PROPOSED REVISION OF SKAGIT RIVER FLOOD PEAKS

Skagit River near Concrete (at the Dalles)

On the basis of a slope-area study made in the reach below the gage for the flood of November 27, 1949, it appears that the value of n used by Stewart in his 1921 flood flow computation was too low for his upper reach. It was also noted that Stewart did not take into account changes in velocity head in his computations. A recomputation of the 1921 peak by present methods using Stewart's values of A, P, and f, and n = .040 for the upper reach and n = .033 for the lower reach gives 209,000 second-feet. An examination of the plan of the channel (in verification study) shows that the upper reach is considerably larger in the middle than at the ends. This and the turbulence caused by water passing through the Dalles probably accounts for the large coefficient. The reach AB in the verification study lies wholly within Stewart's upper reach. For this particular reach it may be the assumption of a 50% recovery of energy is too great. I can find no data on which to base an estimate of the percentage of energy recovery for various conditions, but it might be that much of this energy is lost in moving the gravel bottom of the stream. The turbulence would tend to be absorbed by movement of the gravel rather than to be reflected as from a more solid bottom. Anyway it is consistent to assume 50% recovery for both computations. The lower reach is undoubtedly the better.

The need for revision of the historic flood peaks is supported by the logarithmic extension of the present rating curve. See attached rating sheet showing present rating curve and Stewart's figures for the historic flood. It may be argued that the curve should bend to the right at the upper end because of the great overflow area on the right bank. This is of course possible, but at those times the overflow area was heavily timbered and would carry little water. In

addition, the possibility of a reduction in slope due to log jams downstream is to be considered. The recomputed value of 209,000 second-feet mentioned above checks this logarithmic extension within 2%. The flood frequency curve shows a sharp offset to the right between recorded and historic floods and casts further doubt on the published values for the historic floods.

It is proposed that the values for the historic floods be revised as shown in the following table:

	Discharge in second-feet		
Flood year	Stewart's figures as published		Proposed revision
1815	500,000		400,000
1856	350,000		280,000
1897	275,000	265,000	230,000
1909	260,000	230,000	220,000
1921	240,000	225,000	210,000
1917	220,000	205,000	190,000

Skagit River near Sedro Woolley

Revision of flood peaks near Concrete will necessitate revision of those near Sedro Woolley. There was little basis for the original extension of the rating curves at Sedro Woolley. A discussion of the 1921 flood peak determination at Sedro Woolley is given in order to show that a substantial reduction of the published value is reasonable. On the basis of the revised rating curve extension and revised discharges near Concrete all the Sedro Woolley flood peaks are reduced in value.

The extension of the rating curve for the 1921 flood is based on measurements made during 1922-23. See rating curve sheet approved by Stewart & Parker, March 11, 1923. Measurements 64 and 65 were float measurements. Discounting

them, the curve is defined above 52,000 second-feet. This curve could be extended to 24.3 ft. to show 150,000 second-feet or less. It would seem that flattening of the slope at high stages would partly counteract the additional effective cross sectional area due to overflow of the banks.

The flood of Nov. 28, 1949, reached a stage of 41.7 ft. (U.S.G.S. datum) at Sedro Woolley. Measurement No. 76 shows the datum then in use (prior to 1923) to be 8.93 ft. higher than U.S.G.S. datum. Then the 1921 flood was higher than the 1949 by 54.3 - 8.9 - 41.7 = 3.7 feet. The discharge of the 1949 flood was 112,000 second-feet at Mt. Vernon (from rating curve extended above 101,000). Therefore, it does not seem unreasonable to reduce the 1921 flood peak at Sedro Woolley substantially from the published figure. The attached log rating curve shows the proposed extension for main channel flow. It is used as a guide in reducing Stewart's figures for flood peaks. The channel was probably less confined in 1921 than at the present time. The proposed revisions are shown below:

Year	Peak Discharge in Second-feet	
	Stewart's figures as published	Proposed revision
1815	400,000	330,000
1856	300,000	230,000
1896	185,000	170,000
1897	190,000	170,000
1906	180,000	160,000
1909	220,000	190,000
1917	195,000	160,000
1921	210,000	170,000

The great difference between the 1897 peak near Concrete and near Sedro

Woolley must be due to the extreme sharpness of the peak. This is mentioned in the 1922 analysis for the station near Sedro Woolley. This reduction in discharge between Concrete and Sedro Woolley is about the same percentage as occurred during the flood of November 27, 28 1949.

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