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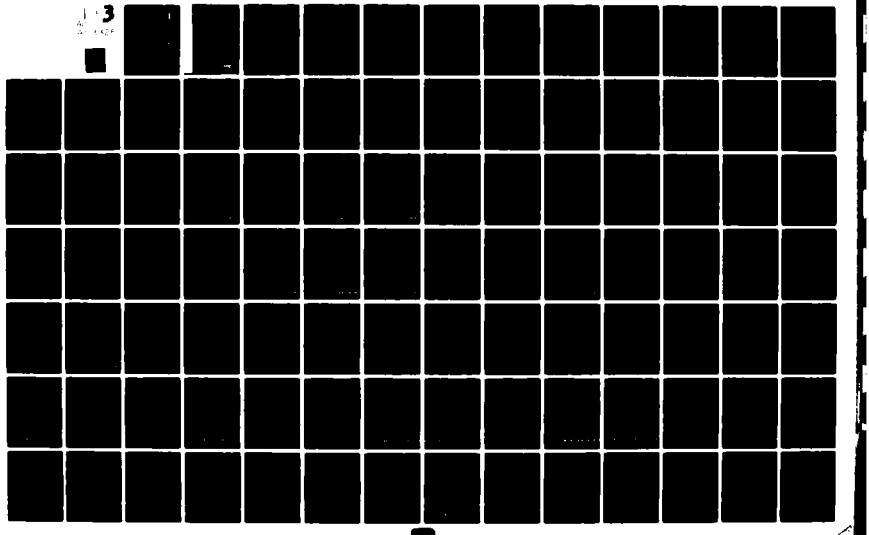

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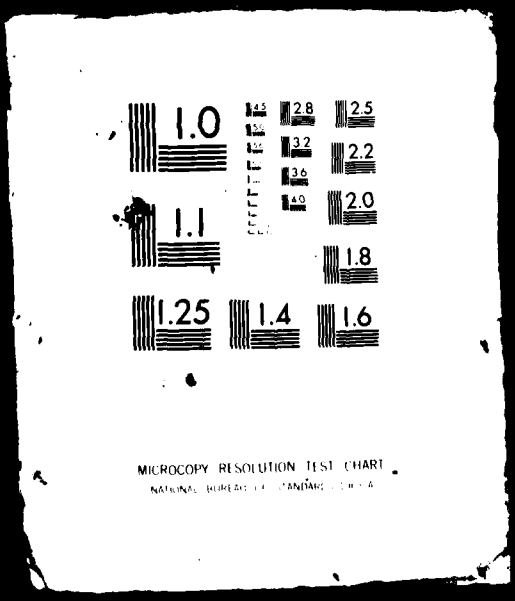

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VOLUME III
NEVADA-UTAH
VERIFICATION STUDIES, FY 79
GEOTECHNICAL DATA,
SNAKE EAST CDP, UTAH

PREPARED FOR

SPACE AND MISSILE SYSTEMS ORGANIZATION (SAMSO)

NORTON AIR FORCE BASE, CALIFORNIA

FUGRO NATIONAL, INC.
Consulting Engineers and Geologists

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VERIFICATION STUDIES, FY 79
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SNAKE EAST CDP, UTAH

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24 August 1979

FUGRO NATIONAL, INC.

VOLUME III
GEOTECHNICAL DATA, SNAKE EAST CDP

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The objectives of this report are to verify suitable area for MX system & provide preliminary physical & engineering characteristics of the soils. [illegible]

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FOREWORD

This report was prepared for the Department of the Air Force, Space and Missile Systems Organization (SAMSO), in compliance with Contract No. F04704-78-C-0027, CDRL Item 005A2. It presents geological, geophysical, and geotechnical data and evaluates the suitability of portions of Nevada and Utah for siting the MX Land Mobile Advanced ICBM System.

This report is the first of several Verification reports which will be prepared. The objectives are to verify sufficient suitable area for deployment of the MX System and to provide preliminary physical and engineering characteristics of the soils. The Verification Studies are the final phase of a site-selection process which was begun in 1977. Previous studies have been termed Screening, Characterization, and Ranking. In preparing this report, it has been assumed that the reader is familiar with these previous studies.

Results of the FY 79 Verification studies are contained in 11 volumes as follows:

Geotechnical Results

Volume 1A - Sections 1.0, 2.0, and 3.0 contain Introduction, Results and Conclusions, and Recommendations for Future Studies. Sections 4.0 through 6.0 contain summary geotechnical data for Whirlwind, Snake East, and Hamlin CDP's.

Volume 1B - Sections 7.0 through 10.0 contain summary geotechnical data for White River North, Garden-Coal, Reveille-Railroad and Big Smoky CDP's.

Geotechnical Data Volumes

Volume II - Whirlwind CDP
* Volume III - Snake East CDP
Volume IV - Hamlin CDP
Volume V - White River North CDP
Volume VI - Garden-Coal CDP
Volume VII - Reveille-Railroad CDP
Volume VIII - Big Smoky CDP
Volume IX - Dry Lake CDP
Volume X - Ralston CDP

* This volume is presented herein.

SECTION 1.0

GEOLOGIC STATION DATA

EXPLANATIONS OF GEOLOGIC STATION DATA

Geologic stations were established at selected locations throughout the CDP at which detailed descriptions of surficial basin-fill deposits or rock were recorded. Locations of all geologic stations are shown in Drawing 1, Activity Location Map. All data taken on surficial basin-fill units at these stations are listed in Table 1-1 and an explanation of the column headings in the table is given below. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification Studies is included at the end of this section.

Column Heading Table 1-1	Explanation
Station Number	Geologic stations are numbered sequentially. Where more than one geologic field team worked in a CDP, stations made by each team are differentiated with a letter (A, B, or C) following the station number.
Geologic Unit	Generic geologic unit only, i.e. the grain-size designation (f, s, g, c) is omitted from surficial basin-fill units. The letter B in the unit designation indicates a buried deposit not exposed at the surface.
MPS MM	Average maximum particle size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S) and fines (%F) are taken only on the fraction composed of particles less than 3 inches (76 mm) in diameter.
USCS	Soil class according to the Unified Soil Classification System.

Munsell Color — Soil color based on Munsell Soil Color Chart.

Source Rock Types(s) — Rock types of coarse clasts listed in order of abundance.

* Physical Properties — Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table 1-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.

6	(Grain Shape)	1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well rounded
7	(Moisture Content)	1) Dry, 2) Moist, 3) Wet
8	(Plasticity of Fines)	1) None, 2) Low, 3) Medium, 4) High
9	(Consistency)	Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense, Fine grained: 1)Soft, 2) Firm, 3) Stiff, 4) Hard
10	(Structure)	1) Stratified Tabular, 2) Stratified Other (lensed, cross bedded, discontinuous beds), 3) Nonstratified
11	(Cementation Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12	(Depth to Cemented Layers)	Depth to layer (in centimeters) exhibiting cementation induration described in Column 11 (above)
13	(Weathering of clasts)	1) Fresh, 2) Slight, 3) Moderate, 4) Very
14	(Soil Profile Development)	1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
15	(Caliche Development)	1) Stage I, 2) Stage II, 3) Stage III, 4) Stage IV, 5) None

Drainage

DP (M)	Average depth of drainages (in meters)
WD (M)	Average width of drainages (in meters)
Slope (%)	Average slope of ground surface (in percent grade)
Sample	Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

A1 Younger Fluvial Deposits - Major modern stream channel and flood-plain deposits.

A2 Older Fluvial Deposits - Older incised stream channel and flood-plain deposits in elevated terraces bordering major modern drainages.

A3 Eolian Deposits - Wind-blown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).

A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).

A5 Alluvial Fan Deposits - Alluvial deposits consisting of debris flow and water-laid alluvium near mountain fronts, grading into predominantly water-laid alluvium deposited in shifting distributary channels near the basin center. Younger (A5y), intermediate (A5i), and older (A5o) alluvial fans are differentiated by surface soil development, terrain conditions, and present depositional/erosional environment.

Grain sizes of these deposits (except A3 deposits, which are exclusively sandy) are indicated by a single letter (f, s, g, or c) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System:

f - fine-grained (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

c - coarse grained with greater than 30 percent boulders and cobbles (generally GP, GW, GM, GC)

ROCK UNITS

I Igneous (undifferentiated). Rocks formed by solidification of a molten or partially molten mass.

- I1 Intrusive - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).
- I2 Extrusive (intermediate and acidic) - Volcanic rocks of intermediate and acidic compositon formed by solidification of molten material at or near the surface, (e.g., rhyolite, latite, dacite, andesite).
- I3 Extrusive (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).
- I4 Extrusive (pyroclistic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed by accumulation of clastic solids, organic solids and/or chemically precipitated minerals.

- S1 Arenaceous and/or Siliceous Rocks - Composed of sand size particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).
- S2 Carbonate Rocks - Composed predominantly of calcium carbonate detritus or chemical precipitates (e.g., limestone, dolomite, chalk).
- S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).
- S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).
- S5 Coarse Clastic Rocks - Composed of gravel sized or larger clasts (e.g., conglomerate, breccia).

M Metamorphic (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure (e.g., gneiss, schist, hornfels, metaquartzite).

STATION NUMBER	GEOL UNIT	GRAIN SIZE MM	%C	%G	%S	%F	USCS	MUNSELL COLOR	SOURCE ROCK TYPE(S)	*PHYSICAL PROPERTIES 6	7	8	9	10	11	12	13	14	15	TERRAIN DRAINAGE (CM/H)	DRAINAGE (FEET)	SLOPE (%)	SAMPLE
NSEG01A	A40	010	00	00	0T	055	045	SM-SC	10.0YR5/6														
NSEG01A	A40	010	25	15	0T	055	045	SM-SC	10.0YR5/6														
NSEG02A	A40	030	00	0T	75	025	000	GP		S2													
NSEG03A	A40	055	00	0T	50	045	005	GP-GM	10.0YR5/4	S2													
NSEG04A	A5I	110	00	02	10	080	010	SP-SM	10.0YR6/4	S2													
NSEG05A	A5I	060	00	00	30	065	005	SP-SM	10.0YR4/4	S2													
NSEG06A	A40	040	00	0T	10	075	015	SM	10.0YR7/4	S2													
NSEG07A	A40	060	00	0T	75	025	00T	GP		S2													
NSEG08A	A40	030	00	00	05	090	015	SM	10.0YR6/1	S2													
NSEG09A	A30		00	00	00	100	000	SF	10.0YR5/4														
NSEG10A	A4		00	00	00	00T	100	CL	10.0YR6/3														
NSEG11A	A40	040	00	0T	60	040	00T	GP		S2	I2												
NSEG12A	A40	010	00	00	0T	100	00T	SP	10.0YR5/4	S2													
NSEG13A	A40		00	00	00	100	00T	SP	10.0YR5/4														
NSEG14A	A4		00	00	00	000	100	CL	10.0YR5/3														
NSEG15A	I3																						
NSEG16A	A40	160	00	05	70	030	00T	GP		S2	I2												
NSEG17A	A40	060	00	0T	25	055	020	GM	10.0YP6/4	S2													
NSEG18A	A5I	070	00	05	25	060	015	SM	10.0YP5/4	S2	S5												
NSEG19A	A5I	040	00	00	10	070	020	SM	10.0YP5/6	S2													
NSEG20A	A5I	100	0T	03	45	045	010	SM-SP	10.0YR5/6	S2													
NSEG21A	A40		00	00	0T	065	015	SM	10.0YR5/4														
NSEG22A	A40	090	00	0T	90	010	000	GP		S2													
NSEG23A	A5I	050	00	0T	45	040	015	SM-GM	10.0YR5/4	S2													
NSEG24A	A5I	050	00	0T	20	060	020	SM	07.5YR5/4	S2													
NSEG25A	A40		00	00	00	000	100	CL	10.0YP 7														
NSEG26A	A5Y	050	00	0T	05	065	010	SM-SP		S2													
NSEG27A	A5I	100	00	05	55	035	010	GP-GM		S2	S5												
NSEG28A	A5Y	030	00	00	01	079	020	SC-SM	10.0YR4/4	S2													
NSEG29A	A40		00	00	00	00T	100	CL	10.0YR4/4														
NSEG30A	A5I	055	00	00	15	060	020	SM	10.0YR6/3	S2													
NSEG31A	A5I	070	0T	05	40	045	015	SM	10.0YR4/4	S2	S5												
NSEG32A	A5Y	100	00	10	05	040	010	SM	10.0YR5/4	S2													
NSEG33A	A5I	200	0T	05	35	055	010	SM-SP	10.0YR5/4	S2													
NSEG34A	A5I	070	00	01	20	060	020	SM	10.0YR5/4	S2													
NSEG35A	A40	040	00	0T	65	035	00C	GP		S2													
NSEG36A	A5I	060	00	0T	20	065	015	SM	07.5YR5/6	S2													
NSEG37A	A5Y	100	0T	05	20	075	005	SP-SM	07.5YR5/4	S2	S5												
NSEG38A	A5I	025	00	0T	25	055	020	SM-SC	10.0YR4/4	S2													
NSEG39A	A5I	045	00	0T	30	065	005	SP-SM	07.5YR5/4	S2													
NSEG40A	A5Y	045	00	00	10	090	010	SP-SM	10.0YR5/4	S2													
NSEG41A	A5Y	050	00	00	35	050	015	SM	07.5YR4/4	S2													
NSEG42A	A5I	070	00	0T	20	070	010	SP-SM	10.0YR5/4	S2													
NSEG43A	I4																						
NSEG44A	A5S		00	00	0T	100	00T	SP	10.0YR5/4	S2													
NSEG45A	A5I	025	00	00	15	060	025	SC	07.5YR5/4	S2													
NSEG46A	A5Y	030	00	00	05	040	055	CL	10.0YR5/4	S2													
NSEG47A	A5I	040	00	0T	30	045	025	SC	07.5YR5/4	S2													
NSEG48A	S5																						
NSEG49A	A5Y	040	00	00	10	060	030	SM	10.0YR5/4	S2													
NSEG50A	A35	020	00	00	05	045	050	SF	10.0YR5/4	S2													
NSEG51A	A5I	060	00	0T	40	055	005	SF-SM	10.0YR5/4	S2													
NSEG52A	A5I	050	00	0T	10	075	015	SM-SP	10.0YR4/4	S2													
NSEG53A	A5Y	040	00	00	10	075	015	SM	10.0YR4/4	S2													
NSEG54A	A5Y	025	00	00	05	065	030	SM-SP	10.0YR5/4	S2													
NSEG55A	A5I	060	00	0T	10	075	015	SM	10.0YR6/4	S2													
NSEG56A	A40	010	00	00	05	085	010	SM-SP	10.0YR4/4	S2													
NSEG57A	A5Y	030	00	00	05	075	020	SM	10.0YR5/4	S2													
NSEG58A	A40		00	00	00	000	100	CL	10.0YR5/4														
NSEG59A	A5I	060	00	05	15	080	020	SM	10.0YR5/4	S2													
NSEG60A	A5Y	010	00	00	0T	060	040	SM	10.0YR5/4	S2													
NSEG61A	A5I	040	00	0T	30	060	010	SP-SM	07.5YR6/4	S2	S5												
NSEG62A	A5I	040	00	0T	20	070	010	SM-SP	10.0YR6/1	S2													
NSEG63A	A5I	060	00	05	10	050	035	SM	10.0YR5/4	S2													
NSEG64A	A5I	030	00	0T	15	065	020	SM	10.0YR5/4	S2													
NSEG65A	A5I	170	00	05	60	020	020	SM		S2													
NSEG66A	A5I	050	00	0T	10	075	015	SM	10.0YR4/1	S2													
NSEG67A	A5I	040	00	0T	10	070	020	SP	10.0YR4/4	S2													
NSEG68A	A50	035	00	00	25	065	010	SM-SP		S2													
NSEG69A	A5Y	010	00	00	0T	040	020	SM	07.5YR5/4	S2													
NSEG70A	A5I	040	00	0T	10	070	020	SP	10.0YR5/4	S2													
NSEG71A	A5I	150	0T	05	65	030	001	SP-SM		S2													
NSEG72A	A40	030	00	00	60	040	00T	GP		S2													
NSEG73A	A40	030	00	00	55	045	00T	GP		S2													
NSEG74A	A40		00	00	00	00T	100	CL	10.0YR5/4														
NSEG75A	A40		00	00	0T	035	065	CL	10.0YR5/4														
NSEG76A	A5I	050	00	30	05	040	015	SM	10.0YR5/4	S2													
NSEG77A	A35	020	00	00	0T	100	00T	SP	10.0YR4/3	S2													

SOIL DESCRIPTION — TERRAIN

*PHYSICAL PROPERTIES :
6 - GRAIN SHAPE
7 - MOISTURE CONTENT
8 - PLASTICITY FINES
9 - CONSISTENCY
10 - STRUCTURE
11 - CEMENTATION-INDURATION
12 - DEPTH TO CEMENTED LAYER(CM)
13 - WEATHERING OF CLASTS
14 - SOIL PROFILE DEVELOPMENT
15 - CALICHE DEVELOPMENT

GEOLOGIC STATION DATA
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
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TABLE 1-1

UGRO NATIONAL, INC.

SECTION 2.0

GROUND-WATER DATA

EXPLANATIONS OF GROUND-WATER DATA

Existing ground-water data were collected from all available sources. These data were updated where possible from measurements taken during Fugro field operations, and all data are shown on Table 2-1. Locations of water wells and boreholes in which water-level measurements were available are shown in Drawing 1. Well numbers listed in Column 1 (Table 2-1) refer to well locations in Drawing 1. Actual well numbers giving location according to the Bureau of Land Management Land Survey System are shown in Column 2.

Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W1	12S/17W-34add	4485 (1367)	175 (53)	80 (24)	1911	4405 (1343)	1
W2	12S/17W-34dba	4450 (1356)	175 (53)	120 (37)	1946	4330 (1320)	4
W3	13S/16W-6CC	4660 (1420)	252 (77)	210 (64)	-	4450 (1356)	1
W4	13S/16W-6CCC	4650 (1417)	252 (77)	100 (31)	1962	4550 (1387)	4
W5	13S/18W-35C	4760 (1451)	140 (43)	Flowing	1949	4765 (1452)	1
W6	14S/18W-3ddc	4739 (1444)	120 (37)	Flowing	1949	4745 (1446)	1
W7	15S/18W-11cdb	5160 (1573)	485 (148)	Dry	1962 -		4
W8	15S/18W-17acc	4755 (1449)	72 (22)	35 (11)	1953	4720 (1439)	4
W9	16S/18W-3bac	4978 (1517)	100 (31)	37 (11)	1958	4941 (1506)	4
W10	16S/18W-16dad	4823 (1470)	-	Flowing	1964	4823 (1470)	1
W11	16S/18W-22a	4850 (1478)	-	Flowing	1911	1850 (1478)	2
W12	16S/18W-22cab	4810 (1466)	-	Flowing	1964	4810 (1466)	1
W13	16S/18W-27a	4839 (1475)	-	Flowing	1911	4839 (1475)	2
W14	18S/18W-1b	5060 (1542)	-	100-200 (31-62)	-	4960-4860 (1512-1481)	2
W15	18S/18W-8a	4853 (1479)	-	Flowing	-	4853 (1479)	1,2
W16	18S/18W-16b	4875 (1486)	-	Flowing	-	4875 (1436)	2
W17	19S/18W-6a	5000 (1524)	-	50-150 (15-46)	-	4950-4850 (1509-1478)	2

* Salt Lake Baseline and Meridian

** References:

1. Hood and Rush (1966)
2. Snyder (1963)
3. Utah State Department of Natural Resources (1978)
4. Utah State Engineers Office (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA VERIFICATION SITE SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
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TABLE 2-1 1 OF 3

UGRO NATIONAL, INC.

AFV-18

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W18	19S/19W-14acd	4923 (1500)	177 (54)	11 (4)	1961	4912 (1497)	4
W19	19S/19W-14dcc	4928 (1502)	59 (18)	59 (18)	1966	-	4
W20	19S/19W-14dcd	4928 (1502)	65 (20)	3 (1)	1957	4925 (1501)	4
W21	19S/19W-23bdc	4935 (1504)	110 (34)	13 (4)	1965	4922 (1500)	4
W22	19S/19W-26aba	4948 (1508)	-	17 (5)	1978	4931 (1503)	3
W23	19S/19W-26acd	4947 (1508)	112 (34)	112 (34)	1960	-	1
W24	19S/19W-26bdd	4947 (1508)	100 (31)	12 (4)	1977	4935 (1504)	3
W25	19S/19W-34acd	4968 (1514)	98 (30)	15 (5)	1964	4953 (1510)	4
W26	19S/19W-34adb	4958 (1511)	110 (34)	8 (2)	1960	4950 (1509)	4
W27	19S/19W-34dac	4960 (1512)	82 (25)	6 (2)	1960	4954 (1510)	4
W28	19S/19W-35bdd	4960 (1512)	45 (14)	9 (3)	1955	4951 (1509)	4
W29	19S/19W-35dcd	4975 (1516)	-	11 (3)	1965	4964 (1513)	1
W30	20S/17W-9C	5490 (1673)	760 (232)	600 (183)	-	4890 (1490)	1
W31	20S/19W-1b	4990 (1521)	375 (114)	0	-	4990 (1521)	2
W32	20S/19W-16cc	4985 (1519)	-	12 (4)	1951	4973 (1516)	1
W33	20S/19W-15cba	5010 (1527)	60 (18)	18 (5)	1960	4992 (1522)	4
W34	20S/19W-16bdc	5025 (1532)	40 (12)	15 (5)	1942	5010 (1527)	1

* Salt Lake Baseline and Meridian

** References:

1. Hood and Rush (1966)
2. Snyder (1963)
3. Utah State Department of Natural Resources (1978)
4. Utah State Engineers Office (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA VERIFICATION SITE SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1
2 OF 3

UGRO NATIONAL, INC.

AFV-18

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W35	20S/19W-21acc	5030 (1533)	-	32 (10)	1978	4998 (1523)	3
W36	20S/19W-21b	5020 (1530)	-	32 (10)	1978	4988 (1520)	2
W37	20S/19W-22bcc	5025 (1532	64 (20)	28 (9)	1975	4997 (1523)	4
W38	21S/17W-8dcc	5070 (1545)	316 (96)	225 (69)	1935	4845 (1477)	1
W39	21S/18W-10cdd	5035 (1535)	66 (20)	65 (20)	-	4970 (1515)	1
W40	21S/18W-12ccd	5050 (1539)	205 (62)	105 (32)	1968	4945 (1507)	1
W41	21S/18W-17ad	5040 (1536)	166 (51)	52 (16)	1958	4988 (1520)	1
W42	21S/19W-14	5080 (1548)	-	50-100 (15-31)	-	5030-4980 (1533-1518)	2
W43	21S/19W-31dcc	5220 (1591)	175 (53)	24 (7)	-	5196 (1584)	1
W44	22S/16W-7ccc	5250 (1600)	550 (168)	D	1935 -		1
W45	22S/16W-8	5390 (1643)	-	D	-	-	2
W46	22S/16W-19b	5305 (1617)	680 (207)	D	-	-	2
W47	22S/16W-20	5340 (1628)	100 (31)	D	-	-	1
W48	24S/18W-20bcc	5777 (1761)	360 (110)	D	1950	-	1
W49	24S/18W-27a	5870 (1789)	500 (152)	D	-	-	2
W50	24S/18W-29b	5850 (1783)	936 (285)	D	-	-	2
W51	13N/70E19b	5160 (1573)	82 (25)	25 (8)	1947	5125 (1562)	1

* Salt Lake Baseline and Meridian

** References:

1. Hood and Rush (1966)
2. Snyder (1963)
3. Utah State Department of Natural Resources (1978)
4. Utah State Engineers Office (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA VERIFICATION SITE SHAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1 3 OF 3

FUGRO NATIONAL, INC.

AFV-18

SECTION 3.0

SEISMIC REFRACTION DATA

EXPLANATIONS OF SEISMIC REFRACTION DATA

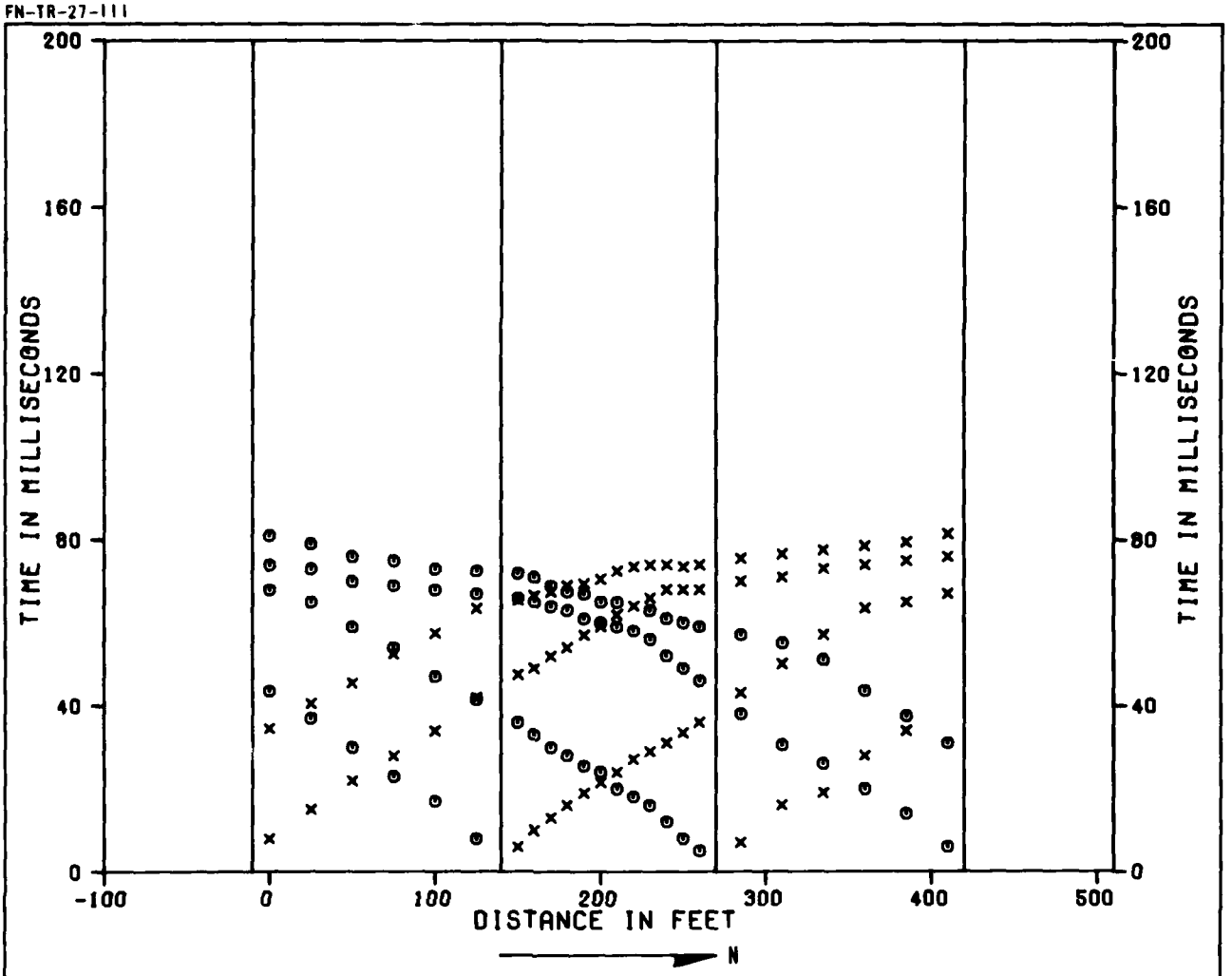
Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction of the geophone array from geophone 1 to geophone 24.

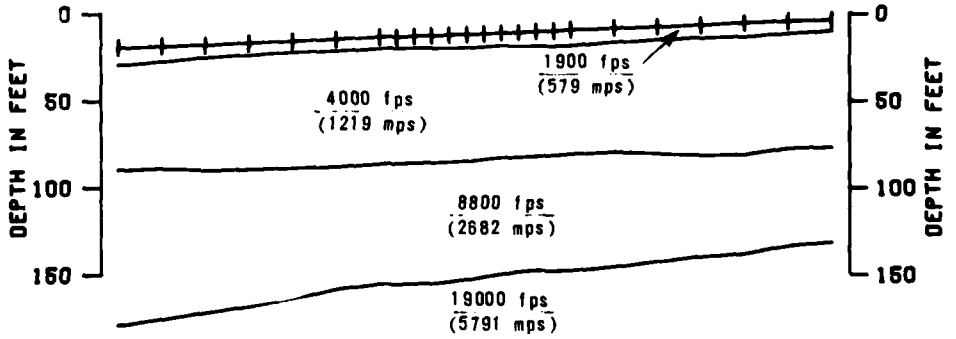
Travel Time Versus Distance Graph (Upper Half of Figure)

This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, ⊖, denotes travel times that were located to the left of shots.

Velocity Cross Section (Lower Half of Figure)

This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-1
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-1

FUGRO NATIONAL, INC.

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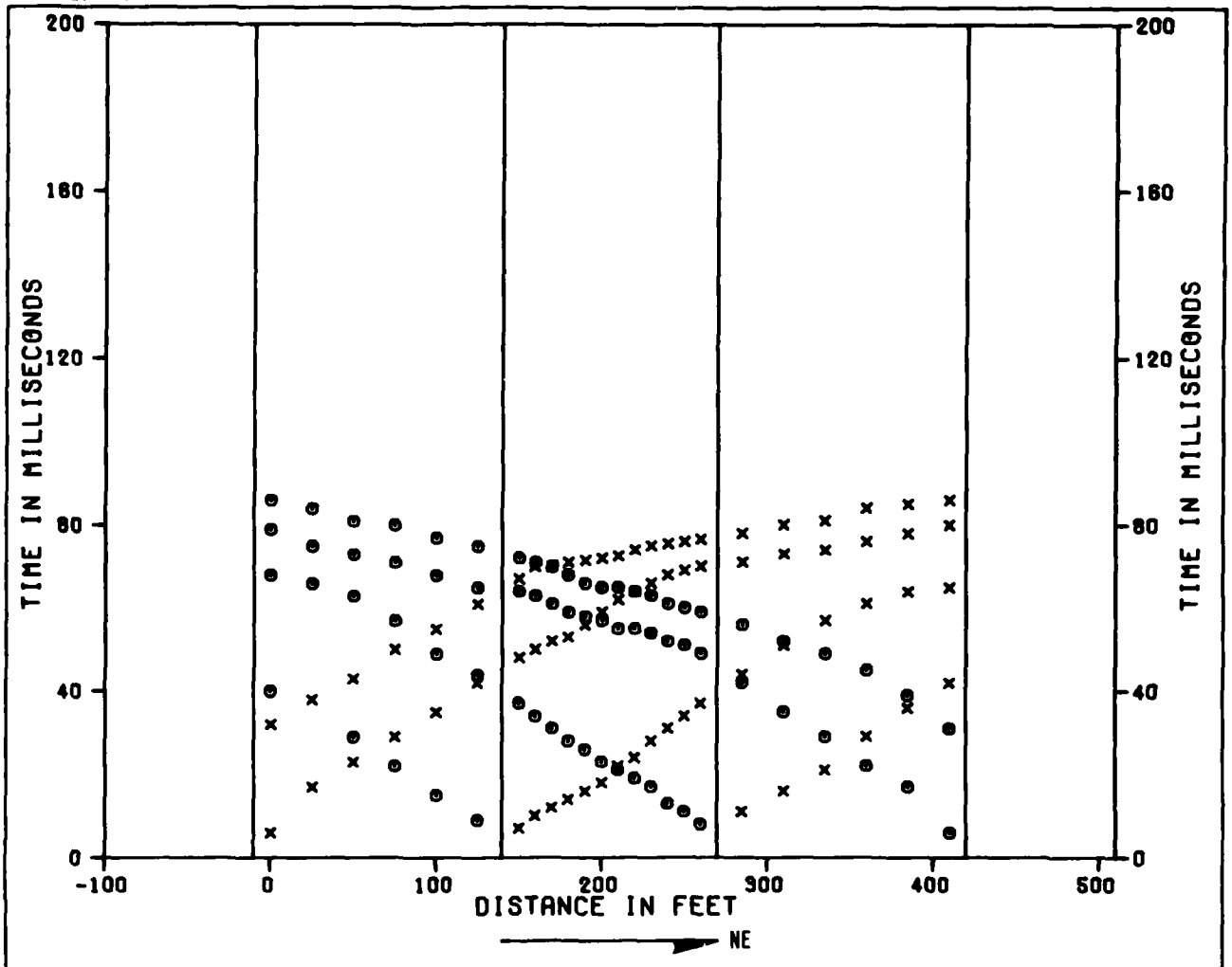

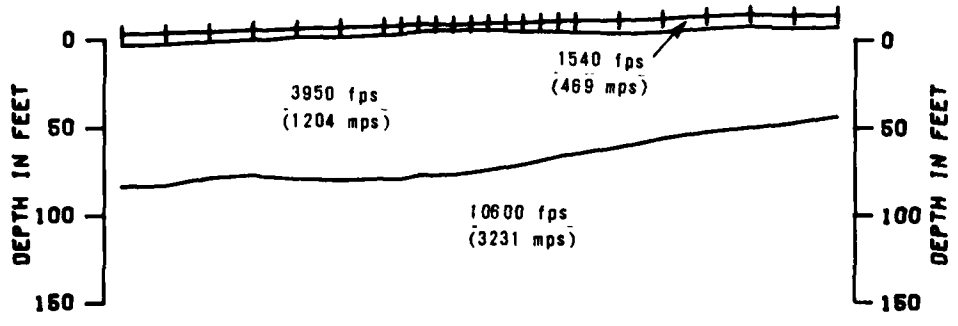

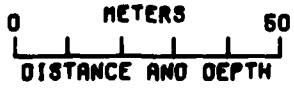

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-2
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICIATION SITE, SNAKE EAST CDP, UTAH

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DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-2

FUGRO NATIONAL, INC.

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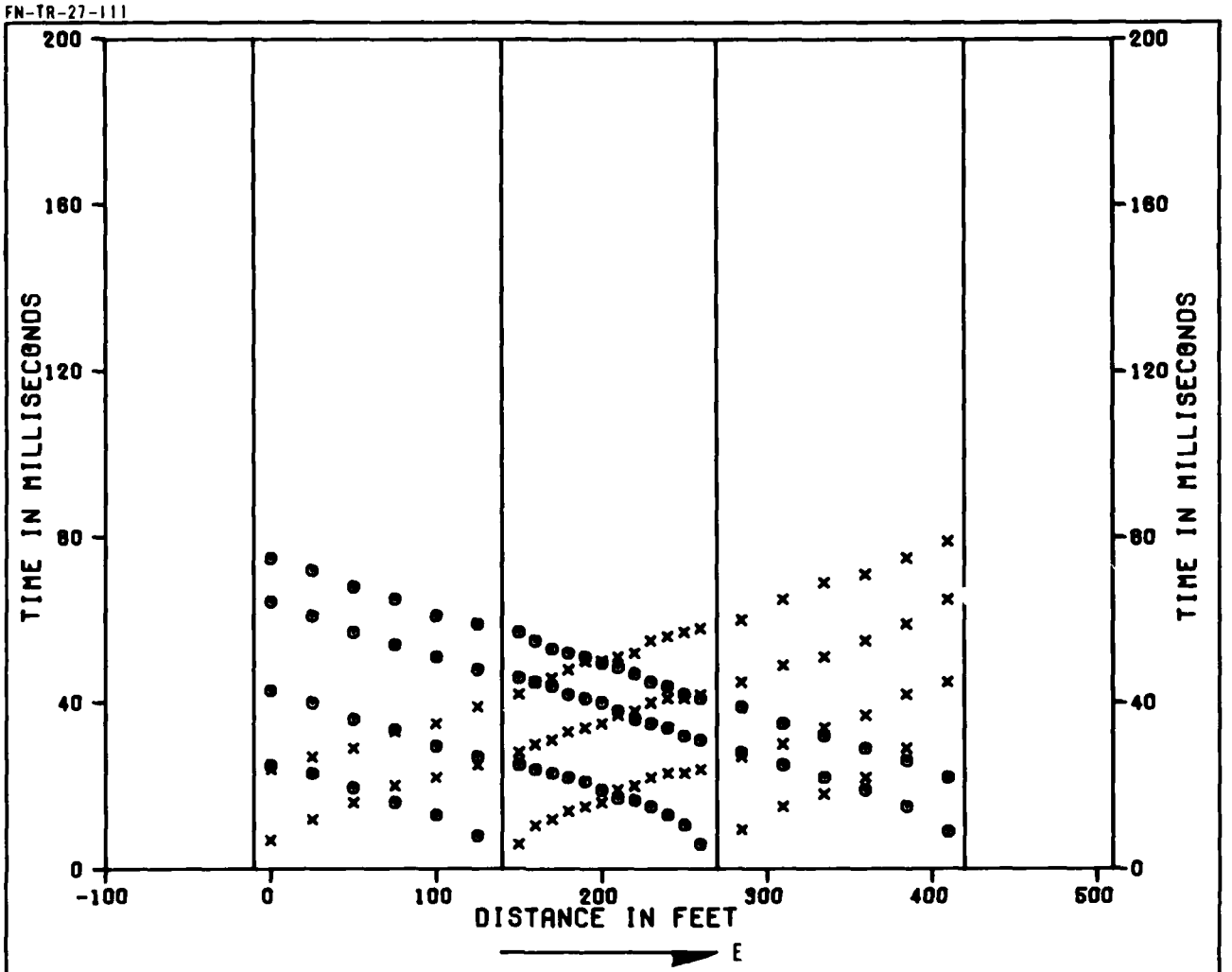

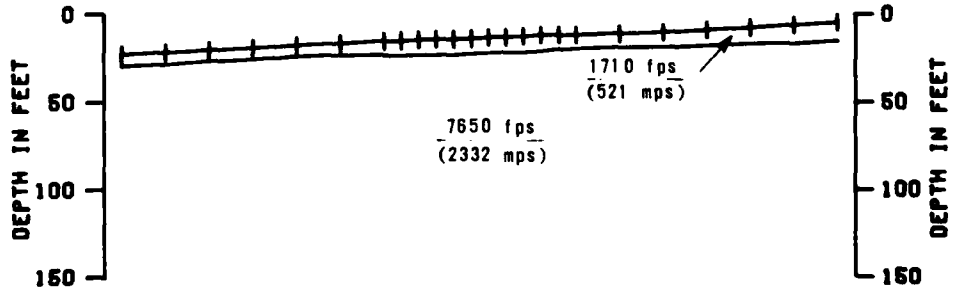

0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-3
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-3

FUGRO NATIONAL, INC.

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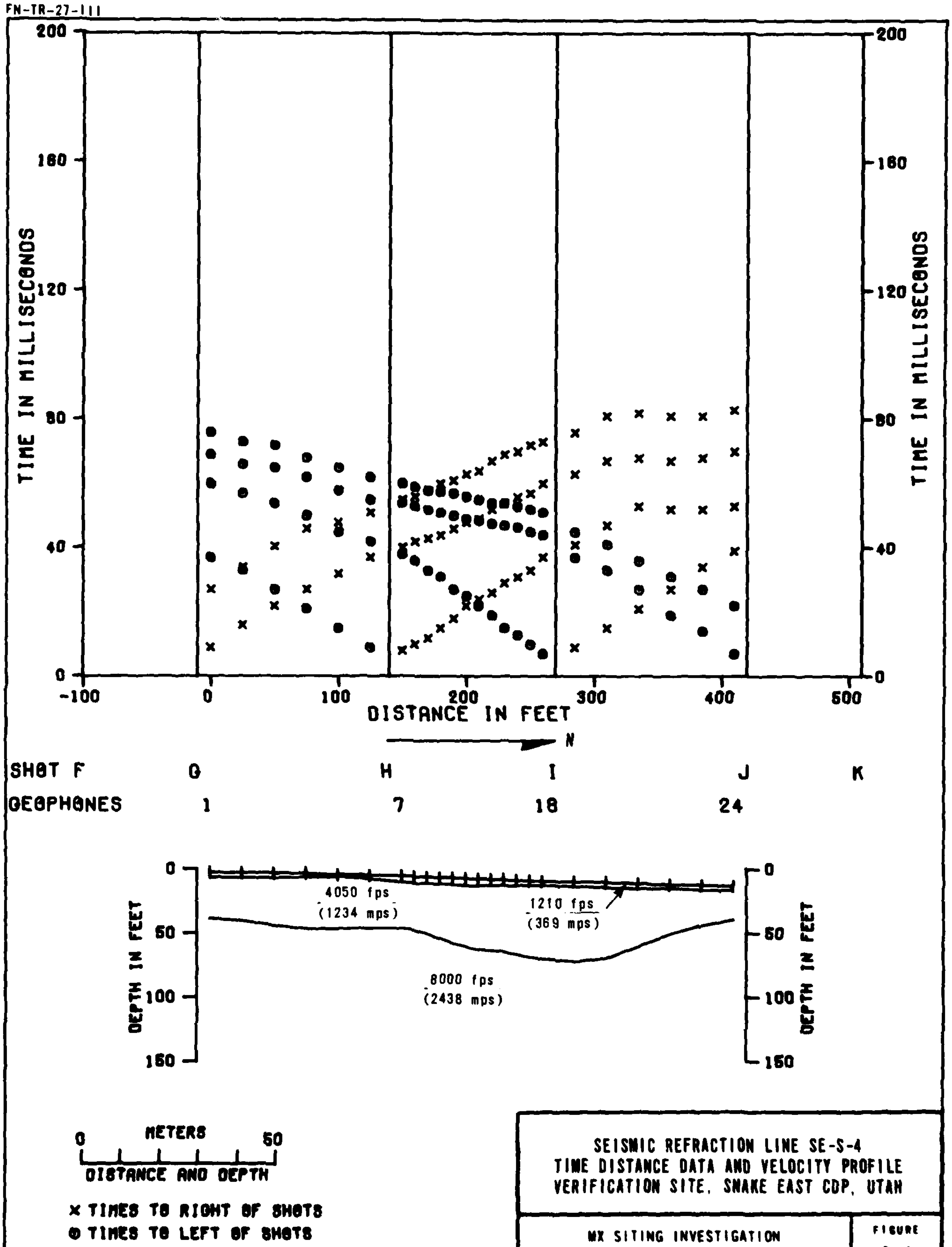

SEISMIC REFRACTION LINE SE-S-4
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-4

FUGRO NATIONAL, INC.

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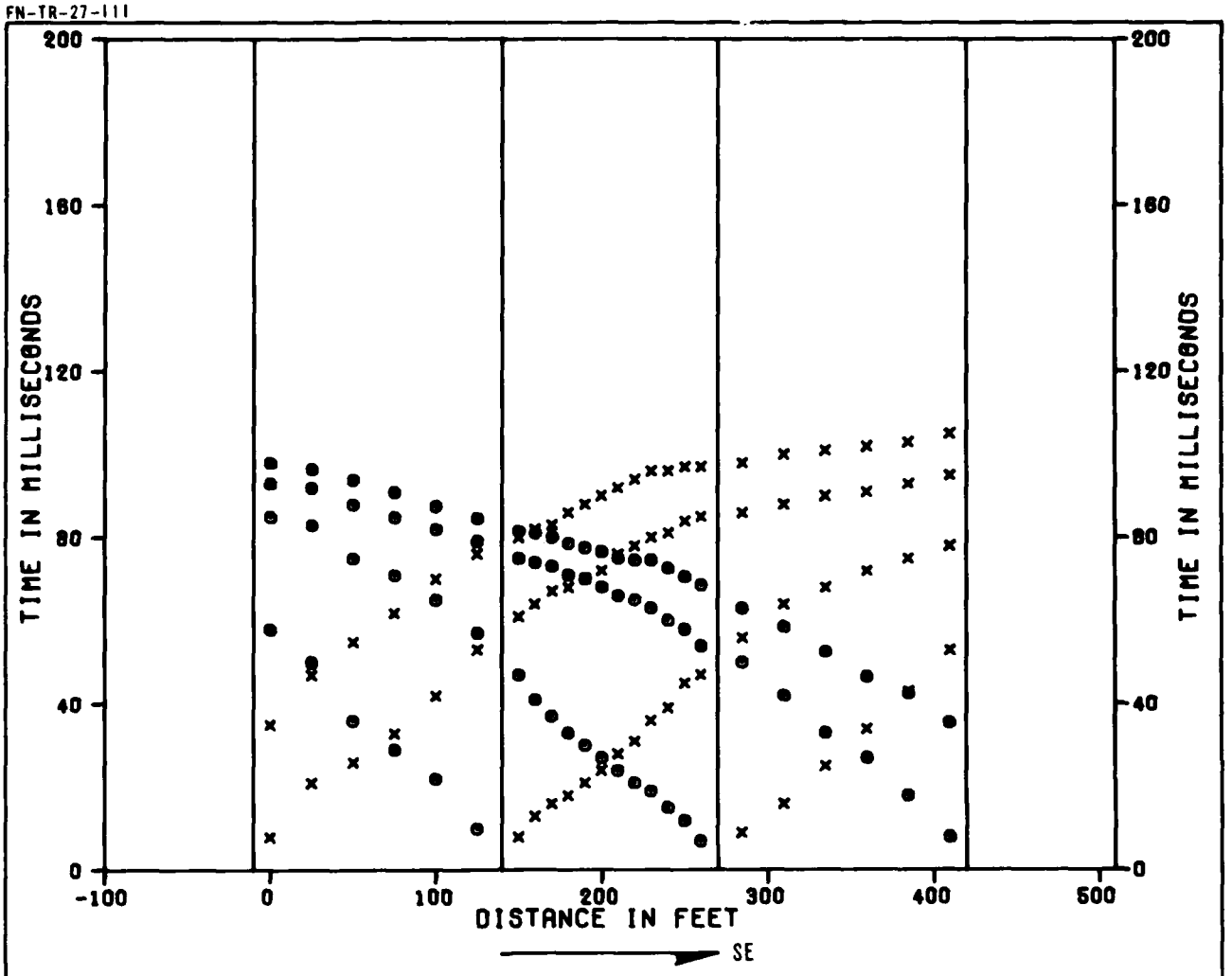

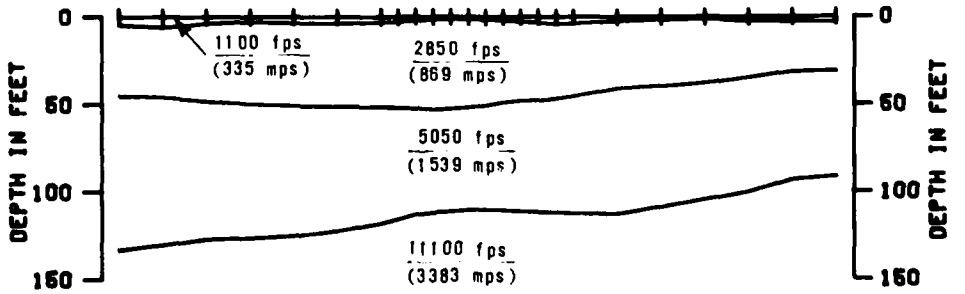

0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-5
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-5

FUGRO NATIONAL, INC.

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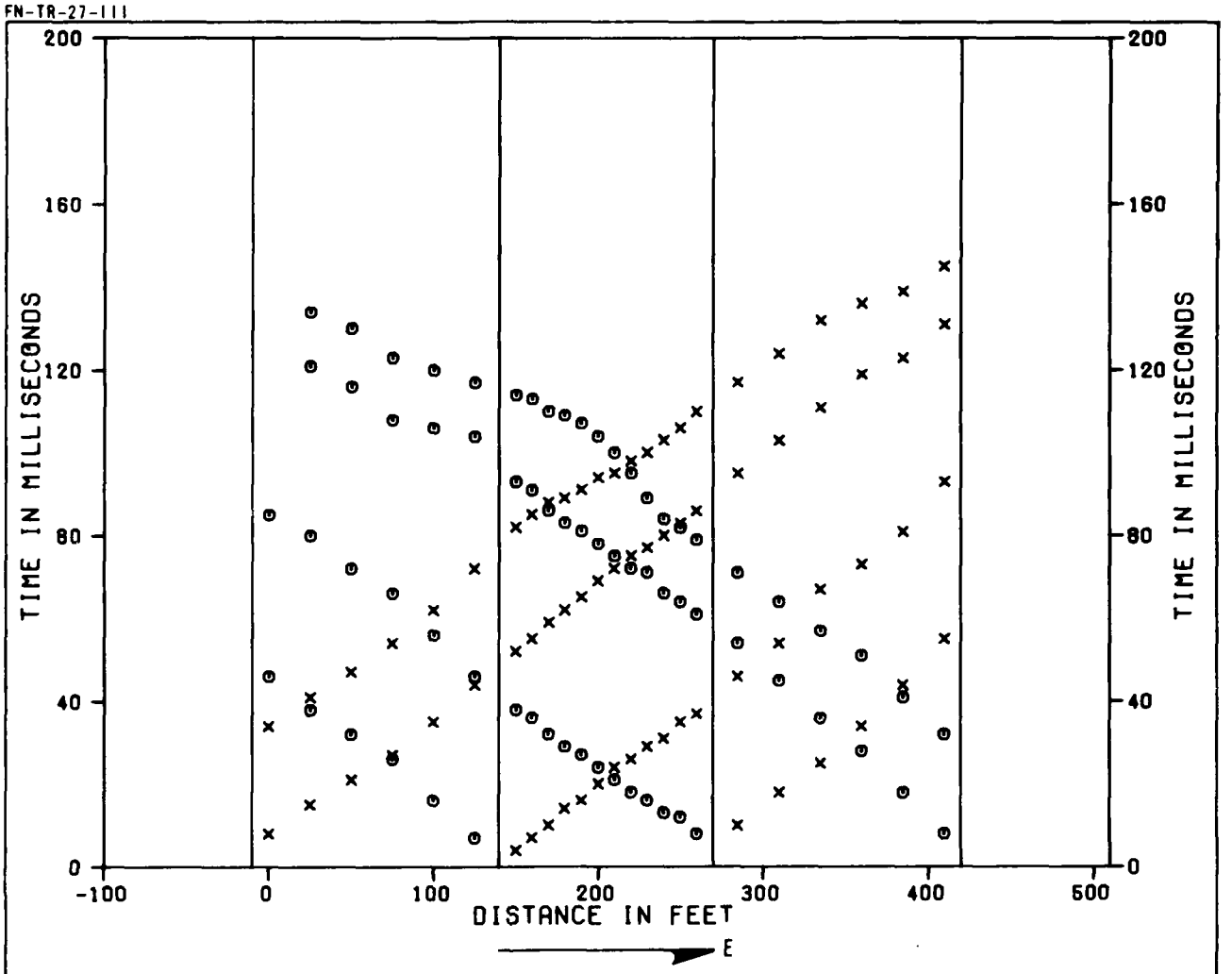

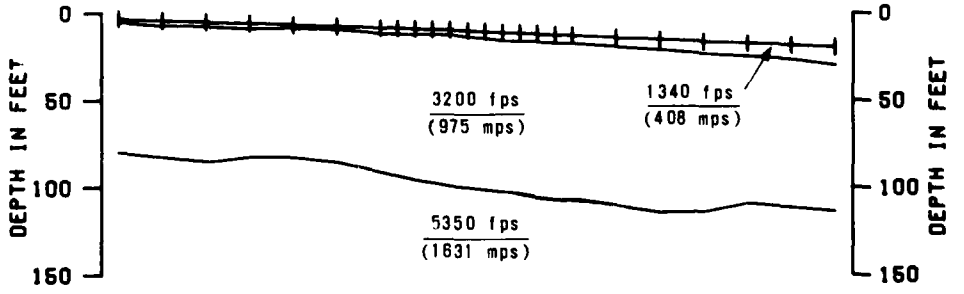

0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-6
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-6

FUGRO NATIONAL, INC.

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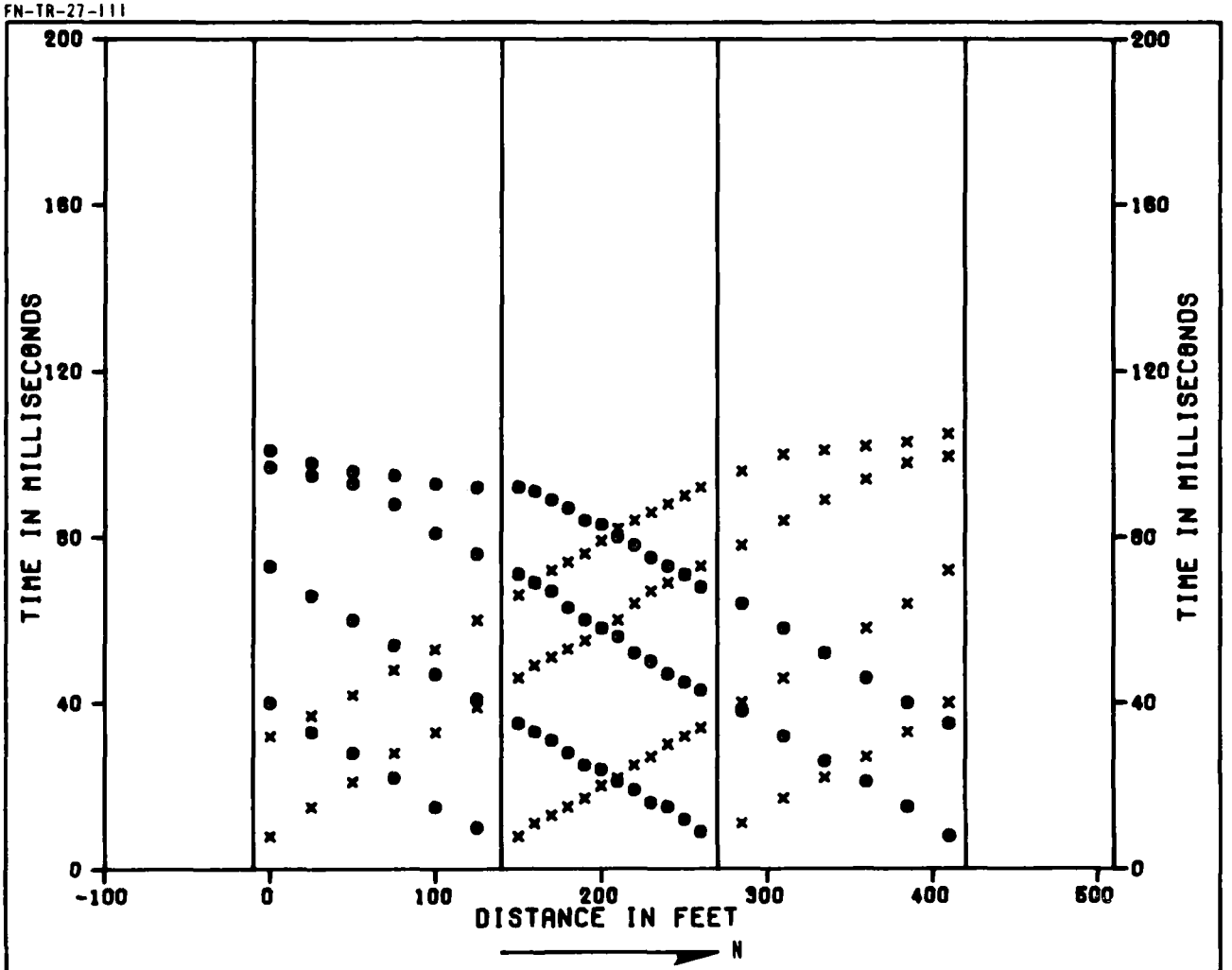

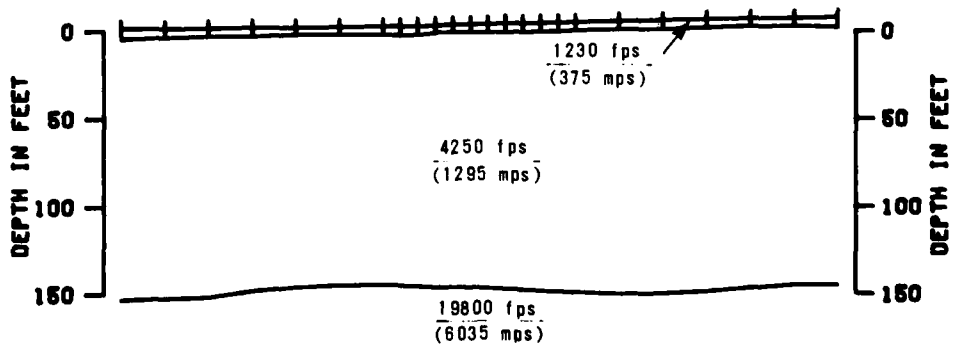

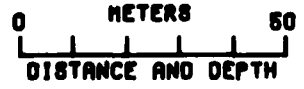

× TIMES TO RIGHT OF SHOTS
⊕ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-7
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-7

FUGRO NATIONAL, INC.

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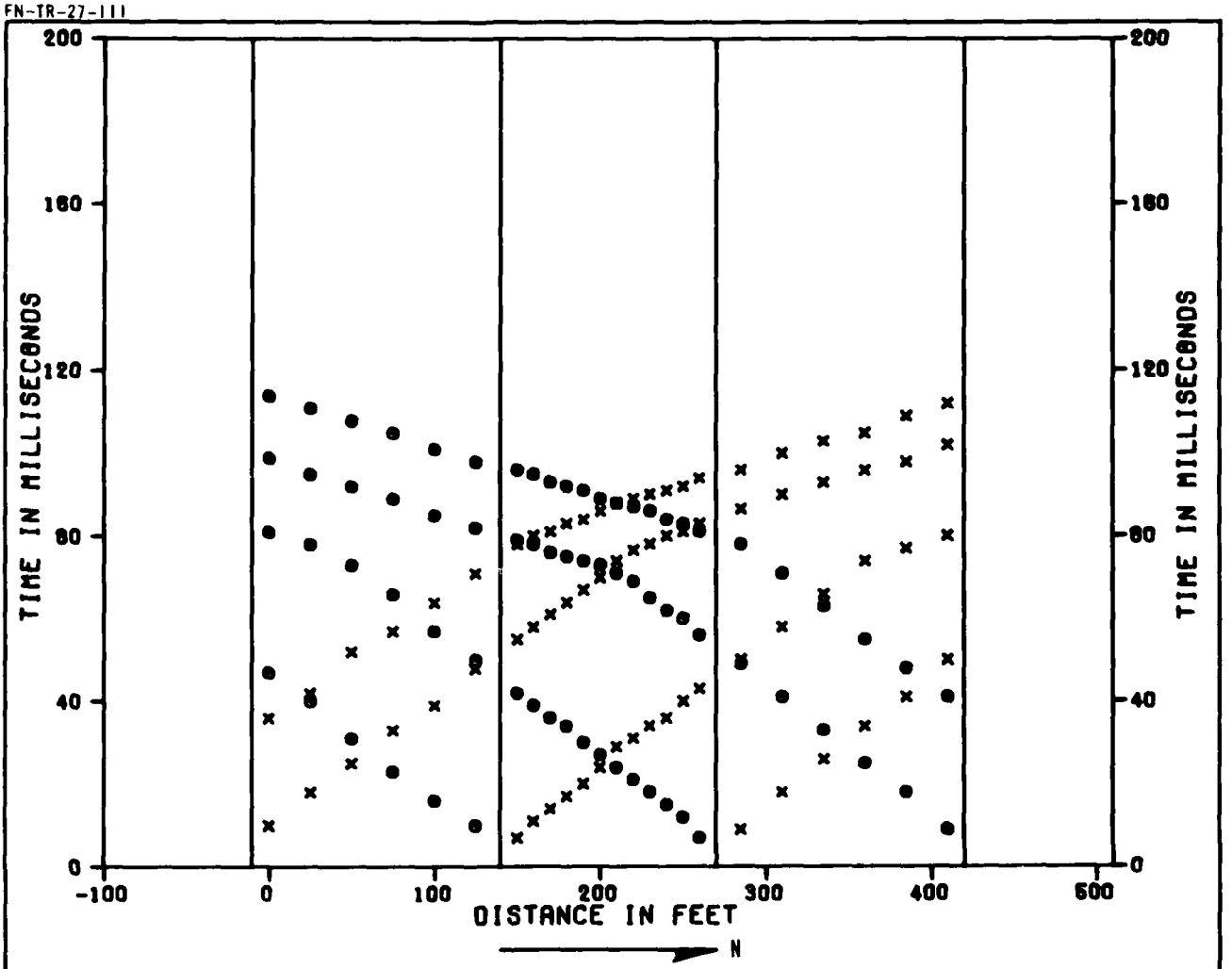

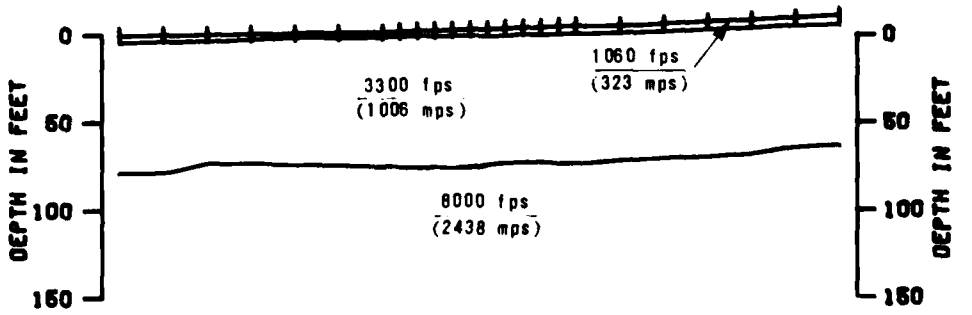

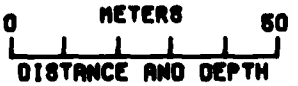

× TIMES TO RIGHT OF SHOTS
○ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-8
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-8

FUGRO NATIONAL, INC.

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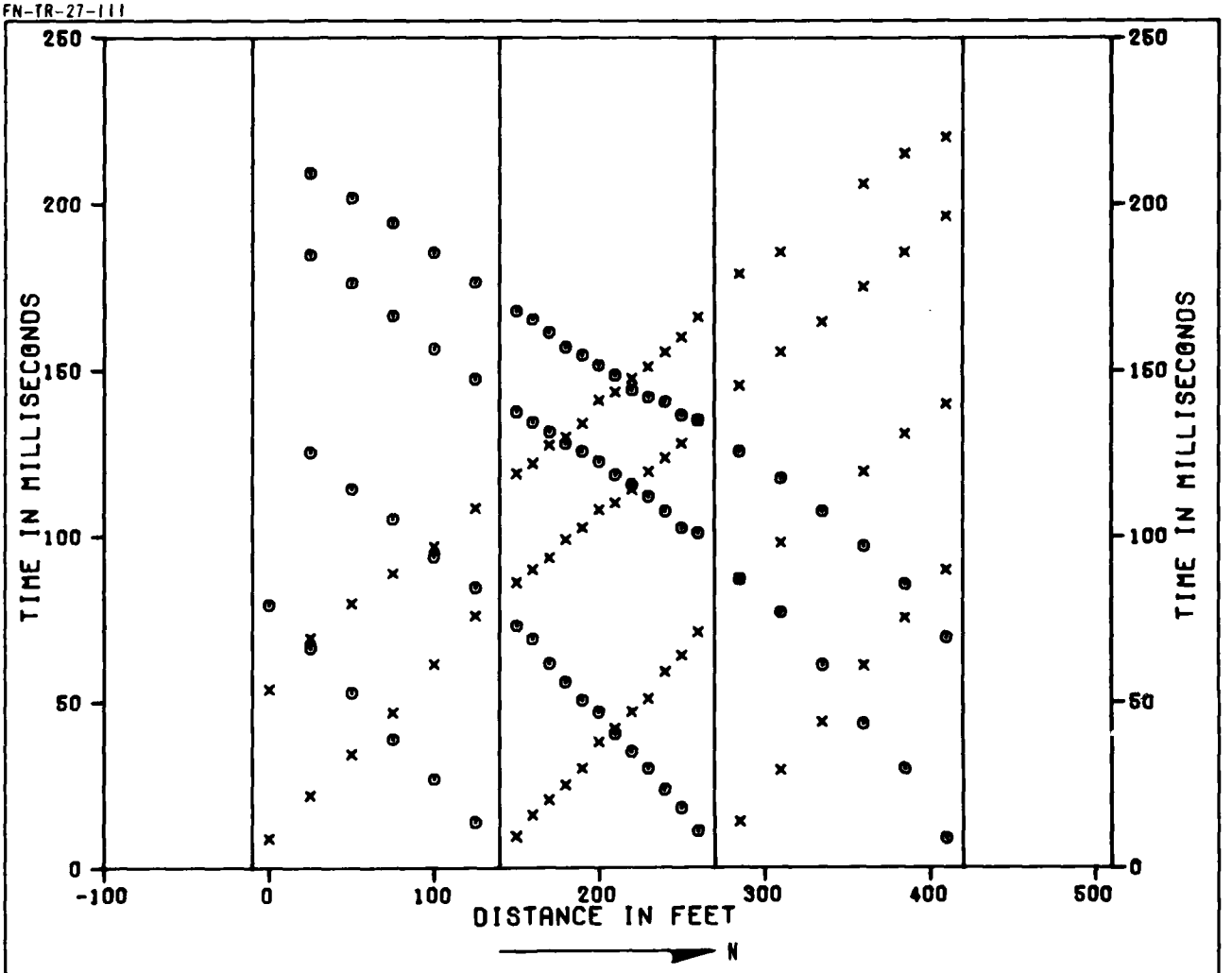

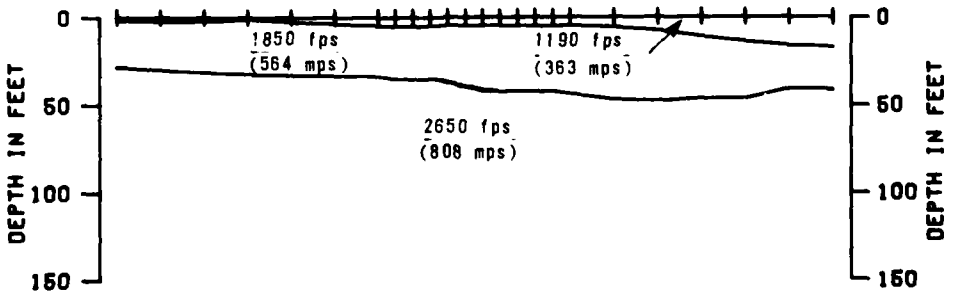

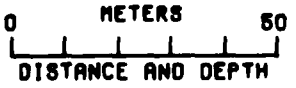

× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-9
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-9

FUGRO NATIONAL, INC.

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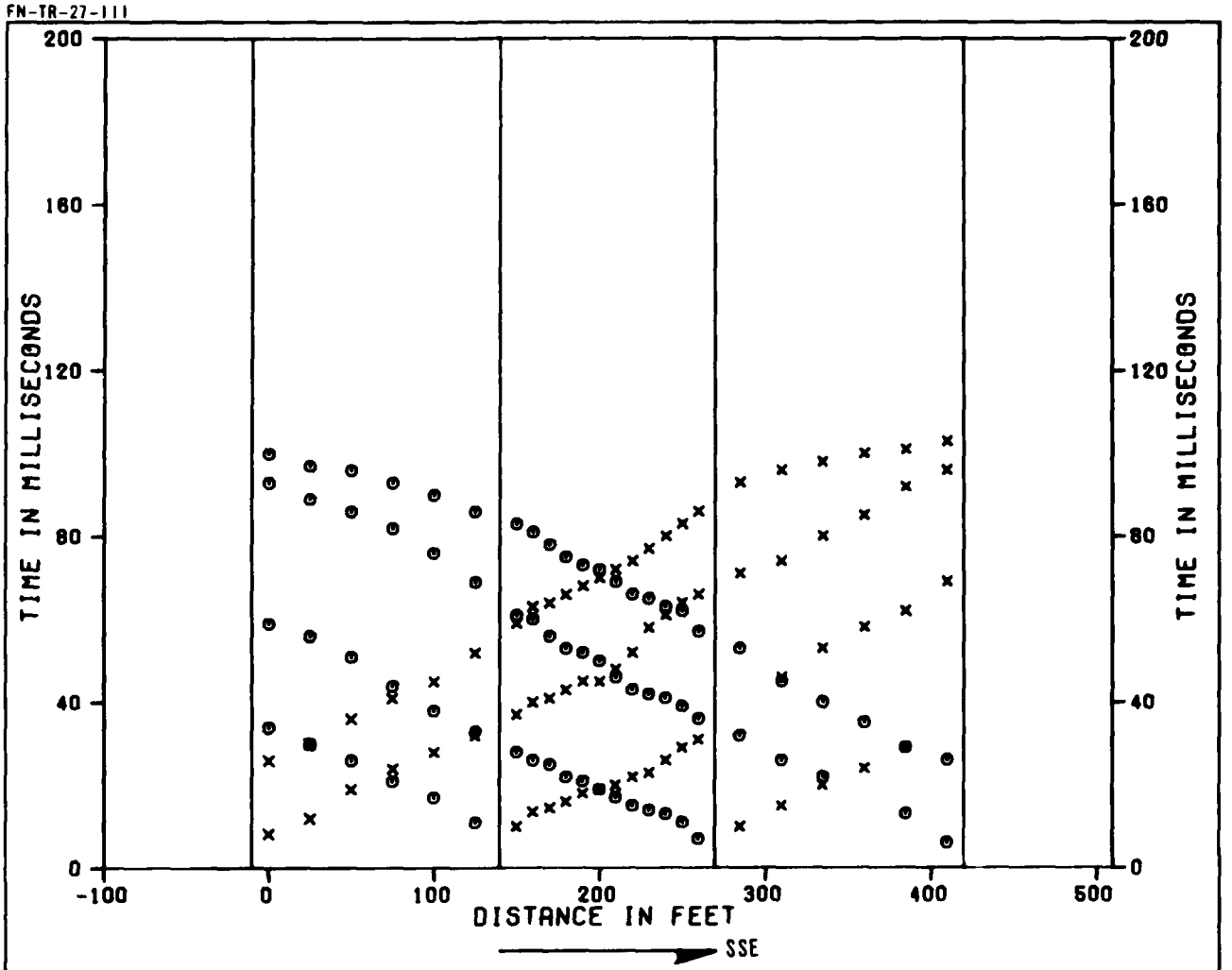

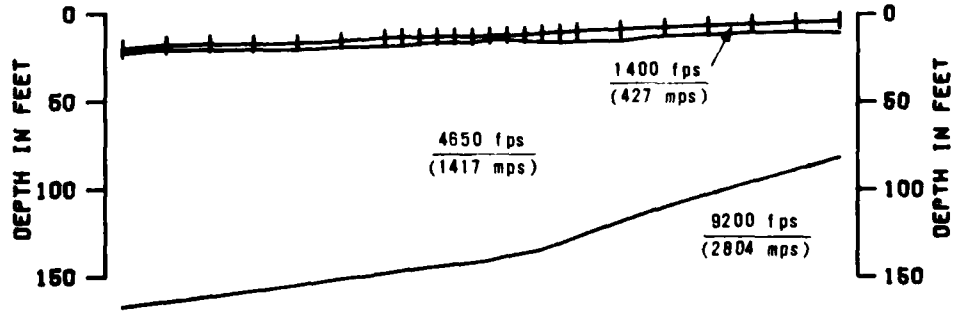

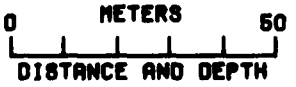

× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-10
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-10

FUGRO NATIONAL, INC.

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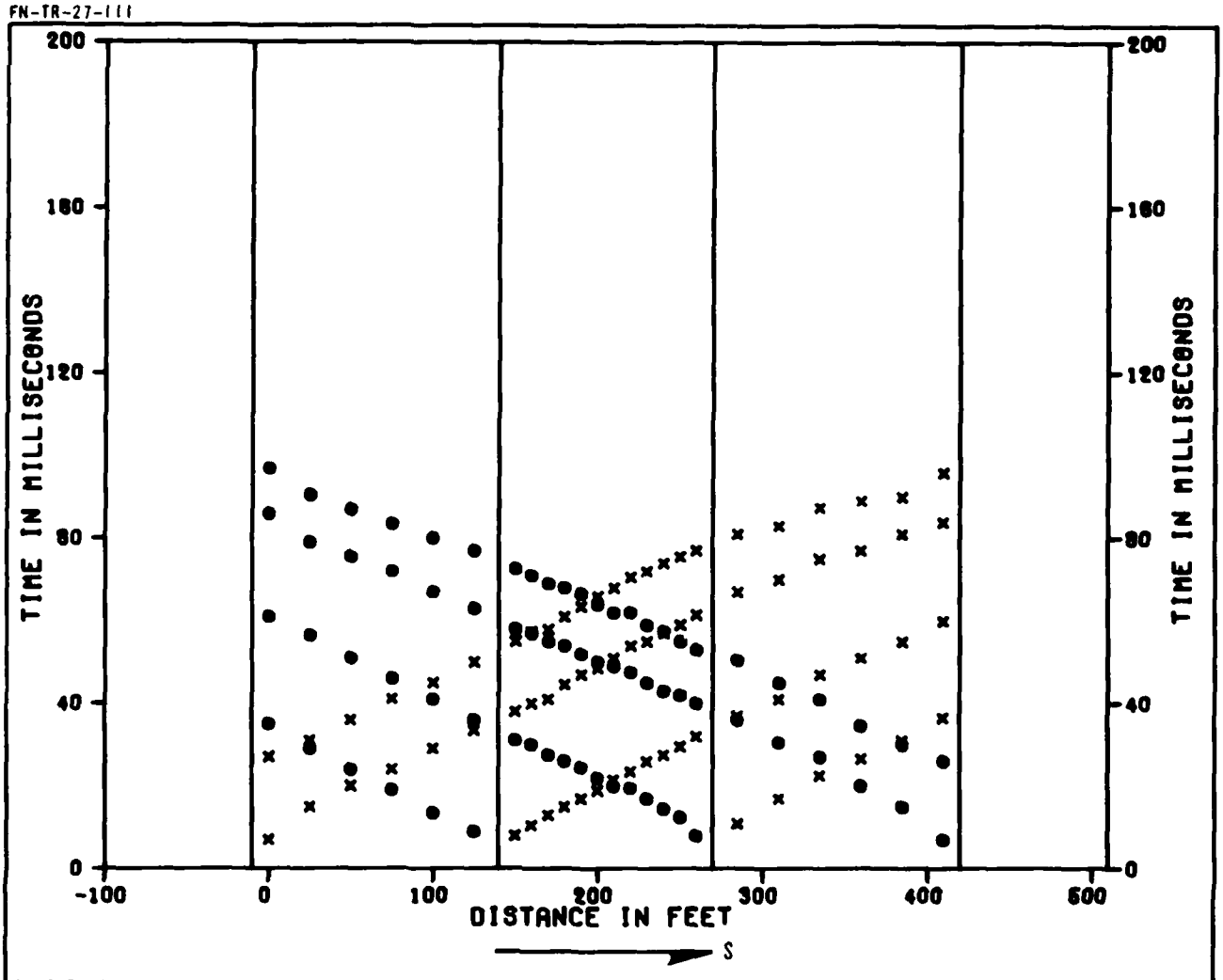

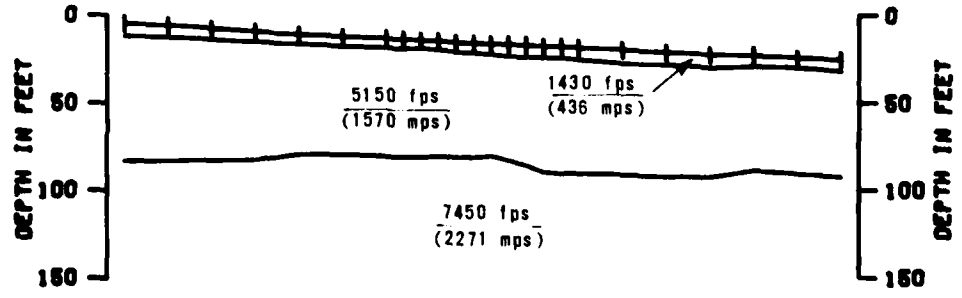

0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-11
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-11

FUGRO NATIONAL, INC.

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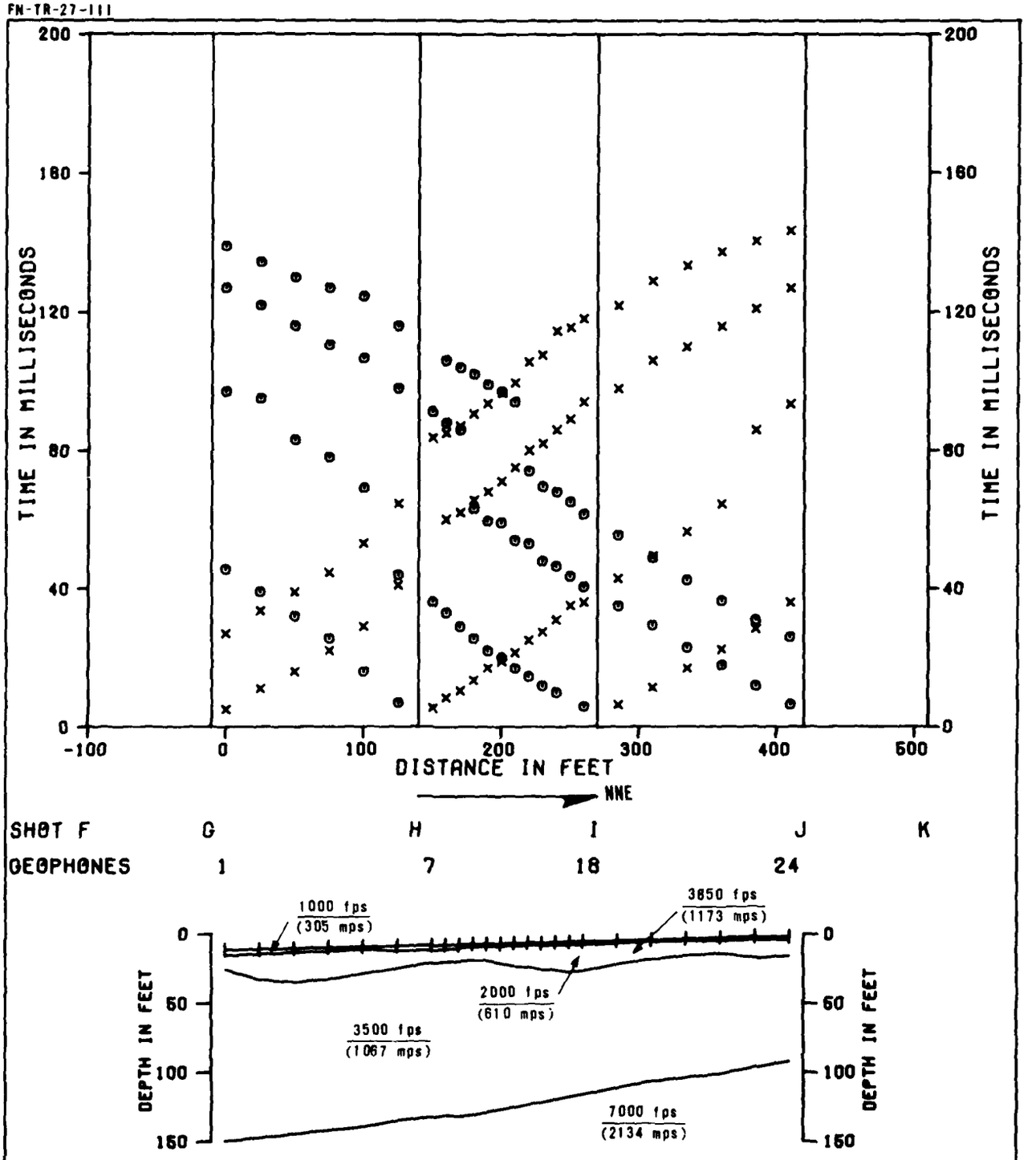

0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-12
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-12

WOODWARD-CLYDE CONSULTANTS

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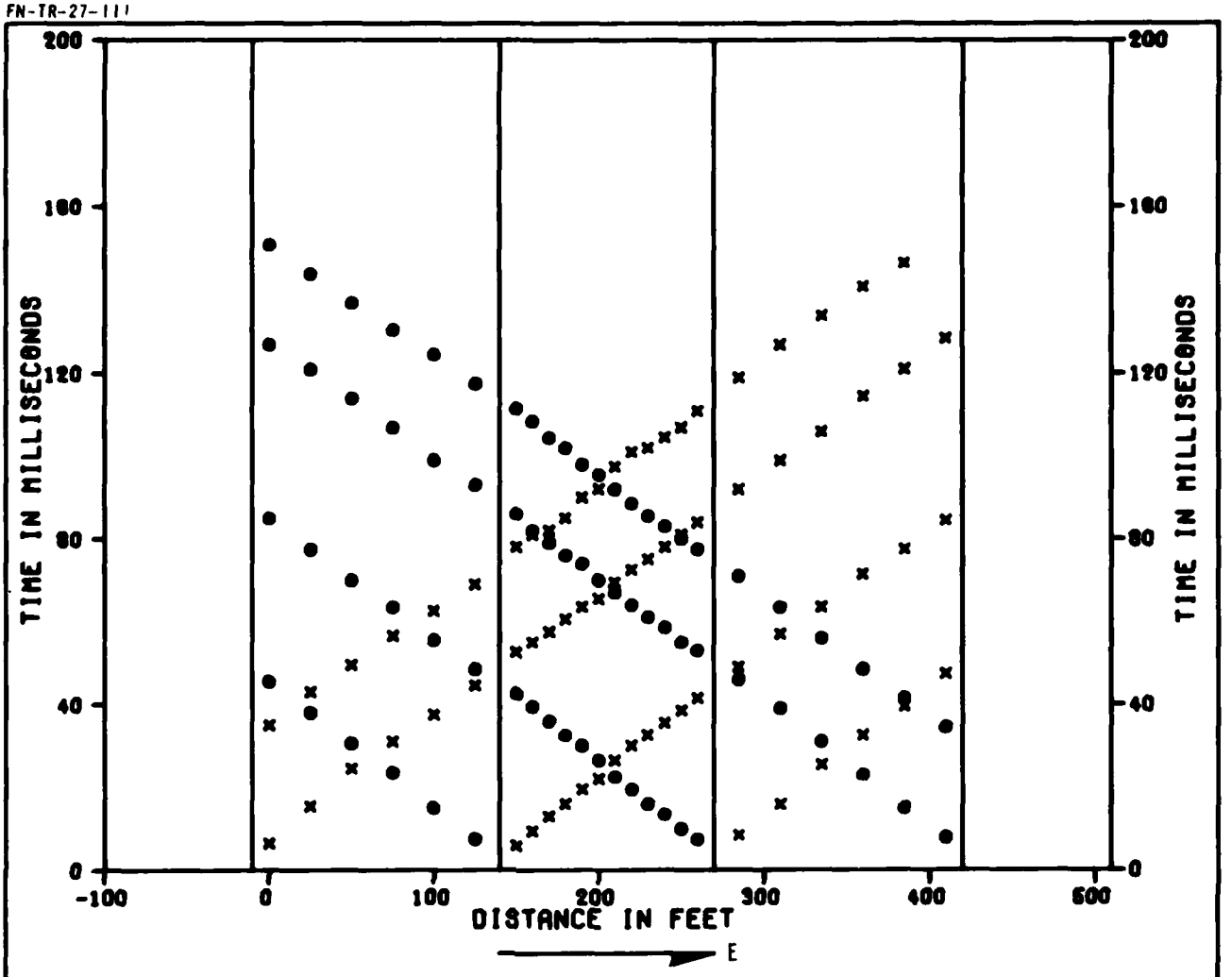

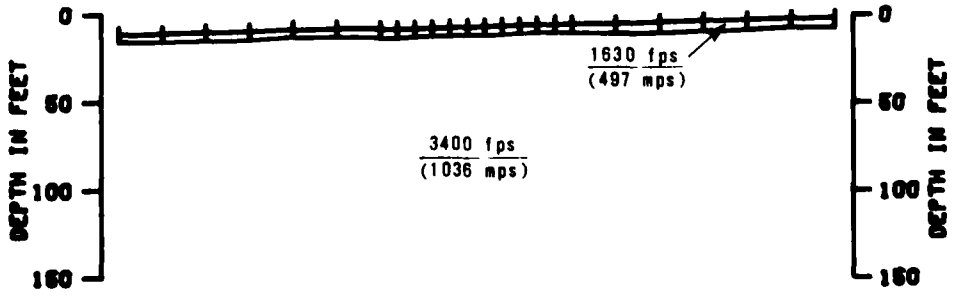

0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-13
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-13

FUGRO NATIONAL, INC.

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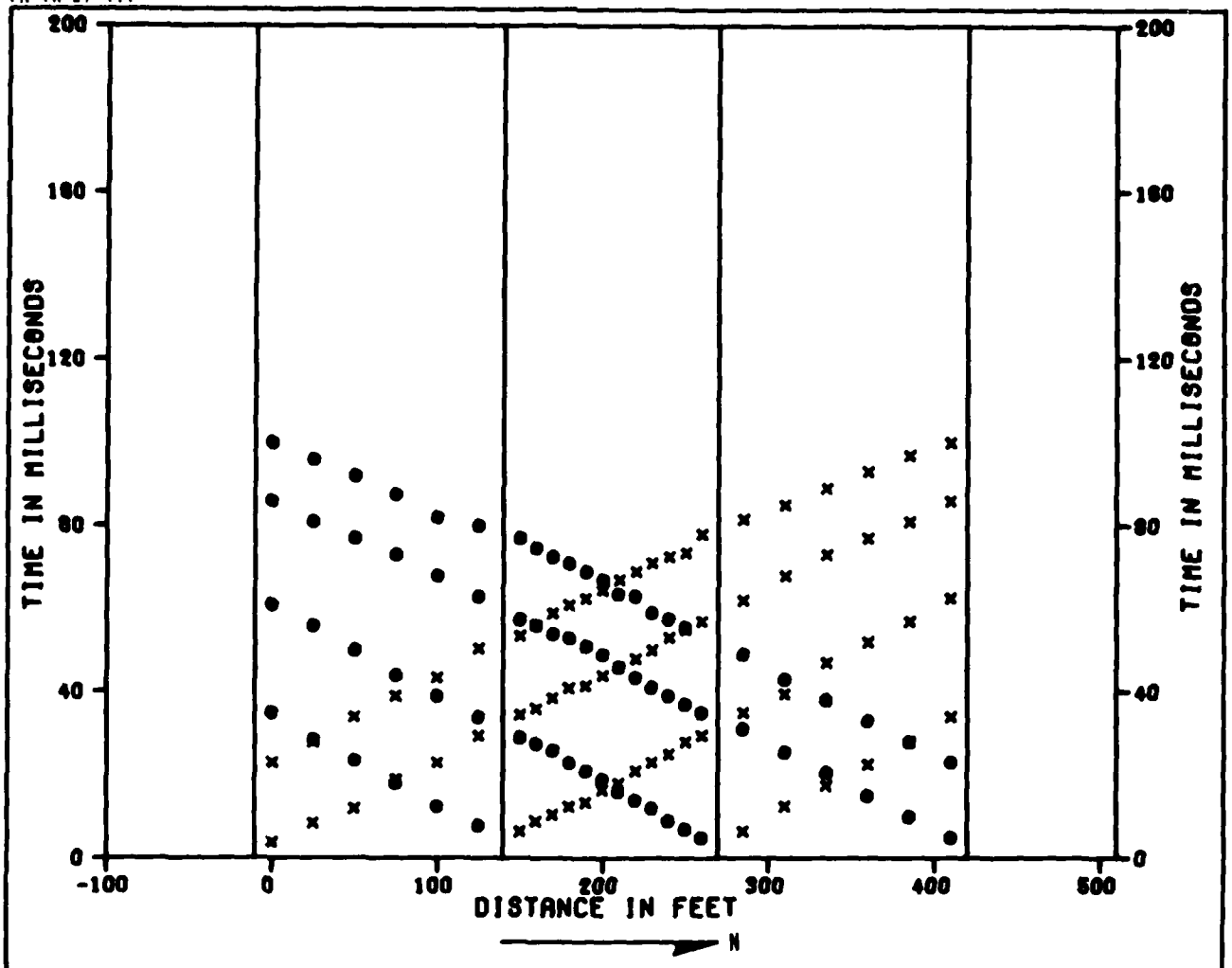

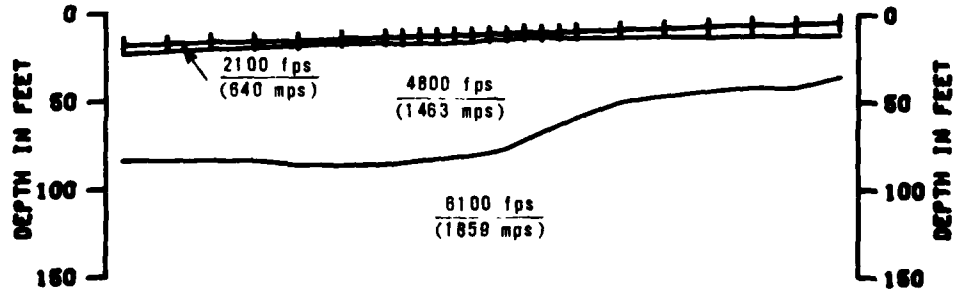

0 METERS 50
DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS
● TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-14
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-14

UBRO NATIONAL, INC.

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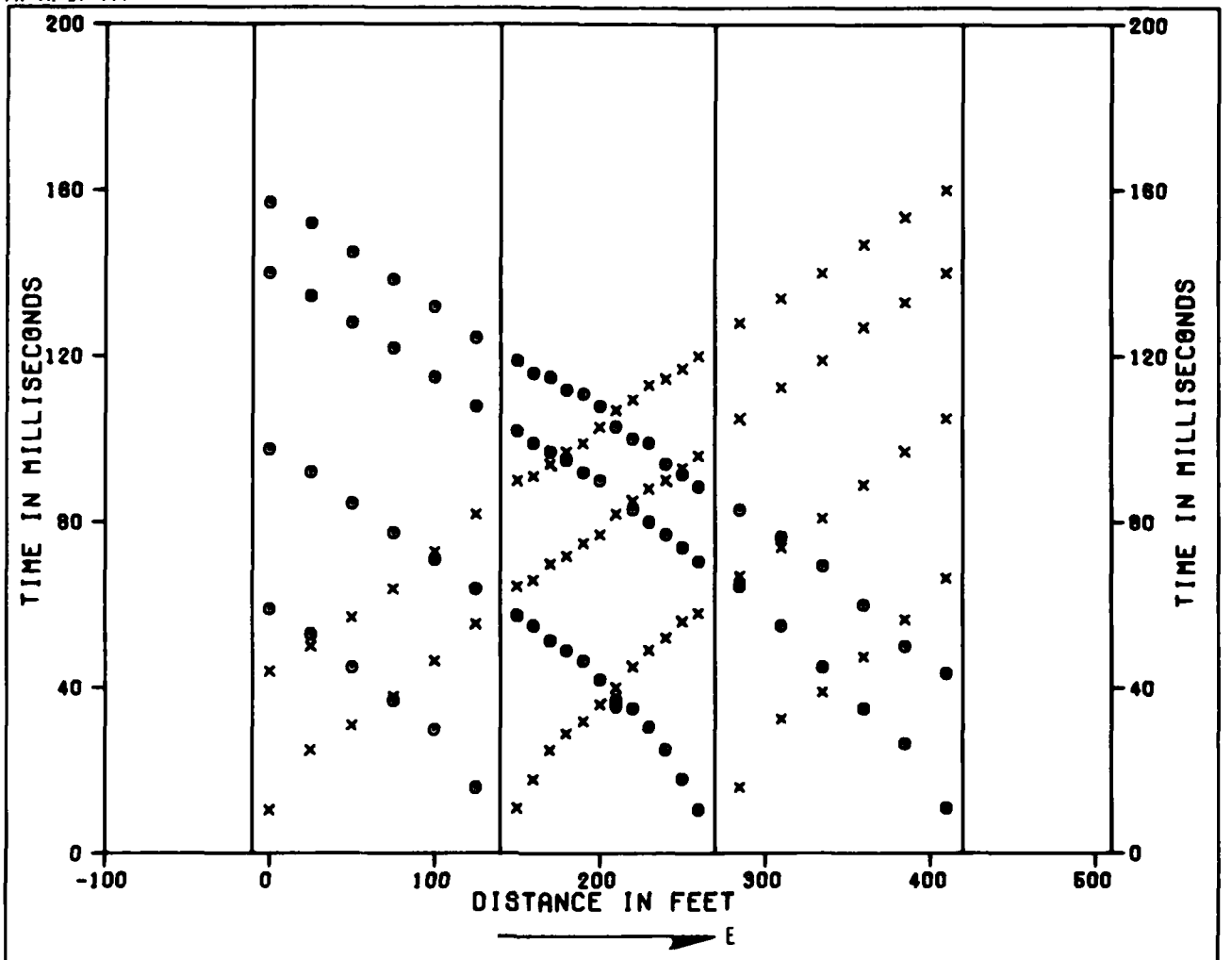
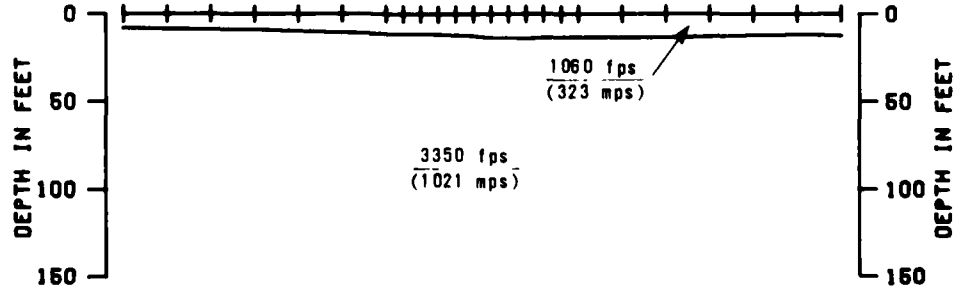
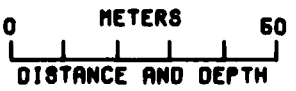






× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-15
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

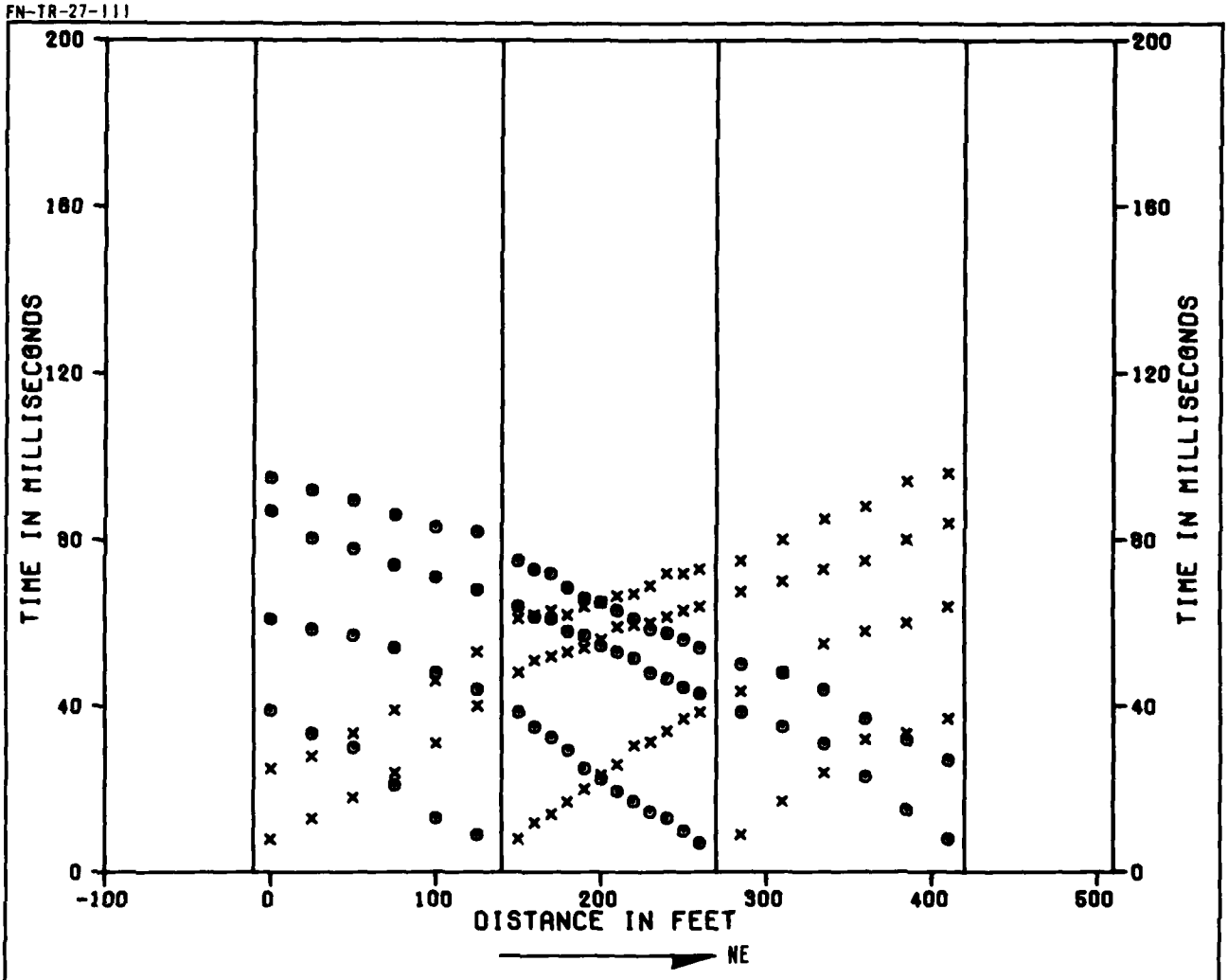
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

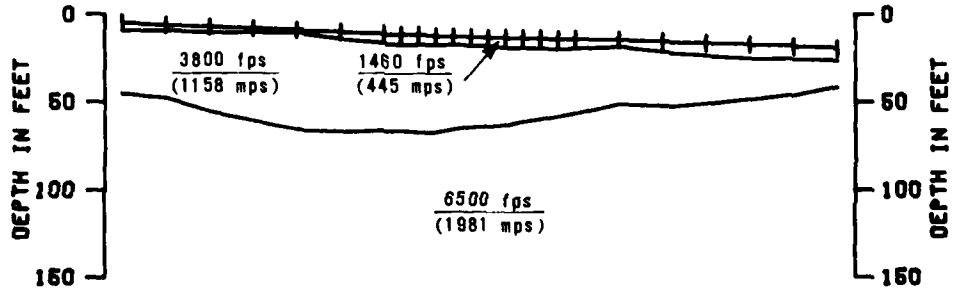
FIGURE
3-15

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-111





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE SE-S-16
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

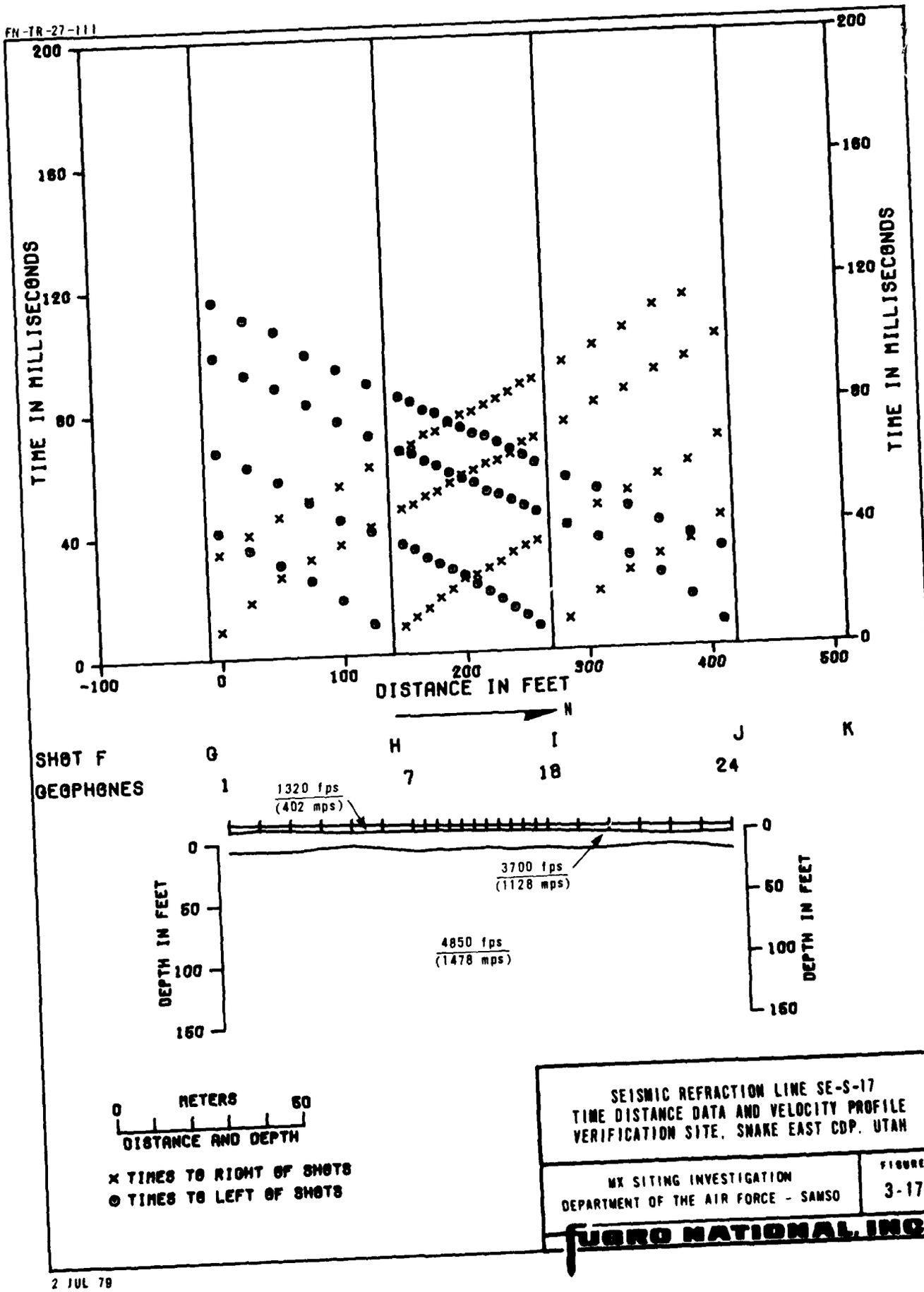
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-16

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-111



SEISMIC REFRACTION LINE SE-S-17
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

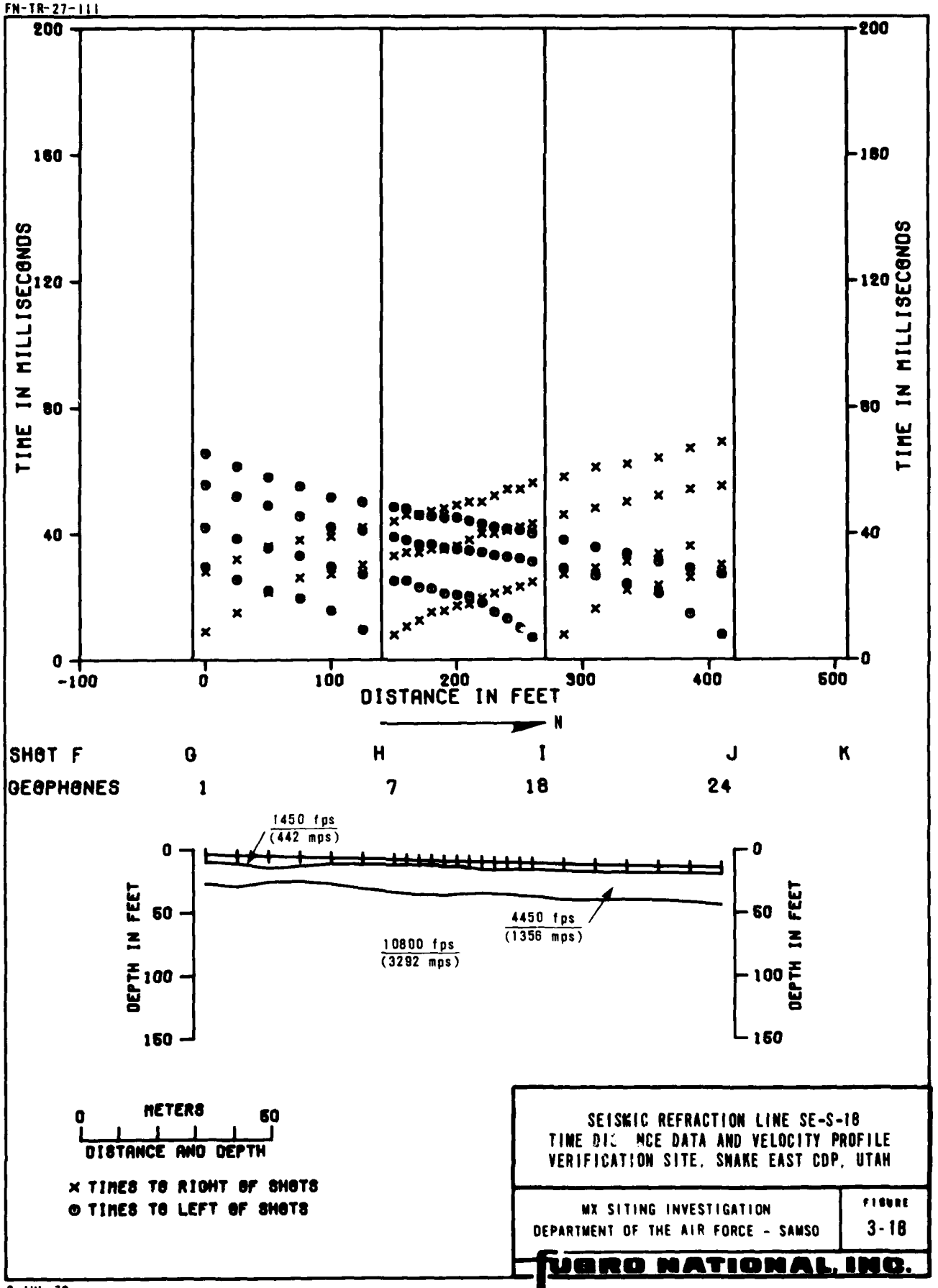
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-17

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-111



SEISMIC REFRACTION LINE SE-S-18
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-18

FUGRO NATIONAL, INC.

2 JUL 79

SECTION 4.0

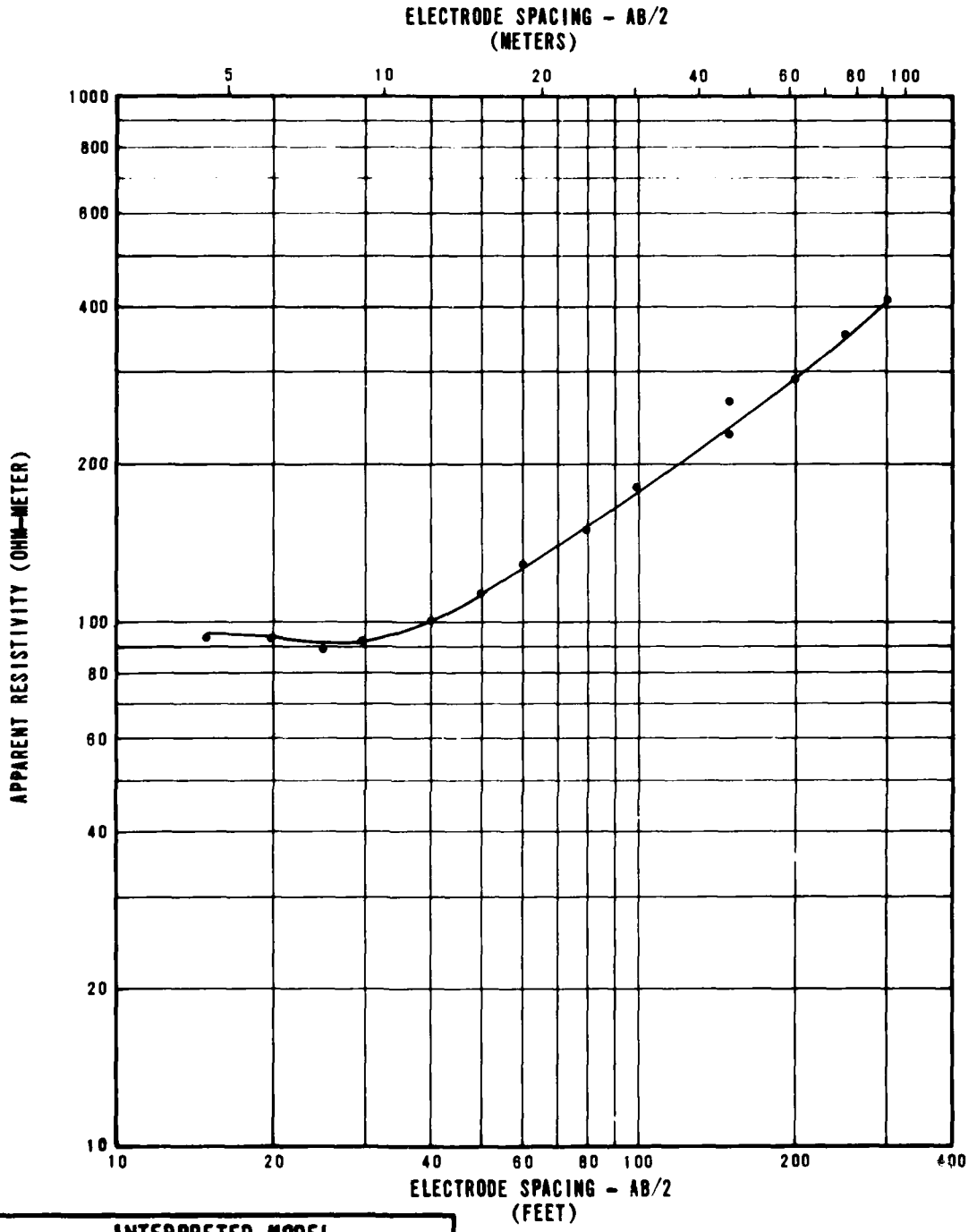
ELECTRICAL RESISTIVITY DATA

EXPLANATIONS OF ELECTRICAL RESISTIVITY DATA

Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.



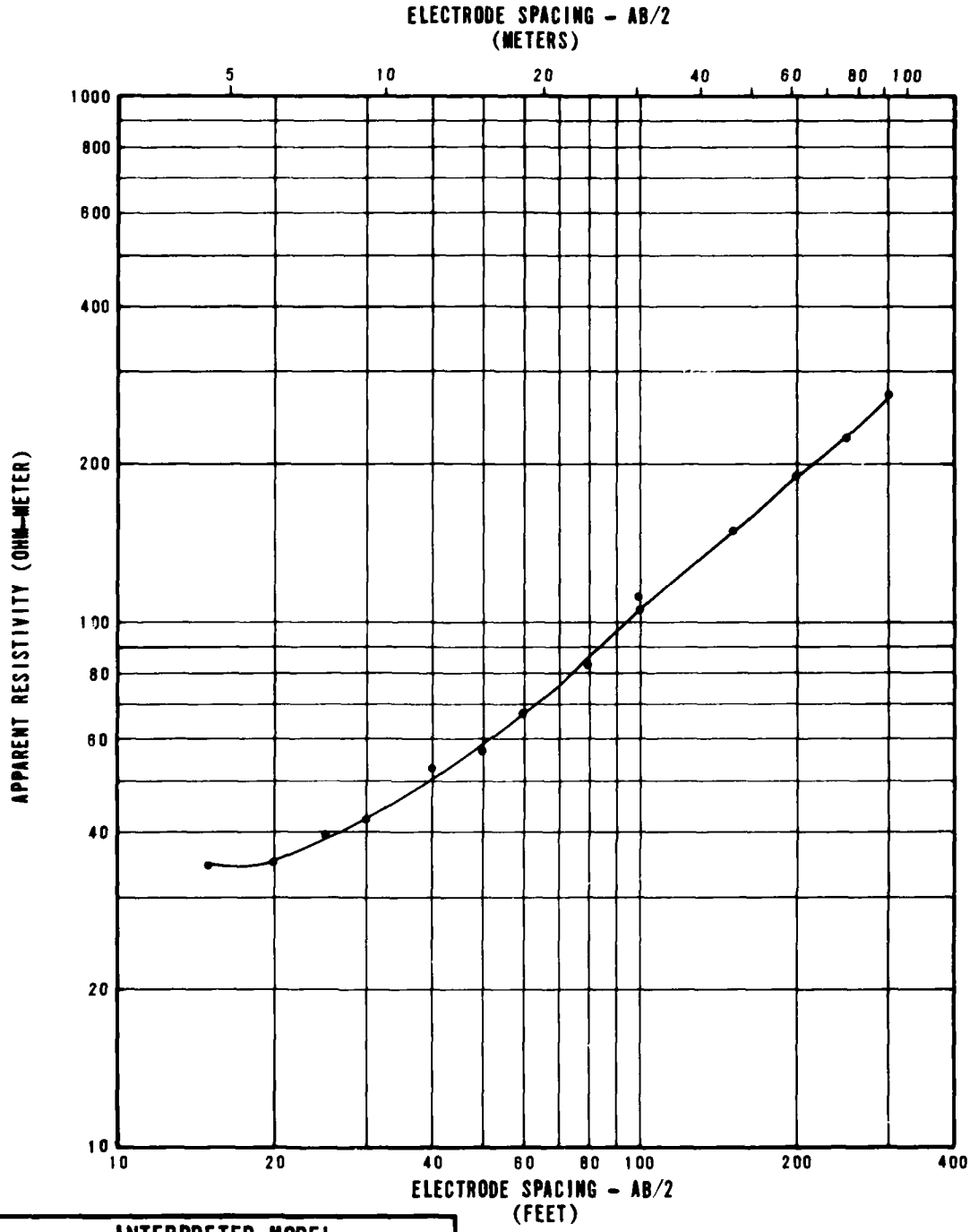
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	100
11	3	70
32	10	470
131	40	1880

RESISTIVITY SOUNDING SE-R-1
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-1

WOODWARD-CLYDE CONSULTANTS



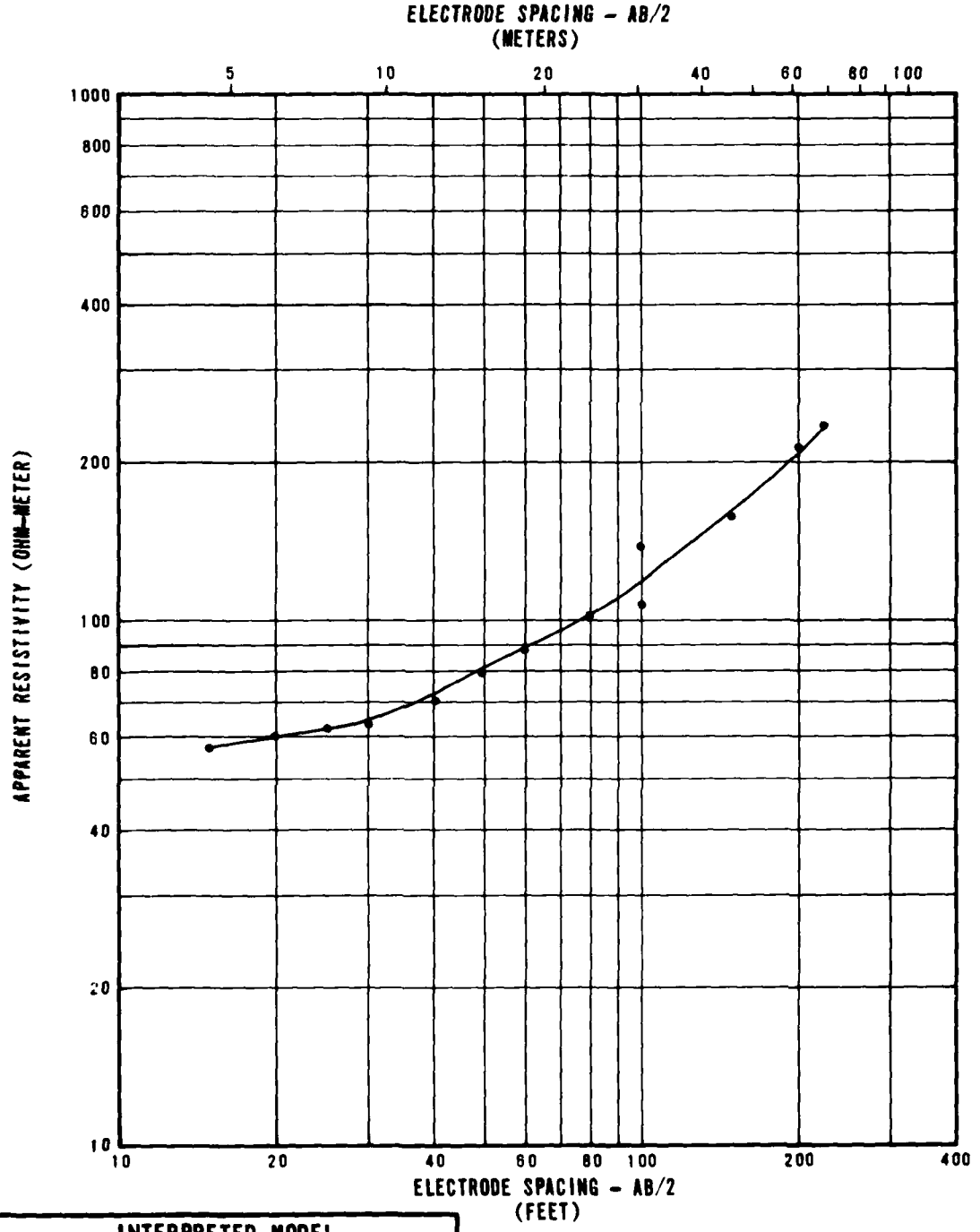
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
25	8	130
44	13	790
67	20	1300

RESISTIVITY SOUNDING SE-R-2
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-2

FURRO NATIONAL, INC.

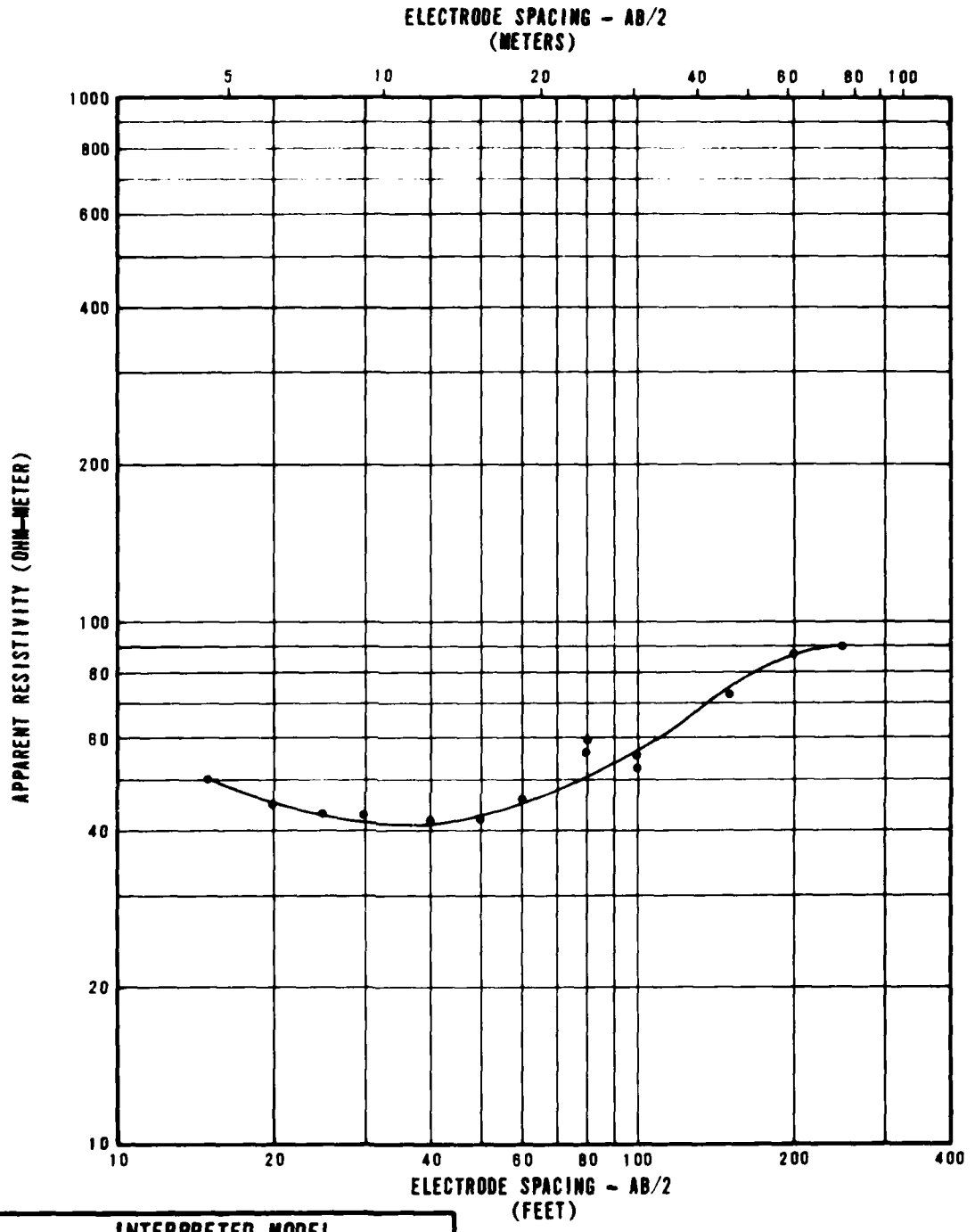


INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
28	9	220
100	30	980

RESISTIVITY SOUNDING SE-R-3
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-3



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
12	4	30
45	14	150
156	48	100

RESISTIVITY SOUNDING SE-R-4
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

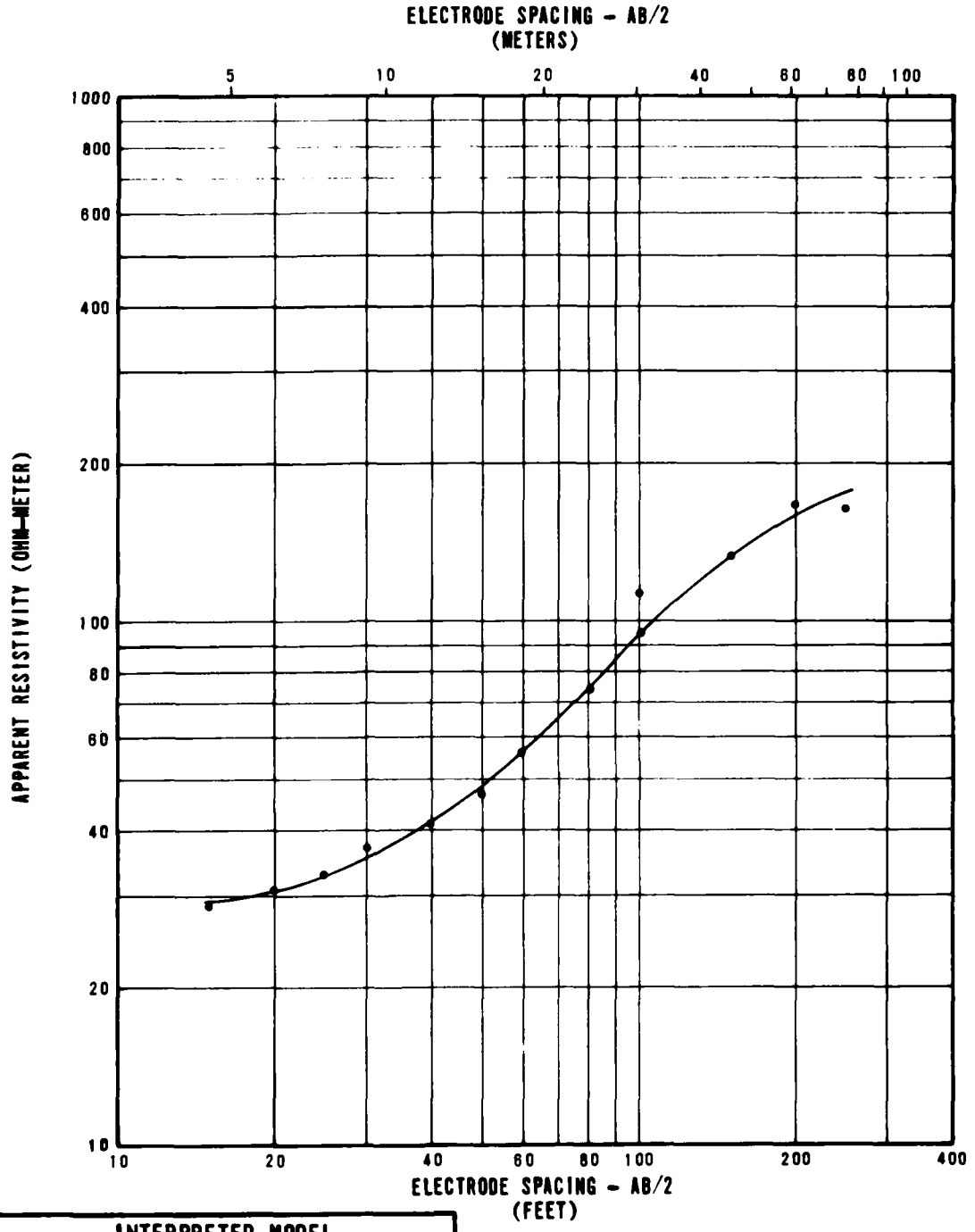
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 4-4

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFV-15



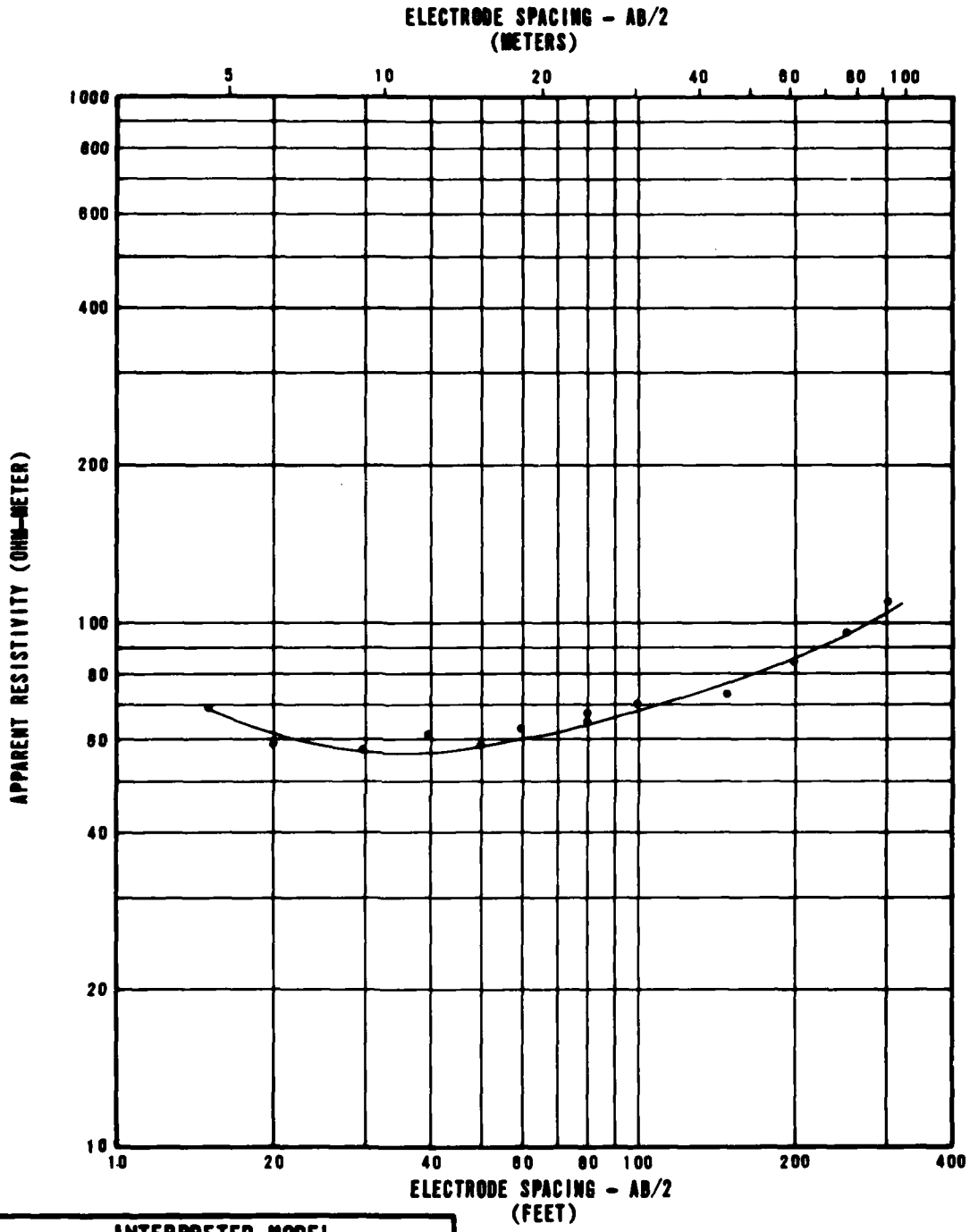
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
21	6	120
54	16	570
106	32	370

RESISTIVITY SOUNDING SE-R-5
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE
4-5

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	75
11	3	45
38	12	95

RESISTIVITY SOUNDING SE-R-6
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

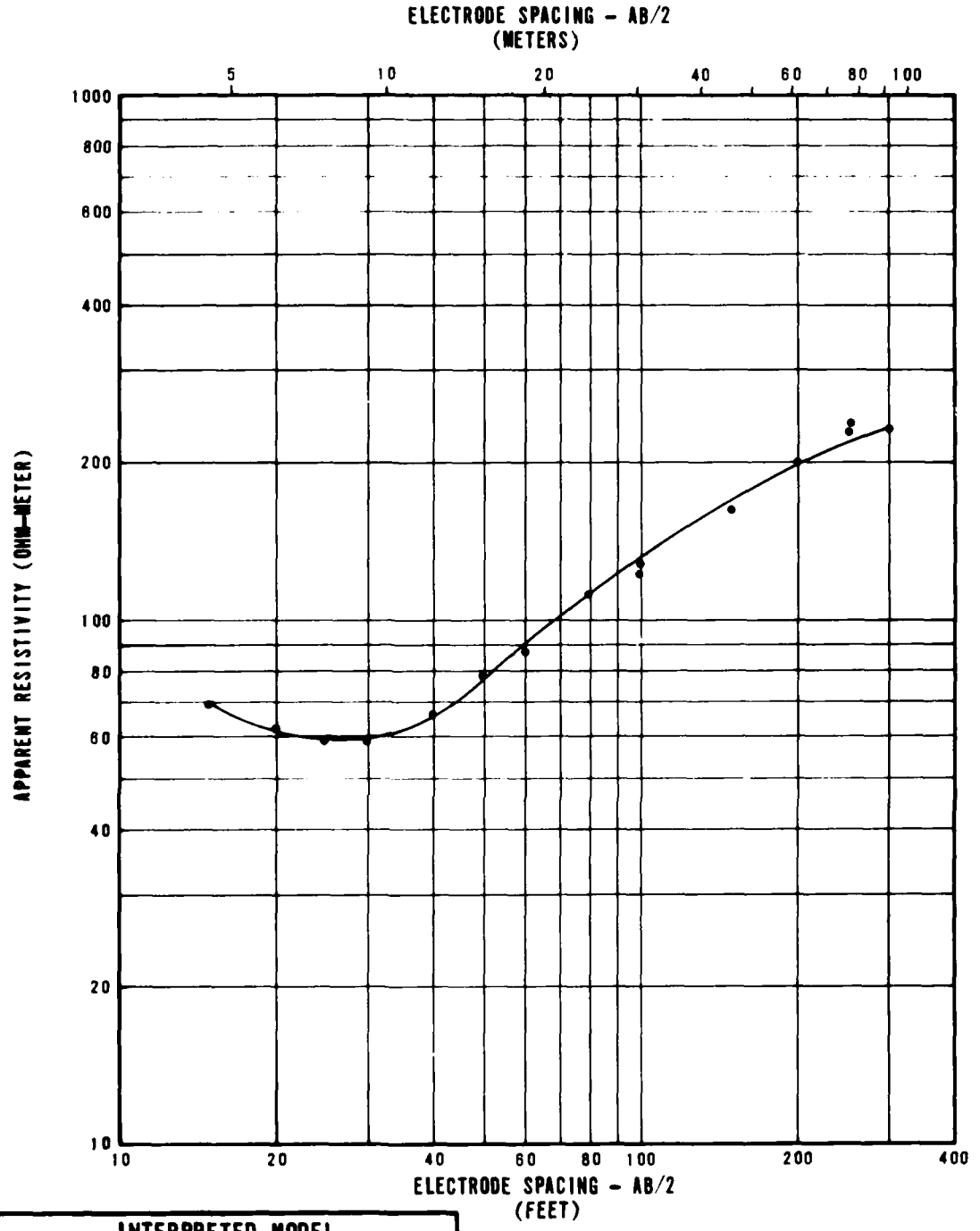
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-6

FURRO NATIONAL, INC.

2 JUL 79

AFV-15



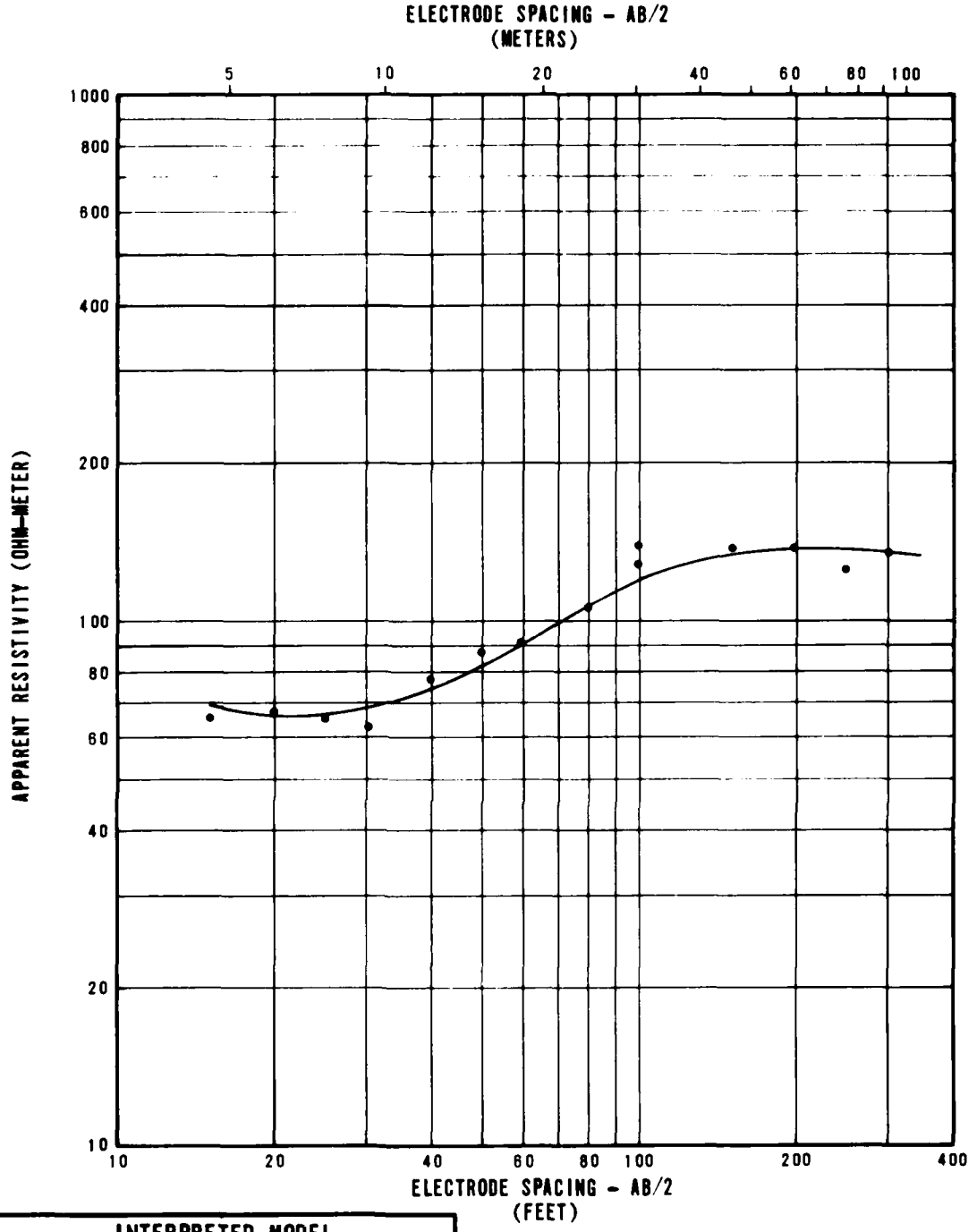
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	90
7	2	45
30	9	900
46	14	310

RESISTIVITY SOUNDING SE-R-7
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 4-7

FURRO NATIONAL, INC.



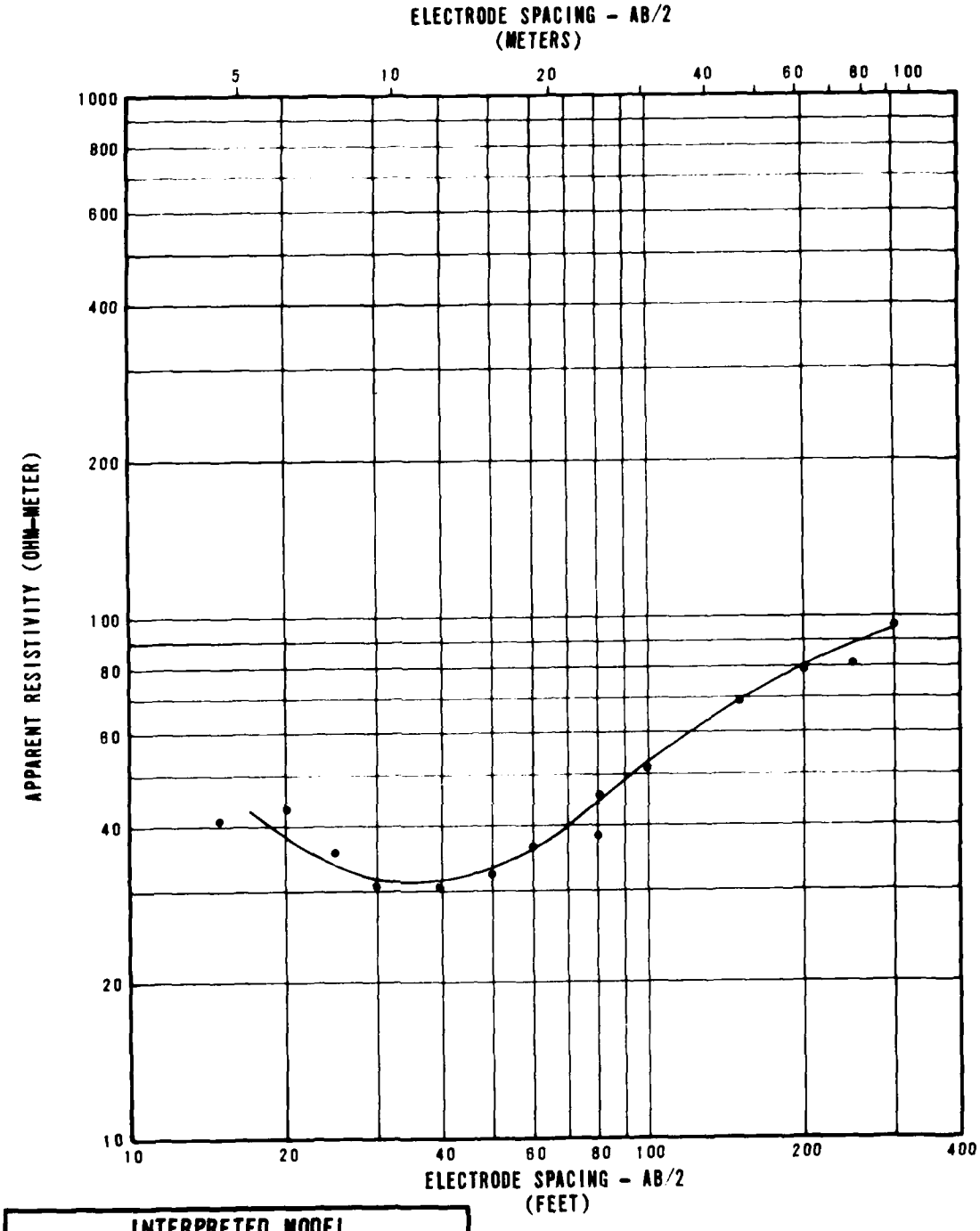
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	75
9	3	50
28	9	290
82	25	90

RESISTIVITY SOUNDING SE-R-8
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 4-8

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
8	2	25
42	13	250
68	21	130

RESISTIVITY SOUNDING SE-R-9
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST COP, UTAH

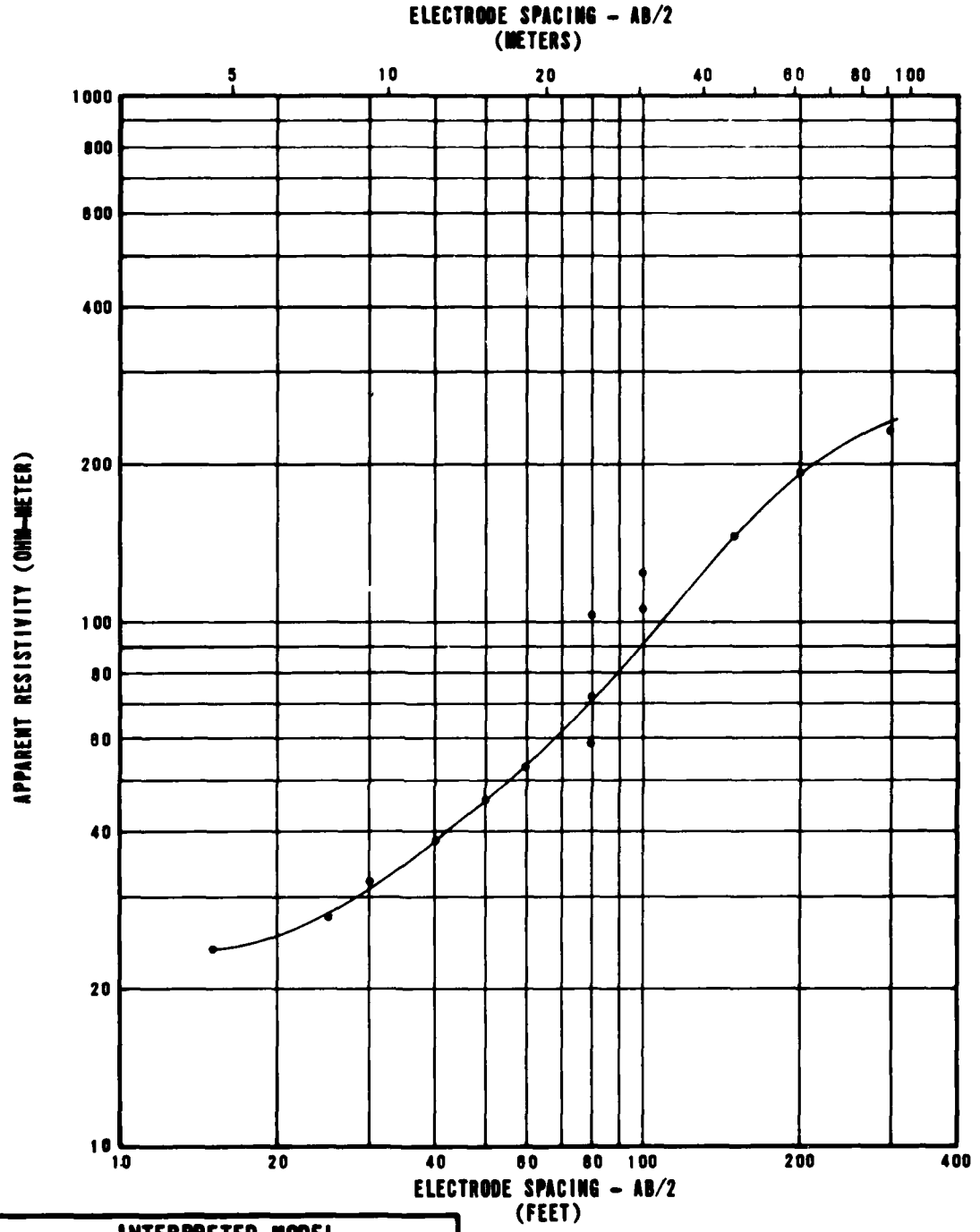
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE
4-9

FUGRO NATIONAL, INC.

2 JUL 78

AFV-15

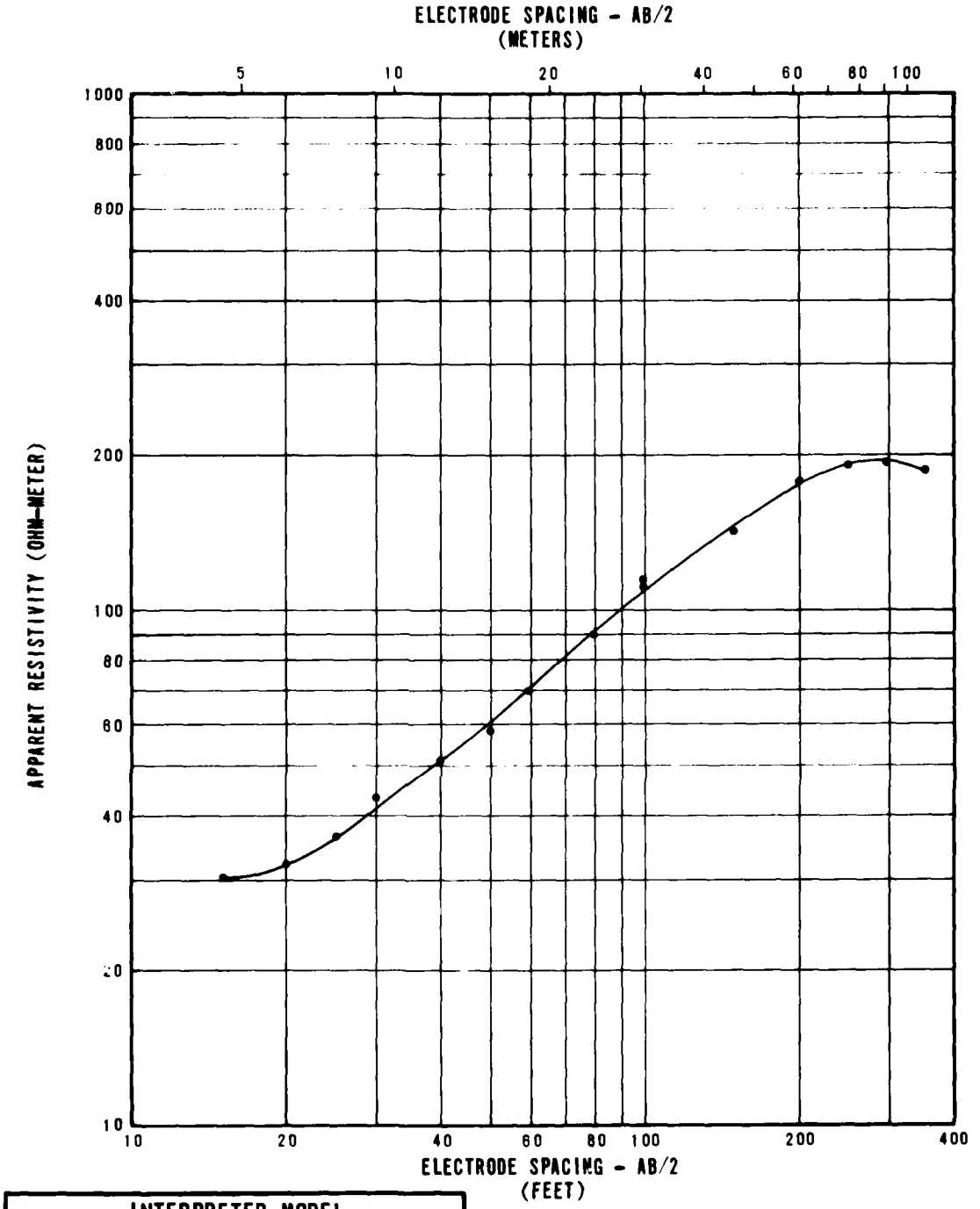


INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	20
21	6	110
49	15	1150

RESISTIVITY SOUNDING SE-R-10
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-10



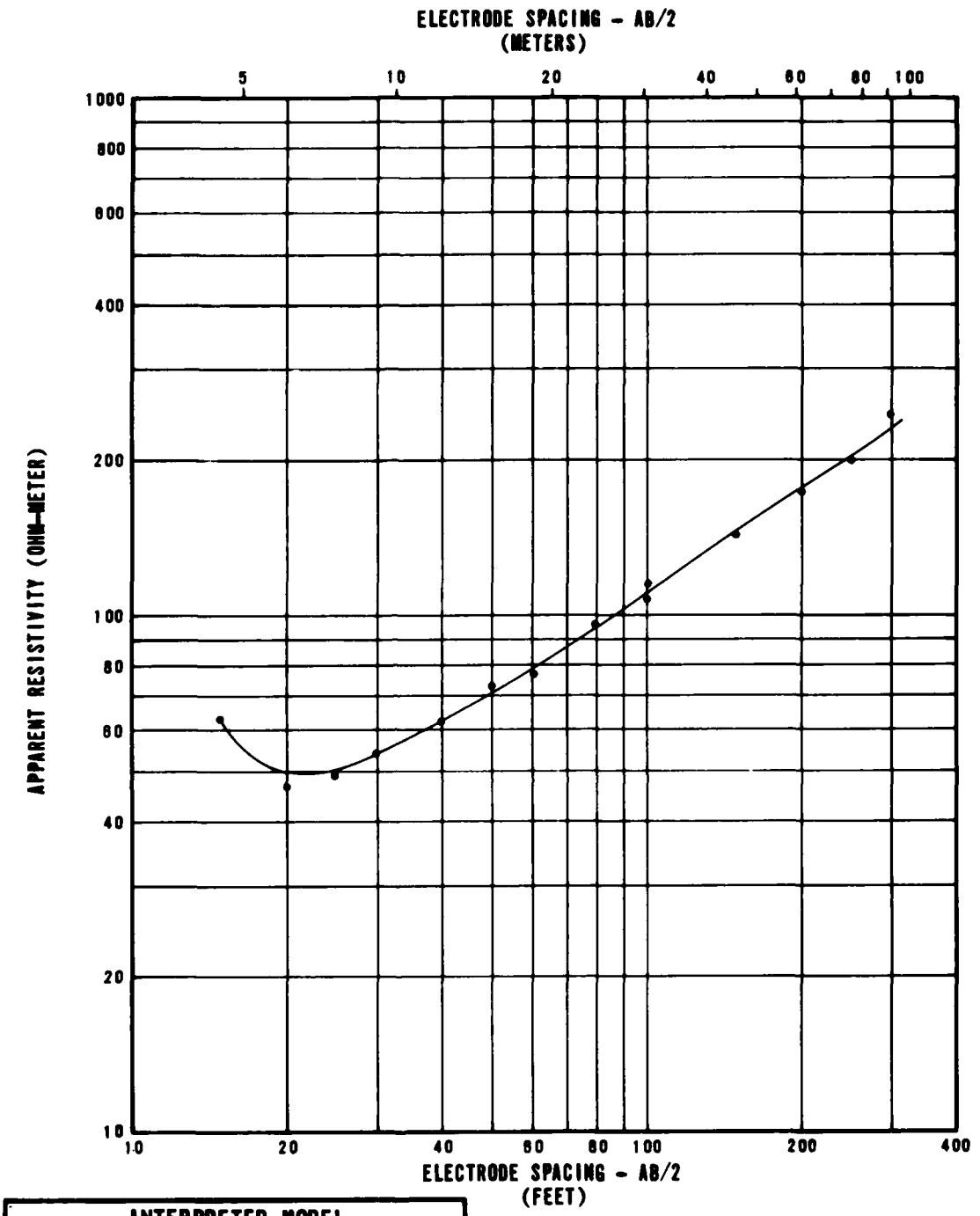
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
20	6	210
40	12	1590
57	17	240

RESISTIVITY SOUNDING SE-R-11
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 4-11

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	85
6	2	35
26	8	310
95	29	410

RESISTIVITY SOUNDING SE-R-12
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

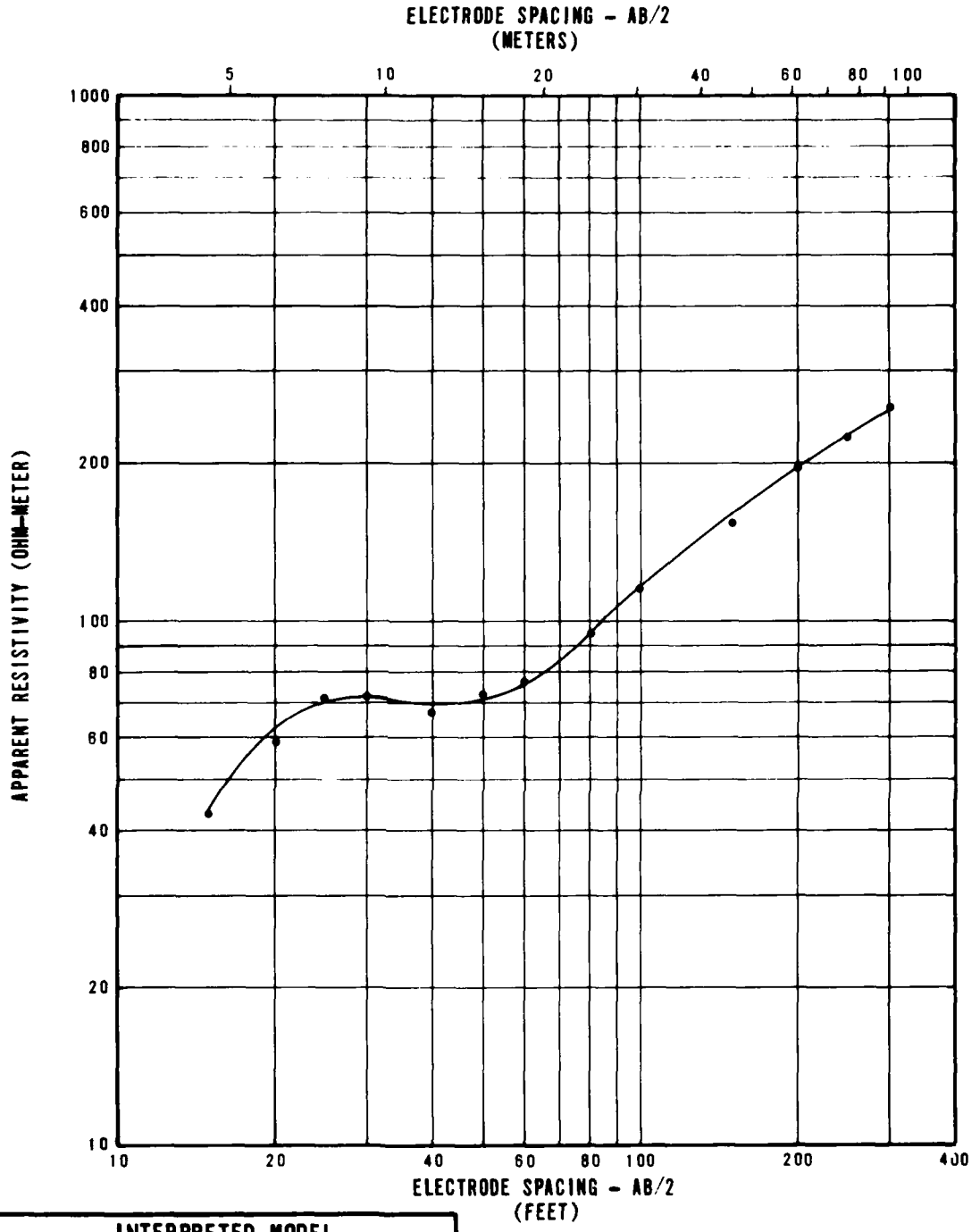
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-12

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	45
13	4	120
62	19	400
137	42	510

RESISTIVITY SOUNDING SE-R-14
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

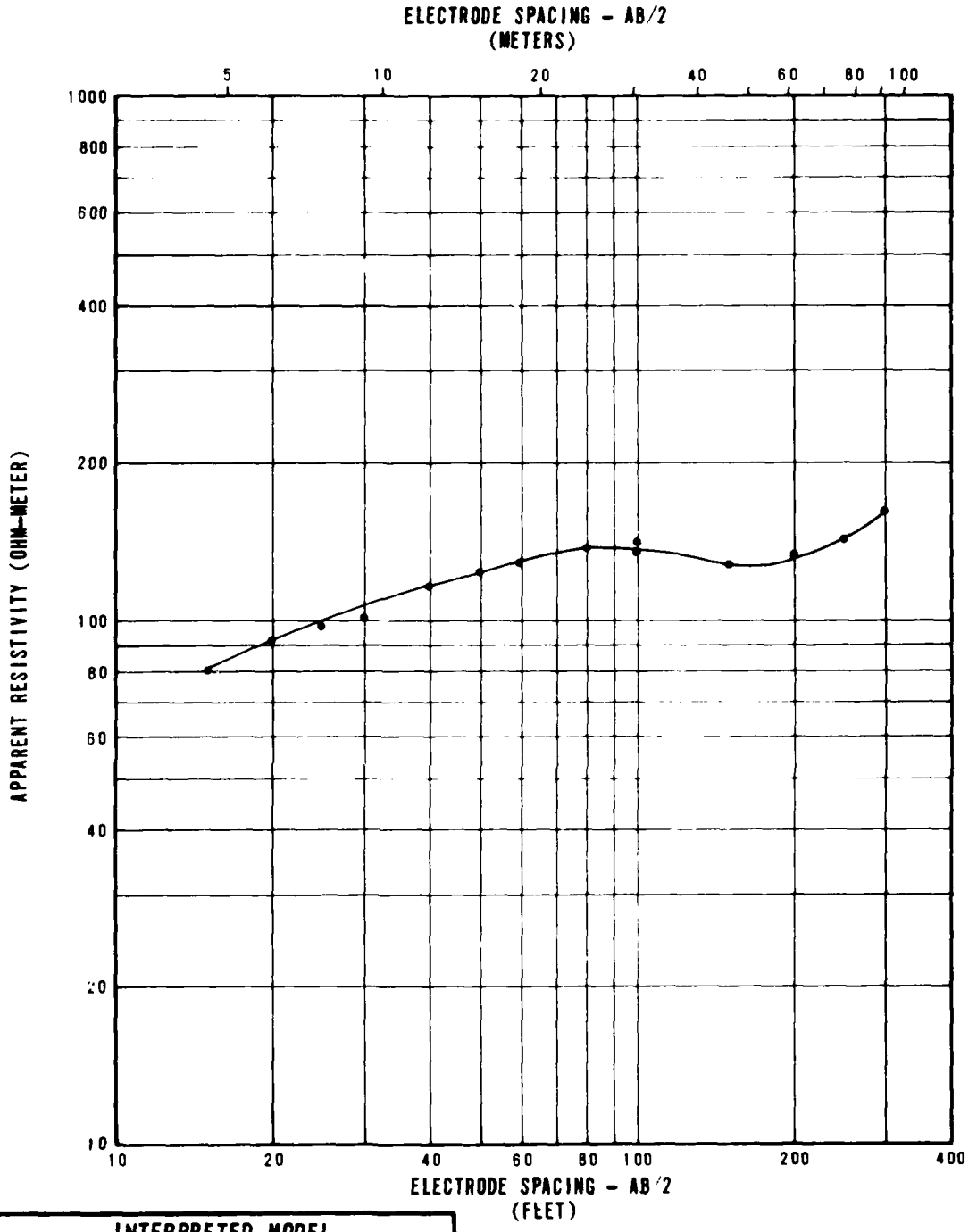
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE
4-13

FURO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	70
9	3	150
74	23	80
188	57	450

RESISTIVITY SOUNDING SE R-15
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

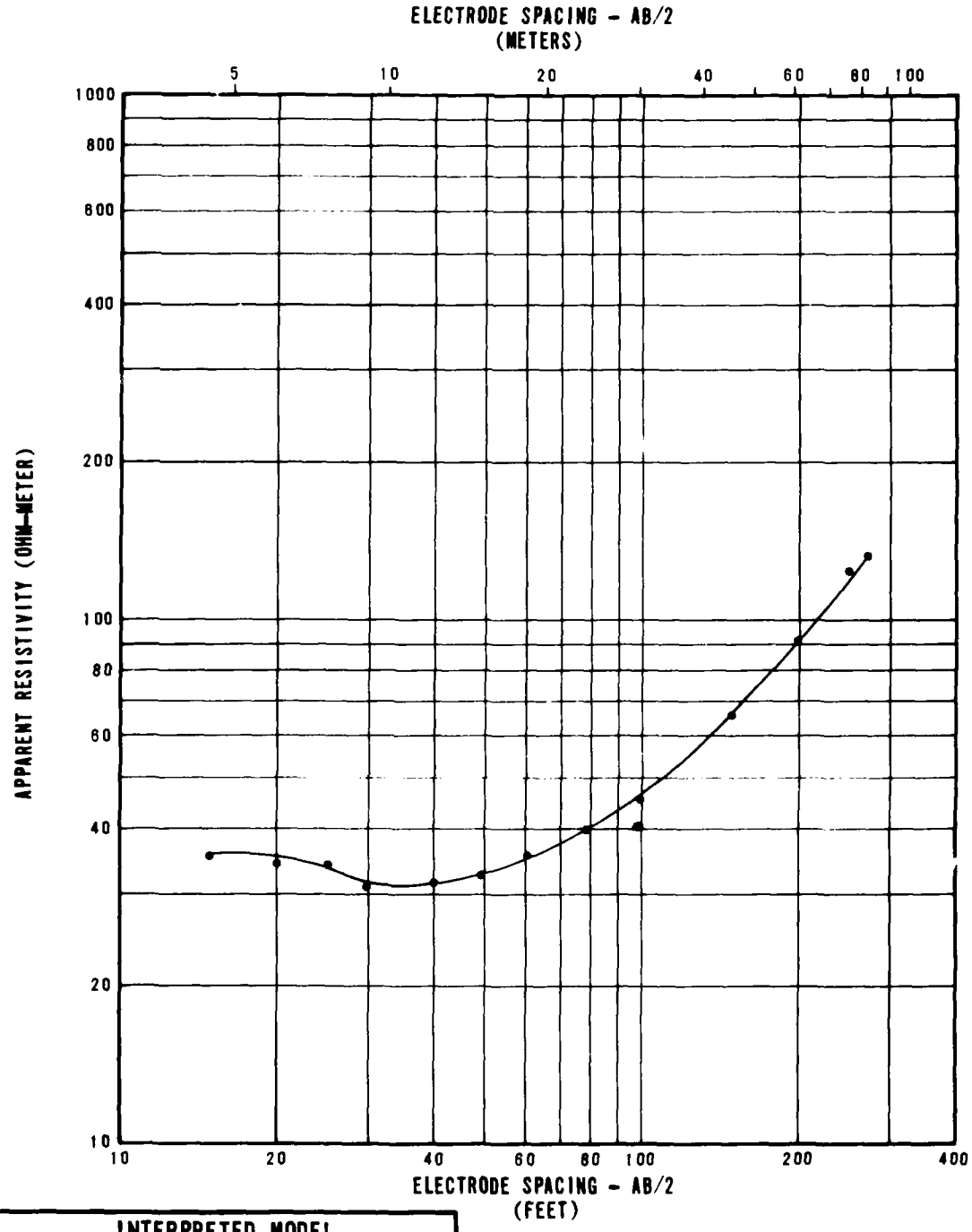
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 4-1[illegible]

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



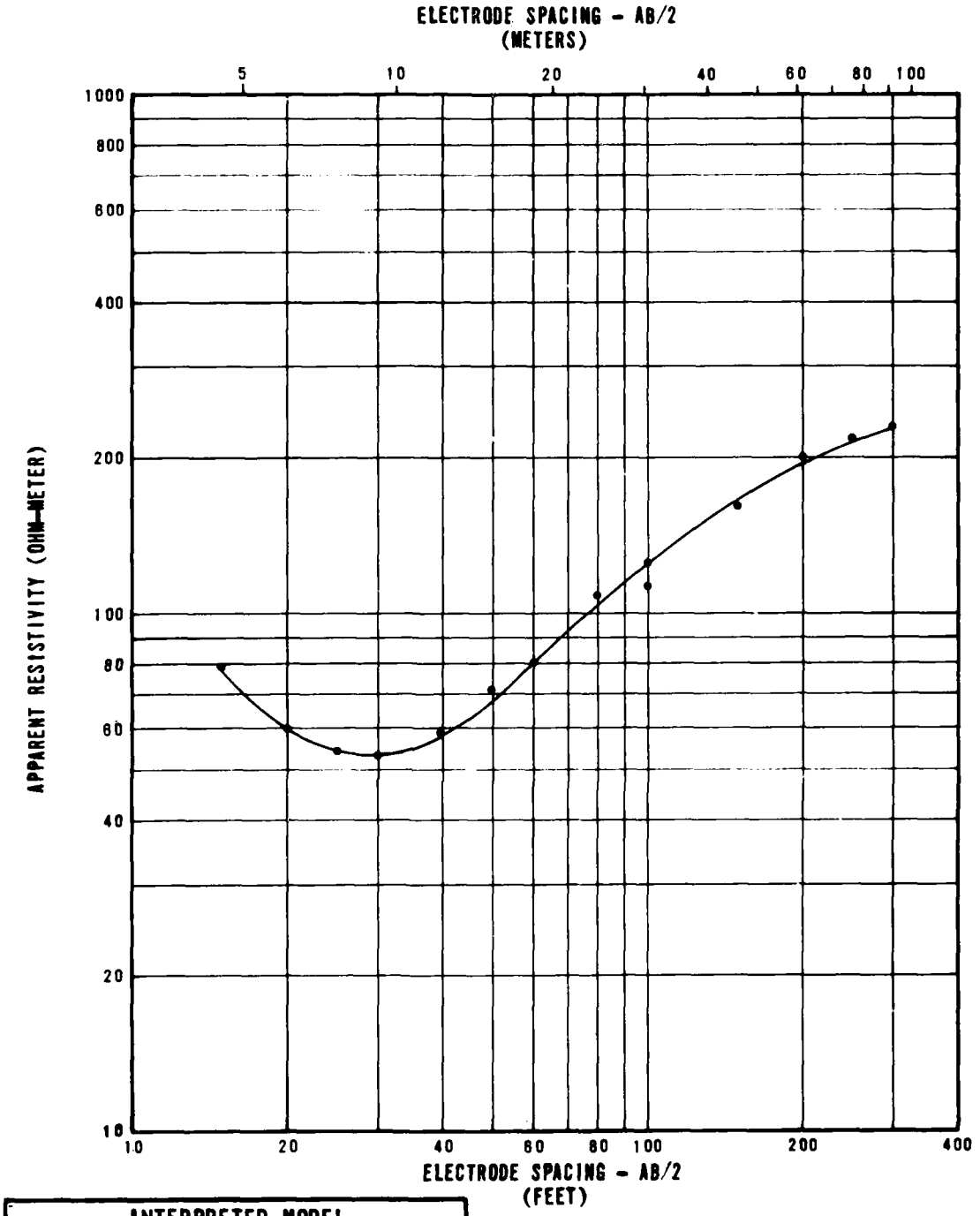
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
15	5	25
45	14	120
88	27	1180

RESISTIVITY SOUNDING SE-R-16
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-15

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	110
9	3	20
20	6	170
37	11	730
59	18	340

RESISTIVITY SOUNDING SE-R-17
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

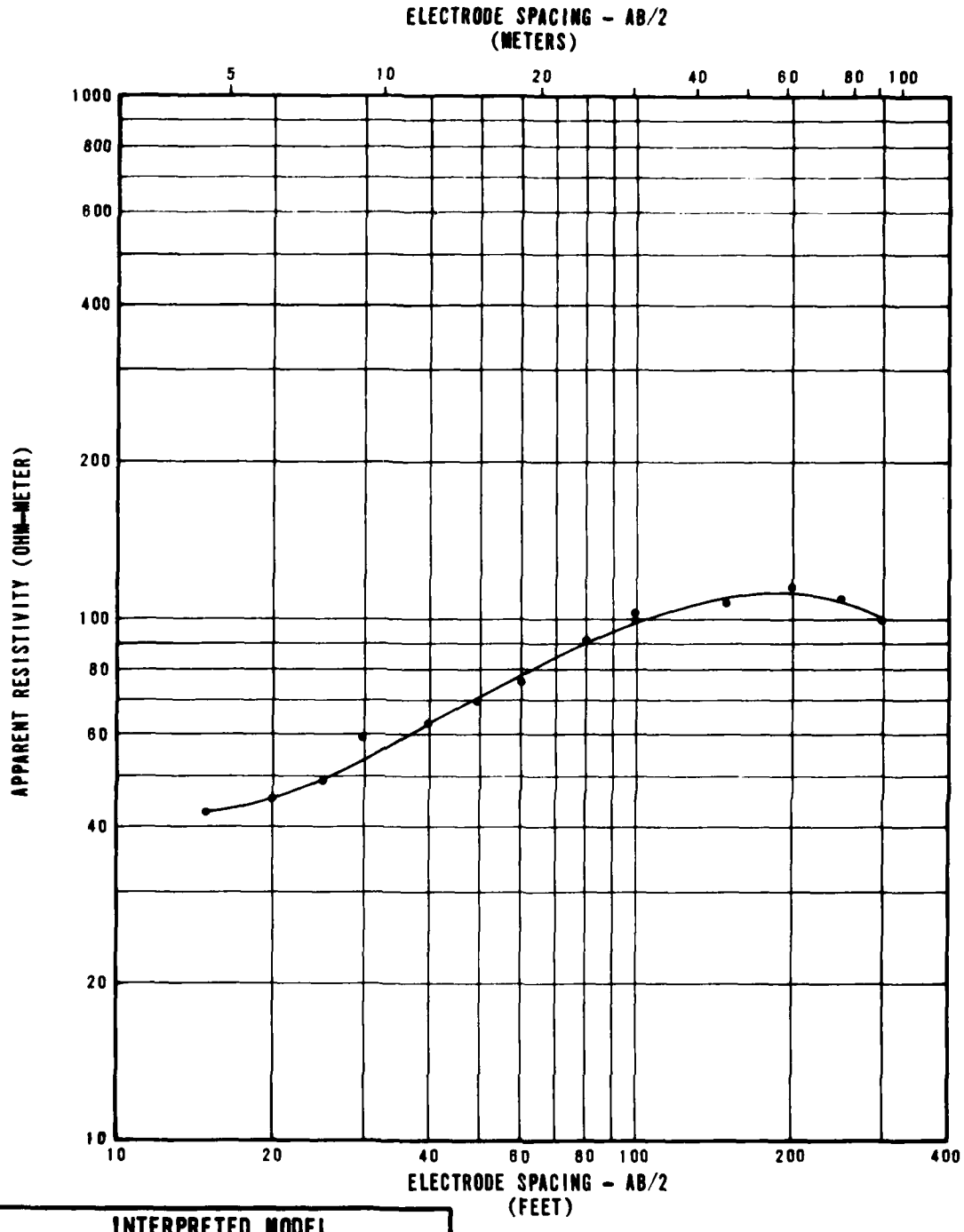
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE
4-16

FUGRO NATIONAL, INC.

2 JUL 79

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	40
20	6	160
130	40	65

RESISTIVITY SOUNDING SE-R-18
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE
4-17

WOODWARD-CLYDE CONSULTANTS

SECTION 5.0

GRAVITY DATA

EXPLANATIONS OF GRAVITY DATA

Gravity data were not available in time (prior to June 1979) for incorporation into this report. A supplemental report containing gravity data and results will be issued at a later date.

SECTION 6.0

BORING LOGS

EXPLANATIONS OF BORING, TRENCH, AND TEST PIT LOGS

All data from borings, trenches, and test pits are presented on standard Fugro National logs in Sections 6.0 and 7.0. The following explanations are provided as a key to the logs.

A. Designations - Borings, trenches, and test pits are identified as follows:

WW-B-1
WW - abbreviation for the site (e.g., WW-Whirlwind)
B - abbreviation for activity (e.g., B-boring, T-trench, P-test pit)
1 - number of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of sampling techniques, see Section A5.0 of Appendix in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.

C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.

D. N Value - Corresponds to standard penetration resistance, which is number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15 cm) increments with a 140-pound (63.5 kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).

E. Depth - Corresponds to depth below ground surface in meters and feet.

F. Lithology - Graphic representation of the soil and rock types.

G. USCS - Unified Soil Classification System (see Table 6-1 for complete details) symbols.

H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in ASTM D 2487-69, Classification of Soils for Engineering Purposes, and D 2488-69, Description of Soils (Visual-Manual Procedure) were followed. Solid lines across the column indicate known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture :

Dry	- no feel of moisture
Slightly Moist	- much less than normal moisture
Moist	- normal moisture for soil
Very Moist	- much greater than normal moisture
Wet	- for soils below the water table (if known)

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)					Group Symbol[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is larger than No. 200 sieve size[b] (The No. 200 sieve size is about the smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes		GW	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand, gravelly*; about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *GW*
			Predominantly one size or a range of sizes with some intermediate sizes missing		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)		GM	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with *PI* greater than 7
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes		SW	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *SW*
			Predominantly one size or a range of sizes with some intermediate sizes missing		SP	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)		SM	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)		SC	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits above "A" line with *PI* greater than 7

Identification Procedures on Fraction Smaller than No. 40 Sieve Size					
	Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)		
Silts and clays liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
	Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	Slight to medium	Slow	Slight	OL	Organic silts and organic silty clays of low plasticity
Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays
	Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity
Highly Organic Soils	Readily identified by colour, odour, spongy feel and frequently by fibrous texture			Pt	Peat and other highly organic soils

Use grain size curve in identifying the fractions as given under field identification

Determine percentages of gravel and sand from grain size curve

Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows:

Less than 5%	*GW, GP, SW, SP*
More than 12%	*GM, GC, SM, SC*
5% to 12%	*Borderline* cases requiring use of dual symbol

From Wagner, 1957.

a *Boundary classifications*. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW-GC*, well graded gravel-sand mixture with clay binder.

b All sieve sizes on this chart are U.S. standard.

Field Identification Procedures for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately ¼ in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):
After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.
Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.
Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a *moderately quick reaction*.

Dry Strength (Crushing characteristics):
After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.
High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when crushing the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):
After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.
After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.
The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.
Highly organic clays have a very weak and spongy feel at the plastic limit.

UNIFIED SOIL CLASSIFICATION SYSTEM

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 6-1

Consistency: Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

Consistency	N Value (ASTM D 1586-67)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils (ML, CL, MH, CH,) are as follows:

Consistency	Shear Strength (ksf)	Shear Strength (kn/m^2)	Field Guide
Very Soft	0.25	12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25-0.50	12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50-1.00	24-48	Can be molded easily with fingers
Stiff	1.00-2.00	48-96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00-4.00	96-192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00	over 192	Cannot be imprinted by fingers

Grain Shape: Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by porous calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

Stage	Gravelly Soils	Nongravelly Soils
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt

Trace - 5-12% (by dry weight)
Little - 13-20% (by dry weight)
Some - >21% (by dry weight)

Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic	(PI, 0 - 4)
Slightly Plastic	(PI, 4 - 15)
Medium Plastic	(PI, 15 - 30)
Highly Plastic	(PI, >31)

Cobbles and Boulders : A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (8 and 30 cm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (30 cm) or more.

I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, trench wall stability, loss of drilling fluid in the boring, and other conditions encountered during drilling and excavations.

J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Seive Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass a 3-inch (76 mm) sieve and are retained on No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing No. 4 sieve and retained on No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area, within an accuracy of half the contour interval.

Surficial Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

Drilling Method - signifies the type of drilling procedure used such as rotary wash.

Hole Diameter - nominal size of boring drilled.

Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

Trench Orientation - bearing of longitudinal trench centerline.

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2 JUL 79

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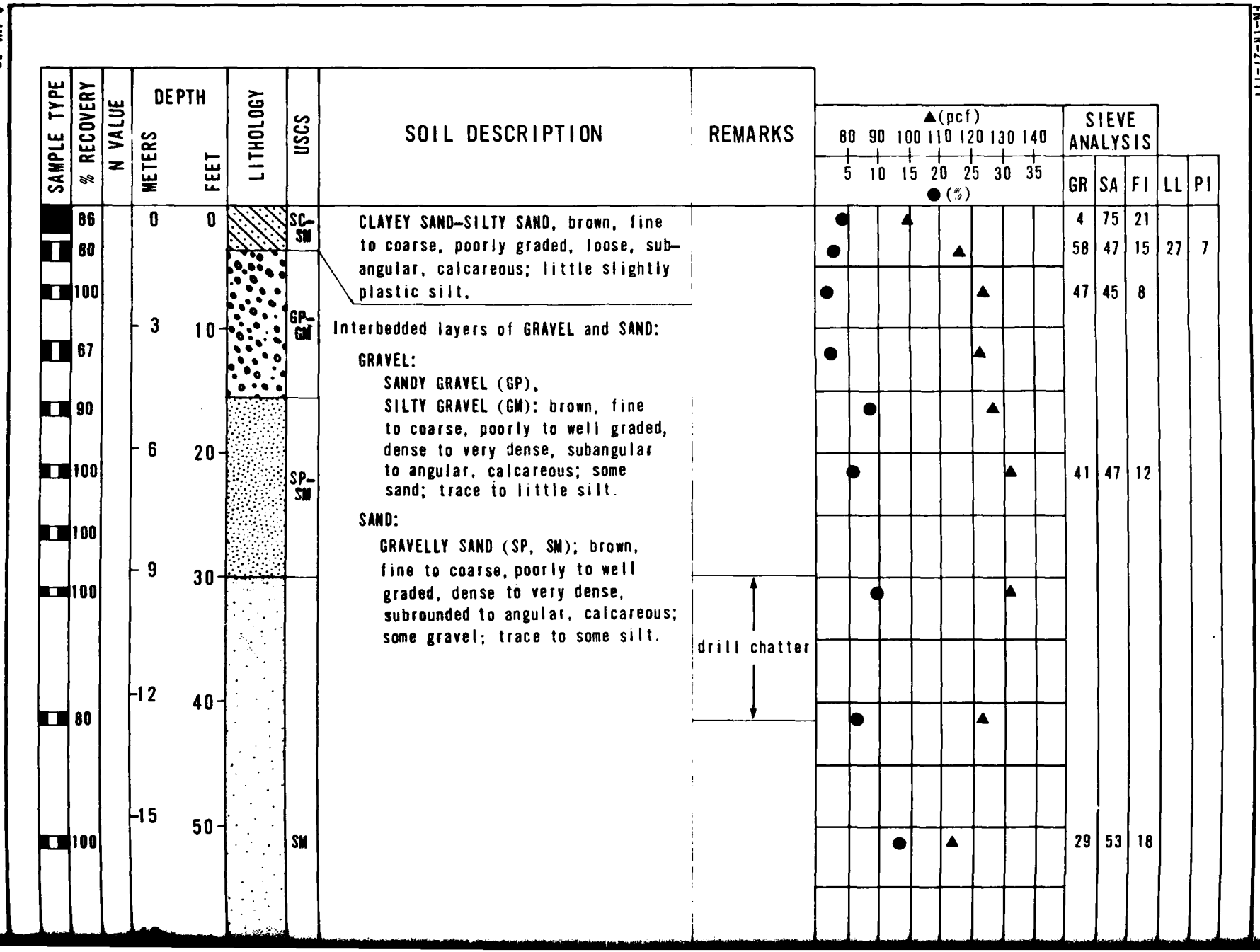
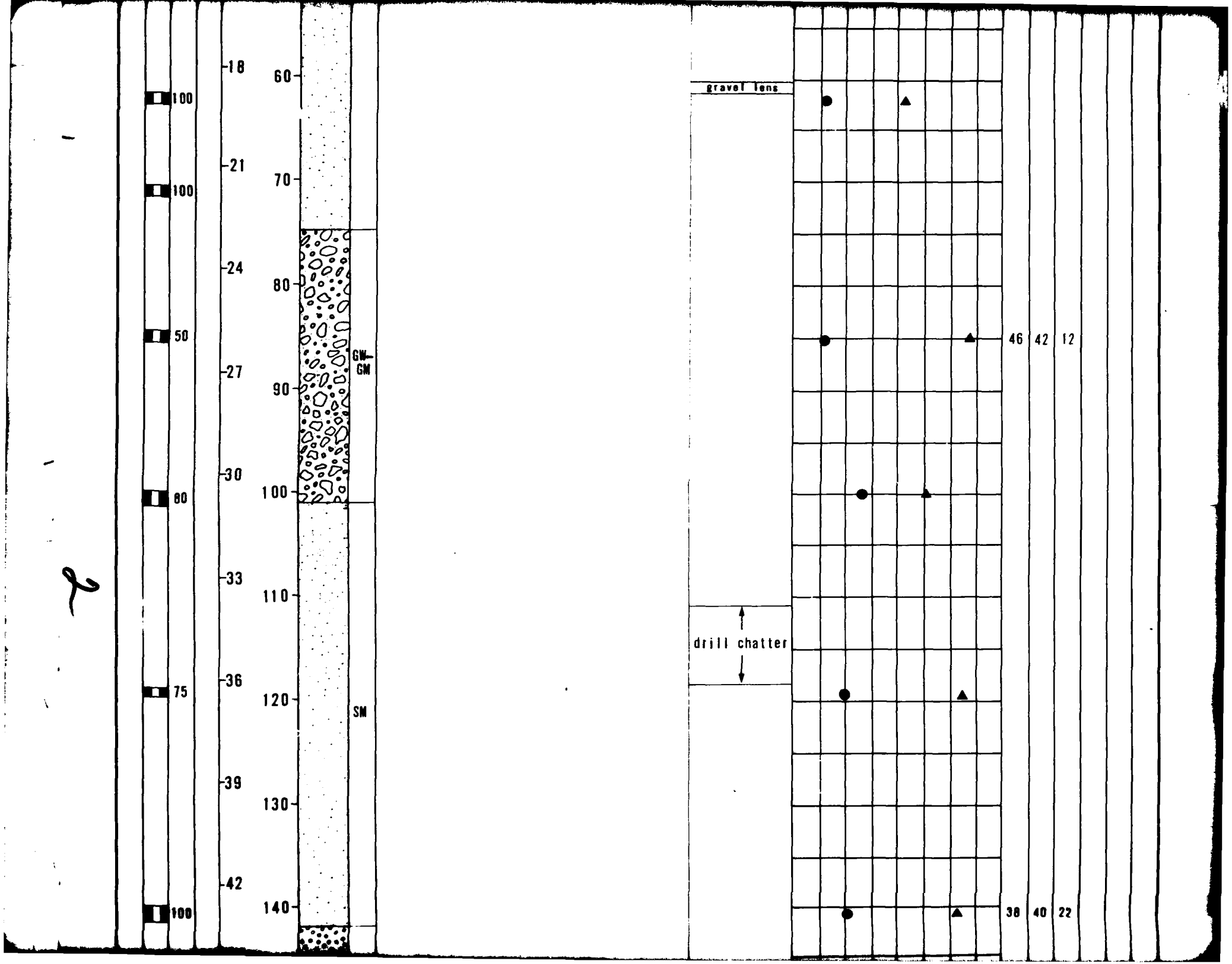
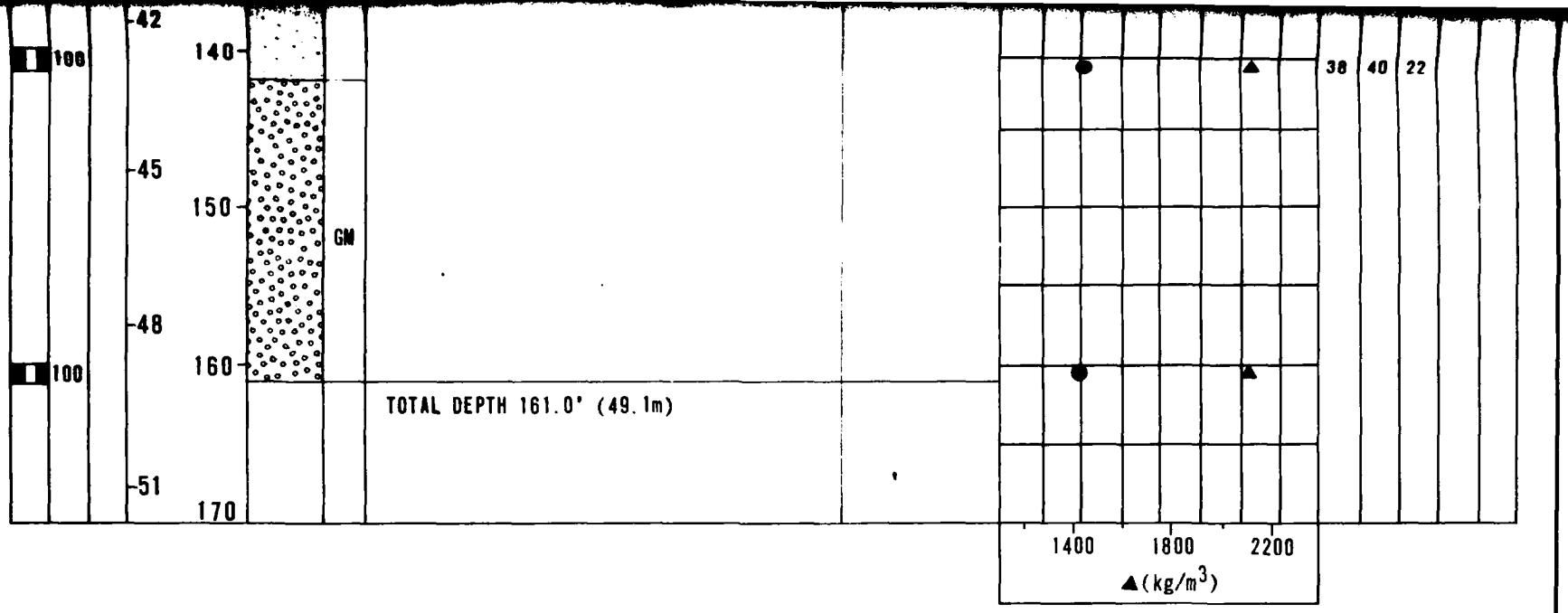



100
100
50
80
75
100
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
GW-GM
SM
gravel lens
drill chatter
46 42 12
38 40 22



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 5115' (1559m)
SURFICIAL GEOLOGIC UNIT	: A5y/A4o
DATE DRILLED	: 30-31 October 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not encountered

LOG OF BORING SE-B-1
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 6-1

FUGRO NATIONAL, INC.

AFV-08

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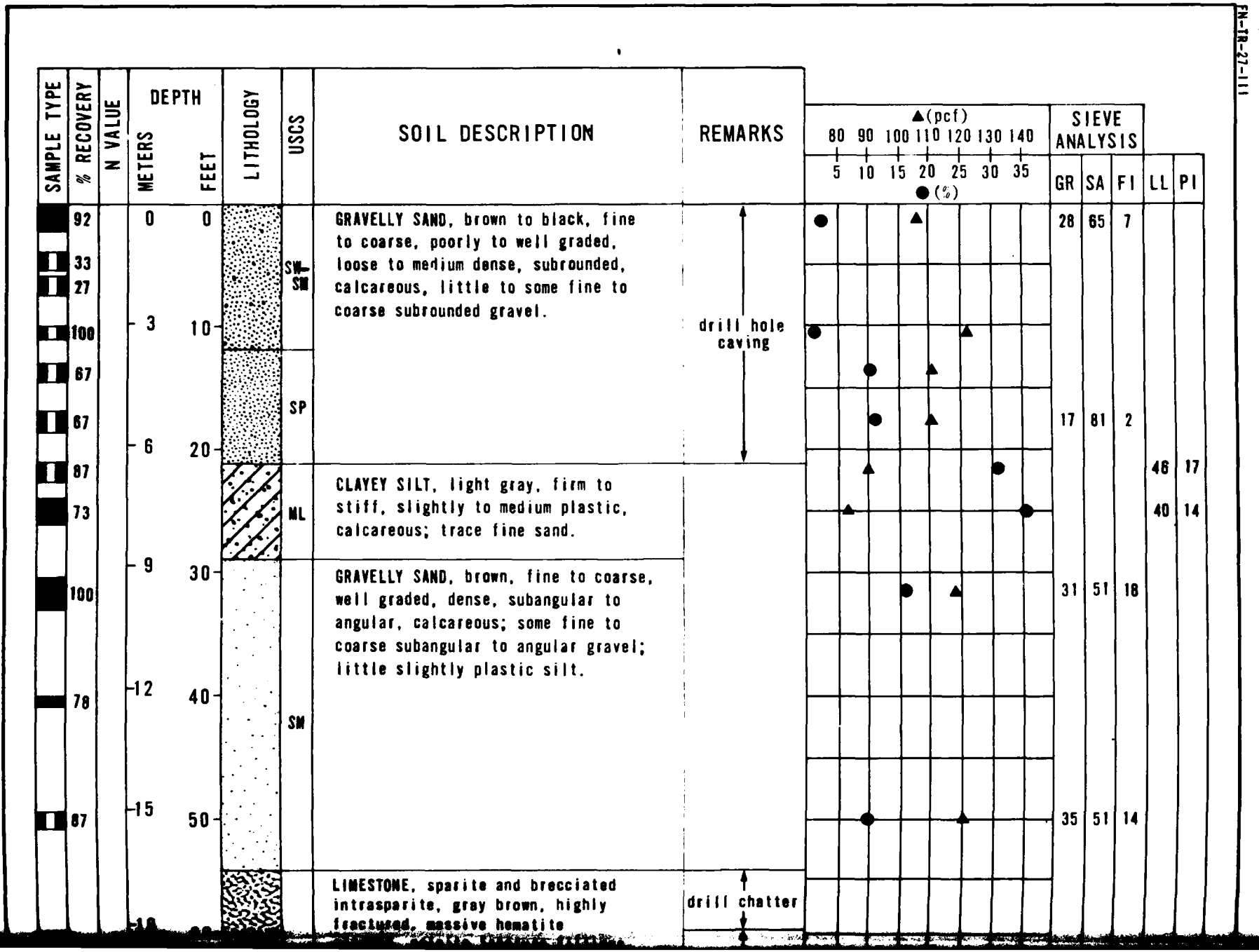
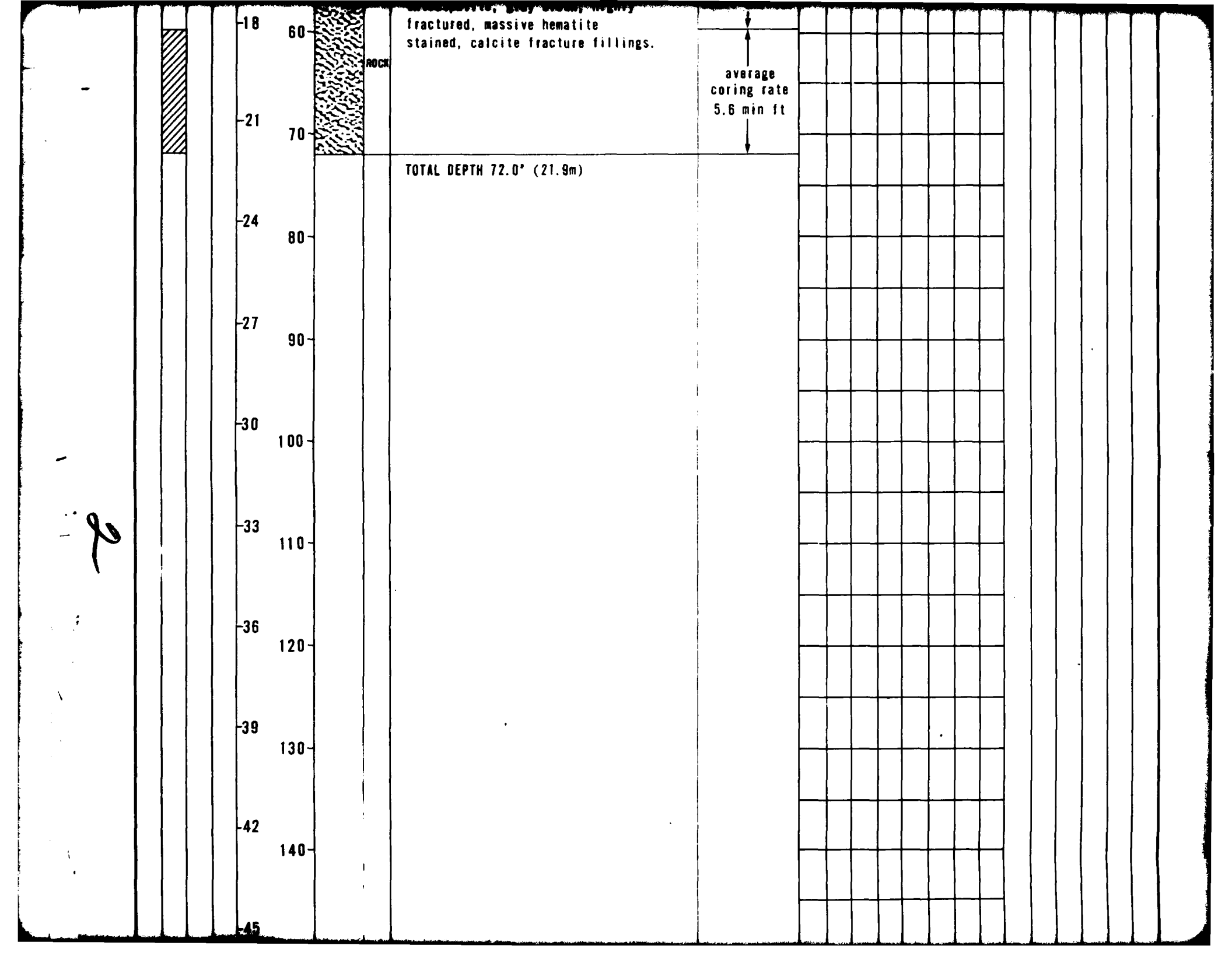
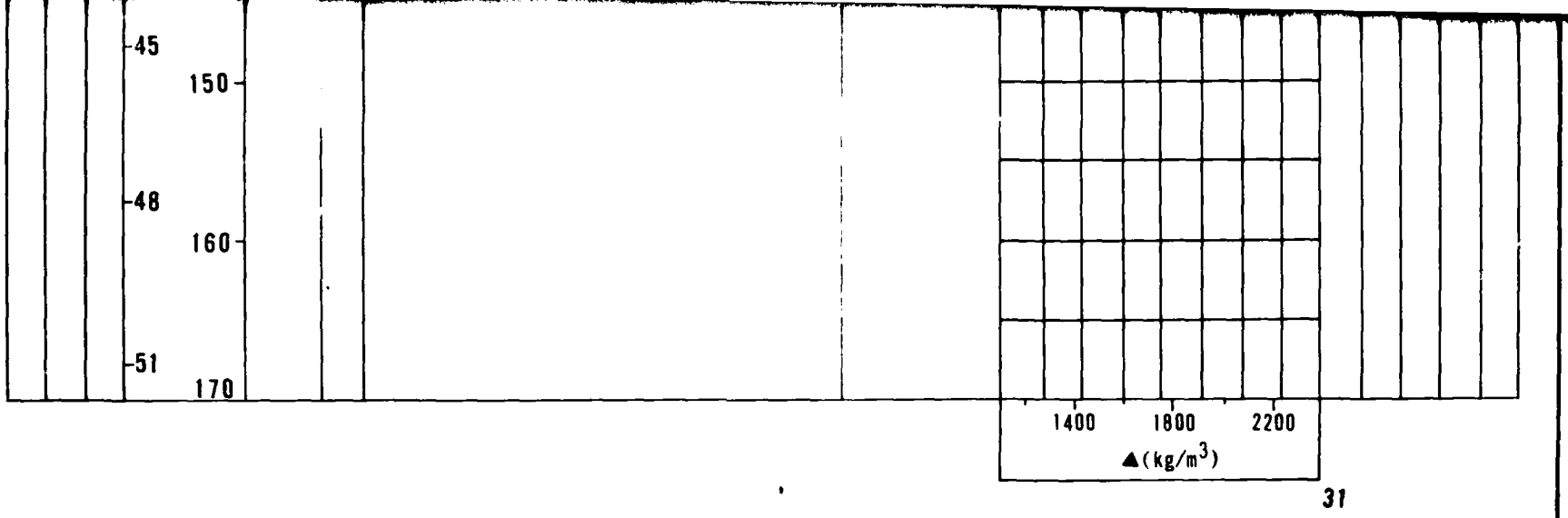
FN-IR-27-111




18
21
24
27
30
33
36
39
42
45
60
70
80
90
100
110
120
130
140
ROCK
fractured, massive hematite
stained, calcite fracture fillings.
average
coring rate
5.6 min ft
TOTAL DEPTH 72.0' (21.9m)



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 5030' (1533m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 31 OCT-1 NOV 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING SE-B-2
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE B-2

AFV-08

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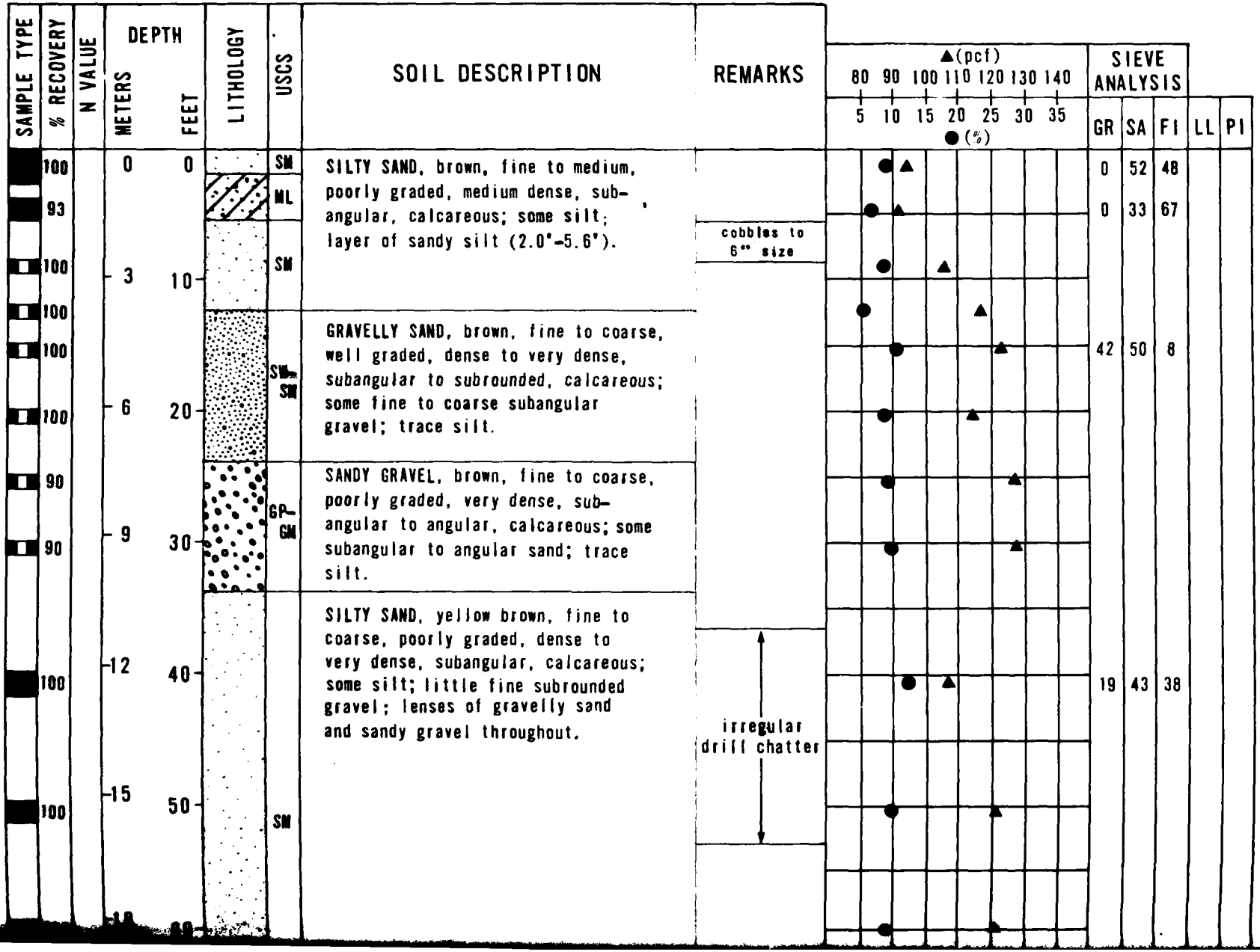
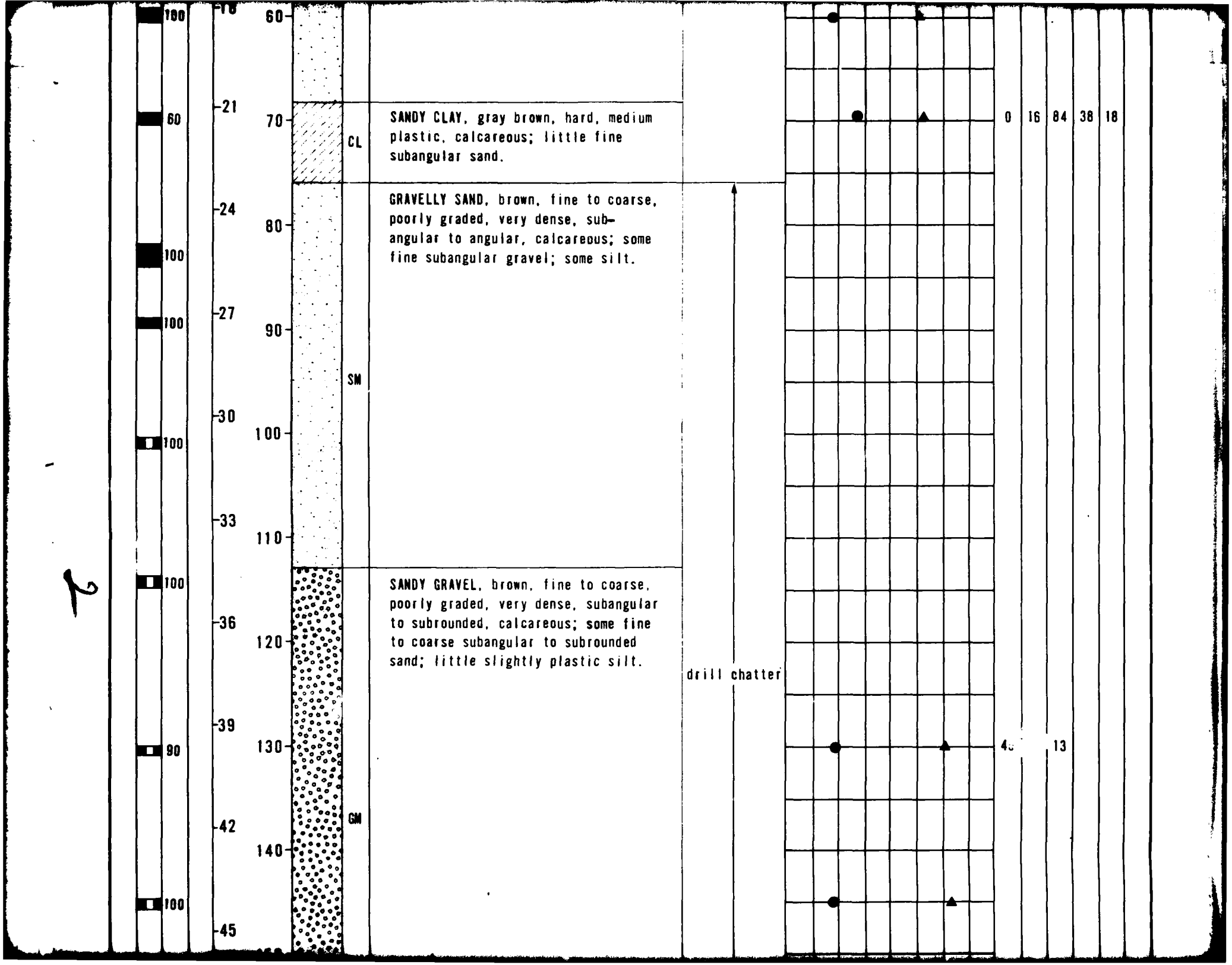
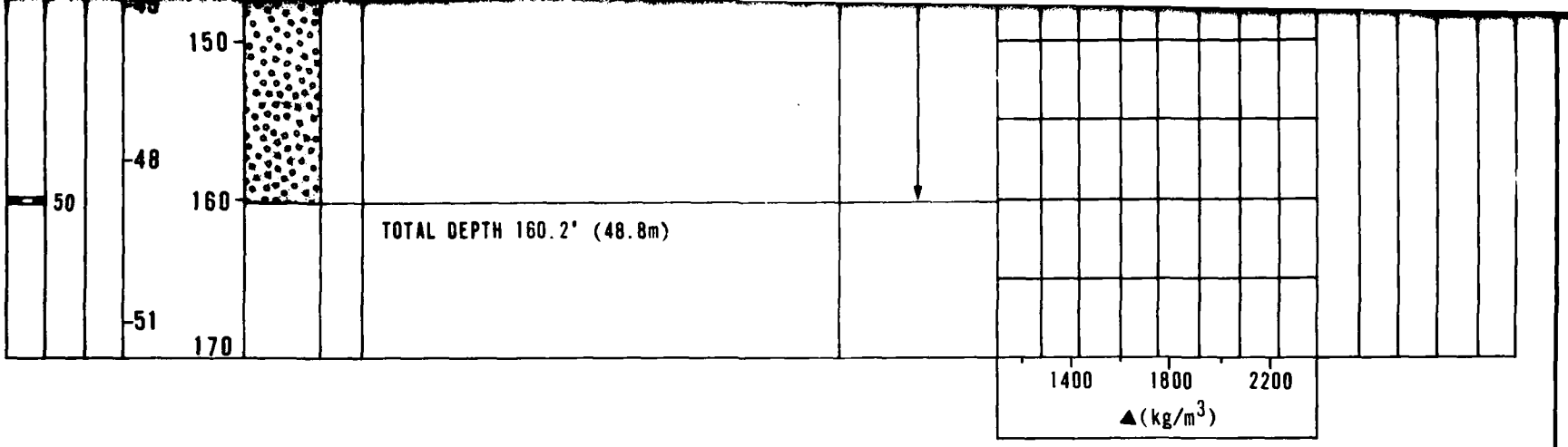



100
60
100
100
100
100
90
100
60
70
80
90
100
110
120
130
140
21
24
27
30
33
36
39
42
45
CL
SM
GM
SANDY CLAY, gray brown, hard, medium plastic, calcareous; little fine subangular sand.
GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, sub-angular to angular, calcareous; some fine subangular gravel; some silt.
SANDY GRAVEL, brown, fine to coarse, poorly graded, very dense, subangular to subrounded, calcareous; some fine to coarse subangular to subrounded sand; little slightly plastic silt.
drill chatter
0
16
84
38
18
13



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 5086' (1550m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 2-3 November 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

LOG OF BORING SE-B-3
VERIFICATION SITE, SNAKE EAST COP, UTAH

FIGURE B-3

AFV-08

3

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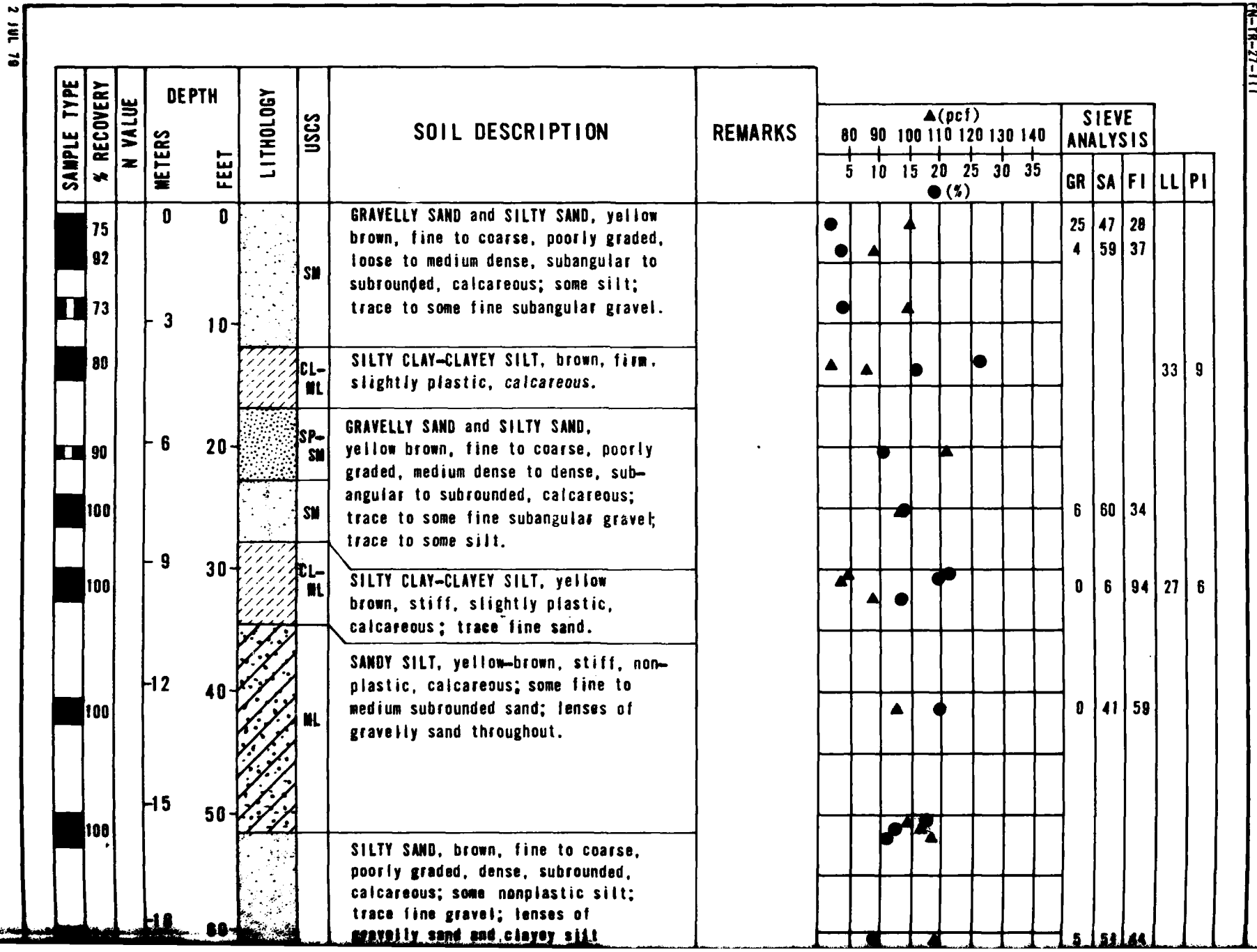

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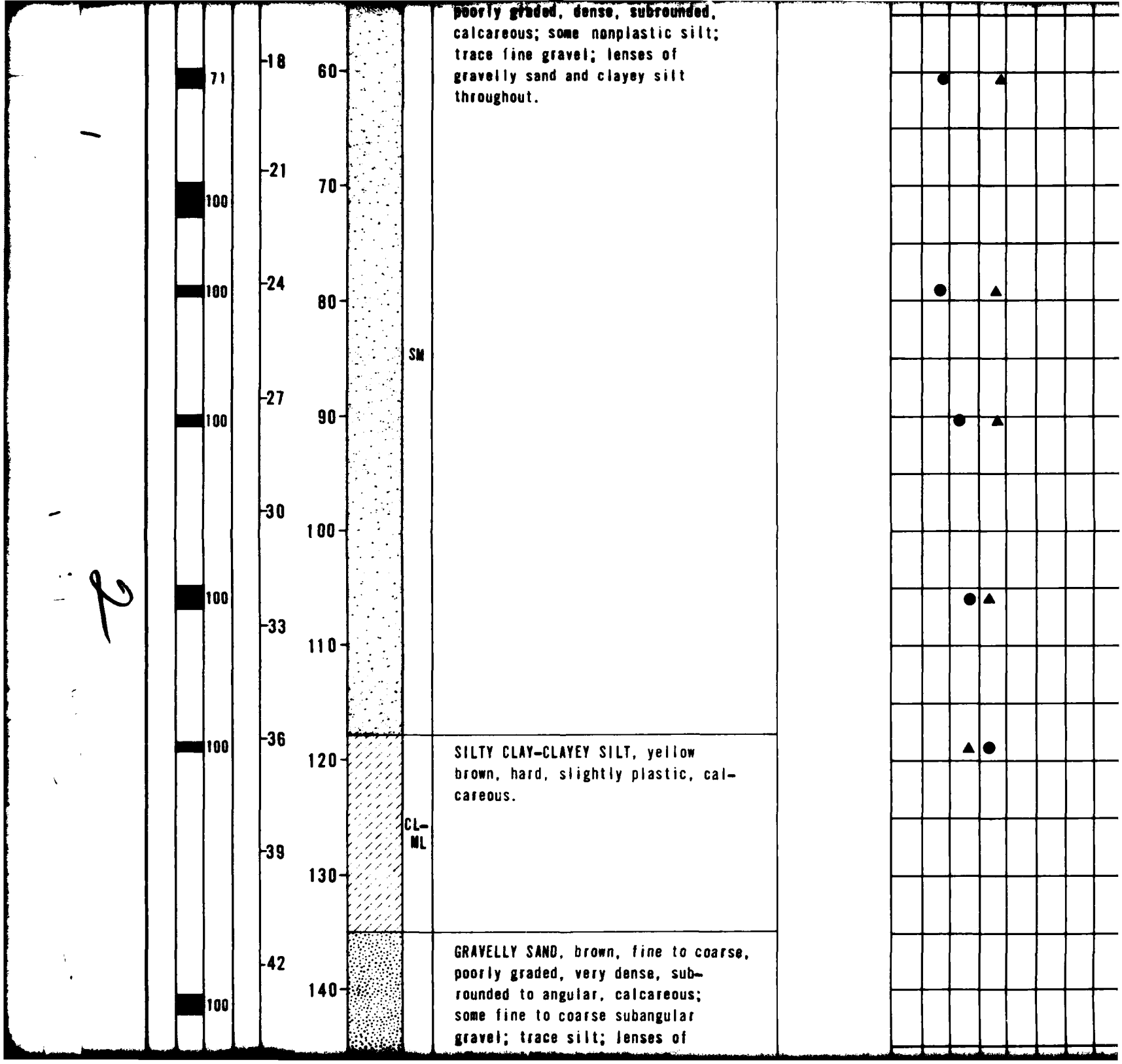
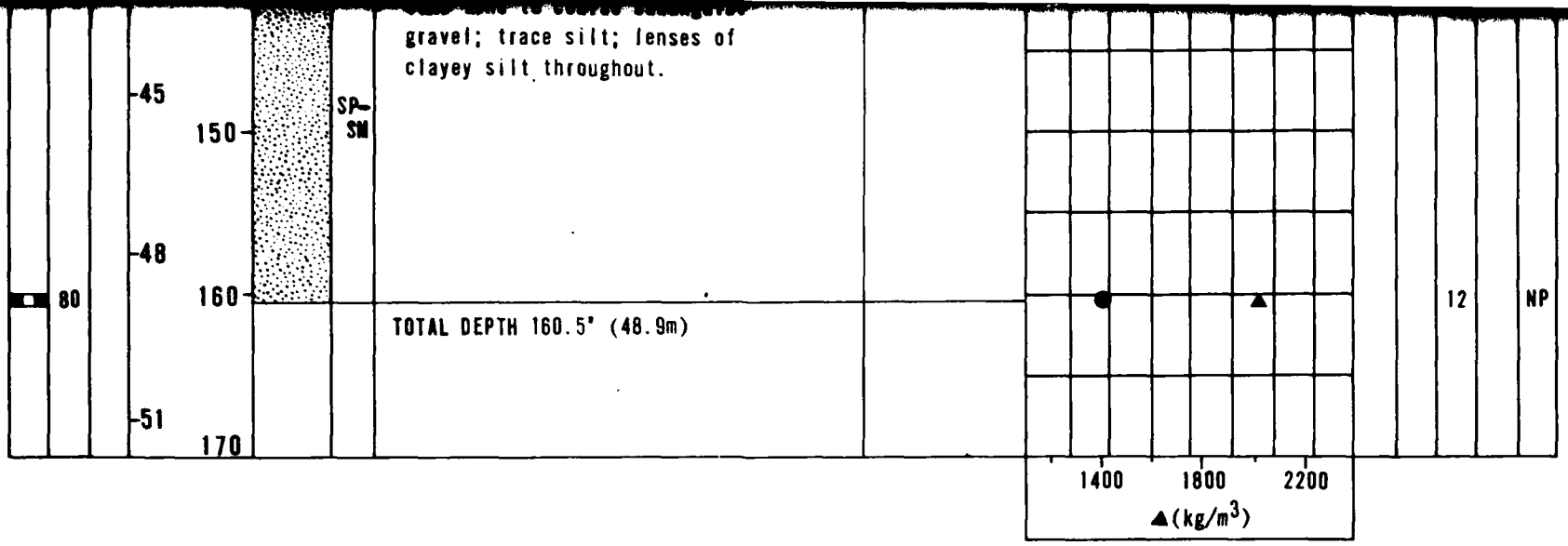

71
100
100
100
100
100
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
SM
CL-ML
poorly graded, dense, subrounded, calcareous; some nonplastic silt; trace fine gravel; lenses of gravelly sand and clayey silt throughout.
SILTY CLAY-CLAYEY SILT, yellow brown, hard, slightly plastic, calcareous.
GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, subrounded to angular, calcareous; some fine to coarse subangular gravel; trace silt; lenses of



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 5070' (1545m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 3-4 November
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING SE-8-4
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE · SAMSO

FIGURE 6-4

FUGRO NATIONAL, INC.

AFV-08

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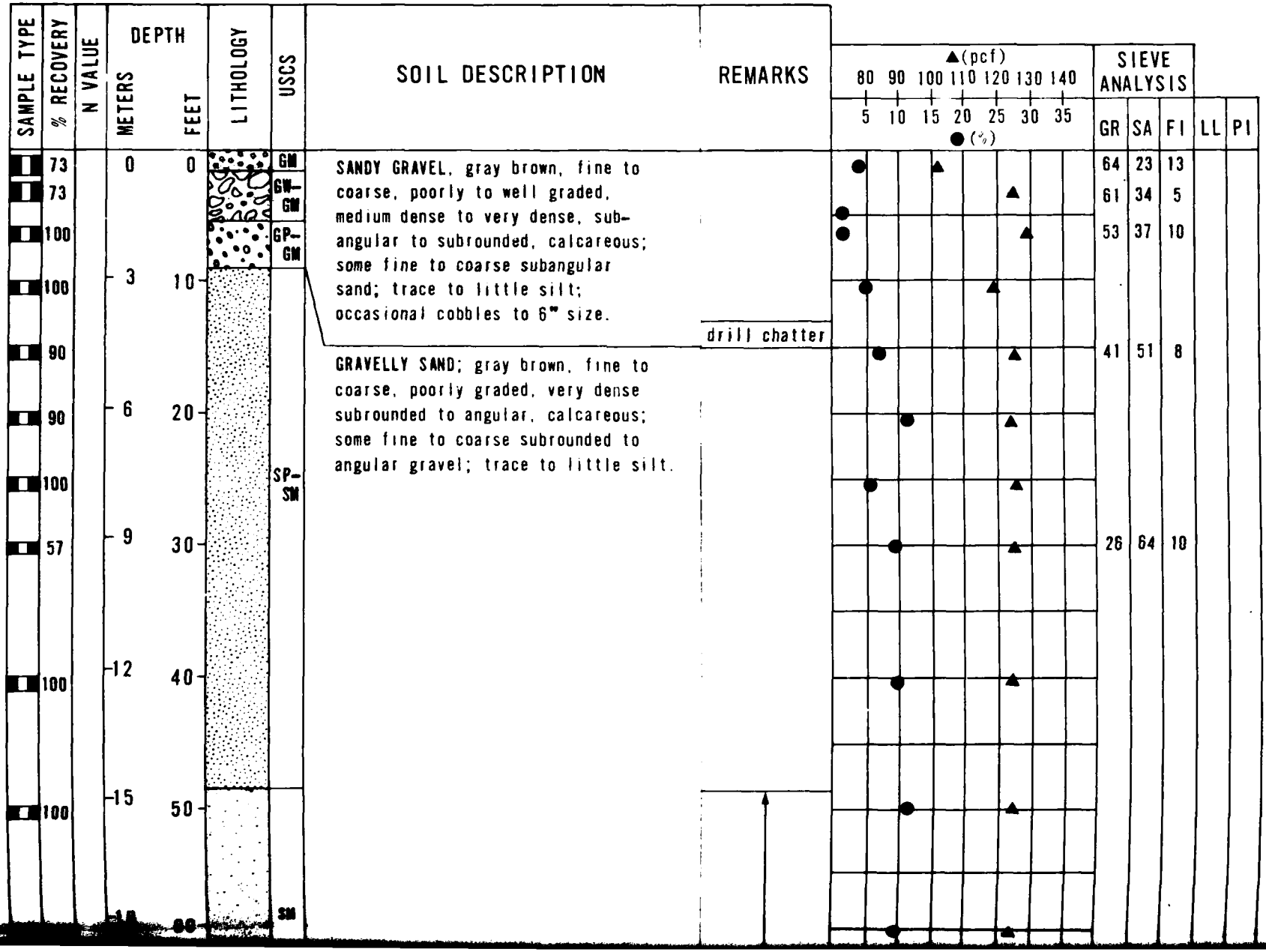
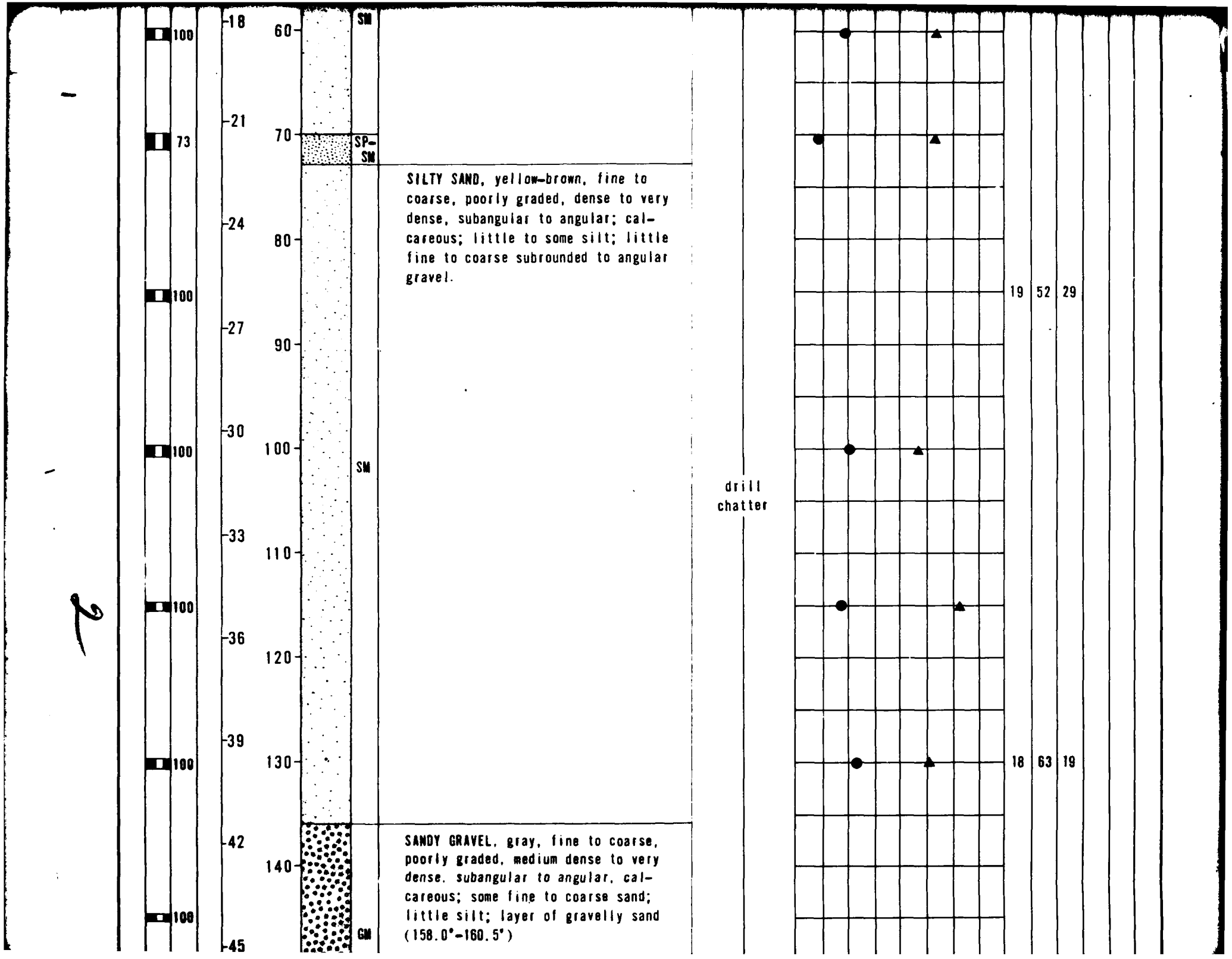
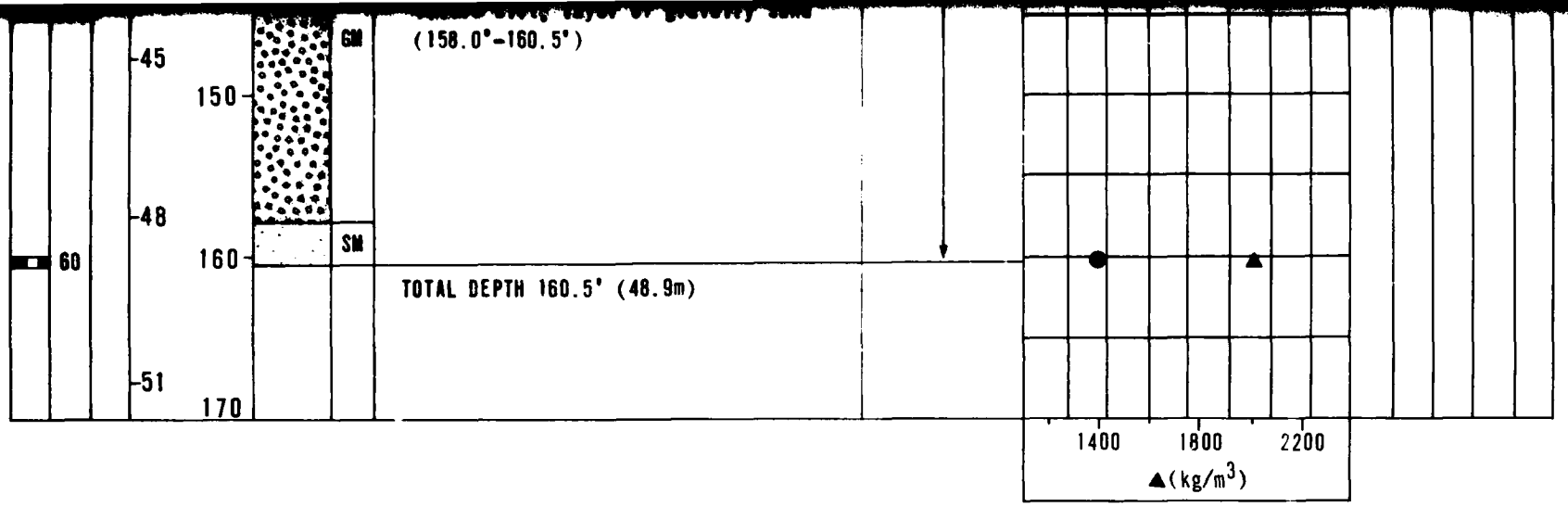



100
73
100
100
100
100
100
18
21
24
27
30
33
36
39
42
45
60
70
80
90
100
110
120
130
140
SM
SP-SM
SM
GM
SILTY SAND, yellow-brown, fine to coarse, poorly graded, dense to very dense, subangular to angular; calcareous; little to some silt; little fine to coarse subrounded to angular gravel.
SANDY GRAVEL, gray, fine to coarse, poorly graded, medium dense to very dense, subangular to angular, calcareous; some fine to coarse sand; little silt; layer of gravelly sand (158.0'-160.5')
drill chatter
19 52 29
18 63 19



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	:	5475' (1669m)
SURFICIAL GEOLOGIC UNIT	:	A5i
DATE DRILLED	:	4-5 November 1978
DRILLING METHOD	:	Rotary Wash
HOLE DIAMETER	:	4 7/8" (124mm)
WATER LEVEL	:	Not Encountered

LOG OF BORING SE-8-5
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 8-5

FUGRO NATIONAL, INC.

AFV-08

3

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2 JUL 78

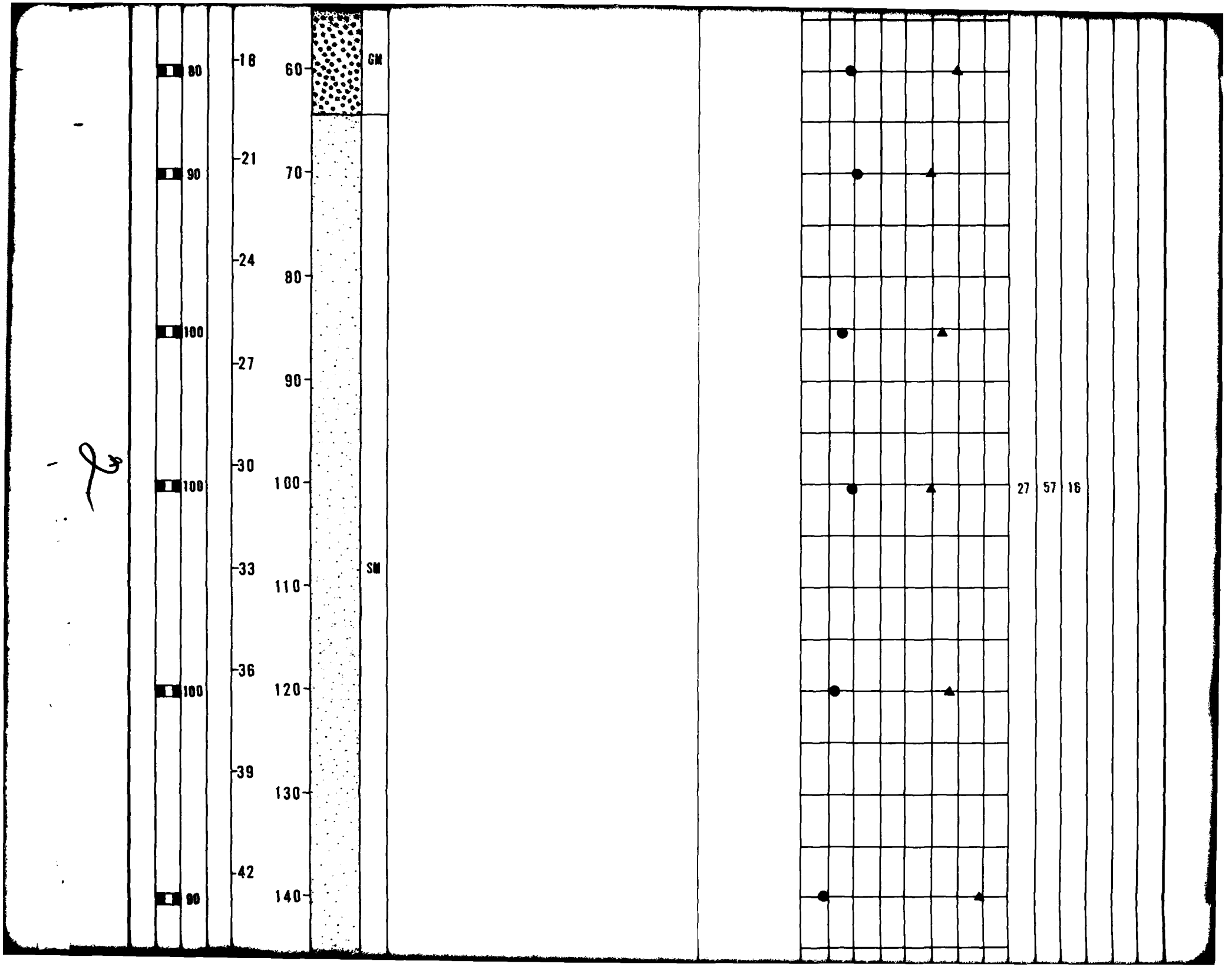
FN-TR-27-111

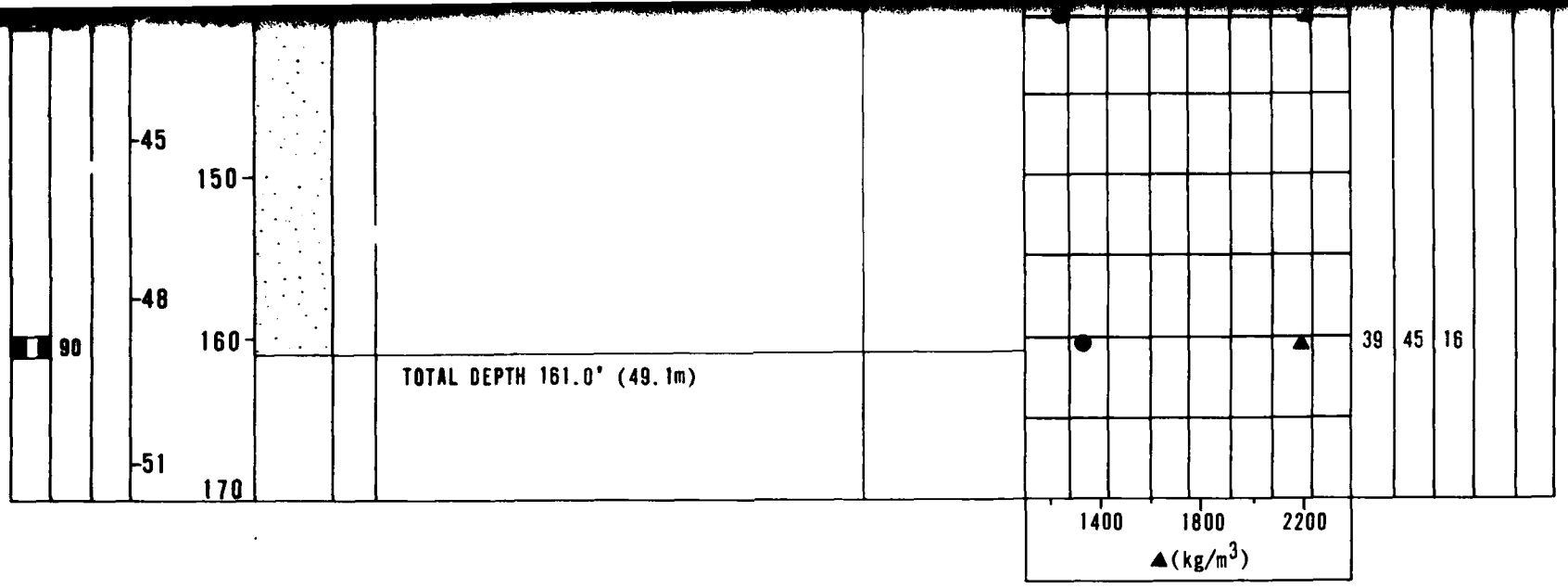
SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
	73		0	0		GM	Interbedded layers of GRAVEL and SAND:	drill hole caving
	80						GRAVEL:	
	67						SILTY GRAVEL (GM); brown, fine to coarse, poorly graded, medium dense to very dense, sub-rounded to subangular, calcareous; some fine to coarse sand; trace to little silt.	
	67		3	10		SM		drill chatter 6" cobble
	100							
	100		6	20		SP	SAND:	
	90						GRAVELLY SAND (SP, SM); brown, fine to coarse, poorly graded, dense to very dense, subrounded to angular, calcareous; some fine to coarse gravel; trace to little silt.	
	90		9	30		GM		
	90		12	40				
	90		15	50		SM		

▲(pcf) 80 90 100 110 120 130 140

● (%) 5 10 15 20 25 30 35

SIEVE ANALYSIS	GR	SA	FI	LL	PI
	49	28	23		
	21	59	20		
	25	61	14		
	45	42	13		
	26	53	21		


80
90
100
100
100
90
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
GM
SM
27
57
16



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 5375' (1638m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 6 November 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 3/4" (121mm)
WATER LEVEL	: Not Encountered

LOG OF BORING SE-B-6
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 6-6

FUGRO NATIONAL, INC.

AFV-08

CHECKED BY _____ APPROVED BY _____

2 JUL 78

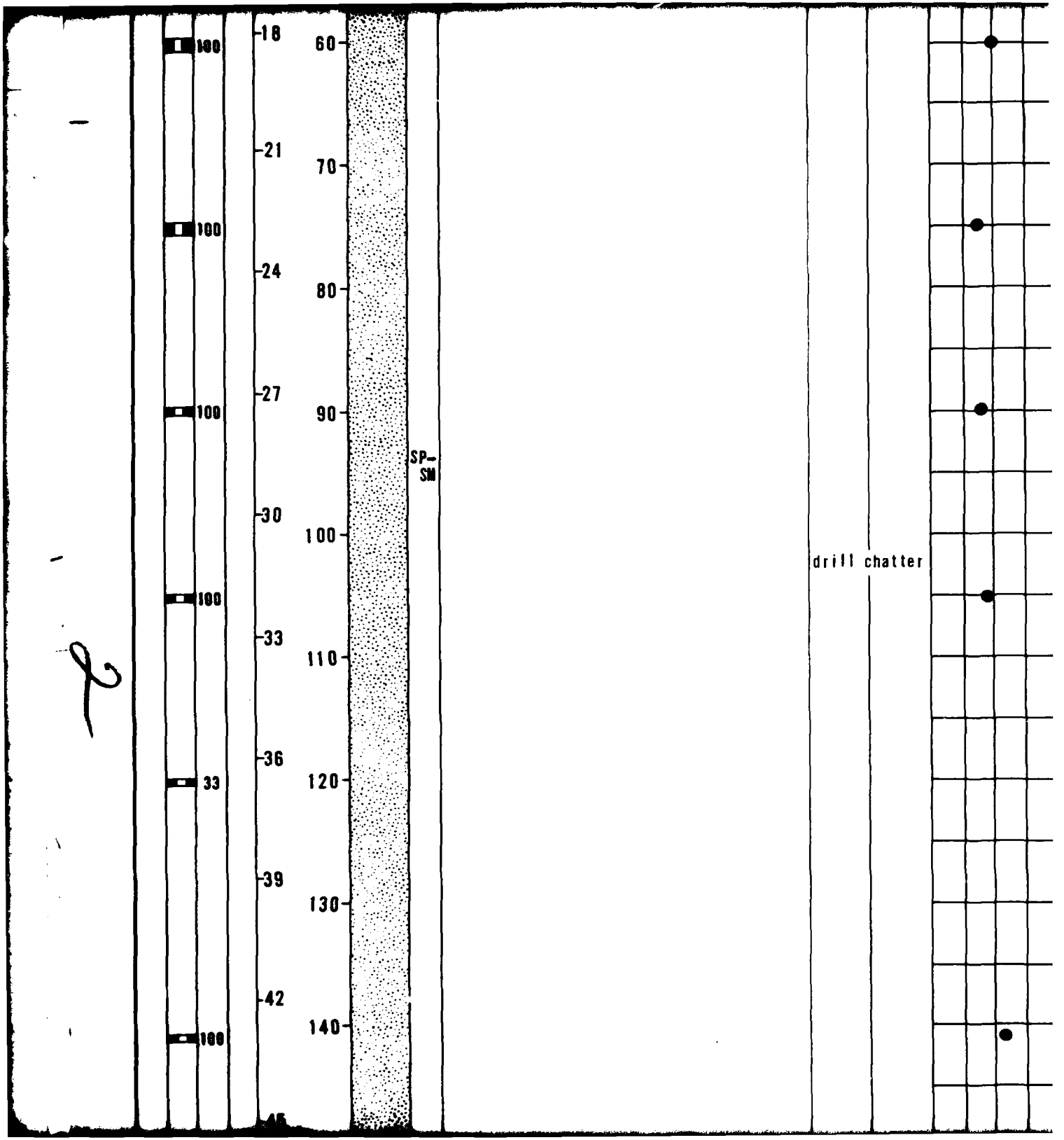
FN-TR-27-111

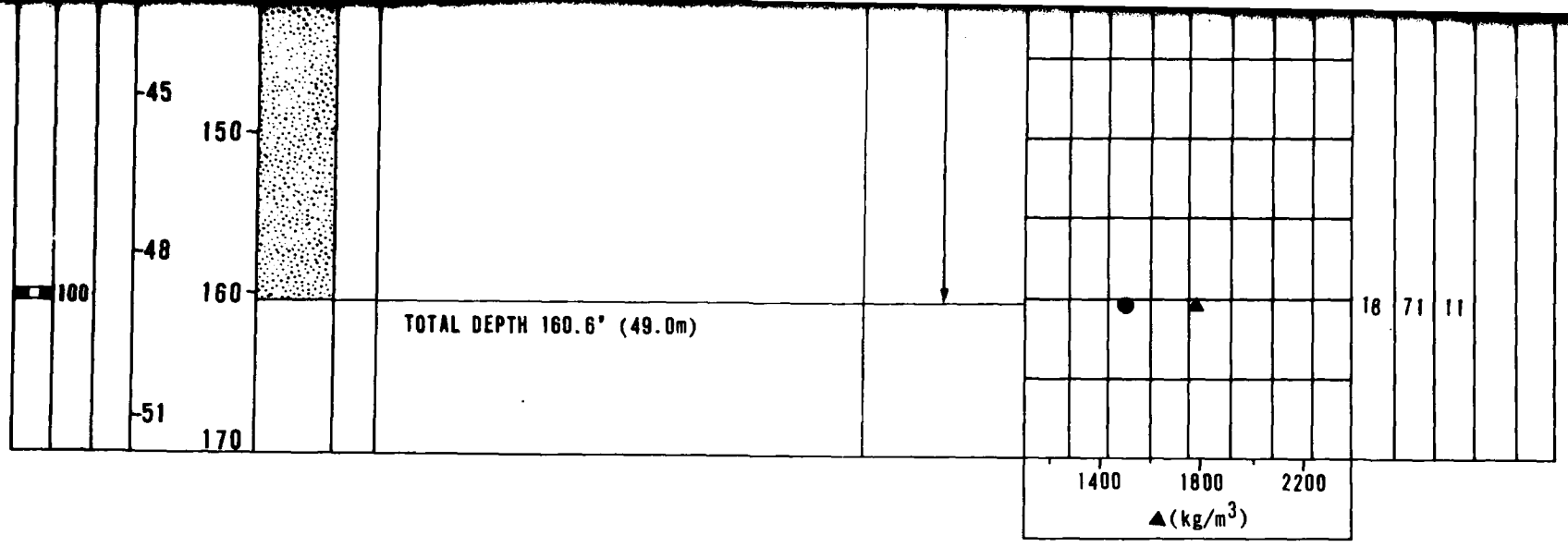
SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
	93		0	0		SM	GRAVELLY SAND, brown, fine to coarse, poorly to well graded, medium dense to very dense, subrounded to angular, calcareous; some fine to coarse subrounded to subangular gravel; trace silt; layers of silty sand (0.0'-2.0' and 23.0-28.0').	occasional cobbles to 6" size
	100							
	100					SP-SM		
	100		3	10				
	90					SW-SM		
	100		6	20				
	100					SM		
	100		9	30				
	100		12	40				
	100		15	50				

▲(pcf) 80 90 100 110 120 130 140

● (%) 5 10 15 20 25 30 35

SIEVE ANALYSIS GR	SA	FI	LL	PI
24	46	30		
21	65	14		
42	49	9		
24	66	10		
11	54	35		
28	66	6		


100
100
100
100
33
100
18
21
24
27
30
33
36
39
42
45
60
70
80
90
100
110
120
130
140
SP-
SM
drill chatter



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
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- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 5200' (1585m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 6–7 November 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 3/4" (121mm)
WATER LEVEL	: Not Encountered

LOG OF BORING SE-B-7
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE · SAMSO

FIGURE B-7

FUGRO NATIONAL, INC.

AFV-08

3

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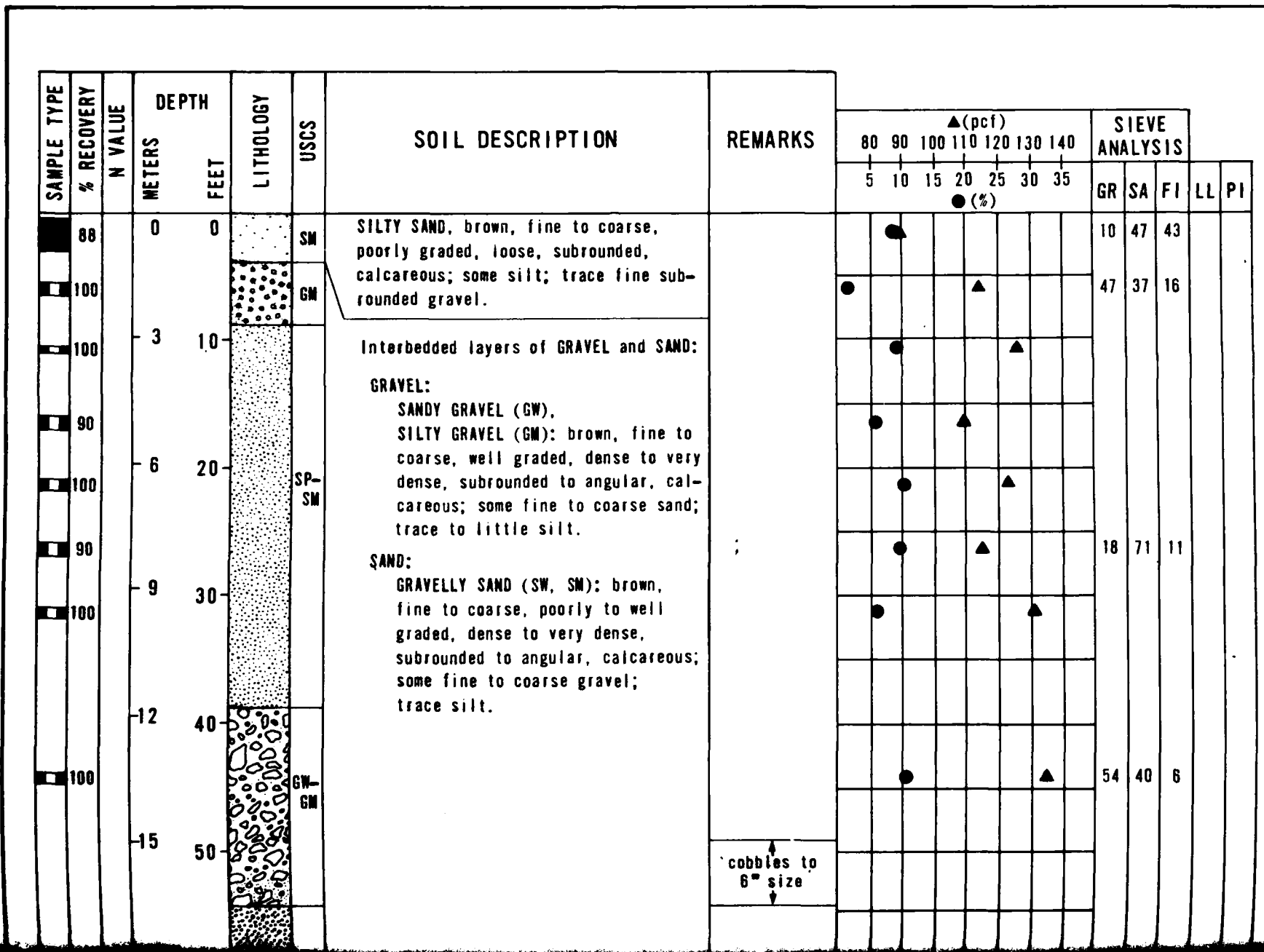
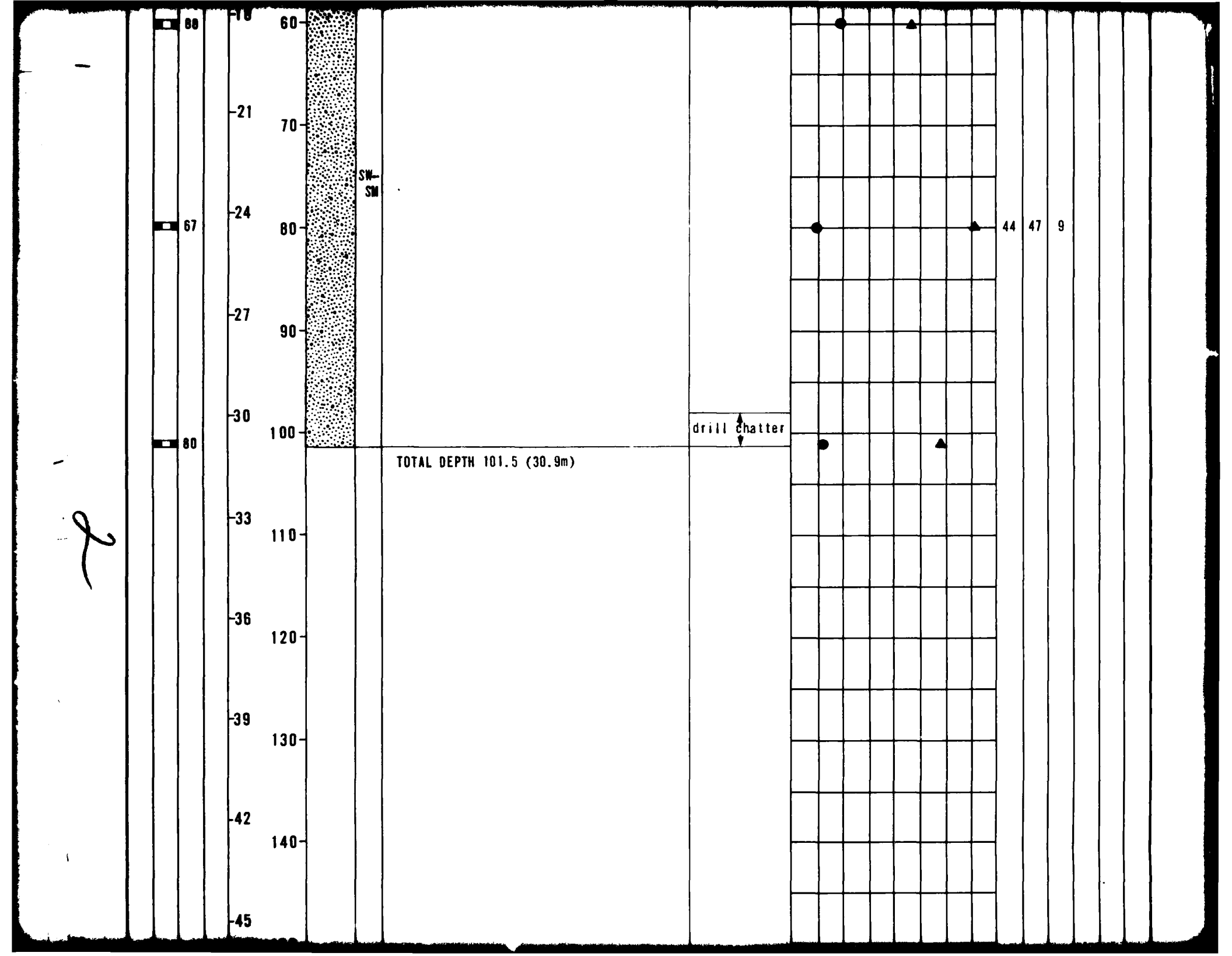
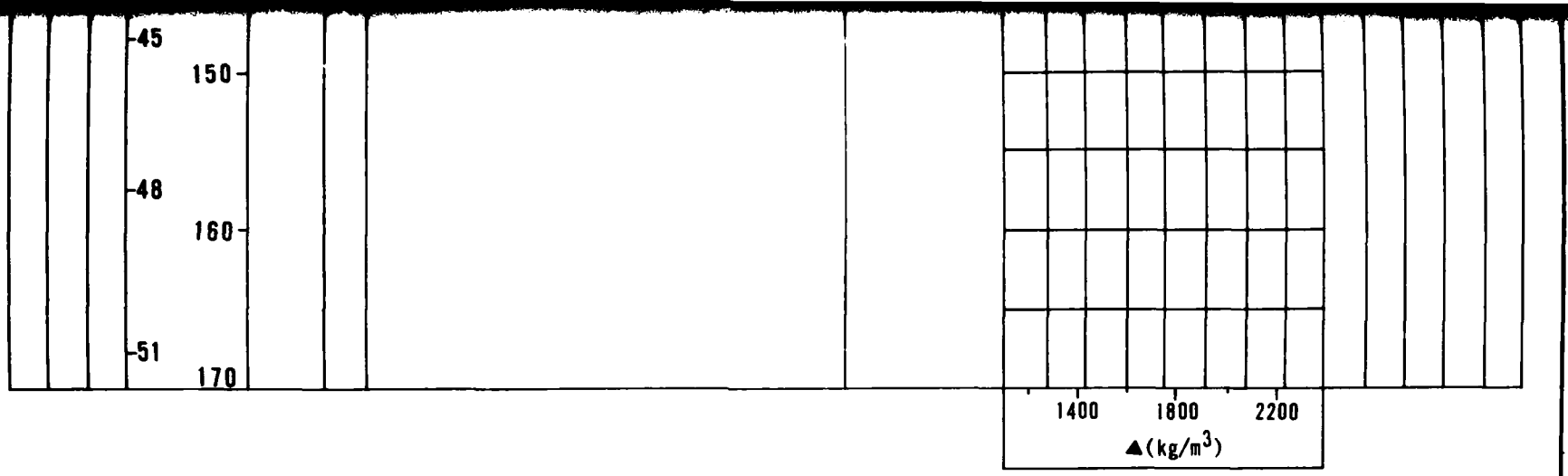
FN-TR-27-111




88
67
80
60
70
80
90
100
110
120
130
140
-21
-24
-27
-30
-33
-36
-39
-42
-45
SW-SM
drill chatter
TOTAL DEPTH 101.5 (30.9m)
44
47
9



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	: 5202' (1586m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 7-8 November 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 3/4" (121mm)
WATER LEVEL	: Not Encountered

LOG OF BORING SE-8-8
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 8-8

FUGRO NATIONAL, INC.

AFV-06

3

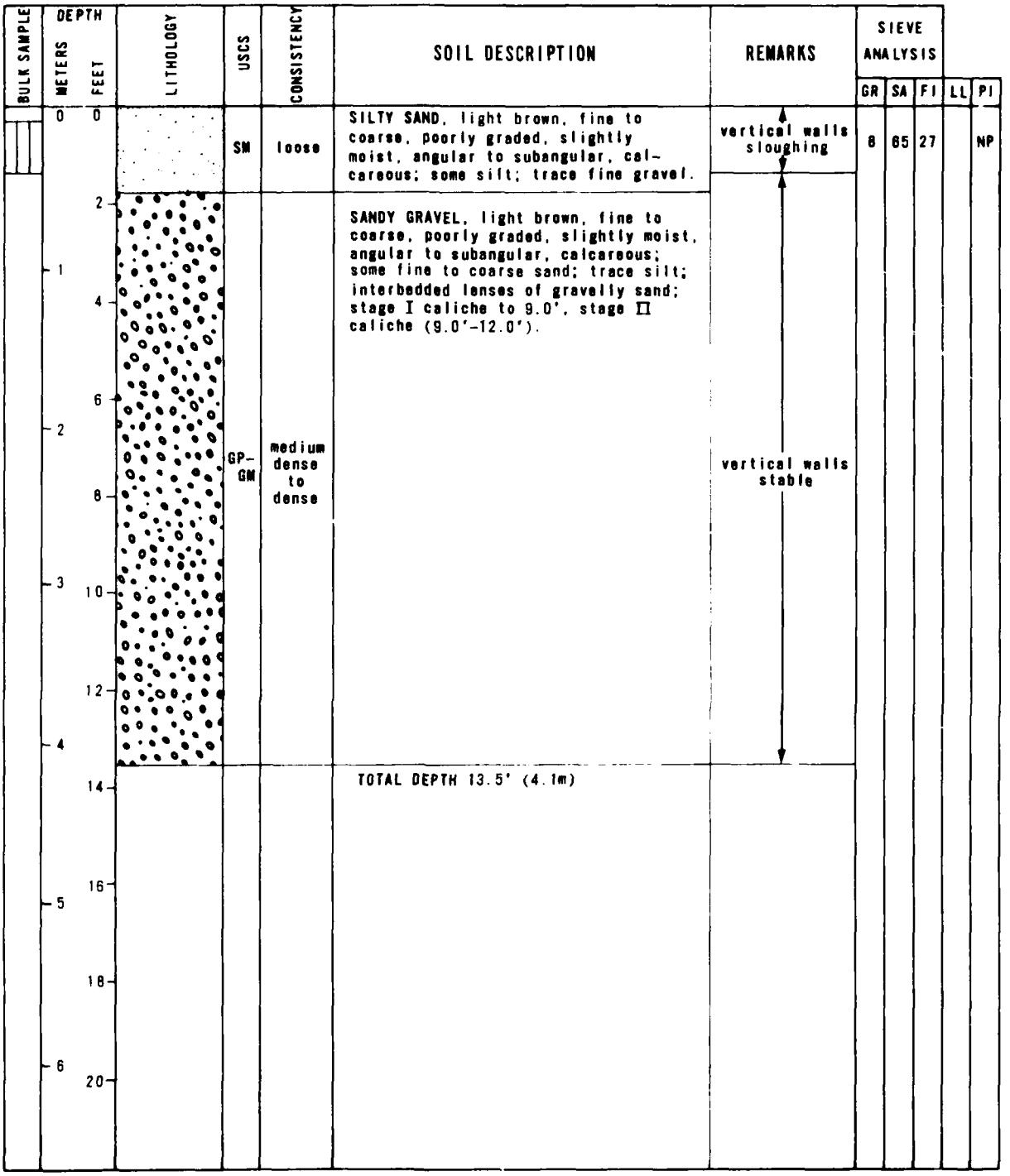
SECTION 7.0

TRENCH AND TEST PIT LOGS

EXPLANATIONS OF TRENCH AND TEST PIT LOGS

See Section 6.0, "Boring Logs", for explanations.

FN-TR-27-111



TRENCH DETAILS

SURFACE ELEVATION	:	5115' (1559m)
DATE EXCAVATED	:	31 OCTOBER 1978
SURFICIAL GEOLOGIC UNIT	:	A5y, A4o
TRENCH LENGTH	:	14.8' (4.5m)
TRENCH ORIENTATION	:	NW - SE

LOG OF TRENCH SE-T-1
VERIFICATION SITE, SNAKE EAST CDP, UTAH

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FIGURE 7-1

WOODWARD-CLYDE CONSULTANTS

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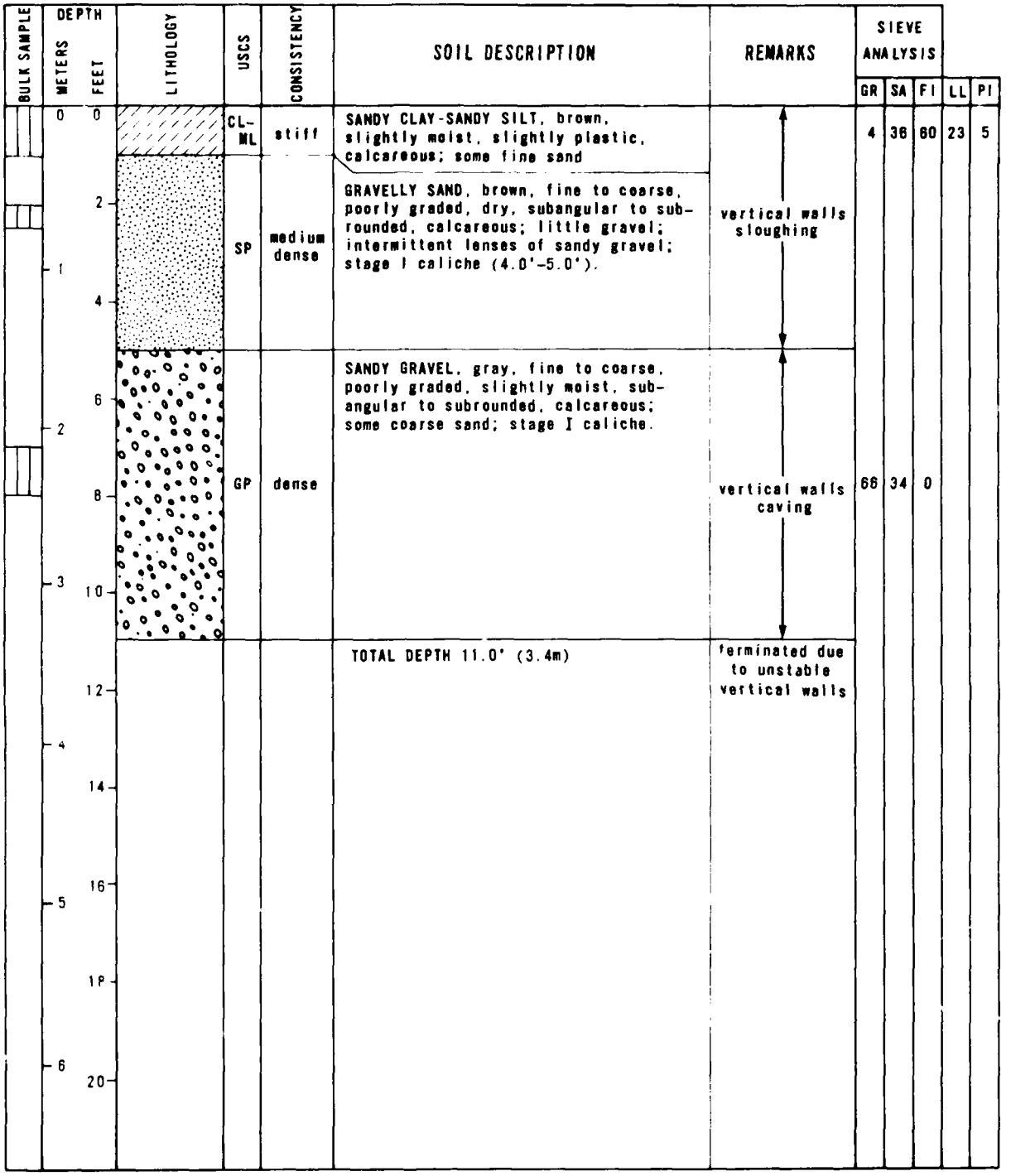

TRENCH DETAILS

SURFACE ELEVATION : 5030' (1533m)
DATE EXCAVATED : 1 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT : A4a
TRENCH LENGTH : 12.5' (3.8m)
TRENCH ORIENTATION : W-E

LOG OF TRENCH SE-T-2
VERIFICATION SITE, SNAKE EAST CDP, UTAH

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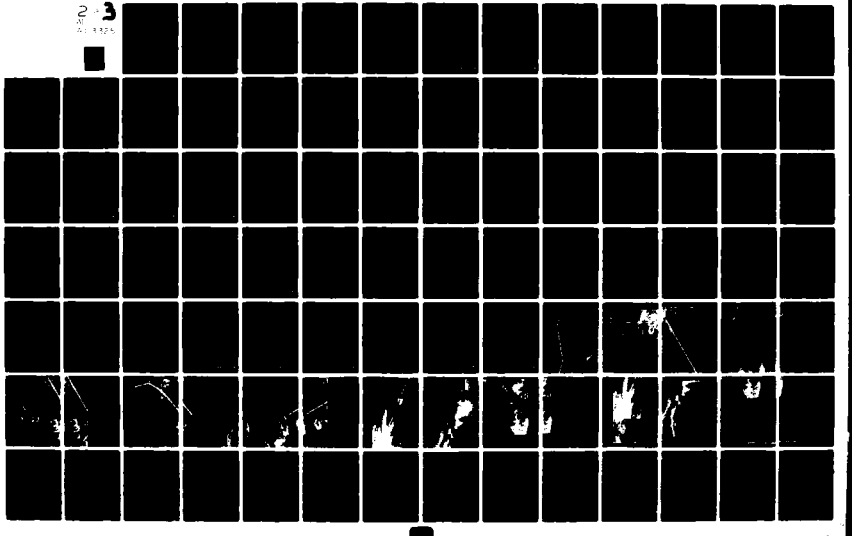
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 7-2

UGRO NATIONAL, INC.

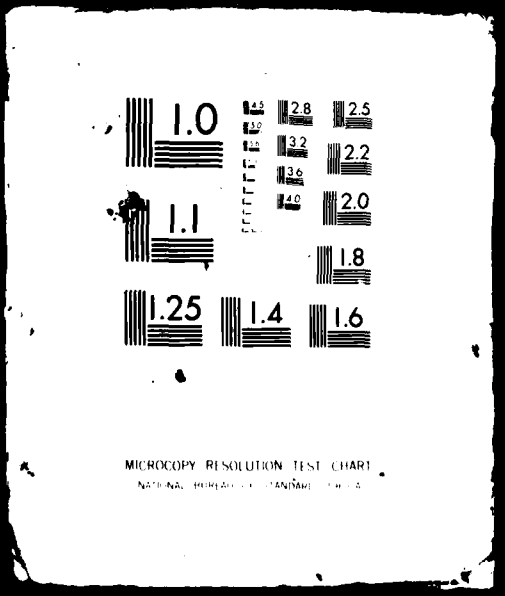
AD-A113 325 FUGRO NATIONAL INC .LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME III. N--ETC(U)
AUG 79 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-VOL-3 NL



2 OF 3

AD-

A113325



FN-TR-27-111

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SC-SM	medium dense	CLAYEY SAND-SILTY SAND, light brown, fine to medium, poorly graded, slightly moist, subangular to subrounded, calcareous; some slightly plastic silt; lenses of sand and silty clay throughout.	vertical walls stable			33	26	7
		2										
	1	4		GM	medium dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; little silt; occasional cobbles to 5" size (6.0'-14.0'). stage I caliche.						
		6										
	2	8			dense							
	3	10										
		12			medium dense							
	4	14				TOTAL DEPTH 14.0' (4.3m)						
		16										
	5											
		18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 5086' (1550m)
DATE EXCAVATED : 3 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH SE-T-3
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-3

WOODWARD-NATIONAL, INC.

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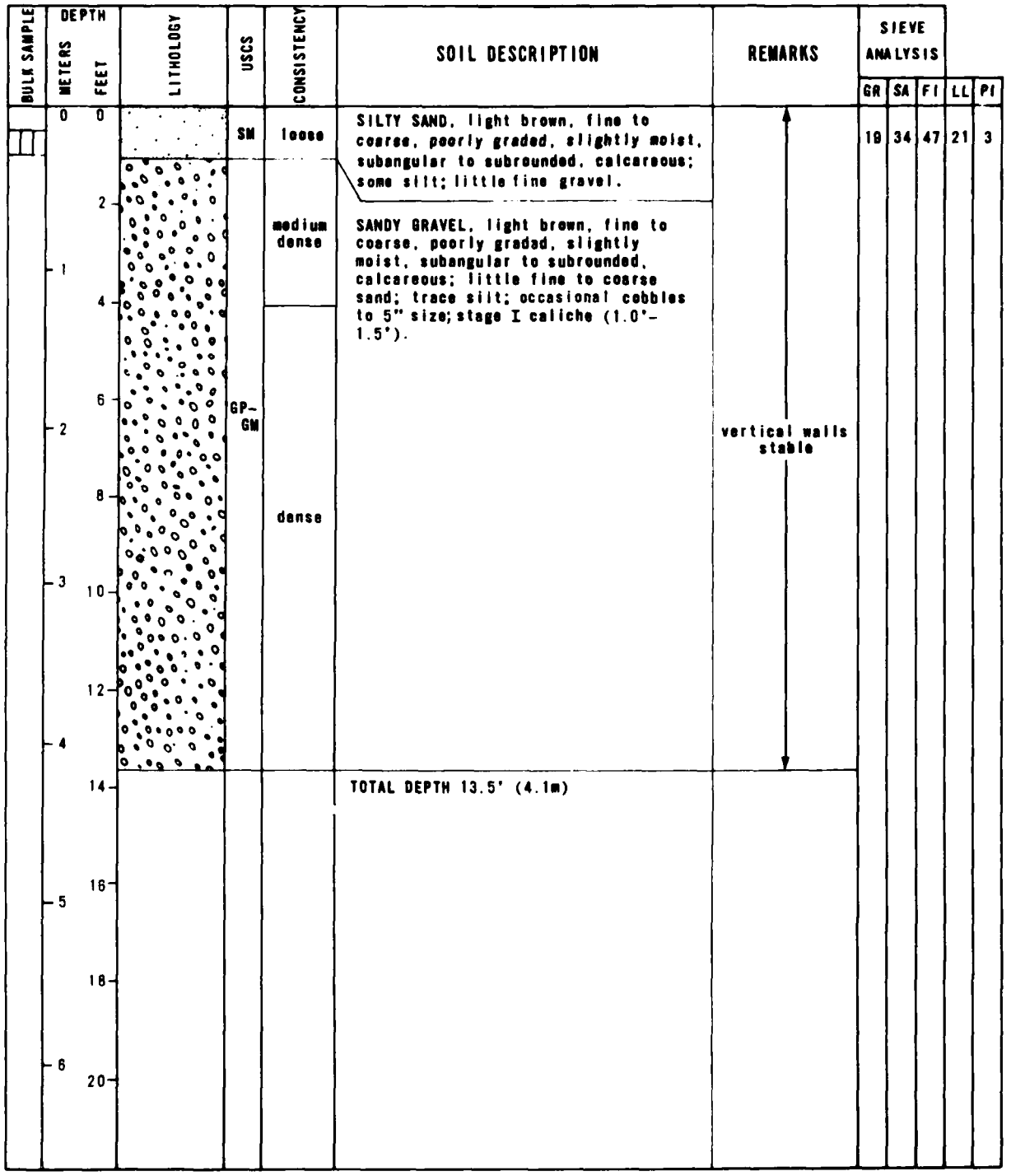
AFV-04



TRENCH DETAILS

SURFACE ELEVATION : 5475' (1669m)
DATE EXCAVATED : 4 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.3' (4.4m)
TRENCH ORIENTATION : NE - SW

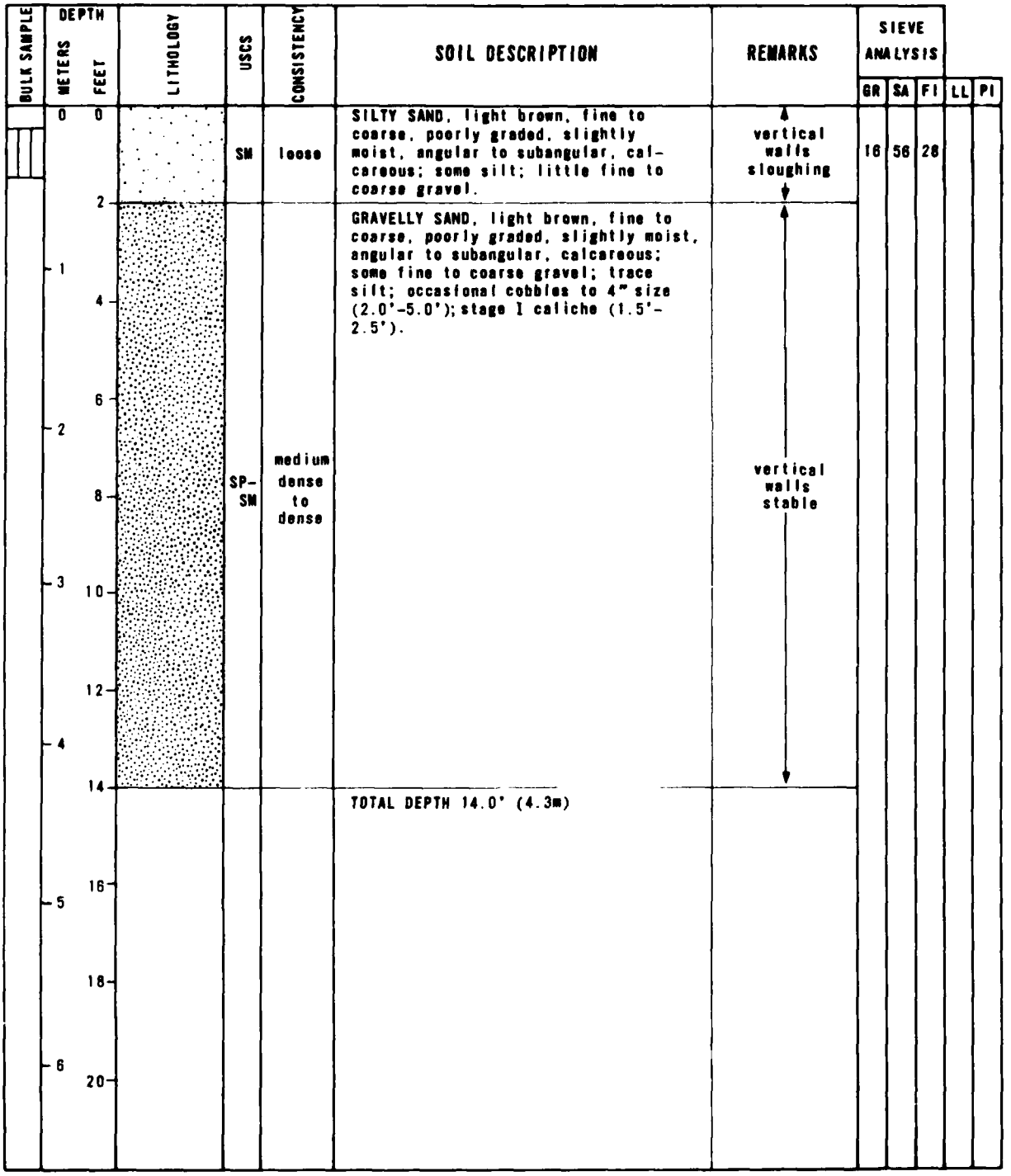
LOG OF TRENCH SE-T-4
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-4

WOODWARD-CLYDE CONSULTANTS

FN-TR-27-111



TRENCH DETAILS

SURFACE ELEVATION	: 5200' (1585m)
DATE EXCAVATED	: 5 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 14.7' (4.5m)
TRENCH ORIENTATION	: W-E

LOG OF TRENCH SE-T-5
VERIFICATION SITE, SNAKE EAST CDP, UTAH

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DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-5

FUGRO NATIONAL, INC.

2 JUL 79

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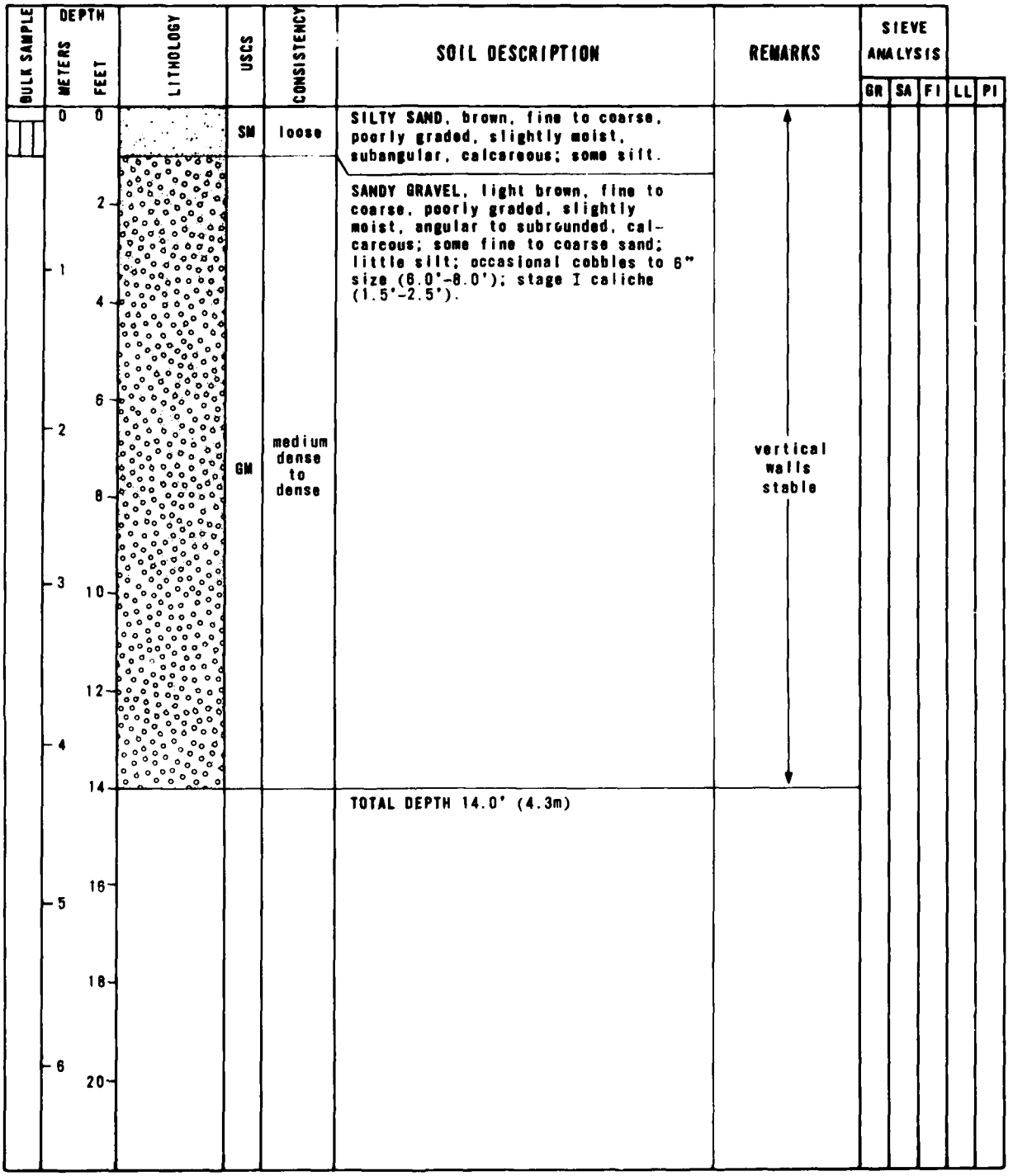
FN-TR-27-111



TRENCH DETAILS

SURFACE ELEVATION : 5375' (1638m)
DATE EXCAVATED : 5 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 14.3' (4.4m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH SE-T-6
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

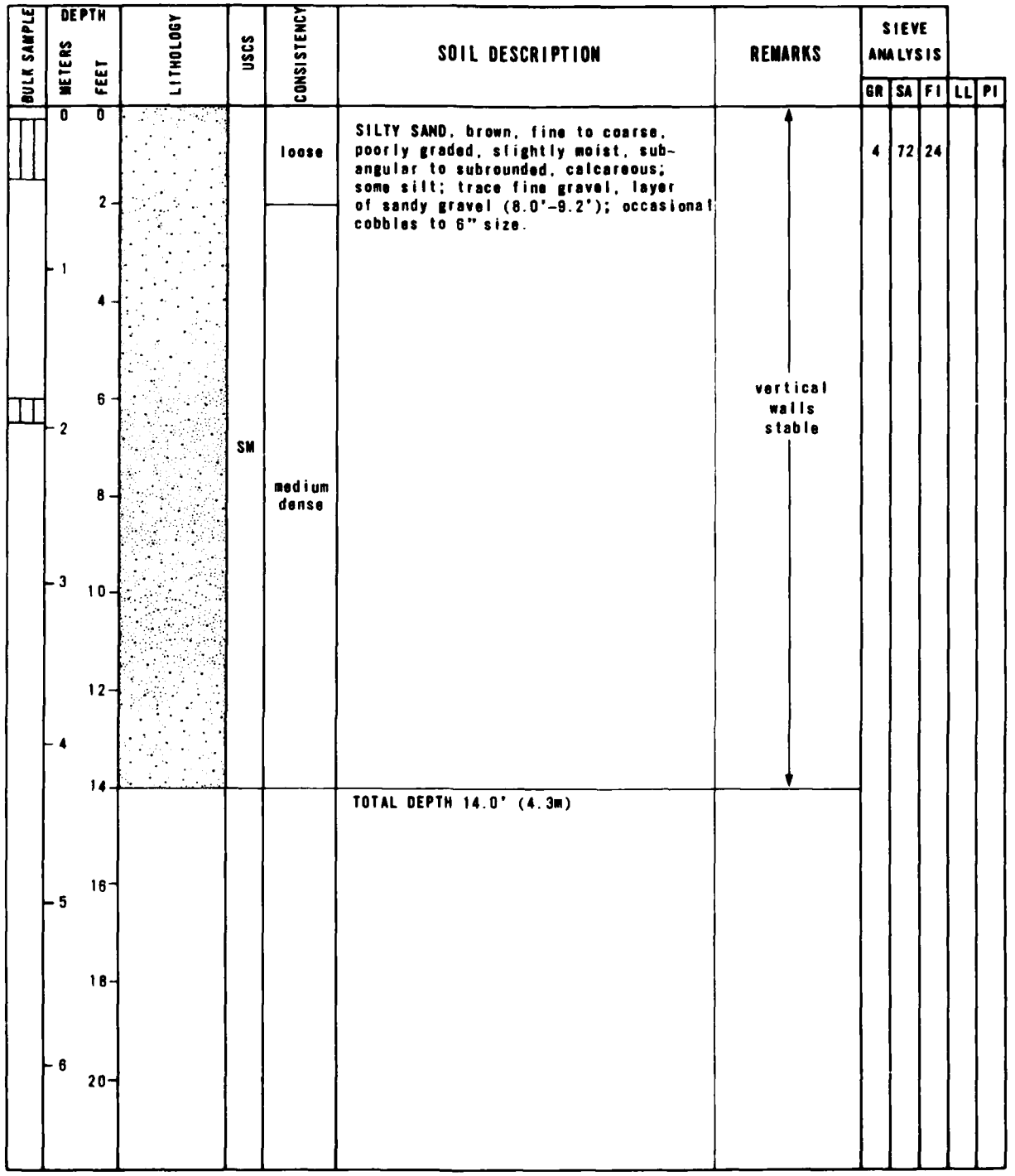
FIGURE 7-6

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFV-04

FN-TR-27-III



TRENCH DETAILS

SURFACE ELEVATION	:	5070' (1545m)
DATE EXCAVATED	:	6 NOVEMBER 1978
SURFICIAL GEOLOGIC UNIT	:	A4o
TRENCH LENGTH	:	16.0' (4.9m)
TRENCH ORIENTATION	:	NE-SW

LOG OF TRENCH SE-T-7
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-7

FUGRO NATIONAL, INC.

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AFV-04

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse gravel; little silt.		18	69	13		
		1		GP	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some sand; trace silt; stage I caliche.						
		2										
		3		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some silt; trace fine gravel; layer of sandy gravel (4.0'-4.5').		12	50	38		
	1	4		GP	dense							
				SM	dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5098' (1553m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

LOG OF TEST PIT SE-P-1

	0	0										
		1										
		2										
	1	3										
		4										
		5										

SURFACE ELEVATION:
SURFICIAL GEOLOGIC UNIT:

LOG OF TEST PIT

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CHEC Y

LOG OF TEST PIT SE-P-1
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-8

WOODWARD-CLYDE CONSULTANTS

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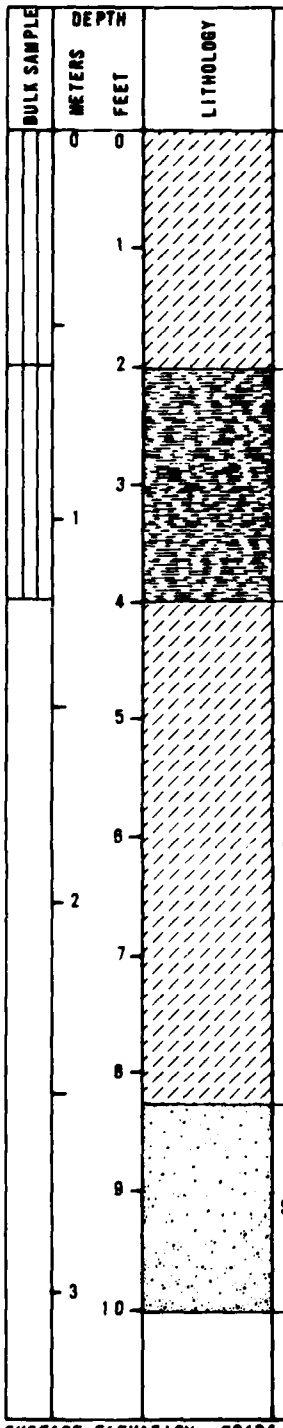
AFV-03



BULK SAMPLE	DEPTH METERS	DEPTH FEET	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0	CL	firm	SILTY CLAY, brown, slightly moist, medium plastic, calcareous; little fine sand; stage I caliche						
		1									
		2	CH	very stiff	CLAY, light brown, slightly moist, medium to highly plastic, calcareous.						
	1	3									
		4	CL	firm	SANDY CLAY, light brown, slightly moist, slightly plastic, calcareous; little gravel (6.8'– 8.0'); stage I caliche.						
		5									
		6									
	2	7									
		8									
		9	SM	dense	GRAVELLY SAND, light brown, medium to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little fine gravel; trace silt; stage II caliche.						
	3	10			TOTAL DEPTH 10.0' (3.0m)						

SURFACE ELEVATION: 5010' (1527m)
SURFICIAL GEOLOGIC UNIT: A4e

LOG OF TEST PIT SE-P-2

LOG OF TEST PIT SE-P-2
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-9

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFV-05

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt; trace fine gravel.		8	64	28		
		1										
		2		GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some sand; occasional cobbles to 5" size; little silt; stage II caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5055' (1547m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

LOG OF TEST PIT SE-P-3

	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some silt; trace fine gravel.		9	61	30		
		1			medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse gravel; little silt; stage I caliche.						
		2										
	1	3			dense							
		4			very dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5010' (1527m)
SURFICIAL GEOLOGIC UNIT: A5y, A4o

LOG OF TEST PIT SE-P-4

LOGS OF TEST PITS SE-P-3 AND SE-P-4
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-10

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; little silt; trace fine gravel; stage I caliche.						
		1										
		2		GP	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; occasional cobbles to 5" size (2.0'-5.0'); stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5198' (1584m)
SURFICIAL GEOLOGIC UNIT: A5i (S2)

LOG OF TEST PIT SE-P-5

	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; little fine to coarse gravel; stage I caliche.						
		1										
		2		GP-GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5025' (1532m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

LOG OF TEST PIT SE-P-6

APPR... BY

CHEC... Y

LOGS OF TEST PITS SE-P-5 AND SE-P-6
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 7-11

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, *subangular to subrounded, calcareous*; and fine to coarse gravel; some silt; stage I caliche.		36	38	26		
	1											
		2		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subrounded, calcareous; some medium to coarse sand; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5034' (1534m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

LOG OF TEST PIT SE-P-7

	0	0		SM	medium dense	SILTY SAND, light brown, fine to *coarse, poorly graded, slightly moist*, subangular to subrounded, calcareous; *some silt*; some fine gravel; stage I caliche (1.0'-1.5').		22	46	32		
	1											
		2		GP-GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; trace silt; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5301' (1618m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-8

LOGS OF TEST PITS SE-P-7 AND SE-P-8
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 7-12

FUGRO NATIONAL, INC.

2 JUL 79

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little fine to coarse gravel; little silt.						
	1											
		2		GP-GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; trace silt; occasional cobbles to 8" size; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5485' (1868m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-9

	0	0		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt.						
		1										
		2		SC	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse gravel; little clay; stage I caliche.						
	1	3		CL	very stiff	SANDY CLAY, brown, slightly moist, medium plastic, calcareous; some fine to coarse sand.						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5024' (1531m)
SURFICIAL GEOLOGIC UNIT: A5y A4o

LOG OF TEST PIT SE-P-10

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LOGS OF TEST PITS SE-P-9 AND SE-P-10
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

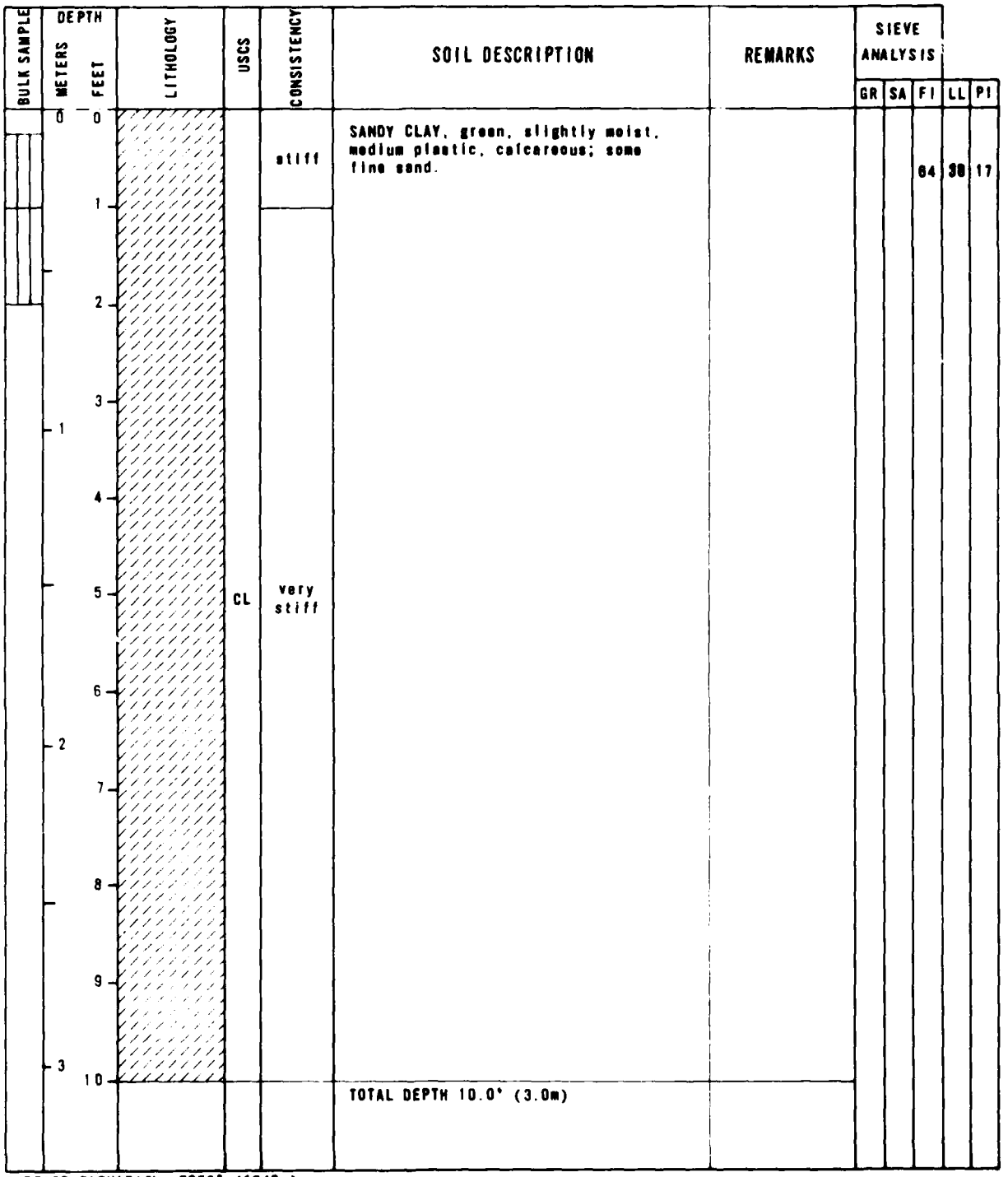
FIGURE 7-13

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFV-03

FN-TR-27-111



SURFACE ELEVATION: 5053' (1540m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

LOG OF TEST PIT SE-P-11

APPR BY

MECH

LOG OF TEST PIT SE-P-11
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE · SAMSO

FIGURE
7-14

WOODWARD-NATIONAL, INC.

2 JUL 79

AFV-05

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little silt; little fine gravel; occasional cobbles to 5" size (1.0'-5.0').						
		1										
		2		GM	very dense	SANDY GRAVEL, light brown, fine to coarse sand, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; some silt; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5145' (1568m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-12

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, dark brown, fine to coarse, poorly graded, moist, angular to subangular, calcareous.						
		1										
		2		GP-GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little fine to coarse sand, trace silt; occasional cobbles to 5" size; stage II caliche (2.0'-5.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5410' (1649m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-13

APPR BY

CHEC Y

LOGS OF TEST PITS SE-P-12 AND SE-P-13
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-15

FUGRO NATIONAL, INC.

2 JUL 79

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some silt; some fine gravel.		21	54	25		NP
	1											
		2		GP-GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some sand; trace silt; occasional cobbles to 4" size; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5069' (1545m)
SURFICIAL GEOLOGIC UNIT: A5y A4o

LOG OF TEST PIT SE-P-14

	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little silt; trace fine gravel.						
	1											
		2		GP-GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little fine to coarse sand; trace silt; occasional cobbles to 5" size; stage I caliche (1.5'-4.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5160' (1573m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-15

LOGS OF TEST PITS SE-P-14 AND SE-P-15
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 7-16

WOODWARD-CLYDE CONSULTANTS

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some silt; little fine gravel; occasional cobbles and boulders to 18" size (0.5'-5.0').		16	55	29		
	1											
		2		GP-GM	medium dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, angular to subrounded, calcareous; little fine to coarse sand; trace silt; stage I caliche (1.0'-3.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5800' (1707m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-16

	0	0										
		1										
		2										
	1	3										
		4										
		5										

SURFACE ELEVATION:
SURFICIAL GEOLOGIC UNIT:

LOG OF TEST PIT

LOG OF TEST PIT SE-P-16
VERIFICATION SITE, SNAKE EAST CDP, UTAH

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FIGURE 7-17

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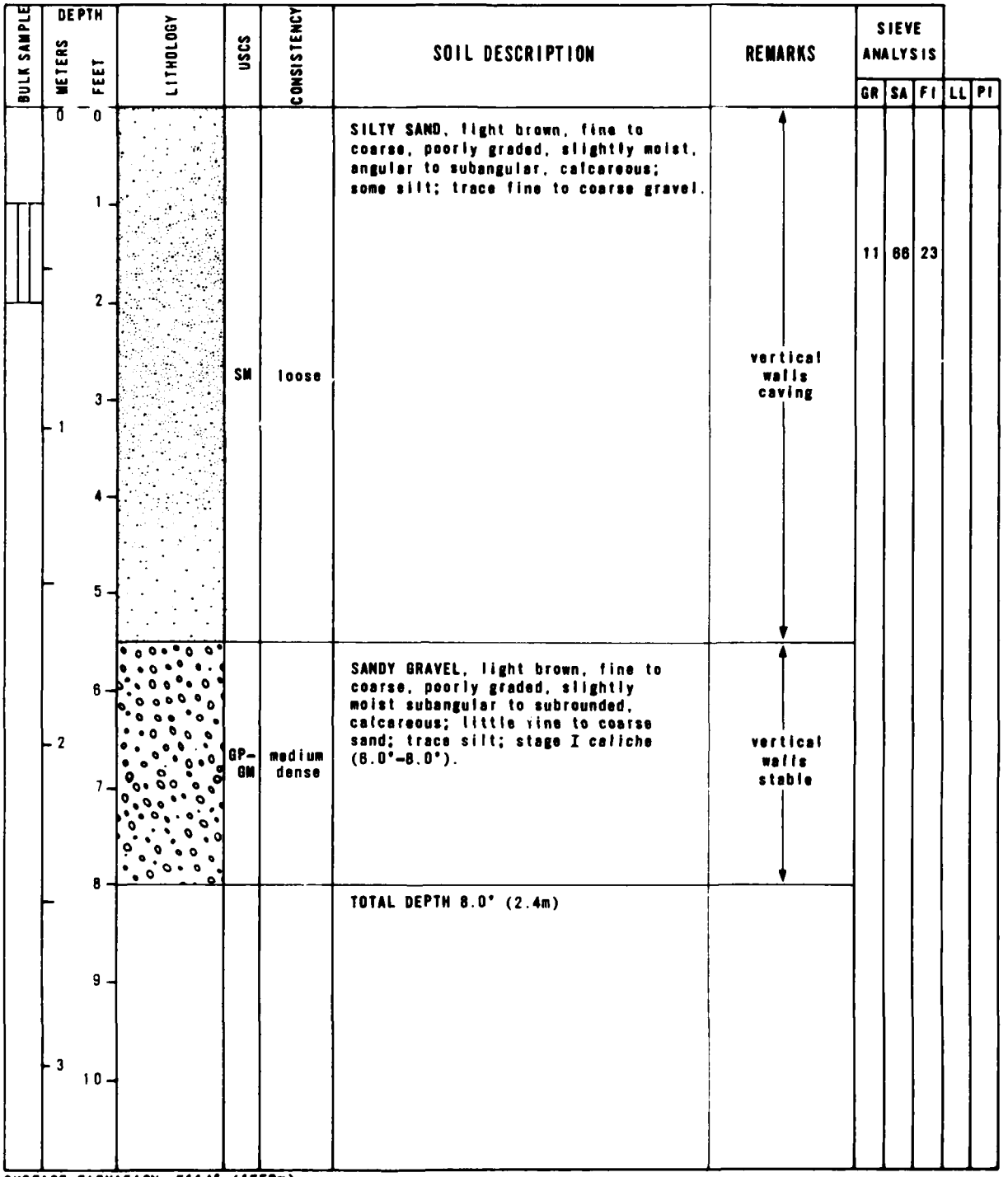
2 JUL 79

AFV-03



SURFACE ELEVATION: 5114' (1559m)
SURFICIAL GEOLOGIC UNIT: A5I

LOG OF TEST PIT SE-P-17

LOG OF TEST PIT SE-P-17 VERIFICATION SITE, SNAKE EAST CDP, UTAH	
MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAMSO	FIGURE 7-18

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AFV-05

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse gravel; trace silt; occasional cobbles to 10" size.						
		1										
		2		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; little fine to coarse gravel; stage I caliche; layer of sandy gravel (4.5'-5.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5248' (1600m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-18

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subrounded, calcareous; some silt; trace fine gravel; occasional cobbles to 4" size.						
		1										
		2										
		3		SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subrounded calcareous; some fine to coarse gravel; little silt; occasional cobbles to 4" size; stage I caliche.						
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5220' (1591m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-19

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LOGS OF TEST PITS SE-P-18 AND SE-P-19
VERIFICATION SITE, SNAKE EAST COP, UTAH

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DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 7-19

FUGRO NATIONAL, INC.

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AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, brown, fine to medium, poorly graded, slightly moist, calcareous; little silt; trace fine gravel.	vertical walls caving					
		1										
		2										
		3		GP	dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little medium to coarse sand; occasional cobbles to 10" size; stage I caliche.	vertical walls stable					
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5355' (1632m)
SURFICIAL GEOLOGIC UNIT: A1

LOG OF TEST PIT SE-P-20

	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; little silt; little fine gravel.						
		1										
		2		GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse sand; little silt; occasional cobbles to 6" size; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5485' (1672m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-21

APPI BY
CHEC BY

LOGS OF TEST PITS SE-P-20 AND SE-P-21
VERIFICATION SITE, SNAKE EAST CDP, UTAH

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FIGURE 7-20

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine gravel; little silt.						
		1										
		2		GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly mois., angular to subangular, calcareous; little fine to coarse sand; little silt; stage I caliche.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5425' (1654m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-22

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some silt; little fine gravel.		18	52	30		
		1										
		2		GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse sand; little silt; occasional cobbles to 9" size; stage I caliche (1.0'-2.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5600' (1707m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-23

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CHECD

LOGS OF TEST PITS SE-P-22 AND SE-P-23
VERIFICATION SITE, SNAKE EAST COP, UTAH

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FIGURE 7-21

FUGRO NATIONAL, INC.

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AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0										
		1		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some silt; trace fine gravel.						
		2										
	1	3		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse gravel; trace silt; stage I caliche (2.0'-3.0').						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5154' (1571m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-24

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0										
		1		ML	stiff	SANDY SILT, light brown, slightly moist, slightly plastic, calcareous; some fine sand.		0	47	53		NP
		2										
	1	3		CL	very stiff	SILTY CLAY, light brown, slightly moist, medium plastic, calcareous.						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5071' (1546m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT SE-P-25

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LOGS OF TEST PITS SE-P-24 AND SE-P-25
VERIFICATION SITE, SNAKE EAST COP, UTAH

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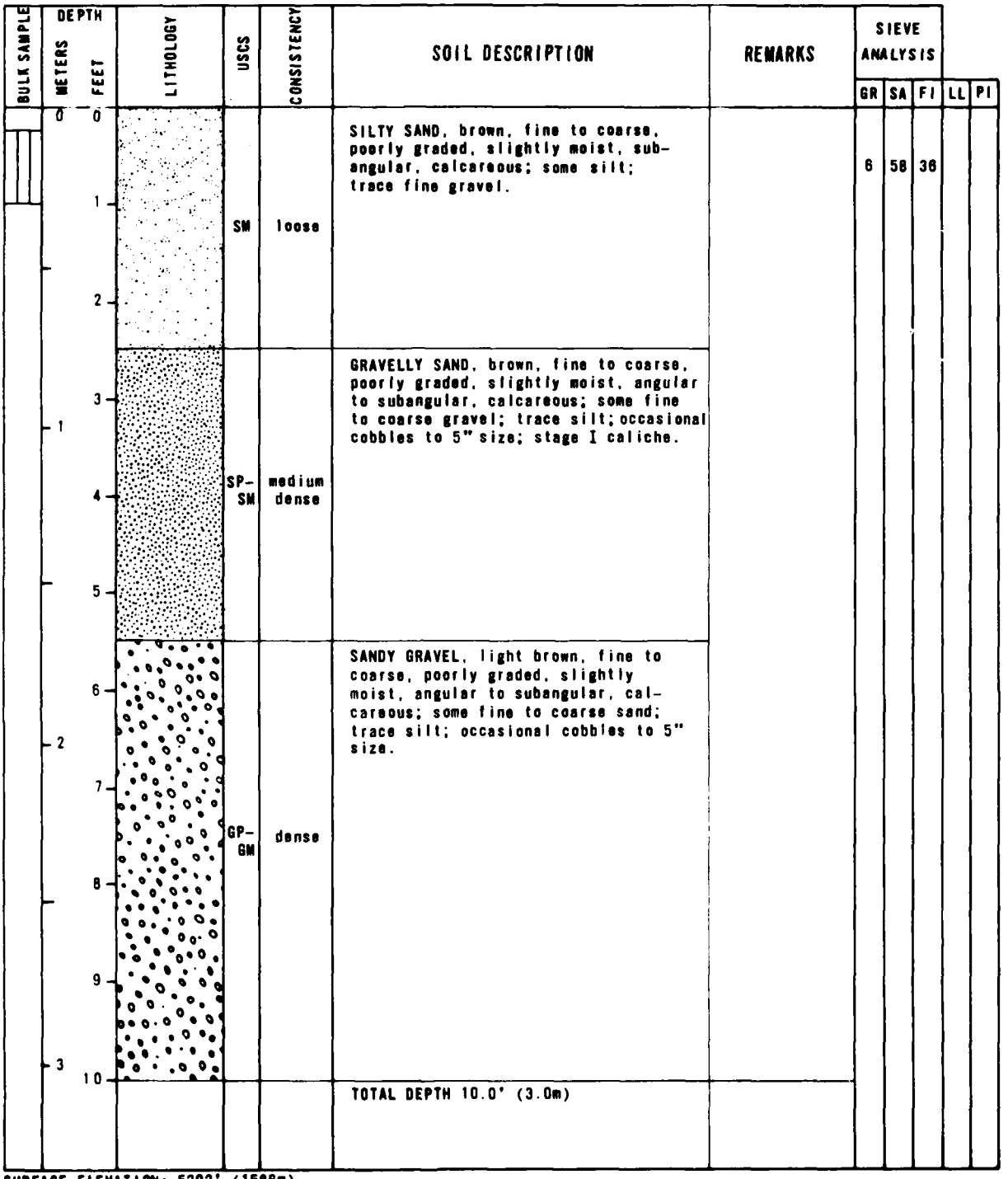
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-22

FUGRO NATIONAL, INC.

FN-TR-27-111



SURFACE ELEVATION: 5202' (1586m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT SE-P-26

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LOG OF TEST PIT SE-P-26
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
7-23

FUGRO NATIONAL, INC.

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AFV-05

FN-TR-27-111

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some silt; trace fine gravel.		10	58	32		
	1											
		2		GP-GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; trace silt.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5280' (1609m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT SE-P-27

	0	0		SM	loose	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; little fine gravel; little silt; stage I caliche (2.0'-3.0').						
	1											
		2										
		3		GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse sand; little silt.						
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5580' (1701m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-28

LOGS OF TEST PITS SE-P-27 AND SE-P-28
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-24

FUGRO NATIONAL, INC.

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AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some silt; trace fine gravel.						
	1			SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse gravel; trace silt; stage I caliche (1.0'-1.5').						
	2											
	3	1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5572' (1898m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-29

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some silt; trace fine gravel.		6	59	35		
	1			GP-GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; trace silt; stage I caliche (1.0'-2.0').						
	2											
	3	1										
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5670' (1728m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT SE-P-30

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LOGS OF TEST PITS SE-P-29 AND SE-P-30
VERIFICATION SITE, SNAKE EAST CDP, UTAH

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FIGURE 7-25

WOODWARD-CLYDE CONSULTANTS

SECTION 8.0

SURFICIAL SAMPLE LOGS

EXPLANATIONS OF SURFICIAL SAMPLE LOGS

Finalized logs of the surficial samples are presented in this section. The explanations provided here are to serve as general guidelines to reading the logs.

A. Designations - Surficial samples are identified as follows:

SE-CS-1

SE - abbreviation for the site (e.g., SE - Snake East)
CS - abbreviation for surficial sample
1 - number of activity

B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification Symbol; see Table 6-1 of Section 6.0, "Boring Logs", for details of USCS.

F. Soil Description - Soil is described based on field visual descriptions and/or laboratory test results. See Section 6.0, "Boring Logs", for procedures of soil description.

G. Sieve Analysis, LL and PI - These are from results of laboratory tests. See Section 6.0, "Boring Logs", for explanation.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
SE-CS-3	5080 (1548)	A5y A4o	0.0-2.0 (0.0-0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, angular to subangular, calcareous; some fine to coarse sand; little silt.	43	37	20		
SE-CS-5	5024 (1531)	A5y A4o	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little silt; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded; calcareous; little silt; occasional cobbles					
SE-CS-6	5016 (1529)	A5y A4o	0.0-2.0 (0.0-0.6)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, calcareous; trace silt; some fine gravel.					
SE-CS-9	5400 (1646)	A5i(S2)	0.0-0.75 (0.0-0.2)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded; some fine gravel; some silt					
			0.75-2.0 (0.2-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; some fine to coarse sand; occasional cobbles.					
SE-CS-11	5130 (1564)	A4 (S2)	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some nonplastic silt; trace fine gravel.	7	57	36		NP
SE-CS-14	5065 (1544)	A5y A4o	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subrounded to subangular, calcareous; little silt; trace to some fine gravel; occasional cobbles.					
SE-CS-15	5185 (1574)	A5i	0.0-0.75 (0.0-0.2)	CL	SILTY CLAY, light brown, slightly plastic, calcareous; trace fine to coarse sand; trace fine gravel.					
			0.75-2.0 (0.2-0.6)	GP	SANDY GRAVEL, light brown, fine, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; occasional cobbles.					
SE-CS-16	5240 (1597)	A5i	0.0-1.5 (0.0-0.5)	CL	SILTY CLAY, light brown, slightly plastic, calcareous; little fine sand; trace fine gravel.					
			1.5-2.0 (0.5-0.6)	GP	GRAVEL, brown, fine to coarse, poorly graded, angular to subangular, calcareous; some fine sand; occasional cobbles.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
1 OF 5

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
SE-CS-18	5007 (1528)	A5y A4o	0.0-1.0 (0.0-0.3)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine to medium sand, trace fine gravel.					
			1.0-2.5 (0.3-0.8)	GC	CLAYEY GRAVEL, brown, fine, poorly graded, subrounded, calcareous; some fine to medium sand; some slightly plastic clay.					
SE-CS-20	5335 (1626)	A5i	0.0-2.0 (0.0-0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; some fine to coarse sand; little silt; occasional cobbles.					
SE-CS-23	5025 (1532)	A4o	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, light brown, fine to medium, poorly graded, calcareous; some silt.					
			0.75-2.0 (0.2-0.6)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine to medium sand.					
SE-CS-24	5028 (1533)	A4o	0.0-2.0 (0.0-0.6)	CL	SANDY CLAY, light brown, slightly to medium plastic, calcareous; trace to some fine to coarse sand.					
SE-CS-26	5125 (1562)	A5i	0.0-2.0 (0.0-0.6)	GM	SILTY GRAVEL, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; some highly plastic silt; some fine to coarse sand.	34	26	40	52	18
SE-CS-32	5110 (1558)	A5y/A4o	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; trace to some silt; trace to some fine gravel.					
SE-CS-38	5170 (1576)	A5i	0.0-2.0 (0.0-0.6)	GP-GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little fine to coarse sand; trace silt; occasional cobbles.					
SE-CS-40	5340 (1628)	A5i	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; some fine gravel.					
			1.5-2.5 (0.5-0.8)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; occasional cobbles.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
2 OF 5

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
SE-CS-43	5754 (1754)	S5t	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some silt; some fine to coarse gravel.	18	47	35		
			0.75-2.0 (0.2-0.6)	GM	SANDY GRAVEL, light brown, fine, poorly graded, subrounded to subangular, calcareous; some fine to coarse sand; trace silt.					
SE-CS-45	5175 (1577)	A5i	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some silt; some fine gravel.					
			1.5-2.5 (0.5-0.8)	GP-GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular, calcareous; some fine sand; trace silt; occasional cobbles.					
SE-CS-46	5240 (1597)	A5i	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.					
			0.75-2.0 (0.2-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, angular to subangular, calcareous; some fine to coarse sand; trace silt.					
SE-CS-47	5295 (1614)	A5i	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some slightly plastic silt; little fine gravel.	13	52	35		
			1.5-4.0 (0.5-1.2)	SP	GRAVELLY SAND, brown, fine to coarse, poorly graded, calcareous; some fine to coarse gravel; trace silt.					
SE-CS-48	5535 (1687)	A5i	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little fine to coarse sand; trace silt; occasional cobbles.					
SE-CS-51	5380 (1640)	A5i	0.0-2.5 (0.0-0.8)	SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, calcareous; some fine gravel; little silt.					
SE-CS-53	5330 (1625)	A5i	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; little silt; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	SP	GRAVELLY SAND, light brown, fine to coarse, poorly graded, calcareous; little fine to coarse gravel; trace silt.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
3 OF 5

WOODWARD-CLYDE CONSULTANTS

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
SE-CS-58	5400 (1646)	A5i	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.	7	63	30		
			1.5-2.5 (0.5-0.8)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; little fine to coarse sand; trace silt.					
SE-CS-60	5566 (1697)	A5i	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.	11	65	24		
			0.75-2.0 (0.2-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; occasional cobbles.					
SE-CS-63	5085 (1550)	A5y/A4o	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	GP	SANDY GRAVEL, light brown, fine, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt.					
SE-CS-65	5218 (1590)	A5i	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; some fine gravel.	24	50	26		
			1.0-2.0 (0.3-0.6)	SP	GRAVELLY SAND, light brown, fine to coarse, poorly graded, calcareous; some fine gravel; occasional cobbles.					
SE-CS-66	5129 (1572)	A5y	0.0-1.0 (0.0-0.3)	CL	SANDY CLAY, brown, slightly plastic, calcareous; some fine sand.			53	27	10
			1.0-2.0 (0.3-0.6)	SP-SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, calcareous; little fine gravel; trace silt.					
SE-CS-69	5366 (1636)	A5y	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some silt; trace fine gravel.					
			1.5-2.0 (0.5-0.6)	SP	SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; little fine gravel.					
SE-CS-70	5480 (1670)	A5i	0.0-1.5 (0.0-0.5)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, calcareous; some slightly plastic clay; trace fine gravel.	9	48	43		
			1.5-2.0 (0.5-0.6)	GP-GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, angular to subrounded, calcareous; some fine to coarse sand.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
4 OF 5

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
SE-CS-71	5480 (1670)	A5i	0.0-1.5 (0.0-0.5)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, calcareous; some slightly plastic clay; trace fine gravel.					
			1.5-2.0 (0.5-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, angular to subrounded, calcareous; some fine to coarse sand.					
SE-CS-74	5730 (1748)	A5i	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; little silt; little fine gravel.	14	67	19		
SE-CS-76	5645 (1721)	A5i	0.0-2.0 (0.0-0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; some fine to coarse sand; little silt; occasional cobbles.	59	26	15		

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
5 OF 5

SECTION 9.0

LABORATORY TEST RESULTS

EXPLANATIONS OF LABORATORY TEST RESULTS

Laboratory test results are presented in this section. Table 9-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables 9-2 through 9-6 and Figures 9-1 through 9-3 present results of triaxial compression, unconfined compression, direct shear, consolidation, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following table presents the ASTM designations for the tests performed during the investigation.

Type of Test	ASTM Designations
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows.

A. Activity Number - Boring, trench, test pit, or surficial sample designation.

B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.

C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.

D. Percent Finer by Weight - Presents the results of laboratory particle size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (by dry weight) of the total sample weight passing through each sieve size indicated.

E. Atterberg Limits (ASTM D 423-66 and D 424-59)

LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

F. USCS - Unified Soil Classification Symbols are given here; see Table 6.1 in Section 6.0, "Boring Logs", for complete details of USCS system.

G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71)

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen

H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test as per ASTM D 1557-70.

I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of (1) the weight in air of a given volume of soil solids at a stated temperature, to (2) the weight in air of an equal volume of distilled water at a stated temperature.

J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure), and was then compressed (and hence sheared) by increasing the

vertical stress. Drained indicates that excess pore water pressure generated by strains are permitted to dissipate by the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure (σ_3) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ($\sigma_1 - \sigma_3$) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain, ε, at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_o). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to (1) increase saturation of the sample, or (2) simulate the actual in-situ pressure regime.

K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.

L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance (ksf) of a soil to shearing (tangential) stresses.

M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation", as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).

N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the table at the beginning of the "Explanation of Laboratory Test Results".

O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade soil to that developed by a standard crushed-rock

base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested for CBR were also analyzed for particle size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5 kg) Hammer and 18-inch (457 mm) Drop".

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT									
				STANDARD SIEVE OPENING							U S STANDA		
				BLDRS.	COBBLES		GRAVEL				SAND		
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	
SE-B-1	P-1	0.0-1.9	0.00-0.58							100	96	92	
	D-2	3.1-3.8	0.94-1.16					100	90	77	62	52	
	D-3	6.5-7.2	1.98-2.19					100	89	73	53	37	
	D-4	11.2-11.9	3.41-3.63										
	D-5	16.2-16.9	4.94-5.15										
	D-6	21.2-21.9	6.46-6.68					100	87	78	59	42	
	D-8	31.0-31.6	9.45-9.63										
	D-9	41.4-41.9	12.62-12.77										
	D-10	51.4-51.9	15.67-15.82					100	96	80	71	66	
	D-11	62.4-62.9	19.02-19.17										
	D-12	71.3-71.8	21.73-21.88										
	D-13	85.4-85.9	26.03-26.18						100	81	54	36	
	D-14	100.5-100.9	30.63-30.75										
	D-16	119.0-119.5	36.27-36.42										
	D-17	140.8-141.3	42.92-43.07						100	83	62	46	
	D-18	160.4-160.9	48.89-49.04										
SE-B-2	P-1	0.0-2.2	0.00-0.67					100	97	93	72	42	
	D-4	10.0-10.4	3.05-3.17										
	D-5	13.7-14.4	4.18-4.39										
	D-6	17.6-18.3	5.36-5.58						100	98	83	33	
	D-7	21.6-22.3	6.58-6.80										
	P-8	24.0-25.6	7.32-7.80										
	P-9	30.5-33.0	9.30-10.06					100	97	89	69	48	
	D-11	50.4-50.9	15.36-15.51					100	93	84	65	50	
SE-B-3	P-1	0.0-2.6	0.00-0.79								100	99	
	P-2	4.0-5.3	1.22-1.62										
	D-3	8.6-9.3	2.62-2.83										
	D-4	12.1-12.8	3.69-3.90										
	D-5	15.2-15.9	4.63-4.85						100	83	58	39	
	D-6	20.2-20.9	6.16-6.37										
	D-7	25.3-25.9	7.71-7.89										
	D-8	30.2-30.9	9.20-9.42										
	P-9	40.0-41.8	12.19-12.74						100	90	81	72	
	P-10	50.0-51.4	15.24-15.67										
	P-11	59.5-60.7	18.14-18.50										
	P-12	69.5-70.0	21.18-21.34									100	
	P-13	82.0-83.7	24.99-25.51										
	P-14	89.0-90.0	27.13-27.43										
	D-15	100.7-101.2	30.69-30.85										
	D-16	114.3-114.8	34.84-34.99										
	D-17	130.3-130.8	39.72-39.87					100	83	73	55	39	

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- O - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

CHECKED BY _____ APPROVED BY _____

PASSING STANDARD SIEVE NO			PARTICLE SIZE (mm)			ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION
SAND			SILT OR CLAY							DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)			
10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)				
92	82	39	21						SC-SM	98.1	1571	4.1	15.4	0.72						
52	41	22	15			27	20	7	SC-SM	116.2	1861	2.7	16.4	0.45				2.67		
37	29	12	8						GP-GM	124.0	1986	2.0	15.4	0.36						
									GP-GM	122.6	1964	2.6	18.5	0.38						
									SP-SM	126.7	2030	8.3	68.2	0.33						
42	30	19	12						SP-SM	131.6	2108	5.8	56.2	0.28						
									SM	131.3	2103	9.5	91.1	0.28						
									SM	122.9	1969	7.0	50.8	0.37						
66	59	31	18						SM	113.7	1821	13.3	74.7	0.48						
									SM	112.7	1805	6.5	35.6	0.50						
									SM											
36	28	20	12						GW-GM	136.3	2183	6.0	68.9	0.24						
									GW-GM	120.1	1924	13.0	87.2	0.40						
									SM	135.1	2164	9.8	100.0	0.25						
46	34	29	22						SM	133.0	2130	10.5	100.0	0.27						
									GM	132.2	2118	9.7	95.8	0.27						
42	14	9	7						SW-SM	107.6	1724	2.6	12.4	0.57						
									SP	122.4	1961	2.1	15.2	0.38						
									SP	111.5	1786	10.4	55.0	0.51						
33	4	3	2						SP	110.5	1770	11.1	57.3	0.52						
						46	29	17	ML	89.6	1435	30.8	94.5	0.88				2.67		
						40	26	14	ML	83.4	1336	35.4	93.7	1.02						*
48	28	22	18						SM	118.5	1898	15.6	99.6	0.42						
50	26	18	14						SM	120.3	1927	8.5	57.2	0.40						
99	91	69	48						SM	94.2	1509	8.0	27.5	0.79						
	100	96	67						ML	90.9	1456	6.9	21.7	0.85						
									SM	105.7	1693	8.1	36.9	0.59						
									SM	116.7	1869	5.5	33.2	0.44						
39	22	12	8						SW-SM	122.8	1967	10.9	79.4	0.37						
									SW-SM	114.2	1829	8.3	47.4	0.48						
									GP-GM	126.8	2031	8.9	72.9	0.33						
									GP-GM	126.7	2030	9.7	79.1	0.33						
72	63	52	38						SM	108.4	1736	13.4	65.2	0.55						*
									SM	120.8	1935	9.6	65.6	0.40						
									SM	120.5	1930	8.6	58.3	0.40						
100	97	93	84	39	15	38	20	18	CL	122.2	1957	13.8	98.5	0.38						
									SM											
									SM											
									SM											
									GM											
39	24	18	13						GM	130.0	2082	9.2	84.4	0.30						

SUMMARY
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COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
(pcf)	(kg/m^3)								
			2.67						
			2.67						
					*		*		
						*			
					*				

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1
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FUGRO NATIONAL, INC.

AFV-01

D-18	145.2-145.7	44.26-44.41									
P-1	1.0-2.5	0.30-0.76						100	81	75	70
P-2	3.0-5.3	0.91-1.62						100	98	96	95
D-3	8.3-9.0	2.53-2.74									
P-4	12.0-12.9	3.66-3.93									
P-4	12.9-14.0	3.93-4.27									
D-5	20.2-20.9	6.16-6.37									
P-6	24.0-26.5	7.32-8.08							100	94	86
P-7	30.0-30.7	9.14-9.36									
P-7	30.7-31.4	9.36-9.57									
P-7	31.4-32.1	9.57-9.78									
P-8	40.5-42.6	12.34-12.98									100
P-9	50.0-50.8	15.24-15.47						100	99	95	81
P-9	50.8-51.5	15.47-15.70							100	91	73
P-9	51.5-52.2	15.70-15.91									
P-9	52.2-52.8	15.91-16.09						100	99	91	69
P-10	60.0-61.2	18.29-18.65							100	95	85
P-11	70.0-72.8	21.34-22.19									
P-12	79.0-79.8	24.08-24.32									
P-13	90.0-90.9	27.43-27.71									
P-14	105.0-106.9	32.00-32.58									
P-15	118.5-119.2	36.12-36.33									
P-16	140.5-142.2	42.82-43.34									
D-17	160.0-160.4	48.77-48.89									
D-1	0.8-1.5	0.24-0.46					100	90	54	36	29
D-2	2.8-3.5	0.85-1.07					100	68	51	39	27
D-3	6.2-6.9	1.89-2.10						100	64	47	33
D-4	10.2-10.9	3.11-3.32									
D-5	15.2-15.9	4.63-4.85						100	88	59	35
D-6	20.2-20.9	6.16-6.37									
D-7	25.2-25.9	7.68-7.89									
D-8	30.1-30.5	9.17-9.30						100	90	74	49
D-9	40.4-40.9	12.31-12.47									
D-10	50.4-50.9	15.36-15.51									
D-11	60.4-60.9	18.41-18.56									
D-12	70.8-71.3	21.58-21.73									
D-13	85.4-85.9	26.03-26.18						100	97	81	63

STANDARD SIEVE NO			PARTICLE SIZE (mm)		ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION
SAND		SILT OR CLAY							DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)			
40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)				
								GM	133.4	2137	8.4	86.3	0.26						
60	47	28	10	3				SM	99.6	1595	2.4	9.5	0.69						
85	69	37						SM	87.3	1398	3.6	10.6	0.93						
								SM	109.1	1748	8.7	43.3	0.55						
								CL-ML	76.2	1221	26.6	59.3	1.21						*
					33	24	9	CL-ML	85.1	1363	16.8	46.3	0.98				2.66		
								SP-SM	112.8	1807	11.1	60.9	0.49						
69	52	34						SM	96.3	1543	13.7	49.2	0.75						
100	99	94			33	26	7	ML	79.0	1266	21.5	51.4	1.13					*	
		91						ML	78.7	1261	20.6	48.8	1.14					*	
					27	21	6	CL-ML	87.4	1400	13.6	49.2	0.75						
93	76	59	24	4				ML	94.8	1519	19.5	67.8	0.78						
61	48	37			21	20	1	SM	99.7	1597	17.1	66.9	0.69					*	
48	31	19						SM	103.6	1660	12.2	52.3	0.63					*	
								SM	106.0	1698	11.7	53.6	0.59					*	
40	23	14						SM											
73	61	44	17	4				SM	109.8	1759	8.6	43.6	0.54						
								SM											
		37					NP	SM	106.8	1711	8.0	37.7	0.58						
								SM	107.6	1724	12.2	58.4	0.57						
								SM	104.5	1674	13.2	58.1	0.61						
					27	22	5	CL-ML	97.9	1568	16.1	60.3	0.72						*
								SP-SM											
		12					NP	SP-SM	125.9	2017	9.1	72.4	0.34						
22	17	13						GM	102.0	1634	4.1	16.8	0.65						
13	7	5						GW-GM	124.8	1999	1.9	14.8	0.35						
21	14	10						GP-GM	128.5	2058	2.0	17.2	0.31						
								SP-SM	118.1	1892	4.7	29.9	0.43						
17	11	8						SP-SM	125.2	2006	7.2	56.3	0.35						
								SP-SM	124.0	1986	11.1	83.9	0.36						
								SP-SM	125.7	2014	5.6	44.2	0.34						
21	13	10						SP-SM	124.7	1998	9.3	71.8	0.35						
								SP-SM	123.7	1981	9.5	71.1	0.36						
								SM	123.6	1980	11.6	86.3	0.36						
								SM	123.9	1985	9.5	71.6	0.36						
								SP-SM	123.4	1977	4.1	30.0	0.37						
45	34	29						SM											
								SM	117.2	1877	10.3	63.6	0.44						
								SM	132.3	2119	8.3	81.9	0.27						
35	24	19						SM	120.1	1924	12.2	81.4	0.40						
								SM	126.2	2022	7.5	60.7	0.34						

SUMMARY O
VERIFICATION

MX SITING
DEPARTMENT OF T

fugro

	COMPACTED									
	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	(pcf)	(kg/m³)								
									*	
						*		*		
8				2.66						
9									*	
5							*			
3					*					
4					*					
5									*	
8										
9					*				*	
3					*					
9					*					
4										
8										
7									*	
61										
72						*			*	
									*	
34										
65										
35										
31										
43										
35										
36										
34										
35										
36										
36										
36										
37										
44										
27										
40										
34										

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1
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FUGRO NATIONAL, INC.

D-10	50.4-50.9	15.36-15.51		
D-11	60.4-60.9	18.41-18.56		
D-12	70.4-70.9	21.46-21.61		
D-13	85.3-85.8	26.00-26.15		
D-14	100.4-100.9	30.60-30.75		
D-15	120.4-120.9	36.70-36.85		
D-16	140.4-140.9	42.79-42.95		
D-17	160.3-160.8	48.86-49.01		
D-1	1.2-1.9	0.37-0.58		
D-2	3.8-4.4	1.16-1.34		
D-3	6.1-6.8	1.86-2.07		
D-4	10.2-10.9	3.11-3.32		
D-5	15.2-15.9	4.63-4.85		
D-6	20.2-20.9	6.16-6.37		
D-7	25.2-25.9	7.68-7.89		
D-8	30.2-30.9	9.20-9.42		
D-9	40.2-40.9	12.25-12.47		
D-10	50.9-51.4	15.51-15.67		
D-11	60.4-60.9	18.41-18.56		
D-12	75.3-75.8	22.95-23.10		
D-13	90.0-90.4	27.43-27.55		
D-14	105.0-105.4	32.00-32.13		
D-16	141.0-141.4	42.98-43.10		
D-17	160.0-160.4	48.77-48.89		

					GM	105.9	1696	6.2
					SM	110.4	1768	4.7
					SM	118.1	1892	2.2
					SM	128.3	2055	2.4
					SM	124.9	2001	8.8
					SP	120.2	1925	12.6
					GM	118.5	1898	9.2
					GM	126.1	2020	9.3
					GM	125.8	2015	8.2
					SM	108.4	1736	10.6
					SM	129.3	2071	8.8
					SM	119.4	1913	10.2
					SM	123.2	1973	7.6
					SM	119.7	1917	9.1
					SM	127.3	2039	6.1
					SM	138.5	2219	4.5
					SM	136.6	2188	6.7
					SM	99.9	1600	4.0
					SM	128.9	2065	2.0
					SP-SM	122.7	1965	1.5
					SW-SM	126.8	2031	2.0
					SW-SM	131.1	2100	8.0
					SW-SM	126.6	2028	6.1
					SM	115.0	1842	9.9
					SP-SM	127.9	2049	8.9
					SP-SM	116.6	1868	13.0
					SP-SM	124.3	1991	10.8
					SP-SM	130.9	2097	10.1
					SP-SM	129.5	2074	7.6
					SP-SM	128.5	2058	7.8
					SP-SM	131.3	2103	8.3
					SP-SM	124.6	1996	12.3
					SP-SM	111.8	1791	12.7
					SM	87.3	1398	7.1
					GM	114.5	1834	1.8
					SP-SM	125.4	2009	8.9
					SP-SM	109.7	1757	6.1
					SP-SM	123.7	1981	10.8
					SP-SM	115.1	1844	9.6
					SP-SM	130.9	2097	5.7
					GP-GM	134.7	2158	10.4

OMPACTED		SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
IMUM ENSITY (kg/m³)	OPTIMUM MOISTURE (%)							
					*			

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 8-1
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FUGRO NATIONAL, INC.

AFV-01

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ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT								
				STANDARD SIEVE OPENING							U S STA	
				BLDRS.	COBBLES		GRAVEL					
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10
SE-B-8	D-9	60.0-60.5	18.29-18.44									
	D-10	80.0-80.1	24.38-24.41					100	90	76	56	40
	D-11	101.0-101.2	30.78-30.85									
SE-T-1	B-1	0.3-1.4	0.09-0.53					100	98	95	92	88
SE-T-2	B-1	0.1-1.0	0.03-0.30						100	98	96	92
	B-3	7.0-8.0	2.13-2.44					100	89	60	34	8
SE-T-3	B-1	0.1-0.8	0.03-0.24									
SE-T-4	B-1	0.5-1.0	0.15-0.30				100	98	97	91	81	75
SE-T-5	B-1	0.5-1.5	0.15-0.46					100	93	91	84	78
SE-T-7	B-1	0.3-1.5	0.09-0.46						100	99	96	93
SE-P-1	B-1	0.3-1.0	0.09-0.30					100	96	90	82	78
	B-2	2.3-3.0	0.70-0.91						100	93	88	86
SE-P-3	B-1	0.0-1.0	0.00-0.30							100	92	84
SE-P-4	b-1	0.0-1.0	0.00-0.30						100	97	91	84
SE-P-7	b-1	0.3-1.0	0.09-0.30					100	95	79	64	55
SE-P-8	b-1	0.3-1.0	0.09-0.30						100	93	78	64
SE-P-11	B-1	0.3-1.0	0.09-0.30									
SE-P-13	b-1	0.3-0.8	0.09-0.24									
SE-P-14	B-1	0.3-1.0	0.09-0.30					100	94	87	79	72
SE-P-16	b-1	0.3-1.0	0.09-0.30						100	90	84	76
SE-P-17	B-1	1.0-2.0	0.30-0.61						100	94	89	85
SE-P-23	b-1	0.3-1.0	0.09-0.30						100	90	82	74
SE-P-25	B-1	0.1-1.5	0.03-0.46									
SE-P-26	B-1	0.3-1.0	0.09-0.30						100	96	94	91

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

ENT																					
STANDARD SIEVE NO				PARTICLE SIZE (mm)		ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION
SAND			SILT OR CLAY							DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)			
10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m^3)				(pcf)	(kg/m^3)				
									SW-SM	117.1	1876	9.9	60.9	0.44						
10	23	14	9						SW-SM	141.1	2260	4.9	68.9	0.19						
									SW-SM	127.5	2042	5.7	48.1	0.32						
38	80	39	27					NP	SM						127.8	2047	9.6			
92	86	73	60			23	18	5	CL-ML						122.9	1969	12.8			
8	1	0	0						GP											
			33			28	21	7	SC-SM											
75	67	57	47			21	18	3	SM						127.0	2034	10.3			
78	72	47	28						SM											
93	84	58	24						SM											
78	68	25	13						SM											
86	79	48	38						SM											
84	72	43	28						SM											
84	69	47	30						SM											
55	46	37	26						SM											
54	52	44	32						SM									2.64		
			64			38	21	17	CL											
									SM											
72	62	46	25					NP	SM											
76	56	45	29						SM											
75	72	40	23						SM											
94	58	42	30						SM											
	100	96	53					NP	ML											
91	86	61	36						SM											

SUMMARY
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DEPARTMENT OF

fugro

ACTED								
ITY (kg/m³)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
2047	9.6							*
1969	12.8							*
2034	10.3							*
								*
								*
								*
		2.64						
								*
							*	
								*
								*

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1
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FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEI								
				STANDARD SIEVE OPENING							U S ST	
				BLDRS.	COBBLES		GRAVEL					
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10
SE-P-27	b-1	0.5-1.0	0.15-0.30						100	98	90	84
SE-P-29	b-1	0.3-0.8	0.09-0.24									
SE-P-30	b-1	0.3-1.0	0.09-0.30							100	94	86
SE-CS-3	B-1	0.0-2.0	0.00-0.61					100	87	68	57	49
SE-CS-11	B-1	0.3-1.5	0.09-0.46						100	95	93	77
SE-CS-14	b-1	0.3-1.0	0.09-0.30									
SE-CS-18	B-1	0.3-0.5	0.30-0.15									
SE-CS-26	b-1	0.1-0.5	0.03-0.15									
	B-2	0.5-2.0	0.15-0.61					100	86	78	66	58
SE-CS-43	b-1	0.3-0.8	0.09-0.24					100	93	86	82	76
SE-CS-47	b-1	0.5-1.5	0.15-0.46						100	94	87	81
SE-CS-53	b-1	0.3-0.8	0.09-0.24									
SE-CS-58	b-1	0.5-1.0	0.15-0.30							100	93	85
SE-CS-60	b-1	0.3-0.8	0.09-0.24						100	97	89	82
SE-CS-65	b-1	0.3-1.0	0.09-0.30						100	86	76	66
SE-CS-66	B-1	0.1-1.0	0.03-0.30									
SE-CS-70	B-1	0.3-1.0	0.09-0.30							100	91	80
SE-CS-74	b-1	0.3-1.0	0.09-0.30							95	86	76
SE-CS-76	b-1	0.3-2.0	0.09-0.61					100	77	52	41	34

CHECKED BY _____ APPROVED BY _____

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m^3)	MO CO	SAT	VO RA	(pcf)	(kg/m^3)	OP MC	SP GR OF	TR	UN CO
94	77	59	32						SM											
									SM											
86	78	51	35						SM											
89	41	27	20						GM											
97	53	44	36					NP	SM											
									SM											
									CL											
									GM											
88	51	44	40			52	33	18	GM											
96	64	49	35						SM											
91	69	52	35						SM											
									SM											
95	71	38	30						SM											
92	70	35	24						SM											
96	55	33	26						SM											
			53			27	17	10	CL											
90	72	57	43						SC											
96	67	35	19						SM											
94	26	22	15						GM											

SUMMARY
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FUGRO

COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
IMUM ENSITY		OPTIMUM MOISTURE (%)							
	(kg/m³)								
								*	
									*
								*	
								*	
									*
								*	

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-1
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FUGRO NATIONAL, INC.

CHECKED BY____ APPROVED BY____

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FN-TR-27-111

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	TYPE OF TEST	DRY DENSITY		MOISTURE CONTENT	CONFINING PRESSURE (σ_3)		MAXIMUM DEVIATOR STRESS ($\sigma_1-\sigma_3$)		STRAIN RATE	BACK PRESSURE	
		FEET	METERS			pcf	kg/m³	(%)	ksf	kN/m²	ksf	kN/m²	(% min)	ksf	kN/m²
SE-B-4	P-7	30.0-30.7	9.14-9.36	ML	CU	79.0	1266	21.5	3.0	144	4.0	192	.006	14.4	689
		30.7-31.4	9.36-9.57	ML	CU	78.7	1261	20.6	6.0	287	5.6	268	.006	14.4	689
	P-9	50.0-50.8	15.24-15.47	SM	CD	99.7	1597	17.1	5.0	239	16.1	771	.006	0.0	0
		50.8-51.5	15.47-15.70	SM	CD	103.6	1660	12.2	10.0	479	29.4	1408	.006	0 0	0
		51.5-52.2	15.70-15.91	SM	CD	106.0	1698	11.7	15.0	718	50.5	2418	.006	0.0	0

SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-2

WOODWARD-CLYDE CONSULTANTS

AFV-10

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	UNCONFINED COMP. STRENGTH		DRY DENSITY		MOISTURE CONTENT (%)	DEGREE OF SATURATION (%)	HEIGHT DIAMETER
		FEET	METERS		ksf	kN m^2	pcf	kg m^3			
SE-B-2	P-8	24.0-24.8	7.32-7.56	ML	4.0	191	83.4	1336	35.4	93.7	2.4
SE-B-3	P-9	40.0-41.8	12.19-12.74	SM	1.3	62	108.4	1736	13.4	65.2	2.1
SE-B-4	P-4	12.0-12.9	3.66-3.93	CL-ML	1.6	77	76.2	1221	26.6	59.3	2.4
	P-15	118.5-119.2	36.12-36.33	CL-ML	2.2	105	97.9	1568	16.1	60.3	2.4

SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-3

FUGRO NATIONAL, INC.

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m^2	ksf	kN/m^2
SE-B-3	P-2	4.0-5.3	1.22-1.62	ML	0.5	24	0.6	29
					1.0	48	2.3	110
					1.5	72	2.5	120
SE-B-4	P-6	24.0-26.5	7.32-8.08	SM	2.0	96	1.5	72
					4.0	192	2.5	120
					6.0	287	4.6	220
SE-B-6	D-5	15.1-15.8	4.60-4.82	SM	4.0	192	4.0	192

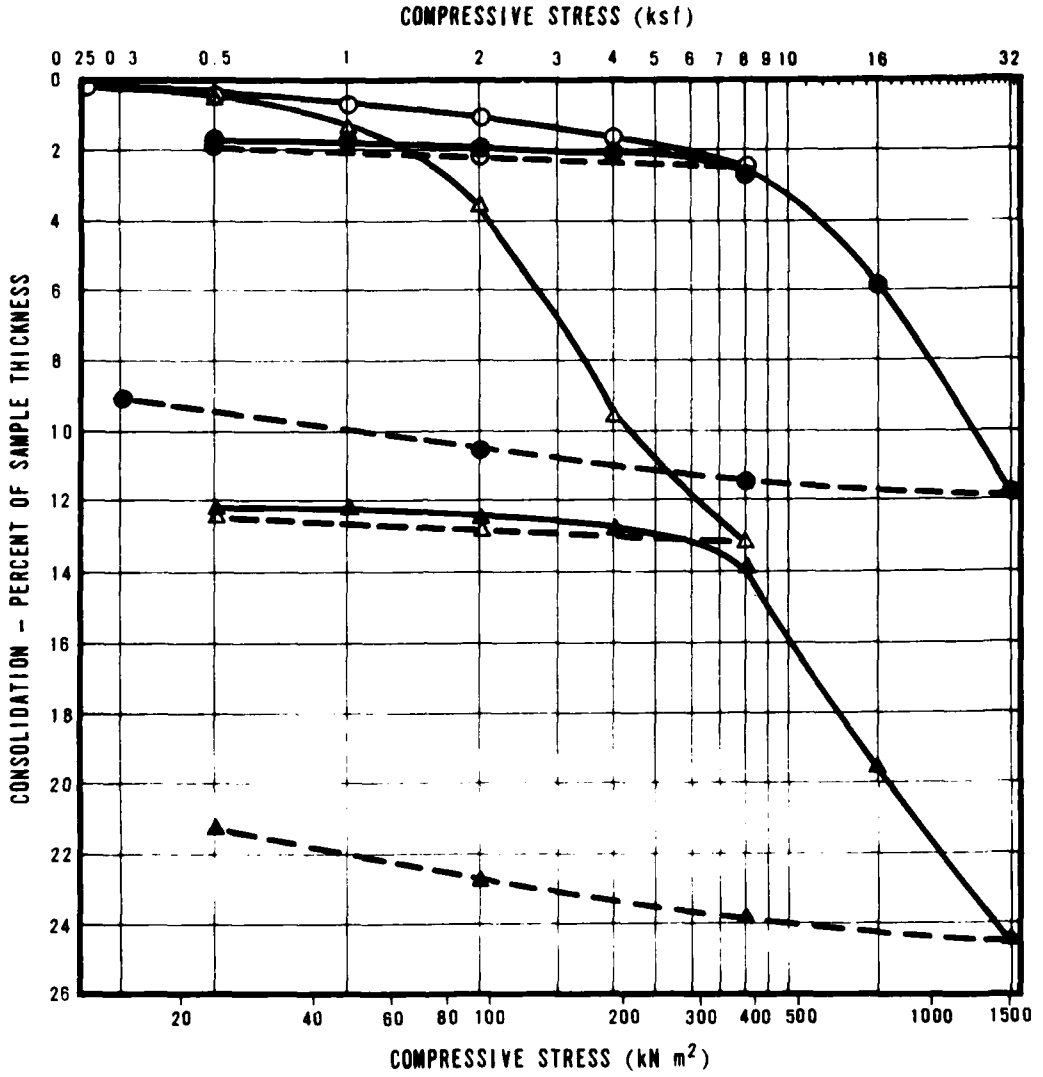
APPR BY

CHECK

DIRECT SHEAR TEST RESULTS
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-4



SYMBOL	BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	INITIAL DRY DENSITY		INITIAL MOISTURE CONTENT (%)	INITIAL VOID RATIO	INITIAL DEGREE OF SATURATION (%)
			FEET	METERS		pcf	kg/m³			
○	SE-B-2	P-8	24.0-24.8	7.32-7.56	ML	81.9	1311	35.1	1.06	89.6
△	SE-B-4	P-4	12.0-12.9	3.65-3.93	CL-ML	73.0	1169	28.3	1.31	58.4

○ AT FIELD MOISTURE

● AFTER ADDITION OF WATER

——— COMPRESSION

– – – REBOUND

CONSOLIDATION TEST RESULTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 9-1

FUGRO NATIONAL, INC.

2 JUL 79

AFV-02

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2 JUL 78

FN-TR-27-111

ACTIVITY NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE				CALCIUM CARBONATE
		FEET	METERS			SODIUM	CHLORIDE	SULPHATE	CALCIUM	
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SE-B-4	D-3	8.3-9.0	2.53-2.74	SM	6.9	362	38	562	133	448
	D-5	20.2-20.9	6.16-6.37	SP-SM	7.0	299	310	<11	136	549
	P-7	32.1-32.7	9.78-9.97	CL-ML	7.1	436	365	27	120	474
	P-9	50.0-50.8	15.24-15.48	SM	7.2	226	46	85	420	433
	P-13	90.0-90.9	27.43-27.71	SM	7.1	85	10	18	80	250
	P-15	118.5-119.2	36.12-36.33	CL-ML	7.2	75	16	<10	100	315
	P-16	140.5-142.2	42.82-43.34	SP-SM	7.2	43	19	11	59	243
SE-P-13	b-1	0.3-0.8	0.09-0.24	SM	7.2	17	20	248	196	302
SE-P-29	b-1	0.3-0.8	0.09-0.24	SM	7.3	124	19	107	54	179
SE-CS-14	b-1	0.3-1.0	0.09-0.30	SM	7.2	530	488	78	32	106
SE-CS-18	B-1	0.3-0.5	0.09-0.15	CL	7.2	70	13	27	43	167
SE-CS-53	b-1	0.3-0.8	0.09-0.24	SM	7.2	82	16	34	77	215

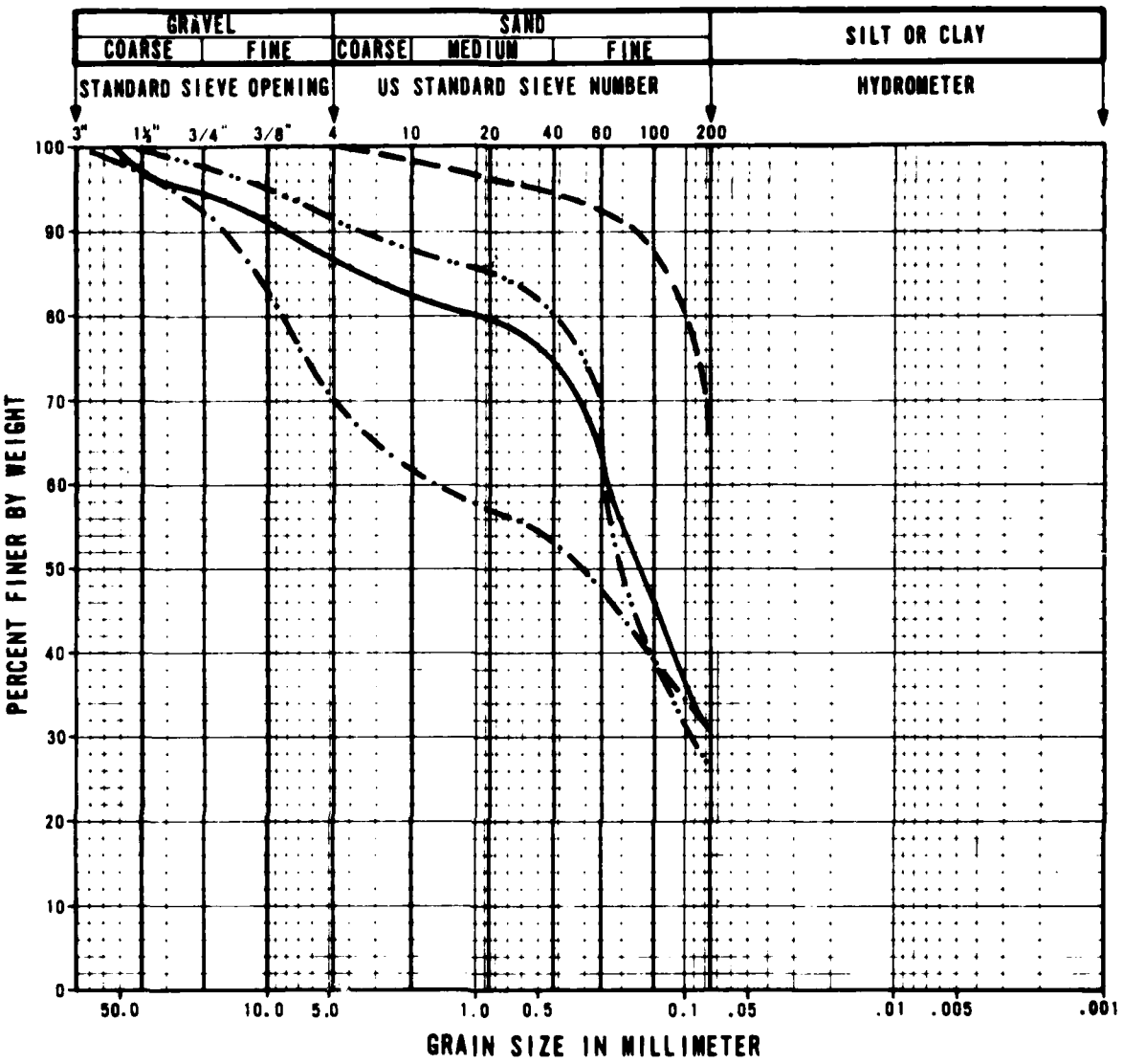
SUMMARY OF CHEMICAL TEST RESULTS
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-5

CUBRO NATIONAL, INC.

AFV-07



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	A	SE-P-26	0.3-1.0	0.09-0.30	SM
		SE-P-1	0.3-1.0	0.09-0.30	
– – –	B	SE-P-11	0.3-1.0	0.09-0.30	CL-ML
		SE-P-25	1.0-1.5	0.30-0.46	
—·—	C	SE-CS-28	0.5-2.0	0.15-0.61	SC-SM
		SE-CS-3	0.0-2.0	0.00-0.61	
—··—	D	SE-T-1	0.3-1.4	0.09-0.43	SM

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

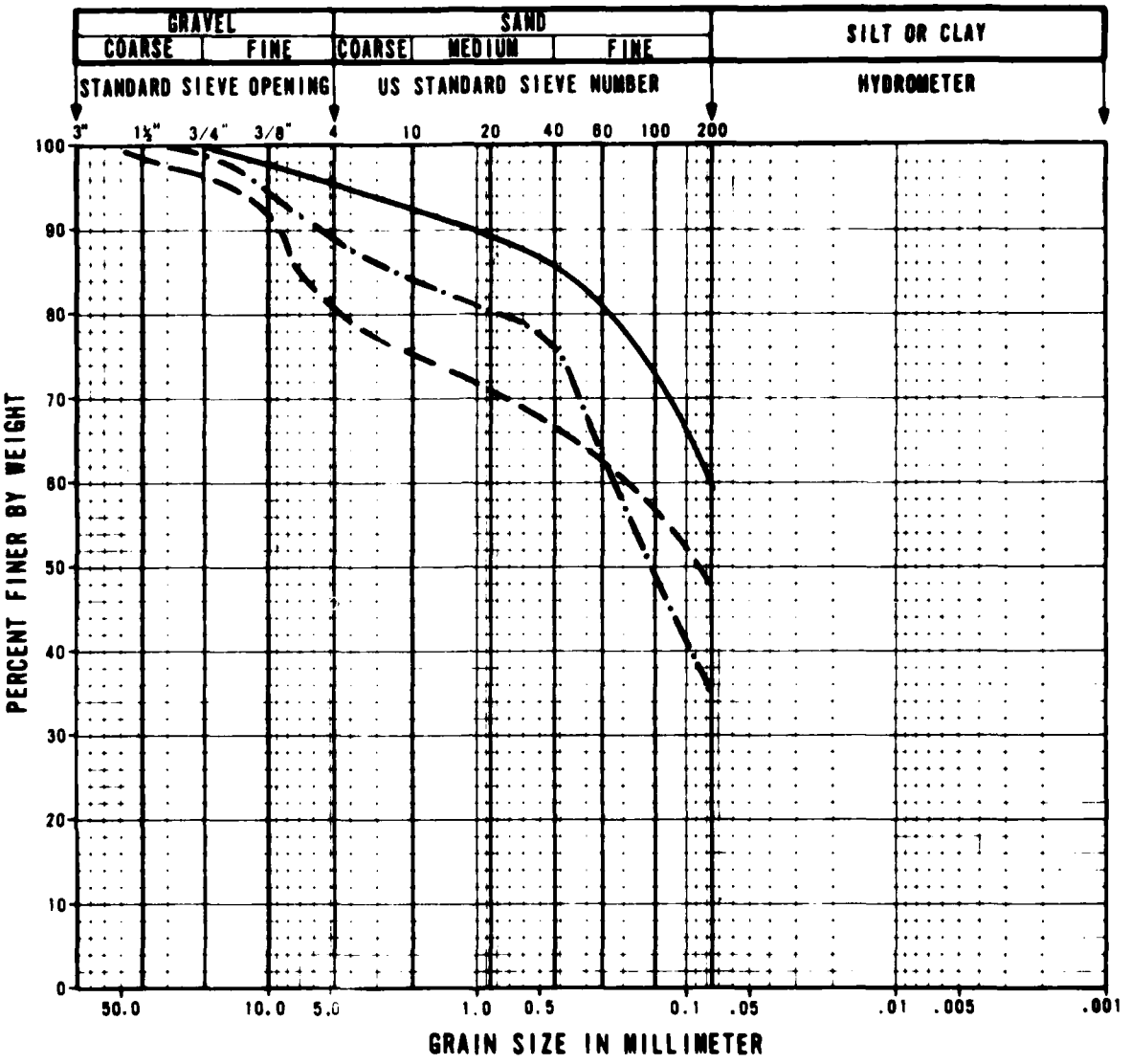
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2
1 OF 2

WOODWARD-CLYDE CONSULTANTS

2 JUL 79

AFV-12



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	E	SE-T-2	0.1-1.0	0.03-0.30	CL-ML
– – –	F	SE-T-4	0.5-1.0	0.15-0.30	SM
—·—	G	SE-T-5	0.0-1.0	0.00-0.30	SM
		SE-P-3	0.0-1.0	0.00-0.30	

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 9-2
2 OF 2

MRO NATIONAL, INC.

2 JUL 79

AFV-12

CHECKED BY____ APPROVED BY____

2 JUL 79

FM-TR-27-111

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg m^3		pcf	kg/m^3			
A	SM	29		NP		132.3	2119	7.5	118.6	1899	6.9	89.6	40
									113.3	1815	6.7	85.6	10
B	CL-ML	66	20	4		119.5	1914	14.0	117.5	1884	14.2	98.4	29
									109.4	1753	14.0	91.6	14
									99.1	1588	13.8	82.9	3
C	SC-SM	30	33	9		131.0	2098	9.0	125.5	2011	8.8	95.8	73
									118.4	1897	9.2	90.4	19
									112.9	1809	9.2	86.2	11
D	SM	27		NP		127.8	2047	9.6	120.1	1925	9.7	94.0	34
									110.7	1774	9.7	86.6	8
									105.6	1693	9.1	82.7	2

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-6 1 OF 2

URS RESEARCH CO.

AFV-13

CHECKED BY_____ APPROVED BY_____

2 JUL 78

FN-TR-27-111

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m^3		pcf	kg/m^3			
E	CL-ML	60	23	5		122.9	1969	12.8	119.8	1920	12.6	97.5	42
									112.1	1796	12.7	91.2	11
									102.1	1637	12.5	83.1	4
F	SM	47	21	3		127.0	2034	10.3	120.6	1931	10.9	94.9	32
									114.5	1834	10.7	90.2	13
G	SM	36	20	2		128.2	2054	10.0	118.2	1894	8.8	92.2	33
									110.2	1765	8.6	86.0	10

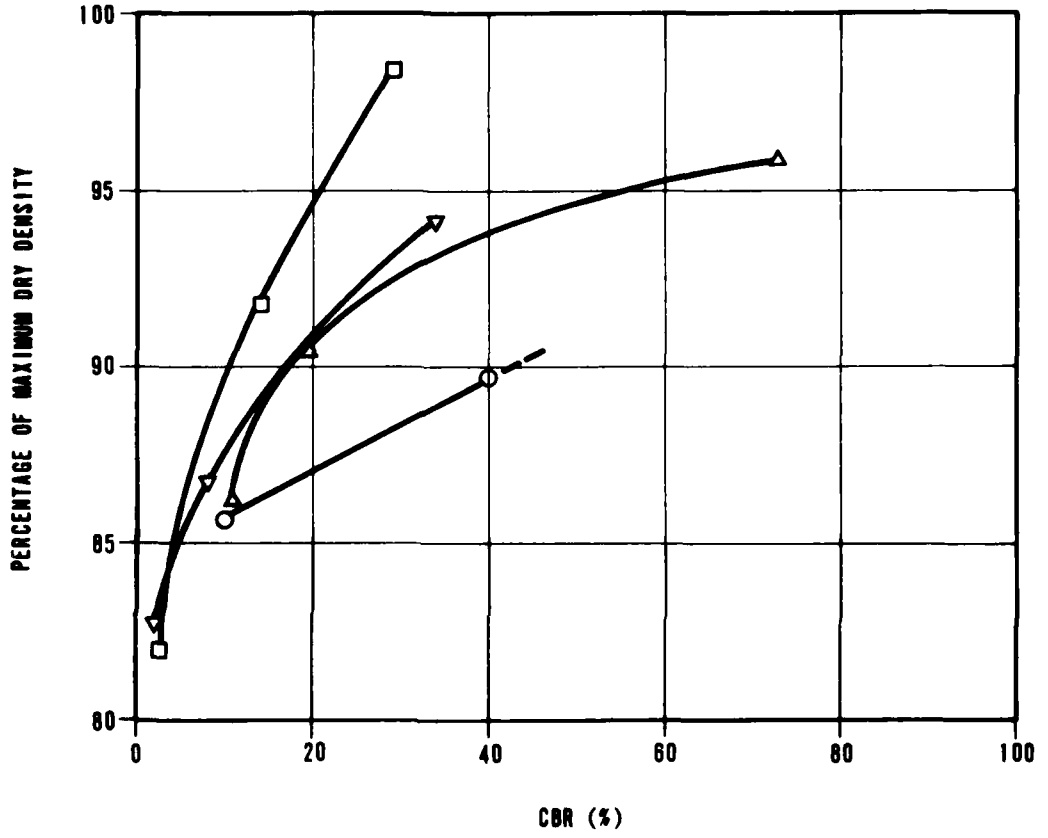
CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-6 2 OF 2

WOODWARD-NATIONAL, INC.

AFV-13



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	CL-ML
△	C	SC-SM
▽	D	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, SNAKE EAST CDP, UTAH

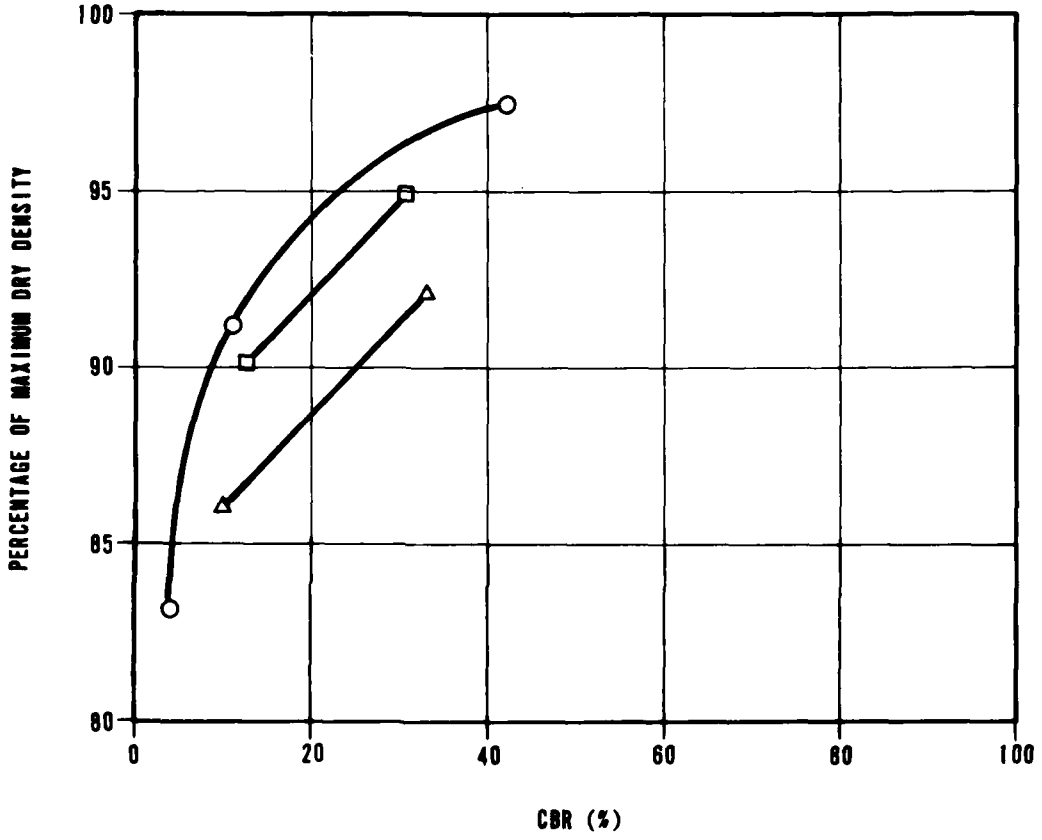
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE · SAMSO

FIGURE 9-3
1 OF 2

FLUOR NATIONAL, INC.

2 JUL 79

AFV-14



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	E	CL-ML
□	F	SM
△	G	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, SNAKE EAST CDP, UTAH

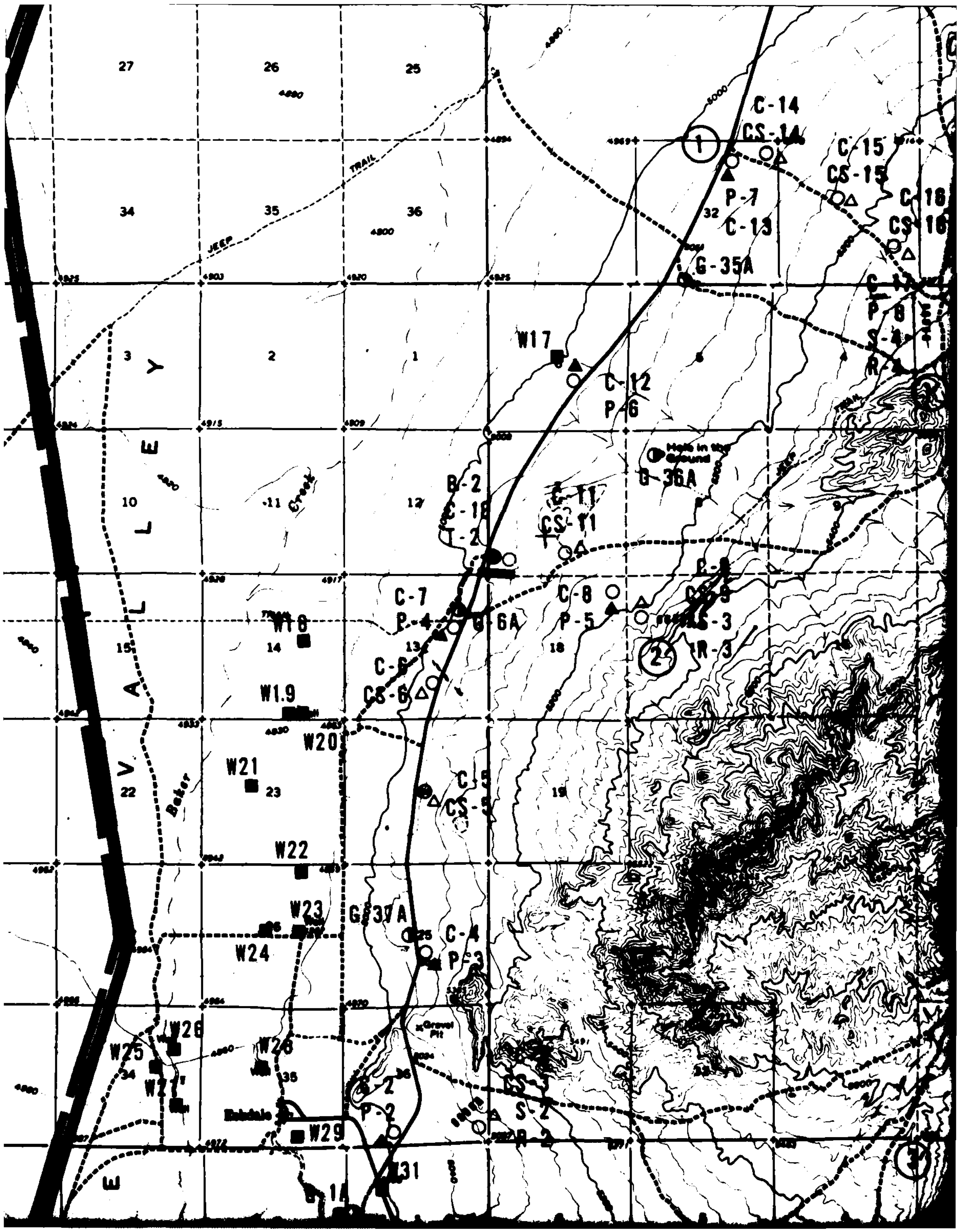
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3 2 OF 2

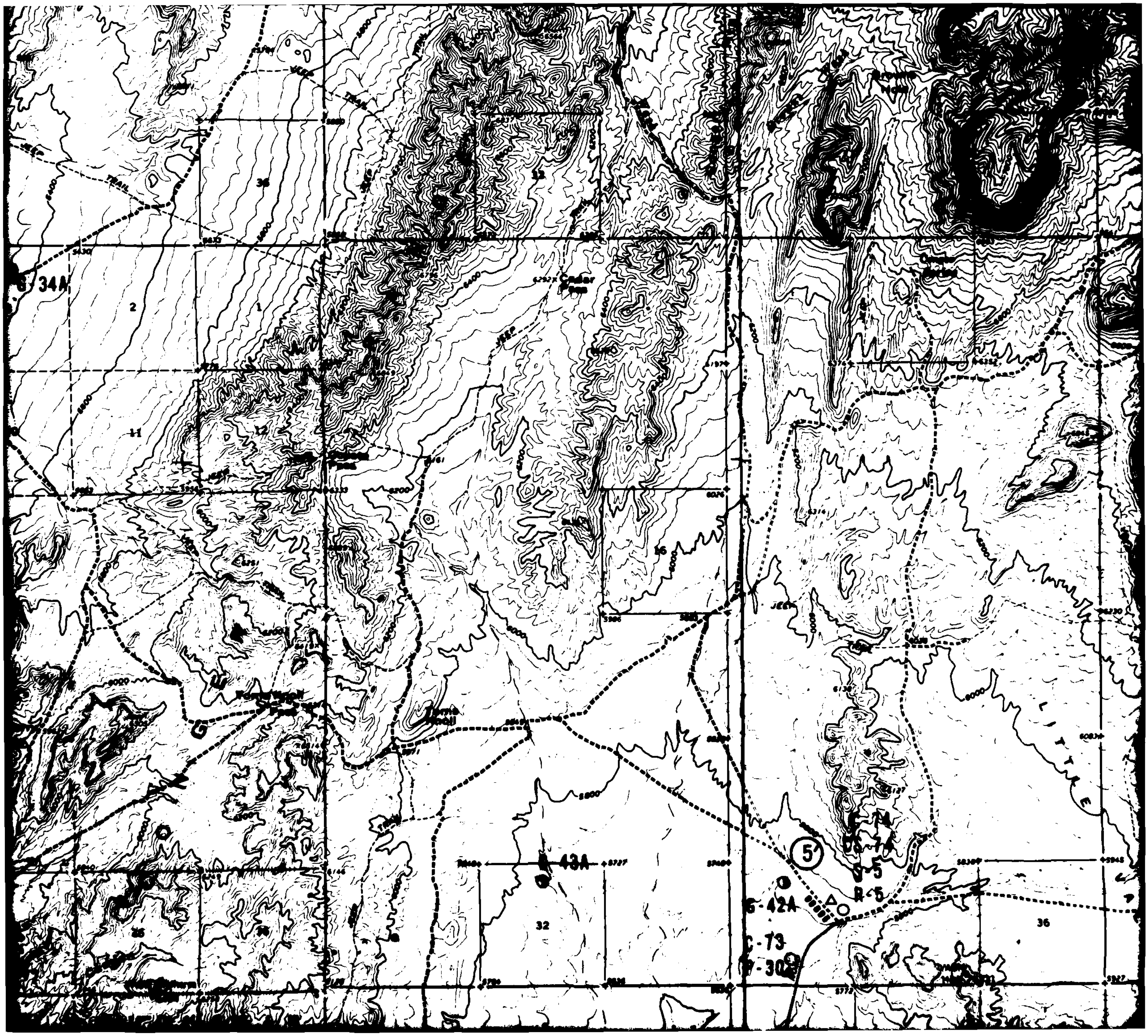
FUGRO NATIONAL, INC.

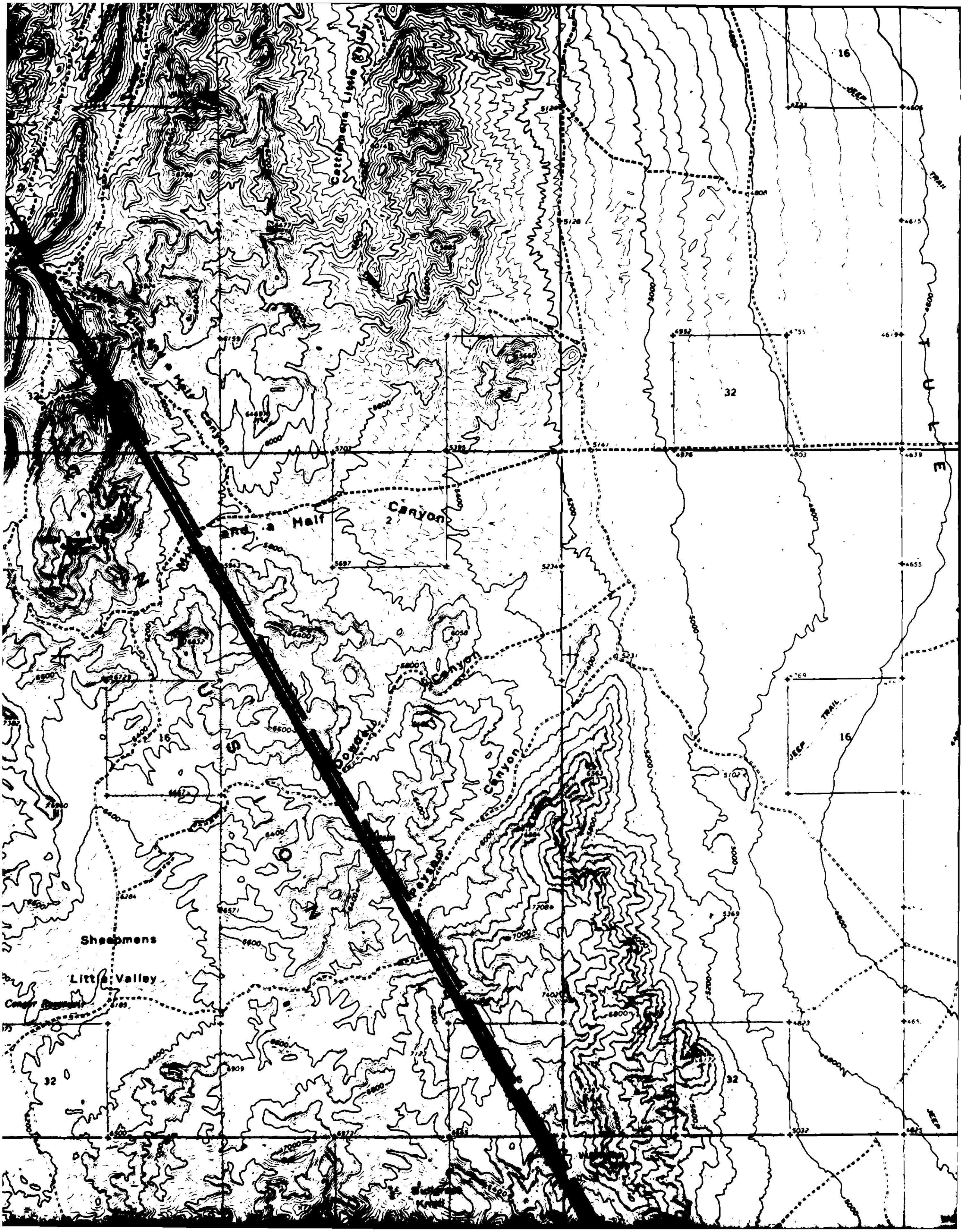
2 JUL 79

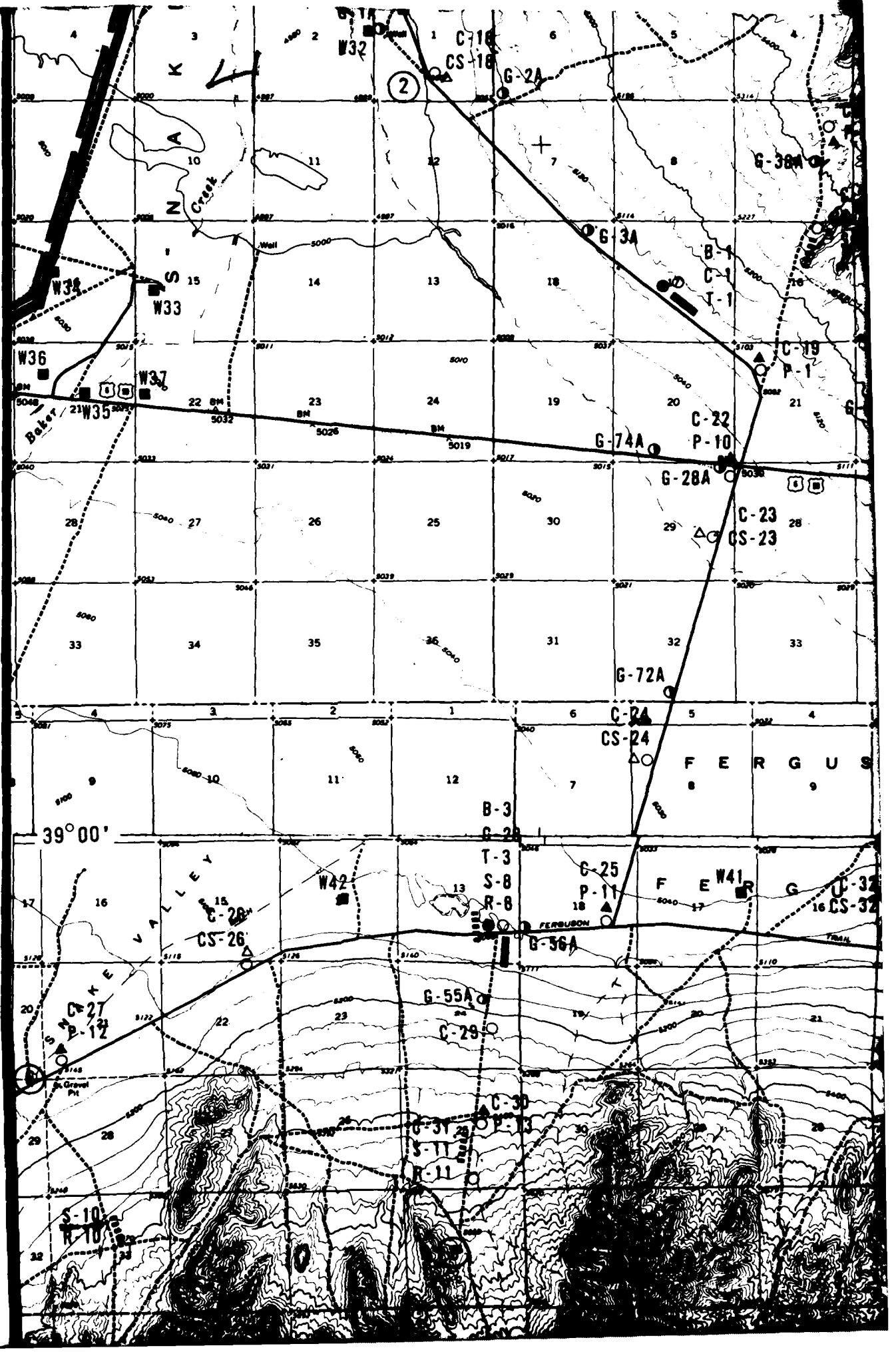
AFV-14

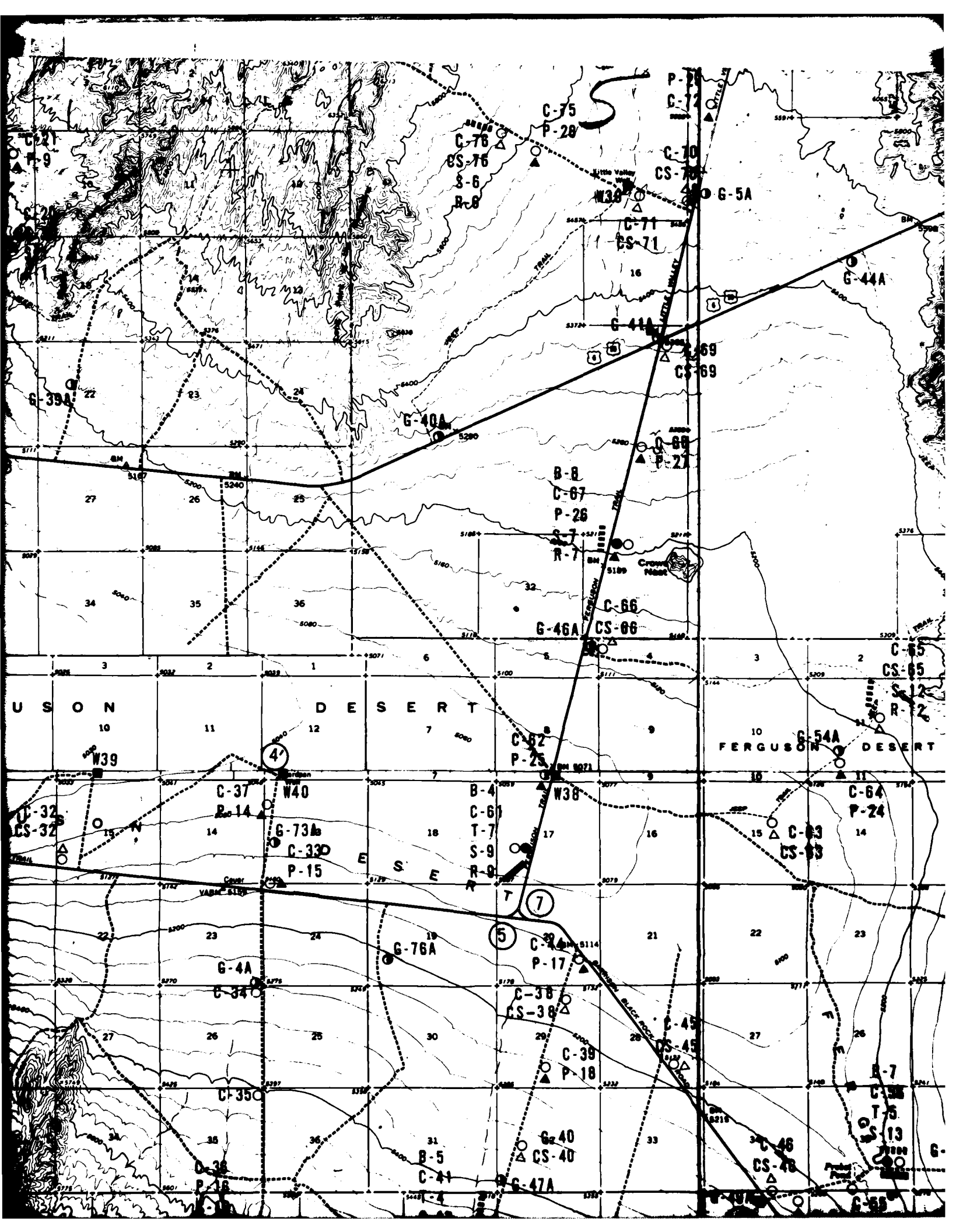


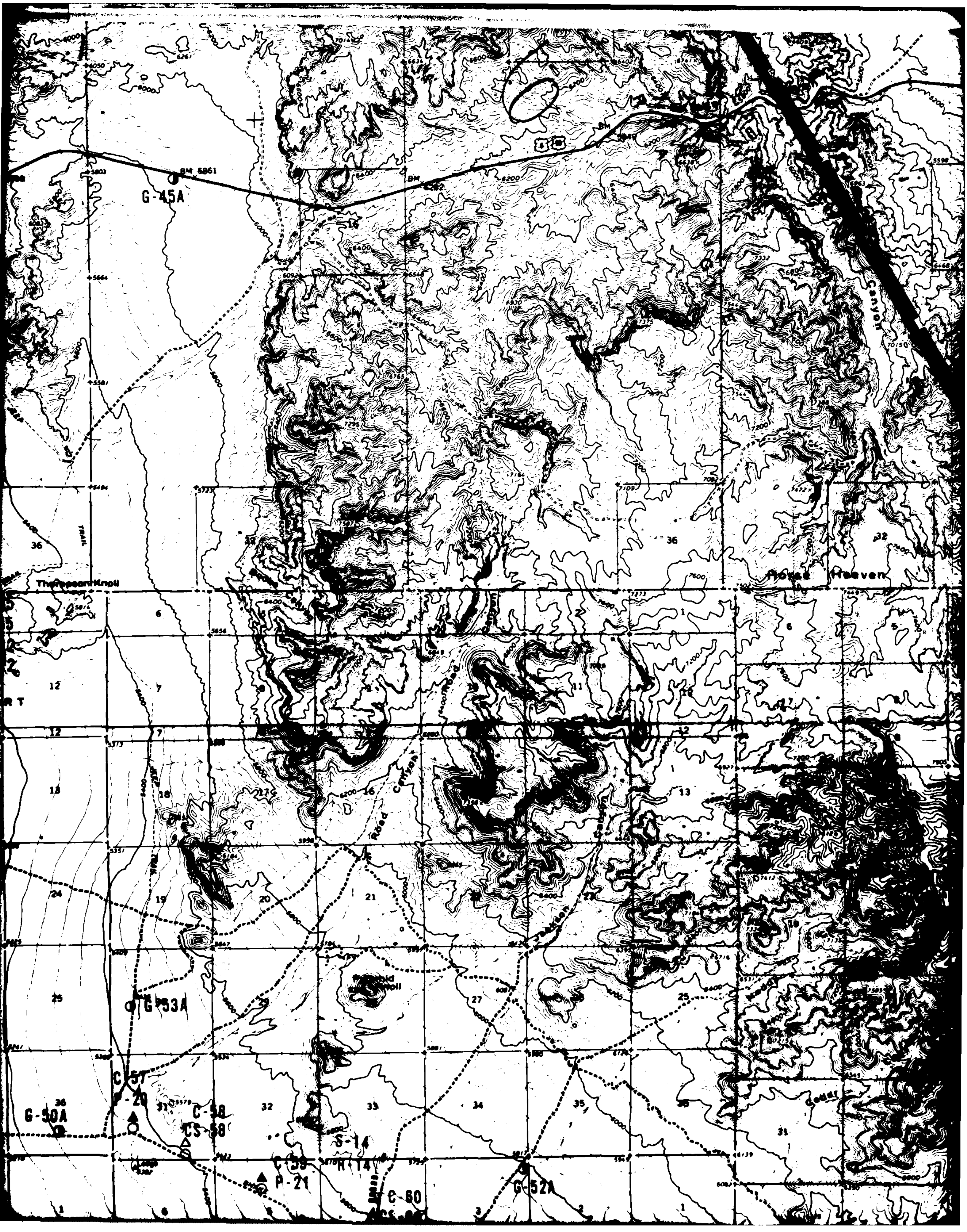
C-14
CS-14
C-15
CS-15
CS-16
P-7
C-13
G-35A
W17
C-12
P-6
Hole in the Ground
G-36A
B-2
T-2
C-11
CS-11
C-7
P-4
C-8
P-5
R-3
C-6
CS-6
W20
W21
C-5
CS-5
W22
W23
C-4
P-3
W24
W25
W29
P-2
S-2
R-2
W31
JEEP
TRAIL
Creek
Baker
Gravel Pit
27
26
25
34
35
36
3
2
1
10
12
15
14
13
18
22
23
19

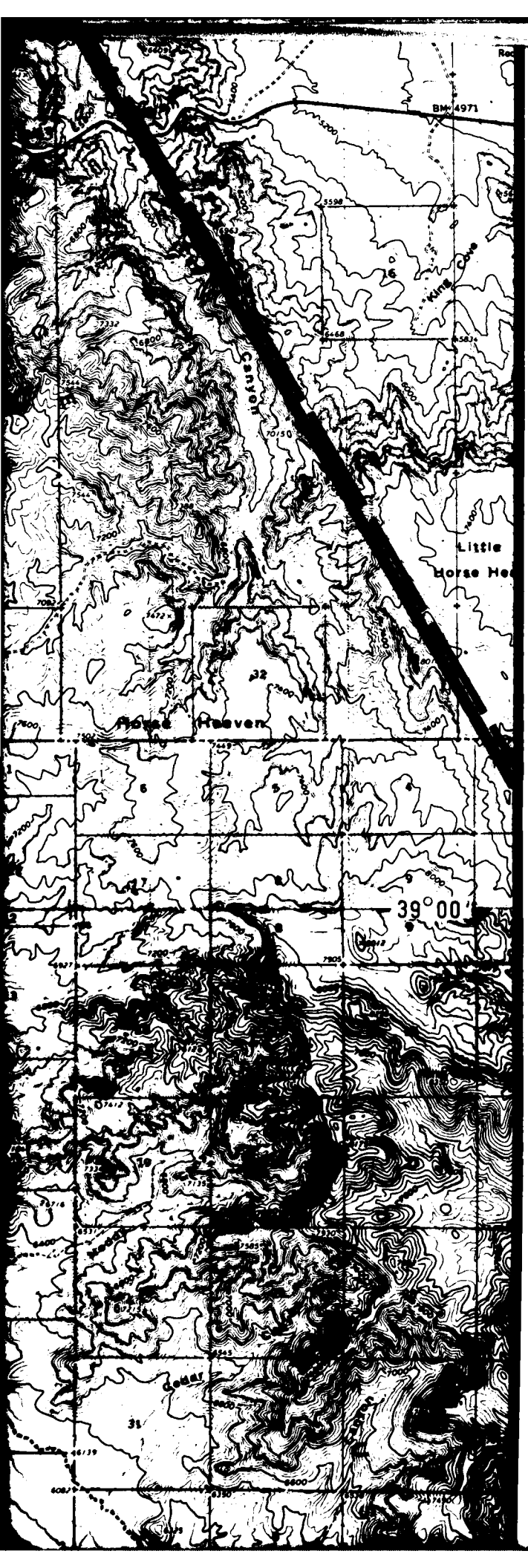

G-34A
5
R-5
G-42A
C-73
43A
LITTLE
TRAIL
JEEP
2
1
11
36
32

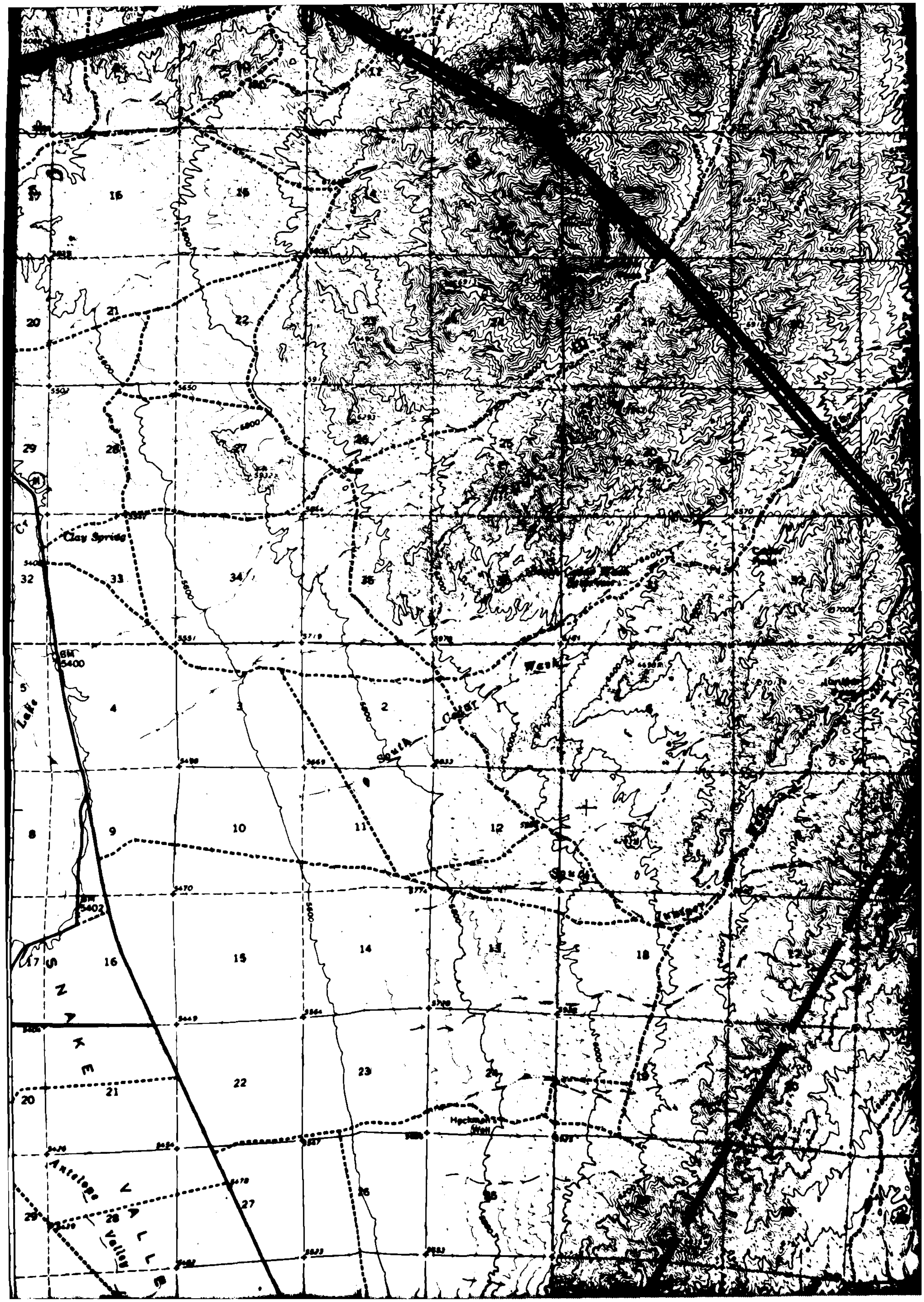

Cattlemens Little Valley
Canyon
Half
Canyon
Canyon
Canyon
Sheepmens
Little Valley
JEEP TRAIL
TRAIL
16
32
2
16
16
32
32
5000
5000
4800
6000
6800
7000


W32
C-18
CS-18
G-2A
G-38M
G-3A
B-1
C-1
T-1
W34
W33
W36
W37
W35
C-19
P-1
C-22
P-10
G-74A
G-28A
C-23
CS-23
G-72A
C-24
CS-24
F E R G U S
B-3
C-28
T-3
S-8
R-8
39° 00'
W42
W41
C-25
P-11
C-26
CS-26
G-56A
G-55A
C-29
C-27
P-12
C-30
P-13
C-31
S-11
R-11
S-10
R-10
Baker
Creek
Well
FERGUSON
TRAIL
SNAKE VALLEY

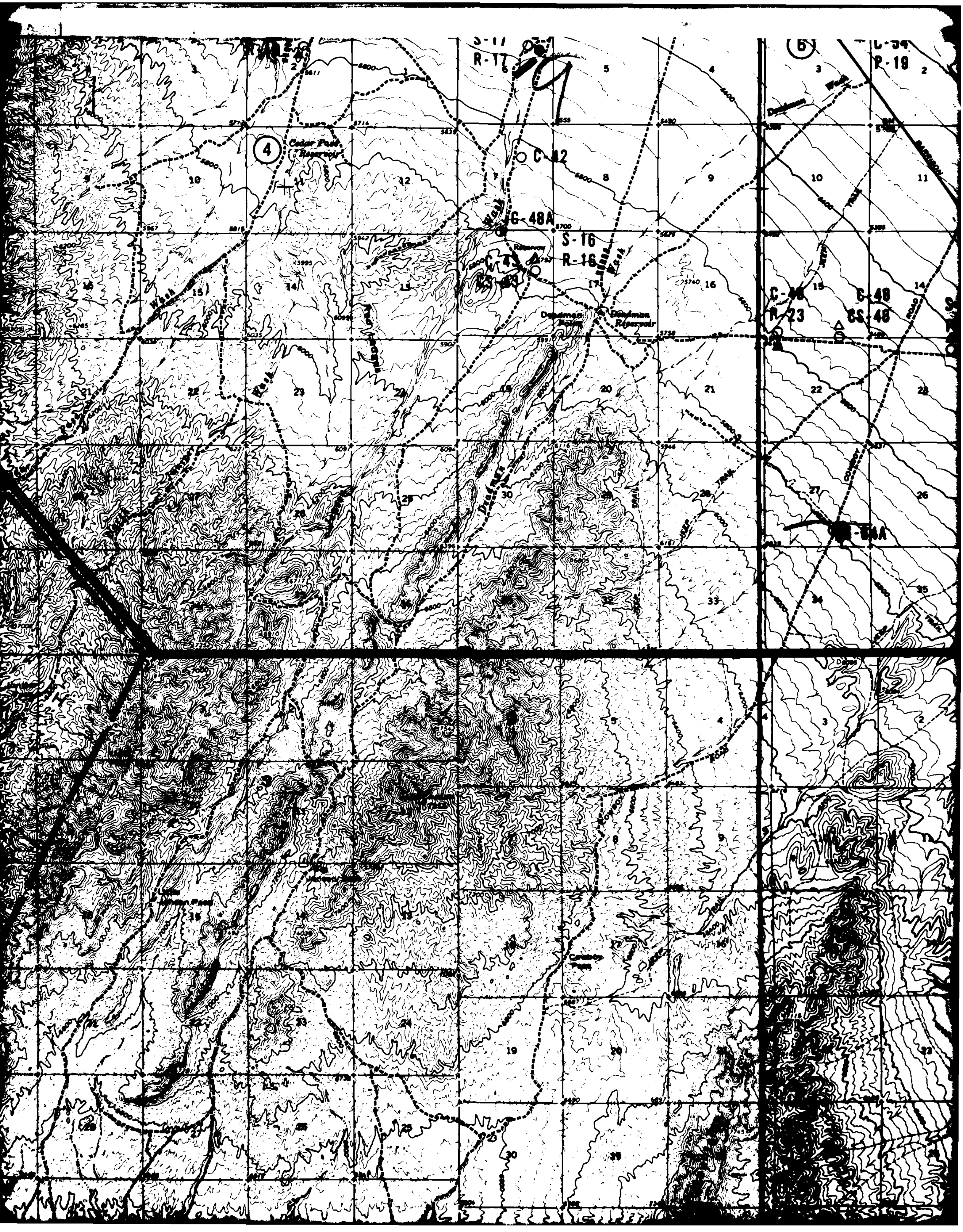

C-75
P-28
C-76
CS-76
S-6
R-8
C-10
CS-70
G-5A
W38
C-71
CS-71
G-44A
G-41A
C-69
CS-69
G-39A
G-40A
C-68
P-27
B-8
C-67
P-26
S-7
R-7
Crown Point
C-66
G-46A
CS-66
C-65
CS-65
S-12
R-2
G-54A
FERGUSON DESERT
C-64
P-24
C-63
CS-63
C-62
P-25
W39
W40
W38
C-37
Rec 14
G-73A
C-33
P-15
B-4
C-61
T-7
S-9
R-9
U-32
CS-32
G-76A
C-44
P-17
G-4A
C-34
C-36
CS-36
C-45
CS-45
C-39
P-18
C-35
R-7
T-5
S-13
C-38
P-16
B-5
C-41
Gz 40
CS-40
G-47A
C-46
CS-46
C-55


G-45A
BM 6861
Canyon
Thompson Knoll
House Heaven
TRAIL
Road Canyon
G-53A
C-57
P-20
G-50A
C-58
CS-58
S-14
C-59
H-14
P-21
C-60
G-52A
Cedar

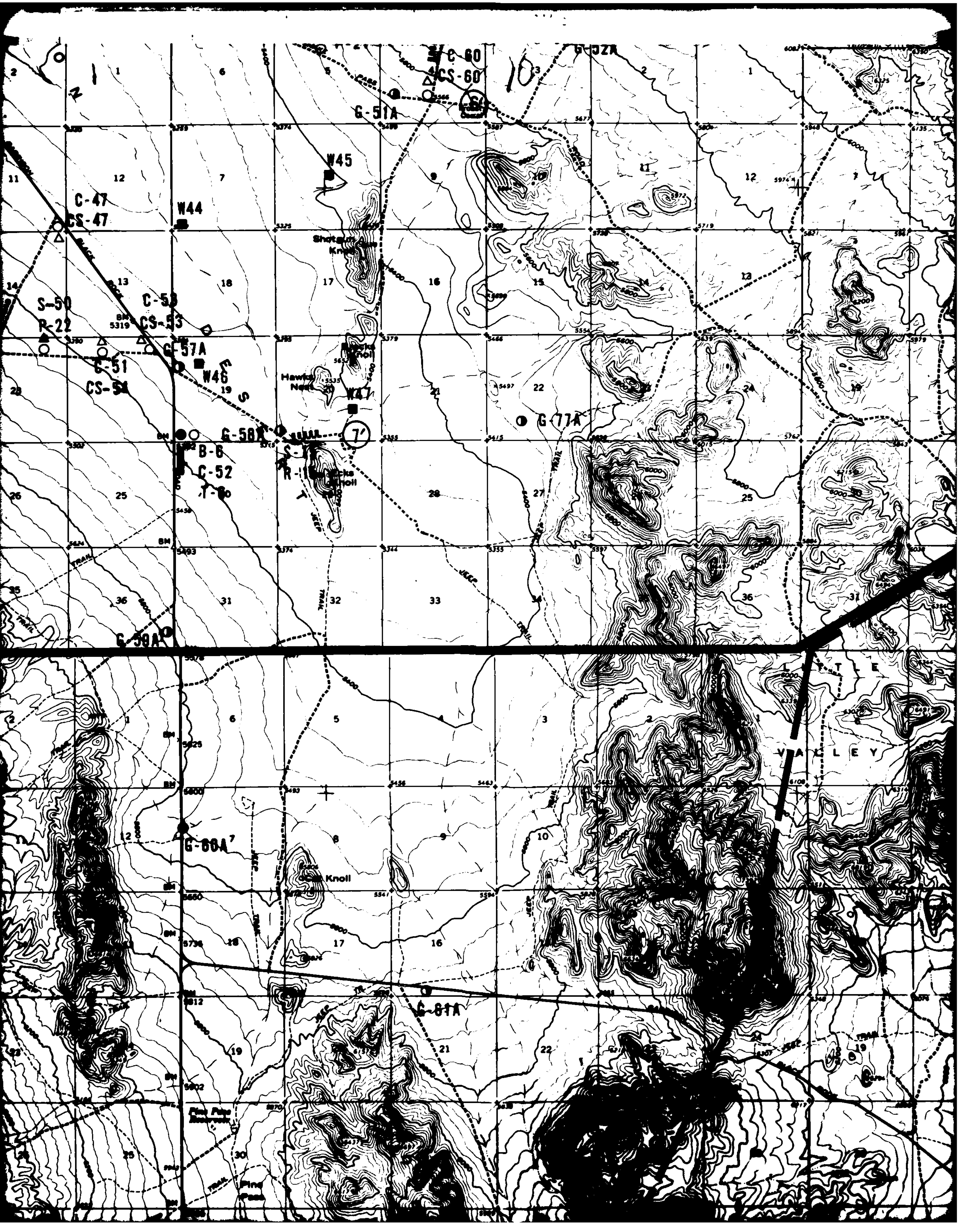

BM 4971
Canyon
Little
Horse Heaven
39°00'

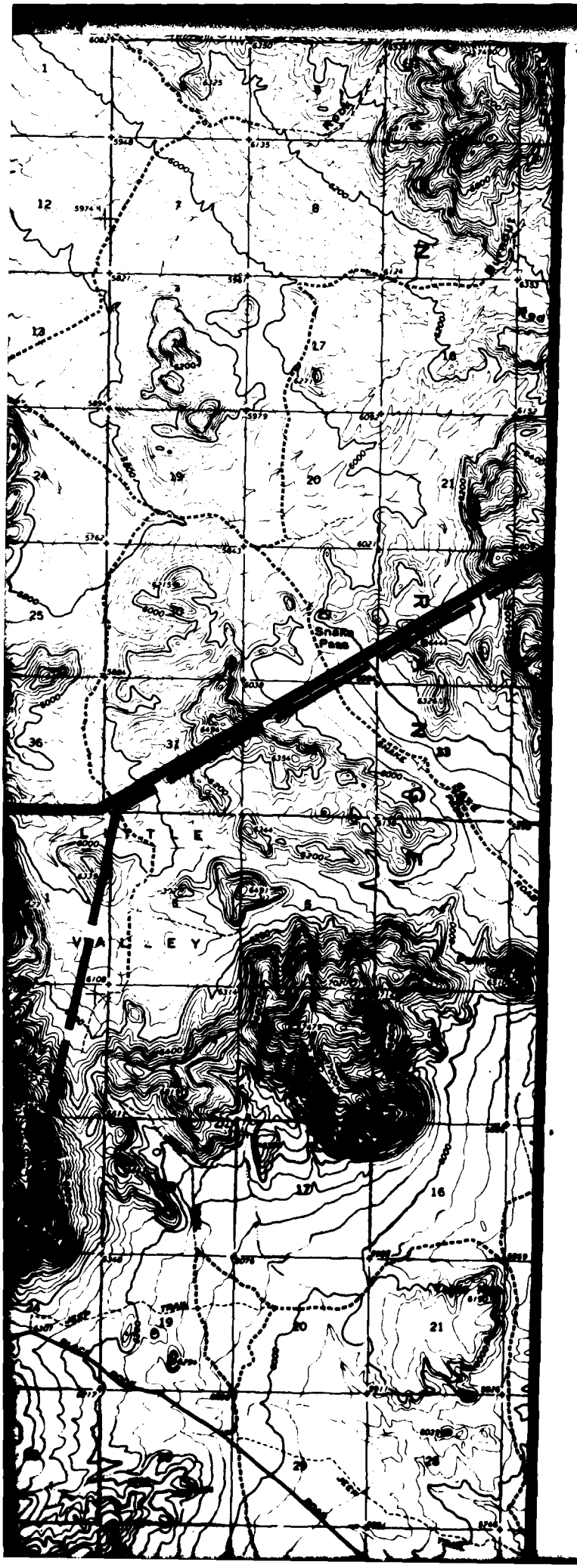


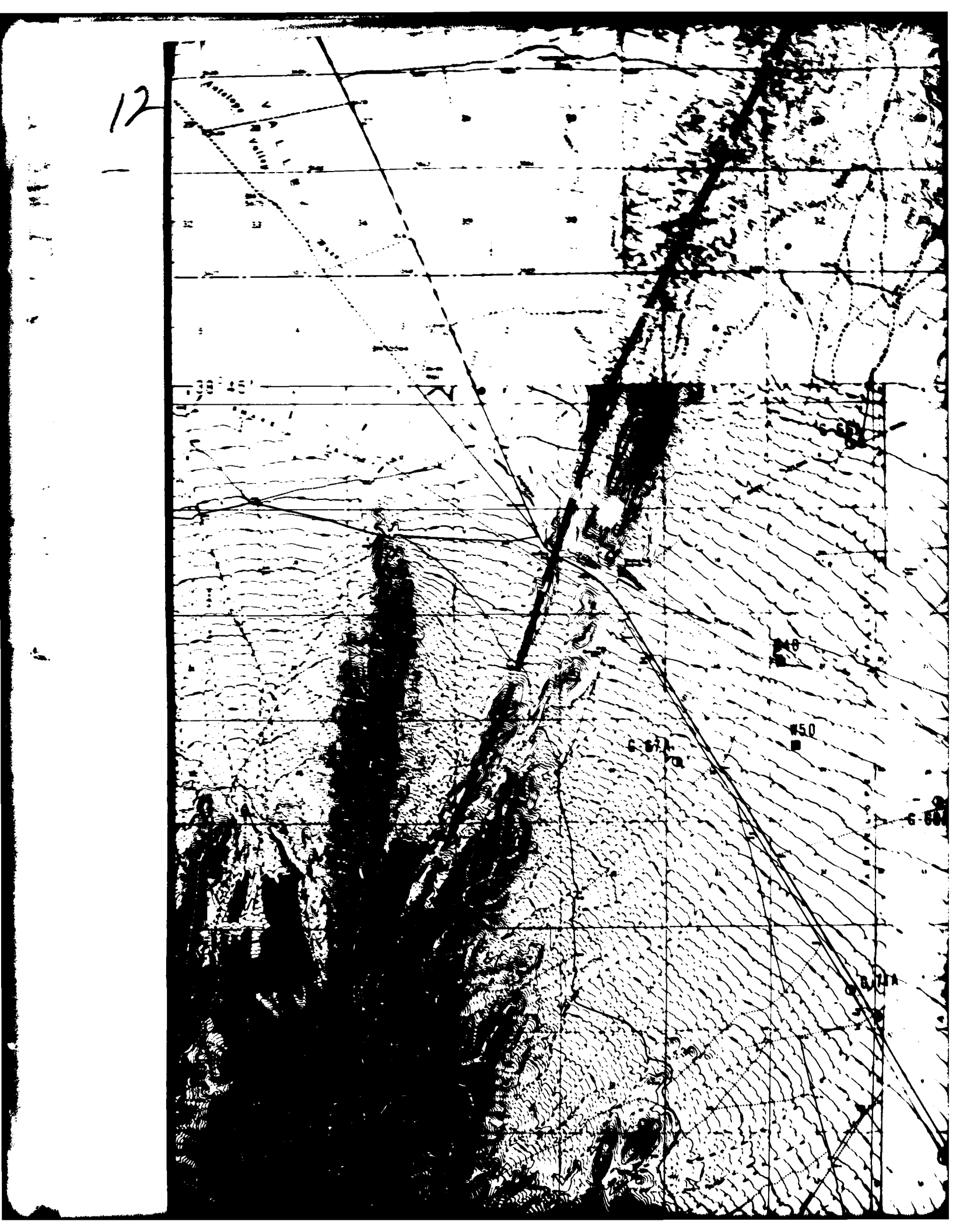
Clay Spring
BM 5400
BM 5402
Lake
S N A K E
V A L L E
Antelope
Valley
South Cedar
Wash

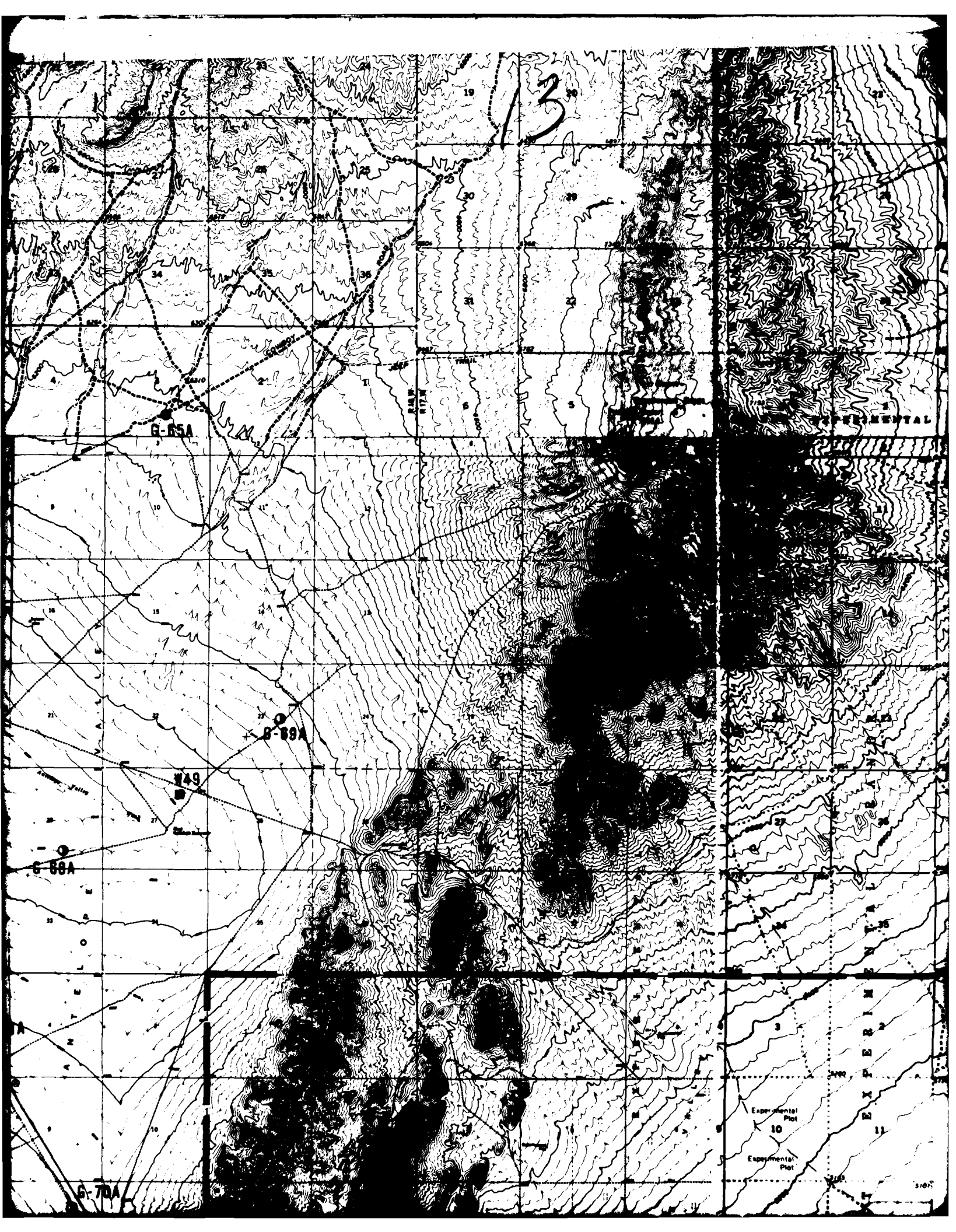


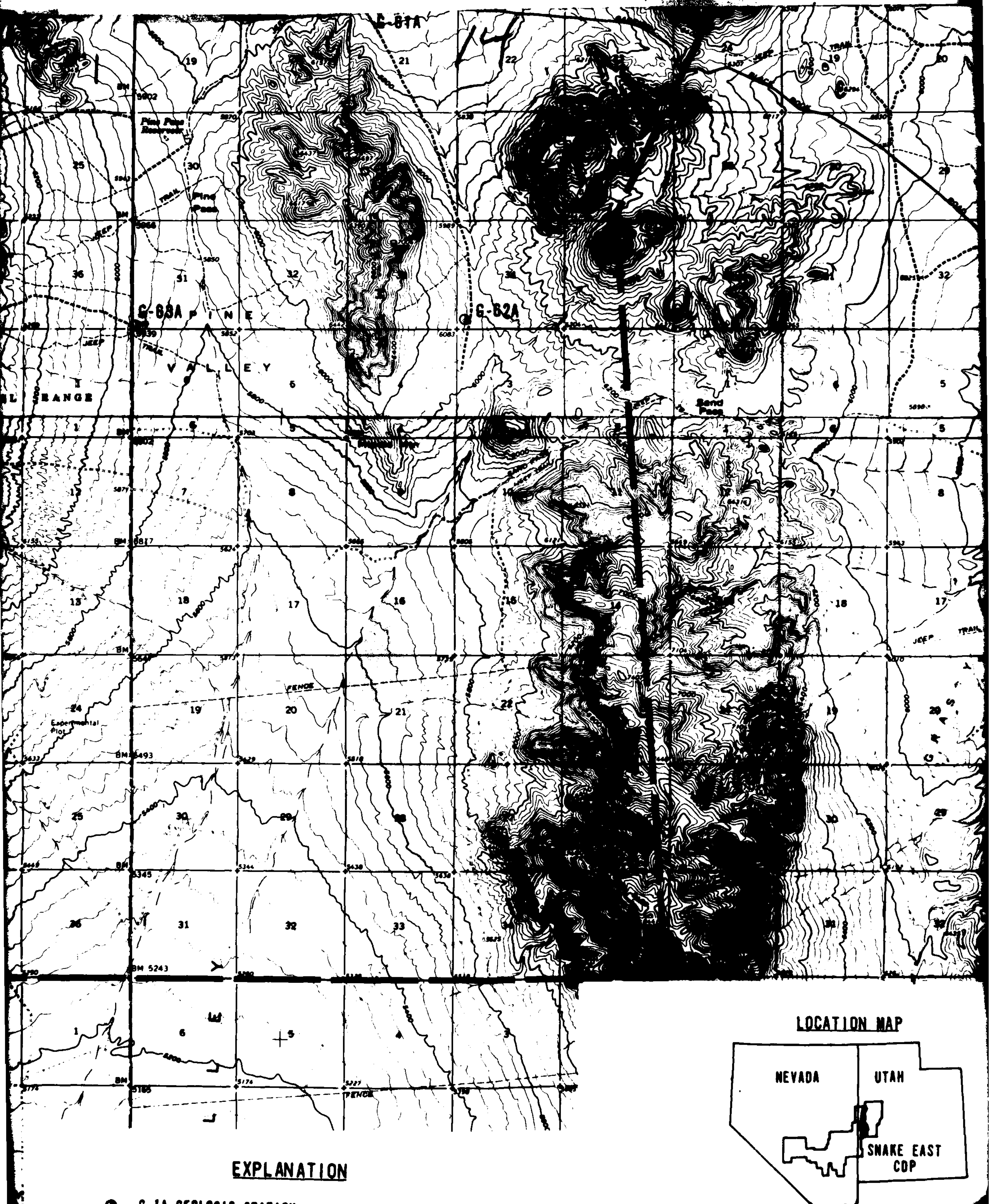
R-17
4
Cedar Pass Reservoir
C-42
C-48A
S-16
R-16
Reservoir
C-43
CS-43
Deadman Reservoir
C-48
R-23
C-48
CS-48
Deadman Wash
Cowboy Pass


C-60
CS-60
G-51A
W45
C-47
CS-47
W44
Shotgun Knoll
S-50
P-22
C-53
CS-53
G-57A
C-51
CS-51
W46
Hawks Nest
W47
G-77A
G-58A
B-6
C-52
G-59A
G-60A
Cat Knoll
G-61A
VALLEY
TRAIL
JEEP


Snake Pass
V A L L E Y



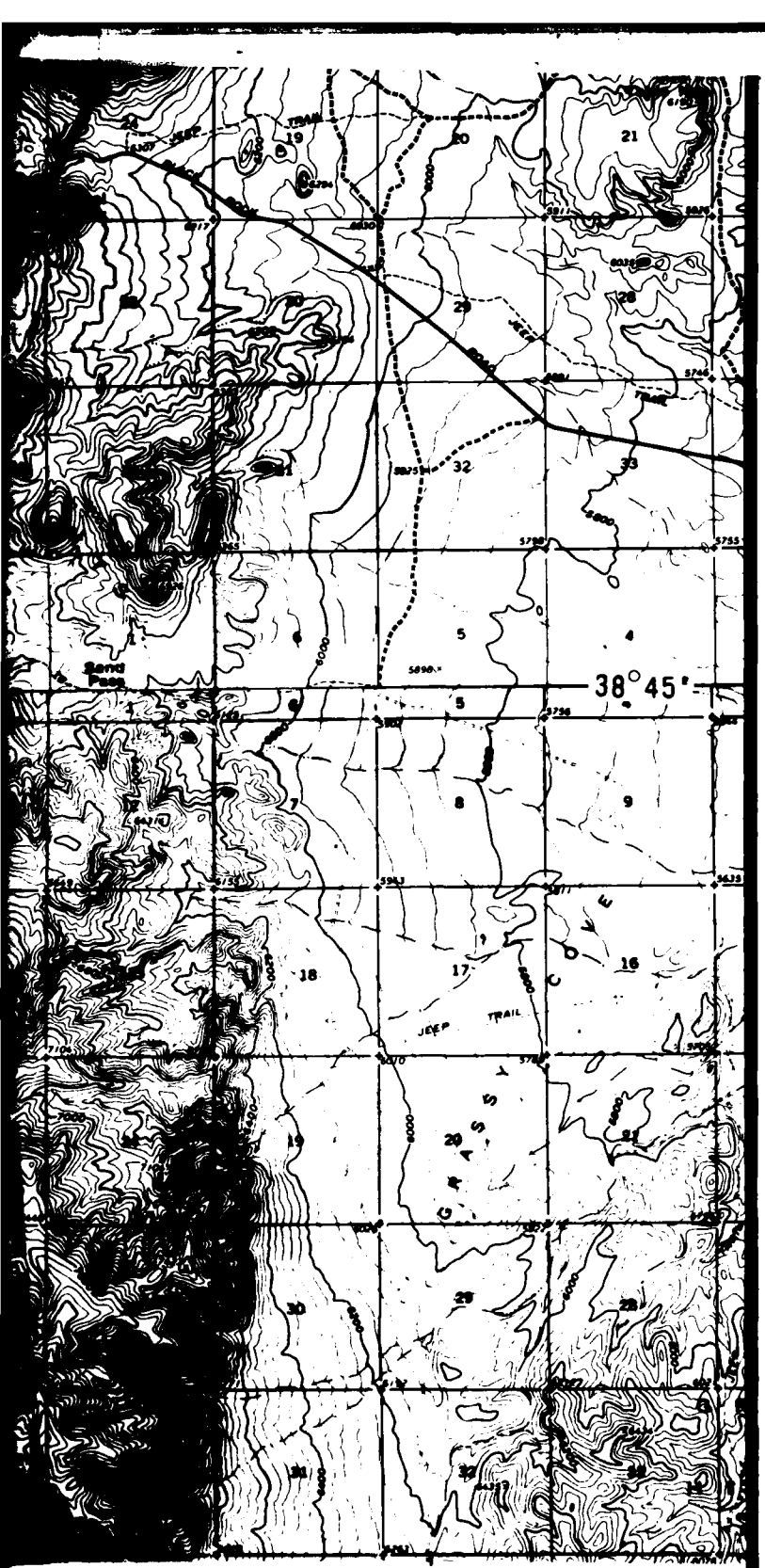

13
G-65A
G-69A
149
G-68A
G-70A
Experimental Plot
10
Experimental Plot



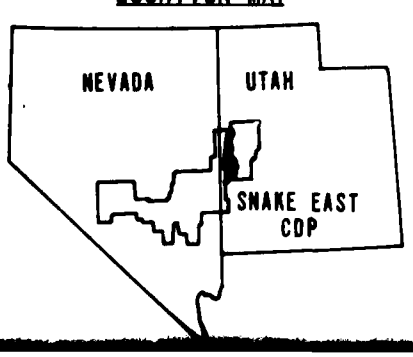
EXPLANATION

◐ G-1A GEOLOGIC STATION

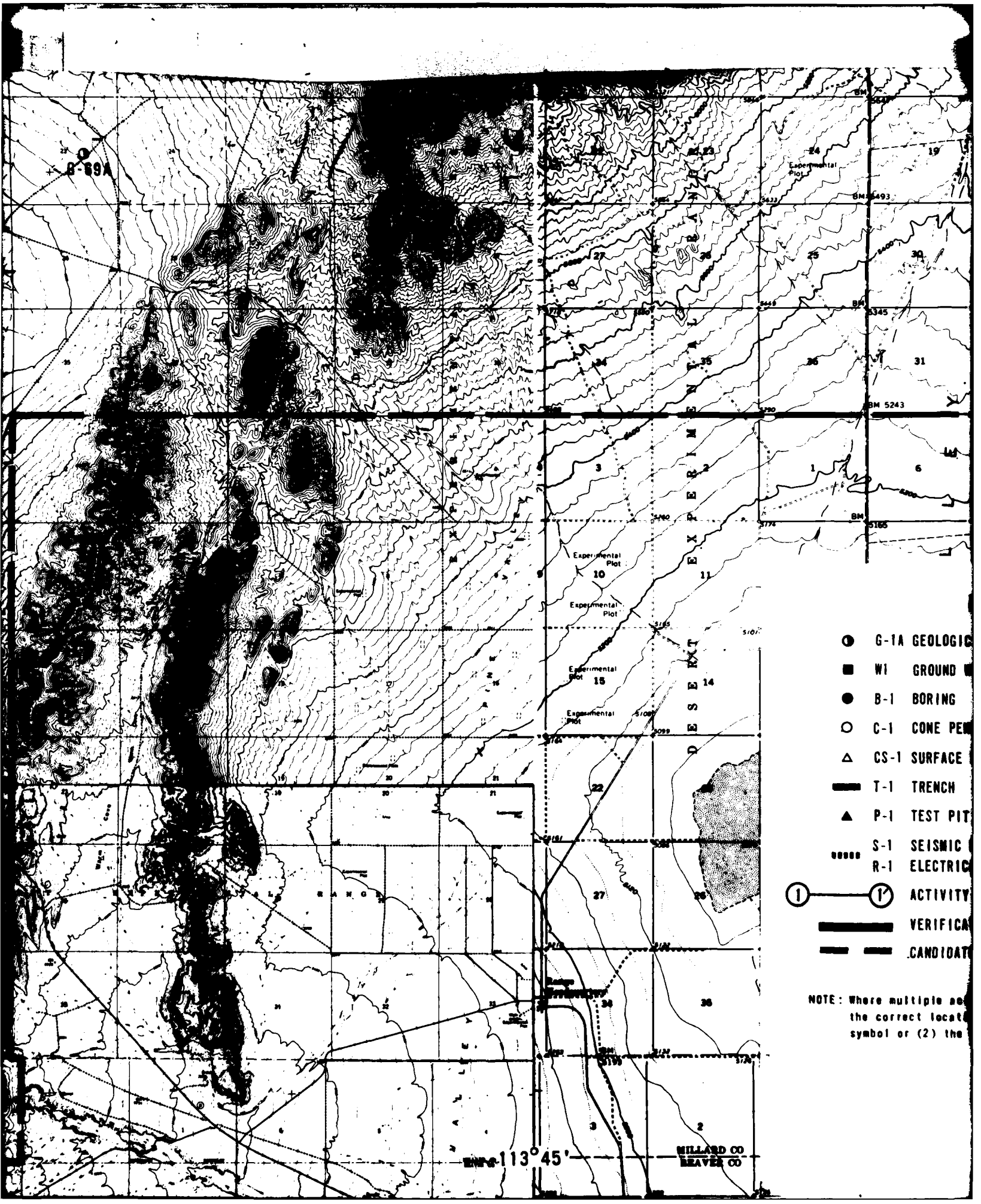
15

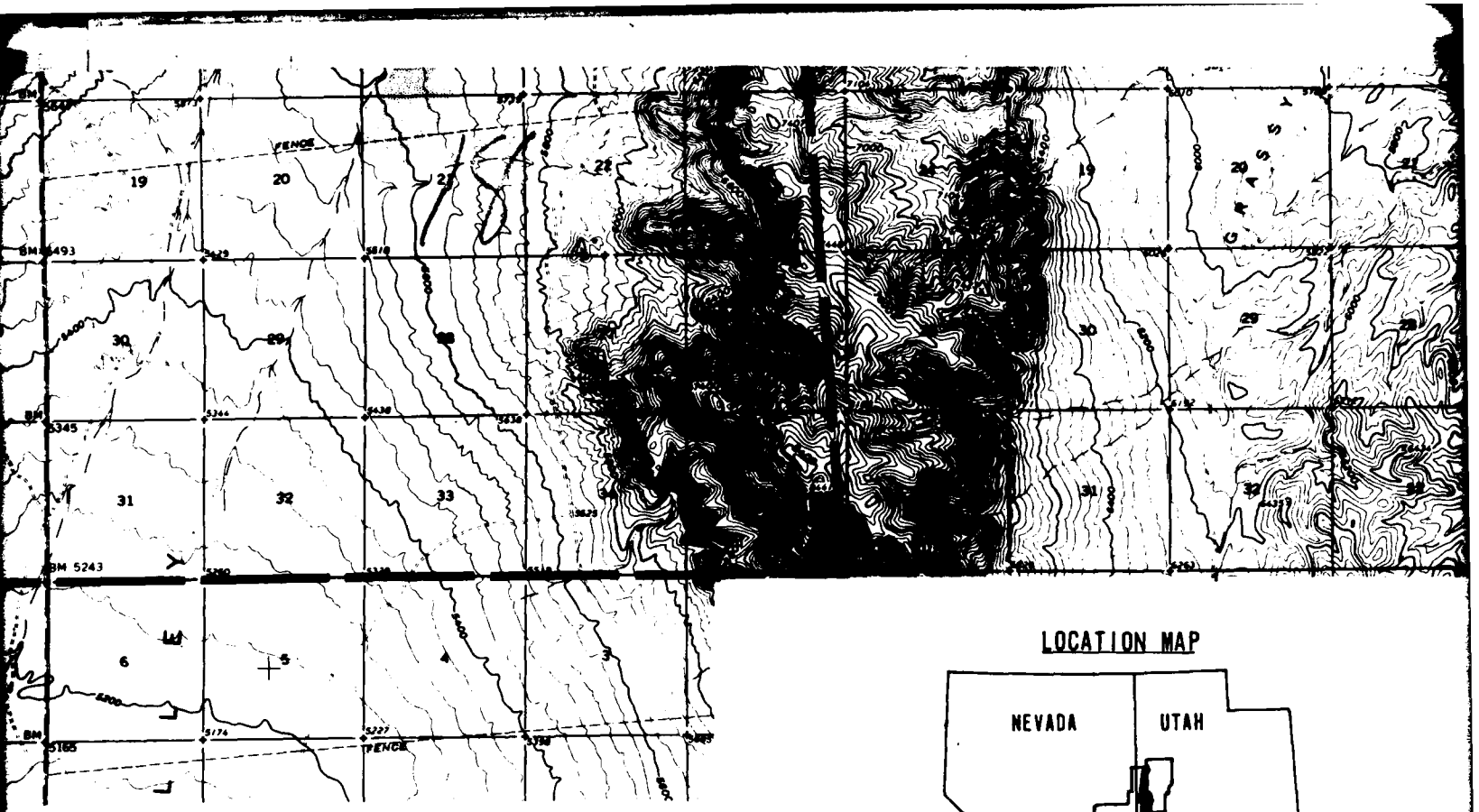


LOCATION MAP

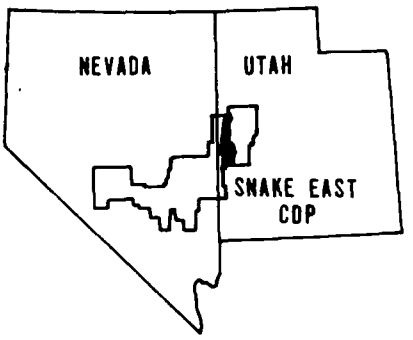


W40
W50
C-17A
C-17A


B-69A
Experimental Plot
BM 5493
BM 5345
BM 5243
BM 5165
Experimental Plot
10
Experimental Plot
Experimental Plot
15
Experimental Plot
RANGE
113°45'
MILLARD CO
BEAVER CO
G-1A GEOLOGIC
WI GROUND
B-1 BORING
C-1 CONE PE
CS-1 SURFACE
T-1 TRENCH
P-1 TEST PIT
S-1 SEISMIC
R-1 ELECTRIC
ACTIVITY
VERIFICA
CANDIDAT
NOTE: Where multiple ac
the correct locat
symbol or (2) the



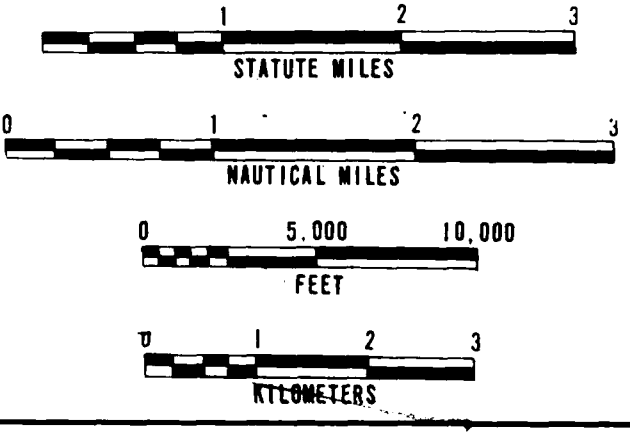
LOCATION MAP



EXPLANATION

- G-1A GEOLOGIC STATION
- WI GROUND WATER LEVEL MEASUREMENT
- B-1 BORING
- C-1 CONE PENETROMETER TEST (CPT)
- CS-1 SURFACE SAMPLE AT CPT LOCATION
- T-1 TRENCH
- P-1 TEST PIT
- S-1 SEISMIC REFRACTION LINE
- R-1 ELECTRICAL RESISTIVITY LINE
- (1) ACTIVITY LINE
- VERIFICATION SITE BOUNDARY
- CANDIDATE DEPLOYMENT PARCEL (CDP) BOUNDARY

Where multiple activities were performed at the same location, the correct location is designated by either (1) the boring symbol or (2) the CPT symbol, if no boring wss drilled

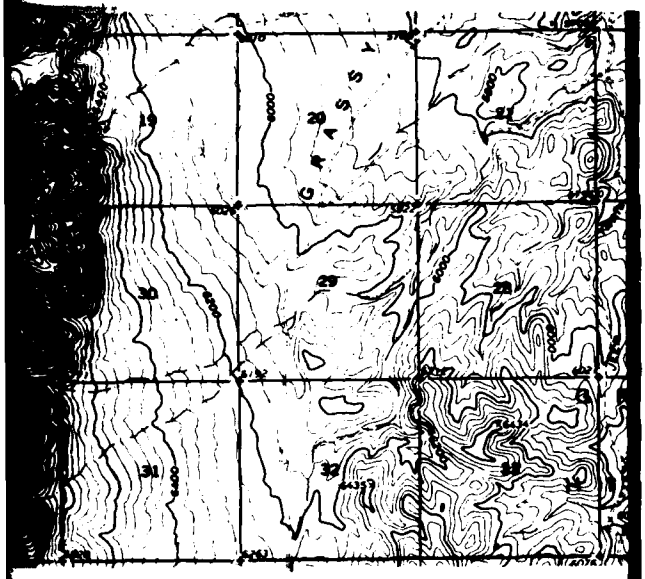


ACTIVITY LOCATION MAP
SNAKE EAST CDP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

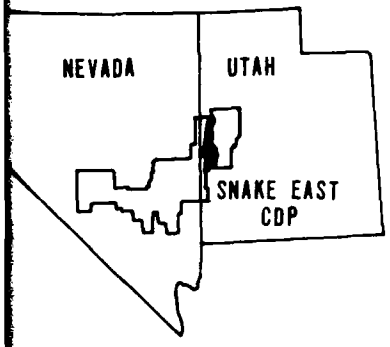
DRAWING 1

FUGRO NATIONAL, INC



19

LOCATION MAP



1 2 3
STATUTE MILES

1 2 3
NAUTICAL MILES

5,000 10,000
FEET

1 2 3
KILOMETERS

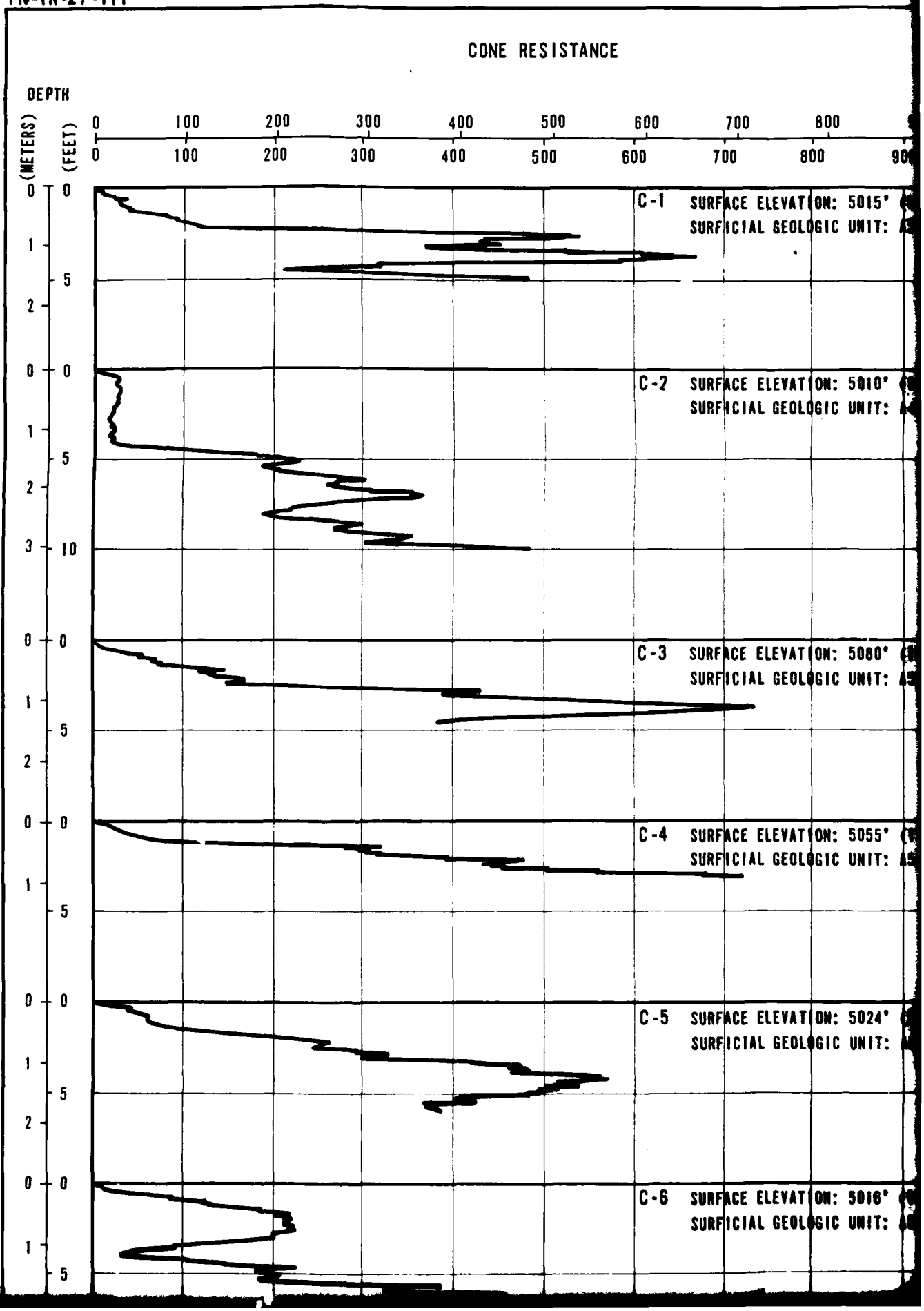
TIVITY LOCATION MAP
AKE EAST CDP, UTAH

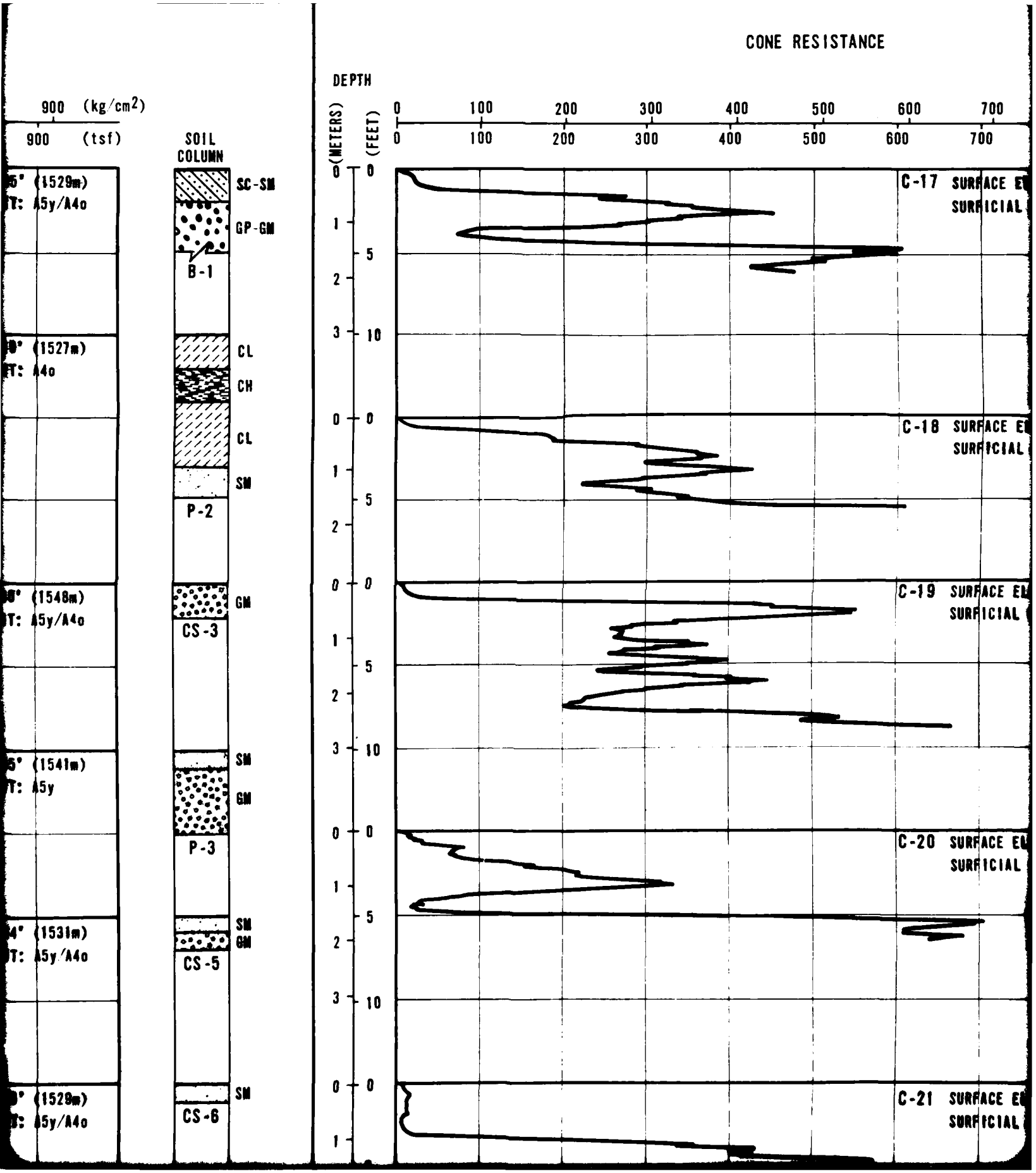
INVESTIGATION
HE AIR FORCE - SAMSO

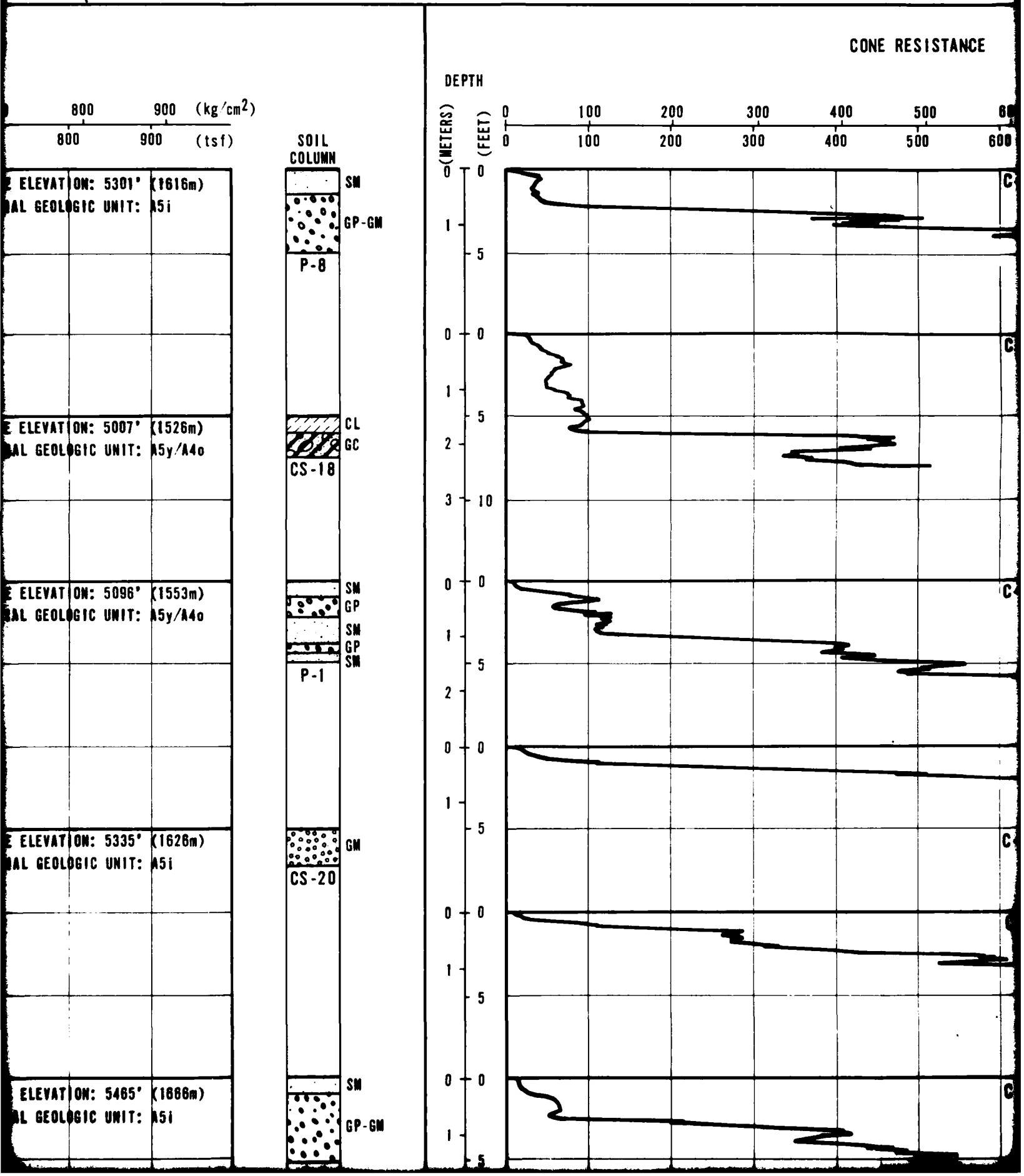
DRAWING
1

NATIONAL, INC.

FN-TR-27-111


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0
100
200
300
400
500
600
700
800
C-1 SURFACE ELEVATION: 5015'
SURFICIAL GEOLOGIC UNIT:
C-2 SURFACE ELEVATION: 5010'
SURFICIAL GEOLOGIC UNIT:
C-3 SURFACE ELEVATION: 5080'
SURFICIAL GEOLOGIC UNIT:
C-4 SURFACE ELEVATION: 5055'
SURFICIAL GEOLOGIC UNIT:
C-5 SURFACE ELEVATION: 5024'
SURFICIAL GEOLOGIC UNIT:
C-6 SURFACE ELEVATION: 5010'
SURFICIAL GEOLOGIC UNIT:


900 (kg/cm2)
900 (tsf)
SOIL COLUMN
SC-SM
GP-GM
B-1
CL
CH
CL
SM
P-2
GM
CS-3
SM
GM
P-3
SM
GM
CS-5
SM
CS-6
CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700
C-17 SURFACE EL
SURFICIAL
C-18 SURFACE EL
SURFICIAL
C-19 SURFACE EL
SURFICIAL
C-20 SURFACE EL
SURFICIAL
C-21 SURFACE EL
SURFICIAL


800 900 (kg/cm²)
800 900 (tsf)
SOIL COLUMN
E ELEVATION: 5301' (1616m)
AL GEOLOGIC UNIT: A5i
SM
GP-GM
P-8
E ELEVATION: 5007' (1526m)
AL GEOLOGIC UNIT: A5y/A4o
CL
GC
CS-18
E ELEVATION: 5096' (1553m)
AL GEOLOGIC UNIT: A5y/A4o
SM
GP
SM
GP
SM
P-1
E ELEVATION: 5335' (1626m)
AL GEOLOGIC UNIT: A5i
GM
CS-20
ELEVATION: 5465' (1666m)
L GEOLOGIC UNIT: A5i
SM
GP-GM
CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600
0 100 200 300 400 500 600

CONE RESISTANCE

200 300 400 500 600 700 800 900 (kg/cm^2)

200 300 400 500 600 700 800 900 (tsf)

SOIL COLUMN

C-27 SURFACE ELEVATION: 5145' (1568m)
SURFICIAL GEOLOGIC UNIT: A5i

SM
GM
P-12

C-28 SURFACE ELEVATION: 5086' (1550m)
SURFICIAL GEOLOGIC UNIT: A5i

SM
ML
SM
B-3

C-29 SURFACE ELEVATION: 5230' (1594m)
SURFICIAL GEOLOGIC UNIT: A5i

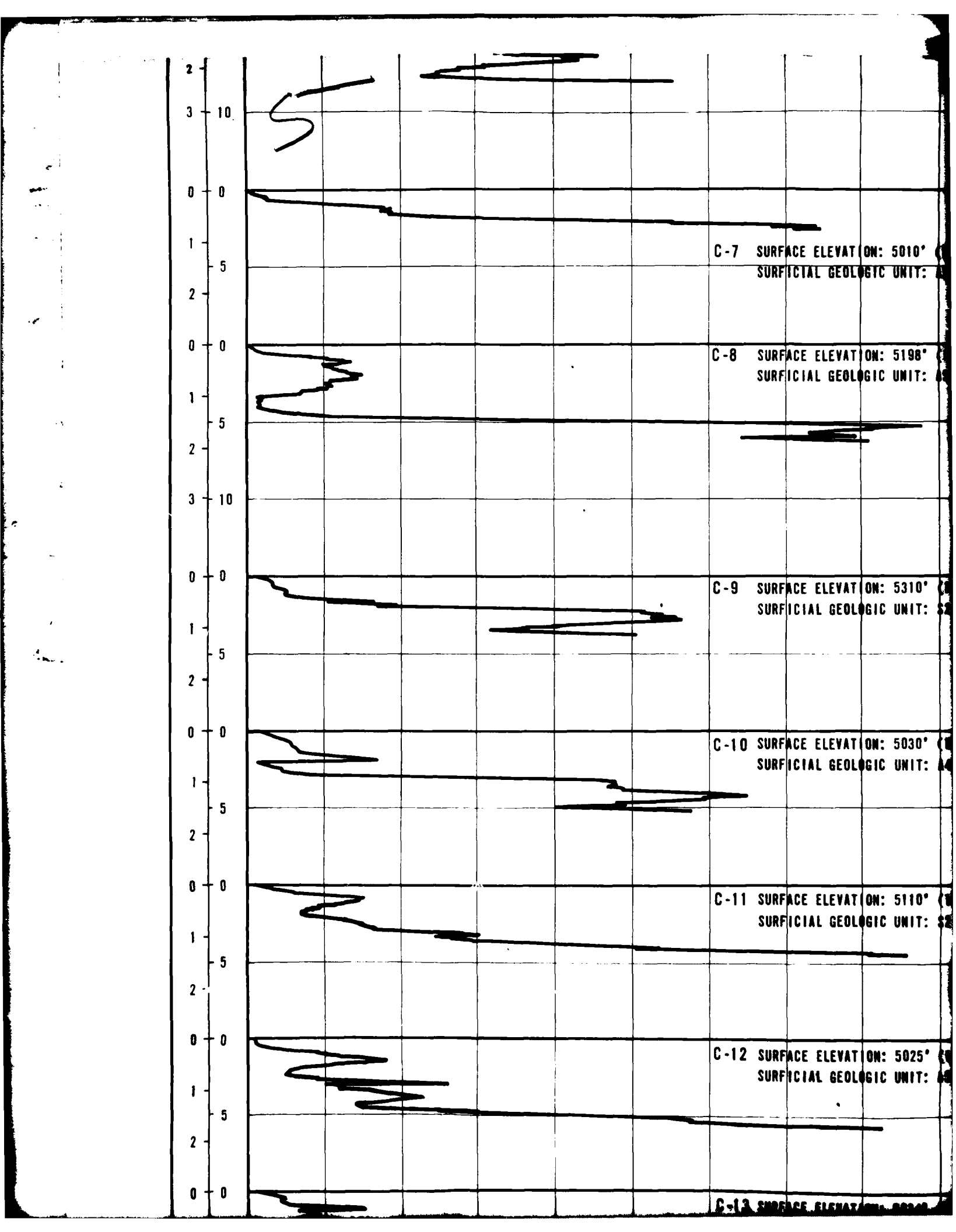
SM
GP-GM
P-13

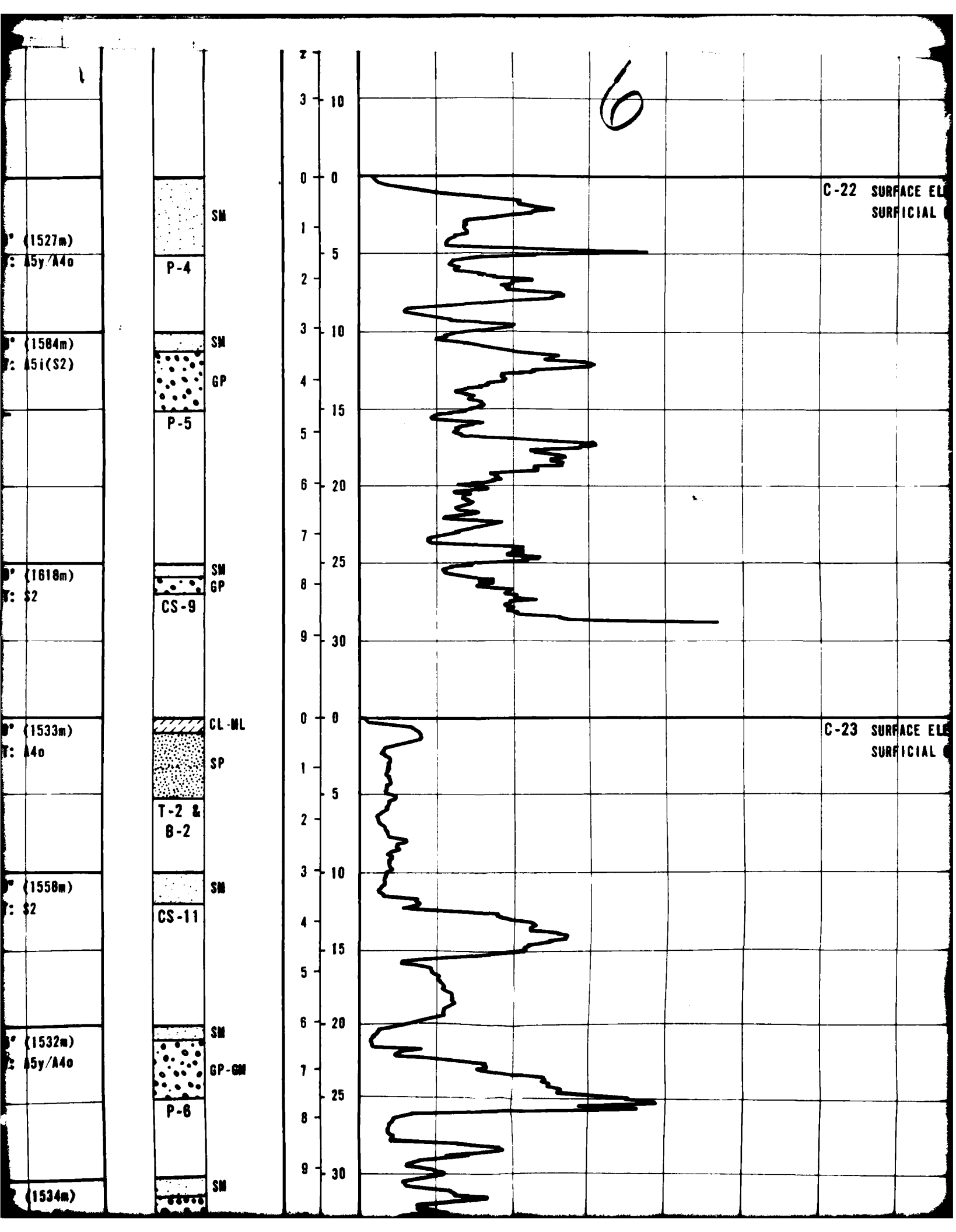
C-30 SURFACE ELEVATION: 5410' (1649m)
SURFICIAL GEOLOGIC UNIT: A5i

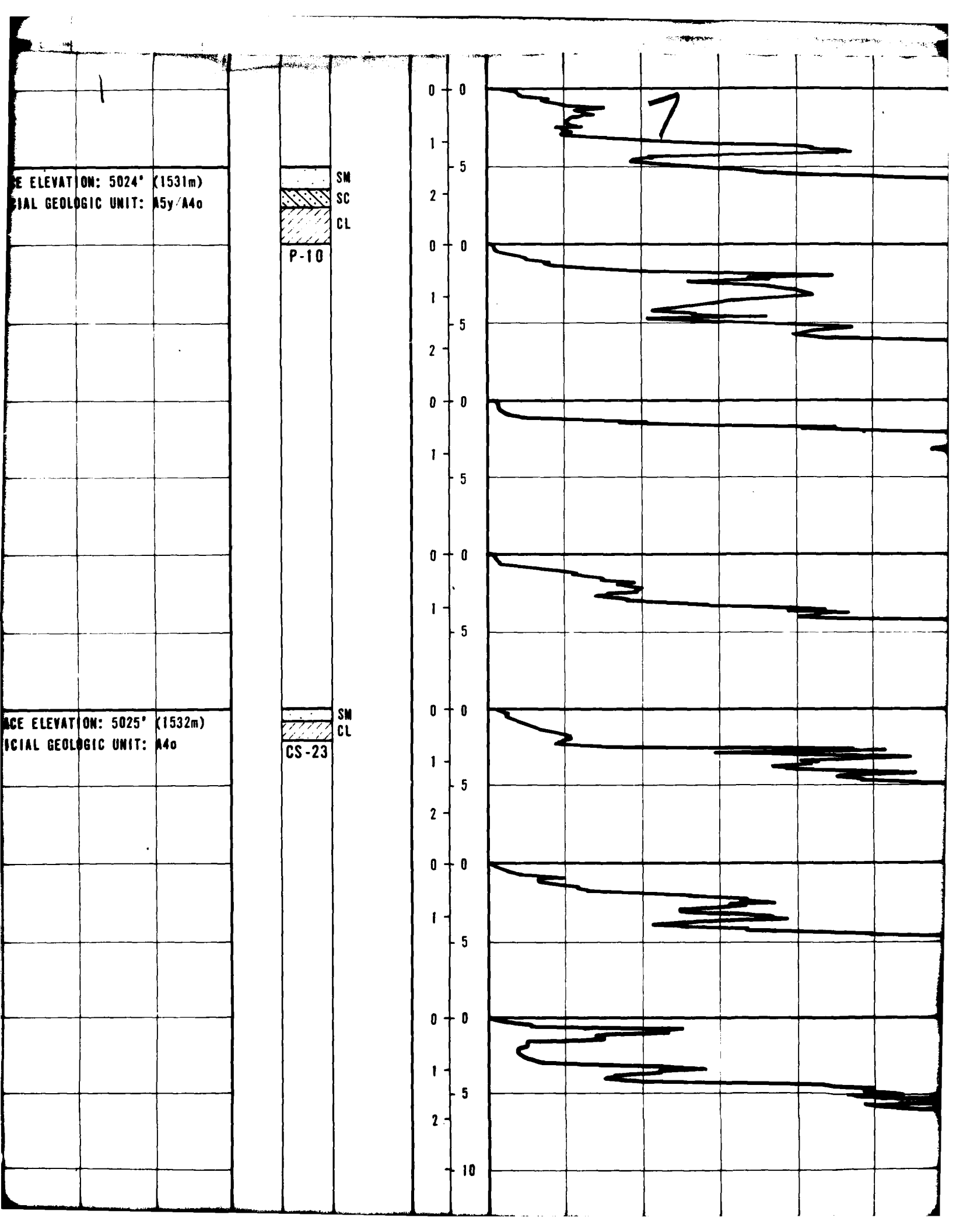
C-31 SURFACE ELEVATION: 5540' (1689m)
SURFICIAL GEOLOGIC UNIT: A5i

C-32 SURFACE ELEVATION: 5110' (1558m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

SM
CS-32


C-7 SURFACE ELEVATION: 5010'
SURFICIAL GEOLOGIC UNIT:
C-8 SURFACE ELEVATION: 5198'
SURFICIAL GEOLOGIC UNIT:
C-9 SURFACE ELEVATION: 5310'
SURFICIAL GEOLOGIC UNIT:
C-10 SURFACE ELEVATION: 5030'
SURFICIAL GEOLOGIC UNIT:
C-11 SURFACE ELEVATION: 5110'
SURFICIAL GEOLOGIC UNIT:
C-12 SURFACE ELEVATION: 5025'
SURFICIAL GEOLOGIC UNIT:


6
(1527m)
A5y/A4o
SM
P-4
(1584m)
A5i(S2)
SM
GP
P-5
(1618m)
S2
SM
GP
CS-9
(1533m)
A4o
CL-ML
SP
T-2 &
B-2
(1558m)
S2
SM
CS-11
(1532m)
A5y/A4o
SM
GP-GM
P-6
(1534m)
SM
C-22 SURFACE EL
SURFICIAL
C-23 SURFACE EL
SURFICIAL


E ELEVATION: 5024' (1531m)
IAL GEOLOGIC UNIT: A5y/A4o
SM
SC
CL
P-10
ACE ELEVATION: 5025' (1532m)
ICIAL GEOLOGIC UNIT: A4o
SM
CL
CS-23
0
1
2
5
10

C-33 SURFACE ELEVATION: 5160' (1573m)
SURFICIAL GEOLOGIC UNIT: A5i

C-34 SURFACE ELEVATION: 5285' (1611m)
SURFICIAL GEOLOGIC UNIT: A5i

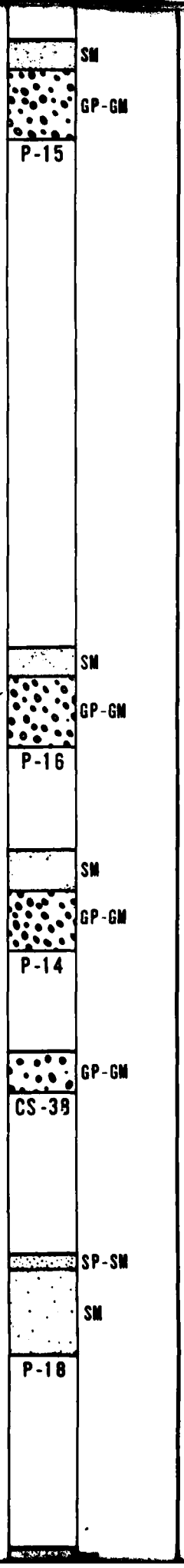
C-35 SURFACE ELEVATION: 5405' (1647m)
SURFICIAL GEOLOGIC UNIT: A5i

C-36 SURFACE ELEVATION: 5600' (1707m)
SURFICIAL GEOLOGIC UNIT: A5i

C-37 SURFACE ELEVATION: 5069' (1545m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

C-38 SURFACE ELEVATION: 5170' (1576m)
SURFICIAL GEOLOGIC UNIT: A5i

C-39 SURFACE ELEVATION: 5248' (1600m)
SURFICIAL GEOLOGIC UNIT: A5i



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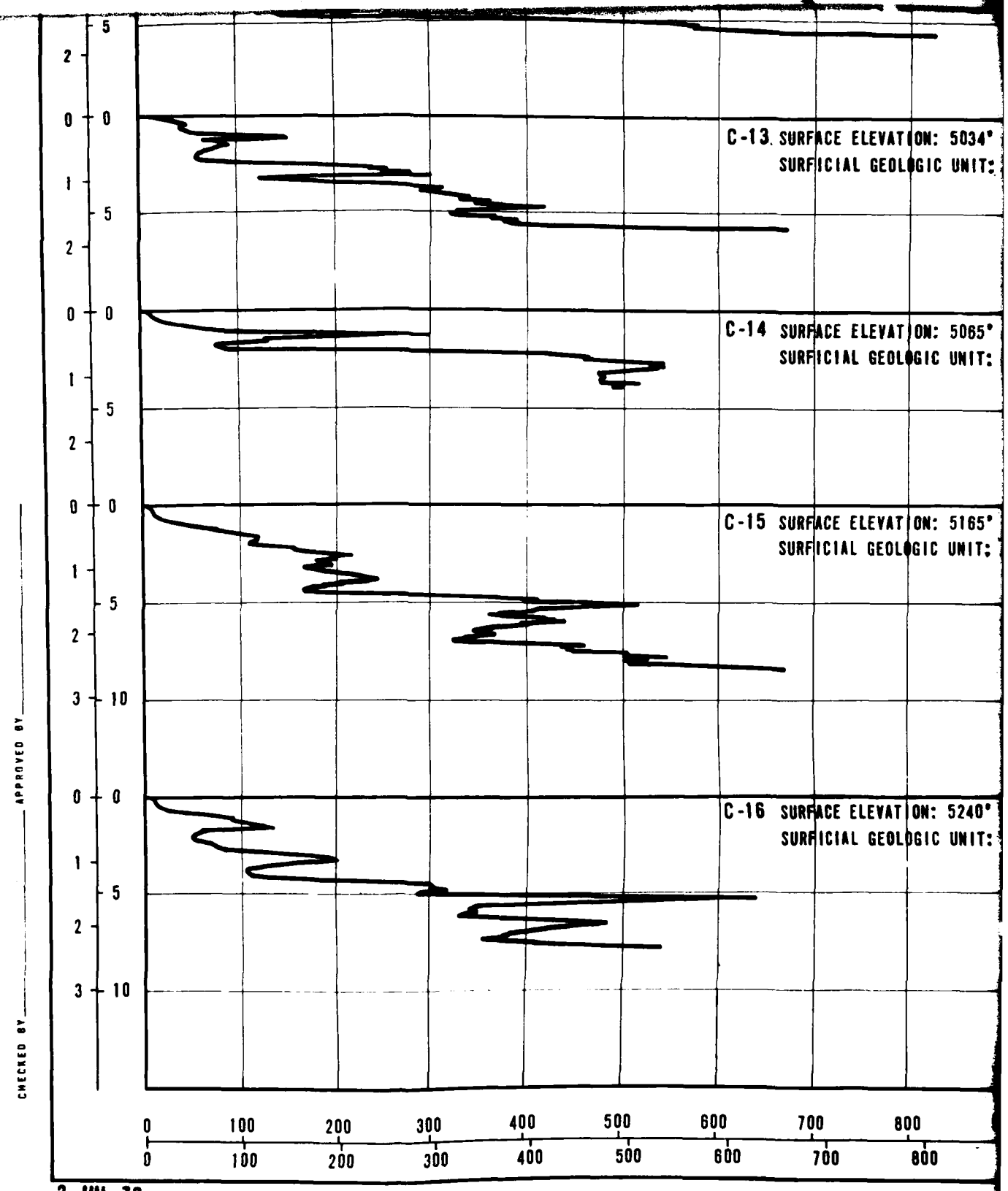
C-13 SURFACE ELEVATION: 5034'
SURFICIAL GEOLOGIC UNIT:
C-14 SURFACE ELEVATION: 5065'
SURFICIAL GEOLOGIC UNIT:
C-15 SURFACE ELEVATION: 5165'
SURFICIAL GEOLOGIC UNIT:
C-16 SURFACE ELEVATION: 5240'
SURFICIAL GEOLOGIC UNIT:
0 100 200 300 400 500 600 700 800
0 100 200 300 400 500 600 700 800
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APPROVED BY
2 JUL 79

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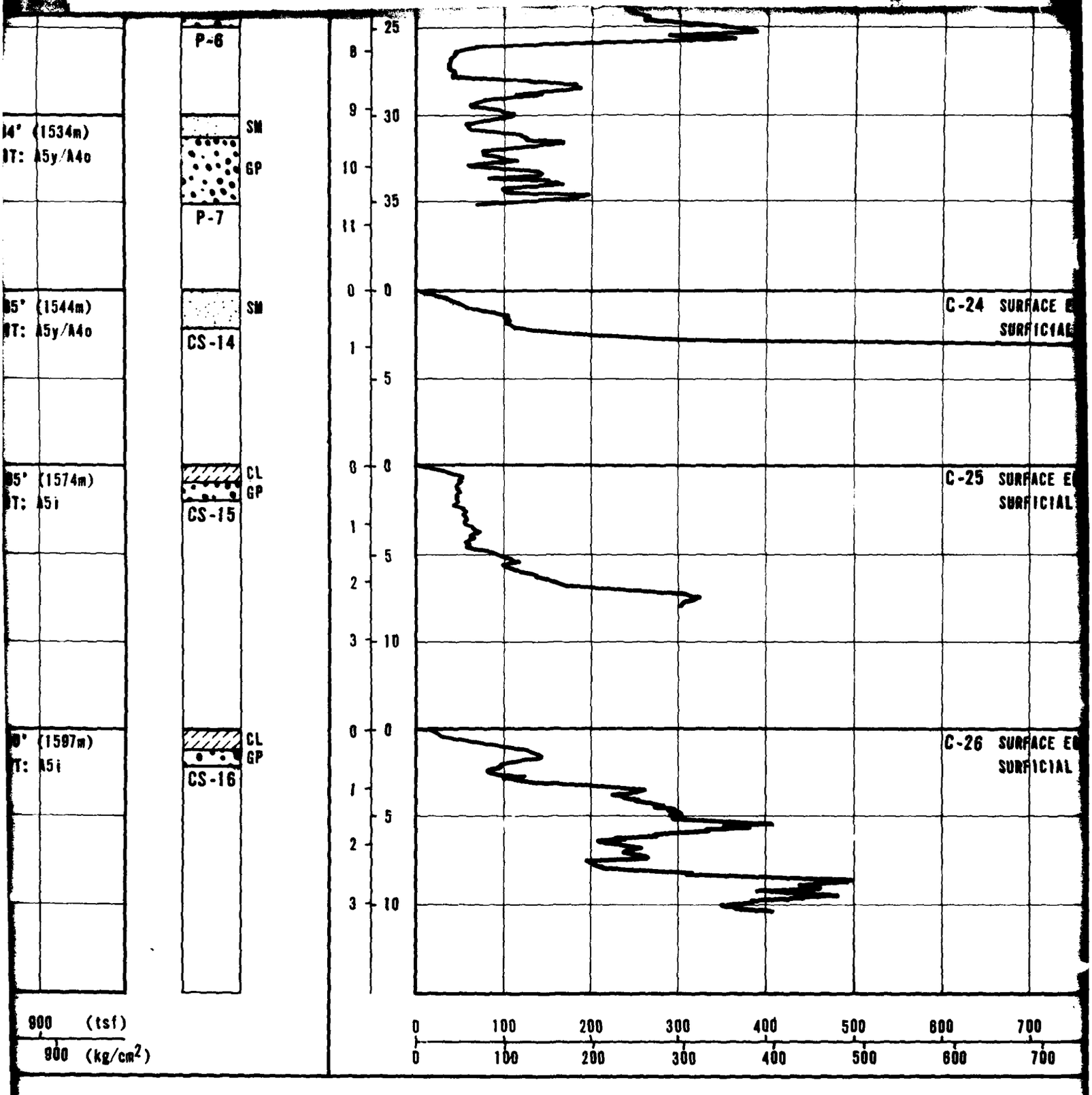
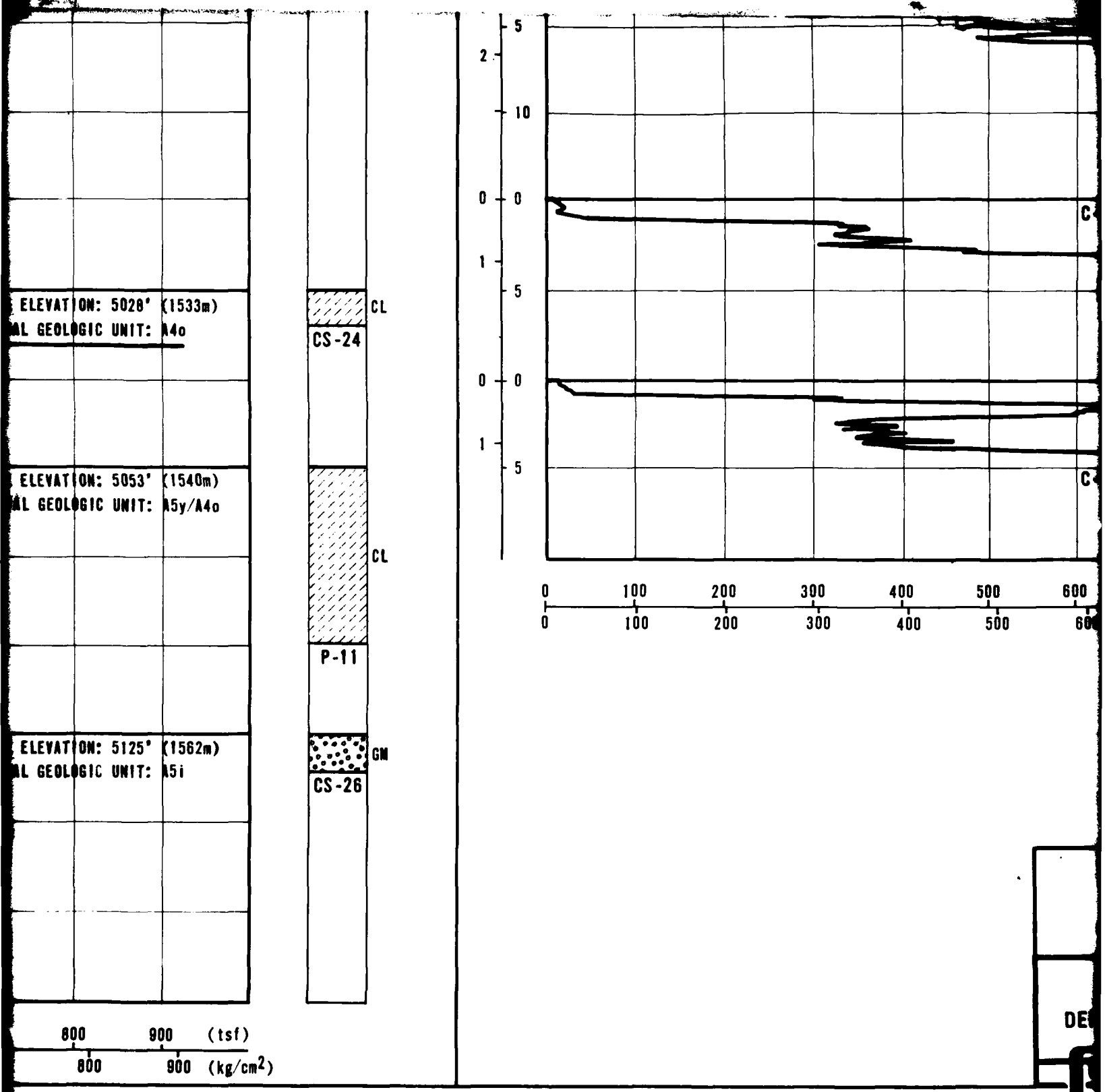
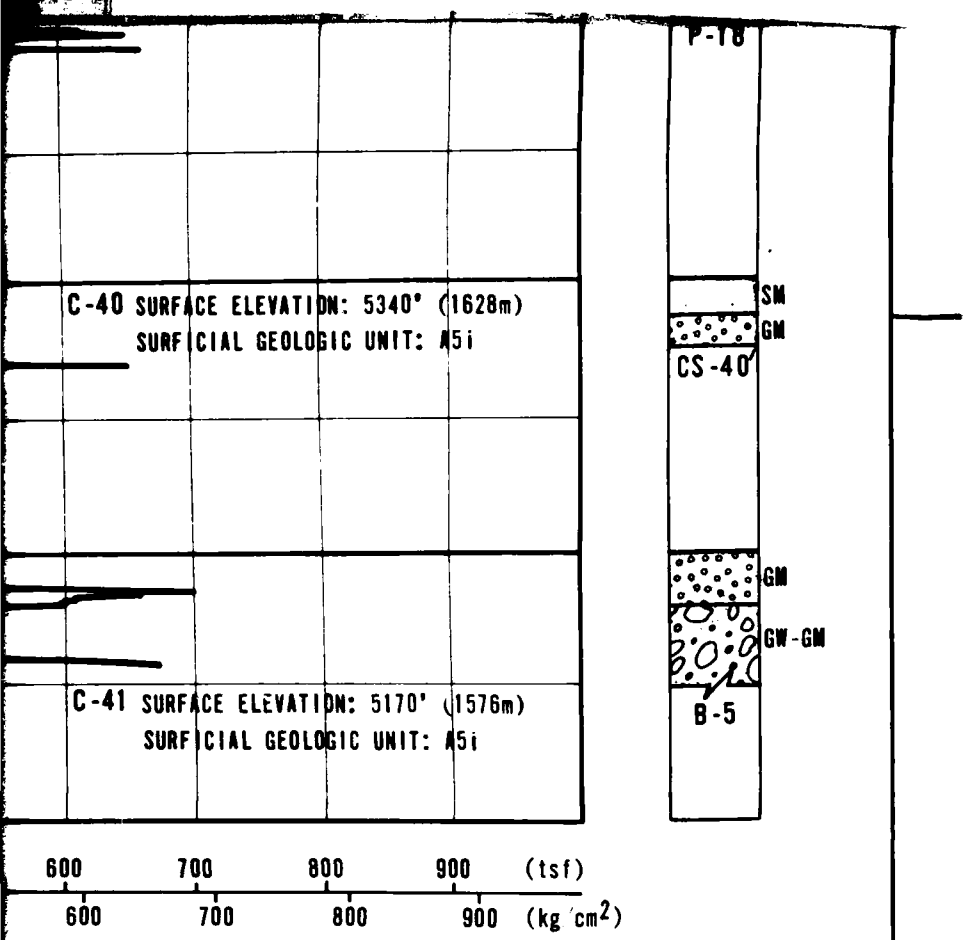

P-6
SM
GP
P-7
SM
CS-14
CL
GP
CS-15
CL
GP
CS-16
(1534m)
(1544m)
(1574m)
(1597m)
A5y/A4o
A5y/A4o
A5i
A5i
C-24 SURFACE E
SURFICIAL
C-25 SURFACE E
SURFICIAL
C-26 SURFACE E
SURFICIAL
900 (tsf)
900 (kg/cm²)
0 100 200 300 400 500 600 700
0 100 200 300 400 500 600 700


ELEVATION: 5028' (1533m)
AL GEOLOGIC UNIT: A4o
ELEVATION: 5053' (1540m)
AL GEOLOGIC UNIT: A5y/A4o
ELEVATION: 5125' (1562m)
AL GEOLOGIC UNIT: A5i
CL
CS-24
CL
P-11
GM
CS-26
800
900
(tsf)
800
900
(kg/cm2)
5
2
10
0
0
1
5
0
0
1
5
0
100
200
300
400
500
600
0
100
200
300
400
500
C
C
DE



CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
SNAKE EAST COP, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

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2
1 OF 2

FUGRO NATIONAL, INC.

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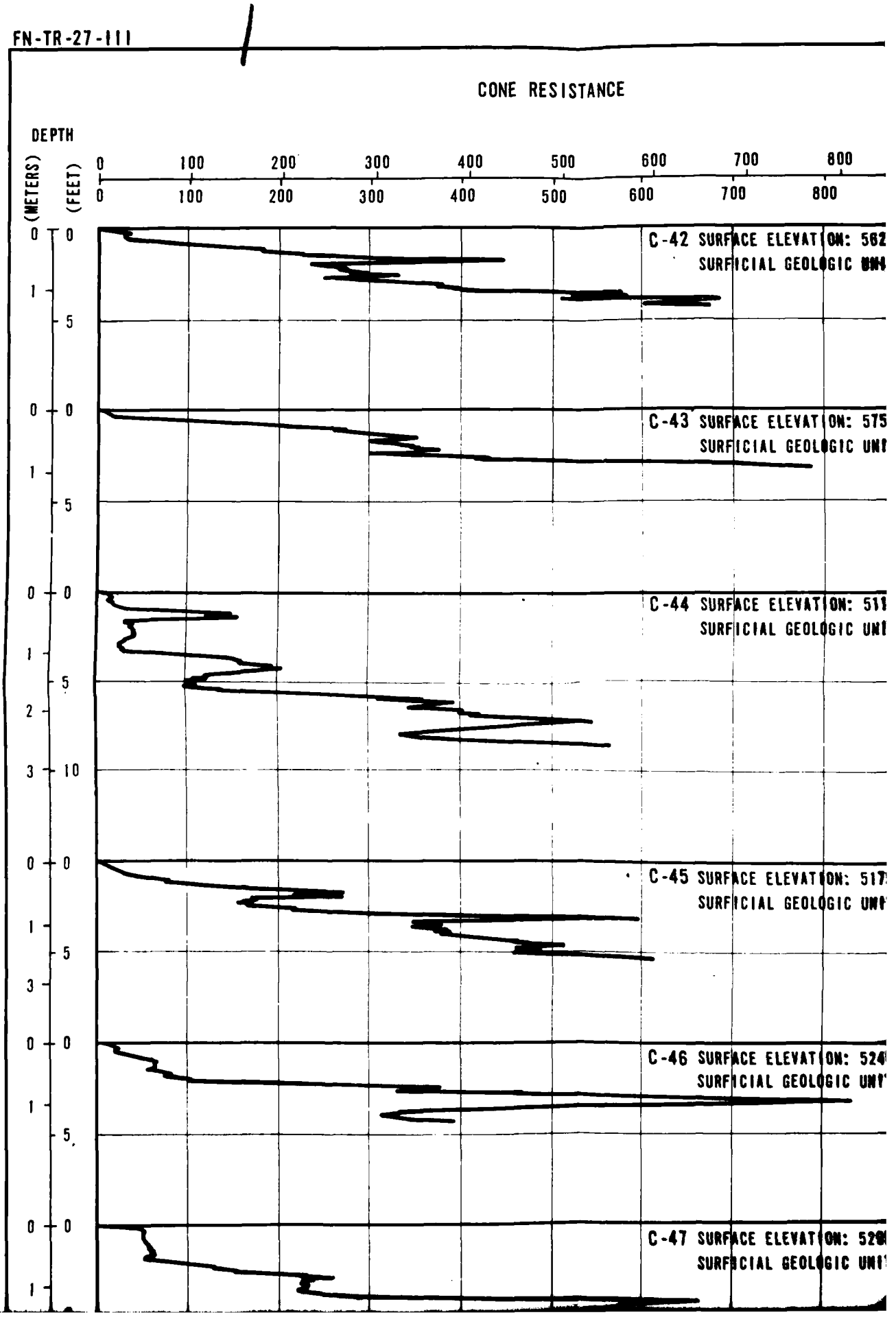
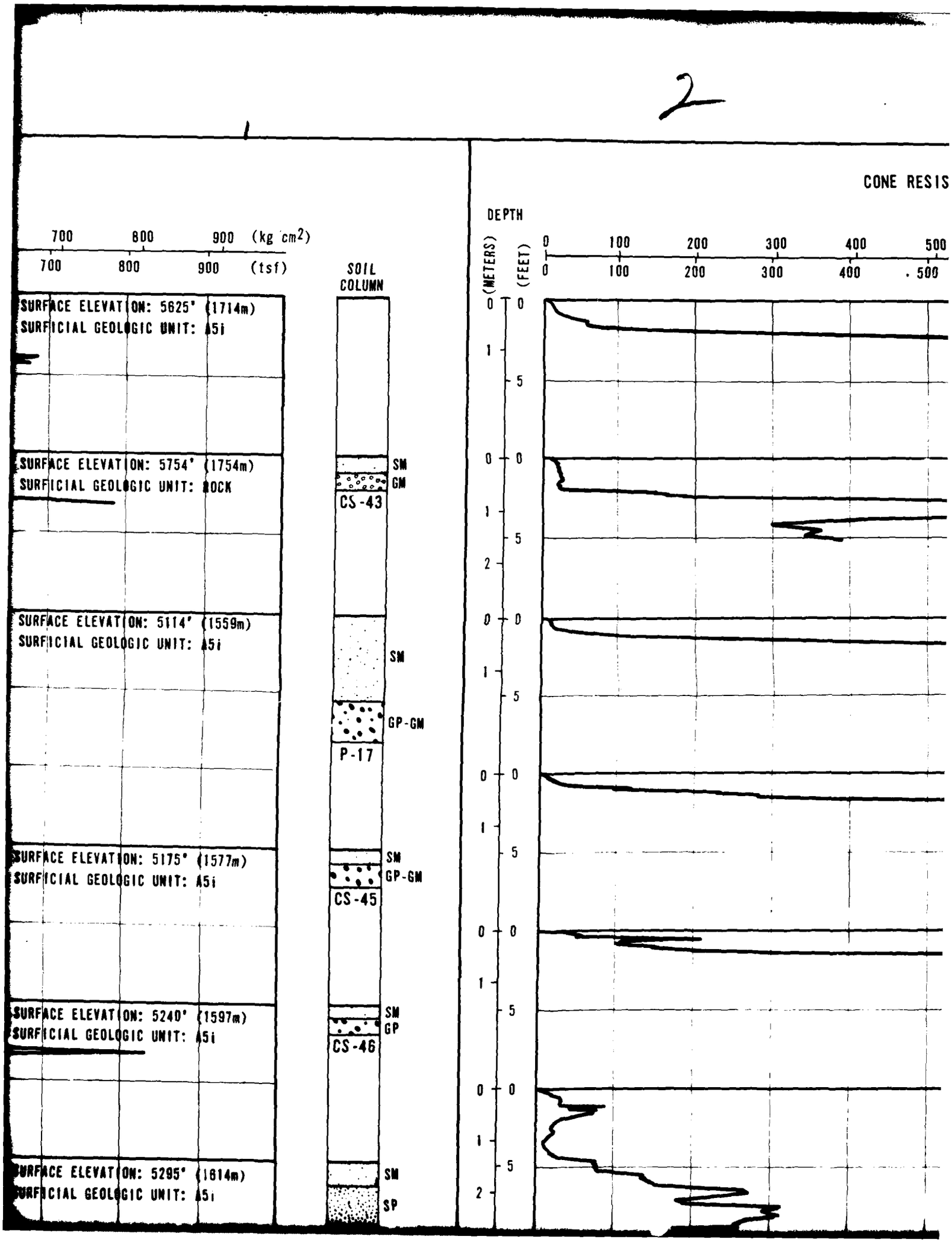
FN-TR-27-111


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800
C-42 SURFACE ELEVATION: 562
SURFICIAL GEOLOGIC UNI
C-43 SURFACE ELEVATION: 575
SURFICIAL GEOLOGIC UNI
C-44 SURFACE ELEVATION: 511
SURFICIAL GEOLOGIC UNI
C-45 SURFACE ELEVATION: 517
SURFICIAL GEOLOGIC UNI
C-46 SURFACE ELEVATION: 524
SURFICIAL GEOLOGIC UNI
C-47 SURFACE ELEVATION: 529
SURFICIAL GEOLOGIC UNI


2
CONE RESIS
DEPTH
(METERS)
(FEET)
0
100
200
300
400
500
700
800
900
(kg cm2)
(tsf)
SOIL COLUMN
SURFACE ELEVATION: 5625' (1714m)
SURFICIAL GEOLOGIC UNIT: A5i
SURFACE ELEVATION: 5754' (1754m)
SURFICIAL GEOLOGIC UNIT: ROCK
SURFACE ELEVATION: 5114' (1559m)
SURFICIAL GEOLOGIC UNIT: A5i
SURFACE ELEVATION: 5175' (1577m)
SURFICIAL GEOLOGIC UNIT: A5i
SURFACE ELEVATION: 5240' (1597m)
SURFICIAL GEOLOGIC UNIT: A5i
SURFACE ELEVATION: 5295' (1614m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
GM
CS-43
SM
GP-GM
P-17
SM
GP-GM
CS-45
SM
GP
CS-46
SM
SP

AD-A113 325 FUGRO NATIONAL INC LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME III. N--ETC(U)
AUG 79 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-VOL-3 NL

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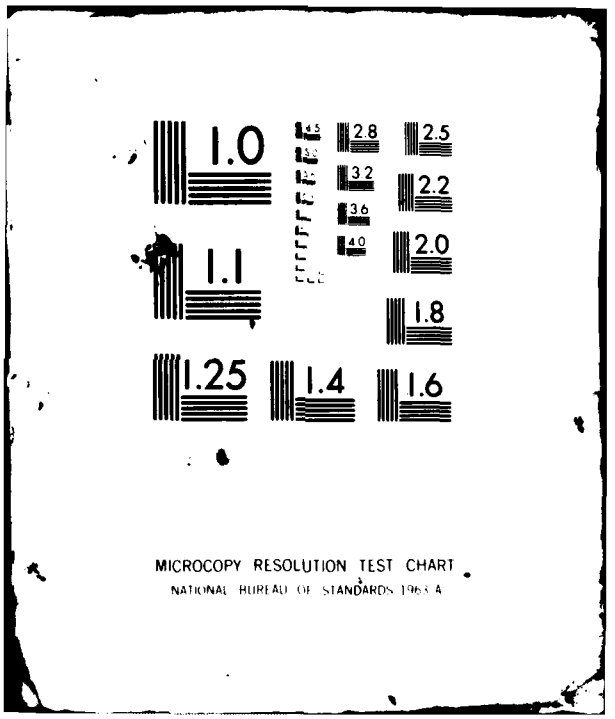
1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

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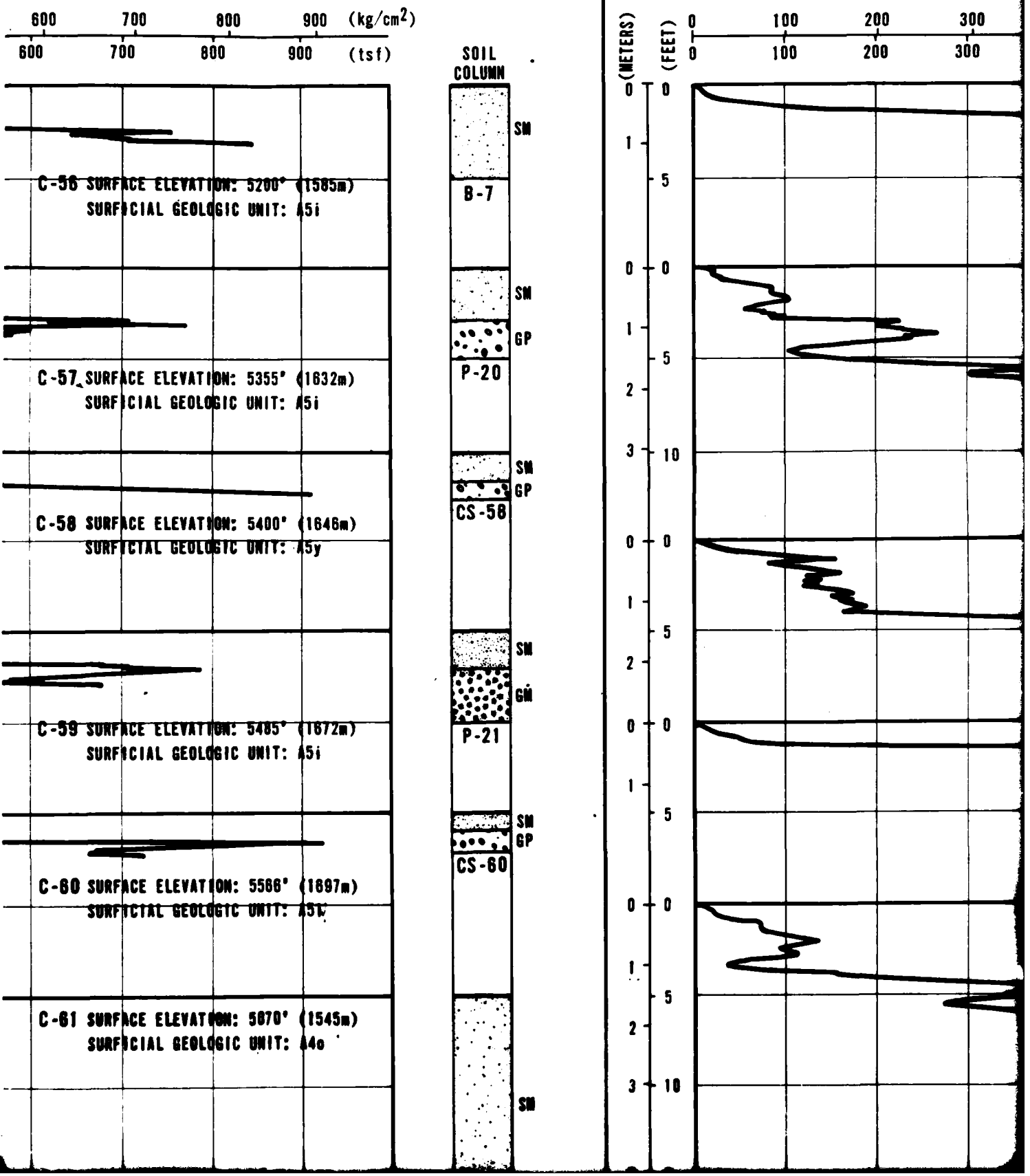
CE


600 700 800 900 (kg/cm²)
600 700 800 900 (tsf)
C-56 SURFACE ELEVATION: 5200' (1585m)
SURFICIAL GEOLOGIC UNIT: A5i
C-57 SURFACE ELEVATION: 5355' (1632m)
SURFICIAL GEOLOGIC UNIT: A5i
C-58 SURFACE ELEVATION: 5400' (1646m)
SURFICIAL GEOLOGIC UNIT: A5y
C-59 SURFACE ELEVATION: 5485' (1672m)
SURFICIAL GEOLOGIC UNIT: A5i
C-60 SURFACE ELEVATION: 5566' (1697m)
SURFICIAL GEOLOGIC UNIT: A5i
C-61 SURFACE ELEVATION: 5070' (1545m)
SURFICIAL GEOLOGIC UNIT: A4o
SOIL COLUMN
SM
B-7
SM
GP
P-20
SM
GP
CS-58
SM
GM
P-21
SM
GP
CS-60
SM
DEPTH
(METERS)
(FEET)
0 100 200 300
0 100 200 300

CONE RESISTANCE

400 500 600 700 800 900 (kg/cm^2)

400 500 600 700 800 900 (tsf)

C-70 SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5i

C-71 SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5i

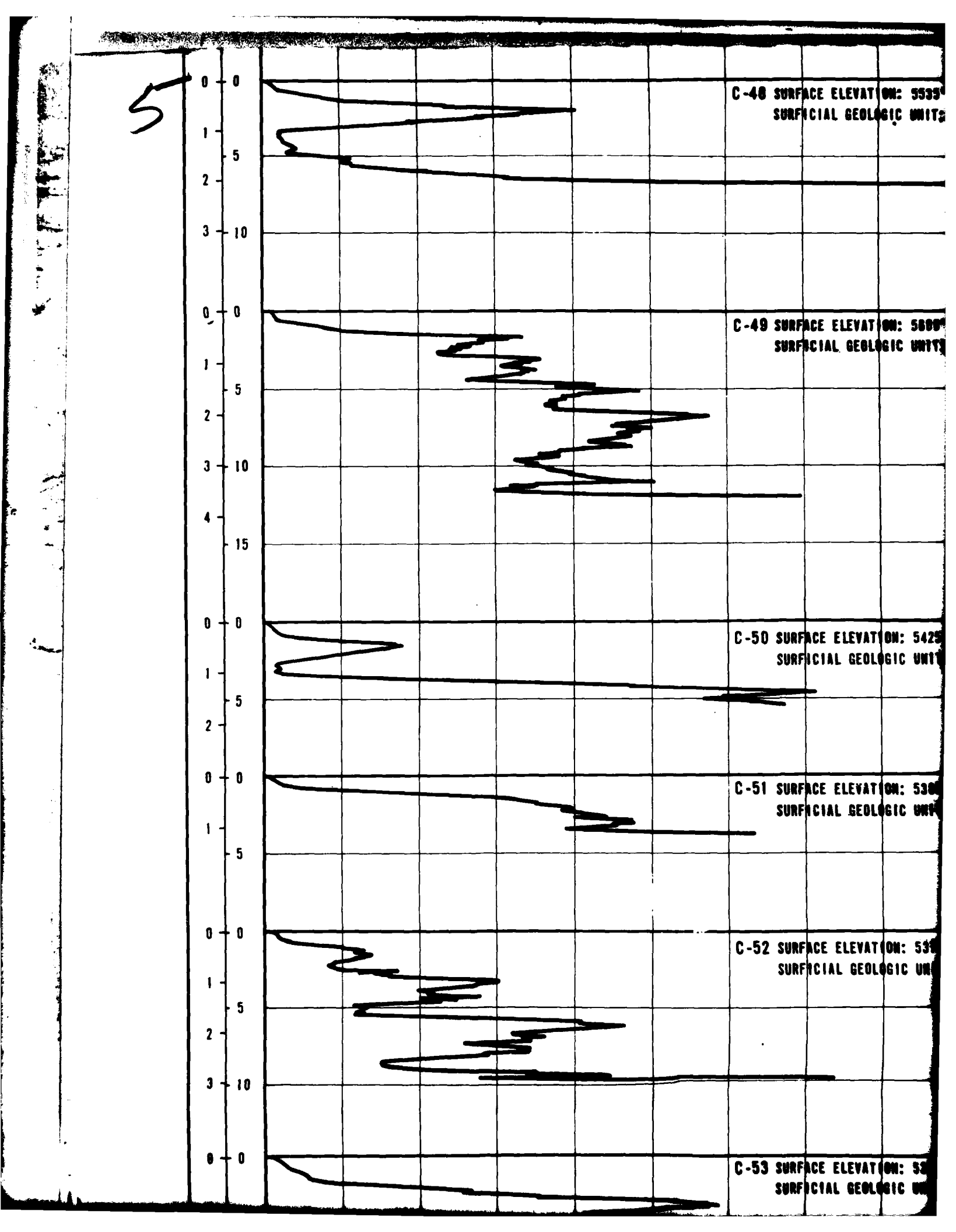
C-72 SURFACE ELEVATION: 5572' (1698m)
SURFICIAL GEOLOGIC UNIT: A5i

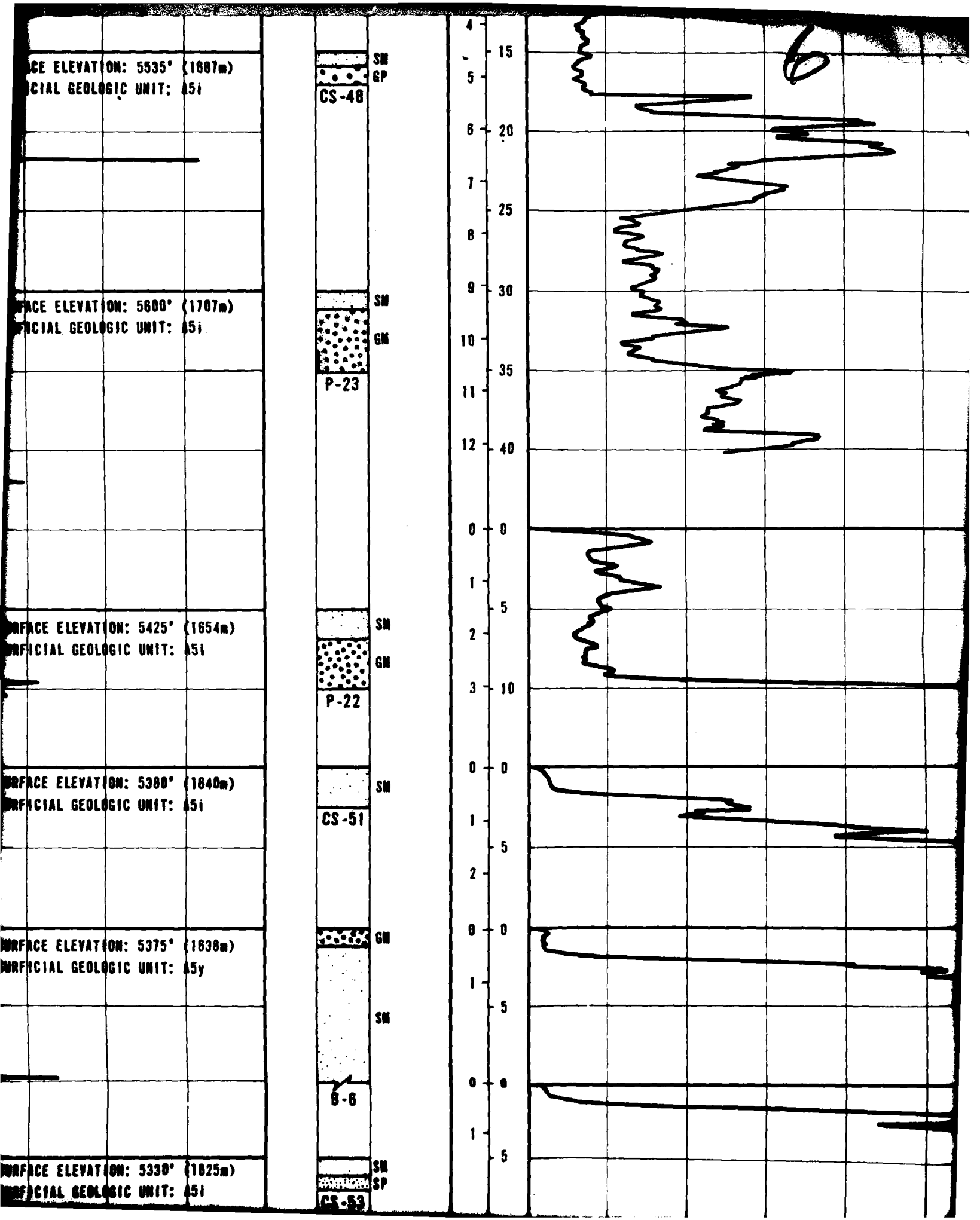
C-73 SURFACE ELEVATION: 5670' (1728m)
SURFICIAL GEOLOGIC UNIT: A5i

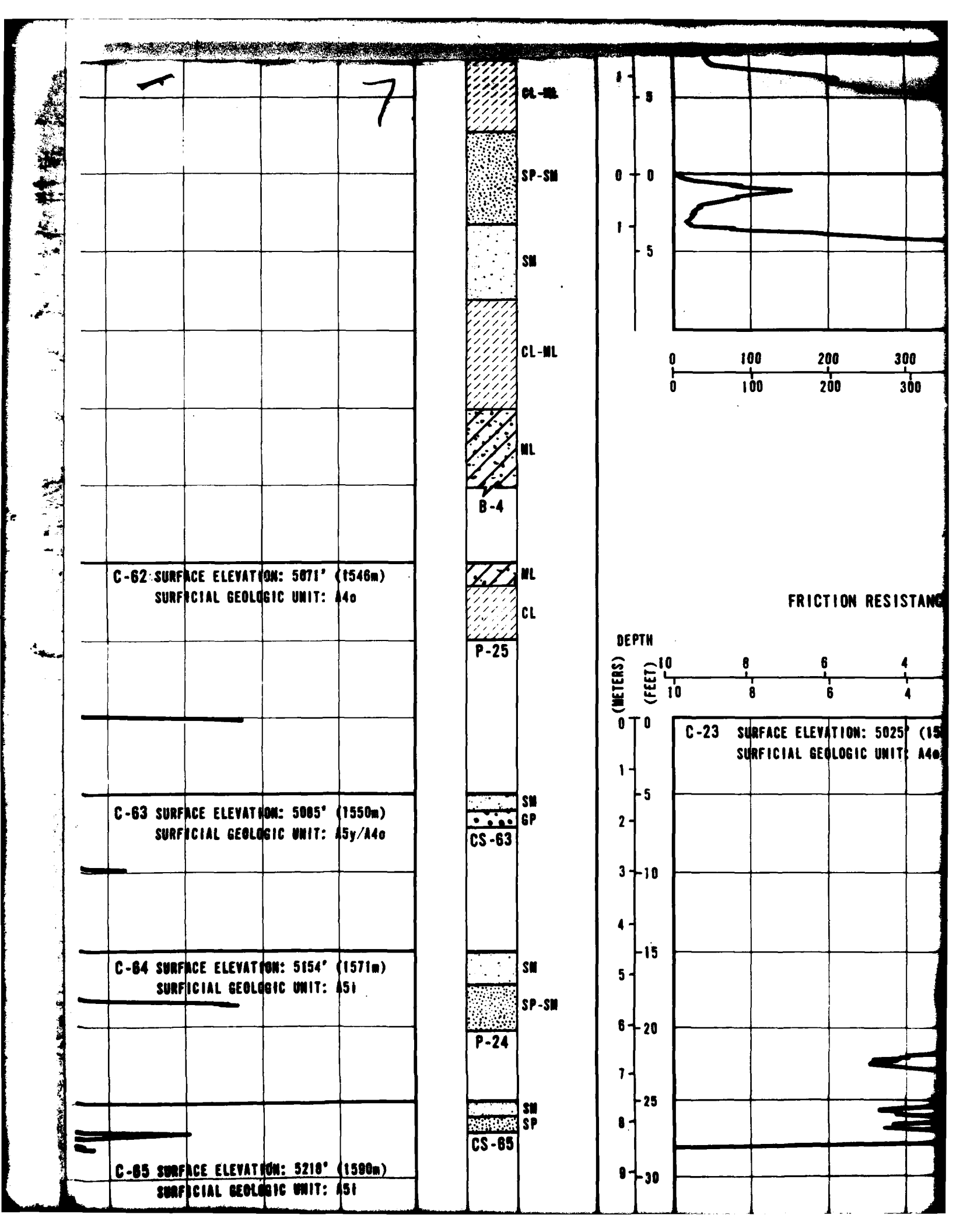
C-74 SURFACE ELEVATION: 5730' (1747m)
SURFICIAL GEOLOGIC UNIT: A5i

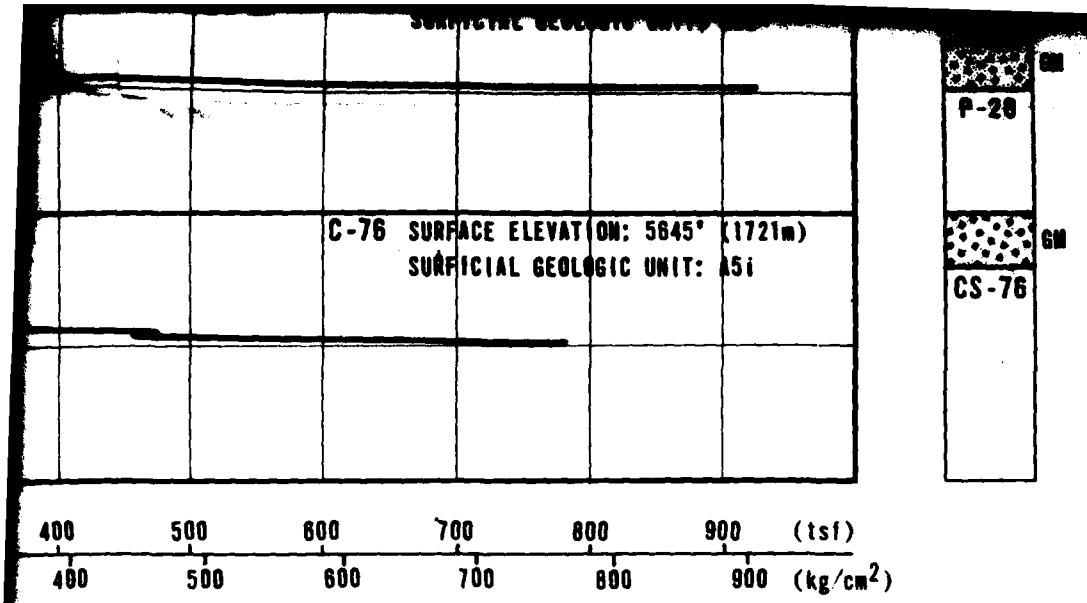
SOIL COLUMN

SC
GP-GM
CS-70
SC
GP
CS-71
SM
SP-SM
P-29
SM
GP-GM
P-30
SM
CS-74

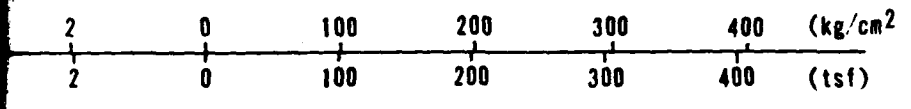

5
C-48 SURFACE ELEVATION: 5535
SURFICIAL GEOLOGIC UNIT:
C-49 SURFACE ELEVATION: 5600
SURFICIAL GEOLOGIC UNIT
C-50 SURFACE ELEVATION: 5425
SURFICIAL GEOLOGIC UNIT
C-51 SURFACE ELEVATION: 530
SURFICIAL GEOLOGIC UNI
C-52 SURFACE ELEVATION: 53
SURFICIAL GEOLOGIC UN
C-53 SURFACE ELEVATION: 5
SURFICIAL GEOLOGIC U

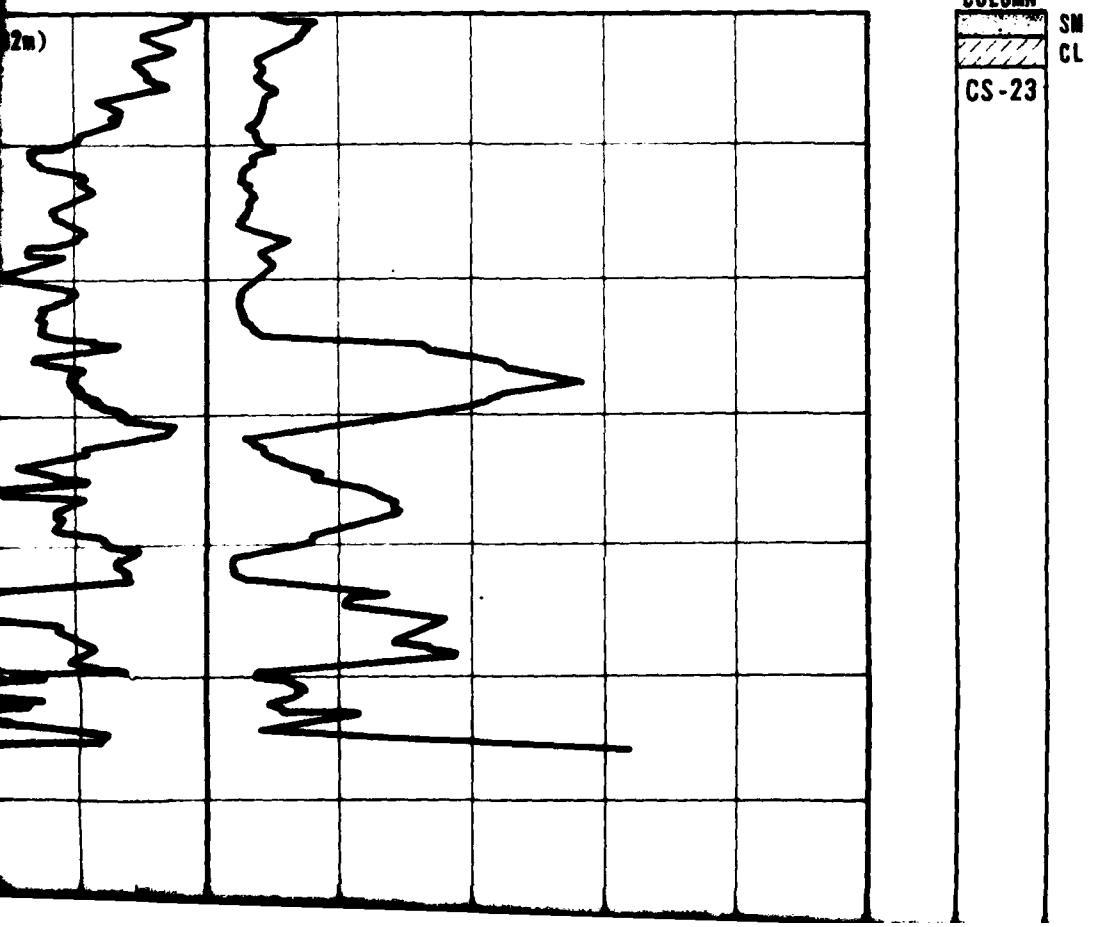

CE ELEVATION: 5535' (1687m)
CIAL GEOLOGIC UNIT: A5i
SM
GP
CS-48
FACE ELEVATION: 5600' (1707m)
FICIAL GEOLOGIC UNIT: A5i
SM
GM
P-23
RFACE ELEVATION: 5425' (1654m)
RFICIAL GEOLOGIC UNIT: A5i
SM
GM
P-22
RFACE ELEVATION: 5380' (1640m)
RFICIAL GEOLOGIC UNIT: A5i
SM
CS-51
RFACE ELEVATION: 5375' (1638m)
RFICIAL GEOLOGIC UNIT: A5y
GM
SM
B-6
RFACE ELEVATION: 5330' (1625m)
RFICIAL GEOLOGIC UNIT: A5i
SM
SP
CS-53
4 15
5
6 20
7
25
8
9 30
10
35
11
12 40
0 0
1 5
2
10
3
0 0
1 5
2
0 0
1 5
0 0
1 5

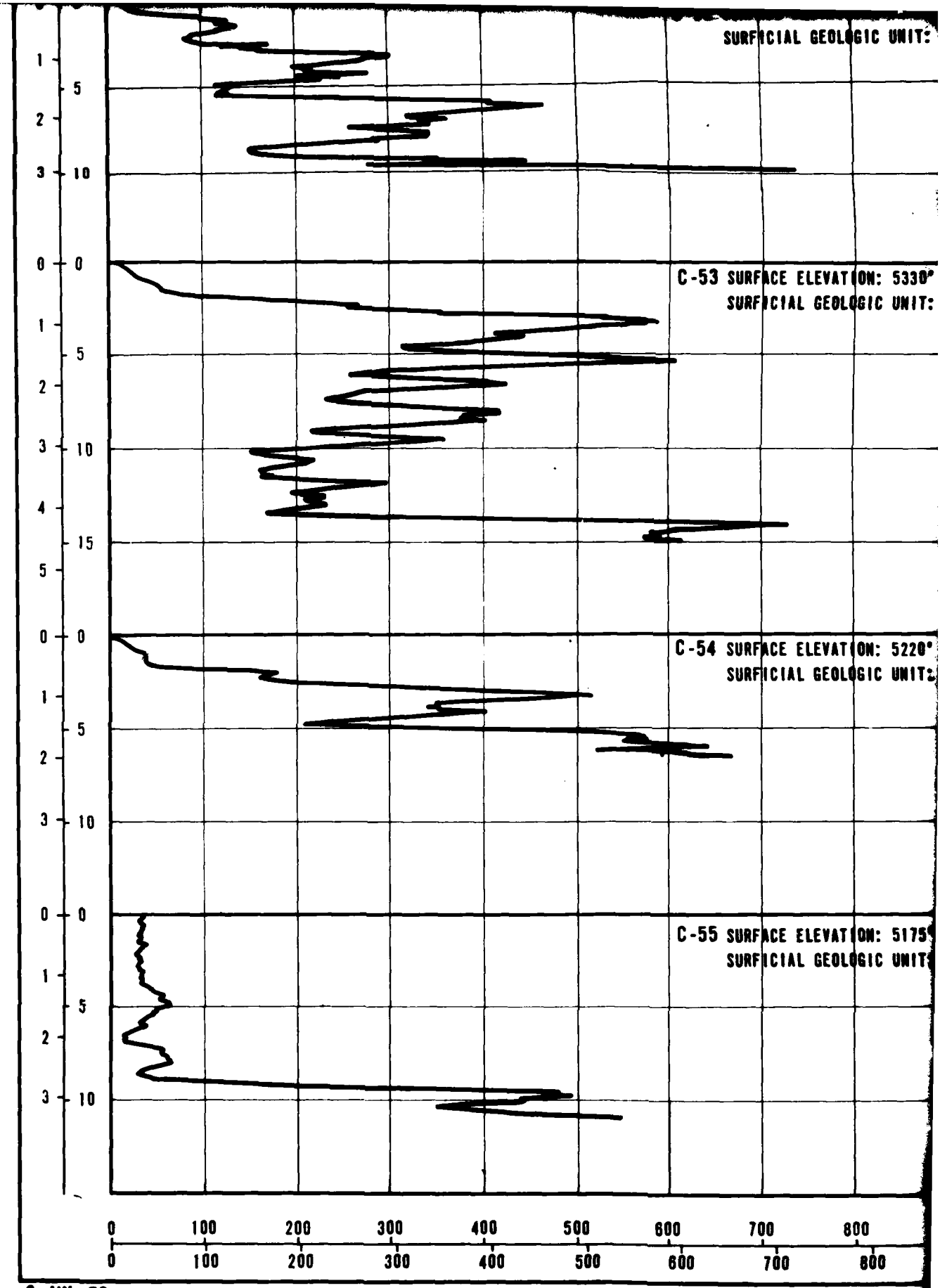

CL-ML
SP-SM
SM
CL-ML
ML
B-4
ML
CL
P-25
SM
GP
CS-63
SM
SP-SM
P-24
SM
SP
CS-65
C-62 SURFACE ELEVATION: 5071' (1546m)
SURFICIAL GEOLOGIC UNIT: A4o
C-63 SURFACE ELEVATION: 5085' (1550m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o
C-64 SURFACE ELEVATION: 5154' (1571m)
SURFICIAL GEOLOGIC UNIT: A5i
C-65 SURFACE ELEVATION: 5210' (1590m)
SURFICIAL GEOLOGIC UNIT: A5i
FRICTION RESISTANC
DEPTH
(METERS)
(FEET)
C-23 SURFACE ELEVATION: 5025' (15
SURFICIAL GEOLOGIC UNIT: A4o



CONE RESISTANCE







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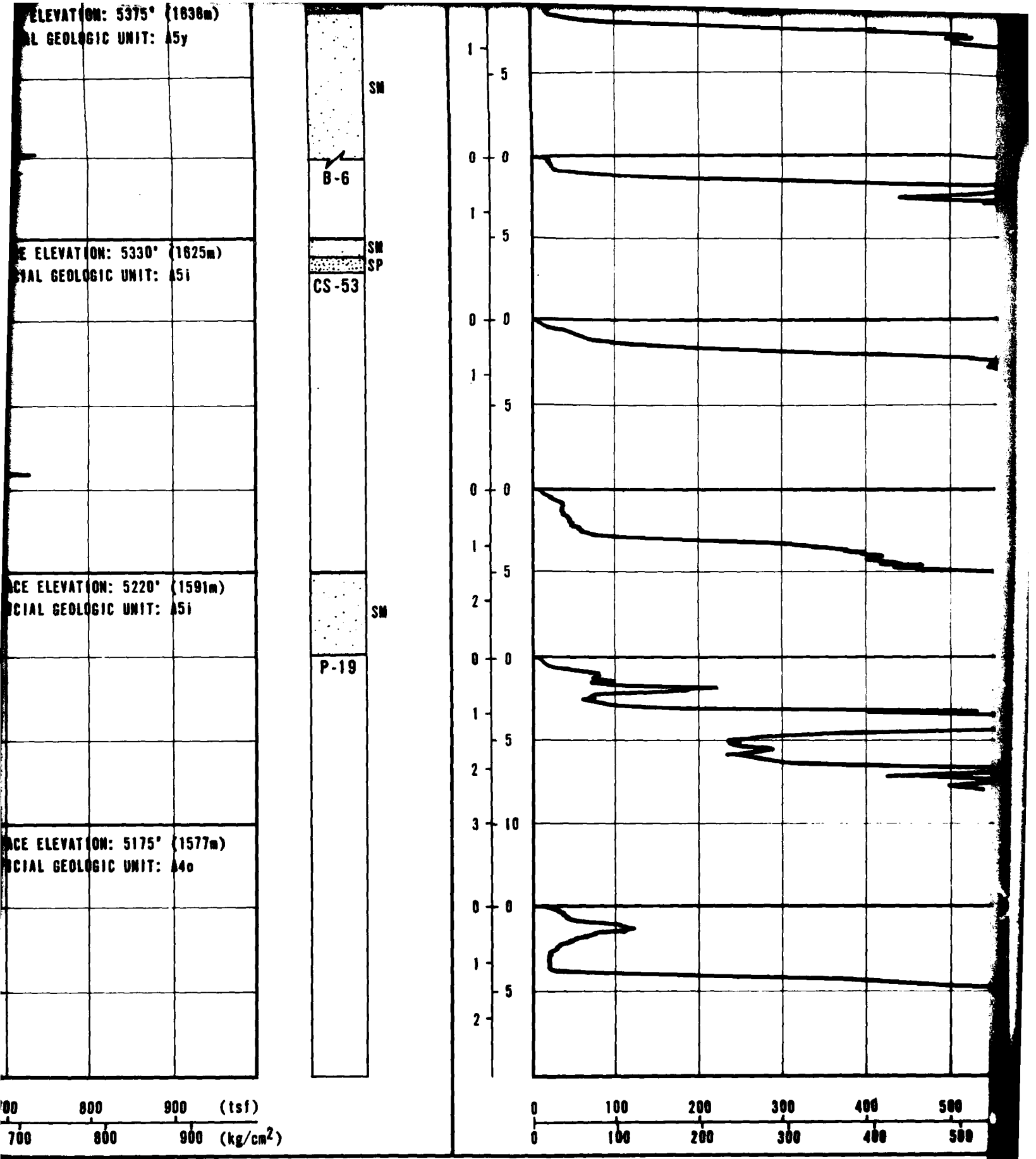

ELEVATION: 5375' (1638m)
L GEOLOGIC UNIT: A5y
SM
B-6
E ELEVATION: 5330' (1625m)
IAL GEOLOGIC UNIT: A5i
SM
SP
CS-53
CE ELEVATION: 5220' (1591m)
CIAL GEOLOGIC UNIT: A5i
SM
P-19
CE ELEVATION: 5175' (1577m)
CIAL GEOLOGIC UNIT: A4o
1 5
0 0
1 5
0 0
1 5
0 0
1 5
2
0 0
1 5
2
3 10
0 0
1 5
2
00 800 900 (tsf)
700 800 900 (kg/cm2)
0 100 200 300 400 500
0 100 200 300 400 500

10

1

C-64 SURFACE ELEVATION: 5154' (1571m)
SURFICIAL GEOLOGIC UNIT: A5i

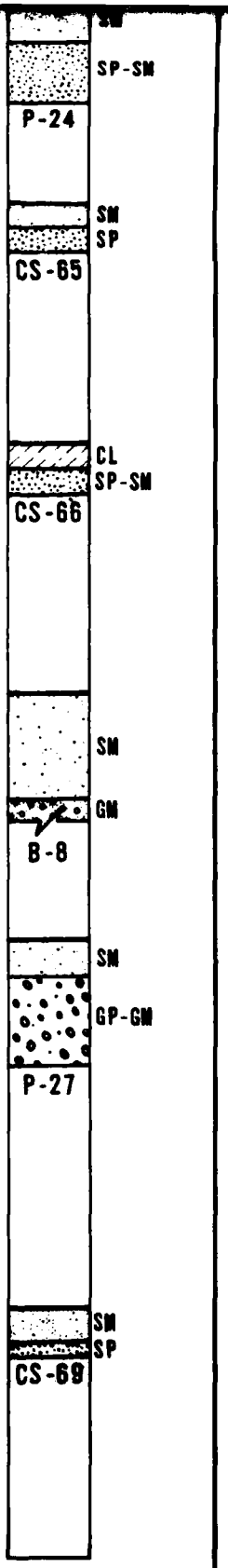
C-65 SURFACE ELEVATION: 5218' (1590m)
SURFICIAL GEOLOGIC UNIT: A5i

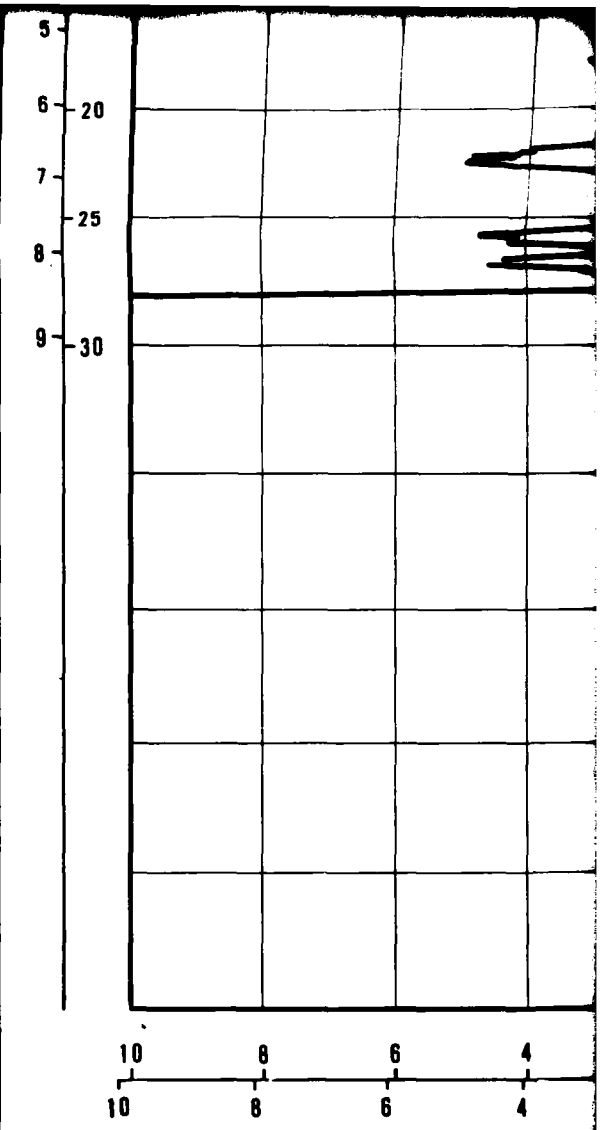
C-66 SURFACE ELEVATION: 5129' (1563m)
SURFICIAL GEOLOGIC UNIT: A5y

C-67 SURFACE ELEVATION: 5202' (1586m)
SURFICIAL GEOLOGIC UNIT: A5y

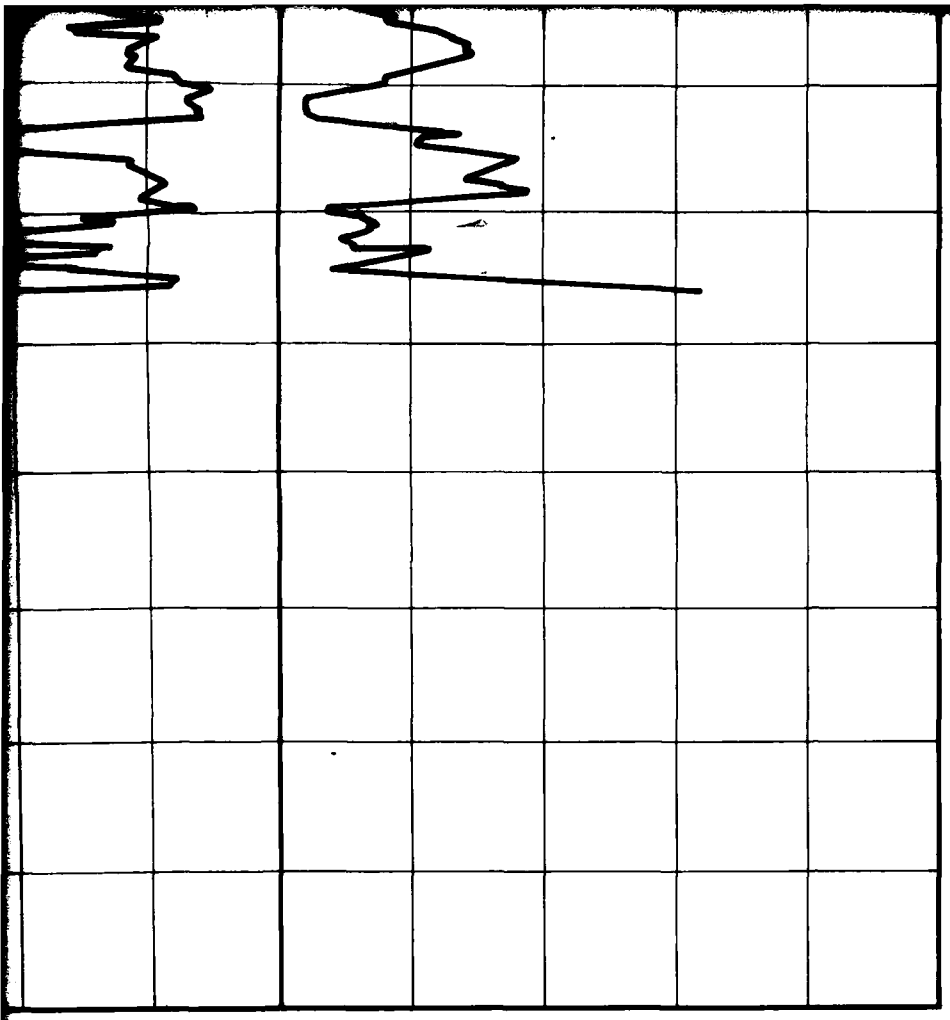
C-68 SURFACE ELEVATION: 5260' (1603m)
SURFICIAL GEOLOGIC UNIT: A5y

C-69 SURFACE ELEVATION: 5366' (1636m)
SURFICIAL GEOLOGIC UNIT: A5y





600 700 800 900 (tsf)
600 700 800 900 (kg/cm^2)



CONE PENETROMETER TEST RESULTS
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