

# Memorandum

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Northwest Hydraulic Consultants  
16300 Christensen Road, Suite 350  
Seattle, WA 98188  
206.241.6000  
206.439.2420 (fax)

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PROJECT: 21759

TO: Lorna Ellestad

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COMPANY/AGENCY: Skagit County

COPY TO: Will Thomas (Michael Baker), Zhida Song-James (Michael Baker), Robert Mason (USGS), Mark Mastin (USGS), Bob Kimbrough (USGS), Cindy Barton (USGS), Chal Martin (City of Burlington), Albert Liou (PIE), Siamak Esfandiary (FEMA), Kevin Long (FEMA), Ted Perkins (FEMA), John Hunter (USACE), Dan Berentson (Skagit County)

FROM: Malcolm Leytham

SUBJECT: Skagit River 1921 High Water Marks

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Mark Mastin (USGS Tacoma) has recently pointed out that our March 2010 report on the reevaluation of historic peak discharges on the Skagit near Concrete overlooked a number of 1921 high water marks included in Stewart's field notes. The high water marks I've overlooked are at the upper and lower cross-sections of Stewart's slope area reach below The Dalles.

All 1921 high water marks we are now aware of in the slope area reach below The Dalles are summarized in Table 1 and plotted in Figure 1 on the following pages.

With the addition of high water marks at the upper and lower cross-sections (XS-1 and XS-3 on Figure 1), it now appears that Stewart defined a water surface profile to envelope the available 1921 HWMs. No weight was apparently put on any of the lower HWMs surveyed within the slope area reach. Note that, as pointed out in our March 2010 report, there are no known 1921 HWMs between XS-2 and XS-3, the reach relied on by the USGS in the 2007 re-computation of the 1921 peak discharge. (It is perhaps also worth pointing out Stewart's comment<sup>1</sup> that "the only elevations available, when the flood crest is based on high water marks, is the crest of the surges, whereas what is needed is the mean level of the water at the time of the flood crest".) It remains our opinion that given the available HWMs, there is considerable scope for uncertainty in the slope area measurements of the 1921 peak discharge.

My apologies for the oversight and thanks to Mark Mastin for pointing it out.

kml

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<sup>1</sup> Correspondence entitled *Slope Sections "The Dalles" on Skagit River near Concrete* included with letter dated 1 June 1950 from J.E. Stewart to F.M. Veatch, District Engineer, USGS Tacoma.

**Table 1: Summary of HWMs from the December 1921 Flood**

Station (ft. relative to Dalles gage)	Lower	Side of River	HWM Elevation (ft., Lower Dalles datum)	Comments from Field Notes	Source	Note
0+00			30.00	On rotten stump 25' N gauge	Loose notes 3-8-23	
5+25			29.68	H.W. - Maple tree 60' L of line	Loose notes 3-8-23	
5+38		Right	30.79	1921 HW sand in stump 80' upstream from cross-section	Page 68, 31 Jan 1923	1
6+18 - upper slope area section		Left	31.05	1921 HW mark on tree at L end of cross-section	Page 68, 31 Jan 1923	2
6+18		Right	29.70	1921 drift	Page 68, 31 Jan 1923	3
6+18		Right	31.09	1921 HWmK about OK I think. Use this	Page 68, 31 Jan 1923	4
8+65			29.06	1921 HW at Cedar tree. Note: Levels at cross-sections above and below indicate this probably is in error.	Page 64/65 30 Jan 1923	5
9+85			30.37	10" Alder - 50' Left H.W.	Loose notes 3-8-23	
15+25			28.62	H.W. 30" Hemlock 30' Left	Loose notes 3-8-23	
20+90			28.40	H.W. 10' Left Line - Moss on Vine Maples - Poorest Evidence	Loose notes 3-8-23	
24+70			28.97	H.W. 12" Alder 10' L	Loose notes 3-8-23	
46+55 - lower slope area section		Left	26.26	1921 flood mk 1.45' above this TP	Page 78/79, 29 Jan 1923	6
46+55		Right	26.30	About 0.25 above HI looks like 1921 HW, moss scoured off of tree	Page 78/79, 29 Jan 1923	7

1. Field notes give 27.9 ft above WS. WS 2.89 ft above Lower Dalles gage datum (see bottom pg 69)
2. Field notes give 28.16 ft above WS. WS 2.89 ft above Lower Dalles gage datum (see bottom pg 69)
3. Field notes give 26.81 ft above WS. WS 2.89 ft above Lower Dalles gage datum (see bottom pg 69)
4. Field notes give 28.2 ft above WS, WS 2.89 ft above Lower Dalles gage datum (see bottom pg 69)
5. Field notes give 170.10 on Lower Dalles gage datum of 141.04 (pg 67)
6. Field notes give 24.75 ft above WS on 29 Jan (pg 79). WS elev on 30 Jan given as 142.35 (pg 64/65). WS 30 Jan 0.2 ft below WS of 29 Jan (pg 65).
6. (cont.) WS to Lower Dalles gage Datum =  $24.75 + (142.35 - 141.04) + 0.2 = 26.26$  ft. (Assumes Lower Dalles datum 141.04)
7. Field notes give 24.79 ft above WS on 29 Jan (pg 79) - elevation to Lower Dalles datum determined as in Note 5.

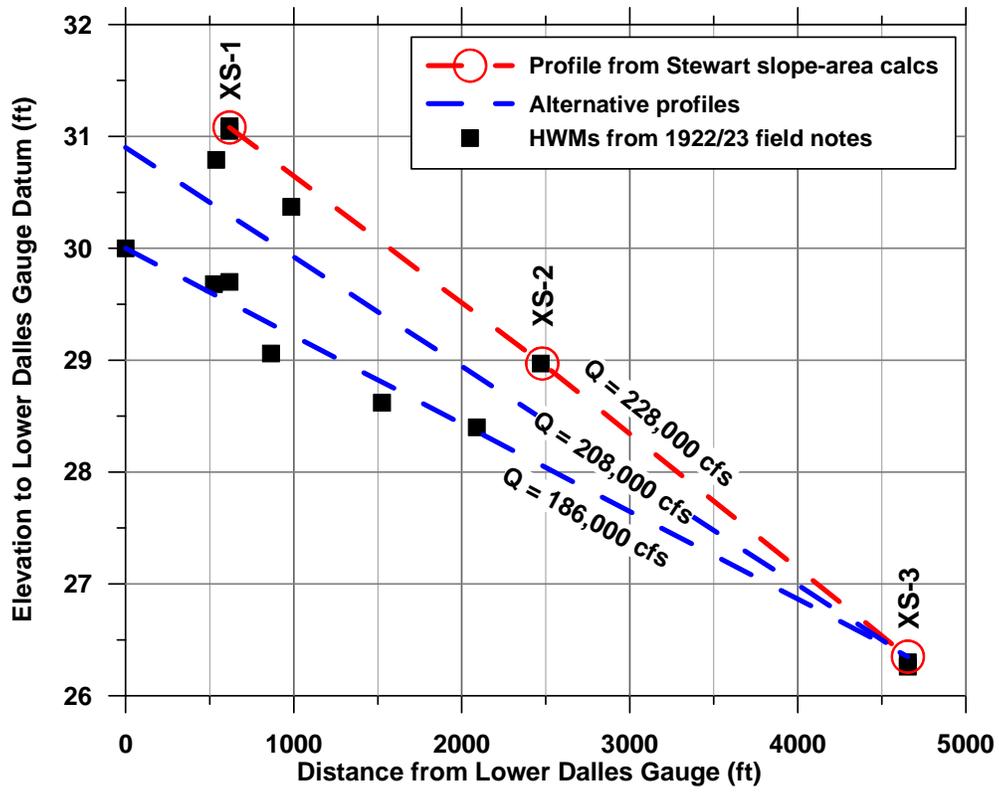


Figure 1: Stewart's 1921 HWMs and water surface profile used in slope area calculations. (Revised from Figure 3 of NHC, March 2010)