10-9-91		F	SP 1	#38; PG-6	S.7.M
ANS SPD-30	N-18154.092	E-36163.822	850.71	10-9-91		F	GEO #1	#38; PG-6	S.7.M
ANS SPD-30	N-18155.432	E-36279.363	863.10	10-9-91		F	SP 2	#38; PG-6	S.7.N
ANS SPD-30	N-18154.479	E-36391.564	866.56	10-8-91		F	GEO #24	#38; PG-2	"
ANS SPD-30	N-18154.182	E-36401.543	866.16	10-8-9		F	SP.3	#38; PG-2	S.7.N
ANS SPD-31	N-17831.726	E-36079.205	852.28	10-9-91		F	SP 1	#38; PG 3	S.8.M
ANS SPD-31	N-17841.852	E-36078.678	854.10	10-9-91		F	GEO #1	#38; PG-4	S.8.M
ANS SPD-31	N-17955.253	E-36080.117	869.61	10-9-91		F	SP 2	#38; PG-4	S.7.M
ANS SPD-31	N-18067.783	E-36080.214	854.44	10-9-91		F	GEO #24	#38; PG-5	"
ANS SPD-31	N-18077.152	E-36080.494	851.65	10-9-91		F	SP 3	#38; PG-5	S.7.M
ANS SPD-32	N-17434.713	E-36078.969	847.67	10-9-91		F	SP 1	#38; PG-3	S.9.M
ANS SPD-32	N-17443.331	E-36078.313	845.75	10-9-91		F	GEO #1	#38; PG-3	S.9.M
ANS SPD-32	N-17555.426	E-36079.661	841.50	10-9-91		F	SP 2	#38; PG-3	S.8.M
ANS SPD-32	N-17670.956	E-36079.056	840.71	10-9-91		F	GEO #24	#38; PG-3	"
ANS SPD-32	N-17681.700	E-36079.876	839.82	10-9-91		F	SP 3	#38; PG-3	S.8.M

ACHW Job No. 91945 BKs 35 Pg. 73-75.

Ref. F.B. X-10 BK# 38 PG. 1 & 11.

BORING LOG DATA INFORMATION

FOR GEOTECHNICAL INVESTIGATION AT X-10

Date: 10-23-91

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CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 FIB BK#	PLANT BLOCK PLAN
ANS SPD-33	N-17755.354	E-36379.987	858.60	10-8-91		F	SP1 PROFILE #1 10-1-91	#35; PG-74	S.8.N
ANS SPD-33	N-17754.152	E-36469.305	862.55	10-8-91		F	SP2 (ANS " SPD-13) "	#35; PG-74	"
ANS SPD-33	N-17754.964	E-36479.802	863.18	10-7-91		F	GEO#1 " "	#35; PG-73	"
ANS SPD-33	N-17754.853	E-36592.135	872.23	10-8-91		F	SP3 " "	#35; PG-75	"
ANS SPD-33	N-17754.614	E-36707.497	883.03	10-8-91		F	GEO#24 " "	#35; PG-75	"
ANS SPD-33	N-17756.511	E-36717.600	883.79	10-8-91		F	SP-4 " "	#35; PG-75	S.8.N
ANS SPD-33	N-17754.773	E-36806.979	891.72	10-8-91		F	SP-5 " "	#35; PG-75	S.8.O
ANS SPD-34	N-17755.417	E-36579.968	871.02	10-8-91		F	SP1 PROFILE #1 10-2-91	#35; PG75	S.8.N
ANS SPD-34	N-17753.654	E-36668.364	879.76	10-8-91		F	SP2 " "	#35; PG-75	"
ANS SPD-34	N-17754.622	E-36677.603	880.59	10-8-91		F	GEO#1 " "	#35; PG-75	"
ANS SPD-34	N-17753.330	E-36791.567	890.66	10-8-91		F	SP3 " "	#35; PG-75	S.8.N
ANS SPD-34	N-17754.765	E-36905.953	901.69	10-8-91		F	GEO #24 " "	#38; PG-1	S.8.O
ANS SPD-34	N-17756.203	E-36916.252	902.75	10-8-91		F	SP-4 " "	#39; PG-1	"
ANS SPD-34	N-17755.079	E-37005.245	912.53	10-8-91		F	SP-5 " "	#38; PG-1	S.8.O
ANS SPD-35	N-17457.734	E-36479.114	876.49	10-10-91		F	SP1 PROFILE #2 10-2-91	#38; PG-1	S.9.N
ANS SPD-35	N-17546.088	E-36481.024	864.61	10-7-91		F	SP2 " "	#35; PG-72	S.8.N
ANS SPD-35	N-17555.484	E-36479.076	861.15	10-7-91		F	GEO#1 " "	#35; PG-72	"
ANS SPD-35	N-17669.111	E-36480.790	864.25	10-8-91		F	SP3 " "	#35; PG-74	"
ANS SPD-35	N-17782.694	E-36479.066	863.62	10-7-91		F	GEO#24 " "	#35; PG-72	"
ANS SPD-35	N-17792.754	E-36479.779	864.09	10-7-91		F	SP-4 " "	#35; PG-72	"
ANS SPD-35	N-17892.069	E-36479.578	857.72	10-7-91		F	SP-5 " "	#35; PG-72	S.8.N

ACHW Job No. 91945.

Ref. F.B. X-10 BK# 35 Pg. 73 & 74. BK# 38 PG. 3-5 & 25.

BORING LOG DATA INFORMATION

FOR GEOTECHNICAL INVESTIGATION AT X-10

Date: 10-23-91

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CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 F.B BK#	PLANT BLOCK PLAN
ANS SPD-36	N-17604.576	E-36479.719	856.77	10-8-91		F	SP1 PROFILE #2 10-3-91	#35; Pg-74	S.8.N
ANS SPD-36	N-17742.854	E-36478.429	863.55	10-22-91		F	SP2 " "	#39; Pg-25	"
ANS SPD-36	N-17753.410	E-36478.930	863.12	10-7-91		F	GEO#1 " "	#35; Pg-77	"
ANS SPD-36	N-17867.036	E-36479.325	861.68	10-7-91		F	SP-3 " "	#35; Pg-77	S.8.N
ANS SPD-36	N-17980.518	E-36481.557	860.36	10-7-91		F	GEO#24 " "	#35; Pg-73	S.7.N
ANS SPD-36	N-17990.637	E-36480.913	860.17	10-7-91		F	SP-4 " "	#35; Pg-73	"
ANS SPD-36	N-18150.642	E-36480.220	863.99	10-7-91		F	SP-5 " "	#35 Pg-73	S.7.N
ANS SPD-37	N-17753.752	E-35980.198	846.37	10-22-91		F	SP-1 PROFILE #3 10-4-91	#38; Pg-25	S.8.M
ANS SPD-37	N-17753.682	E-36019.682	846.48	10-9-91		F	SP-2 " "	#38; Pg-3	"
ANS SPD-37	N-17754.561	E-36029.608	845.18	10-9-91		F	GEO#1 " "	#38; Pg-3	"
ANS SPD-37	N-17755.659	E-36143.705	841.84	10-8-91		F	SP-3 " "	#35; Pg-74	S.8.M
ANS SPD-37	N-17756.633	E-36257.667	850.68	10-8-91		F	GEO#24 " "	#35; Pg-74	S.8.N
ANS SPD-37	N-17757.161	E-36267.586	851.40	10-22-91		F	SP-4 "	#38; Pg-25	"
ANS SPD-37	N-17755.281	E-36406.906	840.11	10-8-91		F	SP-5 "	#35; Pg-74	S.8.N
ANS SPD-38	N-17605.109	E-36079.934	840.66	10-9-91		F	SP-1 PROFILE #4 10-4-91	#38; Pg-3	S.8.M
ANS SPD-38	N-17746.158	E-36078.420	839.90	10-9-91		F	SP-2 " "	#38; Pg3	"
ANS SPD-38	N-17756.531	E-36078.969	840.84	10-8-91		F	GEO#1 " "	#35; Pg-74	"
ANS SPD-38	N-17869.718	E-36078.275	857.92	10-9-91		F	SP-3 " "	#38; Pg-4	S.8.M
ANS SPD-38	N-17983.157	E-36080.198	870.94	10-9-91		F	GEO#24 " "	#38; Pg-4	S.7.M
ANS SPD-38	N-17992.918	E-36079.377	870.28	10-9-91		F	SP-4 " "	#38; Pg-4	"
ANS SPD-38	N-18130.826	E-36080.220	846.82	10-9-91		F	SP-5 " "	#38; Pg-5	S.7.M

ACHW Job No. 91945.

Ref. F.B. X-10 BK# 35 PG. 74 & 75. BK# 38 PG. 13, 14 & 26.

BORING LOG DATA INFORMATION

FOR GEOTECHNICAL INVESTIGATION AT X-10

Date: 10-29-91

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CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT			BORING CODE X-10 F.B. BK#	PLANT BLOCK PLAN
ANS-SPD-39	N-17755.522	E-36162.625	842.73	10-8-91		F	SP1	PROFILE 3	10-4-91	#35; PG-74	S.8.M
ANS SPD-39	N-17753.263	E-36302.148	854.66	10-8-91		F	SP 2	"	"	#35; PG-74	S.8.N
ANS SPD-39	N-17753.333	E-36312.273	855.53	10-8-91		F	GEO#1	"	"	#35; PG-74	"
ANS SPD-39	N-17755.773	E-36427.566	860.81	10-8-91		F	SP-3	"	"	#35; PG-74	"
ANS SPD-39	N-17755.641	E-36540.177	868.17	10-8-91		F	GEO#24	"	"	#35; PG-75	"
ANS SPD-39	N-17755.161	E-36549.166	868.52	10-8-91		F	SP-4	"	"	#35; PG-75	"
ANS SPD-39	N-17755.370	E-36689.455	881.69	10-8-91		F	SP-5	"	"	#35; PG-75	S.8.N
ANS SPD-40	N-17631.562	E-37577.191	875.07	10-10-91		F	SP-1		10-7-91	#38; PG 13	S.8.P
ANS SPD-40	N-17642.120	E-37579.071	876.97	10-10-91		F	GEO#1		"	#38; PG-13	"
ANS SPD-40	N-17754.454	E-37578.202	893.55	10-10-91		F	SP-2		"	#38; PG-13	"
ANS SPD-40	N-17868.785	E-37579.306	899.62	10-10-91		F	GEO#24		"	#38; PG-13	"
ANS SPD-40	N-17878.858	E-37579.228	901.08	10-10-91		F	SP-3		"	#38; PG-13	S.8.P
ANS SPD-41	N-18186.346	E-37559.925	829.18	10-22-91		F	SP#1		10-7-91	#38; PG 26	S.7.P
ANS SPD-41	N-18187.486	E-37570.198	828.28	10-22-91		F	GEO#1		"	#38; PG-26	"
ANS SPD-41	N-18191.979	E-37684.666	826.58	10-22-91		F	SP#2		"	#38; PG-26	"
ANS SPD-41	N-18201.576	E-37803.277	824.86	10-22-91		F	GEO#24		"	#38; PG-26	"
ANS SPD-41	N-18199.785	E-37809.011	824.89	10-22-91		F	SP-3		"	#38; PG-26	S.7.P
ANS SPD-42	N-17226.889	E-37678.693	878.02	10-10-91		F	SP1		10-7-91	#38; PG-14	S.9.P
ANS SPD-42	N-17241.886	E-37680.403	877.86	-10-10-91		F	GEO#1		"	#38; PG-14	"
ANS SPD-42	N-17355.950	E-37678.599	874.40	10-10-91		F	SP-2		"	#38; PG-14	"
ANS SPD-42	N-17469.607	E-37679.888	875.81	10-10-91		F	GEO#24		"	#38; PG-14	"
ANS SPD-42	N-17479.924	E-37679.286	876.99	10-10-91		F	SP-3		"	#38; PG-14	S.9.P

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Date: 10-24-91

Ref. F.B. X-10 BK#3B PG. 5 & 18. FOR GEOTECHNICAL INVESTIGATION AT X-10

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CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location St= Staked NORTH	EAST	ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 F.B BK#	PLANT BLOCK PLAN
ANS SPD-43	N-17952.947	E-35921.620	848.67	10-9-91		F	SP-1 PROFILE #5 10-8-91	#7B; PG-5	S.7.M
ANS SPD-43	N-17953.955	E-36060.082	868.51	10-9-91		F	SP-2 " "	#7B; PG-5	"
ANS SPD-43	N-17955.038	E-36069.979	869.81	10-9-91		F	GEO #1 " "	#7B; PG-5	"
ANS SPD-43	N-17954.588	E-36184.229	866.70	10-14-91		F	SP-3 " "	#7B; PG-1B	S.7.M
ANS SPD-43	N-17955.853	E-36297.447	856.18	10-14-91		F	GEO #24 " "	#7B; PG-1B	S.7.N
ANS SPD-43	N-17955.157	E-36307.652	854.14	10-14-91		F	SP-4 " "	#7B; PG-1B	"
ANS SPD-43	N-17955.506	E-36446.795	854.86	10-14-91		F	SP-5 " "	#7B; PG-1B	S.7.N
ANS SPD-44	N-17955.299	E-36281.484	858.08	10-14-91		F	SP-1 PROFILE #5 10-8-91	#7B; PG-1B	S.7.N
ANS SPD-44	N-17956.205	E-36420.697	853.47	10-14-91		F	SP-2 " "	#7B; PG-1B	"
ANS SPD-44	N-17954.962	E-36450.872	855.11	10-14-91		F	GEO #1 " "	#7B; PG-1B	"
ANS SPD-44	N-17954.528	E-36544.949	864.40	10-14-91		F	SP-3 " "	#7B; PG-1B	"
ANS SPD-44	N-17955.341	E-36658.996	870.20	10-14-91		F	GEO #24 " "	#7B; PG-1B	"
ANS SPD-44	N-17954.855	E-36669.020	870.37	10-14-91		F	SP-4 " "	#7B; PG-1B	S.7.N
ANS SPD-44	N-17954.841	E-36809.081	878.80	10-14-91		F	SP-5 " "	#7B; PG-1B	S.7.O

ACHW Job No. 91945.

BORING LOG DATA INFORMATION

Date: 10-28-91

Ref. F.B. X-10 BK# 38 PG. 23 & 24. FOR GEOTECHNICAL INVESTIGATION AT X-10

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CORE HOLE DESIGNATION	COORDINATE LOCATION S = Scaled F = Field Location ST= Staked		ELEV.	REPORT DATE	PROJECT RELEASE NUMBER	DESC. OF BORING	NAME OF THE GEOTECHNICAL INVESTIGATION FOR PROPOSED PROJECT	BORING CODE X-10 FB BK#	PLANT, BLOCK PLAN
	NORTH	EAST							
ANS # R-1	18,549.022	36,071.141	874.98	10-22-91		F	SP1 REFLECTION NOISE TEST 10-9-91	#38; pg.23	S.6.M
ANS # R-1	18,548.811	36,066.459	874.85	10-22-91		F	GEO#1 " " " "	#38; pg.23	"
	18,547.007	35,989.557	872.08	10-22-91		F	NO INFO	#38; pg.23	S.6.M
ANS # R-3	18,547.150	35,996.173	872.33	10-22-91		F	GEO # 1 REFLECTION NOISE TEST 10-11-91	#38; pg.23	S.6.M
ANS # R-3	18,546.752	35,977.998	871.72	10-22-91		F	GEO # 12 " " " "	#38; pg.23	"
ANS # R-3	18,545.345	35,958.465	871.67	10-22-91		F	GEO # 24 " " "	#38; pg.23	S.6.M
ANS # R-4	18,545.901	35,960.027	871.57	10-22-91		F	GEO#1 REFLECTION NOISE TEST	#38; pg.23	S.6.M
ANS # R-4	18,545.035	35,942.112	871.01	10-22-91		F	GEO#12 " " "	#38; pg.23	"
ANS # R-4	18,544.213	35,922.475	870.75	10-22-91		F	GEO # 24 " " "	#38; pg.23	S.6.M
ANS # R-5	18,544.570	35,924.162	870.89	10-22-91		F	GEO#1 REFLECTION NOISE TEST	#38; pg.23	S.6.M
ANS # R-5	18,543.933	35,906.120	869.76	10-22-91		F	GEO#12 " " "	#38; pg.23	"
ANS # R-5	18,542.660	35,886.556	867.64	10-22-91		F	GEO#24 " " "	#38; pg.23	S.6.M
ANS # R-6	18,542.642	35,888.069	867.85	10-22-91		F	GEO#1 REFLECTION NOISE TEST	#38; pg.23	S.6.M
ANS # R-6	18,542.533	35,873.387	866.10	10-22-91		F	GEO#12 " " "	#38; pg.23	"
ANS # R-6	18,542.084	35,850.731	865.39	10-22-91		F	GEO#24 " " "	#38; pg.24	S.6.M
ANS # R-7	18,542.269	35,852.259	865.41	10-22-91		F	GEO#1 REFLECTION NOISE TEST	#38; pg.24	S.6.M
ANS # R-7	18,541.887	35,834.490	865.82	10-22-91		F	GEO#12 " " "	#38; pg.24	"
ANS # R-7	18,540.028	35,814.884	864.47	10-22-91		F	GEO#24 " " "	#38; pg.24	S.6.M
ANS # R-8	18,541.972	35,816.340	866.11	10-22-91		F	GEO#1 REFLECTION NOISE TEST	#38; pg.24	S.6.M
ANS # R-8	18,540.196	35,798.295	865.96	10-22-91		F	GEO#12 " " "	#38; pg.24	"
ANS # R-8	18,539.139	35,778.668	865.81	10-22-91		F	GEO#24 " " "	#38; pg.24	S.6.M

Appendix G

PROJECT SUPPORT DOCUMENTATION

SCOPE OF SEISMIC REFRACTION SURVEY
AT THE PROPOSED ANS SITE
September 5, 1991

Anticipated Schedule:

Field Work September 16 to October 7,1991 - Report will be due by October 31, 1991.

The seismic refraction survey at the proposed ANS site will incorporate two methods, station and profile. The equipment will be the same for both methods: EG&G ES2401 24 channel seismograph as the recording instrument, one 290' land cable with 24 SMWW takeouts at 10 foot intervals, 24 geophones(10-14Hz), and a Betsy Downhole Percussion Firing Rod with 8 gauge, 300 grain black power blank shells as the energy source.

Top-of-rock will be defined by a velocity and may not be tied to specific geologic "contact".

STATION METHOD:

This method involves centering the geophone cable at the desired point of investigation and recording the data from shots at 10' offsets from each end, to provide both forward and reverse records. This will provide an average depth to rock beneath the point half way between geophones 12 and 13. The top-of-rock data from this method will be used to produce a contour map of the average top-of-rock surface(1"=100' horizontal scale, 5-foot contour interval) for the proposed ANS site. The specific points of investigation will be the following:

Borehole locations 10 through 34;

16=200+00E;	17=200+00E;	21=200+00N;	21=200+00E,200+00N;
22=200+00N;	22=200+00E,200+00N;	23=200+00N;	21=200+00E;
22=200+00E;	26=200+00N;	26=200+00E,200+00N;	27=200+00N;
27=200+00E,200+00N;	28=200+00N;	26=200+00E;	27=200+00E.

This will give 41 "seismic" top-of-rock elevation points.

PROFILE METHOD:

This method involves continuous geophone coverage over a straight line for a pre-defined distance. The object being to provide a top-of-rock elevation point under each geophone location(every 10 feet), thus producing a top-of-rock profile of the line covered by the geophones. This profile should have a resolution of 20 feet, that is, be able to define a geologic structure 20 feet or larger in size. The lines of investigation will be the following:

1) west to east line to run from 20=200+90E to 23=100+20E;
2) north to south line to run from 22=100+10N to 32=200+80N;

Each of the two lines will be 1030 feet long, providing 103 "seismic" top-to-rock elevation points each. To cover 1030 feet will require five cable moves, four geophone overlap with every move. At each move five shots will be recorded; two shots 160 feet from each end(forward and reverse), two shots 10 feet from each end(forward and reverse), and one shot between geophones 12 and 13.

SCOPE OF SEISMIC REFRACTION SURVEY
AT THE PROPOSED ANS SITE
September 5, 1991

FINAL REPORT:

1) Brief discussion of field methods
2) Brief discussion of processing methods
3) Brief discussion of results
4) Contour map of top-of-rock (1"=100' scale, 5-ft contour interval)
5) Two top-of-rock profiles (1"=100' horizontal scale)
6) Tables of both, arrival times and calculation results
7) Time/Distance plots of all spreads
8) Procedures for data acquisition, processing and reducing
9) Copies of raw field printouts

Title: PROCEDURE FOR SEISMIC REFRACTION SURVEY
AT THE PROPOSED ANS SITE
April 10, 1991

Though this procedure is intended to be as complete as possible, site conditions may warrant varying from this procedure. Variations from this procedure will be recorded in the daily field log.

Purpose of Seismic Refraction Survey

To obtain general bedrock topographic configuration over the 2000 x 2000-foot site area. The survey will be performed in two phases. Phase 1 - depth to bedrock will be performed nominally on a 400-foot grid over the entire site, with 200-foot grid interval in area projected to site structures. Phase II will consist of 2 each 800-foot seismic profile lines providing detailed top-of-rock information in area immediately adjacent to borehole #22.

Anticipated Results of Seismic Refraction Survey

Data to be provided as top-of-rock elevation contour map of area and two (2) profile sections. Top-of-rock will be defined by a velocity and may not be tied to specific geologic "contact", even with drill control.

Elements of Procedure Discussed

1. Background - purpose, anticipated results
2. Required equipment
3. Pre-survey preparation
4. Field set up - Station or Sounding Mode
5. Field set up - Profiling Mode
6. Data Reduction
7. Data Presentation
8. Quality Assurance

Equipment

Betsy Downhole Percussion Firing Rod and 300-grain encapsulated shells; 2-foot x 2-foot x 1/2 inch plywood shield; operating manual.

EG&G Geometrics ES2401 Digital Seismograph - 24 channel; operating manual.

One each 24-takeout, 10-foot centers seismic land cable, and adapter cable is needed - if conditions are marsh, then appropriate marsh cables and phones may be warranted.

Twenty-six each (8 - 14 Hz) land geophones with appropriate connectors.

Trigger switch and minimum of 250-feet of trigger cable - compatible with EG&G ES2401 Seismograph and Betsy Firing Rod (and additional 500-foot trigger cable may be required for profiling mode).

AT THE PROPOSED ANS SITE

Auger with 1-1/2 inch diameter- 24 inch-long auger stem or rolled steel ROD with sledgehammer - to provide shot holes for Betsy Downhole Percussion Rod.

Safety Equipment - safety shoes, goggles or face shield, hardhat, ear plugs, gloves.

Miscellaneous - hand level, CB radios (1 for each crew member), field notebooks, computer disks, seismic recording paper, maintenance tool kit, 300-foot fiberglass survey tape.

Procedure PRE-SURVEY SET UP

1. Check out all equipment prior to going into field - assure all equipment is operable and compatible.

2. Determine how equipment is going to be transported infield - assign by task (i.e. keep all shot equipment together).

3. Keep equipment together after check out - allow time daily for maintenance and cleanup of equipment - document all maintenance.

4. Field crew should be familiar with equipment - may require spending 1st day in field as training session - each field crew member should read vendor manuals regarding field operation and safety procedures or be properly instructed.

5. Obtain field maps; establish grid numbering system.

FIELD SET UP (STATION OR SOUNDING MODE)

1. After arriving at the station to be surveyed, the geophone cable is stretched out with the station stake located midway between geophone takeouts #12 and #13 unless field conditions prohibit - cable orientations should be varied to help eliminate always recording parallel or perpendicular to geologic strike - line orientations should be selected to allow as little elevation variation as possible.

2. The seismic cable should be as straight as possible so that the geophones can be placed using the takeouts as reference - however if site conditions warrant - a fiberglass survey tape may be required to accurately space geophones.

3. Twenty-four geophones are laid out and one is connected to each takeout on the cable, keeping the connectors dry. The geophones "plant" should be in a straight line and vertical and well coupled with the ground. Sandbags may be used and/or the upper several inches of topsoil removed to improve coupling and minimize air shock.

4. The ES2401 operator hooks up seismic land cable to the seismograph and checks for continuity and leakage and "noise". The operator relays by CB radio, which geophones need reconnecting or drying off and/or replanting and rechecks system. Once line is ready for shooting - crew members should remain away from it to insure not getting tangled and disconnecting or damaging cable or geophones. Instrument recording parameter will be determined during first day of field work - may have to be modified as required.

5. Measure 10 feet off end to the first shot point, deploy Betsy equipment and shot cord. Shot cord should be away from seismic land cable to minimize chance of interference and tangling of lines. After trigger is connected to one end of the shot cord and the other connected to the seismograph - a test should be performed prior to shooting with a shell - if system triggers, then ready to continue - if not, determine cause of malfunction and fix.

6. Shot hole is augered (with auger or steel rod) to a depth of 24 inches, encapsulated shell is attached to rod (after checking that firing safety is on) and rod placed in shot hole. The Betsy operator determines if the area is safe for shooting and informs the seismograph operator; field crew reminded to remain still during shooting - this may be important especially if the entire field crew is not visible due to line length, elevation or vegetation.

7. With coordination with seismograph operator, the shooting operator will release firing safety and detonate shell - following vendor manual and safety instructions. When the seismograph is "armed" care should be taken not to cause erroneous triggers as this will degrade the data. If stacking is required, a judgement made by the seismograph operator, then reset safety and reload. If in the stacking mode, care should be maintained to not allow erratic triggering of the system - this may result in re-shooting.

8. After final stacking of shots, the seismograph operator will print the record to a disk file and to the field printer. The operator will annotate the disk file as required by the seismographs's software menu and also, label the paper record with the date, line number, shot location, and filename.

9. Follow items 5, 6, 7 and 8 at each shot location - with a minimum of two shot locations off the ends of each line (forward and reverse).

10. Care should be taken to shoot and record during the quietest possible times - the crew should be away from the line and listening for cultural noise (cars, airplanes, etc) and wind noise - remember that all of these factors excite the geophones and cause degradation of signal. An acceptable record should exhibit quality data by not incorporating excessive noise and not requiring maximum equipment gains.

Title: PROCEDURE FOR SEISMIC REFRACTION SURVEY
AT THE PROPOSED ANS SITE

11. The seismograph operator will physically walk the line and record in field notebook: date, line number, orientation, relative geophone elevation, and any other pertinent information (e.g. geophone position relative to potential interference or grid location, weather conditions, etc.)

FIELD SET UP PROFILING MODE

The survey field set up and procedures will stay basically the same for the two (2) proposed profile lines except as follows:

1. Geophone #1 will always be the most westerly or northerly geophone of each seismic spread. There will be a three geophone overlap between spreads for time correlation control. Care must be taken not to disturb these three geophones when moving the seismic cable to next position.

2. Initial field shooting parameters require a minimum of five shot locations per seismic spread: two at 150-feet and two at 10-feet off ends, and one midway between geophones #12 and #13. The two at 150-feet may be changed depending on the testing performed during first profiling day (energy attenuation may be excessive).

3. Same safety and field procedures as for sounding surveys applies.

Data Reduction

It is imperative that the seismic refraction data be reviewed and preliminary data reduction performed on a daily basis. This is not only an economic consideration but is necessary to provide necessary quality control and proper maintenance of survey parameters.

1. Preliminary data reduction begins with review of the analog record (on the seismograph screen or printed copy) by the operator.

2. Daily the data will be downloaded from the seismograph to diskettes. A backup copy of the diskettes will be made. One diskette will remain at ORNL and one copy will be used for subsequent data reduction. Copies of the field printer records will be made daily to aid in data reduction (originals will remain at ORNL).

3. Copies of all field data sheets will be made daily and originals kept at ORNL.

4. The seismic data will be processed using an industry-accepted method (Generalized Reciprocal Method - GRM; Time/Intercept - TI; or some combination of these methods - which specific method will be dependent on the recorded data, purpose - sounding vs profiling). The methods used will be documented in the accompanying project report.

Title: PROCEDURE FOR SEISMIC REFRACTION SURVEY
AT THE PROPOSED ANS SITE

5. Data processing sequence: Copies of raw seismic field data (720K, 3.5" diskette), analog records, and field information (e.g. geophone elevations and locations, shot info) provided

daily.

1- Digital data transferred to picking routine format
2- Elevations of each geophone determined and merged with shot information. Digital trace file created for each seismic spread
3- Seismic trace from each geophone reviewed and time of first arrival picked and merged with trace file
4- Data plotted as Time/Distance plot (1"=100 feet horizontal scale) and reviewed
5- Arrivals assigned to proper layers (maximum of 3 or 4 layers)
6- Time/velocity/depth section information calculated
7- Top-of-rock information plotted manually on site map

6. Results of data reduction discussed with field survey crew

Data Presentation

The top-of-rock configuration data obtained from the seismic refraction survey will be presented as follows:

1. Contour map of top-of-rock surface based on the sounding data: 1 inch = 100 feet scale and 5-foot contour interval.
2. Two top-of-rock profile plots at 1 inch = 100 feet horizontal scale.

Quality Assurance

Though this survey is performed for an economic evaluation of the site and does not provide engineering parameters, it is imperative that the appropriate level of quality assurance is applied. The data acquired must be the best possible, under the time and cost constraints associated with its usage, it does not have to be tied rigidly with such ASTM, or similar, standards as would engineering-related data.

There is quality control inherent in the varying orientation of the seismic lines, the recording of forward and reverse information, the documentation of field procedures, including the recording of geophone specific information previously discussed, and with the daily review of the data and modifying field procedures as required.

It is recommended that one station be kept intact for reference for future refraction work if performed. This location could then be surveyed by subsequent seismic contractors to minimize equipment/technique variations.

BETSY DOWNHOLE SEISGUN SOURCES (Patent Pending)

Betsy downhole seismic energy sources use common shot shells in disposable, inexpensive plastic capsules to achieve maximum energy output of these shells which are safe, economical, unrestricted, packaged power in a variety of sizes and loads, readily available and well suited for many types of seismic surveys with objectives down to several thousand feet.

Energy efficiency of encapsulated and exploded shot shells approaches 100%, compared to as little as 20% for some gun-fired projectiles and even less for no-barrel devices in which the shell primer blows projectile, wad and propellant out of the shell casing with near total wastage of the propellant, which must be severely confined, as in a long gun barrel or strong-walled capsule, to induce heat and pressure required for complete propellant burn and energy release.

Shell capsules are 4 inches/10 cm in length; 1.5 inches/4 cm in diameter; can be loaded down a slim shot hole; will accomodate the Remington R21MM 8-gauge seismic electric shell or percussion shells of 8-gauge, 12-gauge and .410 caliber.

Electric and percussion firing methods include sleeve, holder and seal accessories which permit open muzzle downhole shell fire without capsules; wired capsules which can be lowered to any hole depth; threaded connectors with which multiple capsules may be coupled together and fired in sequence, with shot initiation by electric blaster or percussion hammer.

Shortest sequential shell-to-shell firing times average, by chronograph timing, one-third millisecond in standard 4-inch capsule/connector/firing pin assemblies.

Assemblies of other lengths can be provided for sequential shot firing at propagation velocities from below 500 ft/sec, 152 m/sec, and up. Experience to date indicates optimum results are obtained if sequential shot propagation velocity is about 4/5's the velocity of the surrounding medium.

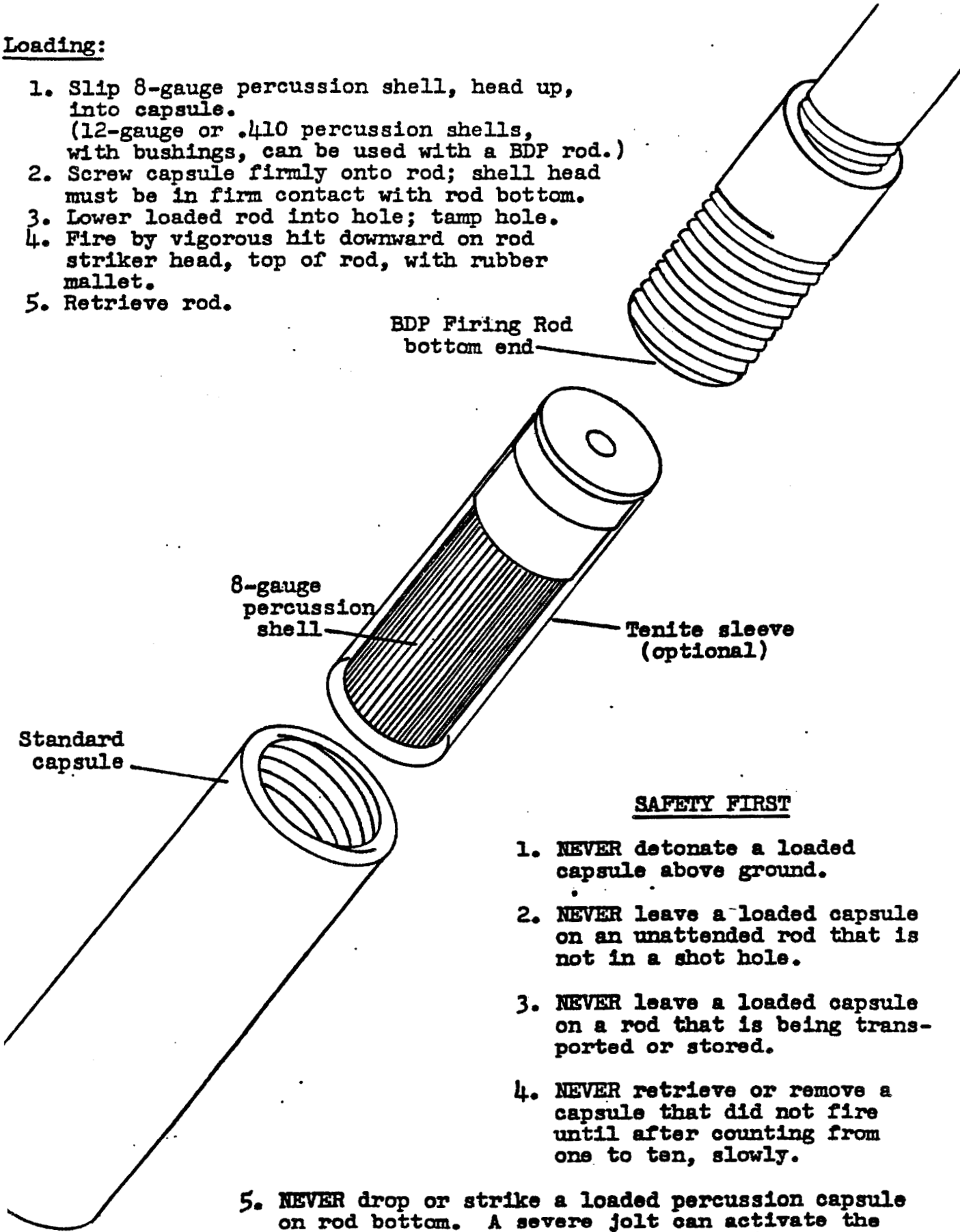
Winchester UW12BL 12-gauge percussion black powder blank is shell of choice for most energy at least cost, plus usually apparent wider seismic bandwidth, believed due to highly efficient energy transfer into elastic radiation from black powder explosion at a velocity of 1800 ft/sec, 549 m/sec.

BETSY SEISGUN INC.
P.O. Box 471143 Tulsa, OK 74147-1143 U.S.A. (918) 622-6865 Telex: 796374 HQ TUL

Firing Method No. 3 - Betsy Downhole Percussion (BDP) Firing Rod

Loading:

1. Slip 8-gauge percussion shell, head up, into capsule.
   (12-gauge or .410 percussion shells, with bushings, can be used with a BDP rod.)
2. Screw capsule firmly onto rod; shell head must be in firm contact with rod bottom.
3. Lower loaded rod into hole; tamp hole.
4. Fire by vigorous hit downward on rod striker head, top of rod, with rubber mallet.
5. Retrieve rod.



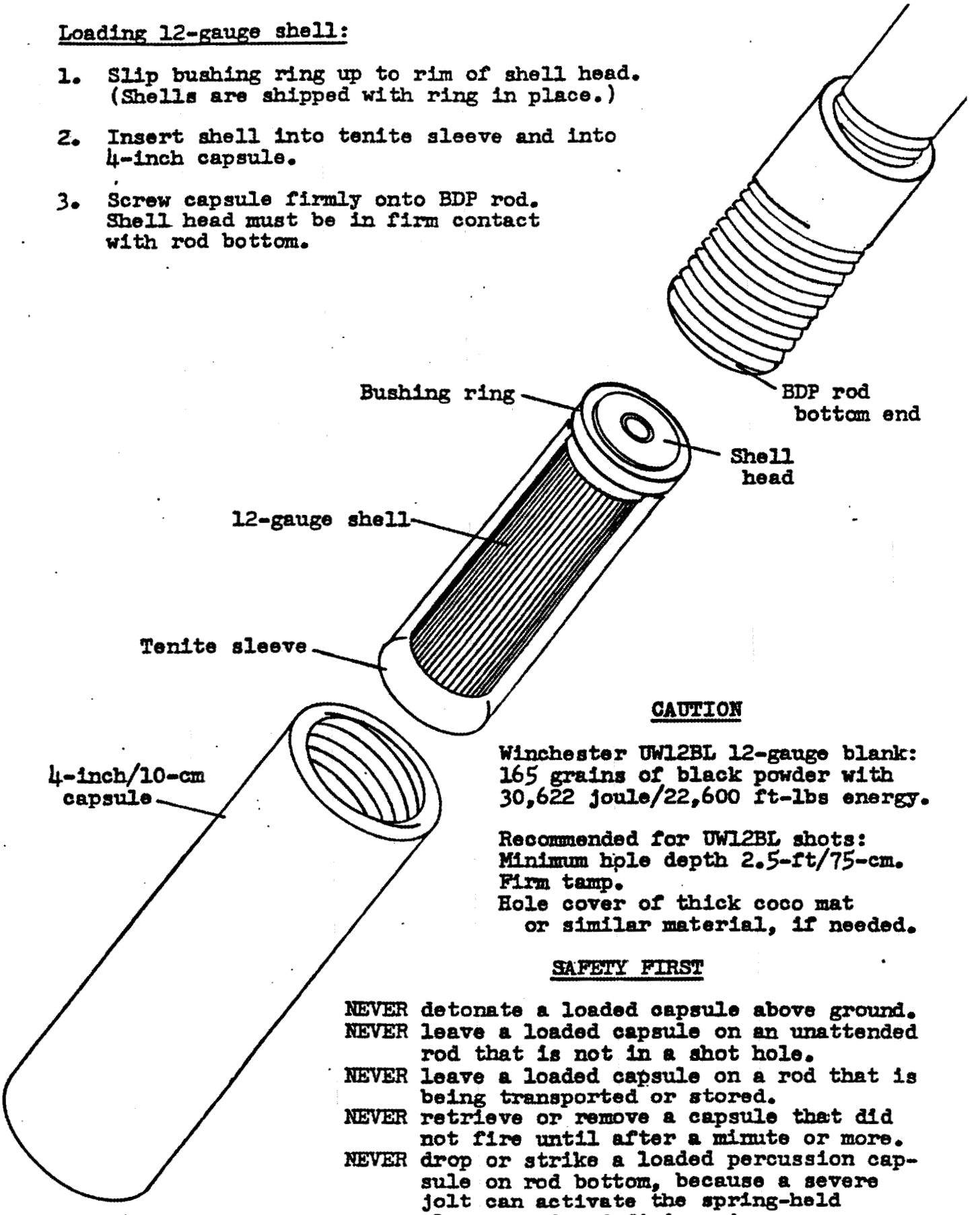
SAFETY FIRST

1. NEVER detonate a loaded capsule above ground.
2. NEVER leave a loaded capsule on an unattended rod that is not in a shot hole.
3. NEVER leave a loaded capsule on a rod that is being transported or stored.
4. NEVER retrieve or remove a capsule that did not fire until after counting from one to ten, slowly.
5. NEVER drop or strike a loaded percussion capsule on rod bottom. A severe jolt can activate the spring-held plunger rod and firing pin.

Firing Method No. 3 - Betsy Downhole Percussion (BDP) Firing Rod

Loading 12-gauge shell:

1. Slip bushing ring up to rim of shell head. (Shells are shipped with ring in place.)
2. Insert shell into tenite sleeve and into 4-inch capsule.
3. Screw capsule firmly onto BDP rod. Shell head must be in firm contact with rod bottom.



CAUTION

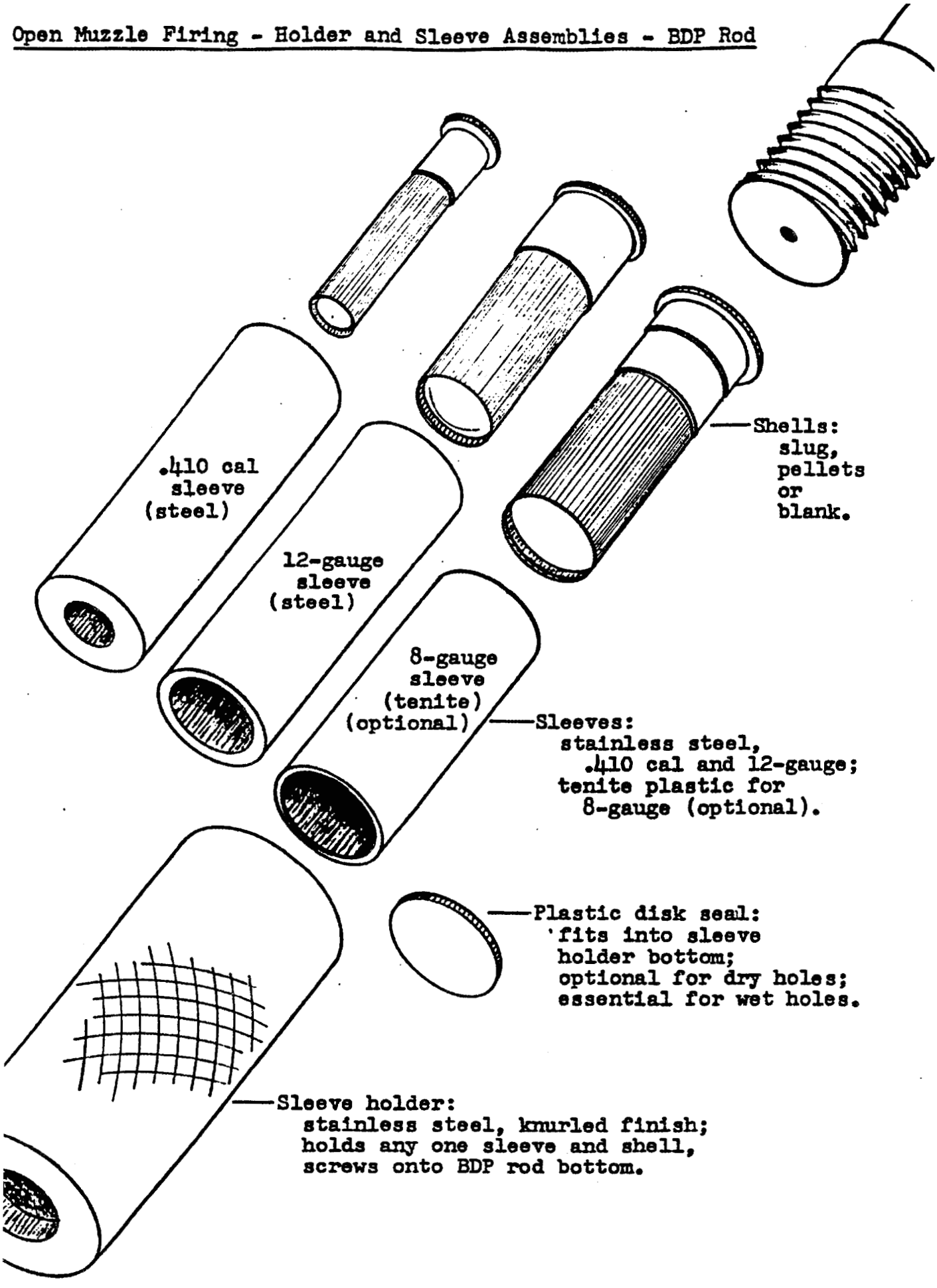
Winchester UW12BL 12-gauge blank: 165 grains of black powder with 30,622 joule/22,600 ft-lbs energy.

Recommended for UW12BL shots:
Minimum hole depth 2.5-ft/75-cm.
Firm tamp.
Hole cover of thick coco mat or similar material, if needed.

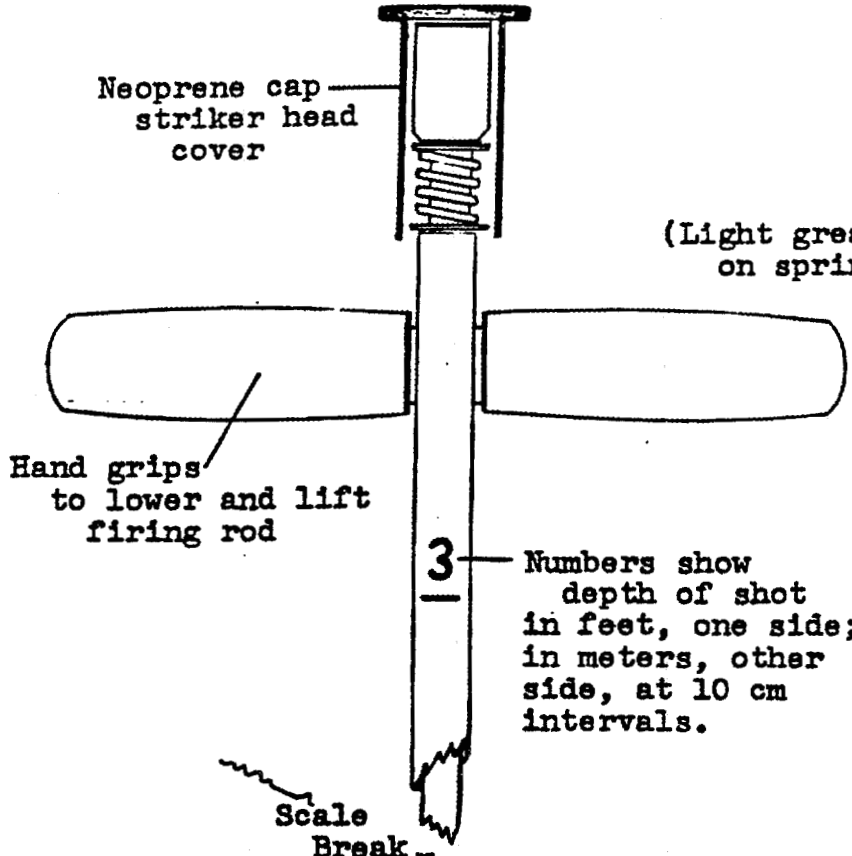
SAFETY FIRST

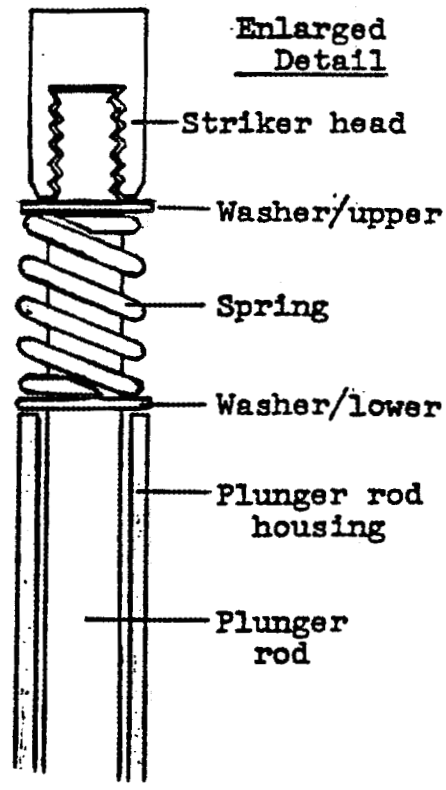
NEVER detonate a loaded capsule above ground.
NEVER leave a loaded capsule on an unattended rod that is not in a shot hole.
NEVER leave a loaded capsule on a rod that is being transported or stored.
NEVER retrieve or remove a capsule that did not fire until after a minute or more.
NEVER drop or strike a loaded percussion capsule on rod bottom, because a severe jolt can activate the spring-held plunger rod and firing pin.

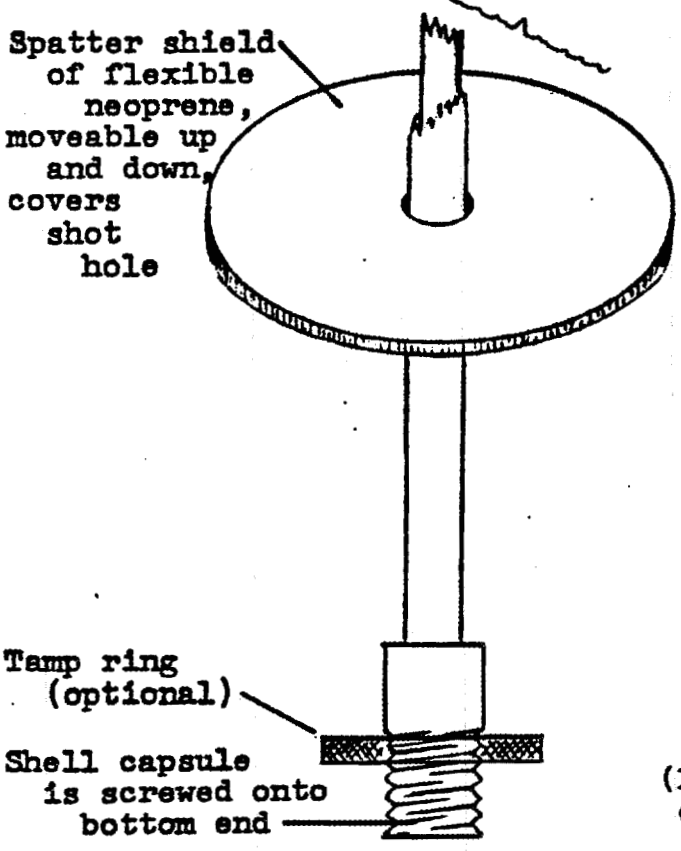
Open Muzzle Firing - Holder and Sleeve Assemblies - BDP Rod



Betsy Downhole Percussion (BDP) Firing Rod Assembly

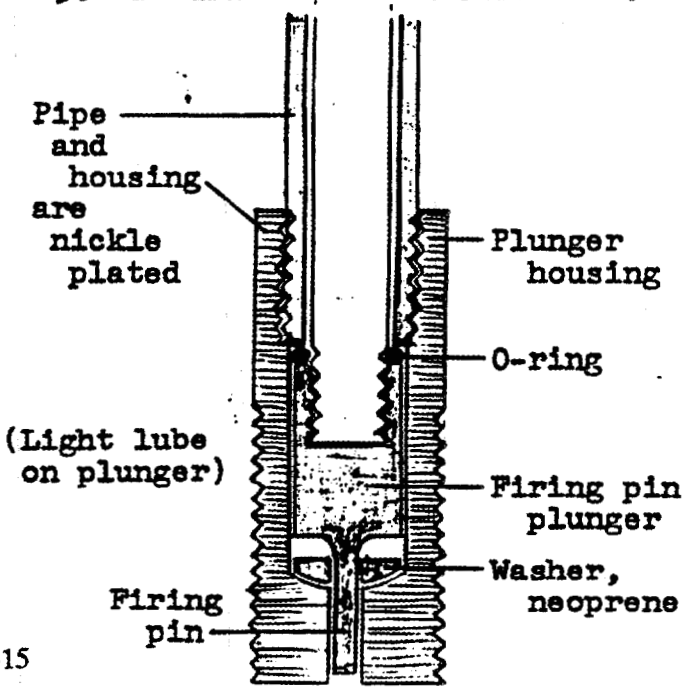




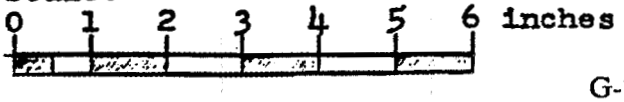


OPERATION

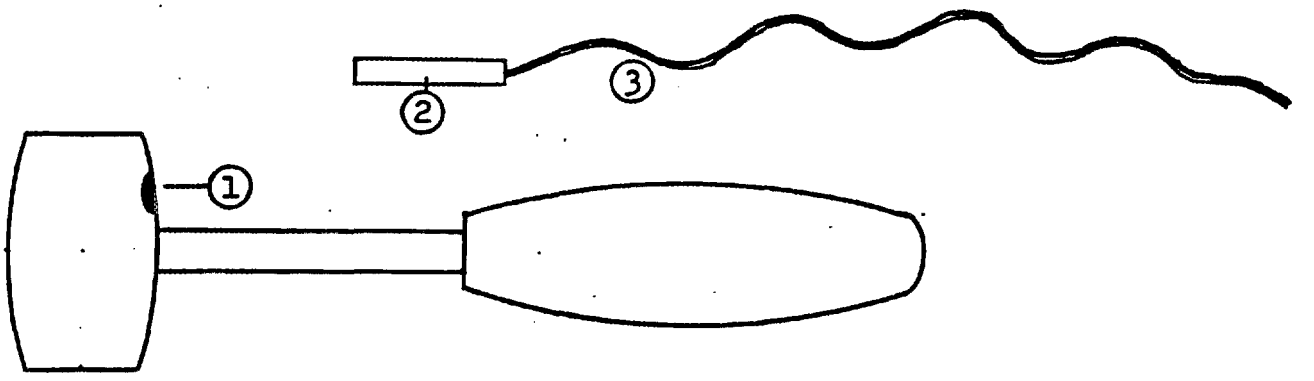
1. Check striker head spring action to make sure firing pin is retracted just inside plunger housing at bottom of rod.
2. Screw capsule containing percussion shell onto bottom of rod.
3. Lower rod into hole; tamp hole.
4. Hit downward, with vigor, on top of striker head with rubber headed mallet to fire shell.
5. Withdraw rod from shot hole.



Scale:



Betsy Downhole Percussion (BDP) Firing Rod
Hammer and Switch Recommendations

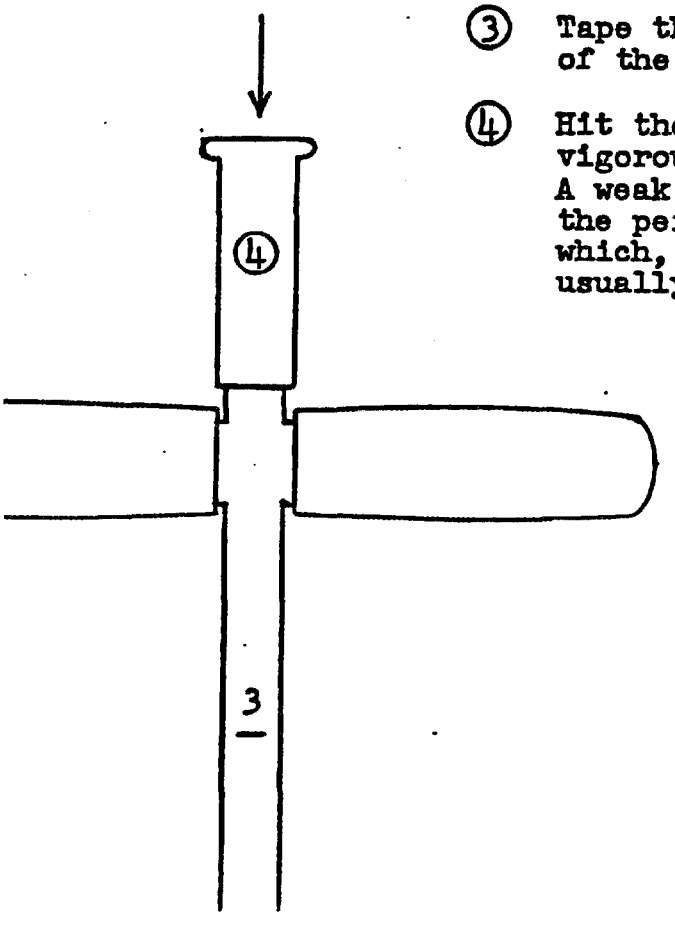


1. Bore a hole of suitable size into or through the rubber head of the striker mallet or hammer.

2. Insert the hammer switch into the hole and secure with sealant or several wraps of tape.

3. Tape the switch wire to the handle of the mallet or hammer.

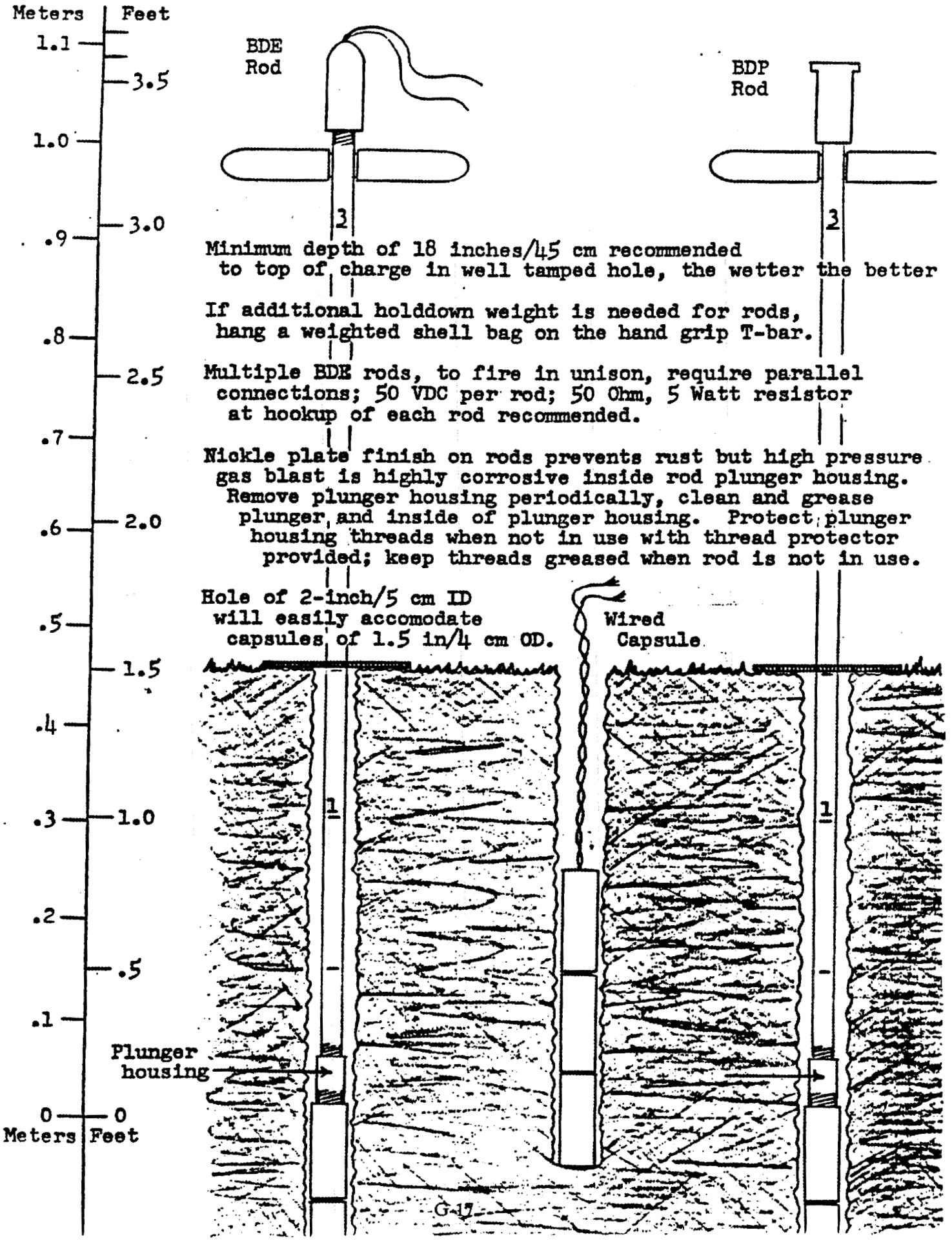
4. Hit the BDP striker head with a vigorous heavy blow of the mallet. A weak light blow will only dent the percussion shell primer, after which, dented, the shell cannot usually be detonated.



It is not necessary to hold onto the rod hand grips, percussion or electric rods, when detonating a shot, although recoil is slight in a well tamped hole because the encapsulated shells explode spherically divergent, not directionally downward as in a gun barrel.

Shots in very shallow or hard rock holes will, of course, result in more rod recoil.

Betsy Downhole Rods and Capsules - General Recommendations



SHALLOW SHOT HOLDDOWNS:

Capsule shots at hole depths of one foot or less, because of rocky soil, frozen ground, etc., may result in unwanted blow out and blast noise.

A coco fiber door mat, usually available at any discount store, is an efficient and economical and long wearing hole cover, holddown and muffler.

For use with a firing rod: Cut a 2-inch diameter hole in the center of the mat; insert the rod thru the mat and into the shot hole; tamp the hole; slide the mat and spatter shield down the rod, with the mat on the ground, the spatter shield on top of the mat.

For use with wired capsules: Plant the wired capsule in the shot hole; tamp the hole; place the mat over the shot hole; place a heavy object, if available, on top of the mat. The best mat weight is a steel plate, 1-ft diameter sufficient, on which a helper can stand.

CHARGE TAMPING:

Detonation of any type explosive charge in a void lessens energy propagation because of poor ground couple.

The smaller the diameter of the shot hole, the better for good ground couple. A 2-inch diameter shot hole is recommended for Betsy capsules.

Firm dirt tamp above the capsule is essential. Water poured downhole onto the tamped capsule will improve holddown, ground couple and energy propagation.

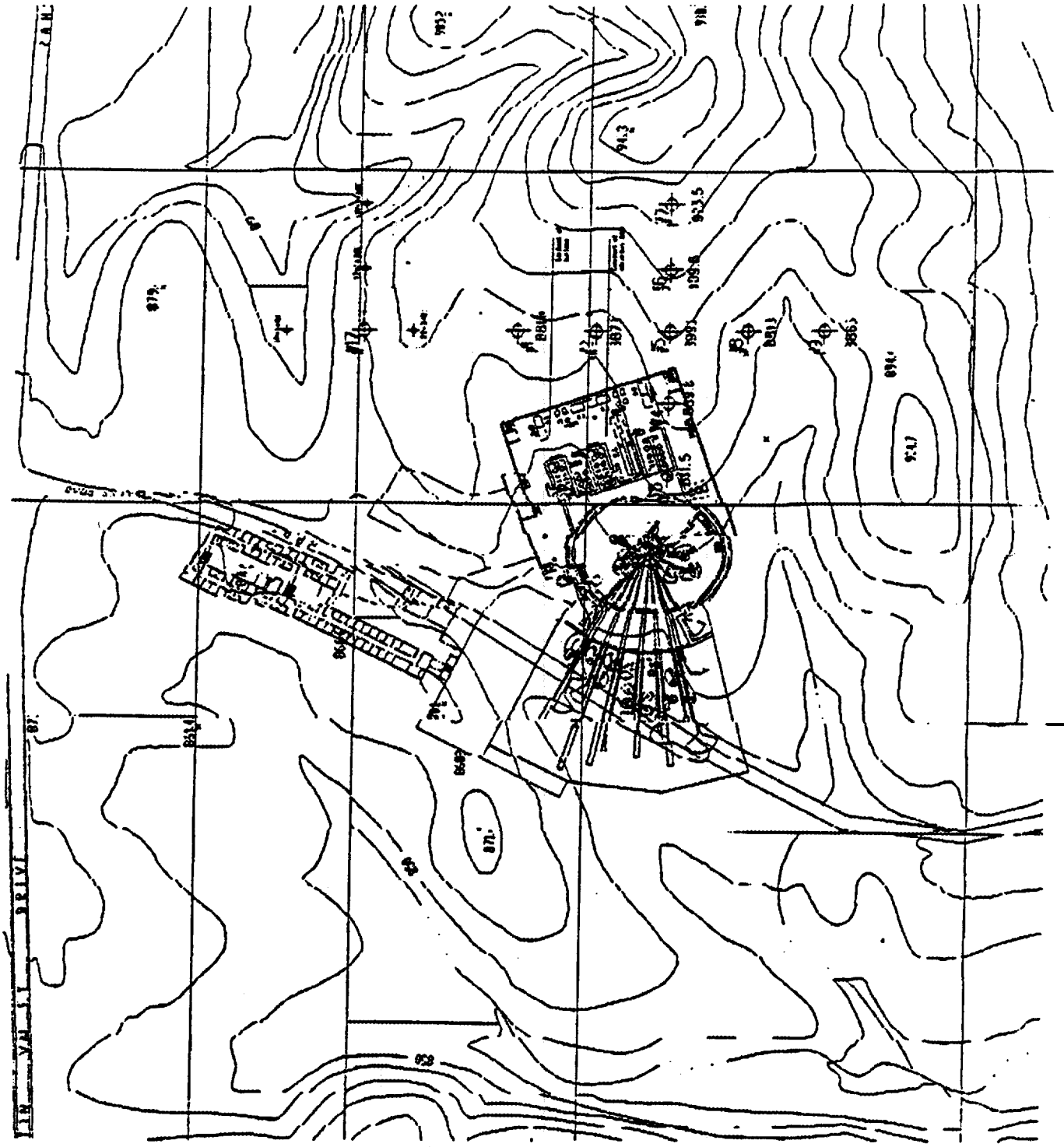
Sep 20, 1991

Bill Doll

Kim Davis asked me about relocating the ANS buildings relative to the work he is doing in the field. The attachment shows the most probable location of the facilities to date. Does it make sense to him or to you to recenter his activities given this change?

Please call

Dick Brown



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