COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

* * * * *

In the Matter of

THE APPLICATION OF THE WOOD CREEK WATER DISTRICT, OF LAUREL COUNTY, KENTUCKY, FOR (1) A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY, AUTHORIZING AND PERMITTING SAID WATER DISTRICT TO CONSTRUCT A WATERWORKS CONSTRUCTION PROJECT, CONSISTING OF EXTENSIONS, ADDITIONS, AND IMPROVEMENTS TO THE EXISTING WATERWORKS SYSTEM OF THE DISTRICT; AND (2) APPROVAL OF THE PROPOSED PLAN OF FINANCING OF SAID PROJECT	CASE NO. 8905

O R D E R

IT IS ORDERED That this case be and it hereby is set for hearing on March 22, 1984, at 10:00 a.m., Eastern Standard Time, in the Commission's offices at Frankfort, Kentucky.

IT IS FURTHER ORDERED That the Staff Report dated March 1, 1984, attached hereto and made a part hereof (Appendix A), be and it hereby is made a part of the record herein.

Done at Frankfort, Kentucky, this 8th day of March, 1984.

PUBLIC SERVICE COMMISSION

For the Commission

ATTEST:

Secretary

APPENDIX A

APPENDIX TO AN ORDER OF THE PUBLIC SERVICE COMMISSION IN CASE NO. 8905 DATED March 8, 1984.

R E P O R T

TO: Claude G. Rhorer, Jr., Director
Division of Utility Engineering
and Services

THRU: Byrnes C. Fairchild, Chief Engineer
Water and Sewage Section

FROM: Eddie B. Smith
Public Service Engineer
Water and Sewage Section

RE: Review of the engineering hydraulics submitted by Wood Creek Water District in Case No. 8905.

DATE: March 1, 1984

BRIEF

The purpose of this report is to discuss the engineering data and hydraulic calculations presented by the Wood Creek Water District ("Wood Creek") to justify its proposed construction of a 300,000-gallon standpipe near London, Kentucky. On September 20, 1983, the Public Service Commission received a petition from Wood Creek for approval of the construction of a 300,000-gallon steel water storage tank and approximately 7,500 linear feet of 10-inch diameter water pipeline.

Copies of the engineering construction drawings and specifications together with an amendment to an engineering report dated February 1982, were filed by Wood Creek on September 23, 1983. In an attempt to determine if the proposed water storage tank would "be used and useful in rendering service to the public" additional engineering data was requested from the District by Order dated October 5, 1983. During the same period of time

the District's consulting engineers, Russell & Axon, were made directly aware of the request for information. Wood Creek's response to the information request was received October 27, 1983. The engineering and hydraulic data supplied by Wood Creek was reviewed by the staff and was found lacking sufficient detail for a "complete understanding of the situation." Mr. Glen House, Chairman of Wood Creek, was informed of this fact and a conference with the Commission's engineering staff was suggested by a November 21, 1983, letter from Secretary Heman.

A conference was held with Mr. Glen House, Mrs. Peggy Brown, and Mr. Charles Buchanan representing Wood Creek and Eddie B. Smith of the Commission staff on December 14, 1983, at the Commission's offices in Frankfort. The discussion at this meeting revolved around the type and detail of the engineering documentation desired for staff review. The similarities between this case and Case No. 8723, West Daviess County Water District, were pointed out. Subsequent to the December 14 meeting, a copy of the staff report in Case No. 8723 was mailed to Wood Creek's consulting engineer, Charles Buchanan of Russell & Axon. Following the December 14 conference Byrnes C. Fairchild, Chief of the Water and Sewage Section, loaned Wood Creek three of the Commission's recording pressure gauges for use in obtaining documentation of the existing hydraulic conditions. On February 15, 1984, Wood Creek's Peggy Brown and Russell & Axon's Charles Buchanan, and Lenny Vaughan met with Eddie B. Smith of the Commission's engineering staff and supplied additional engineering data concerning the proposed construction project.

BACKGROUND INFORMATION

The Wood Creek Water District began operation in May 1969 with approximately 650 customers. The District presently serves over 2,286 retail customers in northwestern Laurel County. In addition Wood Creek supplies water for resale to West Laurel Water Association, East Laurel Water District, Laurel County Water District #2, and the city of London. The water distribution system is made up of some 100 miles of pipeline, 3 storage tanks, and a water treatment plant at Wood Creek Lake (See Figure 2). The three storage tanks include a 300,000-gallon standpipe near Mt. Moriah Church at Bernstadt, a 250,000-gallon standpipe near East Bernstadt (locally called the "Mother" tank), and a 200,000-gallon standpipe on Highway 490 near the community of Victory. The Mt. Moriah tank has an overflow elevation of 1,410 feet above sea level (ASL) which is regulated by an altitude valve. The "Mother" tank has an overflow elevation of 1,420 feet ASL and is monitored telemetrically at the water treatment plant. The water tank at Victory has an overflow elevation of 1,360 feet ASL and, although not mentioned in the data, is apparently controlled by an altitude valve. All three storage tanks are fed by the high service pumps at the water treatment plant.

Wood Creek's water treatment plant was originally constructed in 1968-69 with a rated capacity of 0.72 million gallons per day (MGD). In 1978 the plant was doubled to its present rated capacity of 1.44 MGD. The water plant is currently undergoing another modification project to increase its rated capacity to 2.88 MGD.

The 1982 Annual Report showed average daily customer usage of 1.02 MGD which included average daily sales of 0.29 MGD to West Laurel, 0.19 MGD to East Laurel, 0.16 MGD to the city of London, and 0.01 to Laurel County #2. Nearly two thirds of Wood Creek's water sales are to wholesale customers in the vicinity north of London. This large draft on Wood Creek's distribution system routinely causes noticeable reductions in the water pressure available to Wood Creek's customers in the higher elevations northwest of London. In addition the District has been experiencing difficulty in maintaining the water level of both the "Mother" and Mt. Moriah standpipes. Wood Creek proposes to address all of these circumstances by construction of a 300,000-gallon steel tank on the high ridge northwest of the city of London along with a 10-inch diameter pipeline connection to the existing system.

FIELD OBSERVATIONS AND DATA COLLECTION

As mentioned previously, the staff review of the initial engineering information submitted by the Wood Creek Water District found it to be insufficient to allow an adequate engineering evaluation of the proposed waterworks improvements. In order to gather additional data on the water system's operational characteristics personnel from Wood Creek and their consulting engineers set pressure recorders and made observations of system activity.

Recording pressure gauges were set by Wood Creek at three locations to continuously monitor the system's operational pressure. Copies of the pressure charts supplied by Wood Creek for Shaney Ridge (1,300 feet ASL); Dogwood Hills Subdivision (1,300 feet ASL); and west 80 pump house (1,190 feet ASL @ suction side) are attached to this report. A copy of a vicinity map showing these locations

is also attached. The District also measured instantaneous pressures of 120 PSI at U.S. 25 and Highway 2041 and 60 PSI on the 6-inch waterline on Old Highway 80 where the 4-inch waterline to the Dogwood Area begins.

Wood Creek personnel conducted a hydrant flow test in the vicinity of the proposed connection of the 10-inch waterline to the tank site. The following data was supplied by Wood Creek.

Date:	January 18, 1984
Time:	11:13 A.M.
Line:	10-inch asbetos cement
Location:	U.S. 25 at Highway 2041
Elevation:	1,133 ft. ASL
Initial Pressure:	120 PSI
Residual w/Fire Flow	105 PSI
Estimated Flow	790-820 GPM

A sketch showing the locations of the flow test and pressure measurements is attached to this report. Wood Creek also supplied daily flow rate charts from the Treatment Plant's high service pumps for the same period (See Attached Examples).

CALCULATIONS AND DATA REDUCTION

Wood Creek did not present any sort of mass diagram or diurnal usage data to identify the water storage requirements of its system. The District proposes to construct a 115 feet tall 300,000-gallon steel standpipe with an overflow elevation of 1,420. Generally, water storage is necessary to help meet peak demands; maintain relatively uniform water pressures; to eliminate the necessity for continuous pumping; and to make use of economical pipe sizes. Water storage requirements should take into consideration the peak daily water use and the maximum hourly demand, and the capacity of the normal and standby pumping equipment.

It is not clear from Wood Creek's presentation exactly how it was determined that the proposed standpipe was necessary. The fundamental questions of how much water is needed, when the water tank will be utilized, and when the tank will fill were not directly addressed by Wood Creek.

Wood Creek did offer calculations to support its contention that the proposed standpipe will be filled from the existing distribution system. An existing available pressure of 120 pounds per square inch (PSI) was measured at elevation 1,133 ASL in the immediate vicinity of the proposed connection of the 10-inch waterline to the new tank. From this data Wood Creek calculated that a hydraulic gradient of 1,410.2 feet ASL was available at the proposed connection to fill the new standpipe. The District then calculated that the proposed tank will fill at a rate of 600 gallons per minute (gpm) to an elevation of 1,397.1 feet ASL or nearly 23 feet below full. The District stated in its February 15, 1984, answer to the Commission that "considering the lower demands during late evening and early morning periods and the conservation built into this analysis the tank may be expected to fill to approximately the 1,400 level or possibly higher." In addition, Wood Creek plans to construct a 16-inch diameter water transmission line at some unspecified future date which it states will enable the tank to be filled to capacity.

Unfortunately the hydraulic measurements and pressure recordings supplied by Wood Creek do not appear to support its analysis of the water system's ability to fill the proposed standpipe.

It is somewhat curious that the District did not make any pressure recordings in the immediate area of the proposed location of the new standpipe. However, at the suggestion of the Commission staff, Wood Creek did conduct a hydrant flow test near the proposed connection point. While there are some technical questions concerning the flow test and the manner it was conducted, it will be assumed that the data is correct as given by Wood Creek. According to the flow test results (listed previously), a flow of approximately 800 gpm at the proposed connection point caused a drop of 15 PSI or 35 feet of head. This means that the hyrdaulic gradient fell from the 1,410.2 feet ASL calculated by Wood Creek to approximately 1,375 feet ASL under 800 gpm flow. Quite simply this shows that the hydraulic gradient present at any particular instant of time is dependent upon the amount of water flowing through the pipes at that instant. Therefore Wood Creek's use of a constant hydraulic gradient of 1,410.2 feet ASL at the proposed connection point is not supported by either theory or actual measurement. The question then becomes what would the head drop at the proposed connection point under the 600 gpm flow rate used by Wood Creek in its calculation for the fill rate to the new tank. From the results of the flow test and using the head loss formula developed by Hazen and Williams we can calculate the drop at the proposed connection due to a flow of 600 gpm. The Hazen and Williams formula gives a drop of 20 feet in the hydraulic gradient at the same point for 600 gpm flow under the same conditions as the original flow test. For the calculation submitted by Wood Creek the 600 gpm fill rate would only be available to 1,377 feet

ASL or 43 feet below fill. This calculation is only valid, however, if the treatment plant's high service pumps can maintain the level of the "Mother" tank at 1,410 feet ASL and no other customer demands are present.

The only evidence of the hydraulic gradient available in the vicinity of the proposed standpipe are the pressure recorder charts Wood Creek provided for Shaney Ridge, Dogwood Subdivision, and the West 80 pump station. Examination of the Shaney Ridge chart shows a recorded pressure in the range of 30-35 PSI with several noticeable sharp "spikes" of higher and lower pressures. These pressures mean a hydraulic gradient of 1,369 feet ASL to 1,381 feet ASL. This appears to be particularly the case in the daily time period from midnight to 6:00 A.M. when customer usage would be expected to be a minimum. The chart labled Dogwood Subdivision shows fairly constant activity at all hours of the day. The pressures are mainly between 10 PSI to 30 PSI for the period recorded. This translates to a hydraulic gradient from 1,323 feet ASL to 1,369 feet ASL with no observeable slack period. The chart for the recorder at the West 80 pump station plots a reasonably steady pressure varying between 70 PSI and 90 PSI. This equates to a hydraulic gradient of 1,352 feet ASL to 1,390 feet ASL. In addition, there is a distinct pressure increase lasting approximately an hour recorded on two occasions in the early morning hours between midnight and 6:00 A.M. These abrupt pressure changes suggest some sort of pump activity on the distribution system, possibly the West 80 pump station itself.

During these two short periods the hydraulic gradient is around 1,402 feet ASL. All of this suggests that the existing water distribution system cannot support a water level in the proposed standpipe above 1,380 feet ASL - or less than two thirds full.

The existing water treatment plant was constructed in 1978 with a rated capacity of 1.44 MGD - or approximately 1,000 gpm output. The engineering data submitted to the Commission at that time listed the high service pumps as two 75 horsepower pumps, each capable of delivering 1,000 gpm against 250 feet of head. Review of the flow rate charts supplied by Wood Creek does not indicate that the existing treatment plant can furnish 1,000 gpm to the distribution system. The chart dated 12-28-83, for instance, records one pump furnishing around 550 gpm, another pump delivering approximately 650 gpm, and both together providing only 790 gpm. This means that the existing water treatment plant cannot effectively operate at its rated capacity. Since this condition was not discussed by Wood Creek it is not clear why the situation exists. The flow rate chart dated 1-17-84 notes the water level of the Mt. Moriah tank as 72 feet or 1,392 feet ASL and the "Mother" tank level as 66 feet or 1,411 feet ASL. The chart itself is obviously the wrong type and style for the particular recorder being used. Nevertheless, by referring to the chart dated 2-28-84 it was inferred that the plant was pumping approximately 600 gpm. Under these conditions the discharge head at the high service pump should have been close to 190 feet or 1,440 feet ASL. No pressure recordings were provided by Wood Creek of the discharge pressure of the high service pumps, however, the 600 gpm discharge against

the 190 feet of head is significantly different from the original design data and merits additional investigation. It appears that the high service pumps are being "throttled" by some sort of device to reduce the discharge pressure.

Wood Creek's flow rate charts show that the District routinely ran the treatment plant's high service pumps around the clock to meet its customer demands. During the period represented by the flow rate charts the high service pumps were only occasionally turned off. Hand written notations on the charts indicate that at no time was Wood Creek able to fill both the Mt. Moriah and "Mother" tanks. The charts do show a few instances when the "Mother" tank got within 3 or 4 feet of full.

CONCLUSIONS AND RECOMMENDATIONS

Based on the data review and hydraulic computations conducted, the following conclusions are presented:

(1) There is a demonstrable need for additional water storage facilities in the Wood Creek Water District.

(2) The water system is not presently capable of supplying adequate service pressure to customers in the higher elevations located northwest of London.

(3) The existing high service pumps and water distribution system are only marginally capable of filling the existing water storage tanks.

(4) The existing high service pumps and water distribution system cannot reasonably be expected to fill and maintain the water level of the proposed water tank on a daily basis.

(5) The proposed water tank will not appreciably improve the low pressure conditions in the higher elevations northwest of London.

(6) The maintenance of a single pressure zone to serve all customers does not appear to be hydraulically or economically justifiable.

This report makes the following recommendations:

(1) The Wood Creek Water District's application for a certificate of public convenience and necessity should be denied.

(2) The Wood Creek Water District should be instructed to investigate, identify, and correct the conditions at the treatment plant and in the distribution system that restrict the filling of the existing water storage tanks.

(3) The Wood Creek Water District should be instructed to institute a high pressure zone or zones to directly serve its customers northwest of London with adequate pressure.

(4) The Wood Creek Water District should be instructed to improve its water delivery capability and to quantify its water storage requirements either prior to or in conjunction with the addition of any new storage facilities.

EBS:jsb

Attachments

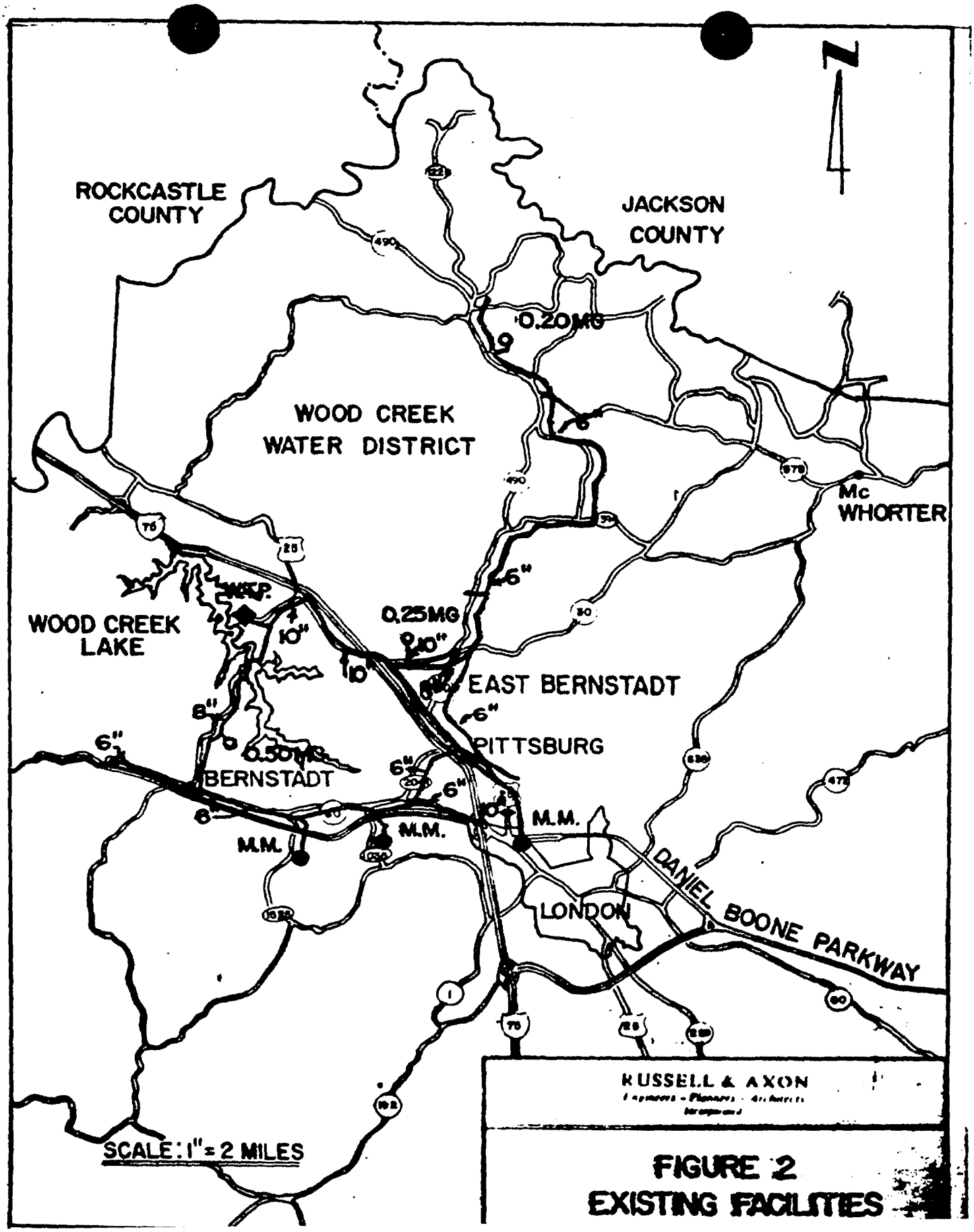
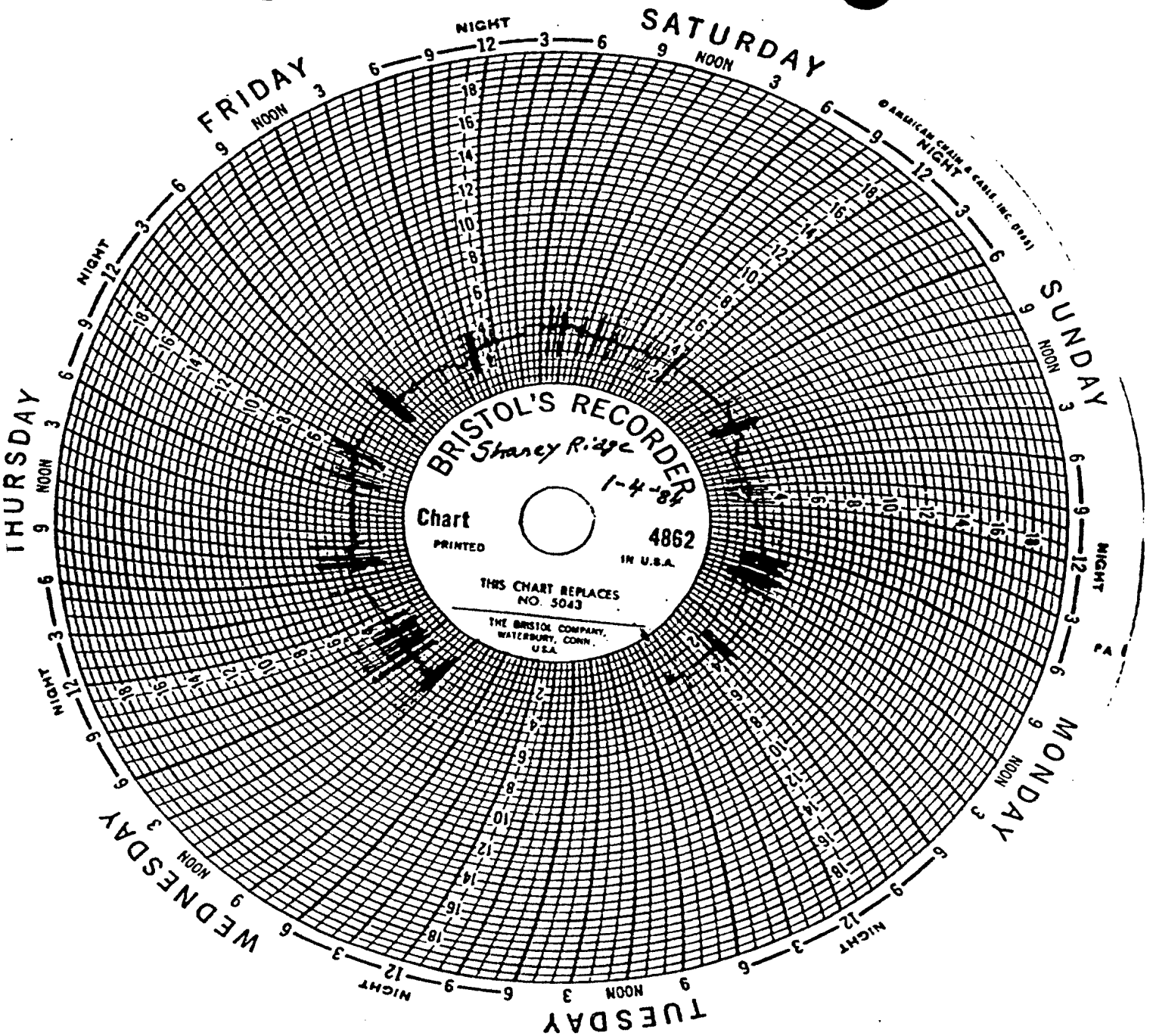


FIGURE 2
EXISTING FACILITIES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Stoney Ridge
1-4-84
Chart
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4862
IN U.S.A.
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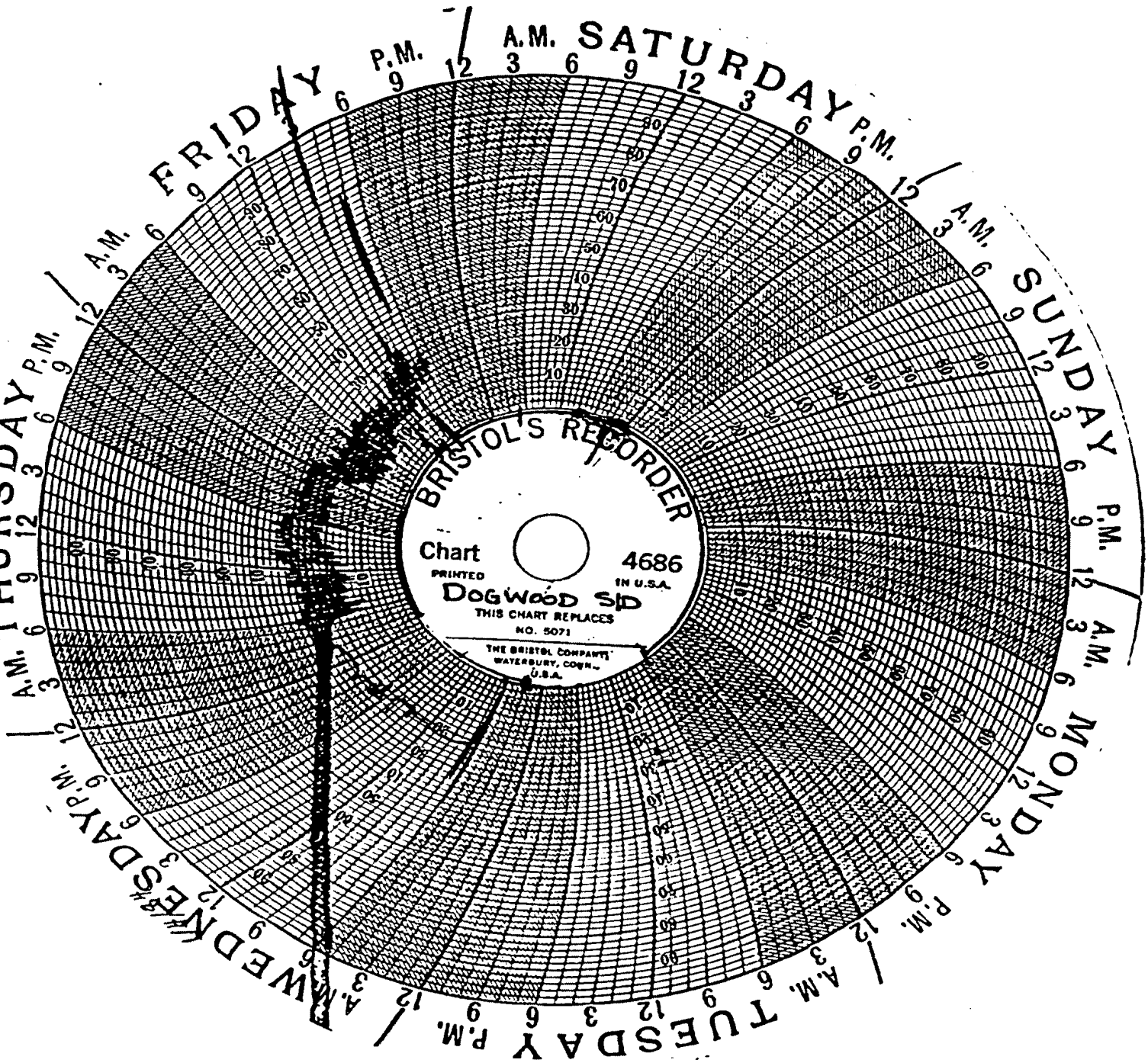
THE BRISTOL COMPANY,
WATERBURY, CONN.
U.S.A.
SATURDAY
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
NIGHT
NOON


BRISTOL'S RECORDER
Chart
4686
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DOGWOOD SID
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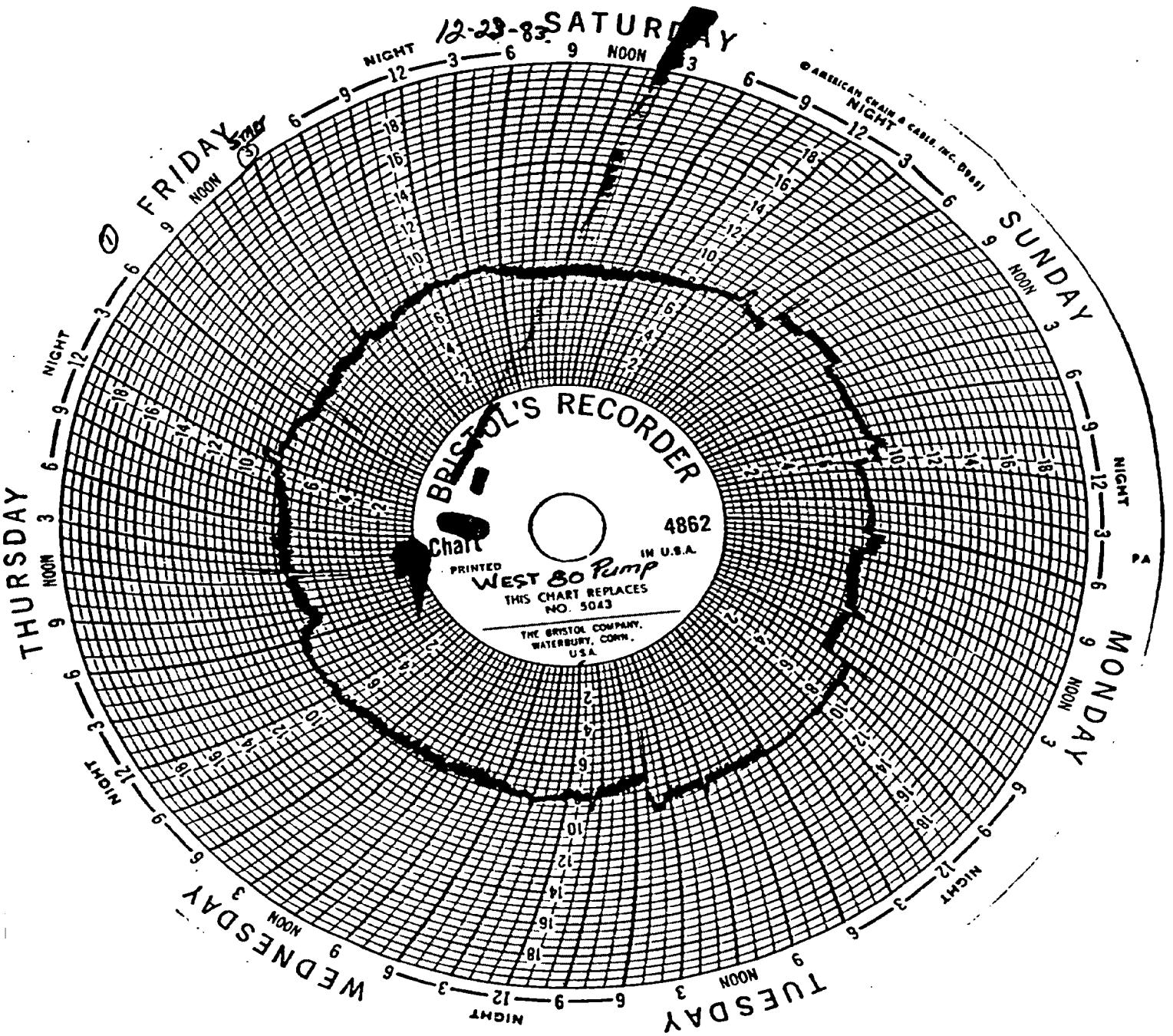
THURSDAY
FRIDAY
A.M.
P.M.


12-23-83
SATURDAY
FRIDAY
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
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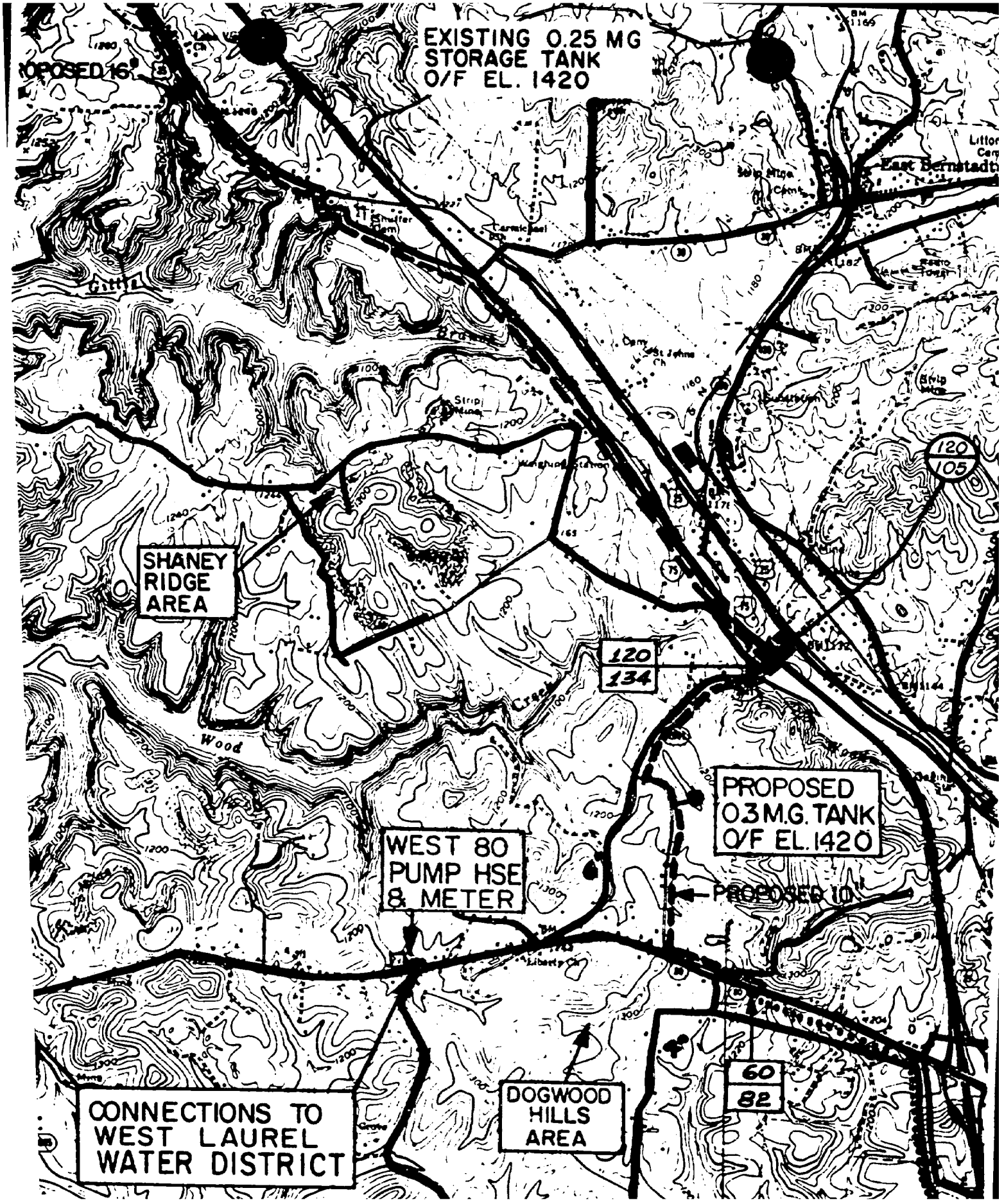
NOON
© AMERICAN CHAIN & CABLE, INC. (BRASS)
BRISTOL'S RECORDER
4862
Chart
PRINTED IN U.S.A.
WEST 80 Pump
THIS CHART REPLACES
NO. 5043
THE BRISTOL COMPANY,
WATERBURY, CONN.
U.S.A.


EXISTING 0.25 MG
STORAGE TANK
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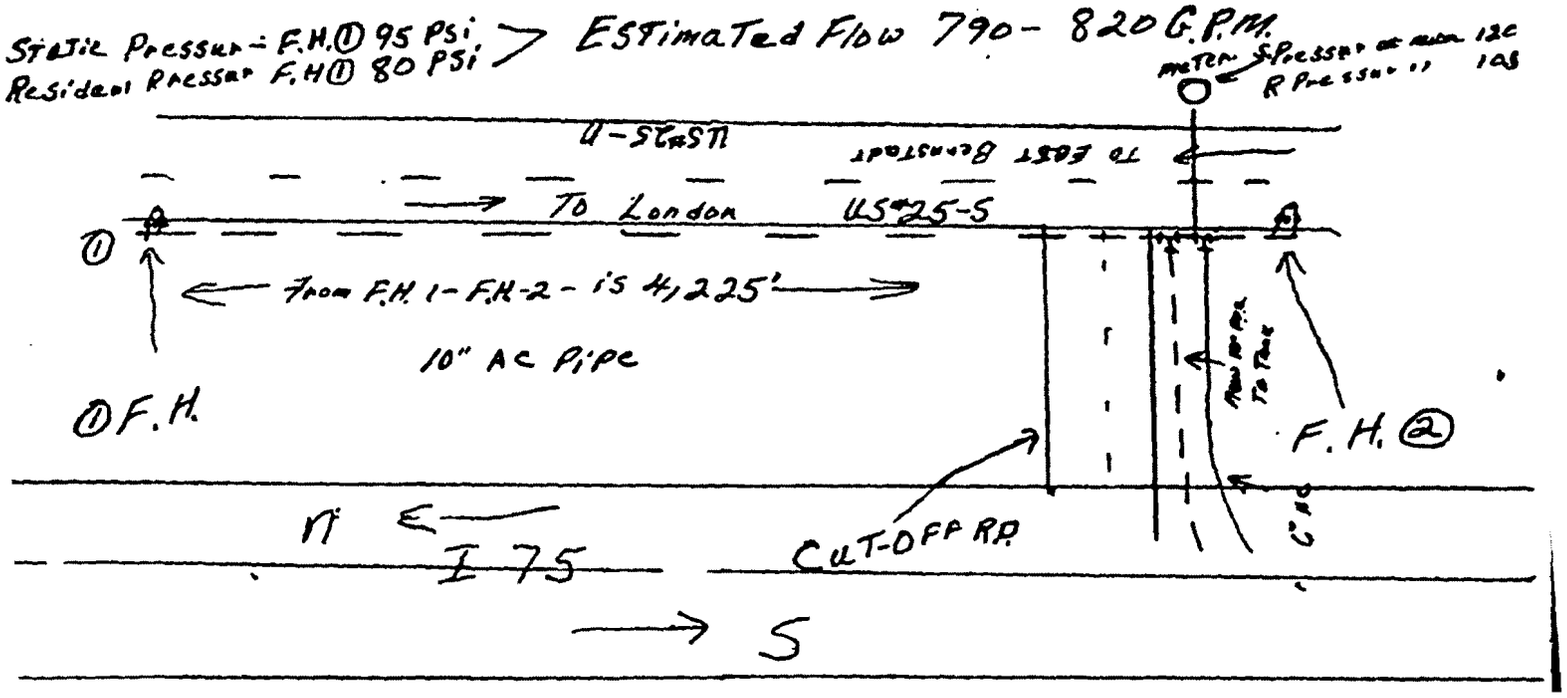
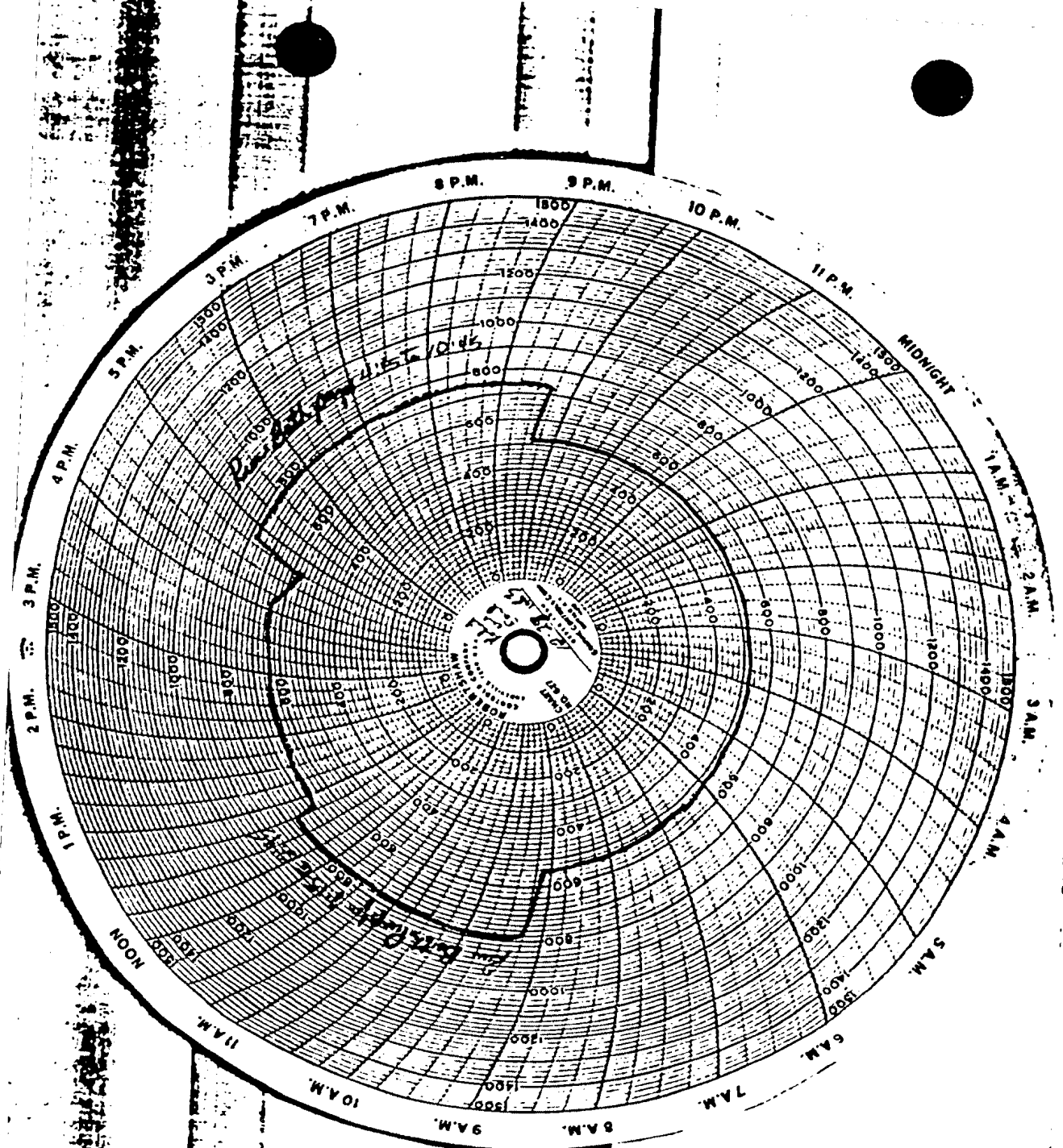
SHANEY
RIDGE
AREA
WEST 80
PUMP HSE
& METER
PROPOSED
0.3 M.G. TANK
O/F EL. 1420
PROPOSED 10"
DOGWOOD
HILLS
AREA
CONNECTIONS TO
WEST LAUREL
WATER DISTRICT
120
105
120
134
60
82
East Bernstadt

WOOD CREEK WATER DISTRICT
118 Carter Drive
P. O. Box 726
London, Kentucky 40741

Hydrant Flow Test January 18-1984

Date	1-18-84
Time	11:00 AM
Location	US #25
Elevation	1132 A.S.L.
Static Pressure	120 PSI
Residual Pressure	105 PSI
Estimated Flow	790 - 820 G.P.M.

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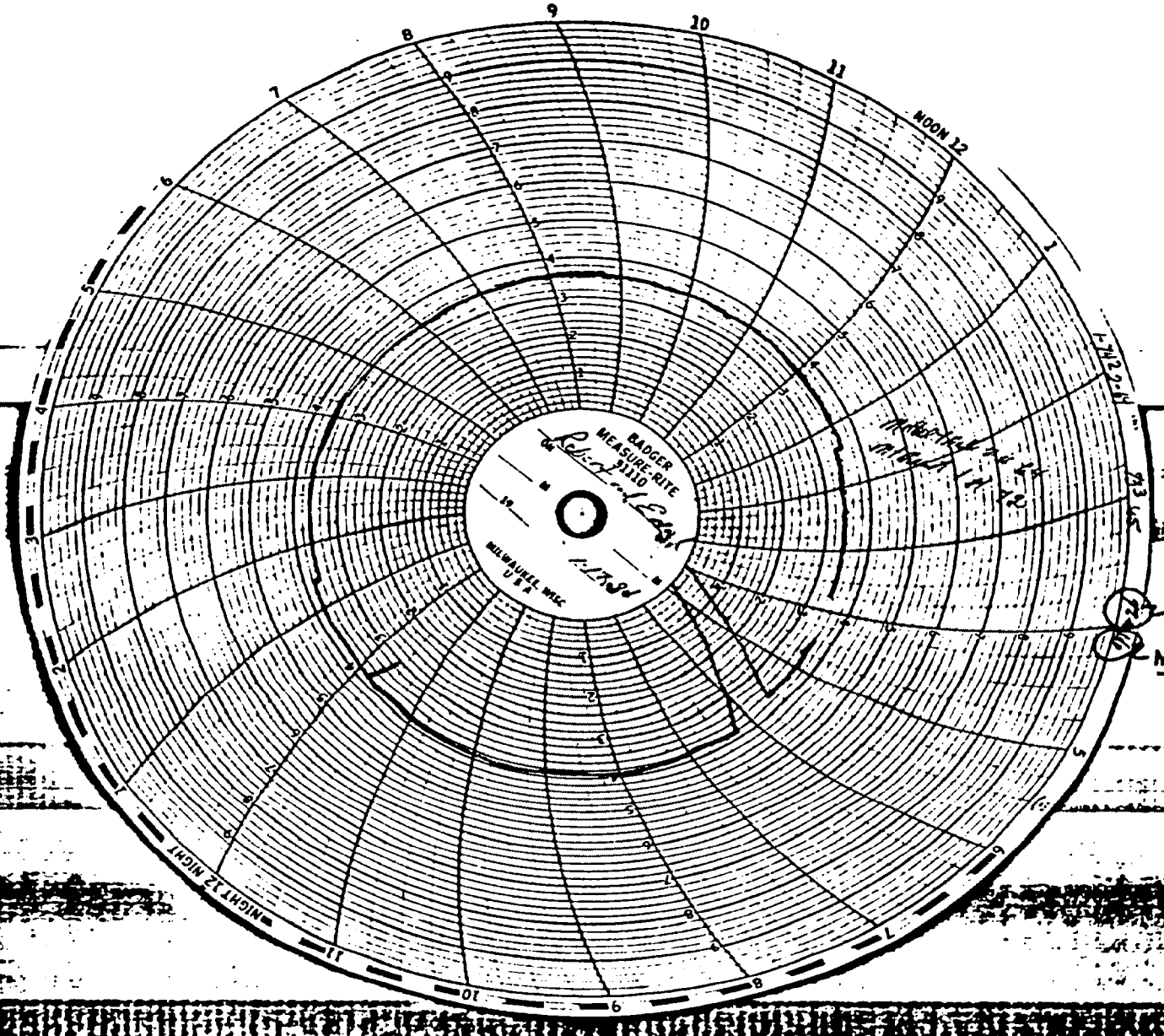
17-26-83



1-17-84

MOTHER TANK - #2
MT. MORIAH TANK - #1