

14 Wood Street,
Pittsburgh, Pa.,
May 4, 1925.

Mr. G. L. Parker, District Engineer,
U. S. Geological Survey,
Tacoma, Washington.

Dear Mr. Parker:

I desire to acknowledge with thanks the typewritten portions of the Skagit Flood Report that were transmitted with Mr. Calkin's letter.

I regret to say that I have no more of the report ready for typing. My family (including myself) had a protracted siege of the influenza just after I asked you for some information concerning Baker River. Following the influenza the children had the measles, from which the last one has just recovered. Now it will be necessary to spend a week or ten days in the field, but after that I hope to get a great deal of work done on the Report.

In my hydrographic studies for the West Penn Power Company, I have had a chance to go into much more detail than was generally possible for any of us in the Survey. As a result of these studies, I have about come to the conclusion that for many, if not practically all, of the steep sloped streams the Survey records for maximum flood discharge are too low, except where they are based on discharge curves, the upper extensions of which were derived from area and mean velocity curves. These under-estimates I consider to be due in some cases to the use of French curves, which, at the high water end, have too little and an improper curvature for steep sloped streams. In other cases, or supplementary to the first case, I consider the trouble to be due to extending the rating table by the continued use of the last difference derived from the rating curve. In some cases, I believe a contributory cause has been the use of .2 or surface velocities with reduction coefficients to mean velocities based on measurements made at much lower stages, and consequent coefficients that are too low. Lastly, I believe that in many cases no account has been taken of the over-flow that occurs when the banks have been topped. However, in allowing for such over-flow I believe there is more danger of over-allowance than under-allowance, due to the fact that in many cases there is dead water, a large coefficient of roughness, and other factors tending to reduce the flow much below the figures for the main channel.

If you can do so, I would be interested in learning what effect the use of area and mean velocity curves have on some of your discharge curves where the area and mean velocity curves have not previously been drawn, and where .2 and .8 measurements have not been made close to the highest recorded flood stage. Possibly

the Spokane River stations are good examples if the 1894 flood crest is known; also any stations on the Columbia River where the gage is at or close to the measuring section and the 1894 flood crest is known. Another station might be the Snake River at Riparia. However, I am under the impression that I put considerably more curvature into that discharge curve before I left Tacoma. The 1917 (?) flood crest on the South fork of the Skykonish, based on mean velocity and area curves at the 1905 (?) measuring section, might also be of value, and probably there are many other stations, where the gage is at the cable section and the banks do not overflow, that would be suitable for testing out my hypothesis. The Clarks Fork at Metaline Falls, although not steep sloped, might be an interesting case, but for this curve also, I believe I put in or indicated the possibility of more curvature before leaving Tacoma. I have brought this feature up at this time because I believe that the Skagit River flood discharge at The Dalles can better be determined by an extension of the rating curve with the use of area and mean velocity curves based on the highest convenient .2 and .8 depth measurements than by attempting extreme high flood measurements. Of course, for this work a gage or reference point would be needed at the cable section. Possibly you already have such a plan in operation.

The highest flood measurements made at The Dalles should be used in checking up the coefficient of roughness that I used in my slope calculations. However, if I remember correctly, you mentioned in a previous letter that this probably would be done. One factor that should be remembered in this connection is that the slope cannot be used for 500 feet or more below The Dalles. This is due to the reduction in velocity head in that stretch of the river for high stages. In fact, for extreme high stages there is an upstream slope for some distance below The Dalles.

Very truly yours,

James E. Stewart.

JES:S