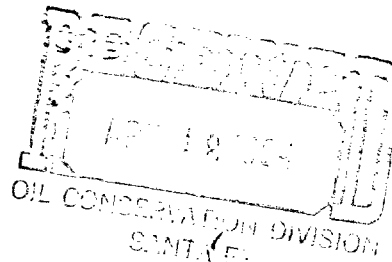


ARCO Oil and Gas Company
Rocky Mountain District
707 17th Street
Mailing address: P.O. Box 5540
Denver, Colorado 80217
Telephone 303 575 7000



M.S.

April 11, 1984

Mr. Joe D. Ramey
State of New Mexico
Energy and Minerals Department
Oil Conservation Division
Box 2088
Santa Fe, New Mexico 87501

See for hearing
amendment to R-7395
Page 8255

Dear Mr. Ramey:

ARCO Oil and Gas Company, operator of the Horseshoe Gallup Unit in San Juan County, is requesting a revision to Order No. R-7395 which permitted injection of polymer into eight wells at Horseshoe Gallup. ARCO is asking that Item No. 5, regarding conducting annual tracer surveys, be deleted. The following explanation should help clarify this issue.

Normal waterflooding began at Horseshoe Gallup in 1960. In November, 1983, polymer was injected into eight water injection wells as a Qualified Tertiary Oil Recovery Project under the "Crude Oil Windfall Profit Tax Act of 1980". A complexed biopolymer was injected into each well over a four-day period. The wells were then shut-in for three days to allow the polymer to gel. The gelled polymer will stay in the formation and alter the permeability in the polymer-invaded zone. After the shut-in period, normal water injection resumed. The wells have been on normal water injection since the shut-in time; no further polymer treatments are planned for these wells at this time.

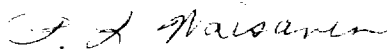
Injection surveys (attached) were run before and after the polymer injection. There is little change in the profiles, probably due to the fact that all the wells have been fractured. We were unable to obtain surveys for the annular injection; due to the low injection rates, the radioactive slug was too dispersed by the time it reached the perforations to give any meaningful reading.

Order No. R-7395, as written now, requires annual radioactive tracer surveys. Surveys were run before and after polymer injection. Surveys are not required for normal water injection at Horseshoe Gallup; and currently, only water is being injected. Surveys will be run before and after all future polymer treatments, which must be approved by the State.

Mr. Joe D. Ramey
State of New Mexico
Oil Conservation Division
April 11, 1984
Page Two

Since only water is currently being injected at Horseshoe Gallup Unit and injection surveys have never been deemed necessary for water injection, we request that Item No. 5 requiring annual surveys be deleted in Order No. R-7395.

Very truly yours,



P. L. Waisanen
Special Projects Engineer *PLW*

PLW/sh *JK*

Attachments

cc: Oil Conservation Division - Aztec Office

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 7931
Order No. R-7395

APPLICATION OF ARCO OIL AND GAS COMPANY
FOR AMENDMENT OF DIVISION ORDER NO. R-2210
TO INCLUDE A POLYMER AUGMENTED WATERFLOOD
AND FOR APPROVAL OF THE HORSESHOE GALLUP
POLYMER AUGMENTED WATERFLOOD PILOT PROJECT
AS A QUALIFIED TERTIARY OIL RECOVERY
PROJECT UNDER THE "CRUDE OIL WINDFALL
PROFIT TAX ACT OF 1980", SAN JUAN COUNTY,
NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8 a.m. on August 3, 1983,
at Santa Fe, New Mexico, before Examiner Michael E. Stogner.

NOW, on this 8th day of December, 1983, the Division
Director, having considered the testimony, the record, and the
recommendations of the Examiner, and being fully advised in the
premises,

FINDS:

(1) That due public notice having been given as required
by law, the Division has jurisdiction of this cause and the
subject matter thereof.

(2) That the applicant, Arco Oil and Gas Company, seeks an
amendment to Division Order No. R-2210, as amended, to include
the injection of polymer augmented water in a portion of its
previously authorized pressure maintenance project in the
Horseshoe Gallup Unit, for conversion of existing injection
wells to polymer augmented water injection wells, and for the
approval of the Horseshoe Gallup Polymer Augmented Waterflood
Pilot Project as a Qualified Tertiary Oil Recovery Project under
the "Crude Oil Windfall Profit Tax Act of 1980."

(3) That said Horseshoe Gallup Unit Area lies within the
Horseshoe Gallup Pool, San Juan County, New Mexico, and is
located part on Indian, State of New Mexico, and Federal leases.

(4) That said oil pool was discovered in June, 1957, by Arizona Exploration, Inc. and developed on 40-acre spacing, with waterflooding beginning and initiated in some portions of the pool in 1960, and with the unit-wide pressure maintenance being initiated in 1962.

(5) That the Atlantic Refining Company (presently known as Arco Oil and Gas Company) Horseshoe-Gallup Unit Pressure Maintenance Project consisting of approximately 20,925.58 acres was approved by said Division Order No. R-2210 on April 18, 1962, which was amended by Division Order No. R-2210-A entered on May 21, 1974, Division Order No. R-2719 entered on June 1, 1969, and Division Order No. R-6172 entered on November 2, 1979.

(6) That the New Mexico Oil Conservation Division has been designated by the Governor of the State of New Mexico as the appropriate agency to approve qualified tertiary recovery projects in New Mexico for purposes of the "Crude Oil Windfall Profit Tax Act of 1980" pursuant to I.R.C. § 4993(d)(5) (A) (i).

(7) That the applicant now seeks approval for the injection of polymer augmented water into eight (8) project wells as shown on Exhibit "A" attached to this order and the approval of the Horseshoe Gallup Polymer Augmented Waterflood Pilot Project as meeting the requirements of subparagraph (A), (B), and (C) of Section 4993 (c) (2) of the Internal Revenue Code for designation of a Qualified Tertiary Recovery Project.

(8) That the proposed Qualifying Tertiary Project Area (Q.T.P. Area) lies wholly within said Horseshoe-Gallup Unit Pressure Maintenance Project in the Horseshoe-Gallup Unit Area and consists of the following described acreage:

SAN JUAN COUNTY, NEW MEXICO

TOWNSHIP 31 NORTH, RANGE 16 WEST, NMPM

Sections 32 and 33: S/2

Section 34: SW/4

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM

Section 3: W/2

Sections 4 and 5: All

Section 8: NE/4

Section 9: N/2

Section 10: NW/4

containing approximately 3,040 acres.

(9) That the proposed Q.T.P. Area is adequately delineated.

(10) That the tertiary oil recovery method used in this Project is a polymer-augmented waterflood method which is a recognized tertiary oil recovery method described in Section 212.78(c) of the Department of Energy Regulations in effect in June, 1979.

(11) That the Q.T.P. Area tertiary recovery operations beginning date will be September 14, 1983.

(12) That the Q.T.P. Area tertiary recovery operation beginning date is after May, 1979.

(13) That past production from the Horseshoe-Gallup Unit Area underlying the proposed Q.T.P. Area is approximately 3,792,000 barrels of oil as of March, 1983. Future recovery from the project area without the proposed tertiary recovery project is estimated to be 49,000 barrels of oil over a three-year period. With the proposed tertiary project that recovery is expected to increase to 61,000 barrels of oil. This 12,000 barrel increase represents an increase in estimated recoverable reserves of 24 percent, a more than insignificant increase.

(14) The Horseshoe Gallup Unit Area presently contains 127 active producing wells, 61 active water injection wells, 98 shut-in wells and 1 active water supply well. Eight water injection wells in the project area will be used for polymer injection and the 19 currently producing wells in the project area will continue to be utilized for production.

(15) The projected future expense for the proposed pilot project is approximately \$100,000.

(16) That the proposed tertiary recovery operation within said Q.T.P. Area meets all requirements of Section 4993 of the Internal Revenue Code.

(17) That injection in this tertiary recovery pilot project shall be subject to a surface pressure limitation of 750 psi.

(18) That in many of the injection wells, in the present Horseshoe Gallup Unit Pressure Maintenance Project, injection is being accomplished through the casing/tubing annulus.

(19) That there is no fresh water in the proposed Q.T.P. Area.

(20) That the approval of this application will prevent waste, protect correlative rights and promote conservation.

IT IS THEREFORE ORDERED:

(1) That effective September 14, 1983, the Qualifying Tertiary Recovery Project Area, described in Finding No. (8) of this Order, being the ARCO Oil and Gas Company Horseshoe-Gallup Polymer Augmented Waterflood Pilot Project, Horseshoe-Gallup Pool, San Juan County, New Mexico, is hereby approved as a Qualified Tertiary Recovery Project under the "Crude Oil Windfall Profits Tax Act of 1980".

(2) That the applicant, ARCO Oil and Gas Company, is hereby authorized to inject polymer augmented water into the eight wells listed on Exhibit "A" attached to this Order, and that Division Order No. R-2210, dated April 18, 1962, is hereby amended to allow the injection of said polymer augmented water.

(3) That the injection wells herein authorized and/or the injection pressurization system shall be so equipped as to limit injection pressure at the wellhead to no more than 750 psi.

(4) That the operator shall immediately notify the supervisor of the New Mexico Oil Conservation Division's Aztec District Office of the failure of the tubing, packer, or casing in the injection wells within the project area and shall take such timely steps as may be necessary or required to correct such failure or leakage.

⇒ (5) That Applicant shall conduct annual tracer surveys on all injection wells and shall provide notice of the dates of such surveys and the results of such surveys to the New Mexico Oil Conservation Division's Aztec District Office.

(6) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


JOE D. RAMEY,
Director

S E A L

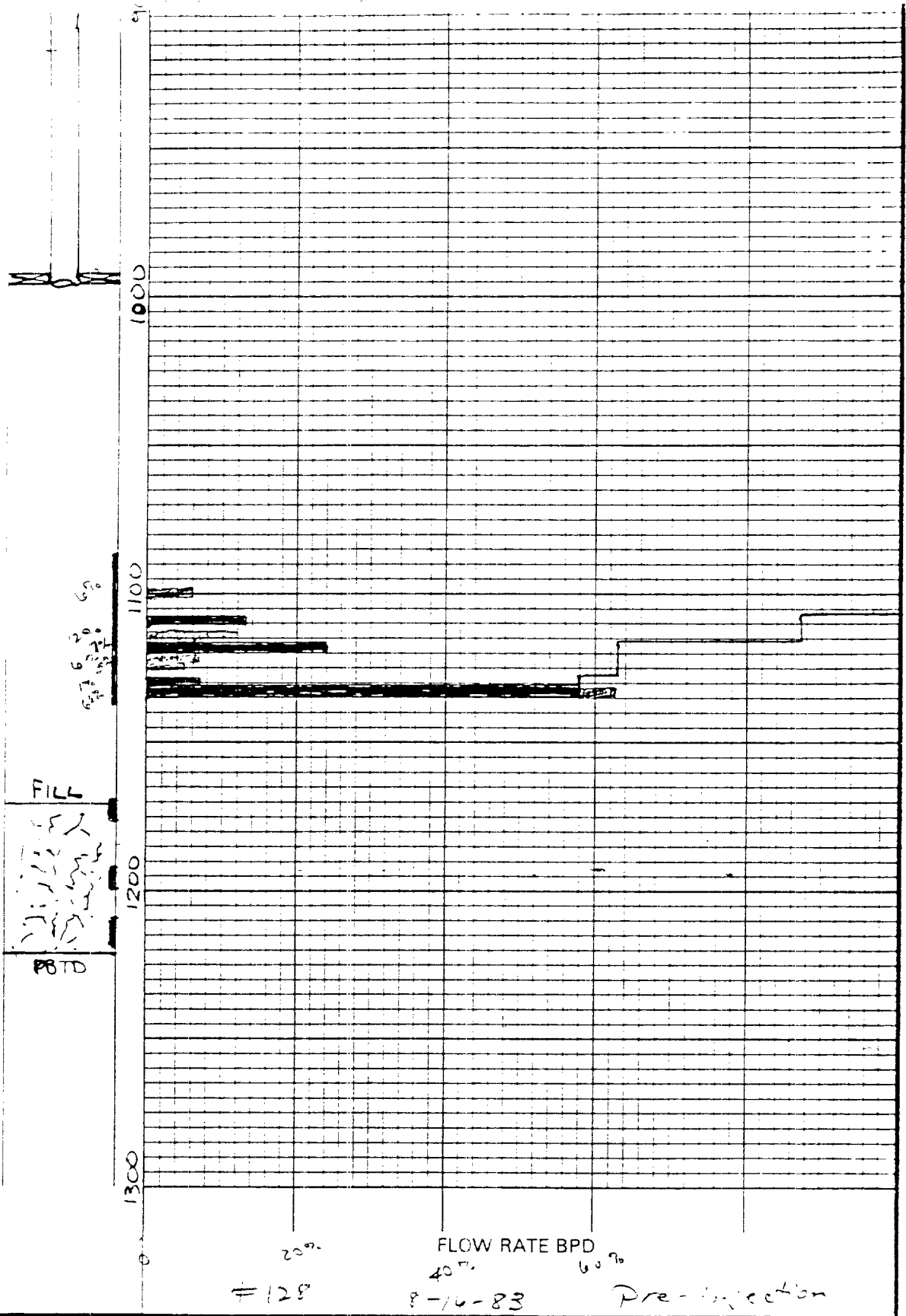
SAN JUAN COUNTY, NEW MEXICO

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM

Horseshoe Gallup Unit

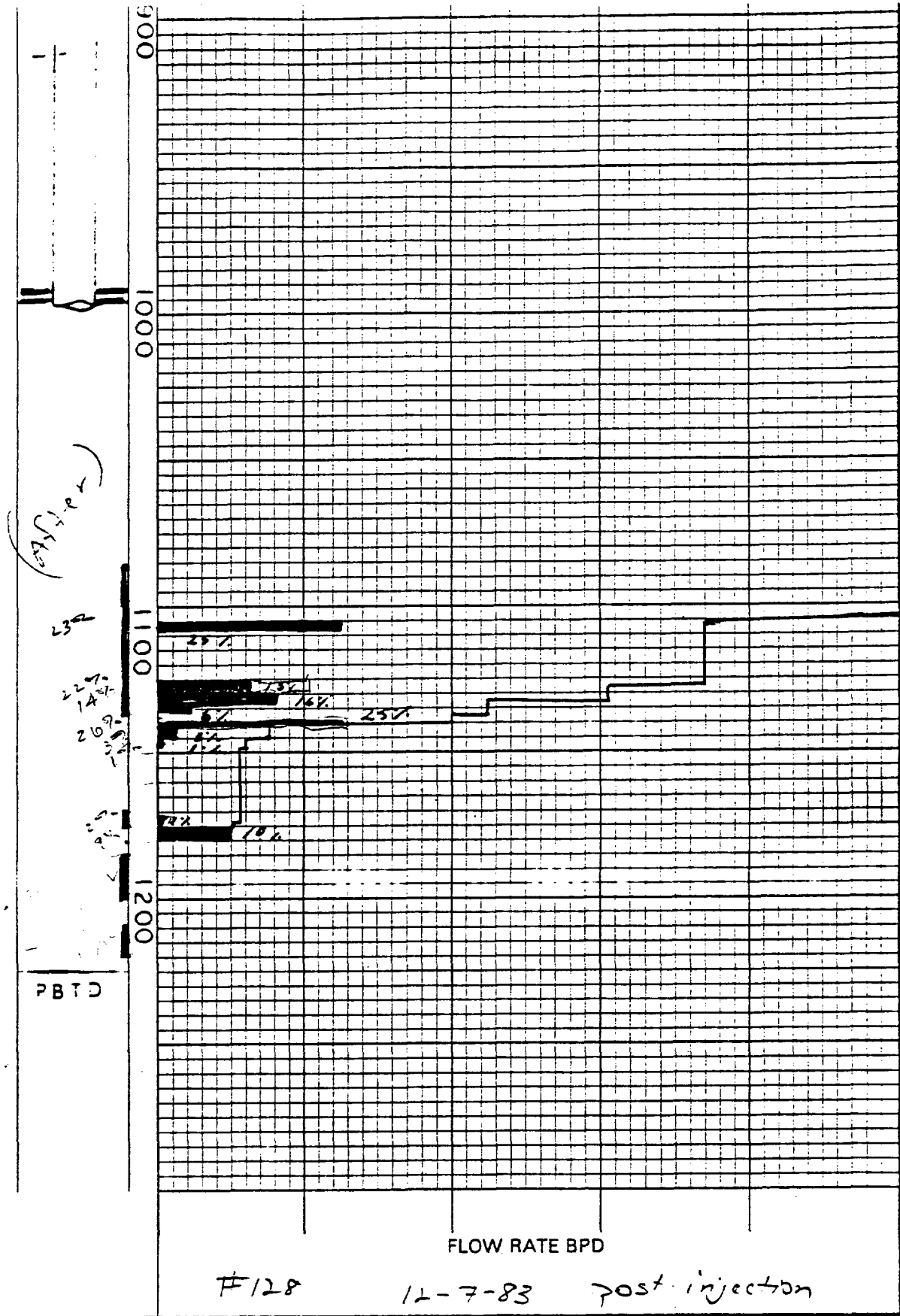
<u>Well No.</u>	<u>Location</u>
128	330 FNL and 1650 FEL of Section 5
134	1650 FNL and 330 FEL of Section 5
219	455 FNL and 4435 FEL of Section 4
221	330 FNL and 2160 FEL of Section 4
232	2069 FNL and 1710 FWL of Section 4
242	2310 FSL and 4390 FEL of Section 4
244	1820 FSL and 2130 FEL of Section 4
253	660 FSL and 3300 FEL of Section 4

(20-6-83)



TEMPERATURE LOG RUN WITH WELL
SHOWN IN FLOW DEPTH

GARDEN 1900 Dike-X10



TEMPERATURE LOG

DEPTH	TEMPERATURE GRADIENT-°F TEMPERATURE DIFFERENTIAL
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FILL →

T.D.

PRTD

1200

1250

1300

1300

2nd

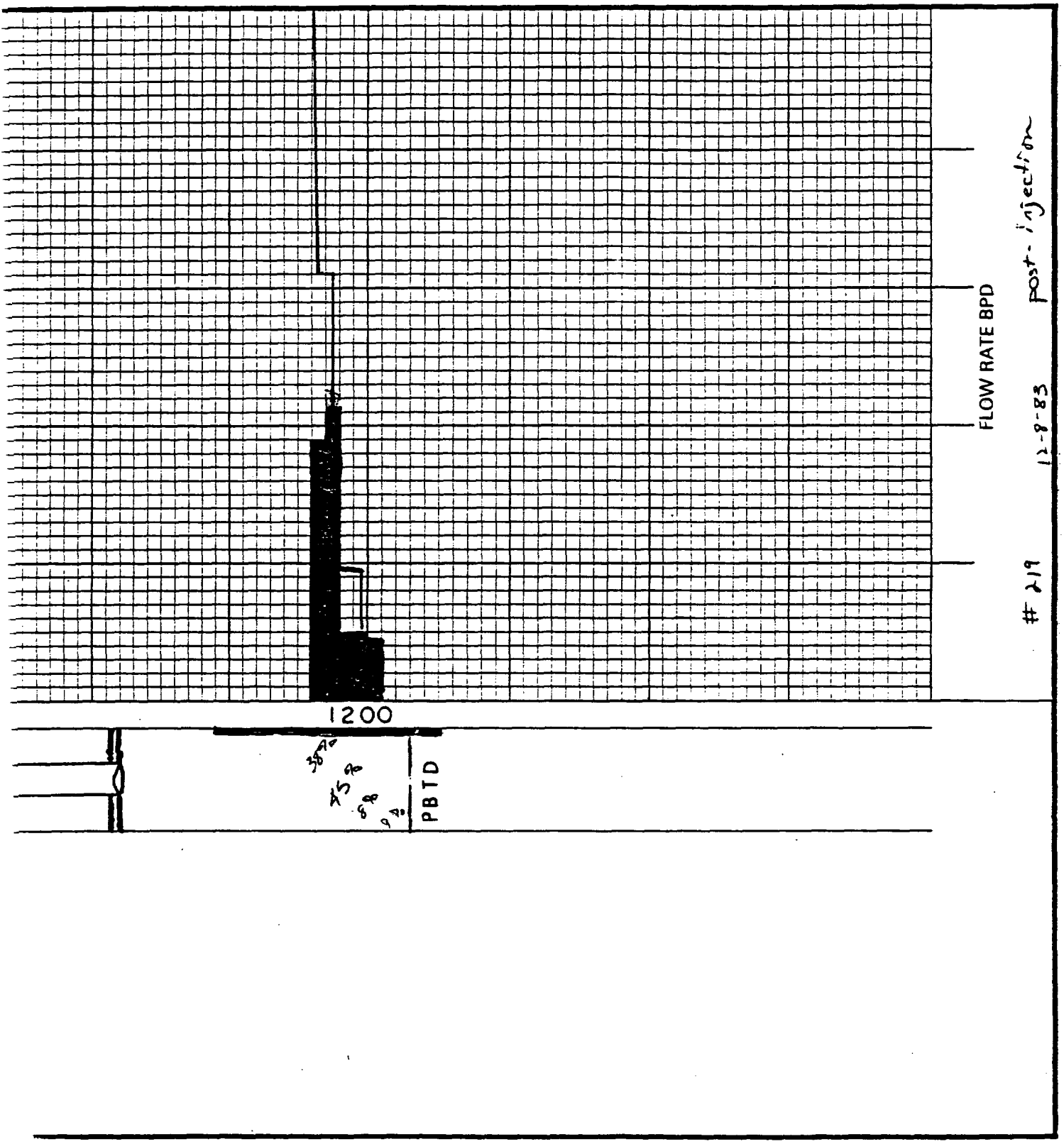
FLOW RATE BPD

219

8-23-83

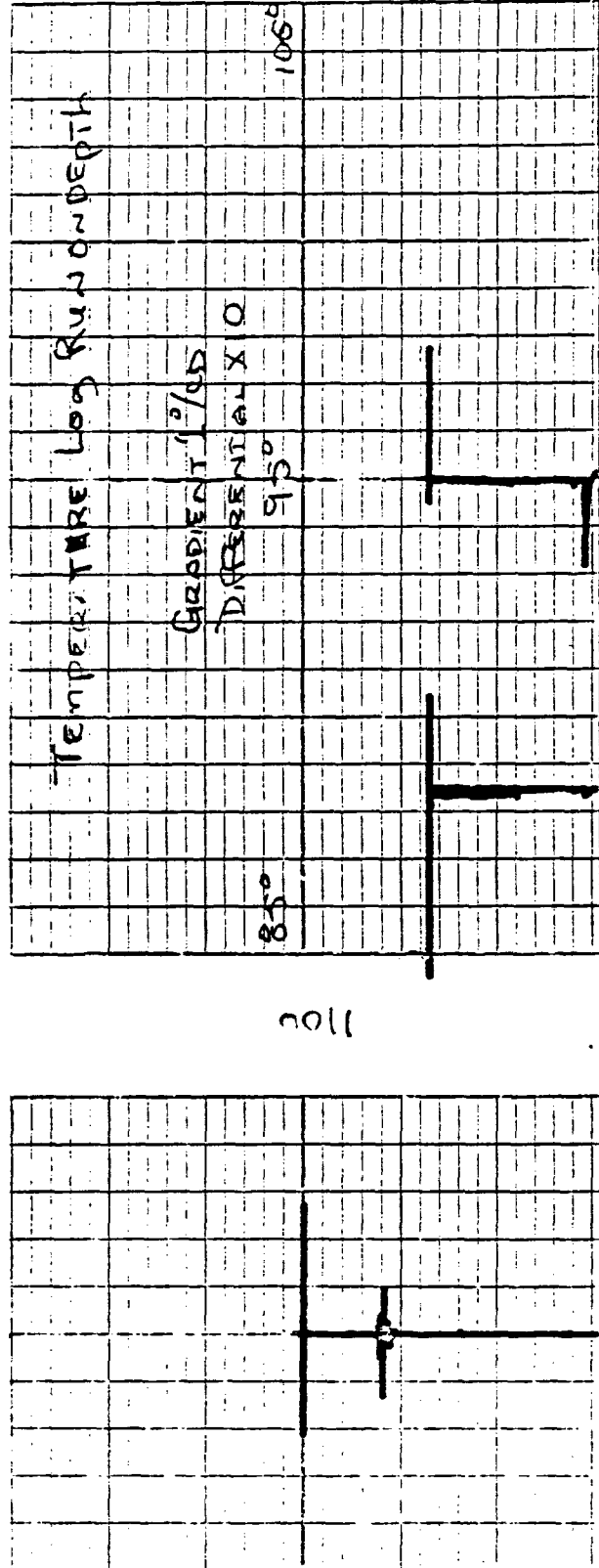
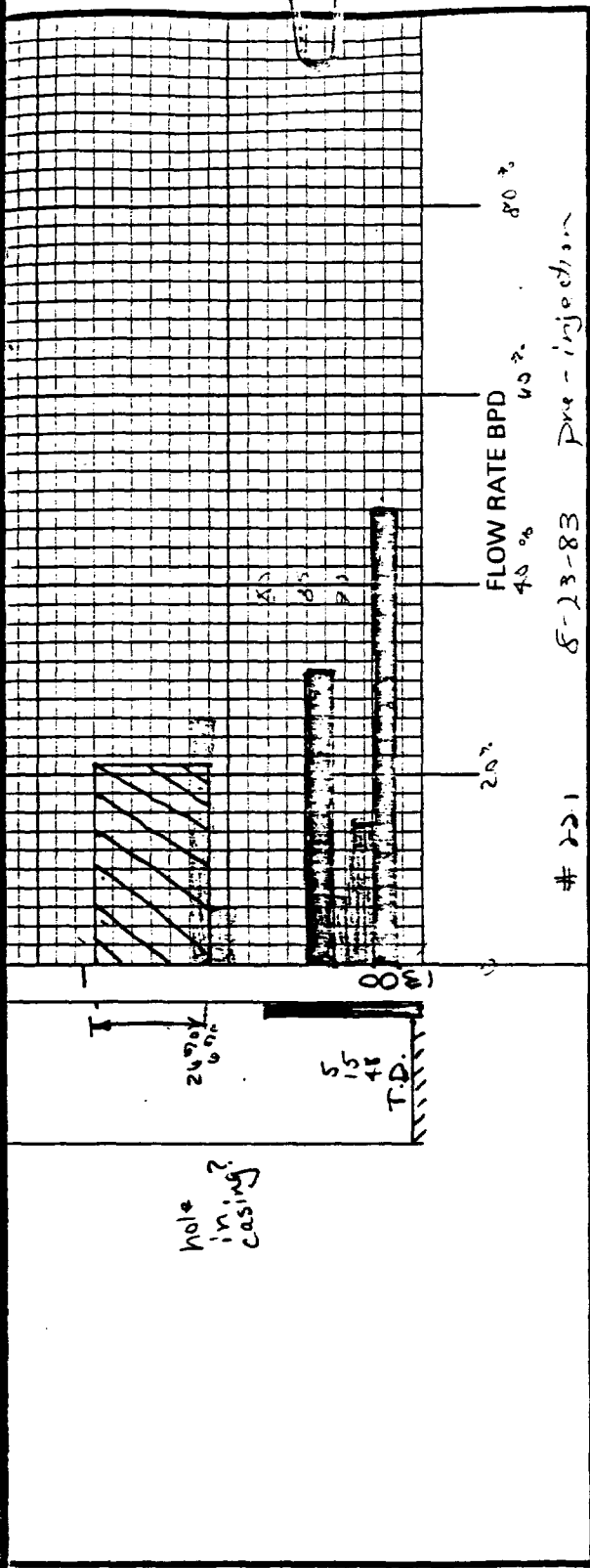
Pre-injection

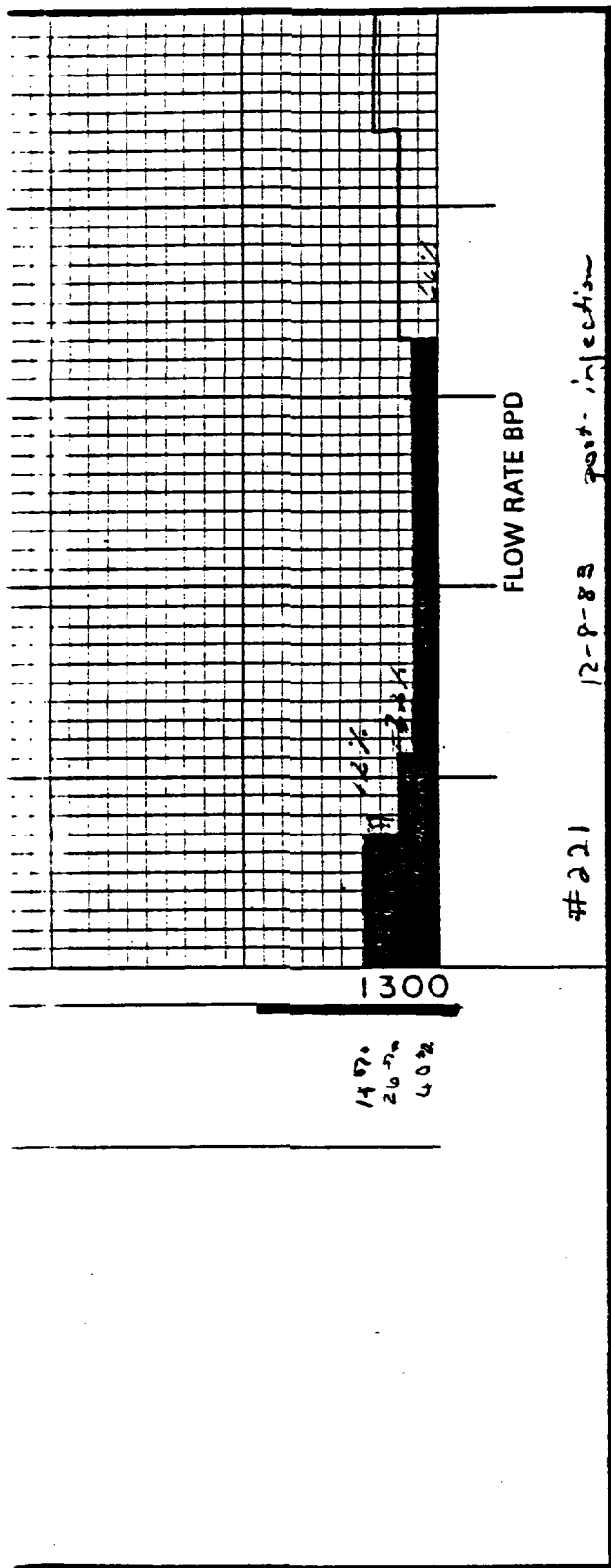
TEMPERATURE LOG SHUT-IN
LOG RUN 1 DEEP



358
58
9.4

PBTD

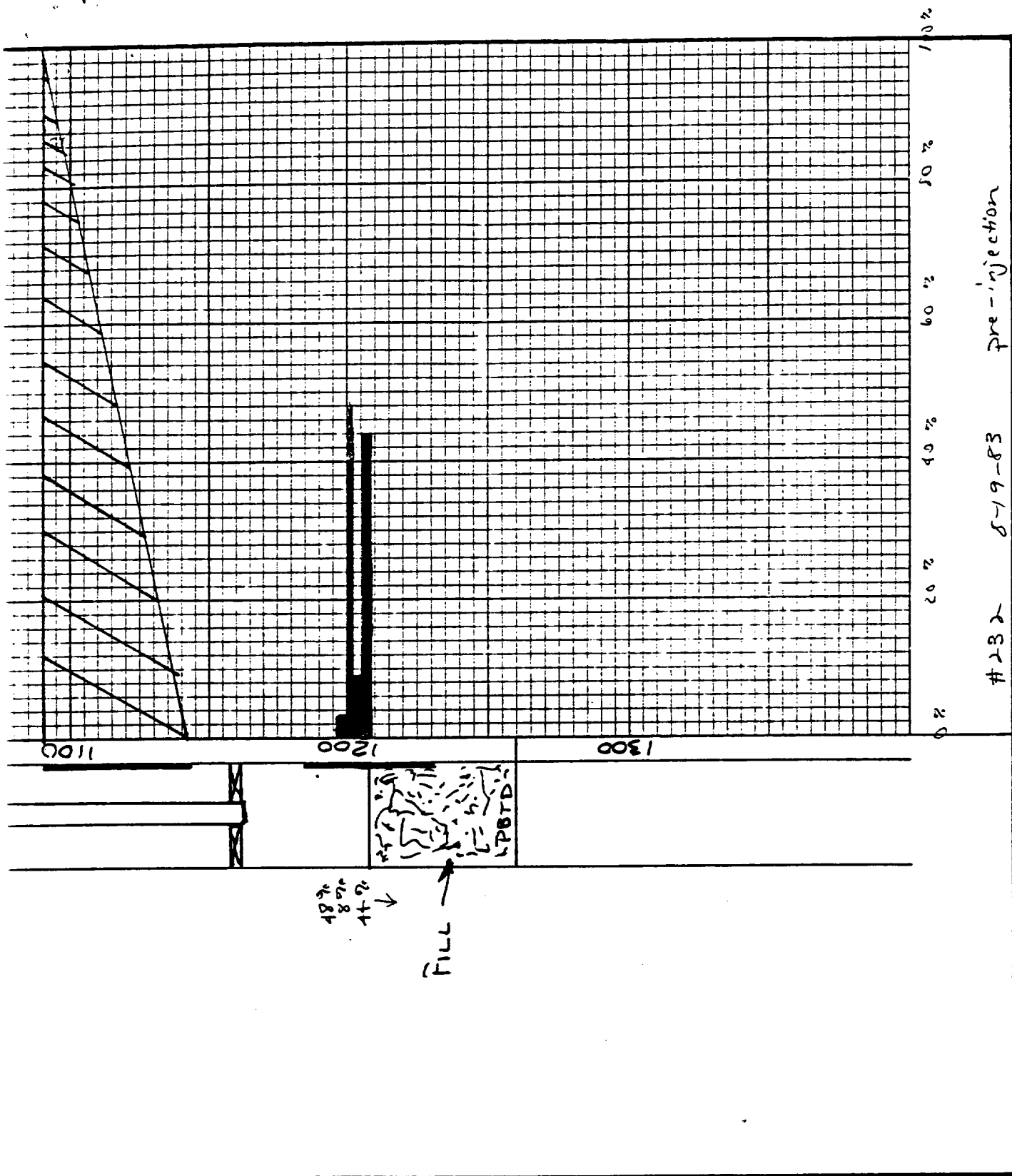


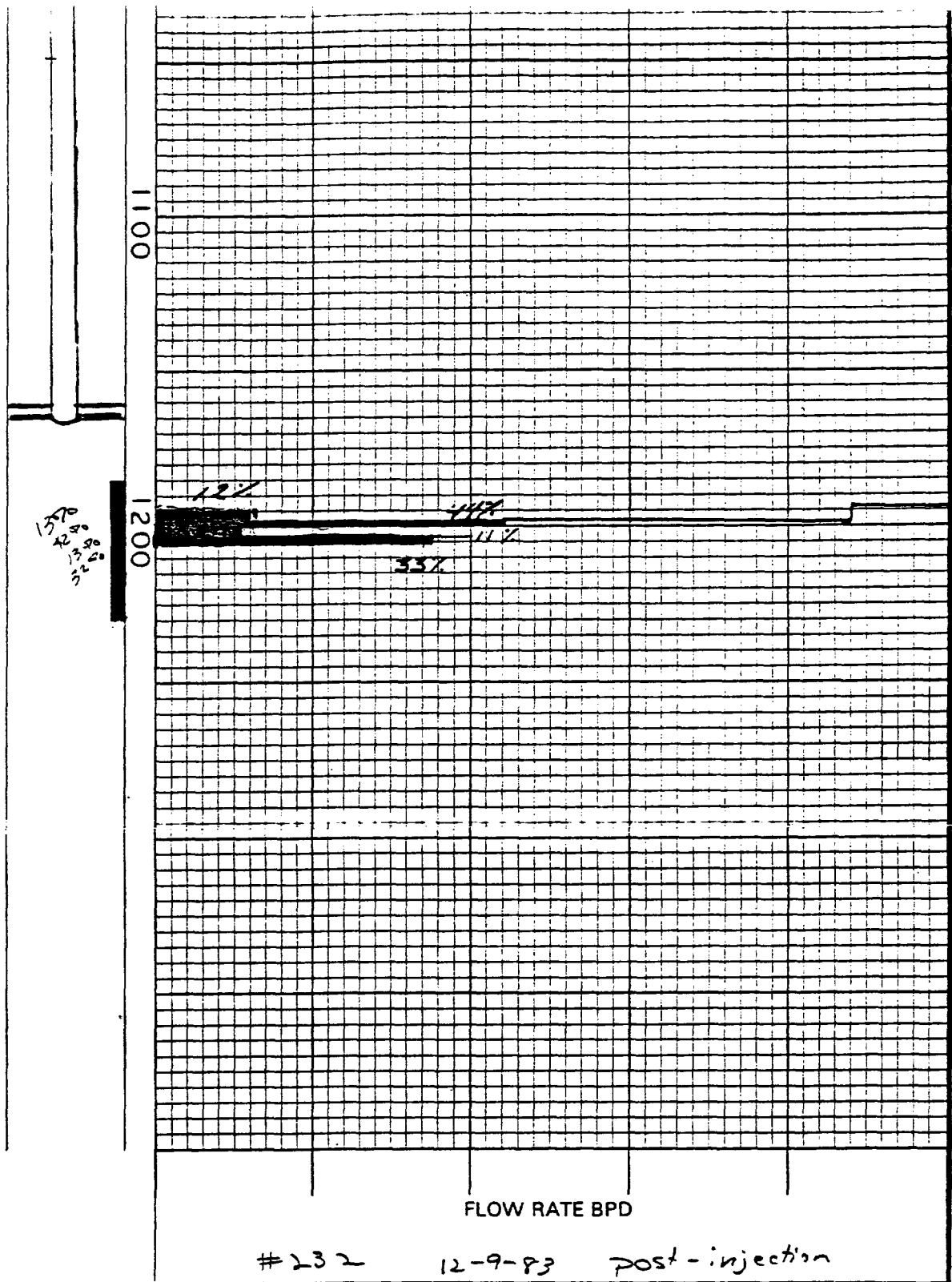


FORM 925334 (8/80)

TEMPERATURE LOG

GAMMA RAY	DEPTH	TEMPERATURE GRADIENT-°F TEMPERATURE DIFFERENTIAL
		TEMP. SCALE 1 DEG./C.D. 76 86 96 - 0 + 10





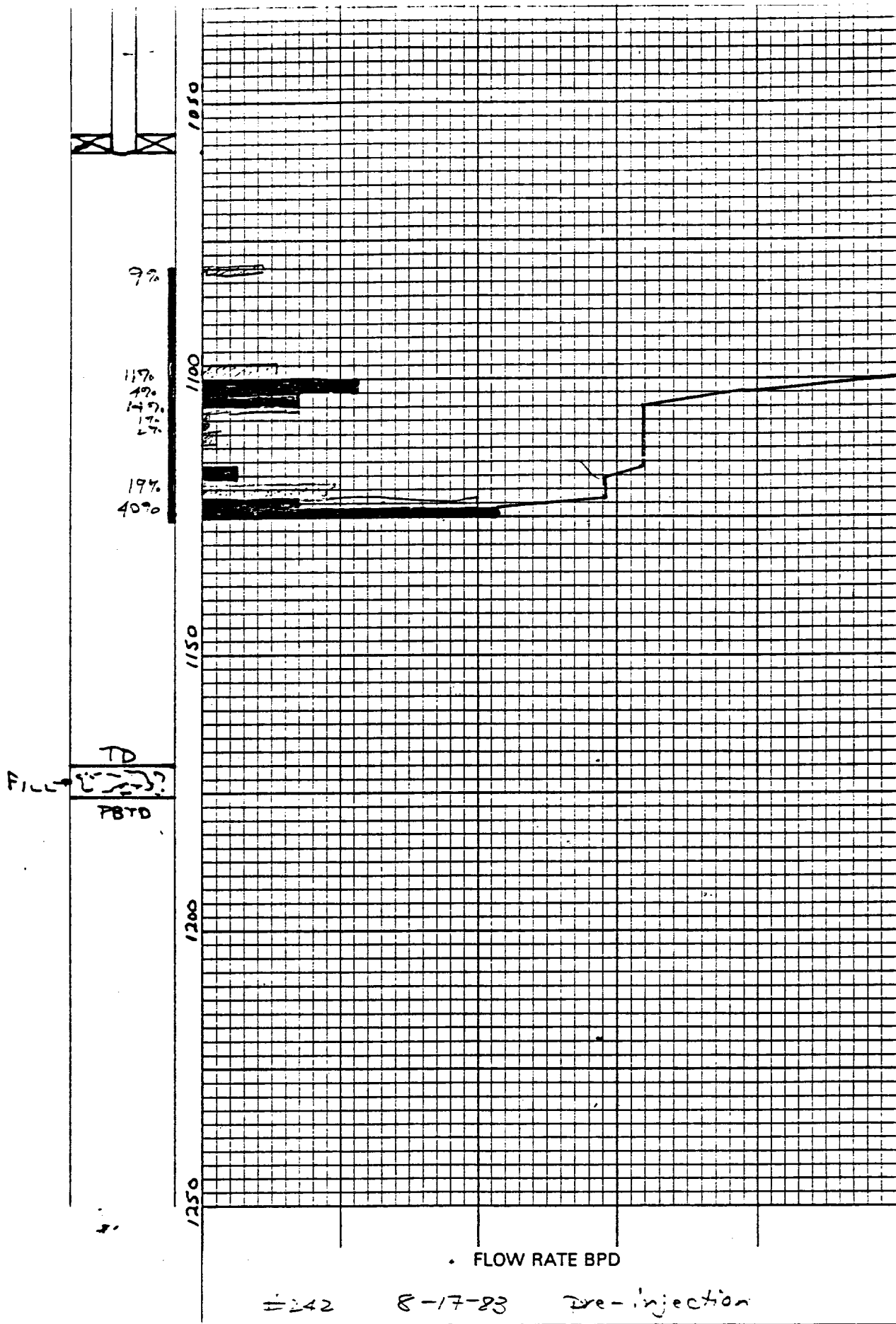
TEMPERATURE LOG

DEPTH

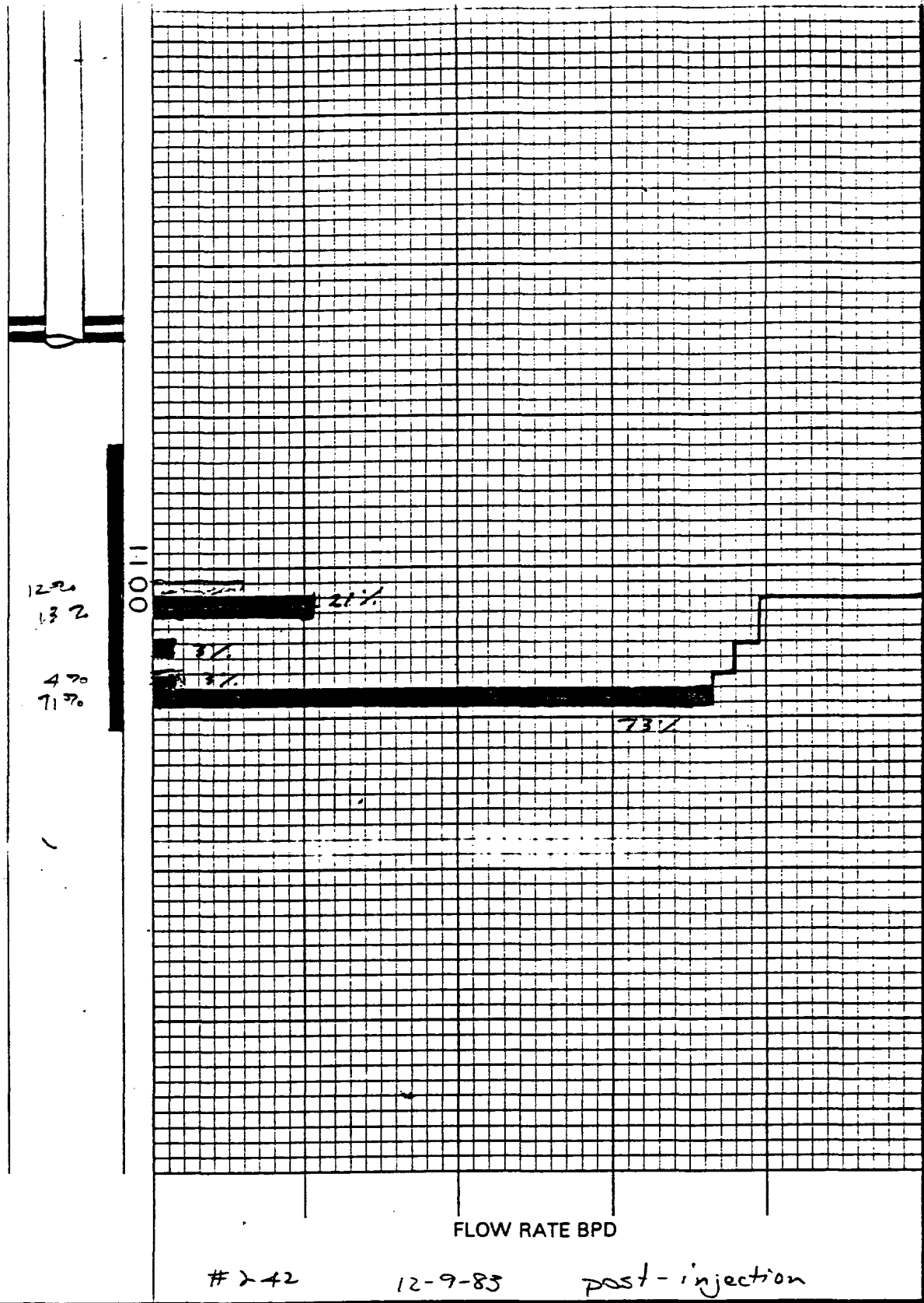
TEMPERATURE GRADIENT-°F
TEMPERATURE DIFFERENTIAL

TEMP. SCALE _____ DEG./C.D.

HOLE SIZE
AL DEPTH

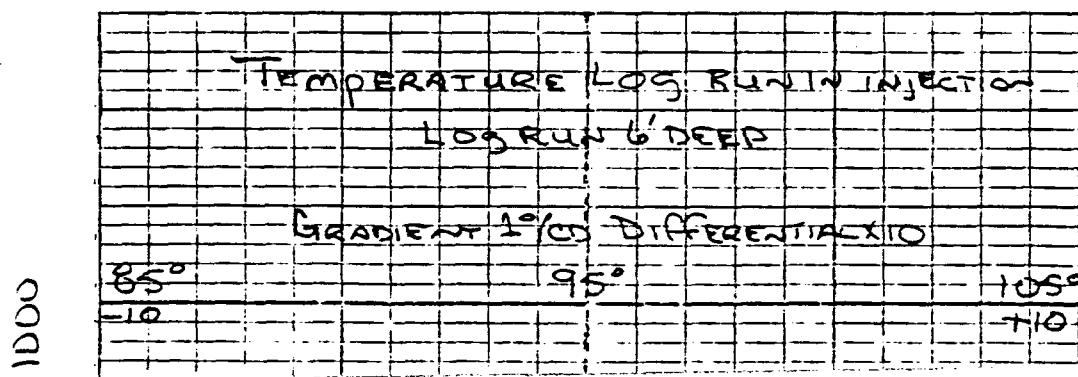
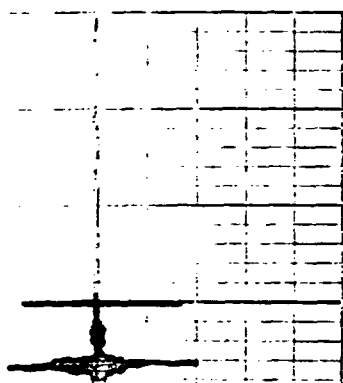
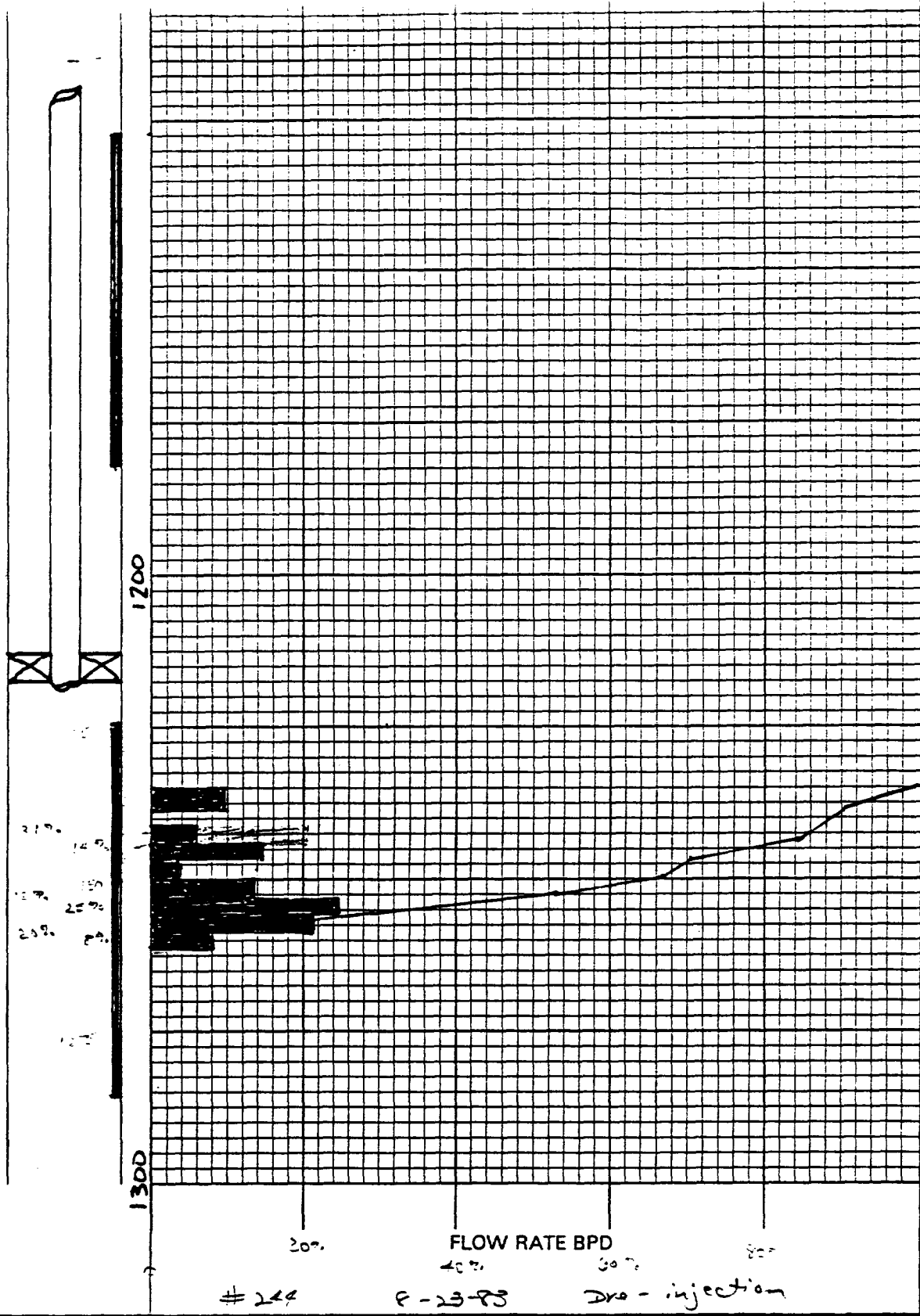


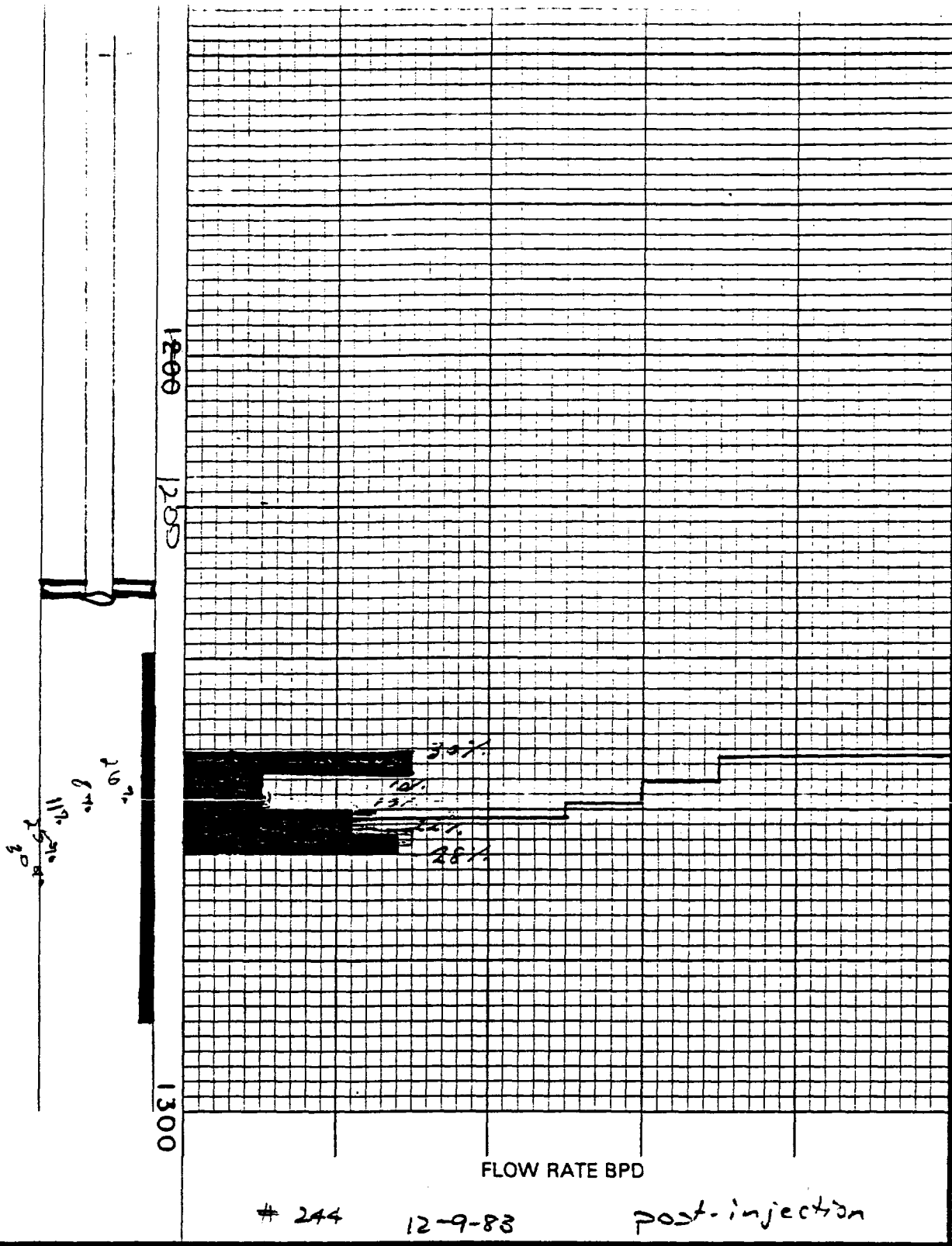
NUCLEAR FLOLOG



TEMPERATURE LOG

	DEPTH	TEMPERATURE GRADIENT-°F TEMPERATURE DIFFERENTIAL
		TEMP SCALE 1 DEG / 100





TEMPERATURE LOG

DEPTH

TEMPERATURE GRADIENT-°F
TEMPERATURE DIFFERENTIAL

TEMP. SCALE 1 DEG./C.D.

82

92

102