Cooper Creek Draft PHABSIM Model Review
Alaska Department of Fish and Game

#	ADF&G Comment	Relevance	HDR/Chugach Response	Action Taken
General Comments				
1	We agree it can be difficult to accurately measure WSL's (water surface elevations), depths and velocities in high gradient, turbulent streams with large substrates (high roughness), such as in plunge pool, step pool, and cascade habitats. These conditions make it difficult to collect high quality discharge measurements as well, and consequently, discharge measurements made at a given flow can vary greatly from transect to transect within a reach.	For these reasons, there were some problems with the observed measurements and modeling results for the Cooper Creek PHABSIM study, as you pointed out in PHABSIM calibration notes provided. It appeared that the alluvial reaches (I, J, K, and L) had fewer measurement problems and consequently, modeled better than the higher gradient reaches.	We are in agreement with this comment. Significant surface turbulence was present at higher flows in the Alluvial and especially Canyon Reaches, making accurate water surface elevation and depth measurements difficult to obtain.	For situations where water was measured as flowing "uphill," each water surface profile at each study site was inspected. When feasible, the water surface elevation was recalculated using the geometry station elevation and the measured depth. If this did not correct the problem, no further action was taken, and the flow was avoided during calibration, if possible.
Specific Comments				
2	A description is needed on whether the downstream most transect of each reach was established at a hydraulic control.	It's difficult to tell, but by looking at the longitudinal profiles of the stream bed/thalweg, it looks some of the reaches did not start at a hydraulic control (e.g., reaches A, E, J, K, L).	The downstream cross-section at all study sites was located on a hydraulic control, most of which were selected during the Instream Flow Review Team transect selection field trip on May 9 and 12, 2003. In the cases of Study Sites A, E, and K, the downstream site is located at a narrow channel width that controls the upstream segment. The downstream cross-section at study Site J is across the head of what appears to be a historic rock weir. For Study Site L, the downstream transect was placed at a high terrace-induced riffle.	None.
3	A description is needed on how the best estimates of discharge used in calibration were determined.	It is not clear how these best estimates of discharge were derived when reviewing measured discharge values collected at the sites. For example, how did you come up with 9 cfs as the calibration discharge for sites A – D during trip 1 given that all the measured discharges were greater than 9 cfs?	For Trips 2, 3, and 4, flows were estimated using the Haested Methods FlowMaster Software (v. 6.1). Channel geometry, energy slope, and water surface elevation data were entered into the program to estimate flows at each cross-section. Output were averaged when appropriate across the study site, and compared to known data at the USGS gage for Study Sites I, J, K, and L, and at the project flow gage for Study Sites E and F. Flows were directly measured in Trips 1 and 5.	The decision was made to limit the water surface elevation and velocity calibration to Trips 1 and 5, for which individual cross-section flows were collected.
4	It is unclear how the discharge measurements were determined for each WSL calibration set.	There should be at least one discharge measurement for each set of measured WSL's at each reach. In other words, for each measured WSL, its important to know the corresponding discharge. For example, there are discharge measurements for 9 and 18 cfs for reach A, but no discharge measurement for the other listed stream discharges of 2, 6, and 7 cfs.	See comment for Item #3.	See comment for Item #3.
Water Surface Modeling				
5	Based on the measured WSL's, several reaches had: 1) water running uphill (F, G, and H – cells in highlighted in tan in attached spreadsheet) or 2) WSL's decreasing as Q increased at a given transect (as evidenced by lines crossing on the longitudinal profiles of observed WSL's e.g., A, C, D, E) (the cells highlighted in green in attached).		See comment for Item #1.	All measured data were double-checked against the survey data; no errors in data entry were found. The WSL's in question were analyzed using the method described in the comment for Item #1.
6	The high Q (82 cfs) WSL profile for Reach L appears very odd – possible data transcription error.		This estimate was based on the procedure described in the comment for Item #3.	This flow was adjusted in the final model to 77.2 cfs. This estimate was based on linear regression between measured and gaged flows in Trips 1 and 5.
Velocity Modeling				

7	As discussed, making good Q measurements in complex channels is difficult, as evidenced by the variability in measured Q's from transect to transect within a reach at a given flow. Given the complexity of the stream channels, more measurements along each cross section should have been taken (i.e., spaced the verticals closer together).	All of these things contributed to the numerous examples of odd looking VAFs however this could also be an artifact or site-specific conditions and do not necessarily mean that the velocity modeling is bad.	We agree with these comments. It should be noted that the validity of velocity calibration is highly dependent on the accurate calibration of water surface elevations. Increasing the accuracy of WSL calibration should positively impact velocity modeling results, including VAFs.	In the final model, WSLs were adjusted when applicable (see comment for item #1), and a more accurate WSL calibration resulted in better velocity calibration. VAFs and Froude numbers increased with flow at most cross-sections; the few cross-sections (A-2, E-3) for which this relationship was not seen had odd physical situations (low terrace at E-3, consistent water surface elevation eccentricities at A-2).