REGIONAL ANALYSIS OF HYDROLOGIC INFORMATION
FOR THE COPPER-NICKEL REGION,
NORTHEASTERN MINNESOTA

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FINAL REPORT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The hydrologic impact of proposed copper-nickel mining in northeastern Minnesota is one of the critical assessments to be made by the State. The extent and degree of impacts on water resources and aquatic ecosystems are of primary interest. In order to make such an impact assessment, the existing surface water systems need to be characterized. Peak streamflow discharges and low-flow discharges of specified recurrence intervals should be identified for streams likely affected by mining and related activities. This information thus provides a basis for comparison with peak and low-flow discharges associated with mining. Hydrologic computer models such as the SSARR can be used to simulate the hydrology of watersheds modified by mining development. Physically, such mining effects may consist of changing the contributing drainage areas to some streams, the establishment of small reservoirs or tailings basins, or perhaps removing water and returning flows at certain locations along a stream.

The limited number of streamflow gages in the approximately 2800 square mile study area necessitates a regional hydrology analysis. Continuous streamflow records for 10 stations and partial records for another 12 stations exist in the watersheds of the Kawishiwi, Isabella, Stony, Upper Cloquet, Upper St. Louis, Partridge, Embarrass and Dunka rivers. The Basswood and Vermillion Rivers were also included in the analysis because of their long periods of record and proximity to the study area. Five stations in the study area were not included in the analysis because their lengths of record were too short. With regional analysis, watershed characteristics can be related to specific hydrologic characteristics of interest, for example the 100-year recurrence interval flood (HEC, 1972). Thus, with only watershed characteristics, estimates of hydrologic information can be obtained for areas without streamflow records.

The objective of this study is to provide a regional analysis of hydrologic information for the copper-nickel region of northeastern Minnesota, including:

(1) Annual peak streamflow frequency analyses in which spring snowmelt events and summer rainfall events were evaluated.

(2) Low-flow frequency analyses of the 1-, 7-, and 30-day duration for 10- and 20-year recurrence intervals.

(3) Annual volumes of runoff vs. annual precipitation for selected watersheds.

PART I

Peak Streamflow Frequency Analysis

Annual peak streamflow analysis was performed for 19 stations in the region (Table 1) according to the guidelines established by the U.S. Water Resources Council (1976). Because annual peak discharges can be caused by either snowmelt or rainfall events, the procedure by Beard (1962) was used to separate the analyses and then combine frequency curves. Snowmelt events were considered from November 15 - May 31 and rainfall events from June 1 - November 14. These dates were only used as guides; precipitation and air temperature data were used to estimate the cause of peak flow. Many annual peak-flow events were attributed to a combination of rainfall and snowmelt events. Although initially we intended to develop frequency curves for both snowmelt and rainfall events, this became impractical because of separation problems. Special care was also taken to insure that peak-flow discharges were independent.

Frequency curves of annual peak discharge and associated confidence limits for the 19 stations are presented in Appendix I. These curves were developed using a regional skew coefficient of -0.1 based on the values presented by WRC (1976). The following criteria were used to determine an adopted skew for each station (WRC 1976):

(1) If the station had 100+ years of record, the skew determined from the data itself (called a computed skew) became the adopted skew.

Table 1. Stream gaging stations used in the regional frequency analysis.

Station Name	USGS Number	Drainage Area (mi^2)	Period of Record
Armstrong Cr. near Ely	05127210	5.29	1968-1976
Basswood R. near Winton	05127500	1740	1932-1976
Bear Island R. near Ely	05126500	68.5	1952-62, 1975-76
Burgo Cr. near Ely	05127220	3.04	1968-1976
Burntside R. near Ely	05127205	-	1968-1976
Dunka R. near Babbitt	05126000	53	1952-62, 1975-76
Embarrass R. near Embarrass	04017000	93.	1943-1963
Isabella R. near Isabella	05124500	341	1953-1960
Kawishiwi R. near Ely	05124480	253	1967-1976
Kawishiwi R. near Winton	05127000	1200	1906. 1914, 1924-76
Longstorff Cr. near Ely	05127215	8.84	1967-1976
Partridge R. near Aurora	04016000	156	1943-1976
Pike R. near Embarrass	05128500	115	1954-1959
St. Louis R. near Aurora	04016500	312	1943-1976
Second Cr. near Aurora	04015500	26.3	1955-1976
Shagawa R. near Ely	05127230	-	1968-1976
S. Kawishiwi R. near Ely	05125000	-	1952-1960
Stony R. near Isabella	05125500	180	1953-1960
Vermillion R. below Vermillion Lake	05129000	483	1929-1976

(2) If the station had <25 years of record, the regional skew coefficient of -0.1 became the adopted skew.

(3) If the station had from 25-99 years of record, the adopted skew = computed skew [(N-25)/75] + generalized skew [1 - ((N-25)/75)], where N = number of years of record.

The adopted skew, along with mean and standard deviation, was then used to characterize the frequency curve for each station.

Final frequency curves were developed using records based on the regional frequency computation computer program (HEC, 1972). This program was used to estimate missing events and to extend short-record station data on the basis of correlations with long-record stations. These frequency curves are presented in Appendix II. The regional skew of -0.1 was again used. The resultant exceedance frequency curves were the basis for the regional frequency analysis.

The regional frequency analysis was performed with regression analyses as described by HEC (1975). Frequency curve statistics and characteristics for each station were regressed against basin characteristics. Prediction equations were developed with the University of Minnesota computer program MULTREG (Weisburg, 1977).

Watershed characteristics were not readily available for all watersheds in the study area. Basin area was available for 16 of 19 stations, main channel slope and storage area (area in lakes, swamps, etc.) were available for 8 of the 19 stations, and main channel length was available for 7 of the 19 stations. Consequently, regression equations were developed by:

(1) determining a simple linear regression with area as the independent variable for the 16 stations, and

(2) developing multiple regression using all 4 basin characteristics as independent variables with 7 stations.

By convention all independent and dependent variables were expressed as $\log_{10}$ values.

A Log Pearson Type III curve is characterized by the mean, standard deviation, and skew. Since skew was assumed to be -0.1 for all the stations the frequency curve for an ungaged station could be estimated by predicting only the mean and standard deviation. An alternative way to predict the curve (or a portion of it) is to predict certain points on the curve (such as the .01[1] event, the .10 event, etc.) and connect the points. In total, six dependent variables were examined and included the base 10 logarithm of the .01, .02, .05, .10, .50 (mean) values of discharge and the standard deviation.

The regression equations for 16 stations using only drainage areas as the independent variable are listed in Table 2. Because of the low coefficient of determination for predicting the standard deviation ($R^2 = .26$), the best estimates of exceedance frequencies for an ungaged area would be determined by predicting peaks associated with .01, .02, .05, .10 and .50 and drawing a "best fit" line. Annual peak flows can be determined graphically using Figure 1 with basin area as the only watershed characteristic.

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1 .01 refers to the probability that a particular discharge will be equaled or exceeded in a given year, i.e. there is a 1 in 100 chance that the .01 event will occur in a given year. This is sometimes referred to as the "100 year event."

Table 2. Regression equations of the form $\log Q_{cfs} = b_1 + b_2 \log \text{area}$ (mi^2) developed from 16 stations.

$\hat{Y}$	Regression	R^2
Log $Q_{.01}$	$\hat{Y} = 1.7446 + .7309 \log \text{area}$	.9042
Log $Q_{.02}$	$\hat{Y} = 1.6636 + .7419 \log \text{area}$	.9138
Log $Q_{.05}$	$\hat{Y} = 1.5522 + .7538 \log \text{area}$	.9272
Log $Q_{.10}$	$\hat{Y} = 1.4470 + .7675 \log \text{area}$	.9374
Mean ($\log Q_{.50}$)	$\hat{Y} = 1.0794 + .8135 \log \text{area}$	.9595
Standard Dev.	$\hat{Y} = .2819 - .0337 \log \text{area}$	.2605

n = 16 stations

Multiple regression analyses performed on 7 stations with area (mi^2), slope (ft/mile) and main channel length (miles) as independent variables were unsatisfactory. More stations (samples) would be needed to develop satisfactory prediction equations.

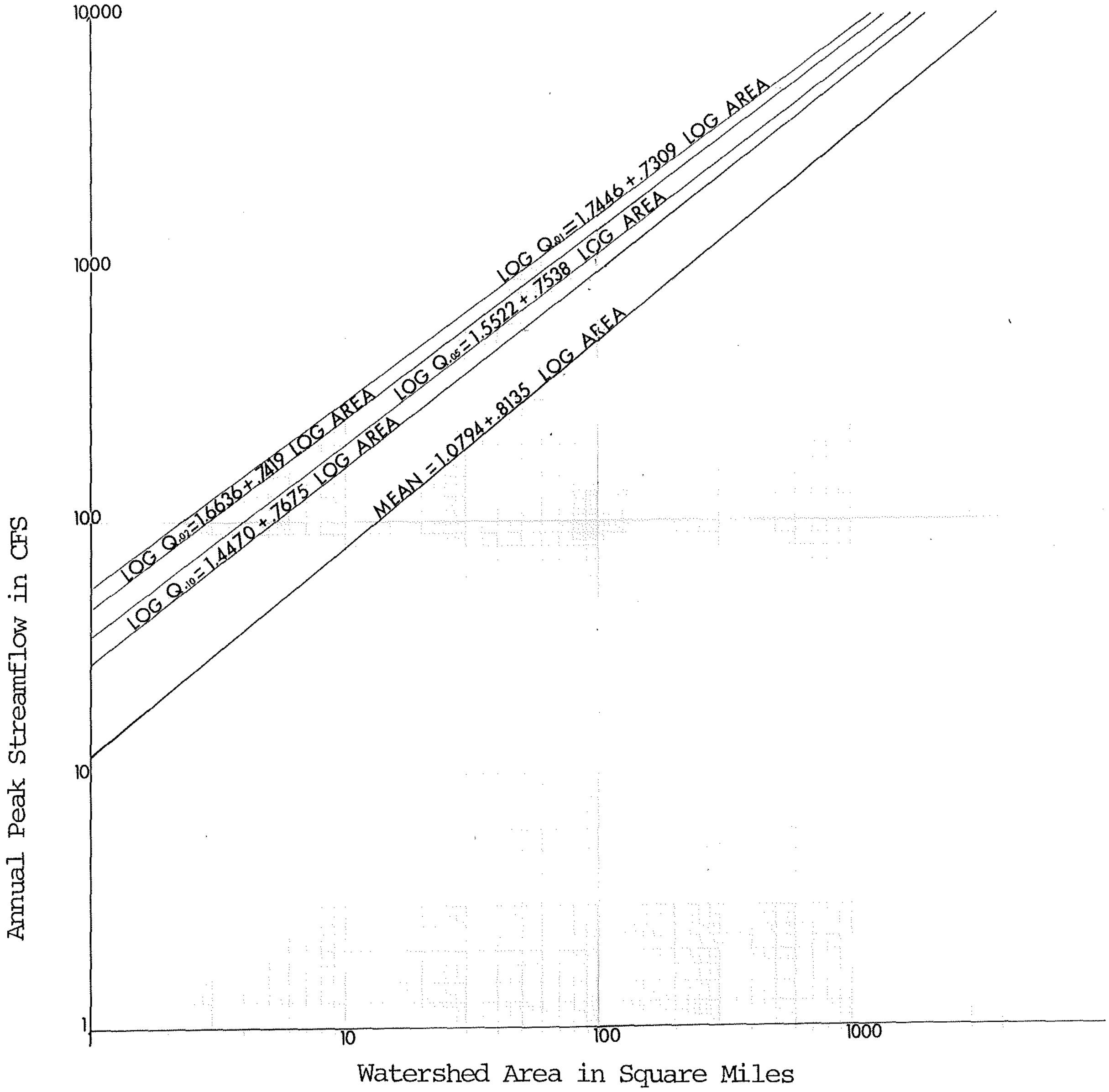

Figure 1. Regional relationships between watershed area and annual peak streamflow for .01, .02, .05, .10, and .50 exceedance frequencies, for the Copper-Nickel Study Area.

PART II

Low-Flow Frequency Analysis

The three different low-flow "periods" analyzed, were annual, winter, and summer. The winter period was between November 15 and May 31; the summer period ran from June 1 to November 14. One-day, seven-day, and thirty-day low-flow were computed for the whole year (annual) as well as for summer and winter periods.

Unlike the peak flow frequency analysis, low-flow curves were determined by the graphical method (Beard, 1962). This method simply involves assigning a plotting position to each flow according to its rank within the period of record. Once the points are plotted, a smooth curve is subjectively drawn through the points. Annual, winter, and summer frequency curves are presented in Appendices III, IV, and V, respectively.

For the regional analysis, prediction equations were developed for the .05 and .10 streamflow events for 1-day, 7-day, and 30-day low-flow for the annual, winter, and summer periods. The dependent variable was the $\log_{10}$ of the streamflow and the independent variable was the $\log_{10}$ of watershed area. Values less than or equal to .10cfs were all assigned $\log_{10}$ values of -1.000 since .10cfs was judged to be the minimum value that could be recorded at the gaging station.

The prediction equation developed using MULTREG (Weinberg, 1977) are summarized in Tables 3, 4, and 5 and are shown as curves in Figures 2, 3, 4, 5, 6, and 7. Fifteen of the nineteen stations in the study area were used to develop these equations. The Kawishiwi River near Winton was considered an outlier because of extensive regulation at low-flows and was, therefore, omitted from the analysis.

The annual precipation -- annual runoff volumes were not completed for this report. Precipitation analyses were not available to the authors.

Table 3. Prediction Equations for 1-day Low-Flows

Dependent Variable	Equation	R^2
Annual .10 (Log_{10})	$Y = -1.9304 + 1.2254 \log_{10}$ Area	.89
Annual .05 " "	$Y = -1.9358 + 1.1633 \log_{10}$ Area	.83
Summer .10 " "	$Y = -1.8843 + 1.2349 \log_{10}$ Area	.88
Summer .05 " "	$Y = -1.9133 + 1.1788 \log_{10}$ Area	.82
Winter .10 " "	$Y = -1.7425 + 1.2146 \log_{10}$ Area	.95
Winter .05 " "	$Y = -1.8384 + 1.2004 \log_{10}$ Area	.94

Table 4. Prediction Equations for 7-day Low-Flow

Dependent Variable	Equation	R^2
Annual .10 (Log_{10})	$Y = -1.9320 + 1.2479 \log_{10}$ Area	.92
Annual .05 " "	$Y = -1.9336 + 1.1951 \log_{10}$ Area	.89
Summer .10 " "	$Y = -1.8681 + 1.2607 \log_{10}$ Area	.90
Summer .05 " "	$Y = -1.8771 + 1.2010 \log_{10}$ Area	.85
Winter .10 " "	$Y = -1.7118 + 1.2114 \log_{10}$ Area	.94
Winter .05 " "	$Y = -1.7939 + 1.1972 \log_{10}$ Area	.94

Table 5. Prediction Equations for 30-day Low-Flows

Dependent Variable	Equation	R^2
Annual .10 (Log_{10})	$Y = -1.7768 + 1.2204 \log_{10}$ Area	.94
Annual .05 " "	$Y = -1.8842 + 1.2091 \log_{10}$ Area	.92
Summer .10 " "	$Y = -1.5180 + 1.1649 \log_{10}$ Area	.90
Summer .05 " "	$Y = -1.6279 + 1.1531 \log_{10}$ Area	.86
Winter .10 " "	$Y = -1.6891 + 1.2198 \log_{10}$ Area	.94
Winter .05 " "	$Y = -1.7619 + 1.2036 \log_{10}$ Area	.94

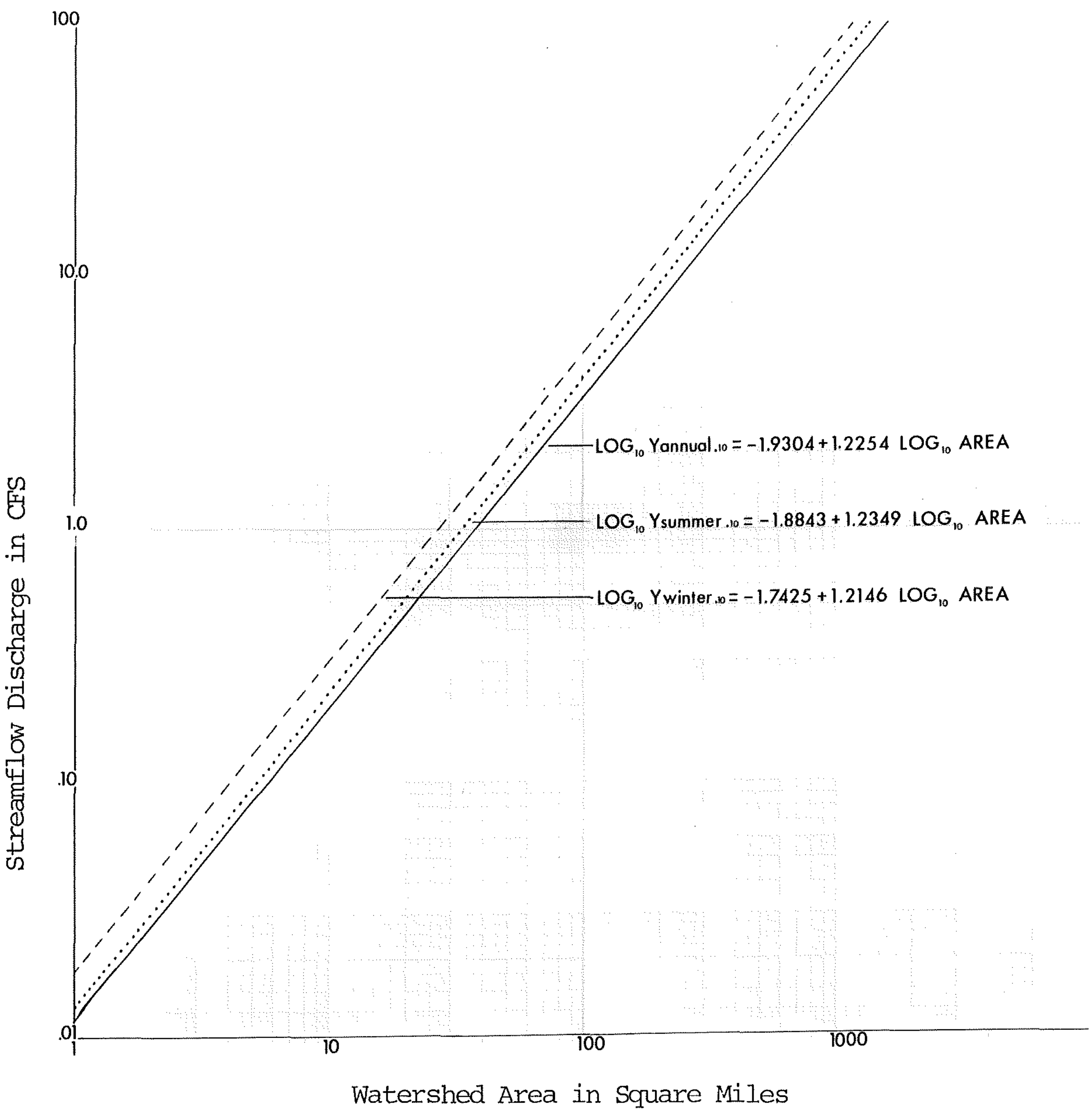

Figure 2. One-day low-flow discharge with 0.10 non-exceedance frequency versus watershed area for Copper-Nickel Study Area.

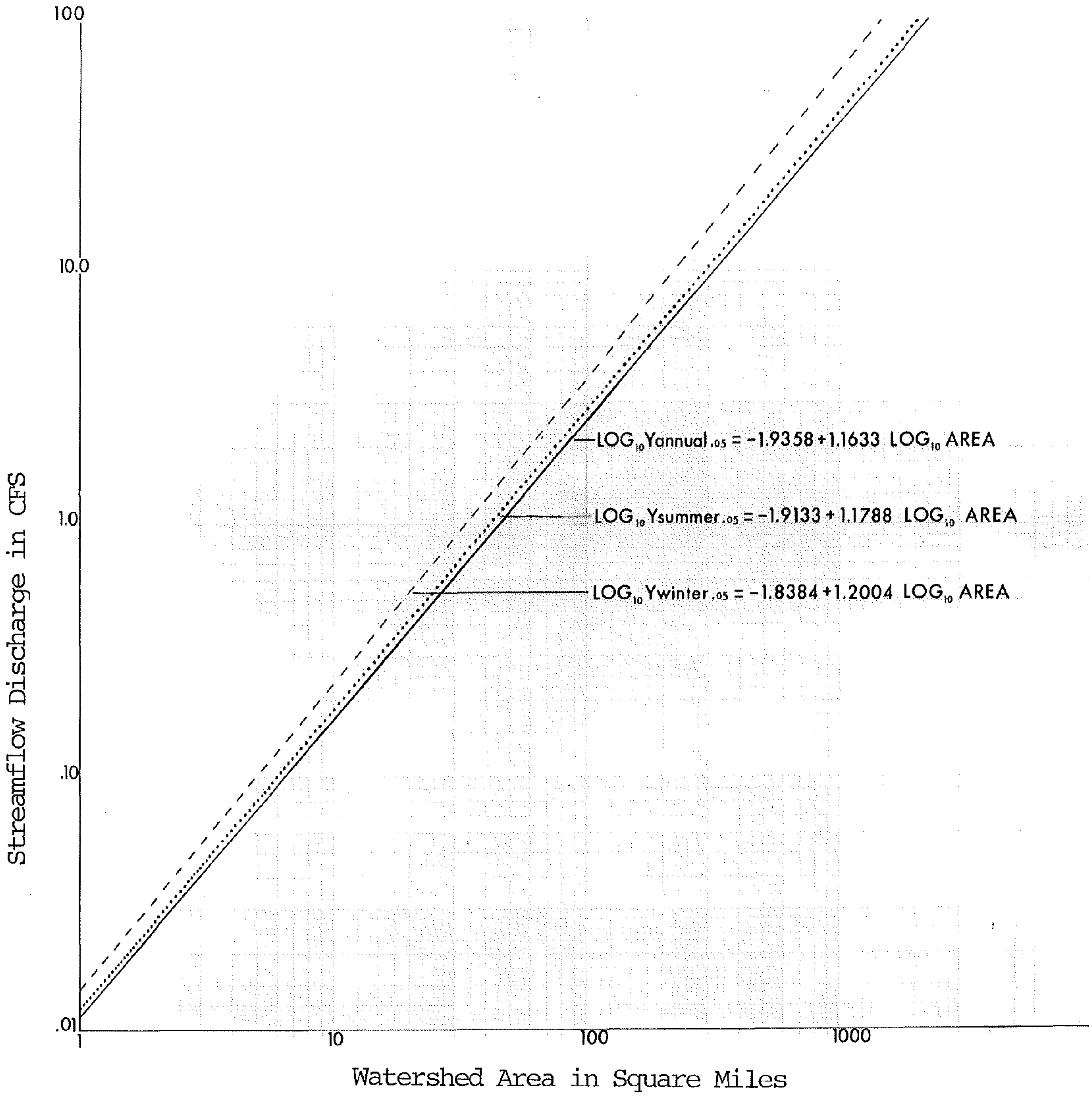

Figure 3. One-day low-flow discharge with 0.05 non-exceedance frequency versus watershed area for Copper-Nickel Study Area.

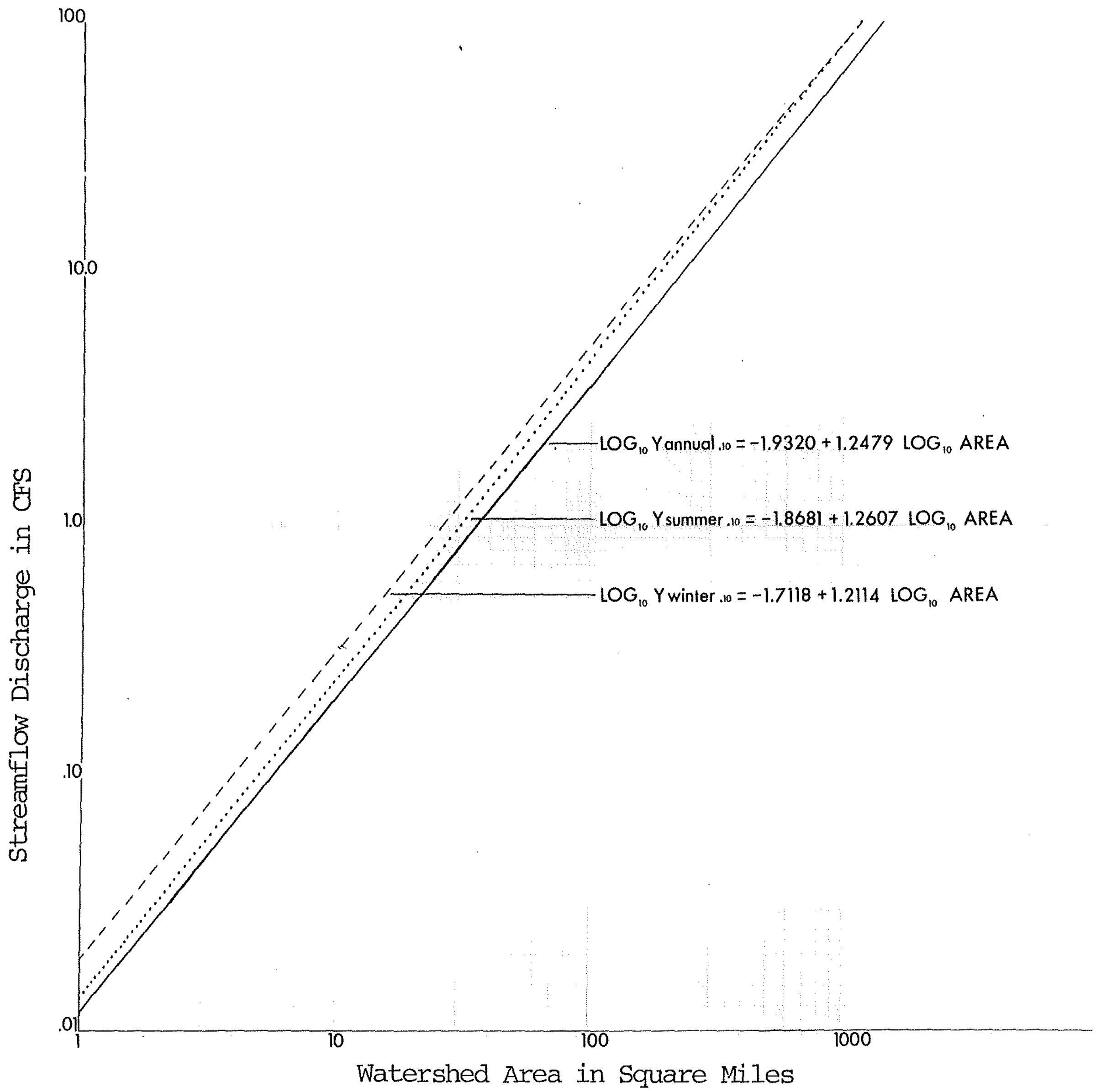

Figure 4. Seven-day low-flow discharge with 0.10 non-exceedance frequency versus watershed area for Copper-Nickel Study Area.

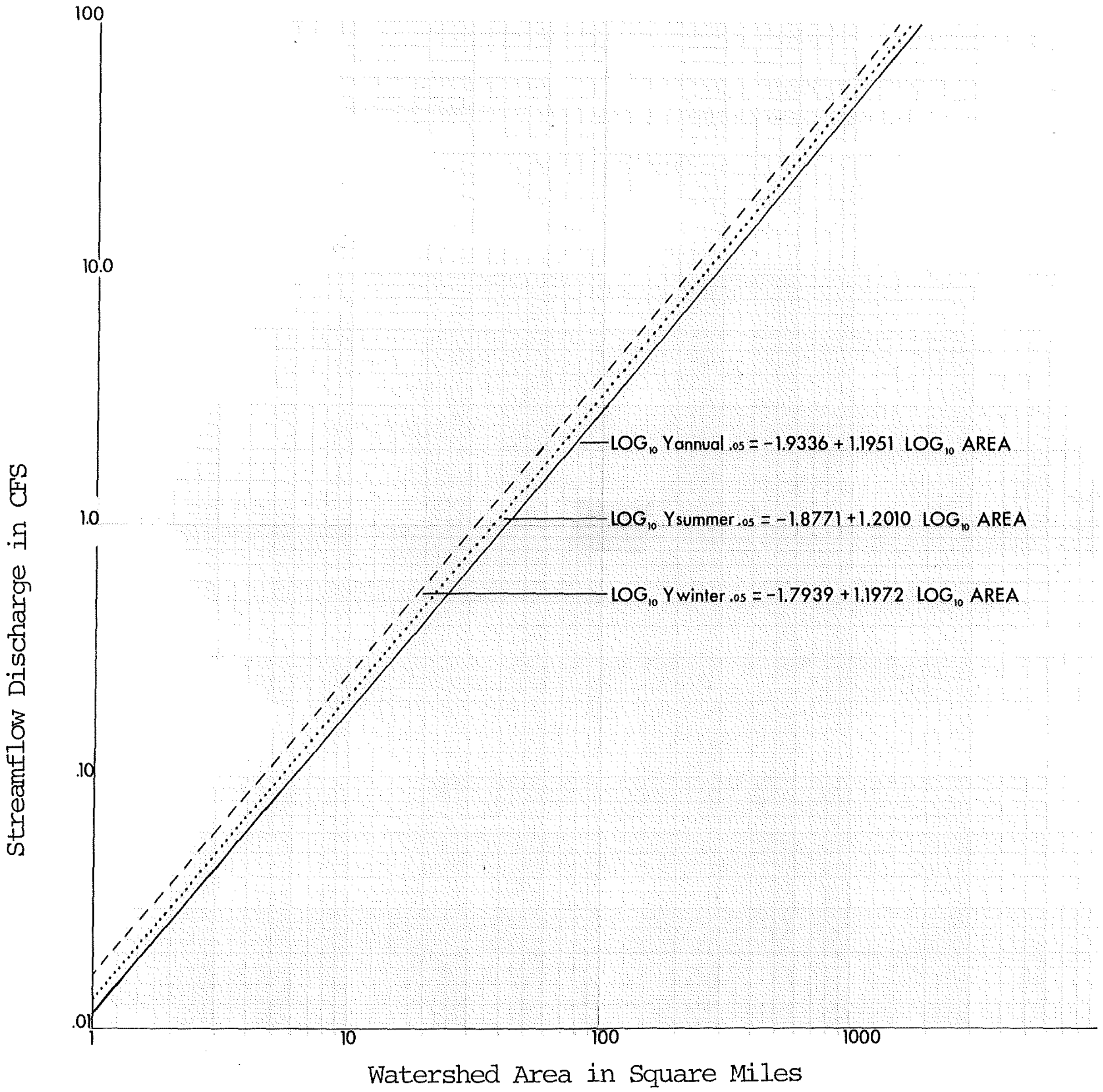

Figure 5. Seven-day low-flow discharge with 0.05 non-exceedance frequency versus watershed area for Copper-Nickel Study Area.

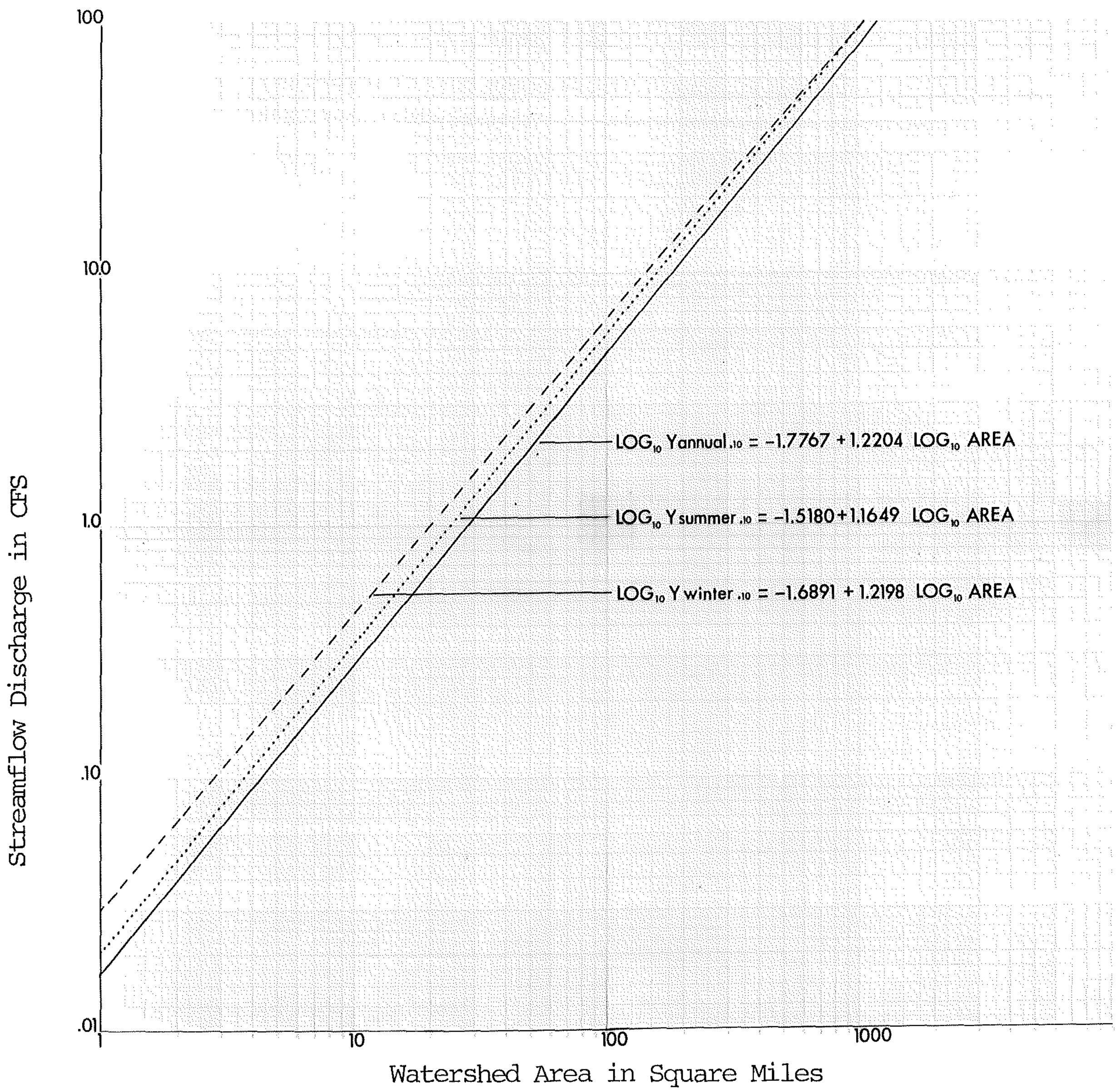

Figure 6. Thirty-day low-flow discharge with 0.10 non-exceedance frequency versus watershed area for Copper-Nickel Study Area.

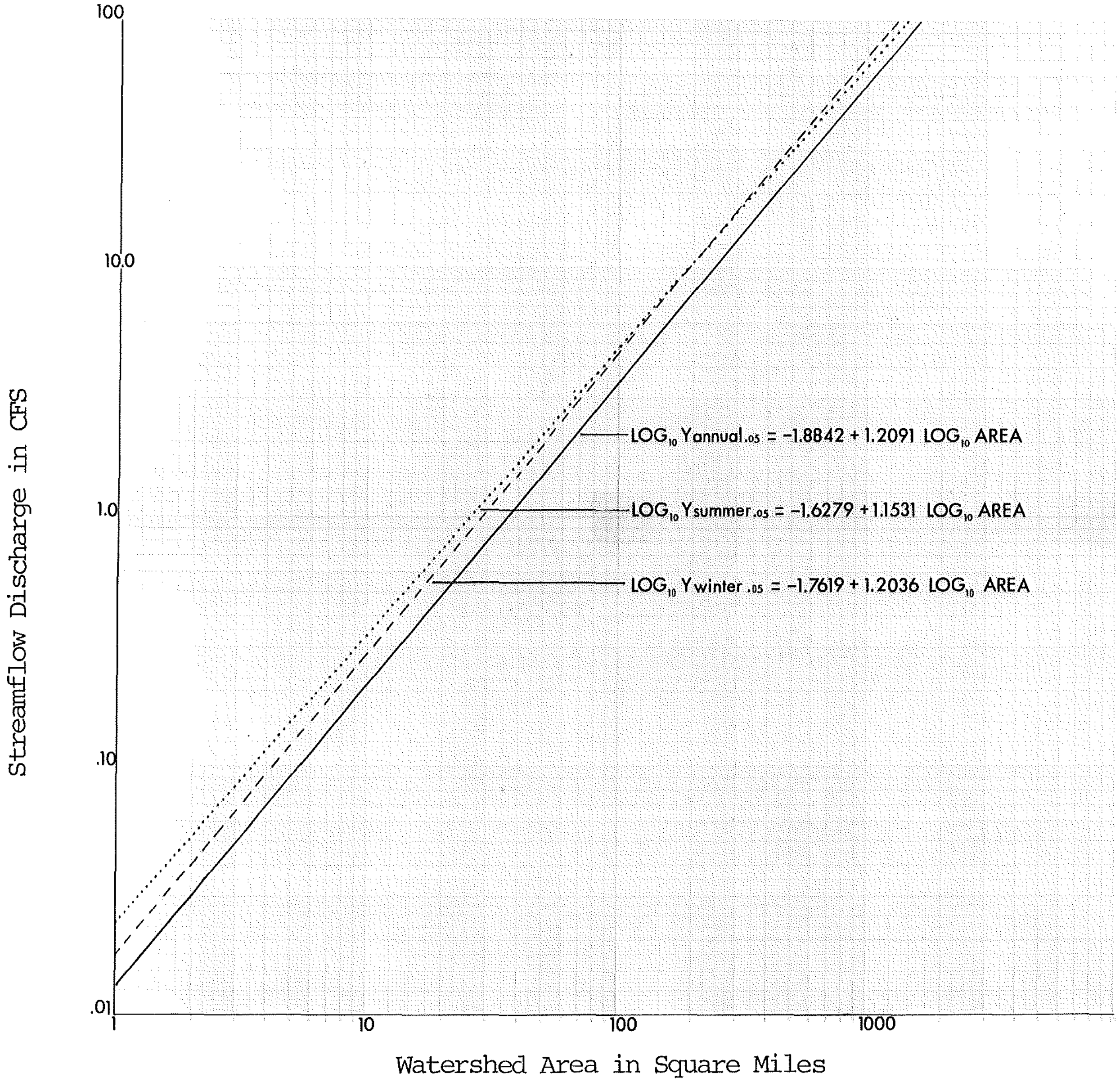

Figure 7. Thirty-day low-flow discharge with 0.05 non-exceedance frequency versus watershed area for Copper-Nickel Study Area.

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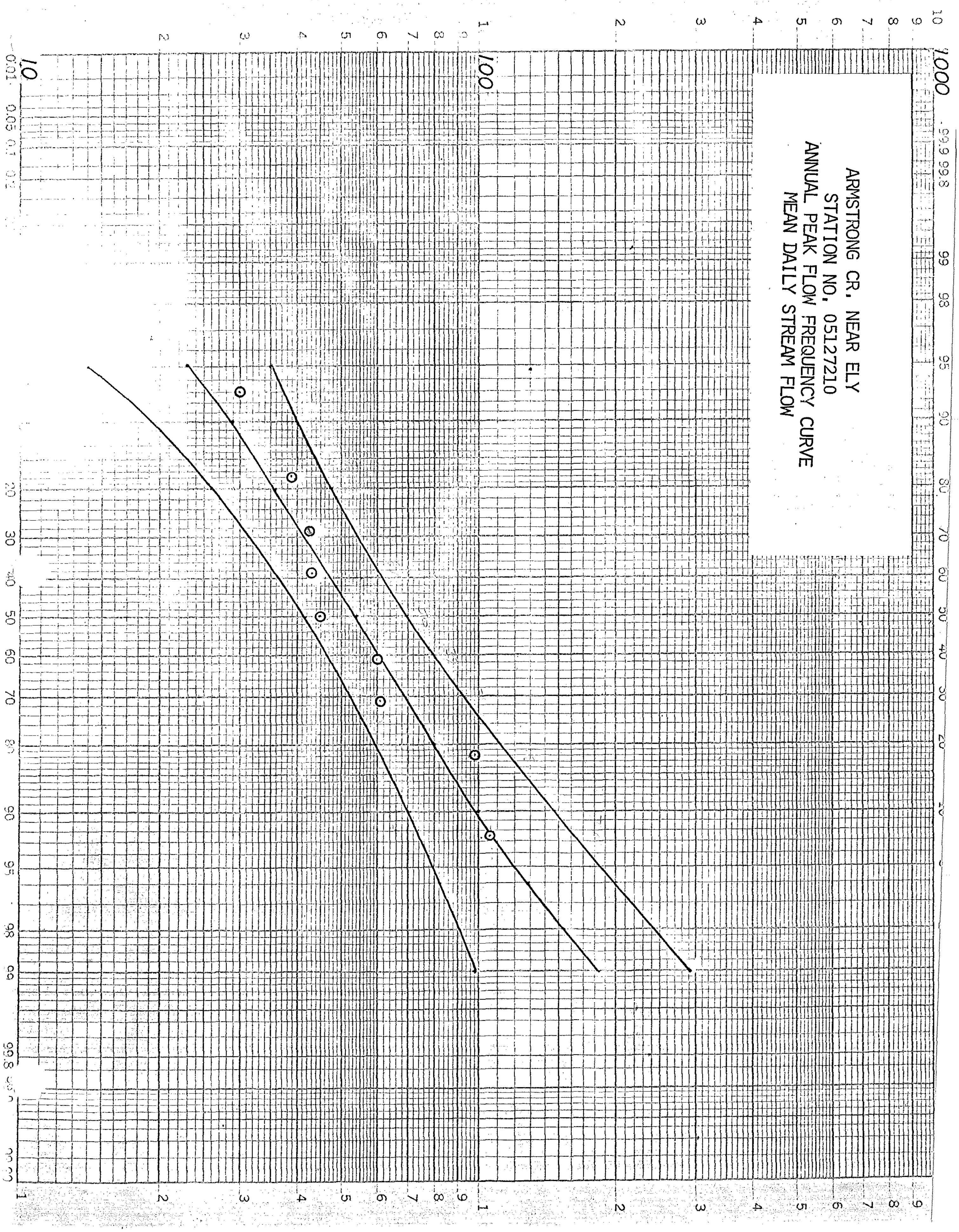
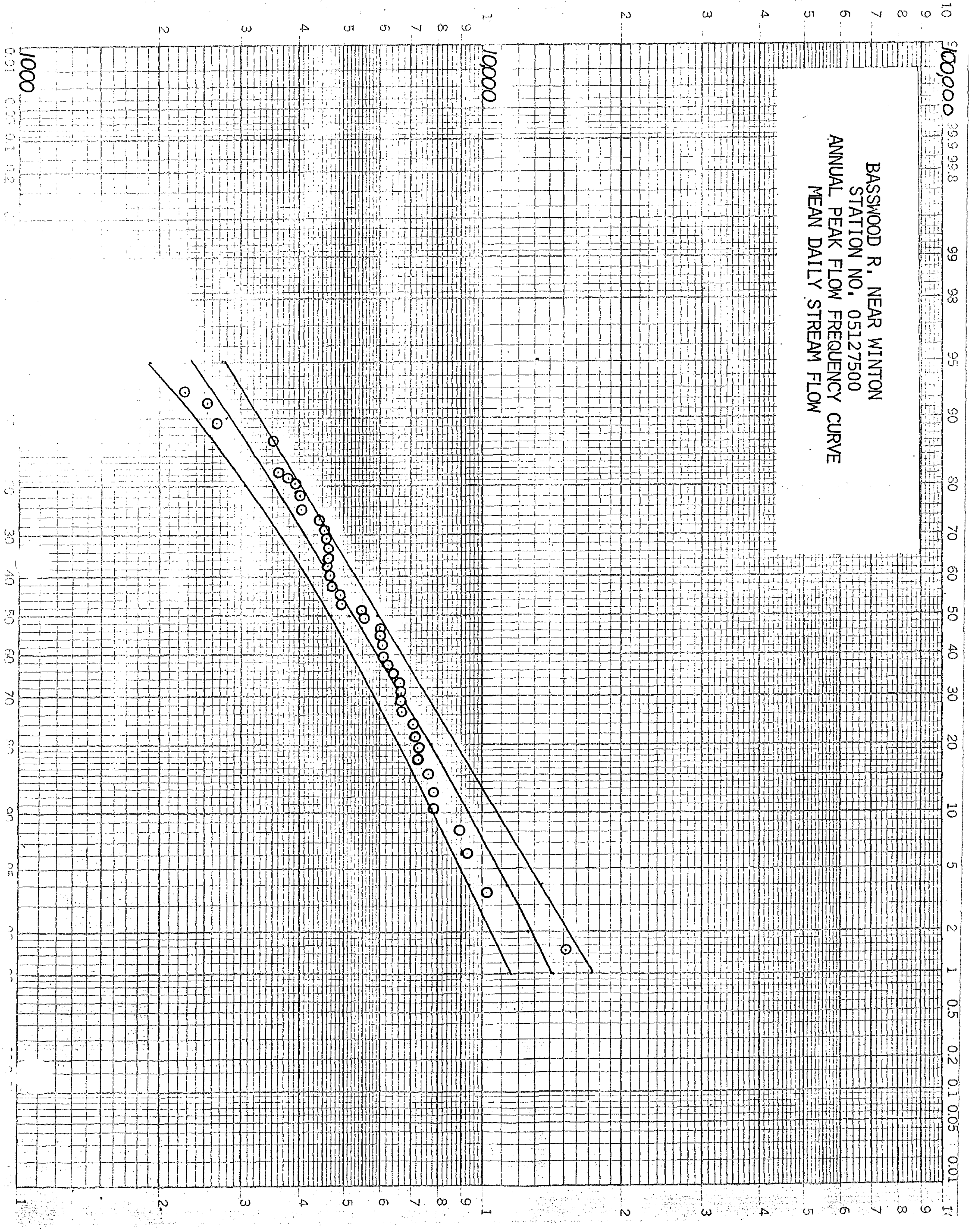
APPENDIX I

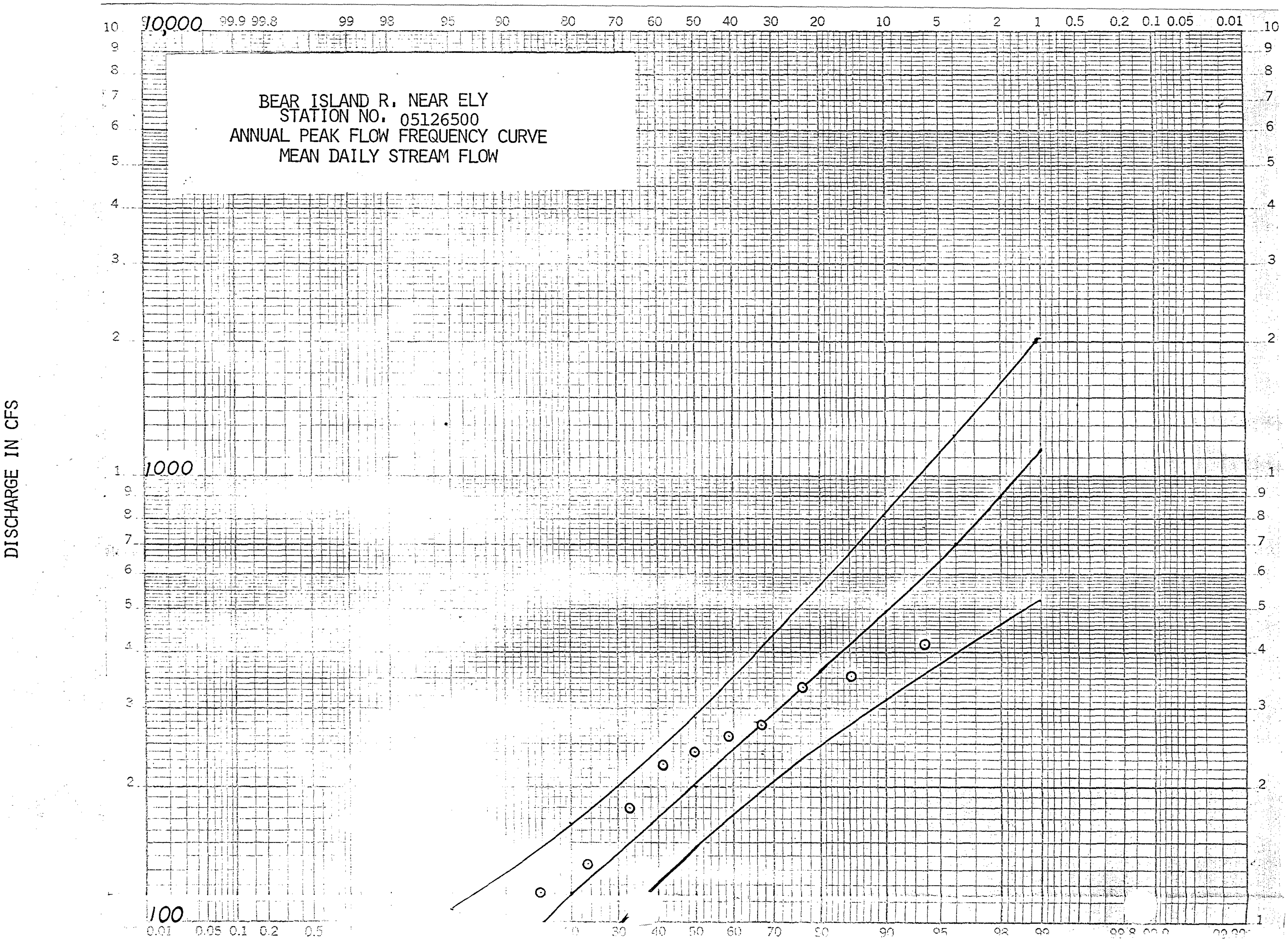
Annual Peak Discharge Frequency Curves for Stations in Copper-Nickel Study Area

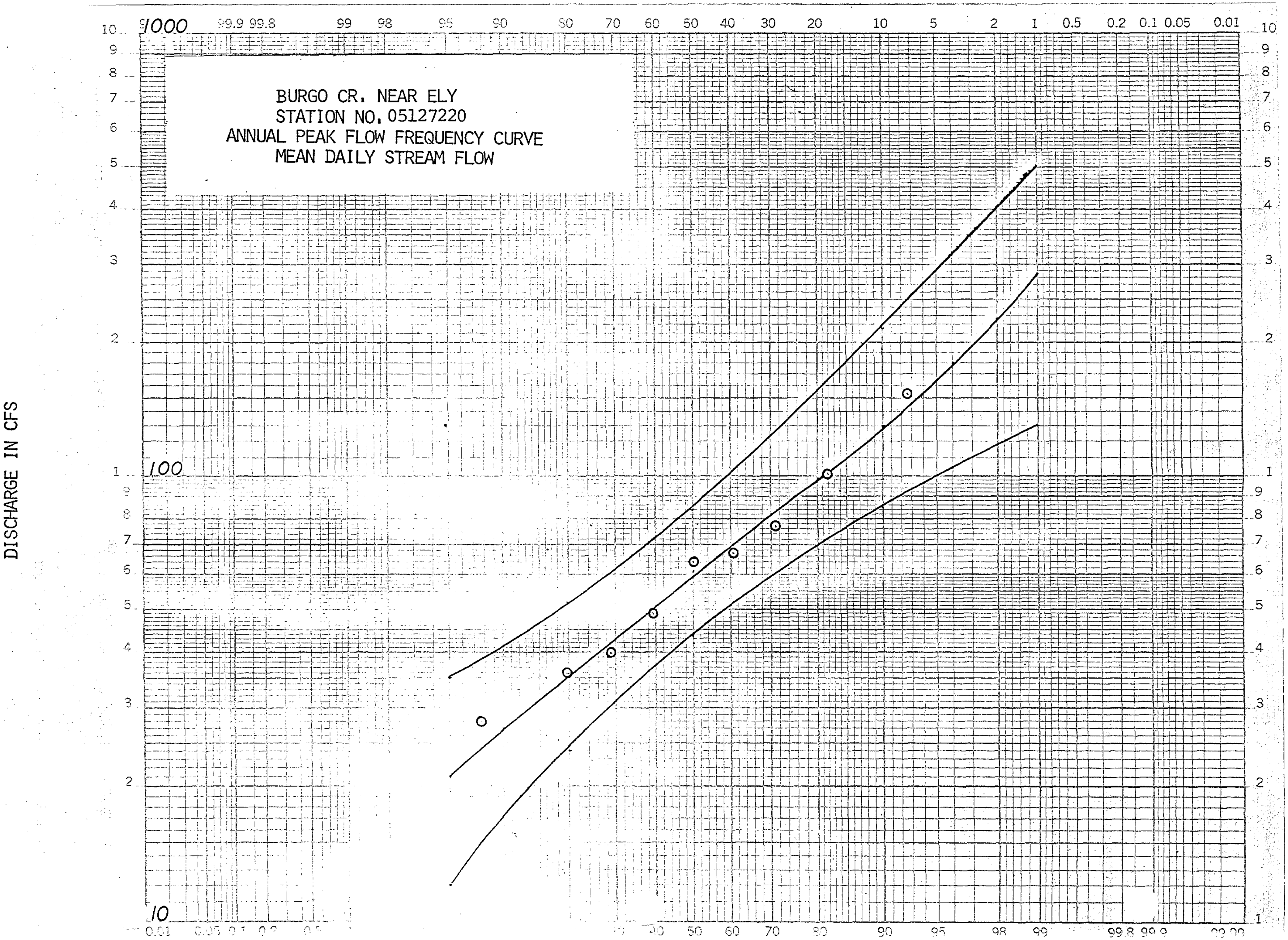
DISCHARGE IN CFS

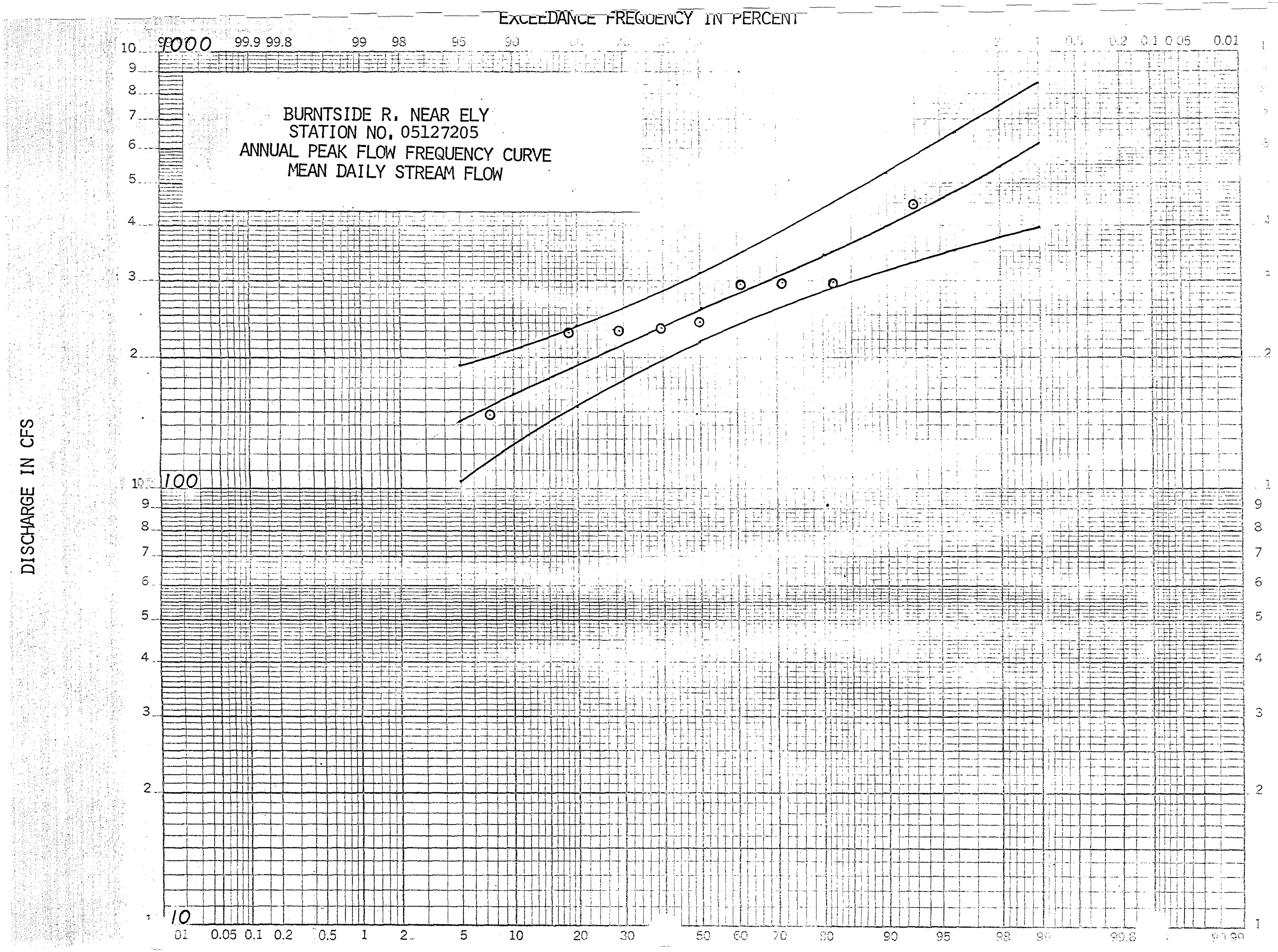


DISCHARGE IN CFS

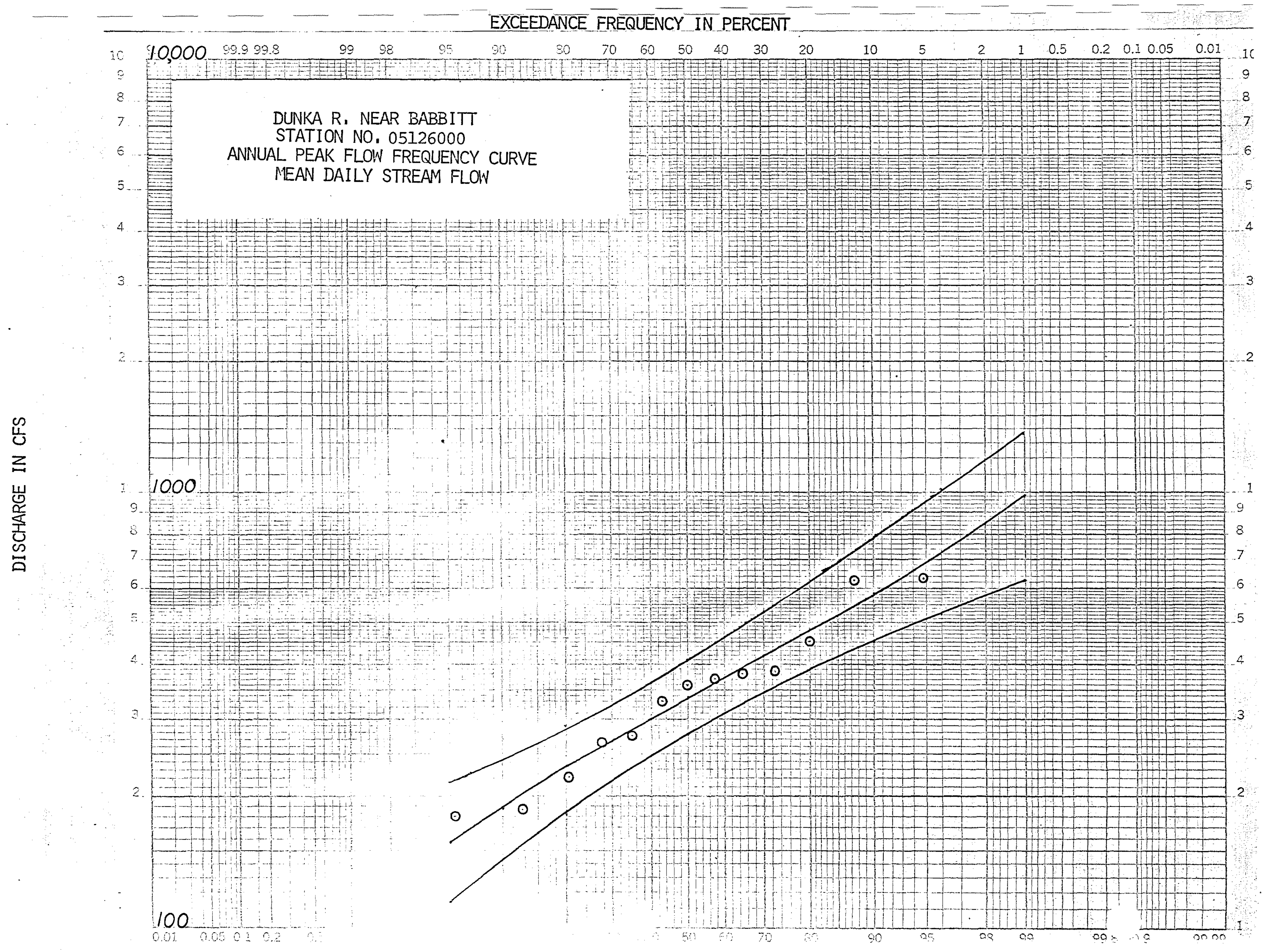



BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100

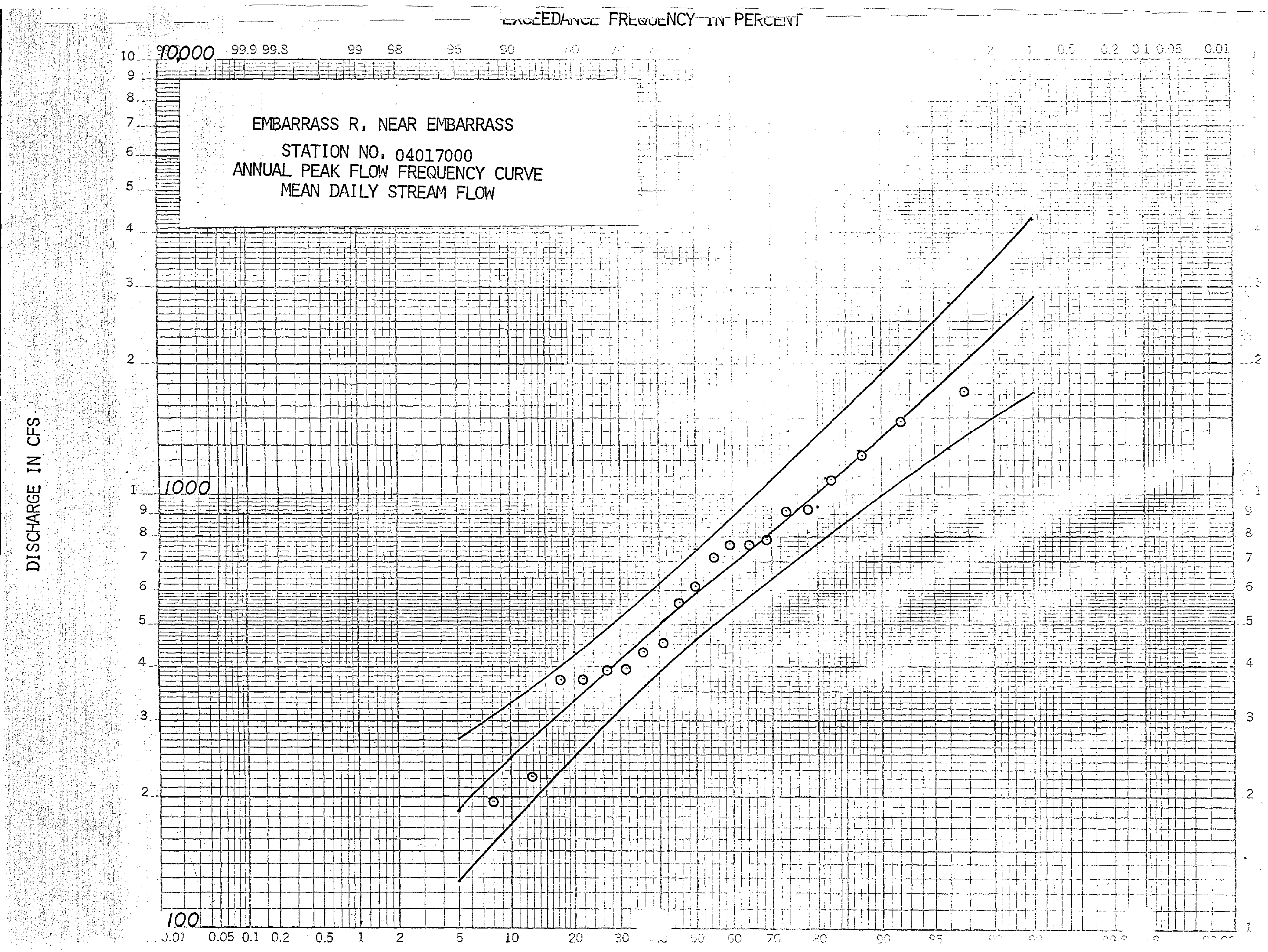

BURGO CR. NEAR ELY
STATION NO. 05127220
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
1000
100
10

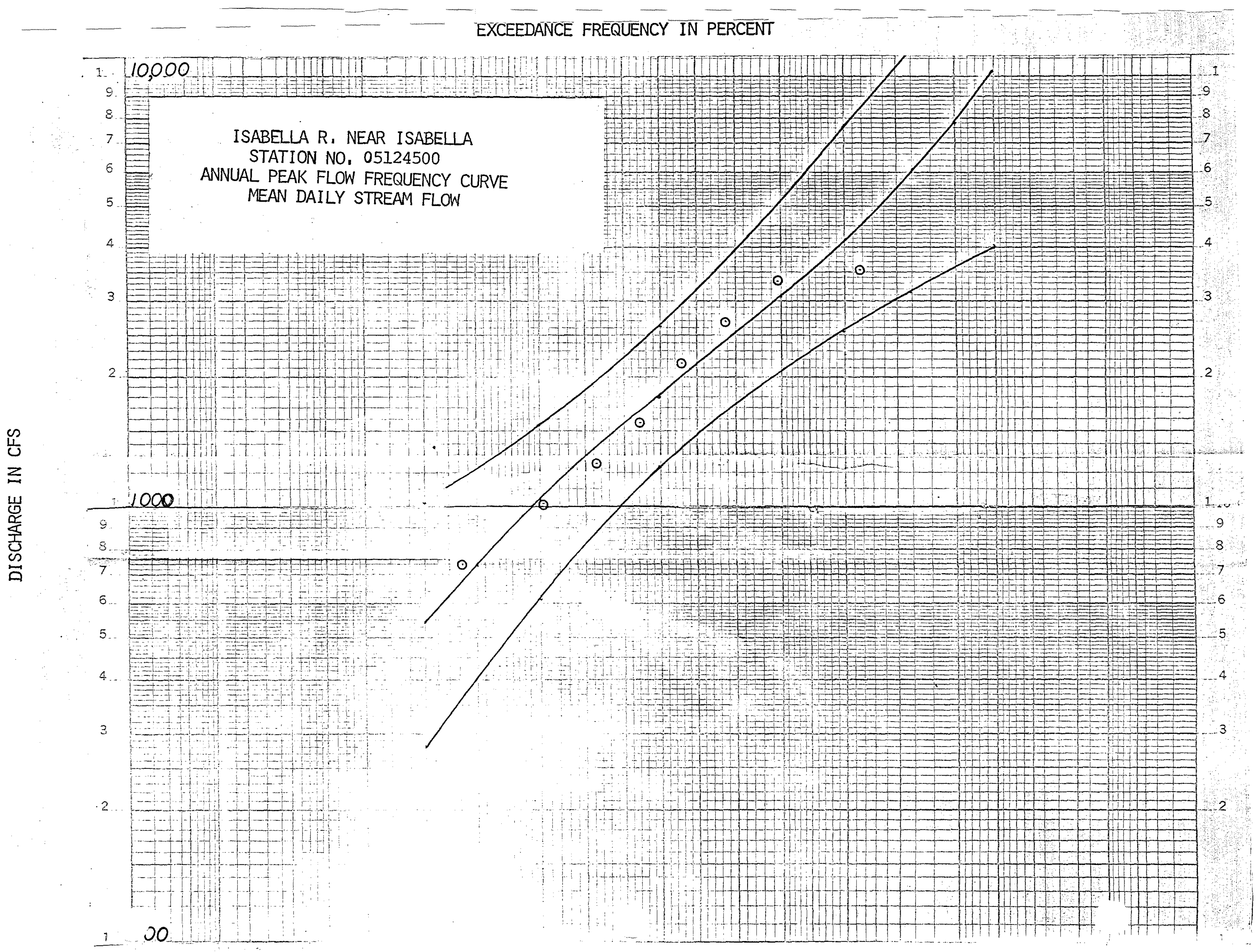


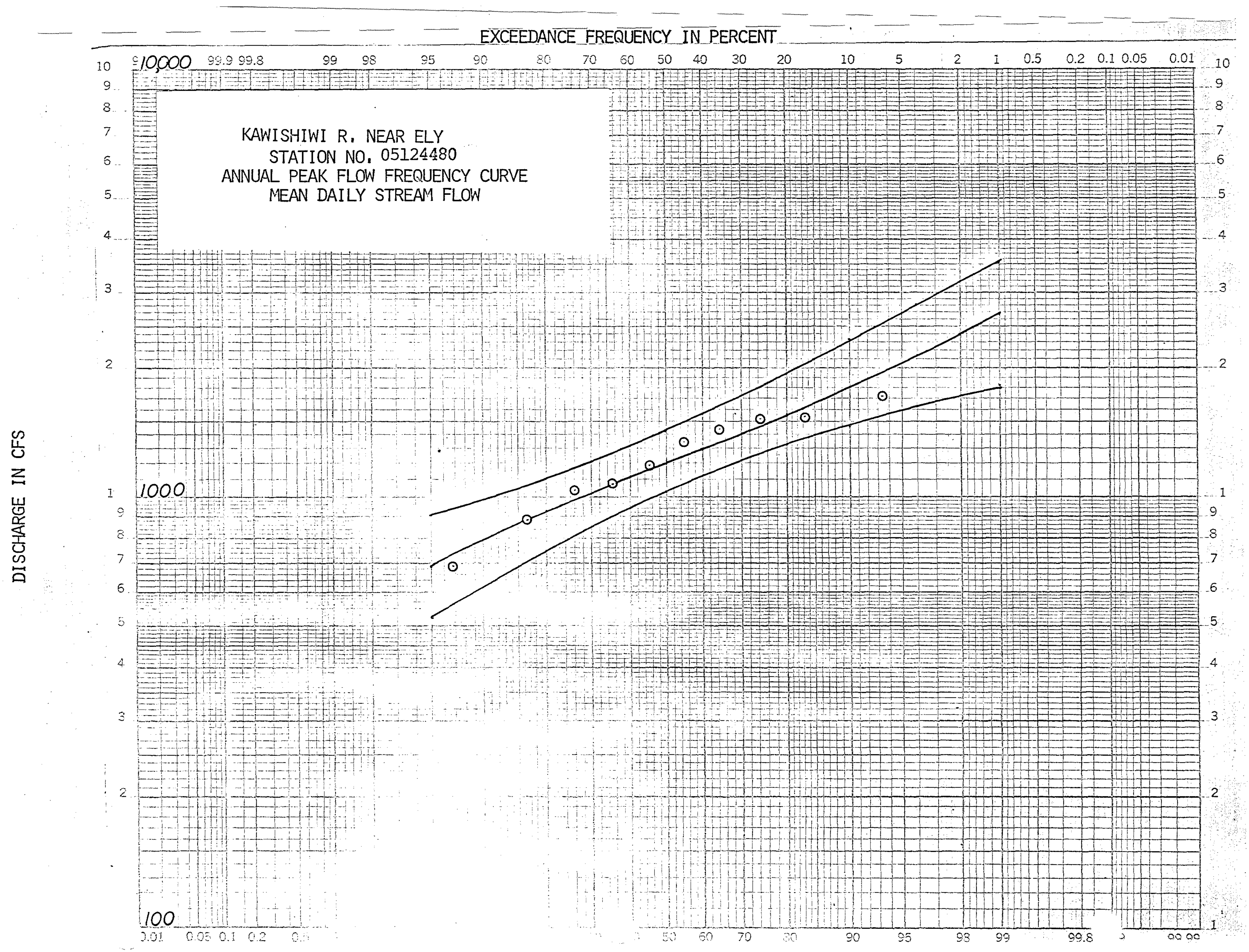
EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
1000
100
10

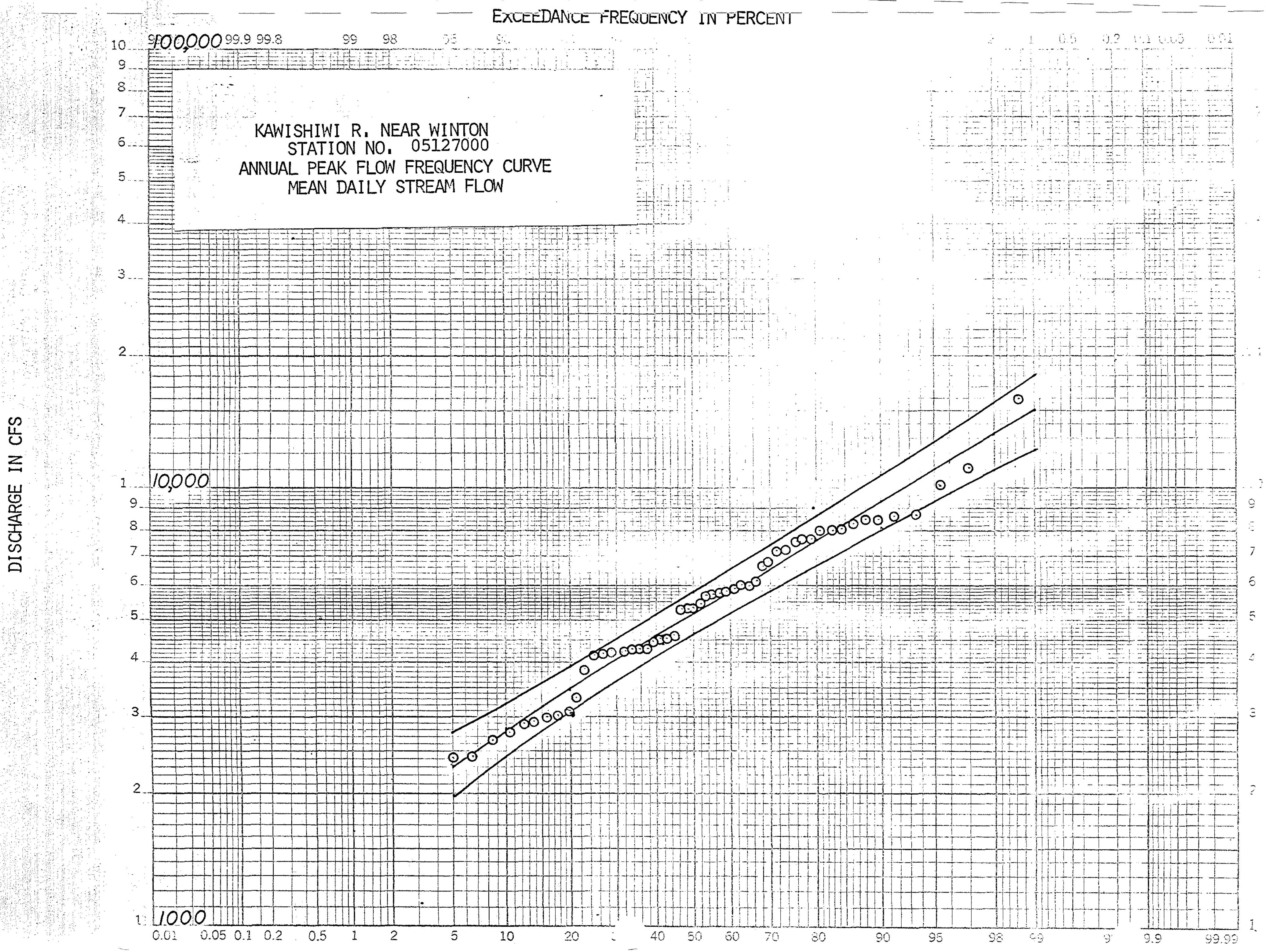


EXCEEDANCE FREQUENCY IN PERCENT
DUNKA R. NEAR BABBITT
STATION NO. 05126000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100


EXCEEDANCE FREQUENCY IN PERCENT
EMBARRASS R. NEAR EMBARRASS
STATION NO. 04017000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100


EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
00


EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10000
1000
100


EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR WINTON
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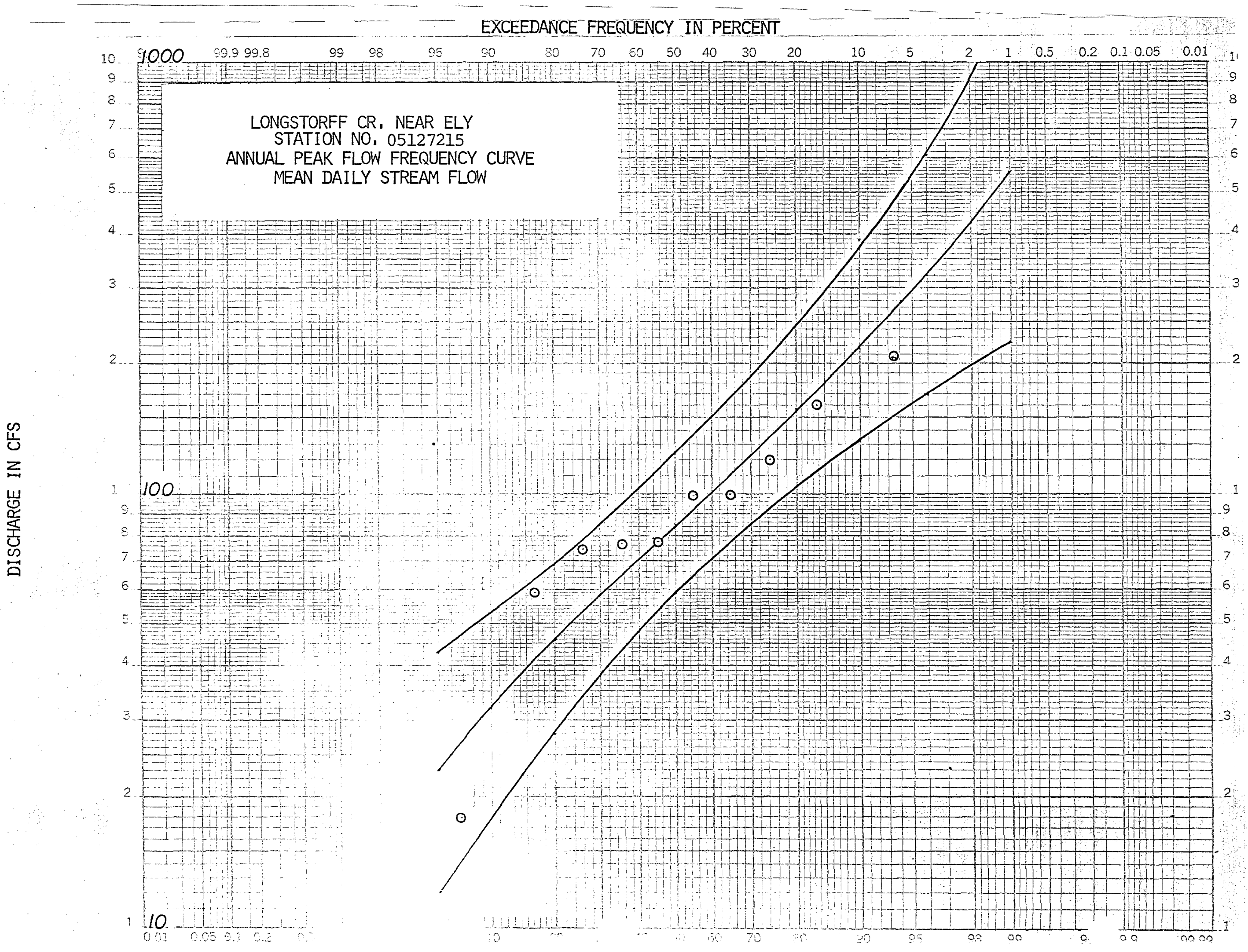
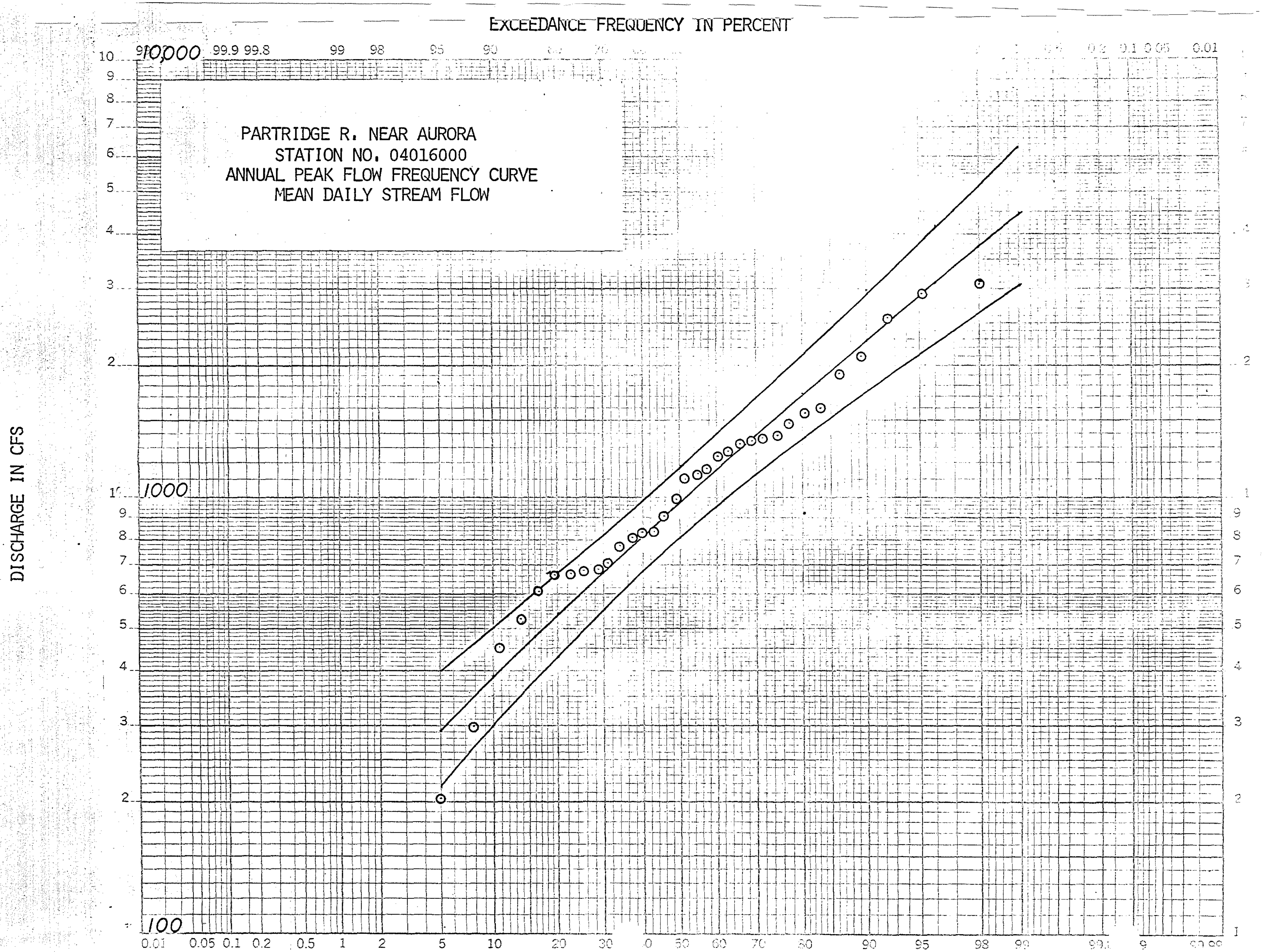
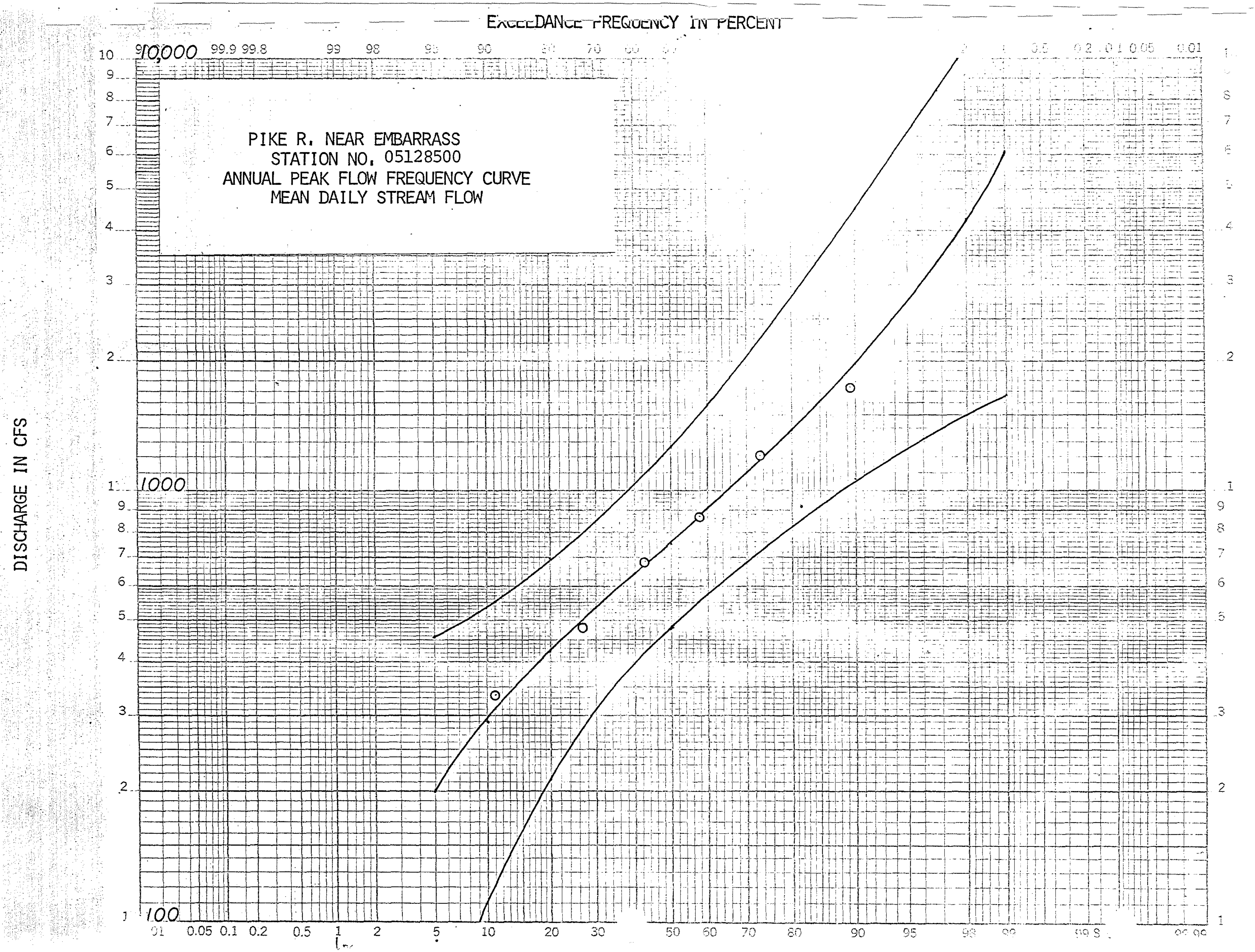
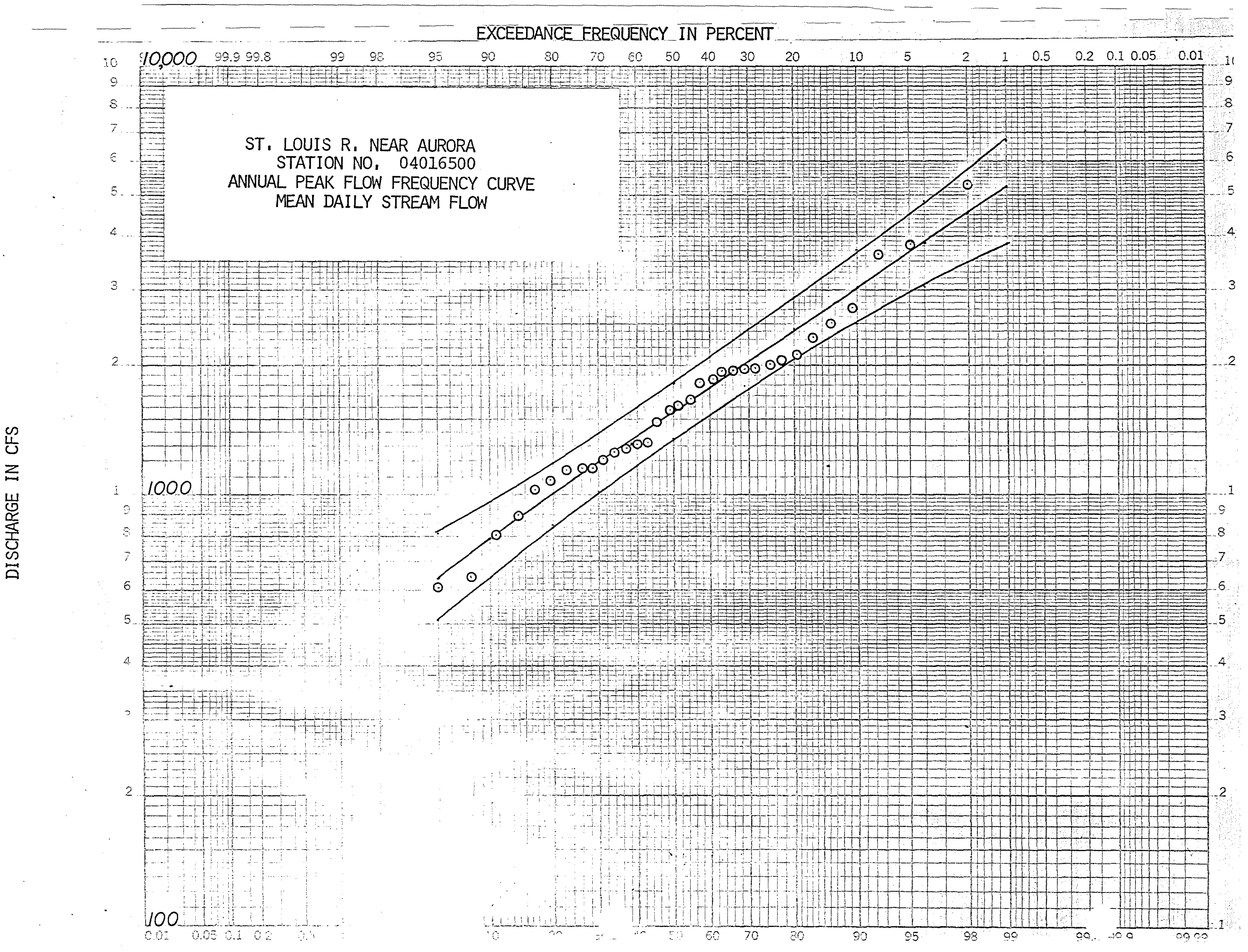
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
100,000
10,000
1000

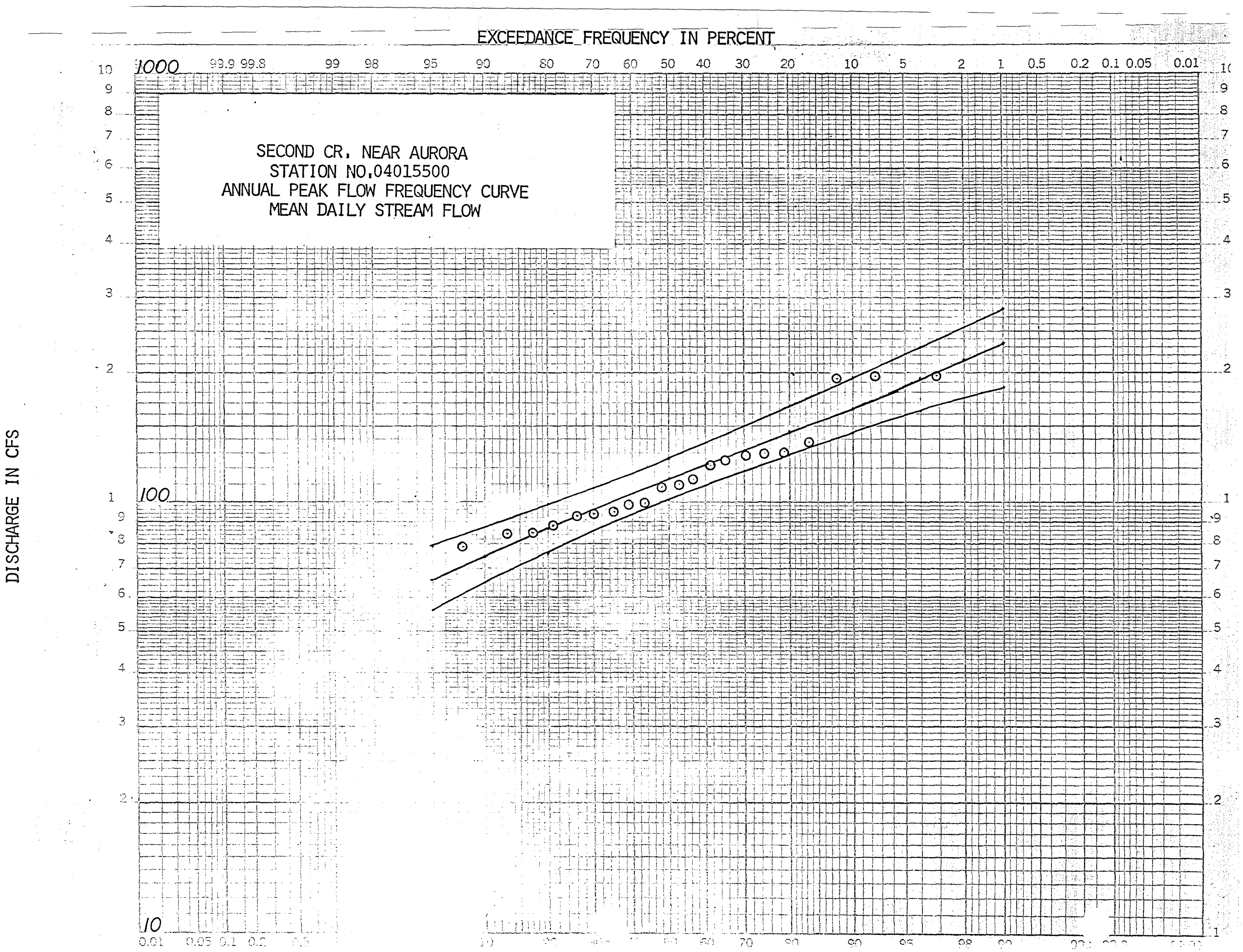


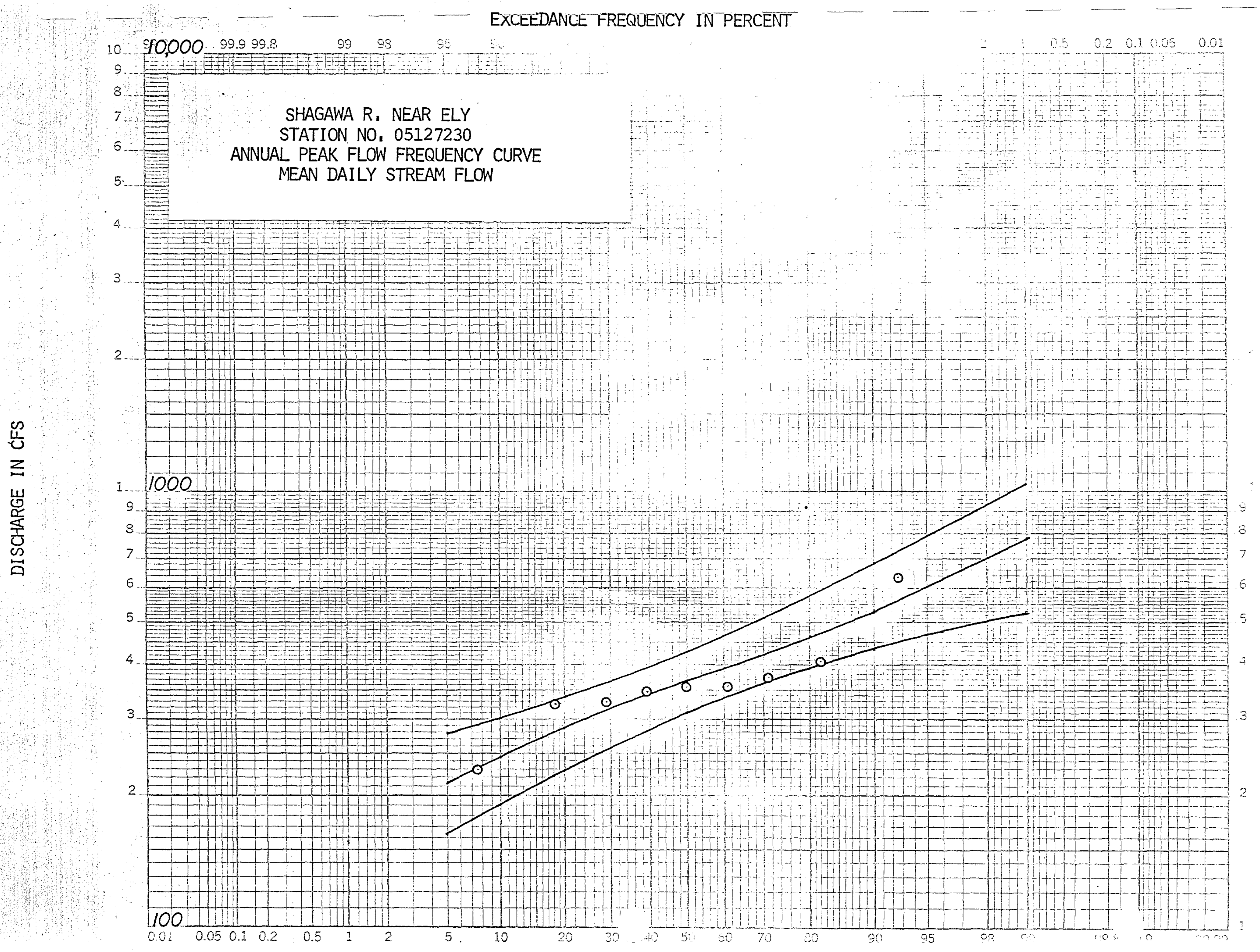
EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
1000
100
10
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01


EXCEEDANCE FREQUENCY IN PERCENT
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10000
1000
100

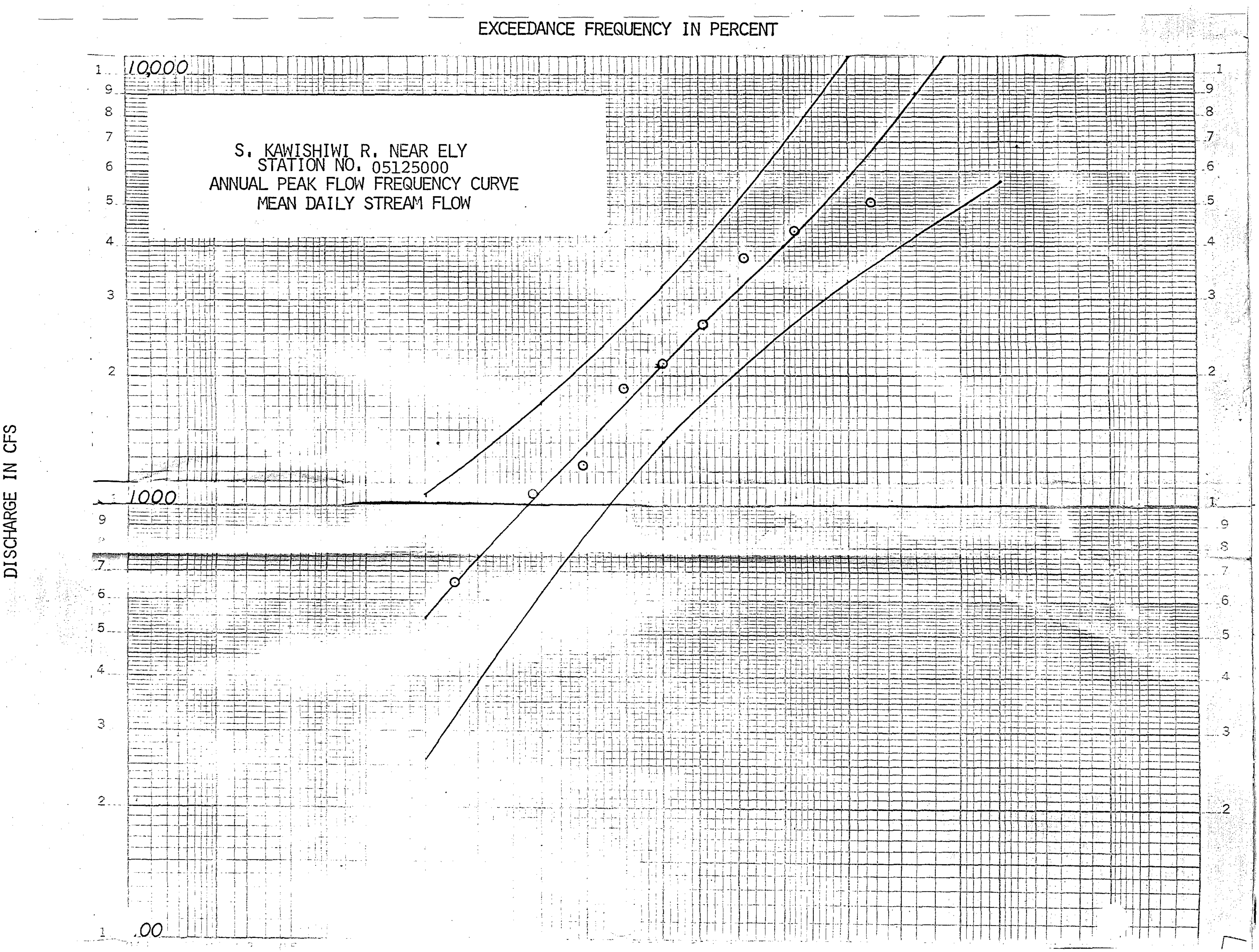

EXCEEDANCE FREQUENCY IN PERCENT
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100


EXCEEDANCE FREQUENCY IN PERCENT
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100

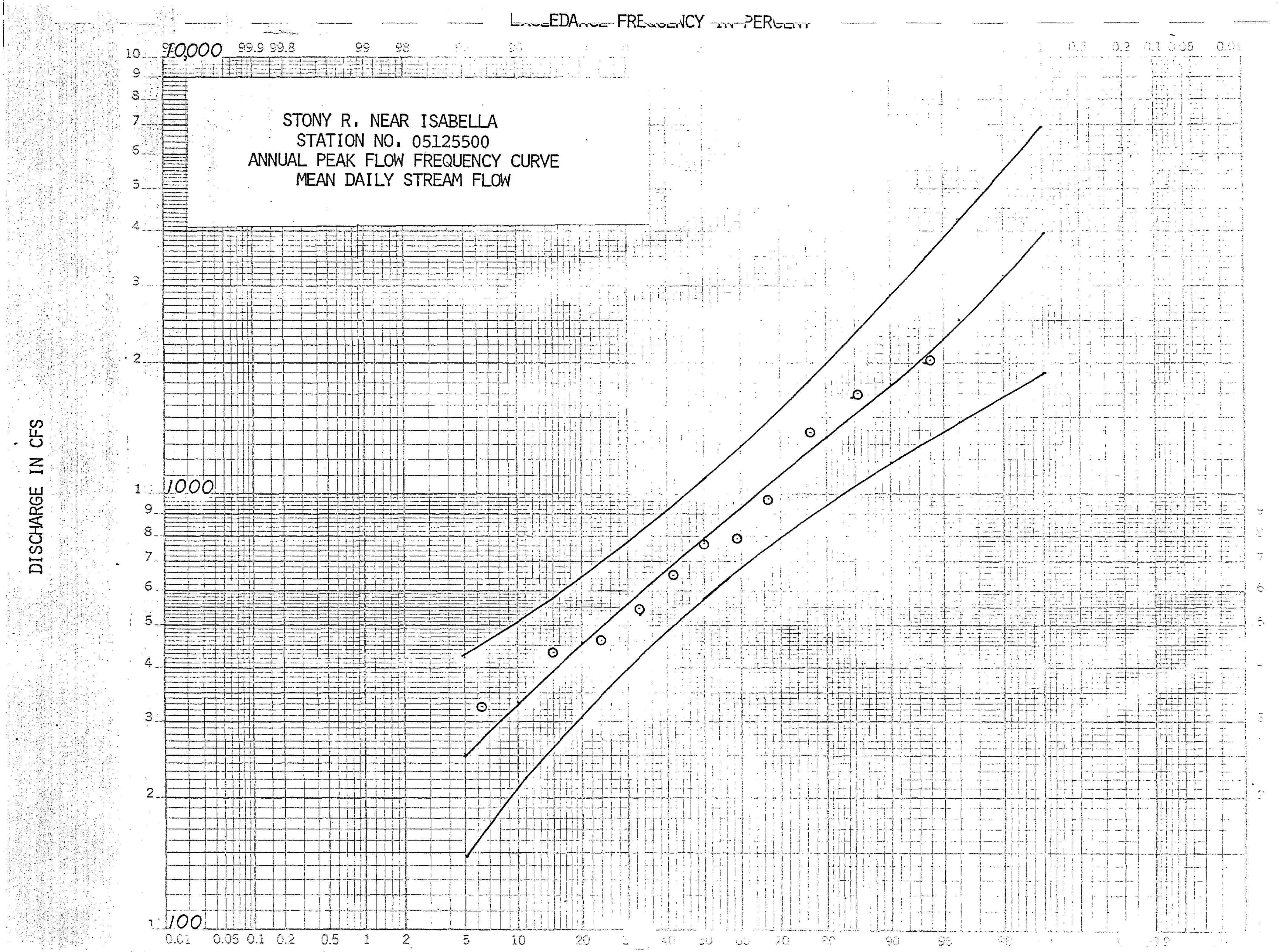

SECOND CR. NEAR AURORA
STATION NO.04015500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
1000
100
10
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01



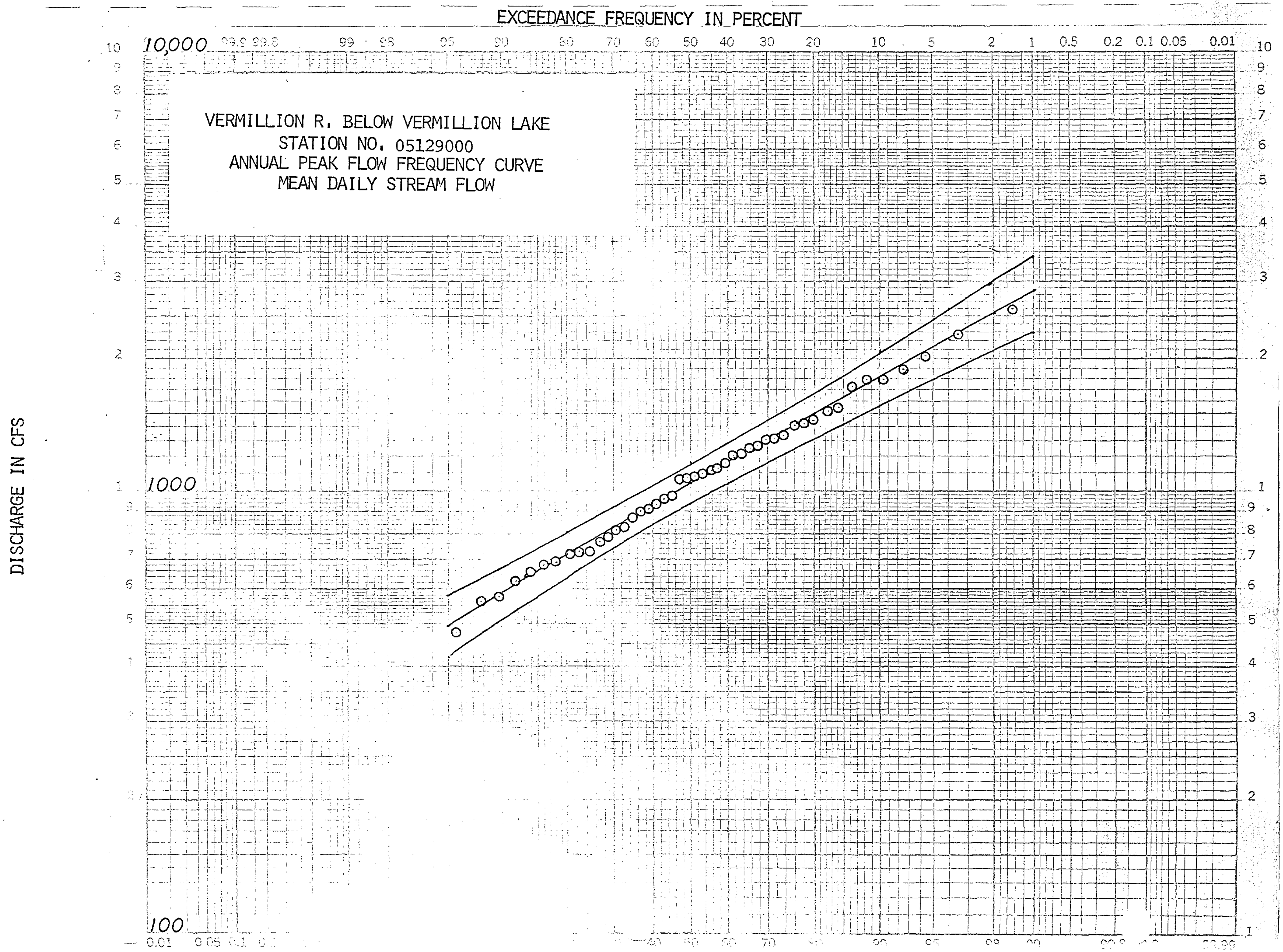
EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100



EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
10,000
1000
.00

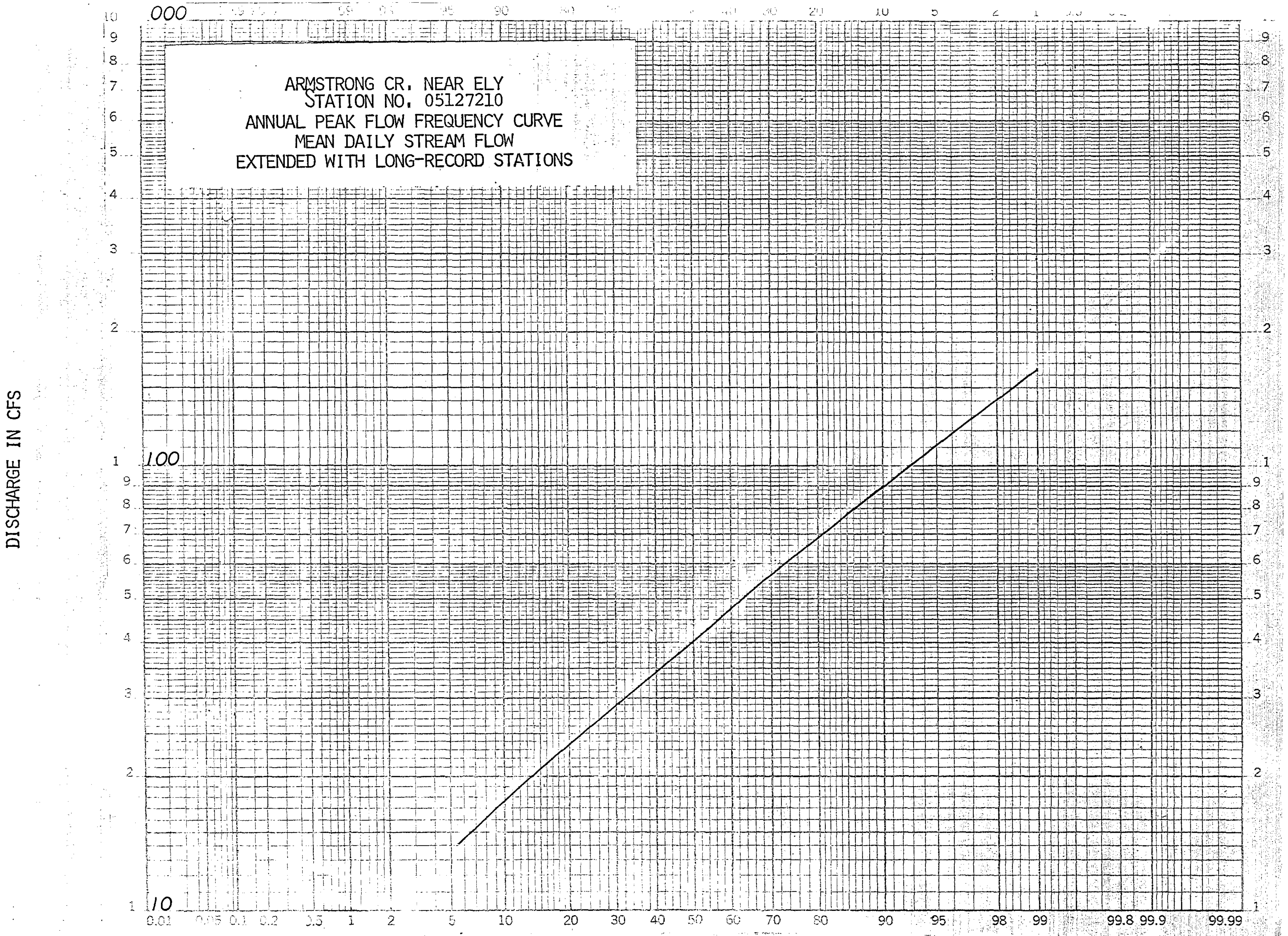


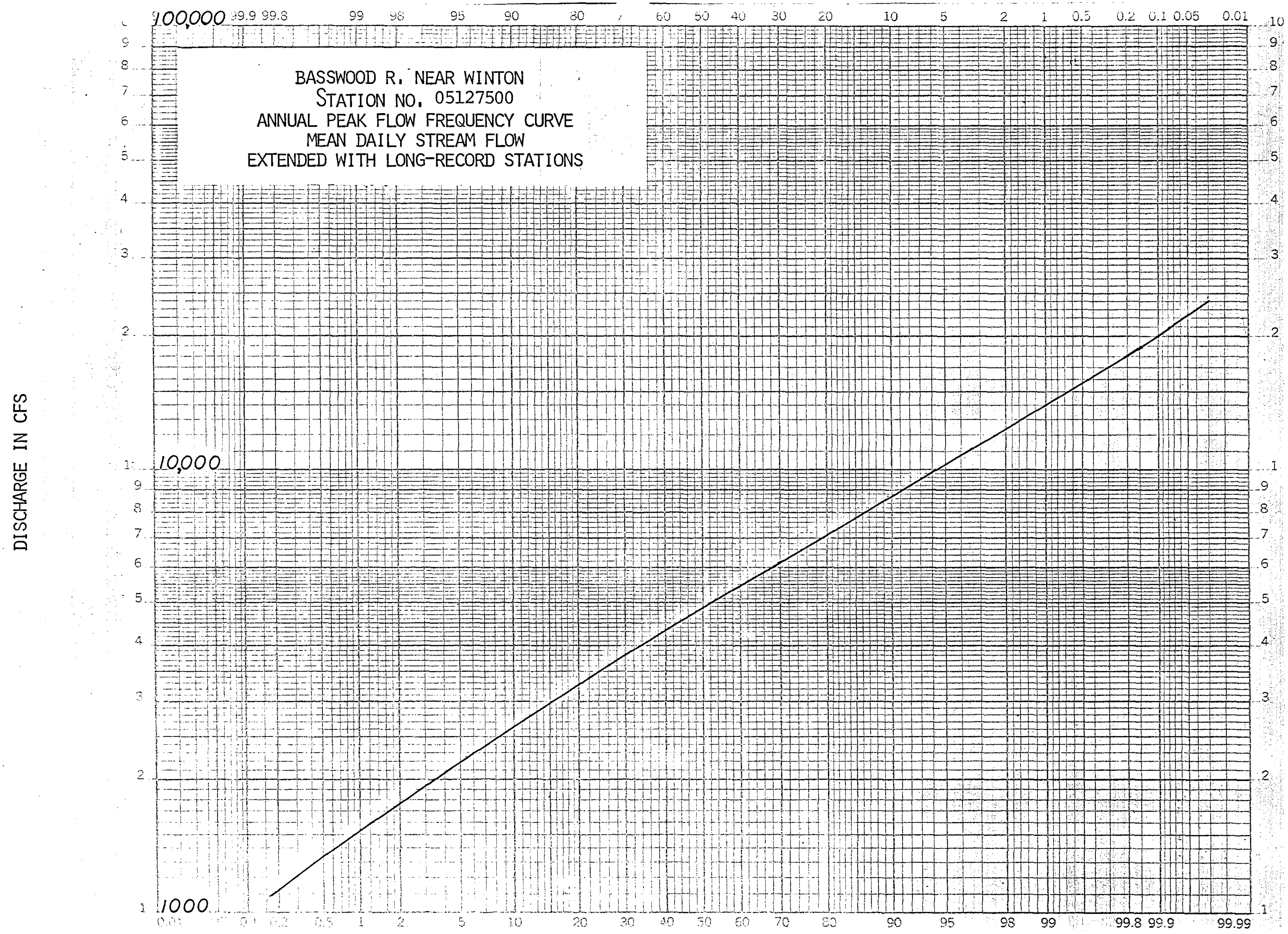
EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO. 05125500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100


EXCEEDANCE FREQUENCY IN PERCENT
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
DISCHARGE IN CFS
10,000
1000
100

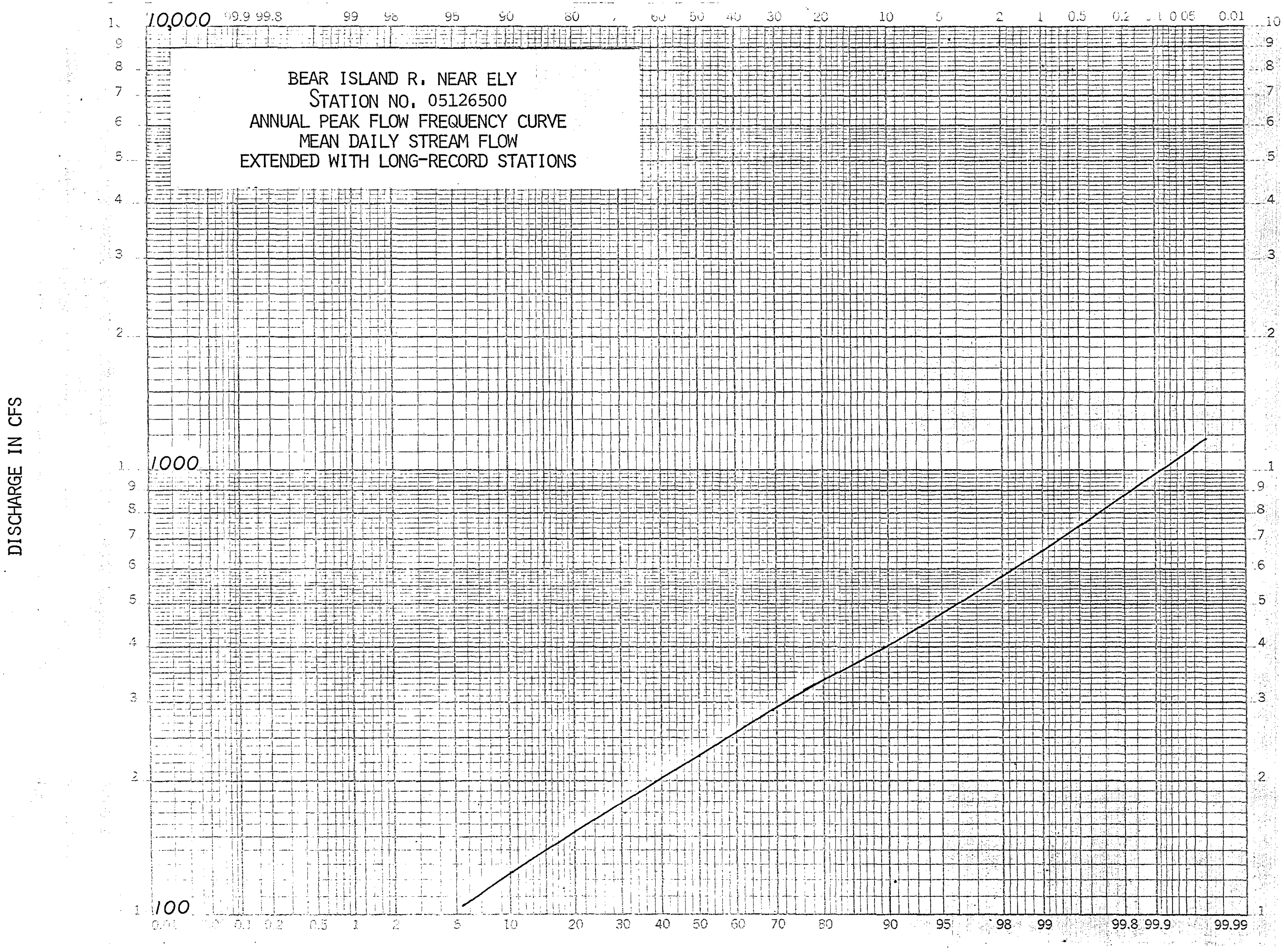
APPENDIX II

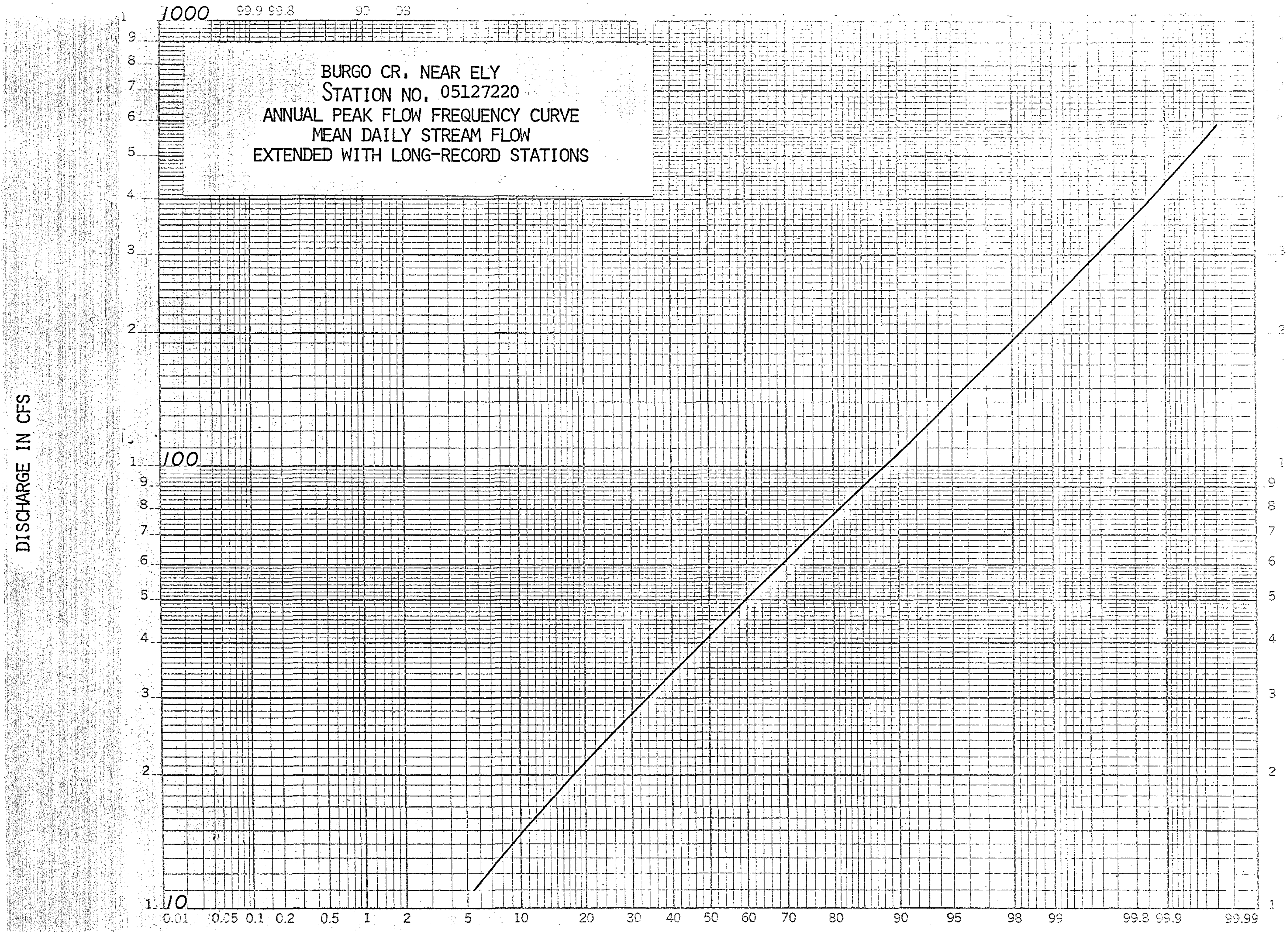
Annual Peak Discharge Frequency Curves for Stations in Copper-Nickel Study Area. Curves based on records extended with the Regional Frequency Computer Program

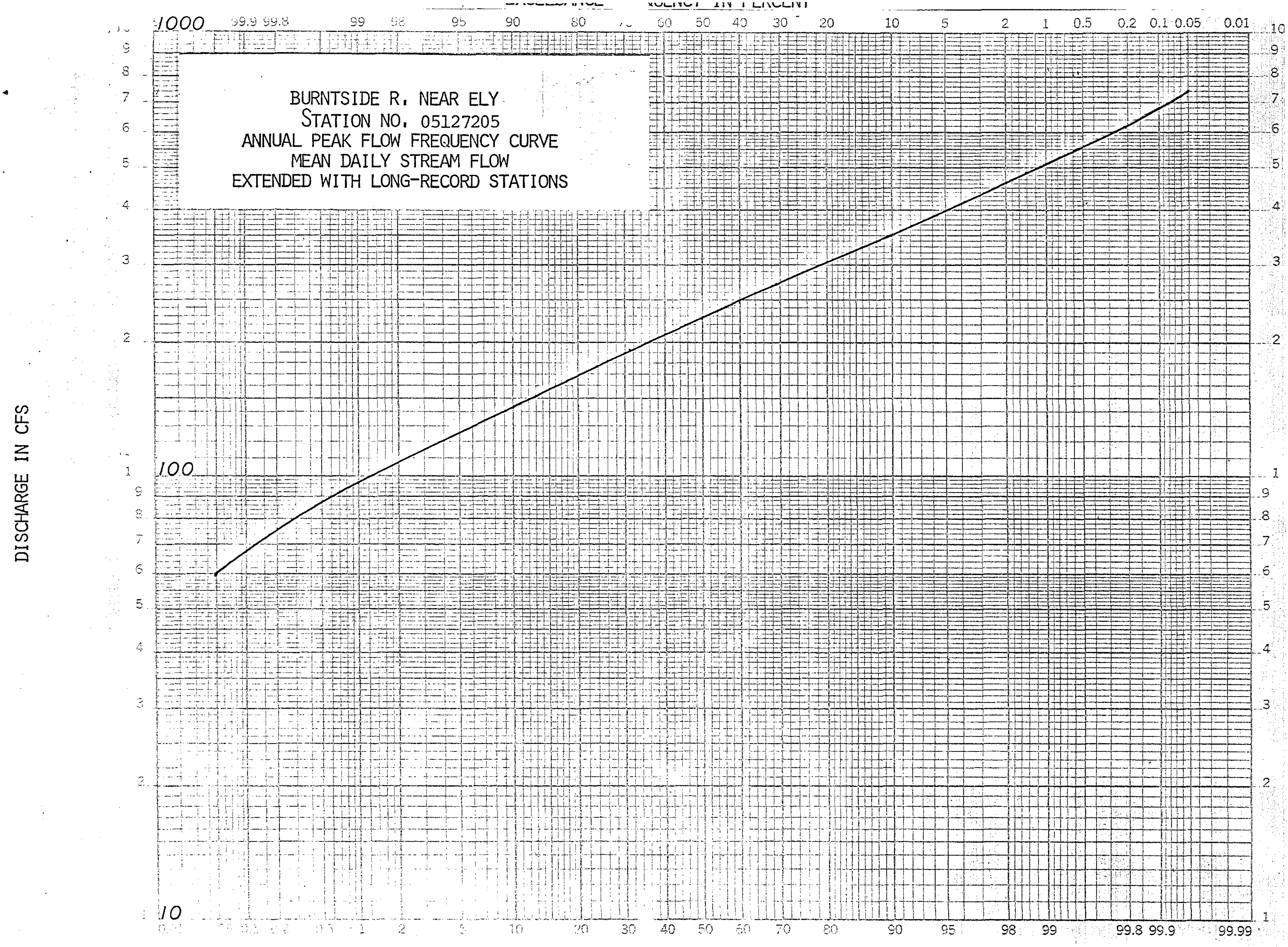

ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
1000
100
10
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
10 5 2 1

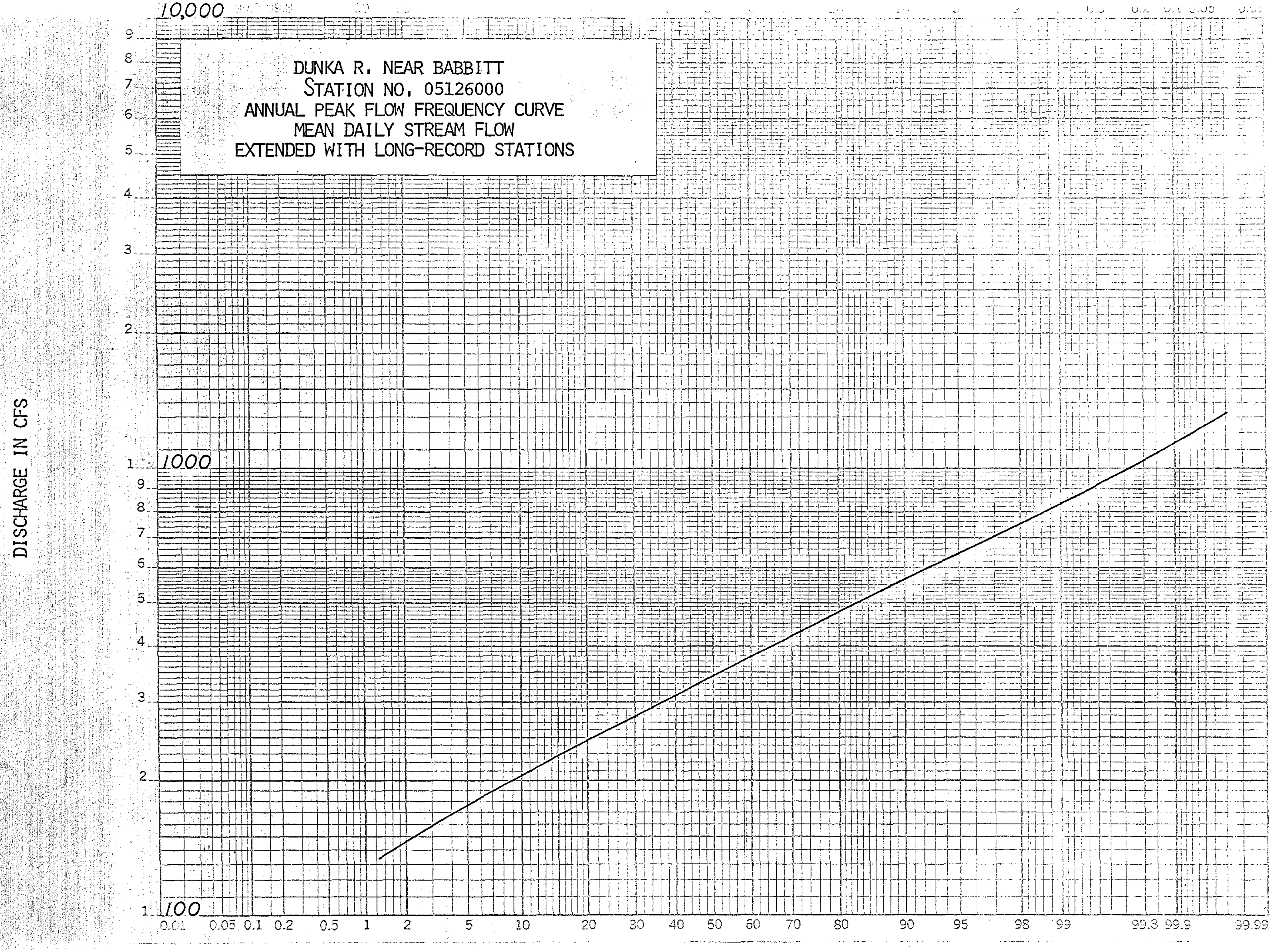


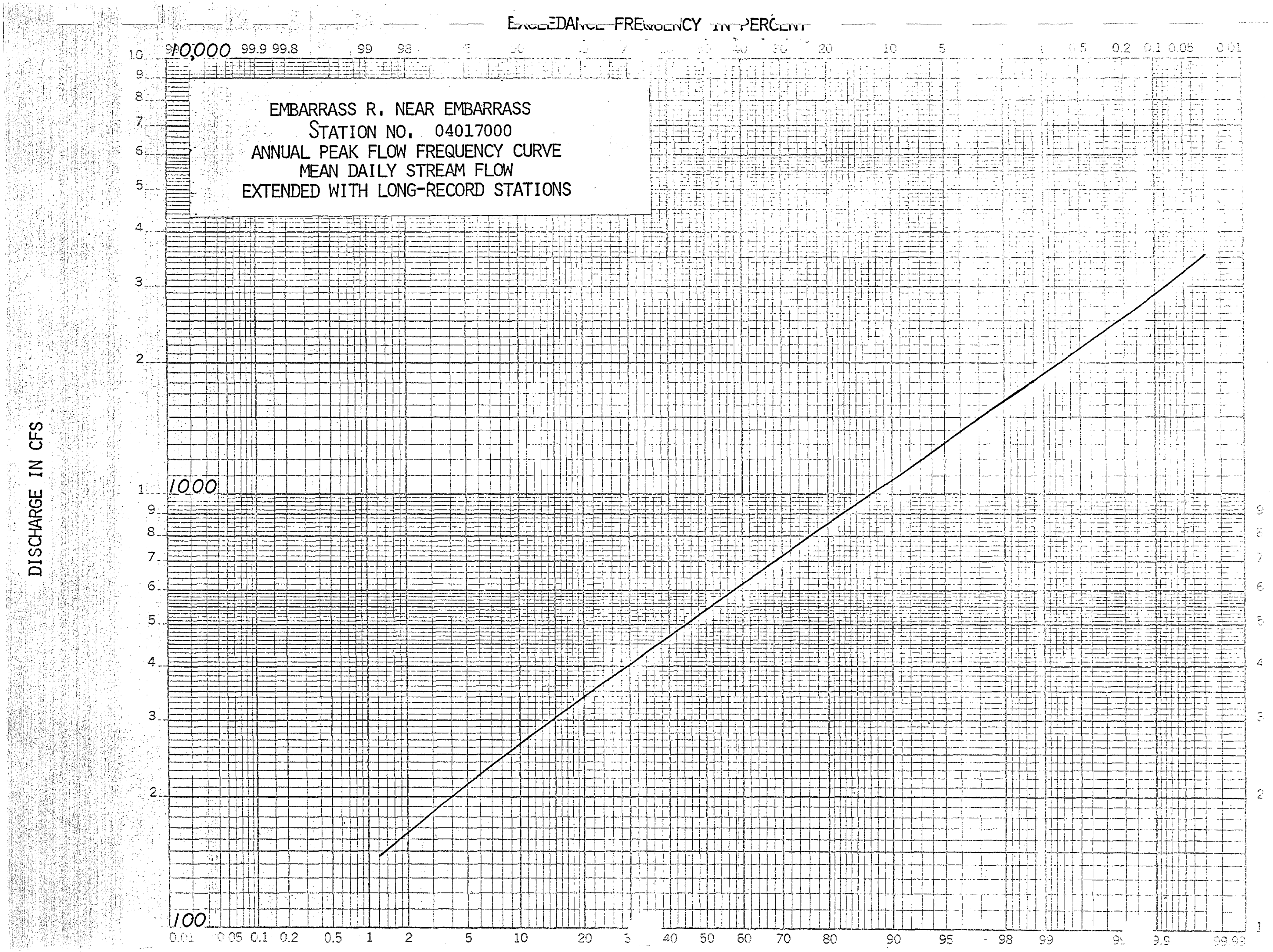
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
100,000
10,000
1000

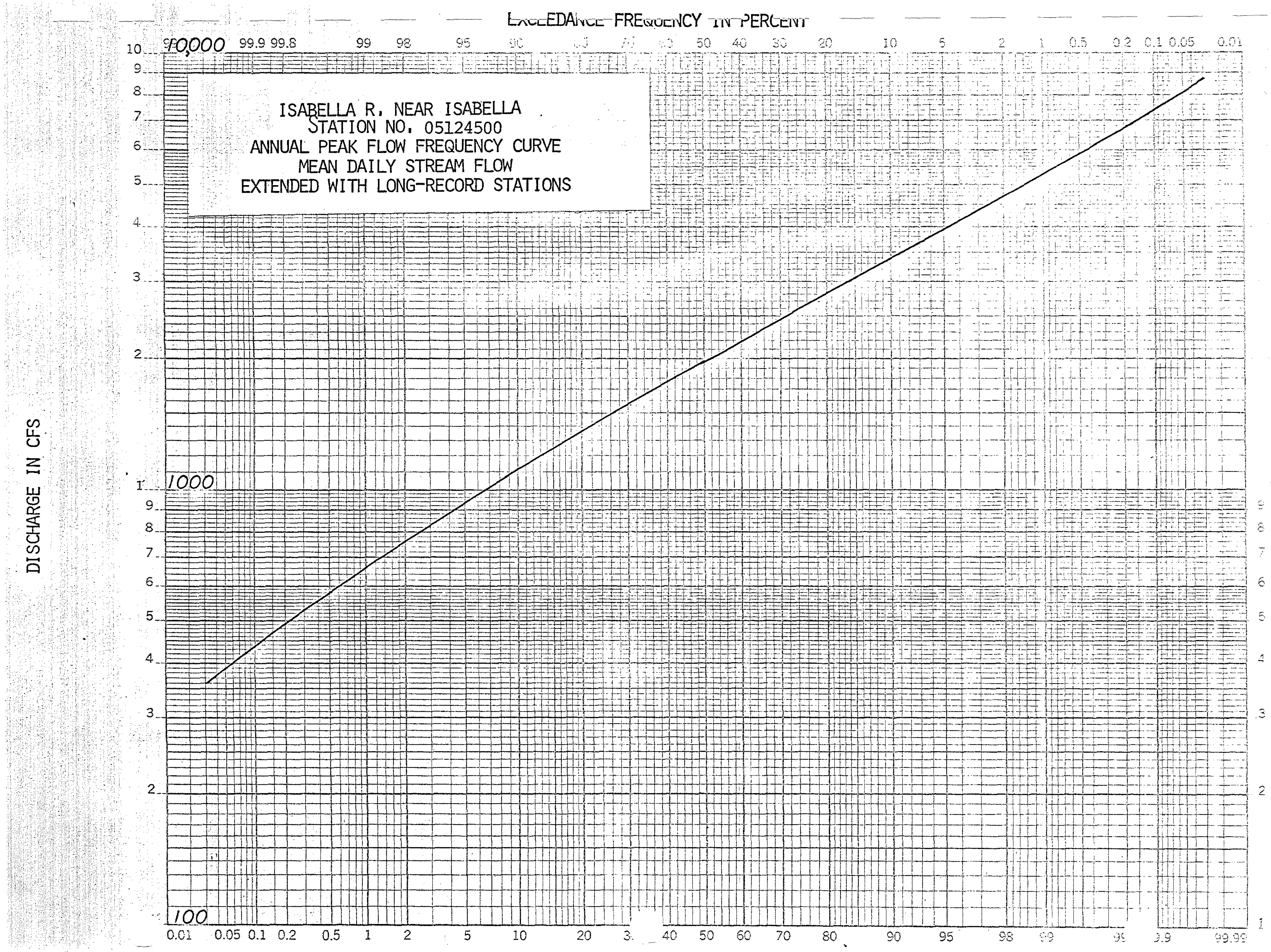

BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100

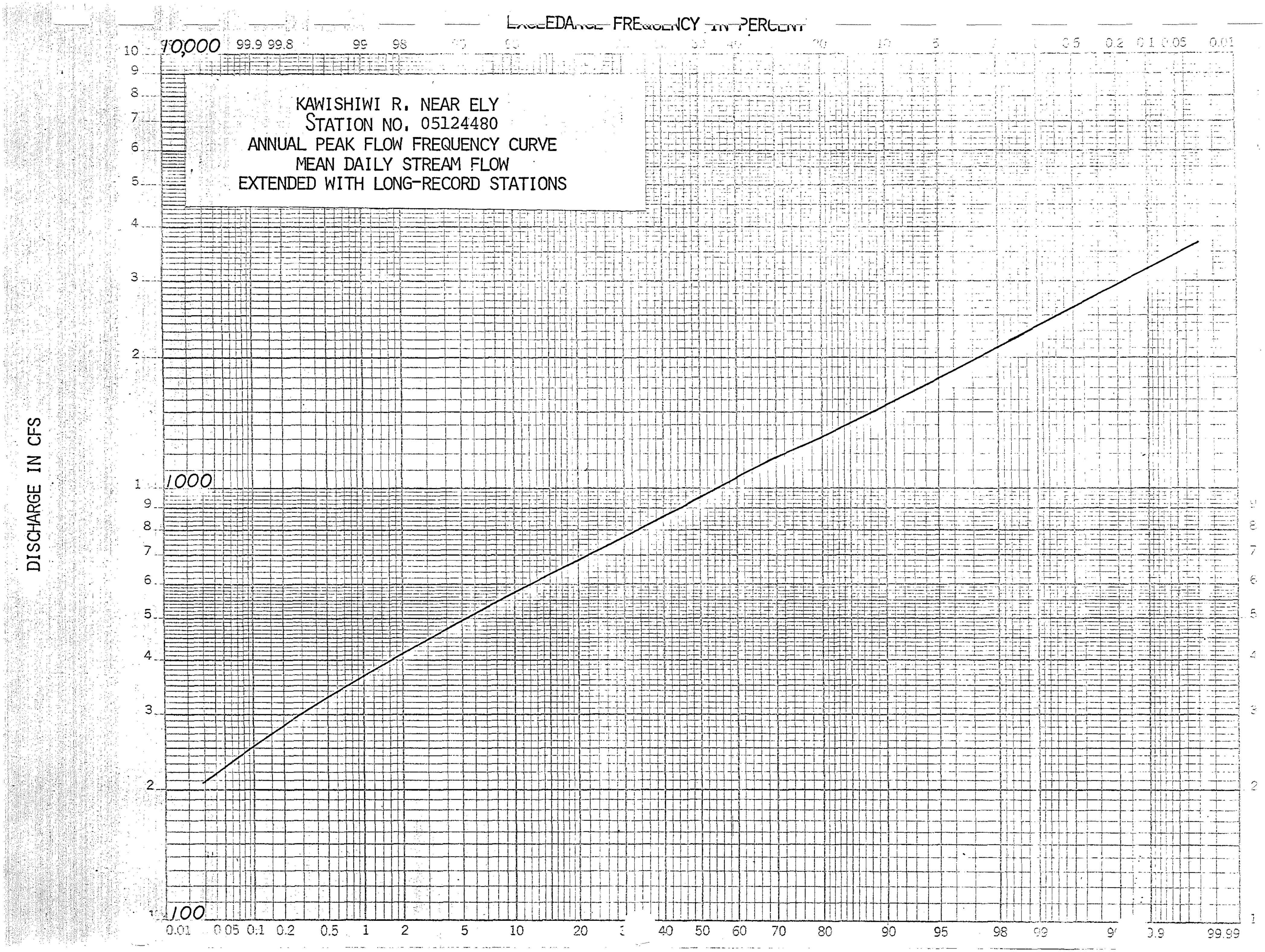

BURGO CR. NEAR ELY
STATION NO. 05127220
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
1000
100
10
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99


BURNTSIDE R. NEAR ELY
STATION NO. 05127205
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
1000
100
10

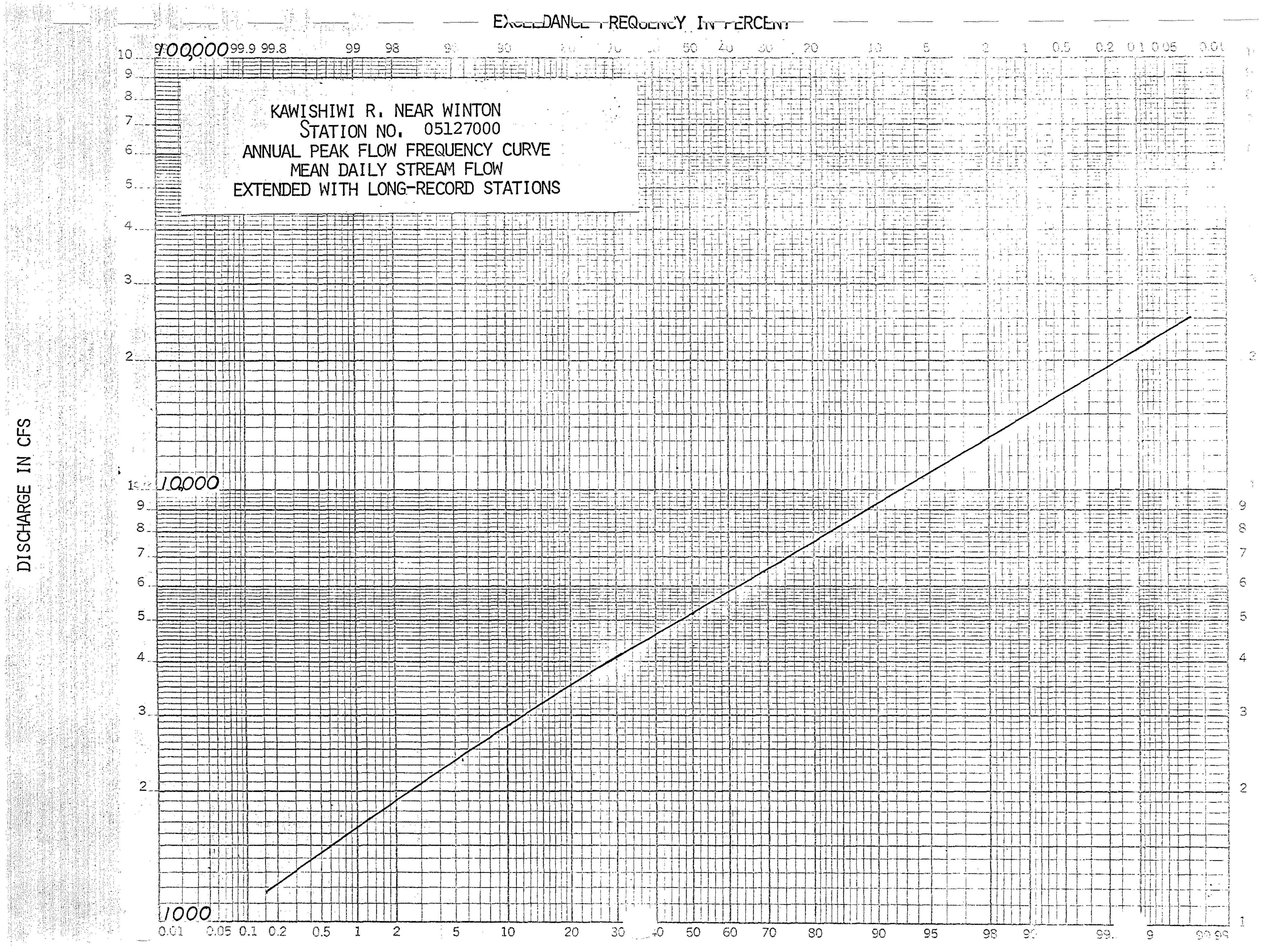

DUNKA R. NEAR BABBITT
STATION NO. 05126000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99

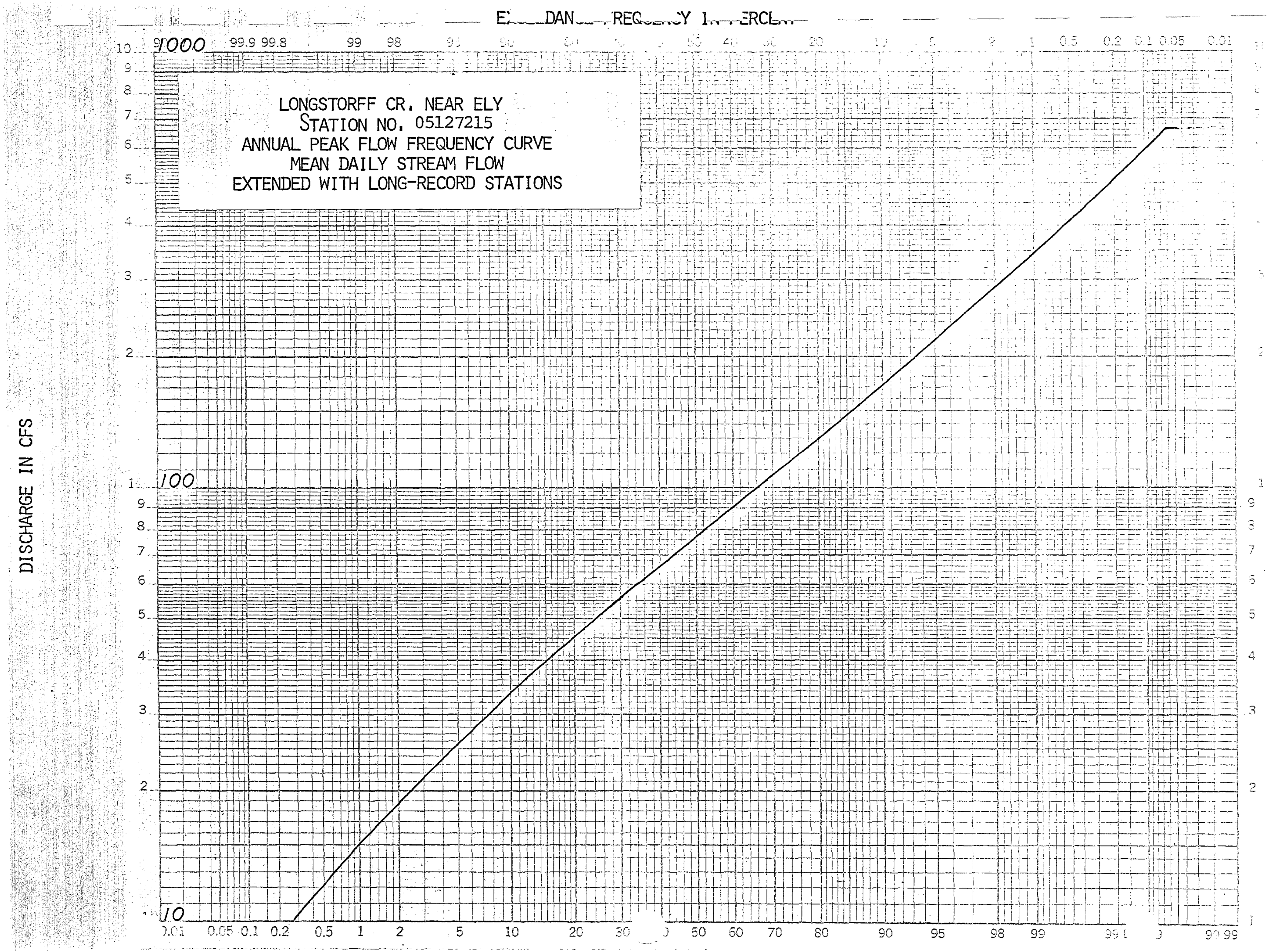

EXCEEDANCE FREQUENCY IN PERCENT
EMBARRASS R. NEAR EMBARRASS
STATION NO. 04017000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 40 50 60 70 80 90 95 98 99 99.99
99.9 99.8 99 98 20 10 5 0.5 0.2 0.1 0.05 0.01


EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100

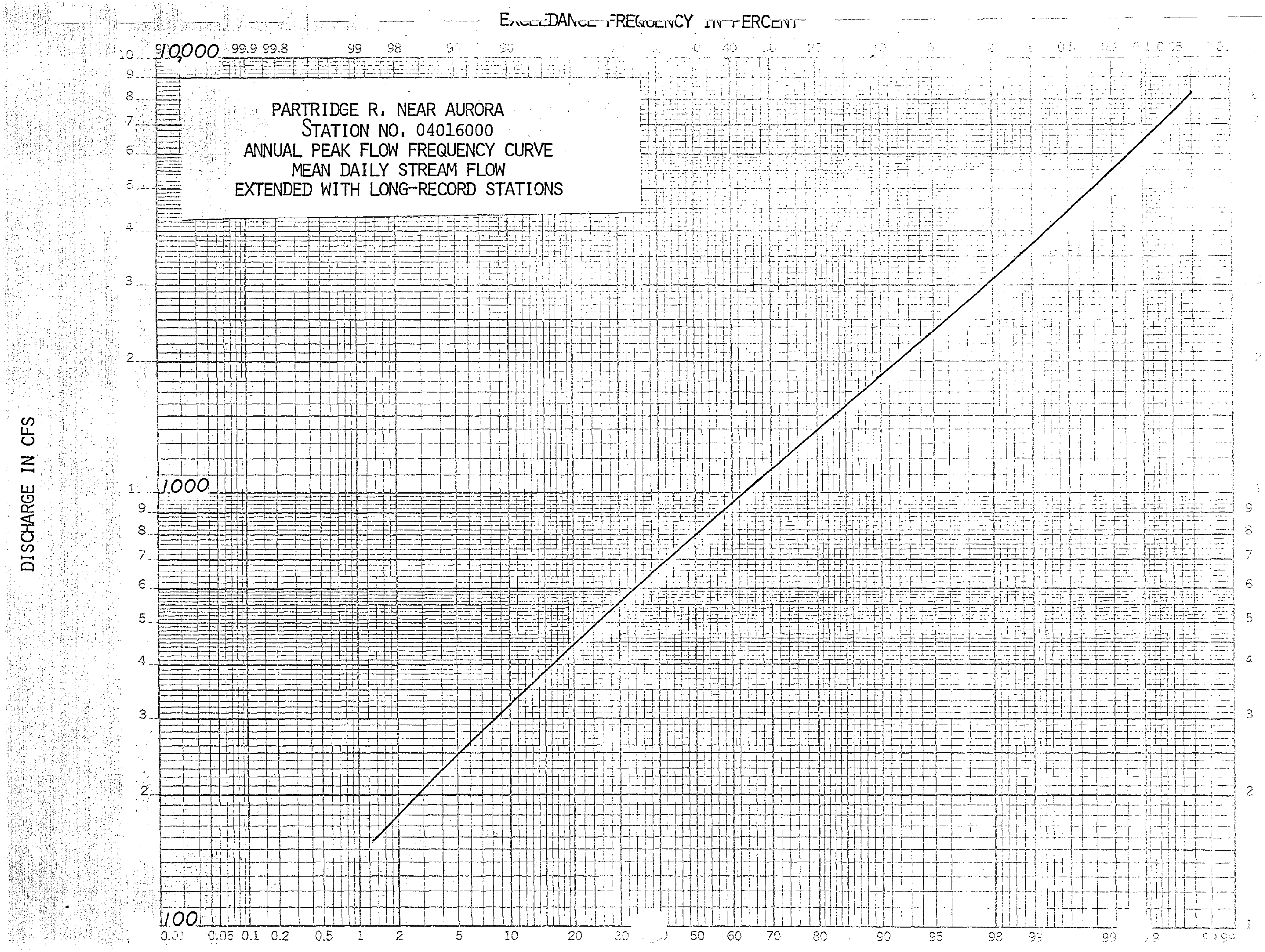


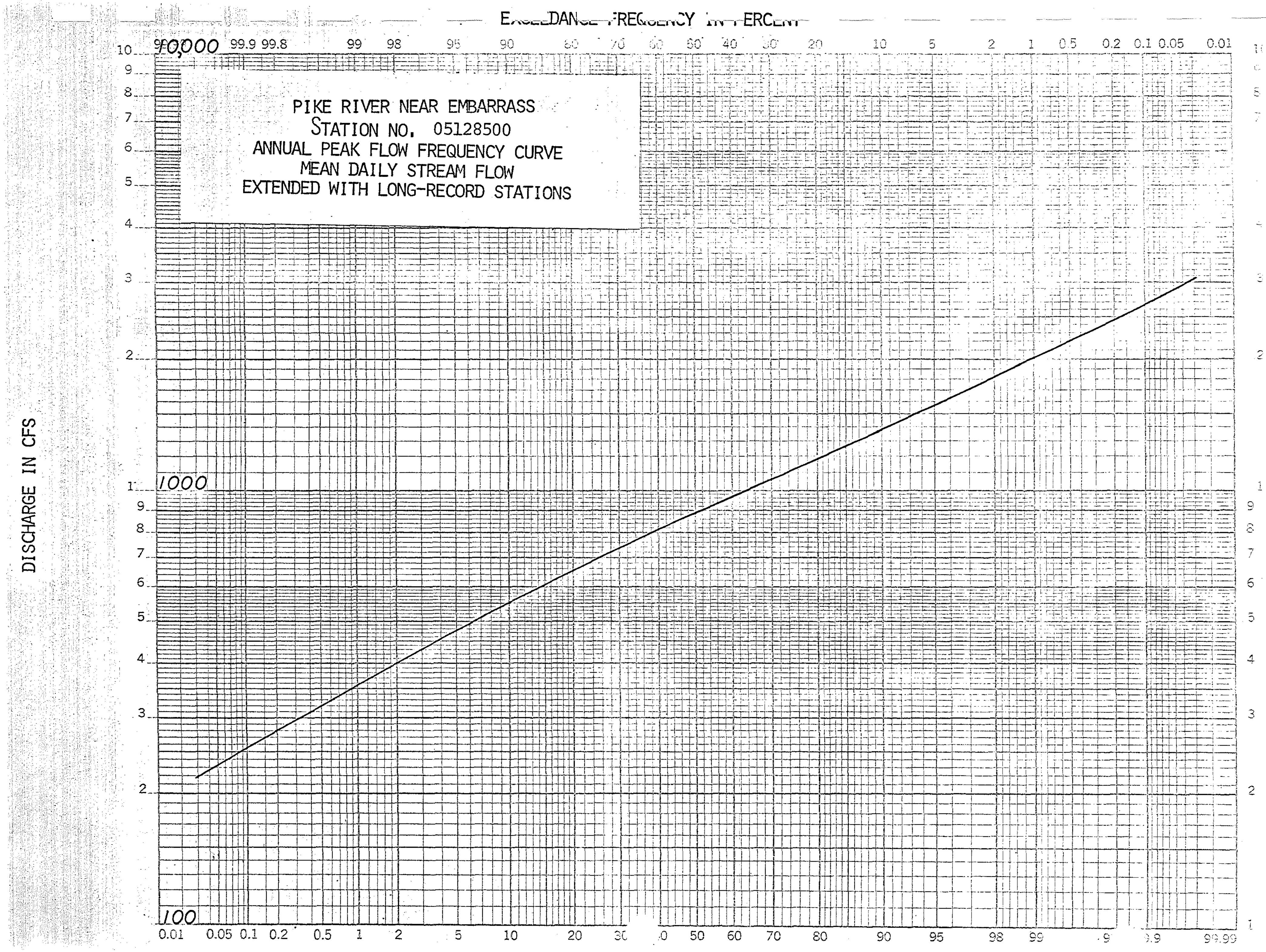
EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100

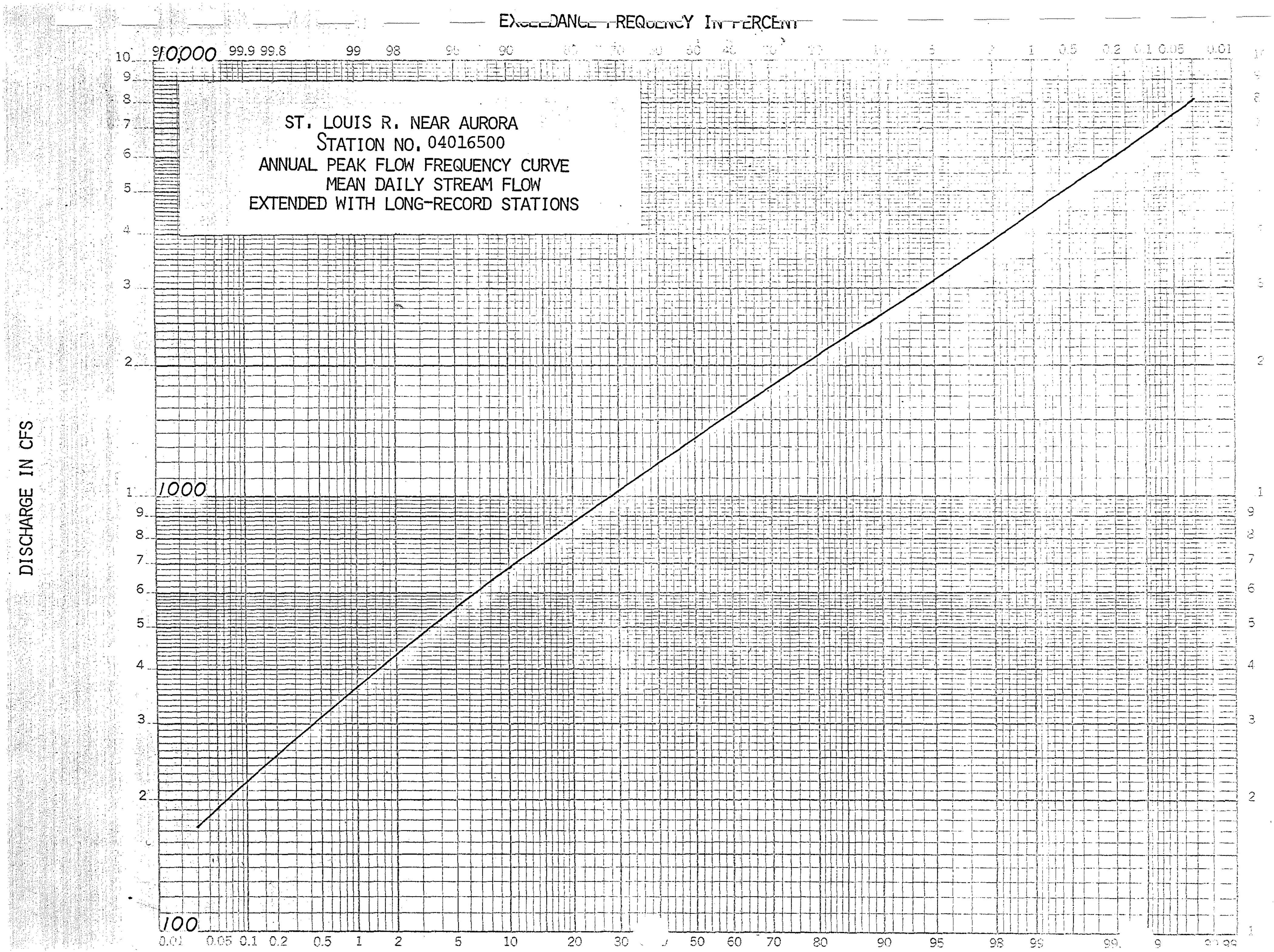

EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR WINTON
STATION NO. 05127000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
100,000
10,000
1000



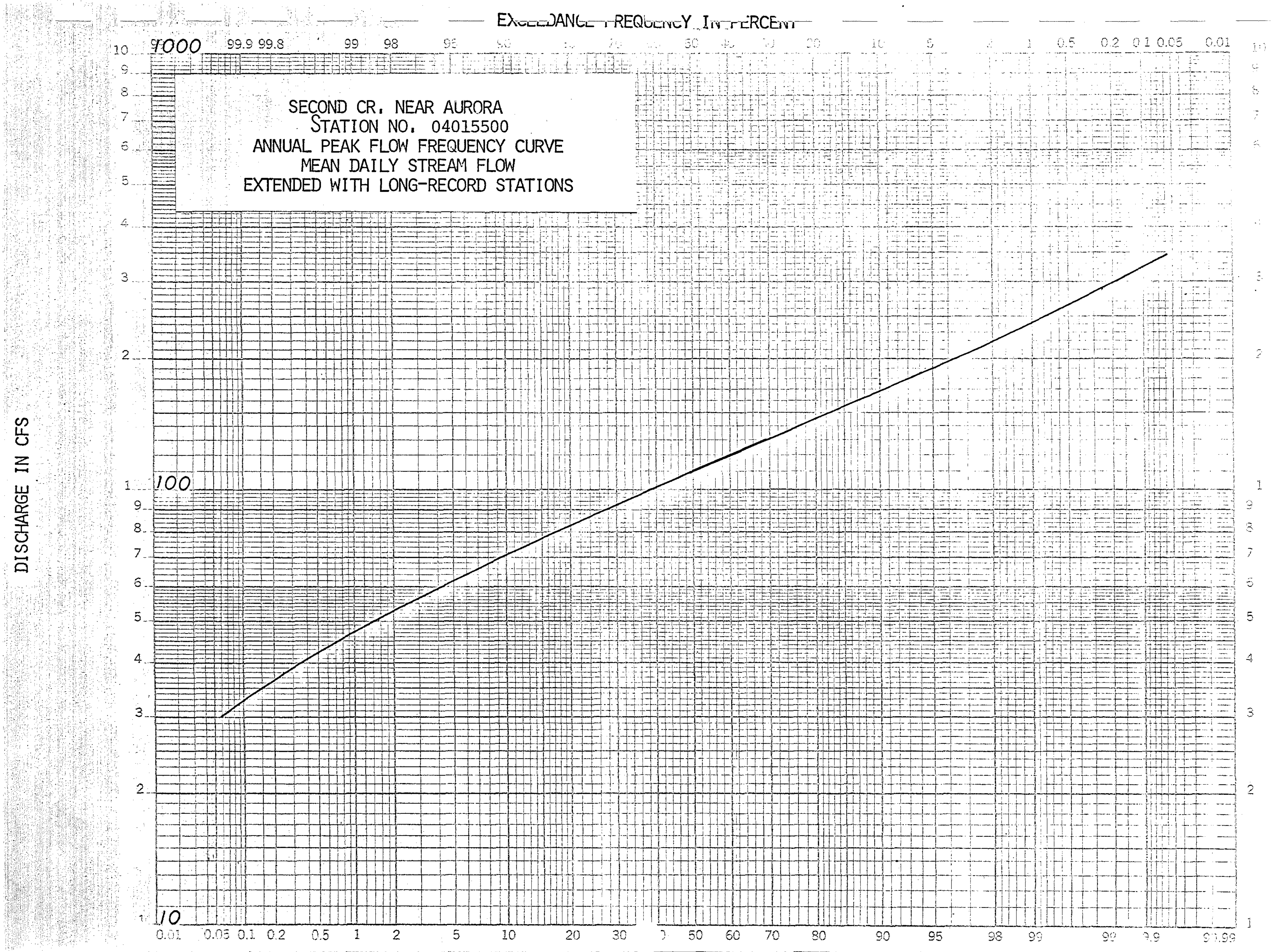
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
1000
100
10

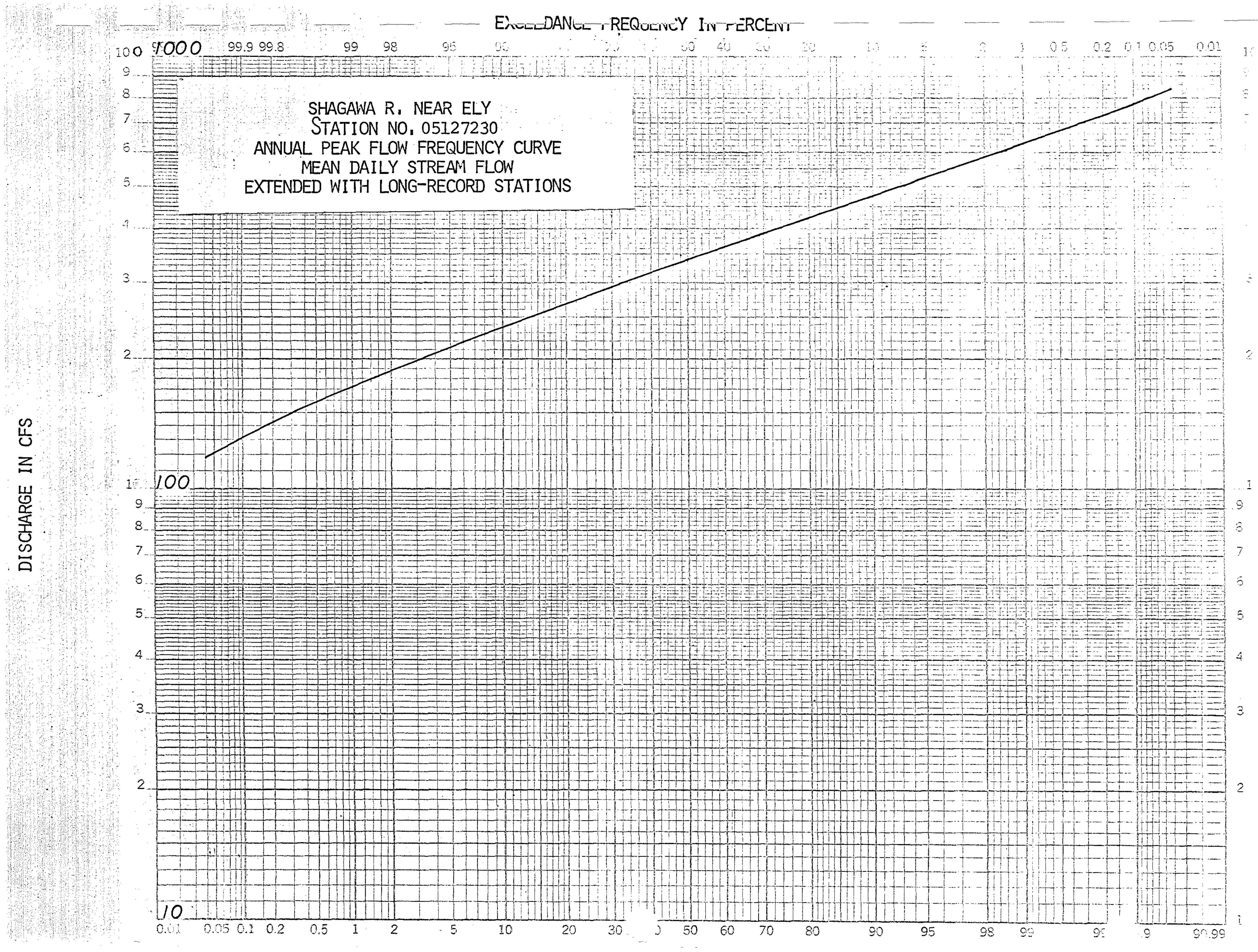

EXCEEDANCE FREQUENCY IN PERCENT
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 50 60 70 80 90 95 98 99

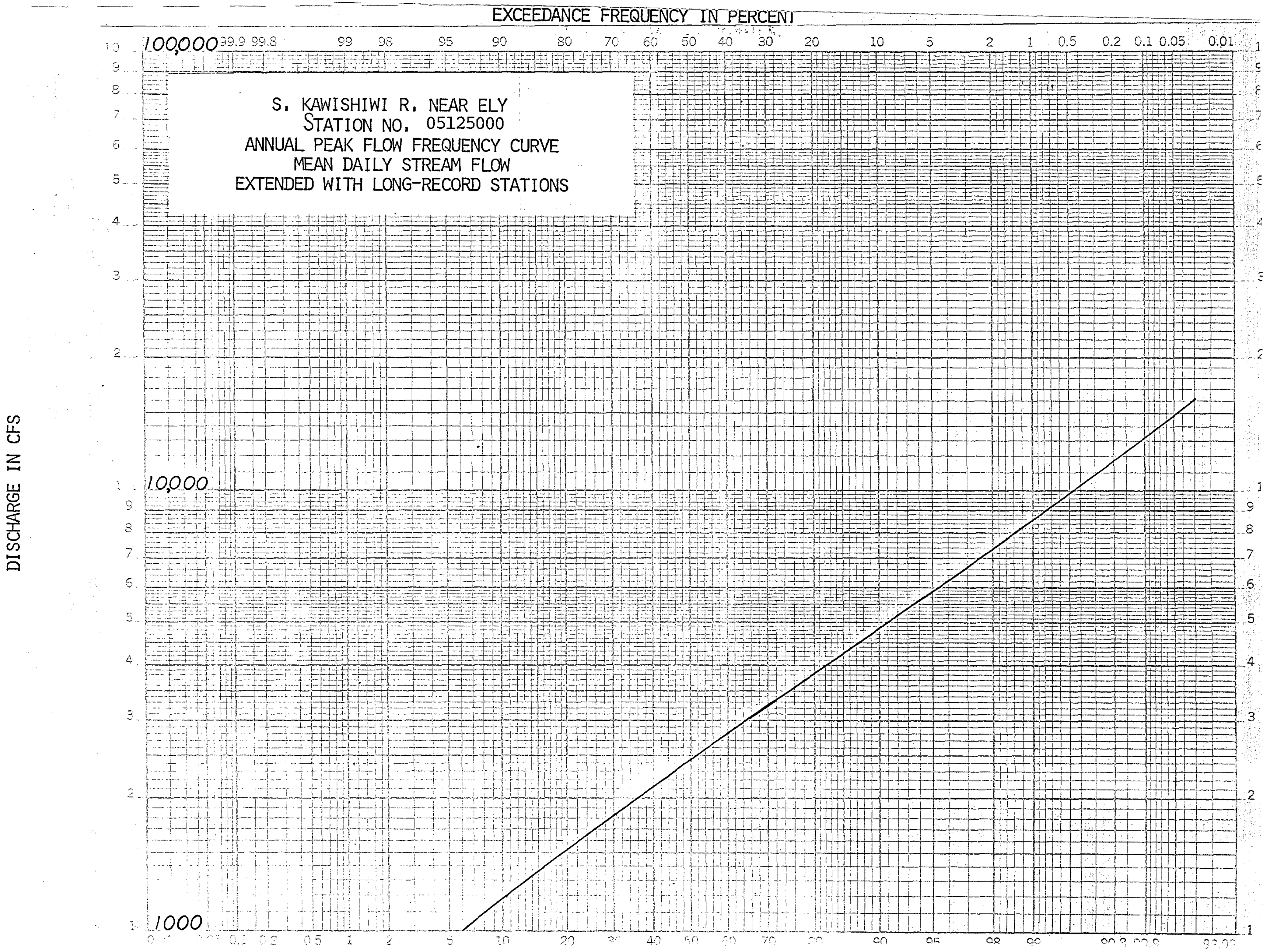

EXCEEDANCE FREQUENCY IN PERCENT
PIKE RIVER NEAR EMBARRASS
STATION NO. 05128500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100

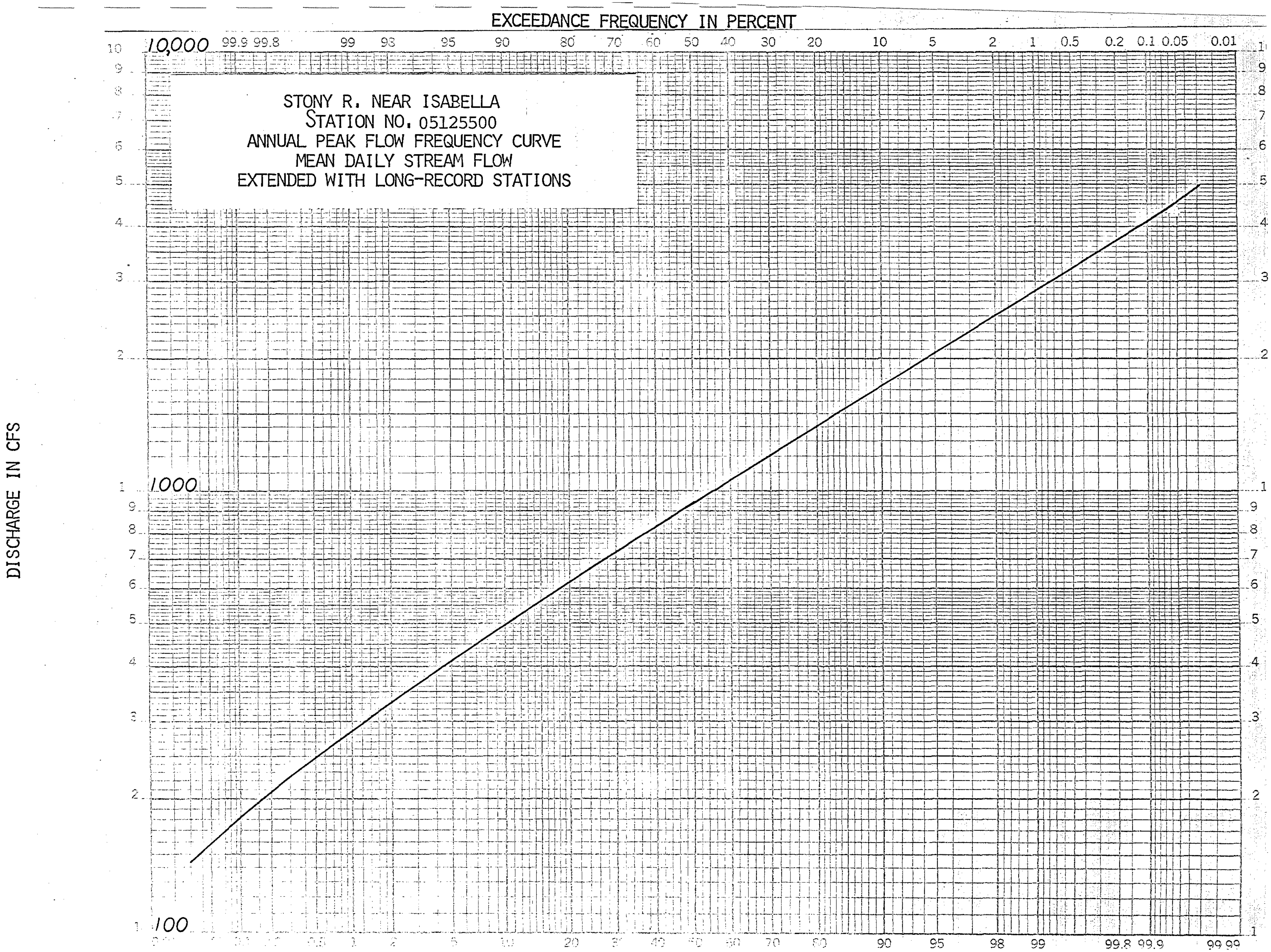


EXCEEDANCE FREQUENCY IN PERCENT
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100

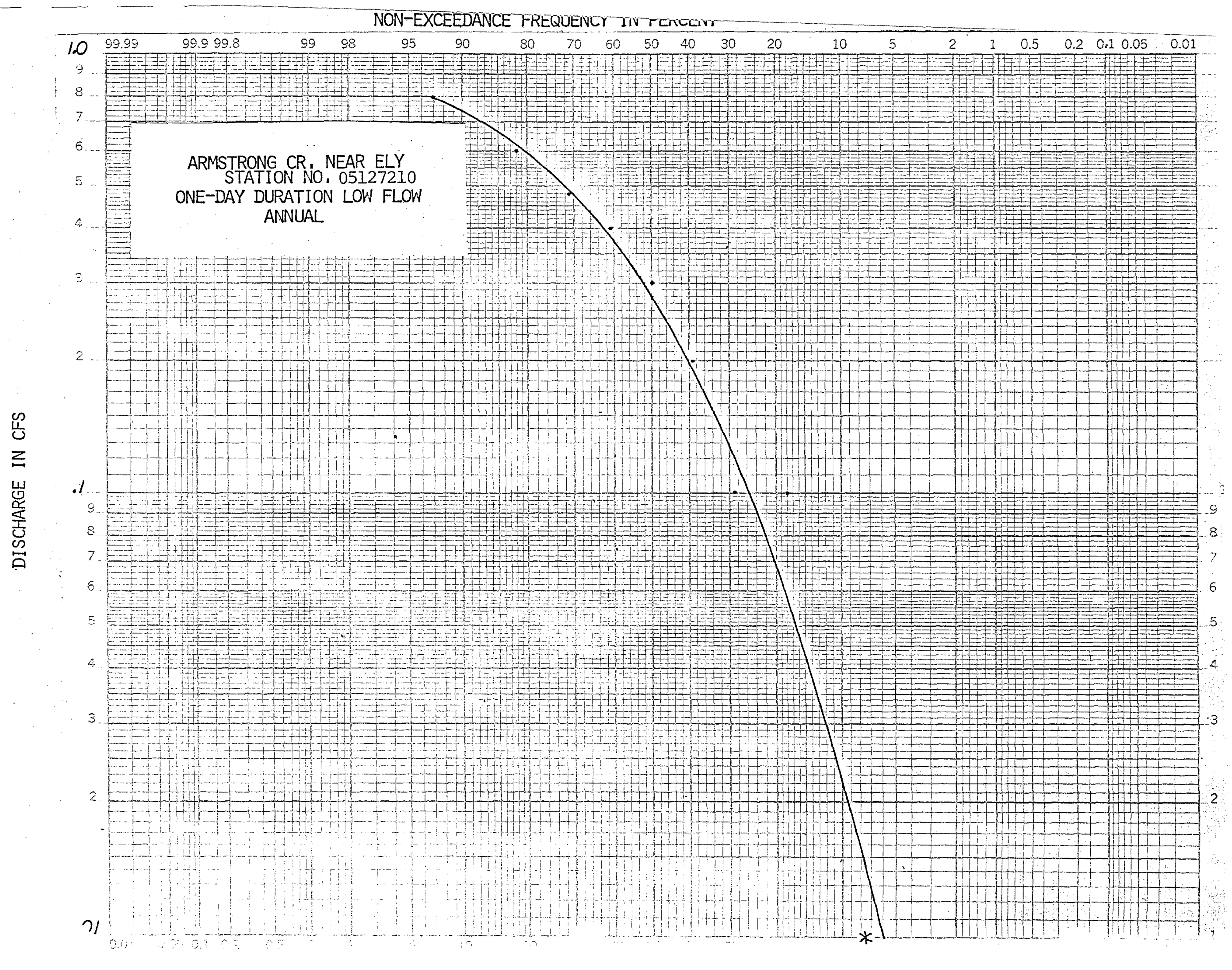

EXCEEDANCE FREQUENCY IN PERCENT
SECOND CR. NEAR AURORA
STATION NO. 04015500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
1000
100
10


EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
1000
100
10

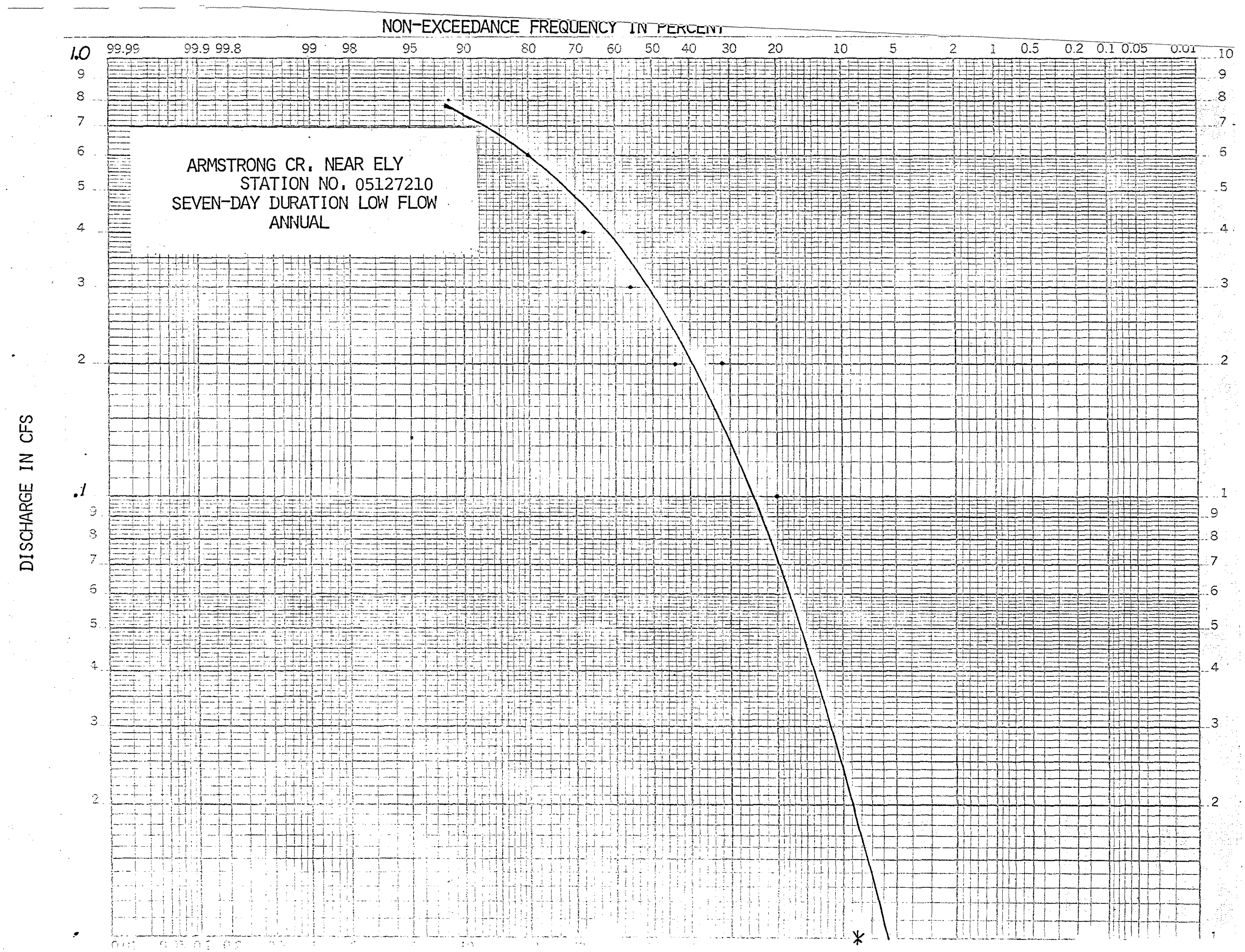

EXCEEDANCE FREQUENCY IN PERCENT
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
100,000
10,000
1000
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

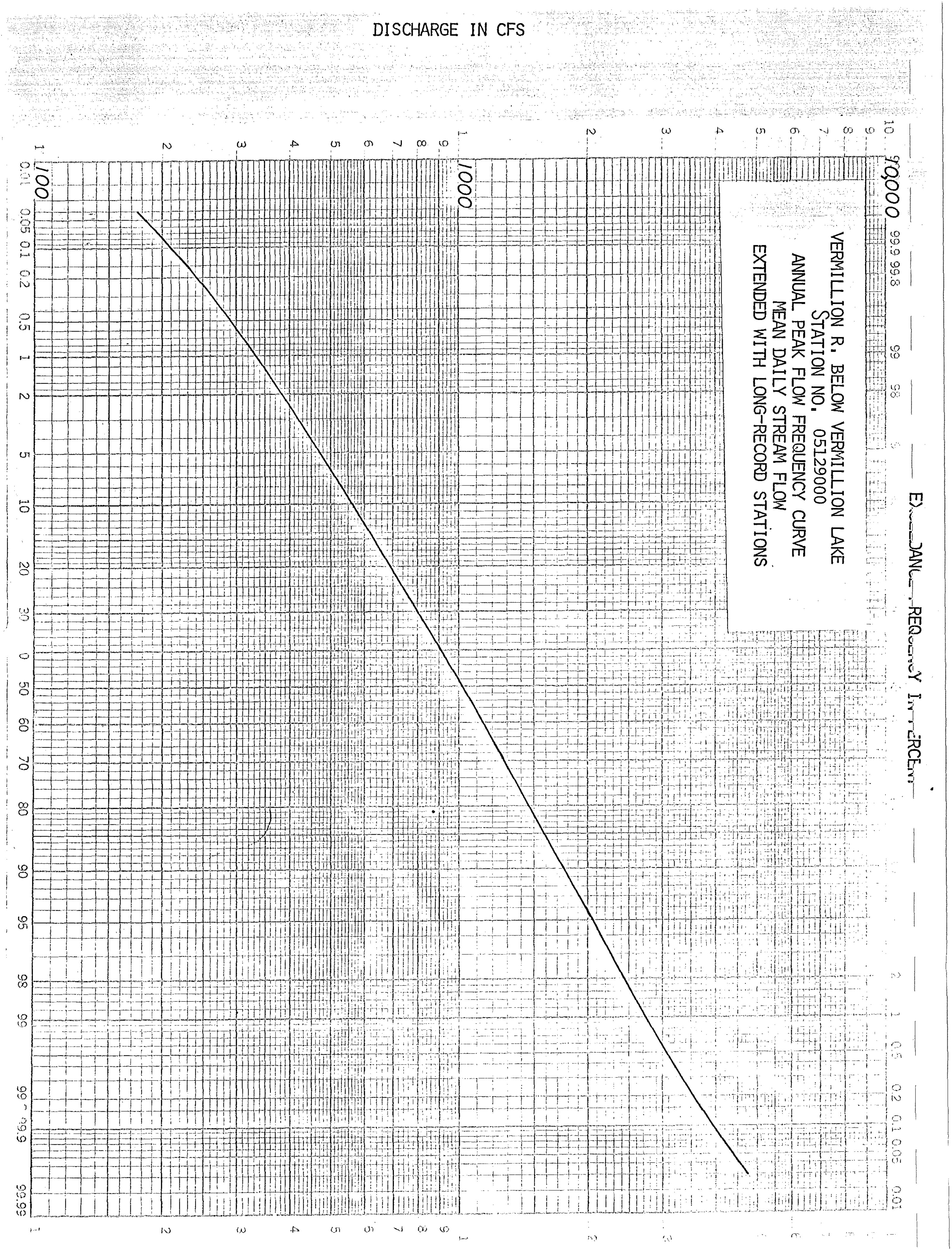


EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO. 05125500
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
DISCHARGE IN CFS
10,000
1000
100
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01



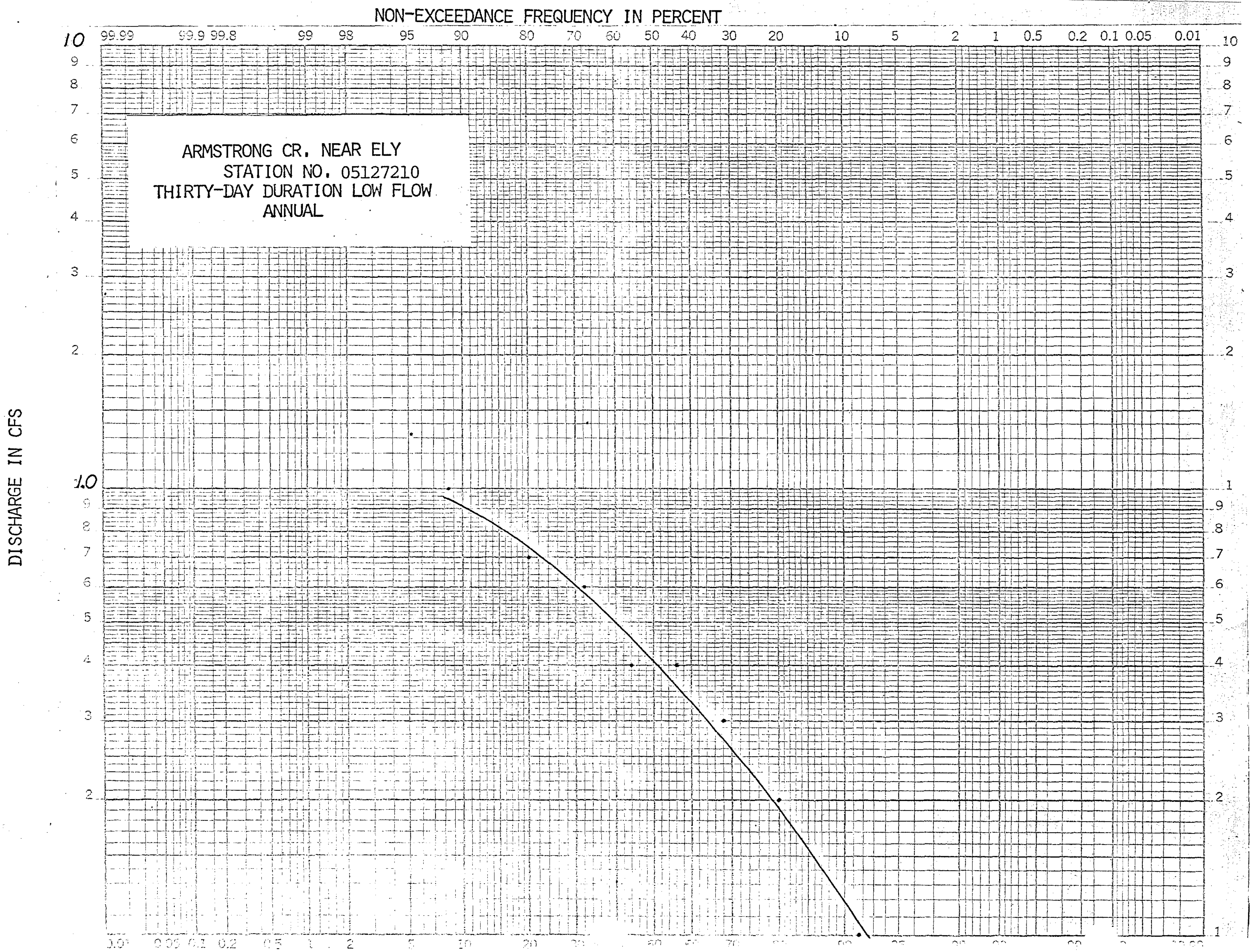
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
ONE-DAY DURATION LOW FLOW
ANNUAL
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2 0.1 0.05
0.01
1.0
.1
.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
DISCHARGE IN CFS
1.0 9 8 7 6 5 4 3 2 .1 9 8 7 6 5 4 3 2
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
SEVEN-DAY DURATION LOW FLOW
ANNUAL

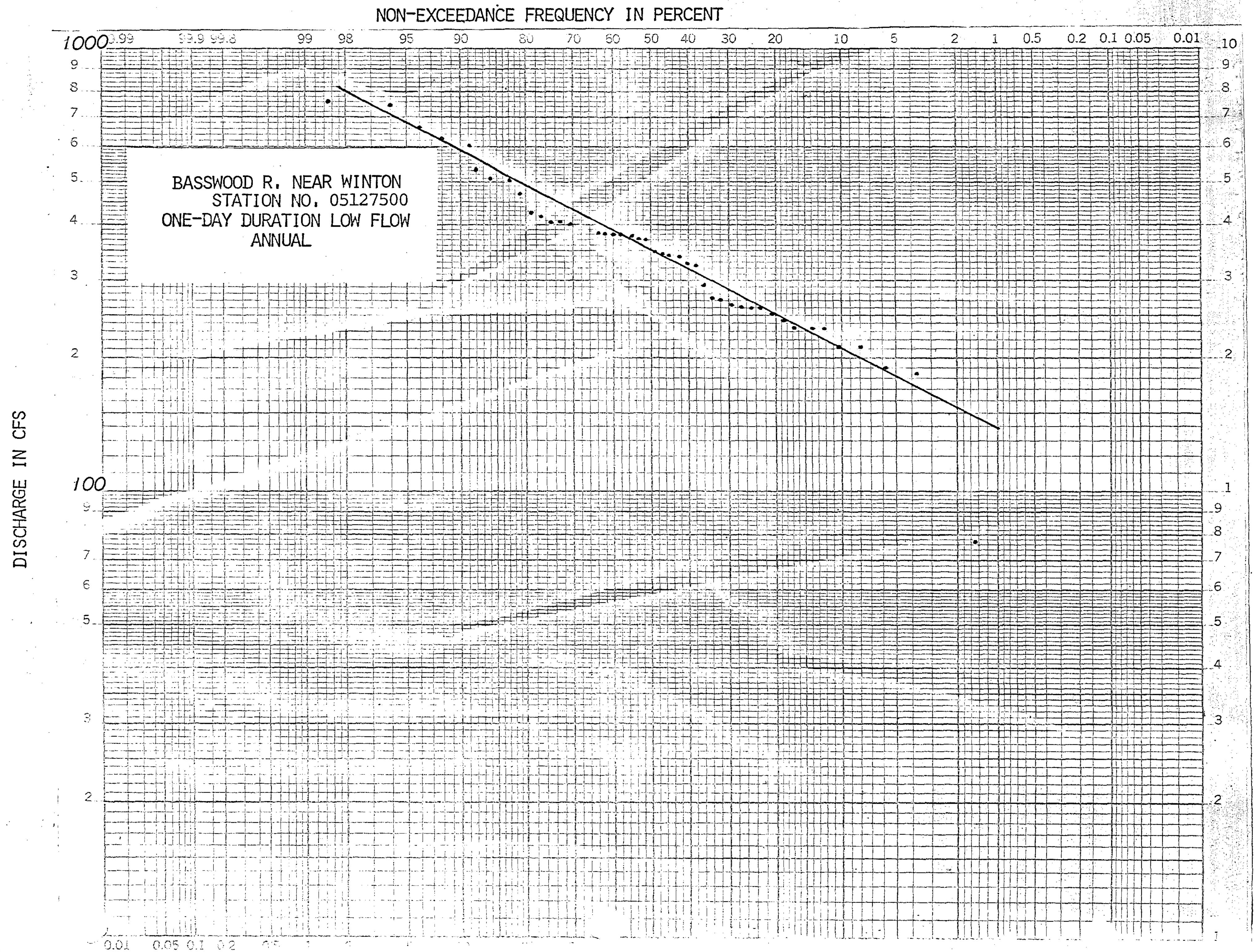

DISCHARGE IN CFS
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
ANNUAL PEAK FLOW FREQUENCY CURVE
MEAN DAILY STREAM FLOW
EXTENDED WITH LONG-RECORD STATIONS
100
1000
10,000

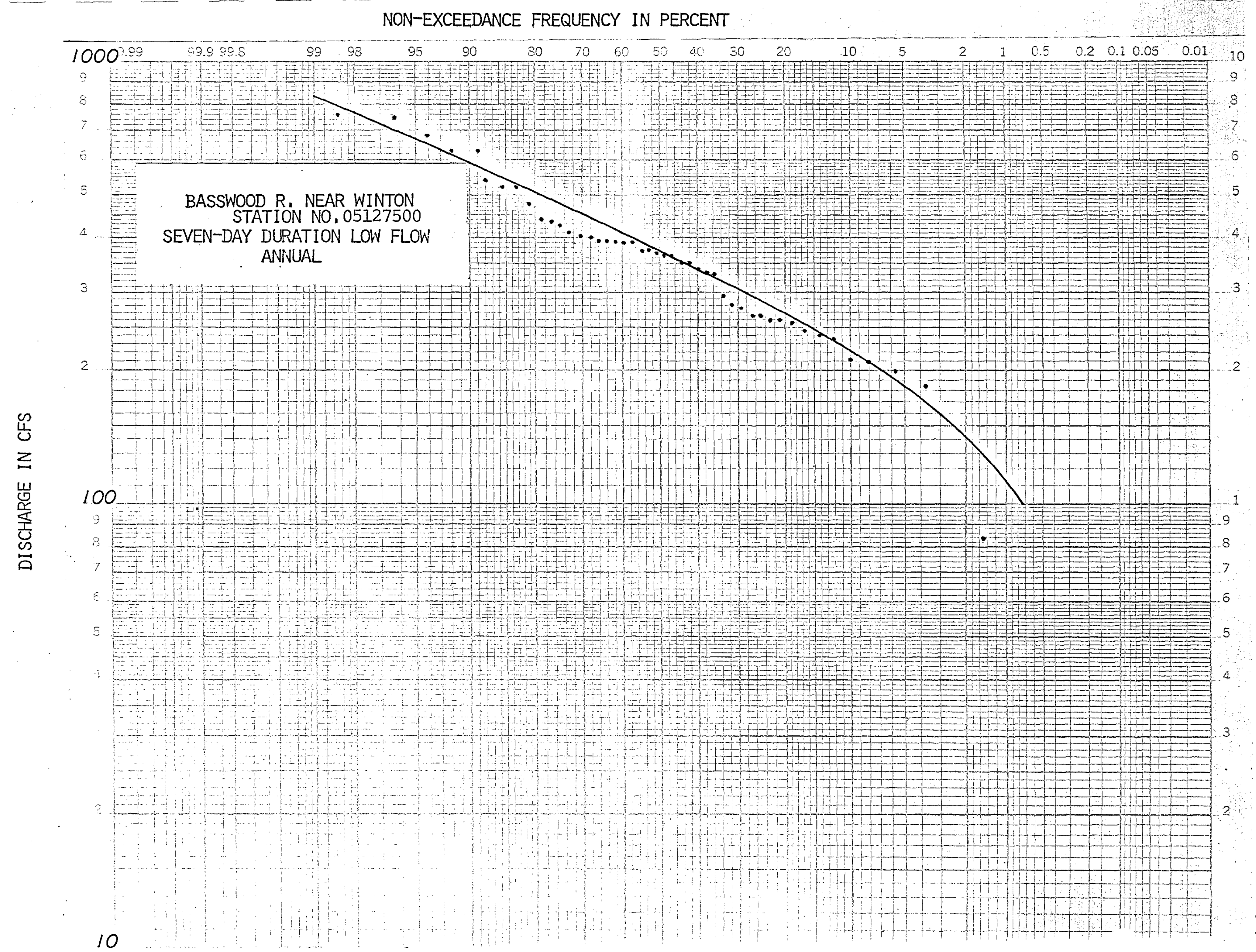
APPENDIX III

Annual 1-day, 7-day, and 30-day Low-Flow Frequency Curves for Stations in Copper-Nickel Study Area

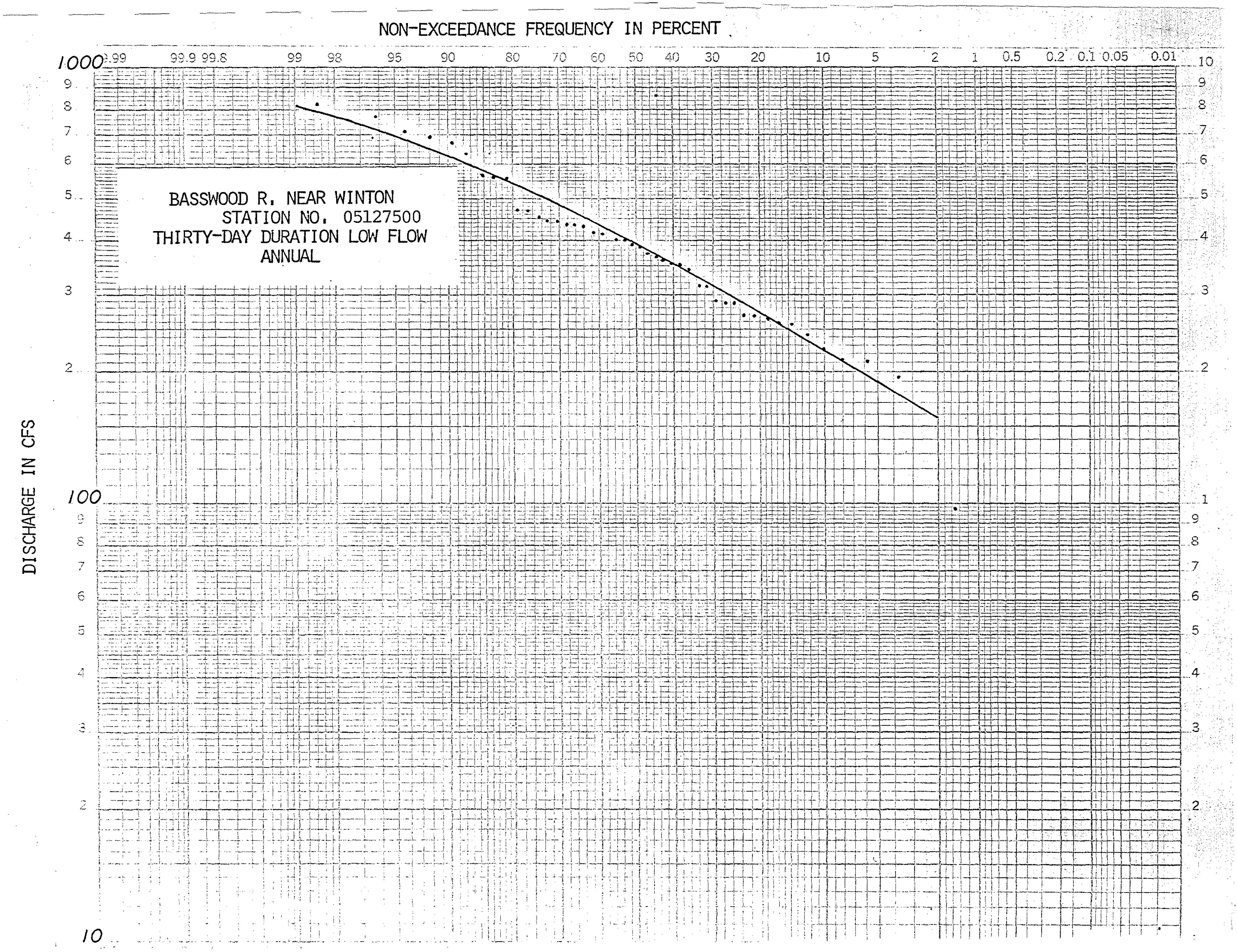


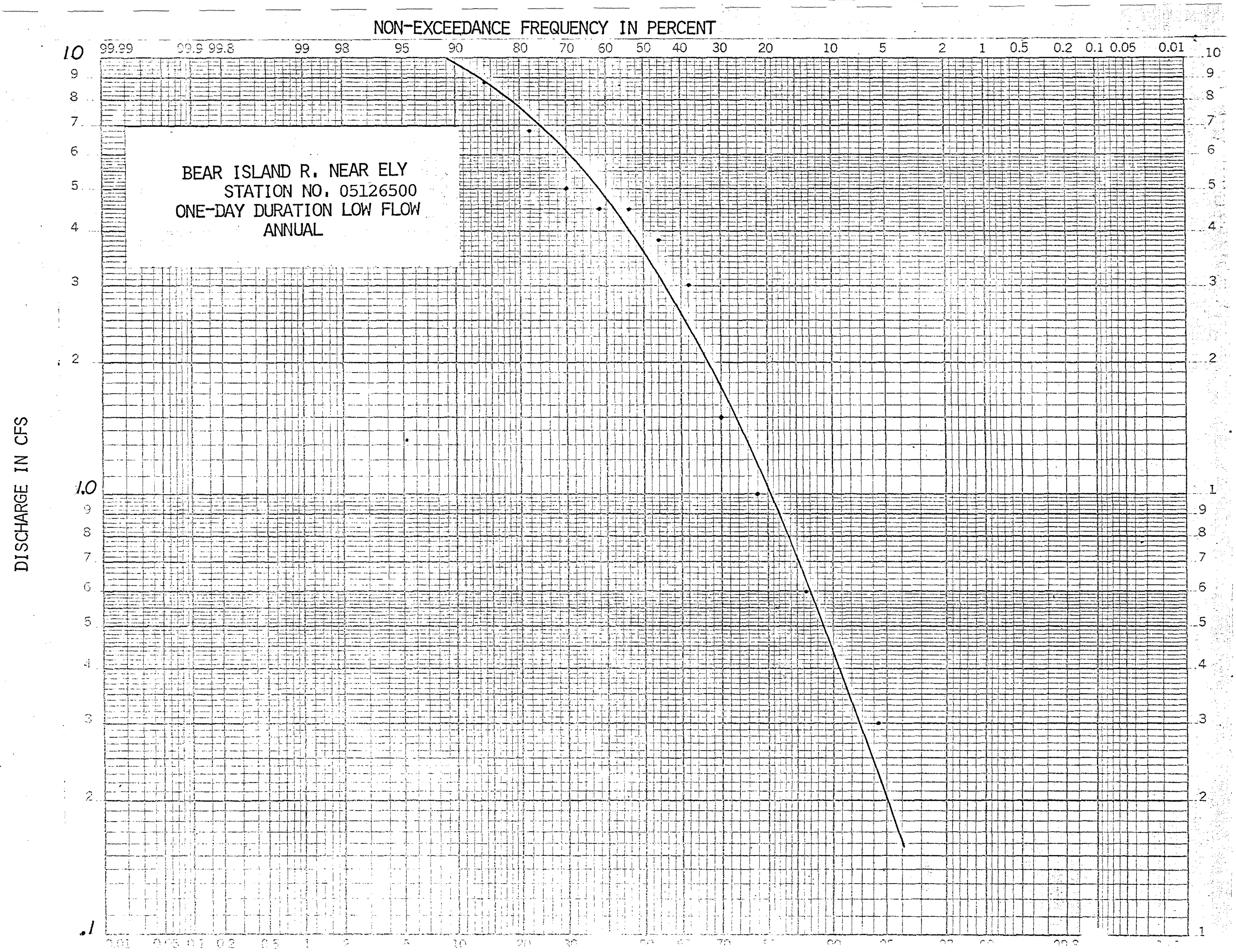
NON-EXCEEDANCE FREQUENCY IN PERCENT
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
10
9
8
7
6
5
4
3
2
1.0
.9
.8
.7
.6
.5
.4
.3
.2
1

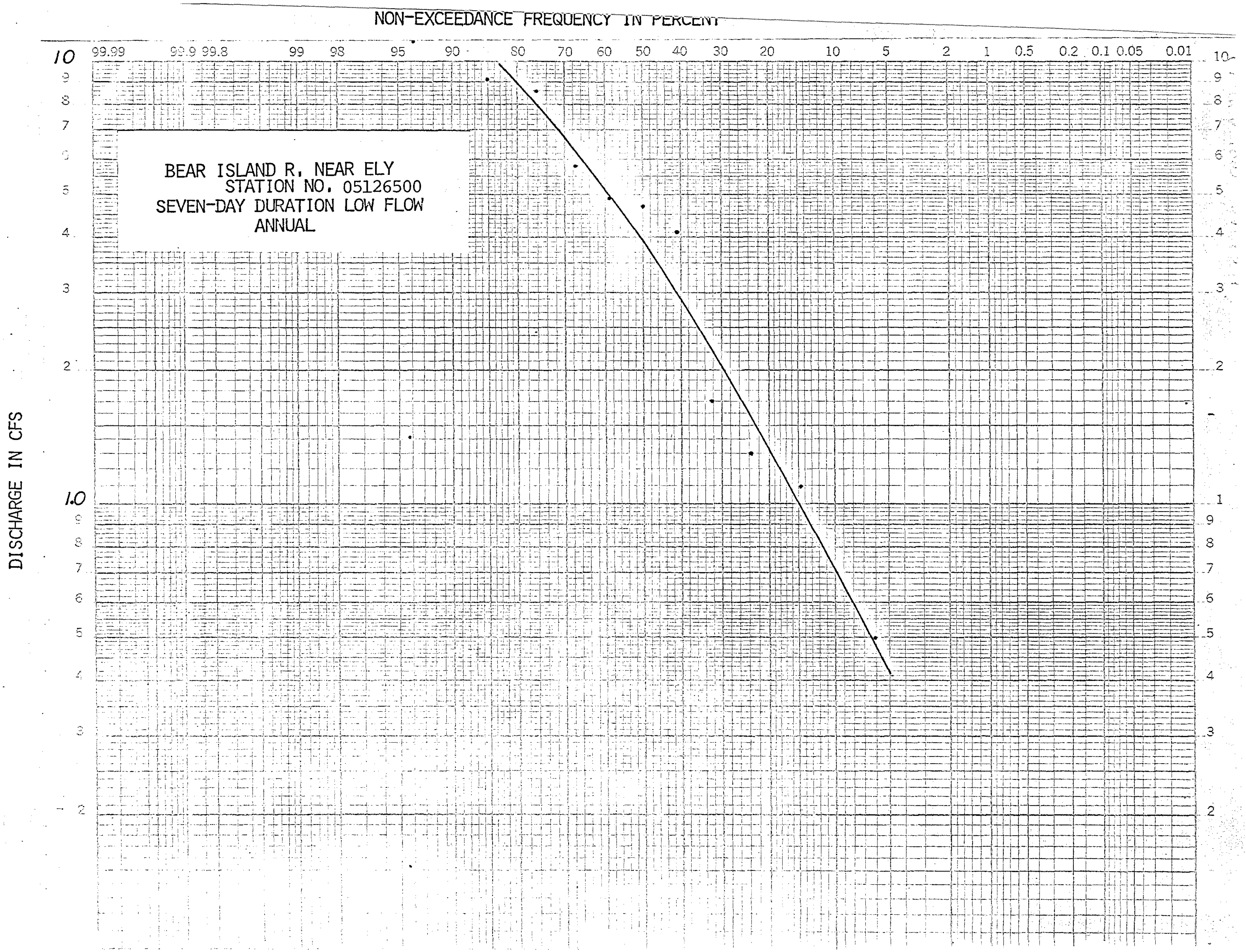

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
ONE-DAY DURATION LOW FLOW
ANNUAL



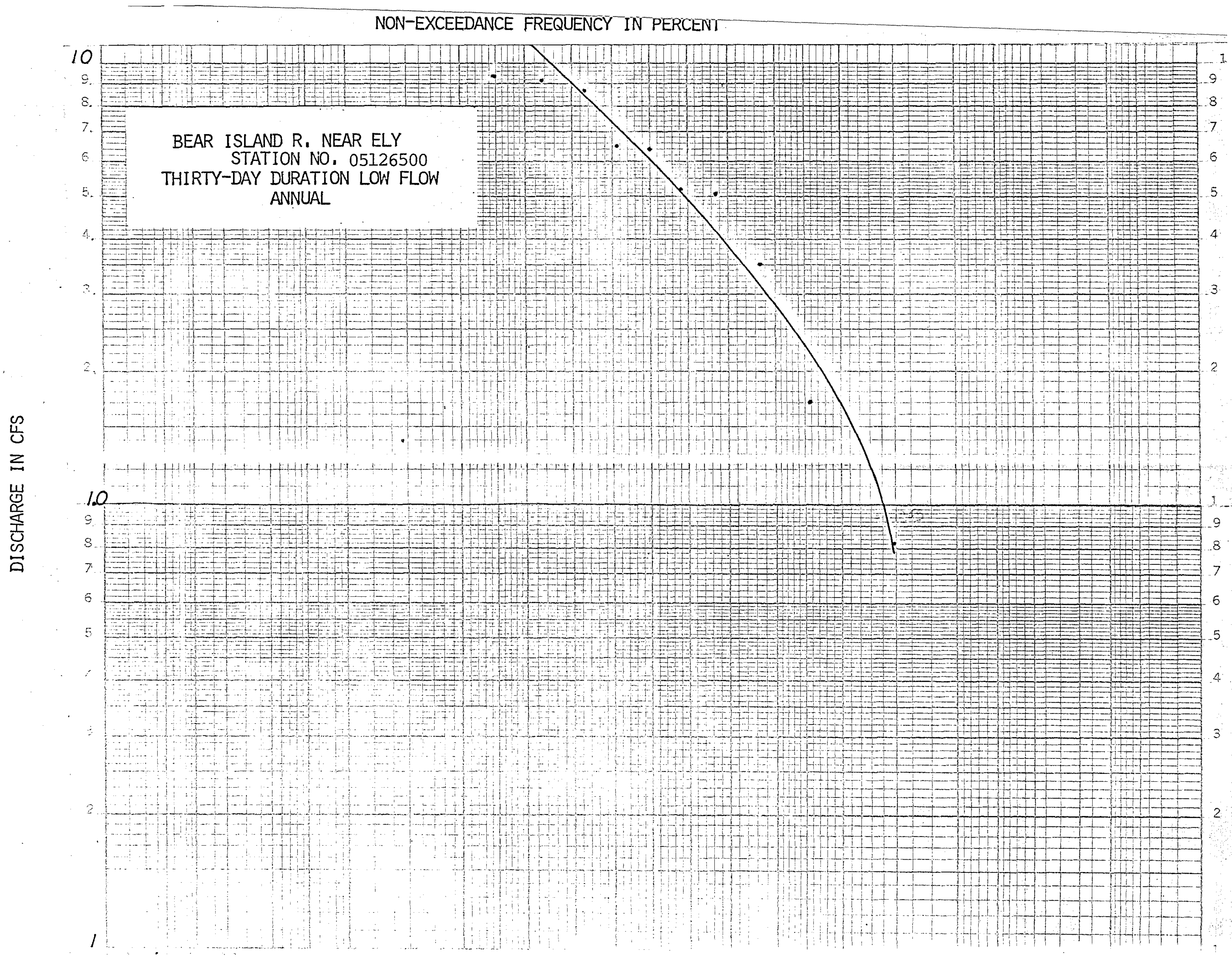
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
SEVEN-DAY DURATION LOW FLOW
ANNUAL

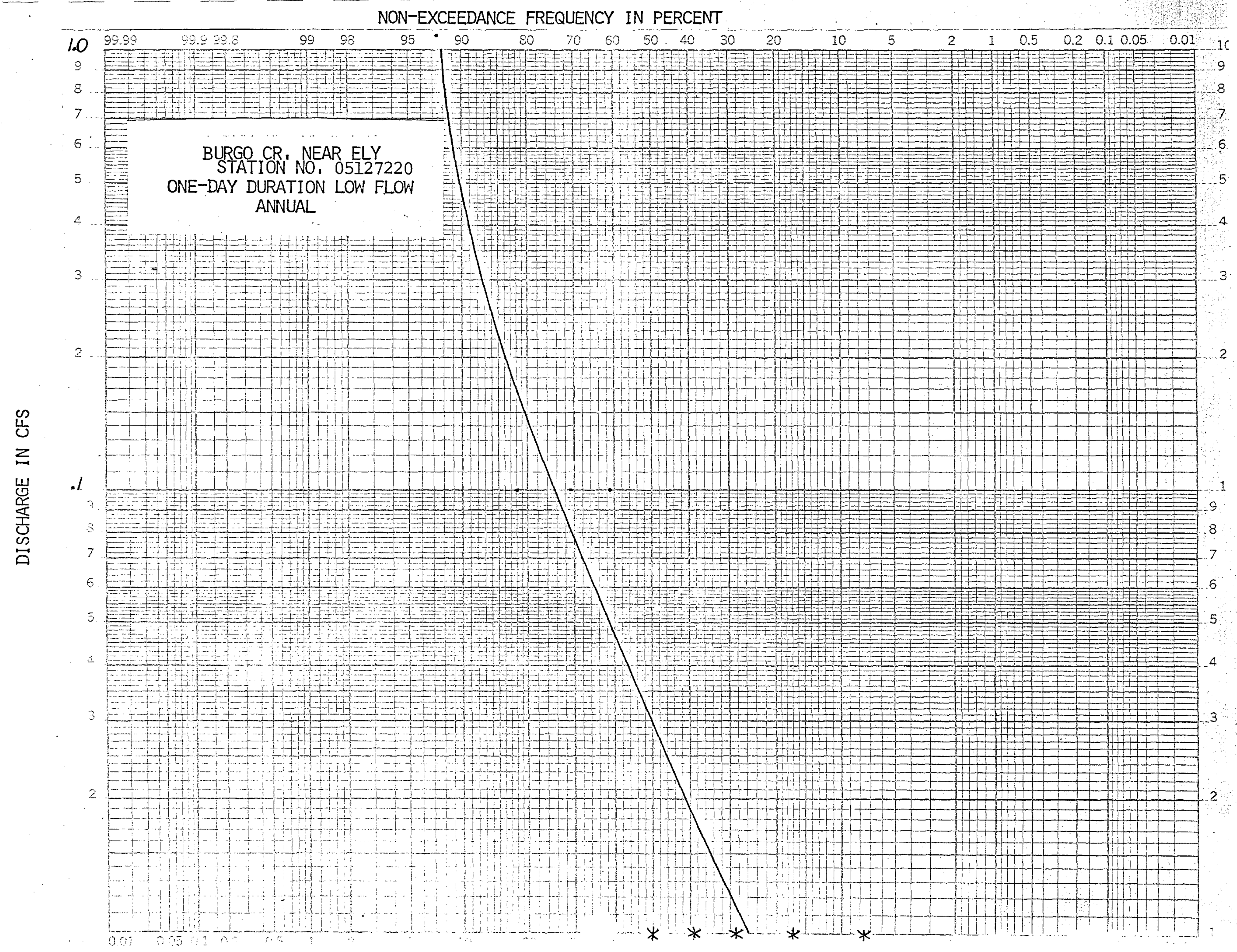

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
1000
100
10
DISCHARGE IN CFS
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
THIRTY-DAY DURATION LOW FLOW
ANNUAL

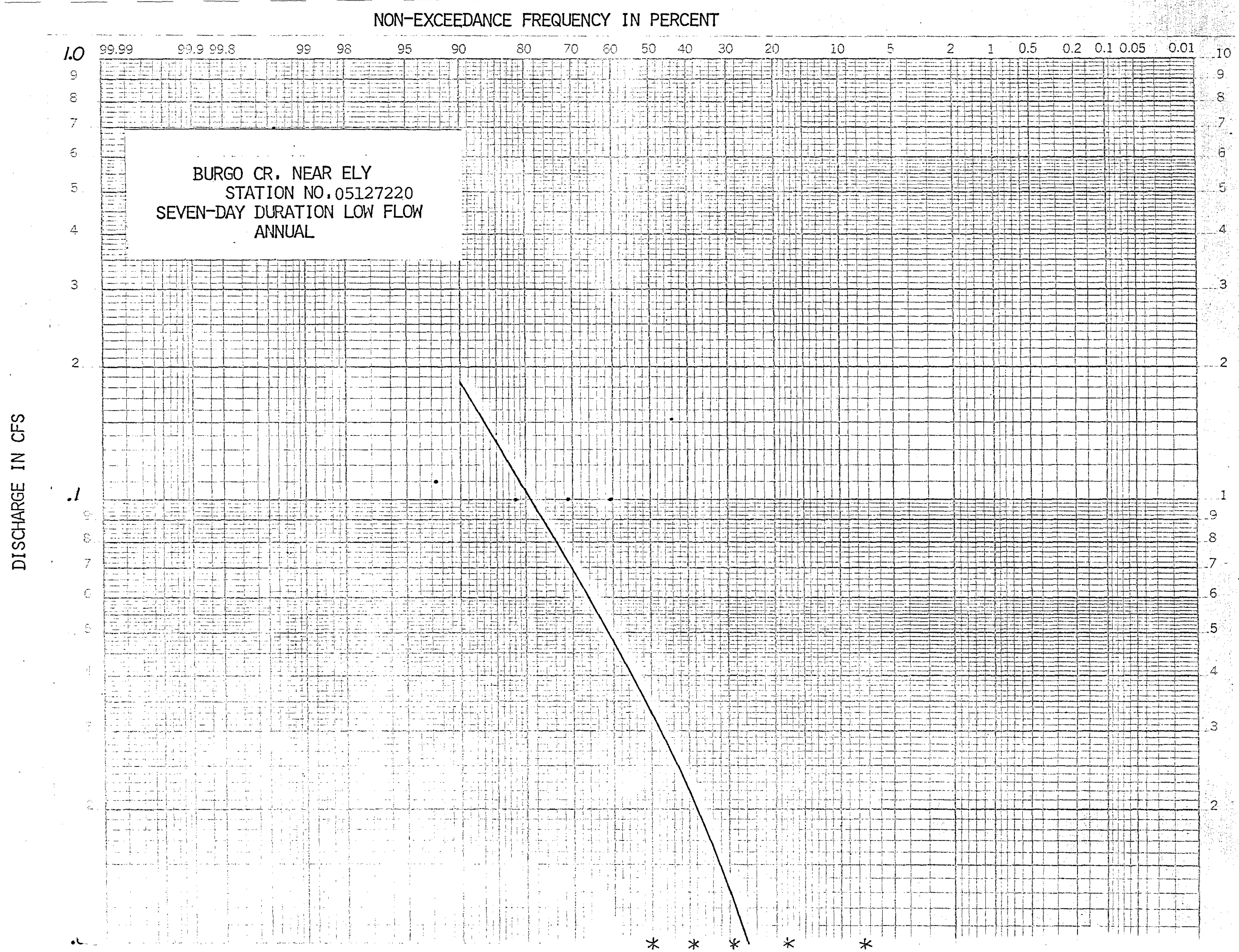

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
ONE-DAY DURATION LOW FLOW
ANNUAL

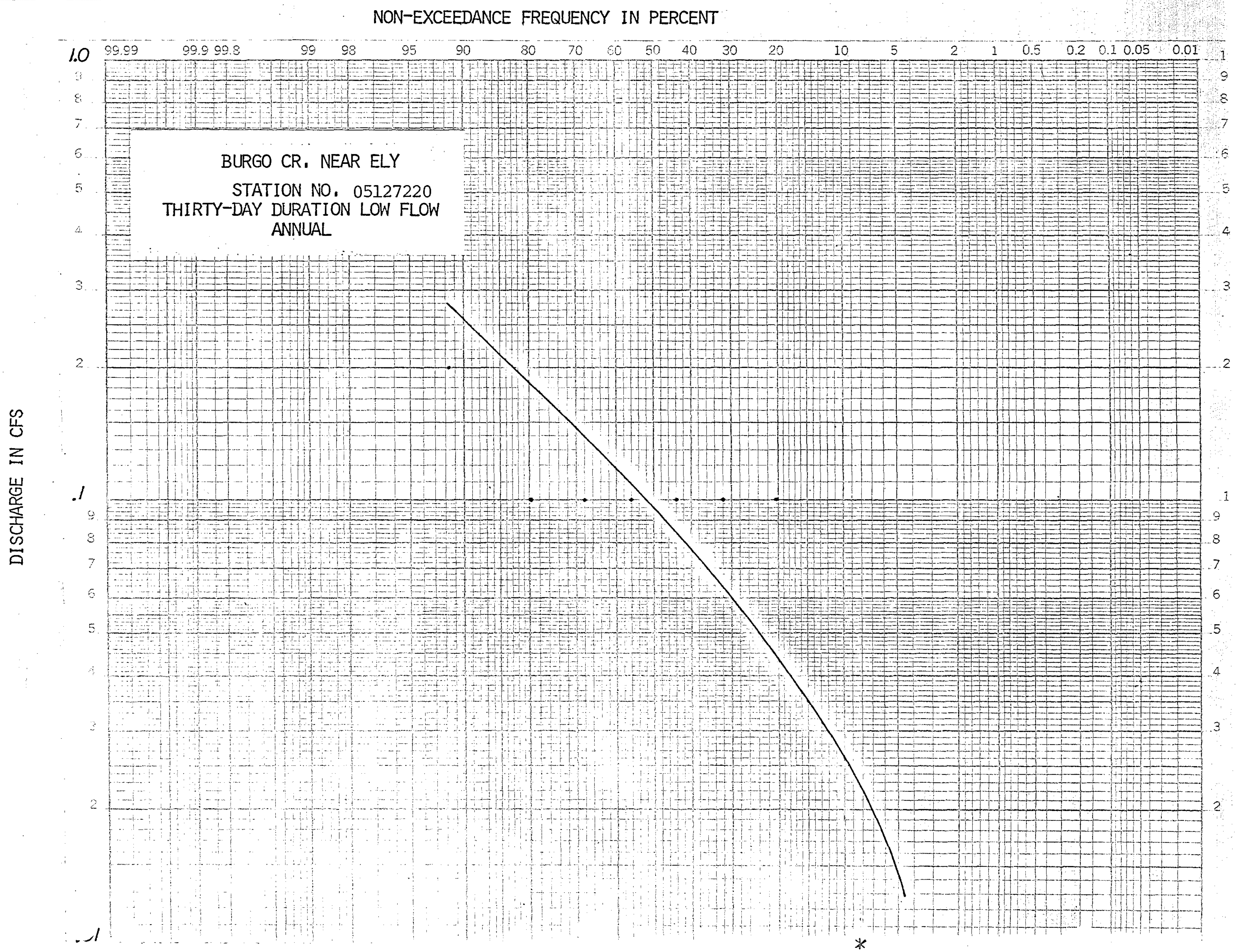


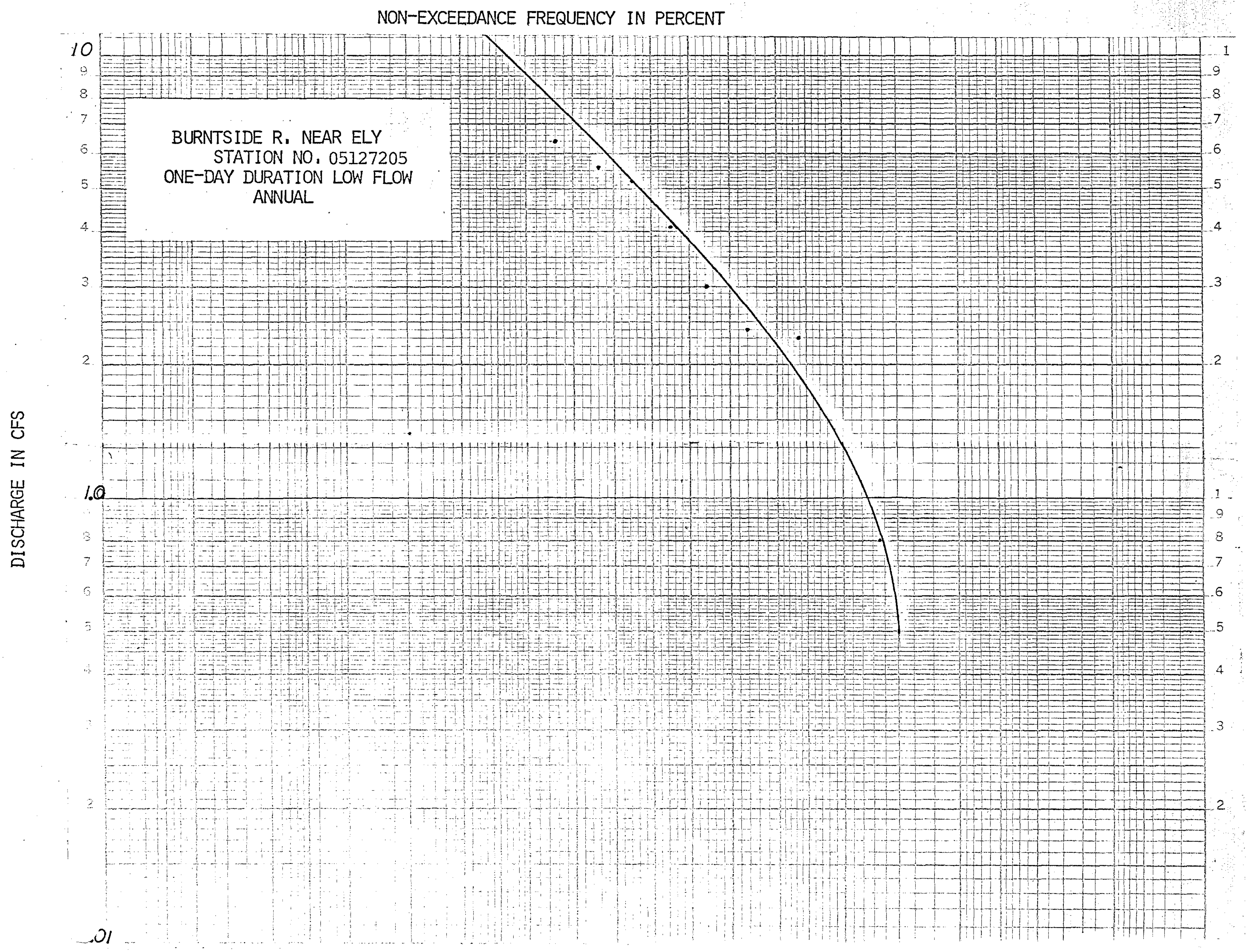
NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
DISCHARGE IN CFS
10
9
8
7
6
5
4
3
2
1.0
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
SEVEN-DAY DURATION LOW FLOW
ANNUAL

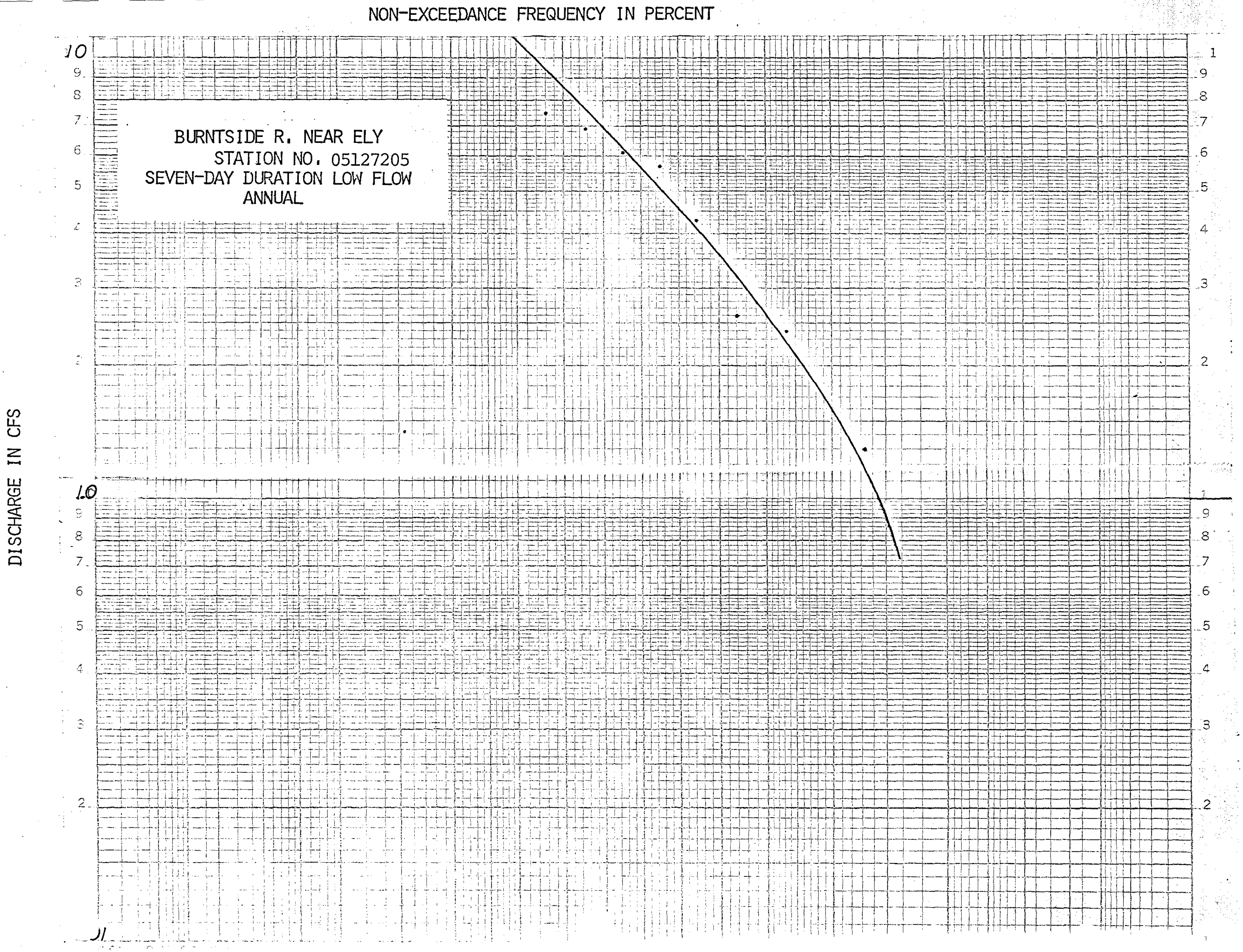

NON-EXCEEDANCE FREQUENCY IN PERCENT
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
10
1.0
1

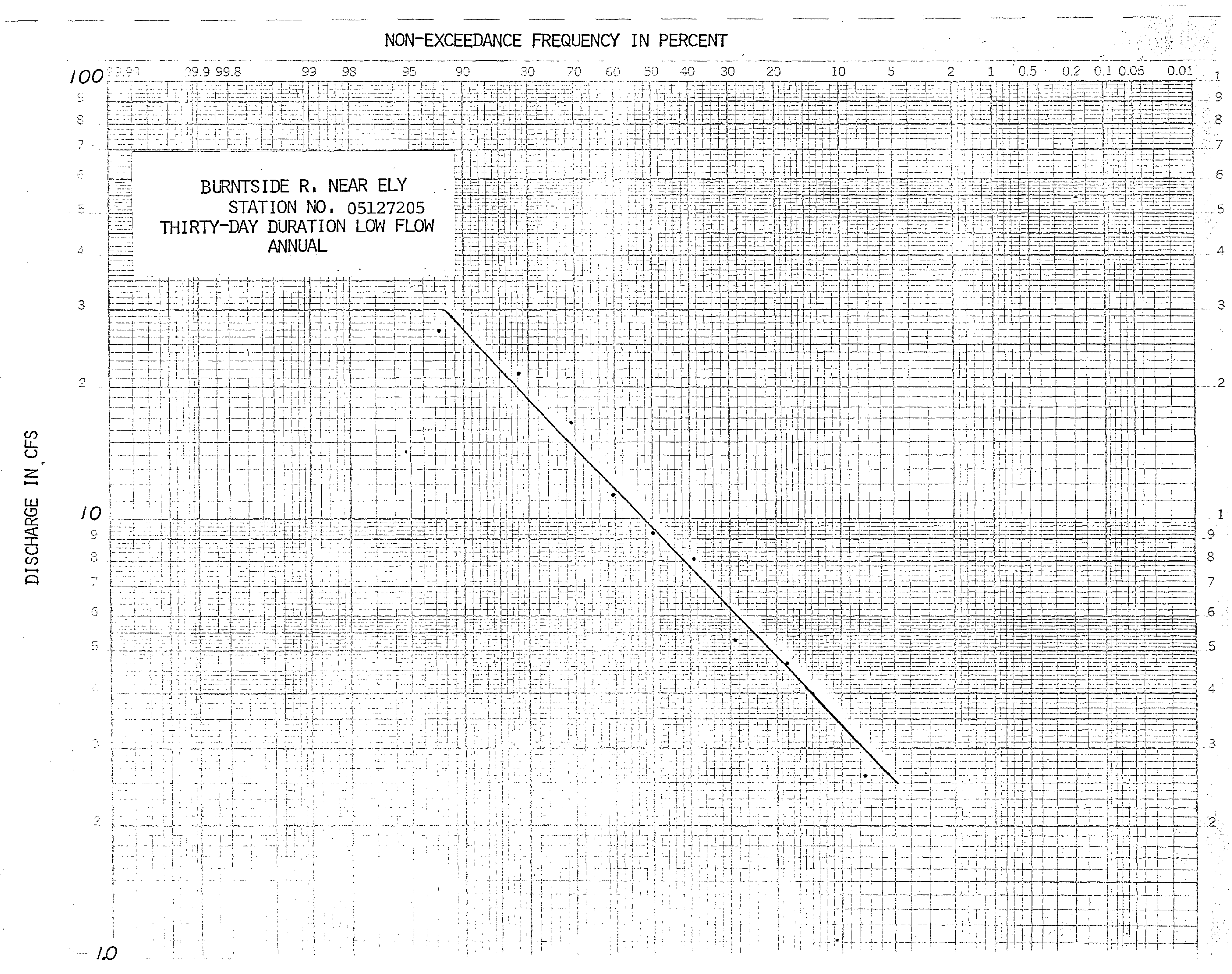

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BURGO CR. NEAR ELY
STATION NO. 05127220
ONE-DAY DURATION LOW FLOW
ANNUAL

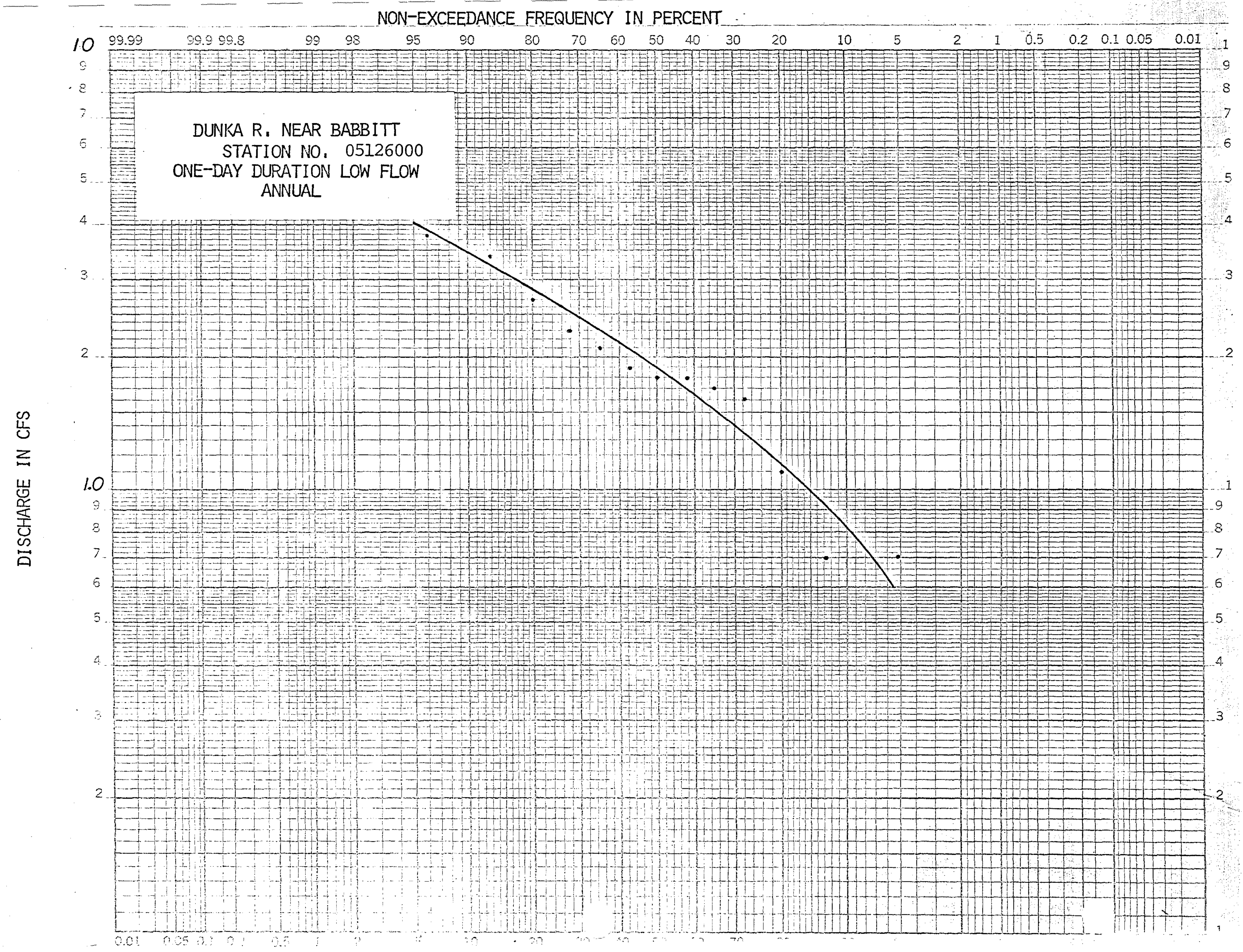

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
BURGO CR. NEAR ELY
STATION NO. 05127220
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1.0
.1
* * * * *

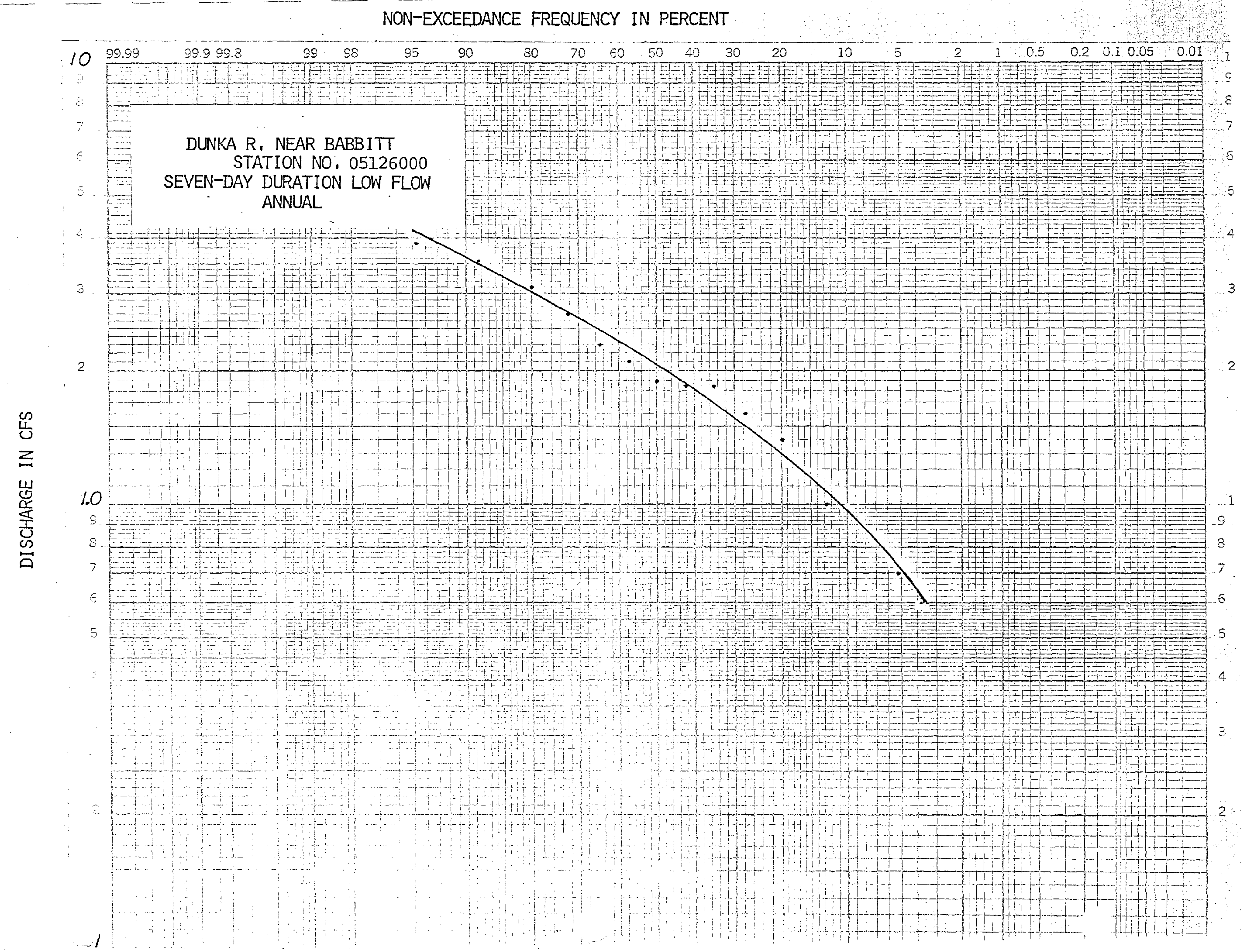

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
BURGO CR. NEAR ELY
STATION NO. 05127220
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1.0
.1
.01
*

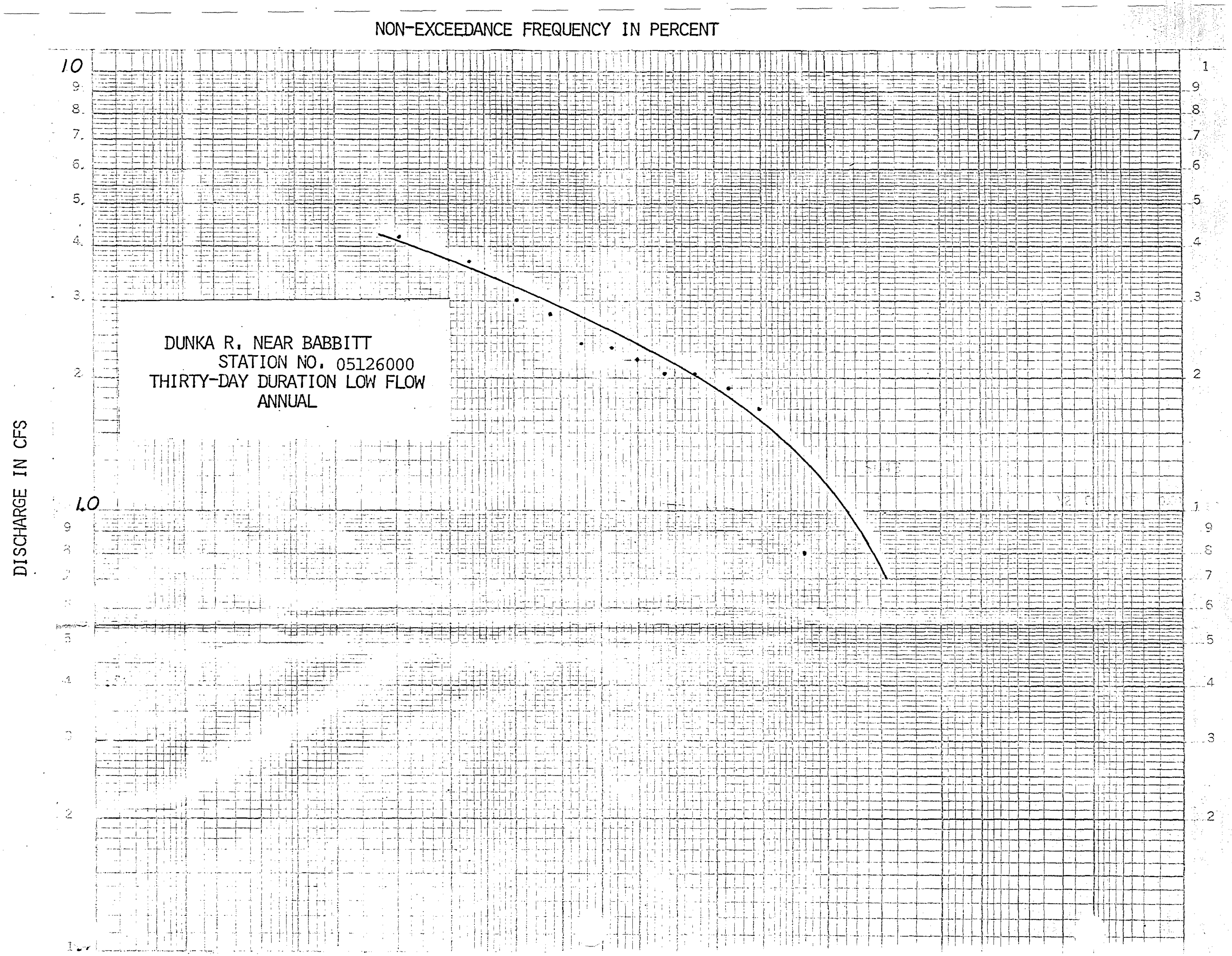

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
ONE-DAY DURATION LOW FLOW
ANNUAL
10
1.0
.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
SEVEN-DAY DURATION LOW FLOW
ANNUAL
10
1.0
.01

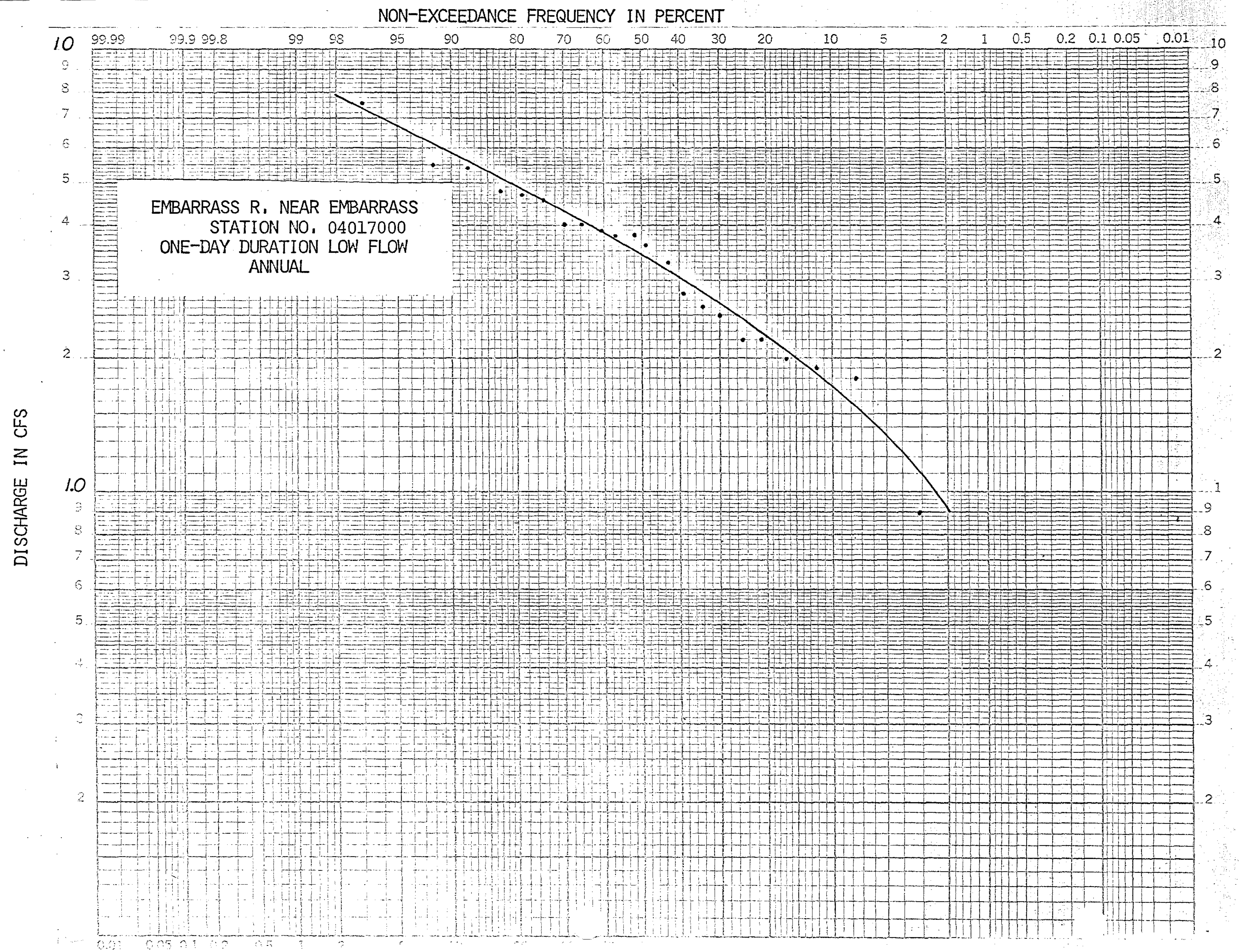

NON-EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
100
10
1.0

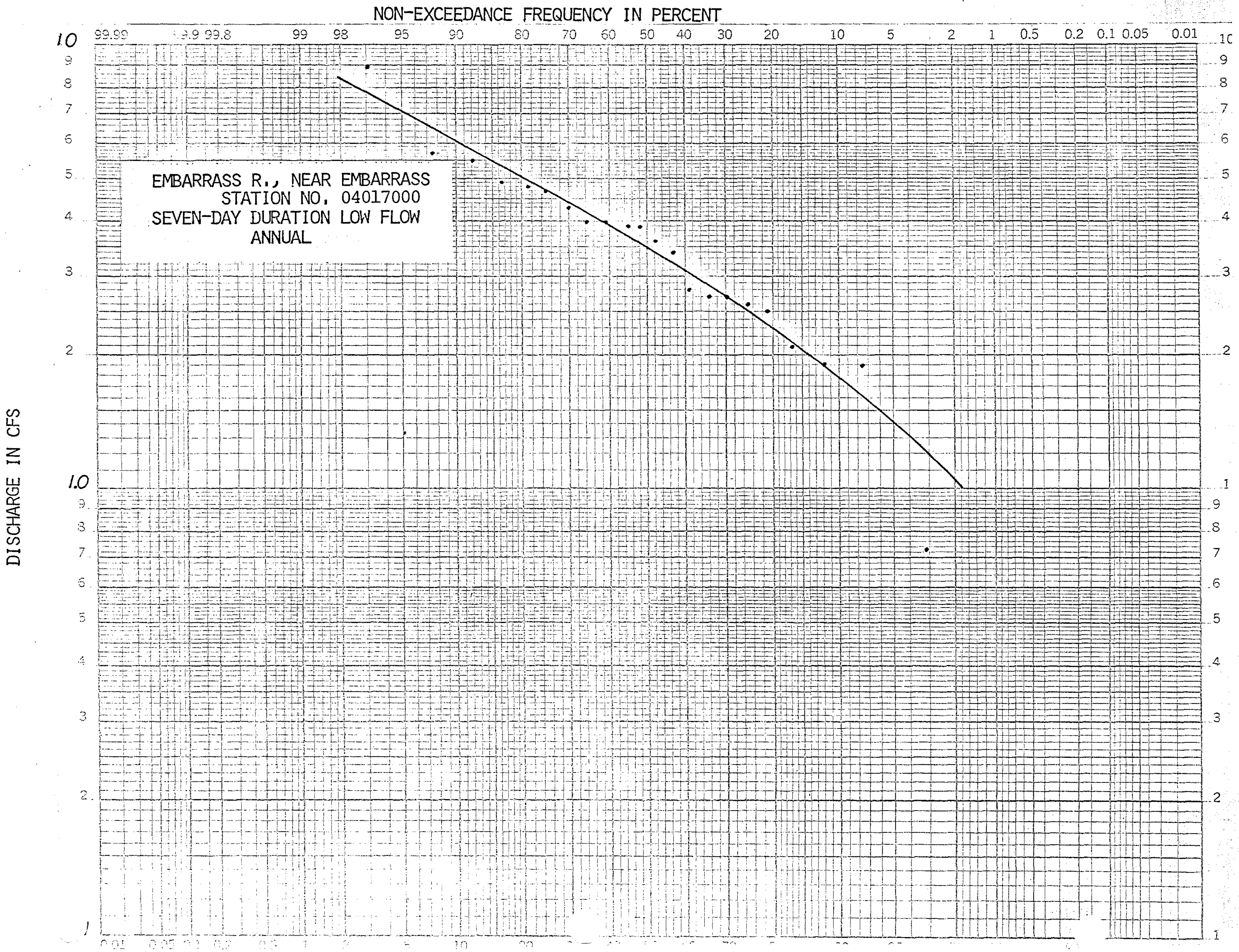

NON-EXCEEDANCE FREQUENCY IN PERCENT
DUNKA R. NEAR BABBITT
STATION NO. 05126000
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
10
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
DUNKA R. NEAR BABBITT
STATION NO. 05126000
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
10
1.0
.1

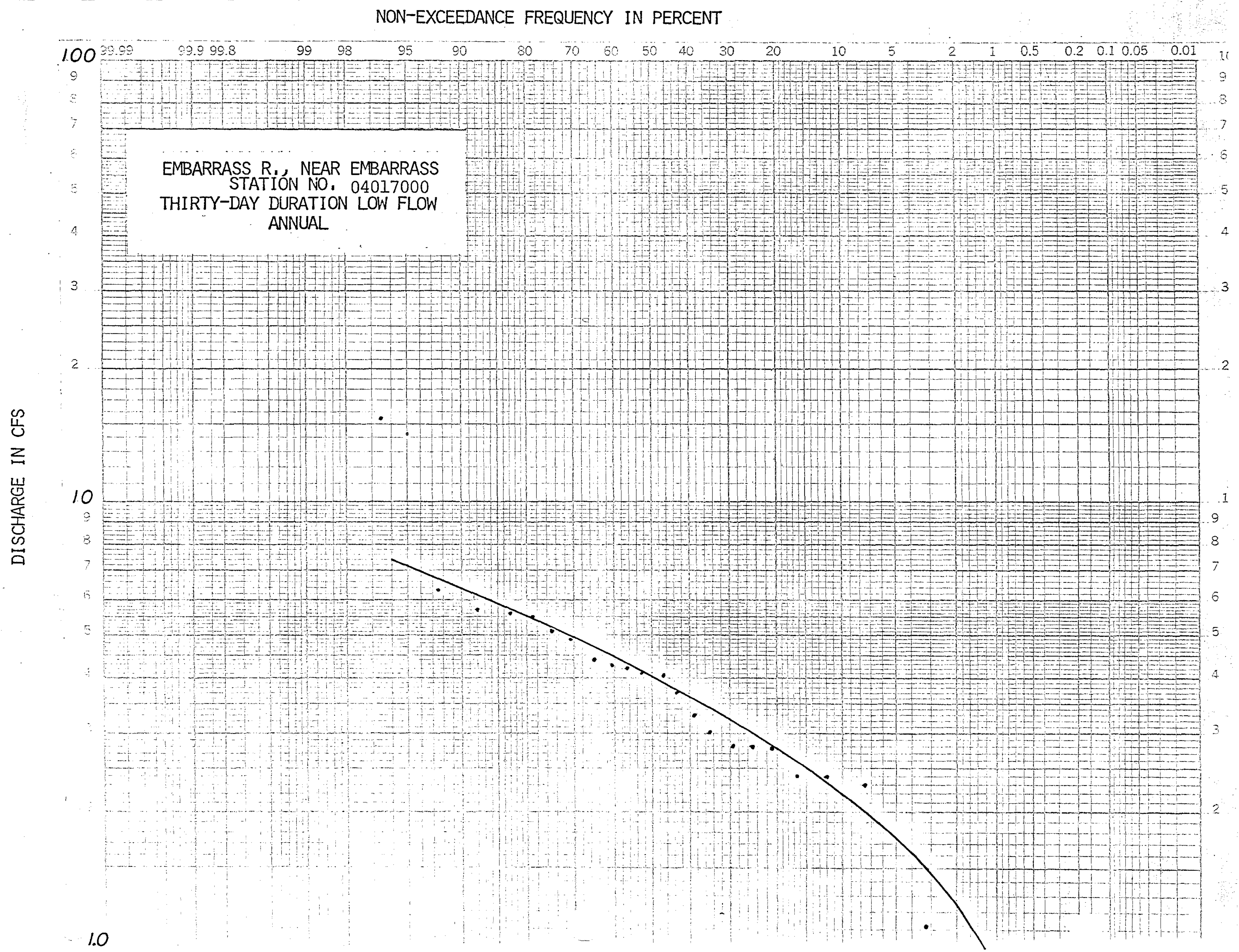


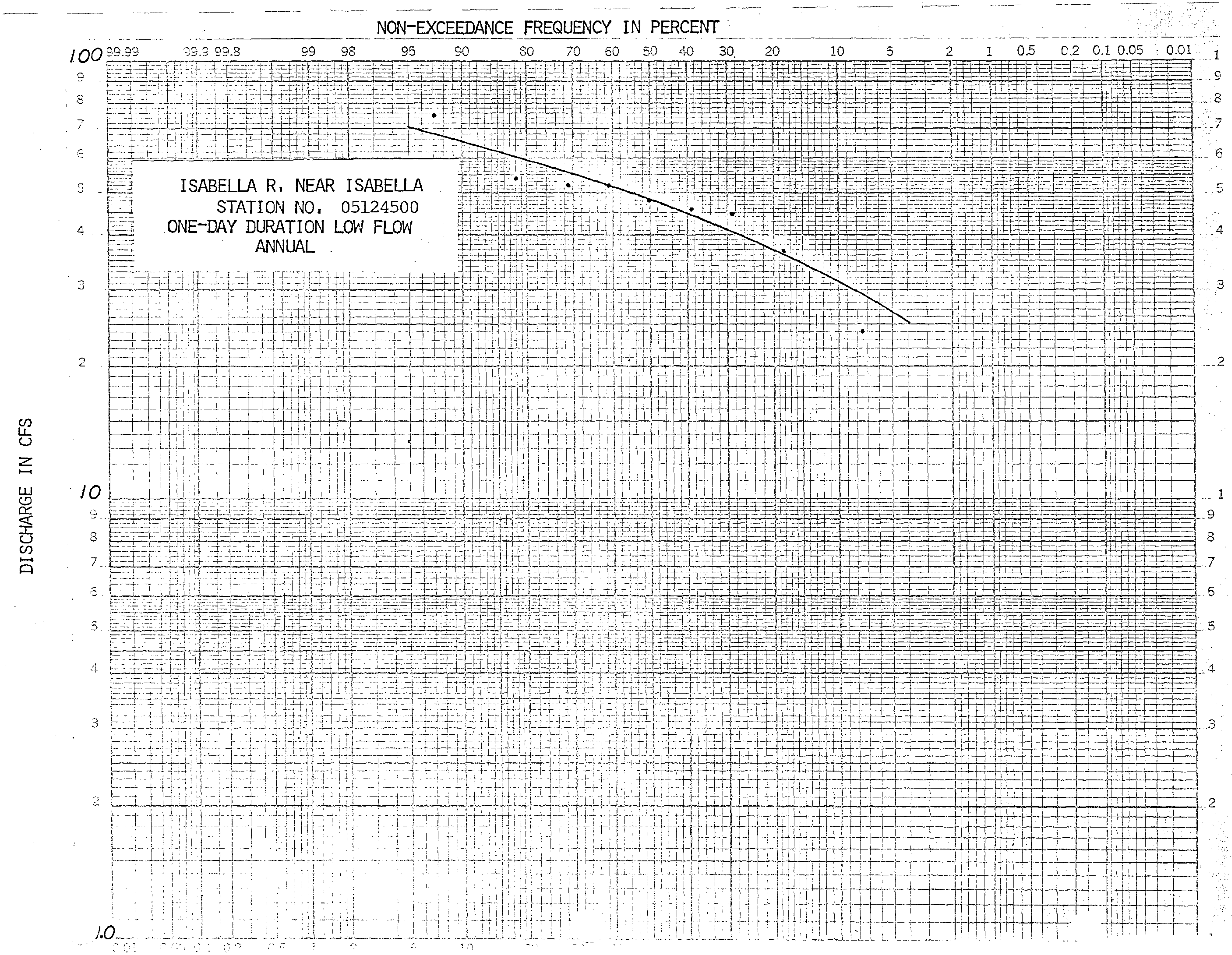
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
DUNKA R. NEAR BABBITT
STATION NO. 05126000
THIRTY-DAY DURATION LOW FLOW
ANNUAL
10
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
EMBARRASS R. NEAR EMBARRASS
STATION NO. 04017000
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS

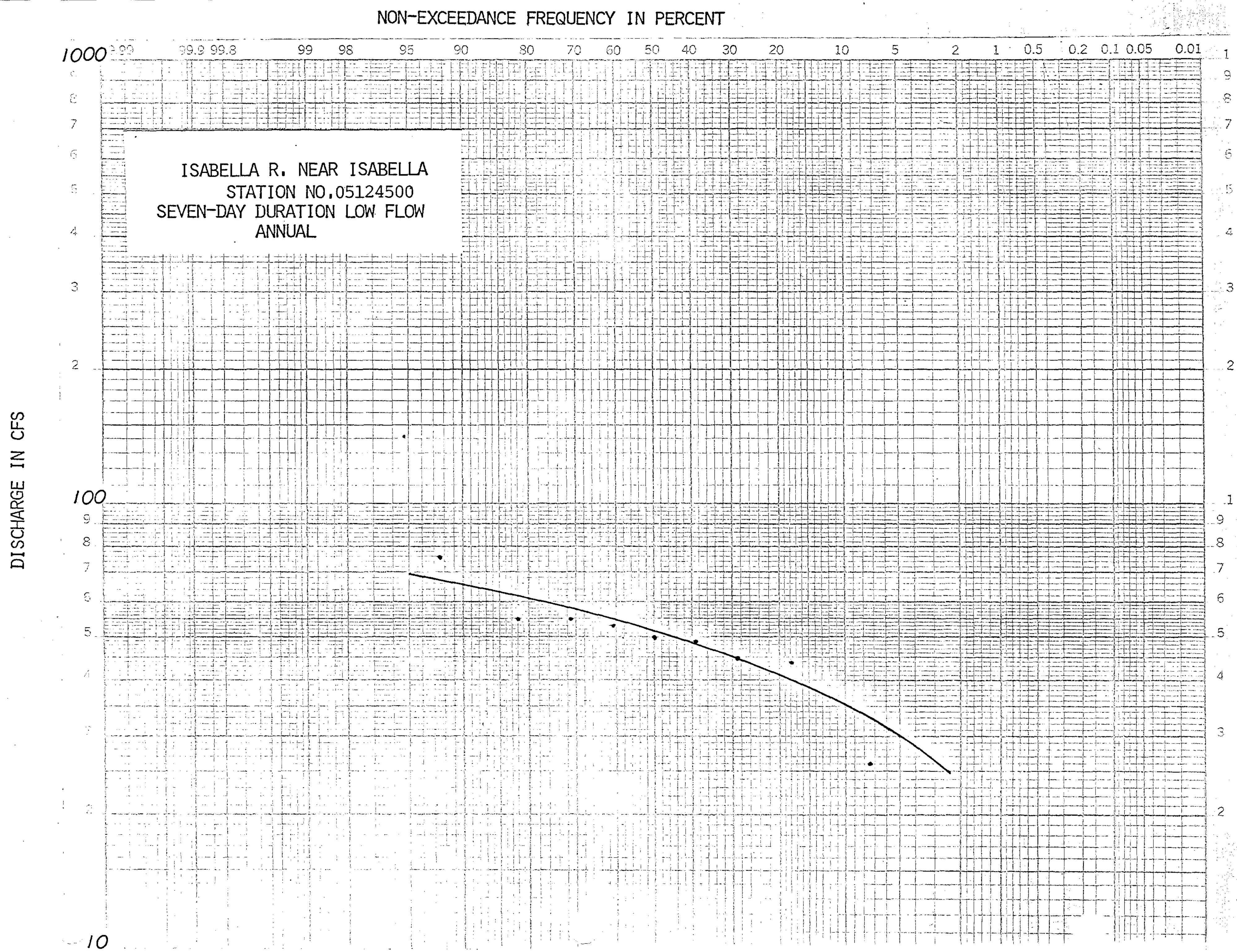


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
SEVEN-DAY DURATION LOW FLOW
ANNUAL

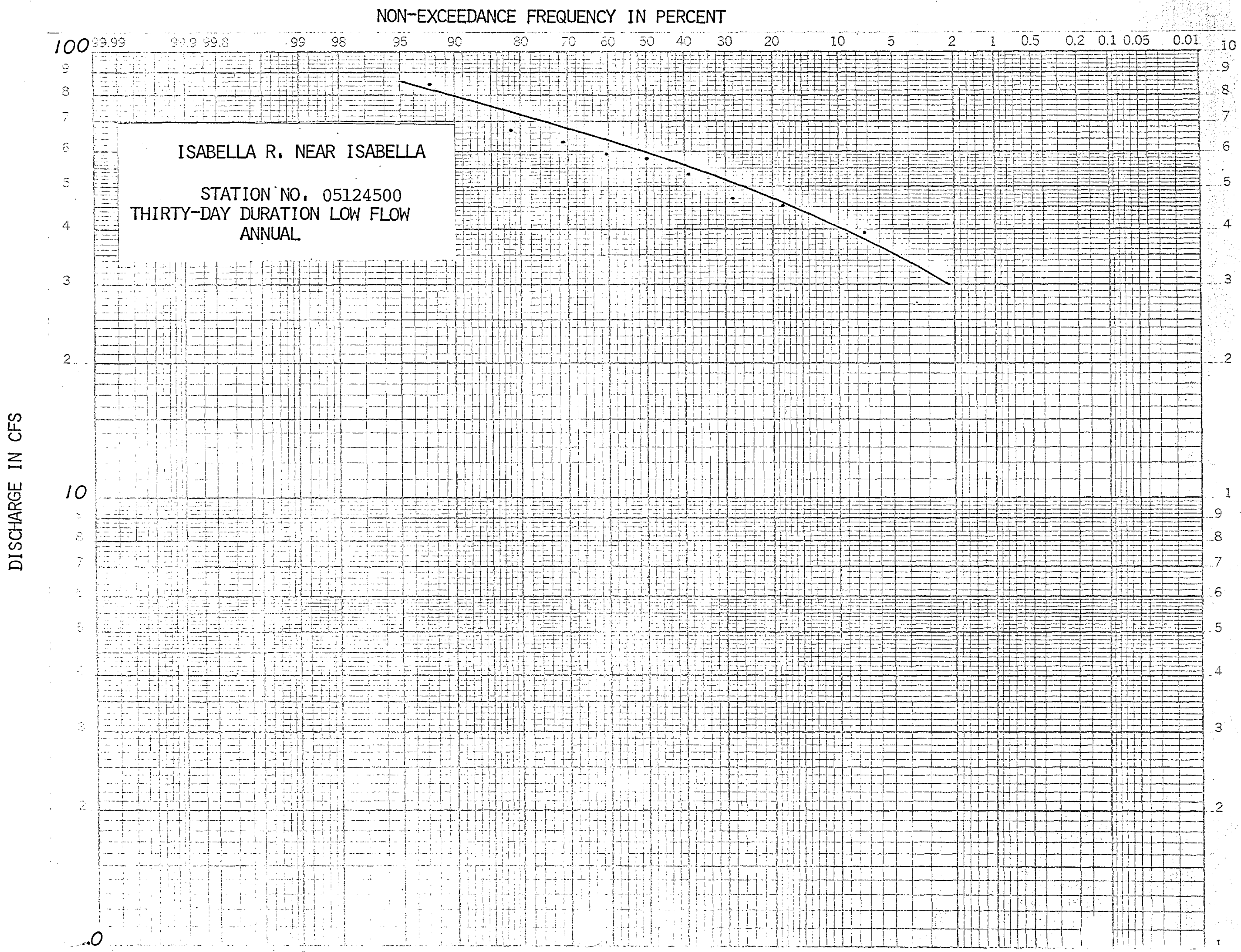

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
100
10
1.0

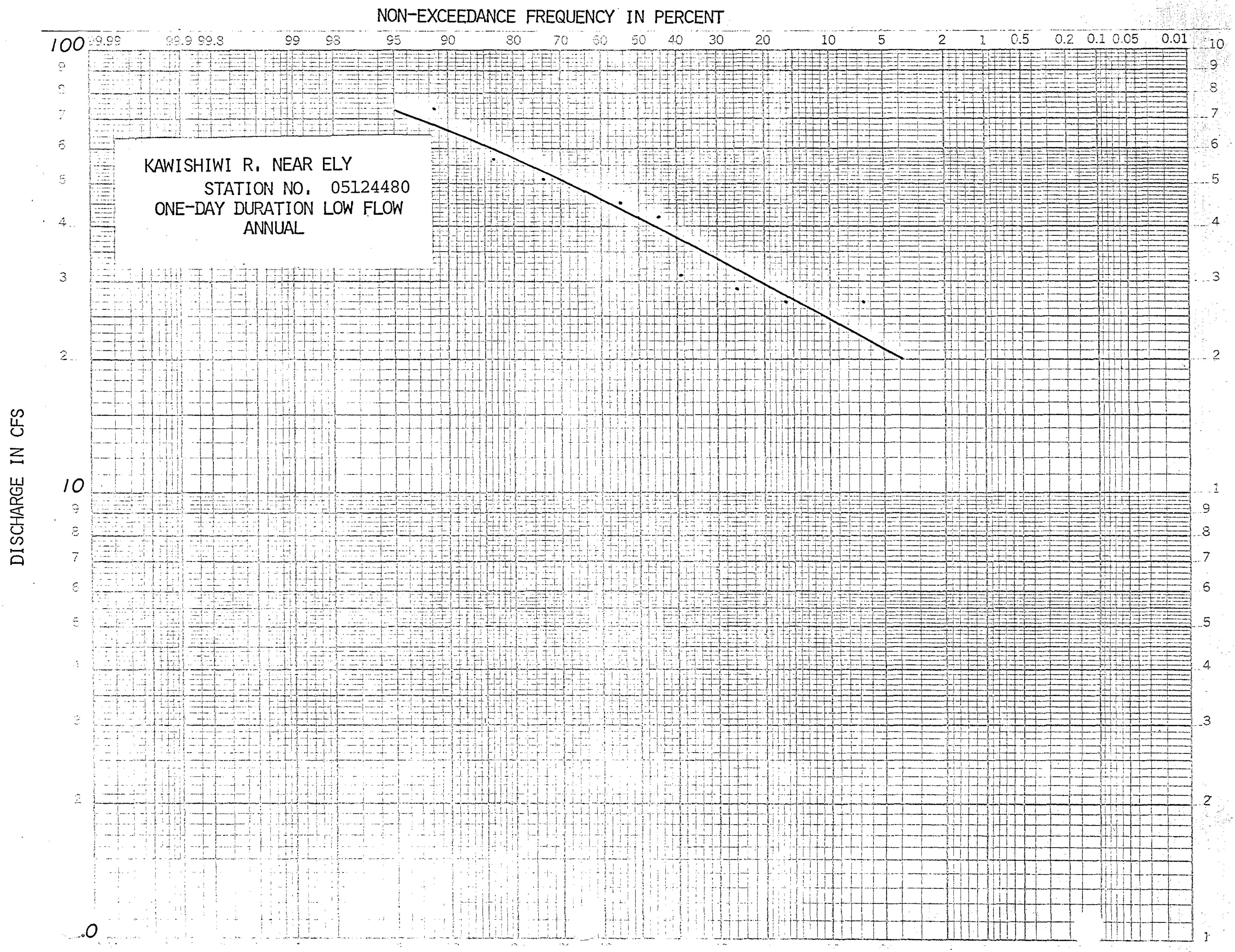


NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS

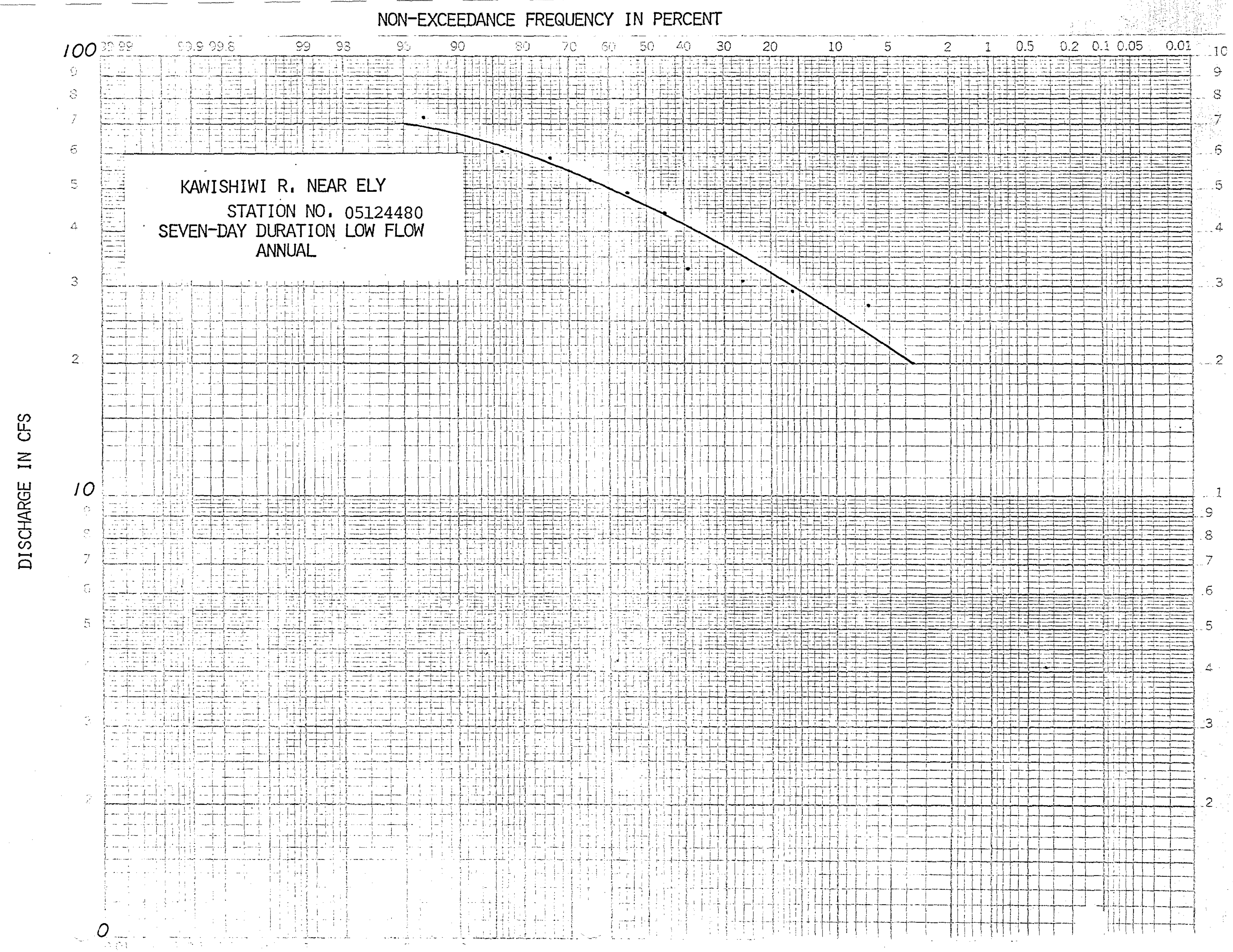


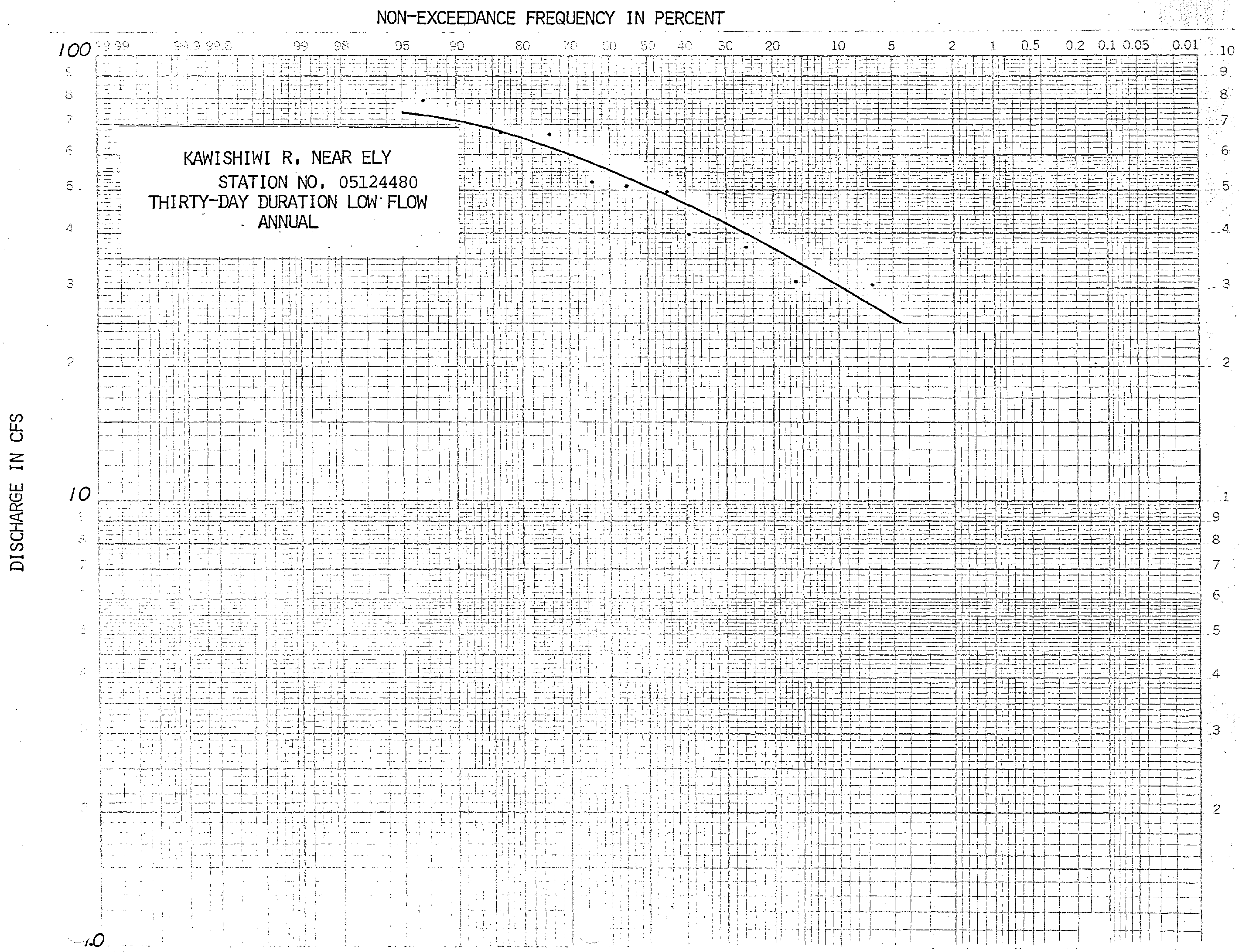
NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO.05124500
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1000
100
10
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
100
10
1.0

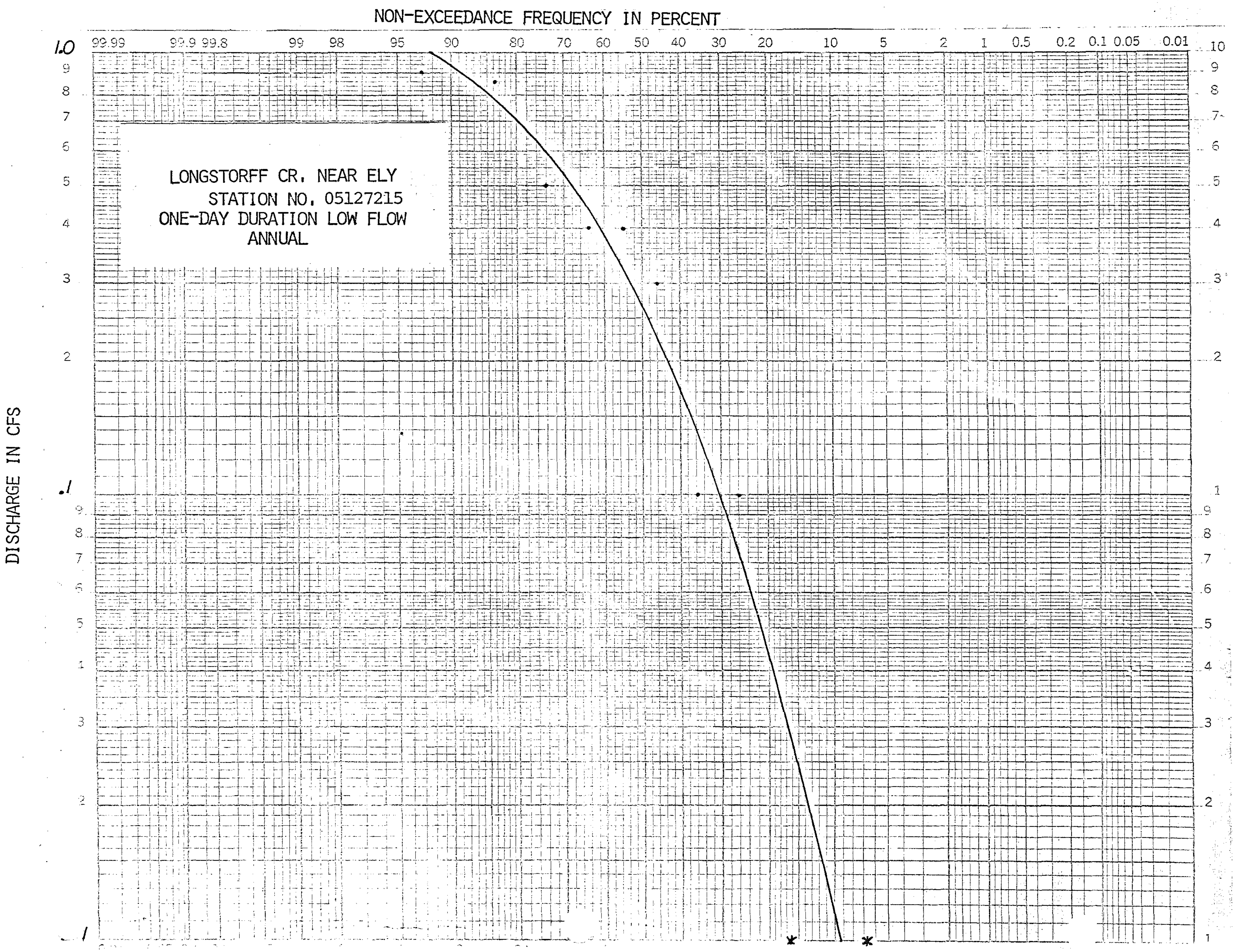


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
ONE-DAY DURATION LOW FLOW
ANNUAL

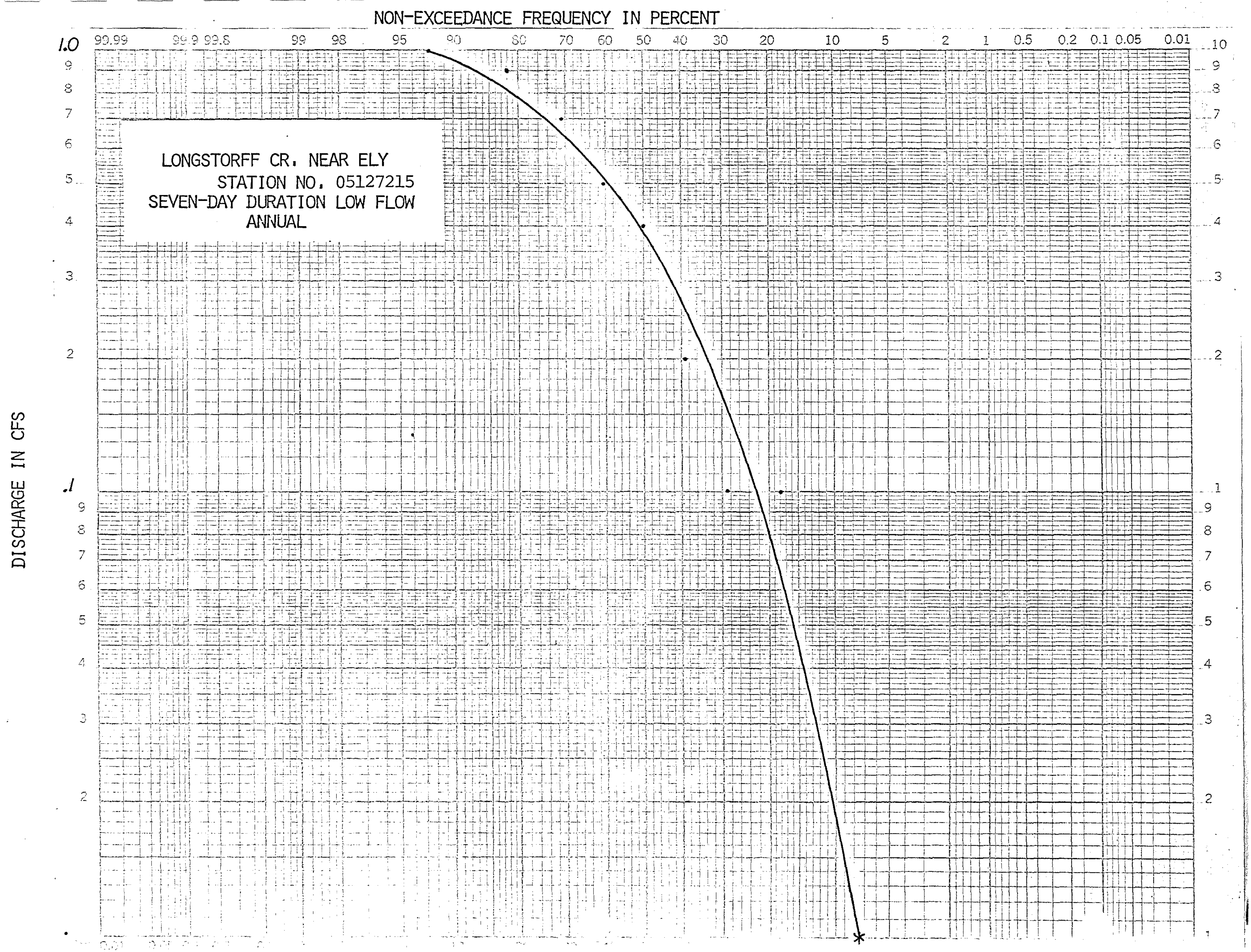

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
SEVEN-DAY DURATION LOW FLOW
ANNUAL
100
10
0
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01



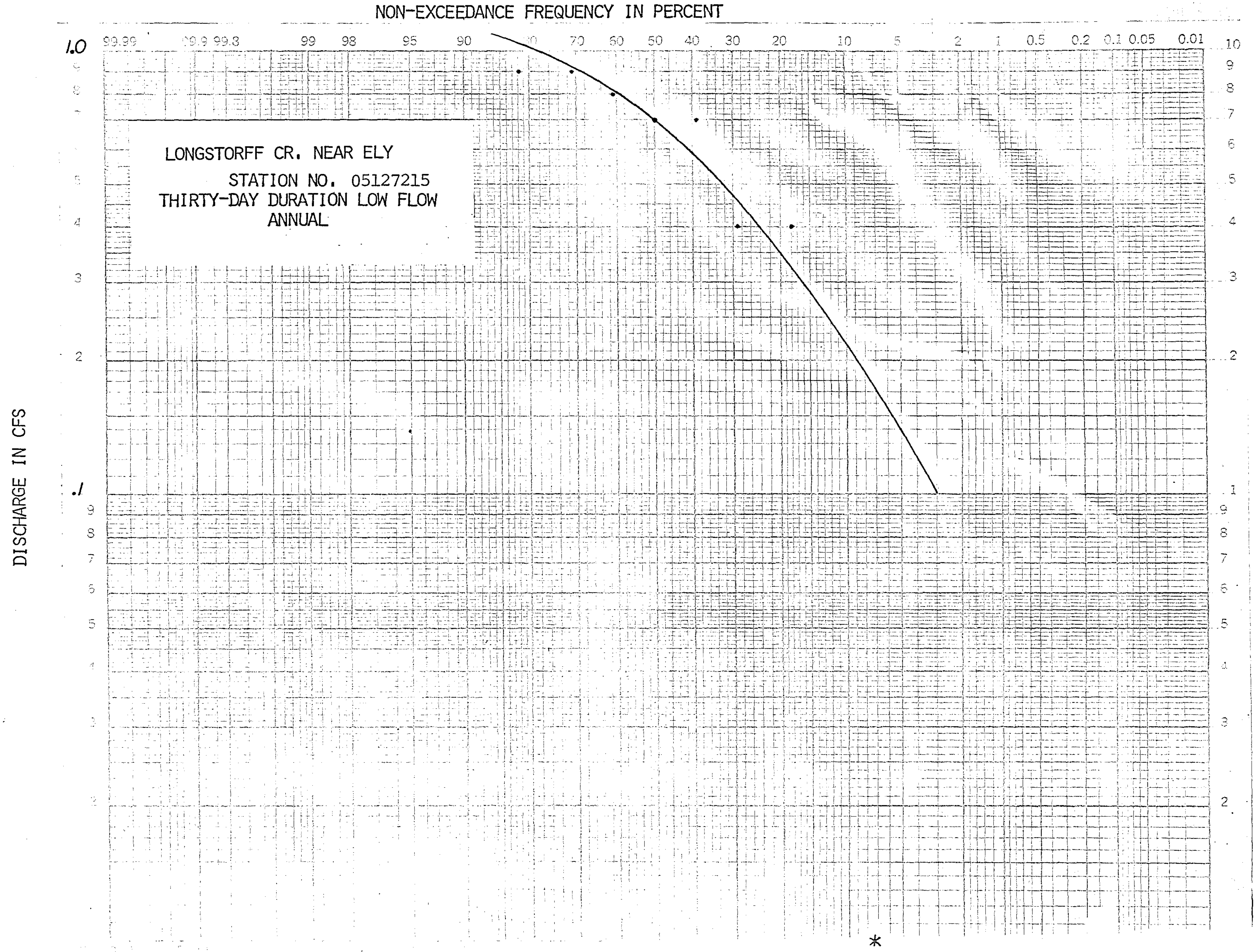
NON-EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
100
10

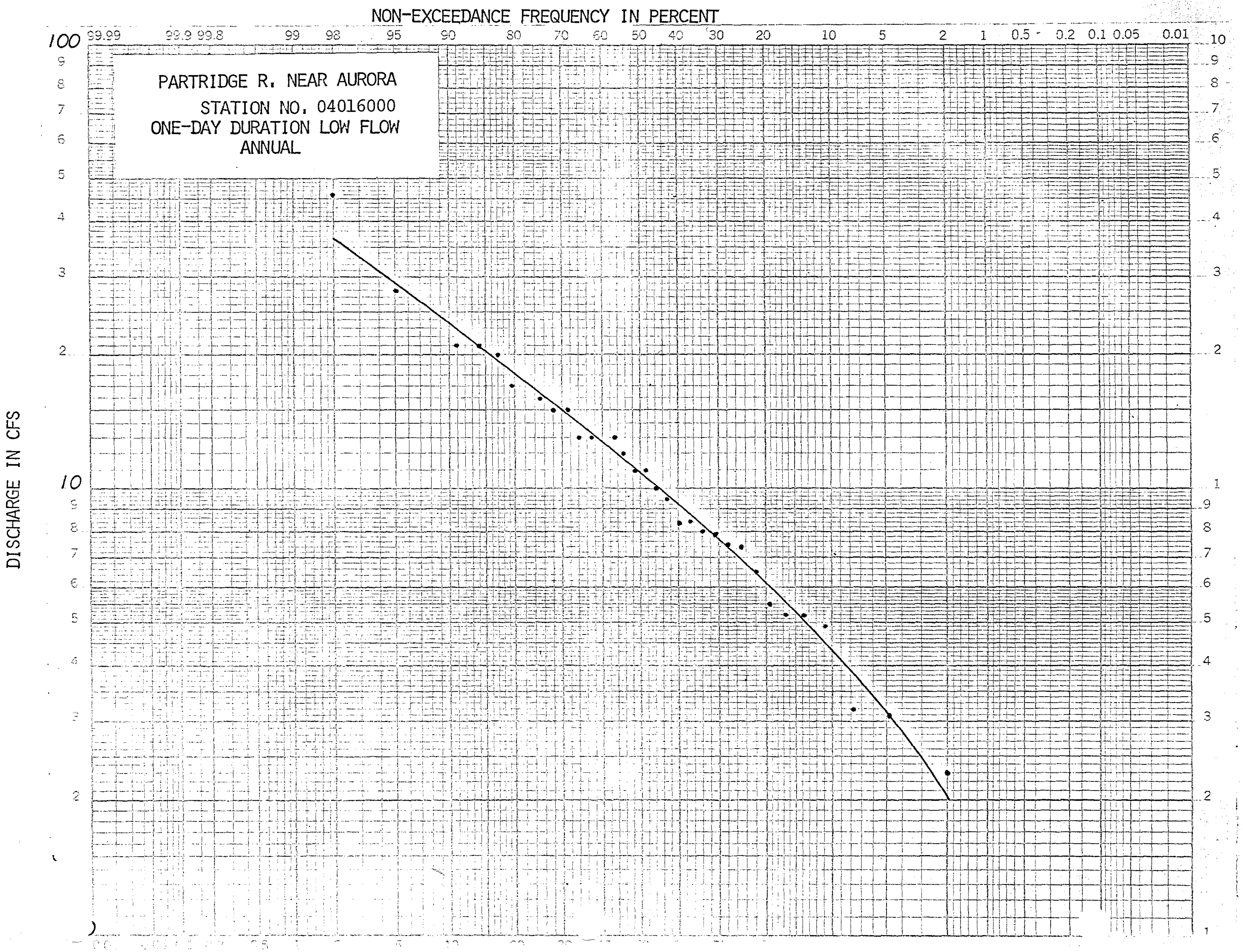


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
ONE-DAY DURATION LOW FLOW
ANNUAL

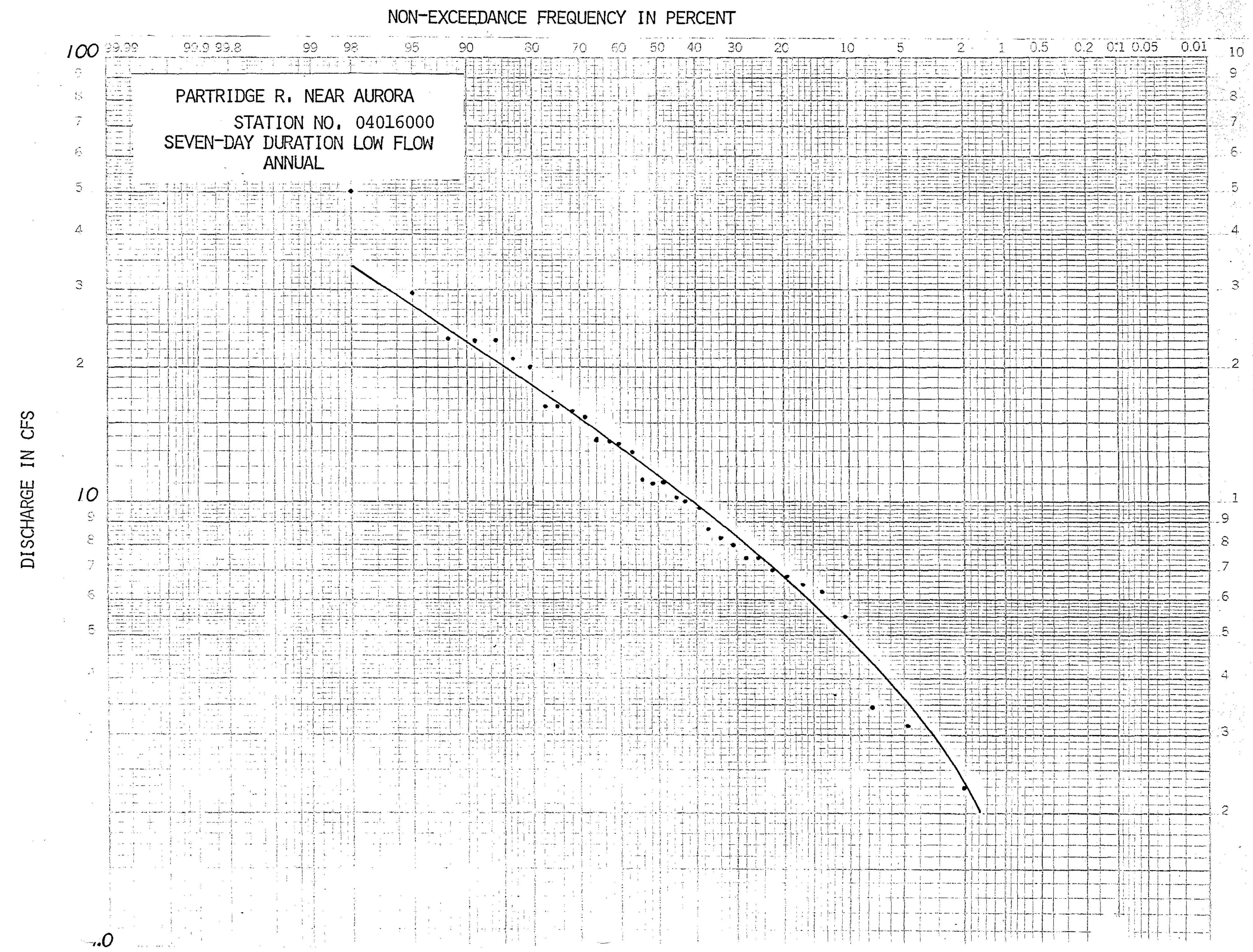


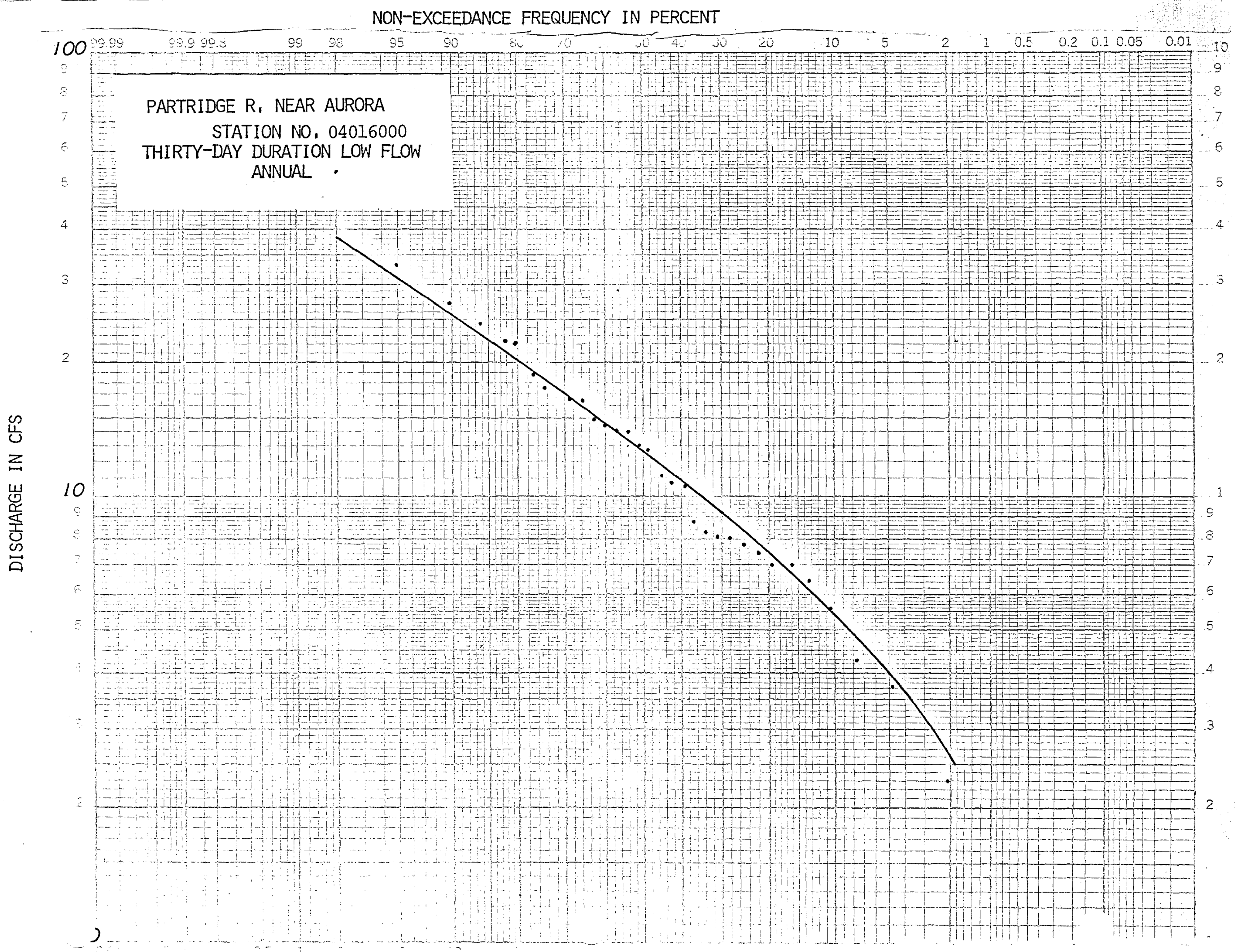
NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1.0
.1


NON-EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1.0
.1
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
*

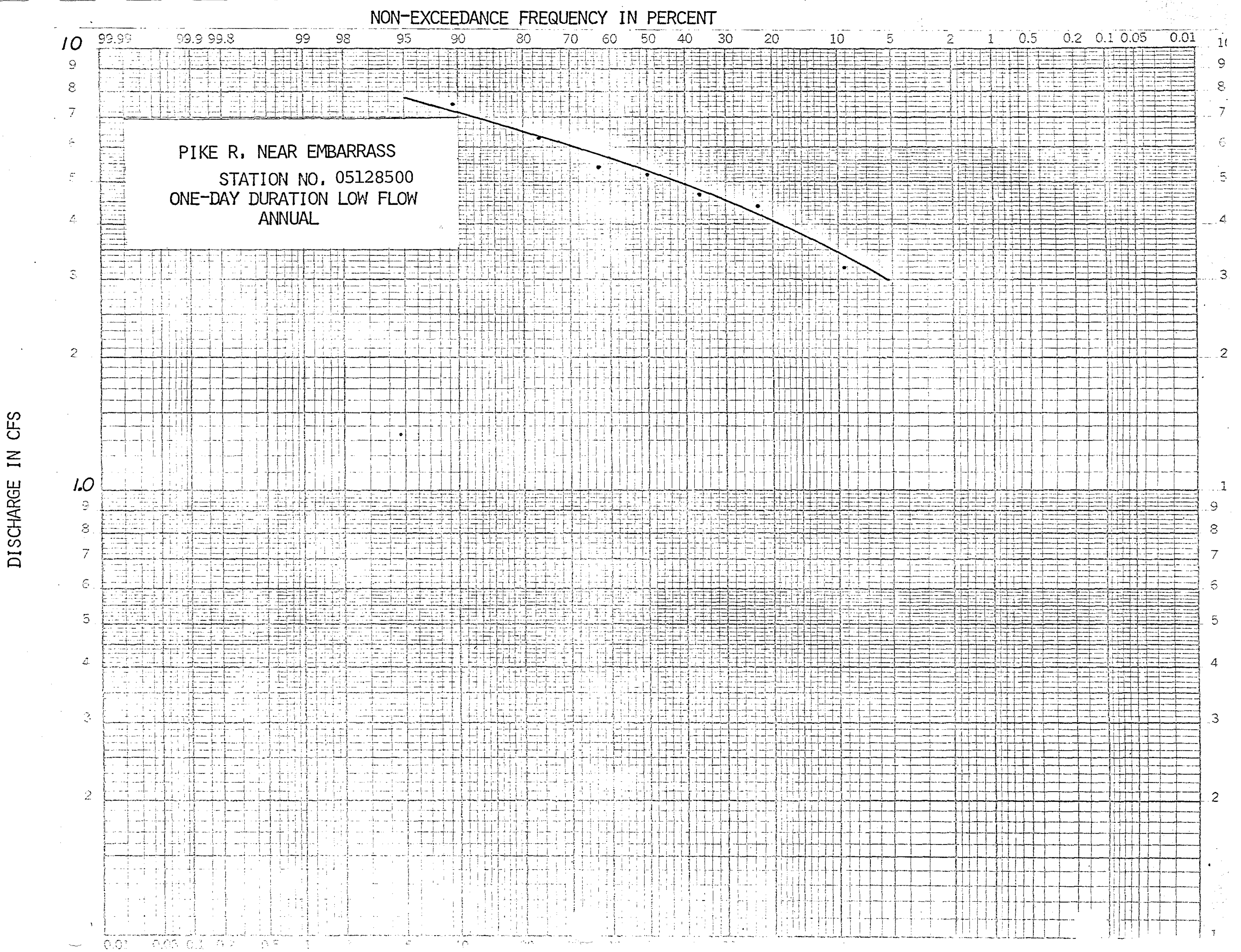


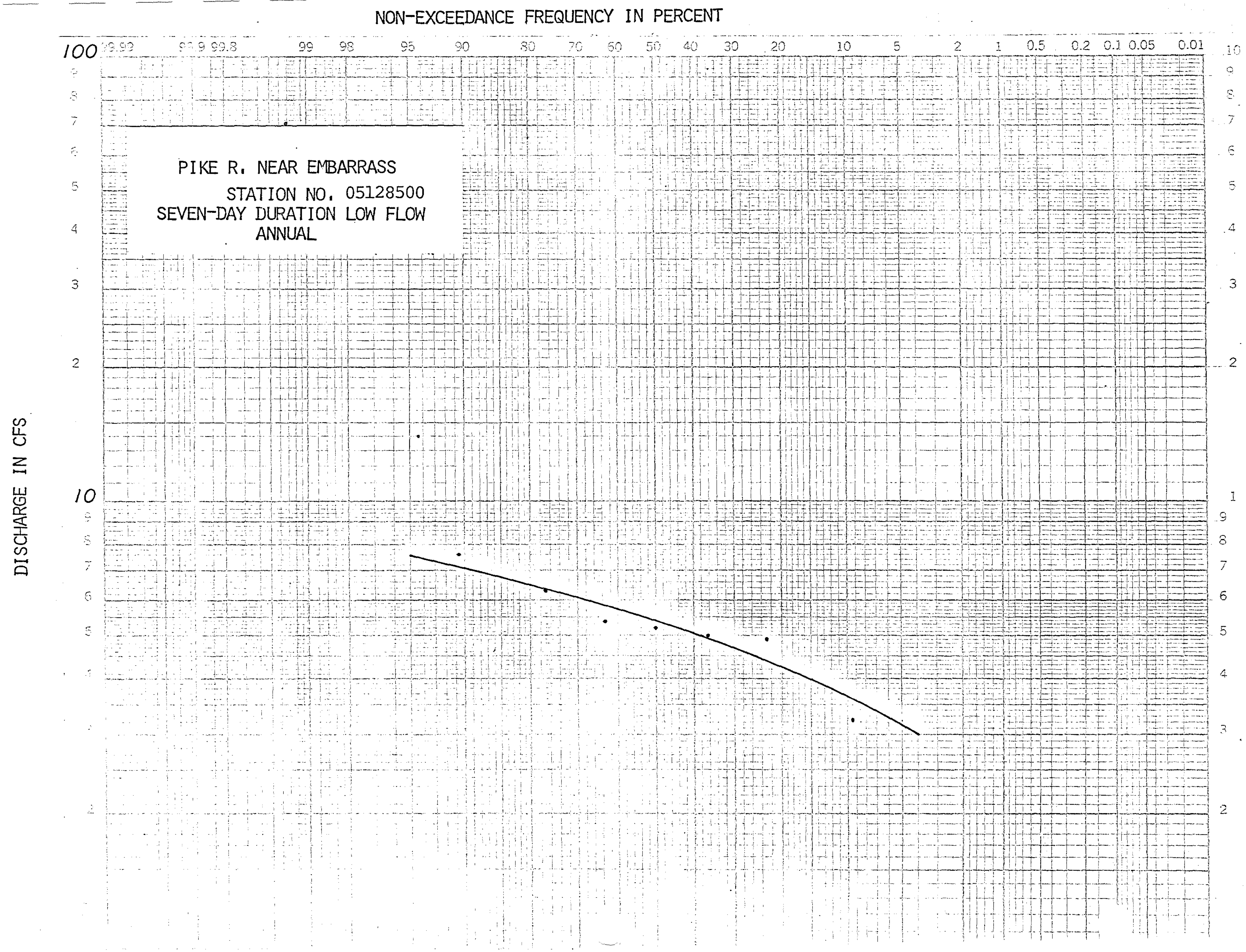
NON-EXCEEDANCE FREQUENCY IN PERCENT
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10

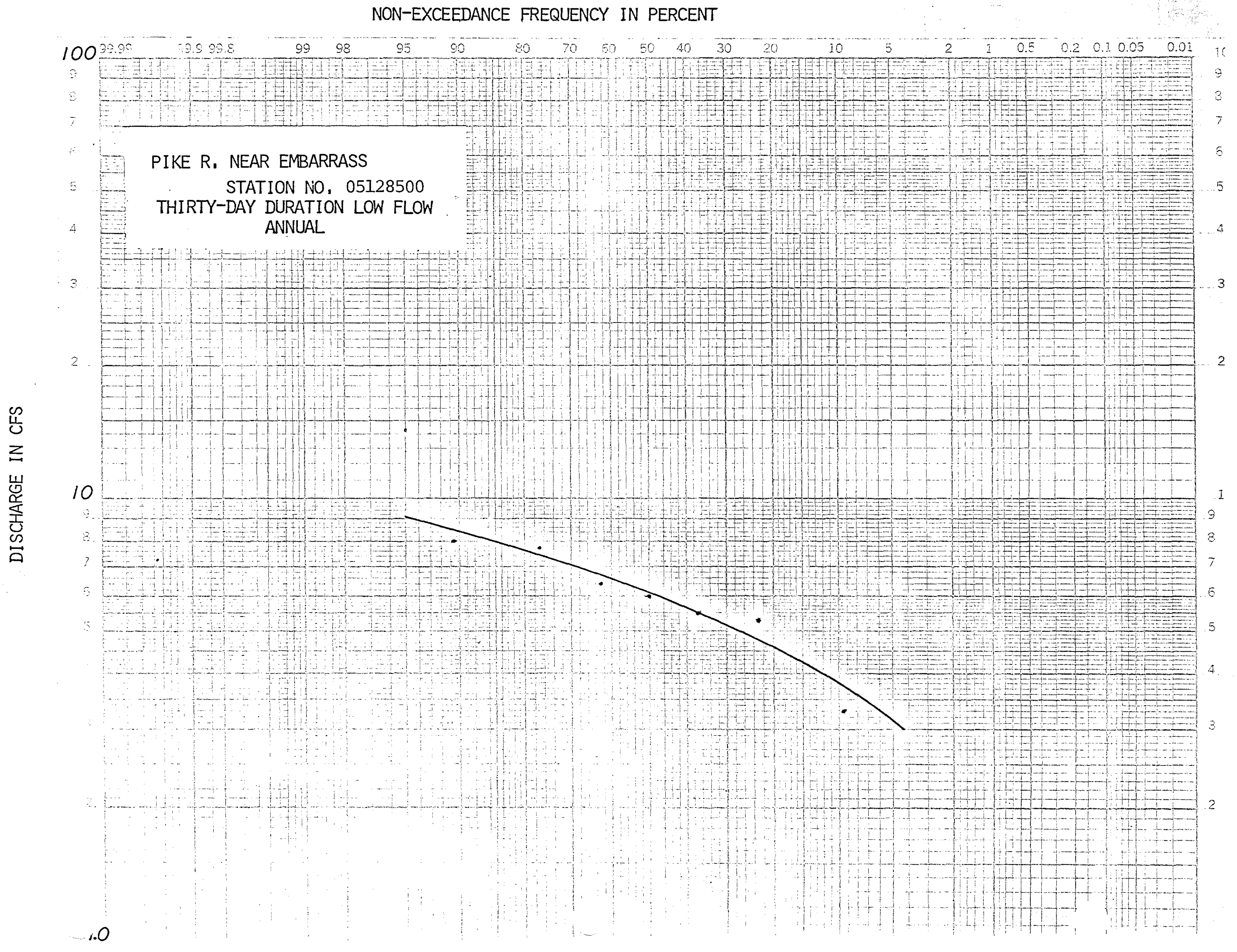

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
SEVEN-DAY DURATION LOW FLOW
ANNUAL

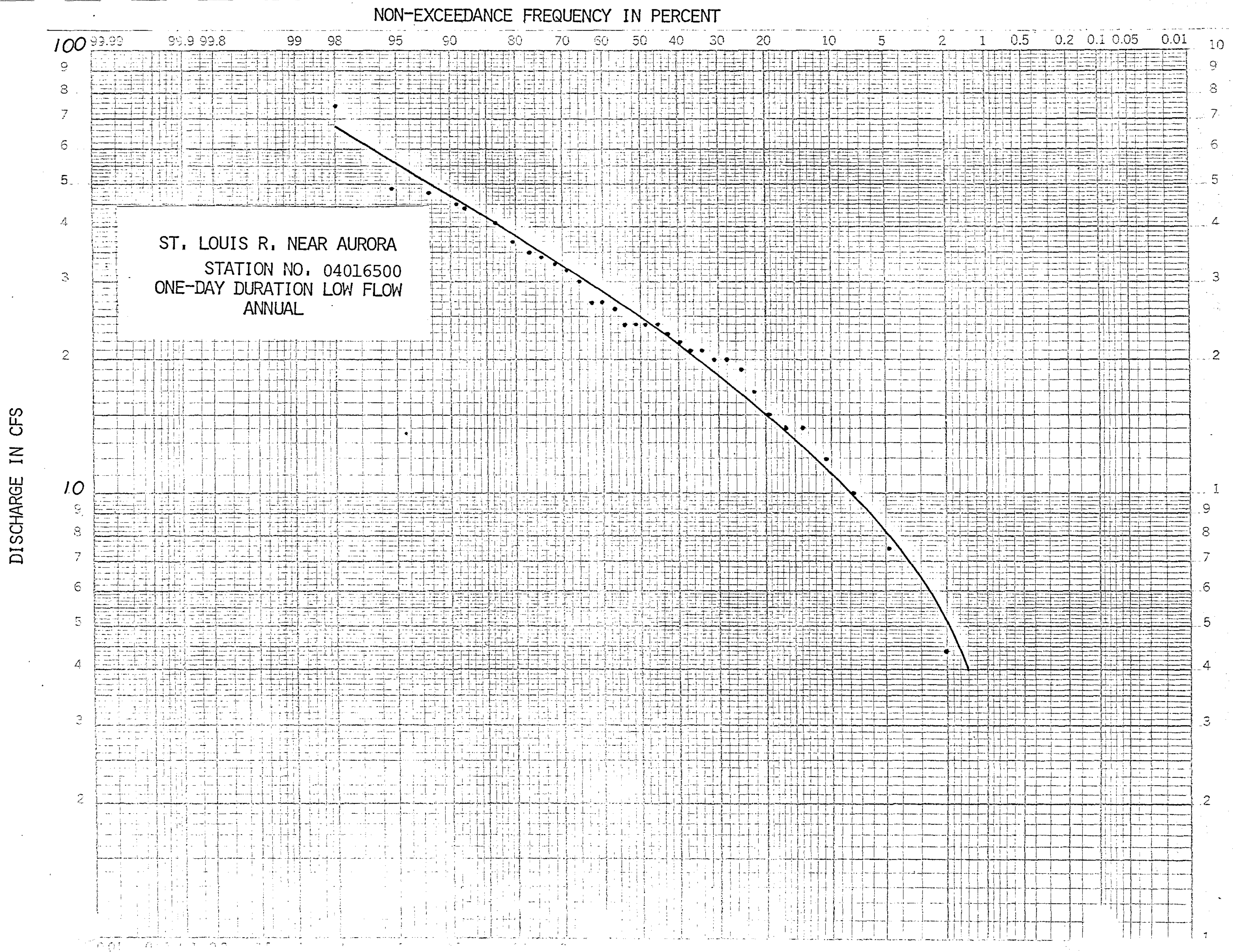


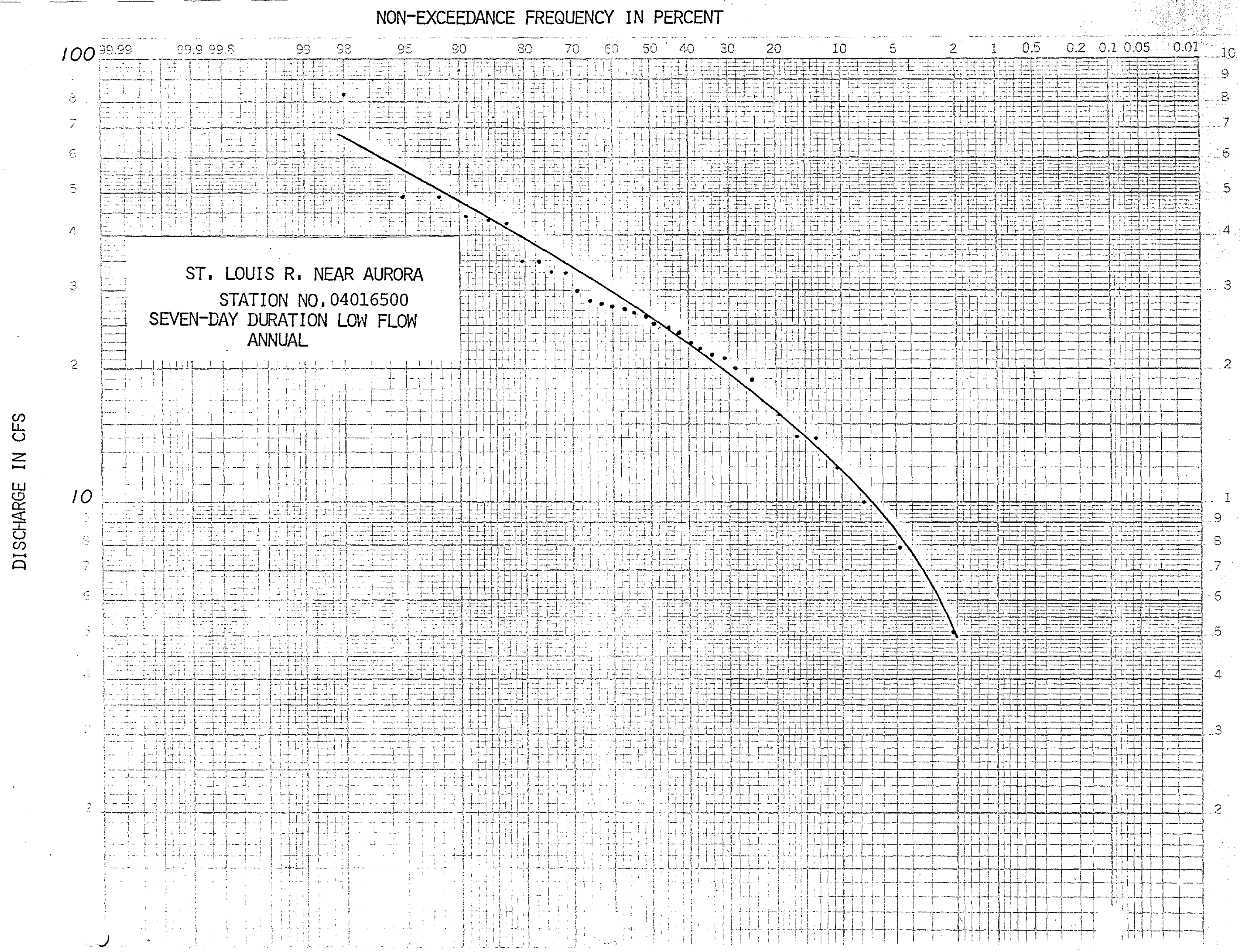
NON-EXCEEDANCE FREQUENCY IN PERCENT
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS

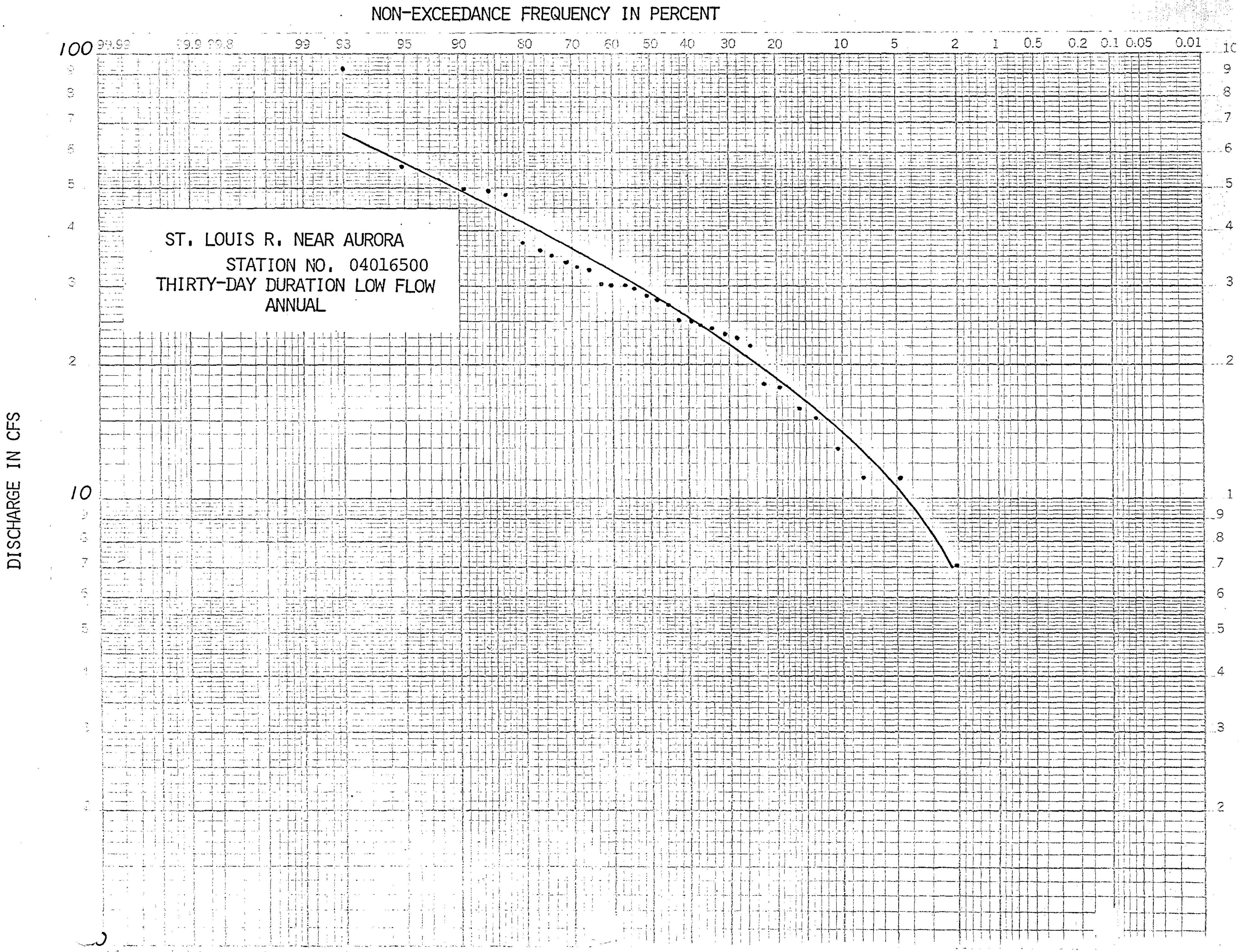

NON-EXCEEDANCE FREQUENCY IN PERCENT
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
10
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
SEVEN-DAY DURATION LOW FLOW
ANNUAL

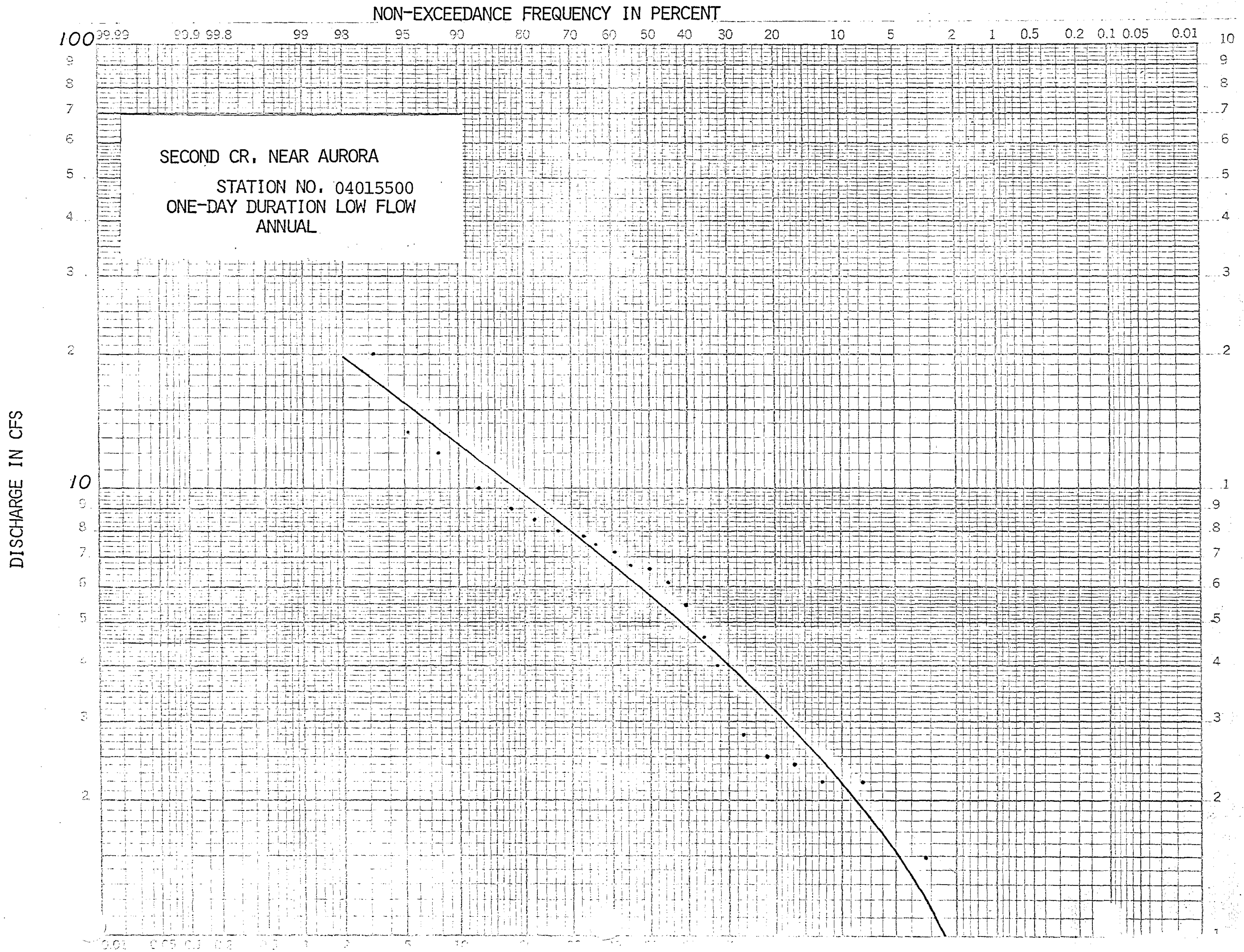

NON-EXCEEDANCE FREQUENCY IN PERCENT
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
100
10
1.0
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01

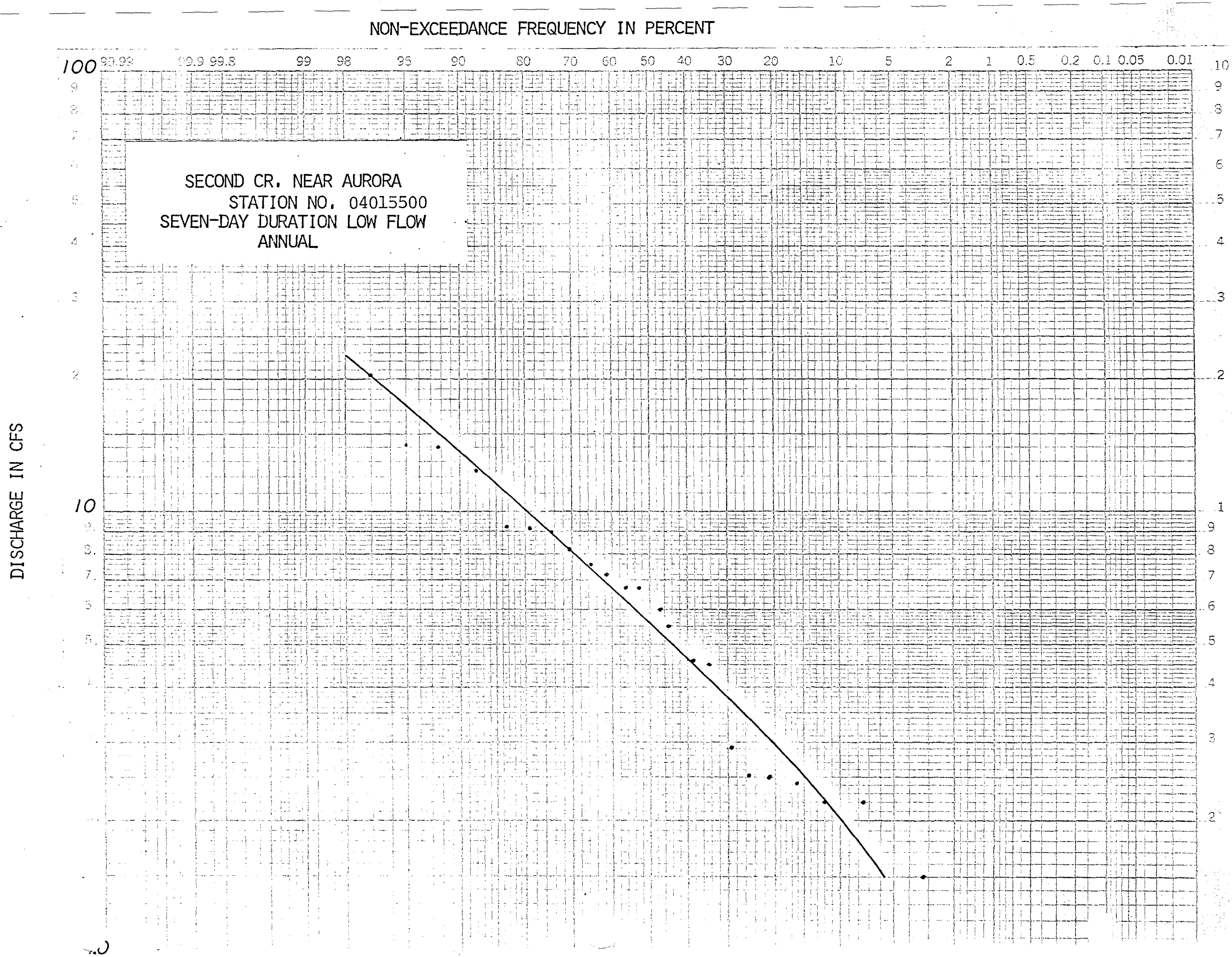

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
ONE-DAY DURATION LOW FLOW
ANNUAL
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
100
10

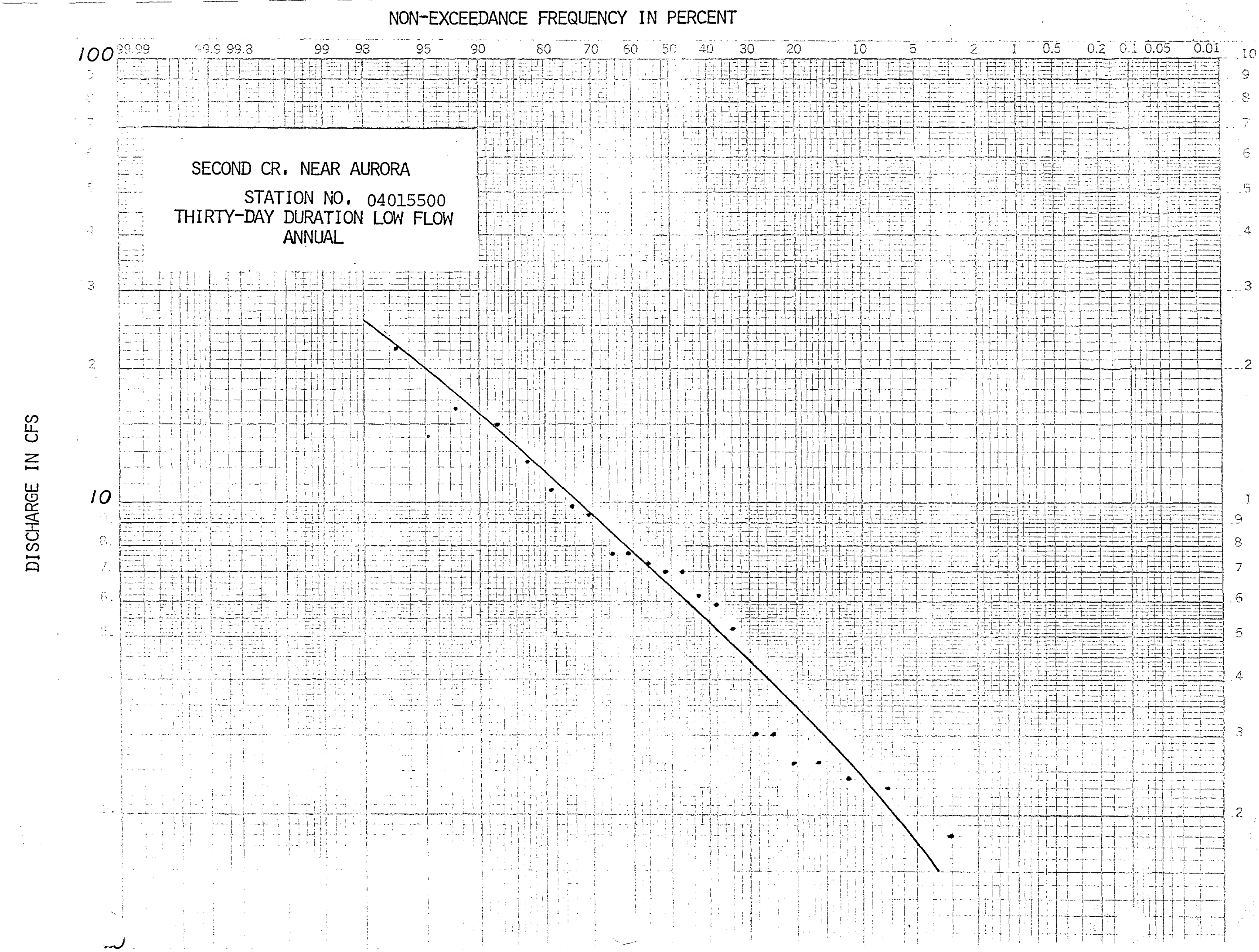

NON-EXCEEDANCE FREQUENCY IN PERCENT
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS



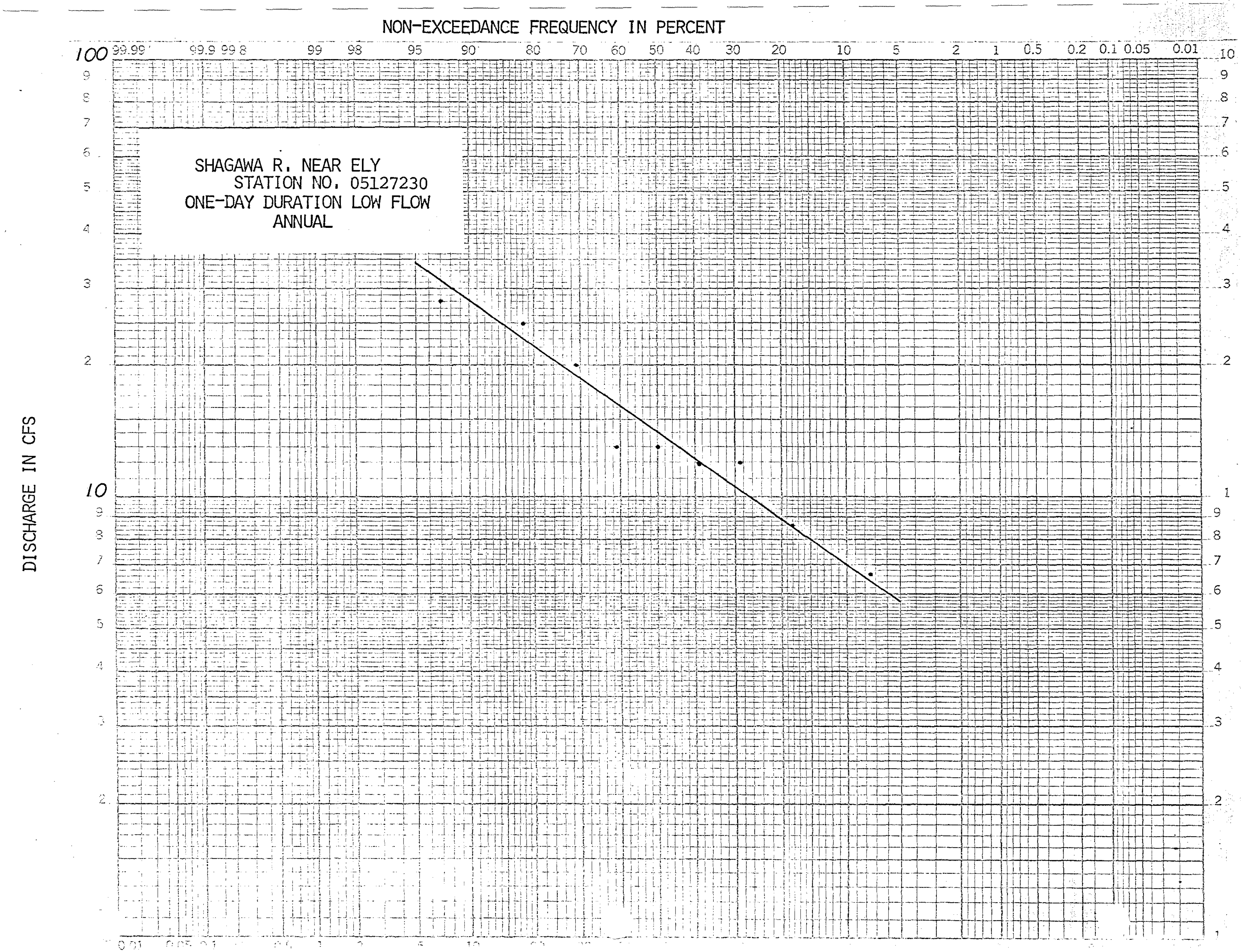
NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
100
10
DISCHARGE IN CFS
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
THIRTY-DAY DURATION LOW FLOW
ANNUAL


NON-EXCEEDANCE FREQUENCY IN PERCENT
SECOND CR. NEAR AURORA
STATION NO. 04015500
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS

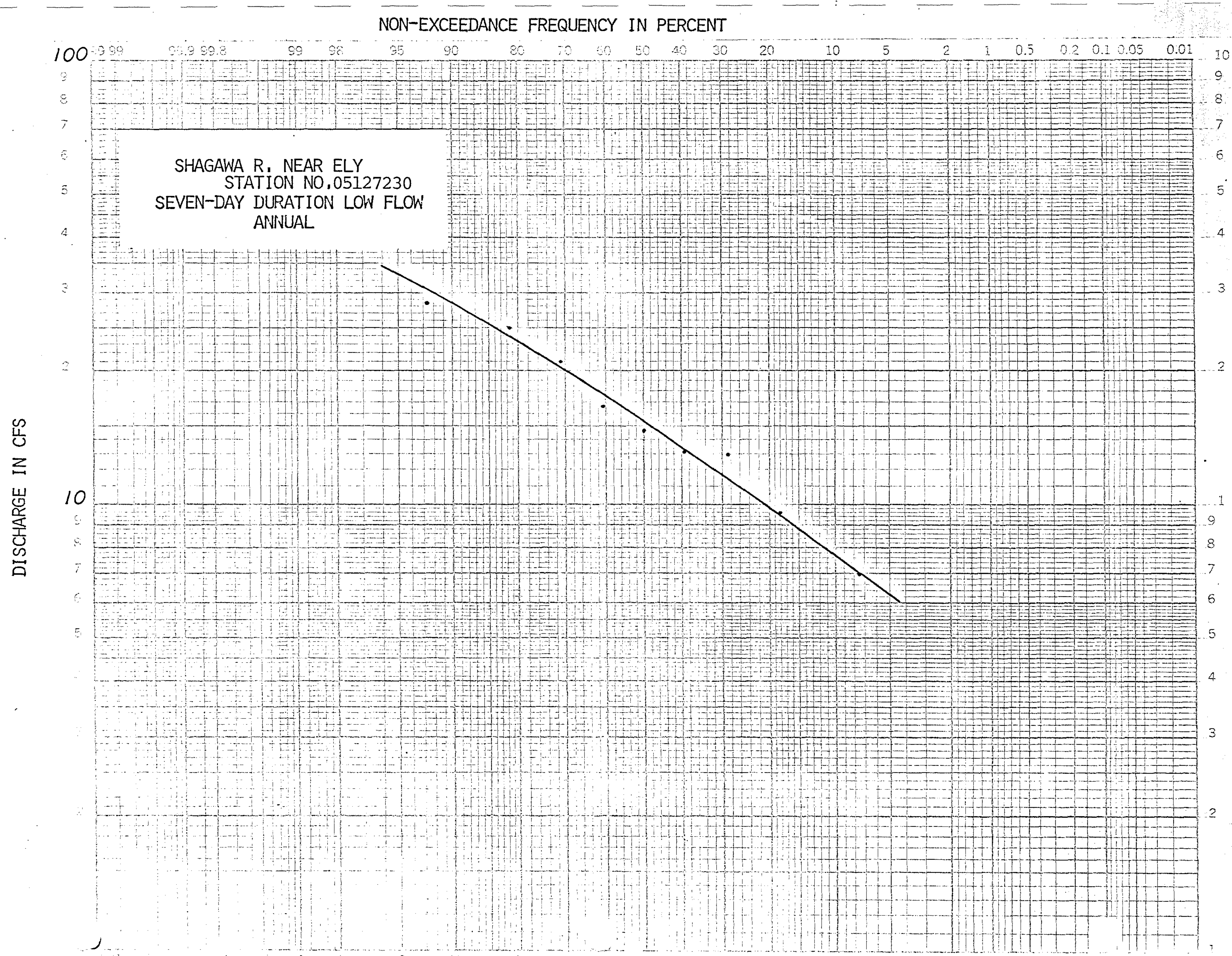

NON-EXCEEDANCE FREQUENCY IN PERCENT
SECOND CR. NEAR AURORA
STATION NO. 04015500
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
100
10
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01

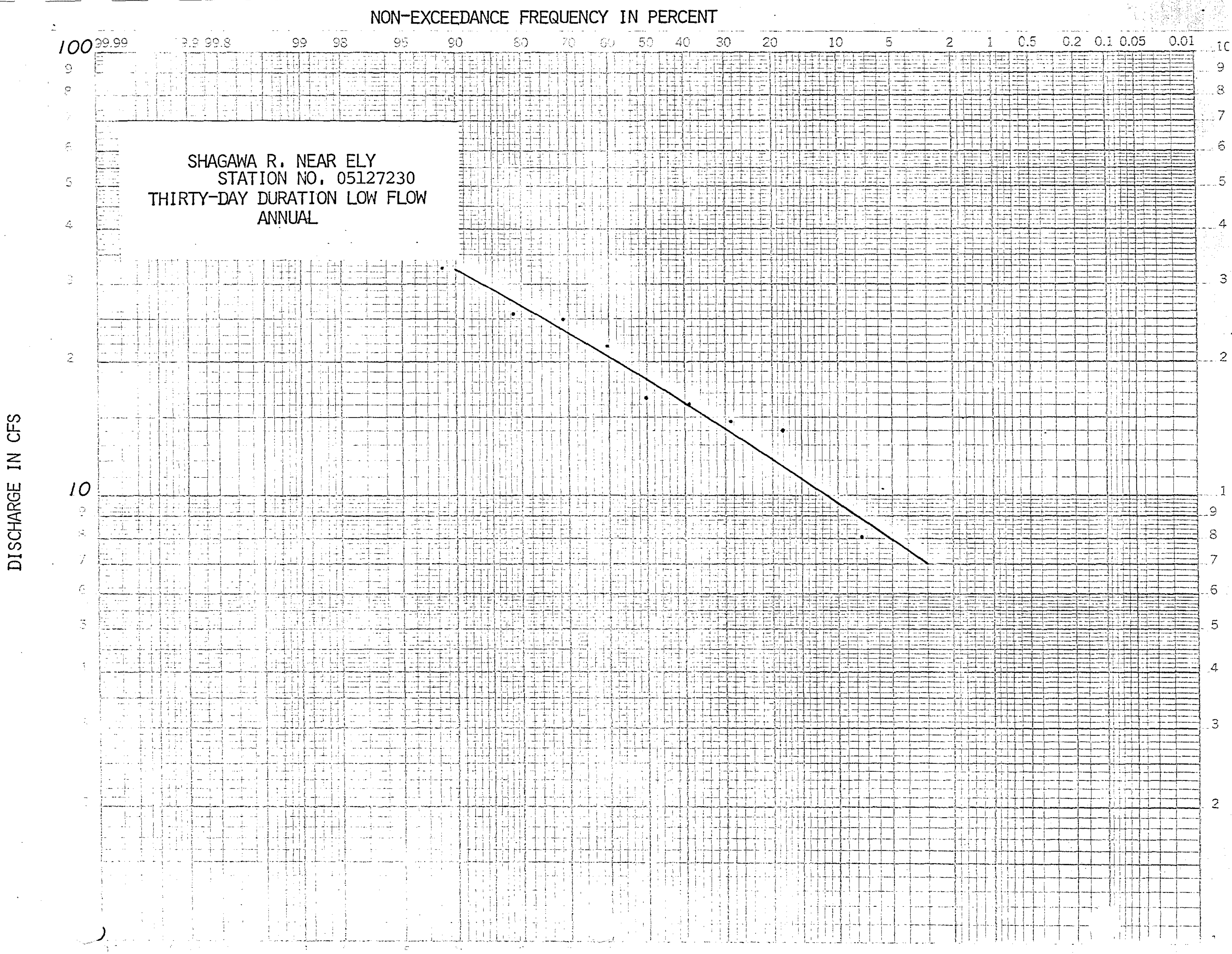


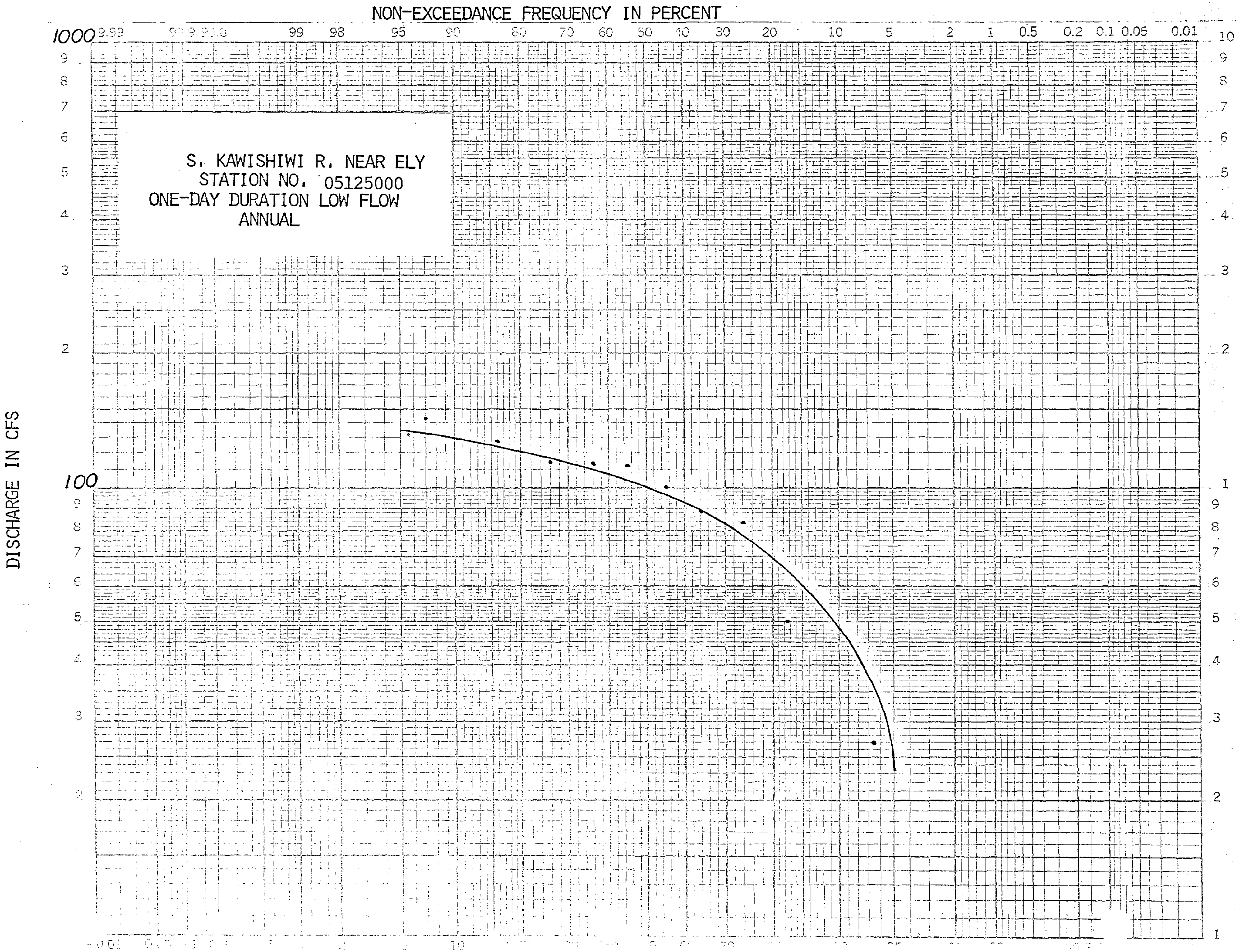
NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
DISCHARGE IN CFS
100
10
SECOND CR. NEAR AURORA
STATION NO. 04015500
THIRTY-DAY DURATION LOW FLOW
ANNUAL

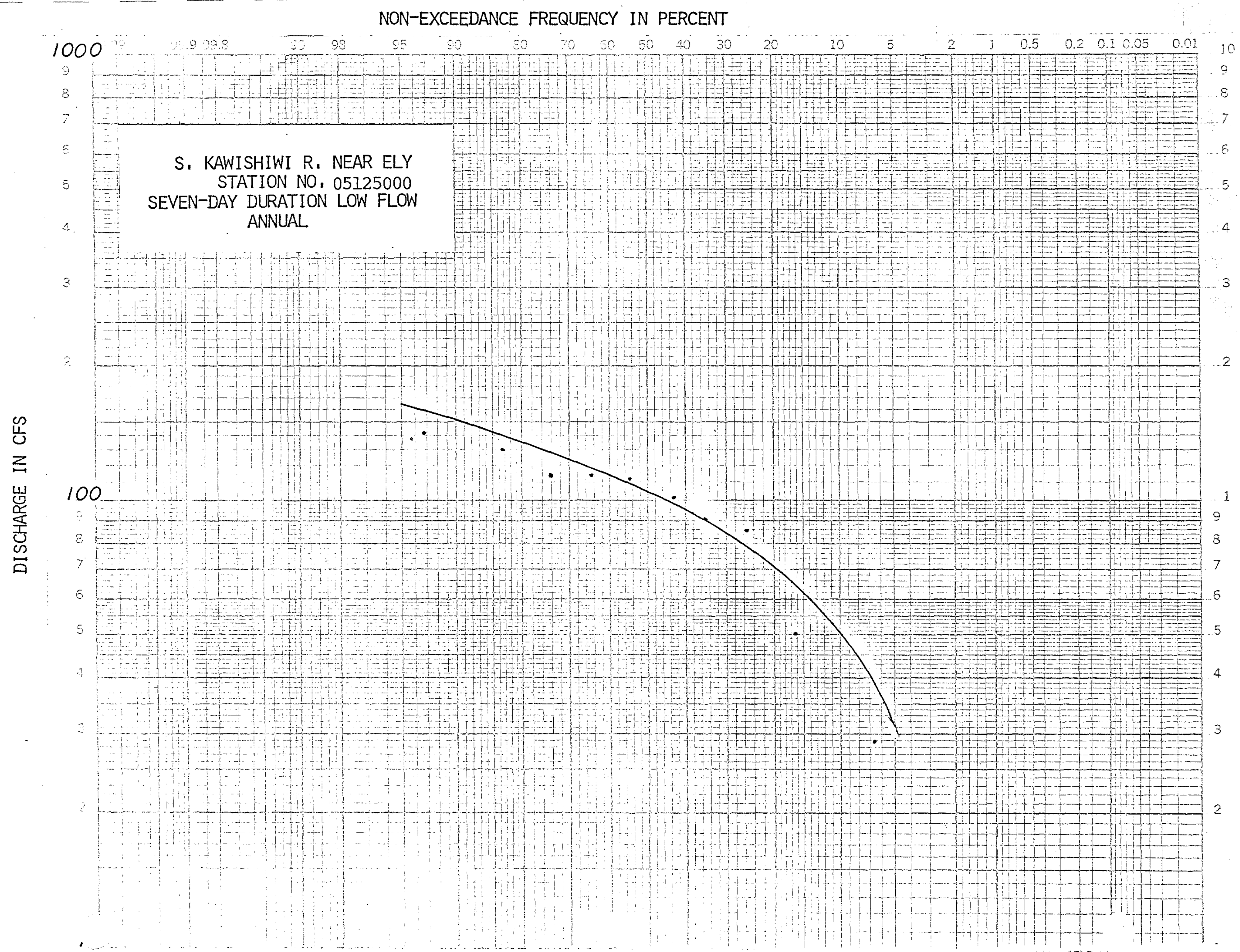


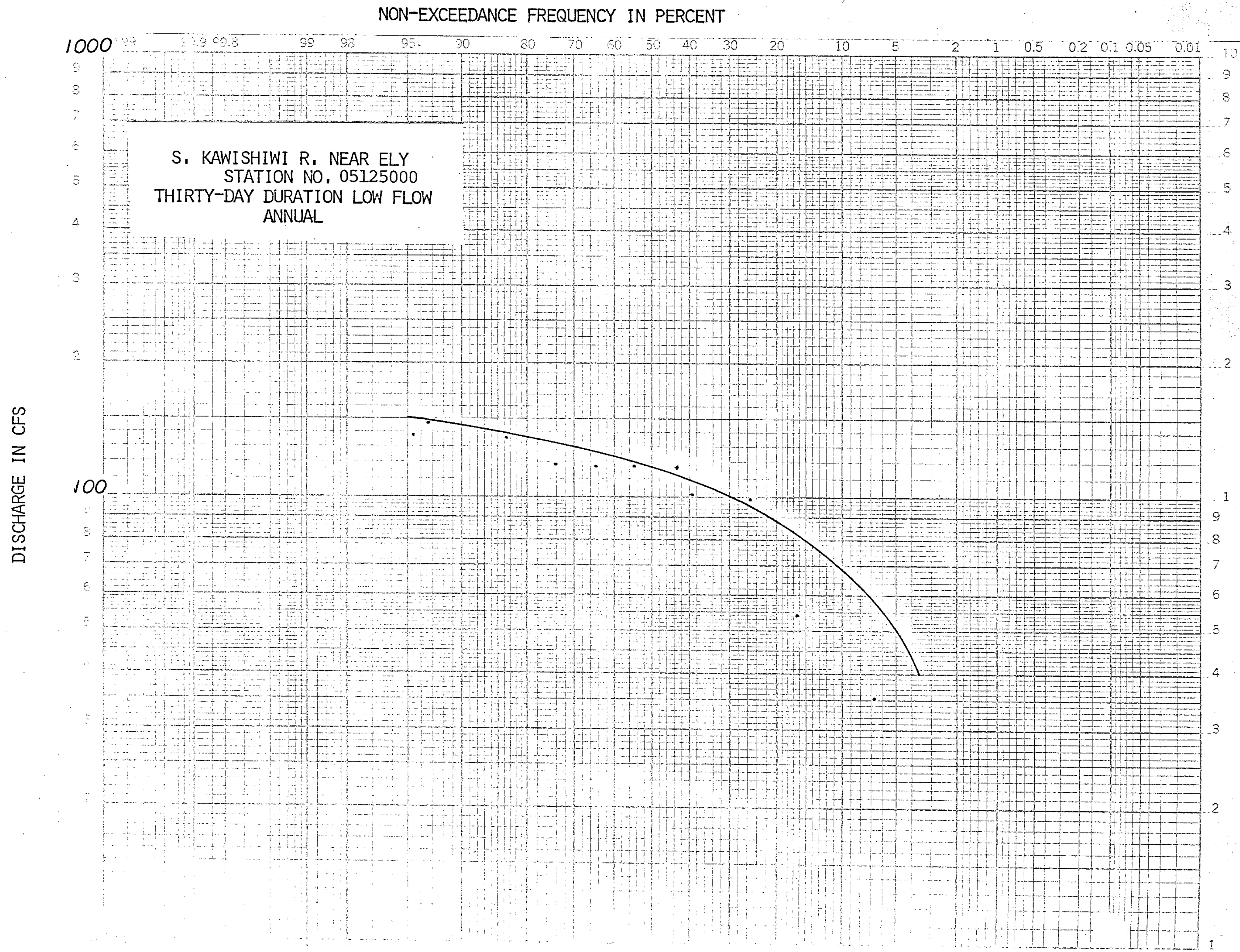
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
SHAGAWA R. NEAR ELY
STATION NO. 05127230
ONE-DAY DURATION LOW FLOW
ANNUAL

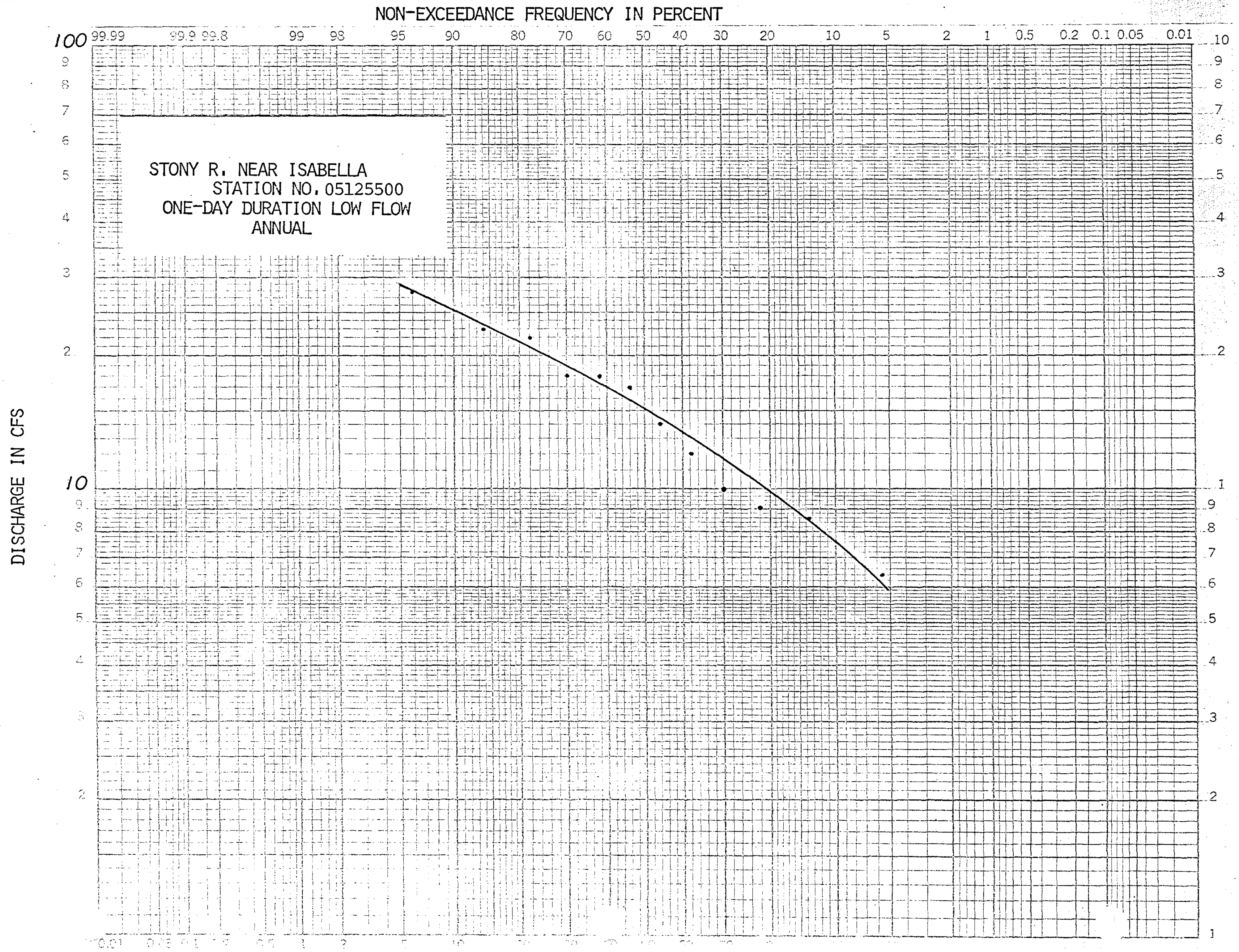

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
SHAGAWA R. NEAR ELY
STATION NO.05127230
SEVEN-DAY DURATION LOW FLOW
ANNUAL
100
10
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01

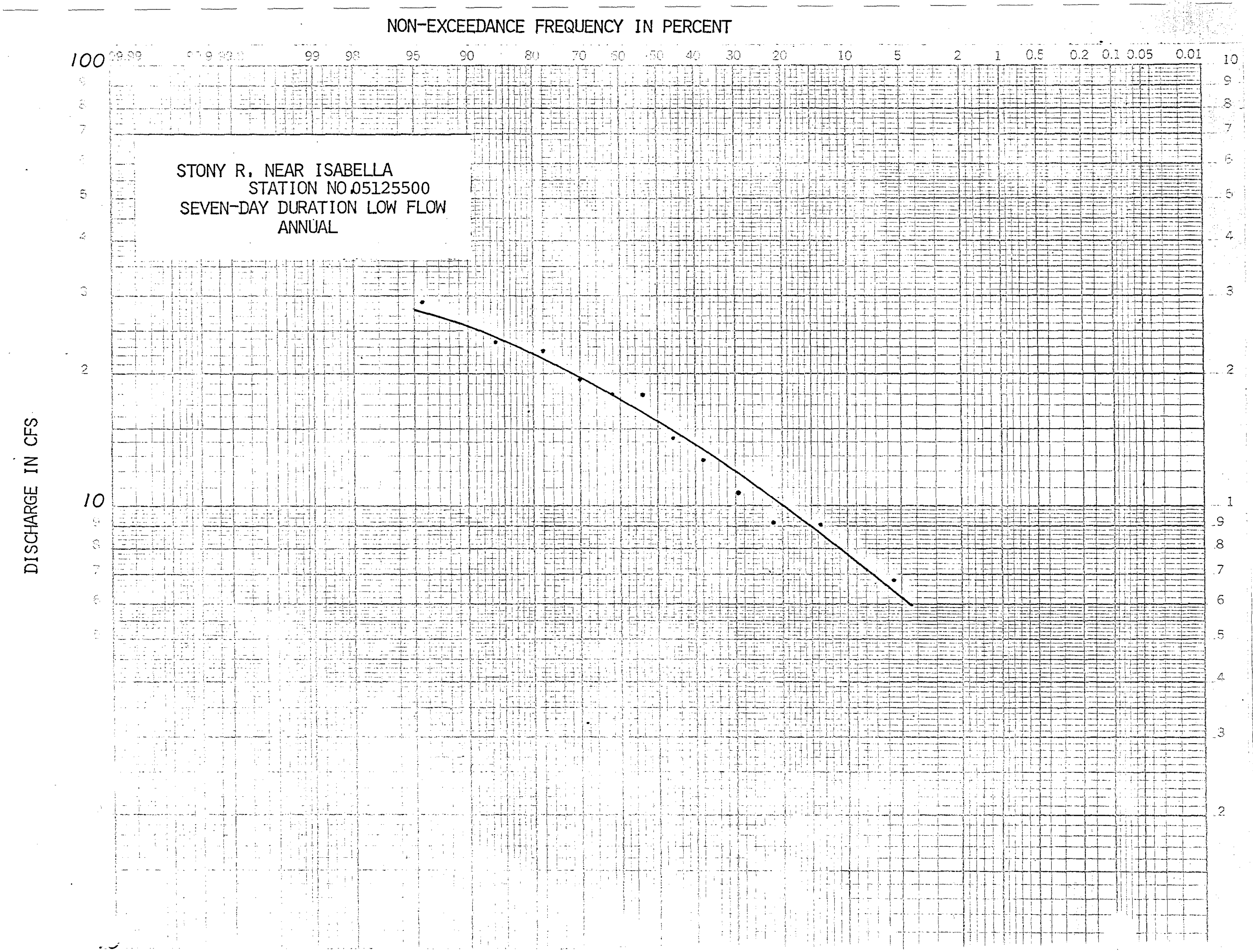

NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
100
10
99.99
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1000
100


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
SEVEN-DAY DURATION LOW FLOW
ANNUAL
1000
100
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
1000
100


NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO. 05125500
ONE-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO.05125500
SEVEN-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
100
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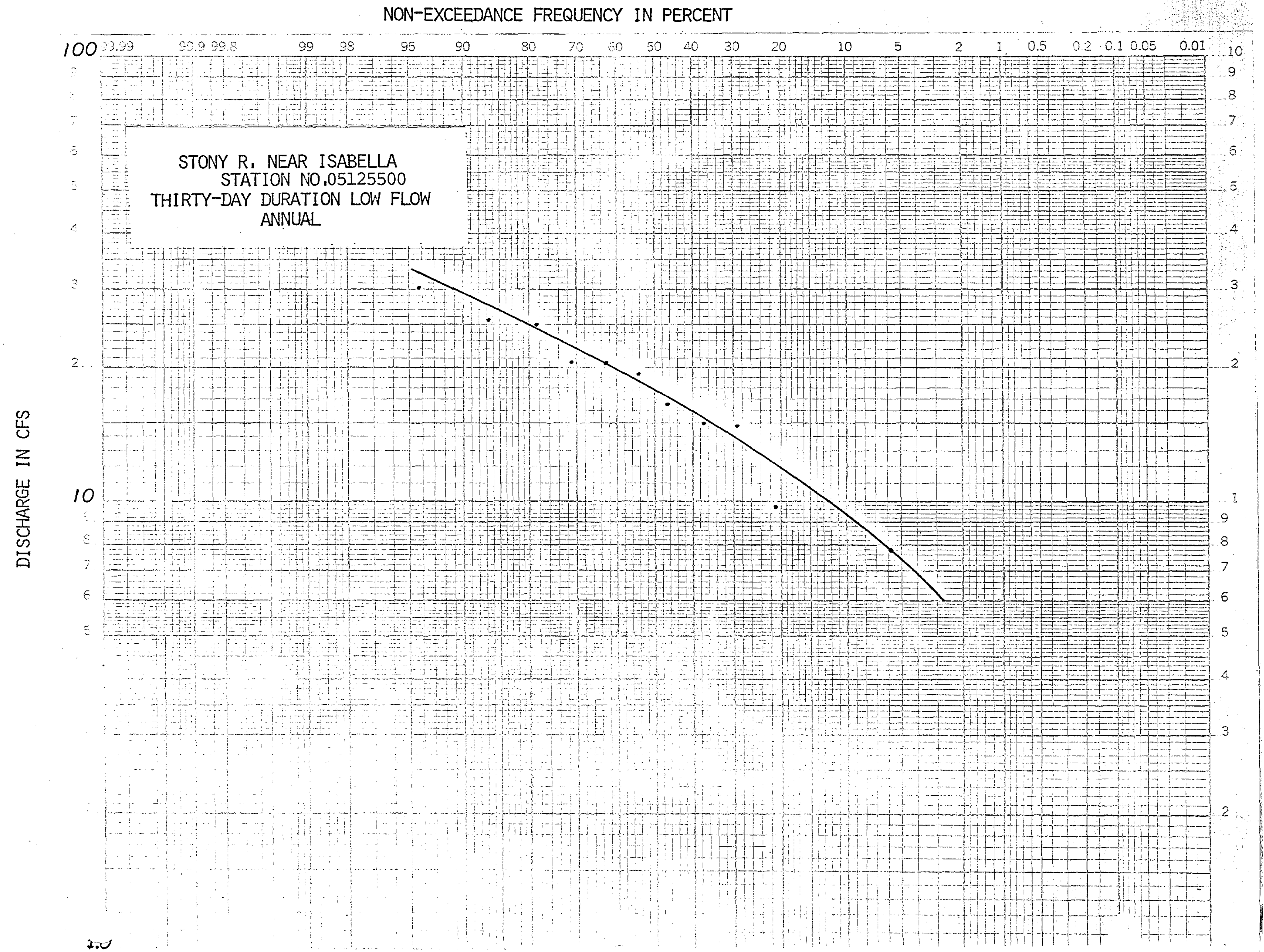
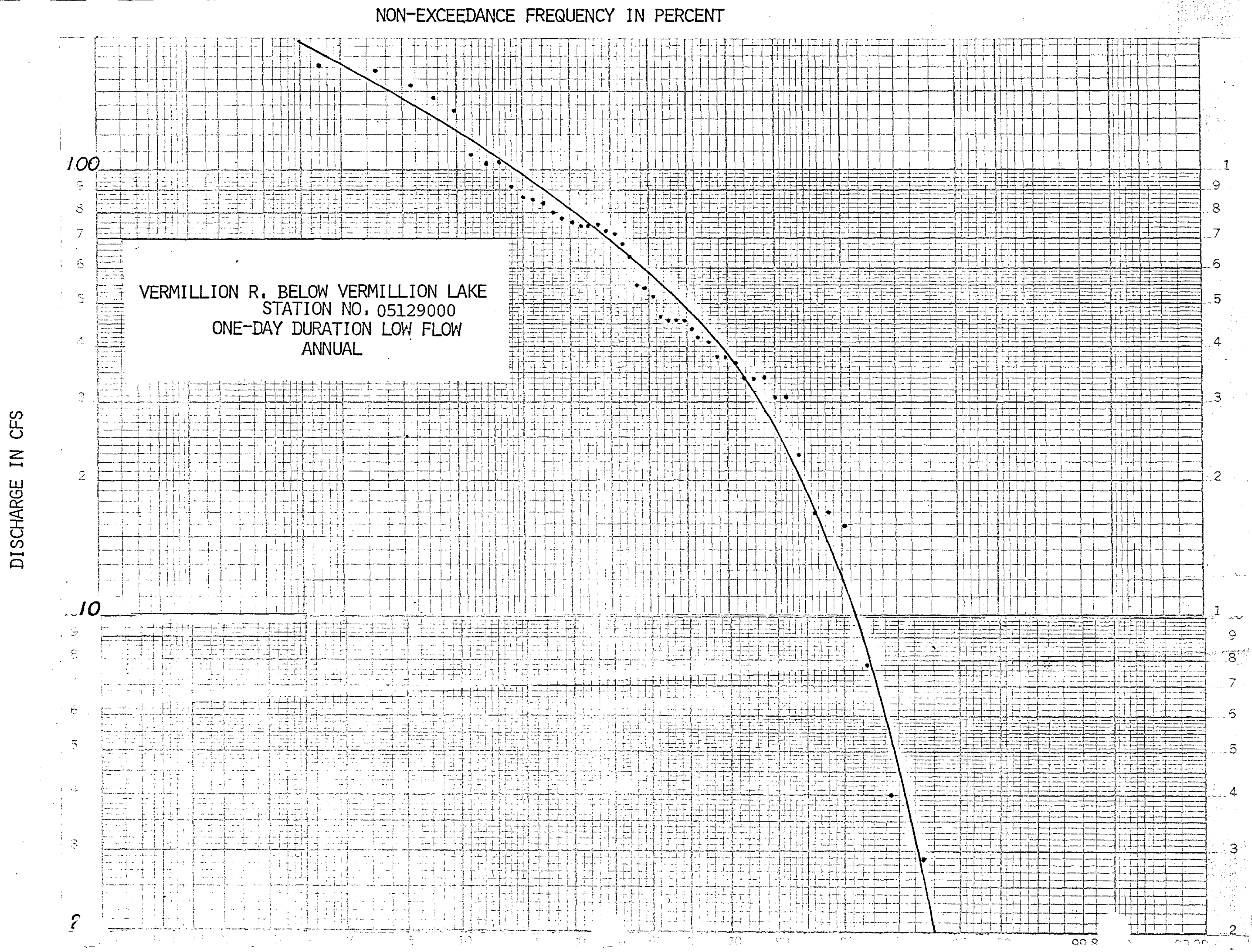
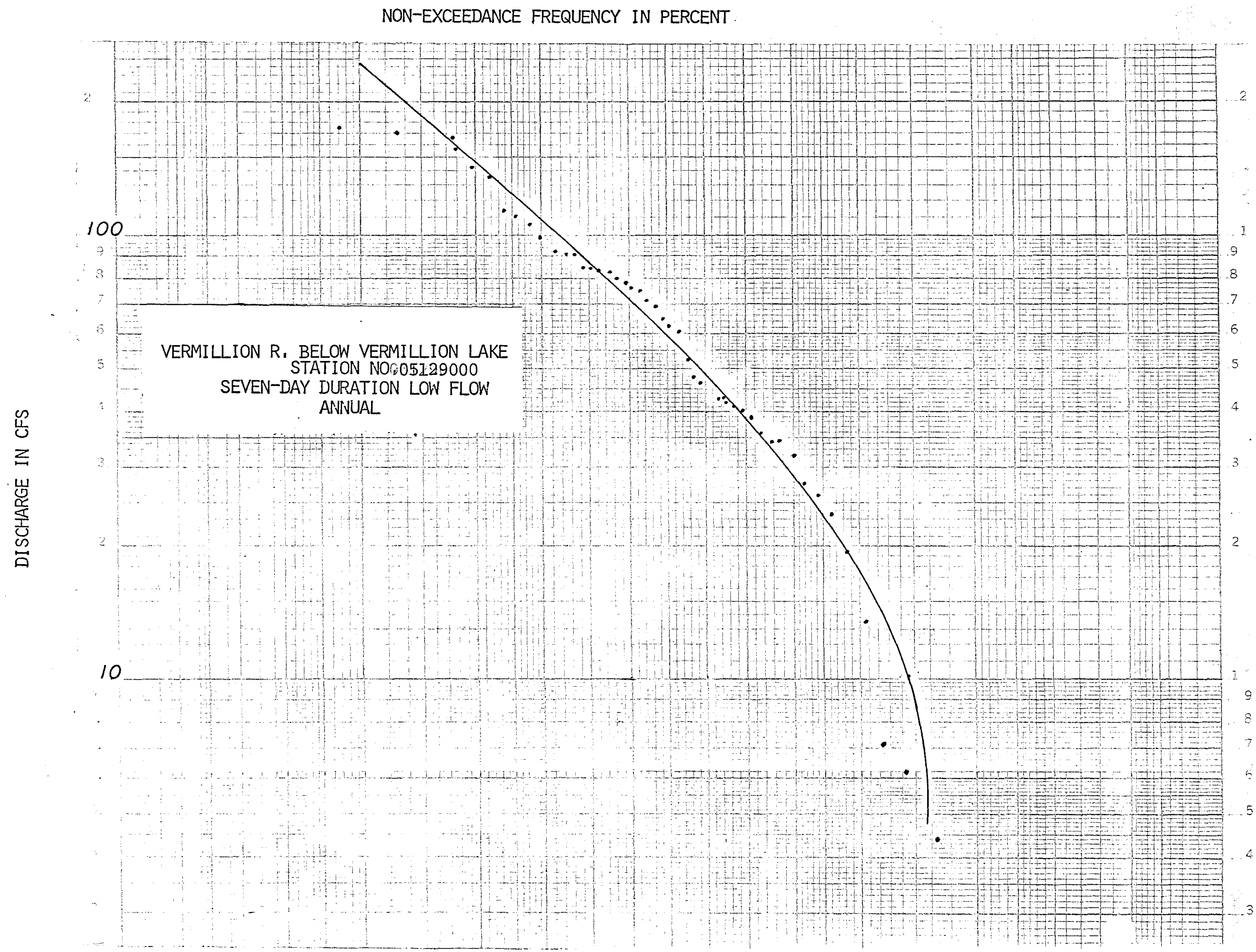
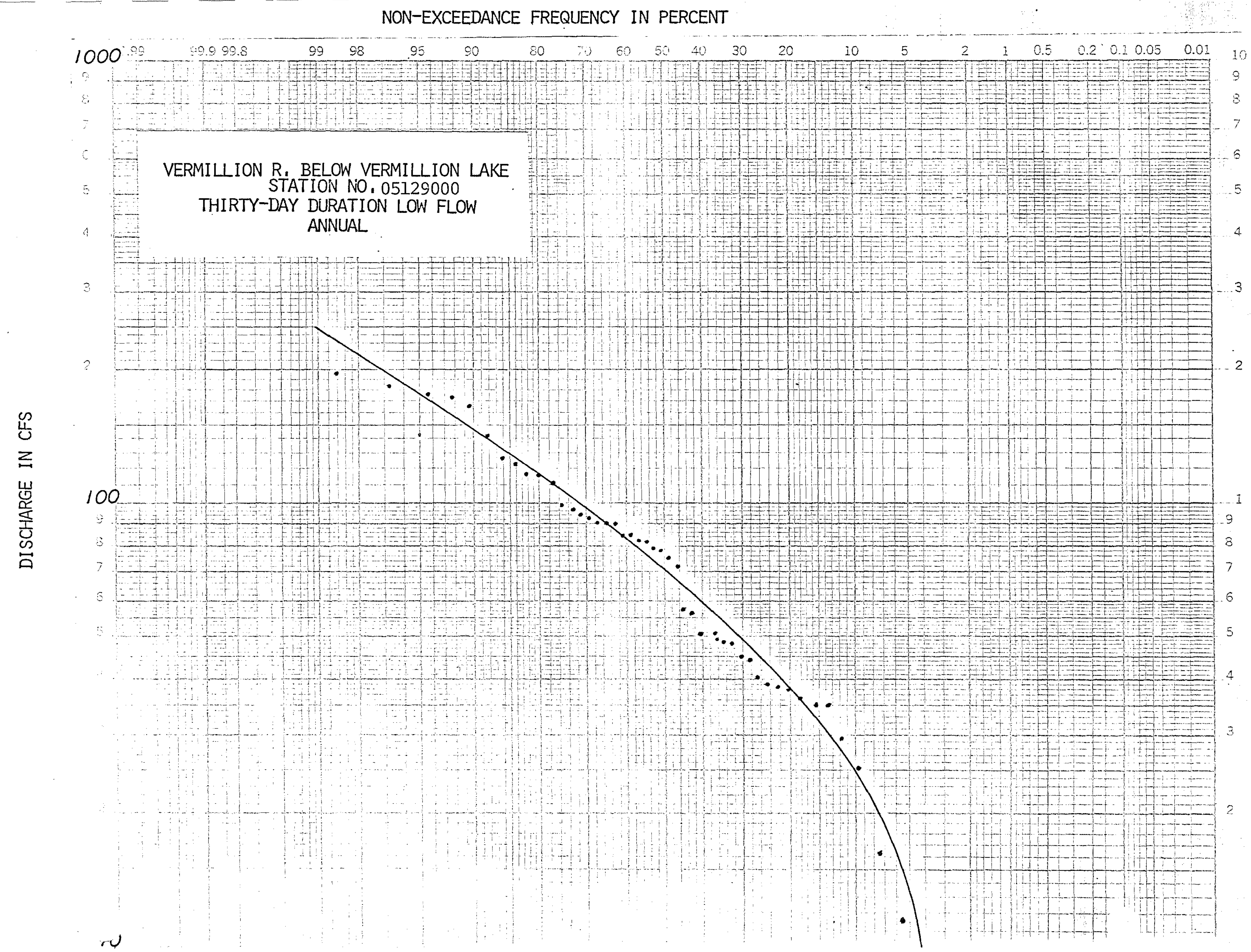


NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO.05125500
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS



NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
ONE-DAY DURATION LOW FLOW
ANNUAL
100
10

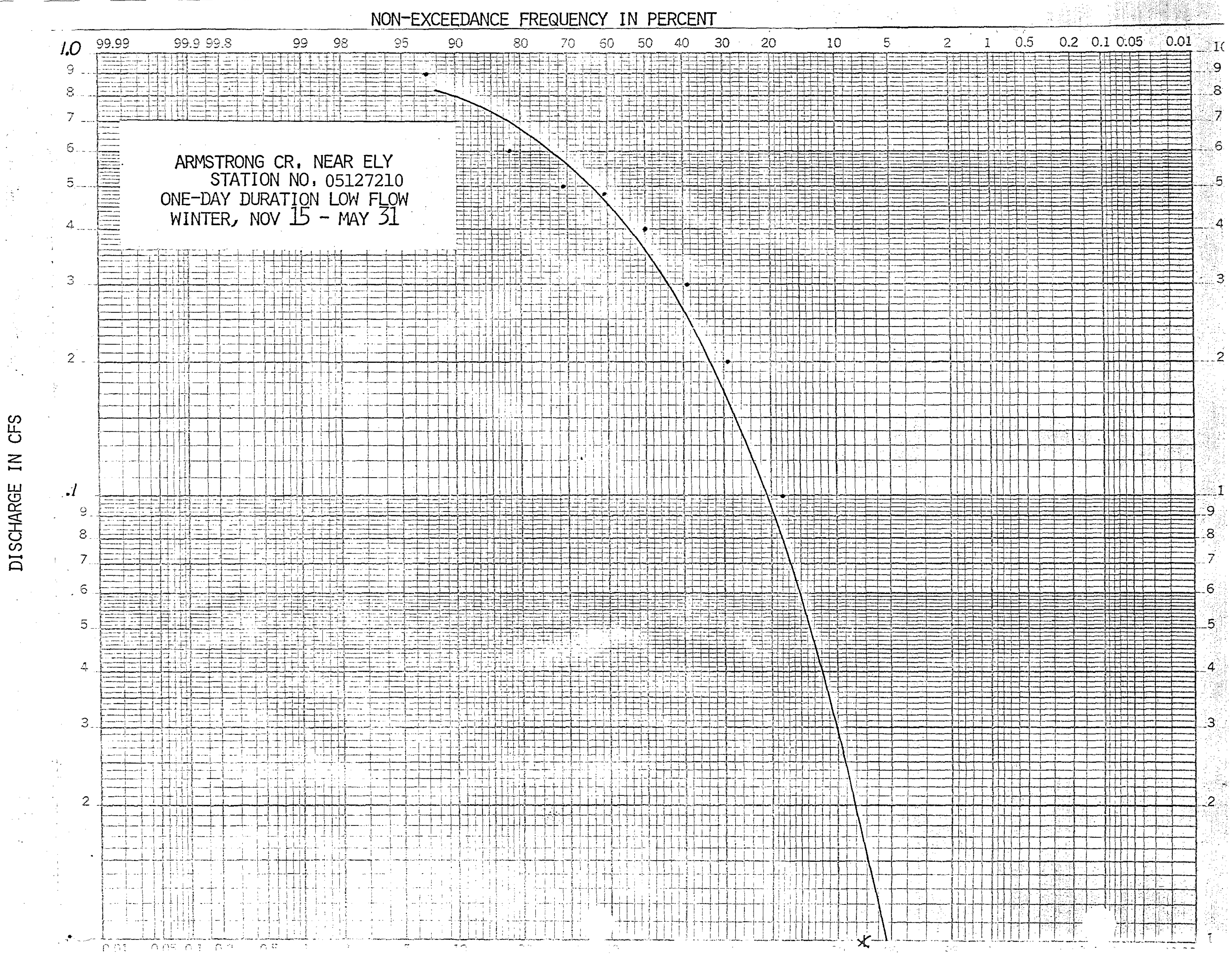

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
100
10
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
SEVEN-DAY DURATION LOW FLOW
ANNUAL



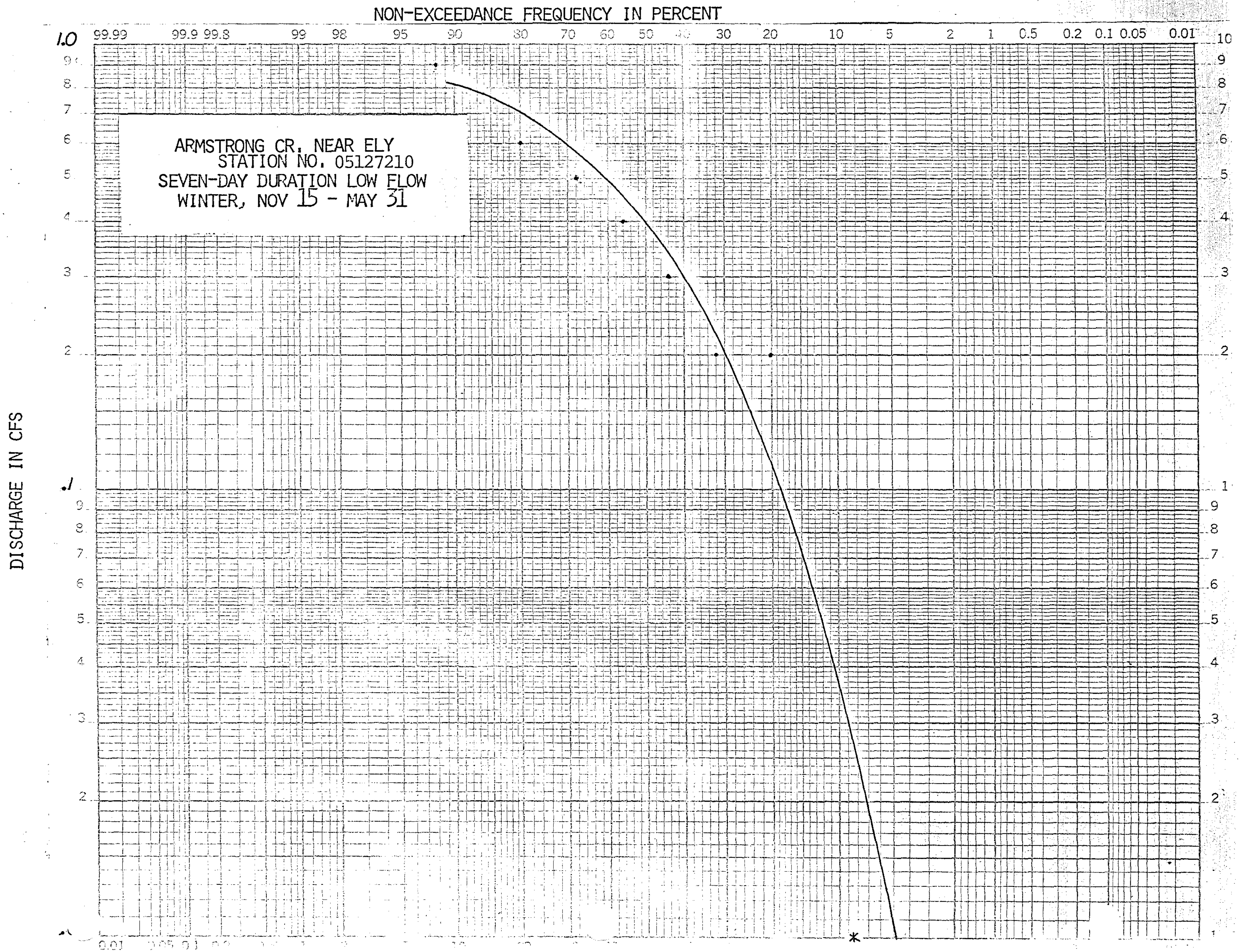
NON-EXCEEDANCE FREQUENCY IN PERCENT
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
THIRTY-DAY DURATION LOW FLOW
ANNUAL
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
1000
100
10

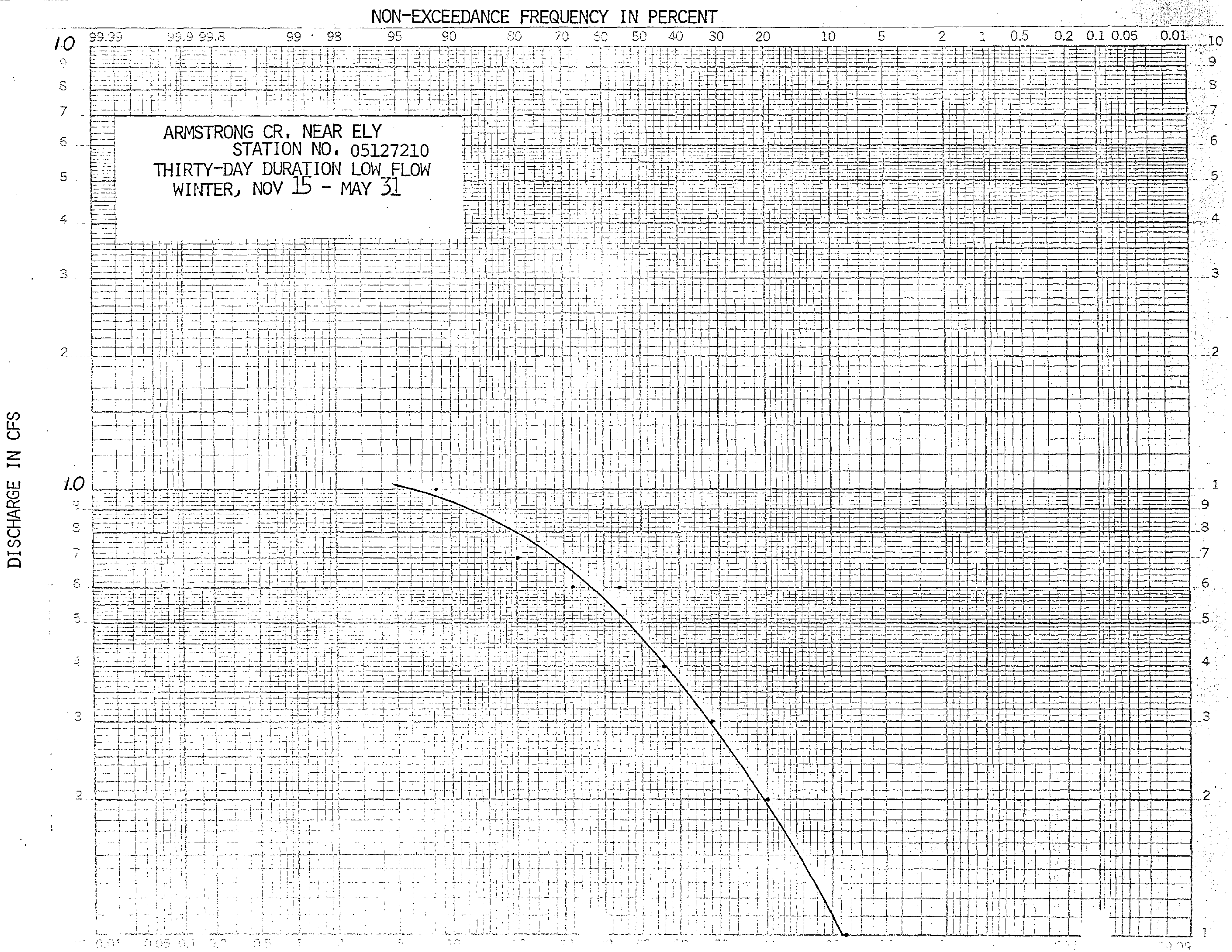
APPENDIX IV

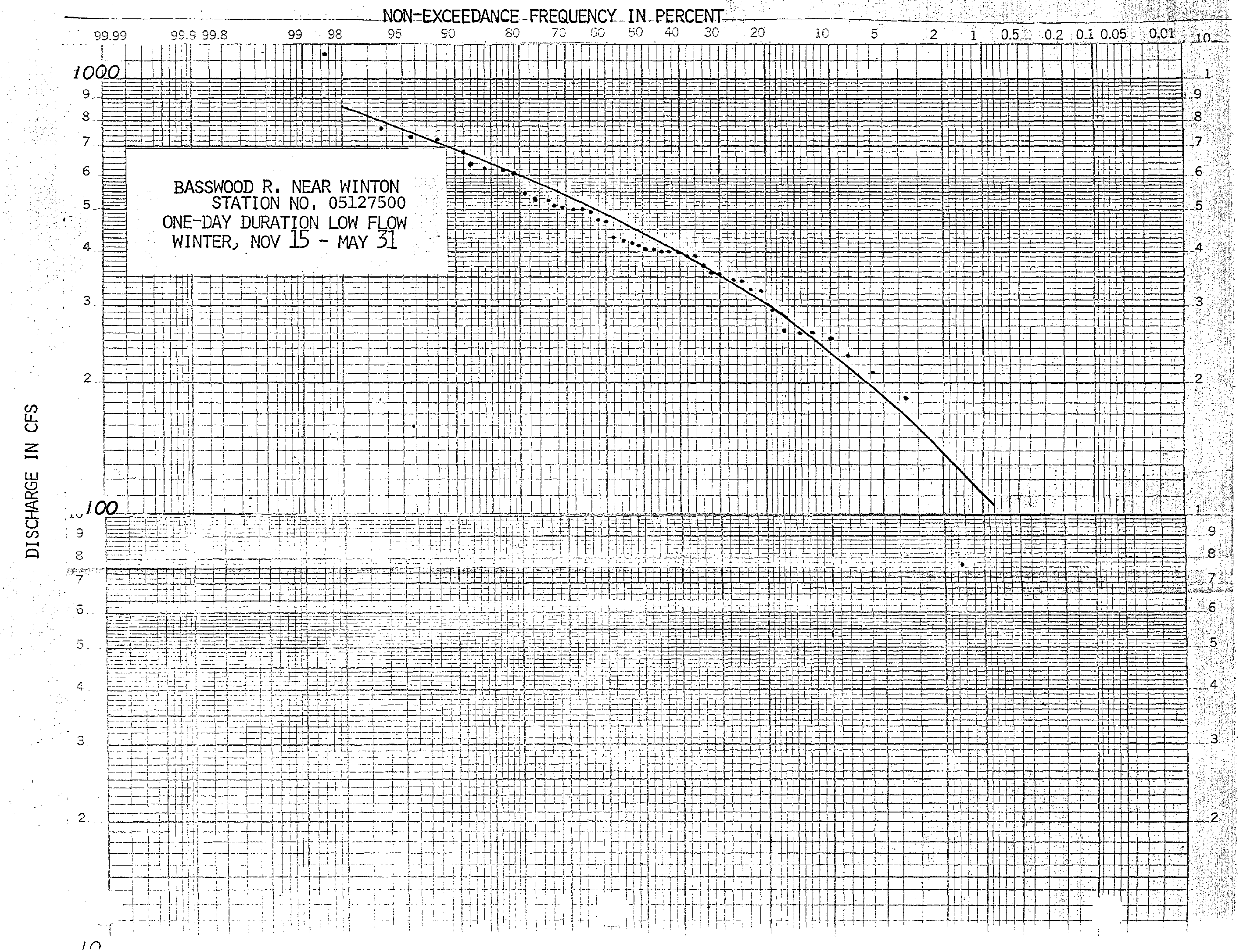
Winter 1-day, 7-day, and 30-day Low-Flow Frequency Curves for Stations in Copper-Nickel Study Area



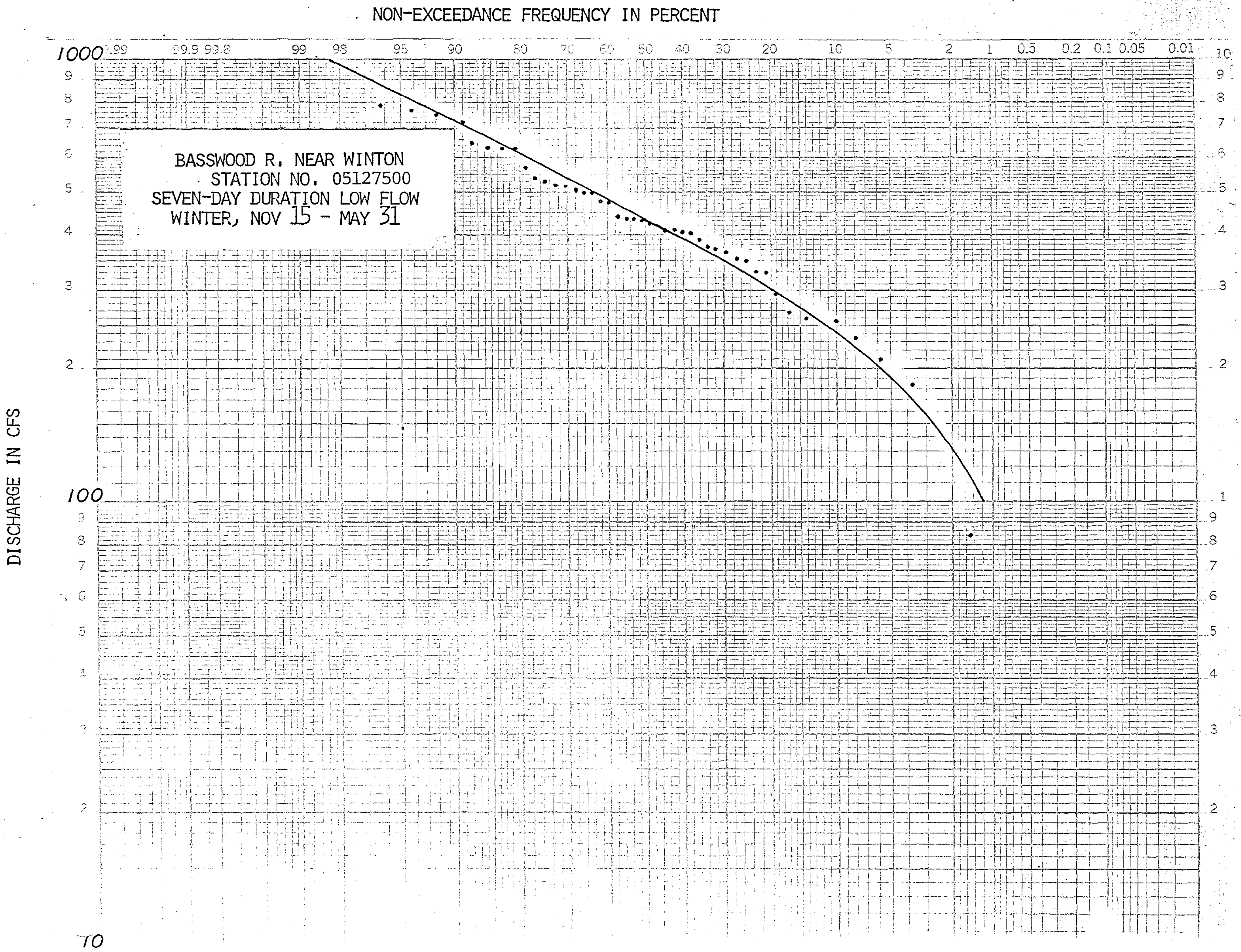
NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
1.0
.1


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
10
1.0



NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
DISCHARGE IN CFS
1000
100
10
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
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99.9 99.8
99
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95
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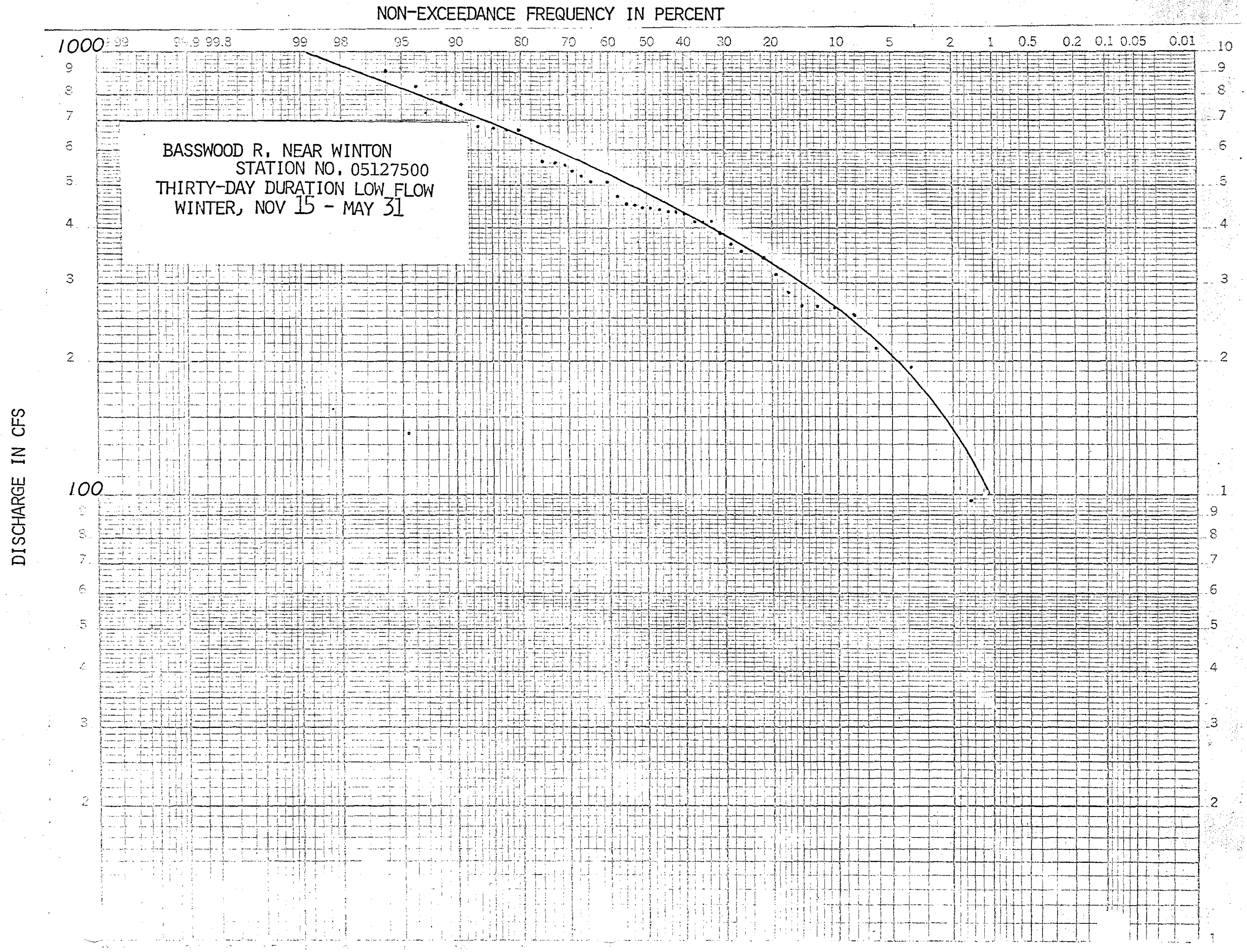
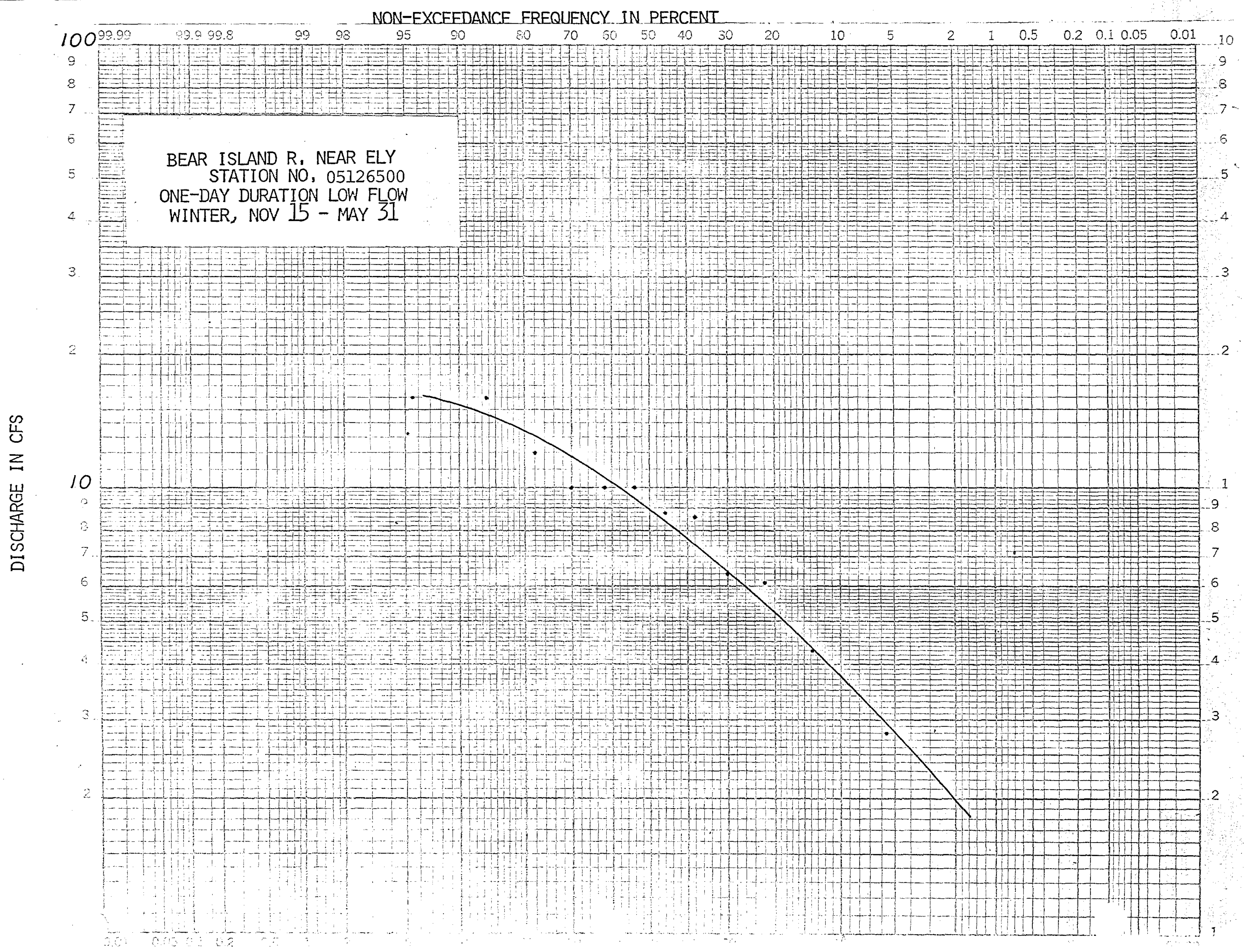
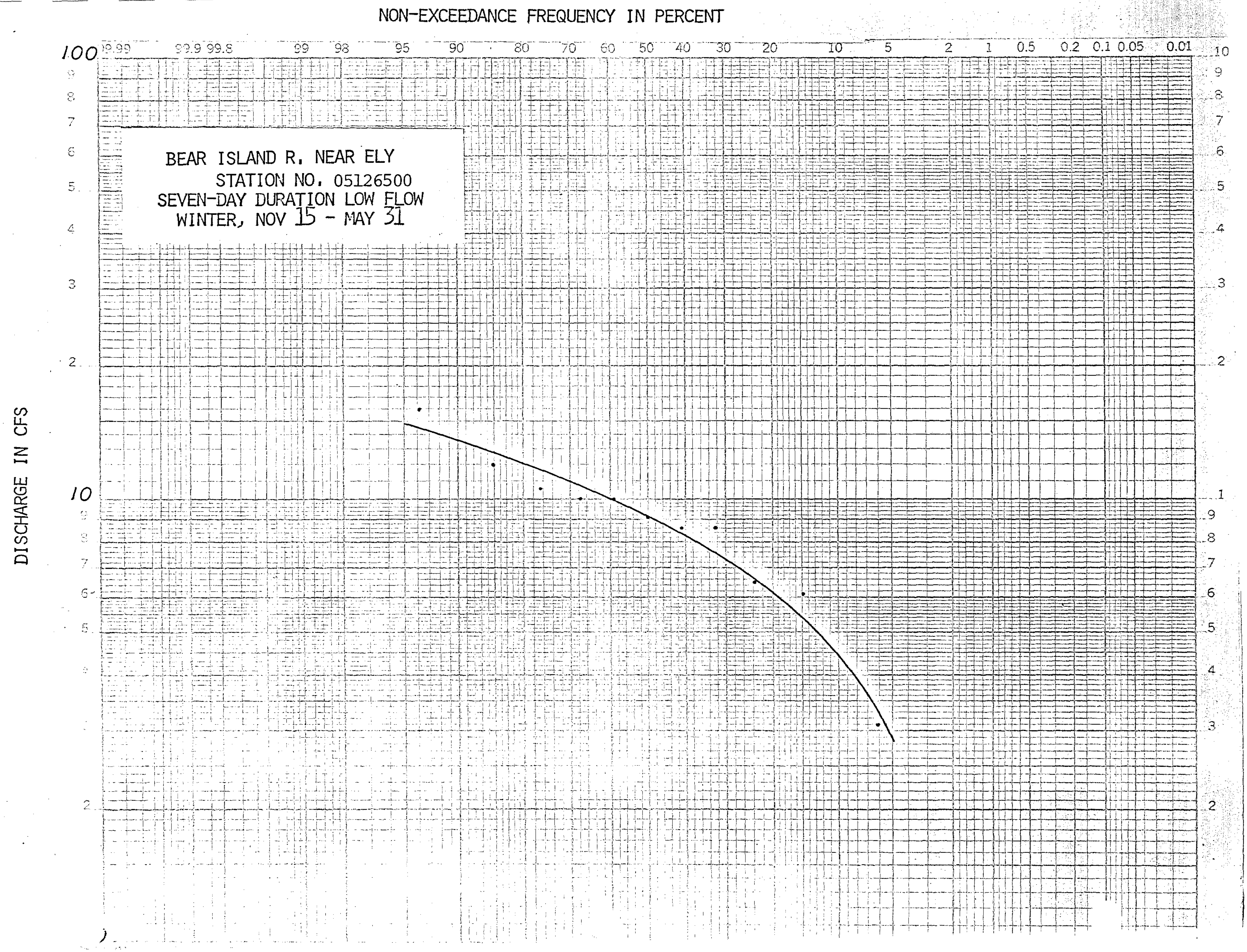
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
1000
100
10
DISCHARGE IN CFS
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
1000
100



NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31



NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
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90
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60
50
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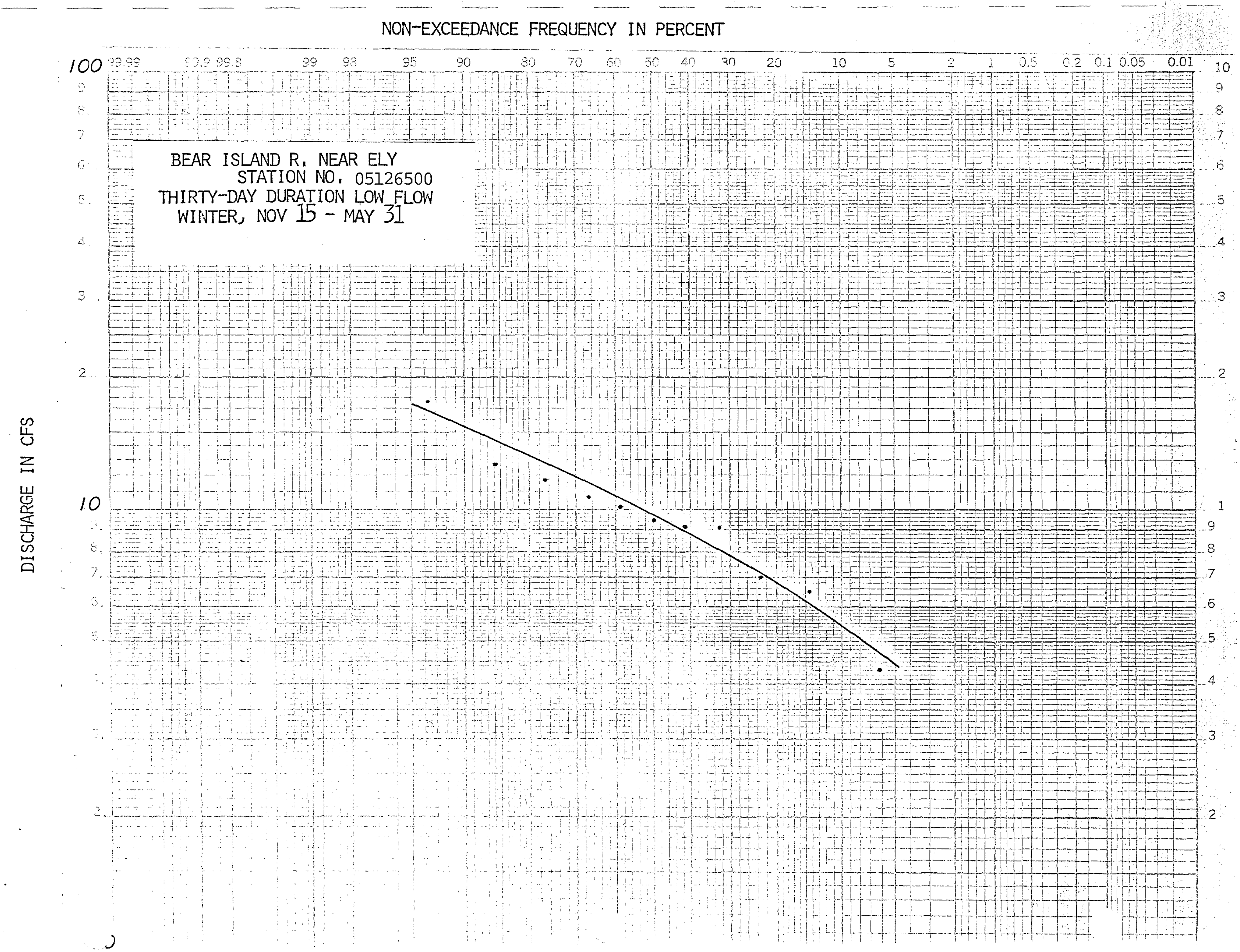
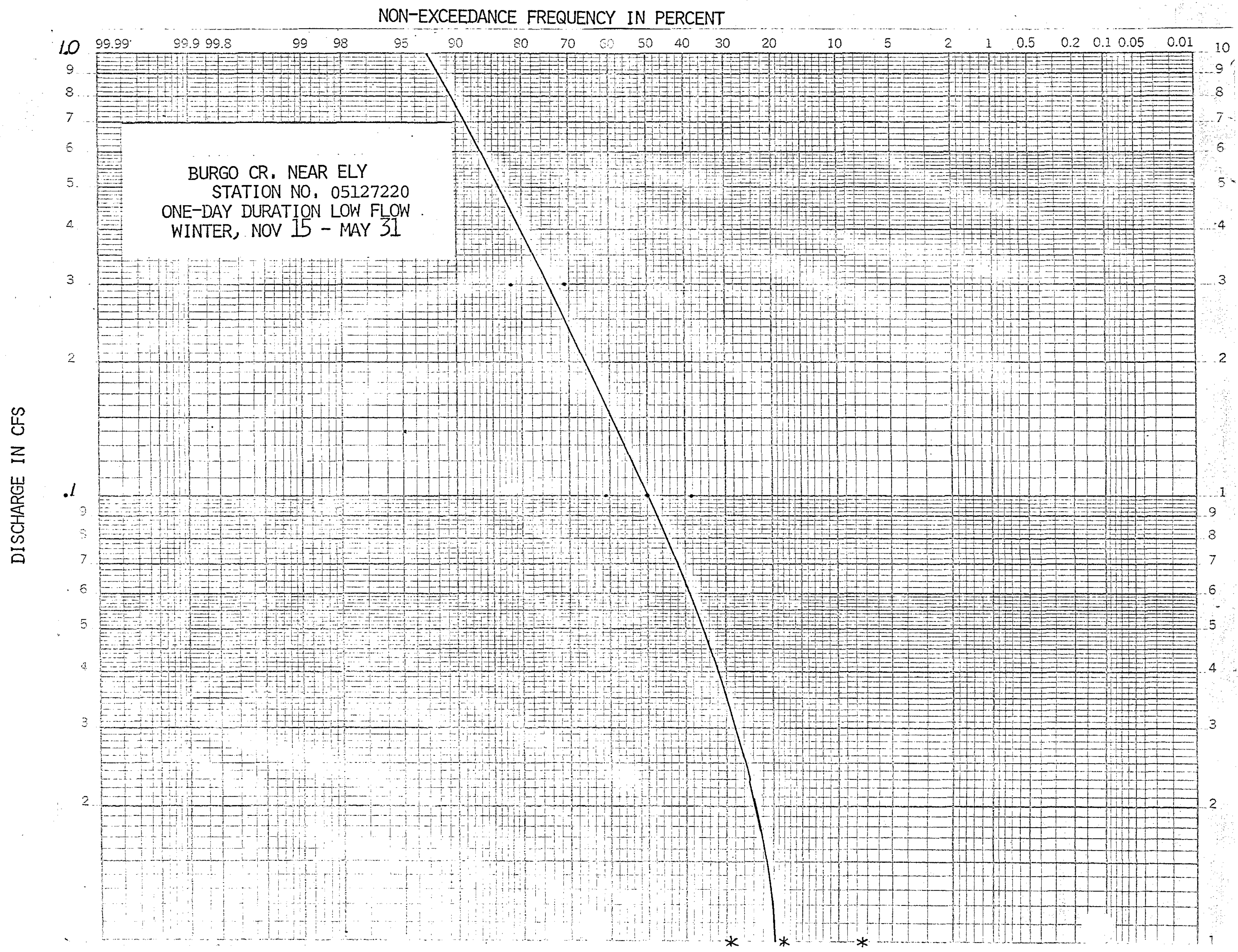
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31



NON-EXCEEDANCE FREQUENCY IN PERCENT
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99.9 99.8
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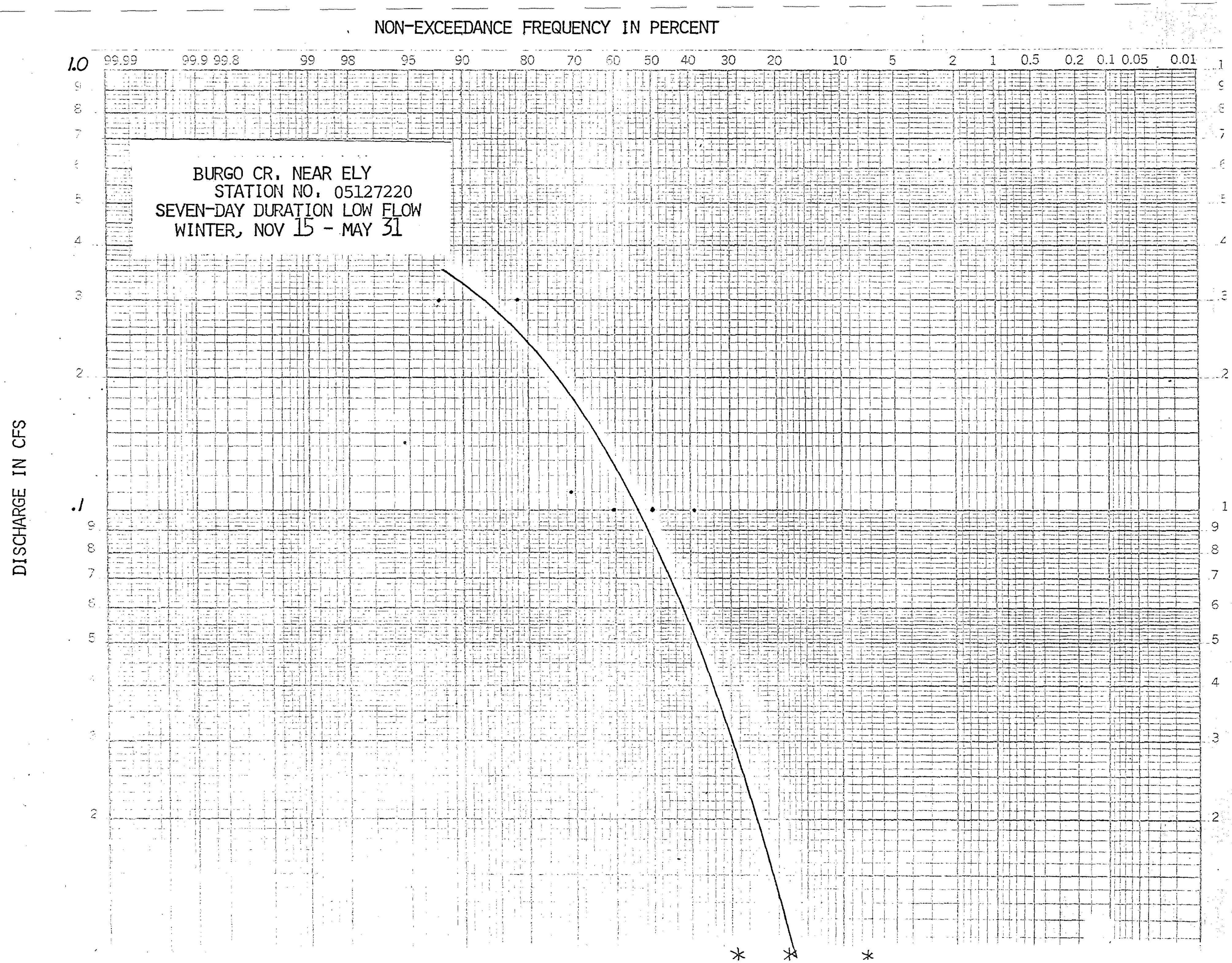
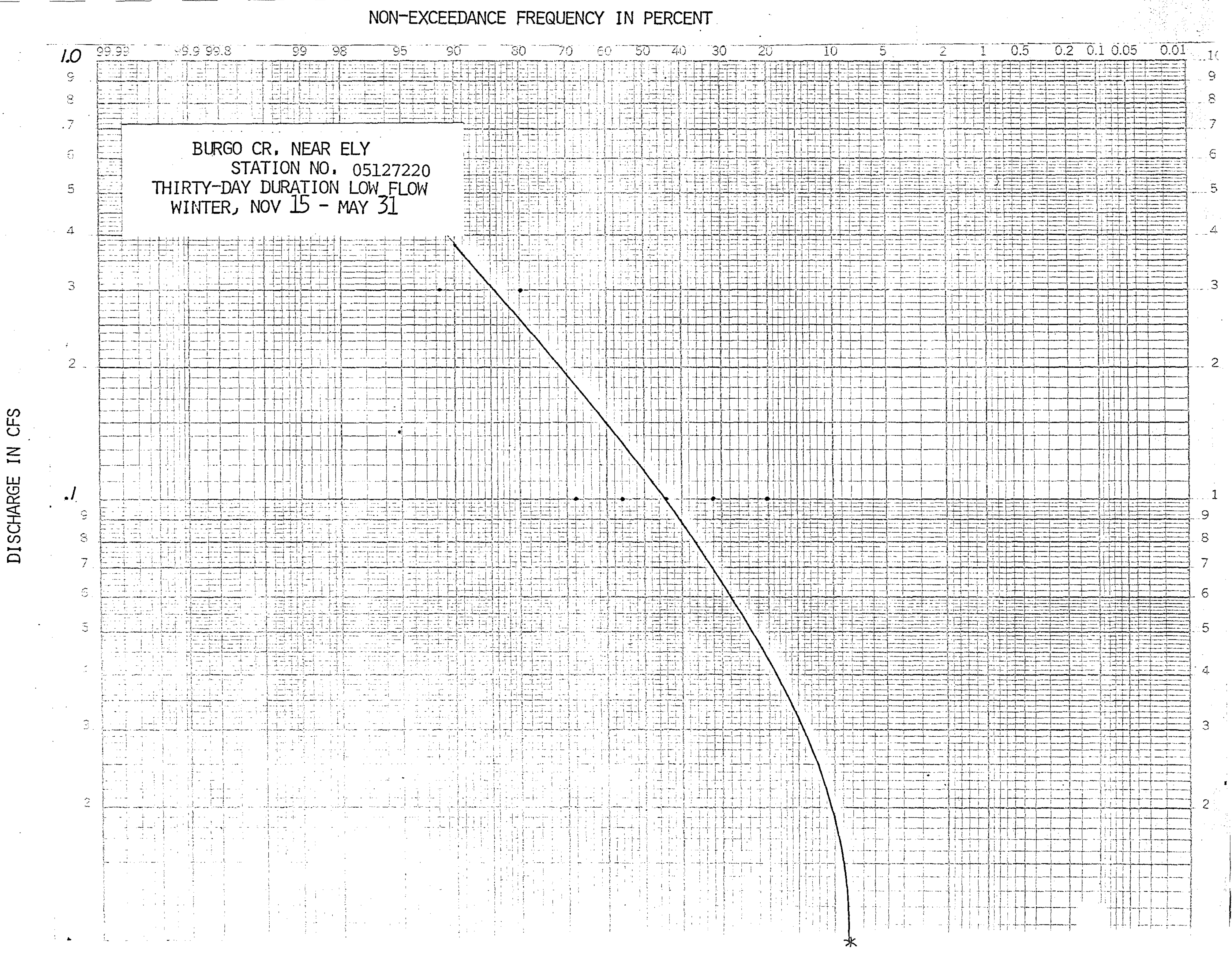
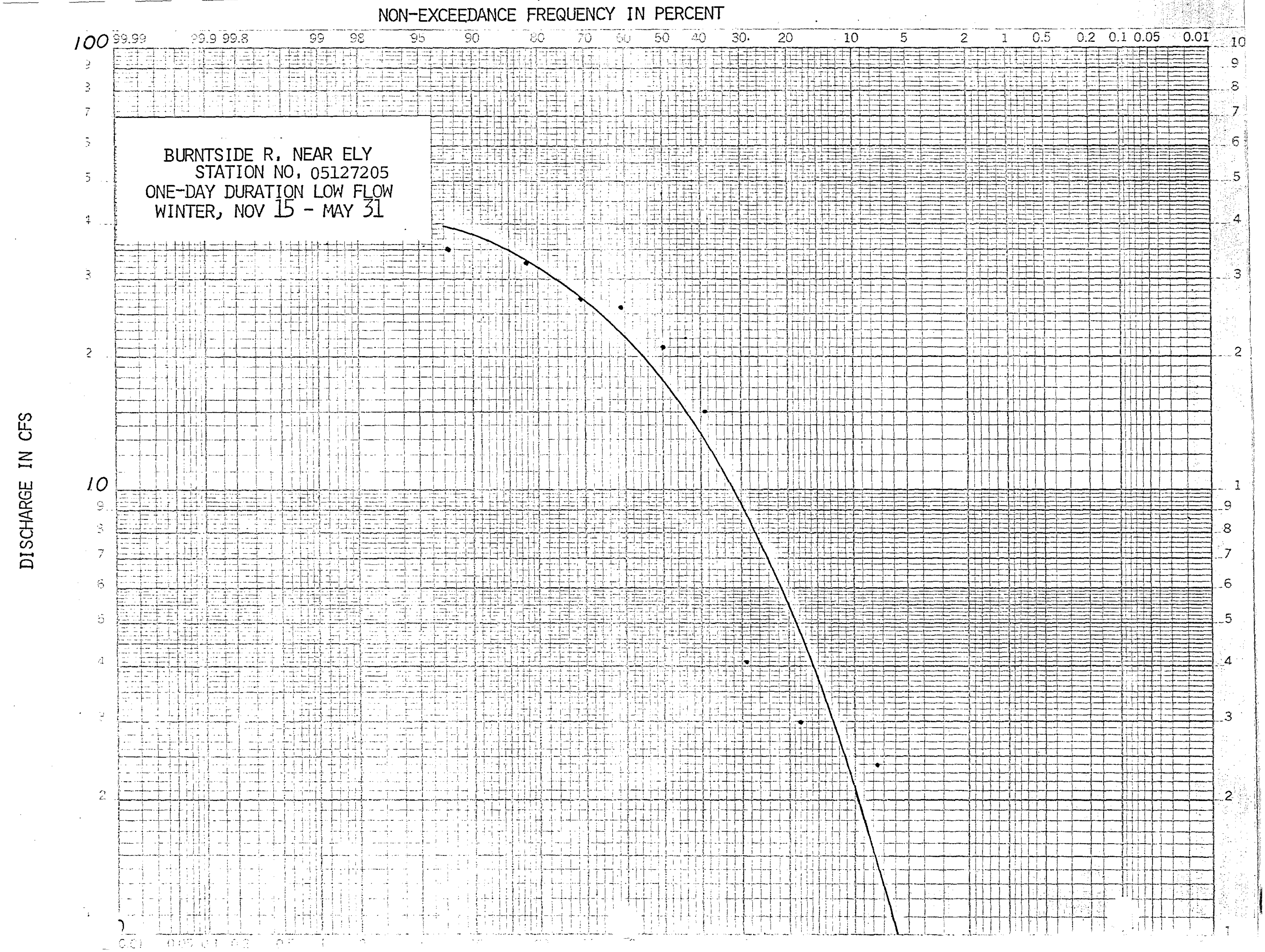
10
5
2
1
0.5
0.2
0.1 0.05
0.01
1.0
.1
DISCHARGE IN CFS
BURGO CR. NEAR ELY
STATION NO. 05127220
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31

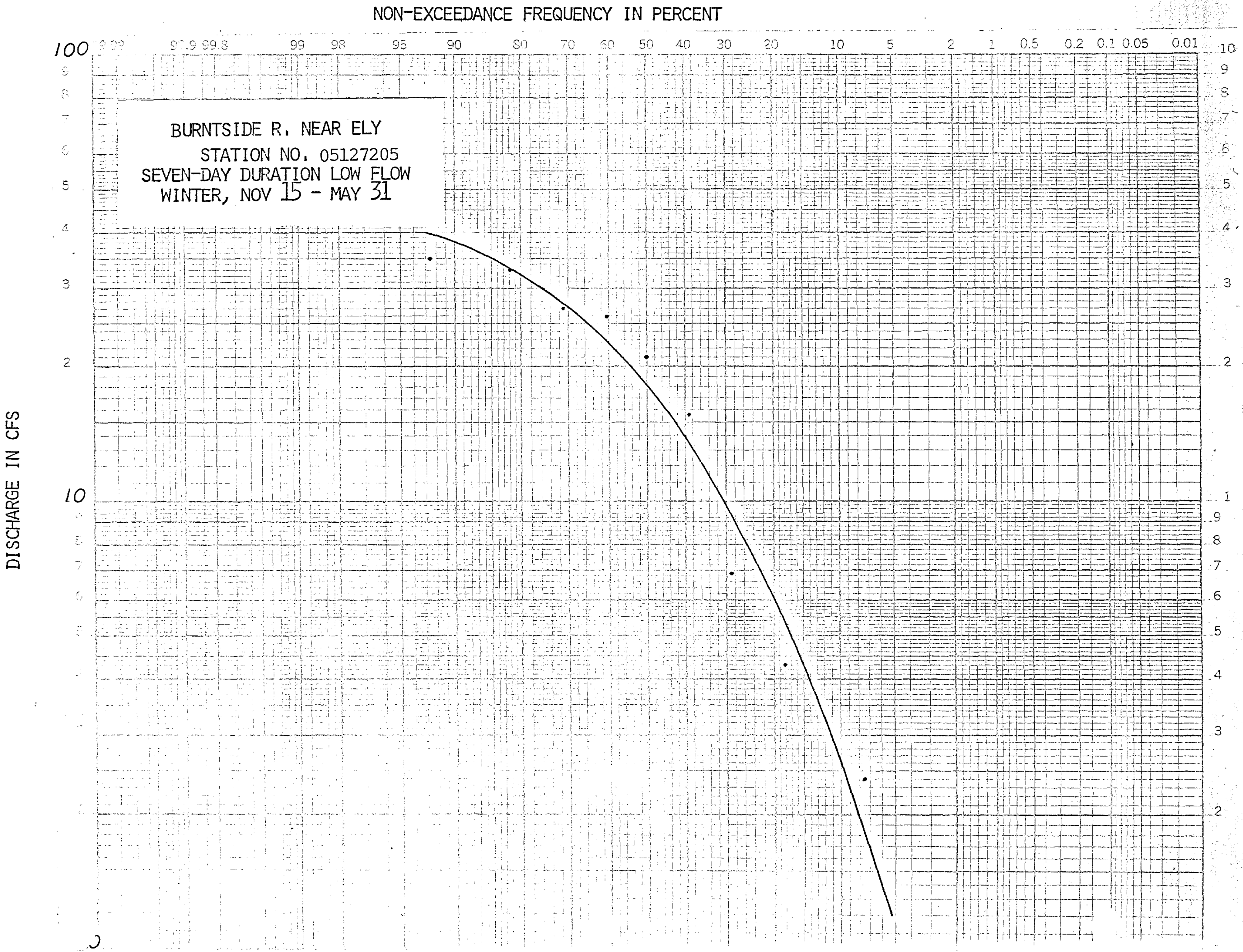


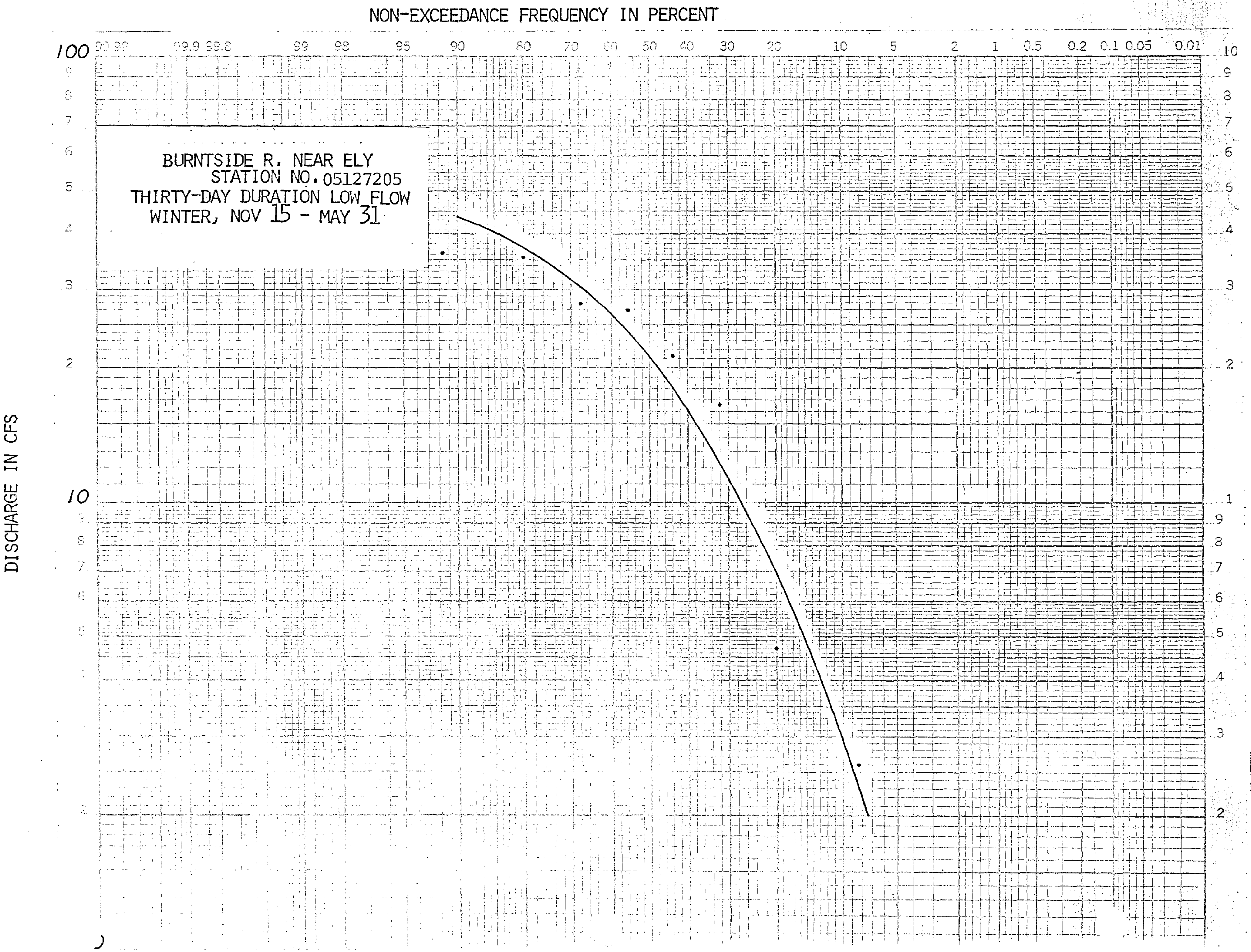
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BURGO CR. NEAR ELY
STATION NO. 05127220
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
BURGO CR, NEAR ELY
STATION NO. 05127220
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS



NON-EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS


NON-EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS


NON-EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
99.99
99.9 99.8
99
98
95
90
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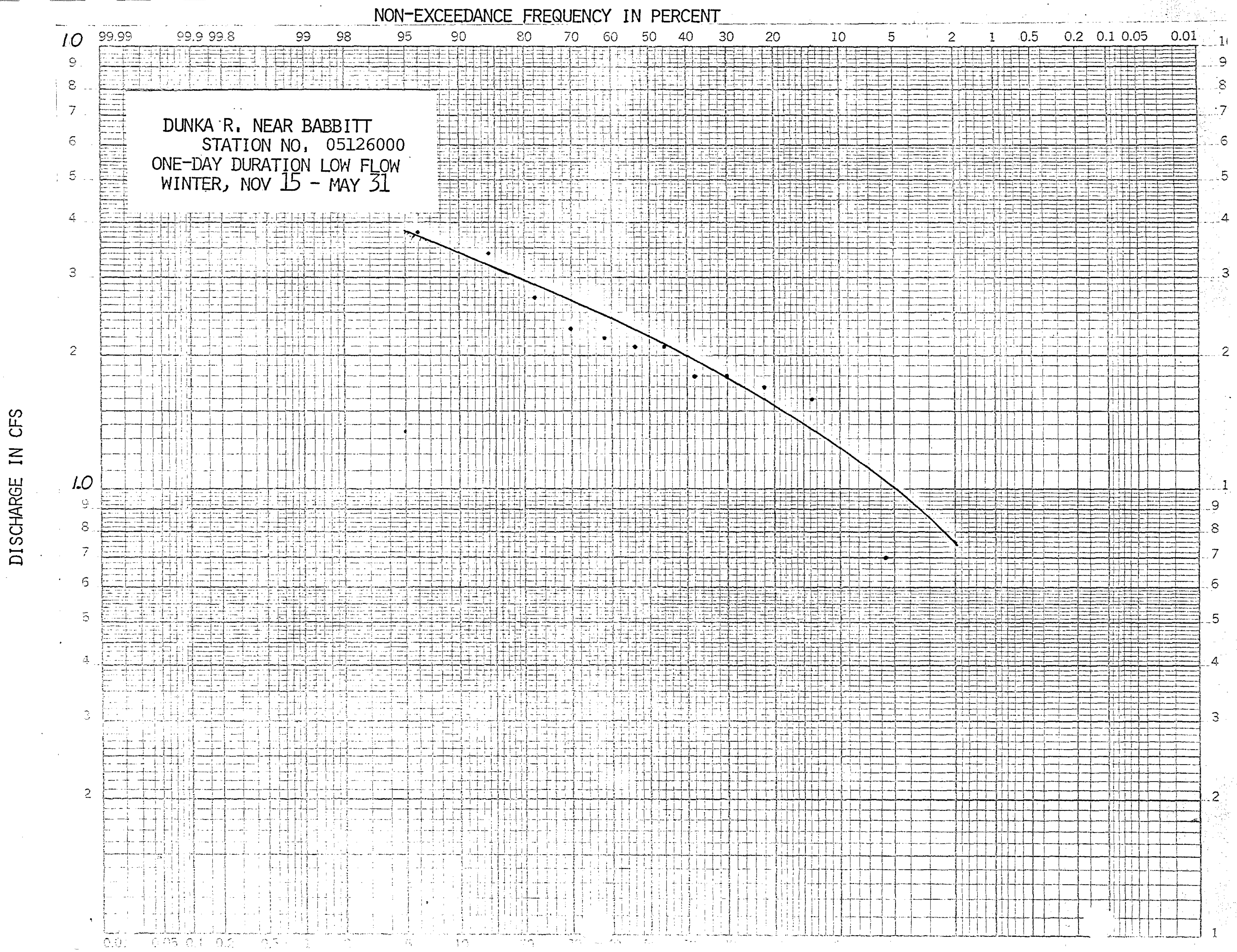
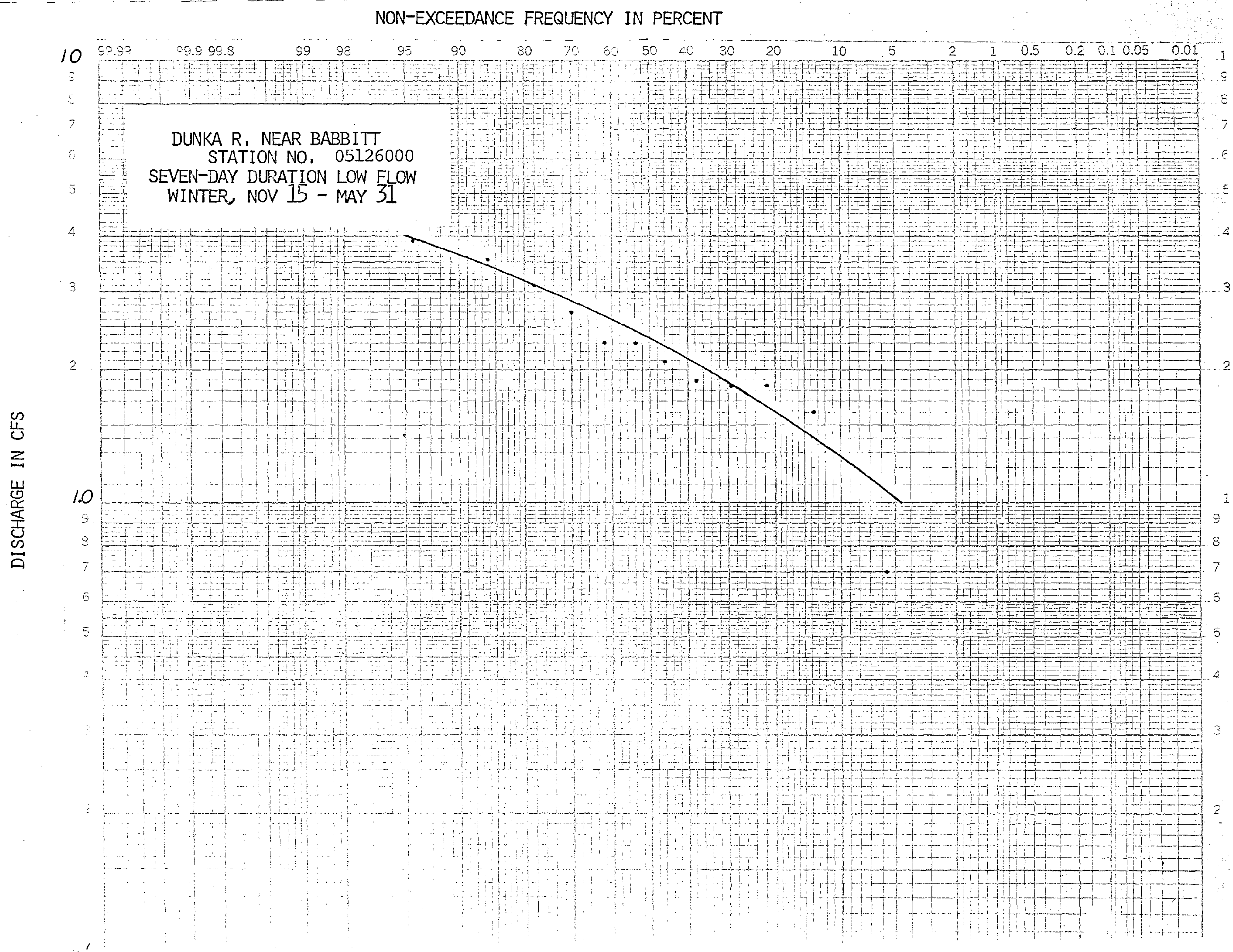
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
DUNKA R. NEAR BABBITT
STATION NO. 05126000
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
DUNKA R. NEAR BABBITT
STATION NO. 05126000
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
99.99
99.9
99.8
99
98
95
90
80
70
60
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2
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0.5
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0.1
0.05
0.01
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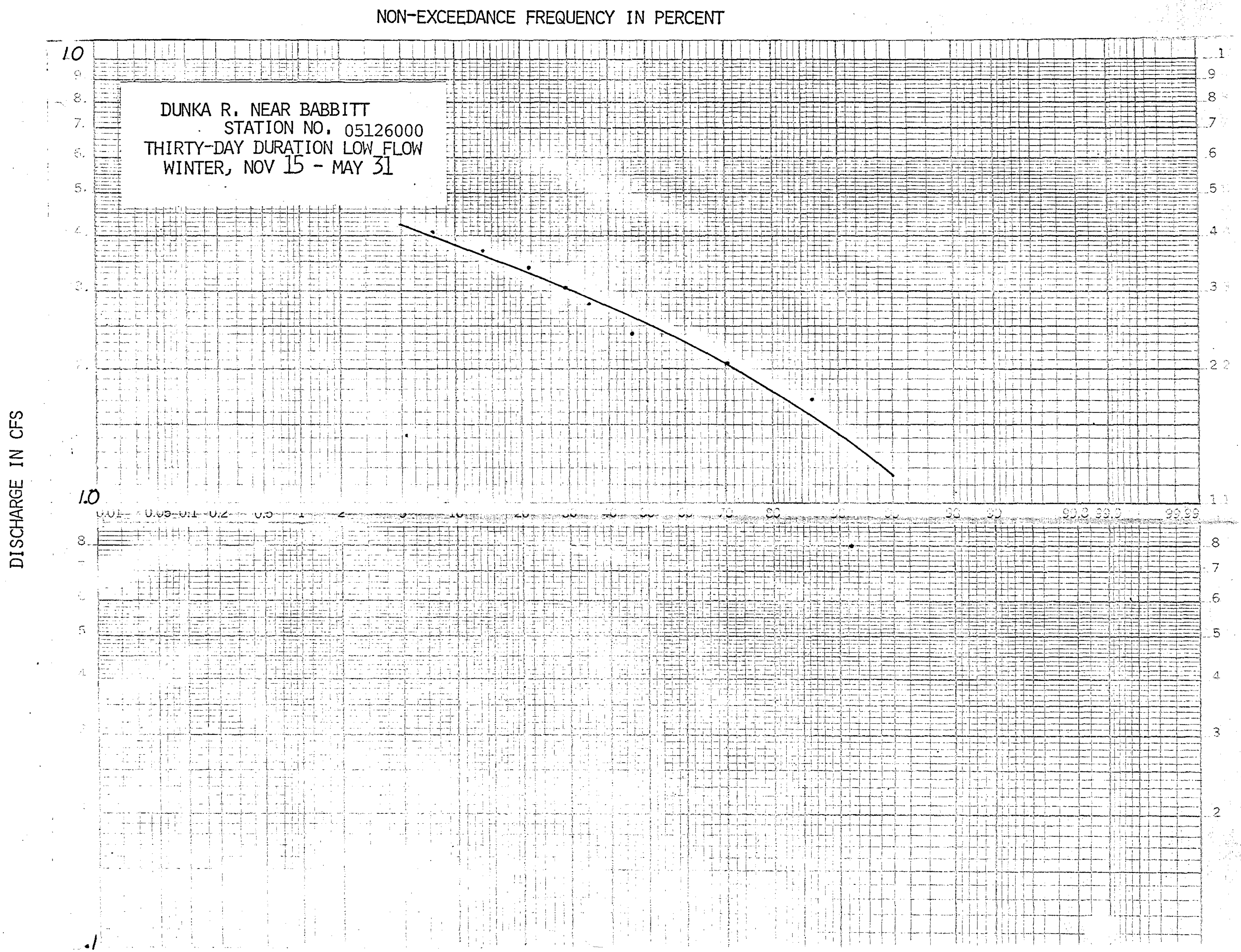
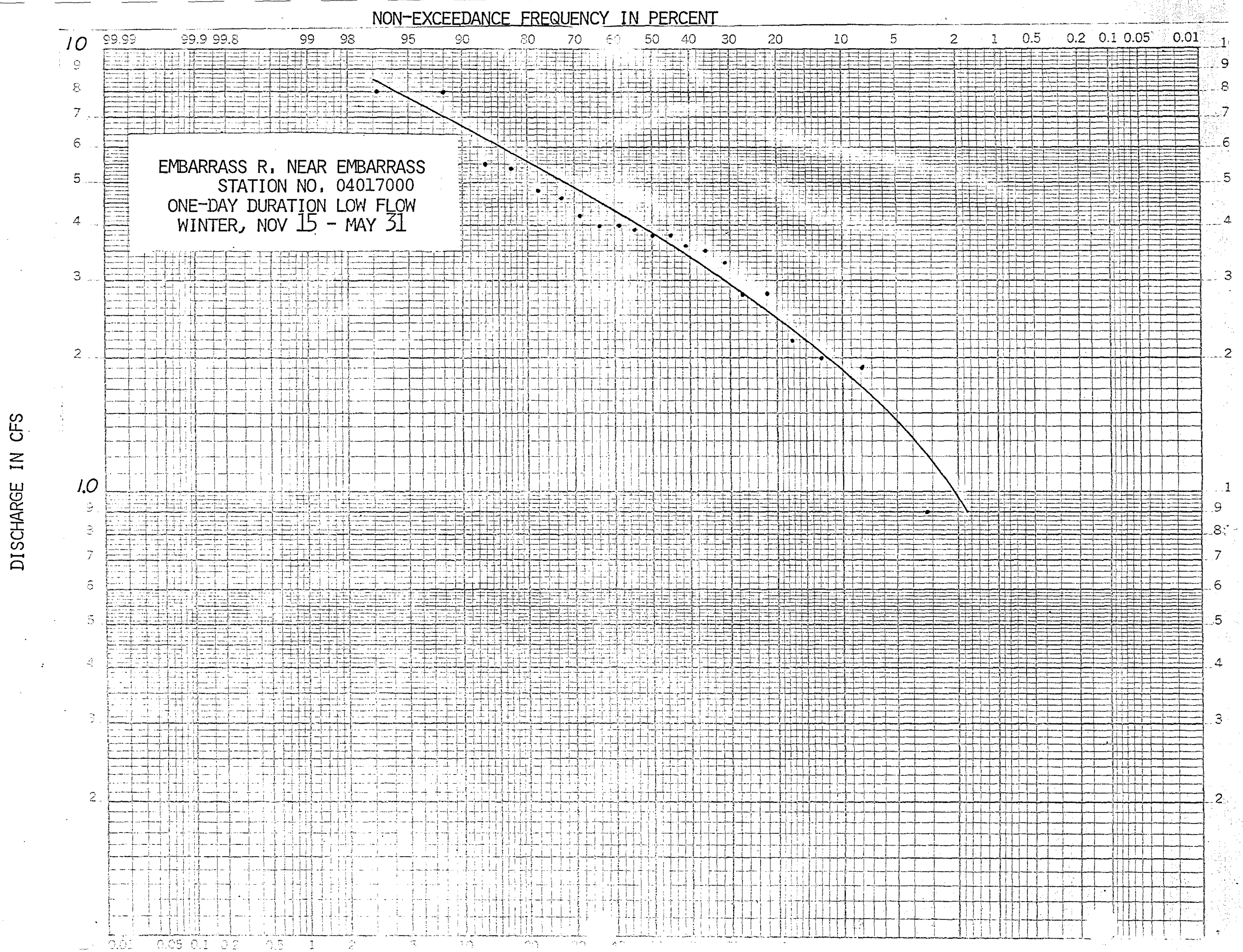
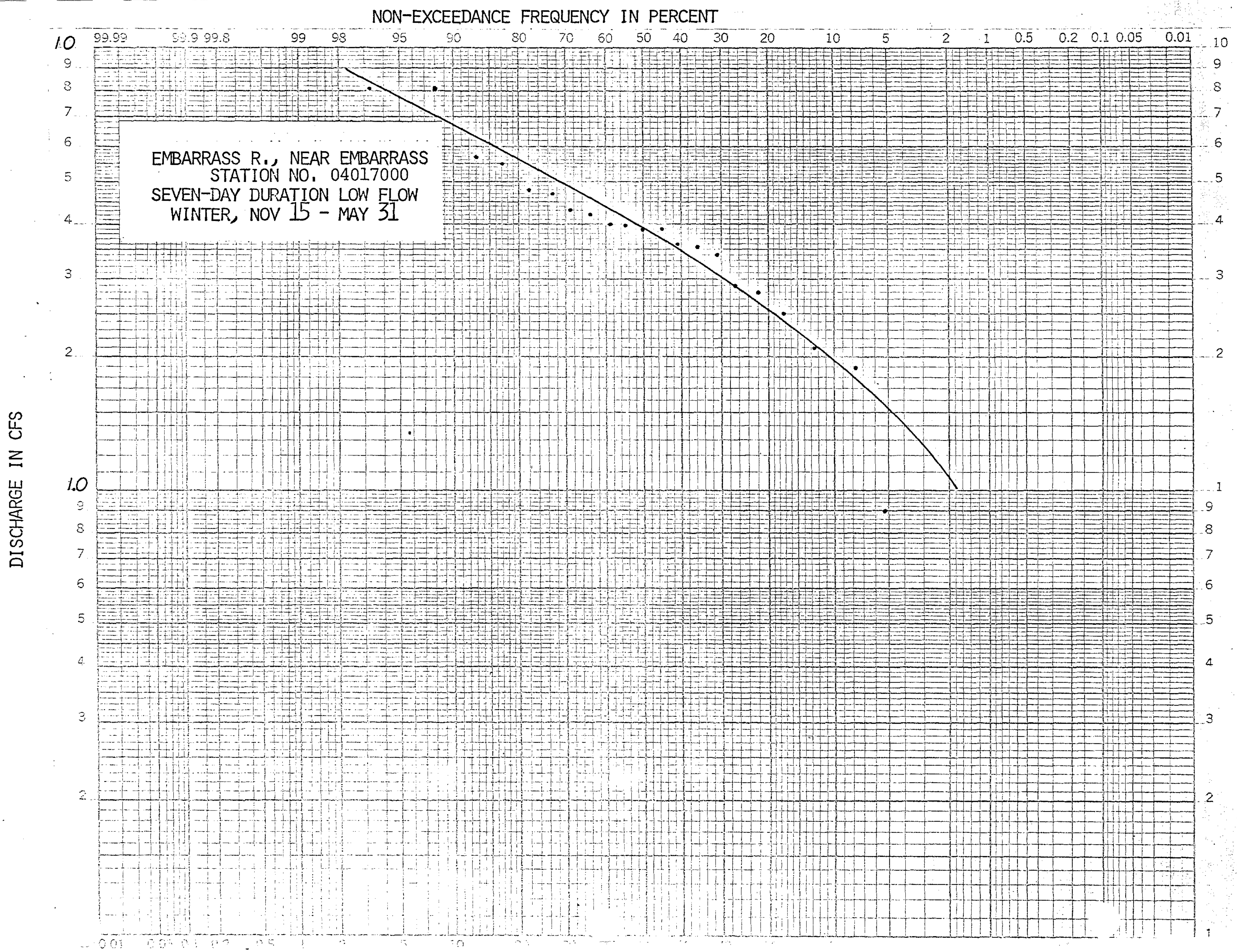
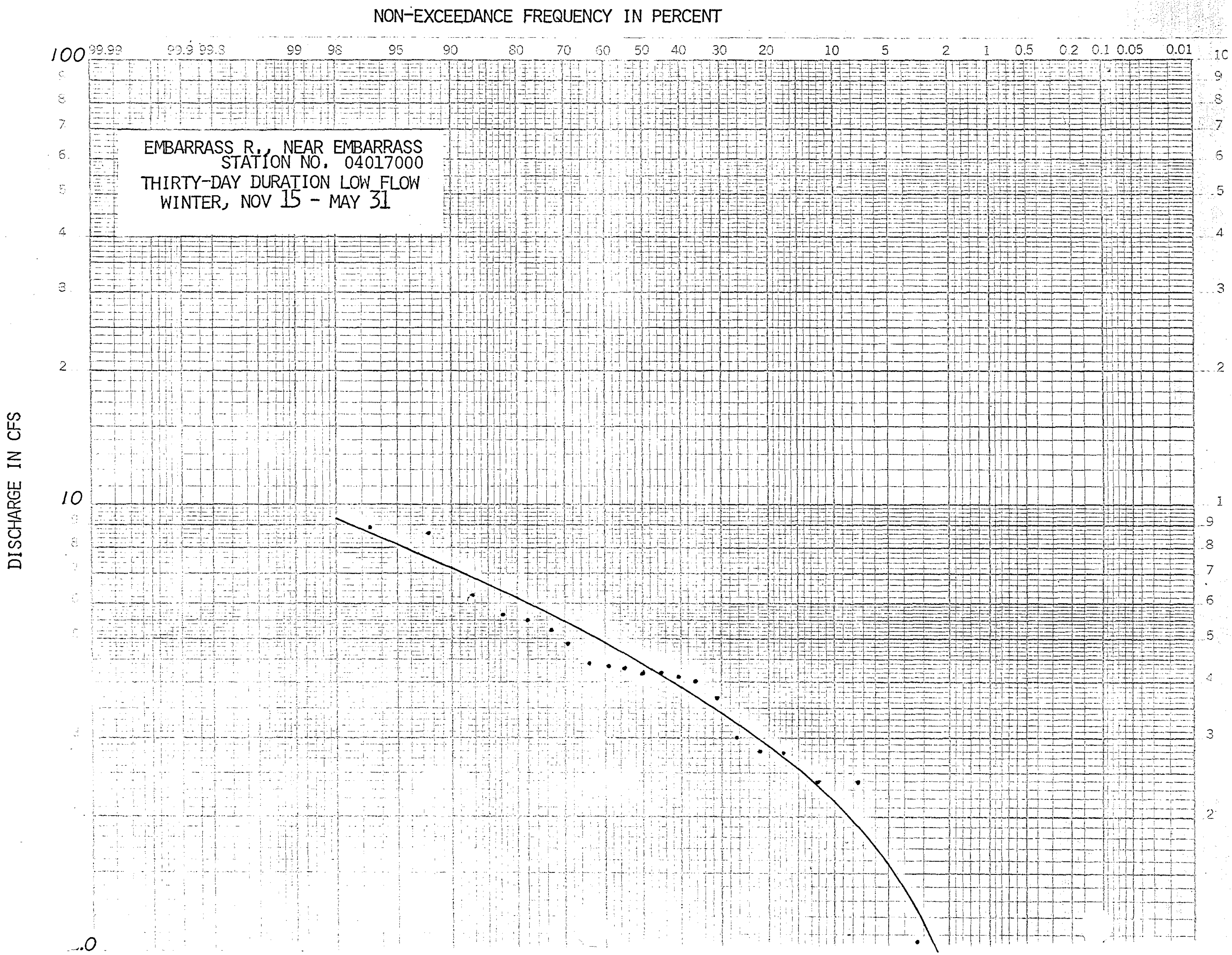
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
DUNKA R. NEAR BABBITT
STATION NO. 05126000
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
10
1.0
.1



NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
EMBARRASS R. NEAR EMBARRASS
STATION NO. 04017000
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
10 9 8 7 6 5 4 3 2 1.0 9 8 7 6 5 4 3 2


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
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10
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2
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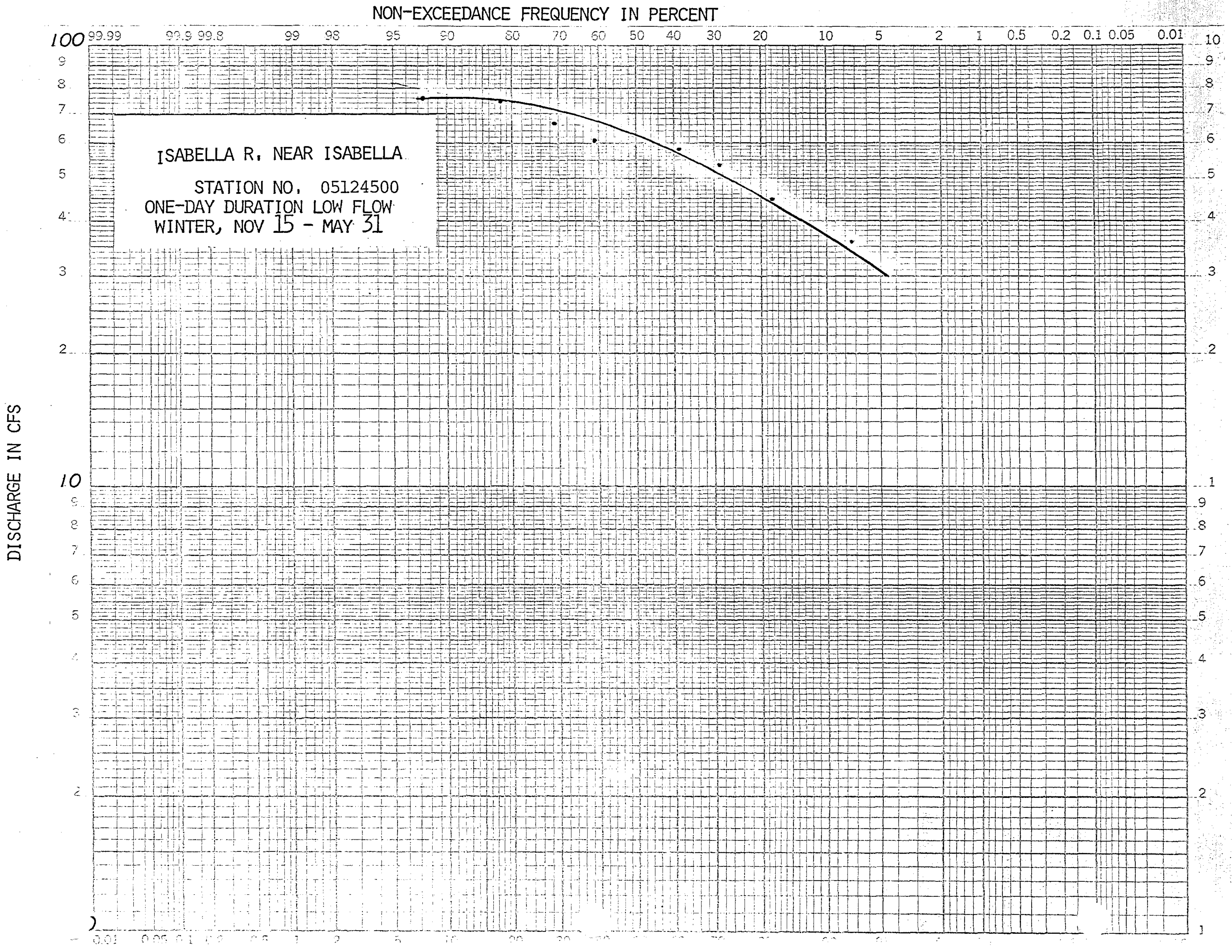
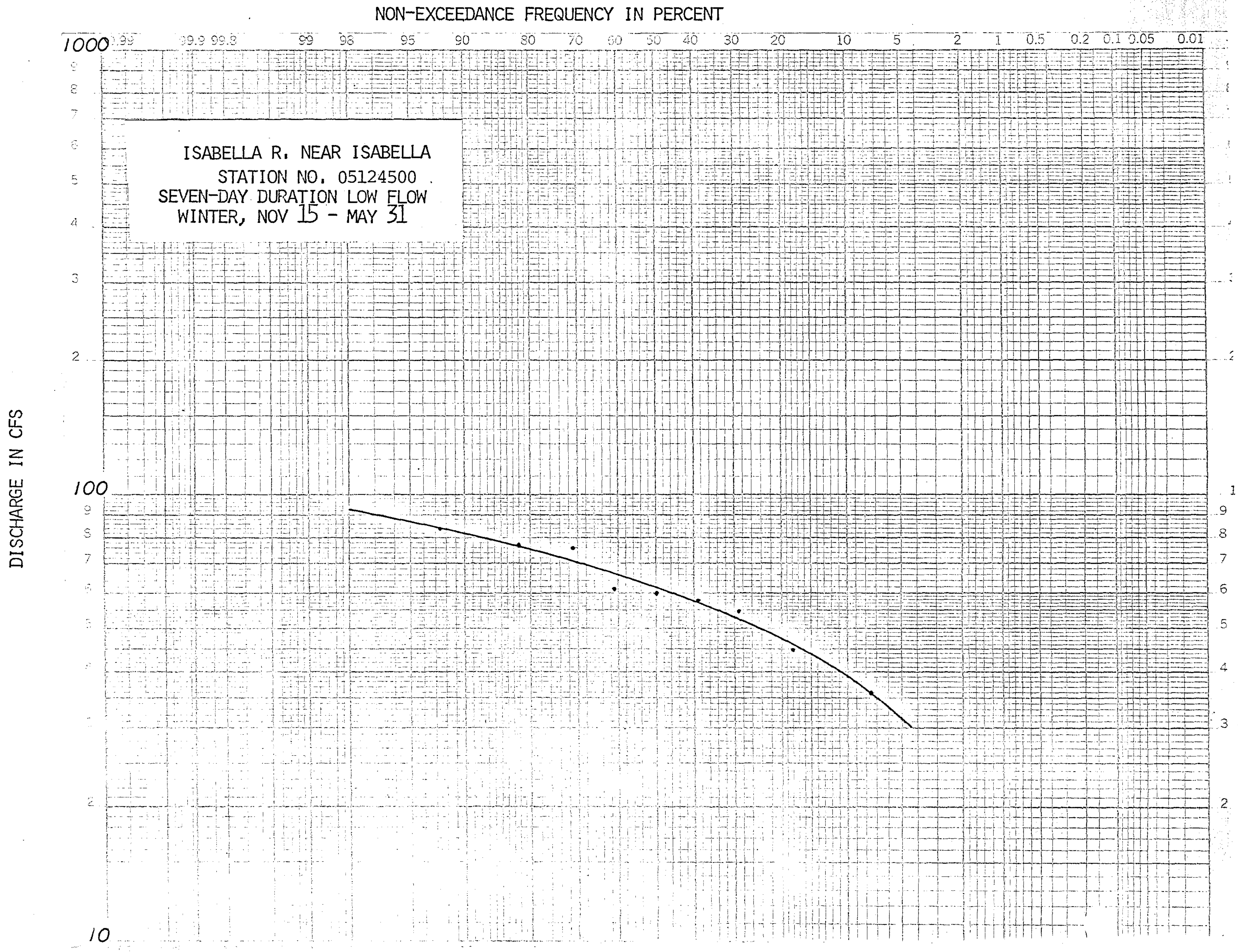
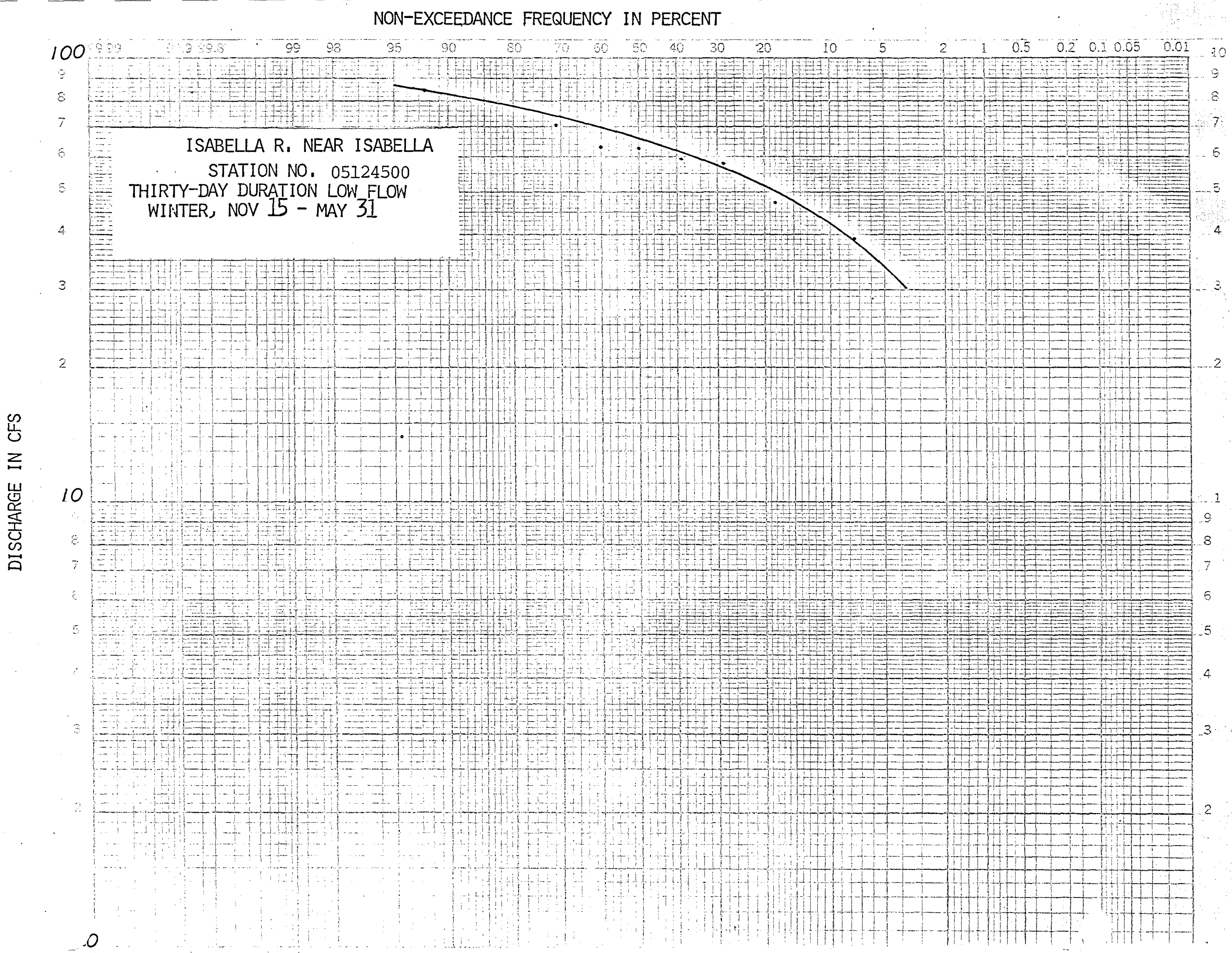
0.5
0.2
0.1 0.05
0.01
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
1000
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
99.99
99.9 99.8
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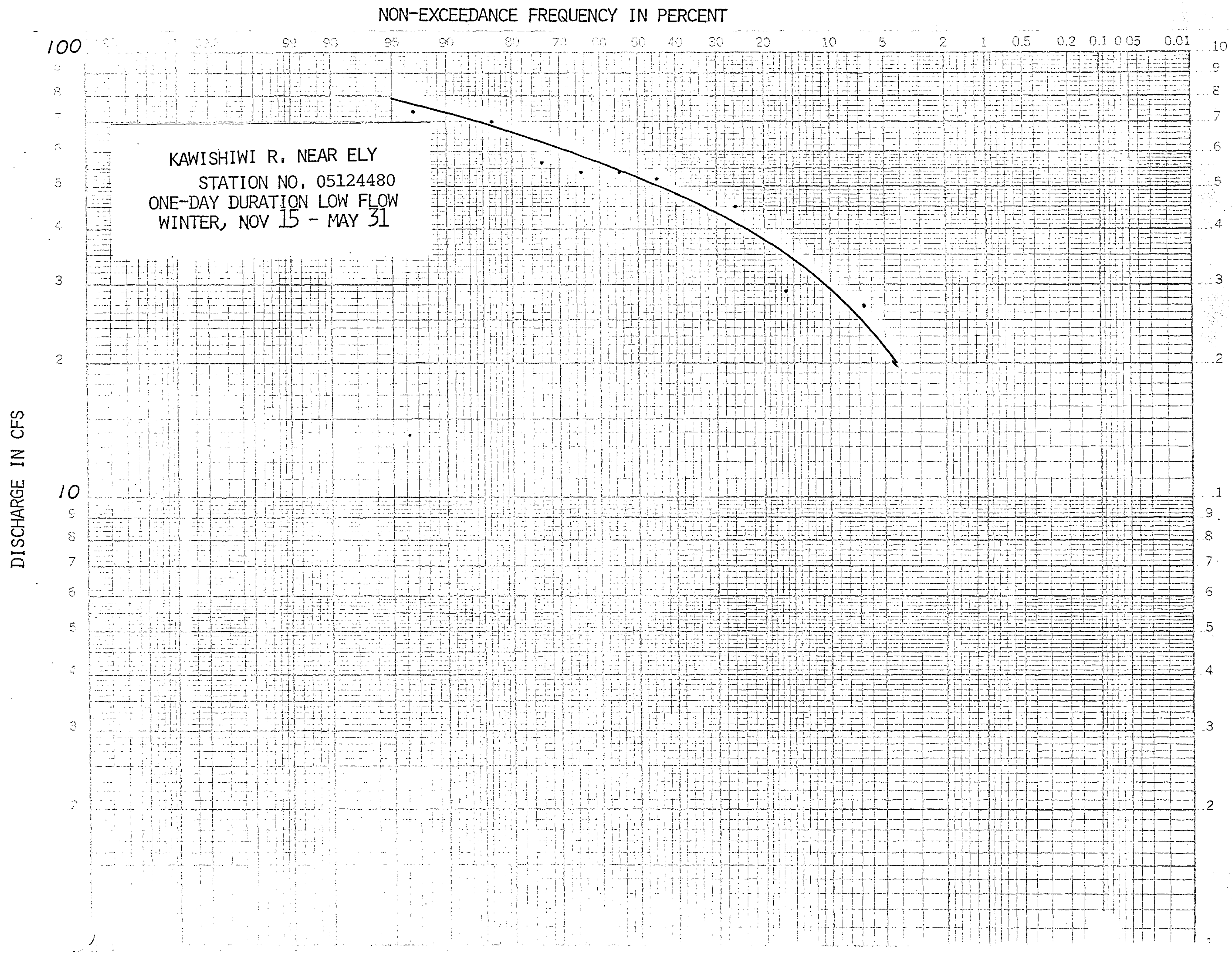
0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
95
90
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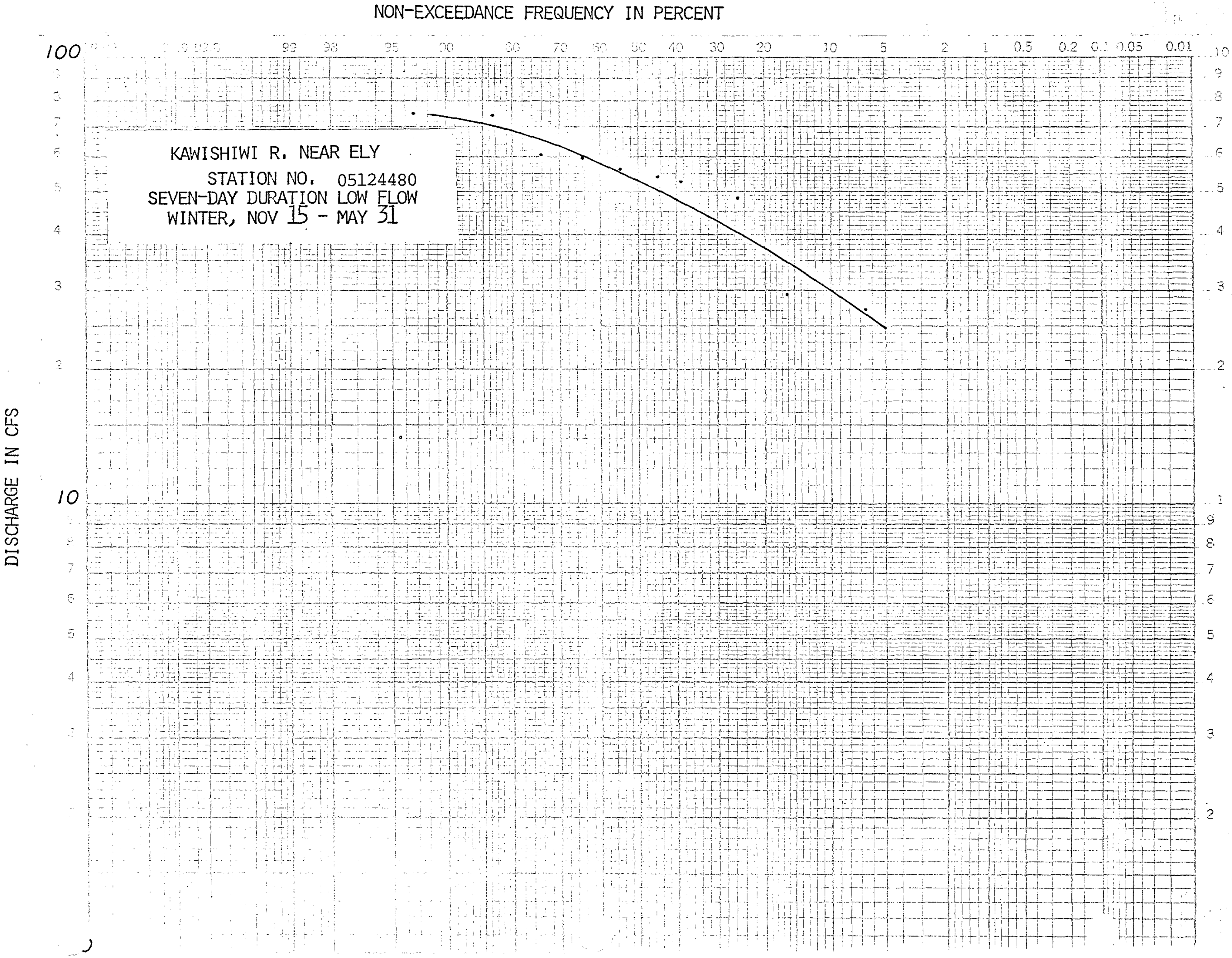
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
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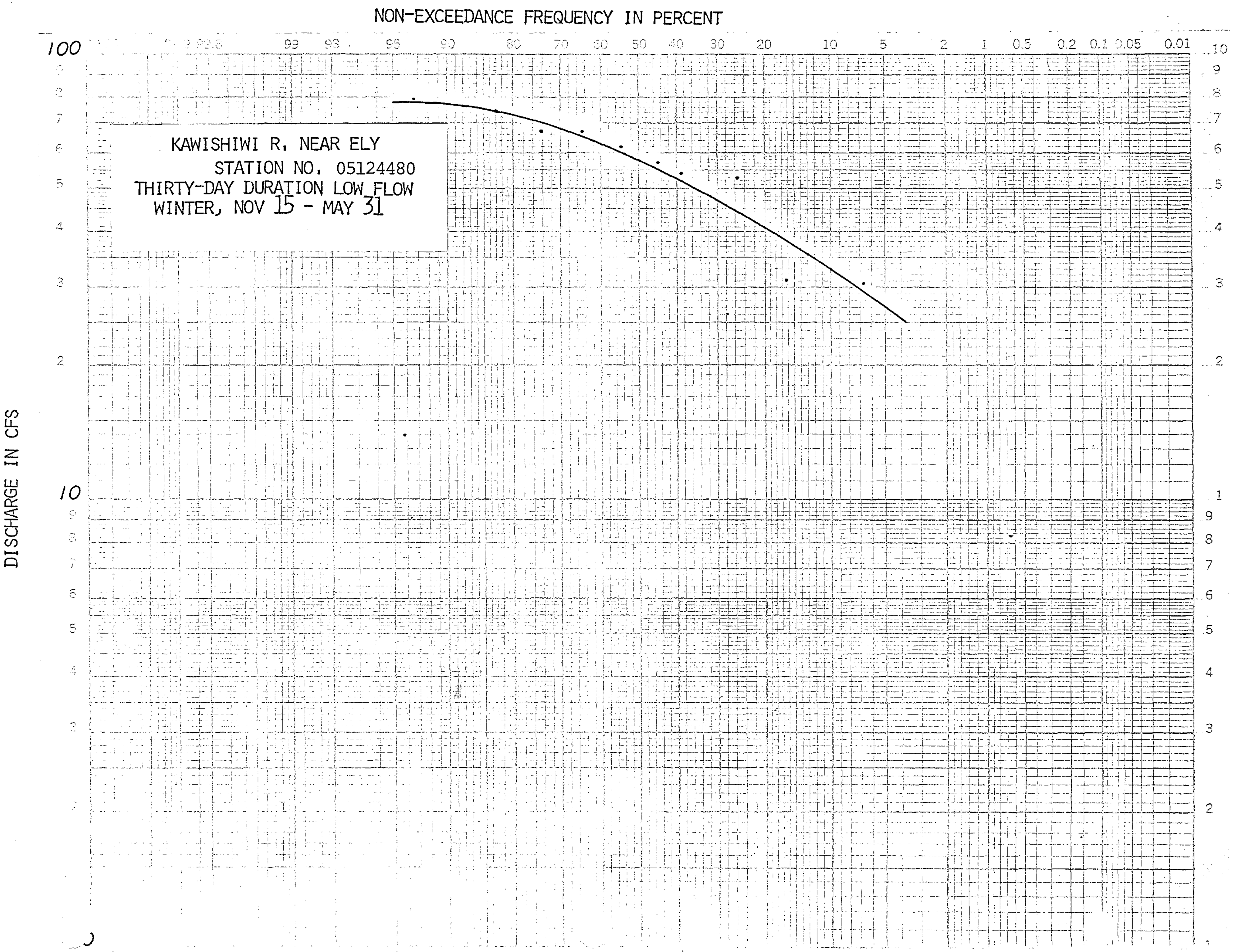
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
99
95
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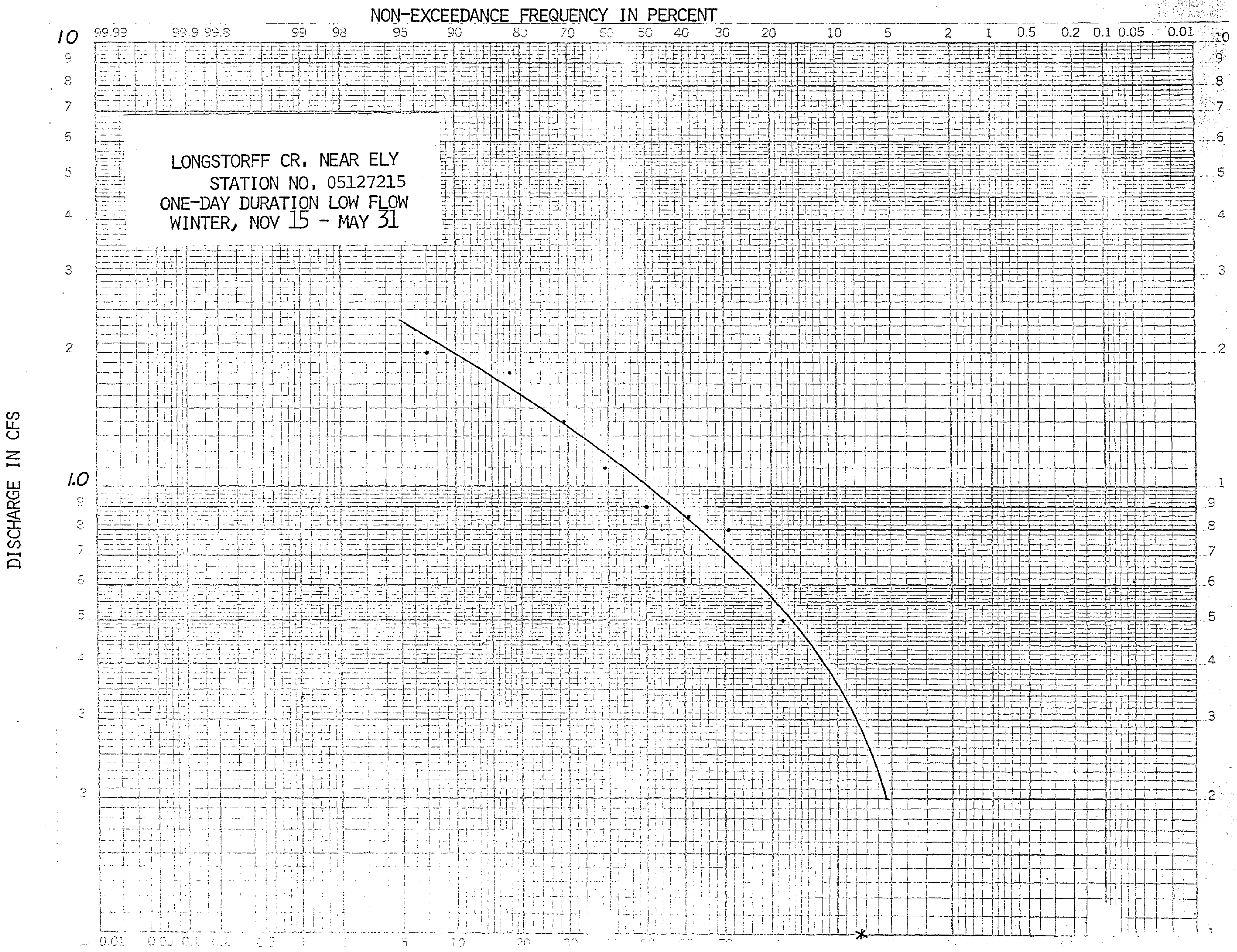
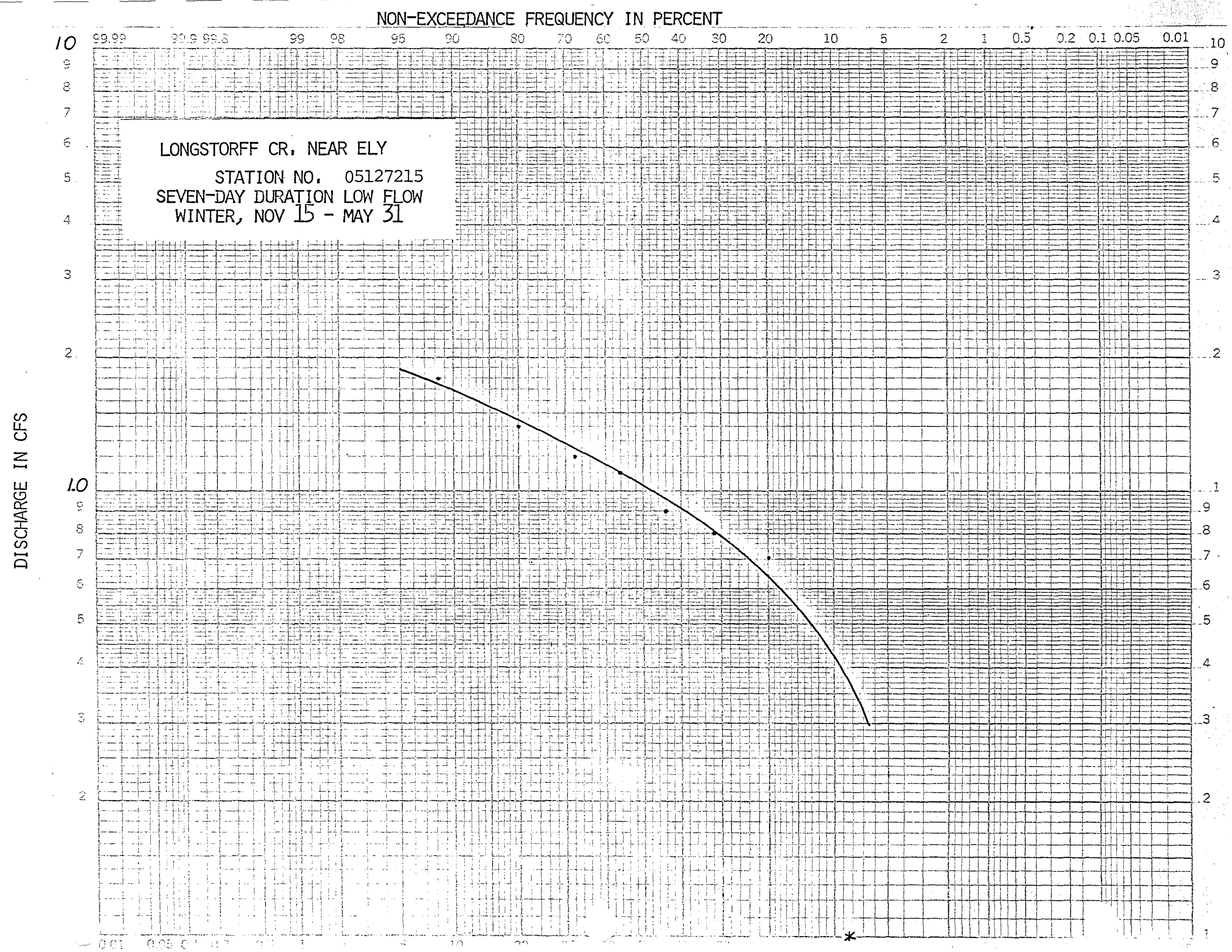
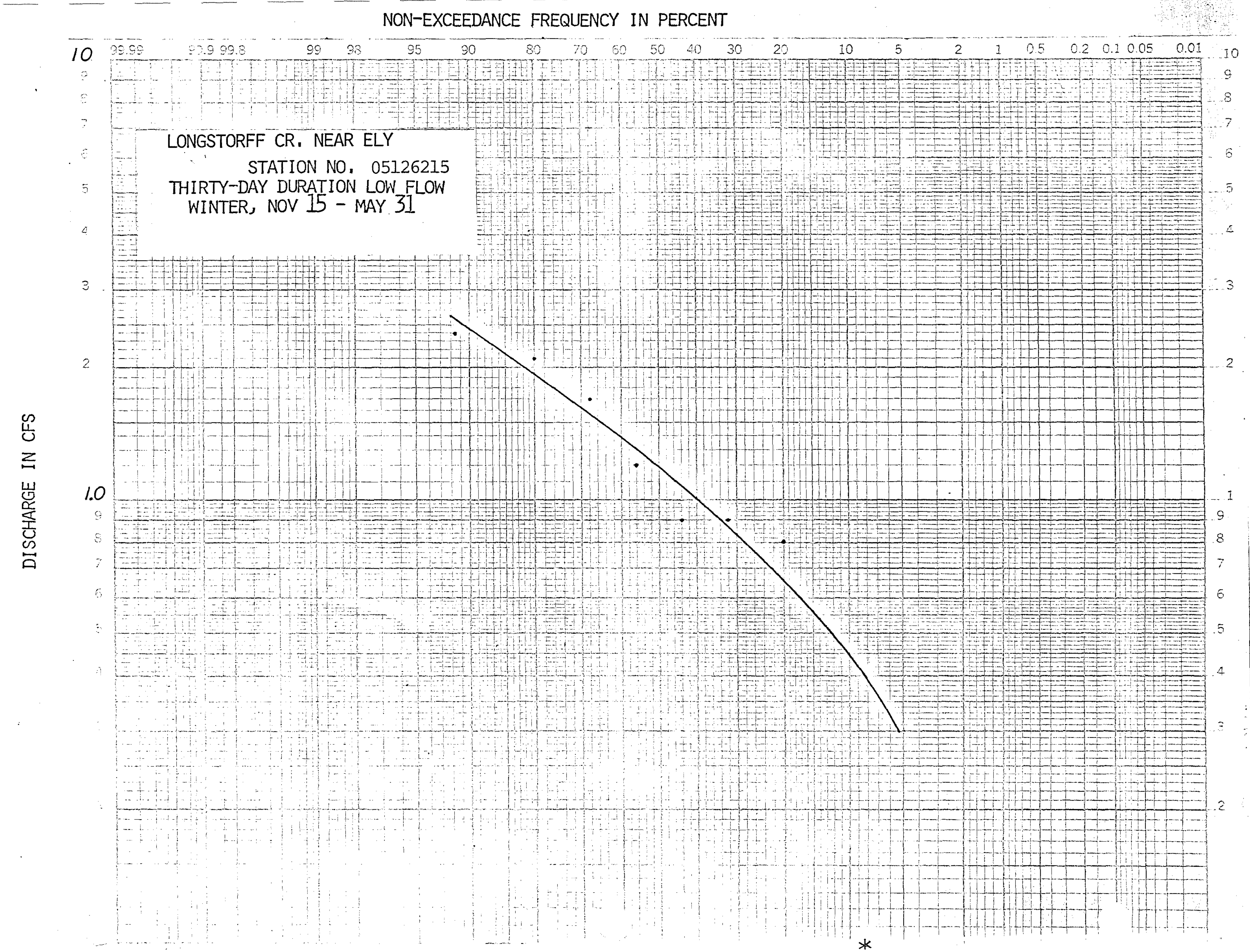
0.5
0.2
0.1
0.05
0.01
100
10

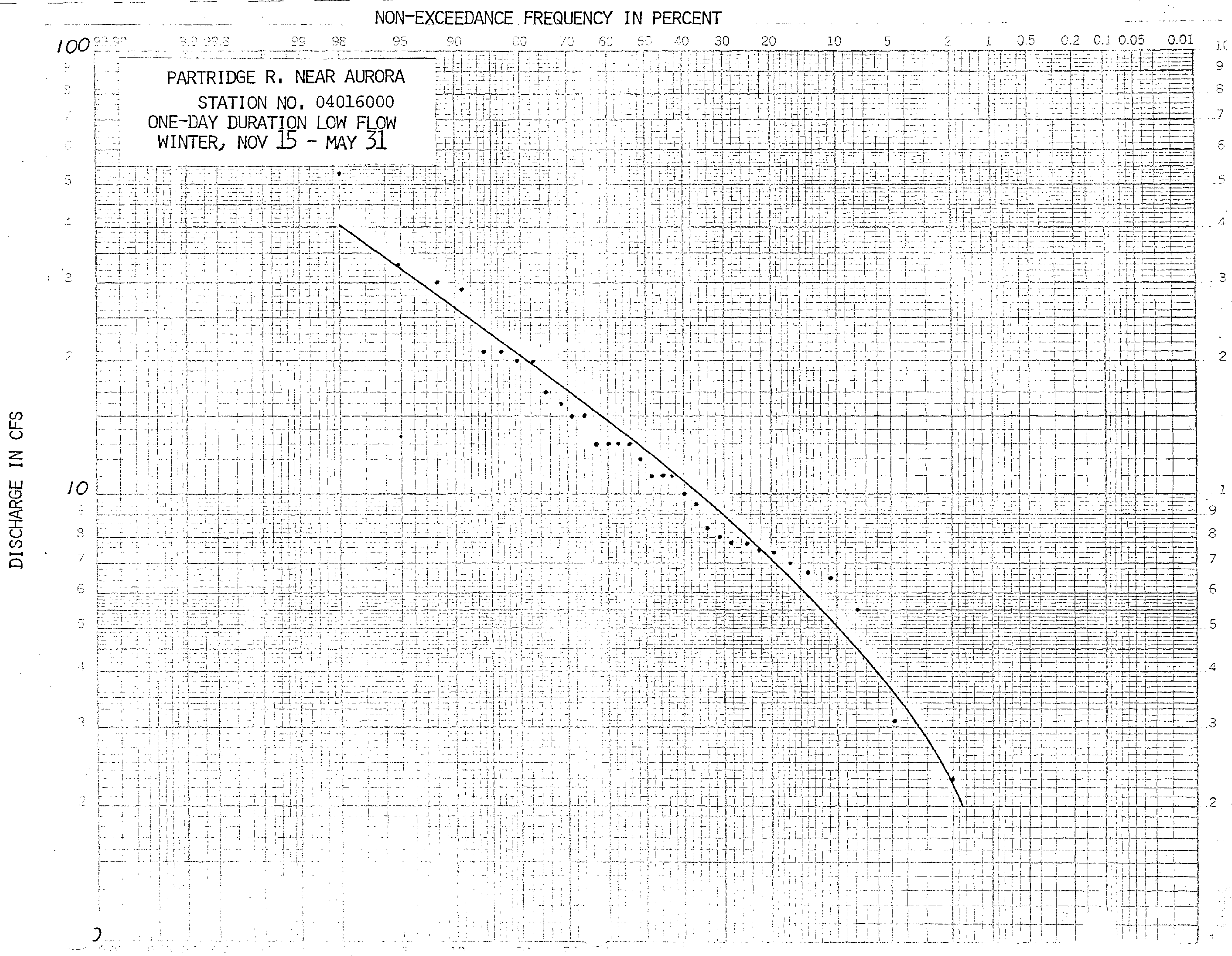


NON-EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS



NON-EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
LONGSTORFF CR. NEAR ELY
STATION NO. 05126215
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
*

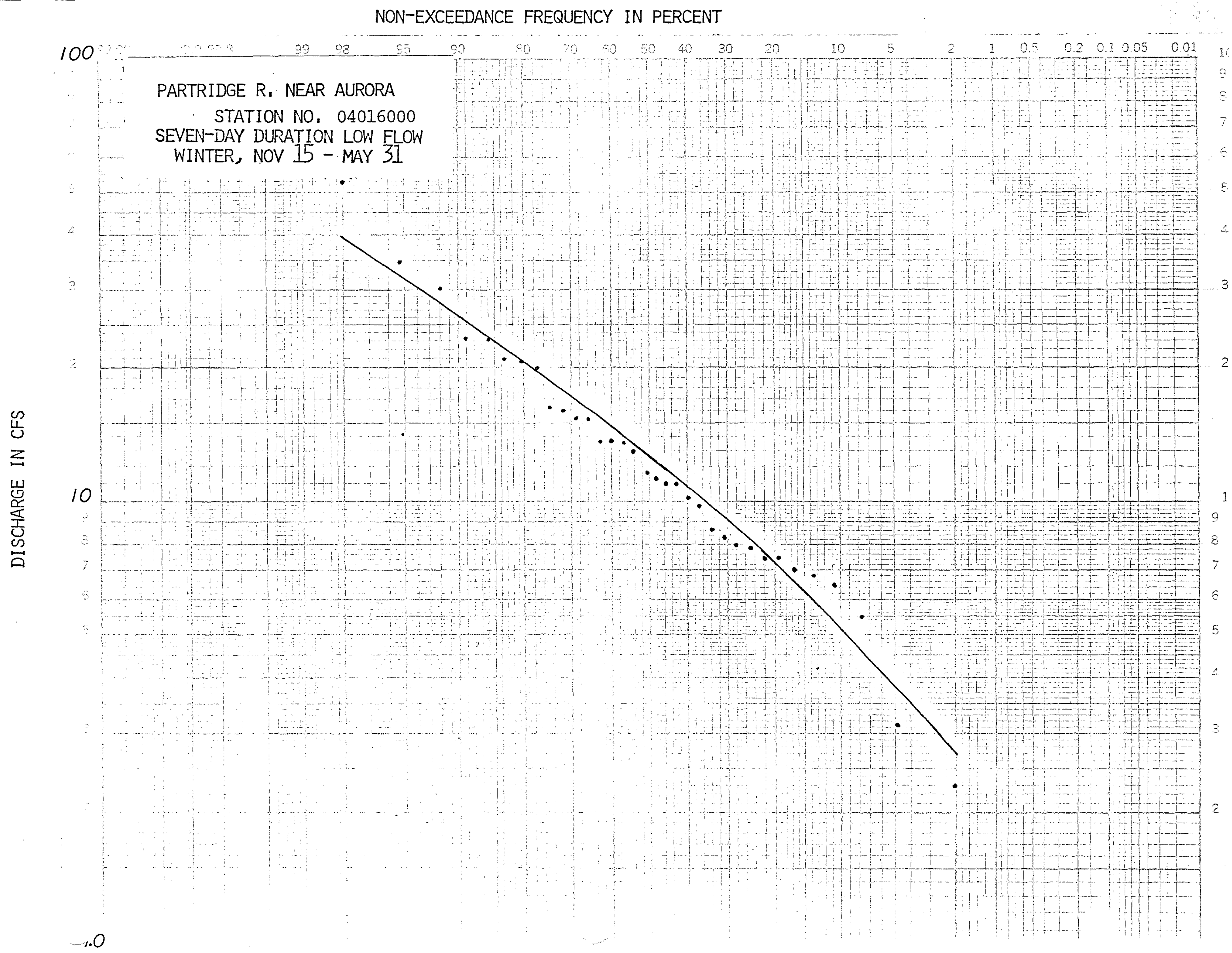

NON-EXCEEDANCE FREQUENCY IN PERCENT
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10

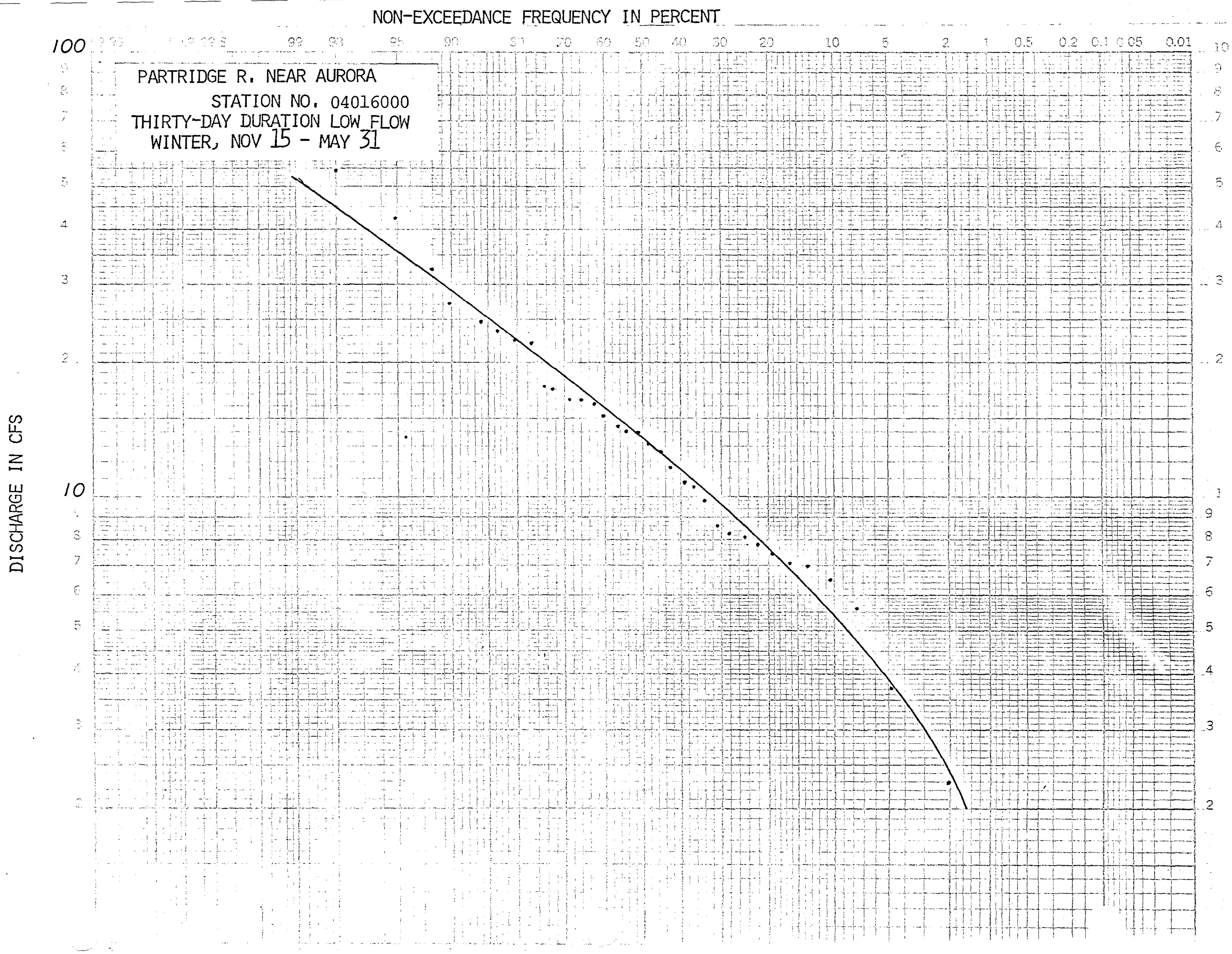
PARTRIDGE R. NEAR AURORA

STATION NO. 04016000

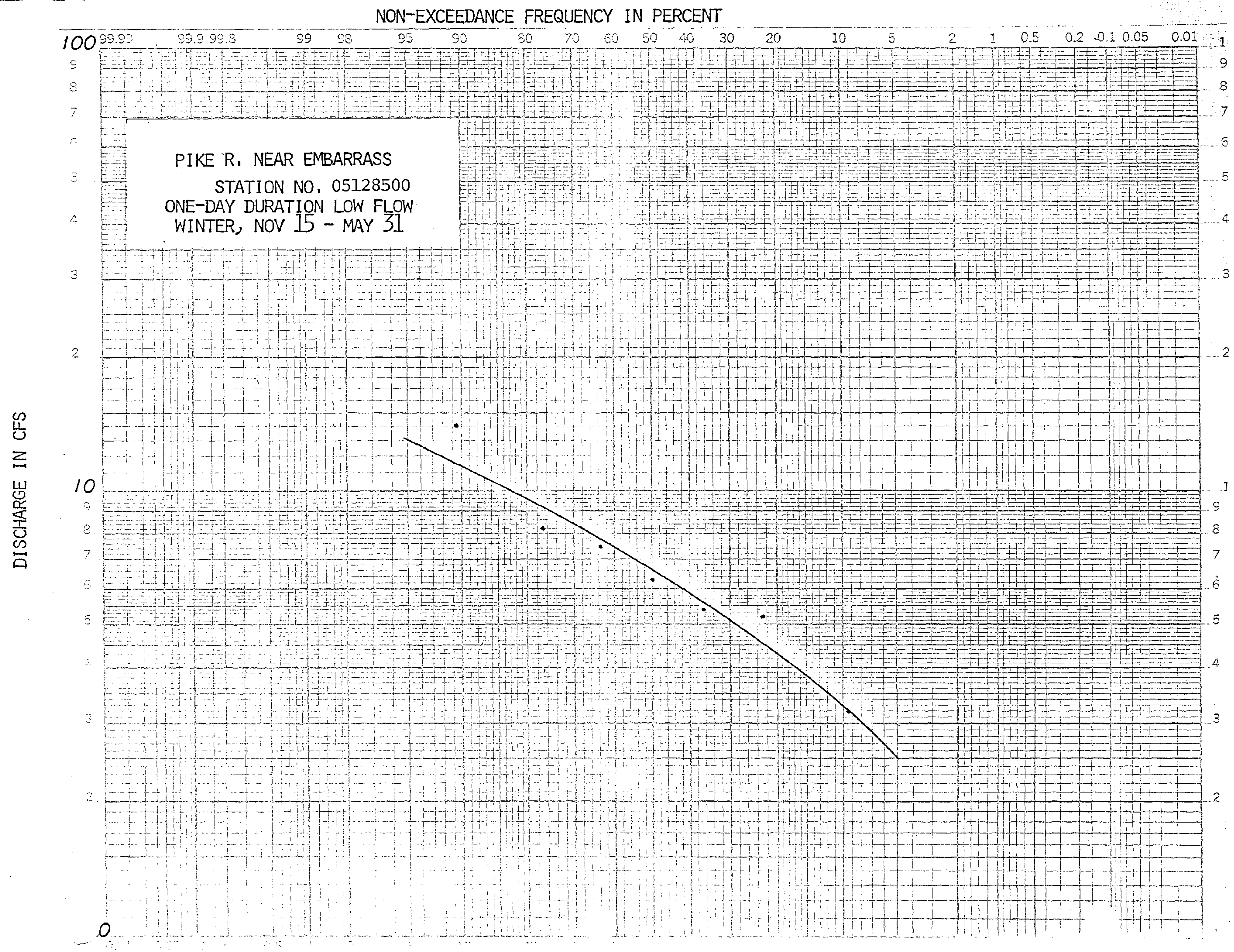
SEVEN-DAY DURATION LOW FLOW

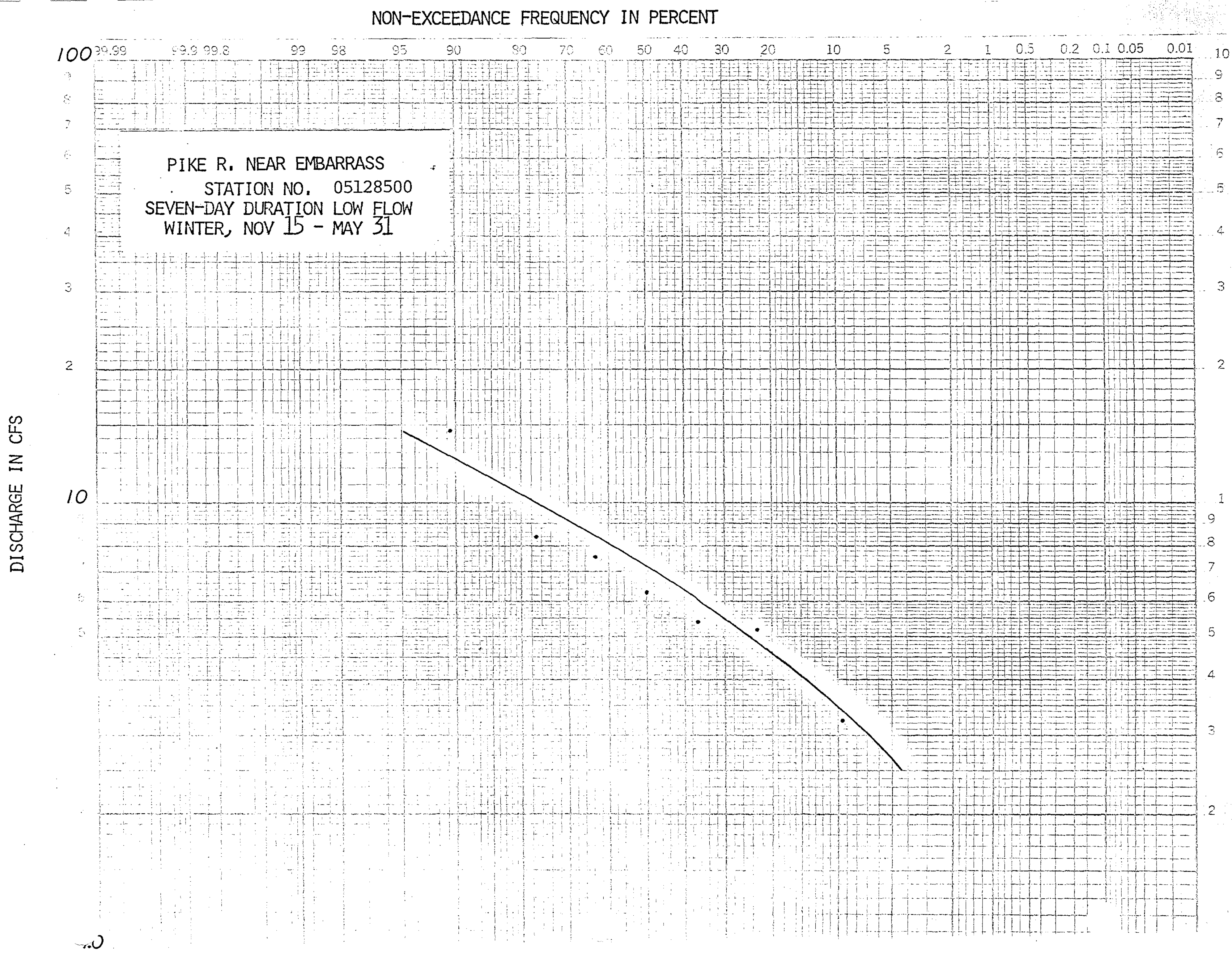
WINTER, NOV 15 - MAY 31



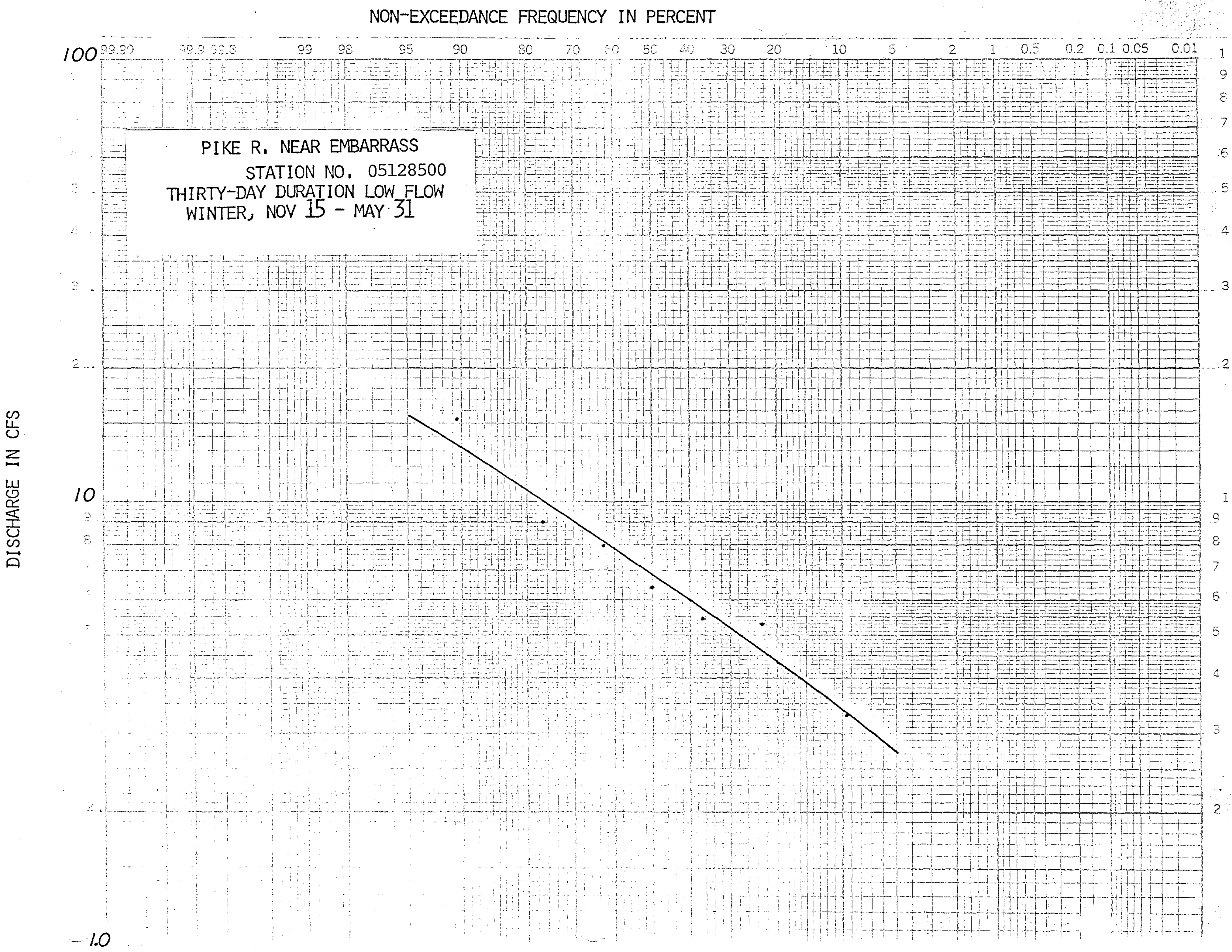


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10
1.0



NON-EXCEEDANCE FREQUENCY IN PERCENT
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
99.99
99.9 99.8
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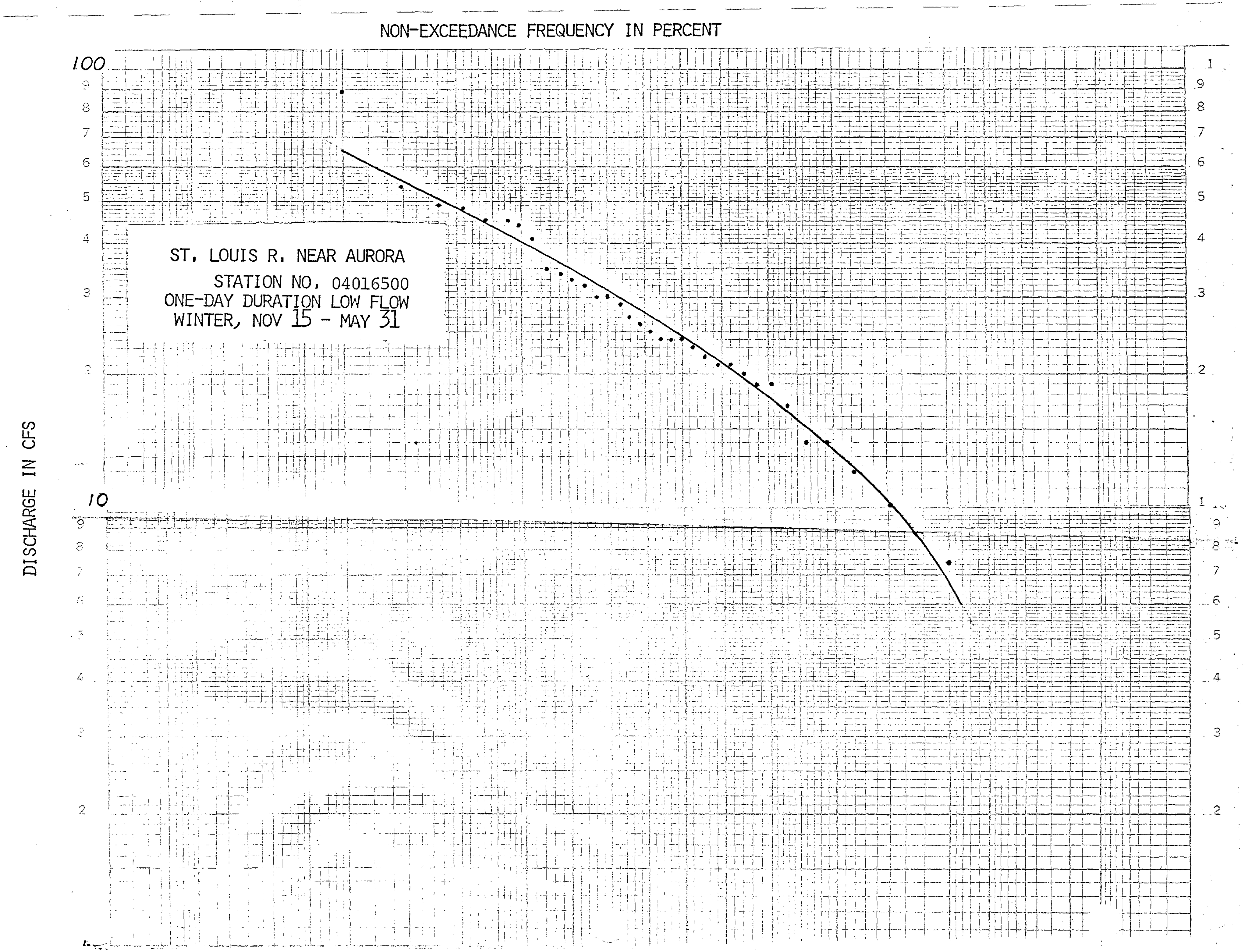
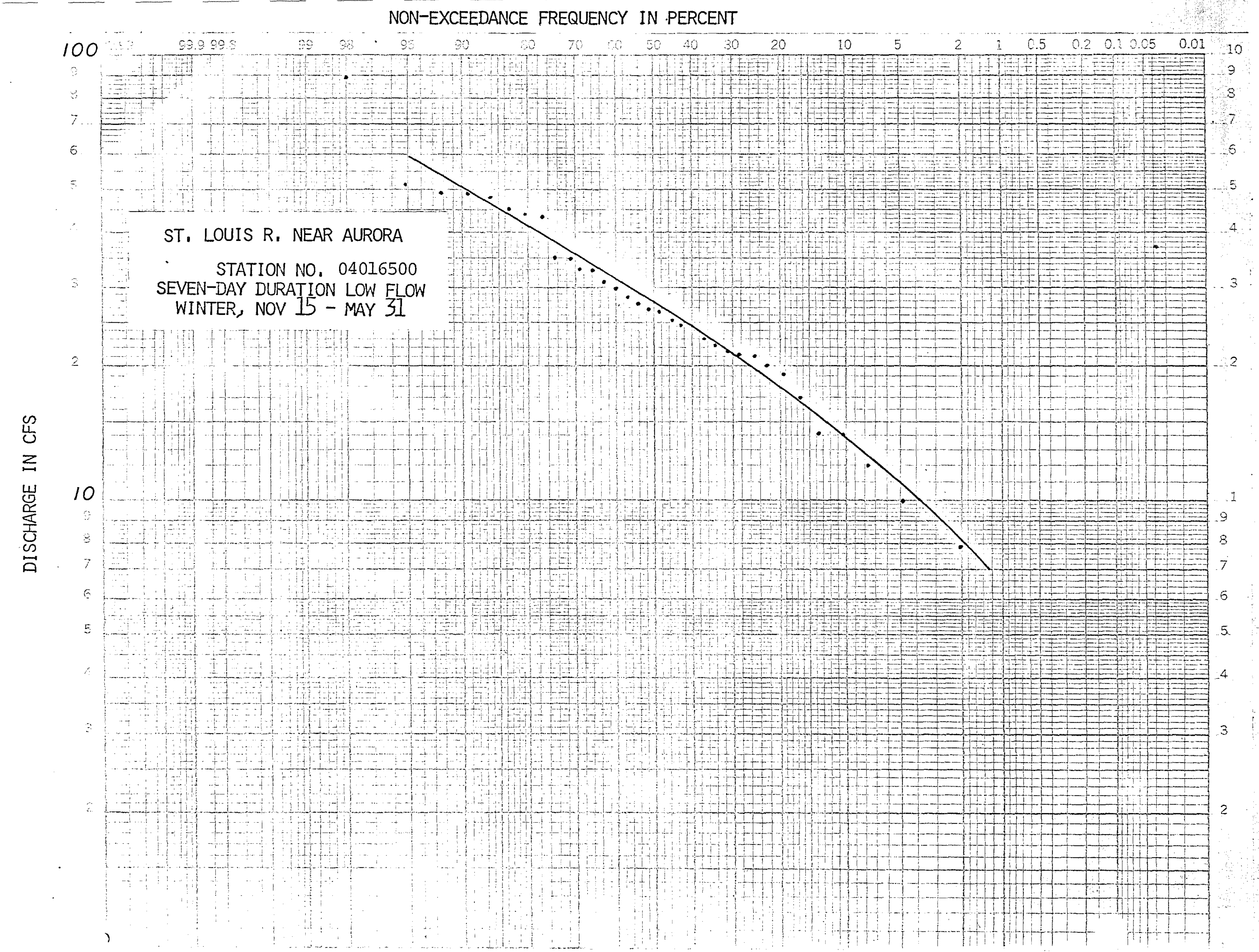
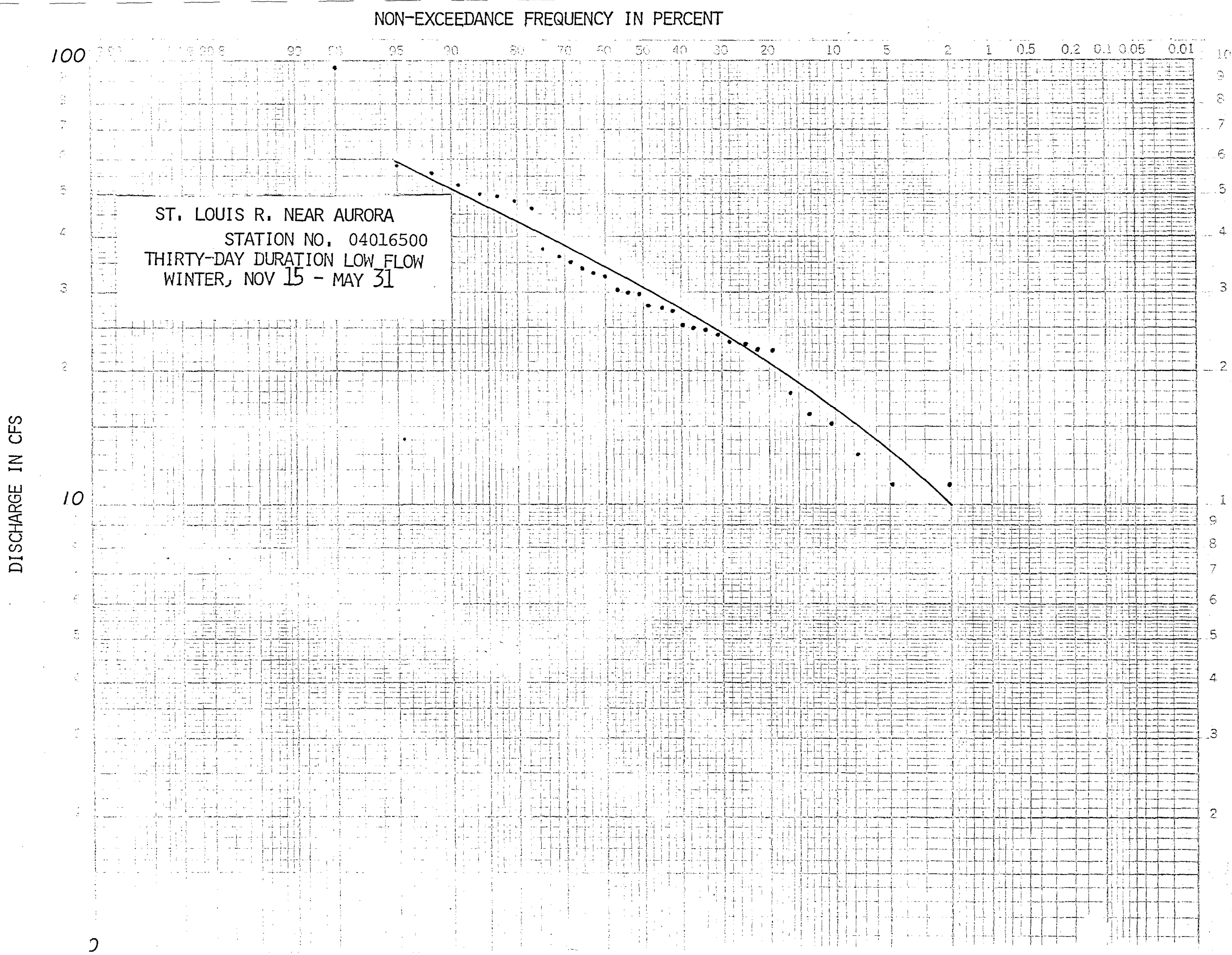
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
DISCHARGE IN CFS
100
10
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31


NON-EXCEEDANCE FREQUENCY IN PERCENT
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
95
90
80
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20
10
5
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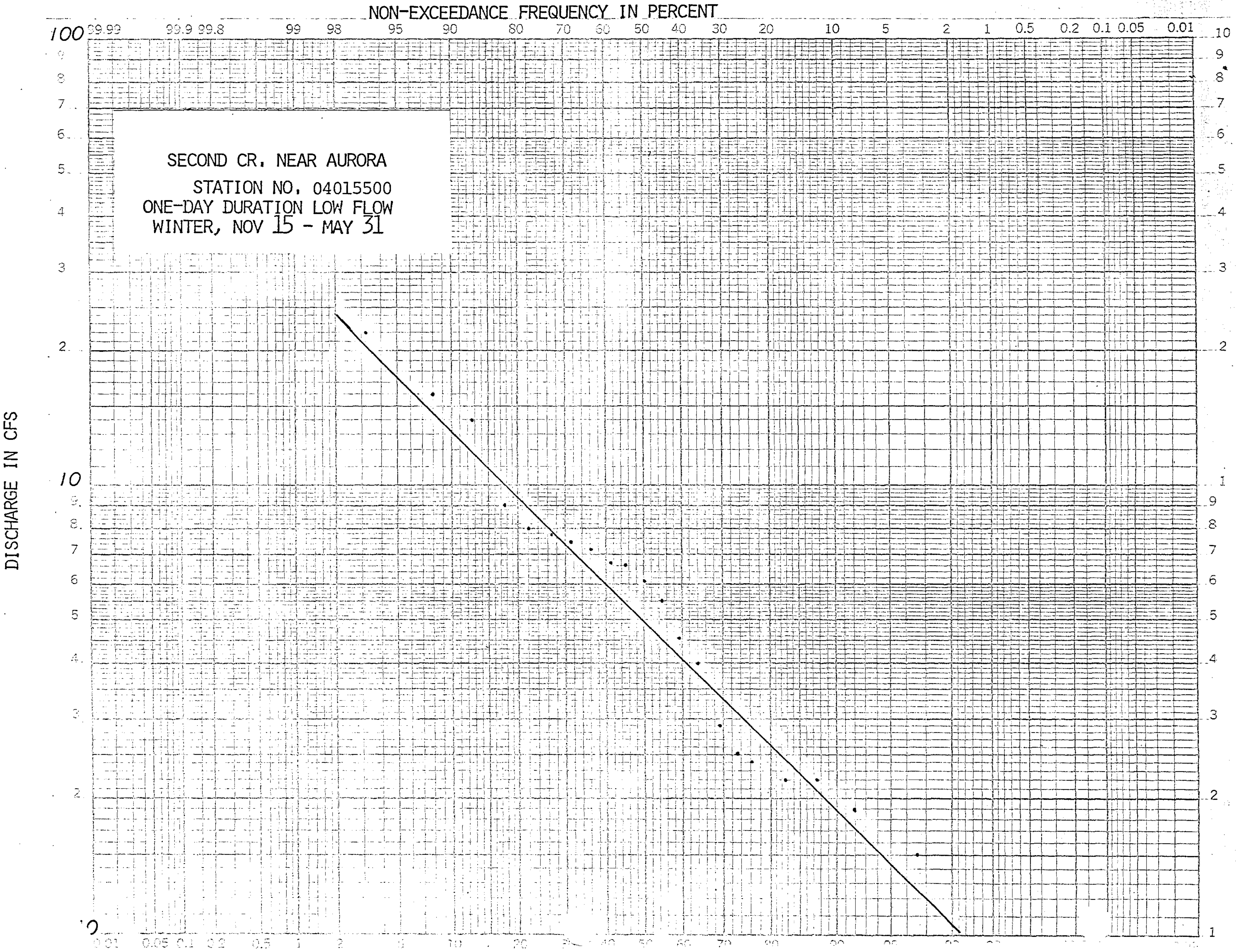
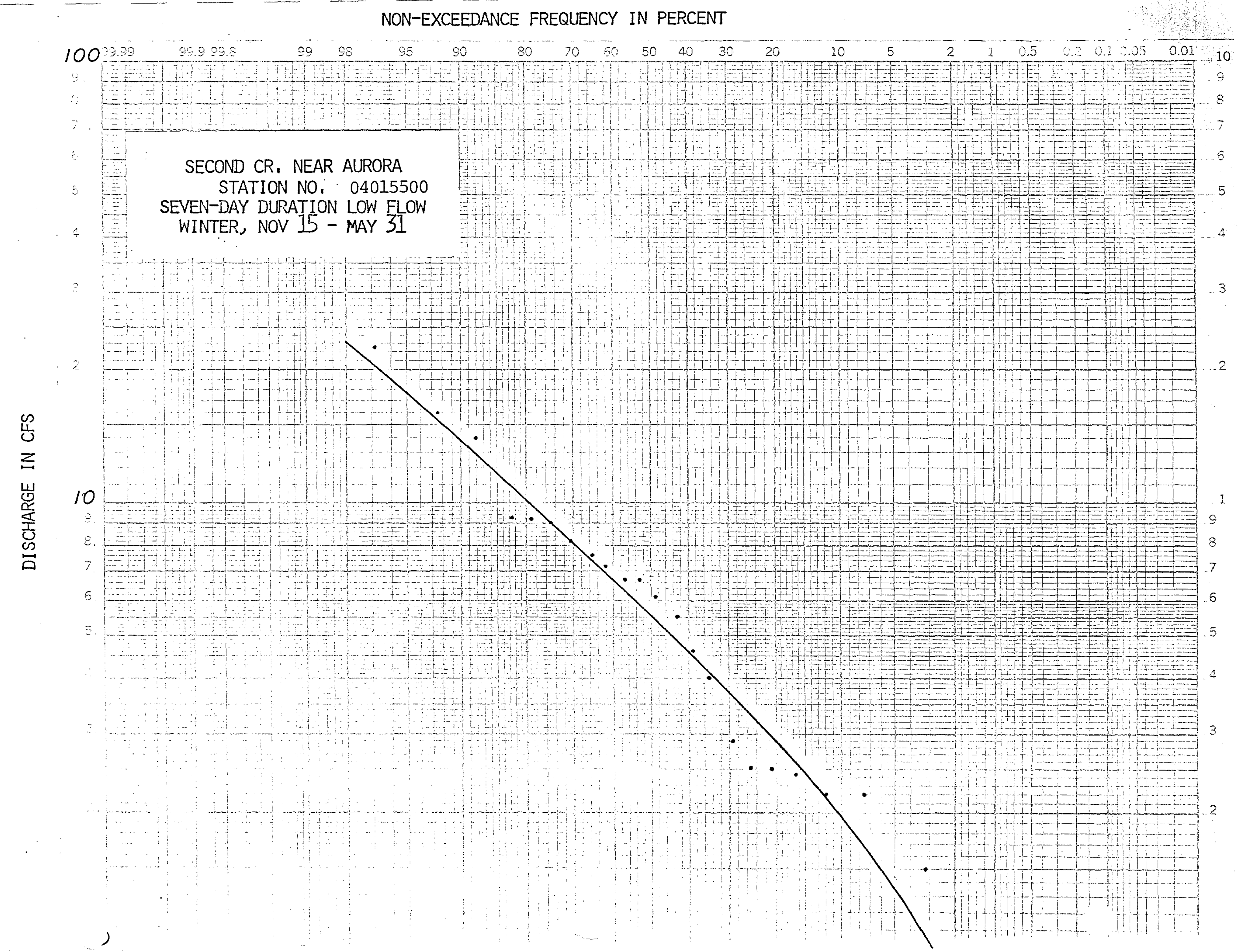
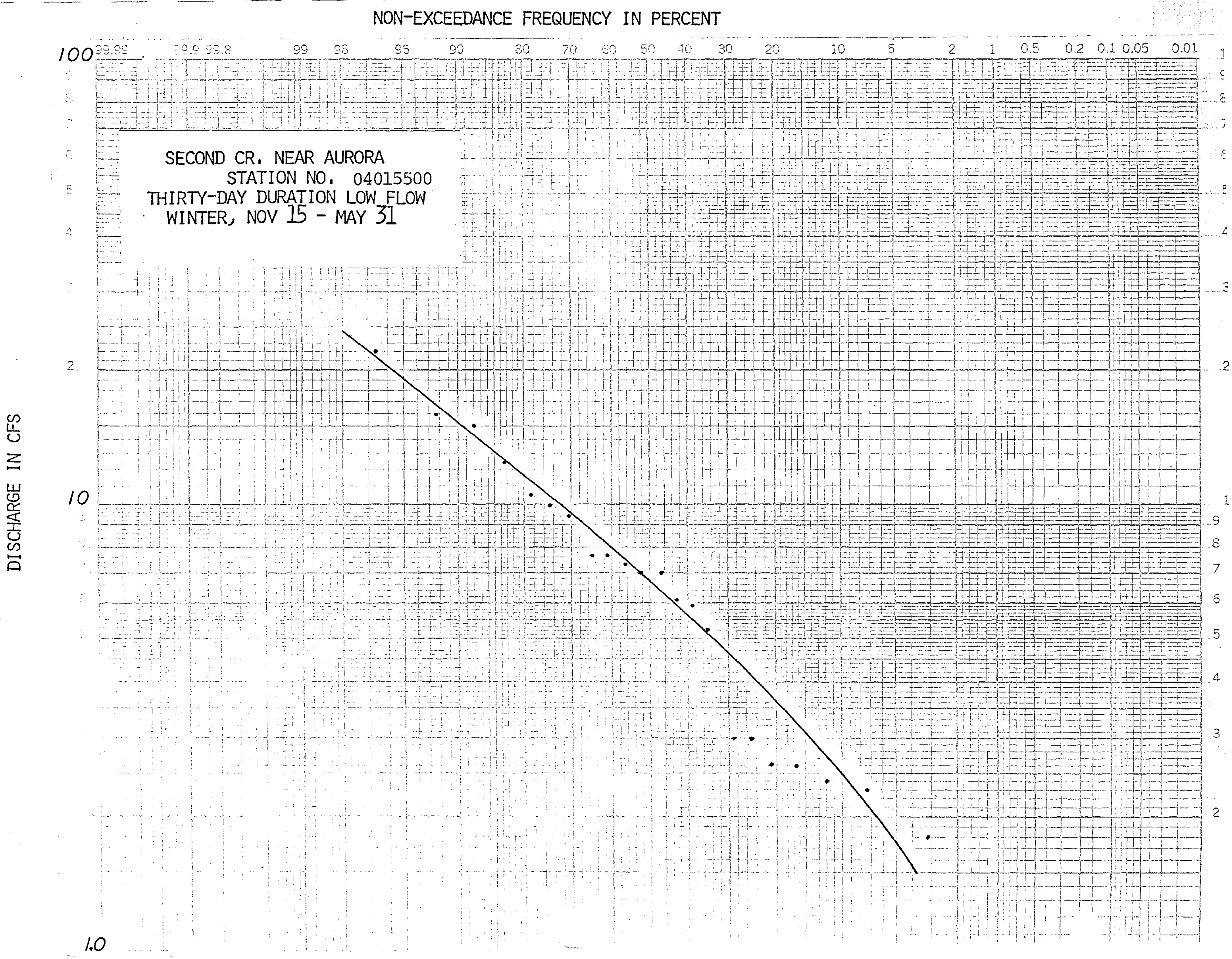
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
SECOND CR. NEAR AURORA
STATION NO. 04015500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
SECOND CR. NEAR AURORA
STATION NO. 04015500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31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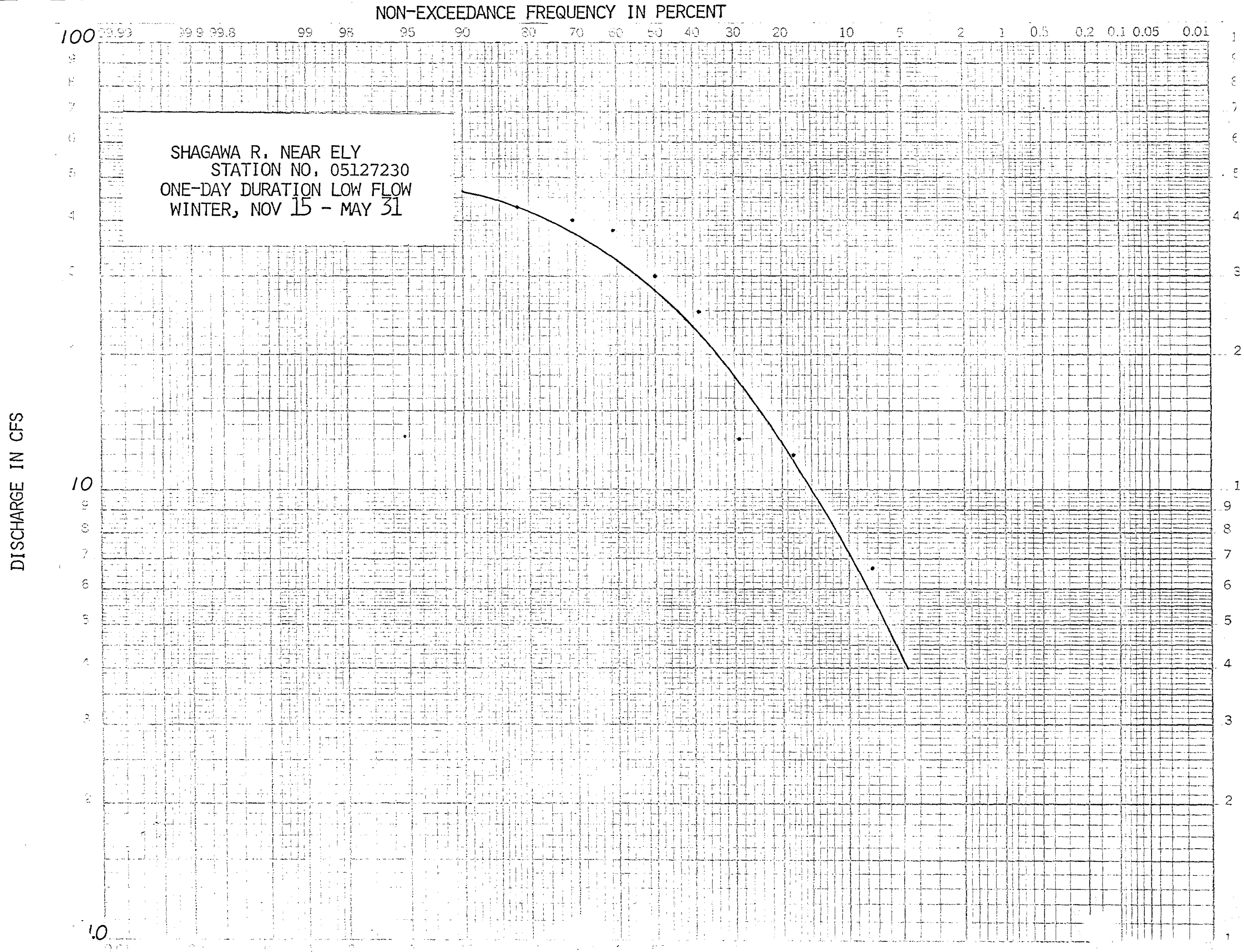
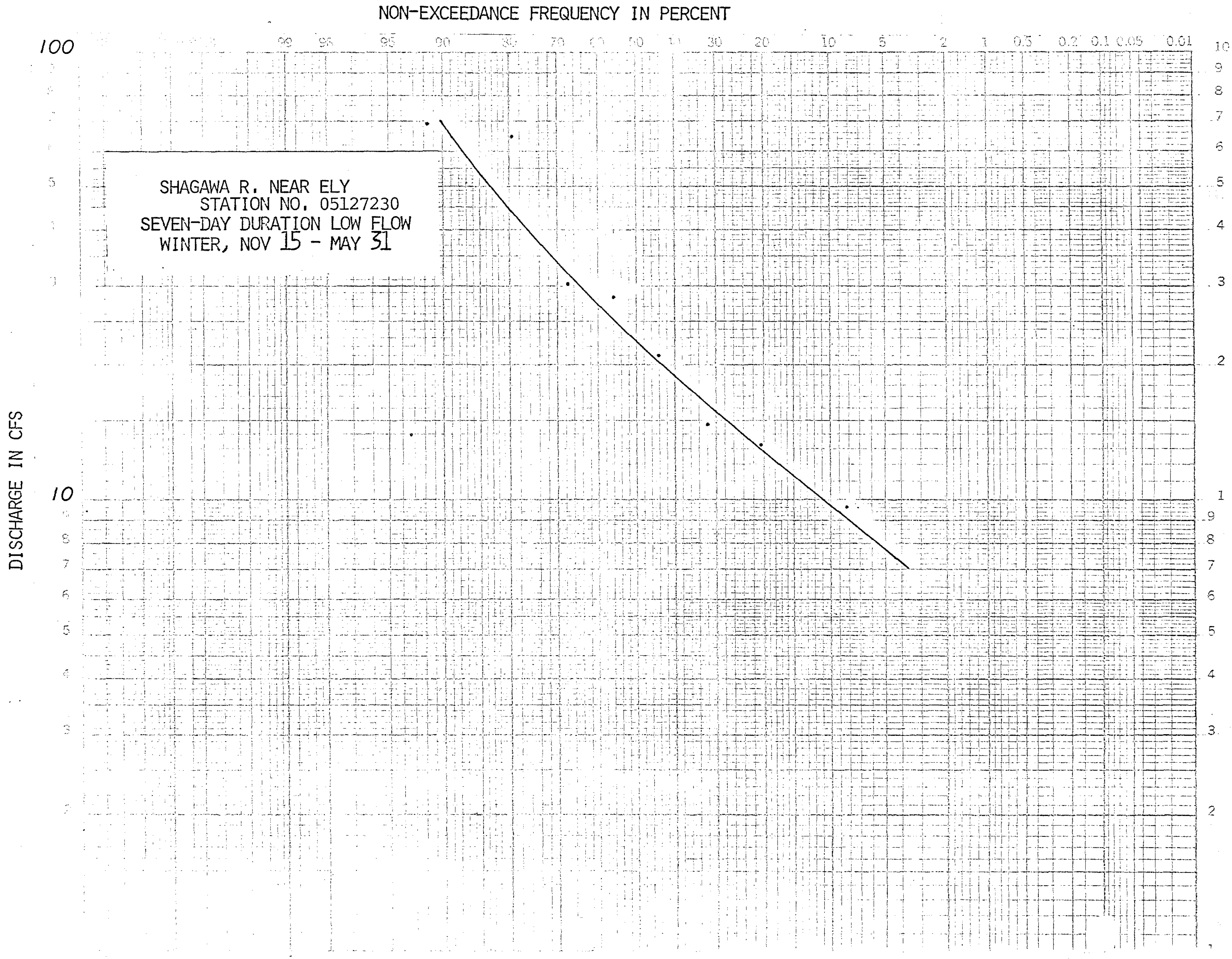
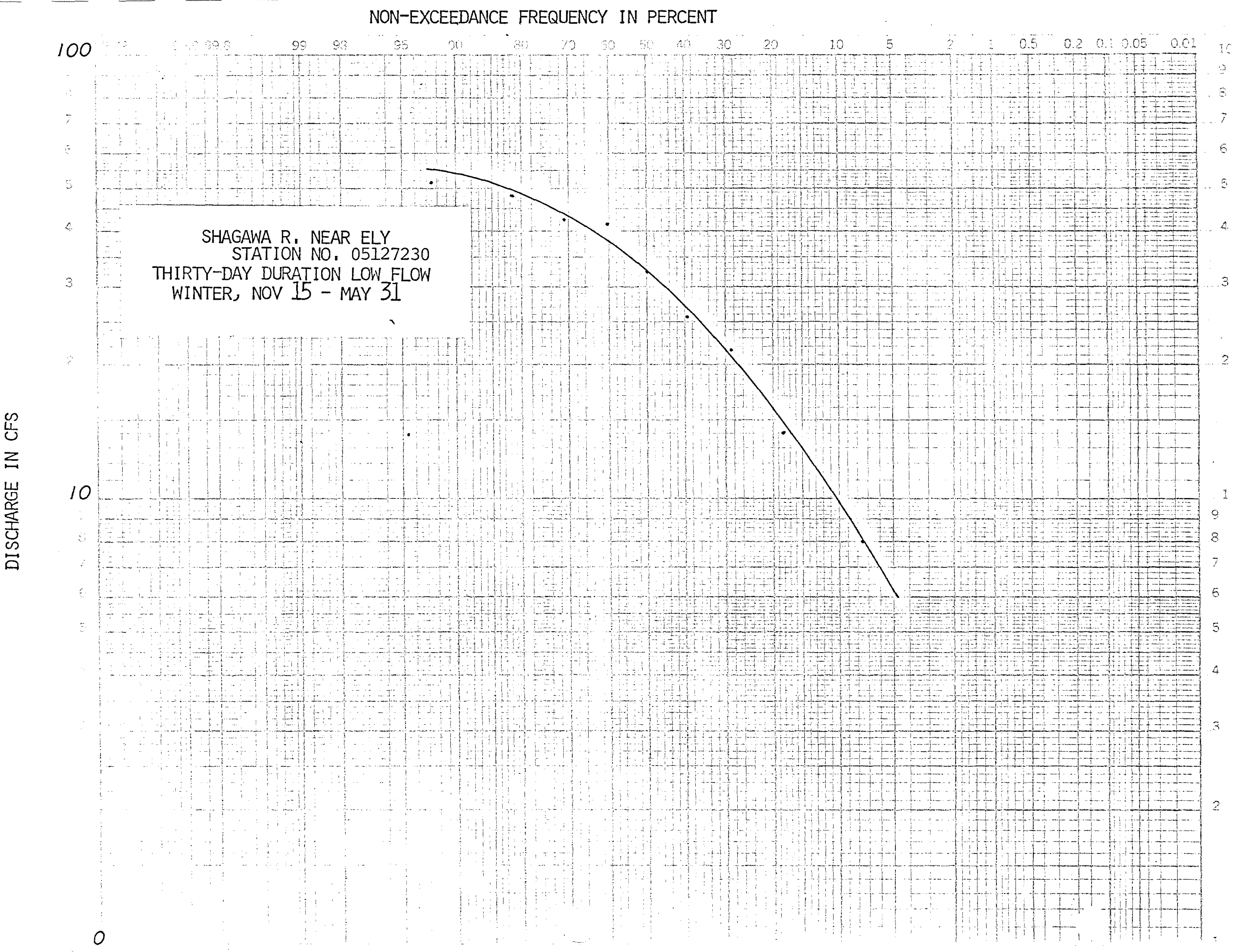
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
SECOND CR. NEAR AURORA
STATION NO. 04015500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
1.0



NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10



NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
0
99
98
95
90
80
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50
40
30
20
10
5
2
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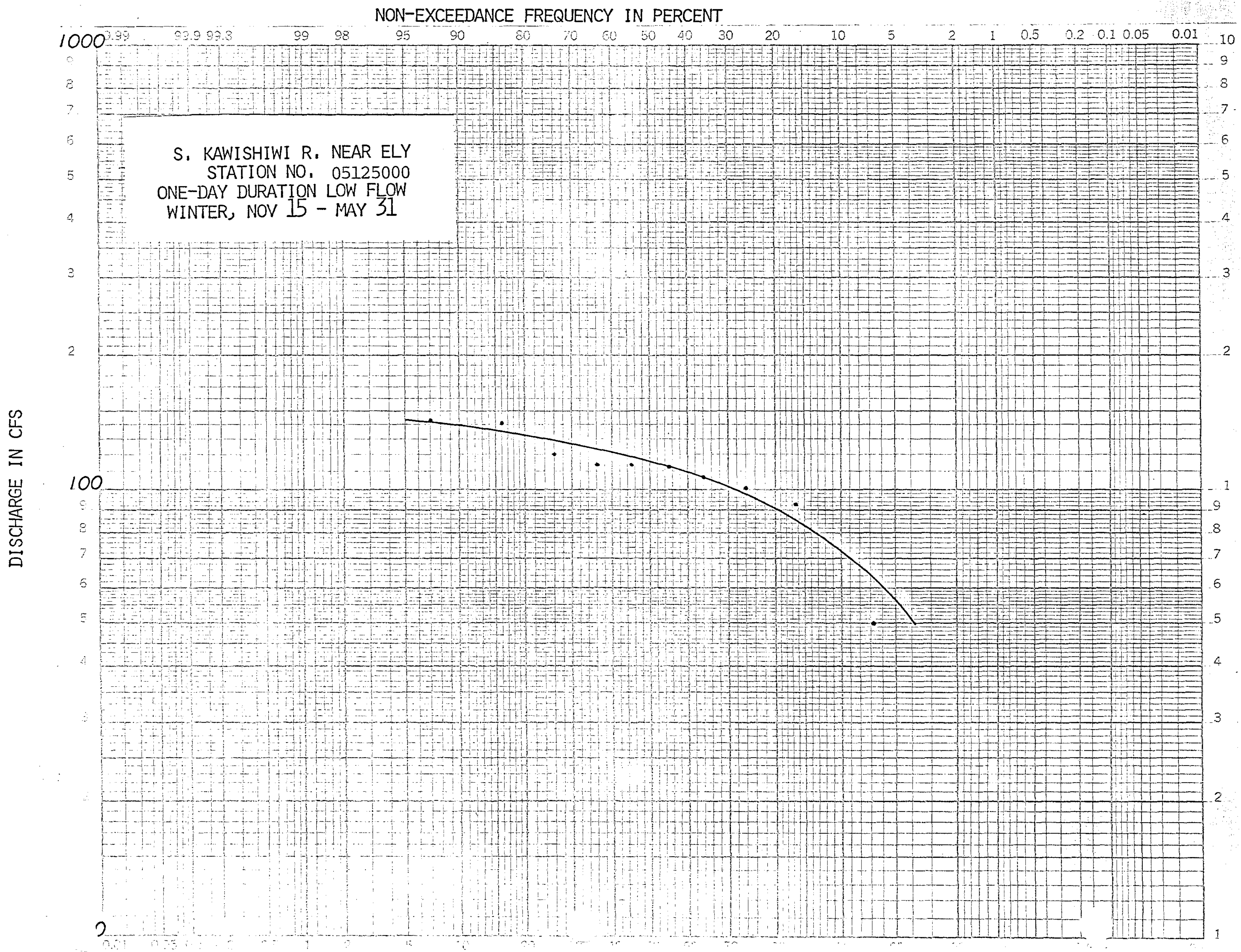
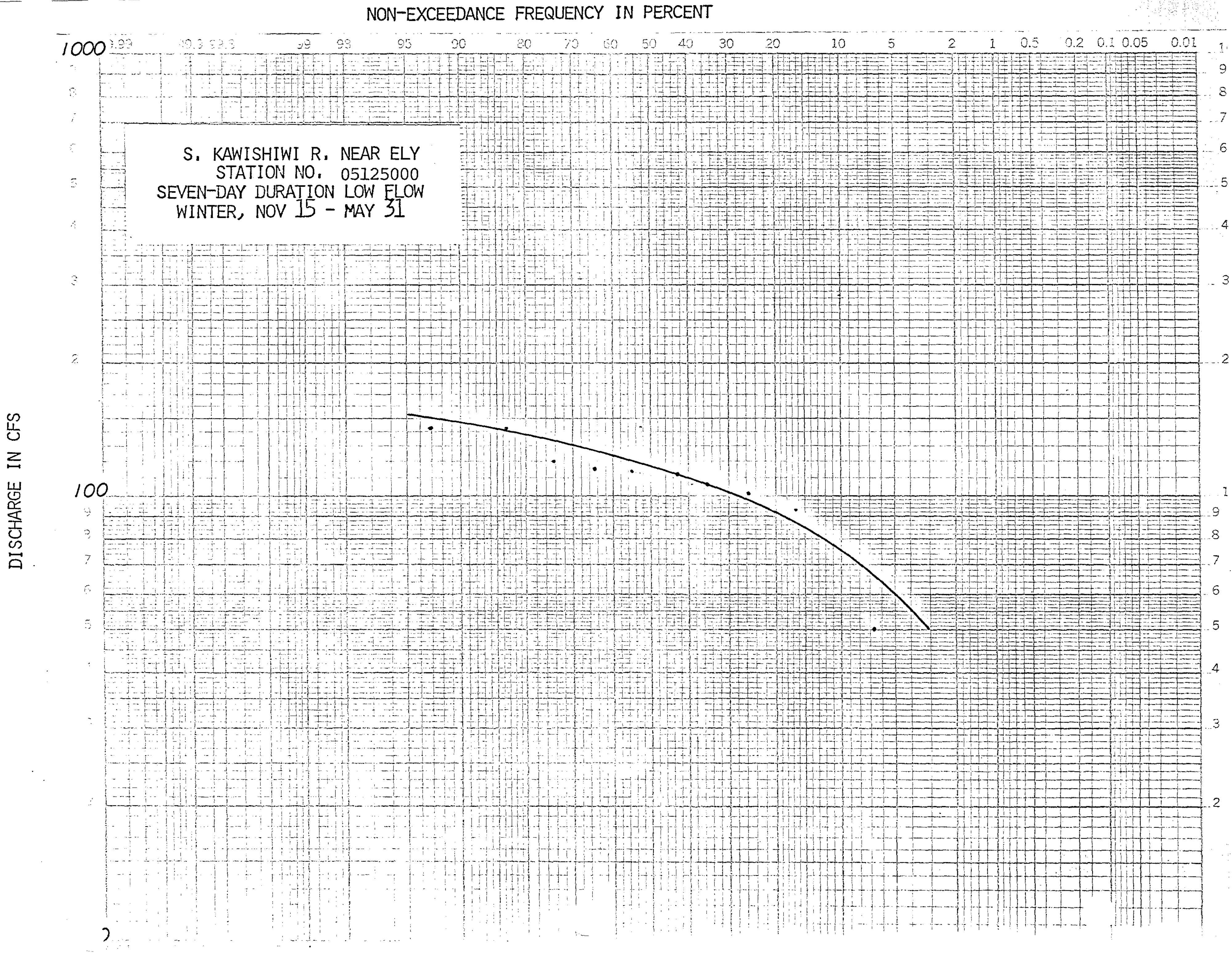
0.5
0.2
0.1
0.05
0.01



NON-EXCEEDANCE FREQUENCY IN PERCENT
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
1000
100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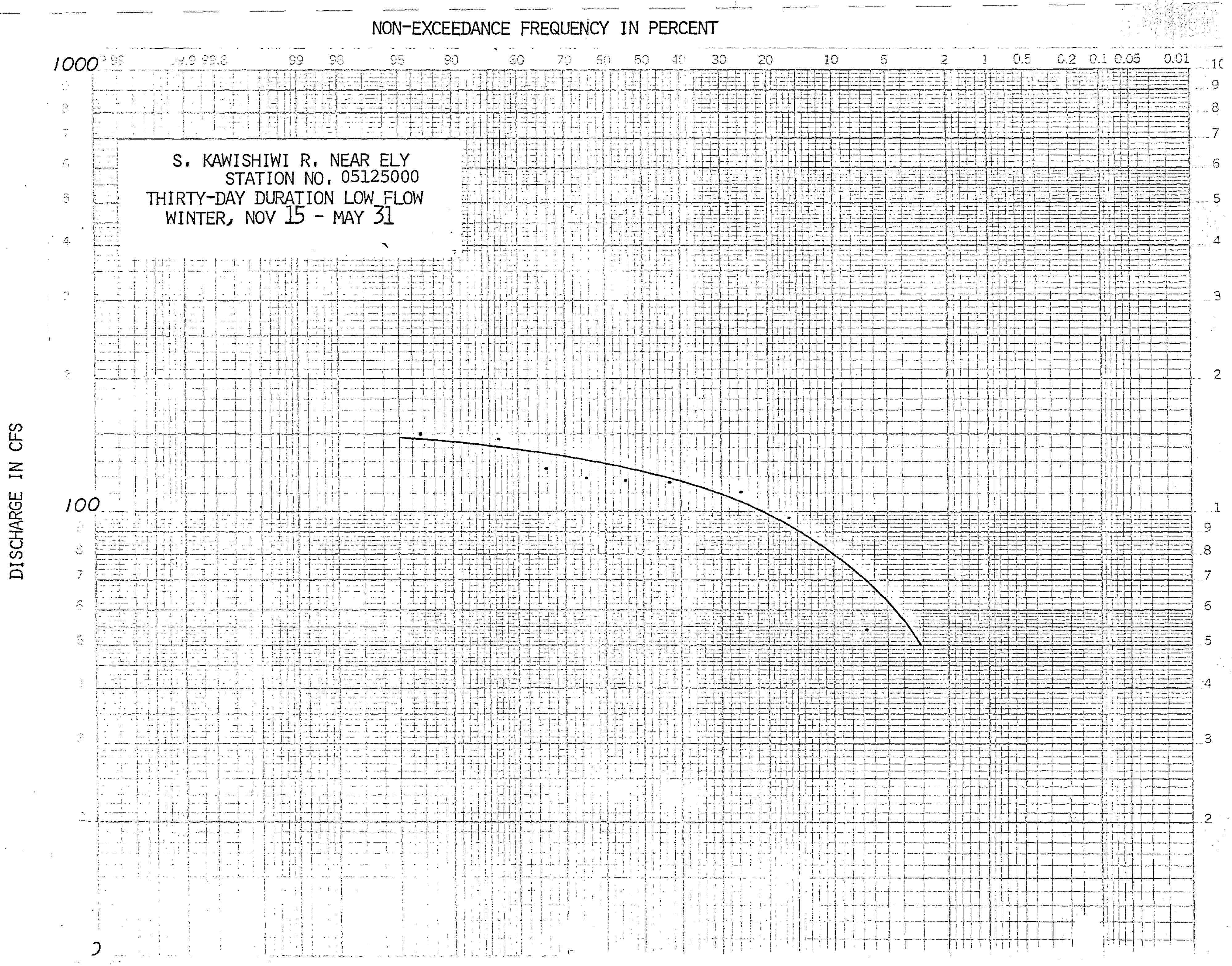
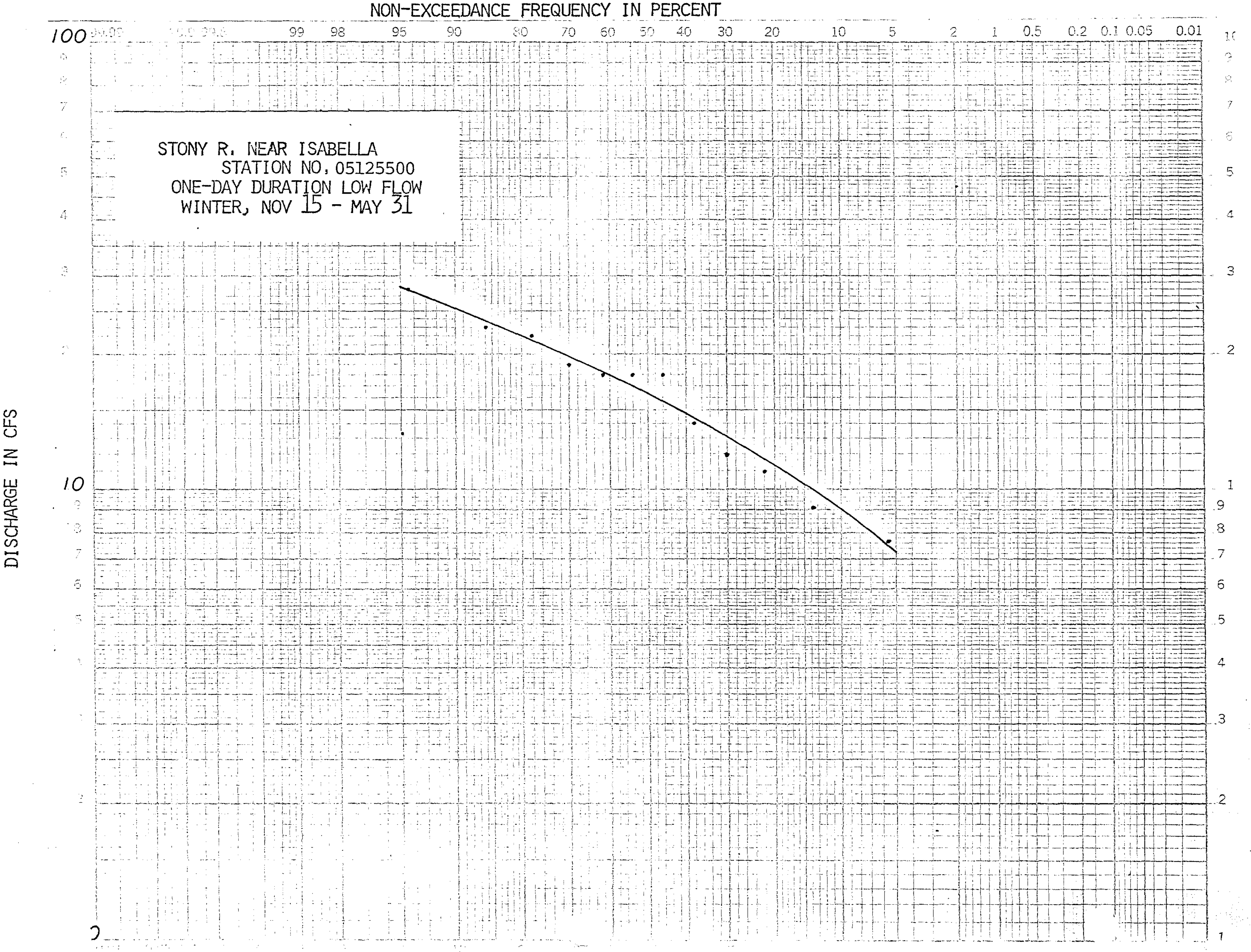
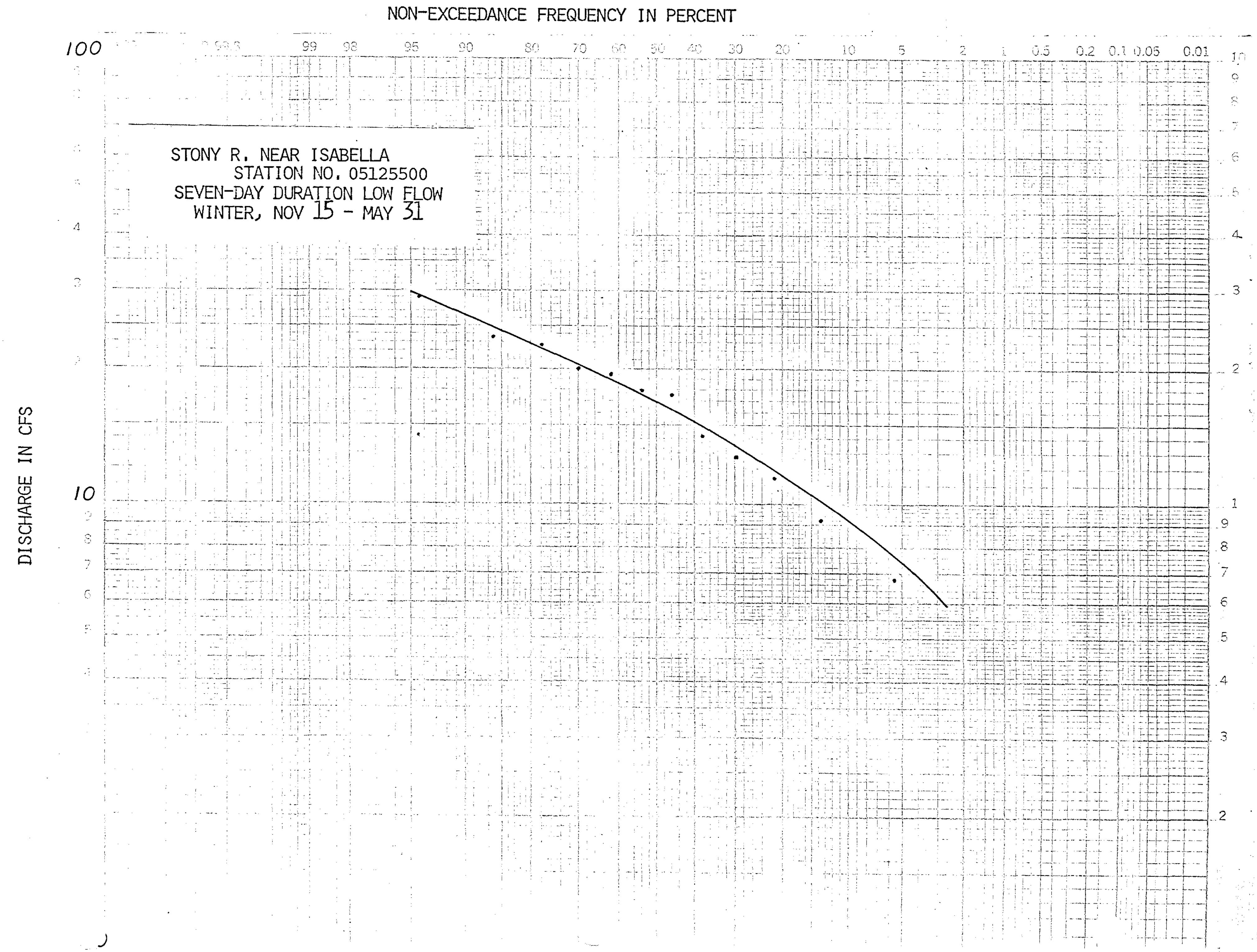
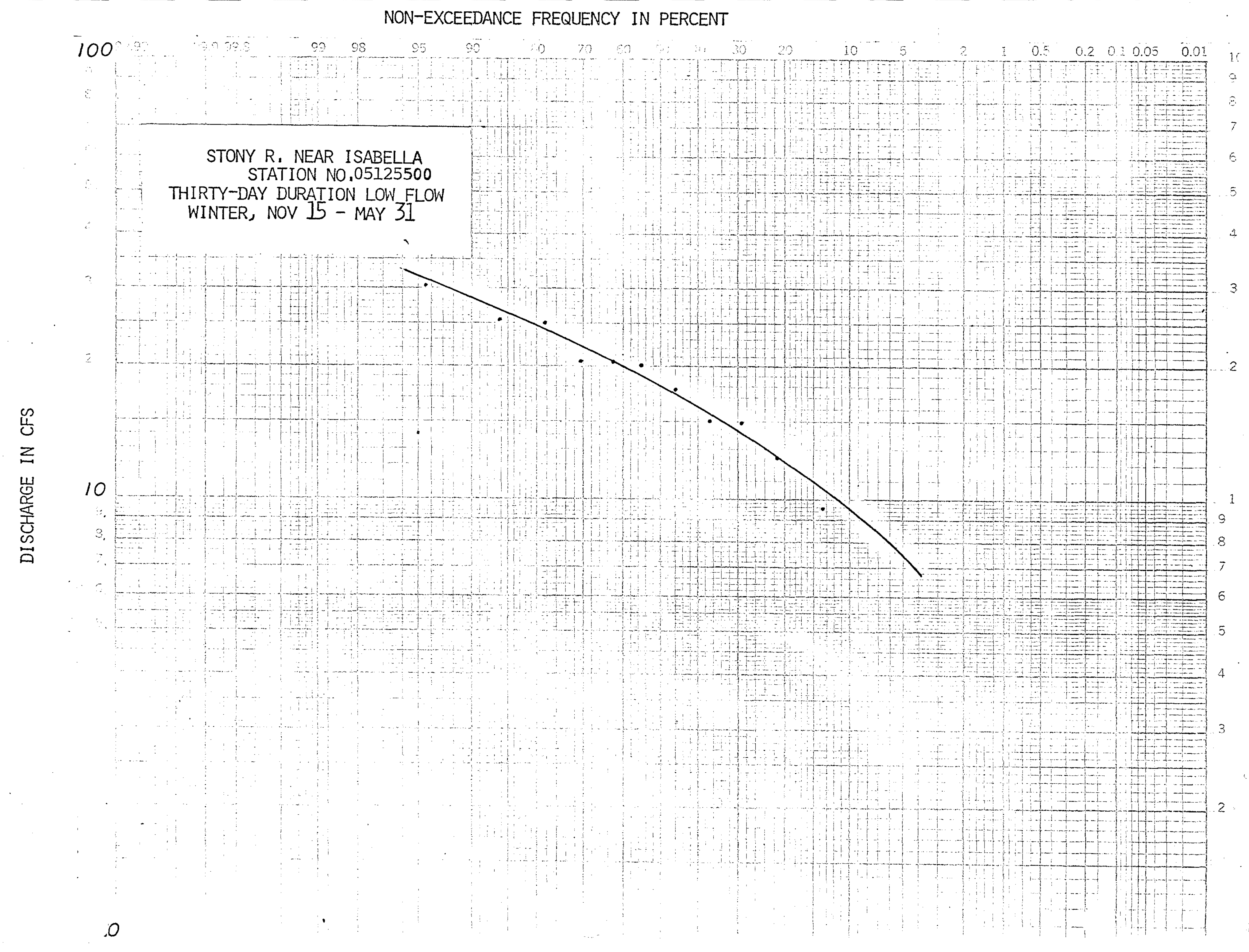
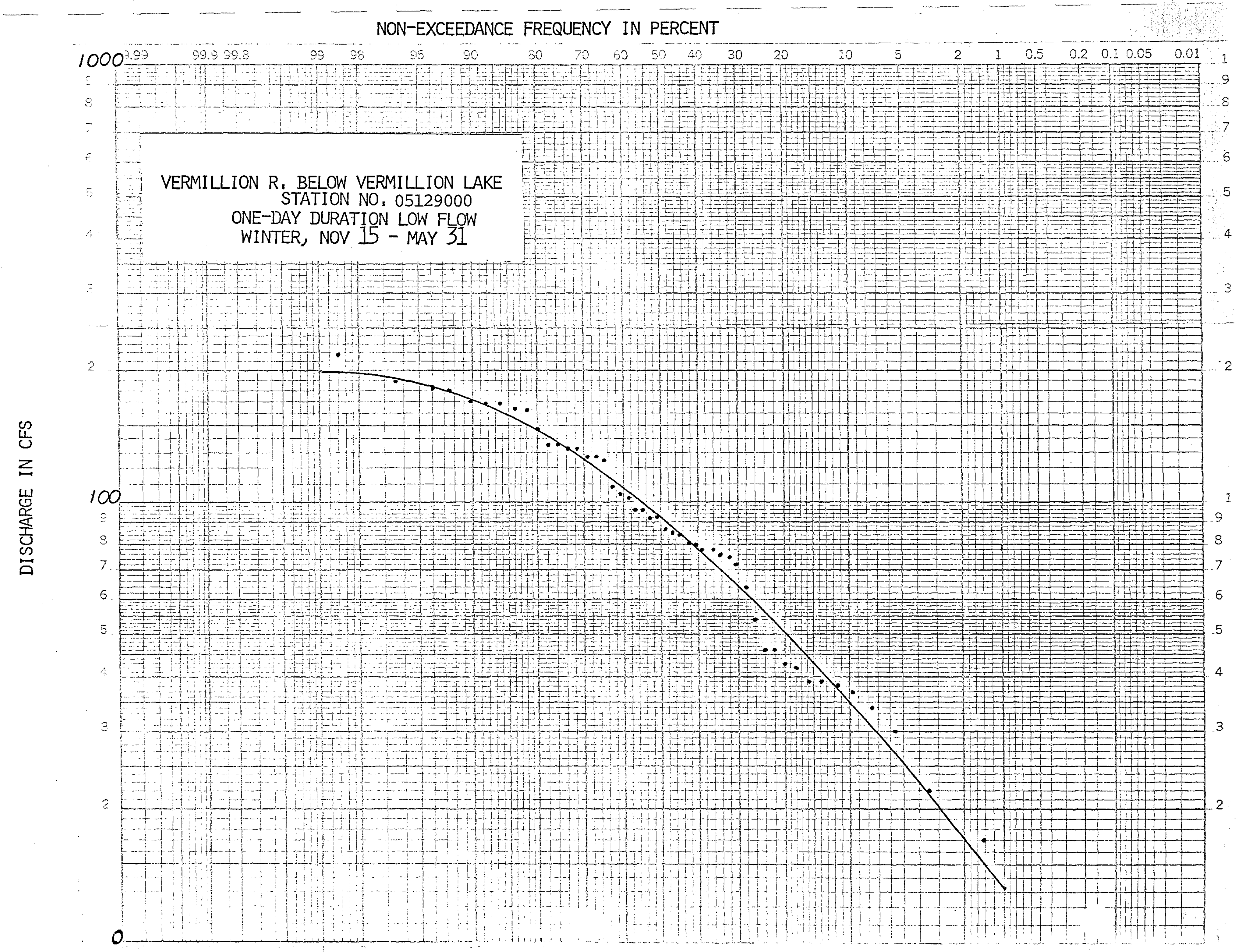
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
1000
100
DISCHARGE IN CFS
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31

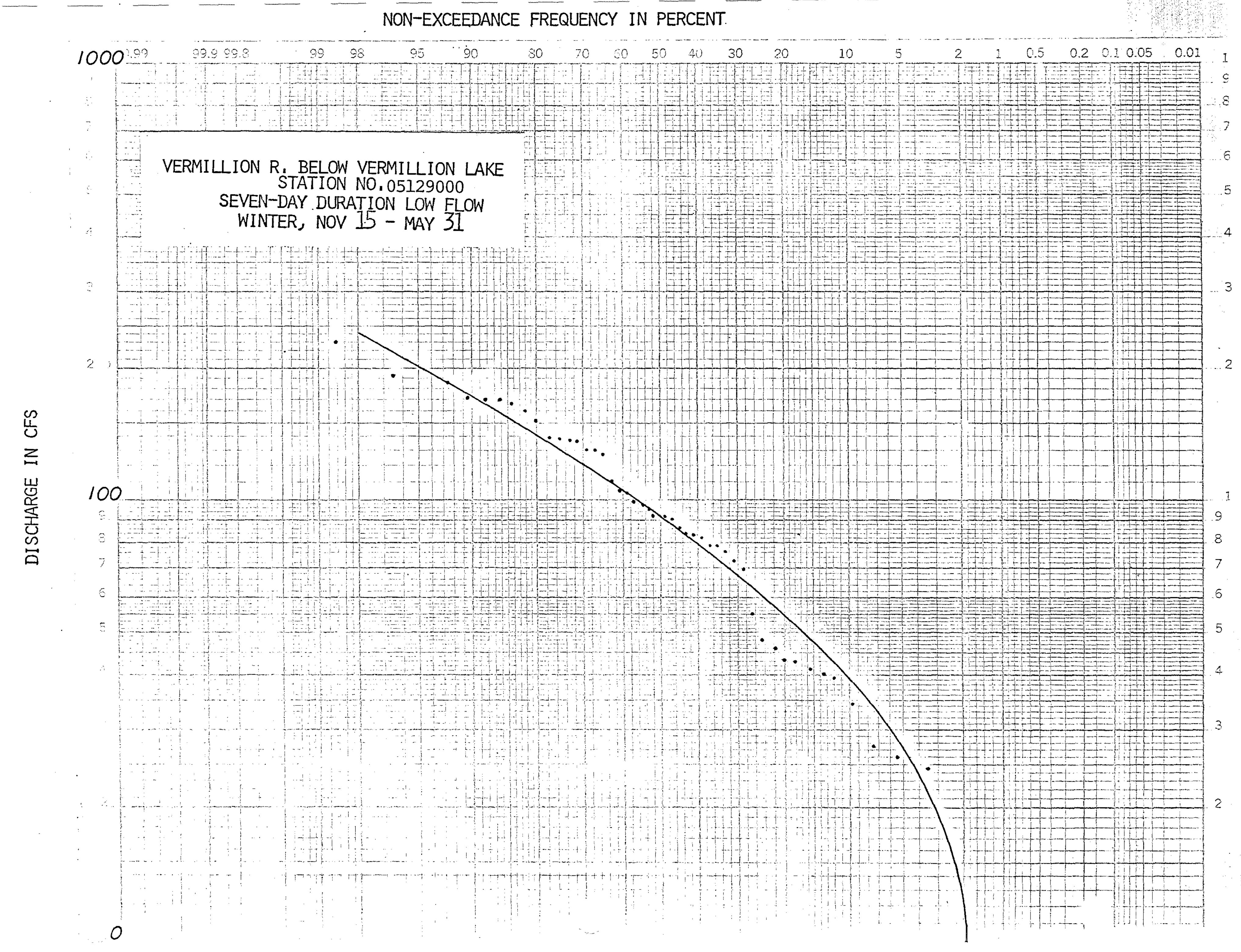

NON-EXCEEDANCE FREQUENCY IN PERCENT
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
1000
100
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01

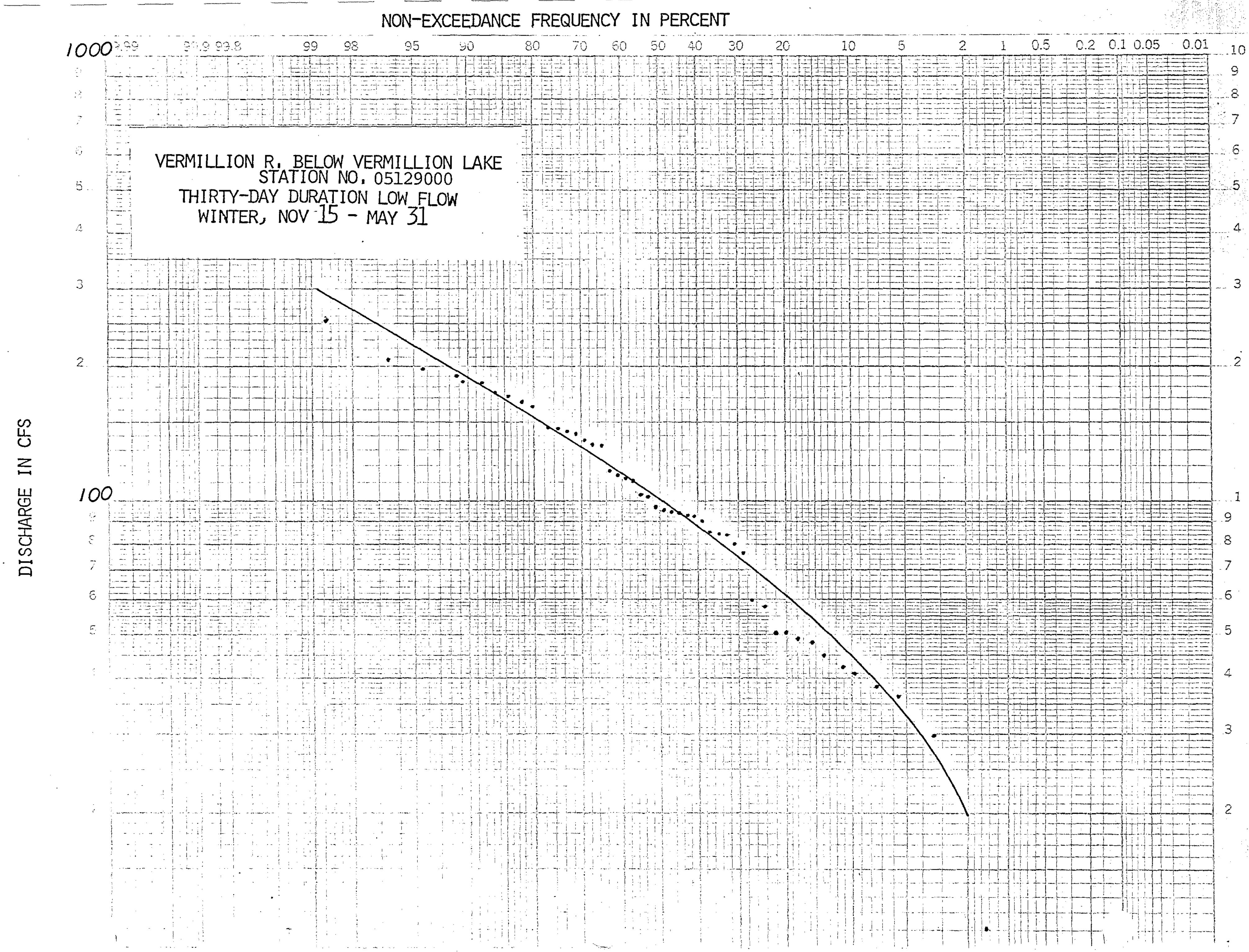

NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO. 05125500
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
STONY R. NEAR ISABELLA
STATION NO. 05125500
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO.05125500
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
100
10
99 98 95 90 70 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
ONE-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
1000
100
0

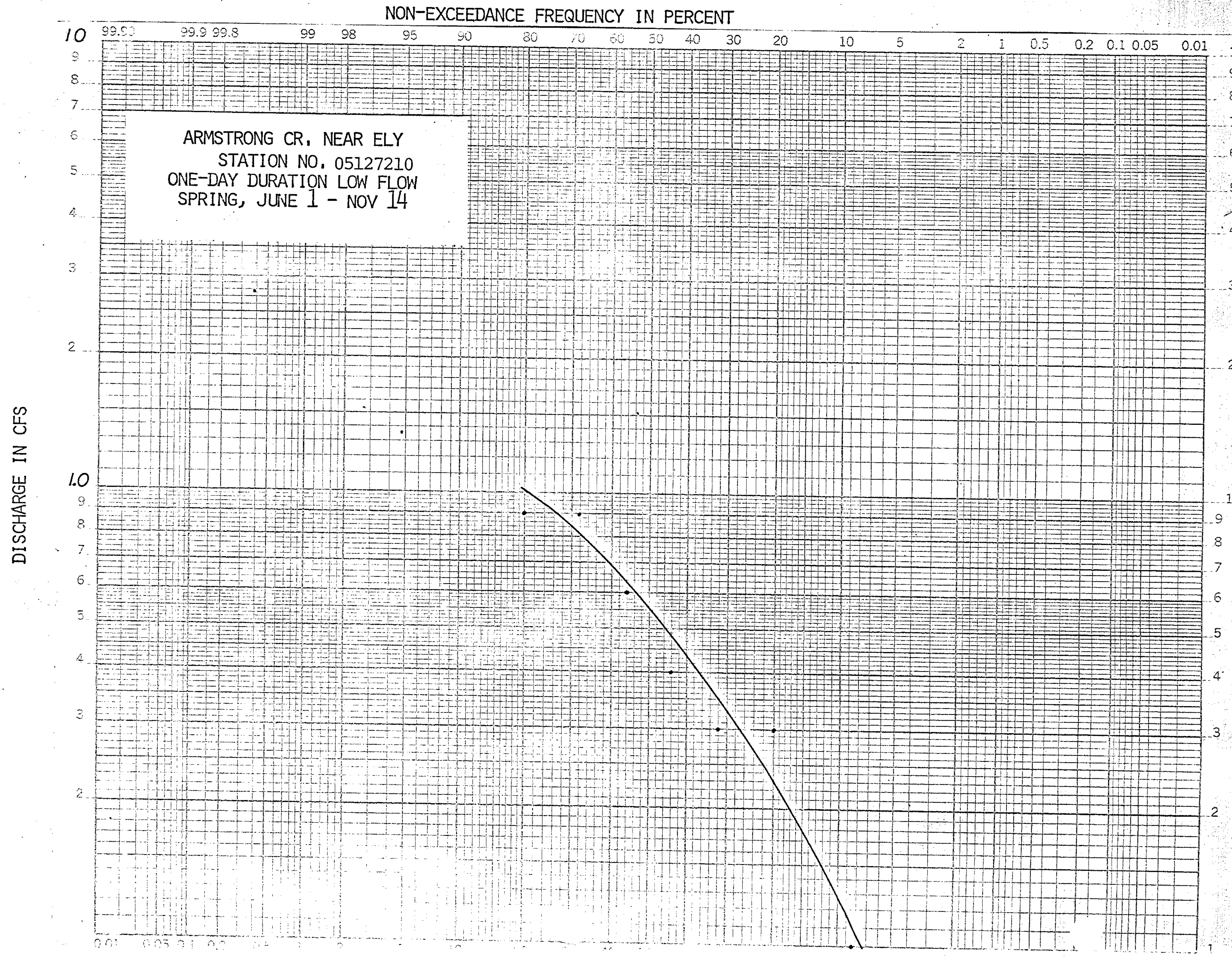

NON-EXCEEDANCE FREQUENCY IN PERCENT
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
SEVEN-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
1000
100
0
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

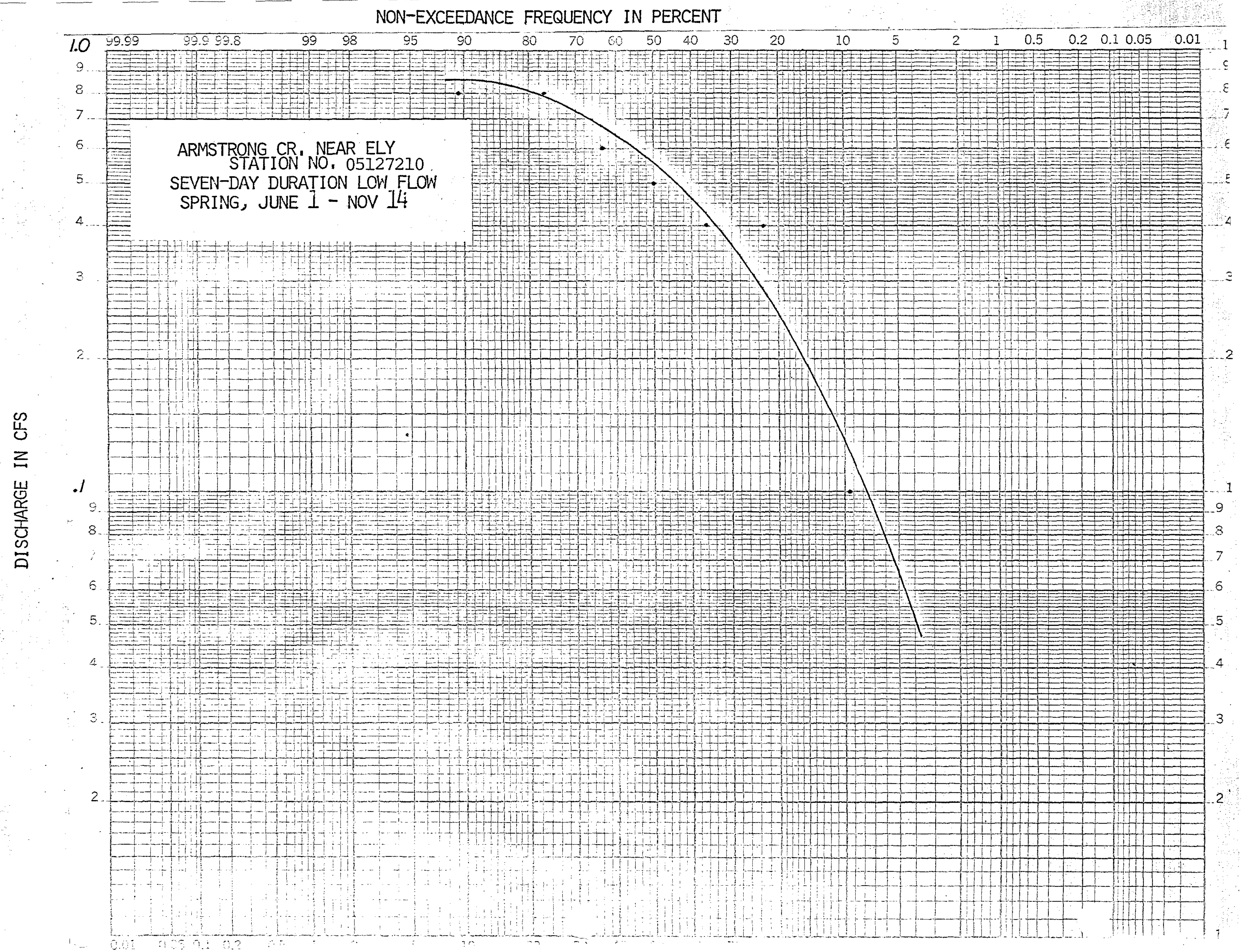


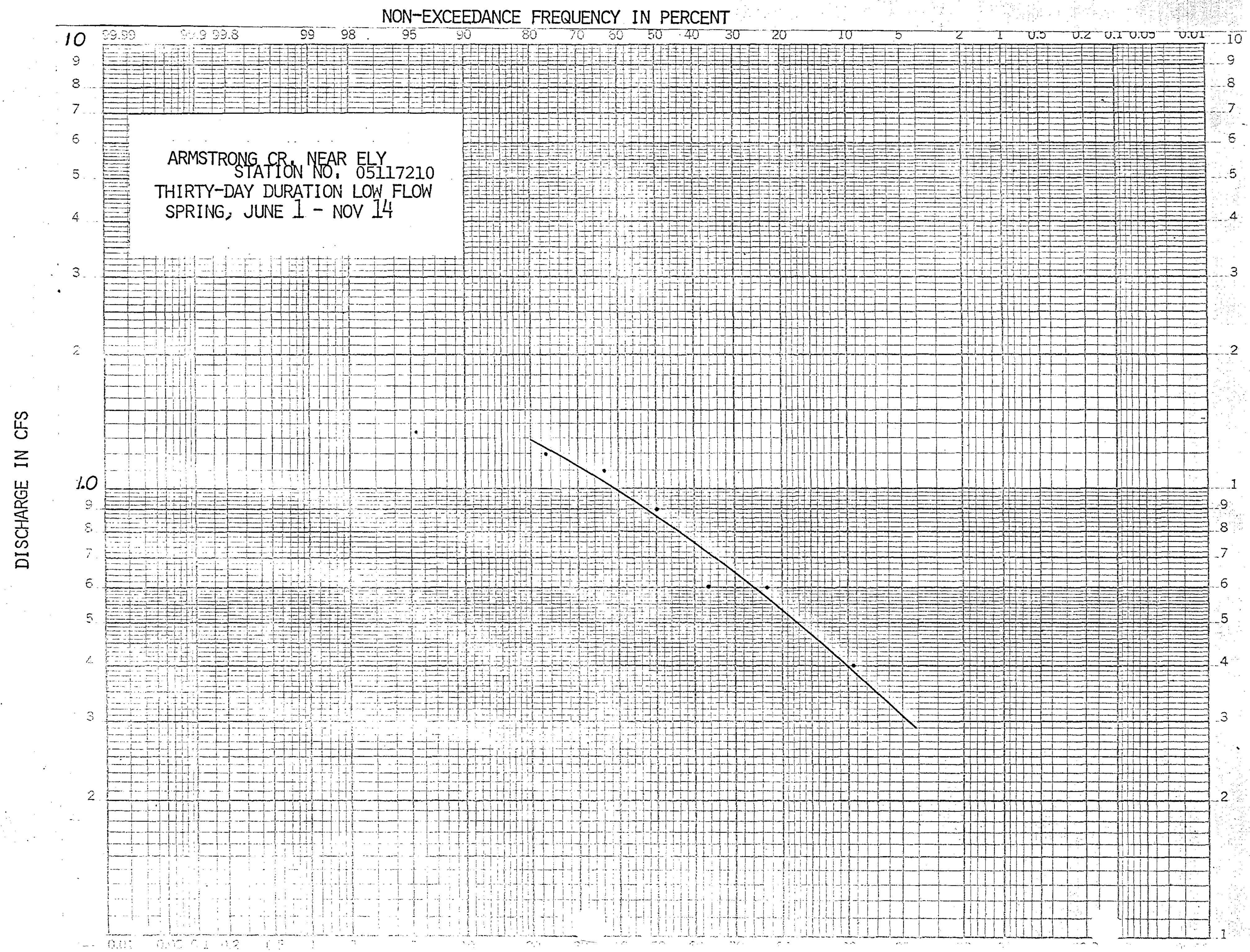
NON-EXCEEDANCE FREQUENCY IN PERCENT
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
THIRTY-DAY DURATION LOW FLOW
WINTER, NOV 15 - MAY 31
DISCHARGE IN CFS
1000
100
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

APPENDIX V

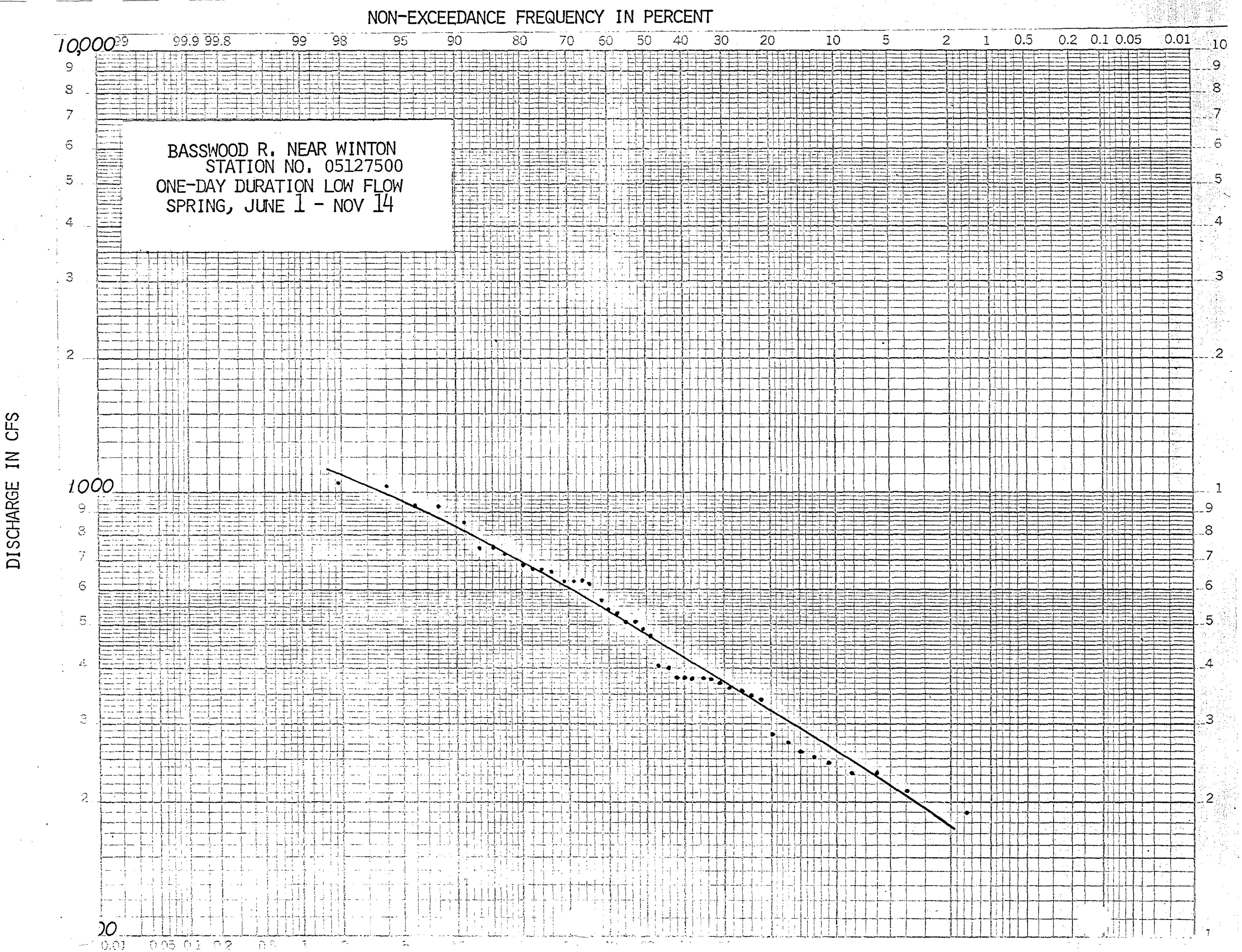
Summer 1-day, 7-day, and 30-day Low-Flow Frequency Curves for Stations in Copper-Nickel Study Area

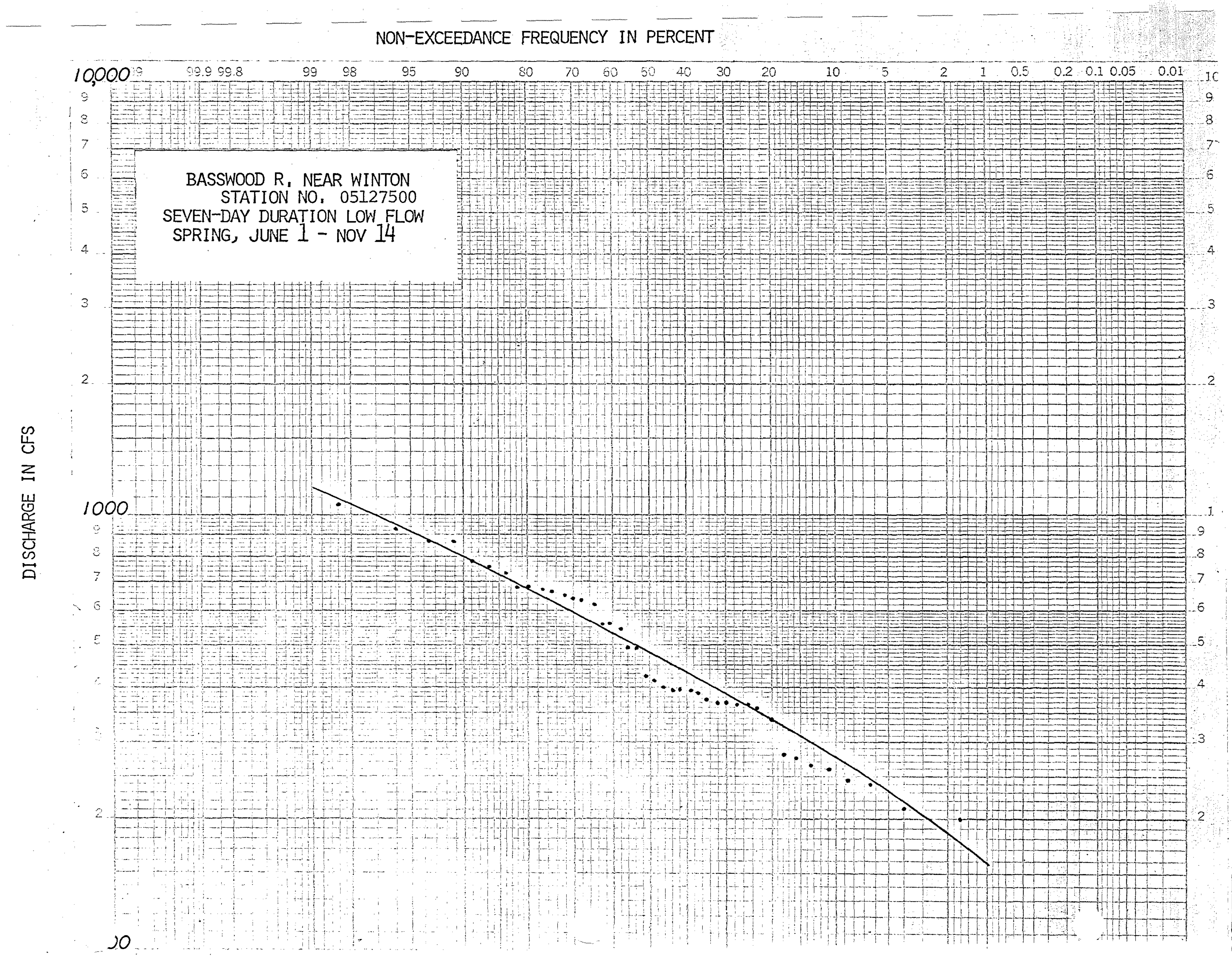

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
10
1.0

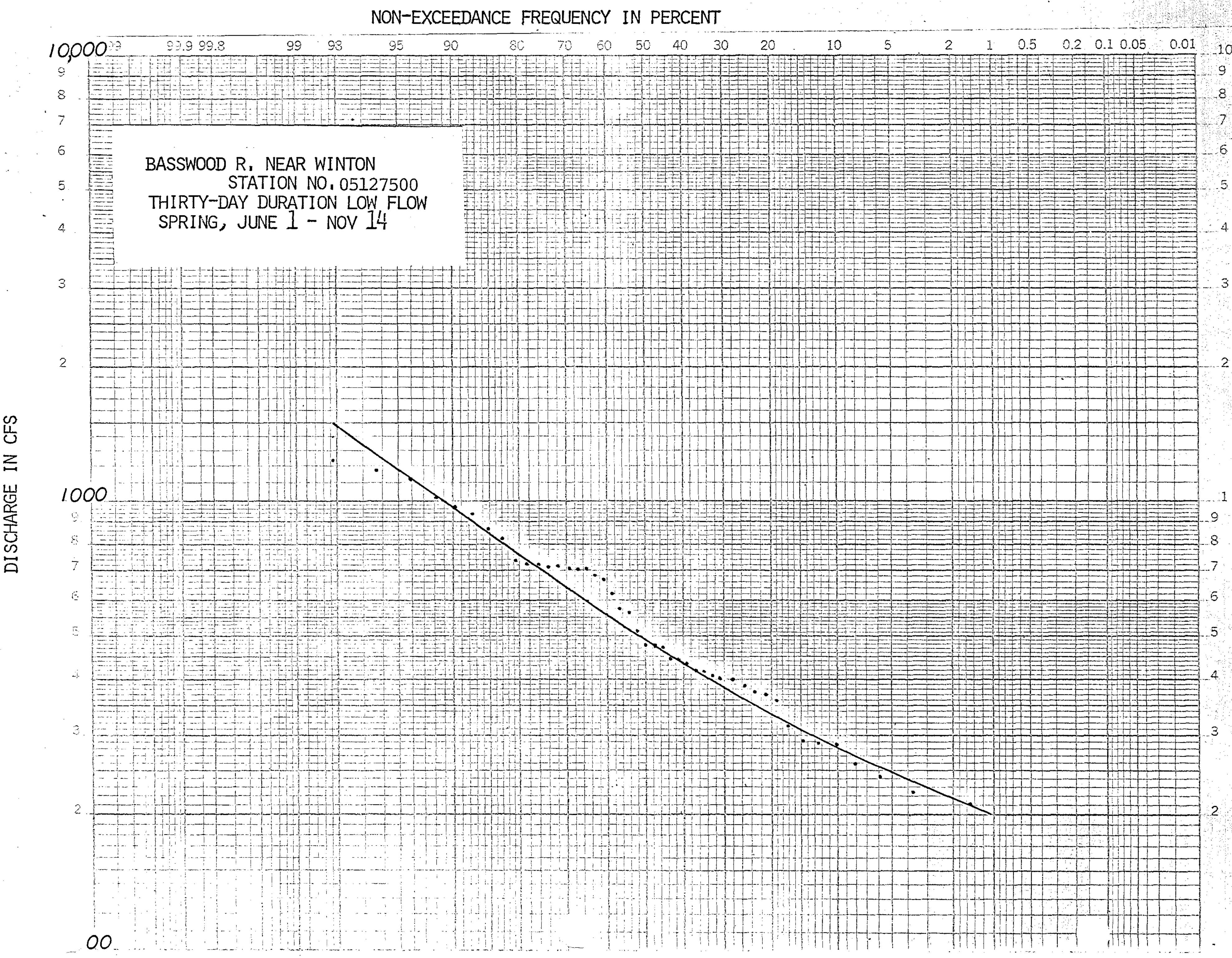

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ARMSTRONG CR. NEAR ELY
STATION NO. 05127210
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
1.0
.1

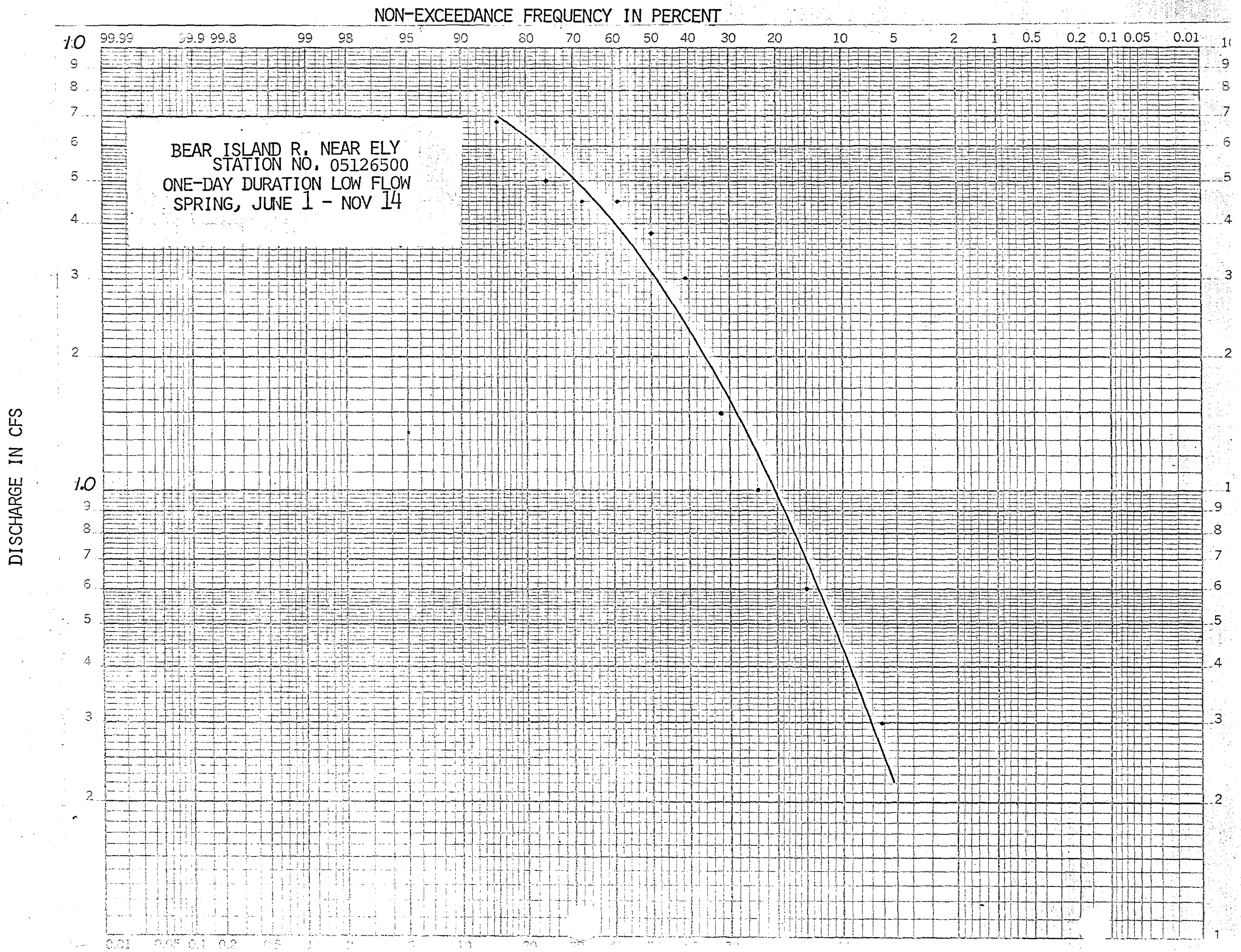


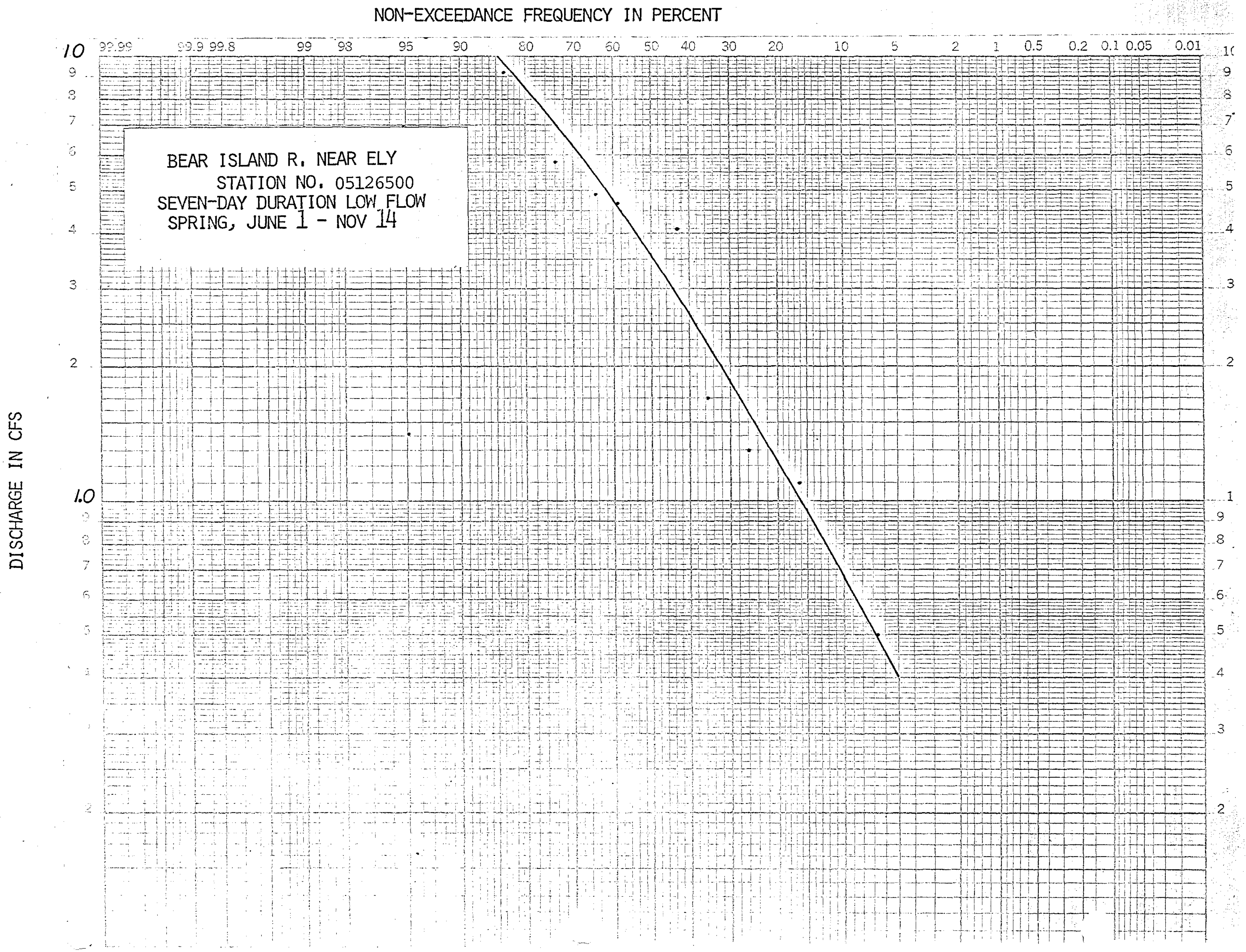
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ARMSTRONG CR. NEAR ELY
STATION NO. 05117210
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14


NON-EXCEEDANCE FREQUENCY IN PERCENT
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
10,000
1000

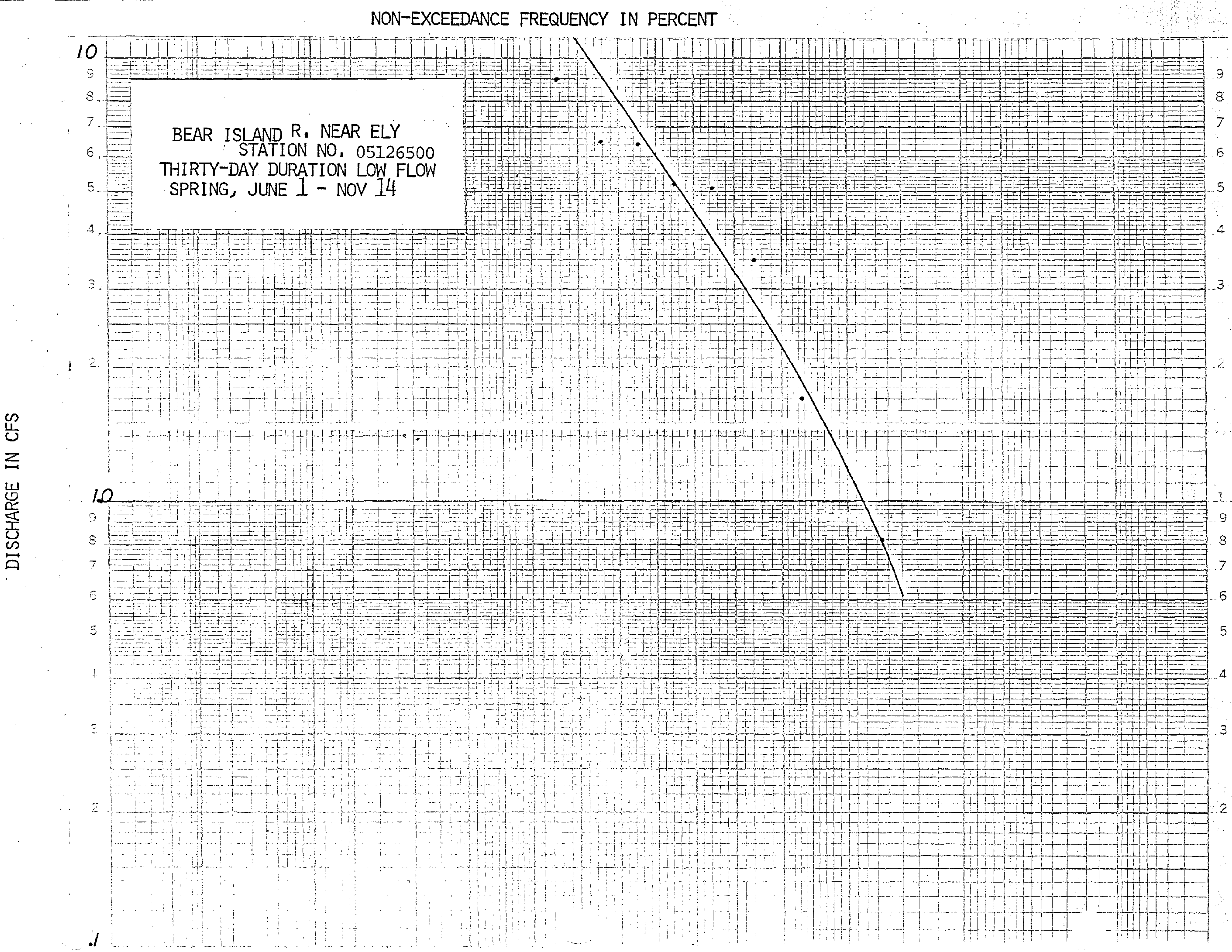

NON-EXCEEDANCE FREQUENCY IN PERCENT
BASSWOOD R, NEAR WINTON
STATION NO. 05127500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
10,000
1000
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

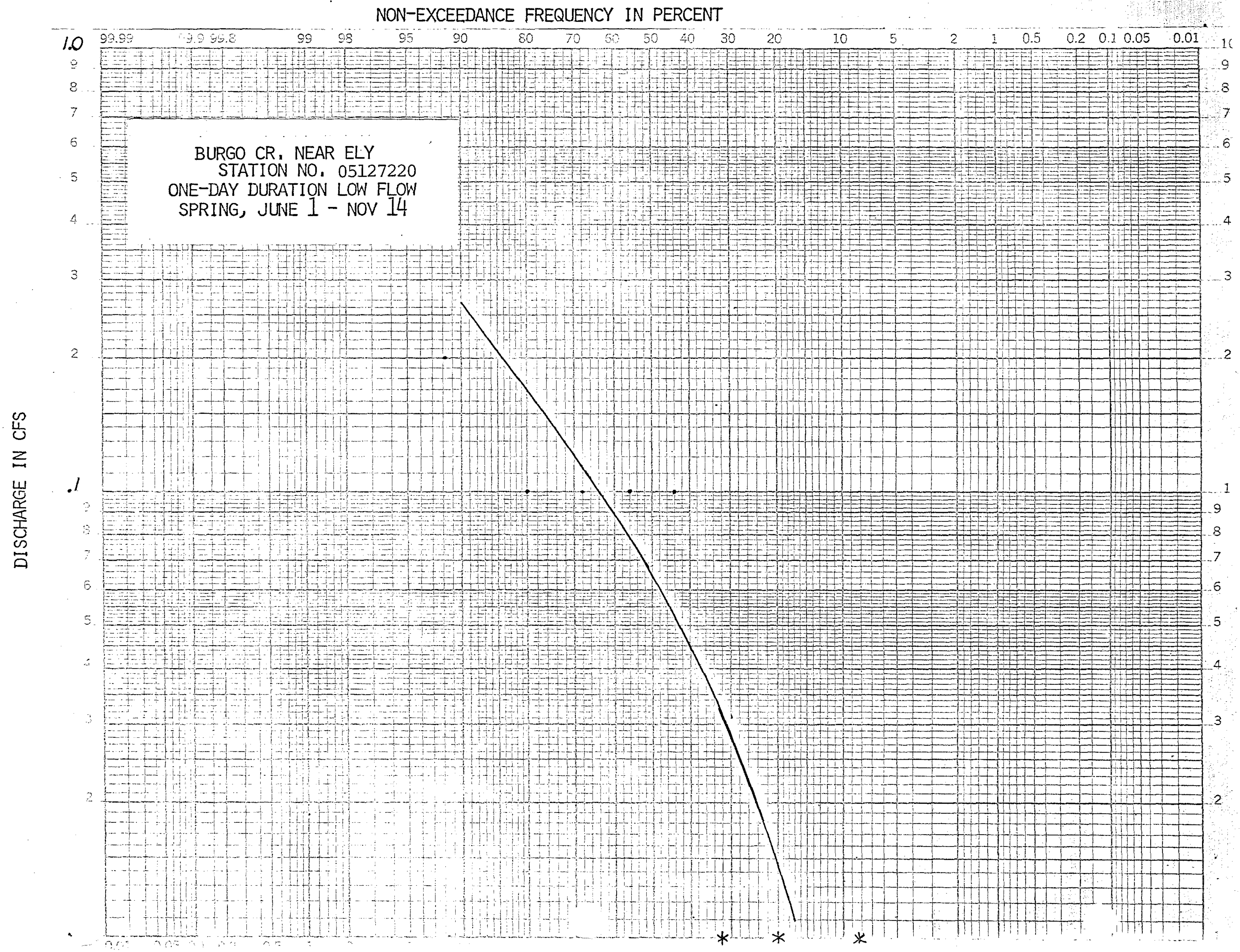

NON-EXCEEDANCE FREQUENCY IN PERCENT
BASSWOOD R. NEAR WINTON
STATION NO. 05127500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
10,000
1000
00
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

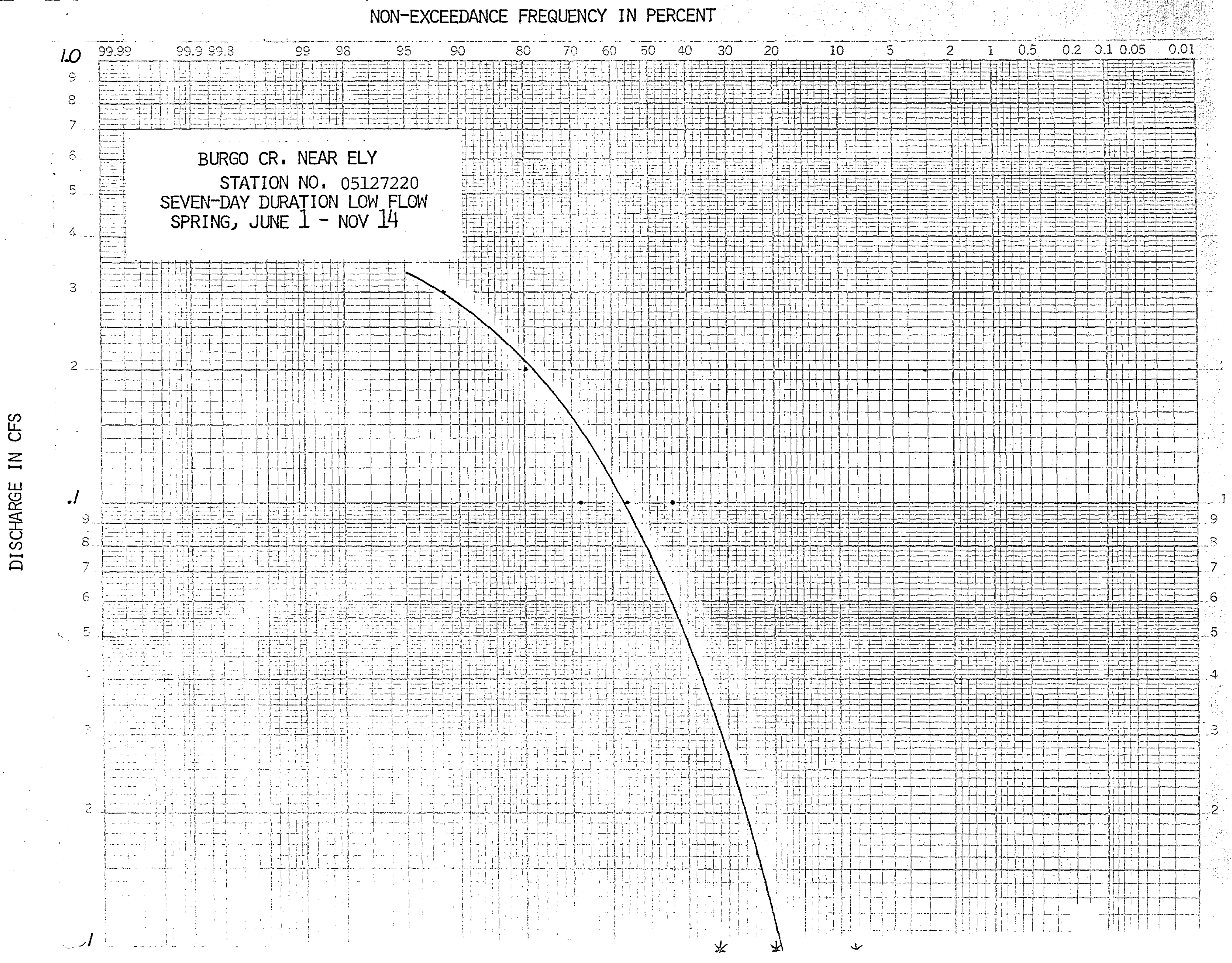

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
1.0 9 8 7 6 5 4 3 2 1.0 9 8 7 6 5 4 3 2

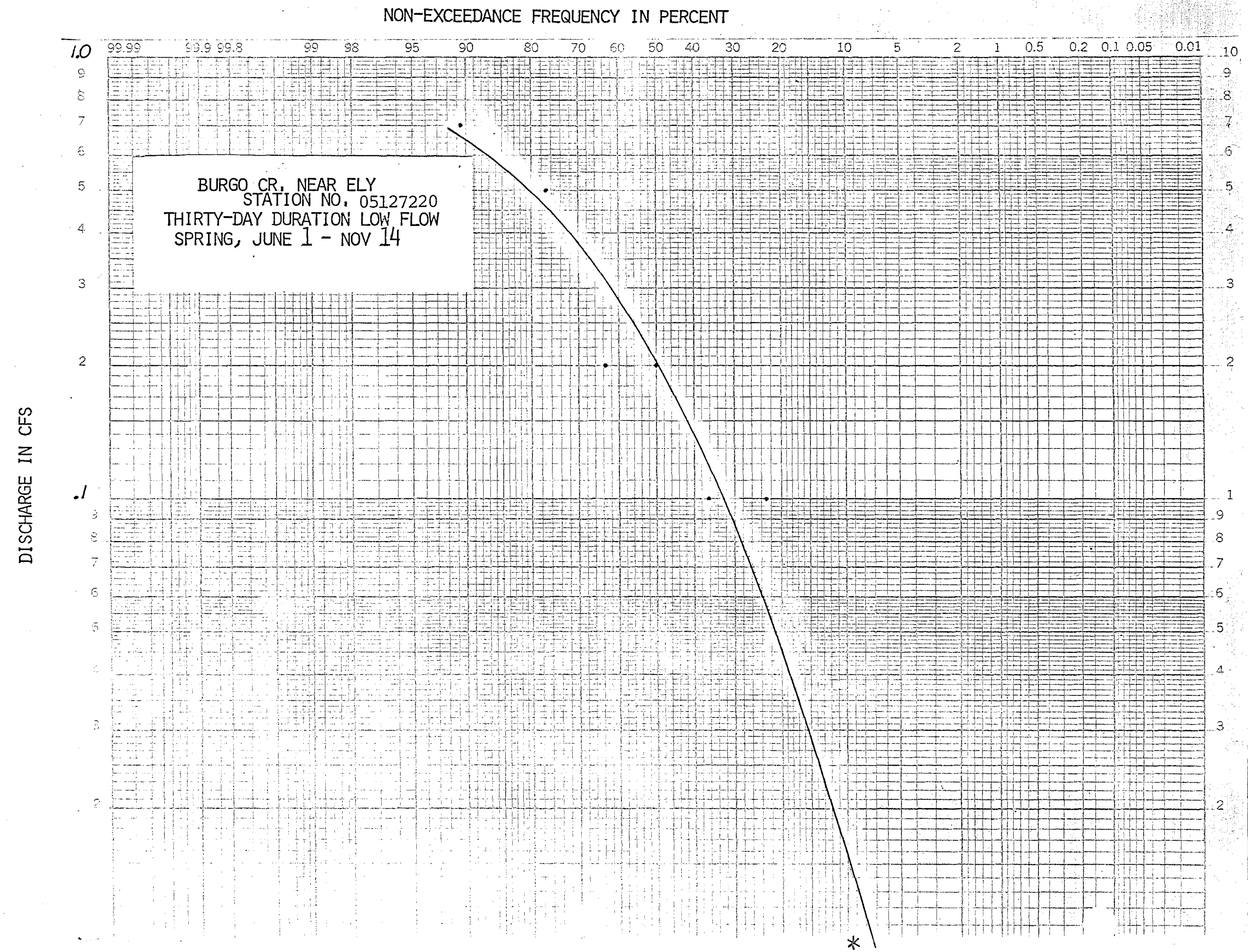


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
10
1.0

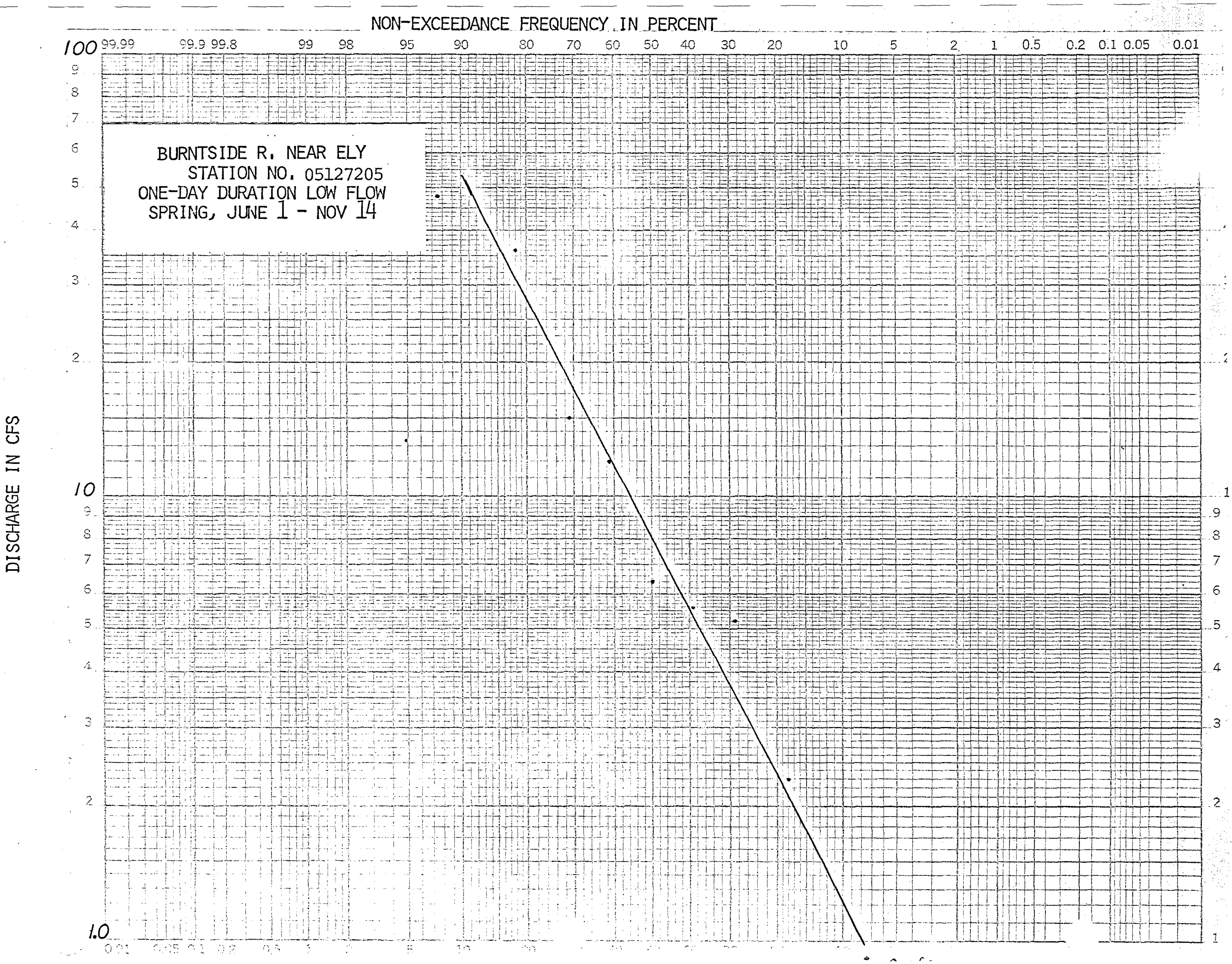

NON-EXCEEDANCE FREQUENCY IN PERCENT
BEAR ISLAND R. NEAR ELY
STATION NO. 05126500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
10
1.0
.1

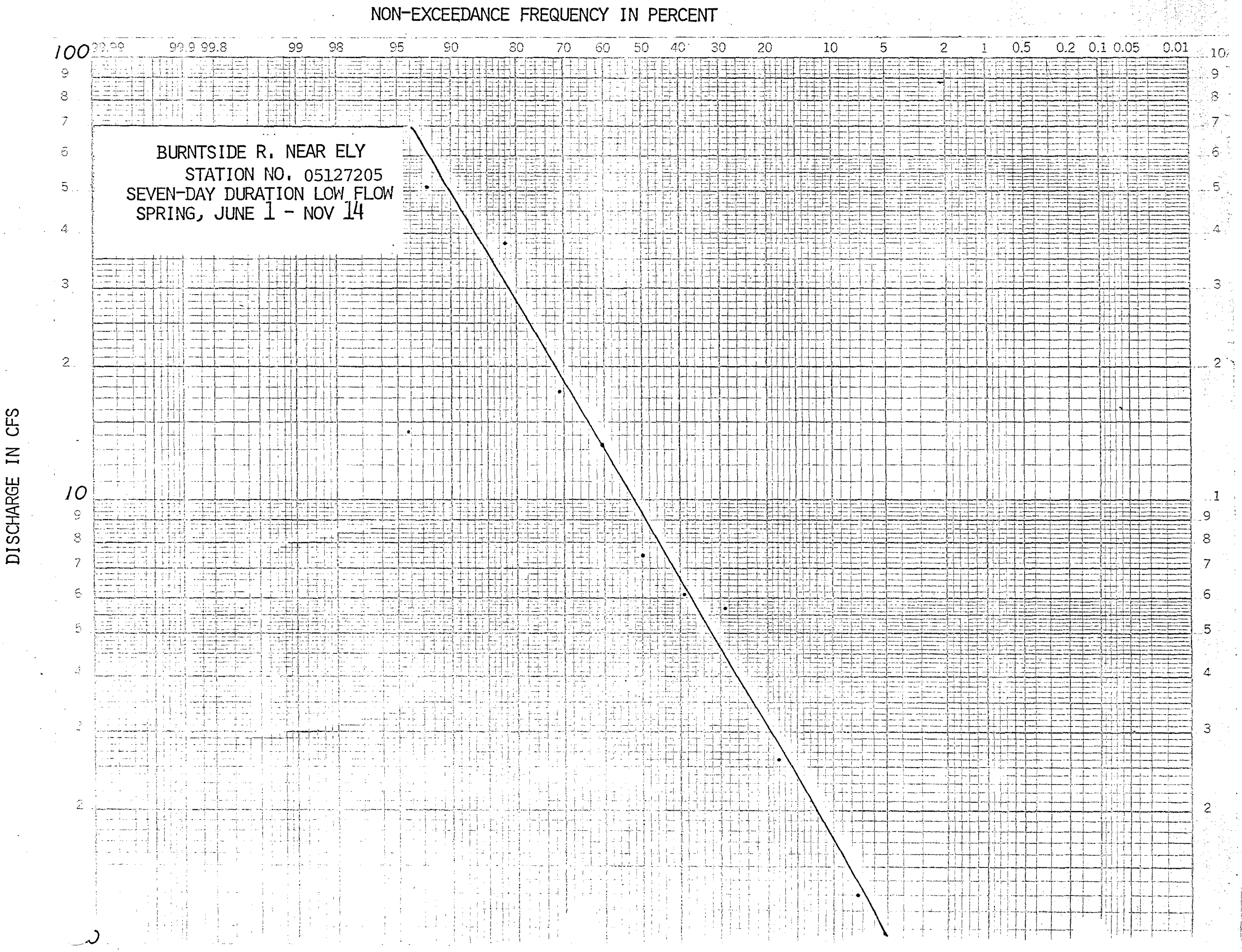

NON-EXCEEDANCE FREQUENCY IN PERCENT
BURGO CR. NEAR ELY
STATION NO. 05127220
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1.0
.1
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
* * *

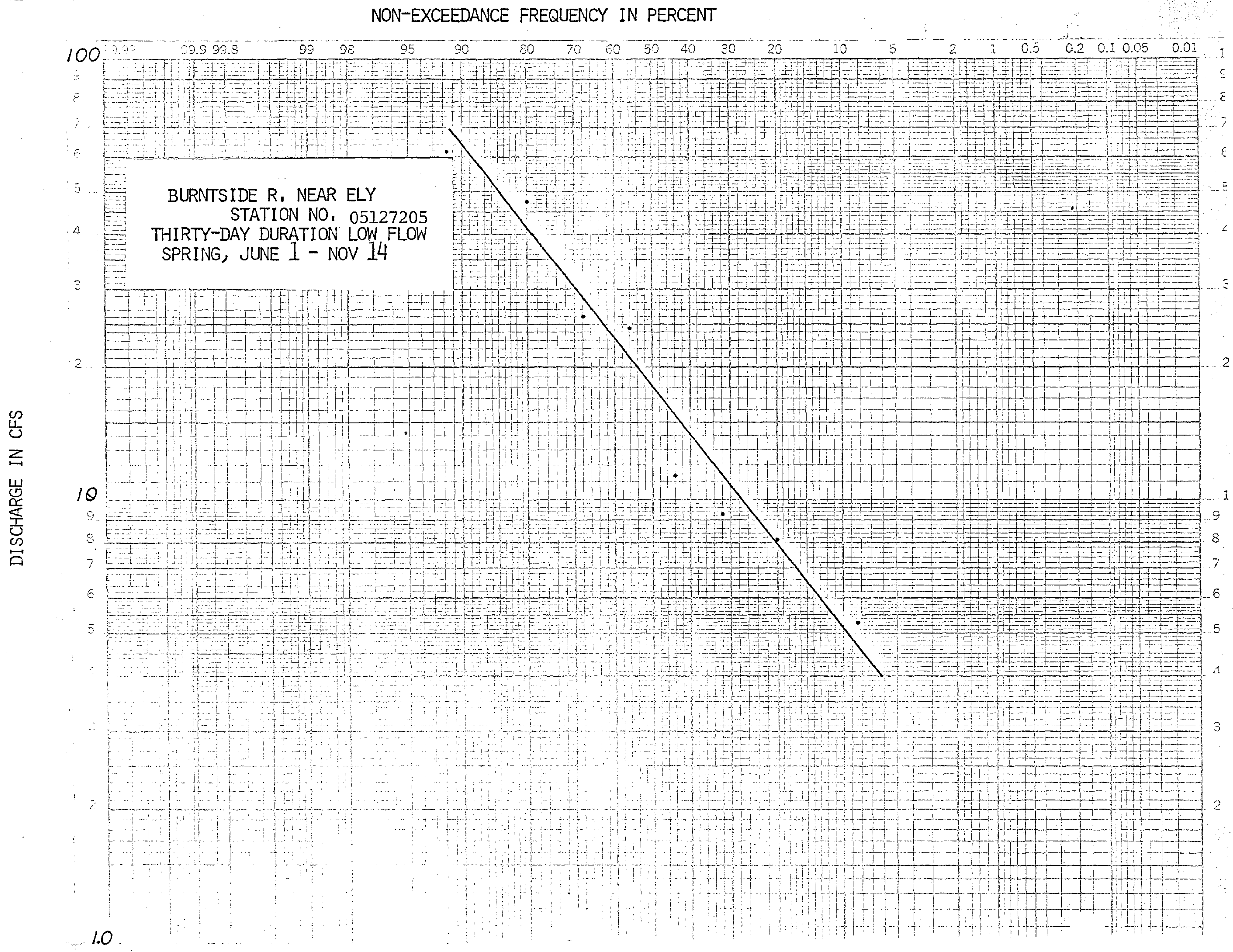

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
BURGO CR. NEAR ELY
STATION NO. 05127220
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1.0
.1
.01



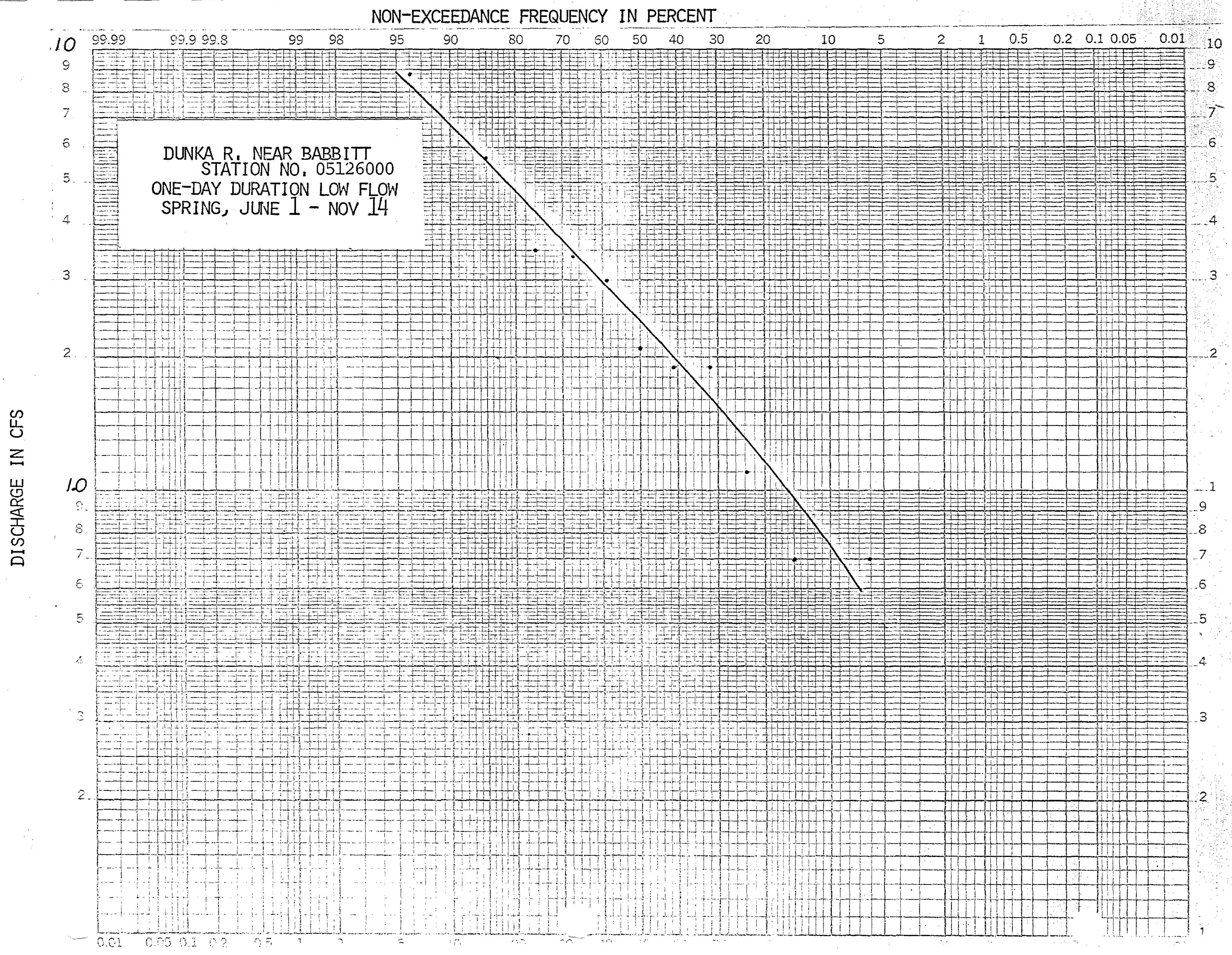
NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
1.0
.1
DISCHARGE IN CFS
BURGO CR. NEAR ELY
STATION NO. 05127220
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14


NON-EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
100
10
1.0
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01

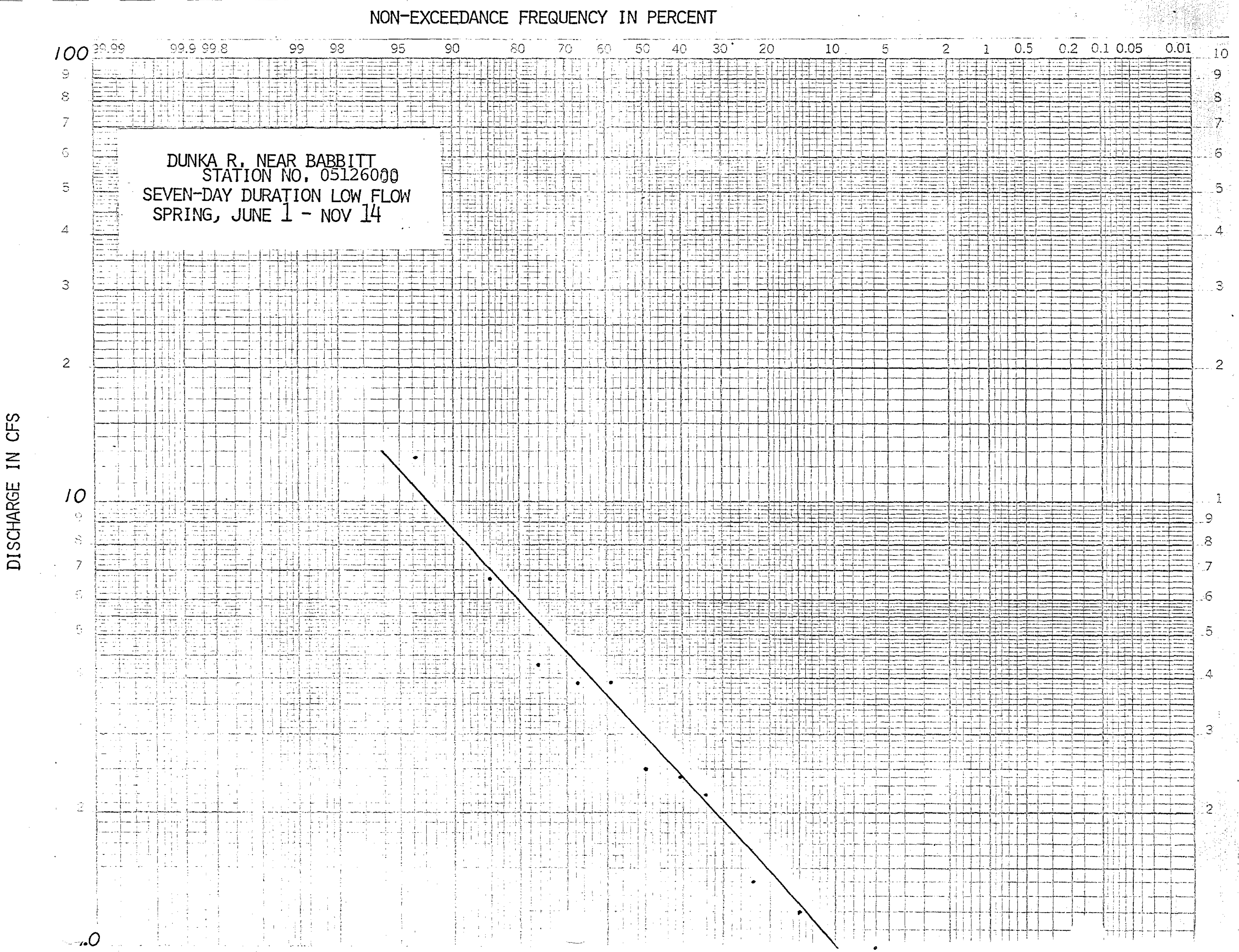

NON-EXCEEDANCE FREQUENCY IN PERCENT
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
100
10
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01



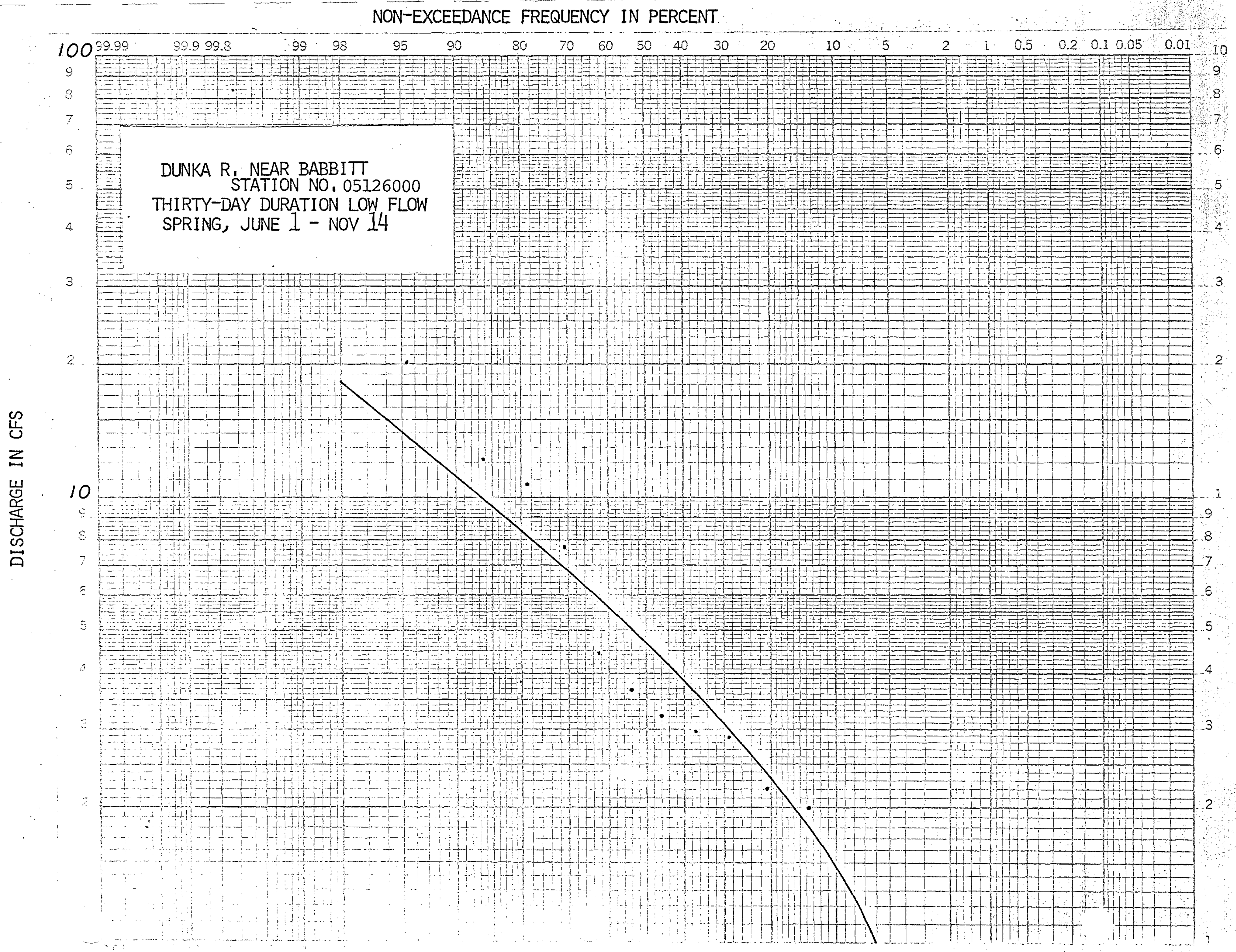
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
BURNTSIDE R. NEAR ELY
STATION NO. 05127205
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14



NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
DUNKA R. NEAR BABBITT
STATION NO. 05126000
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14



NON-EXCEEDANCE FREQUENCY IN PERCENT
DUNKA R. NEAR BABBITT
STATION NO. 05126000
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2 0.1 0.05
0.01
100
10
1.0


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
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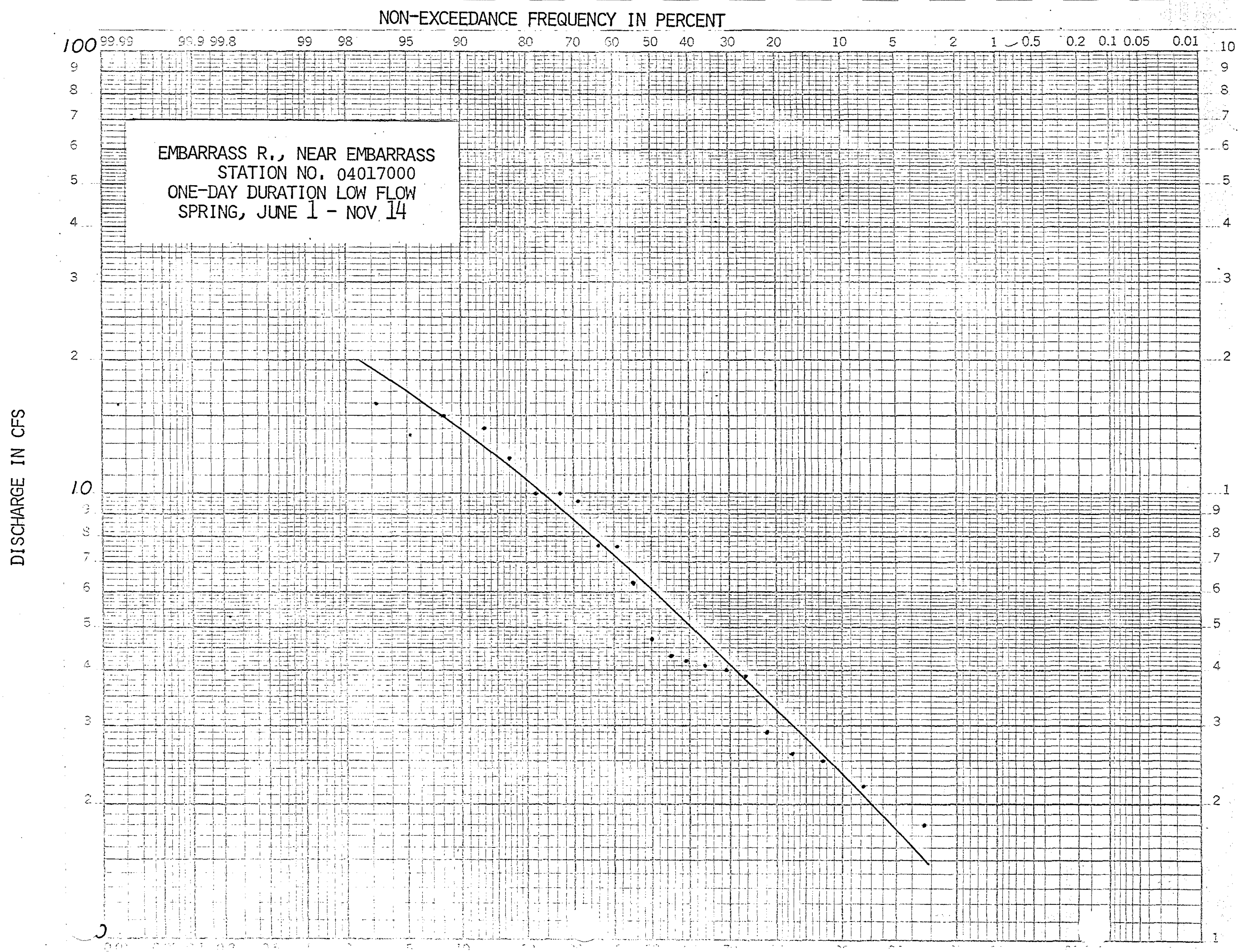
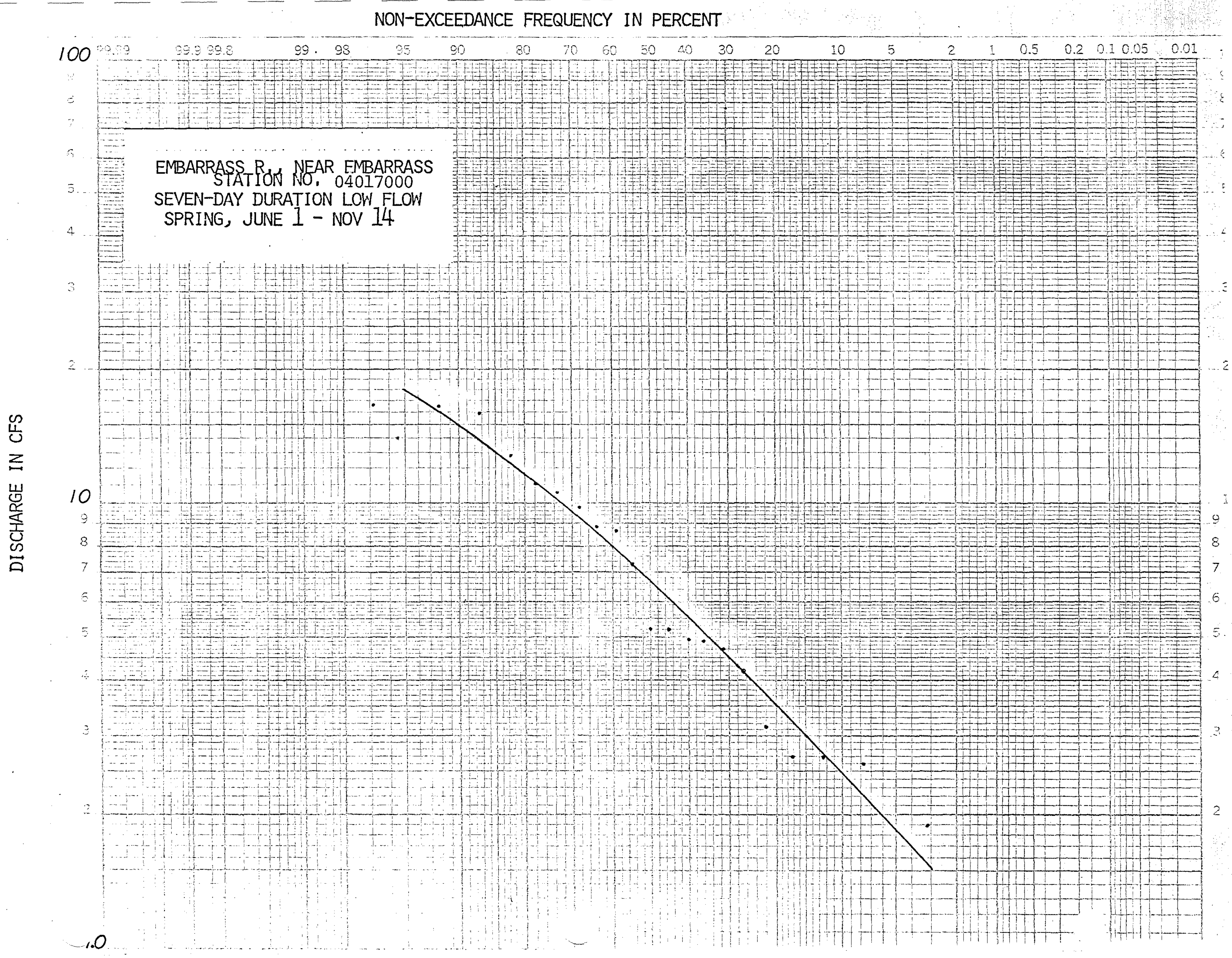
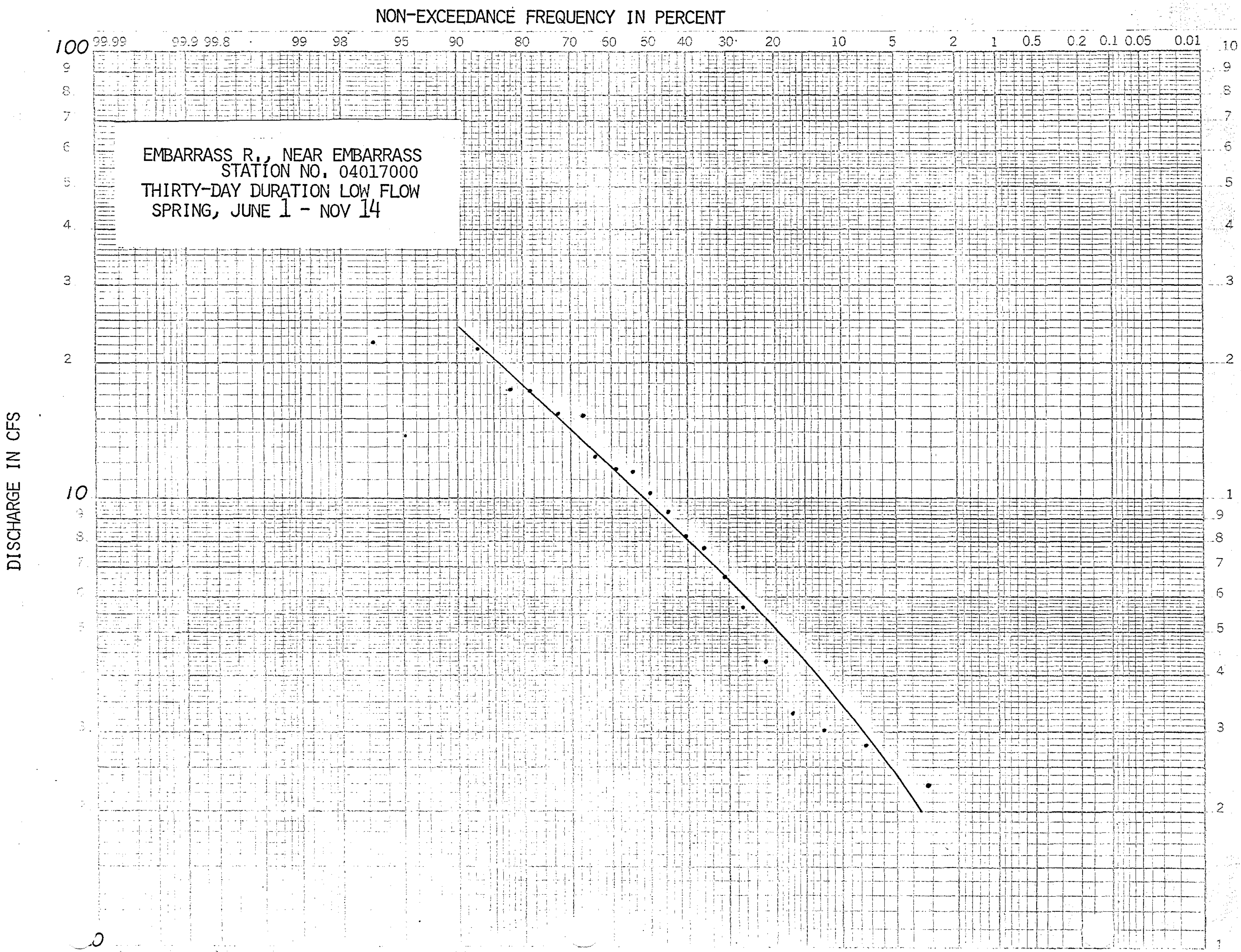
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01
DUNKA R. NEAR BABBITT
STATION NO. 05126000
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
100
10



NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14


NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99
99.9 99.8
99
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95
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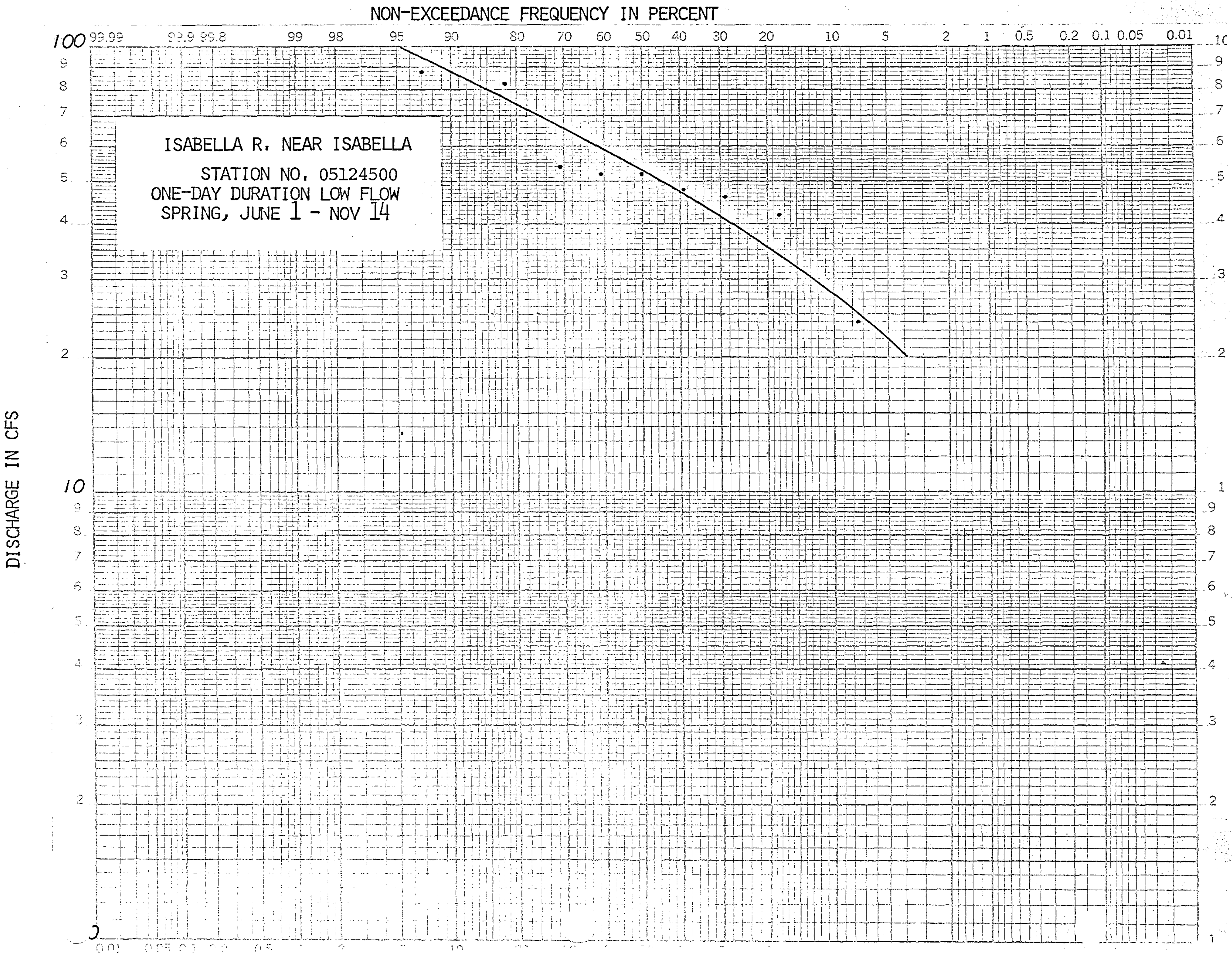
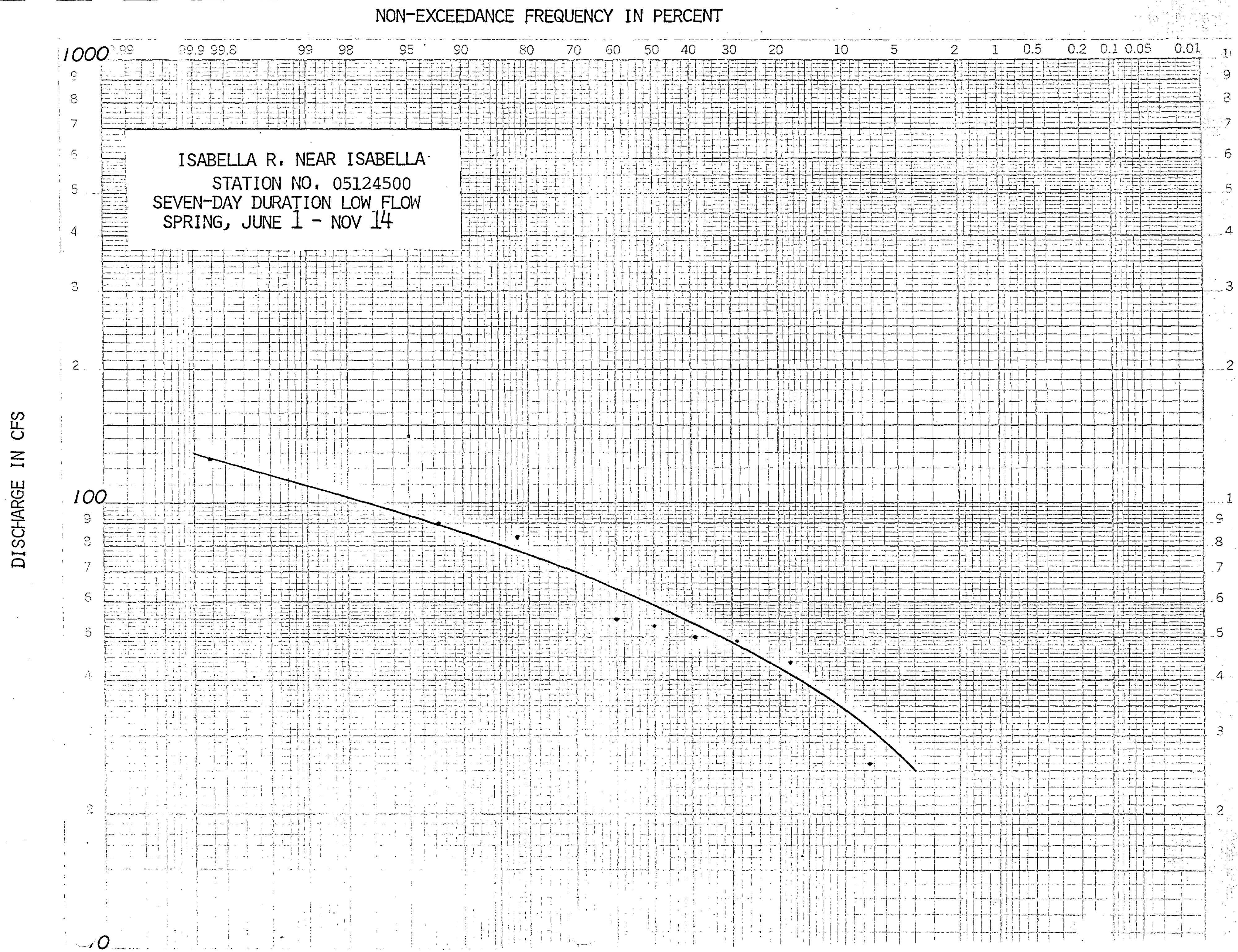
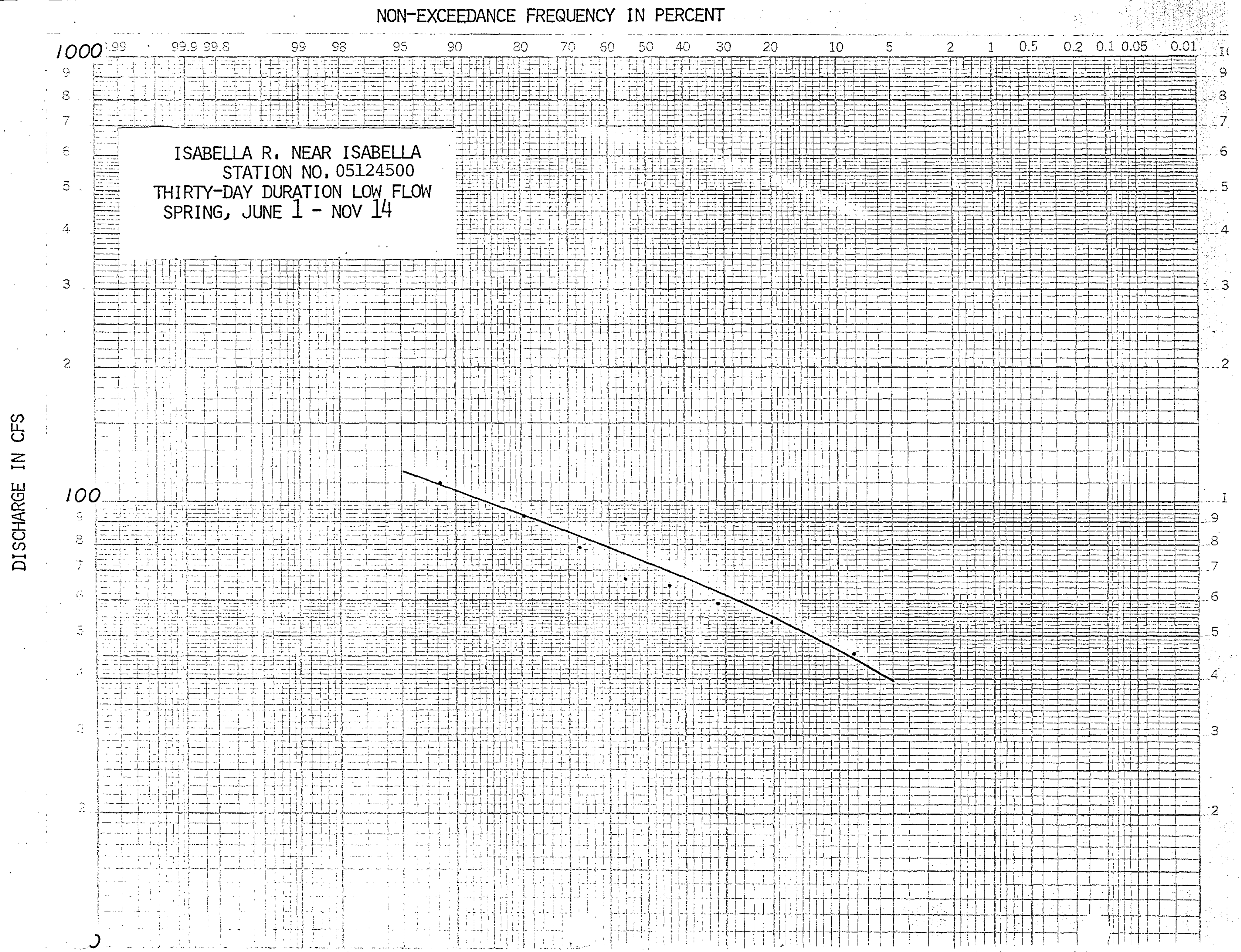
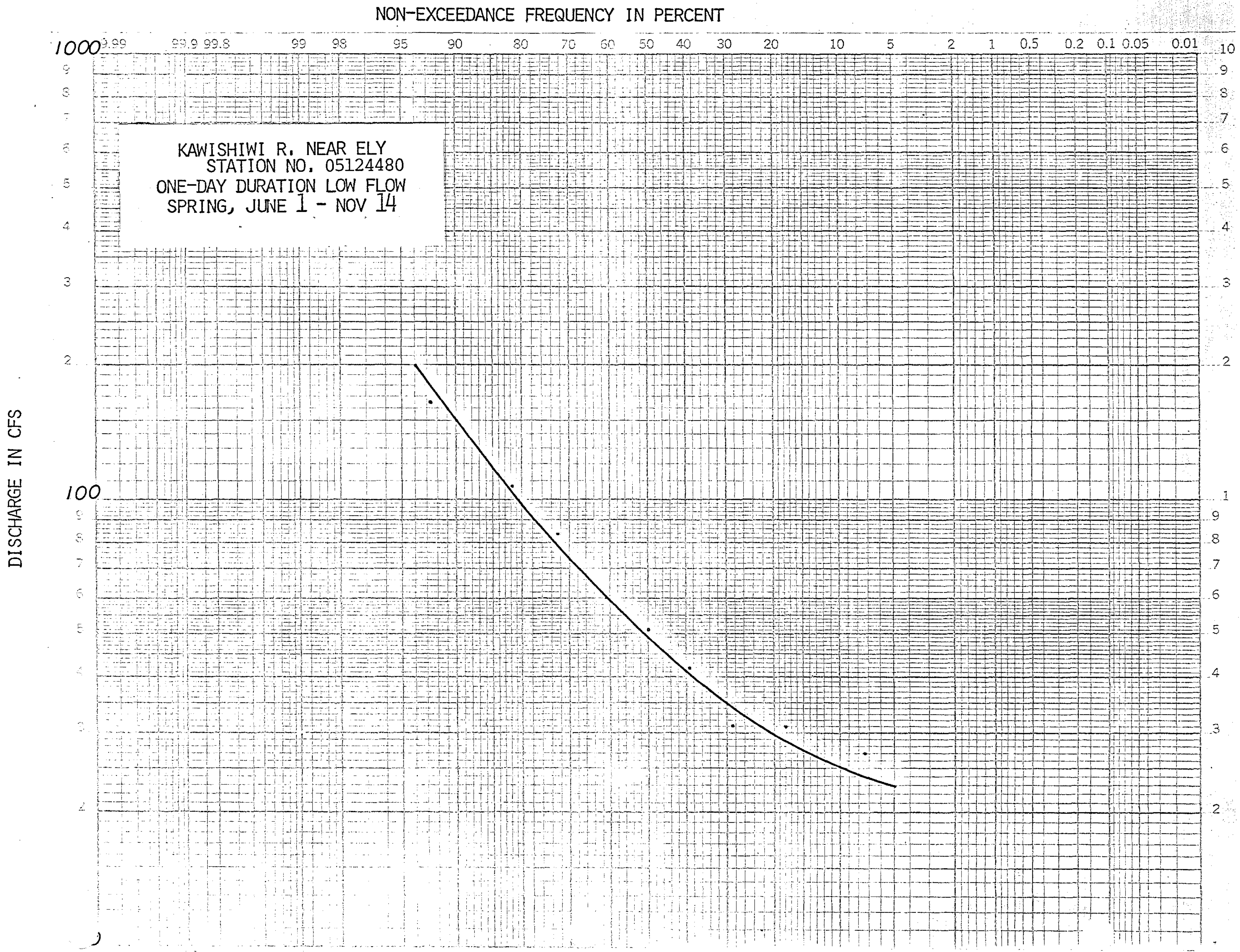
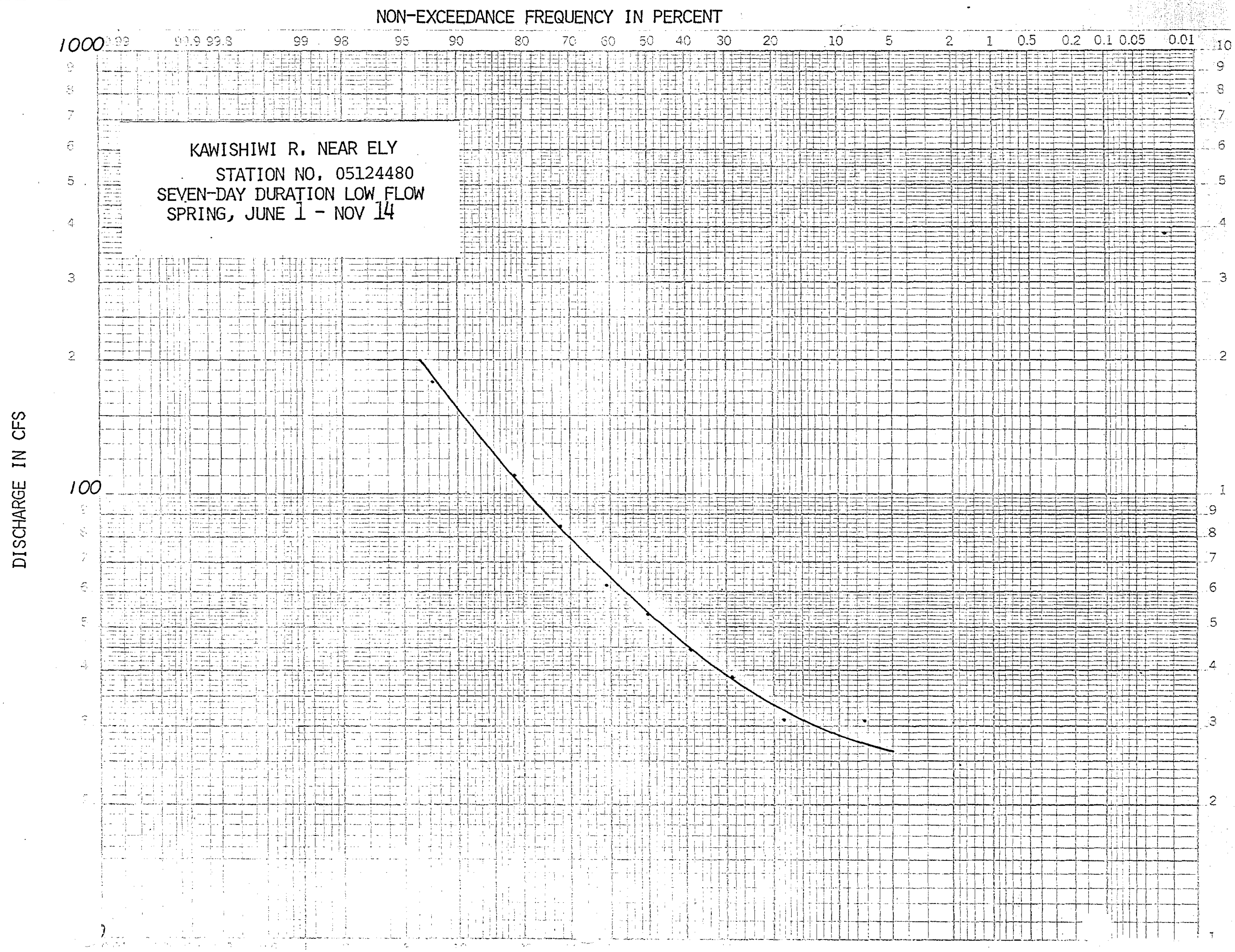
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1 0.05
0.01
DISCHARGE IN CFS
100
10
EMBARRASS R., NEAR EMBARRASS
STATION NO. 04017000
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14

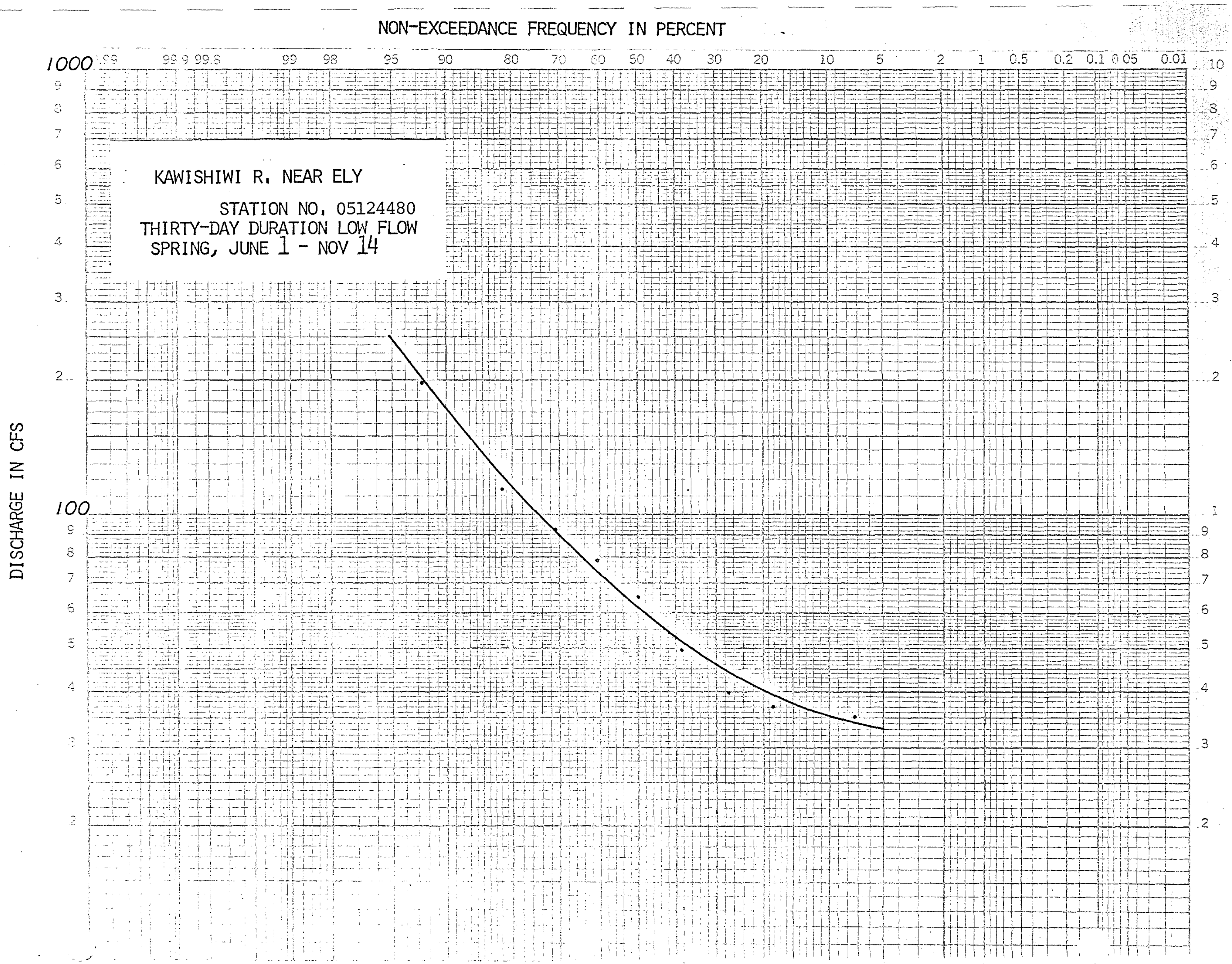

NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1000
100
10

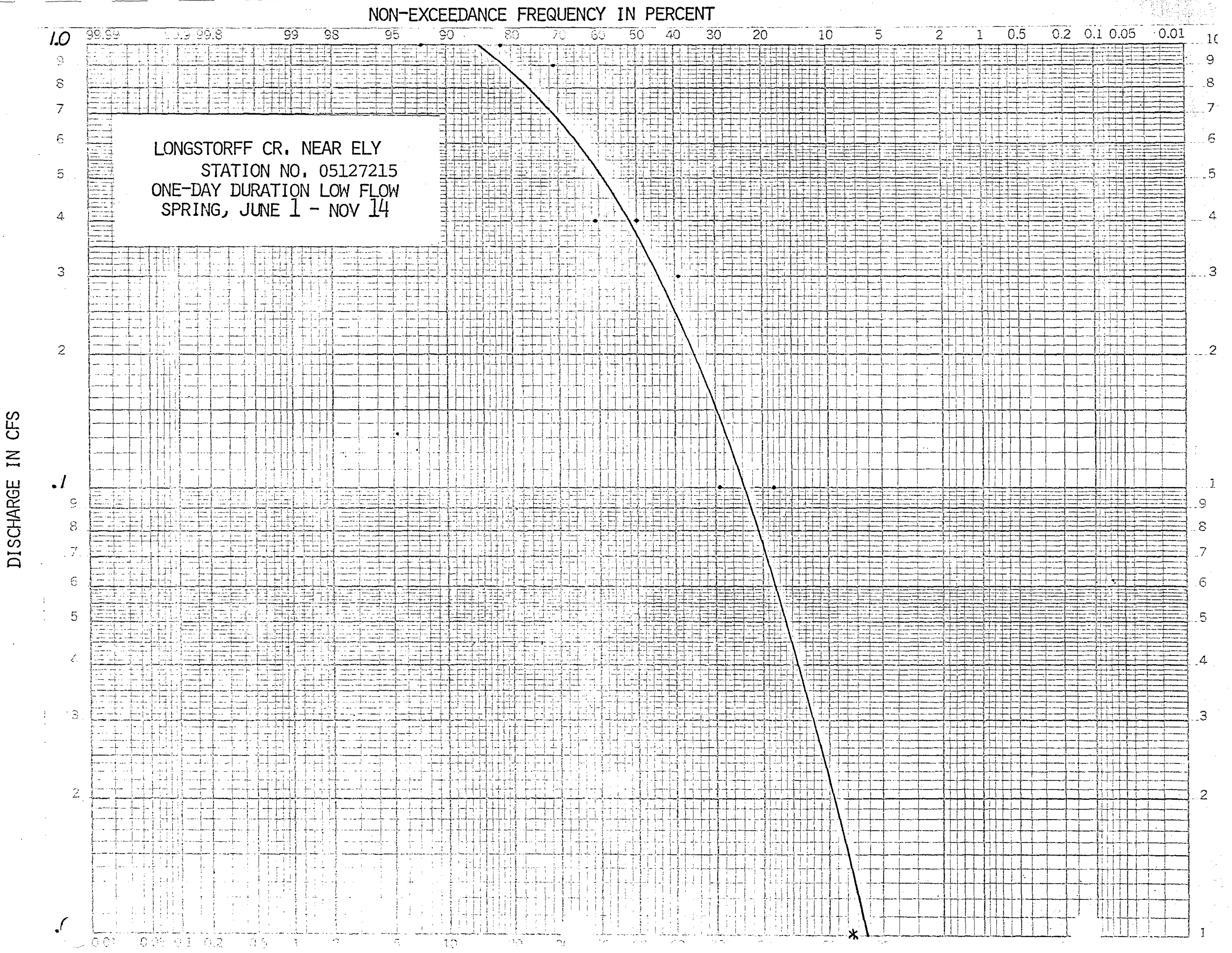

NON-EXCEEDANCE FREQUENCY IN PERCENT
ISABELLA R. NEAR ISABELLA
STATION NO. 05124500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1000
100

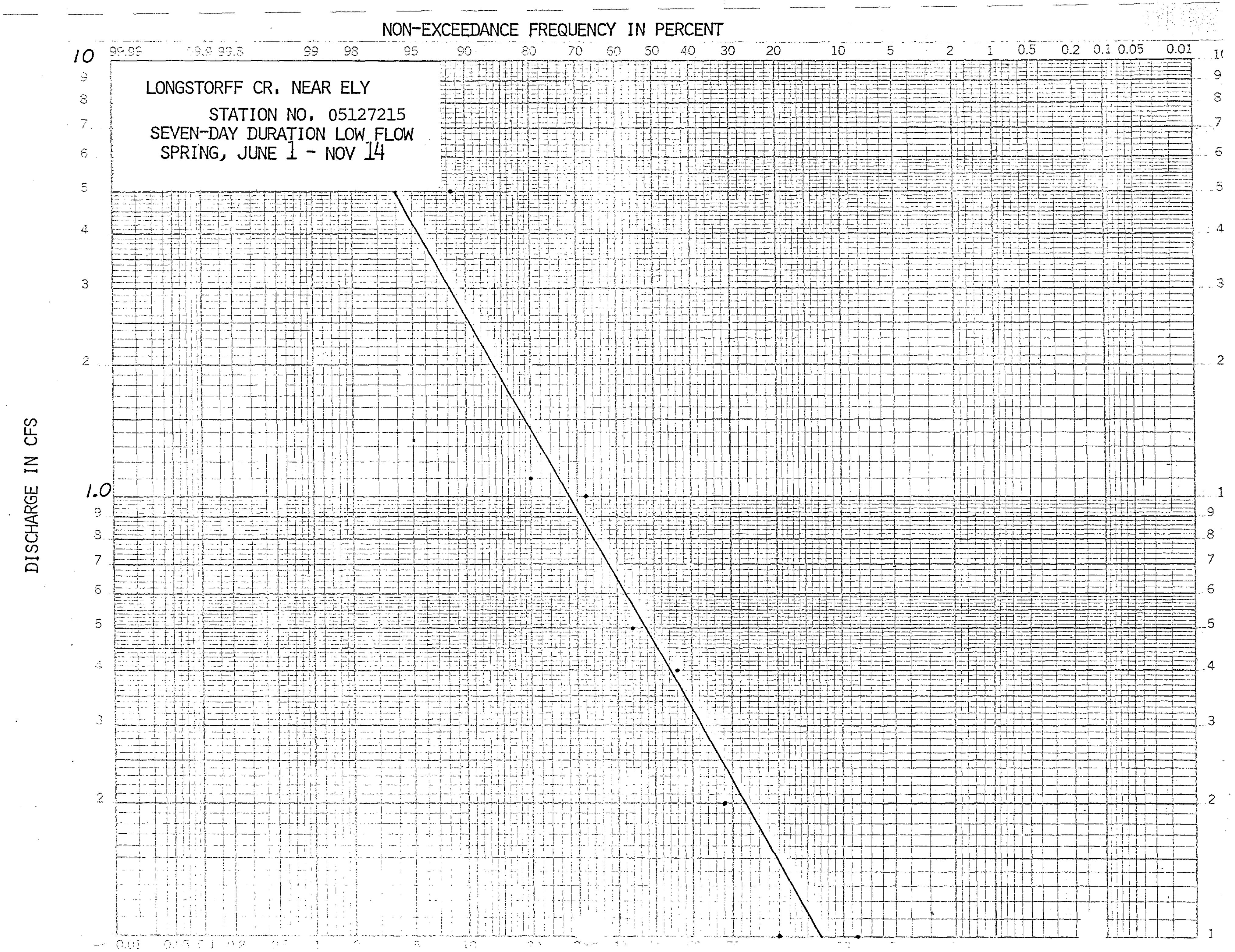

NON-EXCEEDANCE FREQUENCY IN PERCENT
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1000
100

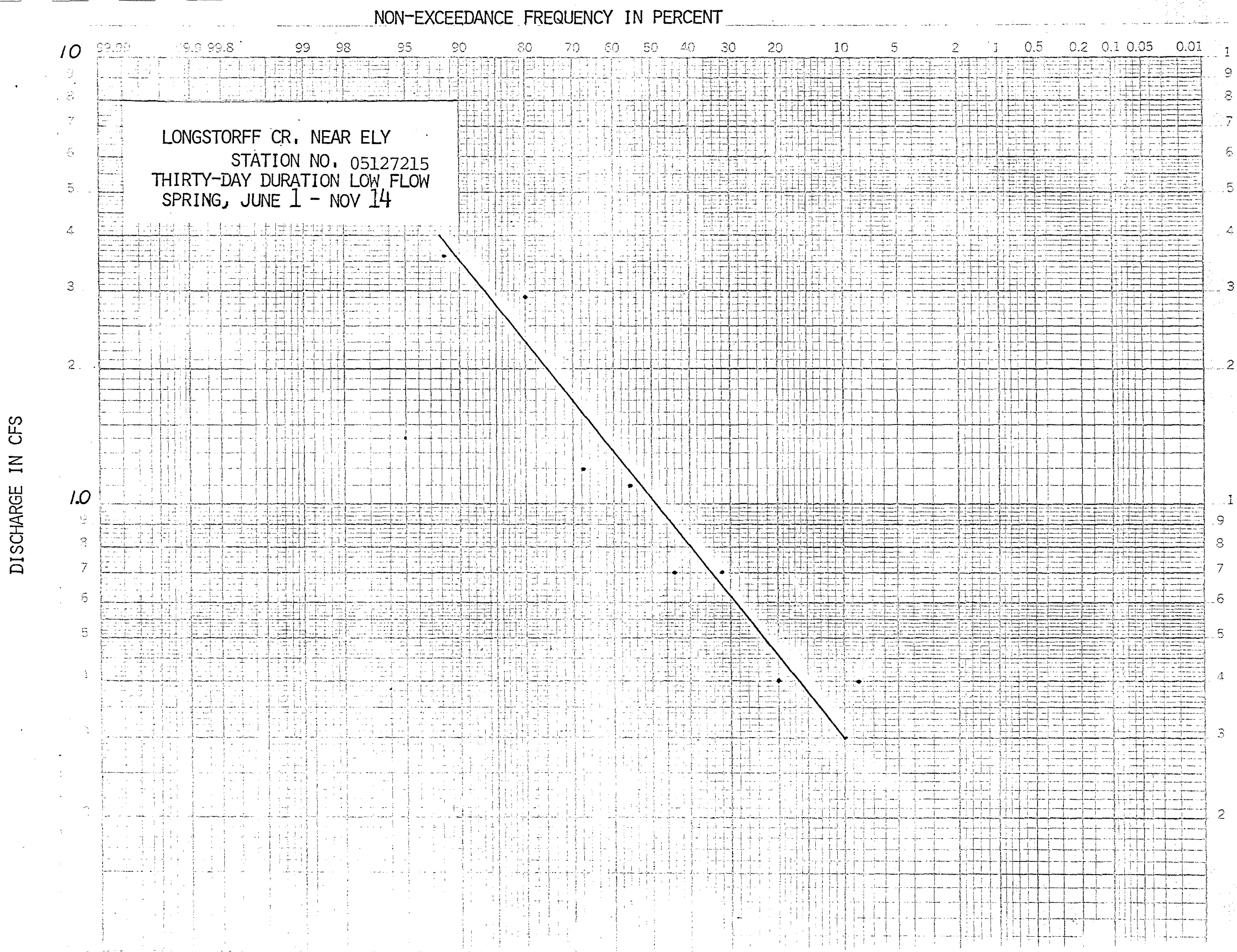

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
1000
100
99.99
99.9 99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01



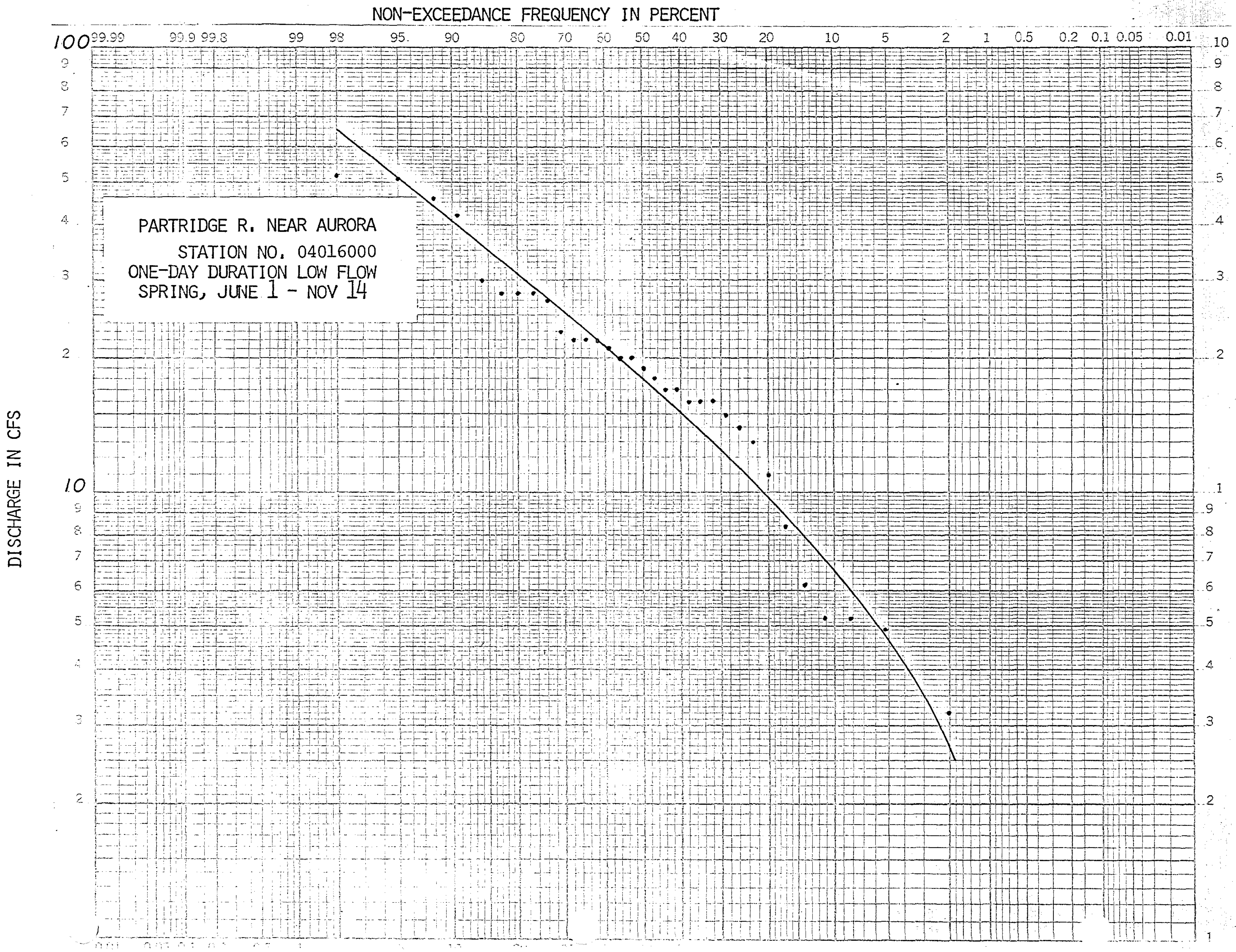
NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
KAWISHIWI R. NEAR ELY
STATION NO. 05124480
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14

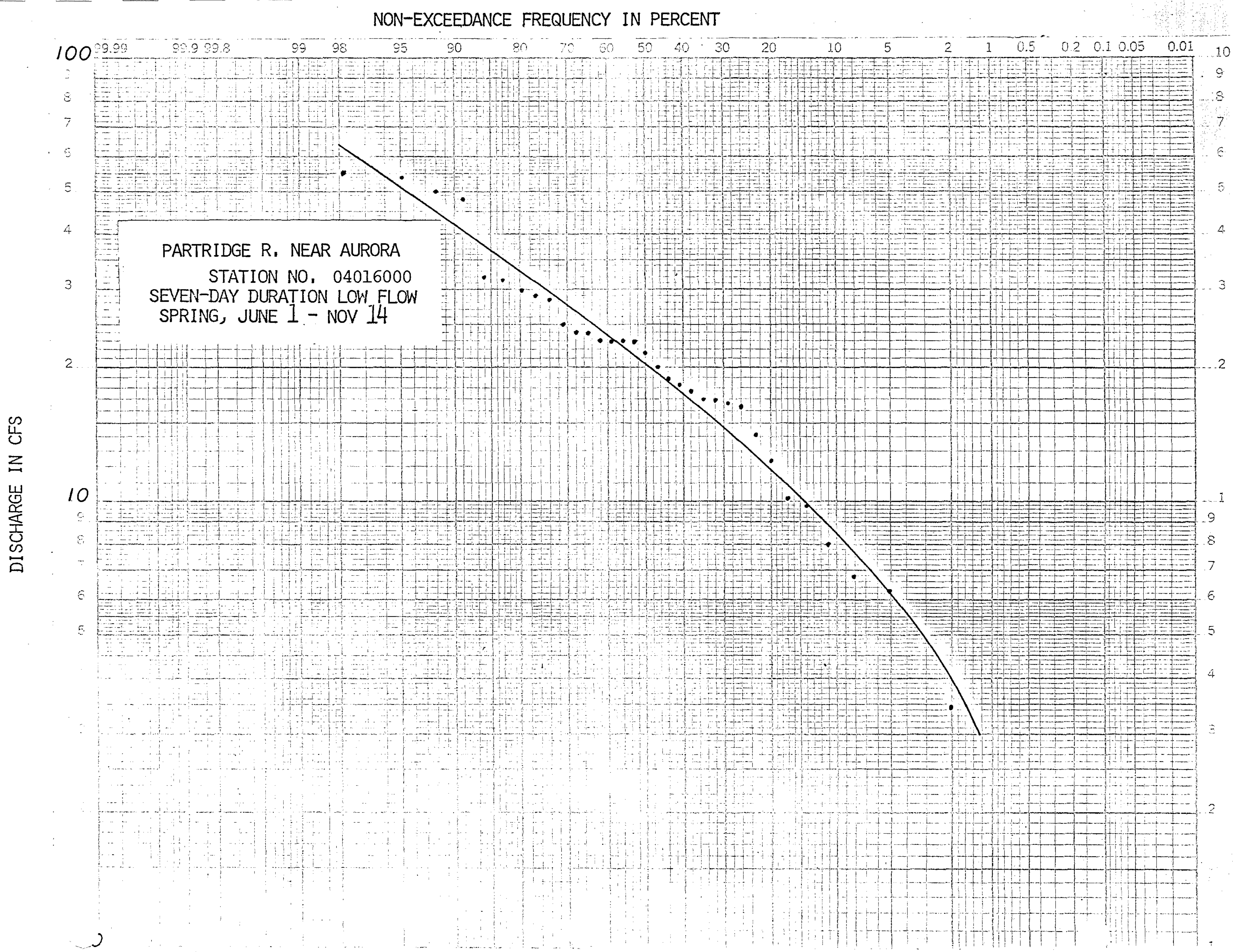

NON-EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1.0
.1
.01

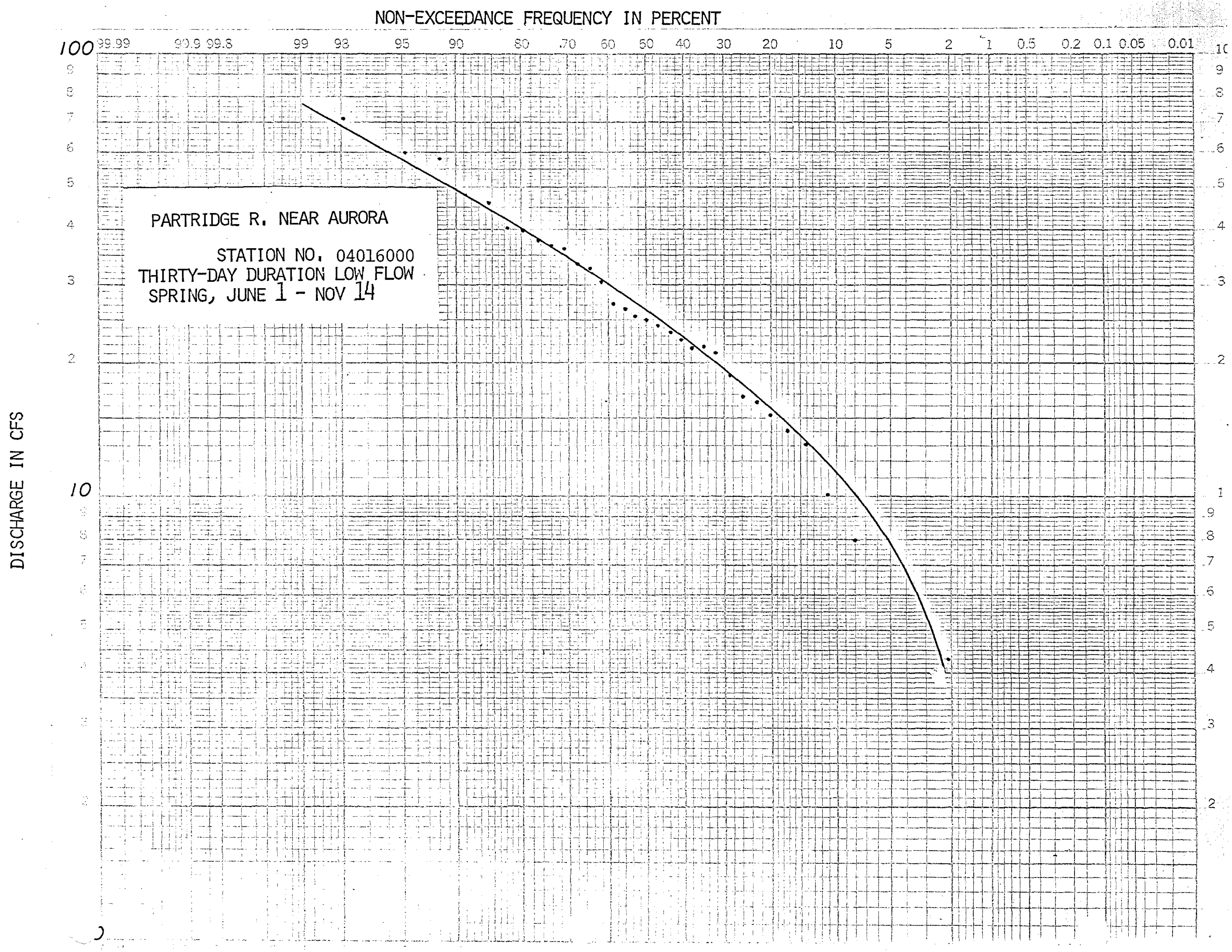

NON-EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
10 9 8 7 6 5 4 3 2 1.0 9 8 7 6 5 4 3 2 1

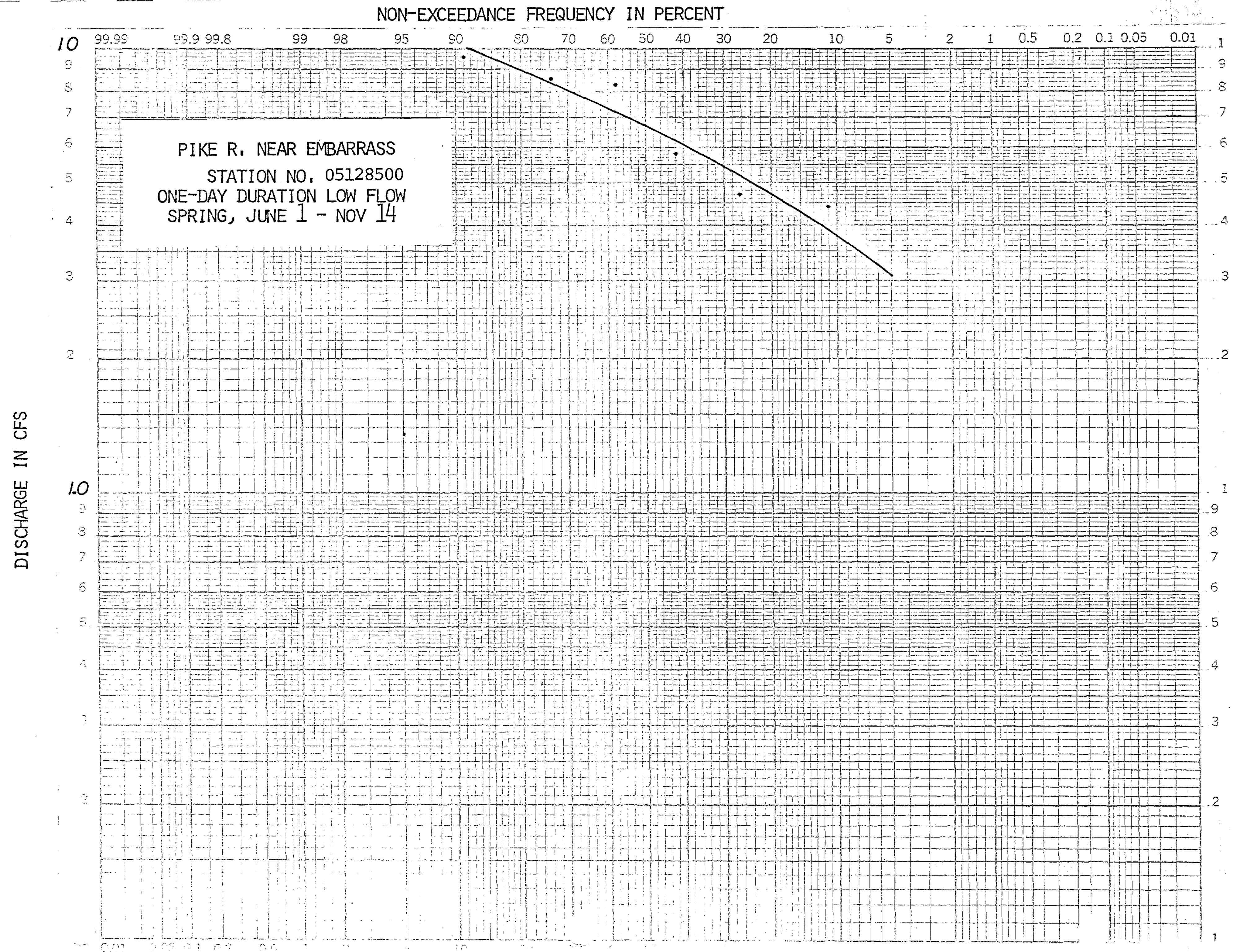


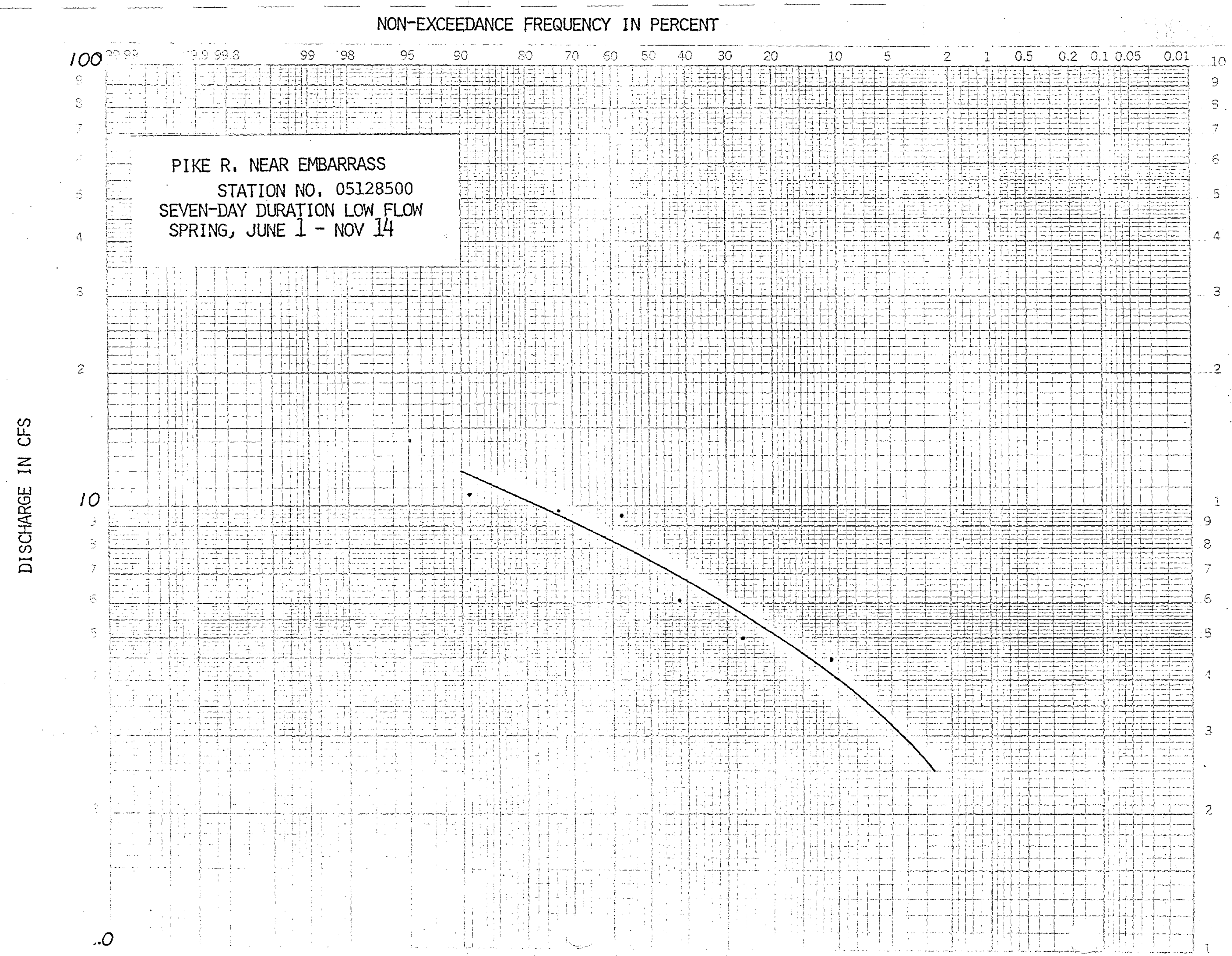
NON-EXCEEDANCE FREQUENCY IN PERCENT
LONGSTORFF CR. NEAR ELY
STATION NO. 05127215
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS

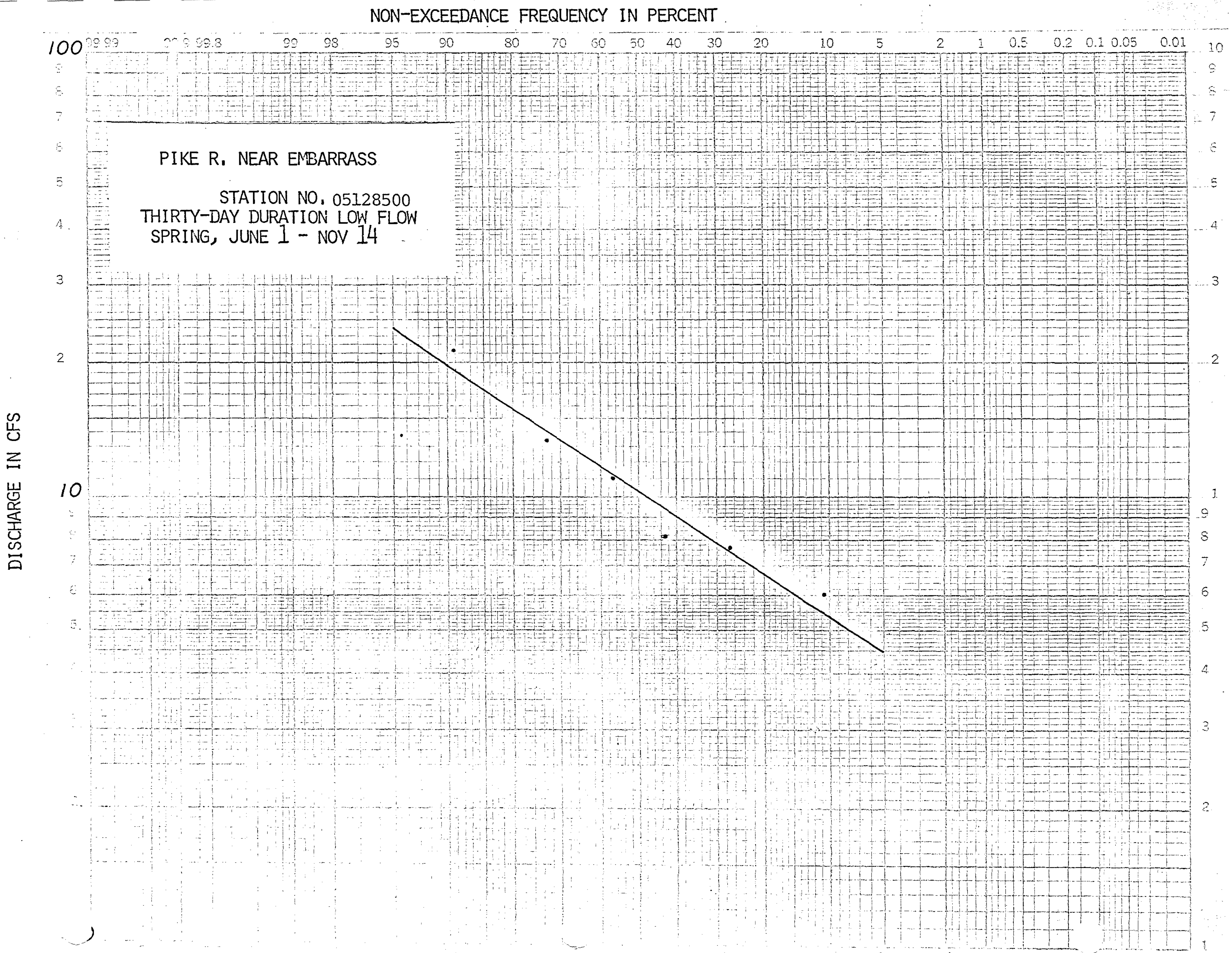

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
100
10
1

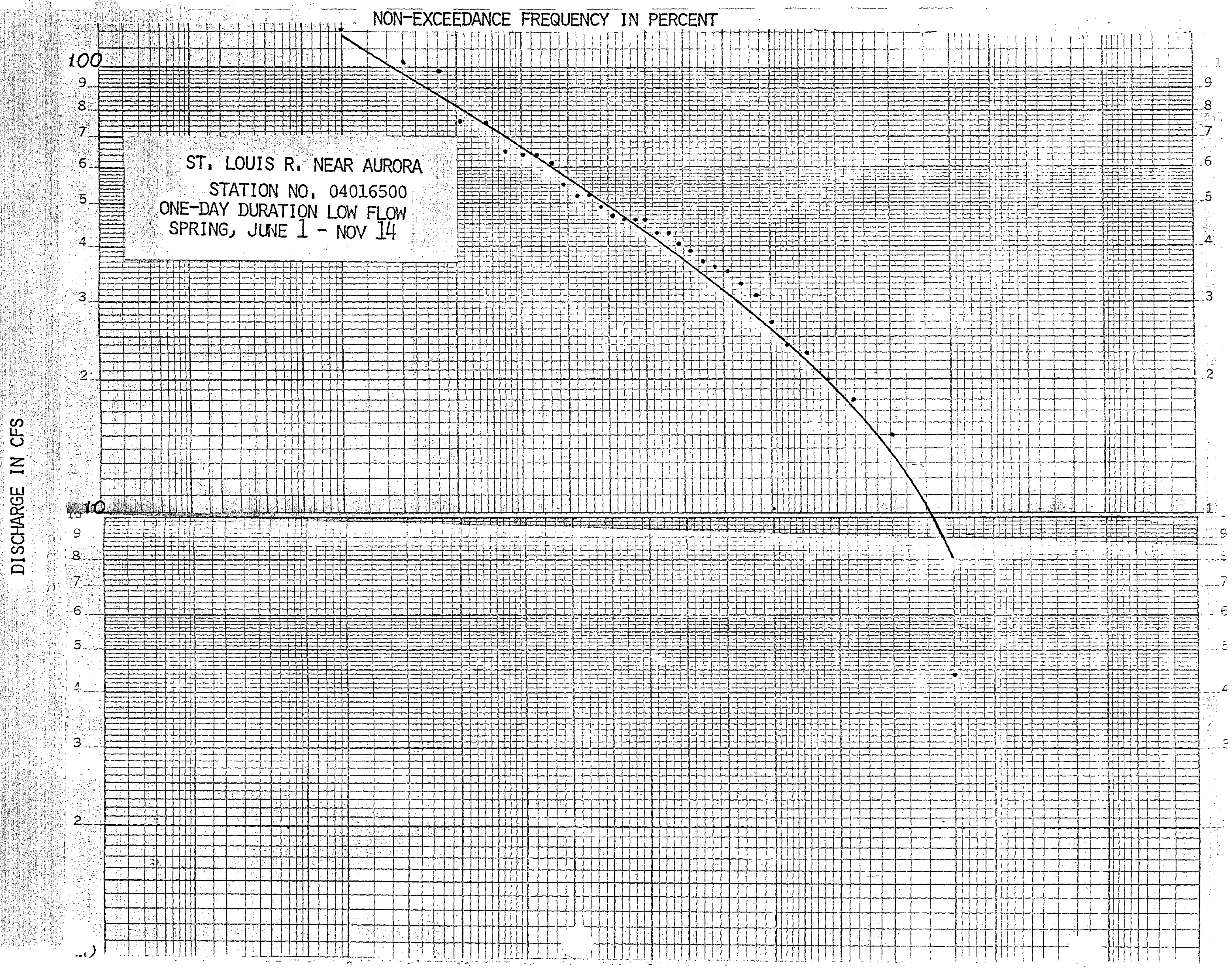

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
DISCHARGE IN CFS
100
10
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14

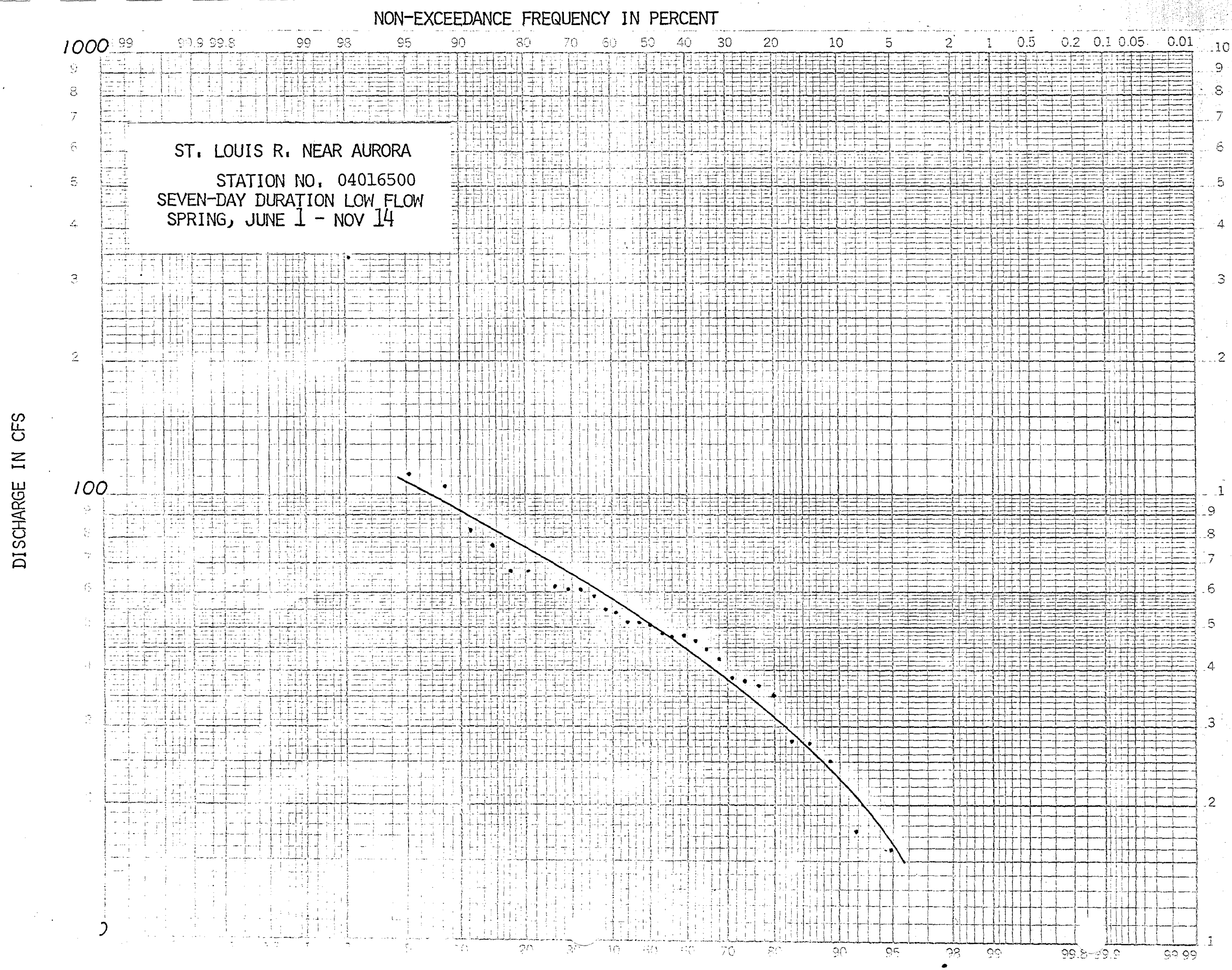

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PARTRIDGE R. NEAR AURORA
STATION NO. 04016000
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14

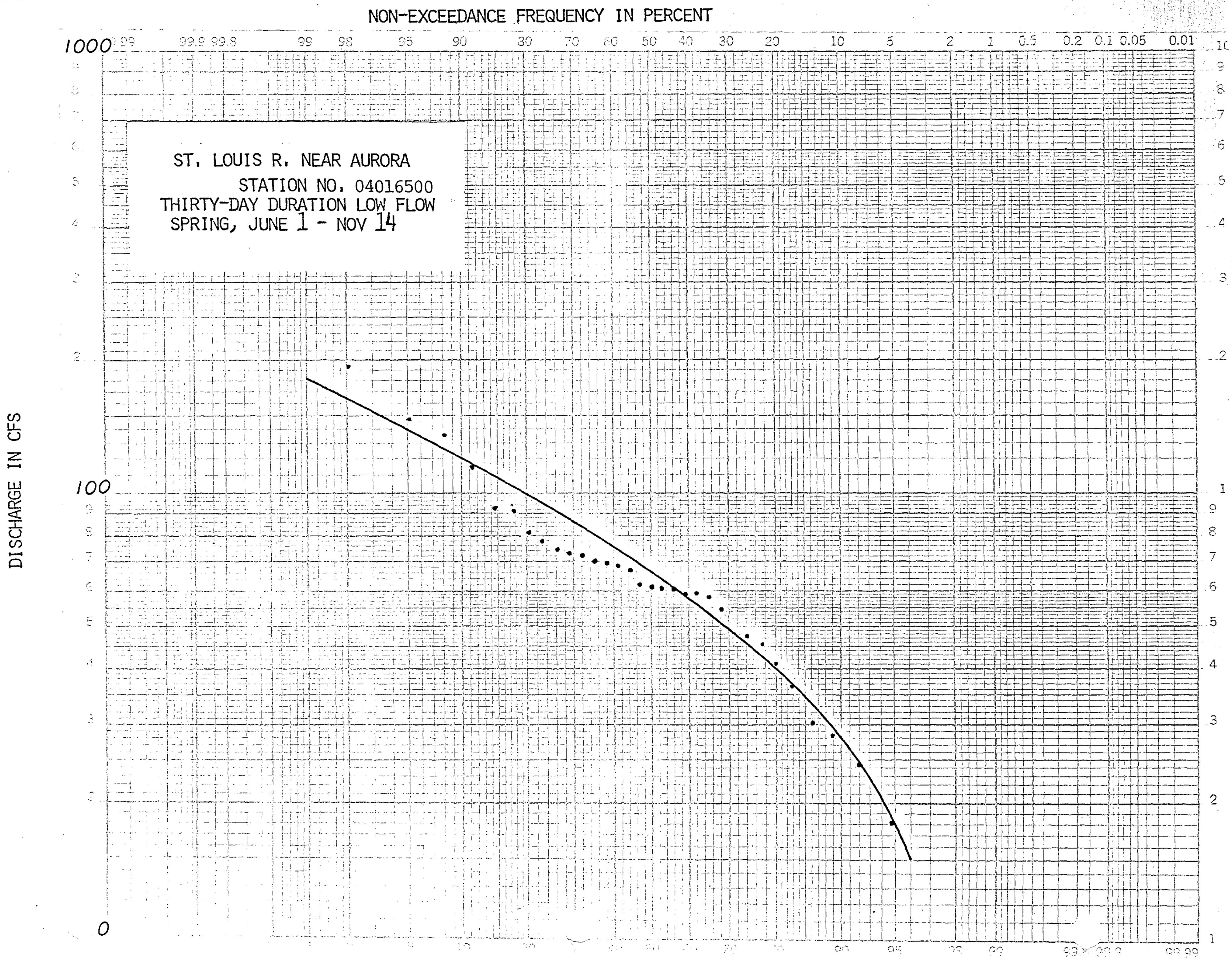

NON-EXCEEDANCE FREQUENCY IN PERCENT
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
10
1.0

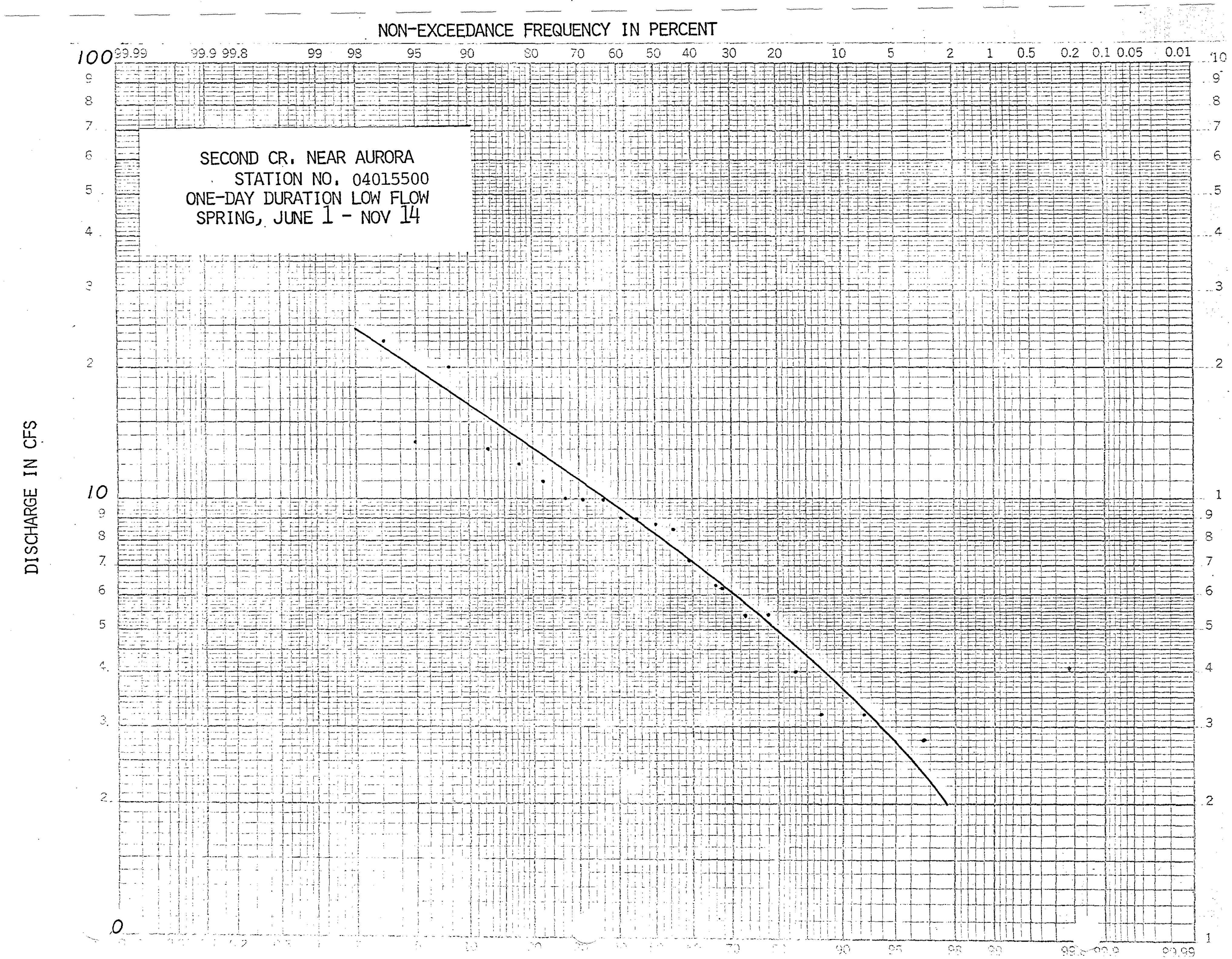

NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14

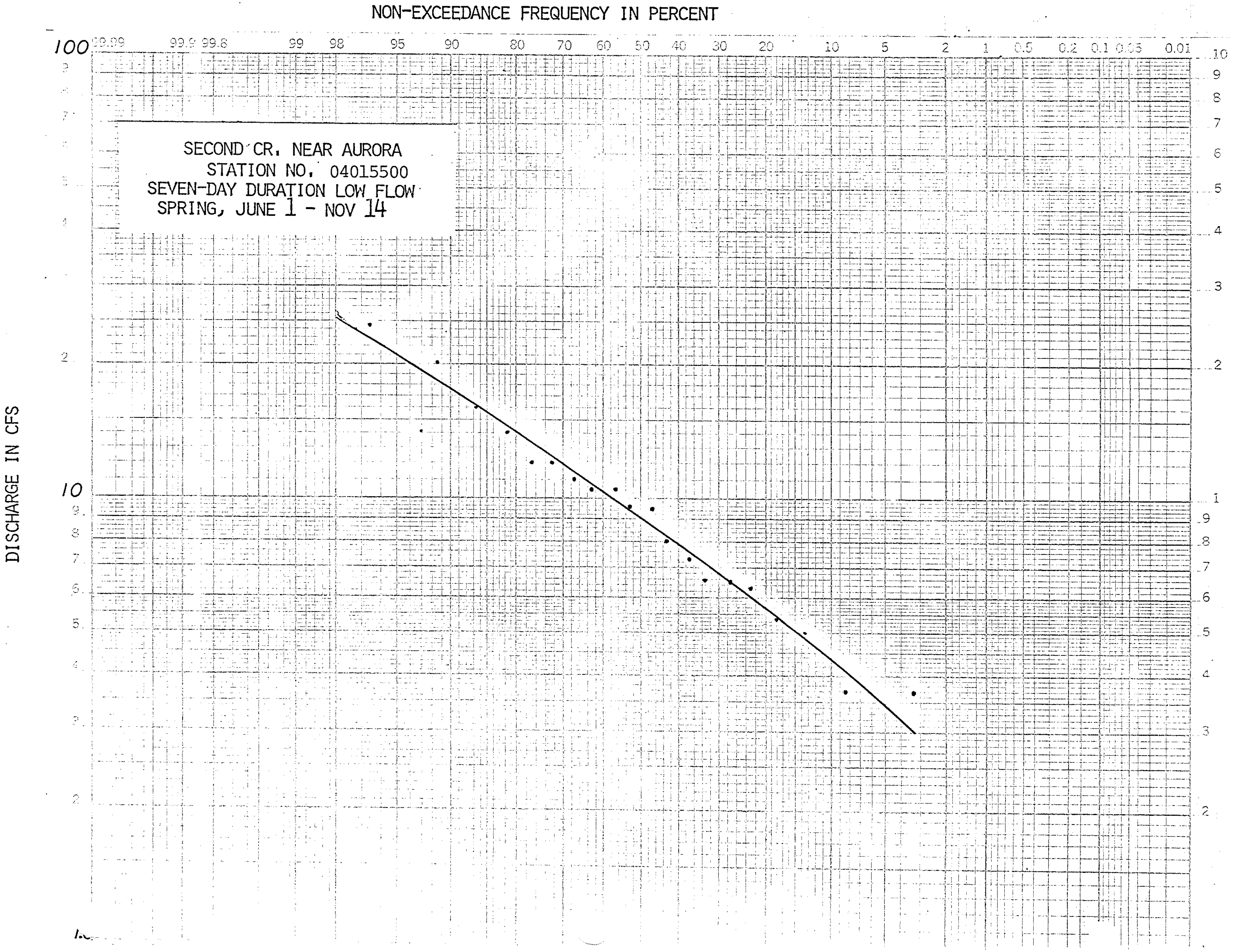

NON-EXCEEDANCE FREQUENCY IN PERCENT
PIKE R. NEAR EMBARRASS
STATION NO. 05128500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
1000
100
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14


NON-EXCEEDANCE FREQUENCY IN PERCENT
ST. LOUIS R. NEAR AURORA
STATION NO. 04016500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1000
100
0


NON-EXCEEDANCE FREQUENCY IN PERCENT
SECOND CR. NEAR AURORA
STATION NO. 04015500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10
0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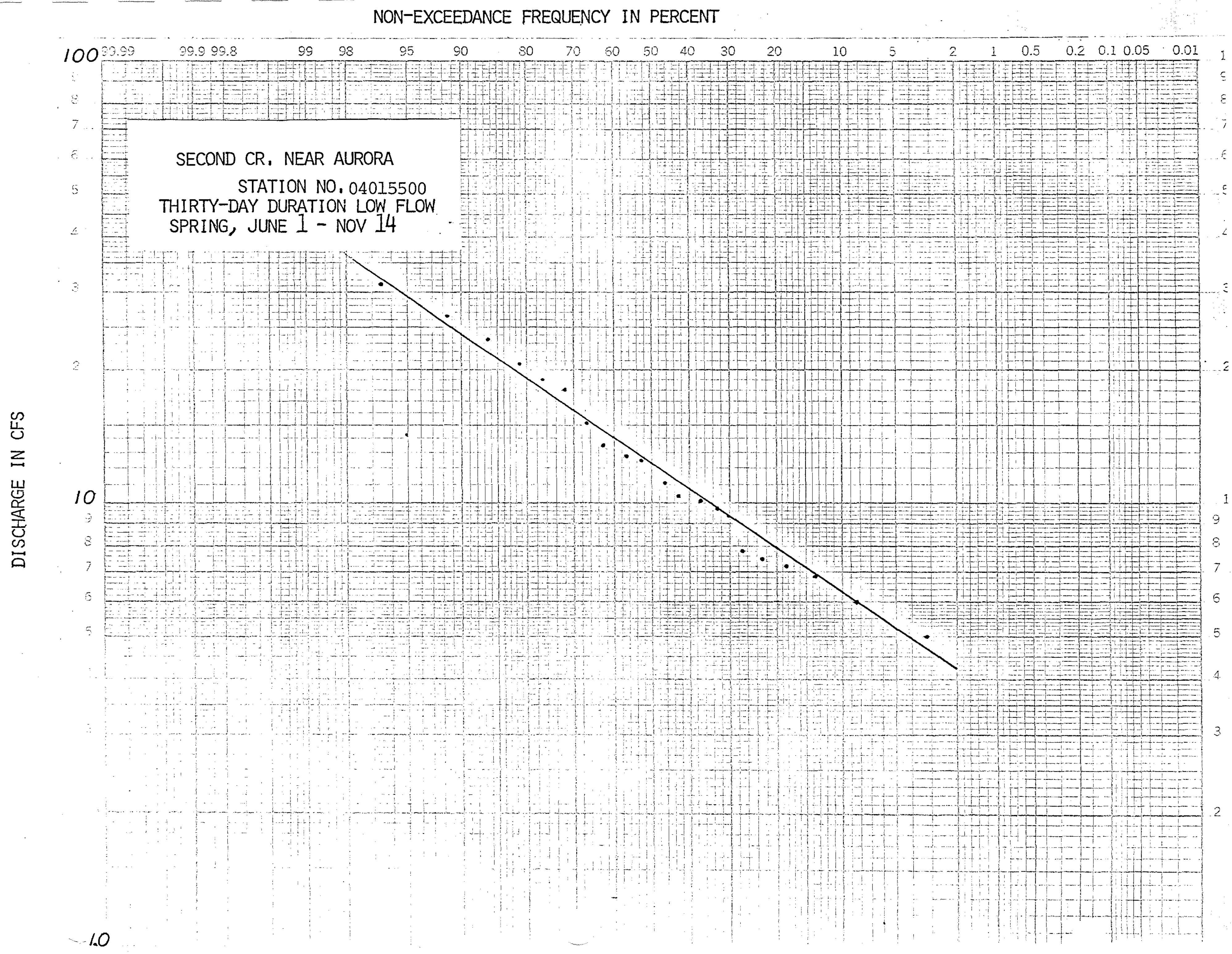
DISCHARGE IN CFS
SECOND CR. NEAR AURORA
STATION NO. 04015500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14


NON-EXCEEDANCE FREQUENCY IN PERCENT
SECOND CR. NEAR AURORA
STATION NO. 04015500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
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10
5
2
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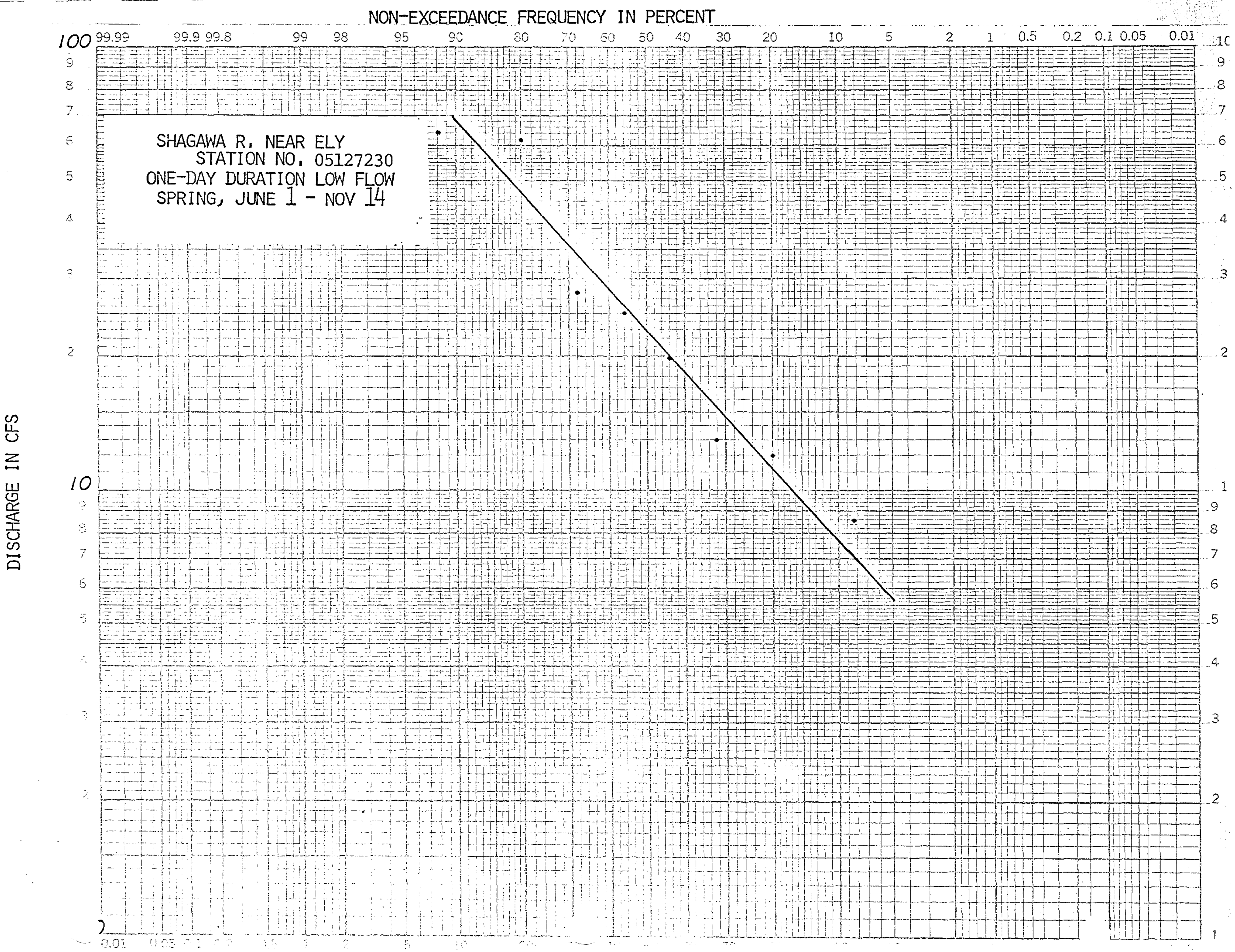
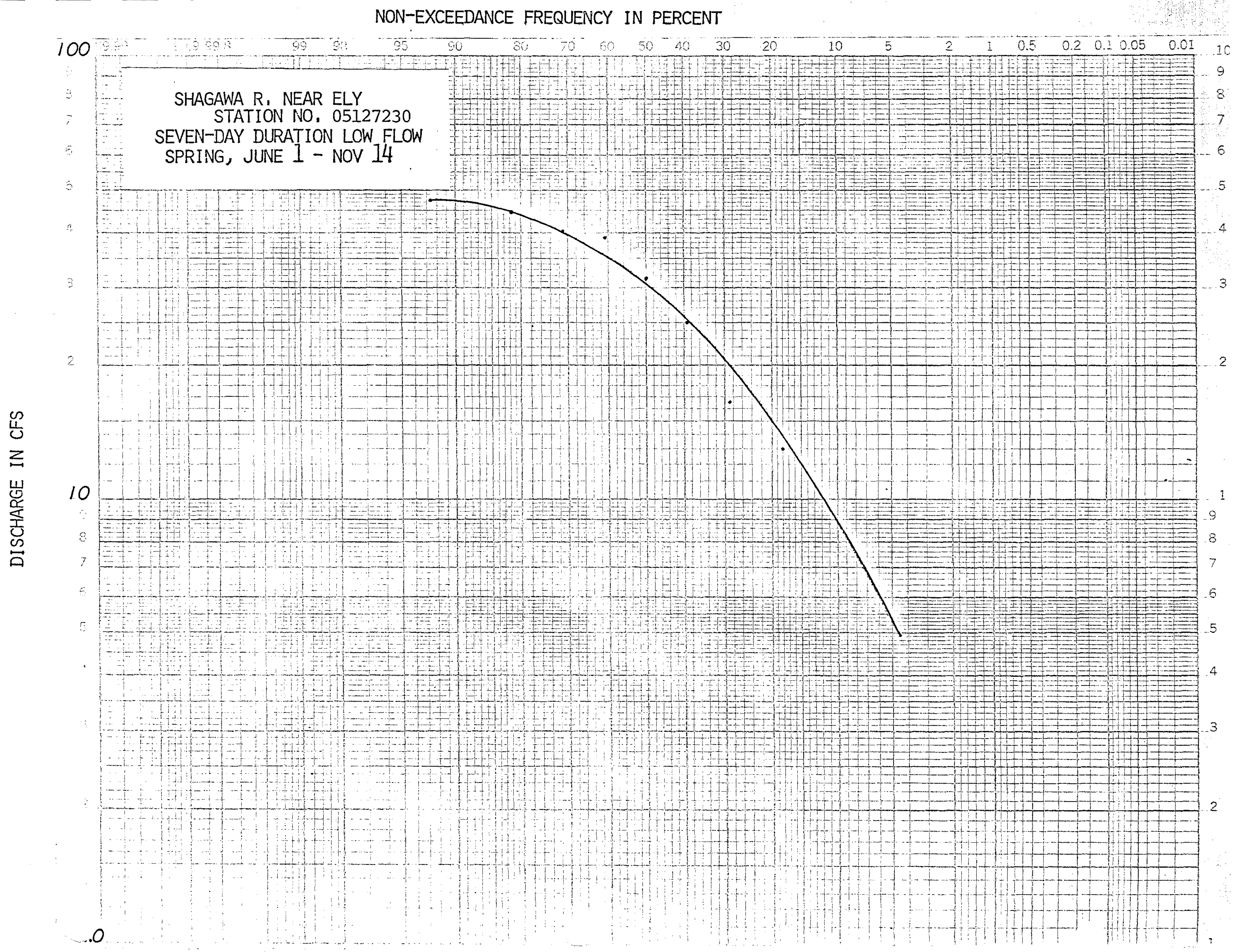
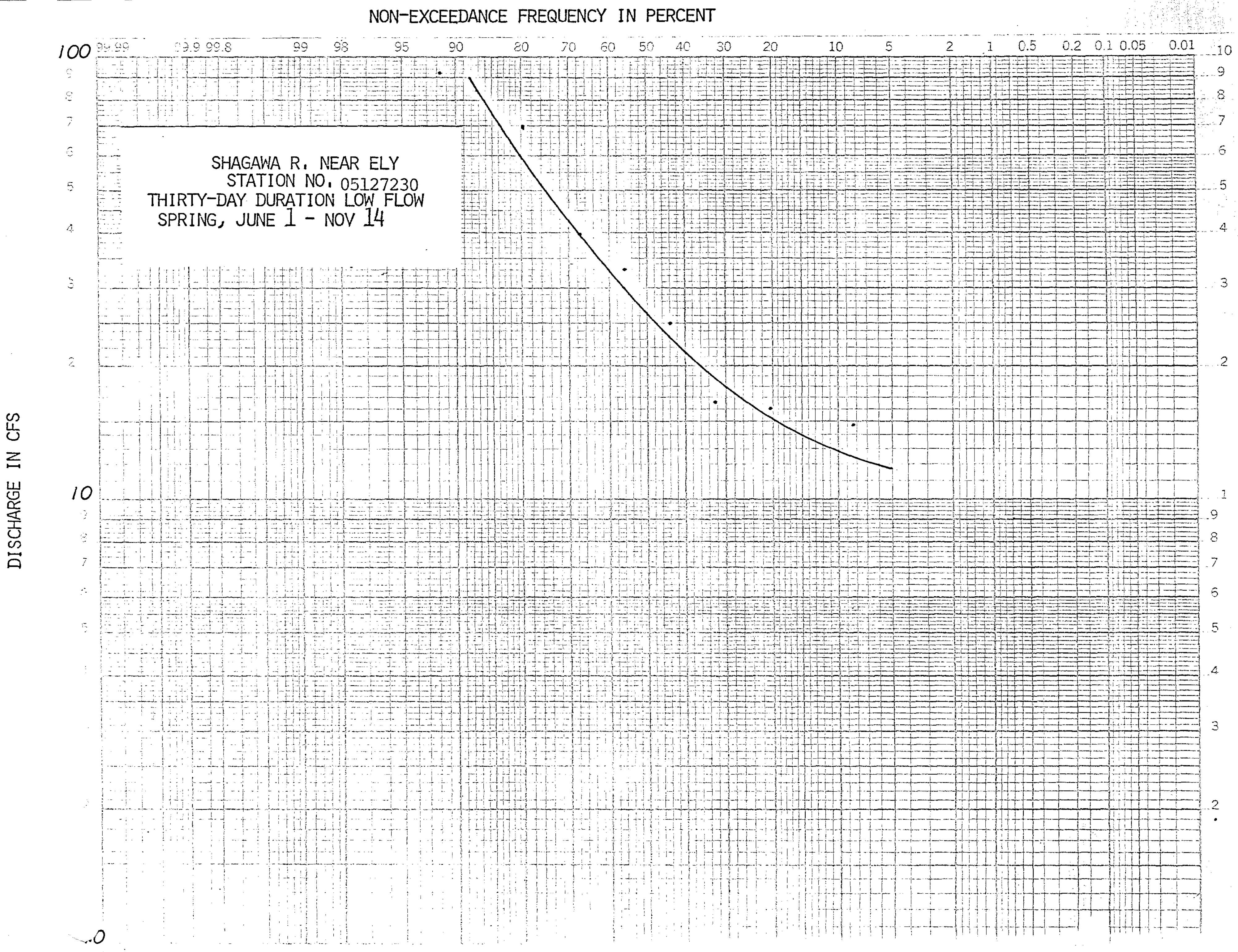
0.5
0.2
0.1
0.05
0.01
100
10
1.0

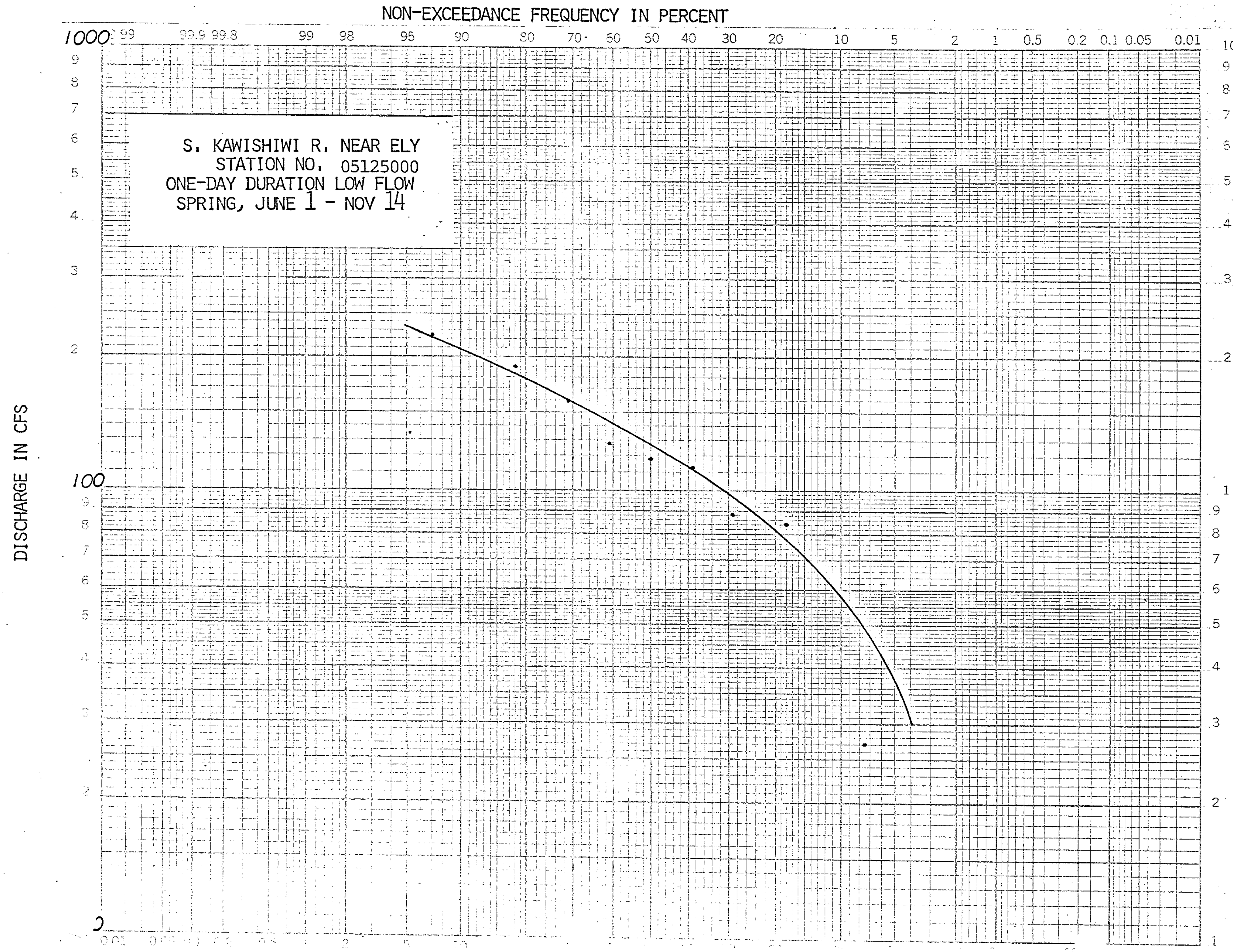


NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS



NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
SHAGAWA R. NEAR ELY
STATION NO. 05127230
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
1000
100
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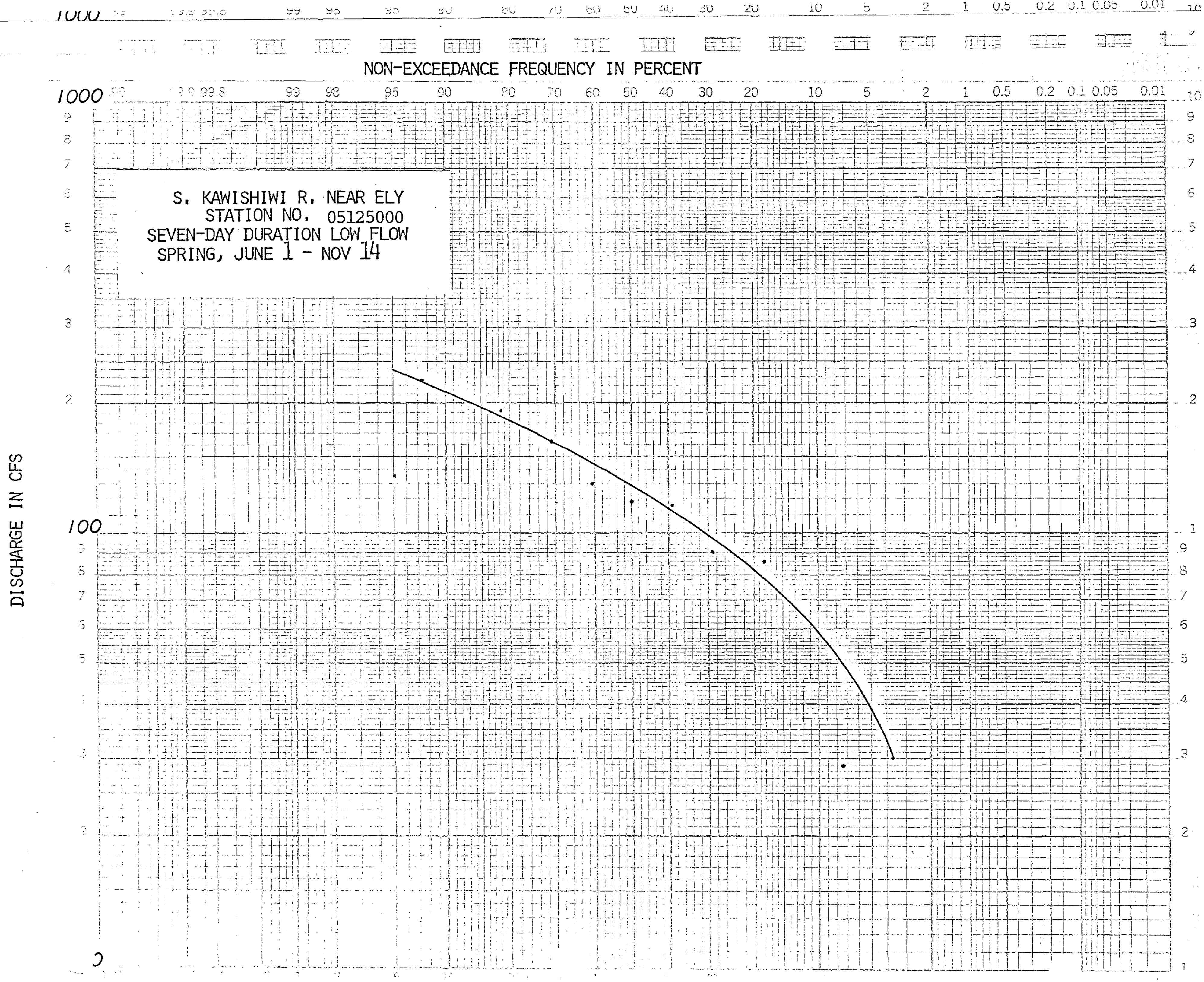
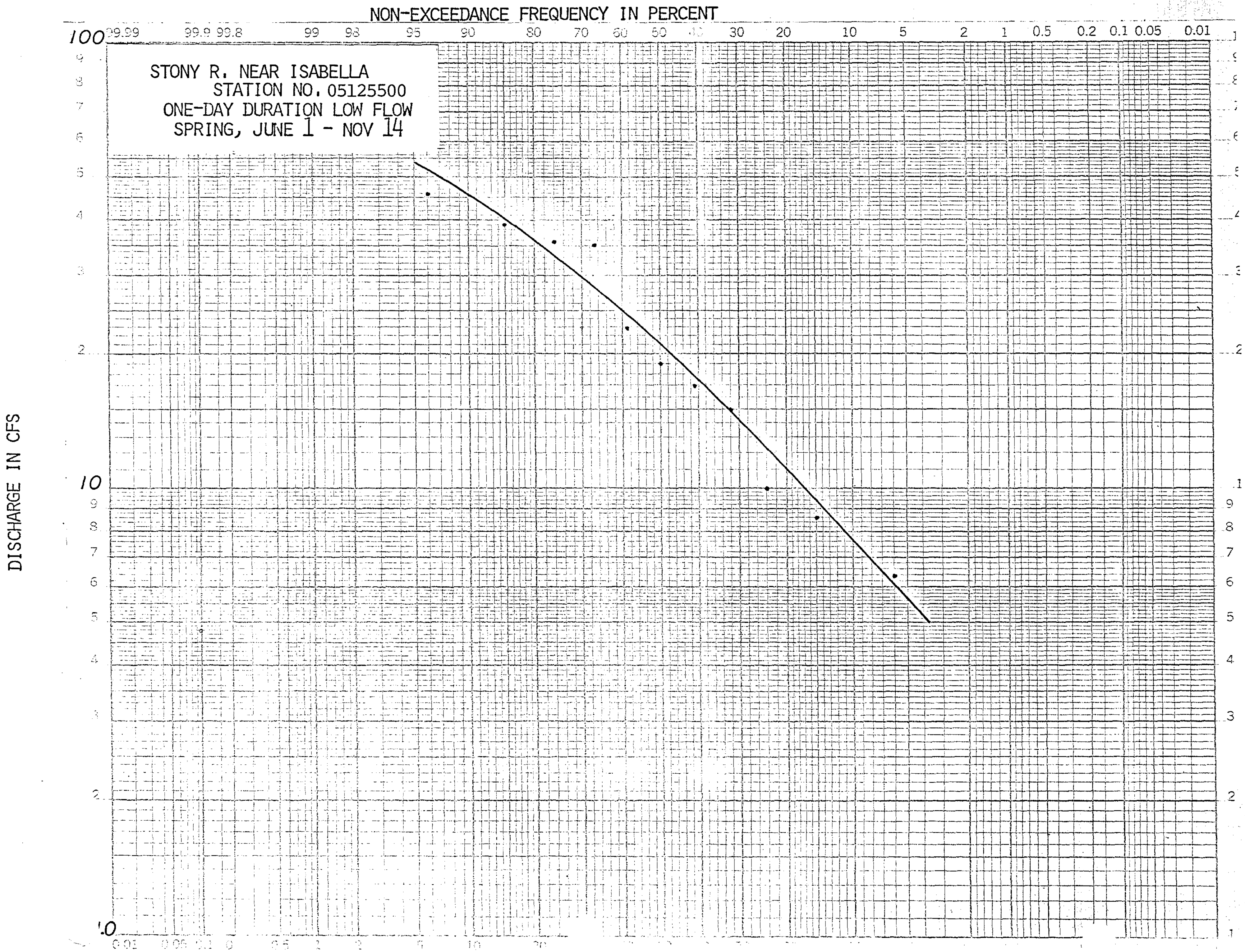
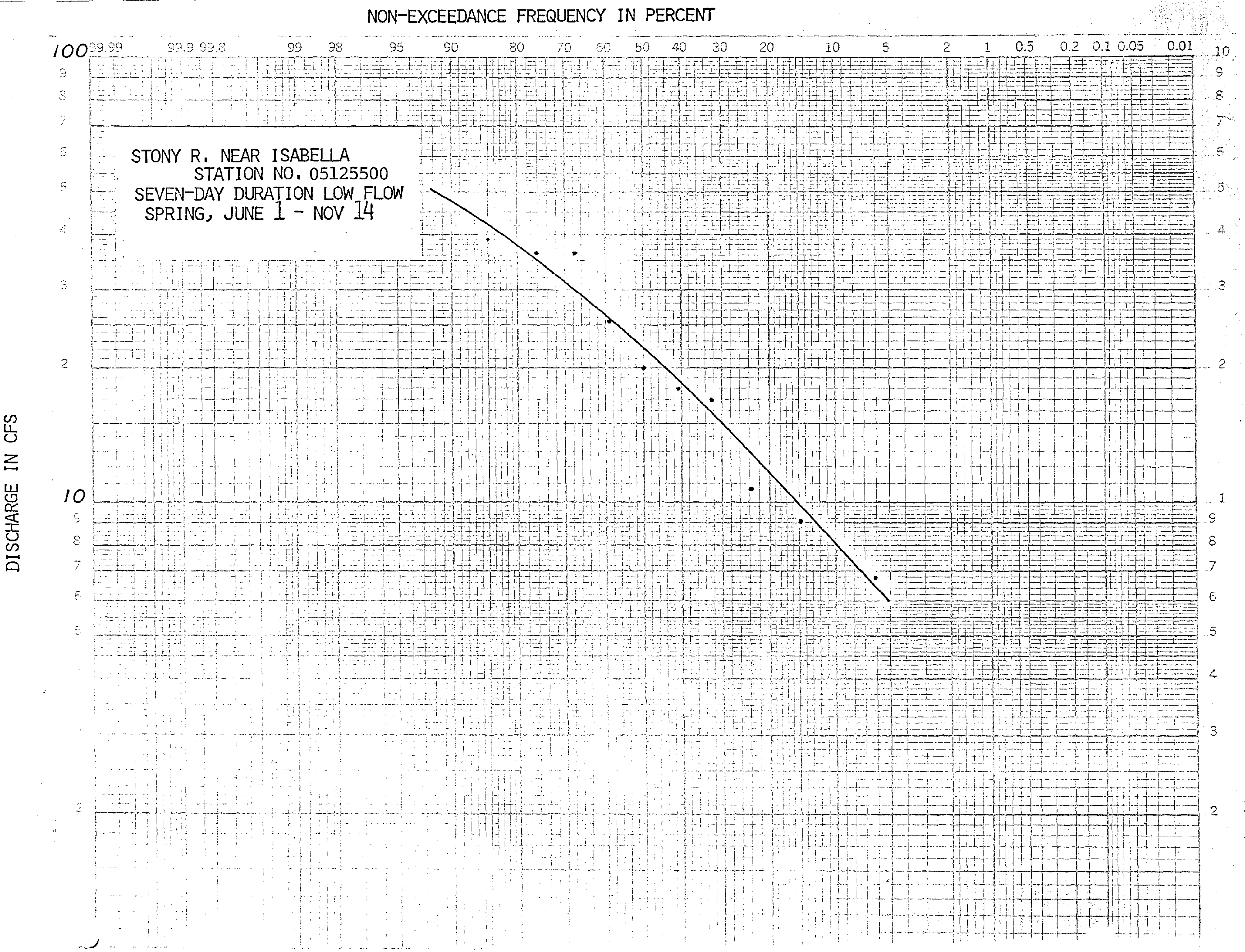

NON-EXCEEDANCE FREQUENCY IN PERCENT
S. KAWISHIWI R. NEAR ELY
STATION NO. 05125000
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1000
100
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01



NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO. 05125500
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10
1


NON-EXCEEDANCE FREQUENCY IN PERCENT
STONY R. NEAR ISABELLA
STATION NO. 05125500
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
99.99
99.9 99.8
99
98
95
90
80
70
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2
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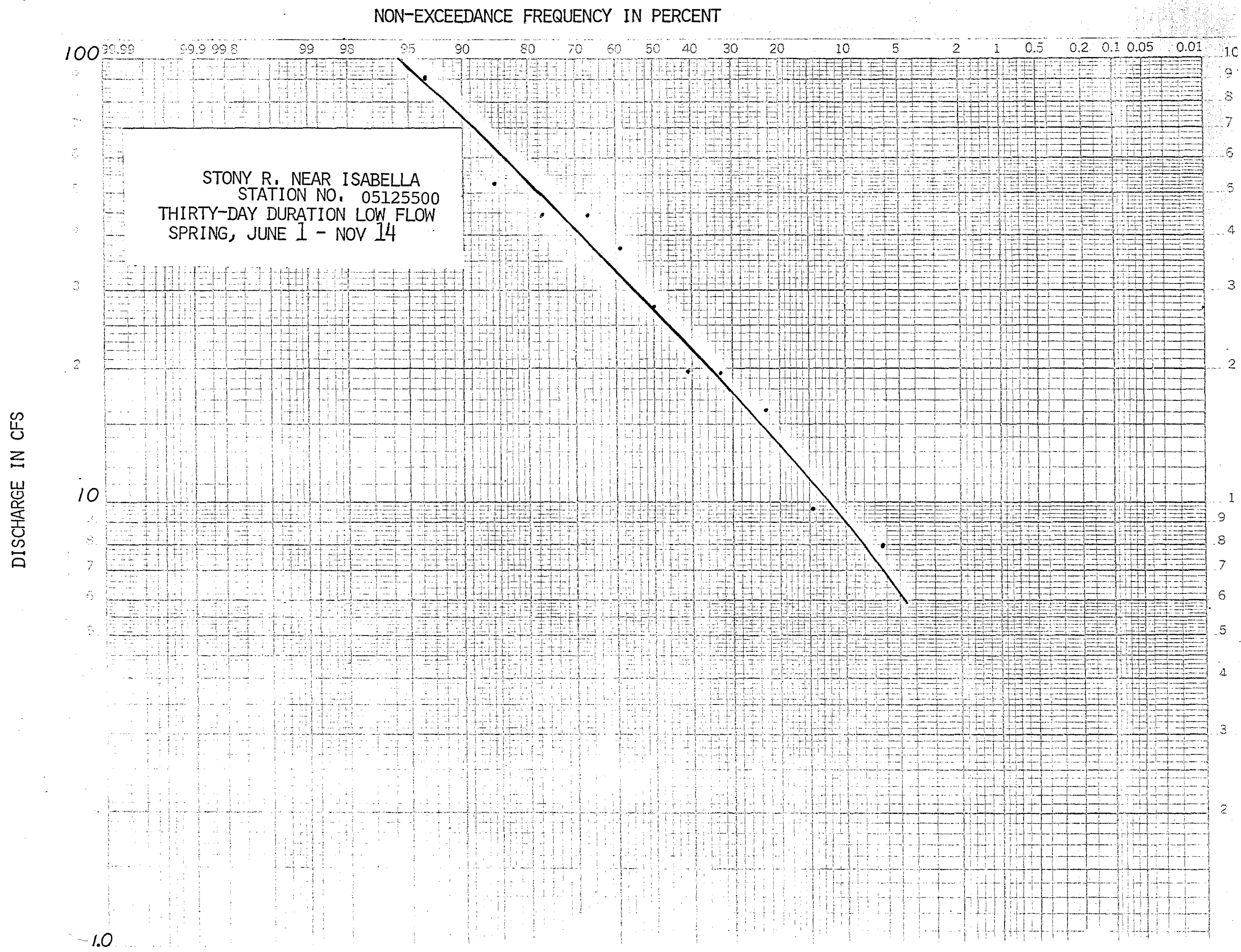
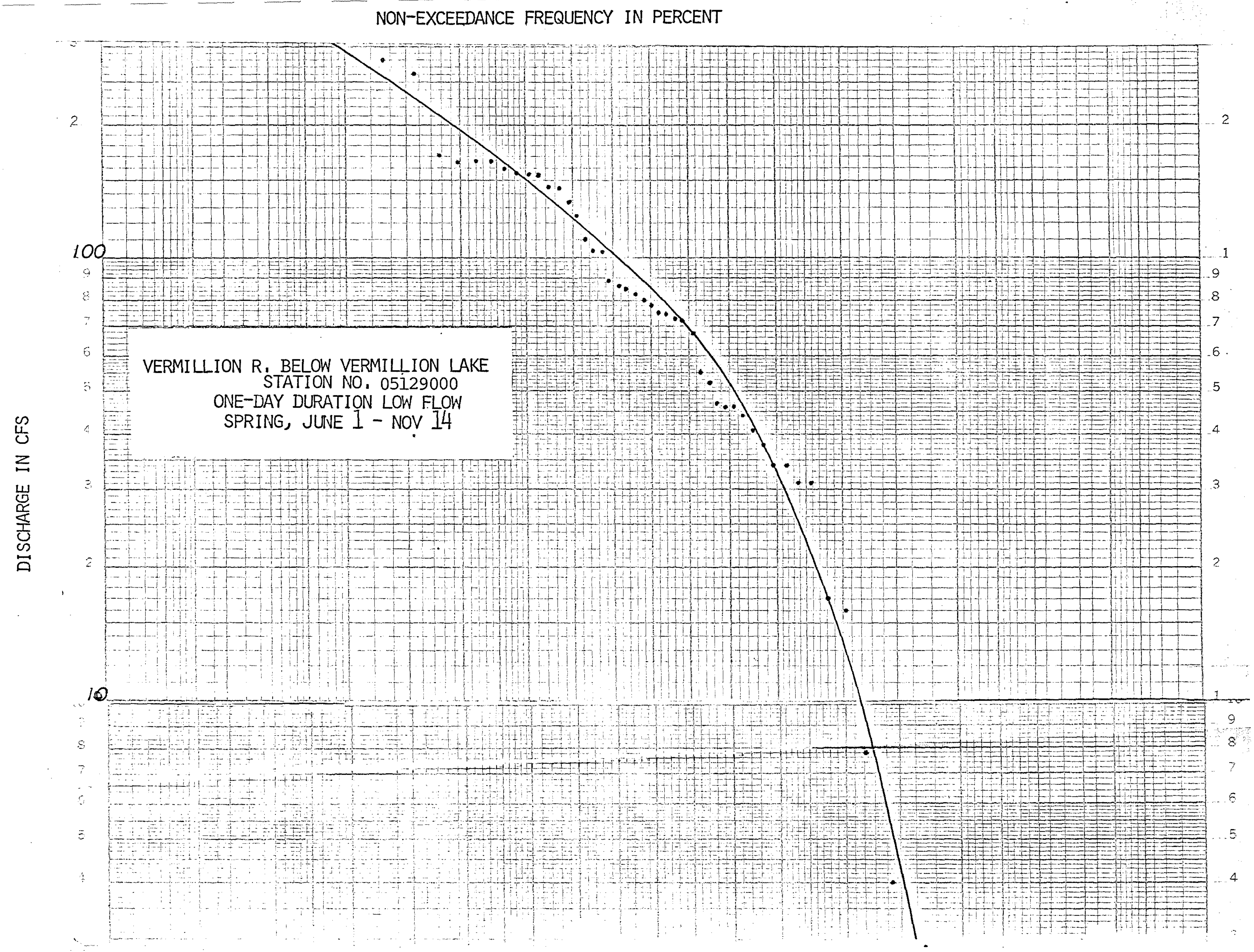
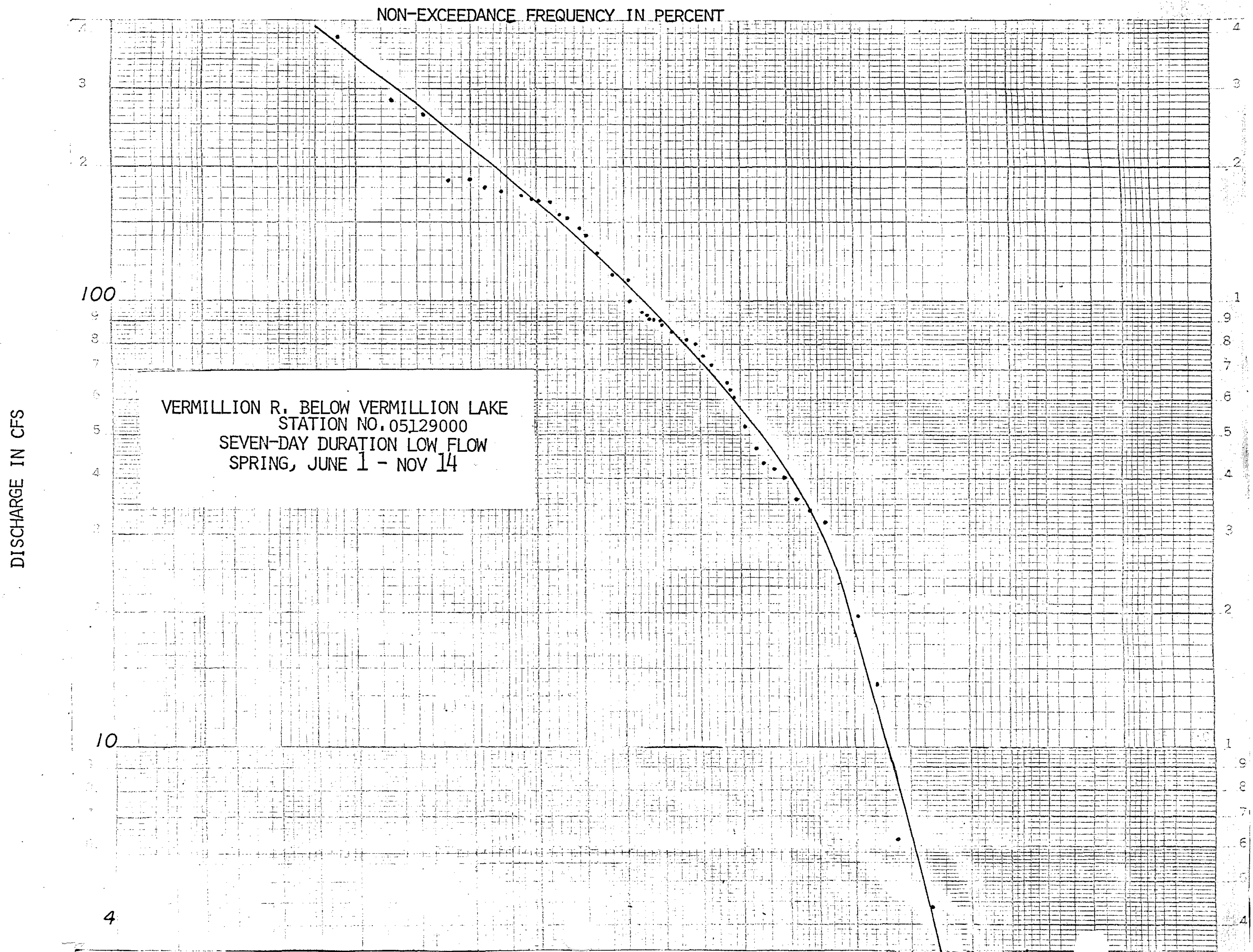
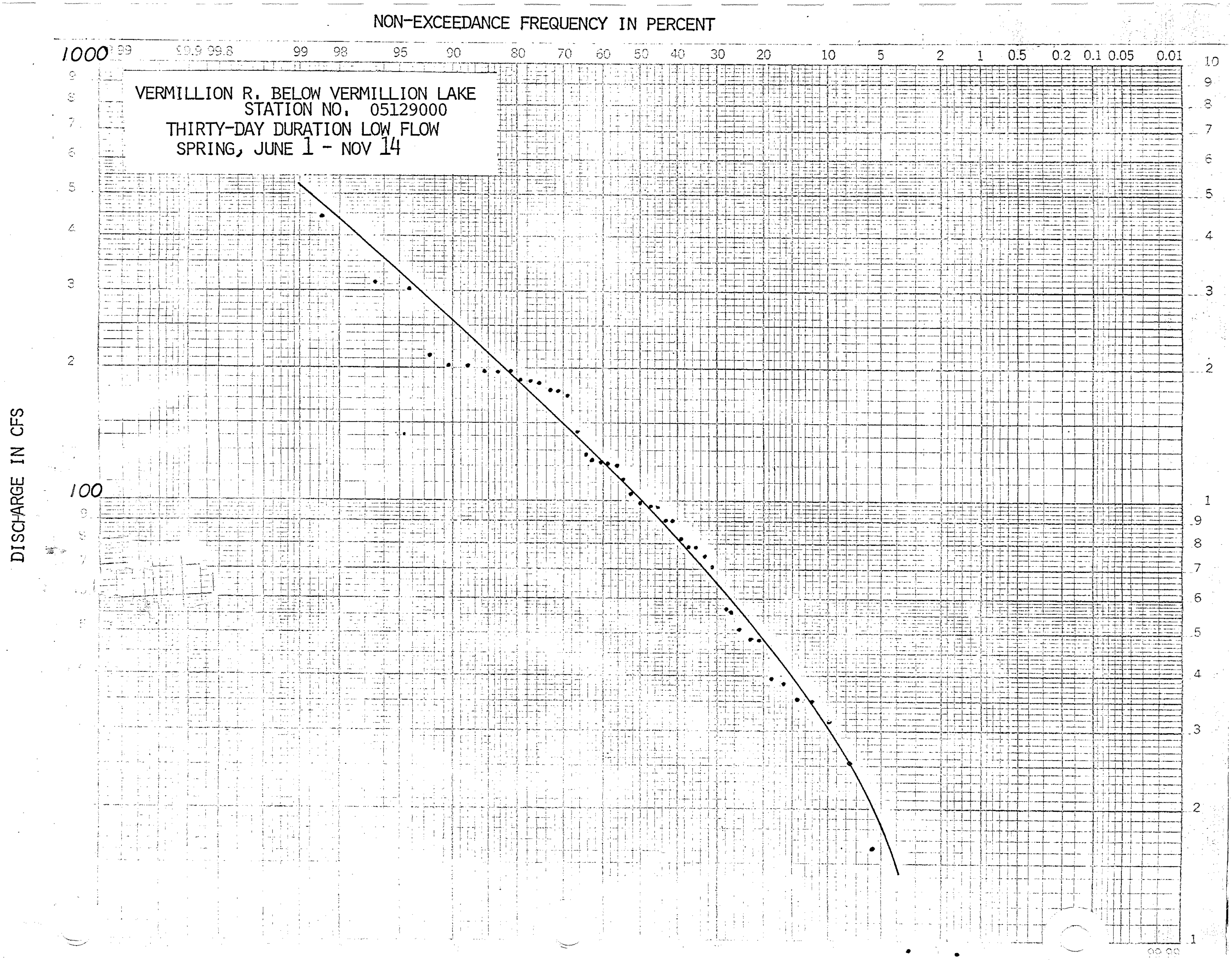
0.5
0.2
0.1
0.05
0.01
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
STONY R. NEAR ISABELLA
STATION NO. 05125500
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100
10
1.0



NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
ONE-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
100
10


NON-EXCEEDANCE FREQUENCY IN PERCENT
DISCHARGE IN CFS
100
10
4
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
SEVEN-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14



NON-EXCEEDANCE FREQUENCY IN PERCENT
VERMILLION R. BELOW VERMILLION LAKE
STATION NO. 05129000
THIRTY-DAY DURATION LOW FLOW
SPRING, JUNE 1 - NOV 14
DISCHARGE IN CFS
1000
100
99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01