DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
SUSQUEHANNA RIVER BASIN COMMISSION
U.S. ARMY CORPS OF ENGINEERS

HYDROLOGIC INVESTIGATIONS
ATLAS HA–523

FLOOD OF JUNE 1972 IN WILKES-BARRE AREA, PENNSYLVANIA

This atlas presents hydrologic information on the frequency, depth, and extent of flooding along a 19-mile reach of the Susquehanna River, from the vicinity of Harding to Nanticoke, in the Wyoming Valley of Luzerne County, Pennsylvania. The principal community within this reach is Wilkes-Barre. The atlas provides a technical foundation for plans that involve the use of flood-plain lands.

The areal extent of flooding is mapped for the largest known flood, which occurred June 24, 1972, as a result of heavy rains that accompanied Tropical Storm Agnes. The approximate inundation area for a hypothetical flood having a recurrence interval of 100 years is also mapped. The areal extent was determined on the basis of flood profiles and delineations of inundated areas as defined by field surveys of the 1936 and the 1972 floods.

Flood history.—The stream-gaging station at Wilkes-Barre, in operation since 1891, is the primary source of flood data in the vicinity of Wilkes-Barre. In addition, streamflow records are collected on Solomon and Toby Creeks within the study area. Records for these and other nearby gages are included in water-supply papers of the U.S. Geological Survey.

The floods of March 1865 and March 1936, both of which reached a stage of 33.1 feet, were the greatest floods in the period from 1784 to 1971. These floods were of major significance and, consequently, flood-protection works were installed in the 1940's and 1950's to protect Wilkes-Barre and nearby communities from floods of similar magnitude. The 1972 flood, which reached elevations 7 to 8 feet higher than those of the 1936 flood, breached the protective levees in most areas.

Flood occurrence.—Annual floods above 534.0-foot elevation, which corresponds to bankfull stage in unprotected areas upstream of Wilkes-Barre, have occurred in 45 of 82 consecutive years. Their peak elevations and the years of occurrence are shown in figure 1. The irregular distribution of floods with respect to time is evident. Peak gage heights for the Wilkes-Barre gage can be determined by subtracting 512.07 feet from flood elevations.

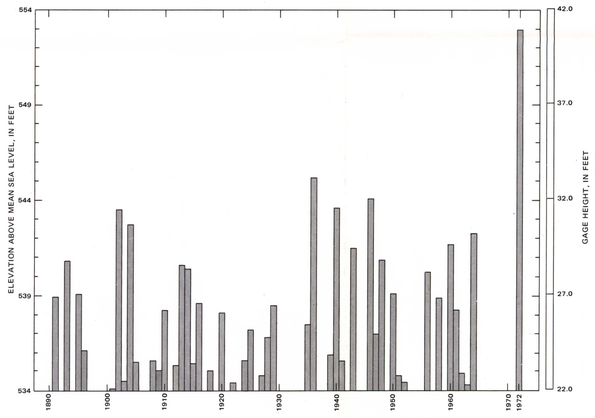

FIGURE 1. – *Annual floods above 534.0-foot elevation, Susquehanna River at Wilkes-Barre (1-5365), 1891–1972.*

Flood discharge.—Flood discharge, which is commonly expressed in cubic feet per second, indicates the maximum rate of flow during the flood. The maximum discharges of some floods, particularly those involving ice jams, are not simultaneous with the maximum elevations, because of variable backwater.

Flood frequency.—Frequency of flooding on the Susquehanna River was determined from the records of annual floods for the gaging station at Wilkes-Barre. Analyses were made by the log-Pearson Type III method (Water Resources Council, 1967) and by the regional relationships developed for the Susquehanna River by Tice (1967). For recurrence intervals of 2.33 to 100 years, the results of these analyses agree within 2 percent. The relationship between discharge and frequency, as developed by the log-Pearson Type III method, is given in figure 2.

As applied to flood events, recurrence interval is the average interval of time within which a given flood will be equaled or exceeded once. Frequency of floods may also be stated in terms of their probabilities of occurrence (virtually reciprocals of their recurrence intervals for floods with recurrence intervals greater than 10 years). For example, a flood with a 25-year recurrence interval would have 1 chance in 25 or 4-percent chance of being equaled or exceeded in any given year, or a flood with a 100-year recurrence interval would have 1 chance in 100 or 1-percent chance of being equaled or exceeded in any given year. Extrapolation of the flood-frequency curve beyond a recurrence interval of 200 years is not recommended, owing to the questionable validity of estimated relations. Thus, the recurrence interval for annual floods of the magnitude of the 1972 flood cannot be reliably predicted through analysis of the flood records available.

The relationship between recurrence interval and flood height at the Wilkes-Barre gaging station, shown in figure 2, is based on present channel conditions. This relationship could be altered by future changes in the stream channel and the bridges downstream from the gaging station.

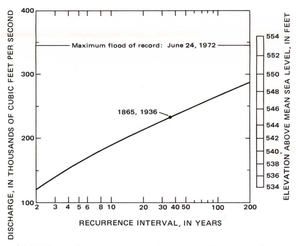

FIGURE 2. – *Frequency of flood discharges of Susquehanna River at Wilkes-Barre (1-5365).*

Flood profiles.—Profiles of the surface of the Susquehanna River along its main channel are shown in figure 3 for the floods of 1936 and 1972 and for the hypothetical flood of 100-year recurrence interval. The 1936 and 1972 profiles are based on field surveys of peak elevations on both sides of the channel. All indicated effects of bridges are based on surveys of the 1972 flood. Peak elevations in the central third of the mapped reach were as much as 1½ feet lower on the west side of the channel than on the east side at the peak of the 1972 flood, as a result of flow over the levees on the west bank.

An approximate water-surface profile for a flood of a selected recurrence interval may be prepared by plotting the appropriate elevation, as obtained from figure 2, at river mile 187.45, and drawing the profile through that point approximately parallel to the profiles shown.

Elevations for the 100-year flood correspond very closely to the minimum elevations of the levee tops at the time of the 1972 flood. Thus, the levee system is expected to provide protection from all floods whose magnitudes do not exceed that of the 100-year flood.

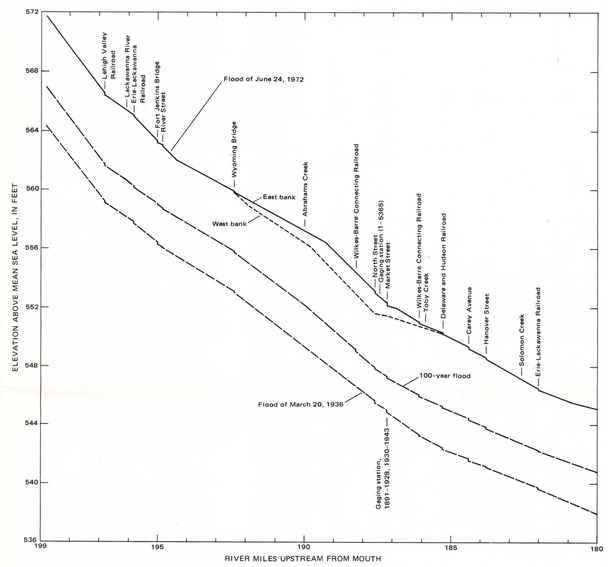

FIGURE 3. – *Profiles of floods on Susquehanna River in the Wilkes-Barre area.*

Depth of flooding.—The area inundated by the flood of June 24, 1972, is shown on the topographic map. Flood elevations along the channel (fig. 3) do not generally correspond to flood elevations in developed areas of the adjacent flood plain; therefore, spot water-surface elevations and depths of inundation have been inserted to provide a general guide to flood elevations and water depths in areas away from the river channel. Depths for the sites shown were determined at the edges of roadways and at road intersections.

Acknowledgments.—This report was prepared by the Pennsylvania District of the U.S. Geological Survey in cooperation with the Pennsylvania Department of Environmental Resources, the Susquehanna River Basin Commission, and the U.S. Army Corps of Engineers. The investigation was conducted under the administrative direction of Norman H. Beamer, district chief.

Additional information.—Other information pertaining to floods on the Susquehanna River in Pennsylvania may be obtained from the U.S. Geological Survey, P.O. Box 1107, Harrisburg, Pennsylvania, 17108, and from the following published reports:

Grover, N.C., 1937, The floods of March 1936: U.S. Geol. Survey Water-Supply Paper 799, 667 p.
Mangan, J.W., 1936, The floods of March 1936 in Pennsylvania: Commonwealth of Pennsylvania, Department of Forests and Waters, 129 p.
Tice, R.H., 1967, Magnitude and frequency of floods in the United States, part 1-B: U.S. Geol. Survey Water-Supply Paper 1672, 585 p.
Water Resources Council, Hydrology Committee, 1967, A uniform technique for determining flood-flow frequencies: Washington, D.C., Water Resources Council Bull. 15, 15 p.

EXPLANATION

- Boundary and area for flood of June 24, 1972
- Approximate boundary and area of hypothetical 100-year flood
- Elevation of 1972 high-water mark, in feet above mean sea level (upper figure) and depth of inundation, in feet (lower figure) — 545.4 / 6.0
- River miles upstream from mouth — 187
- Gaging station — 1-5375
- Direction of flow

Base from U.S. Geological Survey
Kingston, 1946, Wilkes-Barre West, 1950
Pittston, Wilkes-Barre East, 1947
Photorevision as of 1969

SCALE 1:24 000
1 0 1 MILE
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

PENNSYLVANIA
MAP LOCATION

APPROXIMATE MEAN DECLINATION, 1973

FLOOD OF JUNE 1972 IN WILKES-BARRE AREA, PENNSYLVANIA

By
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1973

For sale by U.S. Geological Survey, price 75 cents

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