

# FLOOD HAZARD ANALYSES

## STEWARTS CREEK - LOVILLS CREEK

SURRY COUNTY, NORTH CAROLINA



Prepared By

UNITED STATES DEPARTMENT OF AGRICULTURE  
Soil Conservation Service  
Raleigh, NC



In Cooperation With

North Carolina Department of Natural Resources and Community Development  
Surry Soil and Water Conservation District  
Town of Mount Airy  
Surry County Watershed Improvement Commission

June, 1979

APPENDIX 1

## TABLE OF CONTENTS

	<u>Page</u>
Introduction -----	1
Description of Study Area -----	2
Flood History -----	6
Flood Potential -----	6
Floodplain Management -----	8

## APPENDICES

- Appendix A - Flood Hazard Photomap Index and Photomaps
- Appendix B - Flood Profiles
- Appendix C - Typical Cross Sections
- Appendix D - Water Surface Elevations
- Appendix E - Investigations, Analyses, and Technical Data
- Appendix F - References
- Appendix G - Glossary
- Appendix H - North Carolina Floodway Regulation Law

APPENDIX I  
STEWARTS CREEK-LOVILLS CREEK PLAN OF WORK  
FLOOD HAZARD ANALYSES

INTRODUCTION

With growth pressure developing in Mount Airy and in the surrounding area of Surry County, the Town Council and the County Commissioners see a need to administer a land use program that will be compatible with the natural resources of both the Town of Mount Airy and Surry County. In order to administer a sound land use program, the two governing bodies have found it necessary to obtain information about the flood prone land in their respective areas of concern.

To obtain this information, the Surry County Commissioners and Mount Airy Town Council requested the Soil Conservation Service (SCS), U.S. Department of Agriculture to perform flood hazard analyses of the developing area. The Surry County Soil and Water Conservation District concurred in this request, and the North Carolina Department of Natural Resources and Community Development (DNR&CD) established a priority for this study in accordance with their joint coordination agreement, dated April, 1973.

The study area is divided into two units, Ararat River and Stewarts Creek-Lovills Creek. This division was made because the Stewarts Creek-Lovills Creek area is within the boundary of a PL-566 watershed project currently under construction (1). This report is for the Stewarts Creek-Lovills Creek portion of the requested study area.

The flood hazard analyses were carried out in accordance with the Plan of Study dated June, 1976. SCS conducted the study under authority of Section 6 of Public Law 83-566, in response to Recommendation 9(c); "Regulation of Land Use", of House Document No. 465, 89th Congress, 2nd Session and in accordance with Executive Order 11988, dated May 24, 1977.

Technical data required to define limits of flooding for the selected 10-year, 50-year, 100-year and 500-year frequency floods, and determination of floodway limits were developed by SCS. The Town of Mt. Airy and Surry County Commissioners have the responsibility of implementing the flood plain management and floodway based on the technical data developed by SCS. The delineation of the floodway is controlled by the Floodway Regulation Law, G.S. 143-215.56-61, and General Statutes G.S. 142-215.52(2) and G.S. 143-215.53, the floodway regulation law is shown in Appendix H.

#### Description of Study Area

Stewarts Creek and Lovills Creek have their headwaters along the southern edge of the Blue Ridge Parkway in Carroll County Virginia and flows south to North Carolina and through Surry County to their confluence with the Ararat River at Mount Airy, North Carolina. The Stewarts Creek study area consisted of a 16 mile reach of Stewarts Creek and a 5.4 mile reach of Pauls Creek, a tributary to Stewarts Creek. The Lovills Creek study area consists of a 6.7 mile reach on Lovills Creek. These study reaches are from the proposed structures downstream to Ararat River.

Stewarts Creek and Lovills Creek, being tributaries of Ararat River, and the Ararat River being a tributary to the Yadkin River, is designated as a part of the South Atlantic Gulf Water Resources Region by the Water Resources Council (2) and has been assigned by a hydrologic unit code of 03040101.

The study area is in the Piedmont Plateau portion of North Carolina and is characterized by hills, narrow ridges, and low knobs. The streams have cut rather narrow valleys ranging in depth from 50 to 300 feet below



the general level of the uplands (3). The most prominent feature, downstream from the study area is Pilot Mountain.

The principal soils in the study area are members of the Pacolet, Cecil, and Appling series, with smaller amounts of Durham, Louisburg, and Wilkes. The floodplain soils are members of the Congaree, Chewacla, Wedhadkee series (3).

The vicinity map shows the study area covered by these flood hazard analyses. The Stewarts Creek portion has a drainage area of 76 square miles at its confluence with the Ararat River. Lovills Creek has 36 square miles of drainage area at its confluence with the Ararat.

The flood hazard analyses performed in this study were developed for two conditions. The first condition shows the floodplain-flooded and the floodway-required with the present condition in the watershed, with structure 1A constructed on Stewarts Creek. The second condition reflects completed construction in the watershed with structure 1A on Stewarts Creek, structure 11B on Pauls Creek, and structure 9A on Lovills Creek. Table 1 shows the stream reaches studied and the acres flooded by both the 100-year flood and the 500-year flood for both present and completed project conditions.

Development in the floodplain of the study area has already occurred where the state road system crosses the floodplain. This development will continue as the urbanization of the county continues. A well managed zoning ordinance is an effective method of controlling this development so that flood damages will be minimized.

STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES

TABLE 1

STREAM REACH		Length Of Reach Miles	1/ 100-Year Floodplain Acres		1/ 500-Year Floodplain Acres		2/ 100-Year Floodplain Acres		2/ 500-Year Floodplain Acres	
From	To									
<u>STEWARTS CREEK</u>										
Confluence w/ Ararat River	SR 2000	.5	14	17	13	15				
SR 2000	SR 2258	2.0	161	196	155	181				
SR 2258	US 601	.5	38	40	36	39				
US 601	SR 1350	3.6	476	484	453	479				
SR 1350	NC 89	1.8	141	142	134	143				
NC 89	SR 1622	3.7	306	357	305	357				
SR 1622	SR 1602	2.7	88	185	88	185				
SR 1602	I-77	.23	3	8	3	8				
I-77	Str 1A	.94	1	22	1	22				
Sub-Total		<u>16.0</u>	<u>1228</u>	<u>1451</u>	<u>1188</u>	<u>1429</u>				
<u>PAULS CREEK</u>										
Confluence w/ Stewarts Crk.	SR 1624	2.7	293	330	259	291				
SR 1624	Str 11B	2.7	208	219	196	214				
Sub-Total		<u>5.4</u>	<u>501</u>	<u>549</u>	<u>455</u>	<u>505</u>				
Stewarts Creek Total		<u>21.4</u>	<u>1729</u>	<u>2000</u>	<u>1643</u>	<u>1934</u>				

1/ Present Condition  
2/ Project Completed

STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSIS

TABLE 1

STREAM REACH		Length Of Reach Miles	1/ 100-Year Floodplain Acres		1/ 500-Year Floodplain Acres		2/ 100-Year Floodplain Acres		2/ 500-Year Floodplain Acres	
FROM	TO									
LOVILLS CREEK										
Confluence w/ Ararat River	US 52 Byp	.5	45	47	44	47	44	47	47	47
US 52 Byp	US 601	.4	16	17	15	16	15	16	16	16
US 601	SR 1731	.4	13	14	11	13	11	13	13	13
SR 1731	NC 89	.8	58	62	55	59	55	59	59	59
NC 89	SR 1620	.3	17	18	15	17	15	17	17	17
SR 1620	US 52 Bus	1.3	118	125	95	113	95	113	113	113
US 52 Bus	SR 1700	2.2	184	200	52	137	52	137	137	137
SR 1700	Str 9A	.8	27	29	0	10	0	10	10	10
Total		6.7	478	512	287	412	287	412	412	412

1/ Present Conditions  
2/ Project Completed

### Flood History

Historical flood records show the June 14, 1947 flood to be the largest flood since 1904, when records were started (4). This flood, when compared to the stream gage analyses (5) (for the gage located on Ararat River at Ararat, North Carolina) was greater than the 100-year flood. This gage is located approximately twelve miles downstream from the study area.

The gage located on the Ararat River near Pilot Mountain, which is approximately three miles downstream from the gage of Ararat, North Carolina, has a longer record and list two additional large floods. The first, in October 1937, was larger than the 25-year flood, and the second, on August 14, 1940, was in excess of the 10-year flood. The most recent flood occurred in 1975 and was in excess of the two year event. Flooding in the area is caused by locally intense thunder storms, general large area storms and by hurricanes. Flooding is distributed throughout the year. During the gathering of field data for the Stewarts Creek-Lovills Creek work plan, the flood of March 12, 1963 occurred. Flood marks were obtained by the survey crew. The recorded rainfall and the flood marks correlated to approximately the five-year flood.

### Flood Potential

As long as the Stewarts Creek-Lovills Creek Watershed project remains incomplete, the potential for flooding in the study area will remain high with the annual flood causing damages in some reaches. When the watershed project is completed, the potential for flooding from the smaller flood will be decreased. However, there will be some areas with residual flooding. A well managed floodplain management program can limit the damages from the remaining flood potential.



Flood damage on Lovills Creek from April 1963 flood.



Flooding along Stewarts Creek below Junction of Pauls Creek from April 1978 flood.



Flooding along Stewarts Creek downstream from Junction of Pauls Creek  
from February, 1966 flood.



Warehouse flooded on Lovills Creek from February, 1973 flood.

Located in Appendix A, are Flood Hazard Area Photomaps showing the stream reaches studied. On these photomaps the areas subjected to flooding by the 100-year and 500-year floods are delineated, and a proposed theoretical floodway is shown for the existing conditions and the completed project conditions. Complimenting these photomaps are Flood Profiles located in Appendix B. These profiles show the floodwater elevations for the 10-year, 50-year, 100-year and 500-year floods at all points in the study area for both conditions discussed above. Shown on both the profiles and the photomaps are the roads crossing the stream and the location of all the surveyed cross sections used in making the study analyses. Typical cross sections showing the general shape of the valley and depth of flooding are located in Appendix C.

Location of areas subject to flooding and the depth of flooding incurred under floods of varying frequencies can be determined by utilizing Appendices A and B. Utilization of the Appendices is as follows:

1. Locate area of concern on the Flood Hazard Photomap.
2. If the point is within delineated flood prone areas,
3. Locate the point along streams relative to the surveyed cross section and the roads crossing the stream.
4. Turn to the profile.
5. Find profile representing desired reach of stream.
6. Locate point on the profiles using road crossings and surveyed sections.
7. Read flood water elevations from the profile.

The likelihood of a particular property's flooding can be determined by the predescribed process. However, the exact elevation at the point of interest must be determined by field surveys using the elevation reference marks located on the photomaps and described in Table 3, located in Appendix E.

## Floodplain Management

Minimization of flood damages can be obtained through active floodplain management. Contained in a floodplain management program should be both corrective and regulatory measures. Regulatory measures, while not affecting flooding, reduce the flood damage or loss of life by discouraging development on floodplains. Regulatory measures include:

1. Floodplain regulations
2. Land use restrictions
3. Development policies
4. Green belts or open space
5. Flood insurance

Measures related to these are tax adjustments and warning signs posted in the floodplain.

Corrective measures act to reduce the extent of flooding and thereby reduce the resulting damages. Included in corrective measures are:

1. Land treatments
2. Floodwater retarding structures
3. Stream improvements
4. Levees or floodwalls
5. Management program for existing reservoirs
6. Flood proofing of structures
7. Floodplain reclamations
8. Floodwater and warning systems

The Water Resources Council published a report entitled "Regulation of Flood Hazard Areas to Reduce Flood Losses", in 1971 and 1972. This report contains general draft statutes for flood hazard ordinances and regulations, discusses specific legal considerations, and includes useful information on the techniques for managing flood hazard areas. This two-volume report



is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 at a cost of \$2.50 for Vol. I and \$2.00 for Vol. II. A reference copy is available in Soil Conservation Service Office at 310 New Bern Avenue, Raleigh, North Carolina 27611.

Assistance in developing a floodplain management program, is available from the Piedmont Triad Council of Governments and from the State of North Carolina, Department of Natural Resources and Community Development, Division of Community Assistance. Some of the alternative techniques of minimizing flood damages are discussed in the following sections.

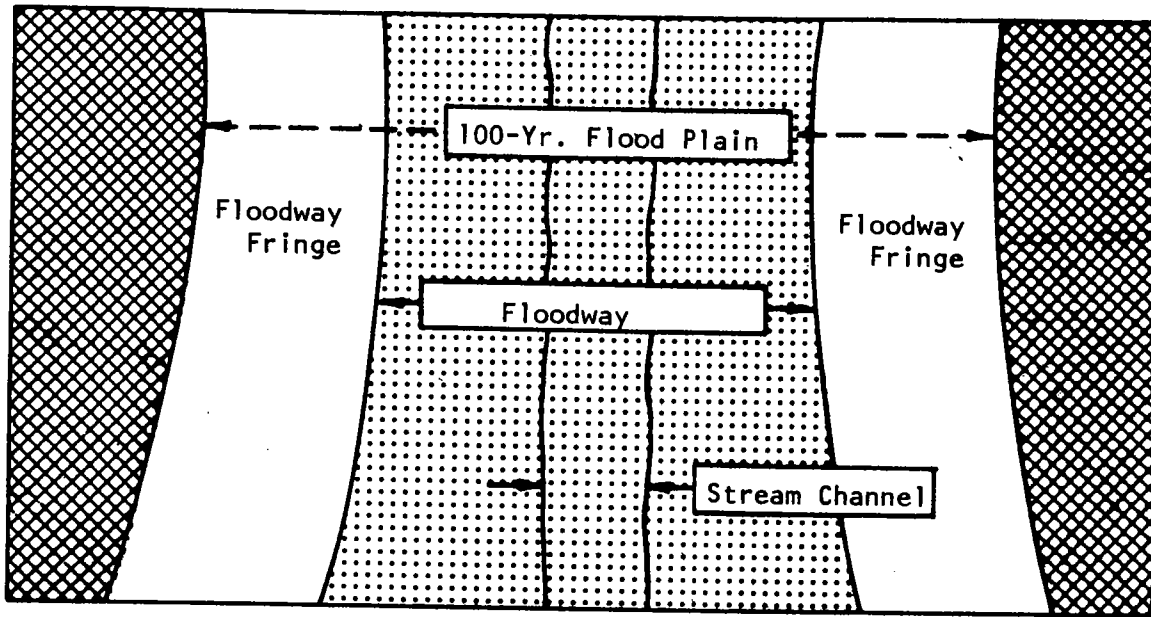
### Regulatory Measures

Floodplain management nonstructural alternatives which reduce flood water damages by controlling development in the floodplain include:

Floodways - Any encroachment on floodplains, such as land fill, reduces the flood-carrying capacity of the floodplain, thus increasing the flood hazards in areas beyond the encroachment itself. However, restricting all development in the floodplain can deprive property owners from any economic gain from their property. The concept of a floodway is a floodway management tool that balances economic gain from floodplain development against the resulting increase in flood hazard.

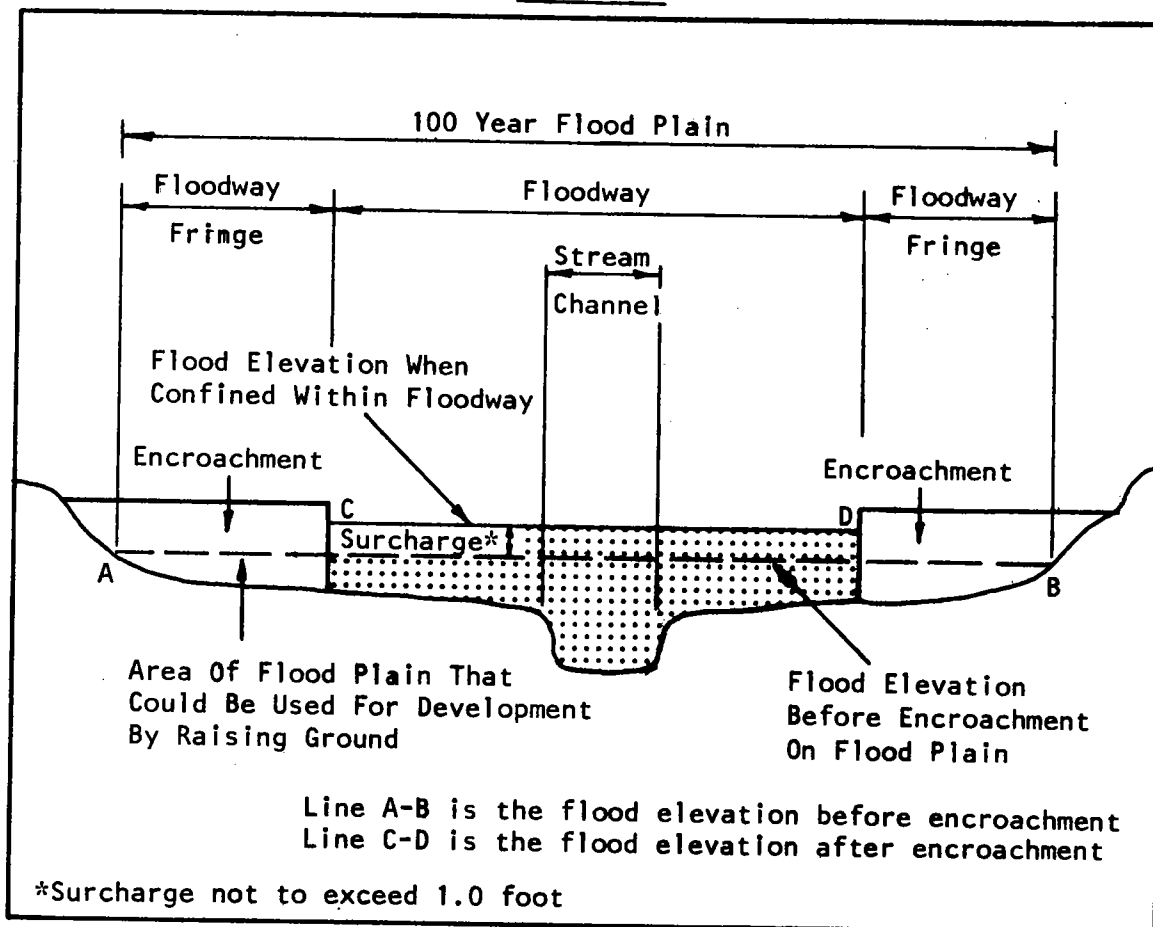
The floodway concept consists of dividing the area inundated by the 100-year flood into a floodway and floodway fringe. The floodway is the stream channel and any immediately adjacent floodplain areas that must be kept free of encroachment in order that the 100-year flood might be carried without a substantial increase in flood heights. The State of North Carolina has determined a substantial increase to be one foot. The lateral floodway boundaries are two definitely established lines, one on each side of the stream, between which no construction or fill should be permitted. The floodway fringe is the remaining area of the 100-year floodplain and is the floodplain area upon which fill and construction could be allowed. (See Figure 1 and Table 2).

FIGURE 1



PLAN

SECTION



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
A	600	243	3748	3.06	990.5	989.5	1.0
B	1320	125	2400	4.78	990.9	989.9	1.0
Southern Railway							
C	1520	-	-	-	-	-	-
D	1700	342	5265	2.18	991.8	990.8	1.0
E	2660	273	4331	2.66	992.3	991.3	1.0
SR 2000							
F	2780	-	-	-	-	-	-
G	2880	132	2823	4.08	992.5	991.5	1.0
H	4800	965	13413	0.87	993.3	992.3	1.0
I	7320	491	5268	2.24	994.7	993.7	1.0
J	10000	1221	10563	1.12	995.2	994.2	1.0
K	13040	99	1738	7.02	1002.2	1001.2	1.0
SR 2258							
L	13220	-	-	-	-	-	-
M	13380	108	1557	7.83	1003.0	1002.0	1.0
N	14980	601	6899	1.80	1004.5	1003.5	1.0
US 601							
O	15740	-	-	-	-	-	-
P	15850	1138	14173	0.88	1006.6	1005.6	1.0
Q	16180	669	8507	1.64	1006.8	1005.8	1.0
R	18180	1359	14416	0.98	1008.8	1007.8	1.0
S	20540	964	7180	2.00	1010.5	1009.5	1.0
T	21600	921	6601	2.26	1012.3	1011.3	1.0
U	24160	623	4167	3.59	1015.0	1014.0	1.0
V	25360	257	2624	5.70	1018.3	1017.3	1.0
W	27120	1155	6714	2.28	1020.2	1019.2	1.0
X	30720	381	3110	4.94	1029.5	1028.5	1.0
Y	32700	1033	5715	2.72	1032.3	1031.3	1.0
Z	34650	95	1671	9.27	1041.3	1040.3	1.0
SR 1350							
AA	34750	-	-	-	-	-	-
AB	34850	412	5592	2.77	1044.5	1043.5	1.0

Feet above confluence with Ararat River.

TABLE 2

SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

# FLOODWAY DATA

STEWARTS CREEK PRESENT CONDITIONS

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
X	37150	149 ✓	2217	7.11	1052.2	1051.2	1.0
Y	39950	1143 ✓	12174	1.30	1053.6	1052.6	1.0
Z	41750	569 ✓	5490	2.88	1055.0	1054.0	1.0
AA	42730	562 ✓	5588	2.85	1056.0	1055.0	1.0
AB	44330	114 ✓	1782	9.06	1059.2	1058.2	1.0
89	44440	-	-	-	-	-	-
AC	44630	402 ✓	5498	2.94	1062.0	1061.0	1.0
AD	45430	325 ✓	2204	2.95	*1062.5	1061.5	1.0
AE	46130	812 ✓	4823	1.35	*1062.5	1061.5	1.0
AF	46610	681 ✓	3876	1.68	*1062.5	1061.5	1.0
AG	49235	425 ✓	1828	3.74	1066.0	1065.0	1.0
AH	50955	191 ✓	1358	5.04	1071.3	1070.3	1.0
AI	53555	248 ✓	1192	4.36	1080.0	1079.0	1.0
AJ	55035	292 ✓	1406	3.66	1084.9	1083.9	1.0
AK	56235	351 ✓	1308	3.92	1089.0	1088.0	1.0
AL	57275	244 ✓	1121	4.56	1094.0	1093.0	1.0
AM	58875	403 ✓	1420	3.50	1098.0	1097.0	1.0
AN	60275	160 ✓	885	5.58	1104.2	1103.2	1.0
AO	61675	169 ✓	734	6.64	1113.5	1112.5	1.0
AP	64075	157 ✓	871	5.55	1123.9	1122.9	1.0
1622	64185	-	-	-	-	-	-
AQ	64285	181 ✓	1600	3.02	1126.0	1125.0	1.0
AR	66445	356 ✓	1684	2.77	1133.6	1132.6	1.0
AS	67605	110 ✓	816	5.65	1139.6	1138.6	1.0
AT	69805	171 ✓	613	3.24	1146.0	1145.0	1.0
AU	71525	36 ✓	222	4.67	1152.9	1151.9	1.0
AV	73085	108 ✓	362	2.71	1162.0	1161.0	1.0
AW	75085	35 ✓	185	4.94	1175.4	1174.4	1.0

Feet above confluence with Ararat River

\* Backwater elevations from Pauls Creek



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

## FLOODWAY DATA

STEWARTS CREEK PRESENT CONDITIONS

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
AX	76845	<del>41</del>	217	3.82	1185.9	1184.9	1.0
AY	78445	<del>50</del>	231	3.25	1193.6	1192.6	1.0
SR 1602	78495	-	-	-	-	-	-
AZ	78595	50 ✓	193	3.88	1195.0	1194.0	1.0
BA	78635	<del>60</del>	214	2.93	1207.7	1206.7	1.0
I-77	79735	-	-	-	-	-	-
BB	79835	80 ✓	194	3.24	1210.0	1209.0	1.0
BC	81195	<del>37</del>	176	3.41	1217.6	1216.6	1.0
BD	83035	50 ✓	219	2.55	1221.5	1220.5	1.0
STR 1A	84715	60	210	2.41	1231.5	1230.5	1.0

Feet above confluence with Ararat River



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

STEWARTS CREEK-LOVILLIS CREEK  
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CARROLL COUNTY, VIRGINIA

## FLOODWAY DATA

STEWARTS CREEK PRESENT CONDITIONS

TABLE 2

FLOODING SOURCE			FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)	
SR 1621	BE	180	8154	1.29	1063.2	1062.2	1.0	
	BF	270	-	-	-	-	-	
	BG	390	448	1.53	1065.0	1064.0	1.0	
	BH	2230	1073	1.24	1065.2	1064.2	1.0	
	BI	5110	469	2.73	1068.7	1067.7	1.0	
	BJ	7470	378	5.15	1079.2	1078.2	1.0	
	BK	8870	567	3.29	1085.0	1084.0	1.0	
	BL	10870	1027	3.08	1091.2	1090.2	1.0	
	BM	12070	344	5.08	1103.2	1102.2	1.0	
	BN	13950	282	2417	4.72	1107.2	1106.2	1.0
SR 1624	14050	-	-	-	-	-	-	
	14150	319	3643	3.13	1110.5	1109.5	1.0	
	15630	501	4216	2.73	1111.9	1110.9	1.0	
	19430	394	2465	4.66	1122.5	1121.5	1.0	
	23110	502	1840	3.37	1134.6	1133.6	1.0	
STR 11B	25670	356	1417	4.15	1146.9	1145.9	1.0	
	28150	65	607	9.30	1160.5	1159.5	1.0	

<sup>1</sup>Feet above confluence with Stewarts Creek



SOIL CONSERVATION SERVICE  
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STEWARTS CREEK-LOVILLIS CREEK  
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CARROLL COUNTY, VIRGINIA


TABLE 2

FLOODWAY DATA

PAULS CREEK PRESENT CONDITIONS

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
A	140	296	3307	2.37	993.2	992.2	1.0
B	1100	841	9973	0.78	993.4	992.4	1.0
C	2245	650	7143	1.09	993.5	992.5	1.0
US 52 Byp	2445	-	-	-	-	-	-
D	2555	639	8018	0.97	993.7	992.7	1.0
E	3115	538	4349	1.79	994.0	993.0	1.0
F	4075	217	1897	4.11	996.7	995.7	1.0
US 601	4375	-	-	-	-	-	-
G	4615	164	1493	5.23	998.1	997.1	1.0
H	5615	283	2349	3.32	1000.0	999.0	1.0
I	6215	221	1550	5.03	1002.8	1001.8	1.0
SR 1731	6345	-	-	-	-	-	-
J	6515	281	2885	2.70	1004.0	1003.0	1.0
K	7395	331	3065	2.54	1005.1	1004.1	1.0
L	8275	530	3516	2.21	1005.9	1004.9	1.0
M	9235	342	2489	3.12	1007.8	1006.8	1.0
N	10395	436	2566	3.03	1011.0	1010.0	1.0
NC 89	10645	-	-	-	-	-	-
O	10845	501	3045	2.55	1012.2	1011.2	1.0
P	11555	408	2178	3.57	1013.7	1012.7	1.0
Q	12115	201	1141	6.82	1016.0	1015.0	1.0
SR 1670	12265	-	-	-	-	-	-
R	12605	540	4789	1.62	1019.5	1018.5	1.0
S	13325	386	2834	2.75	1020.4	1019.4	1.0
T	13725	553	4133	1.88	1021.0	1020.0	1.0
U	14525	547	2323	3.35	1023.6	1022.6	1.0
V	15805	726	3461	2.25	1025.5	1024.5	1.0
W	17405	439	1960	3.92	1028.9	1027.9	1.0

<sup>1</sup> Feet above confluence with Ararat River

 SOIL CONSERVATION SERVICE  
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 CARROLL COUNTY, VIRGINIA

## FLOODWAY DATA

LOVILLS CREEK PRESENT CONDITIONS

TABLE 2

FLOODING SOURCE			FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)	
X	18285	267	1171	6.56	1033.1	1032.1	1.0	
Y	18965	269	1643	4.67	1036.8	1035.8	1.0	
Z	19165	141	1007	7.61	1037.4	1036.4	1.0	
US 52 Bus	19265	-	-	-	-	-	-	
AA	19365	80	821	9.33	1040.8	1039.8	1.0	
AB	19685	683	5286	1.45	1042.2	1041.2	1.0	
AC	20805	521	2911	2.63	1043.7	1042.7	1.0	
AD	21905	220	1373	5.56	1048.0	1047.0	1.0	
AE ✓	23585 <del>825</del>	67	858	8.88	1057.9	1056.9	1.0	
AF ✓	25185 <del>425</del>	480	2542	2.99	1061.4	1060.4	1.0	
AG ✓	26385 <del>625</del>	328	1835	4.14	1065.8	1064.8	1.0	
AH ✓	27585 <del>825</del>	152	1192	6.34	1071.2	1070.2	1.0	
AI ✓	29185 <del>425</del>	640	3649	2.05	1073.4	1072.4	1.0	
AJ ✓	29955 <del>3045</del>	310	1226	6.10	1077.5	1076.5	1.0	
AK ✓	30755 <del>945</del>	389	1999	3.72	1079.5	1078.5	1.0	
SR 1700	30815 <del>31055</del>	-	-	-	-	-	-	
AL ✓	30965 <del>31205</del>	697	4903	1.52	1085.0	1084.0	1.0	
AM ✓	31965 <del>32205</del>	227	1701	4.37	1086.6	1085.6	1.0	
AN ✓	33045 <del>33285</del>	87	838	8.85	1090.8	1089.8	1.0	
AO	34245 <del>34485</del>	109	882	8.33	1099.0	1098.0	1.0	
STR 9A	35245	109	882	8.33	1107.4	1106.4	1.0	

Feet above confluence with Ararat River



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURRY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

TABLE 2

## FLOODWAY DATA

LOVILLS CREEK PRESENT CONDITIONS



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
A	600	189	2279	3.39	990.5	*989.5	1.0
B	1320	101	1688	4.59	990.5	*989.5	1.0
SOUTHERN RAILWAY	1520	-	-	-	-	-	-
C	1700	309	3510	2.21	990.5	*989.5	1.0
D	2660	209	2667	2.91	990.5	*989.5	1.0
SR 2000	2780	-	-	-	-	-	-
E	2880	99	1945	3.99	990.5	*989.5	1.0
F	4800	851	8290	0.97	990.5	*989.5	1.0
G	7320	444	3507	2.24	991.8	990.8	1.0
H	10000	1138	6948	1.13	992.7	991.7	1.0
I	13040	90	1361	5.87	999.0	998.0	1.0
SR 2258	13220	-	-	-	-	-	-
J	13380	93	1071	7.46	999.6	998.6	1.0
K	14980	530	4310	1.87	1001.0	1000.0	1.0
US 601	15740	-	-	-	-	-	-
L	15850	1052	9110	0.88	1002.8	1001.8	1.0
M	16180	604	5428	1.57	1003.0	1002.0	1.0
N	18180	1135	6767	1.27	1004.1	1003.1	1.0
O	20540	603	3070	2.82	1007.6	1006.6	1.0
P	21600	763	3797	2.36	1010.0	1009.0	1.0
Q	24160	545	2748	3.26	1013.3	1012.3	1.0
R	25360	219	1803	4.97	1016.1	1015.1	1.0
S	27120	792	3535	2.58	1018.5	1017.5	1.0
T	30720	262	1948	4.70	1028.0	1027.0	1.0
U	32700	609	3349	2.75	1031.0	1030.0	1.0
V	34650	83	1236	7.46	1038.0	1037.0	1.0

Feet above confluence with Ararat River

\*\* Backwater elevations from Ararat River



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

STEWARTS CREEK-LOVILLIS CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

TABLE 2

## FLOODWAY DATA

STEWARTS CREEK PROJECT COMPLETED

FLOODING SOURCE		FLOODWAY			BASE FLOOD		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
SR 1350	34750	-	-	-	-	-	-
W	34850	222	2664	3.46	1039.9	1038.9	1.0
X	37150	117	1393	6.71	1048.1	1047.1	1.0
Y	39950	975	6517	1.44	1049.5	1048.5	1.0
Z	41750	504	3380	2.78	1052.0	1051.0	1.0
AA	42730	506	3649	2.58	1053.2	1052.2	1.0
AB	44330	88	1232	7.74	1056.0	1055.0	1.0
NC 89	44440	-	-	-	-	-	-
AC	44630	341	3362	2.84	1057.8	1056.8	1.0
AD	45430	325	2204	2.95	1058.5	1057.5	1.0
AE	46130	812	4823	1.35	1059.0	1058.0	1.0
AF	46610	681	3876	1.68	1059.4	1058.4	1.0
AG	49235	425	1828	3.74	1066.0	1065.0	1.0
AH	50955	191	1358	5.04	1071.3	1070.3	1.0
AI	53555	248	1192	4.36	1080.0	1079.0	1.0
AJ	55035	292	1406	3.66	1084.9	1083.9	1.0
AK	56235	351	1308	3.92	1089.0	1088.0	1.0
AL	57275	244	1121	4.56	1094.0	1093.0	1.0
AM	58875	403	1420	3.50	1098.0	1097.0	1.0
AN	60275	160	885	5.58	1104.2	1103.2	1.0
AO	61675	169	734	6.64	1113.5	1112.5	1.0
AP	64075	157	871	5.55	1123.9	1122.9	1.0
SR 1622	64185	-	-	-	-	-	-
AQ	64285	181	1600	3.02	1126.0	1125.0	1.0
AR	66445	356	1684	2.77	1133.6	1132.6	1.0
AS	67605	110	816	5.65	1139.6	1138.6	1.0
AT	69805	171	613	3.24	1146.0	1145.0	1.0

Feet above confluence with Ararat River

TABLE 2

 SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

## FLOODWAY DATA

STEWARTS CREEK PROJECT COMPLETED

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (FPS.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
AU	71525	36	222	4.67	1152.9	1151.9	1.0
AV	73085	108	362	2.71	1162.0	1161.0	1.0
AW	75085	35	185	4.94	1175.4	1174.4	1.0
AX	76845	41	217	3.82	1185.9	1184.9	1.0
AY	78445	50	231	3.25	1193.6	1192.6	1.0
SR 1602	78495	-	-	-	-	-	-
AZ	78595	50	193	3.88	1195.0	1194.0	1.0
BA	78635	60	214	2.93	1207.7	1206.7	1.0
I-77	79735	-	-	-	-	-	-
BB	79835	80	194	3.24	1210.0	1209.0	1.0
BC	81195	37	176	3.41	1217.6	1216.6	1.0
BD	83035	50	219	2.55	1221.5	1220.5	1.0
STR 1A	84715	60	210	2.41	1231.5	1230.5	1.0

<sup>1</sup> Feet above confluence with Ararat River



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURRY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

TABLE 2

## FLOODWAY DATA

STEWARTS CREEK PROJECT COMPLETED

FLOODING SOURCE		FLOODWAY		BASE FLOOD		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)
PAULS CREEK						
BE	180	420	2575	1.76	1057.9	*1056.9
SR 1621	270	-	-	-	-	-
BF	390	325	2531	1.79	1057.9	*1056.9
BG	2230	785	2246	2.05	1060.2	1059.2
BH	5110	255	1633	2.85	1065.5	1064.5
BI	7470	259	1222	3.85	1078.0	1077.0
BJ	8870	334	1470	3.32	1083.0	1082.0
BK	10870	631	1497	3.31	1089.8	1088.8
BL	12070	222	909	5.48	1100.5	1099.5
BM	13950	217	1466	3.44	1104.7	1103.7
SR 1624	14050	-	-	-	-	-
BN	14150	193	1385	3.64	1105.2	1104.2
BO	15630	390	1786	2.85	1108.1	1107.1
BP	19430	301	1431	3.56	1120.7	1119.7
BQ	23110	342	1219	3.97	1134.0	1133.0
BR	25670	311	1099	4.38	1146.4	1145.4
STR 11B	28150	60	543	8.83	1160.0	1159.0

Feet above confluence with Stewarts Creek \* Backwater elevations from Stewarts Creek

TABLE 2

SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
STEWARTS CREEK-LOVILL'S CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

FLOODWAY DATA

PAULS CREEK PROJECT COMPLETED

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
LOVILLS CREEK							
A	140	139	1868	2.97	992.1	**991.0	1.0
B	1100	790	6385	0.87	992.1	**991.1	1.0
C	2245	456	3786	1.46	992.1	**991.1	1.0
US 52 Byp	2445	-	-	-	-	-	-
D	2555	577	5397	1.03	992.1	**991.1	1.0
E	3115	462	2721	2.03	992.1	**991.1	1.0
F	4075	203	1389	3.98	994.8	993.8	1.0
US 601	4375	-	-	-	-	-	-
G	4615	162	1250	4.42	996.7	995.7	1.0
H	5615	270	1860	2.96	998.5	997.5	1.0
I	6215	98	877	6.29	1001.1	1000.1	1.0
SR 1731	6345	-	-	-	-	-	-
J	6515	227	2137	2.58	1002.5	1001.5	1.0
K	7395	307	2432	2.25	1003.7	1002.7	1.0
L	8275	484	2585	2.12	1004.6	1003.6	1.0
M	9235	304	1939	2.88	1006.8	1005.8	1.0
N	10395	274	1611	3.46	1010.0	1009.0	1.0
NC 89	10645	-	-	-	-	-	-
O	10845	350	1897	2.97	1011.0	1010.0	1.0
P	11555	371	1562	3.62	1012.7	1011.7	1.0
Q	12115	172	889	6.38	1015.3	1014.3	1.0
SR 1670	12265	-	-	-	-	-	-
R	12605	524	4127	1.38	1018.5	1017.5	1.0
S	13325	349	2199	2.59	1019.3	1018.3	1.0
T	13725	498	3265	1.77	1020.0	1019.0	1.0
U	14525	483	1720	3.37	1072.9	1021.9	1.0

Feet above confluence with Ararat River \*\* Backwater elevations from Ararat River



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

TABLE 2

## FLOODWAY DATA

LOVILLS CREEK PROJECT COMPLETED

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
V	15805	604	2603	2.24	1024.8	1023.8	1.0
W	17405	312	1040	3.23	1027.5	1026.5	1.0
X	18285	109	593	5.55	1031.8	1030.8	1.0
Y	18965	88	565	5.57	1034.5	1033.5	1.0
Z	19165	115	666	4.66	1035.4	1034.4	1.0
US 52 Bus	19265	-	-	-	-	-	-
AA	19365	80	524	5.92	1036.7	1035.7	1.0
AB	19685	201	1021	2.95	1037.6	1036.6	1.0
AC	20805	97	609	4.70	1041.0	1040.0	1.0
AD	21905	70	524	4.86	1045.5	1044.5	1.0
AE	23585	67	498	4.80	1052.5	1051.5	1.0
AF	25185	126	667	3.14	1056.9	1055.9	1.0
AG	26385	45	339	6.03	1061.6	1060.6	1.0
AH	27585	56	403	4.42	1067.0	1066.0	1.0
AI	29185	308	724	1.69	1069.8	1068.8	1.0
AJ	29955	45	219	5.09	1073.7	1072.7	1.0
AK	30755	55	368	2.57	1074.3	1073.3	1.0
SR 1700	30815	-	-	-	-	-	-
AL	30965	50	256	3.70	1076.0	1075.0	1.0
AM	31965	63	284	3.18	1078.0	1077.0	1.0
AN	33045	70	240	3.45	1081.7	1080.7	1.0
AO	34245	50	163	3.46	1092.3	1091.3	1.0
STR 9A	35245	50	163	3.46	1101.4	1100.4	1.0

Feet above confluence with Ararat River



SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURREY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

TABLE 2

## FLOODWAY DATA

LOVILLS CREEK PROJECT COMPLETED

Zoning - Zoning is a legal tool used to implement and enforce the details of the floodplain management program, preserve property values and achieve the appropriate and most beneficial use of the managed land. Land use and degree of development in the flood hazard areas can be controlled through zoning. Effective zoning requires enforcement of the zoning by-laws, which in turn is dependent upon clear, concise, and thorough by-laws.

Subdivision Regulations - The manner in which large tracts of land within the jurisdiction of a government body may be subdivided is controlled by subdivision regulations. These regulations may state the required widths of streets, requirements for curb and gutter, size of lots, percentage open space, minimum capacity of storm sewers, size of floodways and other points pertinent to the welfare of the community. In flood hazard areas the regulations may:

1. Require location of flood prone areas to be shown on the plate map.
2. Require streets and public utilities be above a selected flood elevation.
3. Require installation of adequate drainage facilities.
4. Prohibit encroachment in the floodway or flood hazard areas.
5. Provide safe building elevations on lots above selected flood heights by means of fill or open structural support.

Building Codes - Building codes are primarily used to set minimum standards which control the design, construction, and quality of materials used in buildings and structures so that life, health, property and public welfare are safeguarded. Due to the fact that it is impractical to prevent all construction from areas that are subject to flooding (i.e., floodway fringe), building codes can be used to minimize damages due to inundation.

Building code requirements can:

1. Prevent floatation of buildings by requiring adequate anchorages.
2. Establish minimum elevations of the lowest floor to be above potential flood elevations.
3. Prohibit basements in those areas where fill and slab on grade construction would eliminate flood damages.
4. Require buildings to be designed and constructed to withstand the lateral forces associated with water pressure due to inundation and impacts from floating objects.
5. Prohibit equipment or materials that might be hazardous to life when submerged. Examples are electrical equipment, boilers, or active chemical storage.

Development Policies - Sound policy and action decisions to prevent construction of streets and utility systems in flood prone areas tend to show development of floodplains.

Land Use Restrictions - Land use restrictions can be used to restrict development to that which is compatible with public objectives while allowing land to remain in private ownership. However, some compensations might be required if the land use restrictions prevent all economic development of the property. Some of the land uses compatible with flood hazard areas are farming, wildlife, recreation, parks and woodland.

Greenbelts - A greenbelt is a strip of open, vegetated space, usually following a stream that runs through an urban area. Flood hazard areas can be used as greenbelt systems. The land in the greenbelt, under either public or private ownership, can be used as golf courses, picnic area, pasture or grazing and similar other uses.



Flood Insurance - Congress established the national flood insurance program with the passage of the Housing and Urban Development Act of 1968, PL 90-448, to provide limited amounts of flood insurance available to property owners and residents. This insurance was unavailable prior to this legislation. This program requires the state and local city and county governments to adopt and enforce land use control measures that will restrict future flood damage. Once the local community is declared eligible and urban development, insurance is available through local insurance agents.

The FIA declared the Town of Mt. Airy eligible for flood insurance on June 28, 1974, Surry County is not yet in the flood insurance program.

Tax Adjustments - An effective method of preserving existing floodplain is adjusting the tax rate on land dedicated to agriculture, recreation, or other open space uses.

Warning Signs - A method with no enforcement powers, but which acts to discourage development in flood prone areas is a system of warning signs or high water mark signs posted at public access points (i.e., roads, etc.) to the floodplain.

#### Corrective Measures

Corrective measures are usually physical measures that are designed to reduce or control floods and flood damage and are best used in combination with preventive measures. Some corrective measures, as described below are usually necessary where existing developments occupy the floodplains.

Land Treatment - This includes vegetative and mechanical measures installed on the uplands to prevent destruction of land by erosion and reduce the movement of sediment to the streams and floodplains. Erosion control practices include: protection and maintenance of existing vegetation,

including woodland management; establishment of vegetative buffer or infiltration zones by seeding, tree planting and mulching; and installation of water control and disposal practices. Water management practices include: debris or sediment basins to trap runoff waters and sediment from a development; retention area formed by high curbs on parking lots and the extension of walls above roofs of large buildings to temporarily store rainwater; and recharge basins to store and dispose of excess water. Land treatment measures slow or reduce runoff and peak flood flows from upland areas.

Floodwater Retarding Structures - These are earth-fill or concrete impoundments that check the uncontrolled flow of floodwater. These structures are located and planned to protect the largest possible area of land subject to flooding, encroach as little as possible on high value lands, and provide a high level of protection of downstream property.

Stream Improvements - Improvement of the stream channel to increase its capacity to carry floodwater by straightening, deepening, widening, clearing or by lining the channel, so that flooding will be less frequent and less severe.

Levees - An embankment or floodwall along the bank of a stream, built to confine flood flows to the channel or floodway. Levees are normally used to provide protection to high risk flood prone areas.

Floodproofing of Buildings - Techniques used to make buildings, contents and grounds located in flood hazard areas less vulnerable to flood damage are:

1. Permanent measures, built as an integral part of the structure such as raising the elevation of the structure; waterproofing of basement and foundation walls; anchorage and reinforcement of floors and walls; and use of water-resistant construction materials.
2. Contingency measures which require action to be taken to make them effective, such as manually closed sewer valves; and removable bulkheads.

3. Emergency measures carried out during floods according to prior plans, such as sandbagging; pumping; and removal of contents to higher elevations.

Floodplain Acquisition and Relocation - This measure includes the permanent evacuation of developed areas subject to inundation and the acquisition of lands by purchase, removal of structures, and the relocation of the population from such areas. Such lands could then be returned to a natural wildlife habitat or used for agriculture, public parks or other purposes which would not interfere with flood flows.

Flood Watch and Warning Systems - The National Weather Service (formerly the U.S. Weather Bureau) of the National Oceanic and Atmospheric Administration issues frequent warnings of potential flood producing storms. Frequently the flood warnings are preceded by a "severe weather or flood watch."

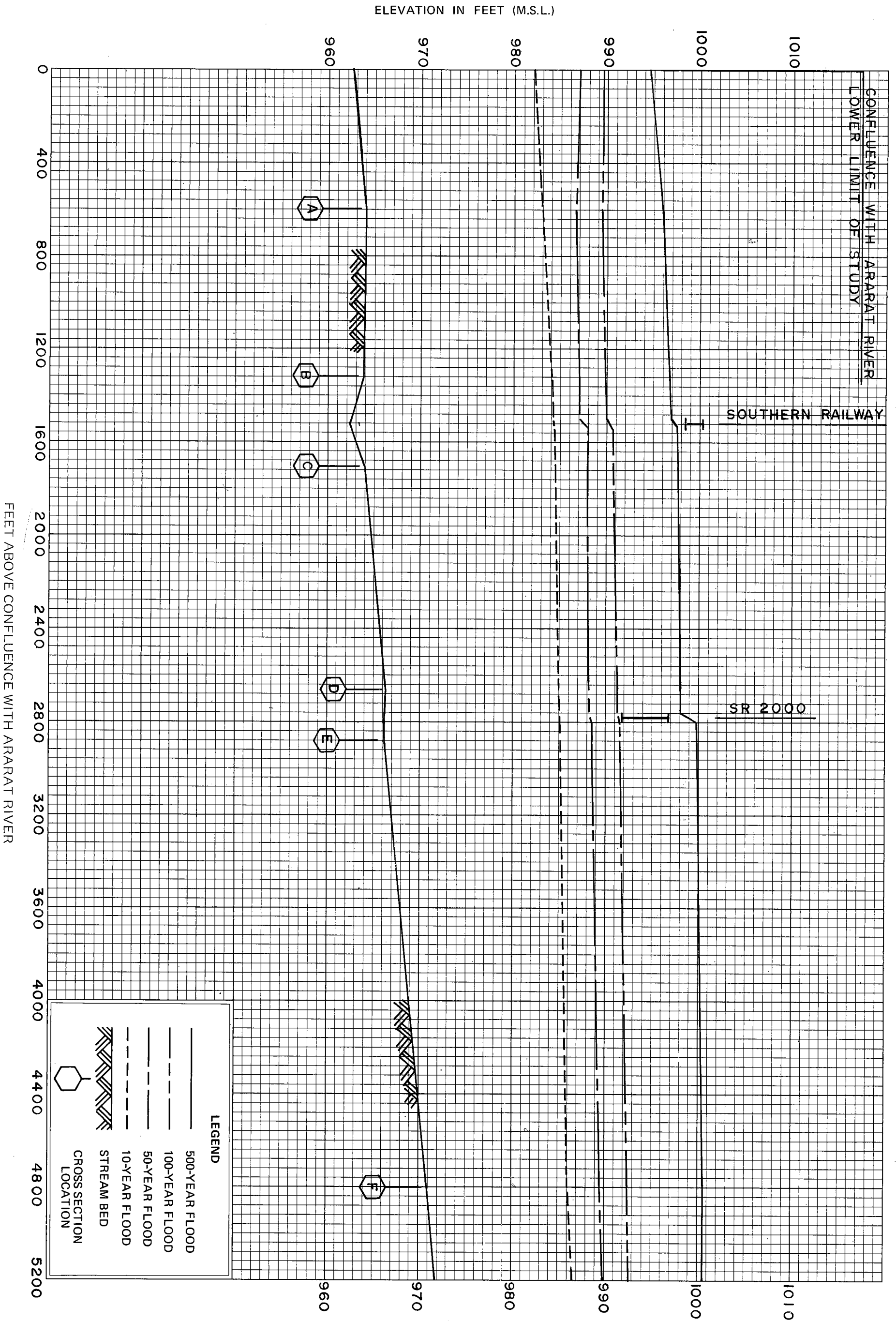
"Self-help" programs can also be implemented to give advance warnings to flood prone areas of potential or impending flood danger. On small watersheds, especially those with considerable natural floodwater storage, local personnel could monitor staff gages set at key locations. Monitoring could also be accomplished if high risks are involved by the use of float-activated electronic warning signals connected to the local police or fire department. All warning systems should be coordinated with local Civil Defense disaster plans.

#### General

The Soil Conservation Service will, upon request, provide technical assistance to federal, state and local agencies and organizations in the interpretation and use of the information developed in this study. Flood damage prevention can only be achieved through proper recognition of the hazards associated with floodplain development. County Commissioners, town council members,

and other responsible local officials should take the steps necessary to promote wise floodplain land use. Zoning and subdivision regulations are the primary regulatory tools available to local officials to control and prevent unwise developments in flood prone areas. Comprehensive planning is a necessary prerequisite for zoning and floodplain limitations are an important consideration for land use planning.

**APPENDIX B  
FLOOD PROFILES**



FLOOD PROFILES

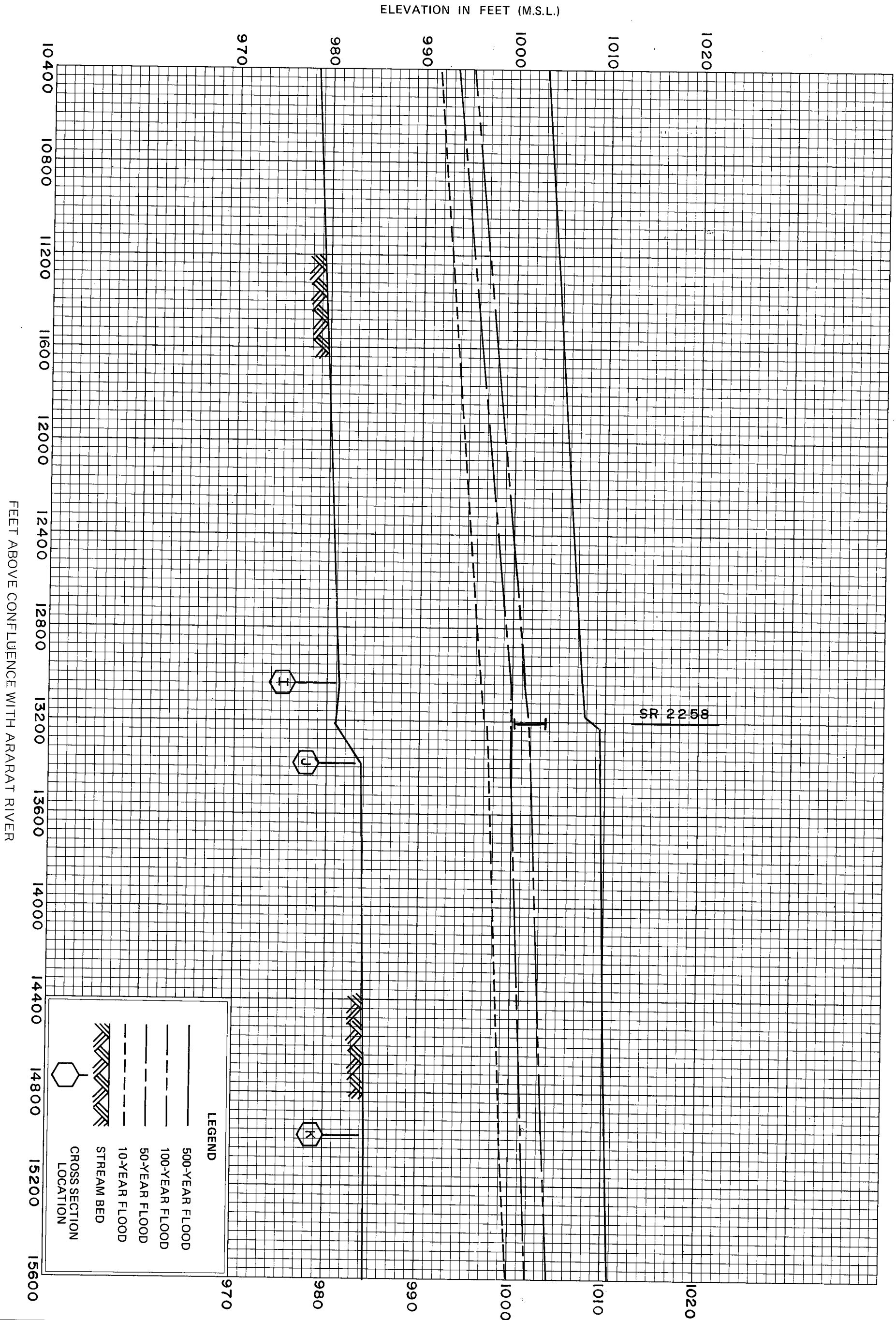
STEWARTS CREEK PRESENT CONDITIONS



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.





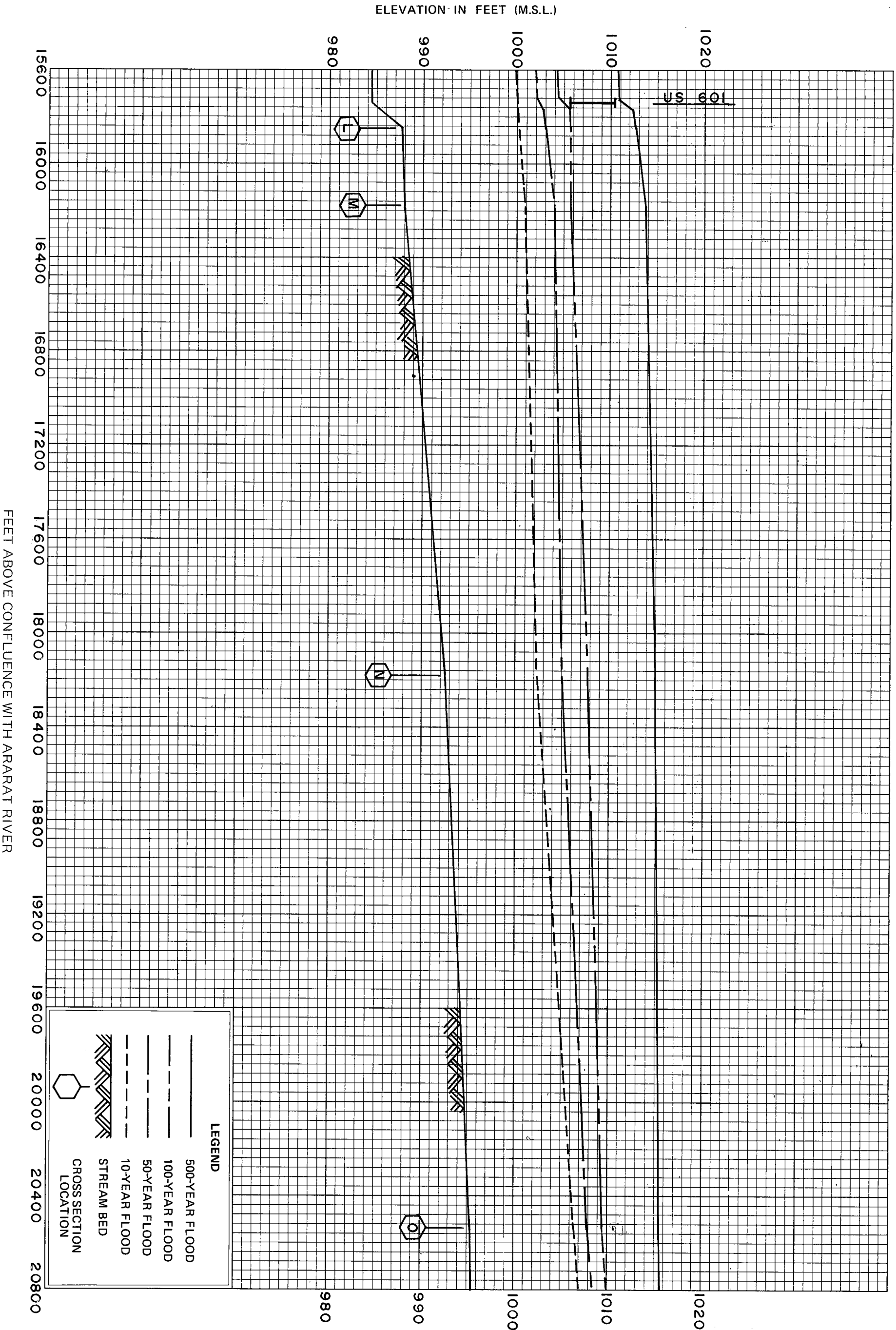
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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

### FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS





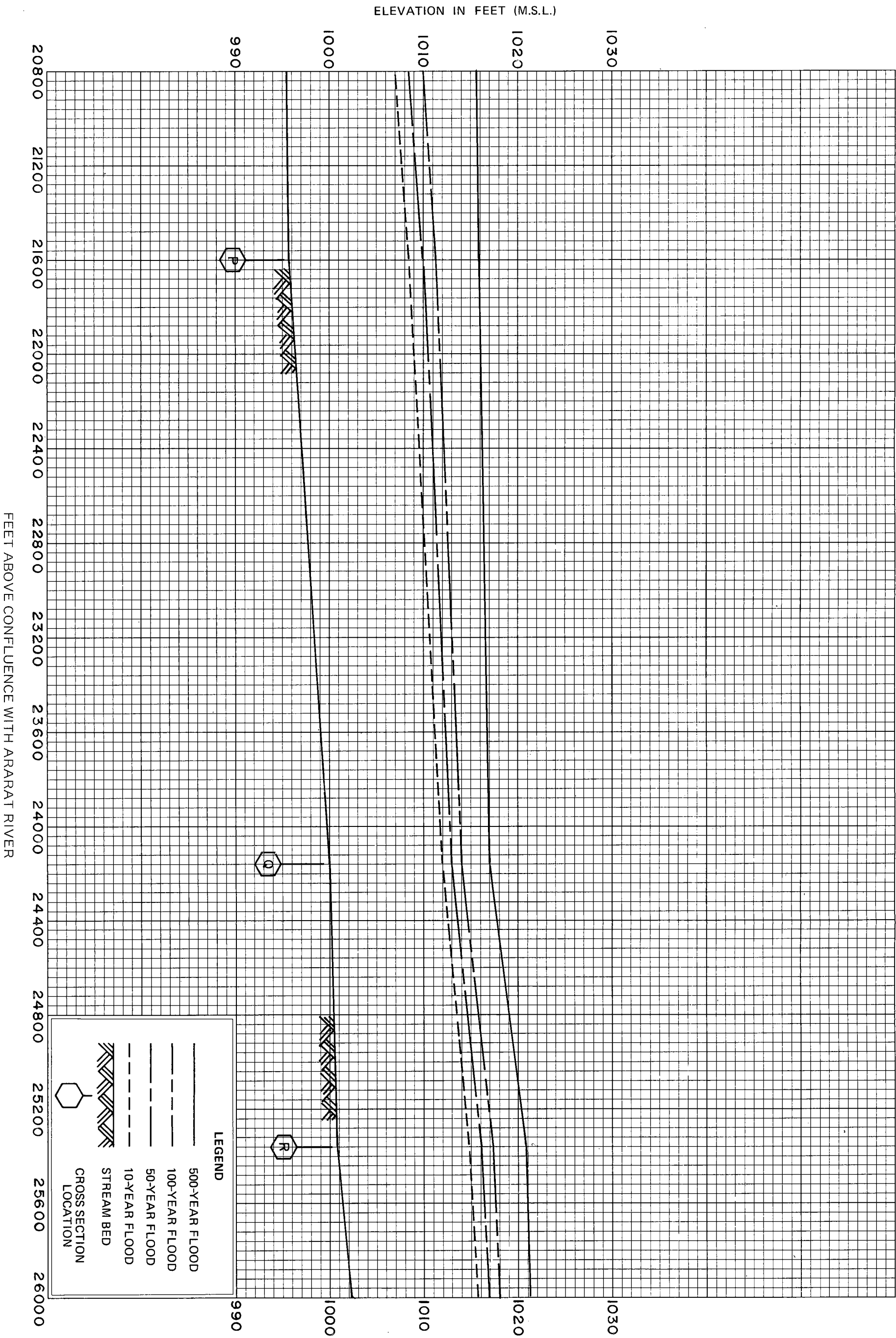
FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

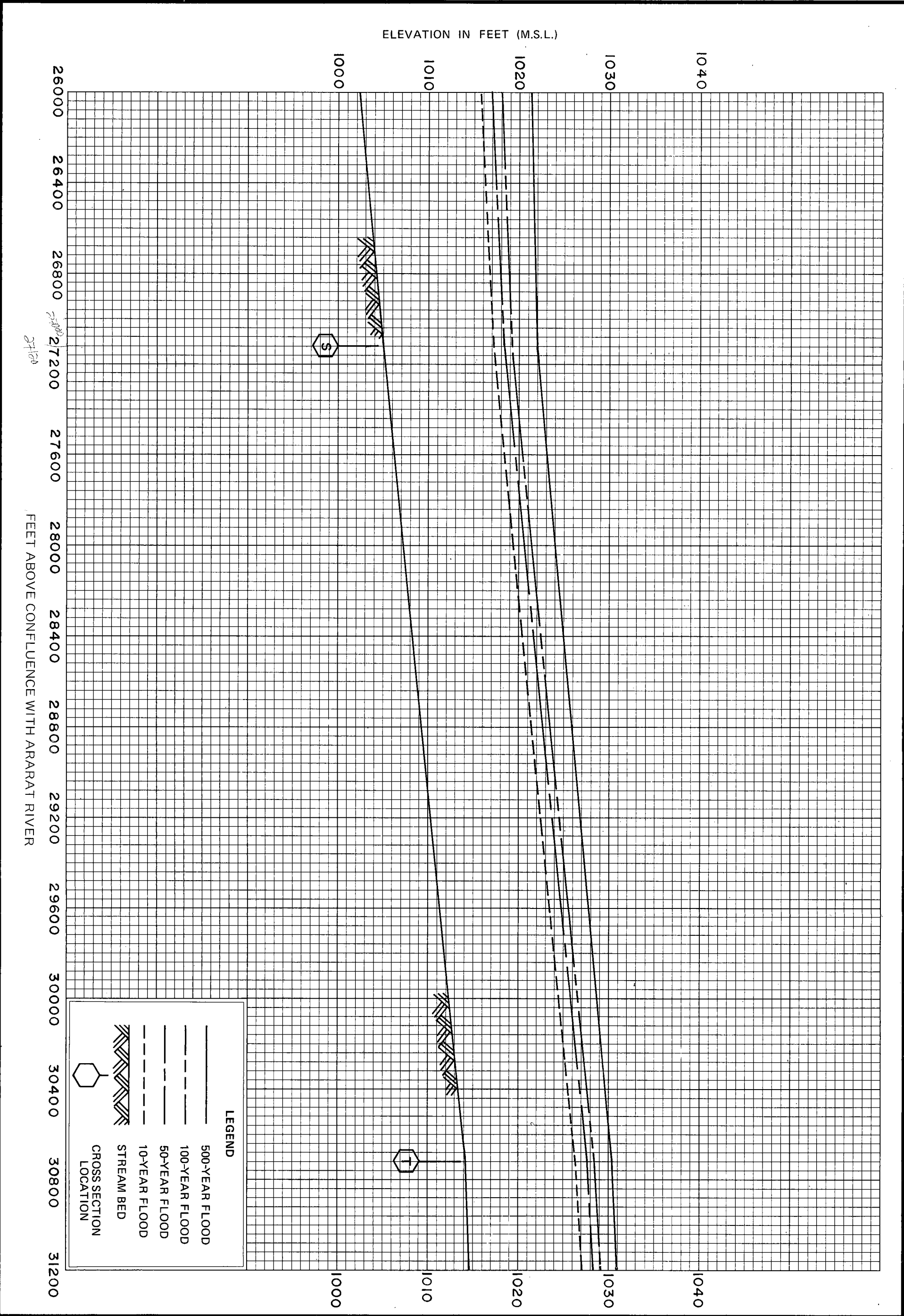


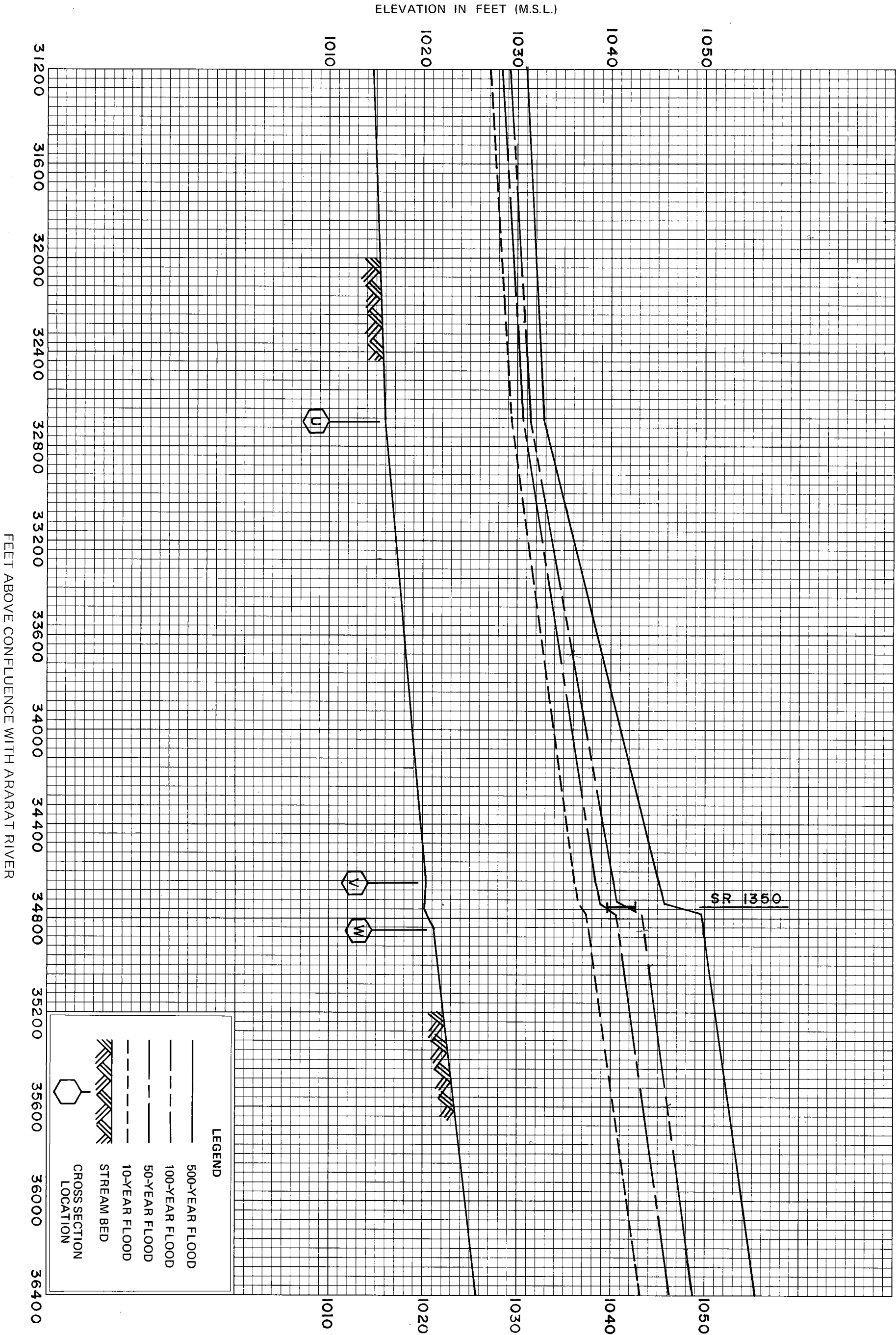
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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

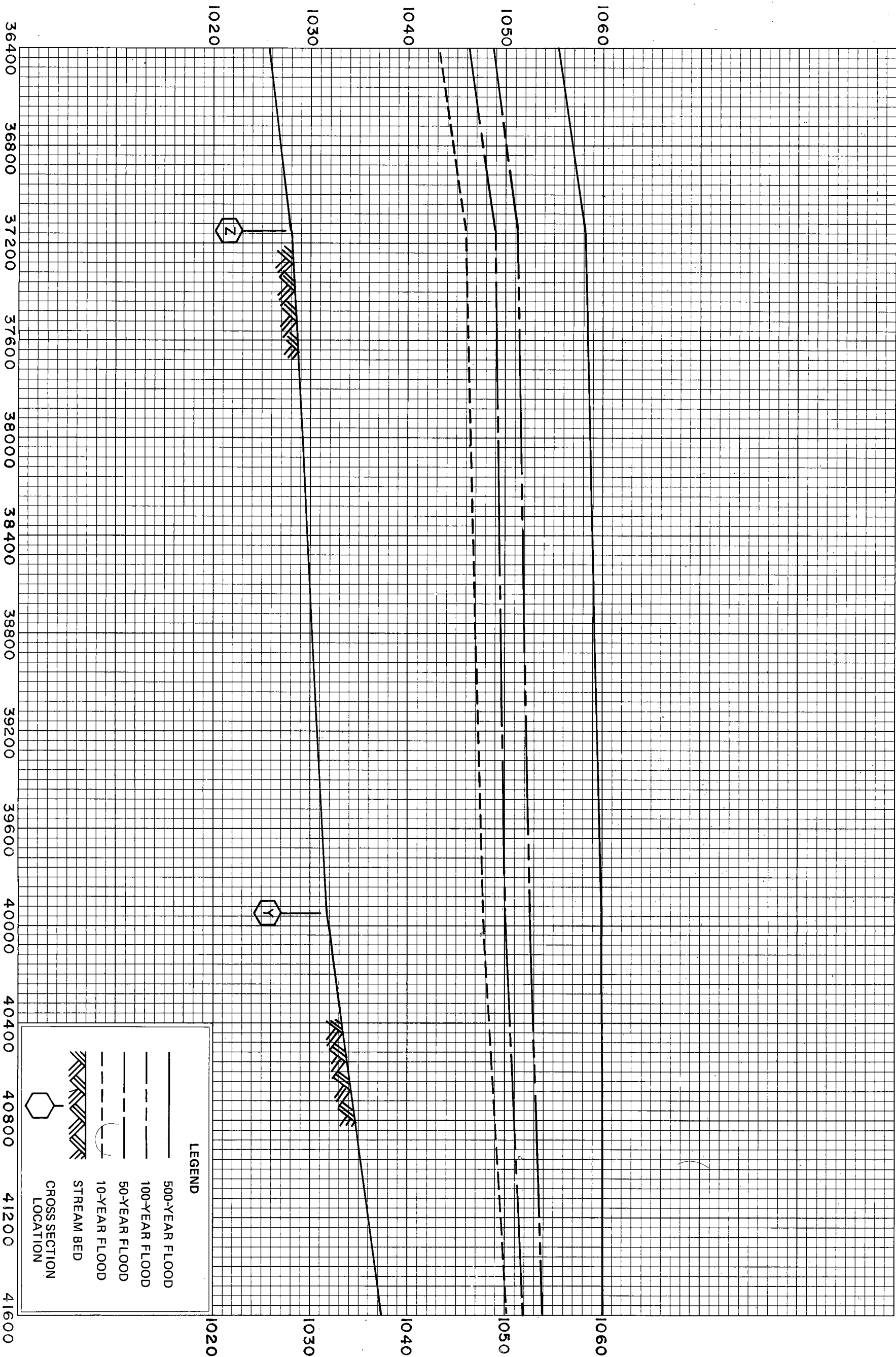
### FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS





ELEVATION IN FEET (M.S.L.)



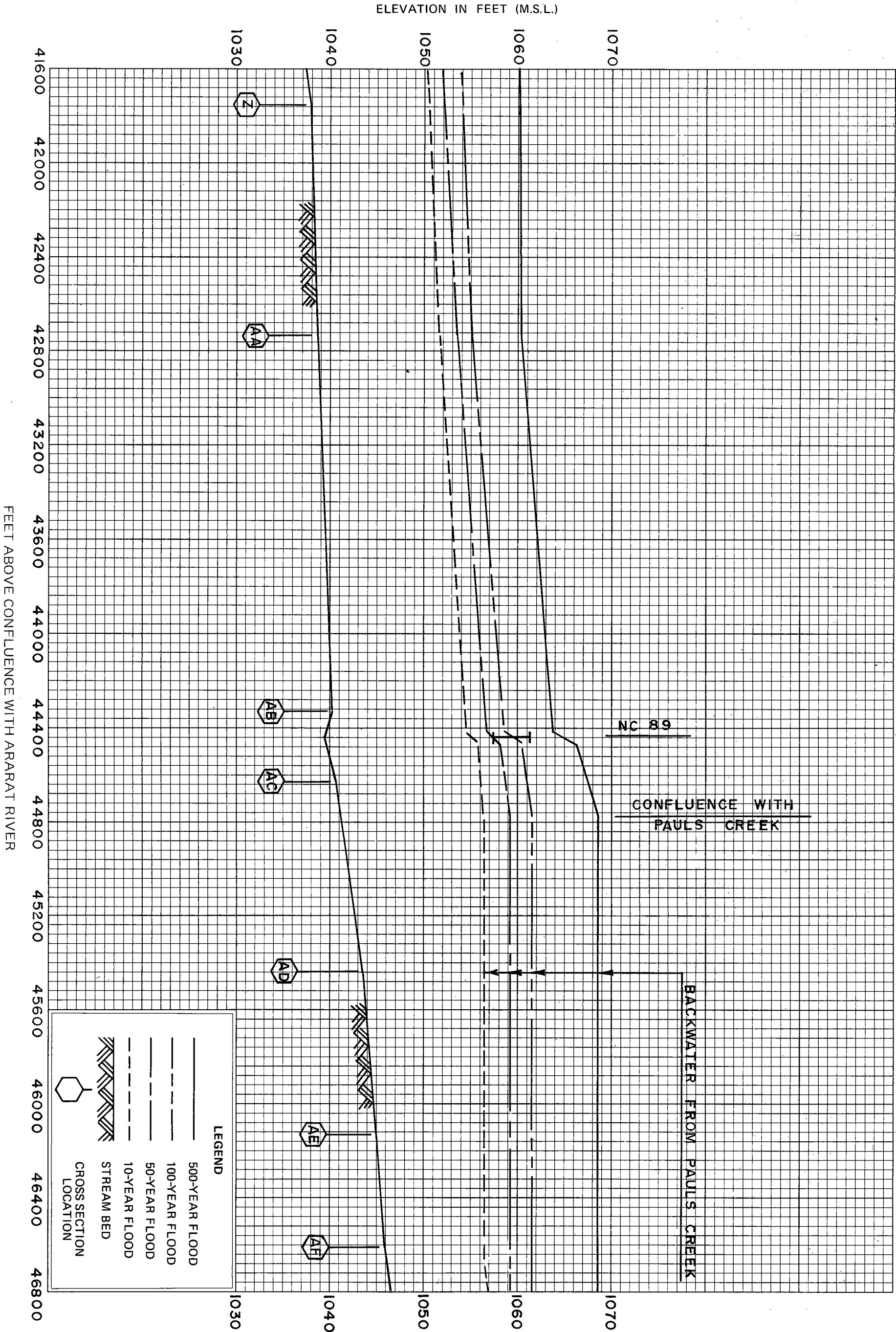
FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS



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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
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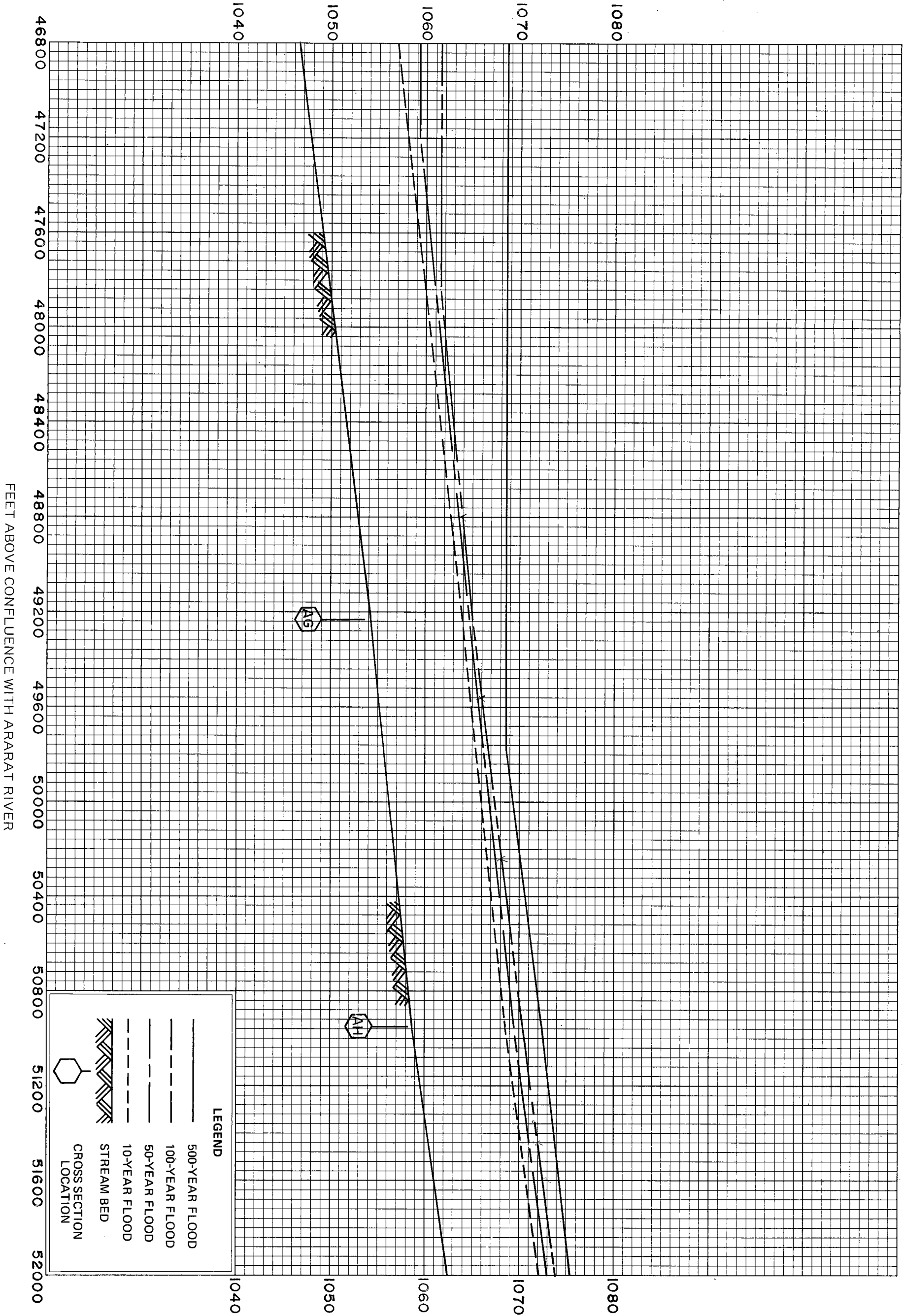
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STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS

ELEVATION IN FEET (M.S.L.)



LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

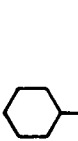
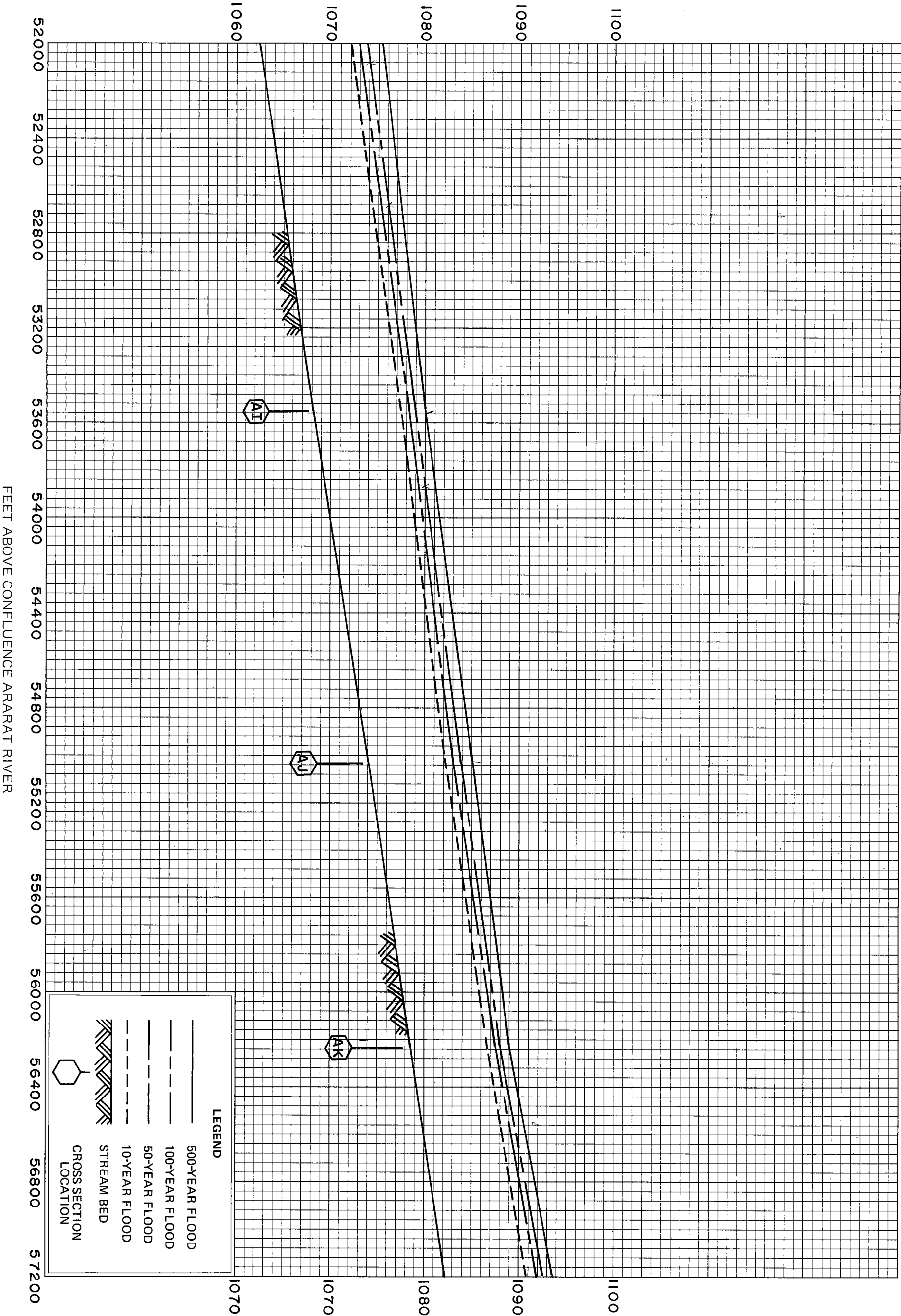
STEWARTS CREEK PRESENT CONDITIONS



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

ELEVATION IN FEET (M.S.L.)



CROSS SECTION  
LOCATION



STREAM BED

10-YEAR FLOOD

50-YEAR FLOOD

100-YEAR FLOOD

500-YEAR FLOOD

LEGEND

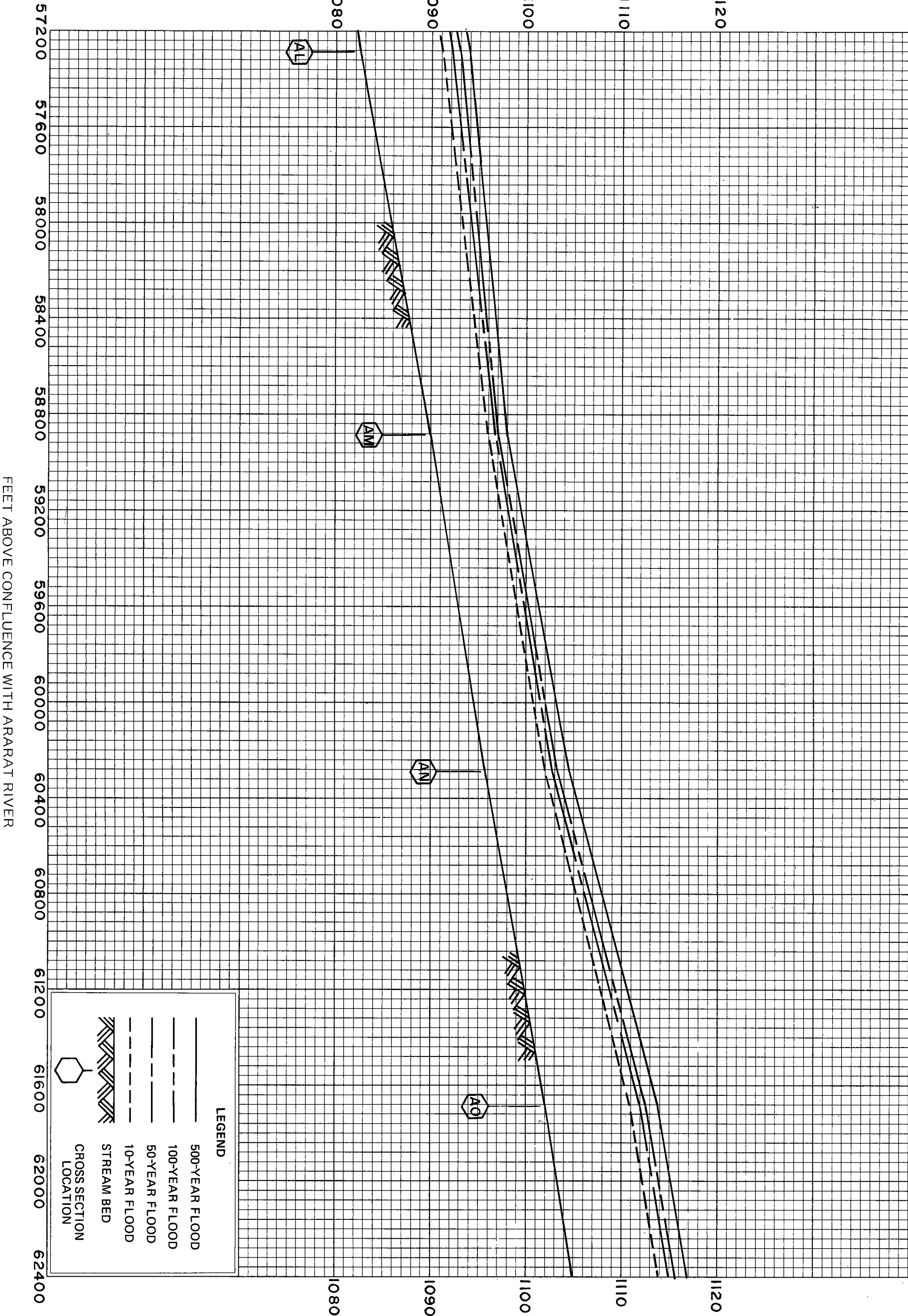
FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK - LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.



ELEVATION IN FEET (M.S.L.)

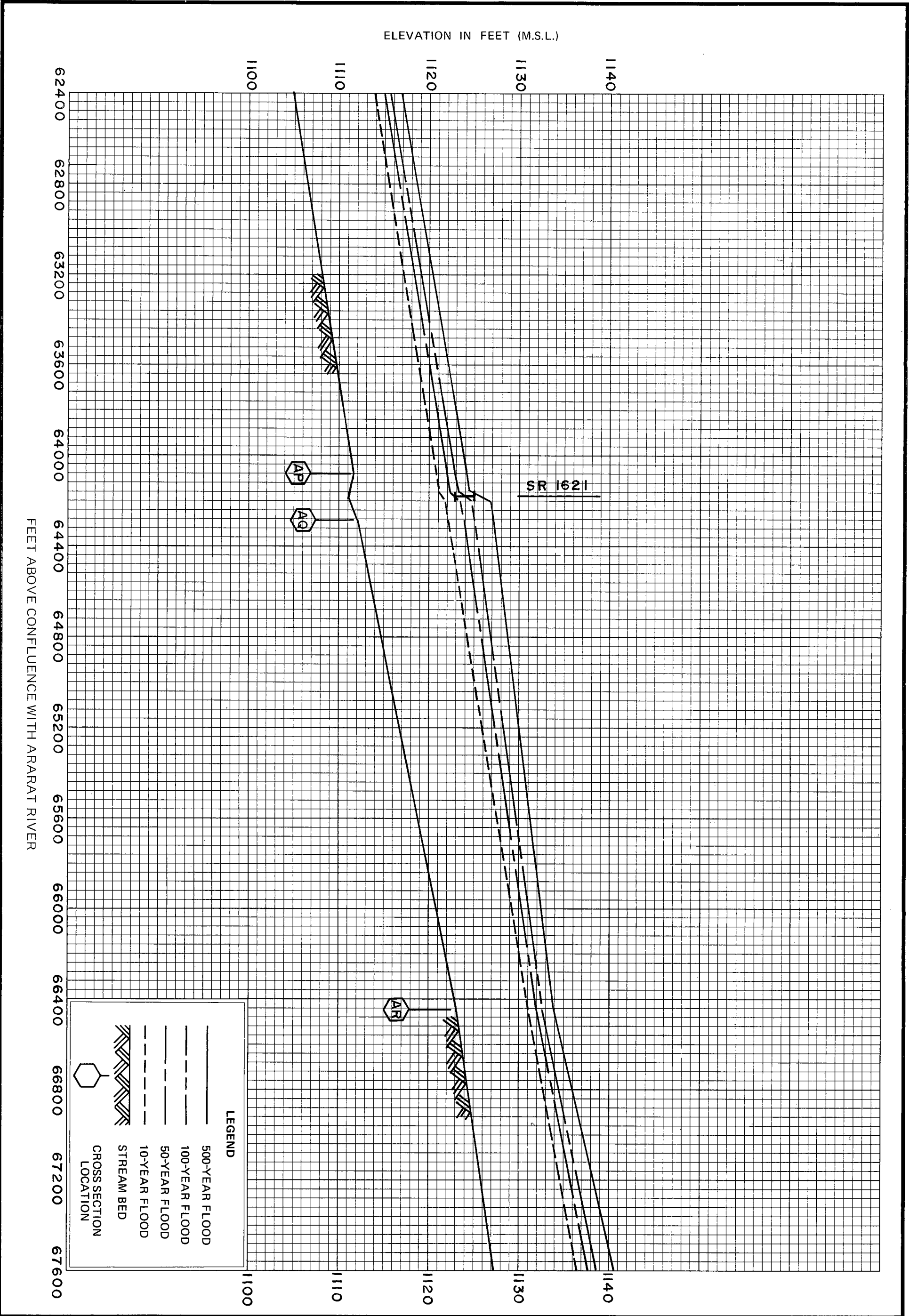


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STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS

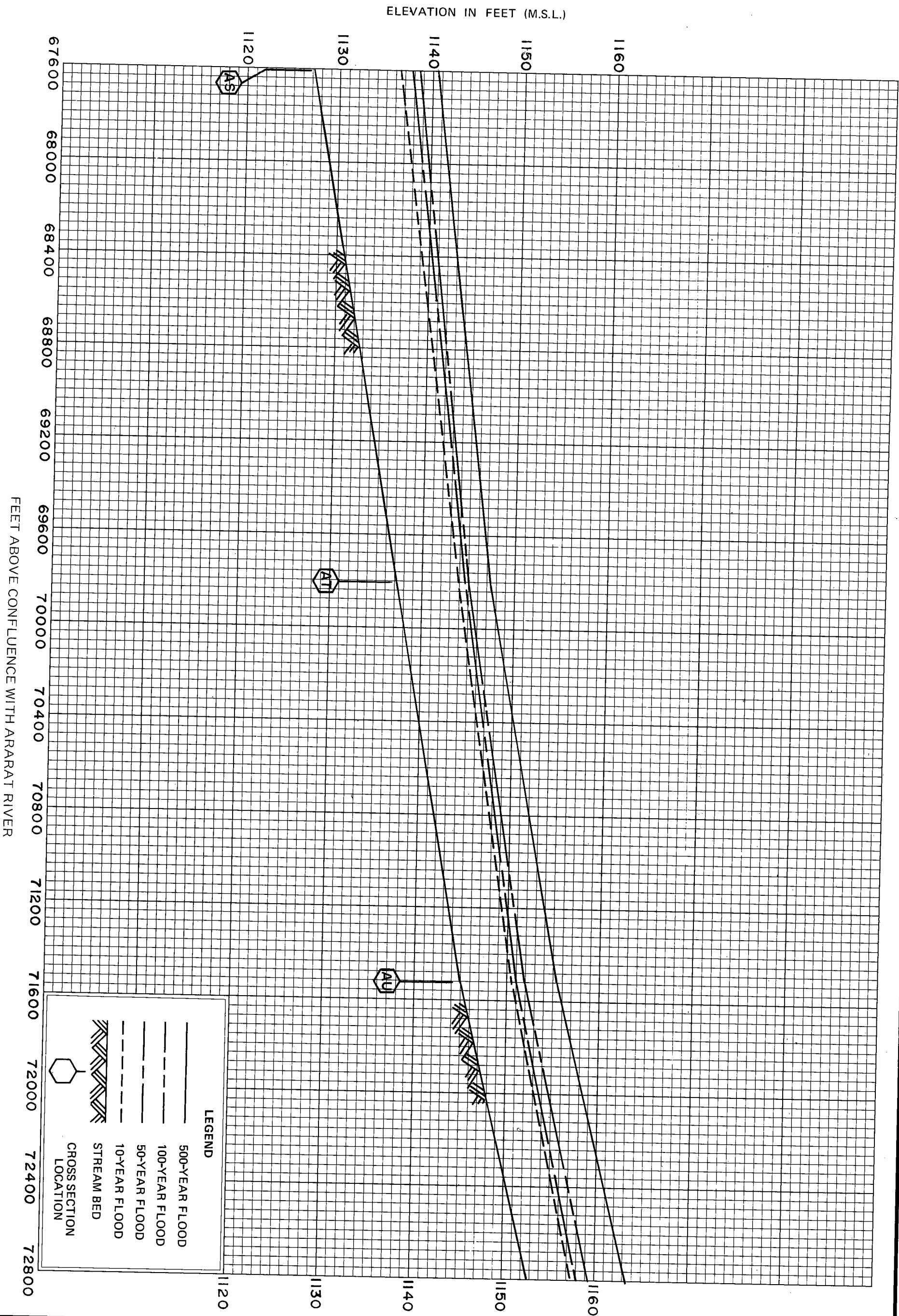


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STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS

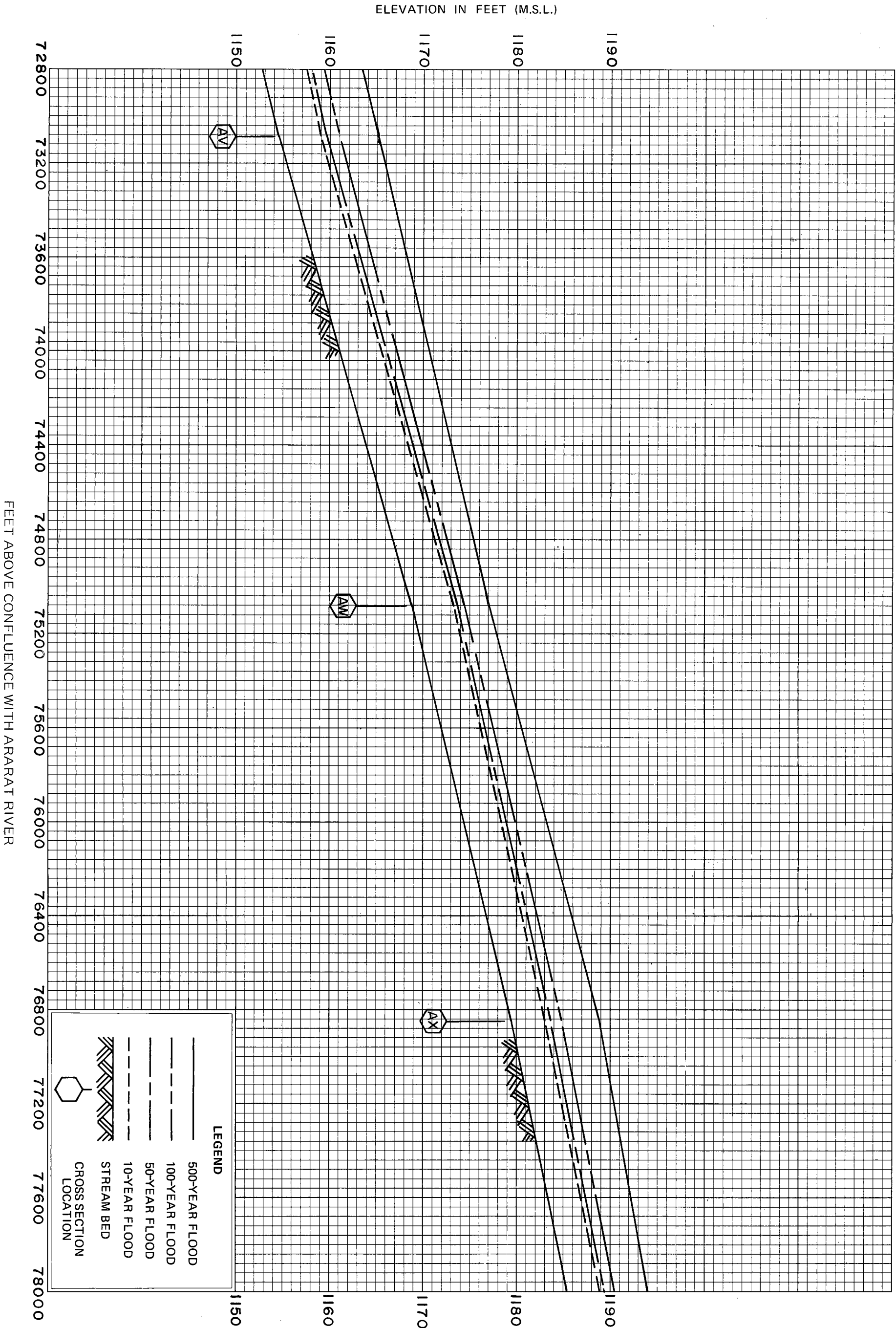


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STEWARTS CREEK-LOVILLS CREEK FLOOD  
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Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS

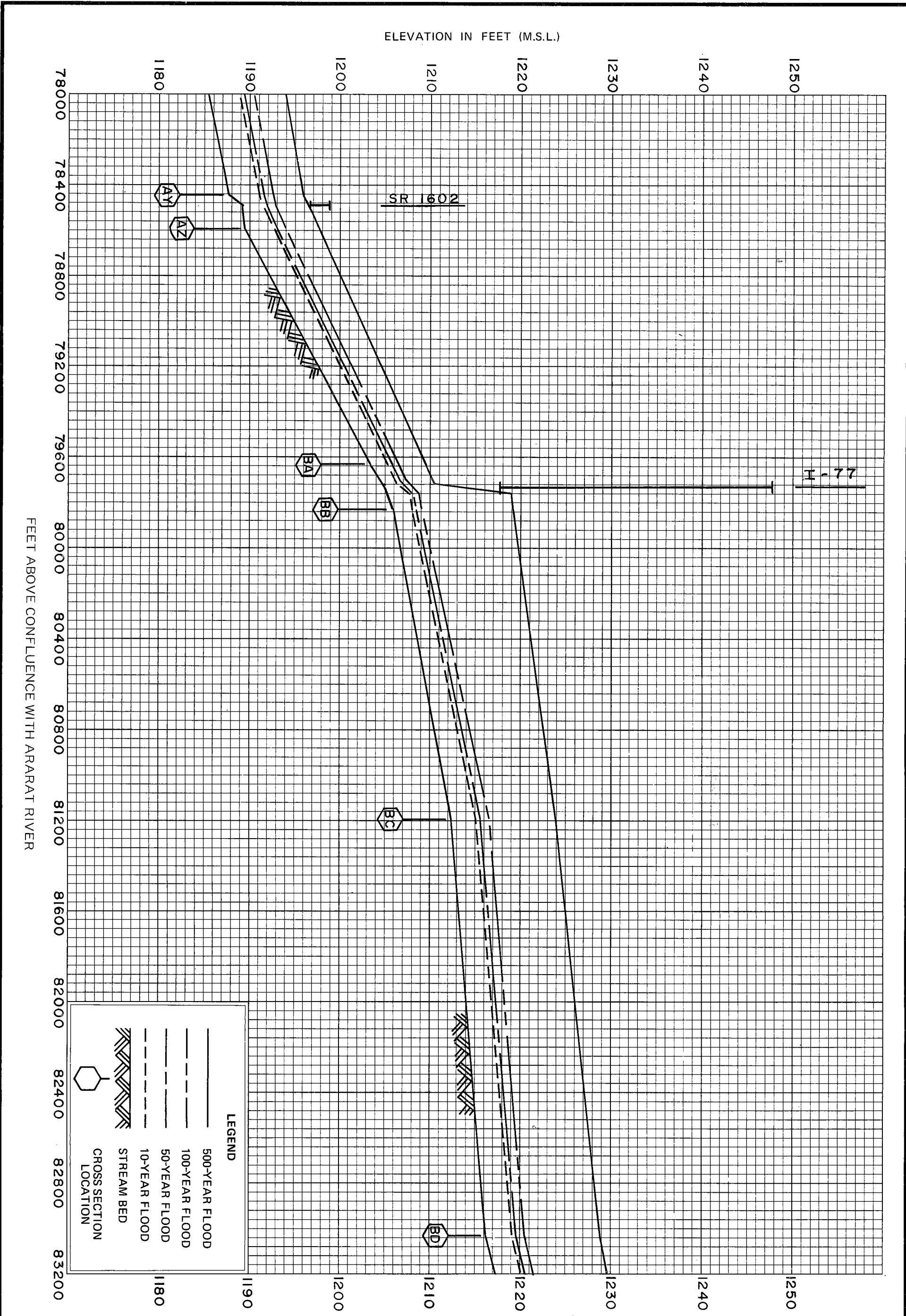


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
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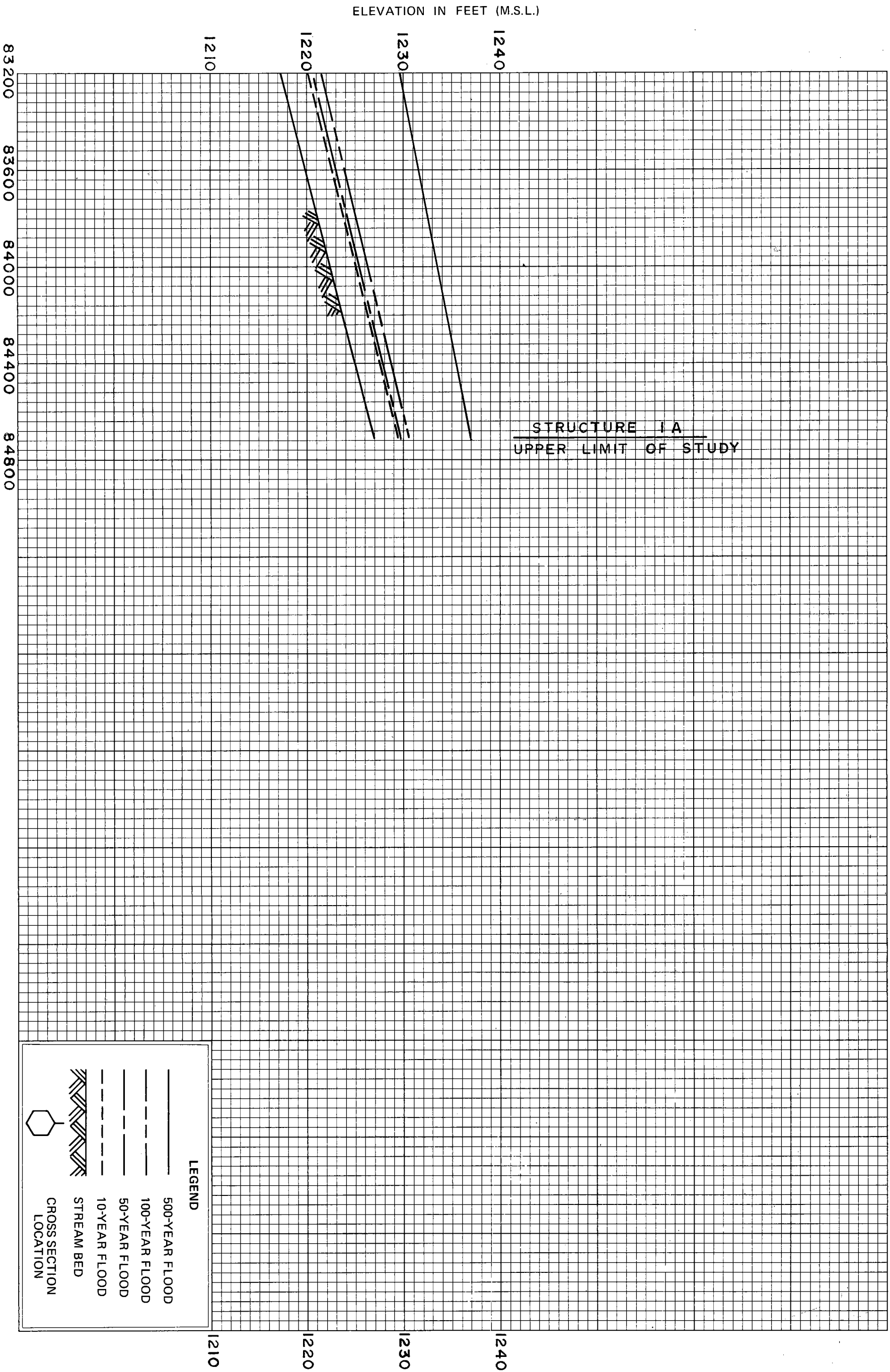
## FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS



**LEGEND**

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION



FEET ABOVE CONFLUENCE WITH ARARAT RIVER



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

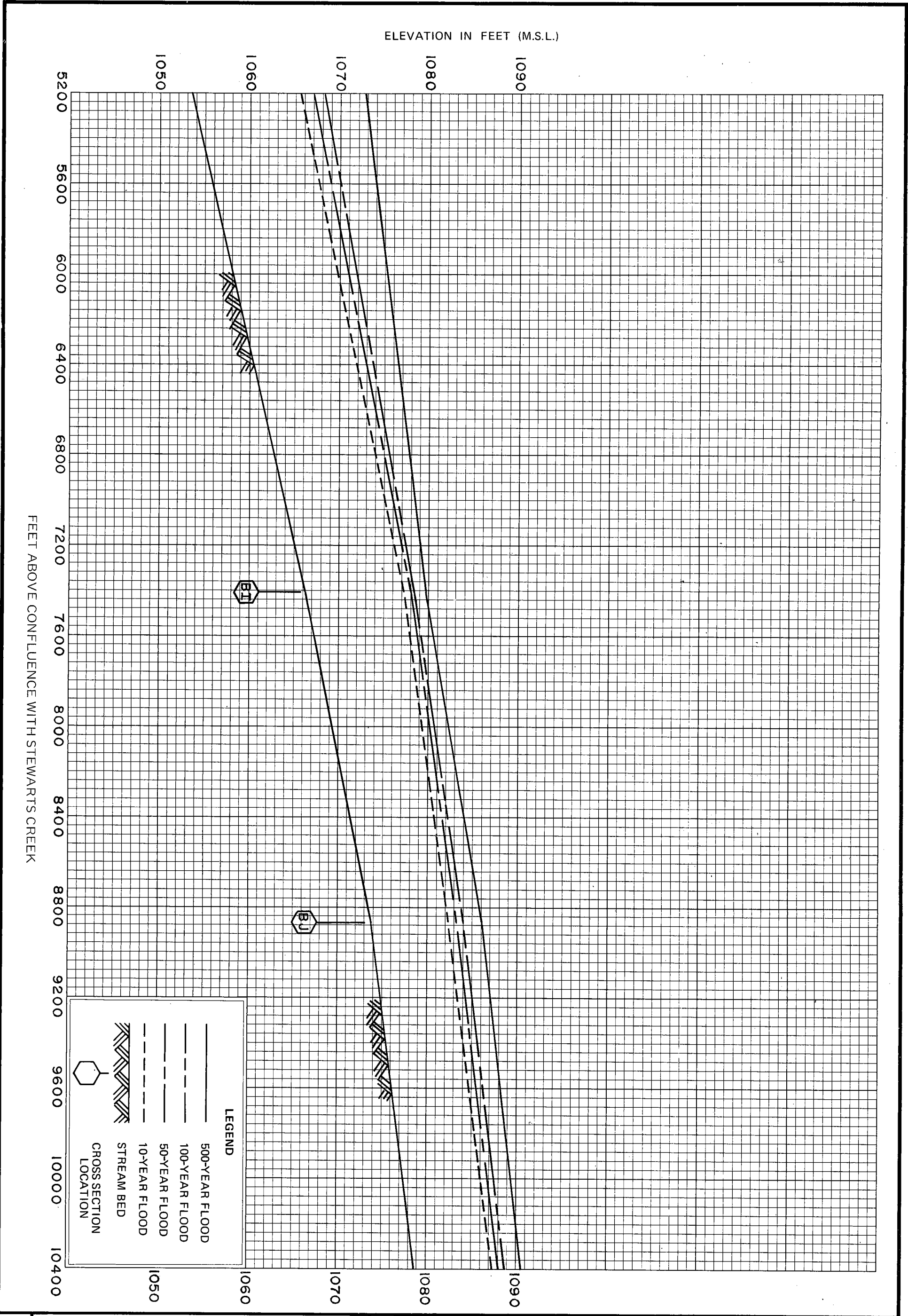
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PRESENT CONDITIONS







U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

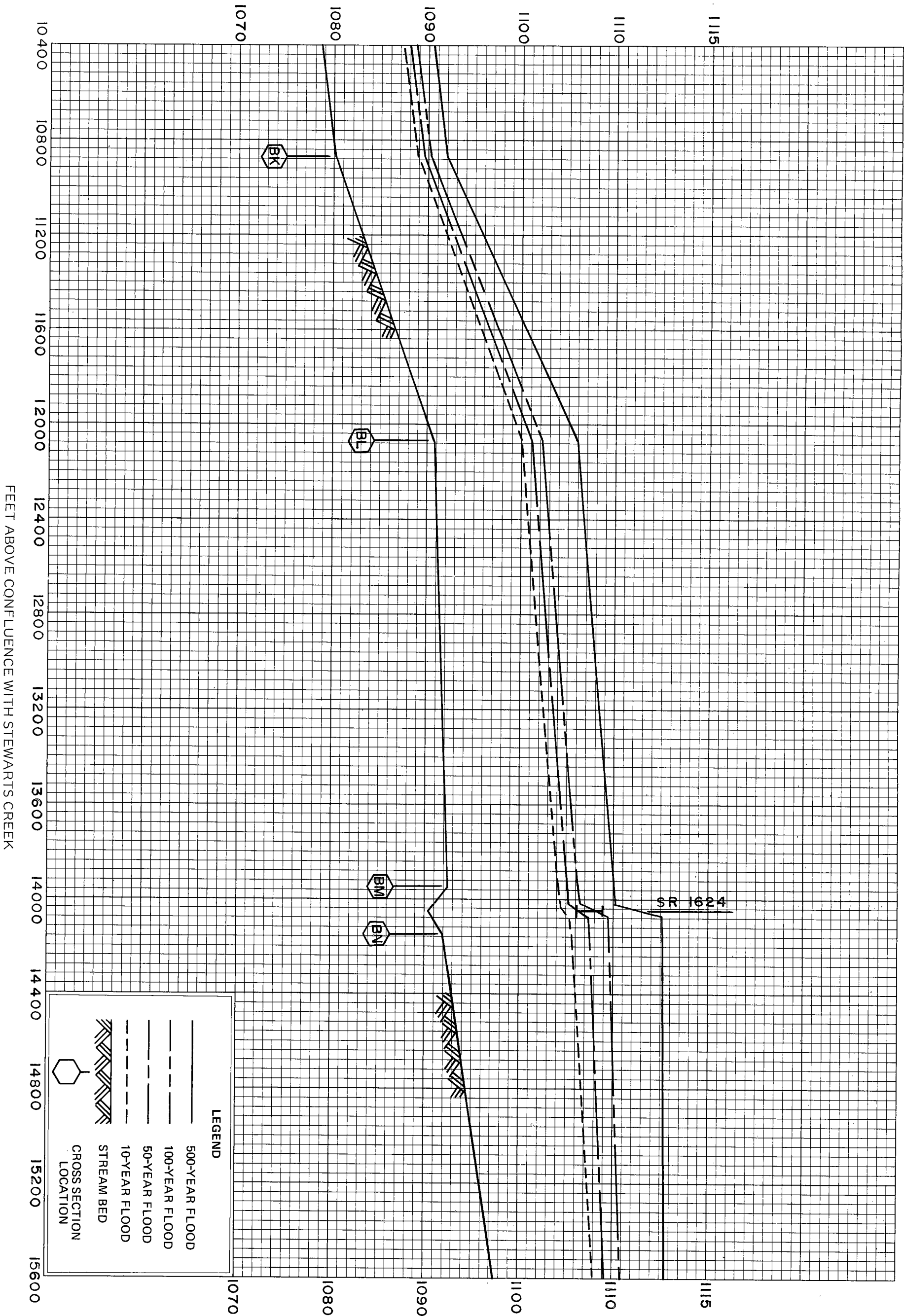
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

PAULS CREEK PRESENT CONDITIONS



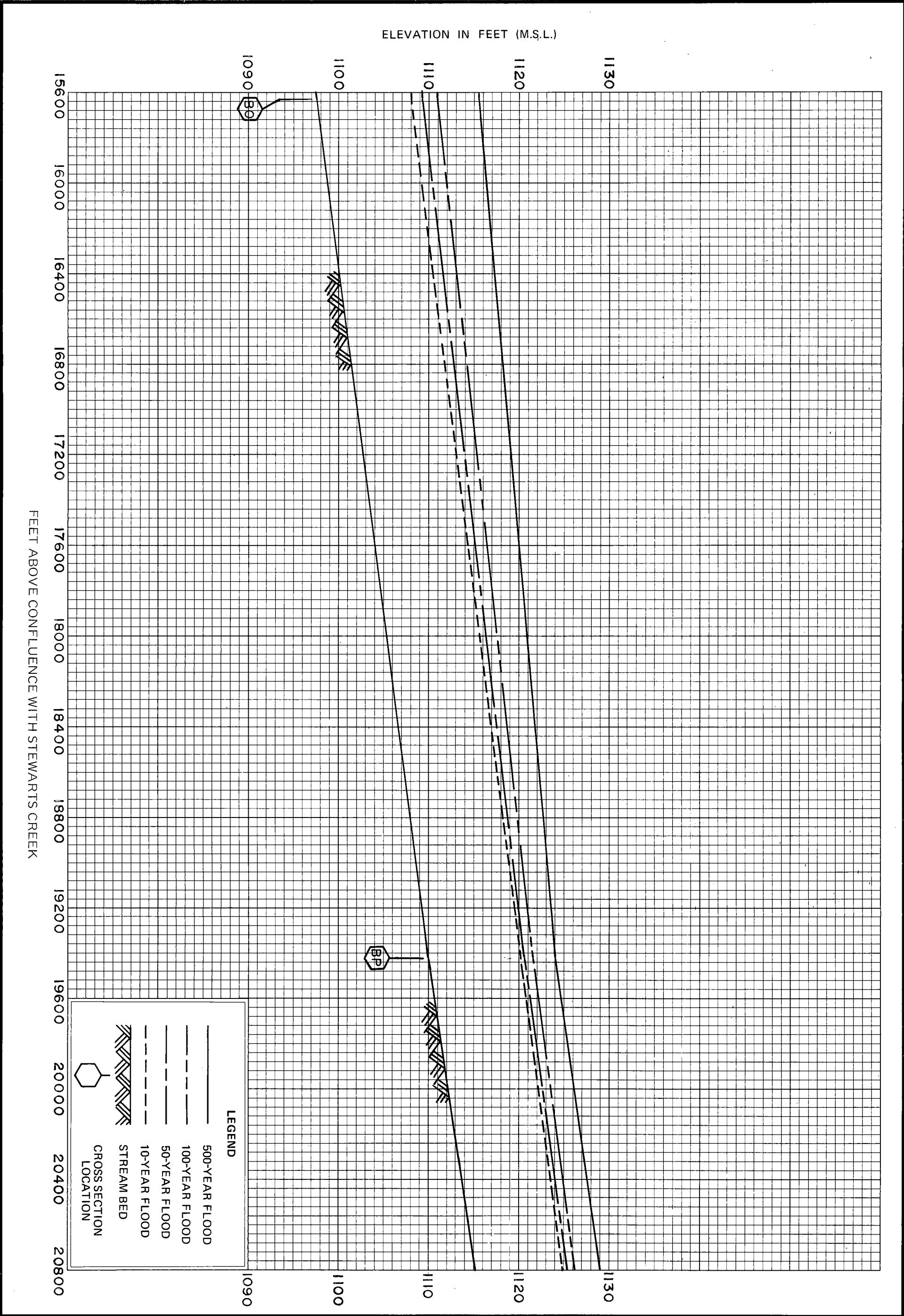
ELEVATION IN FEET (M.S.L.)



FEET ABOVE CONFLUENCE WITH STEWARTS CREEK

**LEGEND**

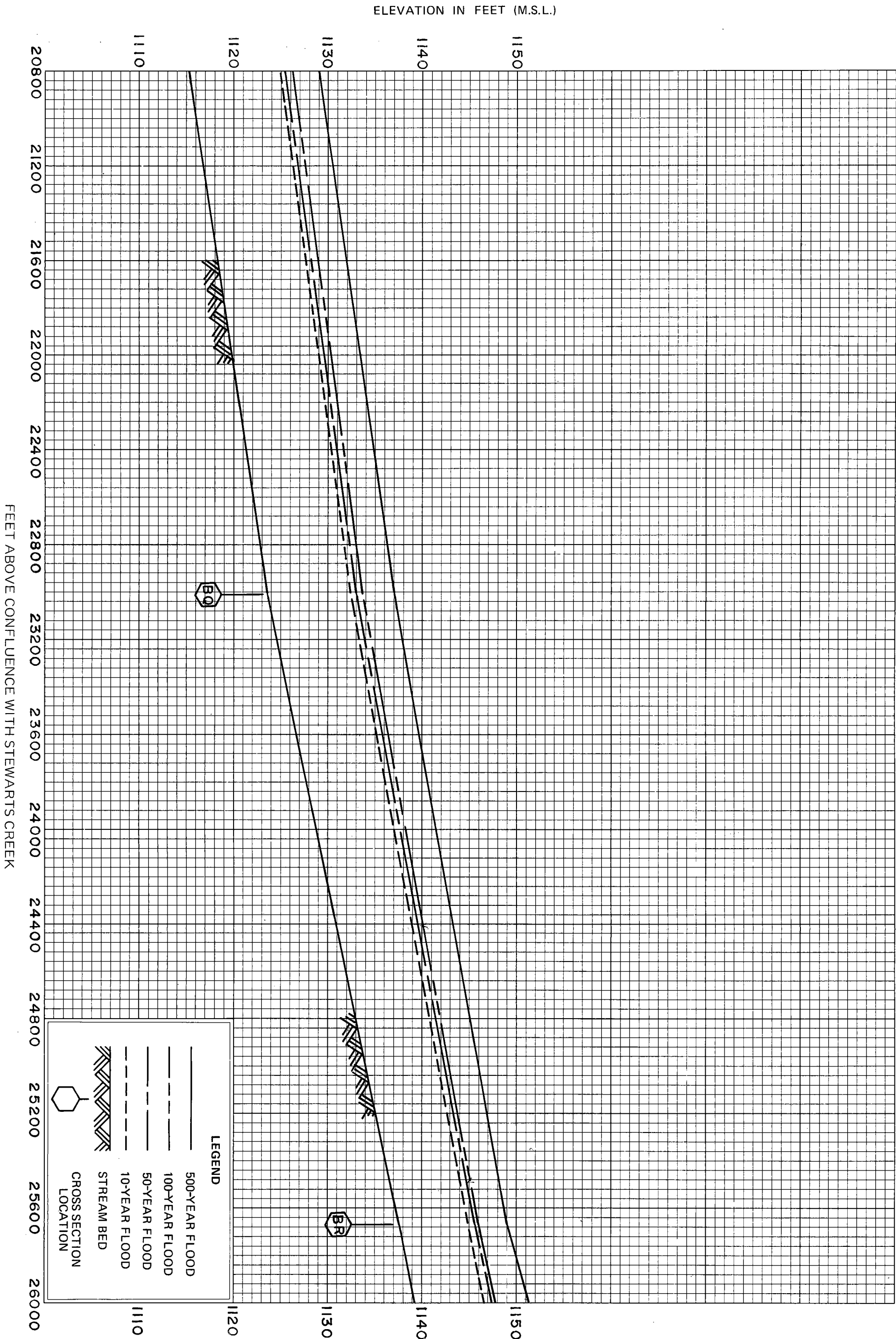
- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION



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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

FLOOD PROFILES

PAULS CREEK PRESENT CONDITIONS



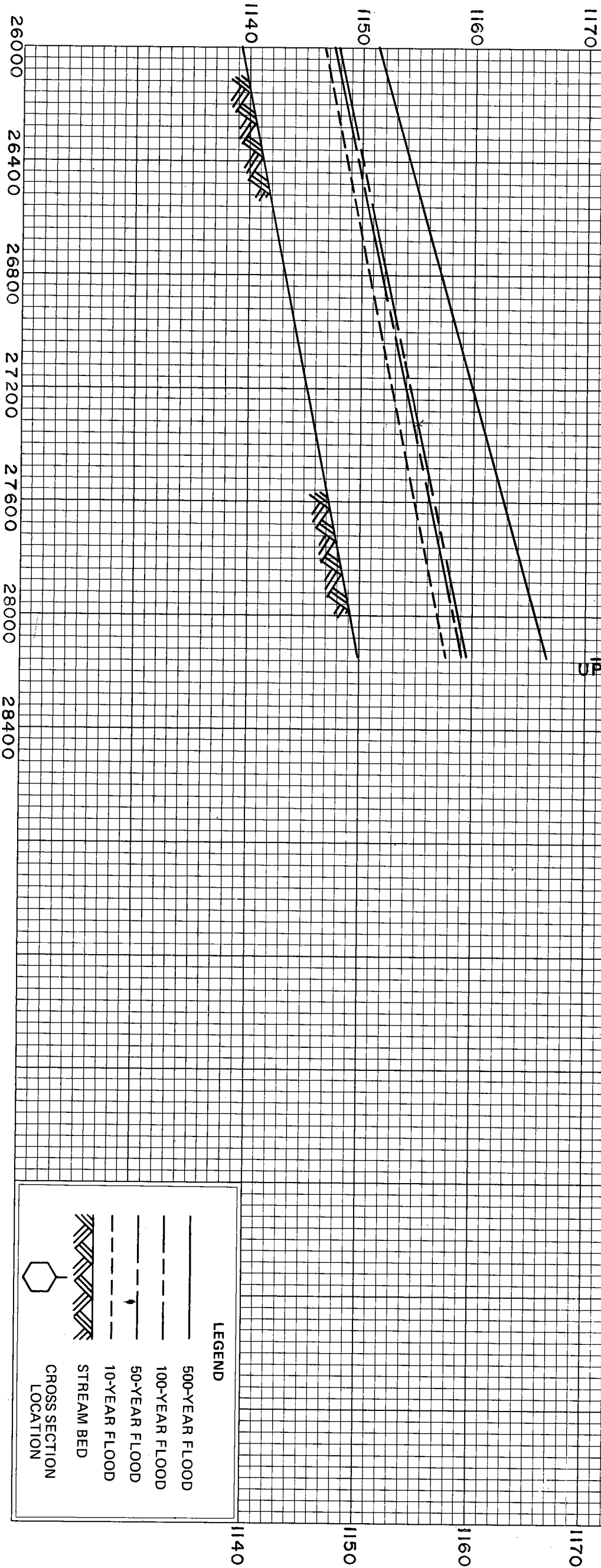
FLOOD PROFILES

PAULS CREEK PRESENT CONDITIONS

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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

ELEVATION IN FEET (M.S.L.)

STRUCTURE IIB  
UPPER LIMIT OF STUDY



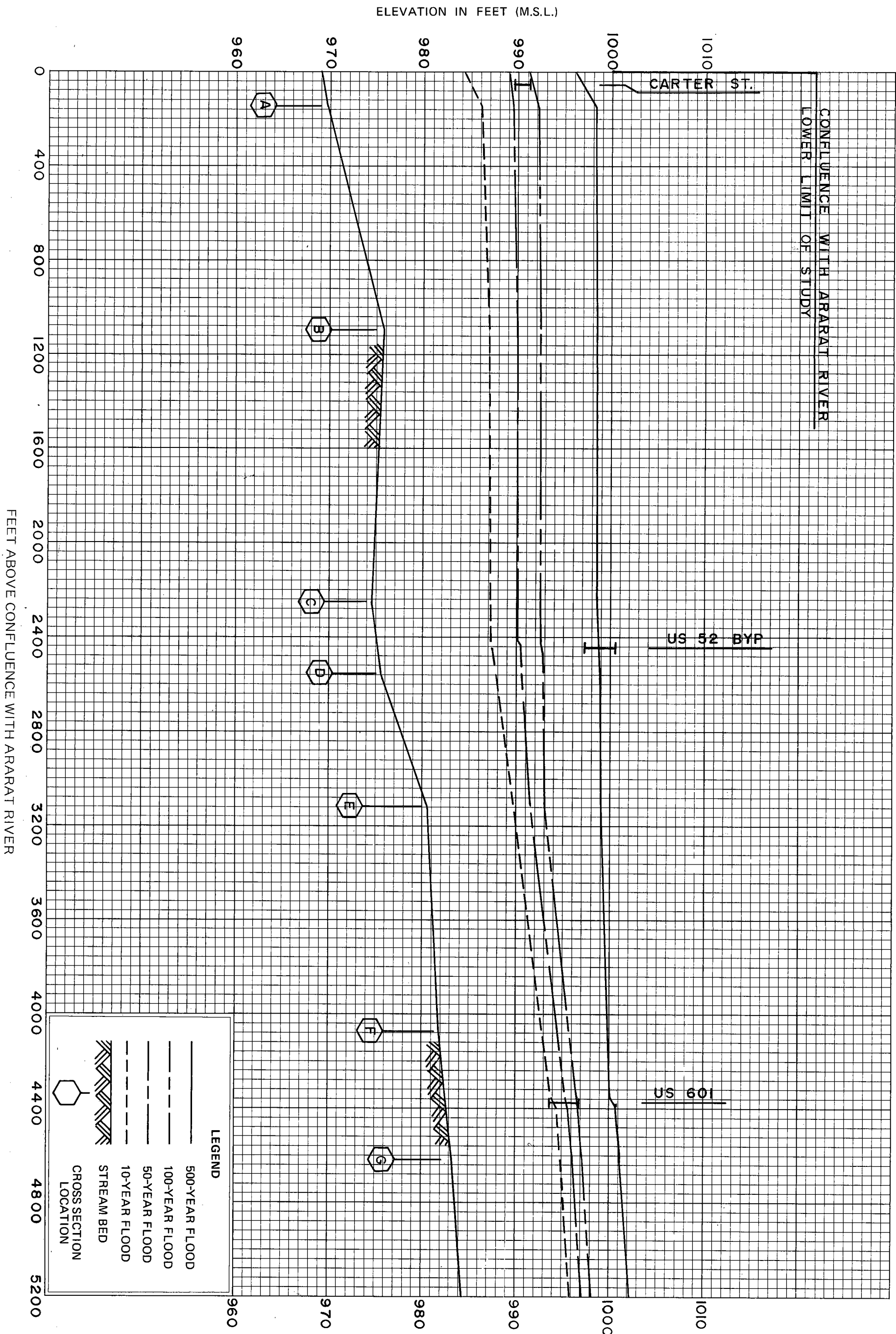
LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

PAULS CREEK PRESENT CONDITIONS

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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
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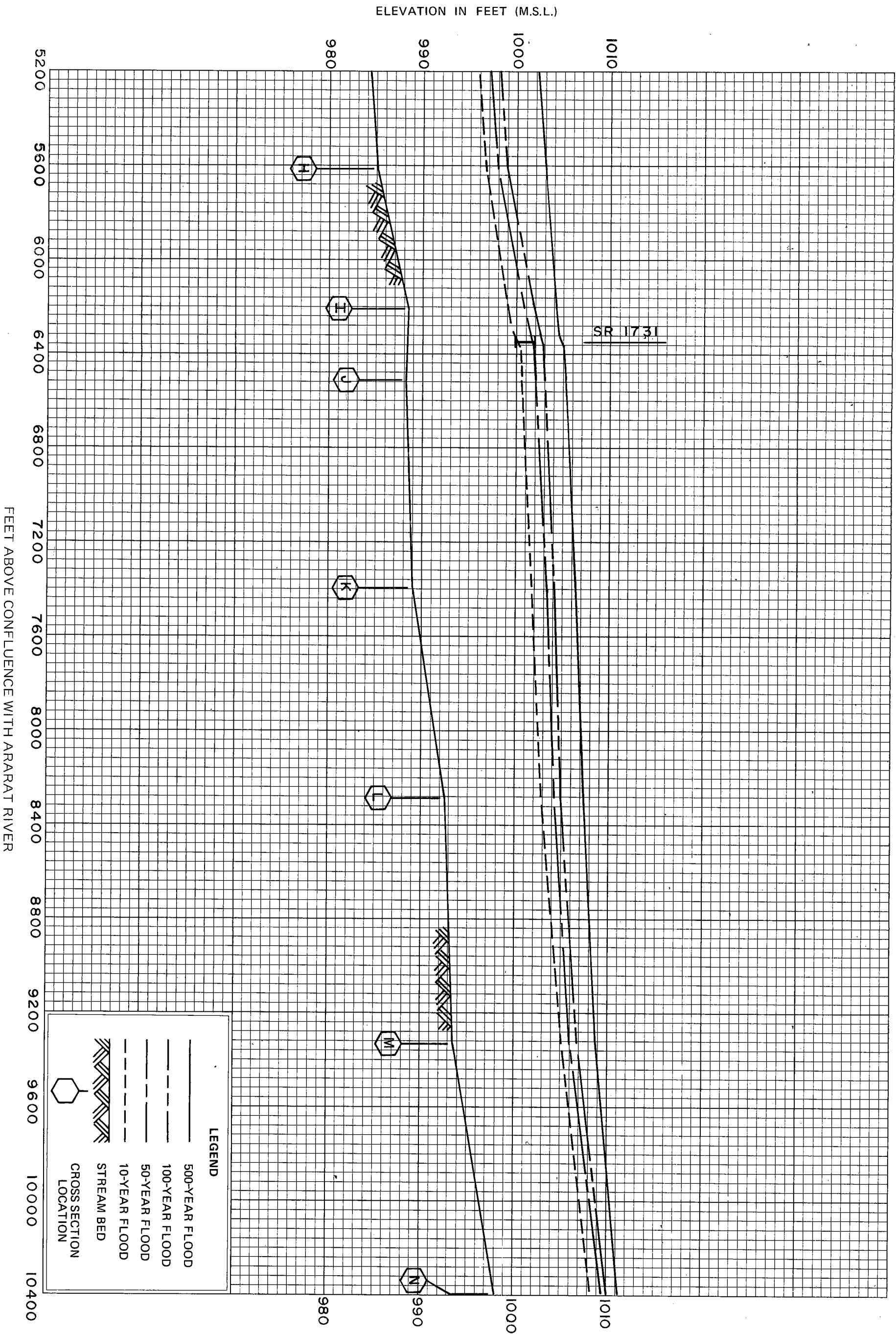


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STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PRESENT CONDITIONS

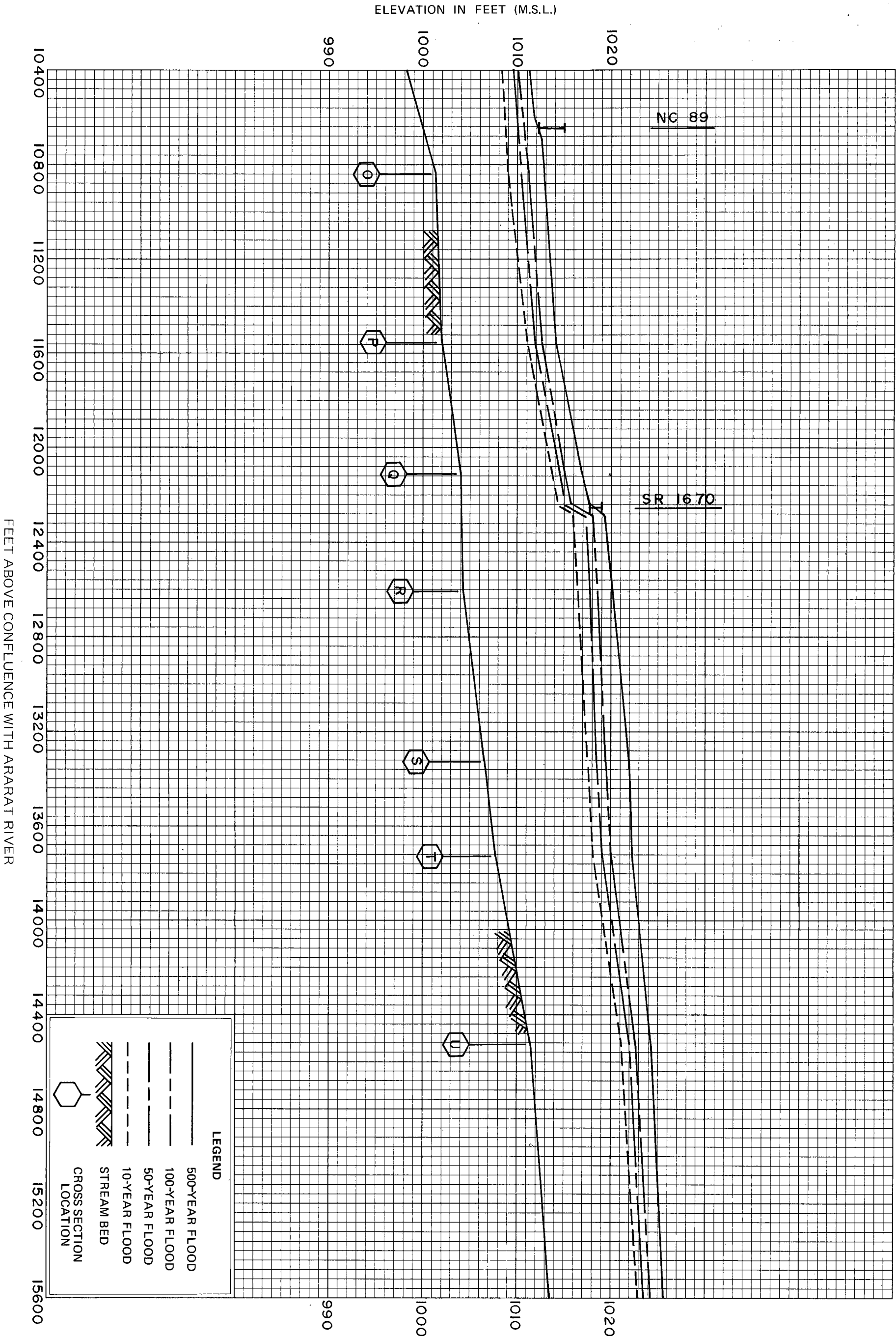


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PRESENT CONDITIONS



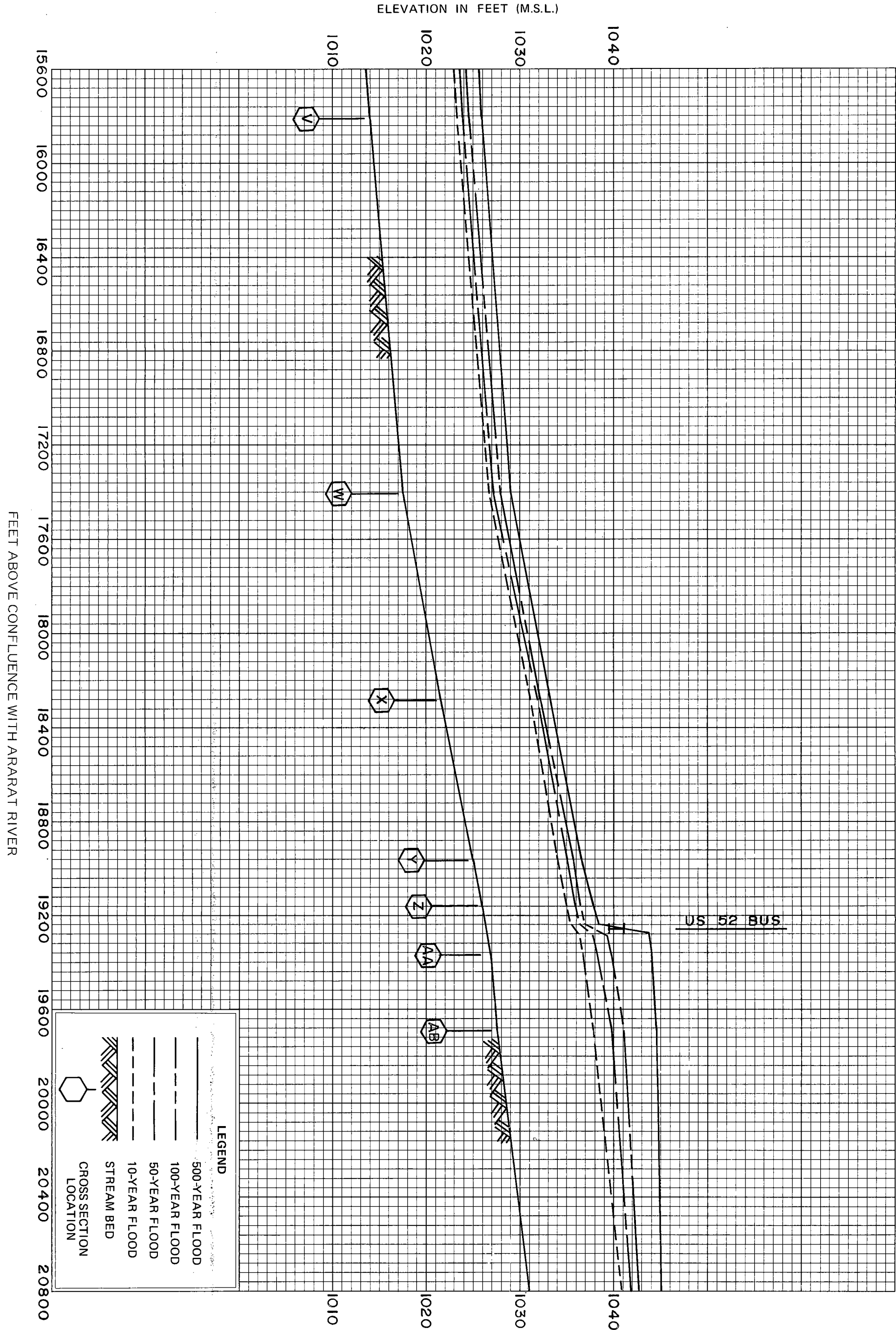
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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PRESENT CONDITIONS





FLOOD PROFILES

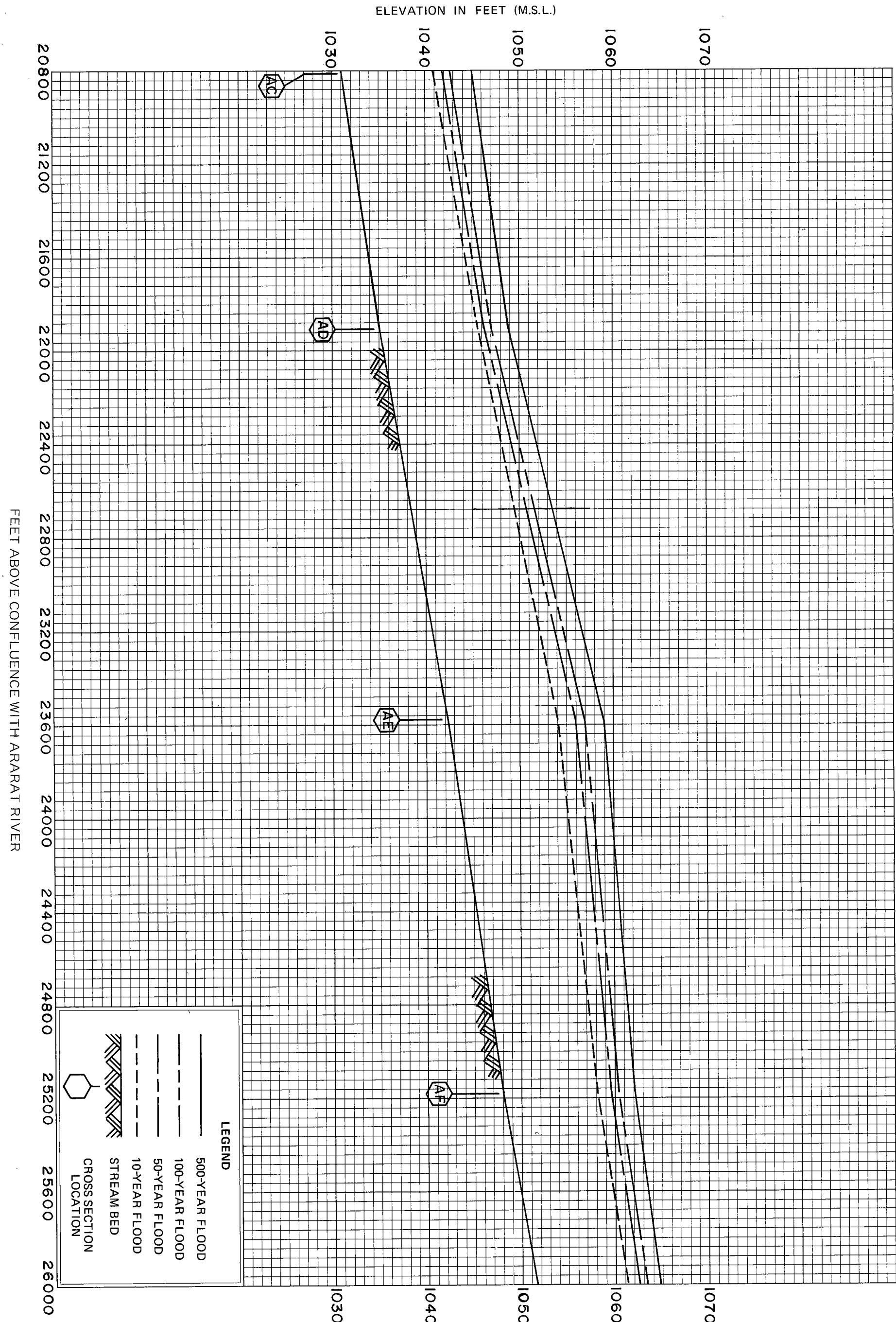
LOVILLS  
STEWARTS CREEK PRESENT CONDITIONS



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.



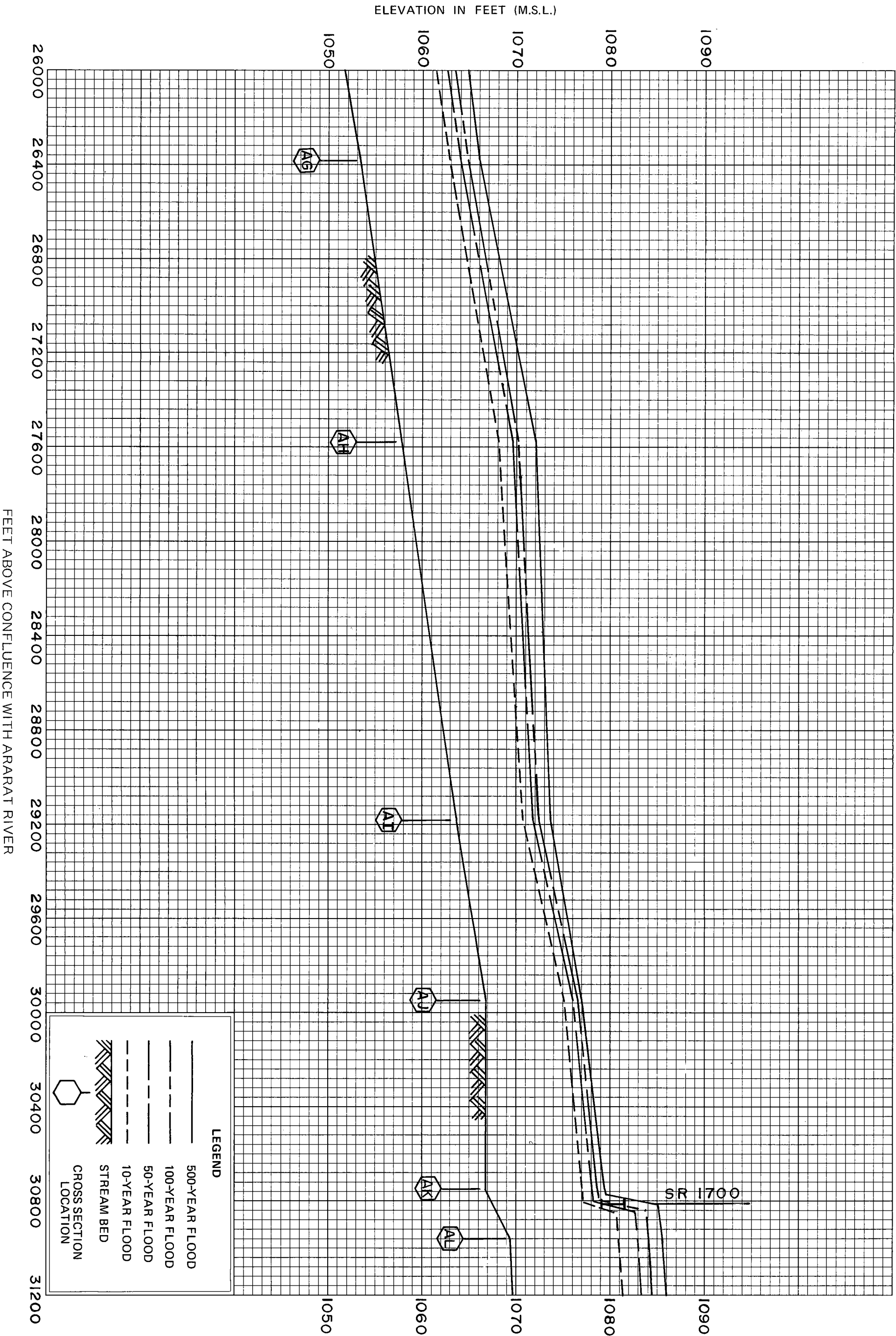


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PRESENT CONDITIONS

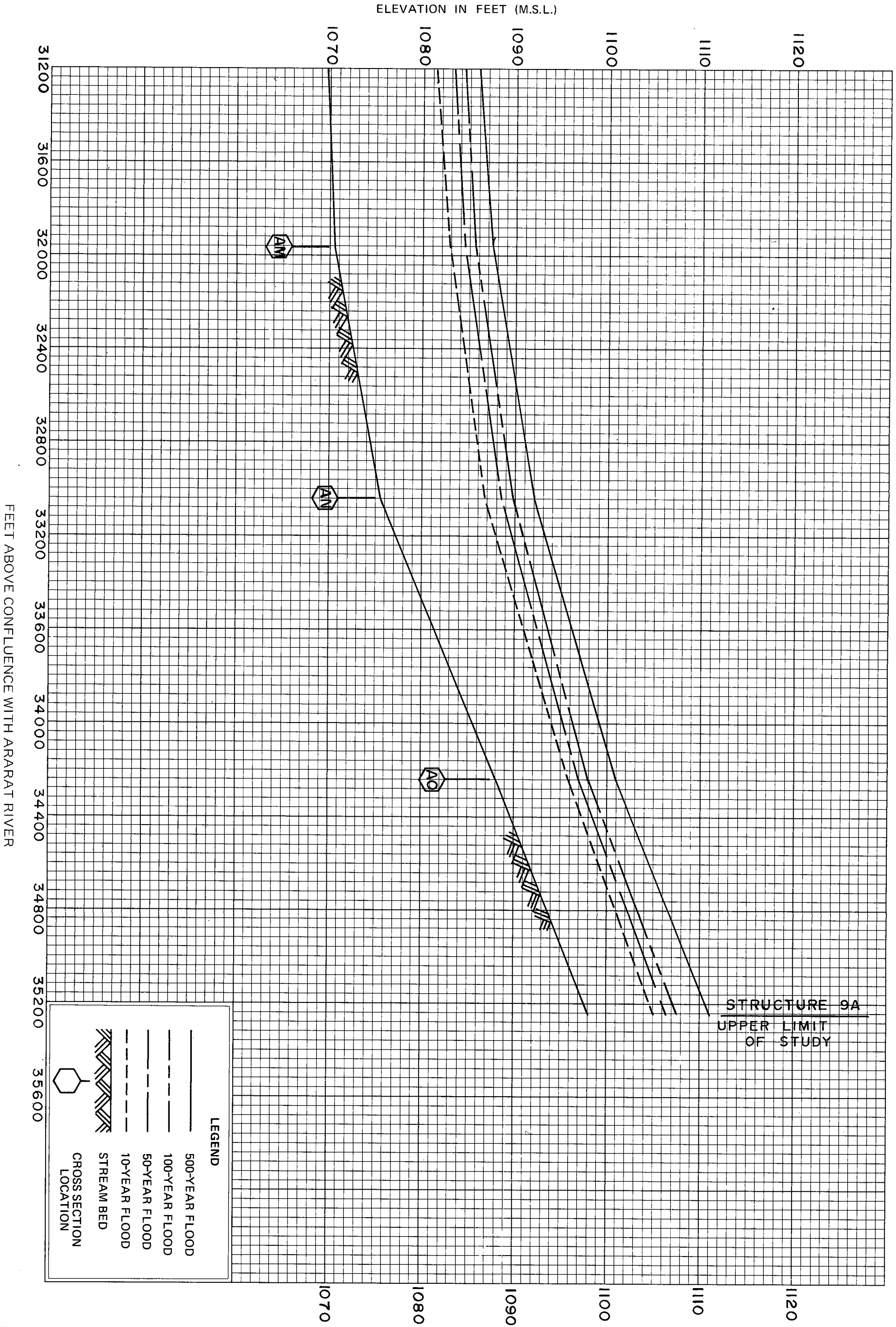


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PRESENT CONDITIONS

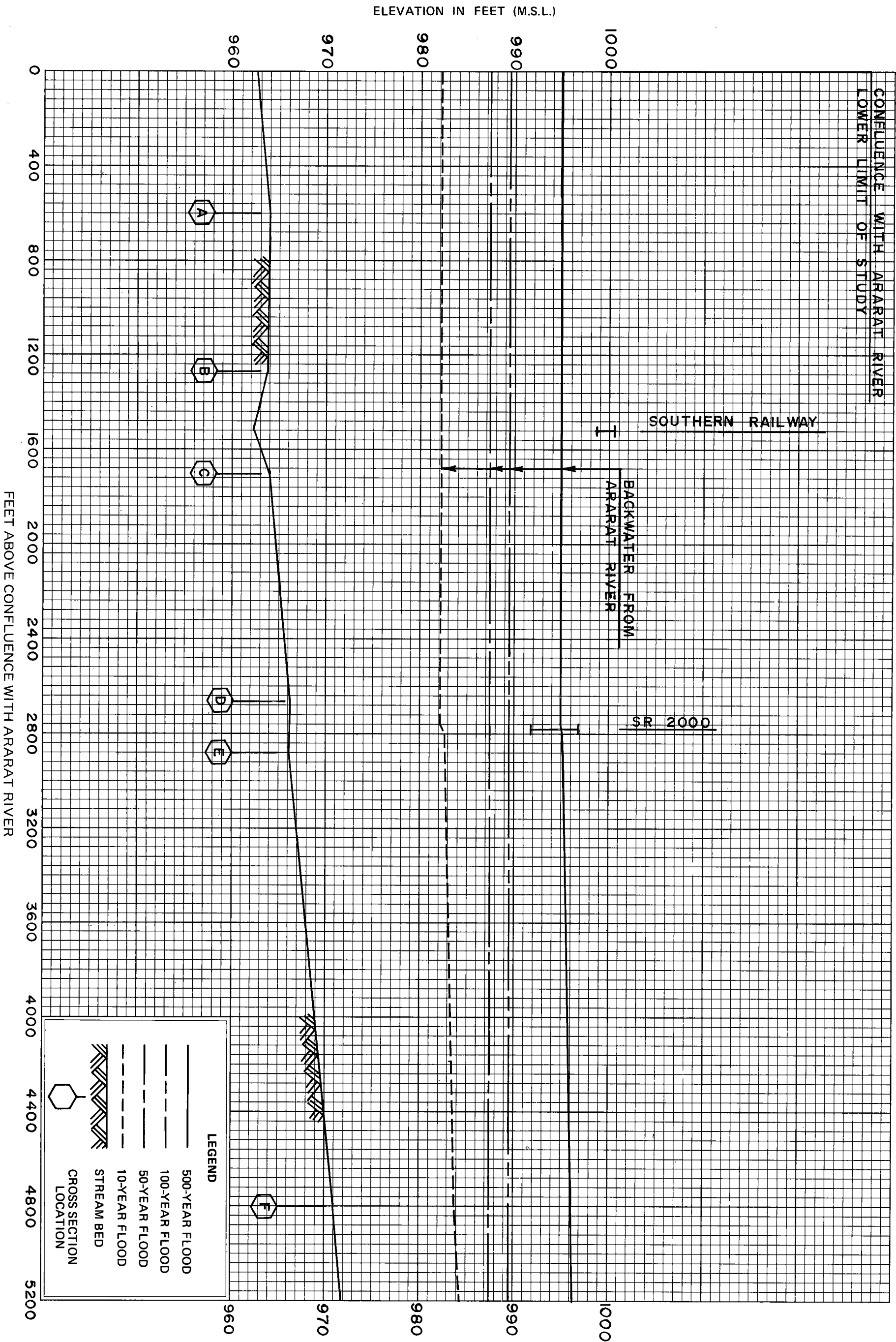


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

### FLOOD PROFILES

LOVILLS CREEK PRESENT CONDITIONS



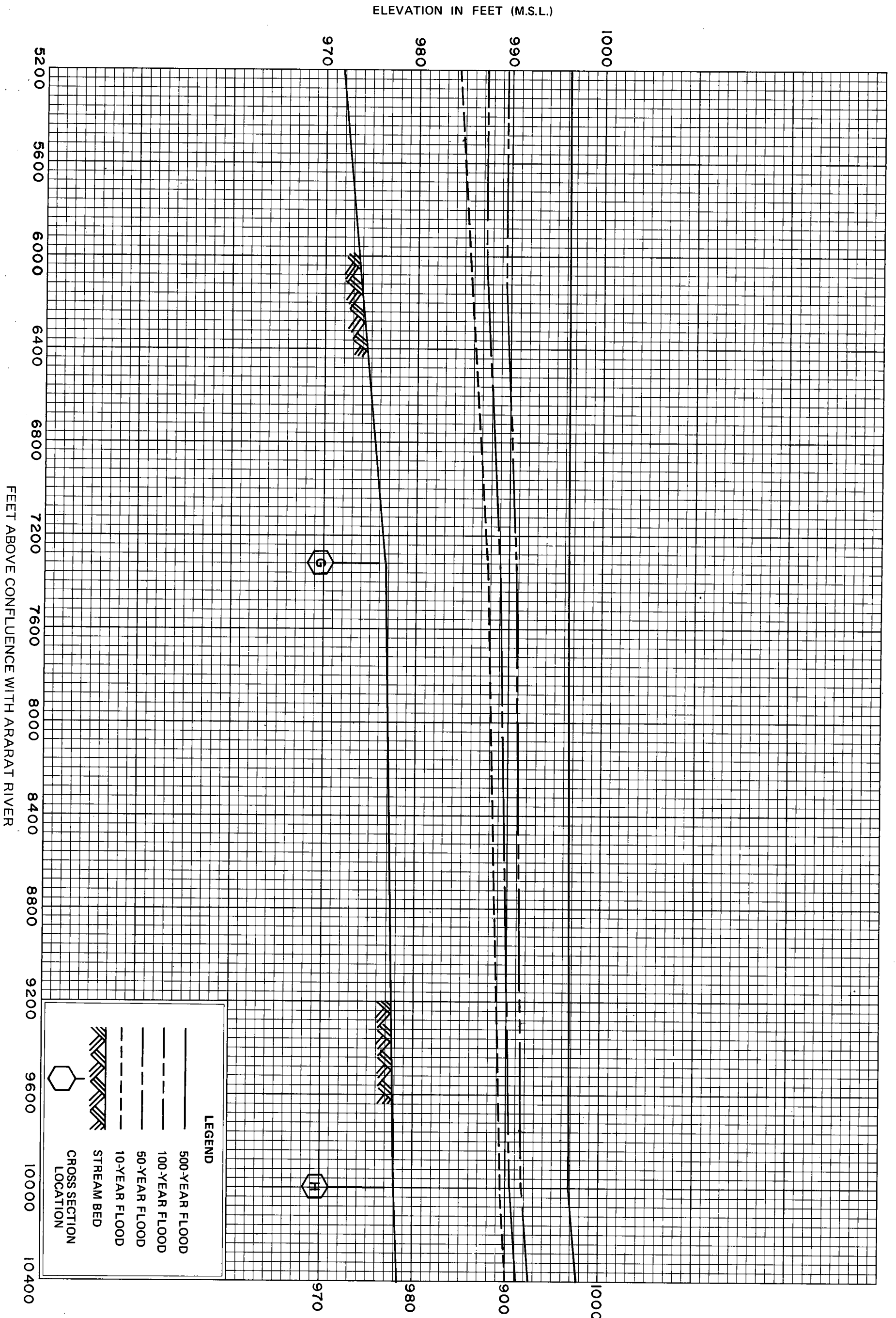
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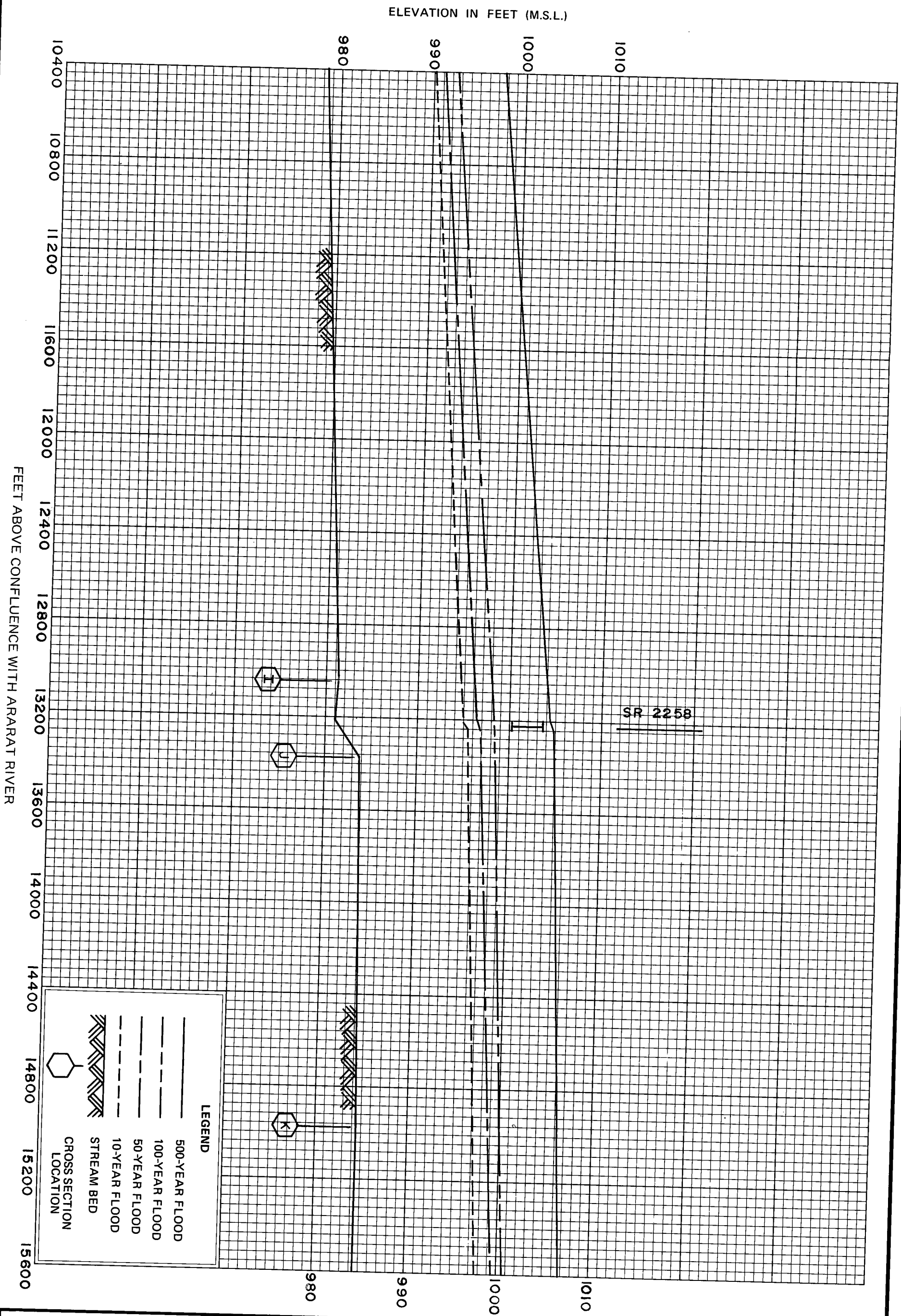
- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

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STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.

**FLOOD PROFILES**

STEWARTS CREEK PROJECT COMPLETED





**LEGEND**

500-YEAR FLOOD

100-YEAR FLOOD

50-YEAR FLOOD

10-YEAR FLOOD

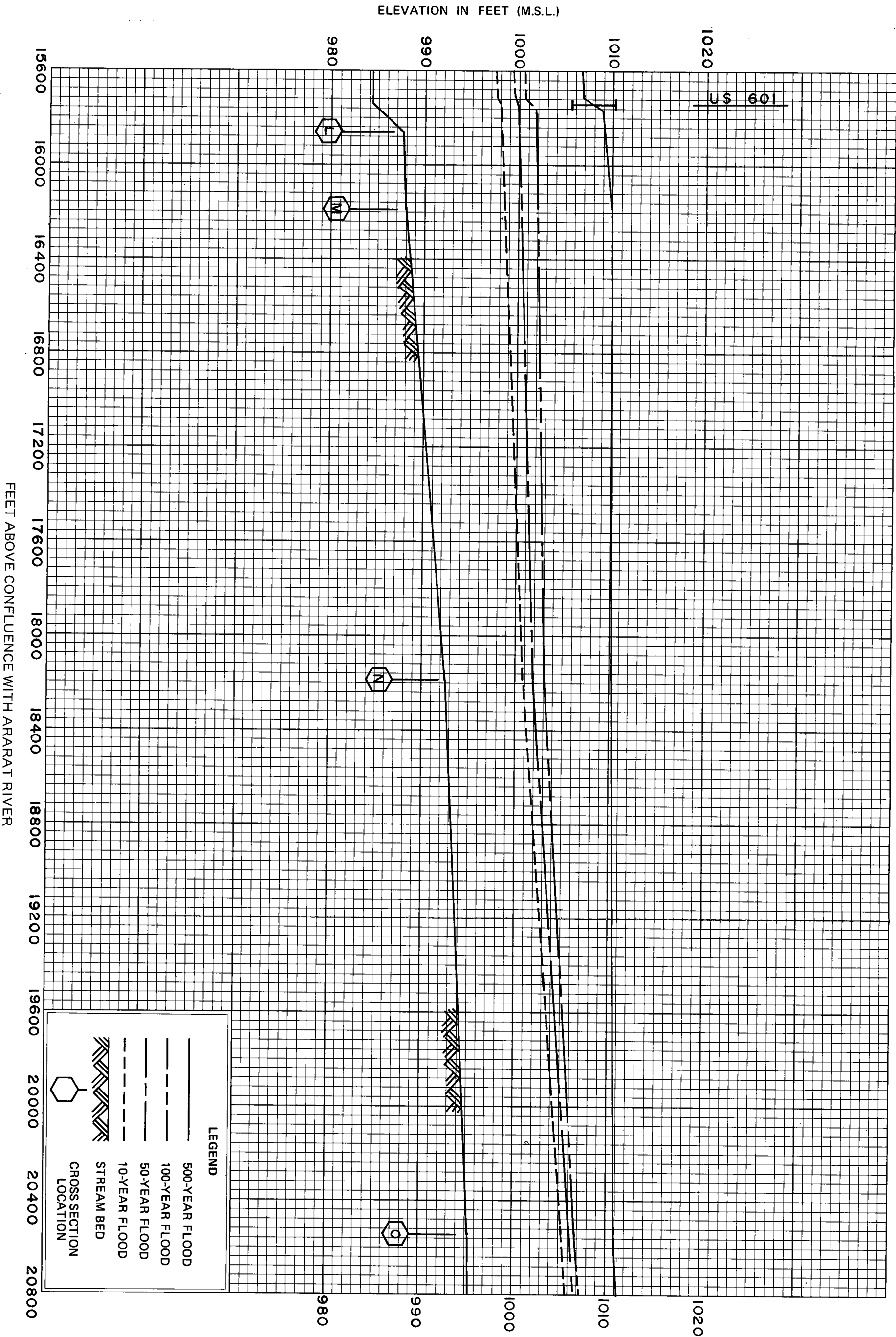
STREAM BED

CROSS SECTION LOCATION

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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

**FLOOD PROFILES**

STEWARTS CREEK PROJECT COMPLETED



**LEGEND**

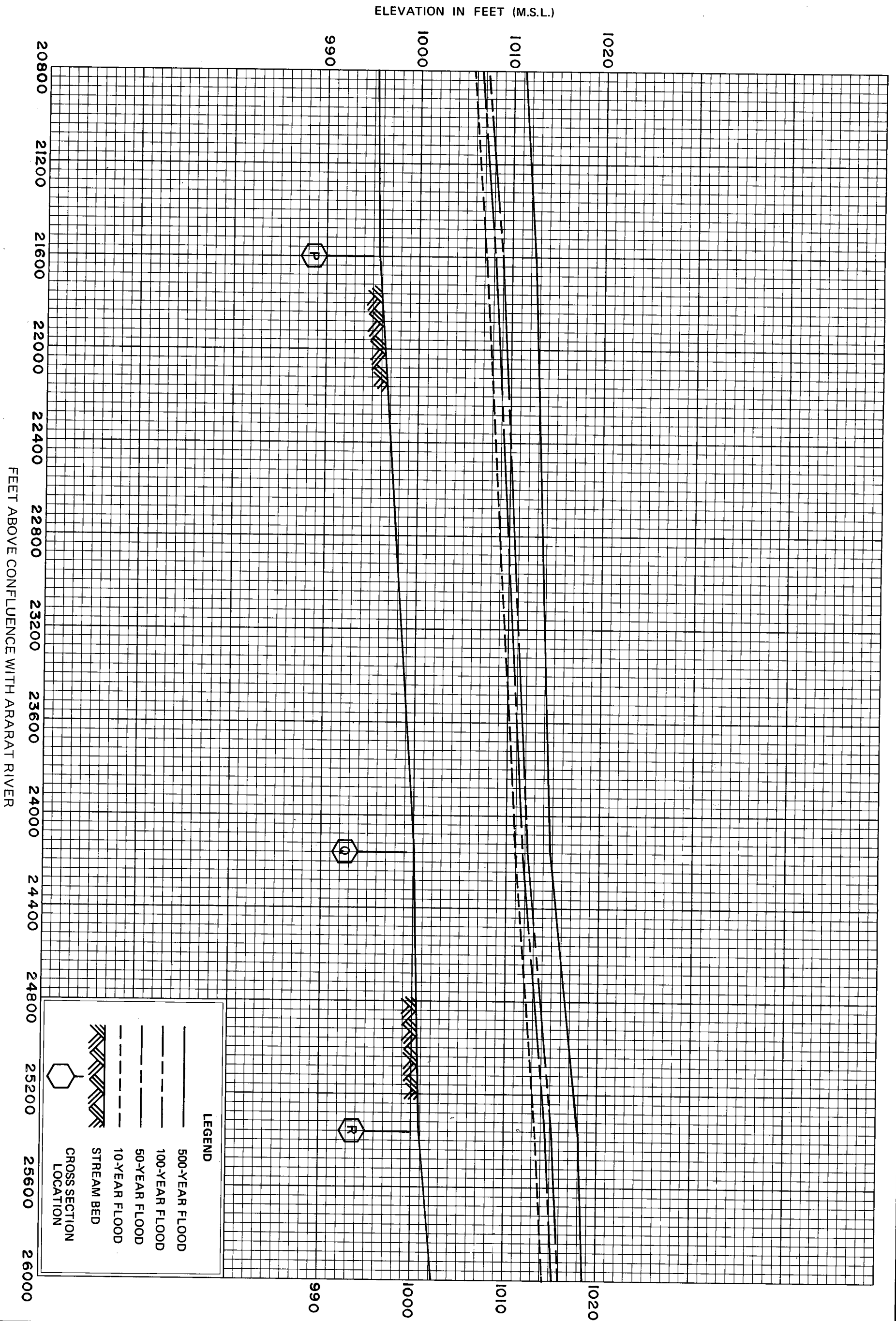
- 500-YEAR FLOOD
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- STREAM BED
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 HAZARD STUDY  
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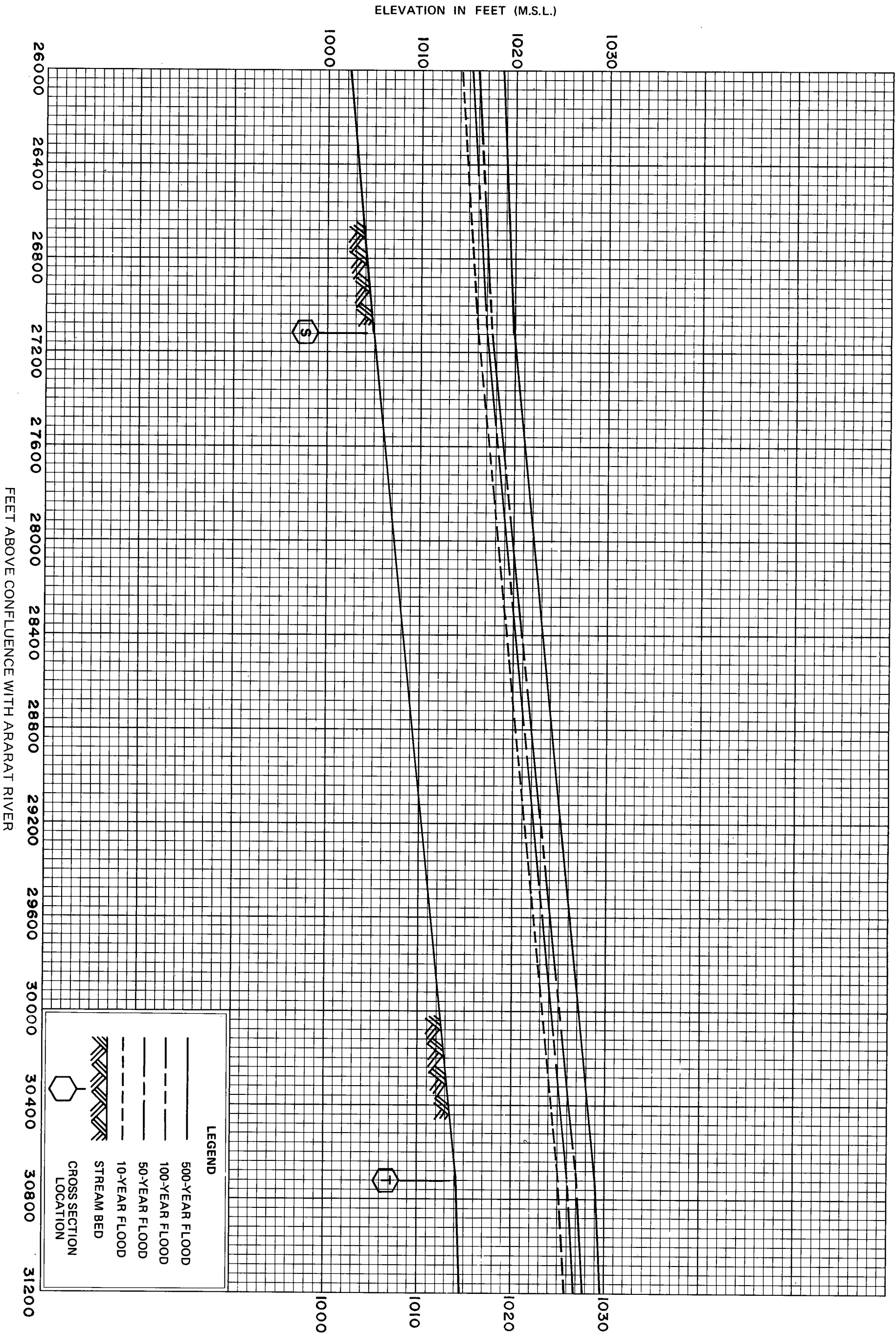
**FLOOD PROFILES**

STEWARTS CREEK PROJECT COMPLETED









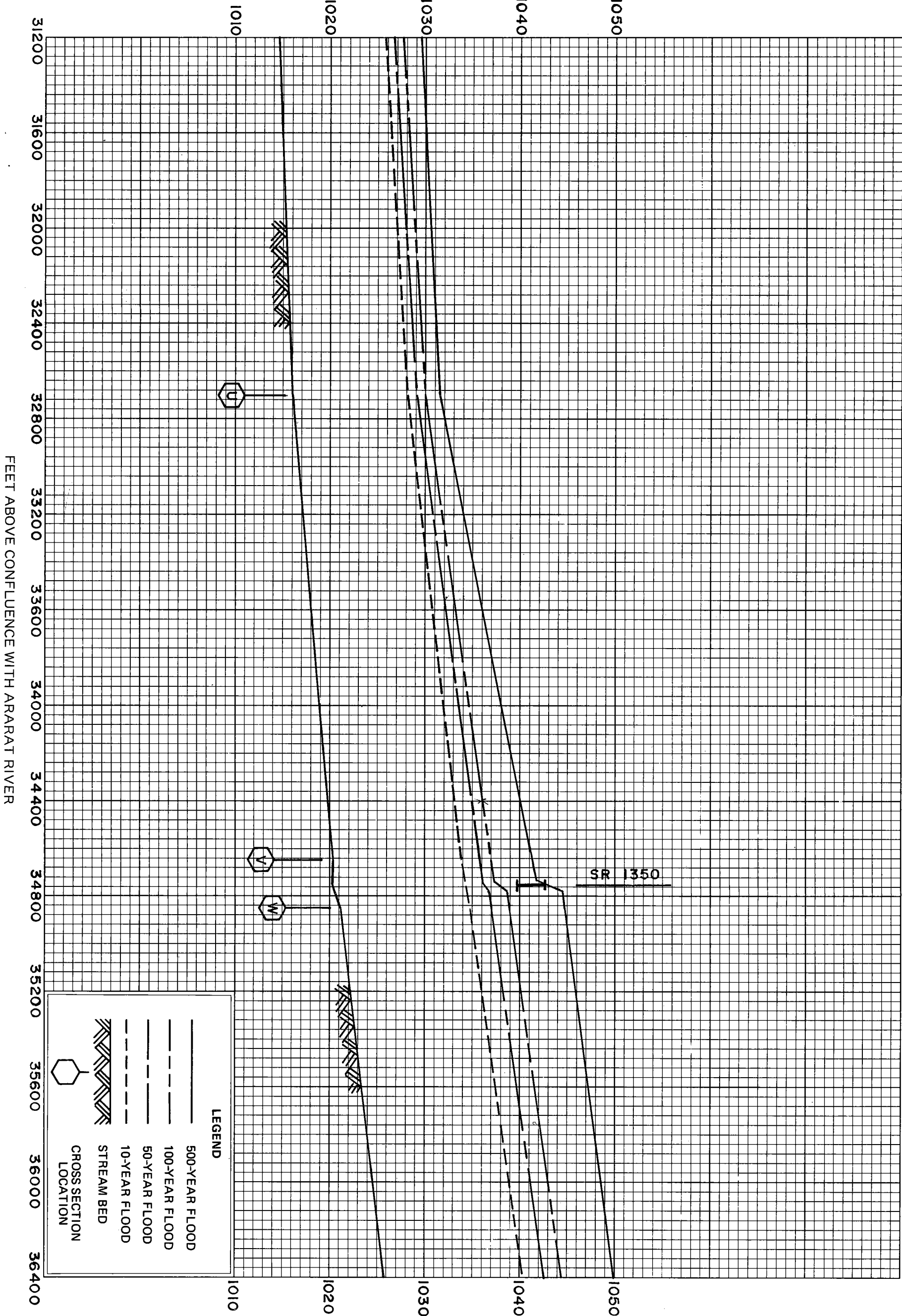
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STEWARTS CREEK-LOVILL'S CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

### FLOOD PROFILES

STEWARTS CREEK PROJECT COMPLETED

ELEVATION IN FEET (M.S.L.)



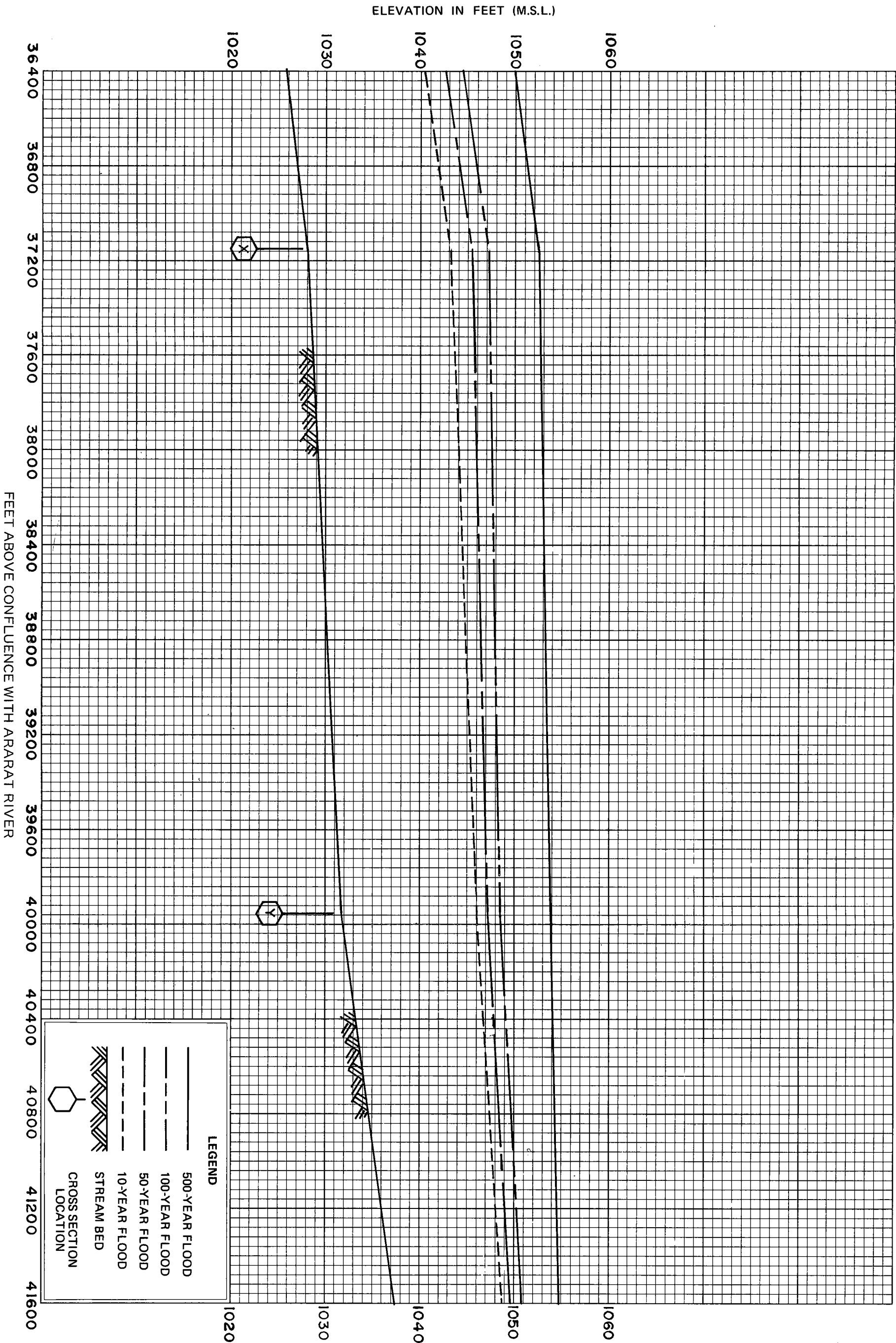
**LEGEND**

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

**FLOOD PROFILES**

STEWARTS CREEK PROJECT COMPLETED

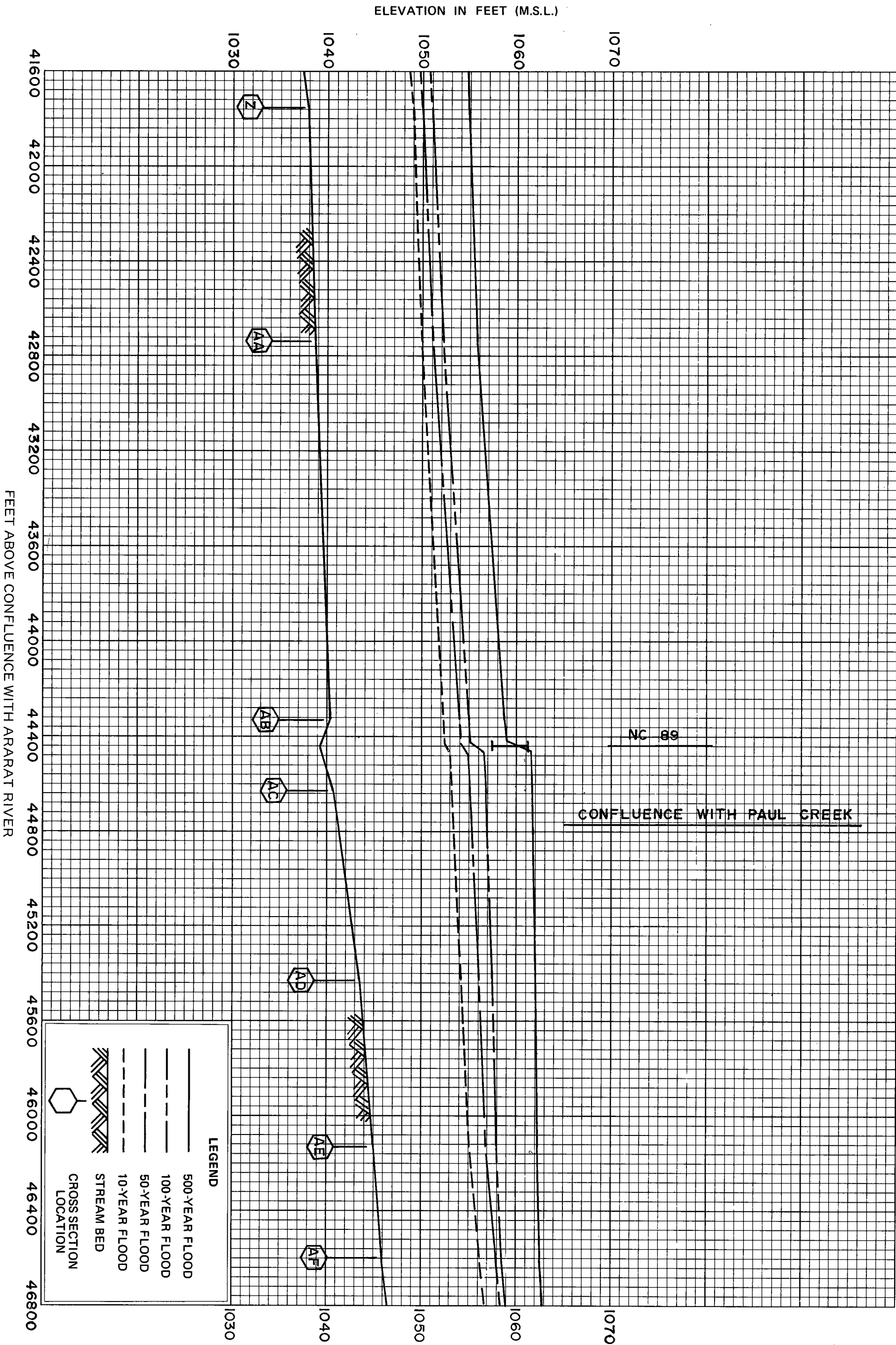
U.S. DEPARTMENT OF AGRICULTURE  
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STEWARTS CREEK-LOVILLS CREEK FLOOD  
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HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.

FLOOD PROFILES

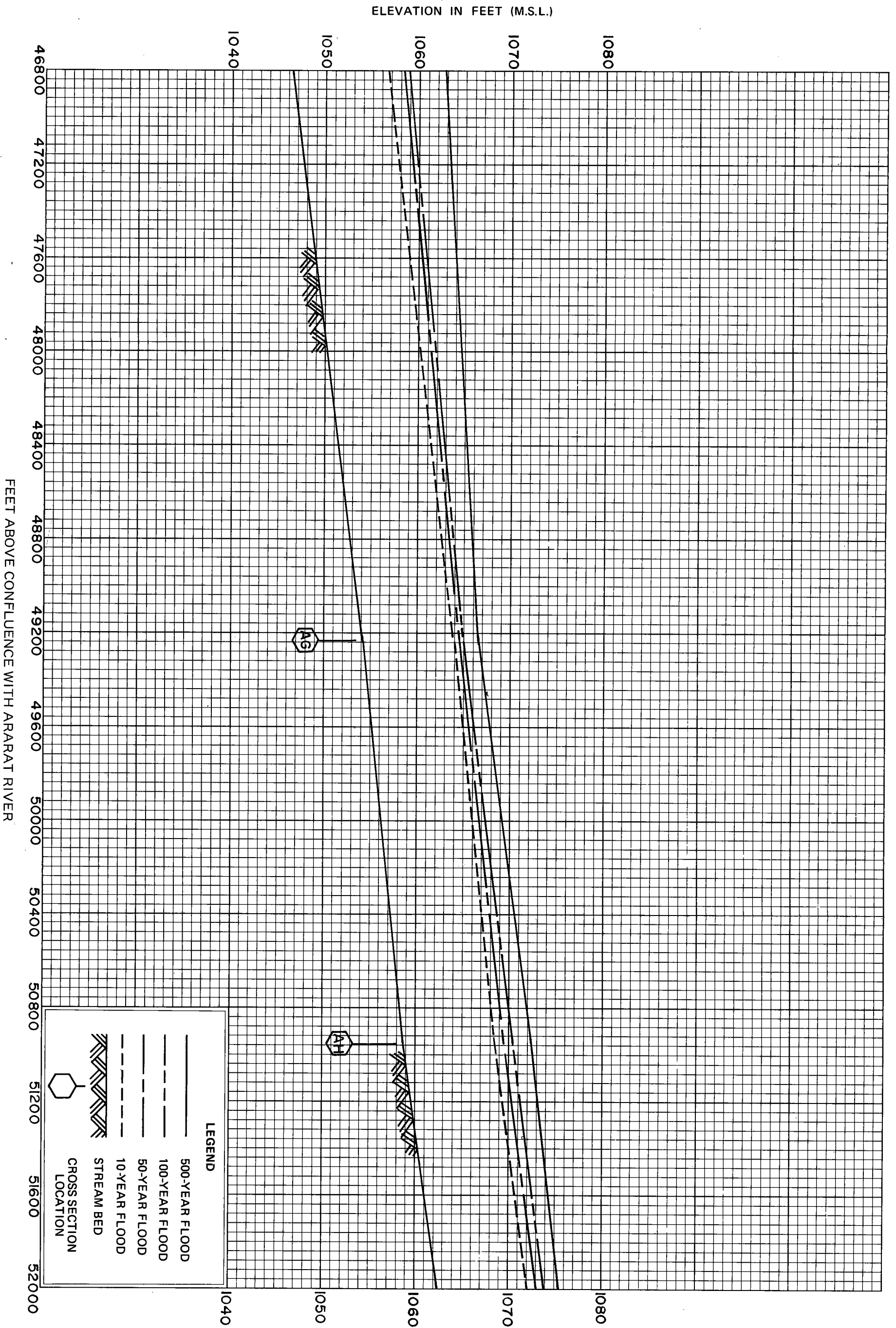
STEWARTS CREEK PROJECT COMPLETED



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

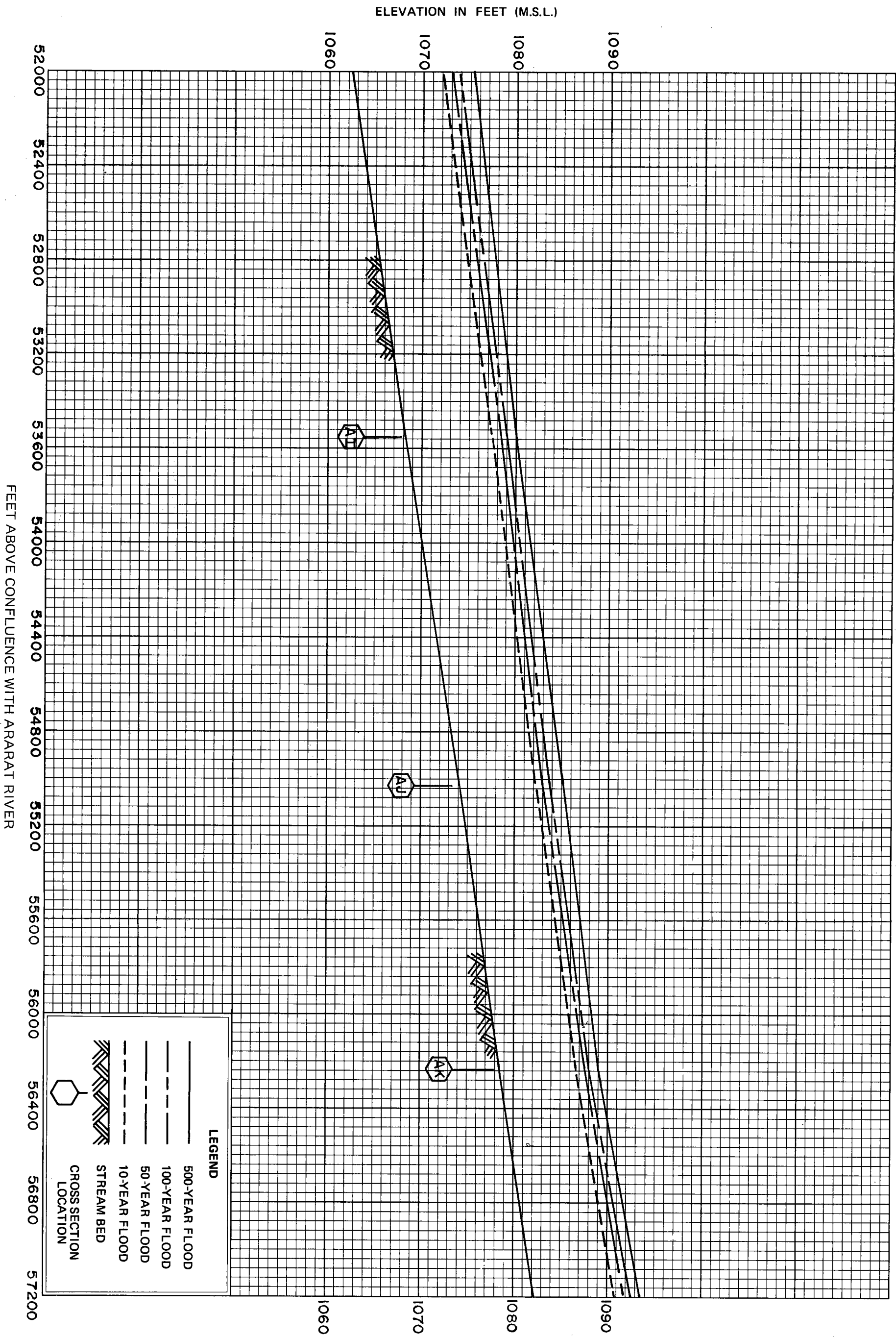
STEWARTS CREEK PROJECT COMPLETED



FLOOD PROFILES

STEWARTS CREEK PROJECT COMPLETED

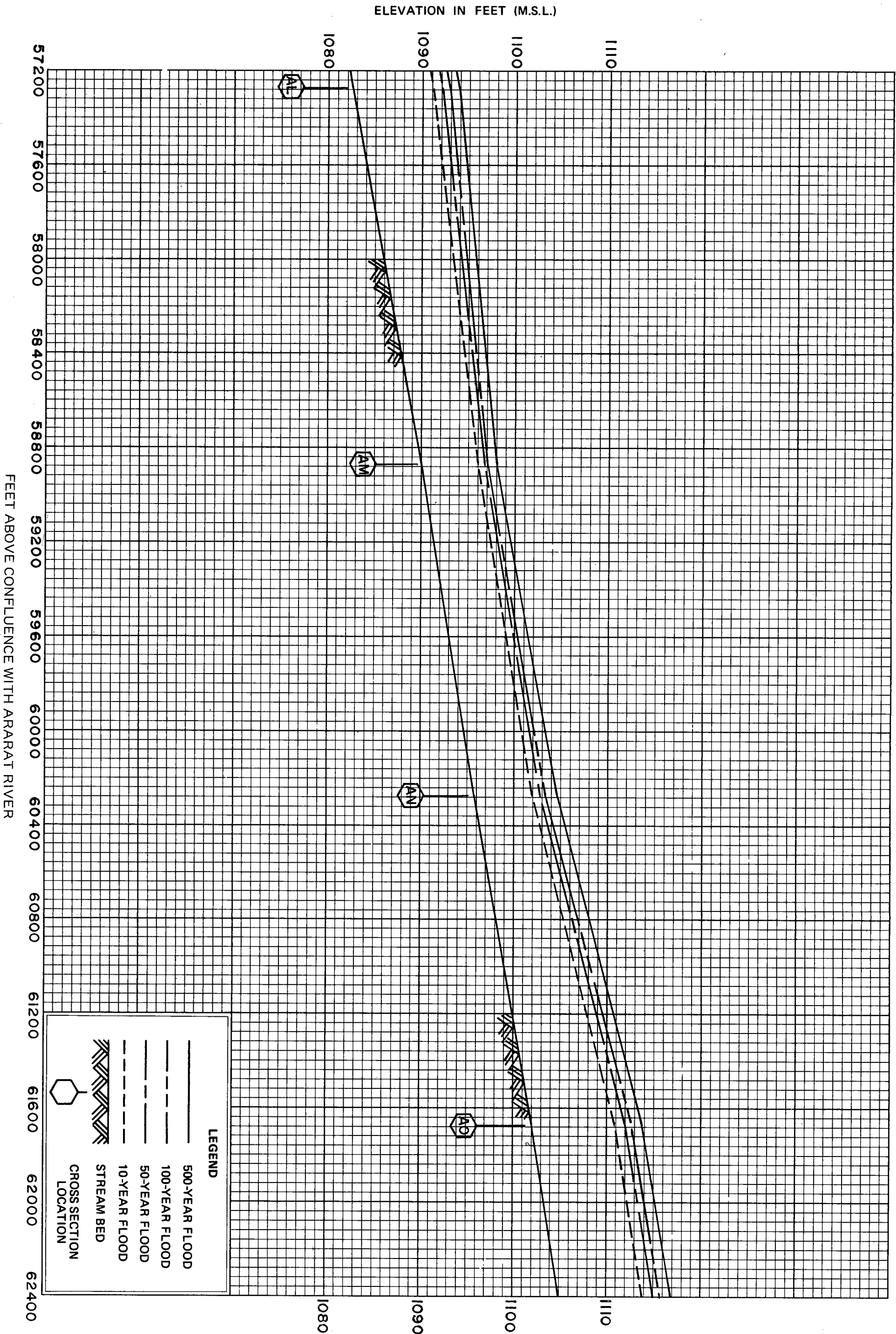
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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.



# FLOOD PROFILES

STEWARTS CREEK PROJECT COMPLETED

U.S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE  
 STEWARTS CREEK-LOVILLS CREEK FLOOD  
 HAZARD STUDY  
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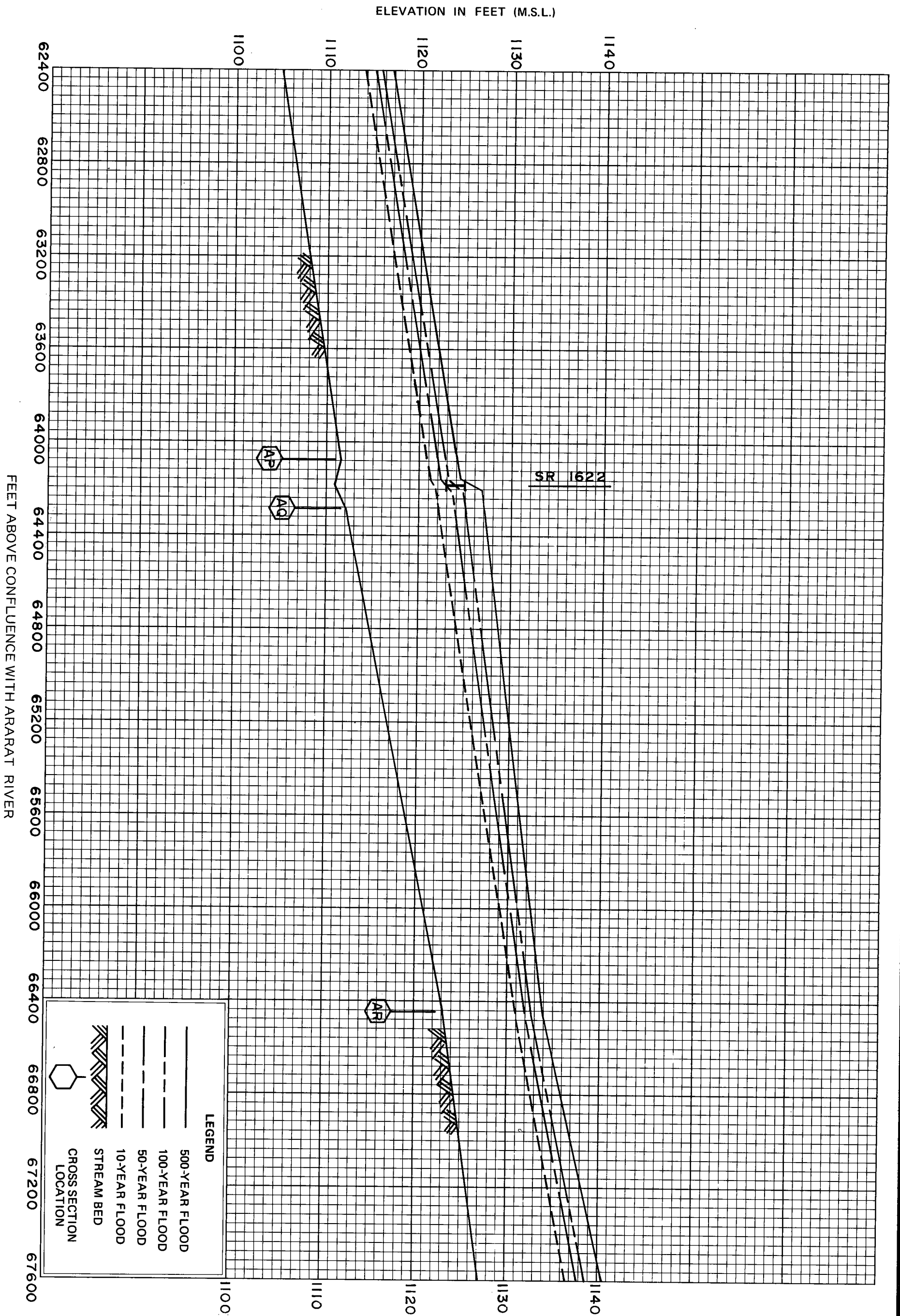


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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PROJECT COMPLETED



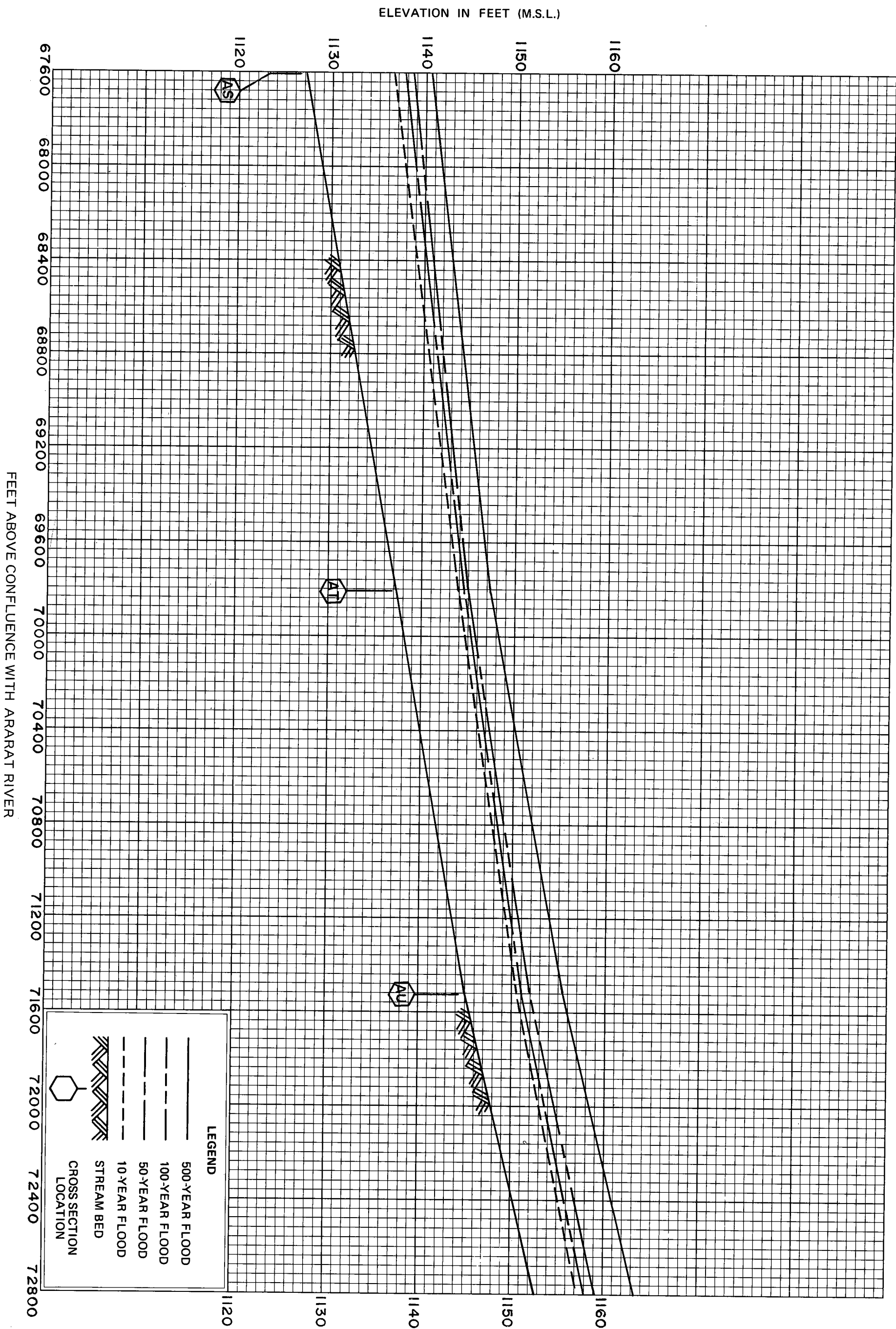


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STEWARTS CREEK-LOVILLS CREEK FLOOD  
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Surry Co., N. C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PROJECT COMPLETED

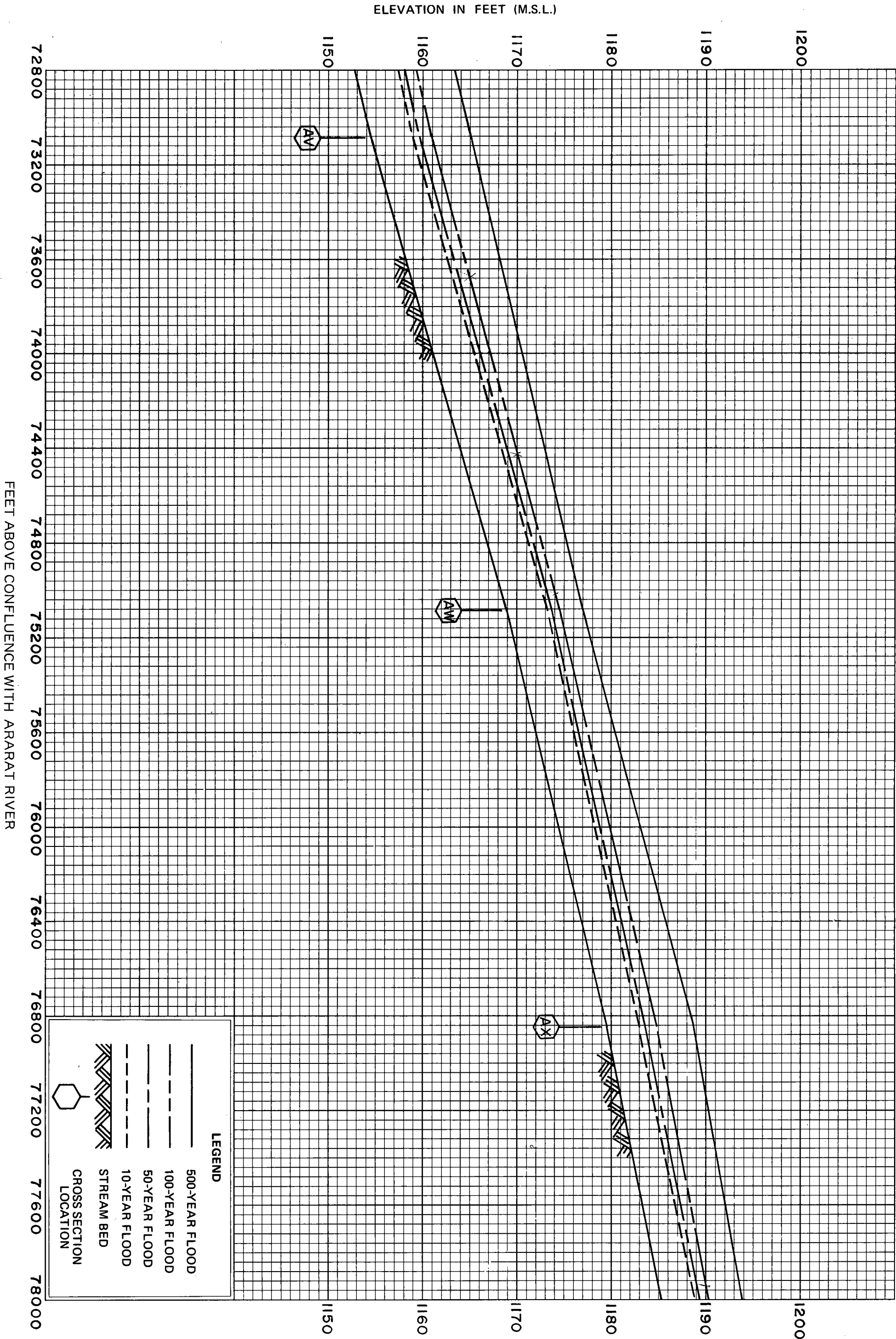




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**STEWARTS CREEK-LOVILLS CREEK FLOOD**  
**HAZARD STUDY**  
 Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

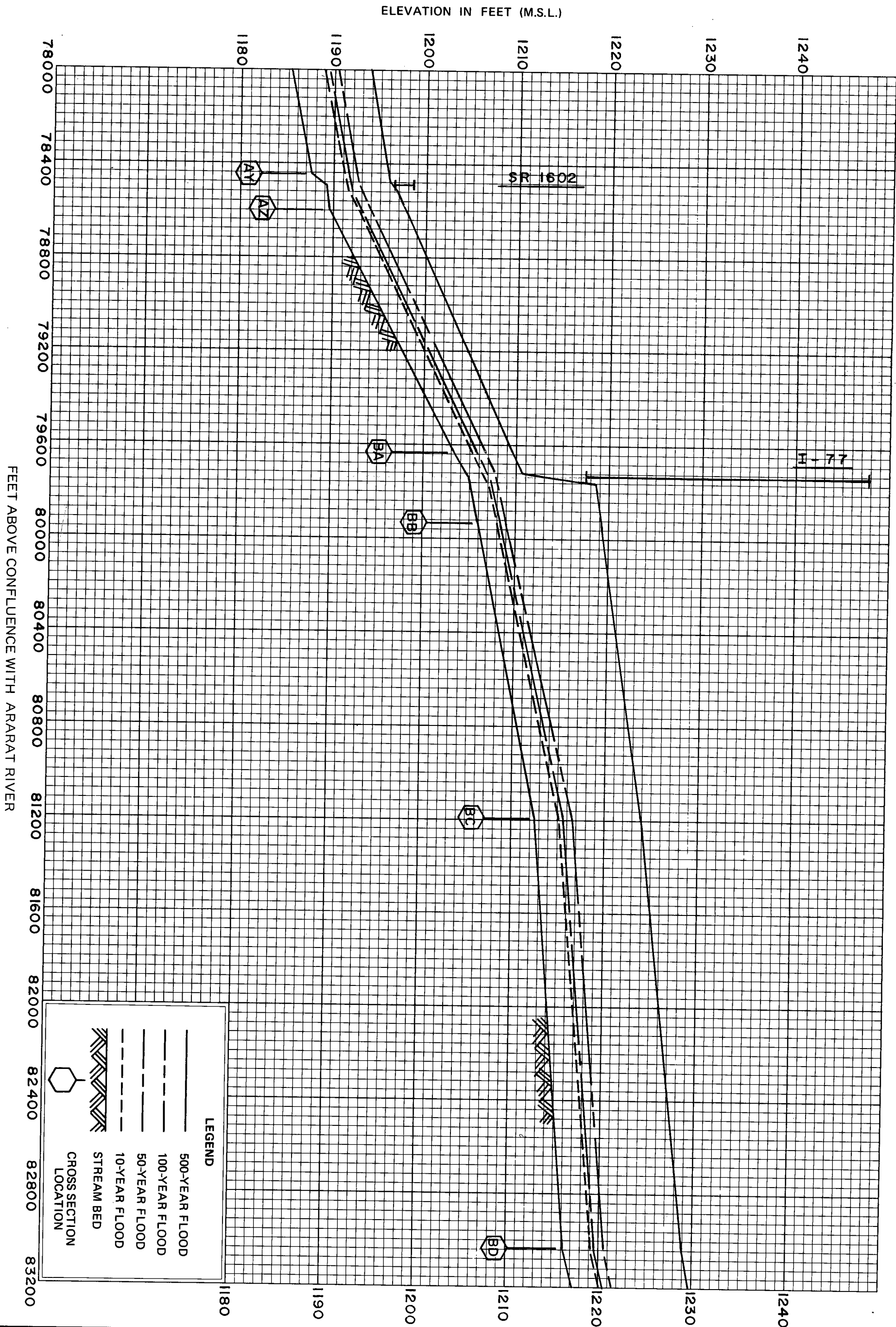
STEWARTS CREEK PROJECT COMPLETED



**FLOOD PROFILES**

STEWARTS CREEK PROJECT COMPLETED

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
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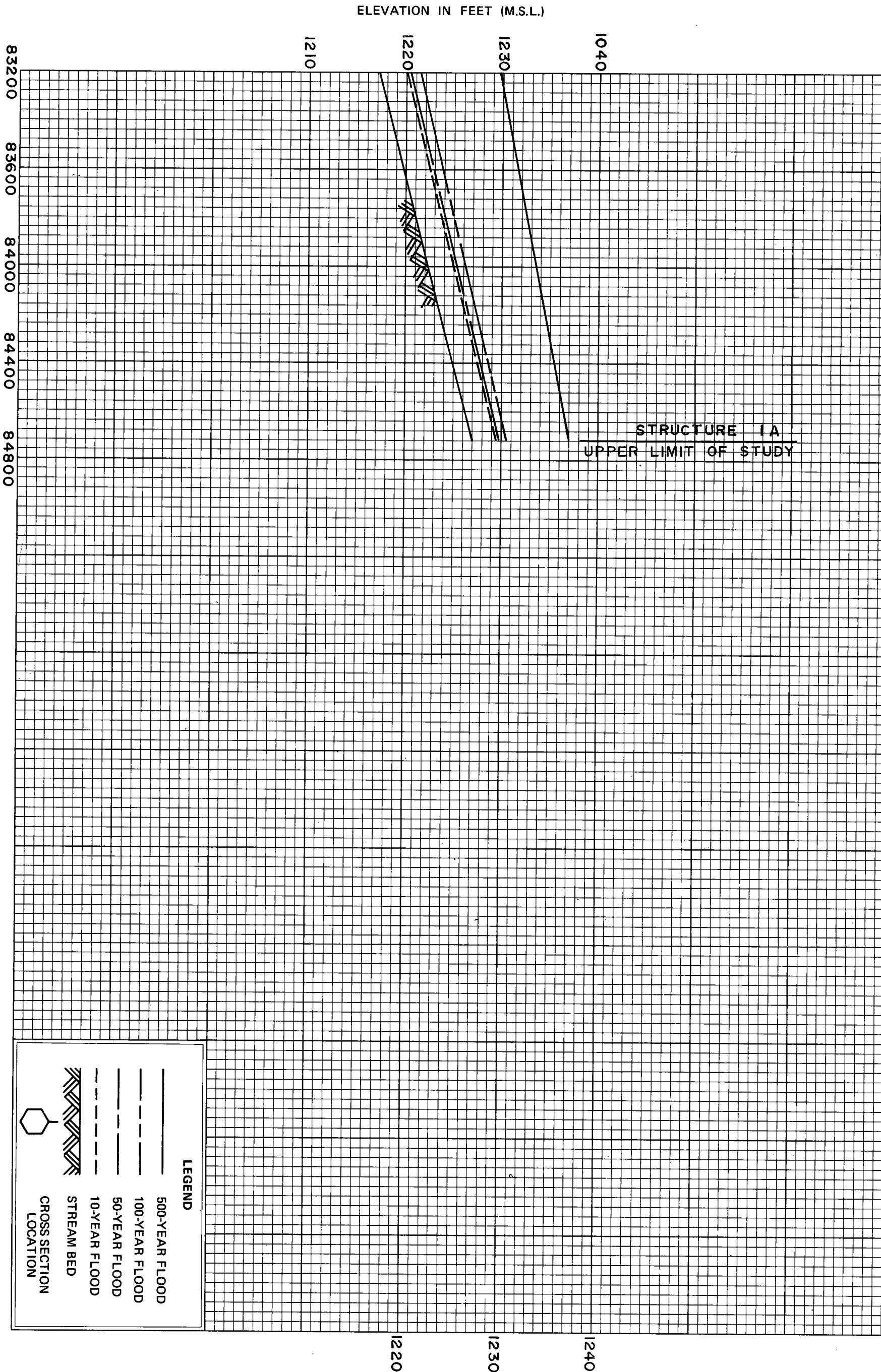


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 STEWARTS CREEK-LOVILL'S CREEK FLOOD  
 HAZARD STUDY  
 Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

STEWARTS CREEK PROJECT COMPLETED

FEET ABOVE CONFLUENCE WITH ARARAT RIVER



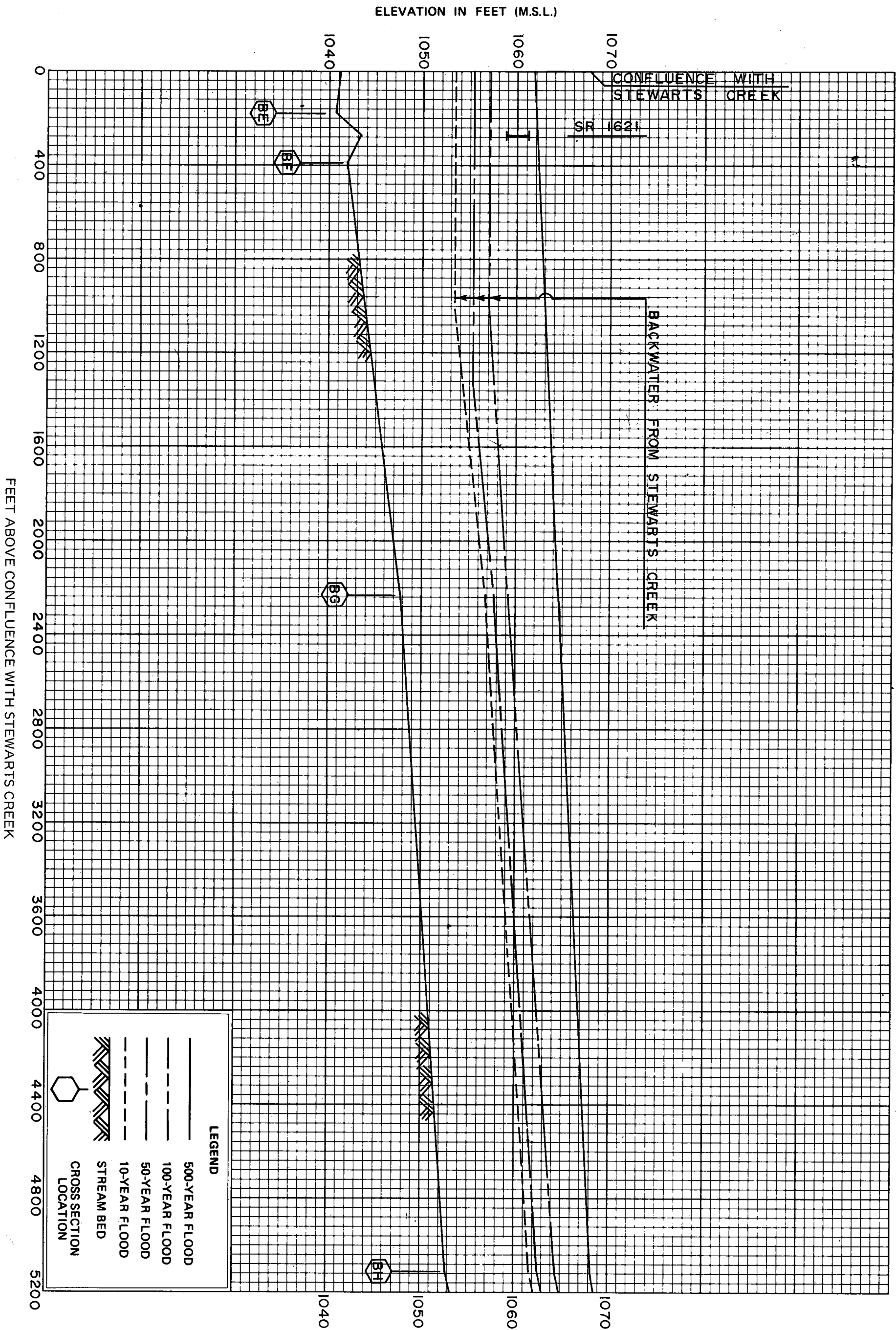
**LEGEND**

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.

**FLOOD PROFILES**

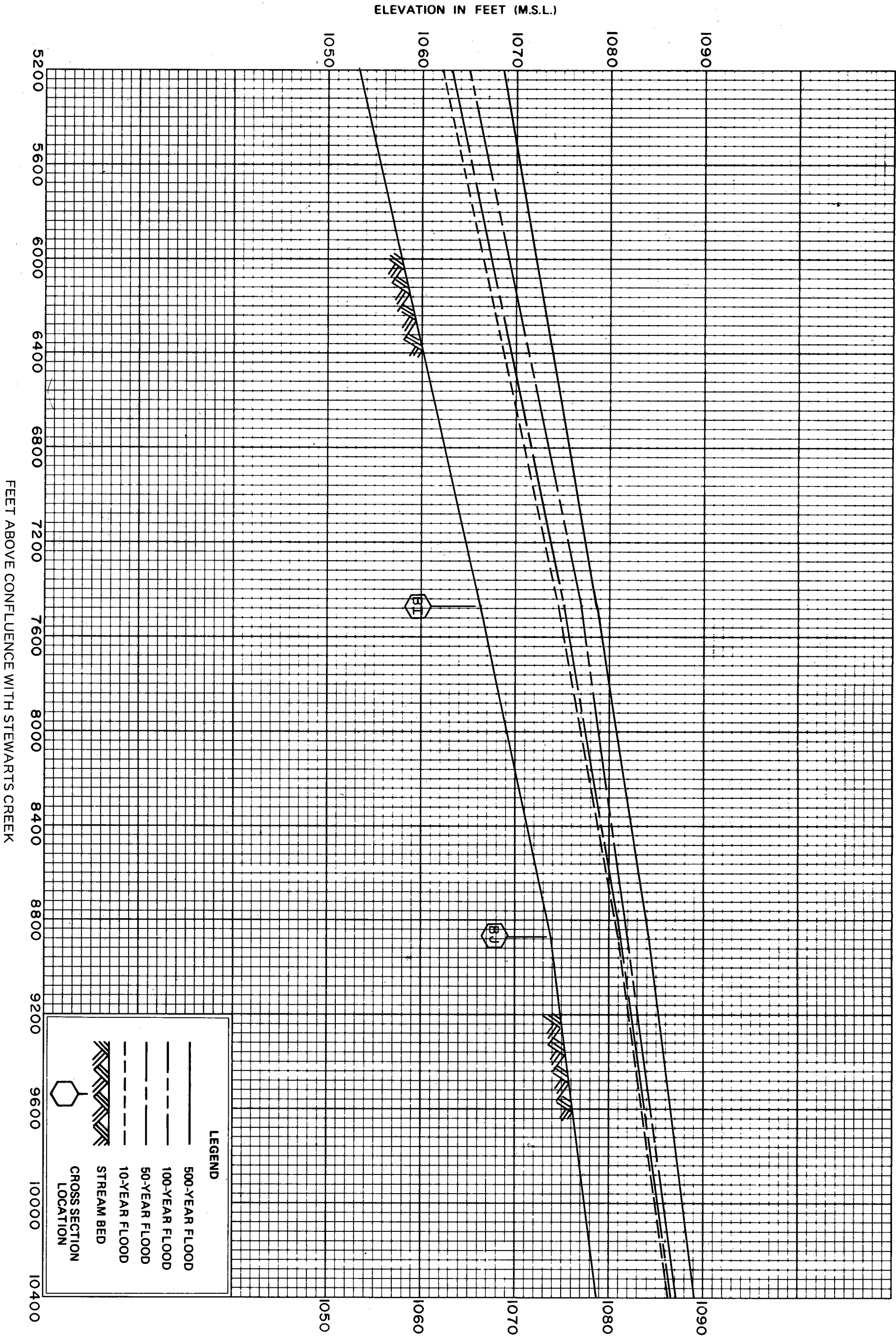
STEWARTS CREEK PROJECT COMPLETED



## FLOOD PROFILES

PAULS CREEK PROJECT COMPLETED

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.



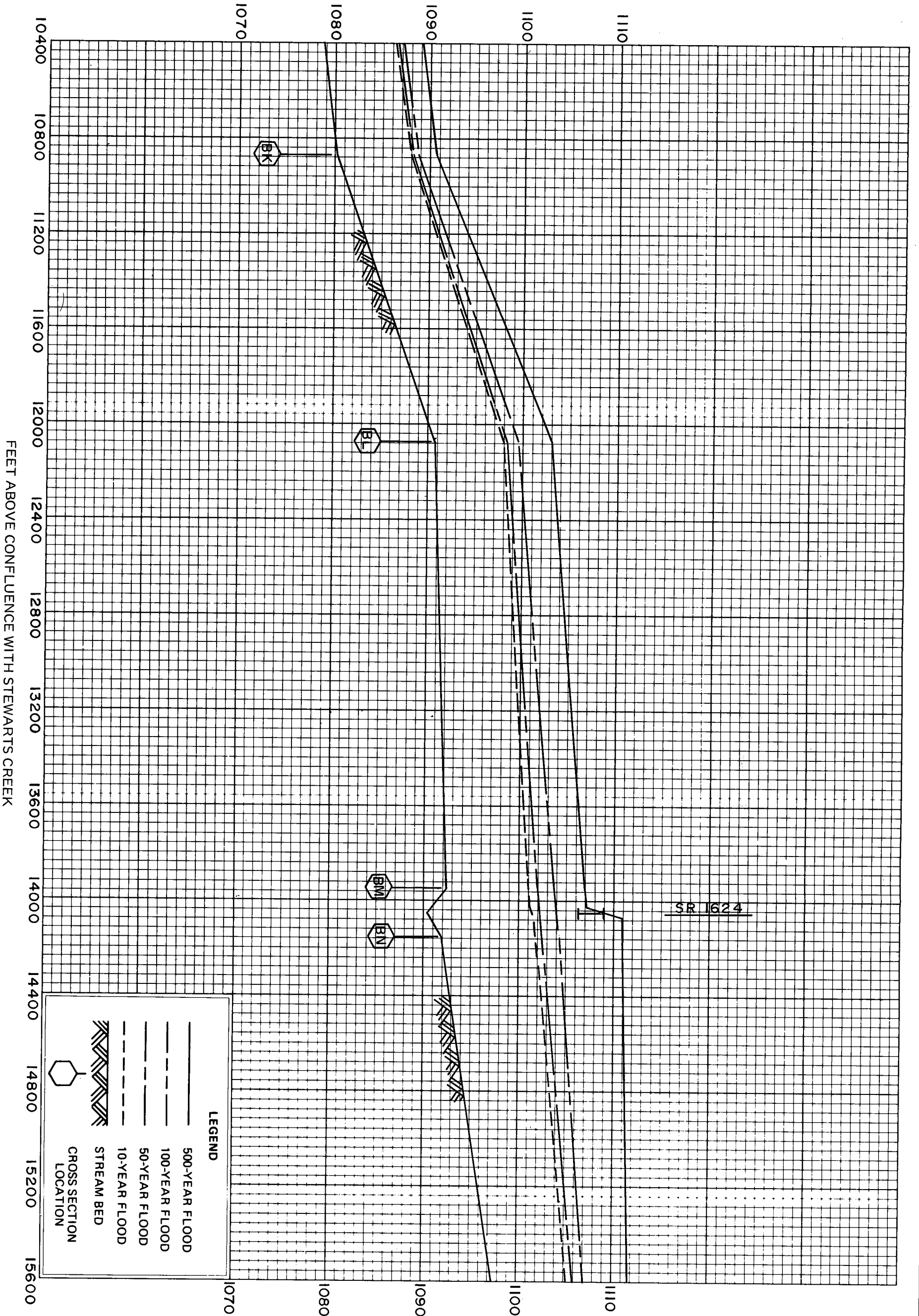
**FLOOD PROFILES**

PAULS CREEK PROJECT COMPLETED

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SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.



ELEVATION IN FEET (M.S.L.)



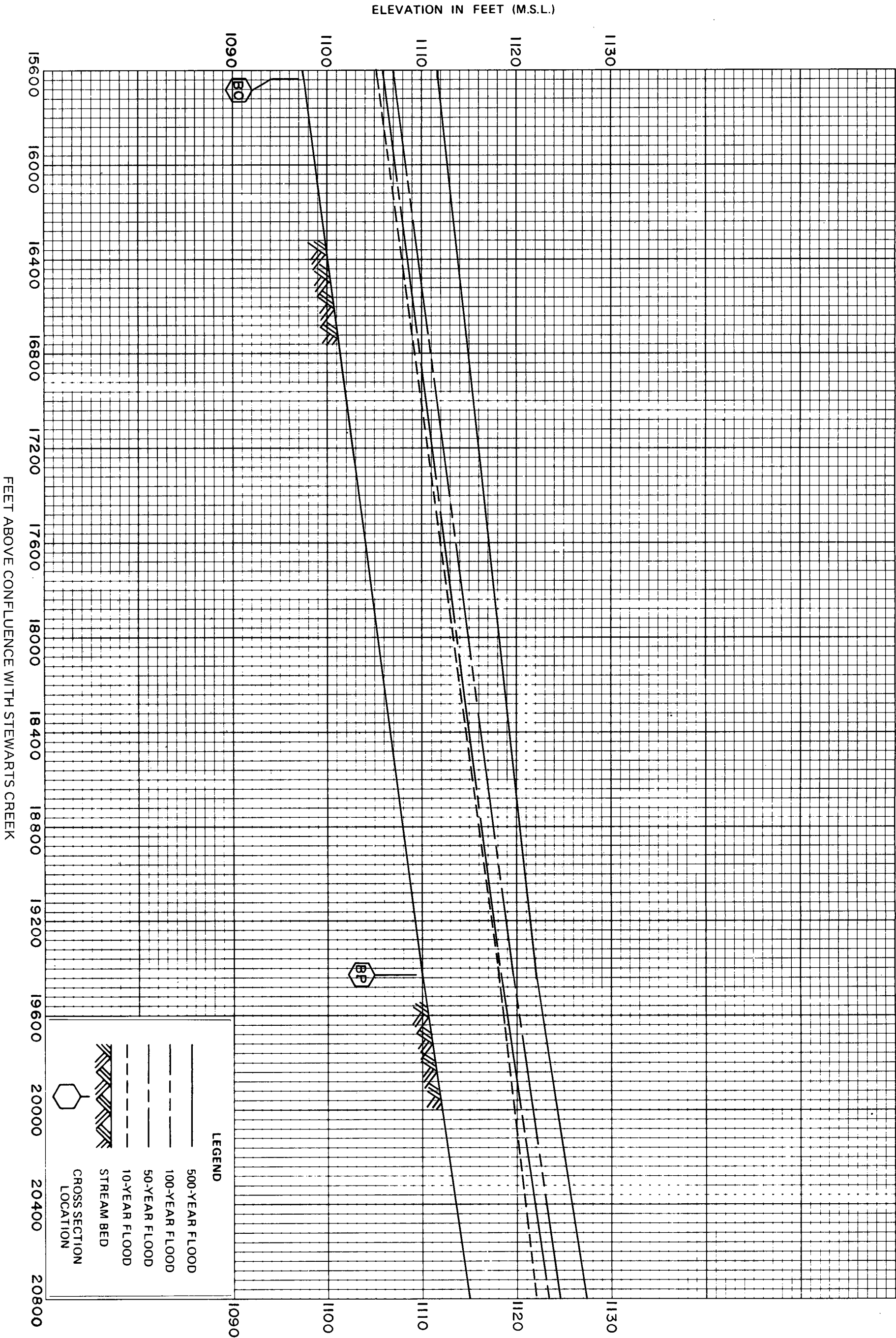
LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

PAULS CREEK PROJECT COMPLETED

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.



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SOIL CONSERVATION SERVICE

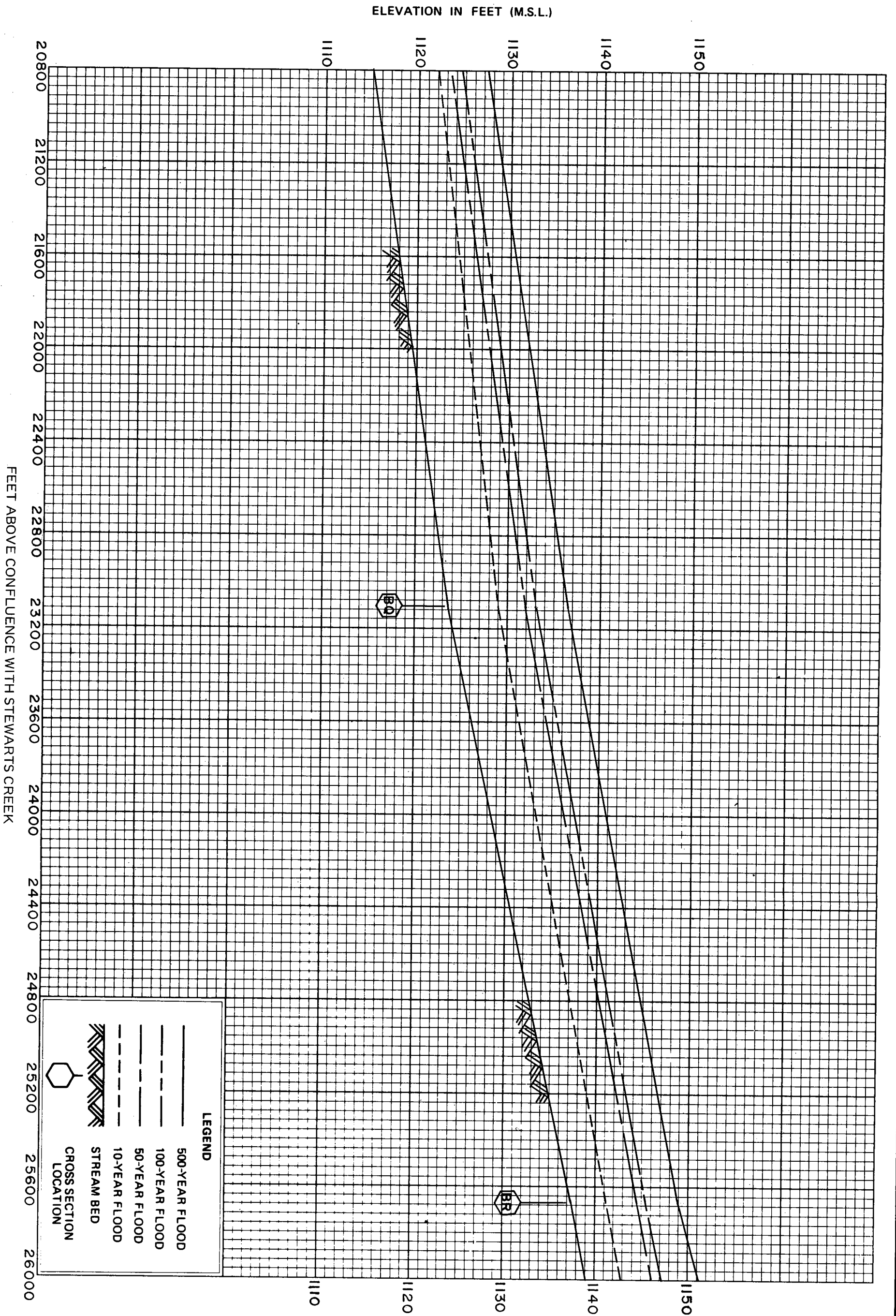
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY

Surry Co., N. C. & Carroll Co., Va.

## FLOOD PROFILES

PAULS CREEK PROJECT COMPLETED





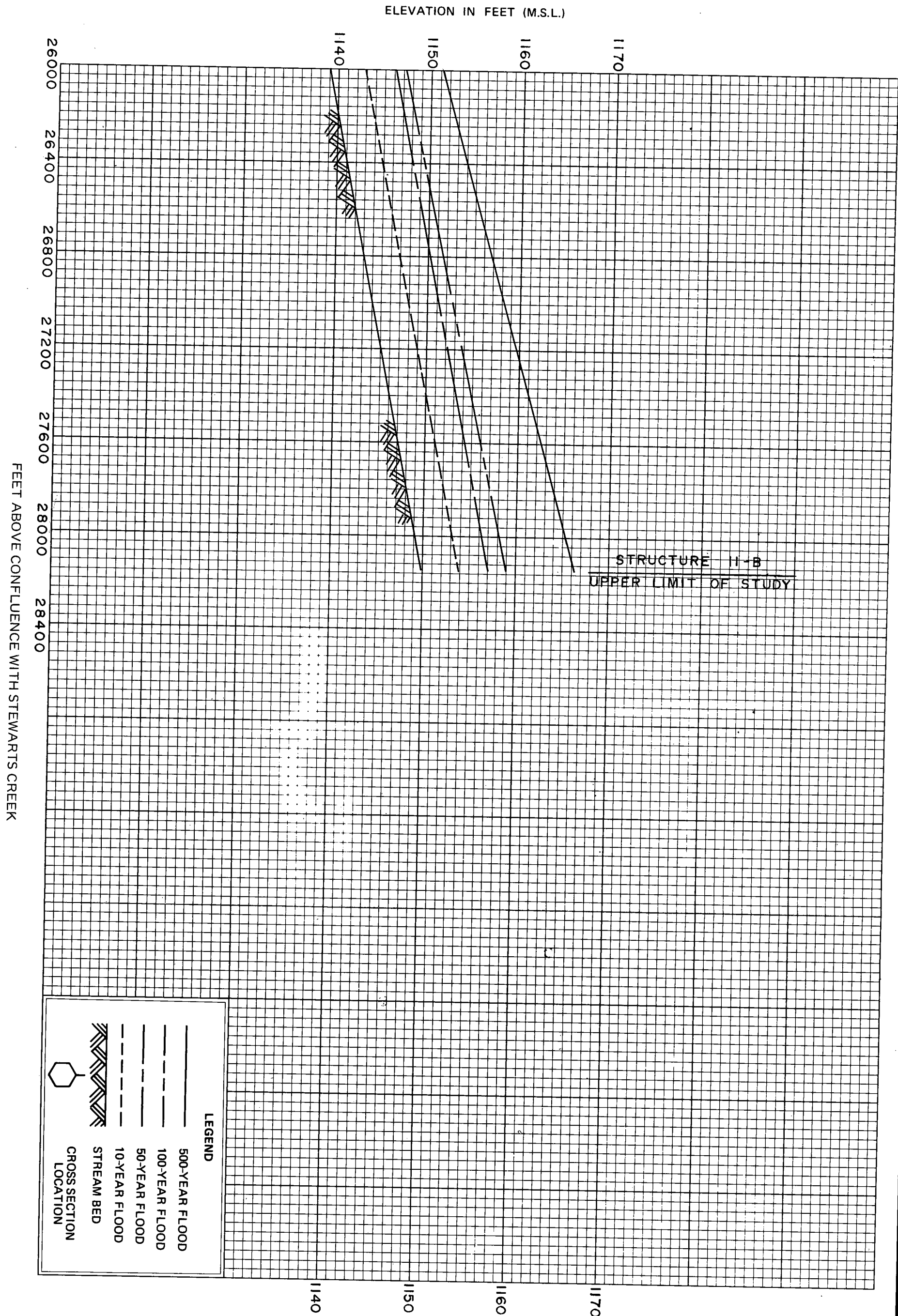
U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

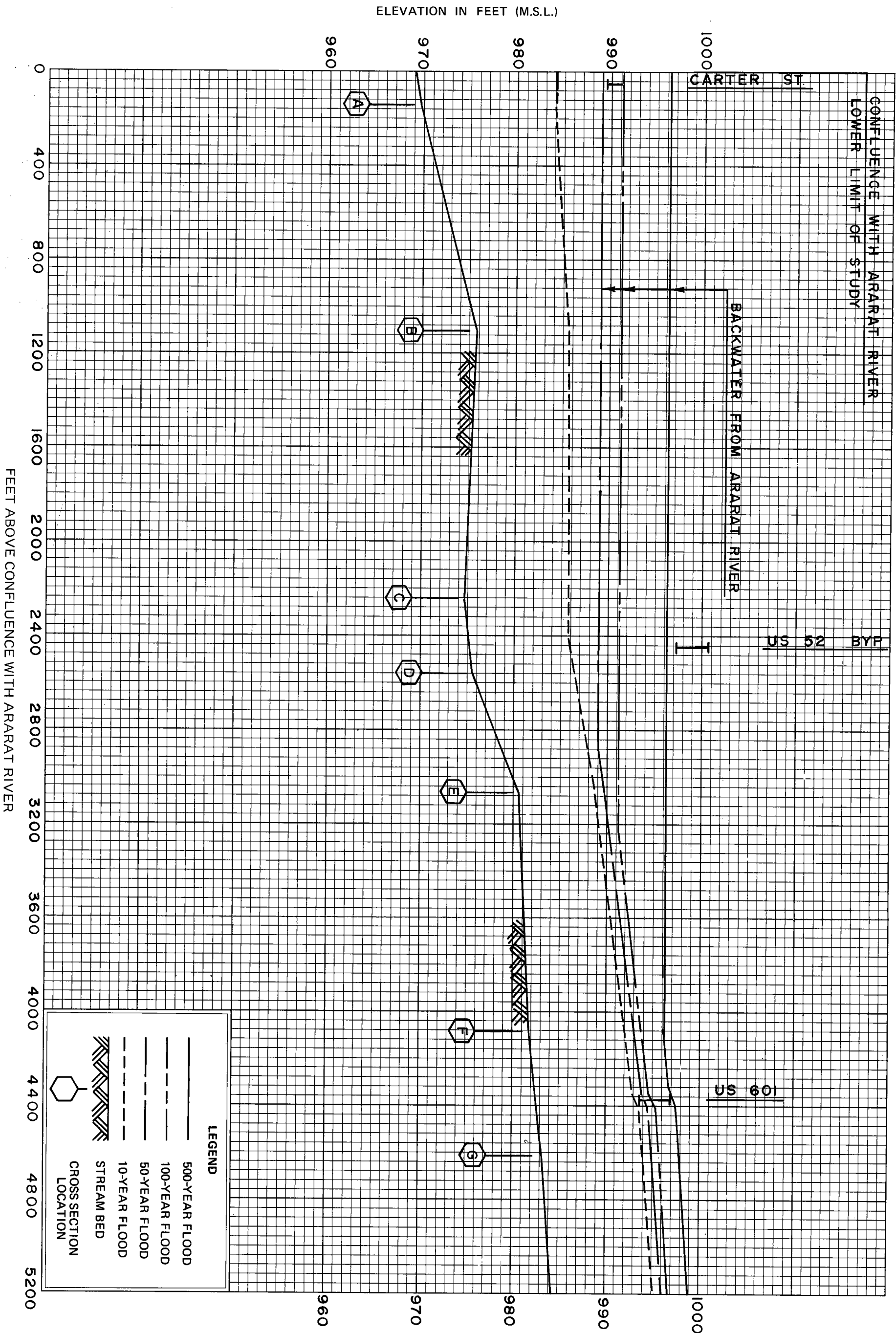
STEWARTS CREEK - LOVILLS CREEK FLOOD  
HAZARD STUDY

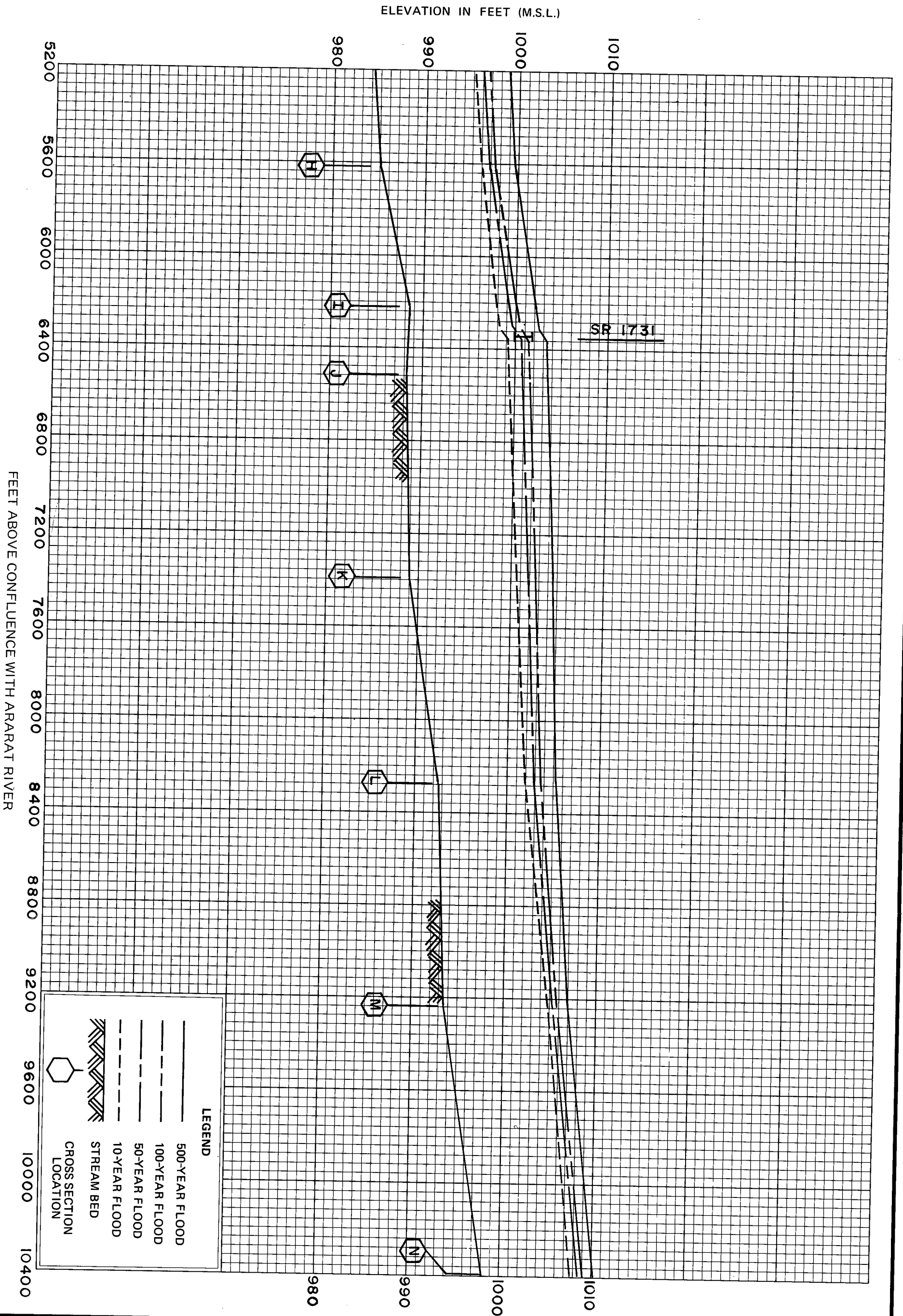
Surry Co., N. C. & Carroll Co., Va.

## FLOOD PROFILES

PAULS CREEK PROJECT COMPLETED



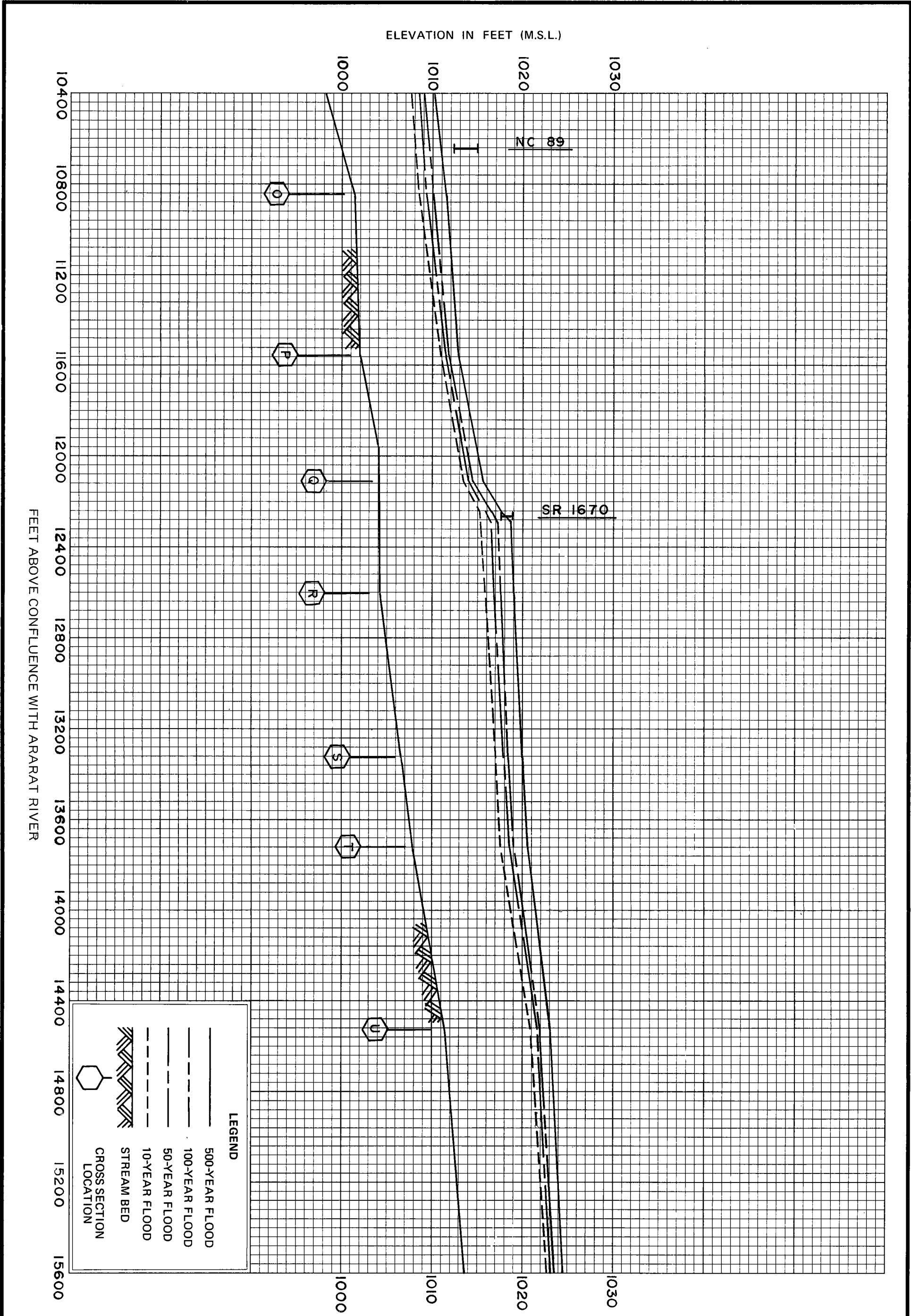




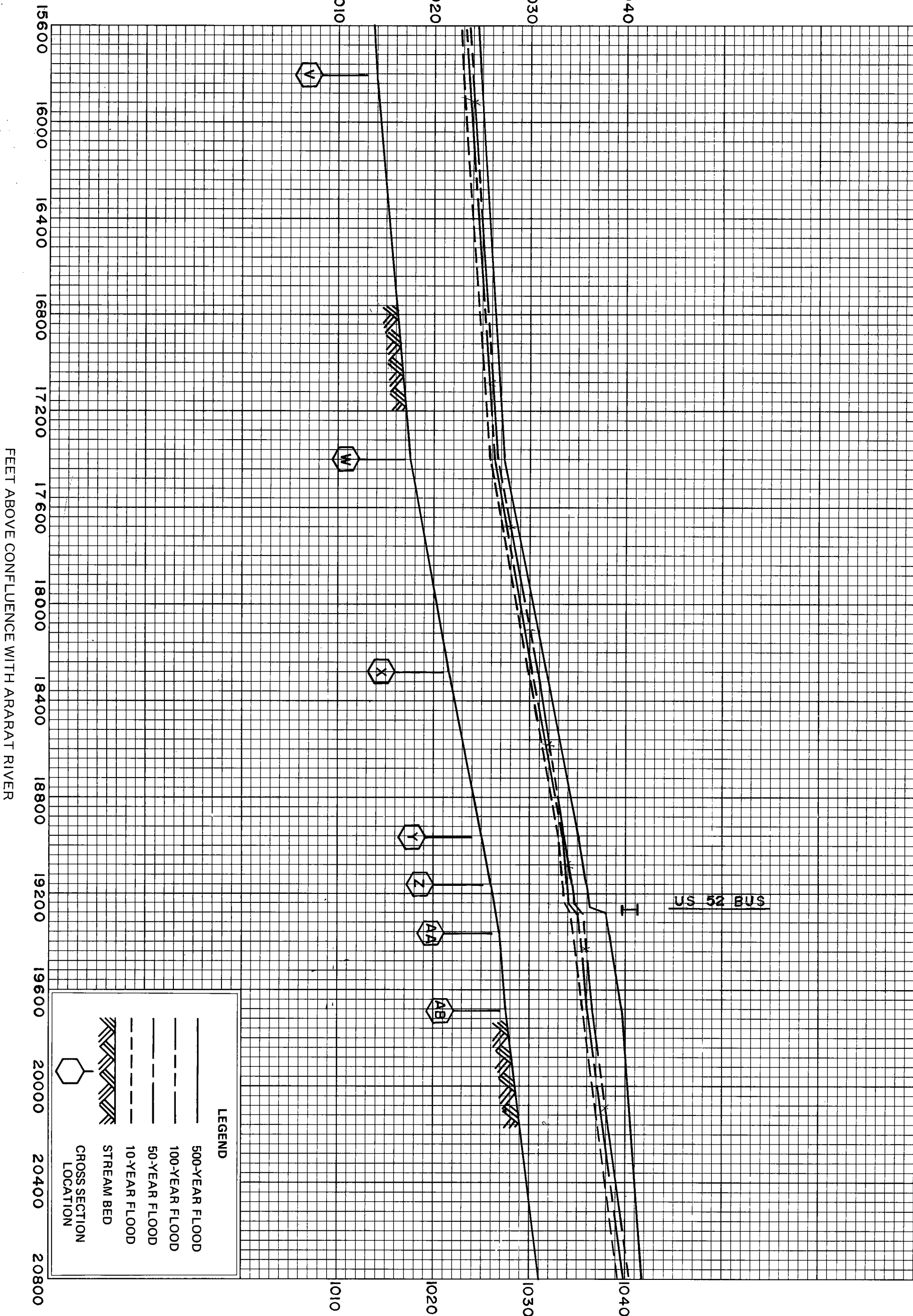
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 SOIL CONSERVATION SERVICE  
 STEWARTS CREEK-LOVILLS CREEK FLOOD  
 HAZARD STUDY  
 Surry Co., N.C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PROJECT COMPLETED



ELEVATION IN FEET (M.S.L.)



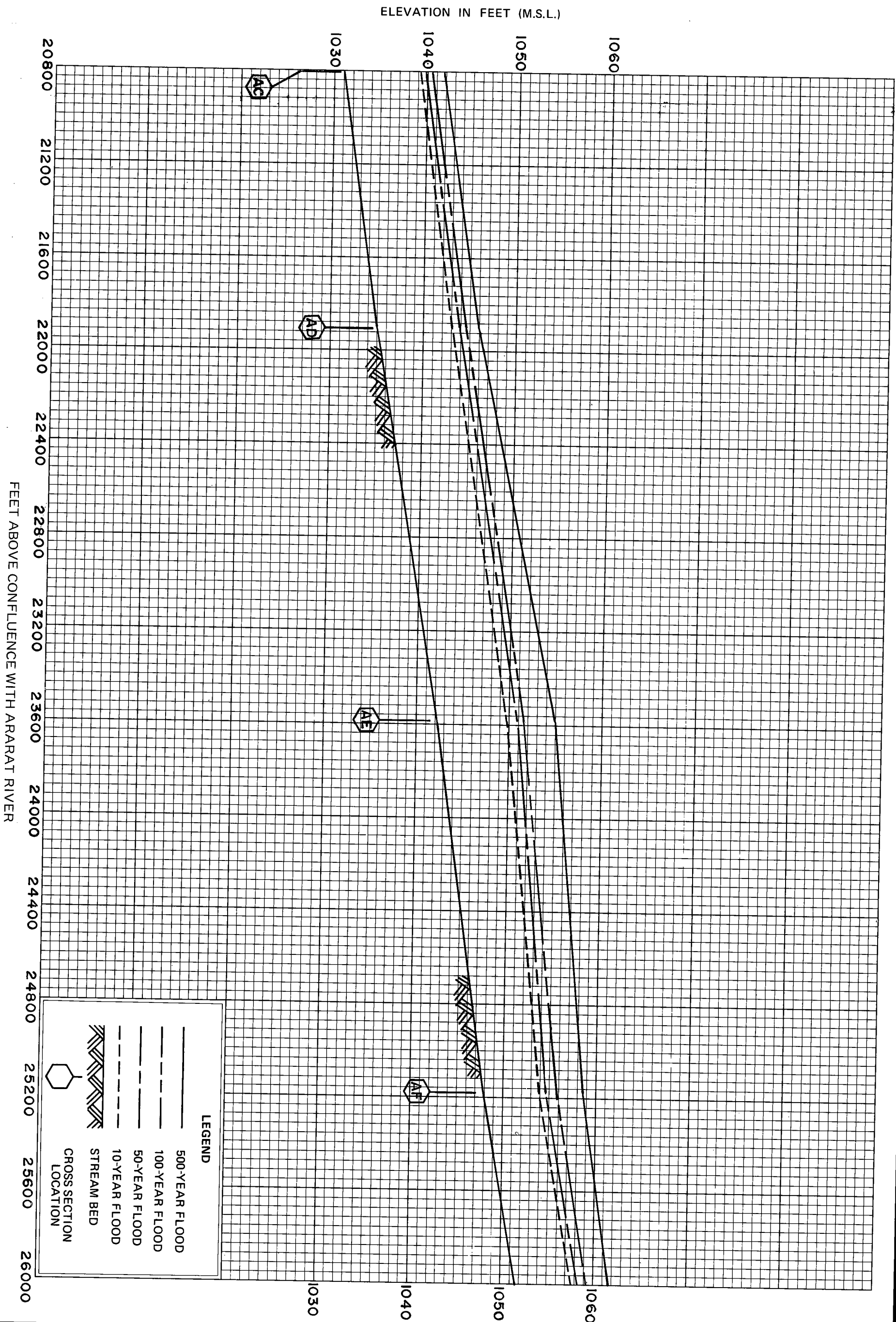
LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

LOVILLS CREEK PROJECT COMPLETED

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

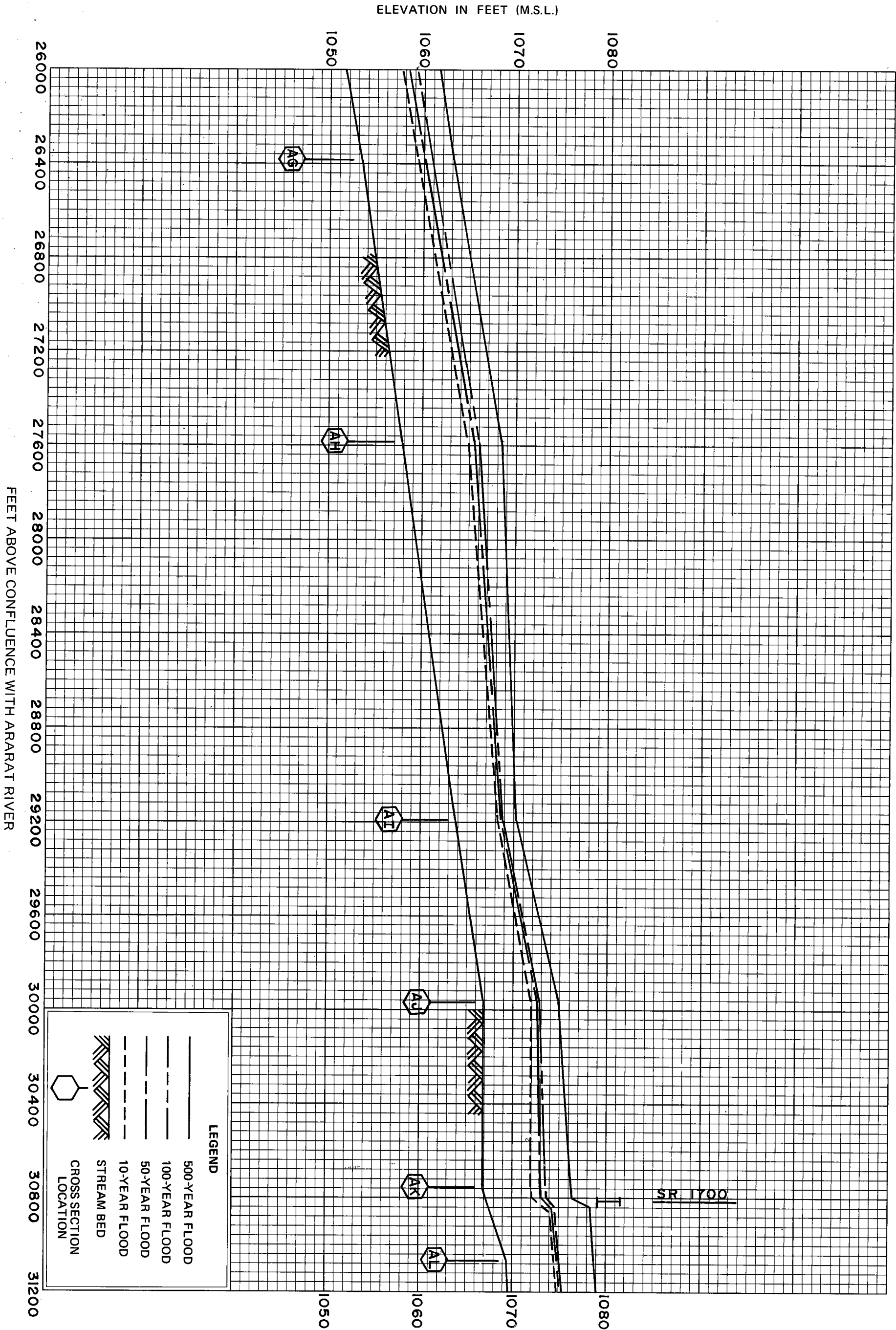


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STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.

## FLOOD PROFILES

LOVILLS CREEK PROJECT COMPLETED



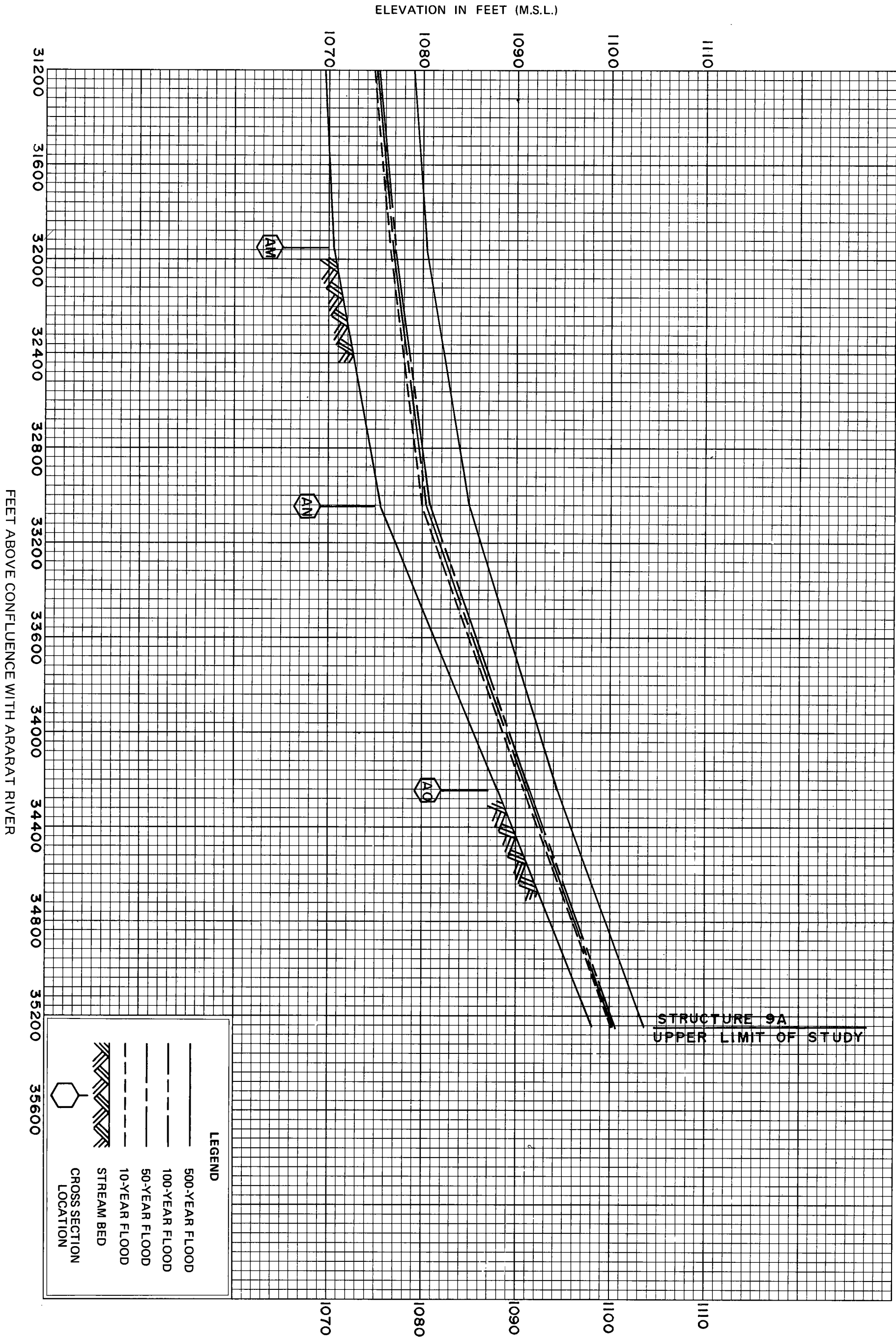


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HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

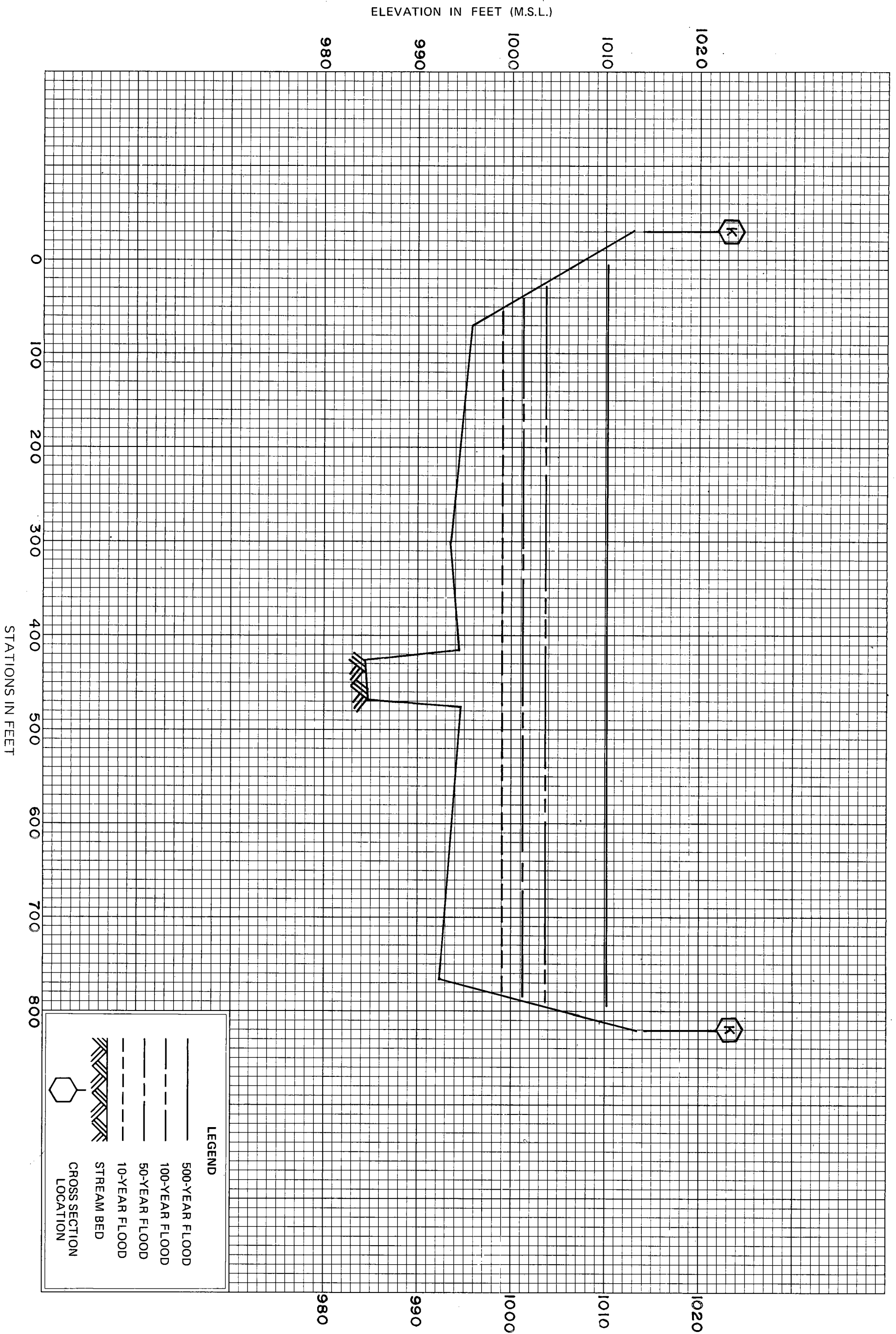
### FLOOD PROFILES

LOVILLS CREEK PROJECT COMPLETED





APPENDIX C  
TYPICAL CROSS SECTIONS

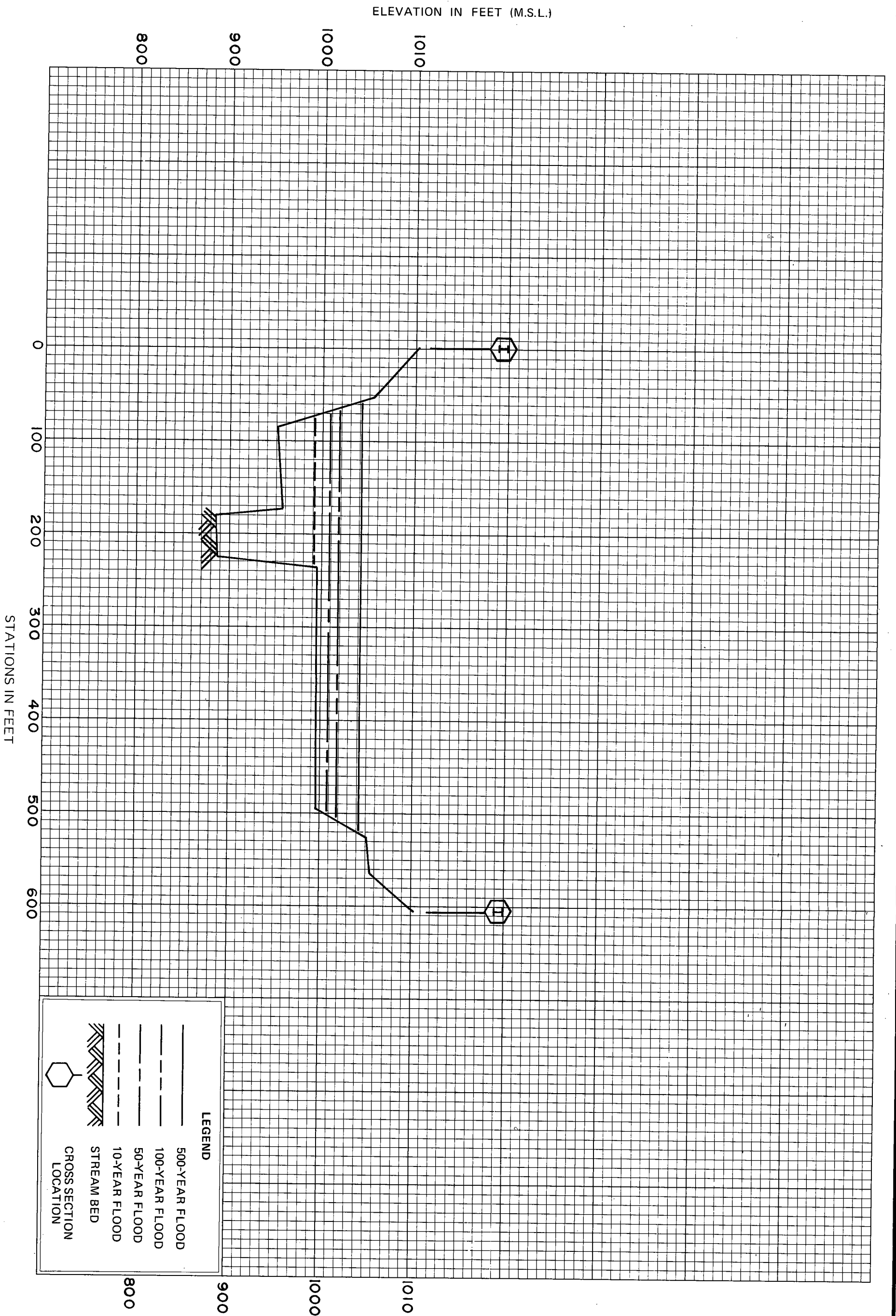


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N. C. & Carroll Co., Va.

TYPICAL CROSS SECTION

STEWARTS CREEK PRESENT CONDITIONS

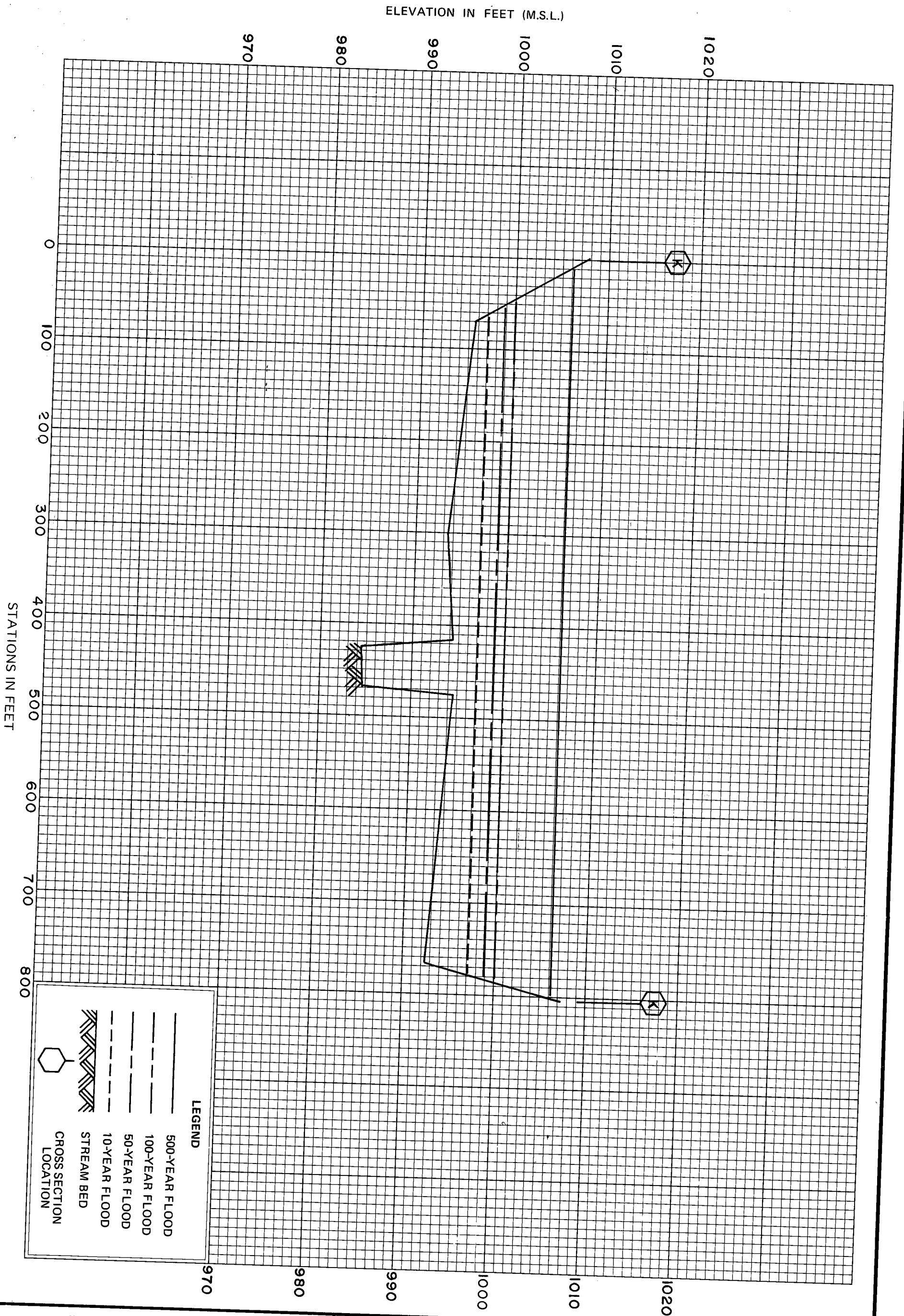


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SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

TYPICAL CROSS SECTION

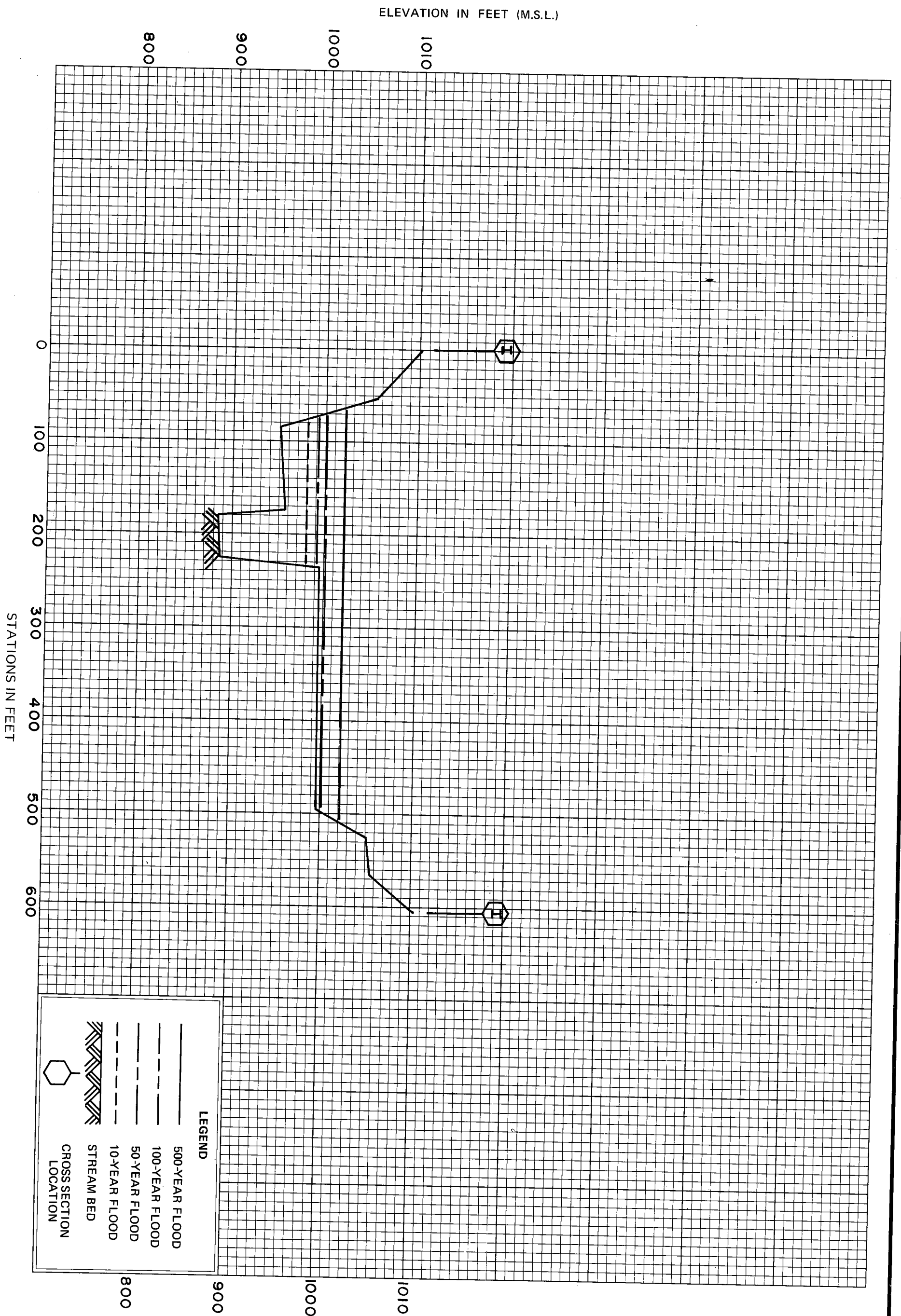
LOVILLS CREEK PRESENT CONDITIONS



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

TYPICAL CROSS SECTION

STEWARTS CREEK PROJECT COMPLETED



U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

STEWARTS CREEK-LOVILLS CREEK FLOOD  
HAZARD STUDY  
Surry Co., N.C. & Carroll Co., Va.

TYPICAL CROSS SECTION

LOVILLS CREEK PROJECT COMPLETED

**APPENDIX D**  
**WATER SURFACE ELEVATIONS**

# APPENDIX D WATER SURFACE ELEVATIONS

## STEWARTS CREEK PRESENT CONDITIONS

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
Confluence with Ararat River	0	982.0	987.3	989.5	994.9
A	600	983.0	986.7	989.5	996.0
B	1320	994.1	987.1	989.9	996.8
Southern Railway	1520	-	-	-	-
C	1700	984.6	988.0	990.8	997.8
D	2660	985.0	988.2	991.3	998.1
SR 2000	2780	-	-	-	-
E	2880	985.2	988.5	991.5	999.9
F	4800	986.0	989.4	992.3	1000.5
G	7320	989.4	991.8	993.7	1001.5
H	10000	990.8	992.5	994.2	1002.5
I	13040	996.7	999.0	1001.2	1007.6
SR 2258	13220	-	-	-	-
J	13380	997.6	999.9	1002.0	1009.5
K	14980	999.0	1001.2	1003.5	1010.3
US 601	15740	-	-	-	-
L	15850	1000.2	1003.0	1005.6	1012.8
M	16180	1000.9	1004.0	1005.8	1013.8
N	18180	1002.3	1005.0	1007.8	1015.0
O	20540	1006.5	1008.0	1009.5	1015.5
P	21600	1008.5	1010.0	1011.3	1015.9
Q	24160	1012.0	1013.0	1014.0	1017.0
R	25360	1014.8	1016.1	1017.3	1020.9
S	27120	1017.2	1018.3	1019.2	1022.0
T	30720	1026.2	1027.7	1028.5	1030.4
U	32700	1029.5	1030.6	1031.3	1032.9
V	34650	1036.2	1038.5	1040.3	1045.2
SR 1350	34750	-	-	-	-
W	34850	1037.8	1040.9	1043.5	1049.9
X	37150	1046.0	1049.0	1051.2	1058.2
Y	39950	1047.8	1050.1	1052.6	1060.0
Z	41750	1050.4	1052.1	1054.0	1060.1
AA	42730	1051.7	1053.5	1055.0	1060.2
AB	44330	1054.4	1056.5	1058.2	1063.4
NC 89	44440	-	-	-	-
AC	44630	1056.0	1058.8	1061.0	1067.5
AD	45430	*1056.3	*1059.1	*1061.5	*1068.5
AE	46130	*1056.3	*1059.1	*1061.5	*1068.5
AF	46610	*1056.3	*1059.1	*1061.5	*1068.5
AG	49235	1064.0	1064.5	1065.0	1068.5
AH	50955	1068.5	1069.5	1070.3	1072.4
AI	53555	1077.5	1078.3	1079.0	1080.0
AJ	55035	1082.2	1083.0	1083.9	1085.1

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER



# **APPENDIX D** **WATER SURFACE ELEVATIONS**

STEWARTS CREEK PRESENT CONDITIONS

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
AK	56235	1086.7	1087.5	1088.0	1089.0
AL	57275	1091.1	1092.1	1093.0	1093.9
AM	58875	1096.0	1096.7	1097.0	1098.0
AN	60275	1102.0	1102.8	1103.2	1104.6
AO	61675	1110.9	1112.0	1112.5	1113.7
AP	64075	1120.8	1122.0	1122.9	1124.1
SR 1622	64185	-	-	-	-
AQ	64285	1122.1	1123.9	1125.0	1127.1
AR	66445	1131.0	1131.9	1132.6	1133.9
AS	67605	1136.5	1137.8	1138.6	1140.5
AT	69805	1144.0	1144.6	1145.0	1147.4
AU	71525	1150.5	1151.0	1151.9	1155.6
AV	73085	1159.0	1159.6	1161.0	1165.1
AW	75085	1173.2	1173.6	1174.4	1177.0
AX	76845	1183.0	1183.5	1184.9	1188.9
AY	78445	1191.1	1191.5	1192.6	1196.0
SR 1602	78495	-	-	-	-
AZ	78595	1192.8	1193.0	1194.0	1197.8
BA	79635	1205.2	1205.7	1206.7	1209.6
I-77	79735	-	-	-	-
BB	79835	1208.0	1208.3	1209.0	1219.2
BC	81195	1215.1	1215.4	1216.6	1224.0
BD	83035	1219.1	1219.3	1220.5	1228.9
STR 1A	84715	1229.5	1229.8	1230.5	1237.0

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER

**APPENDIX D**  
**WATER SURFACE ELEVATIONS**

PAULS CREEK PRESENT CONDITIONS

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
Confluence w/ Stewarts Creek	0	1056.3	1059.1	1061.5	1068.5
BE	180	1056.7	1059.5	1062.2	1070.1
SR 1621	270	-	-	-	-
BF	390	1057.2	1060.9	1064.0	1071.8
BG	2230	1060.0	1061.6	1064.2	1072.2
BH	5110	1065.0	1066.5	1067.7	1072.3
BI	7470	1077.2	1078.0	1078.2	1079.8
BJ	8870	1082.3	1083.2	1084.0	1086.1
BK	10870	1089.0	1089.7	1090.2	1092.0
BL	12070	1100.0	1101.1	1102.2	1106.0
BM	13950	1104.2	1105.1	1106.2	1110.0
SR 1624	14050	-	-	-	-
BN	14150	1105.5	1107.5	1109.5	1115.2
BO	15630	1108.0	1109.3	1110.9	1115.5
BP	19430	1120.0	1120.5	1121.5	1124.0
BQ	23110	1132.3	1133.0	1133.6	1137.0
BR	25670	1144.9	1145.5	1145.9	1149.0
STR 11B	28150	1157.8	1159.0	1159.5	1166.6

<sup>1</sup> FEET ABOVE CONFLUENCE WITH STEWARTS CREEK

# **APPENDIX D** **WATER SURFACE ELEVATIONS**

LOVILLS CREEK PRESENT CONDITIONS

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
Confluence with Ararat River	0	984.2	989.0	991.1	996.2
Carter Street	50	-	-	-	-
A	140	986.1	989.5	992.2	998.3
B	1100	987.0	990.0	992.4	998.4
C	2245	987.2	990.1	992.5	998.5
US 52 Byp	2445	-	-	-	-
D	2555	987.8	990.4	992.7	998.9
E	3115	989.8	991.5	993.0	999.0
F	4075	992.9	994.3	995.7	999.8
US 601	4375	-	-	-	-
G	4615	994.9	996.1	997.1	1001.0
H	5615	996.8	998.0	999.0	1003.0
I	6215	999.1	1000.8	1001.8	1004.2
SR 1731	6345	-	-	-	-
J	6515	1000.5	1002.0	1003.0	1005.3
K	7395	1001.8	1003.2	1004.1	1006.4
L	8275	1002.8	1004.1	1004.9	1007.4
M	9235	1005.2	1006.0	1006.8	1008.8
N	10395	1008.3	1009.4	1010.0	1011.1
NC 89	10645	-	-	-	-
O	10845	1009.0	1010.4	1011.2	1012.9
P	11555	1011.2	1011.9	1012.7	1014.1
Q	12115	1013.8	1014.5	1015.0	1017.0
SR 1670	12265	-	-	-	-
R	12605	1016.5	1017.8	1018.5	1020.1
S	13325	1017.6	1018.5	1019.4	1022.0
T	13725	1018.1	1019.1	1020.0	1022.2
U	14525	1021.2	1022.0	1022.6	1024.2
V	15805	1023.3	1023.9	1024.5	1025.9
W	17405	1026.8	1027.1	1027.9	1029.0
X	18285	1031.1	1031.9	1032.1	1033.2
Y	18965	1034.1	1035.1	1035.8	1036.5
Z	19165	1035.0	1035.9	1036.4	1037.9
US 52 Bus	19265	-	-	-	-
AA	19365	1036.7	1038.2	1039.8	1044.0
AB	19685	1037.9	1039.9	1041.2	1044.5
AC	20805	1040.9	1041.9	1042.7	1045.0
AD	21905	1045.5	1046.2	1047.0	1048.9
AE	23585	1054.0	1055.9	1056.9	1059.0
AF	25185	1058.1	1059.7	1060.4	1062.2

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER

# **APPENDIX D** **WATER SURFACE ELEVATIONS**

LOVILLS CREEK PRESENT CONDITIONS

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
AG	26385	1062.9	1064.0	1064.8	1066.0
AH	27585	1068.2	1069.6	1070.2	1072.0
AI	29185	1070.8	1071.8	1072.4	1073.7
AJ	29955	1075.2	1076.0	1076.5	1077.0
AK	30755	1077.0	1078.0	1078.5	1079.3
SR 1700	30815	-	-	-	-
AL	30965	1080.9	1083.0	1084.0	1085.5
AM	31965	1082.9	1084.7	1085.6	1087.4
AN	33045	1086.8	1088.6	1089.8	1092.1
AO	34245	1095.9	1097.0	1098.0	1101.1
STR. 9A	35245	1105.1	1106.4	1107.5	1111.1

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER

# **APPENDIX D** **WATER SURFACE ELEVATIONS**

STEWARTS CREEK PROJECT COMPLETED

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
Confluence w/ Ararat River	0	*982.2	*987.3	*989.5	*994.9
A	600	*982.2	*987.3	*989.5	*994.9
B	1320	*982.2	*987.3	*989.5	*994.9
Southern Railway	1520	-	-	-	-
C	1700	*982.2	*987.3	*989.5	*994.9
D	2660	*982.2	*987.3	*989.5	*994.9
SR 2000	2780	-	-	-	-
E	2880	982.7	*987.3	*989.5	995.2
F	4800	983.7	*987.3	*989.5	996.1
G	7320	987.8	989.0	990.8	996.2
H	10000	989.5	990.5	991.7	996.9
I	13040	994.7	996.1	998.0	1004.0
SR 2258	13220	-	-	-	-
J	13380	995.5	997.0	998.6	1005.0
K	14980	997.1	998.8	1000.0	1006.2
US 601	15740	-	-	-	-
L	15850	998.1	1000.0	1001.8	1009.1
M	16180	998.5	1000.2	1002.0	1010.0
N	18180	1000.9	1001.9	1003.1	1010.3
O	20540	1005.4	1006.1	1006.6	1010.9
P	21600	1007.3	1008.1	1009.0	1012.5
Q	24160	1011.0	1011.8	1012.3	1014.8
R	25360	1013.3	1014.4	1015.1	1018.0
S	27120	1016.1	1017.0	1017.5	1019.9
T	30720	1025.0	1026.0	1027.0	1029.0
U	32700	1028.1	1029.1	1030.0	1031.5
V	34650	1033.9	1035.8	1037.0	1041.2
SR 1350	34750	-	-	-	-
W	34850	1034.8	1037.0	1038.9	1044.8
X	37150	1043.1	1045.4	1047.1	1052.6
Y	39950	1046.0	1047.2	1048.5	1053.9
Z	41750	1049.0	1050.0	1051.0	1054.9
AA	42730	1050.0	1051.1	1052.2	1055.8
AB	44330	1052.3	1054.0	1055.0	1058.8
NC 89	44440	-	-	-	-
AC	44630	1053.2	1055.1	1056.8	1061.7
AD	45430	1054.3	1056.0	1057.5	1062.0
AE	46130	1055.1	1056.8	1058.0	1062.2
AF	46610	1056.2	1057.9	1058.4	1062.6
AG	49235	1064.0	1064.5	1065.0	1066.7
AH	50955	1068.5	1069.5	1070.3	1072.4
AI	53555	1077.5	1078.3	1079.0	1080.0

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER  
D-6

# **APPENDIX D** **WATER SURFACE ELEVATIONS**

## STEWART'S CREEK PROJECT COMPLETED

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
AJ	55035	1082.2	1083.0	1083.9	1085.1
AK	56235	1086.7	1087.5	1088.0	1089.0
AL	57275	1091.1	1092.1	1093.0	1093.9
AM	58875	1096.0	1096.7	1097.0	1098.0
AN	60275	1102.0	1102.8	1103.2	1104.6
AO	61675	1110.9	1112.0	1112.5	1113.7
AP	64075	1120.8	1122.0	1122.9	1124.1
SR 1622	64185	-	-	-	-
AQ	64285	1122.1	1123.9	1125.0	1127.1
AR	66445	1131.0	1131.9	1132.6	1133.9
AS	67605	1136.5	1137.8	1138.6	1140.5
AT	69805	1144.0	1144.6	1145.0	1147.4
AU	71525	1150.5	1151.0	1151.9	1155.6
AV	73085	1159.0	1159.6	1161.0	1165.1
AW	75085	1173.2	1173.6	1174.4	1177.0
AX	76845	1183.0	1183.5	1184.9	1188.9
AY	78445	1191.0	1191.5	1192.6	1196.0
SR 1602	78495	-	-	-	-
AZ	78595	1192.8	1193.0	1194.0	1197.8
BA	79635	1205.2	1205.7	1206.7	1209.6
I-77	79735	-	-	-	-
BB	79835	1208.0	1208.3	1209.0	1219.2
BC	81195	1215.1	1215.4	1216.6	1224.0
BD	83035	1219.1	1219.3	1220.5	1228.9
STR 1A	84715	1229.5	1229.8	1230.5	1237.0

\*Backwater elevations from Ararat River

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER

# **APPENDIX D** **WATER SURFACE ELEVATIONS**

PAULS CREEK PROJECT COMPLETED

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
Confluence w/ Stewarts Crk.	0	*1053.4	*1055.3	*1056.9	1061.8
BE	180	*1053.4	*1055.3	*1056.9	1062.2
SR 1621	270	-	-	-	-
BF	390	*1053.4	*1055.3	*1056.9	1064.2
BG	2230	1056.8	1057.7	1059.2	1064.5
BH	5110	1061.7	1062.5	1064.5	1068.1
BI	7470	1074.5	1075.1	1077.0	1078.6
BJ	8870	1081.0	1081.1	1082.0	1084.1
BK	10870	1088.0	1088.1	1088.8	1090.7
BL	12070	1098.0	1098.3	1099.5	1103.0
BM	13950	1101.0	1101.9	1103.7	1106.9
SR 1624	14050	-	-	-	-
BN	14150	1101.8	1102.4	1104.2	1110.9
BO	15630	1105.2	1105.9	1107.1	1111.8
BP	19430	1118.0	1118.3	1119.7	1122.0
BQ	23110	1129.0	1131.9	1133.0	1136.5
BR	25670	1141.1	1144.5	1145.4	1148.9
STR. 11B	28150	1153.9	1157.0	1159.0	1166.2
* Backwater elevations from Stewarts Creek					

<sup>1</sup> FEET ABOVE CONFLUENCE WITH STEWARTS CREEK

# **APPENDIX D** **WATER SURFACE ELEVATIONS**

LOVILLS CREEK PROJECT COMPLETED

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
Confluence with Ararat River	0	*984.2	*989.0	*991.1	*996.2
Carter St.	50	-	-	-	-
A	140	*984.2	*989.0	*991.1	*996.2
B	1100	985.6	989.0	991.1	996.2
C	2245	985.8	989.0	991.1	996.2
US 52 Byp	2445	-	-	-	-
D	2555	986.4	989.0	991.1	996.2
E	3115	988.7	989.8	991.1	996.2
F	4075	992.0	993.0	993.8	996.2
US 601	4375	-	-	-	-
G	4615	994.0	995.0	995.7	997.9
H	5615	996.0	996.9	997.5	999.7
I	6215	998.0	999.2	1000.1	1002.1
SR 1731	6345	-	-	-	-
J	6515	999.3	1000.8	1001.5	1003.6
K	7395	1000.7	1001.9	1002.7	1004.5
L	8275	1002.0	1002.9	1003.6	1005.2
M	9235	1004.9	1005.3	1005.8	1007.0
N	10395	1007.7	1008.5	1009.0	1010.2
NC 89	10645	-	-	-	-
O	10845	1008.5	1009.3	1010.0	1011.5
P	11555	1011.0	1011.5	1011.7	1012.9
Q	12115	1013.5	1014.0	1014.3	1015.5
SR 1670	12265	-	-	-	-
R	12605	1015.7	1016.8	1017.5	1019.0
S	13325	1017.0	1017.9	1018.3	1020.0
T	13725	1017.6	1018.5	1019.0	1020.4
U	14525	1020.9	1021.5	1021.9	1023.0
V	15805	1023.0	1023.5	1023.8	1024.8
W	17405	1025.9	1026.2	1026.5	1027.2
X	18285	1030.0	1030.3	1030.8	1031.8
Y	18965	1033.0	1033.4	1033.5	1035.1
Z	19165	1033.5	1034.0	1034.4	1035.9
US 52 Bus	19265	-	-	-	-
AA	19365	1034.6	1035.2	1035.7	1038.2
AB	19685	1035.5	1036.0	1036.6	1039.8
AC	20805	1039.2	1339.8	1040.0	1041.8
AD	21905	1043.1	1043.9	1044.5	1046.0
AE	23585	1049.9	1050.9	1051.5	1055.0

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER



# APPENDIX D WATER SURFACE ELEVATIONS

LOVILLS CREEK PROJECT COMPLETED

FLOODING SOURCE		SELECTED FLOOD ELEVATIONS			
CROSS SECTION NO.	DISTANCE <sup>1</sup> FT.	10 YEAR MSL	50 YEAR MSL	100 YEAR MSL	500 YEAR MSL
AF	25185	1054.9	1055.5	1055.9	1058.6
AG	26385	1059.5	1060.1	1060.6	1063.1
AH	27585	1064.9	1065.4	1066.0	1068.4
AI	29185	1068.3	1068.6	1068.8	1070.2
AJ	29955	1072.0	1072.5	1072.7	1074.9
AK	30755	1072.0	1073.0	1073.3	1076.3
SR 1700	30815	-	-	-	-
AL	30965	1074.5	1074.8	1075.0	1078.8
AM	31965	1076.5	1076.8	1077.0	1081.3
AN	33045	1080.0	1080.3	1080.7	1085.0
AO	34245	1090.9	1091.2	1091.3	1094.3
STR 9A	35245	1100.1	1100.2	1100.4	1103.8
*Backwater elevations from Ararat River					

<sup>1</sup> FEET ABOVE CONFLUENCE WITH ARARAT RIVER

ELEVATION REFERENCE MARK

TABLE 3

REFERENCE MARK	ELEVATION IN FT (MSL)	DESCRIPTION OF LOCATION
2A	1001.78	A chiseled square on right downstream wing-wall of bridge over Lovills Creek on U.S. 52 Highway Bypass.
1	997.37	A chiseled square on right downstream abutment of bridge over Lovills Creek on U.S. Highway 601.
3	1001.24	A nail and plate on a 12 inch post on right downstream wingwall of bridge over Lovills Creek on SR 1731.
4	1000.28	A nail and plate on a 12 inch sycamore tree 100 feet right of Lovills Creek on cross section "K".
5	1005.01	A nail and plate on a 18 inch sycamore tree on right bank of Lovills Creek; 35 feet north of cross section "M" and 9 feet southeast of a house.
52A	1043.00	A chiseled square on right downstream concrete abutment of bridge over Lovills Creek on U.S. Highway 52 Business.
9	1065.56	A nail and plate in an 18 inch poplar tree, approximately 150 feet upstream from cross section "AF" and 250 feet right of Lovills Creek on Hedge Row.
10	1080.94	A nail and plate on right downstream abutment of bridge on SR 1700 over Lovills Creek.
11	1095.06	A nail and plate in a 12 inch poplar tree, near right end of cross section "AM" and 300 feet from right bank of Lovills Creek.

ELEVATION REFERENCE MARKS

SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE



STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURRY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

ELEVATION REFERENCE MARK  
TABLE 3

REFERENCE MARK	ELEVATION IN FT (MSL)	DESCRIPTION OF LOCATION
222	1093.59	A nail and plate on a power pole at edge of road on left end of cross section "AN" on Lovills Creek.
221	1096.18	A nail and plate in a 20 inch poplar tree on left bank of Lovills Creek on cross section "AO".
37	977.90	A nail and plate in an 18 inch ash tree on left bank of Stewarts Creek and about 125 feet upstream from its confluence with Ararat River.
36	1005.81	A nail and plate on right downstream end of Southern Railway trestle over Stewarts Creek near its confluence with Ararat River.
38	999.28	A chiseled square on right downstream concrete abutment of bridge over Stewarts Crk. on SR 2000.
22	1000.09	A nail and plate on a forked wild cherry tree near left end of cross-section "F" near large rock at old farm road on Stewarts Crk.
21	1002.27	A nail and plate on a right downstream abutment post of bridge over Stewarts Creek on SR 2258.
23	1017.37	A nail and plate on a power pole approximately 200 feet from right bank of Stewarts Creek and 200 feet upstream from right end of cross-section "M".
14A	1023.01	A chiseled square on concrete foundation for gas pump at airport near left end of cross section "Q", on Stewarts Creek.
39	1042.64	A chiseled square on right downstream concrete abutment of bridge over Stewarts Crk. on SR 1350.


**ELEVATION REFERENCE MARKS**

SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURRY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

ELEVATION REFERENCE MARK  
TABLE 3

REFERENCE MARK	ELEVATION IN FT (MSL)	DESCRIPTION OF LOCATION
25	1053.28	A nail and plate on a 15 inch poplar tree at bottom of hill approximately 1100 feet from right bank on Stewarts Creek cross section "Y".
UE	1061.87	A chiseled square on left end of downstream wheel guard of bridge over Stewarts Creek on N.C. Hwy. 89.
26	1077.39	A nail and plate on a 12 inch persimmon tree approximately 900 feet from right bank of Stewarts Creek near right end of cross section "AG" and behind a feed barn.
17	1125.59	A nail and plate on double poplar tree, approximately 800 feet from right bank of Stewarts Creek and near right end of cross section "AM".
42	1123.88	A nail and plate on right downstream abutment post of bridge over Stewarts Creek on SR 1622.
18	1192.96	A nail and plate on a 12 inch pine tree, approximately 500 feet from right bank of Stewarts Creek near farm path at right end of cross section "AV".
20	1198.49	A nail and plate on a 6 x 6 inch abutment post on right downstream end of bridge over Stewarts Creek on SR 1602.
22A	1108.20	A nail and plate on REA power pole 3/109, approximately 2,000 feet from left bank of Pauls Creek about 200 feet downstream from left end of cross-section "BK".
49	1108.73	A chiseled square on right downstream wing-wall of bridge over Pauls Creek on SR 1624.
33	1125.46	A nail and plate on right downstream abutment post of bridge over Pauls Creek on SR 1625.


**ELEVATION REFERENCE MARKS**

 SOIL CONSERVATION SERVICE  
 U.S. DEPARTMENT OF AGRICULTURE  
 STEWARTS CREEK-LOVILL'S CREEK  
 FLOOD HAZARD ANALYSES  
 SURRY COUNTY, NORTH CAROLINA  
 CARROLL COUNTY, VIRGINIA

ELEVATION REFERENCE MARK  
TABLE 3

REFERENCE MARK	ELEVATION IN FT (MSL)	DESCRIPTION OF LOCATION
23A	1135.53	A nail and plate on a power pole approximately 50 feet upstream from the left end of cross-section "BQ" on Pauls Creek on edge of SR 1626.

**ELEVATION REFERENCE MARKS**

 SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
STEWARTS CREEK-LOVILLS CREEK  
FLOOD HAZARD ANALYSES  
SURRY COUNTY, NORTH CAROLINA  
CARROLL COUNTY, VIRGINIA

APPENDIX E  
INVESTIGATIONS, ANALYSES, AND TECHNICAL DATA

## Investigations, Analyses, and Technical Data

These analyses were made using 83 cross sections on Stewarts Creek and 50 cross sections on Lovills Creek surveyed with level and stadia methods by field survey crews. Sections were located on enlarged aerial photographs made in November 1966 by the Agricultural Stabilization and Conservation Service. Reach distances, and distances between cross sections were then determined from measurements on these photographs.

Hydrology was developed for Stewarts Creek and Lovills Creek using the SCS Computer Model TR-20 which utilize unit hydrograph techniques (8). Results of the model were compared with analysis of the U.S. Geological Survey gages on the Ararat River, along with one at Ararat, North Carolina and another near Pilot Mountain. These data were analyzed using Log-Pearson Type III distribution (5) and were compared with regional analysis (7) and the Putnam Method (6). The results from all these methods compared favorably, and since the effects of planned structures had to be analyzed, the computer model method was used in these analyses.

Hydraulics for the study area was obtained by using the surveyed cross sections and developing 100-year and 500-year frequency floods, using the SCS water surface profile program WSP-2 (9). Data from the water surface profile program were used to develop the flood boundary line, floodway, and flood profiles (Appendices A and B). Flood boundaries in Appendix A were delineated using data determined at each surveyed cross section. Between cross sections the boundaries were extrapolated using both topographic maps and stereoscopic methods. The delineation were made on photomaps developed from the November 1966 aerial photography mentioned above.

The floodway, shown on flood hazard photomaps, is based on equal loss of conveyance from both sides of the floodplain, allowing a one foot increase in water surface elevation, and assuming the hydraulic gradient remains parallel.

To assist the users of this report in locating the flood hazard areas on the ground, a series of elevation reference marks were established in the study area. The location of these reference marks are shown on the photomaps. Descriptions and mean sea level elevations of these reference marks are given in Table 3 in this Appendix. Appendix D gives a list of elevations for the floodwater profiles at each cross section. This compliments the flood profiles given in Appendix B.



APPENDIX F  
REFERENCES

## REFERENCES

1. "Stewarts Creek-Lovills Creek Watershed Work Plan" U.S. Department of Agriculture, Raleigh, N.C., 1965.
2. "Water Resources Region and Related Land Resources", Water Resources Council, Washington, D. C., 1970.
3. Davis, W.A. and E.P. Goldston, "Soil Survey of Surry County", North Carolina", U.S. Department of Agriculture, Bureau of Chemistry and Soils, Washington, D. C. 1937.
4. Speer, Paul R. and Charles R. Gamble, "Magnitude and Frequency of Floods in the United States, Part 2A, South Atlantic Slope Basins, James River to Savannah River," U.S. Geological Survey, Region 1673, U.S. Geological Survey, Washington, D.C., 1964.
5. Water Resources Council Hydrology Committee, "Guidelines for Determining Flood Flow Frequencies", Bulletin 17A, Washington, D.C. 1977.
6. Putnam, Arthur L., "Effects of Urban Development on Floods in Piedmont Province of North Carolina", Open File Report 76-17, U.S. Geological Survey, Raleigh, N.C., 1972.
7. Jackson, M.M. Jr., "Magnitude and Frequency of Floods in North Carolina", Water Resources Investigations 76-17, U.S. Geological Survey, Raleigh, N.C., 1976.
8. Project Formulation, Hydrology, "Technical Release 20", U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C., 1969.
9. "WSP-2 Computer Program" Technical Release No. 61, U.S. Department of Agriculture, Soil Conservation Service, Washington, D. C.

APPENDIX G  
GLOSSARY

## GLOSSARY

backwater. High water caused by downstream obstruction or restriction, or by high stage on an intersecting stream.

baseflood. 100-year frequency flood.

BM. Benchmark of established elevation. A permanent marker of known elevation (See Appendix E).

cfs. Cubic feet per second, a unit of discharge equal to the flow of one cubic foot per second past a given point.

cross section. Shape and dimensions of a channel and valley perpendicular to the line of flow.

elevation. The height of a point above an established datum. This datum is usually mean sea level.

flood. An inundation of lands not normally covered by water; a temporary increase in streamflow or stage; or the discharge causing the overflow or temporary increase.

flood frequency. An expression of how often a flood of given magnitude can be expected. See the following examples:

10-year flood or 10-year frequency flood. The flood which can be expected or exceeded on an average once in 10 years; and which would have a 10 percent chance of being equaled or exceeded in any given year.

50-year flood. Two percent chance . . . in any given year.

100-year flood. One percent chance . . . in any given year.

500-year flood. Two-tenths percent chance. . . any given year.

flood peak or peak discharge. Highest discharge attained during a flood.

floodplain or flood-prone area. Land adjoining a stream (or other body of water) which has been or may be covered with water.

flood profile or profile. A plotted or imaginary line defining the highest water surface elevations along a stream during a particular flood.

flood-prone area. See flood plain.

flood routing. Computation of the changes in the rise and fall in streamflow as a flood moves downstream. The results provide hydrographs of discharges versus time at given points on the stream.

GLOSSARY (Continued)

frequency-discharge curve. A plotted line showing the recurrence interval (or flood frequency) of discharges at a stream gage, surveyed cross-section, or other station along stream. (Used with a stage-discharge curve to determine the high water elevations resulting from selected flood discharges at the station on the stream.)

hydrograph. A curve showing the rise and fall of flood discharge with respect to time at a specific station on the stream.

land use. Classification of types of vegetation or other surface cover conditions on a watershed - used (with a similar classification of soils) to indicate the rate and volume of flood runoff.

msl. Mean sea level.

peak discharge or flood peak. The highest rate of runoff (discharge) attained during a flood.

profile. See flood profile.

RM. See BM

runoff. That portion of the total storm rainfall flowing across the ground or other surface and contributing to the flood discharge.

stage-discharge curve. A plotted curve showing elevations resulting from a range of discharges at a surveyed cross section, stream gage, or other point on a stream.

TBM. Temporary benchmark (see BM).

watershed. The land area which collects and transmits runoff to the outlet of the drainage basin.

APPENDIX H  
NORTH CAROLINA FLOODWAY REGULATION LAW

## FLOODWAY REGULATION LAW

Sec. 3. Article 21 of Chapter 143 of the General Statutes of North Carolina is hereby amended by adding thereto at the end thereof a new part, to be numbered Part 6, and to read as follows:

### "Part 6. Floodway Regulation

143-215.51. Preamble. -- The purpose of this Part is to specify a means for regulation of artificial obstructions in floodways by responsible local governments with guidance, coordination and assistance from State Government, consonant with the State policy of vesting primary responsibility for flood plain management with local levels of government. It is hereby declared that the channel and a portion of the flood plain of all of the State's streams will be designated as a floodway in which artificial obstructions may not be placed except with the permission of the responsible local government. The purpose of designating these areas as a floodway is to help control and minimize the extent of floods by preventing obstructions which inhibit water flow and increase flood height and damage, and thereby to prevent or minimize loss of life, injuries, property damage and other losses (both public and private) in flood hazard areas, and to promote the public health, safety and welfare of citizens of North Carolina in flood hazard areas.

143-215.52 Definitions. -- As used in this Part, unless the context otherwise requires:

- (1) 'Floodway' means that portion of the channel and flood plain of a stream designated to provide passage for the 100-year flood, without increasing the elevation of that flood at any point by more than one foot.
- (2) 'Natural obstruction' includes any rock, tree, gravel, or analogous natural matter that is an obstruction and has been located within the floodway by a nonhuman cause.
- (3) 'Artificial obstruction' means any obstruction which is not a natural obstruction, including any which, while not a significant obstruction in itself, is capable of accumulating debris and thereby reducing the flood-carrying capacity of the stream.
- (4) 'Stream' means a water course that collects surface runoff from an area of one square mile or greater. This does not include flooding due to tidal or storm surge on estuarine or ocean waters.
- (5) 'Local government' means any county or municipal corporation.

143-215.53. Artificial obstruction prohibited. -- The placement of any artificial obstruction in the floodway of any stream after the floodway has been delineated pursuant to G.S. 143-215.56 is hereby prohibited, except as set forth in G.S. 143-215.54, unless a permit has been obtained for such artificial obstruction from the responsible local government. No damageable portion of a structure located outside the floodway may be below the elevation that would be attained by the 100-year flood if the stream were contained within the floodway.

143-215.54. Floodway uses. -- (a) Local governments are empowered to grant permits for the use of the floodways consistent with the purposes of this Part.

(b) The following uses may be made of floodways as a matter of right without a permit issued under this Part:

- (1) General farming, pasture, outdoor plant nurseries, horticulture, forestry, wildlife sanctuary, game farm, and other similar agricultural, wildlife and related uses.
- (2) Loading areas, parking areas, rotary aircraft ports, and other similar industrial-commercial uses.
- (3) Lawns, gardens, parking, play areas, and other similar uses.
- (4) Golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, parks, swimming pools, hiking or horseback riding trails, open space and other similar private and public recreational uses.
- (5) Streets, bridges, overhead utility lines, creek and storm drainage facilities, sewage or waste treatment plant outlets, water supply intake structures, and other similar public, community or utility uses.
- (6) Temporary facilities (for a specified number of days), such as displays, circuses, carnivals, or similar transient amusement enterprises.
- (7) Boat docks, ramps, piers, or similar structures.
- (8) Dams.

143-215.55. Existing artificial obstructions. -- Artificial obstructions existing in a floodway on the effective date of this Part shall not be considered to be in violation of this Part. However, they may not be enlarged or replaced in part or in whole, without a permit, as provided by this Part in the case of a proposed artificial obstruction. Local governments are empowered to acquire, by purchase, exchange, or condemnation such



existing artificial obstructions if deemed necessary by the responsible local government for the purpose of avoiding flood damages. The procedure in all condemnation proceedings pursuant to this section shall conform as nearly as possible to the procedure provided in G.S. Chapter 40, Article 2, and all acts amendatory thereof.

143.215.56. Delineation of floodway; powers of Board of Water and Air Resources; powers of local governments. -- (a) For the purpose of delineating the floodway and evaluating the possibility of flood damages, responsible local governments are empowered to:

- (1) request technical assistance from the competent federal agencies, including the Army Corps of Engineers, the Soil Conservation Service, the Tennessee Valley Authority, and the U.S. Geological Survey, or successor agencies, and
- (2) Utilize the reports and data supplies by federal and State agencies as the basis for the exercise by local ordinance or resolution of the powers and responsibilities conferred on responsible local governments by this Part.

(b) The Board of Water and Air Resources shall be empowered to render advice and assistance to any local government having responsibilities under this Part. In exercising this function it shall specifically be authorized to furnish manuals, suggested standards, plans, and other technical data; to conduct training programs; and to give advice and assistance with respect to handling of particular applications; but it shall not be limited to such activities. In the exercise of its powers to adopt rules and regulations interpreting and applying the provisions of this Part, the Board may adopt (but is not limited to adopting) regulations interpreting any of the terms used in this Part, including regulations supplementing the definitions provided in this Part. A copy of every regulation adopted by the Board interpreting or applying the provisions of this Part, shall be filed by the Board with the chairman of the governing body of each county and municipality within the State, as well as with the Secretary of State as required by G.S. 143-195.

(c) The local governing body may delineate any floodway subject to its regulation by showing it on a map or drawing, by a written description, or any combination thereof, to be designated appropriately and filed permanently with the clerk of superior court and with the register of deeds in the county where the land lies and with the Director of Water and Air Resources.

as may be designated by said body, as prescribed by the governing body. Every final decision granting or denying a permit under this Part shall be subject to review by the superior court of the county, with the right of jury trial at the election of the party seeking review. The time and manner of election of a jury trial shall be governed by G.S. 1A-1, Rule 38(b) of the Rules of Civil Procedure. Pending the final disposition of any such appeal, no action shall be taken which would be unlawful in the absence of a permit issued under this Part.

143-215.58. Violations and penalties. -- (a) Any violation of this Part or of any ordinance adopted (or of the provisions of any permit issued) under the authority of this Part shall constitute a misdemeanor.

(b) Failure to remove any artificial obstruction or enlargement or replacement thereof, that violates this Part or any ordinance adopted (or the provision of any permit issued) under the authority of this Part, shall constitute a separate violation of this Part for each ten days that such failure continues after written notice from the county or municipal governing body.

(c) In addition to or in lieu of other remedies, the county or municipal governing body may institute any appropriate action or preceeding to restrain or prevent any violation of this Part or of any ordinance adopted (or of the provisions of any permit issued) under the authority of this Part, or to require any person, firm or corporation which has committed any such violations to remove a violating obstruction or restore the conditions existing before the placement of the obstruction.

143-215.59. Other approvals required. -- (a) The granting of a permit under the provisions of this Part shall in no way affect any other type of approval required by any other statute or ordinance of the State or any political subdivision of the State, or of the United States, but shall be construed as an added requirement.

(b) No permit for the construction of any structure to be located within a floodway shall be granted by a political subdivision unless the applicant has first obtained the permit required by this Part.

143-215.60. Liability for damages. -- No action for damages sustained because of injury caused by an obstruction for which a permit has been granted under this Part shall be brought against the State or any political subdiision of the State, or their employees or agents.

143-215.61. Flood plain management. -- The provisions of this Part shall not preclude the imposition by responsible local governments of land use controls and other regulations in the interest of flood plain management for the flood plain or the floodway."

NOTE: Section 3 of 1971 S.B. 432, which is Chapter 1167 of the 1971 N.C. Session Laws; an extract)