

Little Pinto Creek Tributary near Newcastle, Utah

(Miscellaneous ungaged site in the Virgin River basin, USGS Utah Water Science Center)

Review of peak discharge for the flood of August 11, 1964

Location: This flood was located about 11 mi northwest of New Harmony, Utah, at 37.5894N and 113.4486W.

Published peak discharge: The published peak discharge for this flood is 2,630 ft³/s and is rated poor.

Drainage area: The drainage area of 0.30 mi² was determined by planimeter from the Page Ranch quadrangle map, scale 1:24,500. The drainage-area computations are included with the indirect measurement.

Data for storm causing flood: The measurement summary includes the following sentence:

“Cloudburst storm of unusual intensity which caused heavy runoff on several streams in the Pine Valley Mountains.”

Little else is known about the storm. There is no evidence of similar flooding on any area gaging stations, but there are few gages in the vicinity and none on small streams. A photograph taken during the 2003 review and described herein is provided in figure A197.

Method of peak flow determination: Discharge was determined by a two-section slope-area method. The measurement survey was conducted October 15, 1964. The computation was straightforward. Only eight high-water marks were obtained on each bank, but the resulting profiles were well defined and had more than 6 ft of fall in the 73-ft reach between the two sections ($s = 0.082$ ft/ft); there was fair agreement between the banks with the left bank showing about 0.5 ft of superelevation through the reach. The computation treated both cross sections as unit sections (no subdivision) and used $n=0.045$. The field notes showed subdivision of both banks on the basis of shape but suggested an n -value increase to 0.050 only for the left bank. Elmer Butler, who ran the rod for the survey, reviewed the measurement and did not recommend the subdivision; the authors agree with Butler that the subdivision is not necessary.

The computations and summary were done by J.K. Reid, checked by “L.S.,” and reviewed by Elmer Butler. Because Butler ran the rod on the survey, the measurement had no independent outside review. Butler’s review note written on the measurement summary notes that,

“This flood represents the highest known unit rate of runoff in the State (8,770 cfs/sq mi).”

As part of this 2003 review, the original computation was run through the current slope-area computation (SAC) program. The resulting discharge of 2,640 ft³/s confirms the original computation of 2,630 ft³/s. The reach contracts by about 6 percent, and about 90 percent of the total energy loss was due to friction loss. Mean velocities were 18 ft/s, mean depths are less than 3 ft, and Froude numbers are 1.84 and 1.99. These values of Froude number are high.

Possible sources of error: The most obvious source of uncertainty is in the roughness values associated with slopes of about 8 percent. However, the values used seem to be consistent with verification data collected for more moderate slopes. The other principal source of uncertainty is in the drainage area. Even a small change in the basin boundary would have a significant effect on the final drainage area. That drainage area, however, was determined from a 1:24,000-scale map that is still the best available.

Recommendations of what could have been done differently: Neither the field notes nor the measurement summary mention why the survey was limited to the approximately 130-ft reach. A longer reach with three sections could add confidence in the final result. The site appears that it could have supported at least one more cross section if the profile had been extended about 50 ft.

Apparently no photographs were taken in 1964 or they were misplaced. Photographs are not optional; they are indispensable in reviewing indirect measurements and in locating the reach and cross sections during later site visits. On the basis of the amount of sand now present on the streambed and highly turbulent, supercritical flow, the n values used may actually be low. However, without photographs, one could only assume from the written summary description of the cross sections that less sand was present in 1964.

Site visit and review: A field visit was made August 26, 2003, by John Costa (USGS Office of Surface Water), Gary Gallino (USGS retired), Dale Wilberg and Terry Kenne (USGS, Utah Water Science Center), and Kenneth Wahl (USGS retired). Because the site was located about 0.75 mi from the nearest road and no photographs were taken in 1964, there is no assurance that the reviewers located the exact reach of the original survey. On the basis of the fall, cross-section dimensions, and GPS location, however, it is believed that the appropriate reach was found.

There is considerable evidence of old debris flows along the channel upstream of the survey reach, but the surveyed reach showed none of the characteristics of debris flow. Therefore, the reviewers concluded that the flow had been a water flood. Although the reach appears to be straight on the plan view, the site visit revealed that there is a slight curvature to the right throughout the reach. That curvature, combined with the high velocities, could easily produce the 0.5 ft of superelevation shown for the left bank.

Recommendation: The original peak discharge of 2,630 ft³/s should be accepted as published.

The flood appears to have been a water flood, the computation was done correctly, and there is no new evidence to support a recomputation.



Figure A197. View looking downstream through slope-area reach, Little Pinto Creek tributary near Newcastle, Utah, August 26, 2003.