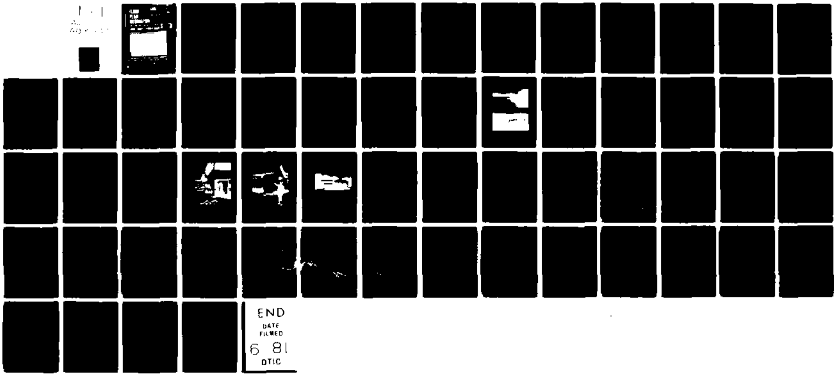
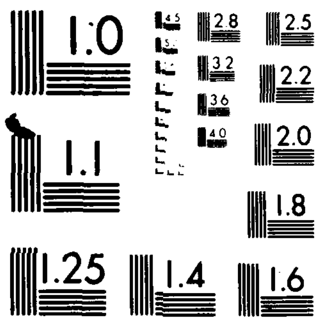
AD-A099 847 ARMY ENGINEER DISTRICT PHILADELPHIA PA F/G 8/8
FLOOD PLAIN INFORMATION, ANTIETAM CREEK AND HEISTER CREEK, BERK--ETC(U)
JUN 74
UNCLASSIFIED DAEN/NAP-82040/FPI03-74/0 NL





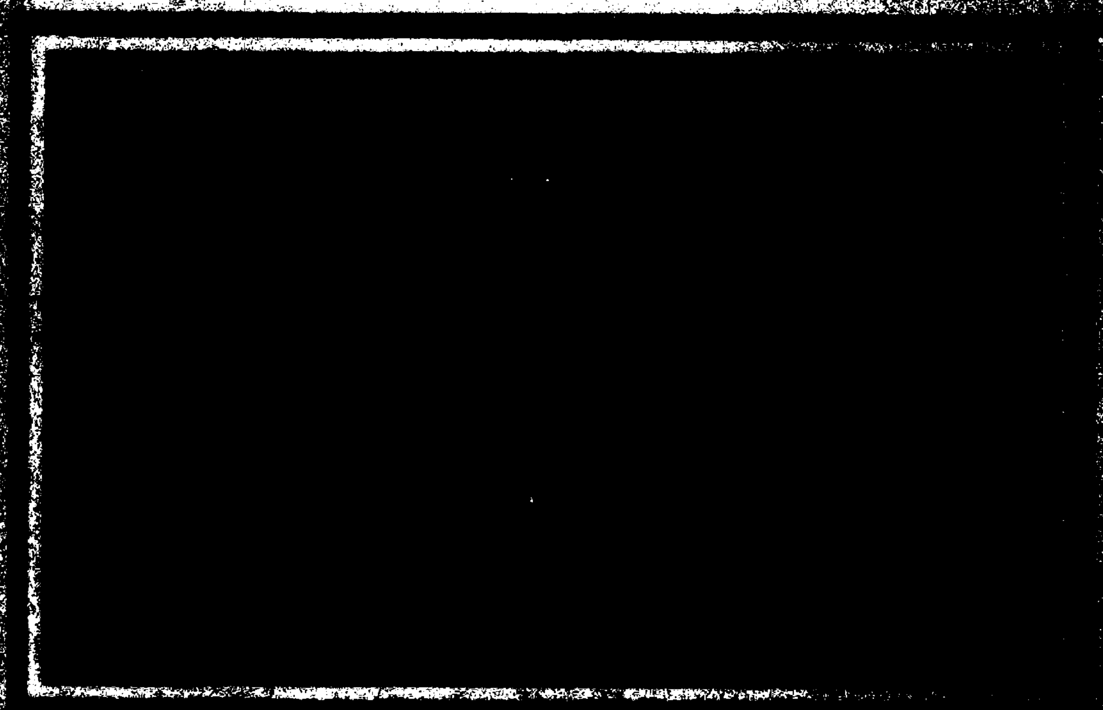
MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963 A

FLOOD PLAIN INFORMATION

ANTIETAM CREEK AND HEISTERS CREEK

BERKS COUNTY, PENNSYLVANIA



PREPARED FOR THE BERKS COUNTY PLAN[illegible]

THE CORPS OF ENGINEERS, U.S. ARMY [illegible]

JUNE 197[illegible]

Rept. [illegible]

TO THE REQUESTOR:

This Flood Plain Information (FPI) Report was prepared by the Philadelphia District office of the U.S. Army Corps of Engineers, under the continuing authority of the 1960 Flood Control Act, as amended. The report contains valuable background information, discussion of flood characteristics and historical flood data for the study area. The report also presents through tables, profiles, maps and text, the results of engineering studies to determine the possible magnitude and extent of future floods, because knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning floodplain utilization. These projections of possible flood events and their frequency of occurrence were based on conditions in the study area at the time the report was prepared.

Since the publication of this FPI Report, other engineering studies or reports may have been published for the area. Among these are Flood Insurance Studies prepared by the Federal Insurance Administration of the Federal Emergency Management Agency, Flood Insurance Studies generally provide different types of flood hazard data (including information pertinent to setting flood insurance rates) and different types of floodplain mapping for regulatory purposes and in some cases provide updated technical data based on recent flood events or changes in the study area that may have occurred since the publication of this report.

It is strongly suggested that, where available, Flood Insurance Studies and other sources of flood hazard data be sought out for the additional, and, in some cases, updated flood plain information which they might provide. Should you have any questions concerning the preparation of, or data contained in this FPI Report, please contact:

U.S. Army Corps of Engineers
Philadelphia District
Custom House, 2nd and Chestnut Streets
Philadelphia, PA 19106

ATTN: Flood Plain Mgt. Services Branch, NAPEN-M

Telephone number: (215) 597-4807

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

14

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER DAEN/NAP-82040/FPI03-74/06	2. GOVT ACCESSION NO. AD-A099 847
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) 6 Flood plain information Antietam Creek and Heister Creek, Berks County, ~~Pa.~~ Pennsylvania.	5. TYPE OF REPORT & PERIOD COVERED Flood plain information
	6. PERFORMING ORG. REPORT NUMBER DAEN/NAP-82040/FPI03-74/06
7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District Philadelphia 2nd & Chestnut Sts. Philadelphia, PA 19106	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 12 64
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District Philadelphia 2nd & Chestnut Sts. Philadelphia, PA 19106	12. REPORT DATE 11 June 1974
	13. NUMBER OF PAGES 35
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Antietam Creek, Pa.
Heister Creek, Pa.
Berks County, Pa.
Berks County Planning Commission
Floods
Flood forecasting
Flood plains

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The portions of Berks County covered by this report are subject to flooding from Antietam and Heisters Creeks. At the time of this report the properties on this flood plains along these streams were primarily residential and have been damaged by the floods caused by Hurricane Agnes.

410

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

This report includes a history of flooding in Berks County near Antieham Creek and Heisters Creek and identifies those areas that are subject to possible future floods. Special emphasis is given to these possible future floods thru maps, photographs, profiles and cross sections.

Under authority granted by Section 206 of the 1960 Flood Control Act this report was prepared in response to a request from the Berks County Planning Commission by the U.S. Army Engineer District, Philadelphia. The information should be considered of an historical nature. Since the publication of this FPI report, other Flood Insurance Studies have been undertaken and should also be consulted.

INSTRUCTIONS FOR PREPARATION OF REPORT DOCUMENTATION PAGE

RESPONSIBILITY. The controlling DoD office will be responsible for completion of the Report Documentation Page, DD Form 1473, in all technical reports prepared by or for DoD organizations.

CLASSIFICATION. Since this Report Documentation Page, DD Form 1473, is used in preparing announcements, bibliographies, and data banks, it should be unclassified if possible. If a classification is required, identify the classified items on the page by the appropriate symbol.

COMPLETION GUIDE

General. Make Blocks 1, 4, 5, 6, 7, 11, 13, 15, and 16 agree with the corresponding information on the report cover. Leave Blocks 2 and 3 blank.

Block 1. Report Number. Enter the unique alphanumeric report number shown on the cover.

Block 2. Government Accession No. Leave Blank. This space is for use by the Defense Documentation Center.

Block 3. Recipient's Catalog Number. Leave blank. This space is for the use of the report recipient to assist in future retrieval of the document.

Block 4. Title and Subtitle. Enter the title in all capital letters exactly as it appears on the publication. Titles should be unclassified whenever possible. Write out the English equivalent for Greek letters and mathematical symbols in the title *(see "Abstracting Scientific and Technical Reports of Defense-sponsored RDT/E,"AD-667 000)*. If the report has a subtitle, this subtitle should follow the main title, be separated by a comma or semicolon if appropriate, and be initially capitalized. If a publication has a title in a foreign language, translate the title into English and follow the English translation with the title in the original language. Make every effort to simplify the title before publication.

Block 5. Type of Report and Period Covered. Indicate here whether report is interim, final, etc., and, if applicable, inclusive dates of period covered, such as the life of a contract covered in a final contractor report.

Block 6. Performing Organization Report Number. Only numbers other than the official report number shown in Block 1, such as series numbers for in-house reports or a contractor/grantee number assigned by him, will be placed in this space. If no such numbers are used, leave this space blank.

Block 7. Author*(s)*. Include corresponding information from the report cover. Give the name*(s)* of the author*(s)* in conventional order *(for example, John R. Doe or, if author prefers, J. Robert Doe)*. In addition, list the affiliation of an author if it differs from that of the performing organization.

Block 8. Contract or Grant Number*(s)*. For a contractor or grantee report, enter the complete contract or grant number*(s)* under which the work reported was accomplished. Leave blank in in-house reports.

Block 9. Performing Organization Name and Address. For in-house reports enter the name and address, including office symbol, of the performing activity. For contractor or grantee reports enter the name and address of the contractor or grantee who prepared the report and identify the appropriate corporate division, school, laboratory, etc., of the author. List city, state, and ZIP Code.

Block 10. Program Element, Project, Task Area, and Work Unit Numbers. Enter here the number code from the applicable Department of Defense form, such as the DD Form 1498, "Research and Technology Work Unit Summary" or the DD Form 1634. "Research and Development Planning Summary," which identifies the program element, project, task area, and work unit or equivalent under which the work was authorized.

Block 11. Controlling Office Name and Address. Enter the full, official name and address, including office symbol, of the controlling office. *(Equates to funding/sponsoring agency. For definition see DoD Directive 5200.20, "Distribution Statements on Technical Documents.")*

Block 12. Report Date. Enter here the day, month, and year or month and year as shown on the cover.

Block 13. Number of Pages. Enter the total number of pages.

Block 14. Monitoring Agency Name and Address *(if different from Controlling Office)*. For use when the controlling or funding office does not directly administer a project, contract, or grant, but delegates the administrative responsibility to another organization.

Blocks 15 & 15a. Security Classification of the Report: Declassification/Downgrading Schedule of the Report. Enter in 15 the highest classification of the report. If appropriate, enter in 15a the declassification/downgrading schedule of the report, using the abbreviations for declassification/downgrading schedules listed in paragraph 4-207 of DoD 5200.1-R.

Block 16. Distribution Statement of the Report. Insert here the applicable distribution statement of the report from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 17. Distribution Statement *(of the abstract entered in Block 20, if different from the distribution statement of the report)*. Insert here the applicable distribution statement of the abstract from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 18. Supplementary Notes. Enter information not included elsewhere but useful, such as: Prepared in cooperation with . . . Translation of *(or by)* . . . Presented at conference of . . . To be published in . . .

Block 19. Key Words. Select terms or short phrases that identify the principal subjects covered in the report, and are sufficiently specific and precise to be used as index entries for cataloging, conforming to standard terminology. The DoD "Thesaurus of Engineering and Scientific Terms" *(TEST)*, AD-672 000, can be helpful.

Block 20. Abstract. The abstract should be a brief *(not to exceed 200 words)* factual summary of the most significant information contained in the report. If possible, the abstract of a classified report should be unclassified and the abstract to an unclassified report should consist of publicly- releasable information. If the report contains a significant bibliography or literature survey, mention it here. For information on preparing abstracts see "Abstracting Scientific and Technical Reports of Defense-Sponsored RDT&E," AD-667 000.

☆ U.S. GPO: 1974—540-847/9082

CONTENTS

CONTENTS (Continued)

TABLES

CONTENTS (Contineud)

PLATES

FIGURES

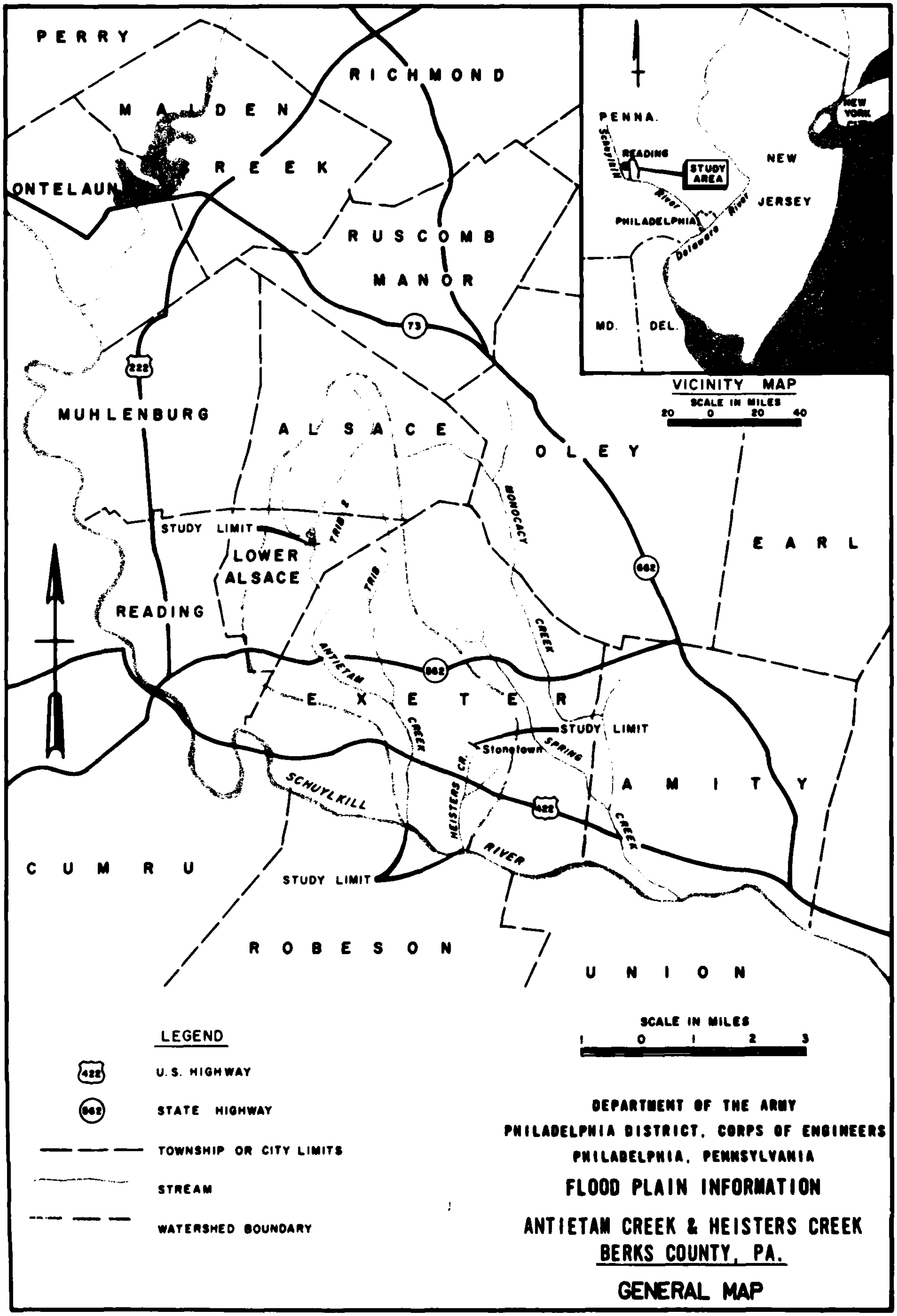

PERRY
MAIDEN CREEK
ONTELAUNEE
RICHMOND
RUSCOMB MANOR
MUHLENBURG
ALSACE
OLEY
EARL
STUDY LIMIT
LOWER ALSACE
READING
TRIB
ANTIETAM
EXETER
MONOCACY CREEK
STUDY LIMIT
Stonetown
SPRING CREEK
AMITY
SCHUYLKILL RIVER
HEISTERS CR.
CUMRU
STUDY LIMIT
ROBESON
UNION
73
222
562
422
PENNA.
Schuylkill
READING
STUDY AREA
NEW JERSEY
River
Delaware River
PHILADELPHIA
NEW YORK
MD.
DEL.
VICINITY MAP
SCALE IN MILES
20 0 20 40
SCALE IN MILES
1 0 1 2 3
LEGEND
422 U.S. HIGHWAY
562 STATE HIGHWAY
TOWNSHIP OR CITY LIMITS
STREAM
WATERSHED BOUNDARY
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA
FLOOD PLAIN INFORMATION
ANTIETAM CREEK & HEISTERS CREEK
BERKS COUNTY, PA.
GENERAL MAP

PLATE I

PREFACE

The portions of Berks County covered by this report are subject to flooding from Antietam Creek and Heisters Creek. The properties on the flood plains along these streams are primarily residential and have been damaged by past floods such as the flood resulting from Hurricane Agnes in June 1972. The open spaces in the flood plains which may come under pressure for future development are extensive. Although large floods have occurred in the past, studies indicate that even larger floods are possible.

This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning flood plain utilization. It includes a history of flooding in Berks County near Antietam Creek and Heisters Creek and identifies those areas that are subject to possible future floods. Special emphasis is given to these floods through maps, photographs, profiles, and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of the loss problems. It will also aid in the identification of areas where other flood damage reduction techniques such as works to modify flooding and adjustments including flood proofing might be embodied in an overall Flood Plain Management (FPM) program. Other FPM program studies--those of environmental attributes and the current and future land use role of the flood plain as part of its surroundings--would also profit from this information.

At the request of the Berks County Planning Commission and endorsement of the Pennsylvania Department of Environmental Resources, this report was prepared by the Philadelphia District Office of the Corps of Engineers, Department of the Army under continuing authority provided in Section 206 of the 1960 Flood Control Act, as amended.

Assistance and cooperation of the Berks County Civil Defense Council, the Berks County Planning Commission, local newspapers and private citizens in supplying useful data and photographs for the preparation of this report are appreciated.

Additional copies of this report can be obtained from the Berks County Planning Commission. The Philadelphia District Office of the Corps of Engineers, Department of the Army, upon request, will provide technical assistance to planning agencies in the interpretation and use of the data presented as well as planning guidance and further assistance including the development of additional technical information.

BACKGROUND INFORMATION

Settlement

Although little historical data has been recorded for the immediate vicinity of Antietam and Heisters Creeks, background information of the surrounding area may provide insight into the historical development of the study area.

At the middle of the 19th century, Berks County had more iron and steel-producing plants than any county in the United States. The prosperity of Reading's primary iron and steel industry continued until the upper Great Lakes ore replaced the use of Pennsylvania ore. Reading made the adjustment by shifting to the fabrication of iron and steel.

The decline of primary iron and steel manufacturing were offset by the development of the textile and hosiery industry around 1900. These textile and hosiery products gave the City a national reputation.

Reading became an important retail and wholesale trading center. The City is located in the midst of a rich agricultural, dairy and industrial county and ranks third industrially in the state with about 700 industrial establishments in the City and its suburbs. These include railway shops, plants which produce builders hardware, foundary products and hosiery machinery, many knitting mills, optical goods and chemical manufacturers, several dairies, and hugh brickworks.

The areas available for potential development in the Antietam and Heisters Creeks vicinity are extensive. The growth of the City of Reading is indicative of the possible future trends of development in the study area. With increasing pressure for numerous developments around the City, it is likely that the Antietam and Heisters Creek Valleys will also come under increasing pressure for development.

The Stream and Its Valley

Antietam Creek flows in a southwesterly direction from its headwaters near Alsace Township, Pennsylvania, to Antietam Reservoir near Stony Creek Mills, Pennsylvania, and thence southward to its confluence with the Schuylkill River. It has a drainage area of approximately 18 square miles, with a total stream length of approximately 11.9 miles.

This study deals with that portion of Antietam Creek from Antietam Reservoir to its confluence with the Schuylkill River above Birdsboro, Pennsylvania. From its upper study limit, the creek flows southerly for approximately 6.8 miles through Lower Alsace and Exeter Townships and St. Lawrence Borough. The characteristics of Antietam Creek vary greatly within the approximately 12.5 square mile drainage area studied in this report. The upper portion of the stream valley from the study limit at Antietam Dam to Friedensburg Road is confined by steep banks with rock outcrops on the streambed and heavy brush. The stream slope in this area is an average of 135 feet per mile. The stream then meanders through gently sloping terrain with light vegetation and brush on the stream banks. Downstream of Oley Turnpike Road, the area is predominantly rural with varying side slopes and vegetation varying from light to dense. The average stream gradient in this region is approximately 39 feet per mile.

Antietam Creek has two main unnamed tributaries. In this report, they are referred to as Tributary 1 and Tributary 2.

Tributary 1 flows in a southwesterly direction to its confluence with Antietam Creek in Exeter Township, Pennsylvania. It has a drainage area of approximately 1.6 square miles with a stream length of 2.46 miles. The stream channel slopes approximately 113 feet per mile within the study area and its banks are partially obstructed by vegetation and wooded areas.

Tributary 2 flows in a southwesterly direction to its confluence with Antietam Creek in Stony Creek Mills, Pennsylvania. It has a drainage area of approximately 2.5 square miles with a stream length of 2.56 miles. Tributary 2 is diverted for approximately 0.28 mile above its mouth into a mill race. The original channel has a streambed 20.3 feet lower than the mill race at the upstream side of the mill race dam.

Heisters Creek flows in a southerly direction from its headwaters near Stonetown, Pennsylvania, to its confluence with the Schuylkill River below the mouth of Antietam Creek. It has a drainage area of approximately 1.7 square miles with a stream length of approximately 2.75 miles. Heisters Creek for the most part is a well defined channel with a slope of approximately 45 feet per mile within the study area. The stream is characterized by low banks which are partially obstructed with dense vegetation and wooded areas.

Watershed boundaries for Anteitam and Heisters Creeks can be found on the general map, Plate 1. Drainage areas for these watersheds are given in Table 1.

The climate of the study area is characterized by moderately warm summers, when temperatures may rise above 80 degrees, and cool winters, when temperatures reach below 25 degrees. Annual precipitation over the basin averages 41 inches and occurs rather uniformly throughout the year.

TABLE 1
DRAINAGE AREAS
Antietam and Heisters Creeks

Location	Mileage Above Mouth	Drainage Area Tributary Sq. Miles	Drainage Area Main Stem Sq. Miles
Antietam Creek			
At confluence with Schuylkill River	0	-----	18.0
Downstream of Tributary 1	2.82	------	14.2
Tributary 1	2.82	1.6	------
Upstream of Tributary 1	2.83	------	12.6
Downstream of Tributary 2	6.14	------	8.2
Tributary 2	6.14	2.5	------
Upstream of Tributary 2	6.15	------	5.7
Antietam Dam	6.84	------	5.5
Heisters Creek			
At confluence with Schuylkill River	0	------	1.7
Upstream of Rte. 422 Bridge.	1.29	------	0.7

Developments in the Flood Plain

From the upper study limit of the main stem of Antietam Creek to Friendensburg Road, the stream valley is extremely steep with negligible development. Downstream of Friendensburg Road to Oley Turnpike Road, the flood plain is considerably more developed with numerous residential structures, including a trailer park. Two community swim clubs are also located within this area. The area below Oley Turnpike Road to the confluence with the Schuylkill River has few residences and the Reading Country Club is located within this reach.

Five dams are located on the main stem of Antietam Creek including the large Antietam Water Supply Reservoir. All five of these dams have no significant flood storage capacity; and, although dams 2 and 3 present obstruction to floodwaters, none of the dams will seriously alter floodflows. There are no dams located on Heisters Creek. A sixth dam is located on Tributary 2 of Antietam Creek and as previously mentioned, the original stream has been diverted into a mill race with the dam being situated near the confluence of the tributary with Antietam Creek. This mill race dam has been breached; and, therefore, there is no flood storage capacity nor alteration of floodflows. Furthermore, the topography of the area indicates that during any major flooding event, the mill race would be flowing full with a major portion of the floodwaters overspilling into and flowing through the old channel. For this reason, only the profile and flooded area outlines for the original stream channel are shown on Plate 9 and Plate 6, respectively.

From the upper limit of Tributary 1 to St. Lawrence Avenue (Pa. Route 562) there is intense residential development in the flood plain. Downstream of St. Lawrence Avenue to the confluence with Antietam Creek the area is less developed but scattered residential structures are still within the flood plain. The flood plain of Tributary 2 is generally rural with some residences located near the highways.

The upper portion of the flood plain of Heisters Creek from the study limit to U.S. Route 422 has some residential development following Stonetown Road. Downstream of U.S. Route 422 to the confluence with the Schuylkill River, the area is generally rural. However, some residential structures as well as the Exeter Township Waste-Water Treatment Plant are located near the mouth of the creek. There is little industrial development within the study limits of this report.

FLOOD SITUATION

Sources of Data and Records

There are no stream gages on Antietam Creek, its tributaries or Heisters Creek. Consequently, basin stream flow data were not available for direct frequency analysis or historical comparison. Discharge-frequency curves were developed using the Rainfall-Runoff Method described in Technical Bulletin No. 40 "Rainfall Frequency Atlas of the United States."

To supplement the discharge-frequency curves, newspaper files, historical documents and records were searched for information concerning past floods. These records have developed a knowledge of floods which have occurred on Antietam Creek and Heisters Creek.

Maps prepared for this report were based on the U.S. Geological Survey Quadrangle Sheet entitled "Birdsboro, Pennsylvania, 1968" and Planimetric and Hydrographic Base Maps, July 1, 1971, furnished by the Berks County Planning Commission. Structural data on bridges and culverts were obtained by field surveys performed by Corps of Engineers, Philadelphia District, Personnel.

Flood Season and Flood Characteristics

Flooding has occurred in the study reaches of Antietam and Heisters Creeks during all seasons of the year with the greatest known flood occurring in June 1972, as a result of Hurricane Agnes. Floodflow stages can rise from normal flow to extreme flood peaks in a relatively short period of time with high velocities in the main channel of the streams.

In addition to floods caused by runoff from general rainfall, the Antietam and Heisters Creek Valleys are susceptible to flooding from hurricane activity as well as floods from snowmelt in combination with rainfall.

Factors Affecting Flooding and Its Impact

Obstructions to floodflows - Natural obstructions to floodflows include trees, brush and other vegetation growing along the stream banks in floodway areas. Man-made encroachments on or over the streams such as dams, bridges and culverts can also create more extensive flooding than would otherwise occur.

During floods, trees, brush and other vegetation growing in floodways impede floodflows, thus creating backwater and increased flood heights. Trees and other debris may be washed away and carried downstream to collect on bridges and other obstructions to flow. As floodflow increases, masses of debris break loose and a wall of water and debris surges downstream until another obstruction is encountered. Debris may collect against a bridge until the load exceeds its structural capacity and the bridge is destroyed. The limited capacity of obstructive bridges or culverts, debris plugs at the culvert mouth or a combination of these factors retard floodflows and result in flooding upstream, erosion around the culvert entrance and bridge approach embankments and possible damage to the overlying roadbed.

In general, obstructions restrict floodflows and result in overbank flows and unpredictable areas of flooding, destruction of or damage to bridges and culverts, and, an increased velocity of flow immediately downstream. It is impossible to predict the degree or location of the accumulation of debris; therefore, for the purposes of this report, it was necessary to assume that there would be no accumulation of debris to clog any of the bridge or culvert openings in the development of the flood profiles.

Antietam Creek, Antietam Creek Tributaries and Heisters Creek are spanned 39 times by bridges and culverts. Pertinent information on all bridges and culverts can be found in Table 4 on Page 16. Many of these bridges are obstructive to floodflows.

These are 4 small dams located on the main stem of Antietam Creek and one small dam located on Tributary 2. These dams have no significant flood control capacity nor do they seriously alter flow characteristics of floodwaters. One additional large dam at the upper limit of the study area forms Antietam Water Supply Reservoir. This dam also has little or no flood storage capacity and, therefore, will not significantly affect the flow characteristics of floodwaters of major flood events. There are no dams located on Heisters Creek.

Flood damage reduction measures - These are no planned flood control structures or county zoning ordinances, building codes, or other regulatory measures specifically for the reduction of flood damages. However, Lower Alsace Township has become eligible for inclusion in the Federal Flood Insurance Program and, therefore, is responsible for incorporating flood plain regulations into the local zoning ordinances in order to retain eligibility. Also, Exeter Township intends to use this Flood Plain Information Report as a basis for the development of flood plain management regulatory measures.

Other factors and their impacts - The impact of flooding along Antietam and Heisters Creeks can be affected by the ability of local residents to anticipate and effectively react to a flood emergency. Efficient flood warning and forecasting systems can give homeowners, business and industry valuable time to remove damageable materials from low-lying areas. Increased damages to downstream areas can also be reduced if floatable materials stored on the flood plain can be removed before being carried downstream by floodwaters to block bridge and culvert openings. Implementation of effective flood fighting and emergency evacuation plans can further reduce flood damages and the incidence of personal injury and death once the creeks have reached flood stage.

Flood warning and forecasting - The National Oceanic and Atmospheric Administration (NOAA) maintains year-round surveillance of weather conditions at Harrisburg, Pittsburgh and Philadelphia, Pennsylvania, and Trenton, New Jersey, all of which have made forecasts for the study area. Flood warnings and anticipated weather conditions are issued by the National Weather Service to city officials, radio and television stations and the local press media for further dissemination to residents of the area. Flood warning for the Antietam and Heisters Creek Watersheds is carried out by the Berks County Civil Defense Council. When the National Weather Service's forecasts indicate high water stages could be expected, observations of stream stages are made at strategic locations.

Flood fighting and emergency evacuation plans - Berks County has a formal flood fighting and emergency evacuation plan which is described in the recent report entitled, "Civil Defense Emergency Operation Plan." The report has been distributed to every borough and township within the county. Provisions for alerting area residents and coordinating operations of city and county public service agencies in time of emergency are accomplished through the Berks County Civil Defense Council. This agency maintains communications with the State Civil Defense Headquarters National Weather Service at its control center and establishes a "flood watch" during the earliest stages of a flood threat. Boroughs and townships are warned of approaching flood conditions by telephone and local radio stations. The police and fire department also aid in alerting the public of the forthcoming danger and advise the citizens to evacuate the area. Subsequent flood fighting, evacuation, and rescue activities are coordinated on a county-wide basis with local public agencies.

Material storage on the flood plain - Due to the minor amount of industrial development along the streams, there is very little floatable material stored on flood plain lands. However, any materials which are situated on the flood plain at the time of flooding, such as domestic equipment, cars, or trash, may be carried away by floodflows causing serious damage to structures downstream and clogging bridge and culvert openings creating more hazardous flooding problems.

PAST FLOODS

Summary of Historical Floods

Damaging floods have been reported to have occurred on the Schuylkill River in the vicinity of Antietam and Heisters Creeks as early as 1757. Floods causing significant damage in this area are described to have occurred on September 2, 1850; October 4, 1869 and February 28, 1902. The floods of January 3, 1937; February 28, 1958 and June 22-23, 1972, are recorded as having a direct affect on Antietam Creek and Heisters Creek. The highest known flood was the flood of June 22-23, 1972. As a result of Hurricane Agnes, the communities of Exeter, St. Lawrence and Lower Alsace sustained damages in excess of $1 million. A portion of this loss was due to flooding on Antietam and Heisters Creeks.

Flood Records

As previously indicated there are no streamflow records available for Antietam or Heisters Creeks. However, residents along the streams were interviewed and newspaper files and historical documents were searched for information concerning past floods. High water marks for Antietam and Heisters Creeks resulting from Hurricane Agnes and possible future floods are shown in Table 2.

TABLE 2
WATER SURFACE ELEVATIONS
Hurricane Agnes and Possible Future Floods

Location	Date	High Water Mark Elevation	Intermediate Regional Flood Elevation	Standard Project Flood Elevation
		feet - mean sea level datum		
Antietam Creek				
Stony Creek A.A. House, Antietam Rd., Exeter Twp., Pa.	June 23, 1972	379.6	381.0	382.8
Heisters Creek				
Waste Water Treatment Plant at Exeter Twp., Pa.	June 23, 1972	178.0	174.0	179.6

Flood Descriptions

The following are descriptions of past flood events which have occurred in the study area of Antietam and Heisters Creeks.

January 3, 1937 - This flood resulted in great destruction through the Ohio and Mississippi Valleys. Although there was no serious damage at Reading, a number of dams were washed away in the Reading vicinity including dams on Antietam Creek.

EXCERPTS FROM THE READING TIMES, [a]

January 3, 1937

Flood-Conscious Reading Citizens Keeping Wary Eye On Schuylkill

With swirling flood water leaving a trail of death and destruction through Ohio and Mississippi Valleys, and newspapers and radios recounting tales of distress and privation suffered by the inhabitants, Berks Countians are keeping a wary eye on the Schuylkill River ....

To add to the flood danger, great quantities of ice jammed up at a dam near Philadelphia until it reached a recorded height of 40 feet. This caused the stream to back up and at Reading it reached a height of 13 feet, 9¼ inches. Although the river did little damage at Reading, a number of dams were washed away in the Tulpehocken, Maiden Creek, Antietam and Manatawny Creeks.

February 27-28, 1958 - The melting snow of a week and a half earlier combined with 1.75 inches of rain had swollen streams in Berks County to the flooding point. Within a 24 hour period, 1.25 inches of rain had fallen on the area. Families were forced to evacuate their homes and roads were rendered impassable.

(a) Simulated from newspaper clippings.

EXCERPTS FROM THE READING EAGLE [a]
FEBRUARY 28, 1958

14 Families Flee Flood In Topton Berks Areas Inundated As Heavy Rain Swells Creeks

Rampaging creeks last night and early today flooded many areas of Berks County, causing at least 14 families to flee their homes in the Topton area and resulting in minor problems in many other districts.

Weatherman Matthew I. Peacock said the waters in the Schuylkill and all creeks would slowly recede during the remainder of the day posing no further threat to homes or roads.

Peacock said the 1.75 inches of rain that fell here during the last 48 hours, plus the melting snow (remnants of the 19 inch snowfall here a week and a half ago) have swollen most area streams to the flooding point. He said 1.25 inches of rain fell during a 24 hour period which ended at 7:00 A.M. today.

The Antietam Creek, which runs through the area was reported overflowing at Butter Lane and in the woods near the old Carsonia Park but reportedly had not caused any trouble.

June 22-23, 1972 - Hurricane Agnes which occurred in June 1972 resulted in the highest known flood in the Antietam Creek and Heisters Creek vicinity. Agnes wrought great destruction throughout the east coast especially within the Schuylkill River and Susquehanna River Watersheds. The Townships of Exeter and Lower Alsace and the Borough of St. Lawrence sustained damages in excess of $1 million. Flooding occurred along the entire length of Antietam and Heisters Creeks causing severe erosion problems at several locations. Floodwaters were deepest near their confluences with the Schuylkill River which peaked at its highest level since recordings were initiated at Pottstown in 1902. Although the Antietam and Heisters Creek Watersheds sustained significant flood damages from Hurricane Agnes, newspaper accounts of the flooding were overshadowed by more devastating flooding in other nearby areas of Berks County such as Reading. Flood information for the area can be found in the "Final Report, Schuylkill River Basin, Post Hurricane Agnes, Flood Damage Survey," which is available for review at the Philadelphia District Office of the U.S. Army Corps of Engineers. Figures 1 and 2 show flooding at the Exeter Waste-Water Treatment Plant.

(a) Simulated from newspaper clippings.

FIGURES 1 and 2 - Flooding at the Exeter Township Waste-Water Treatment Plant during the flood of June 22, 1972

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past could occur in the future. Larger floods have been experienced in the past on streams with similar geographical and physiographical characteristics as those found in the study area. Similar combinations of rainfall and runoff which caused these floods could occur in the study area. Therefore, to determine the flooding potential of the study area, it was necessary to consider storms and floods that have occurred in regions of like topography, watershed cover and physical characteristics. Discussion of the future floods in this report is limited to those that have been designated as the Intermediate Regional Flood and the Standard Project Flood. The Standard Project Flood represents a reasonable upper limit of expected flooding in the study area. The Intermediate Regional Flood may reasonably be expected to occur more frequently although it will not be as severe as the infrequent Standard Project Flood.

Intermediate Regional Flood

The Intermediate Regional Flood is defined as one that occurs once in 100 years on the average, although it could occur in any year. Because basin stream flow records were not available for direct frequency analysis, discharge-frequency curves were developed from a rainfall-runoff method described in Technical Bulletin No. 40, "Rainfall Frequency Atlas of the United States." The peak flow of the Intermediate Regional Flood was then developed by applying runoff to unit hydrographs developed from Appendix M, "Report on the Comprehensive Survey of the Water Resources of the Delaware River Basin, April 1960." Peak flows thus developed for the Intermediate Regional Flood at selected locations in the study area are given in Table 3.

Standard Project Flood

The Standard Project Flood is defined as a major flood that can be expected to occur from a severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the study area is located, excluding extremely rare combinations. The Corps of Engineers, in cooperation with the NOAA Weather Service, has made comprehensive studies and investigations based on the past records of experienced storms and floods and has developed generalized procedures for estimating the flood potential of streams. Peak discharges for the Standard Project Flood at selected locations in the study area are given in Table 3. Discharge hydrographs for the Standard Project Flood at the mouth of Antietam Creek and at the mouth of Heisters Creek are shown on Plate 12. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are shown on Plates 7 through 10.

TABLE 3

PEAK FLOWS FOR THE INTERMEDIATE REGIONAL AND STANDARD PROJECT FLOODS

Location	Distance Above Mouth (miles)	Drainage Area (sq. mi.)	Intermediate Regional Flood Discharge (cfs)	Standard Project Flood Discharge (cfs)
Antietam Creek				
At Mouth	0	18.0	4090	7960
Downstream of Tributary 1	2.82	14.2	3770	7160
Downstream of Tributary 2	6.14	8.2	2670	5010
Antietam Dam	6.84	5.5	1670	3300
Tributary 1				
At Mouth	0	1.6	670	1120
Tributary 2				
At Mouth	0	2.5	1000	1710
Heisters Creek				
At Mouth	0	1.7	660	1260
Upstream of Rte. 422 Bridge	1.29	.7	430	820

Frequency

A frequency curve of peak flows was constructed on the basis of available information and flows of floods were computed up to the magnitude of the Intermediate Regional Flood. Frequencies of floods equivalent to the Standard Project Flood and larger can be obtained through extrapolation of the curve; but it is not practical to assign a frequency to such large flows as their occurrence is so extremely rare. The frequency curve thus derived, which is available on request, reflects the judgment of engineers who have studied the area and are familiar with the region; however, it must be regarded as approximate and should be used with caution in connection with any planning of flood plain use.

Hazards of Large Floods

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise, and developments in the flood plain. An Intermediate Regional or Standard Project Flood on Antietam or Heisters Creeks would result in inundation of residential and commercial sections in the study area. Deep floodwater flowing at high velocity and carrying floating debris would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater 3 or more feet deep and flowing at a velocity of 3 or more feet per second could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed, or in vehicles that are ultimately submerged or floated. Water lines can be ruptured by deposits of debris and the force of floodwaters, thus creating the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of floodwaters creating health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

Flooded areas and flood damages - The areas along the study reach that would be flooded by the Standard Project Flood are shown on Plate 2, which is also an index map to Plates 3 through 6. Areas that would be flooded by the Intermediate Regional and Standard Project Floods are shown in detail on Plates 3 through 6. The actual limits of these overflow areas may vary somewhat from those shown on the maps because the 20 foot contour interval and scale of the maps do not permit precise plotting of the flooded area boundaries. As may be seen from these plates, floodflows from the Antietam and Heisters Creeks Basins cover a large portion of the study area. The highest stages of flooding throughout the study area occur when the floodwaters from Antietam and Heisters Creeks meet with the high stages of the Schuylkill River. The areas that would be flooded by the Intermediate Regional and Standard Project Floods include commercial and residential sections and the associated streets, roads, and private and public utilities. Considerable damage to these facilities would occur during an Intermediate Regional Flood. However, due to the wider extent, greater depths of flooding, higher velocity flow and longer duration of flooding during a Standard Project Flood, damage would be even more severe than during an Intermediate Regional Flood. Special attention should be given to the two unusual conditions which occur within the area depicted on Plate 6. First, the flooded area outline on Tributary 2 encompasses the original stream channel and not the mill race. As previously mentioned, the topography of the area indicates that during any major flooding event the mill race would be flowing full with a major portion of the floodwaters overspilling and flowing through the original channel. Therefore, the flooded area outline and the profile are indicated for the original channel only. The second unusual condition is also due to the topography of the land. As the floodflow approaches the channel bend near Friedensburg Road, the water will attempt to continue in the same direction as the approach flow and will, therefore, overflow the outside bank. Since the topography of the land is such that this flow cannot be redirected into the stream channel, the overland flow will continue until the topography forces the water back into the main stem. This condition results in an undetermined depth of sheet flow. Plates 7 through 10 show water surface profiles of the Intermediate Regional and Standard Project Floods. Depth of flow in the channel can be estimated from these illustrations. Typical cross sections of the flood plain at selected locations, together with the water surface elevation and lateral extent of the Intermediate Regional and Standard Project Floods, are shown on Plate 11.

Obstructions - During floods, debris collecting on bridges and culverts could decrease their carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing profiles of the Intermediate Regional and Standard Project Floods. Similarly, the maps of flooded areas show the backwater effect of obstructive bridges and culverts, but do not reflect increased water surface elevation that could be caused by debris collecting against the structures, or by deposition of silt in the stream channel under structures. As previously indicated, there are 6 dams within the study area which have no significant flood control capacities nor will they seriously alter flow characteristics of floodwaters. Of the 39 bridges and culverts crossing the streams in the study area, most are obstructive to the Intermediate Regional Flood and even more are obstructive to the Standard Project Flood. In some cases bridges may be high enough so as not to be inundated by floodflows; however, the approaches to these bridges may be at lower elevations and subject to flooding and rendered impassable. Table 4 lists upstream water surface elevations at all bridges and culverts within the study limits of Antietam and Heisters Creeks.

TABLE 4

ELEVATION DATA

Bridges Across Antietam Creek, Tributary 1, Tributary 2 and Heisters Creek

Identification	Mileage Above Mouth	Underclearance Elevation	Water Surface Elevation: Intermediate Regional Flood	Water Surface Elevation: Standard Project Flood
		feet - mean sea level datum	feet - mean sea level datum	
Antietam Creek				
Reading RR (culvert)	0.14	165.7	176.0	181.6
Lorane Road	0.76	171.9	176.0	181.6
U.S. Rte. 422	1.44	196.4	195.6	200.6
Golf Course Bridge No. 1	1.48	194.9	196.4	201.3
Golf Course Bridge No. 2	1.53	195.2	197.3	201.5
Golf Course Bridge No. 3	1.57	196.9	198.6	201.8
Golf Course Bridge No. 4	1.58	196.7	199.0	201.9
Golf Course Bridge No. 5	1.63	197.8	200.3	202.0
Golf Course Bridge No. 6	1.74	201.4	203.4	204.4
Golf Course Bridge No. 7	1.79	202.7	206.7	208.7
Golf Course Bridge No. 8	1.85	206.0	209.2	211.0
Private Bridge	2.12	211.1	216.8	220.8
Fairlane Road	2.47	221.4	224.7	226.6
Parkview Road	4.08	282.3	281.8	285.0
Oley Turnpike Road	4.47	298.7	300.9	303.4
Pa. Rte. 562 - St. Lawrence Avenue	4.62	303.5	307.7	310.0
Private Road	4.94	320.3	322.5	325.2
Old Macadam Road	5.03	323.1	327.5	329.2
Harvey Ave.	5.14	328.1	331.2	333.1
Butter Lane Road	5.17	330.3	331.8	333.9
Heidelberg Road	5.85	368.1	369.0	371.4
Private Bridge	6.11	382.3	383.5	385.7
Friedensburg Road	6.36	414.2	417.8	421.8
Private Road	6.62	453.0	454.4	458.6

TABLE 4 (Continued)

ELEVATION DATA

Bridges Across Antietam Creek, Tributary 1, Tributary 2 and Heisters Creek

Identification	Mileage Above Mouth	Underclearance Elevation	Water Surface Elevation: Intermediate Regional Flood	Water Surface Elevation: Standard Project Flood
		feet - mean sea level datum	feet - mean sea level datum	
Tributary 1				
Shelbourne Road (culvert)	0.23	247.1	251.4	252.1
Private Bridge (culvert)	0.65	270.2	273.2	273.9
Schoffers Road (culvert)	0.79	296.1	297.4	297.8
Pa. Rte. 562 - St. Lawrence Avenue	0.82	297.2	300.4	301.5
Foot Bridge	0.85	299.6	301.0	301.9
Oley Turnpike Road (culvert)	1.17	351.4	352.9 (a)	353.2 (a)
Tributary 2				
Exeter Road (culvert)	0.04	387.5	390.4	391.2
Friedensburg Road (culvert)	0.59	446.3	447.5 (a)	448.3 (a)
Heisters Creek				
Reading RR (culvert)	0.21	161.7	174.0	179.6
Lincoln Road	0.44	162.6	174.0	179.6
Private Bridge	1.12	180.9	182.6	184.6
U.S. Rte. 422 (culvert)	1.29	192.1	189.3	192.9
Private Road (culvert)	1.45	197.8	198.3	199.8
Private Bridge	1.65	208.0	209.6	211.0
Stonetown Road (culvert)	2.05	236.7	239.5 (a)	241.8 (a)

(a) Downstream Side of Bridge

Velocities of flow - Water velocities during floods depend largely on the size and shape of the cross sections, conditions of the stream, and the bed slope, all of which vary on different streams and at different locations on the same stream. During an Intermediate Regional Flood, velocities of main channel flow at selected cross sections in the upper reaches of the streams in the study area would vary from 5 to 12 feet per second. Water flowing at this rate is capable of causing severe erosion to streambanks and fill around bridge abutments and transporting large objects. Generally, in the lower reaches, the velocities would be somewhat lower. It is expected that the velocity of flow during a Standard Project Flood would be slightly higher than during an Intermediate Regional Flood. Overbank flow velocity in the study area during the Intermediate Regional Flood would vary from 1 to 4 feet per second. Water flowing at 2 feet per second or less would deposit debris and silt. Table 5 lists the maximum velocities that would occur at selected cross section locations on Antietam and Heisters Creeks during the Intermediate Regional Flood and the Standard Project Flood.

TABLE 5
MAXIMUM VELOCITIES
Antietam Creek and Heisters Creek

		Maximum Average Velocities			
	Mileage	*Intermediate* Regional Flood		Standard Project Flood	
Location	Above Mouth	Channel	Overbank	Channel	Overbank
		ft/sec	ft/sec	ft/sec	ft/sec
Antietam Creek					
Cross Section:					
5	2.41	9.23	1.78	10.49	2.17
10	4.36	9.34	1.91	10.55	2.18
13	5.09	9.36	1.82	11.83	2.53
16	5.95	9.87	1.16	11.46	1.78
Heisters Creek					
5	1.26	6.82	1.39	8.55	1.98
7	1.79	8.61	1.44	10.48	2.32

Rates of rise and duration of flooding - Intense rainfalls that accompany severe storm fronts usually produce the floods occurring in the Antietam and Heisters Creeks areas. There is a time lag of only a few hours before overbank flooding occurs in the vicinity. Floods generally rise rapidly and stay out of banks for long periods of time. Table 6 gives the maximum rate of rise, height of rise (from critical stage level to maximum floodflow level), time of rise (time period corresponding to height of rise), and duration of critical stage (period of time flooding is above critical stage level), for the Standard Project Flood at selected cross section locations on Antietam and Heisters Creeks.

TABLE 6
RATES OF RISE AND DURATION
Standard Project Flood

Location	Maximum Rate of Rise (ft/hr)	Height of Rise (ft)	Time of Rise (hrs)	Duration of Critical Stage (hrs)
Antietam Creek - Section 3	2.2	6.9	6.5	35.5
Heisters Creek - Section 5	0.6	1.4	3.5	16.2

Photographs, future flood heights - The levels that the Intermediate Regional and Standard Project Floods are expected to reach at various locations in the study area are indicated on the following photographs.

FIGURE 3 - Future flood heights of Antietam Creek at the Reading Country Club Maintenance Building.

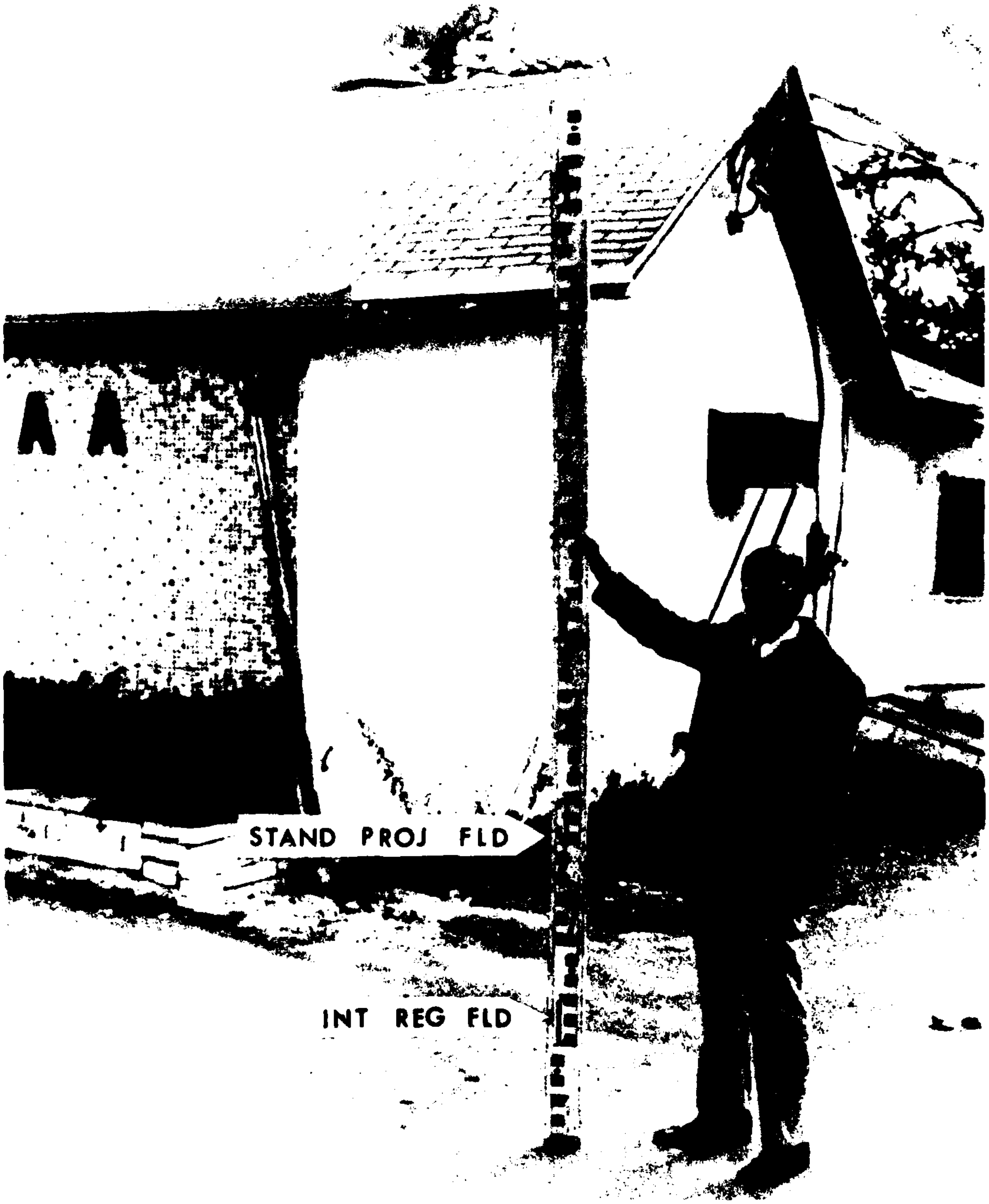


FIGURE 4 - Future flood heights of Antietam Creek at the Stony Creek Athletic Association.

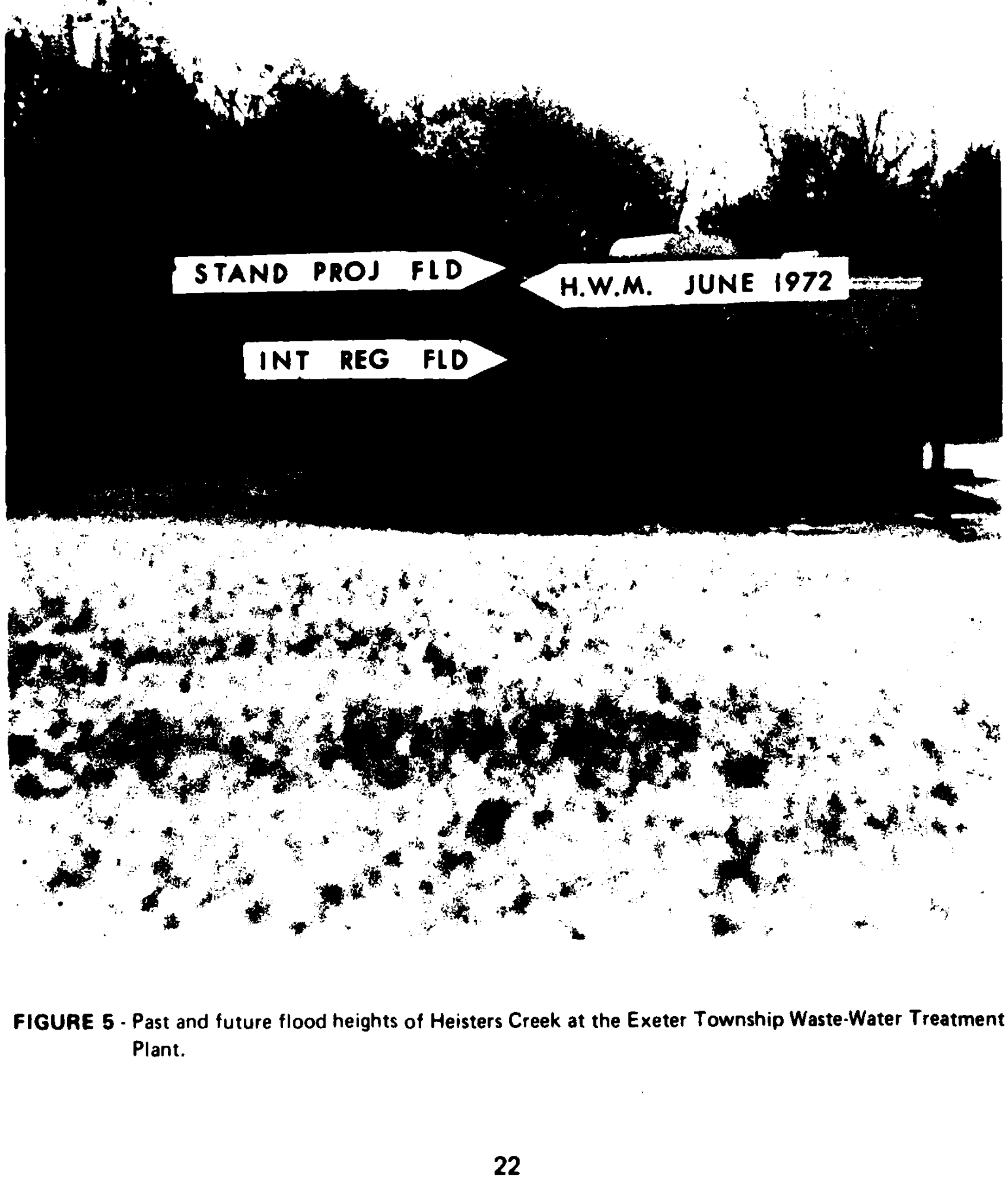


FIGURE 5 - Past and future flood heights of Heisters Creek at the Exeter Township Waste-Water Treatment Plant.

GLOSSARY

Backwater. The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.

Flood. An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary, and the land is adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water.

Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Floor Plain. The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Hurricane. An intense cyclonic windstorm of tropical origin in which winds tend to spiral inward in a counterclockwise direction toward a core of low pressure, with maximum surface wind velocities that equal or exceed 75 miles per hour (65 knots) for several minutes or longer at some points. Tropical storm is the term applied if maximum winds are less than 75 miles per hour.

Hydrograph. A graph showing flow values against time at a given point, usually measured in cubic feet per second. The area under the curve indicates total volume of flow.

Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general region of the watershed.

Left Bank. The bank on the left side of a river, stream, or watercourse, looking downstream.

Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40-60 percent of the Probable Maximum Floods for the same basins. As used by the Corps of Engineers, Standard Project Floods are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance Elevation. The elevation at the top of the opening of a culvert, or other structure through which water may flow along a watercourse.

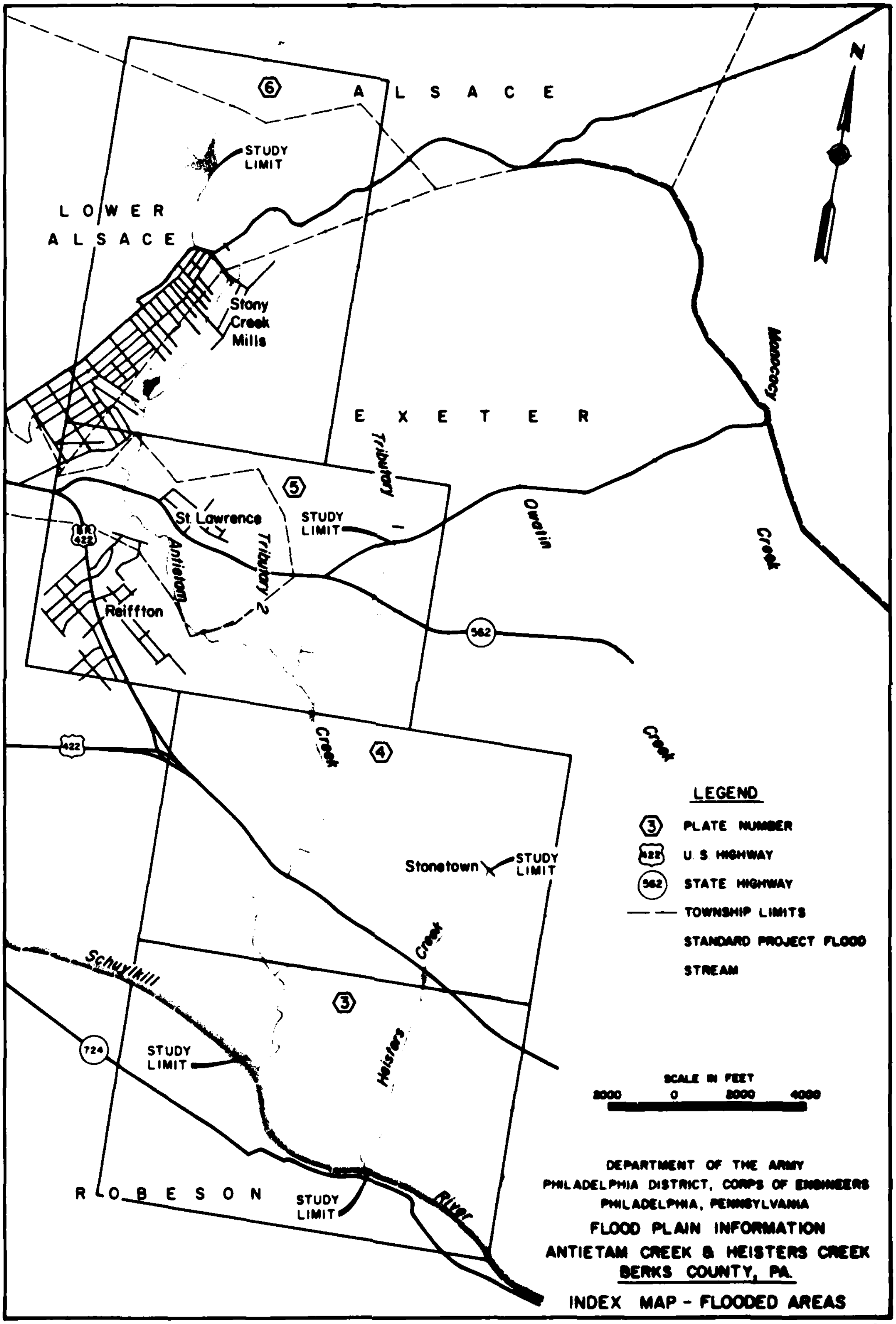
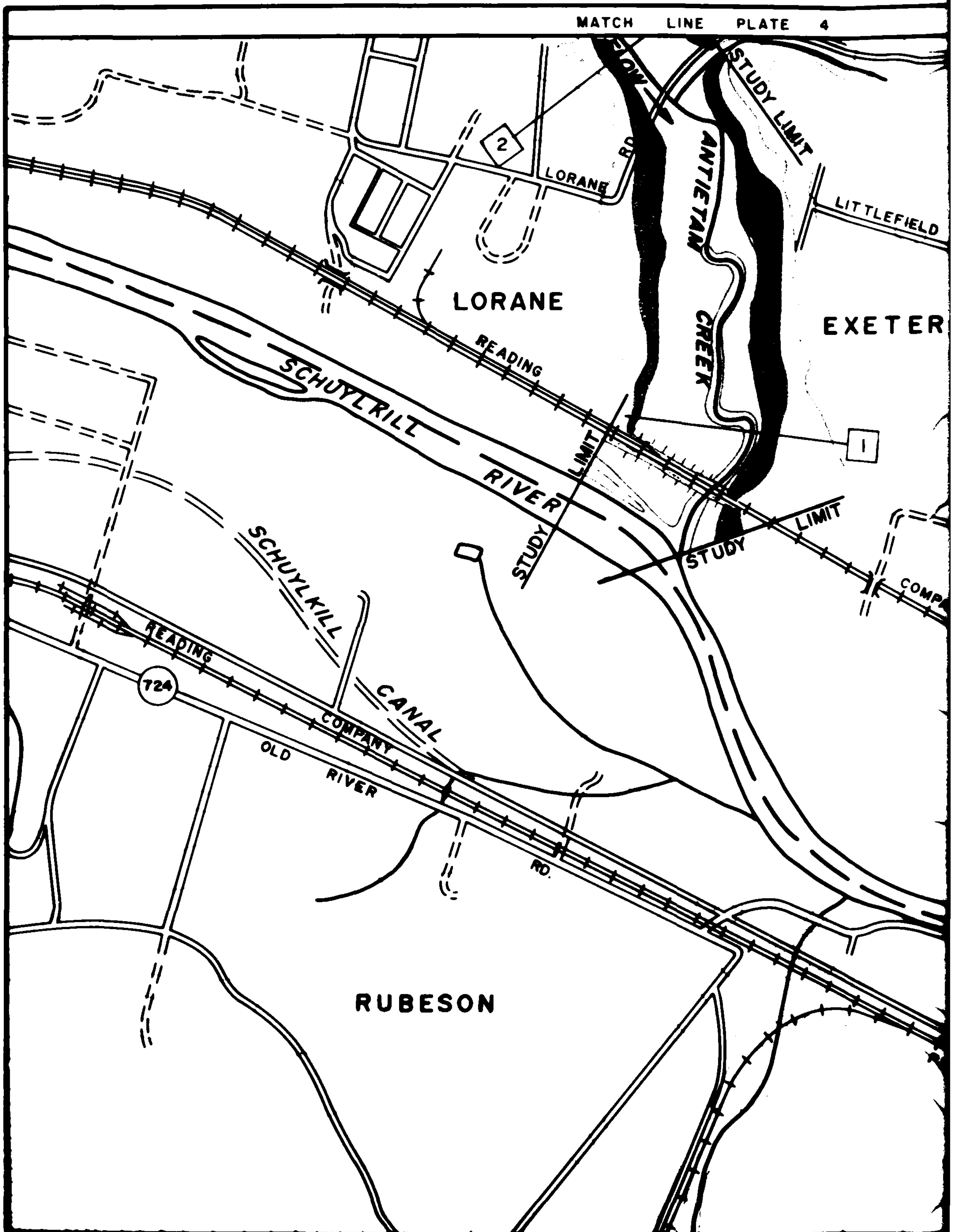
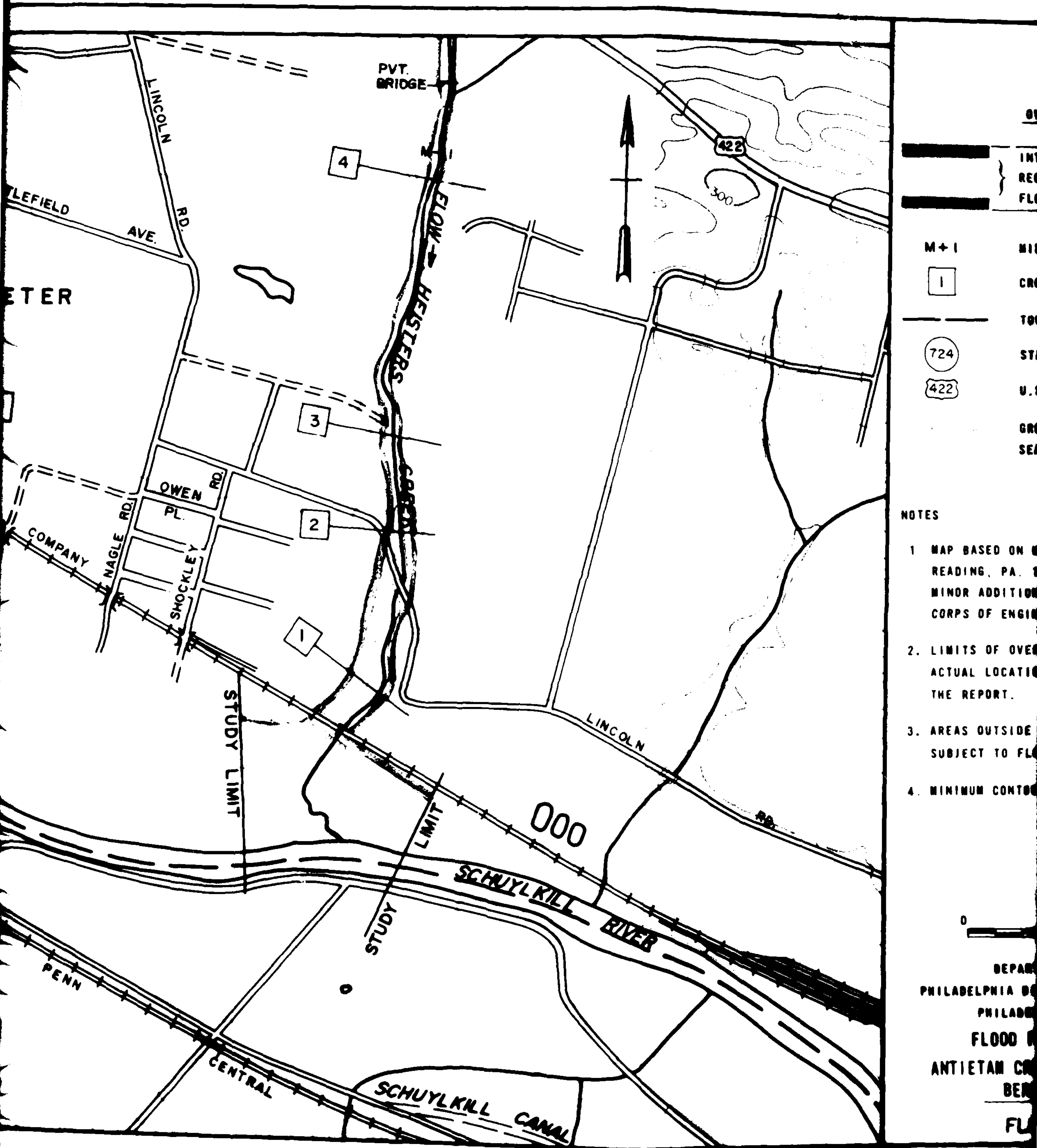
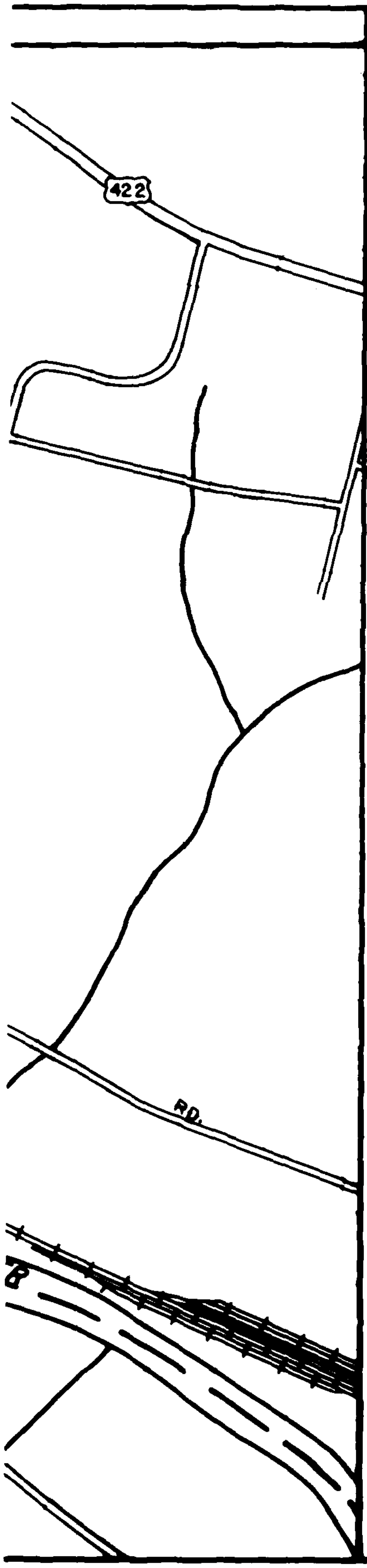

ALSACE
LOWER ALSACE
STUDY LIMIT
Stony Creek Mills
EXETER
Tributary
Owatin
Manacacy
Creek
St. Lawrence
Tributary 2
Antietam
Reiffton
STUDY LIMIT
422
562
Creek
Creek
LEGEND
PLATE NUMBER
U. S. HIGHWAY
STATE HIGHWAY
TOWNSHIP LIMITS
STANDARD PROJECT FLOOD
STREAM
Stonetown
STUDY LIMIT
Creek
Schuylkill
724
STUDY LIMIT
Heisters
SCALE IN FEET
2000 0 2000 4000
ROBESON
STUDY LIMIT
River
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA
FLOOD PLAIN INFORMATION
ANTIETAM CREEK & HEISTERS CREEK
BERKS COUNTY, PA.
INDEX MAP - FLOODED AREAS

PLATE 2


MATCH LINE PLATE 4
LORANE
LORANE RD
LITTLEFIELD
ANTIETAM CREEK
EXETER
STUDY LIMIT
STUDY LIMIT
STUDY LIMIT
2
1
READING
SCHUYLKILL RIVER
SCHUYLKILL CANAL
READING COMPANY
724
OLD RIVER RD.
RUBESON



PVT. BRIDGE
4
3
2
1
422
300
LINCOLN RD.
LEFIELD AVE.
ETER
OWEN PL.
RD.
NAGLE RD.
SHOCKLEY
COMPANY
FLOW
WESTERS CREEK
STUDY LIMIT
STUDY LIMIT
LINCOLN RD.
000
SCHUYLKILL RIVER
PENN CENTRAL
SCHUYLKILL CANAL
M+I
1
724
422
NOTES
1. MAP BASED ON
READING, PA.
MINOR ADDITIO
CORPS OF ENGI
2. LIMITS OF OVE
ACTUAL LOCATI
THE REPORT.
3. AREAS OUTSIDE
SUBJECT TO FL
4. MINIMUM CONTO
0
PHILADELPHIA
FLOOD
ANTIETAM C



LEGEND

OVERFLOW LIMITS

	INTERMEDIATE REGIONAL FLOOD	STANDARD PROJECT FLOOD
M+1	MILES ABOVE MOUTH	
1	CROSS SECTION	
	TOWNSHIP OR BORO LIMITS	
724	STATE ROUTE	
422	U.S. ROUTE	
	GROUND ELEVATION IN FEET SEA LEVEL DATUM	

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLES: READING, PA. 1968 & BIRDSBORO, PA. 1968. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
4. MINIMUM CONTOUR INTERVAL IS 20 FT.

SCALE IN FEET

0 800 1600

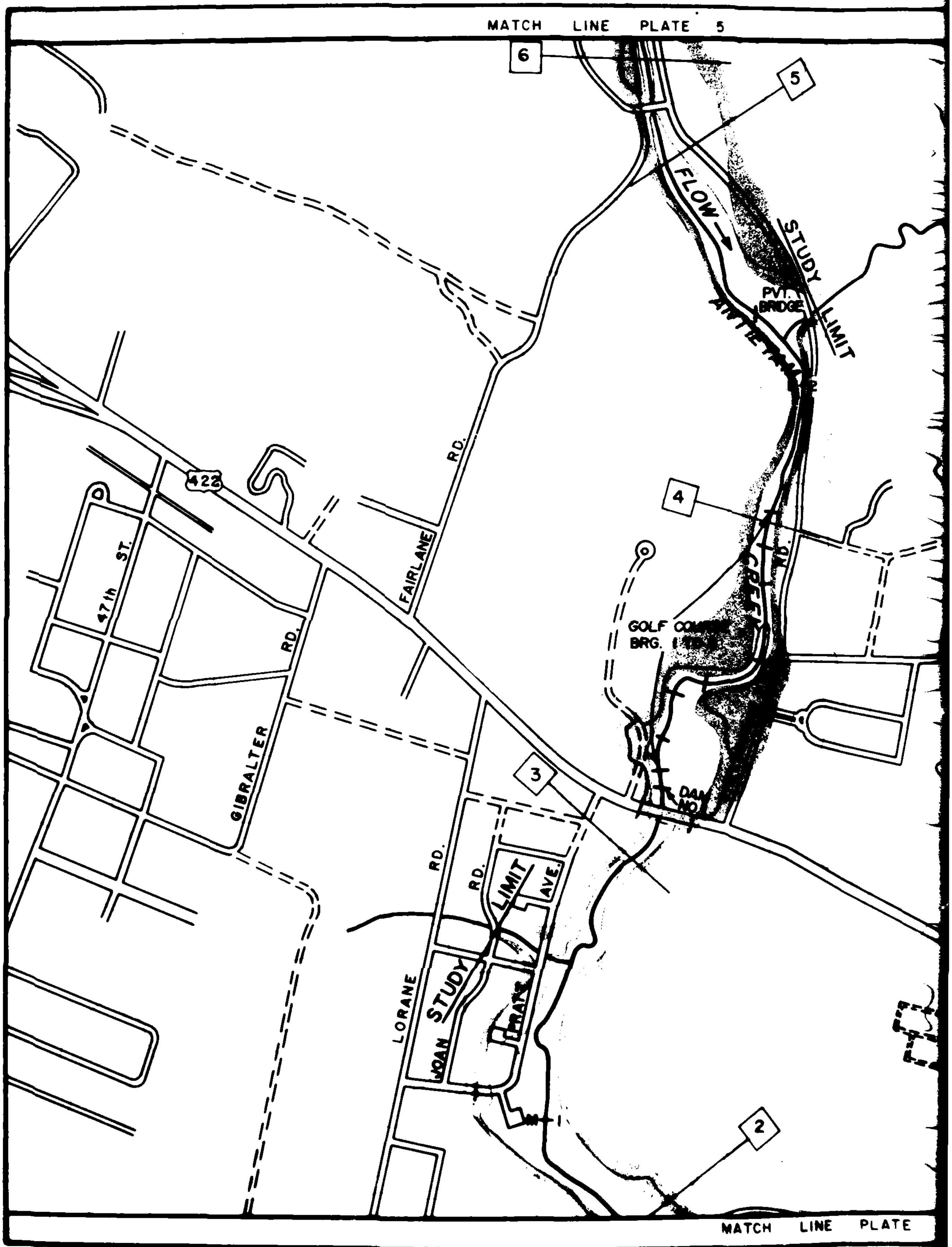
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

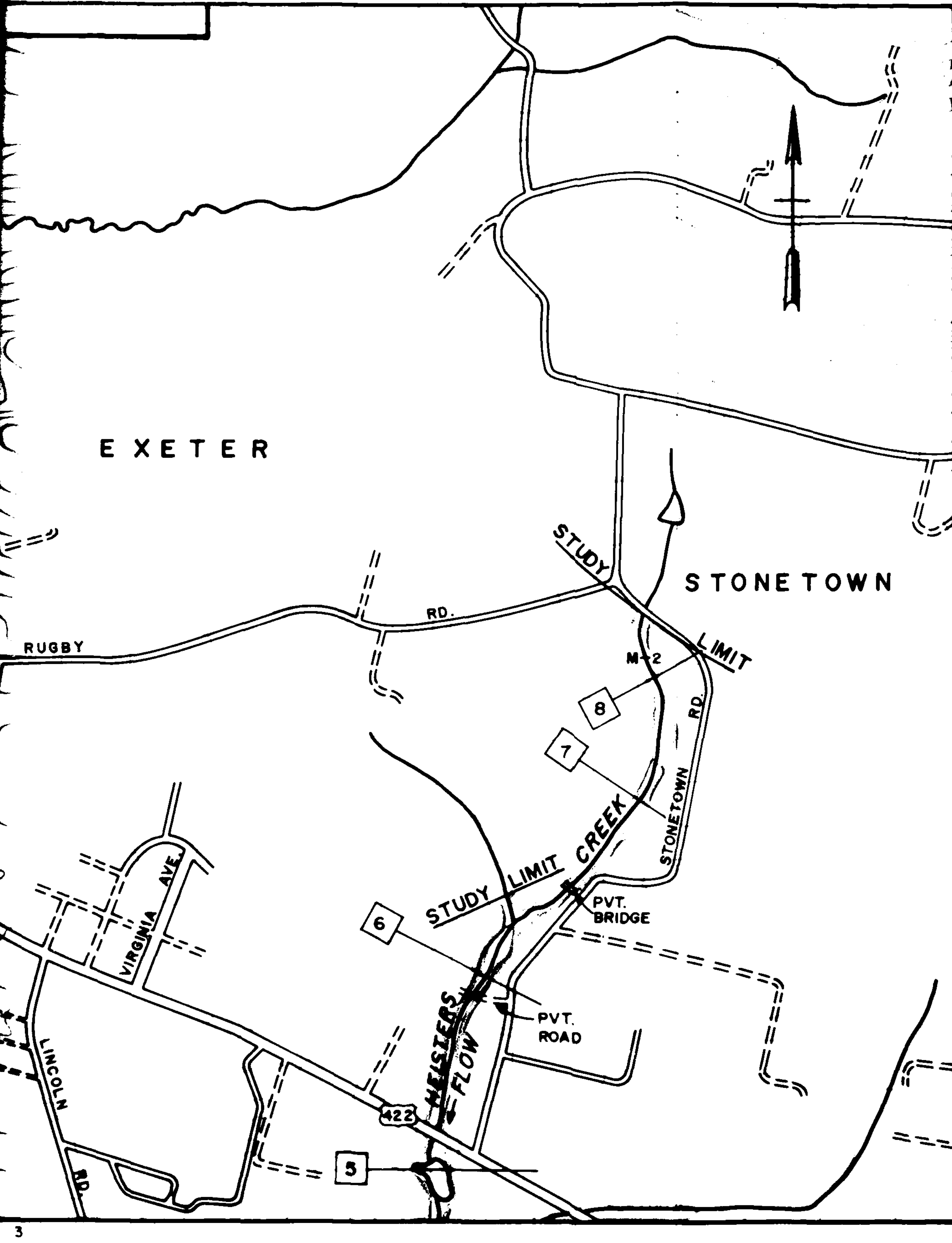
FLOOD PLAIN INFORMATION

ANTIETAM CREEK & HEISTERS CREEK
BERKS COUNTY, PA.

FLOODED AREAS

PLATE 3


MATCH LINE PLATE 5
6
5
FLOW
STUDY LIMIT
PVT. BRIDGE
4
RD.
CREEK
GOLF
BRG.
DAM NO.
3
422
47th ST.
RD.
GIBRALTER
FAIRLANE
RD.
LORANE
RD.
JOAN
RD.
STUDY
LIMIT
AVE.
2
MATCH LINE PLATE



L
OVERF

INTERM
REGION
FLOOD

M+2 MILES
5 CROSS
422 U.S. R
GROUND
SEA LE

NOTES

1. MAP BASED ON U.S.
READING, PA. 1968
MINOR ADDITIONS A
CORPS OF ENGINEER

2. LIMITS OF OVERFLO
ACTUAL LOCATION
THE REPORT.

3. AREAS OUTSIDE THE
SUBJECT TO FLOOD

4. MINIMUM CONTOUR

SCA
0

DEPARTME
PHILADELPHIA DIST
PHILADELPH

FLOOD PLA
ANTIETAM CREE
BERKS

FLOO

LEGEND

OVERFLOW LIMITS

	INTERMEDIATE REGIONAL FLOOD	
		STANDARD PROJECT FLOOD

M + 2 — MILES ABOVE MOUTH

5 — CROSS SECTION

422 — U.S. ROUTE

GROUND ELEVATION IN FEET SEA LEVEL DATUM

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLES: READING, PA. 1968 & BIRDSBORO, PA. 1968. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
4. MINIMUM CONTOUR INTERVAL IS 20 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

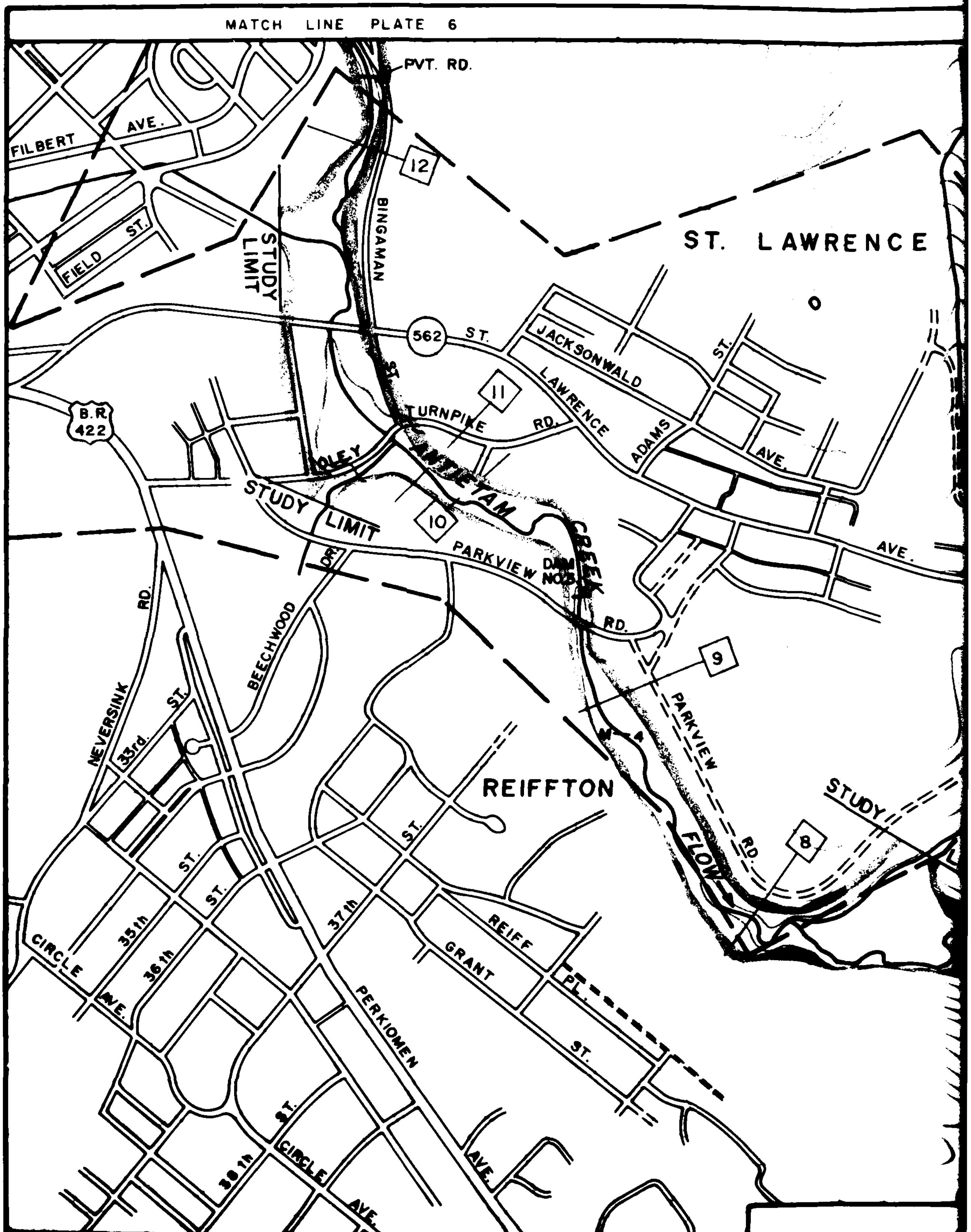
FLOOD PLAIN INFORMATION

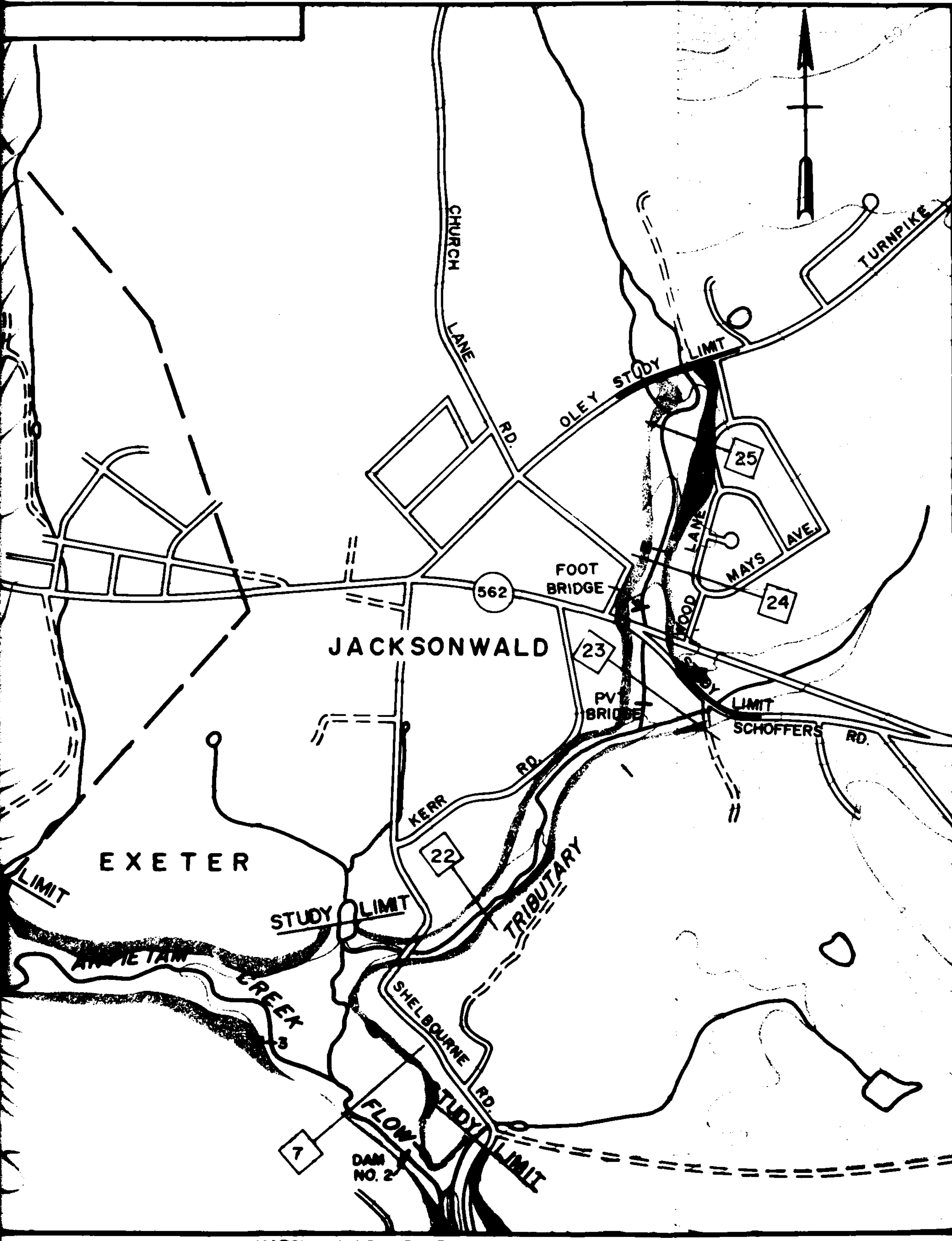
ANTIETAM CREEK & HEISTERS CREEK

BERKS COUNTY, PA.

FLOODED AREAS

PLATE 4 3


MATCH LINE PLATE 6
PVT. RD.
FILBERT AVE.
FIELD ST.
STUDY LIMIT
BINGAMAN ST.
12
ST. LAWRENCE
562
ST.
JACKSONWALD
ST.
LAWRENCE
AVE.
ADAMS
AVE.
11
TURNPIKE RD.
B.R. 422
OLEY
STUDY LIMIT
ANTIETAM CREEK
10
PARKVIEW RD.
DAM NO. 5
DR.
BEECHWOOD
NEVERSINK RD.
33rd ST.
9
PARKVIEW RD.
REIFFTON
STUDY LIMIT
FLOW
8
ST.
ST.
35th
36th
37th
CIRCLE AVE.
REIFF PL.
GRANT ST.
PERKIOMEN AVE.
38th ST.
CIRCLE AVE.



MATCH LINE PLATE 4

L

OVERF

INTERM
REGIONA
FLOOD

M+4 MILES

8 CROSS

TOWNSH

562 STATE

BR. 422 U.S. R

GROUND
SEA LE

NOTES

1. MAP BASED ON U.S.
READING, PA. 1968
MINOR ADDITIONS A
CORPS OF ENGINEER

2. LIMITS OF OVERFLO
ACTUAL LOCATION O
THE REPORT.

3. AREAS OUTSIDE THE
SUBJECT TO FLOODI

4. MINIMUM CONTOUR I

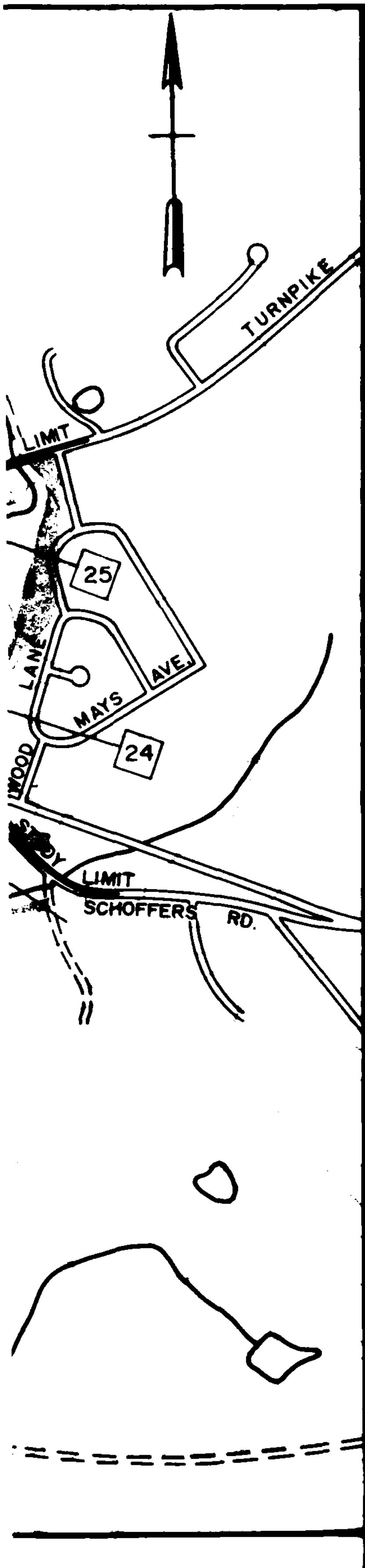
SCA

0

DEPARTME
PHILADELPHIA DISTR
PHILADELPHI

FLOOD PLA
ANTIETAM CREE
BERKS

FLOOD



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD		STANDARD PROJECT FLOOD

M+4 — MILES ABOVE MOUTH

8 — CROSS SECTION

TOWNSHIP OR BORO LIMITS

562 — STATE ROUTE

BR. 422 — U.S. ROUTE

GROUND ELEVATION IN FEET SEA LEVEL DATUM

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLES: READING, PA. 1968 & BIRDSBORO, PA. 1968. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
4. MINIMUM CONTOUR INTERVAL IS 20 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

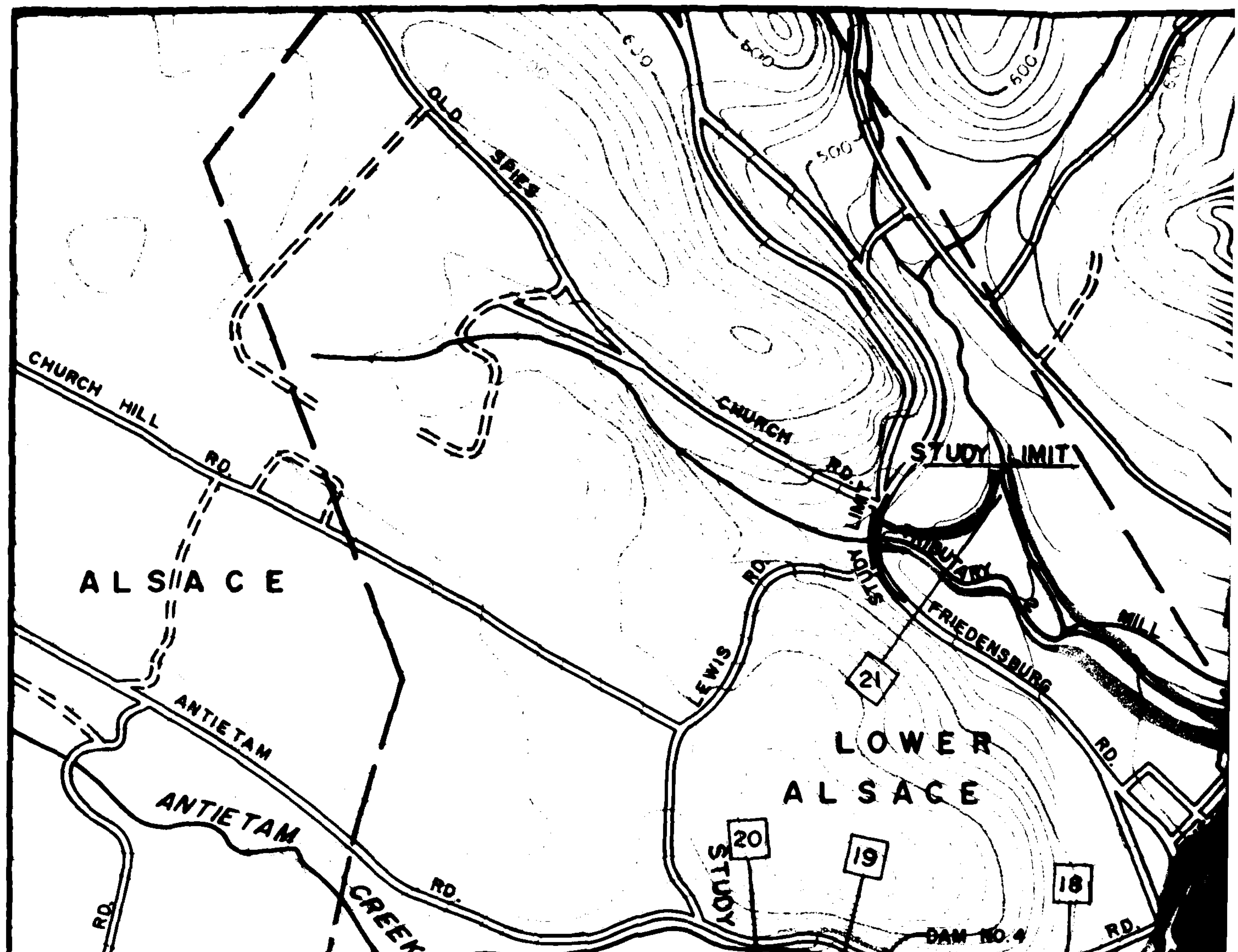
FLOOD PLAIN INFORMATION

ANTIETAM CREEK & HEISTERS CREEK

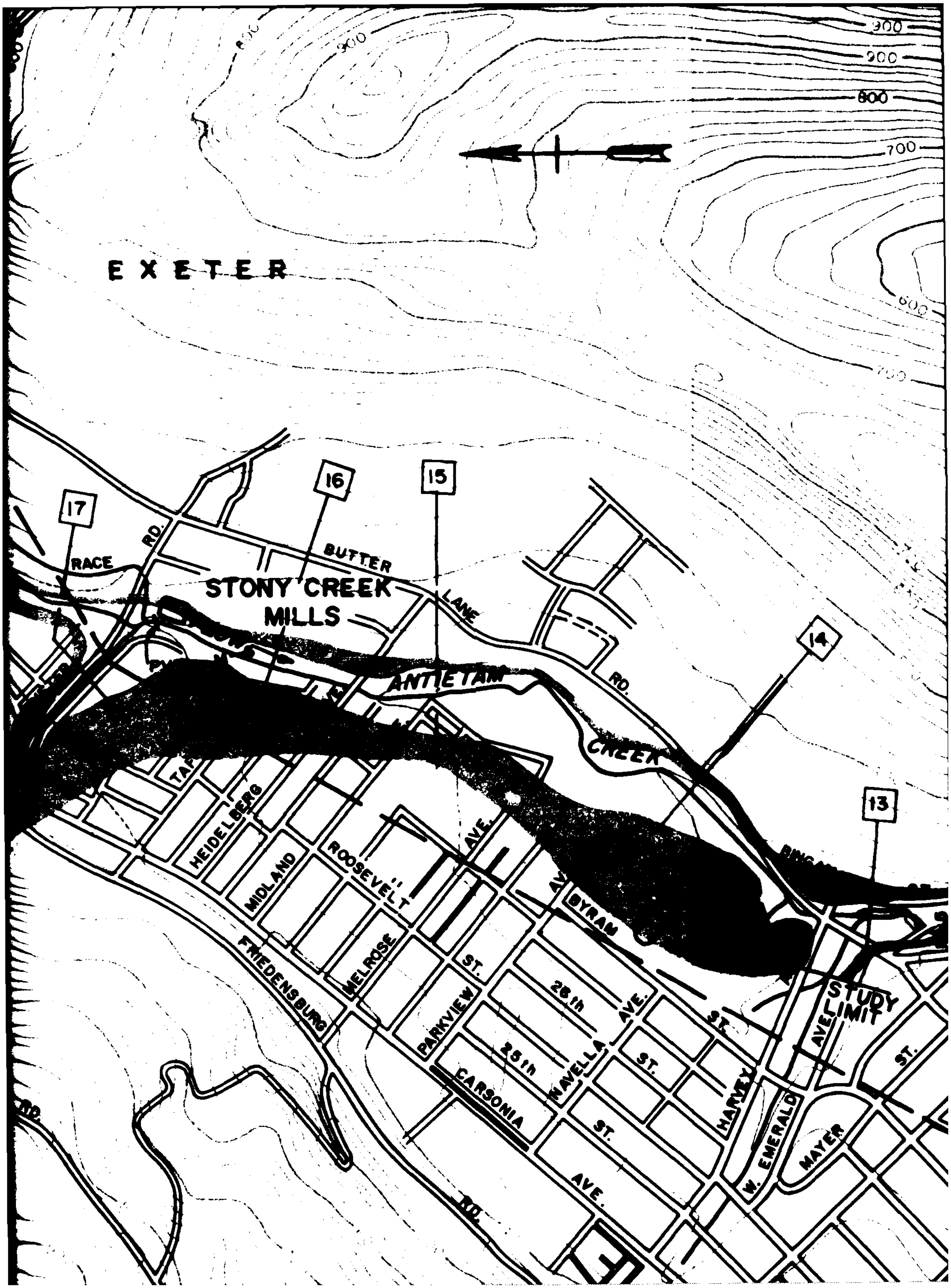
BERKS COUNTY, PA.

FLOODED AREAS

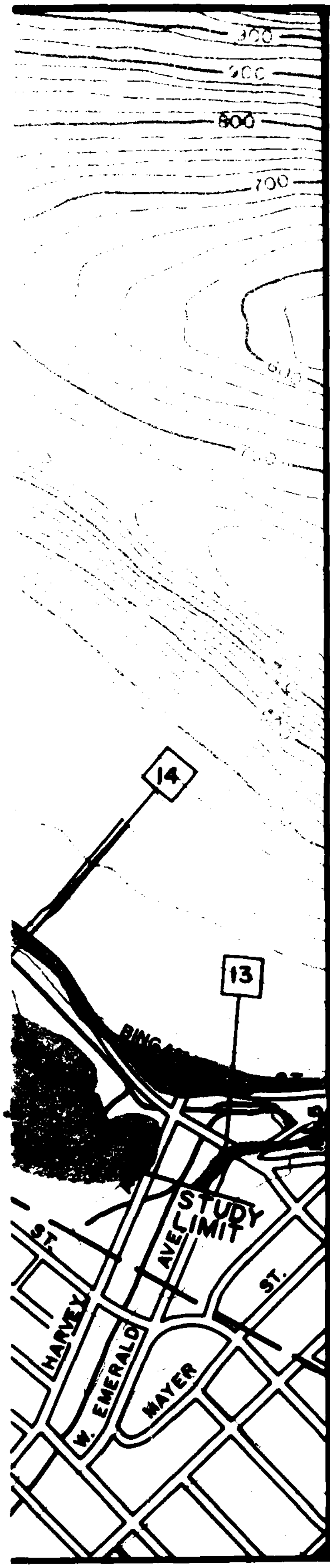
PLATE 5 3



600
500
OLD SPIES
CHURCH HILL RD.
CHURCH RD.
STUDY LIMIT
ALSACE
LEWIS RD.
FRIEDENSBURG RD.
MILL
21
LOWER ALSACE
ANTIETAM RD.
ANTIETAM CREEK
SEIDEL RD.
20
19
18
STUDY LIMIT
DAM NO. 4 ANTIETAM
ANTIETAM RESERVOIR
PVT. ROAD
HILL RD.



900
900
800
700
600
700
EXETER
17
16
15
14
13
RACE
RD.
BUTTER
LANE
STONY CREEK
MILLS
ANTIETAM
CREEK
RD.
HEIDELBERG
MIDLAND
ROOSEVELT
AVE.
MELROSE
FRIEDENSBURG
PARKVIEW
ST.
BYRAM
26th
AVE.
ST.
25th
NAVELLA
CARSONIA
ST.
AVE.
HARVEY
W. EMERALD
MAYER
AVE.
STUDY
LIMIT
ST.
RD.
RD.



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+5 — MILES ABOVE MOUTH

15 — CROSS SECTION

TOWNSHIP OR BORO LIMITS

GROUND ELEVATION IN FEET SEA LEVEL DATUM

APPROXIMATE AREA SUBJECT TO SHEET FLOW

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN QUADRANGLES: READING PA 1968 & BIRDSBORO PA 1968 MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS

2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.

3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.

4. MINIMUM CONTOUR INTERVAL IS 20 FT.

SCALE IN FEET

0 800 1600

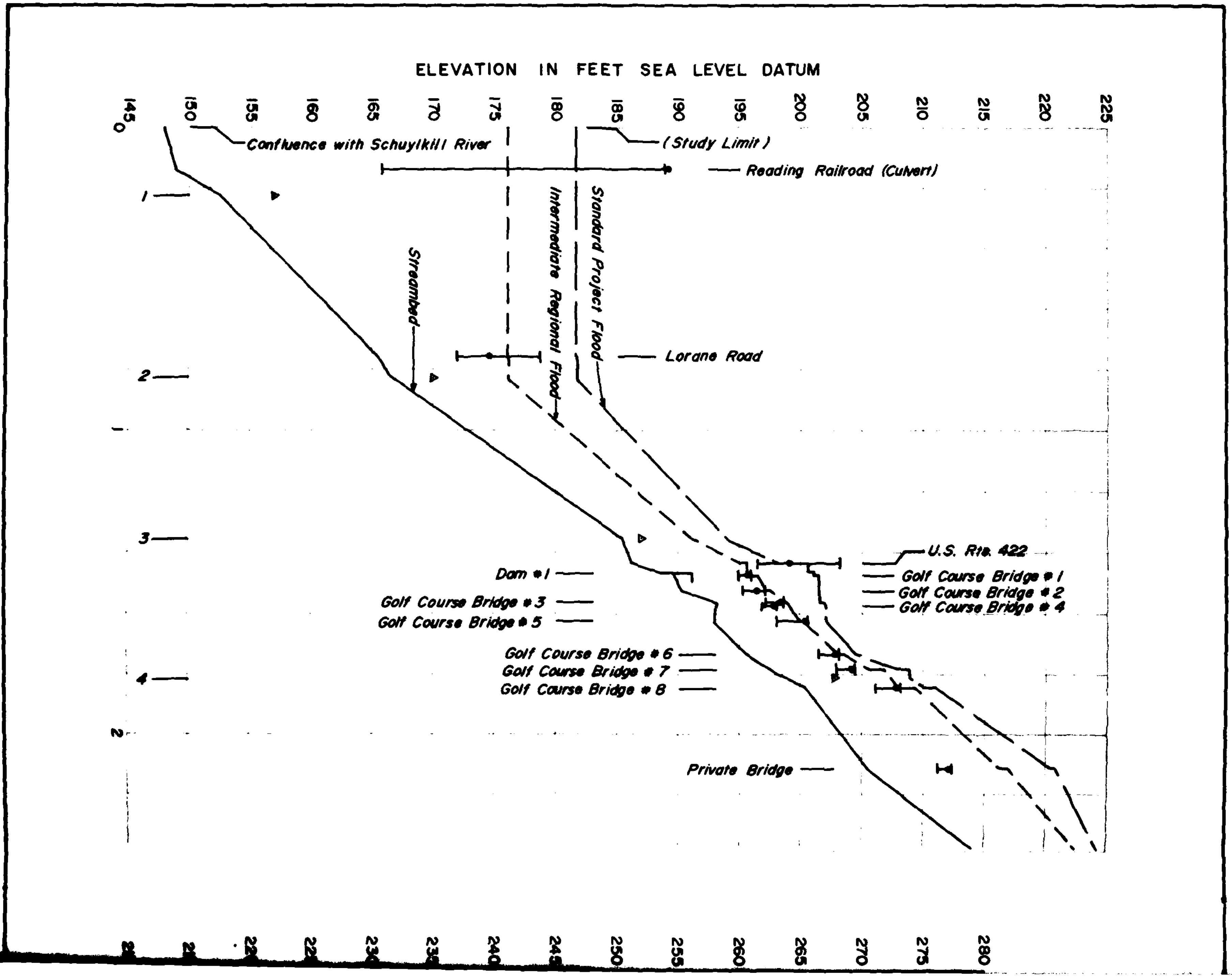
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

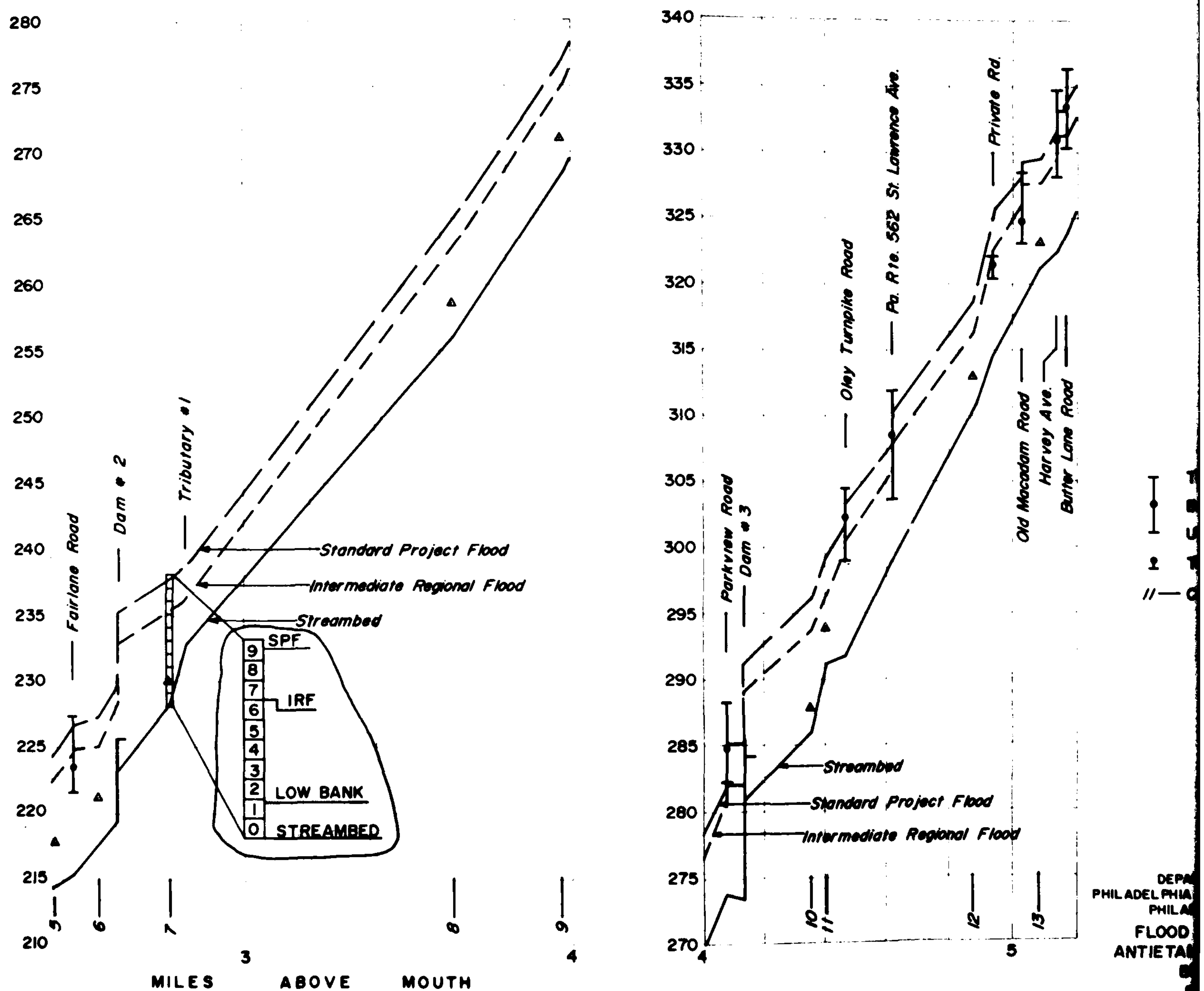
ANTIETAM CREEK & HEISTERS CREEK
BERKS COUNTY, PA.

FLOODED AREAS

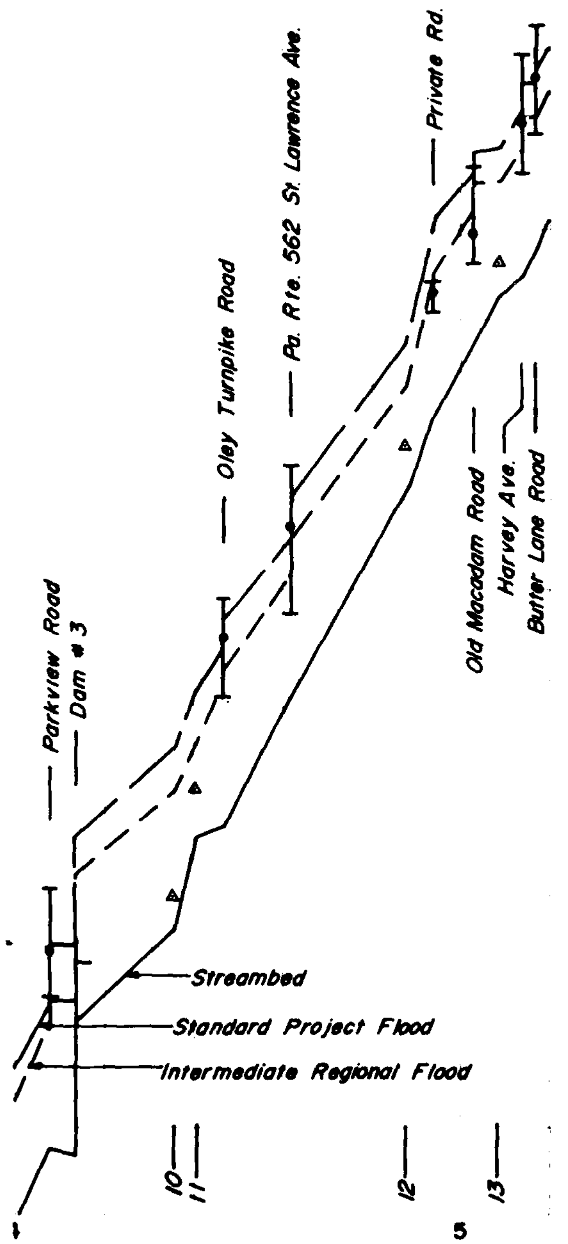
PLATE 6 3



ELEVATION IN FEET SEA LEVEL DATUM
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
0
1
2
Confluence with Schuylkill River
(Study Limit)
Reading Railroad (Culvert)
Lorane Road
Standard Project Flood
Intermediate Regional Flood
Streambed
U.S. Rte. 422
Golf Course Bridge # 1
Golf Course Bridge # 2
Golf Course Bridge # 4
Dam # 1
Golf Course Bridge # 3
Golf Course Bridge # 5
Golf Course Bridge # 6
Golf Course Bridge # 7
Golf Course Bridge # 8
Private Bridge
1
2
3
4
250
255
260
265
270
275
280



DEPA
PHILADELPHIA
PHILA
FLOOD
ANTIETA
HIGH
AN



LEGEND

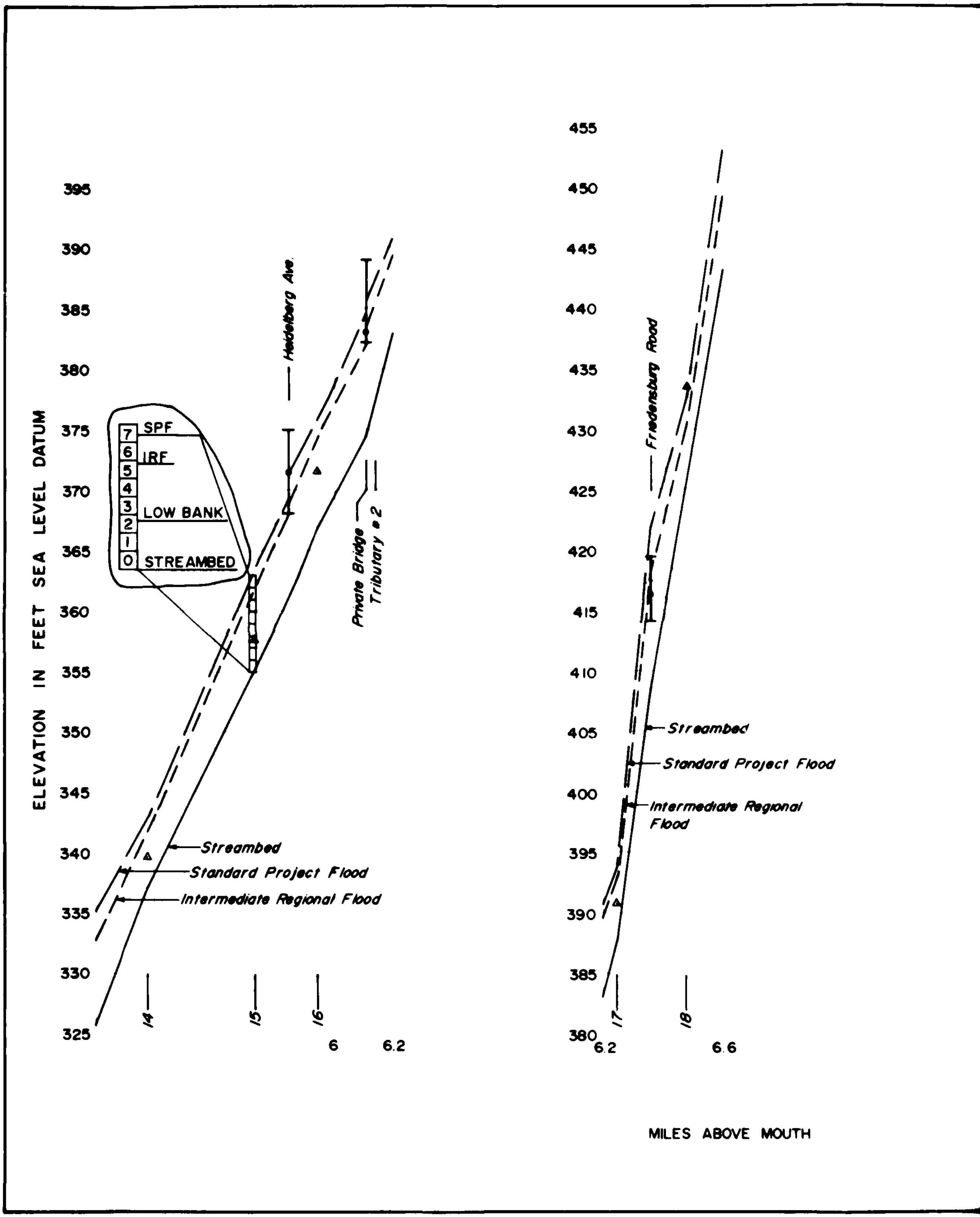
Top of Bridge Railing
Bridge Floor
Underclearance
Top of Rail (Railroad Bridge)
// — Cross Section

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

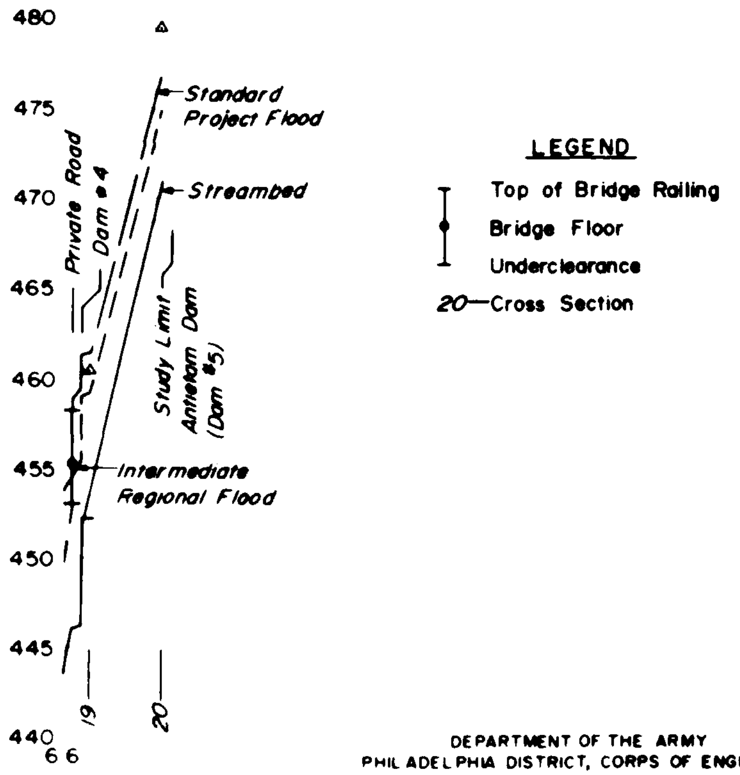
FLOOD PLAIN INFORMATION
ANTIETAM AND HEISTERS CREEK
BERKS COUNTY
PENNSYLVANIA

HIGH WATER PROFILE
ANTIETAM CREEK

PLATE 7



ELEVATION IN FEET SEA LEVEL DATUM
395
390
385
380
375
370
365
360
355
350
345
340
335
330
325
455
450
445
440
435
430
425
420
415
410
405
400
395
390
385
380
7 SPF
6 IRF
5
4
3 LOW BANK
2
1
0 STREAMBED
Heidelberg Ave.
Private Bridge
Tributary #2
Fredensburg Road
Streambed
Standard Project Flood
Intermediate Regional Flood
Streambed
Standard Project Flood
Intermediate Regional Flood
14
15
16
17
18
6
6.2
6.2
6.6
MILES ABOVE MOUTH

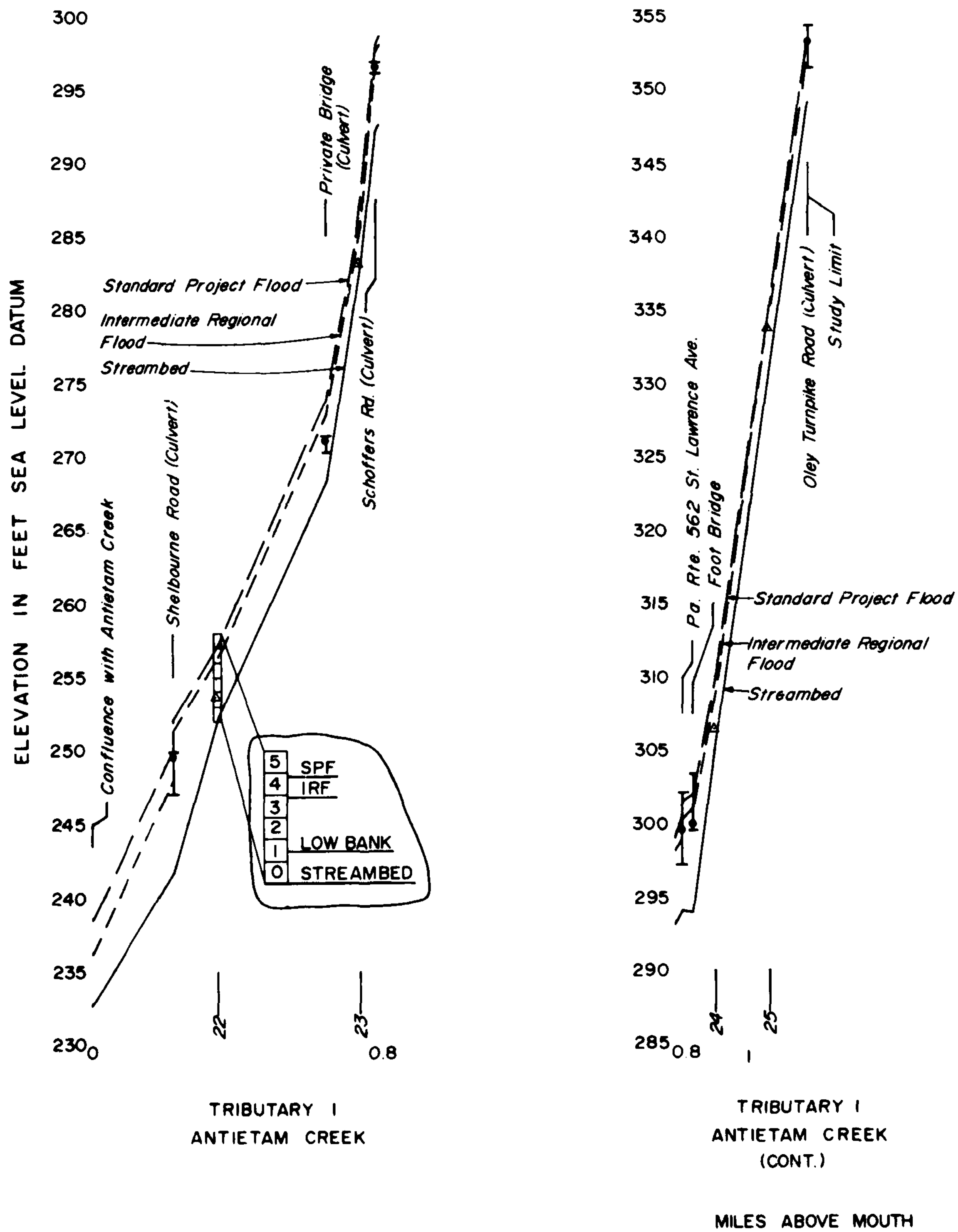


DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

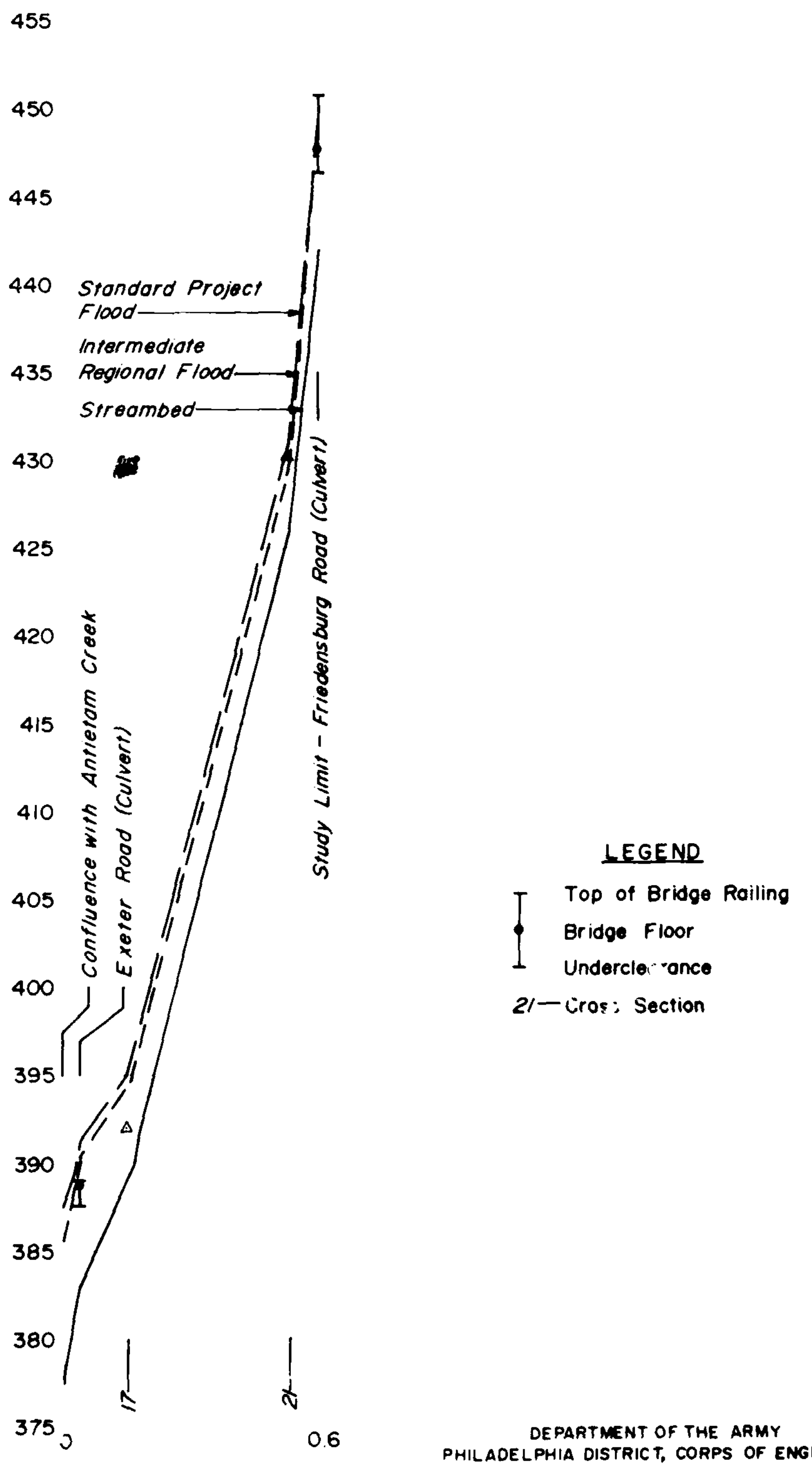
FLOOD PLAIN INFORMATION
ANTIETAM AND HEISTERS CREEK
BERKS COUNTY
PENNSYLVANIA

HIGH WATER PROFILE
ANTIETAM CREEK

PLATE 8



ELEVATION IN FEET SEA LEVEL DATUM
300
295
290
285
280
275
270
265
260
255
250
245
240
235
230
0
0.8
22
23
Confluence with Antietam Creek
Shelbourne Road (Culvert)
Private Bridge (Culvert)
Schoffers Rd. (Culvert)
Standard Project Flood
Intermediate Regional Flood
Streambed
5 SPF
4 IRF
3
2
1 LOW BANK
0 STREAMBED
TRIBUTARY 1
ANTIETAM CREEK
355
350
345
340
335
330
325
320
315
310
305
300
295
290
285
0.8
1
24
25
Pa. Rte. 562 St. Lawrence Ave.
Foot Bridge
Oley Turnpike Road (Culvert)
Study Limit
Standard Project Flood
Intermediate Regional Flood
Streambed
TRIBUTARY 1
ANTIETAM CREEK
(CONT.)
MILES ABOVE MOUTH



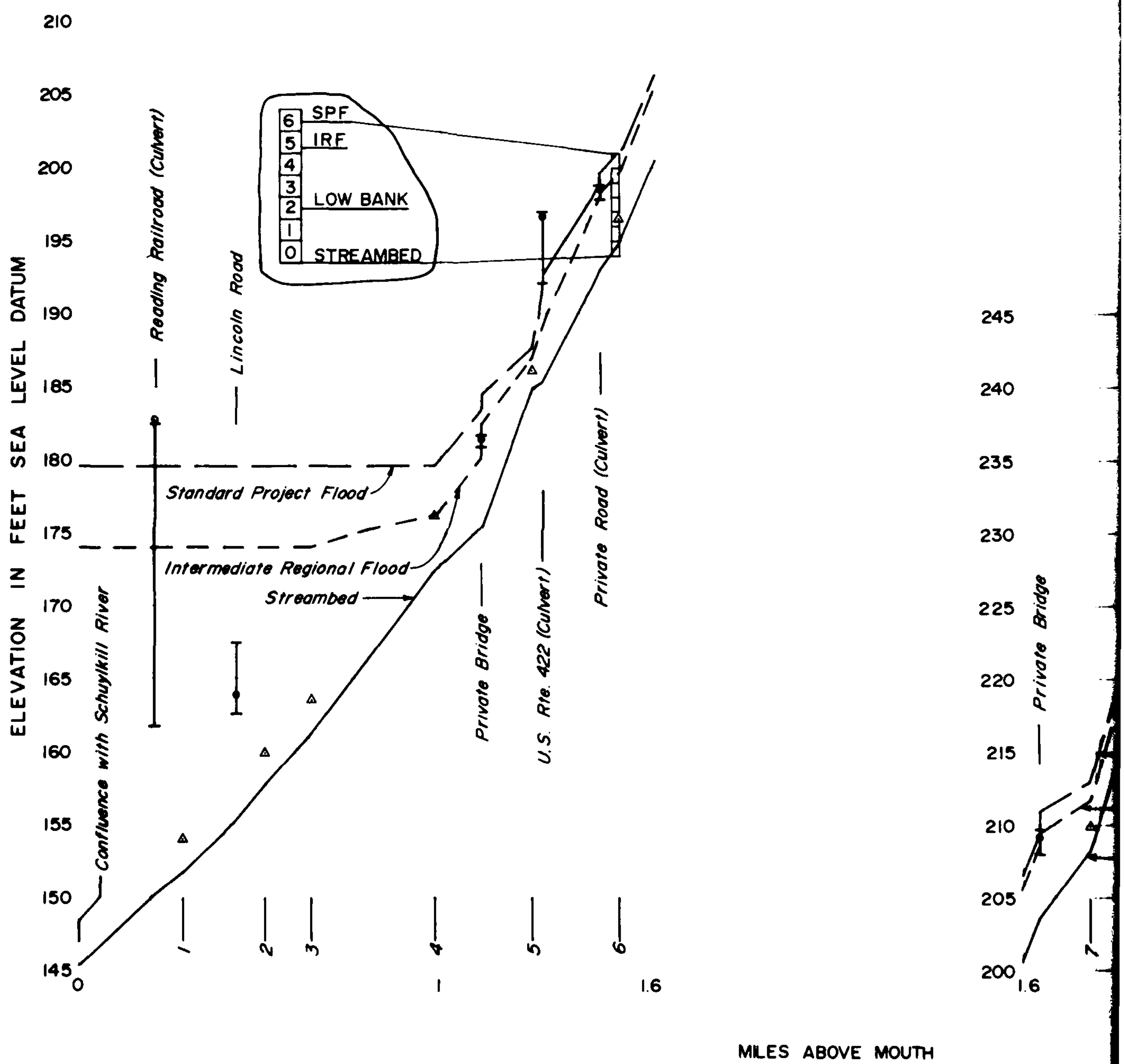
TRIBUTARY 2
ANTIETAM CREEK

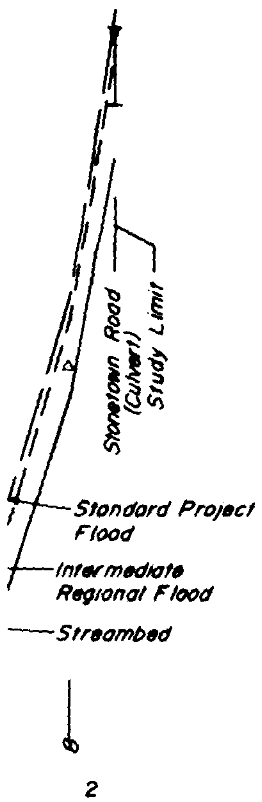
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
ANTIETAM AND HEISTERS CREEK
BERKS COUNTY
PENNSYLVANIA

HIGH WATER PROFILES
TRIBUTARIES 1 AND 2

PLATE 9


ELEVATION IN FEET SEA LEVEL DATUM
MILES ABOVE MOUTH
SPF
IRF
LOW BANK
STREAMBED
Standard Project Flood
Intermediate Regional Flood
Streambed
Confluence with Schuylkill River
Reading Railroad (Culvert)
Lincoln Road
Private Bridge
U.S. Rte. 422 (Culvert)
Private Road (Culvert)
Private Bridge



LEGEND

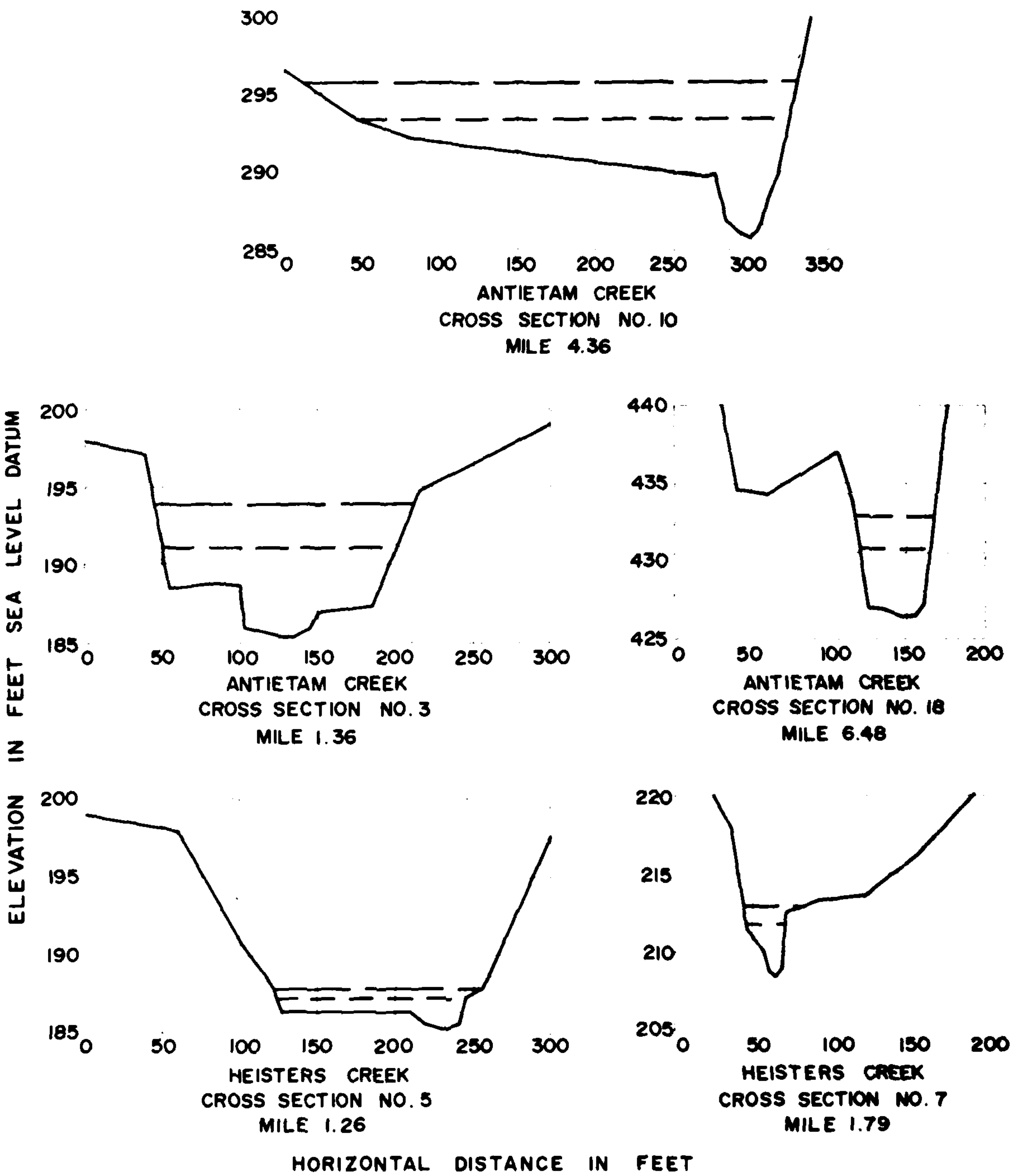
- Top of Bridge Railing
- Bridge Floor
- Underclearance
- Top of Rail (Railroad Bridge)
- 2— Cross Section

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
ANTIETAM AND HEISTERS CREEK
BERKS COUNTY
PENNSYLVANIA

HIGH WATER PROFILE
HEISTERS CREEK

PLATE 10



NOTES:

The 27 sections of Antietam Creek and Heisters Creek not shown in this report are on file at the Philadelphia District, Corps of Engineers and are available for inspection upon request.

Cross sections taken looking downstream.

LEGEND

— — Standard Project Flood

– – – – Intermediate Regional Flood

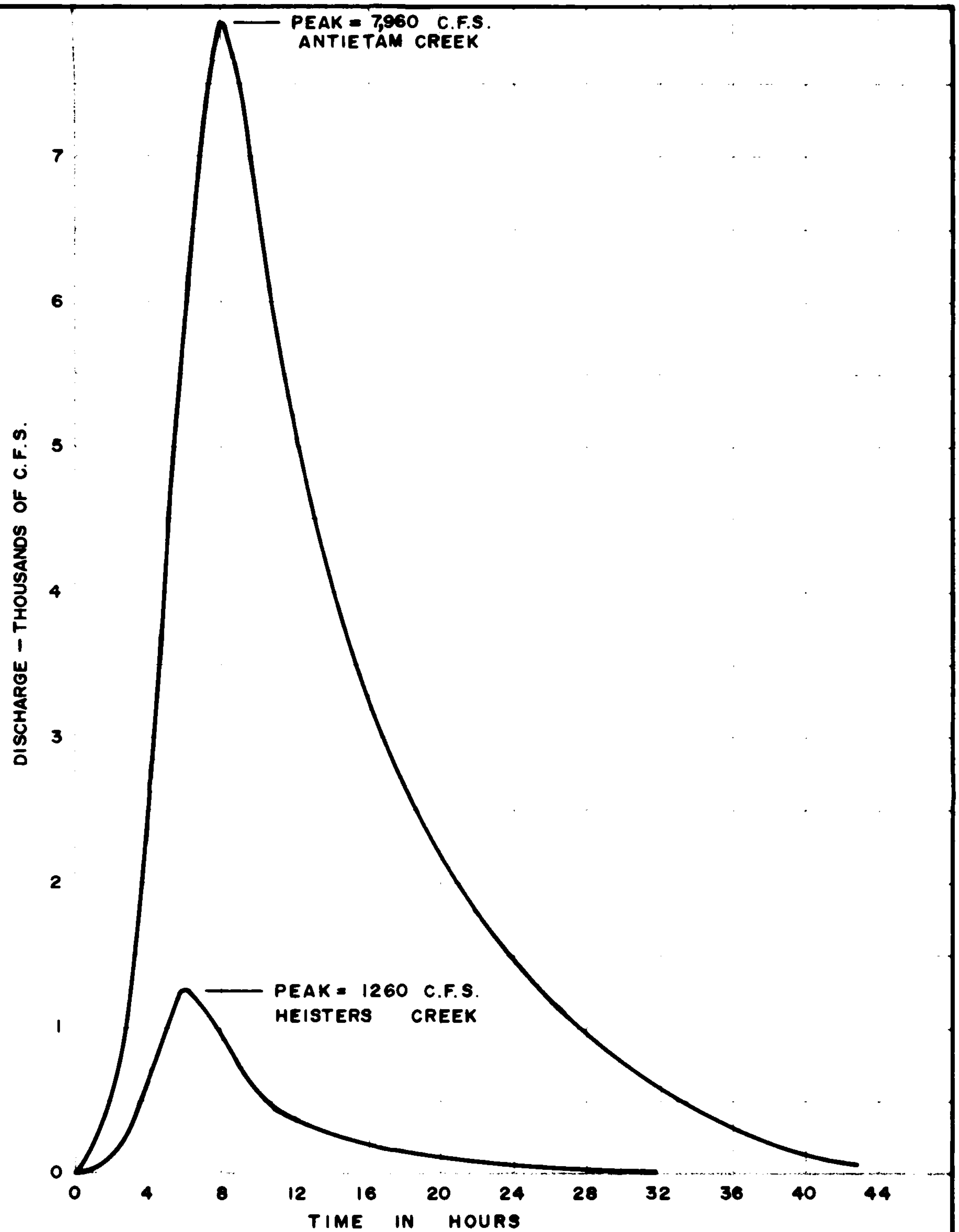
——— Ground Line

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
ANTIETAM CREEK
& HEISTERS CREEK
BERKS COUNTY, PA.

SELECTED CROSS SECTIONS

PLATE II



NOTES

HYDROGRAPHS COMPUTED AT CONFLUENCE WITH SCHUYLKILL RIVER – STREAM MILE 0.0

DRAINAGE AREA	SQ. MI.
ANTIETAM CREEK (AT MOUTH)	18.0
HEISTERS CREEK (AT MOUTH)	1.67

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
ANTIETAM CREEK & HEISTERS CREEK
BERKS COUNTY, PA.

STANDARD PROJECT FLOOD HYDROGRAPHS

DATE
FILMED

8