01578310 Susquehanna River at Conowingo, Maryland

(Gaging station in Susquehanna River basin, USGS Maryland Water Science Center)

Review of peak discharge for the flood of June 24, 1972

Location: This flood was located about 3 mi north of Havre de Grace, Maryland, on the Interstate Highway I-95 bridge at 39.5812N and 76.1059W.

Published peak discharge: The peak discharge, as published in NWIS, is 1,130,000 ft^3/s for this site and occurred on June 24, 1972. Footnotes state that the peak is affected by regulation and diversion. The peak discharge and date agree with those listed in Costa (1987a, 1987b).

Drainage area: 27,100 mi^2.

Data for storm causing flood: The following quotation was taken from a Web site prepared by the Maryland Water Science Center (http://md.water.usgs.gov/floods/Agnes/Conowingo/index.html).

> "In June 1972, Tropical Storm Agnes produced significant precipitation over much of the Middle Atlantic States, particularly in the Susquehanna River Basin. Although the storm itself was only a minor hurricane, it's large areal extent and sustained path over parts of New York and Pennsylvania resulted in 6 to 10 inches of rainfall throughout the Susquehanna River Basin from June 19 to 23, with the Mahantango Creek watershed north of Harrisburg receiving as much as 18 inches.
>
> Because of the excessive rainfall and relatively wet antecedent conditions, the Susquehanna River experienced the greatest flooding known since as far back as 1784, with peak flows exceeding a 100-year recurrence interval from about the New York state line to its mouth at the Chesapeake Bay."

Photograph of bridge where measurement was made is shown in figure A246.

Method of peak discharge determination: The peak discharge is based on a current-meter measurement made at a stage of 36.76 ft, which is 0.06 ft less than the peak stage of 36.83 ft. The measurement was made at Interstate Highway 95, about 6.5 mi downstream of the gaging station. The gaging station is located at Conowingo Dam.

Adjustments were made to the measured discharge for change in stage and local inflow between the measuring site and the gage site. These adjustments were very small, amounting to a net change of -3,300 ft^3/s (-0.3 percent).

A detailed review was made of the current-meter measurement. All depths are sounded depths, and all mean velocities of verticals are based on the 0.2/0.8 method. All point velocities and mean velocities are rounded to tenths of a foot per second. A total of 24 subsections was used. Considering the total width of the channel of 4,290 ft, the average width of the subsections was almost 200 ft, with some subsections exceeding 200 ft. The channel is deep (60 ft) on the left side and more shallow (20 ft) on the right side. Velocities are distributed relatively uniformly, with the highest velocities on the left side. Subsection discharges are considerably higher on the left side. This would be the main criticism of the measurement. It would have been better if subsections on the left side were not as wide. However, there are no subsections with discharges exceeding 10 percent of the total discharge.

Depths in the deeper part of the channel were computed by applying a vertical-angle correction to determine the wet-line correction. Air-line corrections were not made because a tag was used on the suspension cable at a distance of 30 ft above the meter. Vertical angles were not recorded, or if they were they cannot be discerned in the measurement notes. Only the wet-line correction, to the nearest foot, is shown in the measurement notes. The procedures for determining the wet-line vertical-angle corrections for depth and meter positioning are not shown in the computations.

The rating curve for this site is controlled by Conowingo Dam. All measurement gage heights greater than 1,000 ft^3/s were adjusted by -6.00 ft (log offset), resulting in a straight-line rating throughout. This rating curve has a slope of 2.4, which is indicative of a section control (Conowingo Dam). Although there are very few measurements during the 32-year period 1968–2000, all measurements fit closely to the defined curve. The measurement for the 1972 flood is higher than any previous measurement by a factor of 3.2, so this measurement represents a very significant extension of the rating.

The slight extension (0.06 ft) of the rating from the measurement to the 1972 peak stage did not change the measured peak discharge because of rounding. The measured discharge of 1,128,000 ft^3/s, rounded to 1,130,000 ft^3/s, also is the published peak discharge.

Possible sources of error: The most likely sources of error in the current-meter measurement would be (1) the rather wide subsections in the deep part (left side) of the channel and (2) the vertical-angle corrections for depth and meter positioning. However, because velocities and depths are uniform, the error for subsection width probably is not significant. Errors resulting from vertical-angle corrections cannot be determined. It must be assumed that the streamgagers were familiar with vertical-angle corrections and applied them correctly.

The discharge measurement site (Interstate Highway I-95) is only about 3 mi upstream of the mouth of the river at Chesapeake Bay. Tidal fluctuations would no doubt have an effect on river flow at I-95, but because of the very high river flow, it is unlikely that tide affected the measurement.

Recommendations of what could have been done differently: The fact that a current-meter measurement was made so near the peak stage is highly commendable. The only thing that should have been done differently was to have made more detailed notes regarding the computation of vertical-angle corrections.

Site visit and review: No visit made to this site.

Recommendation: The original peak discharge of 1,130,000 ft^3/s should be accepted as published, and rated good.

Figure A246. View upstream of Interstate Highway I-95 bridge across Susquehanna River where current-meter measurement was made of June 24, 1972 flood, Susquehanna River at Conowingo, Maryland.