OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

M60050.000239
MCAS EL TORO
SSIC #5090.3

May 12, 1998

Mr. Dave Jesperson, Code 57CS1.DJ
Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway
San Diego, CA 92132-5187

Attention: Mr. Bernie Lindsey, 56MC.BL

Subject: Transmittal of CPT Data for Final Site 24 Points
Contract N68711-93-D-1459, Delivery Order 111,
Groundwater Remediation Pilot Test at IRP Site 24, MCAS El Toro, California

Dear Mr. Lindsey:

Attached is a copy of the Fugro Geosciences, Inc., transmittal of the hard copy and electronic copy of the Site 24 CPT data. The data transmitted includes CPT locations 105A, 106A, 107A, 108A, 109A, 110A, 110B, 110C, 110D, 111A, 112A, 113A, 113B, 113C, 113D, 114A, 114B, 114C, 115A, 115B, 115C, 115H, 115I, 116A, and 117A.

An electronic and paper copy has also been sent to Pat Brooks at Bechtel for his use and files.

If you require any additional information or copies of this data please let me know.

Sincerely,

William Sedlak
Sr. Project Manager

attachments: Fugro Geosciences package, dated 5 May 1998
Diskette of CPT data

cc: J. Rogers, COTR
OHM PMO File
Dante Tedaldi, Bechtel, via fax, w/o att.
Pat Brooks, Bechtel
Project File, B.01

2031 Main Street ■ Irvine, California 92614-6509 ■ 714-263-1146 ■ FAX: 714-263-1147

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

ENTERED B-06 D-03

OHM TRANSMITTAL/DELIVERABLE RECEIPT

CONTRACT N68711-93-D-1459 **DOCUMENT CONTROL NO: SW5301**

TO: Contracting Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Dave Jespersen, Code 57CS1.DJ
Building 131
1220 Pacific Highway
San Diego, California 92132-5101

Date: 14-May-98

D.O.: 111

Location: MCAS EL TORO

FROM: Dana Franklin FOR
Stewart Bornhoft, Program Manager

Edwin G. Bond, Contracts Manage

DESCRIPTION OF ENCLOSURE: ***Groundwater Remediation Pilot Test at IRP Site 24, Dated May 12, 1998***

TYPE: Contract Deliverable ( ) ($) D. O. Deliverable (✓) (Tech) Request for Change ( ) Other (X)

VERSION: N/A **REVISION:** 0

ADMIN RECORD: Yes (✓) No (X) Category ( ) Confidential ( )

SCHEDULED DELIVERY DATE: 14-May-98 **ACTUAL DELIVERY DATE:** 14-May-98

NUMBER OF COPIES SUBMITTED TO THE NAVY: 1/O, 3/C, 2/E
[AS REQUIRED/DIRECTED BY THE (SOW)]

COPIES TO:

SWDIV	OHM	OTHER
Name, Code	Name, Location	Name, Company, Location
J. Rogers, 57CS3.JR (1C/1E)	File (1C/1E)	P. Brooks, BNI (1E)
B. Lindsey, 56MC.BL (1C/1E)	Chron (1C)	*D. Tedaldi, BNI (1E)
G. Steinway, 56MC.GS (1C)	W. Sedlak, Irv (1C/1E)	

*Sent Directly

Date/Time Received: _____ / _____

Doc Class: B-06

FUGRO GEOSCIENCES, INC.

6105 Rookin
Houston, TX 77074
Phone : 713-778-5580
Fax : 713-778-5501

May 5, 1998
Report Number 0303-0204

OHM Remediation Services Corporation
2031 Main Street
Irvine, California 92614

Attention: Mr. Bill Sedlak

FINAL REPORT FOR
CONE PENETRATION TESTING (CPT)
AND RELATED SERVICES
IRP SITE 24 - EL TORO MCAS
CALIFORNIA

Dear Mr. Sedlak:

Please find enclosed herewith the final results of the cone penetration tests conducted at the above referenced location. CPT and sampling services were carried out under the direction of OHM's field personnel.

For your information, the soil stratigraphy was identified using Campanella and Robertson's Simplified Soil Behavior Chart. Please note that because of the empirical nature of the soil behavior chart, the soil identification should be verified locally.

At some locations, refusal was reached before reaching the desired depth. There are several conditions which can cause termination or refusal of a CPT probe during a test. These are described in detail below.

The first and most common refusal condition occurs when very had soil (greater than 200 TSF) is encountered after a very soft zone (less than 10 TSF of approximately 3 feet in duration). This allows the rods to flex and possibly break in the soft zone while pushing against the deeper hard zone.

Another refusal criteria occurs when a cobble or impenetrable lense such as caliche or gravel is encountered. This usually causes the rig to lift off the ground and can also result in broken rods or cones.

A third cause for refusal is excessive slope or tilt of the cone and rod string which can be caused by various conditions. One is natural drift of the cone and rods due to the length of the string in the ground which is normal on tests of 100 ft or more. This problem is enhanced when the cone encounters gravel particles or dense lenses interbedded with soft zones since these conditions cause higher than normal deflection of the tip at those points.

The most common problems at El Toro or for any site with deep holes (i.e. >100 ft or more) are dense material (gravel) refusal followed by refusal for inclination or slope. Fugro encountered those problems

throughout the testing program at El Toro but found them to be more prevalent at some test locations than at others.

If excessive inclination or slope is encountered on tests of less than 100 ft in normal soil conditions, the cause has sometimes been traced to a bent rod. The Fugro field crew attempted to eliminate this possibility at the suspicious location (CPT115) by switching out the rods, cones, and finally the entire rig but were never able to pin down the exact cause precisely. Deeper tests were eventually completed after several tries, but the equipment was not found to be bent upon machine shop inspection. It has operated satisfactorily at other locations since the inspection.

This tends to support the cause of drift having been natural rather than equipment related. We did credit the work done on 3/30/98 with the "unusually shallow" refusal (<100 ft) as a precaution, but believe that the slope refusals (especially those at greater than 100 ft) were actually caused by variable site conditions not bent or defective equipment.

Fugro Geosciences appreciates the opportunity to be of service to your organization. If you should have any questions, or if we can be of further assistance, please do not hesitate to contact us. We look forward to working with you in the future.

Very truly yours,
FUGRO GEOSCIENCES, INC.

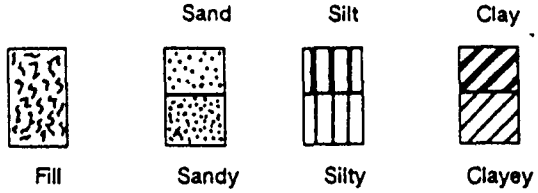
Recep Yilmaz
President

RY/mw

1 Diskette Enclosed

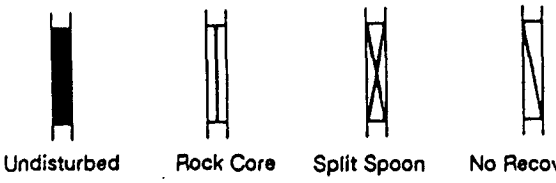
Key To Soil Classification and Symbols

SOIL TYPE
(Shown in Symbol Column)



Predominant Type Shown Heavy

SAMPLE TYPE
(Shown in Samples Column)



TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (Major portion Retained on No. 200 Sieve)
Includes (1) clean gravels and sand described as fine, medium or course, depending on distribution of grain sizes (2) silty or clayey gravels and sands and (3) fine grained low plasticity soils (PI < 10) such as sandy silts. Condition is rated according to relative density, as determined by lab tests or estimated from resistance to sampler penetration.

Descriptive Term	Penetration Resistance*	Relative Density
Loose	0 - 10	0 to 40%
Medium Dense	10 - 30	40 to 70%
Dense	30 - 50	70 to 90%
Very Dense	Over 50	90 to 100%

* Blows/Foot, 140# Hammer, 30" Drop

FINE GRAINED SOILS (Major Portion Passing No. 200 Sieve)
Includes (1) inorganic and organic silts and clays, (2) sandy, gravelly or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with PI $\geq$ 10.

Descriptive Term	Cohesive Shear Strength Tons/Square Foot
Very Soft	Less Than 0.125
Soft	0.125 to 0.25
Firm	0.25 to 0.50
Stiff	0.50 to 1.00
Very Stiff	1.00 to 2.00
Hard	2.00 and Higher

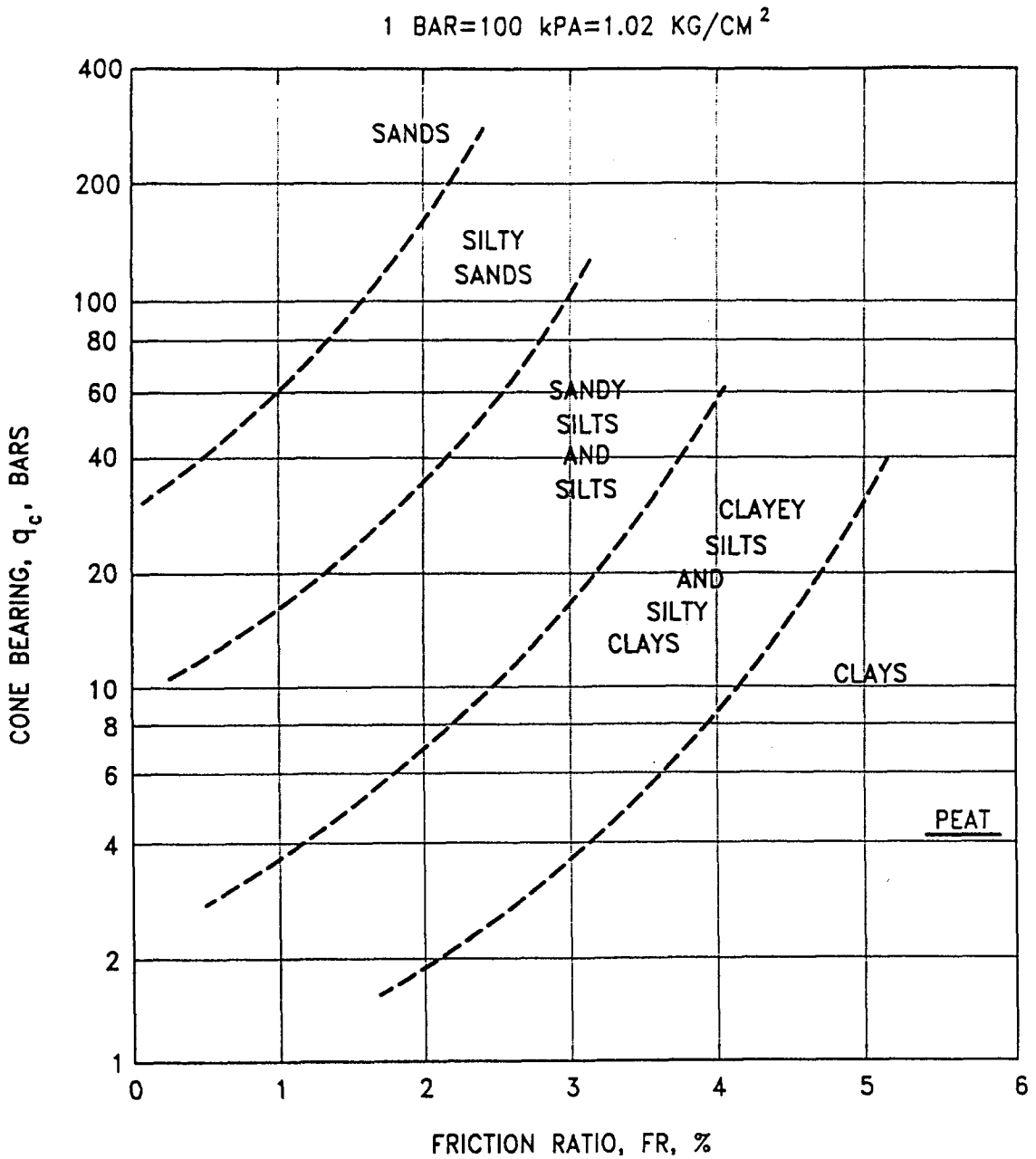
Note: Slickensided and fissured clay may have lower unconfined compressive strengths than shown above because of planes of weakness or shrinkage cracks; consistency ratings of such soils are based on hand penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

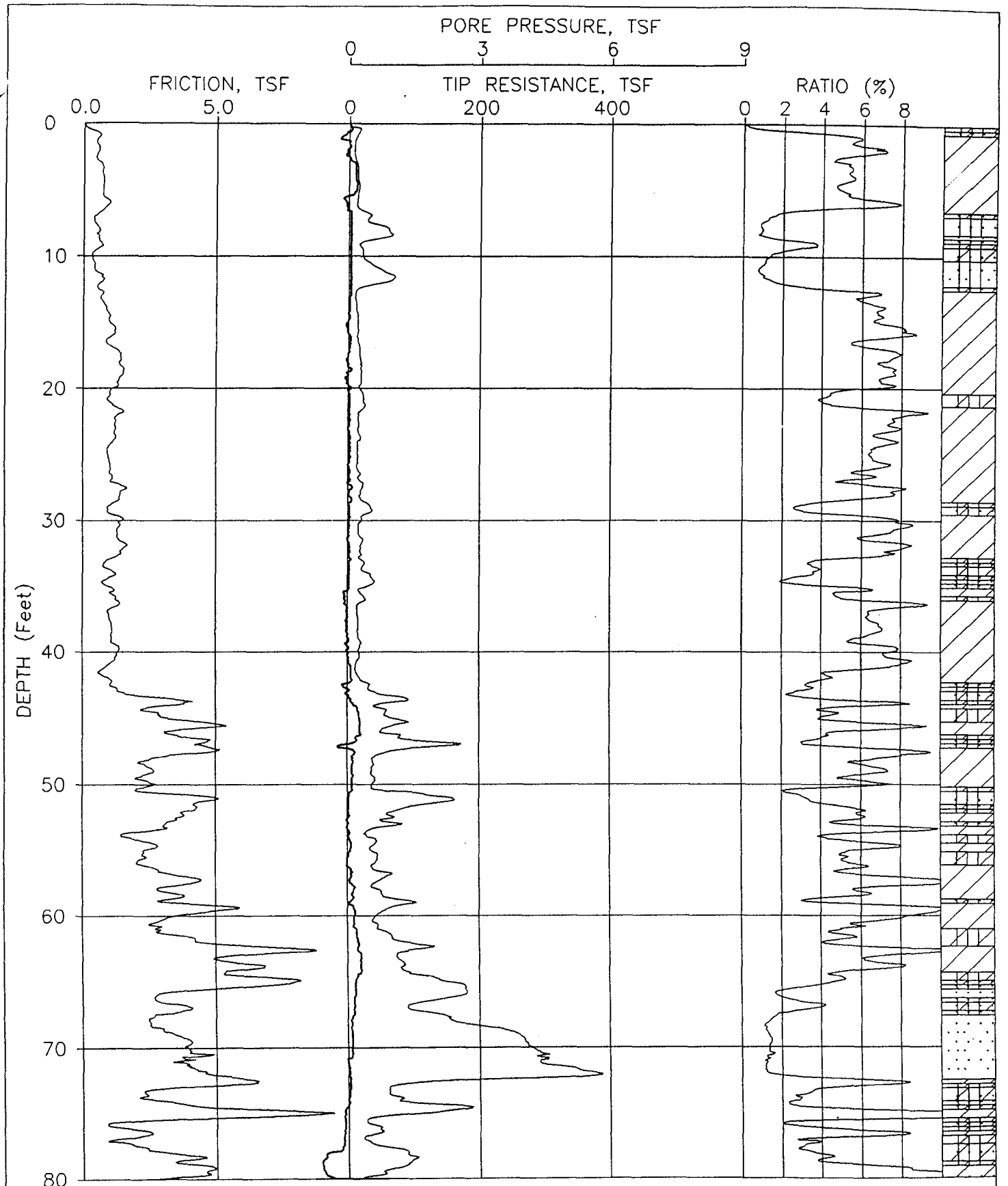
Parting:	paper thin in size
Seam:	1/8" to 3" thick
Layer:	greater than 3"
Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical
Sensitive:	pertaining to cohesive soils that are subject to appreciable loss of strength when remolded
Interbedded:	composed of alternate layers of different soil types
Laminated:	composed of thin layers of varying color and texture
Calcareous:	containing appreciable quantities of calcium carbonate
Well Graded:	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly Graded:	predominantly of one grain size, or having a range of sizes with some intermediate size missing
Flocculated:	pertaining to cohesive soils that exhibit a loose knit or flakey structure
Slickensided:	having inclined planes of weakness that are slick and glossy in appearance.

Degree of Slickensided Development

Slightly Slickensided:	slickensides present at intervals of 1' to 2', soil does not easily break along these plates
Moderately Slickensided:	slickensides spaced at intervals of 1' to 2', soil breaks easily along these planes
Extremely Slickensided:	continuous and interconnected slickensides spaced at intervals of 4" to 12', soil breaks along the slickensides into pieces 3" to 6" in size
Intensely Slickensided:	slickensides spaced at intervals of less than 4", continuous in all directions; soil breaks down along planes into nodules 1/4" to 2" in size.



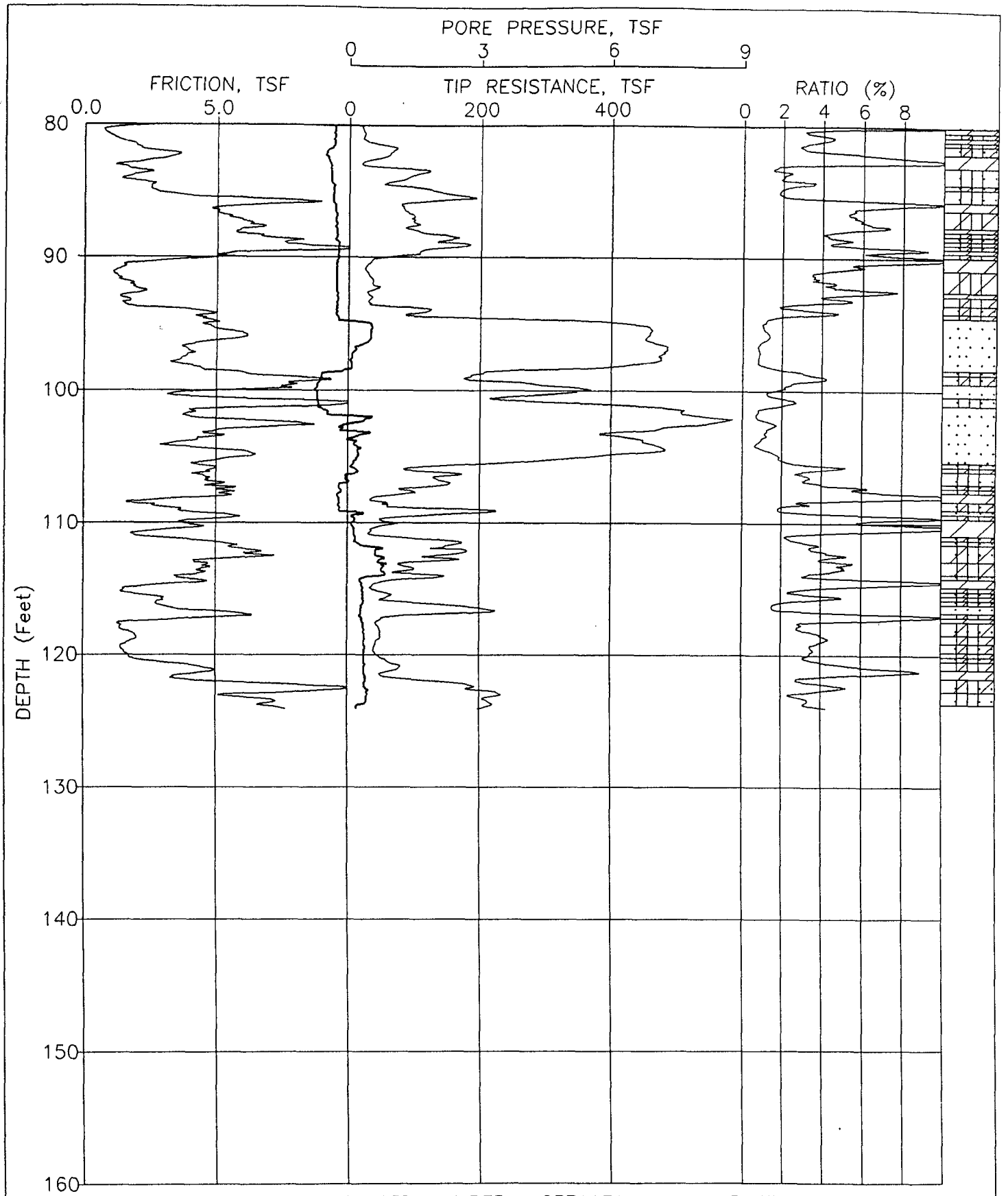
CAMPANELLA AND ROBERTSON CLASSIFICATION CHART (1983)



JOB NUMBER: 0303-0204 CPT NUMBER: CPT113A DATE: 03-18-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW966 PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



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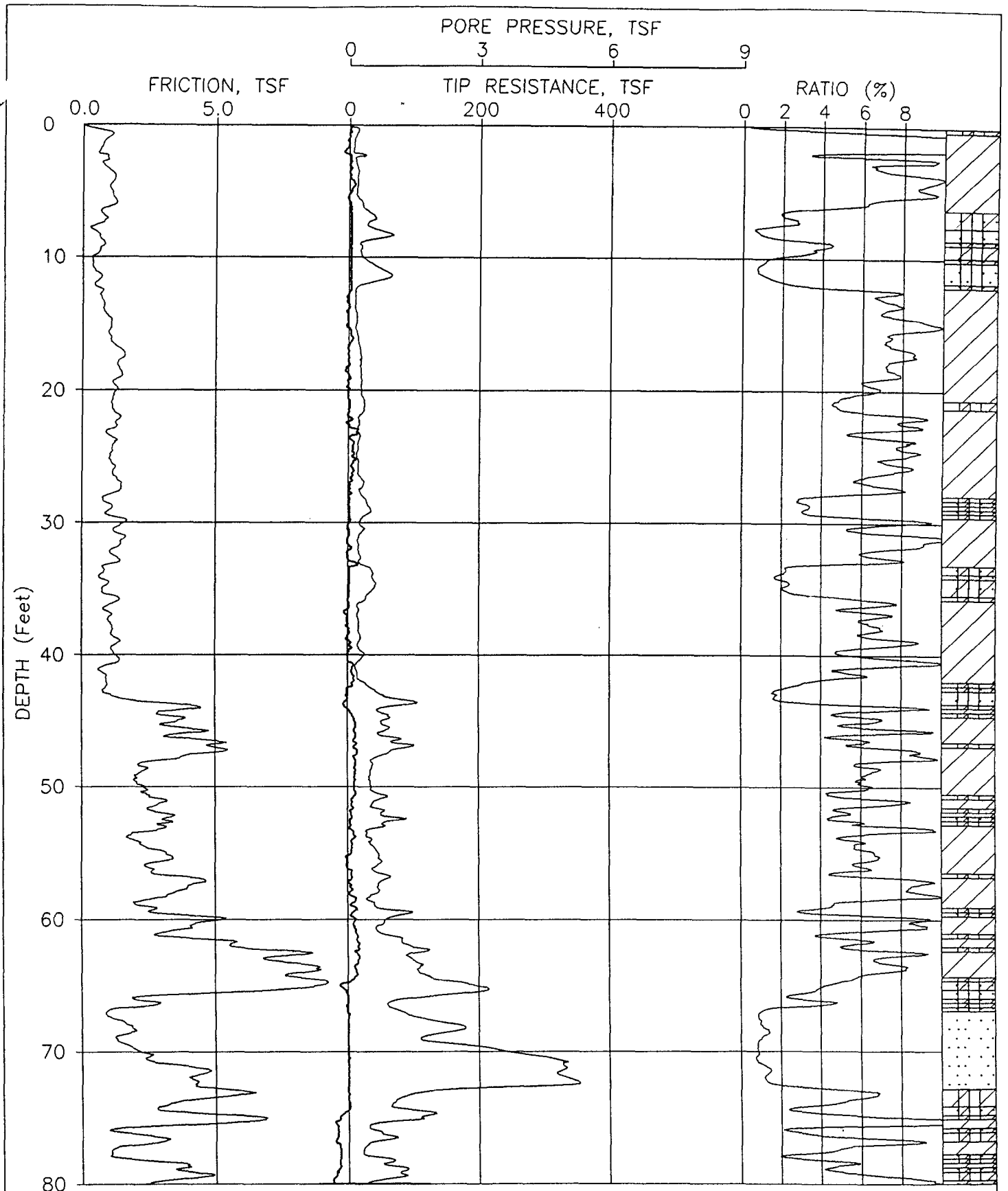

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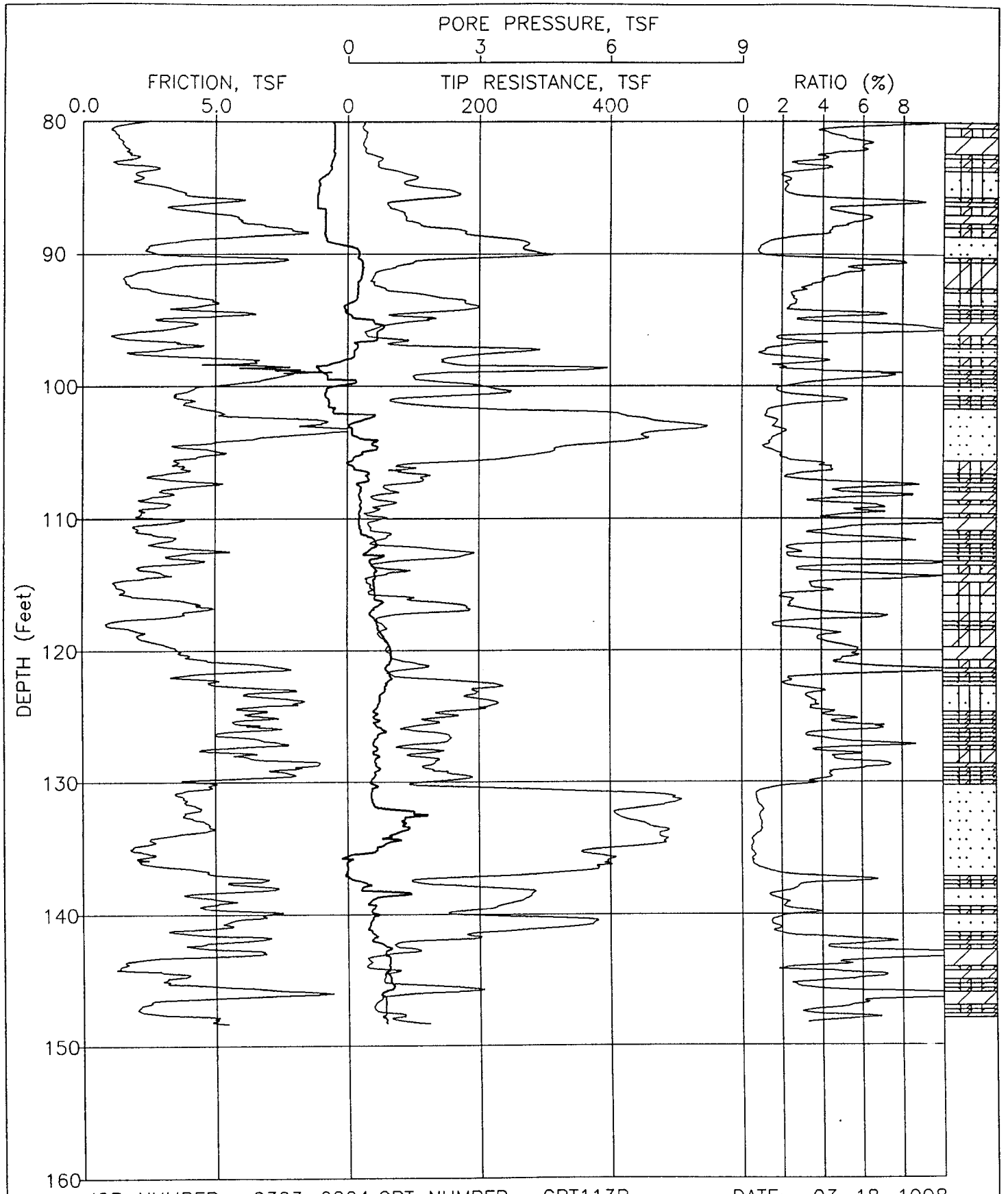

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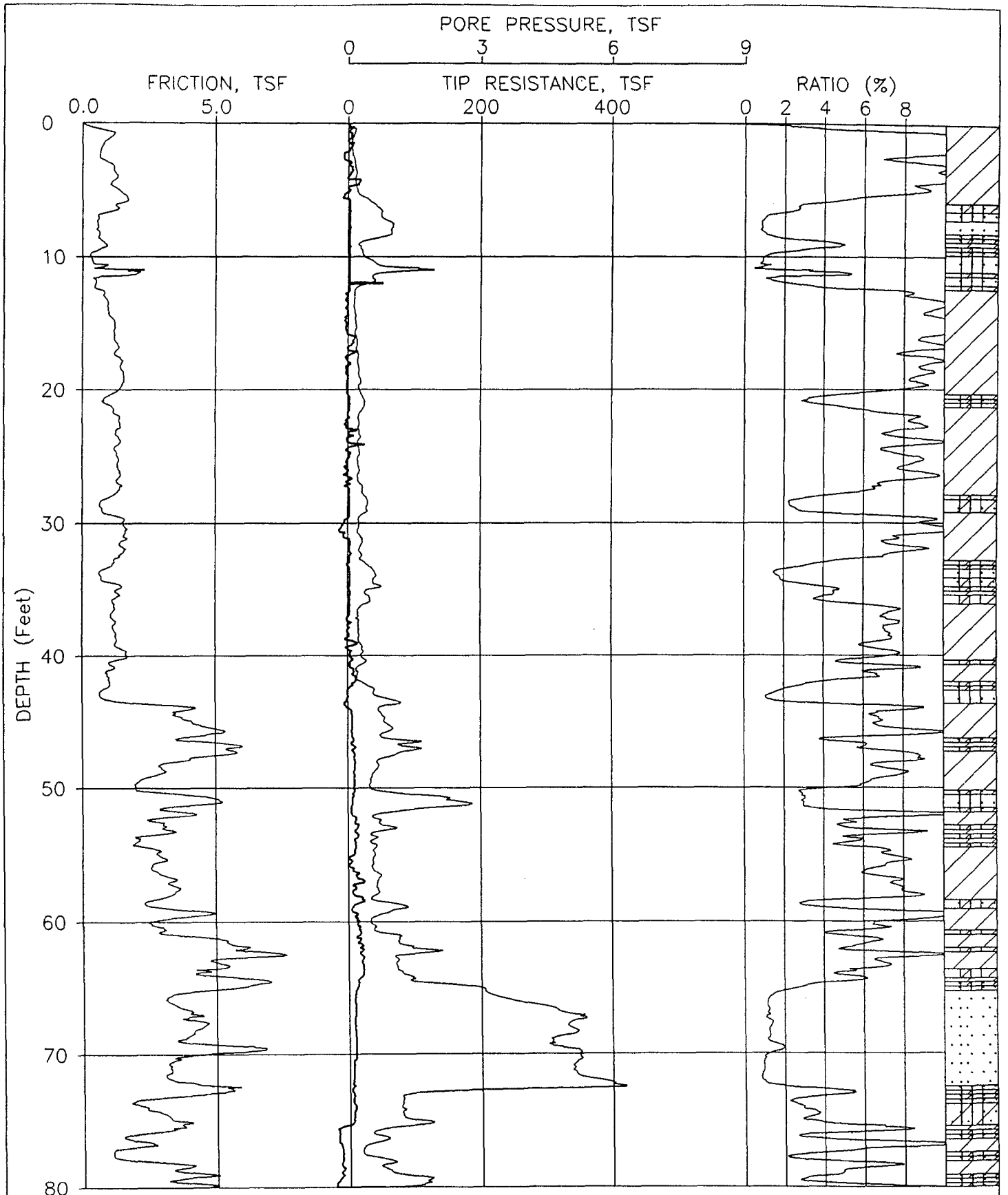

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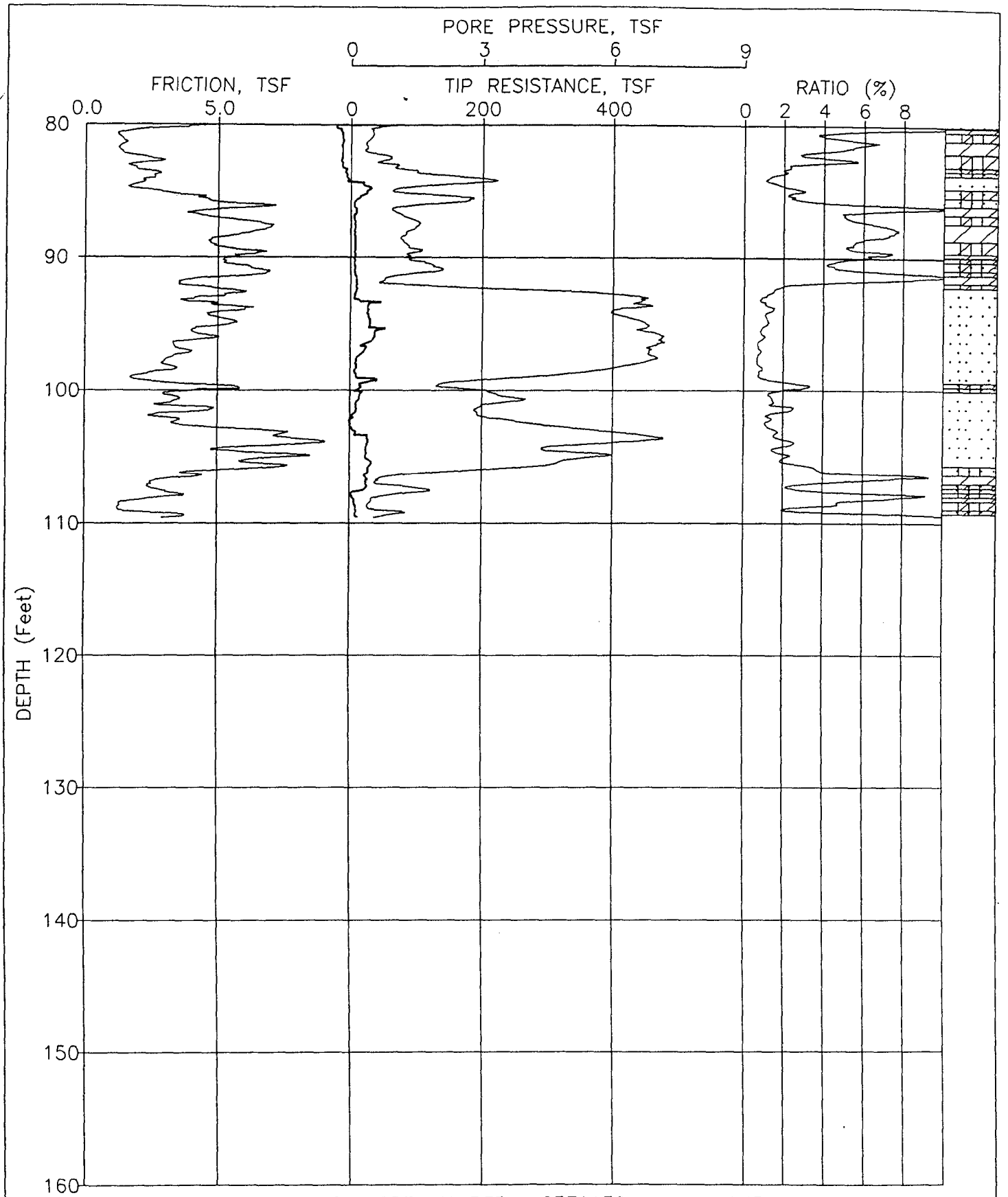

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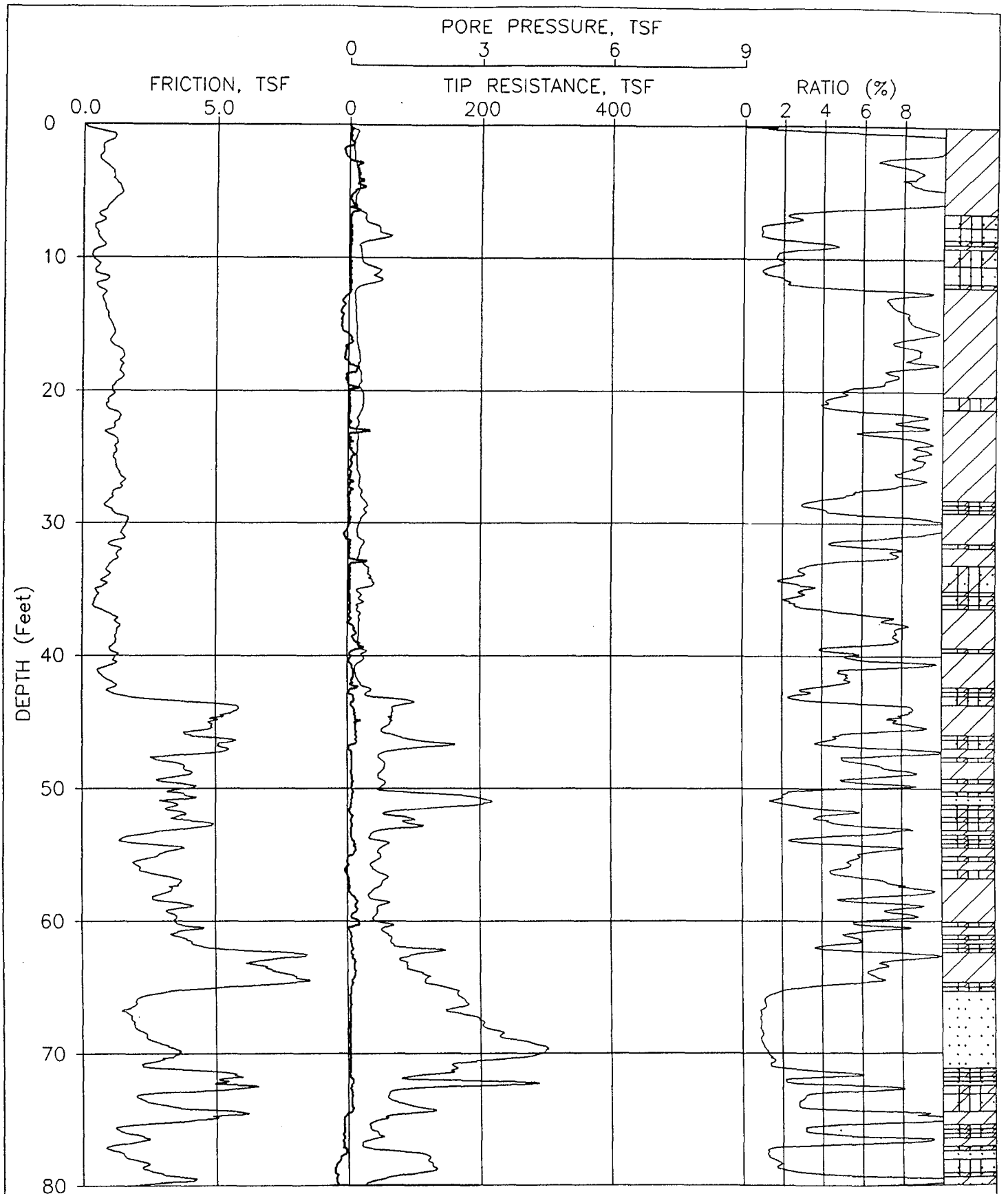

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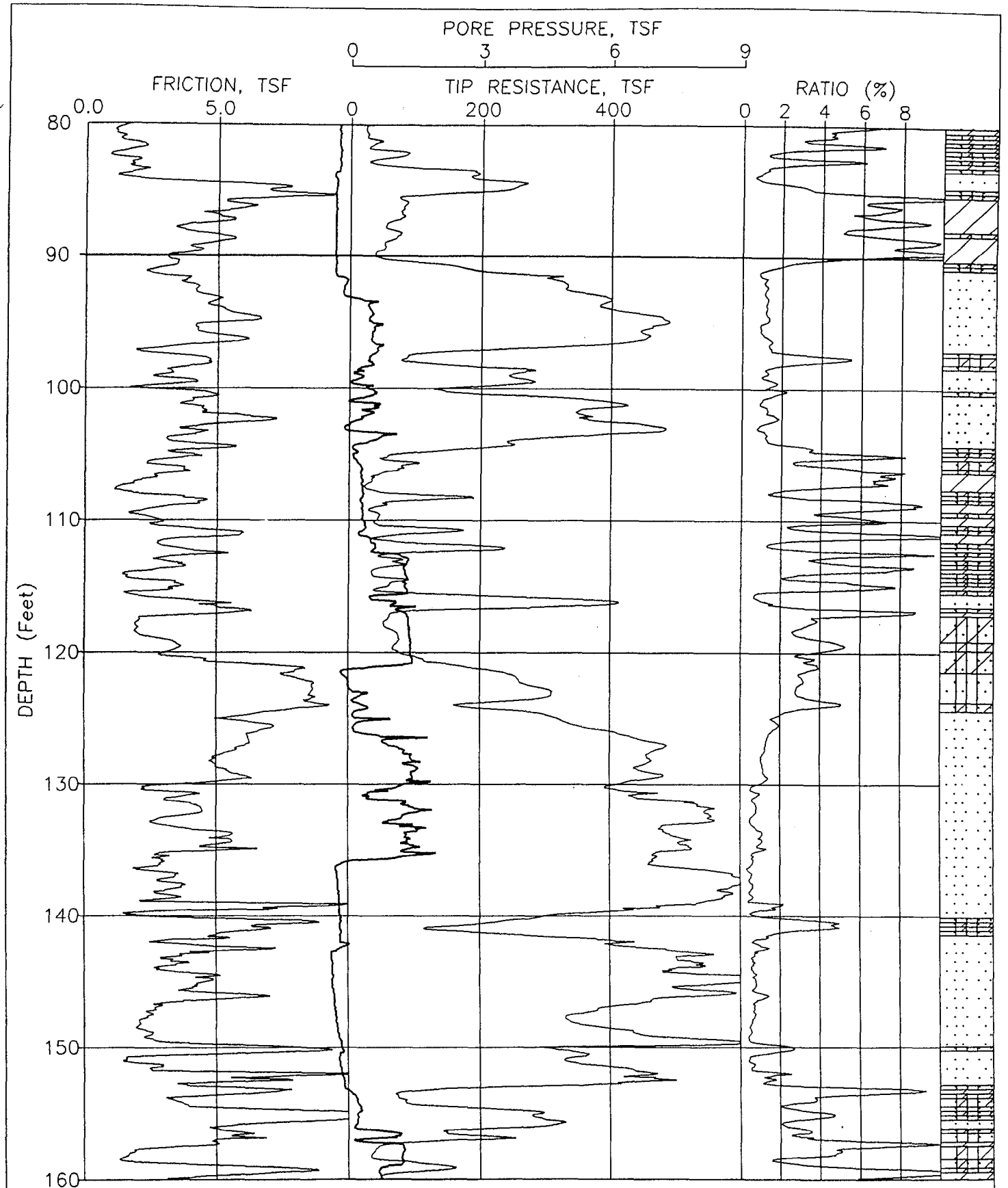

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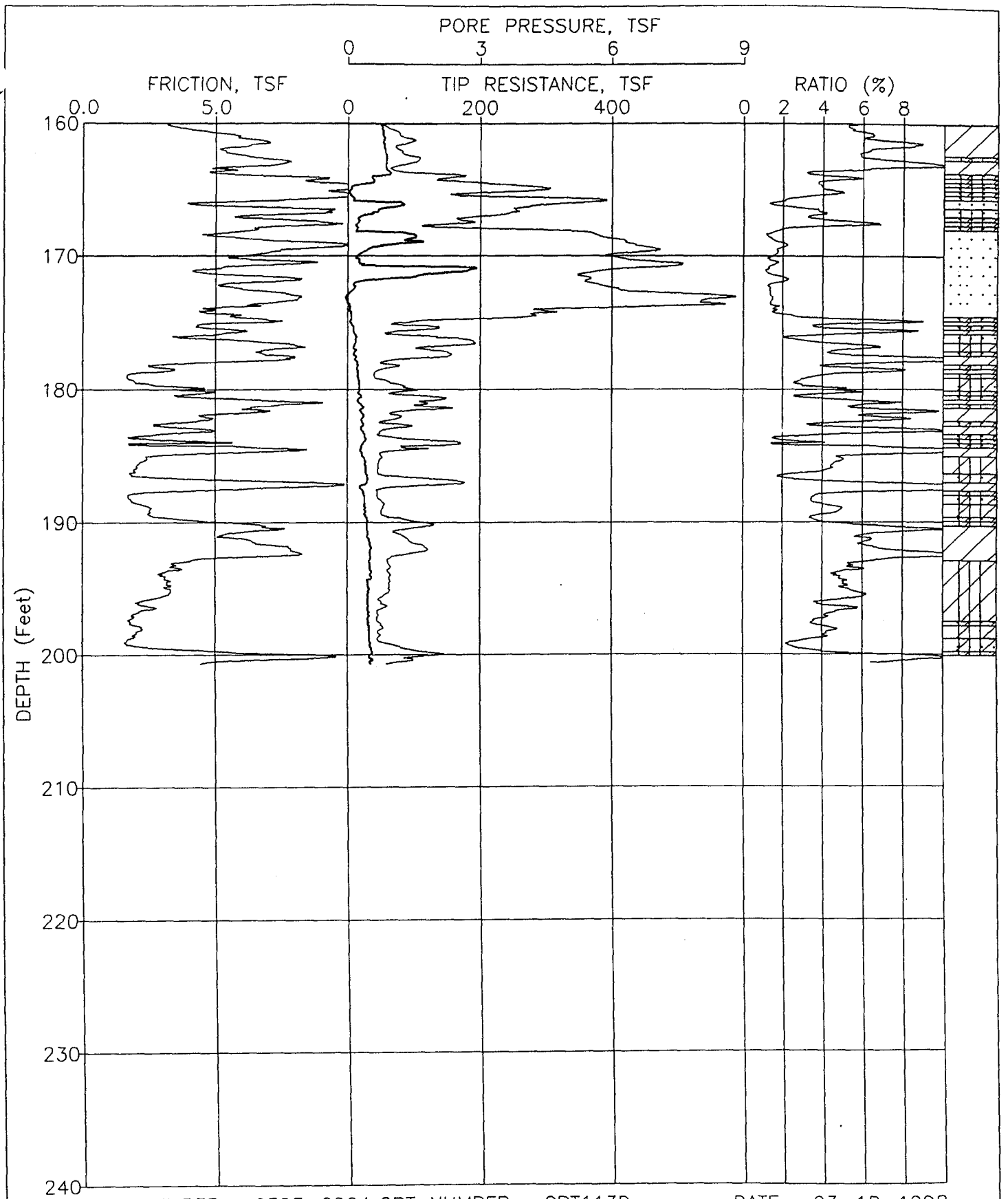

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ELEVATION: 0.00 CONE NUMBER: F7.5CKEW966 PLATE: 3 OF 3

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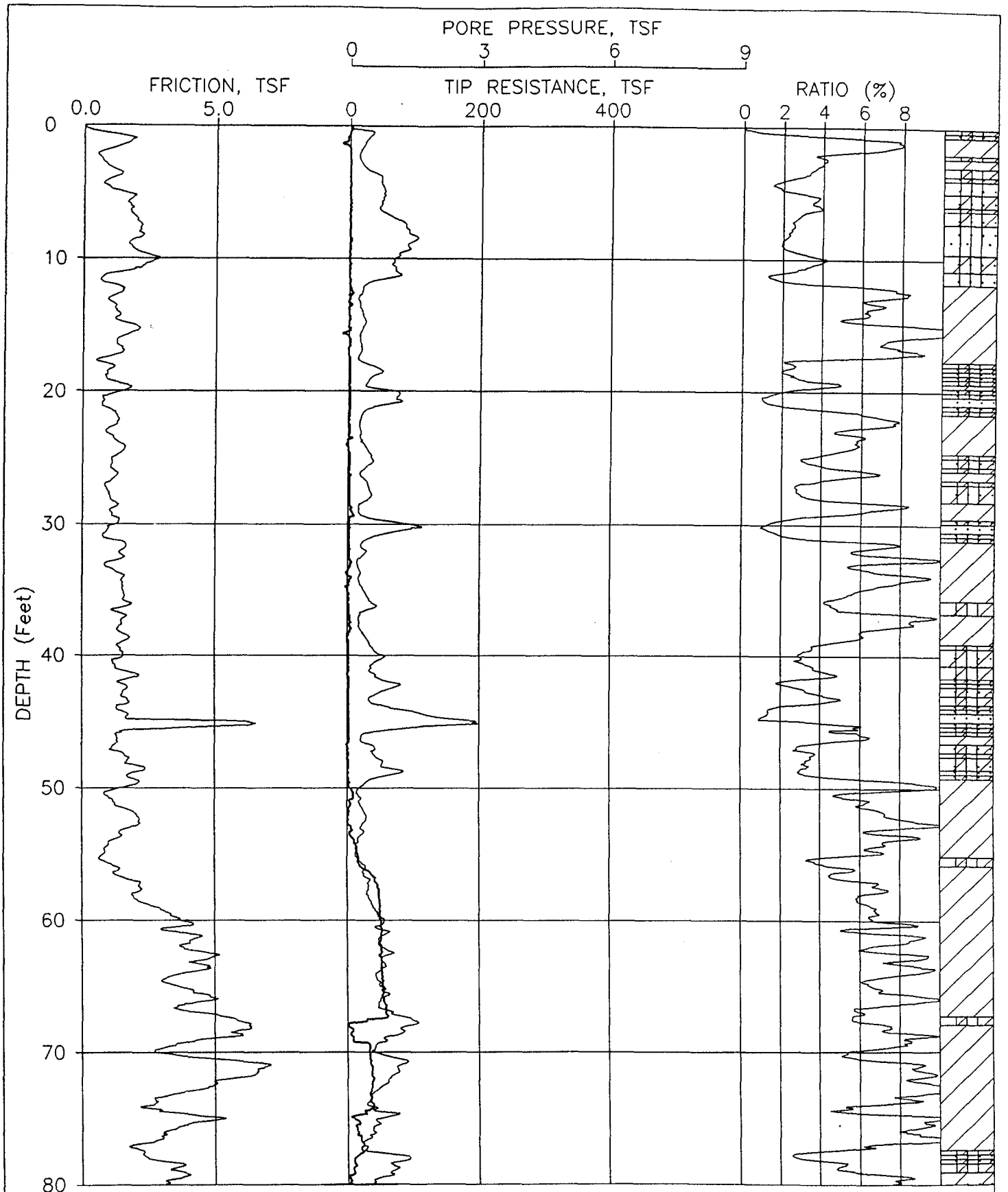

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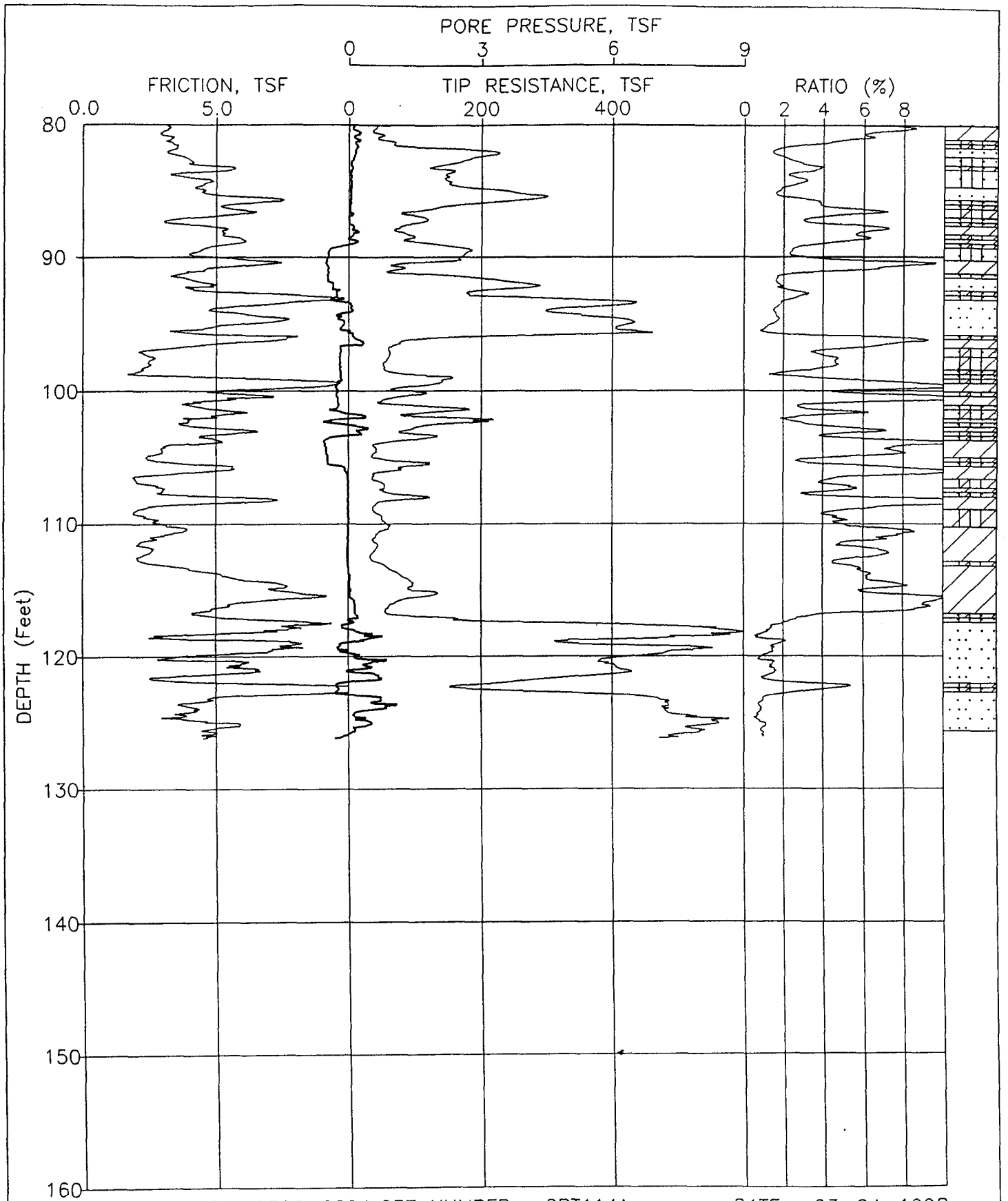

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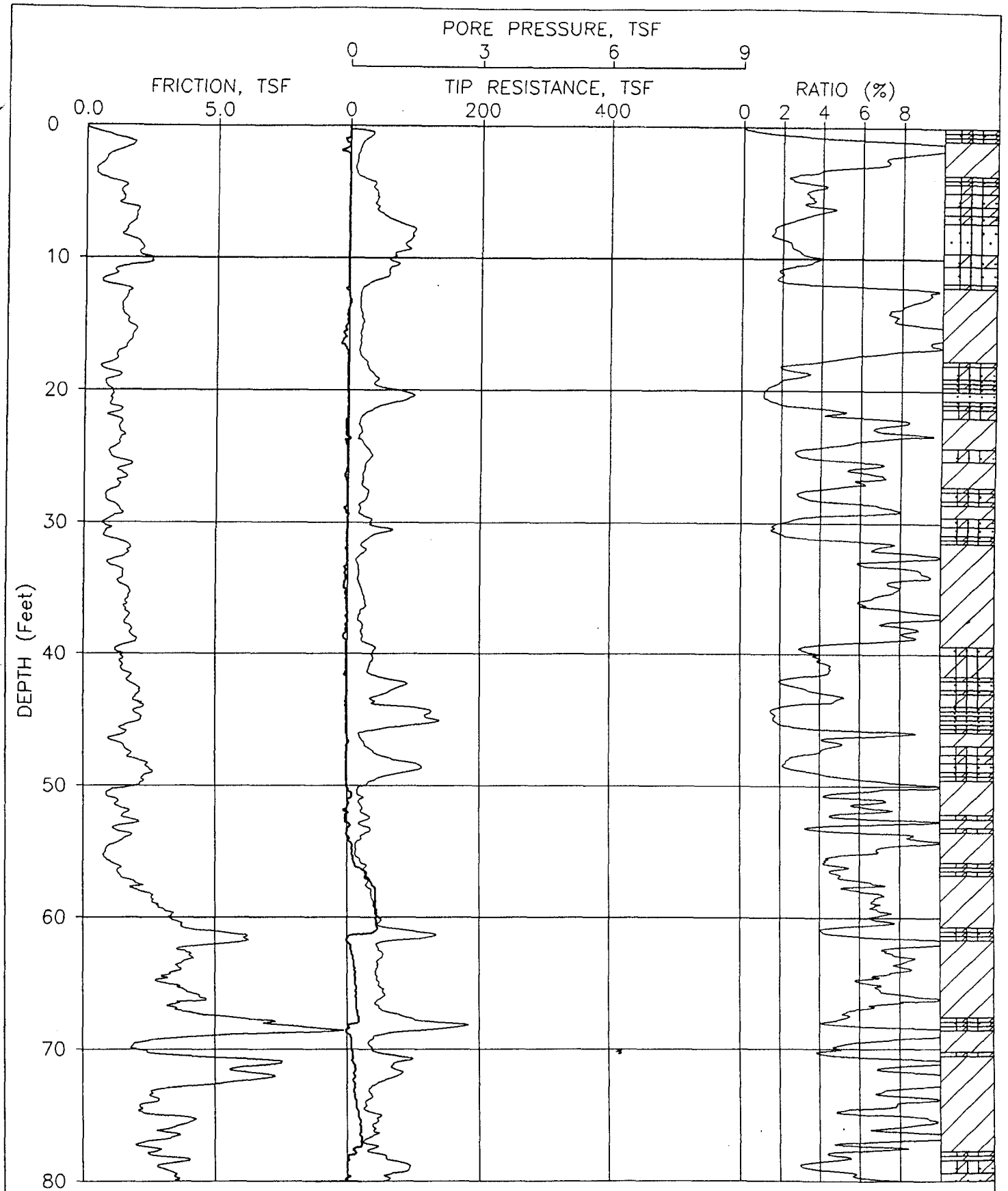

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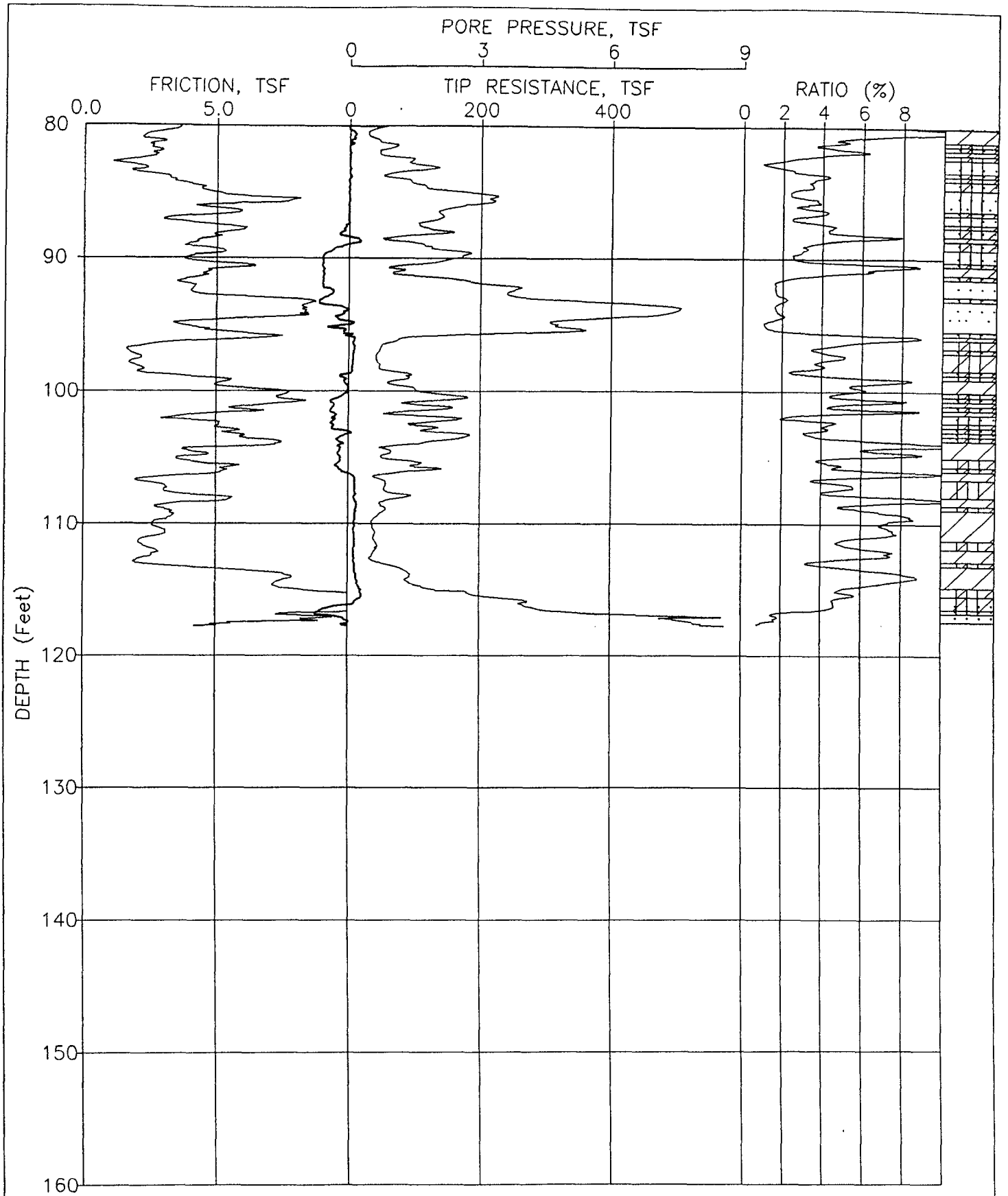

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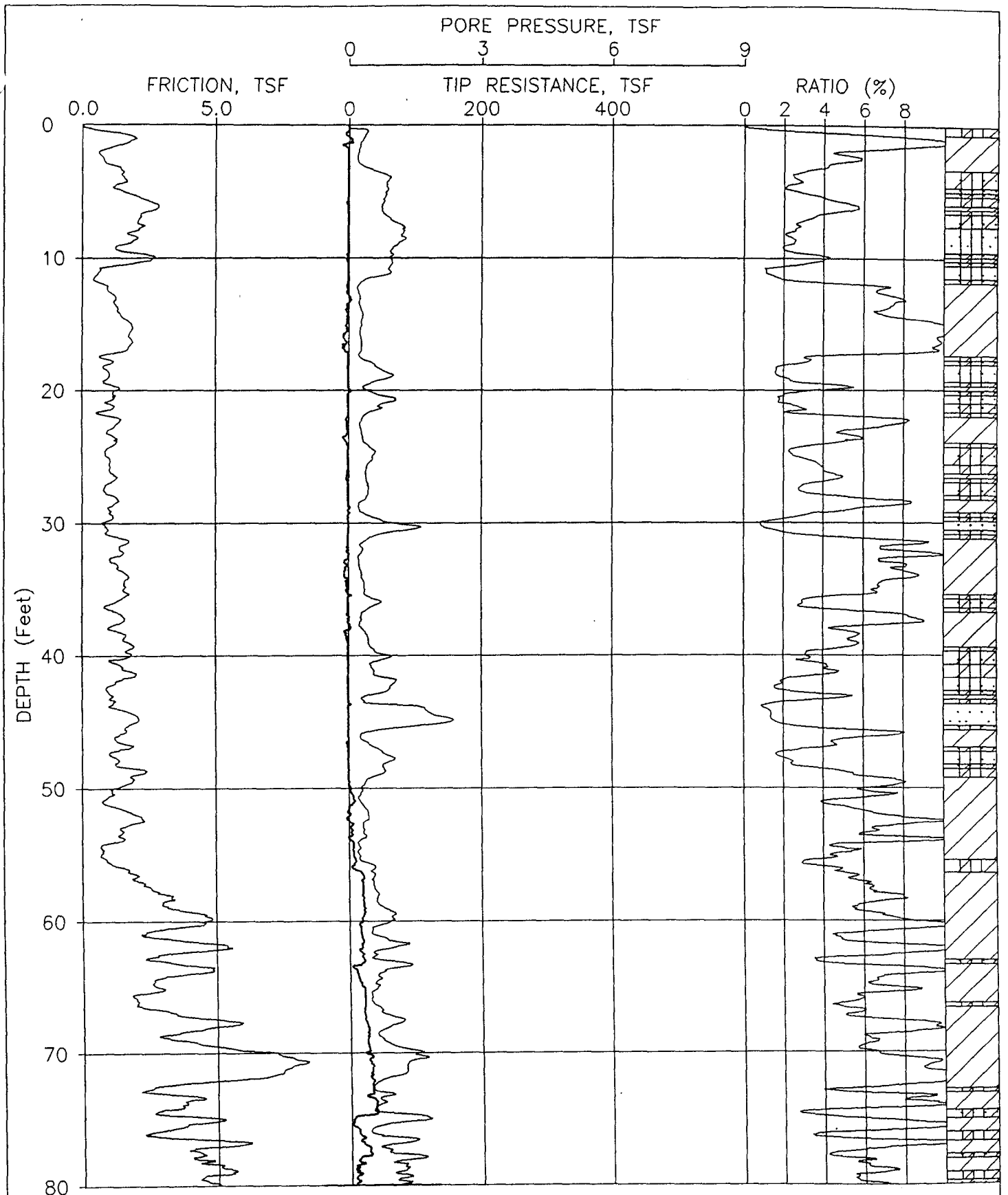

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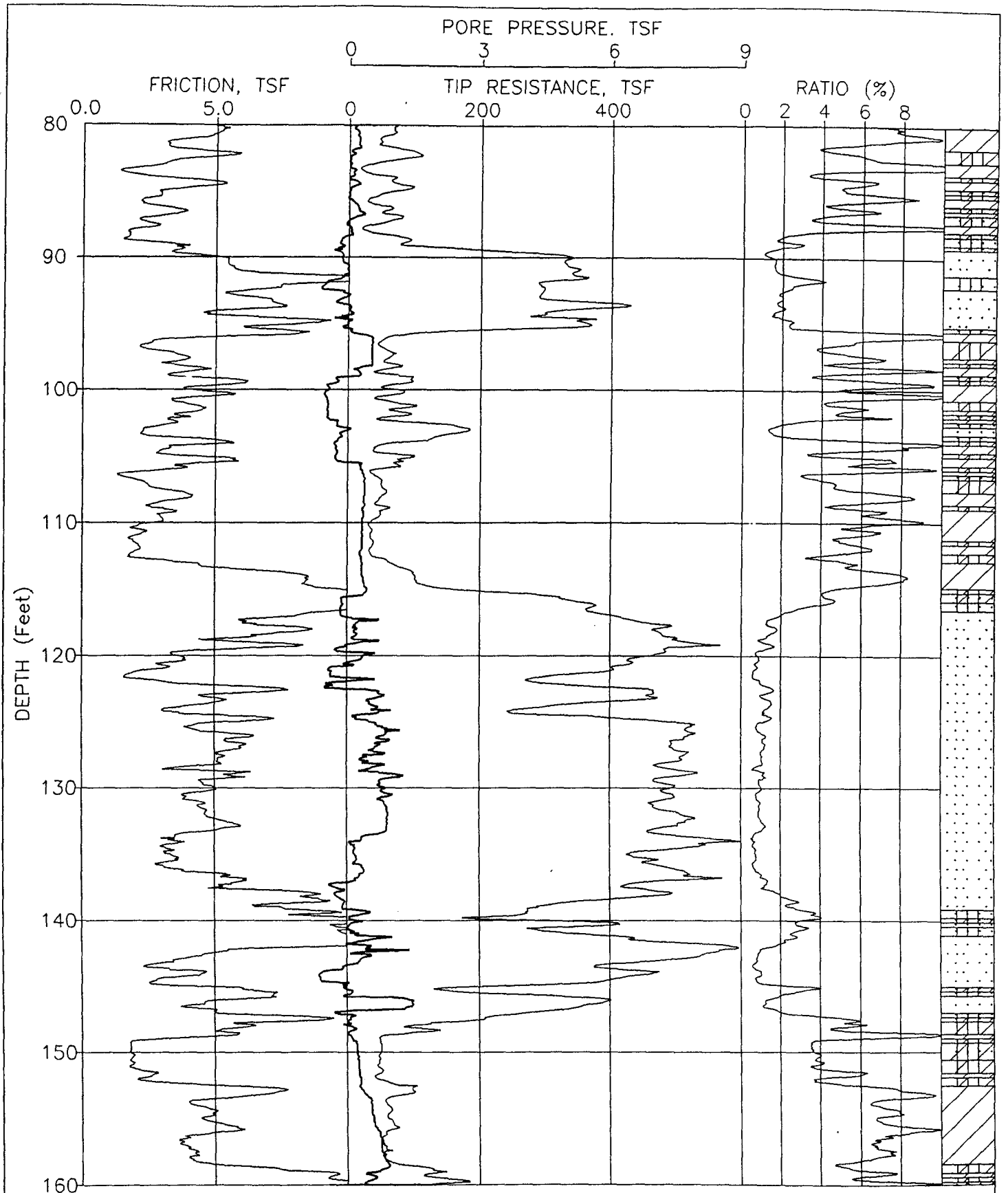

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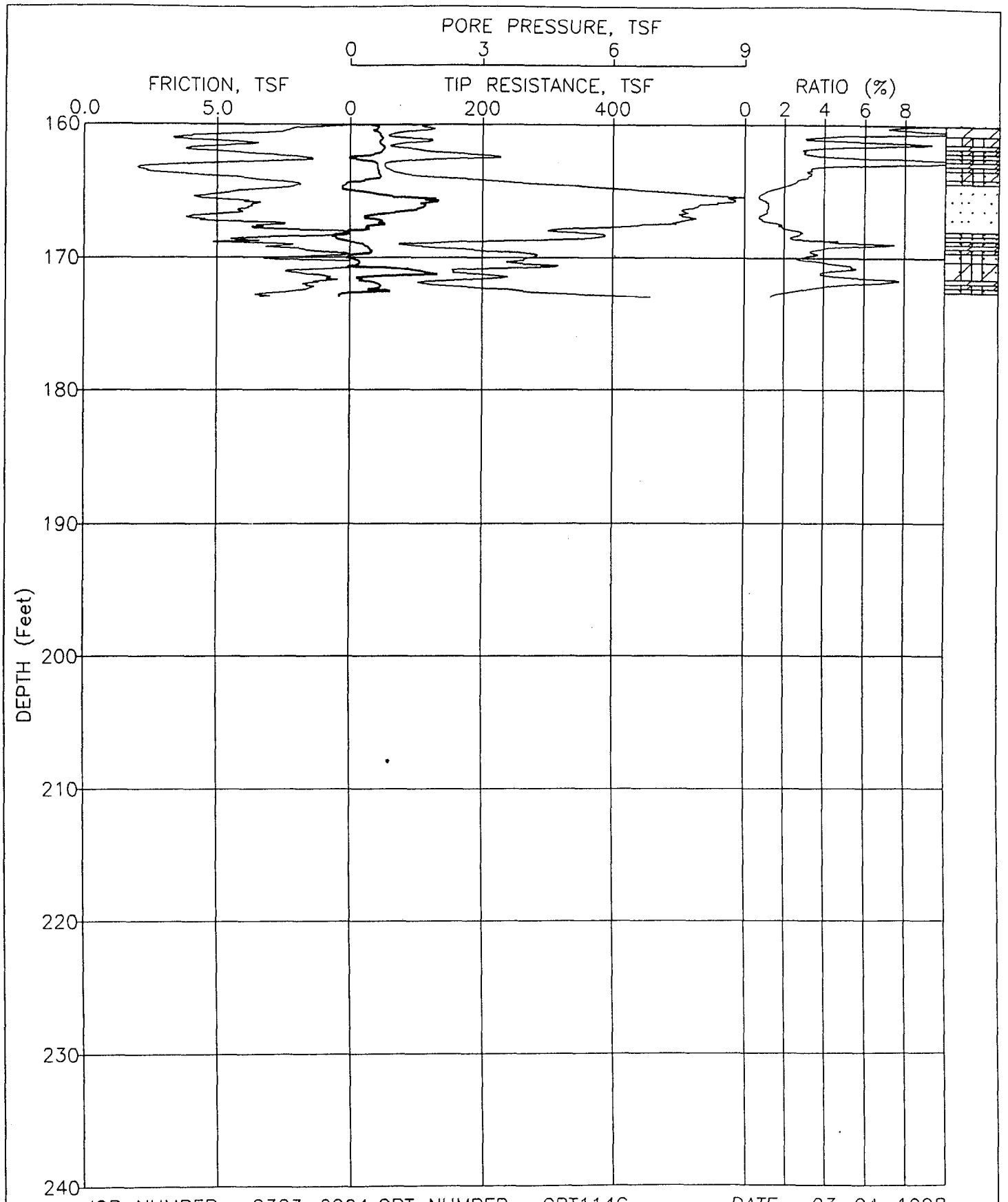

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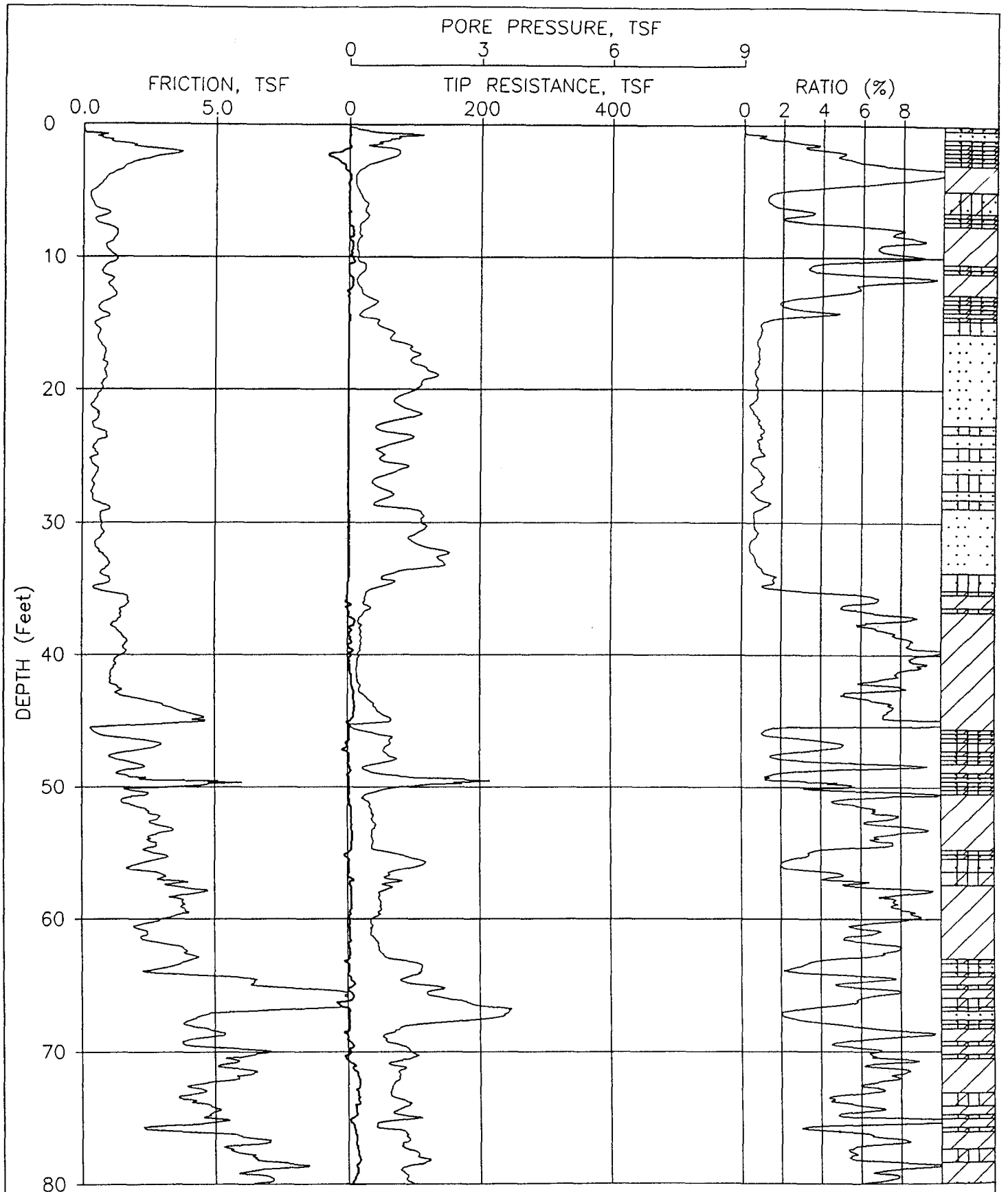

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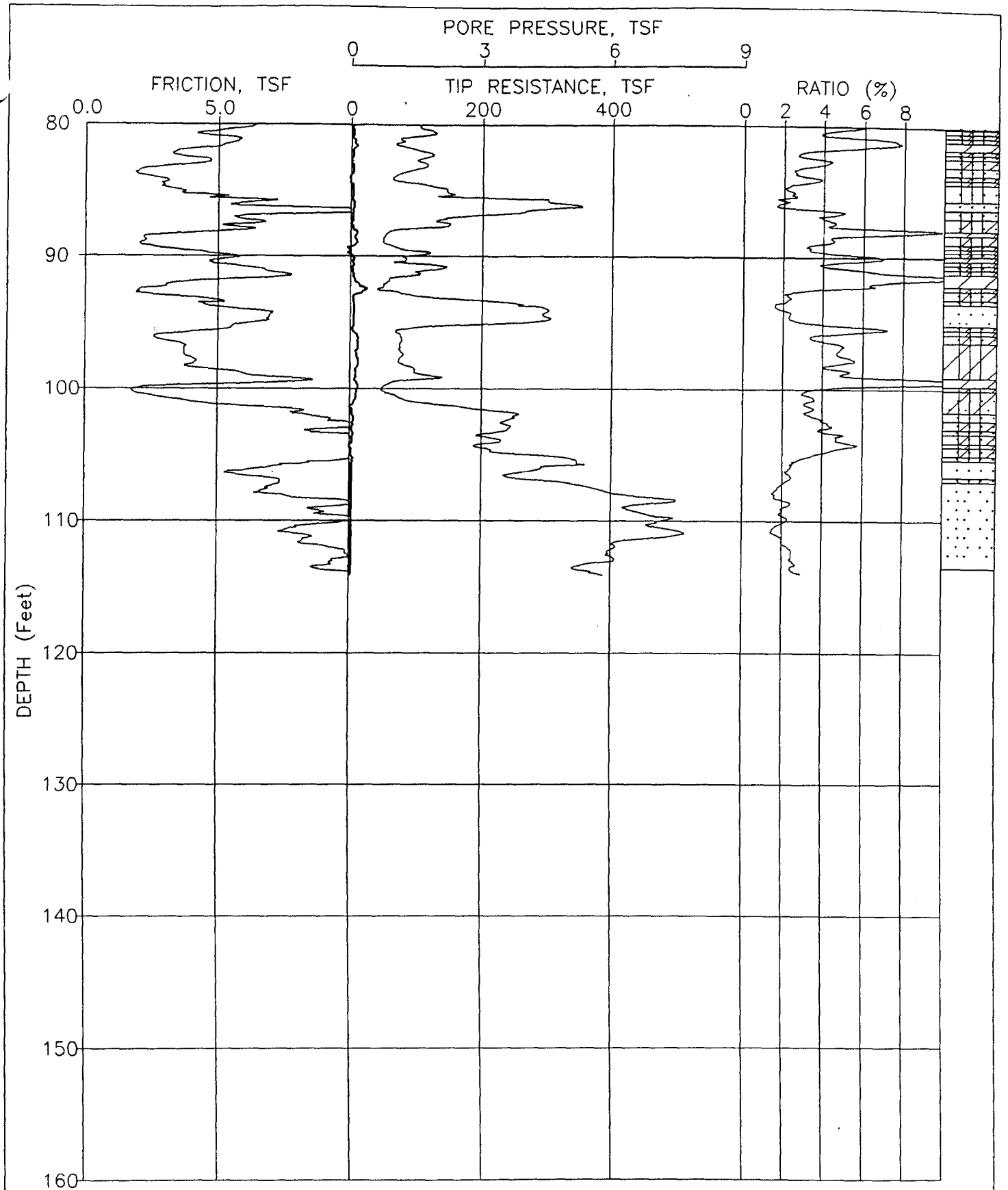

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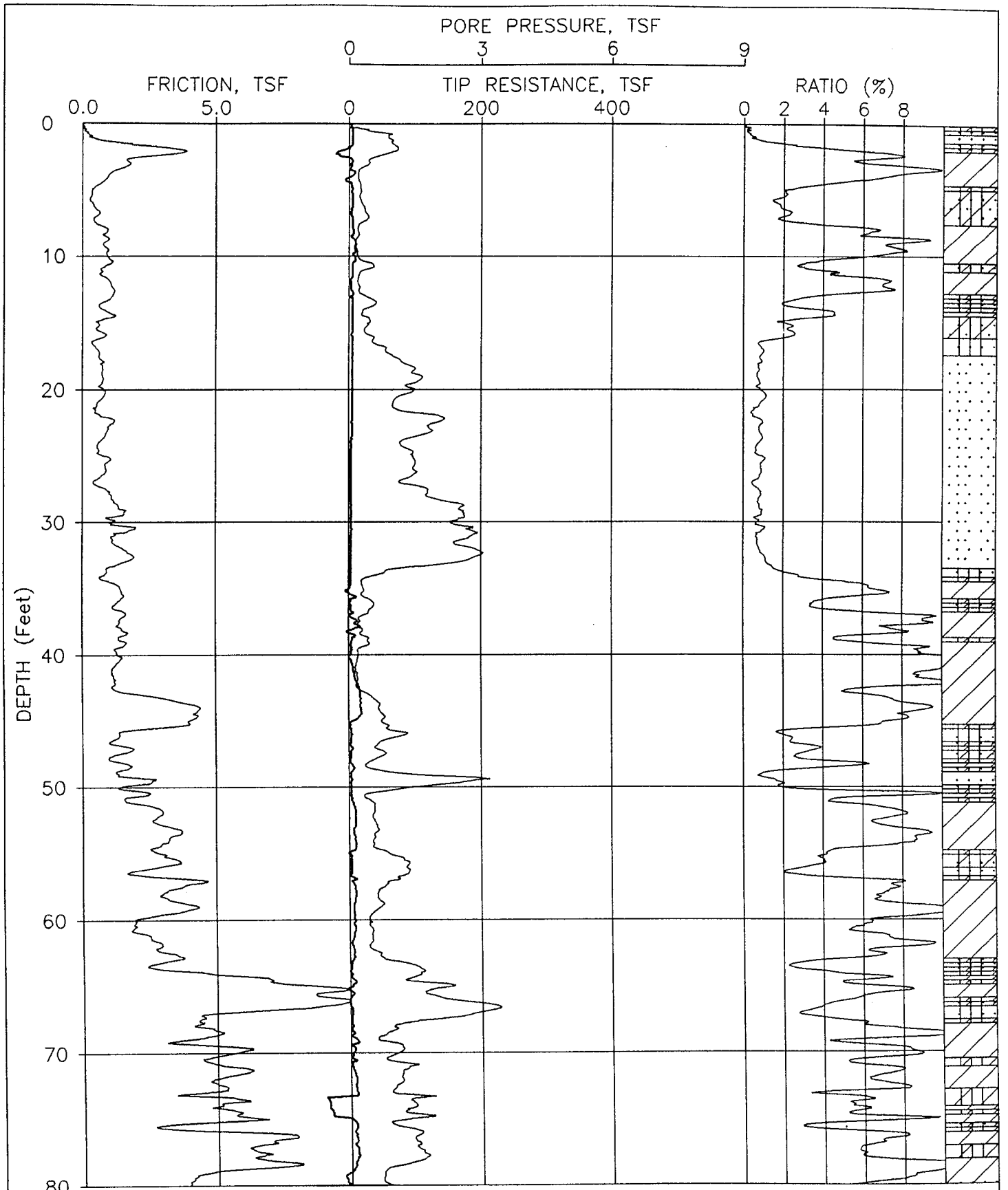

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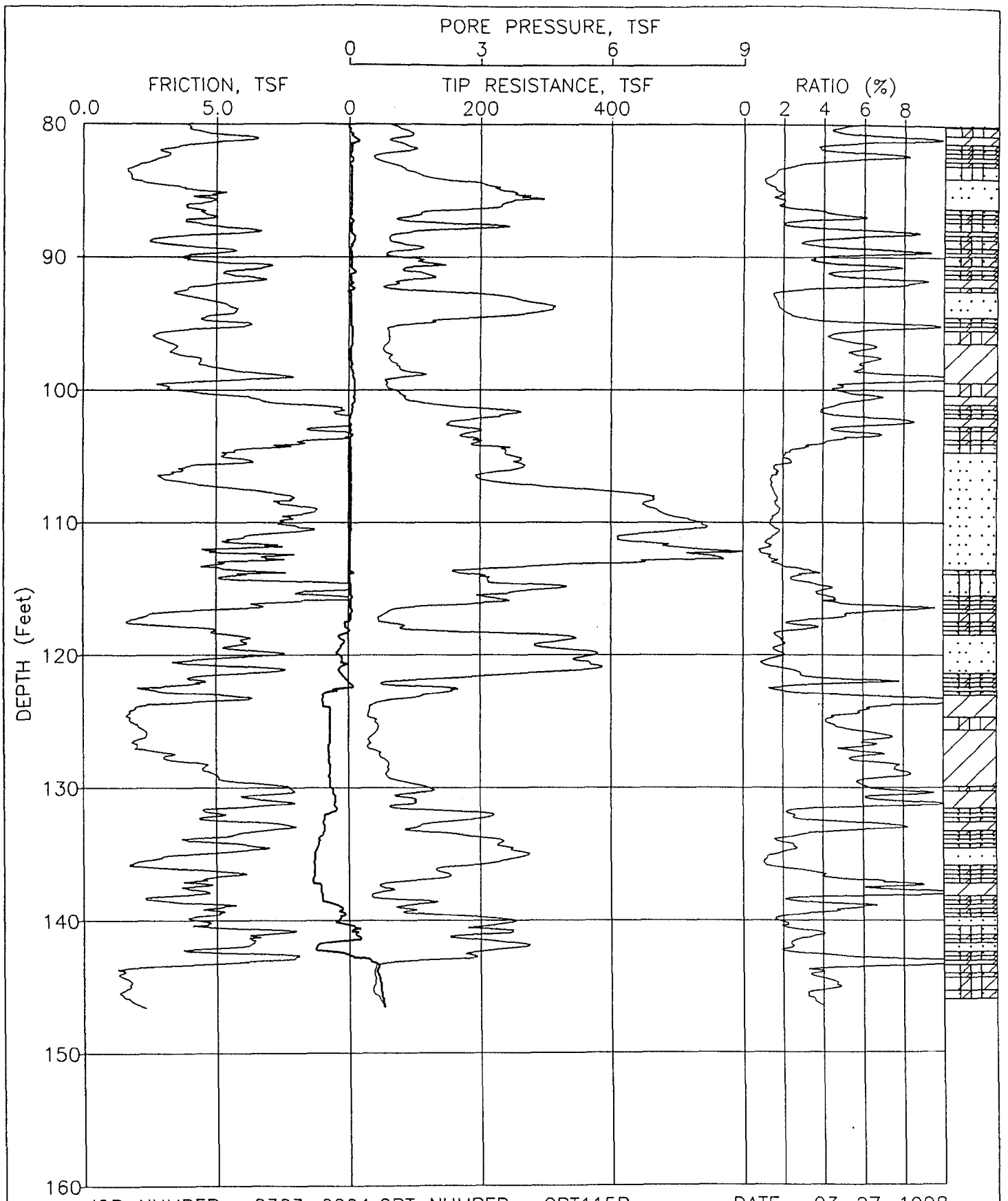
FUGRO GEOSCIENCES,INC



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ELEVATION: 0.00 CONE NUMBER: F7.5CKEW966 PLATE: 2 OF 2

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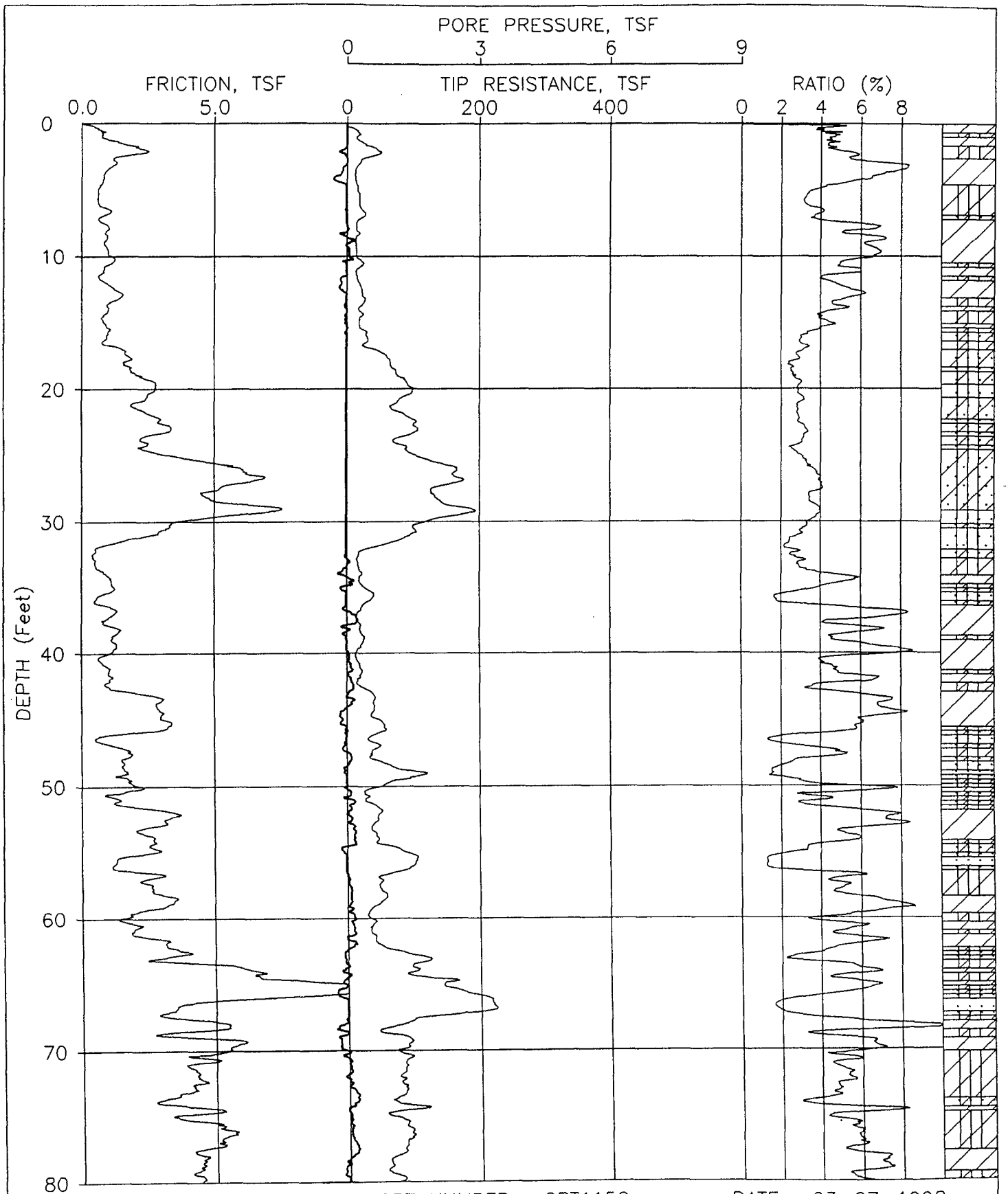

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ELEVATION: 0.00 CONE NUMBER: F7.5CKEW966 PLATE: 1 OF 2

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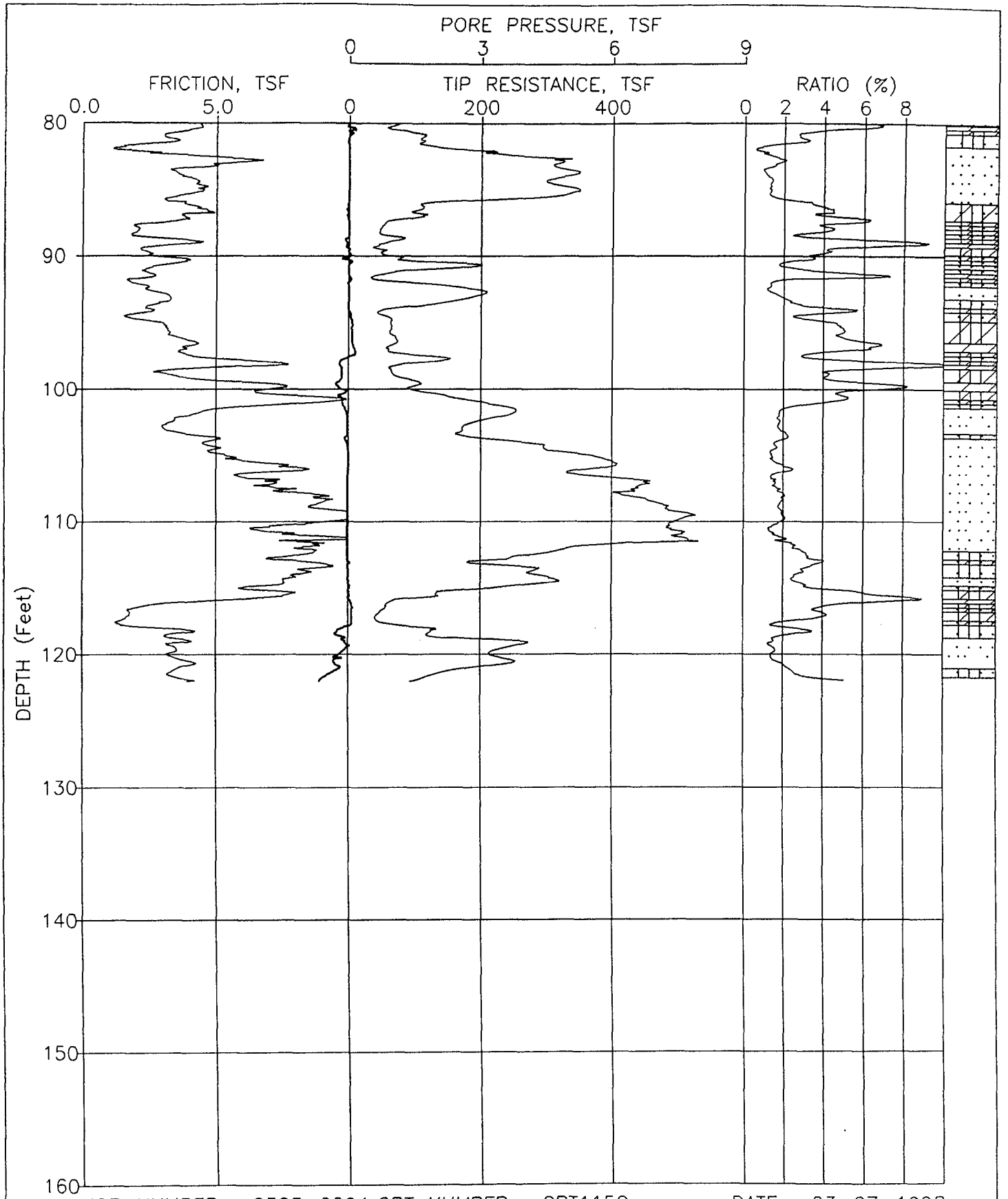

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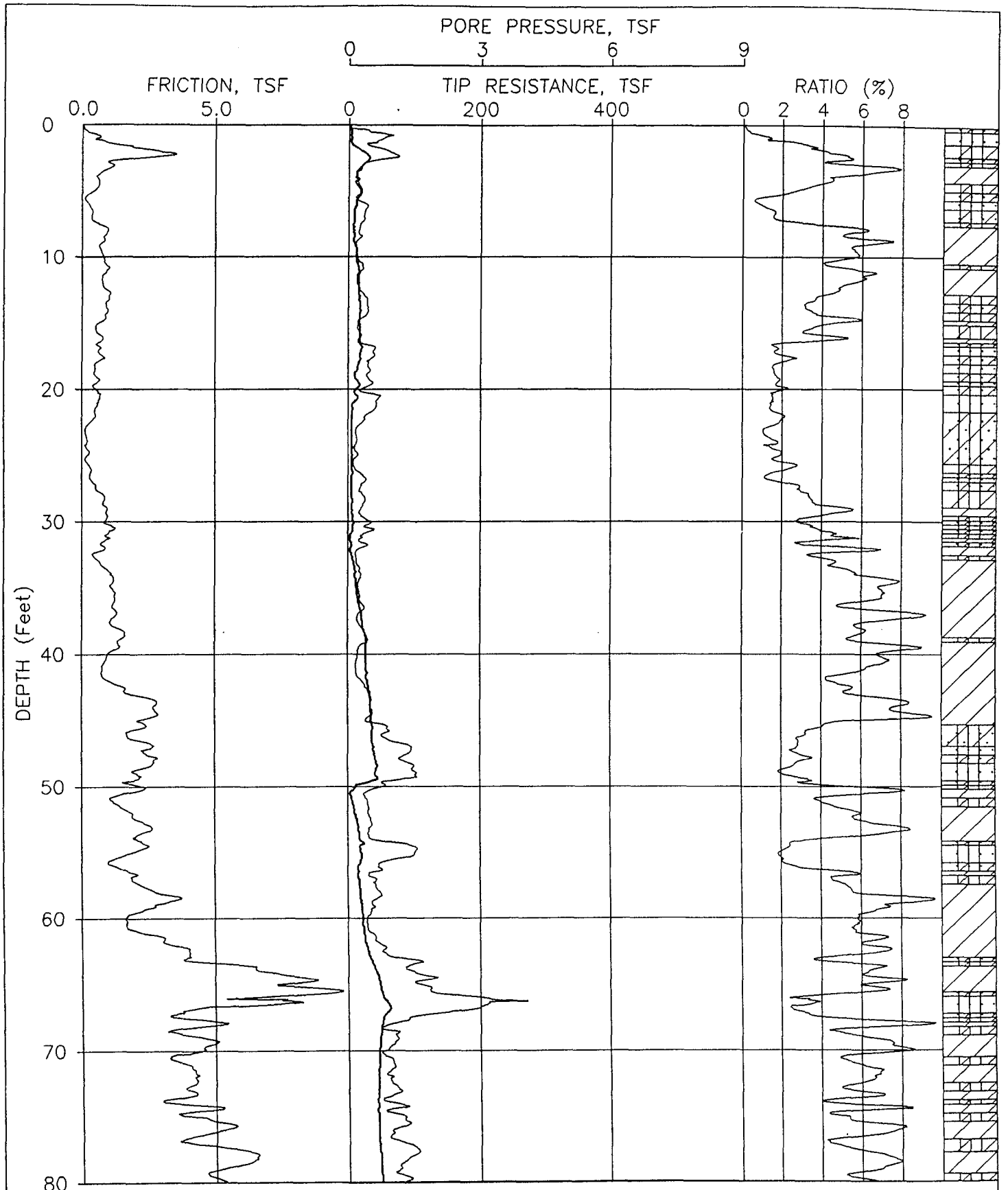
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW966 PLATE: 2 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT115H DATE: 03-31-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 1 OF 3

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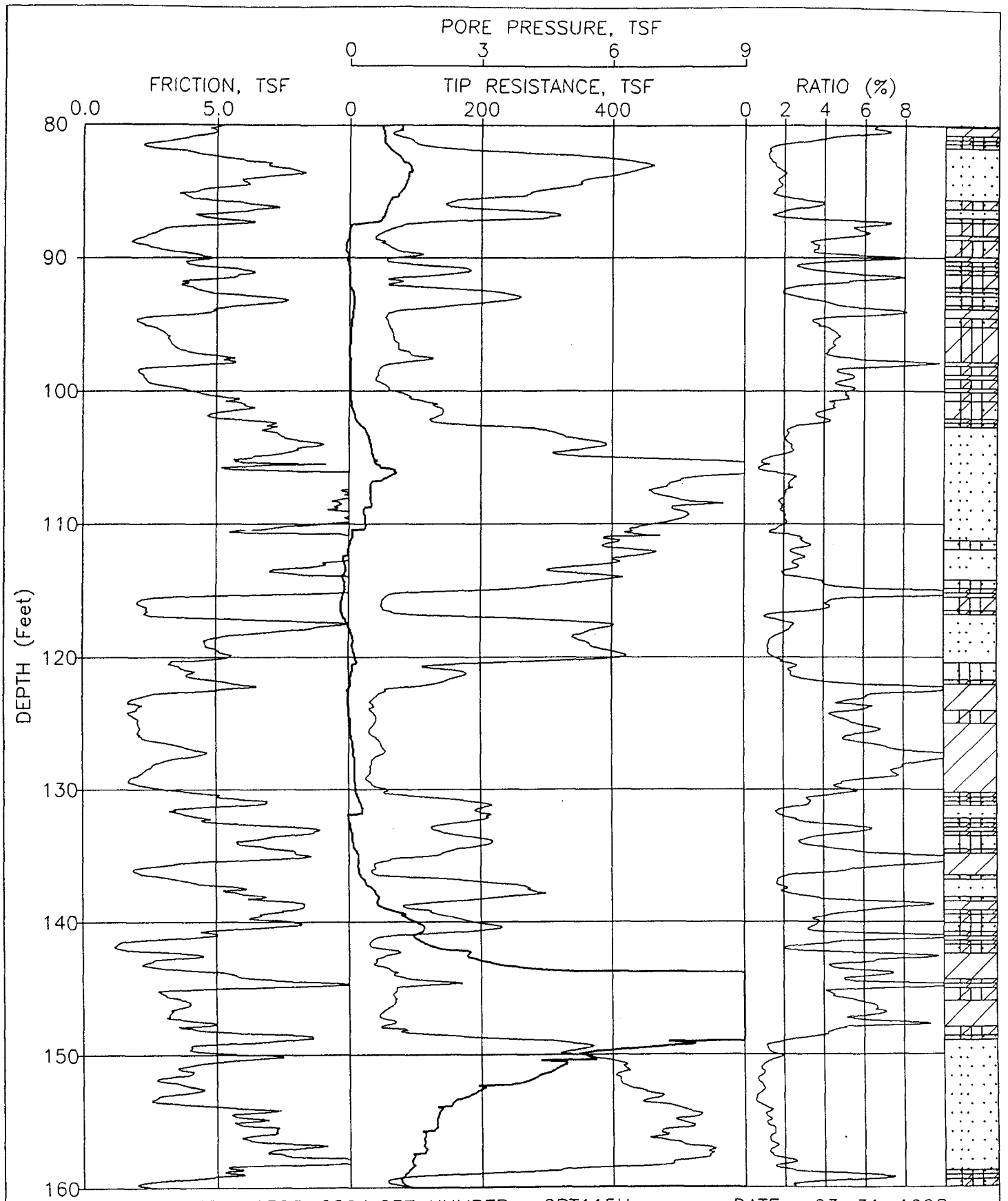
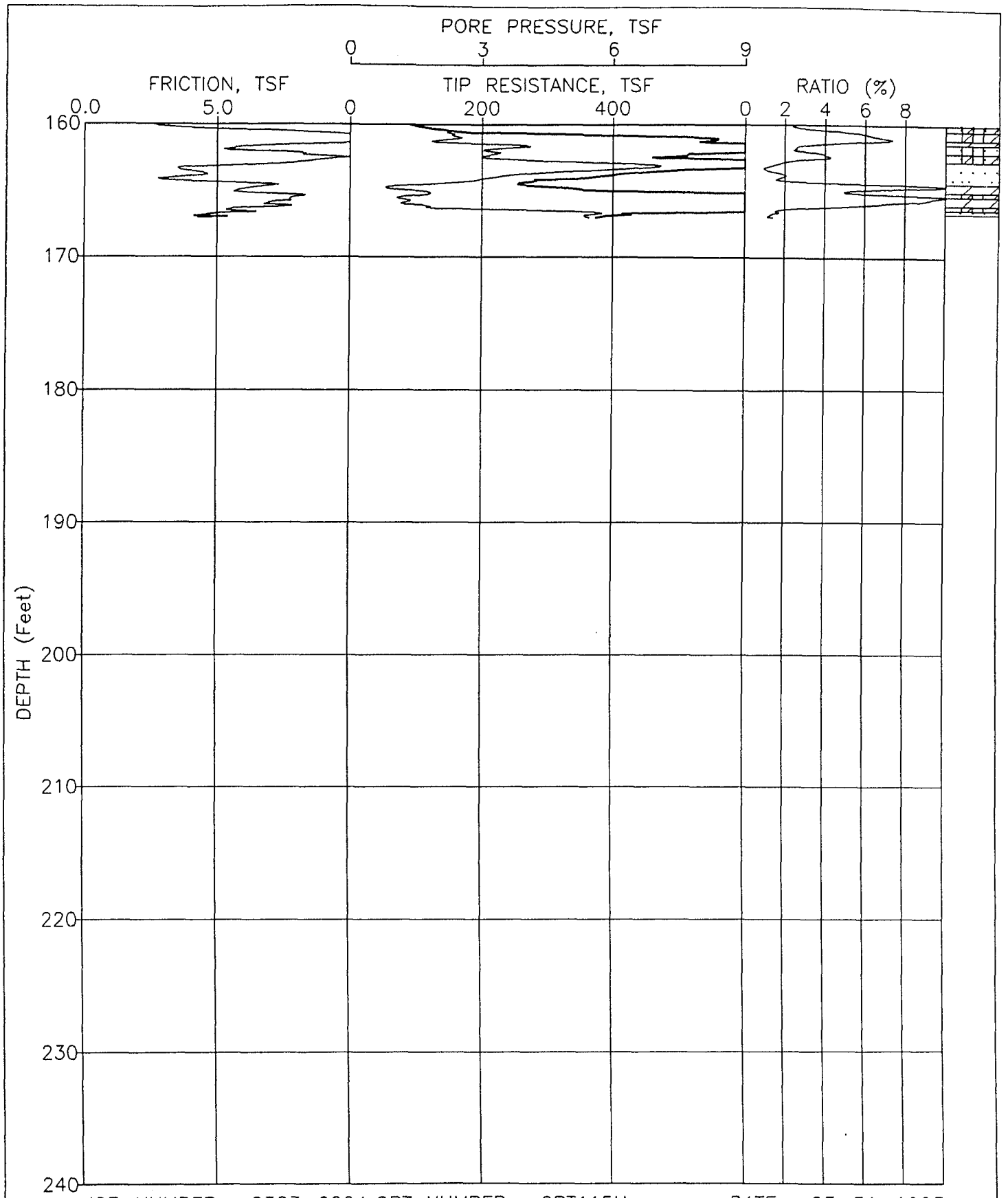


JOB NUMBER: 0303-0204 CPT NUMBER: CPT115H DATE: 03-31-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 2 OF 3

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT115H DATE: 03-31-1998

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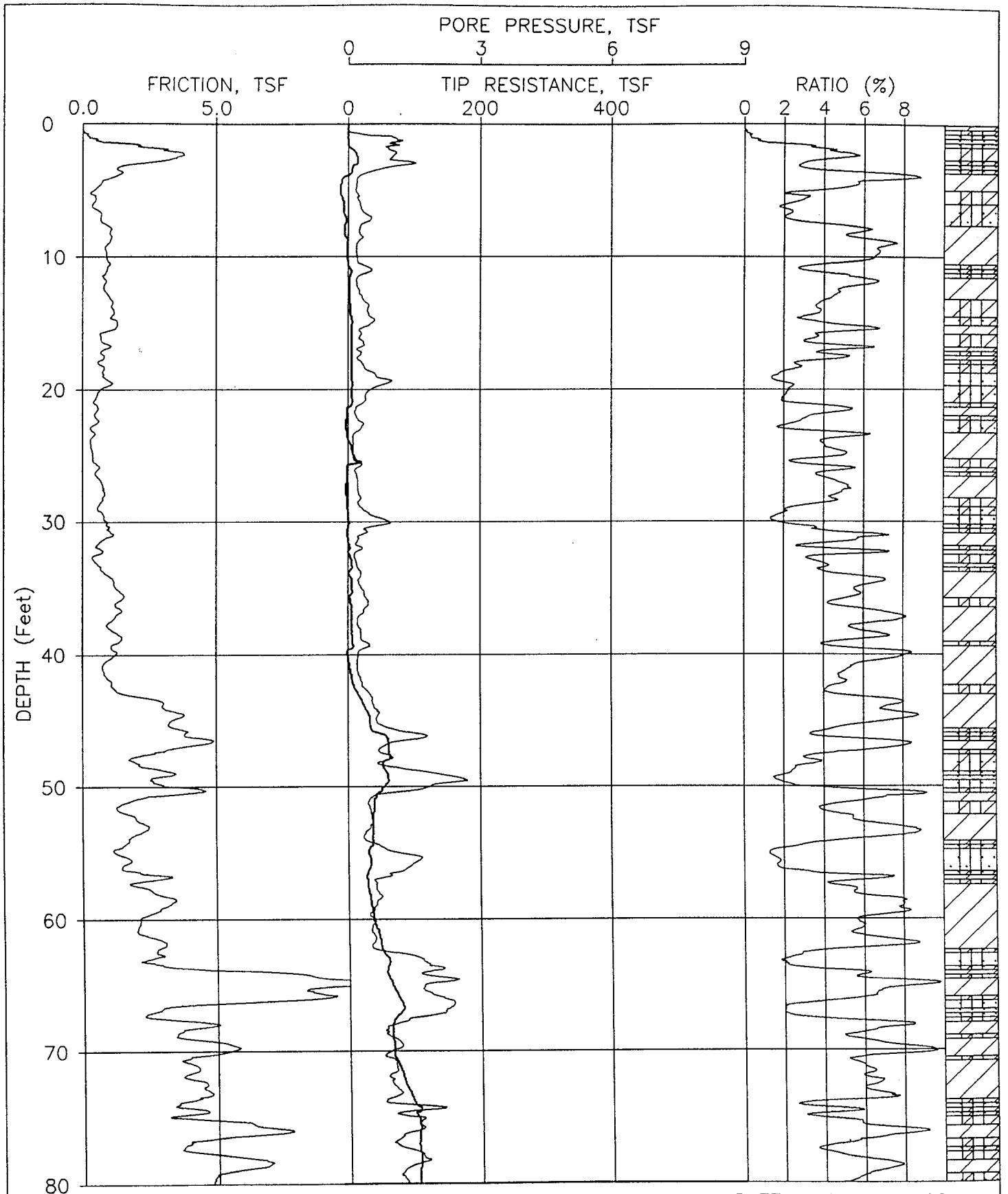
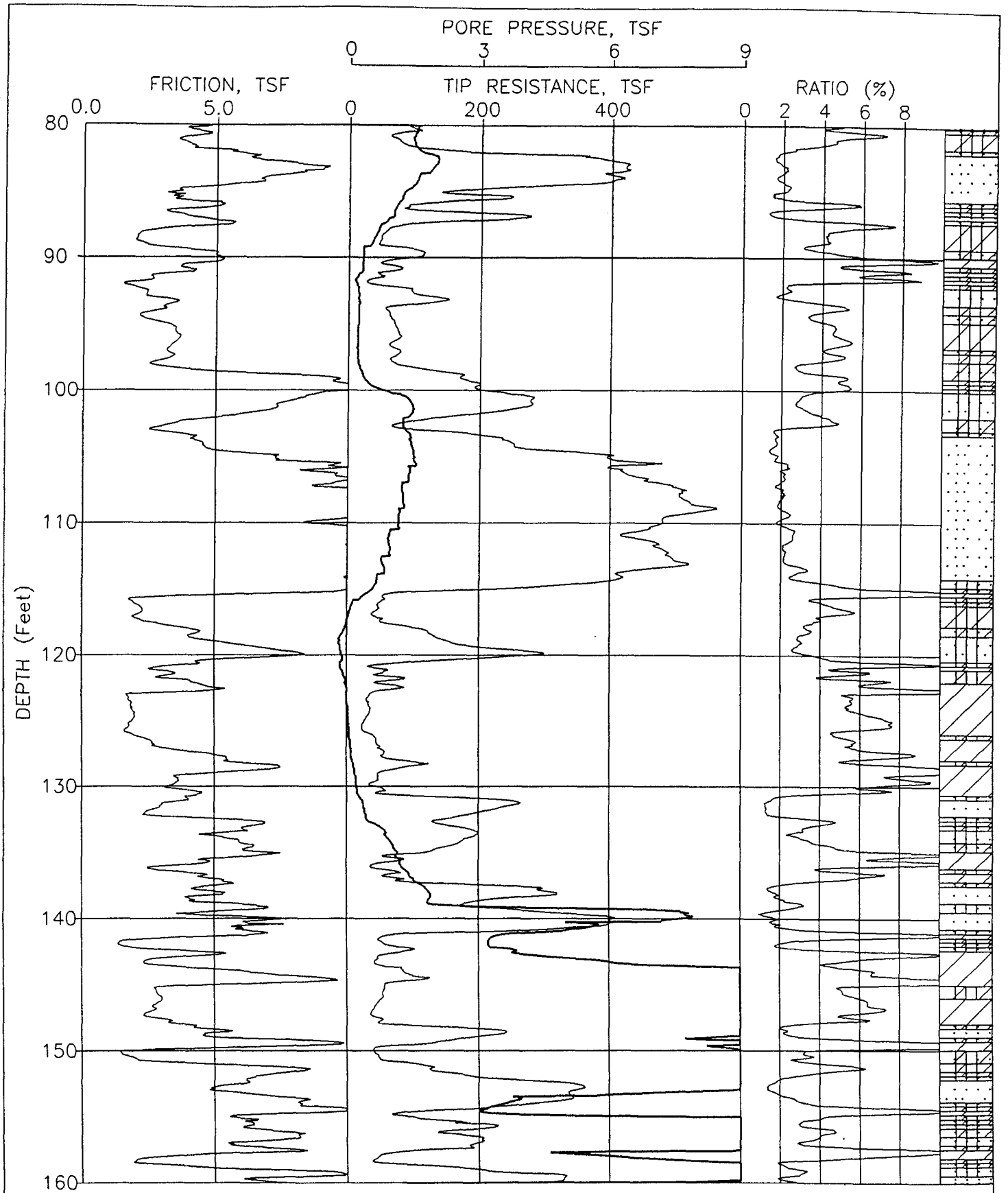
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT1151 DATE: 03-31-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 1 OF 3

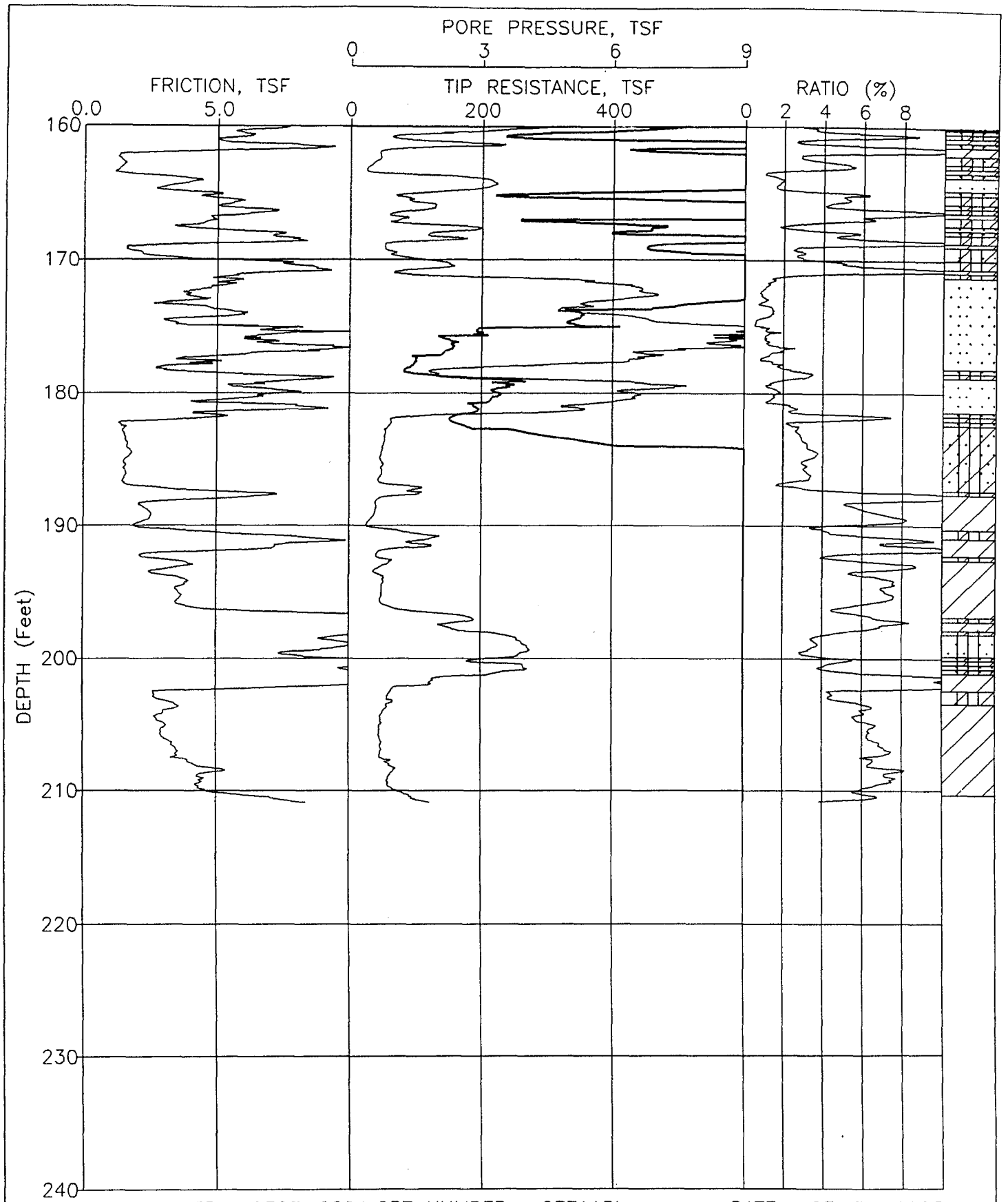
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT115I DATE: 03-31-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 2 OF 3

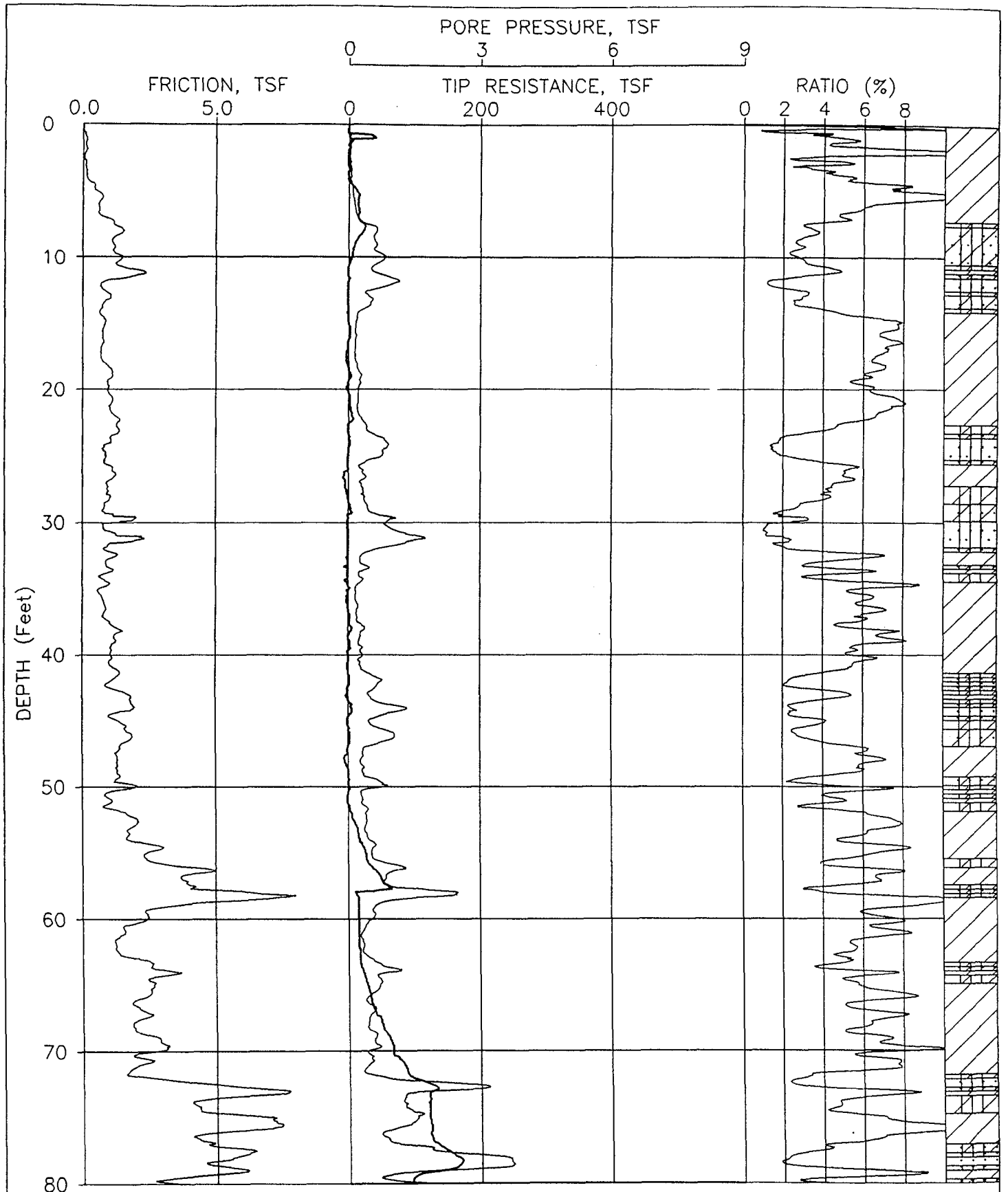
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT115I DATE: 03-31-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 3 OF 3

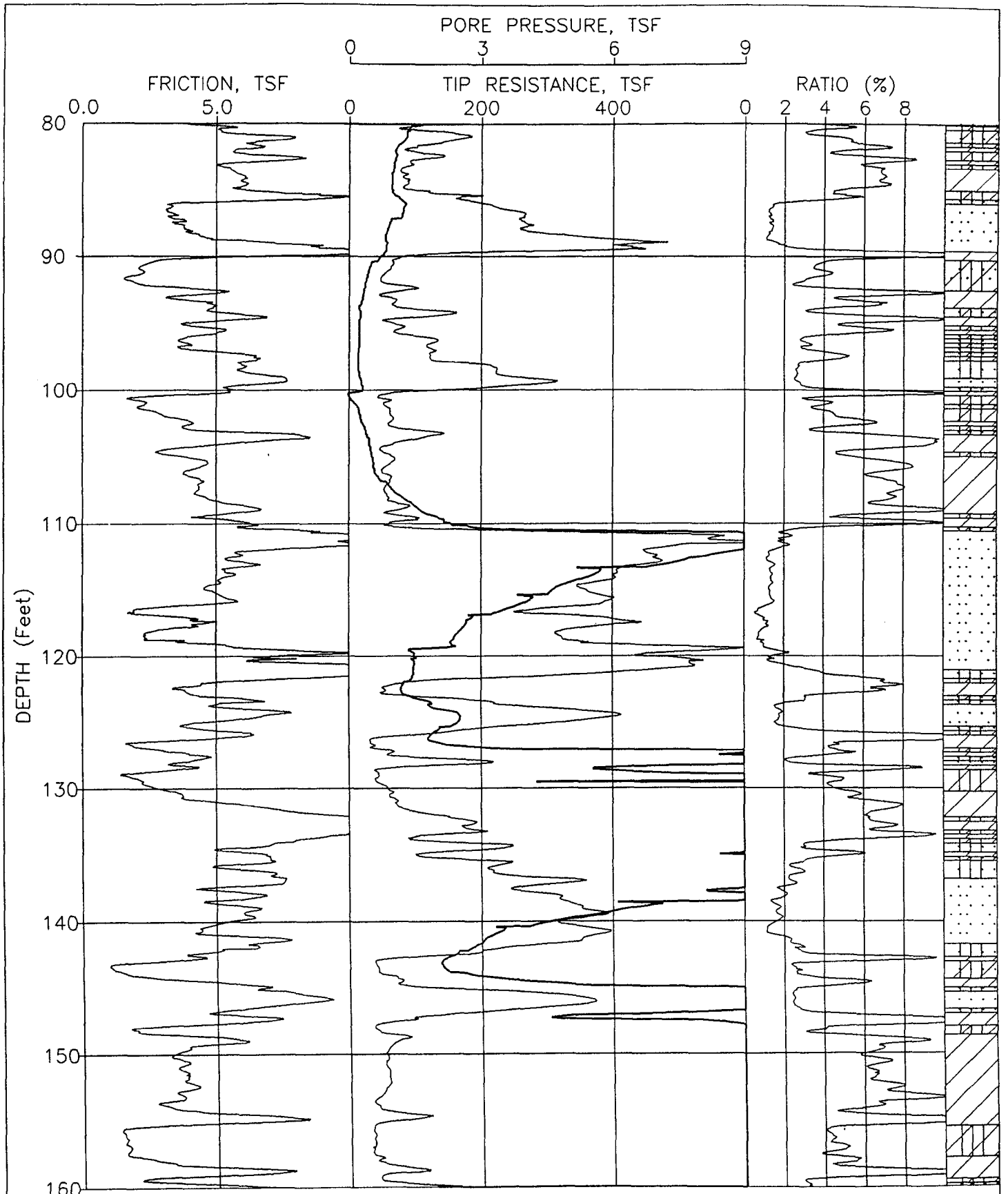
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT116A DATE: 04-03-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 1 OF 3

FUGRO GEOSCIENCES,INC



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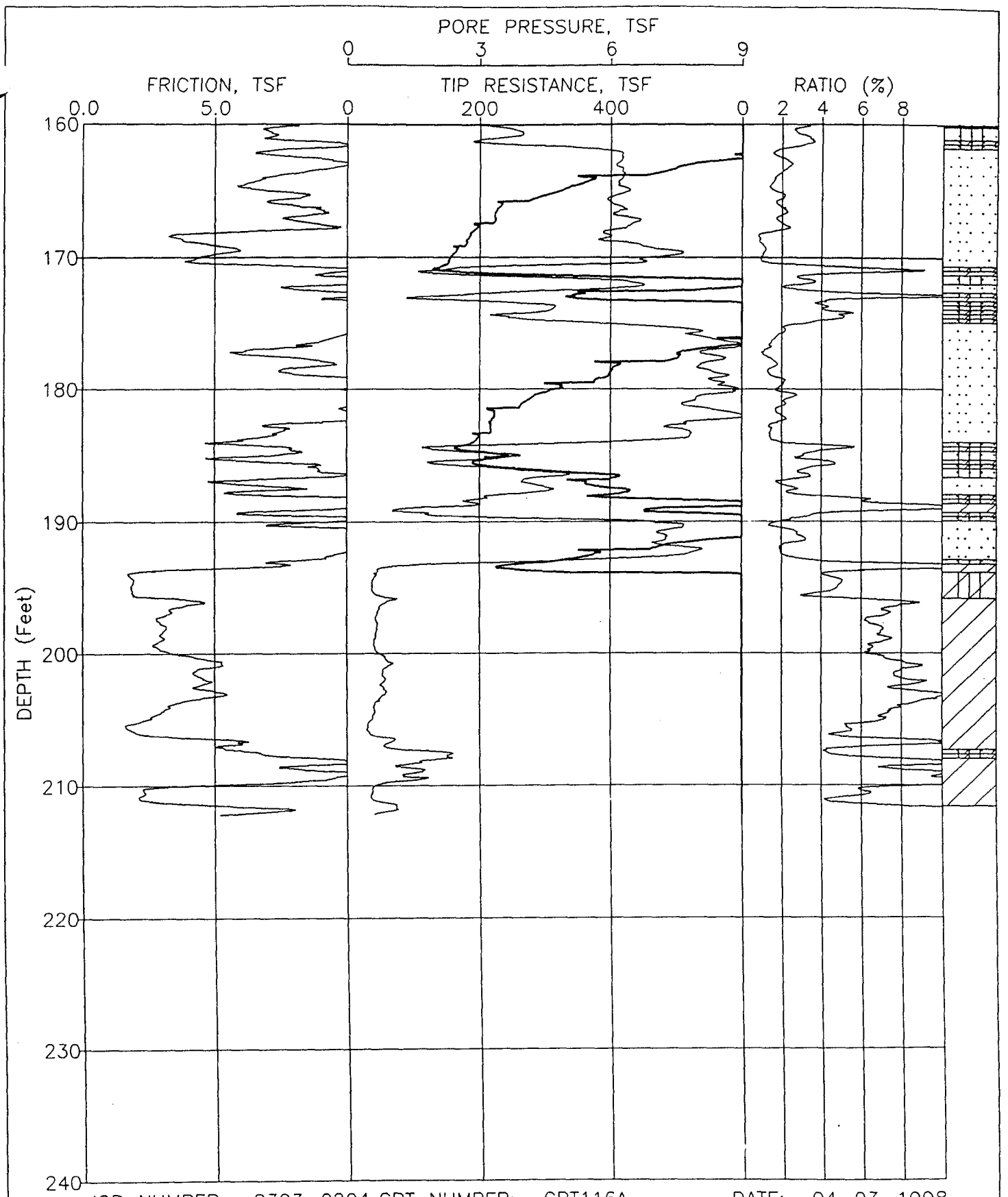
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 2 OF 3

FUGRO GEOSCIENCES,INC



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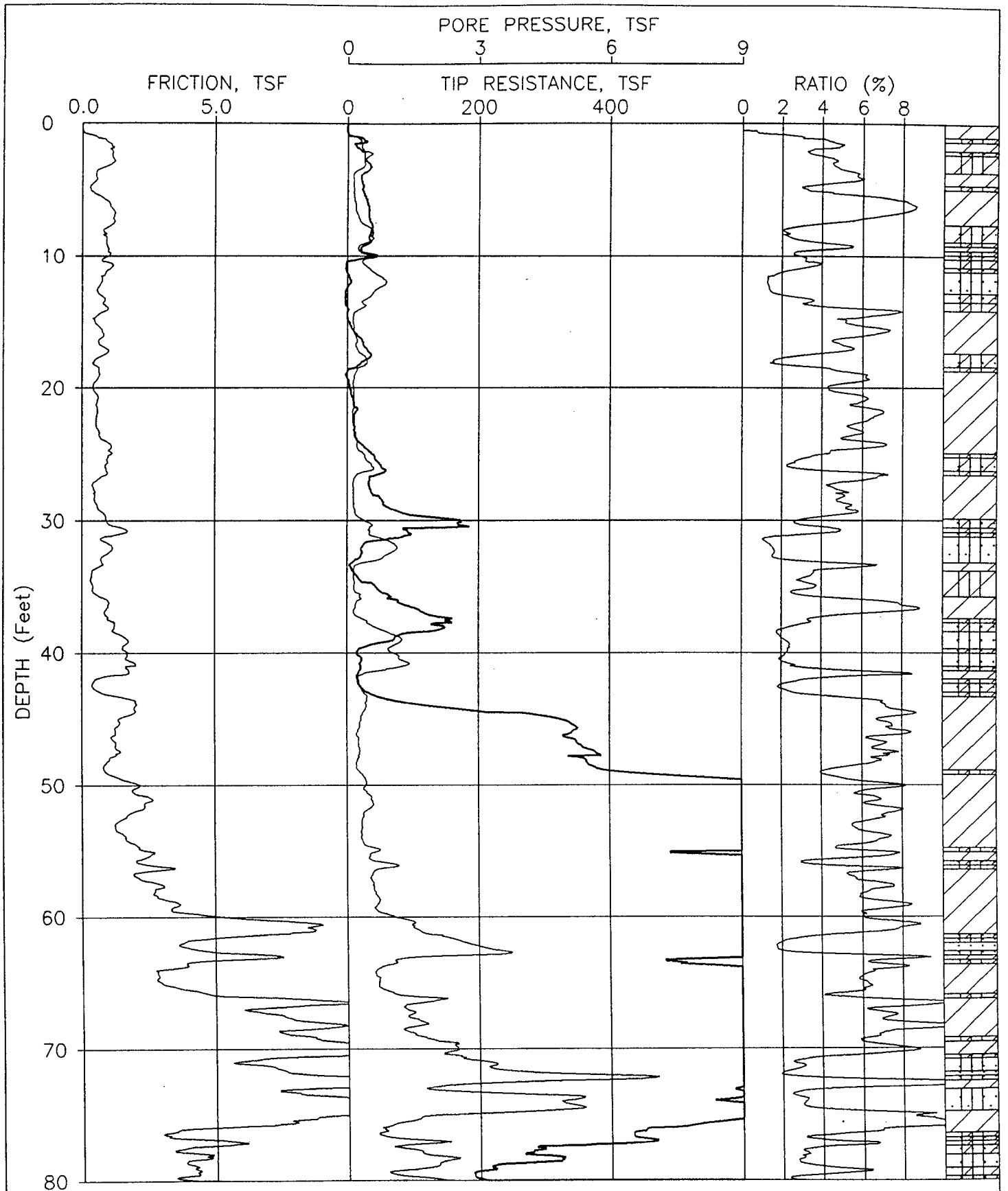
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 3 OF 3

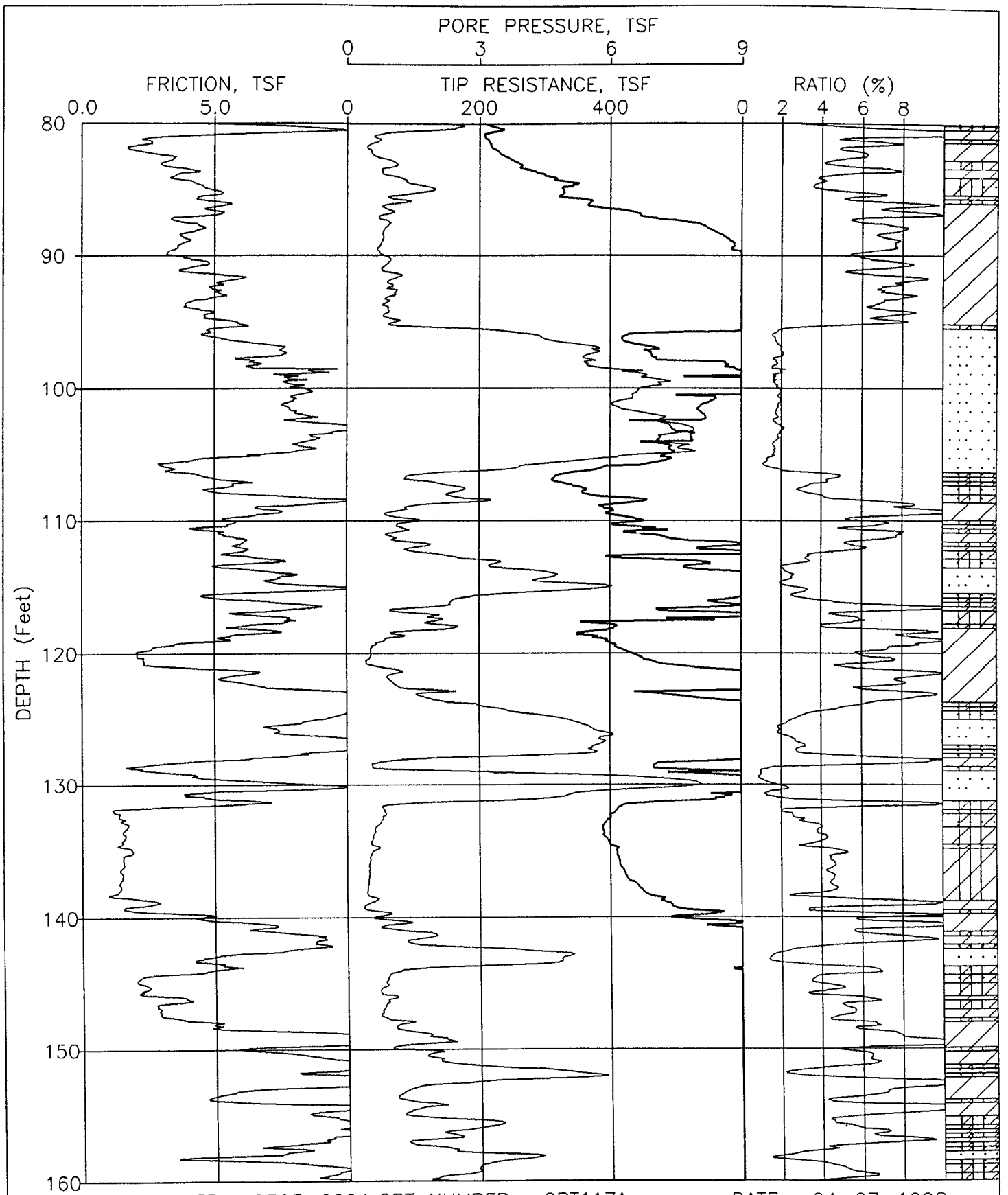
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT117A DATE: 04-07-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 1 OF 3

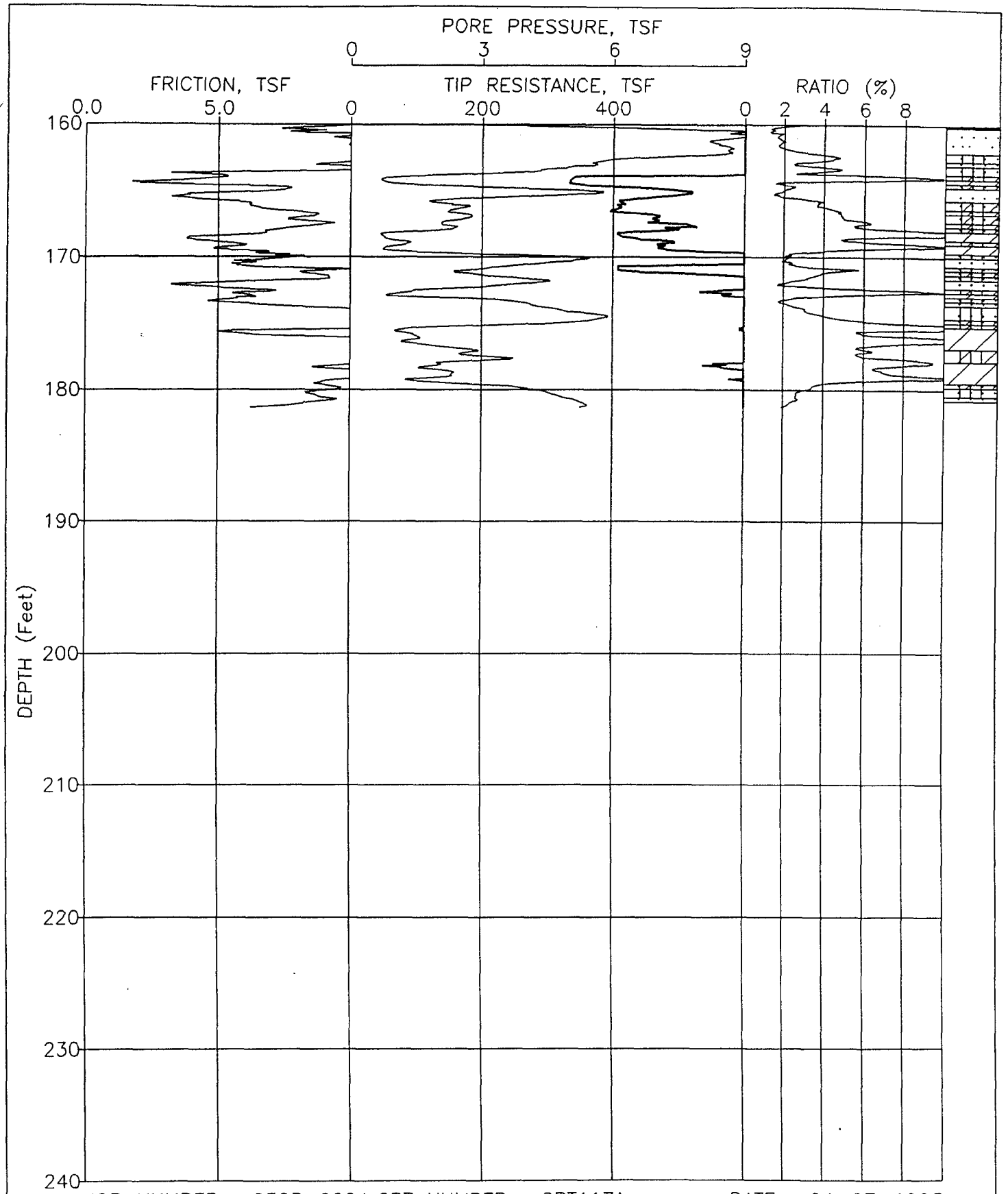
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT117A DATE: 04-07-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 2 OF 3

FUGRO GEOSCIENCES,INC



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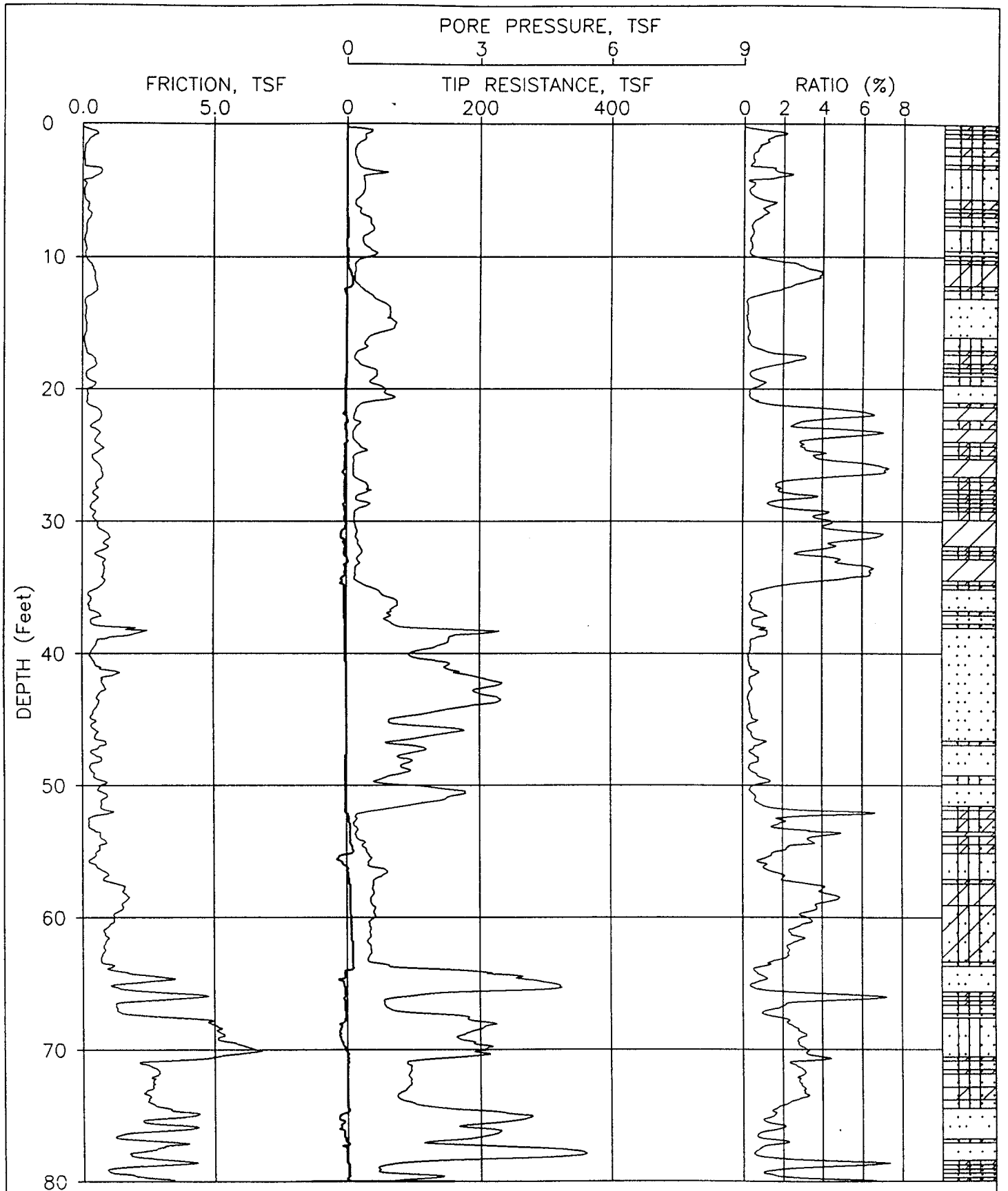
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW480 PLATE: 3 OF 3

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT105A DATE: 01-20-1998

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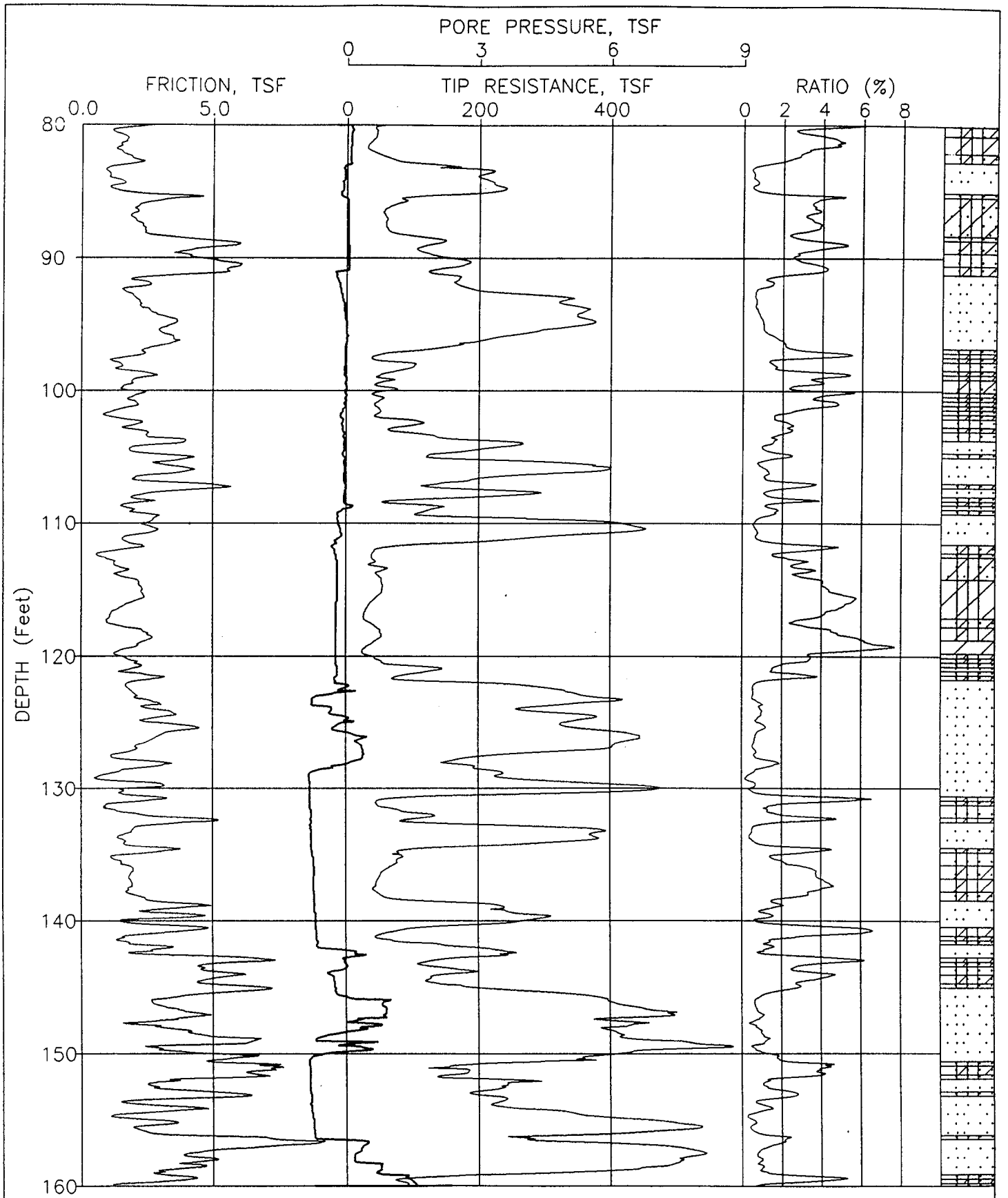
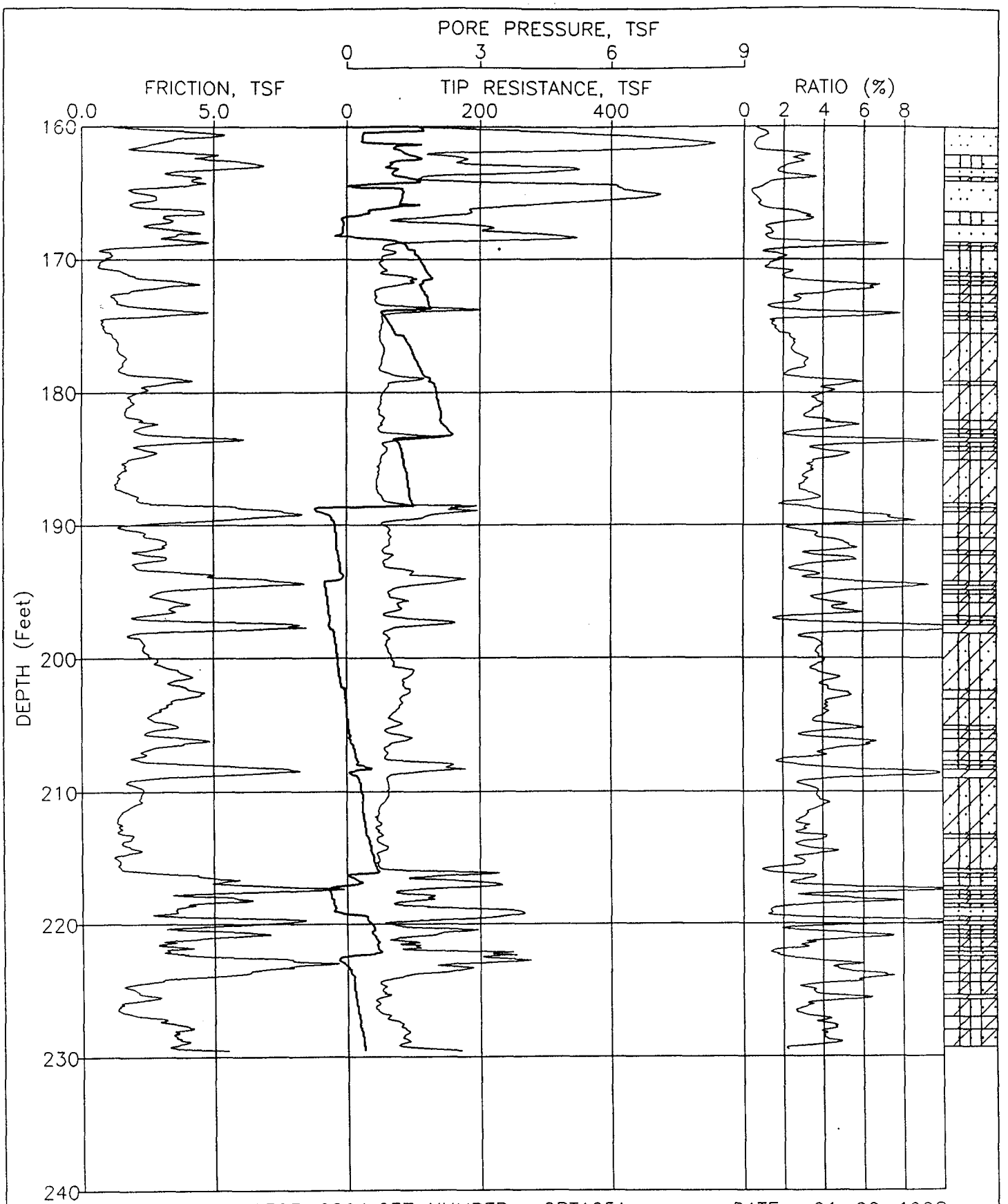
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT105A DATE: 01-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 2 OF 3

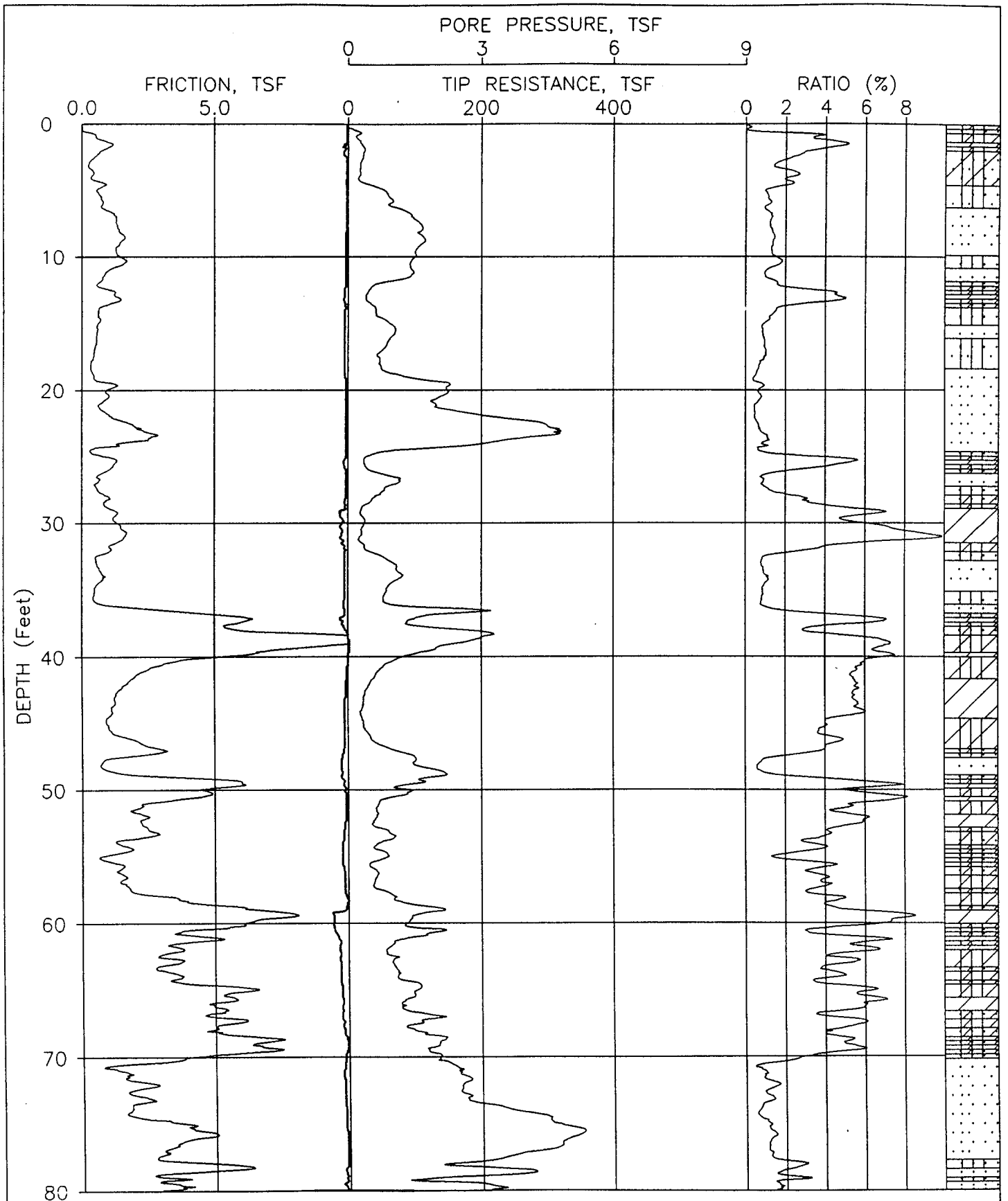
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT105A DATE: 01-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 3 OF 3

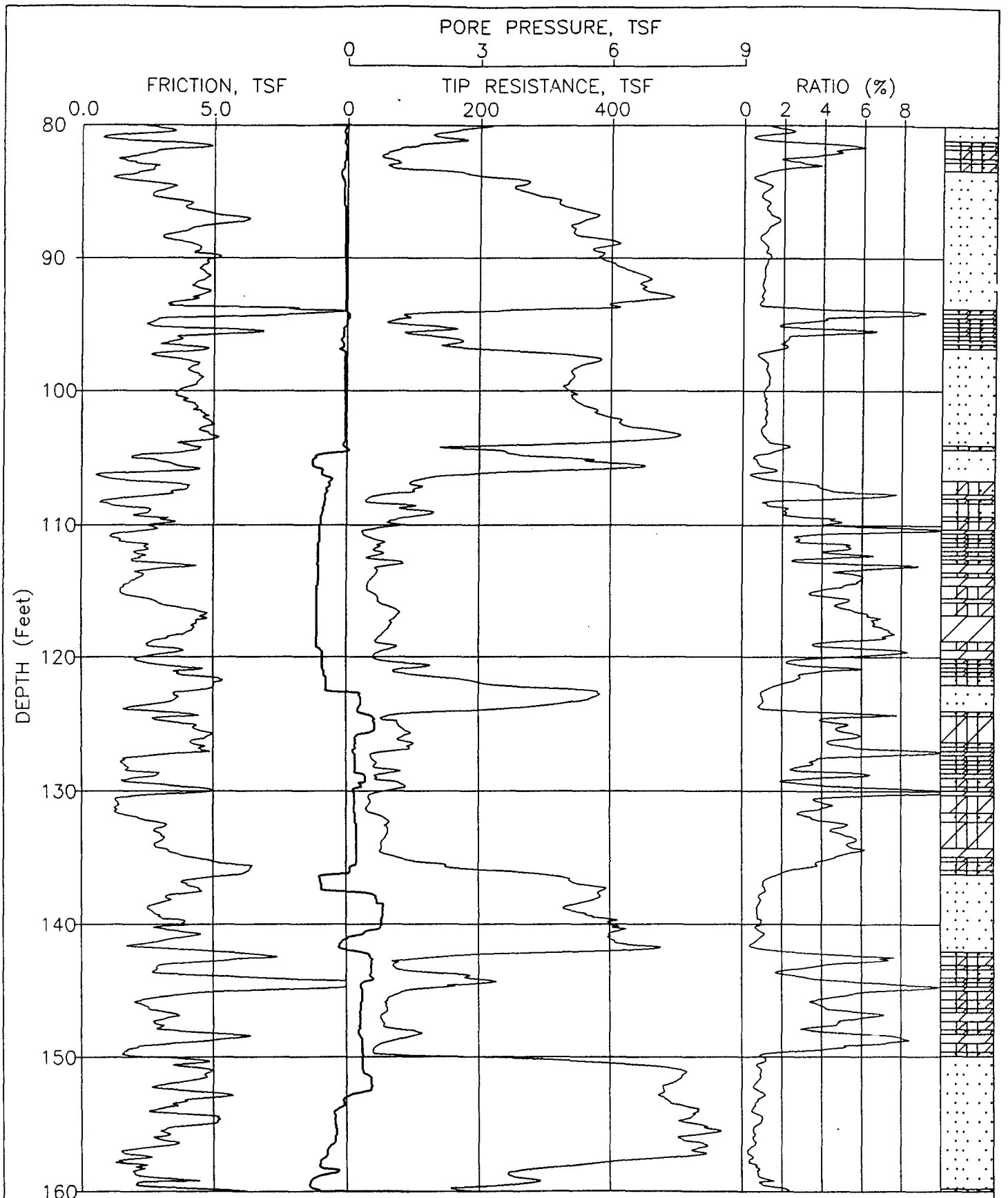
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT106A DATE: 01-26-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 1 OF 3

FUGRO GEOSCIENCES,INC



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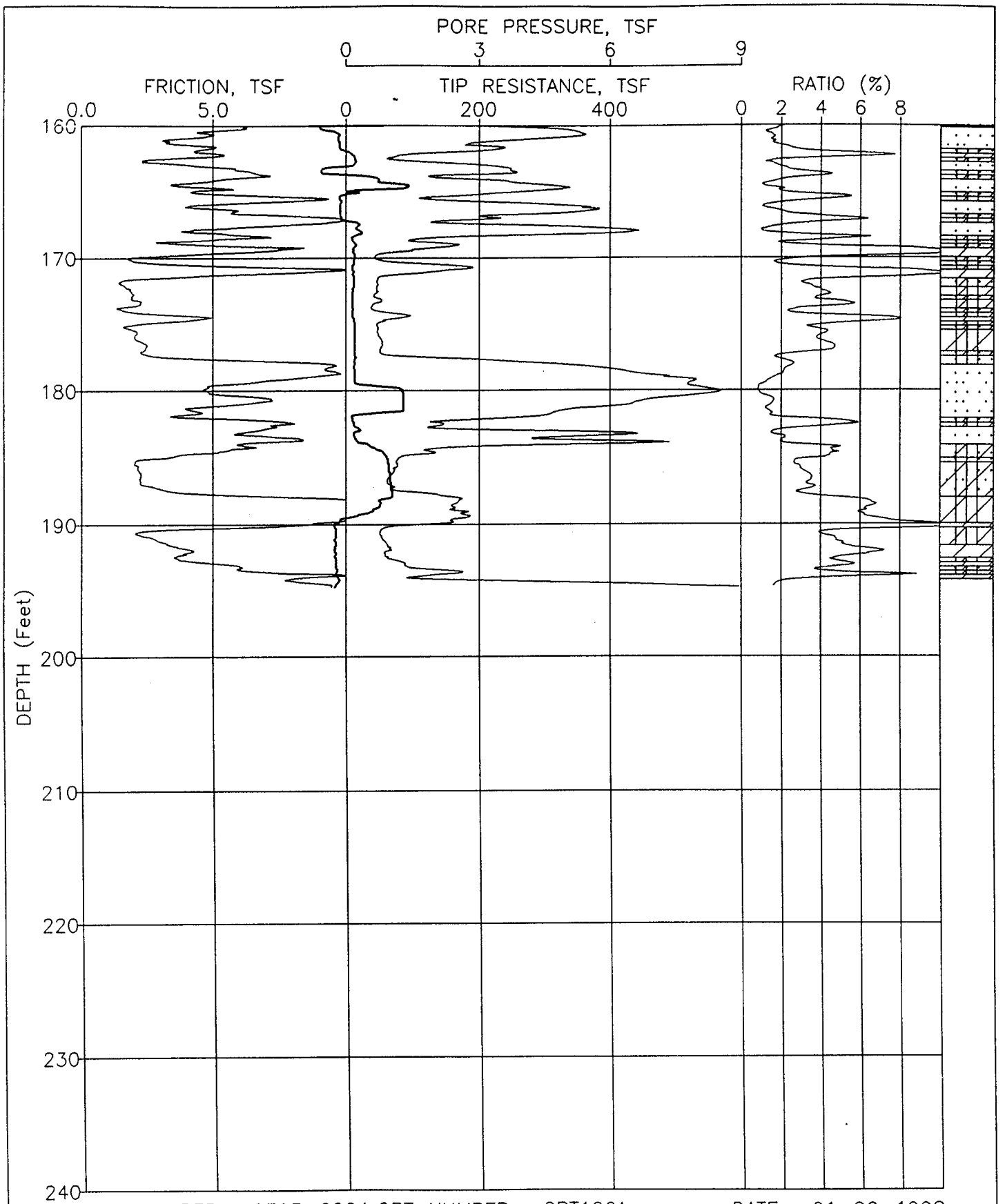
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 2 OF 3

FUGRO GEOSCIENCES,INC



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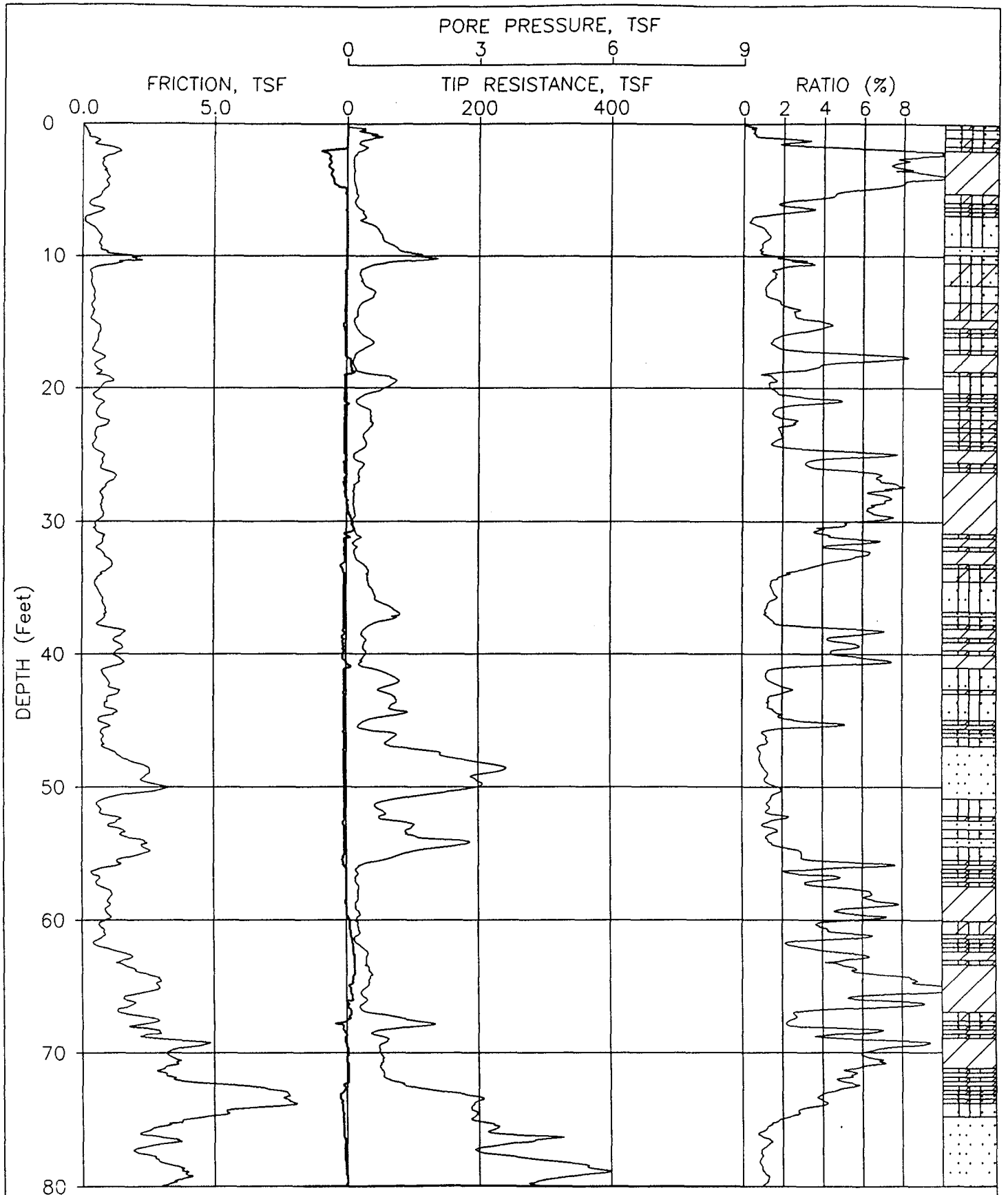
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 3 OF 3

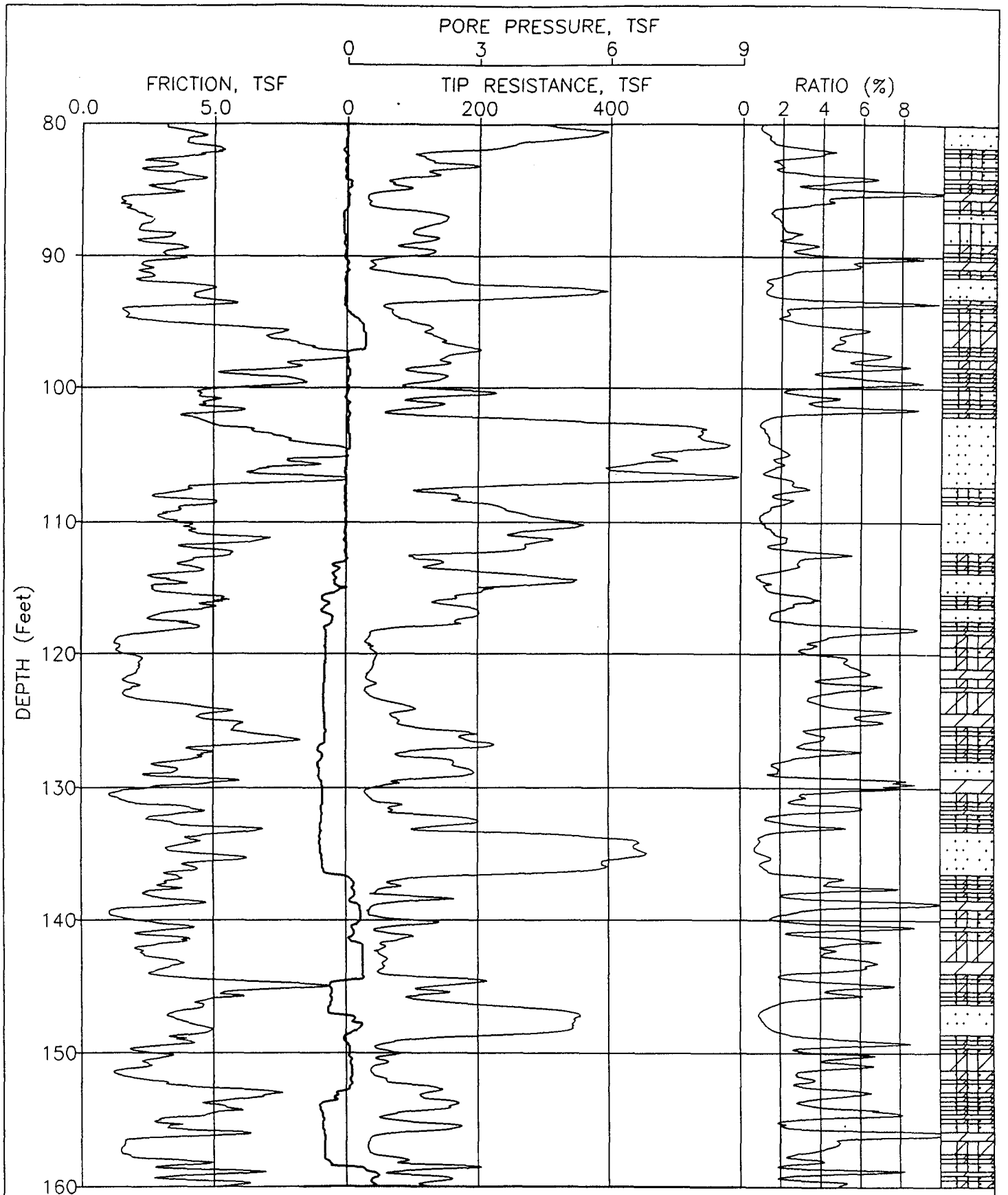
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT107A DATE: 01-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 1 OF 3

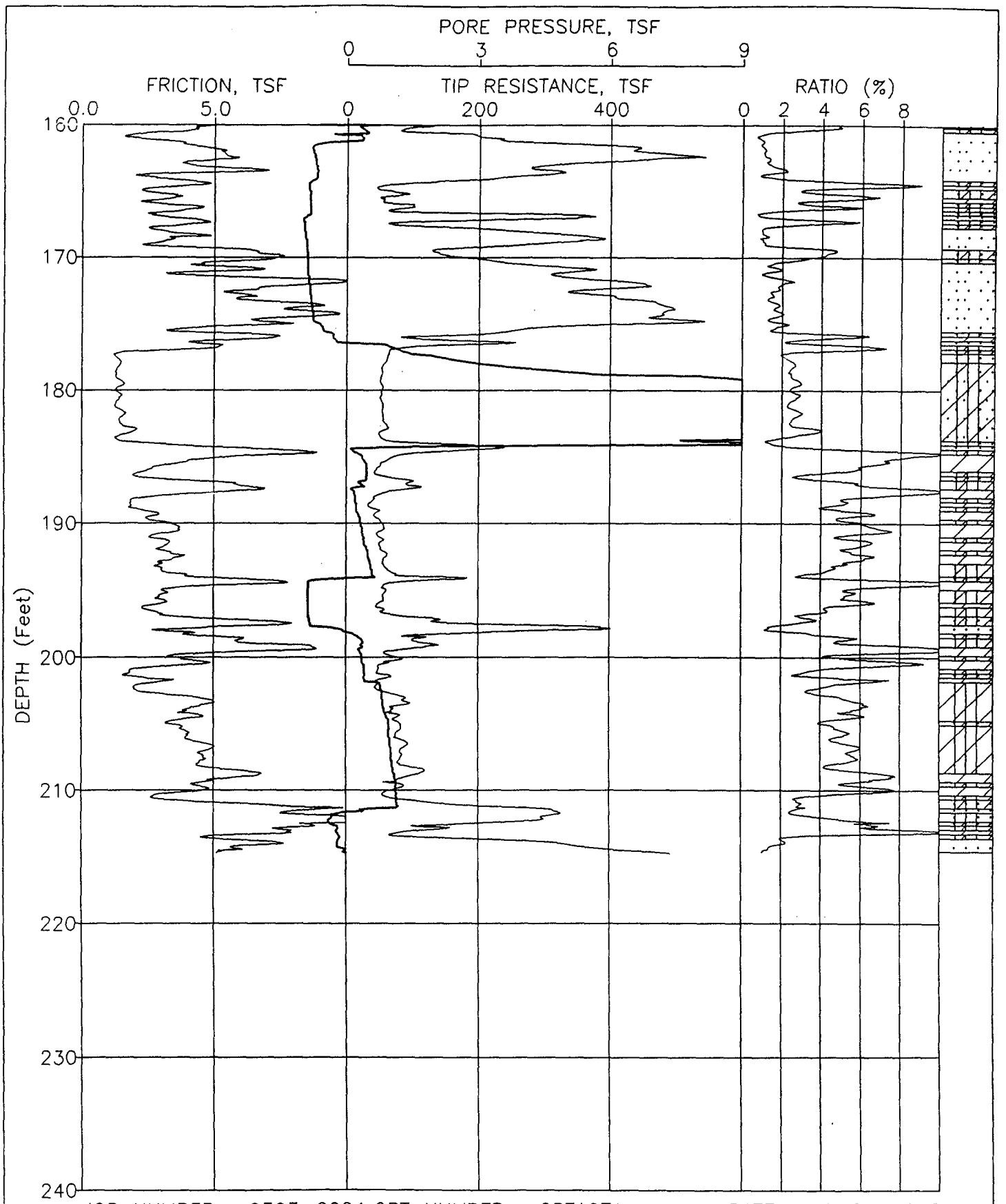
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT107A DATE: 01-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 2 OF 3

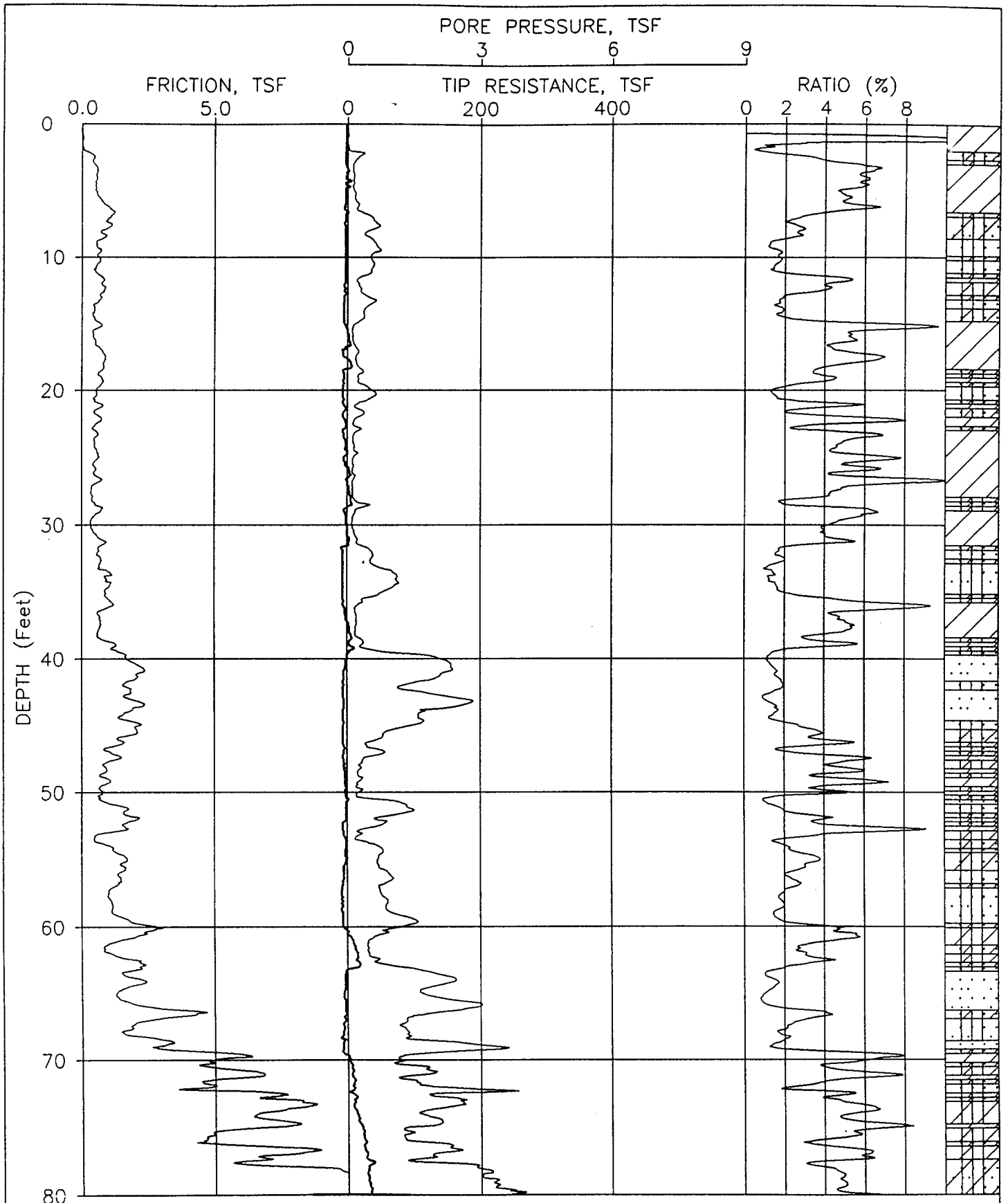
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT107A DATE: 01-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 3 OF 3

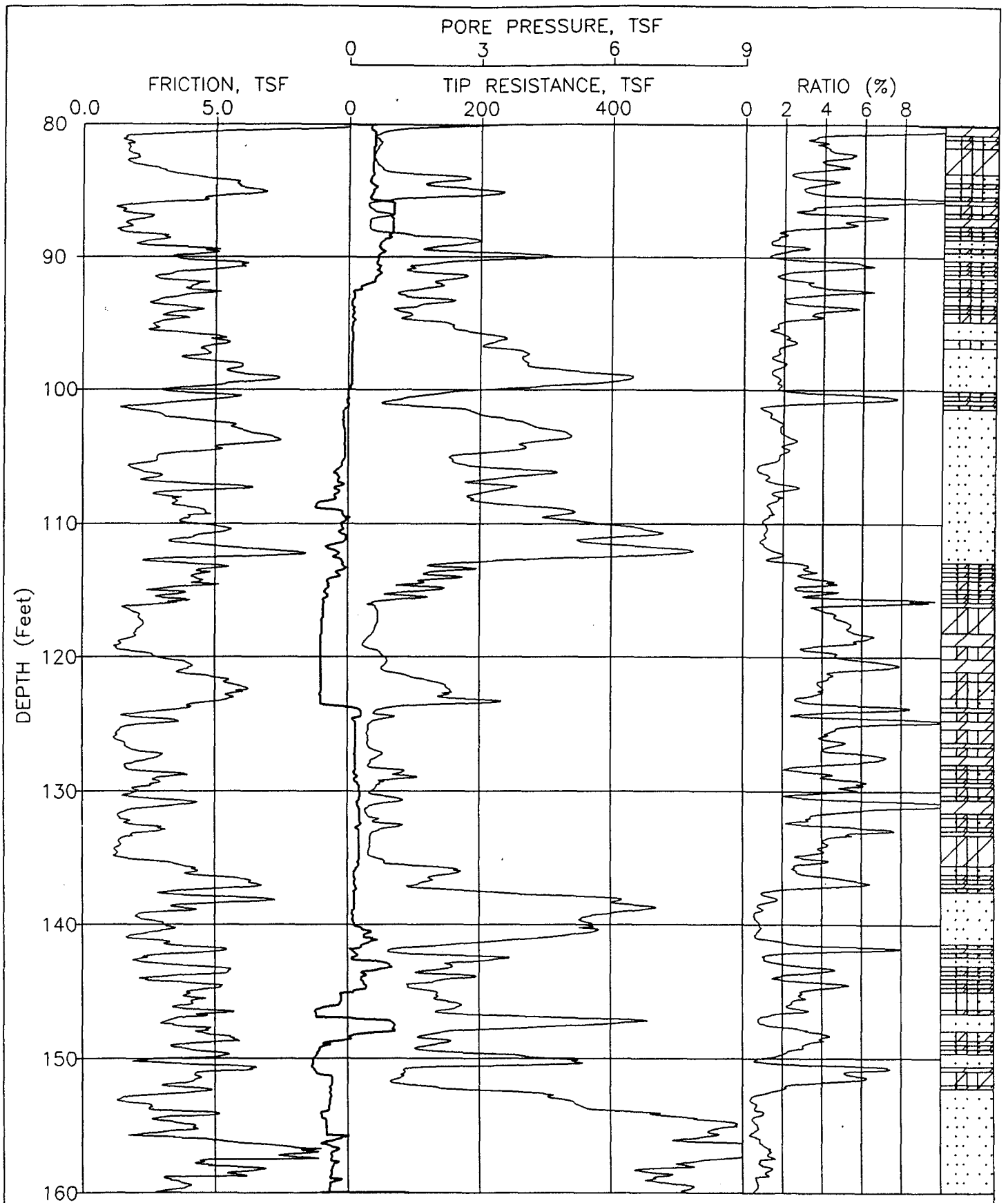
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT108A DATE: 02-02-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 4 OF 3

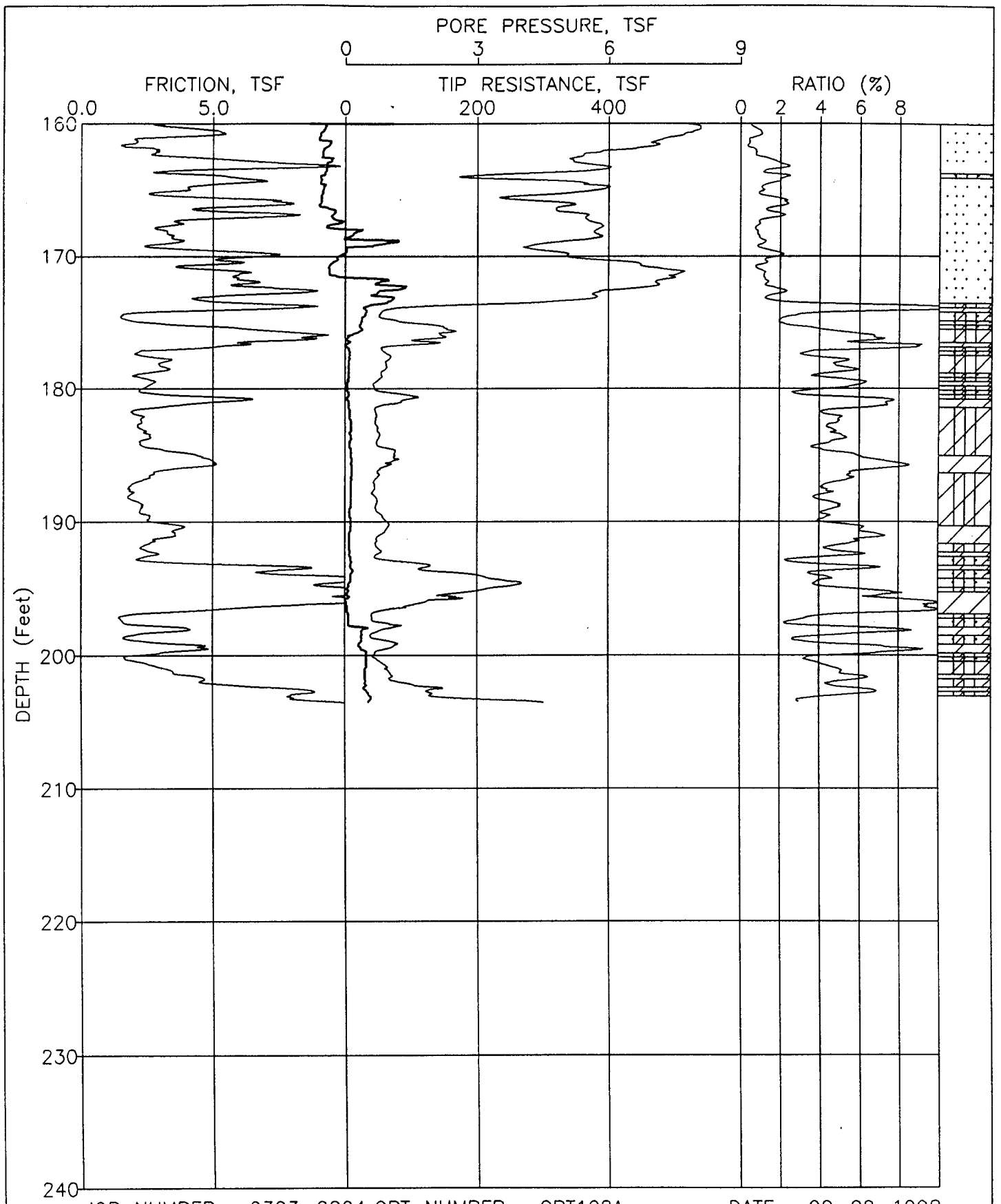
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT108A DATE: 02-02-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 2 OF 3

FUGRO GEOSCIENCES,INC



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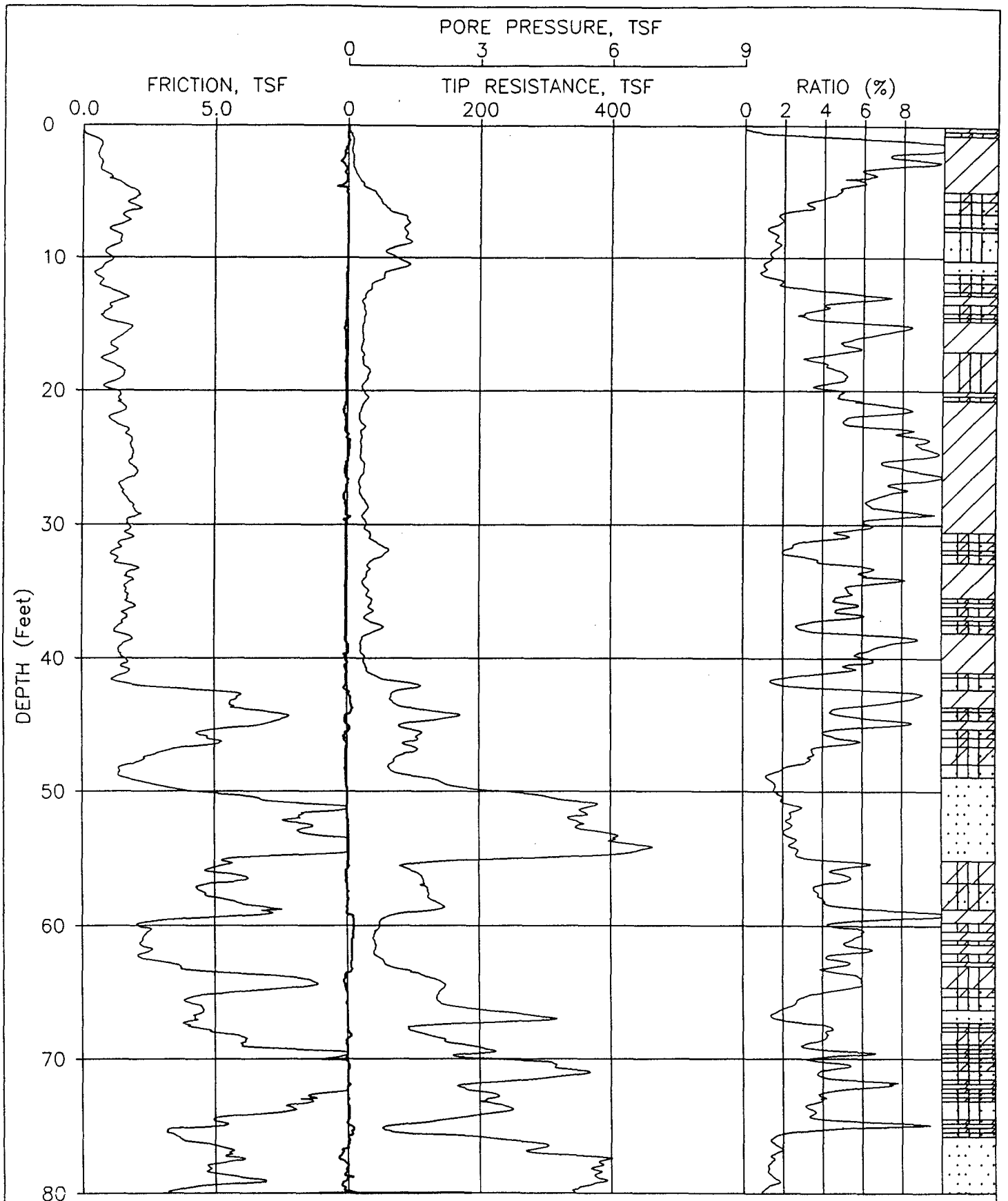
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 3 OF 3

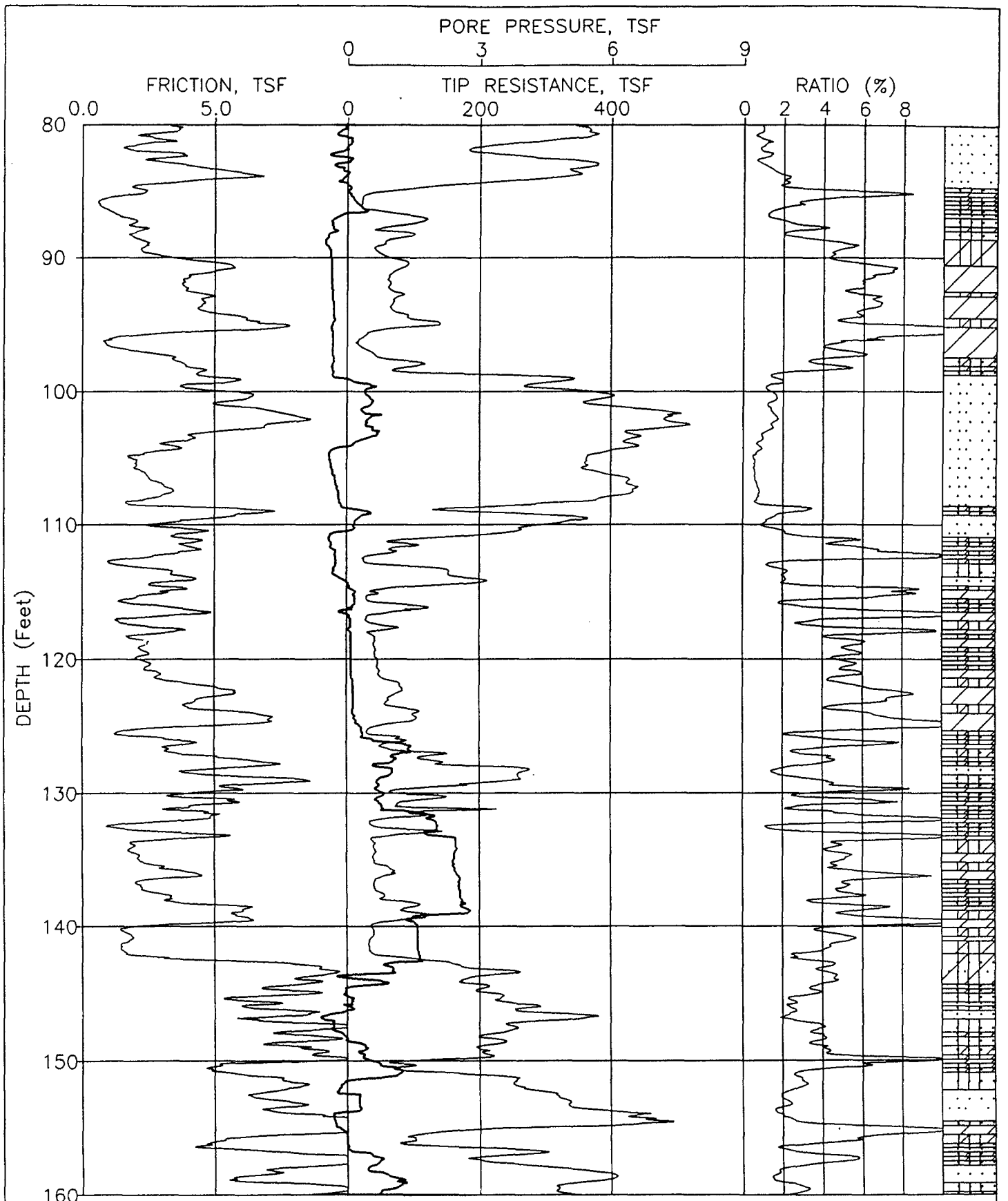
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT109A DATE: 02-04-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 1 OF 3

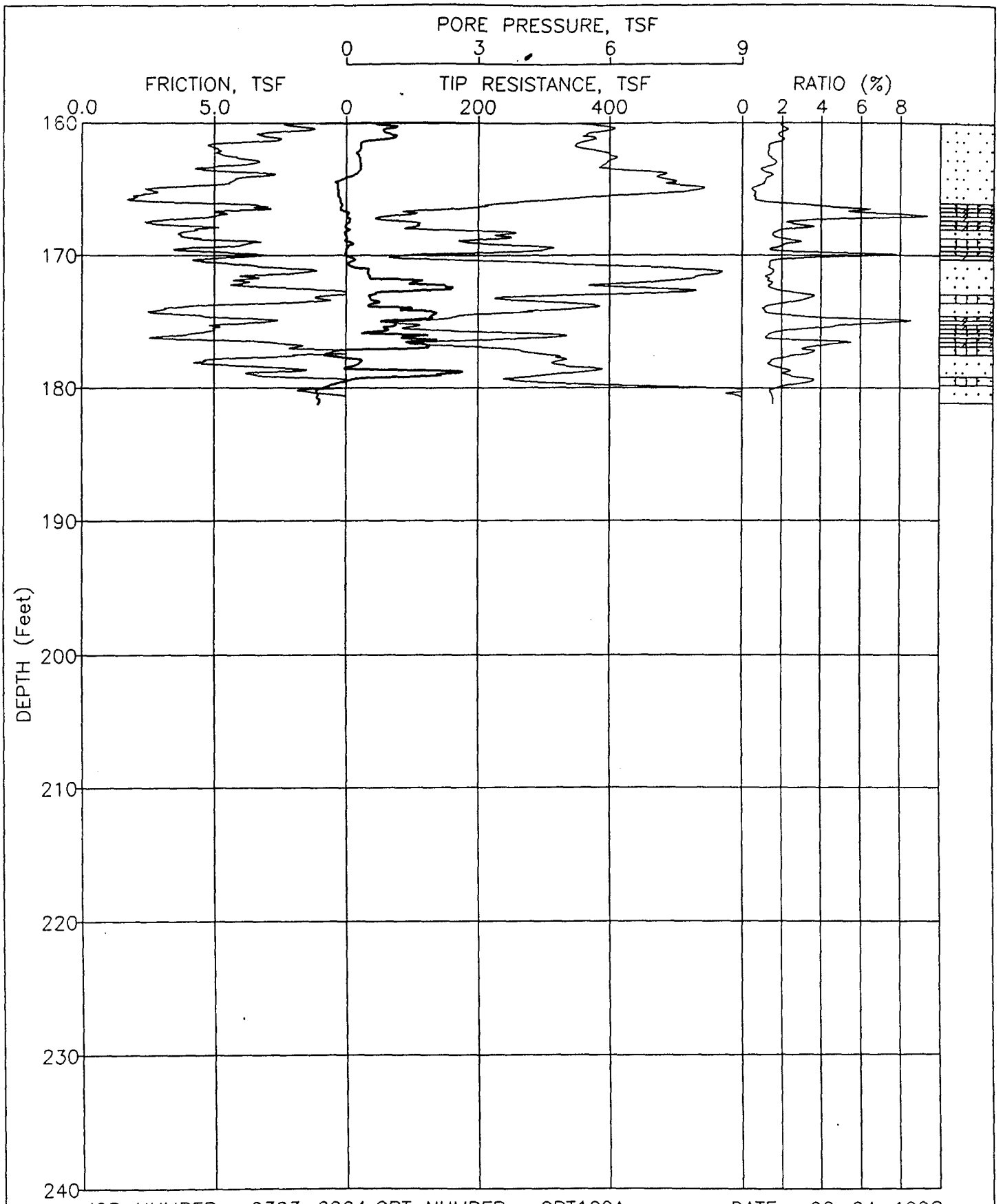
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT109A DATE: 02-04-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 2 OF 3

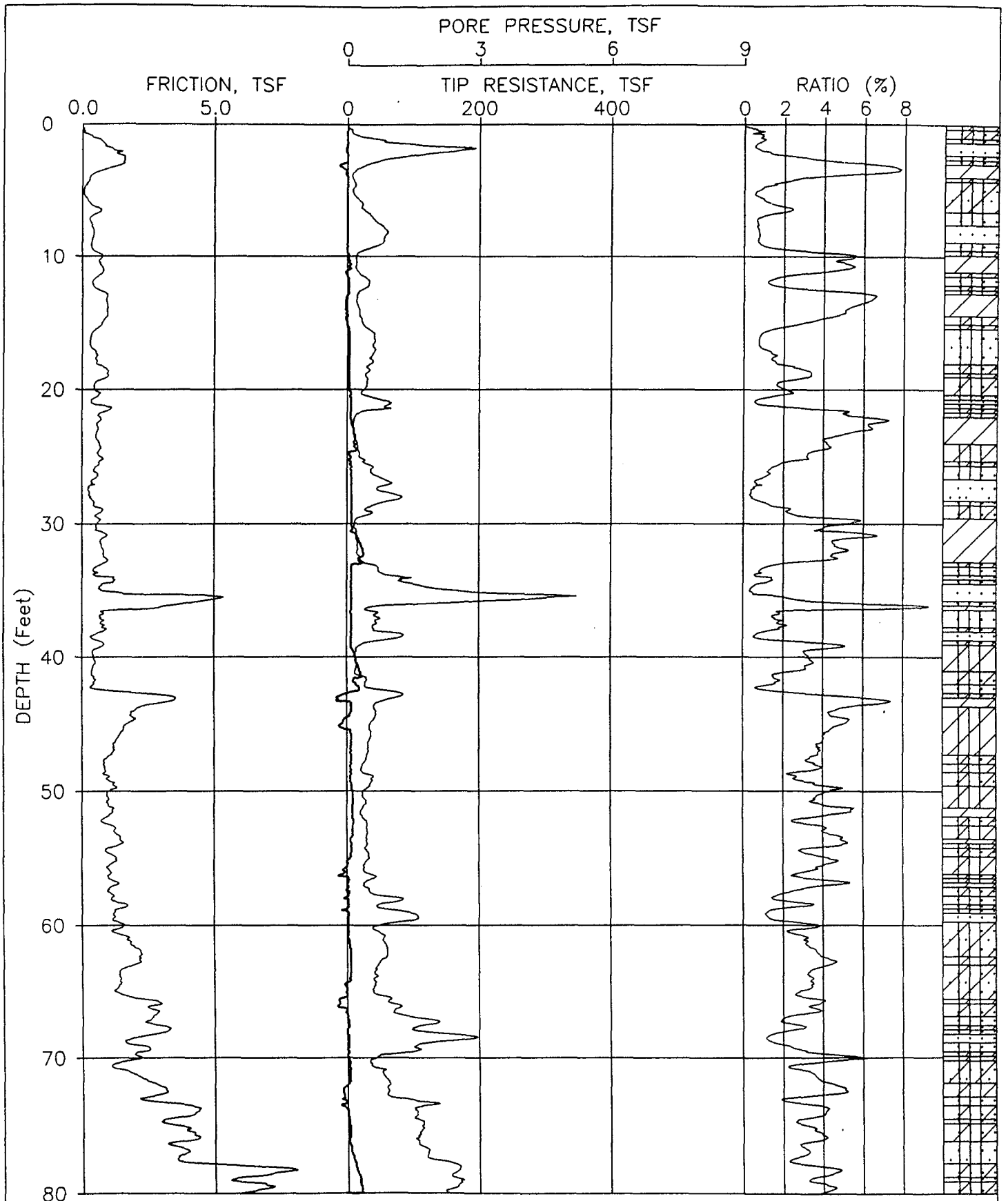
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT109A DATE: 02-04-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW871 PLATE: 3 OF 3

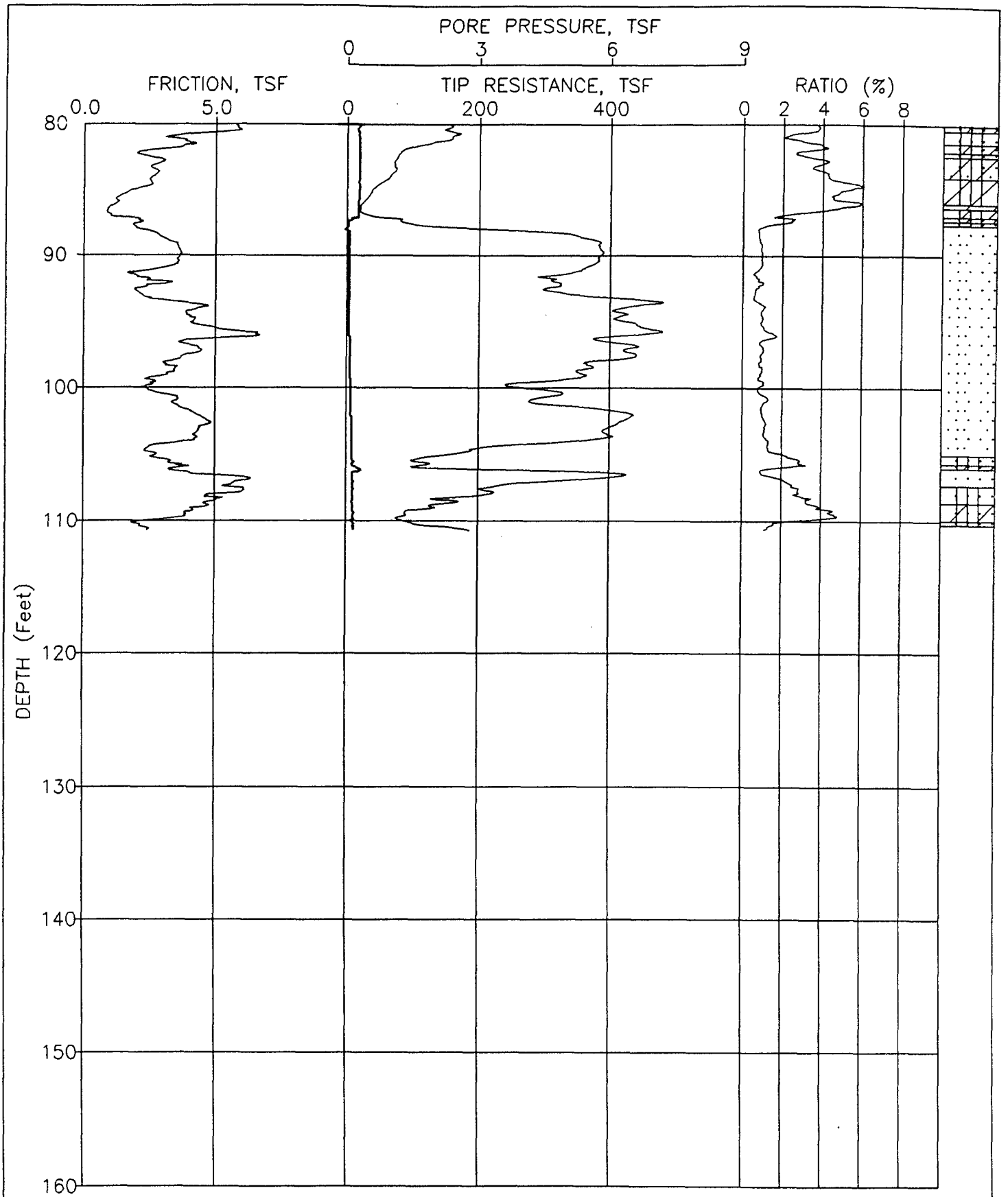
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110A DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 1 OF 2

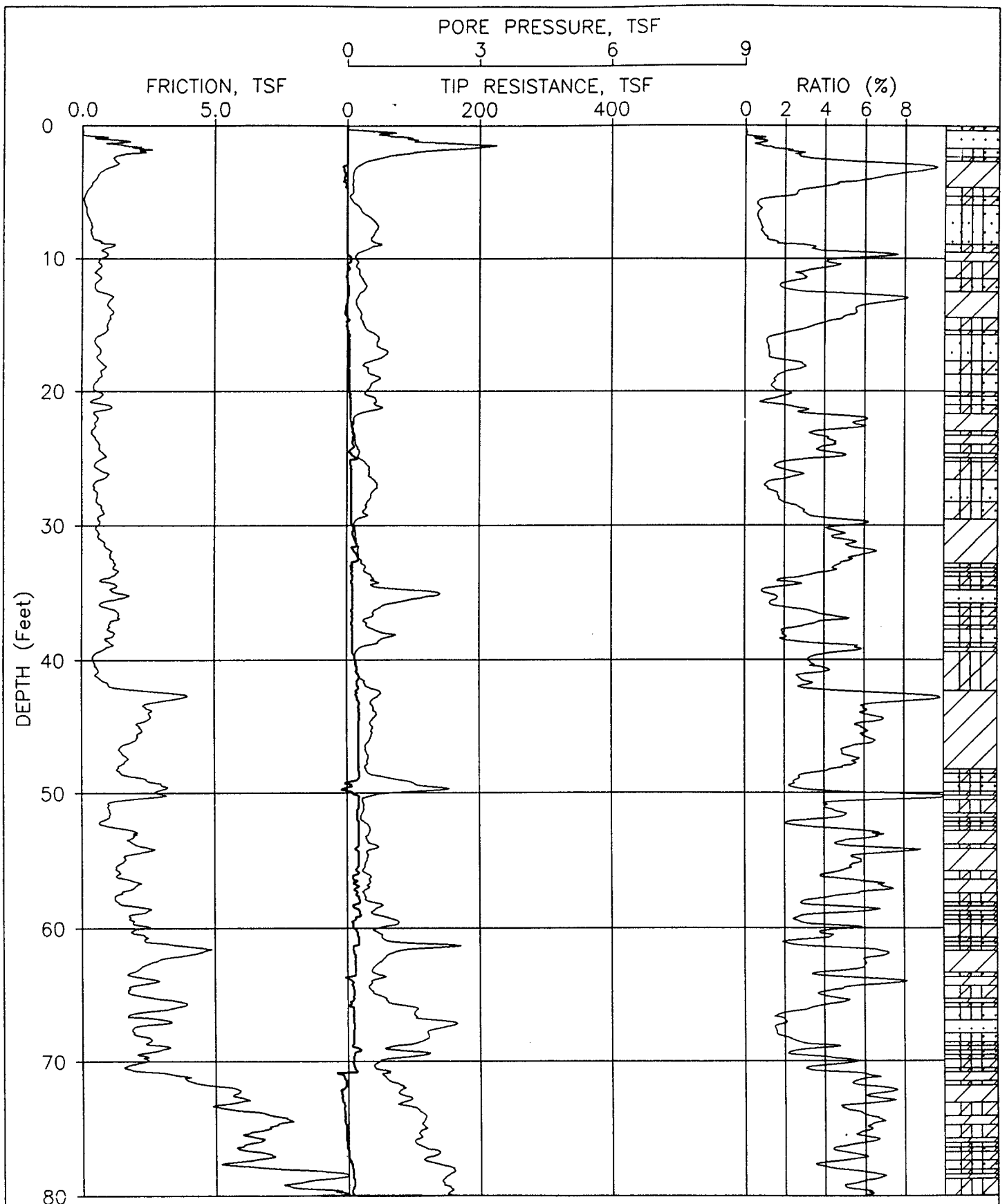
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110A DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 2 OF 2

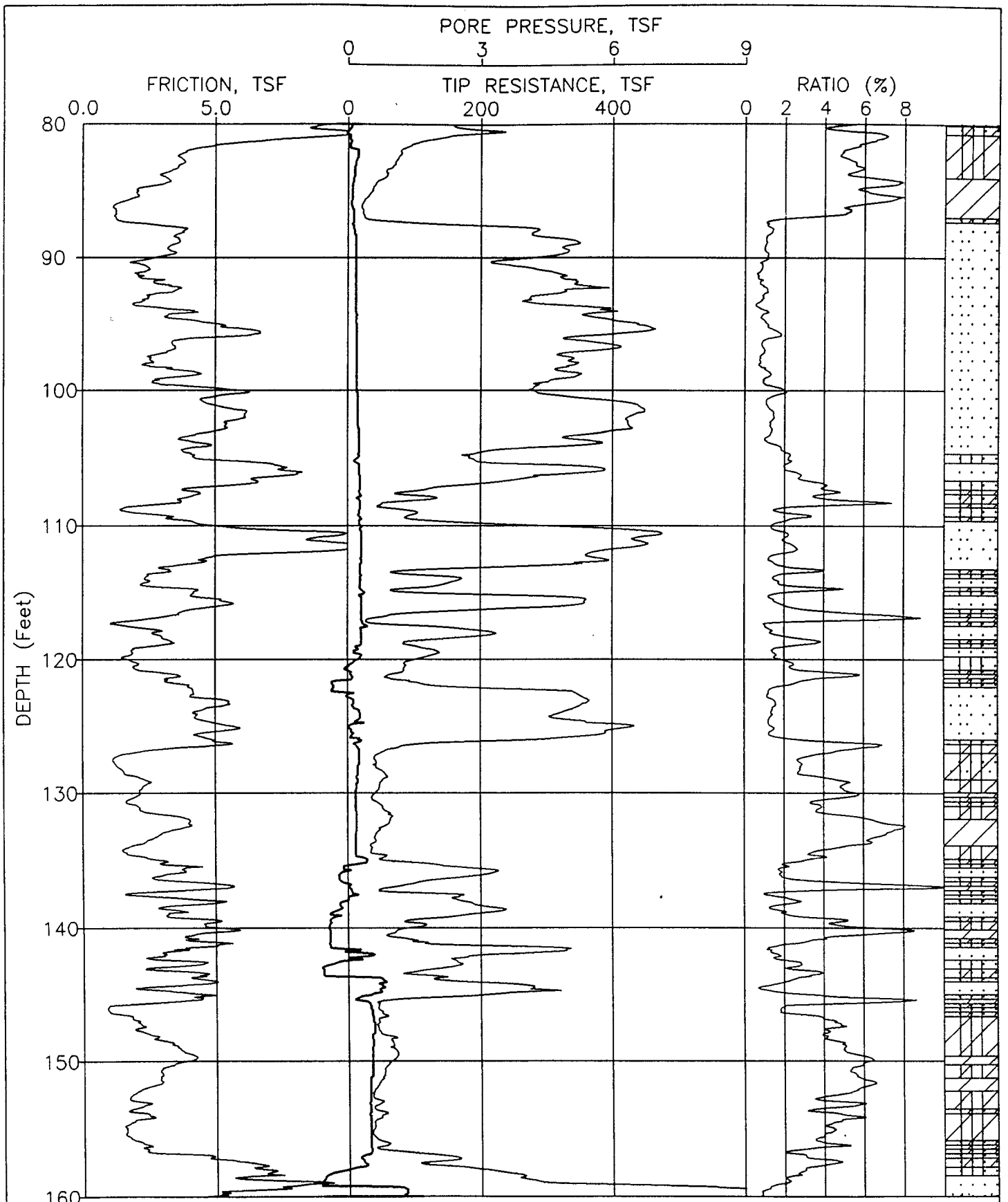
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110B DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 1 OF 3

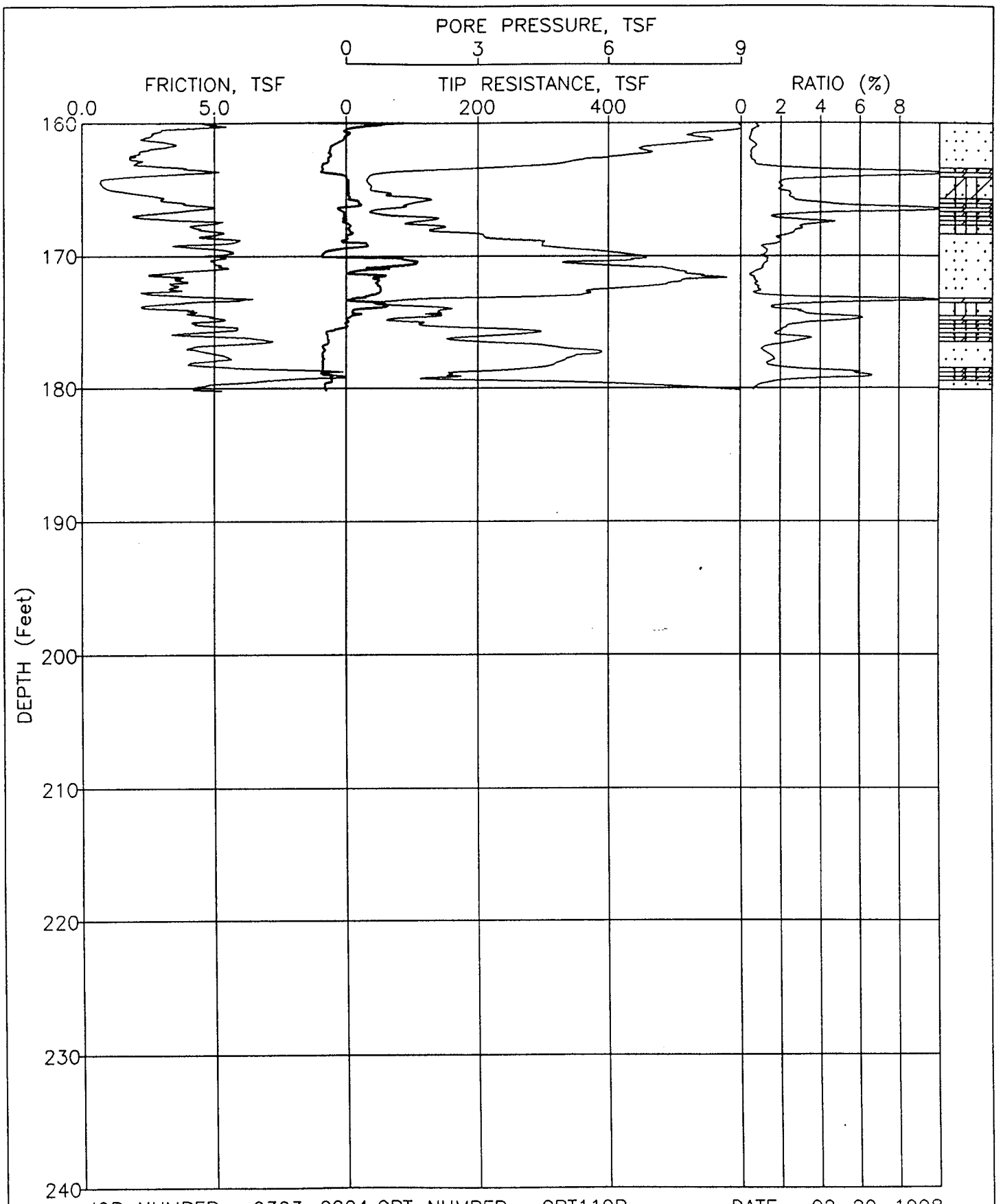
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110B DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 2 OF 3

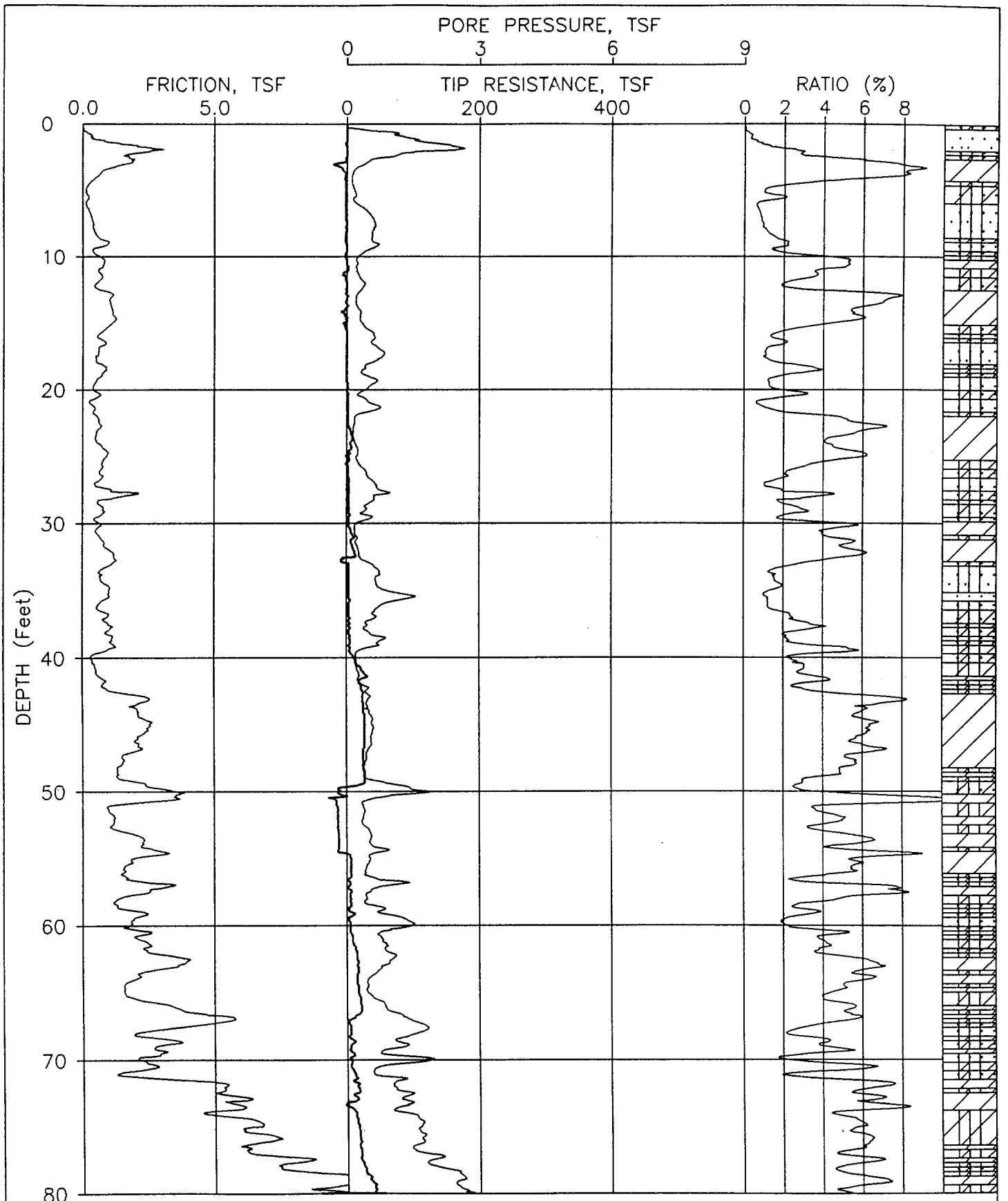
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110B DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 3 OF 3

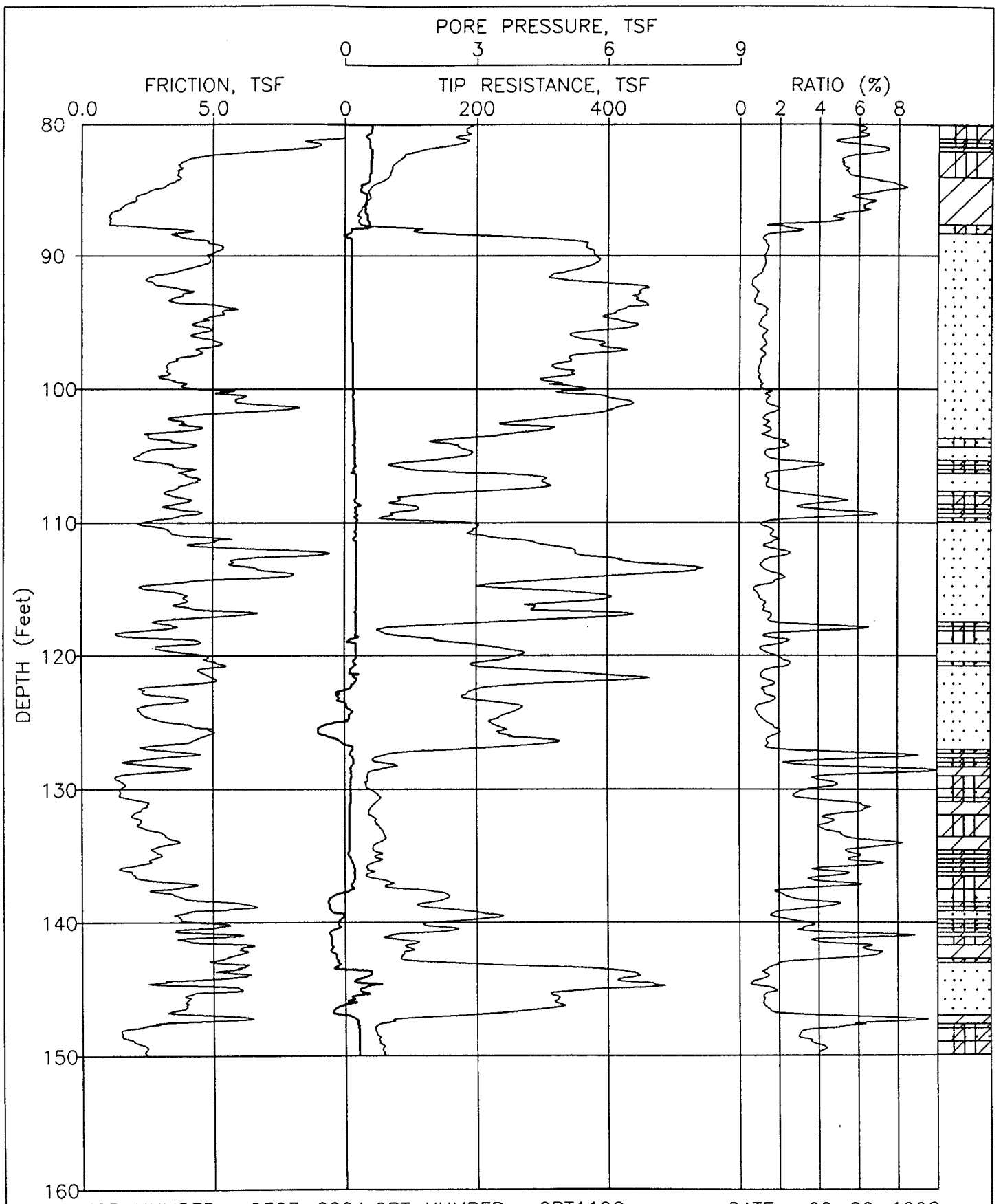
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110C DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 1 OF 2

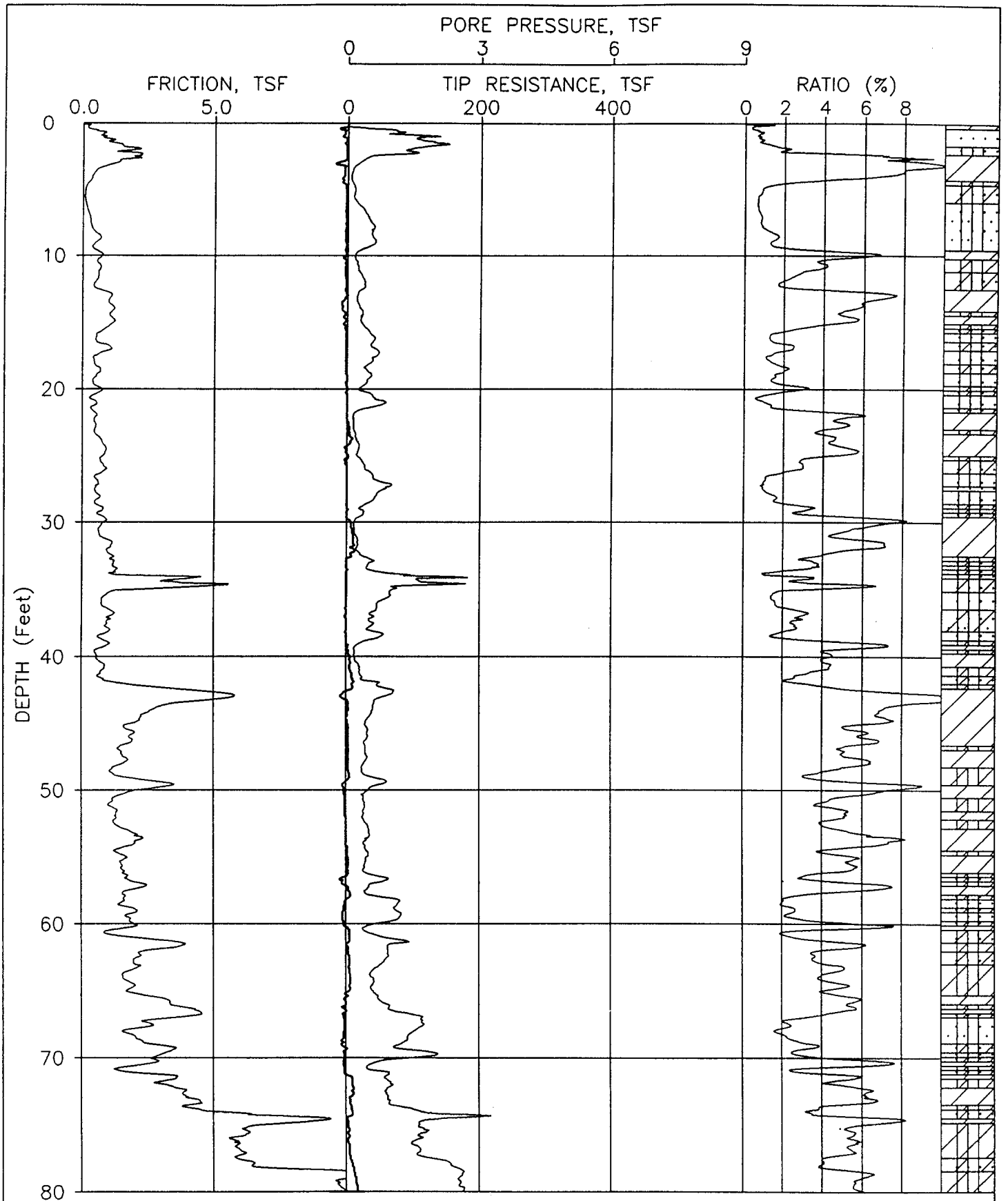
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110C DATE: 02-20-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 2 OF 2

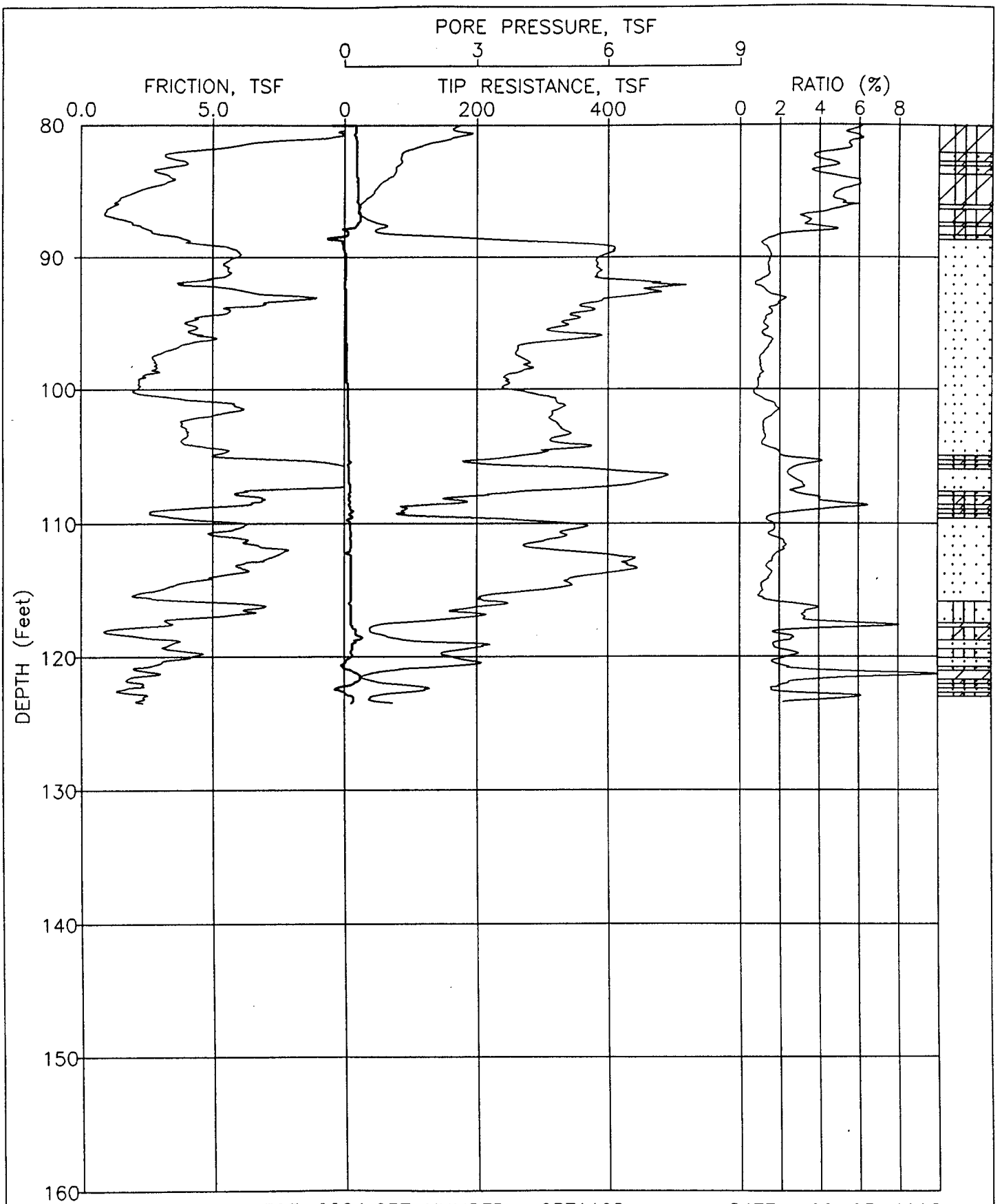
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT110D DATE: 02-23-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



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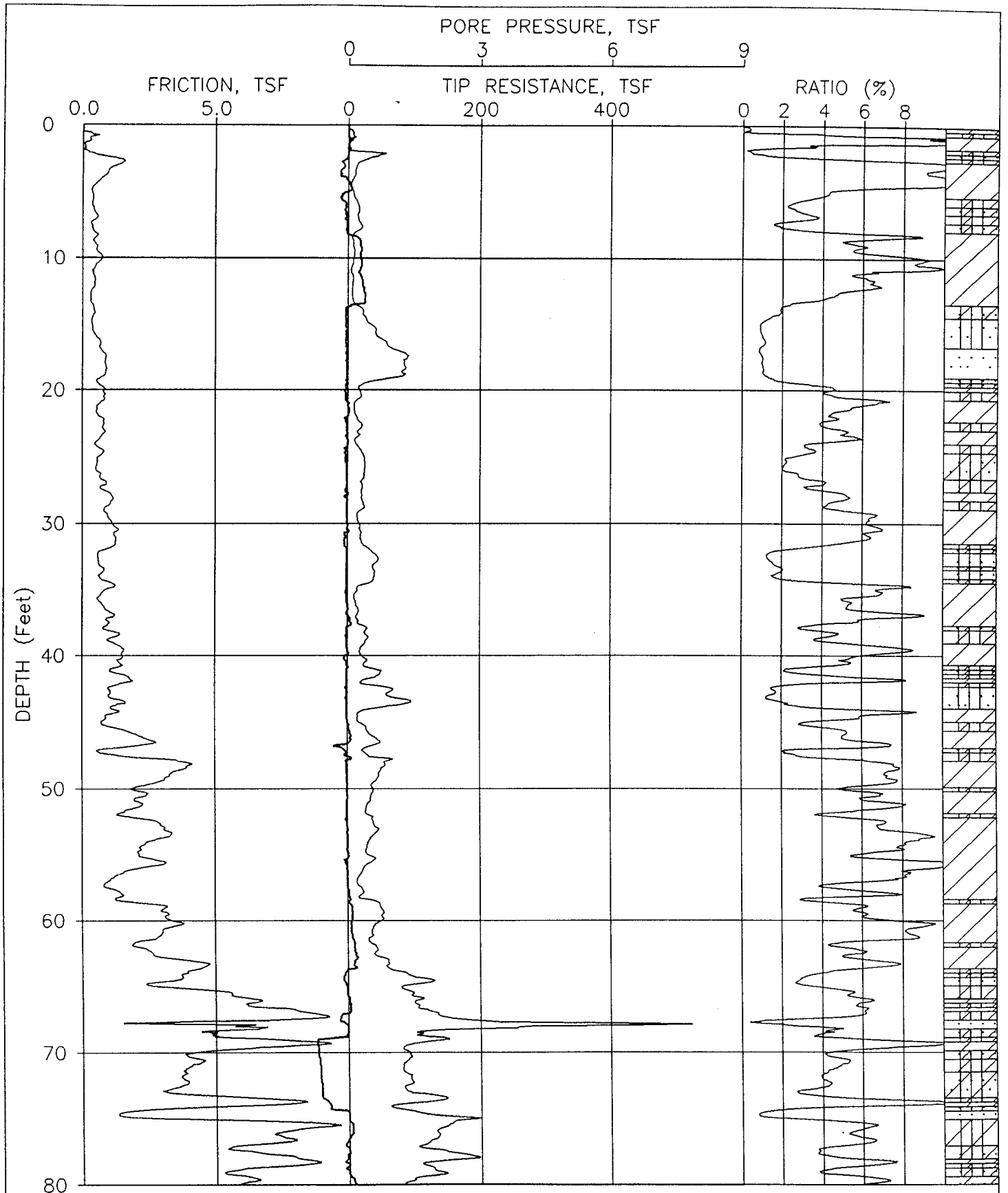
ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 2 OF 2

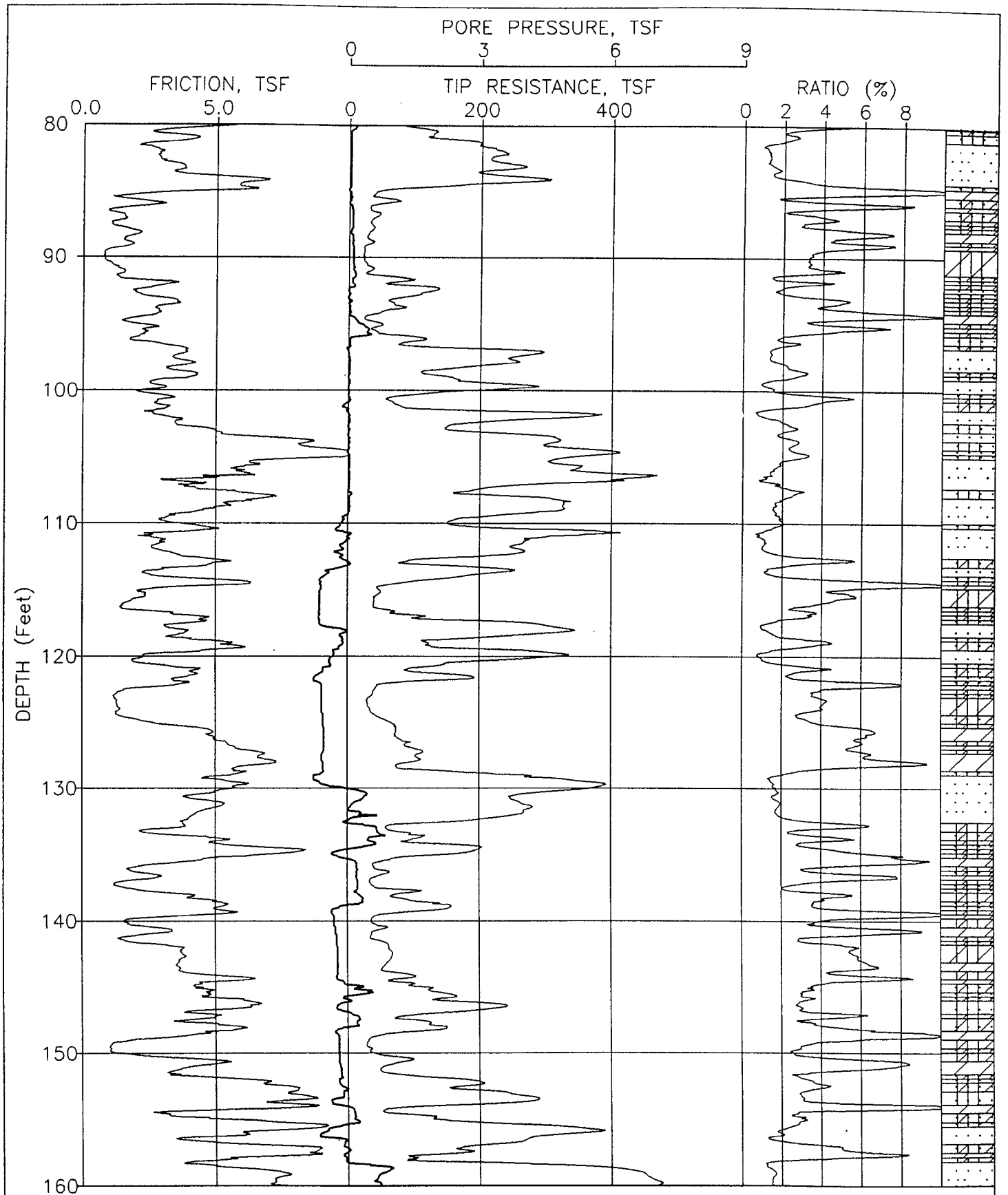
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT111A DATE: 02-25-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 1 OF 3

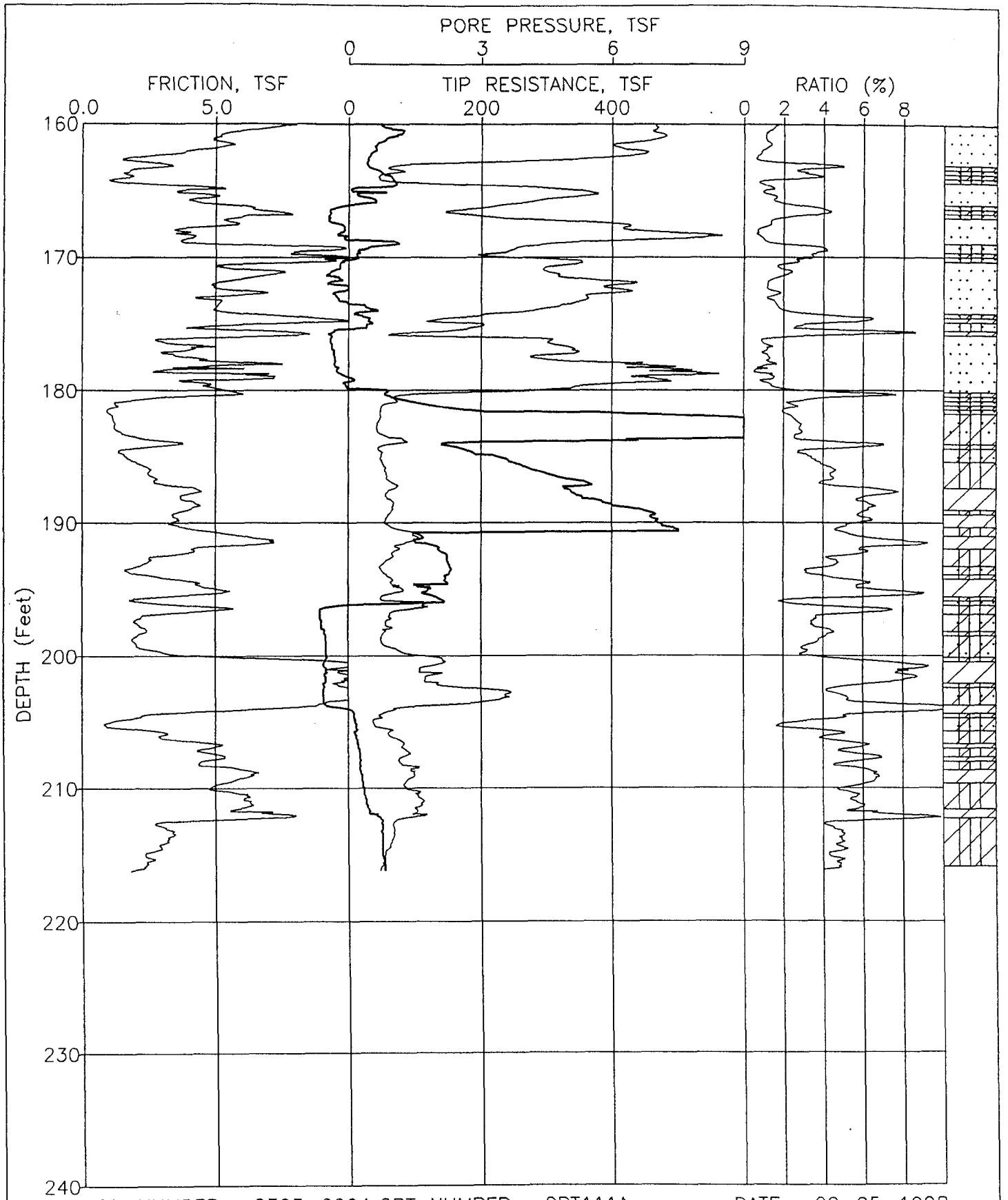
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT111A DATE: 02-25-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 2 OF 3

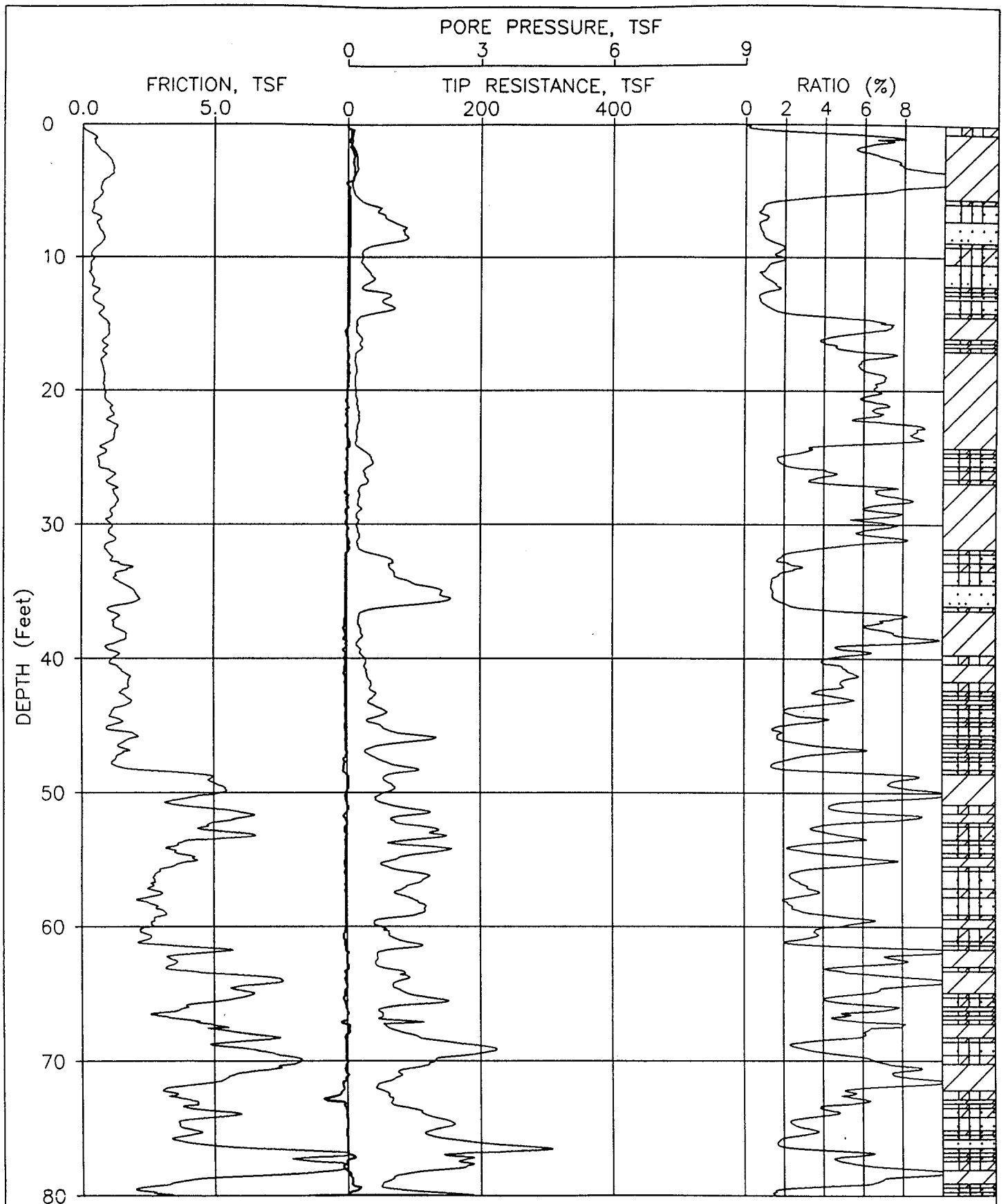
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT111A DATE: 02-25-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 3 OF 3

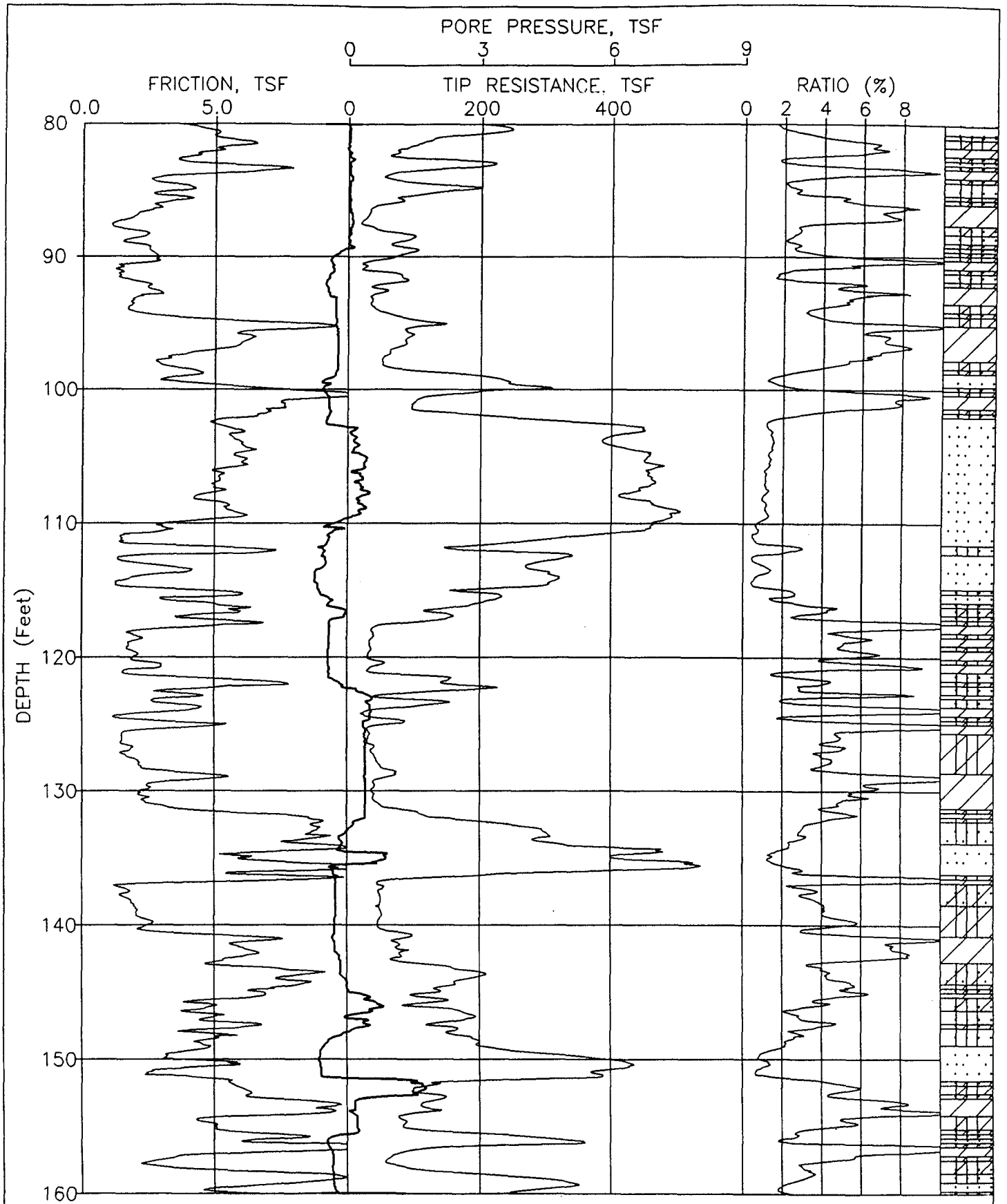
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT112A DATE: 03-02-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 1 OF 3

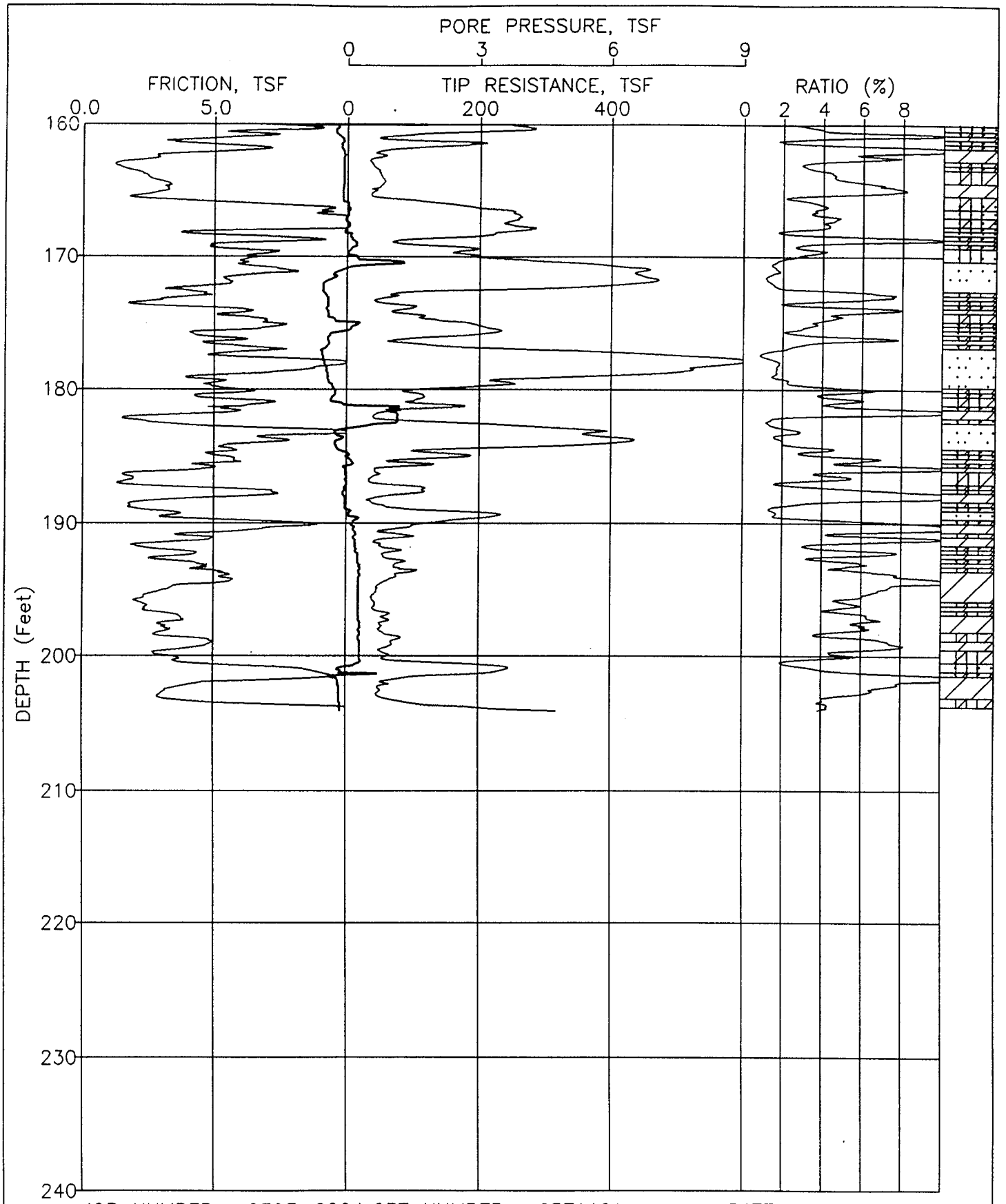
FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT112A DATE: 03-02-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 2 OF 3

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0303-0204 CPT NUMBER: CPT112A DATE: 03-02-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEW949 PLATE: 3 OF 3

FUGRO GEOSCIENCES,INC