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Interim Progress Report — Geophysics: Building E5032 Decommissioning, Aberdeen Proving Ground

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Argonne, Illinois 60439-4815
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by L.D. McGinnis and S.F. Miller

Reclamation Engineering and Geosciences Section, Energy Systems Division,
Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439

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Abstract

Integration of data from surveys using three geophysical technologies has provided information used to define the locations of buried utilities, tanks, vaults, and debris near building E5032 at the Aberdeen Proving Ground. Ground penetrating radar (GPR) profiles indicate the presence of buried pipes, tanks, reinforcement rods (rebar), and remnants of railroad tracks. A magnetic map constructed from a detailed magnetic survey on the north side of the building outlines buried iron-rich objects that are interpreted to be iron pipes, tanks, and other debris of uncertain origin at relatively shallow depths. Horizontal electrical resistivity surveys and vertical electrical resistivity soundings essentially corroborated the findings obtained with the magnetometer and GPR. In addition, a highly resistant layer was observed on the east side of the building where a former railroad bed with a thick gravel fill is believed to immediately underlie the lawn. The resistivity data show no evidence of a conductive leachate plume. Geophysical measurements from three techniques over a buried concrete slab approximately 130 ft north of Building E5032 give geophysical signatures interpreted to be due to the presence of a large iron tank or vault. An attempt was made to gather meaningful magnetic data on the east, west, and south sides of the building; however, the quality of subsurface interpretations in those areas was poor because of the influence of surficial iron lids, pipes, grates, and the effects of the corrugated iron building itself.

1 Introduction

The geophysical phase of the building demolition program at Building E5032, Aberdeen Proving Ground, was carried out during the week of April 8, 1991. A historical overview of Building E5032 and its immediate surroundings, including accessory out-buildings, is given in the ANL Geophysical Survey Work Plan for Building E5032. Geophysical measurements conformed to the basic work plan in that magnetics, ground penetrating radar (GPR), and resistivity surveys were conducted; however, considerably more extensive surveying was accomplished north of the building than to the south, west, and east. The area to the north of the building was perceived to contain buried relics of structures, plumbing, storage tanks, and other objects of interest that were used in former operations related to Building E5032 and that could be defined through geophysical

study. Cultural features (such as the proximity of a major road to the south and an old railroad bed with rails still intact on the west) lessened the quality of subsurface interpretations in those areas. Because of the generally good quality of the GPR and magnetic data, two days were spent on each of these techniques and only one-half day was spent on resistivity data acquisition.

1.1 Geology and Physiographic Setting

The site is contained in topographically low and flat terrain underlain by alluvial and estuarine sands, silts, and clays. The water table is shallow and has low concentrations of dissolved salts. Building E5032 is located in the south half of the area of study. From the present configuration of the topography surrounding the site, a minor drainage system with a few feet of relief was probably present prior to construction of the building. The sand, silt, and clay content of the soils is expected to vary across the site, depending on the proximity to drainageways. Initial construction probably involved considerable amounts of excavation and filling so that most of the shallow sediment at the site is reworked.

Lithologies at the site were determined from the sample study of one bore hole drilled approximately 50 ft west of Building E5032. The descriptive log given in Table 1 was provided to the project by Aberdeen personnel. Facies represented include silt and sand fill material, with some natural soils at the surface to about a four-foot depth, followed primarily by thin beds of varying stratigraphy consisting of sands, silts, and clays. The greatest thickness of a single unit was a clayey silt 21 ft thick.

1.2 Surveys

The geophysics field study for Building E5032 removal at Aberdeen included three techniques that were designed to detect, identify, and locate buried objects associated with human activities that involve construction or operation of the building, as well as activities unrelated to the

TABLE 1 Borehole Log from One Well Drilled near Building E5032

Description	Depth (ft)	Thickness (ft)
Soil zone, tan, dry; with roots	0.5	0.5
Sand, silty, tan to cream, (mU); with olive, silty clay lenses	4.3	3.8
Silt, clayey, white, dense, hard; with red, dense clay that contains orange mottling near base	25.7	21.4
Sand, silty, white, (fU-mL), damp	29.0	3.3
Clay, dark red and olive mottling; with white silt in alternating bands with clay	42.3	13.3
Clay, dark brown, layered with sand, silty, light gray	46.0	3.7
Clay, dark gray, dense, hard; containing silt and sand that increases with depth	54.0	8.0
Iron concretion, hard, followed by running sands	54.1	0.1

building. Field work was accomplished in 4.5 working days. The geophysical studies included, in order of application, GPR, magnetometry, and resistivity surveying. All activities were essentially noninvasive, although resistivity surveying involved the insertion of four electrodes three to four inches deep into the ground.

Each technique had the following specific objectives:

- Ground Penetrating Radar -- to determine the geometry of, and to find the depth to, buried objects.
- Magnetometer -- to determine the location of buried iron-rich objects, including tanks, pipes, debris, etc.
- Resistivity -- to establish the regional subsurface geological framework, lithological characteristics, and depths to buried objects.

Data acquired during field operations included the following:

- 5178 (linear) ft of GPR profile along 83 lines,
- 1631 magnetic observations, and
- 7 electrical depth soundings and 17 fixed electrode separation stations.

1.3 Survey Grid and Locations of Observations

Prior to geophysical surveying, a gridded array of wooden stakes was placed in the ground around the building and coded relative to position. Grid spacing was five feet and is shown in Fig. 1. The zero coordinate was at the intersection of a line running parallel to and 20 ft south of the south side of Building E5032 and a line running parallel to and 20 ft east of the east side of the building. This point is not quite southeast of the southeast corner of the building, because the building is not perfectly aligned north-south and east-west. Positive numbers are measured north and west of the zero coordinate, whereas negative coordinates are measured south and east. North of the building, magnetic observations were made at one-foot intervals along east-west profiles that were spaced five feet apart. Four magnetic profiles (see Appendix A) radiating out and away from each side of the building were also measured to determine building effects and to tie the east-west profiles. These profiles were also surveyed with the GPR. In addition, north-south GPR profiles were run over the area, resulting in a five-foot grid north of the building. Resistivity measurements were made around the site to establish subsurface geological control, although a sounding was made at suspected former Building 91 to substantiate findings made with the magnetometer and GPR.

Objectives of the study as listed in the Work Plan were (1) to detect and locate objects and (2) to characterize a located object. These objectives were achieved and are described in the following pages.

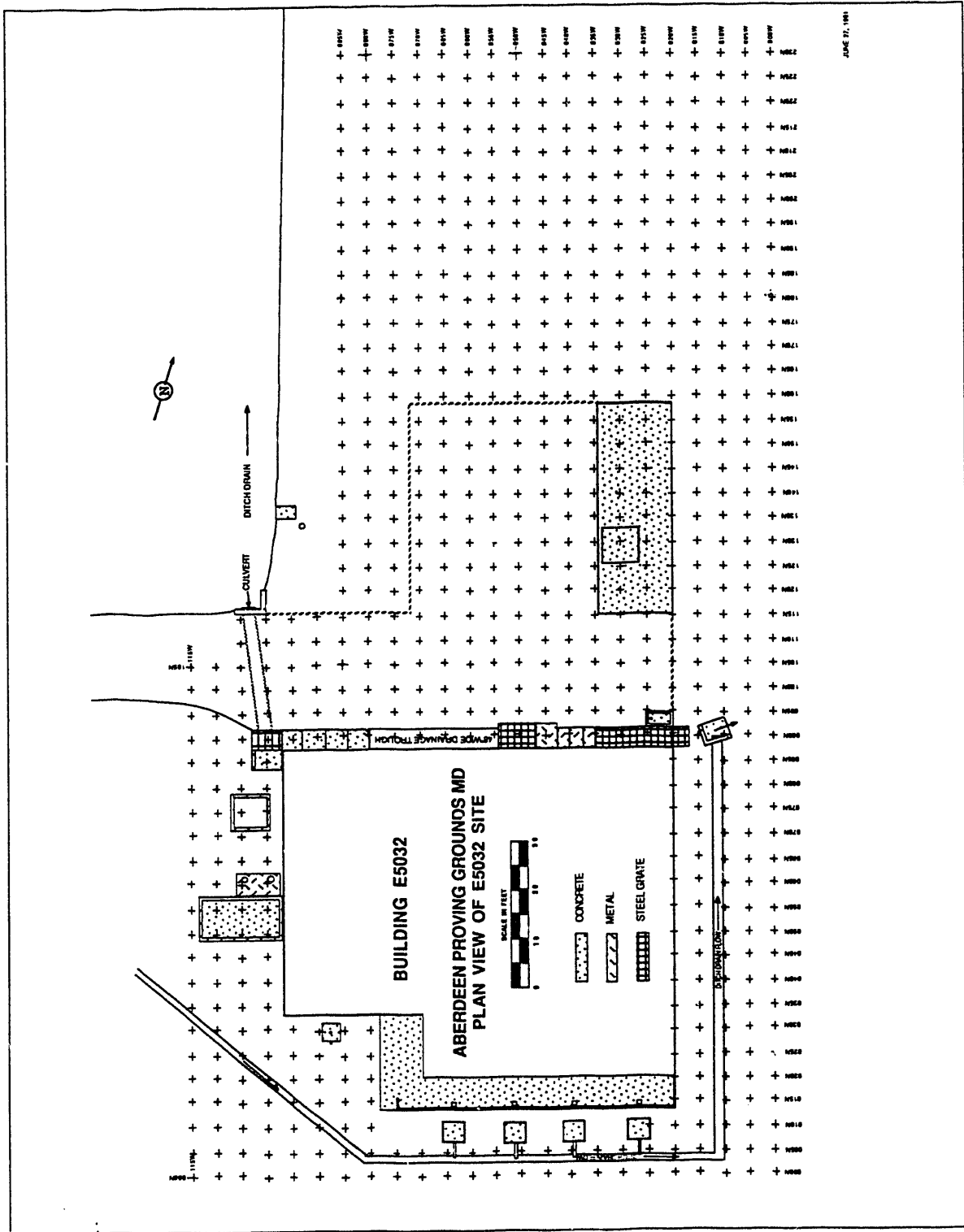


FIGURE 1 Site Map Showing the Outline of Building E5032 and the Grid Spacing

2 Ground Penetrating Radar

Ground penetrating radar measurements were made over 5178 ft of traverse and are shown in App. B. Lines are numbered in sequence and are listed in App. B, along with beginning and ending positions relative to the grid survey. Prior to running the production lines for the survey, repeat tests were run over the same line to determine which of the three antennas listed in the Work Plan were best suited to study the terrain surrounding the site. The antenna providing the best penetration and resolution of buried objects was the 300-MHz unit. Most of the profiling was done in the area north of the building, although lines were run around the perimeter of the building (as well as radially) to evaluate building effect. Perimeter profiles were designed to detect buried objects extending out radially from the building. Figures 2-6 show GPR profiles. Horizontal lines on the GPR graphs are equivalent to one-foot penetration depth, whereas vertical lines are marked at five-foot intervals and correspond to five-foot spacings on the grid map.

Without verification by another technique or by passing the antenna over a known buried object, characteristics of radar anomalies may only be inferred. However, where anomalies are also seen with the magnetometer or electrical resistivity meter, some interpretation of the radar anomaly is made possible. Good penetration was observed when the antenna was over gravel or concrete, whereas poor or no penetration was seen in grass-covered areas except where the sod was very thin and lay over gravel or concrete. For this reason, great care had to be taken to mark the position of the antenna relative to surface characteristics. These characteristics were written in notation form on top of the data record. Many of the anomalies seen on the records were simply manifestations of the reflectivity of the surface. To measure the depth to a buried anomaly, the measurement should be made from the reflector at 1.5 divisions from the top of the record.

Major findings of the GPR survey are listed as follows:

- A buried tank or vault signature seen beneath a buried concrete slab centered at coordinates 220 N-65 W and seen along lines 65 through 77. Figures 2 and 3 show the signature of the tank or vault.
- Rebar signature in concrete slab seen immediately north of Building E5032 on lines 81 and 82 that explains the large amplitude magnetic anomaly (Fig. 4).
- Railroad ties or their molds seen as repetitive hyperbolas on lines 19 and 20 (Fig. 5).
- Pipe anomaly seen on lines 49 and 50 (Fig. 6).
- Steeply dipping strata seen on line 52 at a depth of two to three feet. This is probably a pre-fill surface, although it could be a natural facies change (see App. B).

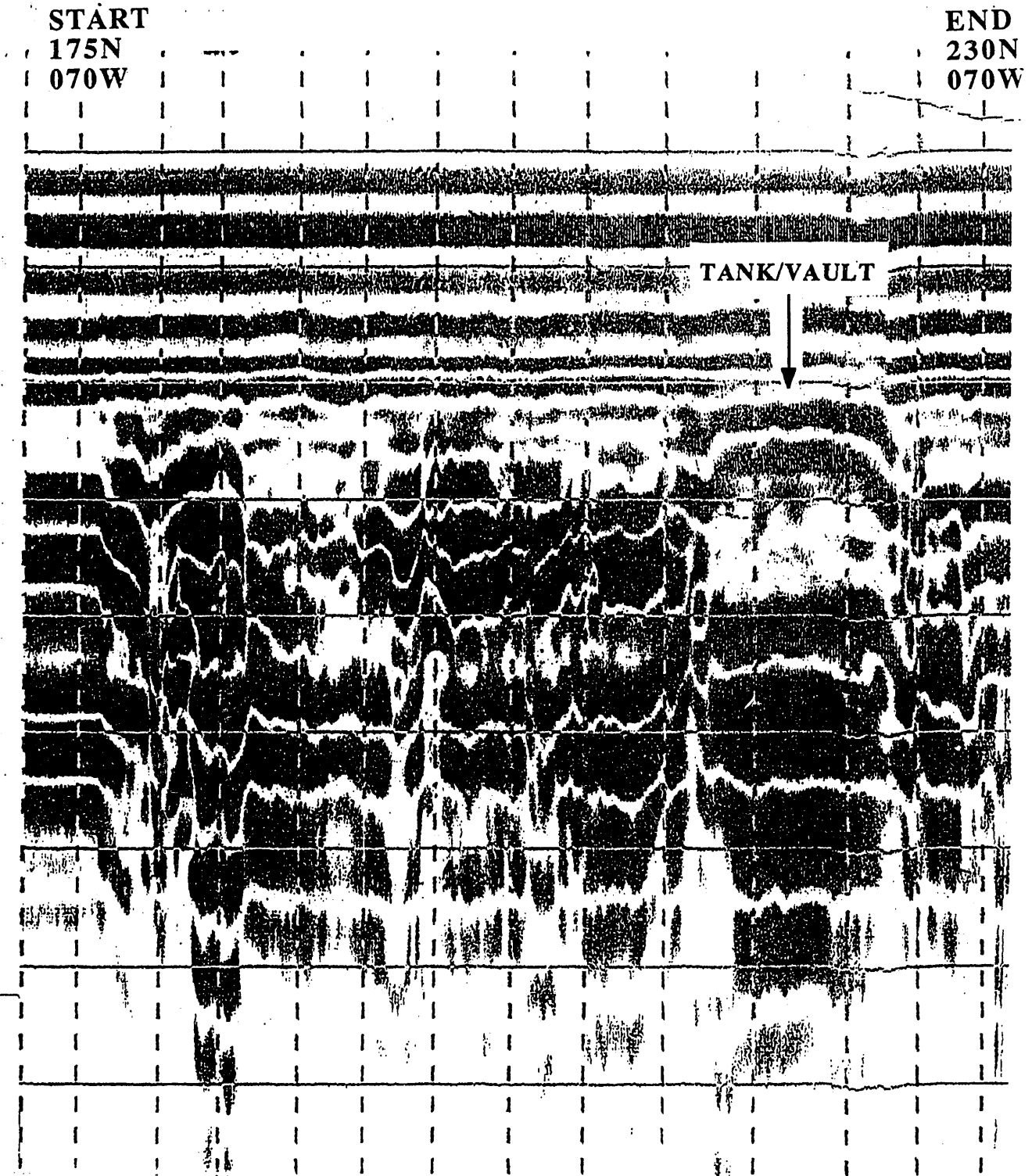


FIGURE 2 Ground Penetrating Radar (GPR) Signature over Buried Tank or Vault Centered at Coordinates 220N-065W along North-South Axis of the Object

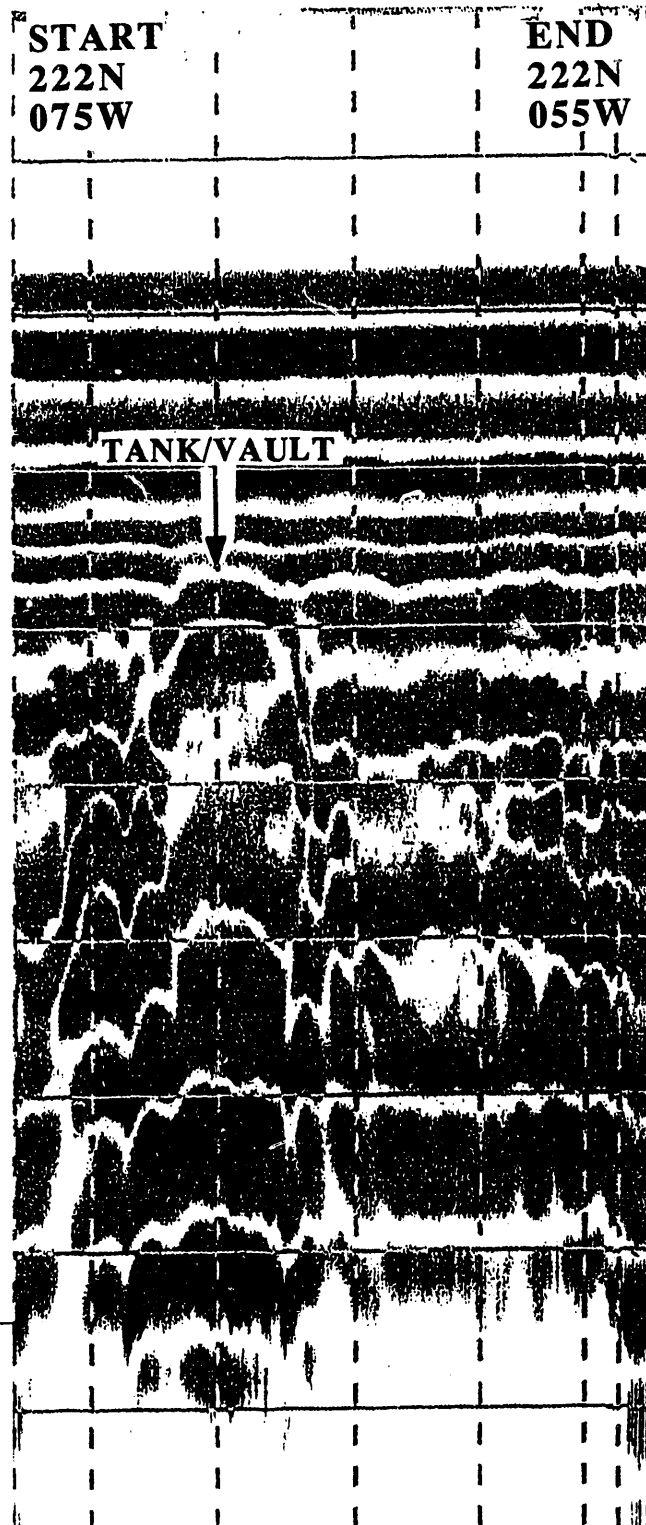


FIGURE 3 GPR Signature over Buried Tank or Vault
along East-West Axis of the Object

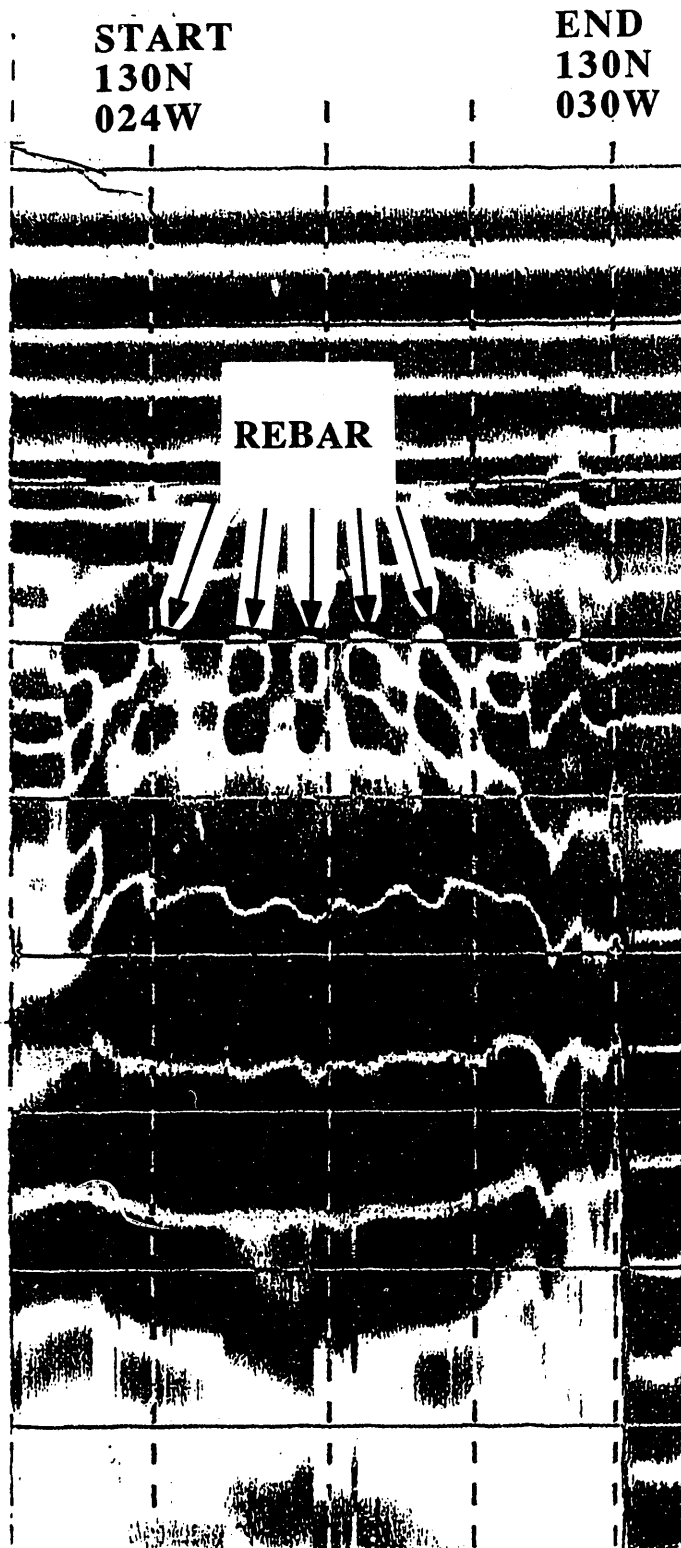


FIGURE 4 GPR Signature over Concrete Slab
Immediately North of Building E5032 (note steel
reinforcement in concrete slab)

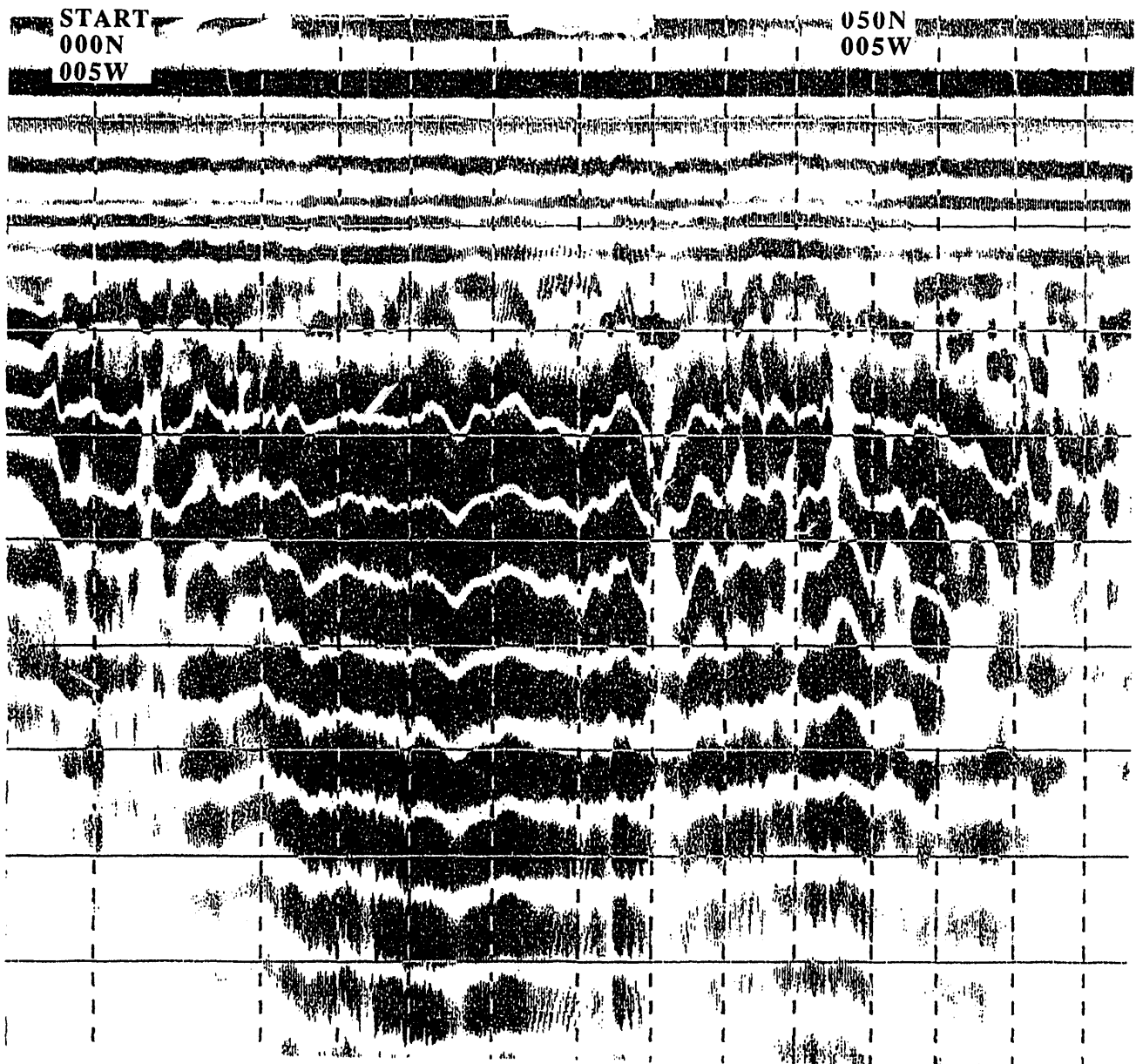


FIGURE 5 GPR Signature over Railroad Ties or Their Molds Seen as Repetitive Hyperbolas

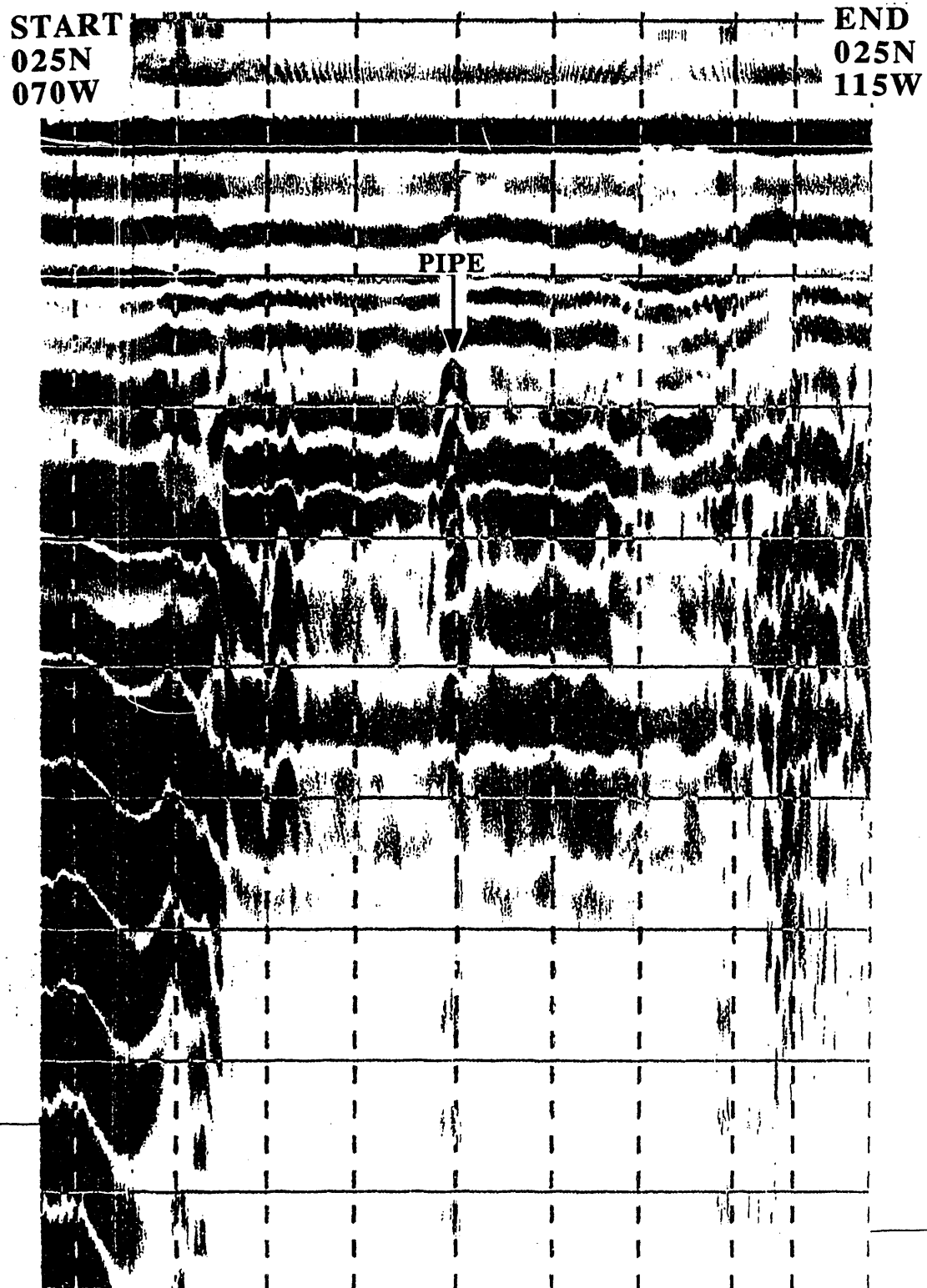


FIGURE 6 GPR Signature over Pipe Anomaly

3 Magnetometer

Total magnetic field observations were made at 1631 stations for use in construction of the magnetic maps shown in Figs. 7 and 8 as well as for diurnal corrections and background purposes. Magnetic data are given in tabular form in App. A. A base station value was read at approximately one-hour intervals during the magnetic survey to monitor natural diurnal variations and eliminate their effect on the data if necessary. Diurnal variations ranged over a field intensity interval of approximately 30 gammas, whereas anomalies due to building effects and buried objects varied over a range of 30,000 gammas, making any corrections unnecessary. Because of the presence of large, surficial magnetic objects in the site area, the magnetic sensitivity of smaller buried objects was enhanced by placing the magnetometer sensing head directly on the ground in an inverted position. Readings taken with the magnetic sensor on the aluminum mast would subtract from the field caused by small objects and enhance the building field.

Radial magnetometer profiles shown in App. A were measured along four lines from the exterior building walls in order to provide information on magnetic gradients expected due to the field caused by the corrugated iron-sided building. The line to the south showed very little change in the magnetic field from normal values of 53,000 gammas and is not shown. The line to the north is dominated by large-amplitude, short wavelength anomalies caused by buried debris and a large anomaly at the north end of the profile, presumed to be caused by a buried tank. East and west lines show strong, simple gradients beginning about 60 ft from the building.

Readings for the survey were made at one-foot intervals around the perimeter of the building. Detailed observations were made north of the building along east-west lines spaced five feet apart. Three north-south tie lines were made to constrain the network of readings. Readings were made at one-foot intervals along the profiles and required approximately two days of field operations. Because of the extremely large variations in the magnetic field, gradiometer measurements were taken but are not shown since they do not add to the interpretation.

3.1 Regional Map

Closely spaced, 200-gamma magnetic contour lines shown on Fig. 7 indicate the presence of buried or surficial iron or steel objects. Areas to the west, south, and east of Building E5032 are generally free of large pieces of iron litter, except for an unidentified anomaly of about 800 gammas centered at coordinates 10 N/0 W. Surface grates, pipes, and objects adjacent to the building on the west, east, and south sides would certainly cause major magnetic anomalies; however, data were not acquired in these areas since the materials were obvious and would mask unknown, buried objects. To the north, an iron-rich and varied magnetic landscape is evident, with some of the anomalies caused by obvious surficial sources such as poles, grates, grounding stakes, etc. Although identifiable if supplementary geophysical data are used, some anomalies are caused by inconspicuous sources (such as buried iron pipes), as well as by rebar in concrete slabs identified in the GPR profiling. Still other objects may only be inferred since they were not observed on the GPR. The details of the features observed in the north area will be discussed in

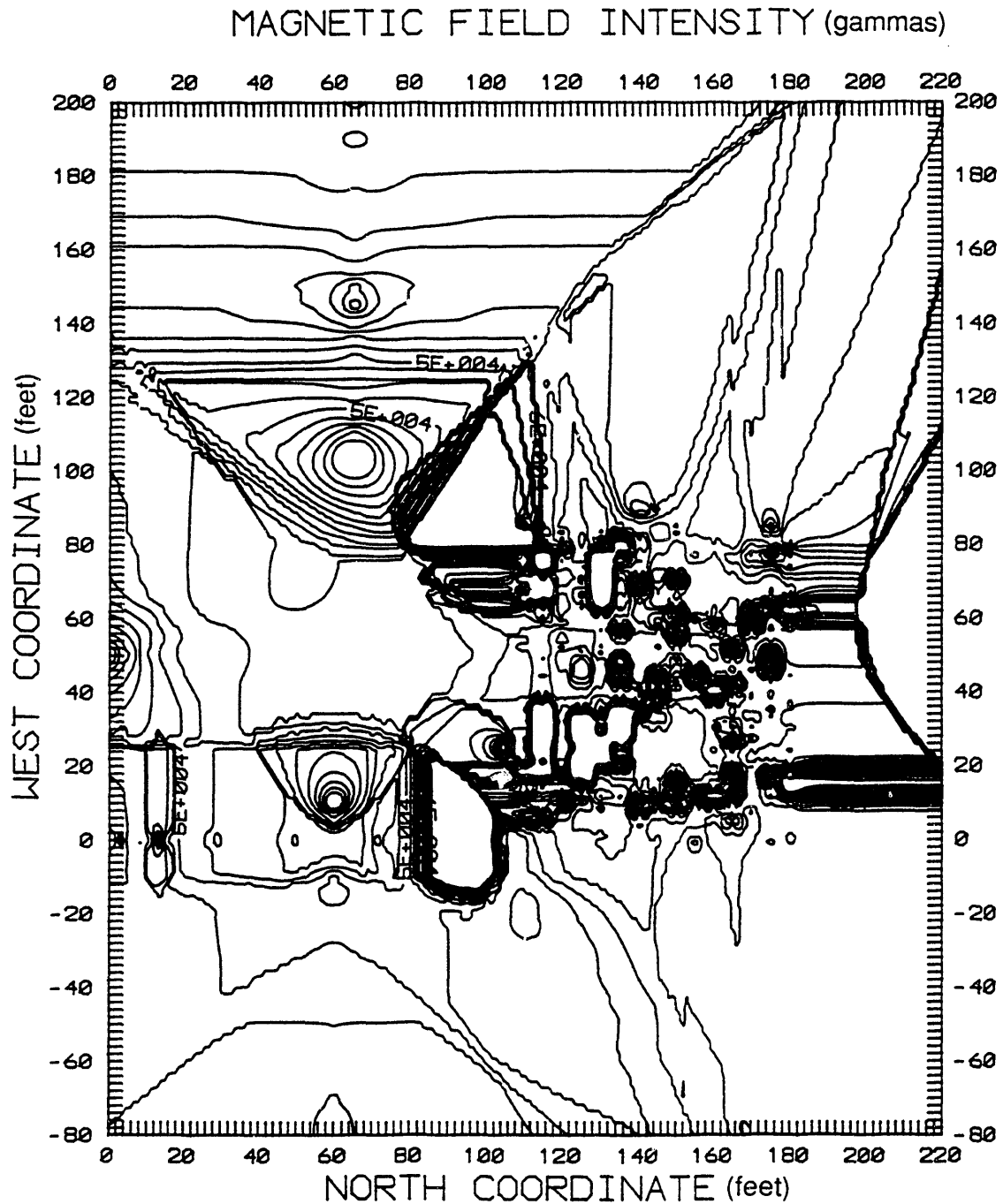


FIGURE 7 Regional Magnetic Map over the Site (Rectangular gradients around the building are due to the building anomaly. The contour interval is 200 gammas, with values over 60,000 deleted.)

the following section on the North Area Map (Fig. 8). Magnetic data over the buried tank at the presumed former Building 91 are not included in the contoured data; however, they are included in the north-south profile shown in App. A.

3.2 North Area Map

The North Area Map shown in Fig. 8, also contoured at a 200-gamma interval, is dominated by large amplitude anomalies having high gradients along their perimeters. The anomalies are truncated at 60,000 gammas so that their perimeters appear as black borders. These features tend to mask smaller anomalies, such as those caused by buried linear pipes. Each of the anomalies or anomaly groups on the map are itemized and explained as follows:

1. Most of the anomalies in the southern part of the area are due to easily identified surface objects near Building E5032 including grates, poles, grounding stakes, and rebar in concrete. Four anomalies may not be explained by surficial features, and the presence of buried tanks should be considered. These anomalies are centered at the coordinates 70 W 130 N, 30 W 135 N, 30 W 128 N, and 30 W 115 N. If the surficial debris were removed, these four anomalies could be evaluated more extensively.
2. A north-south line of anomalies along approximately 18 W appears to follow a ditch and may be caused by old railroad track debris (such as spikes, rail, etc.). This anomaly extends at least 40 ft north-south and may be correlated across 9 east-west lines. The anomaly is high amplitude and is unlikely to be caused by scattered, unconnected debris (such as random spikes, etc.).
3. An east-west line of anomalies along about 135 N and extending from the west side of the surveyed area may be caused by a buried iron pipe that is emerging into the west border ditch.
4. A north-south line of relatively low amplitude along about 75 W beginning at the north side of the surveyed area may be a buried pipe that was associated with Building 91. Although continuous data do not extend to the building site, a buried object probably remains beneath the area. The anomaly ranges from a low amplitude of perhaps 400 gammas to over 2000 gammas. Although less intense than the anomaly to the east, it is a continuous, linked feature.
5. In the area between 35 and 70 W and 140 to 180 N, a number of discrete, high-amplitude anomalies having widths varying from several feet to ten feet are not explained by the presence of any surface feature. These anomalies are in grass- or gravel-covered areas that are otherwise undisturbed. Because of the poor penetration of the GPR in this area, no supplementary information can be used to identify these features.

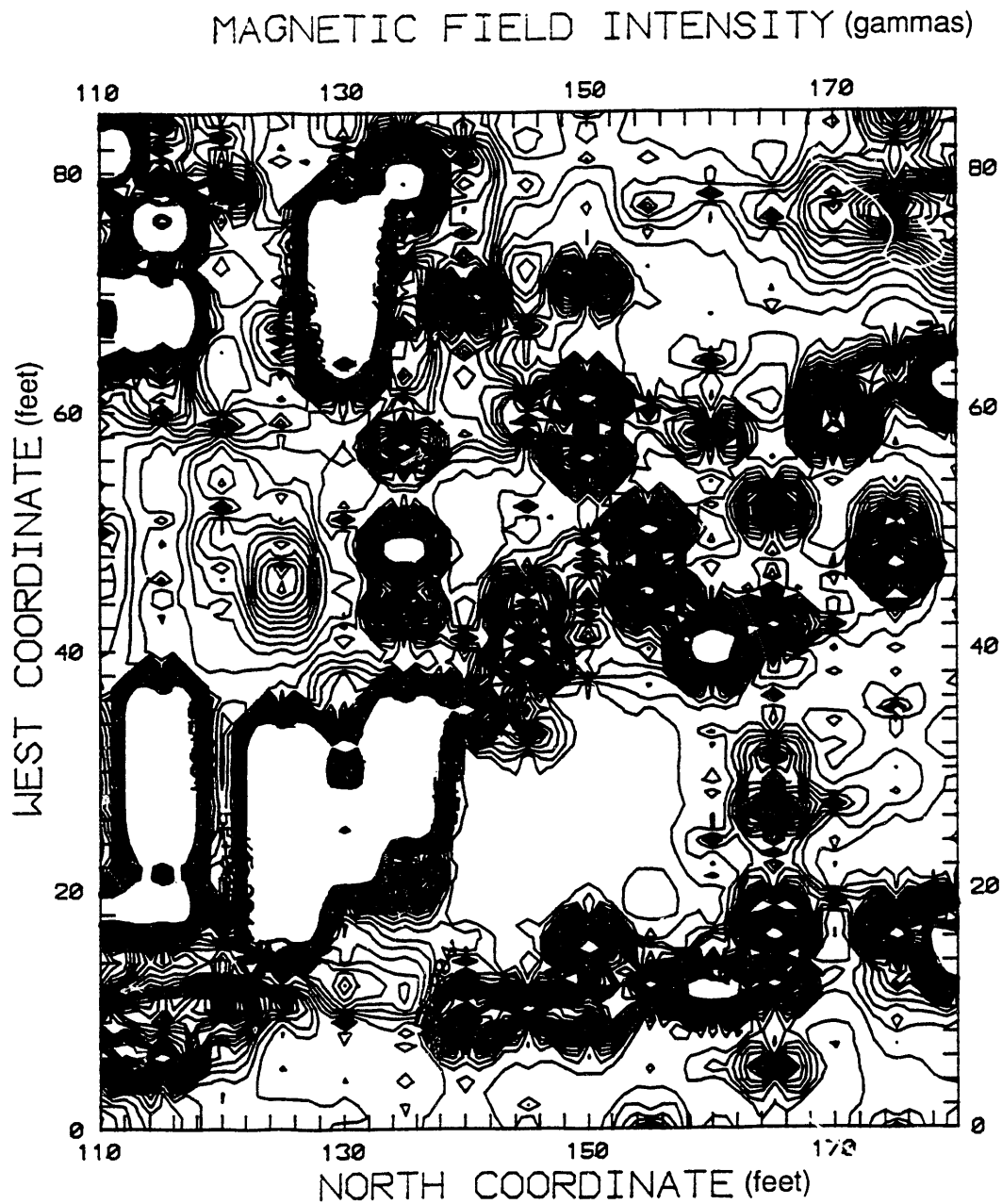


FIGURE 8 Magnetic Map of the Flat Area North of the Building (Contour interval is 200 gammas with values over 60,000 gammas deleted. If values over 60,000 gammas had been included, all anomalies would have black centers. The 200 gamma interval was selected in order to illustrate trends due to long, linear objects such as pipes and cables)

4 Resistivity

Because of the successful implementation of GPR and the magnetometer and their usefulness in identifying and locating buried objects, only one-half day was spent on acquisition of electrical data. Scattered regional data were observed around the site with an electrode spacing of one meter to gain a sense of the regional conductive nature of the near-surface materials. The magnetic base station west of the building was used as a background station, where a near-surface soil resistivity of $68\ \Omega\cdot\text{m}$ was observed. A reading in the far north ditch on the east side of the site had a value of $63\ \Omega\cdot\text{m}$. If these values can be presumed to represent the average background values for the site, anomalous readings were observed over the buried vault at former Building 91 ($6\ \Omega\cdot\text{m}$) and east of the site, where an extremely high value ($180\ \Omega\cdot\text{m}$) was observed. The low reading at the vault suggests the presence of a very conductive object, whereas the high resistivities on the east side of the building suggest the presence of a thick layer of dry gravel-like material that may represent former railroad bed. None of the remaining 15 observations were noteworthy for deviating from the norm.

In addition to the regional observations, seven electrical depth soundings were made to compare interpretations with local geology, to determine if a conductive plume of leachate emanated from the building, and to compare a normal sounding curve with a sounding curve taken adjacent to the presumed buried tank or vault at former Building 91 (App. C). Electrical depth sounding curves and their interpretations are shown in Figs. 9-11. Figure 9 represents the normal type of curve one might expect in this type of geological environment and was observed at the base station west of the site. Figure 10 displays the low-resistivity curve observed over the Building 91 area, while Fig. 11 is representative of the extremely high resistivities that are to be expected over dry gravel. From the limited electrical data acquired, it is impossible to suggest the presence or absence of a leachate plume.

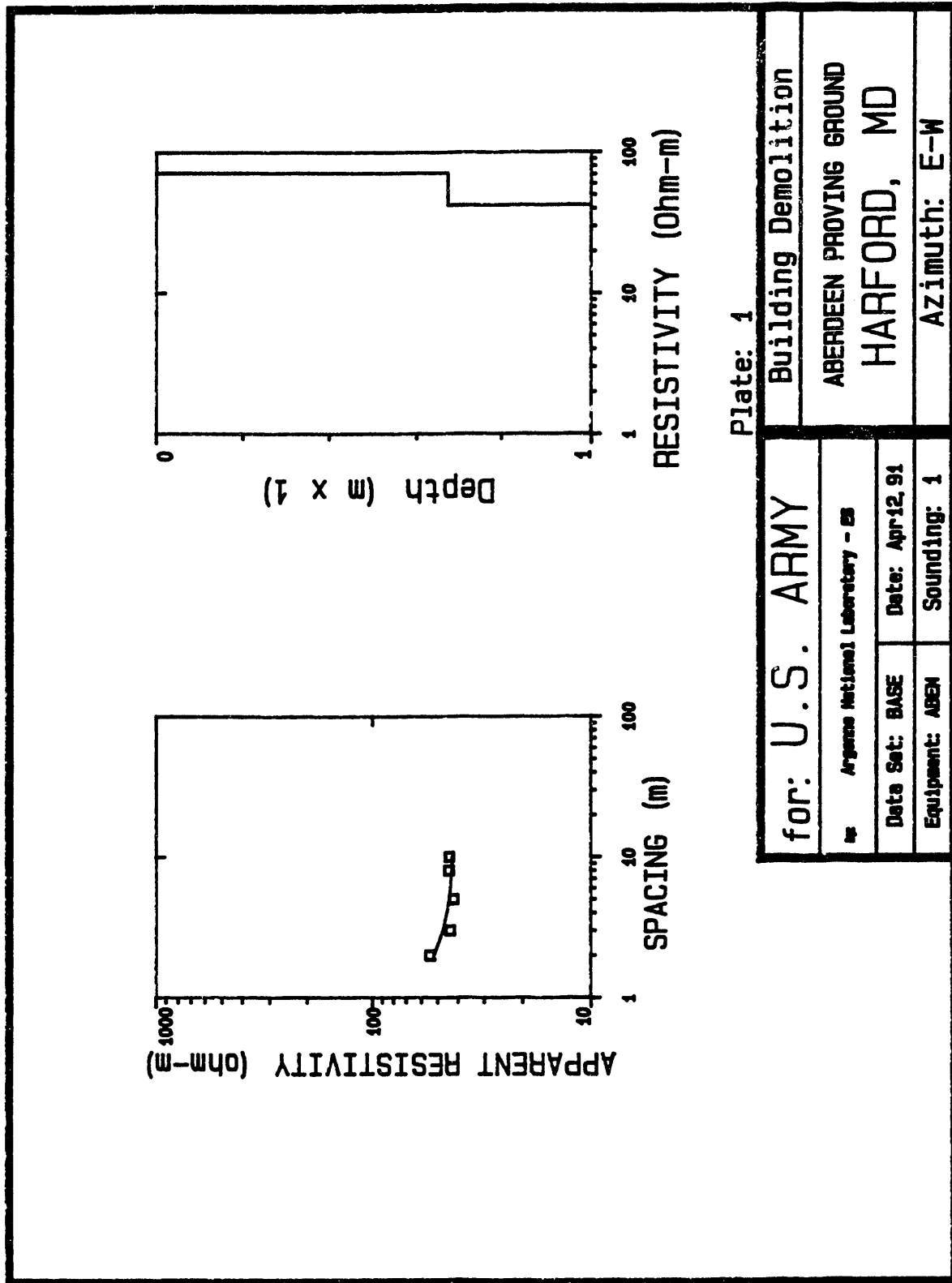


FIGURE 9 Electrical Depth Sounding Curve and Model over the Background Base Station West of Building E5032

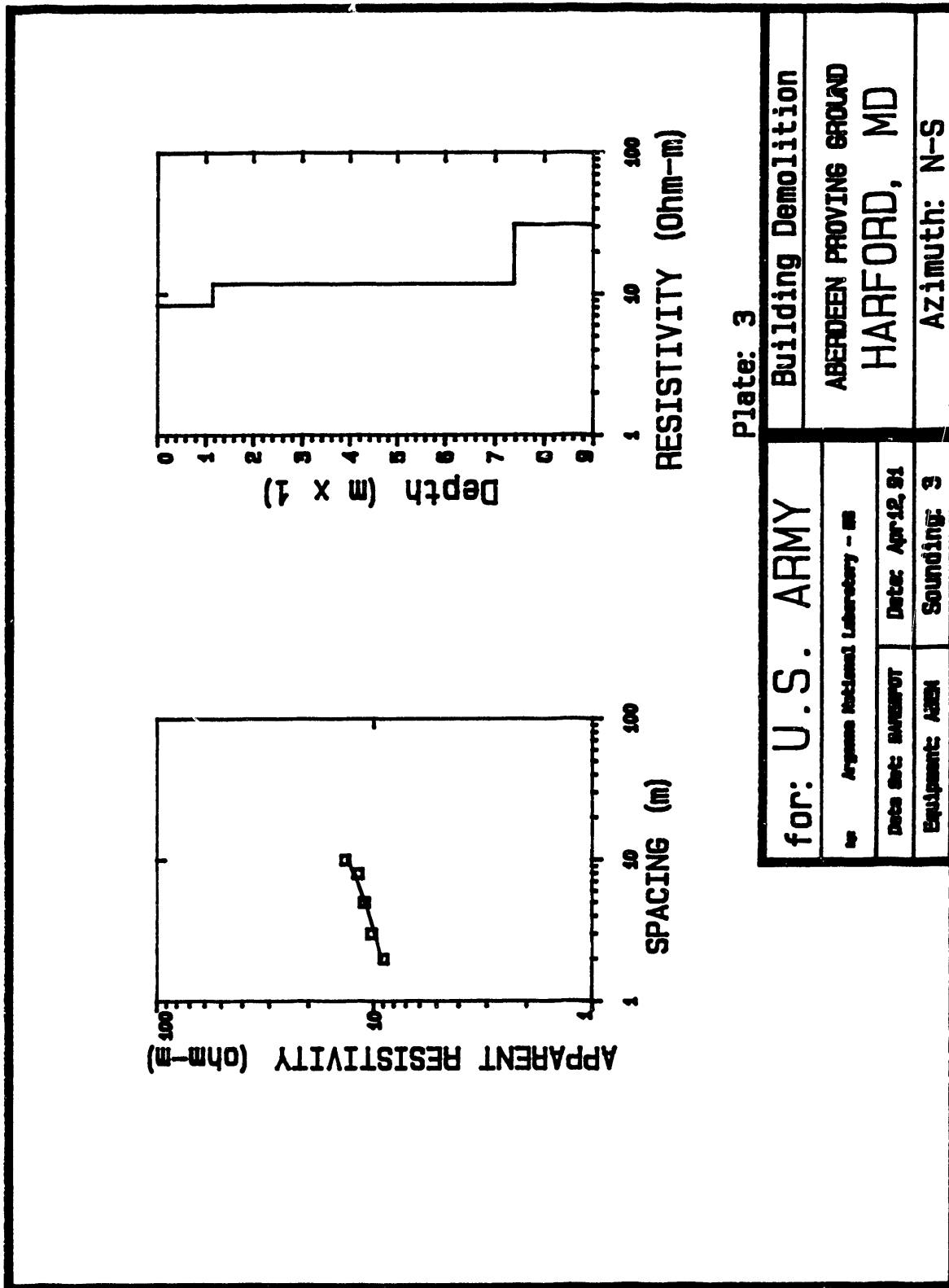


FIGURE 10 Electrical Depth Sounding Curve and Model over the Presumed Buried Tank or Vault at Building 91

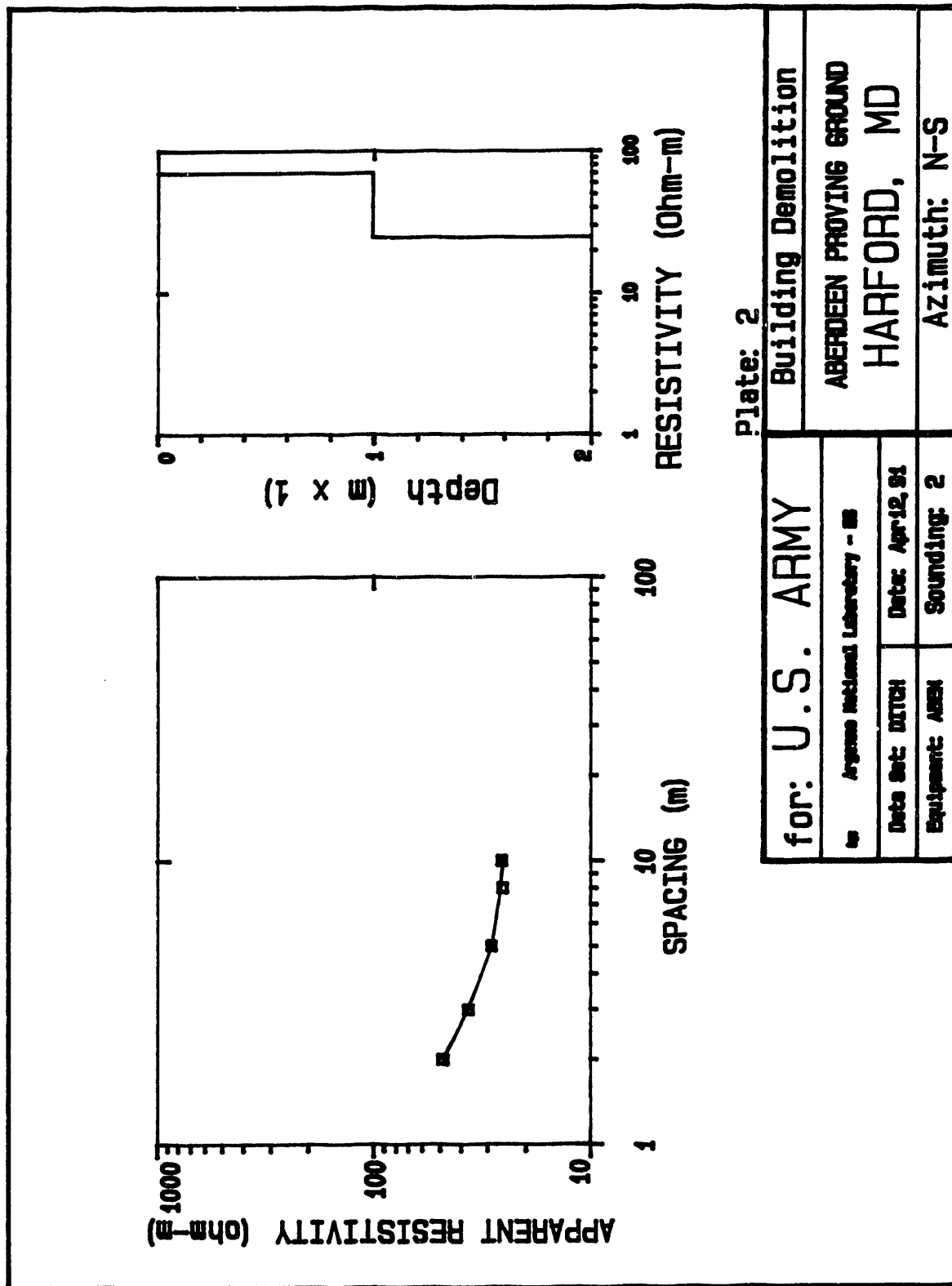


FIGURE 11 Electrical Depth Sounding Curve and Model over the Former Railroad Bed East of Building E5032

5 Conclusions

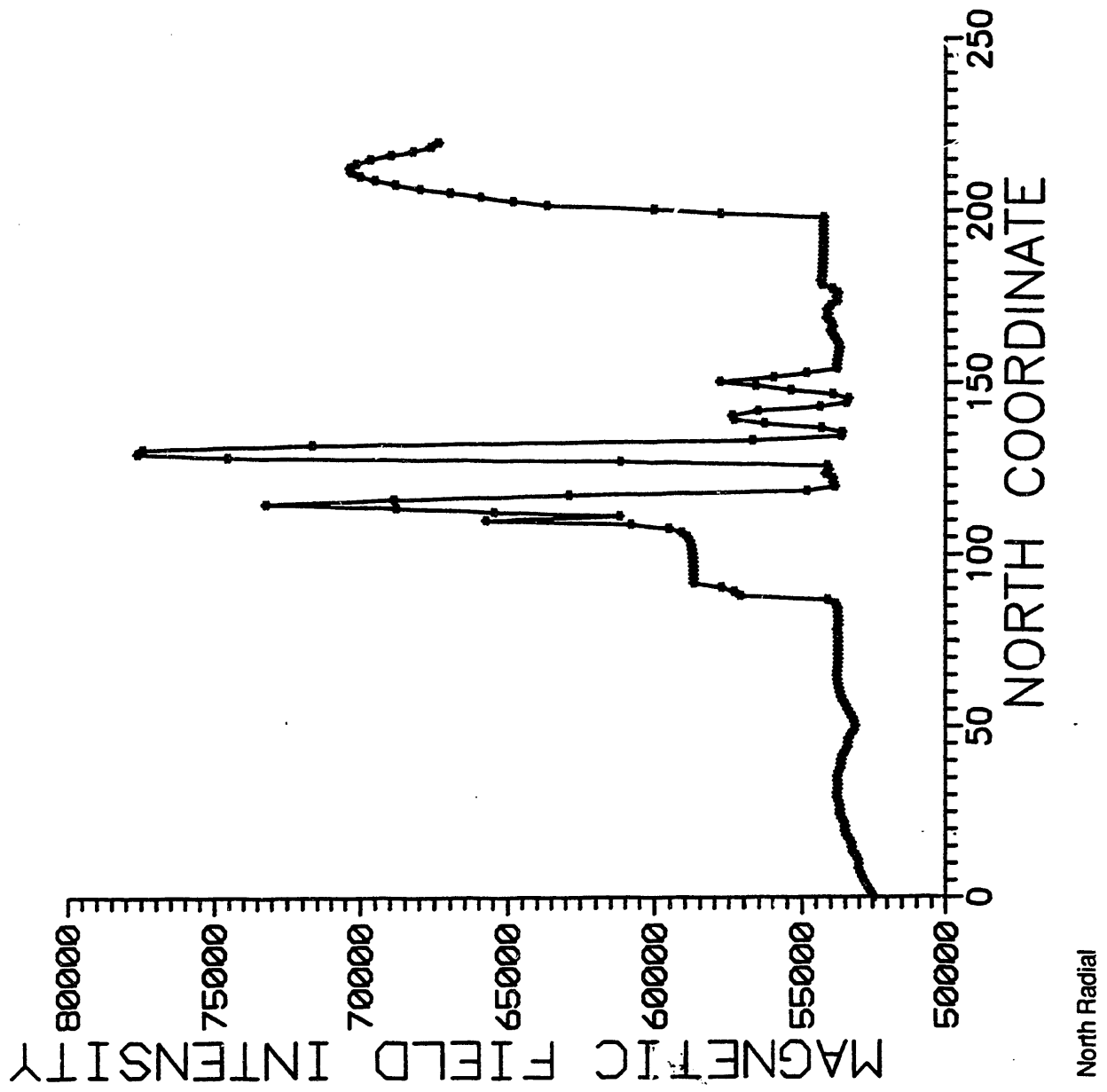
Geophysical surveys near Building E5032 provided information used to aid in the location of buried utilities, tanks, and debris. Ground penetrating radar (GPR) profiles indicate the presence of buried pipes, tanks, reinforcement rods (rebar), and remnants of railroad tracks. A detailed magnetic survey on the north side of the building outlines buried iron-rich objects that are interpreted to be iron pipes, tanks, and other debris of uncertain origin at relatively shallow depth. A magnetic map constructed from the data can be used to locate these items. Horizontal electrical surveys and vertical electrical soundings essentially corroborated the findings obtained with the magnetometer and GPR. In addition, a highly resistant layer was observed on the east side of the building where a former railroad bed with a thick gravel fill is believed to immediately underlie the lawn. The resistivity data show no evidence of a conductive leachate plume.

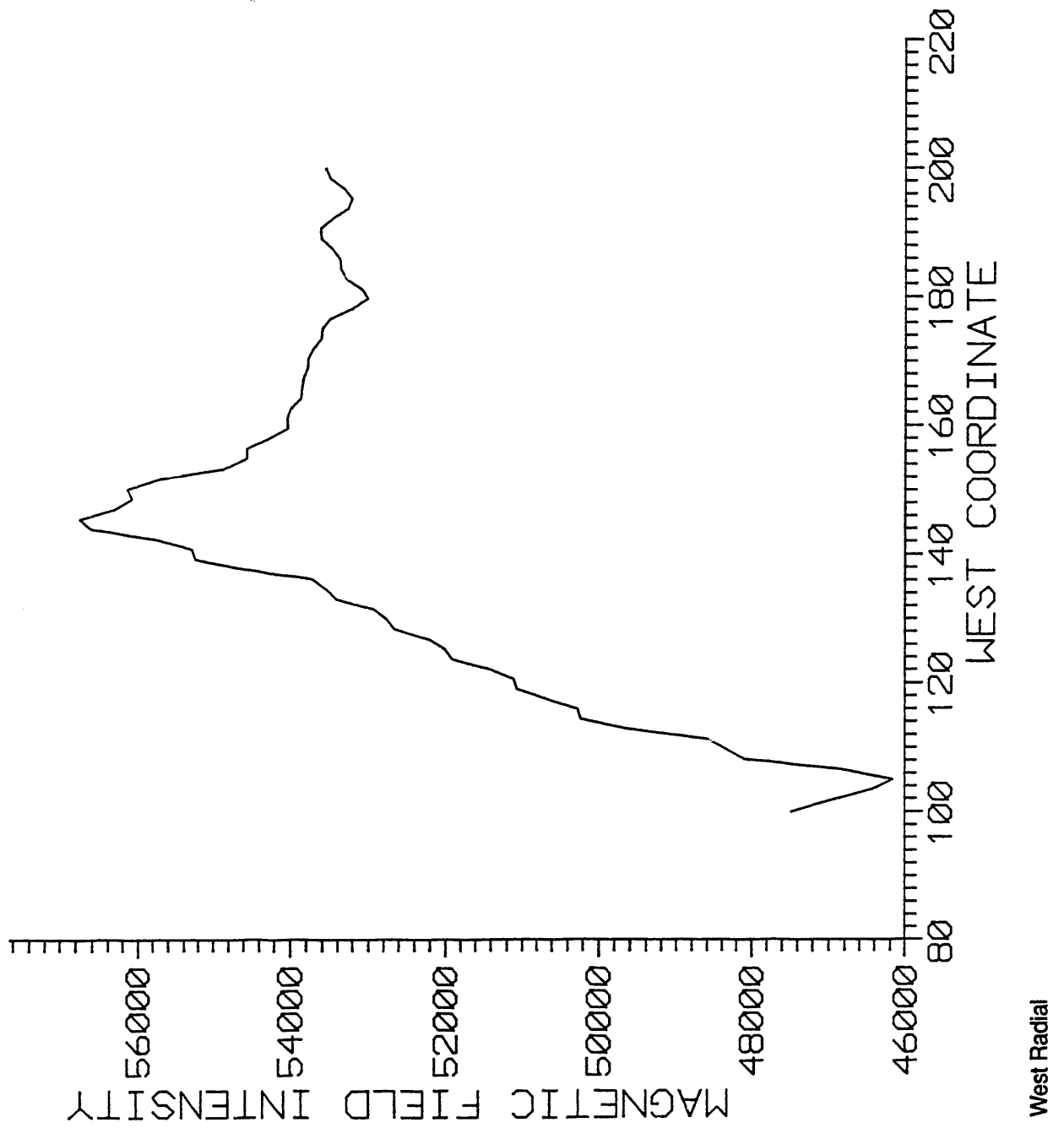
Geophysical measurements from all three techniques over a buried concrete slab approximately 130 ft north of Building E5032 give geophysical signatures interpreted to be due to the presence of a large iron tank or vault. This feature may be the remnant of Building 91 cited in the work plan. An attempt was made to gather meaningful magnetic data on the east, west, and south of the building; however, the quality of subsurface interpretations in those areas was poor because of the influence of surficial iron lids, pipes, grates, and the effects of the corrugated iron building itself.

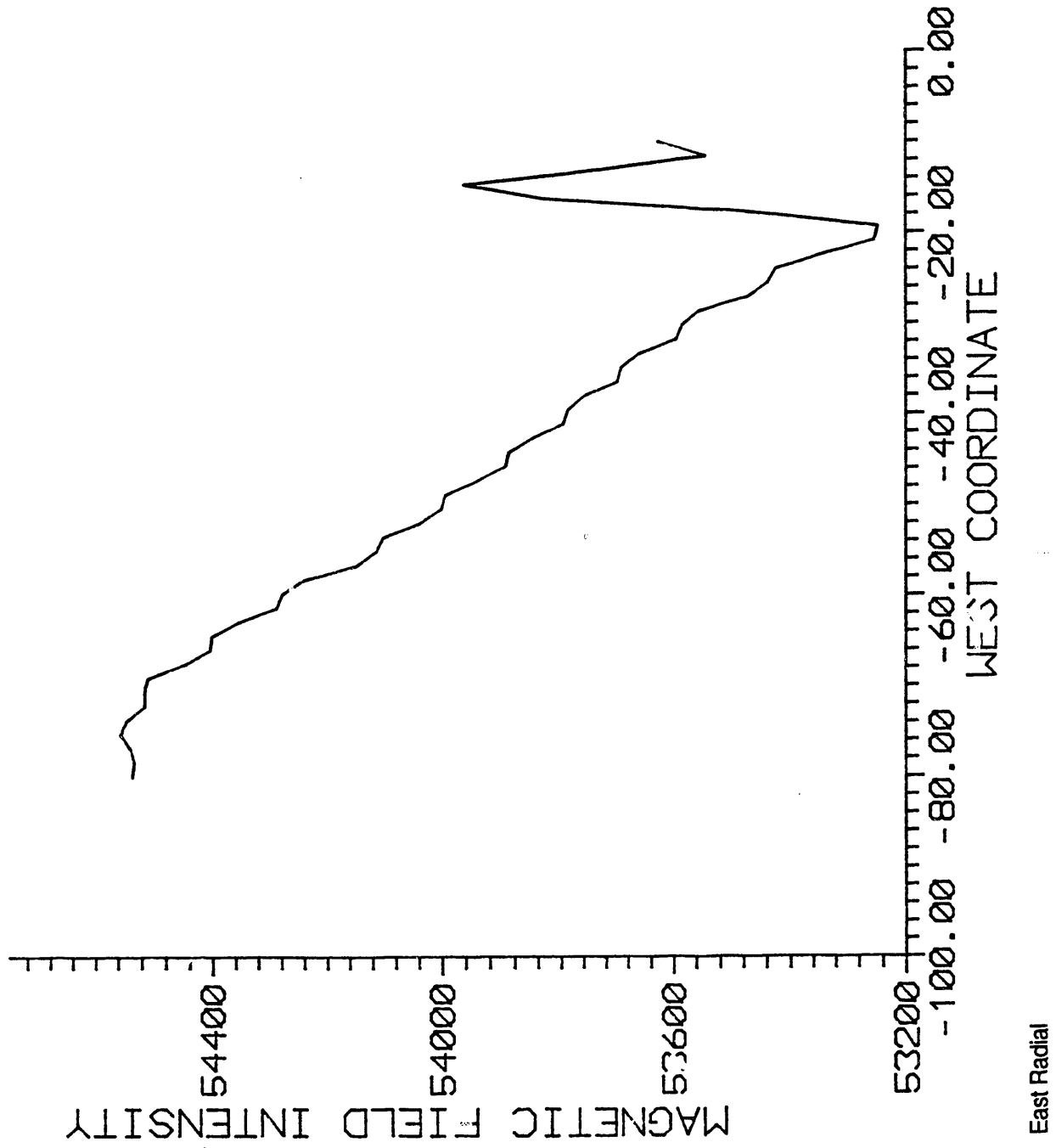
Magnetic anomalies centered at coordinates 70 W 130 N, 30 W 135 N, 30 W 128 N, and 30 W 115 N appear to be caused by buried tanks. A fill pipe protruding above ground near 38 W 115 N further suggests the presence of a buried tank. Surficial iron debris around the anomalies makes more positive identification difficult; however, if surficial debris were removed, the "tank" interpretation could be verified with additional magnetic measurements.

Appendix A:

Magnetic Radial Lines and Magnetic Data







Aberdeen Proving Ground Magnetic Field Intensity Data

	A (ft)	B (ft)	C (gammas)
1	N	W	T.F.
2		-	53939
3	0	-20	53766
4	5	-20	53738
5	10	-20	53692
6	15	-20	53636
7	20	-20	53578
8	25	-20	53524
9	30	-20	53496
10	35	-20	53433
11	40	-20	53418
12	45	-20	53345
13	50	-20	53290
14	55	-20	53264
15	60	-20	53178
16	65	-20	53169
17	70	-20	53166
18	75	-20	53244
19	80	-20	53206
20	85	-20	53520
21	90	-20	52960
22	95	-20	53041
23	100	-20	52869
24	105	-20	52555
25	0	-20	53765.9
26	5	-20	53737.5
27	10	-20	53691.8
28	15	-20	53636.3
29	20	-20	53577.5
30	25	-20	53523.9
31	30	-20	53496.1
32	35	-20	53432.6
33	40	-20	53418.1
34	45	-20	53345.3
35	50	-20	53289.7
36	55	-20	53264.2
37	60	-20	53178
38	65	-20	53168.7
39	70	-20	53165.5
40	75	-20	53244.2
41	80	-20	53206.1
42	85	-20	5352
43	90	-20	52960.4
44	95	-20	5340.7
45	100	-20	52869.2
46	105	-20	52555
47	110	-20	52151.4

	A (ft)	B (ft)	C (gammas)
48	115	-20	52526.9
49	170	50	53948.1
50	165	50	53956.9
51	160	50	53950.6
52	155	50	53920.7
53	150	50	53876.3
54	145	50	53865.3
55	140	50	53935.6
56	135	50	53982.1
57	130	50	53973.5
58	125	50	53974.2
59	120	50	53979
60	115	50	54004
61	110	50	54103
62	105	50	54145
63	100	50	54062.3
64	95	50	53963.3
65	90	50	53902.2
66	85	50	53889.7
67	80	50	53864.5
68	75	50	53853.3
69	70	50	53859.6
70	65	50	53864
71	60	50	53879.4
72	55	50	53871.4
73	50	50	53821.9
74	45	50	53724.8
75	40	50	53580.5
76	35	50	53430.9
77	30	50	53394.6
78	25	50	53377.7
79	20	50	53224.8
80	15	50	52783.6
81	10	50	52015.4
82	5	50	50463.7
83	0	50	48960.3
84	60	-100	54535.6
85	60	-95	54556.8
86	60	-90	54518.1
87	60	-85	54402
88	60	-80	54277
89	60	-75	54112.6
90	60	-70	53998.1
91	60	-65	53889.5
92	60	-60	53787
93	60	-55	53690.7
94	60	-50	53583.3

	A (ft)	B (ft)	C (gammas)
95	60	-45	53436.8
96	60	-40	53226.4
97	60	-35	53973.6
98	60	-30	53626.9
99	60	-25	52078
100	60	-20	51155.9
101	60	-15	49530.9
102	60	-10	46675
103	60	-5	46904
104	60	0	7898
105	50	70	53128.2
106	45	70	53382.1
107	40	70	53625.6
108	35	70	53763.7
109	30	70	53775.8
110	25	70	53666.6
111	20	70	53494.6
112	15	70	53255.6
113	10	70	53005
114	5	70	0
115	65	100	53568.7
116	65	95	53197.7
117	65	90	53648.2
118	65	85	53363.9
119	65	80	53004.8
120	65	75	53601.2
121	65	70	53776.5
122	65	65	53846.8
123	65	60	54017.3
124	65	55	54555
125	65	50	56150.2
126	65	45	56810.7
127	65	40	55289
128	65	35	53559.7
129	65	30	52772
130	65	25	52019
131	65	20	51116
132	65	15	50254
133	65	10	48347
134	65	5	46152
135	65	0	0
136	180	0	53951
137	180	1	53874
138	180	2	54051
139	180	3	54136
140	180	4	54234
141	180	5	54347

	A (ft)	B (ft)	C (gammas)
142	180	6	54316
143	180	7	54190
144	180	8	54341
145	180	9	54415
146	180	10	54749
147	180	11	54438
148	180	12	57089
149	180	13	63170
150	180	14	60030
151	180	15	63872
152	180	16	59982
153	180	17	57476
154	180	18	62725
155	180	19	53806
156	180	20	53565
157	180	21	53658
158	180	22	53809
159	180	22	53844
160	180	24	54114
161	180	25	53921
162	180	26	53764
163	180	27	54016
164	180	28	53974
165	180	29	53931
166	180	30	54188
167	180	31	53959
168	180	32	53909
169	180	33	53822
170	180	34	53809
171	180	35	54005
172	180	36	54162
173	180	37	53923
174	180	38	54009
175	180	39	54090
176	180	40	54114
177	180	41	54005
178	180	42	54154
179	180	43	54253
180	180	44	53933
181	180	45	53991
182	180	46	54129
183	180	47	53981
184	180	48	54011
185	180	49	53917
186	180	50	53895
187	180	51	53814
188	180	52	53737

	A (ft)	B (ft)	C (gammas)
189	180	53	53714
190	180	54	53803
191	180	55	53883
192	180	56	53566
193	180	57	53335
194	180	58	53022
195	180	59	53624
196	180	60	55411
197	180	61	63891
198	180	62	64002
199	180	63	59230
200	180	64	64070
201	180	65	52769
202	180	66	52866
203	180	67	53390
204	180	68	53656
205	180	69	53999
206	180	70	54344
207	180	71	54468
208	180	72	54975
209	180	73	55616
210	180	74	56202
211	180	75	55794
212	180	76	55405
213	180	77	56292
214	180	78	56344
215	180	79	54582
216	180	80	53228
217	180	81	53150
218	180	82	53697
219	180	83	53636
220	180	84	53760
221	180	85	53876
222	175	0	54867
223	175	1	54185
224	175	2	54015
225	175	3	54035
226	175	4	54055
227	175	5	54130
228	175	6	54235
229	175	7	54199
230	175	8	54416
231	175	9	54340
232	175	10	54520
233	175	11	55006
234	175	12	55644
235	175	13	55036

	A (ft)	B (ft)	C (gammas)
236	175	14	54369
237	175	15	54646
238	175	16	64042
239	175	17	58291
240	175	18	56419
241	175	19	54352
242	175	20	53966
243	175	21	53978
244	175	22	53951
245	175	23	53916
246	175	24	53899
247	175	25	53909
248	175	26	53989
249	175	27	54225
250	175	28	54450
251	175	29	54295
252	175	30	54197
253	175	31	54347
254	175	32	54069
255	175	33	53908
256	175	34	53774
257	175	35	55304
258	175	36	54181
259	175	37	54097
260	175	38	53936
261	175	39	54155
262	175	40	53892
263	175	41	54227
264	175	42	54230
265	175	43	53832
266	175	44	55035
267	175	45	55162
268	175	46	54584
269	175	47	64153
270	175	48	59297
271	175	49	55837
272	175	50	55651
273	175	51	57339
274	175	52	54695
275	175	53	54054
276	175	54	53752
277	175	55	53939
278	175	56	53937
279	175	57	53345
280	175	58	53453
281	175	59	53564
282	175	60	53687

	A (ft)	B (ft)	C (gammas)
283	175	61	54245
284	175	62	55982
285	175	63	56265
286	175	64	57330
287	175	65	53274
288	175	66	53317
289	175	67	53398
290	175	68	53464
291	175	69	53523
292	175	70	53784
293	175	71	53835
294	175	72	54082
295	175	73	54335
296	175	74	54862
297	175	75	55734
298	175	76	57161
299	175	77	58158
300	175	78	56458
301	175	79	54353
302	175	80	54089
303	175	81	54064
304	175	82	54051
305	175	83	55163
306	175	84	55844
307	175	85	56349
308	170	0	53958
309	170	1	53933
310	170	2	53983
311	170	3	53986
312	170	4	53968
313	170	5	53895
314	170	6	53983
315	170	7	54012
316	170	8	53821
317	170	9	54022
318	170	10	54118
319	170	11	54114
320	170	12	54335
321	170	13	54565
322	170	14	54063
323	170	15	54073
324	170	16	53989
325	170	17	54009
326	170	18	54013
327	170	19	55921
328	170	20	53798
329	170	21	53836

	A (ft)	B (ft)	C (gammas)
330	170	22	53786
331	170	23	54005
332	170	24	53964
333	170	25	54099
334	170	26	54159
335	170	27	55699
336	170	28	54284
337	170	29	54139
338	170	30	53969
339	170	31	53900
340	170	32	54123
341	170	33	53886
342	170	34	53678
343	170	35	54098
344	170	36	54196
345	170	37	54158
346	170	38	53939
347	170	39	54132
348	170	40	53953
349	170	41	54164
350	170	42	55360
351	170	43	54076
352	170	44	54079
353	170	45	54552
354	170	46	54735
355	170	47	53921
356	170	48	54008
357	170	49	53906
358	170	50	53867
359	170	51	53953
360	170	52	53874
361	170	53	53912
362	170	54	53696
363	170	55	54087
364	170	56	53657
365	170	57	54071
366	170	58	62550
367	170	59	59031
368	170	60	59738
369	170	61	56868
370	170	62	55965
371	170	63	54682
372	170	64	54084
373	170	65	53713
374	170	66	53683
375	170	67	53713
376	170	68	53772

	A (ft)	B (ft)	C (gammas)
377	170	69	53840
378	170	70	54016
379	170	71	54439
380	170	72	54442
381	170	73	54964
382	170	74	54932
383	170	75	55691
384	170	76	55712
385	170	77	56081
386	170	78	54983
387	170	79	55389
388	170	80	55063
389	170	81	54239
390	170	82	54116
391	170	83	54098
392	170	84	53887
393	170	85	54107
394	165	0	53918
395	165	1	53871
396	165	2	53995
397	165	3	54015
398	165	4	54286
399	165	5	58629
400	165	6	54131
401	165	7	53947
402	165	8	54046
403	165	9	54038
404	165	10	54189
405	165	11	54163
406	165	12	64511
407	165	13	54545
408	165	14	53345
409	165	15	54905
410	165	16	65628
411	165	17	58324
412	165	18	54847
413	165	19	58695
414	165	20	54423
415	165	21	54478
416	165	22	54029
417	165	23	55132
418	165	24	54097
419	165	25	53755
420	165	26	57456
421	165	27	59360
422	165	28	54170
423	165	29	54171

	A (ft)	B (ft)	C (gammas)
424	165	30	55129
425	165	31	56750
426	165	32	55129
427	165	33	53951
428	165	34	53677
429	165	35	53802
430	165	36	54667
431	165	37	53983
432	165	38	53562
433	165	39	53184
434	165	40	52864
435	165	41	54453
436	165	42	64802
437	165	43	53053
438	165	44	53795
439	165	45	53710
440	165	46	54979
441	165	47	54669
442	165	48	53976
443	165	49	54222
444	165	50	54107
445	165	51	57545
446	165	52	57541
447	165	53	55676
448	165	54	53905
449	165	55	53815
450	165	56	53569
451	165	57	53740
452	165	58	53616
453	165	59	53345
454	165	60	53106
455	165	61	53031
456	165	62	53253
457	165	63	53289
458	165	64	53446
459	165	65	53469
460	165	66	53502
461	165	67	53730
462	165	68	53803
463	165	69	53756
464	165	70	54014
465	165	71	53978
466	165	72	53901
467	165	73	54055
468	165	74	54128
469	165	75	54069
470	165	76	55411

	A (ft)	B (ft)	C (gammas)
471	165	77	54666
472	165	78	54684
473	165	79	53810
474	165	80	53708
475	165	81	53690
476	165	82	53723
477	165	83	53908
478	165	84	53862
479	165	85	53993
480	160	0	53632
481	160	1	53800
482	160	2	53850
483	160	3	53956
484	160	4	53898
485	160	5	54378
486	160	6	54098
487	160	7	53945
488	160	8	53638
489	160	9	53337
490	160	10	52996
491	160	11	66417
492	160	12	69540
493	160	13	53931
494	160	14	53180
495	160	15	54904
496	160	16	54792
497	160	17	53939
498	160	18	53854
499	160	19	53914
500	160	20	53913
501	160	21	54260
502	160	22	53975
503	160	23	54169
504	160	24	55096
505	160	25	53981
506	160	26	53983
507	160	27	54070
508	160	28	53924
509	160	29	54307
510	160	30	54191
511	160	31	54062
512	160	32	53975
513	160	33	54455
514	160	34	54057
515	160	35	54138
516	160	36	54416
517	160	37	54171

	A (ft)	B (ft)	C (gammas)
518	160	38	54570
519	160	39	64323
520	160	40	62004
521	160	41	62004
522	160	42	58971
523	160	43	54843
524	160	44	54114
525	160	45	54160
526	160	46	54395
527	160	47	54585
528	160	48	54062
529	160	49	53748
530	160	50	53847
531	160	51	53876
532	160	52	54352
533	160	53	53731
534	160	54	53580
535	160	55	54040
536	160	56	53932
537	160	57	53622
538	160	58	60637
539	160	59	53529
540	160	60	53379
541	160	61	53148
542	160	62	53254
543	160	63	53320
544	160	64	55072
545	160	65	53557
546	160	66	53766
547	160	67	53717
548	160	68	53587
549	160	69	53799
550	160	70	53687
551	160	71	53625
552	160	72	53751
553	160	73	53815
554	160	74	53842
555	160	75	53816
556	160	76	53788
557	160	77	53818
558	160	78	55146
559	160	79	53933
560	160	80	53955
561	160	81	54109
562	160	82	53964
563	160	83	53812
564	160	84	53801

	A (ft)	B (ft)	C (gammas)
565	160	85	53961
566	155	0	55674
567	155	1	54324
568	155	2	54090
569	155	3	54072
570	155	4	53847
571	155	5	53773
572	155	6	53856
573	155	7	53943
574	155	8	53870
575	155	9	53526
576	155	10	53616
577	155	11	55936
578	155	12	63099
579	155	13	53593
580	155	14	54223
581	155	15	54474
582	155	16	53687
583	155	17	53867
584	155	18	53682
585	155	19	53683
586	155	20	53714
587	155	21	53752
588	155	22	53824
589	155	23	53857
590	155	24	53911
591	155	25	53948
592	155	26	53942
593	155	27	53932
594	155	28	53924
595	155	29	53908
596	155	30	53924
597	155	31	53885
598	155	32	53833
599	155	33	53874
600	155	34	53963
601	155	35	53969
602	155	36	54283
603	155	37	54183
604	155	38	54406
605	155	39	54813
606	155	40	54571
607	155	41	55059
608	155	42	55276
609	155	43	56336
610	155	44	57859
611	155	45	65285

	A (ft)	B (ft)	C (gammas)
612	155	46	53485
613	155	47	53747
614	155	48	53977
615	155	49	54397
616	155	50	68612
617	155	51	53990
618	155	52	54070
619	155	53	53946
620	155	54	53817
621	155	55	54011
622	155	56	53849
623	155	57	54086
624	155	58	54088
625	155	59	54784
626	155	60	55465
627	155	61	53448
628	155	62	53707
629	155	63	53762
630	155	64	53755
631	155	65	53702
632	155	66	53758
633	155	67	53714
634	155	68	53728
635	155	69	53903
636	155	70	53774
637	155	71	53737
638	155	72	53596
639	155	73	53637
640	155	74	53847
641	155	75	53682
642	155	76	54365
643	155	77	54939
644	155	78	54463
645	155	79	54123
646	155	80	54137
647	155	81	53893
648	155	82	54067
649	155	83	53967
650	155	84	53934
651	155	85	53909
652	150	0	53994
653	150	1	53815
654	150	2	53871
655	150	3	53858
656	150	4	53850
657	150	5	54101
658	150	6	53978

	A (ft)	B (ft)	C (gammas)
659	150	7	54100
660	150	8	56083
661	150	9	59005
662	150	10	56504
663	150	11	56009
664	150	12	52747
665	150	13	52655
666	150	14	53138
667	150	15	67353
668	150	16	58820
669	150	17	54467
670	150	18	53812
671	150	19	53874
672	150	20	54070
673	150	21	53927
674	150	22	53937
675	150	23	53961
676	150	24	53983
677	150	25	53988
678	150	26	53948
679	150	27	53930
680	150	28	53899
681	150	29	53894
682	150	30	53955
683	150	31	53889
684	150	32	53841
685	150	33	53953
686	150	34	53997
687	150	35	53871
688	150	36	53792
689	150	37	53703
690	150	38	55037
691	150	39	54761
692	150	40	54976
693	150	41	53800
694	150	42	54178
695	150	43	55698
696	150	44	53606
697	150	45	54375
698	150	46	54579
699	150	47	56729
700	150	48	53664
701	150	49	56125
702	150	50	53894
703	150	51	54102
704	150	52	54029
705	150	53	54254

	A (ft)	B (ft)	C (gammas)
706	150	54	54834
707	150	55	54114
708	150	56	67083
709	150	57	53782
710	150	58	53930
711	150	59	53941
712	150	60	53783
713	150	61	69300
714	150	62	53888
715	150	63	54146
716	150	64	53961
717	150	65	53942
718	150	66	53800
719	150	67	53850
720	150	68	53897
721	150	69	53783
722	150	70	58745
723	150	71	58745
724	150	72	53797
725	150	73	53660
726	150	74	53594
727	150	75	53599
728	150	76	53615
729	150	77	53572
730	150	78	53637
731	150	79	53785
732	150	80	53845
733	150	81	54423
734	150	82	54066
735	150	83	53883
736	150	84	53871
737	150	85	54679
738	145	0	54072
739	145	1	54058
740	145	2	53594
741	145	3	53908
742	145	4	53843
743	145	5	53996
744	145	6	54091
745	145	7	53985
746	145	8	54070
747	145	9	54015
748	145	10	63963
749	145	11	54647
750	145	12	53882
751	145	13	53713
752	145	14	53719

	A (ft)	B (ft)	C (gammas)
753	145	15	53821
754	145	16	53969
755	145	17	54175
756	145	18	53833
757	145	19	53803
758	145	20	53883
759	145	21	53892
760	145	22	53941
761	145	23	53925
762	145	24	53954
763	145	25	53972
764	145	26	53966
765	145	27	53996
766	145	28	53936
767	145	29	53937
768	145	30	53854
769	145	31	53801
770	145	32	54584
771	145	33	57022
772	145	34	53870
773	145	35	53705
774	145	36	53986
775	145	37	54235
776	145	38	54094
777	145	39	67501
778	145	40	54104
779	145	41	53878
780	145	42	57644
781	145	43	59283
782	145	44	56226
783	145	45	59093
784	145	46	54556
785	145	47	54160
786	145	48	54507
787	145	49	54179
788	145	50	54087
789	145	51	53982
790	145	52	54931
791	145	53	54046
792	145	54	54032
793	145	55	54145
794	145	56	54118
795	145	57	53970
796	145	58	58091
797	145	59	54892
798	145	60	56061
799	145	61	57506

	A (ft)	B (ft)	C (gammas)
800	145	62	54292
801	145	63	54325
802	145	64	53952
803	145	65	53964
804	145	66	53846
805	145	67	56238
806	145	68	53735
807	145	69	53630
808	145	70	53284
809	145	71	53175
810	145	72	53019
811	145	73	53269
812	145	74	53753
813	145	75	53894
814	145	76	53845
815	145	77	53843
816	145	78	54326
817	145	79	54564
818	145	80	54193
819	145	81	54020
820	145	82	53652
821	145	83	53710
822	145	84	53834
823	145	85	53835
824	140	0	54153
825	140	1	54088
826	140	2	54056
827	140	3	54001
828	140	4	53968
829	140	5	54045
830	140	6	54344
831	140	7	53779
832	140	8	58504
833	140	9	59947
834	140	10	54638
835	140	11	57321
836	140	12	54437
837	140	13	53666
838	140	14	54874
839	140	15	53771
840	140	16	53923
841	140	17	54133
842	140	18	53826
843	140	19	53831
844	140	20	53912
845	140	21	53922
846	140	22	53925

	A (ft)	B (ft)	C (gammas)
847	140	23	53967
848	140	24	53915
849	140	25	53851
850	140	26	53928
851	140	27	54008
852	140	28	53999
853	140	29	53926
854	140	30	53923
855	140	31	53913
856	140	32	53961
857	140	33	54161
858	140	34	55030
859	140	35	68190
860	140	36	54326
861	140	37	54236
862	140	38	54013
863	140	39	54029
864	140	40	53705
865	140	41	56199
866	140	42	54101
867	140	43	54007
868	140	44	54038
869	140	45	54345
870	140	46	54096
871	140	47	54054
872	140	48	54165
873	140	49	54030
874	140	50	54053
875	140	51	54004
876	140	52	54077
877	140	53	54139
878	140	54	54102
879	140	55	54189
880	140	56	54433
881	140	57	54574
882	140	58	55082
883	140	59	54889
884	140	60	55104
885	140	61	55060
886	140	62	55209
887	140	63	55371
888	140	64	55151
889	140	65	54573
890	140	66	55015
891	140	67	55197
892	140	68	57829
893	140	69	58918

	A (ft)	B (ft)	C (gammas)
894	140	70	58229
895	140	71	54985
896	140	72	55080
897	140	73	54212
898	140	74	54747
899	140	75	55435
900	140	76	54825
901	140	77	54781
902	140	78	55242
903	140	79	54803
904	140	80	55170
905	140	81	56237
906	140	82	55673
907	140	83	53879
908	140	84	53928
909	140	85	54387
910	135	0	53980
911	135	1	53996
912	135	2	54027
913	135	3	53844
914	135	4	53749
915	135	5	53821
916	135	6	53912
917	135	7	53686
918	135	8	54164
919	135	9	53778
920	135	10	53058
921	135	11	52938
922	135	12	52927
923	135	13	53229
924	135	14	53314
925	135	15	53519
926	135	16	53903
927	135	17	54001
928	135	18	54400
929	135	19	55053
930	135	20	56296
931	135	21	58672
932	135	22	59349
933	135	23	54640
934	135	24	55550
935	135	25	66875
936	135	26	66875
937	135	27	66875
938	135	28	66875
939	135	29	66875
940	135	30	79385

	A (ft)	B (ft)	C (gammas)
941	135	31	76493
942	135	32	75409
943	135	33	76679
944	135	34	75227
945	135	35	76584
946	135	36	55104
947	135	37	54541
948	135	38	54205
949	135	39	54053
950	135	40	54064
951	135	41	53851
952	135	42	54060
953	135	43	61337
954	135	44	57739
955	135	45	54550
956	135	46	54085
957	135	47	56645
958	135	48	66968
959	135	49	66968
960	135	50	54571
961	135	51	54720
962	135	52	53974
963	135	53	54190
964	135	54	54661
965	135	55	53943
966	135	56	54296
967	135	57	64867
968	135	58	54014
969	135	59	53934
970	135	60	54595
971	135	61	55251
972	135	62	53886
973	135	63	53479
974	135	64	53985
975	135	65	54021
976	135	66	54181
977	135	67	51871
978	135	68	53136
979	135	69	53308
980	135	70	53916
981	135	71	53451
982	135	72	52730
983	135	73	55251
984	135	74	55452
985	135	75	55091
986	135	76	57063
987	135	77	55639

	A (ft)	B (ft)	C (gammas)
988	135	78	63738
989	135	79	59759
990	135	80	64301
991	135	81	59367
992	135	82	57539
993	135	83	54697
994	135	84	53548
995	135	85	53491
996	130	0	53950
997	130	1	54040
998	130	2	54067
999	130	3	53976
1000	130	4	53788
1001	130	5	53829
1002	130	6	53842
1003	130	7	53806
1004	130	8	53685
1005	130	9	55075
1006	130	10	53068
1007	130	11	52678
1008	130	12	52393
1009	130	13	52676
1010	130	14	53520
1011	130	15	53461
1012	130	16	53404
1013	130	17	53358
1014	130	18	53765
1015	130	19	53633
1016	130	20	56642
1017	130	21	64913
1018	130	22	64576
1019	130	23	66885
1020	130	24	66885
1021	130	25	57890
1022	130	26	63948
1023	130	27	65923
1024	130	28	65107
1025	130	29	54955
1026	130	30	53418
1027	130	31	56335
1028	130	32	65723
1029	130	33	56867
1030	130	34	54469
1031	130	35	54759
1032	130	36	55116
1033	130	37	55184
1034	130	38	55056

	A (ft)	B (ft)	C (gammas)
1035	130	39	54375
1036	130	40	54021
1037	130	41	53903
1038	130	42	54259
1039	130	43	53588
1040	130	44	53678
1041	130	45	53955
1042	130	46	53712
1043	130	47	53899
1044	130	48	53890
1045	130	49	53962
1046	130	50	53884
1047	130	51	54925
1048	130	52	53898
1049	130	53	54100
1050	130	54	54064
1051	130	55	54041
1052	130	56	53946
1053	130	57	53995
1054	130	58	54004
1055	130	59	54214
1056	130	60	54117
1057	130	61	53905
1058	130	62	53706
1059	130	63	64689
1060	130	64	54918
1061	130	65	67787
1062	130	66	67787
1063	130	67	68367
1064	130	68	75715
1065	130	69	77856
1066	130	70	76871
1067	130	71	81777
1068	130	72	76317
1069	130	73	74797
1070	130	74	74797
1071	130	75	76224
1072	130	76	75900
1073	130	77	75895
1074	130	78	52339
1075	130	79	52204
1076	130	80	55287
1077	130	81	52489
1078	130	82	54133
1079	130	83	52772
1080	130	84	53055
1081	130	85	53157

	A (ft)	B (ft)	C (gammas)
1082	125	0	54034
1083	125	1	54148
1084	125	2	54099
1085	125	3	53915
1086	125	4	53925
1087	125	5	53785
1088	125	6	53838
1089	125	7	53838
1090	125	8	53781
1091	125	9	54090
1092	125	10	55160
1093	125	11	55851
1094	125	12	53452
1095	125	13	52747
1096	125	14	52626
1097	125	15	49851
1098	125	16	65330
1099	125	17	75581
1100	125	18	75349
1101	125	19	75251
1102	125	20	81809
1103	125	21	75517
1104	125	22	82918
1105	125	23	77166
1106	125	24	80181
1107	125	25	76957
1108	125	26	75319
1109	125	27	75447
1110	125	28	77100
1111	125	29	74787
1112	125	30	80427
1113	125	31	76455
1114	125	32	75877
1115	125	33	74164
1116	125	34	53970
1117	125	35	54062
1118	125	36	54055
1119	125	37	54268
1120	125	38	54117
1121	125	39	53987
1122	125	40	53848
1123	125	41	53464
1124	125	42	53184
1125	125	43	52685
1126	125	44	52335
1127	125	45	51916
1128	125	46	52016

	A (ft)	B (ft)	C (gammas)
1129	125	47	51696
1130	125	48	52779
1131	125	49	52434
1132	125	50	53120
1133	125	51	53617
1134	125	52	53446
1135	125	53	53293
1136	125	54	53900
1137	125	55	53902
1138	125	56	53894
1139	125	57	53997
1140	125	58	53938
1141	125	59	54733
1142	125	60	54350
1143	125	61	53935
1144	125	62	54189
1145	125	63	53909
1146	125	64	54729
1147	125	65	55251
1148	125	66	53759
1149	125	67	55906
1150	125	68	54691
1151	125	69	53880
1152	125	70	54063
1153	125	71	53849
1154	125	72	54215
1155	125	73	54183
1156	125	74	54452
1157	125	75	54276
1158	125	76	53621
1159	125	77	53572
1160	125	78	53509
1161	125	79	53498
1162	125	80	53440
1163	125	81	53795
1164	125	82	53361
1165	125	83	53471
1166	125	84	53679
1167	125	85	53574
1168	120	0	54162
1169	120	1	54099
1170	120	2	54003
1171	120	3	53991
1172	120	4	54119
1173	120	5	54438
1174	120	6	54764
1175	120	7	54663

	A (ft)	B (ft)	C (gammas)
1176	120	8	55544
1177	120	9	55673
1178	120	10	57720
1179	120	11	58616
1180	120	12	55341
1181	120	13	54212
1182	120	14	54237
1183	120	15	54690
1184	120	16	55857
1185	120	17	57496
1186	120	18	54232
1187	120	19	53320
1188	120	20	53264
1189	120	21	53375
1190	120	22	53545
1191	120	23	53654
1192	120	24	53721
1193	120	25	53756
1194	120	26	53821
1195	120	27	53854
1196	120	28	53827
1197	120	29	53761
1198	120	30	53704
1199	120	31	53710
1200	120	32	53767
1201	120	33	53726
1202	120	34	53760
1203	120	35	53808
1204	120	36	54154
1205	120	37	54068
1206	120	38	54069
1207	120	39	53916
1208	120	40	53802
1209	120	41	53922
1210	120	42	53849
1211	120	43	53774
1212	120	44	53983
1213	120	45	53520
1214	120	46	53381
1215	120	47	53799
1216	120	48	53332
1217	120	49	53043
1218	120	50	52987
1219	120	51	52992
1220	120	52	54595
1221	120	53	53435
1222	120	54	53130

	A (ft)	B (ft)	C (gammas)
1223	120	55	53294
1224	120	56	53473
1225	120	57	53560
1226	120	58	53949
1227	120	59	56645
1228	120	60	53984
1229	120	61	53919
1230	120	62	53823
1231	120	63	53883
1232	120	64	53865
1233	120	65	53799
1234	120	66	53860
1235	120	67	54218
1236	120	68	54215
1237	120	69	53961
1238	120	70	53822
1239	120	71	53860
1240	120	72	53717
1241	120	73	53797
1242	120	74	54343
1243	120	75	54080
1244	120	76	53732
1245	120	77	54034
1246	120	78	56836
1247	120	79	58092
1248	120	80	53714
1249	120	81	53597
1250	120	82	53835
1251	120	83	55225
1252	120	84	53789
1253	120	85	53716
1254	115	0	53735
1255	115	1	53602
1256	115	2	53748
1257	115	3	53774
1258	115	4	54208
1259	115	5	54872
1260	115	6	64887
1261	115	7	55197
1262	115	8	57201
1263	115	9	55615
1264	115	10	56482
1265	115	11	56595
1266	115	12	55090
1267	115	13	54690
1268	115	14	54176
1269	115	15	54067

	A (ft)	B (ft)	C (gammas)
1270	115	16	54847
1271	115	17	55543
1272	115	18	67545
1273	115	19	68245
1274	115	20	69802
1275	115	21	54278
1276	115	22	56588
1277	115	23	65404
1278	115	24	66440
1279	115	25	79267
1280	115	26	76350
1281	115	27	81067
1282	115	28	75105
1283	115	29	79323
1284	115	30	75706
1285	115	31	79314
1286	115	32	77691
1287	115	33	75543
1288	115	34	74981
1289	115	35	77128
1290	115	36	76357
1291	115	37	54134
1292	115	38	54125
1293	115	39	54260
1294	115	40	54056
1295	115	41	54200
1296	115	42	54181
1297	115	43	54225
1298	115	44	53833
1299	115	45	53852
1300	115	46	54480
1301	115	47	54112
1302	115	48	54075
1303	115	49	53975
1304	115	50	54054
1305	115	51	54562
1306	115	52	54089
1307	115	53	54015
1308	115	54	54134
1309	115	55	54178
1310	115	56	54135
1311	115	57	54045
1312	115	58	54398
1313	115	59	54587
1314	115	60	56469
1315	115	61	55360
1316	115	62	55737

	A (ft)	B (ft)	C (gammas)
1317	115	63	56559
1318	115	64	54689
1319	115	65	55152
1320	115	66	60581
1321	115	67	81038
1322	115	68	76702
1323	115	69	75327
1324	115	70	77589
1325	115	71	54065
1326	115	72	54169
1327	115	73	53859
1328	115	74	67799
1329	115	75	68274
1330	115	76	54054
1331	115	77	75959
1332	115	78	53953
1333	115	79	54068
1334	115	80	54085
1335	115	81	55814
1336	115	82	54133
1337	115	83	55396
1338	115	84	56703
1339	115	85	53957
1340	110	0	53037
1341	110	1	52951
1342	110	2	53276
1343	110	3	53481
1344	110	4	53913
1345	110	5	55082
1346	110	6	63536
1347	110	7	58534
1348	110	8	54822
1349	110	9	57450
1350	110	10	59204
1351	110	11	54270
1352	110	12	53453
1353	110	13	53189
1354	110	14	53048
1355	110	15	53017
1356	110	16	53399
1357	110	17	54228
1358	110	18	67724
1359	110	19	67724
1360	110	20	53641
1361	110	21	53418
1362	110	22	53669
1363	110	23	53549

	A (ft)	B (ft)	C (gammas)
1364	110	24	53501
1365	110	25	53546
1366	110	26	53640
1367	110	27	54071
1368	110	28	53933
1369	110	29	53860
1370	110	30	54039
1371	110	31	53998
1372	110	32	54135
1373	110	33	54099
1374	110	34	54280
1375	110	35	54416
1376	110	36	54677
1377	110	37	54381
1378	110	38	54420
1379	110	39	54519
1380	110	40	54659
1381	110	41	54602
1382	110	42	54631
1383	110	43	54674
1384	110	44	54671
1385	110	45	54980
1386	110	46	54952
1387	110	47	54782
1388	110	48	54668
1389	110	49	54688
1390	110	50	55637
1391	110	51	54561
1392	110	52	54276
1393	110	53	54542
1394	110	54	54652
1395	110	55	54477
1396	110	56	54421
1397	110	57	54462
1398	110	58	54656
1399	110	59	54462
1400	110	60	54663
1401	110	61	55657
1402	110	62	54813
1403	110	63	54743
1404	110	64	54894
1405	110	65	64199
1406	110	66	63164
1407	110	67	56632
1408	110	68	54541
1409	110	69	54580
1410	110	70	66039

	A (ft)	B (ft)	C (gammas)
1411	110	71	67738
1412	110	72	54073
1413	110	73	54134
1414	110	74	54125
1415	110	75	54190
1416	110	76	54420
1417	110	77	54086
1418	110	78	54118
1419	110	79	54705
1420	110	80	63794
1421	110	81	66086
1422	110	82	68574
1423	110	83	70418
1424	110	84	54399
1425	110	85	54854
1426	105	50	55264
1427	110	50	54219
1428	115	50	54073
1429	120	50	52953
1430	125	50	52931
1431	130	50	54510
1432	131	50	53670
1433	132	50	54727
1434	133	50	53774
1435	134	50	54042
1436	135	50	55041
1437	136	50	54181
1438	137	50	53943
1439	138	50	54022
1440	139	50	54134
1441	140	50	54003
1442	141	50	54037
1443	142	50	54069
1444	143	50	53983
1445	144	50	54062
1446	145	50	53958
1447	150	50	53816
1448	155	50	54221
1449	160	50	54565
1450	165	50	53908
1451	170	50	54044
1452	175	50	56650
1453	180	50	53839
1454	135	90	53624
1455	136	90	53830
1456	137	90	54168
1457	138	90	56087

	A (ft)	B (ft)	C (gammas)
1458	140	90	54193
1459	141	90	54077
1460	142	90	56884
1461	143	90	54527
1462	144	90	56712
1463	145	90	54017
1464	105	25	64334
1465	106	25	54167
1466	107	25	53722
1467	108	25	53622
1468	109	25	53778
1469	110	25	53549
1470	111	25	53270
1471	112	25	57961
1472	113	25	69922
1473	114	25	76428
1474	115	25	79191
1475	116	25	74857
1476	117	25	53694
1477	118	25	53736
1478	119	25	53715
1479	120	25	53788
1480	121	25	53878
1481	122	25	53974
1482	123	25	53972
1483	124	25	54175
1484	125	25	67770
1485	126	25	67770
1486	127	25	66266
1487	128	25	64409
1488	129	25	64409
1489	130	25	64409
1490	131	25	63411
1491	132	25	63562
1492	133	25	53089
1493	134	25	53505
1494	135	25	53866
1495	136	25	53962
1496	137	25	53992
1497	138	25	53956
1498	139	25	53945
1499	140	25	53820
1500	155	30	53849
1501	156	30	54002
1502	157	30	53943
1503	158	30	53971
1504	159	30	54071

	A (ft)	B (ft)	C (gammas)
1505	160	30	54286
1506	161	30	59768
1507	162	30	54031
1508	163	30	54303
1509	164	30	54263
1510	165	30	54258
1511	135	90	53638
1512	136	90	53801
1513	137	90	53965
1514	138	90	54461
1515	139	90	56494
1516	140	90	54250
1517	141	90	54099
1518	220	70	67336
1519	220	60	76511
1520	215	60	79750
1521	0	0	53595
1522	1	0	53547
1523	2	0	53533
1524	3	0	56982
1525	4	0	53630
1526	5	0	53650
1527	6	0	53568
1528	7	0	53398
1529	8	0	53467
1530	9	0	53544
1531	10	0	53677
1532	11	0	53823
1533	12	0	53670
1534	13	0	63515
1535	14	0	52958
1536	15	0	53080
1537	16	0	53308
1538	17	0	53133
1539	18	0	53106
1540	19	0	52900
1541	20	0	52871
1542	21	0	52858
1543	22	0	52824
1544	23	0	52896
1545	24	0	52778
1546	25	0	52566
1547	26	0	52331
1548	27	0	52230
1549	28	0	52526
1550	29	0	52673
1551	30	0	52565

	A (ft)	B (ft)	C (gammas)
1552	31	0	52331
1553	32	0	52293
1554	33	0	52252
1555	34	0	52253
1556	35	0	52511
1557	36	0	52555
1558	37	0	52466
1559	38	0	52209
1560	39	0	52114
1561	40	0	52135
1562	41	0	52166
1563	42	0	52298
1564	43	0	52044
1565	44	0	52015
1566	45	0	51988
1567	46	0	51959
1568	47	0	51943
1569	48	0	51858
1570	49	0	52070
1571	50	0	52120
1572	51	0	51868
1573	52	0	51853
1574	53	0	51809
1575	54	0	51863
1576	55	0	51771
1577	56	0	51803
1578	57	0	51883
1579	58	0	51766
1580	59	0	51679
1581	60	0	52094
1582	61	0	51944
1583	62	0	51745
1584	63	0	51720
1585	64	0	51992
1586	65	0	51734
1587	66	0	51864
1588	67	0	51820
1589	68	0	52009
1590	69	0	51982
1591	70	0	52177
1592	71	0	53592
1593	72	0	53822
1594	73	0	51959
1595	74	0	52162
1596	75	0	52248
1597	76	0	52212
1598	77	0	52367

	A (ft)	B (ft)	C (gammas)
1599	78	0	52616
1600	79	0	52894
1601	80	0	53245
1602	81	0	53720
1603	82	0	54458
1604	83	0	55106
1605	84	0	56894
1606	85	0	57598
1607	86	0	59509
1608	87	0	64084
1609	88	0	65894
1610	89	0	66400
1611	90	0	69460
1612	91	0	70032
1613	92	0	70032
1614	93	0	82723
1615	94	0	75088
1616	95	0	84619
1617	96	0	87073
1618	97	0	87073
1619	98	0	75626
1620	99	0	72363
1621	100	0	55554
1622	101	0	64799
1623	102	0	53596
1624	103	0	53052
1625	104	0	53116
1626	105	0	53054
1627	106	0	52798
1628	107	0	52616
1629	108	0	52527
1630	109	0	52714
1631	110	0	53085

Appendix B:

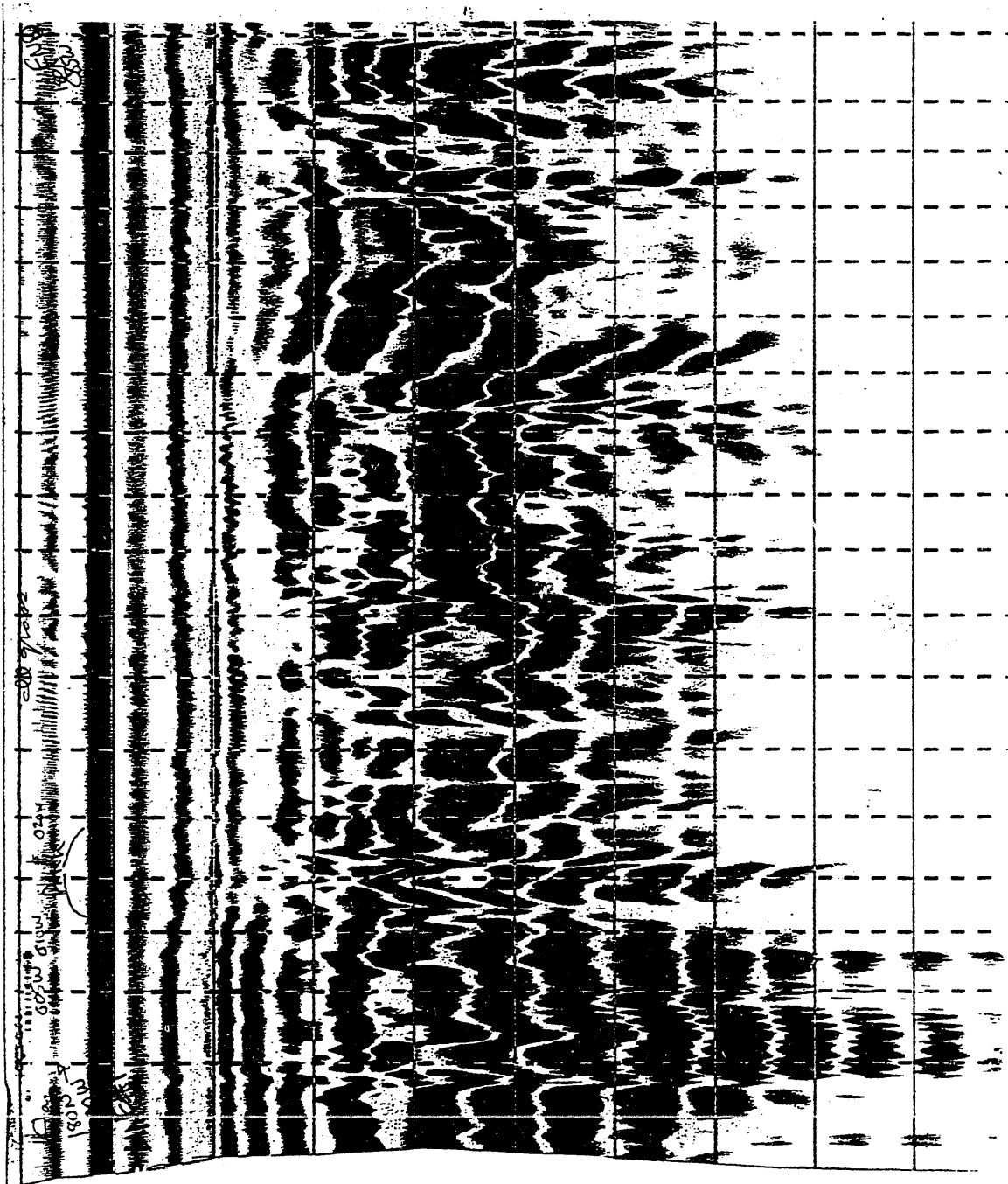
Ground Penetrating Radar Lines

LOCATION OF GPR SURVEY LINES

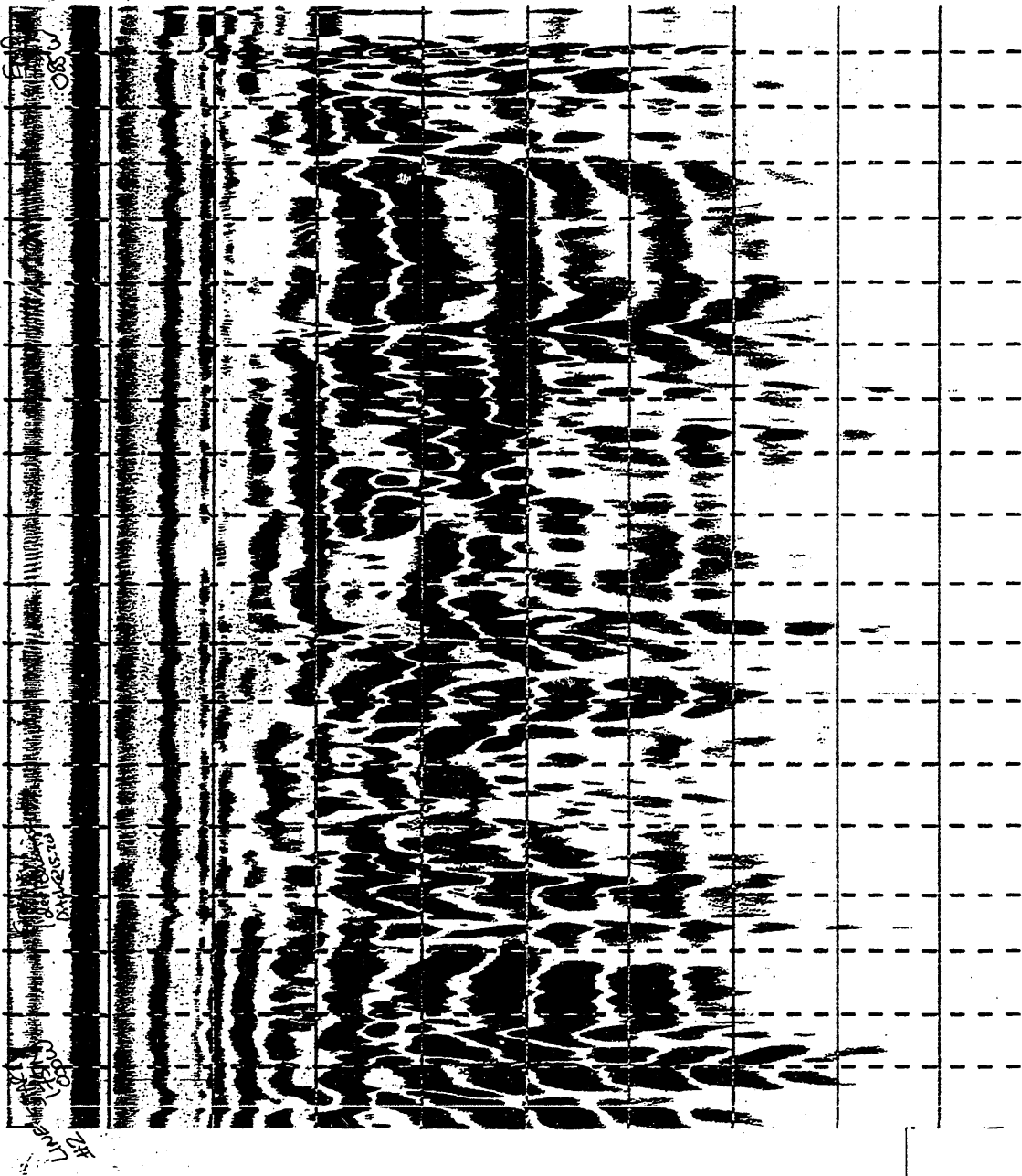
<u>LINE NO</u>	<u>START</u>	<u>END</u>
1	180N 000W	180N 085W
2	175N 000W	175N 085W
3	170N 000W	170N 085W
4	165N 000W	165N 085W
5	160N 000W	160N 085W
6	155N 000W	155N 085W
7	150N 000W	150N 085W
8	145N 000W	145N 085W
9	140N 000W	140N 085W
10	135N 000W	135N 085W
11	130N 000W	130N 085W
12	125N 000W	125N 085W
13	120N 000W	120N 085W
14	115N 000W	115N 085W
15	110N 000W	110N 085W
16	105N 000W	105N 085W
17	100N 000W	100N 085W
18	095N 000W	95N 085W
19	000N 000W	180N 000W
20	000N 005W	180N 005W
21	095N 010W	180N 010W
22	095N 015W	180N 015W
23	095N 020W	180N 020W
24	095N 025W	180N 025W
25	095N 030W	180N 030W
26	095N 035W	180N 035W
27	095N 040W	180N 040W
28	095N 040W	180N 040W
29	095N 045W	180N 045W
30	095N 050W	180N 050W
31	095N 055W	180N 055W
32	095N 060W	180N 060W

<u>LINE NO</u>	<u>START</u>	<u>END</u>
33	095N 065W	180N 065W
34	090N 070W	180N 070W
35	090N 075W	180N 075W
36	095N 080W	180N 080W
37	090N 085W	180N 085W
38	000N 105W	105N 105W
39	000N 110W	105N 110W
40	030N 115W	105N 115W
41	085N 100W	085N 115W
42	080N 100W	080N 115W
43	075N 100W	075N 115W
44	070N 100W	070N 115W
45	065N 100W	065N 115W
46	045N 100W	045N 115W
47	040N 100W	040N 115W
48	035N 100W	035N 115W
49	030N 070W	030N 115W
50	025N 070W	025N 115W
51	020N 070W	020N 095W
52	000N 000W	000N 115W
53	000N -005W	115N -005W
54	000N -010W	115N -010W
55	000N -015W	115N -015W
56	000N -020W	115N -020W
57	000N 020W	000N 000W
58	030N 020W	030N 010W
59	060N 020W	060N 007W
60	115N 020W	115N 010W
61	230N 075W	230N 055W
62	228N 075W	228N 055W
63	228N 075W	228N 055W
64	226N 075W	226N 055W
65	224N 075W	224N 055W

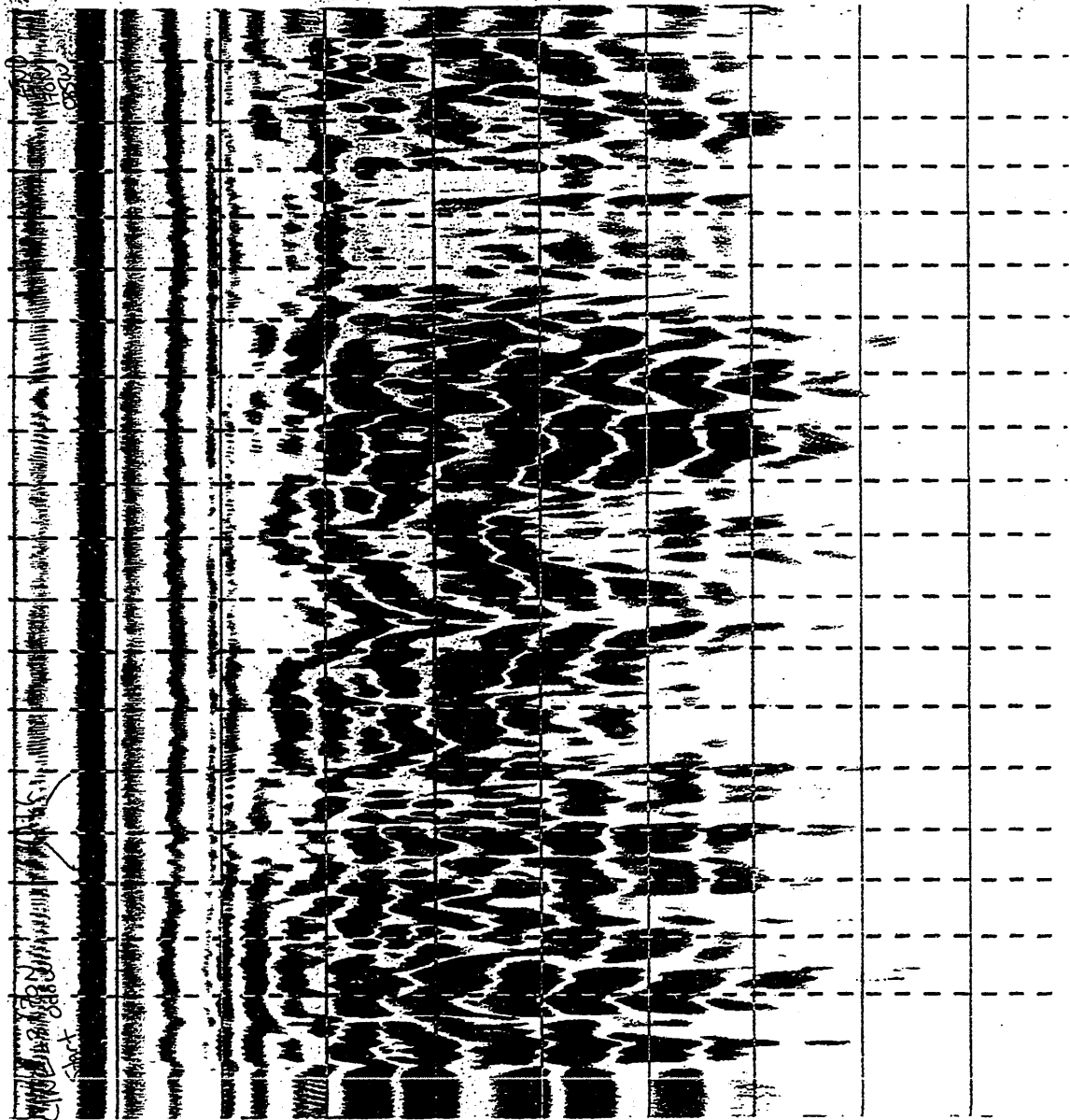
<u>LINE NO</u>	<u>START</u>	<u>END</u>
66	222N 075W	222N 055W
67	220N 075W	220N 055W
68	218N 075W	218N 055W
69	216N 075W	216N 055W
70	214N 075W	214N 055W
71	212N 075W	212N 055W
72	210N 075W	210N 055W
73	205N 075W	205N 055W
74	200N 075W	200N 050W
75	195N 075W	195N 050W
76	190N 075W	190N 050W
77	175N 075W	225N 075W
78	175N 070W	230N 070W
79	175N 065W	230N 065W
80	175N 060W	230N 060W
81	130N 024W	130N 30W
82	130N 030W	136N 030W

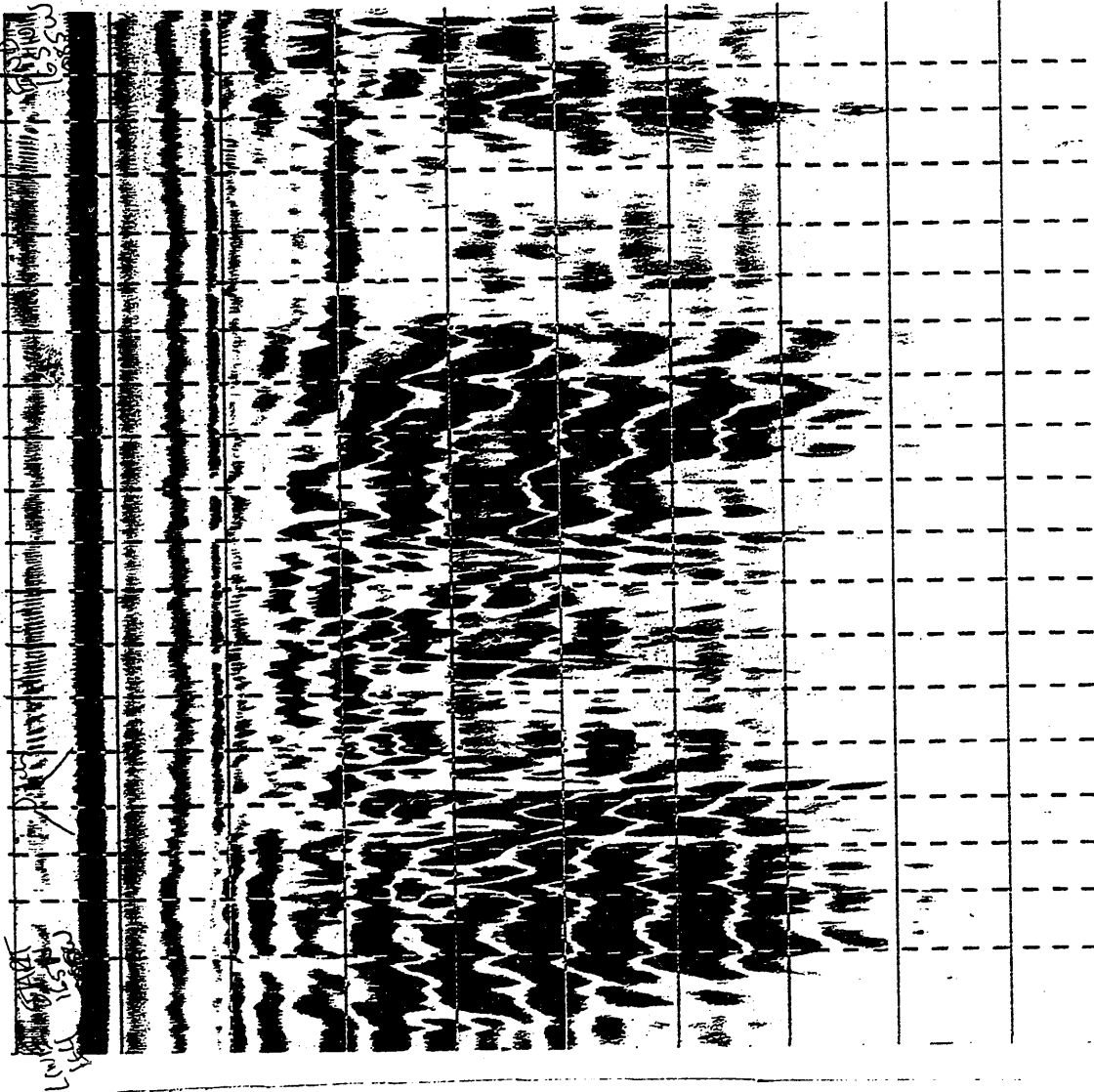


Line 1

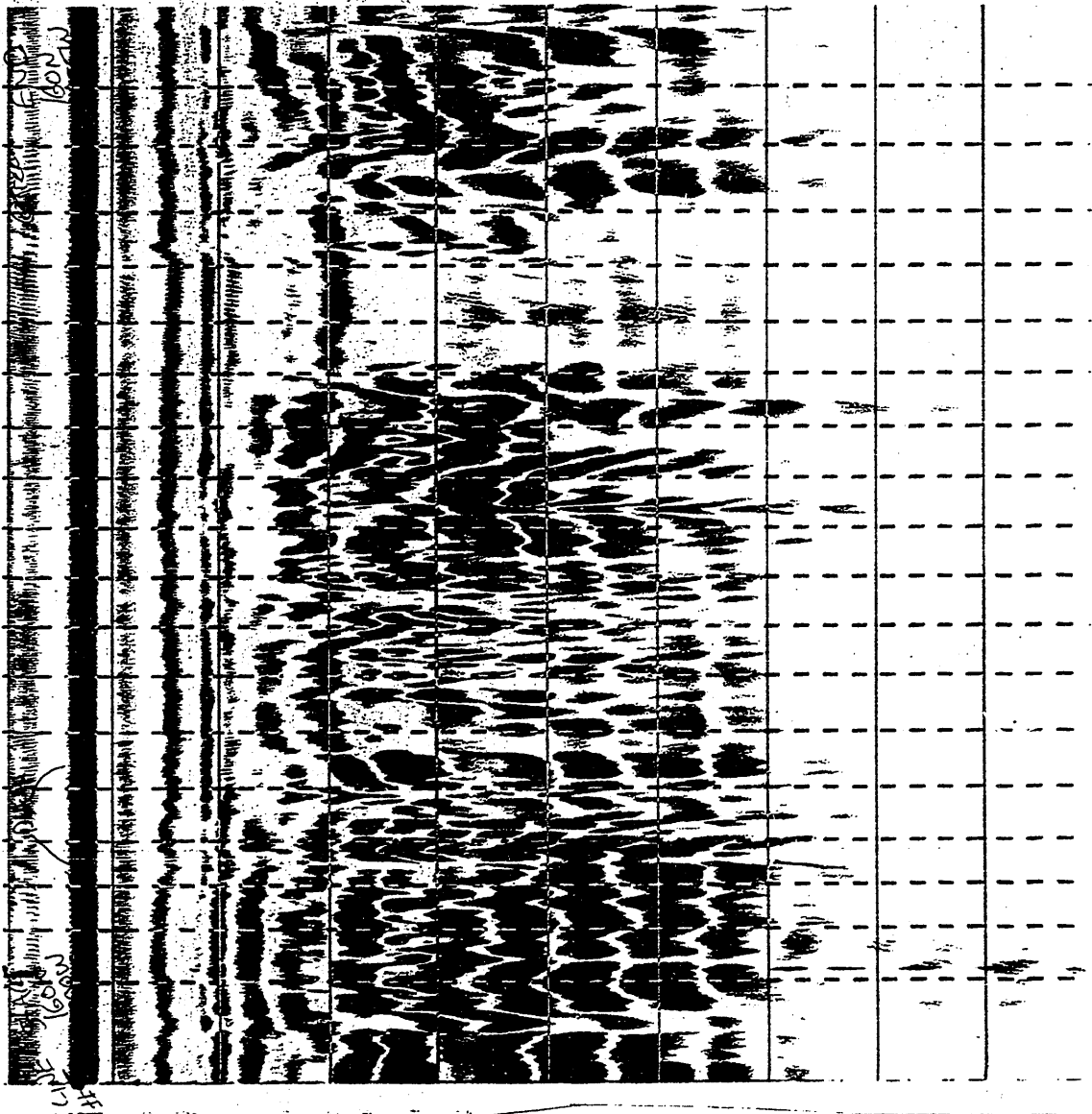


Line 2

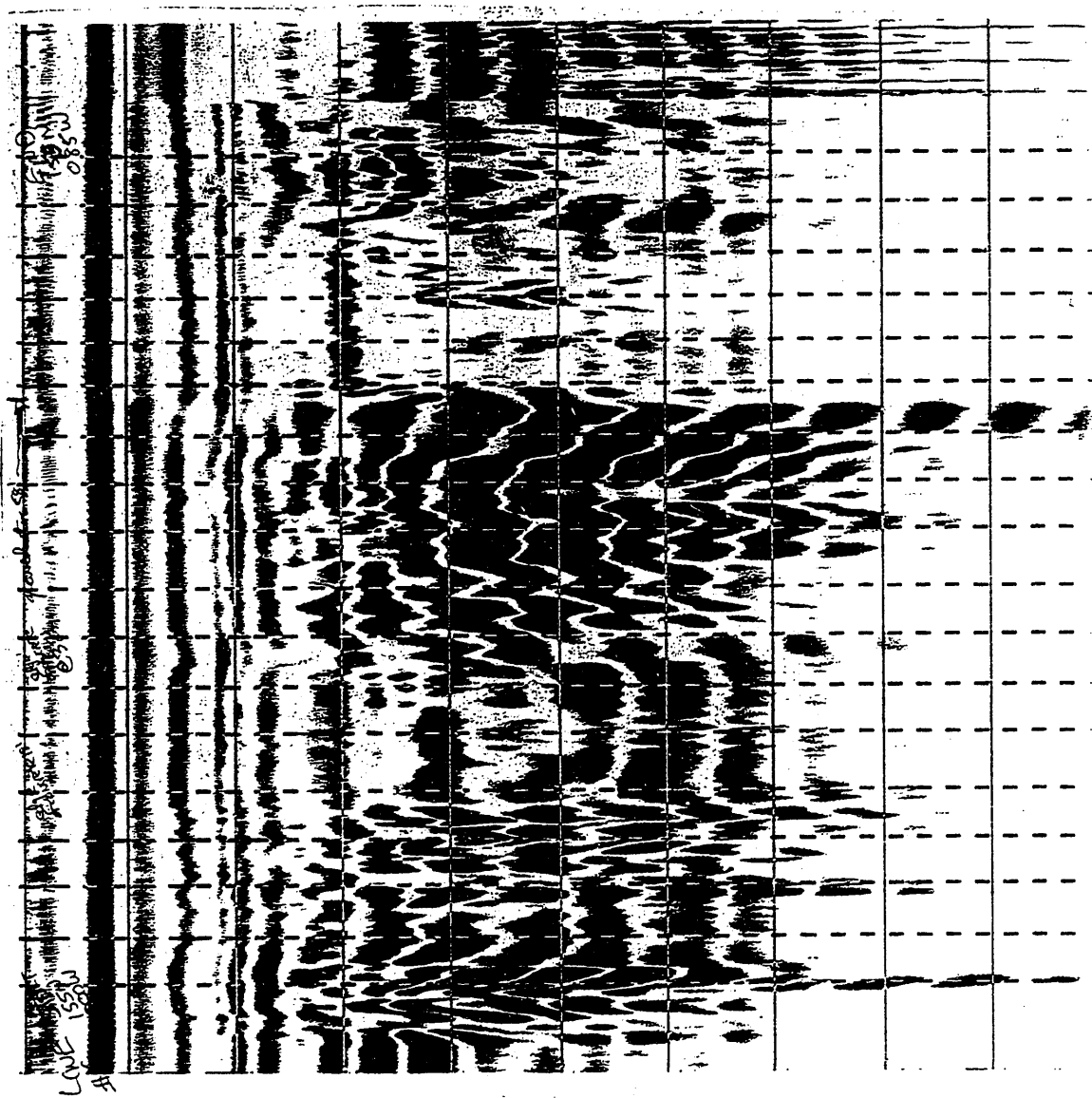




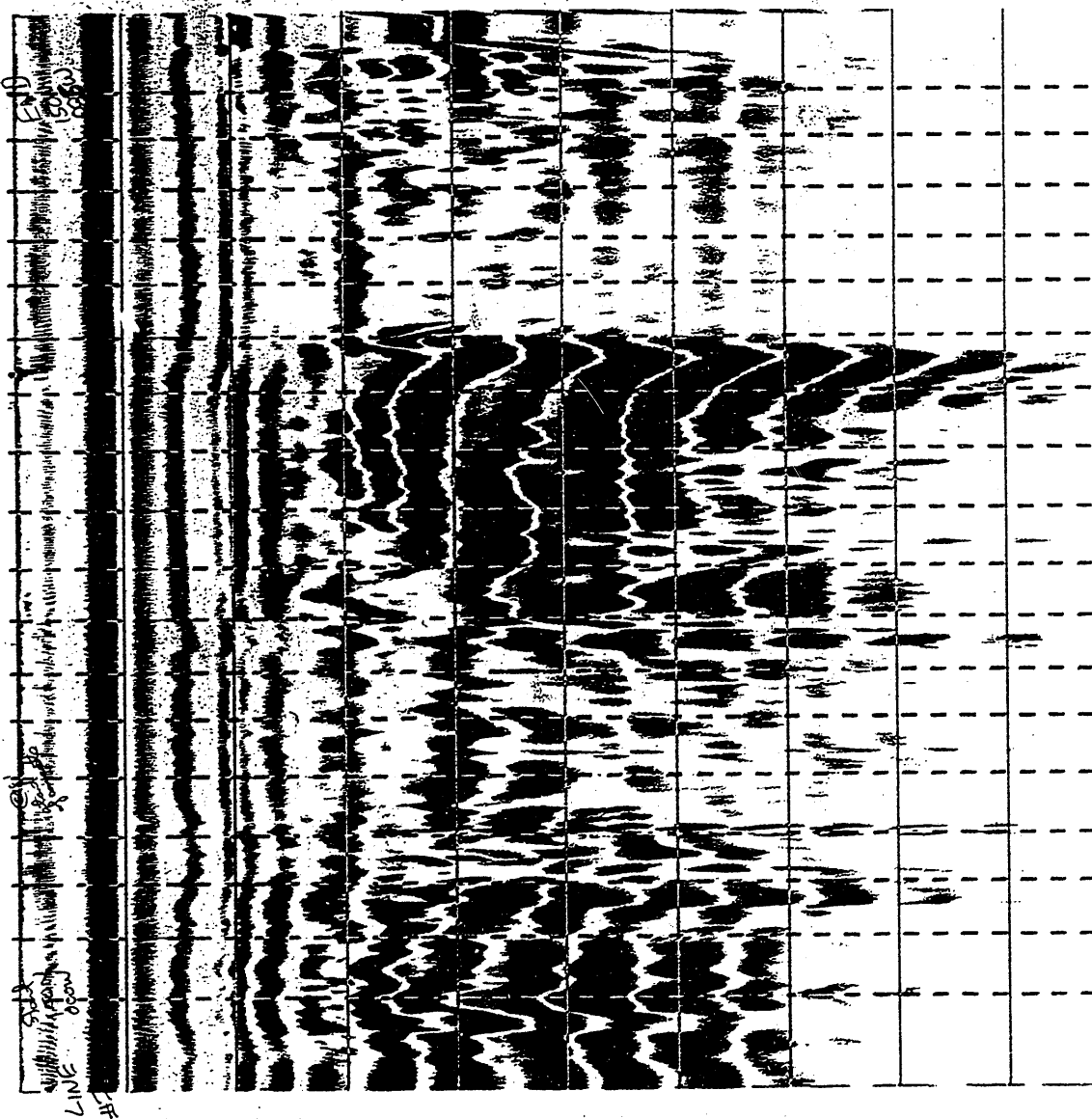
Line 4



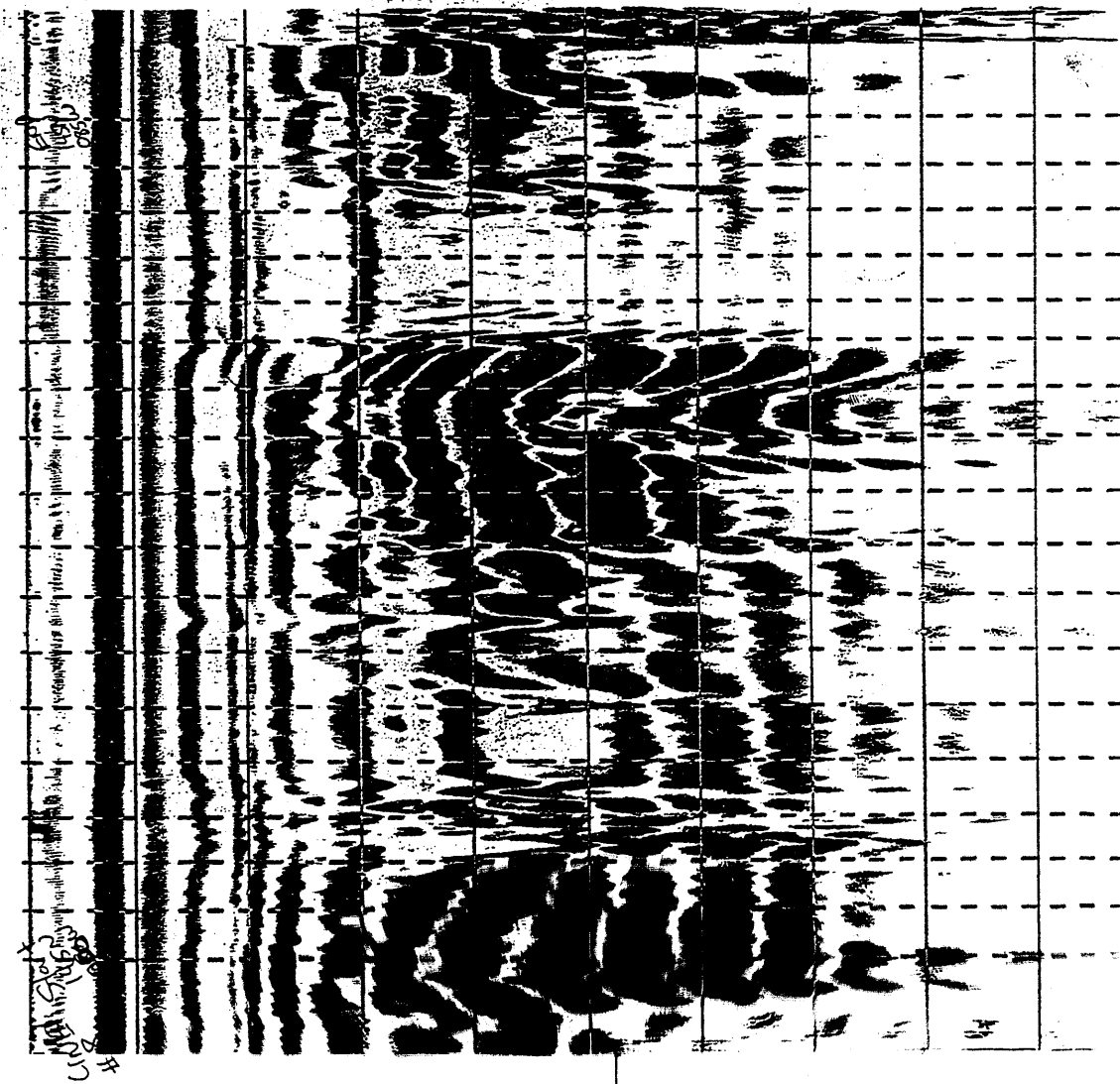
Line 5



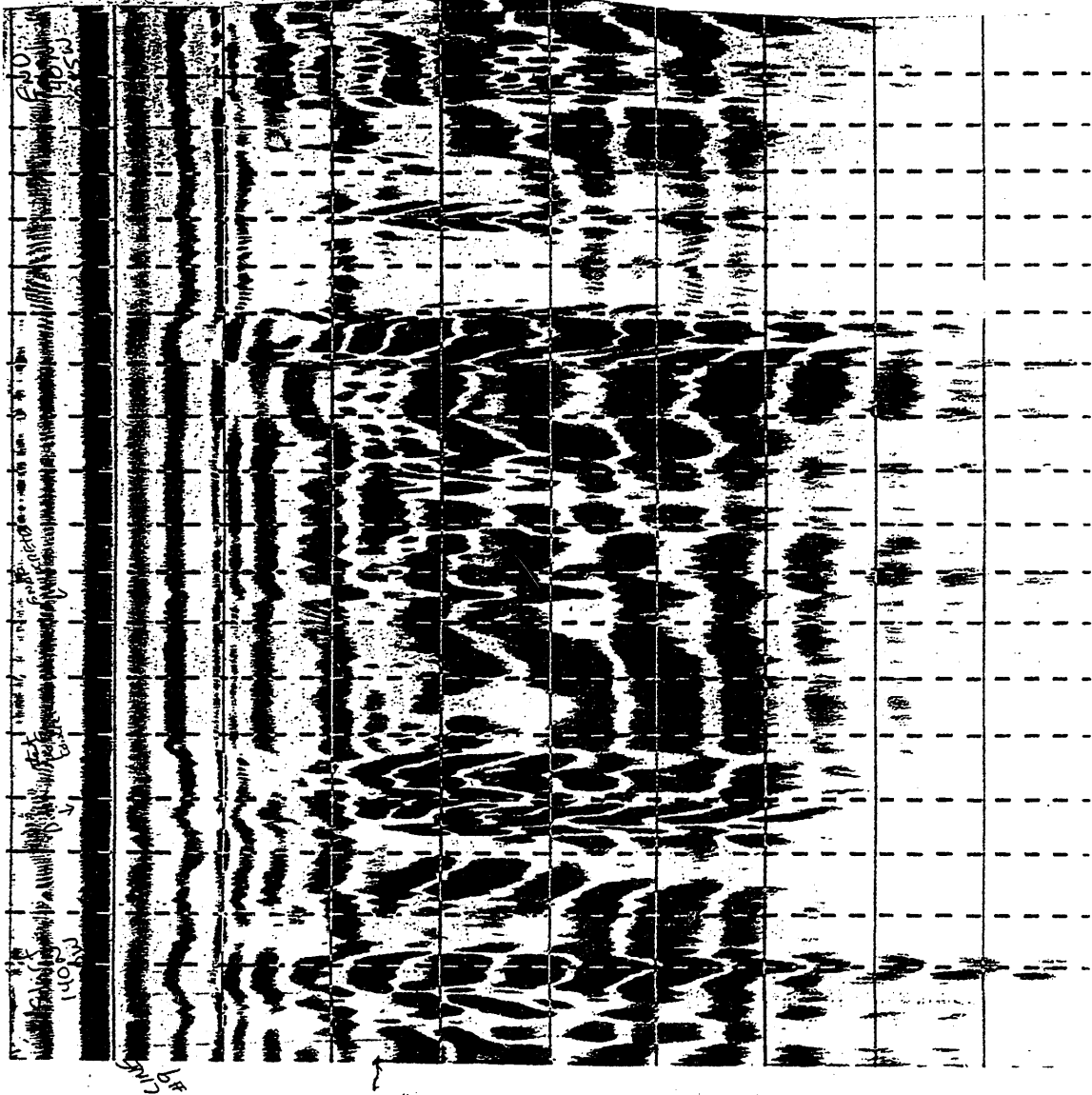
Line 6

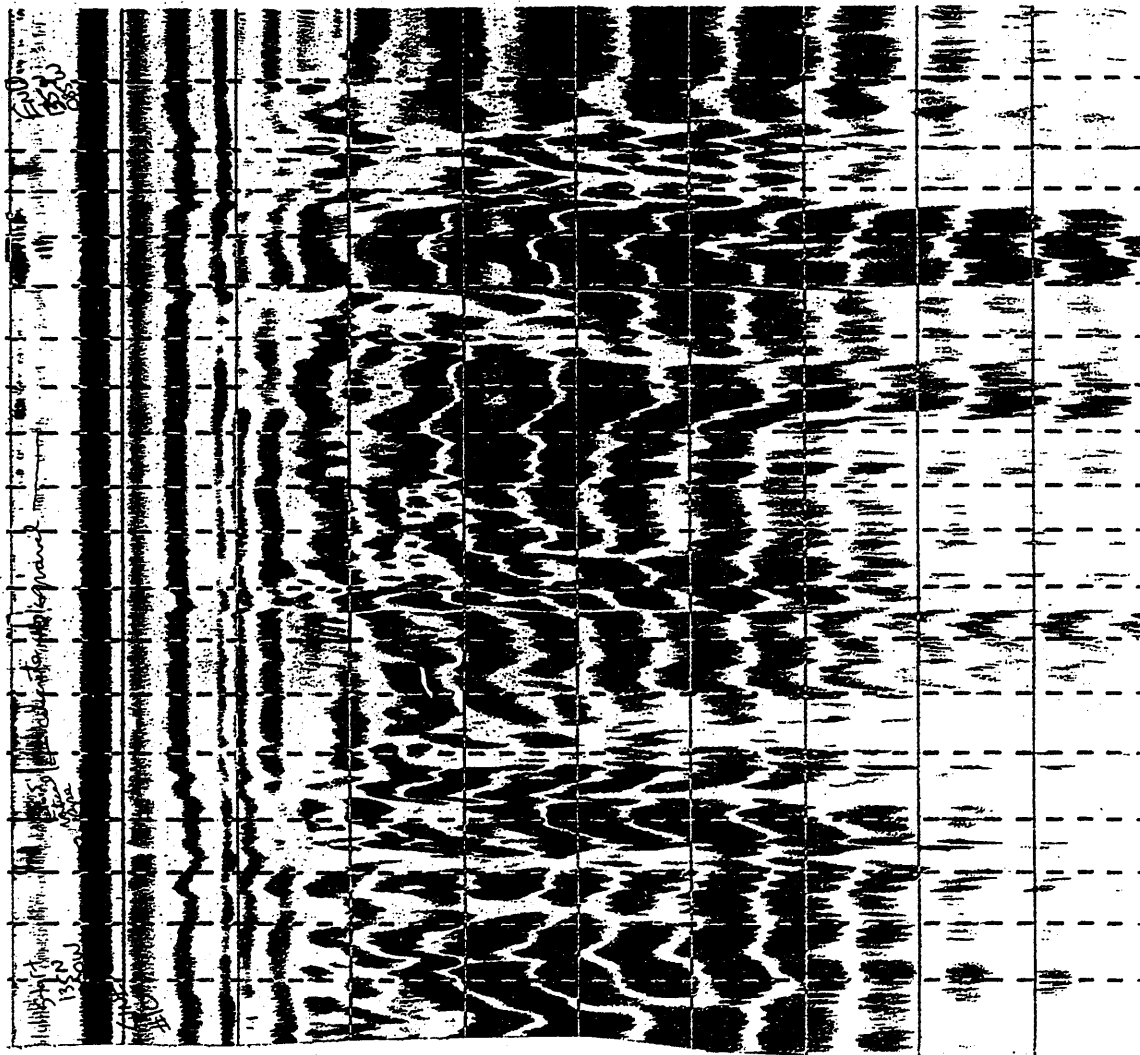


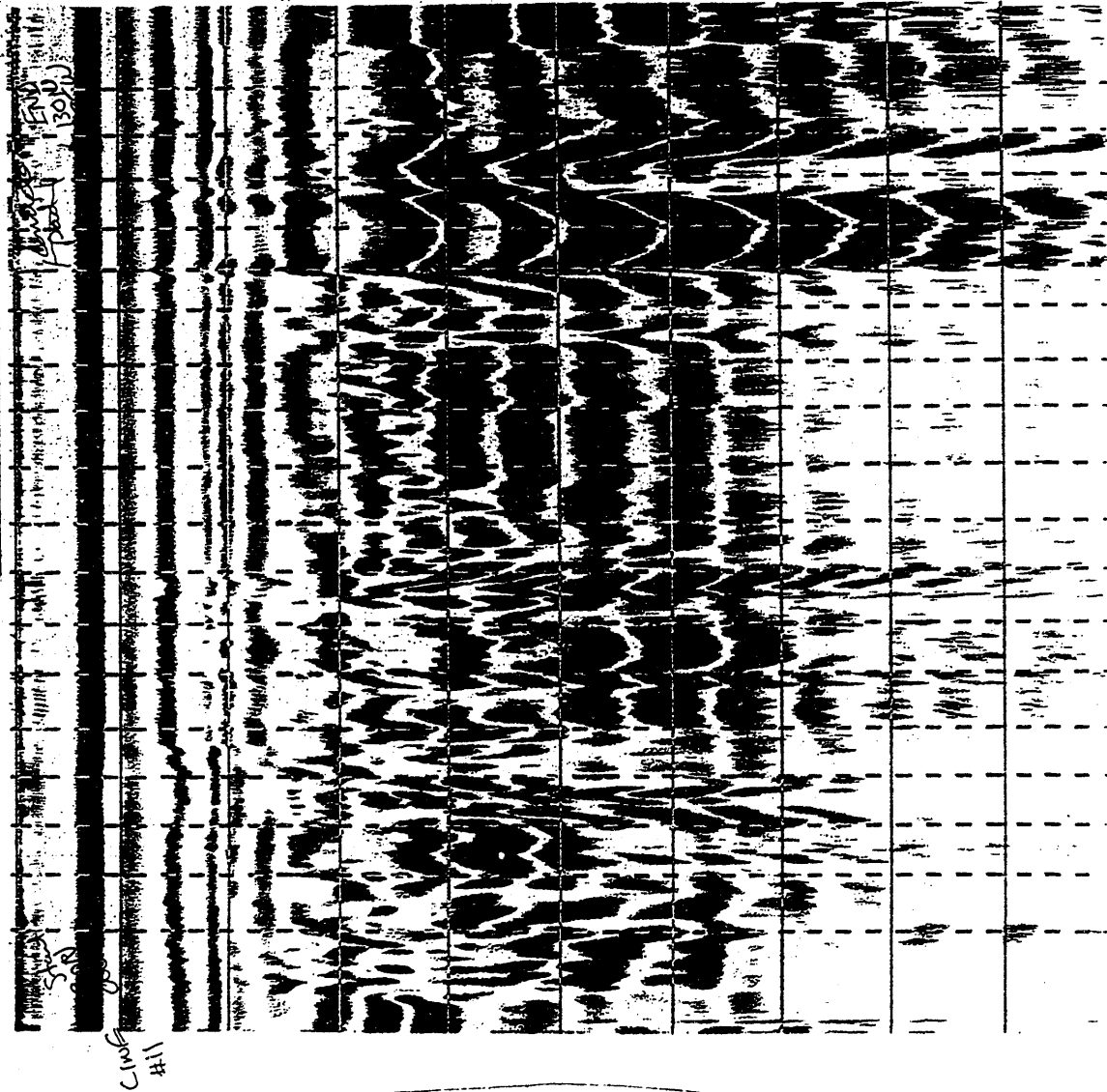
Line 7



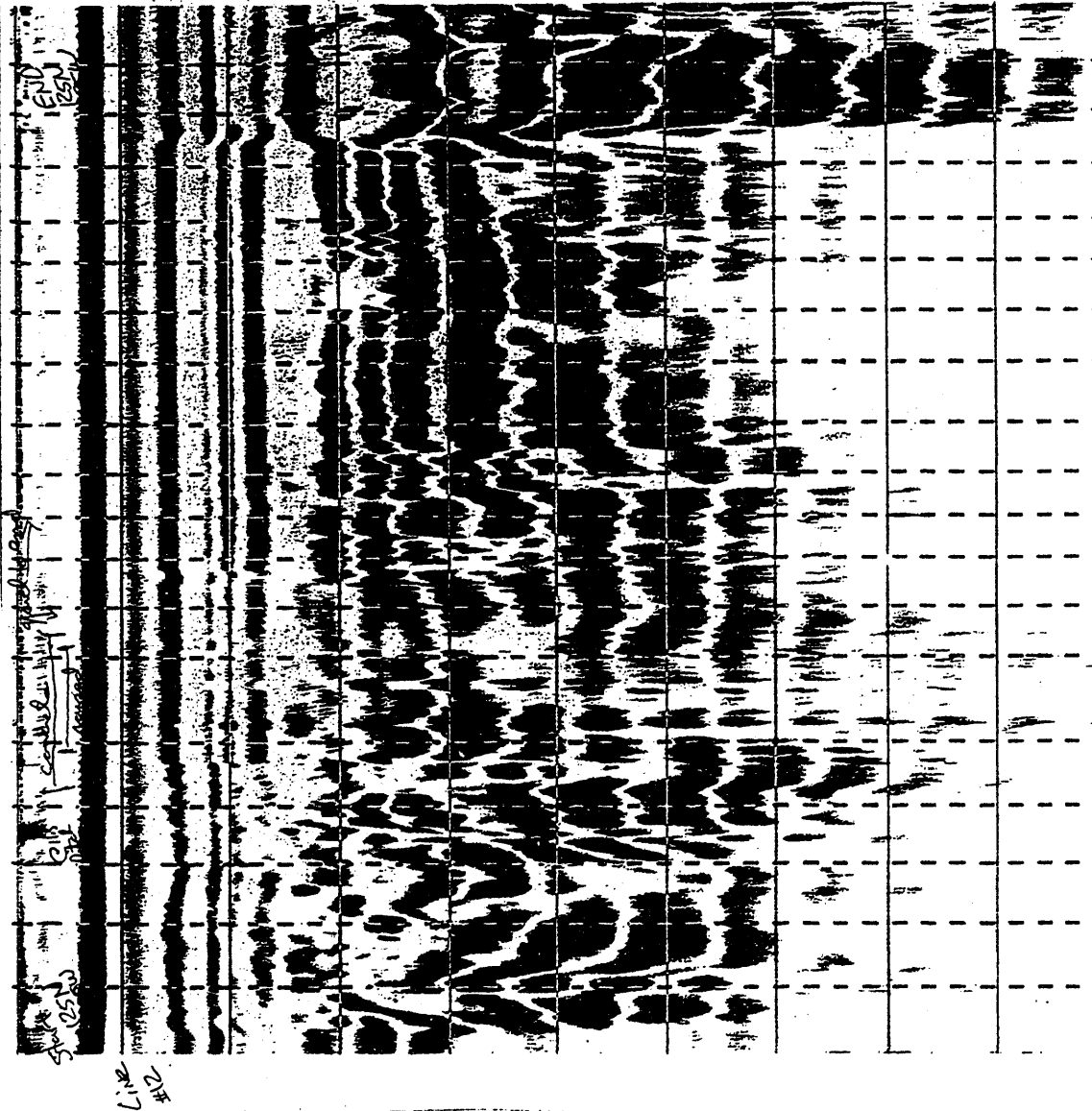
Line 8



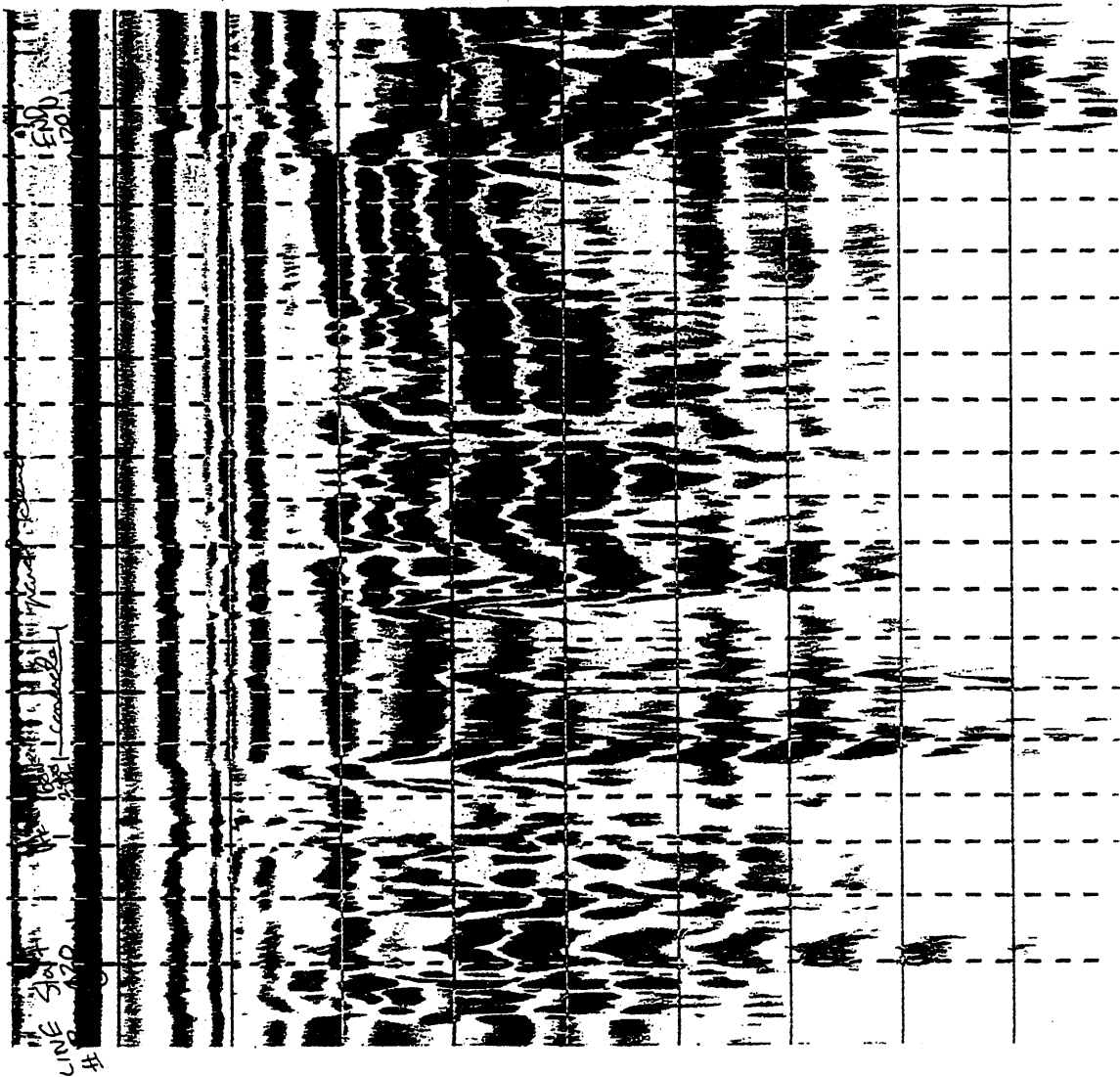




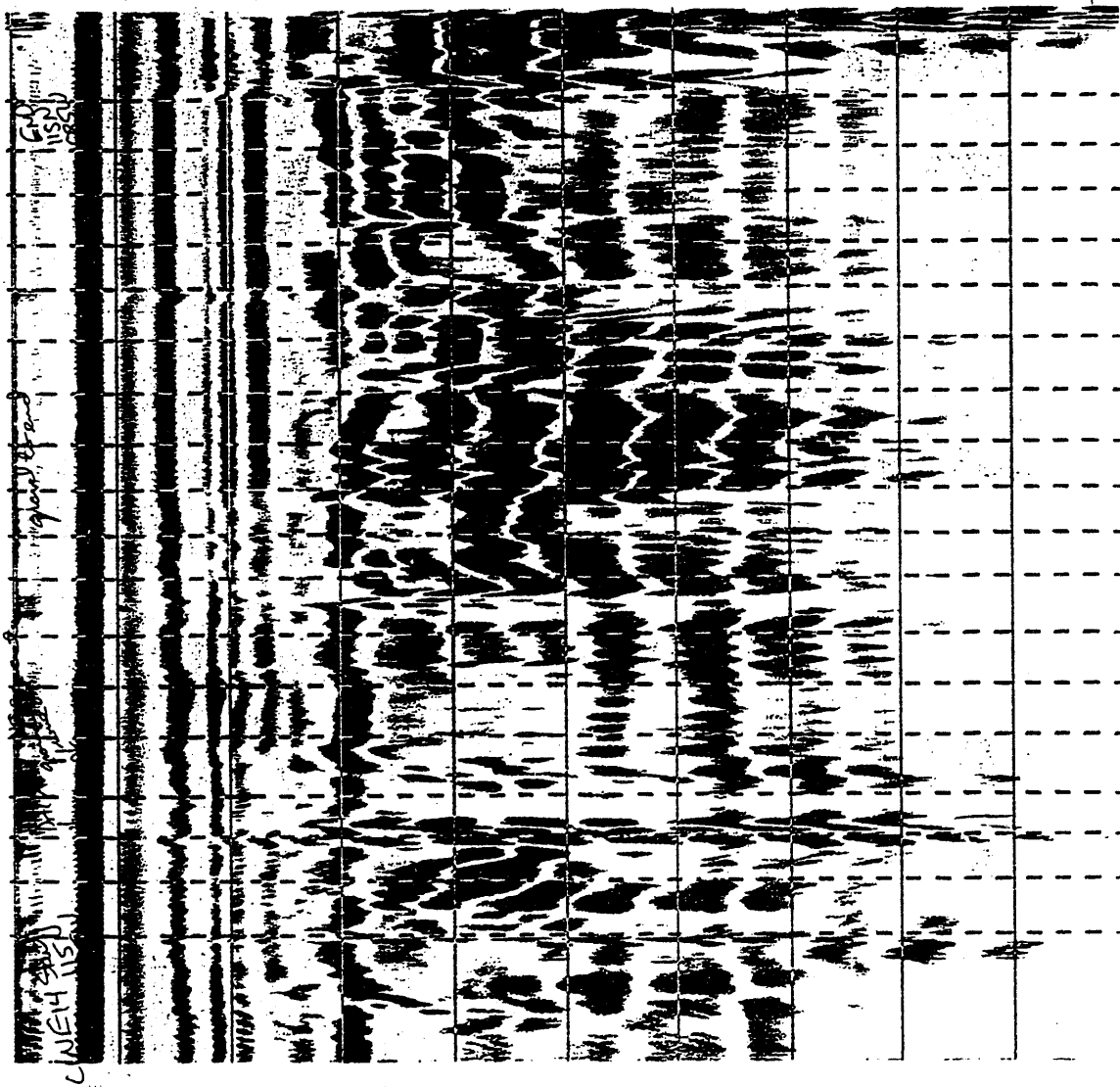
Line 11



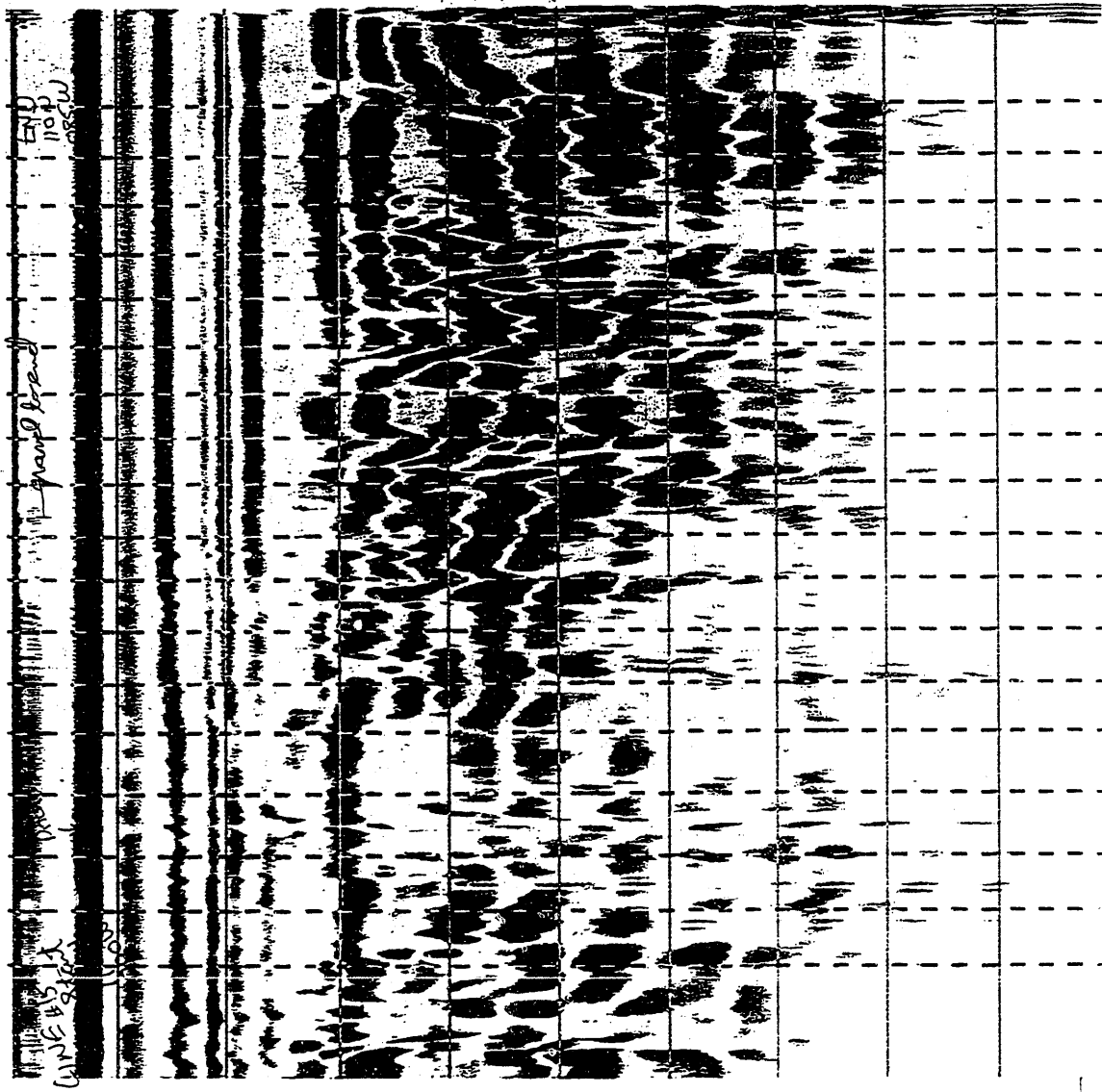
Line 12



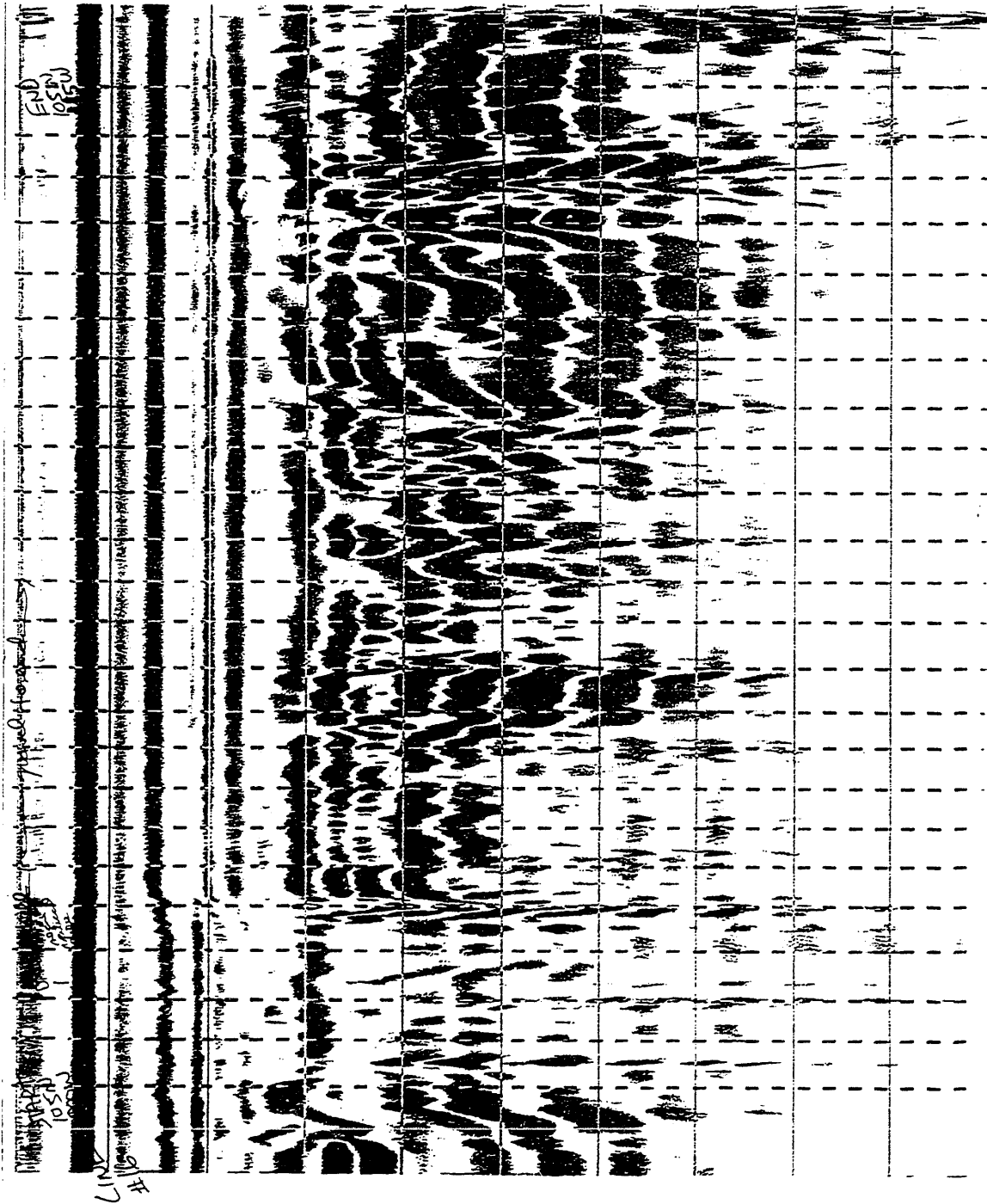
Line 13

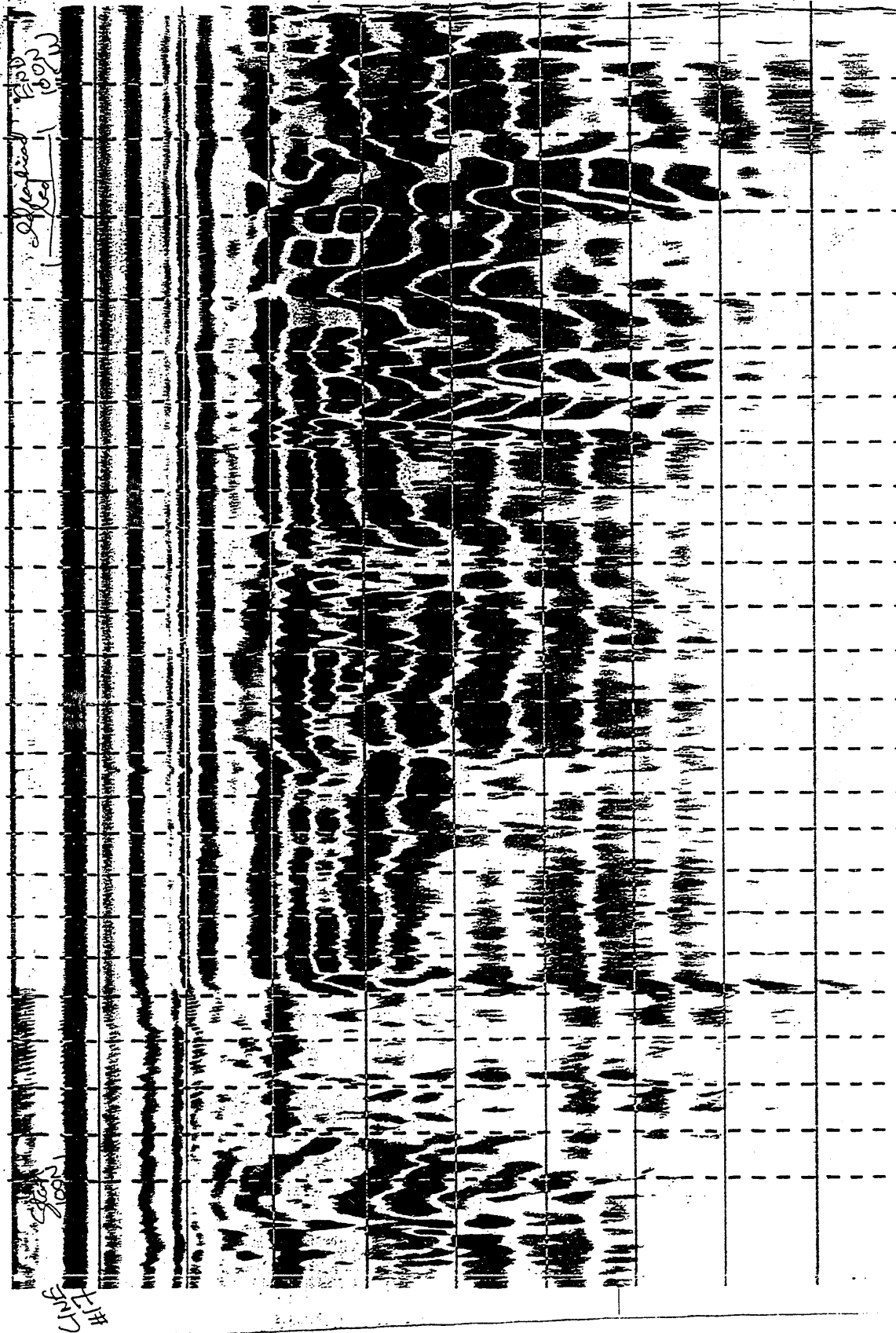


Line 14

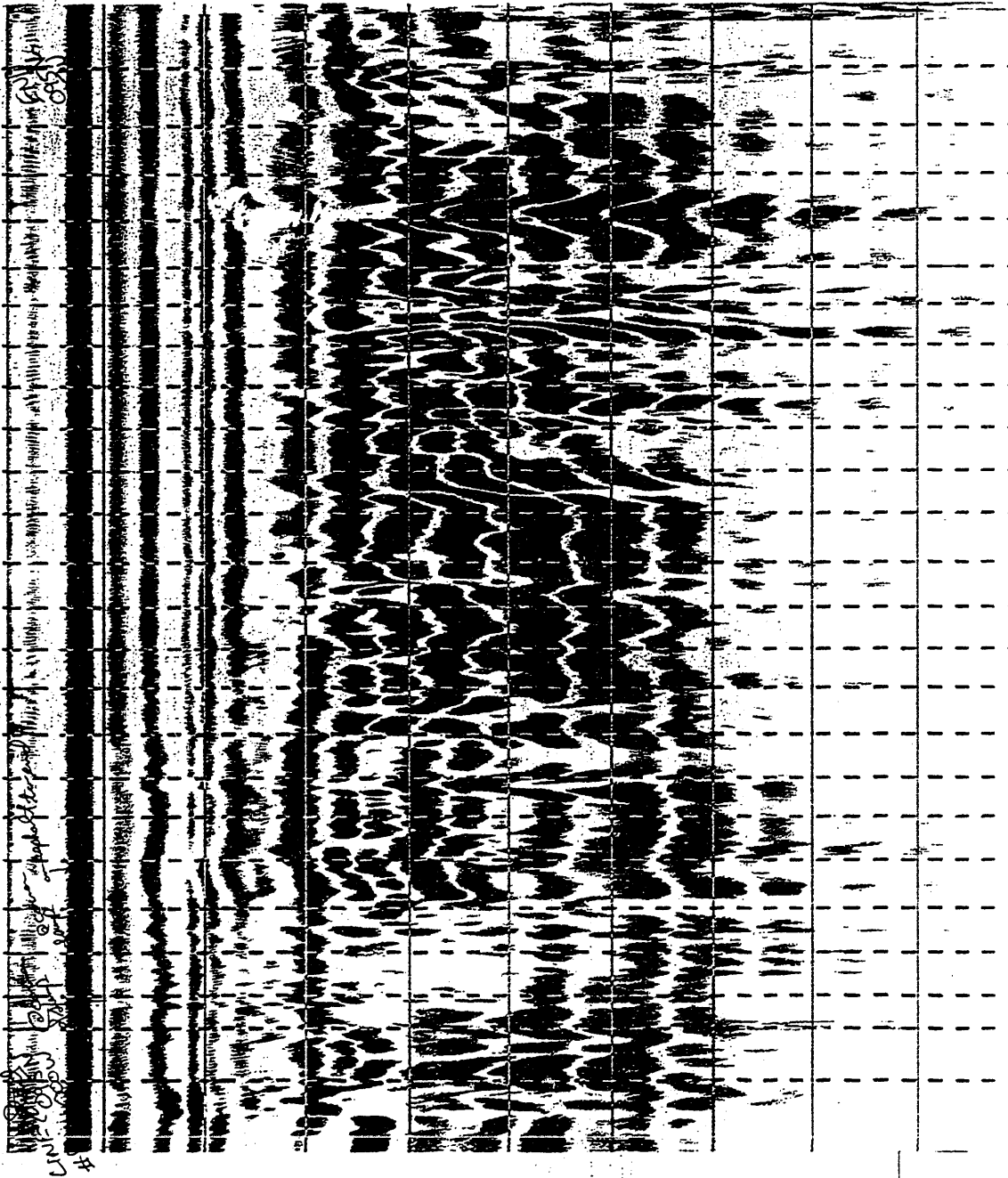


Line 15

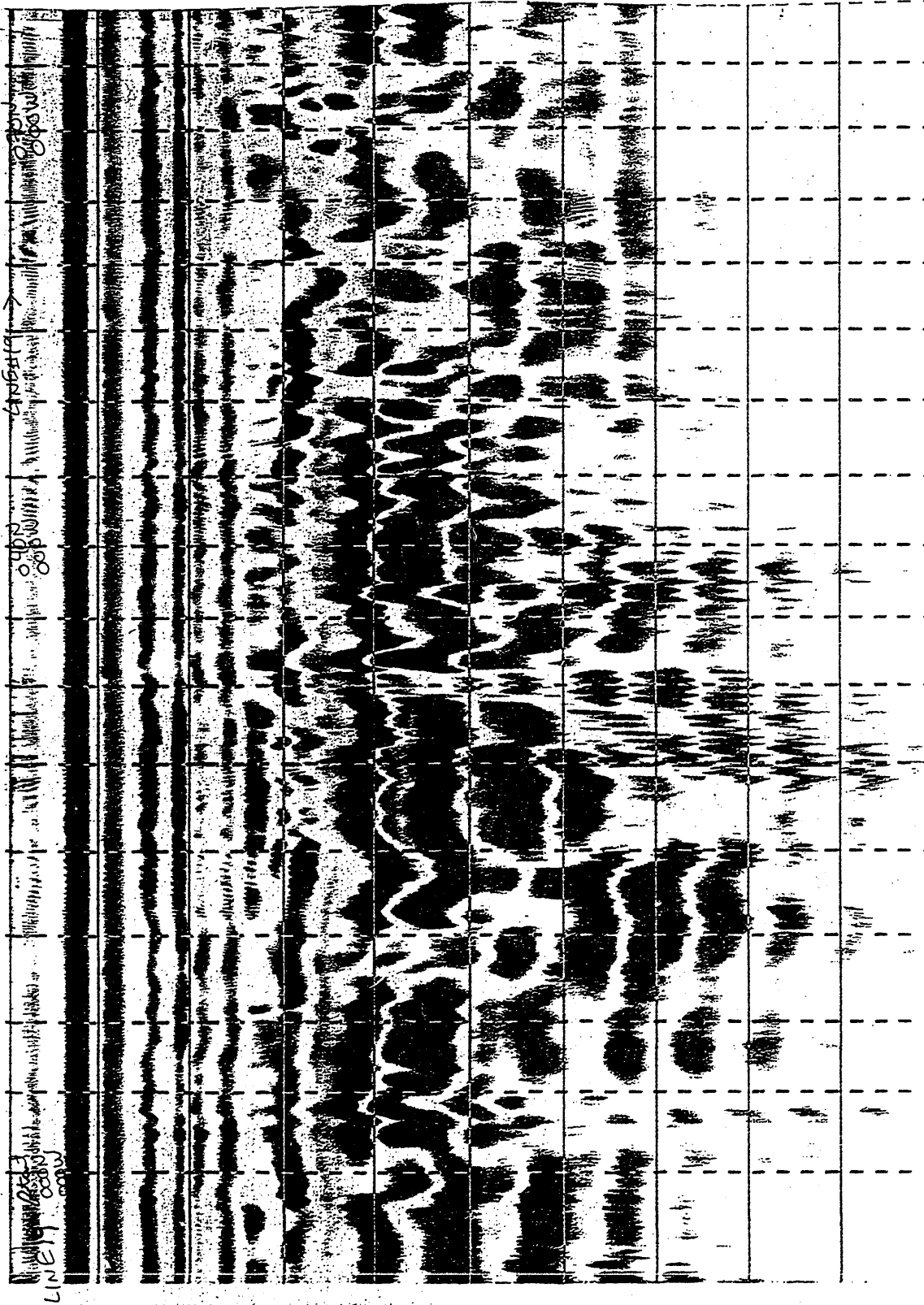


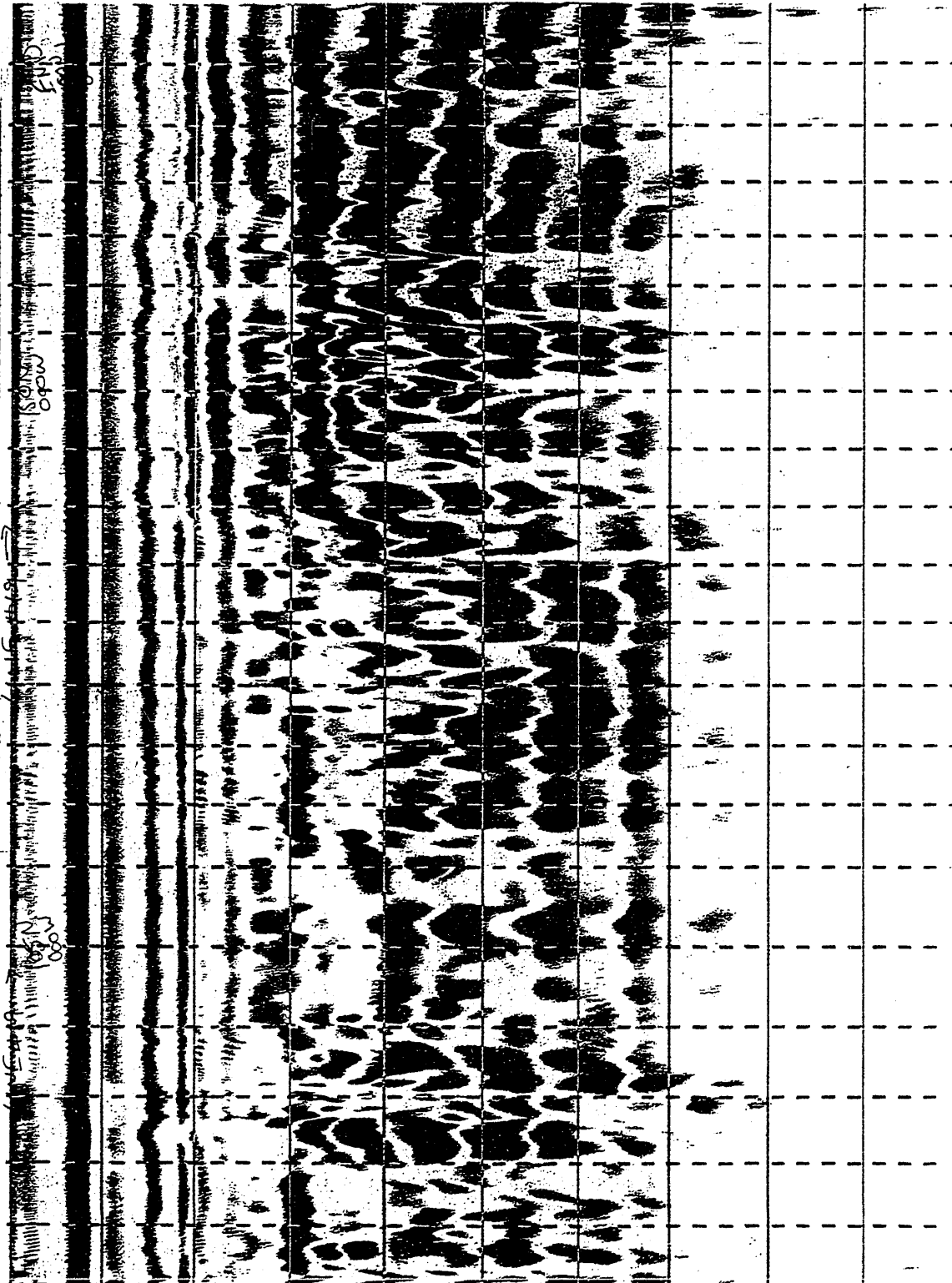


Line 17

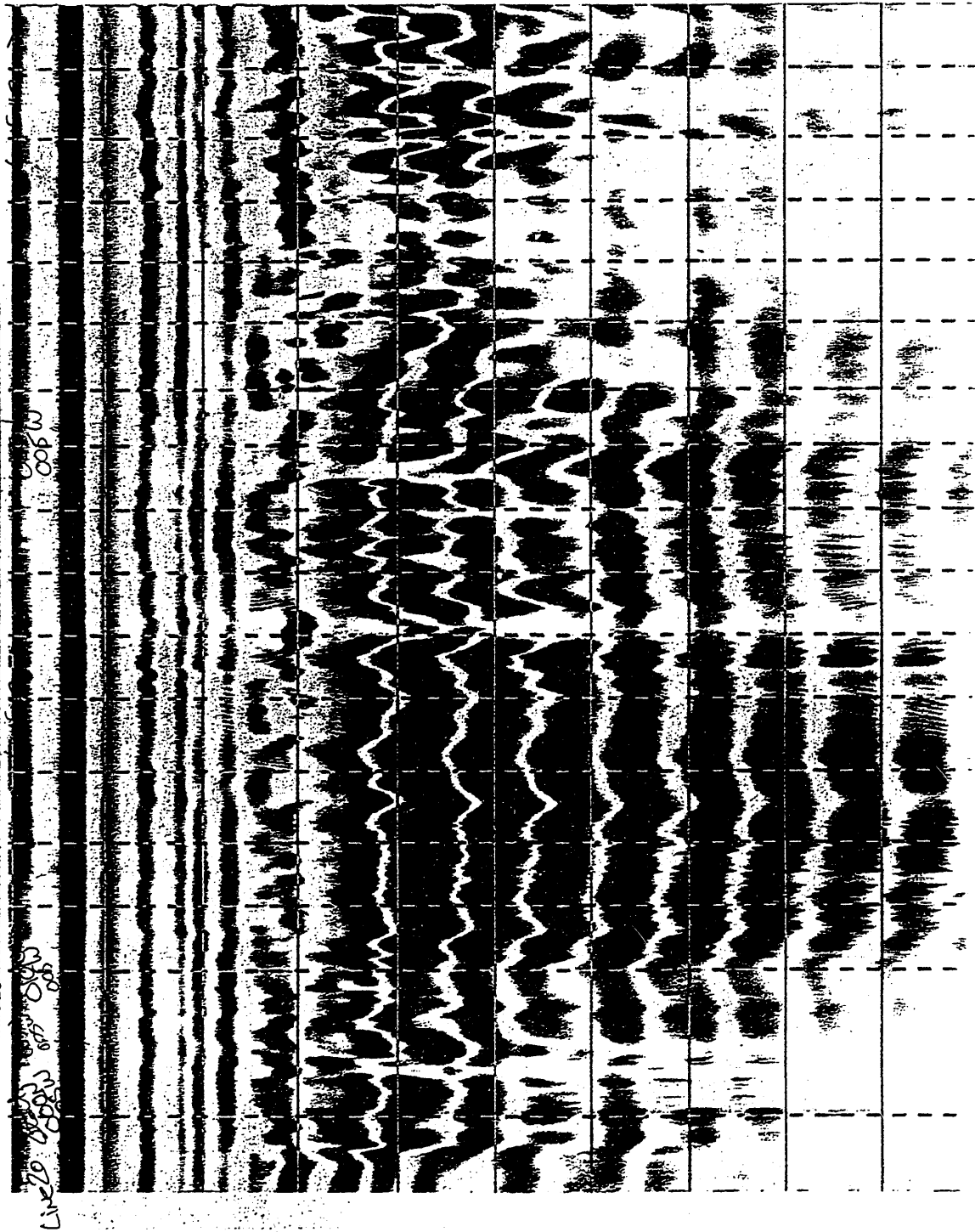


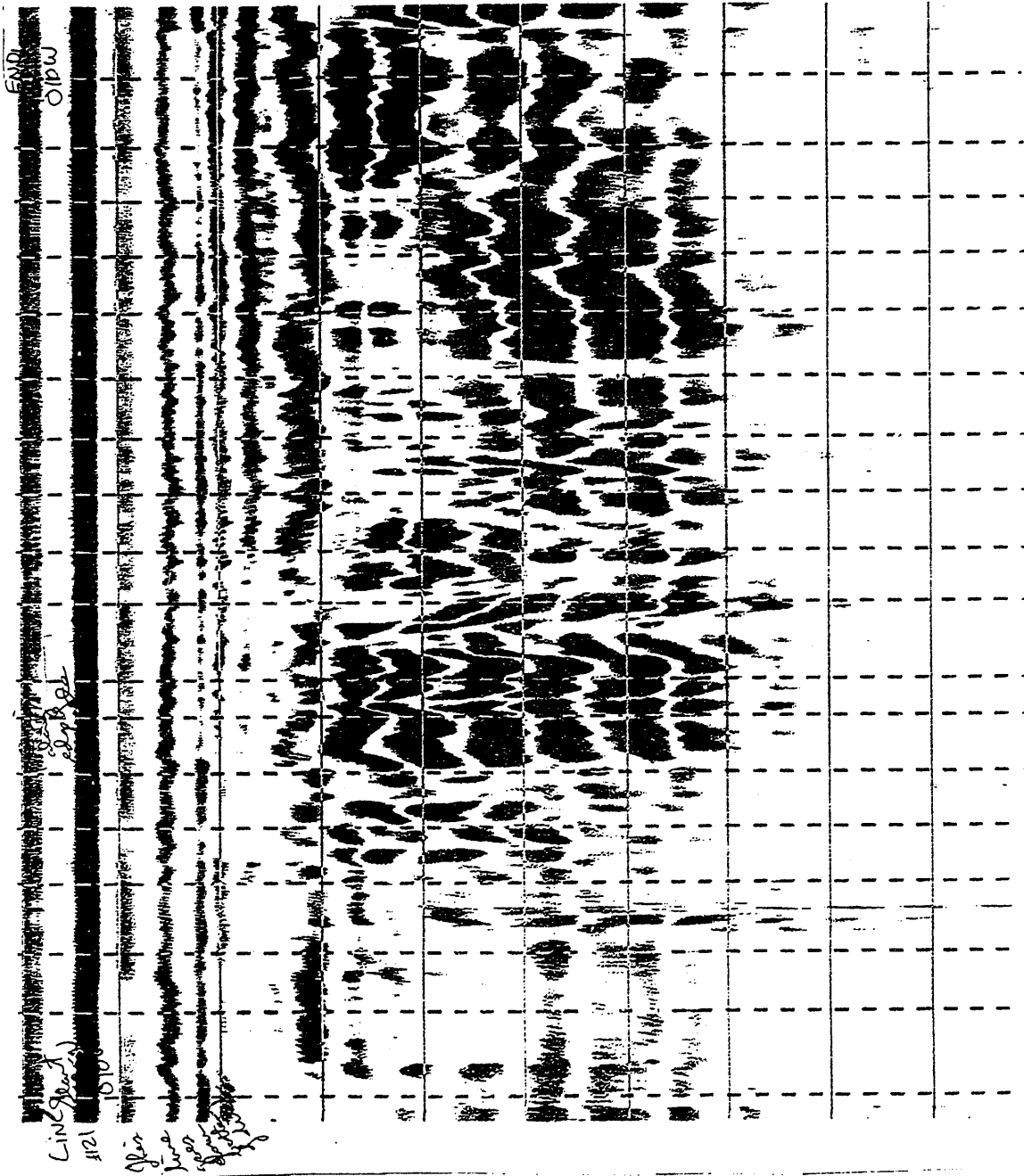
Line 18



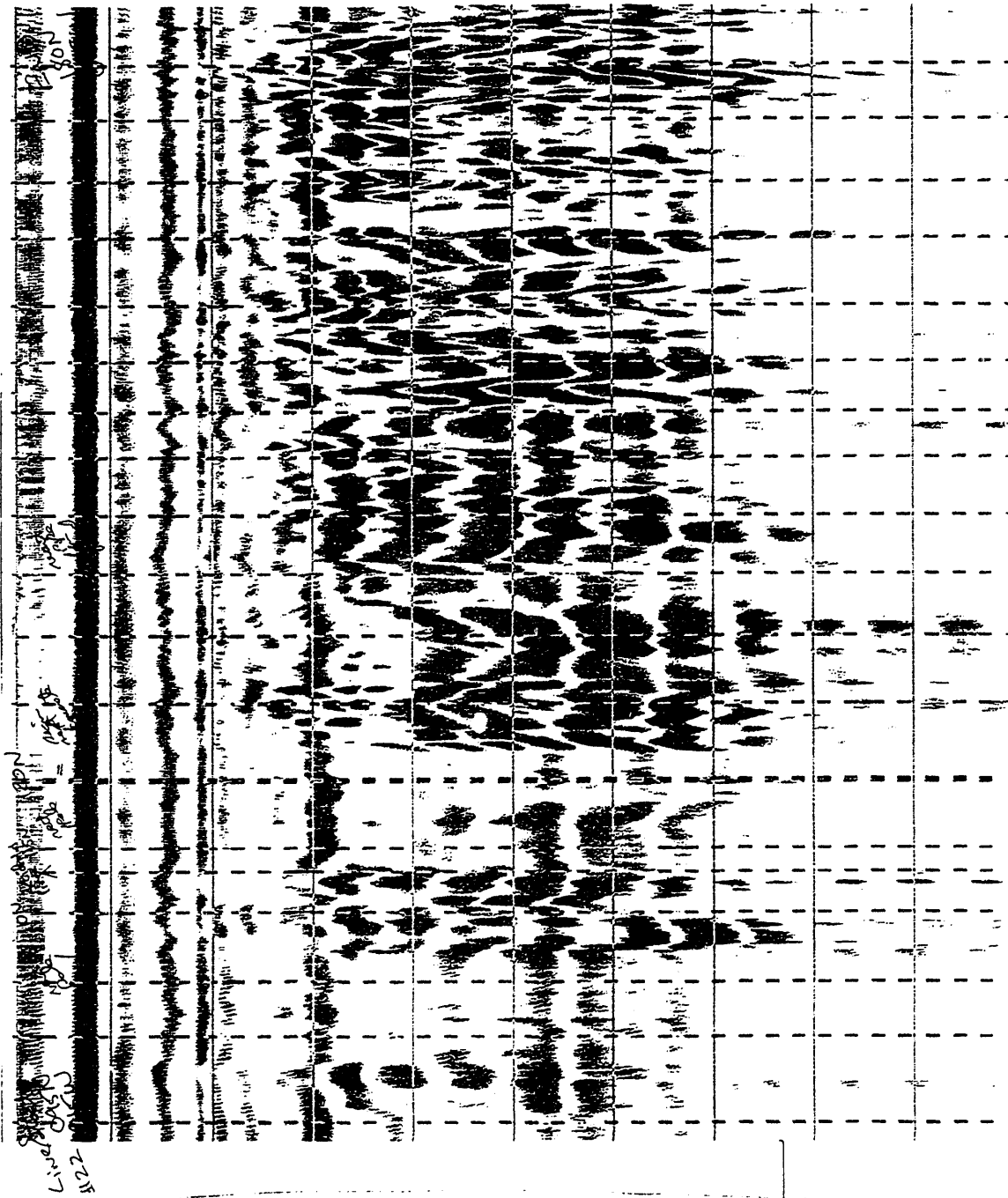


Line 19 (Cont'd)

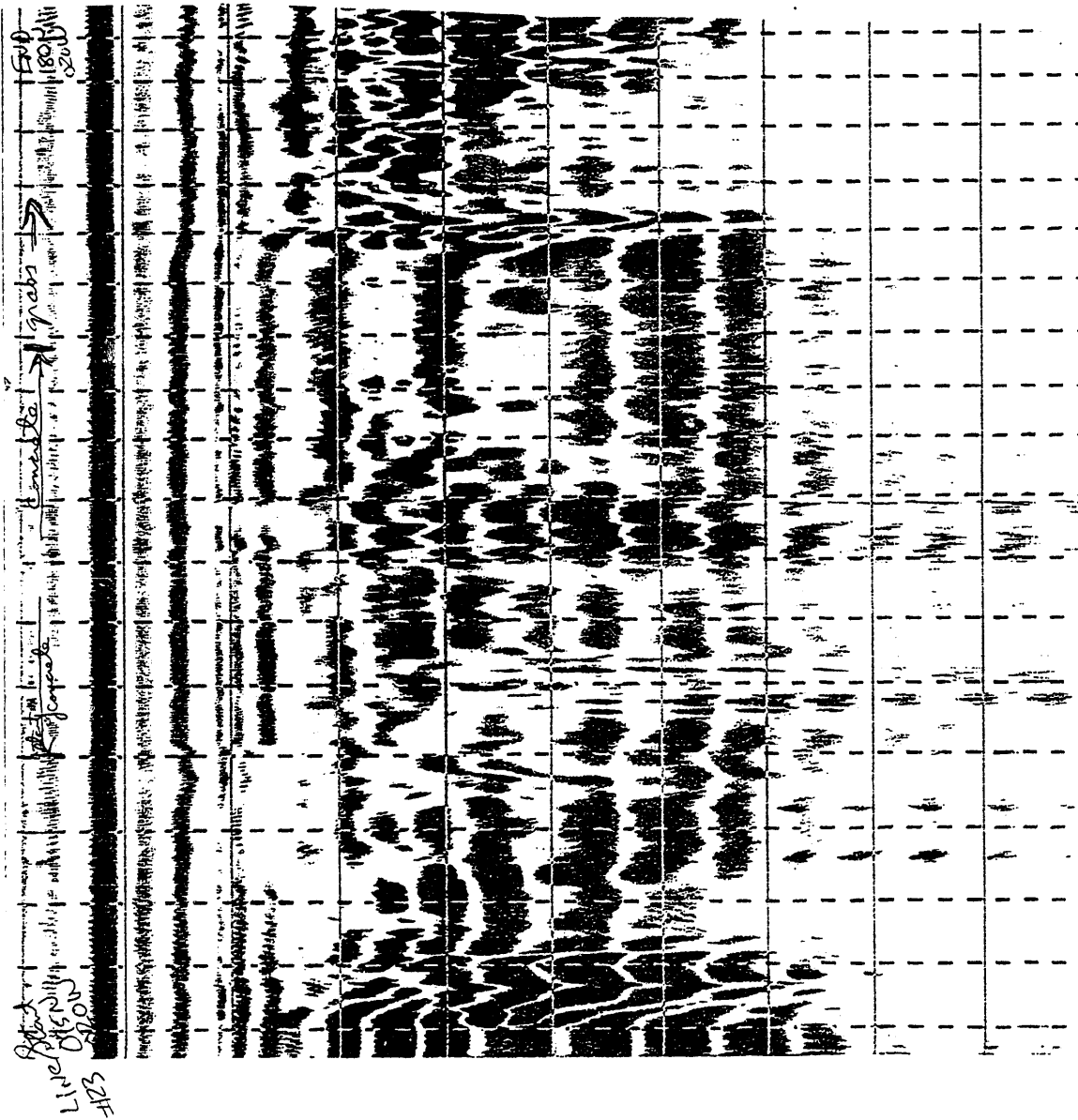


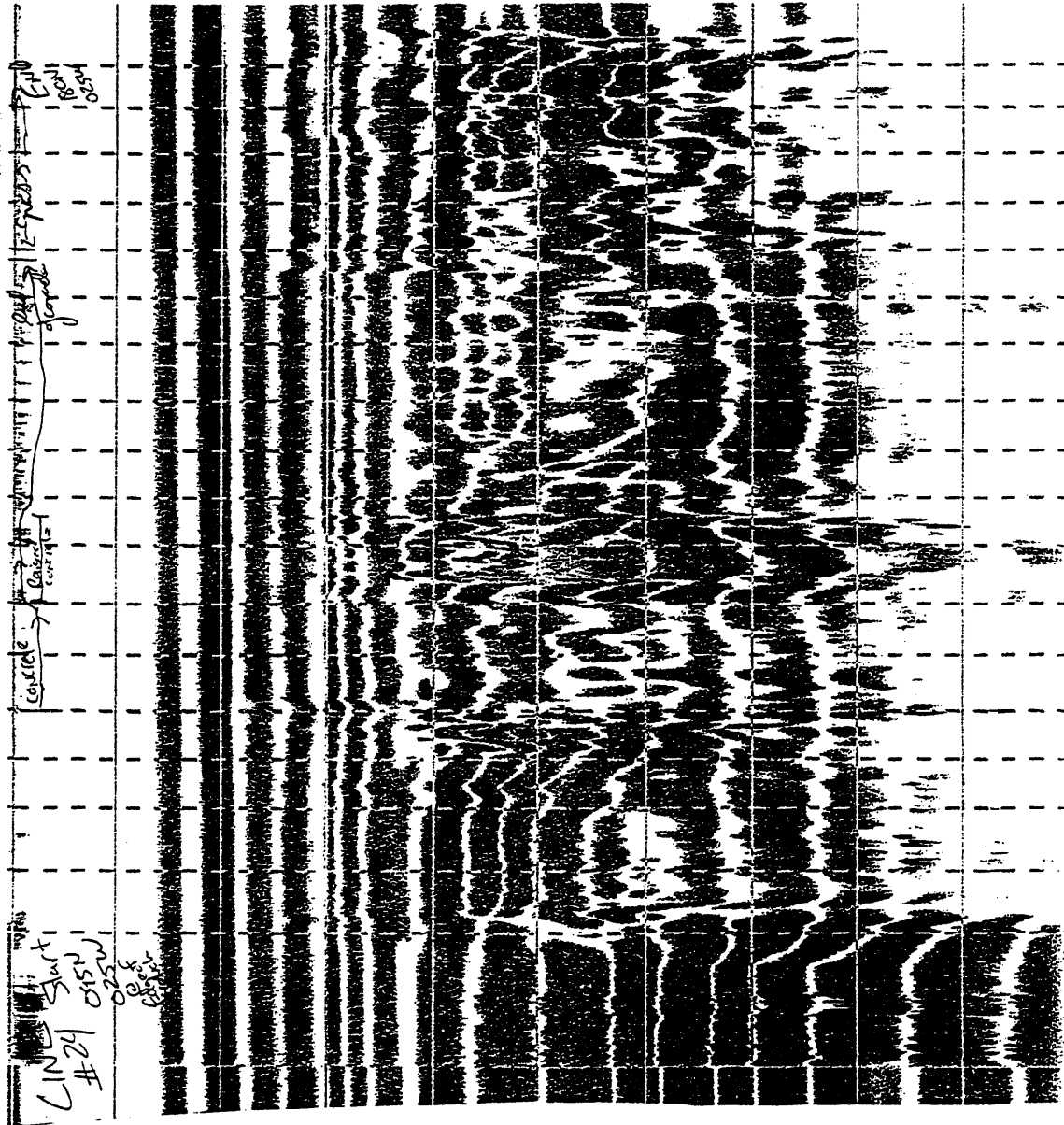


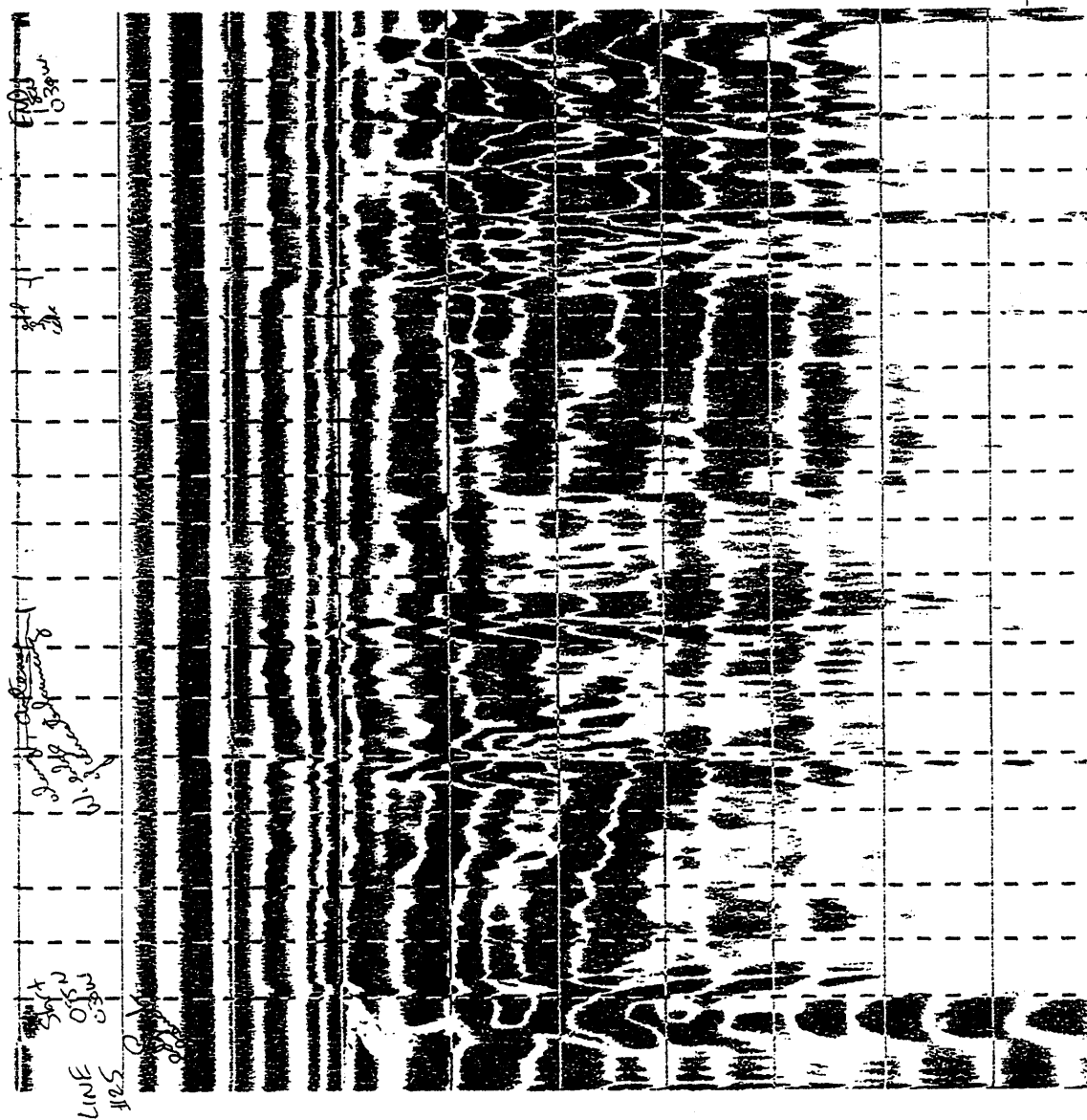
Line 21

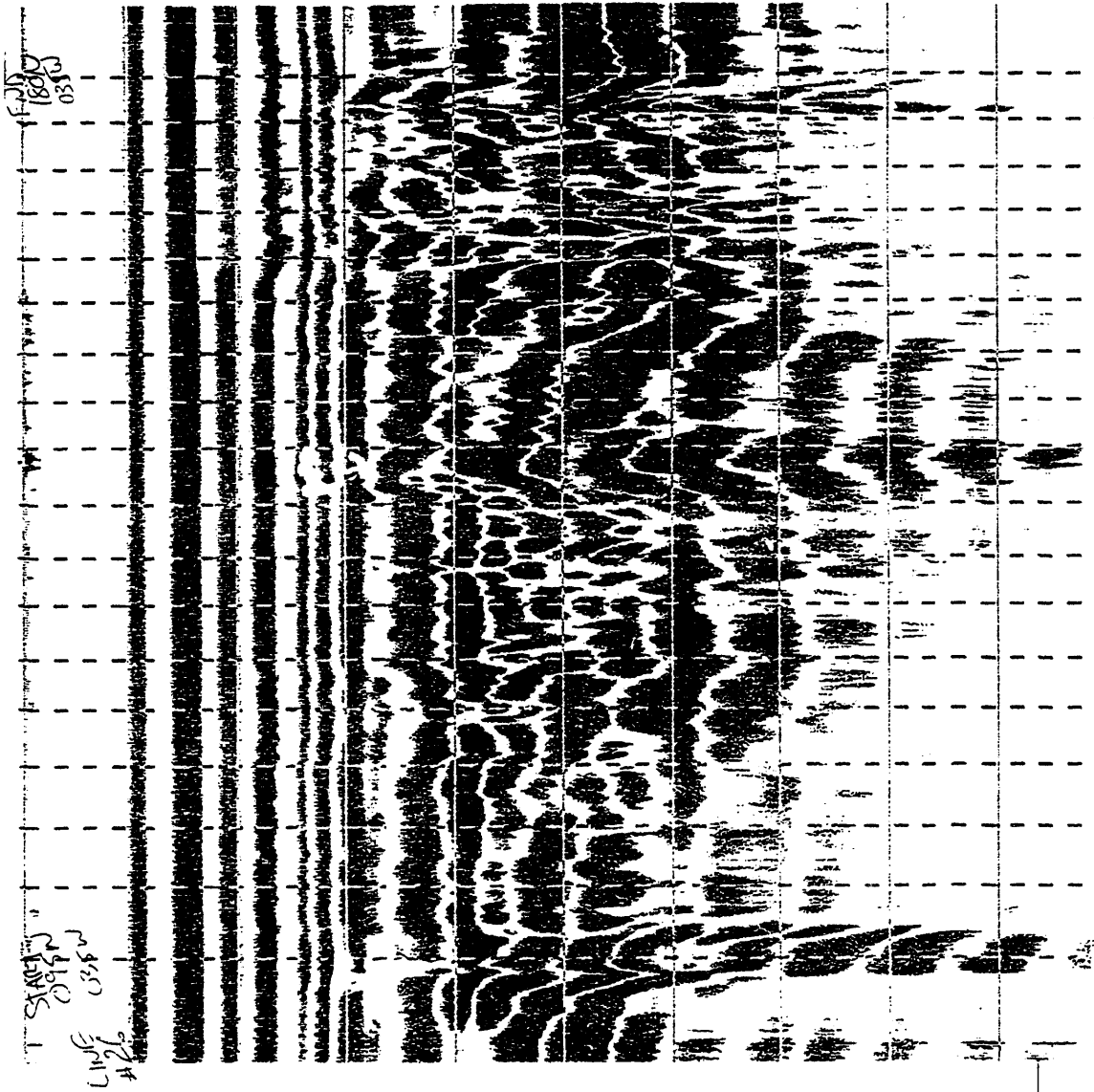


Line 22

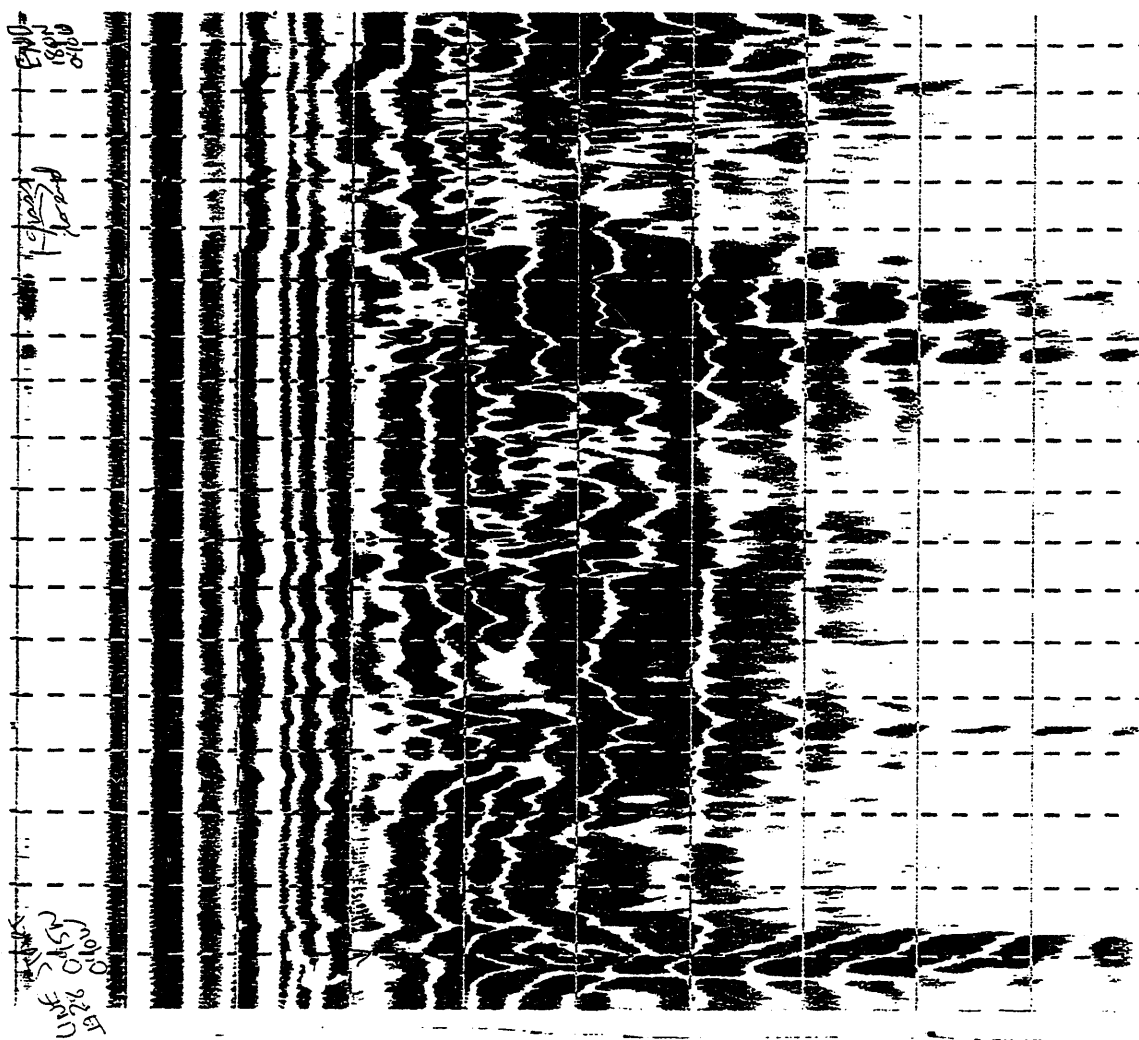




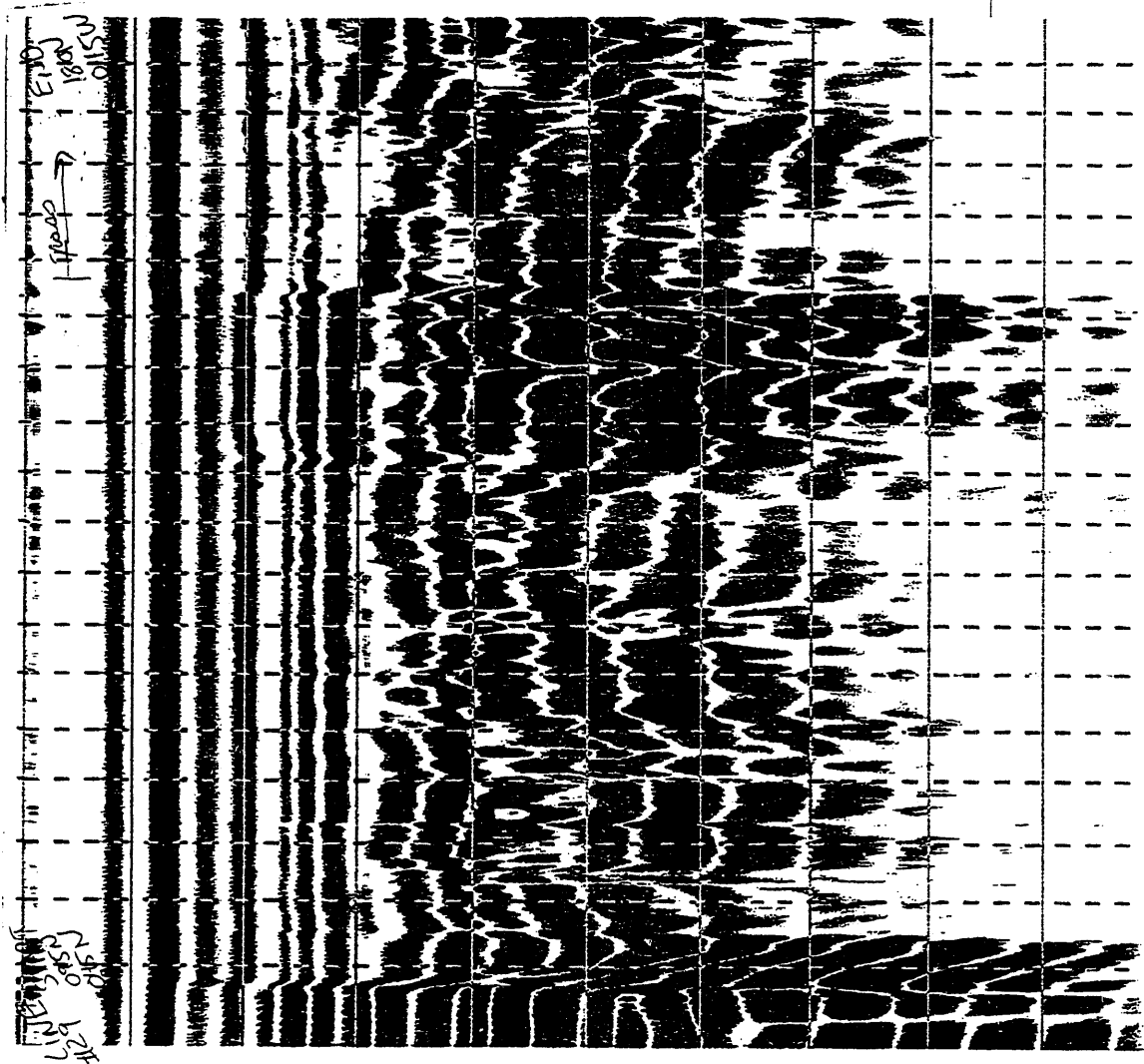




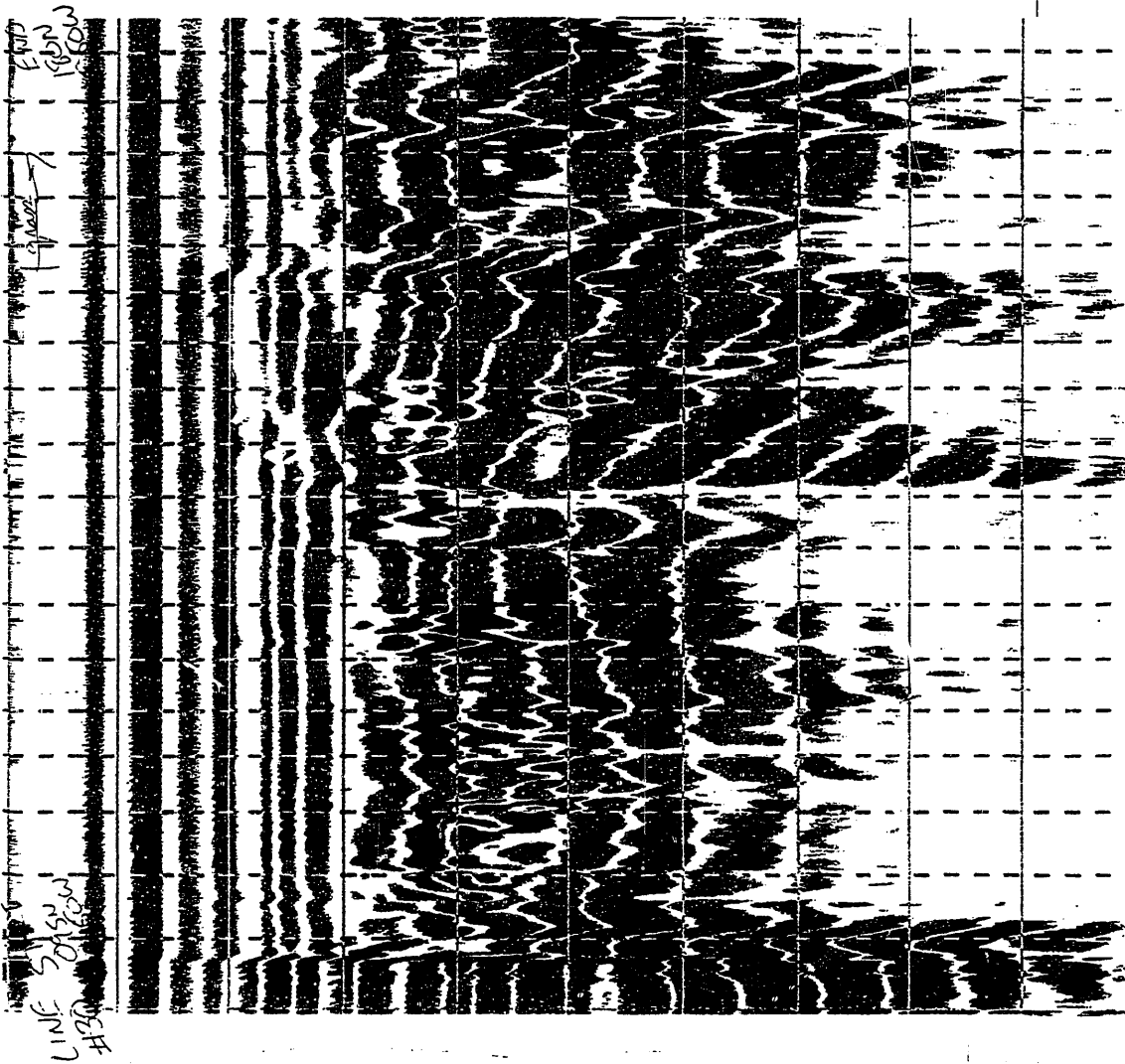
Line 26



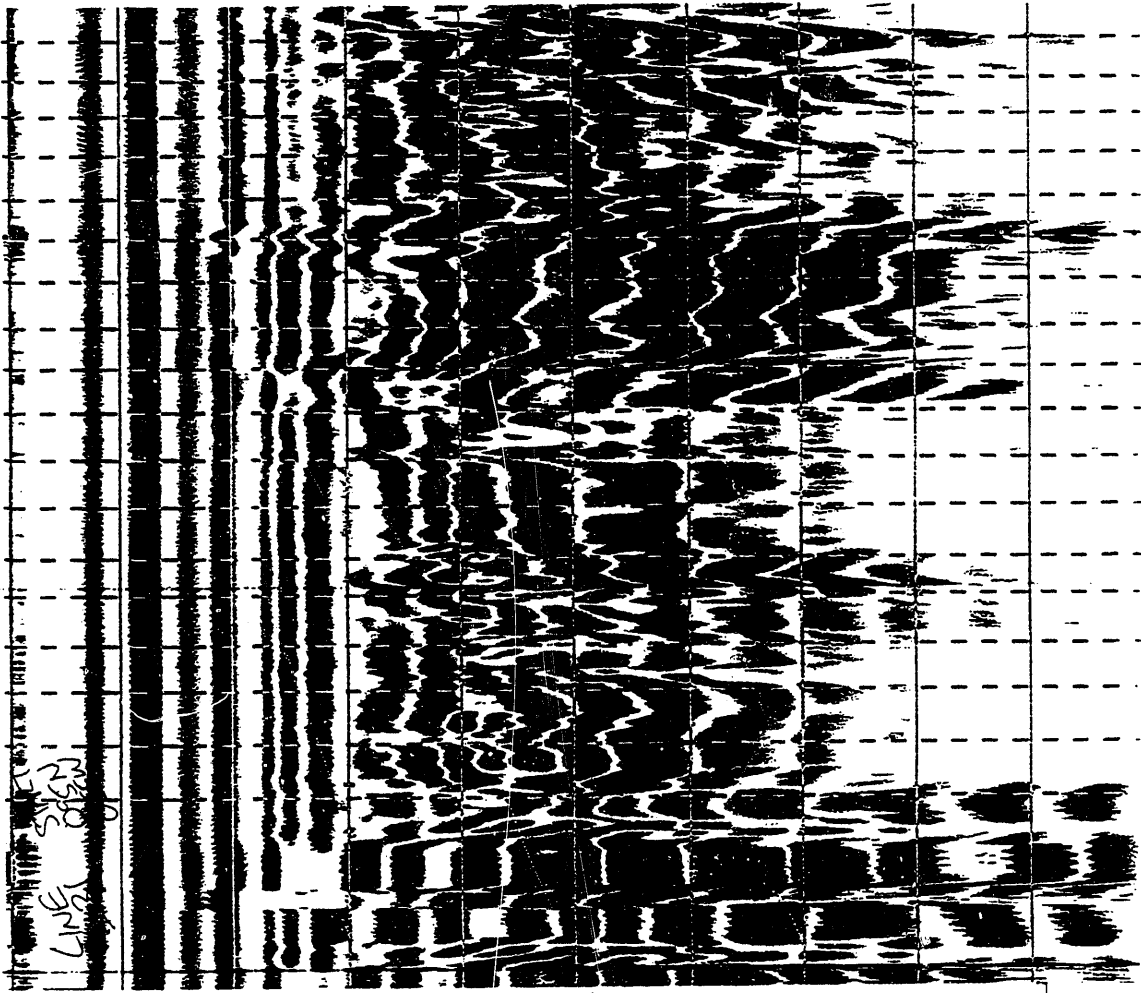
Line 28



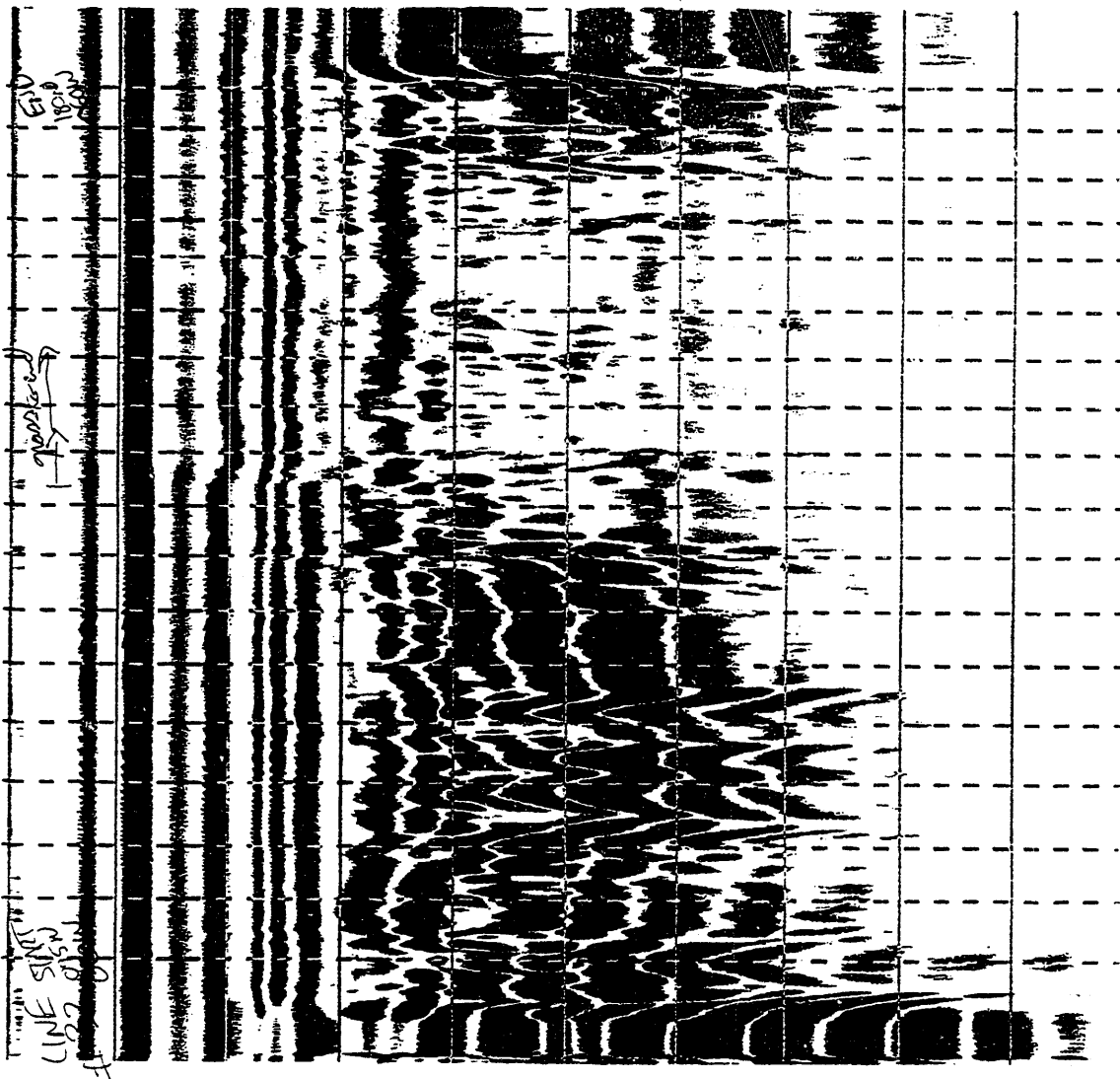
Line 29



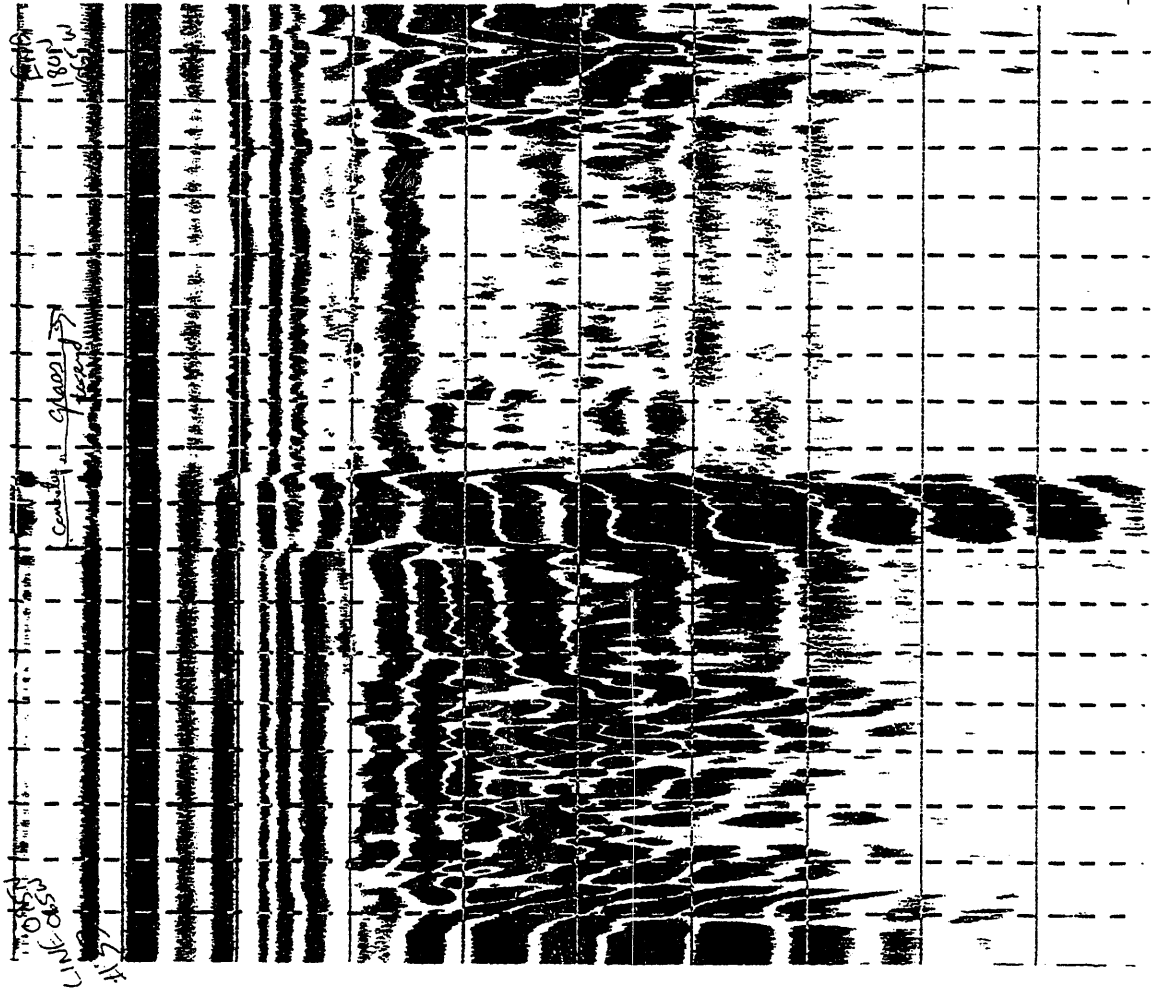
Line 30

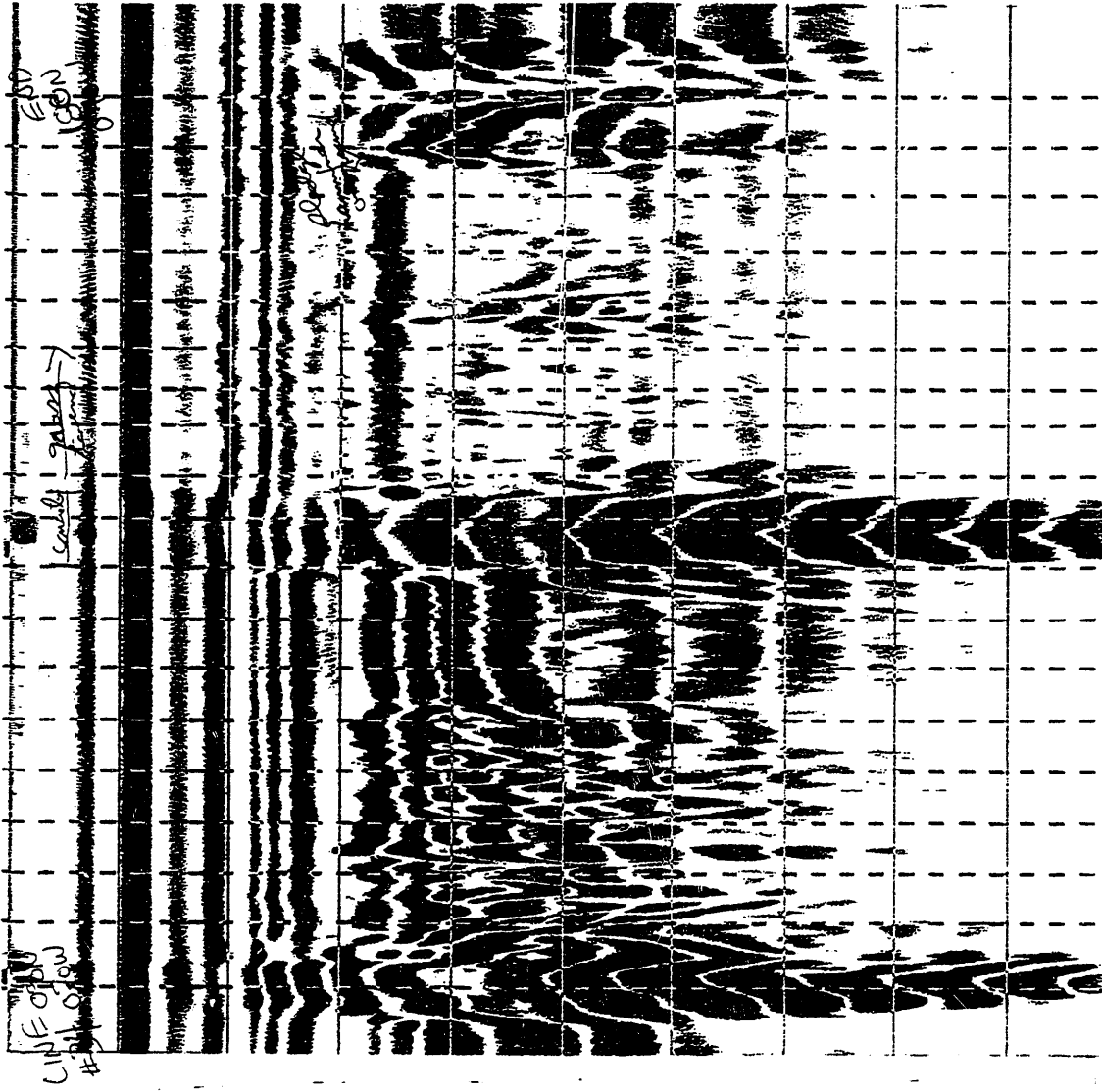


Line 31

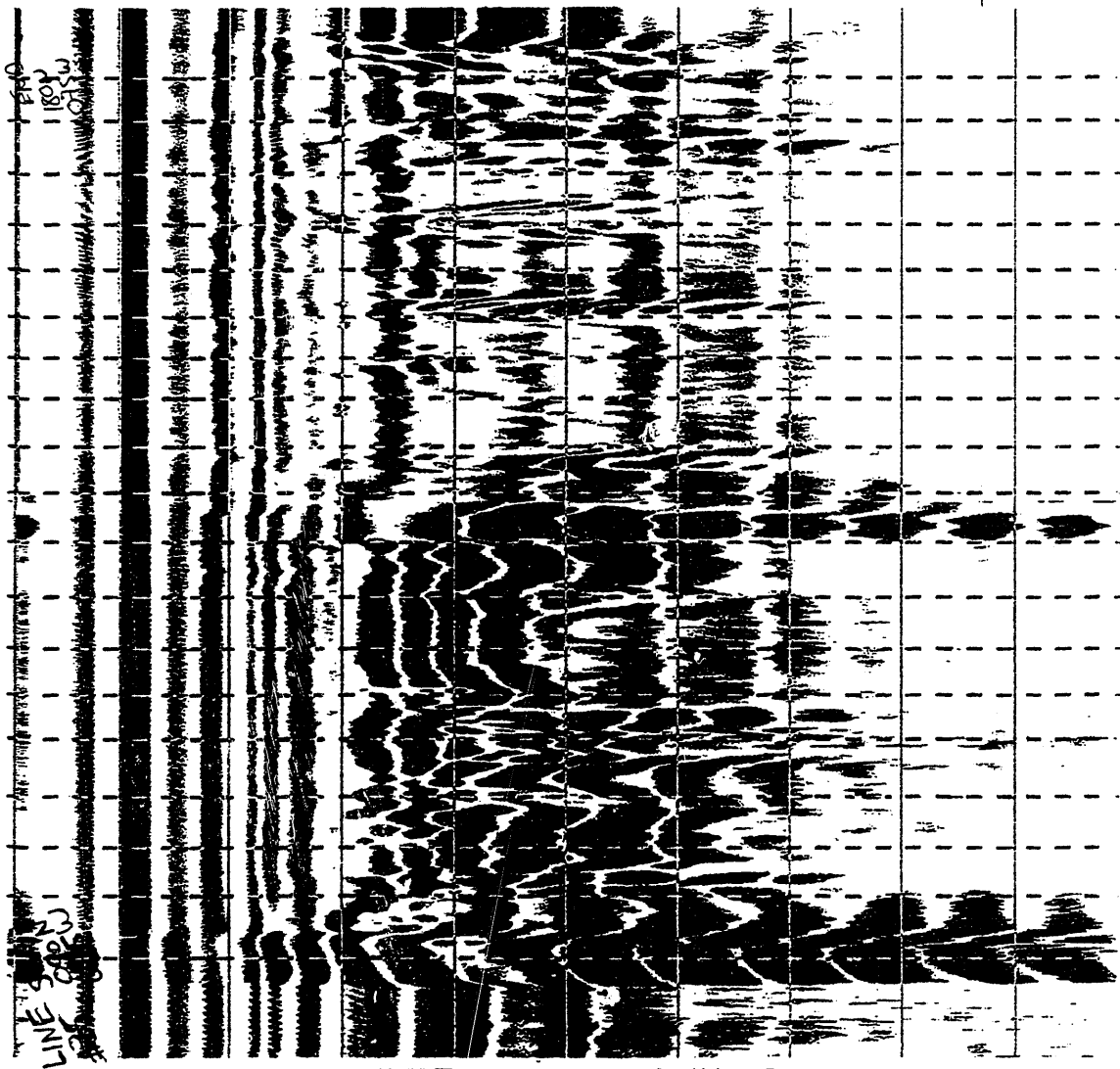


Line 32

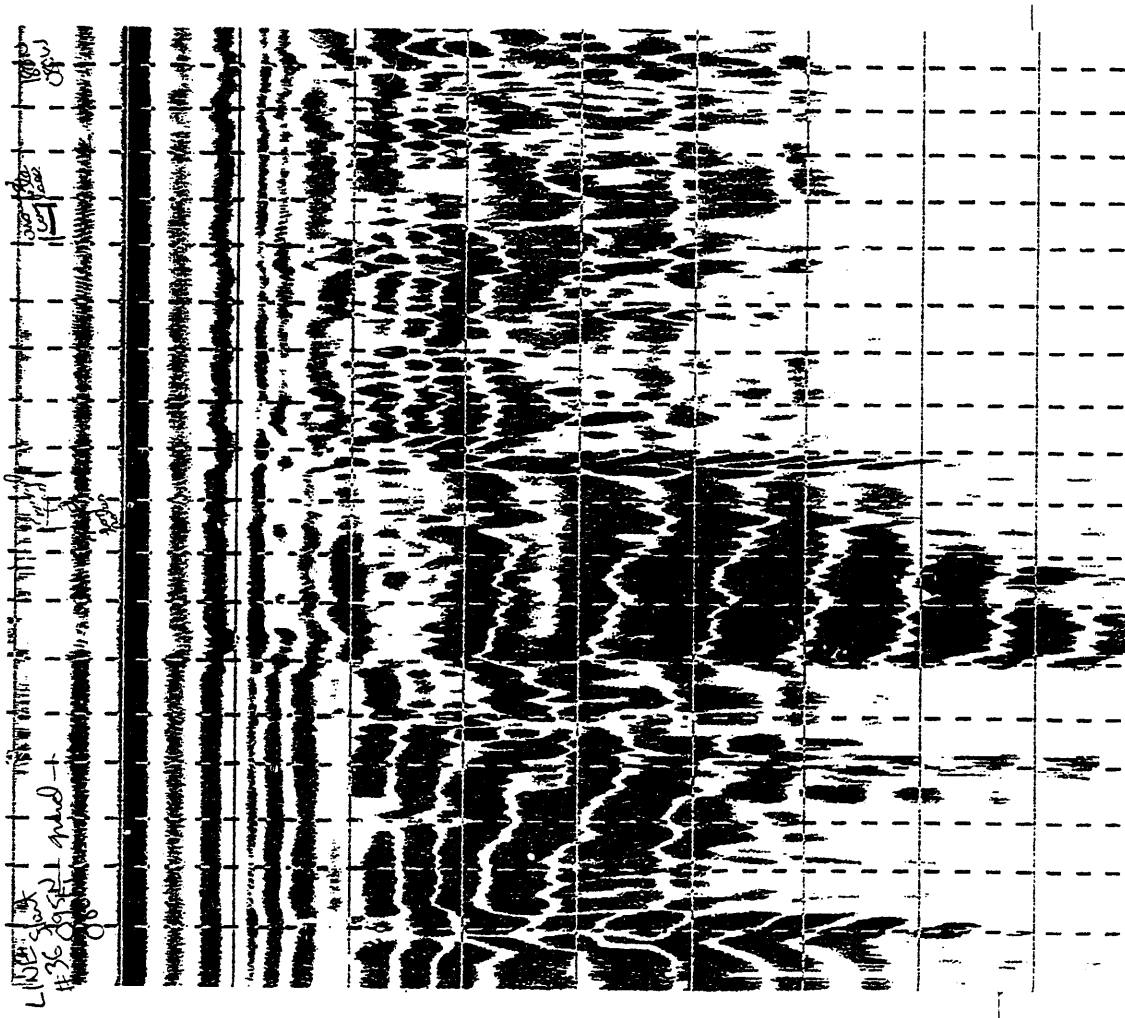


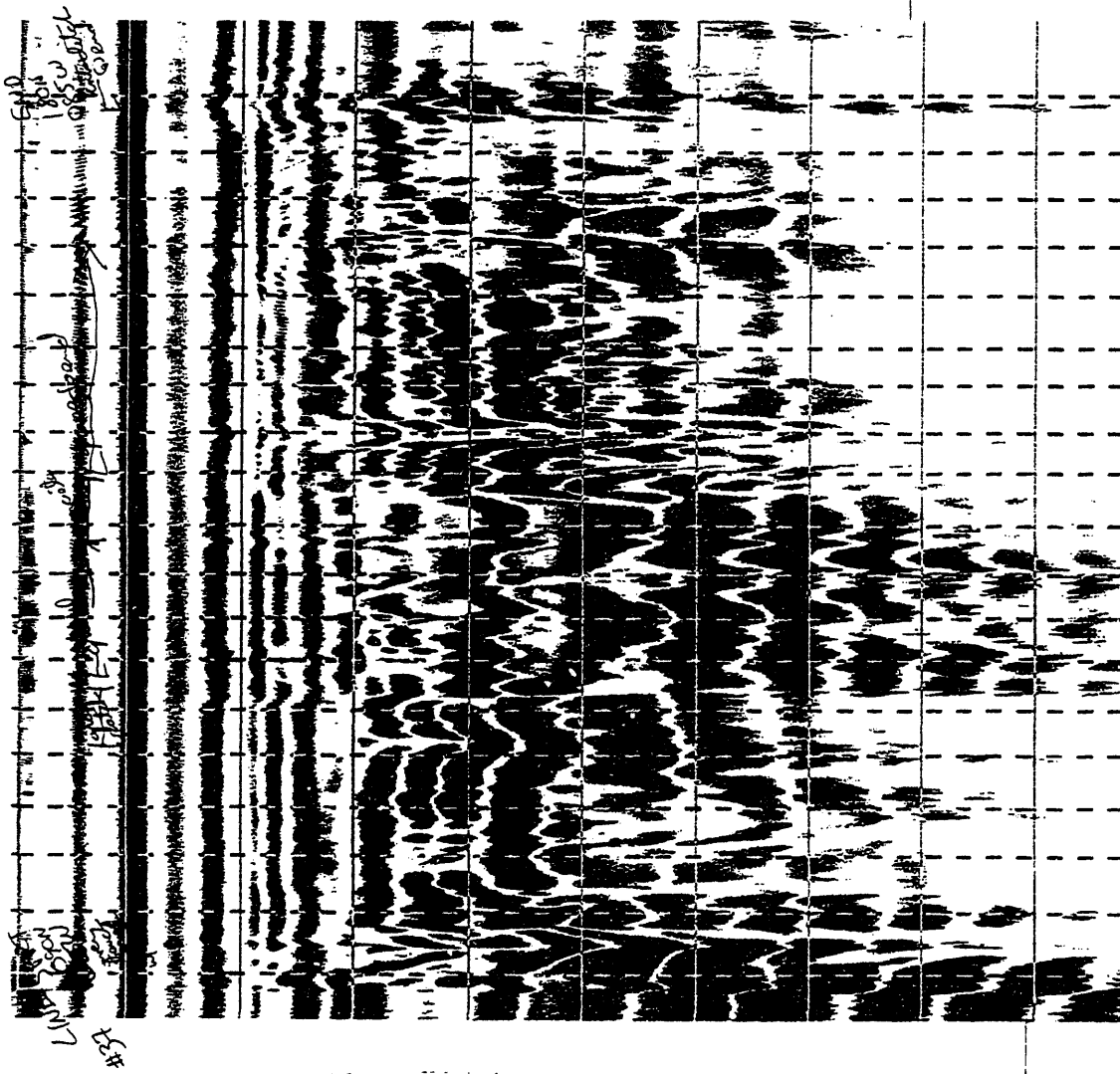


Line 34

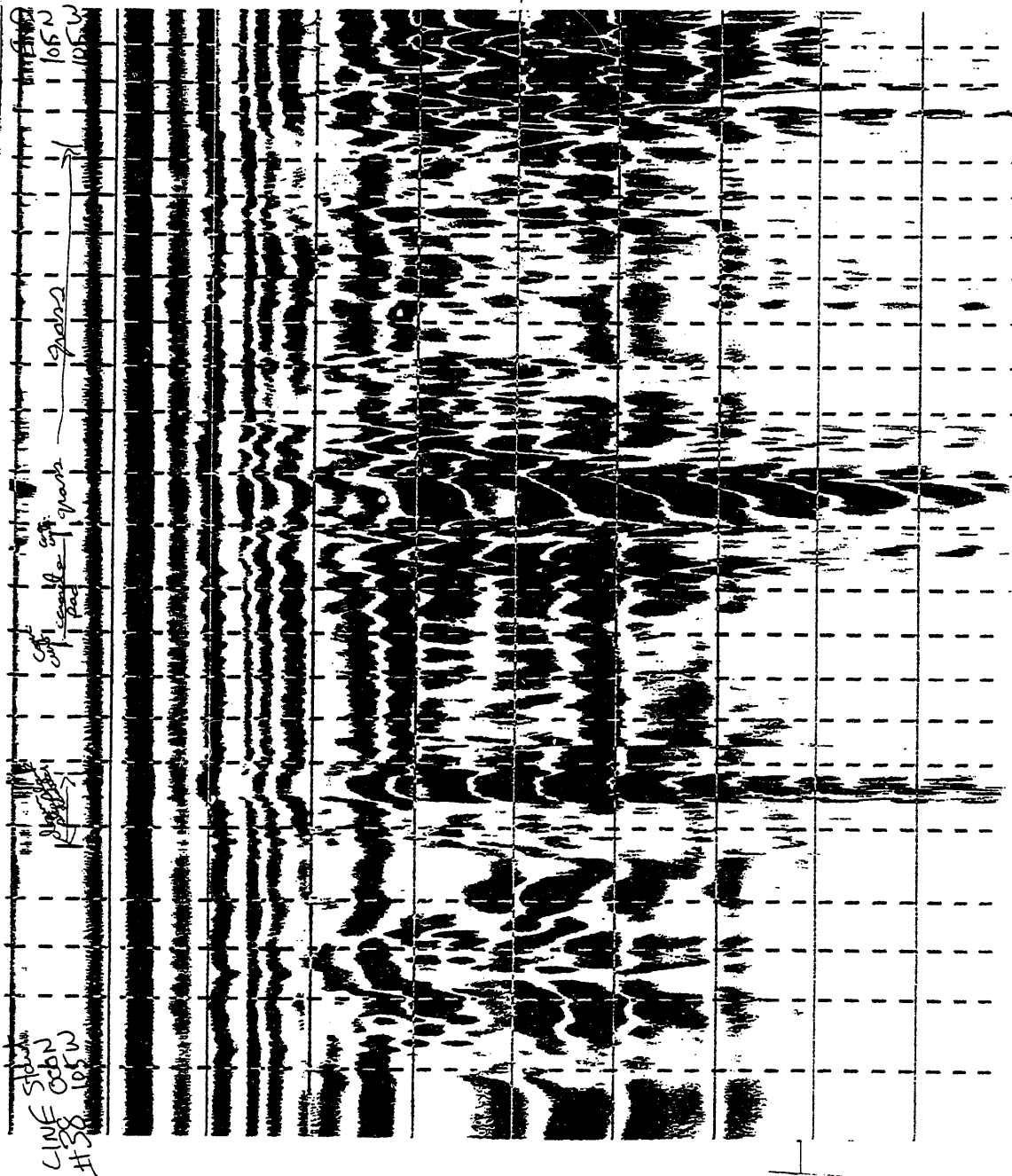


Line 35

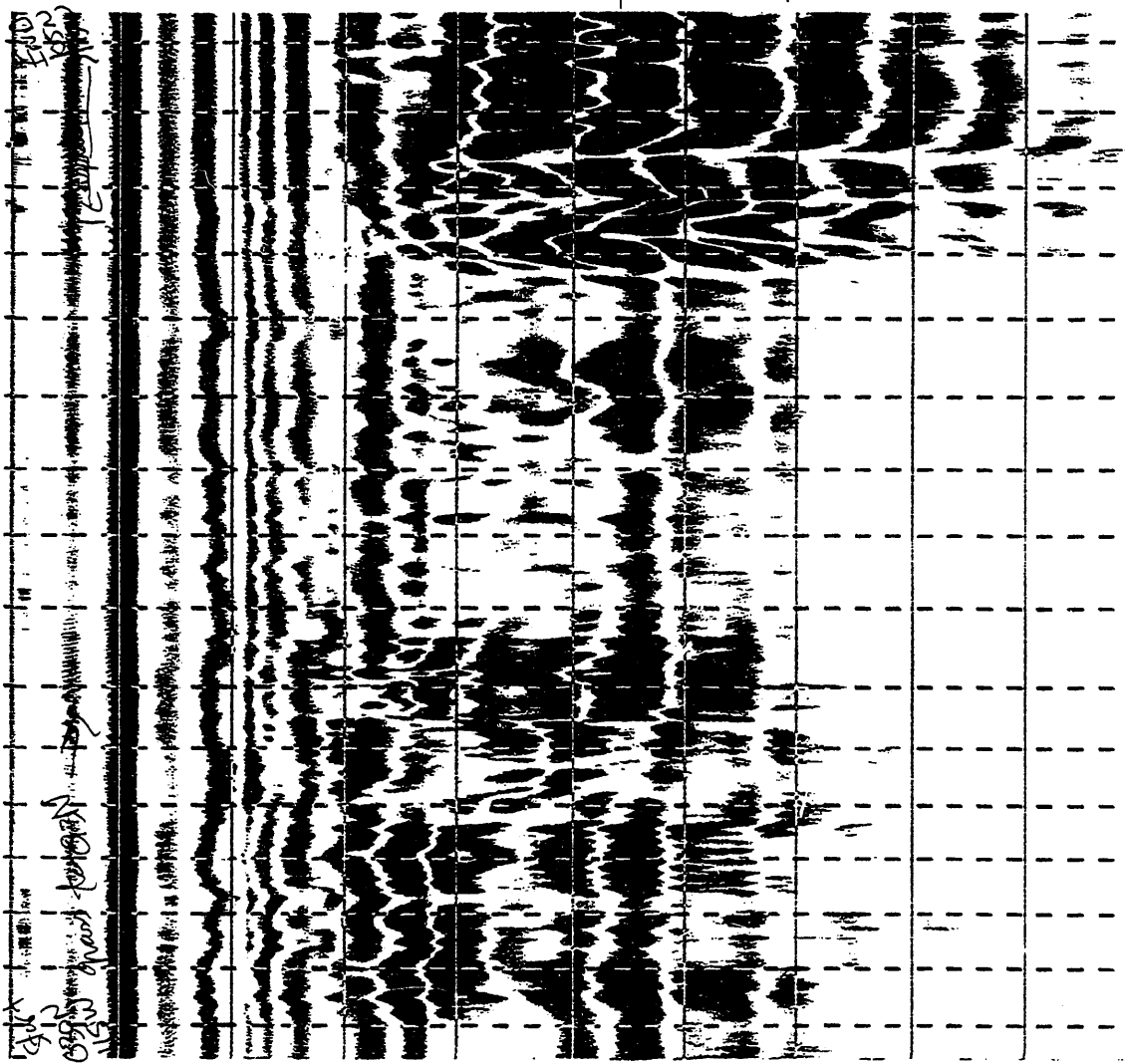




Line 37

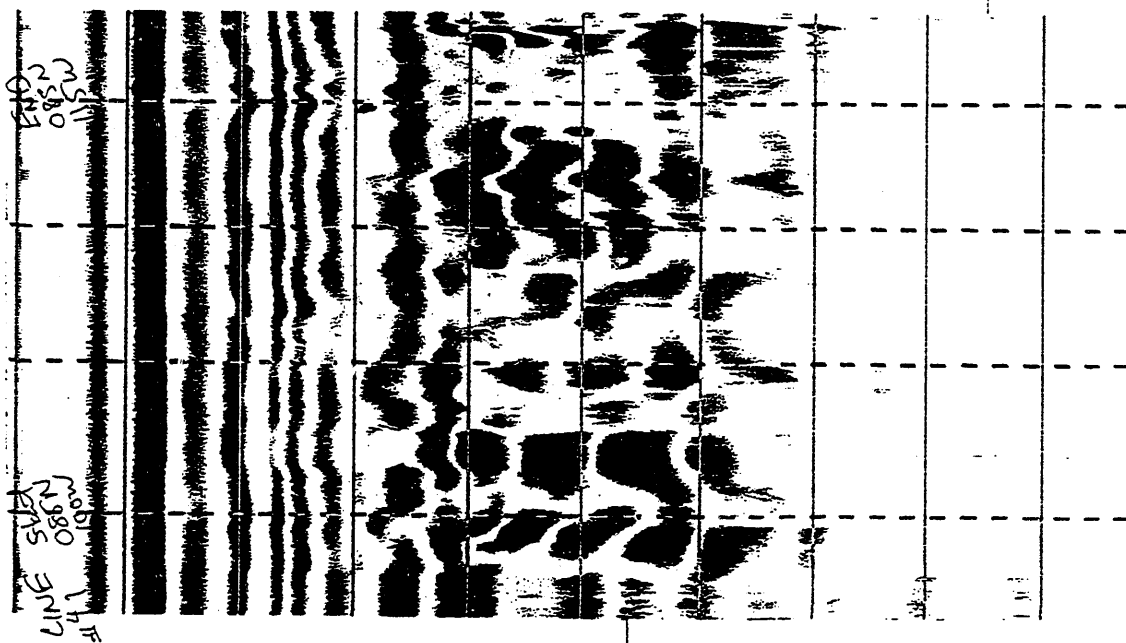
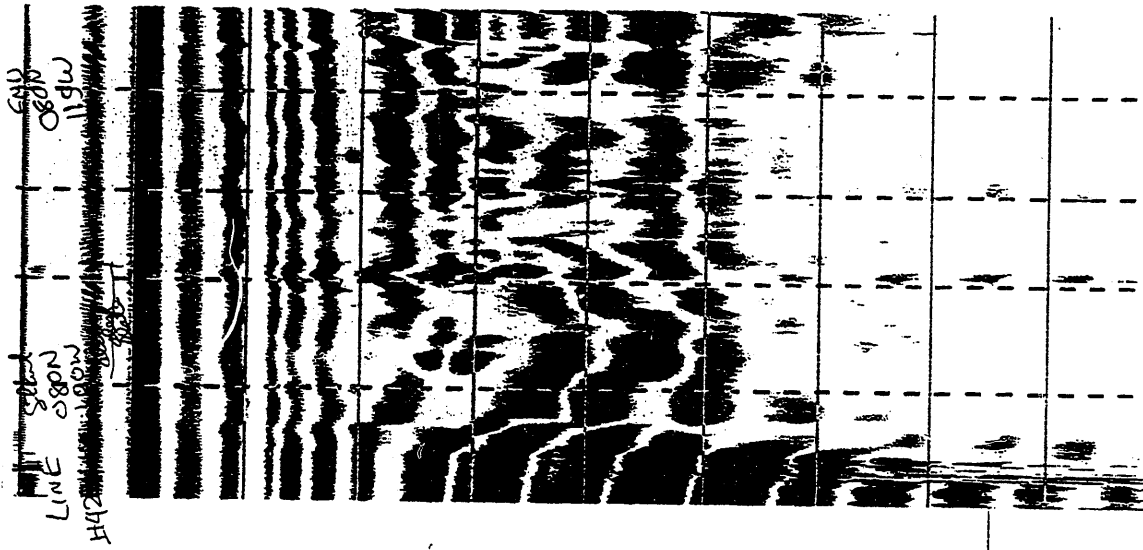


Line 38

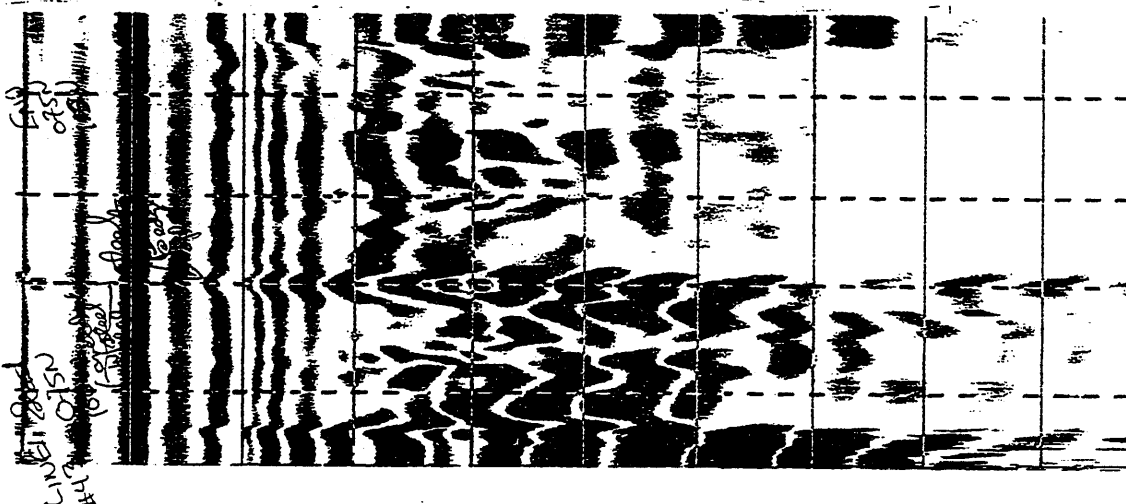
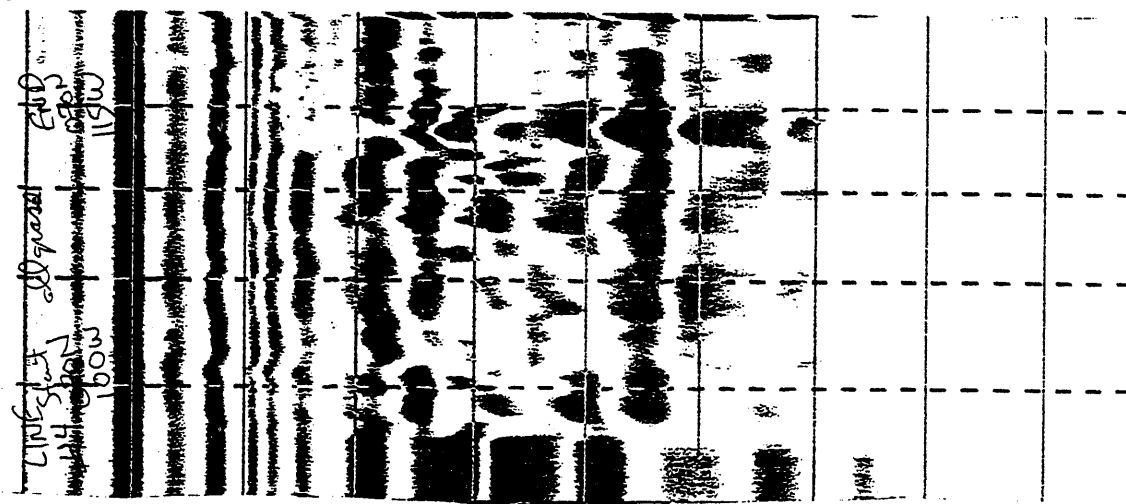


Handwritten notes and markings on the left side of the plot, including the number '1150' and various scribbles.

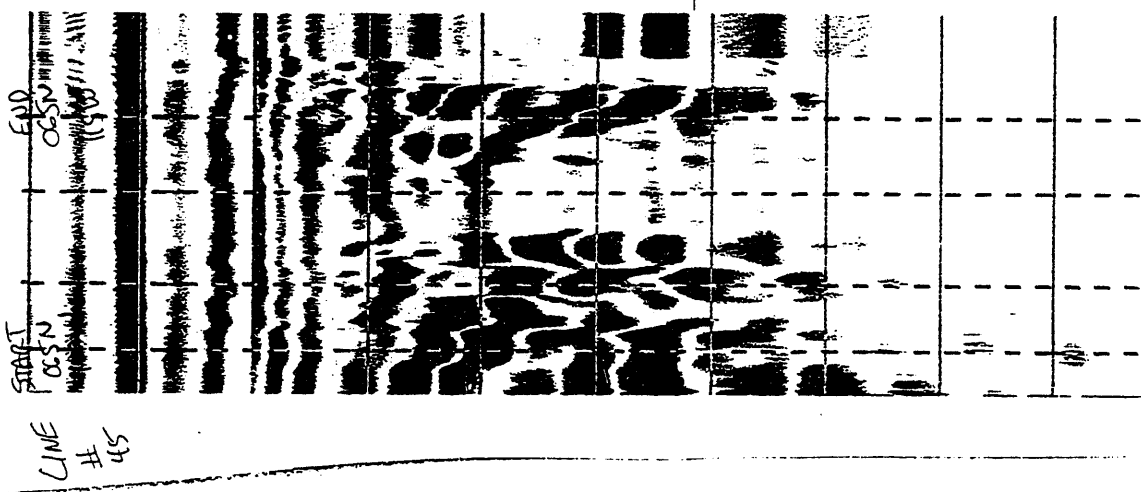
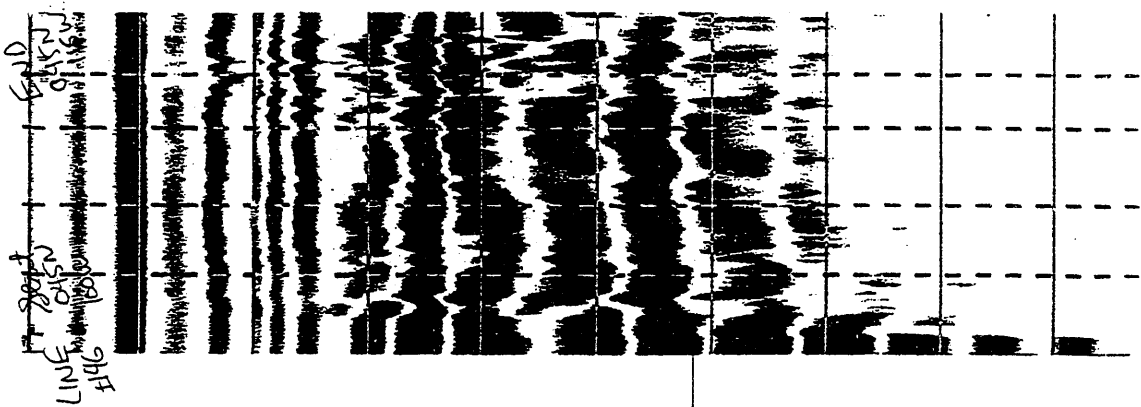
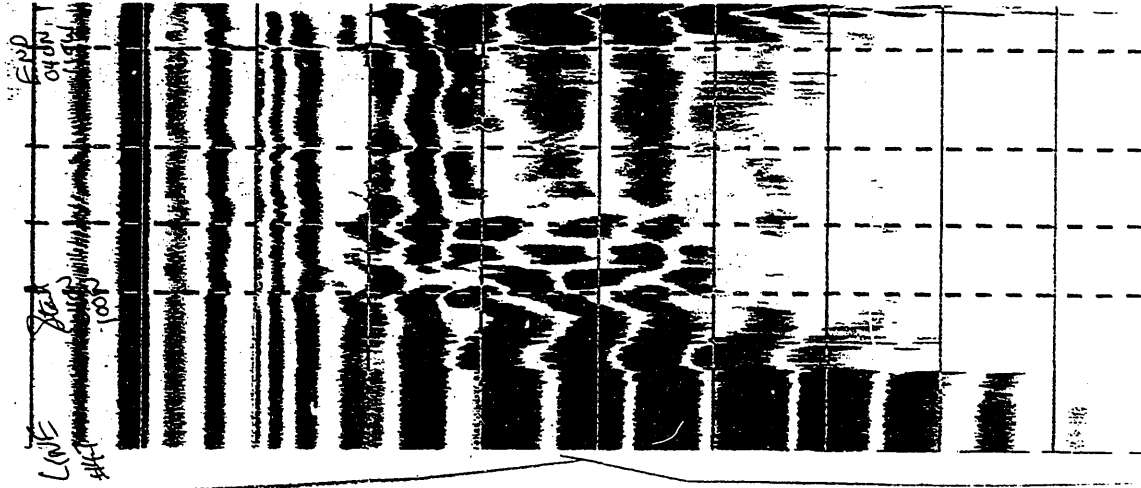
Line 40



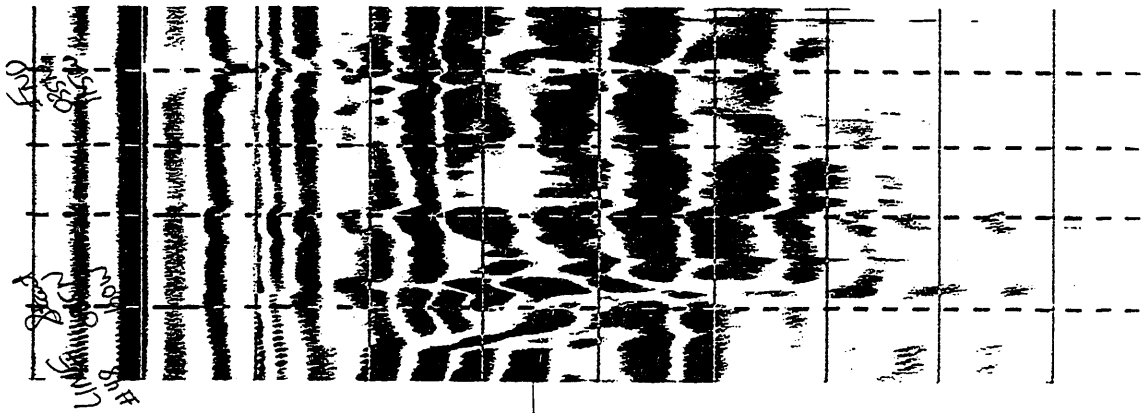
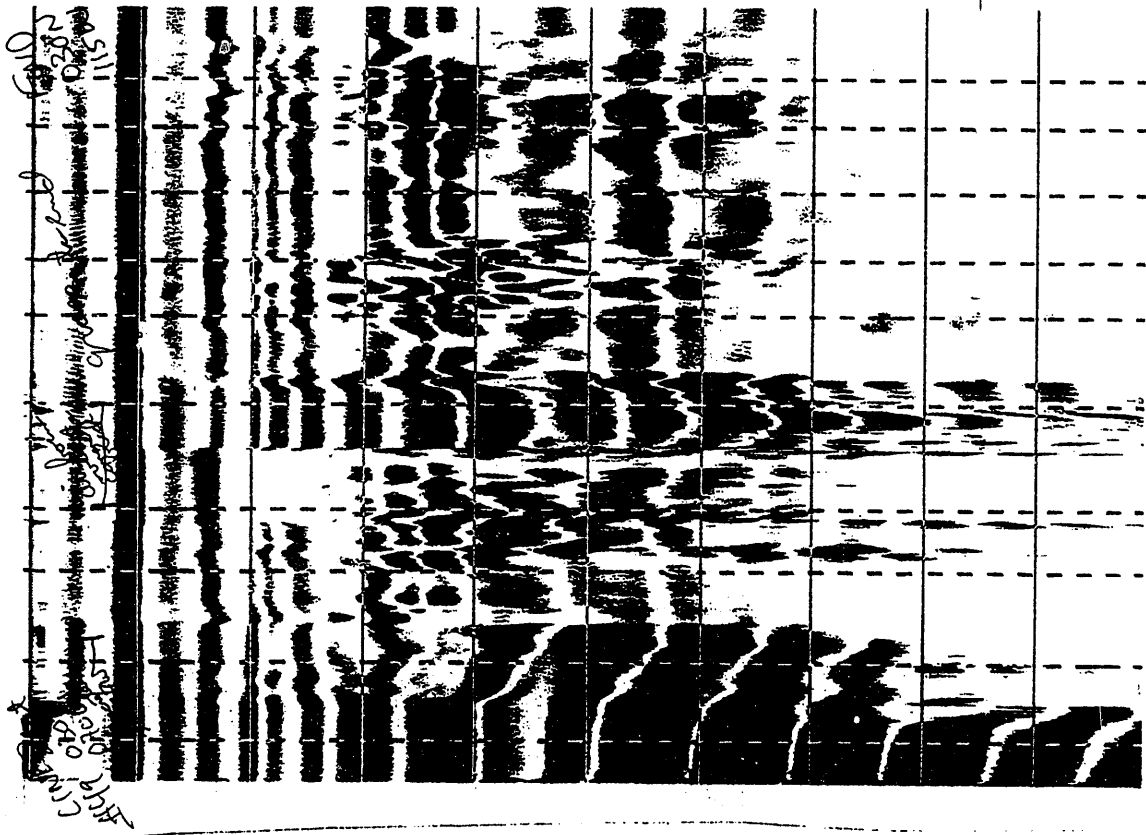
Lines 41-42 Left to Right



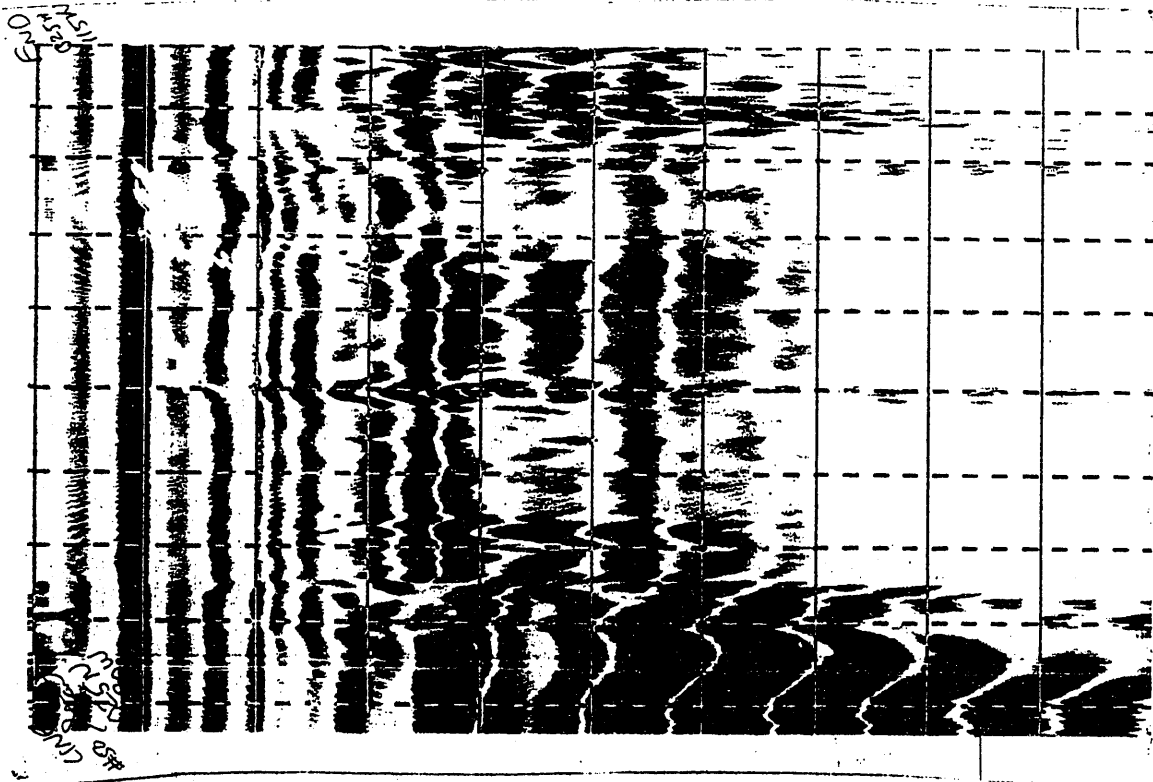
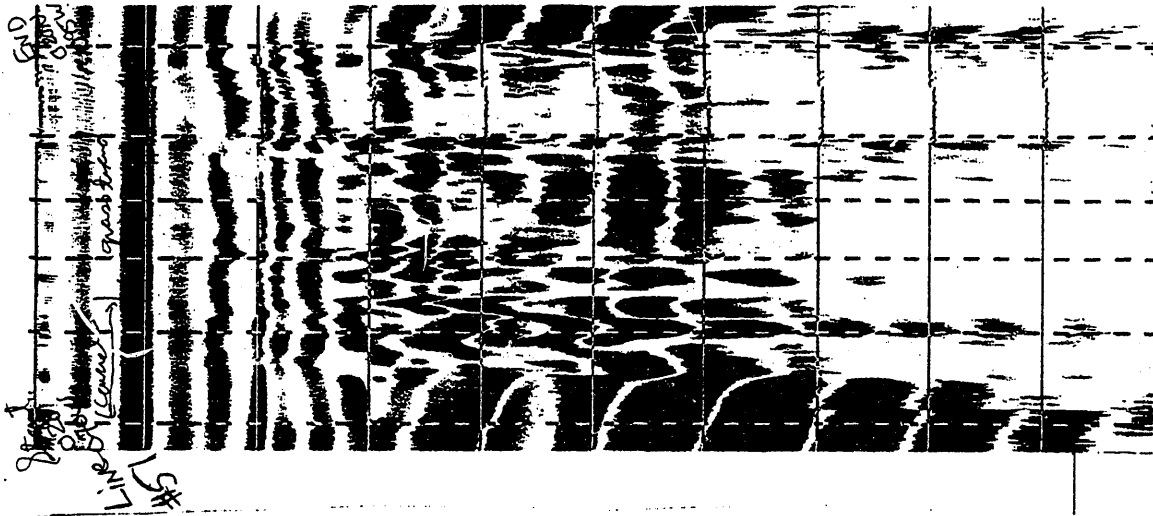
Lines 43-44 Left to Right



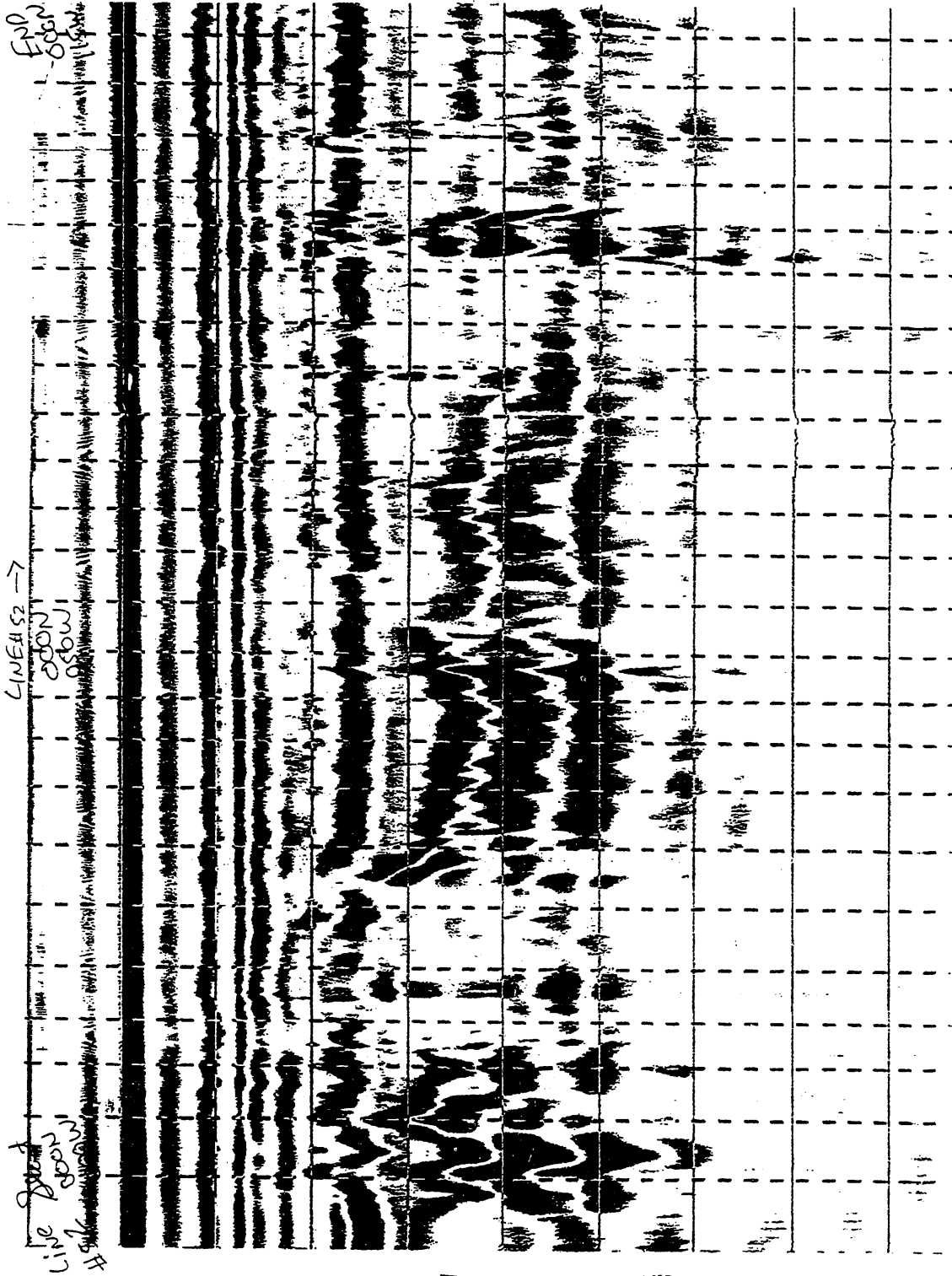
Lines 45-47 Left to Right



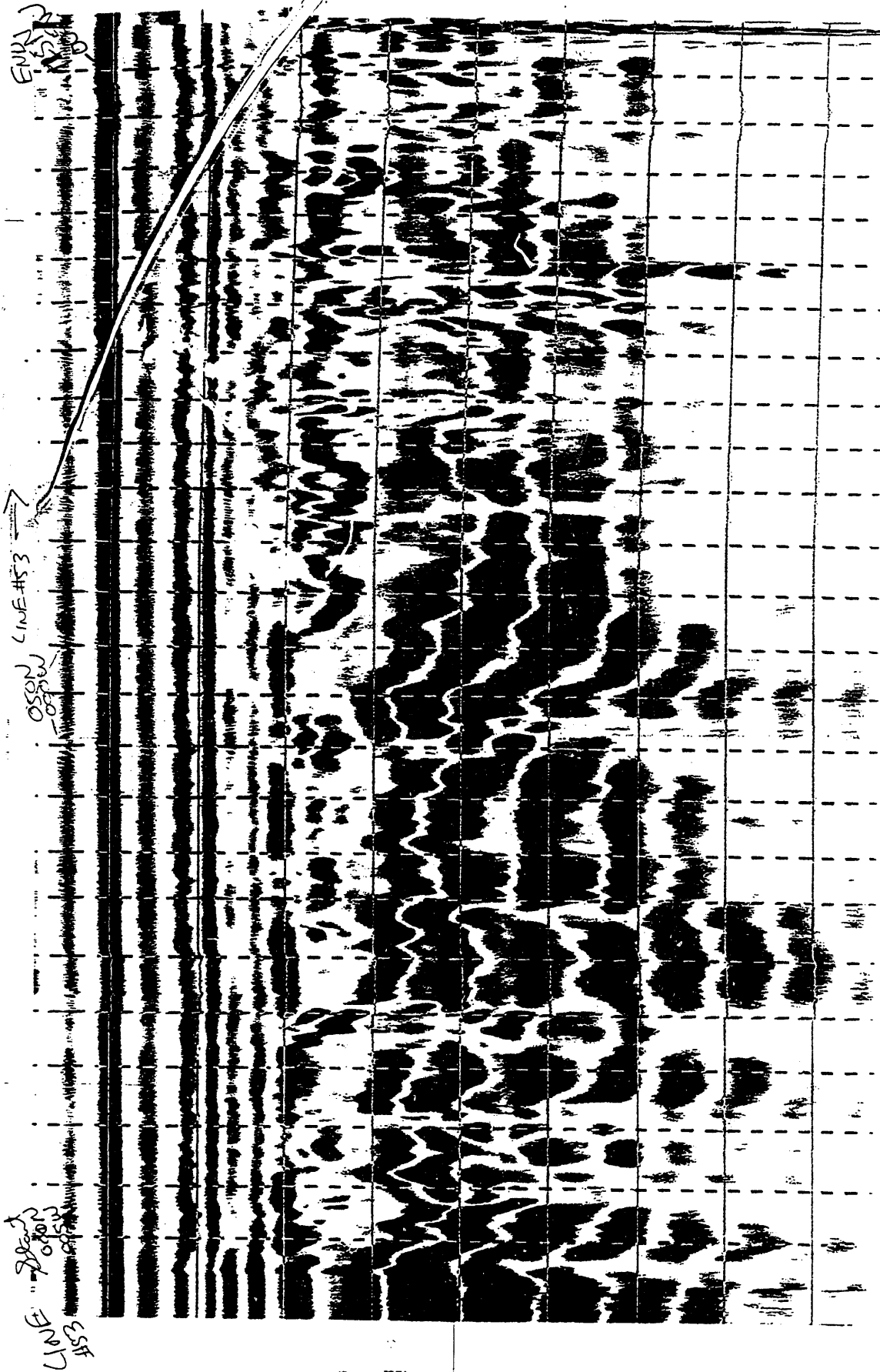
Lines 48-49 Left to Right



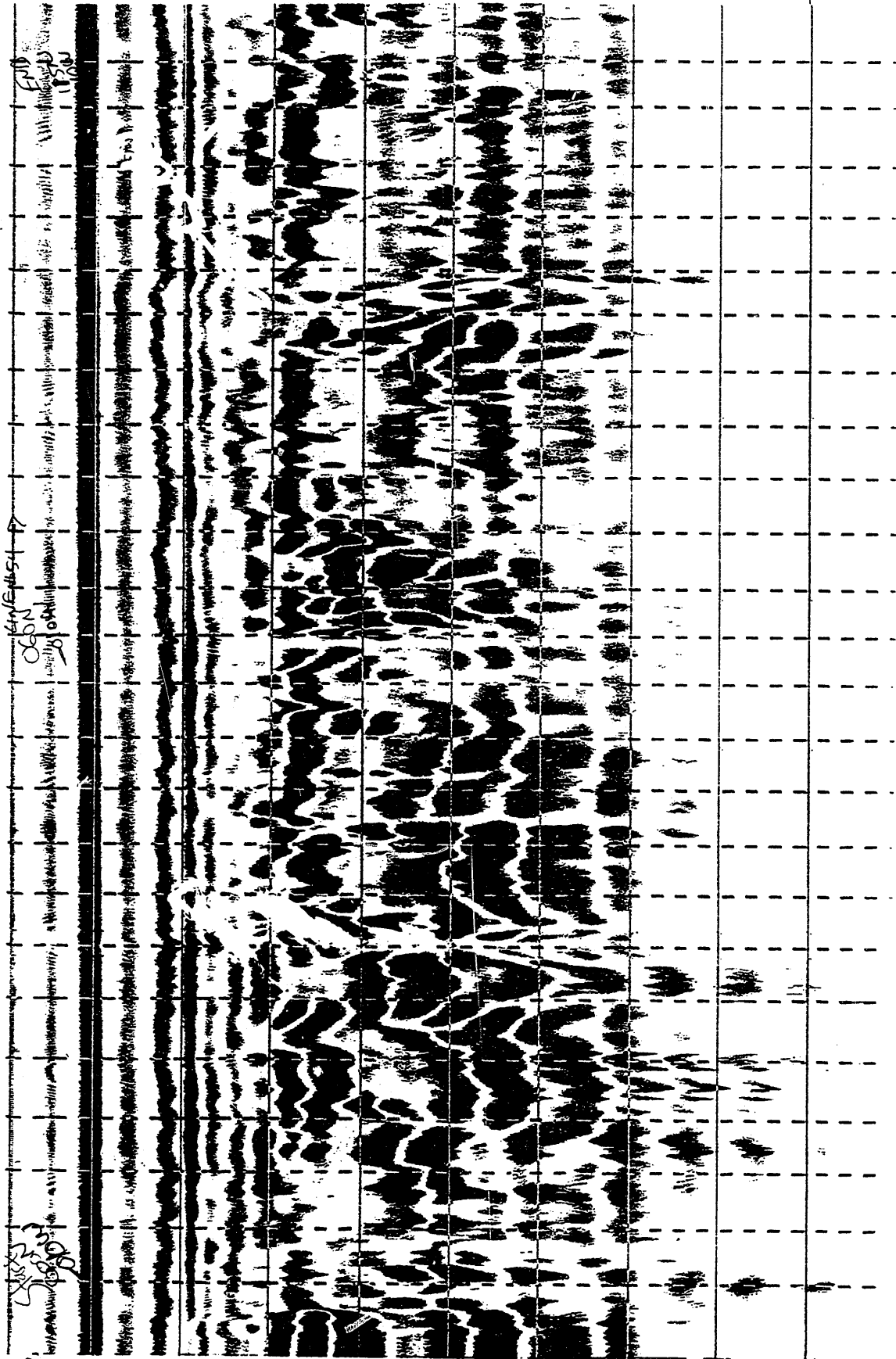
Lines 50-51 Left to Right



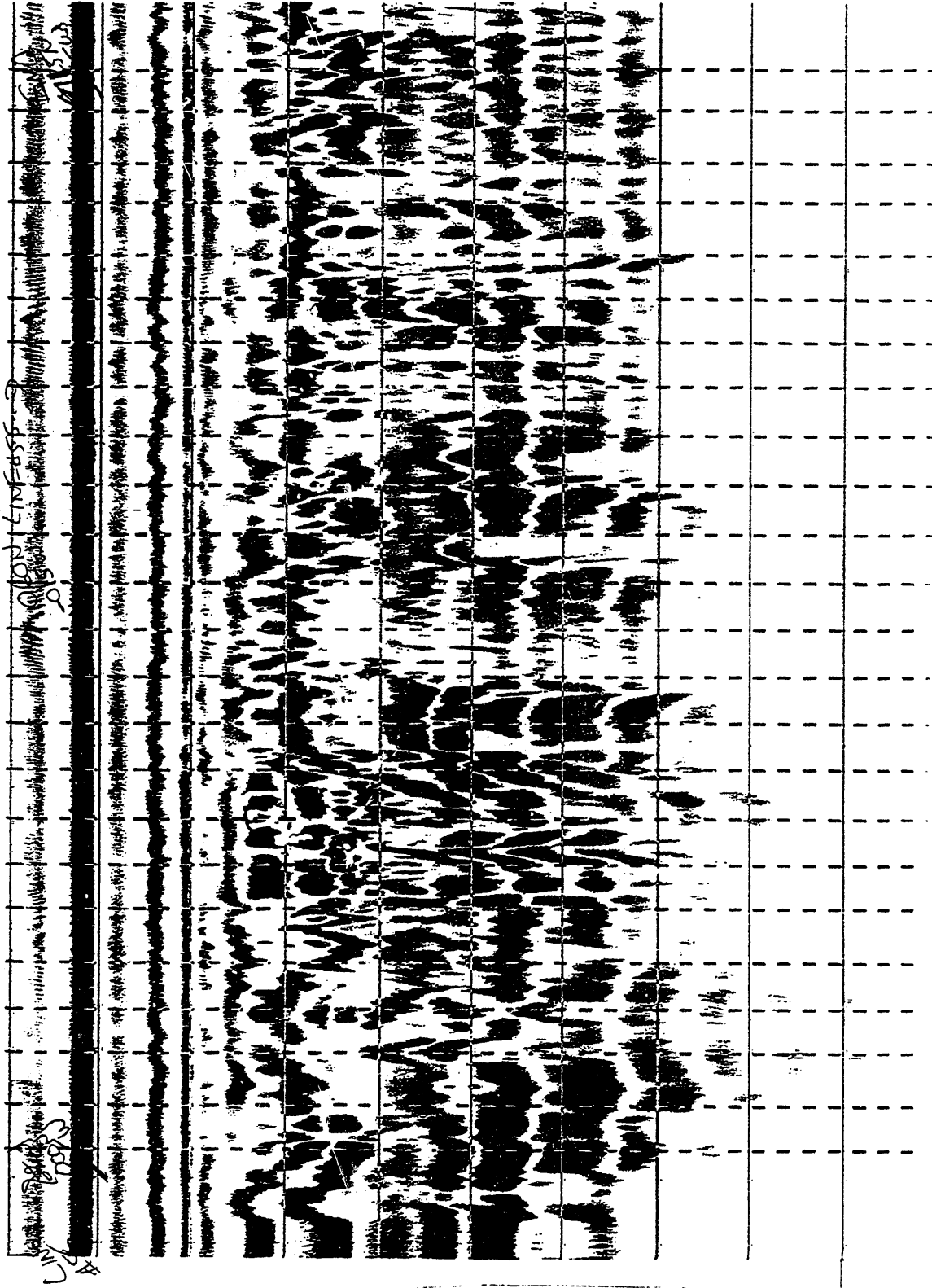
Line 52

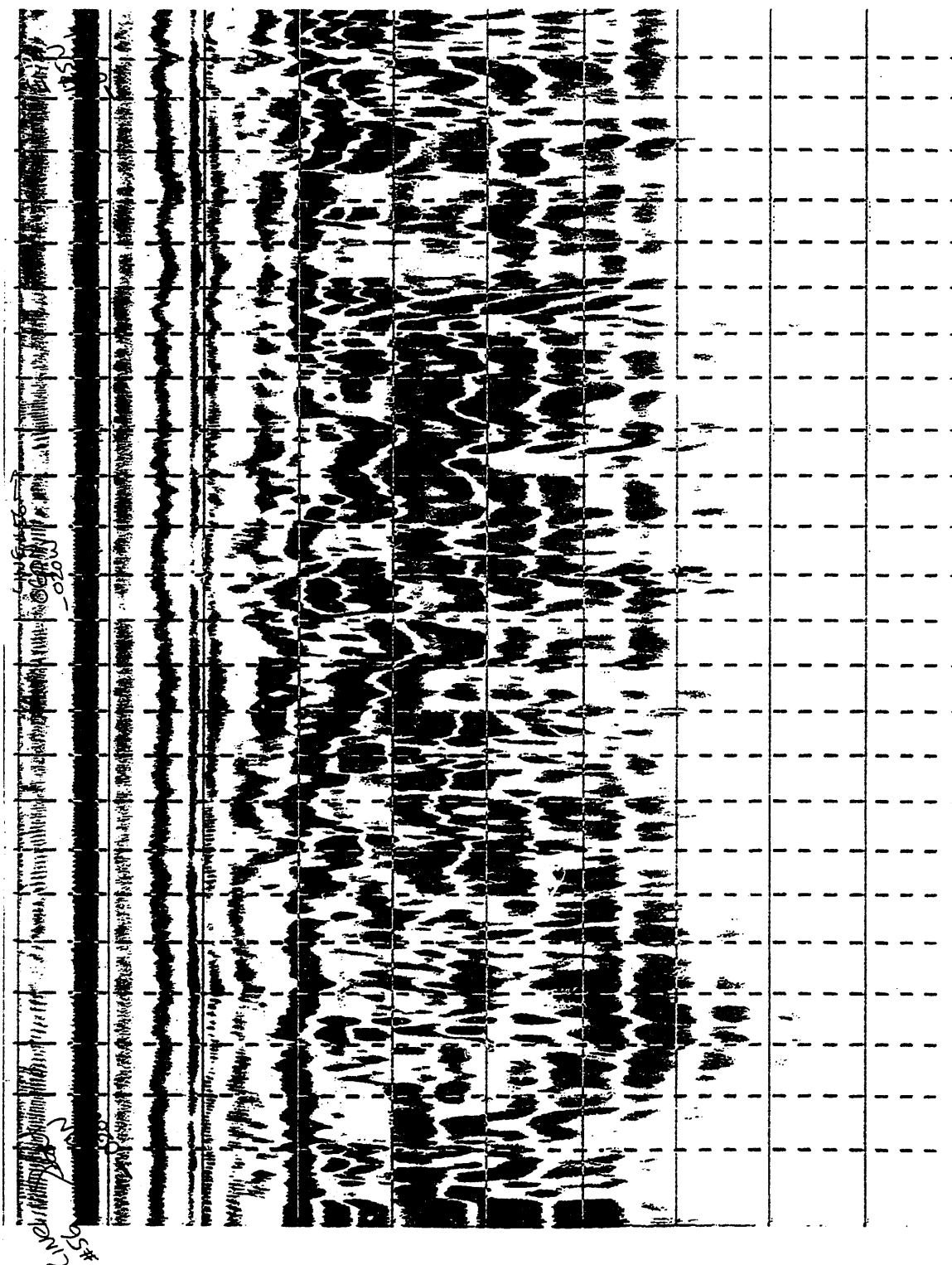


Line 53

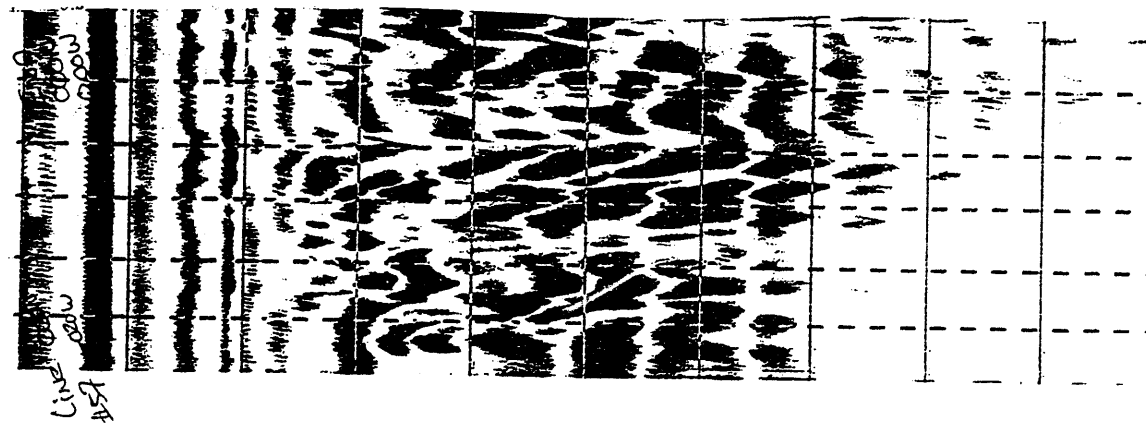
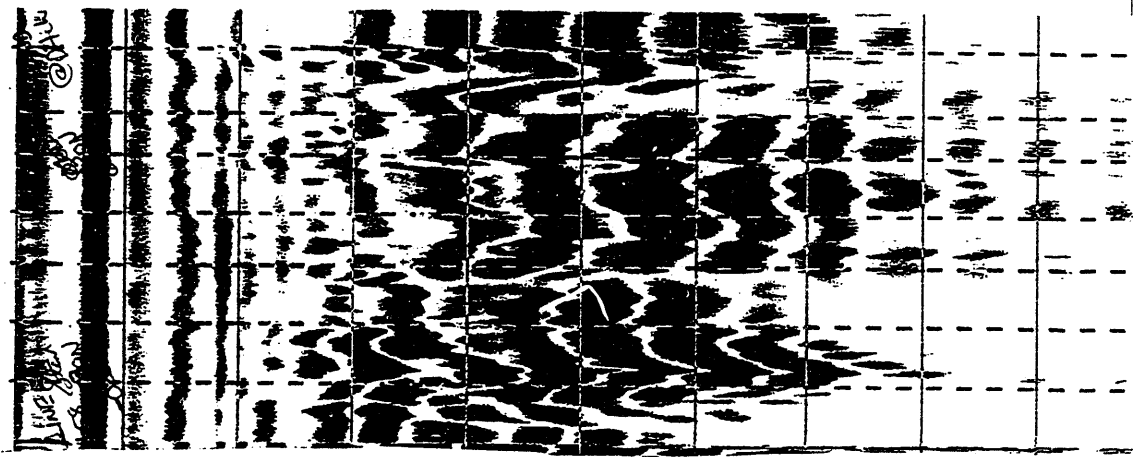
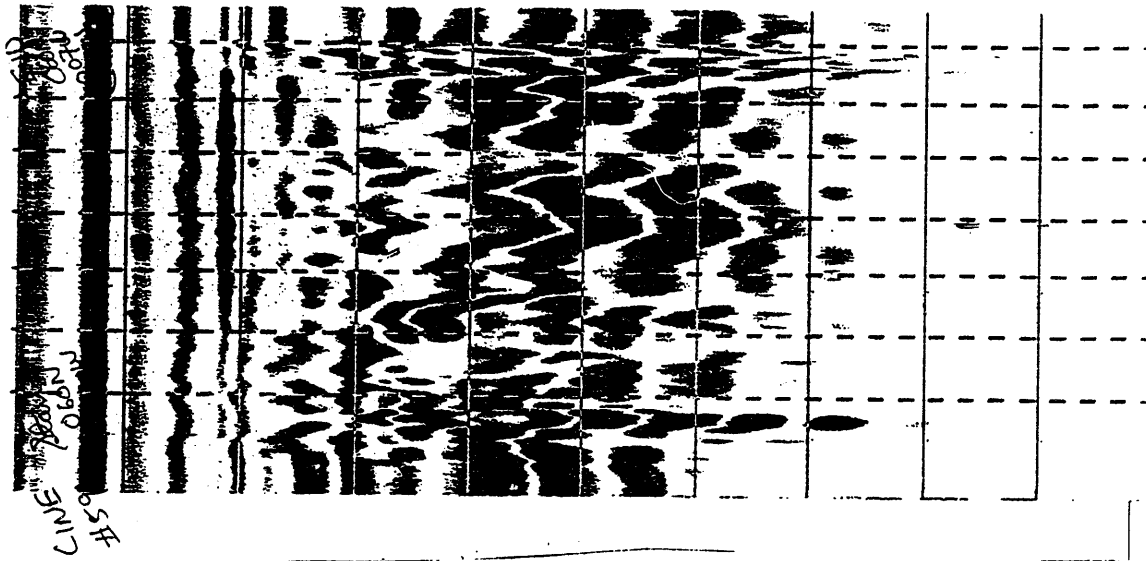


Line 54

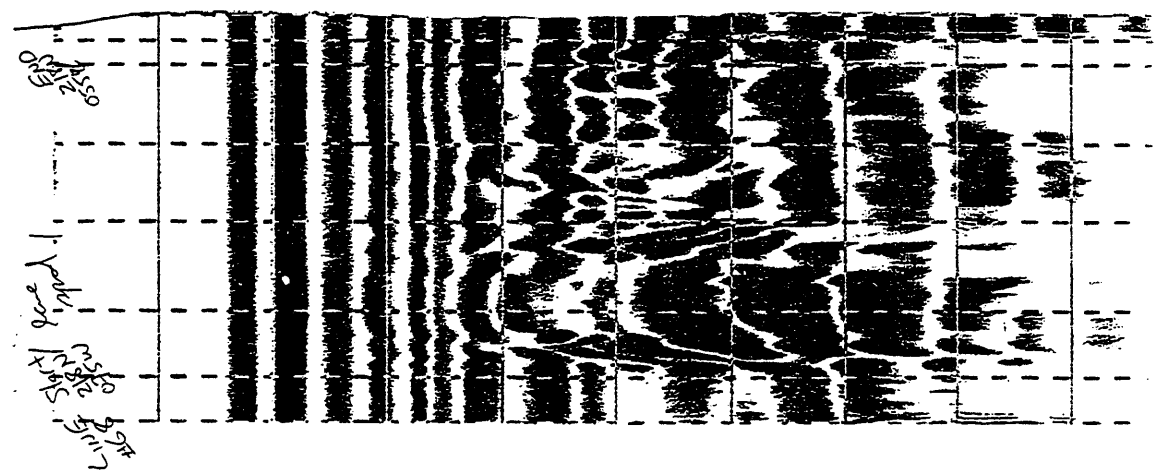
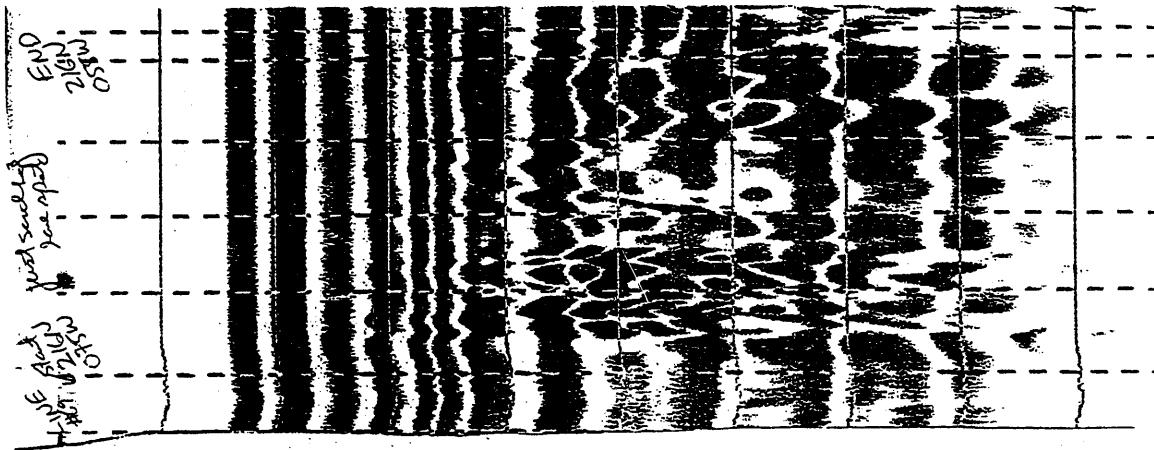
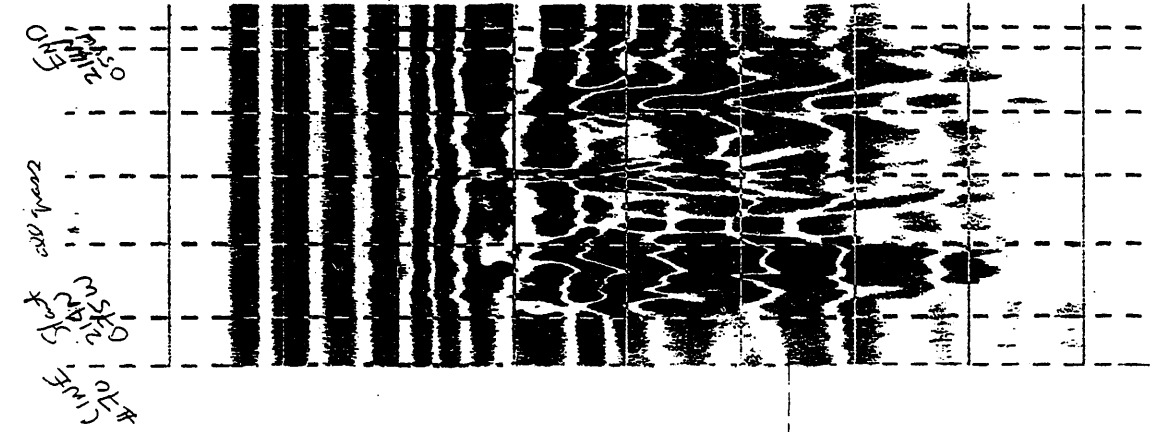




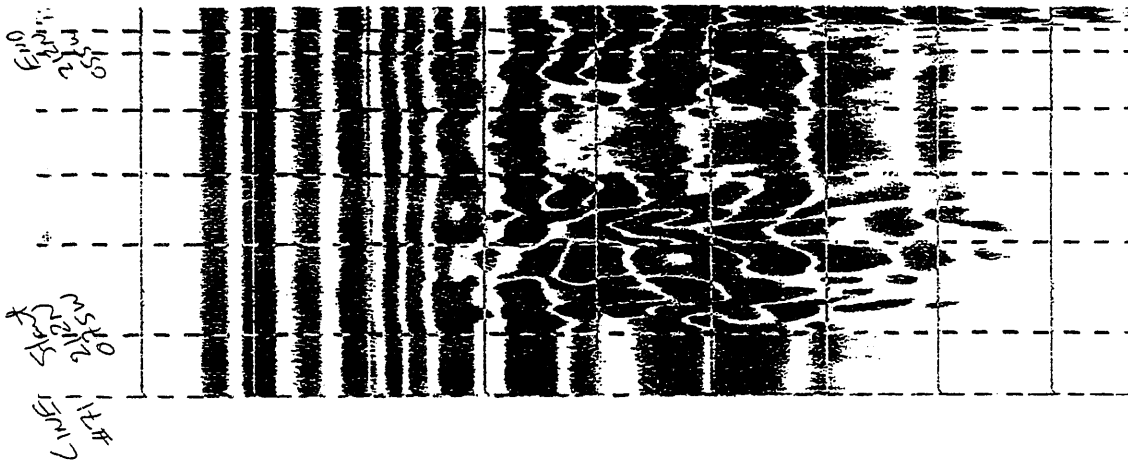
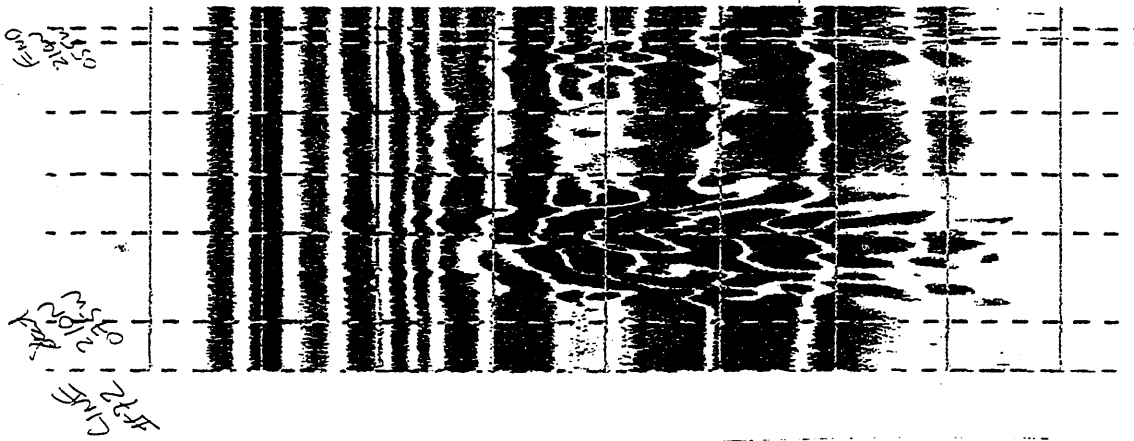
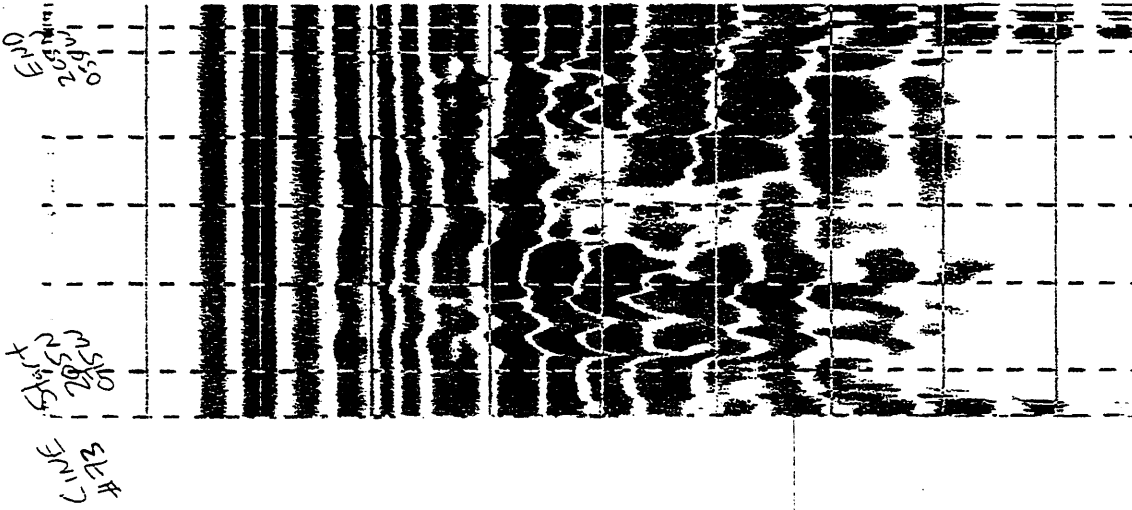
Line 56



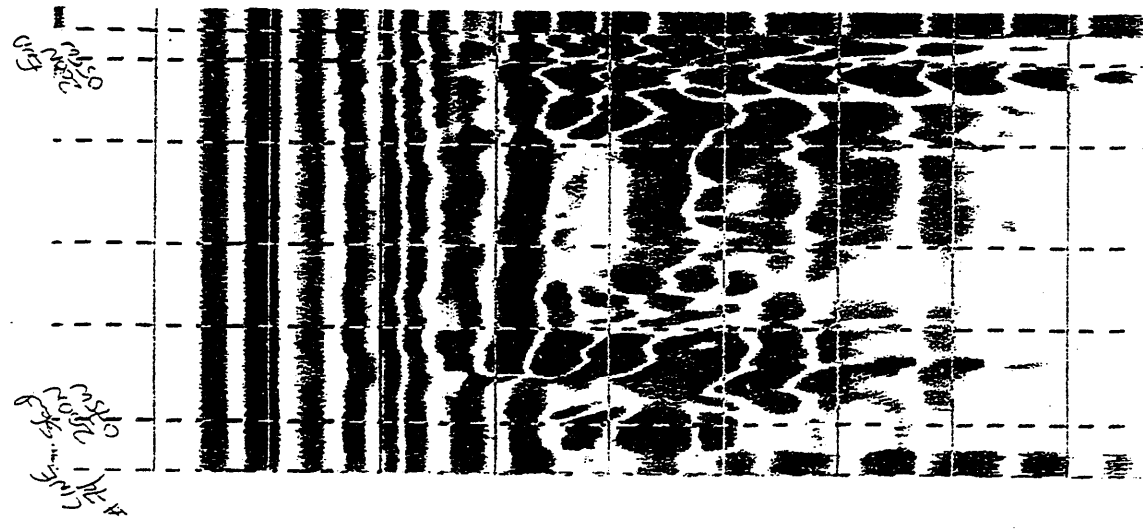
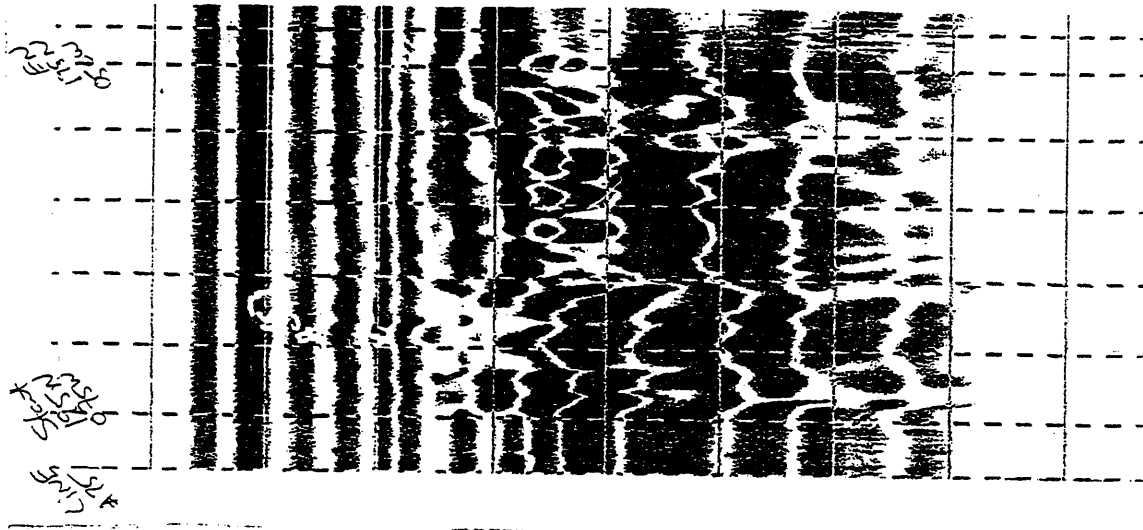
Lines 57-59 Left to Right



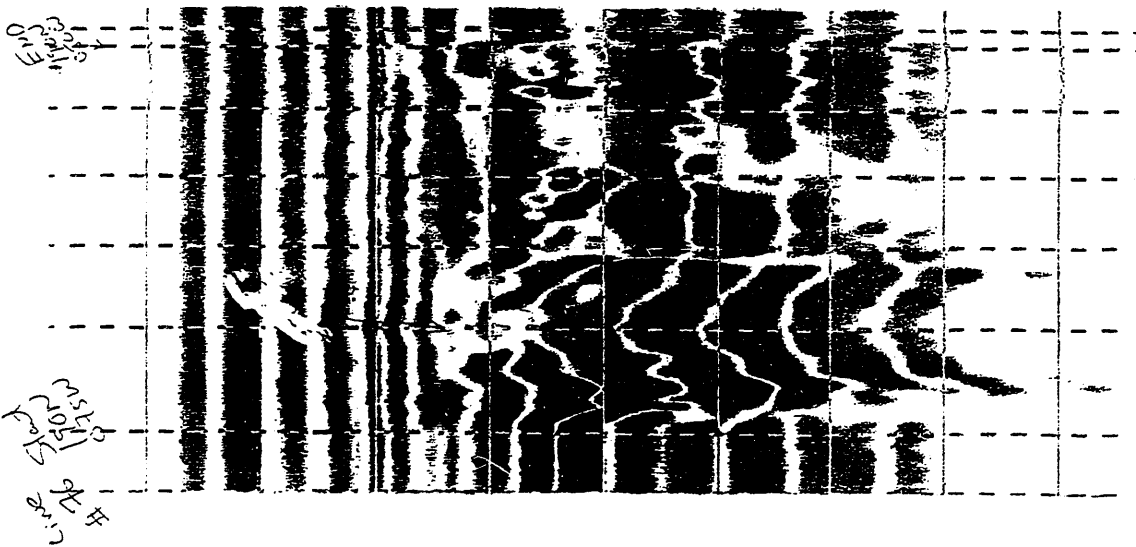
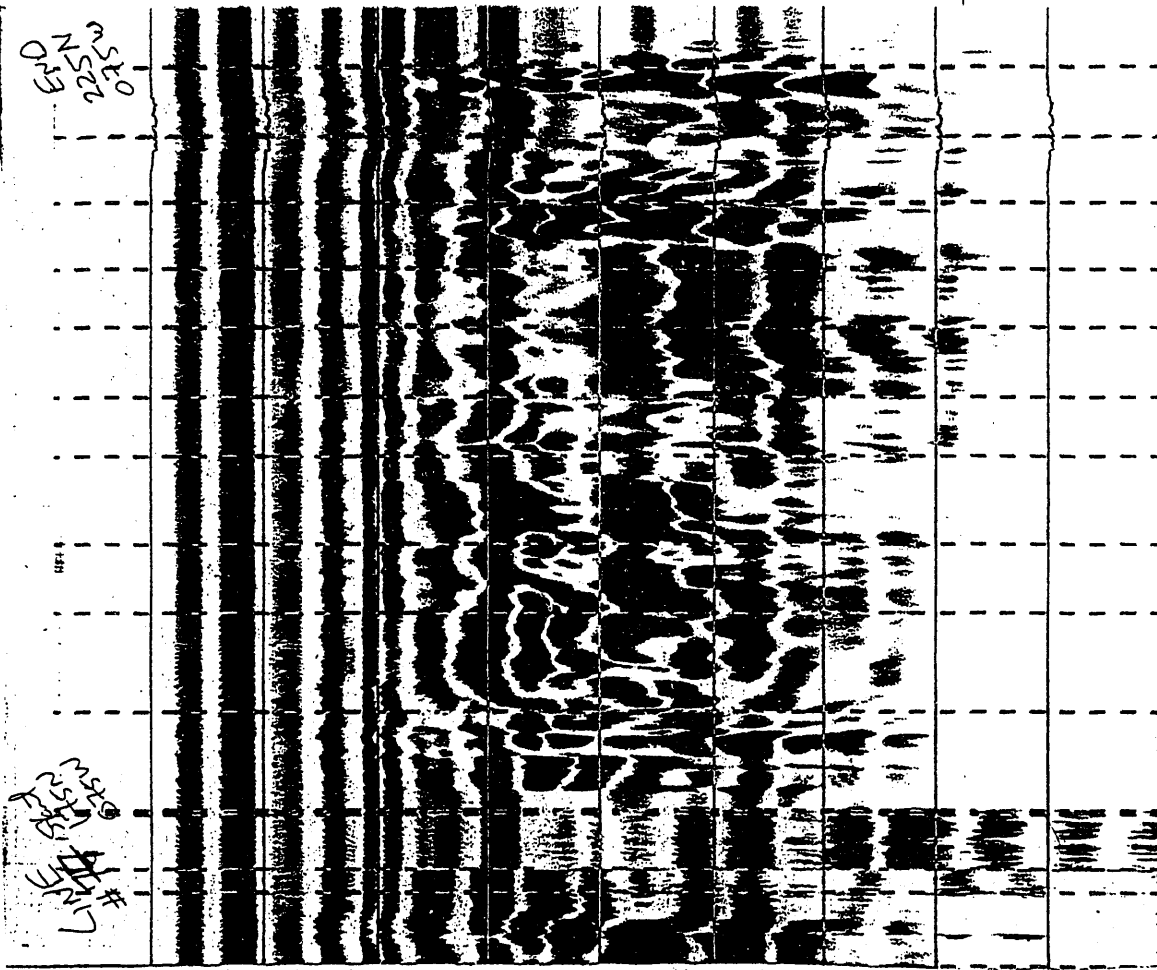
Lines 68-70 Left to Right



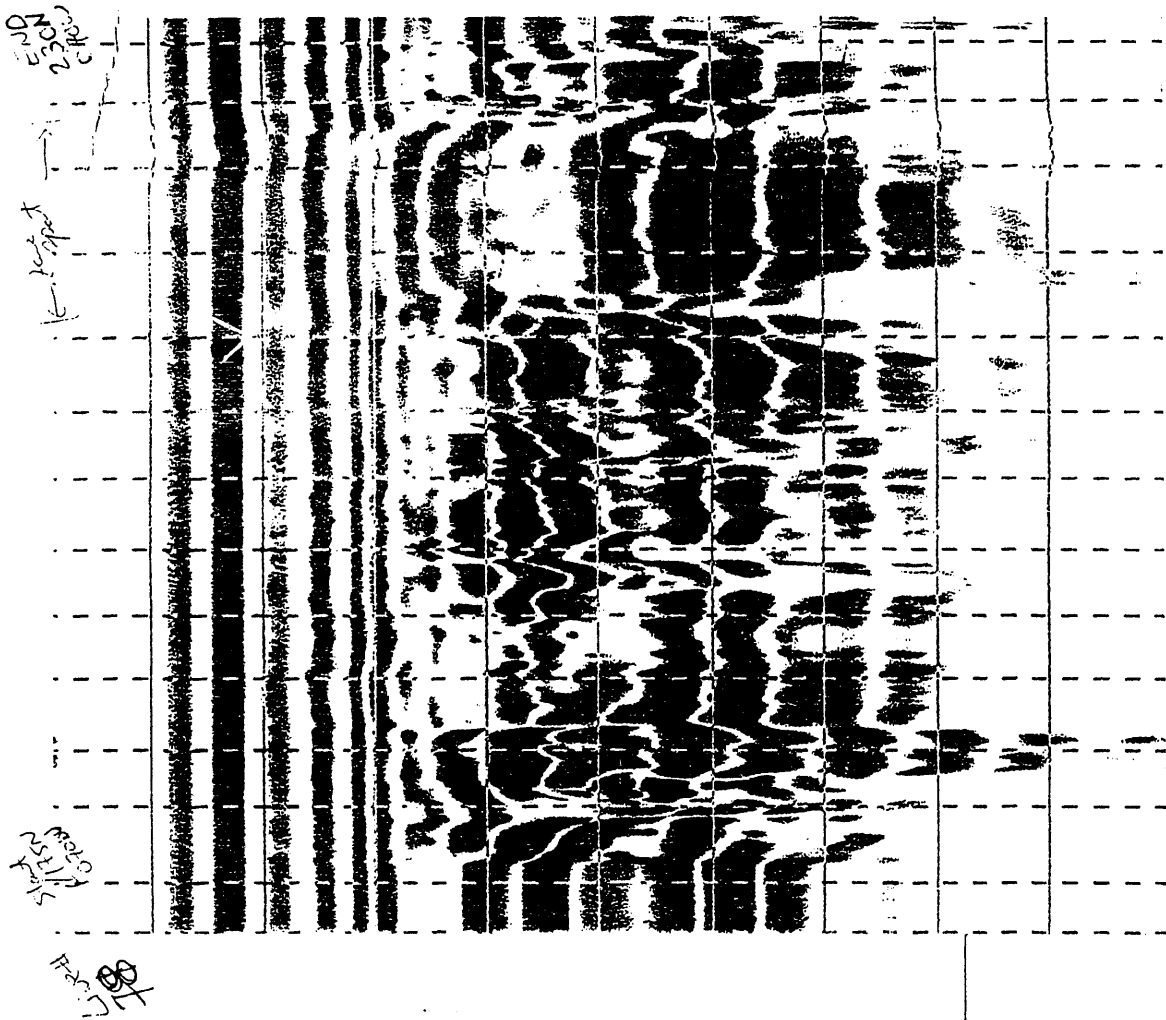
Lines 71-73 Left to Right



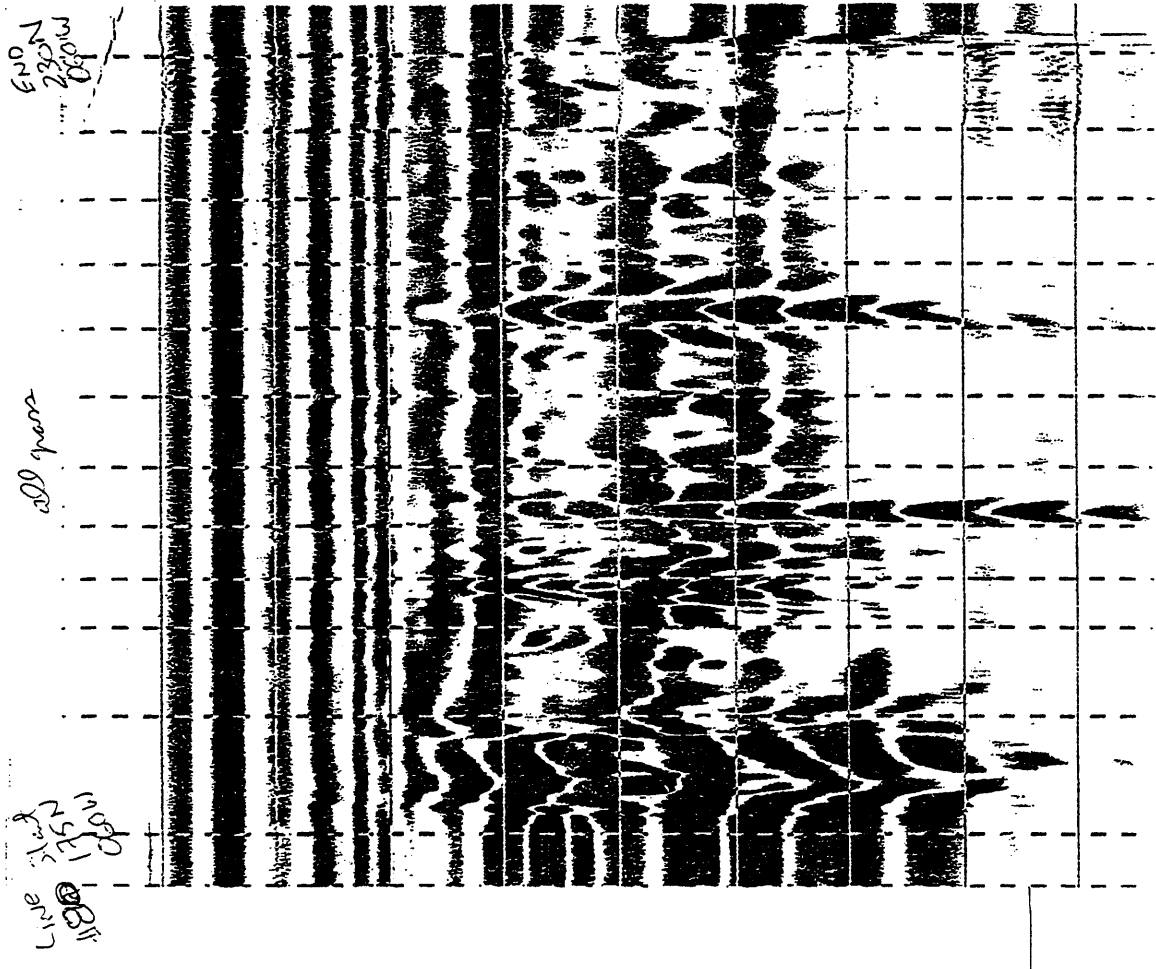
Lines 74-75 Left to Right



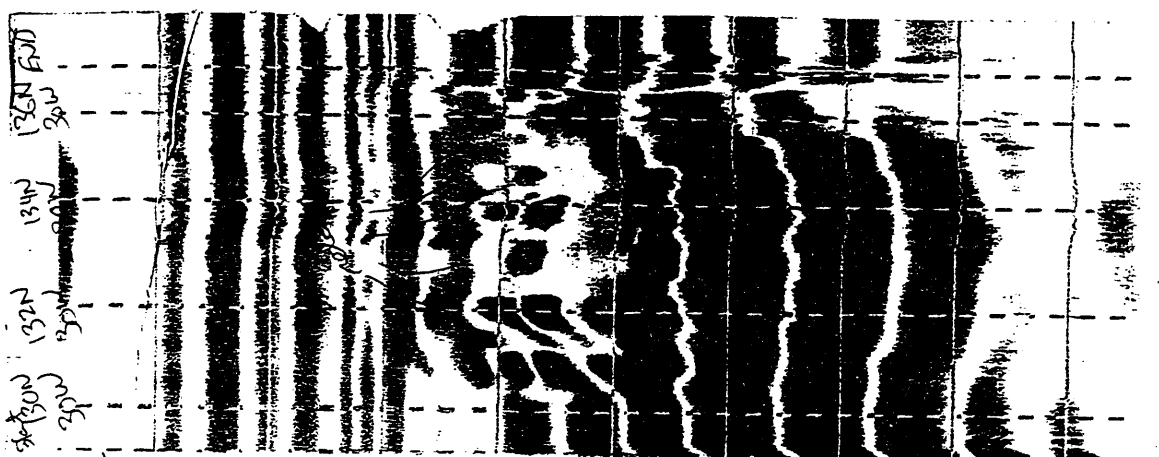
Lines 76-77 Left to Right



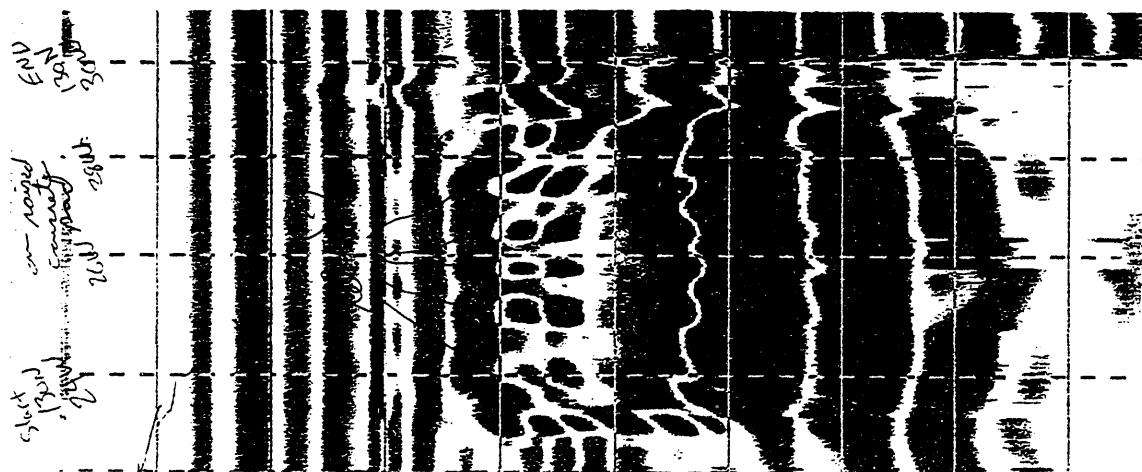
Line 78



Line 80



Line 2



18#

Lines 81-82 Left to Right

Appendix C:

Electrical Depth Sounding Curves and Data

**Apparent Resistivity Observed
at the Study Site Using the
Wenner Configuration**

Station Name or Coordinates (ft)		ρ_a ($\Omega \cdot m$)
Base		68
Ditch (NE)		63
Vault		6
00 N	00 W	37
5 N	00 W	49
10 N	00 W	59
15 N	00 W	97
20 N	00 W	108
25 N	00 W	n.r.
30 N	00 W	n.r.
35 N	00 W	n.r.
60 N	-45 W	180
60 N	-50 W	180
105 N		136
60 N	00 W	161
00 N	50 W	92
55 N	115 W	43

----- BASE -----

DATA SET: BASE

CLIENT: U.S. ARMY	DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND	SOUNDING: 1
COUNTY: HARFORD, MD	AZIMUTH: E-W
PROJECT: Building Demolition	EQUIPMENT: ABEM
ELEVATION: 20.00	
SOUNDING COORDINATES: X: 100.0000 Y: 50.0000	

Schlumberger Configuration

FITTING ERROR: 4.910 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m ²)
			20.00		
1	70.92	0.675	19.32	0.00952	47.89
2	42.06				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	2.00	54.66	52.21	4.47
2	3.00	43.70	46.92	-7.36
3	5.00	41.91	43.72	-4.33
4	8.00	44.26	42.68	3.55
5	10.00	43.96	42.46	3.42

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	0.51		
P 2	0.02	0.97	
T 1	0.33	0.05	0.26
	P 1	P 2	T 1

----- DITCH -----

DATA SET: DITCH

CLIENT: U.S. ARMY	DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND	SOUNDING: 2
COUNTY: HARFORD, MD	AZIMUTH: N-S
PROJECT: Building Demolition	EQUIPMENT: ABEM
ELEVATION: 20.00	
SOUNDING COORDINATES: X: 0.0000 Y: 100.0000	

Schlumberger Configuration

FITTING ERROR: 0.981 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			20.00		
1	69.57	0.994	19.00	0.0142	69.16
2	24.67				

ALL PARAMETERS ARE FREE

PARAMETER BOUNDS FROM EQUIVALENCE ANALYSIS

	LAYER	MINIMUM	BEST	MAXIMUM
RHO	1	65.875	69.571	73.578
	2	24.372	24.673	24.965
THICK	1	0.940	0.994	1.052
DEPTH	1	0.940	0.994	1.052

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
1	2.00	48.65	48.59	0.120
2	3.00	37.11	37.19	-0.236
3	5.00	28.69	28.50	0.659
4	8.00	25.43	25.86	-1.69
5	10.00	25.69	25.39	1.18

PARAMETER RESOLUTION MATRIX:
 "F" INDICATES FIXED PARAMETER
 P 1 1.00

----- BARESPOT -----

DATA SET: BARESPOT

CLIENT: U.S. ARMY	DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND	SOUNDING: 3
COUNTY: HARFORD, MD	AZIMUTH: N-S
PROJECT: Building Demolition	EQUIPMENT: ABEM
ELEVATION: 20.00	
SOUNDING COORDINATES: X: 25.0000 Y: 50.0000	

Schlumberger Configuration

FITTING ERROR: 2.709 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m ²)
			20.00		
1	8.29	1.15	18.84	0.138	9.56
2	11.76	6.21	12.63	0.528	73.12
3	30.92				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	2.00	8.95	9.15	-2.20
2	3.00	10.19	9.87	3.16
3	5.00	11.04	10.97	0.626
4	8.00	11.81	12.28	-3.97
5	10.00	13.47	13.17	2.21

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	0.87				
P 2	0.05	0.86			
P 3	-0.04	0.10	0.07		
T 1	-0.15	-0.13	0.01	0.06	
T 2	0.08	-0.19	-0.11	-0.02	0.18
	P 1	P 2	P 3	T 1	T 2

----- FAREAST -----

DATA SET: FAREAST

CLIENT: U.S. ARMY	DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND	SOUNDING: 4
COUNTY: HARFORD, MD	AZIMUTH: E-W
PROJECT: Building Demolition	EQUIPMENT: ABEM
ELEVATION: 20.00	
SOUNDING COORDINATES: X: -15.0000 Y: 18.0000	

Schlumberger Configuration

FITTING ERROR: 0.780 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m ²)
			20.00		
1	380.7	0.571	19.42	0.00150	217.4
2	49.67	1.45	17.97	0.0293	72.43
3	94.31				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	2.00	99.43	99.88	-0.454
2	3.00	71.19	71.78	-0.828
3	5.00	73.09	73.36	-0.378
4	8.00	82.11	81.24	1.05
5	10.00	83.67	84.45	-0.932

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	0.48				
P 2	-0.15	0.89			
P 3	0.01	-0.01	0.98		
T 1	0.21	0.09	0.00	0.90	
T 2	-0.22	-0.24	-0.07	0.15	0.36
	P 1	P 2	P 3	T 1	T 2

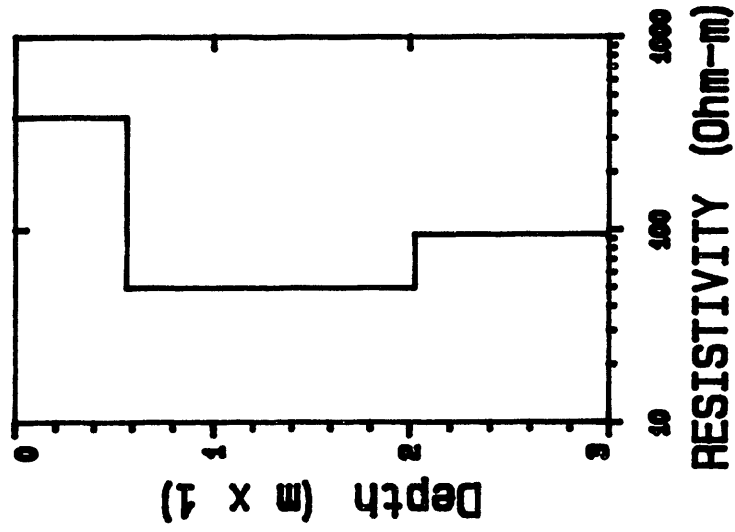
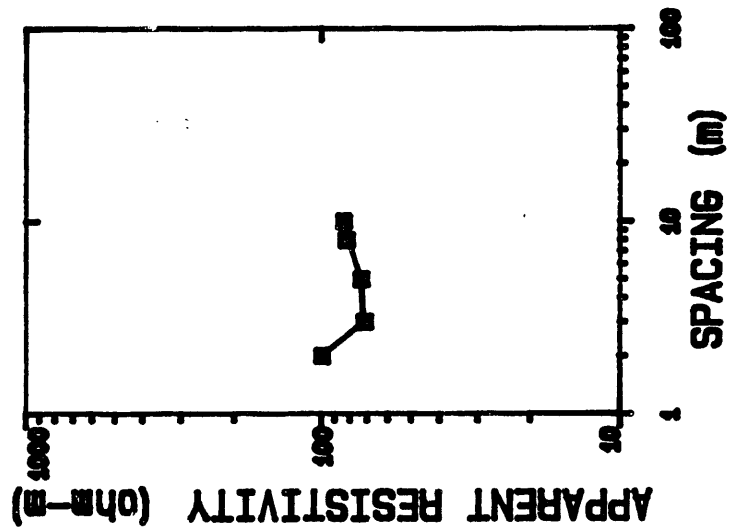


Plate: 4

for: U.S. ARMY		Building Demolition	
by Argonne National Laboratory - MS		ABERDEEN PROVING GROUND	
Date Rec: PRESENT	Date: Apr-12, 91	HARFORD, MD	
Equipment: ABEM	Sounding: 4	Azimuth: E-W	

----- NEAREAST -----

DATA SET: NEAREAST

CLIENT: U.S. ARMY	DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND	SOUNDING: 5
COUNTY: HARFORD, MD	AZIMUTH: N-S
PROJECT: Building Demolition	EQUIPMENT: ABEM
ELEVATION: 20.00	
SOUNDING COORDINATES: X: 0.0000 Y: 18.0000	

Schlumberger Configuration

FITTING ERROR: 14.463 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m ²)
			20.00		
1	167.8	0.203	19.79	0.00121	34.17
2	182.4	4.48	15.30	0.0246	818.9
3	61.92				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	2.00	179.5	179.9	-0.248
2	3.00	147.3	177.3	-20.37
3	5.00	206.0	165.2	19.79
4	8.00	143.2	138.6	3.18
5	10.00	111.5	121.4	-8.81

PARAMETER RESOLUTION MATRIX:
 "F" INDICATES FIXED PARAMETER

P 1	0.02				
P 2	0.03	0.96			
P 3	-0.03	0.01	0.26		
T 1	0.00	0.00	0.02	0.00	
T 2	-0.06	0.06	0.37	0.04	0.59
	P 1	P 2	P 3	T 1	T 2

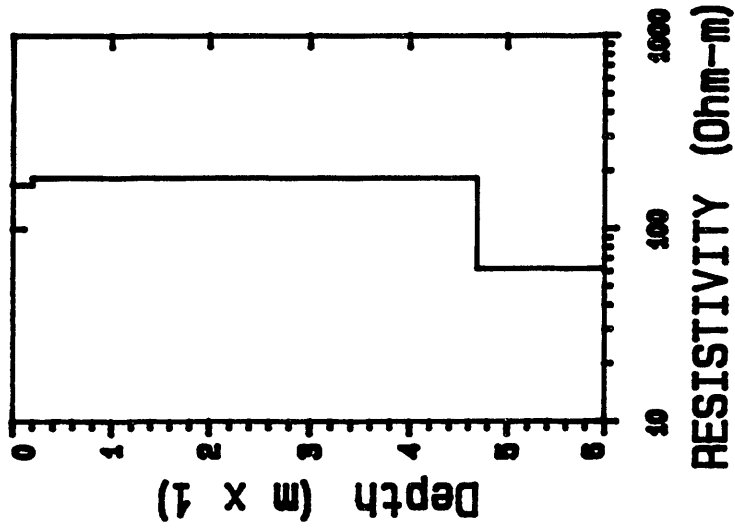
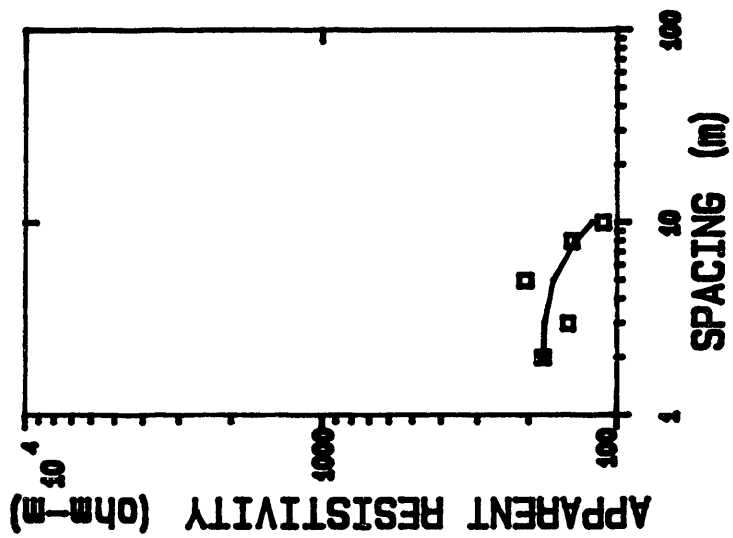


Plate: 5

for: U.S. ARMY

Building Demolition

by Argonne National Laboratory - MS

ABERDEEN PROVING GROUND

Data Set: NEARWAST

Date: Apr 12, 94

HARFORD, MD

Equipment: ABEN

Sounding: 5

Azimuth: N-S

----- SOUTH -----

DATA SET: SOUTH

CLIENT: U.S. ARMY	DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND	SOUNDING: 6
COUNTY: HARFORD, MD	AZIMUTH: E-W
PROJECT: Building Demolition	EQUIPMENT: ABEM
ELEVATION: 20.00	
SOUNDING COORDINATES: X: 15.0000 Y: 0.0000	

Schlumberger Configuration

FITTING ERROR: 9.439 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m ²)
			20.00		
1	61.99	0.772	19.22	0.0124	47.86
2	237.0	2.33	16.89	0.00984	552.9
3	13.35				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	2.00	99.19	102.0	-2.85
2	3.00	109.6	119.3	-8.76
3	5.00	142.6	122.4	14.20
4	8.00	97.73	93.31	4.52
5	10.00	65.81	71.63	-8.85

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	0.52				
P 2	0.11	0.56			
P 3	-0.02	0.06	0.02		
T 1	-0.42	-0.08	0.03	0.37	
T 2	-0.08	0.44	0.09	0.12	0.48
	P 1	P 2	P 3	T 1	T 2

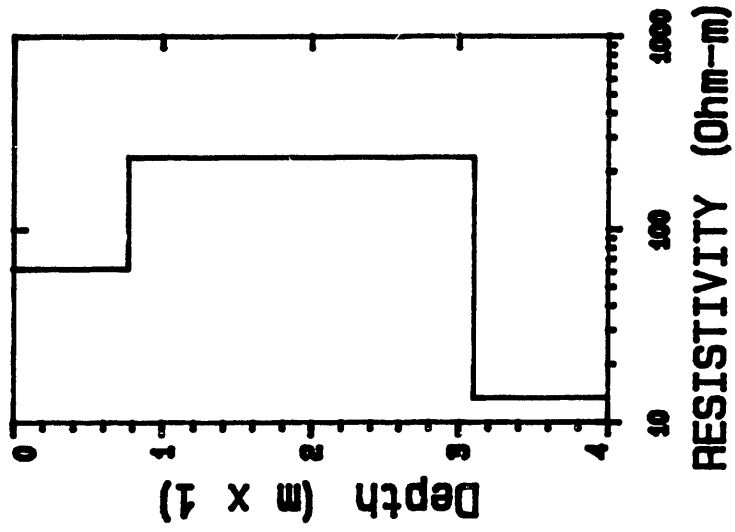
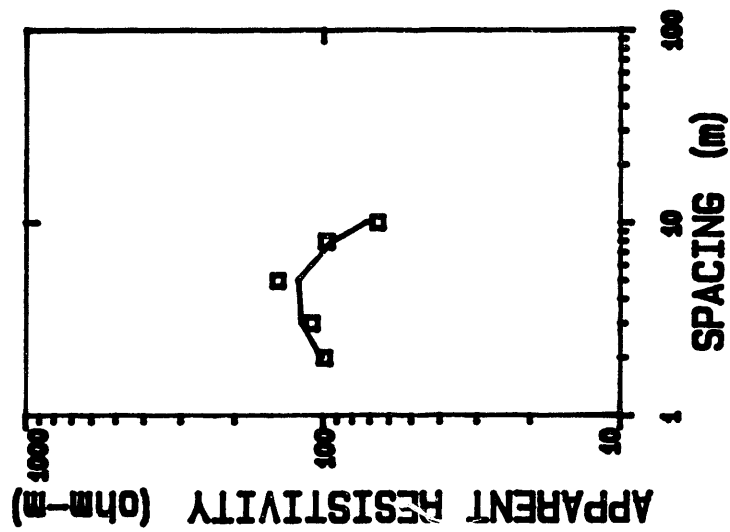


Plate: 6

for: U.S. ARMY		Building Demolition	
by Argonne National Laboratory - EM		ABERDEEN PROVING GROUND	
Date Set: SOUTH	Date: Apr 12, 91	HARFORD, MD	
Equipment: AMEN	Sounding: 6	Azimuth: E-W	

CLIENT: U.S. ARMY DATE: Apr12,91
LOCATION: ABERDEEN PROVING GROUND SOUNDING: 7
COUNTY: HARFORD, MD AZIMUTH: N-S
PROJECT: Building Demolition EQUIPMENT: ABEM
ELEVATION: 20.00
SOUNDING COORDINATES: X: 38.0000 Y: 17.0000

Schlumberger Configuration

FITTING ERROR: 4.106 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			20.00		
1	72.40	0.688	19.31	0.00951	49.88
2	21.81				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	2.00	36.40	36.23	0.468
2	3.00	26.94	27.38	-1.65
3	5.00	23.94	23.25	2.87
4	8.00	23.43	22.30	4.81
5	10.00	20.68	22.12	-6.94

PARAMETER RESOLUTION MATRIX:

"F" INDICATES FIXED PARAMETER

P 1	1.00		
P 2	0.00	1.00	
T 1	0.00	0.00	1.00
	P 1	P 2	T 1

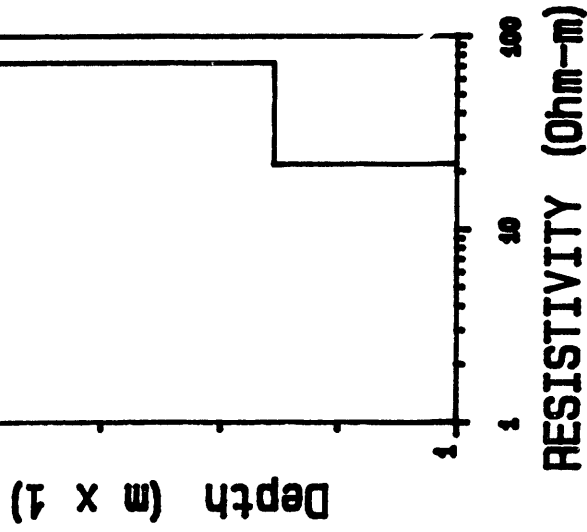
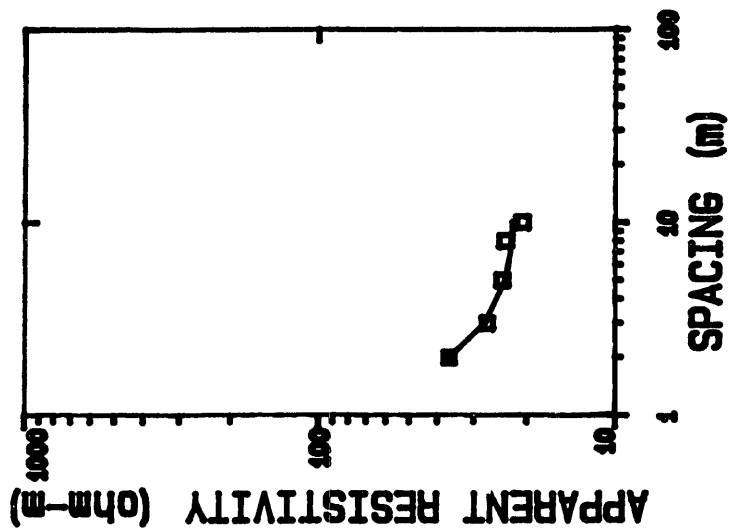


Plate: 7

for: U.S. ARMY

Building Demolition

by Argonne National Laboratory - MS

ABERDEEN PROVING GROUND
HARFORD, MD

Data Set: WEST Date: Apr 12, 84

Equipment: AMEN Sounding: 7

Azimuth: N-S

END

**DATE
FILMED**

12 / 16 / 91

