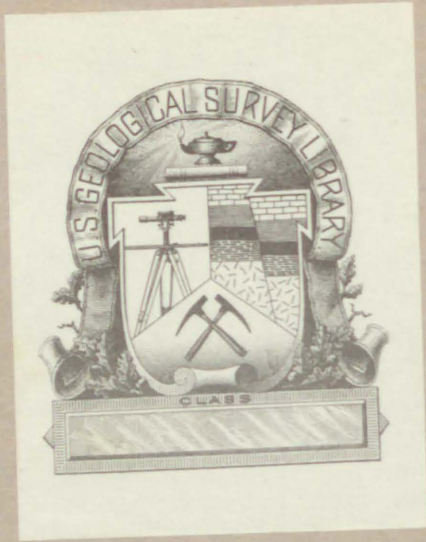




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FLOODFLOW CHARACTERISTICS AT PROPOSED
BRIDGE SITE ON MOHAWK RIVER,
WHITESBORO, NEW YORK

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Open-File Report 75-442

Prepared in cooperation with
New York State Department of Transportation

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Albany, New York

September 1975

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ILLUSTRATION

Figure 1. Location map showing planned road relocation and bridge construction over the Mohawk River at Whitesboro, N.Y..	5
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CONVERSION FACTORS AND ABBREVIATIONS

The following factors may be used to convert English units to the International System of Units (SI):

Multiply English units	By	To obtain SI Units
	<u>Length</u>	
feet (ft)	0.3048	metres (m)
miles (mi)	1.609	kilometres (km)
	<u>Area</u>	
square miles (mi ²)	2.590	square kilometres (km ²)
	<u>Flow</u>	
cubic feet per second (ft ³ /s)	.02832	cubic metres per second (m ³ /s)
feet per second (ft/s)	.3048	metres per second (m/s)

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE
ON MOHAWK RIVER, WHITESBORO, NEW YORK

By

Bernard Dunn

ABSTRACT

An evaluation of floodflow characteristics at the proposed bridge site revealed that:

1. The design-flood discharge for the proposed bridge site would be 18,200 cubic feet per second (515 cubic metres per second), which is about equal to the discharge for the 100-year flood.
2. The elevation at the bridge site for the flood of October 2, 1945, was 411.8 feet (125.5 metres).
3. Alternate-bridge designs 1 and 2 would cause 0.2 foot (0.06 metre) increase in water level.

INTRODUCTION

New York State Department of Transportation plans to relocate a section of County Highway 30 in the towns of Marcy and Whitestown in Oneida County. Two alternate sections that would eliminate a series of broken-back and reverse curves and replace the present structures over the Mohawk River and the New York State Barge Canal are proposed.

By a letter to the U.S. Geological Survey on March 5, 1975, Mr. A. W. Moon, Assistant Deputy Chief Engineer, New York State Department of Transportation, requested an analysis of the floodflow characteristics of the Mohawk River to determine the effects of the road relocation and bridge construction on floodflow. Data and computations supporting the information in this report are available for inspection at the U.S. Geological Survey office in Albany. All elevations are referred to mean sea level, datum of 1929.

Data Available

Hydrologic information in this report is based primarily on flood data collected for the flood of October 2, 1945, by the Geological Survey and the State Department of Transportation. Additional data used in the analysis included plan drawings and cross-sectional profiles, which were provided by the State Department of Transportation.

Site Description

Relocation of the section of the highway would be as shown in figure 1. At this site the drainage area of the Mohawk River is 436 mi² (1,130 km²).

The relocated highway would cross a broad flood plain of the Mohawk River. The channel is straight, through and downstream from the site. Upstream from the site toward the Thomas E. Dewey Thruway bridge, about 2,500 ft (762 m), the channel bends slightly. The right-bank flood plain upstream from the site is flat and is covered with grass, brush, and trees. Several businesses are on this bank. On the left bank between the river and the canal, the land is farmed. The south side of the canal has a berme, which prevents flooding of the canal.

Work on the proposed location would start north of the Penn Central Railroad tracks, proceed northerly for about 1.2 mi (1.9 km), and terminate at State Highway 49. The road would cross the Mohawk River and the New York State Barge Canal. Elevation of the highway would be sufficient to prevent flow over the road.

MAGNITUDE AND FREQUENCY OF FLOODS

Although no flood discharges have been obtained at the proposed bridge site, discharge of the Mohawk River at Leland Avenue in Utica for the flood of October 2, 1945, was computed to be 21,000 ft³/s (595 m³/s). Drainage area for the site is 532 mi² (1,360 km²).

The elevation 411.8 ft (125.5 m) at the proposed bridge site for the flood of October 2, 1945, was furnished by the New York State Department of Transportation.

Flood Frequency

No flood frequency has been computed for the site. A comparison of discharges at gaging stations in the area was made for the flood of October 2, 1945. Discharge of the October 2, 1945, flood was the highest since 1899 for the Mohawk River and most tributary gaging stations. A log-Pearson Type III analysis for each gaging station determined that the 100-year discharge was comparable to that experienced during the flood of October 2, 1945.

The design-flood discharge for the proposed bridge site would be 18,200 ft³/s (515 m³/s), which is about equal to the discharge for the 100-year flood. This discharge was computed by multiplying the discharge at Leland Avenue by a factor consisting of drainage area ratios raised to a power developed from data collected in the area of study.

ANALYSIS OF HYDRAULIC CONDITIONS

The planned bridge over the Mohawk River is identical for alternate plans 1 and 2. The only difference in the alternates is the proposed highway alignment. Effects of the two alternates are so similar that hydraulically they both give virtually the same answer.

Elevation of the roadway in both alternate highway designs would be sufficiently high to prevent road overflow. The hydraulic analysis of the bridge over the Mohawk River for each alternate plan was made to include all the floodflow through the bridge. This condition would cause the maximum water level at the site. The design report for these alternates mentioned that culverts approximately 6 ft (1.8 m) in diameter would be installed at various locations along the embankment. However, as the analysis was made when the design was in a preliminary stage, culvert flow was not considered in the analysis.

Results of the computations for alternates 1 and 2 show that both bridges, each having a length of 230 ft (70 m) and a net area of 3,350 ft² (311 m²) would cause an increase in water level of 0.2 ft (0.06 m). The water elevation at the approach section for each design would be 412.1 ft (125.6 m). This elevation represents the total of the normal

water-surface elevation, the normal friction loss between the approach section and the proposed bridges, and the increase in water level created by the proposed bridges. The approach section is a cross section of the natural, unconfined channel upstream from the beginning of drawdown. It is usually one bridge-opening width upstream from the bridge.

Average velocities in feet per second in the approach section of alternate bridge designs 1 and 2 for planned bridge over the Mohawk River at Whitesboro, N.Y. would be as shown in the following table:

	Approach section				Through bridge
	Average velocity	Left bank overflow plain	Main channel	Right bank overflow plain	Average velocity
Alternate 1	1.60	0.90	3.72	0.89	5.36
Alternate 2	1.79	1.17	3.99	.90	5.35

SUMMARY

This study has evaluated the effect of two alternate-bridge designs on the floodflow characteristics of the Mohawk River. Results of this analysis may be summarized as follows:

1. The design-flood discharge for the proposed bridge site would be 18,200 ft³/s (515 m³/s), which is about equal to the discharge for the 100-year flood.
2. The elevation at the bridge site for the flood of October 2, 1945, was 411.8 ft (125.5 m).
3. Alternate-bridge designs 1 and 2 would cause 0.2 ft (0.06 m) increase in water level.
4. Average velocities through alternate-bridge designs 1 and 2 would be 5.36 ft/s (1.63 m/s) and 5.35 ft/s (1.63 m/s), respectively, and in the main channel of the approach section for alternate-bridge designs 1 and 2 would be 3.72 ft/s (1.13 m/s) and 3.99 ft/s (1.22 m/s), respectively.

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