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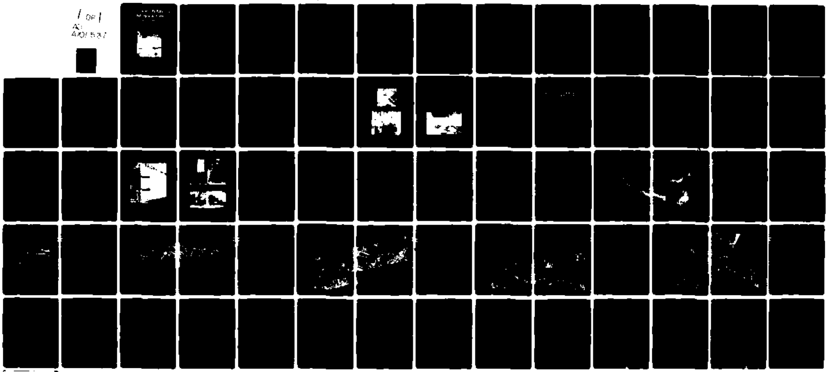

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LEVEL II

FLOOD PLAIN INFORMATION

CRUM CREEK

DELAWARE COUNTY PENNSYLVANIA

PREPARED FOR THE DELAWARE COUNTY PLANNING COMMISSION BY THE DEPT. OF THE ARMY, PHILADELPHIA DISTRICT, CORPS OF ENGINEERS, PHILADELPHIA, PA.

MARCH 1974

REPT. NO: DAEN/NAP-82040/FPI16-74/03

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

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This report covered areas of Chester County and Delaware County, Pa. subject to flooding by Crum Creek, Pa. It included a history of flooding along Crum Creek Pa. (to date of report and identified those areas which may be subject to future floods. Special emphasis was given to these possible future flood forecasts thru maps, photographs and profiles. Some aerial photography is provided along with hydrographs and maps.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

Under authority of Section 206 of the 1960 Flood Control Act as amended the flood plain information was prepared by the U.S. Army Corps of Engineers Philadelphia District at the request of the Delaware County Planning Commission. The information should be considered for its historical nature. Since the publication of this FPI report other Flood Insurance studies have been undertaken and should also be consulted for more current information.

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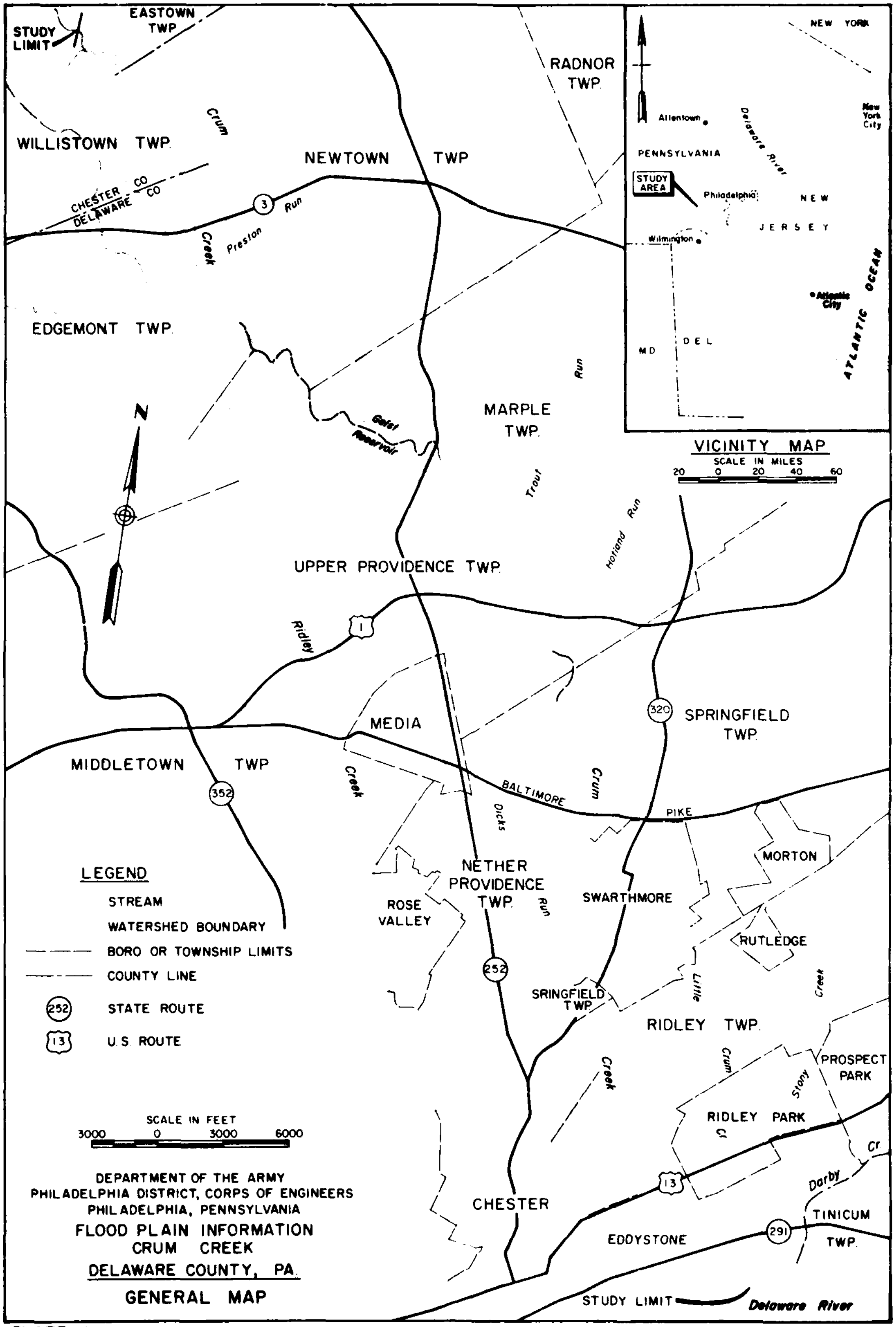


DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CRUM CREEK
DELAWARE COUNTY, PA.

GENERAL MAP

PLATE I

PREFACE

The areas of Chester County and Delaware County, Pennsylvania, covered by this report are subject to flooding from Crum Creek. The properties on the flood plain of Crum Creek include residential, commercial, and industrial structures, and have been damaged by floods of 1843, 1955, 1968, and 1971. The open spaces in the flood plain 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 along Crum Creek and identifies those areas that are subject to possible future floods. Special emphasis is given to these possible future 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 other flood damage reduction techniques such as works to modify flooding and adjustments including flood proofing which 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 Delaware County Planning Commission and endorsement of the Pennsylvania Department of Environmental Resources this report was prepared by the Philadelphia District Office of the U. S. Army Corps of Engineers under the continuing authority provided in Section 206 of the 1960 Flood Control Act, as amended.

Assistance and cooperation of the U. S. Geological Survey (U.S.G.S.), Delaware County Planning Commission, 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 Delaware County Planning Commission. The Philadelphia District Office, 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

The original inhabitants of the Crum Creek Watershed were the Lenni-Lenape Indians of the Algonquin Nation that inhabited much of what is now Southeastern Pennsylvania. The first Europeans to arrive in the area were the Dutch, but they were primarily explorers and traders, and their contribution to developing the area was minimal.

The first permanent colony in the area was established by the Swedes in 1643 on Tinicum Island (Essington), when John Printz was commissioned Governor of New Sweden, the area known today as the Delaware Valley. The Swedish colonists were sent to the New World to seek minerals, investigate commercial fishing and trade with the Indians for pelts. They were also instructed to cultivate grain, tabacco and grapes , and raise large numbers of sheep to provide Sweden with ample supplies of wool. For many years the Dutch and Swedes fought for control of the area and its rich abundance of natural resources.

These early settlers established a few trading posts along the Delaware River and made a few land purchases from the Indians. Then William Penn and a group of Englishmen arrived in the area in 1682. Penn had originally intended to realize his "Holy Experiment" and "settle a great towne" in the vicinity of Upland (Chester). However,he eventually decided on a site further up the Delaware near the Schuylkill River, a site which became the City of Philadelphia.

The area around Crum Creek never really flourished as the Swedes had hoped, and it generally remained agricultural land. Today the area retains a rural, suburban setting, with the only concentrated development located near the confluence of Crum Creek and Delaware River. However, in the future the Crum Creek Watershed will come under increasing pressure for development as the intense development in the City of Philadelphia spreads to surrounding suburban areas.

The Stream and Its Valley

Crum Creek drains a total of 38.4 square miles of Chester and Delaware Counties in Southeastern Pennsylvania. Crum Creek flows in a southeasterly direction from its headwaters near Malvern, Pennsylvania, to Springton (Geist) Reservoir near Marple Township and then generally in a southerly direction to Crum Reservoir south of U. S. Route 1 and on to its confluence with the Delaware River at Eddystone-Ridley, Pennsylvania. The 18.2 mile portion of Crum Creek included in this study -- that portion of Crum Creek within or adjacent to Delaware County -- is shown on the general map. Drainage areas contributing to runoff at locations in the study area are listed in Table 1.

From its origin near Malvern, Crum Creek follows a winding course through a relatively narrow flood plain bordered by steep slopes. Downstream of Pennsylvania Route 320 (Chester Road), the flood plain becomes increasingly wider and flatter as the creek flows to its confluence with the Delaware River. Over the 18.2 mile study reach, Crum Creek falls approximately 300 feet in elevation, for an average slope of 16.5 feet per mile. The channel of Crum Creek is well defined and overbank areas are covered with vegetation in the more rural, upper reaches. In the lower reaches, the channel is sometimes lined with concrete or mortared stone, while overbank areas are paved and occupied by numerous buildings.

The climate of the area is characterized by warm summers, when temperatures may rise above 85^{o}, and cool winters, when temperatures may fall below 20^{o}. Annual precipitation in the area averages 42 inches and is fairly evenly distributed throughout the year, with a major portion occurring in the late summer and spring.

TABLE 1
DRAINAGE AREAS ALONG CRUM CREEK

Location	Mileage Above Mouth	Drainage Area Sq. Mi.
Confluence with Delaware River	0	38.4
Downstream of Confluence with Dick's Run	4.02	32.9
Downstream of U. S. Rte. 1 Bridge (State Rd.)	8.87	27.8
Downstream of Springton (Geist) Reservoir	11.11	22.3
Upstream of West Chester Pike Bridge	14.99	15.8
Upstream of Study Limit (Grubb Mill Rd.)	18.20	9.9

Developments in the Flood Plain

Upstream of Baltimore Pike to the study limit at Grubb Mill Road, the flood plain of Crum Creek is rural and largely undeveloped. In this reach of Crum Creek, two large dams have been constructed, forming Crum and Springton (Geist) Reservoirs for water supply. Some residential structures are located on flood plain land, and the Philadelphia Suburban Water Works is located on the flood plain just downstream of Crum Reservoir. Downstream of Baltimore Pike to MacDade Boulevard, development of the flood plain becomes more evident as additional residential structures and several industries can be found on the flood plain. Downstream of MacDade Boulevard to the mouth of Crum Creek, development of the flood plain is intense, with numerous commercial and industrial buildings located on flood plain land. Upstream of Pennsylvania Route 291, approximately 1,300 feet of Crum Creek has been placed in a culvert and flows underneath an industrial complex. One industrial building is built directly over Crum Creek, while numerous other buildings and railroad sidings occupy the flood plain nearby. In addition to buildings, numerous streets, roads, bridges, railroads, parking lots, and public utilities can be found on flood plain land in the lower study reach of Crum Creek.

Four high level bridges for Interstate Route 95, having little or no expected effect on floodflows, are currently under construction in the flood plain of Crum Creek upstream of Chester Pike, U. S. Route 13. Approximately 16 additional bridges are presently being planned in the Crum Creek Valley for the proposed Interstate Route 476. Realignment of the channel of Crum Creek is also planned in several locations in conjunction with these two projects.

FLOOD SITUATION

Sources of Data and Records

The U. S. Geological Survey maintained a stream gaging station on Crum Creek at Woodlyn, Pennsylvania, from October 1931 to September 1937. However, due to the short period of record and inaccuracy introduced by Crum Reservoir upstream of the gage, the data provided was not considered truly representative for flow analysis. Therefore, reliance was placed on field investigations and synthetic methods for deriving discharge data. A U. S. Geological Survey stream gaging station on nearby Ridley Creek at Moylan, Pennsylvania, also provided some general information on the occurrence of floodflows in the area. Estimated peak discharges for floods of record on Crum Creek and Ridley Creek are given in Table 2. Flooding on Crum Creek can also be affected by backwater from high tides on the Delaware River. Table 3 gives elevations for record high tides and possible future tides on the Delaware River near the mouth of Crum Creek. To supplement these tide records and the records of the gaging station, residents were interviewed, and newspaper files, historical documents and records were searched for information concerning past floods.

Topographic data and maps prepared for this report were based on aerial photographs of the Crum Creek watershed furnished by contract, to the Army Corps of Engineers by the U. S. Army Topographic Command, Washington, D. C. Supplementary information was provided by U. S. Geological Survey quadrangle sheets entitled: "Bridgeport, New Jersey-Pennsylvania, 1967;" "Lansdowne, Pennsylvania, 1967;" and "Media, Pennsylvania, 1966;" Stream and valley cross sections and structural data on bridges and culverts were obtained by field surveys performed by Corps of Engineers, Philadelphia District personnel.

TABLE 2
STREAM GAGE RECORDS
Crum Creek and Ridley Creek

Date of Crest	Crum Creek U.S.G.S. Gage at Moylan, Pa. (a) Estimated Peak Discharge cfs	Ridley Creek U.S.G.S. Gage at Moylan, Pa. (b) Estimated Peak Discharge cfs
November 25, 1950	– – –	5,720
August 18, 1955	– – –	4,390
July 23, 1938	– – –	3,320
July 9, 1935	660	3,000
August 23, 1933	1,420	2,680
March 15, 1940	– – –	1,770
January 3, 1936	775	1,590
August 3, 1950	– – –	1,590
March 11, 1952	– – –	1,490
September 4, 1935	1,060	1,330

(a) Drainage area is 33.3 square miles. Period of Record is October 1931 to September 1937.

(b) Drainage area is 31.9 square miles. Period of Record is March 1932 to August 1955.

TABLE 3
TIDE HEIGHTS
Delaware River near Crum Creek

Tidal Description	Elevation Ft. - Mean Sea Level Datum
Standard Project Tide	14.1
Intermediate Regional Tide (100-Yr.)	9.5
50-year Tide	8.8
November 25, 1950	8.4
August 1933	8.4
10-year Tide	7.5
August 19, 1955	6.7
Annual Flood Tide	5.8
Mean High Tide	3.4
Mean Low Tide	-2.4

Flood Season and Flood Characteristics

Accounts of high flows on Crum Creek and nearby Ridley Creek indicate that flooding has occurred in the area during all seasons of the year. Stages can rise from normal flow to flood peaks in relatively short periods of time with high velocities in the main stream channel. In addition to flooding caused by runoff from general rainfall, Crum Creek is also susceptible to hurricane activity and floods from snowmelt in combination with rainfall. The lower reach of Crum Creek near the mouth is also subject to tidal flooding from the Delaware River for approximately 0.5 miles. High stages of the Delaware can create a "backwater" effect which literally backs-up floodwater on Crum Creek, causing greater depths and wider extent of flooding upstream.

Factors Affecting Flooding and Its Impact

Obstructions to floodflows - Natural obstructions to floodflows include trees, brush and other vegetation growing along the creek banks in floodway areas. Man-made encroachments on or over the creek 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 floodflows increase, 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. Representative photographs of obstructions to floodflows may be seen in Figures 1 through 3.

There are five dams located on Crum Creek. Three are small dams and they will have no effect on floodflows. The remaining two dams are large by comparison, and form Crum and Springton (Geist) water supply reservoirs. While these two dams will have no effect on the large, infrequent floods such as a 100-year flood or greater, they may retard peak flows from the more frequent thunderstorm induced floods. The effects of all five dams on the floodwaters of Crum Creek can be seen on the high water profiles, Plates 9 through 11.

Crum Creek is spanned by one building, one 1,300 foot long culvert, and 42 bridges, many of which are obstructive to floodflows. Pertinent information on all bridges and culverts on Crum Creek may be found in Table 5 on Page 16.

Flood damage reduction measures - There are no existing or authorized flood control projects on Crum Creek. As previously stated, the two large water supply reservoirs on Crum Creek may retard peak flows from the more frequent, short duration storms, but will have no effect on the large infrequent flood events. However, flood plain zoning ordinances and regulations are being adopted by communities located on the flood plain.

The Borough of Swarthmore has passed a model resolution governing the use of flood plain land in order to qualify for inclusion in the National Flood Insurance Program. Marple Township has a Grading, Drainage and Erosion Control Ordinance and Springfield Township has building code stipulations which help to control development of flood plain land. Upper Providence Township has recently approved flood plain regulations, and other communities are expected to pass similar ordinances and regulations in the future.

Other factors and their impacts - The impact of flooding along Crum Creek 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 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 creek has reached flood stage.

Flood warning and forecasting - Inhabitants of the Crum Creek watershed depend on the usual warnings issued through radio, television, and local newspapers for information concerning possible flooding conditions. The National Oceanic and Atmospheric Administration (NOAA) maintains year-round surveillance of weather conditions in the study area with stations located at the Philadelphia, Pennsylvania, and Wilmington, Delaware, airports. Flood warnings and predicted flood peaks are issued by the NOAA Flood Forecasting Centers located at Harrisburg, Pennsylvania, and Trenton, New Jersey.

Flood fighting and emergency evacuation plans - Provisions for implementing flood emergency operations are coordinated by the Delaware County Civil Defense Office. This office maintains communications with the State Civil Defense Headquarters and the National Weather Service and establishes a "flood watch" during the earliest stages of a flood threat. Flood fighting, evacuation, and rescue activities are coordinated on a county-wide basis with local agencies.

Material storage on the flood plain - The rural, undeveloped areas along Crum Creek have very little material stored on the flood plain. However, due to the intense industrial development in the flood plain from MacDade Boulevard to the mouth of Crum Creek, there are large quantities of materials stored in the flood plain of this reach. Some of the material is floatable such as lumber, crates, and large volume lightweight containers. In addition, storage tanks and other containers may be unrestrained and buoyant. Supplies and materials stored in warehouses may be damaged by floodwaters entering the building and might be swept from damaged or destroyed structures. These floatable materials may be carried away by floodflows causing serious damage to structures downstream and clogging bridge openings, creating more hazardous flooding problems.

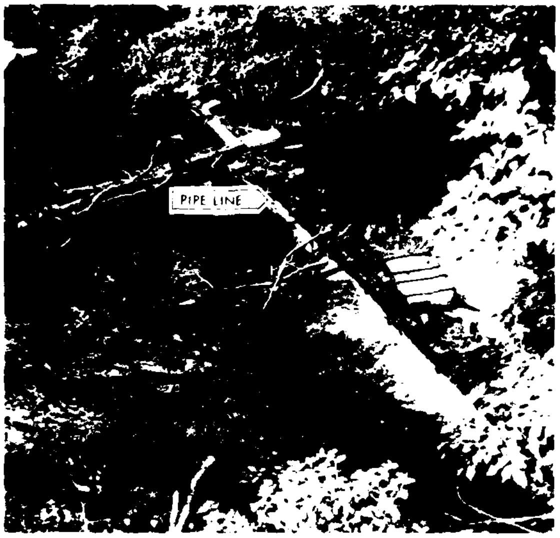


FIGURE 1 - Accumulated debris at a pipe line crossing Crum Creek upstream of MacDade Boulevard.

FIGURE 2 - Boulders and rock outcrops can become a natural obstruction to Crum Creek's flow.

FIGURE 3 - Chester Pike, U. S. Route 13, bridge is obstructive to the flow of Crum Creek.

PAST FLOODS

Summary of Historical Floods

In general, published accounts of flooding on Crum Creek have been overshadowed by more extensive and damaging floods on larger streams nearby. However, Crum Creek has experienced periodic flooding in the past. The August 5, 1843 flood, generally acknowledged to be the greatest known flood on nearby Ridley Creek, might also be the greatest flood of record on Crum Creek. Other documented flood events include June 1968 and September 1971.

Flood Records

Because of the limited period of record of the U.S.G.S. Gage on Crum Creek at Woodlyn, Pennsylvania (October 1931 - September 1937) there is little information available concerning the occurrence and severity of past floods. A U.S.G.S. Stream Gage on nearby Ridley Creek provided some insight into the flood history of the area. High water marks were obtained, residents along the stream were interviewed and newspaper files and historical documents were searched for information concerning past floods.

Flood Descriptions

The following are descriptions of known large floods that have occurred on Crum Creek:

August 5, 1843 - A general heavy rain started to fall early in the morning, with the rainfront extending well beyond the boundaries of Delaware County. This rain saturated the ground to a depth of several inches. Late the same day, heavy clouds concentrated over Delaware County accompanied in some areas by violent winds. The heavy rain turned into an intense downpour that lasted several hours. Because of the already-saturated ground, the water in the streams rose rapidly and before long all of the creeks within the county had overflowed their banks.

A permanent high water mark at elevation 105.7 feet, mean sea level datum, was established at the Philadelphia Suburban Water Authority Building, downstream of Crum Reservoir and upstream of Beatty Road bridge.

EXCERPTS FROM THE CHESTER DAILY TIMES, OCTOBER 24, 1964,
RELATIVE TO THE STORM OF AUGUST 5, 1843

OUT OF DELCO'S PAST, METEOROLOGICAL PHENOMENON HITS AREA 1843 STORM WAS VIOLENT

It was cool and overcast as dawn broke in Delaware County on Saturday, August 5, 1843. The sun was barely visible. Dark clouds quickly moved into the area and residents had hopes for a much-needed rain.

At about 7 a.m. the rain began to fall. It was a moderate intermittent rainfall for about eight hours. It was a welcome sight for lawns and fields parched from the late July heat. Up until noon, only a half inch or so of rain had fallen on any part of the county, according to Dr. J. W. Ash of Upper Darby. It had little more than a soaking effect. Then, at about 3 p.m. a meteorological phenomenon struck the area. A violent wind and rainstorm of dreadful magnitude developed.

Black Clouds

Black, menacing clouds appeared to come from different directions, and hung low in the sky. There were loud peals of thunder and incessant flashes of lightning. In some parts of the county there appeared to be no wind at all. In others, it was violent. Some even referred to it as a hurricane. The rain fell in torrents resembling a waterspout, according to one resident. The clouds seemed to dump everything they carried . . . The storm, which extended into parts of Chester and Montgomery Counties, dumped 12 or more inches of rain on many parts of Delaware County. Within a very short time, Chester, Crum, Ridley and Darby Creeks were swirling beyond their banks. They rose more than a foot an hour. Floodwaters reached a height of 20 feet or more in several areas.

The greatest height of the flood in Darby Creek was 17½ feet; in Crum Creek, 20 feet; in Ridley Creek, 21 feet; and in Chester Creek, 33 feet. A survey of the hard hit Crum Creek showed these examples of damages and destruction:

Crum Creek

The mills of T. Chalkley Palmer suffered heavy damage. A large stone wagon house 50 feet in length was carried off. Many bridges were carted away. John C. Beatty said one bridge "seemed to fall over as if there was no strength in it." His edge-tool factory went down with a tremendous crash. He also lost his plaster and finishing mills.

At Avondale where Thomas Leiper, a host to presidents, built one of America's first railroads, the floodwaters rose to the second story windows in the tenant houses. But being constructed of stone, they were not demolished. Crum Creek in the Avondale area separates Nether Providence and Springfield Townships. The cotton factory owned by William J. Leiper suffered heavy damages. The historic Leiper Canal was breached. George C. Leiper also sustained considerable damage to his mill dams. Leiper's Sleeper Bridge was carried away.

[a] Simulated from newspaper clippings.

June 12, 1968 - Heavy rainfall over the upper Crum Creek Watershed caused local flooding on Boot Road near Goshen Road. Debris in the channel caused the stream to back up covering Boot Road with water to a depth of several feet. There is no specific flood information from Crum Creek on this date but a high water mark was recorded on Boot Road near Goshen Road. (See Figure 6, Page 20).

September 13, 1971 - Rain began falling late Friday night and continued through the weekend before ending late on Monday. Rainfall readings ranged from 4.7 inches in Philadelphia to 12.3 inches in West Chester. Although the storm was believed to be one of the most severe storms in the history of Delaware County, with 450 persons left homeless and 4 fatalities reported throughout the County, there was less severe flooding along Crum Creek. According to a local resident, high water on Crum Creek, combined with high water from a minor tributary, flooded the lower level of a home on Boot Road to a depth of 22 inches.

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 Crum Creek Watershed. 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 estimates of the Intermediate Regional Flood and the Standard Project Flood as presented in this report are based on the existing development of the watershed since future changes within the basin cannot be accurately predicted. 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. The peak flow of this flood was developed from regional synthetic analysis, since adequate streamflow records were not available. Peak flows thus developed for the Intermediate Regional Flood at selected locations in the study area are listed in Table 4.

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 listed in Table 4.

A discharge hydrograph for the Standard Project Flood at the mouth of Crum

Creek is shown on Plate 14. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are shown on Plates 9 through 11.

TABLE 4
PEAK FLOWS
Intermediate Regional Flood and Standard Project Flood

Location	River Mile	Drainage Area Sq. Mi.	Intermediate Regional Flood cfs	Standard Project Flood cfs
Confluence with Delaware River	0	38.4	7,800 (a)	15,550 (a)
Downstream of U. S. Rte. 1 Bridge (State Rd.)	8.87	27.8	6,600	13,300
Downstream of Springton (Geist) Reservoir	11.11	22.3	5,900	12,000
Grubb Mill Rd. (Study Limit)	18.20	9.9	4,150	7,400

(a) Nontidal, fluvial flow only.

Frequency

A frequency curve of peak flows on Crum Creek was developed from a synthetic analysis because sufficient records of annual peak flows were not available. The curve presents the frequency of floodflows up to the magnitude of once in 100 years (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 curve, which is available upon 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 Crum Creek would result in the inundation of residential, commercial and industrial properties 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. Waterlines 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 of Crum Creek that would be flooded by the Standard Project Flood are shown on Plate 2 which is also an index map to Plates 3 through 8. Areas that would be flooded by the Intermediate Regional Flood and the Standard Project Flood are shown in detail on Plates 3 through 8. The actual limits of these overflow areas may vary somewhat from those shown on the maps because the scale of the maps does not permit precise plotting of the flooded area boundaries. As may be seen from these plates, floodflows from Crum Creek would inundate portions of many communities adjacent to the stream.

The areas that would be flooded by the Intermediate Regional and Standard Project Floods include residential, commercial and industrial properties, along with associated streets and roads. Considerable damage to these improvements 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 more severe than during an Intermediate Regional Flood. Plates 9 through 11 show the water surface profiles for the Intermediate Regional and Standard Project Floods. Depth of flow in the channel can be estimated from these illustrations. Cross sections of the flood plain at selected locations, together with the water surface elevation and lateral extent of the Intermediate Regional and the Standard Project Floods are shown on Plates 12 and 13.

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 five dams on Crum Creek, only two of which will significantly alter the flow of floodwaters. Of the 42 bridges crossing Crum Creek in the study area, many are obstructive to both the Intermediate Regional and Standard Project Floods. Table 5 lists water surface elevations at these bridges.

TABLE 5

ELEVATION DATA

Bridges Across Crum Creek

Identification	Mileage Above Mouth	Underclearance Elevation Feet - Mean Sea Level Datum	Water Surface Elevation (a) Intermediate Regional Flood	Water Surface Elevation (a) Standard Project Flood
			Feet - Mean Sea Level Datum	
Reading R. R.	0.40	7.9	9.5	14.1
Reading R. R.	0.42	8.1	9.5	14.1
Pa. Rte. 291	0.44	8.8	9.5	14.1
Boeing Co. - Footbridge	0.56	6.5	12.0	16.4
Private Road-Boeing Co. (Downstream end of culvert)	0.61	8.5	12.0	17.6
Private Road-United Engr. Co. (Upstream end of culvert)	0.85	8.3	13.4	17.7
R. R. Spur	1.00	7.1	14.6	18.3
Penn Central R. R.	1.07	20.7	15.5	22.7
R. R. Spur	1.15	5.3 (c)	15.7	22.9
Baldwin Co. - Footbridge	1.21	13.1	16.2	23.1
Baldwin Co. Building	1.30	13.5	18.4	23.6
Chester Pike U.S. Rte. 13	1.42	13.7	18.9	23.9
Interstate Rte. 95 (4 bridges)	1.50-1.59 (b)	– –	– –	– –
B & O R. R.	1.66	38.6	24.8	33.7
Jefferson Ave.	2.11	31.5	29.0	40.4
MacDade Blvd.	2.21	23.7	29.8	40.6
Bullens Lane	2.58	29.2	33.6	40.9
Chester Rd., Pa Rte. 320	3.34	82.6	44.9	50.9
Private Road	3.38	48.7	47.4	56.5
Yale Ave.	4.09	56.2	53.8	64.6
Penn Central R. R.	4.98	142.4 (c)	65.9	69.2
Wallingford Rd.	5.72	72.1	76.4	81.2
Baltimore Pike	5.89	105.4 (c)	85.7	88.2
SEPTA-Trolley	6.19	100.9 (c)	85.9	90.8
Footbridge-Smedley Park	6.27	78.8	87.0	92.0
Paper Mill Road	6.65	84.1 (c)	88.1	93.2
Beatty Road	7.78	97.8 (d)	98.3	103.2
State Road, U. S. Rte. 1	8.87	144.9 (c)	119.3	120.6
Old State Road	8.97	127.2 (c)	119.7	121.6
Crum Creek Road	9.49	118.3	124.2	126.0
Paxton Hollow Road	10.21	128.7 (c)	130.1	132.3
Newtown Rd. - Pa. Rte. 252	11.11	207.9	203.6	206.5
Bishop Hollow Rd.	13.21	207.5	203.7	206.7
Gradyville Road	13.67	207.7	204.2	207.4
West Chester Pike, Pa. Rte. 3	14.99	221.8	219.0	224.6
Private Bridge	15.33	220.6	224.5	226.4
Private Bridge	15.40	226.0	227.2	229.4
Covered Bridge	16.03	243.4	245.4	246.5
Goshen Road	16.02	243.6	245.5	246.6
Grubb Mill Road-Study Limit	18.20	302.7	300.5 (e)	301.5 (e)

(a) Flood elevations are reported for the upstream side of the bridge.
(b) Four high level bridges under construction in this area.
(c) Elevation at centerline of stream.
(d) Approximate elevation - bridge under construction.
(e) Flood elevation at 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 for selected cross sections in the study area would vary from 0.7 to 14.0 feet per second. It is expected that the velocity of main channel flow during a Standard Project Flood would be slightly higher than during an Intermediate Regional Flood; however, in some cases backwater from restrictive cross sections may result in lower velocities. Overbank flow in the study area for the same selected cross sections would vary from 0.4 to 4.8 feet per second.

In general, water flowing at 2 feet per second or less would deposit debris and silt, while 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, causing injury or drowning. Floodwater flowing at greater velocities is capable of causing severe erosion to streambanks and fill around bridge abutments and transporting large objects. Table 6 lists velocities that would occur in the main channel and overbank areas of selected cross sections of Crum Creek during the Intermediate Regional and Standard Project Floods.

TABLE 6
CRUM CREEK VELOCITIES

Location (a)	Mileage Above Mouth	Velocities: Intermediate Regional Flood, Channel Ft/Sec	Velocities: Intermediate Regional Flood, Overbank (b) Ft/Sec	Velocities: Standard Project Flood, Channel Ft/Sec	Velocities: Standard Project Flood, Overbank (b) Ft/Sec
Cross Section Number					
3	1.41	4.4	1.9	3.5 (c)	2.0
9	2.52	4.8	2.8	2.8 (c)	2.0
12	3.74	11.8	4.0	6.3 (c)	3.6
16	5.32	14.0	4.7	15.7	6.5
24	8.85	4.1	2.2	4.7	2.7
27	9.91	10.9	4.8	11.3	6.1
39	16.93	11.7	1.3	12.4	4.2

(a) See Plates 3 through 11 for locations of cross sections.
(b) Value given is maximum of left or right overbank velociety.
(c) Velocities reduced by the backwater effect of restrictive cross sections and/or bridge approach embankments.

Rates of rise and duration of flooding - Intense rainfalls that accompany severe storm fronts usually produce the floods occurring in the Crum Creek Basin. There is a time lag of several hours before overbank flooding occurs along the main stream. Floods generally rise slowly and remain out of banks for long periods of time. Table 8 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 two representative locations on Crum Creek. Plate 14 shows a discharge hydrograph for the Standard Project Flood at the mouth of Crum Creek.

TABLE 7
RATES OF RISE AND DURATION OF FLOODING
Standard Project Flood
Crum Creek

Location	Maximum Rate of rise FT./Hr.	Height of rise Ft.	Time of rise Hrs.	Duration of critical stage Hrs.
Cross Section No. 3	3.8	6.9	6.0	17.0
Cross Section No. 24	1.4	8.0	12.0	36.0

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

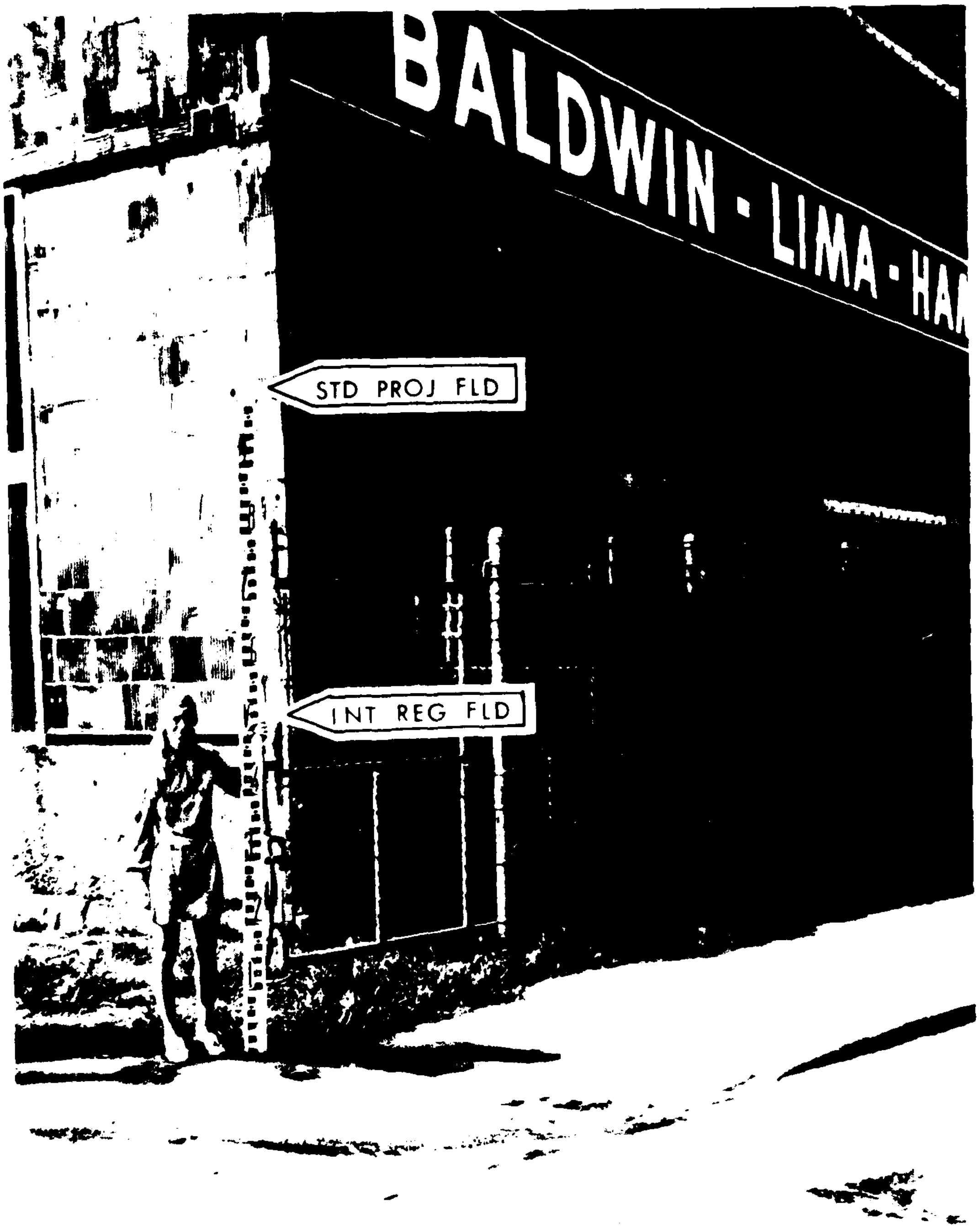


FIGURE 4 - Future flood heights of Crum Creek at a Baldwin-Lima-Hamilton Corporation Plant on Chester Pike, U. S. Route 13.

FIGURE 5 - Flood heights at the Philadelphia Suburban Water Works.

FIGURE 6 - Flood heights near the intersection of Boot and Goshen Roads.

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 stream flow, and other problems.

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

Flood 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.

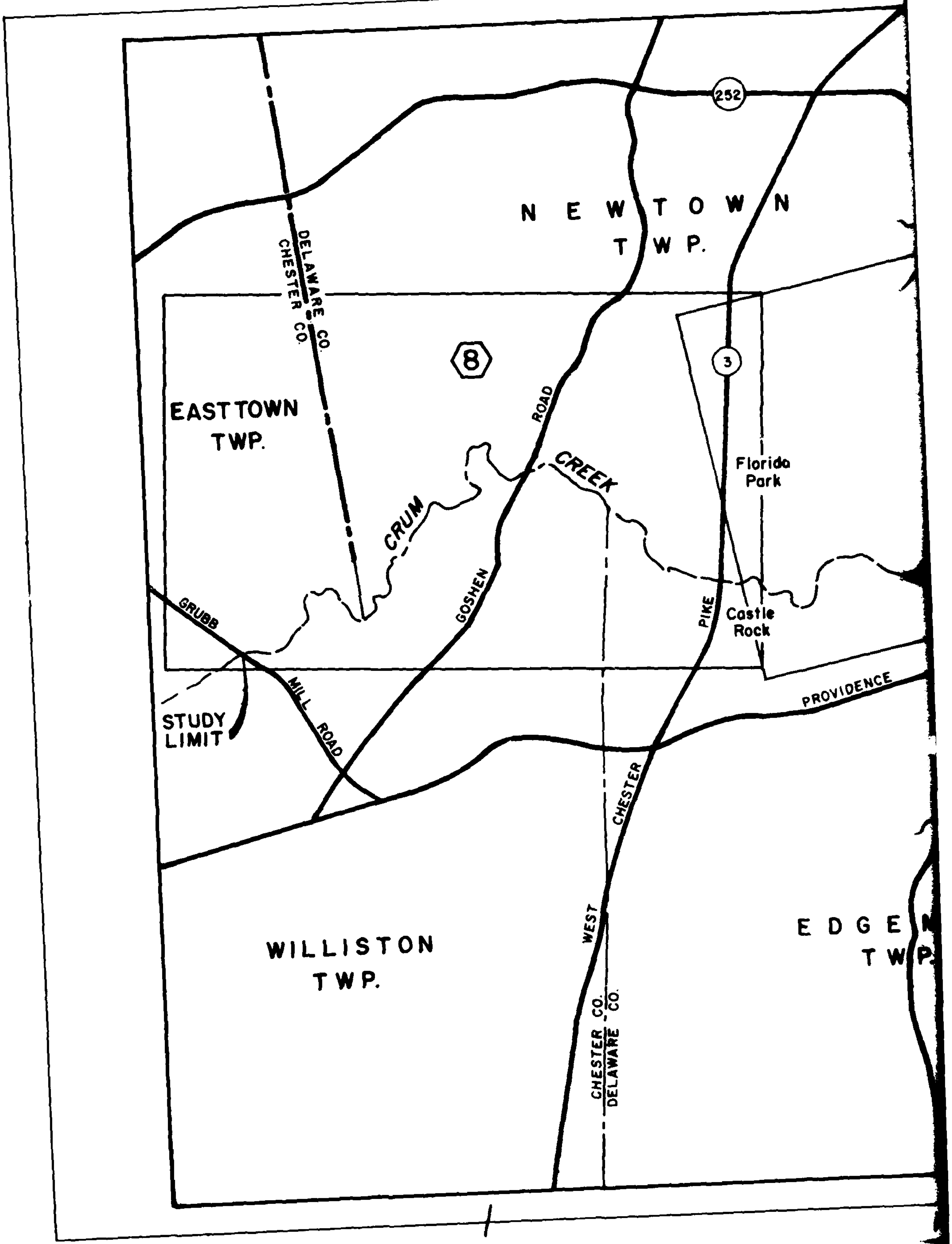
Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general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

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

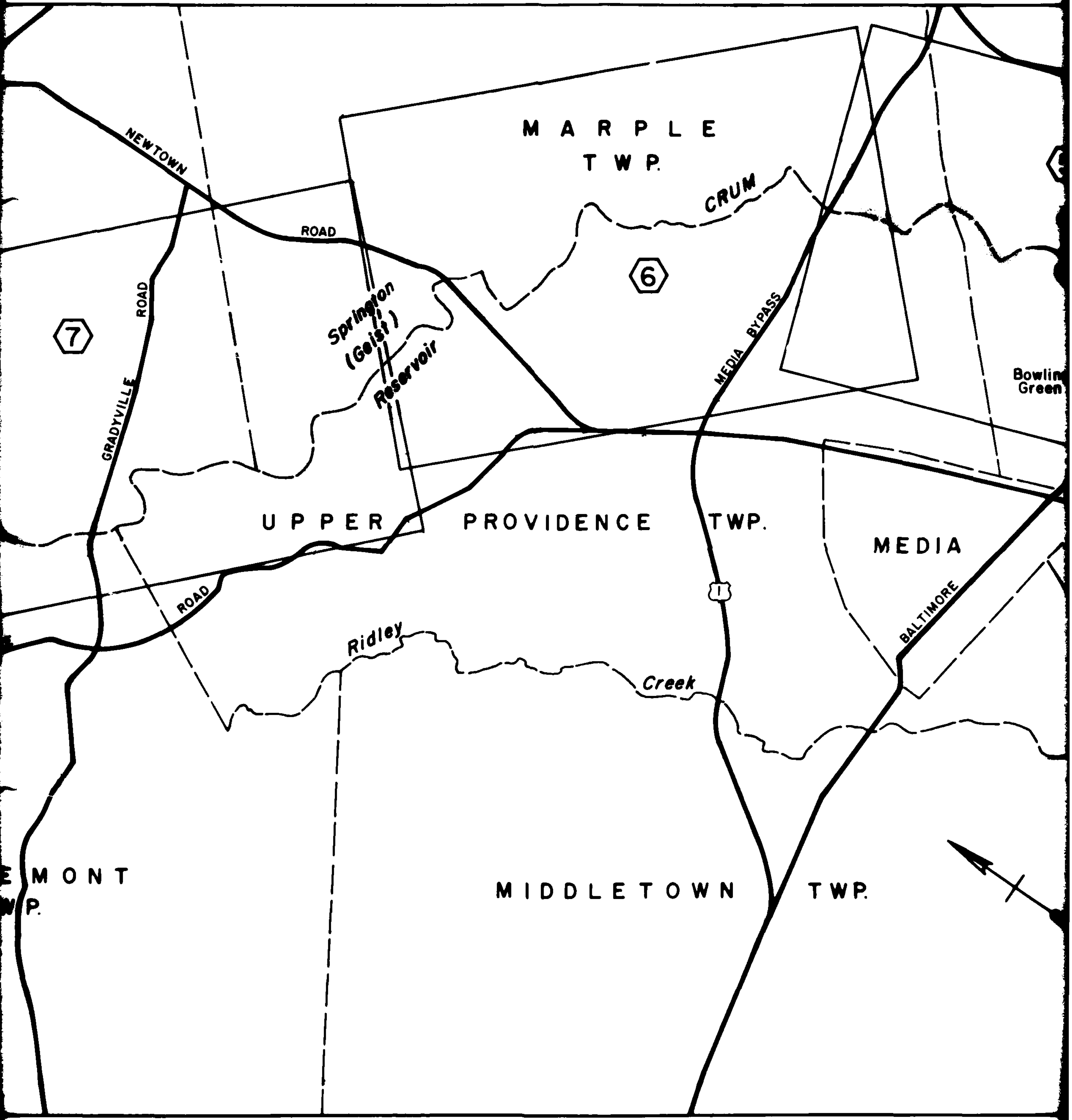
Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

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.

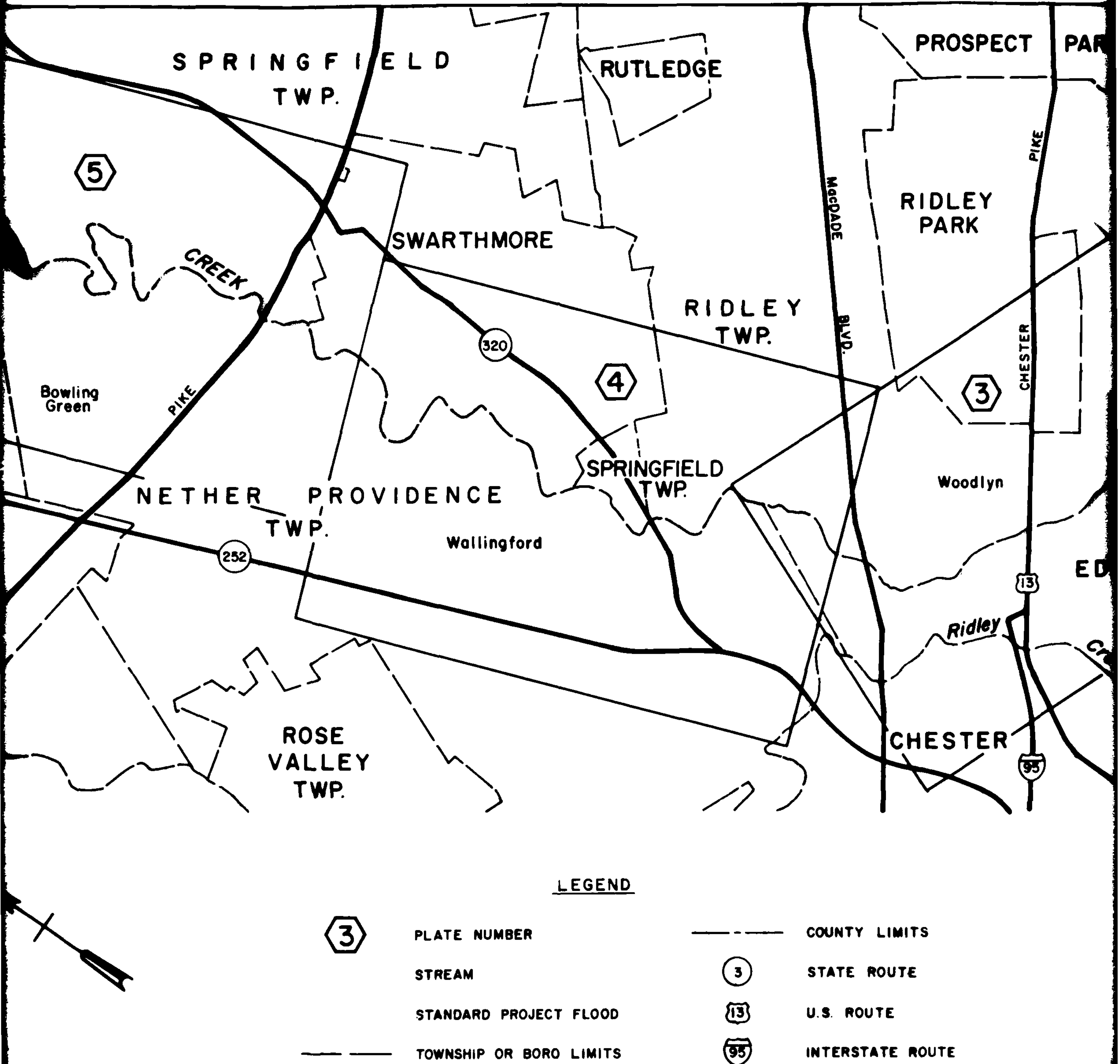


252
NEWTOWN
TWP.
DELAWARE CO.
CHESTER CO.
8
3
EASTTOWN
TWP.
ROAD
CRUM
CREEK
Florida
Park
GRUBB
GOSHEN
PIKE
Castle
Rock
MILL
ROAD
STUDY
LIMIT
PROVIDENCE
CHESTER
WEST
WILLISTON
TWP.
CHESTER CO.
DELAWARE CO.
EDGE
TWP.



MARPLE
TWP.
CRUM
6
NEWTOWN
ROAD
ROAD
7
GRADYVILLE
Springton
(Geist)
Reservoir
MEDIA BYPASS
Bowlin
Green
UPPER PROVIDENCE TWP.
MEDIA
1
ROAD
BALTIMORE
Ridley
Creek
EMONT
WP.
MIDDLETOWN TWP.

1



SPRINGFIELD TWP.
RUTLEDGE
PROSPECT
PAR
5
SWARTHMORE
RIDLEY PARK
PIKE
MacDADE BLVD.
CREEK
RIDLEY TWP.
320
4
3
CHESTER PIKE
Bowling Green
PIKE
SPRINGFIELD TWP.
Woodlyn
NETHER PROVIDENCE TWP.
Wallingford
252
ED
13
Ridley
Cr
ROSE VALLEY TWP.
CHESTER
95
LEGEND
3
PLATE NUMBER
STREAM
STANDARD PROJECT FLOOD
TOWNSHIP OR BORO LIMITS
COUNTY LIMITS
3
STATE ROUTE
13
U.S. ROUTE
95
INTERSTATE ROUTE

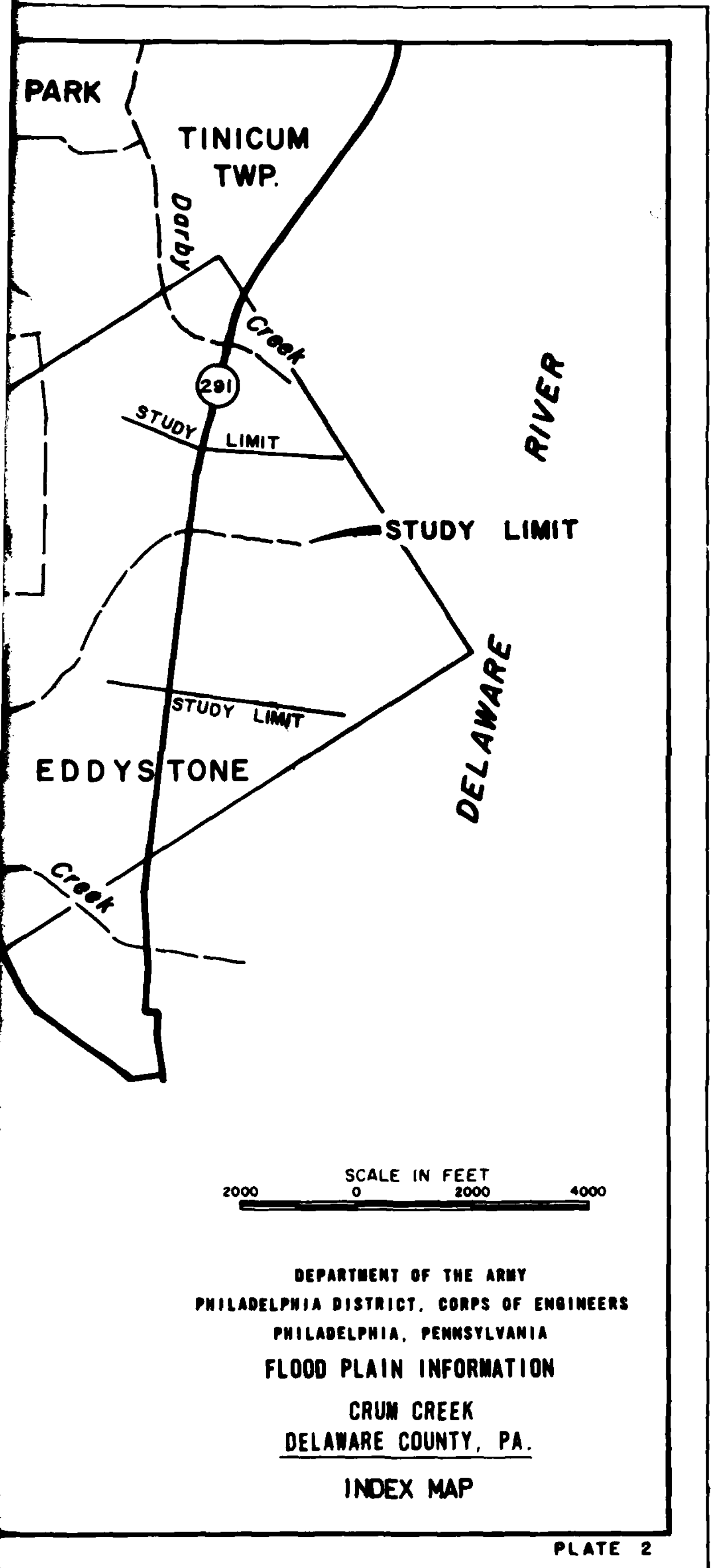
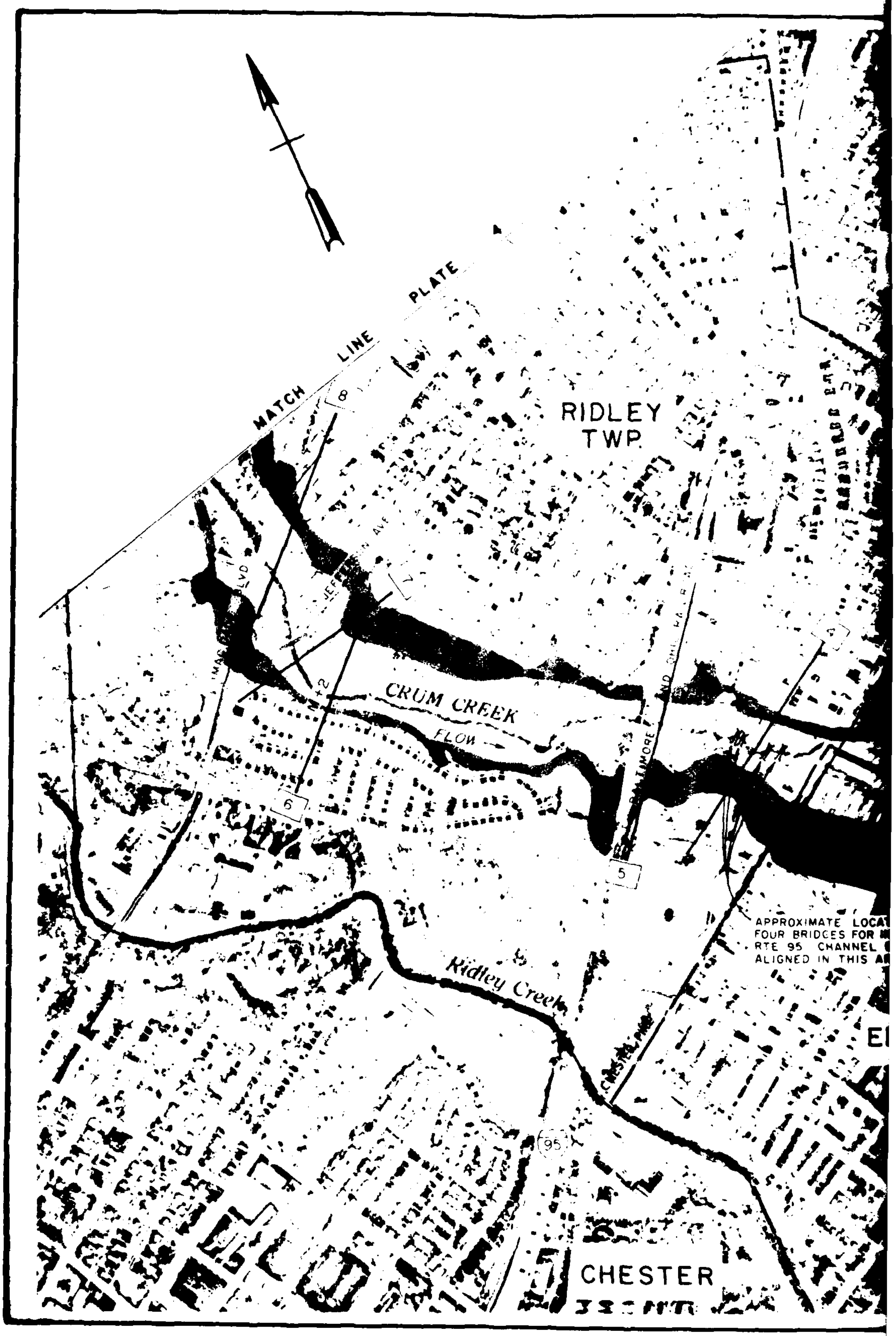
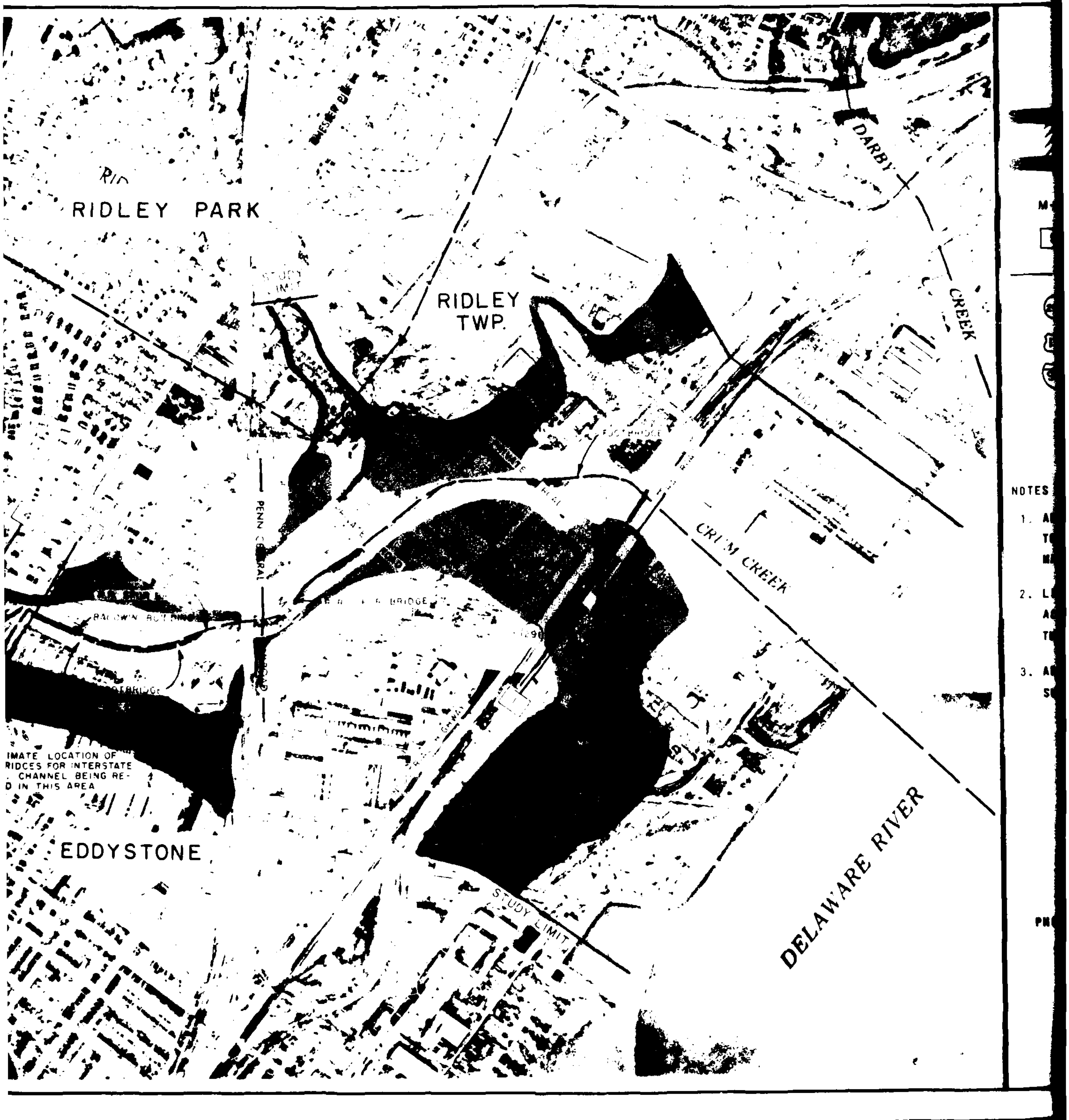

PARK
TINICUM TWP.
Darby
Creek
291
STUDY LIMIT
RIVER
STUDY LIMIT
STUDY LIMIT
EDDYSTONE
DELAWARE
Creek
SCALE IN FEET
2000 0 2000 4000
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA
FLOOD PLAIN INFORMATION
CRUM CREEK
DELAWARE COUNTY, PA.
INDEX MAP

PLATE 2


MATCH LINE PLATE
RIDLEY
TWP.
8
7
6
5
4
CRUM CREEK
FLOW
Ridley Creek
95
APPROXIMATE LOCA
FOUR BRIDGES FOR
RTE 95 CHANNEL
ALIGNED IN THIS A
CHESTER


RIDLEY PARK
RIDLEY TWP.
STUDY LIMIT
DARBY
CREEK
CRUM CREEK
PENN CENTRAL
EDDYSTONE
IMATE LOCATION OF
RIDGES FOR INTERSTATE
. CHANNEL BEING RE-
D IN THIS AREA
STUDY LIMIT
DELAWARE RIVER
NOTES
1.
2.
3.

LEGEND

OVERFLOW LIMITS

	INTERMEDIATE REGIONAL FLOOD	STANDARD PROJECT FLOOD
M+1	MILES ABOVE MOUTH	
5	CROSS SECTION	
—— ——	TOWNSHIP OR BORO LIMITS	
291	STATE ROUTE	
13	U.S. ROUTE	
95	INTERSTATE ROUTE	

NOTES

1. AERIAL PHOTOGRAPHY FURNISHED BY U.S. ARMY TOPOGRAPHIC COMMAND. DATE OF PHOTOGRAPHY MARCH-APRIL 1972.

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

SCALE IN FEET

0 800 1600

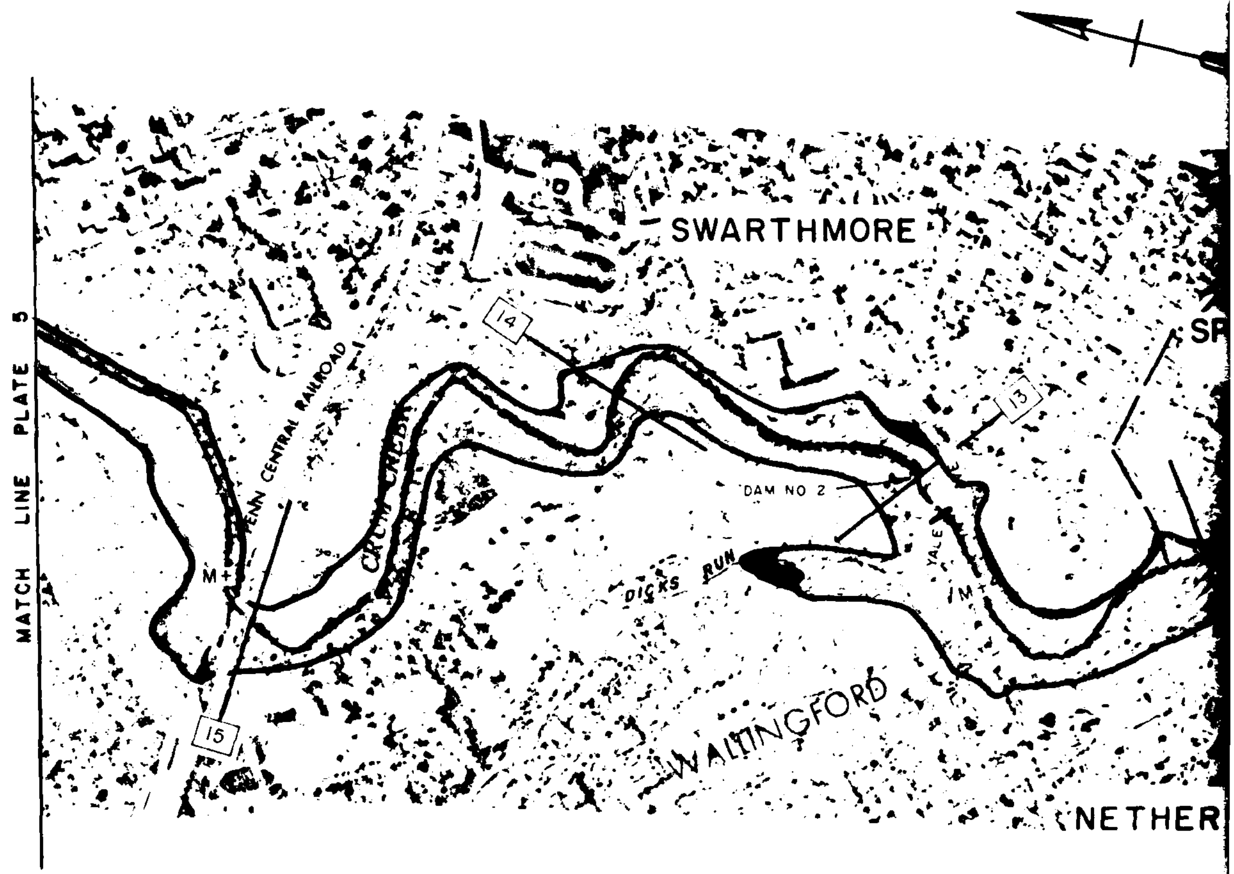
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

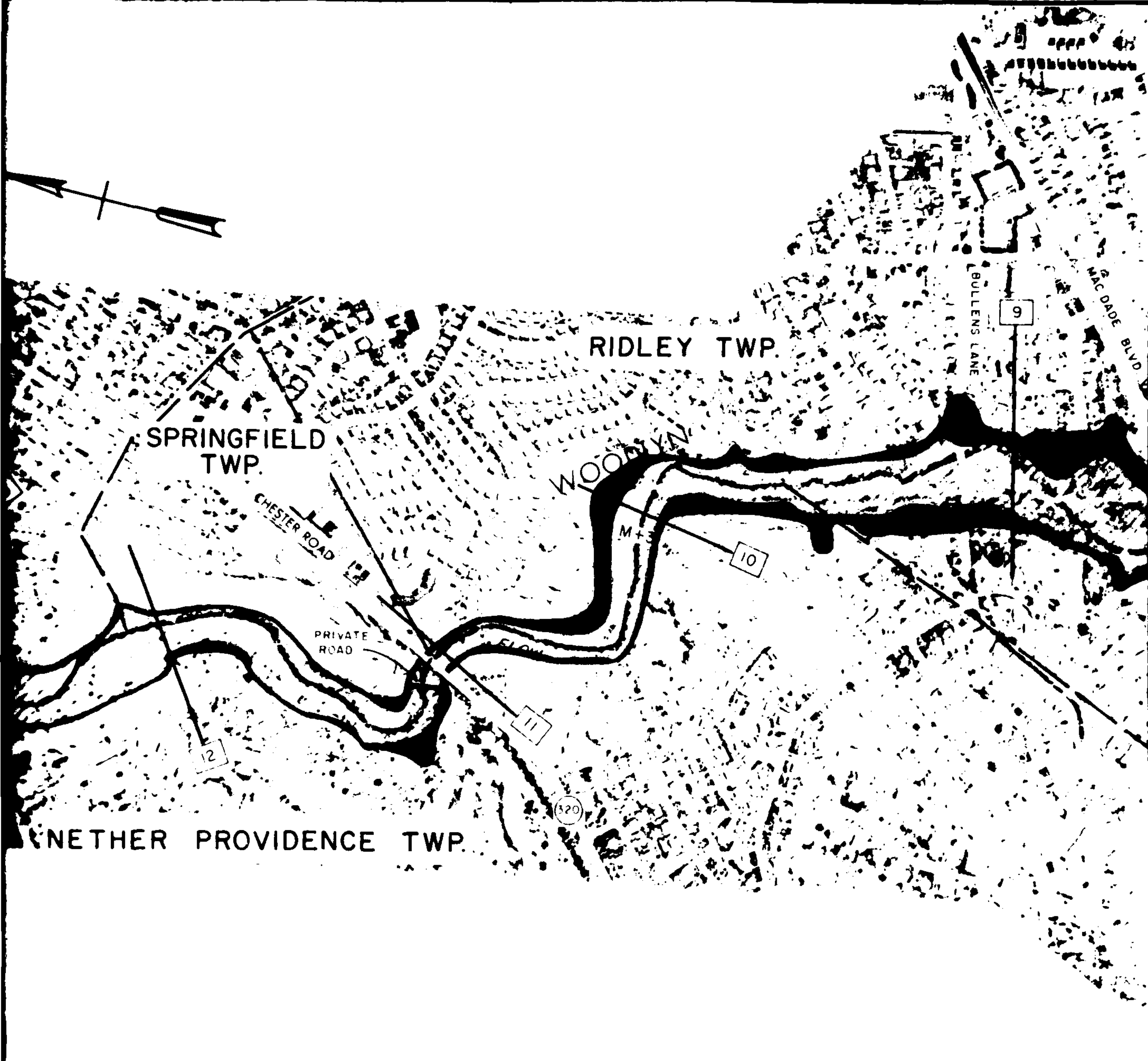
CRUM CREEK
DELAWARE COUNTY, PA.

FLOODED AREAS

PLATE 3



MATCH LINE PLATE 5
SWARTHMORE
PENN CENTRAL RAILROAD
CRUM CREEK
DAM NO 2
DICKS RUN
YALE
WALLINGFORD
NETHER
14
13
15
M
M



M+3

9

320

NOTES

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LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD	STANDARD PROJECT FLOOD

M-3 MILES ABOVE MOUTH

9 CROSS SECTION

TOWNSHIP OR BORO LIMITS

STATE ROUTE

NOTES

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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

SCALE IN FEET

0 800 1600

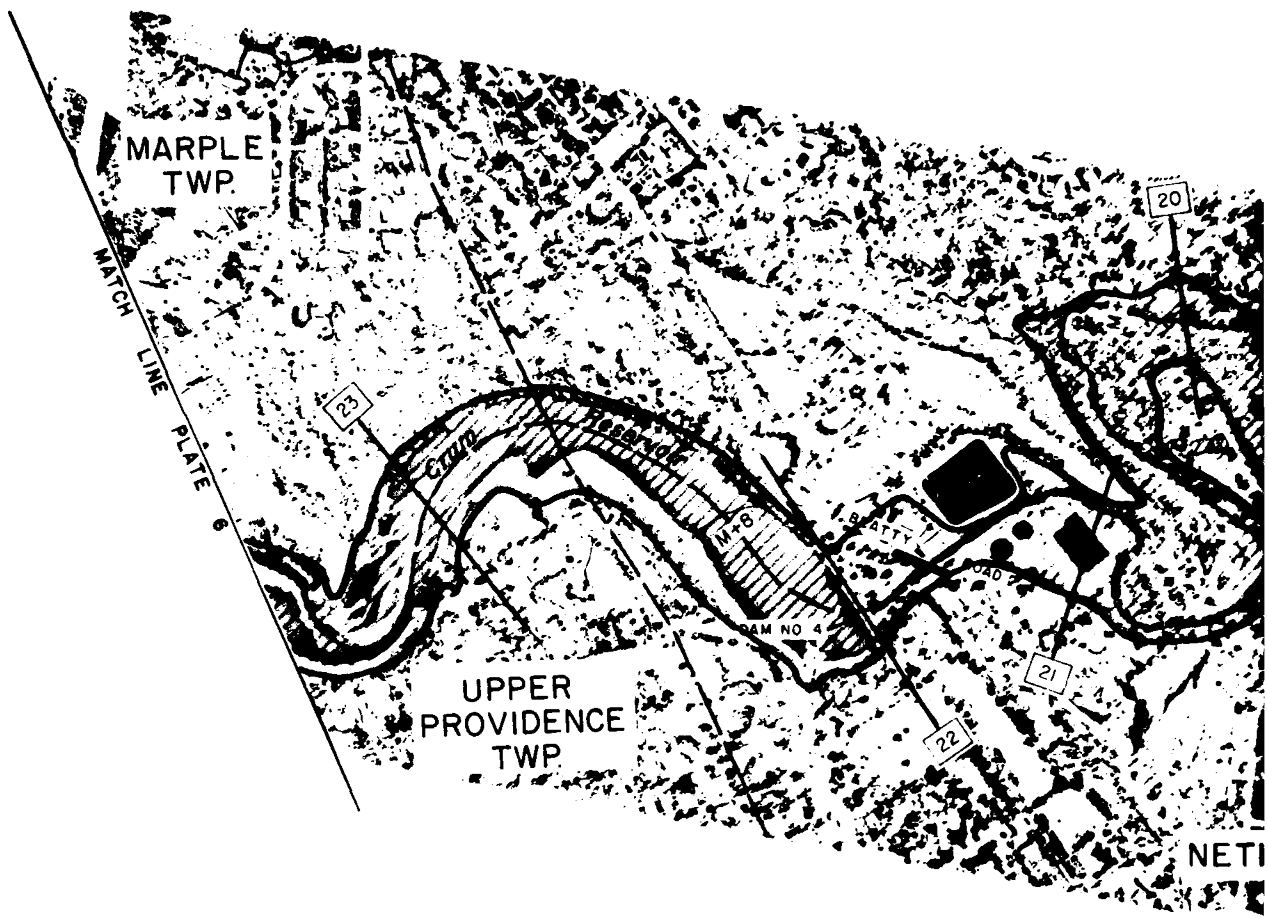
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

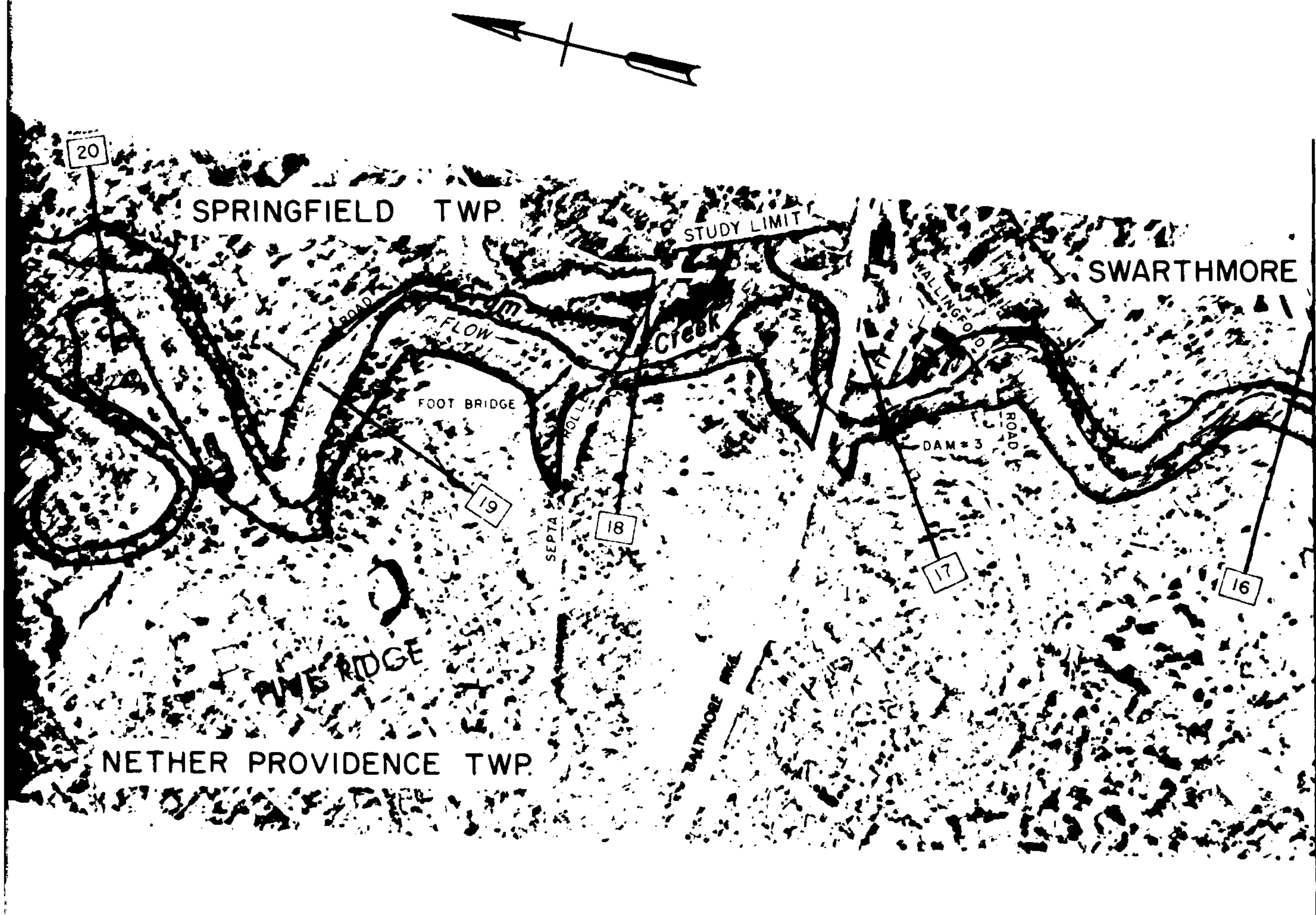
FLOOD PLAIN INFORMATION

CRUM CREEK
DELAWARE COUNTY, PA.

FLOODED AREAS

PLATE 4


MARPLE TWP.
MATCH LINE PLATE 6
23
Crum Reservoir
M-8
DAM NO 4
20
21
22
UPPER PROVIDENCE TWP.
NETI



M+6

20

NOTES

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OVERFLOW LIMITS

INTERMEDIATE	STANDARD
REGIONAL	PROJECT
FLOOD	FLOOD

6 MILES ABOVE MOUTH

0 CROSS SECTION

TOWNSHIP OR BORO LIMITS

ERIAL PHOTOGRAPHY FURNISHED BY U.S. ARMY
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ARCH-APRIL 1972.

MITS OF OVERFLOW SHOWN MAY VARY FROM
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SCALE IN FEET

0 800 1600

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

FLOOD PLAIN INFORMATION

CRUM CREEK
DELAWARE COUNTY, PA.

FLOODED AREAS

PLATE 5


MATCH LINE PLATE 7
Springron
(Geist) Reservoir
DAM NO 5
30
29
28
252
Crum Creek
FLOW
STUDY LIMIT
UPPER


MARPLE TWP.
UPPER PROVIDENCE TWP.
28
27
26
25
24
1
STUDY LIMIT
STUDY LIMIT
CRUM CREEK ROAD
ROAD
ROAD
M+10
MATCH LINE PLATE 5

NOTES

1.

2.

3.

2

LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD		STANDARD PROJECT FLOOD

M+9	MILES ABOVE MOUTH
29	CROSS SECTION
— —	TOWNSHIP OR BORO LIMITS
252	STATE ROUTE
1	U.S. ROUTE

NOTES

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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.

SCALE IN FEET

0 800 1600

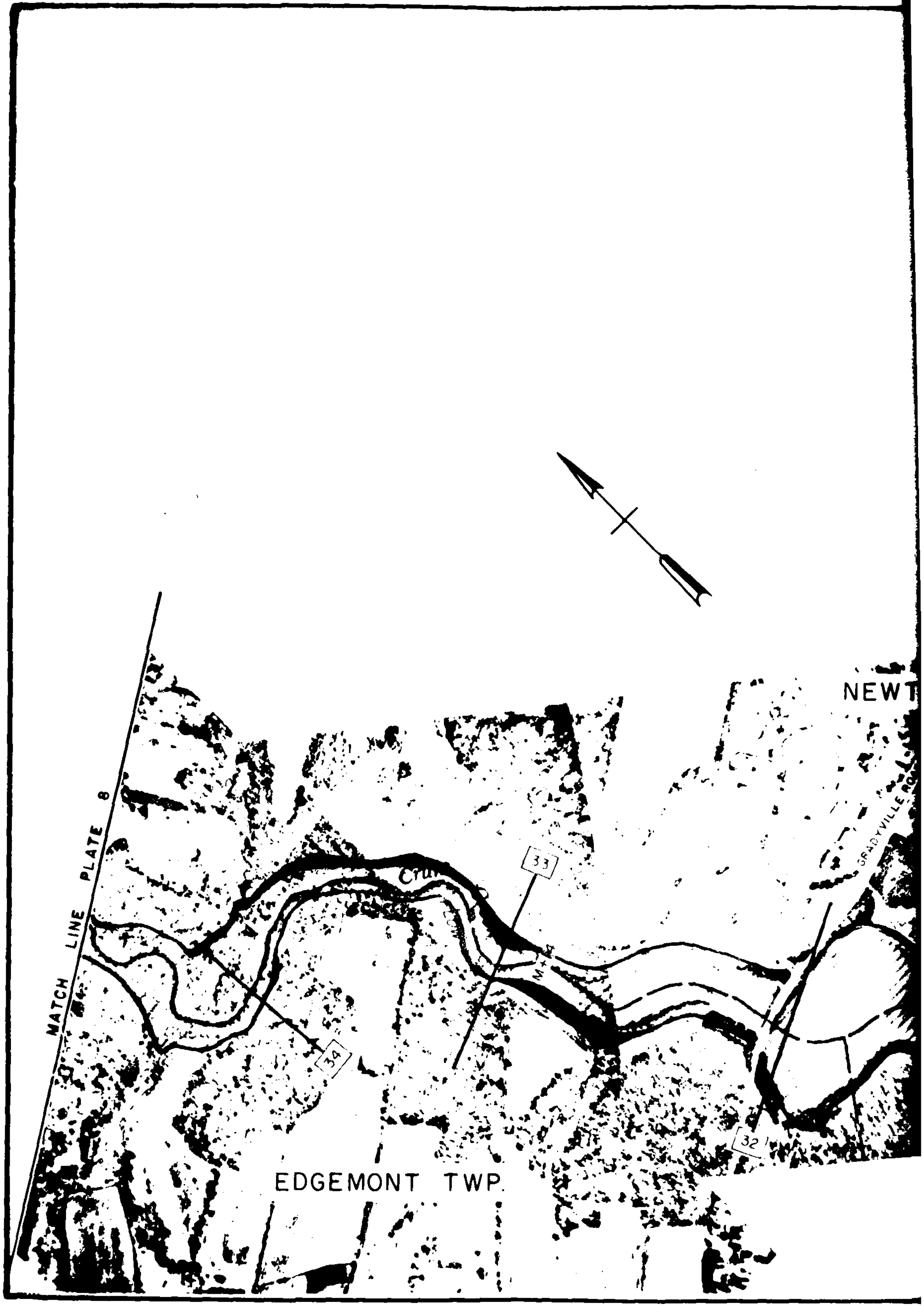
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

CRUM CREEK
DELAWARE COUNTY, PA.

FLOODED AREAS

PLATE 6



MATCH LINE PLATE 8
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33
34
32
EDGEMONT TWP.

M +12

32

NOTES

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OVERFLOW LIMITS

(heavy line)	INTERMEDIATE REGIONAL FLOOD	
(heavy line)		STANDARD PROJECT FLOOD

M - 2 MILES ABOVE MOUTH

32 CROSS SECTION

—— —— TOWNSHIP OR BORO LIMITS

NOTES

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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

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT, CORPS OF ENGINEERS

PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

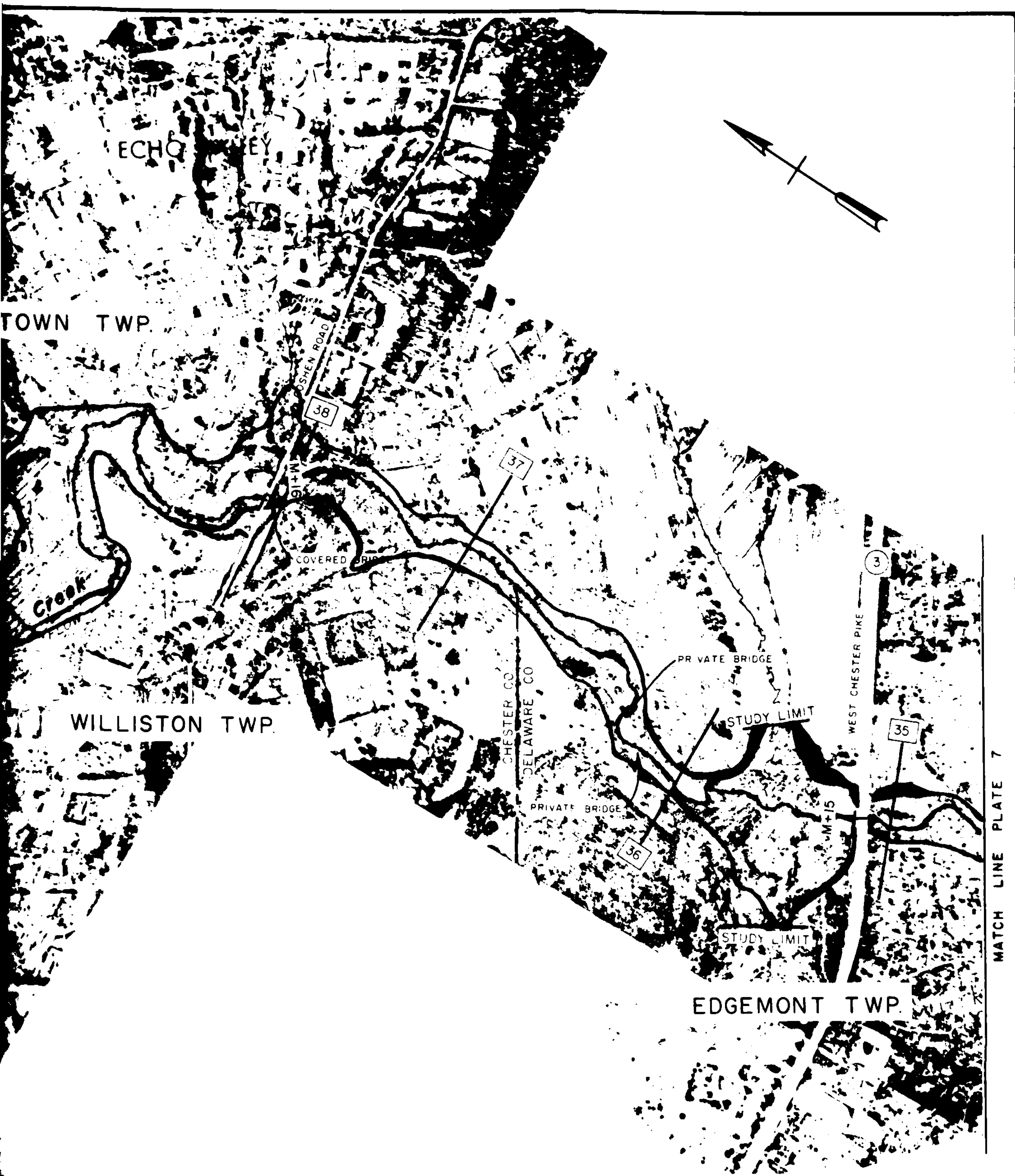
CRUM CREEK

DELAWARE COUNTY, PA.

FLOODED AREAS

PLATE 7

NEWTOWN TW
Crum Creek
39
WIL
M+17
DELAWARE CO.
CHESTER CO.
EASTTOWN
TWP.
40
STUDY LIMIT
GRUBB MILL ROAD
M+18



M+16

40

3

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LEGEND

OVERFLOW LIMITS

	INTERMEDIATE REGIONAL FLOOD	STANDARD PROJECT FLOOD
+16	MILES ABOVE MOUTH	
40	CROSS SECTION	
	TOWNSHIP OR BORO LIMITS	
3	STATE ROUTE	
	COUNTY LIMITS	

AERIAL PHOTOGRAPHY FURNISHED BY U.S. ARMY TOPOGRAPHIC COMMAND. DATE OF PHOTOGRAPHY MARCH-APRIL 1972.

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

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

SCALE IN FEET

0 800 1600

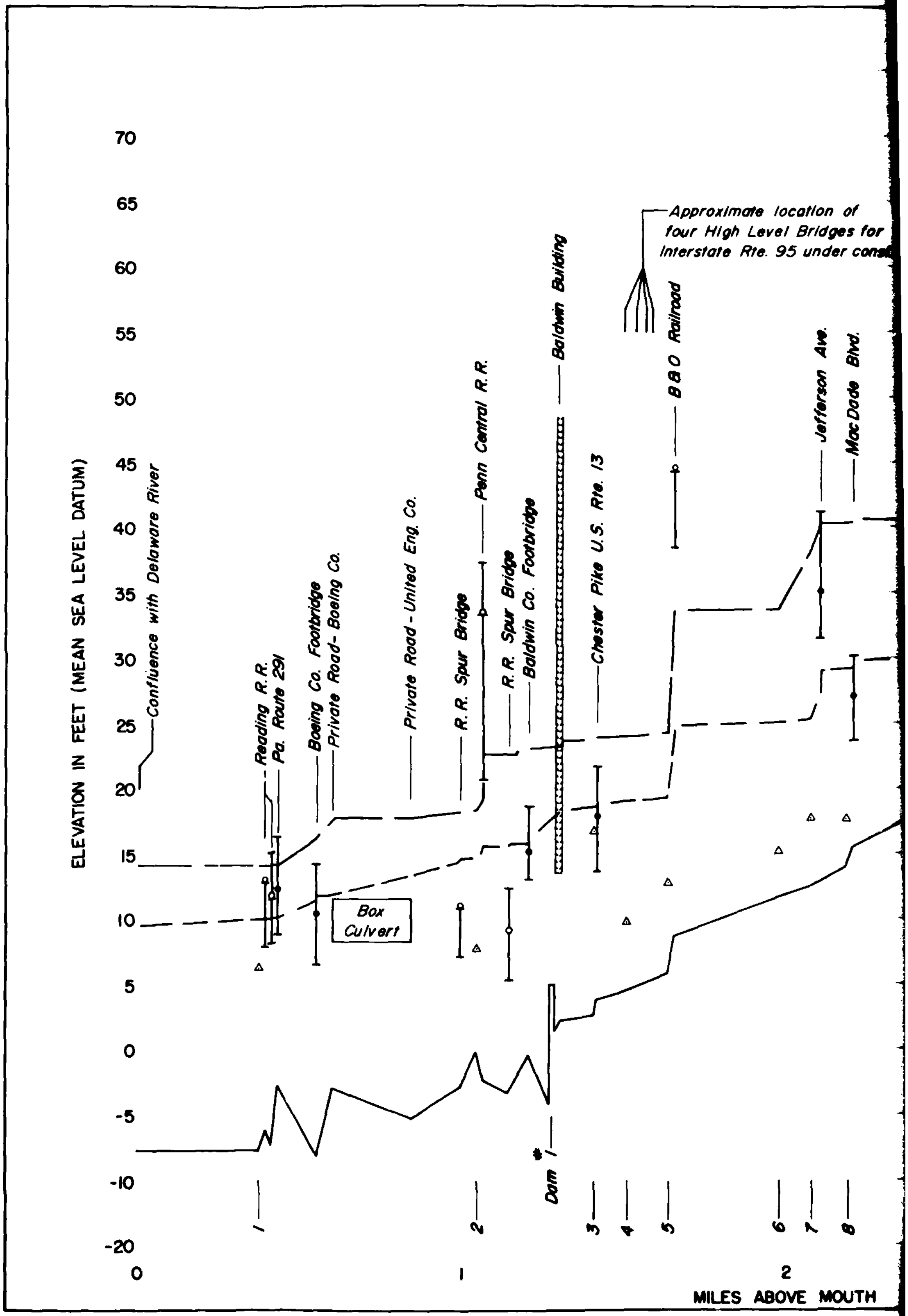
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

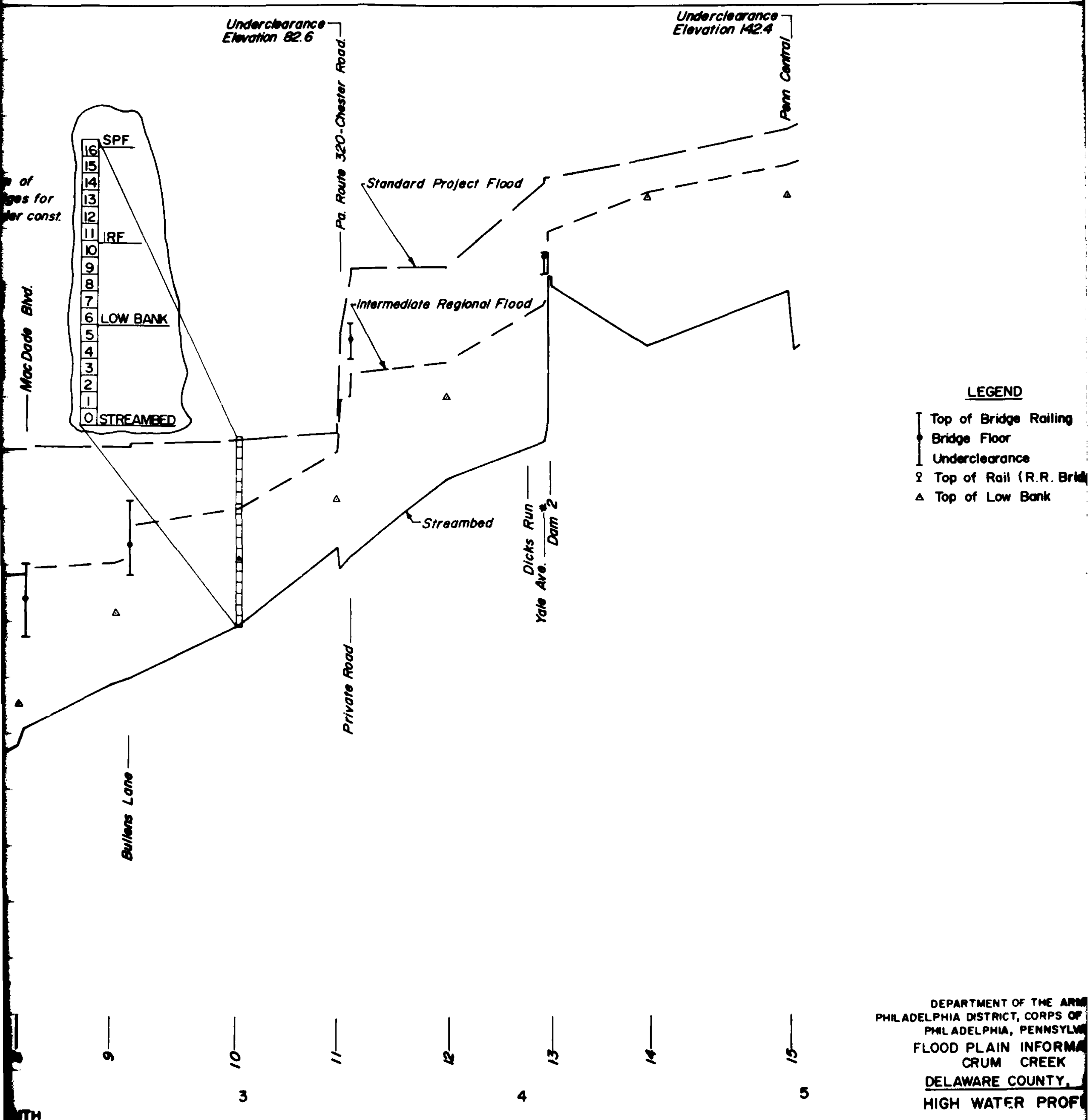
CRUM CREEK
DELAWARE COUNTY, PA.

FLOODED AREAS

PLATE 8



ELEVATION IN FEET (MEAN SEA LEVEL DATUM)
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-10
-20
Confluence with Delaware River
Reading R.R.
Pa. Route 291
Boeing Co. Footbridge
Private Road - Boeing Co.
Private Road - United Eng. Co.
R.R. Spur Bridge
Penn Central R.R.
R.R. Spur Bridge
Baldwin Co. Footbridge
Baldwin Building
Chester Pike U.S. Rte. 13
B&O Railroad
Approximate location of four High Level Bridges for Interstate Rte. 95 under cons
Jefferson Ave.
MacDade Blvd.
Box Culvert
Dam #1
1
2
3
4
5
6
7
8
0
1
2
MILES ABOVE MOUTH



DEPARTMENT OF THE ARM
PHILADELPHIA DISTRICT, CORPS OF
PHILADELPHIA, PENNSYLV

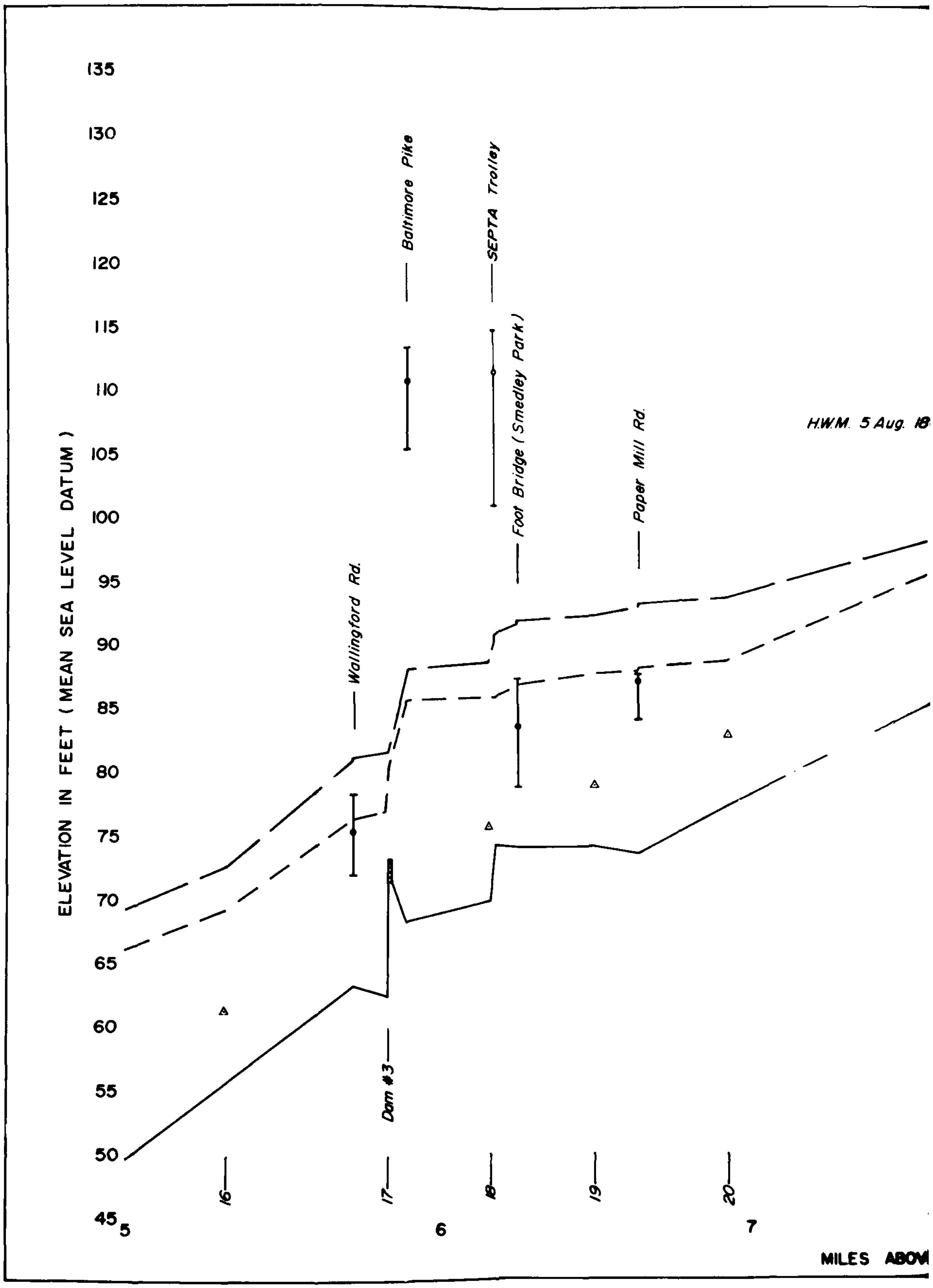
FLOOD PLAIN INFORMA
CRUM CREEK
DELAWARE COUNTY,
HIGH WATER PROF

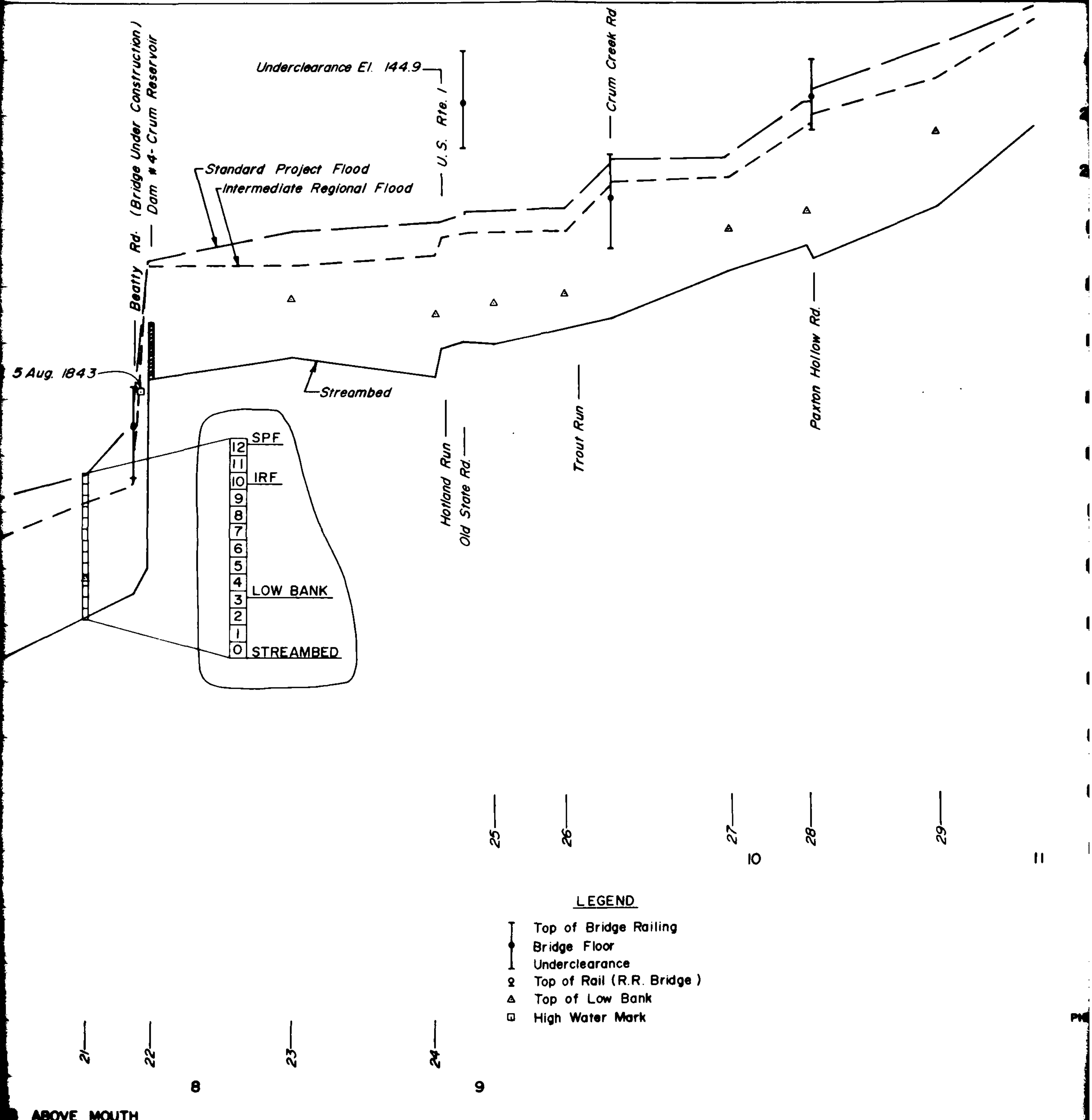
Railing

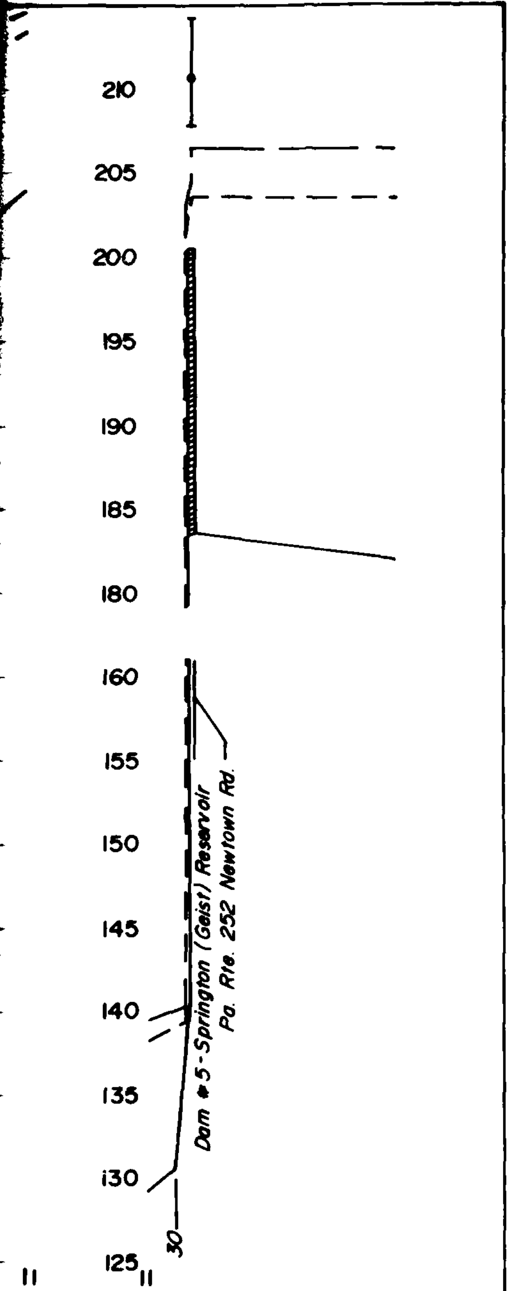
(R R Bridge)
Bank

THE ARMY
CORPS OF ENGINEERS
PENNSYLVANIA
INFORMATION
CREEK
UNTY, PA.
PROFILES

PLATE 9


ELEVATION IN FEET (MEAN SEA LEVEL DATUM)
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
Baltimore Pike
SEPTA Trolley
Foot Bridge (Smedley Park)
Paper Mill Rd.
Wallingford Rd.
Dam #3
H.W.M. 5 Aug. 18
16
17
18
19
20
5
6
7
MILES ABOV


Underclearance El. 144.9
U.S. Rte. 1
Crum Creek Rd
Beatty Rd. (Bridge Under Construction)
Dam # 4-Crum Reservoir
Standard Project Flood
Intermediate Regional Flood
5 Aug. 1843
Streambed
Hotland Run
Old State Rd.
Trout Run
Paxton Hollow Rd.
SPF
IRF
LOW BANK
STREAMBED
12
11
10
9
8
7
6
5
4
3
2
1
0
21
22
23
24
25
26
27
28
29
8
9
10
11
LEGEND
Top of Bridge Railing
Bridge Floor
Underclearance
Top of Rail (R.R. Bridge)
Top of Low Bank
High Water Mark
ABOVE MOUTH



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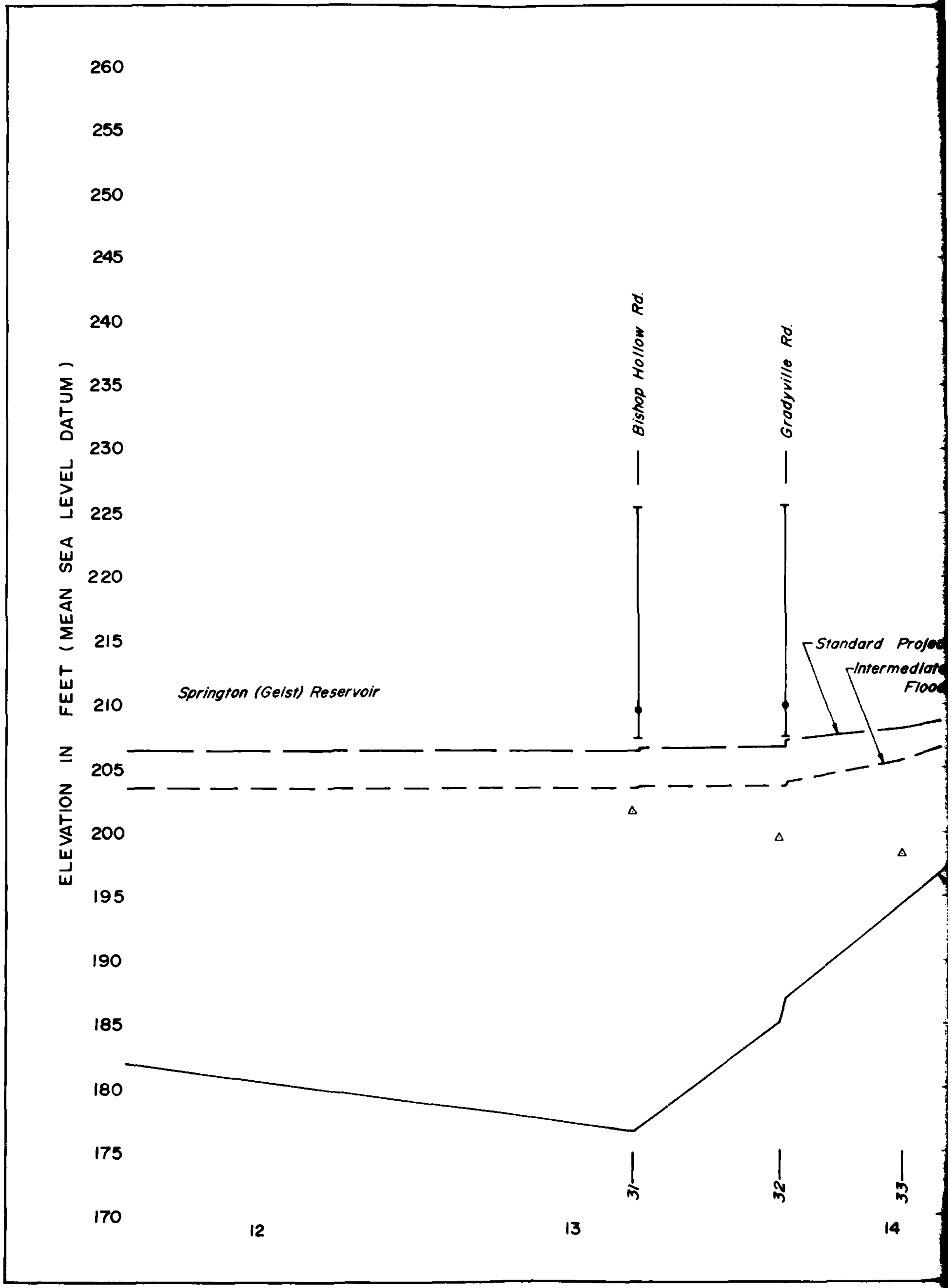
PHILADELPHIA, PENNSYLVANIA

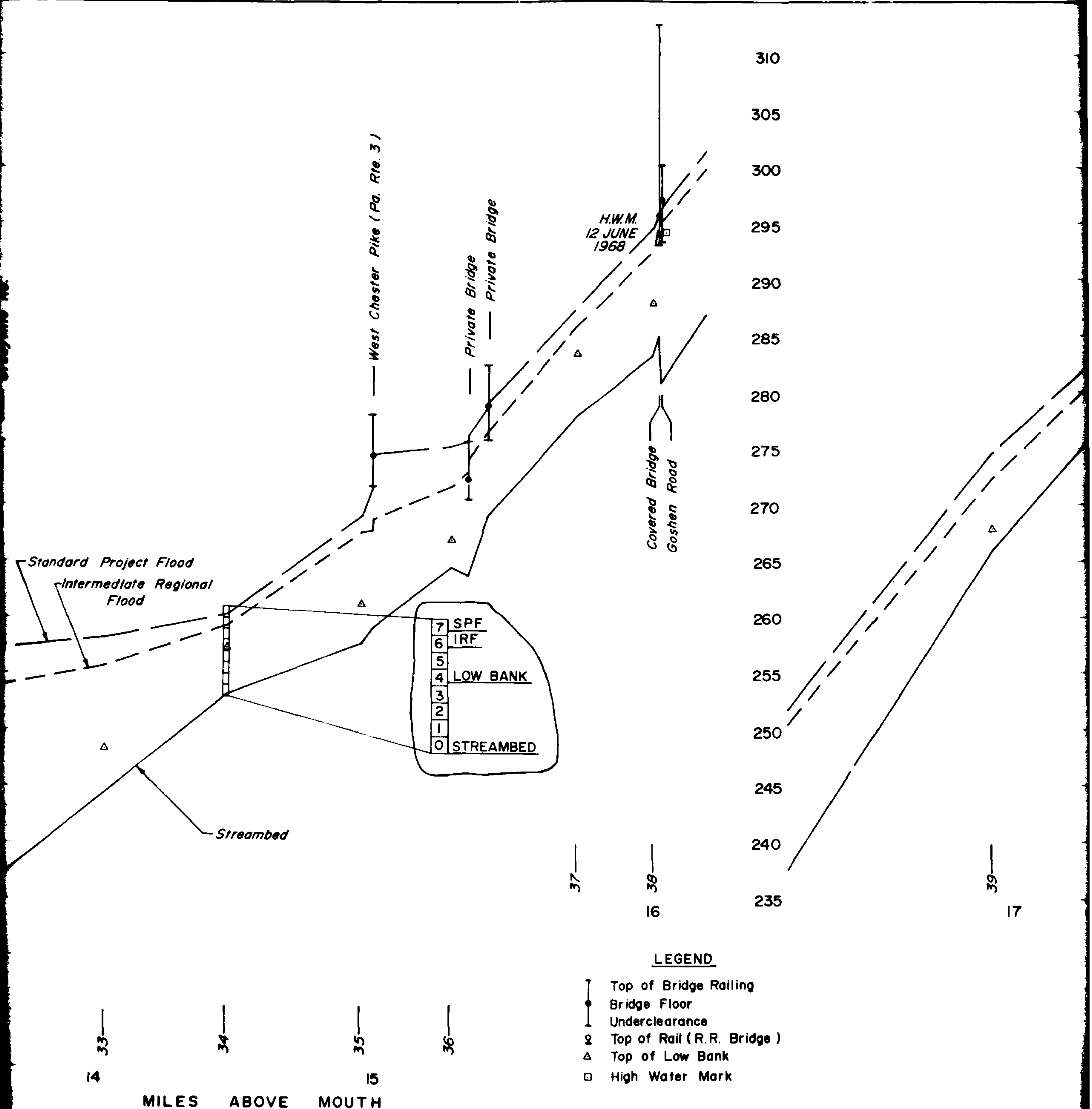
FLOOD PLAIN INFORMATION
CRUM CREEK
DELAWARE COUNTY, PA.

HIGH WATER PROFILES

PLATE 10

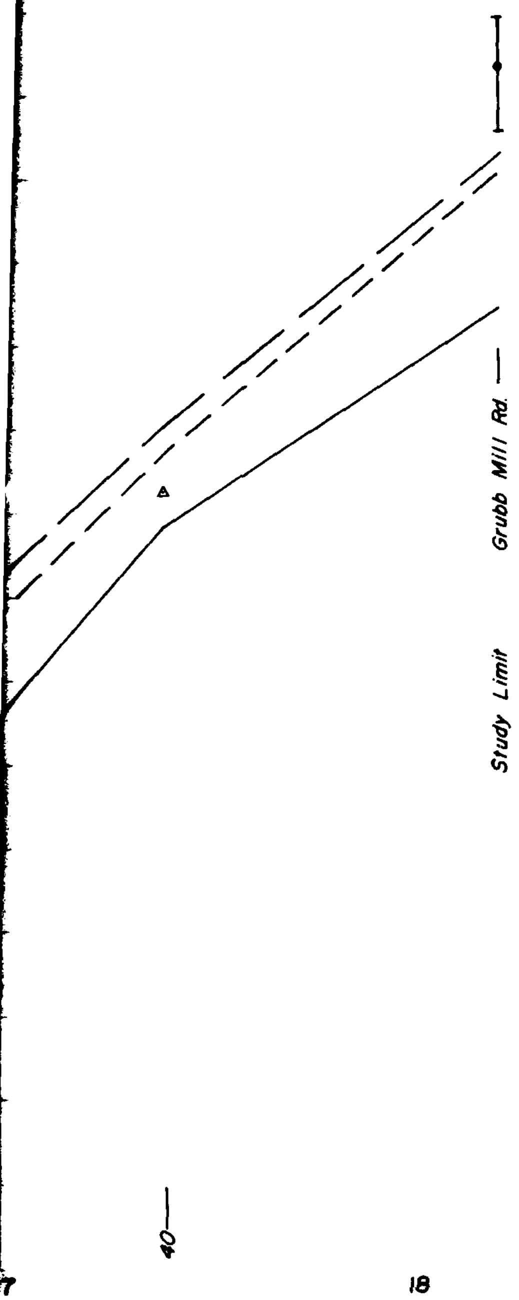


ELEVATION IN FEET (MEAN SEA LEVEL DATUM)
260
255
250
245
240
235
230
225
220
215
210
205
200
195
190
185
180
175
170
Bishop Hollow Rd.
Gradyville Rd.
Standard Proje
Intermediate
Flood
Springton (Geist) Reservoir
31
32
33
12
13
14



West Chester Pike (Pa. Rte. 3)
Private Bridge
Private Bridge
H.W.M.
12 JUNE
1968
Covered Bridge
Goshen Road
Standard Project Flood
Intermediate Regional Flood
Streambed
7 SPF
6 IRF
5
4 LOW BANK
3
2
1
0 STREAMBED
310
305
300
295
290
285
280
275
270
265
260
255
250
245
240
235
33
34
35
36
37
38
39
14
15
16
17
MILES ABOVE MOUTH
LEGEND
Top of Bridge Railing
Bridge Floor
Underclearance
Top of Rail (R.R. Bridge)
Top of Low Bank
High Water Mark

1 2



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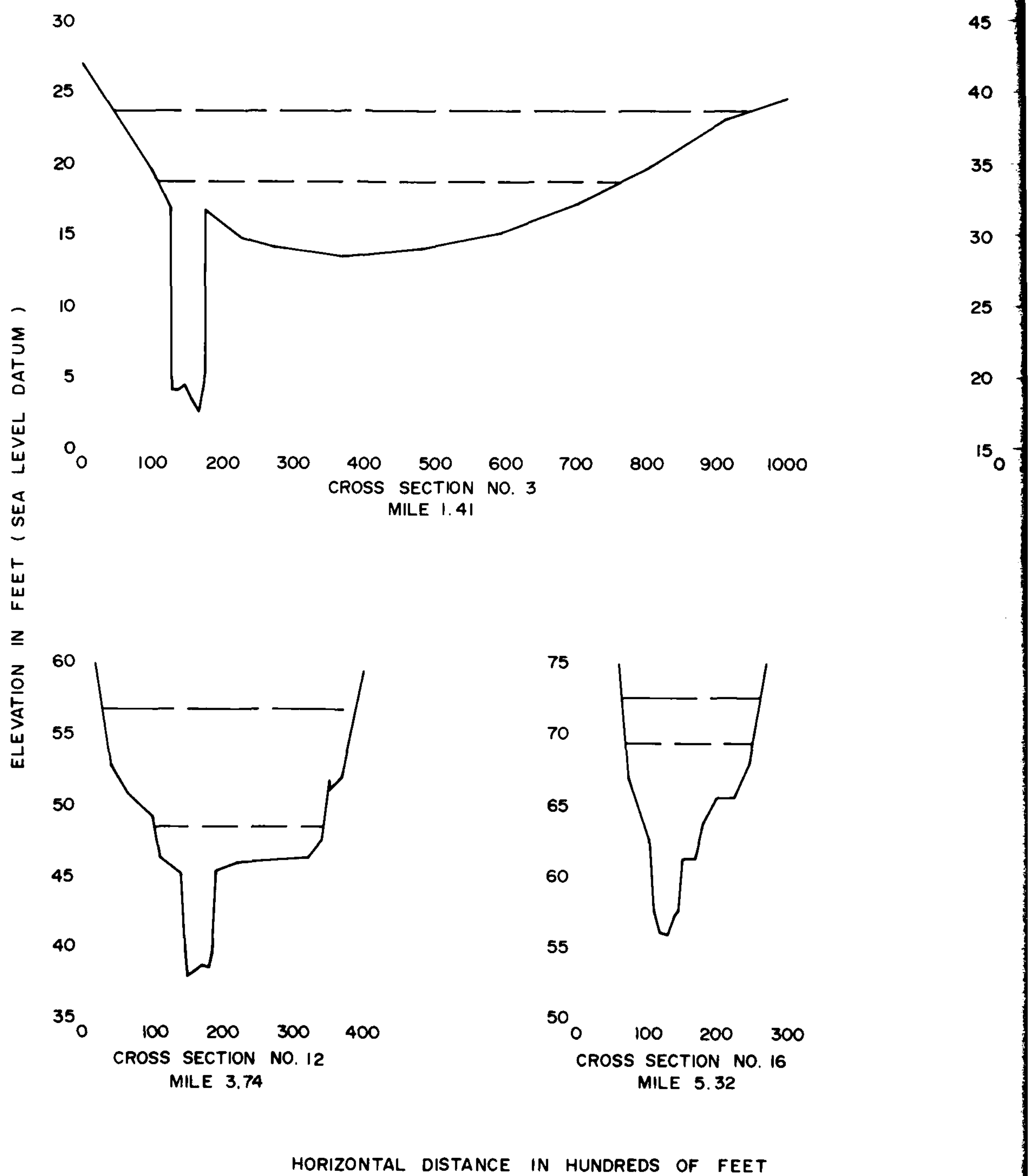
PHILADELPHIA, PENNSYLVANIA

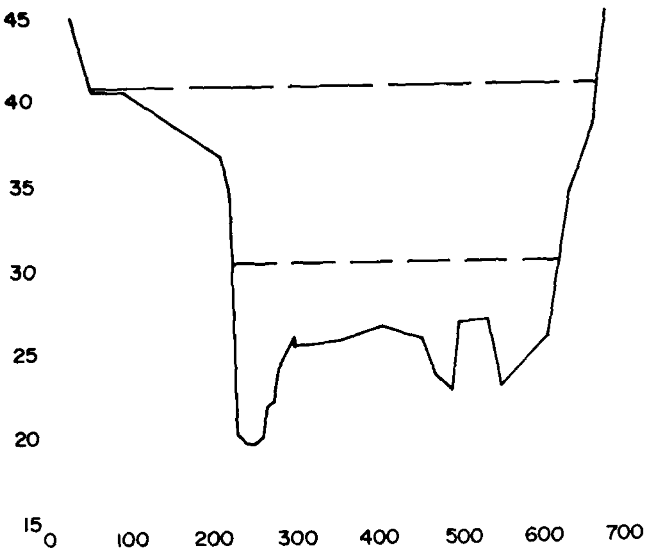
FLOOD PLAIN INFORMATION
CRUM CREEK
DELAWARE COUNTY, PA.

HIGH WATER PROFILES

PLATE 11

3


ELEVATION IN FEET (SEA LEVEL DATUM)
30
25
20
15
10
5
0
0
100
200
300
400
500
600
700
800
900
1000
45
40
35
30
25
20
15
0
CROSS SECTION NO. 3
MILE 1.41
60
55
50
45
40
35
0
100
200
300
400
CROSS SECTION NO. 12
MILE 3.74
75
70
65
60
55
50
0
100
200
300
CROSS SECTION NO. 16
MILE 5.32
HORIZONTAL DISTANCE IN HUNDREDS OF FEET



CROSS SECTION NO. 9
MILE 2.52

NOTES:
The 32 sections on Crum 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

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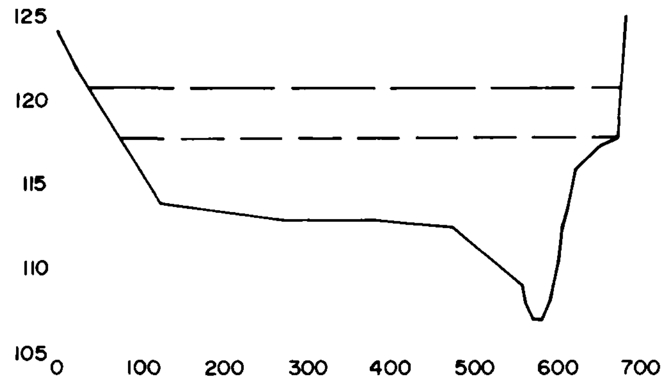
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

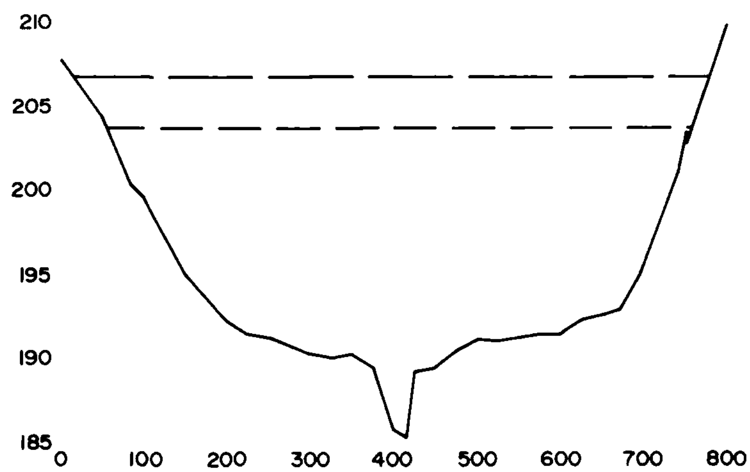
FLOOD PLAIN INFORMATION
CRUM CREEK
DELAWARE COUNTY, PA.

SELECTED CROSS SECTIONS



CROSS SECTION NO. 24
MILE 8.85

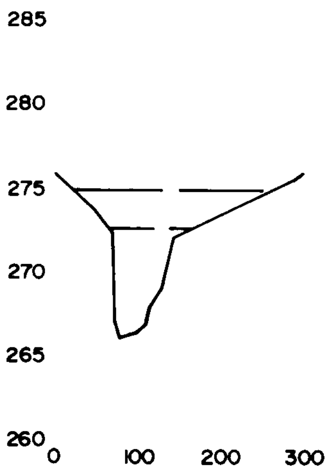
ELEVATION IN FEET (SEA LEVEL DATUM)



CROSS SECTION NO. 32
MILE 13.65

HORIZONTAL DISTANCE IN HUNDREDS OF

CROSS SECTION NO. 27
MILE 9.91



CROSS SECTION NO. 39
MILE 16.93

NOTES:
See Plate No. 12

LEGEND

— — —	Standard Project Flood
— — — —	Intermediate Regional Flood
———	Ground Line

DREDS OF FEET

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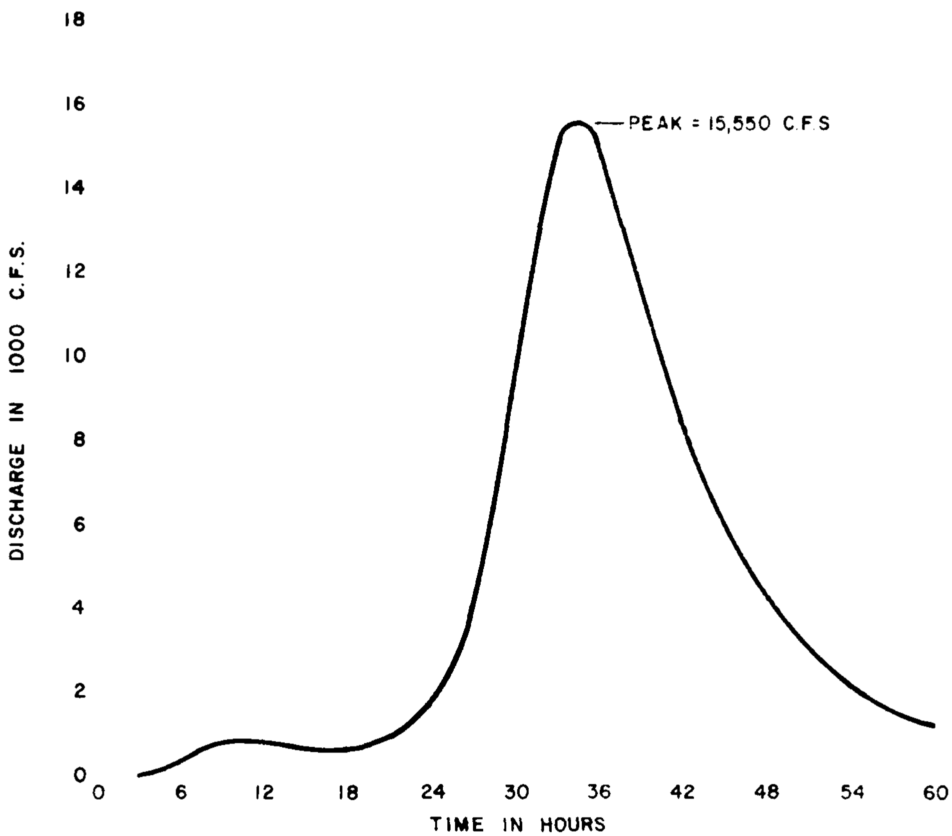
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CRUM CREEK
DELAWARE COUNTY, PA.

SELECTED CROSS SECTIONS

PLATE 13



NOTES

HYDROGRAPH IS TAKEN AT THE MOUTH OF CRUM CREEK.

DRAINAGE AREA = 38.4 SQ. MI.

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

FLOOD PLAIN INFORMATION

CRUM CREEK
DELAWARE COUNTY, PA.

STANDARD PROJECT FLOOD
HYDROGRAPH