Boney Branch at Rock Port, Missouri

(Miscellaneous ungaged site in the Boney Branch basin, USGS Missouri Water Science Center)

Review of peak discharge for the flood of July 18, 1965

Location: This flood was located in the western city limits of Rock Port, Missouri, at 40.4139N and 95.5167W.

Published peak discharge: The published peak discharge for this flood is 5,080 ft^3/s at a miscellaneous site 0.3 mi from the confluence with Rock Creek. The computation was rated fair.

Drainage area: The drainage area of 0.76 mi^2 was estimated from a 1:62,500-scale topographic map. A GIS re-run from a 1:24,000-scale topographic map produced an area of 0.71 mi^2. The basin drains the loess hills west of the town of Rock Port. There are numerous small dams in drainages to create stock-watering ponds and two larger ponds probably designed as detention ponds to slow runoff from storms. It is not known how many of these small ponds were in place at the time of the 1965 flood, but the largest was built afterwards.

Data for storm causing flood: Torrential rainfall covered the entire Boney Branch basin on July 18, 1965. Estimates range from 11 to 18 in. of rain from the storm on July 18 and about 8 in. from a second storm on July 19 (Atchison County Mail, July 20, 1965, edition). A local resident measured 14 in. of rain from the first storm, which caused the peak flow in Boney Branch, and 8 in. from the second storm the next day. Boney Branch is an east-flowing drainage from the loess hills bordering the Missouri River flood plain and is a tributary to Rock Creek that flows into the Missouri River. Rock Creek also flooded and damaged bridges and businesses in downtown Rock Port. Historical photographs taken after the flood of July 18, 1965, and photographs taken during the 2003 review and described herein are provided in figures A198–A211.

Method of peak-discharge determination: Peak discharge was computed from a three-section slope-area measurement. The 400-ft-long reach is slightly curving with a fairly large overflow area along the left bank. The main channel is covered with small brush and scattered trees. The left-bank overflow is grass and is kept short by local residents. The right bank is steep and did not overtop except in the upstream part of the reach. The main channel is very sinuous upstream of the reach. There is a road embankment about 0.25 mi upstream of the reach, but it is unknown if flow was impounded behind this embankment, if the road was overtopped and the embankment failed, or if the road embankment was in place at the time of the peak discharge.

The site was first visited on August 11, 1965. The reach was selected, and a few high-water marks were flagged. These were mostly seed lines on trees near the main channel. The profile and cross sections were surveyed on August 24–25, 1965. The high-water profile is defined by six high-water marks on each bank, most of which were flagged marks selected during the initial site visit. The profiles define a 1.8-ft fall through the approximately 300 ft (slope = 0.006 ft/ft) between sections 1 and 3. The slope of the high-water profile on both banks is essentially parallel. Most of the right bank slumped during or after the peak eliminating most usable high-water marks. The left bank was essentially a lawn maintained by local residents, so most high-water marks along that bank probably were destroyed during cleanup.

Manning's "*n*" values were estimated during the initial site visit on August 11, and the survey party chief concurred with the assigned values. A composite "*n*" value of 0.055 was used throughout the reach even though each of the three sections was subdivided. The left-bank grassy overflow had a relatively low-flow resistance. Roughness in the upstream part of the reach appears to be greater because of a brushy left-bank overflow area just upstream of the upstream section and the sharp curvature just upstream of section 1. The main channel is cut into the loess, so the main flow resistance comes from vegetation and irregular banks.

Computed velocities ranged from about 5.5 to 7.0 ft/s. Froude numbers seem reasonable and are about 0.5 for all three sections. There must not have been much floating debris because a small pipeline crossing the channel was overtopped by about 8 ft of water and was not damaged.

Possible sources of error: The profiles are defined by too few high-water marks. Many of the defining marks are seed lines on trees in the main channel that could have been affected by run-up from surface velocities approaching 10 ft/s. These marks should have been verified by leveling to high-water marks along the flow margins. If this had been done, more high-water marks might have been found along the margins.

A composite "*n*" value probably should not have been used for subdivided sections. Independent estimate of flow resistance should have been assigned for each subdivided area and would have yielded a more defensible result. As an example, approximately 40 percent of the area of section 2 was grass inundated by about 8 ft of water. The same is true for about

25 percent of section 3 and a smaller percentage of section 1. Manning's "*n*" for the main channel would have to be higher (about 0.075) to account for the composite roughness coefficient used for the computation.

It is not known how much rain fell in the upstream part of the basin during the storm. There is no evidence that anyone investigated the possibility of failed storage ponds or ponding upstream of the road embankment.

Recommendations of what could have been done differently: Visiting flood sites as soon as possible after a flood, particularly in developed areas, would improve the accuracy and reliability of data collected. For example, cleanup often starts almost immediately after a flood, and good quality high-water marks can be destroyed. Always verify high-water marks obtained in mid-channel with evidence at the flow margin if possible to eliminate artificially elevated stage caused by run-up on the flow obstructions. Flow-resistance coefficients for each subarea need to be estimated for subdivided sections. Always conduct a reconnaissance of the upstream part of the basin, particularly in small basins, to search for evidence of landslides, erosion, or failed structures that could have a major effect on peak flow. Substantiate results for extreme floods by estimating peak flow in other affected drainages in the area to verify basin yield and spatial distribution of the storm and flooding (Jarrett, 1990).

Site visit and review: The site was visited on May 6, 2003, by John Costa (USGS Office of Surface Water), Rodney Southard (USGS Missouri Water Science Center), and Gary Gallino (USGS, retired). The field-review team interviewed a local resident who observed the flood and collected precipitation data for the storm. The team also visited the local newspaper office and reviewed articles about the storm and flood. Rodney Southard used the WSPRO step-backwater model to analyze water-surface elevations in the measurement reach because of concern about how representative the superelevated high-water marks caused by velocity-head run-up on tree trunks located near mid-channel were of actual water-surface elevations. Model results verified water-surface elevations at the cross sections within acceptable limits. Southard also re-ran the discharge computation using estimated Manning's "*n*" values for each subdivided area. The results were not significantly different than the original computation.

Recommendations: The original peak discharge of 5,080 ft^3/s should be accepted as published and the rating should be assigned as "fair."

The amount and intensity of the storm rainfall make this result reasonable.

Figure 198. View looking downstream of left bank of cross section 3, Boney Branch at Rockport, Missouri, August 1965.

Figure A199. View looking downstream of right endpoint of cross section 2, Boney Branch at Rockport, Missouri, August 1965.

Figure A200. View looking downstream of right endpoint of cross section 3, Boney Branch at Rockport, Missouri, August 1965.

Figure A201. View looking downstream of right endpoint of cross section 1, Boney Branch at Rockport, Missouri, August 1965.

Figure A202. View looking downstream at cross section 1, Boney Branch at Rockport, Missouri, August 1965.

Figure A203. View looking downstream of right bank between sections 2 and 1, Boney Branch at Rockport, Missouri, August 1965.

Figure A204. View looking downstream of cross section 2, Boney Branch at Rockport, Missouri, August 1965.

Figure A205. View looking downstream of cross section 1, Boney Branch at Rockport, Missouri, August 1965. Rod between sections 1 and 2.

Figure A206. View looking upstream of right bank between cross sections 2 and 3, Boney Branch at Rockport, Missouri, August 1965.

Figure A207. View looking upstream of cross section 1 to section 2, Boney Branch at Rockport, Missouri, August 1965.

Figure A208. View looking downstream between cross sections 2 and 3, Boney Branch at Rockport, Missouri, May 6, 2003.

Figure A209. View looking upstream at cross section 2, Boney Branch at Rockport, Missouri, May 6, 2003.

Figure A210. View looking upstream to cross section 2, Boney Branch at Rockport, Missouri, May 6, 2003.

Figure A211. Small agricultural dams in loess headwaters of Boney Branch at Rockport, Missouri May 6, 2003.